



Installation Guide

Turntide Smart Motor System for AHU Applications with Pre-Wired Motor Controllers

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March 2022

Revision History

Document Revision Number	Description	Date
1.0	Initial Release	March 11, 2022

Conventions

Bold	Used in procedures for names of interface elements, such as buttons, fields, and menu items.
<i>Italics</i>	Used for emphasis, typically when introducing a new concept.
Note:	Indicates information that can help a customer make better use of a Turntide product.
Caution icon 	Indicates an instruction that draws attention to the risk of damage to the product, process, or surroundings.
Warning icon 	Indicates an instruction that draws attention to risk of injury or death and tells the customer how to avoid the potential problem.

Legal

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Audience

The instructions in this guide are intended for a mechanical technician who is used to working with commercial AHU equipment.

You will have access to Remote Support from Turntide Technical Services:

877.776.8470

support@turntide.com

Installation Prerequisite

Installers are required to complete our online training courses for this product prior to performing installations. See Turntide Academy: www.turntideacademy.com



REQUIRED

Follow all local and national electrical codes, safety compliance requirements, and common installation procedures.

Overview

The Turntide software-driven motor solution includes the Turntide Smart Motor and the Turntide Motor Controller, complete with networking and connection capabilities to Turntide Cloud Services. It is proven to significantly reduce energy consumption, dramatically reducing energy costs and carbon footprint resulting from electric motor operation.

The Turntide Smart Motor are very heavy—make appropriate plans for moving it safely.

- V01 motor weighs 54 lbs.
- V02 motor weighs 72 lbs.
- V03 motor weighs 150 lbs.

Unique Aspects

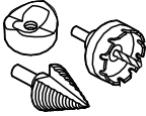
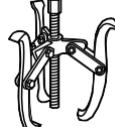
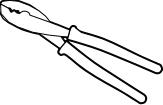
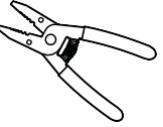
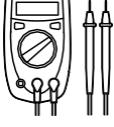
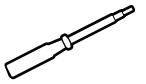
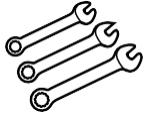
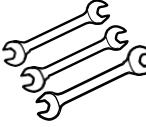
- Less hardware is required to control HVAC and other equipment because the Turntide Smart Motor System enables a configurable sequence of operation, based on internal and external sensor feedback from up to 16 integrated I/O points:
 - 7x digital inputs (dry-contact or 24- volt)
 - 4x dry contact relays
 - 4x universal inputs (resistive, voltage, current, logic signal)
 - 1x analog output (0-10VDC)
- Safe DC Bus discharge ensures the internal voltages of the controller are rapidly discharged for safe service and maintenance immediately after power-down
- Built-in soft start and brownout protection eliminate service calls due to inadvertent circuit breaker trips



All cables provided by Turntide are NOT rated for outdoor use.



Tools You'll Need

			
Cordless Drill	Uni-bit, Hole Saw or Knock Outs for 1/2", 3/4" & 1" EMT	Drill Bit Index up to 1/2"	Wheel Puller 3-jaw for removing existing motor pulley
			
Terminal (Spade) Crimp Tool	Wire Strippers	Multi-VOM Meter	Clamp Amp Meter
			
Adjustable Pliers	Needle Nose Pliers	Allen Wrench 5m	Allen Wrench Set 1/8"-3/8"
			
Screwdriver Phillips	Screwdriver Slot	Screwdriver Small terminating	Nut Driver 1/4" and 5/16"
			Additional supplies: <ul style="list-style-type: none"> • Silicon Caulk • Loctite 620 • Degreaser
Combo Box/Open-End Wrenches up to 3/4"	Thin Head Access Wrenches	90 Degree Offset Wrenches	

Included Items

Everything typically required to install the Turntide Smart Motor System arrives in three separate boxes:

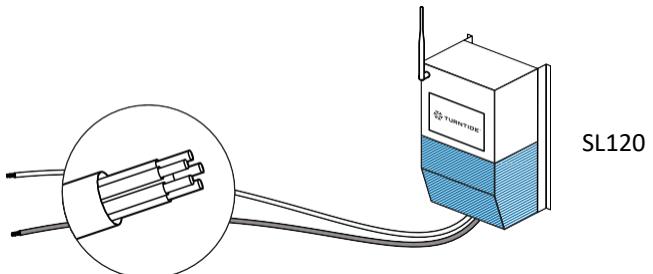
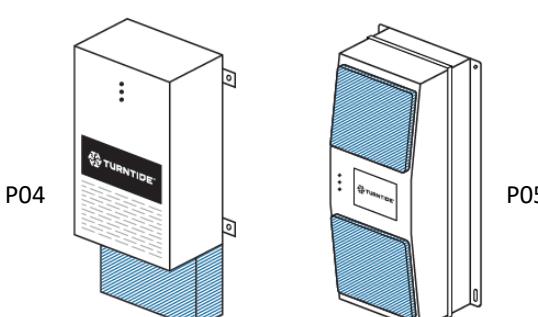
- Turntide Smart Motor
- Turntide Motor Controller
- Turntide Motor Install Kit

Note: Not all components will be used on every installation. For unique applications, additional supplies may be required.

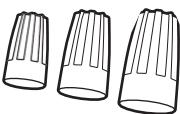
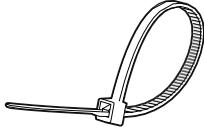
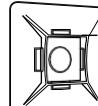
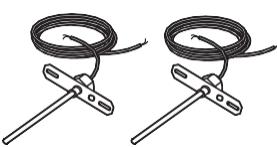
Box 1: Turntide Smart Motor

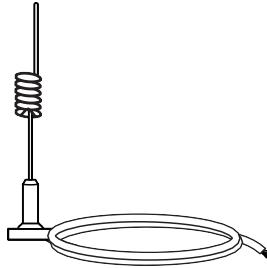
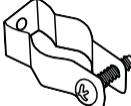
Item	Quantity
Turntide motor	1
Shaft Adapter & Key (included only with motors having a 5.8" shaft. Loctite 620 retaining compound)	1
Power cable	1
Feet spacers	2
Feet spacer bolts	4
Bolt spacers	4

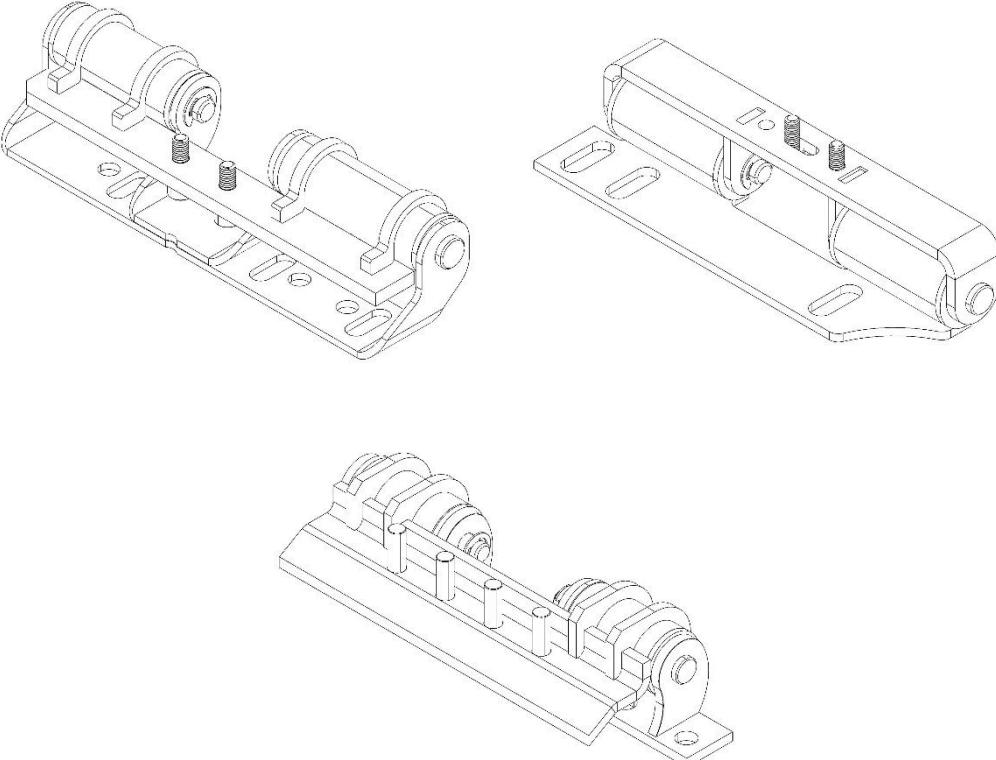
Box 2: Turntide Smart Motor

Item	Quantity
Motor Controller and Control Cables	1 Motor 2 Cables
 <p>SL120</p>	
Different Turntide Motor Controller models are available for different motor configurations. Their installation is described in this guide.	
 <p>P04 P05</p>	
Antenna	1

Box 3: Motor Installation Kit

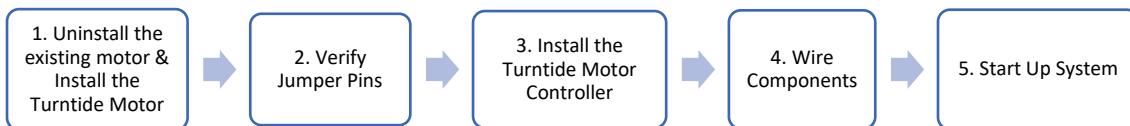
Item	Quantity
Wire nuts – tan/red for motor power cable	6
	
Wire nuts – blue for thermostat	12
	
Hex screws – 5/16" x 3/4"	6
	
Cable ties	10
	
Snap-in bushing – 1/2"	6
	
Snap-in bushing – 3/4"	6
	
Cable Tie bases	6
	
Air temp sensors & 10" wire included if applicable and may arrive in a separate box. Sensor appearance may vary.	2
	

Item	Quantity
Turntide and Caution labels	1 each
 <p>The image shows two labels. The top label is a yellow 'CAUTION' sign with the text 'SMART MOTOR MAY START UNEXPECTEDLY' and 'SMART MOTOR SYSTEM'. The bottom label is a blue 'POWERED BY TURNTIDE by Software Motor Company' logo.</p>	
Antenna Installation Kit - 1 kit (all items)	1
 <p>The image shows a diagram of an antenna installation kit. It consists of a vertical antenna pole mounted on a base, with a coiled cable running from the base to the pole.</p>	
½" Conduit Hanger	2
 <p>The image shows a diagram of a ½" EMT conduit hanger, which is a U-shaped bracket with a screw mechanism for securing conduit to a wall or joist.</p>	
½" x 12" EMT Conduit	2
 <p>The image shows a diagram of a ½" x 12" EMT (Electrical Metal Tubing) conduit, represented as a long cylindrical tube.</p>	
½" EMT Coupling	1
 <p>The image shows a diagram of a ½" EMT coupling, which is a short section of conduit with threaded ends for joining two pieces of conduit together.</p>	
½" EMT Connector	1
 <p>The image shows a diagram of a ½" EMT connector, which is a fitting used to connect a conduit to a junction box or another type of electrical fixture.</p>	
Sheet Metal Screw	2
 <p>The image shows a diagram of a sheet metal screw, which is a type of fastener with a flat head and a sharp point for driving into metal surfaces.</p>	

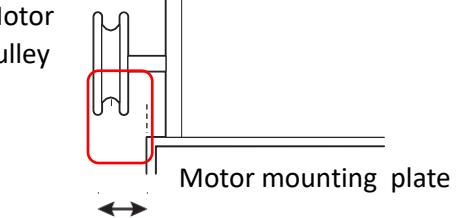
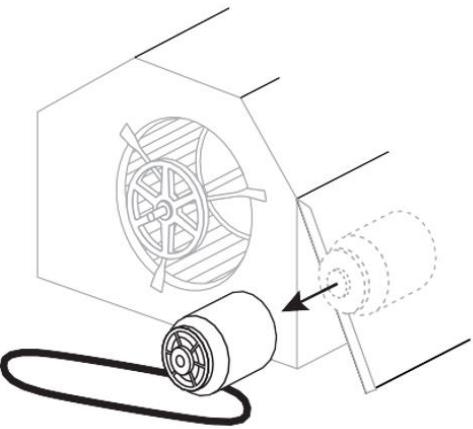
Item	Quantity
Electrical Box Cover	1
Weather Tite Connector	1
Motor Isolator Kit V01, V02, V03 Motor Isolators	1 Kit
	

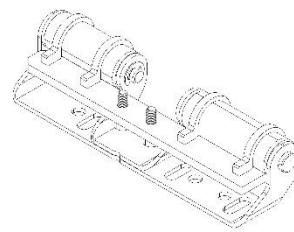
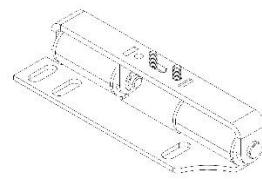
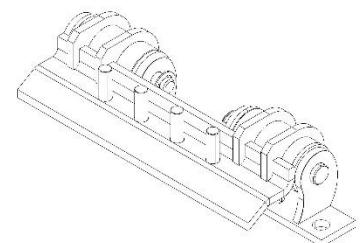
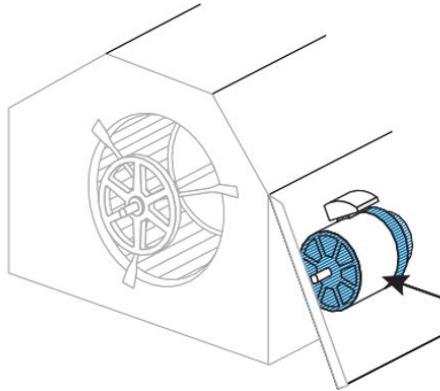
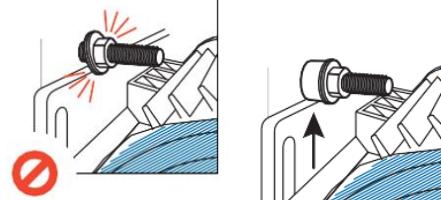
Installation Instructions in an AHU

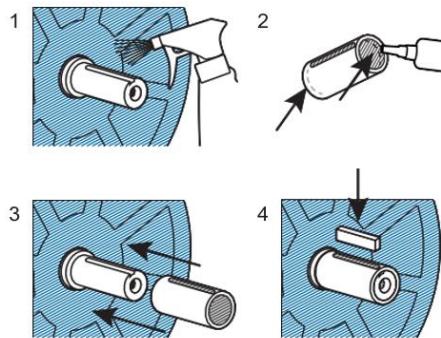
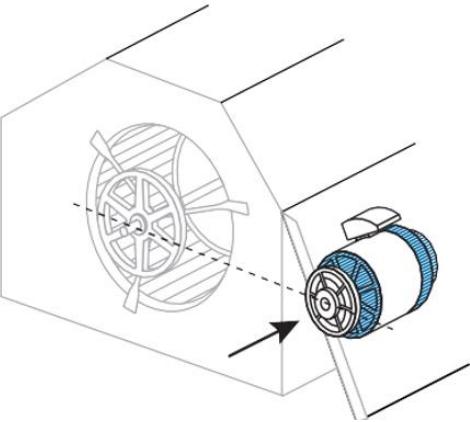
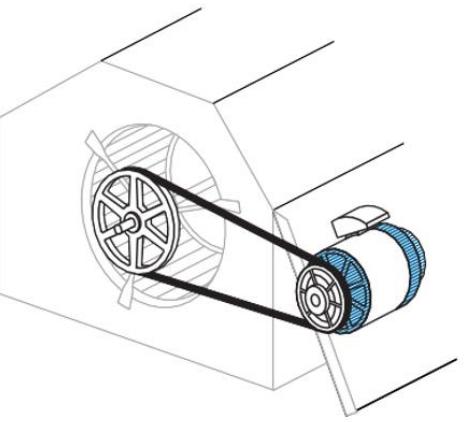
Follow these simple step-by-step instructions to replace the existing motor in a common Air Handling Units (AHU) with a new Turntide Smart Motor System.



Step 1: Uninstall the existing motor and install the Turntide Motor

1	<p>Isolate all incoming power to AHU unit using normal Lock Out/Tag Out and local code requirements and verify that all power is turned off to the unit.</p>	
2	<p>Measure and record the distance between the end of the motor mounting plate and the end of motor pulley.</p>	
3	<p>Remove the existing belt and motor. In most cases, it's easier to remove the motor pulley before removing the motor.</p>	

	<p>4 Install Motor Isolator Feet to the base of the motor as per instructions in the <i>Motor Isolator Kit Installation Guide</i> (in the Appendix of this guide).</p> <p>Isolators are motor-specific.</p>	<p>V01 Motor Isolator</p>  <p>V02 Motor Isolator</p>  <p>V03 Motor Isolator</p> 
	<p>5 Install the Turntide Smart Motor to the existing motor mounting plate.</p>	
	<p>6 In some cases, tightening the motor plate nut is not possible. The provided bolt spacers allow for proper nut tightening.</p>	

7	<p>If the Turntide Motor has a 5/8" shaft and the existing pulley is 7/8" ID, install the shaft adapter as follows:</p> <ol style="list-style-type: none"> 1. Clean the shaft with degreaser. 2. Apply a small amount of Locktite 620. 3. Install the shaft adapter with the set screw towards the shaft end. 4. Insert the extended height shaft key and tighten the set screw to lock the shaft adapter in place. 	
8	<p>Reinstall original motor pulley, referencing the distance you recorded. If the existing belt or pulley show signs of excessive wear, they should be replaced. Replacing worn components will ensure that the system is running most efficiently.</p>	
9	<p>Install the belt and tension to 1/64" deflection per inch of distance between motor and blower shafts. If the belt cannot be properly tensioned after replacing the existing motor with a Turntide Smart Motor System, a longer or shorter belt should be installed. This will ensure that the belt can be tensioned correctly, and the system will run most efficiently.</p>	

Step 2: Verify Jumper Pins

Turntide motor controllers are designed for several applications. The jumpers are used to configure the motor controller for a specific application.

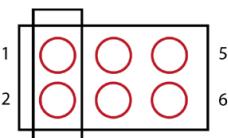
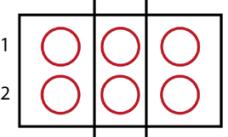
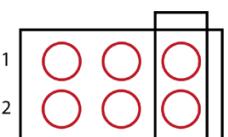
The **Digital Input Mode** jumpers determine the inputs the motor controller recognizes.

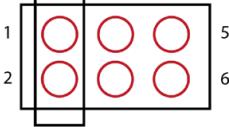
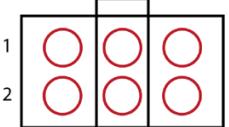
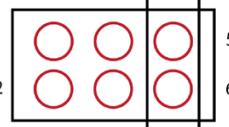
- The most common configuration is a jumper across pins 1&2 and another across pins 5&6.
- Pins 1&2 enable the MODBUS EOL resistor.
- Pins 5&6 set the motor controller to respond to 24VAC inputs.

The **Universal Input (UI)** jumpers define the connected device type.

- Currently UI3 and UI4 are used in applications with Supply and Return Air sensors.
- Setting the respective jumpers across pins 1 & 2 configure the control to respond to the resistive load of the thermistor.

Important: Mode Input Selection must be jumpers 1&2 and 3&4 OR 1&2 and 5&6.

Motor Controller Model	Modbus EOL Jumper	Digital Input Mode Jumper	Universal Input Mode Jumpers			
			UI1	UI2	UI3	UI4
P04W	J96	J96	J5125	J111	J112	J113
P05	J96	J96	J5125	J111	J112	J113
SL120	J10	J10	J11	J12	J13	J14
Modbus EOL Selection						
Pin Selections		Mode			Examples	
1 & 2		Installed: Enables EOL Resistor (End of line) Removed: Disables EOL Resistor (End of line0			Install if wiring to terminals D+/D is end of daisy chain.	
						
Digital Input Mode Selection						
Pin Selections		Mode			Examples	
3 & 4		Enables digital inputs LOGIC or dry contact mode.			Install if S1 through S7 will be used to receive contact closures for control.	
						
5 & 6		Enables digital inputs 24VAC signaling mode.			Install if S1 through S7 will be used to received 24VAC input signal from existing BMS or thermostat.	
						

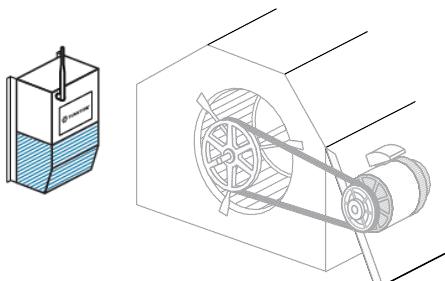
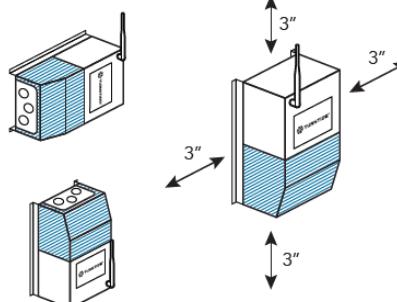
Universal Input Mode Selection		
Pin Selections	Mode	Examples
1 & 2 	Resistive/LOGIC: Returns resistance of connected element or ON/OFF if declared as resistive or LOGIC mode respectively.	Resistive: 2 wire 10K Ω thermistor LOGIC: Dry contact closure = ON Dry contact open = OFF
3 & 4 	Voltage: 0-10V signal ended voltage input.	3-wire device with external power source that provides 0-10V signal. (1 signal, 1 common, 1 power)
5 & 6 	Current: 0-20mA current input.	3-wire device with external power source that provides a 0-20mA signal. (1 signal, 1 common, 1 power)

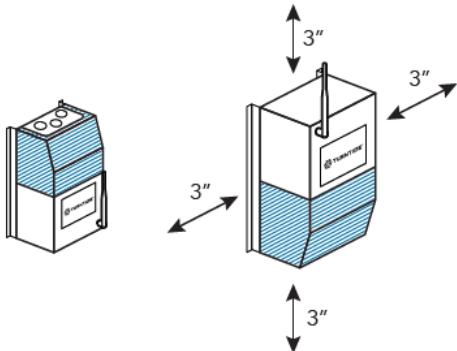
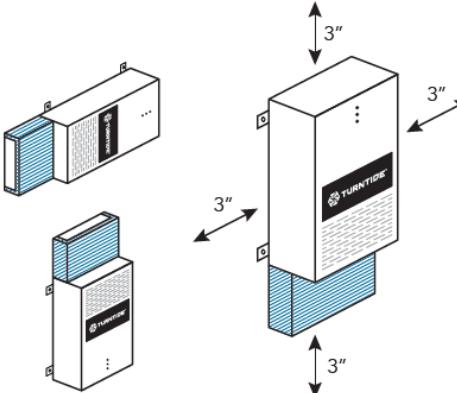
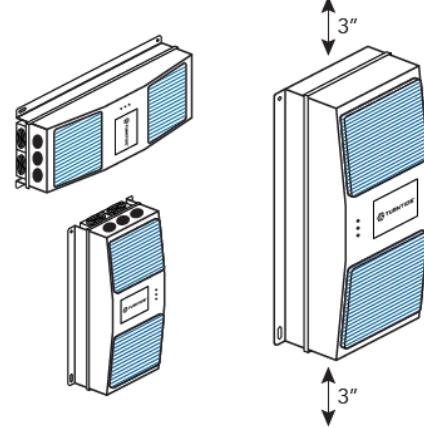
Step 3: Install the Turntide Motor Controller

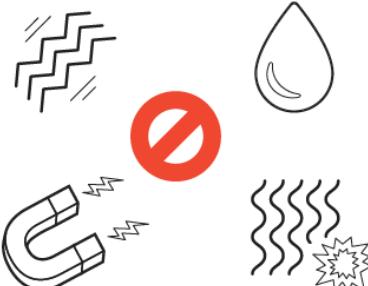
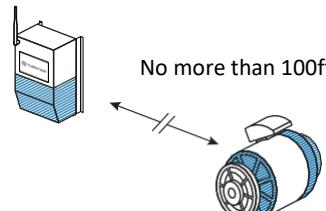
Important:

If the existing motor uses an analog signal to control motor speed, remove the **white** and **black** prewired cable assemblies from the motor controller. These are intended for use with a traditional thermostat and will not be used when speed control is a 0-10V, 2-10V, 0-20 mA or 4-20 mA signal.

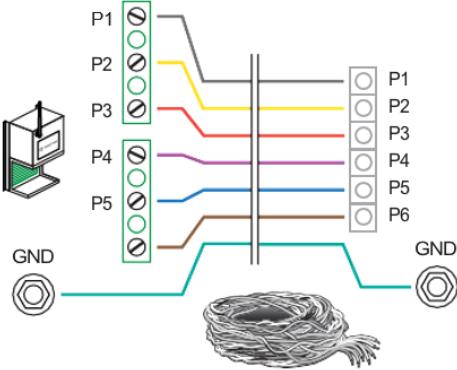
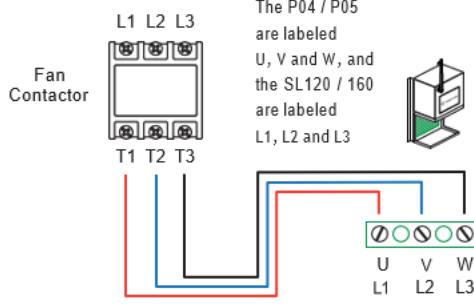
If the AHU is constant volume or is controlled by a thermostat control board, leave the control cables installed. Perform the motor controller installation procedures for an RTU installation (including the [Step 2: Verify Jumper Pins](#) in this guide). The **Turntide® Smart Motor System Install Guide For RTU Monitor Only Applications with Pre-Wired Motor Controllers** instructions are available in the [Appendix](#).

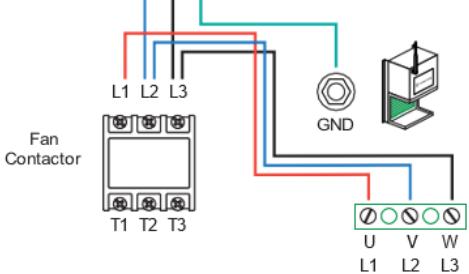
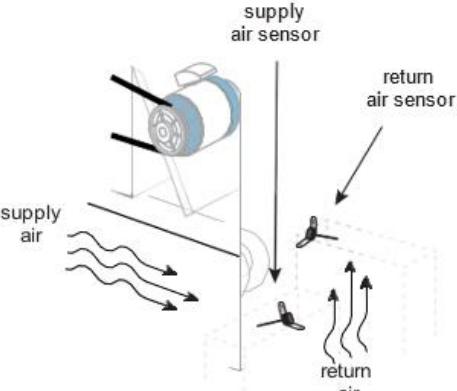
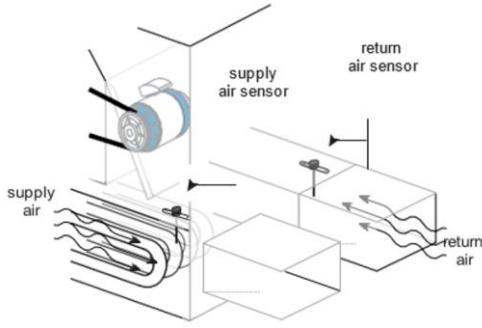
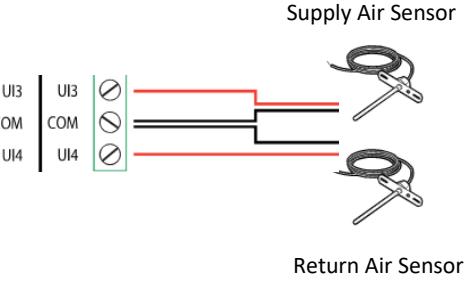
1	<p>Mount the Turntide Motor Controller inside the AHU-ideally in the blower cabinet-using caution not to penetrate the cabinet with the screws.</p> <p>If a suitable location is <i>not</i> available, it may be mounted to the exterior of the AHU within a NEMA 3 enclosure if outdoors, or on a wall of the mechanical room close to the AHU.</p>	
2a	<p>SL120 Motor Controller</p> <p>Insert bushings into the motor controller and mount in any position to a rigid surface with a minimum clear space of 3" on all sides.</p>	

2b	<p>SL160 Motor Controller Insert bushings into the motor controller and mount vertically to a rigid surface with a minimum clear space of 3" on all sides, with antenna up for best results.</p>	
2c	<p>P04 Motor Controller Insert bushings into motor controller and mount in any position to a rigid surface with a minimum clear space of 3" on all sides.</p>	
2d	<p>P05 Motor Controller Insert bushings into motor controller and mount in any position to a rigid surface with a minimum clear space of 3" on top and bottom. Note that there is no minimum clearance on the sides.</p>	

3	<p>Ensure the controller is far from excessive vibration, moisture, electromagnetic interference, and explosive/corrosive vapors.</p>	
4	<p>If a longer Motor Power Cable is needed, Turntide offers a 10M (~33Ft) option. Contact Turntide Technical Services for distances greater than 10M.</p>	

Step 4: Wire Components

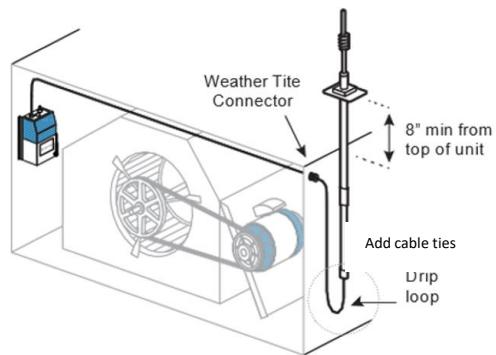
1	<p>Refer to Input Specific Wiring Schematics for detailed wiring instructions.</p> <p>Important: If the AHU is constant volume or is controlled by a thermostat control board, consult the wiring diagram and instructions in the <i>Turntide® Smart Motor System Install Guide For RTU Monitor Only Applications with Pre-Wired Motor Controllers</i> in the Appendix.</p>	<ul style="list-style-type: none"> • Single Speed – Single Start/Stop Signal on page 24 • Multi Speed – Multi Start/Stop Signals on page 25 • 0-10V / 2-10V plus Start/Stop Signal on page 26 • 0-20mA / 4-20mA plus Start/Stop Signal on page 27
2	<ol style="list-style-type: none"> 1. Insert bushing into the motor electrical box. 2. Install the ferrules end of the motor power cable to the Turntide Motor Controller and unterminated leads to the Turntide Smart Motor. 3. Cut excess length from the raw end of the cable to required length, leaving ample slack for future servicing. 	
3	<p>Connect the induction motor power wires to the Turntide Motor Controller.</p> <p>If the original induction motor had separate overload wires, then they must be connected together.</p>	

4	<p>Relocate induction motor power wires from the Load side of the fan contactor to the Line side, so that the Turntide Motor Controller has an unswitched power supply.</p>	
5a	<p>Air Sensor Installation Air sensors are NOT intended for installations exposed to weather. If not using, skip tasks (5a) through (5c).</p> <p>Install the supply air sensor downstream of the coil and heat exchanger, and the return air sensor in the return duct inlet. (Sensors are identical and can be installed in either location.)</p>	
5b	<p>For horizontally ducted units, install the supply air sensor through blower deck just beyond the heat exchanger, and the return air sensor where duct enters unit.</p>	
5c	<p>Wire sensors to the Turntide Motor Controller per configuration specific wiring diagrams. See Input Specific Wiring Schematics on page 24.</p> <p>Sensors are not polarity sensitive.</p>	 <p style="text-align: center;">Supply Air Sensor</p> <p style="text-align: center;">Return Air Sensor</p>

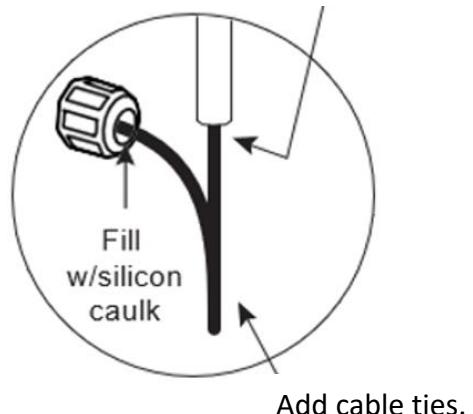
6 *If no Remote Monitoring Kit (RMK) is on site, skip this task.*

If an existing RMK is on site:

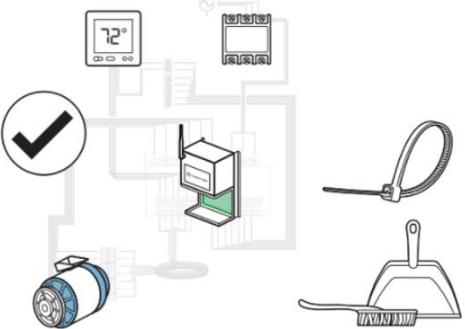
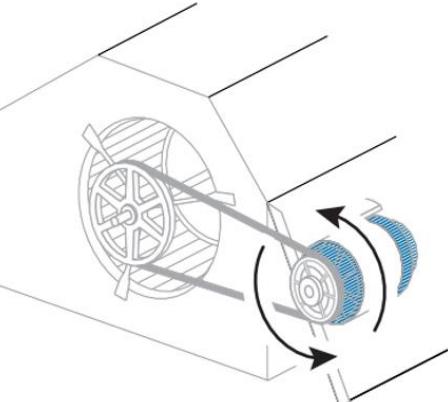
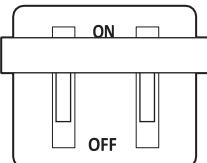
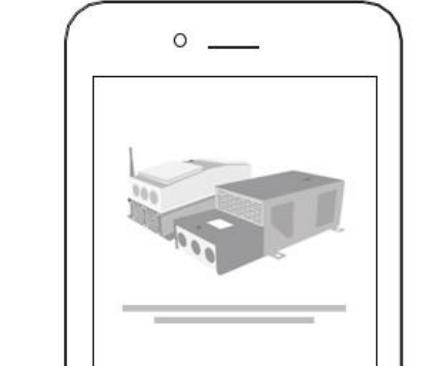
1. Install antenna on top of electrical box cover and route wire down through EMT conduit.
2. Attach Weather Tite connector to non-removable panel and route the antenna lead though the connector, sealing the opening from weather using silicone caulk.
3. Connect the antenna lead to the Turntide Motor Controller using a finger-tight connection only—overtightening will damage the connection.

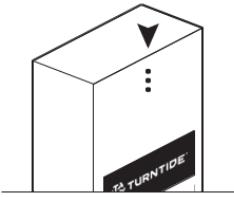
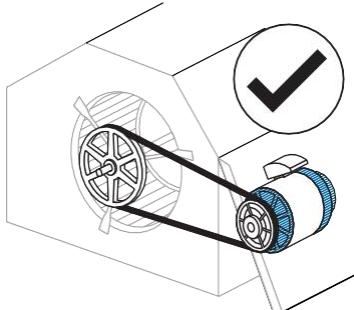
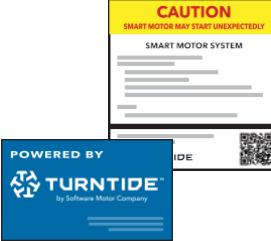


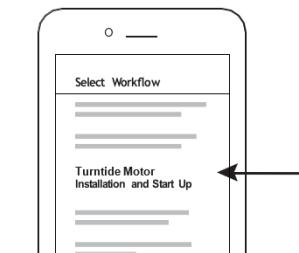
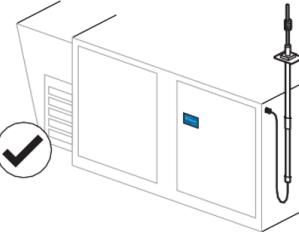
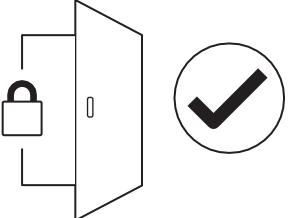
Open for drainage.
Do not seal.



Step 5: Start Up the System

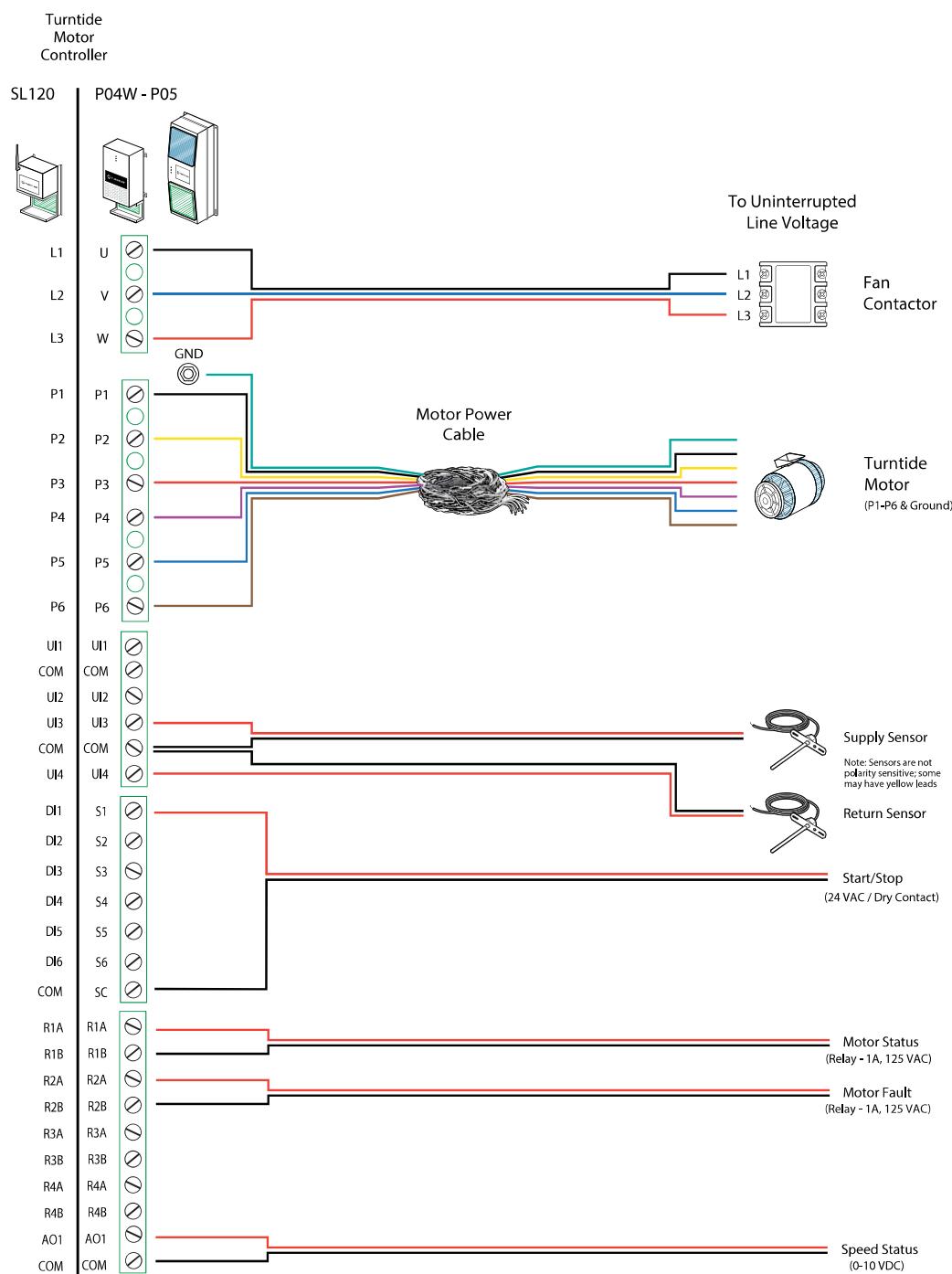
1	<ol style="list-style-type: none"> 1. Verify that all wiring is correct and wire terminations are tight and secure. 2. Install cable ties around any loose wires and clean blower cavity of any debris from installation. 	
2	<p>Turn the fan pulley by hand and verify that the motor pulley and fan rotate freely.</p>	
3	<p>Turn on power to the unit.</p>	
4	<p>Use the Turntide Technician App to commission the motor. The Turntide Technician App User Guide is in the appendix of this document.</p>	

5	<p>Upon power up, the red and yellow LEDs will illuminate briefly, the green LED will the illuminate solid, and the yellow LED will blink once every five seconds to indicate logic flow.</p> <p>Inspect the Turntide Motor Controller's LEDs for the correct run sequence.</p>	 <table border="1" data-bbox="1220 242 1428 418"> <thead> <tr> <th>POWER UP</th><th>NORMAL CONDITION</th></tr> </thead> <tbody> <tr> <td>Red</td><td>Green</td></tr> <tr> <td>Yellow</td><td>Yellow</td></tr> </tbody> </table>	POWER UP	NORMAL CONDITION	Red	Green	Yellow	Yellow										
POWER UP	NORMAL CONDITION																	
Red	Green																	
Yellow	Yellow																	
6	<p>Use the Turntide Technician App to confirm that the motor will ramp to full speed.</p> <p>The Turntide Technician App User Guide is in the appendix of this document.</p>																	
7	<p>Cycle system through all stages of heating, cooling, and vent to confirm operation matches system demand.</p>	<p>Single Stage Systems</p> <table border="1" data-bbox="1073 1015 1416 1205"> <thead> <tr> <th>MODE</th><th>MOTOR SPEED</th></tr> </thead> <tbody> <tr> <td>Vent</td><td>Low</td></tr> <tr> <td>Heat</td><td>High</td></tr> <tr> <td>Cool</td><td>High</td></tr> </tbody> </table> <p>Two Stage Systems</p> <table border="1" data-bbox="1073 1248 1416 1410"> <thead> <tr> <th>MODE</th><th>MOTOR SPEED</th></tr> </thead> <tbody> <tr> <td>Vent</td><td>Low</td></tr> <tr> <td>Heat 1 / Cool 1</td><td>Med</td></tr> <tr> <td>Heat 2 / Cool 2</td><td>High</td></tr> </tbody> </table>	MODE	MOTOR SPEED	Vent	Low	Heat	High	Cool	High	MODE	MOTOR SPEED	Vent	Low	Heat 1 / Cool 1	Med	Heat 2 / Cool 2	High
MODE	MOTOR SPEED																	
Vent	Low																	
Heat	High																	
Cool	High																	
MODE	MOTOR SPEED																	
Vent	Low																	
Heat 1 / Cool 1	Med																	
Heat 2 / Cool 2	High																	
8	<p>Affix the Turntide label on the exterior of the blower access panel and the Caution label on the blower housing.</p>																	

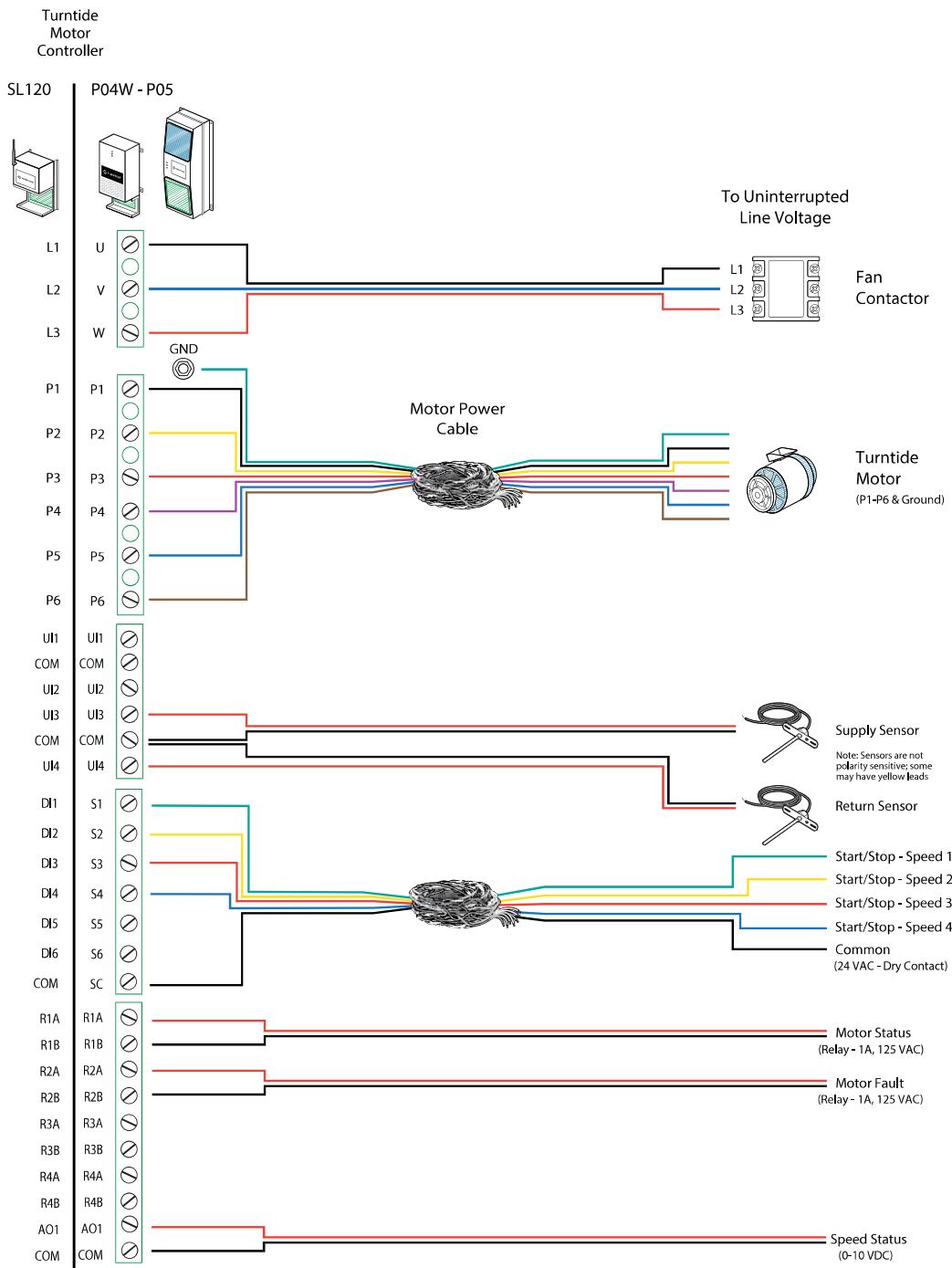
9	<p>Complete any remaining steps in the <i>Turntide Motor Installation and Start Up XOi</i> workflow.</p>	
10	<p>Confirm all access panels are re-installed and secure on unit. Ensure all unit disconnects are in the ON position and remove all materials and tools from roof/location.</p>	
11	<p>Secure roof/location access and check out with on-site manager.</p>	

Input Specific Wiring Schematics

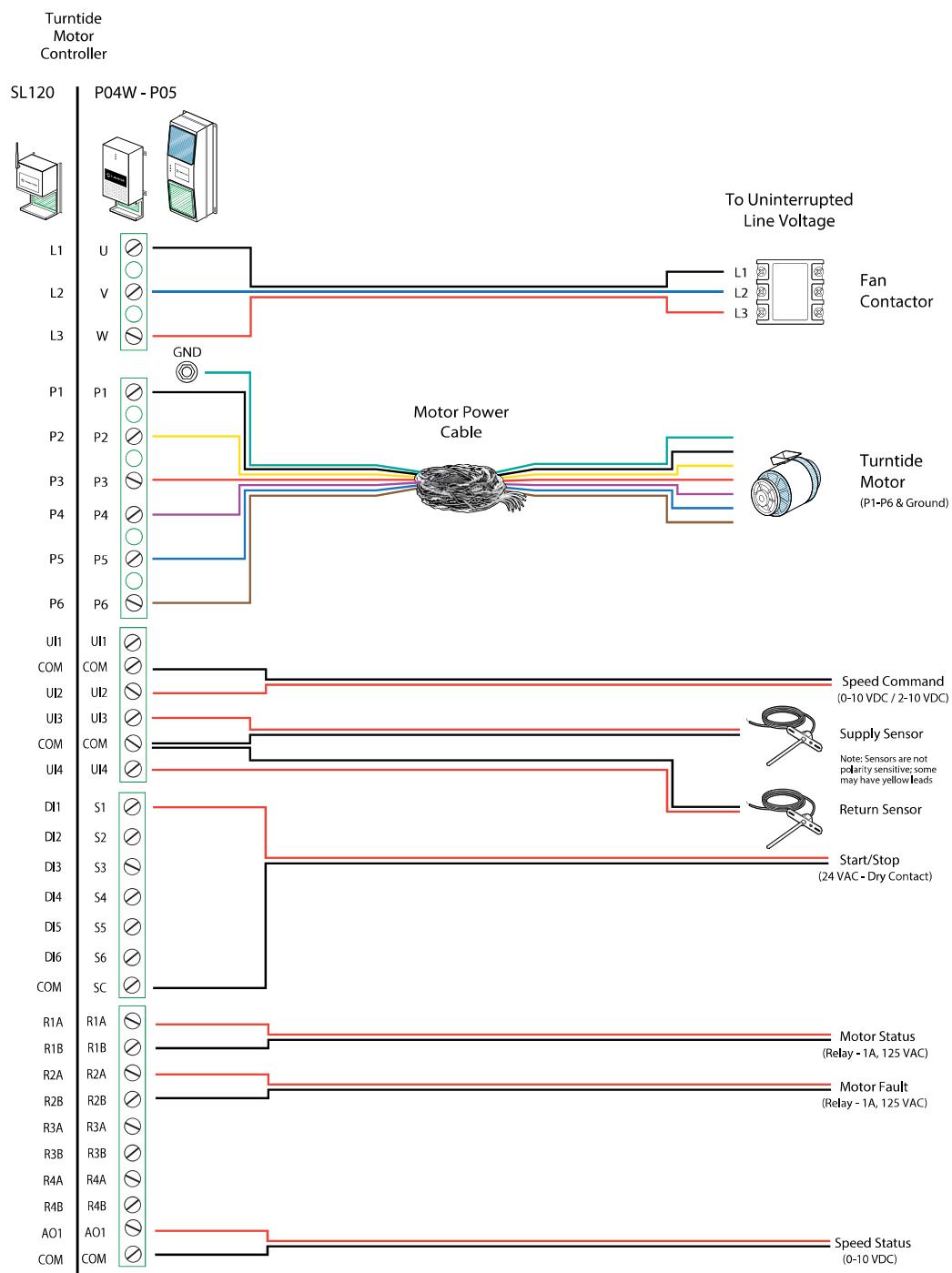
Single Speed – Single Start/Stop Signal



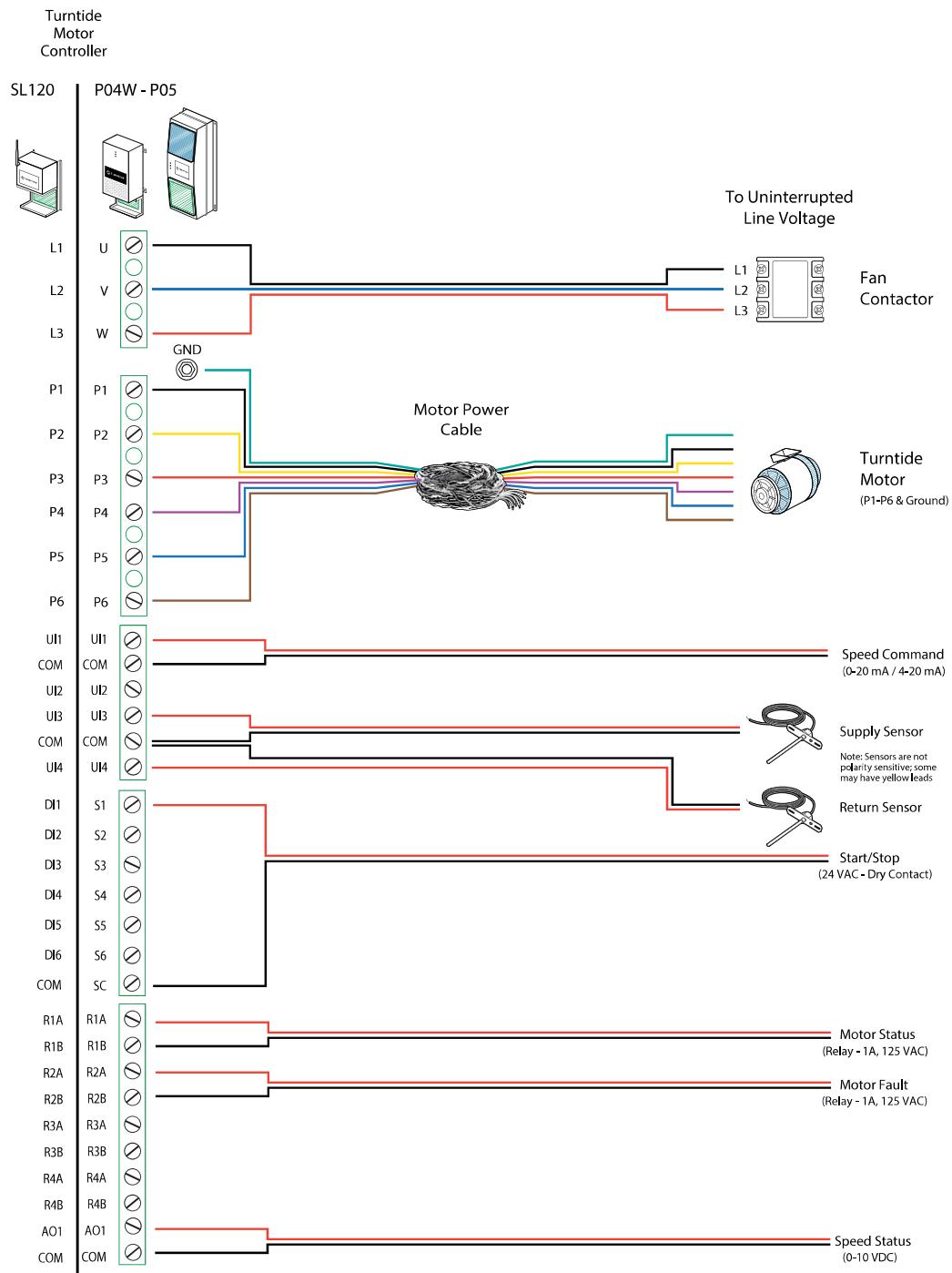
Multi Speed – Multi Start/Stop Signals



0-10V / 2-10V plus Start/Stop Signal



0-20mA / 4-20mA plus Start/Stop Signal





Appendix

The following guides are appended to this Turntide Smart Motor System for AHU Applications with Pre-Wired Motor Controllers Installation Guide:

Motor Isolator Kit Installation Guide

Turntide Technician App User Guide

Turntide® Smart Motor System Install Guide

For RTU Monitor Only Applications with Pre-Wired Motor Controllers

TURNTIDE TECHNOLOGY FOR SUSTAINABLE OPERATIONS

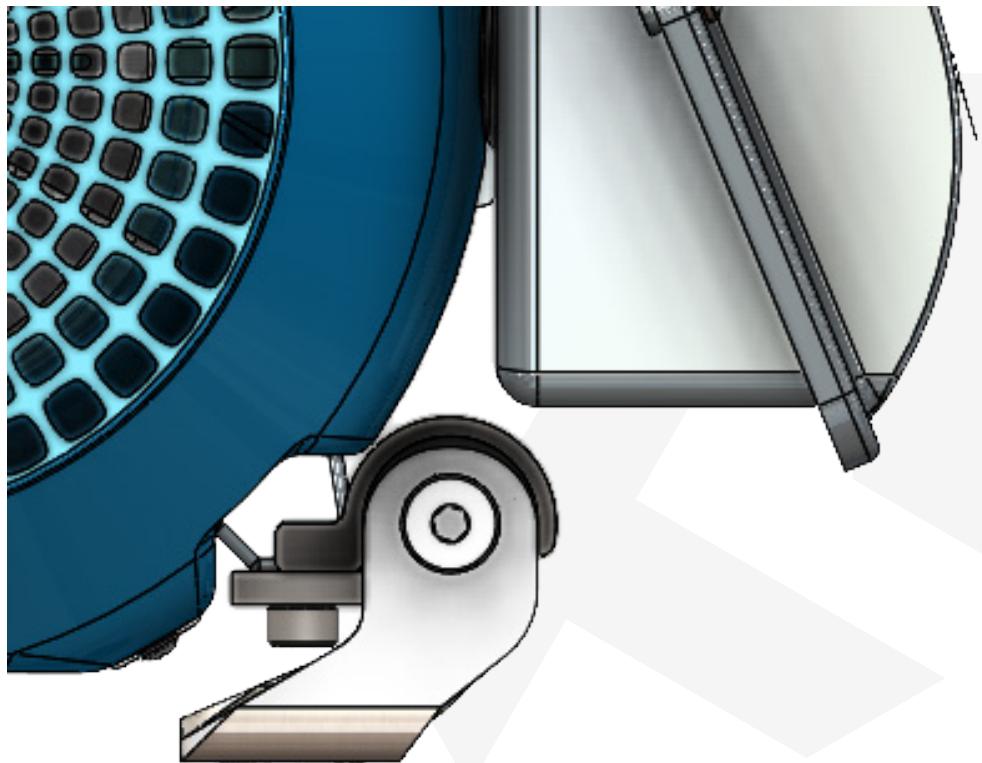
Our breakthrough technologies accelerate electrification and sustainable operations for energy-intensive industries.

Turntide Technologies | 1295 Forgewood Avenue, Sunnyvale, CA 94089 | turntide.com | sales@turntide.com





Motor Isolator Kit Installation Guide

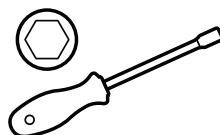
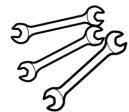


Know Before You Go

Tools You'll Need



Cordless Drill

Nut Driver
1/4" and 5/16"Screwdriver
Phillips

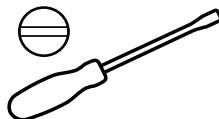
Thin Wrenches



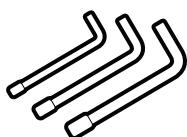
Adjustable Pliers



Needle Nose Pliers

Screwdriver
Slot

Offset Wrenches

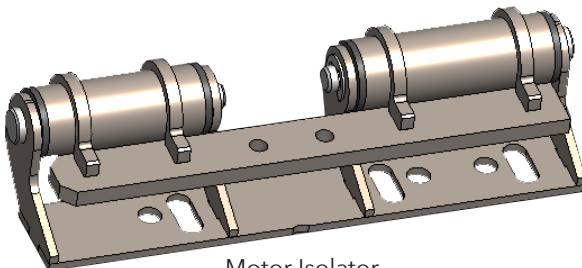
Hex Wrenches
Metric



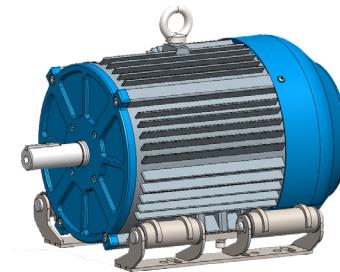
Getting Started

This guide is divided into three sections. Each section is specific to a motor model. Identify the motor model and select the appropriate section.

V01 Model Installation page 4



Motor Isolator
Qty 2
Left Foot Shown

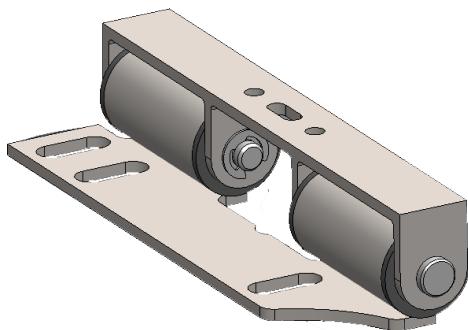


V01 Motor with
Motor Isolator Feet Installed

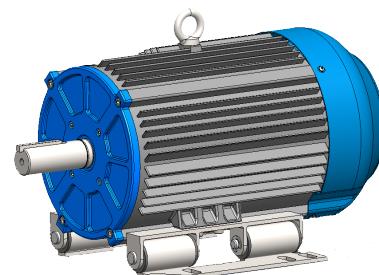
V01 Notes:

- V01-F motors, which are <3hp motors with a 182/184T frame size, may require V02 isolation feet. Contact your Turntide representative for more information.
- Some motor mounting plates have a lip that may not have the width necessary to install the V01 feet. If you encounter this situation, contact your Turntide representative for solutions.

V02 Model Installation page 8

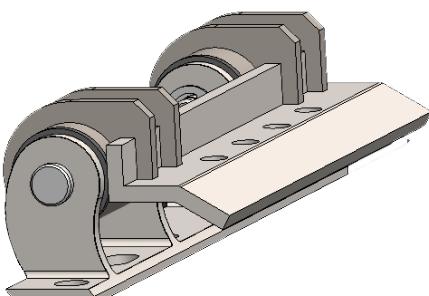


Motor Isolator
Qty 2
Left Foot Shown



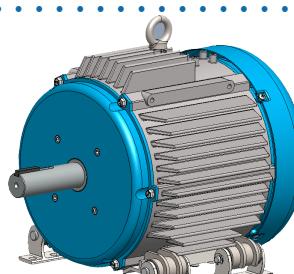
V02 Motor with
Motor Isolator Feet Installed

V03 Model Installation page 10



Motor Isolator
Qty 2

Both left and right are the same

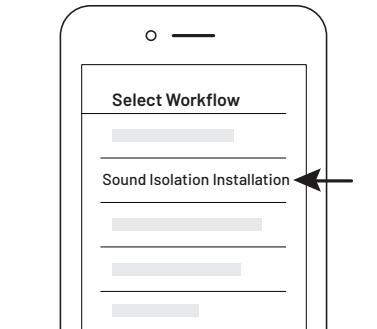


V03 Motor with
Motor Isolator Installed

Step-by-Step Motor Isolator Installation

V01 Series Instructions

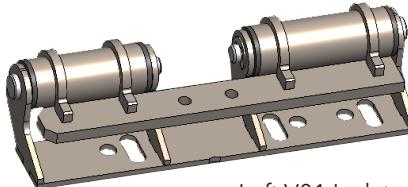
1. Start XOi Workflow #16



Some steps in the XOi workflow must be completed before installing the isolator feet. Open the XOi app and start XOi Workflow #16.

4. Confirm Components

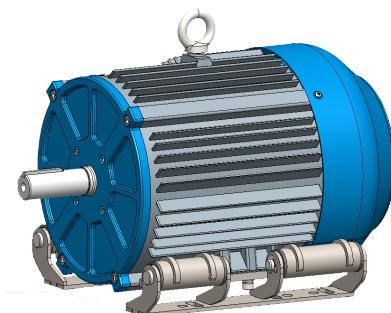
The isolator feet are motor specific. Confirm the correct isolator feet before continuing.



Left V01 Isolator Foot

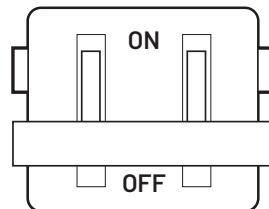
Note that the feet are not symmetrical. Thus they are identified as left and right.

7. Foot Orientation



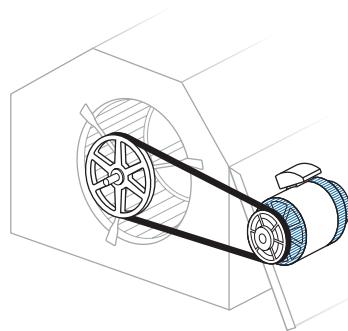
The feet are not symmetrical. They are identified as left and right, when facing the shaft end of the motor. The illustration here shows the correct orientation. Note that the shorter isolator is on the motor shaft end.

2. Disconnect Power



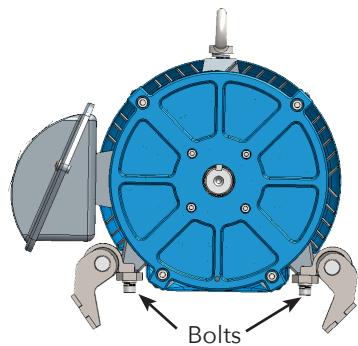
Isolate all incoming power to HVAC unit using normal "Lock Out/Tag Out" and local code requirements. Verify no power is present at the unit.

5. Remove Turntide Motor



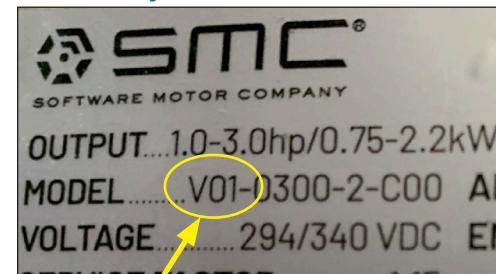
Unbolt the motor from the mounting plate. If necessary, disconnect the motor power wires.

8. Pivot Isolator Feet



Pivot the isolator feet to allow space for reinstalling the feet bolts which were removed in previous step.

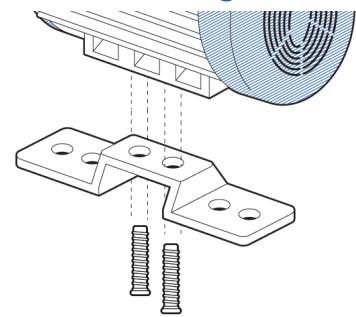
3. Identify Turntide Motor



Motor Model

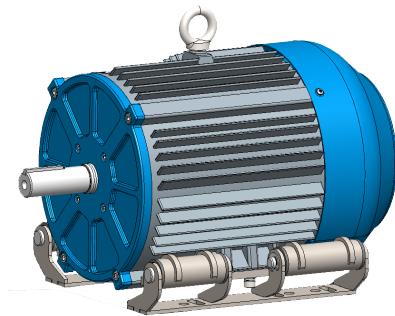
The Turntide motor model and series are found on the nameplate. This section is specific to the V01 series motors. Separate sections cover the V02 and V03 series motors.

6. Remove Existing Motor Feet



Using a 5mm hex wrench remove the bolts and existing motor feet. Retain the bolts for reuse when attaching the isolator foot.

9. Position Isolators



Pivot isolator feet back to align with motor mounting plate mounting holes. Use of push nut bolt retainers may be helpful when bolting the motor to the mounting plate.



Step-by-Step Motor Isolator Installation

V01 Series Instructions

Difficult Access

Overview

In some situations the motor mounting bolts are difficult to access. This procedure listed here outlines the general process for such situations.

A. Foot Identification



Identify the left and right feet. Note that the design provides for a shorter foot, which goes to the motor front. The longer isolator goes toward the rear of the motor.

B. Foot Disassembly



Disassemble the isolator by removing the E-clips from the rod, sliding the rods out and separating the lower foot section from the upper foot section.

C. Mounting Plate Removal



Position the motor on the mounting plate and securely tighten the bolts. The motor is now ready to reinstall in the unit.

D. Lower Foot Installation



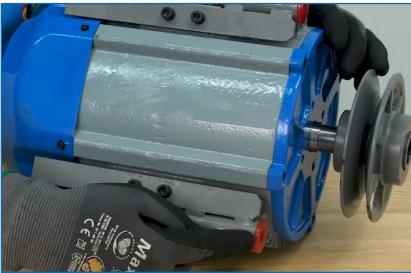
Place the lower section of the isolator foot on the motor mounting plate. Install the motor mounting bolts hand tight.

E. Remove Existing Feet



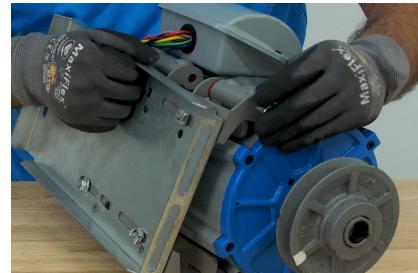
Remove the existing motor foot bolts from the motor using a 5mm hex wrench. If a foot spacer was originally installed, it may be removed in most situations.

F. Upper Foot Installation



Attach the upper foot section to the motor.

G. Reassembly



Connect the upper and lower sections of the isolator foot using the rods and E-clips that were removed earlier. Ensure the E-clips are securely in place.

H. Tighten Motor Foot Bolts



Position the motor on the mounting plate and securely tighten the bolts. The motor is now ready to reinstall in the unit.

Step-by-Step Motor Isolator Installation

V01 Series Instructions

Overview

Some vertical applications present a unique set of challenges, which are easily addressed. The information here provides guidance on overcoming the challenges.

Additional Necessary Supplies



5/16" x 1"
Carriage bolt



5/16" Push Nut
Bolt Retainer

Qty - 1

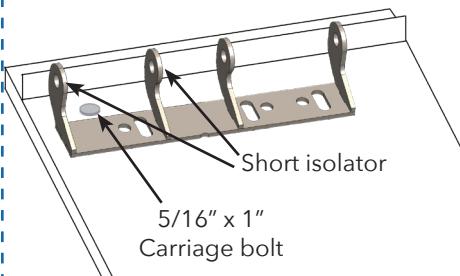
Qty - 2

C. Remove Existing Motor Feet



Remove the existing motor foot bolts from the motor using a 5mm hex wrench. If a foot spacer was originally installed, it may be removed in most situations.

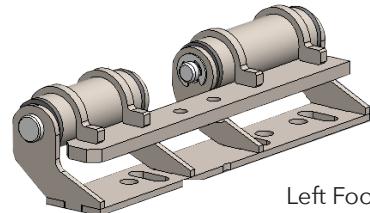
F. Attach Lower Foot to Plate



Place the lower section of the isolator foot on the motor mounting plate. The shorter isolator must be nearest to the side closest to the shaft/belt. Install the motor mounting bolts hand tight.

Vertical Mounting

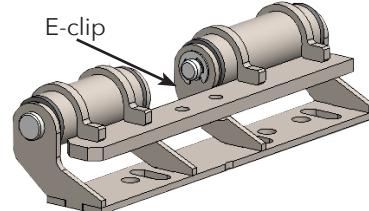
A. Foot Identification



After removing the motor assembly from the unit, remove the motor and mounting plate from the unit.

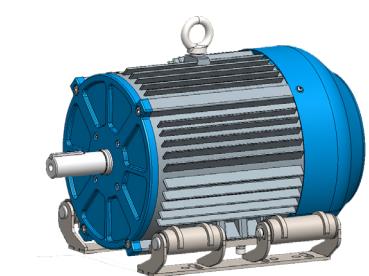
Identify the left and right feet. Note that the design provides for a shorter foot, which goes to the motor front. The longer isolator goes toward the rear of the motor.

D. Disassemble Isolator Feet



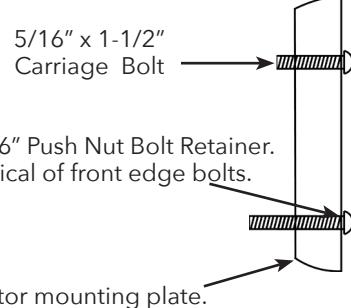
Disassemble the isolator by removing the E-clips from the rod, sliding the rods out and separating the lower foot section from the upper foot section.

G. Reassemble the Isolator Foot



Connect the upper and lower sections of the isolator foot using the rods and E-clips that were removed earlier. Ensure the E-clips are securely in place.

B. Install Bolt & Push Nuts

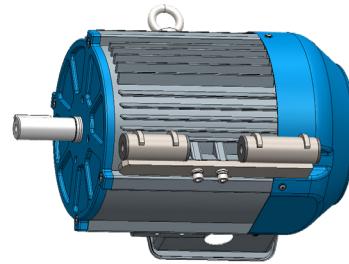


5/16" Push Nut Bolt Retainer.
Typical of front edge bolts.

Motor mounting plate.

Install the new carriage bolt in the upper left corner of the mounting plate. Add push nut bolt retainer to the bolts nearest the shaft/belt.

E. Attach Upper Foot to Motor



Install the upper isolator foot to the motor. Ensure the shorter section is toward the front of the motor. If the motor foot spacer was removed, shorter motor foot mounting bolts will be necessary.

H. Tighten Motor Foot Bolts



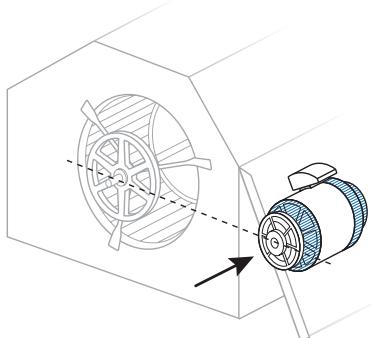
Position the motor on the mounting plate and securely tighten the bolts. The motor is now ready to reinstall in the unit.



Step-by-Step Motor Isolator Installation

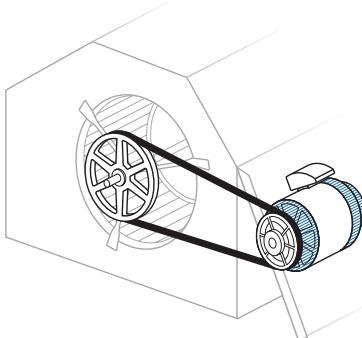
V01 Series Instructions

10. Verify Pulley Alignment



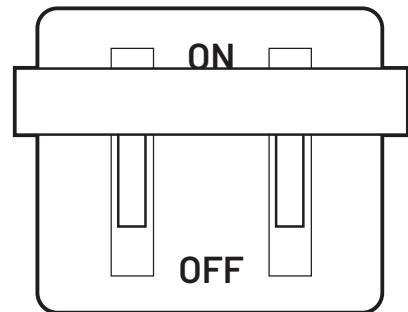
Verify pulley alignment.

11. Tension Belt As Necessary



Make necessary adjustments to properly tension the belt. A different length belt may be required.

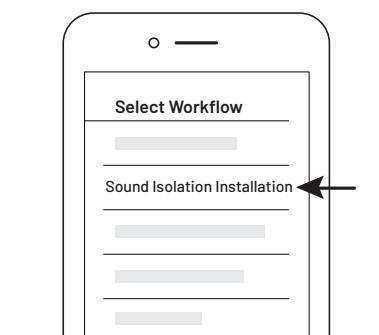
12. Restore Power



13. Verify Motor/Unit Operation

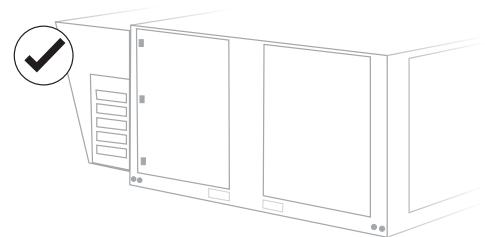
Confirm unit and motor operation.

14. Complete XOi Workflow #16



Complete the Turntide Motor Sound Isolation Installation workflow (XOi Workflow #16).

15. Re-install Panels



Confirm all access panels are re-installed on unit and are secure. Ensure all unit disconnects are in the ON position. Remove all materials and tools from roof.

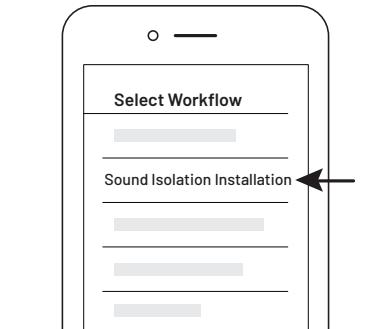
16. Secure Roof and Check Out

Secure roof access and check out with on-site manager.

Step-by-Step Motor Isolator Installation

V02 Series Instructions

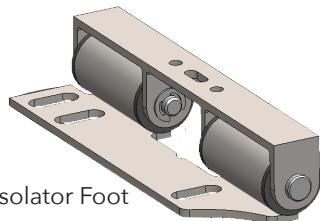
1. Start XOi Workflow #16



Some steps in the XOi workflow must be completed before installing the isolator feet. Open the XOi app and start XOi Workflow #16.

4. Confirm Components

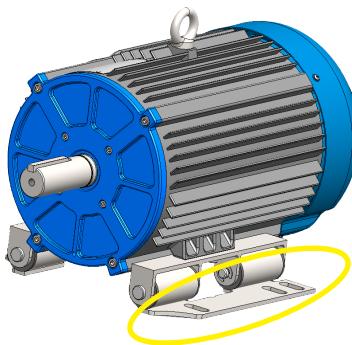
The isolator feet are motor specific. Confirm the correct isolator feet before continuing.



Left V02 Isolator Foot

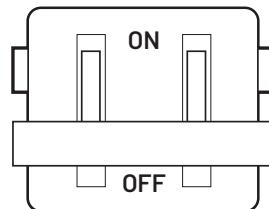
Note that the feet are not symmetrical. Thus they are identified as left and right.

7. Foot Orientation



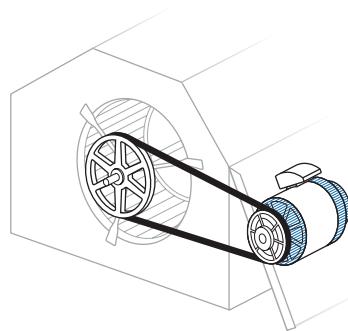
The feet are not symmetrical. They are identified as left and right, when facing the shaft end of the motor. The illustration here shows the correct orientation.

2. Disconnect Power



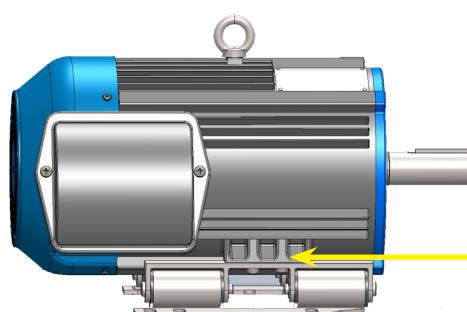
Isolate all incoming power to HVAC unit using normal "Lock Out/Tag Out" and local code requirements. Verify no power is present at the unit.

5. Remove Turntide Motor



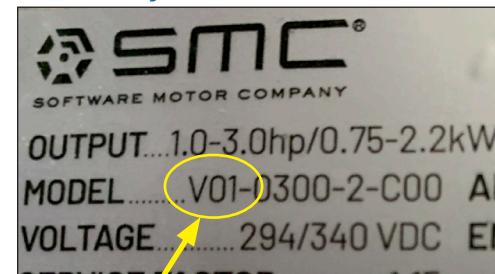
Unbolt the motor from the mounting plate. If necessary, disconnect the motor power wires.

8. Foot Alignment



There are multiple mount holes for attaching the foot to the V02 series motor. The rear bracket/bushing should be aligned with the foot mounting boss on the motor.

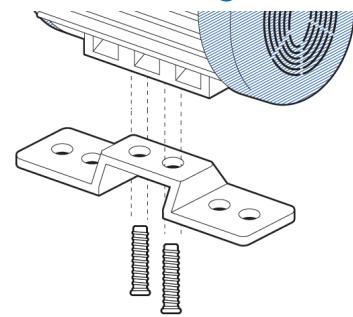
3. Identify Turntide Motor



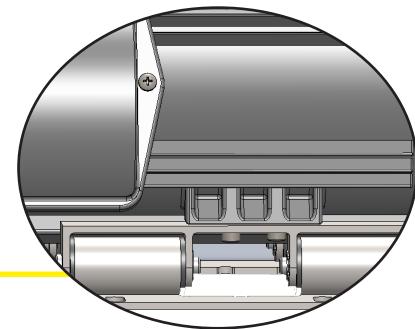
Motor Model

The Turntide motor model and series are found on the nameplate. This section is specific to the V02 series motors. Separate sections cover the V01 and V03 series motors.

6. Remove Existing Motor Feet



Using a 5mm hex wrench remove the bolts and existing motor feet. Retain the bolts for reuse when attaching the isolator foot.

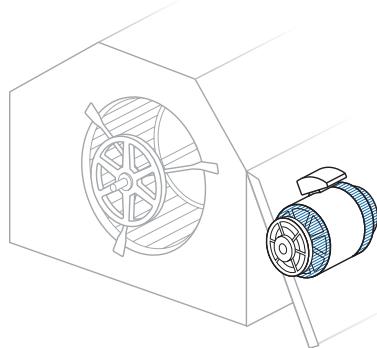




Step-by-Step Motor Isolator Installation

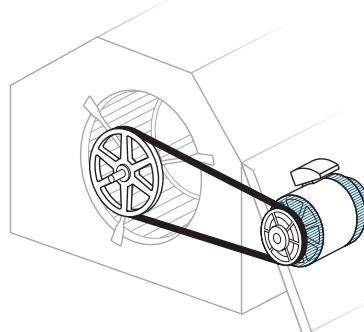
V02 Series Instructions

9. Reinstall Turntide Motor



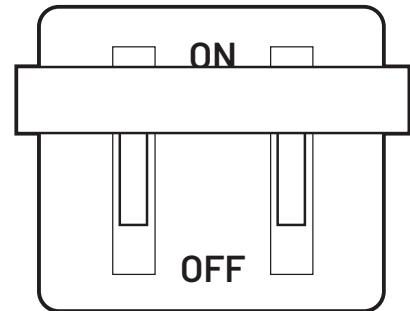
Reinstall the Turntide motor. If necessary, reconnect the motor power wires.

10. Tension Belt As Necessary



Make necessary adjustments to properly tension the belt. A different length belt may be required.

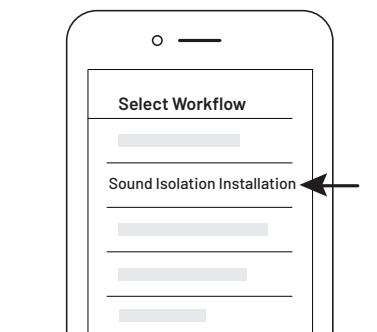
11. Restore Power



12. Verify Motor/Unit Operation

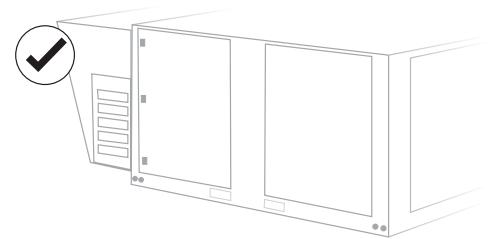
Confirm unit and motor operation.

13. Complete XOi Workflow #16



Complete the Turntide Motor Sound Isolation Installation workflow (XOi Workflow #16).

14. Re-install Panels



Confirm all access panels are re-installed on unit and are secure. Ensure all unit disconnects are in the ON position. Remove all materials and tools from roof.

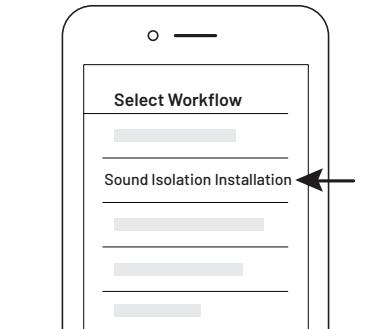
17. Secure Roof and Check Out

Secure roof access and check out with on-site manager.

Step-by-Step Motor Isolator Installation

V03 Series Instructions

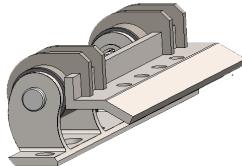
1. Start XOi Workflow #16



Some steps in the XOi workflow must be completed before installing the isolator feet. Open the XOi app and start XOi Workflow #16.

4. Confirm Components

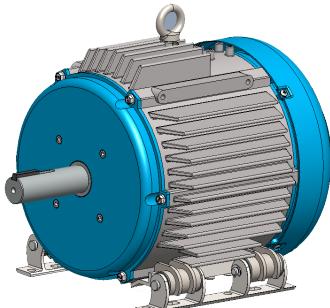
The isolator feet are motor specific. Confirm the correct isolator feet before continuing.



V03 Isolator Foot

Note that the feet are symmetrical. Thus there is no left or right foot for the V03 motor series

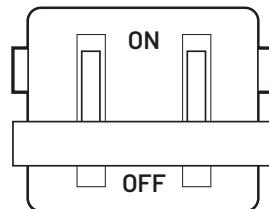
7. Foot Orientation



V03 Foot Orientation

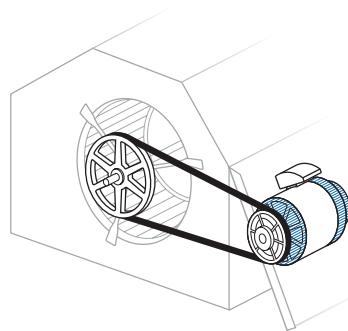
The feet are symmetrical. The illustration here shows the normal configuration.

2. Disconnect Power



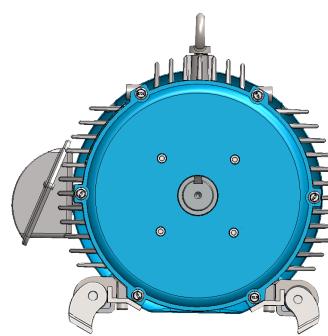
Isolate all incoming power to HVAC unit using normal "Lock Out/Tag Out" and local code requirements. Verify no power is present at the unit.

5. Remove Turntide Motor



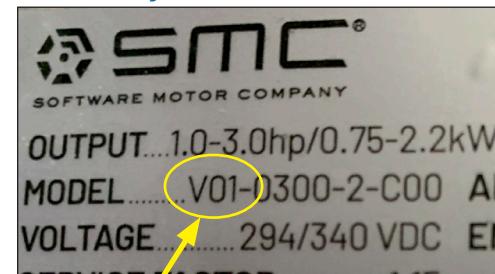
Unbolt the motor from the mounting plate. If necessary, disconnect the motor power wires.

8. Pivot Isolator Feet



Pivot the isolator feet to allow space for reinstalling the feet bolts which were removed in previous step.

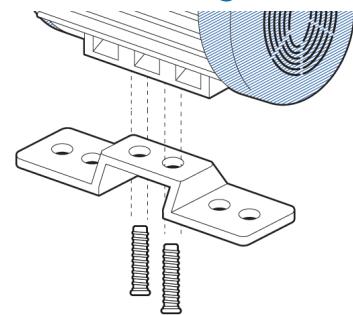
3. Identify Turntide Motor



Motor Model

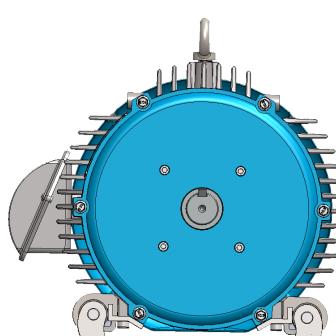
The Turntide motor model and series are found on the nameplate. This section is specific to the V03 series motors. Separate sections cover the V02 and V03 series motors.

6. Remove Existing Motor Feet



Using a 5mm hex wrench remove the bolts and existing motor feet. Retain the bolts for reuse when attaching the isolator foot.

9. Position Isolators



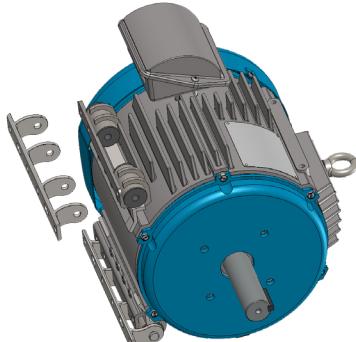
Pivot isolator feet back to align with motor mounting plate mounting holes.



Step-by-Step Motor Isolator Installation

V03 Series Instructions

PRO TIP: V03 Vertical Installation



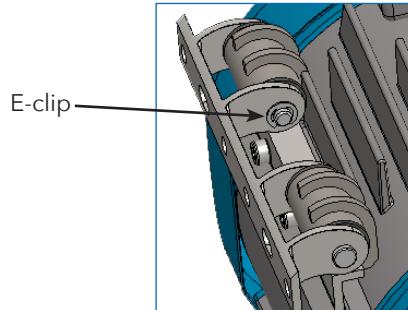
It may be easier to 1) disassemble the top foot, 2) bolt the foot section to the mounting plate, 3) reassemble the foot, 4) with the motor hanging from the top foot, bolt the lower foot in place.

Disassembly Instructions

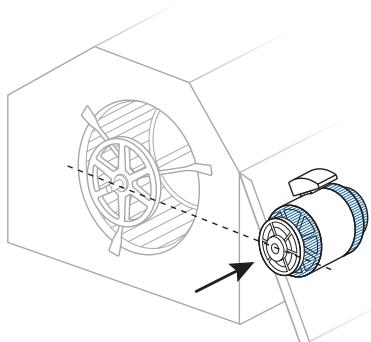
- Remove the two E-clips from left motor foot rod pins.
- Remove the two rod pins from the motor foot.

Reassembly Instructions

- Insert the rod pin back into the foot assembly.
- Reinstall the two E-clips on the rod pins.

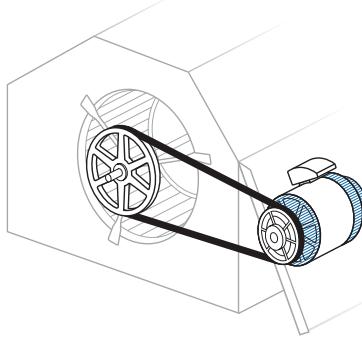


10. Verify Pulley Alignment



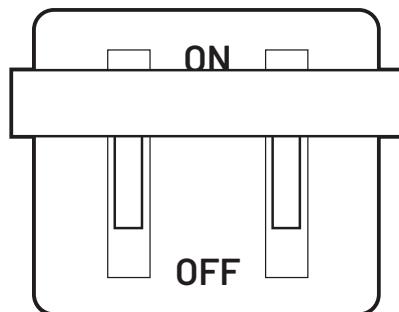
Verify pulley alignment.

11. Tension Belt As Necessary



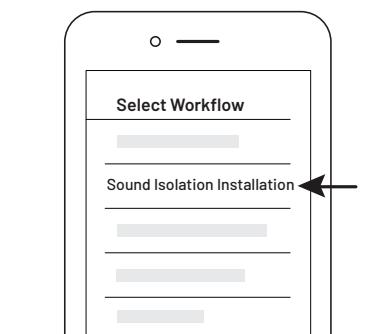
Make necessary adjustments to properly tension the belt. A different length belt may be required.

12. Restore Power



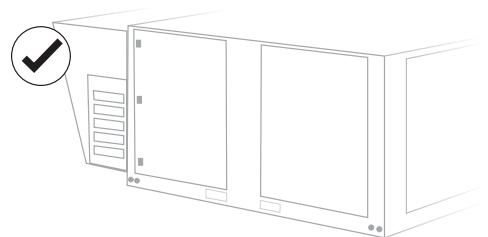
13. Verify Motor/Unit Operation

Confirm unit and motor operation.



Complete the Turntide Motor Sound Isolation Installation workflow (XOi Workflow #16).

14. Complete XOi Workflow #16



Confirm all access panels are reinstalled on unit and are secure. Ensure all unit disconnects are in the ON position. Remove all materials and tools from roof.

Secure roof access and check out with on-site manager.

Contact Us

If you encounter issues that are not covered in this Install Guide or have other questions about the Turntide Motor System as it relates to your specific application, please contact Turntide's Technical Support team.

877.776.8470
(877.PRO.TIP+)
support@turntide.com

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Indemnity

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Turntide Technologies (formerly Software Motor Company) has developed the world's most efficient and intelligent electric motor system. The revolutionary Smart Motor System is based on proven switched reluctance technology, now managed with advanced cloud software and connected to precise controls via IoT. Turntide's vision is to eliminate the 25% of global electricity consumption that is wasted by legacy motors, thus accelerating the world's transition from fossil fuels. Turntide is based in Sunnyvale, Calif., with offices in San Francisco; Arlington, Wash.; and Kennesaw, Ga. Turntide has installed Smart Motor Systems with dozens of customers, reducing their motor electricity consumption by an average of 64%, and is powering the systems of leading OEMs. For further information, visit www.turntide.com.

TECHNICAL MANUAL

Turntide Technician App User Guide

RTU Applications

Last Modified: 12/17/21

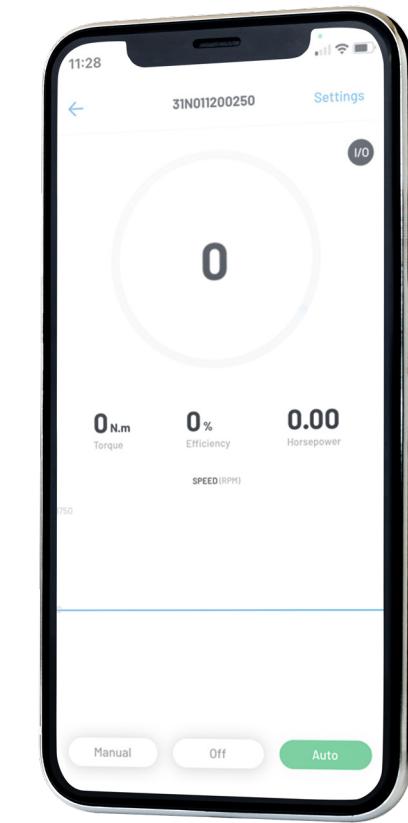


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It's Time to Rethink Sustainability



Introduction

About This Guide

This guide is intended for qualified technicians that have completed specific technical courses on Turntide Academy. There are three sections to this guide:

- About the App - This brief section provides a general overview of the app usage and requirements.
- Commissioning Wizard - This section contains only the essential steps for the initial Turntide Smart Motor System commissioning.
- Copy Configurations - A streamlined version of commissioning a Turntide Smart Motor System with the Technician app based on a previous installation configuration.
- Additional Features - The Technician app has many features that go beyond the initial setup.

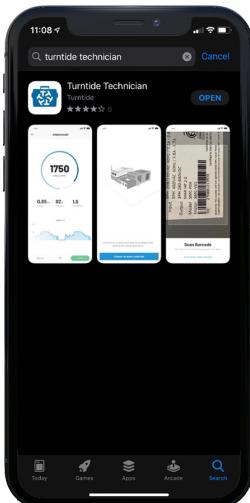
About the Turntide Technician App

The Turntide Technician app is essential to commissioning and interacting with a Turntide Smart Motor system. Turntide motor controllers emit a localized WiFi signal. A smart phone with the Technician app is necessary for connecting to the motor controller.

Getting Started

The Turntide Technician app is a free download on the Google Play Store and App Store. Simply search for the Turntide Technician app.

NOTE: There is more than one app associated with Turntide. The correct app for Turntide Smart Motor Systems is the Turntide Technician app.



Want to Practice?

Want to practice with the app before your on site? Check out the explanation of how to use the demo mode on page 14 of this guide.

Phone Operating System Requirements

- Apple Devices (iPhone) require iOS 12.0 or later
- Android Devices require Android 9 (Pie) or later

Links and QR Codes



[Apple Devices](#)



[Android Devices](#)



Commissioning Wizard

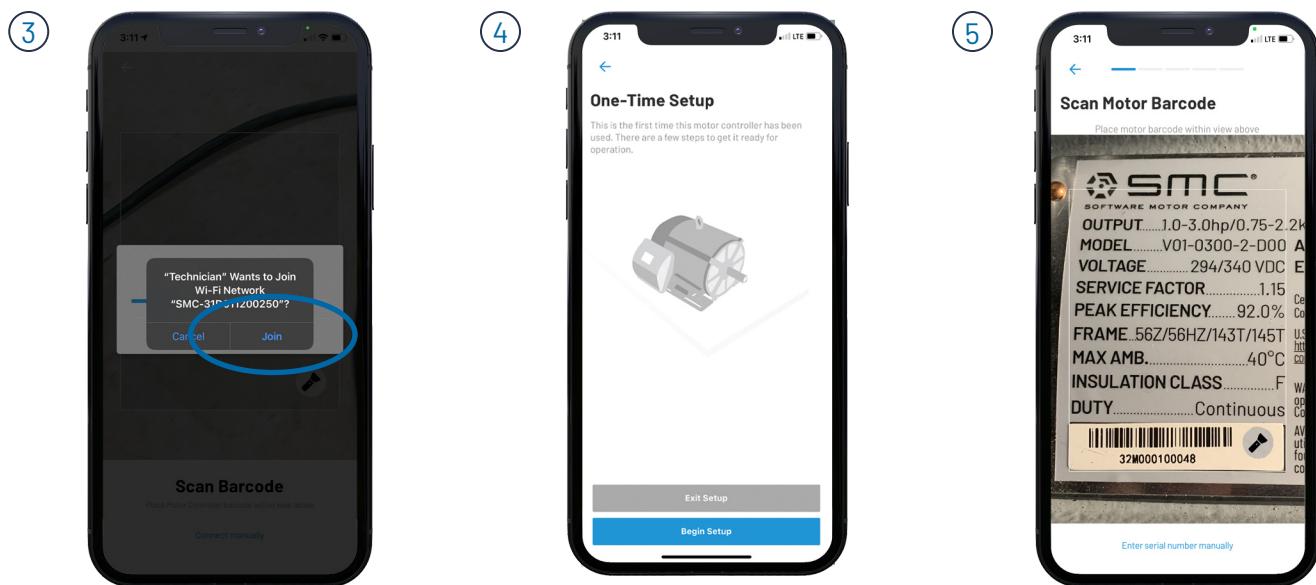
Initial Motor System Commissioning



Barcode Location Example

Open the app and touch "Connect to motor controller" to start the setup process.

The next step is to scan the Turntide motor controller barcode. The light icon turns on the phone's light. A two finger pinch-n-zoom feature is now available for obtaining an optimal view for scanning.



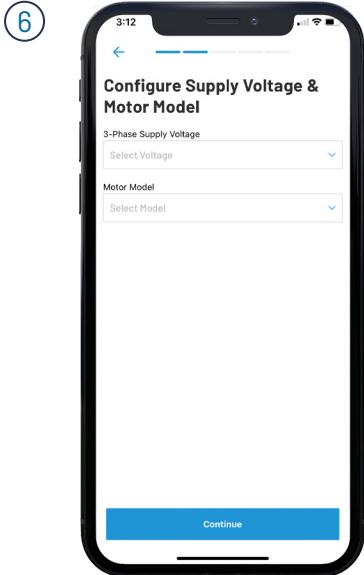
Touch "join" to allow the phone to connect to the motor controller WiFi signal.

Next touch the blue "Begin Setup" button.

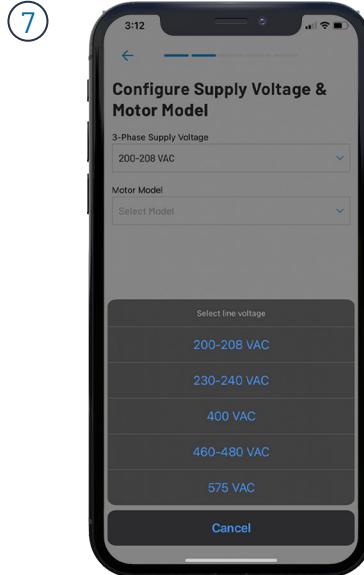
Scan barcode on the Turntide motor nameplate.

Commissioning Wizard

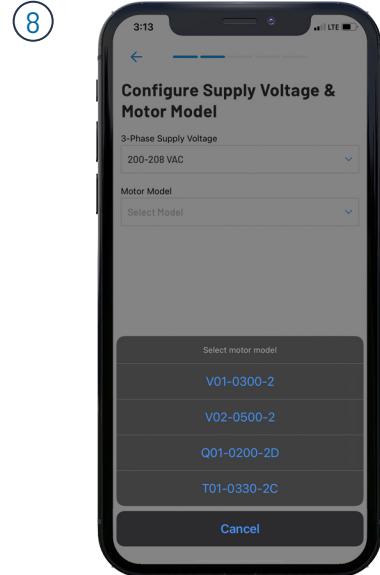
Initial Motor System Commissioning



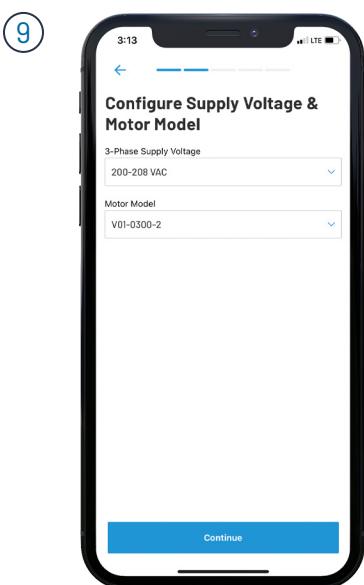
From the dropdown menus select the correct applied voltage and Turntide motor model.



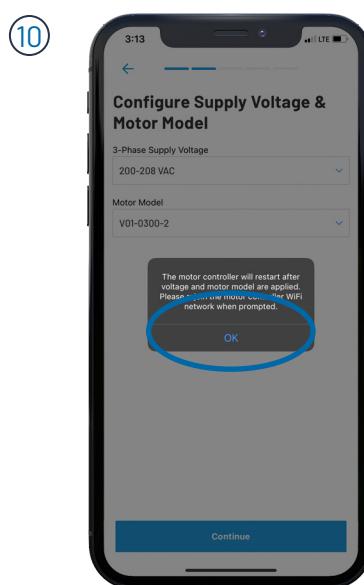
Select the correct applied voltage.
Note: Selecting the incorrect voltage may result in over/under voltage errors.



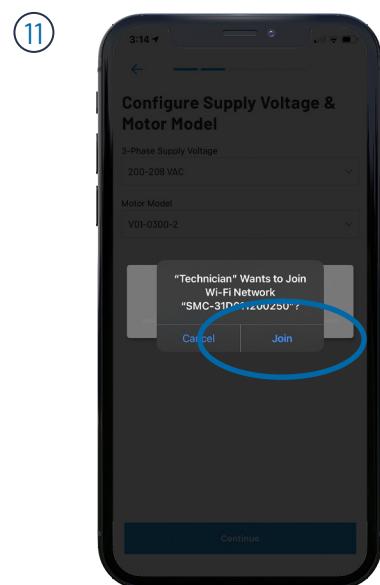
Select the Turntide motor model.
Note: Only models compatible with the selected voltage are displayed.



After confirming the voltage and motor model are correct touch the blue "Continue" button.



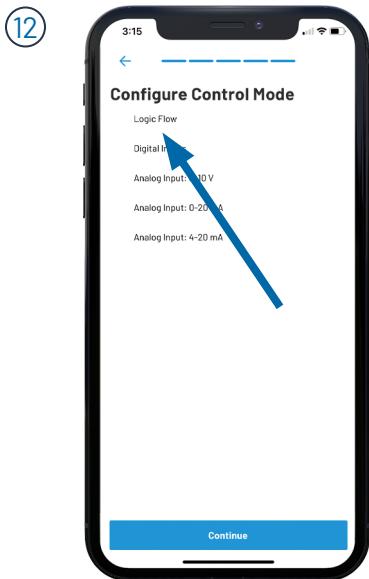
Acknowledge the motor controller will restart message by touching "OK".



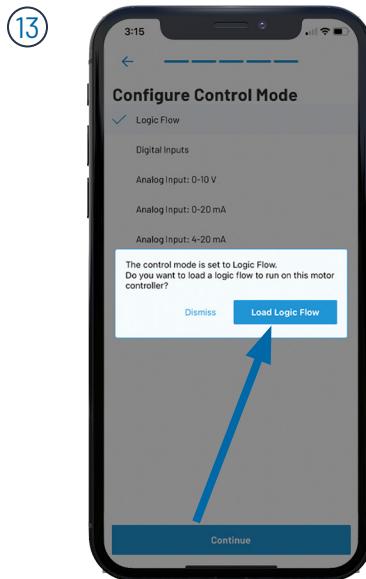
After the motor controller restarts, touch "Join" to rejoin the motor controller.

Commissioning Wizard

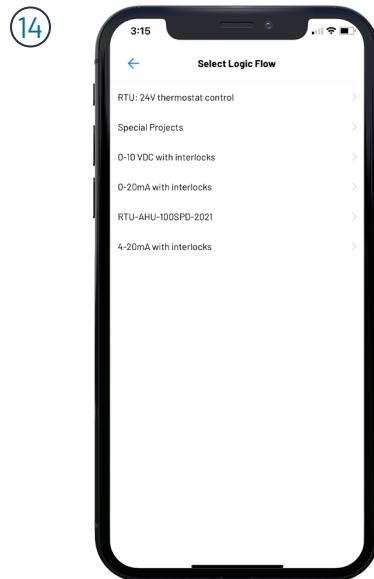
Initial Motor System Commissioning



Now configure the control mode. "Logic Flow" is the most common for RTU applications. The other options are beyond this guide.



Confirm the selection by touching the "Load Logic Flow" button.



There are several logic flow to choose from. The following provides selection guidance.

Logic Flow Selection

A logic flow is basically a set of instructions the Turntide Motor Controller follows to optimize motor and RTU performance. Each Turntide Motor Controller is shipped blank. Thus, the technician must select, or load, the correct logic flow for the application.

There are several logic flow options available. The most common for RTU applications are RTU: 24V Thermostat Control and Special Projects. The other logic flows are seldom used in RTU applications. Thus, they are beyond the scope of this guide.

RTU: 24V Thermostat Control is a general logic flow that is easy configured by the installing technician based on the number of heating and/or cooling stages. See page 7 for more details.

Special Projects are unique logic flows for specific projects. Typically, these are large projects for major organizations with multiple locations across the United States and/or Canada. See page 9 for more details.

Logic flow selection is based on the project. A Turntide representative will inform the technician if they are to use a Special Project and specific

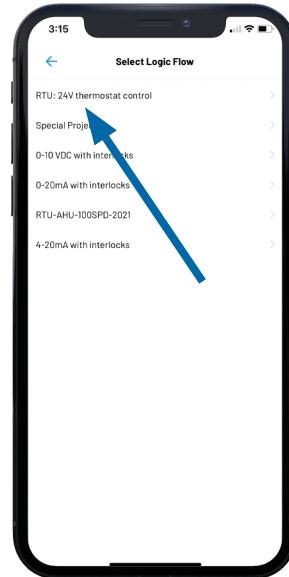
logic flow to load. Otherwise, the RTU: 24V Thermostat Control is used.

Commissioning Wizard

Initial Motor System Commissioning – RTU: 24V Thermostat Control

RTU: 24V Thermostat Control allows the technician to install a control mode based on the number of heating and cooling stages and airflow options. The next few panels review the RTU: 24V Thermostat Control setup process.

1A



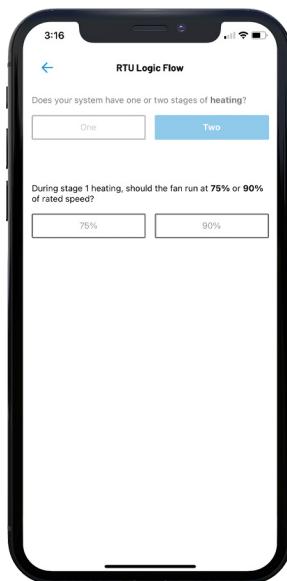
2A



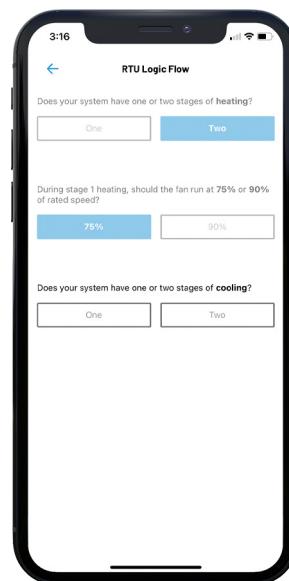
Touch the RTU: 24V Thermostat Control option to begin setup.

Select the number of heating stages.

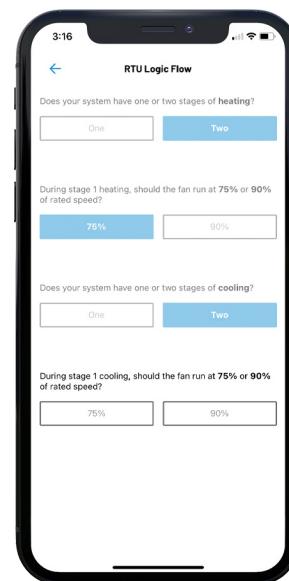
3A



4A



5A



Chose the desired airflow for 1st stage heating. The app automatically sets the 2nd stage heating airflow at 90%.

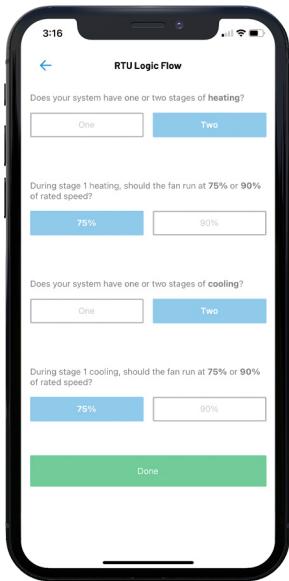
Select the number of cooling stages.

Chose the desired airflow for 1st stage cooling. The app automatically sets the 2nd stage cooling airflow at 90%.

Commissioning Wizard

Initial Motor System Commissioning – RTU: 24V Thermostat Control

6A



7A



8A

Most projects include a Remote Monitoring Kit (RMK) which must be connected to the motor controller. Page 10 discusses the connection process.

If the project does not include an RMK touch "Done" to complete the setup.

Touch the green "Done" button to complete the process.

The Turntide Smart Motor System setup is now complete. Touch "Yes" to complete the setup.

Commissioning Wizard

Initial Motor System Commissioning - Special Projects

The Special Projects screen contains logic flows for large rollouts where the customer has pre-specified unit operation parameters.

A Turntide representative advises technicians if they are working on special project and which logic flow is necessary.

This section reviews the process for installing a “Special Projects” logic flow.

1B



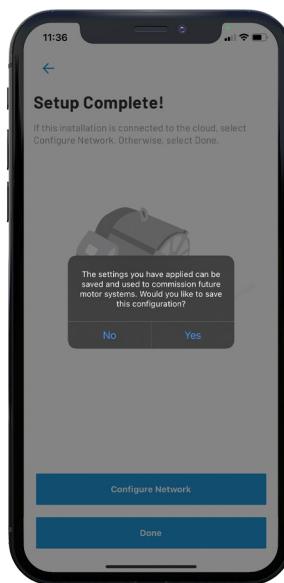
2B



3B



4B



5B

Most projects include a Remote Monitoring Kit (RMK) which must be connected to the motor controller. Page 10 discuss the connection process.

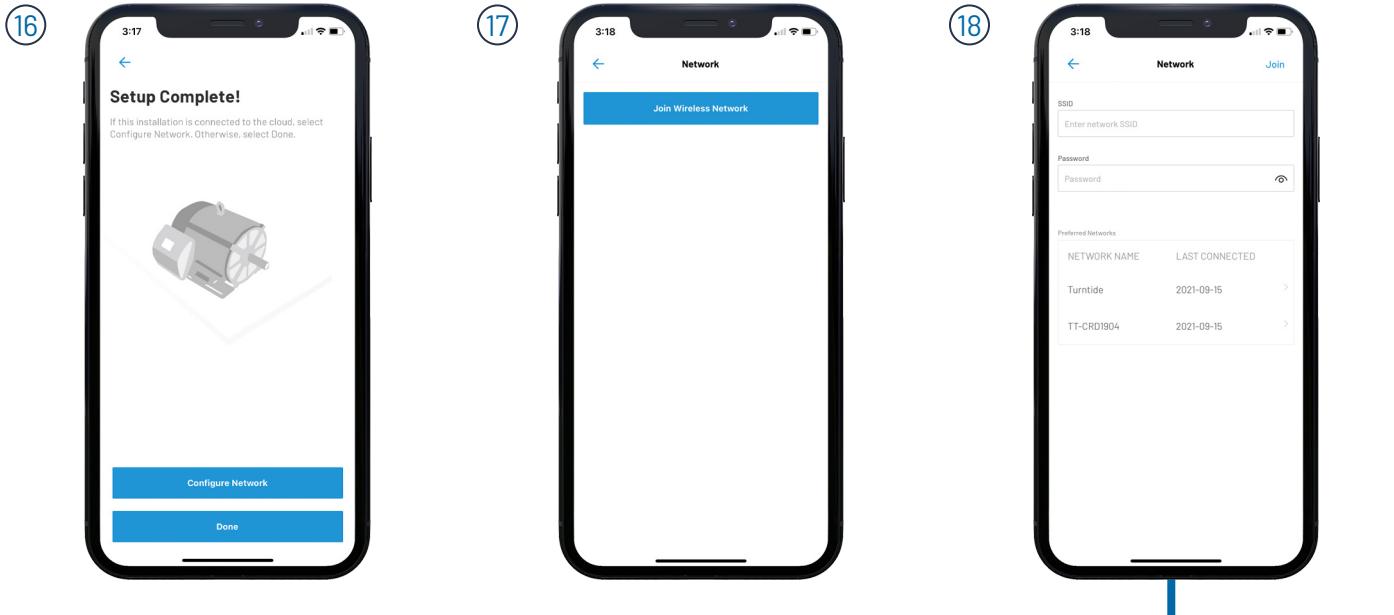
If the project does not include an RMK touch “Done” to complete the setup.

Touch the “Load Flow” button. Other features shown are not essential for initial setup. They are discussed in the Additional Features section.

The configuration can be saved for other installations. Easy Quick Start information starts on page 11.

Commissioning Wizard

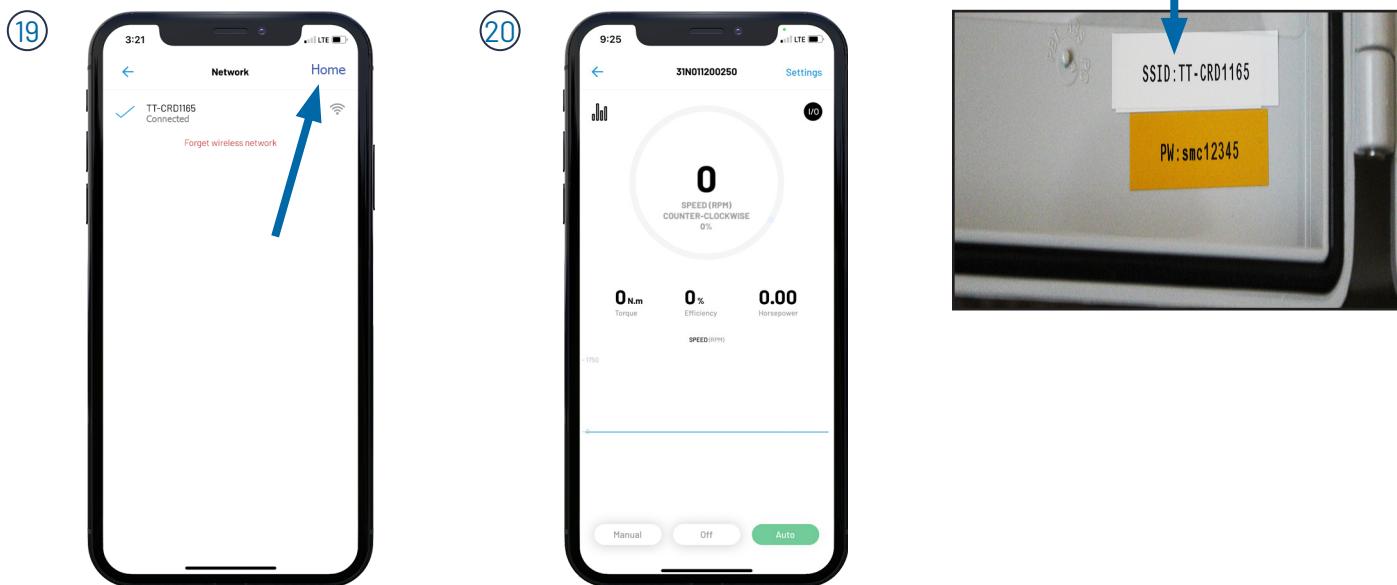
Initial Motor System Commissioning - RMK Connection



After the logic flow is loaded the “Setup Complete” screen appears. If the project includes a RMK, touch “Configure Network.”

With the RMK powered, touch “Join Wireless Network.”

Enter the SSID number and password found inside the RMK door.



The app displays a check mark to confirm the motor controller to RMK connection. Touch the “Home” link to go the home screen.

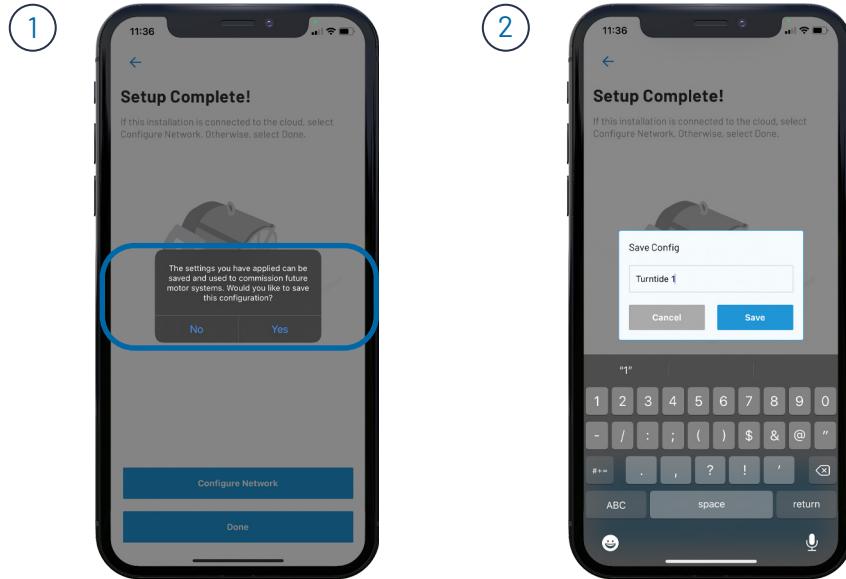
Technician app motor home screen.

Copy Configurations

Initial Motor System Commissioning - Copy Configurations

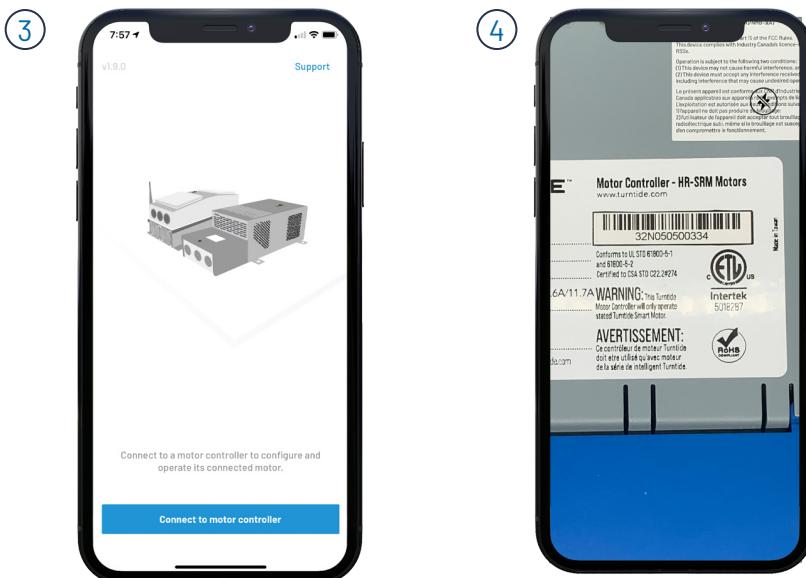
The Technician app includes a feature to save a configuration for future use. The saved configuration is easily applied for similar Turntide motor installations which saves the installer time and reduces the potential of mistakes.

Retaining the configuration is done when completing the initial setup. When "Done" is selected a dialog box appears. To save the configuration touch "Yes." Touch "No" to proceed without saving.



This is the screen that appears at the end of initial configuration.

The saved configuration must be named.
Note that multiple configurations can be stored in the app.



Subsequent installations begin in the same manner. Open the app and touch "Connect to motor controller."

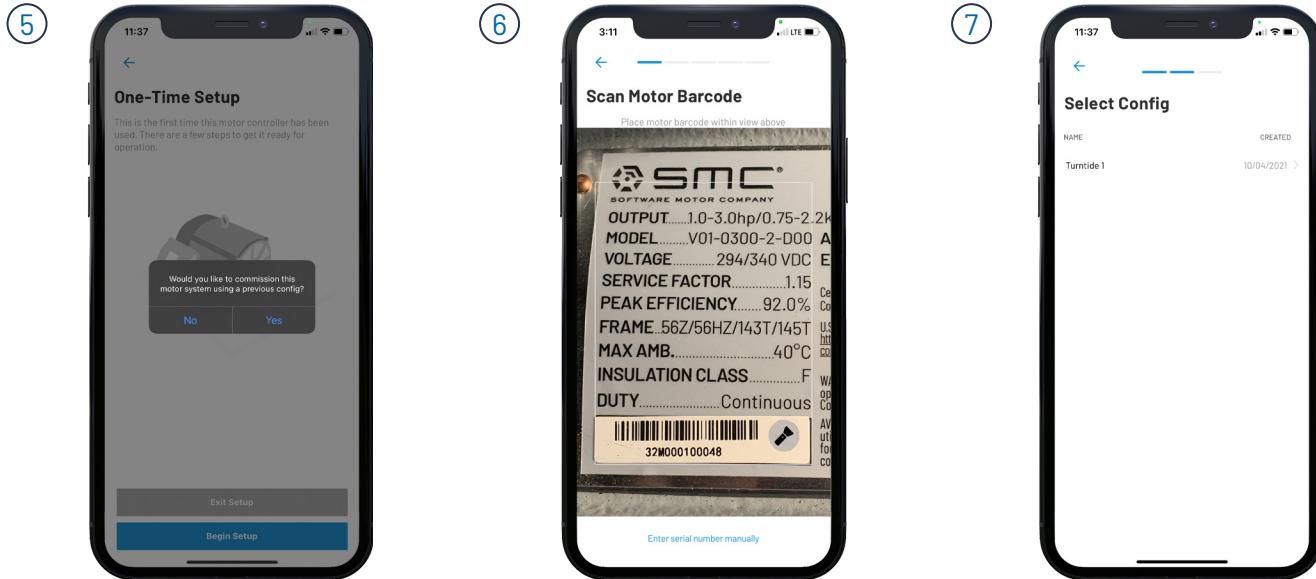
Next scan the Turntide motor controller barcode.



Barcode Location Example

Copy Configurations

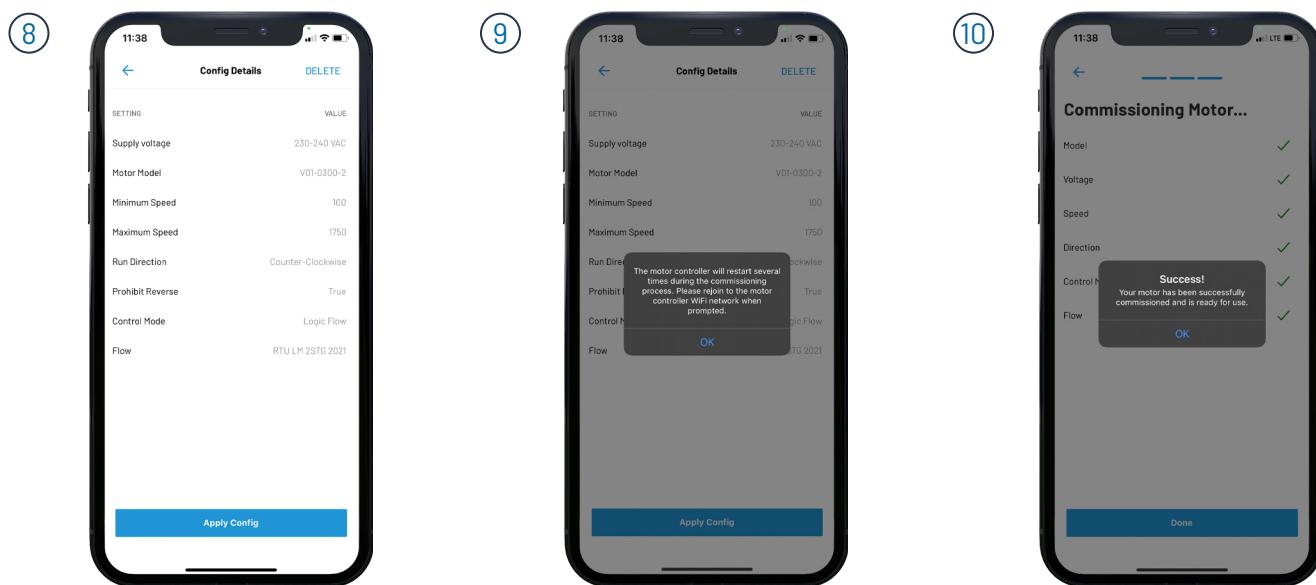
Initial Motor System Commissioning - Copy Configurations



After joining the Turntide motor controller WiFi network, an alert box appears. To apply stored configuration select "Yes."

Now scan the Turntide motor barcode.

Select the desired stored configuration.



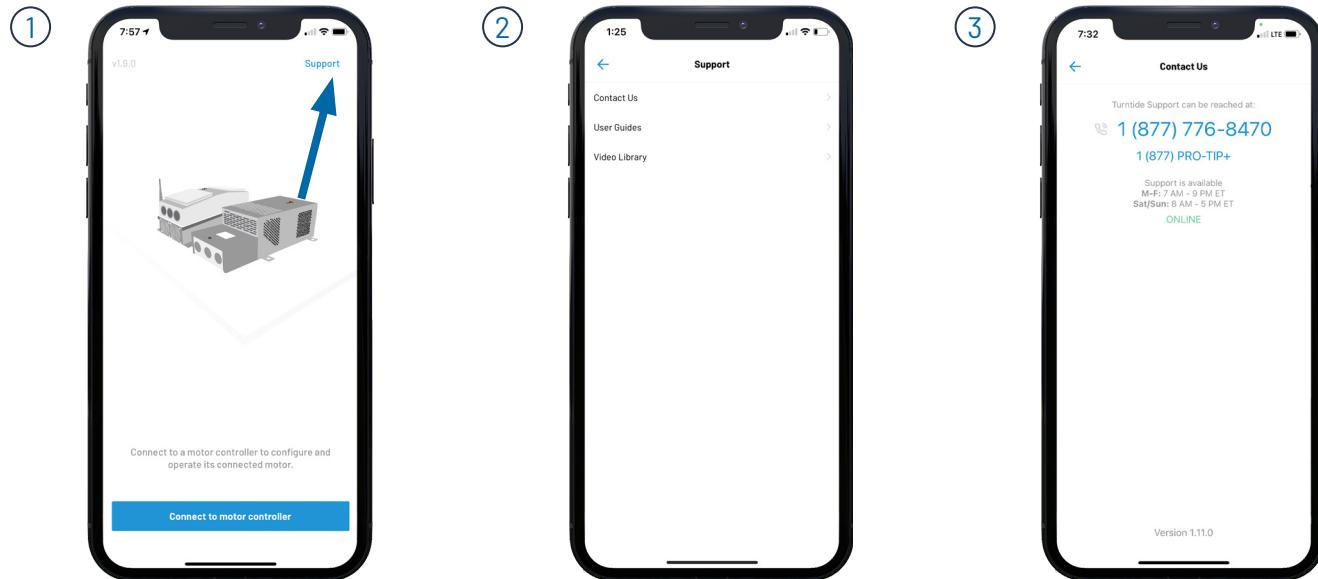
Details of the selected configuration appear for review and confirmation. Apply the configuration by touching "Apply Config"

Acknowledge the motor controller restart message.

A green check appears indicating each aspect of the logic flow is loaded. Acknowledge the successful configuration.

Additional Features

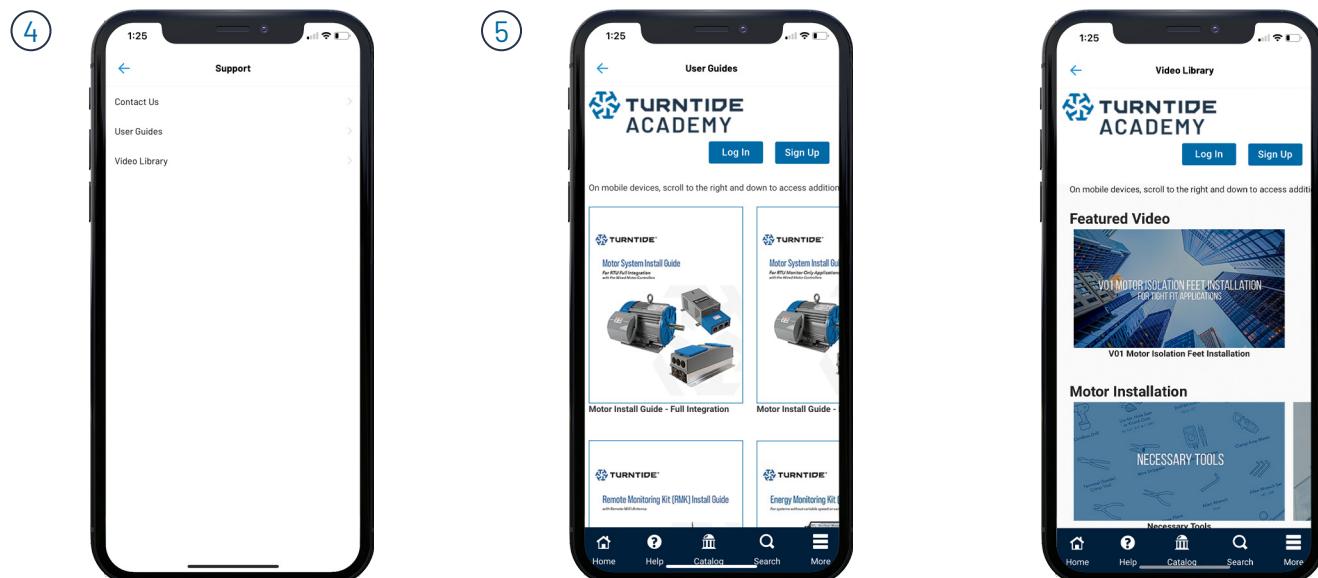
Initial Screen - Support



Upon opening the app, the initial screen appears. In the upper right corner there is a "Support" link.

There are three links on the "Support" page, Contact Us, User Guides, and Video Library.

The Contact Us link is the phone number to Turntide Technical Support and hours of operation.



User Guides and Video Library links directly to technical documents and installation related videos.

Simply select the desired guide to open it.

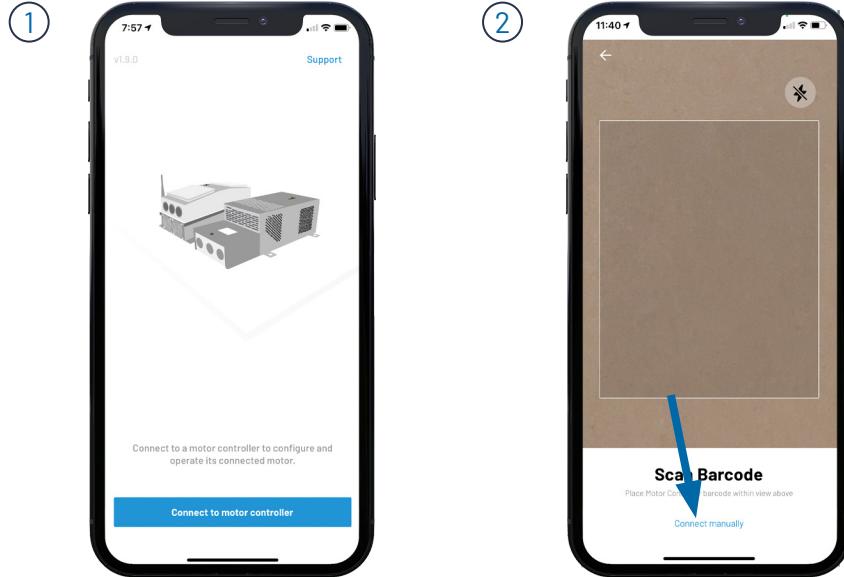
Tap to open a library of short installation videos.

Additional Features

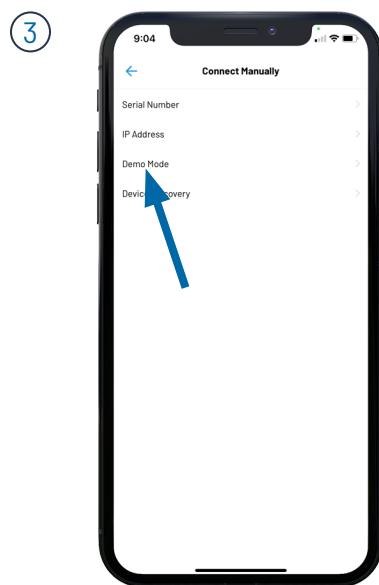
Demo Mode

Demo Mode allows interaction with the Technician app without the need to connect to a Turntide Motor Controller. In this mode the app can be showcased and technicians can become familiar with the app functions prior to a Turntide Motor System commissioning.

The following screenshots show accessing the "Demo Mode."



At the initial screen, select "Connect" Next, select "Connect manually." to motor controller."



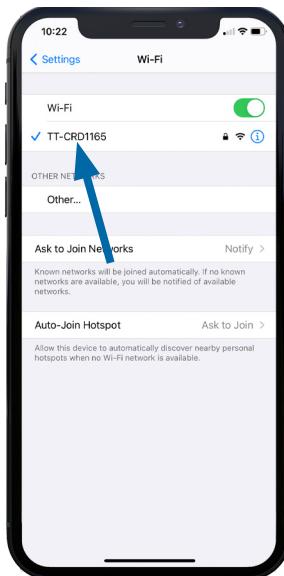
Now touch "Demo Mode."

Additional Features

Device Discovery

Device Discovery allows technicians to connect to Turntide motor controllers on a network without scanning the motor controller barcode. This feature is typically used in applications with a Remote Monitoring Kit. This feature is only available with motor controllers using 2.5.1 firmware or later.

①

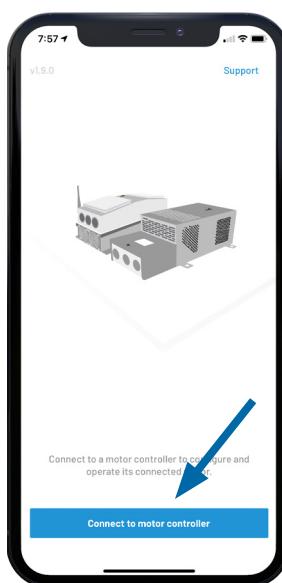


③

RMK SSID Example

The first step is to connect your phone to the RMK WiFi network.

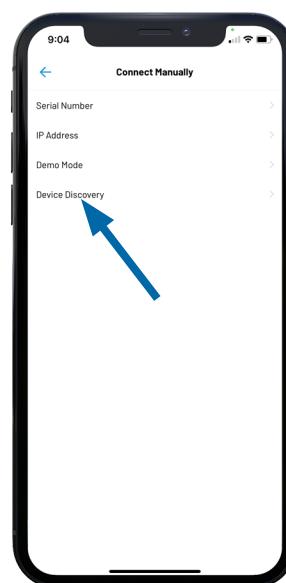
②



③



④



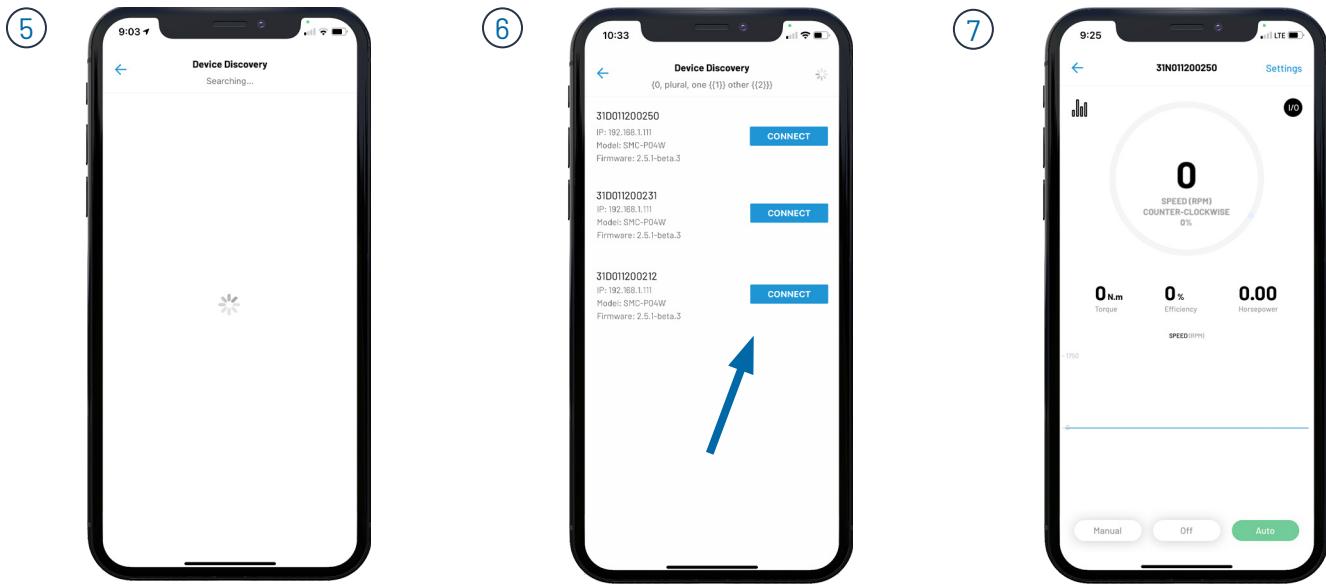
Open the Technician App and touch the blue Connect to motor controller button.

Next select Connect Manually.

Select Device Discovery.

Additional Features

Device Discovery

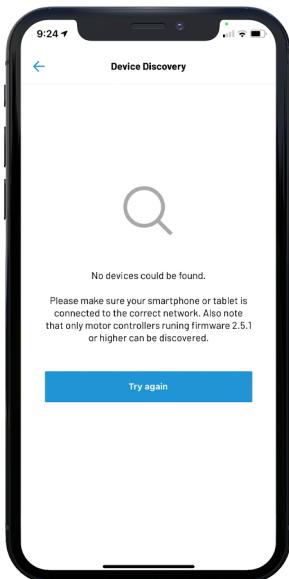


The app will start searching for the motor controllers connected to the RMK network.

The app displays each motor controller connected to the network. Touch a blue Connect button to access a motor controller.

The selected motor controller home screen appears.

Special Note



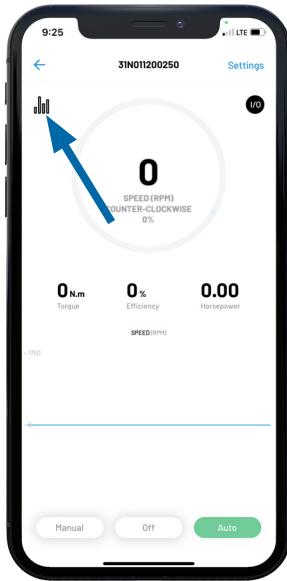
If during the discovery process this screen appears, the phone is not connected to the RMK network.

Additional Features

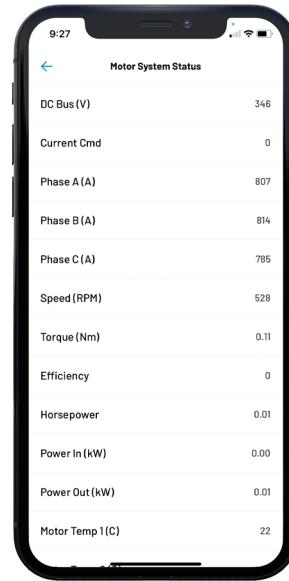
Motor System Status

The Technician app also features real time motor system information for motor controllers with 2.5.1 firmware or higher.

①



②



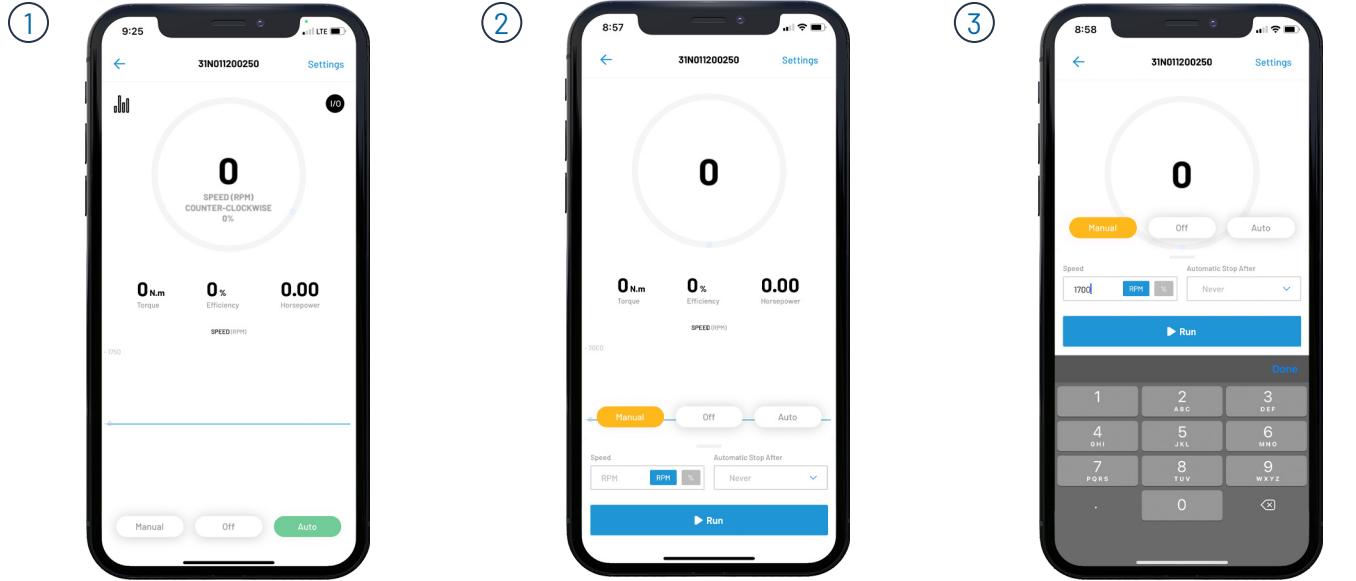
Motor System Status	
DC Bus (V)	346
Current Cmd	0
Phase A (A)	807
Phase B (A)	814
Phase C (A)	785
Speed (RPM)	528
Torque (Nm)	0.11
Efficiency	0
Horsepower	0.01
Power In (kW)	0.00
Power Out (kW)	0.01
Motor Temp 1 (C)	22

From the motor controller home screen touch the bar graph symbol in the upper left corner.

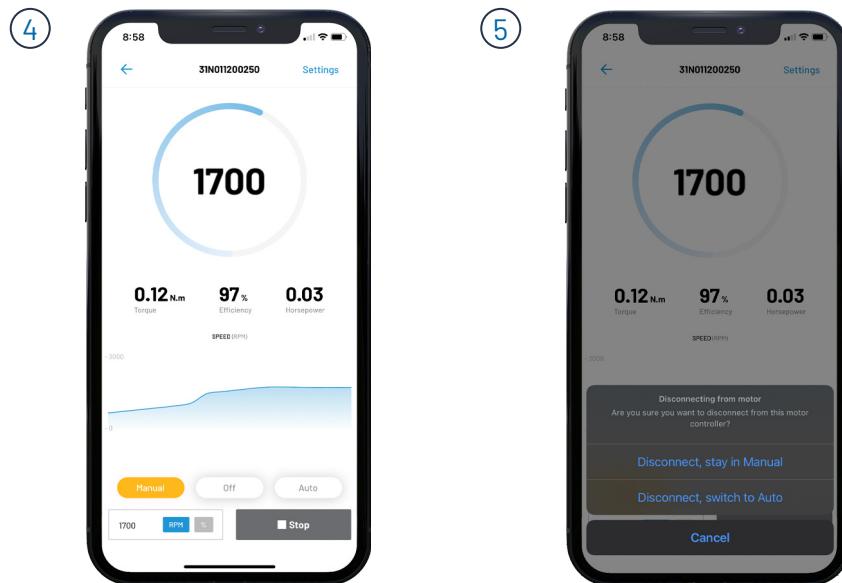
A detailed list of motor performance information displays.

Additional Features

Motor Operation - Manual



Following Turntide motor system configuration the app goes to the motor home screen. The section discusses Manual operation.



The motor ramps to the selected speed. Motor torque, efficiency, and operating horsepower are shown. Touch Stop to stop the motor.

Start by selecting Manual.

Enter the desired motor speed and touch Run.

IMPORTANT NOTE:

When disconnecting from the motor controller a selection box appears. One of the options is to disconnect and leave the system in Manual, which is operating continually at the speed entered earlier. The system remains in this state until stopped.

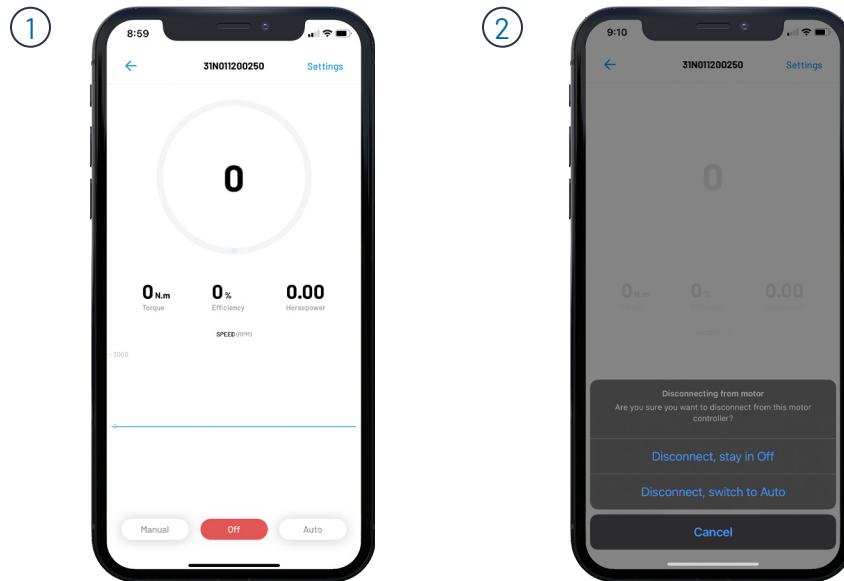
Leaving the system in Manual is seldom desirable. Leaving the system in Manual should only be done after careful consideration.

Manual mode does not force heating or cooling operation. However, if there is a demand for heating or cooling they will function.

Auto allows system operation based on the loaded logic flow.

Additional Features

Motor Operation - Off



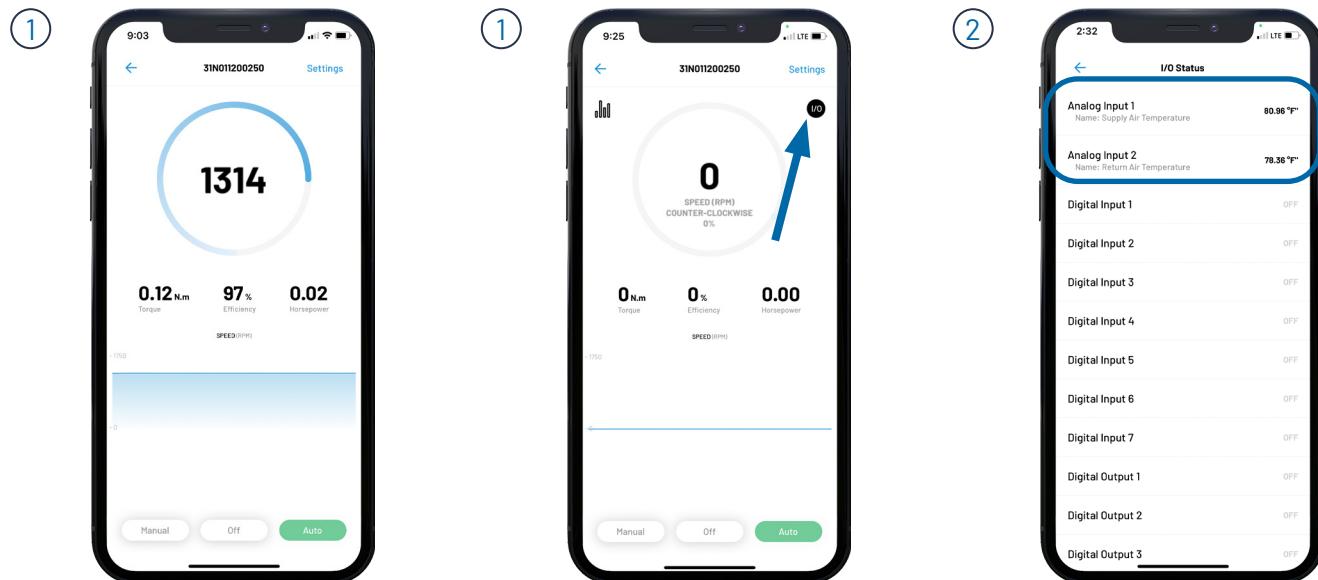
Selecting Off stops all motor operation which in turn prevents HVAC operation. This is NOT a service disconnect.

IMPORTANT NOTE:

When disconnecting from the motor controller a selection box appears. One of the options is to disconnect and leave the system in Off or disconnect and switch to Auto.

Switching to Auto allows the system to operate the loaded logic flow.

Motor Operation - Auto; Motor Controller Input/Output Information



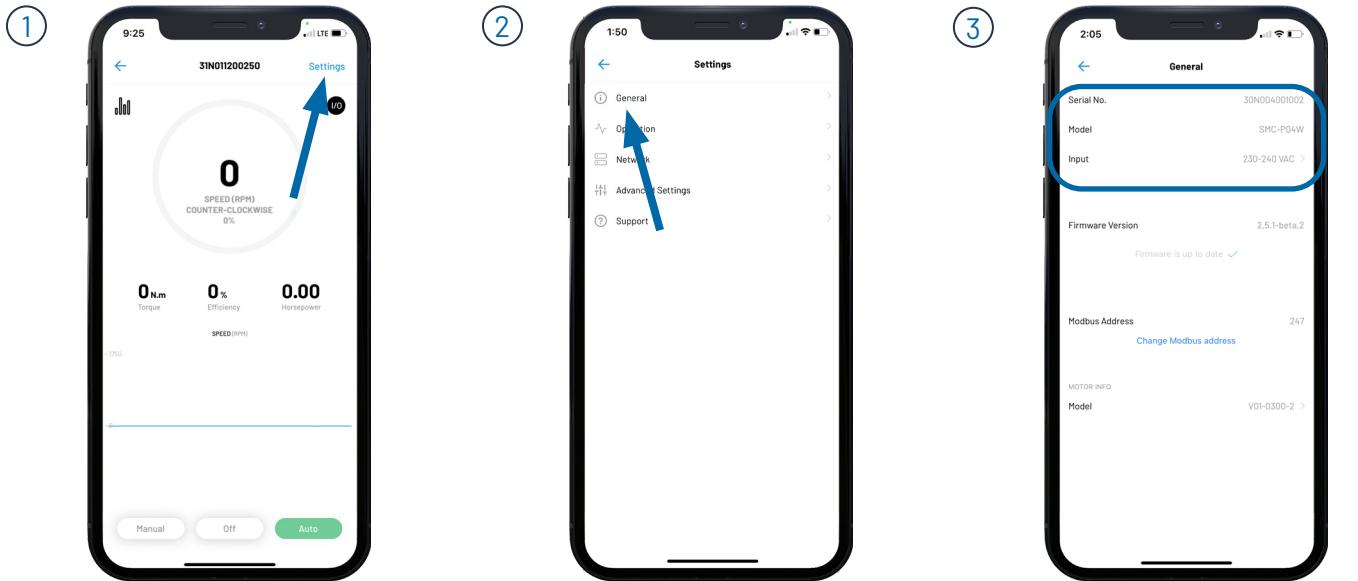
The Auto mode allows the Turntide motor system to function normally.

In the upper right corner of the motor home screen is an I/O icon. Selecting it reveals the I/O screen. Requires firmware 2.5.1 or greater.

The screen displays the state of various inputs and outputs. In this example only supply and return air sensors are connected.

Additional Features

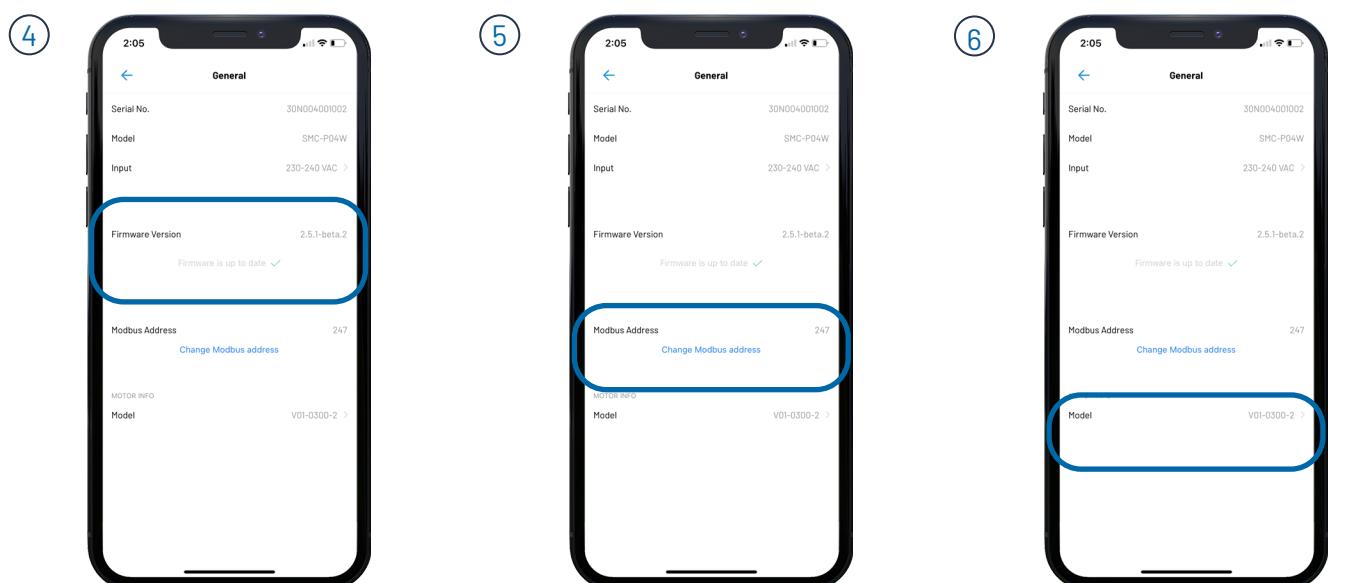
Settings - General



From the motor home screen touch "Settings" in the upper right corner.

Next touch "General"

The first section has motor controller details (serial number, model, and applied voltage). The voltage can be changed here.



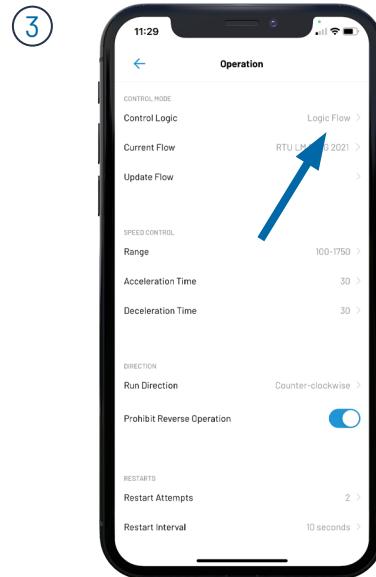
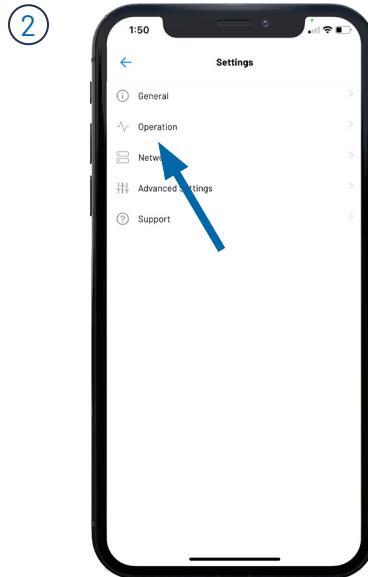
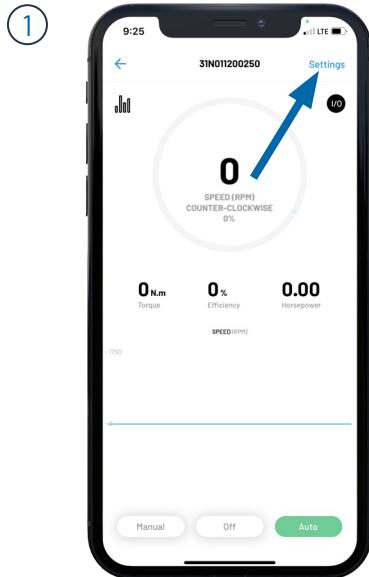
The second section has firmware version information and the ability to update.

Modbus address is listed in the third section. Normally this is not changed for RTU installations.

The final screen has motor model information. Changing motor model is done as this screen, but only if necessary.

Additional Features

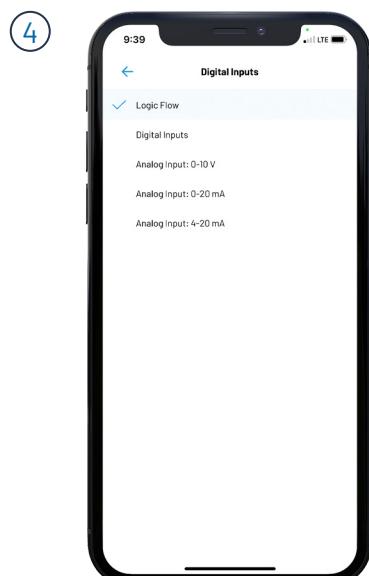
Settings - Operation - Control Logic



After configuring the Turntide motor system the Home screen appears. Touch the "Settings" link to access additional features.

Select "Operation" access the Operation screen.

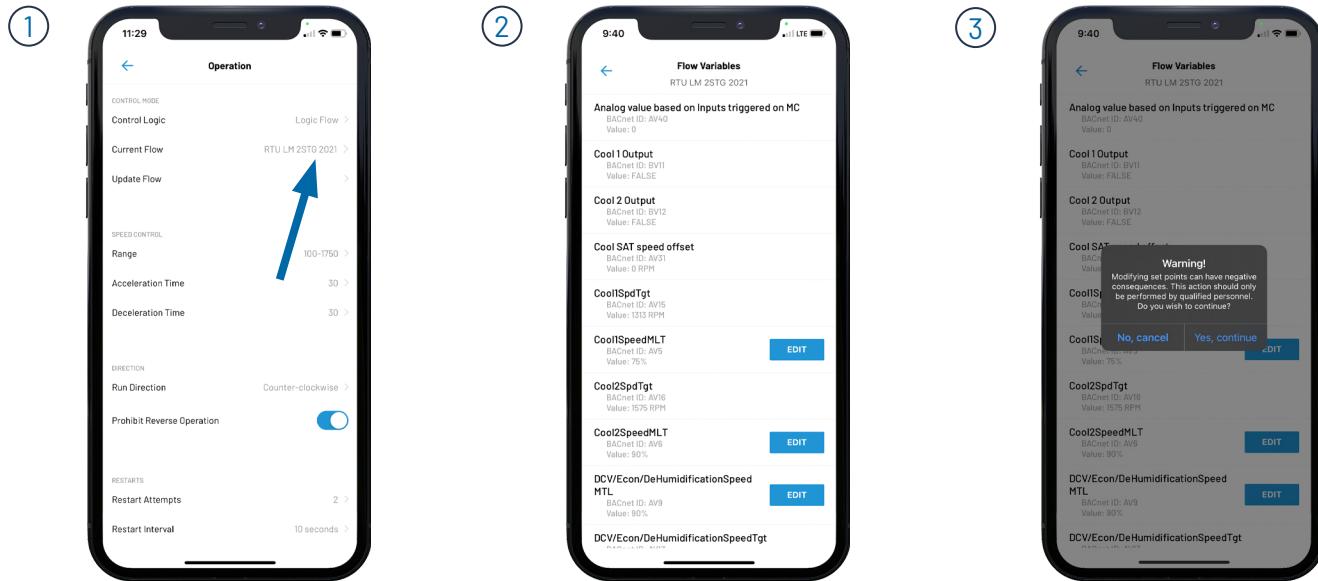
Across from Control Logic is the type of flow loaded.



Tapping the flow type allows to technician to make changes.

Additional Features

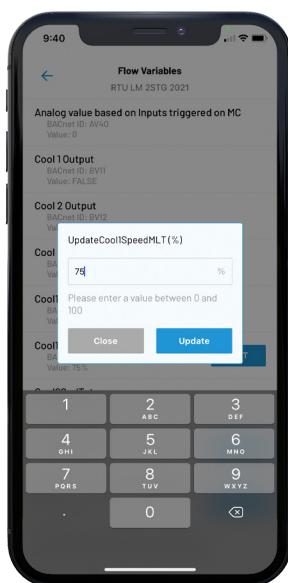
Settings - Operation - Current Flow



The next item is Current Flow. Touching the flow opens the Flow Variables screen. Requires firmware version 2.5.1 or greater.

From this screen some, but not all, flow variables can be modified as necessary.

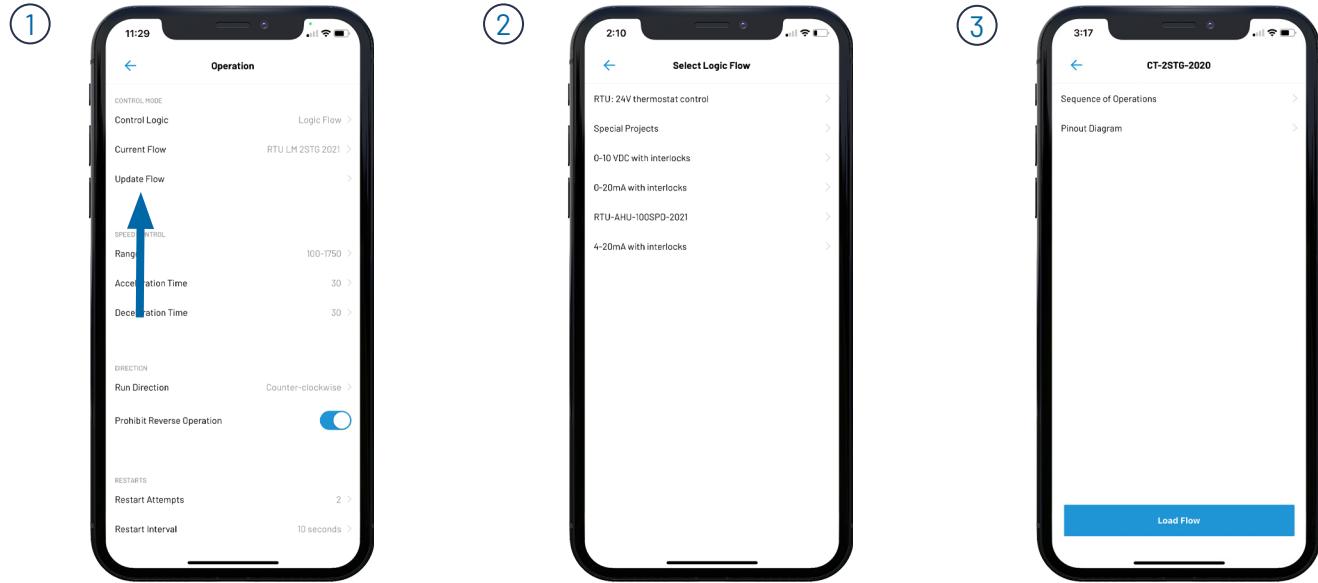
To change a flow variable, touch Edit and acknowledge the warning message.



Enter the new variable. In this example first stage cooling speed is modified. Touch Update when finished.

Additional Features

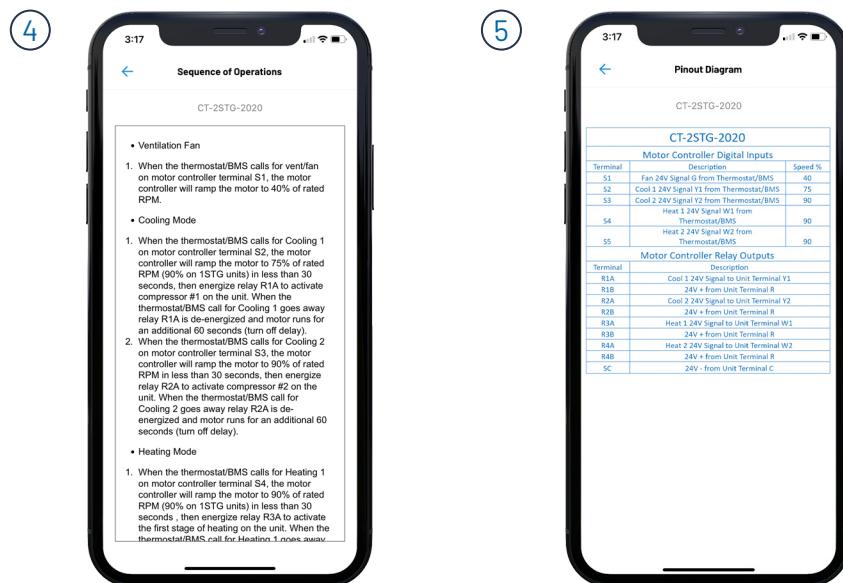
Settings - Operation - Update Flow



Touch Update Flow to change the entire flow.

Similar to motor system configuration select the desired logic flow.

Special Projects contains the Sequence of Operation for a specific flow and Pinout Diagrams.

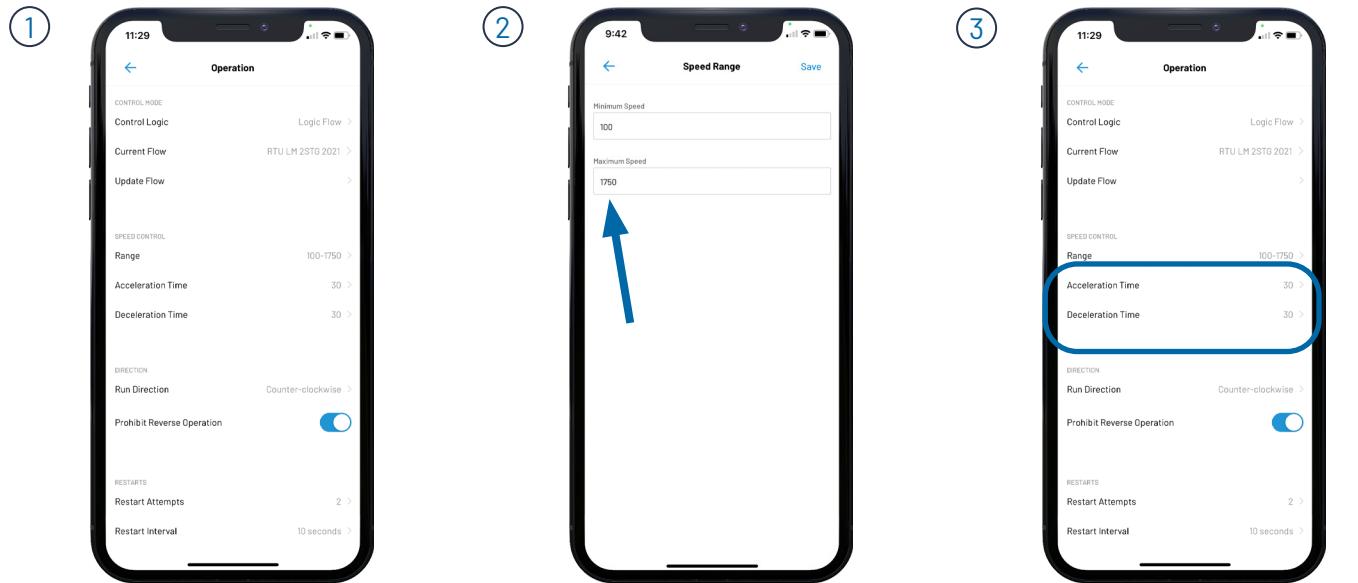


Sequence of Operation example.

Pinout Diagram example.

Additional Features

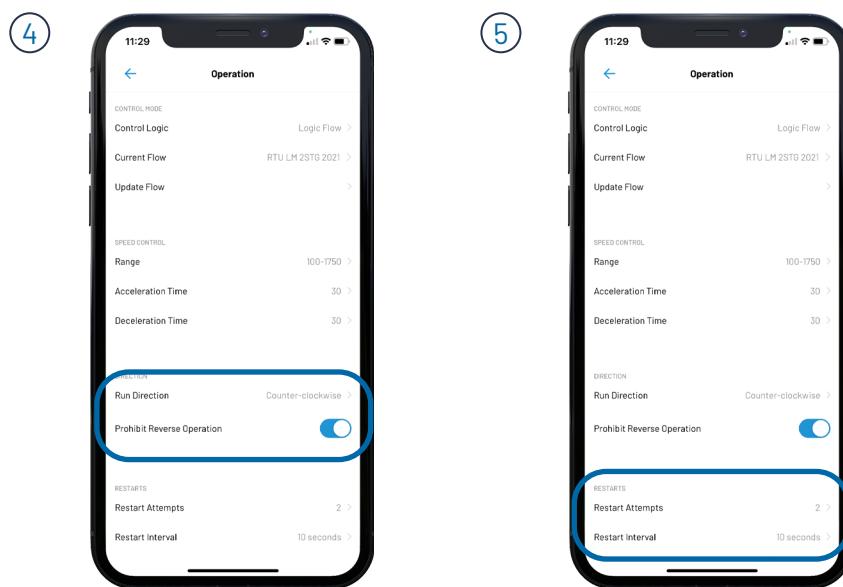
Settings - Operation - Other Features



Other features allow for modifying motor operation.

Speed range should never be set below 100 or above that listed on the original induction motor.

Acceleration and Deceleration time is the motor ramp up and down time. These are typically not adjusted.



The motor run direction and prohibit reverse operation can be changed here. Typically Prohibit Reverse Operation remains on.

Restart Attempts and Restart Interval are the number of time the motor will attempt to restart after a fault before locking out.

IMPORTANT NOTE:

Acceleration and Deceleration

These settings are optimized for most application and are typically not adjusted

Prohibit Reverse Rotation

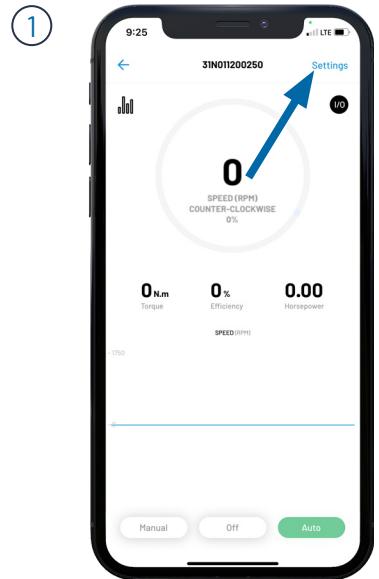
Allowing reverse motor rotation can result in damage to the RTU's blower assembly.

Restart Attempts and Restart Interval.

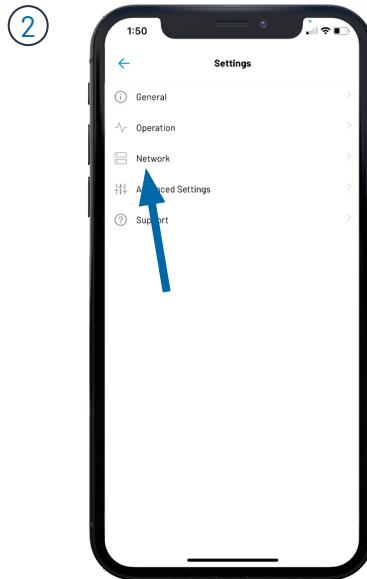
These settings should only be changed at the direction of Turntide Technical Support.

Additional Features

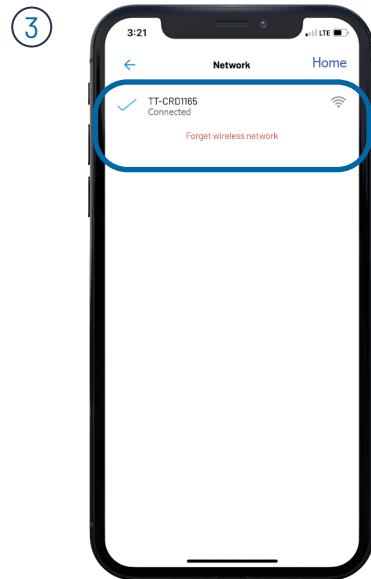
Settings - Network and Support



Touch "Settings"

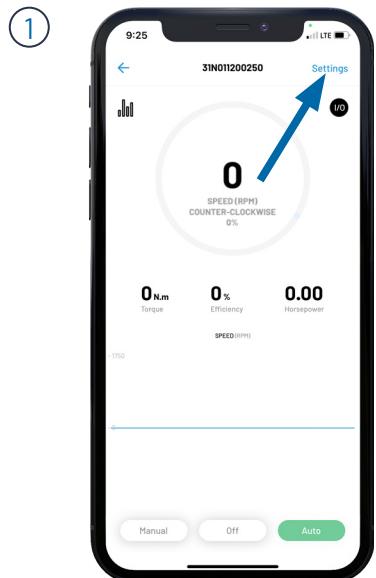


Select "Network"

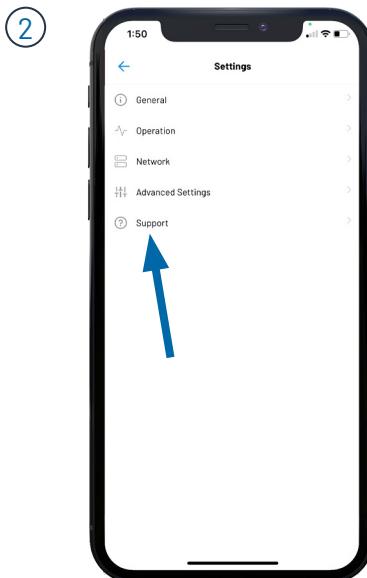


The RMK network information is listed.

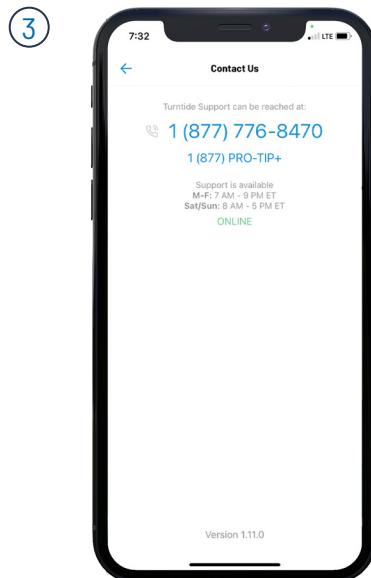
Settings - Support



Touch "Settings" on the motor home screen.



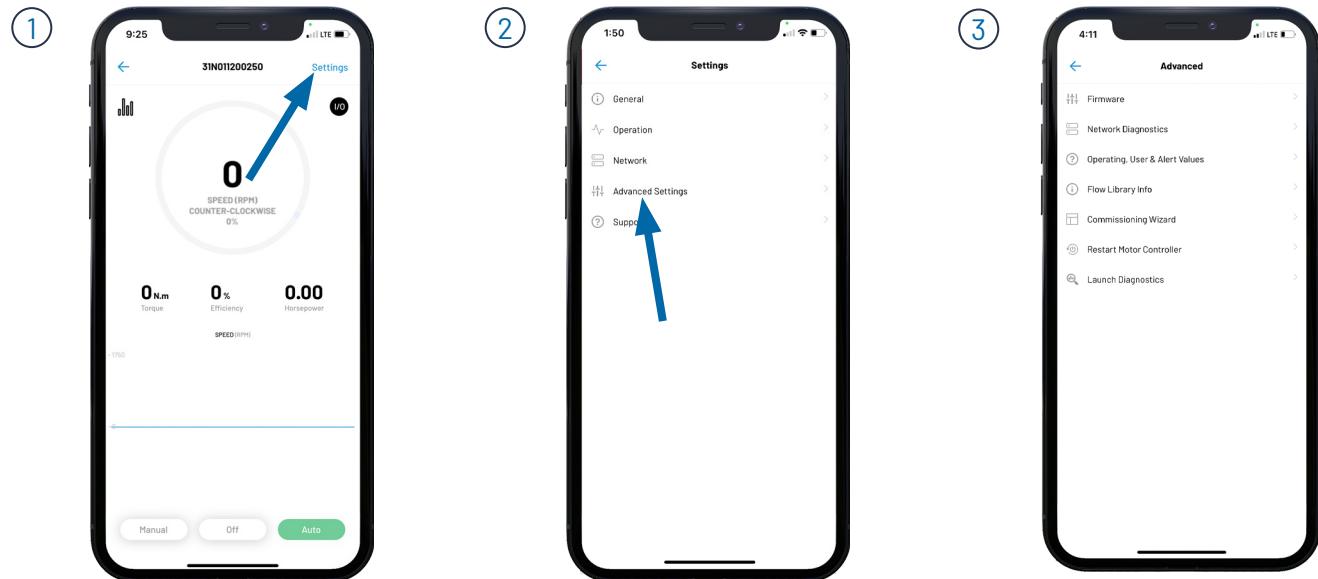
Select "Support"



The Turntide Technical Support number is displayed along with hours of operation.

Additional Features

Settings - Advanced

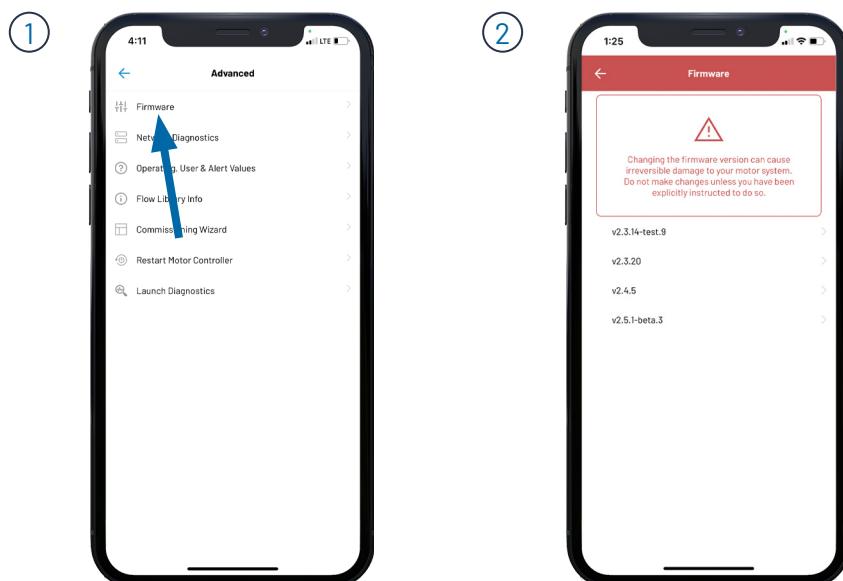


Touch "Settings"

Select "Advanced Settings"

The "Advanced" screen lists the available resources.

Settings - Advanced - Firmware

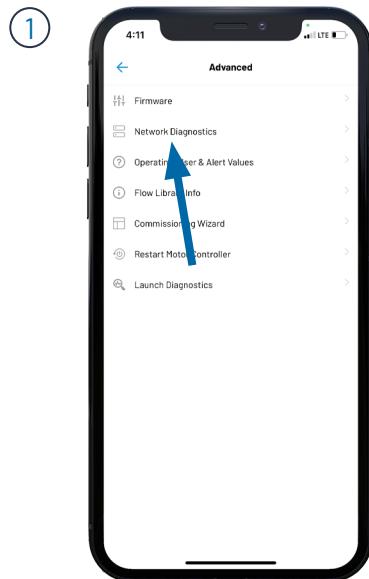


Touch "Firmware."

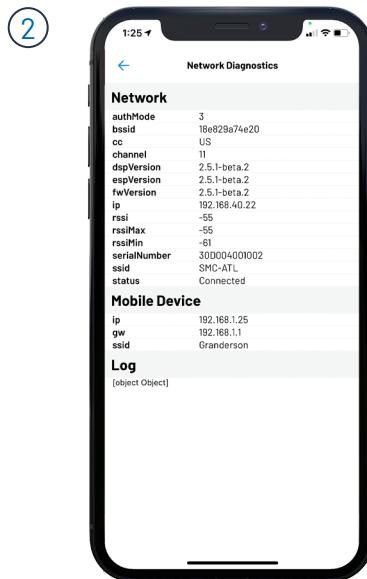
The Firmware screen shows the available versions. Changing should **ONLY** be done at the direction of Turntide Technical Services.

Additional Features

Settings - Advanced - Network Diagnostics

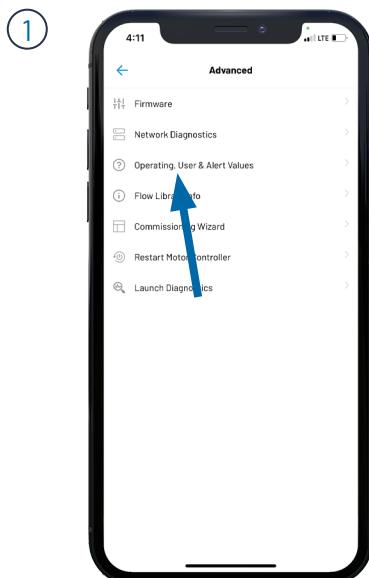


Touch "Network Diagnostics"

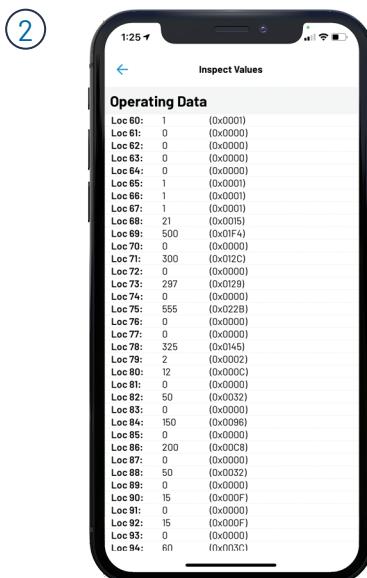


This screen shows WiFi connectivity and signal strength.

Settings - Advanced - Operating User & Alert Values



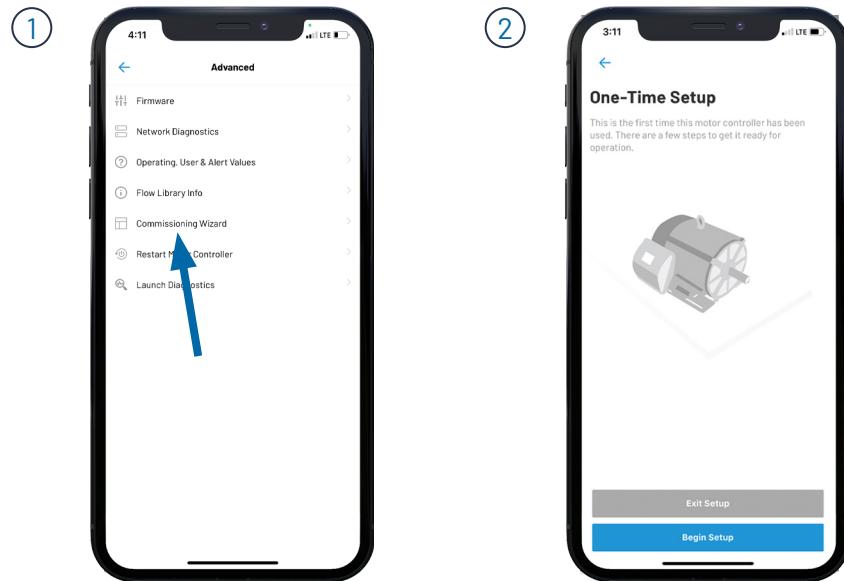
Select "Operating User & Alert Values."



This information is necessary for advanced troubleshooting with Turntide Technical Support.

Additional Features

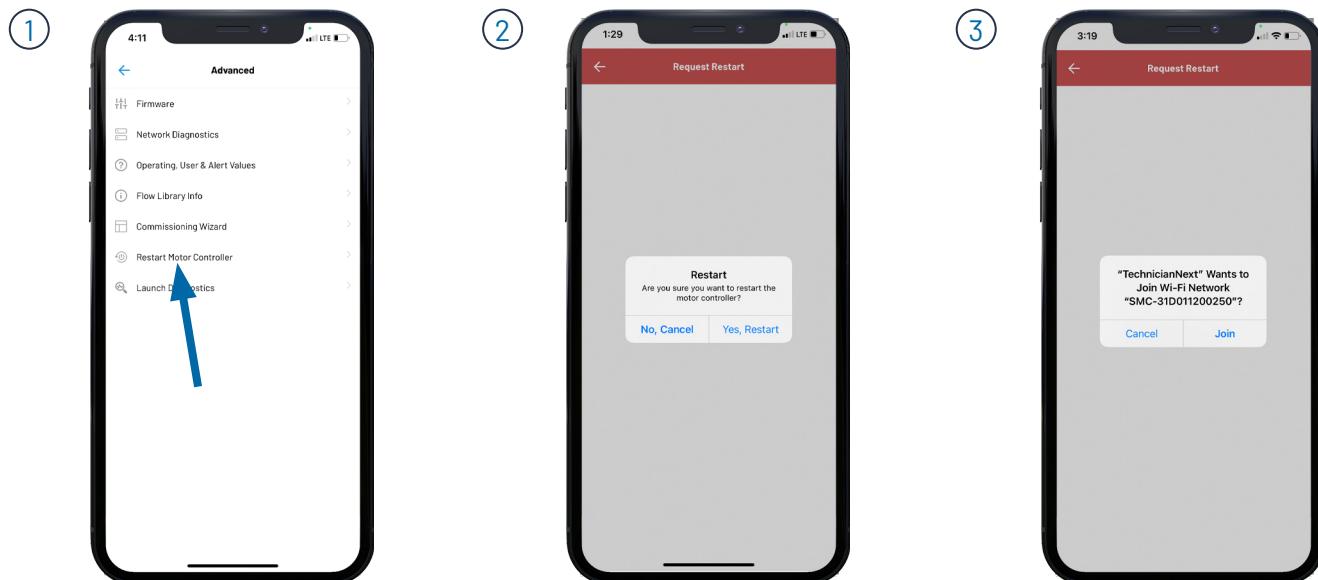
Settings - Advanced - Commissioning Wizard



Touch "Commissioning Wizard"

The One-Time Setup screen appears allowing configuring the Turntide Smart Motor System.

Settings - Advanced - Restart Motor Controller



Restarting the Turntide Motor Controller is a way to reset the controller.

Select "Yes" to restart.

Following the restart rejoining the motor controller WiFi is necessary.

Diagnostics

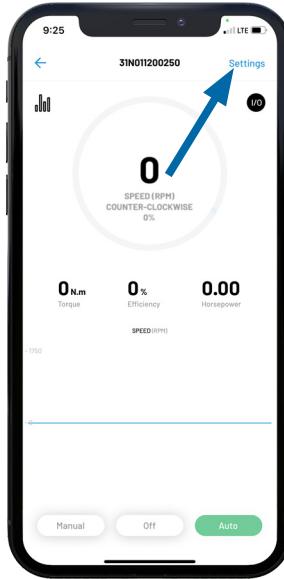
Settings - Advanced - Launch Diagnostics

The diagnostics section is an aid to installing and servicing technicians.

During Turntide motor installation the app can confirm the control wiring is correct, proper motor operation, the sensors, if used, are wired correctly, and the motor controller is emitting proper signal strength.

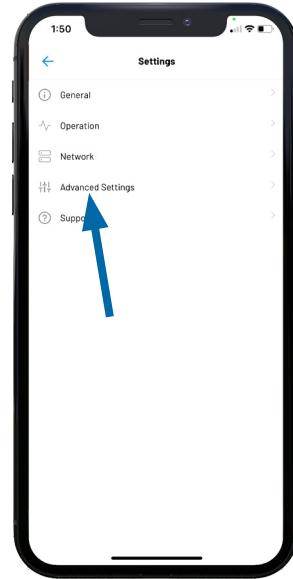
Servicing technicians find these features extremely useful as well. For example, a servicing technician can use the app to confirm proper operation. Thus, reducing the need to manually verify control wiring.

①



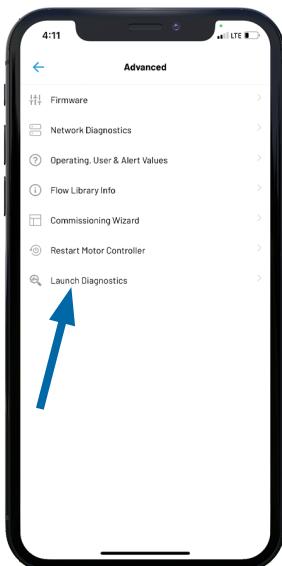
Touch "Settings"

②



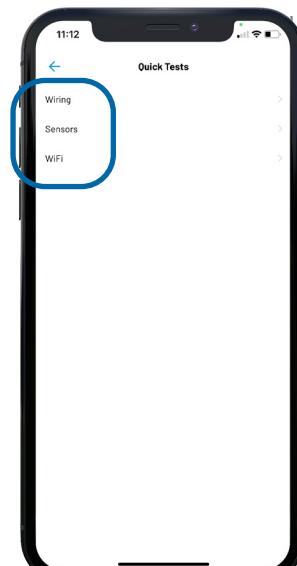
Select "Advanced Settings"

③



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④



The "Advanced" screen select "Launch Diagnostics."

At the "Quick Tests" screen there are three options available.

- Wiring

This feature validates wiring and the motor controller outputs.

- Sensors

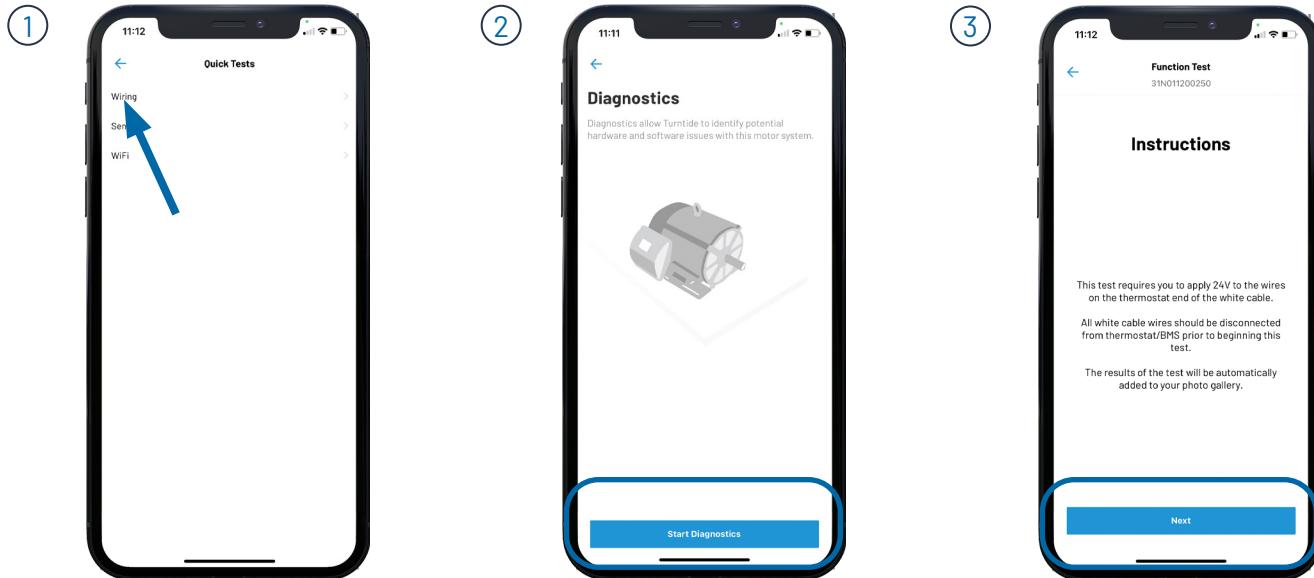
Sensor data is collected to determine proper location and wiring.

- WiFi

Motor controller WiFi signal strength is measured to ensure it is adequate.

Diagnostics

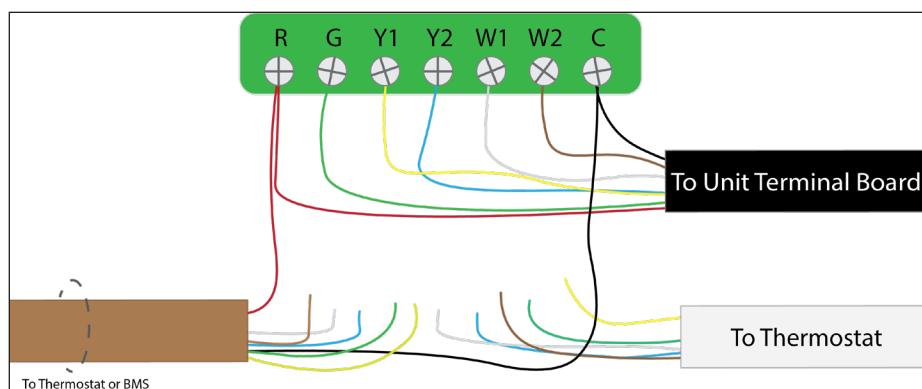
Wiring & Function Test



Select "Wiring" to enter the wiring and function test.

Touch "Start Diagnostics" to begin the test.

To properly test the wiring and motor system function, disconnect the white "To Thermostat" wires from the thermostat wires, see the illustration.



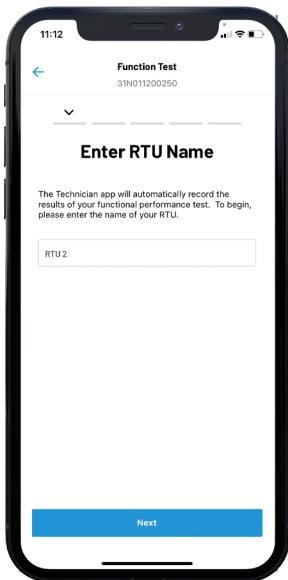
Notes:

1. The example shown is for a two-stage system. When testing a single stage system, the app omits second stage
2. The motor speeds may vary from those shown, based on application.

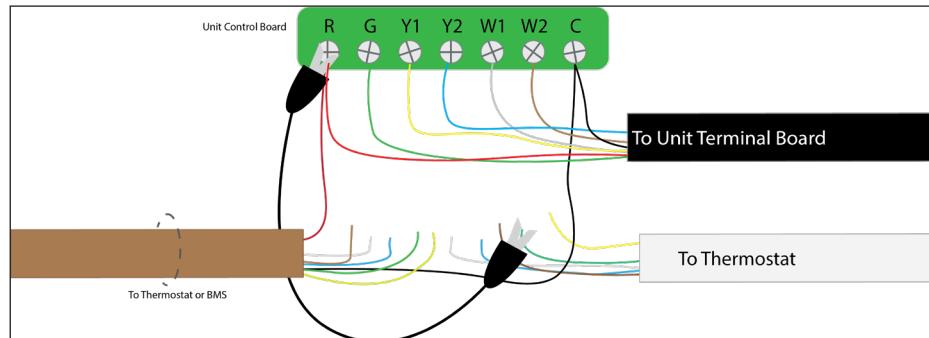
Diagnostics

Wiring & Function Test - Continued

4



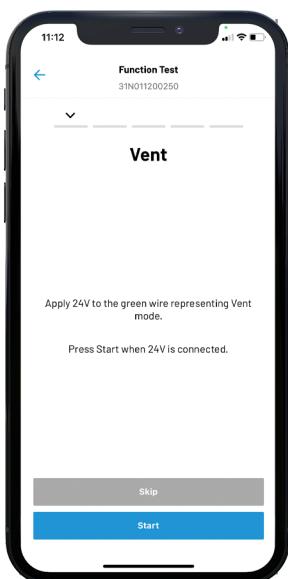
Before starting the test, enter a name for the unit being tested, such as RTU2.



The test requires two jumper wires in most cases. With power applied to the RTU connect one end for the jumper to the power, or "R" side of the 24 volt transformer, such as the "R" terminal of the unit control board. This connection will remain for the duration of the test.

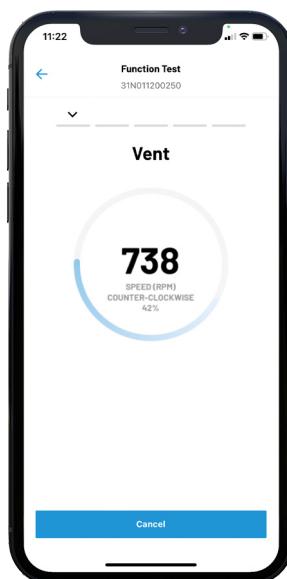
Connect other end of the jumper to the wire indicated by the test instruction. In this "Vent" test example the jumper wire connects to the green wire of the "To Thermostat" cable.

5



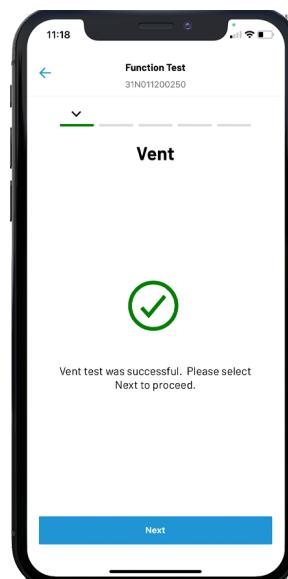
The "Vent" test is the first. Connect the jumper wire to the green wire of the "To Thermostat" cable. Touch Start to begin the test.

6



The app displays motor RPM, rotation, and percent of full speed during ramp up.

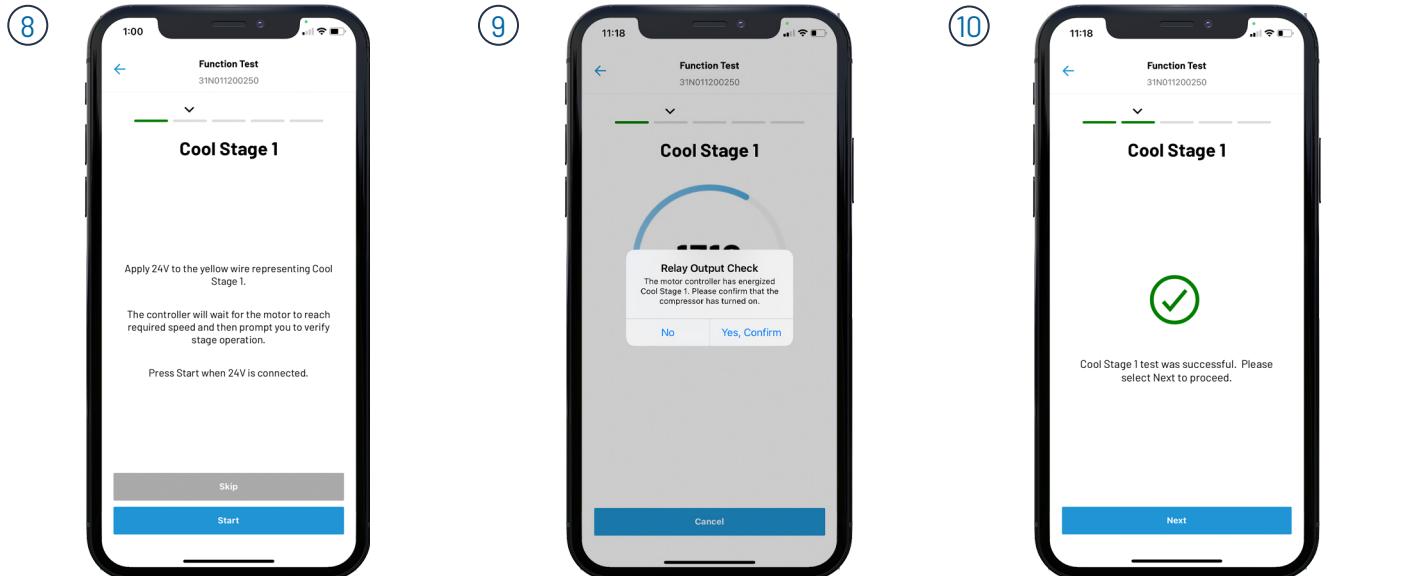
7



After operating at the proper speed for five seconds a green check indicates success. Touch "Next" for the next step.

Diagnostics

Wiring & Function Test - Continued



(8) Cool Stage 1

Apply 24V to the yellow wire representing Cool Stage 1.

The controller will wait for the motor to reach required speed and then prompt you to verify stage operation.

Press Start when 24V is connected.

(9) Cool Stage 1

Relay Output Check

The motor controller has energized Cool Stage 1. Please confirm that the compressor has turned on.

No Yes, Confirm

(10) Cool Stage 1

Cool Stage 1 test was successful. Please select Next to proceed.

Next

(11) Cool Stage 2

Apply 24V to the blue wire representing Cool Stage 2.

The controller will wait for the motor to reach required speed and then prompt you to verify stage operation.

Press Start when 24V is connected.

(12) Cool Stage 2

Relay Output Check

The motor controller has energized Cool Stage 2. Please confirm that the compressor has turned on.

No Yes, Confirm

(13) Cool Stage 2

Cool Stage 2 test was successful. Please select Next to proceed.

Next

Move the jumper to the yellow wire in the "To Thermostat" cable. Begin the test by touching "Start." This step is omitted for single stage equipment.

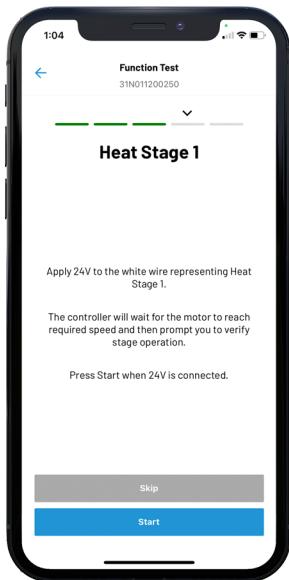
After the motor achieves the correct speed 1st stage cooling will energize*. Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to the next test.

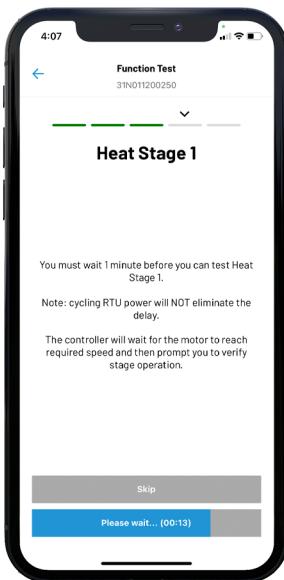
Diagnostics

Wiring & Function Test - Continued

14



15



Move the jumper to the white wire in the "To Thermostat" cable. Begin the test by touching "Start."

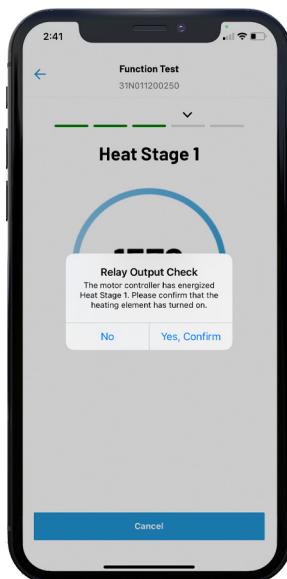
Before 1st stage heating is tested, the motor controller must complete the cooling "off" period. During this time the motor will continue to run for 30 to 240 seconds, depending on the flow loaded.

The screen to the left shows the countdown timer during this period.

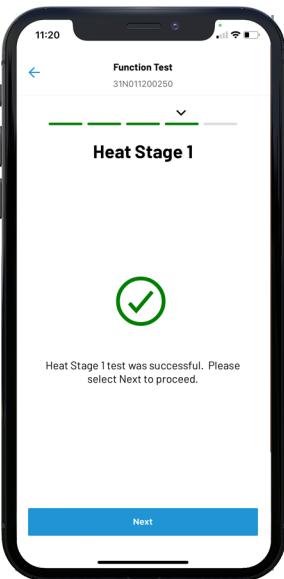
Once the time expires the motor will transition to 1st stage heating speed. In some applications, the 2nd stage cooling motor speed is the same as the 1st stage heating speed. There is no speed change.

The test will proceed 1st stage heat validation.

16



17



18



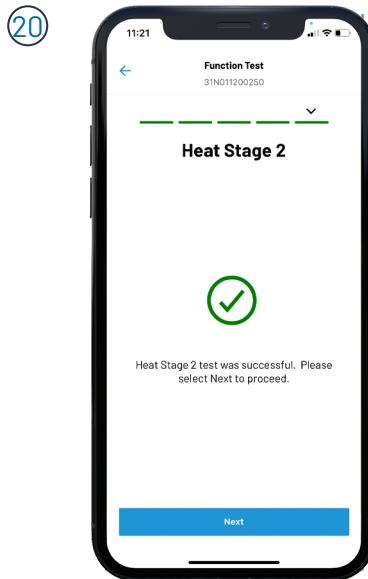
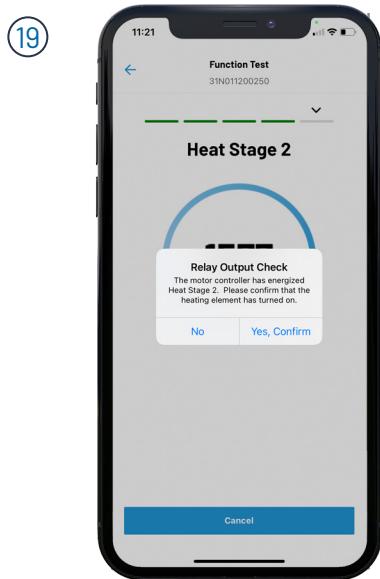
After validating motor operation 1st stage heating will start.* Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to the next test.

Move the jumper to the brown wire of the "To Thermostat" cable.** Touch "Start." This step is omitted for single stage equipment.

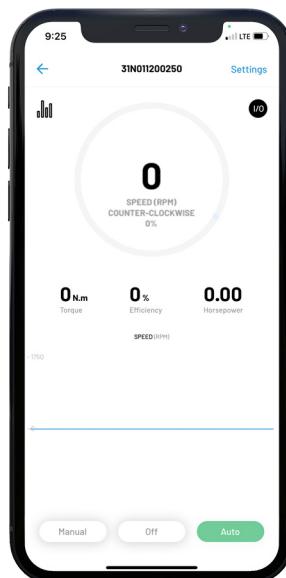
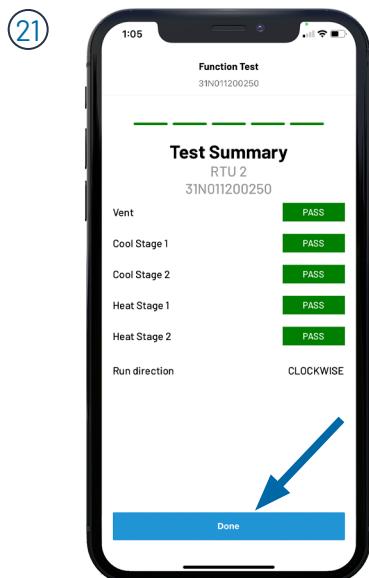
Diagnostics

Wiring & Function Test - Continued



After the motor achieves the required speed select 2nd stage heating will start.* Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to complete testing.



Upon test completion at "Test Summary" screen appears. Touch "Done" to return to the motor home screen. The app automatically saves an image to the "Test Summary" to the phone's photo library. Uploading the image is necessary for specific XOi workflow steps.

② The final step is to disconnect the jumper wire and reconnect the "To Thermostat" cable wires to the thermostat wires.

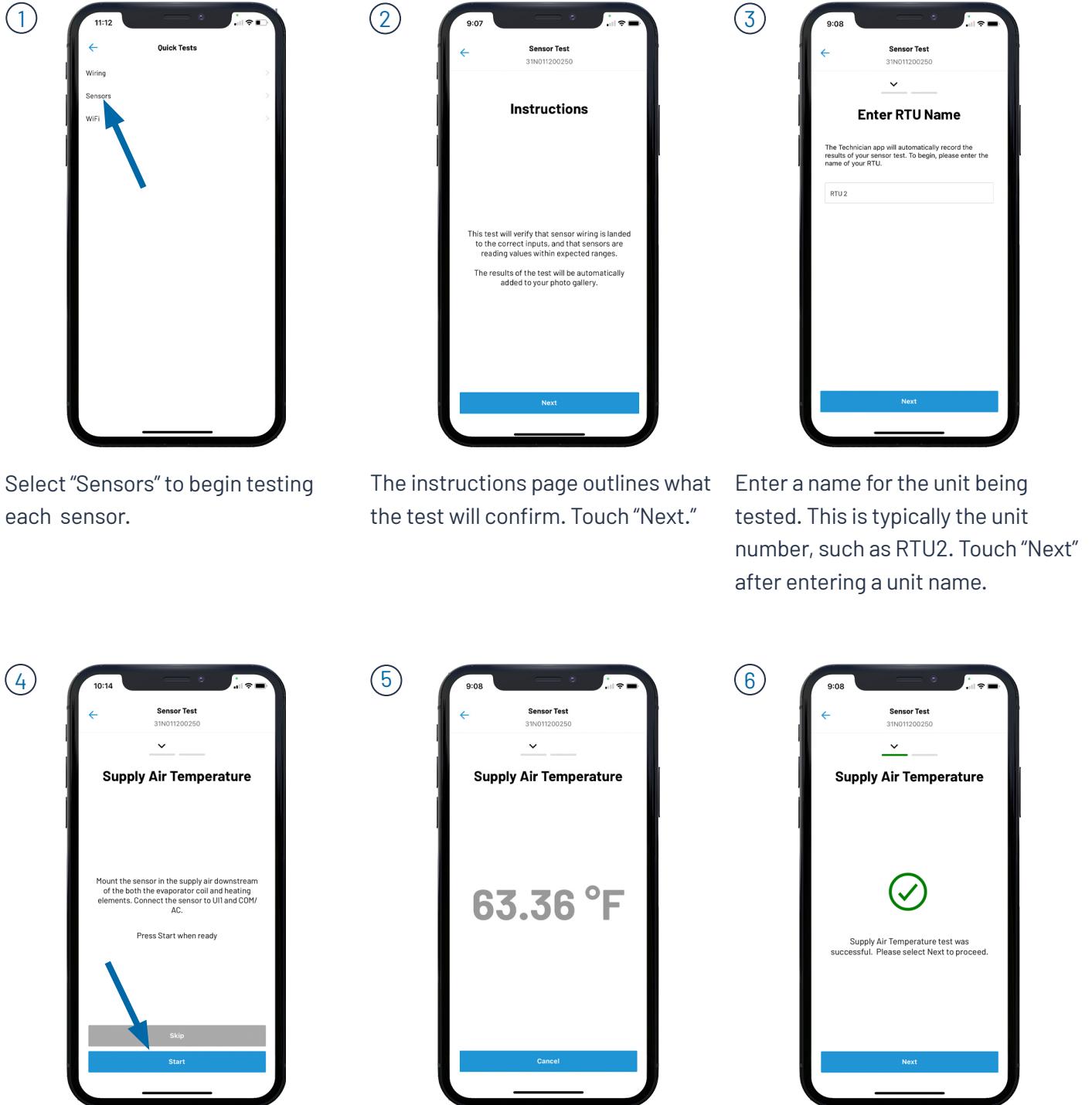
NOTES:

* Time delays built into the RTU control system may prevent the cooling or heating starting immediately.

** In many cases the 1st stage heat must be energized before the 2nd stage can energize. When testing 2nd stage heating, the jumper from R to the white wire of the "To Thermostat" cable must remain. An additional jumper wire is need from R to the brown wire of the "To Thermostat" cable. This allows both stages to energize.

Diagnostics

Sensor Test



Select "Sensors" to begin testing each sensor.

The instructions page outlines what the test will confirm. Touch "Next."

Enter a name for the unit being tested. This is typically the unit number, such as RTU2. Touch "Next" after entering a unit name.

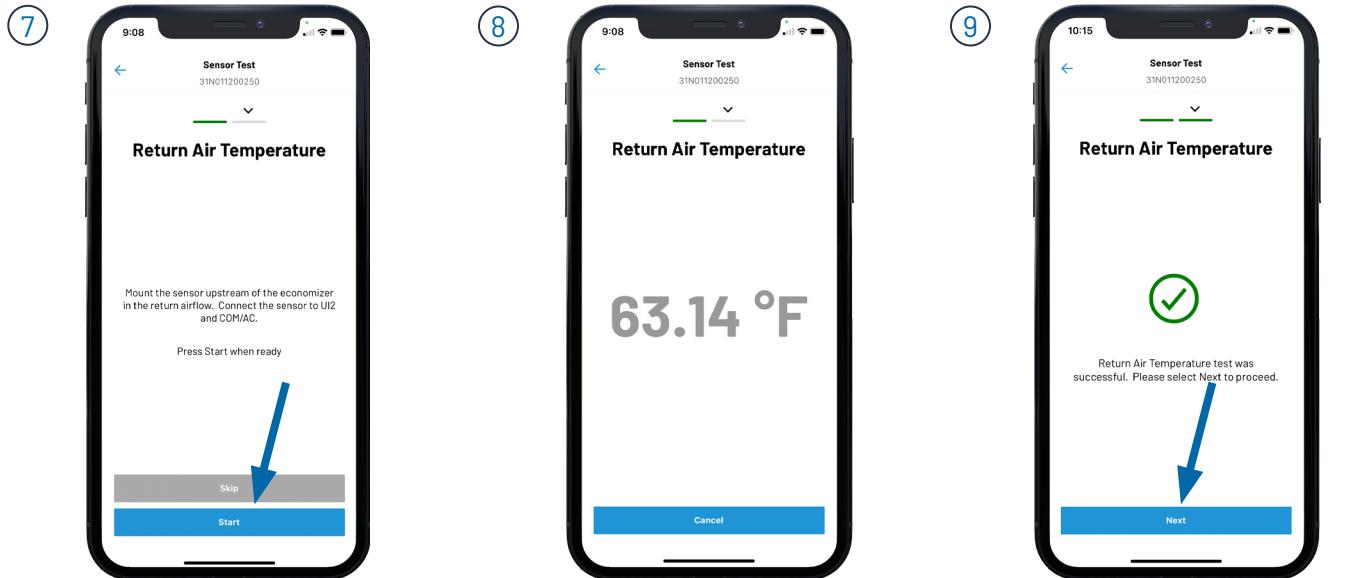
Touch "Start" to begin testing the supply air sensor.

The supply air temperature is displayed.

After a few seconds the screen updates indicating the test was successful. Touch "Next" to go to the next test.

Diagnostics

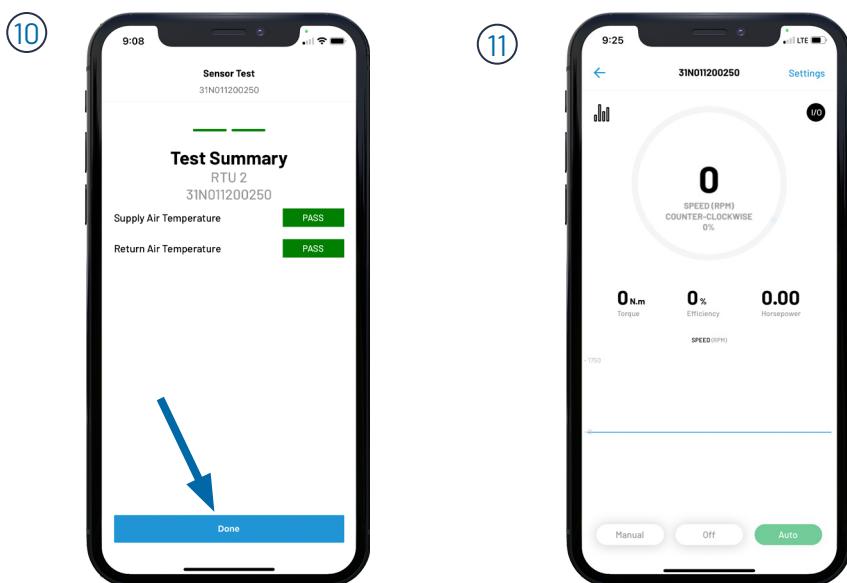
Sensor Test - Continued



Touch "Start" to begin testing the return air sensor

The return air temperature is displayed.

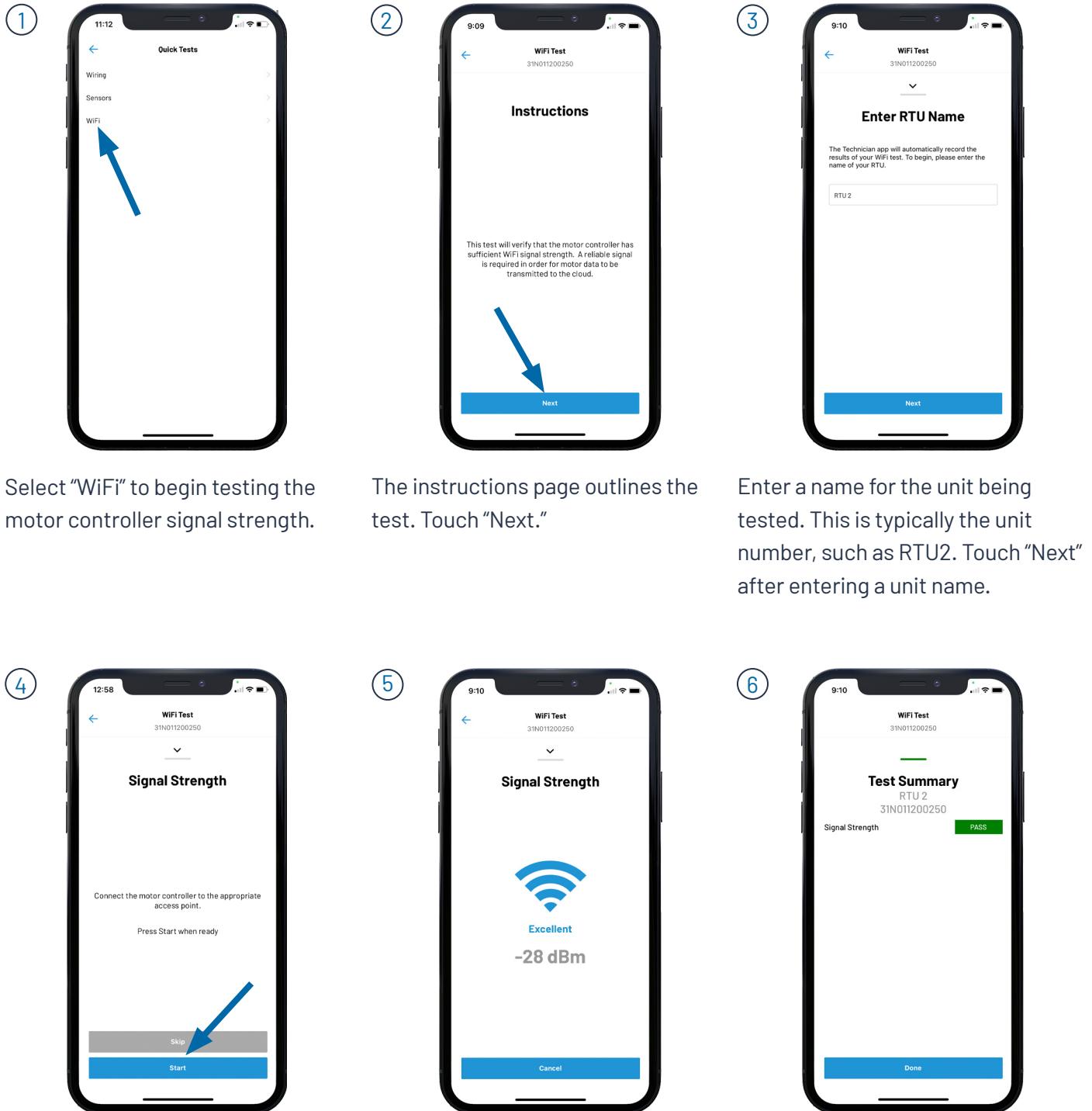
After a few seconds the screen updates indicating the test was successful. Touch "Next" to go to the summary page.



The summary page indicates pass or fail for each sensor. This image is saved to your phone's photo gallery. The image may be uploaded as part of an XoI workflow indicating a successful test. Touch "Done" to return to the home screen.

Diagnostics

WiFi Test



Touch "Start" to launch the test.

The app displays the motor WiFi strength in dBm and as an signal icon.

A "Test Summary" screen appears. If the test fails, contact Turntide Technical Support. Touch "Done" to return to the home screen.

Turntide Academy

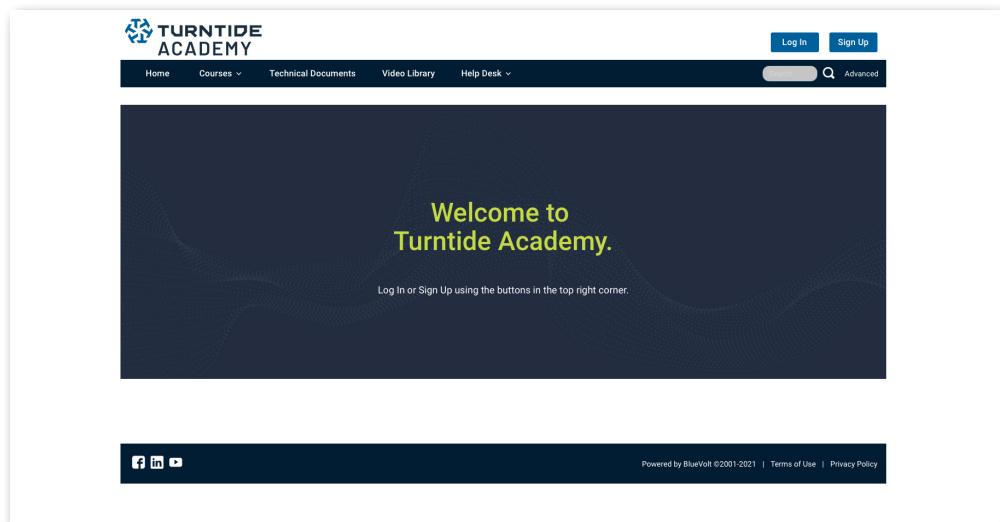
Turntide Academy provides excellent installation and service training for the various Turntide products.

Turntide Academy goes beyond just training. We also offer 27 videos directly related to Turntide Smart Motor System installation.

This site includes resources , such as Motor Specs, Product Information and Installation Manuals.

Check It Out

TurntideAcademy.com



The screenshot shows the Turntide Academy website. At the top, there is a navigation bar with links for Home, Courses, Technical Documents, Video Library, Help Desk, Log In, Sign Up, and a search bar. The main content area features a dark background with a grid pattern. Centered text reads "Welcome to Turntide Academy." Below this, a smaller note says "Log In or Sign Up using the buttons in the top right corner." At the bottom, there is a footer bar with social media icons for Facebook, LinkedIn, and YouTube, along with a link to "Powered by BlueVolt ©2001-2021 | Terms of Use | Privacy Policy".

TURNTIDE TECHNOLOGY FOR SUSTAINABLE OPERATIONS

Our breakthrough technologies accelerate electrification and sustainable operations for energy-intensive industries.



Turntide® Smart Motor System Install Guide

For RTU Full Integration
with Pre-Wired Motor Controllers



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The Turntide Smart Motor System delivers unprecedented energy efficiency in a highly reliable switched reluctance design.

Software Wrapped in Metal™

The Turntide software-driven motor solution includes the Turntide Smart Motor and the Turntide Motor Controller, complete with networking and connection capabilities to Turntide Cloud Services. It is proven to significantly reduce energy consumption, dramatically reducing energy costs and carbon footprint resulting from electric motor operation.



Unique Aspects

- Less hardware is required to control HVAC and other equipment because the Turntide Smart Motor System enables a configurable sequence of operation, based on internal and external sensor feedback from up to 16 integrated I/O points
 - 7x digital inputs (dry-contact or 24-volt)
 - 4x dry contact relays
 - 4x universal inputs (resistive, voltage, current, logic signal)
 - 1x analog output (0-10VDC)
- Safe DC Bus discharge ensures the internal voltages of the controller are rapidly discharged for safe service and maintenance immediately after power-down
- Built-in soft start and brownout protection eliminate service calls due to inadvertent circuit breaker trips

CONSIDERATIONS

- Review this installation guide before beginning
- Review installation training videos
- Follow all local and national electrical codes when installing motor systems
- Follow all local and national Safety Compliance Requirements
- All cables provided by Turntide are NOT rated for outdoor use
- The Turntide Smart Motor weighs over 50 pounds – make appropriate plans for moving it safely
 - V01 motor weighs 54 lbs
 - V02 motor weighs 72 lbs
 - V03 motor weighs 150 lbs

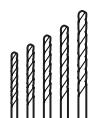
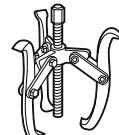
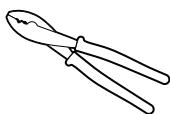
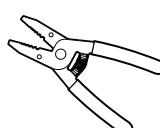
Know Before You Go

Below is a list of the common tools that are required to install the Turntide Smart Motor System. Every application is different, and additional tools may be required. Check your toolbox to make sure you have all the tools you'll need.

Tools You'll Need



Cordless Drill

Uni-bit, Hole Saw
or Knock Outs
for 1/2", 3/4" & 1" EMTDrill Bit Index
Up to 1/2"Wheel Puller
3-jaw for removing
existing motor pulleyTerminal (Spade)
Crimp Tool

Wire Strippers



Multi-VOM Meter



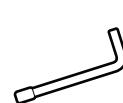
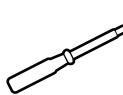
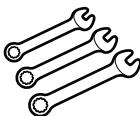
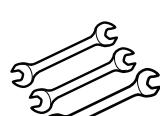
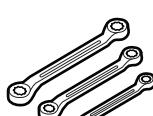
Clamp Amp Meter



Adjustable Pliers



Needle Nose Pliers

Allen Wrench
5mmAllen Wrench Set
1/8" – 3/8"Screwdriver
PhillipsScrewdriver
SlotScrewdriver
Small terminatingNut Driver
1/4" and 5/16"Combo Box/Open-
End Wrenches
Up to 3/4"Thin Head
Access Wrenches90 Degree
Offset Wrenches

Other Supplies

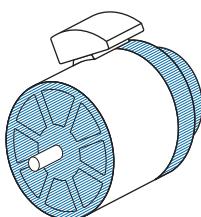
- Silicon Caulk
- Loctite 620
- Degreaser



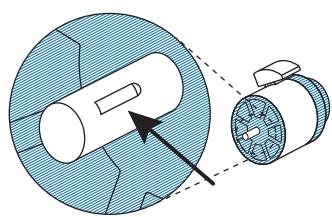
What's Included

Everything commonly necessary to install the Turntide Smart Motor System arrives in three separate boxes. They are the Turntide Smart Motor, the Turntide Motor Controller, and the Turntide Motor Install Kit. Component use is dependent on application. Not all components will be used on every installation. For unique applications, additional supplies may be required.

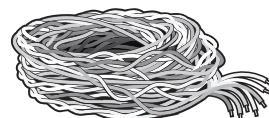
Box 1: Turntide Smart Motor



Turntide Motor
Qty 1

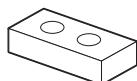


Shaft Adapter & Key
Qty 1 - Included only with motors having 5/8" shaft.
Field supplied Loctite 620 is necessary.

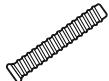


Power Cable
Qty 1

Motor Feet Spacer Install Kit



Feet Spacer
Qty 2

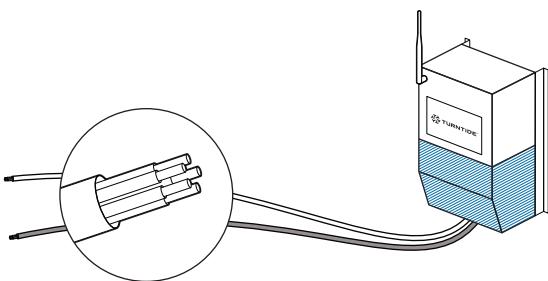


Feet Spacer Bolt
Qty 4

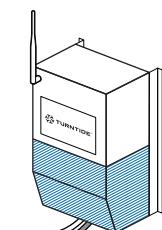


Mounting Plate
Bolt Spacer
Qty 4

Box 2: Motor Controller



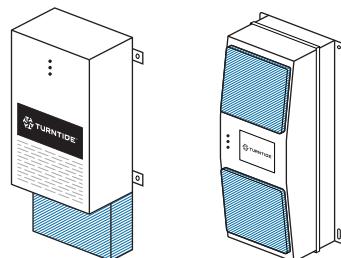
Control Cables
Qty 2



Motor Controller
Qty 1

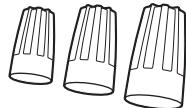


Antenna
Qty 1

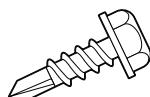


There are different Turntide Motor Controller models for different motor configurations, and each is covered in this Install Guide

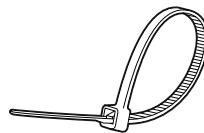
Box 3 : Install Kit



Wire Nuts
Qty 6 – Tan/Red for Motor Power Cable
Qty 12 – Blue for Thermostat



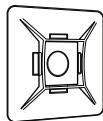
Hex Screws
Qty 6 – 5/16" x 3/4"



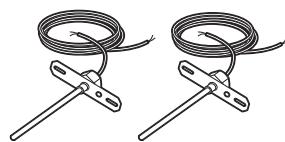
Cable Ties
Qty 10



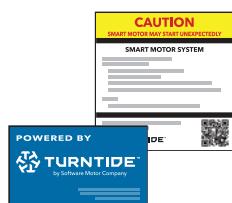
Snap-In Bushing
Qty 6 - 1/2"
Qty 6 - 3/4"



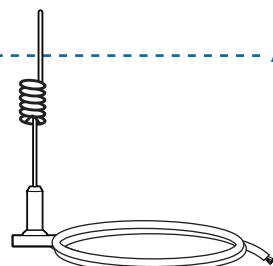
Cable Tie Bases
Qty 6



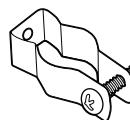
Air Temp Sensors & 10' Wire
Qty 2 - Included if applicable and may arrive
in separate box (sensor appearance may vary)



Turntide & Caution Labels
Qty 1 ea



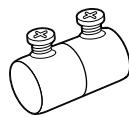
Antenna Install Kit



1/2" Conduit Hanger
Qty 2



1/2" x 12" EMT Conduit
Qty 2



1/2" EMT Coupling
Qty 1



1/2" EMT Connector
Qty 1



Sheet Metal Screw
Qty 2



Electrical Box Cover
Qty 1



Weather Tite Connector
Qty 1



Step-by-Step Installation in an RTU

Follow these simple step-by-step instructions to replace the existing motor in a common packaged rooftop unit (RTU) with a new Turntide Smart Motor System.

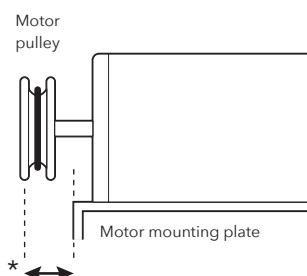
Install the Turntide Motor

1



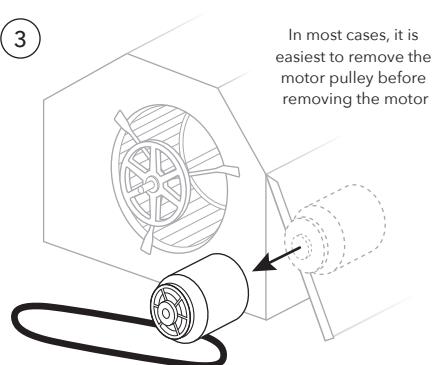
Isolate all incoming power to HVAC unit using normal "Lock Out/Tag Out" and local code requirements and verify all power is turned off to the unit

2



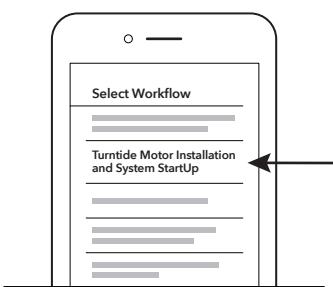
Measure and record the distance (*) between the motor mounting plate and motor pulley

3



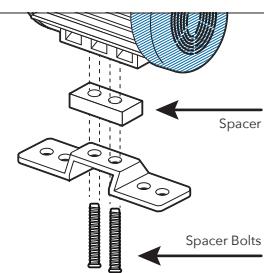
Remove existing belt & motor

4



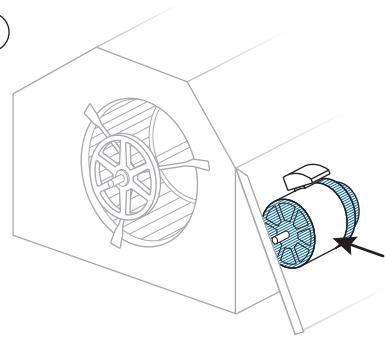
Open the Turntide Motor Installation and Start Up workflow on the XOi mobile app and perform required steps throughout the installation process

5



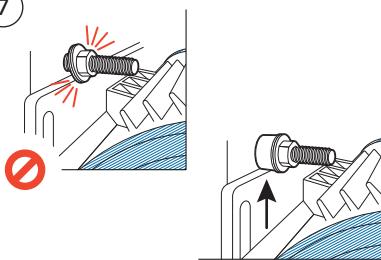
Install motor feet spacer and longer bolts, if additional space is required between motor feet and base

6



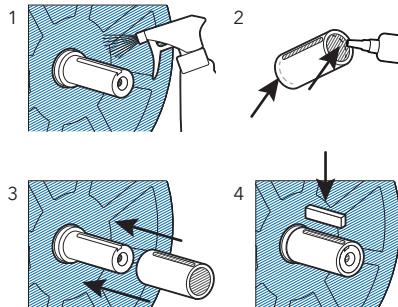
Install Turntide Smart Motor to the existing motor mounting plate

7



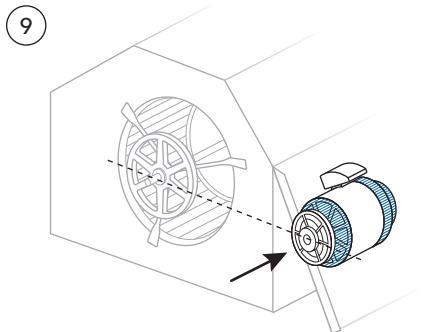
In some cases, tightening the motor plate nut is not possible – the provided bolt spacers allow for proper nut tightening

8

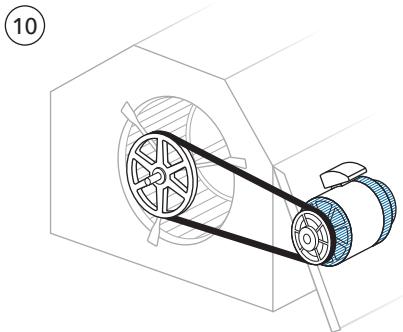


If the Turntide Motor has a 5/8" shaft and existing pulley is 7/8" ID, install the shaft adapter as follows:

1. Clean the shaft with degreaser
2. Apply a small amount of Locktite 620
3. Install the shaft adapter with the set screw towards the shaft end
4. Insert the extended height shaft key and tighten the set screw to lock the shaft adapter in place

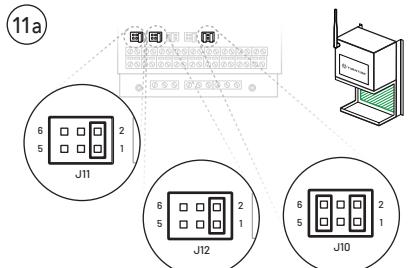


Reinstall original
motor pulley, referencing the
distance recorded in Step 2*



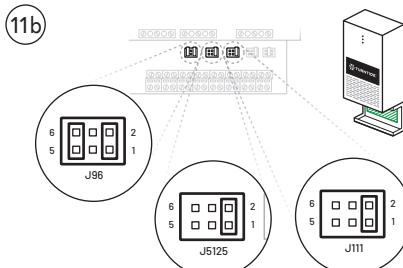
Install the belt and tension
to 1/64" deflection per inch of distance
between motor and blower shafts

Install the Turntide Motor Controller



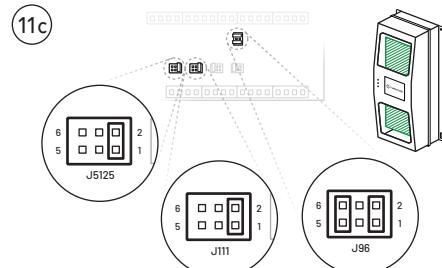
SL120/160 Motor Controller

Confirm J11 and J12 jumper bridges are set on pins 1&2. Confirm J10 jumper bridges are set on pins 1&2 and 5&6



P04 Motor Controller

Confirm the J96 jumper bridges are set on
pins 1&2 and 5&6, the J111 bridges on
1&2 and the JS125 bridges on pins 1&2

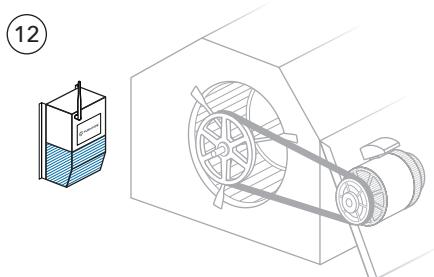


P05 Motor Controller

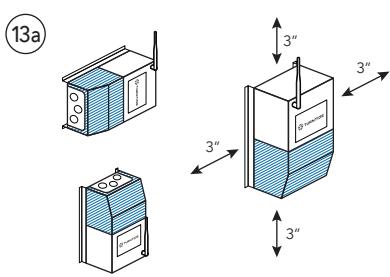
Confirm the J5125 jumper bridges are set on
pins 1&2, the J111 bridges on 1&2
and the J96 bridges on pins 1&2 and 5&6

Note:

For a detailed explanation of the jumper pin function see *Motor Controller Jumper Pin Overview* in the appendix of this document.

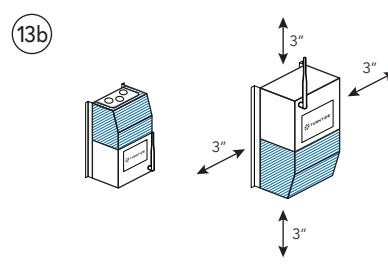


Mount the Turntide Motor Controller
inside the RTU – ideally in the blower
cabinet – using caution not to penetrate
cabinet with the screws (if a suitable
location is not available, it may be
mounted in a NEMA 3 enclosure)



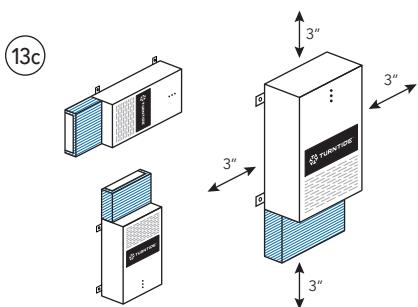
SL120 Motor Controller

Insert bushings into the motor
controller and mount in any position
to a rigid surface with a minimum
clear space of 3" on all sides



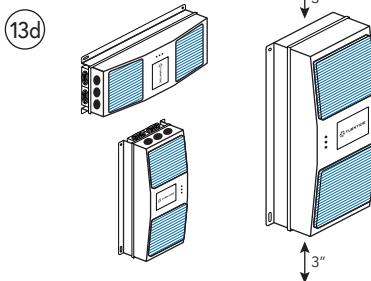
SL160 Motor Controller

Insert bushings into the motor
controller and **mount vertically** to a
rigid surface with a minimum clear
space of 3" on all sides, with antenna
up for best results



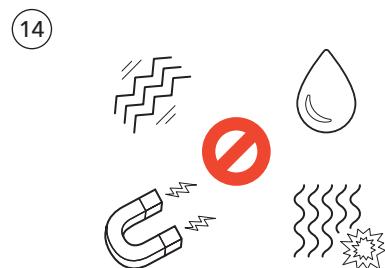
P04 Motor Controller

Insert bushings into motor controller and mount in any position to a rigid surface with a minimum clear space of 3" on all sides

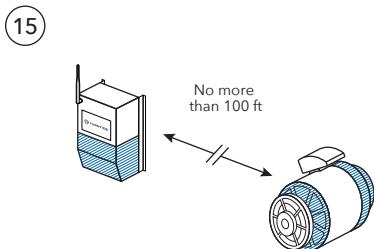


P05 Motor Controller

Insert bushings into motor controller and mount in any position to a rigid surface with a minimum clear space of 3" on top and bottom – note there is no minimum clearance on the sides

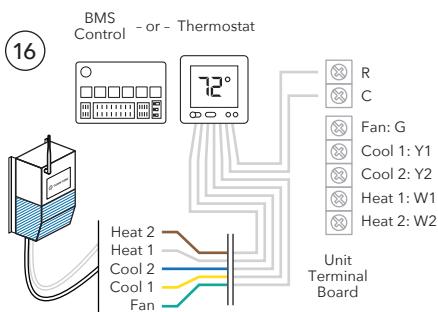


Must be away from excessive vibration, moisture, electromagnetic interference, and explosive/corrosive vapors

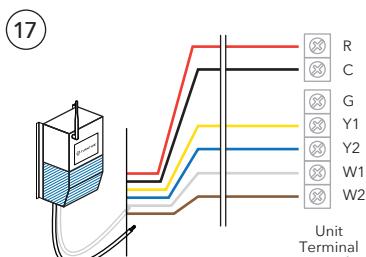


The Turntide Motor Controller and the Turntide Smart Motor can be up to 100' apart, but closer will make for an easier installation

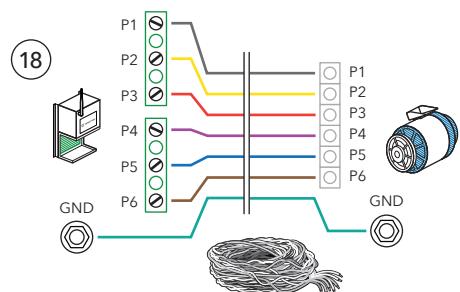
Wire Components



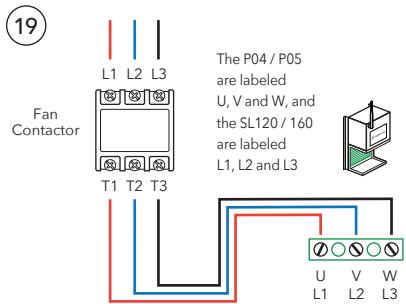
Remove thermostat wires from the unit connection point, connect "to thermostat" wires from the Turntide Motor Controller and cut excess wire to length required



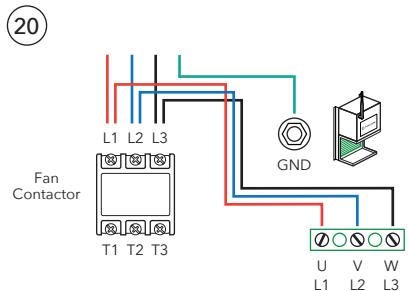
Connect "to unit terminal board" wires from the Turntide Motor Controller to unit connection point where thermostat wires were just removed, and cut excess wire to length required (applies to all motor controllers)



Insert bushing into the motor electrical box, install the ferrules end of the motor power cable to the Turntide Motor Controller and unterminated leads to the Turntide Smart Motor, cutting excess length from the raw end of the cable to required length, leaving ample slack for future servicing



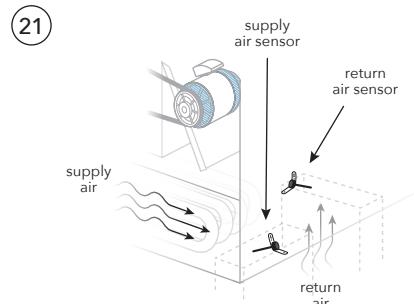
Connect the induction motor power wires to the Turntide Motor Controller (if the induction motor had separate overload wires, they must be connected together)



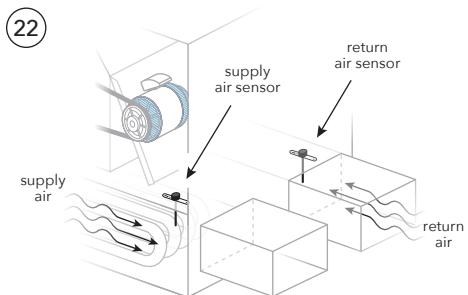
Relocate induction motor power wires from the "Load" side of the fan contactor to the "Line" side, so the Turntide Motor Controller has an unswitched power supply

Air Sensor Installation

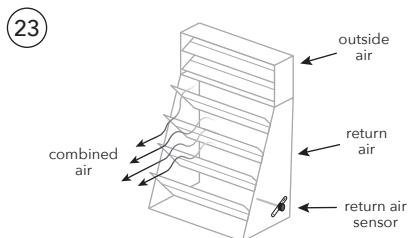
Air sensors are NOT intended for installations exposed to weather – if not using, skip this section



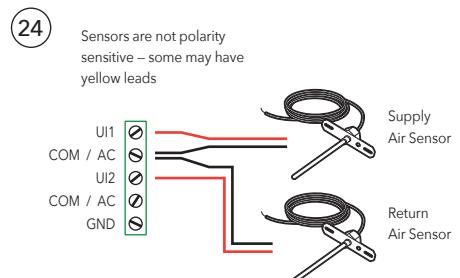
Install the supply air sensor downstream of the coil and heat exchanger, and the return air sensor in the return duct inlet (sensors are identical, and can be installed in either location)



For horizontally ducted units, install the supply air sensor through blower deck just beyond the heat exchanger, and the return air sensor where duct enters unit



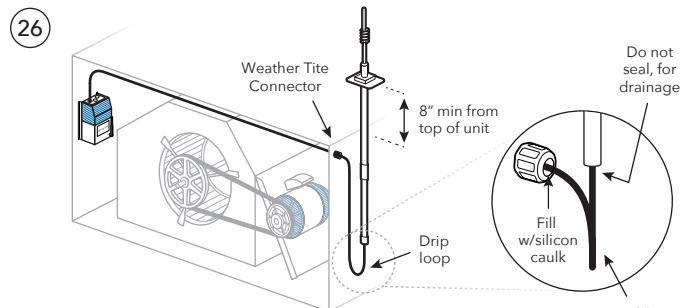
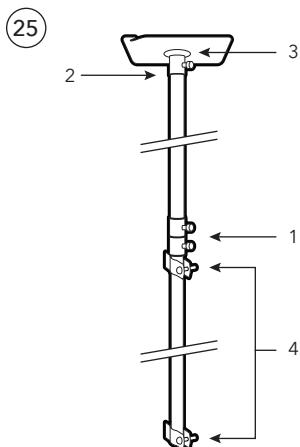
For units equipped with an economizer, install the return air sensor upstream of the economizer such that it senses the indoor return air, not the outside air, taking care to not to impede damper blade operation



Wire sensors to the Turntide Motor Controller (P04 / P05 terminals are labeled UI1 and AC, while SL120 / 160 terminals are labeled UI1 and COM)

Assemble Antenna Mount

If no Remote Monitoring Kit is on site, skip this section

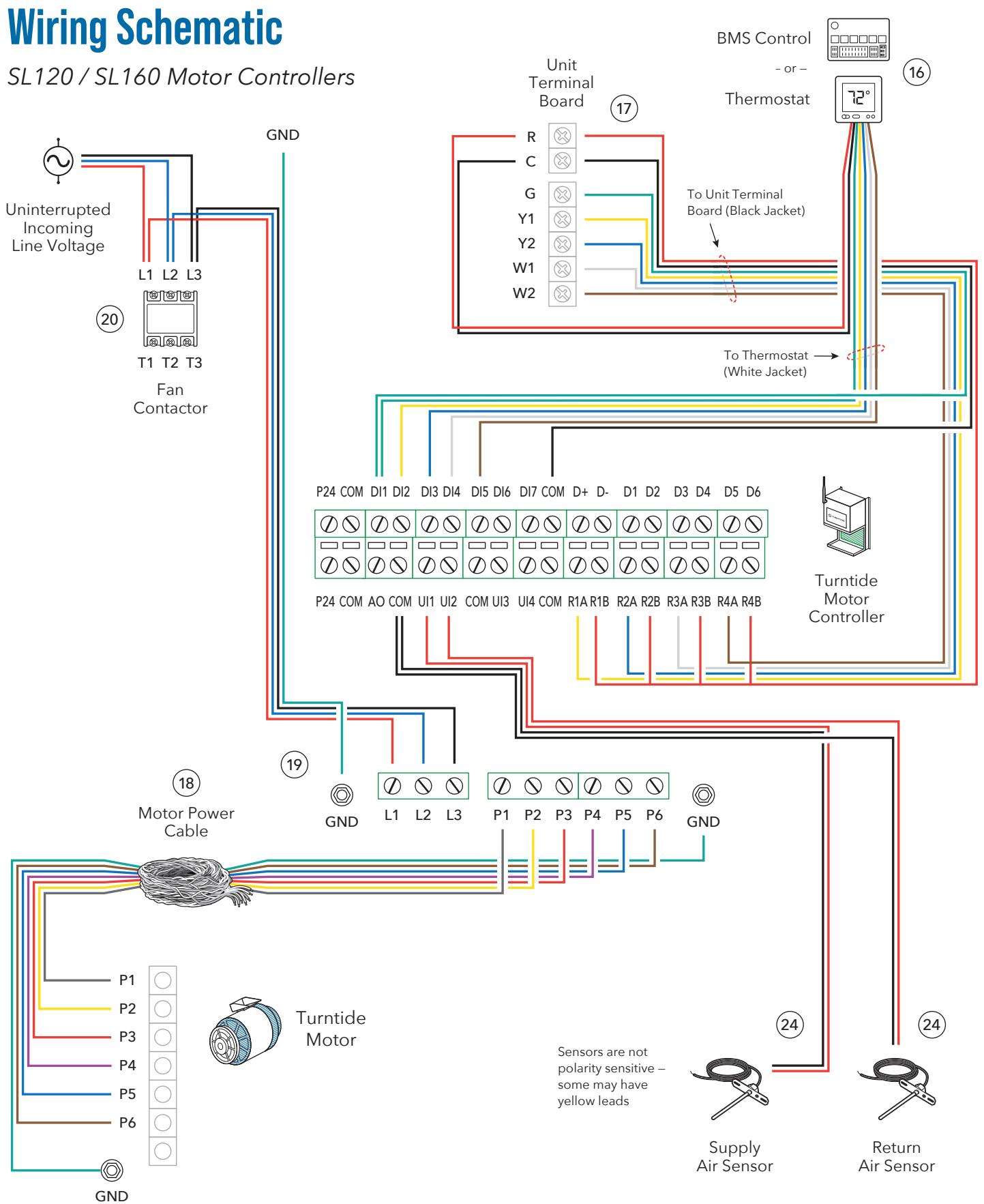


Install antenna on top of electrical box cover and route wire down through EMT conduit, then attach Weather Tite connector to non-removable panel and route the antenna lead though the connector, sealing the opening from weather using silicone caulk. **Connect the antenna lead to the Turntide Motor Controller using a finger-tight connection only – overtightening will cause damage to the connection.**



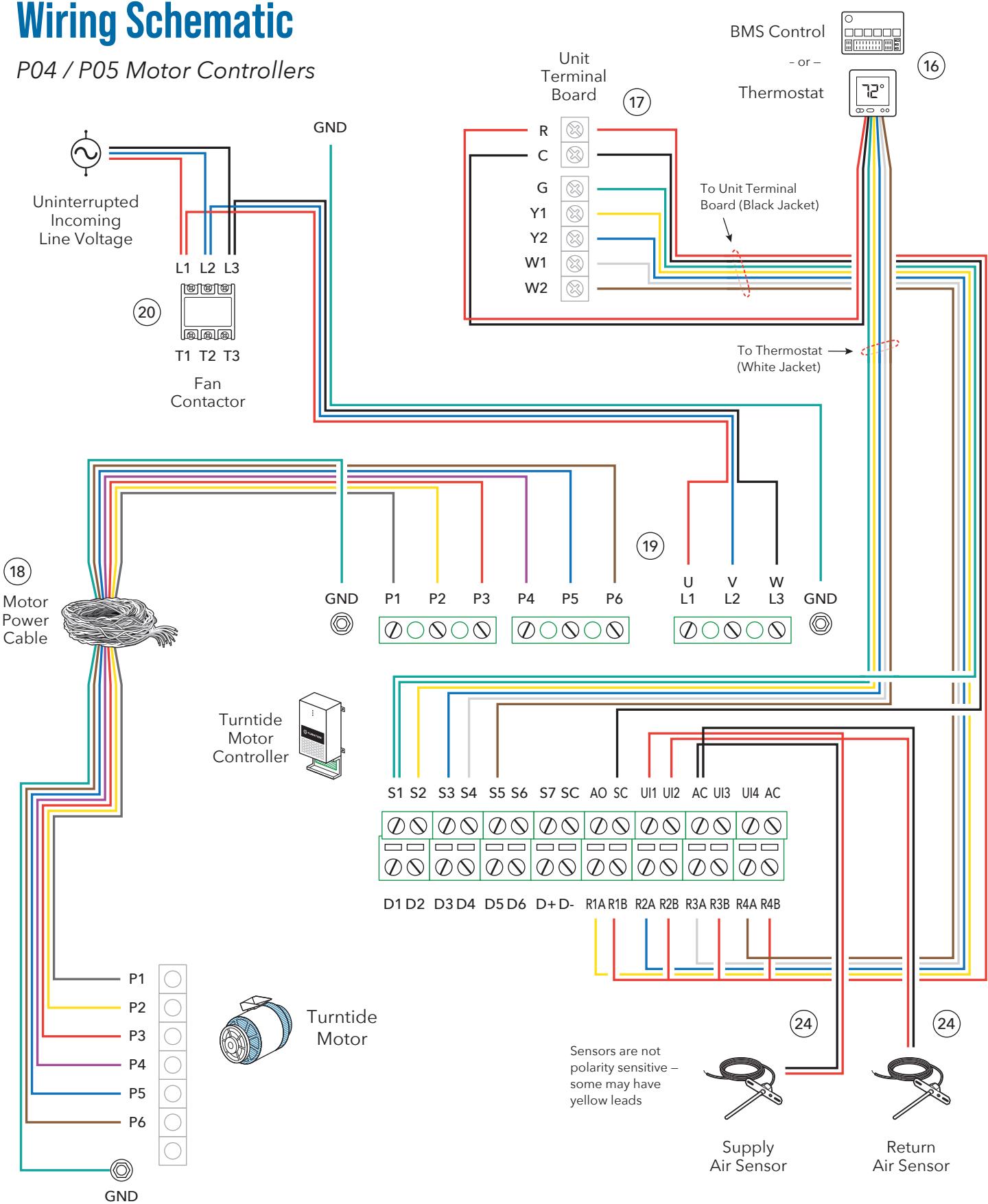
Wiring Schematic

SL120 / SL160 Motor Controllers



Wiring Schematic

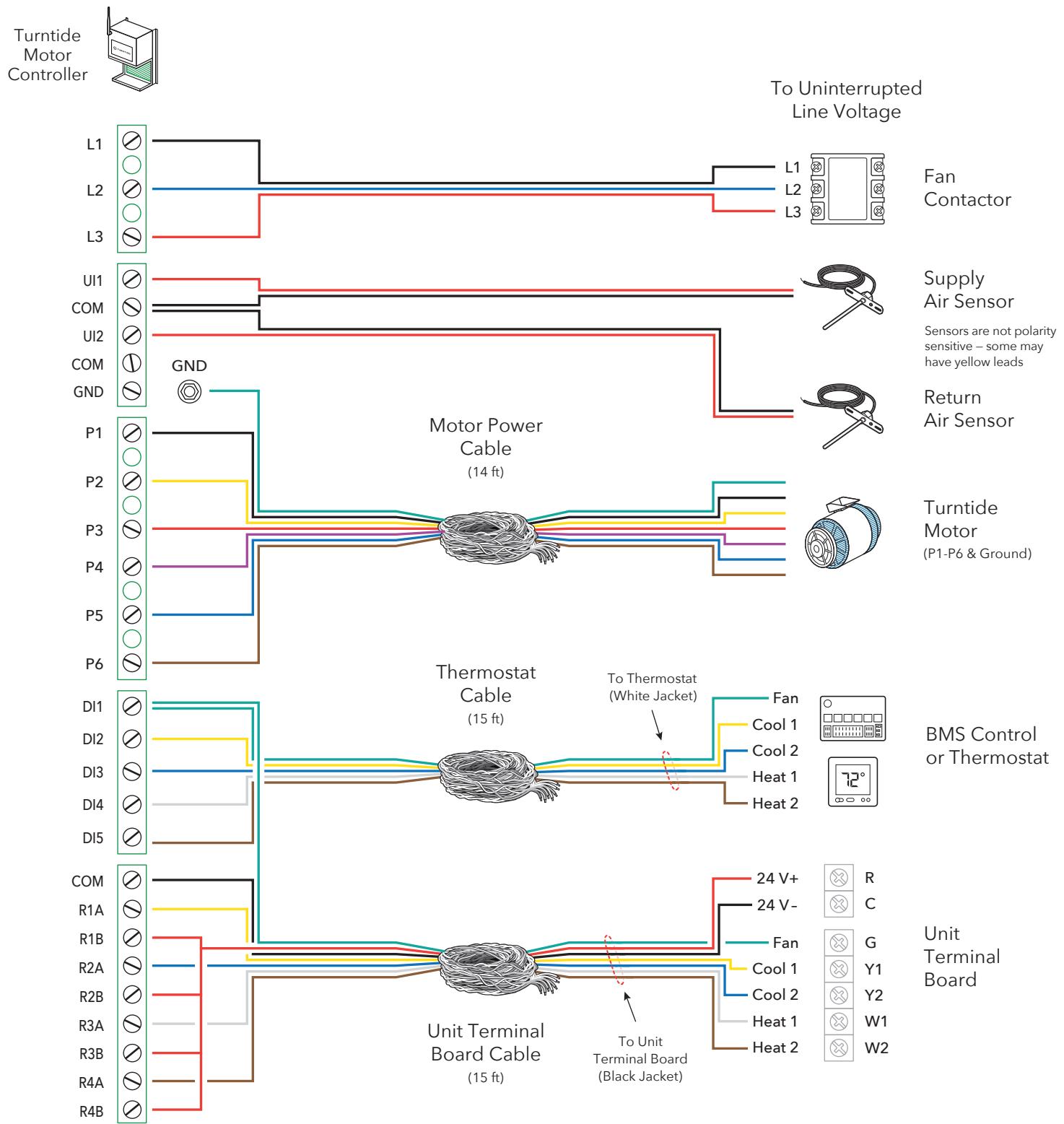
P04 / P05 Motor Controllers





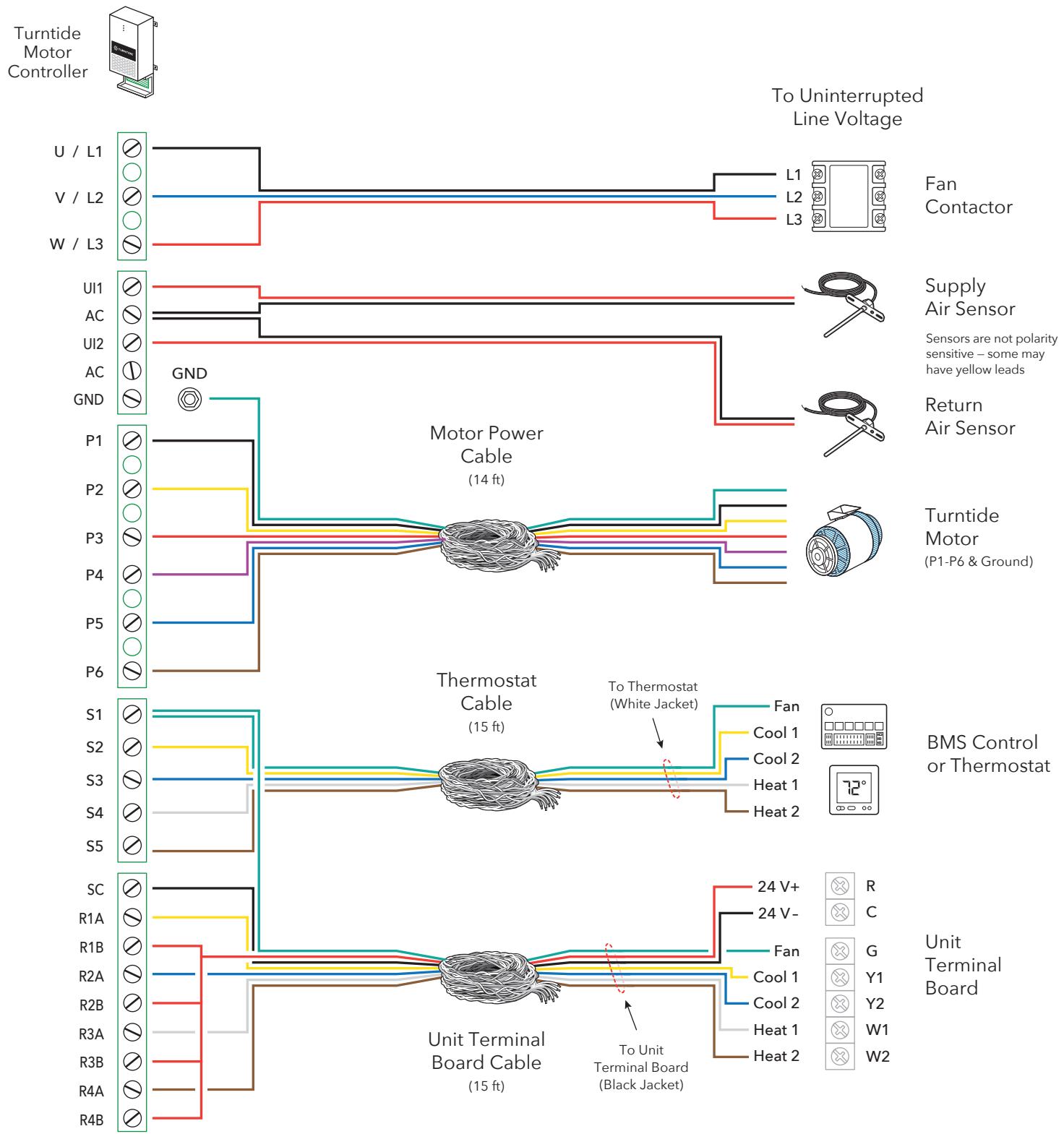
Wiring Information

SL120 / SL160 Motor Controllers



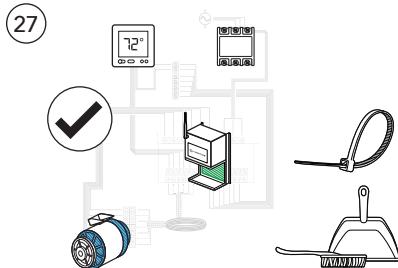
Wiring Information

P04 / P05 Motor Controllers

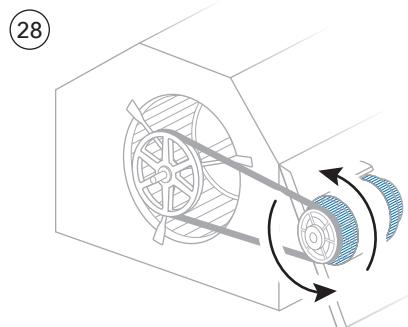




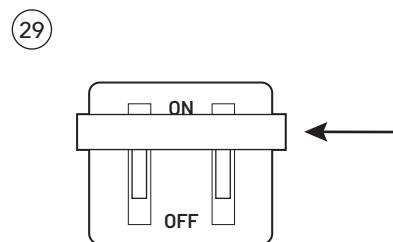
System Startup



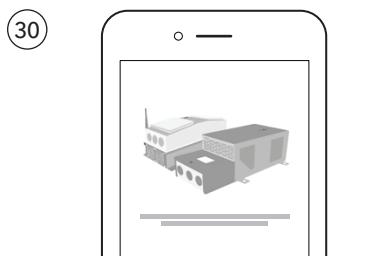
Verify all wiring is correct and wire terminations are tight and secure, then install cable ties around any loose wires and clean blower cavity of any debris from installation



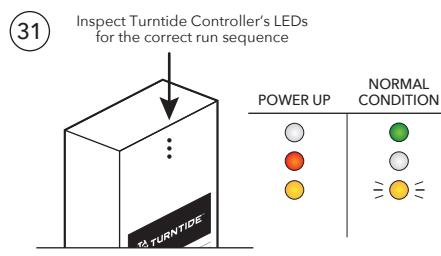
Turn the fan pulley by hand and verify motor pulley and fan rotate freely



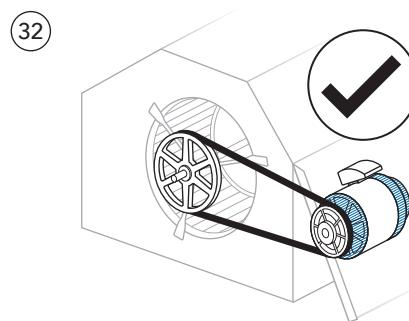
Turn on power to the unit



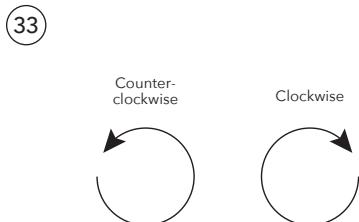
Use Turntide Technician App to commission motor (see Turntide Technician App Quick Start Guide in the appendix of this document for information on using the app)



Upon power up, the red and yellow LEDs will illuminate briefly, the green LED will illuminate solid, and the yellow LED will blink once every five seconds to indicate logic flow



Use the Turntide Technician App to confirm motor will ramp to full speed

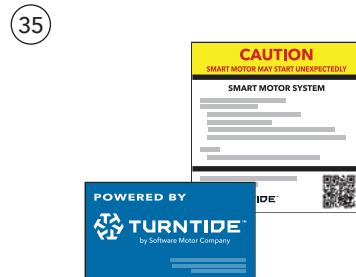


On startup, verify rotation of the Turntide Smart Motor – default rotation is counterclockwise, but can be changed with the Mobile Commissioning App

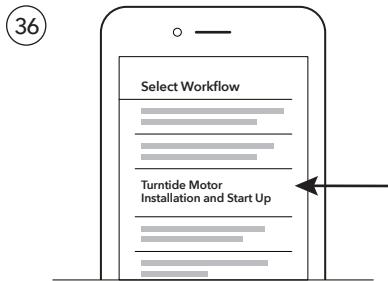
Single Stage Systems	
MODE	MOTOR SPEED
Vent	Low
Heat	High
Cool	High

Two Stage Systems	
MODE	MOTOR SPEED
Vent	Low
Heat 1 / Cool 1	Med
Heat 2 / Cool 2	High

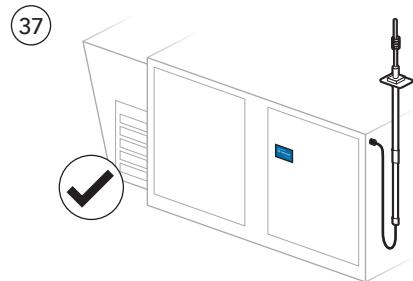
Cycle system through all stages of heating, cooling, and vent to confirm operation matches system demand



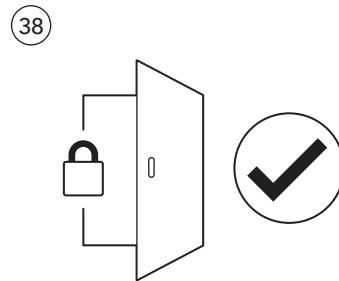
Affix the Turntide label on the exterior of the blower access panel, and the caution label on blower housing



Complete any remaining steps in the Turntide Motor Installation and Start Up XOi workflow



Confirm all access panels are re-installed and secure on unit, then ensure all unit disconnects are in the ON position and remove all materials and tools from roof



Secure roof access and check out with on-site manager

Contact Us

If you encounter issues that are not covered in this Install Guide or have other questions about the Turntide Motor System as it relates to your specific application, please contact Turntide's Technical Support team.

877.776.8470

(877-PRO-TIP+)

support@turntide.com

1295 Forgewood Avenue

Sunnyvale, CA 94089

www.turntide.com

Indemnity

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1295 Forgewood Avenue, Sunnyvale, CA 94089

support@turntide.com

877.776.8470

Turntide Technologies (formerly Software Motor Company) has developed the world's most efficient and intelligent electric motor system. The revolutionary Smart Motor System is based on proven switched reluctance technology, now managed with advanced cloud software and connected to precise controls via IoT. Turntide's vision is to eliminate the 25% of global electricity consumption that is wasted by legacy motors, thus accelerating the world's transition from fossil fuels. Turntide is based in Sunnyvale, Calif., with offices in San Francisco; Arlington, Wash.; and Kennesaw, Ga. Turntide has installed Smart Motor Systems with dozens of customers, reducing their motor electricity consumption by an average of 64%, and is powering the systems of leading OEMs. For further information, visit www.turntide.com.

TECHNICAL MANUAL

Turntide Technician App User Guide

RTU Applications

Last Modified: 12/17/21

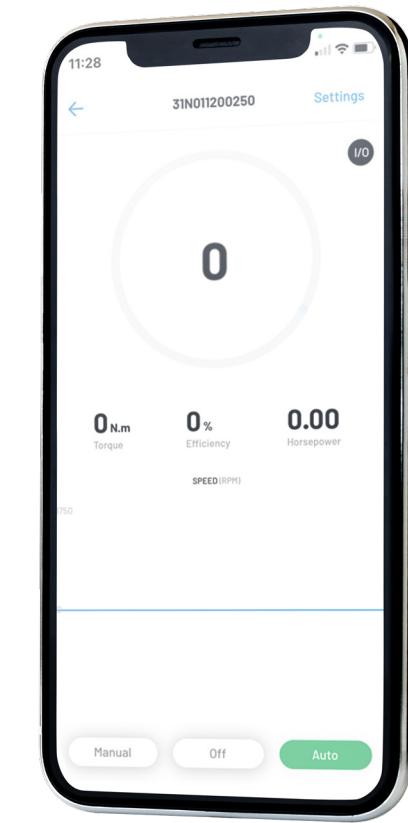


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It's Time to Rethink Sustainability



Introduction

About This Guide

This guide is intended for qualified technicians that have completed specific technical courses on Turntide Academy. There are three sections to this guide:

- About the App - This brief section provides a general overview of the app usage and requirements.
- Commissioning Wizard - This section contains only the essential steps for the initial Turntide Smart Motor System commissioning.
- Copy Configurations - A streamlined version of commissioning a Turntide Smart Motor System with the Technician app based on a previous installation configuration.
- Additional Features - The Technician app has many features that go beyond the initial setup.

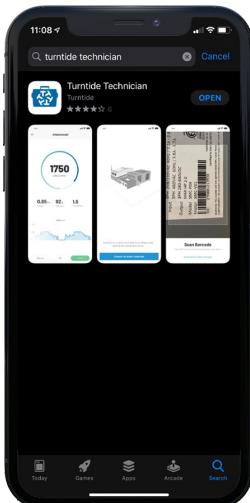
About the Turntide Technician App

The Turntide Technician app is essential to commissioning and interacting with a Turntide Smart Motor system. Turntide motor controllers emit a localized WiFi signal. A smart phone with the Technician app is necessary for connecting to the motor controller.

Getting Started

The Turntide Technician app is a free download on the Google Play Store and App Store. Simply search for the Turntide Technician app.

NOTE: There is more than one app associated with Turntide. The correct app for Turntide Smart Motor Systems is the Turntide Technician app.



Want to Practice?

Want to practice with the app before your on site? Check out the explanation of how to use the demo mode on page 14 of this guide.

Phone Operating System Requirements

- Apple Devices (iPhone) require iOS 12.0 or later
- Android Devices require Android 9 (Pie) or later

Links and QR Codes



[Apple Devices](#)



[Android Devices](#)



Commissioning Wizard

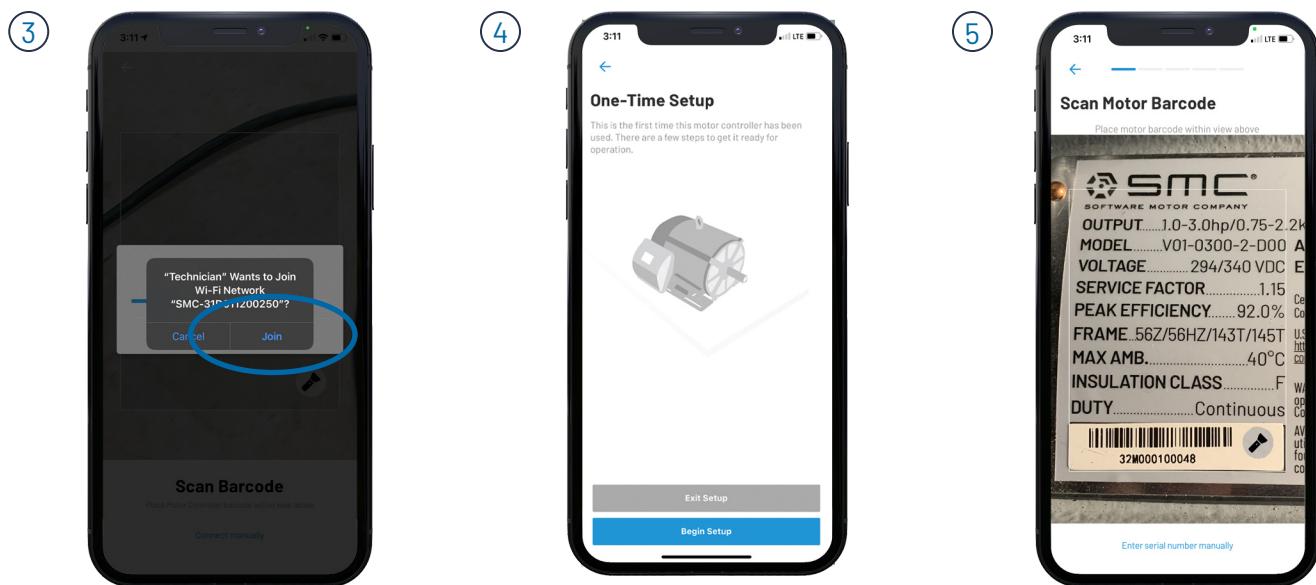
Initial Motor System Commissioning



Barcode Location Example

Open the app and touch "Connect to motor controller" to start the setup process.

The next step is to scan the Turntide motor controller barcode. The light icon turns on the phone's light. A two finger pinch-n-zoom feature is now available for obtaining an optimal view for scanning.



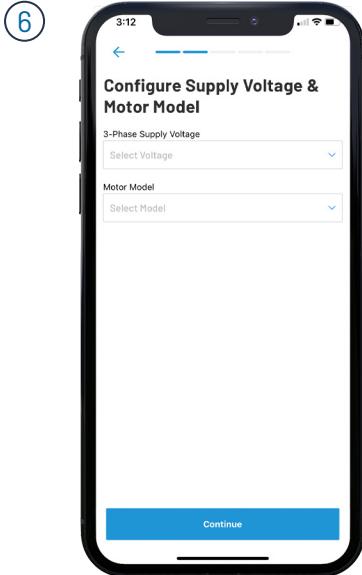
Touch "join" to allow the phone to connect to the motor controller WiFi signal.

Next touch the blue "Begin Setup" button.

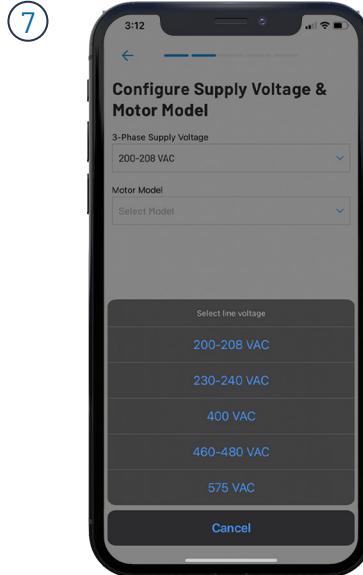
Scan barcode on the Turntide motor nameplate.

Commissioning Wizard

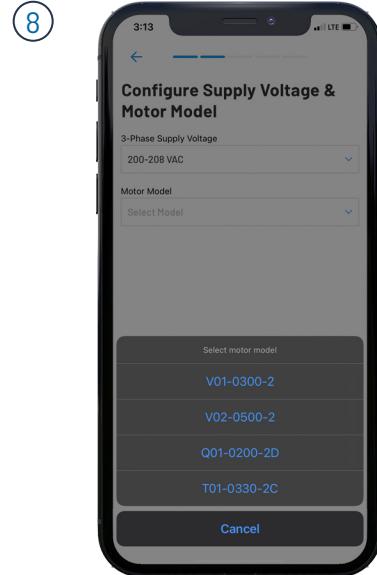
Initial Motor System Commissioning



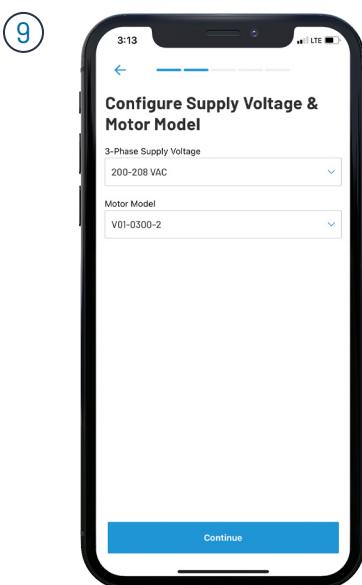
From the dropdown menus select the correct applied voltage and Turntide motor model.



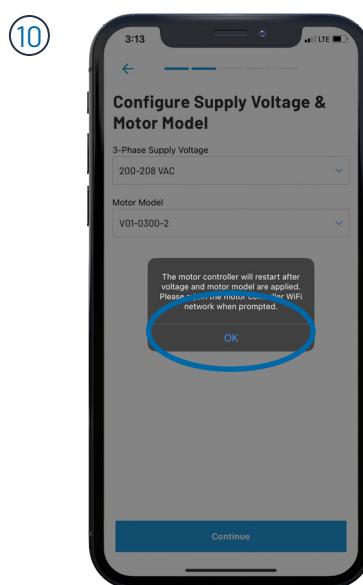
Select the correct applied voltage.
Note: Selecting the incorrect voltage may result in over/under voltage errors.



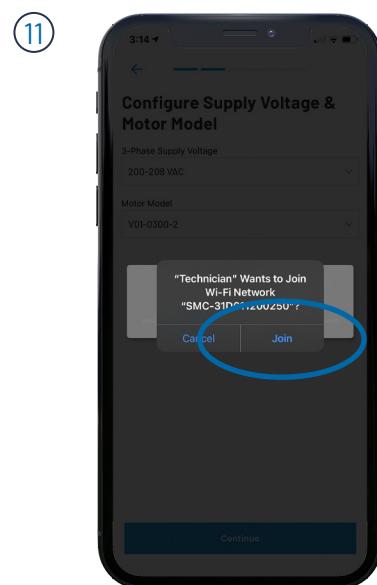
Select the Turntide motor model.
Note: Only models compatible with the selected voltage are displayed.



After confirming the voltage and motor model are correct touch the blue "Continue" button.



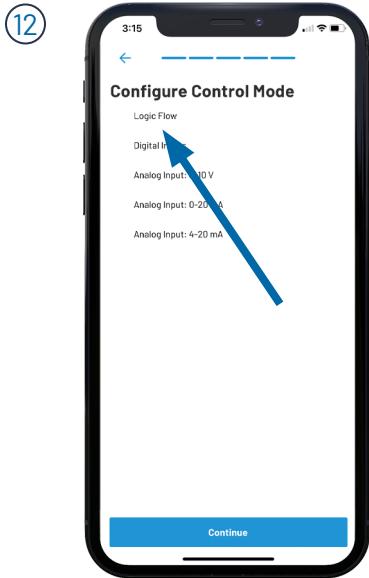
Acknowledge the motor controller will restart message by touching "OK".



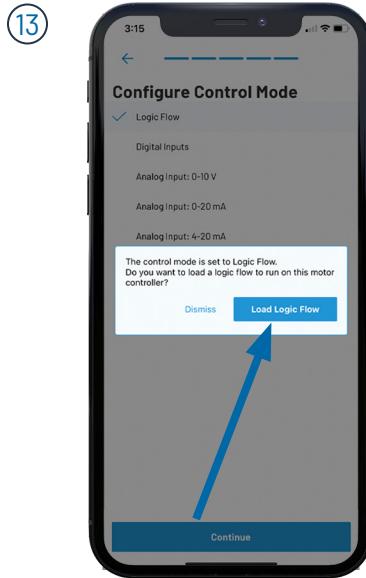
After the motor controller restarts, touch "Join" to rejoin the motor controller.

Commissioning Wizard

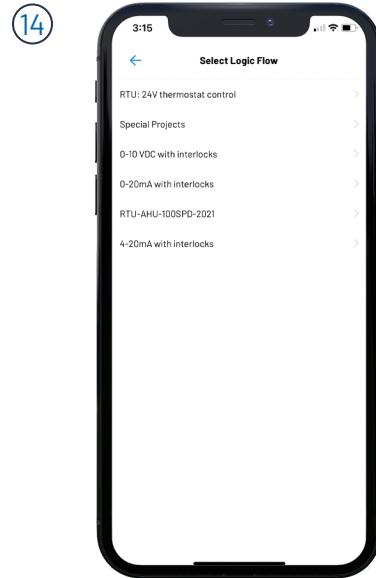
Initial Motor System Commissioning



Now configure the control mode. "Logic Flow" is the most common for RTU applications. The other options are beyond this guide.



Confirm the selection by touching the "Load Logic Flow" button.



There are several logic flow to choose from. The following provides selection guidance.

Logic Flow Selection

A logic flow is basically a set of instructions the Turntide Motor Controller follows to optimize motor and RTU performance. Each Turntide Motor Controller is shipped blank. Thus, the technician must select, or load, the correct logic flow for the application.

There are several logic flow options available. The most common for RTU applications are RTU: 24V Thermostat Control and Special Projects. The other logic flows are seldom used in RTU applications. Thus, they are beyond the scope of this guide.

RTU: 24V Thermostat Control is a general logic flow that is easy configured by the installing technician based on the number of heating and/or cooling stages. See page 7 for more details.

Special Projects are unique logic flows for specific projects. Typically, these are large projects for major organizations with multiple locations across the United States and/or Canada. See page 9 for more details.

Logic flow selection is based on the project. A Turntide representative will inform the technician if they are to use a Special Project and specific

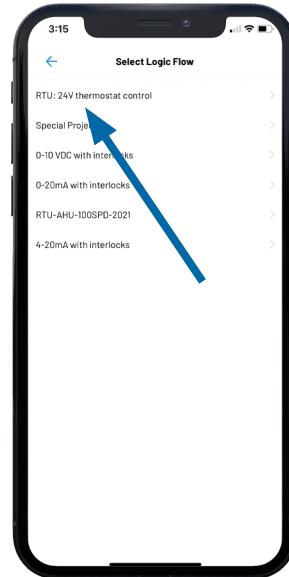
logic flow to load. Otherwise, the RTU: 24V Thermostat Control is used.

Commissioning Wizard

Initial Motor System Commissioning – RTU: 24V Thermostat Control

RTU: 24V Thermostat Control allows the technician to install a control mode based on the number of heating and cooling stages and airflow options. The next few panels review the RTU: 24V Thermostat Control setup process.

1A



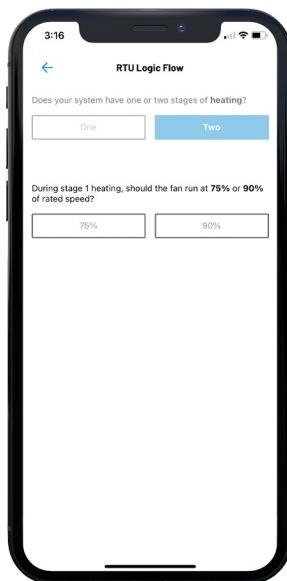
2A



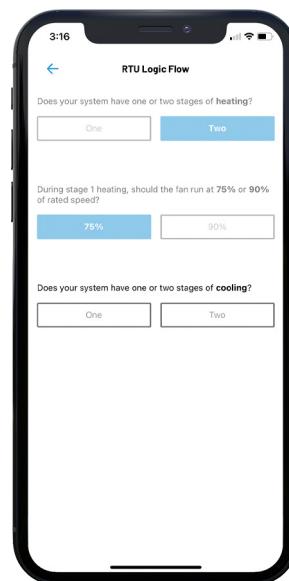
Touch the RTU: 24V Thermostat Control option to begin setup.

Select the number of heating stages.

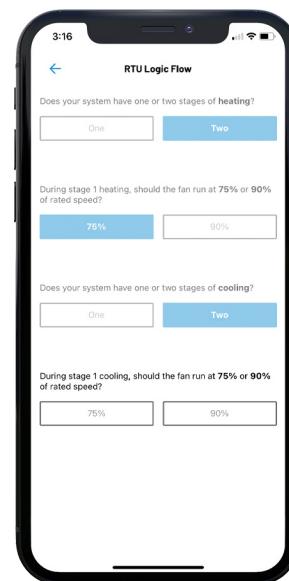
3A



4A



5A



Chose the desired airflow for 1st stage heating. The app automatically sets the 2nd stage heating airflow at 90%.

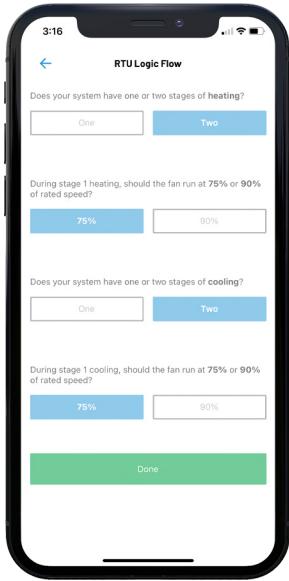
Select the number of cooling stages.

Chose the desired airflow for 1st stage cooling. The app automatically sets the 2nd stage cooling airflow at 90%.

Commissioning Wizard

Initial Motor System Commissioning – RTU: 24V Thermostat Control

6A



7A



8A

Most projects include a Remote Monitoring Kit (RMK) which must be connected to the motor controller. Page 10 discusses the connection process.

If the project does not include an RMK touch "Done" to complete the setup.

Touch the green "Done" button to complete the process.

The Turntide Smart Motor System setup is now complete. Touch "Yes" to complete the setup.

Commissioning Wizard

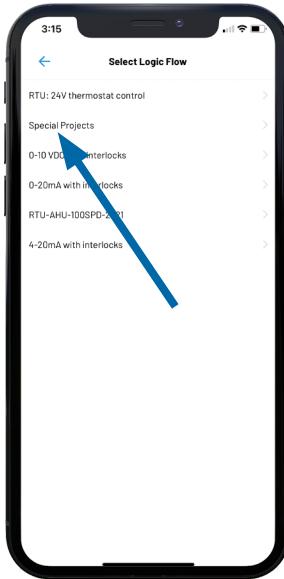
Initial Motor System Commissioning - Special Projects

The Special Projects screen contains logic flows for large rollouts where the customer has pre-specified unit operation parameters.

A Turntide representative advises technicians if they are working on special project and which logic flow is necessary.

This section reviews the process for installing a “Special Projects” logic flow.

1B



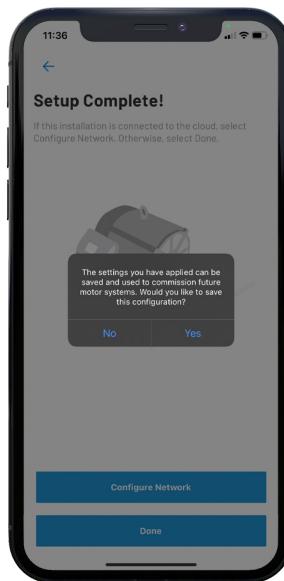
2B



3B



4B



5B

Most projects include a Remote Monitoring Kit (RMK) which must be connected to the motor controller. Page 10 discuss the connection process.

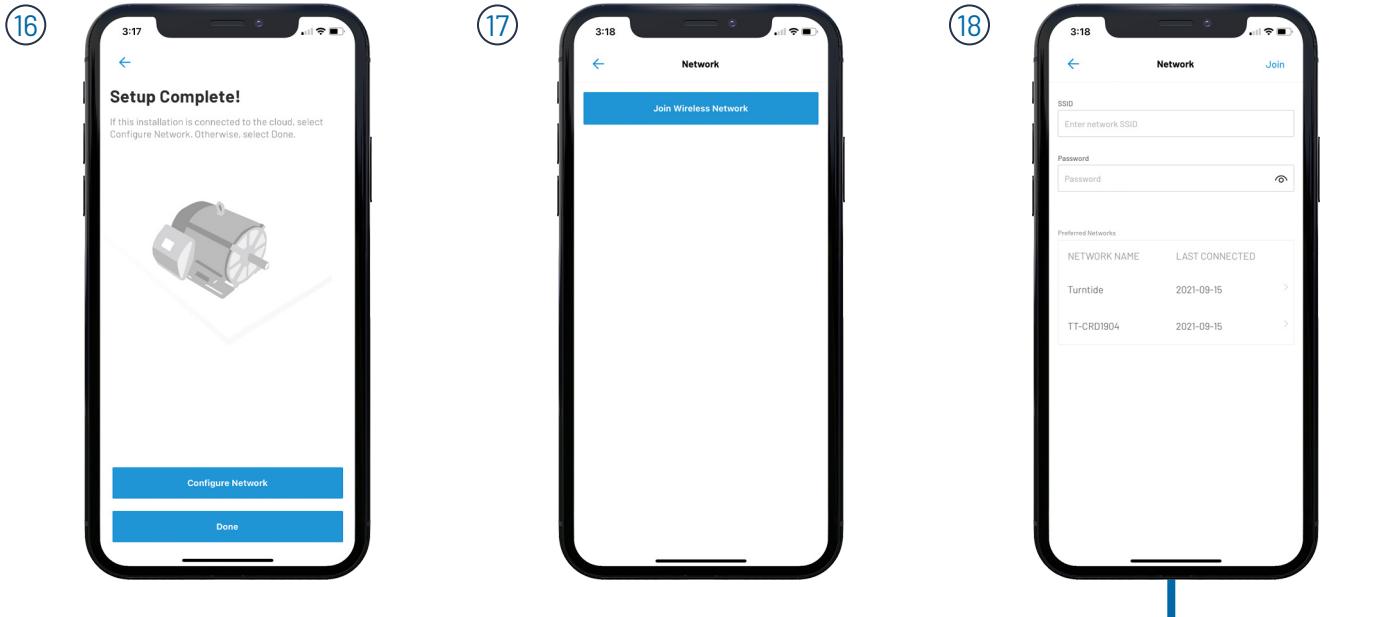
If the project does not include an RMK touch “Done” to complete the setup.

Touch the “Load Flow” button. Other features shown are not essential for initial setup. They are discussed in the Additional Features section.

The configuration can be saved for other installations. Easy Quick Start information starts on page 11.

Commissioning Wizard

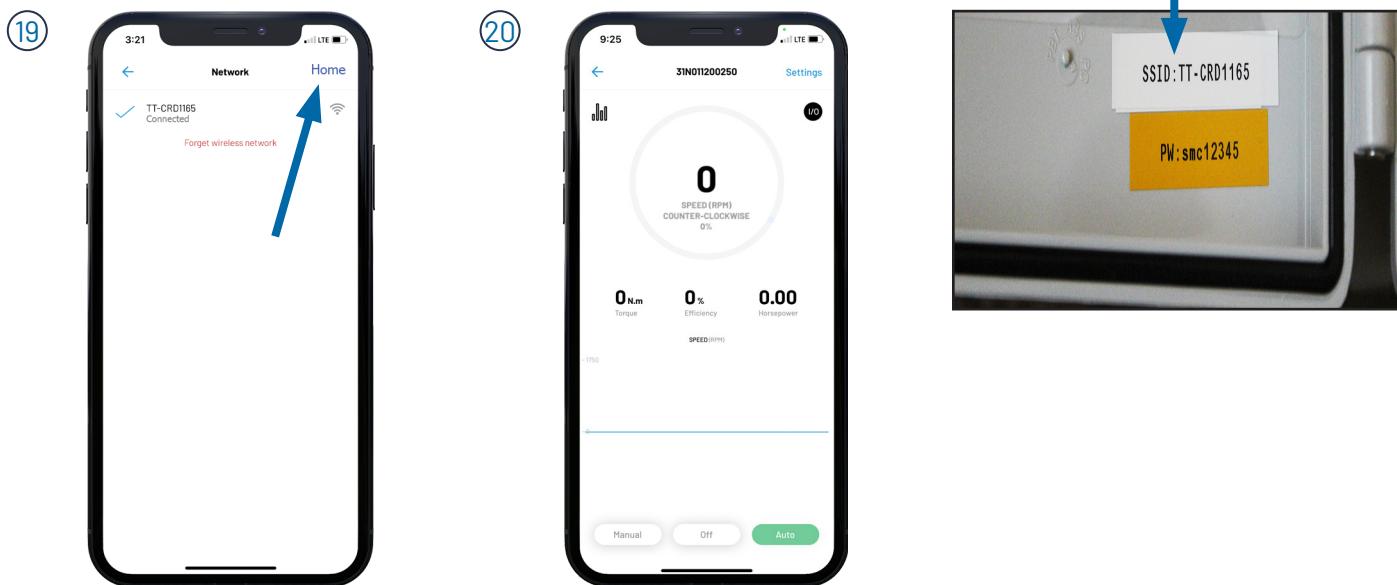
Initial Motor System Commissioning - RMK Connection



After the logic flow is loaded the “Setup Complete” screen appears. If the project includes a RMK, touch “Configure Network.”

With the RMK powered, touch “Join Wireless Network.”

Enter the SSID number and password found inside the RMK door.



The app displays a check mark to confirm the motor controller to RMK connection. Touch the “Home” link to go the home screen.

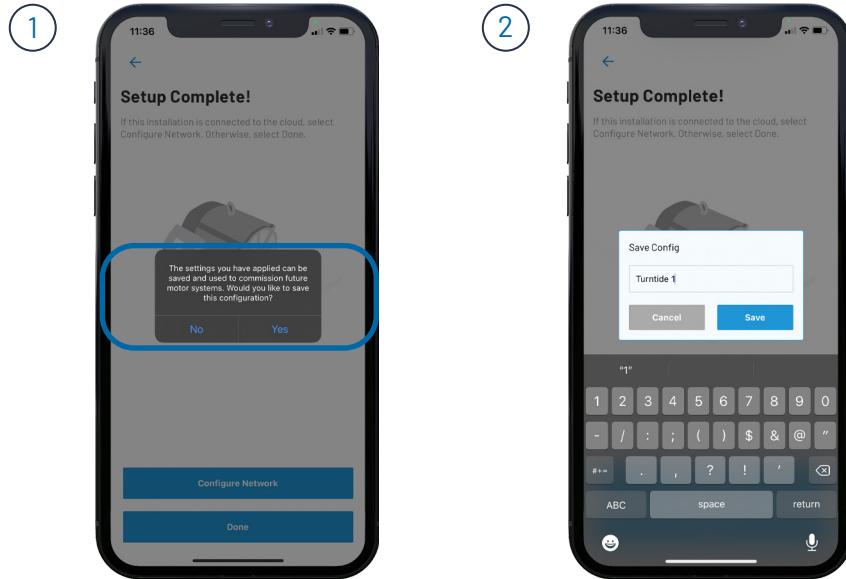
Technician app motor home screen.

Copy Configurations

Initial Motor System Commissioning - Copy Configurations

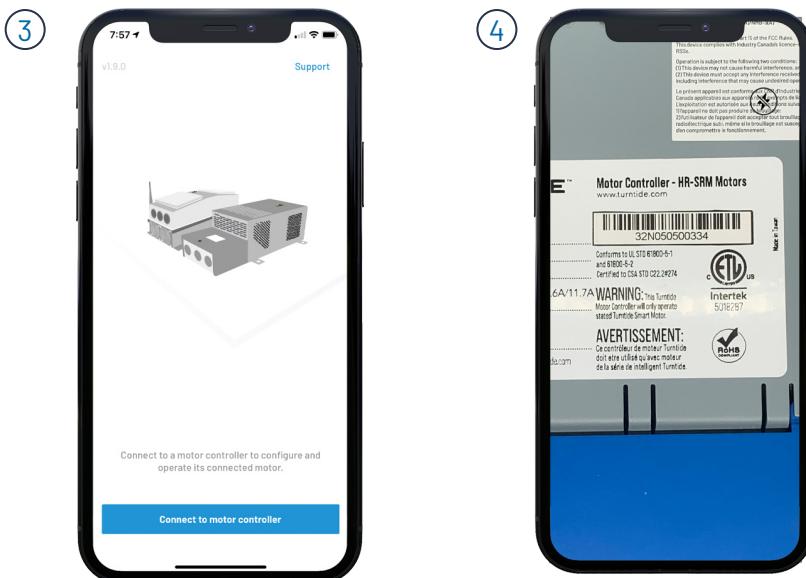
The Technician app includes a feature to save a configuration for future use. The saved configuration is easily applied for similar Turntide motor installations which saves the installer time and reduces the potential of mistakes.

Retaining the configuration is done when completing the initial setup. When "Done" is selected a dialog box appears. To save the configuration touch "Yes." Touch "No" to proceed without saving.



This is the screen that appears at the end of initial configuration.

The saved configuration must be named.
Note that multiple configurations can be stored in the app.



Subsequent installations begin in the same manner. Open the app and touch "Connect to motor controller."

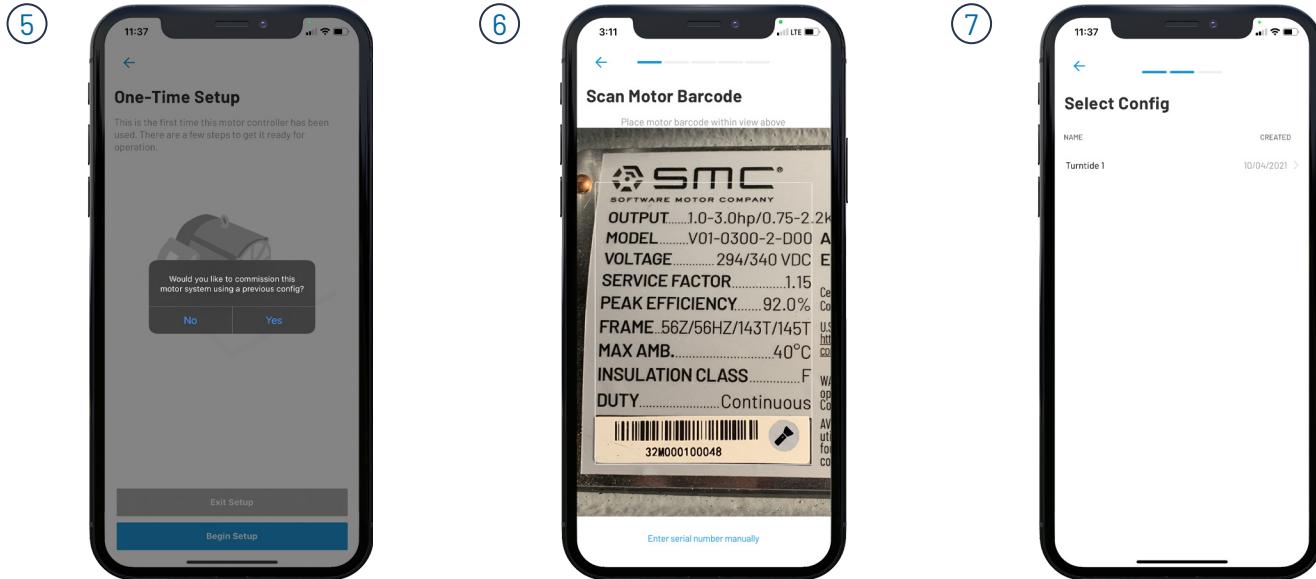
Next scan the Turntide motor controller barcode.



Barcode Location Example

Copy Configurations

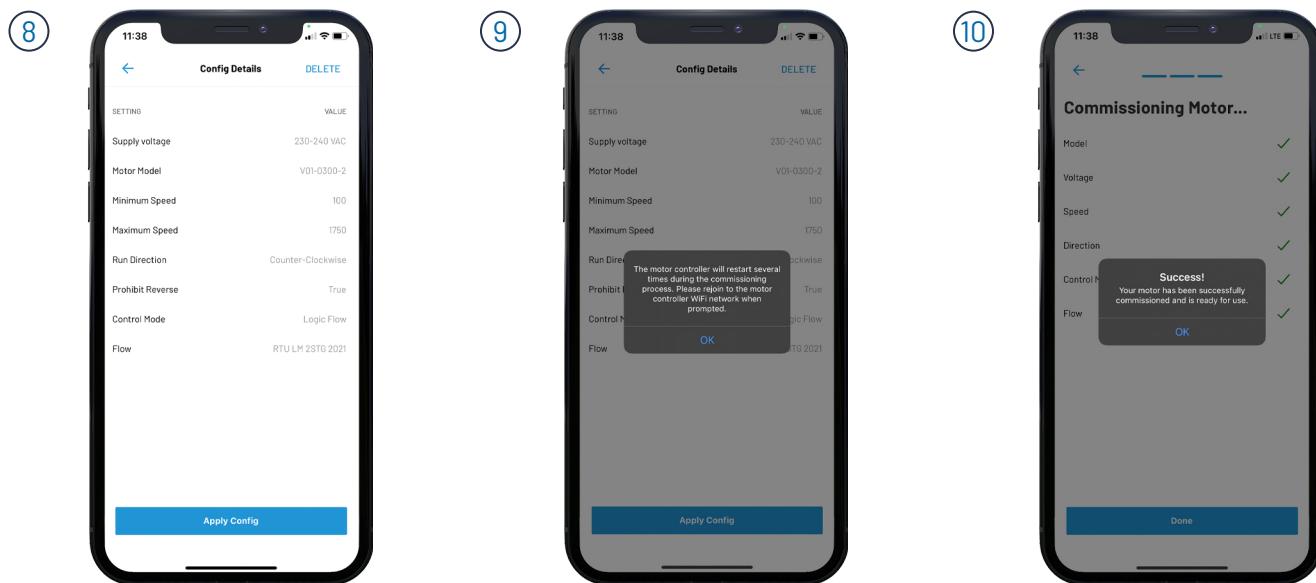
Initial Motor System Commissioning - Copy Configurations



After joining the Turntide motor controller WiFi network, an alert box appears. To apply stored configuration select "Yes."

Now scan the Turntide motor barcode.

Select the desired stored configuration.



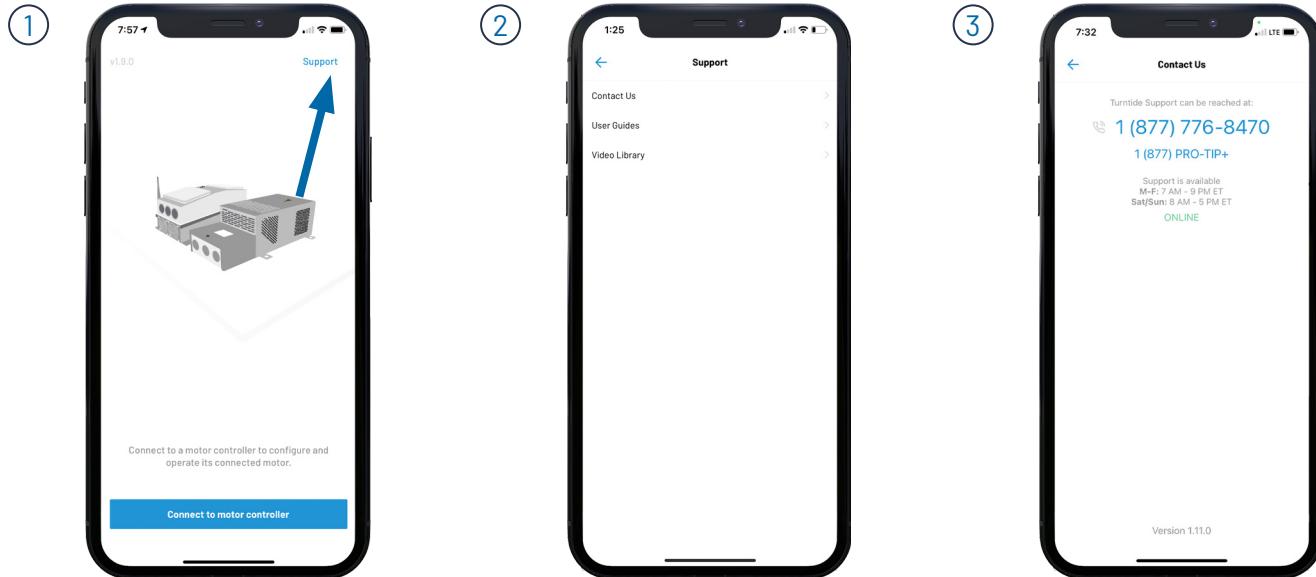
Details of the selected configuration appear for review and confirmation. Apply the configuration by touching "Apply Config"

Acknowledge the motor controller restart message.

A green check appears indicating each aspect of the logic flow is loaded. Acknowledge the successful configuration.

Additional Features

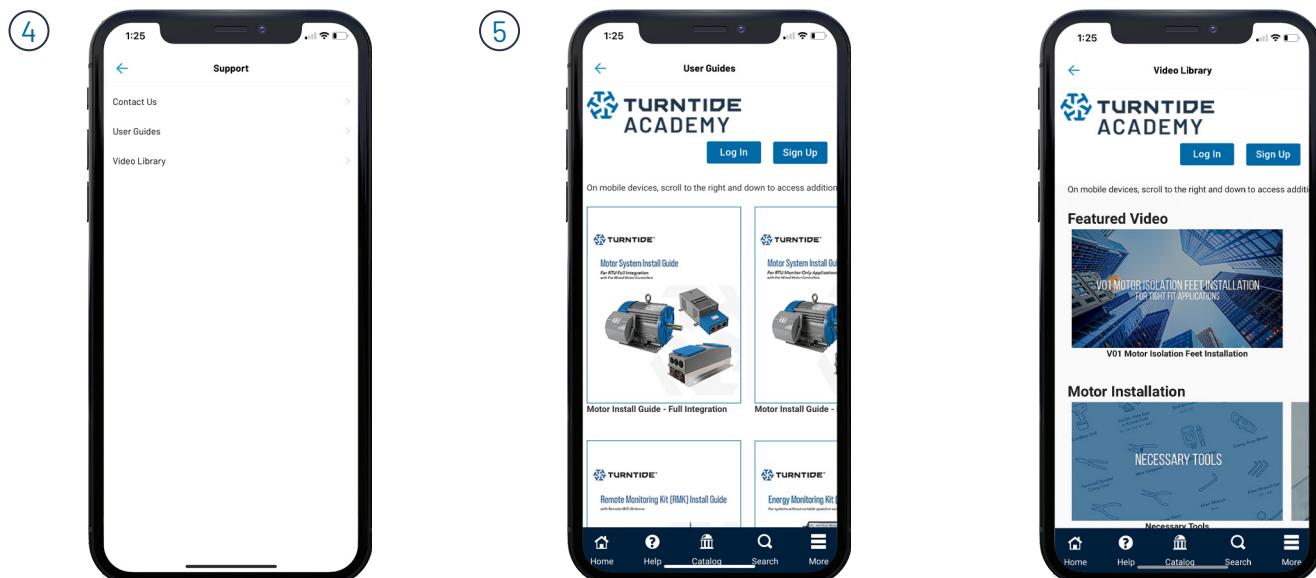
Initial Screen - Support



Upon opening the app, the initial screen appears. In the upper right corner there is a "Support" link.

There are three links on the "Support" page, Contact Us, User Guides, and Video Library.

The Contact Us link is the phone number to Turntide Technical Support and hours of operation.



User Guides and Video Library links directly to technical documents and installation related videos.

Simply select the desired guide to open it.

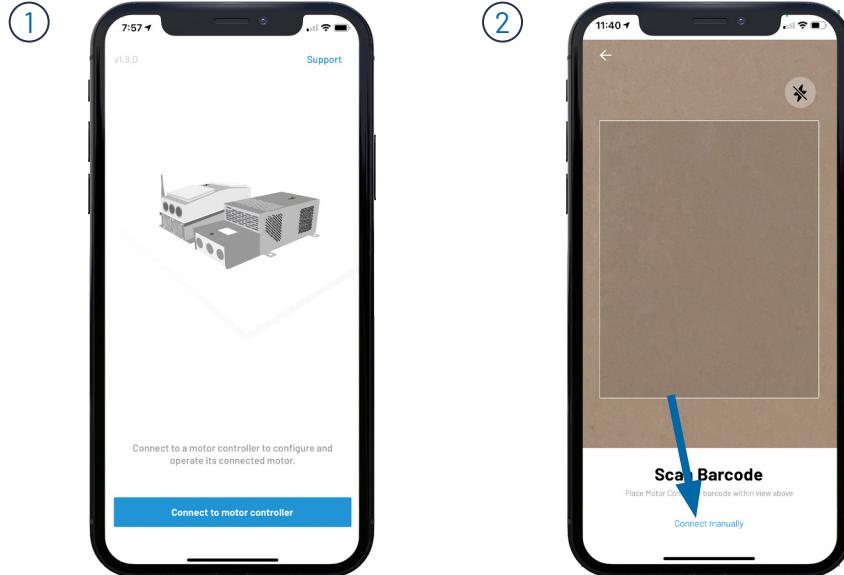
Tap to open a library of short installation videos.

Additional Features

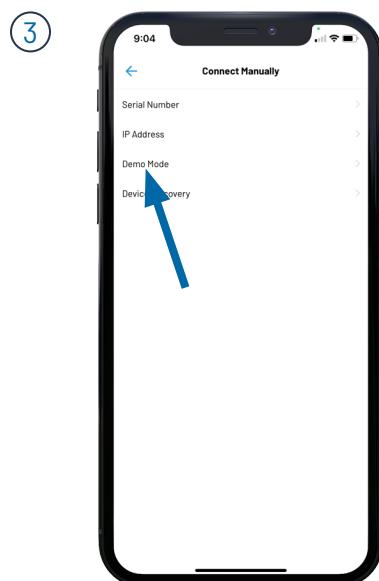
Demo Mode

Demo Mode allows interaction with the Technician app without the need to connect to a Turntide Motor Controller. In this mode the app can be showcased and technicians can become familiar with the app functions prior to a Turntide Motor System commissioning.

The following screenshots show accessing the "Demo Mode."



At the initial screen, select "Connect" Next, select "Connect manually." to motor controller."



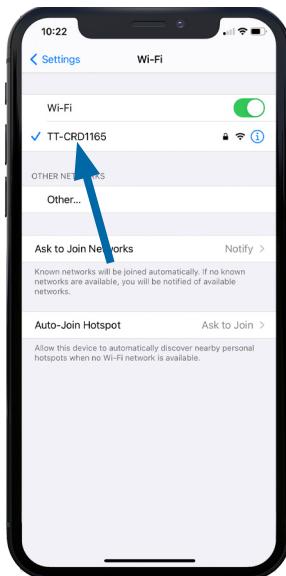
Now touch "Demo Mode."

Additional Features

Device Discovery

Device Discovery allows technicians to connect to Turntide motor controllers on a network without scanning the motor controller barcode. This feature is typically used in applications with a Remote Monitoring Kit. This feature is only available with motor controllers using 2.5.1 firmware or later.

①



③

RMK SSID Example

The first step is to connect your phone to the RMK WiFi network.

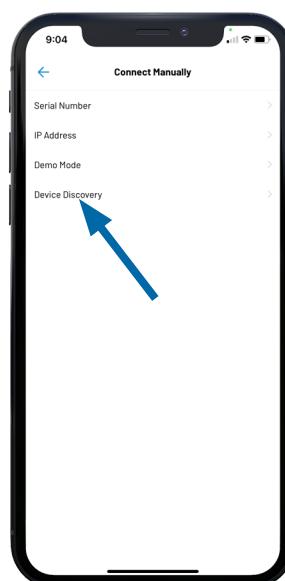
②



③



④



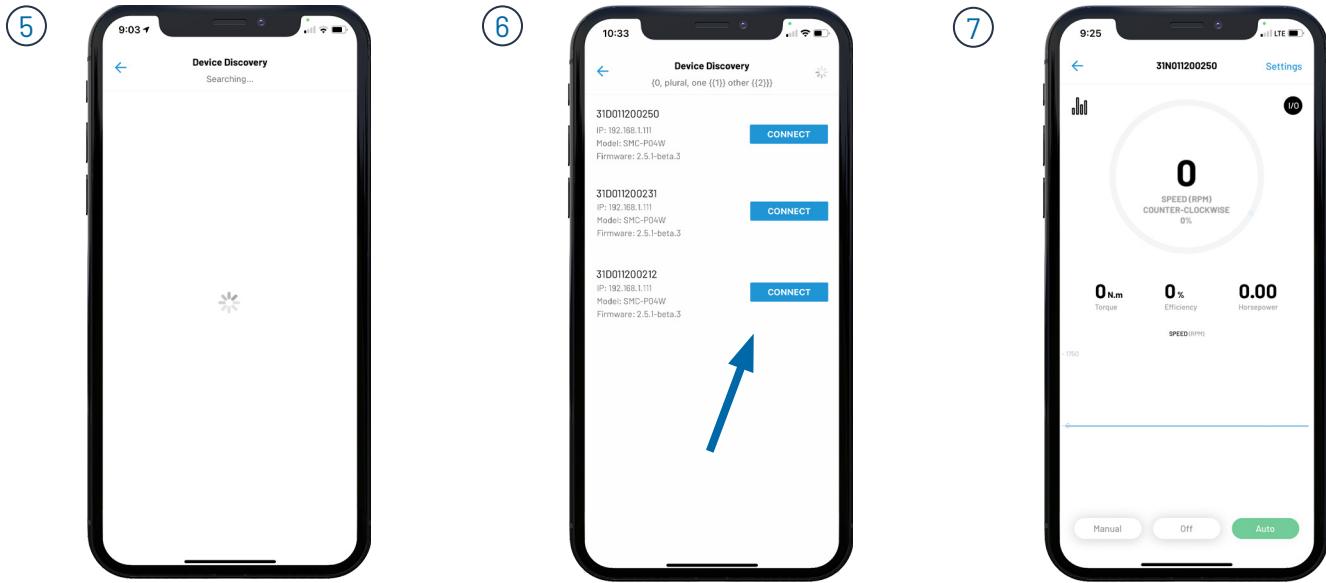
Open the Technician App and touch the blue Connect to motor controller button.

Next select Connect Manually.

Select Device Discovery.

Additional Features

Device Discovery

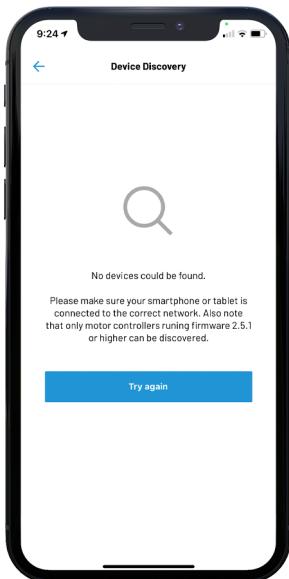


The app will start searching for the motor controllers connected to the RMK network.

The app displays each motor controller connected to the network. Touch a blue Connect button to access a motor controller.

The selected motor controller home screen appears.

Special Note



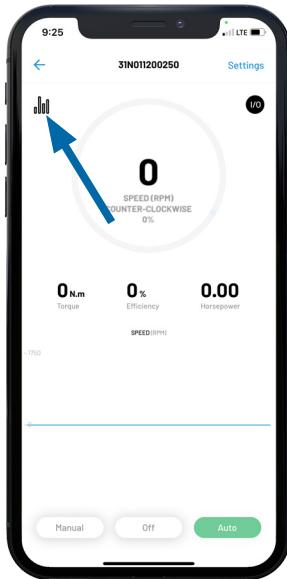
If during the discovery process this screen appears, the phone is not connected to the RMK network.

Additional Features

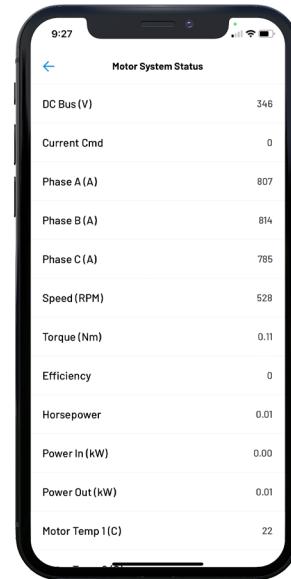
Motor System Status

The Technician app also features real time motor system information for motor controllers with 2.5.1 firmware or higher.

①



②

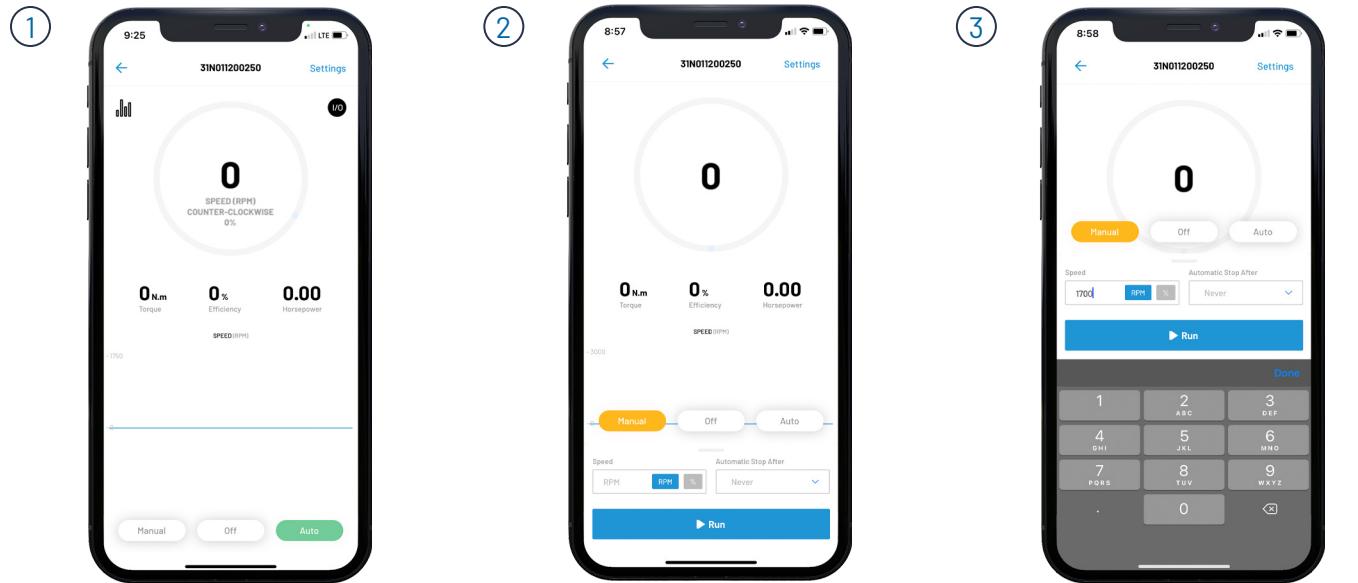


From the motor controller home screen touch the bar graph symbol in the upper left corner.

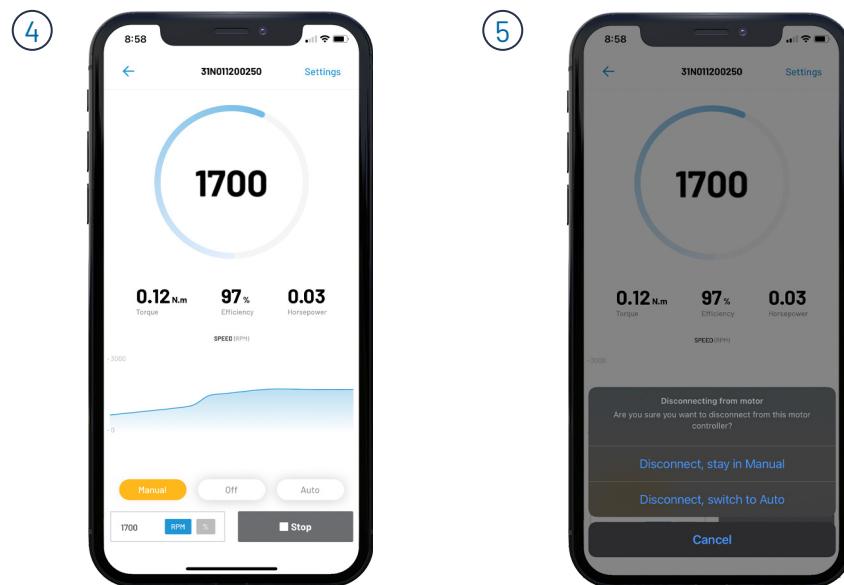
A detailed list of motor performance information displays.

Additional Features

Motor Operation - Manual



Following Turntide motor system configuration the app goes to the motor home screen. The section discusses Manual operation.



The motor ramps to the selected speed. Motor torque, efficiency, and operating horsepower are shown. Touch Stop to stop the motor.

Start by selecting Manual.

Enter the desired motor speed and touch Run.

IMPORTANT NOTE:

When disconnecting from the motor controller a selection box appears. One of the options is to disconnect and leave the system in Manual, which is operating continually at the speed entered earlier. The system remains in this state until stopped.

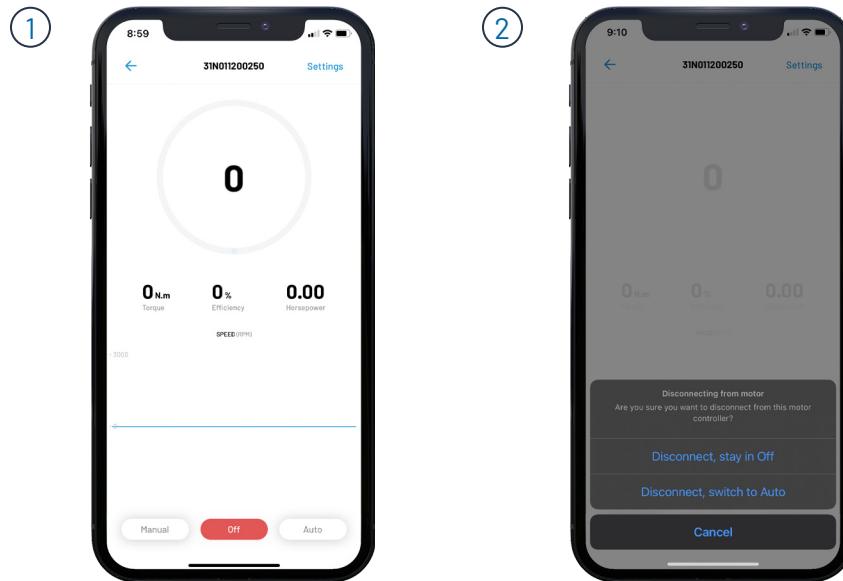
Leaving the system in Manual is seldom desirable. Leaving the system in Manual should only be done after careful consideration.

Manual mode does not force heating or cooling operation. However, if there is a demand for heating or cooling they will function.

Auto allows system operation based on the loaded logic flow.

Additional Features

Motor Operation - Off



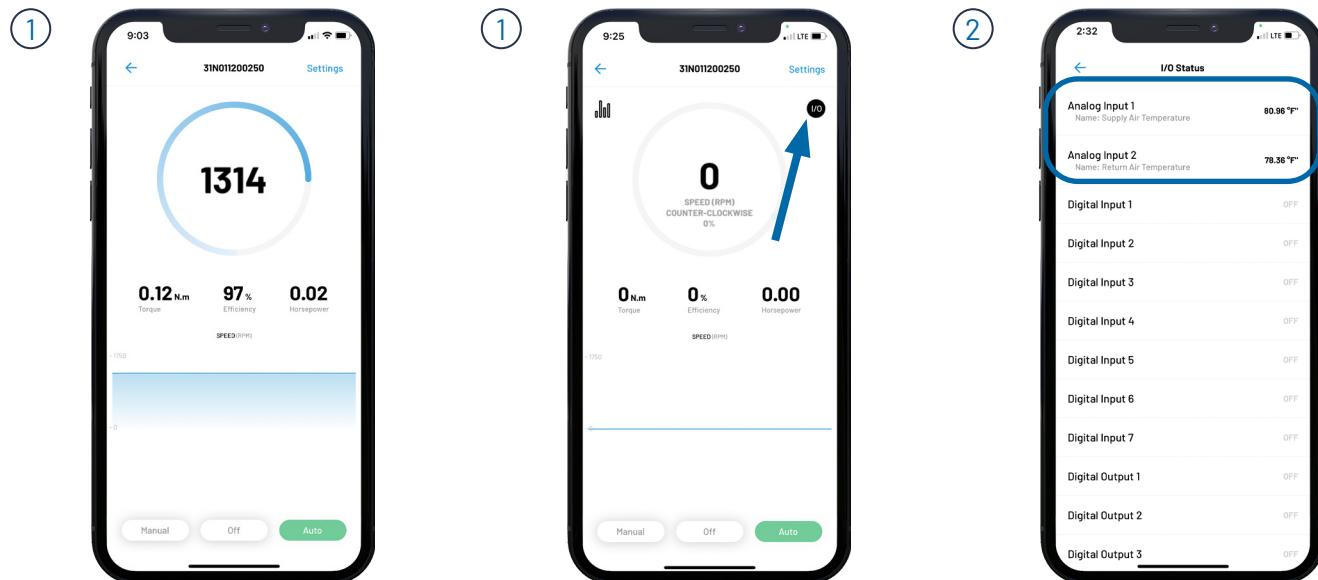
Selecting Off stops all motor operation which in turn prevents HVAC operation. This is NOT a service disconnect.

IMPORTANT NOTE:

When disconnecting from the motor controller a selection box appears. One of the options is to disconnect and leave the system in Off or disconnect and switch to Auto.

Switching to Auto allows the system to operate the loaded logic flow.

Motor Operation - Auto; Motor Controller Input/Output Information



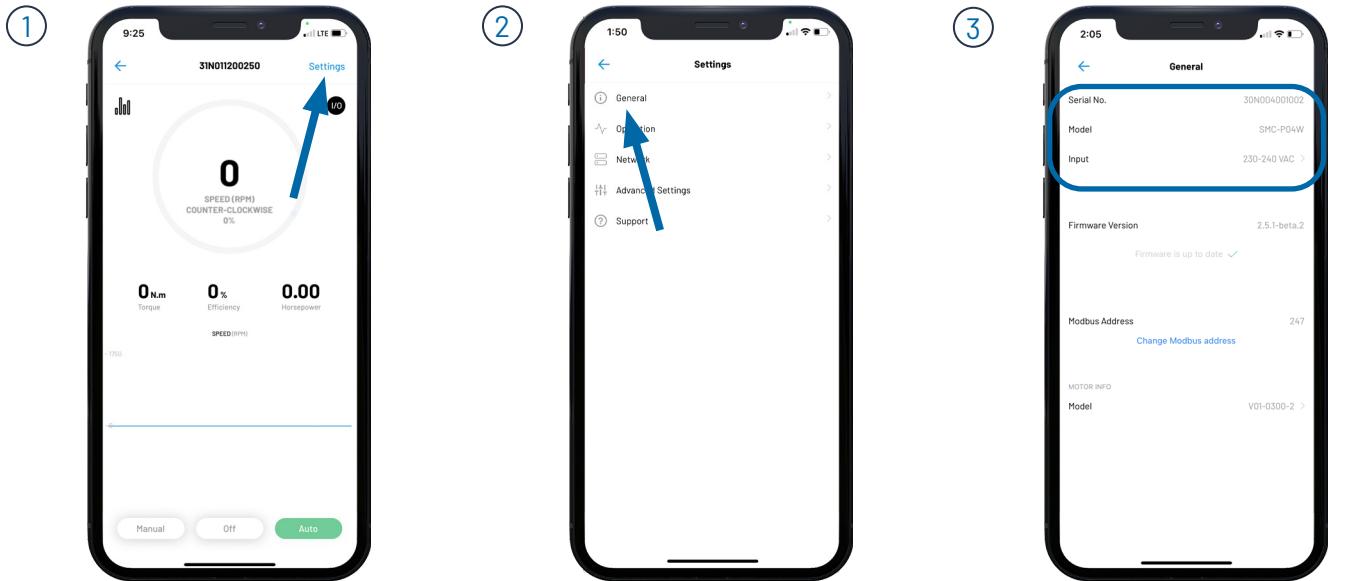
The Auto mode allows the Turntide motor system to function normally.

In the upper right corner of the motor home screen is an I/O icon. Selecting it reveals the I/O screen. Requires firmware 2.5.1 or greater.

The screen displays the state of various inputs and outputs. In this example only supply and return air sensors are connected.

Additional Features

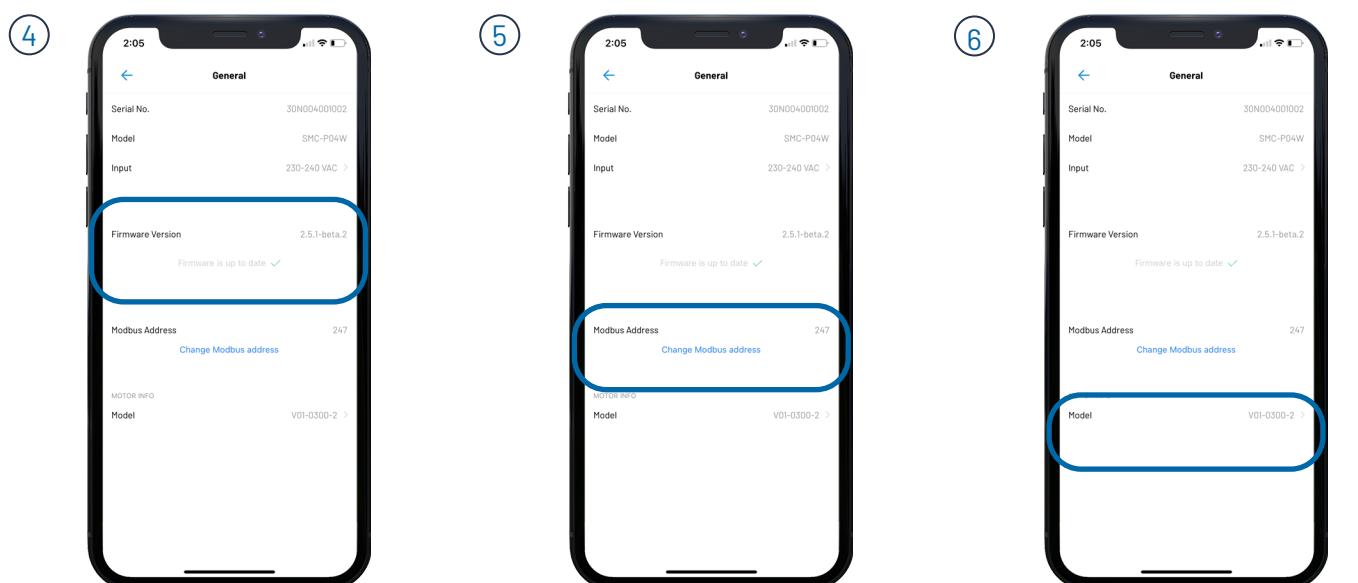
Settings - General



From the motor home screen touch "Settings" in the upper right corner.

Next touch "General"

The first section has motor controller details (serial number, model, and applied voltage). The voltage can be changed here.



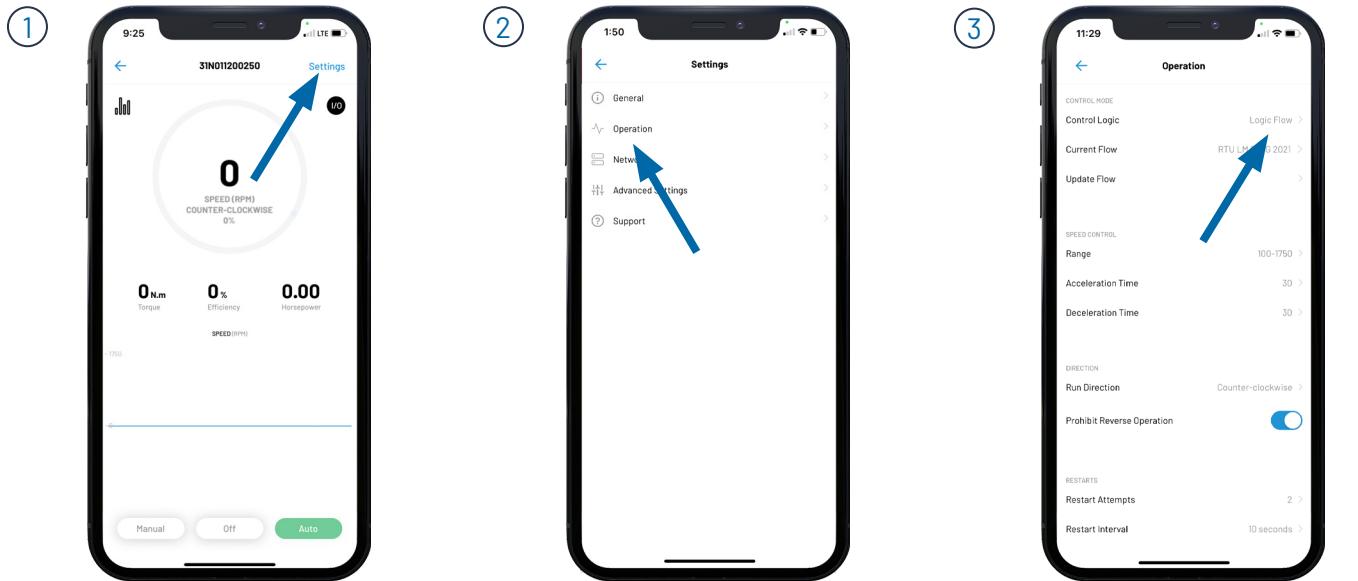
The second section has firmware version information and the ability to update.

Modbus address is listed in the third section. Normally this is not changed for RTU installations.

The final screen has motor model information. Changing motor model is done as this screen, but only if necessary.

Additional Features

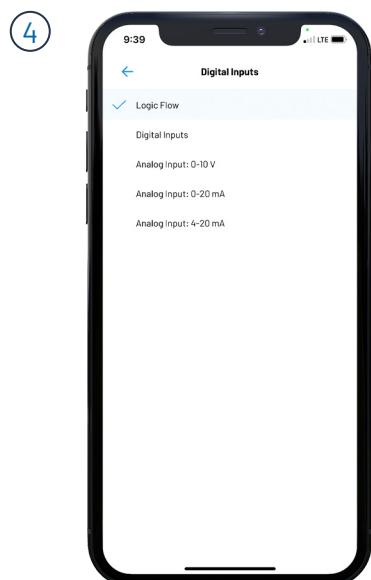
Settings - Operation - Control Logic



After configuring the Turntide motor system the Home screen appears. Touch the "Settings" link to access additional features.

Select "Operation" access the Operation screen.

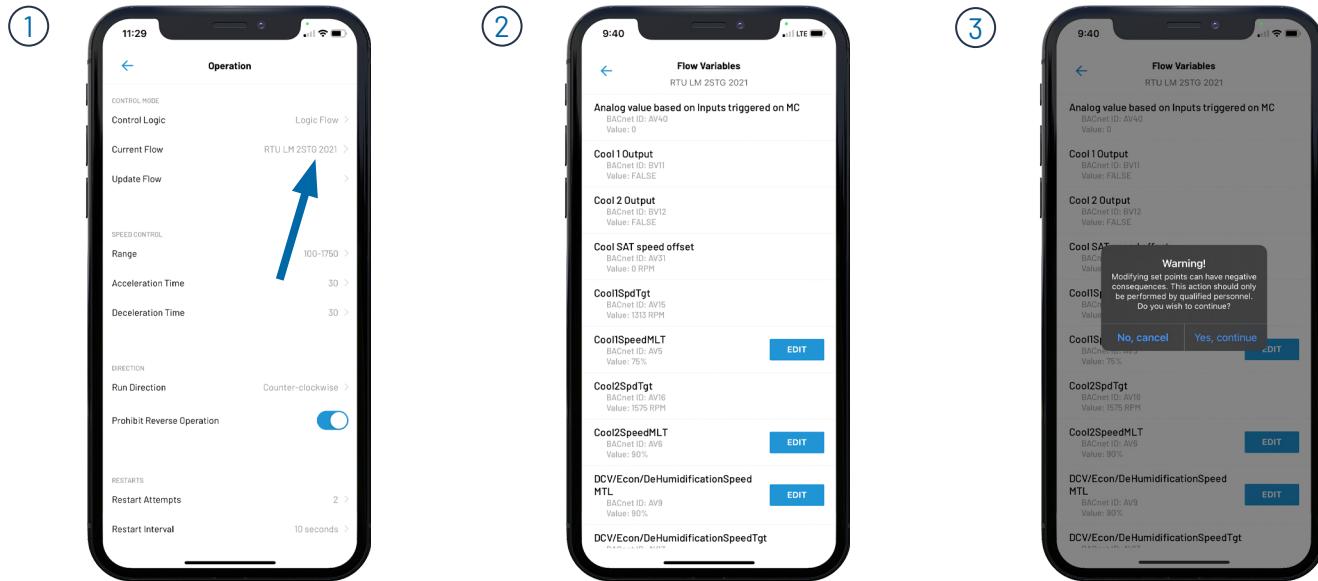
Across from Control Logic is the type of flow loaded.



Tapping the flow type allows to technician to make changes.

Additional Features

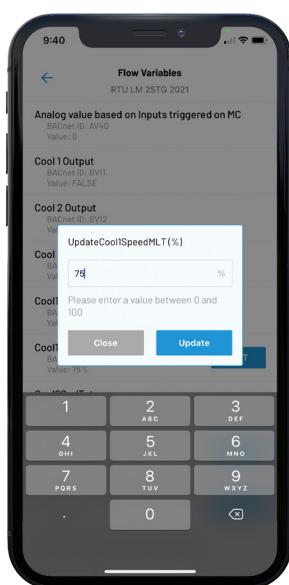
Settings - Operation - Current Flow



The next item is Current Flow. Touching the flow opens the Flow Variables screen. Requires firmware version 2.5.1 or greater.

From this screen some, but not all, flow variables can be modified as necessary.

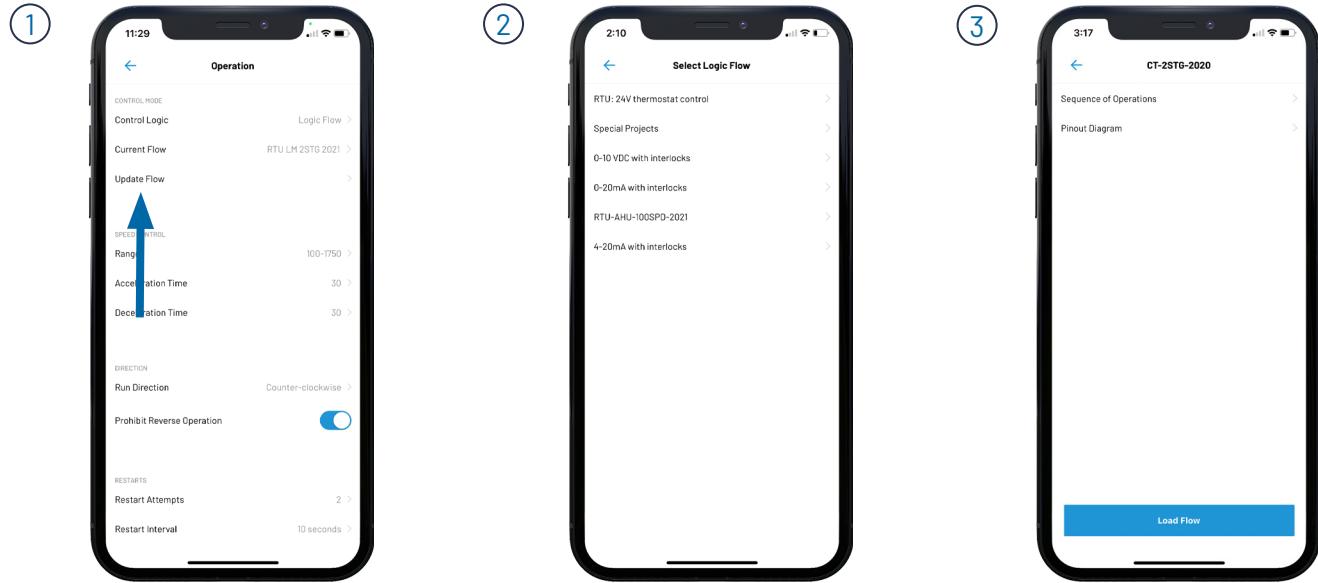
To change a flow variable, touch Edit and acknowledge the warning message.



Enter the new variable. In this example first stage cooling speed is modified. Touch Update when finished.

Additional Features

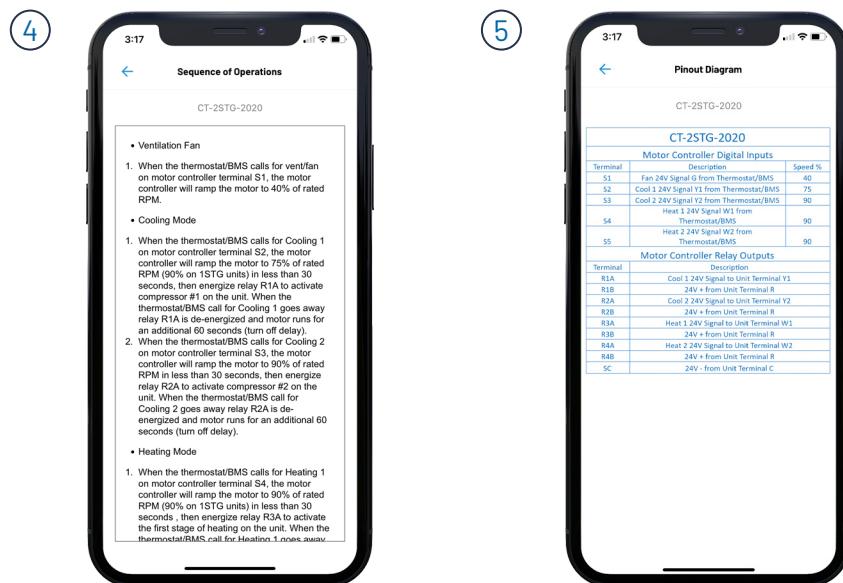
Settings - Operation - Update Flow



Touch Update Flow to change the entire flow.

Similar to motor system configuration select the desired logic flow.

Special Projects contains the Sequence of Operation for a specific flow and Pinout Diagrams.

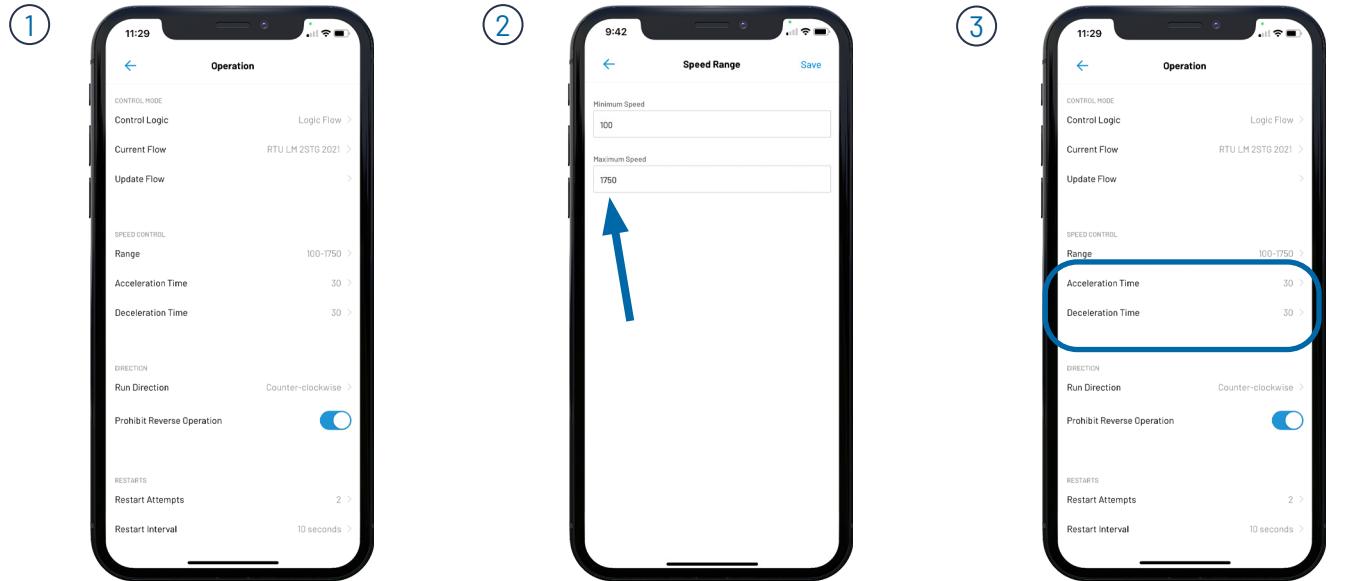


Sequence of Operation example.

Pinout Diagram example.

Additional Features

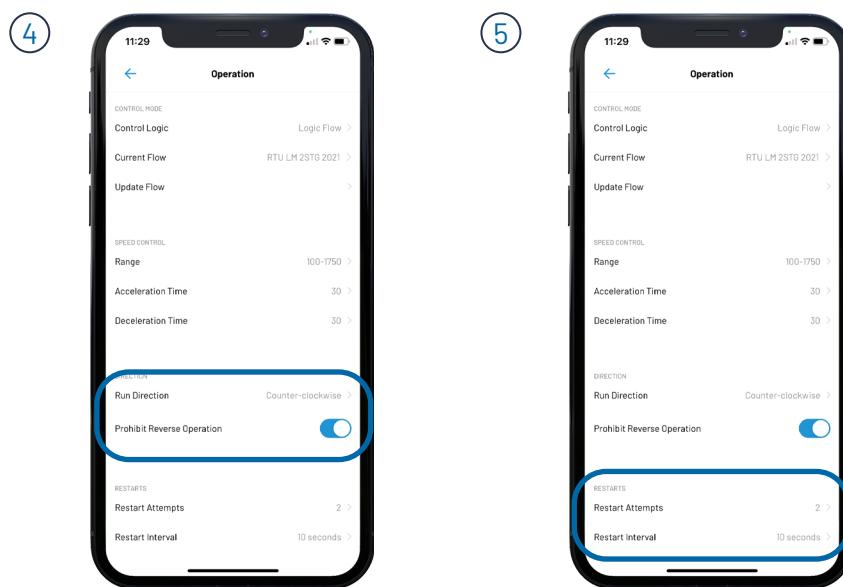
Settings - Operation - Other Features



Other features allow for modifying motor operation.

Speed range should never be set below 100 or above that listed on the original induction motor.

Acceleration and Deceleration time is the motor ramp up and down time. These are typically not adjusted.



The motor run direction and prohibit reverse operation can be changed here. Typically Prohibit Reverse Operation remains on.

Restart Attempts and Restart Interval are the number of time the motor will attempt to restart after a fault before locking out.

IMPORTANT NOTE:

Acceleration and Deceleration

These settings are optimized for most application and are typically not adjusted

Prohibit Reverse Rotation

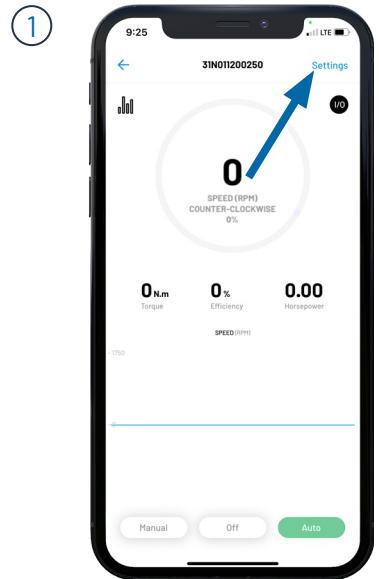
Allowing reverse motor rotation can result in damage to the RTU's blower assembly.

Restart Attempts and Restart Interval.

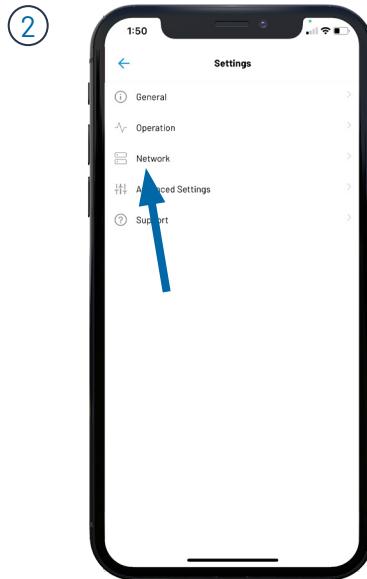
These settings should only be changed at the direction of Turntide Technical Support.

Additional Features

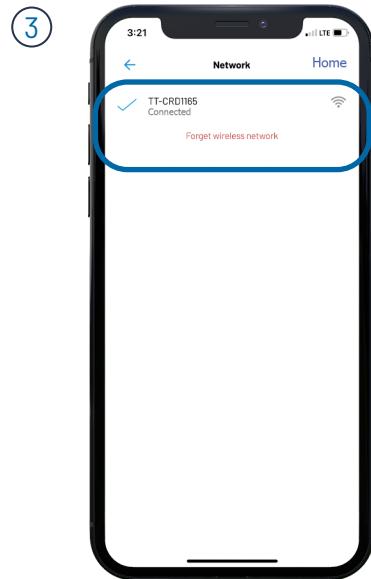
Settings - Network and Support



Touch "Settings"

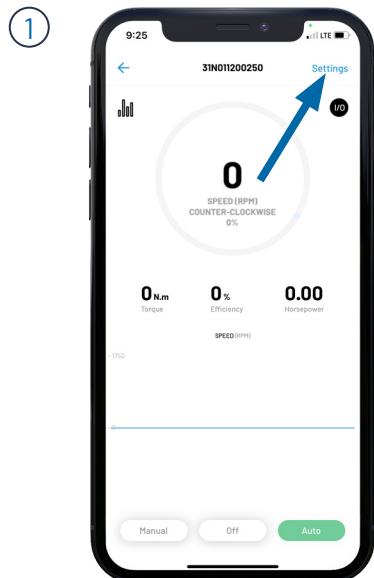


Select "Network"

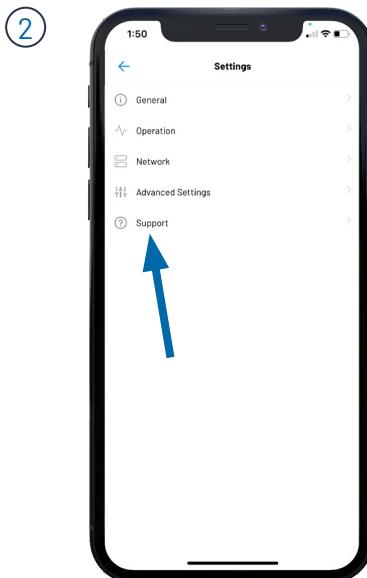


The RMK network information is listed.

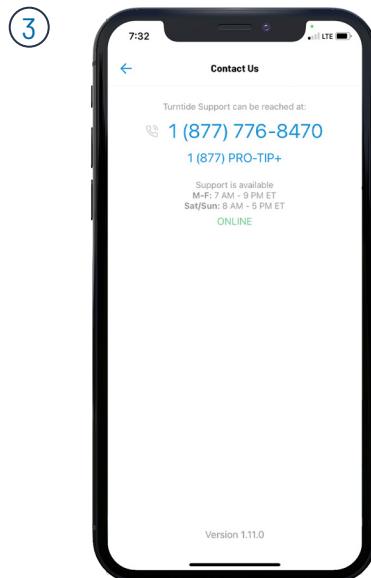
Settings - Support



Touch "Settings" on the motor home screen.



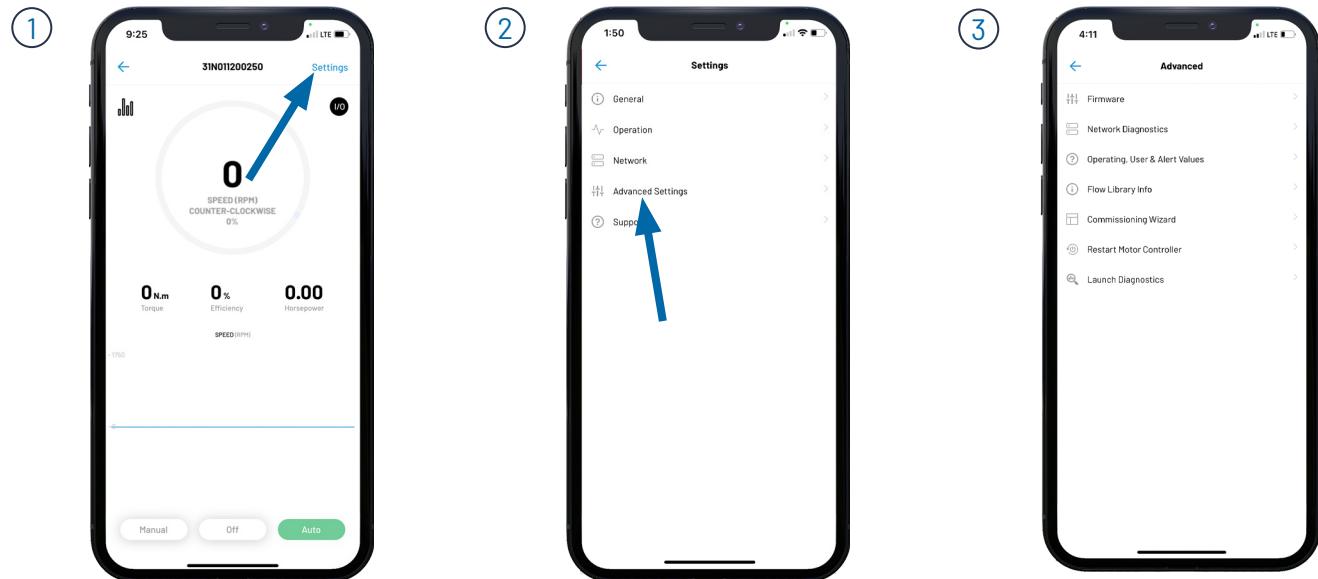
Select "Support"



The Turntide Technical Support number is displayed along with hours of operation.

Additional Features

Settings - Advanced

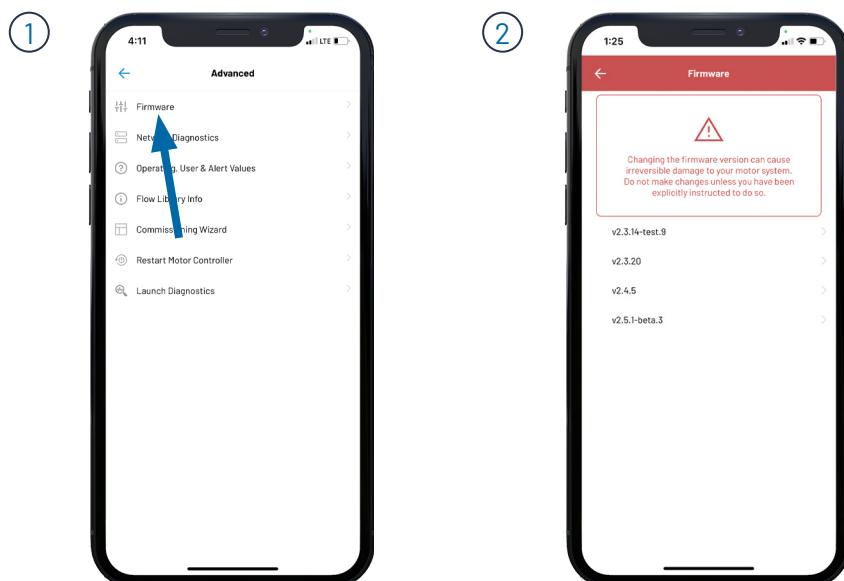


Touch "Settings"

Select "Advanced Settings"

The "Advanced" screen lists the available resources.

Settings - Advanced - Firmware

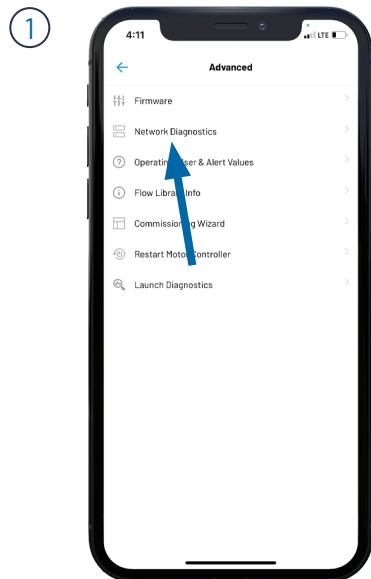


Touch "Firmware."

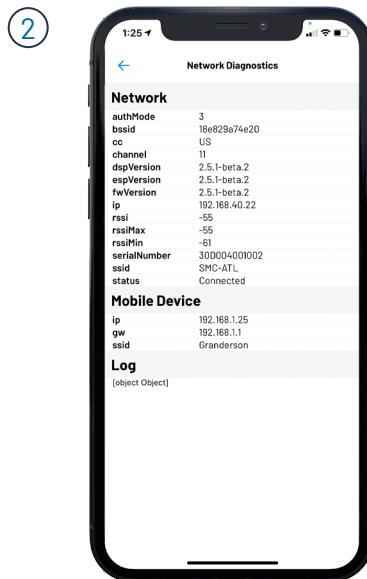
The Firmware screen shows the available versions. Changing should **ONLY** be done at the direction of Turntide Technical Services.

Additional Features

Settings - Advanced - Network Diagnostics

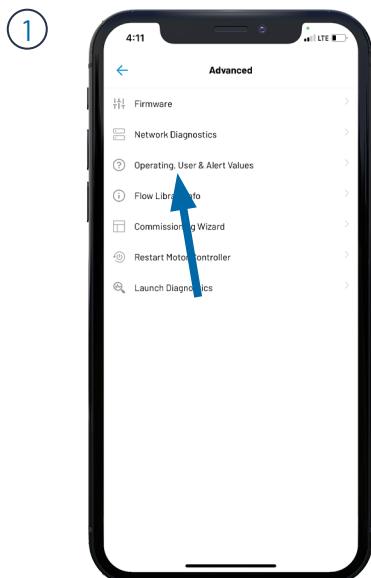


Touch "Network Diagnostics"

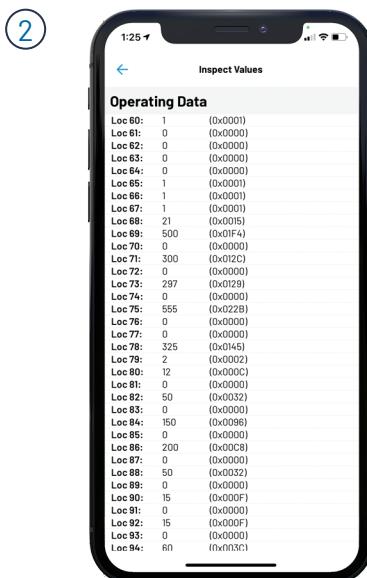


This screen shows WiFi connectivity and signal strength.

Settings - Advanced - Operating User & Alert Values



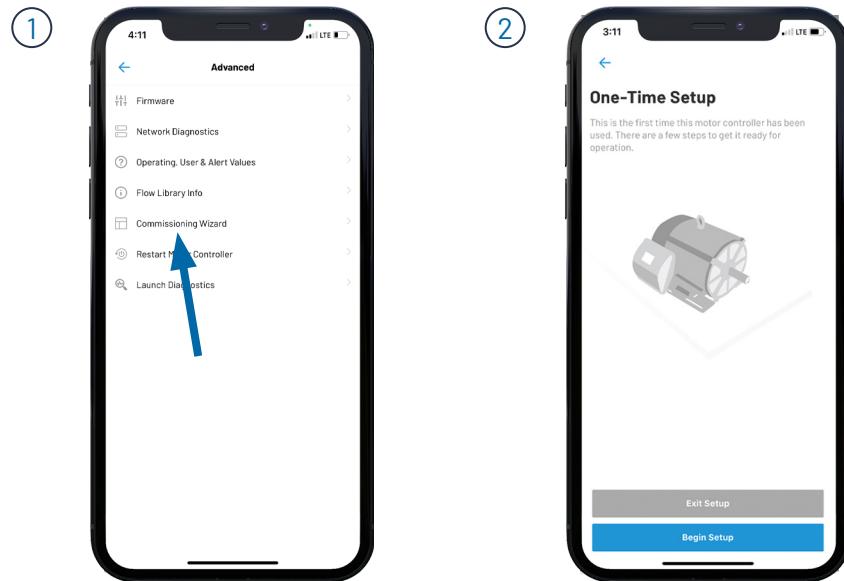
Select "Operating User & Alert Values."



This information is necessary for advanced troubleshooting with Turntide Technical Support.

Additional Features

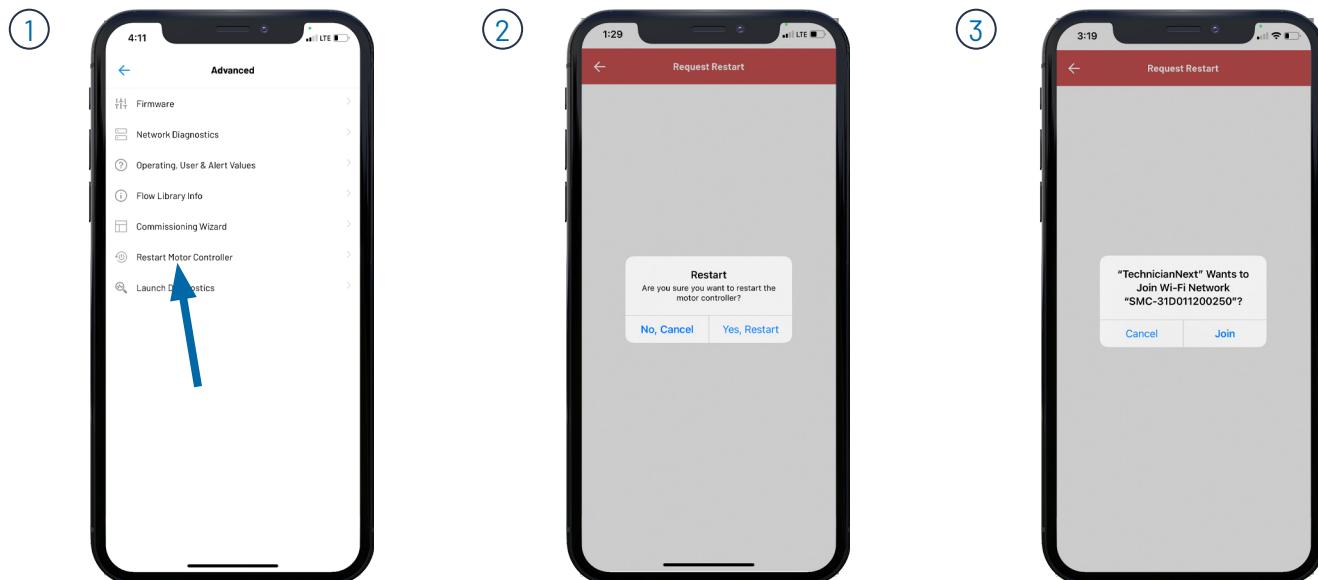
Settings - Advanced - Commissioning Wizard



Touch "Commissioning Wizard"

The One-Time Setup screen appears allowing configuring the Turntide Smart Motor System.

Settings - Advanced - Restart Motor Controller



Restarting the Turntide Motor Controller is a way to reset the controller.

Select "Yes" to restart.

Following the restart rejoining the motor controller WiFi is necessary.

Diagnostics

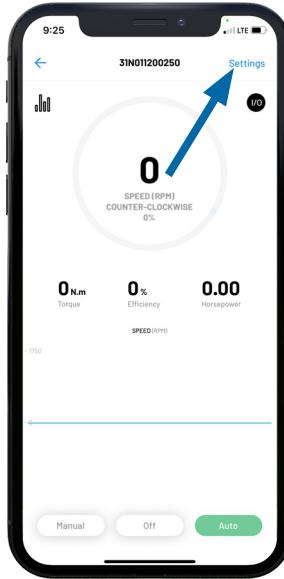
Settings - Advanced - Launch Diagnostics

The diagnostics section is an aid to installing and servicing technicians.

During Turntide motor installation the app can confirm the control wiring is correct, proper motor operation, the sensors, if used, are wired correctly, and the motor controller is emitting proper signal strength.

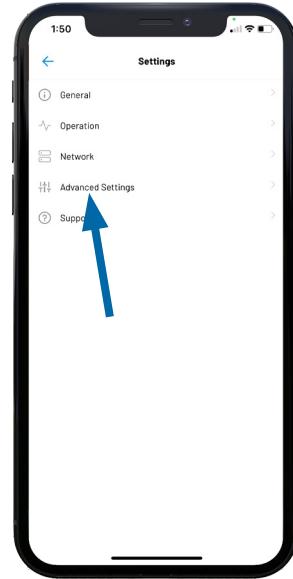
Servicing technicians find these features extremely useful as well. For example, a servicing technician can use the app to confirm proper operation. Thus, reducing the need to manually verify control wiring.

①



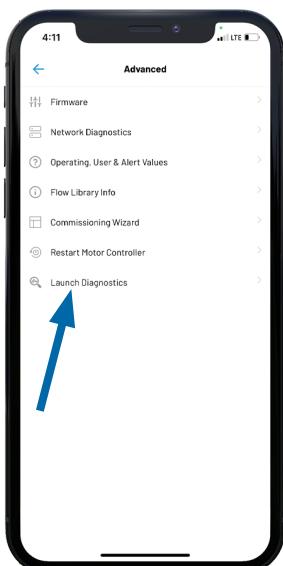
Touch "Settings"

②



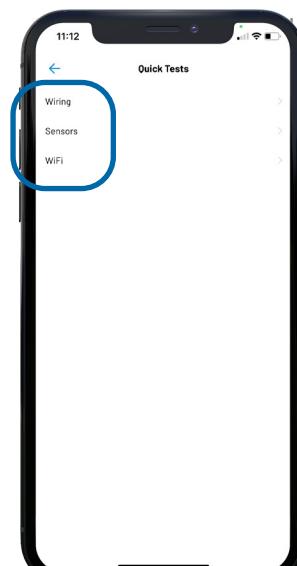
Select "Advanced Settings"

③



②

④



The "Advanced" screen select "Launch Diagnostics."

At the "Quick Tests" screen there are three options available.

- Wiring

This feature validates wiring and the motor controller outputs.

- Sensors

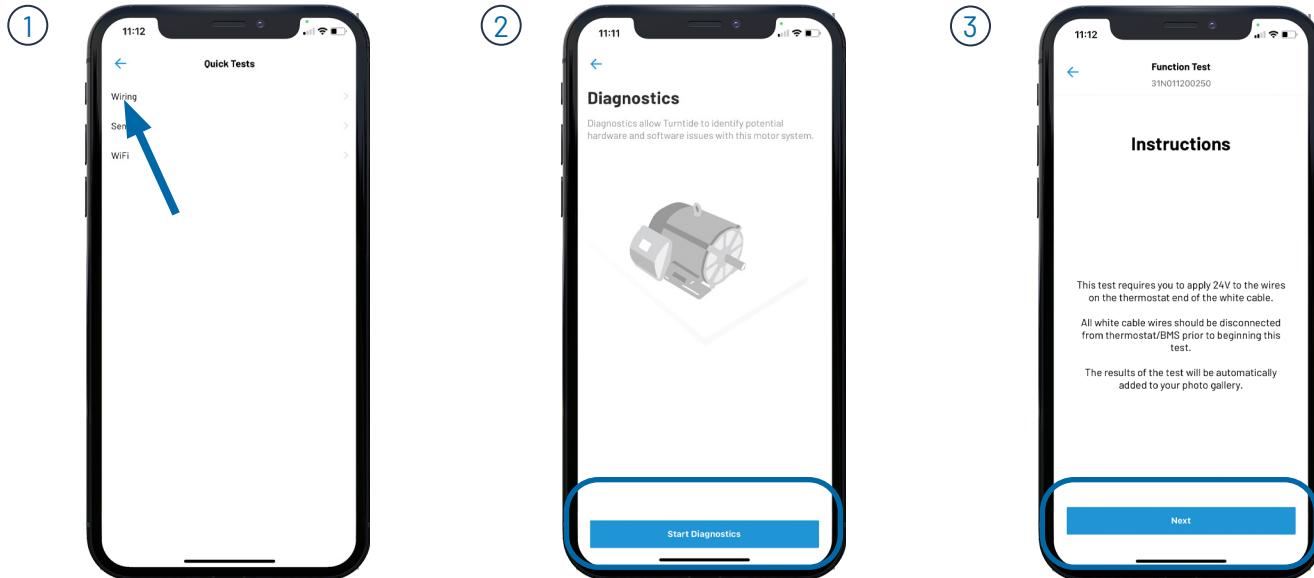
Sensor data is collected to determine proper location and wiring.

- WiFi

Motor controller WiFi signal strength is measured to ensure it is adequate.

Diagnostics

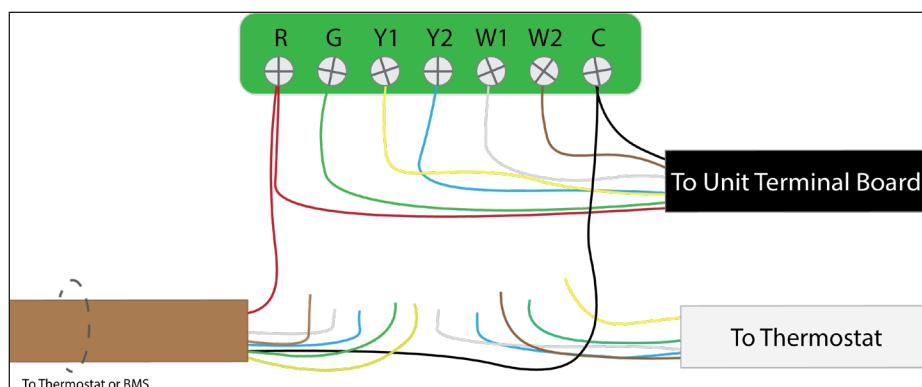
Wiring & Function Test



Select "Wiring" to enter the wiring and function test.

Touch "Start Diagnostics" to begin the test.

To properly test the wiring and motor system function, disconnect the white "To Thermostat" wires from the thermostat wires, see the illustration.



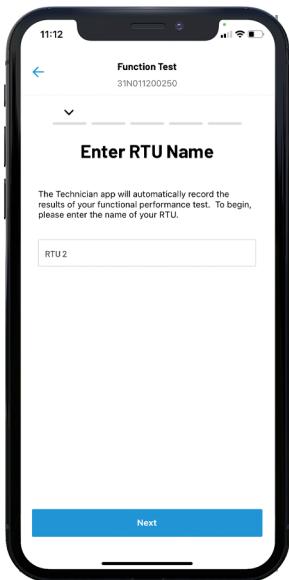
Notes:

1. The example shown is for a two-stage system. When testing a single stage system, the app omits second stage
2. The motor speeds may vary from those shown, based on application.

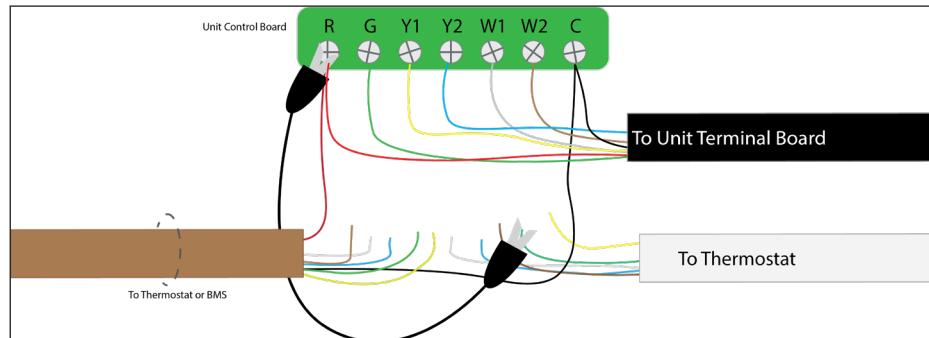
Diagnostics

Wiring & Function Test - Continued

4



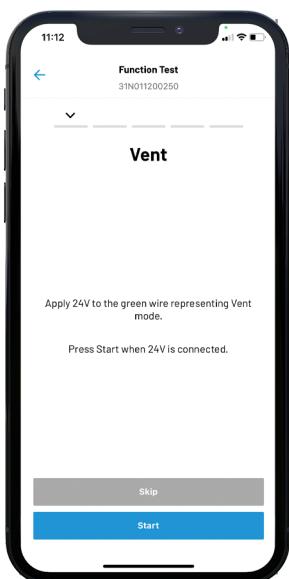
Before starting the test, enter a name for the unit being tested, such as RTU2.



The test requires two jumper wires in most cases. With power applied to the RTU connect one end for the jumper to the power, or "R" side of the 24 volt transformer, such as the "R" terminal of the unit control board. This connection will remain for the duration of the test.

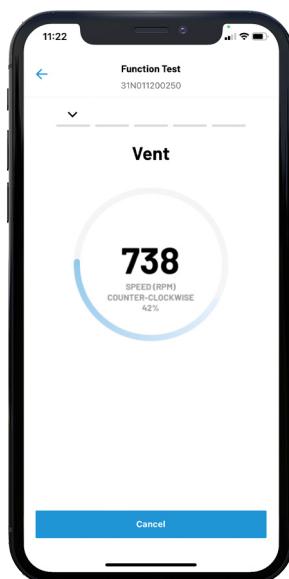
Connect other end of the jumper to the wire indicated by the test instruction. In this "Vent" test example the jumper wire connects to the green wire of the "To Thermostat" cable.

5



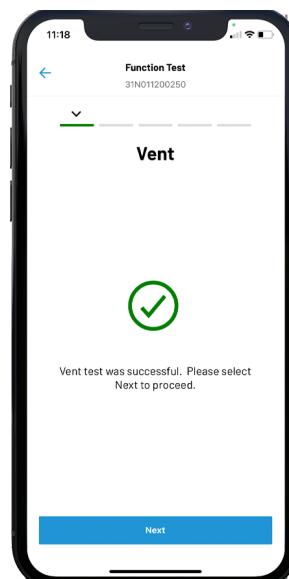
The "Vent" test is the first. Connect the jumper wire to the green wire of the "To Thermostat" cable. Touch Start to begin the test.

6



The app displays motor RPM, rotation, and percent of full speed during ramp up.

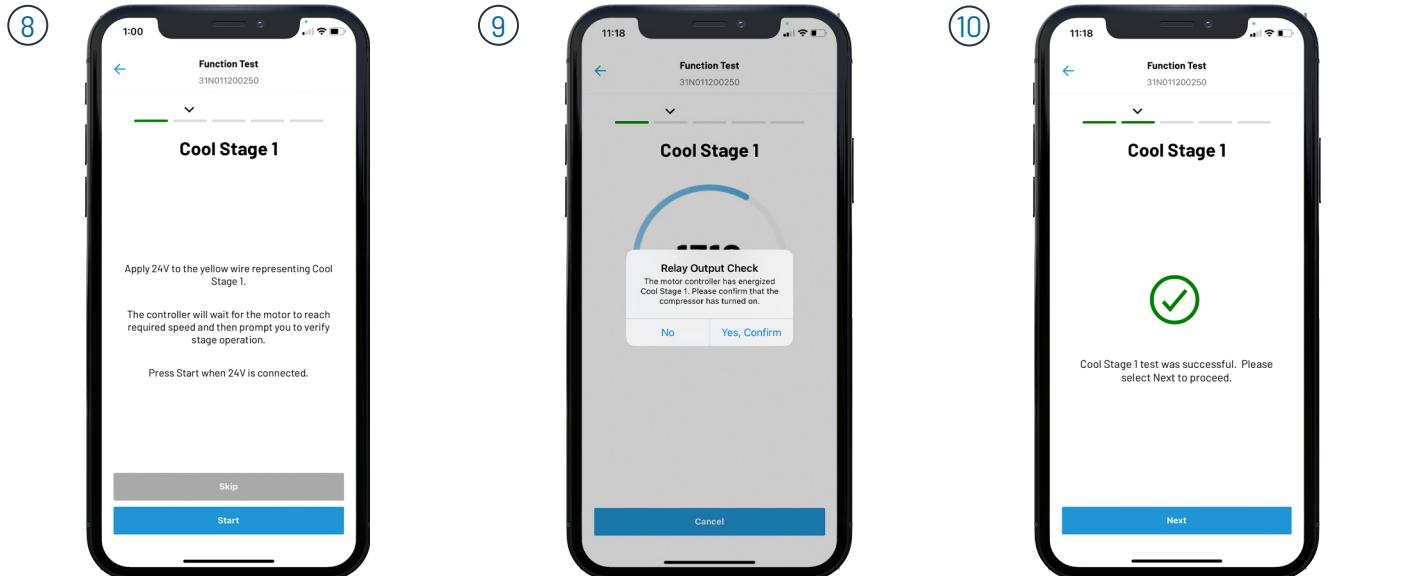
7



After operating at the proper speed for five seconds a green check indicates success. Touch "Next" for the next step.

Diagnostics

Wiring & Function Test - Continued



(8) Cool Stage 1

Apply 24V to the yellow wire representing Cool Stage 1.

The controller will wait for the motor to reach required speed and then prompt you to verify stage operation.

Press Start when 24V is connected.

(9) Cool Stage 1

Relay Output Check

The motor controller has energized Cool Stage 1. Please confirm that the compressor has turned on.

No Yes, Confirm

(10) Cool Stage 1

Cool Stage 1 test was successful. Please select Next to proceed.

Next

(11) Cool Stage 2

Apply 24V to the blue wire representing Cool Stage 2.

The controller will wait for the motor to reach required speed and then prompt you to verify stage operation.

Press Start when 24V is connected.

(12) Cool Stage 2

Relay Output Check

The motor controller has energized Cool Stage 2. Please confirm that the compressor has turned on.

No Yes, Confirm

(13) Cool Stage 2

Cool Stage 2 test was successful. Please select Next to proceed.

Next

Move the jumper to the yellow wire in the "To Thermostat" cable. Begin the test by touching "Start." This step is omitted for single stage equipment.

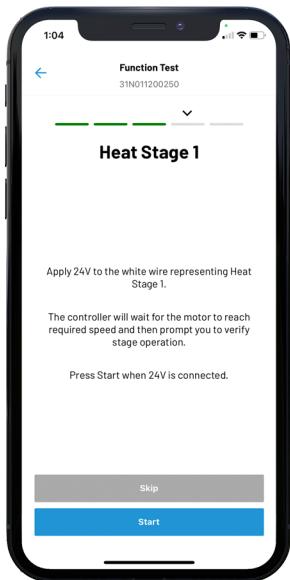
After the motor achieves the correct speed 1st stage cooling will energize*. Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to the next test.

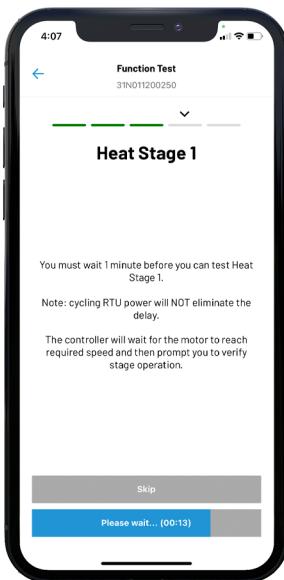
Diagnostics

Wiring & Function Test - Continued

14



15



Move the jumper to the white wire in the "To Thermostat" cable. Begin the test by touching "Start."

Before 1st stage heating is tested, the motor controller must complete the cooling "off" period. During this time the motor will continue to run for 30 to 240 seconds, depending on the flow loaded.

The screen to the left shows the countdown timer during this period.

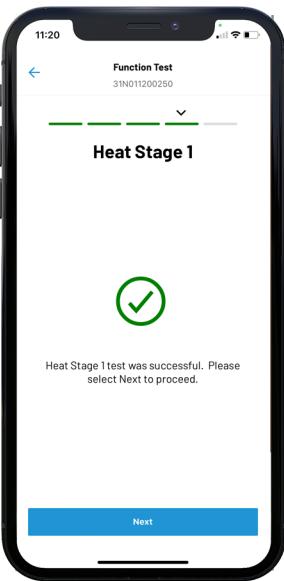
Once the time expires the motor will transition to 1st stage heating speed. In some applications, the 2nd stage cooling motor speed is the same as the 1st stage heating speed. There is no speed change.

The test will proceed 1st stage heat validation.

16



17



18



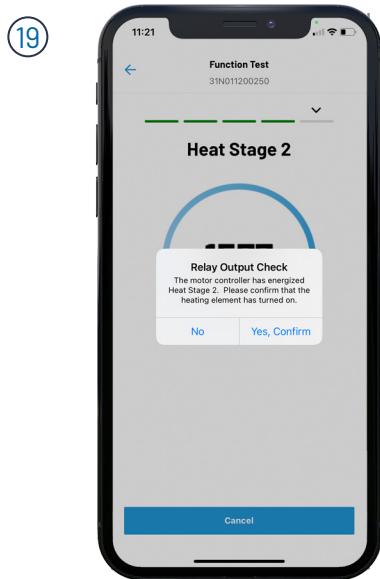
After validating motor operation 1st stage heating will start.* Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to the next test.

Move the jumper to the brown wire of the "To Thermostat" cable.** Touch "Start." This step is omitted for single stage equipment.

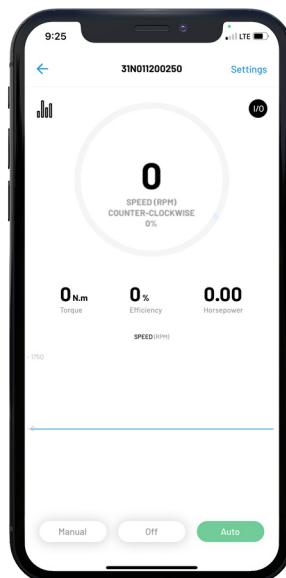
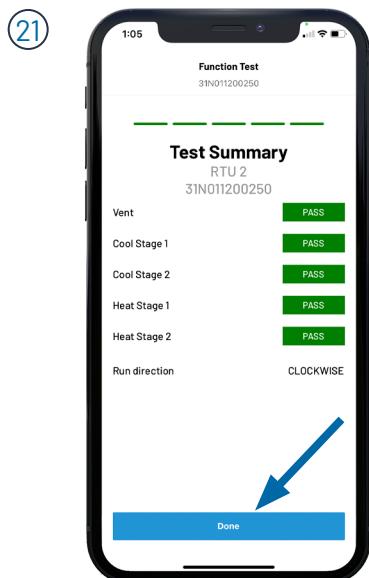
Diagnostics

Wiring & Function Test - Continued



After the motor achieves the required speed select 2nd stage heating will start.* Touch "Yes, Confirm."

Following confirmation, a green check appears indicate the test was successful. Touch "Next" to move to complete testing.



Upon test completion at "Test Summary" screen appears. Touch "Done" to return to the motor home screen. The app automatically saves an image to the "Test Summary" to the phone's photo library. Uploading the image is necessary for specific XOi workflow steps.

② The final step is to disconnect the jumper wire and reconnect the "To Thermostat" cable wires to the thermostat wires.

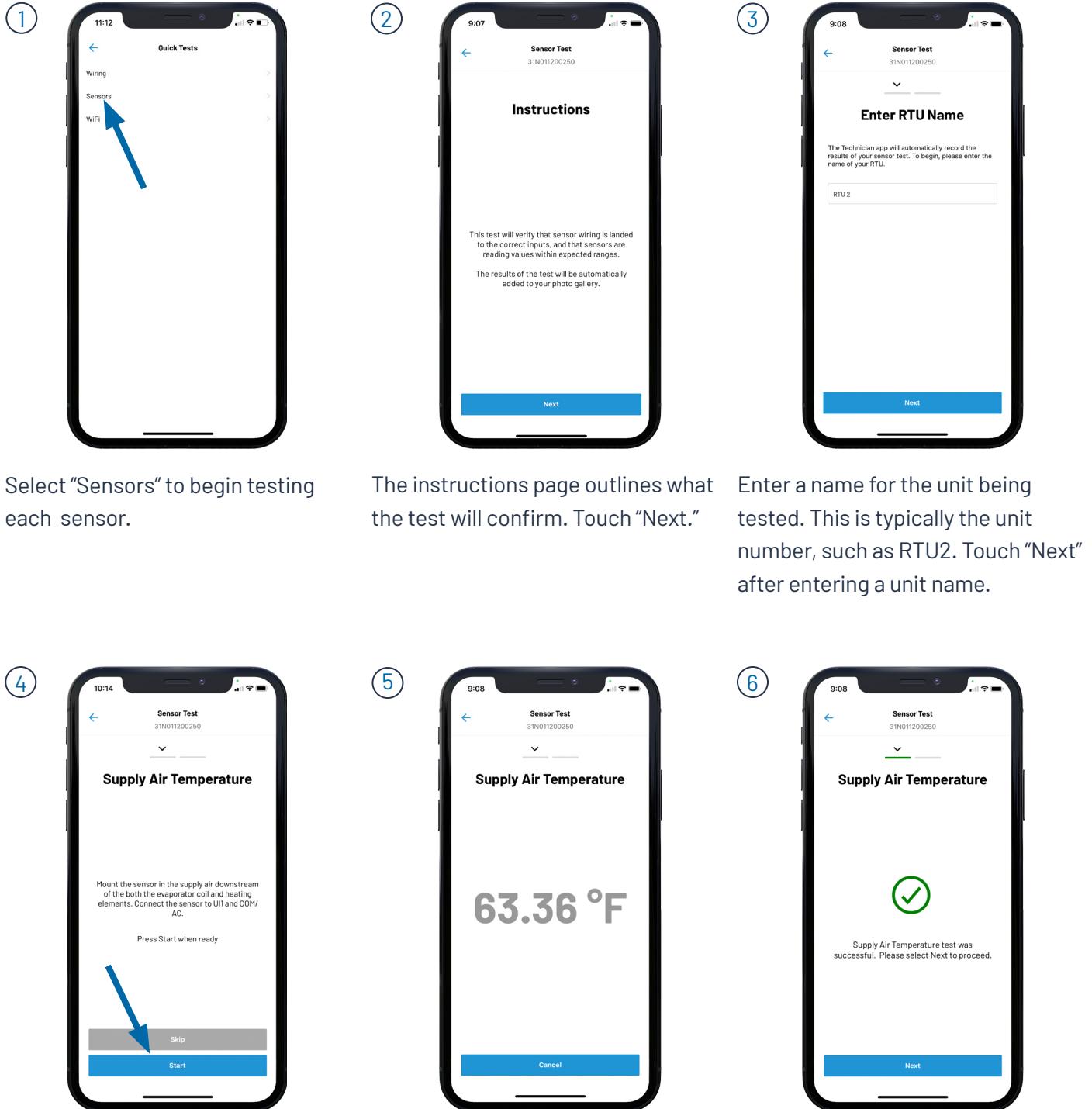
NOTES:

* Time delays built into the RTU control system may prevent the cooling or heating starting immediately.

** In many cases the 1st stage heat must be energized before the 2nd stage can energize. When testing 2nd stage heating, the jumper from R to the white wire of the "To Thermostat" cable must remain. An additional jumper wire is need from R to the brown wire of the "To Thermostat" cable. This allows both stages to energize.

Diagnostics

Sensor Test



Select "Sensors" to begin testing each sensor.

The instructions page outlines what the test will confirm. Touch "Next."

Enter a name for the unit being tested. This is typically the unit number, such as RTU2. Touch "Next" after entering a unit name.

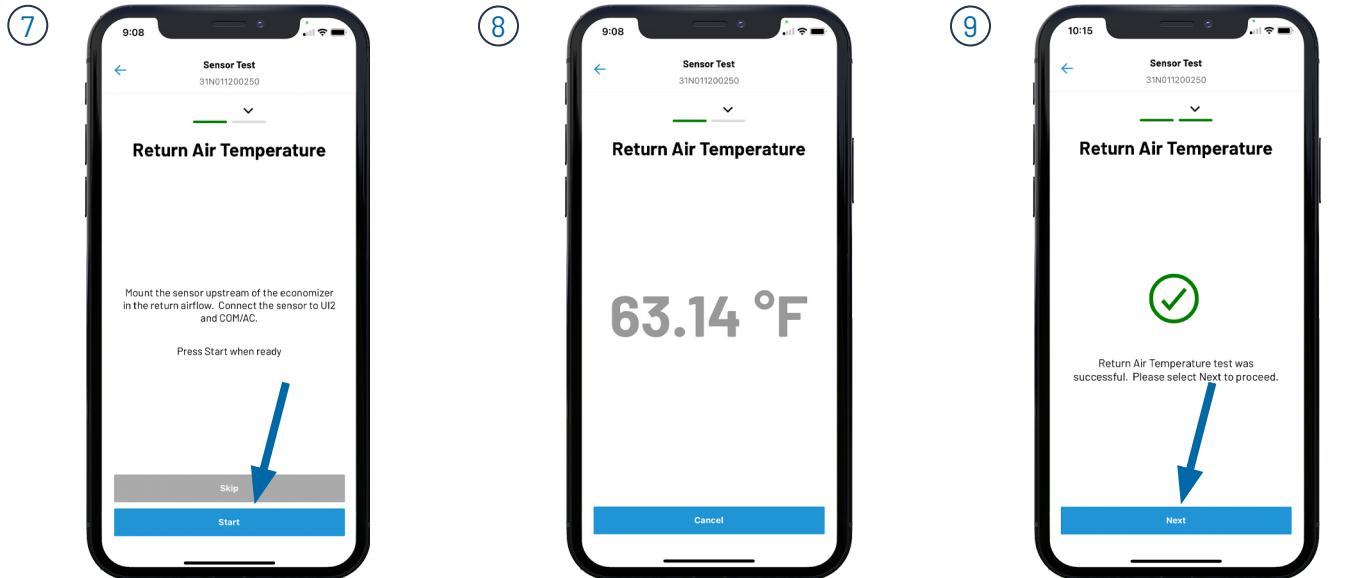
Touch "Start" to begin testing the supply air sensor.

The supply air temperature is displayed.

After a few seconds the screen updates indicating the test was successful. Touch "Next" to go to the next test.

Diagnostics

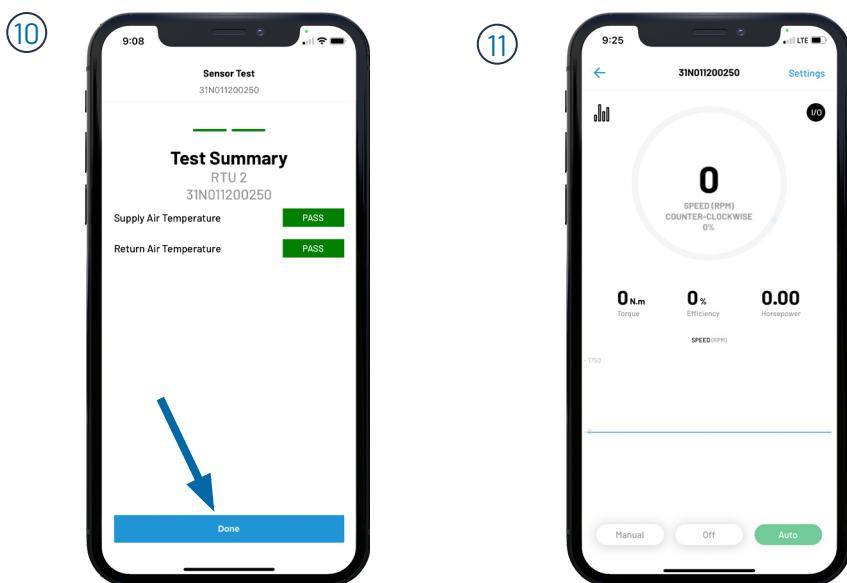
Sensor Test - Continued



Touch "Start" to begin testing the return air sensor

The return air temperature is displayed.

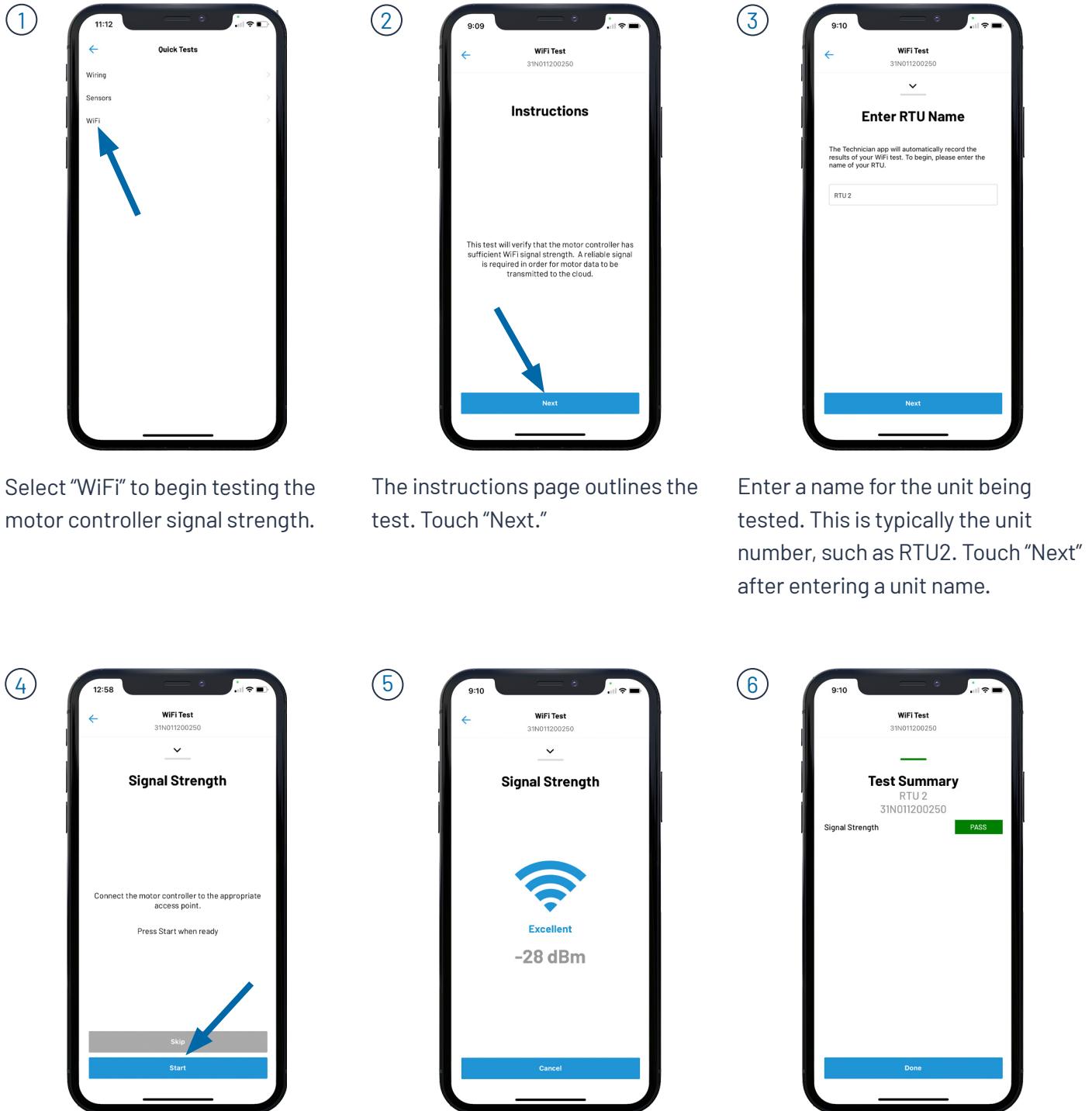
After a few seconds the screen updates indicating the test was successful. Touch "Next" to go to the summary page.



The summary page indicates pass or fail for each sensor. This image is saved to your phone's photo gallery. The image may be uploaded as part of an XoI workflow indicating a successful test. Touch "Done" to return to the home screen.

Diagnostics

WiFi Test



Touch "Start" to launch the test.

The app displays the motor WiFi strength in dBm and as an signal icon.

A "Test Summary" screen appears. If the test fails, contact Turntide Technical Support. Touch "Done" to return to the home screen.

Turntide Academy

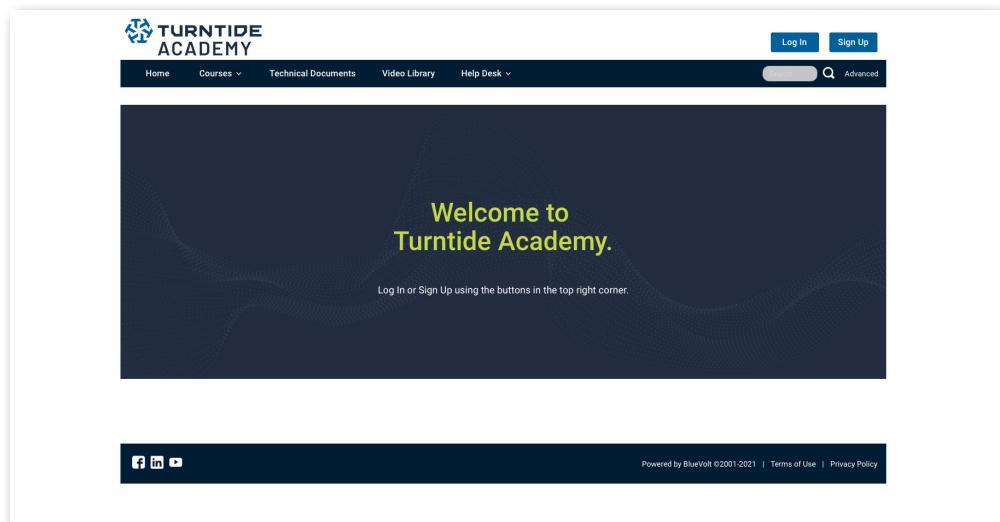
Turntide Academy provides excellent installation and service training for the various Turntide products.

Turntide Academy goes beyond just training. We also offer 27 videos directly related to Turntide Smart Motor System installation.

This site includes resources , such as Motor Specs, Product Information and Installation Manuals.

Check It Out

TurntideAcademy.com



The screenshot shows the Turntide Academy website. At the top, there is a navigation bar with links for Home, Courses, Technical Documents, Video Library, Help Desk, Log In, Sign Up, and a search bar. The main content area features a dark background with a grid pattern. Centered text reads "Welcome to Turntide Academy." Below this, a smaller note says "Log In or Sign Up using the buttons in the top right corner." At the bottom, there is a footer bar with social media icons for Facebook, LinkedIn, and YouTube, along with a link to "Powered by BlueVolt ©2001-2021 | Terms of Use | Privacy Policy".

TURNTIDE TECHNOLOGY FOR SUSTAINABLE OPERATIONS

Our breakthrough technologies accelerate electrification and sustainable operations for energy-intensive industries.

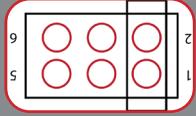
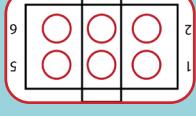
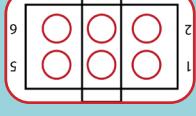
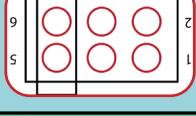
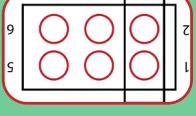
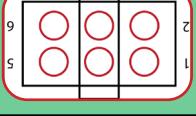
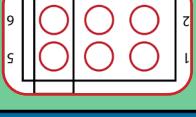
Motor Controller Jumper Pin Overview

Turntide motor controllers are designed for several applications. The jumpers are used to configure the motor controller for a specific application. The table below helps illustrate the jumper usage and settings.

The Input Mode jumpers determine the inputs the motor controller recognizes. The most common configuration is a jumper across pins 1&2 another across pins 5&6. Pins 1&2 enable MODBUS, should it be used. Pins 5&6 set the motor controller to respond to 24VAC inputs.

The Universal Input (UI) jumpers defines the connected device type. Currently UI1 and UI2 are used in applications with Supply and Return Air sensors. Setting the respective jumpers across pins 1 & 2 configure the control to respond to the resistive load of the thermistor.

IMPORTANT NOTE: Mode Input Selection must be jumpers 1&2 and 3&4 OR 1&2 and 5&6.

Motor Controller Model	Modbus EOL Jumper	Digital Input Mode Jumper	Universal Input Mode Jumpers			
			UI1	UI2	UI3	UI4
P04W	J96	J96	J5125	J111	J112	J113
P05	J96	J96	J5125	J111	J112	J113
SL120	J10	J10	J11	J12	J13	J14
Modbus EOL Selection						
Pin Selections		Mode		Examples		
 1&2		Installed: Enables EOL Resistor (End of Line)		Install if wiring to terminals D+/D- is end of daisychain.		
 3&4		Removed: Disables EOL Resistor (End of Line)				
Digital Input Mode Selection						
Pin Selections		Mode		Examples		
 3&4		Enables digital inputs LOGIC or dry contact mode.		Install if S1 thru S7 will be used to receive contact closures for control.		
 5&6		Enables digital inputs 24VAC signaling mode.		Install if S1 thru S7 will be used to receive 24VAC input signal from existing BMS or thermostat.		
Universal Input Mode Selection						
Pin Selections		Mode		Examples		
 1&2		Resistive/LOGIC: Returns resistance of connected element or ON/OFF if declared as resistive or LOGIC mode respectively.		Resistive: 2 wire 10KΩ thermistor LOGIC: Dry contact closure = ON Dry contact open = OFF		
 3&4		Voltage: 0-10V signal ended voltage input.		3-wire device with external power source that provides 0-10V signal. (1 signal, 1 common, 1 power)		
 5&6		Current: 0-20mA current input.		3-wire device with external power source that provides a 0-20MA signal. (1 signal, 1 common, 1 power)		