

## Installation Instructions

# Voyager Light Commercial Constant Volume to Single Zone Variable Air Volume or Multispeed Conversion



**Models:** TCD, TCH, TFD, TFH, YCD, YCH, YFD, YFH, TSD, TSH, THD, THH, YSD, YSH, YHD, YHH

### **⚠ SAFETY WARNING**

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

# Introduction

Read this manual thoroughly before operating or servicing this unit.

## Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

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The three types of advisories are defined as follows:

**⚠ WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**⚠ CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

**NOTICE** Indicates a situation that could result in equipment or property-damage only accidents.

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## Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

## Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

### ⚠ WARNING

#### Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes.

### ⚠ WARNING

#### Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

**⚠ WARNING**

**Hazardous Voltage and Gas!**

Failure to turn off gas or disconnect power before servicing could result in an explosion or electrocution which could result in death or serious injury. Turn off the gas supply and disconnect all electric power, including remote disconnects, before servicing the unit. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

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## Trademarks

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## Revision History

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First version of this literature

# Table of Contents

Introduction .....	2
Warnings, Cautions, and Notices .....	2
Important Environmental Concerns .....	2
Important Responsible Refrigerant Practices	
2	
Copyright .....	3
General Information .....	5
Introduction .....	5
Tool List .....	5
Part Identification .....	5
Installation .....	7
Inverter Duty Motor and Vibration Reduction	
Bracket .....	7
Discharge Air Sensor .....	8
VFD Assembly Mounting .....	8
Control Panel Components .....	9
Wiring .....	10
Control Panel to Drive Connections .....	11
Motor and Drive .....	11
Motor to Drive .....	11
Control Panel .....	12
Wiring Diagrams .....	13
Setting Economizer Damper Positions ...	13
Zone Sensor .....	13

# General Information

## Introduction

The information provided in this manual is intended for use when converting a Voyager™ Light Commercial rooftop unit, shipped from the factory with ReliaTel™ controls, from constant volume supply air to single zone variable air volume or a multispeed (Title 24) supply fan. The work involved in the upgrade consists of replacing the existing supply fan motor with an inverter duty motor, adding a TR200 variable frequency drive and various control panel changes and wiring adaptations.

In this manual other pieces of literature are referred to at various points. The literature referred to is not included in the upgrade package unless noted and is available for download in e-Library.

If technical assistance is needed during the installation process, contact Light Commercial Technical Service in Clarksville. If the installation is not being performed by a Trane/American Standard service technician, please contact your national account executive for assistance.

## Tool List

- Cordless Drill
  - Phillips driver bit (#2/Standard)
  - 3/8-in. hex nut driver bit
- Socket Wrench
  - 3/8-in. and 1/2-in. sockets
- Phillips and flat head screwdrivers
- Needle nose pliers
- Fish Tape or Rod
- Electrical tape
- Medium Crescent wrench or standard combination wrenches
- Flashlight
- Sharpie/Magic Marker

## Part Identification

**Important:** Verify all parts before unit disassembly.

**Table 1. VFD assembly and motors included in kits**

Part	Number	Quantity	Factory Number	Kit
VFD Assembly	DRV01841	1	438570930300	KIT17846
Motor	MOT14568	1	X70371159010	
VFD Assembly	DRV01842	1	438570930400	KIT17847
Motor	MOT14568	1	X70371159010	
VFD Assembly	DRV01844	1	438570930100	KIT17848
Motor	MOT14568	1	X70371159010	
VFD Assembly	DRV01845	1	438570930200	KIT17849
Motor	MOT14569	1	X70371160010	

## General Information

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**Table 2. Common parts included in kits**

Common Parts <sup>(a)</sup>	Number	Quantity	Factory Number
RTOM to Com Wire	WIR04125	1	X19051428010
Relay	RLY02138	1	X13300552020
Terminal Block	BLK01437	1	X13491348010
Terminal Strip	BLK01438	1	X13491349010
Multispeed Harness	WIR07166	1	507113970100
Fully Modulating (SZVAV) Harness	WIR07167	1	507113870100
Motor to Drive Harness	WIR06995	1	X19052292010
Discharge Air Sensing Kit	KIT08676	1	BAYTUBE008AA
Vibration Bracket	BRK04367	1	438572550100
RTRM	MOD02665	1	X13650867170
RTOM	MOD02554	1	X13650868090
Grounding Ring	BAYSHGR001AA	1	N/A
Terminal Block Screw	SCR01871	1	X25330033210
Relay and Strip Screw	SCR00909	8	X25330033130
Vibration Bracket and Drive Screws	X25240209030	10	N/A
Vibration Bracket Nut	NUT00963	1	X28022600000
Drill Bit	TOL03949	1	0308396
Vibration Bracket Washer	WAS00720	6	X22050242010
Hole Location Template	50711426	1	N/A
Installation Literature	PART-SVN227A-EN	1	N/A
Wiring Diagrams	018600350100	1	N/A
RTEM	MOD02618	1	X13651513030

(a) Each kit (KIT17846, KIT17847, KIT17848, and KIT17849) comes with the common parts listed in this table (Table 2), along with the VFD assembly and motor listed in Table 1, p. 5.

# Installation

## Inverter Duty Motor and Vibration Reduction Bracket

**⚠ WARNING**

**Hazardous Voltage!**

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. Remove the supply fan drive belt.
2. Unbolt and remove the existing motor. Remove the drive sheave from the motor shaft.

**Note:** As the drive sheave is a common component to replace due to wear and a different sheave is not needed when upgrading to SZVAV or Multispeed, a new sheave is not included as part of the upgrade program. Sheaves are available through Trane Supply or your Trane or American Standard parts distributor.

3. Affix the sheave to the shaft of the inverter duty motor. A new shaft key is provided with the inverter duty motor.
4. A new wiring harness to connect the motor to the VFD is provided and will need to be connected to the motor. The gauge of the wire in the motor to drive harness might be smaller than the wires that the existing motor was using, this is in line with the current production design.

**Note:** The motors used in the upgrade are dual voltage. If the unit that is being upgraded is not 460V the voltage plug on the back of the motor will need to be taken out, rotated 180° and reinserted.

**Figure 1. Inverter duty motor**



Voltage Plug

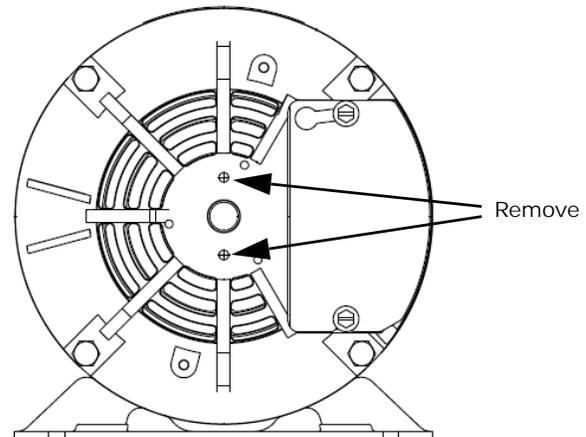
Reuse wire collar from motor that was removed

5. For additional motor bearing protection, a motor shaft grounding ring is provided. Before installing the

motor, follow a, b, and c below to install the grounding ring.

- a. Remove the two screws from the back of the motor as shown in [Figure 2](#).

**Figure 2. Back side of inverter duty motor**



- b. Slide the grounding ring over the end of the shaft and align the holes in the ring with the holes that the screws were in.
- c. Using the screws and washers provided with the grounding ring secure the ring to the motor.
6. Install the inverter duty motor into the unit.
7. Determine the location of the holes used to hold the vibration bracket onto the motor mounting panel.
  - a. Dry fit the bracket according to [Figure 3](#).
  - b. Use a marker to mark the location to drill the holes for the screws that will hold the bracket to the motor mounting panel.
8. Drill the holes that were marked using the 1/8 inch drill bit provided.
9. Install the vibration dampening bracket. See [Figure 3](#) for details.

**Table 3.**

Balloon	Part
1	Inverter Duty Motor
2	Vibration Reduction Bracket
3	Screw, 1/4-14 X 0.625 (X25240209030)
4(a)	Nut, 10-32 Hex Lock (X28022600000)
5(b)	Washer, 0.328 ID X 2.00 OD (X22050242010)
6	Nut (attached by motor supplier)

- (a) The torque applied to the nuts on the end of the extended bolts is to be as follows:  
 18–25 in-lb (~2 ft-lb) for 3 and 5 HP motors  
 (b) Use 1 washer on each bolt for 3 and 5 HP motors.

## Installation

Figure 3. Vibration bracket installation

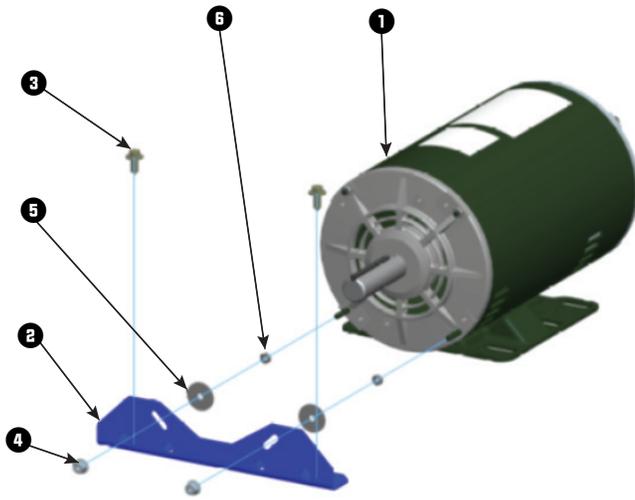


Figure 4. 3 or 5 HP vibration bracket installed



## Discharge Air Sensor

For multispeed or single zone VAV operation a discharge air sensor is required. A discharge air sensing kit ships with each upgrade kit. Literature RT-SVN02\*-EN ships along with the discharge air sensor parts kit and should be referenced for installation of the sensor. If a discharge air sensor is already installed it does not need to be replaced.

## VFD Assembly Mounting

### ⚠ WARNING

#### Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

The VFD assembly is to be mounted on the interior wall in the supply fan section using four sheet metal screws as

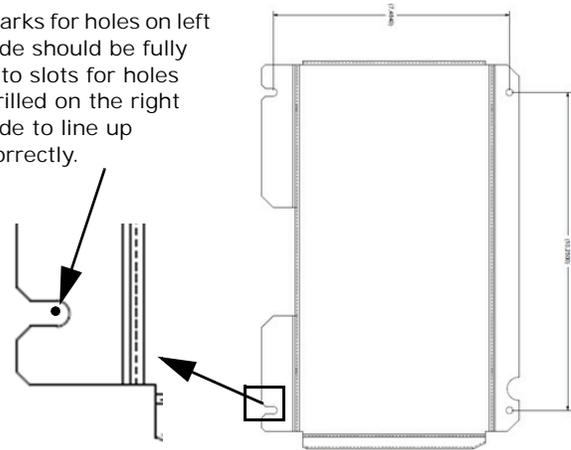
seen in Figure 6. In order to mount the assembly four 1/8th inch holes will need to be drilled.

1. Use the paper template provided to mark the locations of the four holes to be drilled. Note the location of the temperature sensor for some gas heat units as the wiring will need to reach around the drive assembly after it is installed.

Figure 5.

Orient template as shown.

Marks for holes on left side should be fully into slots for holes drilled on the right side to line up correctly.



2. After locating and drilling the four holes, screw in two of the sheet metal screws in the left two holes so that a small gap still remains between the bottom of the screw head and the sheet metal wall.
3. Slide the left side of the drive assembly that has slots for mounting instead of holes on to the screws that are part way screwed in. Holding the drive in place, screw the two screws on the left side the rest of the way down.
4. Screw in the two screws on the right side of the drive assembly.

Figure 6. Field installed VFD assembly



Figure 7. Factory installed VFD assembly



## Control Panel Components

### **⚠ WARNING**

#### **Hazardous Voltage!**

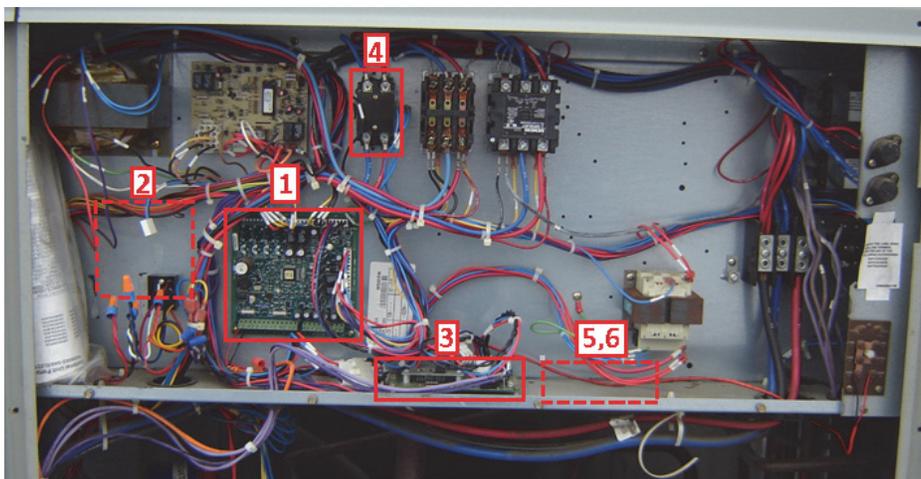
Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. Remove and replace the existing RTRM module with the new RTRM module provided. Reconnect all plugs/wires that were removed from the existing module to the new module. Refer to the Control Box Connections diagram when connecting plugs to the module.

2. Remove and replace (or add) the RTOM module with the new RTOM module provided. Reconnect all plugs/wires that were removed from the existing module to the new module. Refer to the Control Box Connections diagram when connecting plugs to the module.
3. Communications module location is highlighted in the picture below. It is not necessary to add or replace the communications module for the upgrade, it will be referred to in terms of locating the new ground terminal and relay(s).
4. Remove and replace the supply fan motor contactor with the terminal block (HTB3) provided. There will most likely not be two existing holes that will line up with the mounting holes of the terminal block. Use an existing hole and then using a 1/8-in. drill bit drill a hole to provide a location for the second screw. Reconnect wires 1A, 2A, 8A and 9A after the terminal block has been secured to the back panel. (1A to L1, 2A to L2, 8A to T1, 9A to T2)
5. \*Install the terminal strip (GTB) provided.
6. \*Install the relay(s) (VRR, VRS) provided. (For Multispeed operation both relays are needed, for SZVAV only one relay is needed (VRR).)
7. Replace the Economizer Module (RTEM) if the unit is equipped with an economizer. The Economizer Module is located behind the small access panel on the outside of the economizer hood.

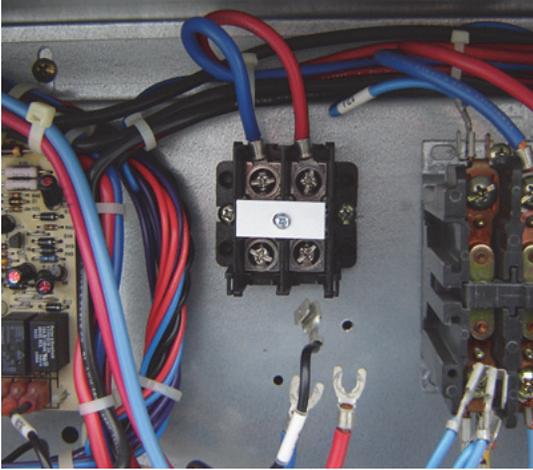
**\*Note:** In units built before single zone VAV or multispeed was available from the factory, holes for the GTB, VRR and VRS will need to be drilled using a 1/8-in. drill bit. Positioning should be to the right of the communications module as seen in Figure 10. If the area to the right of the communications module is not available then use the area to the left of the communications module.

Figure 8. Control panel installation

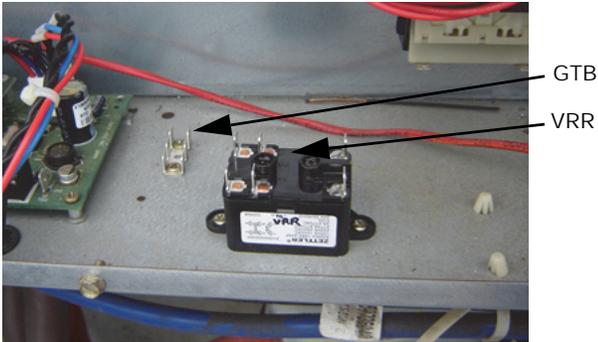


## Installation

**Figure 9. Terminal block installation**



**Figure 10. Field installed terminal strip and relay (SZVAV)**



**Note:** For multispeed conversion the second relay (VSR) would be installed to the right of the VRR pictured.

## Wiring

The tables below contain the connection information for the control panel wires that ship with the upgrade package based on the type of upgrade being performed. Directions and diagrams in the sections to follow will detail the connections to be made.

**Table 4. Multispeed upgrade wires**

Terminal	Wire Number	Terminal	Usage
VRR-3	36CC	GTB	All
VSR-3	36CD	GTB	All
RTRMP1-2	36CF	GTB	All
PPF7-3	36CG	GTB	Electric Heat
GV PPF10-2	36CK	GTB	Gas Heat
PPF27-1	600B	VRR-2	All
PPF27-2	601B	VRR-4	All
PPF27-3	603B	VSR-5	All
PPF27-4	604B	VSR-6	All
PPF27-4	604E	RESISTOR	All
PPF27-6	607C	RESISTOR	All
RTRM P2-5	608A	VSR-1	All
RTRM P9-1	609A	RTRM P9-2	All
PHM Y-OUT	W38	RTRM P1-12	All
COMM PPF5-5	W63	RTOM PPF8-1	All
COMM PPF5-4	W64	RTOM PPF8-2	All
COMM PPF5-2	W65	RTOM PPF8-3	All
COMM PPF5-1	W66	RTOM PPF8-4	All

**Note:** -GTB = New terminal strip installed next to communications module  
 -VRR = New relay  
 -VSR = New relay (Multispeed Only)

**Table 5. New wiring for SZVAV upgrade**

Terminal	Wire Number	Terminal	Usage
VRR-3	36CC	GTB	All
RTOM P12-2	36CE	GTB	All
GV	36CK	GTB	Gas Heat
PPF7-3	36CG	GTB	Electric Heat
PPF27-1	600B	VRR-2	All
PPF27-2	601B	VRR-4	All
PPF27-5	604D	RTOM P11-2	All
PPF27-6	607B	RTOM P11-1	All
COMM PPF5-5	W63	RTOM PPF8-1	All
COMM PPF5-4	W64	RTOM PPF8-2	All
COMM PPF5-2	W65	RTOM PPF8-3	All
COMM PPF5-1	W66	RTOM PPF8-4	All

**Note:** -GTB = New terminal strip installed next to communications module  
 -VRR = New relay  
 -VSR = New relay (Multispeed Only)

## Control Panel to Drive Connections

**⚠ WARNING**

**Hazardous Voltage!**

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. Take the nine pin connector (PPF27) that the signal control wires (600B, 601B etc.) are plugged into and using steel fish tape/stick run the opposite end of that wire harness through the wire chase that runs between the indoor fan section and upper left hand corner of the control panel.
2. Plug PPF27 into PPM27.
3. Remove the screw that holds the fuseholder cover closed in order to make the power connection of wires 3A, 8A, and 9A to FTB. After the connections have been made close the fusholder cover and re-secure it with the screw that was removed.

Figure 11. Control panel to drive connections

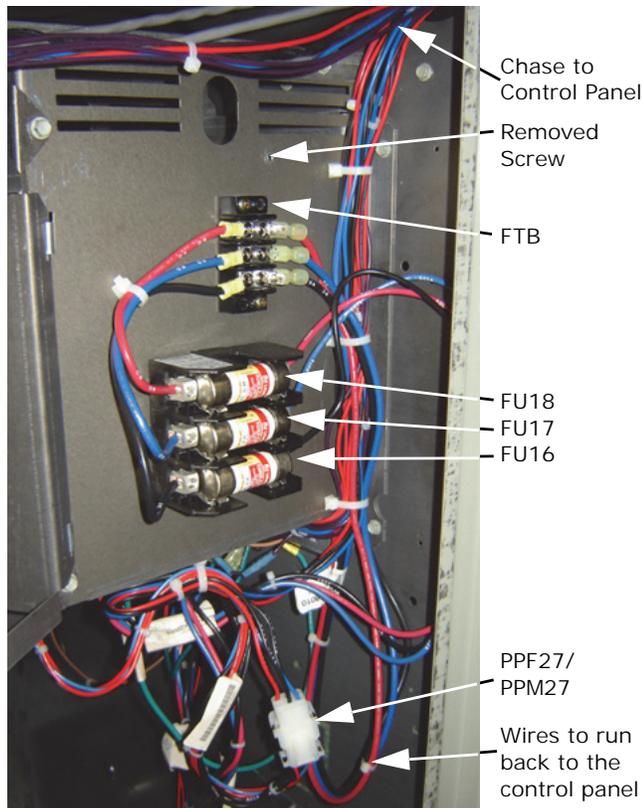
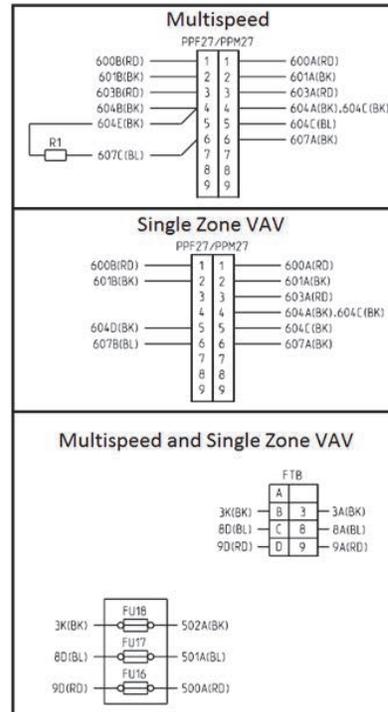


Figure 12. Control panel to drive schematic



## Motor and Drive

### Motor to Drive

**⚠ WARNING**

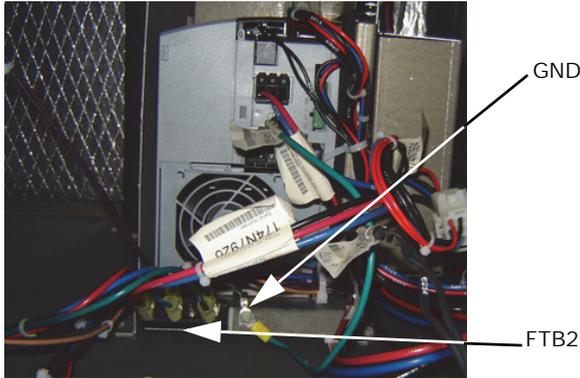
**Proper Field Wiring and Grounding Required!**

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

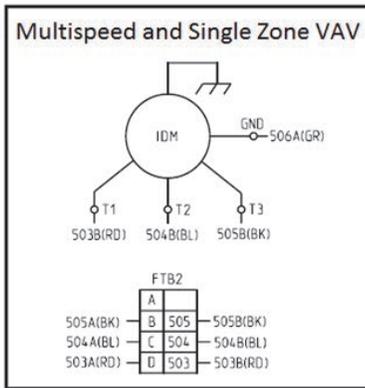
For 3 and 5 hp motors a separate harness containing wires 505B, 504B and 503B is used to connect the inverter duty motor to terminal FTB2. After connecting the power wires, connect the ground wire (506A) from the motor to the ground screw on the bottom of the drive assembly.

# Installation

**Figure 13. Motor to drive connections**



**Figure 14. Motor to drive schematic**



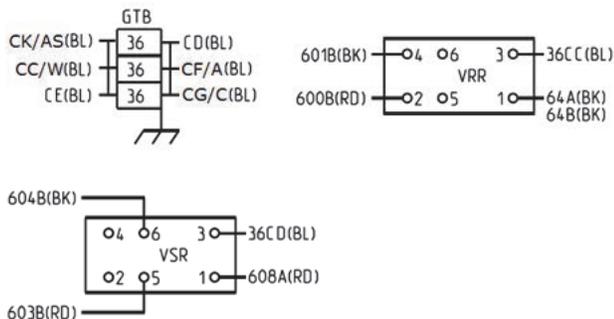
## Control Panel

**⚠ WARNING**

**Hazardous Voltage!**

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**Figure 15. GTB, VRR, and VSR wire connections**



1. Connect the ends of the 600B and 601B to VRR terminals 2 and 4 as shown in [Figure 15, p. 12](#).
  - a. For multispeed applications connect wires 603B and 604B to VSR terminals 5 and 6 as shown in [Figure 15, p. 12](#).
  - b. For SZVAV conversions, connect plug P11 (wires 604D and 607B) to the J11 pins on the RTOM module.
2. Connect the end of wire 64A that was connected to the supply fan motor contactor to VRR-1 along with wire 64B. (Wire 64B only applies to electric heat/cooling only units.)
3. Remove wire 36W (one end is currently connected to TNS1); it is replaced by 36CC which is included with the wiring kit. Connect one end of wire 36CC to VRR terminal 3 and the other end to the GTB.
4. For Multispeed conversions, take wire 36CD (supplied in wiring kit) and connect one end to terminal 3 of the VSR and the other end to the GTB. Also, for Multispeed conversions connect the plug that jumps RTRM P9-1 to RTRM P9-2 to the RTRM board as shown in connection diagram 01860036.
5. For Multispeed conversions, connect wire 608A to terminal 1 of the VSR. Land the other end of the 608A on plug P2, hole 5. P2 connects to the RTRM module at J2. To attach wire 608A to plug P2, slide the press fitting into hole 5 of P2. This connection is shown on diagram 01860036. Use this diagram to find the correct hole location on fitting P2.
6. For SZVAV conversions take the end of wire 36CE that has the 7 pin plug and connect it to the RTOM J12 location and plug the other end on to the GTB.
7. For gas heat units connect the end of wire 36AS that was connected to the supply fan contactor to the GTB. For electric heat units connect the end of wire 36C that was connected to the supply fan contactor to the GTB.
8. Connect Wire 36A to the GTB. In production Multispeed/SZVAV units this wire is labeled as 36CF as seen in [Table 5, p. 10](#).

**Note:** Wire 36CF is included in the wiring kit as a substitute for wire 36A however, replacement is not necessary.

**Table 6. Wire number differences**

Wire Number Changes, Multispeed/SZVAV vs Constant Volume		
Multispeed/SZVAV	Constant Volume	Notes
36CC	36W	Wire 36CC is included in wiring package
36CF	36A	
36CG	36C	Wire 36CG is used with electric heat
36CK	36AS	Wire 36CK is used with gas heat

- The wire harness for W63 through W66 is included with the wiring kit along with the gender change wire for units where an RTOM module was previously not installed. Check the original Control Box Connections diagram for how to use the gender change wire along with the W63 through W66 harness to make the connection from the RTOM J11 to Communications J2 pins. If the unit already had an RTOM and Communications Module these wires will not be needed.

## Wiring Diagrams

Kit 018600350100 contains the wiring diagrams seen in Table 7. The electrical and connection schematic diagrams are common for all units but the electrical control and power diagrams will need to be selected based on the unit voltage and the type of heat that the unit has. Control electrical, power electrical and schematic electrical diagrams can be stuck over the existing electrical diagrams on the inside of the control panel cover however the schematic connection should not be placed over the existing diagram as it only has wire labels for the wiring that was changed or added during the conversion.

**Table 7. Wiring diagrams<sup>(a)</sup> in kit 018600350100**

Number	Type	Heat	Voltage
23130064	Control Electrical	Electric/None	All
23130067	Control Electrical	Gas	All
23130053	Power Electrical	Electric/None	208-230
23130054	Power Electrical	Electric/None	460
23130345	Power Electrical	Gas	208-230
23130347	Power Electrical	Gas	460
23130376	Schematic Electrical	All	All
01860036	Schematic Connection	All	All

(a) Always refer to the most recent revision of each wiring diagram.

In addition to the wiring diagrams, affix the top section of the nameplate sticker that contains the upgrade order number and serial number near the original unit nameplate sticker.

## Setting Economizer Damper Positions

**Note:** *New settings are needed for the economizer damper position so that the amount of outdoor air can keep up with the varying fan speed.*

For units not configured with demand control ventilation (DCV), additional minimum position setpoints to increase outdoor airflow accuracy is supported; directions for setting damper positions with DCV installed are included in the DCV installation literature (ACC-SVN16\*-EN). The operation is similar to OA CFM Compensation on

Traditional VAV units, with the addition of a Design Minimum Position setpoint at Middle Fan Speed Command. The following setpoint potentiometers will be used on the RTEM:

- Design Min at Minimum Fan Speed Command (RTEM DCV Min)
- Design Min at Middle Fan Speed Command (RTEM DCV Setpoint LL)
- Design Min at Full Fan Speed Command (RTEM Design Min)

The controller calculates the active OA Damper Minimum position between the user-selected setpoints based on the supply fan speed command. By default, the Design Minimum Position schedule is a linear line through all user selectable Design Minimum Position setpoints. As with Demand Controlled Ventilation, if the Design Minimum Position at Middle fan speed command is set to a point that would be higher than the calculated linear line between the Design Minimum Position setpoints at Minimum and Maximum fan speed command, the minimum position is limited to the point that would make the Design Minimum Position schedule linear.

Provisions have been made in Service Test Mode to allow for proper damper minimum position setup:

- To set the Design Minimum Position setpoint at Minimum Fan Speed, set the unit to operate at Step 1 (Fan ON) or Step 2 (Economizer Open) and make the proper adjustment.
- To set the Design Minimum Position setpoint at Middle Fan Speed, set the unit to operate at Step 3 (Cool 1) and make the proper adjustment.
- To set the Design Minimum Position setpoint at Full Fan Speed, set the unit to operate at Step 4 (Cool 2) and make the proper adjustment.

## Zone Sensor

For fully modulating Single Zone VAV operation, a zone temperature sensor is required. A zone temperature sensor does not ship with the upgrade kit. Wiring for the zone temperature sensor is included with the sensor if purchased separately.

If thermostat control is being replaced by the zone sensor to achieve fully modulating single zone VAV operation, it is possible to reuse the thermostat wires to connect in the zone sensor. If the unit has been upgraded using the single zone VAV parts and wiring method found in this manual, no additional settings are needed for the unit perform as a single zone VAV unit.

A thermostat will NOT provide fully modulating single zone VAV control. If the unit has been upgraded using the single zone VAV parts and wiring but still has thermostat control, the unit will revert to 2-speed fan control unless a zone sensor is added.





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