

RAB Rooftop Air Handler Belt Drive Installation, Operation, and Maintenance Manual

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Introduction

This document provides installation, operation, and maintenance information for the Titus Rooftop Air Handler Belt Drive (RAB) models.

Additional information may be found at the Titus website, www.titus-hvac.com.

General

The following information is to be used by the installer as a guide. Since each installation is unique unto itself, only general topics are covered. Topic order may not be the same as required by actual installation.

This guide does NOT supersede or circumvent any applicable national, state, or local codes.

The installation is to be performed only by individuals whose experience meets or exceeds the requirements of the work involved.

The installer must read the entire contents of this guide and develop a thorough understanding before beginning installation.

Due to a continuing program of product research, Titus reserves the right to discontinue or change without notice, any or all specifications or designs without incurring obligations.

Safety

The installation and/or servicing of comfort conditioning equipment can be hazardous due to system pressures and electrical devices.

Caution: Only trained/qualified personnel should perform service and/or installation.

Observe all precautions and warnings in product data or attached to the unit.

Follow all safety codes. Wear eye protection and gloves. Have a fire extinguisher readily available.

Caution: Disconnect all power supplies before accessing equipment.

Disconnecting more than one power supply may be required to de-energize some equipment.

DANGER ELECTRIC SHOCK CAN CAUSE DEATH.

Inspection

Thoroughly inspect all packages upon receipt. Ensure carton(s) have not been dropped, crushed or punctured. Inspect all contents for damage. If damage is found, immediately file a claim with the delivering carrier.

Product Description

This section provides model features, number nomenclature, various unit dimensions, and shipping weights.

Model Number Specification

Figure 1 defines model number nomenclature specifics.

Unit Cabinet Dimensions

Figure 2 provides dimensional callouts that correspond to Table 1 information.

Service Data

Table 1 provides RAB model dimensions. Table 2 provides information such as tonnage, free area, water coil connections, and filter sizes.

Shipping Weight

Table 3 provides RAB shipping weights (weight for 4-row and 6-row chilled water coil includes weight for entire unit).

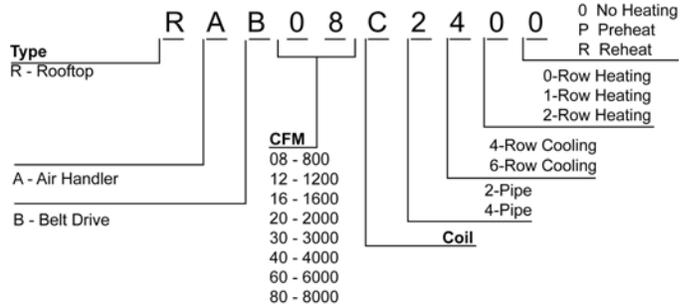


Figure 1. Air Handler Model Number Nomenclature

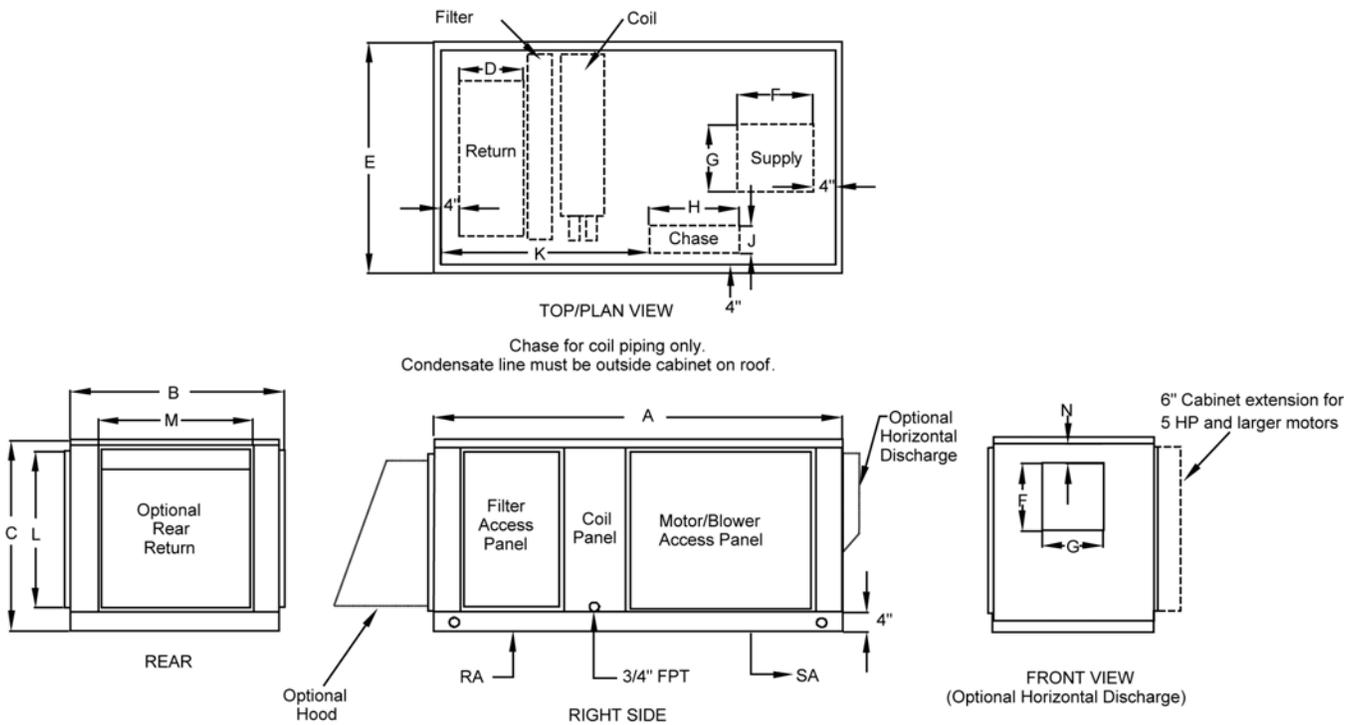


Figure 2. RAB Dimensions

Table 1. RAB Unit Dimensions

Model	Dimensions (inches)												
	A	B	C	D	E	F	G	H	J	K	L	M	N
RAB08	67.3	39.5	22.5	12	26	11.9	8.9	10	8	35.5	14.2	28.4	2.5
RAB12	67.3	39.5	22.5	12	26	11.9	8.9	10	8	35.5	14.2	28.4	2.5
RAB16	72	48	26.5	12	34	14.1	9.5	10	8	35.5	18	36	3
RAB20	72	48	26.5	12	34	14.1	13.1	10	8	35.5	18	36	3
RAB30	72	53	40.5	14	44	16.4	13.4	15	8	37	24.3	46.1	12.3
RAB40	75	53	40.5	14	44	16.4	13.4	15	8	37	24.3	46.1	12.3
RAB60	75	53	54	14	44	16.4	19.4	15	8	41.2	33	46.1	25.8
RAB80	94	74	53.5	14	62	19	22	15	8	48.5	46	68.2	17.5

Table 2. Service Data

Model	Nominal Capacity	Nominal CFM	Coil Free Area (Sq. Ft.)	Water Coil Connection Size (inches)			Filter Size (inches)
				4-Row	6-Row	2-Row	
RAB08	2	800	2.0	3/4	3/4	5/8	16 x 32
RAB12	3	1200	3.0	3/4	7/8	7/8	16 x 32
RAB16	4	1600	4.0	7/8	1-1/8	7/8	(2) 20 x 20
RAB20	5	2000	5.0	1-1/8	1-1/8	1-1/8	(2) 20 x 20
RAB30	7.5	3000	8.1	1-3/8	1-5/8	1-1/8	(2) 16 x 20 (2) 16 x 25
RAB40	10	4000	9.5	1-3/8	1-5/8	1-1/8	(2) 16 x 20 (2) 16 x 25
RAB60	15	6000	12.8	1-3/8	1-5/8	1-3/8	(3) 16 x 20 (3) 16 x 25
RAB80	20	8000	17.5	1-3/8	1-5/8	1-18	(4) 16 x 20 (4) 16 x 25

Note: All water coil connection sizes are outside diameter (OD) sweat (SWT) dimensions.

Table 3. Shipping Weights

Model	Shipping Weight (lbs.)						
	2-Row Coil	4-Row Unit	6-Row Unit	Modulating Damper	Roof Curb Kit	Manual Damper	Horizontal Modulating Damper
RAB08	13	280	290	90	85	50	120
RAB12	18	280	290	90	85	50	120
RAB16	25	315	340	135	95	95	220
RAB20	30	410	420	135	95	95	220
RAB30	40	540	550	175	105	125	300
RAB40	45	580	590	175	105	125	300
RAB60	55	745	760	180	105	125	315
RAB80	75	950	970	200	120	145	410

Installation

Basic installation procedure covers verifying and/or installing the following items.

- Ductwork
- Duct insulation and vapor proofing
- Unit placement
- Sound attenuation
- Condensate drain
- Water piping
- Motors and drives
- Electrical connections

Ductwork

Use accepted industry practices and design guidelines of the *ASHRAE Fundamentals Handbook*. Ductwork must comply with all building codes and the NFPA pamphlet 90A and 90B.

Carefully inspect any previously installed ductwork to determine suitability.

Note: Ductwork should be of a size meeting requirements of the installation. Ductwork should transition gradually from a smaller size blower outlet to required duct run size to avoid excessive loss of air velocity.

Duct Insulation and Vapor Proofing

Previously installed heating supply ductwork may already have adequate insulation against excessive heat loss. This insulation may be satisfactory for protection against heat gain from summer cooling. Depending upon application, additional insulation may be required.

Externally insulated ductwork must have adequate vapor seal for summer operation, especially where duct is exposed to high humidity conditions.

Warning

Before installing unit, determine whether the unit weight can be supported safely.

Possible injury and damage may result due to joist/truss overloading.

When return air duct connection is smaller than return air inlet opening, construct the transition piece so the vertical and horizontal dimensions of transition do not increase more than one inch for every seven inches of length.

Allow a minimum of three feet of straight ductwork preceding equipment inlet

Sound Attenuation

Flexible duct connections should be used between the unit and both the supply and return ducts. Requires unit vibration isolation for suspended and base-mounted units.

Condensate Drain

Install unit with 1/8-inch pitch toward condensate drain opening. Condensate drain must consist of a minimum of 3/4-inch copper tubing, 3/4-inch galvanized pipe, or 3/4-inch PVC pipe. Figure 3 shows condensate drain setup. The drain trap must be properly configured to ensure the removal of all condensate runoff. Ensure drain pitches downward at a slope of one inch every 10 feet.

Note 1: *Incorrect trapping can hold water in pan, causing overflow.*

Note 2: *Consult local codes for additional precautions before installing condensate pan.*

Water Piping

All piping must be supported, independent of coils. Swing joints or flexible fittings must be provided to absorb expansion and contraction strains. Rigid piping reduces the effectiveness of vibration isolators. The water supply should always be connected so the entering water is on the leaving airside of the coil. Coils must be adequately vented in order to prevent air binding. See Figure 4.

Note: *Freeze-ups due to low air temperatures are not covered under the warranty agreement.*

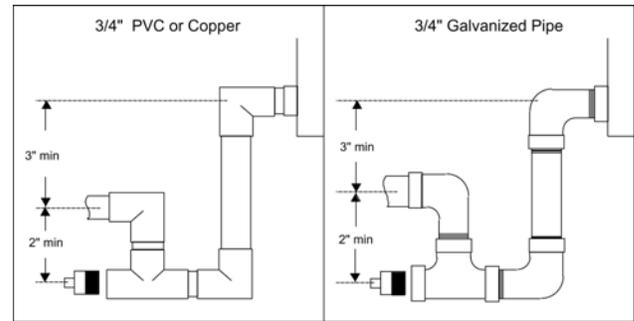


Figure 3. Condensate Drain

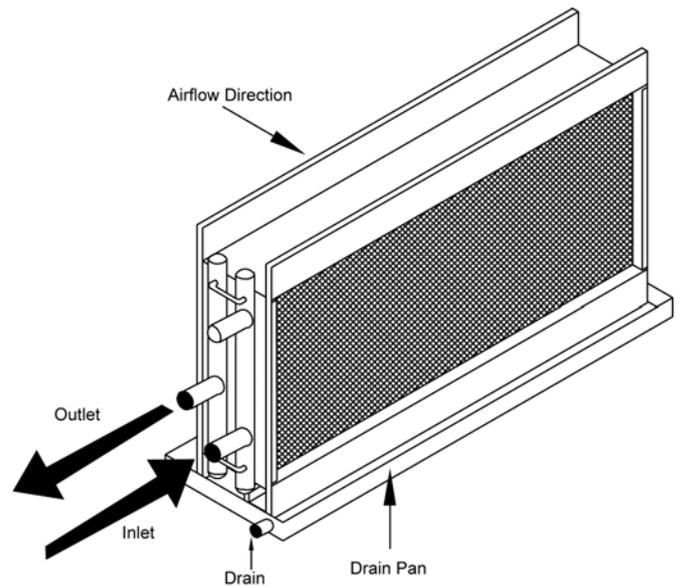


Figure 4. Water Piping

Motors and Drives

Units are normally shipped with motor and drive installed. However, when mounting a motor on the adjustable base in the field, use extreme care to ensure proper alignment and belt tension.

Electrical Connections

Each unit has a mounted control box and, typically, the motor is to be wired to this box. Only ODP, single- and three-phase motors on 800 to 2000 CFM units are factory-wired to junction box. All other motors require field wiring to junction box located on side of the unit cabinet.

Note: *Unit must be permanently grounded in accordance with NEC and local codes and ordinances. See the typical wiring diagrams shown in Figure 5.*

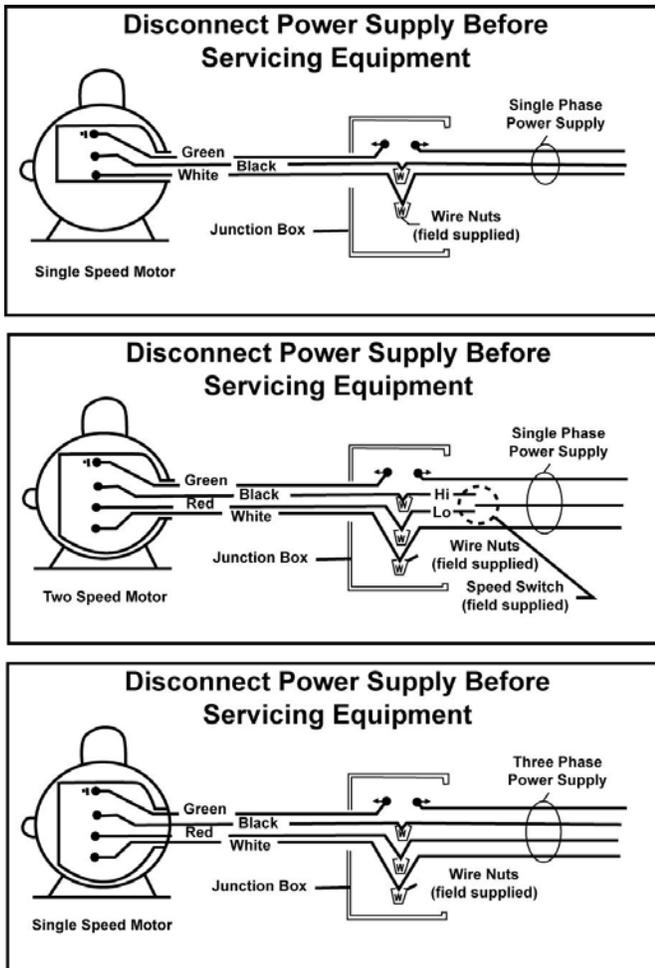


Figure 5. Wiring Diagrams

Installation of Options

In addition to the standard equipment, the following optional equipment may require consideration during installation.

- Manual air damper.
- Motorized outside air damper.
- Roof curbs.

Manual Air Damper

Model RAB may be ordered with a manual air damper. The manual air damper ships separately from the rooftop air handler to be field assembled. The damper kit includes the following components.

- Outside air damper.
- Intake hood.
- Frame rails (two sides, one top, and one bottom).
- Filter.
- Miscellaneous hardware for assembly.

The manual air damper is designed to replace the end return air access panel of the rooftop air handler unit. Figure 6 shows a manual air damper assembly and Figure 7 shows the placement of the manual air damper.

Preparation

- Upon receipt of materials, check shipping container for damage. If damaged, contact shipping carrier.
- Unpack damper package and check contents against packing list.
- Sort contents, especially fasteners, nuts, and bolts according to size and type.

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ELECTRIC SHOCK CAN CAUSE DEATH.

Caution: Disconnect all power supplies before accessing equipment.

Disconnecting more than one power supply may be required to de-energize some equipment.

Allow all rotating parts to completely stop before attempting damper kit installation.

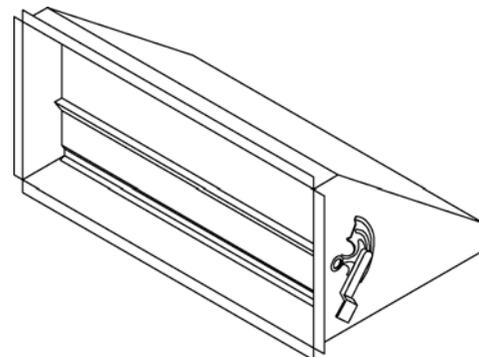


Figure 6. Manual Air Damper Assembly

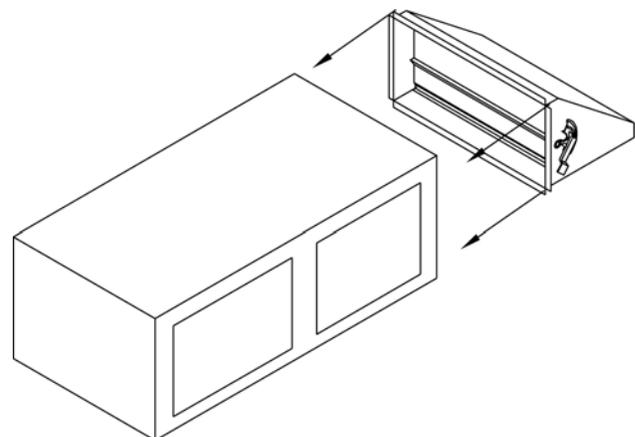


Figure 7. Manual Air Damper Attached to RAB Unit

Installation

1. Remove end return air panel and discard. See Figure 7.
2. Attach side frame rails using sheet metal screws as provided (size 10 x 3/4-inch with bonded-seal washers).
3. Attach top frame rail using sheet metal screws as provided.
4. Attach bottom frame rail using sheet metal screws as provided.
5. Attach manual outside air damper, intake hood, and filter assembly.

Motorized Air Damper

The motorized outside air damper kit can be used only with the manual air damper. The motor kit components consist of the motor operator, hood assembly, hardware (fasteners and screws), and installation instructions. Figure 8 shows the motor placement onto a manual operation air damper.

Only qualified and trained HVAC technicians should install the motorized outside air damper kit.

The instructions serve as guidelines to the technician installing the kit.

Preparation

- Upon receipt of materials, check shipping container for damage. If damaged, contact shipping carrier.
- Unpack the motor assembly that includes the motor operator, operator hood assembly, and instructions.
- Sort contents, especially fasteners, nuts, and bolts according to size and type.

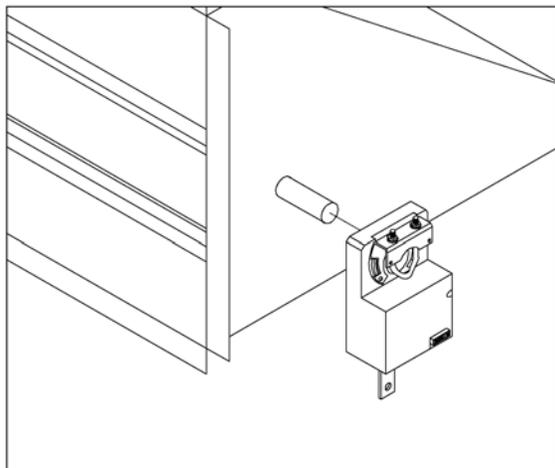


Figure 8. Air Damper Motor Placement onto Damper Shaft

DANGER

ELECTRIC SHOCK CAN CAUSE DEATH.

Caution: Disconnect all power supplies before accessing equipment.

Disconnecting more than one power supply may be required to de-energize some equipment.

Allow all rotating parts to completely stop before attempting damper motor kit installation.

Installation

1. Remove filter from bottom of the fresh air intake.
2. Remove handle from the outside of the fresh air intake. Damper rod should extend beyond unit exterior.
3. Position damper blade to its fully closed position.
4. Press manual override button and rotate actuator clamp to about 1/16 and 1/8-inch between actuator stop and clamp.
5. Slide actuator over damper rod and finger-tighten nuts.
6. Slide anti-rotation bracket (L-bracket) up and under actuator engaging center cutout on actuator back, see Figure 9.

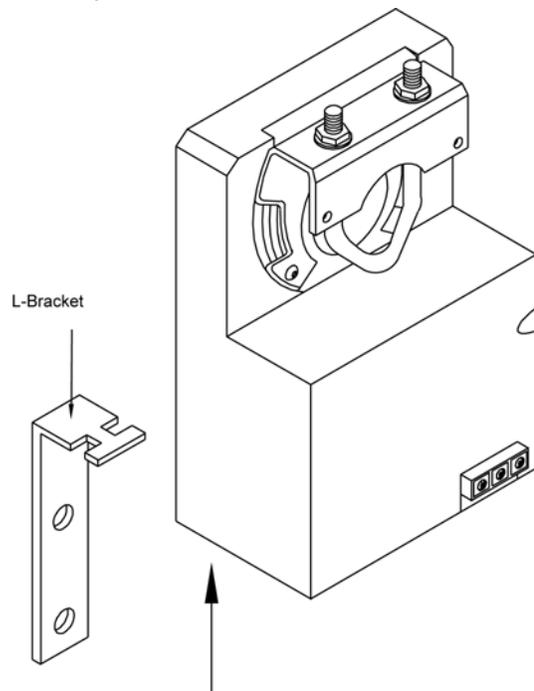


Figure 9. Mounting Bracket Placement

7. Use self-tapping screws to secure bracket.
8. Tighten the two nuts on the universal clamp with 8 mm wrench, 3-5 ft. lb. torque.
Note: Actuator compresses damper blades upon reaching the end position creating an airtight damper.
9. Adjust end stops, if required.
10. Wire motor as shown in Figure 10.
11. Activate motor until blade reaches desired opening and tighten the setscrew. Figure 11 shows setscrew location.
12. Slide the rain cover over motor and use sheet metal screws to secure the cover.
13. Insert filter in the bottom of the fresh air intake.
14. Restore power to system.

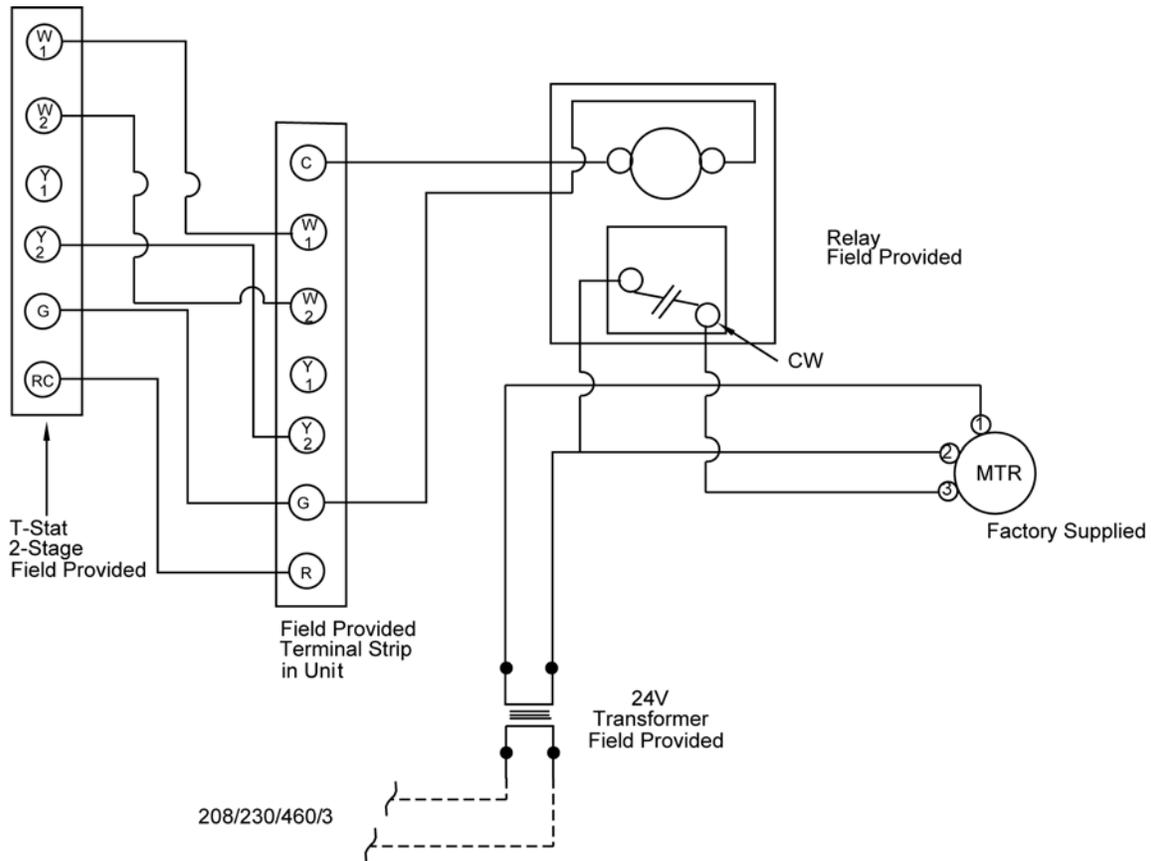


Figure 10. Wiring Diagram

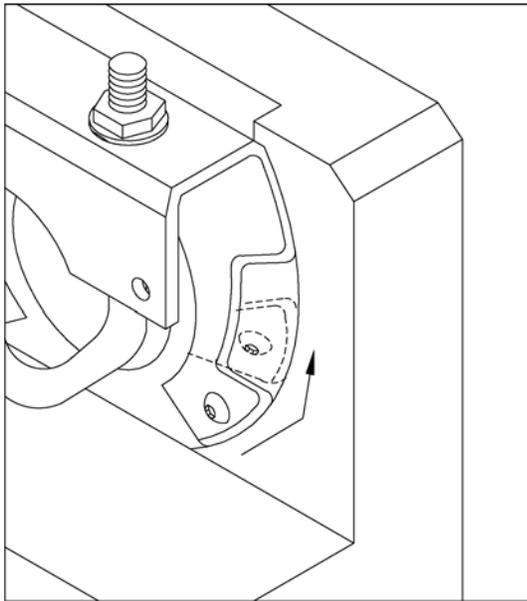


Figure 11. Motor Calibration

Roof Curbs

Roof curb assemblies require field assembly and are shipped separately, knocked down. Select a level and structurally adequate location to support the combined weight of the roof curb, air handler, and plenum. The following table provides a list of components for a roof curb installation. Figure 13 serves as a reference diagram for roof curbs.

Preparation

- Upon receipt of materials, check shipping container for damage. If damaged, contact shipping carrier.
- Place roof curb kit on roof deck for assembly.
- Unpack roof curb package and check contents against packing list.
- Sort contents, especially fasteners, nuts, and bolts according to size and type.

Note: Wood or fiber strips, roofing felts, roofing materials, caulking, adhesive gasket material, and curb to roof fasteners are field supplied.

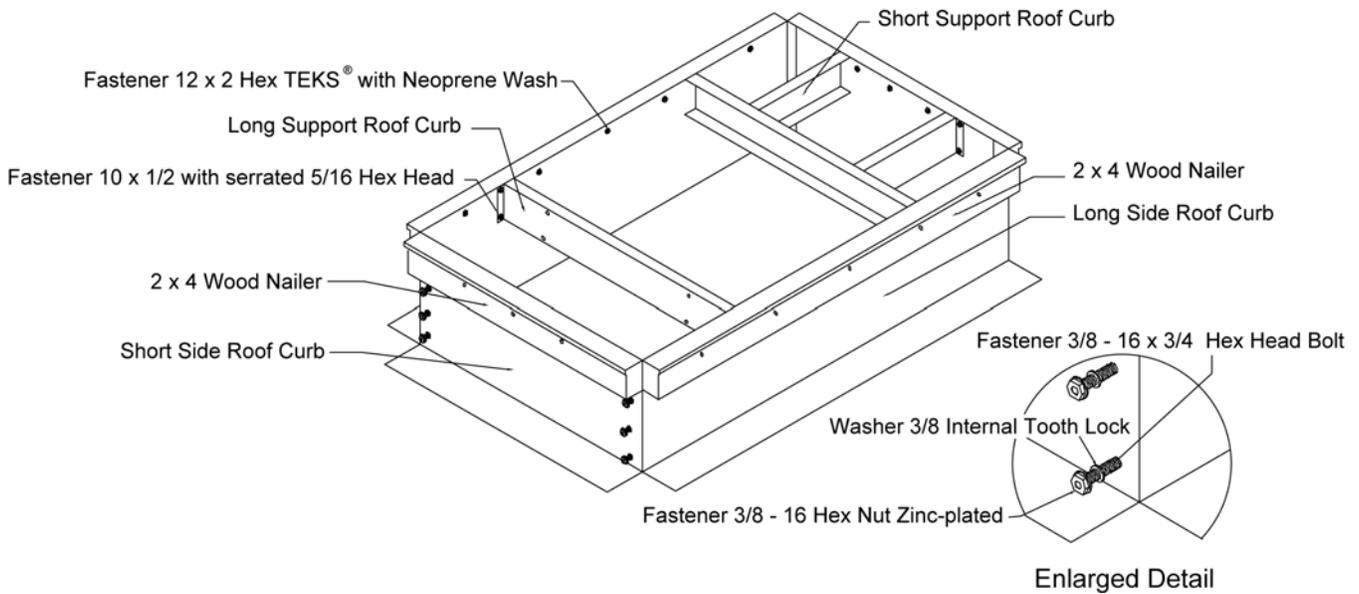


Figure 12. Roof Curb Assembly Diagram

Installation

1. Assemble the 2 x 4 wood nailer to the short and long roof curb frame sides using 12 x 12 Hex TEKS[®] with Neoprene fasteners and washers.
2. Bolt together, forming a rectangle, the long and short roof curb frame sides.
Note: Leave bolts loose allowing for adjustment later.
3. Assemble the long and short roof curb supports using the 10 x ½ serrated head bolts.
4. Position the assembled long and short supports to the inside of the roof curb frame.
5. Secure supports to roof curb frame using 10 x ½ with serrated 5/16 head bolts.
6. Check to be sure frame is squared.
7. Tighten fasteners, bolts and nuts.
8. Position roof curb assembly over roof opening and check again to be sure assembly is squared.
Note: Frame must be within ¼ inch of being squared.
9. Secure curb to structure.
10. Apply ¼ x 1-½ inch adhesive gasket material around the roof curb top and duct cross channels.
11. Roof curb is complete and ready to receive air handler unit.

Air Handler Startup

Check the following items before startup.

- Ensure all shipping bolts/screws are removed and all other bolts and screws are tight.
- Verify motor voltage and phase. Never assume the voltage and phase on the unit nameplate is the same as the motor wired.
- Check the alignment of the sheaves and ensure the setscrews are tight.
- Check for proper rotation of the blower pulley.
- Check motor phase and rotation.
 - Exchanging two of the three leads at the unit junction box can reverse three-phase motor rotation.
 - Exchanging leads inside the motor junction box can reverse the rotation of single-phase motors. Refer to the motor nameplate.
 - Not all installations require a starter (some motors utilize a contactor).

- Ensure all filters are installed. Perform filter check with all doors and panels in place.
- Check the amperage draw of the motor. The amperage draw should not exceed the nameplate amps shown on the motor serial plate.

Operation and Maintenance

Heed the following warning before operation or maintenance.

Warning: Disconnect electrical power to all circuits before servicing unit. Failure to do so may result in personal injury from electrical shock or moving parts.

Return Air Filters

Inspect return air filters on a regular basis (at least monthly). Clean or replace filters. Filters can be accessed from either side of unit.

Caution: Never operate unit without a filter or with filter access door removed. Damage to blower motor may result.

Coil

The coil is easily cleaned when dry. To check or clean, remove unit access panel, filter access door and filters. Use accepted industry methods for cleaning. Remove all foreign matter from pan and condensate drain line. Check for rust and holes.

Belt and Pulley

The following list highlights items to consider for belt and pulley maintenance and adjustment.

- Proper pulley alignment and belt tension must be maintained at all times.
- Reduce speed by adjusting pulley faces so the faces are further apart.
- Increase speed by moving the faces closer together.
- Check pulley setscrews and bolts.

Motor

Proper lubrication is essential to long motor life. Use electric motor oil or SAE20 non-detergent oil. Tighten motor mount bracket and base bolts.

Note: Avoid over-oiling the motor. If a motor is over-oiled, the oil may run down the motor shaft and splatter.

Blower

Periodically check bearing for wear. Replace as required. Check wheel for dirt accumulation and clean as required.

Abbreviations

The following table lists the abbreviations found within this document.

Abbrev.	Term
ASHRAE	American Society of Heating Refrigeration Air-Conditioning Engineers
CFM	cubic feet per minute
CW	cold water, chilled water
fpt	female pipe thread
HVAC	Heating, Ventilation, and Air Conditioning
MTR	Motor
NEC	National Electric code
NFPA	National Fire Protection Association
OD	outside diameter
ODP	open-drip proof
PVC	polyvinyl chloride
RA	return air
SA	supply air
SAE	Society of Automotive Engineers
SWT	sweat



Air Handler Terms and Conditions Warranty

The following terms and conditions apply to and govern the sale of the air handling equipment and parts manufactured by Titus.

EXCLUSIVE TERMS OF SALE – Titus quotes and sells its goods on the expressed condition that the buyer assents to the terms and conditions set forth herein, regardless of any inconsistent or additional terms that may be embodied in any purchase order. Titus' sale of its goods is expressly conditional on the buyer's acceptance and receipt of the goods shall constitute the buyer's assent to such terms and conditions.

ACCEPTANCE – All orders are subject to Credit and Sales Department approval and acceptance. Titus reserves the right, among other remedies, to terminate or suspend further delivery against an order in the event the buyer fails to pay any portion of the order when it becomes due. Should buyer's financial condition become unsatisfactory to Titus, cash payment or satisfactory security may be required by Titus for further deliveries or for goods already delivered.

CANCELLATION – Buyer shall not cancel the order without prior written consent of Titus. In the event buyer cancels the order with the prior written consent of Titus after the buyer's offer to purchase is received and acknowledged in writing, Titus shall be entitled to receive from the buyer Titus' cost plus 15% administrative overhead and liquidated damages in the amount of 10%. Furthermore, for goods released for production but prevented by buyer from shipping upon completion or by the acknowledged shipping date, whichever is later, Titus may, at its option, in addition to all other remedies, invoice buyer to be payable within 30 days and store the goods at buyer's sole expense.

DELIVERIES – Any stated shipping date of the goods is Titus' best estimate based upon the volume of orders for the goods Titus has received or expects to receive at the time it receives buyer's order. **TITUS MAKES NO GUARANTEE OF SHIPMENT BY THE ESTIMATED DATE AND SHALL HAVE NO LIABILITY OR OTHER OBLIGATION, INCLUDING, BUT NOT LIMITED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES THE BUYER OR ANY THIRD PARTY MAY INCURE, FOR ITS FAILURE TO SHIP BY SUCH DATE, REGARDLESS OF CAUSE.**

SHIPMENTS – Titus shall not be bound to deliver any goods for which buyer has not given shipping instructions. **ALL PRODUCTS ARE SOLD F.O.B. SELLER'S PLANT. TITLE TO GOODS PASSES TO THE BUYER UPON DELIVERY BY TITUS TO THE FREIGHT LINE.** All goods are shipped at buyer's risk. Buyer should examine shipments carefully for loss or damage and should have same noted by transportation agent on the freight bill upon accepting delivery. In the event of concealed damage, buyer has 10 days from receipt of the goods in which to call the freight line for an inspection.

In either case, the equipment cannot be returned to Titus until after a freight inspection has been completed. In absence of shipping instructions, Titus shall use its own discretion in choice of carrier.

TAXES – Sales, use, consumption, storage or other taxes, if applicable, shall be paid by the buyer.

RETURN GOODS – New and unused goods returned for credit will not be accepted unless a Return Goods Authorization number has been issued by Titus. Goods must be securely packed to reach Titus without damage and properly identified with the Return Goods Authorization number. **RGA numbers are valid for only 30 days after issuance.** A minimum 20% fee will be charged on all stock products cleared for return that can be returned to stock after inspection. Build-to-order products manufactured and shipped cannot be returned and a 100% cancellation fee applies to any order that has been released for production but has not shipped. All goods must be returned freight prepaid by the buyer.

ALL PRODUCTS LIMITED WARRANTY – Titus warrants that its goods will be free from defects in material and workmanship under normal use and maintenance for a period of one year from the date of original installation or 18 months from the date of shipment whichever comes first. A new or rebuilt part to replace any defective part will be provided without charge, PROVIDED the defective part is returned to Titus. The replacement part assumes the unused portion of the warranty.

THIS WARRANTY DOES NOT INCLUDE LABOR or other costs incurred for identifying, repairing, removing, installing, shipping, servicing, or handling of either defective parts or replacement parts.

TITUS WILL NOT BE RESPONSIBLE FOR:

1. Normal maintenance.
2. Damage or repairs required as a consequence of faulty installation or application by others.
3. Failure to start due to voltage conditions, blown fuses, open circuit breakers, or other damages due to the inadequacy or interruption of electrical service.
4. Damage or repairs required as a consequence of any misapplication, abuse, improper servicing, unauthorized alteration, or improper operation.
5. Damage as a result of floods, winds, fires, lightning, accidents, corrosive atmosphere, or other conditions beyond the control of Titus.
6. Parts not supplied or designated by Titus.
7. Titus products installed outside the United States and Canada.

FOR SERVICE OR REPAIR FOLLOW THESE STEPS IN ORDER:

FIRST: Contact the installing contractor.

SECOND: Contact the distributor or nearest authorized Titus representative.

THIRD: Contact

TITUS
990 Security Row
Richardson, TX 75080
972.699.1030

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

BUYER'S EXCLUSIVE REMEDY – The buyer's acceptance of the goods shall confirm the buyer's review and acceptance of Titus' All Products Limited Warranty, notwithstanding any other written or oral warranty of the goods that may be given to the buyer. **THE BUYER'S EXCLUSIVE REMEDY AGAINST TITUS SHALL BE LIMITED TO TITUS' ALL PRODUCT LIMITED WARRANTY. NO OTHER REMEDY, INCLUDING, BUT NOT LIMITED TO, RECOVERY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS, SHALL BE AVAILABLE TO THE BUYER.**

FIELD MODIFICATIONS – Should the installing contractor believe that the goods do not meet the requirements of the original submittal or do not operate according to the submittal, the buyer should immediately contact the selling distributor or authorized Titus representative as outlined in the All Products Limited Warranty section. Upon Titus' acceptance of responsibility to make modifications to the goods, Titus will, at its sole discretion, either direct the contractor to make the modifications, send its own field service technicians to make the modifications, or engage another contractor to make the modifications. If Titus directs the installing contractor to make the modifications, Titus will issue a Field Repair Order (FRO) specifying the work to be done and the price to be paid. **DO NOT BEGIN ANY MODIFICATIONS WITHOUT AN FRO NUMBER.** Titus will not be responsible for any costs incurred in modifying the goods, unless it has approved the modifications in advance.

EXCUSE OF PERFORMANCE – Titus shall not be liable for its failure to perform due to causes beyond its reasonable control, including but not limited to strikes, fire, war, acts of God, whether such events occur at or about Titus' plant or at the plant of its suppliers.

CREDIT AND TERMS OF PAYMENT – Unless otherwise specified, terms of payment are net cash, thirty (30) days after shipment. Interest at the legal rate applicable to judgments will be charged on past due accounts commencing after the last day of the first calendar month following the date of invoice. Seller may suspend credit and refuse shipment whenever seller in its sole discretion believes buyer's credit is unsatisfactory unless buyer then makes arrangements for payment which are satisfactory to seller.

MISCELLANEOUS – THESE TERMS AND CONDITIONS FOR THE SALE OF THE GOODS SHALL BE CONSTRUED ACCORDING TO THE LAWS OF THE STATE OF TEXAS. ALL SUMS DUE TITUS FOR THE SALE OF ITS GOODS ARE PAYABLE, AND ALL MATTERS ARISING PURSUANT TO SUCH SALE ARE PERFORMABLE, IN DALLAS COUNTY, TEXAS. The terms and conditions state herein constitute the full understanding between Titus and the buyer, and no terms, conditions, understanding or agreement purporting to modify or vary these terms shall be binding unless hereafter made in writing and signed by Titus and the buyer.

Titus has a policy of continuous product improvement, and reserves the right to change design and specification without notice. Titus has no system design or application responsibility to buyer or any third party.