

VAB Vertical Air Handler Belt Drive Installation, Operation, and Maintenance Manual

Contents	Page
General	1
Introduction	1
Safety	1
Inspection	1
Product Description	1
Model Number Specification	1
Dimension Specification	1
Unit Cabinet Dimensions	2
Coil Specifications	2
Dimensional Drawings	2
Installation	4
Ductwork	4
Duct Insulation and Vapor Proofing	4
Motors and Drives	4
Sound Attenuation	4
Electrical Connections	4
Condensate Drain	5
Water Piping	5
Installation of Options	5
Discharge / Return Air Plenum	5
Electric Heater	6
Startup	6
Operation and Maintenance	7
Return Air Filters	7
Coil	7
Belt and Pulley	7
Motor	7
Blower	7
Abbreviations	7

General

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

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

Introduction

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. The order in which topics are presented may not be those required by the 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 and 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 number nomenclature, various unit dimensions, and coil specification.

Model Number Specification

Figure 1 defines model number nomenclature specifics.

Dimension Specification

Table 1 provides VAB model dimension specifics such as tonnage, blower, filter dimensions, optional discharge or return air plenum, and shipping weight of plenum.

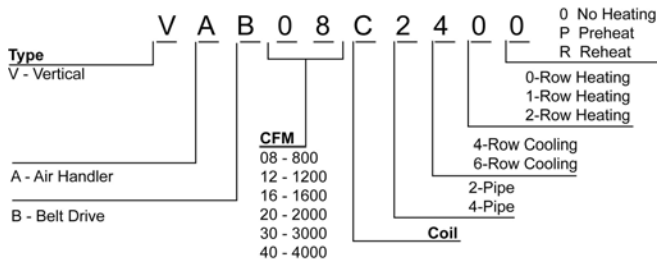


Figure 1. Air Handler Model Number Nomenclature

Unit Cabinet Dimensions

Table 2 provides the cabinet dimensions for each VAB model along with the blower-opening outlet.

Coil Specifications

Table 3 provides VAB model specifics for the chilled and hot water coil outside diameter and shipping weight based on the number of coils (weight for 4-row chilled water coil includes weight for entire unit).

Dimensional Drawings

Figures 2 through 4 provide dimensional callouts with letters corresponding to letters used in Tables 1 through 3.

Table 1. VAB Model Dimensions

Model	Nominal Rating in Tons	Blower	Filter Size (inches)	Optional Discharge or Return Air Plenum Dimensions (inches)			
				K	L	M	Shipping Wgt. (lbs.)
VAB08	2	9 x 9	20 x 20	22	23-1/2	12	23
VAB12	3	9 x 9	20 x 20	22	23-1/2	12	23
VAB16	4	10 x 10	22-1/2 x 22-1/2	25	23-1/2	14	30
VAB20	5	12 x 12	(2) 16 x 25	29-1/4	25-1/2	16	35
VAB30	7-1/2	15 x 15	(3) 16 x 25	39	27	24	41
VAB40	10	15 x 15	(4) 20 x 25	51-1/2	27	24	41

Table 2. Cabinet Dimensions

Model	Cabinet Dimensions (inches)								Blower Opening Outlet (inches)	
	A	B	C	D	E	F	G	H	J	K
VAB08	22	23-1/2	50	-	-	-	-	3	12	8-3/4
VAB12	22	23-1/2	50	-	-	-	-	3	12	8-3/4
VAB16	25	23-1/2	56-1/2	-	-	-	-	1-1/2	14	9-1/2
VAB20	29-1/4	23-1/2	59-5/8	-	-	-	-	1	14	13
VAB30	39	27	-	34	9	19-1/2	15-1/2	1	16-3/4	13-1/4
VAB40	51-1/2	27	-	34	9	19-1/2	20-1/2	1	16-3/4	13-1/4

Table 3. Coil Dimensions

Model	4-Row Unit		2-Row Heating Coil	
	Connection Size	Shipping Wgt. (lbs) Note 1	Connection Size	Shipping Wgt. (lbs) Note 2
VAB08	3/4" OD SWT	164	7/8" OD SWT	14
VAB12	3/4" OD SWT	170	7/8" OD SWT	14
VAB16	7/8" OD SWT	200	7/8" OD SWT	17
VAB20	1-1/8" OD SWT	253	1-1/8" OD SWT	21
VAB30	1-1/8" OD SWT	364	1-1/8" OD SWT	81
VAB40	1-3/8" OD SWT	462	1-1/8" OD SWT	102

Note 1: Weight for entire unit.

Note 2: Weight for heating coil only.

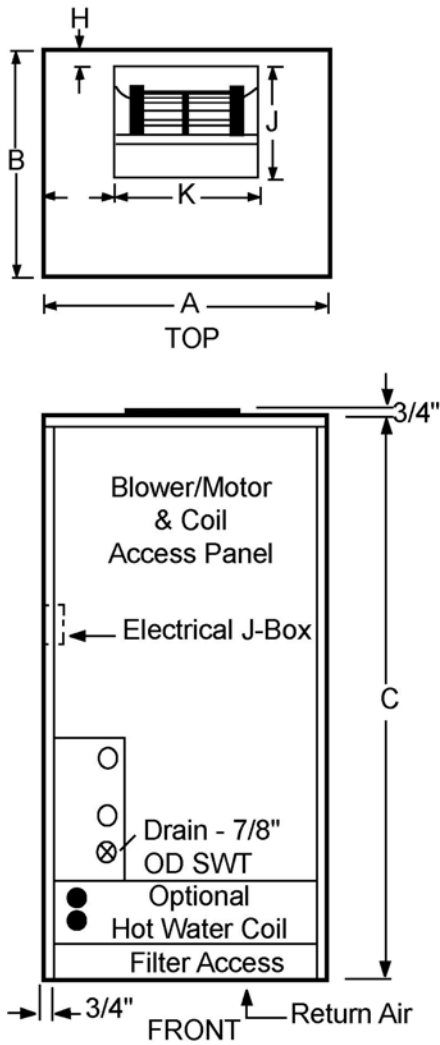
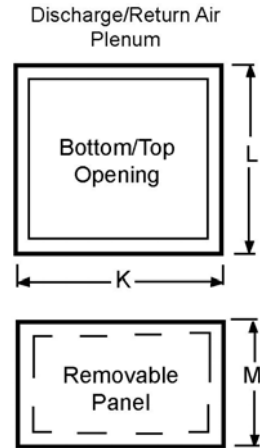


Figure 2. VAB08, 12, 16, and 20



FRONT (OR BACK)

Figure 3. Optional Discharge or Return Air Plenum

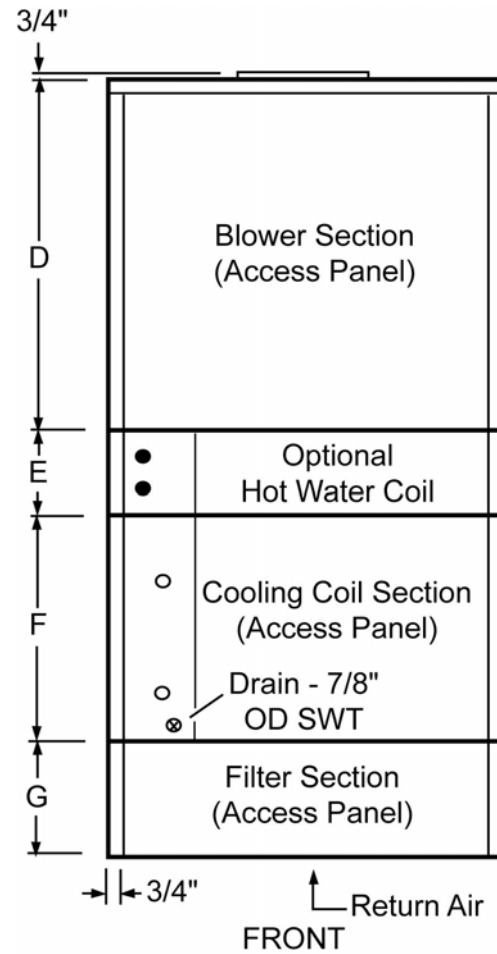


Figure 4. VAB30 and 40

Installation

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

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

Ductwork

Use accepted industry practices and design guidelines of the *ASHRAE Fundamentals Handbook*. Ductwork must comply with all building codes and the National Fire Protection Association's 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.

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 following an equipment outlet.

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.

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.

Sound Attenuation

Flexible duct connections should be used between the unit and both the supply and return ducts.

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

Note 2: Not all installations require a starter (some motors utilize a contactor).

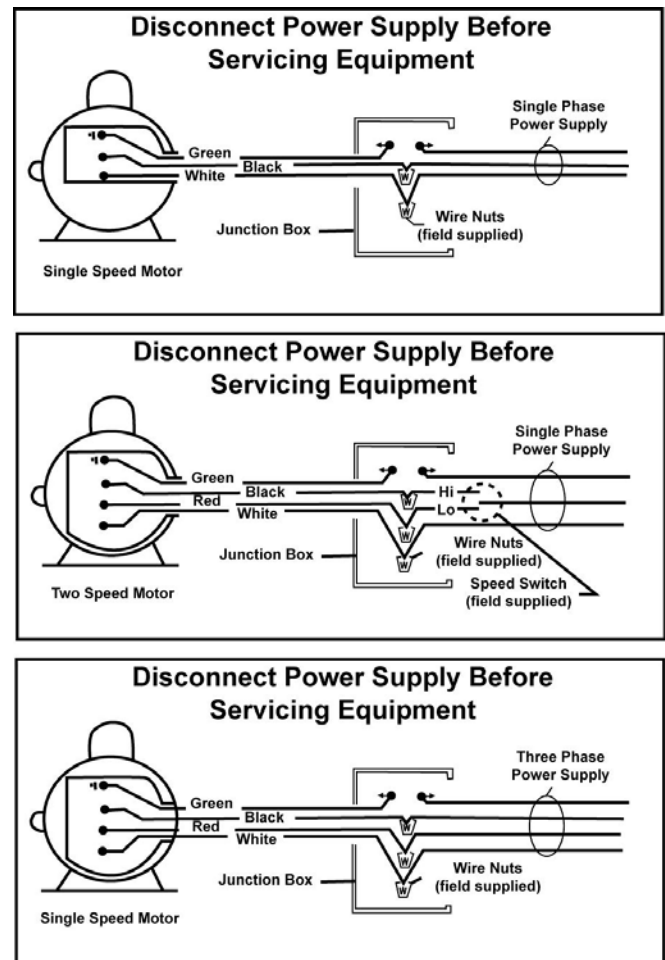


Figure 5. Wiring Diagrams

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 6 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 drain.*

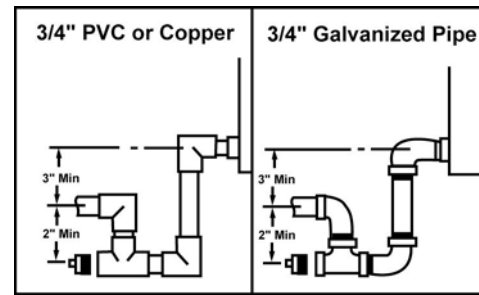


Figure 6. Condensate Drain

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.

Note 1: *Freeze-ups due to low air temperatures are not covered under the warranty agreement.*

Note 2: *Titus recommends a freeze-stat (by others) be installed when a hot water coil is used and mounted in the reheat position.*

Installation of Options

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

- Discharge plenum.
- Return air plenum.
- Two-row hot water heating coil (reheat or preheat location).
- Electric heat.
- Motor and drive selections.

Discharge / Return Air Plenum

The plenum can be used for either the discharge or return air as shown in Figure 7. The construction consists of three permanent sides and one removable panel attached by screws. This panel may be removed to attach a grille (not provided) or ductwork and then re-attached to the plenum. If required, field technicians may choose to cut an opening in one of the other three sides of the plenum.

Note: *The contractor in the field determines the opening size and location for the grille or ductwork since they are field cut.*

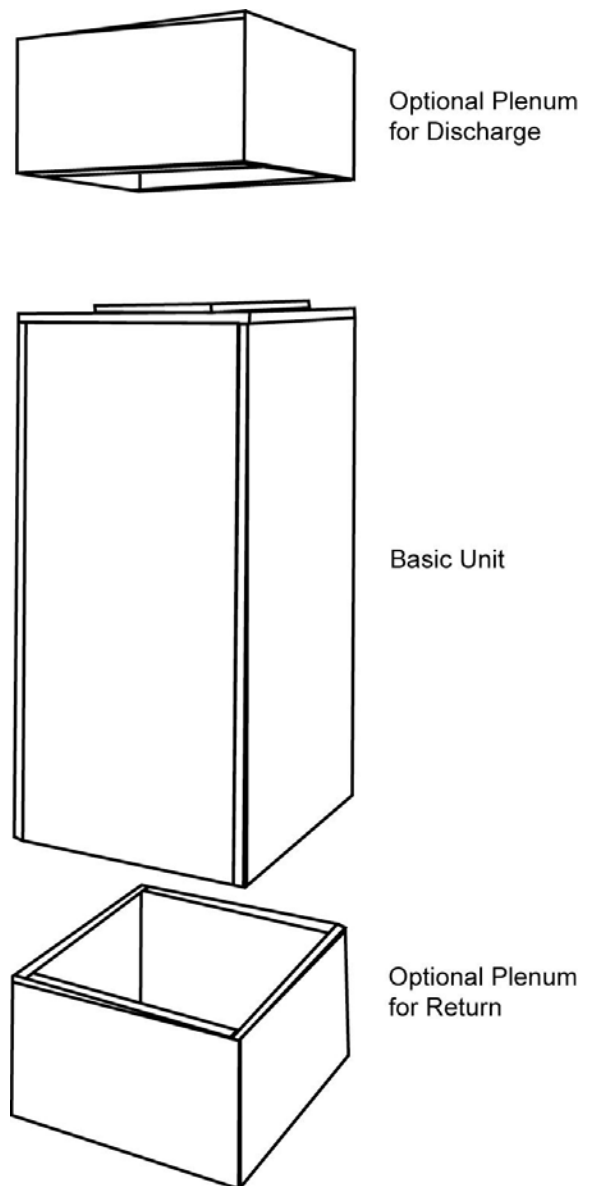


Figure 7. Optional Plenum Locations

Electric Heater

Figure 8 shows electric heater components and their placement and orientation to a VAB unit.

Preparation

Some items to consider prior to installing electric heat are as follows:

- Duct materials must be suitable for 250° F operation. See NFPA 90A and 90B pamphlet.

Note: Electric heaters are incompatible with discharge equipment.

- Ensure ample room exists in the ductwork. Electric heat must have at least 24 inches of straight duct clearance before an elbow. If 24 inches are unavailable, devices such as turning vanes or baffles may be required.

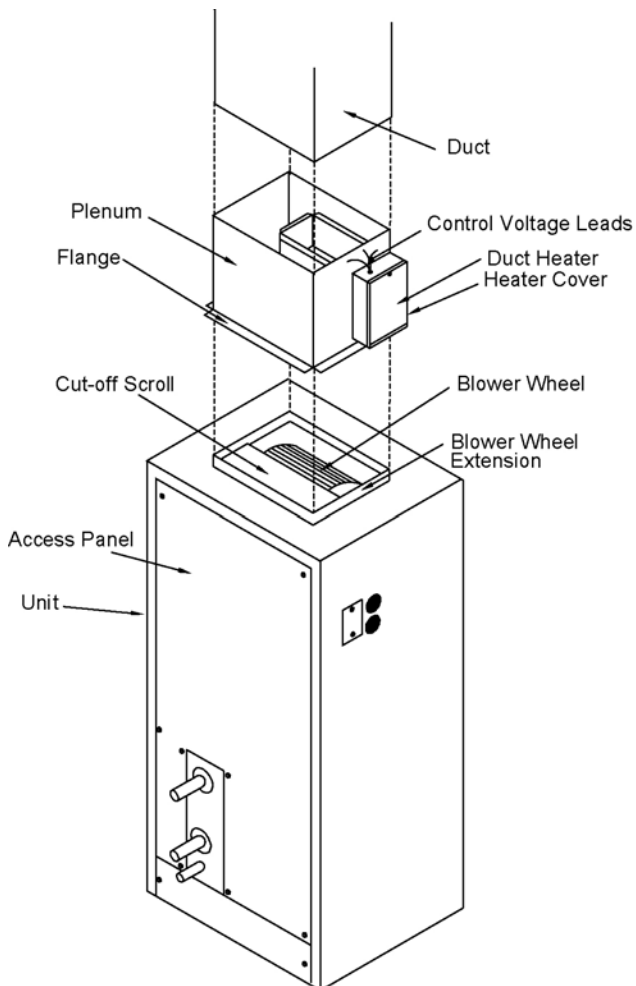


Figure 8. VAB Unit with Electric Heater Components

Installation

Use the following information to install electric heat on VAB models.

1. Position heater element section over the blower wheel of the VAB unit.

Note: Heater baffle must align with blower cut-off scroll. If necessary, rotate heater 180 degrees to align. This ensures proper blower discharge of air over the heater elements.
2. Attach electric heat plenum to VAB unit using #6 or larger sheet metal screws.

Note: Ensure plenum securely attaches to VAB unit only and not just to blower wheel extension.
3. Add insulation, if necessary, to outside of heater plenum section.

Warning: Do not insulate duct heater.

Startup

Check the following items before startup.

- Ensure all shipping bolts and screws are removed; plus, ensure all other bolts and screws are tight.
- Verify the voltage and phase on the unit nameplate, and ensure it is the same as the motor wired.
- Check the alignment of the sheaves (pulley wheels) 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.
- Make sure all doors and panels are 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

Read and observe the following statements before operation or maintenance.

DANGER

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 filter(s). Filter 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 blower access panel, filter access door and filter(s). Use accepted industry methods for cleaning. Remove all foreign matter from pan and condensate drain line. Check for rust and holes.

Belt and Pulley

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
ANSI	American National Standard Institute
ASHRAE	American Society of Heating Refrigeration Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
CFM	cubic feet per minute
CW	chilled water
ETL	Environmental Testing Laboratory
fpi	fins per inch
fpm	feet per minute
HW	hot water
IAQ	Indoor Air Quality
J-Box	Junction Box
lbs	pounds
NEC	National Electric Code
OD	outside diameter
ODP	open-drip proof
PSI	pounds per square inch
PVC	polyvinyl chloride
rpm	revolutions per minute
SAE	Society of Automotive Engineers
SWT	sweat
UL	Underwriters Laboratory
wgt.	weight



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.