

	SOLUTION AIR HANDLING UNITS	
INSTALLATION, OPERATION & MAINTENANCE	Supersedes 102.20-NOM1 (403)	Form 102.20-NOM1 (105)

SOLUTION INDOOR AND OUTDOOR MODELS 27X27 THROUGH 132X138



LDO9624

INDOOR UNIT



LDO9688

OUTDOOR UNIT

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, and materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and

the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:



DANGER indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury.



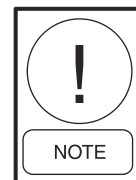
WARNING indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



Consider for IAQ compliance per ASHRAE STANDARD 62-2001



CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.



NOTE is used to highlight additional information that may be helpful to you.



External wiring, unless specified as an optional connection in the manufacturer's product line, is NOT to be connected inside the control panel cabinet. Devices such as relays, switches, transducers and controls may NOT be installed inside the control panel. NO external wiring is allowed to run through the control panel. All wiring must be in accordance with YORK's published specifications and must be performed ONLY by qualified YORK personnel. YORK will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this will void the manufacturer's warranty and cause serious damage to property or injury to persons.

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INTRODUCTION

GENERAL

This manual has been prepared as a guide for installing, operating and maintaining Solution Air Handling Units. YORK has produced a quality product that is adaptable to almost any comfort or industrial application. However, proper installation, operation and maintenance must be followed to realize the full capacity and life of the units.

This instruction contains general recommendations, but specific requirements may apply to the individual installation. Such requirements are outlined in federal, state and local safety codes. Strict compliance with these codes, and strict adherence to these instructions are the responsibility of the user. Particular attention should be given to electrical wiring and other safety elements such as design working pressures and requirements of the Government Clean Air Act Amendments as it applies to refrigerant types and charges. General safety practices are covered in AMCA Publication 410-90.

Read the entire instruction before installing or operating the air handler. Specific details and requirements apply that require careful consideration to avoid damage to the equipment and injury to the installer or operator.

The Solution features segmented construction and is factory assembled. Segment arrangements will vary to suit job application (*see Fig 1*). Heavy gauge galvanized steel is used on the exterior and interior of

the unit. Access doors are provided for accessibility to the various sections. Panels and doors are double wall construction. Panels, doors and structural frame are insulated with spray-injected foam.

TYPICAL SOLUTION OPERATION IN "HVAC" SYSTEM

The operation of these units can be divided into systems:

1. Ventilation system
2. Economizer system (return air/mixing box section)
3. Heating system
4. Cooling system

VENTILATION SYSTEM

A ventilation system simply replaces the air in a given space. Usually the purpose is to remove air that is sub-standard to creature comfort or a process and replace it with suitable air. Depending on the application the system will operate at various specified rates, volumes and conditions. A ventilation system may employ an air handler with a supply fan working in conjunction with other remote exhaust fan(s). A more effective method would employ both a supply fan and an exhaust fan in the air handler.

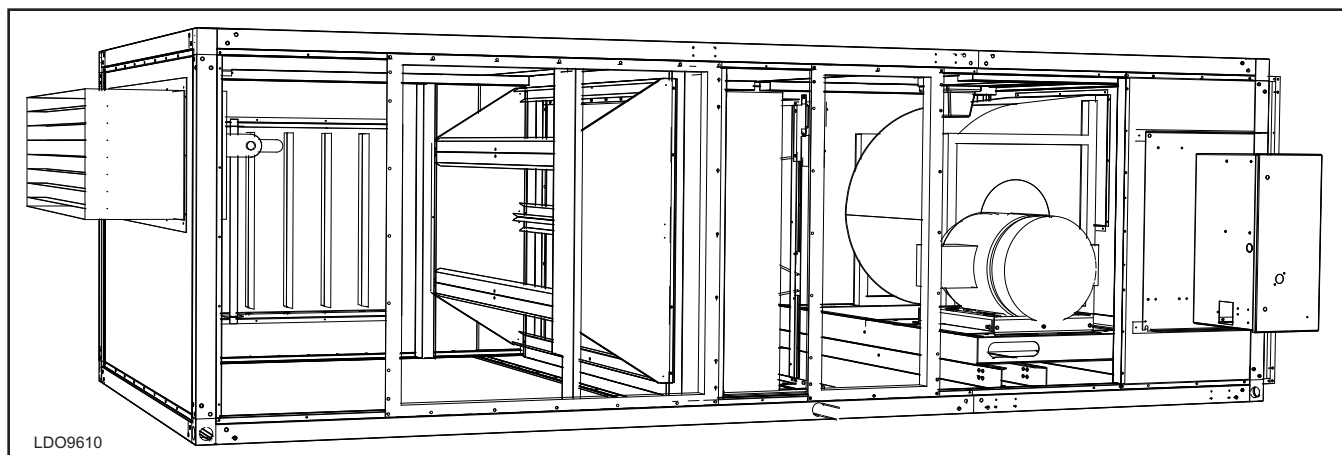


FIG. 1 – CUTAWAY OF SOLUTION SHOWING VARIOUS SEGMENTS

ECONOMIZER SYSTEM - TYPICAL

The Economizer System could typically consist of:

- Outdoor and return air dampers
- Damper actuator
- Enthalpy control
- Minimum outdoor air adjustment
- Exhaust air control

The Economizer system provides the first stage of cooling whenever the outdoor air is cool and dry enough to satisfy the internal cooling demand. The outdoor and the return air dampers are operated by individual actuators. As the outdoor air dampers are opened by the damper actuator, the return air dampers are closed.

If the economizer operation cannot satisfy the space demand for cooling, stages can be energized as needed.

HEATING OPERATION

Various types of heating may be applied. Hot water or steam coils maybe specified typically. Electric heat and fuel burner heat are available.

COOLING OPERATION

Various types of cooling may be utilized. Factory mounted chilled water coils or direct expansion refrigerant coils may be specified for the Solution unit.

SEGMENT IDENTIFICATION

Refer to Tables 1, 2 and Fig. 2 for segment identification, nomenclature and availability.

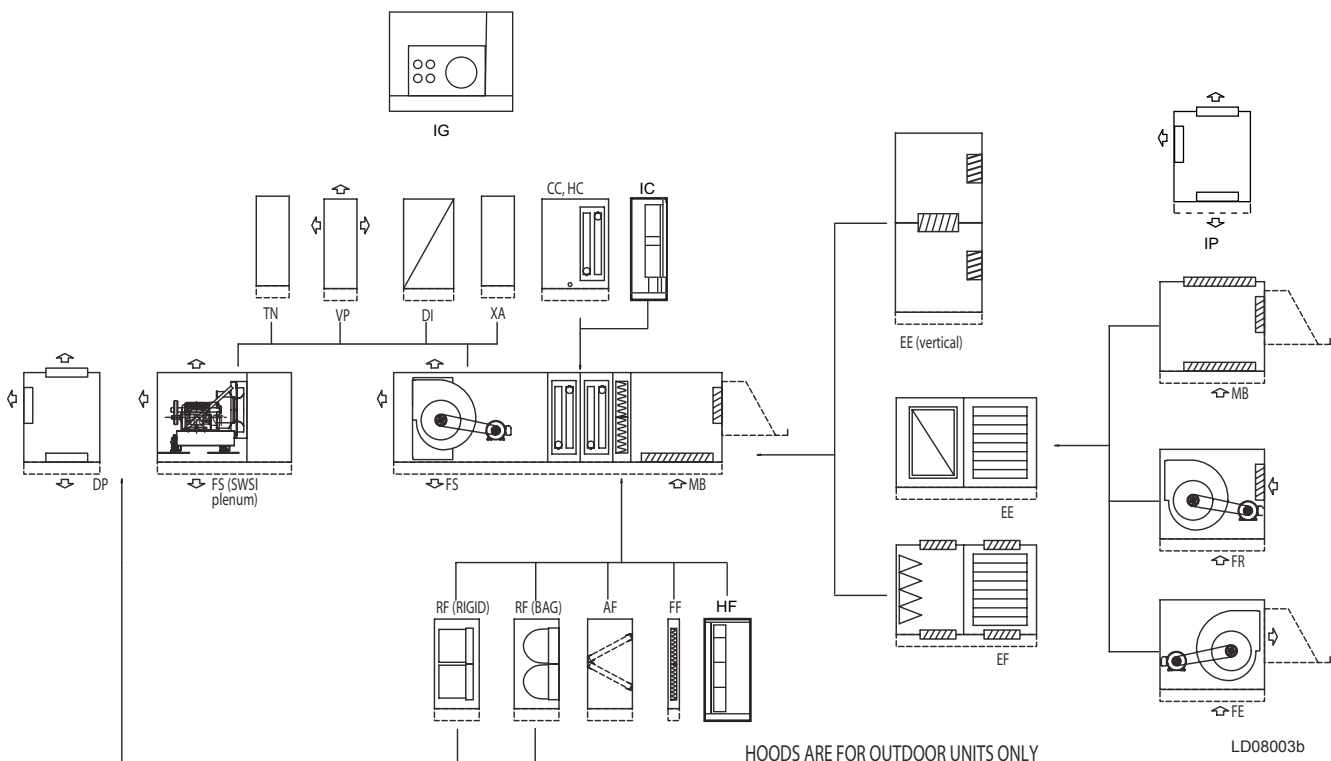


FIG. 2 – SEGMENT AVAILABILITY (SEE TABLE 2)

TABLE 1 – SEGMENT IDENTIFICATION (SEE FIG.2)

SEGMENT IDENTIFICATION	
Fan Segments	Filter Segments
• FS – Supply	• FF – Flat Filter (2” or 4”)
o Forward Curved	• AF – Angle Filter (2”)
o Airfoil	• RF – High Efficiency Filter
o Industrial Airfoil	o Rigid Filter (12”)
o SWSI Plenum (Belt and Direct Drive)	o Bag Filter (21”)
	o Mini Pleat Filter (4”)
	• HF – HEPA Filter
• FR – Return Fan	
o Forward Curved	Inlet Segments
o Airfoil	• MB – Mixing Box
o Industrial Airfoil	• FM – Filter / Mixing Box
o SWSI Plenum (Belt & Direct Drive)	• EF – Filter / Economizer
	• EE – Economizer
• FE – Exhaust Fan	• IP – Inlet Plenum
o Forward Curved	
o Airfoil	Accessory Segments
o Industrial Airfoil	• VP – Vertical Plenum
	• DP – Discharge Plenum
Coil Segments	• TN – Turning Plenum
o CC – Cooling Coil	• DI – Diffuser
o HC – Heating Only Coil	• XA – Access Segment
o VC – Vertical Coil	• IG – Indirect-Fired Gas Furnace
o IC – Heat Only, Integral Face & Bypass Coil	• ER – Energy Recovery Wheel

TABLE 2 – UNIT NOMENCLATURE

Solution Unit Model Number.

PRIMARY IDENTIFIER

ENVIRONMENT

NOMINAL HEIGHT

NOMINAL WIDTH

SUPPLY FAN OPTIONS

RETURN FAN OPTIONS

SUPPLY FAN MOTOR HP

RETURN FAN MOTOR HP

FACTORY MOUNTED END DEVICES

PRIMARY VOLTAGE CODE

DESIGN SERIES

XT

I - 048 X 075 - D

0

46

A

XT

I

INDOOR UNIT

O

OUTDOOR UNIT

DESIGN

A

DEFINITION

ORIGINAL UNIT DESIGN

CODE

12

17

27

28

40

44

46

50

58

63

NAMEPLATE VOLTAGE

120 - 1 - 60

200 or 208 - 3 - 60

277 - 1 - 60

230 or 240 - 3 - 60

380 - 3 - 60

440-3-60

460 - 3 - 60

380 or 415 - 3 - 50

575 - 3 - 60

220 - 3 - 50

FACTORY MOUNT END DEVICES.

0 NO

1 YES

H

27

30

33

36

39

42

45

48

51

54

57

60

63

66

69

72

75

78

84

90

96

102

108

114

120

126

132

WIDTH

27,30,33,36,39,42,45,48,51,54,57

27,30,33,36,39,42,45,48,51,54,57,60

30,33,36,39,42,45,48,51,54,57,60,63,66,69

30,33,36,39,42,45,48,51,54,57,60,63,66,69,72

33,36,39,42,45,48,51,54,57,60,63,66,69,72,75,78

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54,60,66,72,78,84,90,96,102,108,114,120

51,57,63,69,75,81,87,93,96,99,105,108,111,117,123

54,60,66,72,78,84,90,96,102,108,114,120,126,132

57,63,69,75,81,87,93,99,105,111,117,120,123,129,135

60,66,72,78,84,90,96,102,108,114,120,126,132,138,144

66,72,78,84,90,96,102,108,114,120,126,132,138,144

66,72,78,84,90,96,102,108,114,120,126,132,138,144

72,78,84,90,96,102,108,114,120,126,132,138,144

78,84,90,96,102,108,114,120,126,132,138,144

84,90,96,102,108,114,120,126,132,138,144

90,96,102,108,114,120,126,132,138,144

96,102,108,114,120,126,132,138,144

132

FAN OPTIONS

A NONE.

B DWDI FC FAN w/o MOTOR CONTROLLER.

C DWDI FC FAN w/SERVICE DISCONNECT ONLY.

D DWDI FC FAN w/MOTOR STARTER.

E DWDI FC FAN w/VARIABLE FREQUENCY DRIVE.

F DWDI AF FAN w/o MOTOR CONTROLLER.

G DWDI AF FAN w/SERVICE DISCONNECT ONLY.

H DWDI AF FAN w/MOTOR STARTER.

J DWDI AF FAN w/VARIABLE FREQUENCY DRIVE.

K SWSI PL FAN w/o MOTOR CONTROLLER.

L SWSI PL FAN w/SERVICE DISCONNECT ONLY.

M SWSI PL FAN w/MOTOR STARTER.

N SWSI PL FAN w/VARIABLE FREQUENCY DRIVE.

P SWSI PL FAN DIRECT DRIVE w/o MOTOR CONTROLLER.

Q SWSI PL FAN DIRECT DRIVE w/SERVICE DISCONNECT ONLY.

R SWSI PL FAN DIRECT DRIVE w/MOTOR STARTER.

S SWSI PL FAN DIRECT DRIVE w/VARIABLE FREQUENCY DRIVE.

MOTOR HORSEPOWER

A 0

B 1/2

C 3/4

D 1

E 1 1/2

F 2

G 3

H 5

J 7 1/2

K 10

L 15

M 20

N 25

P 30

Q 40

R 50

S 60

T 75

U 100

V 125

Notes: 1. The height and width numbers only correspond to each other in the same row.

1.0 PRE-INSTALLATION

RECEIVING

All units leaving the plant have been inspected to ensure the shipment of quality products. All reasonable means are utilized to properly package the air handling units.

NOTICE TO CUSTOMER/CONTRACTOR PROTECT YOUR WARRANTY PRIOR TO STARTUP.

- Read and follow the Installation, Operation & Maintenance Manual provided with this equipment.
- Storage of this equipment **MUST** be on a flat surface and protected from the weather.
- Protect this equipment from damage, construction dirt, debris and water.

DO NOT OPERATE DOORS WHEN UNIT IS NOT ON A FLAT SURFACE.

- Isolate this equipment from pressure testing of water, steam, gas and air piping.
- Do not test, clean and flush piping through coils in this equipment.
- Isolate this equipment from temporary building power.
- Contact local York International Service for purchase of Startup Service with two weeks advance notice. Provide current job site contact.
- To perform a careful and thorough startup verify the following:
 - Reliable power will be available for startup.
 - Duct work is complete.
 - Controls are complete.
 - Shipping splits completely re-assembled, sealed and wired.
 - Filters are installed and secured.
 - All shipping materials have been removed.

***RED METAL TAB USED TO SECURE
DOOR IS A SAFETY DEVICE. DO NOT
DISCARD IT.***

- Start up will be performed according to that outlined in Section 3 of the Installation, Operation & Maintenance Manual provided.

- Temporary use of Air Handler requires startup performed according to that outlined in Section 3 of the Installation, Operation & Maintenance Manual provided.
- A qualified startup technician must complete the "AIR HANDLING UNITS START-UP CHECK LIST" form 100.00-CL1 (303) and file a copy at the local York Service Office. This form is provided in the information package with each air handler.



YORK will not be responsible for any damage or loss of parts in shipments or at the job site. Refer to Shipping Damage Claims Form 51.15-NM

RIGGING OF INDOOR AND OUTDOOR UNITS



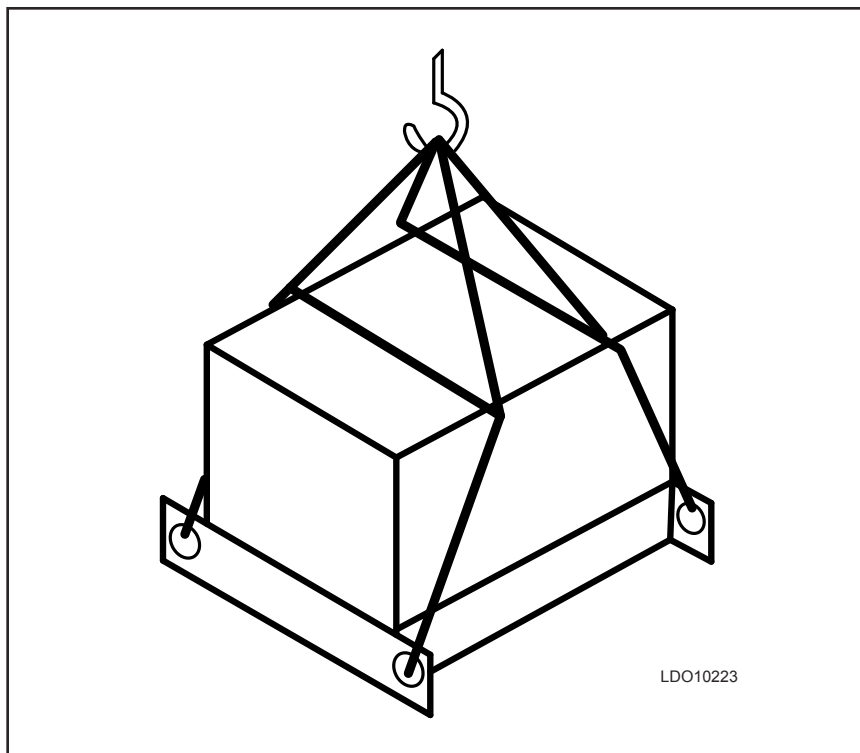
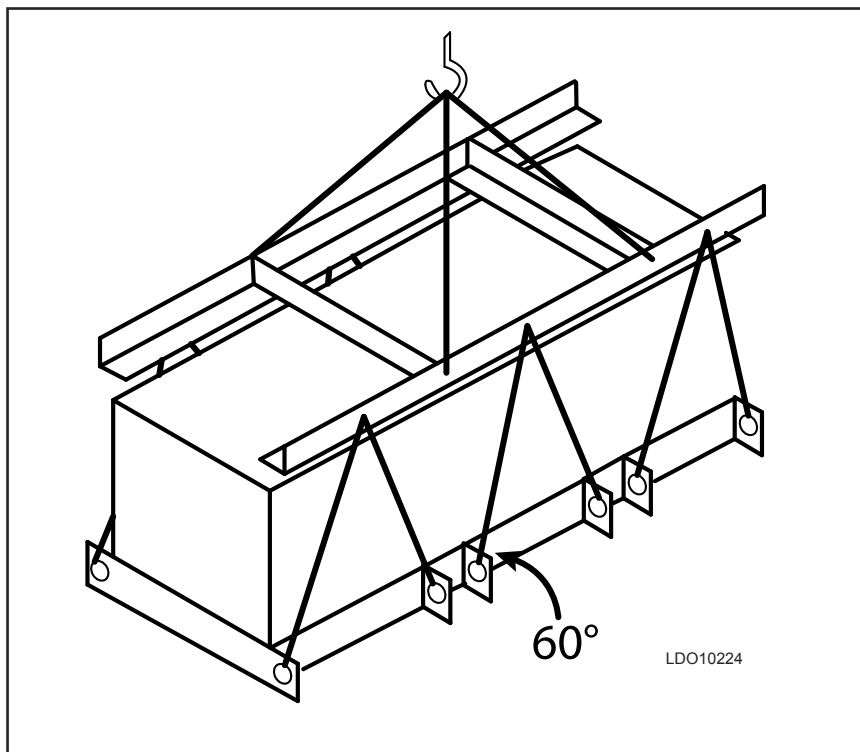
All lifting points must be used to avoid personal injury or death and to avoid damage to the equipment.



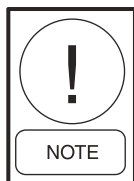
It is the responsibility of the receiver to handle and rig this equipment without causing damage.



Do not damage factory installed pipe chase, electrical cabinet, hoods, pipe stubs, door handles or roof overhang.

**FIG. 1-1 – FOUR POINT HOOK-UP****FIG. 1-2 – MULTI POINT HOOK-UP**

Proper spreader bars and hoisting straps must be used when rigging to prevent damage to the unit casing (see Figures 1-1 & 1-2). When lifting long units a special system must be used to insure a minimum 60° angle between lifting lug and spreader bar/frame. It is also mandatory that an experienced and reliable rigger be selected to handle unloading and final placement of the equipment. The rigger must be advised that the unit contains internal components and that it be handled in an upright position. Care must be exercised to avoid twisting the equipment structure.



Refer to the submittal drawing supplied with the unit for the section weights.

Unit section weights are furnished on the job submittal drawing provided with each unit. Due to the variance in weight of each unit design, it is not possible to list unit weights in this instruction. These drawings must be referred to when selecting a crane for rigging and figuring roof weight loads. Contact your YORK Sales Office if you have any questions regarding unit weights.

CRANE AND SPREADER BARS

See Figures 1-1 and 1-2.

FORK LIFT

When moving air handling equipment with a fork lift or similar means, always make sure the lifting forks are long enough to reach from the fork truck to the opposite side and slightly beyond. It is helpful to leave the shipping blocks attached to the bottom of the equipment until in its final location. There is no structural support under the equipment except what is visible from the perimeter.

COME-A-LONGS OR POWER PULL

See Figure 1-3



LDO9613

FIG. 1-3 – TYPICAL COME-A-LONG TYPES

SHACKLES

Refer to Fig 1-4 for proper lifting with hook and shackle at corners. Refer to Fig 1-5 for proper lifting with hook and shackle at lifting lugs.



LDO9614

FIG. 1-4 – PROPER LIFTING WITH SHACKLE AND HOOK AT CORNER

LDO9615

FIG. 1-5 – PROPER LIFTING WITH SHACKLE AND HOOK AT LIFTING LUG

INSPECTION

Verify equipment is received as ordered.

CHECK FOR DAMAGE

Indoor Units

“It is York’s intention that shrink wrap is applied to unpainted Indoor Units for protection from weather, road dirt, etc. during inland transit and that shrink wrap is removed at the time of delivery to allow for a thorough inspection, both inside and out. Visible damage should be noted on the signed and dated bill of lading with a request that the carrier inspect the damage within 72 HRS. of notification. If shrink wrap is kept intact for storage purposes, be advised that concealed damage must be reported within 15 days of delivery with a request that the carrier inspect the damage within 72 HRS. of notification. Any concealed damaged reported after 15 days will compromise a claim settlement. Inspection requests may be done by telephone or in person, but should be confirmed in writing. If assistance is needed with the claim process, contact your York Sales person.”

Outdoor Units

“Outdoor Units are not fully wrapped. Exposed openings are covered for protection from weather, road dirt, etc. during inland transit. A thorough inspection, both inside and out, should be done at the time of delivery. Visible damage should be noted on the signed and dated bill of lading with a request that the carrier inspect the damage within 72 HRS. of notification. Concealed damage must be reported within 15 days of delivery with a request that the carrier inspect the damage within 72 HRS. of notification. Any concealed damaged reported after 15 days will compromise a claim settlement. Inspection requests may be done by telephone or in person, but should be confirmed in writing. If assistance is needed with the claim process, contact your York Sales person.”

CHECKING FOR NON MOUNTED PARTS

- Check the packing list for non-mounted parts. (Check inside all segments.)
- Packing list will note how many and type of parts.
- Shortages must be reported within 10 days after receipt of order.

STORAGE

SHORT-TERM STORAGE



Indoor Units:

Under no circumstances should outdoor storage be used

Outdoor Units:

Be sure all shipping covers remain in tact during outdoor storage.

Short-term storage is considered six (6) months or less from date of shipment. Storage maintenance during this time is usually limited to the following.

- If the units are to be stored out-of-doors, prior to installation, special care must be taken to cover and protect the units from dust, rain, snow and rodents. The units must be protected from constant exposure to rain and snow.
- Store on a firm, flat surface to prevent distortion. Block the unit off the ground to protect components from water.



Protect all parts and porous materials from rain and other sources of moisture. Decontaminate or replace as needed to ensure microbial growth is not introduced to the air handler.

- The unit must also be protected from damage to the exterior of the cabinet or coil connections by construction vehicles and personnel.

LONG-TERM STORAGE

Long-term storage is considered any period beyond six (6) months from date of shipment. If long-term storage is anticipated, **contact the YORK Sales Office for the proper instructions and requirements for long-term storage.** It is mandatory that a detailed record be maintained during this long-term period, such as, but not limited to: proper sealing of the cabinet, rotation of the blowers and bearings, and protection of all motors from moisture. *Refer to Form 50.20-NM3.*

Preventive Maintenance Prior To Long Term Storage

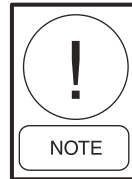
The following precautions should be taken prior to extended storage:

- Fan and motor bearings are to be greased per the manufacturer's specifications.
- On belt driven fans the belt tension should be reduced to less than half the specified value for the fans design to prevent a sag/set from forming in the shafts and belts.
- The fan motor windings should be meggered at this time and recorded for comparison prior to placing in service.
- If the fan housing was supplied with a drain connection, this plug should be removed to prevent moisture from accumulating in this portion of the fan during storage.

Periodic Fan Check

On a monthly basis, the fan and motor should be rotated several times. Perpendicularly add enough grease to replenish the bearing surfaces with fresh grease (refer to fan and motor lubrication procedures, in Section 4 Maintenance).

The fan impeller should be left at approximately 180 degrees from that of the previous month to prevent the belts from taking a set position.



It will be the responsibility of the customer to submit a monthly log sheet (MS577) showing the condition of the unit and noting any discrepancies. A copy of the log sheet should be sent to the A.S. District Office, attn.: Sales Person.

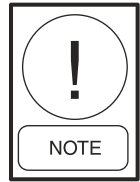


Failure to perform the long-term storage requirements will void the warranty.

2.0 INSTALLATION



Do not weld or use torches on the exterior or interior of the unit housing. The housing contains polyurethane insulation, which when under combustion will produce harmful, toxic gases resulting in personal injury or death.



This instruction is written to provide general information. The product line allows many variations and the installer is fully responsible for adjusting his actions as needed.



Surface must be level on all installations.



If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

SITE PREPARATION

OUTDOOR UNITS (SITE PREP)

Location of unit(s) should be away from building flue stacks or exhaust ventilators to prevent possible introduction of contaminated air through the outside air intakes (see Figure 2-1 for service clearances).



Allow sufficient space around the unit for removing the access panels and various parts of the unit. A minimum clearance equal to the width of the unit must be provided on one side of the unit for removing the coil or fan assembly.

Mounting

Units must be installed in such a manner as to provide enough elevation for properly designed condensate traps (see Section 2 "Drain - Condensate Drain Trap").



• Outdoor Units must be level when mounted on a roof.

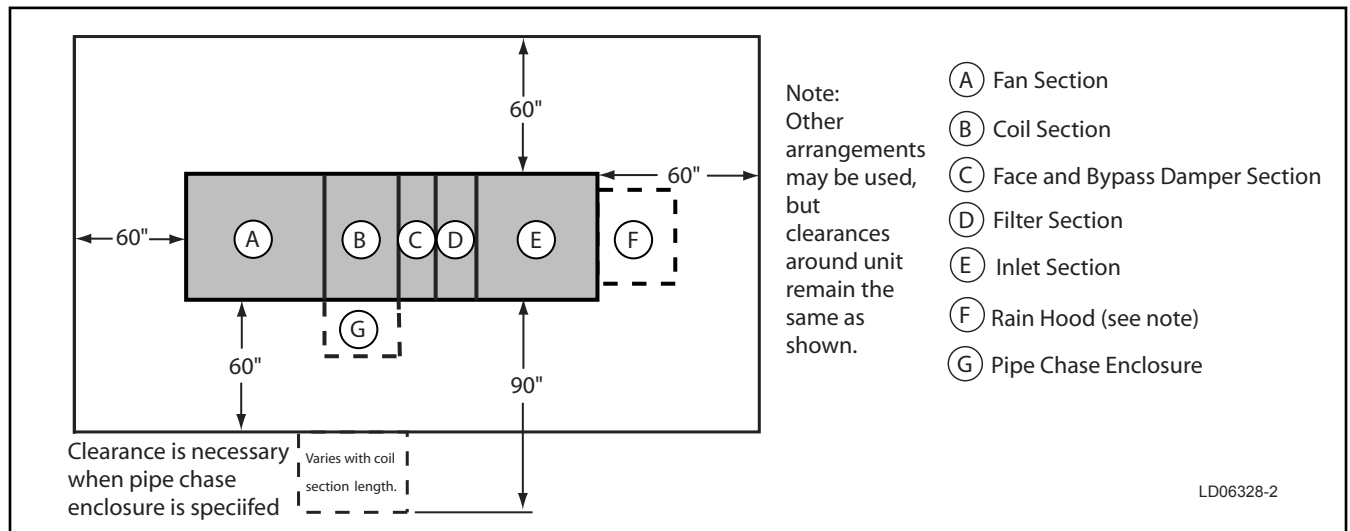


FIG. 2-1 – SERVICE CLEARANCE



• **Installation Site:** Area of roof on which curb is to be installed must be structurally adequate to support the combined weight of curb, unit and system fluids. With these combined weights in place, the curb's resting surface for the unit must be flat and level.

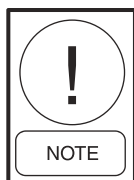


Concrete pads often are not as flat as they should be. Shimming and/or grouting may be necessary. Whether under the unit base or under the curb, this is to ensure the unit base is on a perfectly flat plane.

Curb

The curb, which supports the unit, will be shipped unassembled. It will be necessary to assemble the curb parts on the job site. Each part of the curb is identified. Assembly instructions and a hardware package are shipped with each curb package. It is important the curb be installed square. If applicable, ensure pitch orientation is correct.

When installing a curb, refer to the assembly instructions and curb parts list, as each unit and actual curb installation may not be identical. Do not use this typical information to install your curb.



Should there be any questions as to the number of pieces of curb parts or assembling of the curb, notify YORK immediately.

Wood or Fiber Cant Strips, Roofing Felts, Roofing Material, Caulking and Curb-To-Roof Fasteners Are To Be Field Supplied.

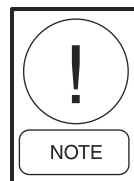
Be sure the supporting structures will not obstruct the duct, piping or wiring connections.

Curb Assembly & Installation Instructions

See Figure 2-2

1. Unpack shipping package, layout pieces and parts according to the exploded views and check against Bill of Materials.

2. Layout all curb walls as shown. Make certain that all curb wall tabs are located on inside of mating surface.



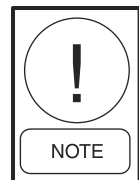
Make certain that all curb walls accessories and flanges, which may have been distorted in handling are straightened before assembly.

3. Attach curb walls together to form rectangular perimeter as shown, leaving bolts loose.



After the curb is set in place, ensure proper consideration has been given to the air duct openings through the roof. Refer to section on Air Ducts. Ensure the pipe chase portion is correctly located.

4. The curb installation drawing (see Figure 2-2) shows a gasket that is mounted between the curb and the unit. This gasket is shipped with the curb parts. Install the curb gasket before setting the unit on the curb. The gasket forms an air seal between the unit and the curb and serves as a dampener, preventing metal-to-metal contact between the unit and curb. However, the gasket should not be used as a vibration isolator where the prevention of noise and vibration transmission into the building is critical.
5. After verifying curb is square and level, tighten all bolts and then anchor as appropriate.

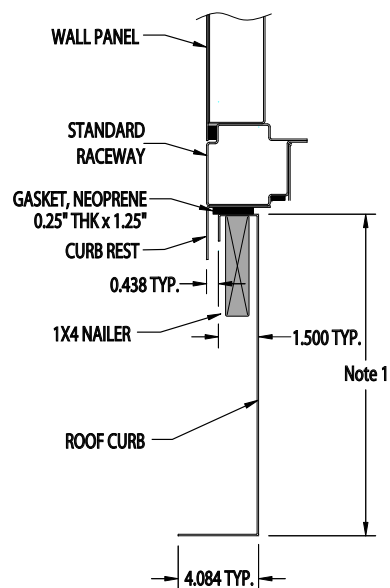
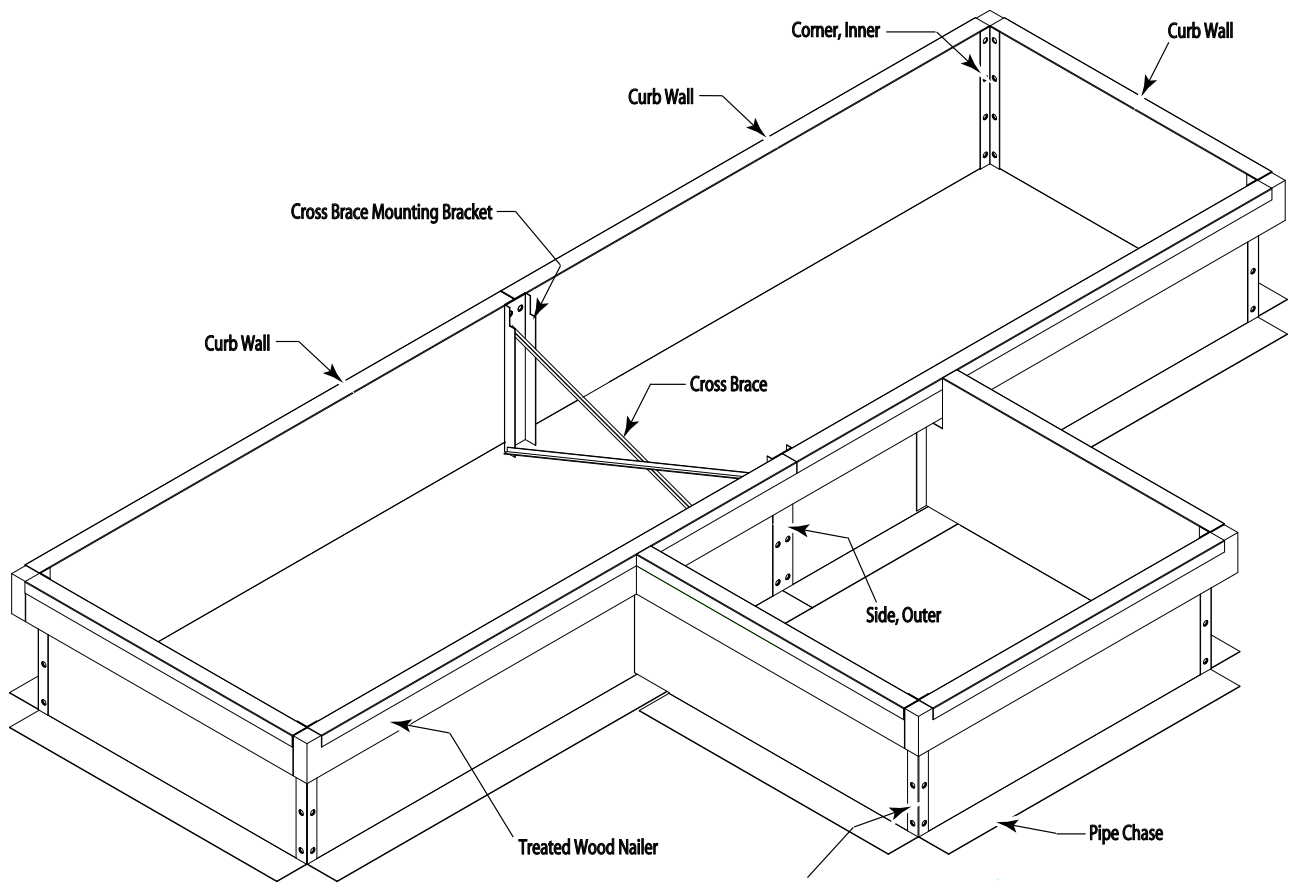


If bolts are tightened after anchoring, curb will be pulled, twisted and torqued out of square.

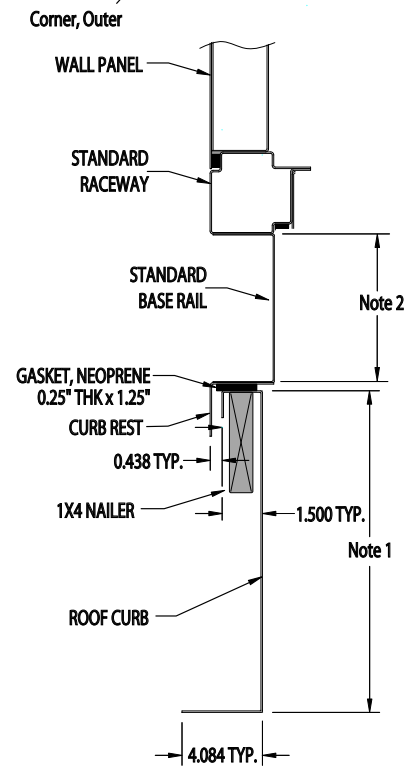
6. The curb should be insulated and roofed as required.

Steel Frame

When a steel frame is used to support unit it must be level, flat without uneven steel frame joints, and support the unit around the full perimeter. As a general rule, cross members should be placed every 96 in.



Typical Curb Section



Typical Curb Section With Base Rail

Caution:

Seal all joints and seams with suitable sealer such as Sikaflex - 221 (York P/N 013-02966-000) or Manus Bond 75-AM 100ZTU (York P/N 013-02966-001)

Notes:

1. Curbs available in 14", 18", 22", 26", 30" & 34" heights
2. Outdoor Base Rails are available in 6", 8" & 10" heights.

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FIG. 2-2 – TYPICAL CURB ASSEMBLY

INDOOR UNITS (SITE PREP)



Concrete pads often are not as flat as they should be. Shimming and/or grouting may be necessary. Whether under the unit base or under the curb, this is to ensure the unit base is on a perfectly flat plane.

Clearance



Allow sufficient space around the unit for removing the access panels and various parts of the unit. A minimum clearance equal to the width of the unit must be provided on one side of the unit for removing the coil or fan assembly.

Mounting

See Section 2 "Piping Connections - "Condensate Drain Trap."

Floor

The floor must be flat and level.

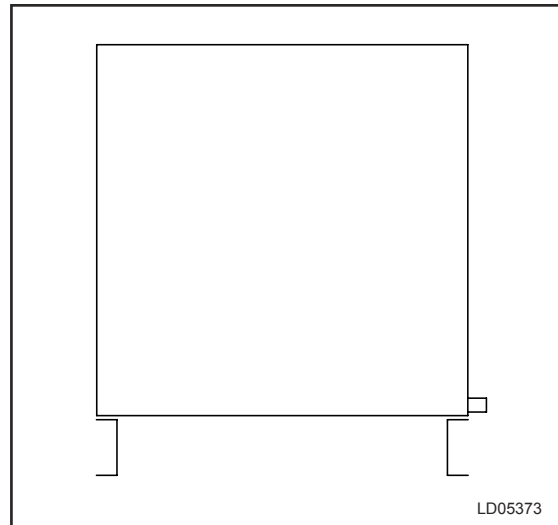


FIG. 2-4 – NO HOUSEKEEPING PAD – EXTENDED BASE RAIL REQUIRED TO ACCOMMODATE TRAP HEIGHT

Housekeeping Pad

The housekeeping pad must be flat and level (see Figures 2-3, 2-4 & 2-5).

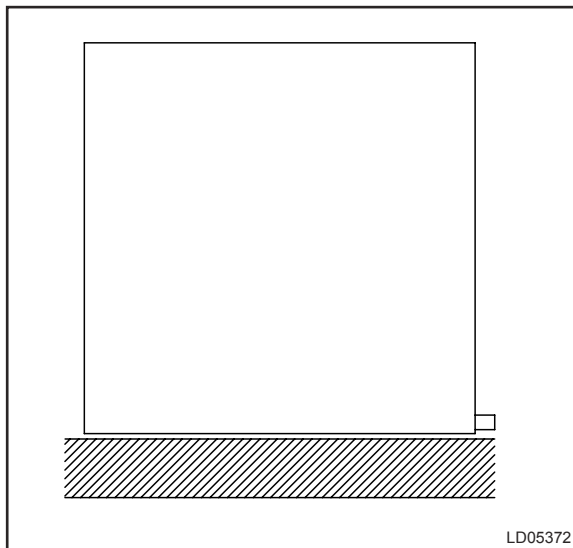


FIG. 2-3 – NO EXTENDED BASE RAIL – HOUSEKEEPING PAD REQUIRED TO ACCOMMODATE TRAP HEIGHT

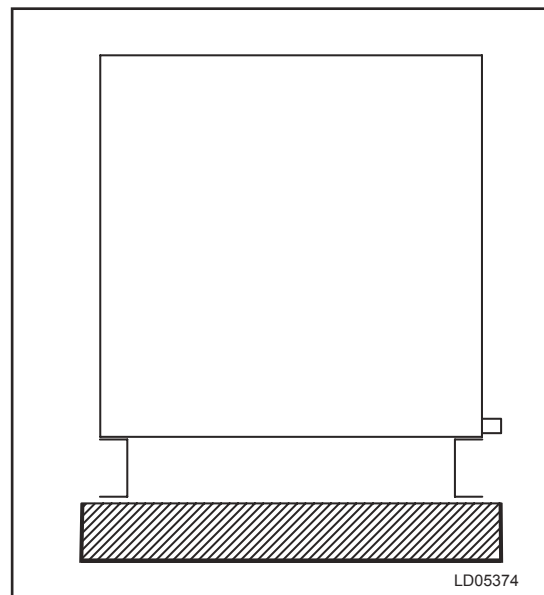


FIG. 2-5 – WITH EXTENDED BASE RAIL AND HOUSEKEEPING PAD

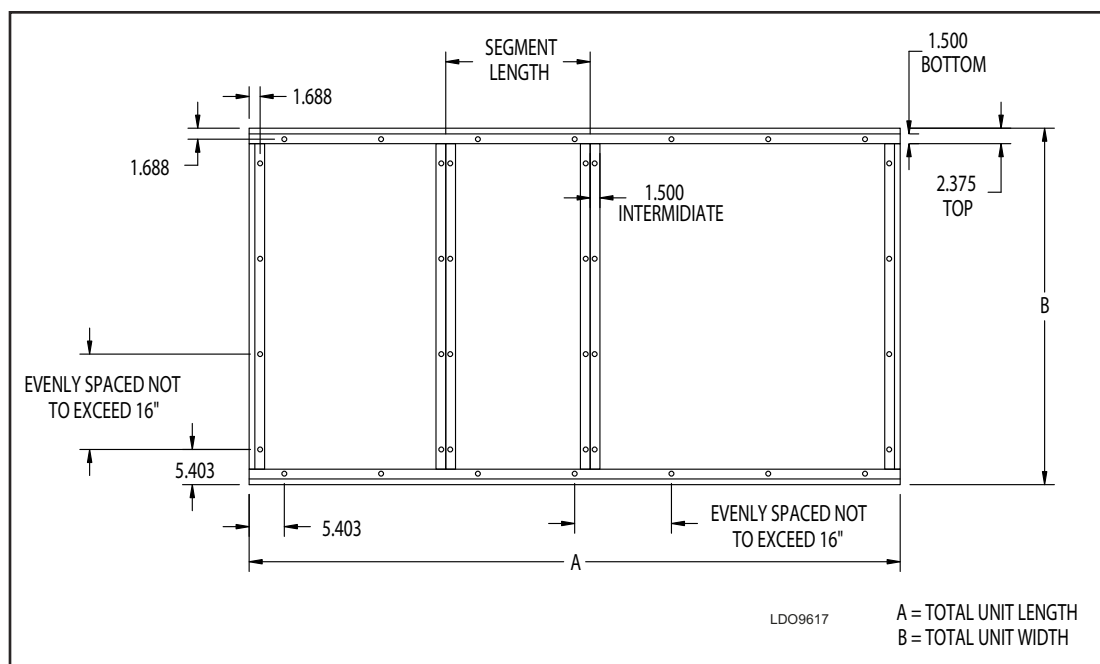
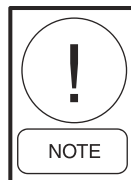


FIG. 2-6 – CEILING SUSPENDED UNIT

Ceiling Suspended Units



It is recommended that support is structurally engineered to prevent flexing, sagging or twisting of air handlers.



Do not obstruct door operation, filter access, piping, electrical or control connections with suspension members.

Refer to figure 2-6 "Ceiling Suspended Unit" for proper support of unit in the direction of airflow and/or perpendicular to the direction of airflow.

General Requirements

York recommends that ceiling suspension of units be accomplished in the field with the following:

Structure Positioned Perpendicular To Airflow

The units must be supported (at a minimum) in the following locations:

- Both ends
- At each shipping split
- Upstream and downstream of each cooling coil segment.
- Under heavy components like fans, attenuators, & heating segment.

Structure Positioned In The Direction Of Airflow

The unit base must be supported continuously, on both sides of the unit.

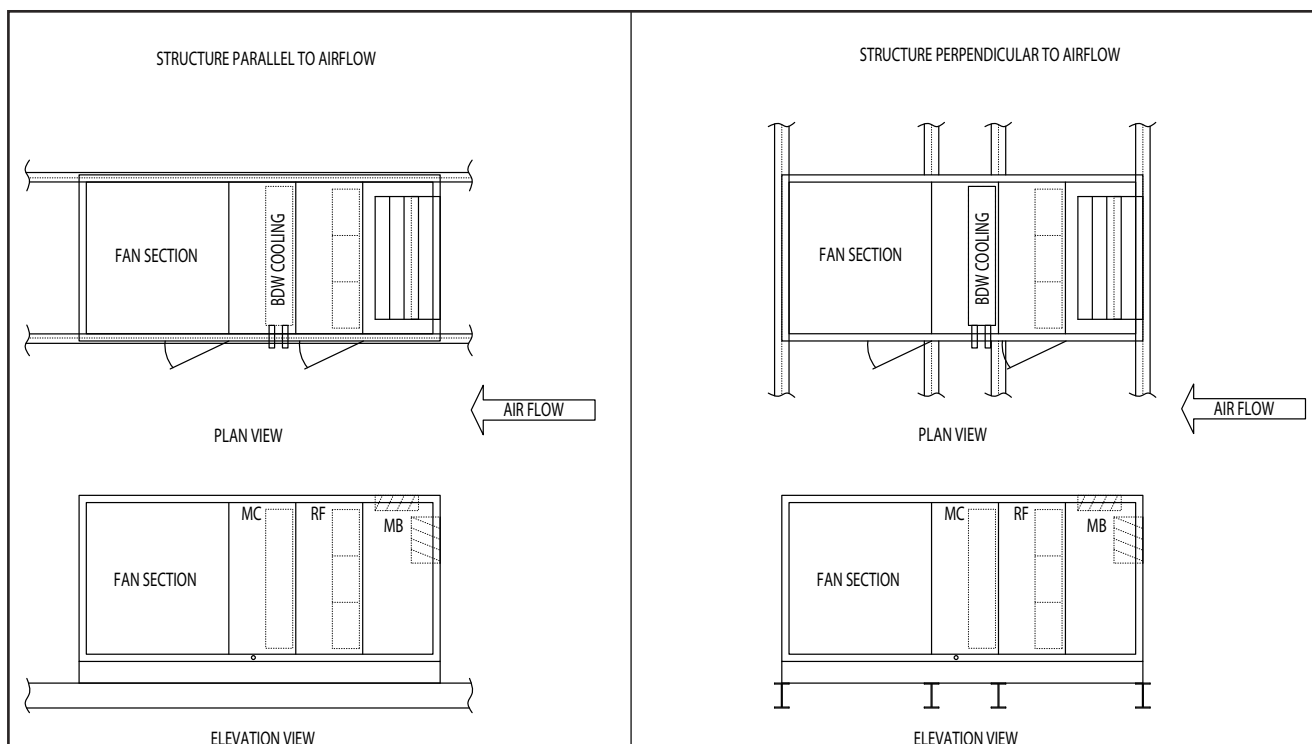


FIG. 2-6 – CEILING SUSPENDED UNIT (CONT.)

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UNIT INSTALLATION**TOOLS NEEDED:**

See Figure 2-7.



FIG. 2-7 – TOOLS TYPICALLY USED FOR ASSEMBLY OF SHIPPING SPLITS

- Drill with No. 3 phillips bit for removing all panel screws.
- Three sixteenth inch hex allen head screwdriver.
- One quarter inch, 5/16", 3/8" and 9/16" nut setters or socket set for removal of all bulkhead, raceway and wireway screws.
- Wire cutters
- Four inch x four inch wood blocks
- Power pulls or come-a-longs
- Slings
- Pry bar
- Drift pins and awls
- Common hand tools
- Caulking Gun

MATERIAL REQUIRED:

(not provided by YORK)

- Sikaflex, York P/N 013-02966-000 or equivalent. (One tube per 10 feet of curb perimeter.)

ASSEMBLY OF OUTDOOR UNIT

See complete rigging instructions explained in detail in Section 1.



Do not damage factory installed pipe chase, electrical cabinet, hoods, pipe stubs, door handles or roof overhang.

Installing Single Piece Unit On Curb

- Units should not be moved over a roof covering but should be lifted from the ground onto the curb or support framework. Remove the wood shipping material from curb rest.



The curb gasket, which is provided, must be installed before the unit is lowered onto the curb. The gasket is shipped with the curb package.

- SEAL (to curbing): When setting the unit onto the curb, the installer should ensure that a sealing gasket is positioned between the unit and curb to provide a continuous airtight and watertight connection.
- Installation should be in accordance with local code requirements.

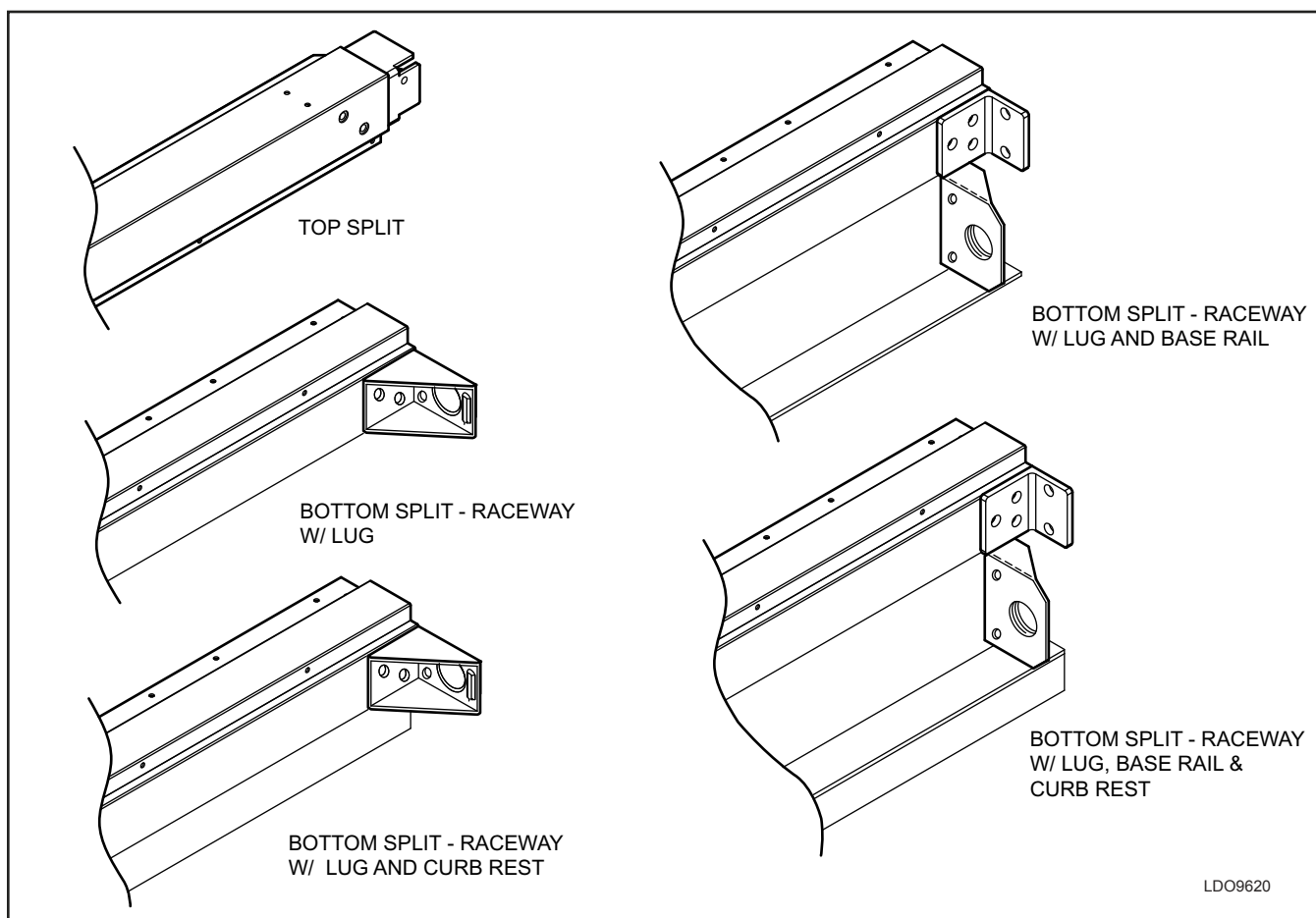
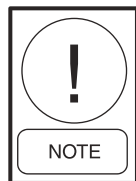


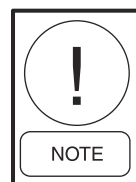
FIG. 2-8 – SHIPPING SPLIT EXAMPLES

Installing Multiple Piece Unit On Curb

See Figure 2-8 for Shipping Split Examples.



When unit is provided with shipping splits, use construction grade caulk in place of gasket (not provided). Apply the caulk on top of curb just before each section is placed on the curb. Apply the caulk with a 1/2" diameter bead to assure seal after sections are pulled together. Positive seal must be achieved. Disregard this note if shipping splits are assembled prior to placing the unit on curb.



If assembly is done prior to setting unit sections on a curb, be sure to have units on a flat surface during the assembly process. Do not remove shipping blocks from under Curb Rests until assembled unit is ready to be lifted and placed on the curb.

1. Before placing sections on the curb:
 - a) Verify the correct sections and orientation of each section.
 - b) Remove cross brace(s) (shipping supports) from each section's shipping split.
 - c) Remove plastic shipping covers and their supports.
 - d) Remove screws from Curb Rest to release wood shipping blocks. Leave blocks under unit sections until lifted. If the unit has no Curb Rest, be sure that no debris clings to the bottom of each section when lifted for placement.
 - e) Make sure all wiring and/or control tubing connection pig tails are tucked inside the wireways to prevent damage during rigging.
 - f) Apply gasket material TO ONE SIDE ONLY of each shipping split. Be sure the entire perimeter is covered with gasket material. Any void, depression or protrusion will allow air or water leakage. Apply adjacent to inside edge of mating surface (nearest to interior of air handler). Refer to Fig. 2-9.



FIG. 2-9 – APPLYING GASKET

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- g) On sections with top raceway connectors, loosen the cap screws one full turn. This will aid in joining the sections. Be sure to retighten the cap screws after the joint is completed.
 - h) Apply a 1/2" thick bead of caulk (not provided), to curb top surface only where the first section will be placed.
2. Place the first section on the curb while positioning it so that the over hanging Curb Rest is spaced evenly from the curb on each side and end.
 3. After the first section is placed in position, anchor or block it before setting the next section.
 4. Attach power pulls or come-a-longs to the first section. Use the lifting lug holes in the two outside corners (not at the shipping split).
 5. Apply a 1/2" thick bead of caulk to curb top surface only where the next section will be placed, plus about 4".
 6. Place the next section on the curb about 4" from the section already placed.

7. At this time feed the electrical and control connections from section to section wireways and ensure that they will be accessible after the sections are joined. If any will not be accessible, assemble the electrical connectors and/or pneumatic tubes each according to their labels before joining of sections is complete. Refer to Fig. 2-10

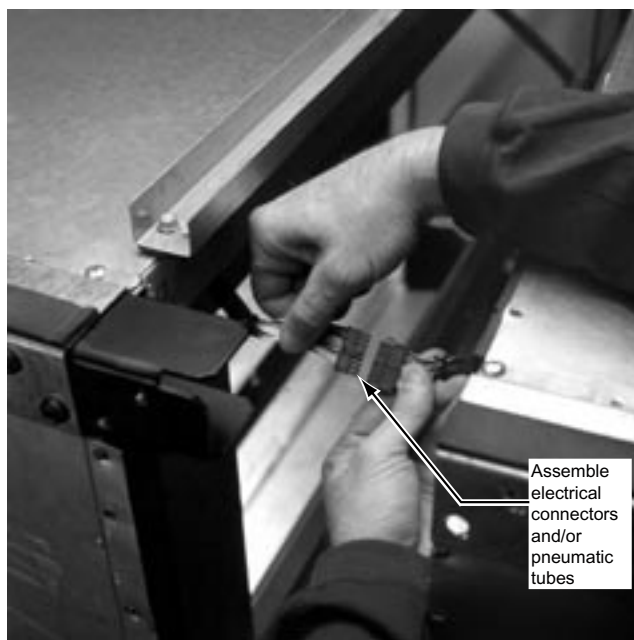


FIG. 2-10 – ELECTRICAL CONNECTIONS

8. Attach the power pulls or come-a-longs to the far end of the next section.
9. Start pulling this section toward the first section. Pull evenly on both the left and right sides.
 - a) Be sure all of the electrical or control wires or tubes in the wire ways are clear.
 - b) Guide the two top connectors into opposite section raceways.
 - c) Guide the bottom raceway guide rails together using rods or drift pins through the bolt holes in the lifting lugs on opposite sections. Do this on each side of the unit simultaneously.
 - d) If any difficulty aligning due to racking of one section or the other, use another come-a-long diagonally on the inside of that section, at or close to the shipping split.
 - e) If any difficulty aligning due to top and bottom not pulling together simultaneously, apply shims under the unit sections as needed to compensate for uneven or flexing support under roof deck and curb.

10. Complete pulling the sections together.
11. Fasten bottom, lifting lugs together with bolts provided.
12. Fasten top raceway connectors with cap screws provided and retighten existing cap screws.
13. Apply butyl tape to the under side of seam caps and install over the joint using the screws provided. Seam caps are applied over the joint on the sides and roof of the exterior and on the floor only of the interior.



If a roof seam cap has a tab on one end only, the end without the tab goes above the pipe chase location.

14. Repeat this procedure for each additional section to be placed in making up the complete unit.
15. After all the electrical and control connections are made according to their labels, assemble the wireway access covers.

Installing Multiple Piece Unit (Not Curb Mounted)

See Figure 2-8 for Shipping Split Examples



If assembly is done prior to placing unit sections, be sure to have sections on a flat surface during the assembly process.

1. Before placing sections:
 - a) Verify the correct sections and orientation of each section.
 - b) Remove cross brace(s) (shipping supports) from each section's shipping split.
 - c) Remove plastic shipping covers and their supports.
 - d) Make sure all wiring and/or control tubing connection pigtails are tucked inside the wireways to prevent damage during rigging.

- e) Apply gasket material TO ONE SIDE ONLY of each shipping split. Be sure the entire perimeter is covered with gasket material. Any void, depression or protrusion will allow air or water leakage. Apply adjacent to inside edge of mating surface (nearest to interior of air handler). Refer to Fig. 2-9.
 - f) On sections with top raceway connectors, loosen the cap screws one full turn. This will aid in joining the sections. Be sure to retighten the cap screws after the joint is completed.
2. Place the first section in its final position and anchor or block it before placing the next section.
 3. Attach power pulls or come-a-longs to the first section. Use the lifting lug holes in the two outside corners (not at the shipping split).
 4. Place the next section about 4" from the section(s) already placed.
 5. At this time feed the electrical and control connections from section to section wireways and ensure that they will be accessible after the sections are joined. If any will not be accessible, assemble the electrical connectors and/or pneumatic tubes each according to their labels before joining of sections is complete. Refer to Fig. 2-10.
 6. Attach the power pulls or come-a-longs to the far end of the next section.
- 
 CAUTION

Ensure chain does not apply pressure to drain connection. Improper positioning of chain may cause damage to unit. See Figure 2-11
7. Start pulling the sections together. Pull evenly on both the left and right sides.
 - a) Be sure all of the electrical or control wires or tubes in the wire ways are clear.
 - b) Guide the two top connectors into the opposing section's raceways.
 - c) Guide the bottom raceway base rails together using rods or drift pins through the bolt holes in the lifting lugs on opposing sections. Do this on each side of the unit simultaneously.
 - d) If any difficulty aligning due to racking of one section or the other, use another come-a-long diagonally on the inside of that section at or close to the shipping split.

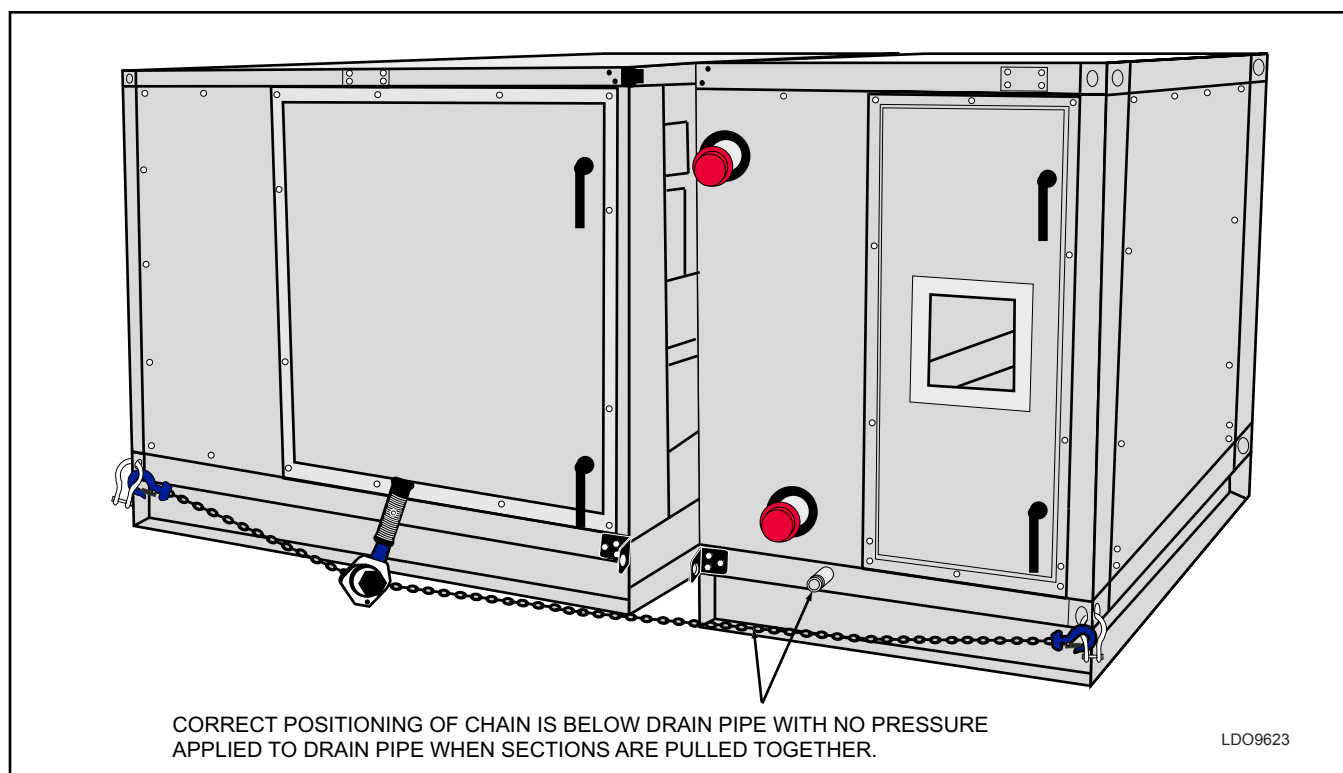


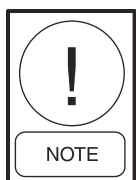
FIG. 2-11 – PULLING SECTIONS TOGETHER WITH COME-A-LONGS

- e) If any difficulty aligning due to top and bottom not pulling together simultaneously, apply shims under the unit sections as needed to compensate for uneven placement area.
8. Complete pulling the sections together.
9. Fasten bottom, lifting lugs together with bolts provided.
10. Fasten top raceway connectors with cap screws provided and retighten existing cap screws.
11. Apply butyl tape to the under side of seam caps and install over the joint using the screws provided. Seam caps are applied over the joint on the sides and roof of the exterior and on the floor only of the interior.
12. Repeat previous steps for each additional section to be placed in making up the complete unit.
13. After all of the electrical and control connections are made according to their labels, assemble the wireway access covers.

ASSEMBLY OF INDOOR UNIT

Installing Multiple Piece Unit (not curb mounted)

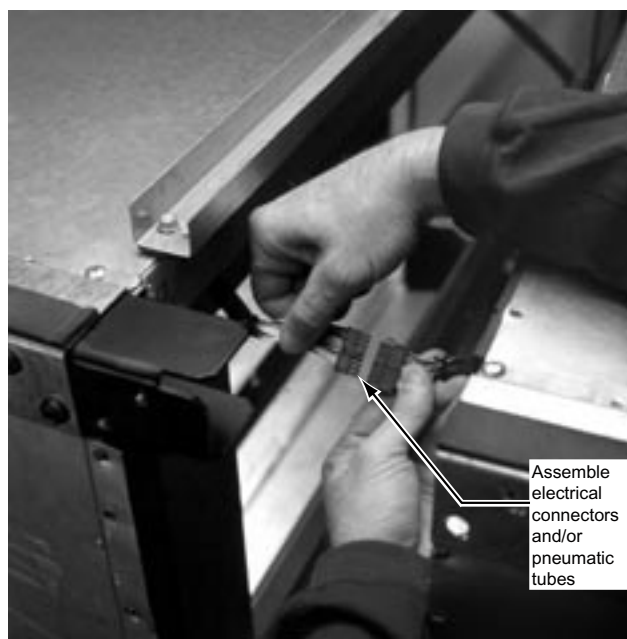
See Figure 2-8 for Shipping Split Examples



If assembly is done prior to placing unit sections, be sure to have sections on a flat surface during the assembly process.

1. Before placing sections:
 - a) Verify the correct sections and orientation of each section.
 - b) Remove cross brace(s) (shipping supports) from each section's shipping split.
 - c) Remove plastic shipping covers and their supports.
 - d) Make sure all wiring and/or control tubing connection pigtails are tucked inside the wireways to prevent damage during rigging.

- e) Apply gasket material TO ONE SIDE ONLY of each shipping split. Be sure the entire perimeter is covered with gasket material. Any void, depression or protrusion will allow air or water leakage. Apply adjacent to inside edge of mating surface (nearest to interior of air handler). *Refer to Fig. 2-9.*
- f) On sections with top raceway connectors, loosen the cap screws one full turn. This will aid in joining the sections. Be sure to retighten the cap screws after the joint is completed.
2. Place the first section in its final position and anchor or block it before placing the next section.
3. Attach power pulls or come-a-longs to the first section. Use the lifting lug holes in the two outside corners (not at the shipping split).
4. Place the next section about 4" from the section(s) already placed.
5. At this time feed the electrical and control connections from section to section wireways and ensure that they will be accessible after the sections are joined. If any will not be accessible, assemble the electrical connectors and/or pneumatic tubes each according to their labels before joining of sections is complete. *Refer to Fig. 2-12.*



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FIG. 2-12 – ELECTRICAL CONNECTIONS

6. Attach the power pulls or come-a-longs to the far end of the next section.
 - a) Panels on one side of the shipping split will have a flange with a gasket already attached. This flange is to extend over the adjoining panel on the opposing section.
 - b) Remove enough panel screws to allow top and side panels to be pulled outward from original position and blocked.



Ensure chain does not apply pressure to drain connection. Improper positioning of chain may cause damage to unit. See Figure 2-13

7. Start pulling the sections together. Pull evenly on both the left and right sides.
 - a) Be sure all of the electrical or control wires or tubes in the wire ways are clear.
 - b) Guide the two top connectors into the opposing section's raceways.
 - c) Guide the bottom raceway base rails together using rods or drift pins through the bolt holes in the lifting lugs on opposing sections. Do this on each side of the unit simultaneously.

- d) If any difficulty aligning due to racking of one section or the other, use another come-a-long diagonally on the inside of that section at or close to the shipping split.
- e) If any difficulty aligning due to top and bottom not pulling together simultaneously, apply shims under the unit sections as needed to compensate for uneven placement area.

8. Complete pulling the sections together.
9. Fasten bottom, lifting lugs together with bolts provided.
10. Fasten top raceway connectors with cap screws provided and retighten existing cap screws. Reposition and securely fasten top and side panels that were previously loosened.
11. Apply butyl tape to the under side of seam caps and install over the joint using the screws provided. Seam caps are applied over the joint on the floor only of the interior.
12. Repeat previous steps for each additional section to be placed in making up the complete unit.
13. After all of the electrical and control connections are made according to their labels, assemble the wireway access covers.

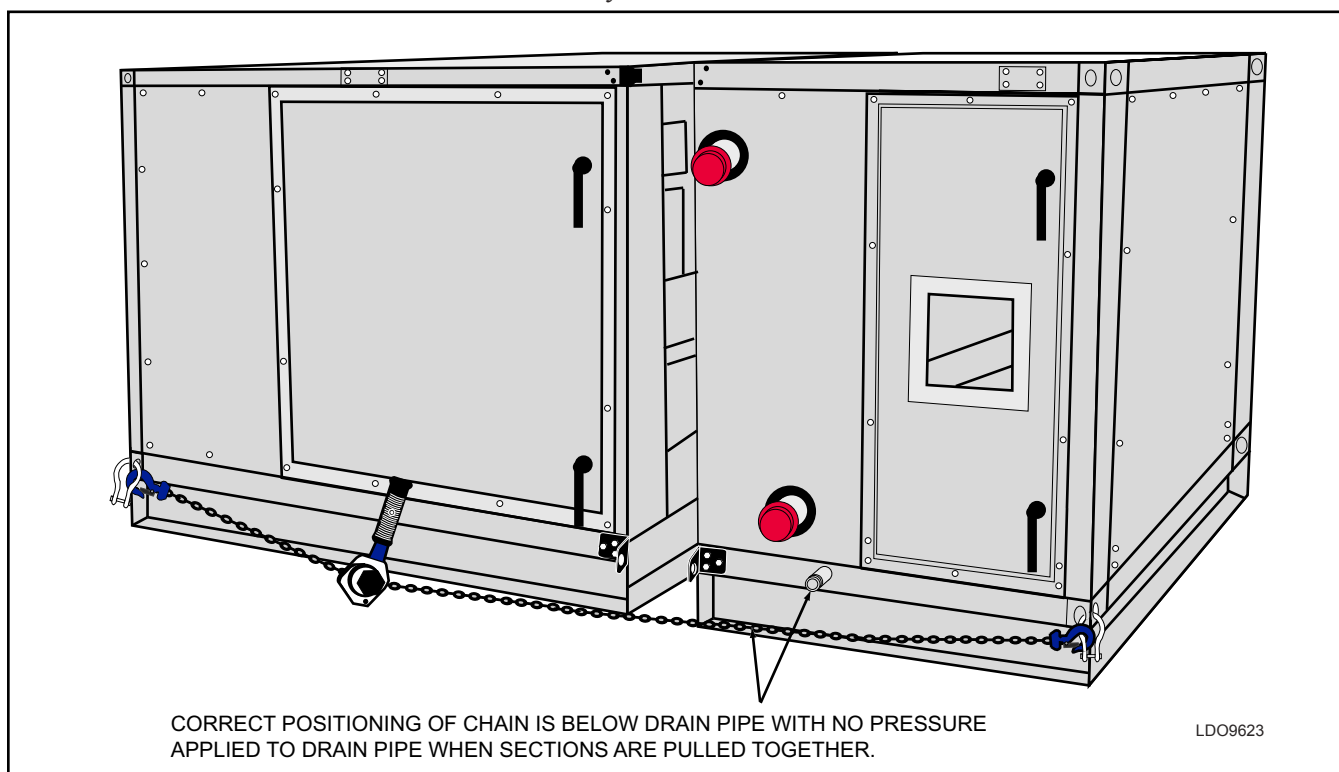


FIG. 2-13 – PULLING SECTIONS TOGETHER WITH COME-A-LONGS



LDO9624

FIG. 2-14 – TIERED UNIT

Installation Of Tiered Unit

A Tiered Unit may not be factory assembled. Field assembled units are shipped with the top-tier segment skidded. This top-tier segment is equipped with brackets bolted to the bottom raceway (see Figure 2-15). The bottom-tier segment is equipped with brackets bolted to the top raceway. These brackets are used to secure the top segment to the bottom segment. After final alignment, bolt the two brackets with hardware supplied.



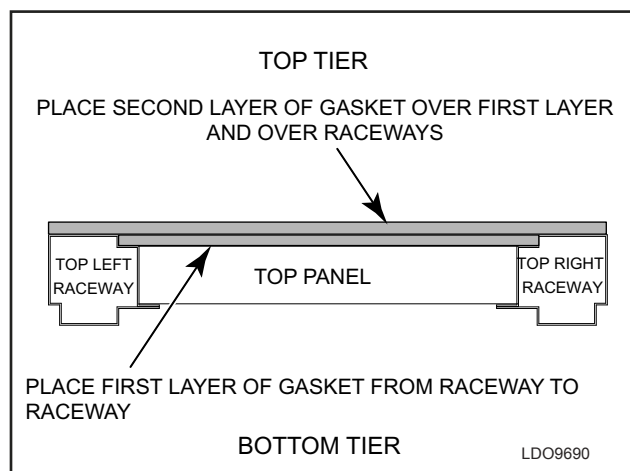
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FIG. 2-15 – TIERED UNIT SECURED WITH BRACKETS



If unit sections do not fit through entrance, disassembly and reassembly may be required. See Form #102.20-FA1 (303).

1. Before placing top tier:
 - a) Verify the correct orientation of top and bottom tier.
 - b) Remove cross brace(s) (shipping supports) from top tier.
 - c) Remove plastic shipping covers and their supports.
 - d) Make sure all wiring and/or control tubing connection pigtailed are tucked inside the wireways to prevent damage during rigging.
 - e) Ensure gasket properly installed on bottom tier. If the top tier is shorter in direction of airflow than the bottom tier, apply gasket material on the top panel of the bottom tier from raceway to raceway but not on top of raceways (see figure 2-16).



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FIG. 2-16 – APPLY GASKETS TO TOP PANEL BOTTOM TIER

- f) Apply second layer of gasket over top of that applied in step (e) but include the raceways. Steps (e) and (f) are necessary because the top panel of the bottom tier is slightly recessed below the height of its raceways.
- g) If top tier has shipping splits, apply gasket material to each shipping split. Be sure the entire perimeter is covered with gasket material. Any void, depression or protrusion will allow air or water leakage. Apply adjacent to inside edge of mating surface (nearest to interior of air handler.) Refer to Fig. 2-17.



FIG. 2-17 – APPLYING GASKET

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Be sure all of the electrical or control wires or tubes in both tiers are clear.

2. Install (4) shackles, one in each bottom corner connector.
3. Fasten sling/chain to shackles.
4. Fasten other end of sling/chain to spreader bar (as needed).
5. Lift top tier assembly with crane, forklift or overhead lift.

6. At this time feed the electrical and control connections from top tier to bottom tier and ensure that they will be accessible after the sections are joined. If any will not be accessible, assemble the electrical connectors and/or pneumatic tubes each according to their labels before joining the top and bottom tier.
7. Lower the top tier onto bottom tier so that mounting brackets mate. Guide brackets together using rods or drift pins through the bolt holes (see Figure 2-18).



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FIG. 2-18 – GUIDING BRACKETS TOGETHER

8. Secure the top tier to bottom tier with mounting hardware.
9. After all of the electrical and control connections are made according to their labels, assemble the wireway access covers.

OUTSIDE AND/OR RELIEF AIR HOODS, BIRD SCREENS & MIST ELIMINATORS

See Figure 2-19

1. Identify correct hood and respective location. Correct orientation is with the tracks for bird screens to the bottom. The flanges at top and sides are predrilled.
2. When multiple stacked hoods are used, install the top hood first then the bottom then the intermediate if required.
3. Remove and save the top row of panel screws from side panel above opening.
4. Apply butyl tape (provided) to the flanges on the hood that contact the unit side panel.
5. Center the hood over the opening aligning the pre-punched holes in the top flange with the top row of holes in the side panel and reinstall the panel screws.
6. Square the hood with the opening and attach the side flanges (vertical) with hex head self-drilling screws provided.
7. Now, install the bottom hood making sure it extends 6" below the bottom of the opening.
8. Center the bottom hood over the opening and align it with the top hood.
9. Attach this hood by its top and side flanges using hex head self-drilling screws provided.
10. If there is a third hood, install it centered between the top and bottom hoods.
11. Attach this hood by its top and side flanges using hex head self-drilling screws provided.
12. Finally, install bird screens, mist eliminators or filters in the hoods.
13. Remove the clip(s) from the leading edge of the hood.
14. Slide the proper size bird screen, mist eliminator or filter into the tracks provided. The object should rest on top of the lip at the back of the hood.
15. Reinstall the clip(s) on the leading edge of the hood.

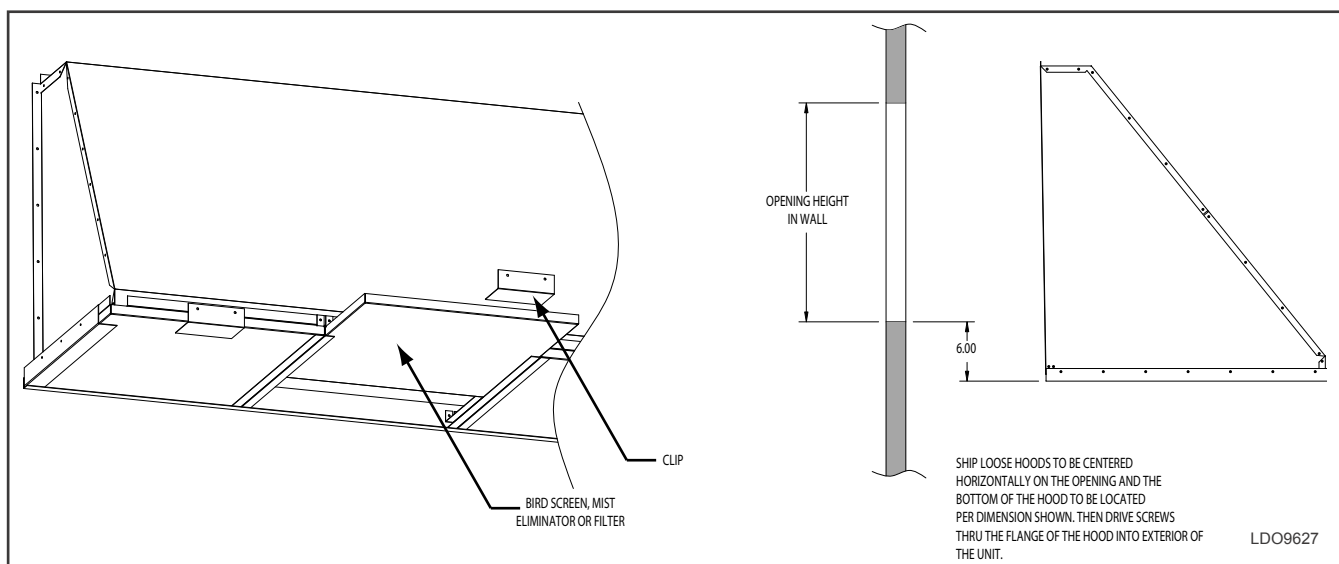


FIG. 2-19 – OUTSIDE AND/OR RELIEF AIR HOODS, BIRD SCREENS & MIST ELIMINATORS

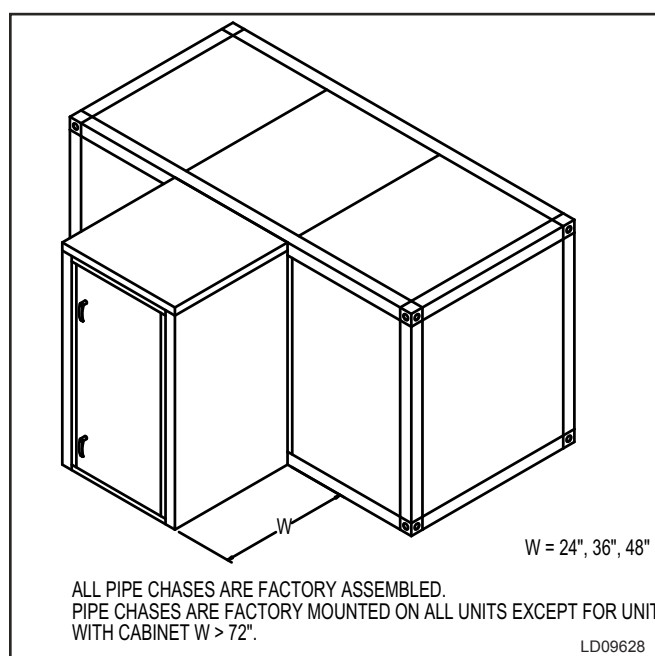
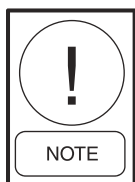


FIG. 2-20 – PIPE CHASE ENCLOSURE ASSEMBLY FOR UNITS WITH PIPE CHASE SHIPPED LOOSE

PIPE CHASE INSTALLATION



Pipe chase must be installed before piping is connected.

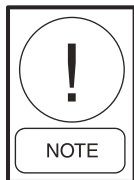
TOOLS REQUIRED

- Ladder
- Tapered punch or awl
- Air or electric driver capable of 1800 to 2200 RPM
- Torque wrench
- Two-man team (pipe chase weight 100+lbs).
- Five sixteenth & three eighth inch nut setters for driver
- # 3 phillips head screw driver bit.
- Shipped loose package containing butyl tape (013-02976-000), phillips head self-threading screws (021-17722-000), hex head self-drilling screws (021-19515-000), caulking (013-02966-001).

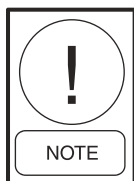
PROCEDURE

- 1 Note that top and bottom flanges are inside pipe chase and vertical flanges are outside.
- 2 Apply butyl tape to all four flanges.
- 3 Be sure foam rubber gasket (supplied with curb) is on top of curb.
- 4 Set pipe chase on pipe chase curb $\frac{1}{2}$ " away from unit side panel.
- 5 Using tapered punch or awl, align holes in top flange with pre-punched holes in top raceway and install phillips head self-threading screws. Torque to 30 in.-lbs. Repeat for bottom flange and bottom raceway.
- 6 Check to be sure door closes and latches properly. If not, loosen screws, re-align and re-torque.
- 7 Install hex head self-drilling screws in vertical flanges outside pipe chase.
- 8 Apply caulking to all interior joints of pipe chase.
- 9 All pipe chase floor penetrations must be flashed, sealed and insulated to prevent condensation entering building.

ELECTRICAL CONNECTIONS



All field wiring must conform to the National Electrical Code (N.E.C.) and possible local codes that may be in addition to N.E.C.



Unit is E.T.L. Listed. Some components are U.L. labeled. Any changes in the field may affect their validity.

The current characteristics, phase, cycle and voltage are stamped on the nameplate of each component.

Electrical conduit connections made to exposed boxes on units should be made on the bottom of the box. Installation should comply with code requirements. Outdoor installation must be made watertight.

The installing contractor is responsible for electrical conduit penetrations through the building roof.

Penetrations through panels must be sealed (see Fig. 5-31 "Penetrations and Grommet Details").



Electrical conduits that penetrate the exterior (walls, pipe chase or floors) of the unit will need to be externally and internally sealed so that unconditioned air will not be drawn into the unit through and around conduit. This unconditioned air will result in condensation that will fail components prematurely.

All accessible electrical connections must be checked for tightness prior to the actual startup. Many of the connections contain several strands of wire, and while they were tightened at the time of assembly, and checked at the time of run-in, they may have developed a "set" and should be re-tightened. The danger of a poor connection can cause overheating and component failure.



DO NOT PENETRATE any main or auxiliary drain pan.

A motor connection diagram may be found on the inside of the motor terminal box or on a tag attached to the motor. Be sure to make a flexible conduit connection at the motor to permit fan belt adjustment and movement of spring isolated fan assembly. Refer to Motor Data Nameplate for all motor specifications (see Figure 2-21).



00495VIP

FIG. 2-21 – TYPICAL MOTOR DATA / NAMEPLATE

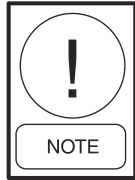
POWER WIRING

See Section 6 for all electrical drawing applications.

CONTROL WIRING

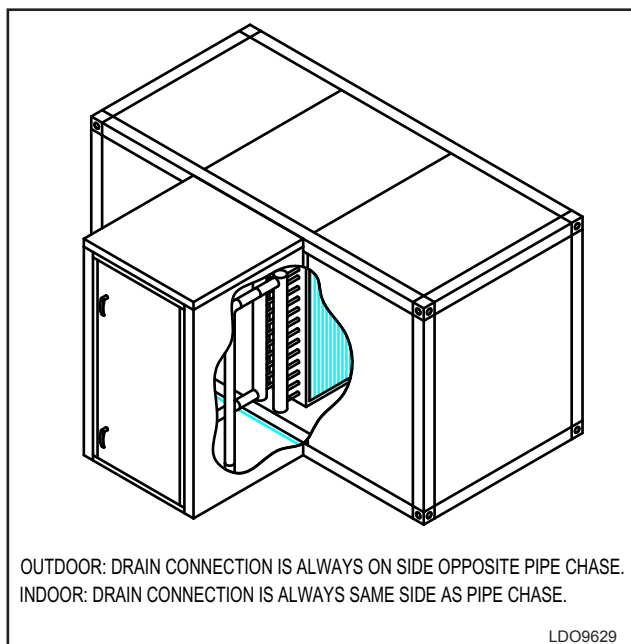
See Section 6 for all electrical drawing applications.

PIPING CONNECTIONS



Do not remove bottom panel in pipe chase.

- Whenever possible, piping should be brought down through outdoor units within the pipe chase (see Figures 2-20 and 2-22).
- Penetrations through pipe chase floor must be flashed and sealed.

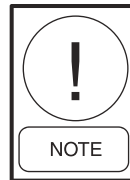


Usable working clearance is approximately the depth of the pipe chase minus 5".

All dimensions are approximate and not certified for construction.

FIG. 2-22 – PIPE CHASE ENCLOSURE

- Penetrations through panels must be sealed (see Fig. 5-31 "Penetrations and Grommet Details").
- Where piping is insulated, insulation should not be installed until after the flashing has been completed.



Pipe chase should be installed before piping is connected.

COIL PIPING



Do not test, clean and flush piping through this equipment.

Isolate this equipment from pressure testing of water, steam gas and air piping.

Consult the job specifications and submittal drawings for specific piping requirements, coil connection sizes and location. The unit should be level to assure proper venting and draining of coils. The piping arrangements must provide for a balanced flow in multiple coil installations (see Figure 2-23 showing factory coil connections).

Support all connecting piping independently of the coils. Provide swing joints or flexible fittings in all piping connections, particularly adjacent to heating coils, to absorb expansion and contraction strains. Rigid piping connections can cause coil damage.

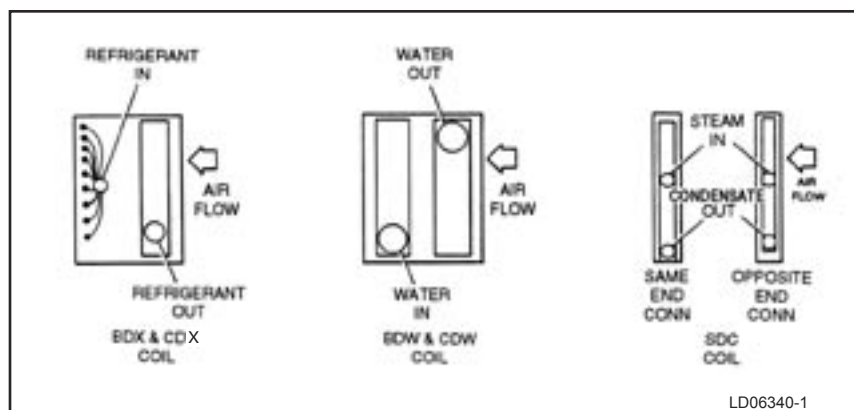


FIG. 2-23 – FACTORY COIL CONNECTIONS

The coil supply and the return pipe connections are labeled. When attaching piping to the coil header, make the connection only tight enough to prevent leaks. Excessive tightening may cause damage to the header. A backup wrench should be firmly held on the coil connection so that in tightening the connecting piping the torque is not transmitted to the coil header, thus damaging the coil connection.

Application Notes - All connections are male piping thread except DX coils, which are solder. Drain and vent taps on water coils are pipe thread shipped with plugs installed. These taps are installed approximately two inches back from the end of the threaded connections.



Pipe for balanced flow and assure even airflow.

WATER

Water Coils - Drainable Water

Connect the water supply to the header connection on the leaving air side of the coil to achieve the counter flow of water and air. The return pipe will be connected to the remaining coil connection.

Install an air vent in place of the top pipe plug on the return header. In order to provide for drainage, install a drain line and shutoff valve in the supply near the coil or in place of the plug in the supply connection.

Hot Water Coils

The temperature rise of the air leaving the coil is dependent on the airflow across the coil, the gallons of water flow through the coil and the entering water temperature into the coil. Consult the submittal for each specific job for the above information. *Refer to VIFB procedures listed in this section.*

Water Treatment

Any copper tube coils may be attacked by acid condensate. The practice of boiler water treatment should include CO₂ removal to assure longer tube life.

Freeze Protection

Chilled water, hot water and steam coils can be damaged during freezing weather. Precautionary measures must be taken to prevent freezing such as:

- Positive coil freeze protection must be used in installations where any part of the water coil is subjected to temperatures of 32 degrees or lower. This may be accomplished by using a suitable antifreeze solution. If the coil is not in use, it is recommended that the coil be completely drained and the inside of the tubes blown dry with compressed air.
- After draining, flush coils with an antifreeze solution such as ethylene glycol. A solution of 50% ethylene glycol and 50% water will protect from freezing to approximately 35 degrees F below zero at sea level. *Also refer to ASHRAE and ARI guidelines.*
- During winter operation due to the possibility of shutdowns such as power failure, night shutdown and weekend shutdown, the controls should be installed so the return air dampers will go to the full open position, and all fresh air dampers go to the full closed position. A source of auxiliary heat must be maintained inside the unit cabinet.
- Other means of protection such as various electro-mechanical switches and the full constant flow of water can be used; however, YORK will not be responsible for water coils damaged by freezing.

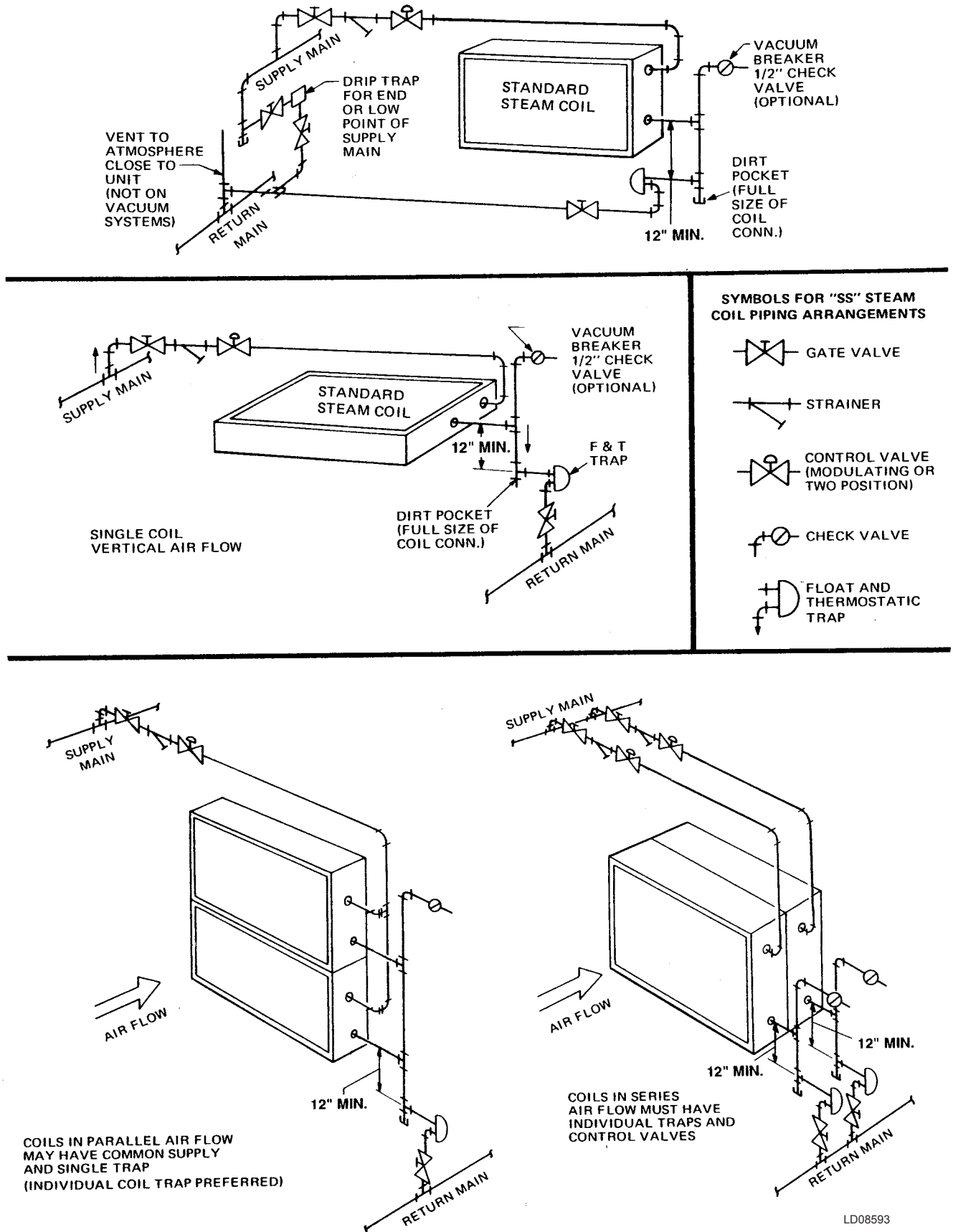


FIG. 2-24 – STEAM COIL PIPING ARRANGEMENTS

STEAM

Refer to Fig. 2-24 "Steam Coil Piping Arrangements."

Steam Coils

The operation of steam coils is dependant on airflow quantity and temperature. Consult the submittal issued for each specific unit for above information.

Steam Distributing Coils

Do not bush or reduce the coil return pipe size. Use a full size return pipe to the bottom of a dirt pocket. The supply pipe may be reduced at the coil connection if necessary. Install the coil casing level with the return down. A coil must be sufficiently elevated to allow a 12-inch minimum drop between the return connection on the coil and the trap. A greater than 2-inch drop is required for protection from freezing. The return main should be located below the trap. *Refer to Figure 2-24.*

Steam Control

Continuous steam supply ensures long coil life and minimizes potential trapping, venting and freezing problems. A rapid cycling of the modulating steam supply or a frequent on-off steam supply control results in repeated thermal and piping stresses which will shorten the coil life. Modulating steam control valves must not be oversized but must be carefully selected. A substantial variation in the supply pressure will require the installation of a pressure-reducing valve ahead of the automatic control valve.

Light load operation with a modulated steam supply can be improved by the installation of a vacuum breaker check valve. An open relief line to the atmosphere from the return line near the coil is desirable, except on vacuum systems.

With a modulated steam supply, it is not practical to lift the condensate to an overhead return. Locate the coil well above the return, or provide condensate unit, or a boiler return trap below the coil.

Individual control valves are required on each coil installed in series with respect to airflow. When a modulating steam valve supplies two or more coils in parallel, with respect to airflow, the piping must be designed to provide for uniform steam distribution to each of the coils.

Steam Traps

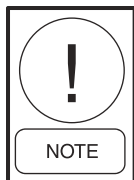
Float and Thermostatic (F. & T.) traps are recommended for all low or medium pressure applications. Use thermostatic traps only for air venting, for outdoor applications where an F. & T. trap might be subject to freezing. Use bucket traps only for a non-modulated steam supply. Size the steam traps in accordance with the manufacturers recommendations (usually several times the steady state steam flow). Use the actual operating conditions (coil pressure vs. return pressure) for the selection of a trap.

It is preferable to provide an individual trap for each coil but a single trap may be used for coils operating in parallel with respect to the airflow. Coils in series with respect to airflow must be supplied with individual traps. Locate the trap at least 12 inches below the coil return connection and even lower when freeze protection is required. Do not attempt to lift condensate modulated steam supply.



FIG. 2-25 – INTEGRAL FACE & BYPASS COIL (HORIZONTAL; TUBES, STEAM SHOWN)

VIFB & IFB



A complete IOM is provided with each IFB or VIFB coil unit.

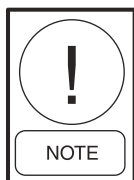
Below 35°, the Vertical Tube Integral Face & Bypass (VIFB) or Integral Face & Bypass (IFB) operates with full steam pressure or full water flow at all times. This prevents freeze-up and temperature stratification.



VIFB lower header must be free to float. After coil has been piped, remove yellow colored bolts to allow header to float. Always "back up" on the coil connections when installing fittings.



VIFB Warranty will be voided should return piping on lower header (inlet and return on two-row header) not include flexible connector(s) and if lower header(s) bolts are not removed prior to use.



See IFB/VIFB manufacturers IOM for additional piping details.

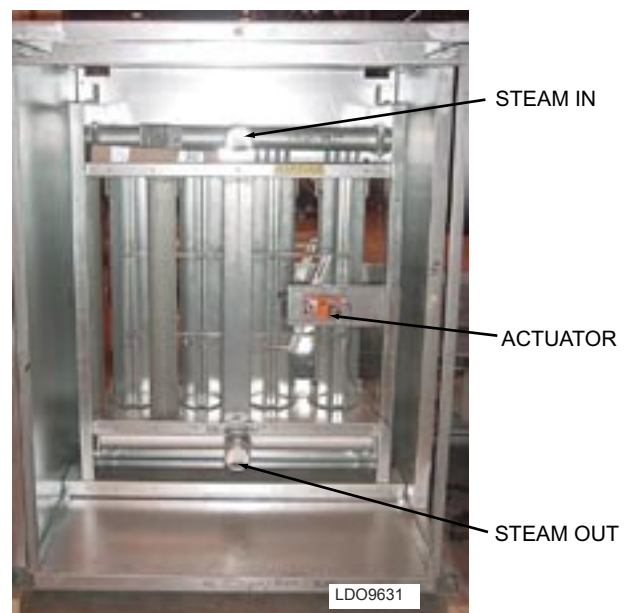


FIG. 2-26 – VERTICAL INTEGRAL FACE & BYPASS COIL (FACE MOUNTED ACTUATOR SHOWN)

Shipping Bolts (VIFB Only)

Return steam condensate headers or hot water supply and return headers are securely bolted to lower mounting brackets to prevent damage to header and tubes during shipment and piping of the coils. These bolts **MUST** be removed before applying steam or hot water but after all piping connections are made.

Piping Suggestions (VIFB & IFB)



See Section 5, “Field Penetrations for Piping & Electrical Connections”

Steam and hot water field piping must be supported separately after the flexible connector to isolate piping strains and additional expansion from the coils.

Internal steam manifolds and piping should be insulated.

Steam traps should be sized for three times the calculated condensate loading at the coil design conditions, based on the pressure differential across the trap, **not the boiler pressure**. Traps should be of types that pass condensate and air at saturated steam temperature. Inverted bucket traps should incorporate thermostatic air vents.

Make return connection full size as required and reduce only at trap. Do not use reducing bushing on coil return connection.

Flexible Connectors (VIFB Only)

Return steam condensate headers, hot water supply, and return headers must be free to float. A flexible connector **MUST** be installed as close as possible to the coil to accommodate a minimum of 1/2” expansion movement of the headers.

Failure to install connectors will restrict expansion of the headers. This can result in bowing of tubes, bending of fins, interference with damper operation, or eventually tube breakage.

Freezing Conditions



Anti-stratification baffles are standard on all IFB and VIFB coils mounted in Solution units.

The outside air and return air must be thoroughly mixed before passing over the coil. When freezing air enters only part of the coil, it creates a greater hazard than when the airflow entering the coil is of a uniform temperature.

Coils used in series with respect to the airflow must have individual controls with ample space between the coils for sensing devices, when required. Coils with two or more rows are more sensitive to freezing than single row coils.

On 100% O.A. capable applications, locate low limit at least 24 “ down stream of leaving edge of VIFB/IFB casing. Low limit element must cross both face and bypass areas, parallel to headers.

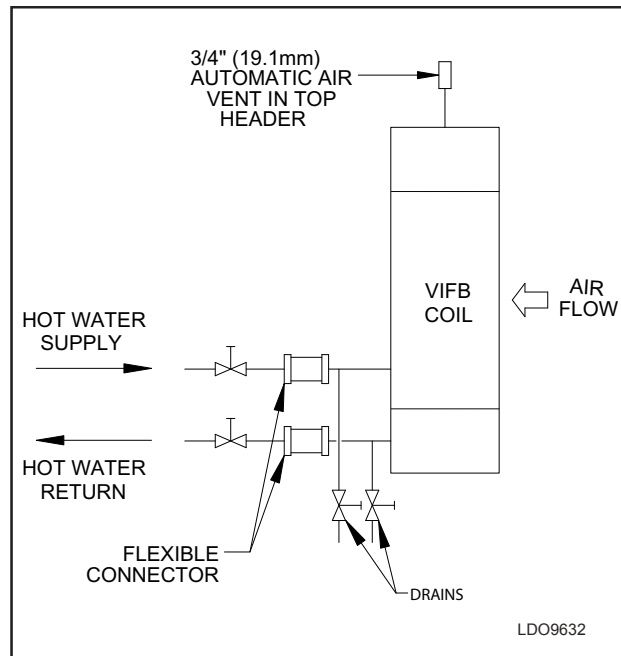


FIG. 2-27 – HOT WATER PIPING FOR 2 ROW COIL VIFB

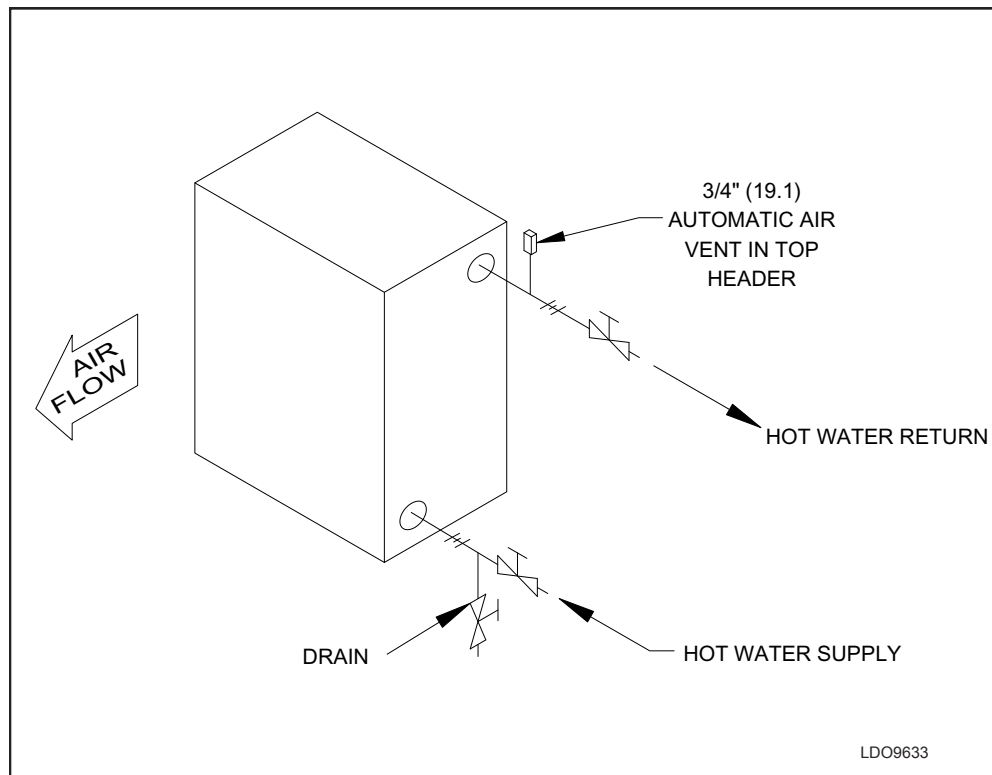
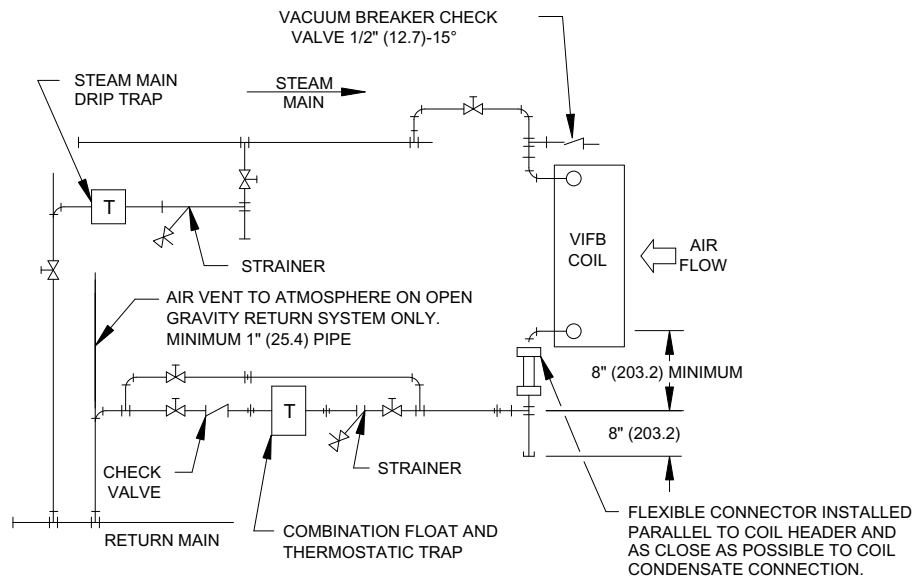
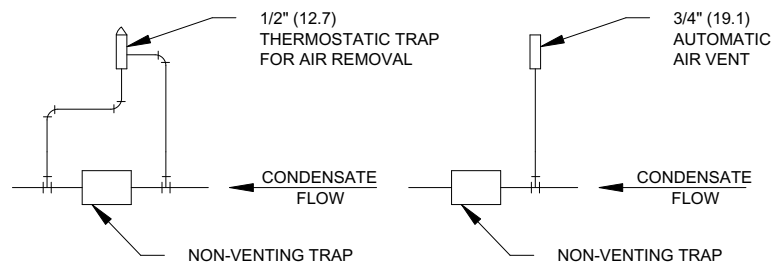


FIG. 2-28 – HOT WATER PIPING FOR IFB

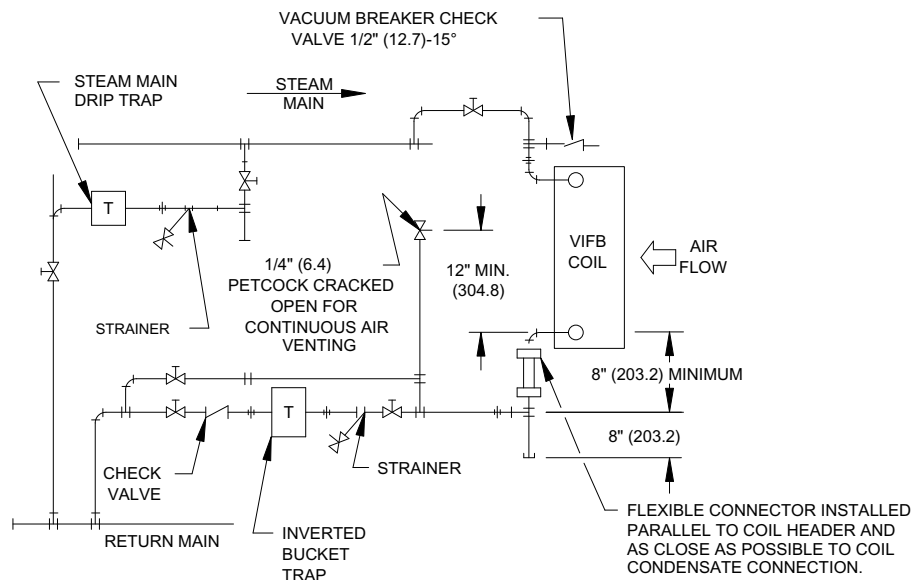
STEAM PRESSURE BELOW 15 PSIG OR 103.4 KPA



Non-venting Traps
(Steam Pressure Below 15 PSIG Or 103.4 KPa)



STEAM PRESSURE ABOVE 15 PSIG OR 103.4 KPA



NOTE : DIMENSIONS ARE IN INCHES.
DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS.

LDO9634

FIG. 2-29 – STEAM PIPING FOR VIFB COIL

REFRIGERATION

Direct Expansion Coils (DX)

DX coils are divided into splits depending upon the unit size and coil circuiting. Each split requires its own distributor nozzle, expansion valve and suction piping. Suction headers are on the air entering side with suction connection at bottom end of headers when the coil is properly installed. Matching distributor connections for each coil refrigeration circuit are on the air leaving side. See certified drawing and/or connection labeling to ensure correct matching of suction and distributor connections.



Direct-expansion coils are shipped charged with nitrogen.

Do not leave piping open to the atmosphere unnecessarily. Water and water vapor are detrimental to the refrigerant system. Until the piping is complete, recap the system and charge with nitrogen at the end of each workday. Clean all piping connections before brazing joints.

The orientation of the refrigerant distributor is not critical but the distributor tubes must not be kinked or bent in a non-uniform configuration. For this and other piping & sundry tips, *refer to Figure 2-30*.

The orientation of the refrigerant distributor is not critical but the distributor tubes must not be kinked or bent in a non-uniform configuration. For this and other piping & sundry tips, *refer to Figure 2-30*.

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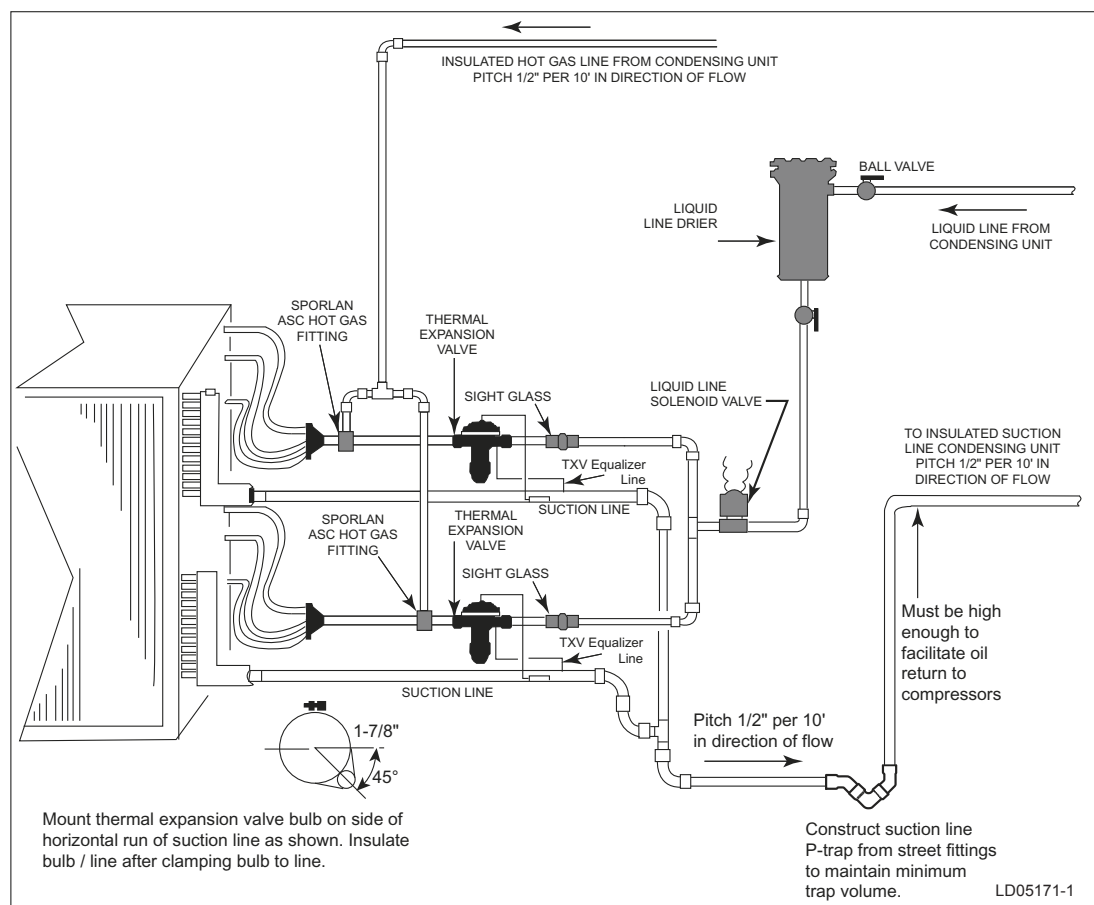


FIG. 2-30 – TYPICAL PIPING AND SUNDRIES AT THE DX COIL

DX Coil Types

There are three basic types of coil arrangements used in field erected split systems, interlaced, row split and face split.

Interlaced

Interlaced coils are the most desirable type of coil "field erected" designs. Interlaced coils ensure the entire face of the coil is active with any number of compressors operating. Interlaced circuitry interweaves coil tubing in both circuits across the entire face of the coil assuring uniform cooling of the air by the refrigerant. This type of coil also allows one circuit to operate while the other circuit is turned off. Interlaced coils provide excellent temperature control at full and part loads as well as good TXV superheat control. TXV control is essential for compressor reliability.

Row Split

Row split coils arrangements place coils back to back in the air stream. Air passes through one coil before passing through the next. Generally, the last coil in the air stream is activated first. Each circuit may be controlled independently in this arrangement. When both coils are operating, the coil closest to the leaving air will operate at a lower temperature. This type of coil may not permit lead lag of the circuits and it may be difficult to balance the capacity between the coils.

Face Split:

On a face split coil, the circuiting is divided between two separate coils. In field-erected systems, this arrangement may suffer from TXV superheat control problems and compressor reliability. At low airflow, low load situations, the TXV may have difficulty controlling system superheat.

Air stratification, poor humidity control and condensation on downstream components can also occur when using face split coils. One way to address TXV control at part load is to provide a face damper to shutoff airflow when a coil face is inactive.

Combined Coil Types

Coil types may be combined in some systems. This requires special care. Control sequences and piping tying the multiple systems and coils together should be well thought out and advice from an experienced design engineer is necessary.

DX Coil Circuiting

On many coil banks, two, or even all three of the methods of circuiting may be combined depending upon the cooling capacity and the level of control required. However, coil sections must be married or combined so that they provide for full-face operation (see Fig. 2-31).

There are numerous coil arrangements available from the Coil Marketing group as either standard designs or contract engineering SQ optional designs. The coil designs fall into the two following categories.

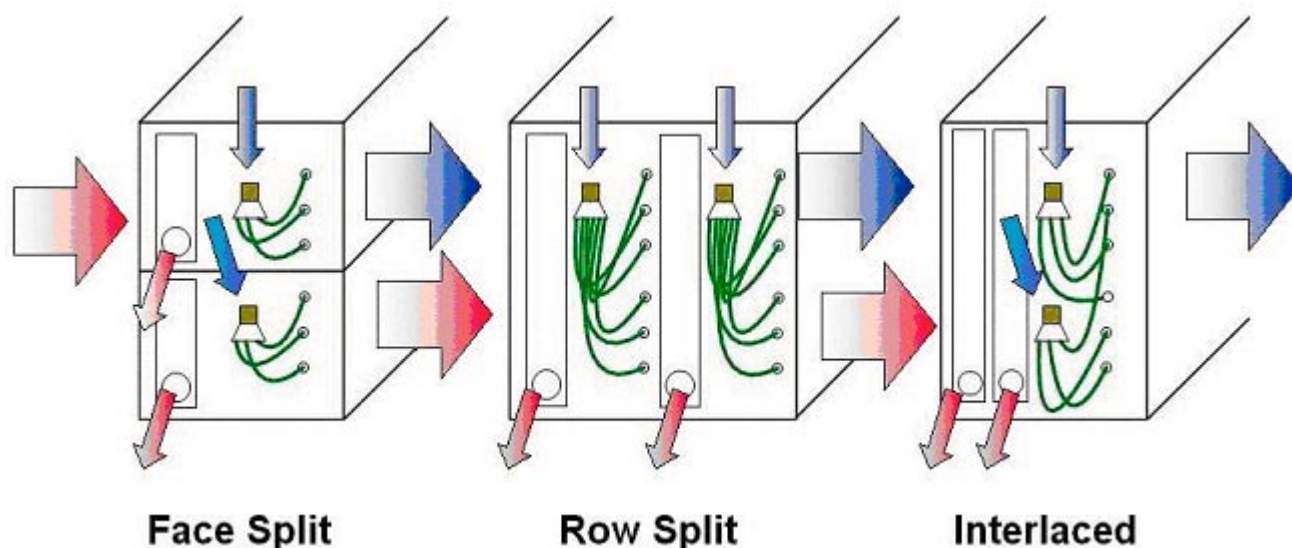
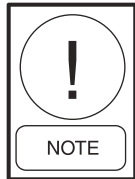


FIG. 2-31 – DX COIL CIRCUITING TYPES

LD09136

Coil Design	Fin Height
Non-Tall	48" and less
Tall	Greater than 48"

Figs. 2-32 through 2-36 illustrate the available coil arrangements. Contact coil marketing for other arrangements not shown.



Face-split DX coils must be configured to provide full-face coverage at all condensing unit load steps. YORK assumes no responsibility for compressor failure if full-face coverage is not applied. Consult the factory, if application assistance is needed to convert split face to full-face operation.

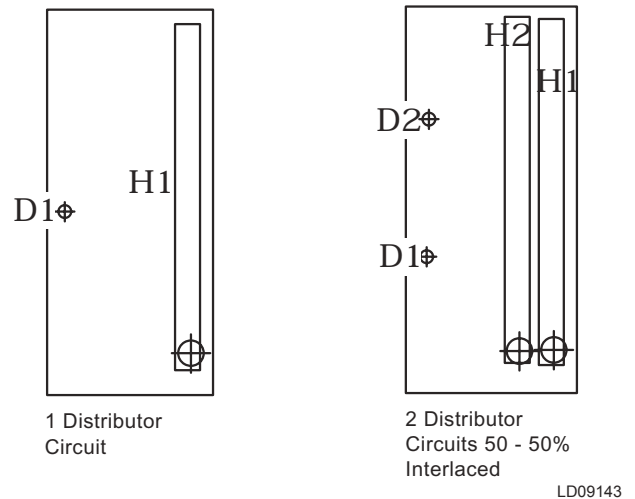


FIG. 2-32 – NON-TALL COIL DESIGN - STANDARD

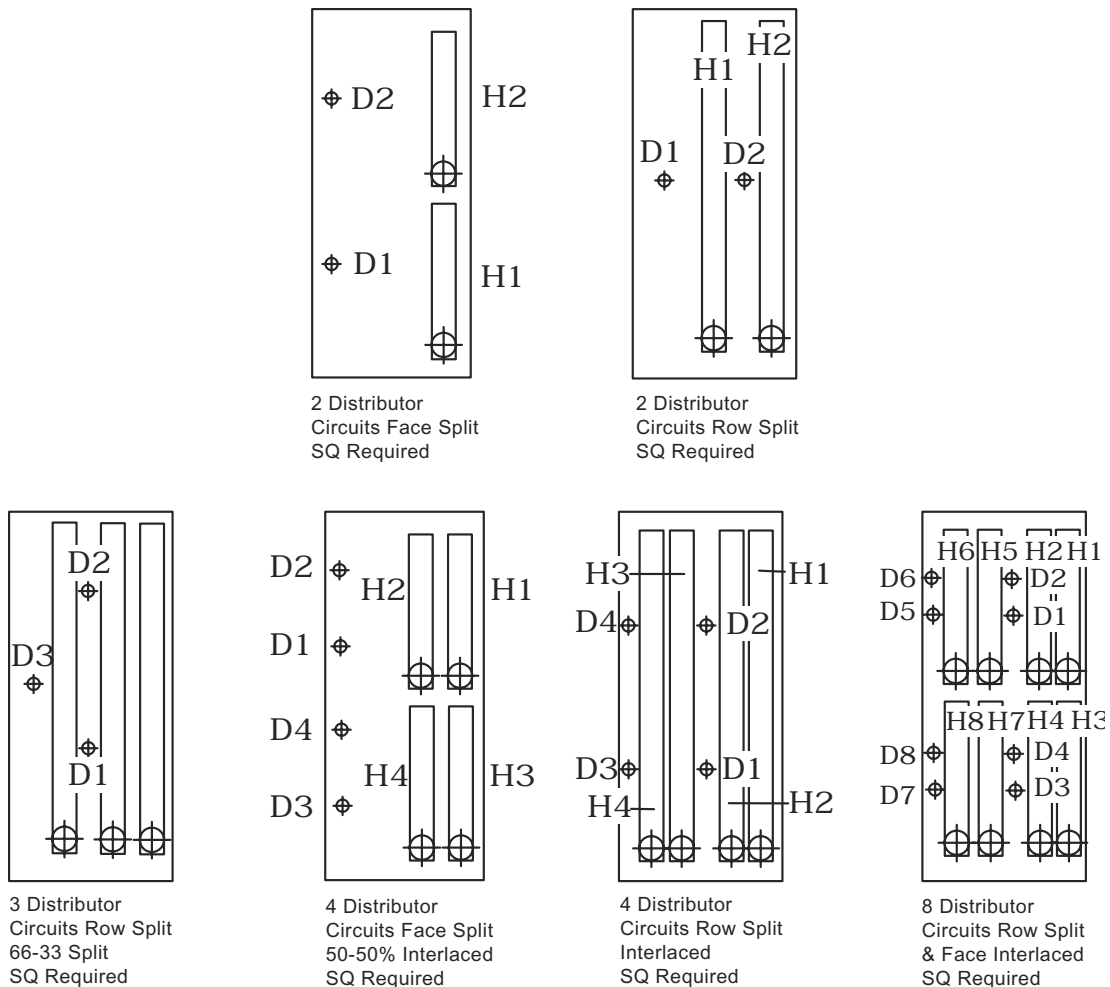


FIG. 2-33 – NON-TALL COIL DESIGN - SQ SPECIAL

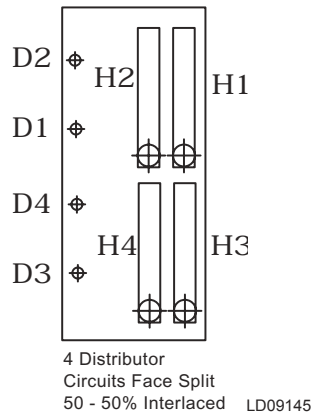


FIG. 2-34 – TALL COIL DESIGN - STANDARD

DX Coil Circuiting And Staging

On tall coils, a minimum of four coil circuits should be used to achieve full-face control (Fig. 2-35). Each coil distributor circuit requires its own Thermostatic Expansion Valve (TXV). Each condensing unit circuit requires its own liquid line solenoid valve (LLSV). When the condensing unit has two compressors per refrigerant circuit, either one or two coil circuits may be used for each refrigerant circuit depending upon the cooling capacity.

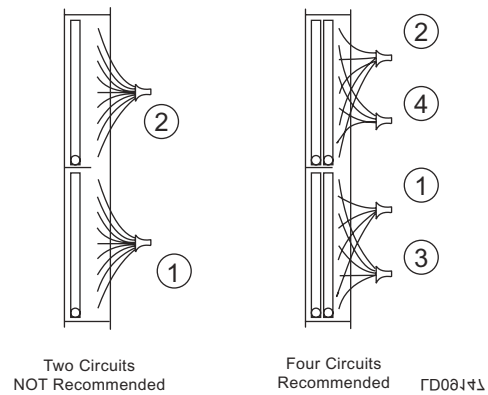


FIG. 2-35 – TALL COIL CIRCUITING

If one coil circuit is used (Fig. 2-37), the LLSV and TXV must be sized to handle the full capacity of the refrigerant circuit. When two coil circuits are used per refrigerant circuit (Fig. 2-38), each TXV should be sized to handle half of the capacity of the refrigerant circuit and the LLSV should be sized to handle the full capacity of the refrigerant circuit.

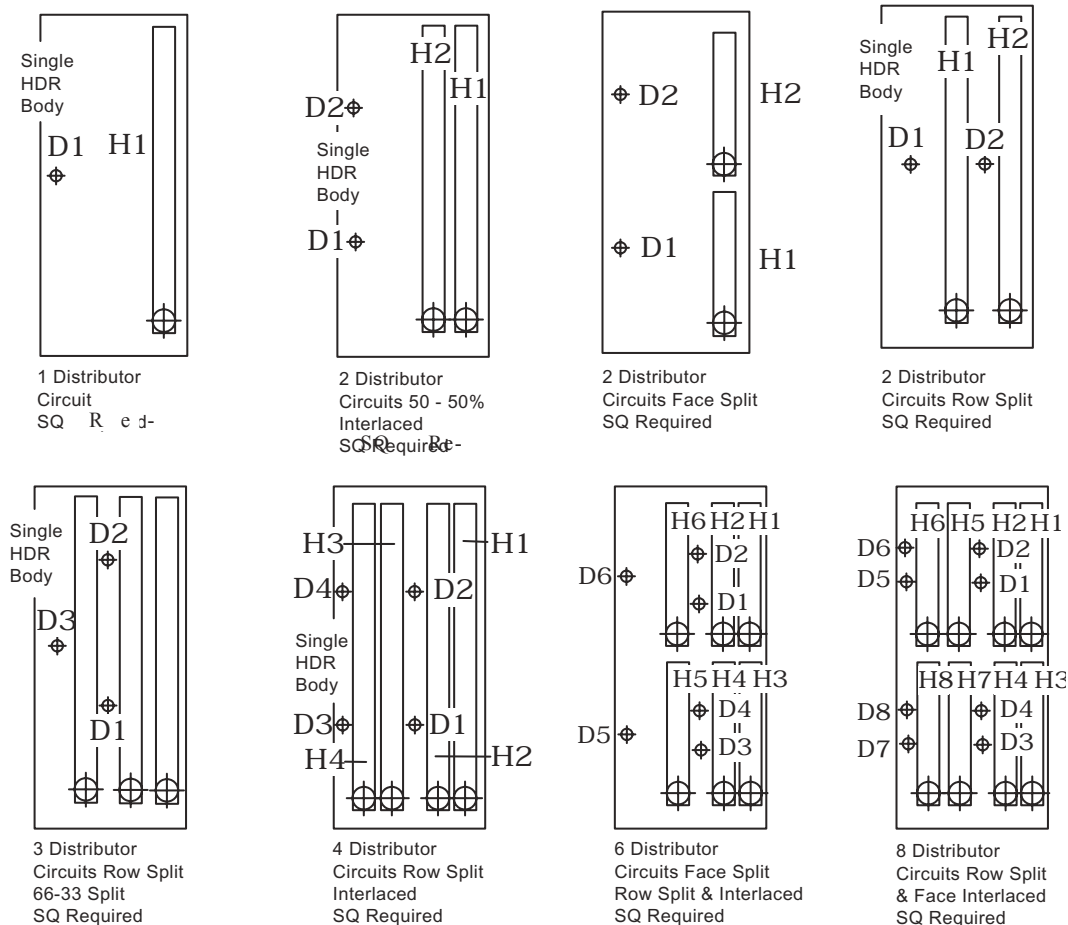
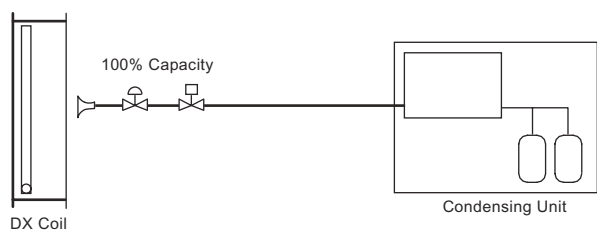


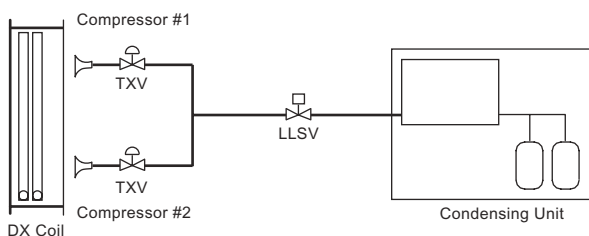
FIG. 2-36 – TALL COIL DESIGNS - SQ SPECIAL

LD09146



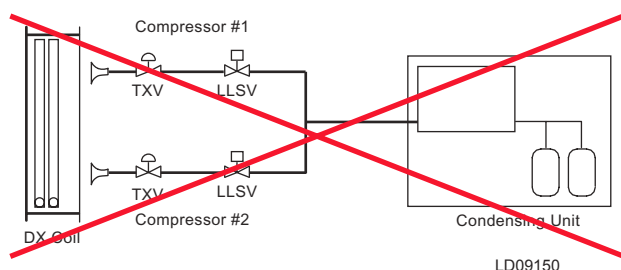
LD09148

FIG. 2-37 – ONE COIL CIRCUIT PER REFRIGERANT CIRCUIT



LD09149

FIG. 2-38 – TWO COIL CIRCUITS PER REFRIGERANT CIRCUIT

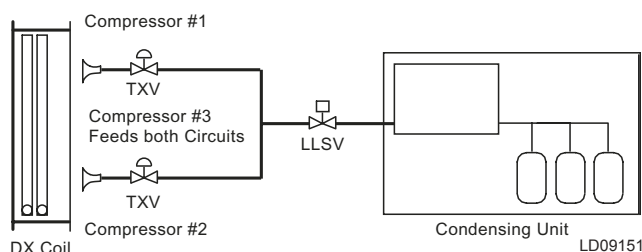


LD09150

FIG. 2-39 – DO NOT USE THE ABOVE CONFIGURATION.

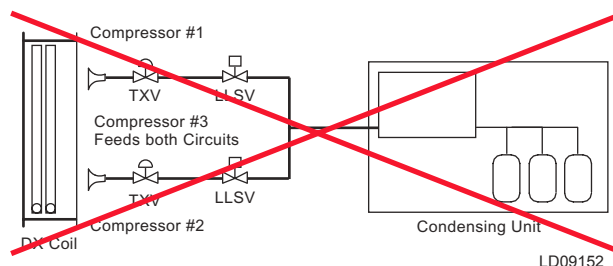
When the condensing unit has three compressors per circuit, two coil circuits should be used for each refrigerant circuit (Fig. 2-40). Each coil circuit must have a dedicated TXV and distributor to handle one coil circuit and the LLSV should be sized to handle the full capacity of the refrigerant circuit. The hot gas bypass line should be connected to all of the distributors in the coil circuit.

In the case of a tall coil with four coil circuits piped to a condenser with six compressors, the coil circuits would be face-split and interlaced with two interlaced circuits on the lower coil section and two on the upper (Fig. 2-42).



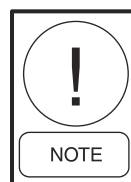
LD09151

FIG. 2-40 – THREE COMPRESSOR YCUL



LD09152

FIG. 2-41 – DO NOT USE THE ABOVE CONFIGURATION.



When sizing TXV's, each TXV must be sized for the refrigerant circuit tonnage divided by the number of DX coil liquid distributors. The TXV should be equal to or smaller than the calculated value.

2

The first three compressors (see Fig. 2-42) would be tied into LLSV1, TXV1 and TXV2. This would provide full-face control of the coil at even the lowest cooling loads. Both distributors on each of the coil circuits would include auxiliary side connectors for HGBP.

The second set of 3 compressors would be tied into LLSV2, TXV3 and TXV4 to maintain full-face control at higher loads. Reference Form 050.40-ES3 Section 9 for compressor staging solutions.

The more control stages used, the more precise the control of the air temperature will be. Smaller incremental changes in capacity will result in a more consistent DX coil leaving air temperature. This will eliminate temperature swings in the conditioned space and improve the comfort level, but more importantly, a consistent space temperature is crucial to many process applications. The smaller changes in capacity that result from using a greater number of control stages will also extend equipment life. The most important thing to remember is to maintain full-face control of the coil at all cooling loads. When row split coils are used, make sure that the first LLSV is energized with the last coil circuit in the leaving air stream. This is always the last one de-energized too.

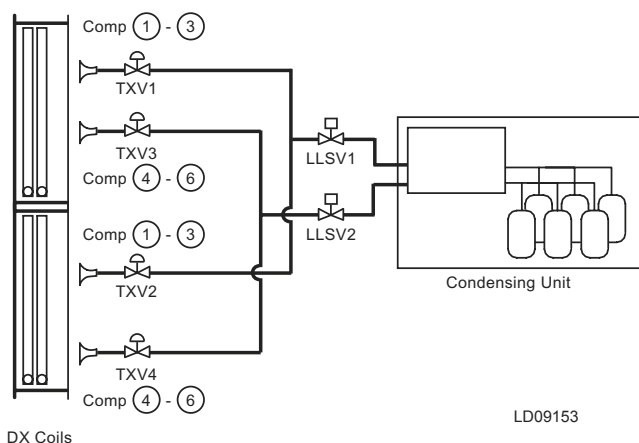


FIG. 2-42 – SIX COMPRESSOR YCUL

Thermostatic Expansion Valves (TXV)

Each coil distributor circuit requires its own Thermostatic Expansion Valve (TXV). Each condensing unit circuit requires its own liquid line solenoid valve (LLSV). TXV's are to be equipped with external equalizer tubes that are field connected to the suction line. The valve should be sized in accordance with the valve manufacturers recommendations, allowing approximately 35-PSI pressure drop throughout the coil and distributor at full load. Do not oversize the valve. Follow the valve manufacturer's instructions on the location of the thermostatic bulb. Proper expansion valve operation is necessary in order to realize the rated coil capacity.

When a DX type coil is operated with a suction temperature below 32°F, a build up of frost will occur on the finned surface. It is, not recommended therefore, to operate DX coils for air conditioning purposes at below freezing suction temperatures. If the full load operating point for the coil is selected at a "safe" temperature, a system analysis is required to check for the lowest probable suction temperature at light load conditions.

Hot Gas Bypass

When using discharge air temperature control or systems with outside air economizer cooling, always include hot gas bypass (HGBP). It is not as critical to use HGBP with return duct air temperature control, or suction pressure control, but it provides better capacity control at low loads.

The venturi type distributor furnished with YORK DX coils may be ordered for field application of a hot gas bypass valve. The connection may be made through a tee installed in the field between the expansion valve and distributor. The system balance point and control adjustments must assure compressor cooling and avoid excessive compressor cycling. Refer to form 50.40-ES3, Section 3.

Maintaining Adequate Airflow

An electrical interlock between the air handler and the condenser must be included for permissive run of the condenser. In addition, a differential pressure switch mounted across the supply fan must always be included to ensure airflow across the coil before the condensing unit is energized. The condenser must never be operated unless the air handler fan is operating and air is flowing across the active coil. Insufficient airflow will result in liquid refrigerant returning to the condensing unit, which could damage the compressors by liquid slugging or washing oil from the bearing surfaces.



In variable volume systems, the minimum acceptable airflow for fixed speed or VAV systems is 350 FPM face velocity across each DX coil, as applied to split DX systems. This is critical to assure that the TXV does not overfeed, causing compressor failure.

The air velocity flowing through chilled water and direct expansion coils must not exceed specific recommended values, to prevent water carryover.

VAV Systems

Overhead variable air volume systems have been the preferred method of air distribution since the early 1970 's. Overhead VAV systems offered greater energy efficiency and better control of building diversity than constant volume systems. Unlike a constant volume system, in which the leaving air temperature is adjusted to satisfy the cooling load, in a VAV system the air temperature remains constant and the air volume is varied to meet the cooling requirements.

There are four basic components in a VAV system - an air-handling unit with airflow control (i.e. variable-speed drives), VAV boxes, zone thermostats and duct static pressure sensors. All of these components must work together to provide good temperature control and a comfortable environment. The zone thermostats control the VAV boxes. As the zone temperature increases, the VAV boxes open to allow greater airflow into the space and as the zone temperature decreases, the VAV boxes close to decrease the airflow to the space.

As the VAV boxes in the system open and close the static pressure in the ductwork changes. When a box opens, the duct static pressure decreases, and when a box closes, the duct static pressure increases. The duct static pressure sensor controls the air handling unit supply fan. Since an increase in duct pressure relates to a decrease in the zone airflow required, the supply fan volume decreases in response. Conversely, a lower duct static pressure indicates a need for increased zone airflow; therefore, the supply fan volume increases in response. The change in supply air volume is accomplished using a variable frequency drive or similar device.

In the air-handling unit a decrease in airflow through the DX coil will result in a corresponding decrease in the suction gas pressure while an increase in airflow will result in an increase in the suction gas pressure. Since the system is designed to maintain a constant suction gas pressure, the compressors will be staged on or off as needed to meet the increase or decrease in load demand. The system should be designed to operate smoothly avoiding transients that could upset system balance and cause liquid flood back.



Problems can arise if the airflow decreases more quickly than the compressor control can respond to the load change. Therefore, airflow should never change at a rate faster than 3% per minute on VAV systems.

This limitation will promote stable control of the system and minimize fluctuations in zone temperature. Under any circumstances, a minimum of 350 FPM face velocity across the coil must be maintained for DX split systems.



Testing of Drain Pans - *To minimize conditions of water stagnation that may result in microbial growth, drain pans shall be field-tested under normal operating conditions to ensure proper drainage.*

Exception: *Field testing of drain pans is not required if units with factory-installed drain pans have been certified (attested in writing) by the manufacturer for proper drainage when installed as recommended.*

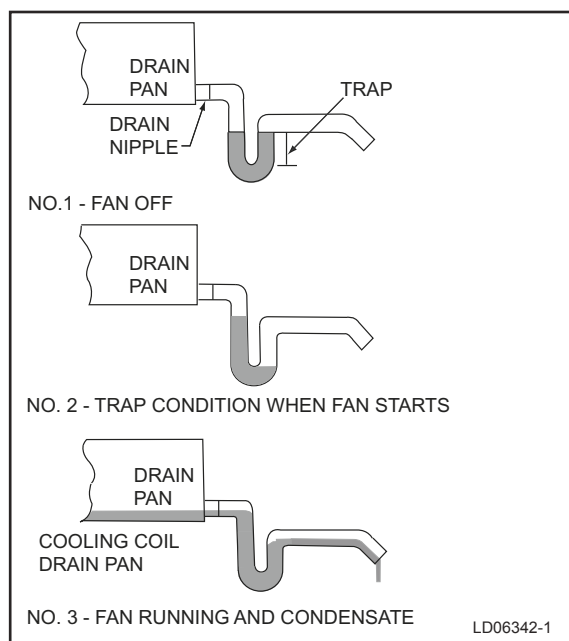


FIG. 2-43 – DRAIN TRAP SHOWING WATER LOCATION DURING DRAW THROUGH OPERATION STAGES

DRAIN

Condensate Drain Piping

The majority of cooling coils are located in the units so that the supply air is drawn through them. This results in the condensate being subjected to negative (-) static pressure. Unless some means of pressure equalization is provided in the condensate drain, the air rushing back through the drainpipe will cause the condensate to build up in the drain pan. As the unit continues to operate, the accumulated water will be carried with the air stream, overflowing the drain pan causing possible water leaks into the supply duct and/or causing water damage in the building. A trap must be installed to prevent this condensate water build-up (see Figures 2-43 and 2-44).

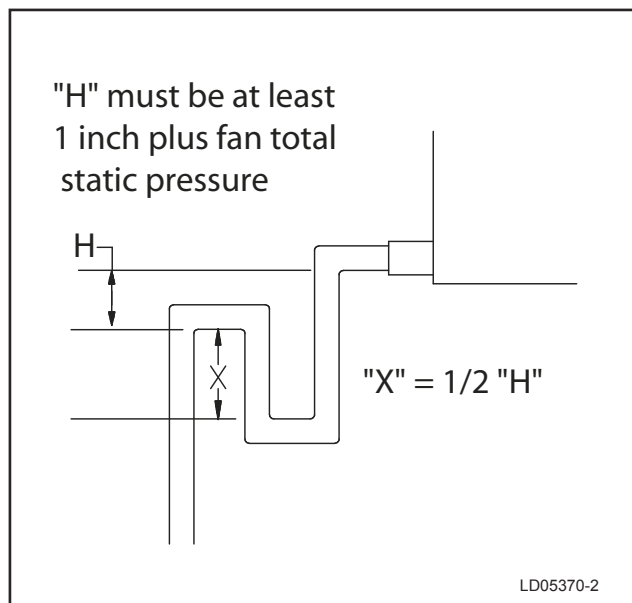


FIG. 2-44 - TRAP DETAIL FOR DRAW THROUGH APPLICATION

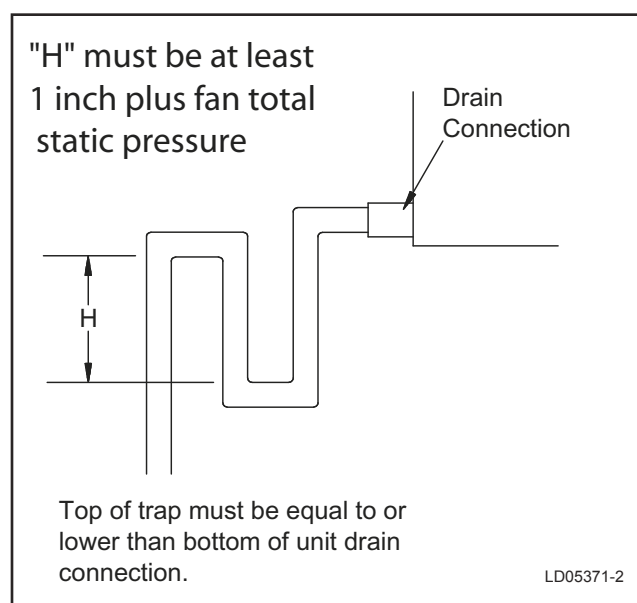


FIG. 2-45 – TRAP DETAIL FOR BLOW THROUGH APPLICATION

Condensate Drain Trap

For "Draw-through" applications install a trapped condensate drain line at unit drain connection (see Figure 2-44) according to all governing codes. "H" dimension must be at least 1 inch greater than design Total Static Pressure (TSP) of fan.

For "Blow-thru" applications, the same principles apply, but the leaving pipe must be as shown in Figure 2-45 for proper trap design.

Two or more drains on same side of unit must be trapped individually before drain lines can be combined and routed to a suitable drain (*see Figure 2-46*).

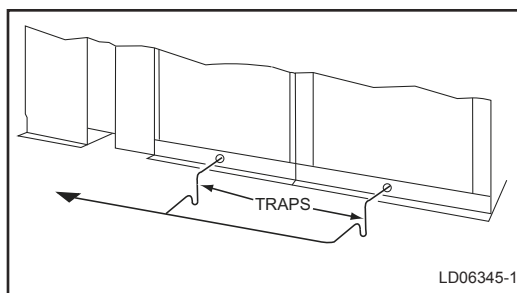


FIG. 2-46 – COMBINING DRAIN LINES

If distance from drain pan outlet to trap exceeds 10', install additional clean outs for each 10' segment of horizontal drain line (min. 1/4 in. per foot fall required).

On initial startup, it may be necessary to fill the trap manually.

Elevating Unit For Gravity Floor Drain Connections

On indoor units, the installer must provide a means of pumping or draining coil condensate water away from the unit. The installer may have to elevate the unit to provide space below the condensate drain of the unit to install properly designed drain trap(s) to permit gravity flow of condensate water from the drain pan (*see Figures 2-3, 2-4 & 2-5*).



Field-testing is not required when drain traps installed per the above instructions.

DUCT CONNECTIONS



Duct must have positive seal to unit openings

DUCT CONNECTION GUIDELINES

See Figure 2-47.

All intake and discharge air duct connections to the unit may be made directly to the unit with the exception of external isolation options. These air duct connections should be of flexible material and should be installed so they are sufficiently loose. Air duct connections should be designed and installed according to AMCA Standards 200 & 201 as a minimum. Duct turns and transitions must be made carefully to hold friction loss to a minimum. Avoid short turns. Duct elbows should contain splitters or turning vanes.

The Effective Duct Length connected to the fan or unit discharge should run in a straight line for at least 2.5 Equivalent Discharge Diameters for up to 2500 FPM fan outlet velocity and one additional diameter for each additional 1000 FPM fan outlet velocity. This ductwork should be no greater than 105.5% or no less than 85.5% of the discharge area. In addition, the slope of the transition elements should not be greater than 15% for converging elements, or greater than 7% for diverging elements.

To find the Equivalent Discharge Diameter:

$$EDD = \sqrt{4ab/\pi}$$

The letters “a” and “b” represent the height and width of the Discharge.

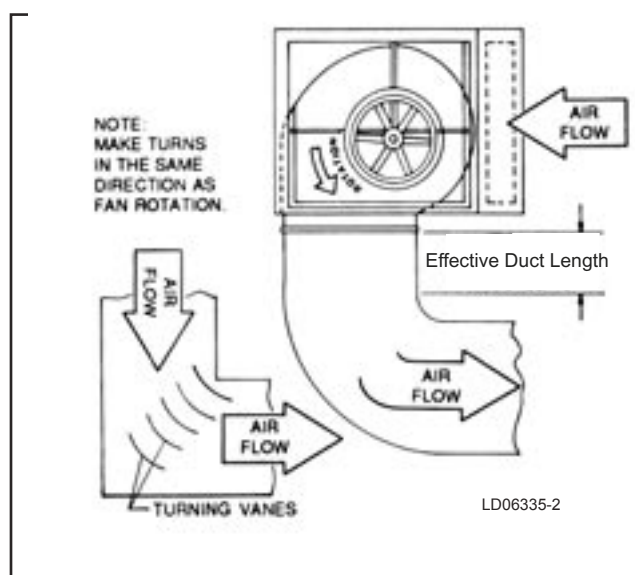


FIG. 2-47 – RECOMMENDED DISCHARGE DUCT ARRANGEMENT WHEN TURNS ARE REQUIRED

A duct turn should be in the same direction as the fan rotation. Never deadhead the discharge into the flat surface of a plenum.

On curb-mounted units with a down discharge, duct connections are contained within the roof curb.

The performance ratings of coils will be met only if the airflow is uniform over the face of the coils. High air velocity spots on the coil may cause the carry-over of moisture from the coil. Low air velocity areas of the coil will not deliver the published ratings. The duct connections must be designed to provide for uniform flow of air across the face of the coil. The entering duct must provide a smooth transition from any high velocity effects. Stratifications of return air, especially where below freezing outside air enters, must be avoided to prevent coil freeze-up or nuisance low limit trips.

SOUND AND VIBRATION TRANSMISSION

All roof mounted air-handling units generate some sound and vibration that may or may not require some special treatment of the air-conditioned space. The noise generated by the air-handling unit is dependent on the speed of the fan, the amount of air the fan is moving, the fan type and the static efficiency of the fan. In applications where sound and vibration transmissions may be objectionable, good acoustical engineering practices must be incorporated in the system design.



On units with return fans, it is especially important to consider the effects of sound transmission into the conditioned space.

When a unit is used with a ceiling plenum return air system, sound may be transmitted from the unit through the ceiling to the conditioned space. For such applications, there should be a sound absorption chamber installed near the unit return air inlet. Various reference sources are available regarding acoustic design.

FRONT DISCHARGE OUTDOOR UNIT DUCT INSTALLATION

- Roof penetrations by ducts should utilize counter flashed curbs. (Typical arrangements are shown in Figure 2-48.)
- All penetrations into ducts should be sealed watertight. Attachment of supports should use a minimum number of duct penetrations.
- Duct systems should not be pressurized without sufficient time for curing of sealant systems. Follow sealant manufacturers recommendations for application of the sealant.
- Adequate clearances between ducts and roof penetration openings should be provided.
- Ducts should be supported to avoid transfer of duct weight across flexible connections (see Figure 2-49).

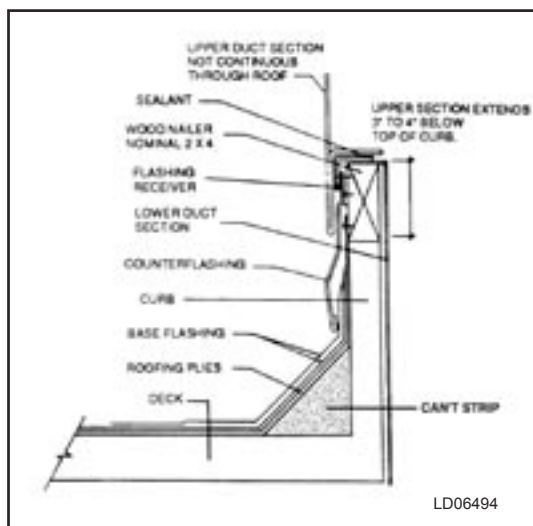


FIG. 2-48 – DUCT PENETRATION OF ROOF

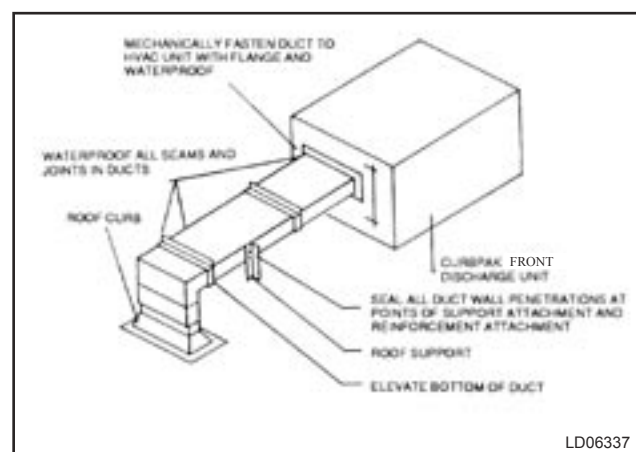


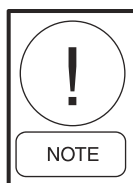
FIG. 2-49 – ROOF TO DUCT INSTALLATION - HORIZONTAL DISCHARGE

- Horizontal ducts should be pitched and provided with drainage outlets as illustrated (by the system designer).
- Ducts should be installed at a height sufficient to install roofing and flashing.

AIR FILTERS

It is mandatory that filters be in place in the filter frames of each unit before putting the unit into operation to protect the coils and keep them clean.

Due to the wide variety of filters it is not possible to cover all of them in this section.



Be sure to install all filters in the correct orientation with regard to air flow and with pleats or pockets vertical. See Section 4, "Filter Segments"

POST INSTALLATION INSPECTION

When the equipment has been set in its final location, the following must be done:

- Remove all plastic spacers between doors and door frames (see Figure 2-50).

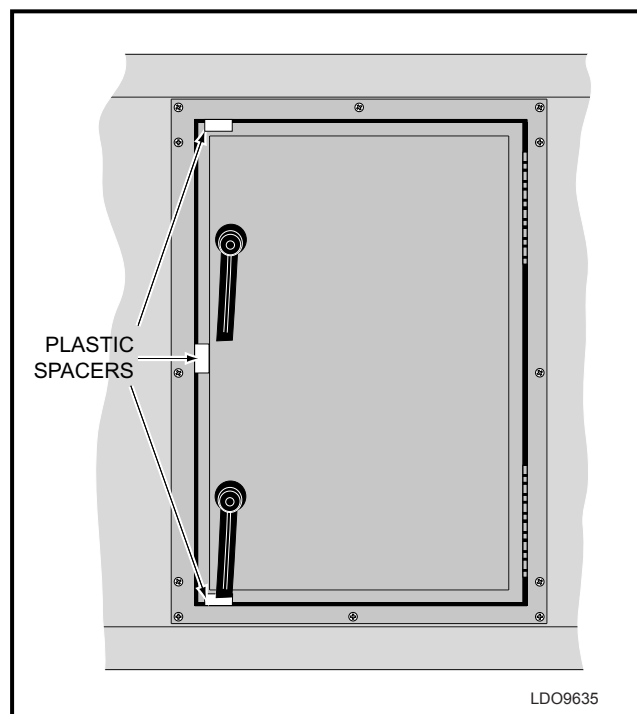


FIG. 2-50 – REMOVE PLASTIC SPACERS BETWEEN DOORS AND DOOR FRAMES

- Check all caulked seams and air seal. Re-caulk if and where caulking has been broken.
- Check all door latches and readjust if necessary to maintain a good tight seal.

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3.0 STARTUP



Rotating parts and electrical shock hazards exist. Lock out and tag out the fan motor(s) and heat power disconnects before servicing. York service personnel should refer to the “YORK Field Service Employee Safety Manual”, 50.05-SM1. Independent contractors refer to OSHA Lockout/Tag out Standard, 29 CFR 1910.147. Failure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this IOM.



Always replace RED metal tab on access doors that provide access to moving parts. This mechanical protection from moving parts is required by UL-1995.

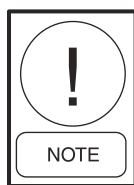
Always replace RED metal tab on access doors that provide access to pressurized areas. This mechanical protection is to prevent accidental release of access doors under positive pressure.



To prevent damage to the duct system, dampers and air handler, insure that duct system, dampers and other equipment will not cause obstruction of airflow.



While it is a common practice to operate the fan as soon as possible (air movement during construction is always preferred by contractors) on the job site, the incomplete ductwork and missing diffuser grilles will greatly reduce air resistance and will allow the fan to operate beyond design parameters. This practice may result in water carry over and flooding of the unit. Also, the motor may over Amp and become damaged.



Fan manufacturers describe the rotation of the fan impeller as being “clockwise” or “counterclockwise” for centrifugal fans when viewing the drive side (see AMCA Standard 2406).



If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

PRE START-UP

Refer to air handler start-up checklist, form 100.00.CL1 (303) provided with information package shipped with unit. Perform a general inspection. Identify and perform appropriate “lock out/tag out” and safety rules. For details on points below, see appropriate section of Installation, Operation, Maintenance manual provided with each air handler. For VFD equipped air handlers, refer to the VFD literature for additional start-up requirements.

- Verify equipment received as ordered.
- Check for damage to the interior and exterior of unit.
- Verify unit installed on flat and level surface.
- Ensure terminal screws and wiring connections secure in control, electric and Air Modulator panels.
- Verify air hoods installed properly.
- Verify condensate drain properly trapped.
- Verify all wiring and tubing connections made at shipping splits.
- Verify all field-piping connections complete.
- Verify all shipped loose parts installed.
- Verify all ductwork is complete and available for full airflow.



• Verify installer has removed all dirt, debris, hardware, mold, etc. from interior of air handler and ducts.

- Verify unit installed with proper clearances.
- Visually inspect roof curb for tight seal around unit.

- Ensure clean air filters installed properly and secured (*see Figures 4-22 and 4-23 and Tables 4-9 & 4-10*).
- Verify filter gauge set to zero.
- Inspect all field wiring for completeness.
- Verify all shipping splits sealed and secured properly.
- Verify pipe chase floor sealed at penetrations.
- Verify all shipping bolts and other material have been removed.



Do not remove functional bolts from seismic isolators (*see Figure 3-4*).

- Verify all plastic spacers have been removed between doors and door frames.
- Ensure damper linkage is tight and in correct "power off" position.



Return air dampers may be closed for shipping. Loosen actuator or crank arm on jackshaft, open dampers, and retighten actuator or crank arm.

- Verify controls installation complete.
 - Contractor Furnished Controls - Controls contractor is responsible for safe and proper control of air handler.
 - Factory Furnished Controls - See Optilogic Factory Packaged Controls (OFPC).

PRE START UP FAN ASSEMBLY INSPECTION



When the unit is removed from long-term storage moisture laden bearing grease should be purged and replenished with fresh grease per lubrication decal. The motor should be meggered to verify that the resistance is still at a satisfactory level compared to the value recorded prior to storage.

- Check the bearings and locking collars (*refer to Table 3-1, "Torque for Tightening Setscrews"*).
- Verify fan wheel properly aligned, tight on shaft and freely moving.

TABLE 3-1 – TORQUE FOR TIGHTENING SET-SCREWS

setscrew dia.	hex. size across flats	min. recommended torque	
		inch lbs.	foot lbs.
1/4	1/8	66 - 85	5.5 - 7.08
5/16	5/32	126 - 164	10.5 - 13.7
3/8	3/16	228 - 296	19.0 - 24.7
7/16	7/32	348 - 452	29.0 - 35.7
1/2	1/4	504 - 655	42.0 - 54.6
5/8	5/16	1104 - 1435	92.0 - 119.6

- Ensure fan bearings properly lubricated (*see Section 4, "Fan Bearing Lubrication"*).
- Belts and Sheaves
 1. Verify sheaves properly aligned and tight on shaft. Improper sheave alignment and belt tension are potential causes of excessive noise and vibration, as well as shortened belt and bearing life (*see Section 4, "Sheaves Alignment"*).
 2. Adjust the belt tension as described in the maintenance section of this instruction. Belt tension is very important on notched belts and tension requirements are different, as shown on label located on the fan housing (*see Section 4, "Belts"*).
 3. Ensure motor mounting bolts and adjustable motor base bolts are tight.

MOTORS - ODP VS. TEFC

See Figure 3-1 for ODP.



LDO9635

FIG. 3-1 – ODP (OPEN DRIP PROOF)

See Figure 3-2 for TEFC.



FIG. 3-2 – TEFC (TOTALLY ENCLOSED FAN COOLED)

ISOLATORS

Check fan base isolators and thrust restraints for proper adjustment.

- Standard fan isolation consists of spring isolators (see Figure 3-3) mounted under the internal fan assembly.
- Fig. 3-4 shows seismic snubber restraint option.
- For Thrust Restraint adjustment procedures, when applied, (see Section 5.0).

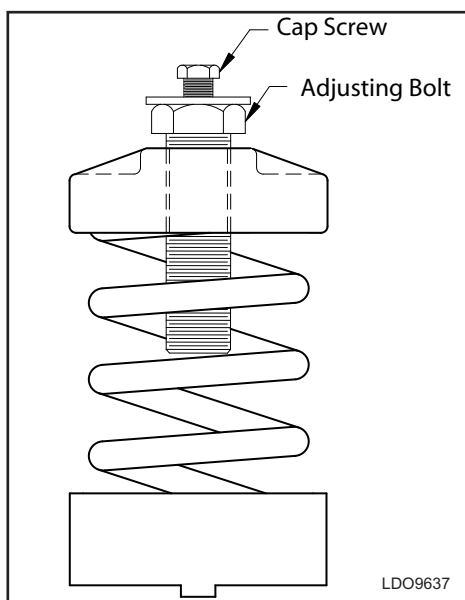


FIG. 3-3 – SPRING ISOLATOR

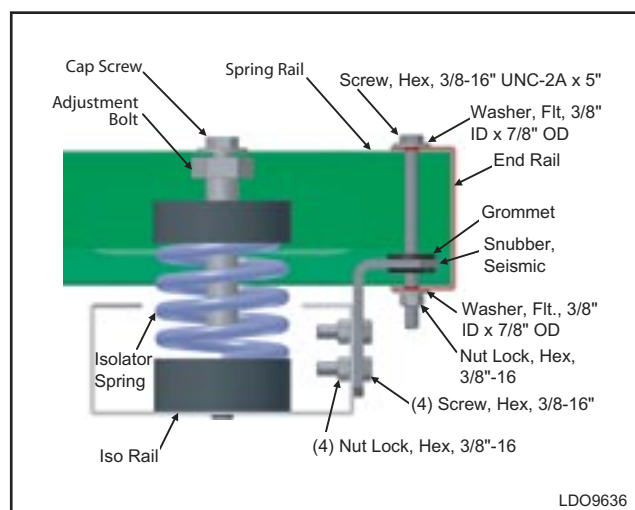


FIG. 3-4 – SEISMIC SNUBBER

Preparing Fan Isolators for operation:

1. Loosen tie down bolts and/or remove the shipping blocks from the internal fan assembly (see Figure 3-5).
2. Check blower/motor frame for correct height and that the frame is level.

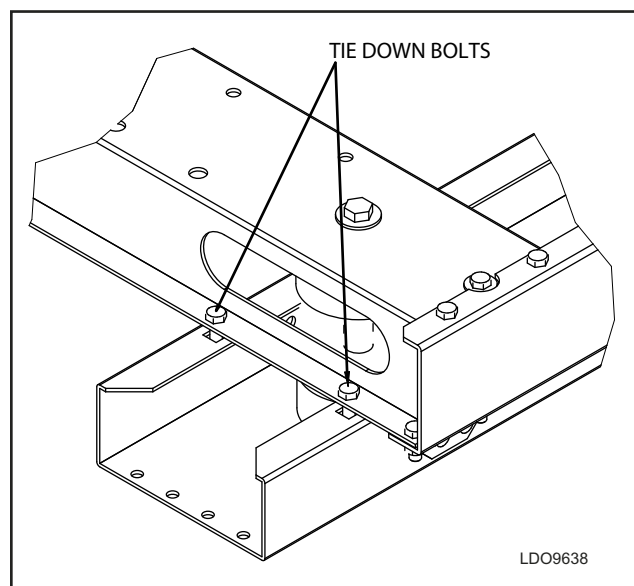


FIG. 3-5 – FAN AND MOTOR ISOLATOR SUPPORT FRAME.

3. To adjust isolators (see Fig. 3-3): First loosen cap screws on top of adjustment bolt. Then turn adjusting bolt. Next, check operational height and level of frame. Repeat this procedure until operational height and frame is level. Finally, tighten cap screws.
4. Verify the fan is aligned with unit discharge.
5. Re-adjust as necessary with isolators.

START-UP

Temporary Operation: *This equipment should not be operated until after complete Start Up as outlined in this guide. Do not allow the unit to run on temporary power that is not reliable and could be off/on periodically or rapidly. Also, protect it from irregular voltages and surges.*



Filter media must be installed prior to Start Up. *Use media provided or temporary media that will adequately protect the components in the air stream and duct system.*

- Energize power to the unit disconnect switch.
- Verify correct voltage, phase and cycles.
- Energize fan motor(s) (see Figure 5-8), briefly (bump) and check for correct fan rotation.

If rotation is incorrect:

1. On three-phase equipment reverse any 2 motor leads at the load side of last starter component.
2. On single-phase equipment, follow wiring diagram on motor housing or inside motor terminal box.
3. Re-check for correct fan rotation.

CHECK OPERATION OF DAMPERS

Ensure unit will not operate with all dampers closed.

Linkage design and/or damper linkage may not be provided by YORK. Air flow control dampers may be operated with pneumatic or electric actuator/controllers.

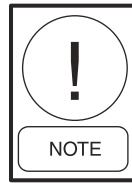


Prior to occupancy, test ventilation system to ensure that outdoor air dampers operate properly in accordance with the system design.

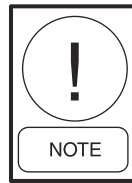
Air Flow Control Dampers

Five combinations of dampers to control the flow, the mixing of return air and outside air in the air inlet section of the unit may be supplied as follows:

- Thirty percent outside air, 100% return air.
- One hundred percent outside air, 100% return air.
- One hundred percent outside air, 0% return air.
- Zero percent outside air, 100% return air.
- Economizer Section - 100% outside air, 100% return air, 100% exhaust air or mixed air.



Dampers are intended for use with individual controllers or actuators. No interconnecting linkage to air dampers is provided as standard equipment by YORK. All damper mounting and linkage schemes are to be provided by others when actuators are not factory installed.



YORK does not provide linkage design when factory packaged controls are not included. Airflow control dampers may be operated with pneumatic or electric actuator/controllers. These items should be setup in accordance with control manufacturer's instructions.



Dampers, actuators, controls and linkage must be checked prior to applying power to the operators making sure nothing will obstruct the operation of the dampers. Do not overdrive damper actuators as this may cause damage to the dampers.



Return air dampers may be closed for shipping. Loosen actuator or crank arm on jackshaft, open dampers, and retighten actuator or crank arm.

Typical Actuators Locations

York's standard actuators are direct coupled on damper jackshaft (see Figure 3-6).

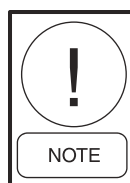
ENERGIZE FAN MOTOR(S)

1. Observe fan(s) for smooth operation.
2. Check motor nameplate Full Load Amp rating.
3. Immediately, check current draw of each leg of each motor.

VARIABLE SPEED DRIVE (VSD)

YORK Air-Modulator (Variable Frequency Drive)

Refer to manufactures start up guide.



York Air Modulators are provided with start up service. See Installation and Start up Guide provided with the York Air Modulator.

The YORK Air-Modulator (variable frequency drive) offers the most efficient means of fan control for variable air volume systems. The Air-Modulator varies the speed of the fan to match the VAV load requirements.

The Air-Modulator takes maximum advantage of the relation between fan speed and fan horsepower. With the Air-Modulator, any reduction in fan speed results in a cubic reduction in fan horsepower. For example, a 10% speed reduction results in a 27% fan horsepower reduction!

Each Air-Modulator (AirMod) is shipped with installation, operation, programming, tech support and troubleshooting information packed inside.

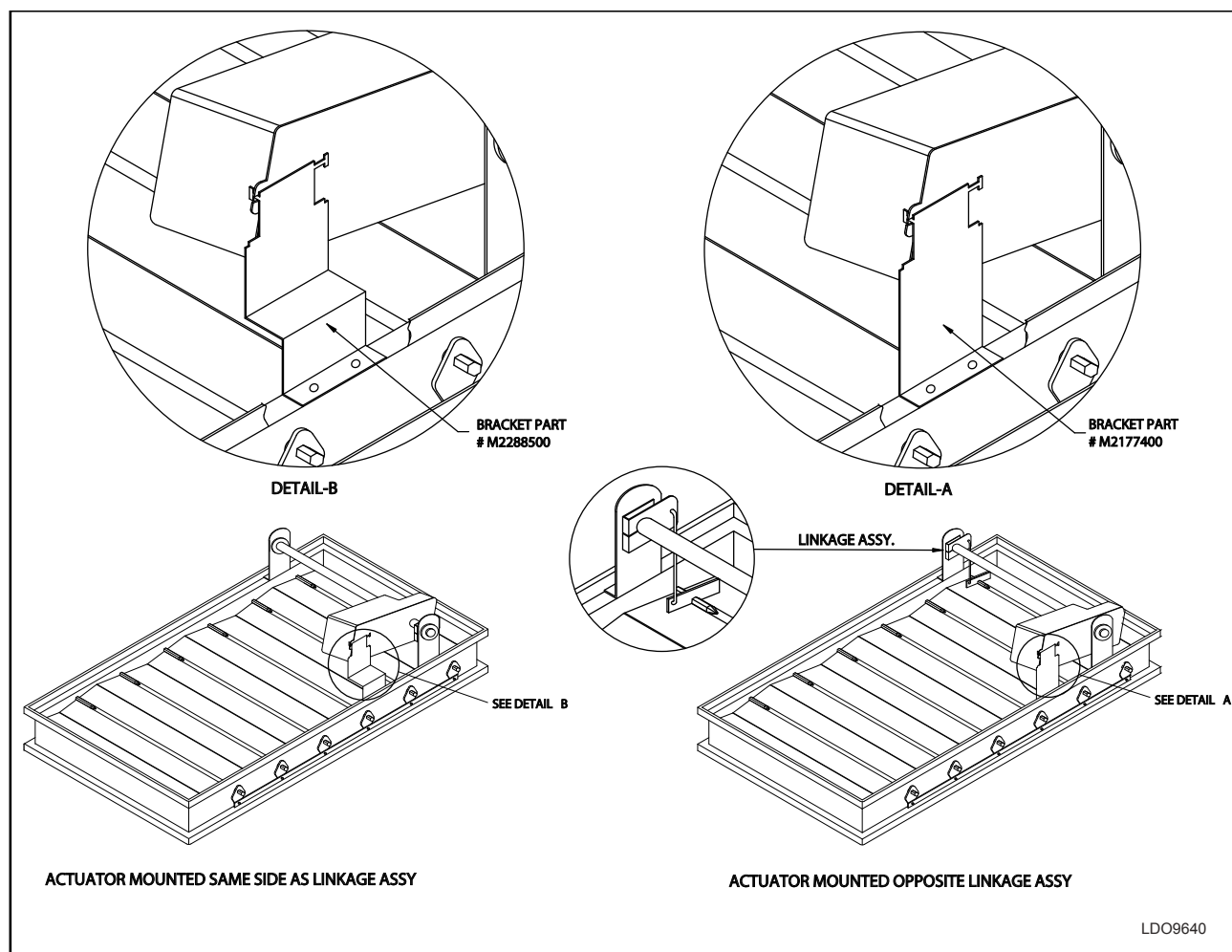


FIG. 3-6 – DIRECT COUPLED ON JACKSHAFT

Set Up Of A Non- Factory Mounted VFD

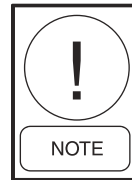
The Variable Frequency Drive (VFD) that controls the speed of a Solution air handler fan needs to be set up so the fan does not run at resonant frequencies. Improper adjustment may damage the equipment. To determine which speeds are detrimental to the York equipment, refer to the document (058-008-002) supplied with the Solution air handler. This information can also be found on the label located on the blower housing (see Figure 3-7). This document lists any frequencies and the bandwidths that need to be jumped (skipped) by the VFD. The installer needs to program the jump (skip) frequencies and the bandwidths referenced in document (058-008-002) into the VFD. Failure to properly set the VFD before applying power to the motor will void the fan and motor warranty.



If the skip frequencies are not available to the installing contractor, the contractor must have the fan analyzed by a professional balancer before the VFD can be set and power is supplied to the fan.

CHECK DOORS AND LATCHES FOR PROPER ADJUSTMENT

See Section 5 "Door Handle/Latch Replacement and Adjustment".



Plastic spacers must be removed between doors and doorframes before Start Up.

CHECK FOR OBVIOUS AUDIBLE LEAKS



Testing of Drain Pans - To minimize conditions of water stagnation that may result in microbial growth, drain pans shall be field-tested under normal operating conditions to ensure proper drainage.

Exception: Field testing of drain pans is not required if units with factory-installed drain pans have been certified (attested in writing) by the manufacturer for proper drainage when installed as recommended.

Page: 058-008-002										Edit Manual										PRODUCT: Solution									
Title: Factory Fan Balance Record Chart										Revision Level : A										ECN Number : 0703-0126									
FAN BALANCE SPECIFICATION																													
SOLUTION FAN BALANCE										NOTES:										TABLE 4.1.3 Balance Specifications - Standard Balance									
FAN SALES ORDER SPEED:										1 ALL READINGS TO BE TAKEN AS CLOSE TO THE BEARINGS AS POSSIBLE										A. Filter IN Specifications:									
F.S. FE. FR. (CIRCLE APPROPRIATE FAN SEGMENT)																				Fan Speed									
DATE:																				Below 750 rpm									
FAN ACTUAL SPEED:										2 ALL READINGS TO BE DIS- PLACEMENT, MILLS P/P										750-1500 rpm									
																				1500-2500 rpm									
																				Above 2500 rpm									
																				Horizontal									
																				4 mills P/P									
																				Vertical									
																				4 mills P/P									
																				0.157 in/sec P									
																				1.5 mills P/P									
																				1 mills P/P									
																				1 mills P/P									
																				B. Filter OUT Specifications:									
																				Below 1000 rpm									
																				1000-1500 rpm									
																				Above 1500 rpm									
																				Horizontal									
																				6 mills P/P									
																				Vertical									
																				6 mills P/P									
																				Axial									
																				7 mills P/P									
																				0.393 in/sec P									
																				5 mills P/P									
																				TABLE 4.2.3 Balance Specifications - Sweep Balance									
																				C. Filter IN Specifications:									
																				Fan Speed									
																				Below 1100 rpm									
																				1100-1500 rpm									
																				Above 1500 rpm									
																				Horizontal									
																				7 mills P/P									
																				0.393 in/sec P									
																				5 mills P/P									
																				D. Filter OUT									
																				Below 1200 rpm									
																				1200-1500 rpm									
																				Above 1500 rpm									
																				Horizontal									
																				9.5 mills P/P									
																				Vertical									
																				9.5 mills P/P									
																				Axial									
																				9.5 mills P/P									
																				0.589 in/sec P									
																				7.5 mills P/P									
																				7.5 mills P/P									
																				TABLE 4.2.4									
																				Fan Speed									
																				Narrow band width limit									
																				<1200 rpm									
																				90									
																				1250-1550 rpm									
																				120									
																				1550-1950 rpm									
																				150									
																				1950-2350 rpm									
																				180									
																				>2350 rpm									
																				230									

FIG. 3-7 – FACTORY FAN BALANCE INFORMATION

SKIP
FREQUENCIES

ENERGY RECOVERY WHEEL**Unit Configuration**

- Indoor Units

All Indoor Units will accommodate vertical Energy Recovery Wheel segments in an over/under stacked arrangement (see Figure 3-8).

- Outdoor Units

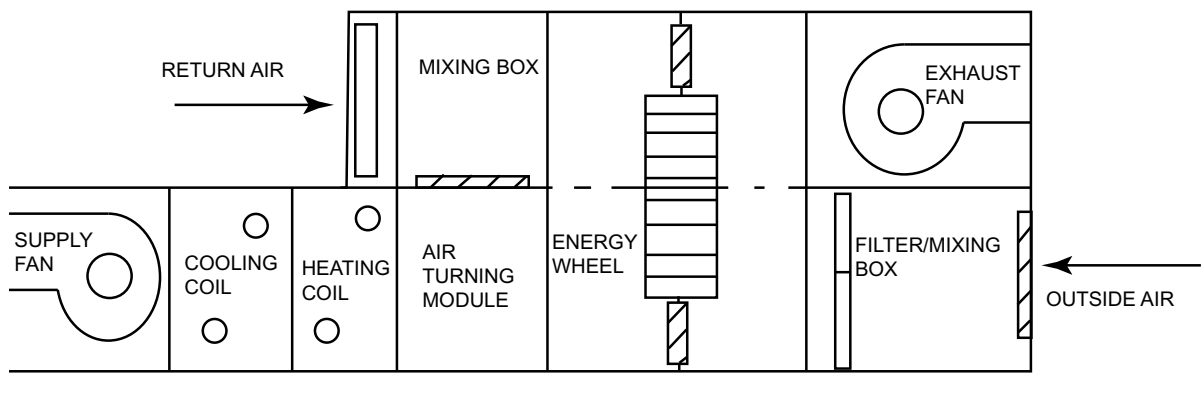
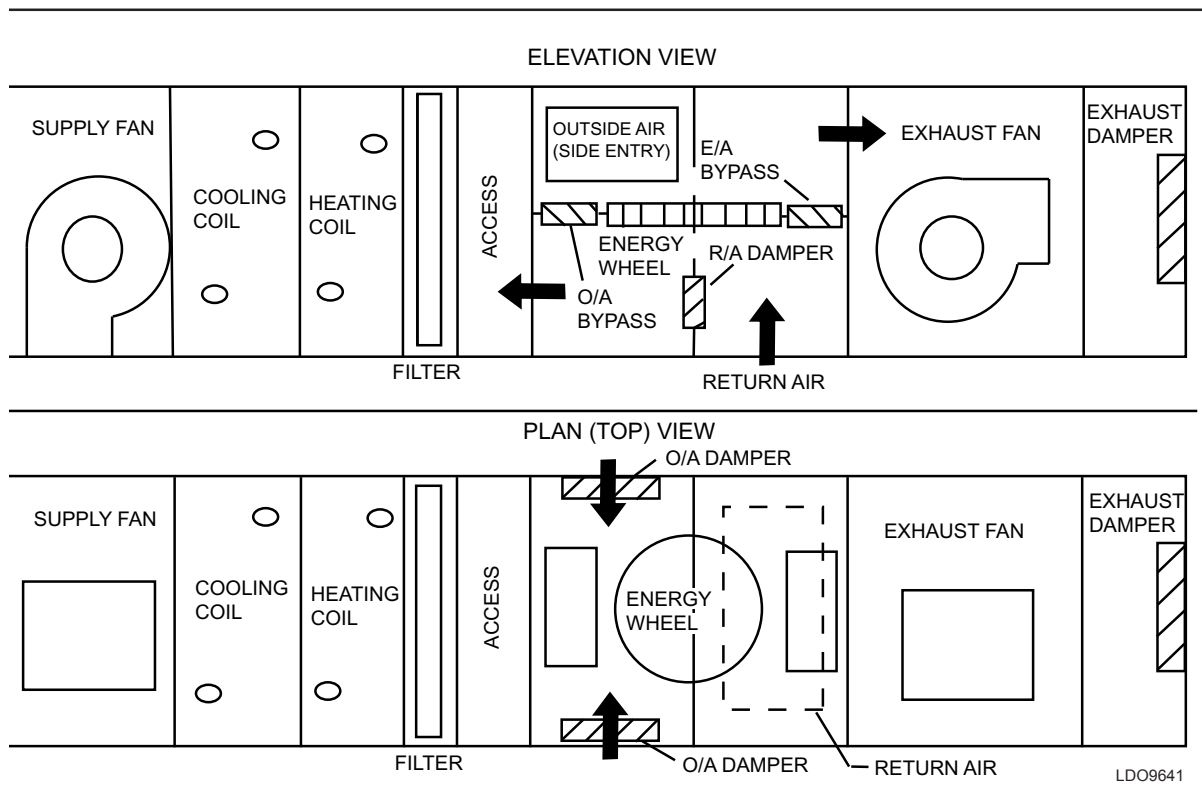
All Outdoor Units will accommodate horizontal Energy Recovery Wheel segments in a low-profile, single unit arrangement (see Figure 3-9)



Keep hands away from rotating wheel! Contact with rotating wheel can cause physical injury.

Start Up Procedure For Energy Recovery Wheel

1. By hand, turn wheel clockwise (as viewed from the pulley side), to verify wheel turns freely through 360° rotation (see Figure 3-10).

**FIG. 3-8 – INDOOR UNIT - VERTICAL WHEEL****FIG. 3-9 – OUTDOOR UNIT - HORIZONTAL WHEEL**

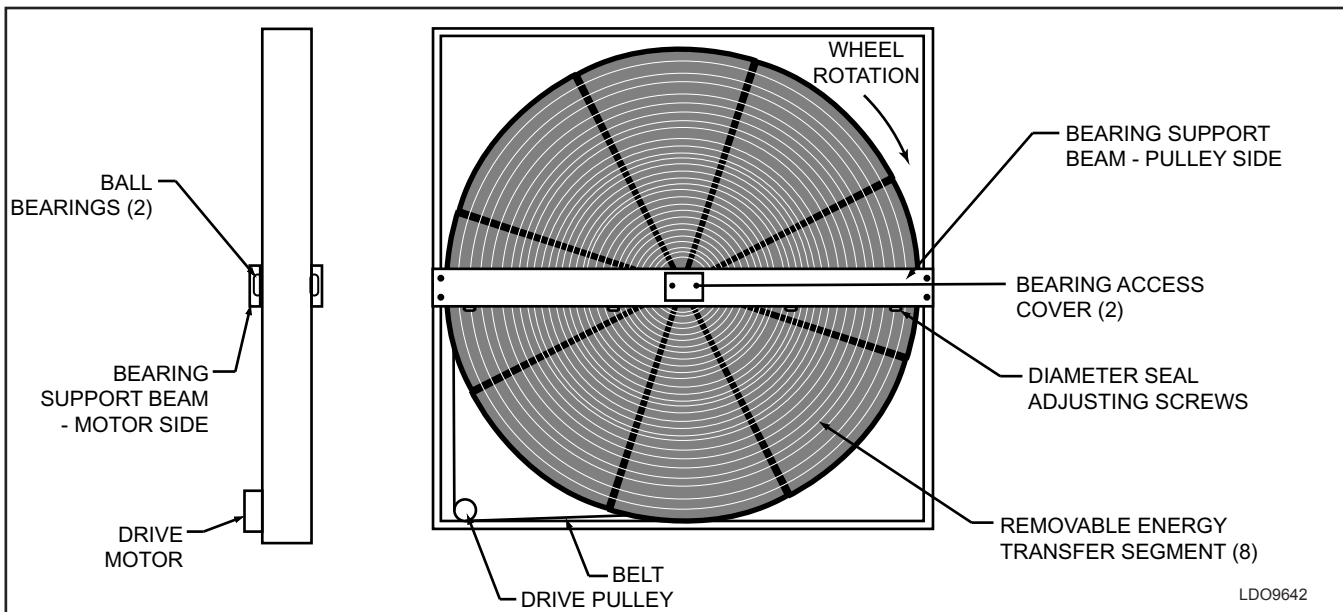


FIG. 3-10 – ENERGY RECOVERY WHEEL - PULLEY SIDE

2. Before applying power to drive motor, confirm wheel segments are fully engaged in wheel frame and segment retainers are completely fastened (see Figure 3-11).
3. With hands and objects away from moving parts, activate unit and confirm wheel rotation. Wheel rotates clockwise (as viewed from the pulley side).
4. If wheel has difficulty starting, turn power off and inspect for excessive interference between the wheel surface and each of the four (4) diameter seals. To correct, loosen diameter seal adjusting screws and back adjustable diameter seals away from surface of wheel. Apply power to confirm wheel is free to rotate, then re-adjust and tighten hub and diameter seals (see Figure 3-12).

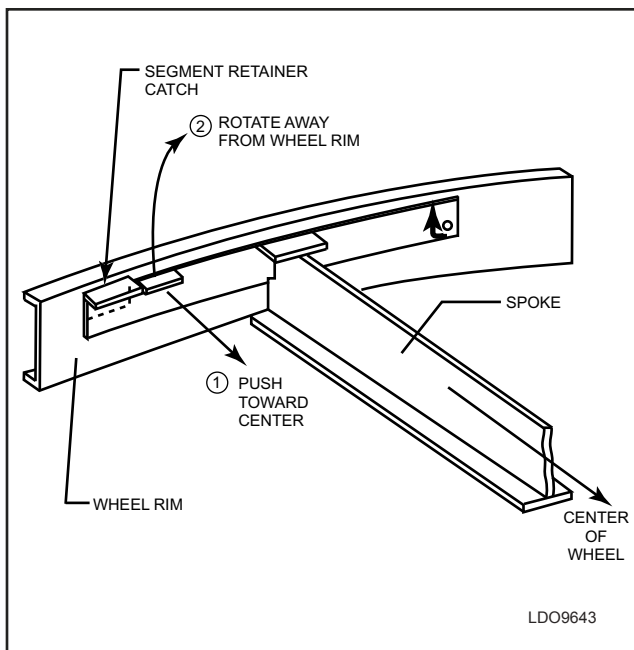


FIG. 3-11 – SEGMENT RETAINER

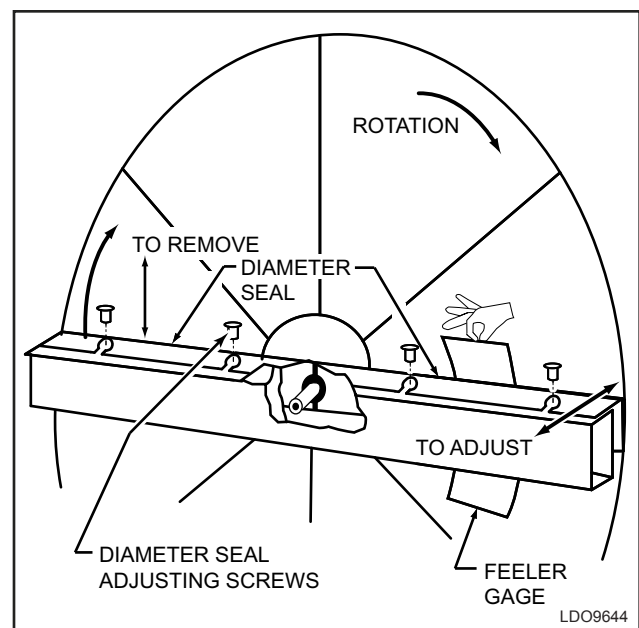


FIG. 3-12 – DIAMETER SEAL ADJUSTMENT

	AIR HANDLING UNITS	
	START-UP CHECKLIST	Supersedes: 100.00-CL1 (303) Form 100.00-CL1 (503)

AIR HANDLER START-UP CHECKLIST

OFFICE LOCATION _____	UNIT TAG # _____
QUALIFIED TECHNICIAN'S NAME: _____	UNIT MODEL # _____
JOB NAME _____	UNIT SERIAL # _____
YORK JOB OR CONTRACT # _____	START DATE _____
JOB SITE LOCATION _____	
JOB SITE CONTACT AND PHONE # _____	
NON-STANDARD SPECIFIED COMPONENTS _____	

PRE START-UP

GENERAL UNIT INSPECTION

Identify and perform appropriate "lock out/tag out" and safety rules. For details on points below see appropriate section of Installation, Operation, Maintenance manual provided with each air handler.

For VFD equipped air handlers, refer to the VFD forms for additional start-up requirements.

CS2000 Belt Drive	AH Units	Form 115.27-NOM1	Air Mod	VI	VFD	Form 100.40-NO3
CurbPak	AH Units	Form 100.10-NOM2	Air Modulator		VFD	Form 100.41-NO1
AirPak	AH Units	Form 100.09-NOM1	Solution (Table 3-2)		AH Units	Form 102.20-NOM1

☐ Equipment received as ordered.	☐ Make sure all ductwork is complete and available for full air flow.
☐ Unit checked for damage interior and exterior.	☐ Unit installed with proper clearances.
☐ Unit installed on flat and level surface. Outdoor unit mounted within roof slope limitations where applicable.	☐ Visually inspect roof curb for tight seal around unit.
☐ Terminal screws and wiring connections secure in control, electric and Air Modulator panels.	☐ Clean air filters installed properly and secured.
☐ Air hoods installed properly.	☐ Filter gauge set to zero
☐ Condensate drain properly trapped.	☐ All field wiring complete and inspected.
☐ All wiring and tubing connections made at shipping splits.	☐ All shipping splits sealed and secured properly.
☐ All field piping connections complete.	☐ Pipe chase floor sealed at penetrations.
☐ All shipped loose parts installed.	☐ All shipping bolts and other material have been removed. (Fan, VIFB, Energy Recovery Wheel, Damper)
☐ Installer has cleaned out interior.	☐ Damper linkage is tight and in correct "power off" position.
☐ Verify all plastic spacers have been removed between door and door frame.	☐ Controls installation complete.
☐ Verify Energy Recovery Wheel turns freely and wheel segments are fully engaged.	

FAN INSPECTION	
☐ Check bearings and locking collars for properly tightened setscrews, bolts and nuts.	☐ Fan wheel properly aligned, tight on shaft and freely moving.
☐ Sheaves properly aligned and tight on shaft.	☐ Check fan base isolators and thrust restraints for proper adjustment. Note: Do not remove functional bolts from seismic isolators.
☐ Belt tension adjusted properly per drive pkg. label on fan.	
☐ Check fan alignment with unit discharge. Adjust with isolation.	☐ Fan bearings properly lubricated.

START-UP

PERFORM THE FOLLOWING STEPS IN ORDER:

Refer to safety standards. Ensure all door latches are secured before starting.

- | | |
|---|---|
| ☐ 1. Energize power to the unit disconnect switch. | ☐ 6. Check motor nameplate Full Load Amp rating. |
| ☐ 2. Verify correct voltage, phase and cycles. | ☐ 7. Immediately check current draw of each leg of each motor. |
| ☐ 3. Energize fan motor(s) briefly (bump) and check for correct fan rotation. | ☐ 8. VFD, refer to manufactures start up guide. |
| ☐ 4. Check operation of dampers. Insure unit will not operate with all dampers closed. | ☐ 9. Check doors and latches for air leaks. |
| ☐ 5. Energize fan motor(s). Observe fan(s) for smooth operation. | ☐ 10. Check for obvious audible leaks. |
| | ☐ 11. Apply steam to cold coils slowly to prevent damage. |

RECORD DATA

POWER SUPPLY:

Unit Nameplate V___ PH___ CYC, ___ Verify V ___/___/___

DATA

SUPPLY FAN MOTOR

Nameplate Volts _____ Amps _____
 Run Amps _____ / _____ / _____
 Catalog Number _____
 Spec Number _____
 Horse Power _____
 RPM Nameplate _____ Actual _____
 Frame size _____
 Service Factor _____
 Jump (Skip) Frequencies _____ / _____ / _____

SUPPLY FAN

Manufacture Name _____
 Type or Model Number _____
 Code or Shop Order Number _____
 Serial Number _____

SUPPLY FAN DRIVE KIT

Belts (Quantity & ID Number) _____
 Belt Tension Tag _____ Actual _____
 Fan RPM (DN) Tag _____ Actual _____

RETURN FAN MOTOR

Volts _____ Amps _____
 _____ / _____ / _____

 Nameplate _____ Actual _____

 _____ / _____ / _____

RETURN FAN

RETURN FAN DRIVE KIT

Tag _____ Actual _____
 Tag _____ Actual _____

other utilities

Steam Pressure	Heating Coils _____ PSI,	Humidifier _____ PSI
Hot Water Pressure/Temp.	Supply _____ PSI, _____ °F,	Return _____ PSI, _____ °F
Chilled Water Pressure/Temp.	Supply _____ PSI, _____ °F,	Return _____ PSI, _____ °F
Potable Water Pressure	_____ PSI,	Pneumatic Air Pressure _____ PSI

MAINTENANCE

Upon completion of start-up the customer assumes responsibility for periodic maintenance of this equipment in order to continue warranty. *Refer to the Installation Operation and Maintenance Manual provided with this equipment.*

Customer's agent signature: _____, Date: _____



TABLE 3-2 – INSPECTION REQUIREMENTS	
ITEM	SOLUTION INSTRUCTION LOCATION
Pre start up	
Equipment received as ordered.	Section 1, Inspection
Unit checked for damage interior and exterior.	Section 1, Inspection
Terminal screws and wiring connections tightened in control, electric and Air Modulator panels.	Section 2, Electrical Connections Section 3, Startup
Air hoods installed properly.	Section 2, Outside and/or Air Hoods, Bird Screens & Mist Eliminators
Condensate drain properly trapped.	Section 2, Condensate Drain Trap
All wiring and tubing connections made at shipping splits.	Section 2, Assembly of Indoor and Outdoor Units
All field piping connections complete.	Section 2, Coil Piping
All shipped loose parts installed.	Section 1, Checking For Non Mounted Parts.
Installer has cleaned out interior.	
Make sure all ductwork is complete and available for full air flow.	Section 2, Duct Connections Section 3, Startup
Unit installed with proper clearances.	Section 2, Outdoor Units Site Prep. Fig 2-1 Section 2, Indoor Units Site Prep.
Visually inspect roof curb for tight seal around unit.	Section 2, Curb; Assembly & Installation Instructions. Fig. 2-2
Clean air filters installed properly and secured.	Section 2, Air Filters Fig. 4-14, 4-15, 4-16, 4-17, 4-18 Table 4-9
Filter gauge set to zero.	
All field wiring complete and inspected.	See Notes in General Safety Guidelines, Introduction & Installation. Section 2, Electrical Connections Section 6, Wiring Diagrams
All shipping splits sealed and secured properly.	Section 2, Unit Installation, Indoor/Outdoor, Curb /Non-curb Mounted & Tiered Units. Fig. 2-9, Fig. 2-17
Pipe chase floor sealed at penetrations.	Section 2, Pipe Chase Installation
All shipping bolts and other material have been removed. Note: Do not remove functional bolts from seismic isolators.	Section 3, Pre Start Up
Damper linkage is tight and in correct "power off" position.	Section 3, Pre Start Up
FAN INSPECTION	
Check bearings and locking collars.	Section 3, Pre Start Up Fan Assembly Inspection Table 3-1
Sheaves properly aligned and tight on shaft.	Section 3, Belts & Sheaves Section 4, Sheave Alignment Fig 4-5
Belt tension adjusted properly per drive pkg. label on fan.	Section 4, Belts Fig. 4-3 & 4-4
Check fan alignment with unit discharge. Adjust with isolator.	Section 3, Preparing Fan Isolators for Operation
Fan wheel properly aligned, tight on shaft and freely moving.	Section 5, Fan Repair Fig 5-9

Table 3-2 - Inspection Requirements (cont.)

ITEM	SOLUTION INSTRUCTIONS
Check fan base isolators and thrust restraints for proper adjustment.	Section 3, Isolators Fig. 3-3 Section 5, Thrust Restraint Replacement & Adjustment Fig. 5-29, Fig. 5-30
Fan bearings properly lubricated	Section 2, Fan Bearing Lubrication Fig's 4-6 through 4-10, Tables 4-2, 4-3 & 4-4
START UP	
Energize power to the unit disconnect switch.	Section 3, Start Up
Verify correct voltage, phase and cycles.	Section 2, Electrical Connections
Energize fan motor(s) briefly (bump) and check for correct fan rotation.	Section 3, Start Up
Check operation of dampers. Insure unit will not operate with all dampers closed.	Section 3, Start Up Section 4, Freeze Protection
Energize fan motor(s). Observe fan(s) for smooth operation.	Section 3, Start Up-Energize Fan Motor
Check motor nameplate Full Load Amp rating.	Section 3, Start Up-Energize Fan Motor Section 2, Electrical Connections Fig 2-21
Immediately check current draw of each leg of each motor.	Section 3, Start Up-Energize Fan Motor Section 2, Electrical Connections Fig 2-21
VFD, refer to manufactures start engine guide.	Section 3, Setup of Non-factory Mounted VFD Fig. 3-7 Section 4, Dynamic Balance
Check damper operation	Section 3, Start Up-Check Operation of Dampers Section 4, Economizer Segment
Check doors and latches for proper adjustment	Section 2, Post Installation Inspection. Section 4, Air Handler Cabinet-Hardware Check Section 5, Door Handle/latch Replacement And Adjustment
Check doors for air leaks.	Section 5, Door Replacement Section 5, Door Gasket Replacement
Verify all plastic spacers have been removed between door and door frame.	Section 2, Post Installation Inspection Fig. 2-50
Controls Installation Complete	Section 3, Pre Start-Up
Verify Energy Recovery Wheel turns freely and wheel segments are fully engaged.	Section 3, Start Up Procedure For Energy Recovery Wheel

4.0 OPERATION & MAINTENANCE



Refer to ASHRAE 62-2001 for startup and maintenance practices related to achieving acceptable indoor air quality. ASHRAE standard 62-2001 is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard (see Table 4-1).



Rotating parts and electrical shock hazards exist. Lock out and tag out the fan motor(s) and heat power disconnects before servicing. York service personnel should refer to the "YORK Field Service Employee Safety Manual", 50.05-SM1. Independent contractors refer to OSHA Lockout/Tag out Standard, 29 CFR 1910.147. Failure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this IOM.



Always replace RED metal tab on access doors that provide access to moving parts. This mechanical protection from moving parts is required by UL-1995.

Always replace RED metal tab on access doors that provide access to pressurized areas. This mechanical protection is to prevent accidental release of access doors under positive pressure.



Do not weld or use torches on the exterior or interior of the unit housing. The housing contains polyurethane insulation, which when under combustion will produce harmful, toxic gases resulting in personal injury or death.



Verify conformance with the total outdoor air flow and space supply air flow requirements of ASHRAE Standard 111, SMACNA's HVAC Systems - Testing, Adjusting and Balancing, 2nd edition, or equivalent.

OPERATION

TEST AND BALANCE

Air Balance

- System air balance should be performed as soon as possible after air handler startup.
- Failure to perform air balance may result in damage to air handler, generate noise and vibration.
- A qualified air balance technician should perform air balance.

Dynamic Balance

- Dynamic balance has been performed at the factory on the fan assemblies. If any changes were made to the fan assembly (fan, motor, sheaves, belts, isolators, support structure) a vibration analysis must be performed and the fan assembly trim balanced if needed.
- Dynamic balance is affected by operation of Variable Frequency Drives. If VFD is applied, see cautions in VFD start up literature. Be sure Skip Frequencies (Jump Frequencies) are installed prior to operation of motors for more than 30 minutes. Refer to caution under Section 3 "Set-Up of a Non-Factory Mounted VFD" or refer to IOM provided with the VSD.



TABLE 4-1 – MINIMUM MAINTENANCE ACTIVITY AND FREQUENCY
(ASHRAE STANDARD 62-2001 FOR INDOOR AIR QUALITY).

Refer to Figure 4-32 - "Maintenance Requirements for Solution Air Handler (includes suggested IAQ minimums for ASHRAE STD. 62-2001 Compliance"

Item	Activity	Minimum Frequency
Filters and air cleaning devices	A	According to O & M Manual
Outdoor air dampers and actuators	B	Every three months or in accordance with O & M Manual
Humidifiers	C	Regularly when it is likely that dehumidification occurs but no less than once per year or as specified in the O & M Manual
Dehumidification coils	D	Once per year during cooling season or as specified in the O & M Manual
Drain pans and other adjacent surfaces subject to wetting	D	Every six months or as specified in the O & M Manual
Outdoor air intake louvers, bird screens, mist eliminators, and adjacent areas	E	Every six months or periodically specified in accordance with the O & M Manual
Sensors used for dynamic minimum outdoor air control	F	Every six months or periodically in accordance with O & M Manual
Air-handling systems except for units under 1000 L/s (2000 cfm)	G	Once every five years
Cooling towers	H	In accordance with the O & M Manual or treatment system provider
Floor drains located in plenums or rooms that serve as air plenums	I	Periodically according to O & M Manual
Equipment / component accessibility	J	
Visible microbial contamination	K	
Water intrusion or accumulation	K	

ACTIVITY CODE:

- A. Maintain according to O & M Manual
- B. Visually inspect or remotely monitor for proper function
- C. Clean and maintain to limit fouling and microbial growth.
- D. Visually inspect for cleanliness and microbial growth and clean when fouling is observed.
- E. Visually inspect for cleanliness and integrity and clean when necessary.
- F. Verify accuracy and recalibrate or replace as necessary.
- G. Measure the minimum quantity of outdoor air. If measured minimum air flow rates are less than 90% of the minimum outdoor rate in the O & M Manual, they shall be adjusted or modified to bring them above 90% or shall be evaluated to determine if the measured rates are in conformance with this standard.
- H. Treat to limit the growth of microbial contaminants.
- I. Maintain to prevent transport of contaminants from the floor drain to the plenum.
- J. Keep clear the space provided for routine maintenance and inspection around ventilation equipment.
- K. Investigate and rectify.

* Minimum frequencies may be increased or decreased if indicated in the O & M Manual

TEMPERATURE LIMITS

Cabinet panels - 140° F
 Standard Motors with (Class B Insulation) - 104°F
 Motors with Class F. Insulation - 140°F
 Power Wiring - 140°F
 Controls & Control Wiring - 140°F
 Prefilters - 150°F
 High Efficiency Filters - 200°F
 Variable Speed Drives - 104°F
 Damper & valve actuators- 140° F

STATIC PRESSURE LIMITS

- Maximum design cabinet pressure for Solution units is $\pm 8"$ W.C.
- Access doors are double wall. Doors provided with adjustable door latches and seals.

CONTROLS

If controls provided by YORK, *refer to OptiLogic Factory Packaged Controls IOM.*

MOTORS



Do not operate fan motors in overload amperage condition.

Motor amperage should be checked again after the connecting duct work is installed and an air balance performed on the air distribution system (*see Section 4 for Air Balancing Requirements*). If motor operates at amperage levels above nameplate, discontinue operation and correct cause, or *refer to Section 5.0, "Service and Repair"*.

BELTS

Belts should be checked for correct tension at startup and should be checked again after 24 hours of operation. On multiple belt adjustable pulleys, the pitch depth should be checked to insure identical belt travel, power transfer and wear. Adjustable motor bases are provided for belt adjustment. See procedure on next page.

SHEAVES



If optional adjustable sheaves provided, they should be replaced immediately after system air balance is performed. It is not unusual for an adjustable sheave at some point in time to create damaging vibration in the fan assembly.

MAINTENANCE

INTRODUCTION

A planned program of regularly scheduled maintenance will return dividends by averting possible costly and unexpected periods of down time. It is the responsibility of the owner to provide the necessary maintenance for the air handling equipment and components.



Refer to Table 4-1 and ASHRAE Standard 62-2001 for Indoor Air Quality.

AIR HANDLER CABINET



Clean exterior with a mild, environmental safe detergent and high pressure water (2000 PSI max.).

Hardware Check

Inspect doors, handles, latches and hinges for proper operation. Secure any loose parts (*see Section 5 for door replacement and door handle/latch replacement guides*).

Gaskets

Inspect door gaskets for damage and proper seal (*see Section 5 for door gasket replacement guide*).

Panels

Inspect panels for damage. If panels show signs of excessive pressure change, they will appear to bulge inward or outward.

See Troubleshooting Guide regarding excessive static pressure.

See Section 5 for panel replacement guide.

Hoods And Louvers



Inspect air hoods and air louvers for damage and debris. Remove debris as needed (see Section 5 for air hood replacement and air louver replacement guides).

Bird Screens



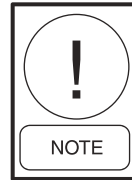
Inspect bird screens for damage and debris. Remove debris as needed. Bird screens are an integral part of hoods and louvers (see Section 5 for bird screen replacement guide).

Mist Eliminators



Inspect mist eliminators for damage, dirt and debris. Mist eliminators are optional equipment. Mist eliminators in air hoods are removable for cleaning (see Section 5 for mist eliminator removal, cleaning and replacement).

FAN SEGMENT (SUPPLY, RETURN, EXHAUST) - FAN ASSEMBLY



Fans can be removed for cleaning. Cleaning should be done using detergent or solvent that is environmentally safe. If water pressure is used, do not direct water stream onto bearing seals.



Forward Curved fan wheels are more susceptible to dirt accumulation than others. Dirt and debris on fan wheels and shafts may adversely affect the balance of the fan assembly.

See Section 5 for replacement guides regarding fan and fan assembly components.

- Check fan housing, wheel, shaft, frame and bearings for damage, wear, loose parts, dirt and debris.
- Check fan base, vibration isolators and thrust restraints (optional) for damage, wear, loose parts, dirt and debris.
- Check flex connector for damage and wear. Make sure fan assembly does not rub flex material.
- Check Drive Kit - Drive kit consists of belts, sheaves and sheave bushings if required. Check for damage, loose parts, wear, dirt, alignment and belt tension.

(See Figure 4-1, "Typical Drive Kit Data Tag" for example of data provided.) The unique/actual data required by design of each fan assembly is listed on the tag affixed to the fan housing near the belts.

 York Airside Products Group YORK INTERNATIONAL		V-BELT DRIVE KIT		
DRIVE PART * 906-04636-100 AP SALES ORDER * 00-111313-08 UNIT TAG * AHU-7		C.O.M. * 30810		S35848
FAN RPM RANGE: 1244 to 1033 TENSION INFO: 4.3 LB. .30 IN. CENTER - 19.84 OPEN MOTOR SHEAVE 3 TURNS TO SET FAN RPM @ 1161				
MOTOR SHEAVE - 1VP60x1 3/8 FAN SHEAVE - BK85x1 DRIVE BELTS - BX59		MOTOR BUSHING - FAN BUSHING - 00494VIP		

FIG. 4-1 – TYPICAL DRIVE KIT DATA TAG

Adjustable Motor Base Operation

1. Secure the nut with a wrench placed through the service hole and loosen the bolt. Do this to all four Hold Down Bolt Assemblies (See Figure 4-2).
2. Insure the Drive Bolt Assembly threads are lightly lubricated.
3. Turn both Drive Bolt Assemblies in the same direction to move motor for belt installation and tensioning.
4. Turn Drive Bolt Assemblies independently to move motor for sheave/belt alignment.
5. Tighten all four Hold Down Bolt Assemblies.

For belt tensioning instruction, *see sub-topic "Belts" in this section.*

For alignment instruction, *see sub-topic "Sheave Alignment" in this section.*

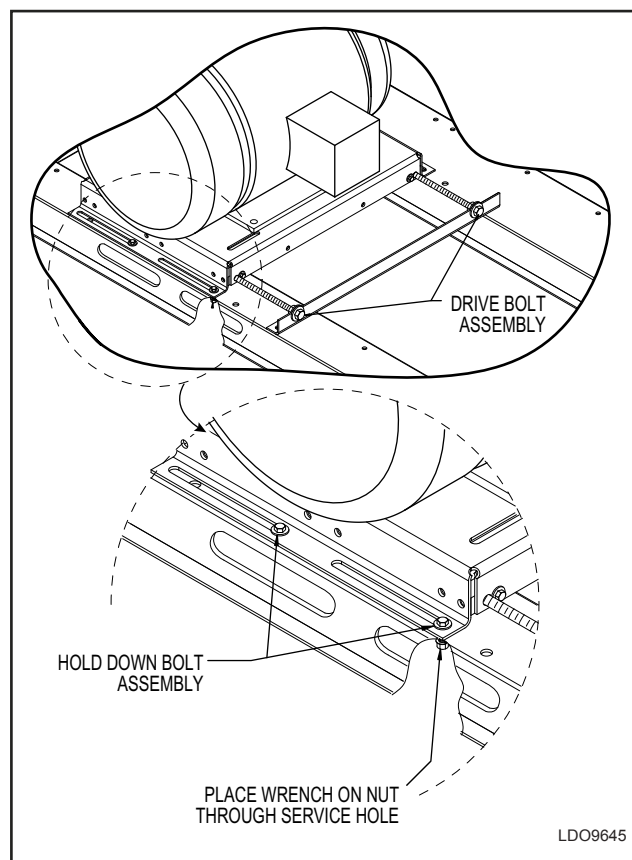


FIG. 4-2 – ADJUSTABLE MOTOR BASE

Belts

Check belt tension (see Figure 4-3, "Belt Tensioning" and Figure 4-4, "Belt Tensioning Gauge").

1. Measure belt span (see figure 4-3).
2. Position bottom of the large "O" ring on the span scale at the measured belt span (see Figure 4-4).
3. Set the small "O" ring on the deflection force scale to zero.
4. Place the tension gauge squarely on one belt at the center of the belt span. Apply a force on the plunger and perpendicular to the belt span until the bottom of the large "O" ring is even with the top of the next belt or with the bottom of a straight edge laid across the sheaves.
5. Remove the tension gauge and read the force applied from the bottom of the small "O" ring on the deflection force scale.
6. Compare the force you have applied with the value given on the Drive Kit Data Tag (see Figure 4-1).

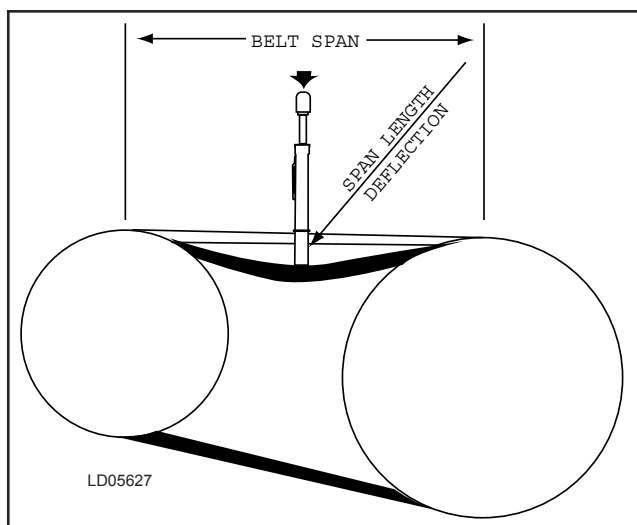


FIG. 4-3 – BELT TENSIONING



Never use excessive tension as this could result in damaging the bearing, motor pulleys or motor base. See drive label on fan housing adjacent to drive for specific details on tension. Squealing belts during starting is caused by slipping belts that are not tensioned properly.

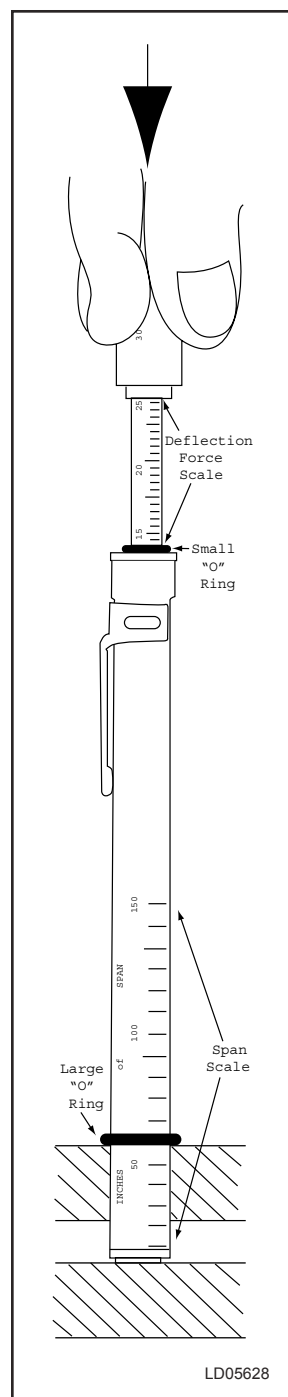


FIG. 4-4 – BELT TENSIONING GAUGE

Sheaves Alignment



An incorrectly aligned sheave can substantially shorten belt life or overload blower and motor bearings, shortening their life expectancy. A belt tensioned too tightly can overload the motor electrically, causing nuisance tripping of the motor overloads and/or motor failure and/or shaft failure.

Sheave alignment and parallelism of shafts is very important. Proper alignment helps equalize the load across the entire belt width, thereby reducing wear and extending belt life. Figure 4-5 shows how to align a synchronous drive properly using a straightedge (A) or a piece of string (B).

After aligning the sheaves, check the rigidity of the supporting framework. Shafts should be well supported to prevent distortion and a resulting change in the center distance under load. Do not use spring-loaded or weighted idlers.

Alignment Using A Straightedge

(Preferred)

Place a straightedge against the outer edge of the sheaves. Figure 4-5(A) shows the four points where the straight edge should touch the sheaves. The straight edge should cross the sheaves at the widest possible part of the sheave.

Alignment Using A String

Tie a string around either shaft and pull it around and across the outer edge of both sheaves. Figure 4-5(B) shows how the string should touch four points when the drive is properly aligned.

If alignment is other than described here, *see Section 5, "Sheave Replacement and Adjustment"*.

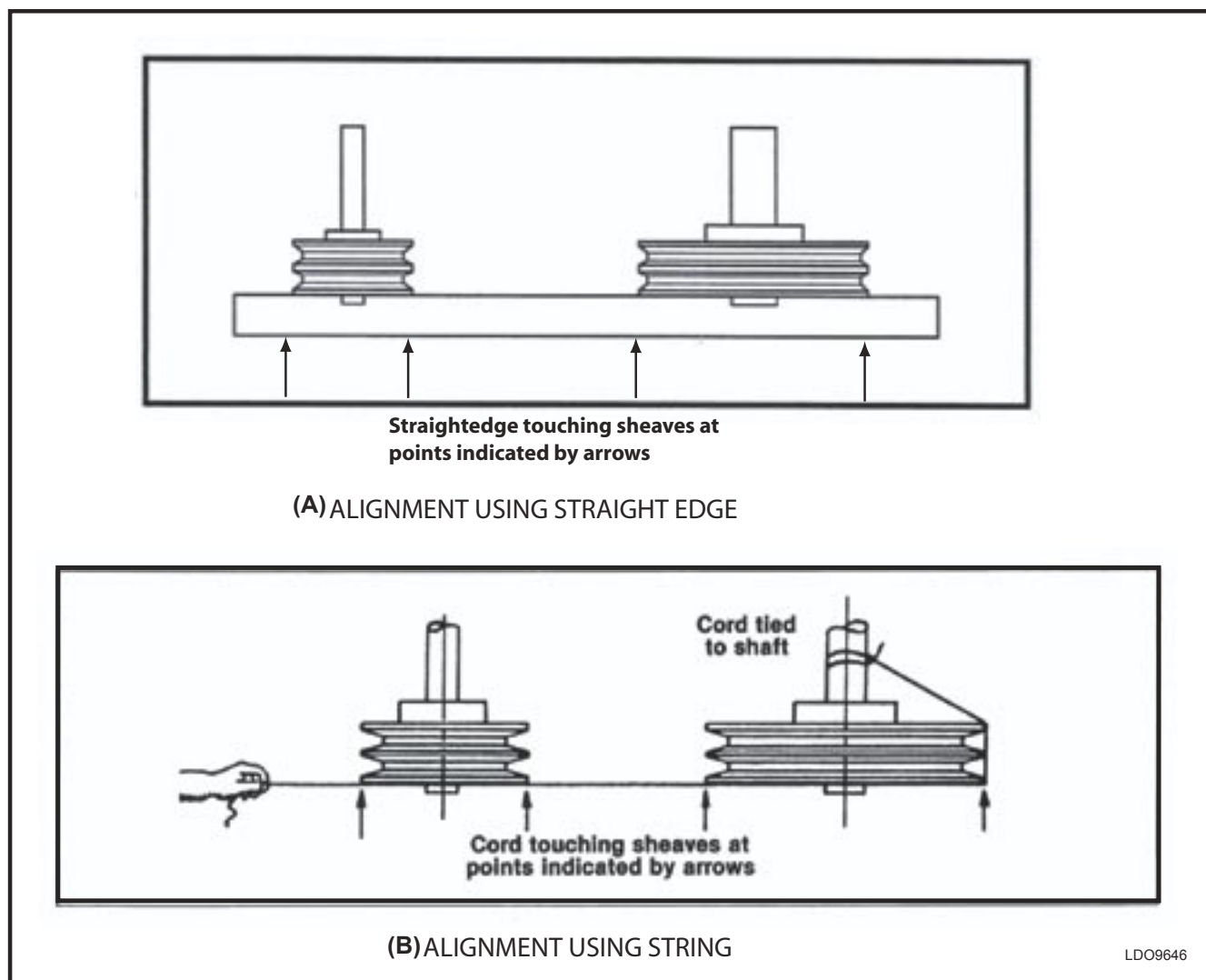


FIG. 4-5 – SHEAVE ALIGNMENT

Lubrication

Verify Types Of Bearings

Sealed (not to be re-lubricated in the field)

See Figure 4-6.



FIG. 4-6 – SEALED BEARING

Standard Pillow Block

See Figure 4-7 & 4-8

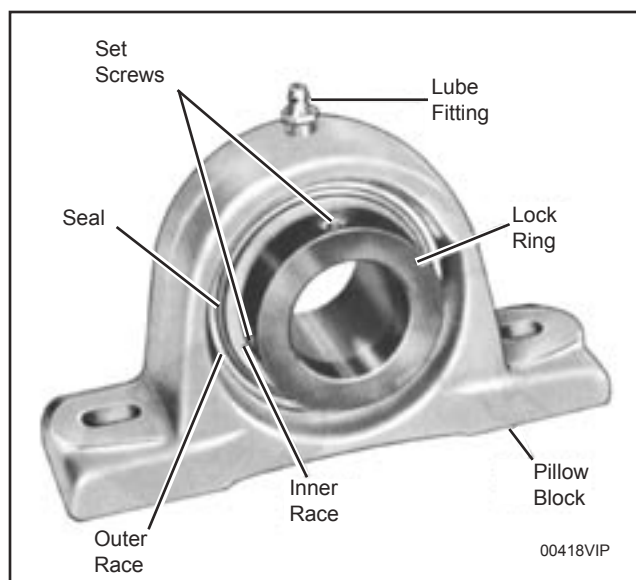


FIG. 4-7 – BEARING WITH SETSCREW TYPE LOCKING DEVICE

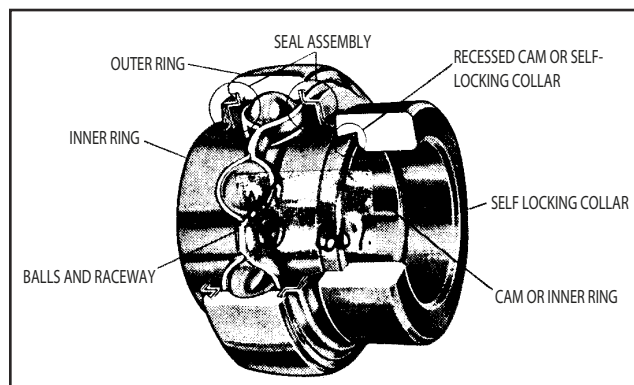


FIG. 4-8 – BEARING WITH ECCENTRIC CAM

Split Pillow Block

See Figure 4-9

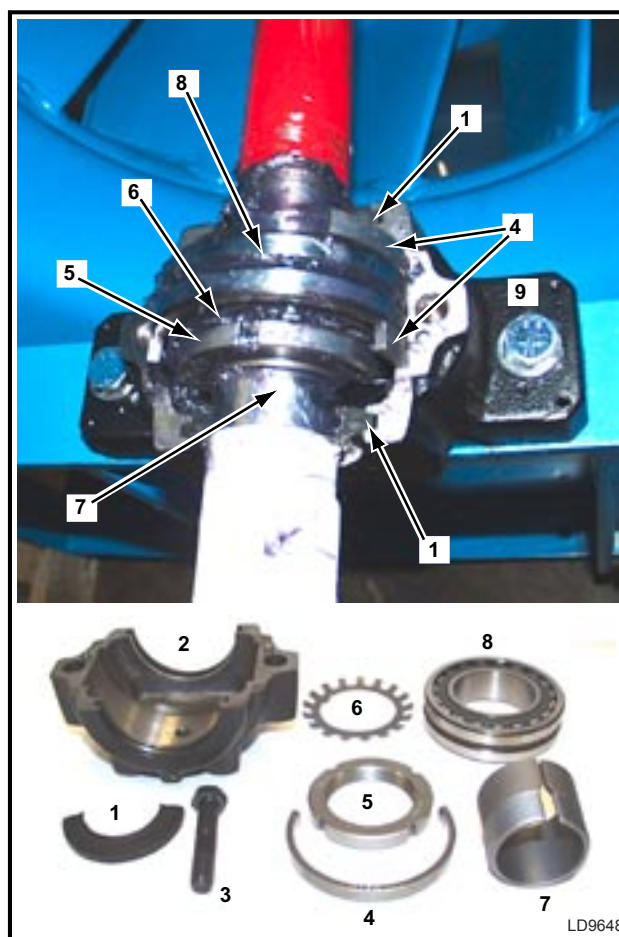


FIG. 4-9 – SPLIT BEARING

- | | |
|----------------------|-------------------|
| 1. Seal (4) | 6. Lock Washer |
| 2. Housing Cap | 7. Tapered Sleeve |
| 3. Cap Bolts (2) | 8. Bearing |
| 4. Locating Ring (2) | 9. Housing Base |
| 5. Lock Nut | |

Fan Bearing Lubrication

See Tables 4-2, 4-3 & 4-4

Fan bearings on the Solution units are equipped with extended lubrication lines enabling lubrication of both fan bearings from one side of fan (see Figure 4-10). External lube lines are optional. Some fans will have permanently lubricated bearings.

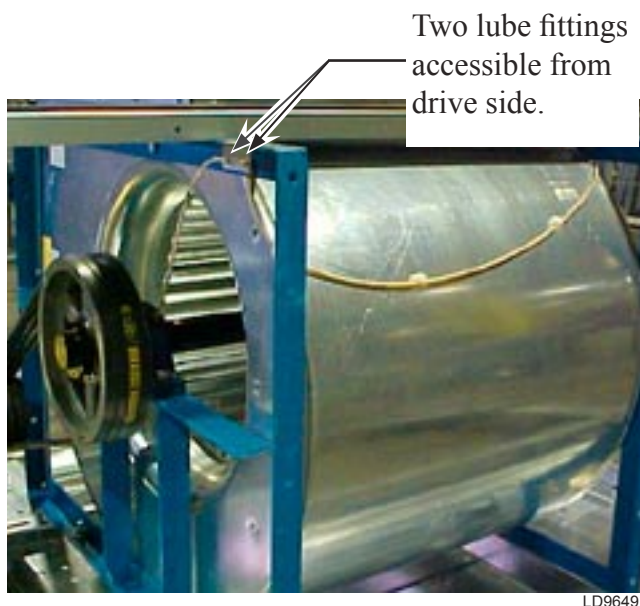
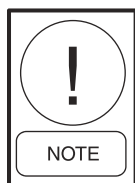


FIG. 4-10 – LUBRICATION LINES



For specific fan bearing lubrication, check the instruction packet attached to the fan housing. Some forward curved fans are permanently lubricated.

For best results, standard pillow block bearings should be re-lubricated while in operation providing personal safety is assured. Add grease slowly with shaft rotating until a slight bead forms at the seals.

If necessary to re-lubricate while bearing is stationary, refer to manufacturer's data for maximum grease capacity for the size bearing.

Re-lubrication is generally accompanied by a temporary rise in operating temperature. Excess grease will be purged at seals. Always wipe away purged grease after several hours of operation.

Check Condition Of Extended Lubrication Lines When Present

See Figure 4-10

Check lube lines for:

- Cracks and brittleness (replace as needed)
- Fittings tight and lube lines tight on fittings.
- Air bubbles in grease (disconnect and purge as necessary).

Recommended Lubricant For Fan Bearings

A Lithium / Petroleum base grease conforming to an NLGI Grade II consistency is normally used. Lubricant must be free of any chemical impurities such as free acid or free alkali, dust, rust, metal particles or abrasive. This light viscosity, low torque grease is rust inhibited and water resistant, has a temperature range of -30°F to +200°F with intermittent highs of +250°F. Lubricate bearings as required by the severity of required duty.

Proper Interval And Quantity

See Tables 4-2, 4-3 & 4-4

TABLE 4-2 – FAN BEARING – LUBRICATION INTERVALS - BALL BEARING PILLOW BLOCKS									
Re-lubrication schedule (months)									
SPEED (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
SHAFT DIA.									
1/2" THRU 1-11/16"	6	6	5	3	3	2	2	2	1
1-15/16" THRU 2-7/16"	6	5	4	2	2	1	1	1	1
2-11/16" THRU 2-15/16"	5	4	3	2	1	1	1		
3-7/16" THRU 3-15/16"	4	3	2	1	1	1			

TABLE 4-3 – FAN BEARING – LUBRICATION INTERVALS - SPHERICAL ROLLER BEARING SOLID PILLOW BLOCKS									
Re-lubrication schedule (months)									
SPEED (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
SHAFT DIA									
1-3/16" THRU 1-7/16"	6	4	4	2	1	1	1	1	½
1-11/16" THRU 2-3/16"	4	2	1½	1	½	½	½	½	½
2-7/16" THRU 3-7/16"	3	1½	1	½	½	½	½		
3-15/16" THRU 4-15/16"	2½	1	½	¼					

TABLE 4-4 – FAN BEARING – LUBRICATION INTERVALS - SPHERICAL ROLLER BEARING-SPLIT PILLOW BLOCKS										Grease to be added at each interval
Re-lubrication schedule (months)										
SPEED (RPM)	500	750	1000	15000	2000	2500	3000	3500	4000	
SHAFT DIA										
1-7/16" THRU 1-15/16"	6	4½	4	4	3½	2½	2½	1	1	0.50 OZ.
2-3/16" THRU 2-11/16"	5	4½	4	2½	2½	1½	½	¼	¼	0.75 OZ.
2-15/16" THRU 3-15/16"	4½	4	3½	2½	1½	1	½			2.00 OZ.
4-7/16" THRU 4-15/16"	4	4	2½	1	½					4.00 OZ.
5-7/16" THRU 5-15/16"	4	2½	1½	1						7.00 OZ.

FAN SEGMENT-FAN MOTOR

See section 5 "Fan Replacement & Adjustment" for motor replacement guide.

Keep the motor clean, dry and properly lubricated at all times. Blow dust and dirt out of windings periodically using low-pressure (50 psig) air.

Mounting Hardware and Adjustable Motor Base

See Section 5 for motor base replacement and adjustment guide.

- Check for loose parts.
- Check for damage.

Motor Condition (visual)

- Check for leaky bearing seals.
- Check for damage.
- Check for dirt, dust & debris in air vents on motor housing.

Electrical Checks

- Check all electrical terminations.
- Check conduit fittings and clamps for damage or looseness.
- Check operating amperage and compare to nameplate.



LD9635

FIG. 4-11 – ODP (OPEN DRIP PROOF)



LD9639

FIG. 4-12 – TEFC (TOTALLY ENCLOSED FAN COOLED)

Lubrication

Motor Bearing Lubricant

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program:

- A high-grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).
 - Maximum operating temperature for standard motors = 110°C.

- Shutdown temperature in case of a malfunction = 115°C.

• **Proper Interval**

Lubrication Intervals – Recommended lubrication intervals are shown in Table 4-5. It is important to realize that the recommended intervals of Table 4-5 are based on average use. *Refer to additional information contained in Tables 4-6 & 4-7*

• **Motor Lubrication Procedure**



Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your distributor or an authorized service center if grease other than the recommended type is to be used.



To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your distributor or an authorized Service Center for additional information.

– **With Grease Relief Plug**

1. Clean all grease fittings.
2. Remove grease relief plug.
3. If motor is stopped, add the recommended amount of grease.
4. If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the end plate for purge relief plug.
5. Re-install grease relief plug.

– **Without Grease Relief Plug**

1. Disassemble motor.
2. Add recommended amount of grease to bearing and bearing cavity. Inboard Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.

TABLE 4-5 – MOTOR BEARING – LUBRICATION INTERVALS

NEMA / (IEC) FRAM SIZE	Rated speed - rpm					
	10000	6000	3600	1800	1200	900
UP TO 210 INCL. (132)	**	2700 HRS.	5500 HRS.	12000 HRS.	18000 HRS.	22000 HRS..
OVER 210 TO 280 INCL. (180)			3600 HRS.	9500 HRS..	15000 HRS.	18000 HRS...
OVER 280 TO 360 INCL. (180)			*2200 HRS.	7400 HRS..	12000 HRS.	15000 HRS.
OVER 360 TO 5800 INCL. (180)			*2200 HRS..	3500 HRS..	7400 HRS..	10500 HRS.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN410).

Re lubrication interval for 6205 bearing is 1550 HRS. (Using grease lubrication).

Re lubrication interval for 6806 bearing is 720 HRS. (Using grease lubrication).

TABLE 4-6 – MOTOR BEARING – SERVICE CONDITIONS

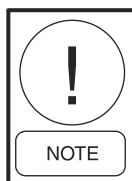
SEVERITY OF SERVICE	AMBIENT TEMPERATURE MAXIMUM	ATMOSPHERIC CONTAMINATION	TYPE OF BEARING
STANDARD	40°C	CLEAN, LITTLE CORROSION	DEEP GROOVE BALL BEARING
SEVERE	50°C	MODERATE DIRT, CORROSION	BALL THRUST, ROLLER
EXTREME	>50°C* OR CLASS H INSULATION	SEVERE DIRT, ABRASIVE DUST,	ALL BEARINGS
LOW TEMPERATURE	<-30°C**	CORROSION	

* Special high temperature grease is recommended. Note that high temperature grease may not mix with other grease types. Thoroughly clean bearing and cavity before adding grease.

** Special low temperature grease is recommended.

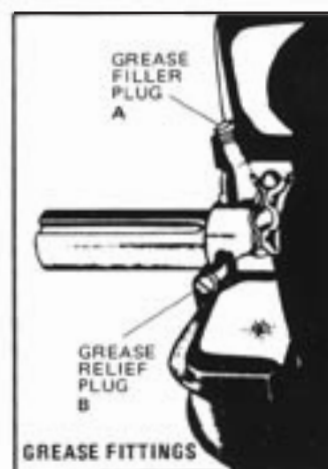
TABLE 4-7 – MOTOR BEARING – LUBRICATION INTERVAL MULTIPLIER

severity of service	multiplier
STANDARD	1.0
SEVERE	0.5
EXTREME	0.1
LOW TEMPERATURE	1.0



Bearing is 1/3 full when only one side of bearing is completely full of grease.

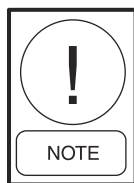
3 Assemble motor.



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FIG. 4-13 – GREASE FITTINGS

FILTER SEGMENTS (PRE FILTER AND FINAL FILTER)



Tables in this section are for Nominal Size units. If the actual unit size is other than those listed in these tables contact your York service representative or measure filter spaces to calculate sizes and quantities.



If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

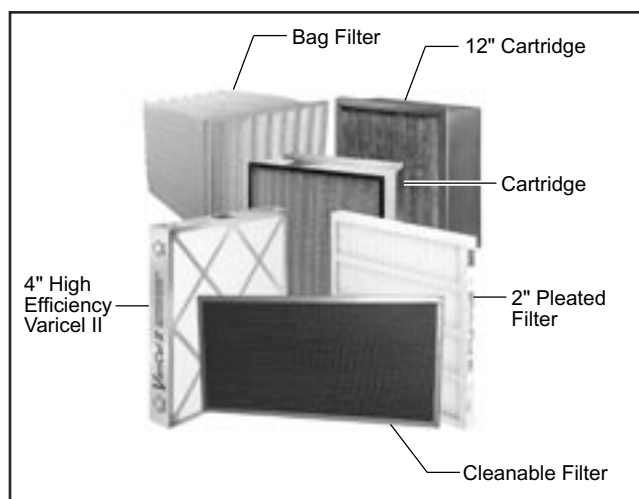


FIG. 4-14 – TYPICAL FILTERS

LD9650

Filter Types

Flat, angle, rigid, bag, HEPA & charcoal

Filter Sizes And Quantities (Except HEPA & Charcoal)

Refer to Table 4-8 for filter sizes and quantities of FF /RF & Table 4-9 for AF in Nominal Size units.

Maintenance And Replacement

Every month, check the cleanliness of the filters and replace (see Tables 4-8 & 4-9, see Figure 4-14 for typical filters used in Solution unit).

Filters should be replaced when the pressure drop, measured by a manometer, reaches the prescribed limits for the installation.

Inserting Filters Into Side Load Filter Tracks For Angle And Flat Filter Segments.

1. Check filter sizes and quantities. *Refer to table 4-8 & 4-9.*
2. Remove filter frame end cover (see Figures 4-15 and 4-16).
3. Remove old filters if present.
4. Make sure gaskets at both ends of Side Load filter tracks are in place. The gaskets are normally found on inside of filter frame end covers.
5. Slide the correct size new filters into tracks.
6. On bag filters (in FF segments) leave banding in place until filters are installed; then remove. Install bag filters so that pocket dividers are vertical if filters are over 12" high.
7. Airflow arrows must point downstream (in direction of airflow).
8. All pleated filters must be installed with pleats vertical.
9. Re-install filter frame end cover.

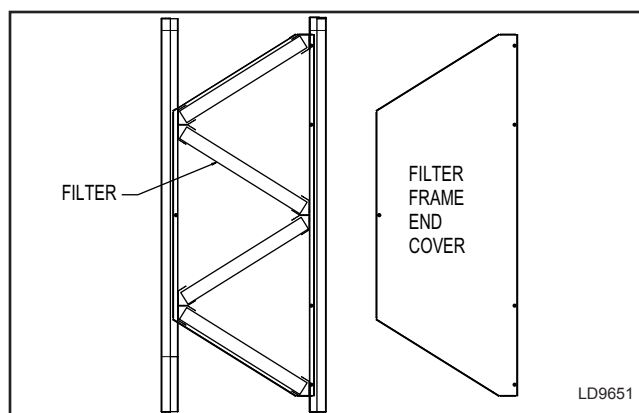


FIG. 4-15 – ANGLE FILTER INSTALLATION.

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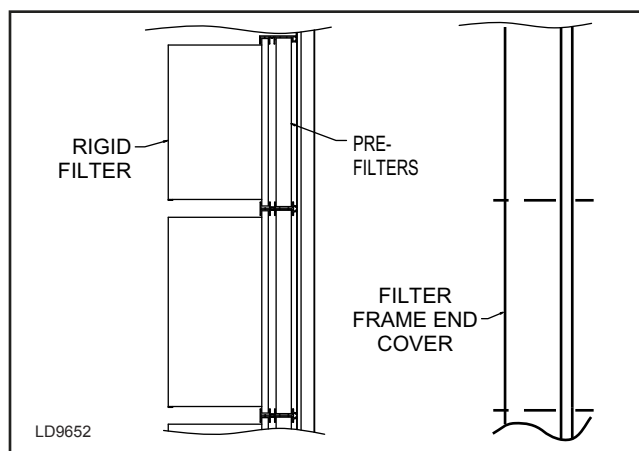


FIG. 4-16 – SIDE LOAD FILTER INSTALLATION.

LD9652

TABLE 4-8 – FILTER SIZES AND QUANTITIES – FLAT & RIGID FILTERS
(SEE FIG. 4-17 FOR ARRANGEMENTS)

Nominal Unit Sizes*		30 x 36	33 x 39	36 x 45	39 x 48	39 x 57	42 x 66	45x 69	48 x 75	51 x 81
Filter Area (sq. ft.)		3.33	4.00	6.00	6.00	8.00	10.67	15.00	15.00	20.00
Filter Size W x H	12 x 24			1	1					
	20 x 16							3	3	
	20 x 20							3	3	
	20 x 24									
	24 x 12						2			
	24 x 20	1					2			6
	24 x 24		1	1	1	2				
Nominal Unit Sizes*		60 x 81	63 x 90	69 x 96	69 x 108	75 x 120	84 x 126	90 x132	96 x 144	120 x 144
Filter Area (sq. ft.)		24.00	28.89	35.00	40.00	45.00	58.00	66.67	73.33	91.67
Filter Size W x H	12 x 24									
	20 x 16		8							
	20 x 20		4	9		9			12	15
	20 x 24						3			
	24 x 12									
	24 x 20			3	12	6		20	12	15
	24 x 24	6					12			

TABLE 4-9 – FILTER SIZES AND QUANTITIES – ANGLE FILTERS (SEE FIG. 4-18 FOR ARRANGEMENTS)

Nominal Unit Sizes*		30 x 36	33 x 39	36 x 45	39 x 48	39 x 57	42 x 66	45x 69	48 x 75	51 x 81
Filter Area (sq. ft.)		4.44	8.00	8.89	11.11	16.00	16.00	26.67	26.67	36.00
Filter Size W x H	16 x 20			4	2					
	20 x 16	2						12	12	
	24 x 12		4			8	8			18
	24 x 20				2					
Nominal Unit Sizes*		60 x 81	63 x 90	69 x 96	69 x 108	75 x 120	84 x 126	90 x132	96 x 144	120 x 144
Filter Area (sq. ft.)		36.00	53.33	48.89	64.00	93.33	80.00	100.00	113.33	151.11
Filter Size W x H	16 x 20			4		6			6	8
	20 x 16		24				36			
	24 x 12	18			32			50		
	24 x 20			12		24			30	40

* For other size units contact your York service representative

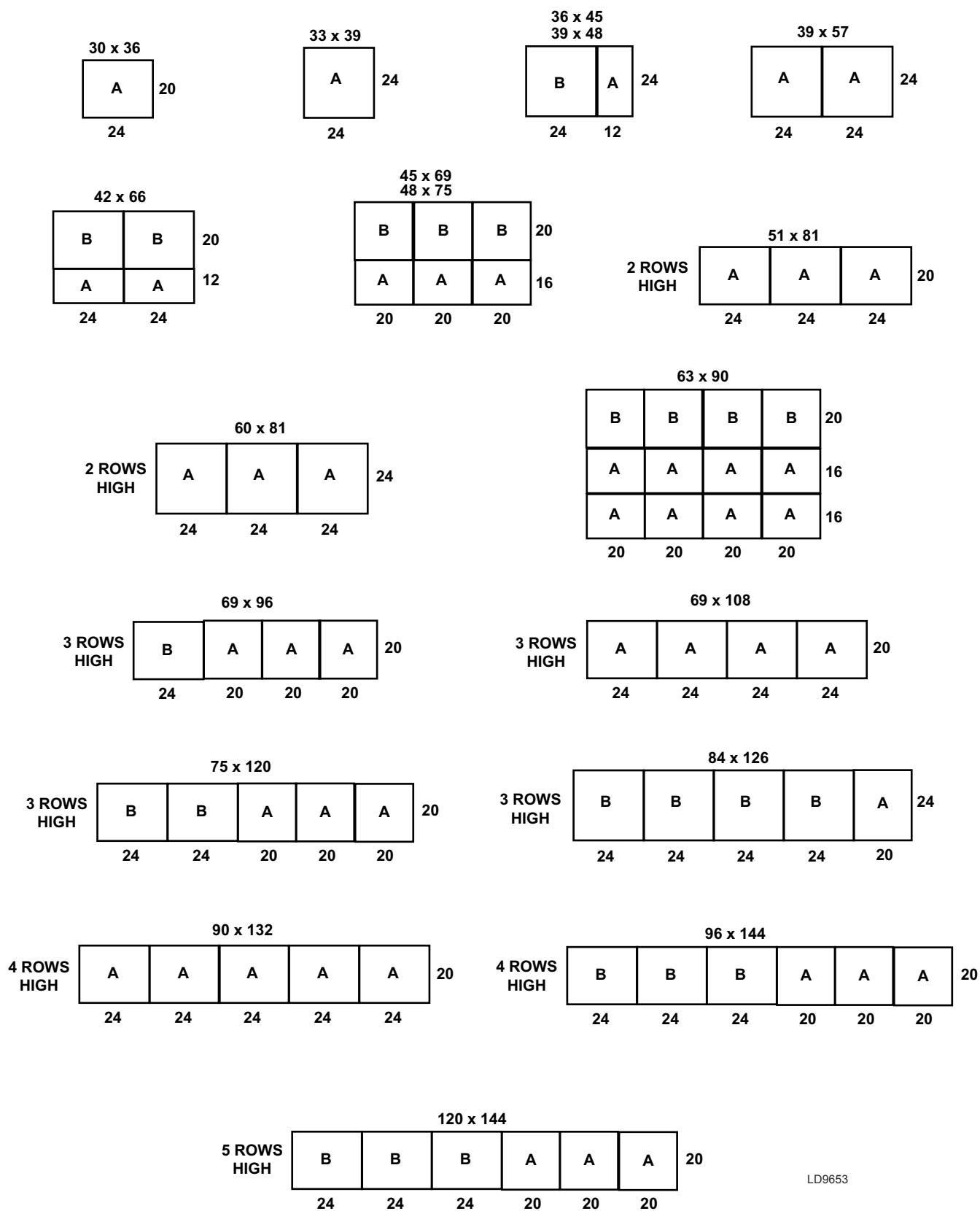
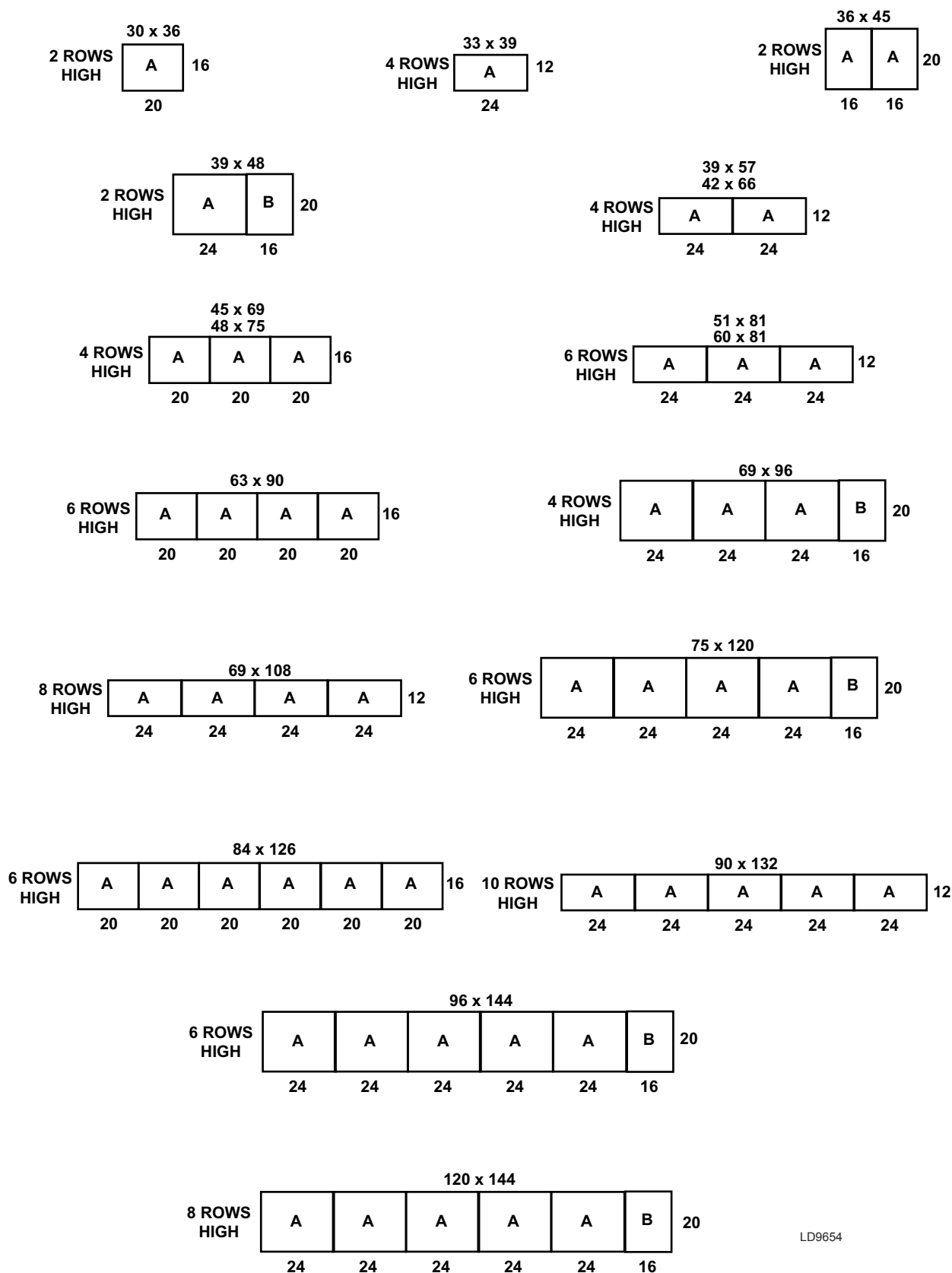


FIG. 4-17 – FILTER ARRANGEMENTS – FF AND RF FILTERS (Nominal sizes shown*)

* For other size units contact your York service representative



LD9654

FIG. 4-18 – FILTER ARRANGEMENTS – AF FILTERS (Nominal sizes shown*)

* For other size units contact your York service representative

UNIVERSAL HOLDING FRAMES AND LATCHES

See Figures 4-19 through 4-23

Inserting Filters Into Universal Holding Frames

For flat filter segments:

1. Check filter sizes and quantities. *Refer to Tables 4-8 & 4-9.*
2. Check that the gasketing in the Universal Holding Frame is in place.

Always load filters from bottom to top.

- 3 On bag filters, leave banding in place until filters are installed; then remove. Install bag filters so that pocket dividers are vertical if filter is over 12" high.
4. Prefilters when required are to be installed on upstream side of bag filters or stand-alone. Airflow arrows must point downstream (in direction of airflow).
5. All pleated filters must be installed with pleats vertical.



FIG. 4-19 – UNIVERSAL HOLDING FRAMES & LATCHES (FRONT AND REAR LOAD)

Universal Holding Frames

Standard Sizes

Galvanized Steel with PVC Gaskets
(Less Latches)

York Part	Nominal Size Inches (W. x H. x D.)	Std. Pkg. Qty.	Shipping Wt. Lbs. per Box (± 10%)
026-36333-002	12 x 24 x 2	8	31.5
026-36333-003	16 x 20 x 2	4	12.5
026-36333-007	20 x 20 x 2	4	18.0
026-36333-005	20 x 24 x 2	4	20.0
026-36333-006	24 x 24 x 2	4	21.5

GENERAL INFORMATION:

- The frames are made from 18 gauge galvanized (G-90) steel and are punched on every side with $\frac{1}{4}$ " holes for bolting or riveting the frames into filter banks. Factory installed $\frac{3}{16}$ " x $\frac{3}{4}$ " gaskets suitable for applications up to 140°F are standard.
- The actual frame depth is 2-13/16"

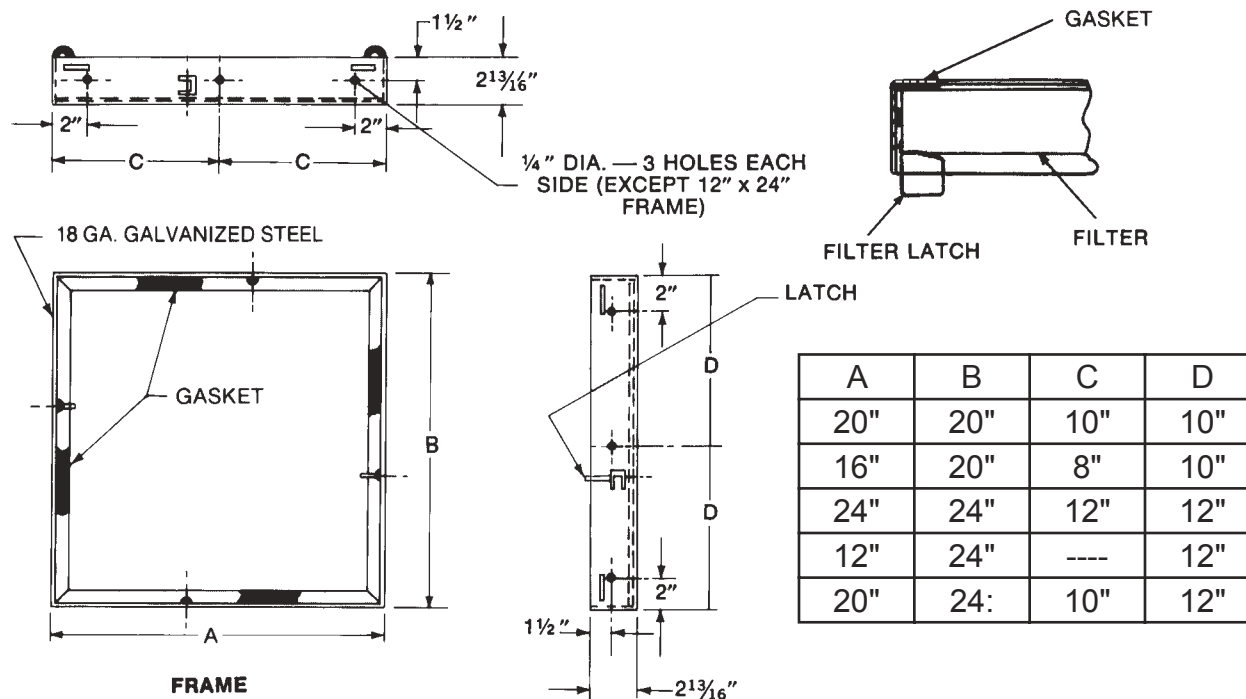
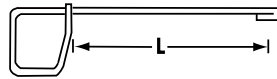
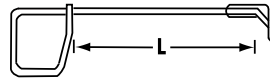


FIG. 4-20 – UNIVERSAL HOLDING FRAME SPECIFICATIONS

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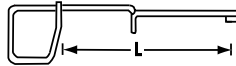
SINGLE LATCHES**KNOCK ON CONVERSION LATCH**

Note: Four (4) latches are recommended per frame

York Part Number	Vendor Part Number	Drawing Number	Latch Model Number	Length (L)
029-01048-005	391-007-004	80-1503507-4	L-10	5/32"
Application: Holds DriPak, VariCel or 1" filter in AAF Universal Holding Frame (UHF).				
029-01048-006	391-007-005	80-1503507-5	L-20	11/16"
Application: Holds 2" thick filter. Also holds DriPak or VariCel with a 1" prefilter in AAF UHF.				
029-01048-000	391-007-006	80-1503507-6	L-30	2"
Application: Holds DriPak or VariCel with a 2" prefilter in AAF UHF.				
029-01048-007	391-007-003	80-1503507-3	L-40	3-1/16"
Application: Holds two 2" or one 4" deep filter in AAF UHF.				
029-01048-008	391-007-007	80-1503507-7	L-50	3-15/16"
Application: Holds DriPak or VariCel with a 4" prefilter in AAF UHF.				
029-01048-012	391-006-004	80-1529262-4	L10 - Knockon	11/16"
Application: Holds DriPak, VariCel or 1" filter.				
029-01048-014	391-006-005	80-1529262-5	L20 - Knockon	1-5/8"
Application: Holds 2" thick filter. Also holds DriPak or VariCel with a 1" prefilter.				
029-01048-013	391-006-008	80-1529262-8	L40 - Knockon	3-5/8"
Application: Holds two 2" filters or one 4" deep filter.				
See HEPA filter section for HEPA filter latch part numbers and application.				

DOUBLE LATCHES

Prefilter can be changed without disturbing the final filter



York Part Number	Vendor Part Number	Drawing Number	Latch Model Number	Length	
				L-1	L-2
029-01048-010	391-007-009	80-1503507-9	L-41	11/16"	3-1/16"
Application: Holds VariCel II or 4" AmAir with a 1" prefilter in AAF UHF					
029-01048-009	391-007-002	80-1503507-2	L-42	1-11/16"	3-1/16"
Application: Holds VariCel II or 4" AmAir with a 2" prefilter in AAF UHF					
029-01048-011	391-007-001	80-1503507-1	L-44	3-9/16"	3-1/16"
Application: Holds VariCel II or 4" AmAir with a 4" prefilter in AAF UHF					
Note: Four (4) latches are recommended per frame.					
General Information: Latches are made of .102" diameter zinc plated dipped spring steel.					

KNOCK ON SPRING LATCH, VARICEL DH

York Part Number	Vendor Part Number	Latch Model Number	Description	Service
026-36343-000	315-001-001	SL-12	SL-12" Spring Latch	Upstream or Downstream
Application: Holds a 12" deep double header VariCel in a FARR Universal Type 8 Holding Frame. (Can be used with AAF Universal Holding Frames or other manufacturers frames).				

PREFILTER RETAINER CLIP, VARICEL DH

York Part Number	Vendor Part Number	Latch Model Number	Description	Service
026-36339-001	315-003-002	VP-2	2" Clip	Upstream
026-36339-000	315-003-004	VP-4	4" Clip	Upstream
Application: Holds a 2" or 4" prefilter respectively, against the face of a DH VariCel. Can also be used on a SH VariCel installed in a DriPak Holding Frame.				
Prefilter Retaining Clips are made of zinc plated yellow chromated dipped steel				

FIG. 4-21 – UNIVERSAL FRAME LATCH SELECTION

Latch Installation

Before installing filters, install filter latches (see Fig. 4-22).

1. Apply light pressure to clip on inside of frame and insert latch.
2. Apply light pressure to clip on outside of frame in order to reposition clip.
3. Turn loop on latch parallel to frame and insert filter (see “insert filter” instructions listed previously in this section of IOM).
4. After filter is installed, turn loop on latch 90° to secure filter in frame.

See Fig. 4-23 for Optional Latch Arrangements.

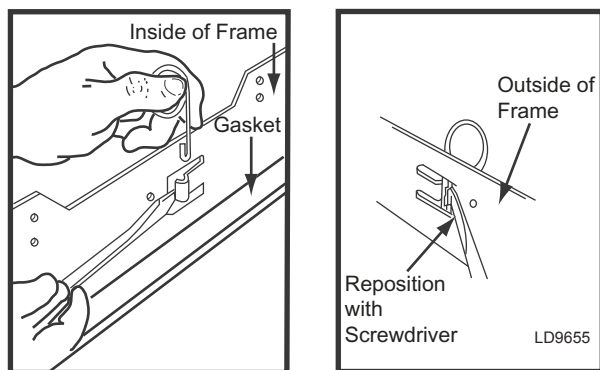


FIG. 4-22 – LATCH INSTALLATION

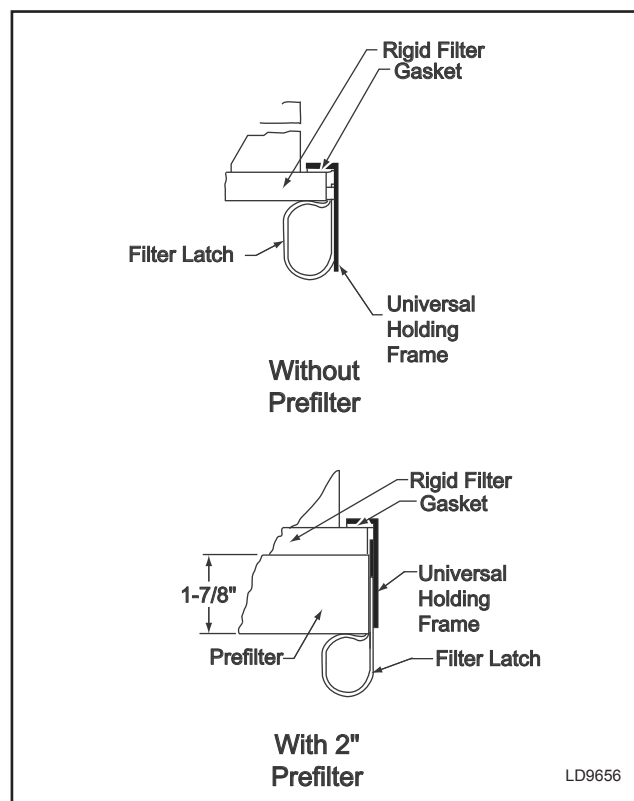


FIG. 4-23 – OPTIONAL LATCH ARRANGMENTS

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VISUAL CONTROL FILTER CLAMPS FOR HEPA FILTERS				
York Part Number	Vendor Part Number	Drawing Number	Latch Model Number	Length (L)
029-22081-000	?	?	Latch, HEPA Single	11-1/2"
Application: Holds one Astrocel I 11.5" D filter along frame sides. (See Fig. 4-25, 4-26 and 4-27 for application)				
029-22082	?	?	Latch, HEPA Double	11-1/2"
Application: Holds one Astrocel I 11.5" D filter along frame middle. (See Fig. 4-25, 4-26 and 4-27 for application)				

HEPA FILTERS

Welded Bevel Seal Frame

Extruded Aluminum Frames For Gasketed HEPA Filter Installations

The Bevel Seal frame is a factory welded, extruded aluminum frame developed specifically for High Efficiency Particulate Air (HEPA) filter installations. Standard Bevel Seal frames accommodate multiple sizes of gasketed HEPA filters 11-1/2" deep. (See Fig 4-24, 4-26, & 4-27)

Two Stage Gasket Compression Prevents Leakage

The Bevel Seal frame features a two level sealing surface connected by a bevel. This causes the filter gasket to be compressed in two stages as clamping pressure is applied. The outer edge of the gasket is compressed to a greater degree than the inner portion of the gasket. (See Fig 4-27)



In the event excessive clamping pressure is applied, the individual cells in the gasket material can be fractured causing the gasket to relax, allowing leakage.

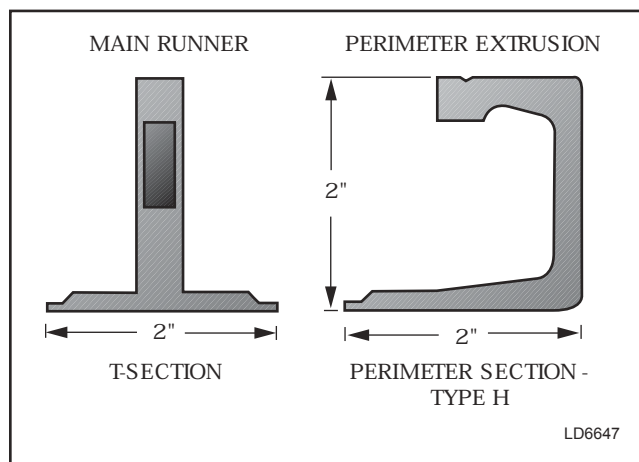


FIG. 4-24 – HEPA FILTER FRAME CROSS SECTION VIEW

Visual Control Filter Clamps

(See Fig. 4-25)

HEPA Filter Applications

Visual Control clamps are designed for use with any conventional gasketed HEPA filter. Located at mid-point of each filter edge, the calibrated spring-loaded clamps maintain up to 100 pounds pressure against the filter at each clamping point. Four clamps are used per filter to assure uniform pressure against the gasket. The clamps have a 1-1/2" wide bearing surface.

Easy Clamp Installation

No special tools are required for proper clamp installation. **Just tighten the bolt head until it is flush with the clamp face** to achieve the prescribed compression. Proper clamping pressure is created indefinitely by the calibrated spring.

Single filter clamps are used around the perimeter of the frame bank. Double clamps are used along main runners to secure a filter on either side of the T-section. (See Fig. 4-25, 4-26 & 4-27)

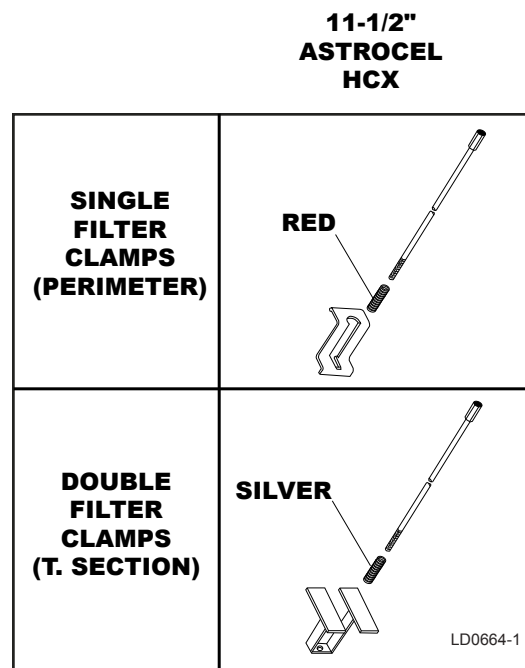


FIG. 4-25 – VISUAL CONTROL FILTER CLAMPS

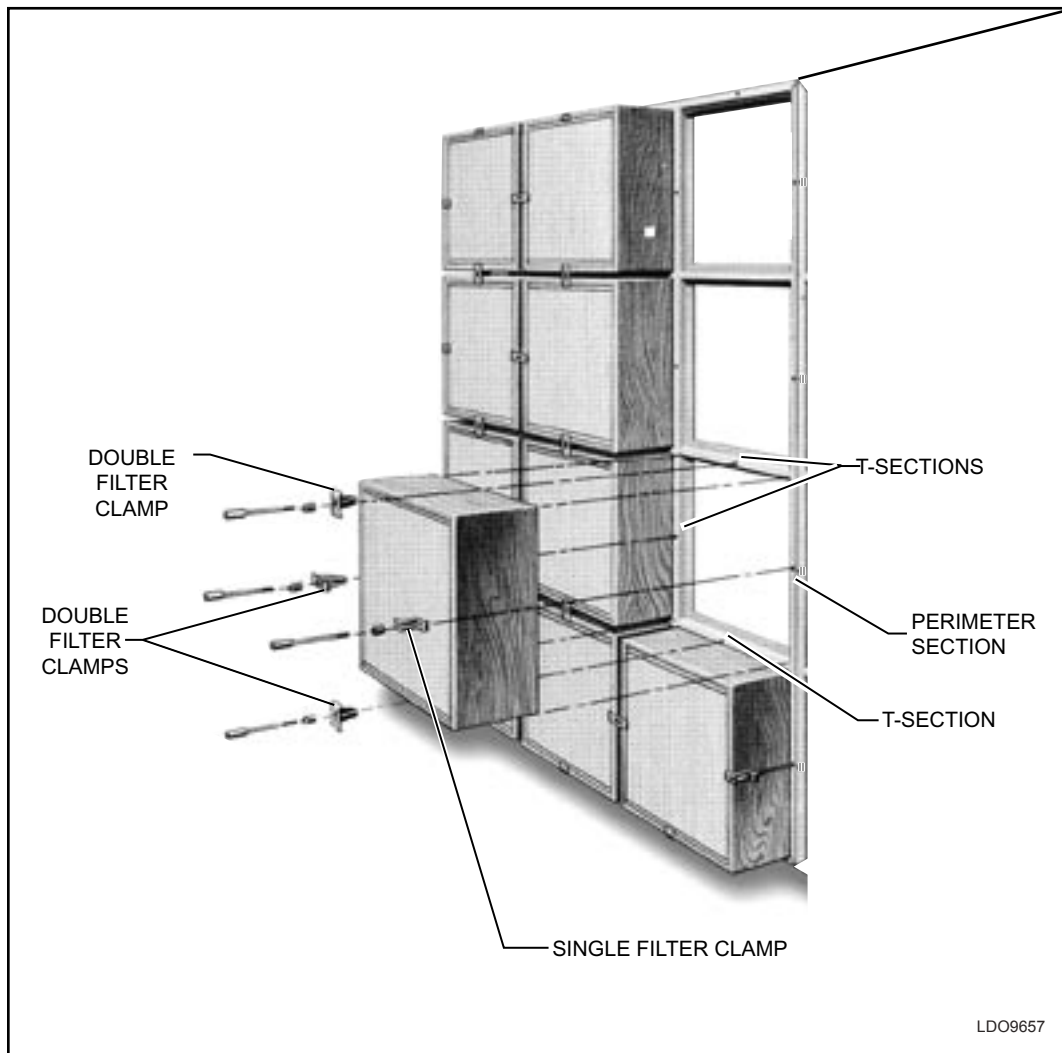


FIG. 4-26 – HEPA FILTER INSTALLATION

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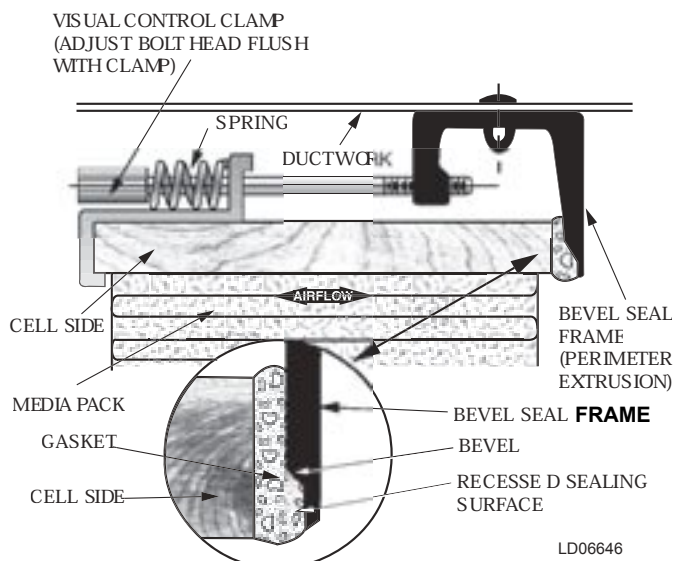
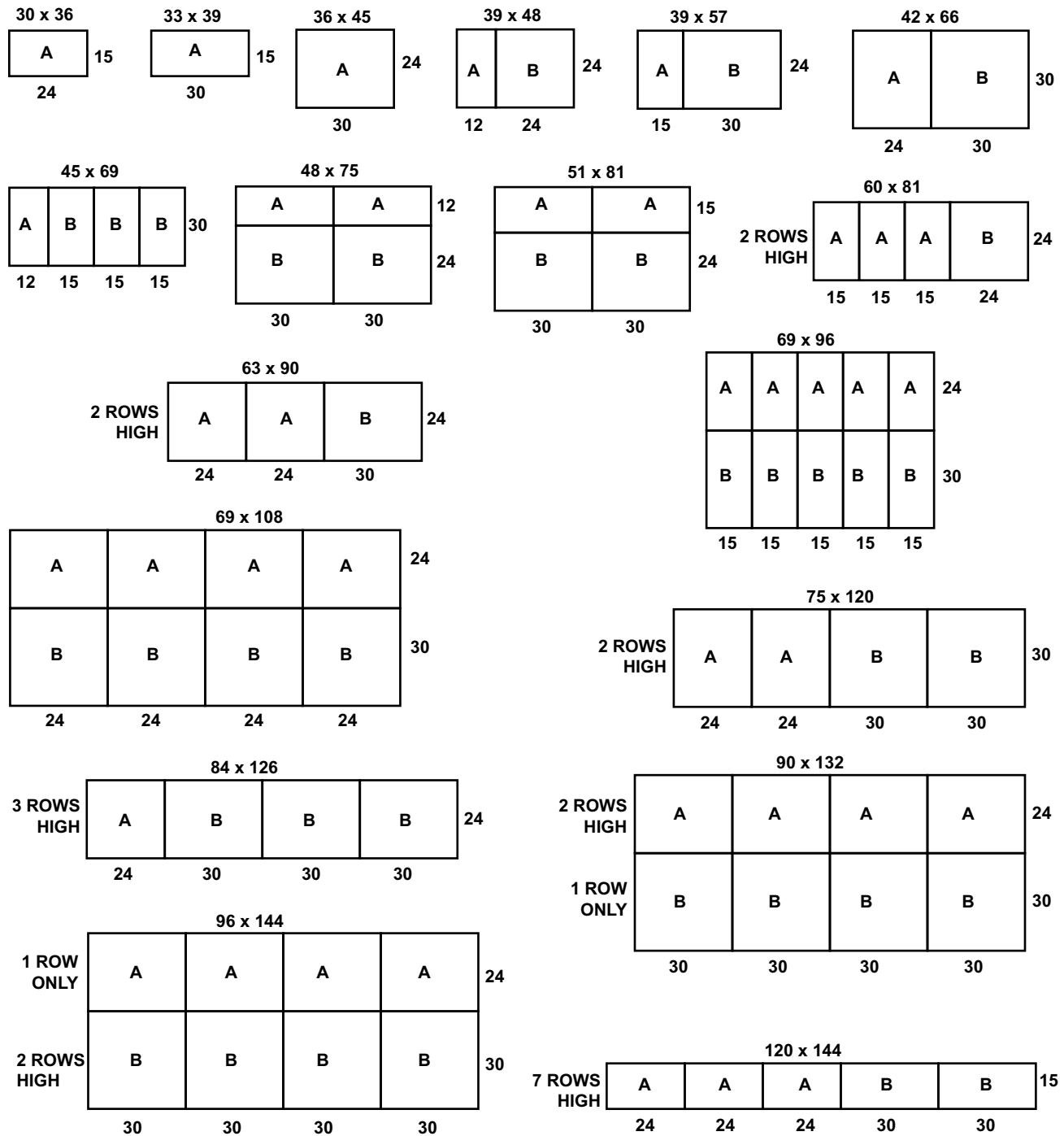


FIG. 4-27 – WELDED BEVEL SEAL FILTER INSTALLATION

TABLE 4-10 – FILTER SIZES AND QUANTITIES – HEPA FILTERS (SEE FIG. 4-28 FOR ARRANGEMENTS)

Nominal Unit Sizes*		30 x 36	33 x 39	36 x 45	39 x 48	39 x 57	42 x 66	45x 69	48 x 75	51 x 81
Filter Area (sq. ft.)		2.50	3.10	5.00	6.00	7.50	11.30	11.90	15.00	16.30
Filter Size W x H	12 x 24				1					
	12 x 30							1		
	15 x 24					1				
	15 x 30							3		
	24 x 15	1								
	24 x 24				1					
	24 x 30						1			
	30 x 12								2	
	30 x 15		1							2
	30 x 24			1		1			2	2
	30 x 30						1			
Nominal Unit Sizes*		60 x 81	63 x 90	69 x 96	69 x 108	75 x 120	84 x 126	90 x132	96 x 144	120 x 144
Filter Area (sq. ft.)		23.00	26.00	28.10	36.00	45.00	57.00	65.00	70.00	96.30
Filter Size W x H	12 x 24									
	12 x 30									
	15 x 24	6		5						
	15 x 30			5						
	24 x 15									21
	24 x 24	2	4		4		3			
	24 x 30				4	4				
	30 x 12									
	30 x 15									14
	30 x 24		2				9	8	4	
	30 x 30					4		4	8	

* For other size units contact your York service representative



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FIG. 4-28 – FILTER ARRANGEMENTS – HEPA FILTERS (Nominal sizes shown*)

* For other size units contact your York service representative

ECONOMIZER SEGMENT (DAMPERS)



Prior to occupancy, test ventilation system to ensure that outdoor air dampers operate properly in accordance with the system design.

Cleaning Of Dampers

Cleaning of dampers should be performed before operation is hindered in any way. Maintenance personnel must determine when cleaning is necessary based on observation and operation.



Do not use Lubricants. York suggests cleaning with contact cleaner or 50/50 H₂O/alcohol solution. Consult proper building personnel to ensure above solution will not harm personnel or equipment.

Hardware Check

Make sure all linkage parts, actuators and, mounting brackets are secure.

Check Operation Of Controls And Actuators (OFPC).

Refer to "OptiLogic™ Factory-Packaged Controls" manual for detailed actuator mounting, adjustment and control.

COIL SEGMENT

Coil Cleaning Procedure

Suggested Tools, Equipment & Materials List

- Pressure washer that does not exceed 2000 PSI
- Sprayer (utility garden, etc.) applicator
- Plastic sheeting
- Duct tape
- Screening
- Coil cleaner (safe, commercial grade, disinfecting)
- Garden hose
- Garden hose spray nozzle

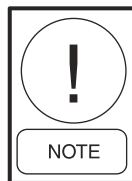
- Rags
- Pail
- Trash bags
- Power cords
- Four-inch paintbrush

Cleaning Procedure



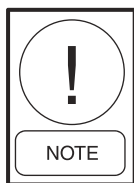
Perform cleaning of dehumidification coils at least once a year or when air pressure drop exceeds 125% of design.

1. Cover electrical components such as fan motors, damper motors, compressors, thermostats, etc. with plastic. Care should be taken on interior coil cleaning. Remove filters; cover fan bearings and any insulation to keep these items free of water damage. Condensate drain piping should be screened to allow coil-cleaning water to flow freely. Screening keeps traps and drain lines from clogging with debris washed from the coils.
2. Prior to any application of wet cleaning materials, use a wide soft bristle paint brush to dust off any heavy dust, leaves, bugs or other foreign matter that may be on the coil fin surface.



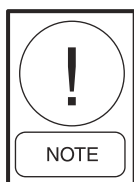
Safety glasses should be worn when cleaning coils

3. When possible, remove dirt lodged in the depth of the coil by using clean oil-free air under pressure. Caution should be taken not to use extreme high-pressure air as this may cause fin surface damage. Direct the air straight at the openings between the fins and never at an angle, which may bend the fins against one another. Always apply the air from the air leaving side of the coil.
4. On heavily soiled coils, use a safe commercial grade coil cleaner.



Follow the safety and mixing instructions as noted on or with the cleaning agent.

5. Spray the cleaning agent on both sides of the coil to be cleaned. Allow the cleaning agent to remain in contact with the dirty surface for about 5 minutes or as recommended by the agent instructions. Then flush the coil with clean water from a hose (with spray nozzle or from pressure washer). Flush from the air leaving side of the coil. Caution should be taken, as extreme water pressure may result in fin surface damage. Direct the water straight at the openings between the fins and never at an angle, which may bend the fins against one another. This process will wash away surface dirt on the air entering side of the coil, and prevent it from loading within the depth of the coil.
6. Most cleaners are concentrated detergents and can be diluted with up to 10 parts of water. Dilute as per cleaning agent instructions and coil condition. Re-spray both sides of the coil with cleaner. Allow to stand 5 minutes and flush as described previously. Finish flushing from both sides of the coil.



Follow cleaning agent instructions. Agent should meet environmental and OSHA standards.

7. Some extreme oil and dirt conditions may require steam cleaning. Most steam equipment can be adjusted to provide a mixture of water and steam at a moderate pressure. Steam alone without the presence of water does not work well with most cleaning agents. Cleaning the coils with steam should be done as described previously.
8. Comb out any bent or flattened areas of fin surface.
9. Restore equipment to operational state.

Condensate Drain Pan, Trap and Drain Line Cleaning Procedure



Clean condensate drain pan, trap, drain line and adjacent wetted surfaces at least once per year or as often as required to retard growth of microbial substances.



Testing of Drain Pans - To minimize conditions of water stagnation that may result in microbial growth, drain pans shall be field-tested under normal operating conditions to ensure proper drainage.

Exception: Field testing of drain pans is not required if units with factory-installed drain pans have been certified (attested in writing) by the manufacturer for proper drainage when installed as recommended.

Tools And Materials

- Toilet bowl brush or similar utility cleaning brush
- Cleaning agent (safe, commercial grade, disinfecting)
- Rags
- Trash bags
- Garden hose with spray nozzle or power washer
- Scraper
- Screening
- Wet vacuum

Cleaning Procedure

1. Cover any nearby components such as motors, control devices or wiring.
2. Sweep, gather and remove debris from drain pan, auxiliary pans and splash guards.
3. Scrape loose and remove any clinging substances.
4. Cover drain pan outlet with screening to prevent drain clogging.
5. Prepare cleaning agent per manufacturer's instructions.

6. Apply cleaning agent with spray applicator or brush.
7. Apply cleaner to ALL surfaces including: under side of coil, header and return bends if in air stream, coil supports, coil wall or bulkhead, auxiliary drain pans, splash guards, any other surfaces subject to wetting by condensation dripping or carried by normal air flow, drain pan and outlet.
8. Add ample amount of cleaning agent to drain line and trap.
9. Allow cleaner to stand for time required by manufacturer's instructions.
10. Flush with clean water from pressure washer or garden hose with spray nozzle.
11. Apply as much water under pressure as possible to drain outlet to clean trap and drain line.
12. Remove water from any puddle areas with wet vacuum.
13. Wipe down if necessary to remove any stubborn material.
14. Restore equipment to operational state.

Freeze Protection

All chilled water, hot water and steam coils can be damaged during freezing weather. Pre-cautionary measures must be taken to prevent freezing such as:

- For all year operation, ethylene glycol and other antifreeze solution must be circulated.
- During winter operation and shutdowns such as power failure, night shutdown and weekend shutdown, the controls must be installed so the valves will go to the full heat position, and all fresh air dampers go to the full closed position. The water circulation pumps must keep circulating water through the coils and/or auxiliary heat must be maintained inside the Solution unit cabinet.
- Draining each coil and related piping such as traps and making sure that all low areas also drain.
- After draining, flush coils with an antifreeze solution such as propylene glycol. A solution of 50% ethylene glycol and 50% water will protect from freezing to approximately 35°F below zero at sea level. Use adequate mixture for the geographic area of the installation.

Winterizing Drain Traps

During the winter months when the cooling system is turned off and the unit is exposed to freezing conditions, an antifreeze solution, which is environmentally friendly and safe for the roof can be poured in the condensate drain trap to prevent freezing and possible damage. The condensate drain trap may also be removed as well as heat traced and insulated.

ENERGY RECOVERY WHEEL

Tools

- Brushes.
- Loctite
- Screwdrivers

Materials

- Acti-Klean, Granger stock # 5W402. or alkaline detergent.

Cleaning



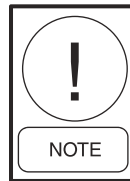
The need for periodic cleaning of the Energy Recovery Wheel will be a function of operating schedule, climate and contaminants in the indoor air being exhausted and outdoor air being supplied to the building.

Wheel

- To clean, gain access to the Energy Recovery Wheel and remove the segments (see Section 5 "Replacing Wheel Segments").
- Brush or vacuum foreign material from the face off the wheel.
- Wash the segments in a 5% solution of non-acid based coil cleaner (see material list above) or alkaline detergent and warm water.
- Allow segments to soak in solution until grease and tar deposits are loosened. An overnight soak may be required to adequately loosen heavy deposits of tar and oil based contaminants. Before removing from solution, rapidly run finger across surface of segment to separate polymer strips for better cleaning action. Rinse dirty solution from segment with clean water (see Figure 4-29) and allow excess water to drain prior to remounting segments in the wheel. (see Section 5, "Replacing Wheel Segments"). A small amount of water remaining in the wheel will be dried out by the airflow.



FIG. 4-29 – RINSE SEGMENTS WITH CLEAN



Some staining of the desiccant may remain and is not harmful to performance.



Do not use acid based cleaners, aromatic solvents, steam or temperatures in excess of 170°F: damage to wheel may occur!

Adjustment Of Air Seals

Four adjustable diameter seals are provided on each cassette to minimize transfer of air between the counter flowing airstreams (see Figure 4-30).

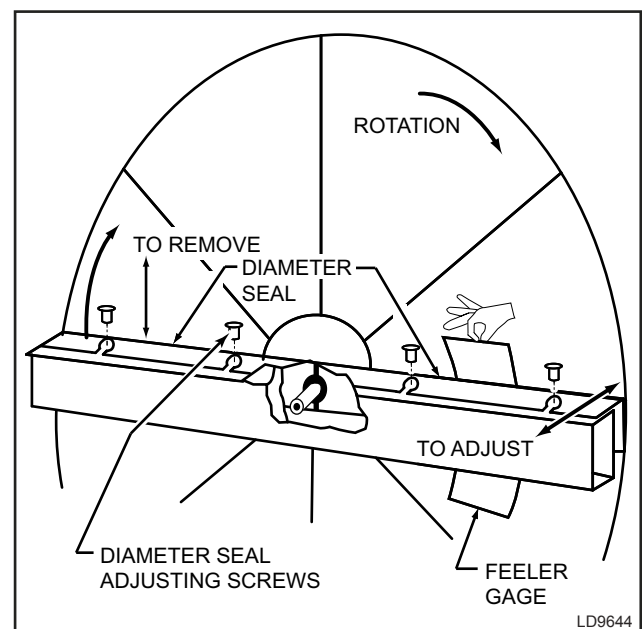


FIG. 4-30 – DIAMETER SEAL ADJUSTMENT

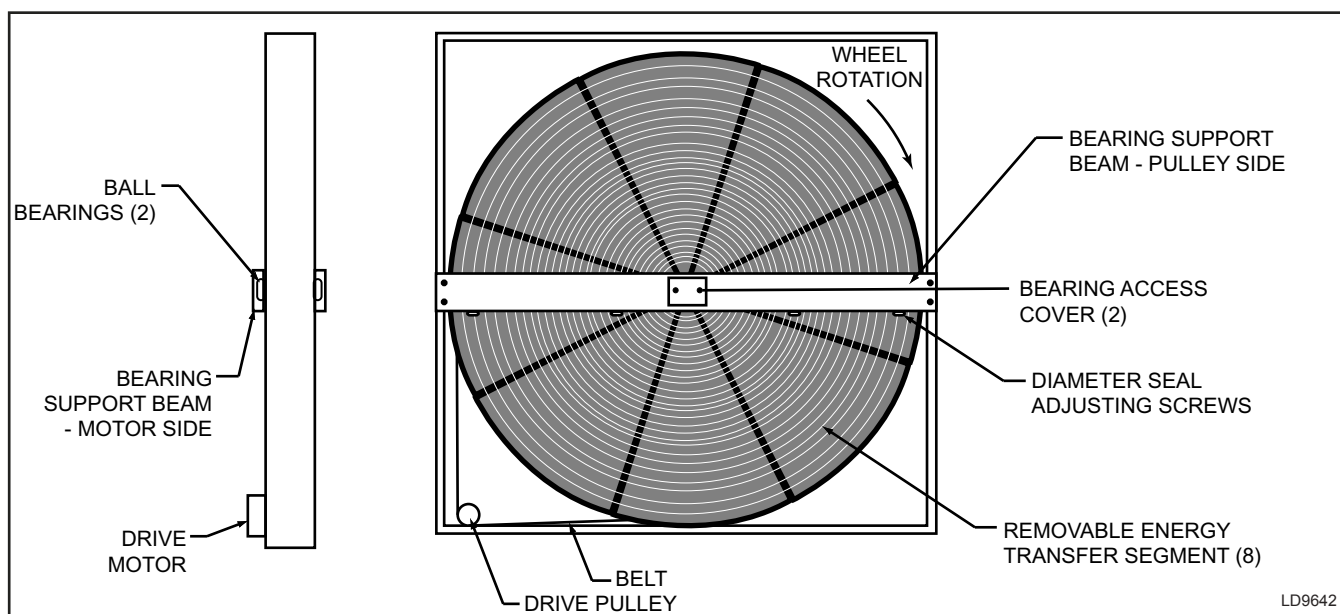


FIG. 4-31 – ENERGY RECOVERY WHEEL, BEARING SUPPORT BEAM SIDE

- To adjust diameter seals, loosen diameter seal adjusting screws and move diameter seal away from wheel surface.
- Rotate wheel clockwise until two opposing spokes are hidden behind the bearing support beam (see figure 4-31).
- Using a folded piece of paper as a feeler gage, position paper between the wheel surface and diameter seals. Adjust seals towards wheel surface until a slight friction on the feeler gage (paper) is detected when gauge is moved along the length of the spoke.
- Retighten adjusting screws and recheck clearance with “feeler” gage.
- The wheel drive pulley is secured to the drive motor shaft by a combination of either a key or D slot and setscrew. The setscrew is secured with removable locktite to prevent loosening. Annually confirm setscrew is secure.
- The wheel drive belt is a urethane stretch belt designed to provide constant tension through the life of the belt. No adjustment is required. Inspect the drive belt annually for proper tracking and tension. A properly tensioned belt will turn the wheel immediately after power is applied with no visible slippage during start-up.

Wheel Drive Components

- The wheel drive motor bearings are pre-lubricated and no further lubrication is necessary.



If slippage is detected, replace wheel drive belt as soon as possible. A non-rotating wheel in the active air stream is likely to become clogged. Contact local York Service to order replacement belt. See Section 5 "Belt Replacement" for Energy Recovery Wheel drive belt replacement procedure.

 MAINTENANCE RECOMMENDATIONS FOR SOLUTION AIR HANDLER (Includes suggested IAQ minimums for ASHRAE Std. 62-2001 Compliance)				
PROCEDURE	MONTHLY	QUARTERLY	YEARLY	OTHER
Clean exterior of air handler cabinet.				As Needed
Inspect doors, handles, latches and hinges for proper operation.			X	
Inspect door gaskets for damage and proper seal.			X	
Inspect panels for damage.			X	
Inspect air hoods and air louvers for damage and debris.				6 months
Inspect bird screens for damage and debris.				6 months
Inspect bird screens for damage, dirt and debris.				6 months
Clean fan segment and fan assembly (supply, return, exhaust).			X	
Check fan housing, wheel, shaft, frame, inlet vanes and bearings for damage, wear, loose parts, dirt and debris.			X	
Check fan base, vibration isolators and thrust restraints for damage, wear, loose parts, dirt and debris.			X	
Check flex connector for damage and wear.			X	
Check the cleanliness of the filters and replace or clean as required.	X			See IOM Tables
Check filter frames (filter tracks) for residual contaminants and clean as necessary.		X		
Verify filter gauge and/or switch function properly.	X			
Check drive kit for damage, loose parts, wear, dirt, alignment and belt tension.		X		
Check belt tension.		X		
Lubricate fan bearings. (Ball Bearing-Table 4-2, Roller Bearing-Table 4-3, Split Pillow Block-Table 4-4)				See IOM Tables
Check condition of extended lubrication lines when present.		X		
Clean variable inlet vanes.			X	
Check adjustable fan motor base and mounting hardware for loose parts.			X	
Check adjustable fan motor base for damage.			X	
Check fan motor for leaky bearing seals.			X	
Check fan for motor damage.			X	
Clean dampers.		X		
Check for dirt, dust & debris in air vents on fan motor housing.			X	
Clean dehumidification coils.			X	
Clean condensate drain pan, trap, drain line and adjacent wetted surfaces.			X	
Check, clean and calibrate controls.				6 months
Check Energy Recovery Wheel, clean media, adjust seals, replace belt				As Needed

¹ For operating and maintenance requirements listed above, refer to appropriate service literature, or contact your local YORK Service Office.

² This procedure must be performed at the specified time interval by a Qualified Technician. A record must be maintained should proof of adequate maintenance be required for warranty validation.

³ More frequent maintenance may be required depending on actual operating conditions.

Form 102.20-MR1 (503)

FIG. 4-32 – MAINTENANCE REQUIREMENTS FOR SOLUTION HANDLER

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5.0 SERVICE AND REPAIR



Rotating parts and electrical shock hazards exist. Lock out and tag out the fan motor(s) and heat power disconnects before servicing. York service personnel should refer to the “YORK Field Service Employee Safety Manual”, 50.05-SM1. Independent contractors refer to OSHA Lockout/Tag out Standard, 29 CFR 1910.147. Failure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this IOM.



Always replace RED metal tab on access doors that provide access to moving parts. This mechanical protection from moving parts is required by UL-1995.

Always replace RED metal tab on access doors that provide access to pressurized areas. This mechanical protection is to prevent accidental release of access doors under positive pressure.



Do not weld or use torches on the exterior or interior of the unit housing. The housing contains polyurethane insulation, which when under combustion will produce harmful, toxic gases resulting in personal injury or death

SERVICE TOOLS AND EQUIPMENT

- Complete set of mechanics hand tools.
- Observation mirror
- Fin comb (straightener)
- Heat gun
- Straightedge
- Tachometer
- Manometers capable of .01” To 36” combined.
- Pitot Tube
- Duct hood
- Velometer
- Psychrometer
- Combustion Efficiency Analyzer
- Standard refrigeration gauges/manifold
- Refrigerant re-claimer
- Refrigerant leak detector
- Vacuum pump
- Gas torches (soldering and/or brazing)
- Fire extinguisher
- Electronic Temperature Meter with a minimum of 3 Leads.
- Meg-ohm Meter
- Phase Meter
- Capacitor Analyzer
- Clamp on ammeter
- Multi-meter or meters capable of reading the following:
 - One thousand volts AC/DC
 - Amperes
 - Ohms
 - Millivolts
 - Milliamps
 - Microfarad

SERVICE INFORMATION

All necessary tags and decals to aid in service or to indicate caution areas are provided. Electrical wiring diagrams are attached to the control panel access door. Installation, operation and maintenance manuals are supplied with each unit.

The Solution offers unlimited unit access with completely removable panels. All of the unit panels, including the top panels can be completely removed.

The removal of top panels allows the use of overhead cranes and gantries in removing and servicing of components. Fan and filter segments come equipped with doors as a standard feature.

TROUBLESHOOTING

An HVAC air system includes the air handling unit and the entire air circuitry through which air flows. Included in the system are such components as duct work, fittings, branch ducts, dampers, heat exchangers, filters, sound traps, coils, elbows, diffusers, grilles, VAV's, MIT's and other items through which air flows or which offer obstruction to air flow.

While differences in temperature and humidity may cause air movement, it may be considered very slight in comparison to the positive circulation required in an air conditioning system. To accomplish this air movement, a fan has two functions to perform:

- Produce sufficient pressure or head to accelerate the mass of air from a state of rest to the required velocity.
- Produce sufficient pressure to overcome any resistances to the flow of air.

The determination of these pressures is a very important part of troubleshooting an air conditioning system. The generally accepted standard instrument for measuring these unit pressures is the Pitot Tube (see Figures 5-1 & 5-2). The Pitot Tube is used in conjunction with an Inclined Manometer, Magnehelic Gauge, or a Tube Manometer.

When the Pitot Tube is used in conjunction with these instruments, one is able to read velocity pressure (V_p), static pressure (sp), and total pressure (T_p) within the system.

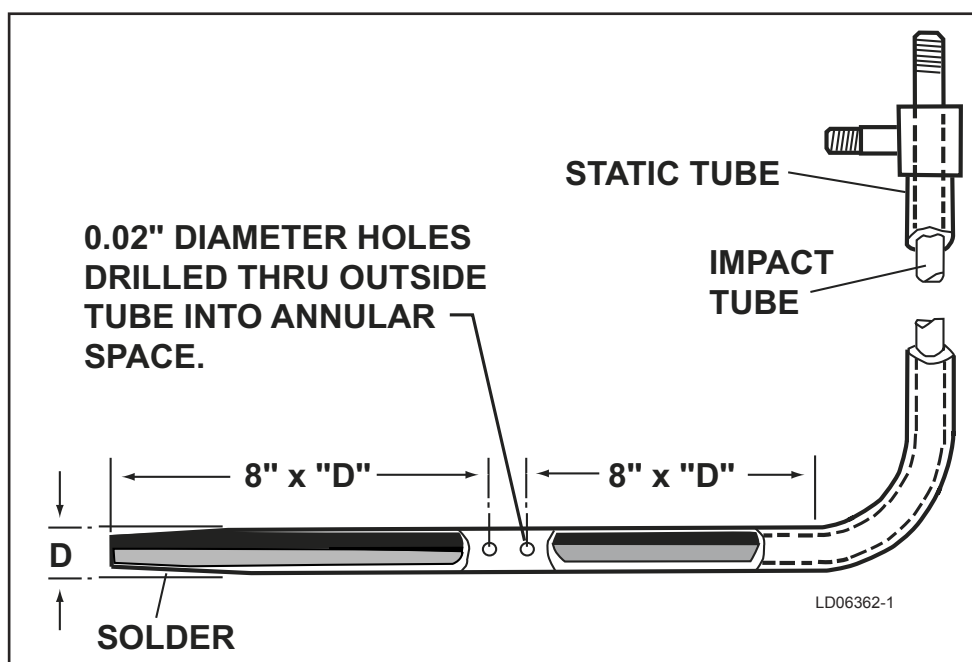
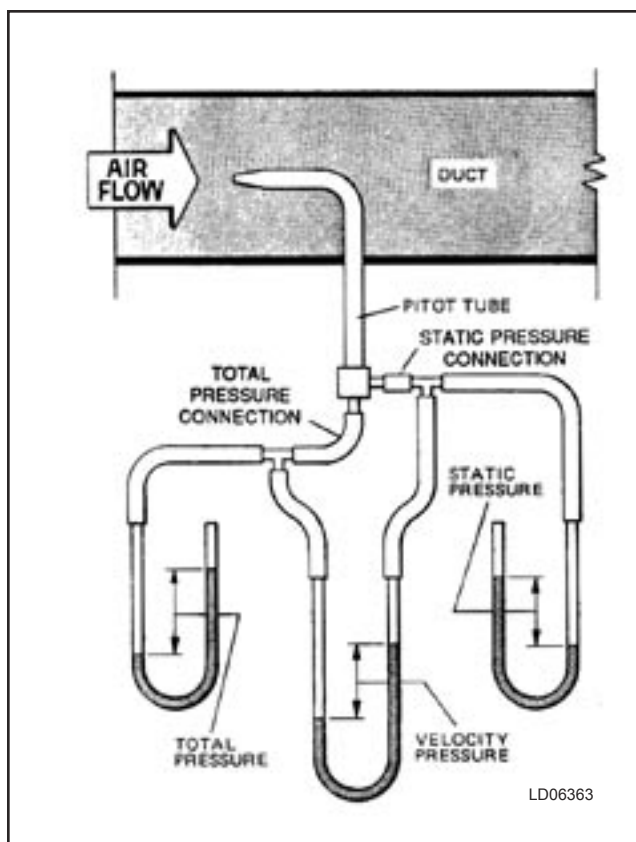


FIG. 5-1 – CONSTRUCTION OF PITOT TUBE

**FIG. 5-2 – PITOT TUBE****PITOT TUBE**

The Pitot consists of an impact tube within a larger static tube. When the impact tube is pointed directly into the air stream, the small static pressure holes are perpendicular to the air stream and are not affected by air velocity (see Figure 5-2).

To read velocity pressure, the total pressure tap at the end of the Pitot Tube is connected to one leg of a manometer and the static pressure tap at the other leg of the manometer (see Figure 5-3).

INCLINED MANOMETER

This instrument, is a simple, foolproof device, which responds directly to the air pressure exerted against it (transmitted from the Pitot Tube), and reads directly in inches of water. Ranges for these instruments vary, and the technician should have one or more instruments to cover the range of 0 to 8 inches of water (see Figure 5-3).

Before using the Inclined Manometer, ensure the instrument is level and then adjust the meniscus to the zero mark. The adjustment knob is located at the base of the fluid reservoir.

**FIG. 5-3 – INCLINED MANOMETER****MAGNEHELIC PRESSURE GAUGE**

The Magnehelic Gauge is a diaphragm-operated gage that has several advantages over a liquid manometer.

Unless extreme accuracy is required, this instrument may replace the manometer for average air conditioning work, and like the manometer, is available in a variety of ranges. The dial is only 4 inches in diameter and therefore has a limited scale; several instruments are required to cover the normal ranges encountered in average air conditioning jobs (see Figure 5-4).

The Magnehelic Gauge should be factory-installed level. Adjust indicator to zero with no airflow across the sensors. Adjustment screw is located at the bottom center of the plastic cover. When airflow is initiated, the indicator should move to the right. If it moves in the opposite direction, reverse the tubes.

**FIG. 5-4 – MAGNEHELIC PRESSURE GAUGE**

“U” TUBE MANOMETER

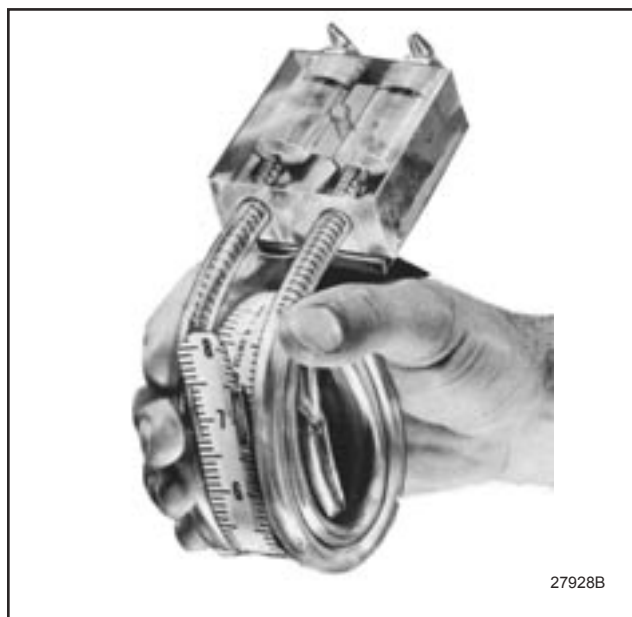
Pressure is defined as force per unit area - and the best way to measure air pressure is to balance a column of liquid of known weight against the air pressure and measure the height of liquid columns so balanced. The units of measure commonly used are: inches of mercury (in. Hg.), using mercury as the fluid; and inches of water (in. WG), using water or oil as the fluid.

Instruments employing this principle are called manometers. The simplest form is the basic and well-known U-tube manometers (*see Figure 5-5*). This device indicates the difference between two pressures or between a single pressure and atmosphere, when one side is open to atmosphere.

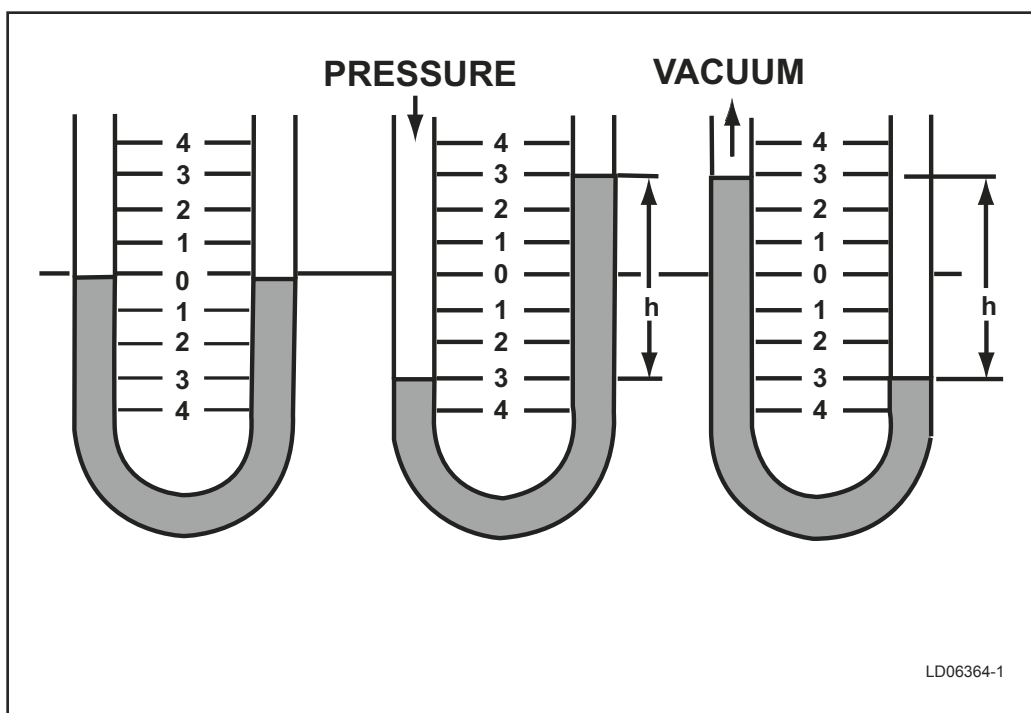
If a U-tube is filled to the halfway point with water and air pressure is exerted on one of the columns, the fluid will be displaced. Thus one leg of water column will rise and the other falls. The difference in height “h” which is the sum of the readings above and below the halfway point indicated the pressure in inches of water column.

The U-tube manometer is a primary standard because the difference in height between the two columns is always a true indication of the pressure regardless of variations in the internal diameter of the tubing.

For use on all YORK air units, the manometers should cover at least a 26-inch range (*see Figure 5-6*).



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FIG. 5-6 – SLACK-TUBE MANOMETER

LD06364-1

FIG. 5-5 – “U” TUBE MANOMETERS

DUCT PRESSURES AND HOW THEY WORK

Velocity

When air moves at a given velocity in a duct it creates a pressure corresponding to the velocity; this is a measure of the kinetic energy in the fluid and it is known as the velocity pressure (Vp). Velocity pressure is always exerted in the direction of air-flow. The relationship between the velocity and the velocity pressure may be expressed by the following formulas:

$$V_p = \left(\frac{V}{4005} \right)^2$$

$$V = 4005 \sqrt{V_p}$$

It is therefore a simple matter to determine the velocity (FPM) of an air stream so the VP can be measured. For example, if a Pitot tube manometer hook-up reads 0.250 inches water, we substitute for the previous equation:

$$4005 \sqrt{0.250} = 2002 \text{ FPM}$$

Static Pressure

Independent of its velocity, air, when confined within an enclosure such as a duct or tank, will exert itself perpendicularly to the walls of the enclosure. This is the compressive pressure existing in a fluid, and it is known as the static pressure (sp). Unlike velocity pressure, which is always positive, static pressure when it is above atmospheric pressure will be positive but when below atmospheric pressure it will be negative. The discharge side of a fan in an air system will read a positive pressure, the inlet side will read a negative or minus pressure.

Total Pressure

Static pressure is exerted whether air is at rest or in motion. The algebraic sum of static pressure and velocity pressure gives the total pressure (Tp). Therefore:

$$V_p = TP - Sp$$

The manometer does not sense the actual velocity pressure directly but by using the Pitot Tube hook-up with the static opening connected to the low pressure side of the gauge, and the total pres-

sure opening connected to the high pressure side of the gauge, the manometer will read the difference between the two, or the velocity pressure.

Velocity pressure and static pressure change in the duct work with every change in the duct configuration, but the total pressure, on the other hand, remains constant. Hence, as the velocity pressure decreases, the static pressure increases and vice versa, because the static pressure is always the difference between total pressure and the velocity pressure. It should be remembered, however, that in an actual duct system, the internal friction would cause a loss of total pressure.

The static pressure in an exhaust system is always below atmospheric pressure, and it is customary among ventilation engineers to omit the minus sign affecting the static (gage pressure). These men know, of course, that the total pressure is higher than the static pressure by the amount of the velocity pressure.

When the unit is designed for connection to a duct system and the installing contractor assembles ducts, elbows, registers, grilles, etc. to the outlet and/or inlet of the unit, the static pressure drop through this external ductwork is called external static pressure (see Figure 5-7).

Fans selected must be capable of moving the desired airflow through the entire air moving system including the unit (internal SP) and the duct system (external SP).

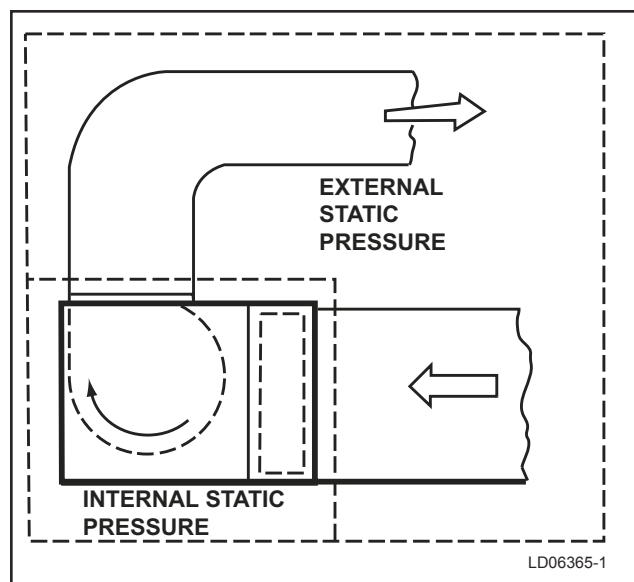


FIG. 5-7 – STATIC PRESSURE - AIR SYSTEM

At a given flow rate the internal pressure losses plus the external static pressure losses equal the system static pressure or the summation static pressure.

These pressures are of great importance when troubleshooting for causes of reduced capacity, vibration and noise. Changes in the cross sectional area of a duct (contractions or enlargements) cause changes in the velocity of the air flowing through the duct.

When the velocity decreases, the velocity pressure also decreases. Some of the velocity energy is lost because of the design of the duct where the area changes. Some of the velocity energy is converted into static pressure energy in the continuing ductwork. This conversion of velocity energy to static pressure is called static regain.

TROUBLE SHOOTING TIPS

For further assistance in troubleshooting the solution unit, *refer to the troubleshooting charts Table 5-7.*

REQUESTING ASSISTANCE

When contacting YORK for assistance the following information will be required:

- YORK Order No
- Job name (not contractor)
- Unit Model No
- Customer's Unit Identification
- Design data and actual data
 - Fan RPM
 - Unit SP (across fan)
 - Unit CFM
 - Pressure drop of water across cooling coil (PSIG).
 - Air pressure drop across cooling coil (inches of water)
 - Temperature differential across cooling coil
 - Motor voltage
 - Motor amperes
- For fan or motor RPM, use a tachometer, stroboscope or revolution counter.
- The voltage and amperes can be obtained by using the appropriate multimeter test device.

- A sketch of the duct configuration would assist us in trying to resolve the problem.
- The most important item is to provide a detailed explanation of the problem.
- An orifice is the best method of measuring flow in piping. This is also true in an air system.

COMPONENT REPLACEMENT, ADJUSTMENT & REPAIR



Disconnect or disable electric motor and lock out.

FAN REPLACEMENT & ADJUSTMENT

Tools Required

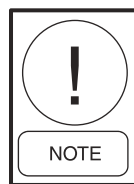
- Standard mechanic's and electricians hand tools.
- Cordless screwdriver
- Hex head socket set
- Socket extension

Materials Required

Correct parts for the application (*see Form 102.20-RPI*).

Procedure

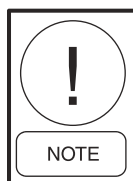
1. Remove unit side panel.



If unit is not high enough to work from side, remove top panel (see Section 5, "Panel Replacement").

- 2 Remove flex connector parts.
- 3 Remove belts.
4. Remove sheave.
5. Remove fan hold down bolts.
6. Remove fan from fan base.
7. Remove skid, crates and packaging material carefully from new fan.

- 8 Move the new fan to the final mounting position.
9. Place the new fan on mounting structure. Carefully level fan using shims as required at all mounting hole locations. Bolt down the fan.
10. Reinstall flex connector parts.
11. Reinstall sheave and belts.
12. Perform sheave alignment (*see Section 4 of this IOM*).
13. Check and adjust belt tension (*see Section 4 “Belts” of this IOM for checking belt tension and Section 4 “Adjustable Motor Base Operation” and “Sheave Alignment” for belt tension adjustment*).
14. Start up fan (*see Section 3 “Start-Up” of this IOM*).
15. Perform dynamic balance (*see Section 4 of this IOM*).



Fan variations are shown in Figure 5-8.

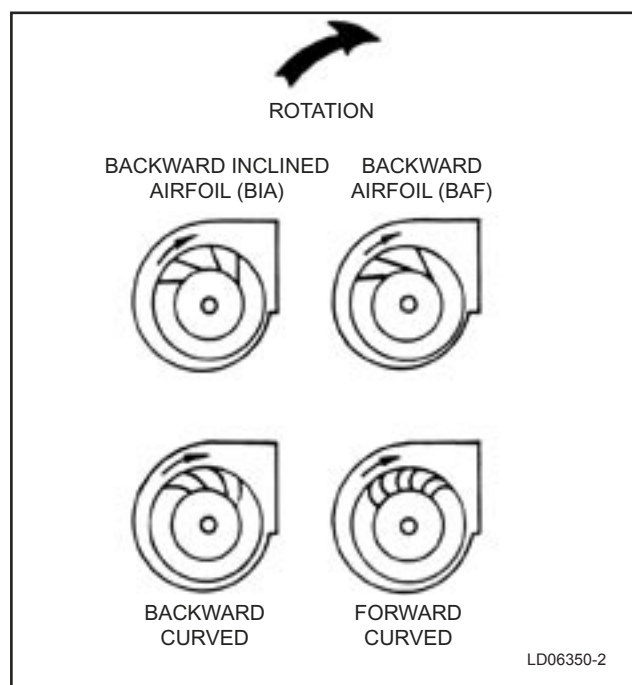


FIG. 5-8 – TYPES OF CENTRIFUGAL FAN IMPELLERS

FAN REPAIR

Tools Required

- Standard mechanic's and electricians hand tools.
- Allen torque wrenches
- Cordless screwdriver
- Emery cloth
- Rubber mallet or brass bar
- Flat file
- Nail set

Materials Required

Correct parts for the application (*see Form 102.20-RP1*).

Forward Curved Fan Wheel Replacement

The forward curved fan wheel must be removed through the fan discharge opening. The location of hubs, fan wheel, and shaft must be marked so each of these components can be reassembled in the same location (*see Figure 5-9*). This will preserve the balance of the rotating assembly. Proceed with the following steps:

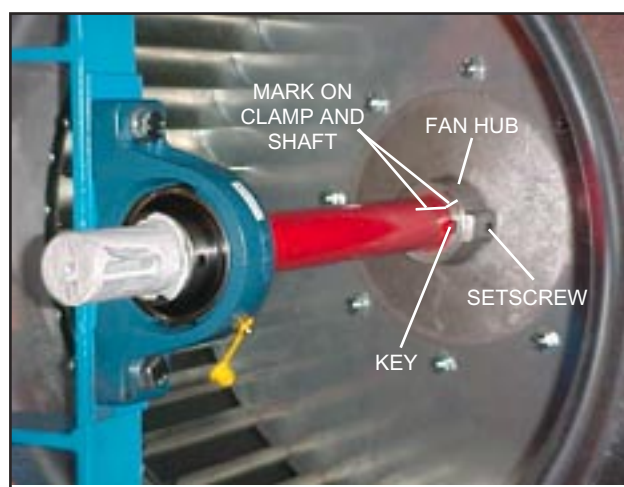
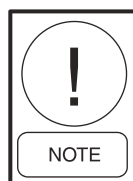


FIG. 5-9 – FC FAN SHAFT AND WHEEL MARKING

1. Disconnect all ductwork or guards attached to the blower housing to permit unobstructed access.
2. Remove the cut off plate attached at the discharge or blast area of the blower housing.

- 3 Thoroughly clean the shaft of all grease and rust inhibitor. Be careful not to contaminate the bearing grease. Use emery cloth to remove all rust or the wheel may become “locked” to the shaft.
4. Loosen and remove setscrews on both bearing locking collars. Inspect and, if necessary, replace.
5. Loosen and remove setscrews from both sides of the wheel hub. Inspect and, if necessary, replace.
6. Using a rubber mallet or brass bar, slowly drive the shaft in one direction until the setscrew marks on the shaft are fully exposed. File the marks completely smooth. Drive the shaft in the opposite direction and file smooth the setscrew marks. Continue to clean the shaft of all dirt and residuals.
7. To remove the key, use a rubber mallet or brass bar to drive the shaft and wheel in one direction. Drive the key in the opposite direction using a nail set or smaller size key stock until the key is completely free of the wheel. Be sure that key does not get bent by allowing it to ride up the key way edge. The slightest bend will prevent quick assembly. Should this occur, replace the key stock with a key of the same size and length.
8. Remove the shaft, supporting the weight of the wheel, particularly for larger diameter wheels. Do not allow the weight of the shaft to be supported by one bearing as you disassemble.
 - a) Remove the wheel through the discharge or outlet area of the blower housing.
 - b) File the setscrew marks on the key until smooth.

- c) Reassemble in reverse order; center the wheel between the edges of the inlet cones. If bearings were removed or replaced, be sure to reuse any shim stock found between the mounting support/plate and bearing housings.
- d) Torque all hardware (*see table 5-1*).



Refer to AMCA Publication 410-90 “Recommended Safety Practices” for users and installers of industrial and commercial fans.

These procedures must be followed to protect personnel and include isolating the fan from any electrical supply.

Service should only be performed by experienced and trained personnel.

Airfoil Fan Wheel Replacement

The airfoil wheels can be removed from the side of the fan housing by removing one or both unit side panels. It is possible to remove the fan wheel through the fan discharge opening.

TABLE 5-1 – TORQUE FOR TIGHTENING SET SCREWS			
setscrew dia.	hex wrench size across flats	min. recommended torque	
		inch lbs.	foot lbs.
1/4	1/8	66 - 85	5.5 - 7.08
5/16	5/32	126 - 164	10.5 - 13.7
3/8	3/16	228 - 296	19.0 - 24.7
7/16	7/32	348 - 452	29.0 - 35.7
1/2	1/4	504 - 655	42.0 - 54.6
5/8	5/16	1104 - 1435	92.0 - 119.6

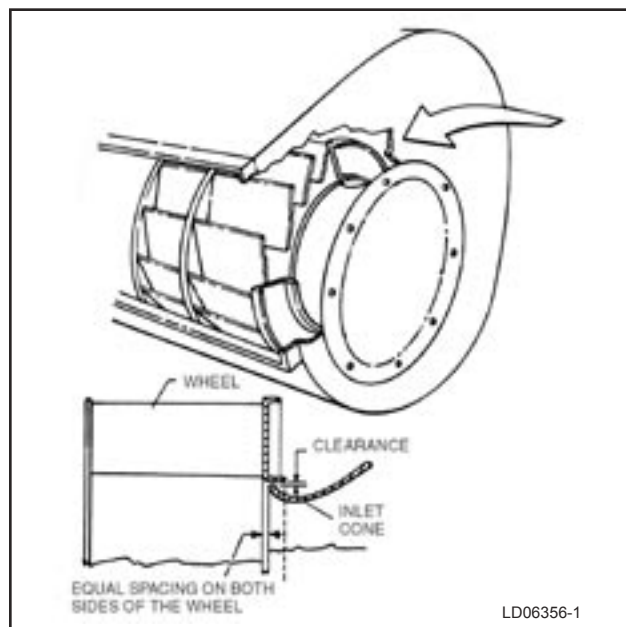


FIG. 5-10 – AIRFOIL WITH CONE ASSEMBLY

The first step in the removal of the fan wheel is to remove the inlet cone from the side of the fan from which the wheel is to be removed from the unit. If the wheel is to be removed from the fan discharge, one of the inlet cones must be removed from the side of the housing since the cones nest inside the blower wheel (see Figure 5-10). The remaining steps for removing the assembly are the same as those provided in the instructions for removing the forward curved fans.

FAN BEARING REPLACEMENT

Sealed Bearings

Tools Required

- Standard mechanic's hand tools
- Medium flat file
- Torque wrench, 0 to 250 In.-Lb. range.
- Hex (allen) socket set for torque wrench.
- Plastic or brass hammer
- Brass bar or pipe of proper size
- Slings or jack to support larger wheels/shafts

Material Required

- Exact replacement bearings (always in pairs)
- Steel wool, fine sanding cloth or fine emery cloth.
- Blocking or temporary support for fan wheel/shaft
- Red "lock-tite" or equivalent

Procedure

See Figure 5-11

1. Remove belts (see Section 4, "Adjustable Motor Base Operation").
2. Remove sheave and key (see Section 5, "Sheave Replacement and Adjustment").
3. Support fan wheel/shaft with cribbing, slings or jacks.
4. Clean shaft until it is shiny from bearings to ends of shaft.
5. File any burrs or set screw impressions from shaft.
6. Partially disassemble the bearing support brackets by removing the bolts closest to

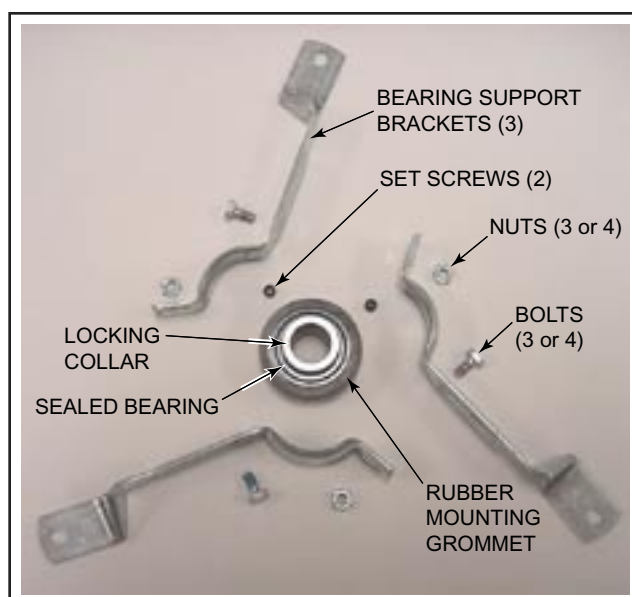


FIG. 5-11 – SEALED BEARING

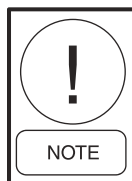
LDO9662

the bearings on the bearing support brackets. Depending on fan size, there are either 3 or 4 bolts with nuts and "Lock-tite".

7. Remove the setscrews from the bearing locking collars (two on one side of each bearing, 90 degrees apart). Inspect and, if necessary, replace.
8. Pull each bearing with its rubber mounting grommet, out of the bearing support brackets as much as possible.
9. Remove bearings. If a bearing will not move, shine the shaft behind the bearing and bump the bearing toward the fan wheel. Use plastic hammer, brass bar or brass pipe. Then de-burr and shine the shaft where the bearing was previously located. Finally, pull the bearing off.
10. If the bearing sticks while pulling it off, don't force it. Clean, shine and de-burr the shaft where ever necessary.
11. Make sure the shaft is straight and not worn at the bearing location.
12. With the shaft and bearings clean, slide the new bearings onto the shaft with the setscrews facing away from the fan wheel.
13. Reassemble the new bearings with rubber mounting grommets gently into the support brackets.
14. Remove any temporary supports or blocking of fan wheel/shaft.

15. Apply red “Lock-tite” or similar product to bolts and re-install them with nuts in the bearing support brackets. Be sure the bearings are seated in the brackets and not twisted. Tighten to appropriate torque rating.
16. Slide the shaft in or out of the new bearings to center the wheel between the inlet cones on both sides of the fan. This is not critical, however should be adjusted as close as possible by feeling the gaps with the fingertips.
17. Install the setscrews in the drive side bearing but only tighten lightly.
18. Spin the fan wheel by hand to insure no rubbing will occur. Readjust if necessary.
19. Install setscrews in opposite side bearing and tighten all setscrews to correct torque rating (see Table 5-1).

- Steel wool, fine sanding cloth or fine emery cloth.
- Blocking or temporary support for fan wheel/shaft
- Grease (see Section 4 or paperwork supplied with new bearings).
- Quarter inch roll pins (1 on each small bearing, 2 on each large bearing).



Our standard is to use Standard Pillow Block Bearings with setscrew type locking collars. If the fan bearings have separate eccentric type locking collars (see Figure 5-13), refer to special instruction “FAN BEARING REPLACEMENT-ECCENTRIC LOCKING COLLAR” elsewhere in this section.



Alternate tightening of setscrews:

Step 1. Tighten “A” to ½ recommended torque value.

Step 2. Tighten “B” to recommended torque value.

Step 3. Tighten “A” to recommended torque value.

20. Re-install sheave and belts (see related instructions in Sections 4 and 5 as needed).
21. Dynamically rebalancing the fan assembly is recommended.

Standard Pillow Block Bearings

Tools Required

- Standard mechanic’s hand tools
- Medium flat file
- Torque wrench, 0 to 250 in.-lb. range.
- Hex (allen) socket set for torque wrench.
- Plastic or brass hammer
- Brass bar or pipe of proper size
- Slings or jack to support larger wheels/shafts.
- Quarter inch drill bit.

Material Required

- Exact replacement bearings (always in pairs)

About This Device

These bearings can be found mounted in various positions, over or under a horizontal support or on either side of a vertical support.

Procedure

See Figure 5-12

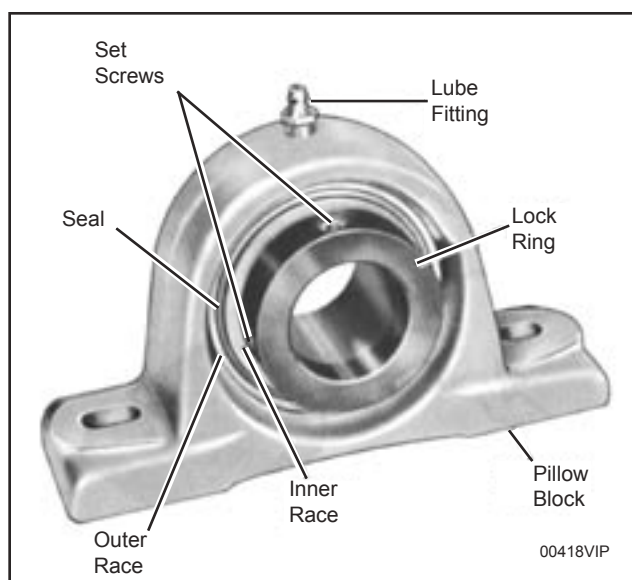


FIG. 5-12 – BEARING WITH SETSCREW TYPE LOCKING DEVICE

1. Remove belts (see Section 4, “Adjustable Motor Base Operation”).
2. Remove sheave and key.

3. Support fan wheel/shaft with cribbing, slings or jacks.
4. Clean shaft until it is shiny from bearings to ends of shaft.
5. File any burrs or set screw impressions from shaft.
6. Remove bolts holding bearings to bearing supports. Be sure to save any shims found between bearing housing and bearing support for re-use.
7. Remove setscrews from bearing locking collars (two on one side of each bearing, 90 degrees apart). Inspect and, if necessary, replace.
8. Remove bearings. If a bearing will not move, shine the shaft behind the bearing and bump the bearing toward the fan wheel. Use plastic hammer, brass bar or brass pipe. Then de-burr and shine the shaft where the bearing was previously located. Finally, pull the bearing off.
9. If the bearing sticks while pulling it off, don't force it. Clean, shine and de-burr the shaft where ever necessary.
10. Make sure the shaft is straight and not worn at the bearing location.
11. With the shaft and bearings clean, slide the new bearings onto the shaft with the setscrews facing away from the fan wheel.
12. Reassemble bolts, flat washers, lock washers, nuts and any shims found exactly as they were originally installed. There should be a flat washer under the bolt head and under the lock washer.
13. Lightly tighten each bolt so bearing position can be adjusted at each bearing.
14. Remove any temporary supports or blocking of fan wheel/shaft.
15. Slide the shaft in or out of the new bearings to center the wheel between the inlet cones on both sides of the fan. This is not critical, however it should be adjusted as close as possible by feeling the gaps between the cones and the edge of the wheel with the fingertips.
16. Install the setscrews in the drive side bearing but only tighten lightly.
17. Spin the fan wheel by hand to insure no rubbing will occur. Readjust if necessary. If the wheel rubs even though it is centered between the inlet cones, adjust by sliding bearing housing(s) on bearing support(s) until the wheel is spaced evenly at both inlet cones all around its circumference.
18. Install setscrews in opposite side bearing and tighten all setscrews to correct torque rating (see Table 5-1).
19. Drill and pin the bearings to the bearing supports. Use ¼" drill bit and ¼" roll pins. Apply in the area of the bolting flange on the housing base.



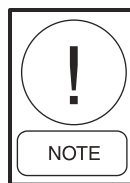
Alternate tightening of setscrews:

Step 1. Tighten "A" to ½ recommended torque value.

Step 2. Tighten "B" to recommended torque value.

Step 3. Tighten "A" to recommended torque value.

20. Re-install sheave and belts (see related instructions in Sections 4 and 5 as needed).
21. Ensure bearings are properly lubricated (see Section 4).
22. Dynamically rebalancing the fan assembly is recommended.



A lock pin is inserted through the lubrication port on the "Sealmaster" brand bearing housing to prevent the bearing from spinning inside the housing. If a grease fitting (lube fitting) must be added or changed on bearings that utilize a lock pin under the fitting, it is important that the lock pin is in place when the fitting is installed. If an adapter or grease fitting of improper style or length is used, the lock pin may be either too tight or loose and can affect the alignment and re-lubrication of the bearing.

Pillow Block Bearings with Eccentric Locking Collar

See Figure 5-13 and 5-14

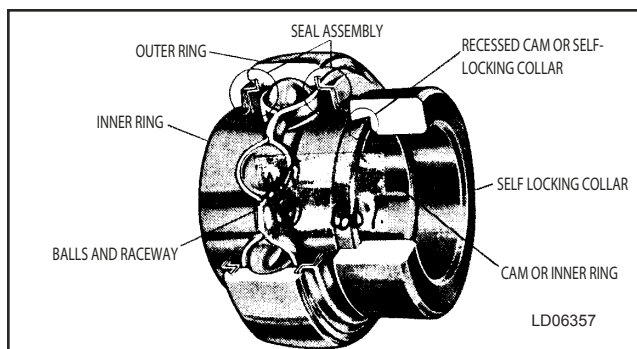


FIG. 5-13 – BEARING WITH ECCENTRIC CAM

Tools Required

- Standard mechanic's hand tools
- Medium flat file
- Torque wrench, 0 to 250 in.-lb. range.
- Hex (allen) socket set for torque wrench.
- Plastic or brass hammer
- Brass bar or pipe of proper size
- Slings or jack to support larger wheels/shafts
- Center punch
- Quarter inch Drill bit.

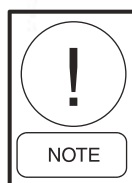
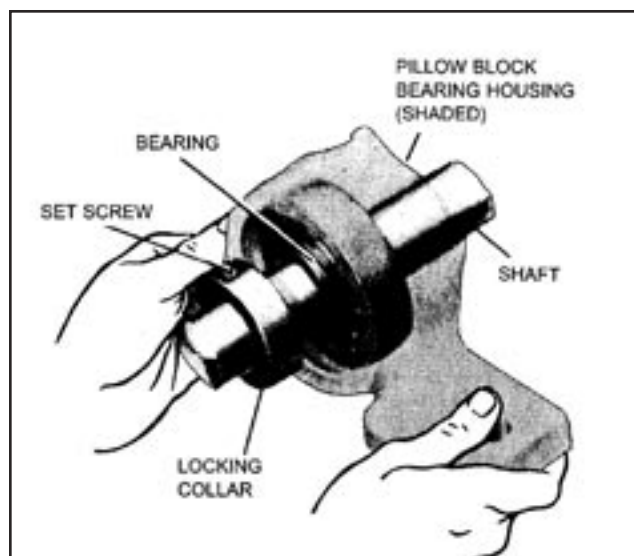
Material Required

- Exact replacement bearings (always in pairs)
- Steel wool, fine sanding cloth or fine emery cloth.
- Blocking or temporary support for fan wheel/shaft
- Grease (*see Section 4 or paperwork supplied with new bearings*).
- Quarter inch Roll pins (1 on each small bearing, 2 on each large bearing)

About This Device

An Eccentric Locking Collar is engaged to a cam on the bearing inner ring. Driven in the normal direction of shaft rotation, it grips the shaft with a positive binding action (*see Figure 5-14*).

These bearings can be found mounted in various positions, over or under a horizontal support or on either side of a vertical support.



Do not apply excessive force to the bearing housing (pillow block or flange) when installing the bearing on the shaft.

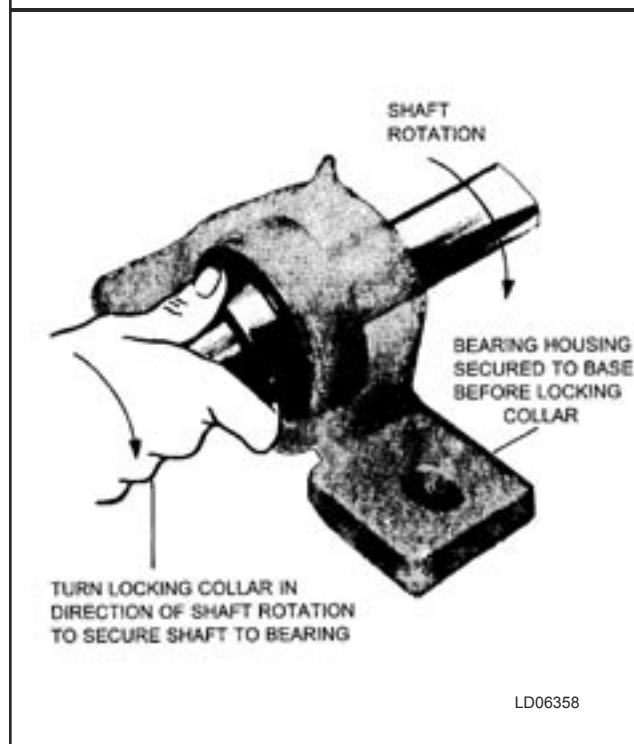


FIG. 5-14 – BEARING INSTALLATION – ECCENTRIC LOCKING COLLAR

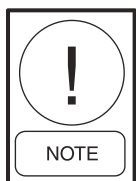
Procedure

See Figures 5-13 & 5-14.

1. Remove belts (*see Section 4, "Adjustable Motor Base Operation"*).

2. Remove sheave and key.
3. Support fan wheel/shaft with cribbing, slings or jacks.
4. Clean shaft until it is shiny from the bearings to ends of shaft.
5. File any burrs or other impressions from the shaft.
6. Remove the setscrew from each eccentric locking collar. Inspect and, if necessary, replace.
7. To remove the eccentric locking collars (self-locking collar). Hold a center punch in the drilled recess on the outer surface of the eccentric locking collar. Position the punch to drive the eccentric locking collar in the opposite direction of normal shaft rotation.
8. Give a sharp blow to the punch and the collar will release. Remove each eccentric locking collar in the same manner.
9. Remove bolts holding bearings to bearing supports. Be sure to save any shims found between bearing housing and bearing support for re-use.
10. Remove old bearings. If a bearing will not move, shine the shaft behind the bearing and bump the bearing toward the fan wheel. Use plastic hammer, brass bar or brass pipe. Then de-burr and shine the shaft where the bearing was previously located. Finally pull the bearing off.
11. If a bearing sticks while pulling it off, don't force it. Clean, shine and de-burr the shaft where ever necessary.
12. Make sure the shaft is straight and not worn at the bearing location.
13. With the shaft and bearings clean, slide the new bearings onto the shaft with the machined cam of the inner ring facing away from the fan wheel.
14. Reassemble bolts, flat washers, lock washers, nuts and any shims found exactly as they were originally installed. There should be a flat washer under the bolt head and under the lock washer. Replace the lock washers if they have taken a set making them nearly flat.
15. Lightly tighten each bolt so bearing position can be adjusted at each bearing.
16. Remove any temporary supports or blocking of fan wheel/shaft.
17. Slide the shaft in or out of the new bearings to center the fan wheel between the inlet cones on both sides of the fan housing. This is not critical, however should be adjusted as close as possible by feeling the gaps between the cones and the edge of the fan wheel with the fingertips.
18. Spin the fan wheel by hand to insure no rubbing will occur. Readjust if necessary. If the fan wheel rubs even though it is centered between the inlet cones, adjust by sliding bearing housing(s) on bearing support(s) until the wheel is spaced evenly at both inlet cones all around its circumference.
19. Tighten all bearing mounting bolts at this time.
20. Place each eccentric locking collar (self-locking collar) on the shaft with its cam adjacent to the machined cam of the bearing inner ring. Rotate the eccentric locking collar until it fits over the machined cam of the inner ring (see Figure 5-14).
21. Holding the eccentric locking collar against the shoulder of the machined inner ring, rotate the eccentric locking collar in the normal direction of shaft rotation. The eccentric locking collar will grip the shaft as the cams engage. Rotate until firmly hand tight.
22. Hold a center punch in the drilled recess on the outer surface of the eccentric locking collar. Position the punch to drive the eccentric locking collar in the same direction as normal shaft rotation.
23. Lightly tap the center punch to lock the eccentric locking collar in the same direction as shaft rotation.
24. Install the setscrew in each eccentric locking collar and tighten to the correct torque rating (see Table 5-1).
25. Drill and pin the bearings to the bearing supports. Use 1/4" drill bit and 1/4" roll pins. Apply in the area of the bolting flange on the housing base
26. Re-install the sheave and belts (see related instructions in Sections 4 and 5 as needed).

27. Ensure bearings are properly lubricated (*see Section 4*).
28. Dynamically rebalancing the fan assembly is recommended.



A lock pin is inserted through the lubrication port on the “Sealmaster” brand bearing housing to prevent the bearing from spinning inside the housing. If a grease fitting (lube fitting) must be added or changed on bearings that utilize a lock pin under the fitting, it is important that the lock pin is in place when the fitting is installed. If an adapter or grease fitting of improper style or length is used, the lock pin may be either too tight or loose and can affect the alignment and re-lubrication of the bearing.

Split Pillow Block Bearings

Tools Required

- Standard mechanic’s hand tools
- Medium flat file
- Torque wrench, 20 to 300 ft.-lb. range.
- Plastic or brass hammer
- Proper size spanner wrench
- Brass bar or pipe of proper size
- Slings or jack to support larger wheels/shafts.
- Quarter inch drill bit.

Material Required

- Exact replacement bearings (always in pairs).
- Steel wool, fine sanding cloth or fine emery cloth.
- Blocking or temporary support for fan wheel/shaft.
- Rags or Paper Shop Towels
- Grease (*see Section 4 or paperwork supplied with new bearings*).
- Quarter inch roll pins (1 on each small bearing, 2 on each large bearing)

About this device

This instruction is for the complete split pillow block bearing assembly replacement. If it is not necessary to replace the undamaged housing, eliminate the steps that follow for unbolting and bolting the base portion of the housing.

The temporary supports for the fan wheel/shaft used during bearing replacement must be flexible, as the assembly will have to be moved out of the base portion of the housing and back into it at some point during this process.

These bearings can be found mounted in various positions, over or under a horizontal support or on either side of a vertical support.

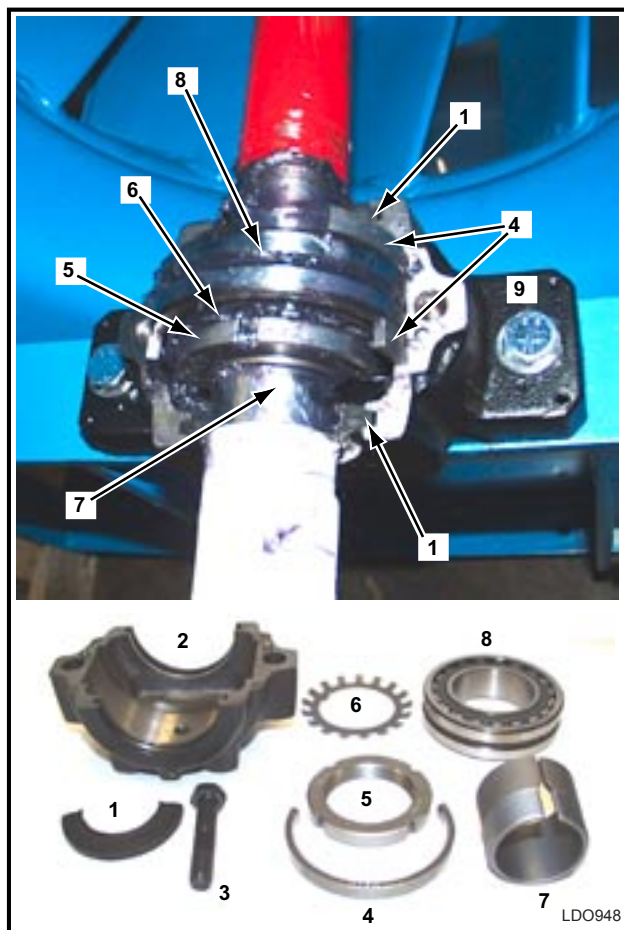


FIG. 5-15 – SPLIT BEARING

- | | |
|----------------------|-------------------|
| 1. Seal (4) | 6. Lock Washer |
| 2. Housing Cap | 7. Tapered Sleeve |
| 3. Cap Bolts (2) | 8. Bearing |
| 4. Locating Ring (2) | 9. Housing Base |
| 5. Lock Nut | |

Procedure

See Figure 5-15 & 5-16

1. Remove belts. (See Section 4, "Adjustable Motor Base Operation".)
2. Remove sheave and key.
3. Support fan wheel/shaft with cribbing, slings or jacks.
4. Clean shaft until it is shiny from bearings to ends of shaft.
5. File any burrs or impressions from shaft.

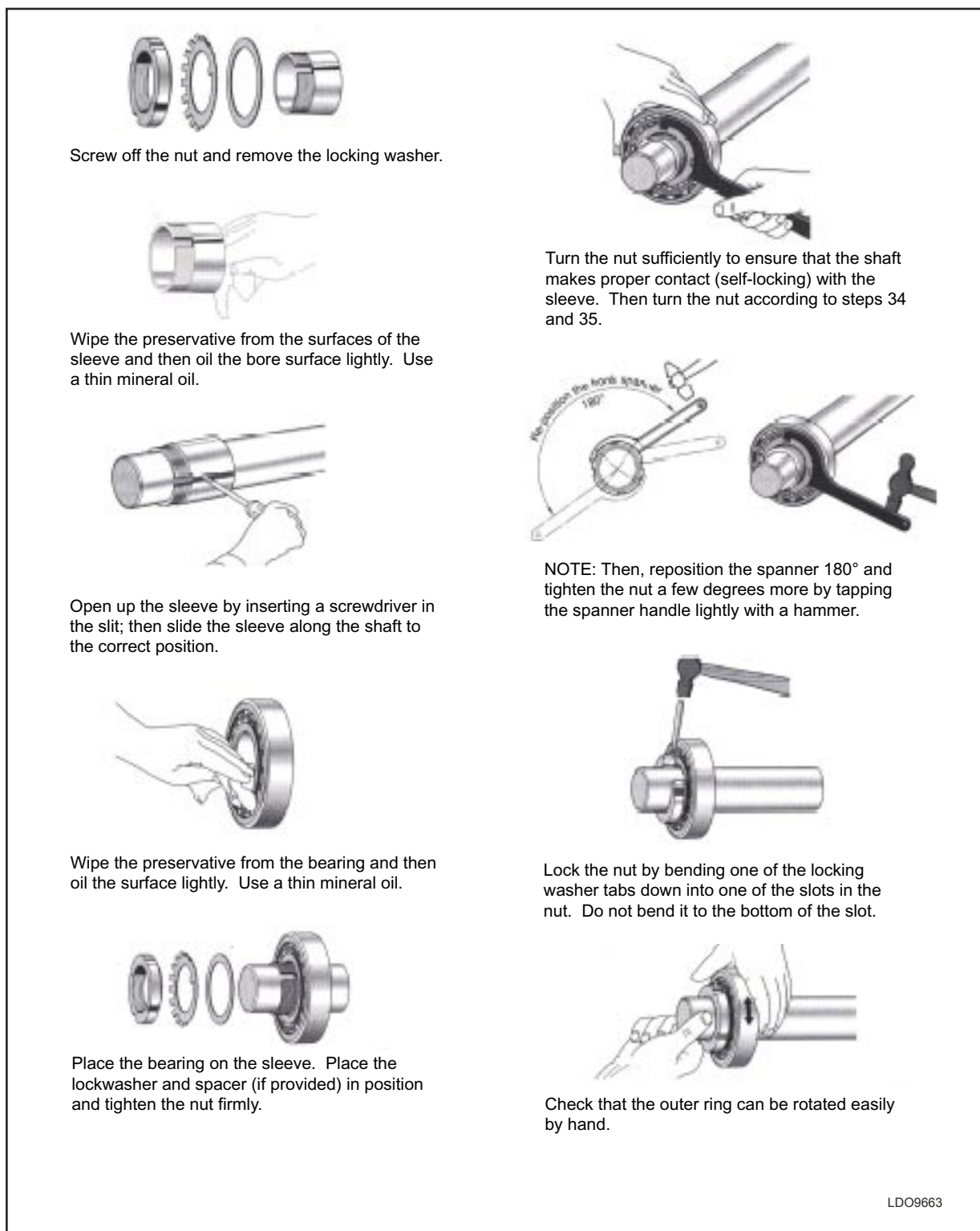
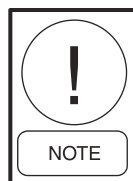


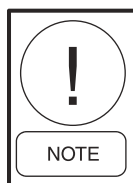
FIG. 5-16 – SPLIT BEARING ASSEMBLY

6. Remove the cap bolts from the split bearing housing.
7. Remove bearing housing cap. Tapping sideways with hammer may be necessary.
8. Move the supported wheel/shaft/bearing assembly out of the housing base.
9. Remove bolts holding the housing base to the bearing support. Remove the housing. If the housing is drilled and pinned to the support, pry the pin from the support. Be sure to save any shims found between the housing and bearing support for re-use.
10. Install the new housing base to the bearing support with bolt, flat washers, new lock washer and nut. There should be a flat washer under the bolt head and the lock washer. Make these hand tight so bearing position can be adjusted at each bearing later in this process.
11. Remove the bulk of the grease from the bearing and parts remaining on the shaft.
12. Find the bent lock washer tab inside one of the slots in the lock nut. Bend it perpendicular to the shaft, in line with the other tabs of the lock washer.
13. Hook proper size spanner wrench onto a slot in the lock nut for counterclockwise rotation.
14. Strike the spanner handle sharply with a hammer to break the nut free and remove the lock nut.
15. Remove the lock washer and spacer (if spacer present)
16. Using a brass bar and hammer bump the bearing off the tapered sleeve.
17. Open the sleeve by inserting a screwdriver in the slit, and then slip it off the shaft.
18. Make sure the shaft is straight and not worn at the bearing location.
19. De-burr, shine and clean the shaft.
20. Wipe preservative from tapered sleeve and bearing bore.
21. Place the tapered sleeve on the shaft with threaded end facing away from the fan wheel. Position the tapered sleeve for approximate location with respect to the required bearing centerline.



Light oil applied to the sleeve outside surface results in easier bearing mounting and removal.

22. Mount the bearing on the tapered sleeve with the large bore side first to match the taper of the sleeve. Push the bearing on hand tight and as straight as possible.
23. With the bearing hanging freely on the shaft, measure the UNMOUNTED, UNLOADED radial clearance by inserting progressively larger feeler blades the full length of the roller between the bottom most unloaded roller and the outer ring. RECORD THIS NUMBER.
24. Apply the spacer, if provided, then the lock washer as illustrated. Fit the tab on the inside of the lock washer into a matching notch in the tapered sleeve.
25. Apply the locknut with the chamfered face toward the lock washer. TIGHTEN BY HAND ONLY.



Apply lubricant on the face of the locknut where it contacts the lock washer for easier mounting and removal.

26. Apply grease to the rubber seals and place one in each new housing base already mounted.
27. Insert the locating rings into the housing base of the DRIVE SIDE BEARING HOUSING ONLY. Leave these rings out of the opposite side bearing to allow for shaft thermal expansion under load.
28. At this time, bring the status of both inboard and outboard bearing assemblies to this same level of completion.
29. Install the wheel/shaft/bearing assembly to the new housing base. It may be necessary to slide the bearing assemblies on the shaft to get both to line up with the proper cavity in the housings.

30. Center the wheel between the inlet cones on both sides of the fan. This should be adjusted as close as possible by feeling the gaps between the cones and the edges of the wheel with your fingertips.
31. Spin the fan wheel slowly by hand to insure no rubbing will occur. Readjust if necessary. If the wheel rubs even though it is centered between the inlet cones, adjust by sliding or shimming bearing housing(s) on bearing support(s) until the wheel is spaced evenly at both inlet cones all around its circumference.
32. Tighten the mounting bolts of the housing bases.
33. Begin tightening the locknuts of each bearing assembly using spanner wrench and hammer. Stop to check that the wheel is still centered.
34. While further tightening the locknuts, periodically stop to check the UNLOADED radial clearance. Since the bearing is mounted and now resting in the housing, insert the feeler blades between the TOP MOST UNLOADED ROLLER and the outer ring. *Spin the wheel before each measurement to ensure the rollers are positioned properly.* It may be necessary to lift the wheel/shaft/bearing assembly off the housing to complete the tightening process.
35. Continue tightening the lock nut until the UNLOADED RADIAL CLEARANCE REDUCTION (difference between clearance measured in step #34 and step #23) is within the specifications listed in Table 5-2.
36. Lock the nut by bending one of the lock washer tabs downward into one of the slots in the locknut. Do not bend more than a 45° angle. If one of the tabs does not line up with one of the

TABLE 5-2 – RECOMMENDED CLEARANCE REDUCTION VALUES OF SKF TAPERED BORE BEARINGS (IN INCHES)

Bore Diameter d(mm)		Reduction in Radial Internal Clearance (in.)	
Over	Incl.	Min.	Max (1)
24	30	0.0006	0.0008
30	40	0.0008	0.0010
40	50	0.0010	0.0012
50	65	0.0012	0.0015
65	80	0.0015	0.0020
80	100	0.0018	0.0025

slots, tighten the locknut until one does line up.
DO NOT LOOSEN THE LOCKNUT.

37. Using your fingers, pack each bearing with grease by pressing measures of grease into the rollers. Rotate the bearing and shaft to access its entire circumference. Be sure to apply grease in this manner to both sides of each bearing so that all of the rollers are embedded in grease over their entire length.
38. Insert the remaining, greased seals into the groove in the housing caps and fill the space between the seal lips with grease.
39. Install each housing cap onto its respective housing base. Apply cap bolts and tighten to correct torque value per Table 5-3.

TABLE 5-3 – RECOMMENDED CAP BOLT TORQUE VALUES FOR SPLIT PILL-LOW BLOCK.

Cap Screw Size	Torque Values
10 mm	37
12 mm	59
16 mm	110
20 mm	148
24 mm	258

40. Drill and pin the bearings to the bearing supports. Use 1/4" drill bit and 1/4" roll pins. Apply in the area of the bolting flange on the housing base.
41. Re-install sheave and belts (see related instructions in Sections 4 and 5 as needed).
42. Ensure bearings are properly lubricated (*see Section 4*).
43. Dynamically rebalancing the fan assembly is recommended.

SHEAVE REPLACEMENT AND ADJUSTMENT

Fixed Pitch Sheaves

T.B. Woods with SURE GRIP® Bushings.

Tools Required

- Standard mechanic's hand tools
- Medium flat file
- Torque wrench, 0 to 250 in.-lb. range.
- Hex (Allen) socket set for torque wrench.
- Torque wrench, 0 to 150 ft.-lb. range.

- Standard 3/8" or 1/2" socket set
- Hammer

Material Required

- Fine emery cloth.
- Contact cleaner or mineral spirits

Sheave Removal

See Fig 5-17

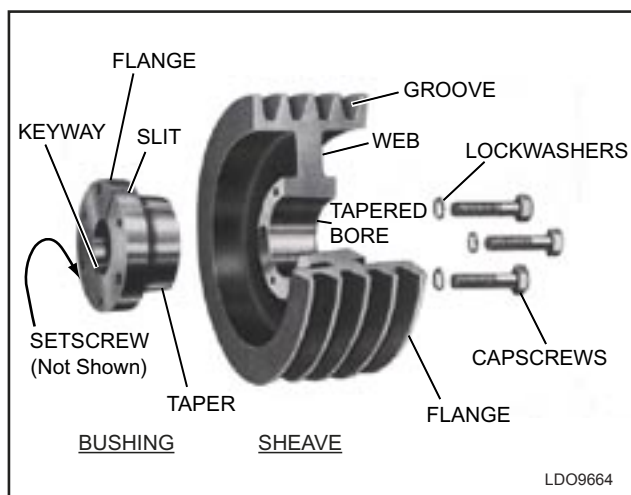


FIG. 5-17 – INSERTION OF CAPSCREWS

1. Remove belts (see Section 4, "Adjustable Motor Base Operation").
2. Remove cap screws from bushing/sheave.
3. Separate sheave from bushing.
 - Standard Mounted - Thread cap screws into threaded holes in sheave. Hand tighten against bushing flange.
 - Reverse Mounted - Thread cap screws into threaded holes in bushing. Hand tighten against sheave web.
4. Tighten each cap screw gradually and evenly in rotation to push the sheave off the taper of the bushing. Light tapping with hammer may be necessary.
5. Remove or loosen setscrew from flange of bushing. Inspect and, if necessary, replace.
6. Pull bushing off shaft. If the bushing will not come off, insert a screwdriver into the slit in the bushing.
7. Remove key from keyway.

Sheave Installation

See Fig 5-17



Do not use lubricants in this installation. Bushing and sheave mating surfaces must be clean and oil free.

1. Inspect the tapered bore of the sheave and the tapered surface of the bushing. Any paint, dirt, oil or grease **MUST** be removed.
2. Select the type of mounting (Fig 5-18 or 5-19) that best suits your application.

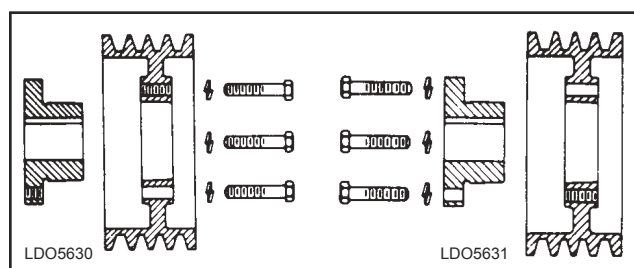
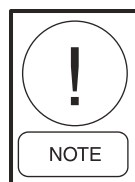


FIG. 5-18 – STANDARD MOUNTING

FIG. 5-19 – REVERSE-MOUNTING

Standard Mounting

- a) Install shaft key.



If key was furnished with bushing, you must use that key.

- b) Install bushing on clean shaft, flange end first. If bushing will not freely slide on the shaft, insert a screwdriver or similar object into the flange sawcut to act as a wedge to open bushings bore.



Excessive wedging will split the bushing.

- c) If using the setscrew, tighten it just enough to prevent the bushing from sliding on the shaft.



Do not tighten the setscrew to standard torque values at this time.

- d) Slide sheave into position on bushing, aligning the drill holes in the sheave with the tapped holes in the bushing flange.
- e) Loosely thread the cap screws with lock washers into the assembly. **Do not use lubricant on the cap screws!**

Reverse Mounting

- a) With large end of the out, slide sheave onto shaft as far as possible. Install shaft key



If key was furnished with bushing, you must use that key.

- b) Install bushing onto shaft so tapered end will mate with sheave.



Excessive wedging will split the bushing.

- c) If using the setscrew, tighten it enough to prevent the bushing from sliding on the shaft.



Do not tighten the setscrew to standard torque values at this time.

- d) Pull the sheave up on the bushing, aligning the drilled holes in the bushing flange with the tapped holes in the sheave.

- e) Loosely thread the cap screws with lock washers into the assembly. **Do not use lubricant on the cap screws!**

3. Using a torque wrench, tighten all cap screws evenly and progressively in rotation to the torque value in Table 5-4. There must be a gap between the bushing flange and sheave hub when installation is complete. Do not over torque! Do not attempt to close gap between bushing flange and sheave hub!

TABLE 5-4 – CAPSCREW TORQUE VALUES FOR FIXED PITCH SHEAVES.

TAPERED BUSH-ING	SIZE & THREAD OF CAPSCREW	FT.-LBS. TO APPLY WITH TORQUE WRENCH
QT	1/4 X 1	9
JA	No. 10-24	5
SH-SDS-SD	1/4-20	9
SK	5/16-18	15
SF	3/8-16	30
E	1/2-13	60
F	9/16-12	110
J	5/8-11	135



The tightening force on the screws is multiplied many times by the wedging action of the tapered surface. If extreme tightening force is applied, or if a lubricant is used, bursting pressures will be created in the hub of the mating part

4. Tighten all setscrews per Table 5-1 "Torque for Tightening Set Screws".

Sheave Adjustment

1. Before belts are installed, check alignment as described in Section 4.
2. If adjustment is required, measure the space between the straight edge and the sheave.
3. Follow steps 2 through 5 under "Sheave Removal".
4. Move the bushing in the proper direction the distance measured.
5. Proceed with "Sheave Installation" as listed above.

Adjustable Pitch Sheaves**T.B. Woods model JVS.****Tools Required**

- Standard mechanic's hand tools
- Medium flat file
- Torque wrench, 0 to 250 in.-lb. range.
- Hex (Allen) socket set for torque wrench.
- Square.
- Straightedge

Material Required

Fine emery cloth.

3. Clean and remove any burrs from shaft from sheave to end.
4. Slide sheave off shaft. If tight, insert screwdriver into slit in central sleeve.

Sheave Installation

See Figure 5-20

1. Loosen clamp screws on new sheave.
2. Slide the JVS sheave onto the shaft. The fan and motor sheaves should be placed on their respective shafts far enough to have shaft exposed just past its chamfer is possible. This is to facilitate proper alignment later in this process.

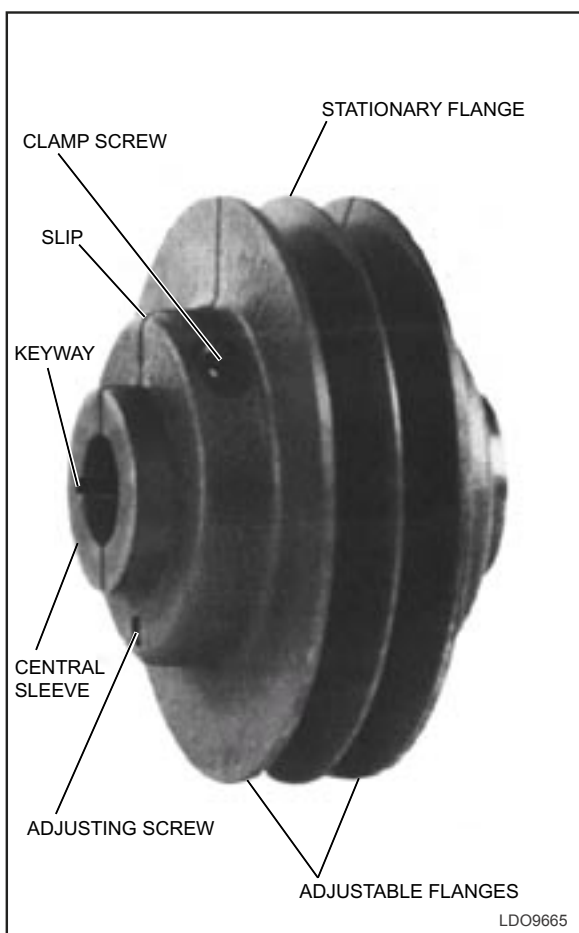
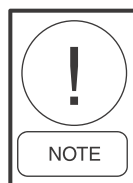


FIG. 5-20 – ADJUSTABLE PITCH SHEAVE (JVS)

Sheave Removal

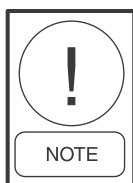
See Figure 5-20

1. Remove belts (see Section 4, "Adjustable Motor Base Operation").
2. Loosen both clamp screws. (Allen wrench)



The central sleeve of this sheave is split at one end only. This end must be installed first as the split allows the sheave assembly to be secured to the shaft.

3. Adjust the sheave to the approximate pitch diameter desired. One turn of the adjusting screw will vary the pitch diameter .2 inches. Seven turns are required to adjust the sheave from minimum to maximum pitch diameter.



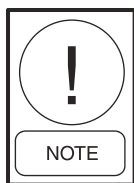
Slight finger pressure on the face of the adjustable flanges near the split (180 ° from adjusting screw) may be required to permit free and equal movement of flanges during pitch adjustments. Tipping and binding may otherwise occur.

4. Align the sheave with the companion sheave (see Section 4).



On adjustable sheaves of two or more grooves, if there is a difference of more than 1/8" between the width of the companion sheave and any adjustable pitch sheave, align per steps 5 through 8.

5. Alignment procedure for adjustable sheaves:
 - Use a square and straight edge to align the center or stationary flange of the adjustable sheave with the center flange of the companion sheave.
 - Insure the shaft of the motor is parallel to the shaft of the fan.
6. Tighten the two clamp screws to the following torque values:
 - a) JVS MODEL 130 - 160 in.-lbs. or 13 ft.-lbs
 - b) All other JVS - 325 in.-lbs. or 27 ft.-lbs



Be careful not to grasp flanges in such a manner as to cock them while tightening the clamp screws.

7. Install belts and properly tension (see Section 4).
8. Recheck alignment and speed.

Sheave Adjustment

1. To adjust pitch diameter it is important to loosen both clamp screws.
2. Remove belts.
3. Follow steps 3 through 8 in "Sheave Installation".

Adjustable Pitch Sheaves

T.B. Woods model FHP.

Tools Required

- Standard mechanic's hand tools
- Medium flat file
- Torque wrench, 0 to 250 in.-lb. range.
- Hex (Allen) socket set for torque wrench.
- Square.
- Straightedge

Material Required

Fine emery cloth.

Sheave Removal

See Figure 5-21

1. Remove belts (see Section 4, "Adjustable Motor Base Operation").
2. Loosen setscrews on adjustable flange(s) of sheave. (Allen wrench)
3. Screw the adjustable flange(s) open to expose and loosen the mounting setscrew in the central sleeve over the key.
4. Clean and remove any burrs from shaft from sheave to end.
5. Slide sheave off of shaft.

Sheave Installation

See Fig. 5-21

1. Loosen setscrews on adjustable flange(s) of new sheave. (Allen wrench)
2. Screw the adjustable flange(s) open to expose and loosen the mounting setscrew in the central sleeve over the keyway.

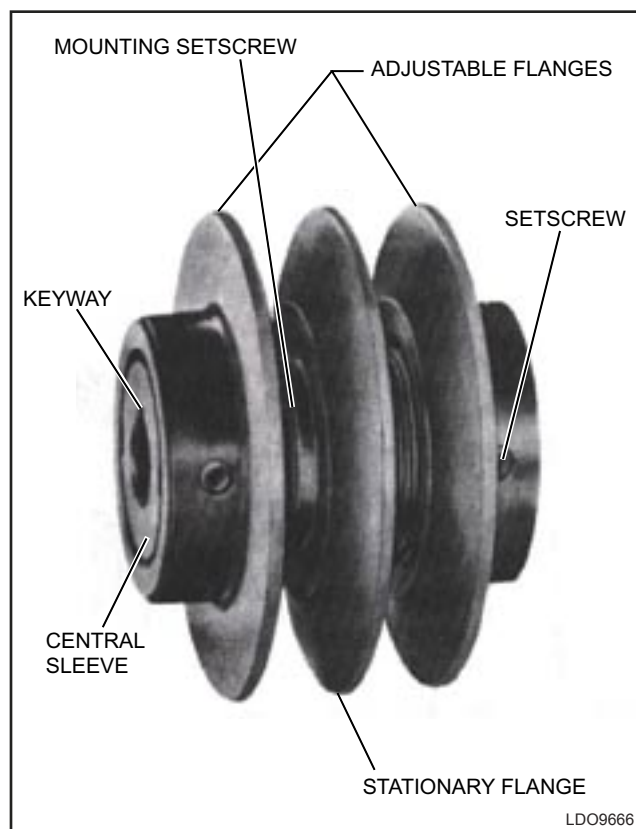


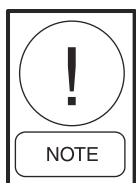
FIG. 5-21 – ADJUSTABLE PITCH SHEAVE (FHP)

3. Inspect the shaft and key for any nicks and burrs. Remove same and clean shaft.
4. Insert key in keyway.
5. Slide the new sheave onto the shaft with the mounting setscrew over the key and toward the motor.



The fan and motor sheaves should be placed on their respective shafts far enough to have shaft exposed just past its chamfer if possible. This is to facilitate ease of alignment later in this process.

6. Align the adjustable sheave's stationary flange with the respective flange of the companion sheave. (See Section 4 on sheave alignment.)



On adjustable sheaves of two or more grooves, if there is a difference of more than 1/8" between the width of the companion sheave and any adjustable pitch sheave, align per steps 7 through 10.

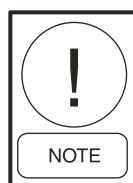
7. Alignment procedure for multiple groove adjustable sheaves:
 - a) Use a square and straight edge to align the center or stationary flange of the adjustable sheave with the center flange of the companion sheave.
 - b) Insure the shaft of the motor is parallel to the shaft of the fan.
8. Secure the adjustable sheave to the shaft by tightening the setscrew over the key to the proper torque value (see table 5-1).

9. Adjust the sheave flange(s) to the desired pitch diameter. Each turn of the flange changes the pitch diameter approximately .2 inches. Six turns are required to adjust the sheave from minimum to maximum for "A" or "B" belts and seven turns for 5V belts.



Both flanges of a 2-groove sheave MUST be adjusted evenly.

10. Lock the adjustable flange(s) in position by tightening the setscrew(s) to the proper torque value (see Table 5-1).



To prevent damage to central sleeve threads, the setscrews MUST be over one of the flat areas of the central sleeve. If the flange is not properly locked, the sheave will fail rapidly.

11. Install belts and properly tension (see Section 4).
12. Recheck alignment and speed.

Sheave Adjustment

1. Remove belts. (See Section 4, "Adjustable Motor Base Operation")
2. To adjust pitch diameter loosen setscrew(s) on adjustable flange(s) of sheave.
3. Follow steps 9 through 12 above.

MOTOR REPLACEMENT

Fan Motor

Tools Required

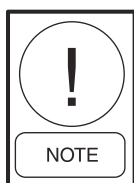
- Standard mechanic's and electricians hand tools.
- Torque wrench, 0 to 250 in.-lb. range
- Flat screwdriver socket for torque wrench. Use with sizes 4, 6 & 8 connector.
- Hex allen sockets, 3/16" and 1/4" for torque wrench for larger size connectors.

Material Required

- Correct size and quantity of insulated wire connectors.
- Correct size and quantity of flexible cable sleeves.

Procedure

1. Shut off motor power and lock out.
2. Disconnect and tag power wires at motor terminals.
3. Loosen motor brace-to-mounting-rail attaching bolts.
4. Remove and set aside belts.
5. Remove motor bracket hold down bolts.
6. Remove motor pulley and set aside.
7. Remove motor.



Connection box may have to be removed from motor body in order to fit motor through doorway. Some extreme cases may require removal of door and frame as well (see Section 5, Door Replacement).

8. Install new motor. Reassemble by reversing steps 1 - 6. Be sure to reinstall multiple belts in their original position. Use a complete new set if required. Do not stretch belts over sheaves (see Section 4 "Sheave Alignment" and belt tensioning Section 4 "Belts").
9. Reconnect motor leads and restore power.

10. Check fan for proper rotation as described in Start-Up Check List.

• Motor Wire Connection Details

See Figures 5-22 & 5-23



All field wiring must conform to the National Electrical Code (N.E.C.) and possible local codes that may be in addition to N.E.C.

Wire insulation must be stripped in accordance with Table 5-5 for standard connectors. The wire insulation on a properly installed wire must be inside the insulated connector conductor port no less than 3/8". Apply the Flexible Cable Sleeves only to the motor wires and not the power feed wires. Refer to Table 5-5 for sleeve and connector part numbers and cable strip lengths. Pressure screws must be secured at the torque value corresponding to the wire size and connector size shown in Table 5-6. The UL listing is for stranded wire only, AL/CU 600V max.



FIG. 5-22 – ASSEMBLY OF CONNECTORS



FIG. 5-23 – MOTOR WIRE CONNECTIONS

TABLE 5-5 – CONNECTORS & SLEEVES WITH STRIP LENGTHS

Motor Voltage	HP	Wire Connector		Flexible Cable Sleeve		Strip Length
		Part Number	QTY	Part Number	QTY	
200/208	1, 1.5, 2, 3	025-39042-001	3			
200/208	5	025-39042-003	3			
200/208	7.5	025-39043-001	4	025-39049-001	3	.689"
200/208	10	025-39043-001	4	025-39049-001	3	.689"
200/208	15	025-39043-001	3	025-39049-001	3	.689"
200/208	20	025-39043-001	3	025-39049-002	3	.875"
200/208	25	025-39044-002	3	025-39049-002	3	.875"
200/208	30	025-39044-002	3	025-39049-003	3	.875"
200/208	40	025-39044-002	3	025-39049-004	3	.875"
230/240	1, 1.5, 2, 3	025-39042-001	4			
230/240	5, 7.5	025-39042-003	4			
230/240	10	025-39042-003	1			
		025-39044-001	3	025-39049-001	3	.689"
230/240	15	025-39043-001	3	025-39049-001	3	.689"
230/240	20, 25	025-39043-001	3	025-39049-002	3	.875"
230/240	30, 40	025-39044-002	3	025-39049-003	3	.875"
230/240	50	025-39044-002	4	025-39049-004	3	.875"
460	1, 1.5, 2, 3, 5, 7.5	025-39042-001	6			
460	10	025-39042-003	6			
460	15	025-39042-003	6			
460	20, 25, 30, 40	025-39043-001	6	025-39049-001	3	.689"
460	50	025-39043-001	6	025-39049-002	3	.875"
460	60, 75	025-39043-002	6	025-39049-003	3	.875"
460	100	025-39043-003	6	025-39049-004	3	.875"

TABLE 5-6 – TORQUE CHART - TIGHTENING
TORQUE IN INCH POUNDS

WIRE SIZE	CONNECTOR SIZE					
	500	350	250	3/0	1/0	#4
4/0	250	250	250			
3/0	250	250	250	250		
2/0	180	180	180	180		
1/0	180	180	180	180	180	
#3-#1	150	150	150	150	150	
#4-#6	110	110	110	110	100	45
#8					75	40
#10-#14					35	35

MOTOR REPAIR**Tools Required**

Standard mechanic's and electricians hand tools.

Materials Required

Correct parts for the application
(See Form 102.20-RP1)



Before replacing motor bearings, get authorization of motor manufacturers representative if within standard warranty period or by Product Service if within extended warranty period.

COIL REPLACEMENT

To determine if a coil has right or left connections, face the unit from the air inlet section (see Figure 5-24).



Always lightly flow dry nitrogen through tubing being brazed when in refrigeration system.

Inspect the coils for cleanliness. If necessary, hose the coils down with a low pressure water hose or low-pressure air.



In no case should the piping joints be heated for unsweating while refrigerant is within the coil. Dangerous pressures and gases can result.

Tools Required

- Screw gun with #3 phillips bit.
- Scraper
- Broad, thin pry bar
- Power cords as required.
- Auxiliary lighting as required.
- Awl
- Coil fin comb or fin straightener
- Pipe wrenches of appropriate sizes
- Brazing/soldering equipment if DX coil.
- Refrigerant reclaim equipment if DX or Condenser coil.
- Standard mechanics tool kit.
- Lifting equipment (crane, fork lift, straps, dolly, roof cart, etc.)

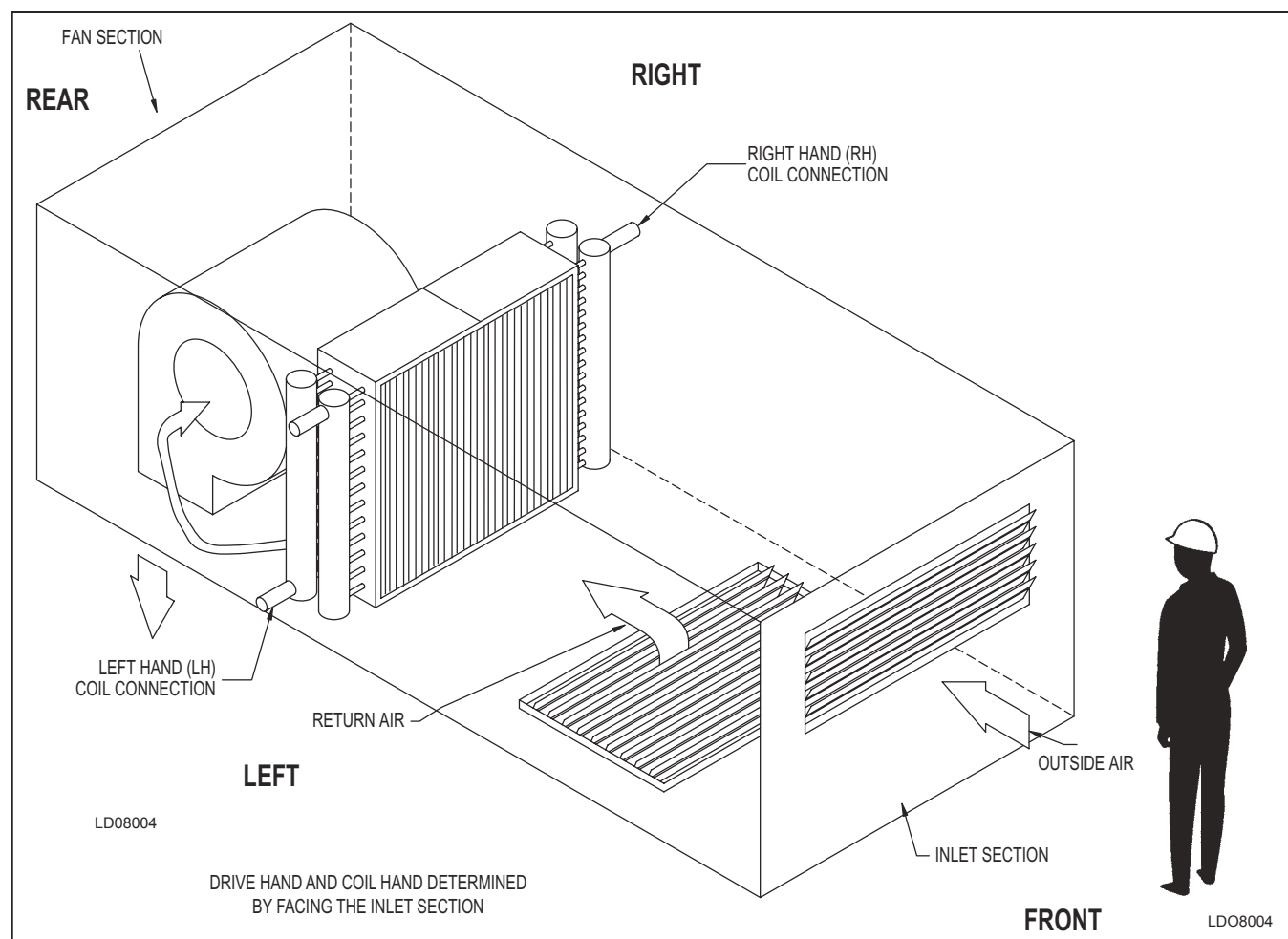


FIG. 5-24 – DETERMINING LEFT - OR RIGHT-HAND COIL CONNECTION / DRIVE SIDE

- Lifting lugs for large coils or difficult work locations. Lifting lugs can be ordered from Baltimore Parts. Contact BPC-Airside for part number. Must provide number of rows deep in order to obtain correct size lugs.

Materials Required

- Roof or floor protection materials.
- Replacement gasket for coil mounting York P/N 010-02917-000.
- Replacement screws for coil mounting York P/N 021-12917-000.
- Replacement gasket for coil access panel York P/N 028-11778-000.
- Replacement screws for coil access panel York P/N 021-17722-000.
- Replacement gasket for indoor coil panel York P/N 028-11960-000.
- Piping needs as required for specific connections.
- Manus Bond caulk York P/N 013-02966-001.
- Heavy cardboard covering for coil fin surface.
- Duct tape.



- ***Cleaning materials including microbial disinfectant.***

Procedure

1. Shut down and lock out unit fan(s).
2. Shut off and lock out piping to coil(s).
3. For DX coils pump refrigerant into condenser, valve off and lock out associated condenser components.
4. Lay down roof or floor protection material at work areas.



5. ***DO NOT STAND INSIDE DRAIN PAN. IAQ EFFECTIVENESS WILL BE COMPROMISED.***

6. Remove content of coil(s) safely in regard to personnel and environment. Usually refrigerant can be pumped into condenser, however if refrigerant remains in the coil being replaced, reclaim it per procedures and licenses according to current, applicable laws.
7. Disconnect Piping from coil(s).
8. Remove coil access panel.
 - On Outdoor Units a removable panel is usually on opposite side of unit from pipe connections. This panel is installed with a dry gasket in order to be removable. If other panels are to be removed, see instruction for Panel Replacement for specific tools, material and procedures.
 - On Indoor Units all panels are installed with a dry gasket in order to be removable.
 - If the panel on the piping side is to be removed to access the coil, piping will have to be removed instead of just disconnected. The reassembly procedure will also be slightly different (see Step 25 of this procedure).
9. Remove any components, devices or sensors attached to coil, frame or intermediate drain pan. This may include another coil.
10. Remove any components, devices, sensors, filters or frames as needed to access coil mounting screws in bulkhead on air entering side of coil.
11. Remove coil mounting screws found securing coil frame to bulkhead. Be sure coil will not tip over.
12. Remove and save rubber grommets from coil connectors.
13. Remove any extended coil drain and vent piping or fixtures.
14. Large coils can be separated top and bottom by removing bolts from splice piece on coil end sheets and intermediate drain pan from coil air leaving side.
15. Large coils may be handled best with addition of lifting lugs.
16. Slide coil out of unit to cribbing, dolly, forklift, roof cart, etc.
17. Install coil lifting lugs if applicable.

18. For crane lift use professionals who will rig coils without damage to coil frames or surfaces.
19. Take necessary precautions in moving heavy objects across roof or flight over people and property.
20. Remove coil from workspace.



21. Clean drain pan, all panels and parts adjacent to coil area and areas wetted by condensation. Use a microbial disinfectant and cleaner or in combination (see also Section 4/Coil Segment/Coil Cleaning Procedure).

22. Check gasket for coil mounting on coil bulkhead. Replace if damaged.
23. Cover new coil fin surface on both sides of coil with heavy cardboard or similar material to protect from damage.
24. Locate replacement coil at workspace.
25. Slide coil into unit using caution not to damage coil supports, coil bulkhead, drain pan, etc.
26. If the panel on the piping side was removed to access the coil, the procedure is the same except reassembly will be in a slightly different order in regards to the panel. The coil will be placed in its final position and anchored; then the panel will be put on over the coil connectors. Before fastening the panel in place, work the grommets into the holes around the coil connectors. Then fasten the panel in place.
27. Guide coil connectors through holes in panel on piping side of unit. Stop short of the final position.
28. Install rubber grommets onto coil connectors.
29. Proceed to move coil guiding connectors and until coil is in final location.
30. Work the grommets into the holes around the coil connectors.
31. Make sure the coil is in the proper mounting position against the gasket on coil bulkhead.
32. Reinstall screws to attach coil frame to bulkhead.
33. Be sure coil and bulkhead will not allow air to bypass coil. Seal with Manus Bond caulk if necessary. This material requires 3 hours to set.
34. Reinstall all components, sensors, frames, pans, filters, etc., which were removed previously inside unit.
35. Check alignment of coil connectors to existing pipe connections. Coil connectors on copper headers may be adjusted slightly by moving carefully and gradually without causing damage or leaks. This may be necessary because the connectors may get bumped, pushed or pulled slightly out of position.
36. Reconnect all piping, test for leaks and charge systems.
37. Remove heavy cardboard or other material previously installed on new coil as protection for fins. Inspect fins for deformation and repair with a fin comb or fin straightener.
38. Check gasket for coil access panel, replaced if damaged.
39. Reinstall coil access panel.
40. Clean up inside and outside of unit. Especially check for screws or other sharp objects left on roof surface.
41. Put unit back into operation per facility requirements. Be sure if caulk was used, that it has had time to set up to avoid creating air leaks.

DOOR REPLACEMENT**Tools Required**

- Standard mechanic's hand tools
- Scraper
- Spacers

Materials Required

- Correct parts for the application (*see Form 102.20-RP1*).
- Perma Gum/Butyl Tape P/N 013-02976-000 for Outdoor Unit
- Neoprene Gasket, P/N 028-11962-000 for Indoor Unit.

Procedure

See Fig. 5-25

1. To prevent damage during removal, close and latch doors. Remove as complete Door/Frame Assemblies. On Outdoor Units, allow Perma Gum/Butyl Tape to properly release by removing Door/Frame Assembly slowly. Failure to do so may result in damage to frame.

2. Before installing Door/Frame Assembly, remove old gasket material.
3. Apply new gasket material to back of frame along the outer edge. Use Compound Sealing (Perma Gum/Butyl Tape), P/N 013-02976-000 for Outdoor Unit and Neoprene Gasket, P/N 028-11962-000 for Indoor Unit.



New door assemblies are provided with plastic spacers to maintain proper alignment.

4. Install new door assembly with door closed and latched with spacers in place. Once door assembly is installed, remove plastic shipping spacers from between door and doorframe.
5. Then, install screws in hinge side of doorframe.
6. Finally, install screws in top, bottom and latch sides of doorframe.
7. Check operation of door with unit off.
8. Check for obvious air leakage with air unit in operation.

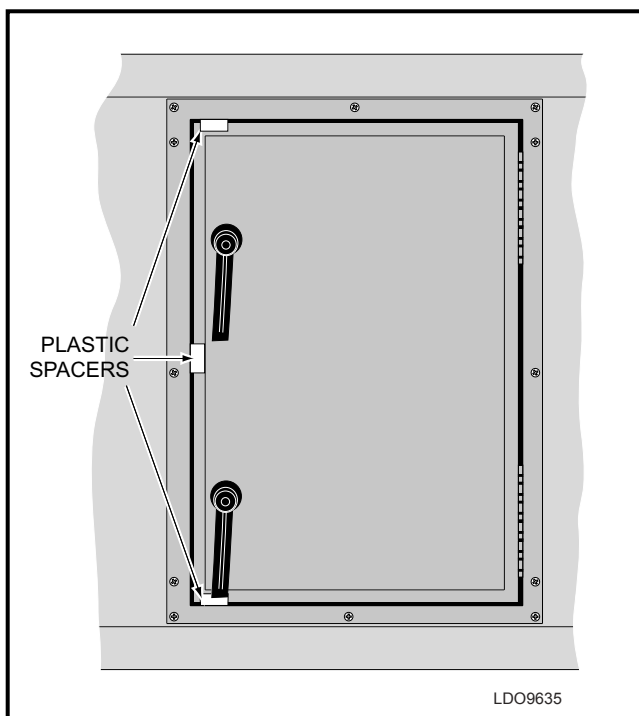


FIG. 5-25 – DOOR REPLACEMENT

DOOR GASKET REPLACEMENT**Tools Required**

- Standard mechanic's hand tools
- Scraper
- Caulk gun

Materials Required

- Door gasket material (order by measuring exact size of door panel height and width).
- One tube Manus Bond caulk, P/N 013-02966-001 or Sika Flex caulk, P/N 013-02966-000



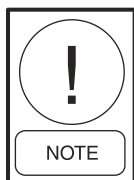
FIG. 5-26 – REPLACEMENT OF DOOR GASKET

Procedure

See Fig. 5-26

1. Remove Old Gasket

Using fingers or pliers, grasp the old gasket at a point near the center of any horizontal or vertical frame component, and pull straight out of the frame, working from the center toward the corners. Repeat on each of the four sides of the gasket.



Do not start at a corner! Starting at a corner may cause a portion of the gasket to tear away and remain inside the narrow groove in the aluminum frame. Any such material must be removed before the new gasket is installed.

- 2 Remove Sealant

It is necessary to clean up any excess factory-applied corner sealant which might prevent the new gasket from laying flat on the frame. Use a flat, rigid object such as a putty knife to scrape the surface of the frame where the new gasket will rest. Also remove as much sealant as possible from inside the groove so that the new gasket will seat properly.

- 3 Install New Gasket

Hold the new gasket in its approximate position in the doorframe. At about 6" from the top of each vertical frame member, insert just enough of the "barb" on the underside of the gasket into the "groove" of the frame to temporarily hold the gasket in place. Check all four corners to make sure that the gasket will fit in this position. Reposition as needed.

Continue forcing the gasket barb into the groove of the frame, starting at the corners and working toward the center of each side. Be certain that the barb is fully seated into the groove all the way around the frame. This is absolutely crucial on the hinge side. A gasket not fully seated into the hinge side frame may roll over as the door is being closed, increasing the likelihood of air leakage.

- 4 Seal Gasket Corners

Force a small amount of Manus Bond caulk, P/N 013-02966-001 under the gasket at each corner where the barbs were cut back. This will prevent air leakage under the gasket at those points. Doors should remain open for a period of 6 hours to allow Manus Bond to cure.

DOOR HANDLE/LATCH REPLACEMENT AND ADJUSTMENT

Standard Out Swing Door

Tools Required

Standard mechanics tool kit

Materials Required

Correct parts for the application (see Form 102.20-RPI).

Procedure

See Figure 5-27

1. Shut down and lock out unit fan(s).
2. Remove existing door latch assembly.
3. Insert shaft of latching mechanism through hole in door from outside to inside.
4. Thread flanged retainer of latching mechanism onto mechanism shaft until firmly against inside of door.

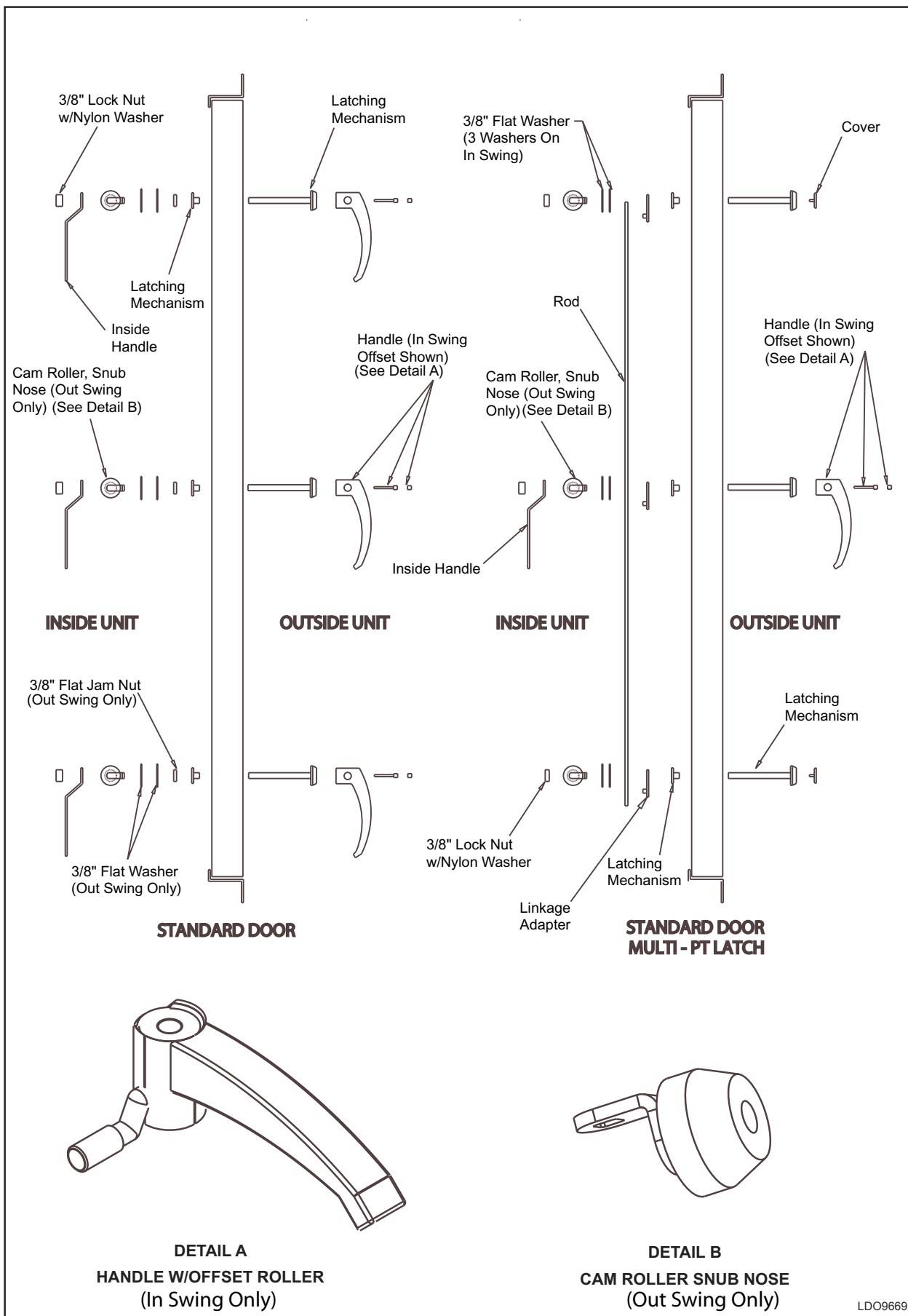


FIG. 5-27 – STANDARD DOOR LATCHES, IN SWING, OUT SWING & MULTI PT. LATCH

5. Thread 3/8" flat jam nut onto mechanism shaft and tighten against retainer.
6. Install handle (without offset roller) to mechanism on outside of door using slotted screw to secure.
7. Tighten slotted screw in handle and apply plastic screw cover.
8. Add two 3/8" flat washers.
9. Add cam roller (Detail B) so that roller will engage doorframe when handle is in the downward position.
10. Add inside handle (if applicable) to mechanism shaft.
11. Thread 3/8" lock nut w/nylon washer onto mechanism shaft and tighten.
12. Repeat these steps for each individual handle on the door.
13. Check operation of door latch with unit off and with unit in operation to check for leakage.
14. If adjustment is required, add or take away 3/8" Flat Washers.
4. Thread flanged retainers of latching mechanisms onto each mechanism shaft until firmly against inside of door.
5. Install one handle (without offset roller) to the mechanism designated to be the "operator" on outside of door using slotted screw to secure.
6. Tighten slotted screw in handle and apply plastic screw cover.
7. To the other mechanism(s), apply push on cover(s) in place of handle(s).
8. Place the designated mechanism handle in a downward position.
9. Place the other mechanism(s) so the square shaft(s) is/are positioned the same as that of the designated mechanism shaft.
10. Apply a linkage adapter to each mechanism shaft. Be sure the peg is downward and at an angle away from the edge of the door. Also, be sure the smooth side of the linkage adapter is toward the door.
11. Install the connecting rod by engaging its holes with the respective peg on each linkage adapter.
12. Secure the connecting rod by placing an "E" ring (snap ring) in the groove on each peg.
13. Add two 3/8" flat washers.
14. Add cam rollers (Detail B) to each mechanism shaft so that rollers will engage doorframe when handle is in the downward position.
15. Add one inside handle (if applicable) to the mechanism shaft most convenient to operate from inside unit.
16. Thread 3/8" lock nuts w/nylon washer onto each mechanism shaft and tighten.
17. Check operation of multi-point latching assembly with unit off and with unit in operation to check for leakage.

If adjustment is required, add or take away 3/8" flat washers

Standard Out Swing Door With Multi-point Latch

Tools Required

Standard mechanics tool kit

Materials Required

Correct parts for the application (*see Form 102.20-RPI*).

Procedure

See Figure 5-27

1. Shut down and lock out unit fan(s).
2. Remove existing door latch assembly.
3. Insert shafts of each of the individual latching mechanisms through holes in door from outside to inside.

Standard In Swing Door**Tools Required**

Standard mechanics tool kit

Materials Required

Correct parts for the application (*see Form 102.20-RPI*).

Procedure

See Figure 5-27

1. Shut down and lock out unit fan(s).
2. Remove existing door latch assembly.
3. Insert shaft of latching mechanism through hole in door from outside to inside.
4. Thread flanged retainer of latching mechanism onto mechanism shaft until firmly against inside of door.
5. Install handle (with offset roller - Detail A) to mechanism on outside of door using slotted screw to secure.
6. Tighten slotted screw in handle and apply plastic screw cover.
7. Add inside handle (if applicable) to mechanism shaft.
8. Thread 3/8" lock nut w/nylon washer onto mechanism shaft and tighten.
9. Ensure offset on door handle engages door frame when handle is in the downward position.
10. Repeat these steps for each individual handle on the door.
11. Check operation of door latch with unit off and with unit in operation to check for leakage. If leakage occurs, check door gasket (*see "Door Gasket Replacement"* in this section).
12. If adjustment is required,

Standard In Swing Door With Multi-point Latch**Tools Required**

Standard mechanics tool kit

Materials Required

Correct parts for the application (*see Form 102.20-RPI*).

Procedure

See Figure 5-27

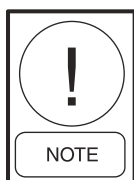
1. Shut down and lock out unit fan(s).
2. Remove existing door latch assembly.
3. Insert shafts of each of the individual latching mechanisms through holes in door from outside to inside.
4. Thread flanged retainers of latching mechanisms onto each mechanism shaft until firmly against inside of door.
5. Install one handle (with offset roller - Detail A) to the mechanism designated to be the "operator" on outside of door using slotted screw to secure.
6. Tighten slotted screw in handle and apply plastic screw cover.
7. To the other mechanism(s), apply push on cover(s) in place of handle(s).
8. Place the designated mechanism handle in a downward position.
9. Place the other mechanism(s) so the square shaft(s) is/are positioned the same as that of the designated mechanism shaft.
10. Apply a linkage adapter to each mechanism shaft. Be sure the peg is downward and at an angle away from the edge of the door. Also, be sure the smooth side of the linkage adapter is toward the door.
11. Install the connecting rod by engaging its holes with the respective peg on each linkage adapter.
12. Secure the connecting rod by placing an "E" ring (snap ring) in the groove on each peg.
13. Add three 3/8" flat washers.
14. Ensure offset on door handle engages door frame when handle is in the downward position.
15. Add one inside handle (if applicable) to the mechanism shaft most convenient to operate from inside unit.
16. Thread 3/8" lock nuts w/nylon washer onto each mechanism shaft and tighten.
17. Check operation of multi-point latching assembly with unit off and with unit in operation to check for leakage (*see "Door Gasket Replacement"* in this section).

THRUST RESTRAINT REPLACEMENT AND ADJUSTMENT

Fan segments are cabinets containing a fan and motor. They can develop extremely high thrusts. These forces are horizontally opposite to the airflow. Thrust restraints are provided for all fans when the air thrust exceeds 15% of the equipment weight when the fan discharge is Rear (see Figure 5-28). Any other fan orientation does not require restraints due to one of several reasons:

- Top and Top Inverted - Isolators function as thrust restraints
- Bottom and Bottom Inverted - The weight of the fan/motor exceed potential thrust.
- Rear Inverted - The horizontal thrust component is low with respect to the center of gravity of the fan/motor assembly.

Rear Discharge Orientation



- *On Forward Curved fans, the thrust is under 15% of the total weight. Hence, the thrust restraints are not required.*
- *On Airfoil fans, it is required that thrust restraints be used where the TSP is greater than 6"*
- *On Plenum fans, it is required that thrust restraints be used where the TSP is greater than 3".*

Tools Required

Two 8" crescent wrenches

Material Required

Appropriate Thrust Restraint Kit (see Form 102.20-RPI).

Procedure

See Figures 5-28 & 5-29

Thrust Restraint Replacement

Supply fan is attached to bulkhead (or bulkhead clip), one thrust restraint on each side near top of fan.

1. Remove any existing thrust restraints.
2. If fan wall will not support thrust or brackets, install additional support from floor to roof and tie in at top, bottom and about 4' intervals.
3. If fan structure angle is not present or doesn't line up, adjust thrust restraint mounting brackets (or clips) furnished with thrust restraints. Attach to each side of fan housing nearest top and toward discharge.
4. Lock two nuts together on one end of threaded rod.
5. Finally, add first flat steel washer, first flat rubber washer, first steel cup retainer, spring, second steel cup retainer, second flat rubber washer and second flat steel washer.

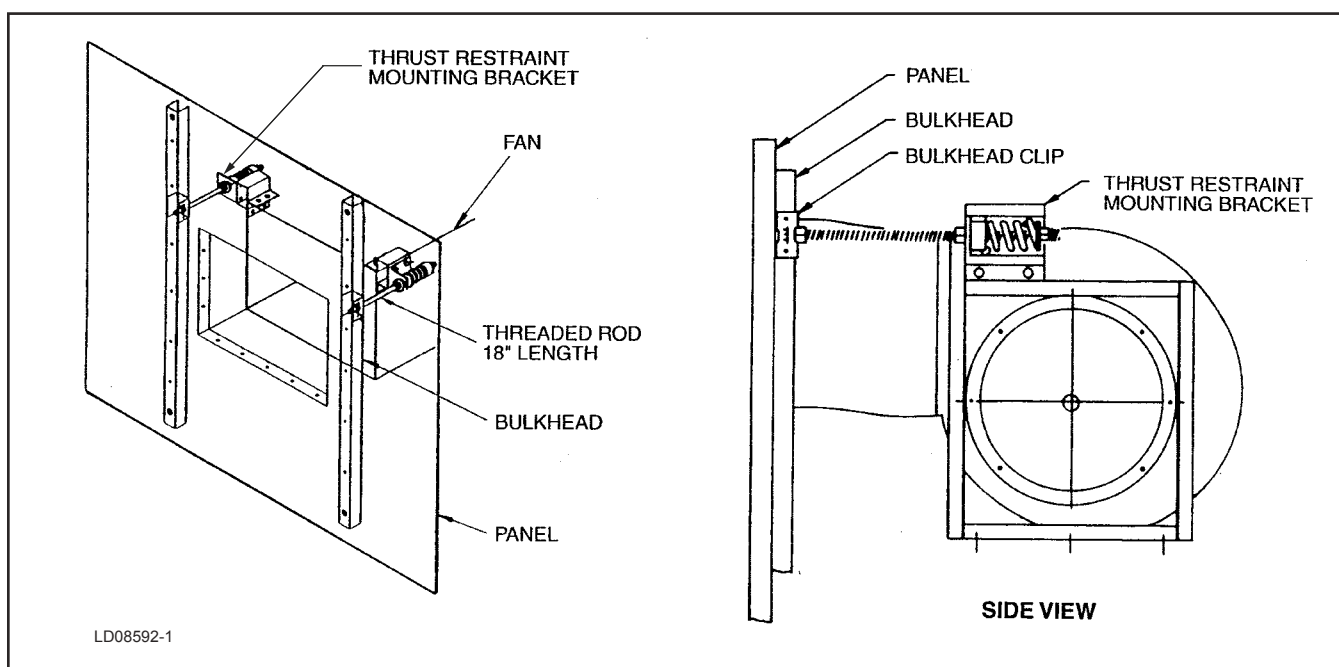


FIG. 5-28 – SUPPLY FAN RESTRAINT

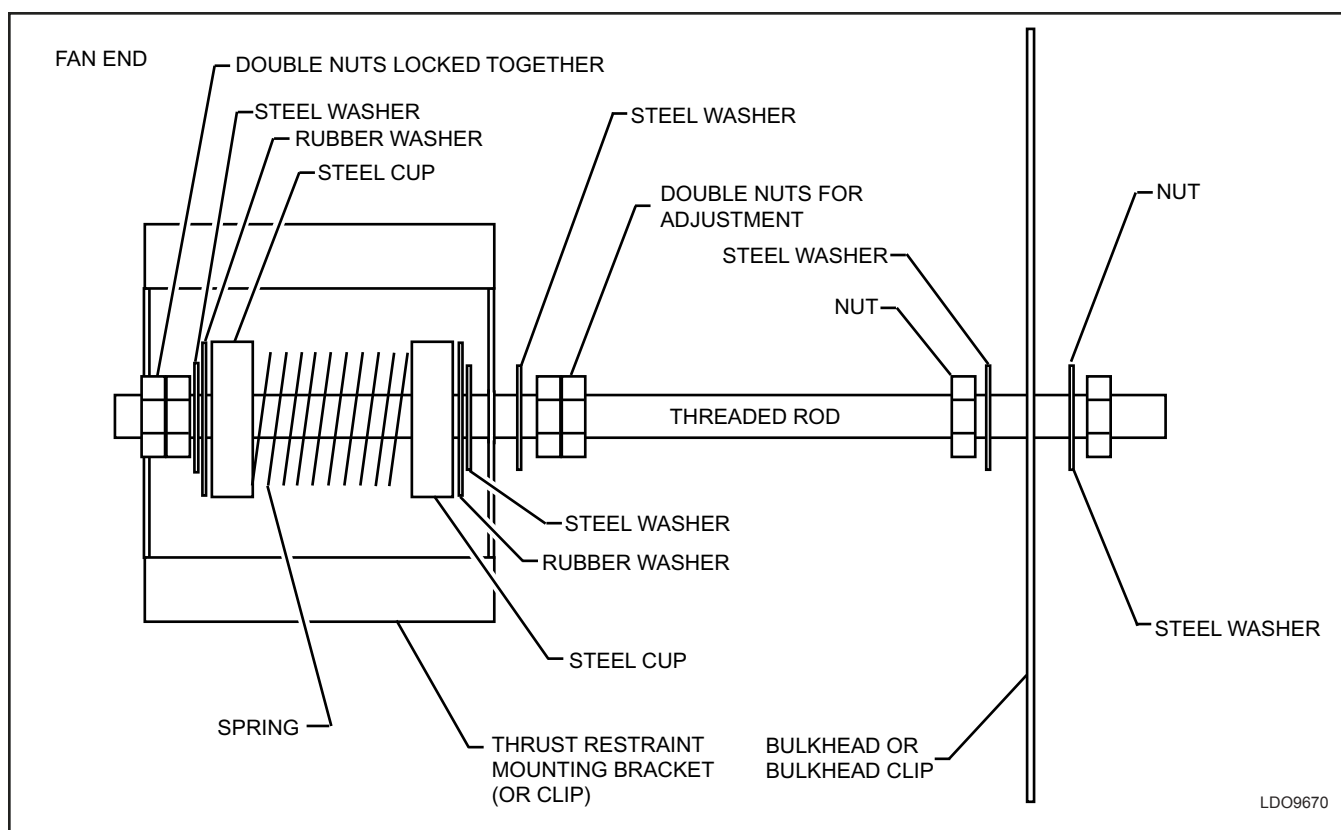


FIG. 5-29 – THRUST RESTRAINT ASSEMBLY

6. Slide threaded rod through thrust restraint mounting bracket on fan (or clip) toward bulkhead (or bulkhead clip).
7. Add third flat steel washer and 2 nuts that will lock together in a later step.

10. Push threaded rod through bulkhead (or bulkhead clip) until spring parts are against thrust restraint mounting bracket on fan (or clip).
11. Tighten nuts on both sides of bulkhead (or bulkhead clip).

Thrust Restraint Adjustment

After installing thrust restraint, adjust as follows:

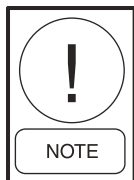
8. Next add 1 nut and flat 1 steel washer and slide threaded rod through bulkhead (or bulkhead clip).
9. Add flat steel washer and 1 nut on the other side of bulkhead (or bulkhead clip).

1. Ensure nuts are tight on both sides of bulkhead or bulkhead clip.
2. Adjust third flat steel washer and second set of double nuts hand tight against thrust restraint mounting bracket on fan.
3. Turn second set of double nuts 4 full turns toward spring and lock in place.
4. Repeat this process for each thrust restraint.



The hardware thus far goes to the fan end of threaded rod.

FIELD CUT OPENINGS FOR DUCTS, DAMPERS AND SPECIAL ACCESS FOR SOLUTION DOUBLE WALL 2" PANELS



A pre-manufactured replacement panel with your specified opening size and location may be available through Baltimore Parts Center—Airside or Local York Service.



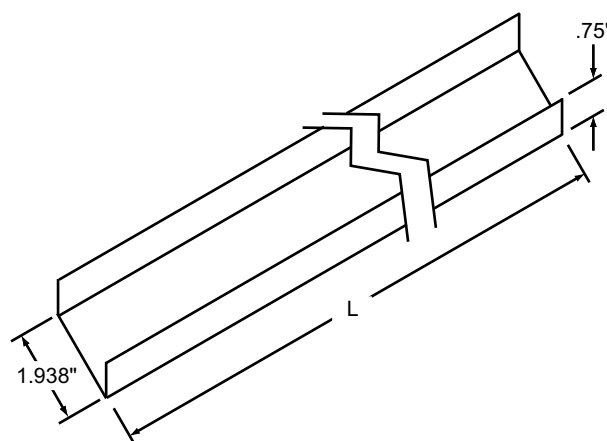
If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

Tools Required

- Screw gun with #3 phillips bit.
- Gasket scraper
- Broad, thin pry bar
- Drill motor
- One-eighth inch drills.
- Pop rivet gun
- Hole saw-approximately 1-1/2" diameter for starter holes
- Power saw or power shear for metal cutting.
- Power cords as required.
- Awl

Material Required

- Two prefabricated pieces of "C" channel used for stiffeners and insulation covers equal to the height of the new opening. If this were a side panel, this would be "vertical". This channel is 20 gauge galvanized sheet metal, 1.938" wide with .750" legs. Available through Baltimore Parts Center-Airside (see Fig. 5-30).
- Two prefabricated pieces of "C" channel used for stiffeners and insulation covers equal to the width of the new opening. If this were a side panel, this would be "horizontal". This channel is 20 gauge galvanized sheet metal, 1.938" wide with .750" legs, available through Baltimore Parts Center-Airside (see Fig. 5-30).



Notes:

1. Select the C-Channel that is nearest to the size of your opening and cut to fit.

2. Available lengths (L) for stiffeners:

PART NUMBER	LENGTH (L)
087-40048-050	47.938"
087-40072-050	71.938"
087-40127-050	126.938"

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FIG. 5-30 – C-CHANNEL

- 1/8" steel pop rivets for 1/4" working thickness.
- Cold Galvanized Paint.
- Touchup Spray Paint, Desert Sand, P/N TAC01494 (for Outdoor Unit exterior only).
- Manus Bond gray sealant York P/N 013-02966-001
- For outdoor unit panel flanges, use sealing compound (Perma Gum/Butyl Tape) 3/16" x 1/2" York P/N 013-02976-000.
- For outdoor unit roof panel to roof panel overlap use gasket, neoprene 0.50" x 1.25" York P/N 028-11967-000.
- For indoor unit panel flanges, use Gasket, neoprene 0.25" x 0.50" York P/N 028-11962-000.
- Panel screws 1/4" x 3/4" pan head sheet metal screw, York P/N 021-17722-000.
- Clean up supplies.

Procedure

1. Cut the “C” Channel stiffeners to fit opening. Use for stiffening the cut panel and for sealing of insulation and probable air leakage areas.
2. Make sure any components; bulkheads or other obstructions are disconnected from panel inside and out.
3. When removing panel, to prevent damage of outdoor unit remove panel slowly allowing Perma Gum/Butyl Tape to release.



Panels can often be cut in place without removing from the air handling unit.

4. Layout location and dimensions of opening to be cut. Do this on both sides of double wall panels.
5. Cut desired opening in panel insuring cuts on both sides line up.
6. Insert stiffeners, legs first, by tapping into panel until flush with new panel opening. This simultaneously forces the legs of the “C” channels between the foam insulation and the liner and between the foam insulation and the outer sheet metal without damage to the insulation. Be sure the broad sides of the “C” channels line up to form the desired opening dimensions. This should be flush with edges of the new opening.
7. Secure “C” channels with pop rivets at 3” intervals on a line 1/4” from the new opening edges. When fastening with pop rivets avoid buckling or bulging of sheet metal by applying rivets simultaneously on each side of opening, working from center to corners.
8. Apply Manus Bond gray sealant to corner seams and all seams inside the new opening.
9. Paint rivets and raw edges of sheet metal with Cold Galvanize paint.
10. If the panel was removed, clean away damaged or residual gasket or sealing compound and replace with appropriate material (see material list above).

11. Install panel on air handling unit carefully using Panel Screws (see material list above).
12. All re-installed panels and alterations of panels must provide integrity equal to original equipment specifications.
13. Reconnect any components, bulkheads or other fixtures that were disconnected from panel in step # 2.
14. Thoroughly clean up inside and outside air unit.

PANEL REPLACEMENT

If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

Tools Required

- Screw gun with #3 phillips bit.
- Gasket scraper
- Broad, thin pry bar
- Awl

Material Required

- Replacement panel, available through Baltimore Parts Center-Airside
- Manus Bond gray sealant, York P/N 013-02966-001
- For outdoor unit panel flanges, use sealing compound (Perma Gum/Butyl Tape) 3/16”x 1/2” York P/N 013-02976-000.
- For outdoor unit roof panel to roof panel overlap use gasket, neoprene 0.50” x 1.25” York P/N 028-11967-000.
- For indoor unit panel flanges, use gasket, neoprene, 0.25” x 0.50” York P/N 028-11962-000.
- Panel screws 1/4” x 3/4” pan head SM screw, York P/N 021-17722-000.
- Clean up supplies.

Procedure

1. Make sure any components; bulkheads or other obstructions are disconnected from panel inside and out (*see Fig. 5-31*).



FIG. 5-31 – REMOVE COMPONENTS PRIOR TO REMOVING PANELS.

2. When removing panel, to prevent damage of outdoor unit remove panel slowly allowing Perma Gum/Butyl Tape to release.

Prior to panel removal on tiered or vertical units, cut any gasket that crosses a seam. This will prevent tearing gaskets.

3. Clean away damaged or residual gasket or sealing compound and replace with appropriate new material (*see material list above*).
4. Install panel on air handling unit carefully using panel screws (*see Figure 5-32*).

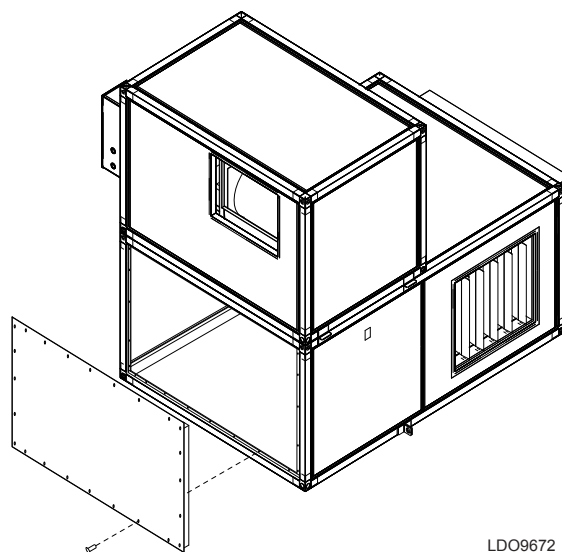
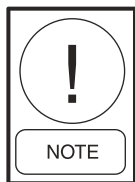


FIG. 5-32 – INSTALL PANELS

5. All re-installed panels must provide integrity equal to original equipment specifications.
6. Seal all penetrations with Manus Bond.
7. Reconnect any components, bulkheads or other fixtures that were disconnected from panel in step # 1.
8. Thoroughly clean up inside and outside air unit.

FIELD PENETRATIONS FOR PIPING & ELECTRICAL CONNECTIONS

For small sizes such as 1/2" iron pipe, 1/2" conduit or 5/8" O.D. copper and smaller; it is acceptable to use Sikaflex or Manus Bond instead of a grommet.



Electrical conduits must be sealed internally to prevent airflow and moisture condensation.

Tools Required

- Drill motor
- Pilot starter bit
- Hole saws-approximately 2-1/2", 3-1/4" & 4-1/2" diameter for holes
- Power cords as required.

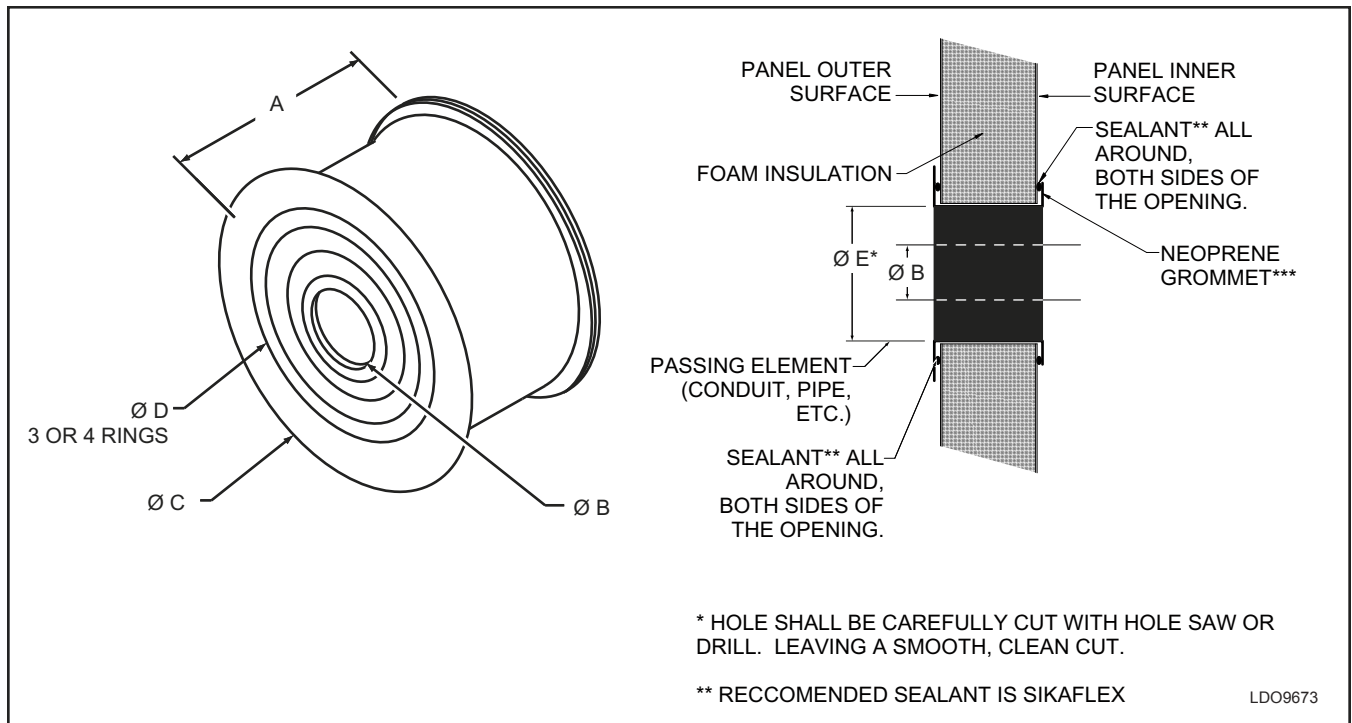
Material Required

- Neoprene Grommet, 2-1/2", 3-1/4", or 4-1/2" as required (see Fig 5-33).
- Cold Galvanized Paint.
- Touchup Spray Paint, Desert Sand, P/N TAC01494 (for Outdoor Unit exterior only).
- Sikaflex - 221 (York P/N 013-02966-000) or Manus Bond 75-AM 100ZTU (York P/N 013-02966-001)
- Exacto knife
- Clean up supplies

Procedure

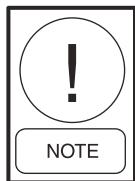
(see Fig 5-33)

1. Make sure any components; bulkheads or other obstructions are disconnected from panel inside and out.
2. Layout location and dimensions of hole opening to be cut. Do this on both sides of double wall panels.
3. Carefully cut correct hole size for the application in panel, insuring cuts on both sides line up and a smooth clean cut is made.
4. Paint raw edges of sheet metal with Cold Galvanize paint.
5. Select appropriate grommet for new panel hole and cut out appropriate hole diameter for penetration with an exacto knife.
6. After paint dries, Install grommet into panel hole opening.
7. Apply Sikaflex sealant all around new hole opening behind lip of grommet, on both sides of panel.
8. Run pipe or conduit through grommet and make appropriate connections.
9. All modified panels must provide integrity equal to original equipment specifications.
10. Reconnect any components, bulkheads or other fixtures that were disconnected from panel in step # 1.
11. Thoroughly clean up inside and outside air unit.



IRON PIPE SIZE (nominal)	COPPER PIPE SIZE (O.D.)	THIN WALL CONDUIT	USE GROMMET P/N	DIMENSIONS				
				GROMMET DEPTH (A)	GROMMET HOLE DIAMETER (ØB)	GROMMET LIP DIAMETER (ØC)	MARKED GROMMET HOLE DIAMETER (CUT OUT) (ØD)	PANEL HOLE CUT DIAMETER (ØE)
3/4", 1"	7/8", 1-1/8"	3/4", 1"	028-11872-000	2.375"	0.500"	3.125"	0.749	2.50"
1-1/4", 1-1/2"	1-3/8", 1-5/8"	1-1/4", 1-1/2"	028-11871-000	2.375"	1.000"	3.875"	1.249	3.25"
1-1/4", 1-1/2"	1-3/8", 1-5/8"	1-1/4", 1-1/2"	028-11872-000	2.375"	0.500"	3.125"	1.249	2.50"
1-1/4", 1-1/2"	1-3/8", 1-5/8"	1-1/4", 1-1/2"	028-11861-000	2.375"	1.000"	5.125"	1.251	4.50"
2"	2-1/8"	2"	028-11871-000	2.375"	1.000"	3.875"	1.749	3.25"
2"	2-1/8"	2"	028-11861-000	2.375"	1.000"	5.125"	1.751	4.50"
2"	2-1/8"	2"	028-11872-000	2.375"	0.500"	3.125"	1.875	2.50"
2-1/2"	2-5/8"	2-1/2"	028-11861-000	2.375"	1.000"	5.125"	2.251	4.50"
2-1/2"	2-5/8"	2-1/2"	028-11871-000	2.375"	1.000"	3.875"	2.375	3.25"
3"	3-1/8"	3"	028-11861-000	2.375"	1.000"	5.125"	2.875	4.50"

FIG. 5-33 – PENETRATIONS AND GROMMET DETAILS

FIELD MODIFICATION TO ADD DOORS

This procedure instructs how to modify panels in order to install a door that runs from the top to bottom raceway. For doors that are smaller than the height of the air handler see “Field Cut Openings for Ducts, Dampers and Special Access for Solution Double Wall 2” Panels” and “Door Replacement” procedures found in this IOM.



If your unit has HEPA filters the filter frames, filter bulkheads and filter segment panels are factory sealed and must remain sealed for NO air bypass.

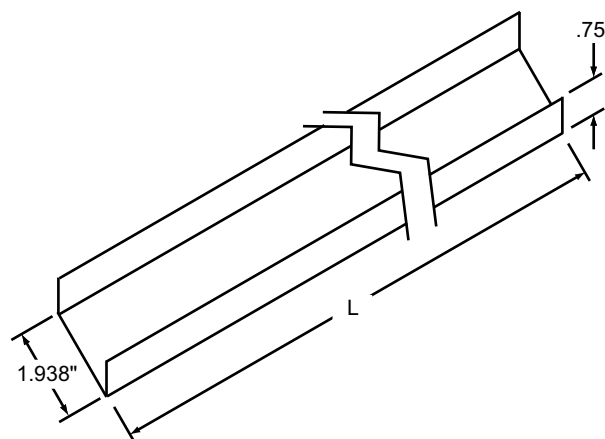
Tools Required

- Standard mechanic’s hand tools
- Spacers, 1/8” thick approximately
- Screw gun with #3 phillips bit
- Awl
- Gasket scraper
- Broad, thin pry bar
- Drill motor
- One-eighth inch drills
- Pop rivet gun
- Hole saw-approximately 1-1/2” diameter for starter holes
- Power saw or power shear for metal cutting
- Power cords as required

Material Required

- Perma Gum/Butyl Tape P/N 013-02976-000 for Outdoor Unit
- Neoprene Gasket, P/N 028-11962-000 for Indoor Unit
- Two prefabricated pieces of “C” channel (one piece if door is to be mounted at a corner) used for stiffeners and insulation covers equal to the height of the panel. This channel is 20 gauge

galvanized sheet metal, 1.938” wide with .750” legs. Available through Baltimore Parts Center-Airside (see Fig. 5-34).

**Notes:**

1. Select the C-Channel that is nearest to the size of your opening and cut to fit.

2. Available lengths (L) for stiffeners:

PART NUMBER	LENGTH (L)
087-40048-050	47.938"
087-40072-050	71.938"
087-40127-050	126.938"

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FIG. 5-34 – C-CHANNEL

- Steel pop rivets, 1/8”, for 1/4” working thickness.
- Self drilling screws, 1/4”-14 x 3/4”, P/N 021-19515-000
- Cold Galvanized Paint.
- Touchup Spray Paint, Desert Sand, P/N TAC01494 (for Outdoor Unit exterior only).
- Manus Bond gray sealant York P/N 013-02966-001
- Panel screws 1/4” x 3/4” pan head sheet metal screw, York P/N 021-17722-000
- Clean up supplies

Procedure

1. Make sure any components; bulkheads or other obstructions are disconnected from panel inside and out.
2. When removing panel, to prevent damage of outdoor unit remove panel slowly allowing Perma Gum/Butyl Tape to release.

3. Clean away damaged or residual gasket or sealing compound and replace with appropriate new material (*see material list above*).
4. Cut “C” Channel stiffener(s) to fit. Use to strengthen the cut panel(s) and for sealing of insulation and probable air leakage areas.
5. Layout location of door for cutting. Do this on both sides of double wall panel.
6. Cut panel from top to bottom at desired location ensuring cuts on both sides line up.
7. Insert stiffeners, legs first, by tapping into panel until flush with cut edges of panel. This simultaneously forces the legs of the “C” channels between the foam insulation and the liner and between the foam insulation and the outer sheet metal without damage to the insulation.
8. Secure “C” channels with pop rivets at 3” intervals on a line $\frac{1}{4}$ ” from the edge of the cut panel(s). When fastening with pop rivets avoid buckling or bulging of sheet metal by applying rivets simultaneously on each side of cut panel(s), working from center to top and bottom.
9. Apply Manus Bond gray sealant to seal the “C” channel to cut edges.
10. Paint rivets and raw edges of sheet metal with Cold Galvanize paint.
11. Install panel(s) on air handling unit carefully using panel screws (*see Figure 5-35*).

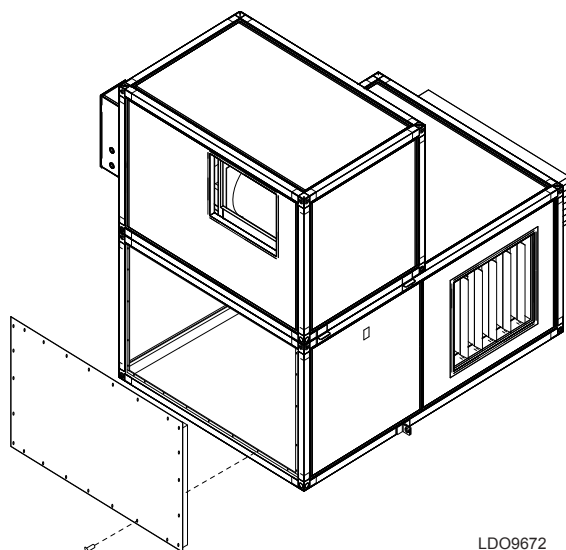
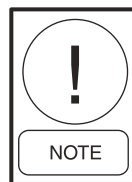


FIG. 5-35 – INSTALL PANELS



All re-installed panels and alterations of panels must provide integrity equal to original equipment specifications.

12. Reconnect any components, bulkheads or other fixtures that were disconnected from panel in step # 1.
13. Apply gasket material to back of doorframe along the outer edge. Use Compound Sealing (Perma Gum/Butyl Tape), P/N 013-02976-000 for Outdoor Unit and Neoprene Gasket, P/N 028-11962-000 for Indoor Unit.



New door assemblies are provided with plastic spacers to maintain proper alignment.

14. Install new door assembly with door closed and latched with spacers in place (*see Figure 5-36*). Once door assembly is installed, remove plastic shipping spacers from between door and doorframe.

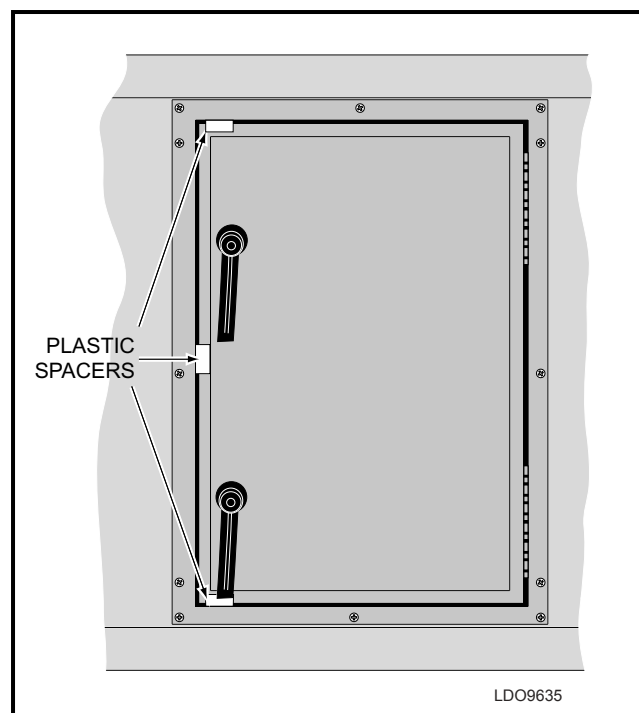


FIG. 5-36 – DOOR REPLACEMENT

15. Then, install self-drilling screws in hinge side of doorframe.
16. Finally, install self-drilling screws in top, bottom and latch sides of doorframe.
17. Check operation of door with unit off.
18. Check for obvious air leakage with air unit in operation
19. Thoroughly clean up inside and outside air unit.

LIGHT BULB REPLACEMENT

Tools Required

- Phillips screwdriver, #2

Materials Required

- Lamp, incandescent, 75W or fluorescent, 20W.

Procedure

See Fig. 5-37

1. Disconnect power from light assembly.
2. Remove two #2 phillips screws connecting cover to base.
3. Remove cover and replace bulb.
4. Fasten cover to base with two #2 phillips screws.

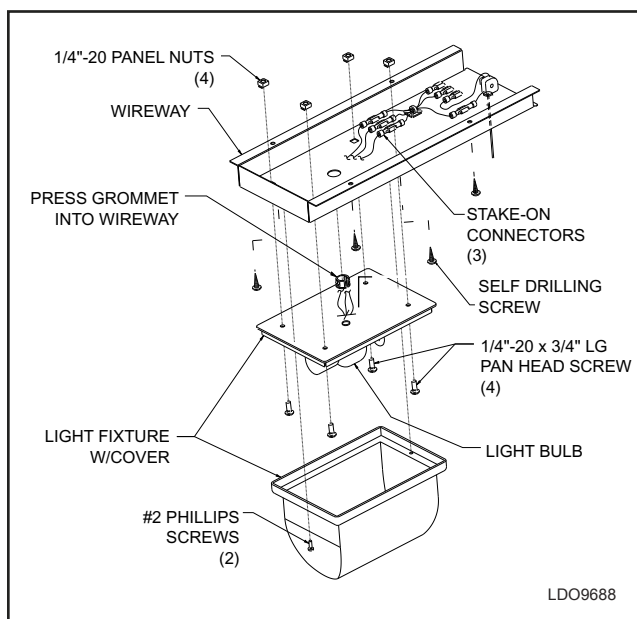


FIG. 5-37 – LIGHT ASSEMBLY PULL SWITCH SHOWN)

LIGHT ASSEMBLY REPLACEMENT

Tools Required

- Phillips screwdriver, # 2
- Nut setter or socket, 1/4”.

Materials Required

- Light fixture w/ cover (P/N 025-39013-001)

Procedure

See Fig. 5-37

1. Disconnect power from light assembly.
2. Remove wireway from where it fastens to top panel by removing all self drilling screws.
3. Disconnect “stake-on” electrical connectors (see Figure 5-38).

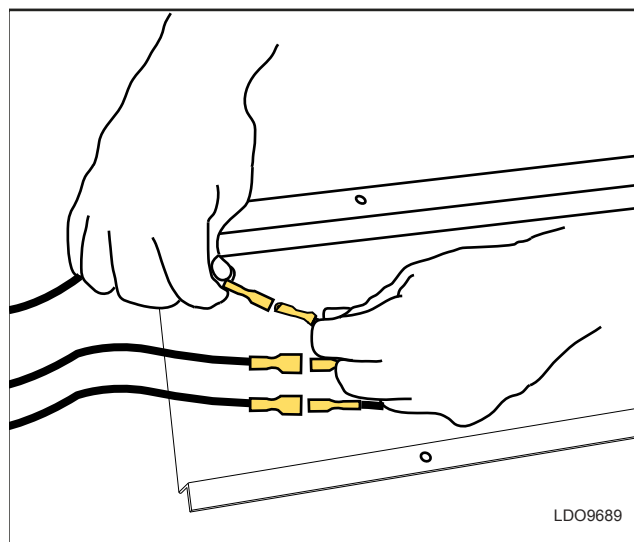


FIG. 5-38 – REMOVE ELECTRICAL CONNECTORS

4. Remove two #2 phillips screws connecting cover to base.
5. Separate light assembly from wireway by removing four 1/4”-20 x 3/4” long pan head screws.
6. Remove grommet from wireway and light assembly; save for reuse.
7. Install new light assembly by reversing steps 1 through 6.



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FIG 5-39 – MINIHHELIC GAGE

FILTER GAGE REPLACEMENT

Tools Required

- 4" adjustable wrench or ignition wrench set.
- Long, thin straight slot screwdriver.
- Caulking gun.

Materials Required

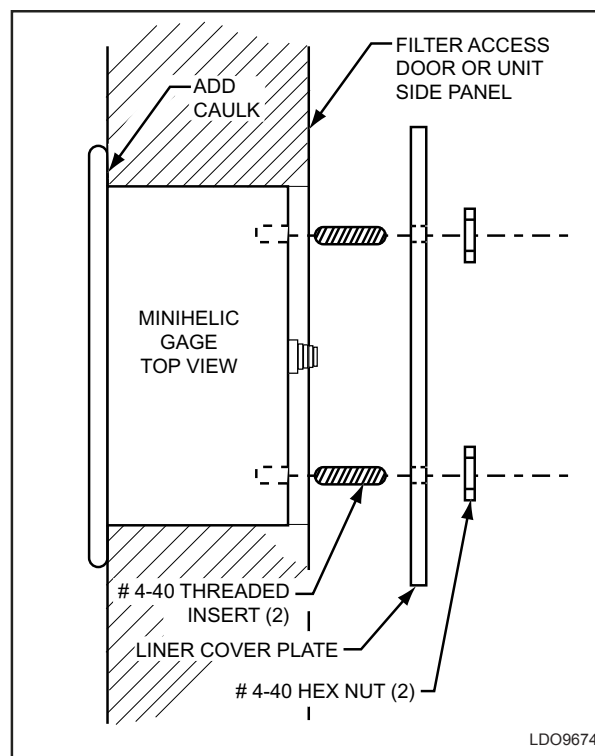
- Manus Bond gray sealant York P/N 013-02966-001.

Procedure

1. Remove the 3/16" tubing from barbed fittings on the back of the gage. Identify each tube as "HIGH" or "LOW".
2. Remove two #4-40 hex nuts and remove the liner cover plate that holds the filter gage in place.
3. Cut existing caulking from perimeter of gage.
4. Slide gage through front of filter access door or unit side panel.
5. Clean old caulking from access panel.



The replacement filter gage will be mounted to the liner cover plate by two (2) #4-40 threaded inserts and hex nuts that come with the gage.



LDO9674

FIG. 5-40 – ASSEMBLY OF GAGE TO LINER COVER PLATE

4. Insert two #4-40 threaded inserts into the threaded holes located in the rear of the replacement gage (see Fig 5-40).
5. Run a small bead of sealant around the exterior perimeter of the gage where it will seal against the filter access door or unit side panel.
6. Slide gage into opening on access panel.
7. Slide liner cover plate over two #4-40 threaded inserts.
8. Secure gage by tightening two #4-40 hex nuts, making sure gage face is level.
9. Re-connect 3/16" tubing to barbed fittings on the back of the gage.
10. Remove lens by pressing finger tips firmly against lens outer ring and turning CCW.
11. Without any air applied, turn adjustment screw until gage reads zero.
12. Replace lens.

FILTER GAGE INSTALLATION (FIELD CUT)**Tools Required**

- Adjustable wrench (4") or ignition wrench set.
- Drill
- Punch
- Hole Saw, 2-5/8" dia.
- Long, thin straight slot screwdriver.
- Calking gun.

Materials Required

- Manus Bond gray sealant York P/N 013-02966-001.
- Clean up supplies.

Installation Considerations

- Filter Gage(s) can be installed in any filter segment. A Filter Gage can be installed across one filter bank only, installed across each filter bank in a segment, or one installed across all filter banks in a segment.
- If the unit is to have multiple filter gages then the preferred method of mounting the gages is horizontally with the prefilter gage being mounted first in airflow and the final filter gage being mounted last in airflow. If room does not allow for horizontal mounting then the gages can be mounted vertically with the prefilter gage to be mounted on the top.
- For all units with multiple filter gages, each gage should be labeled with a polyester printed label. The labels should read as follows:
 - A.) "Prefilter"
 - B.) "Intermediate Filter"
 - C.) "Final Filter"
 - D.) "Total Filter"

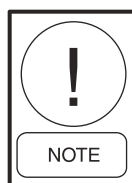
Procedure

1. The filter gages are to be mounted into the filter access door or into unit side panel if space permits on filter segment.



The filter gage will require a 3" O.D. surface area on the door or panel for mounting clearances and a minimum of 3" of depth behind the door panel, for proper tubing clearances.

2. Drill a 2-5/8" O.D. hole in the door or panel as close to the hinge side of the door as possible. Center the hole as follows:
 - For units up to 72" the filter gage(s) should be mounted 6" down from the top of the unit.
 - For units taller than 72" the gage should be mounted up 60" from the bottom of the unit.

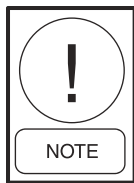


If a view port is installed in the door the filter gage should be mounted above or below the view port to ensure best visibility.



The filter gage will be mounted to the liner cover plate by two (2) #4-40 threaded inserts and hex nuts that come with the gage.

3. Insert two #4-40 threaded inserts into the threaded holes located in the rear of the replacement gage (see Fig 5-40).
4. Run a small bead of sealant around the exterior perimeter of the gage where it will seal against the filter access or unit side panel.
5. Slide gage into opening on access door or unit side panel.
6. Slide liner cover plate over two #4-40 threaded inserts.
7. Secure gage by tightening two #4-40 hex nuts, making sure gage face is level.
8. Mount static pressure ports (eyelets) by drilling a 3/16" hole in the proper location(s) (see Fig. 5-41 for a general filter gage mounting and tubing diagram) and inserting this eyelet through the hole then installing the 3/16" push nut retainer onto the backside of the eyelet to hold it in place.



The static pressure ports (eyelets) have to be installed “out of the air stream” to enable them to sense only static pressure and not velocity pressure. An “out of the air stream” location would be above or beside the filters. Not mounted in the face of the filter.

9. Make Tubing Connections

- The air entering side of the filter is always the high-pressure side. The downstream side is always the low-pressure side, of the filter bank.
- If the filter gage is mounted on the upstream side of the filter bank then the “HI” port of the gage is left as is to sense high-pressure and the “LO” port is tubed to the low-pressure side, of the filter.
- If the filter gage is mounted on the downstream side of the filter bank then the “LO” port is left as is, to sense low-pressure and the “HI” port is tubed to the high-pressure side of the filter bank.
- If the filter section is a combination filter assembly then the “LO” port of the prefilter gage is always tee’d into the “HI” port of the final filter gage and an eyelet is installed in the filter track between the filters, that is tubed to this tee. The remaining ports are treated just like above.
- The prefilter is always the first filter bank in the airstream and the final filters are always the last. There may also be an intermediate filter bank, which would be between the prefilters and final filters. This configuration will require two filter segments in the same unit.
- When the gage is door mounted, clamp the tubing to the back of the door as you run it along the hinge side. It will need to be looped so that there is enough tubing to flex around the corner of the door when it is in its full open position. The tubing will then need to be clamped to the wall panel and neatly run to the proper places.

10. Re-connect 3/16” tubing to barbed fittings on the back of the gage.
11. Remove lens by pressing finger tips firmly against lens outer ring and turning CCW.
12. Without any air applied, turn adjustment screw until gage reads zero.
13. Replace lens.

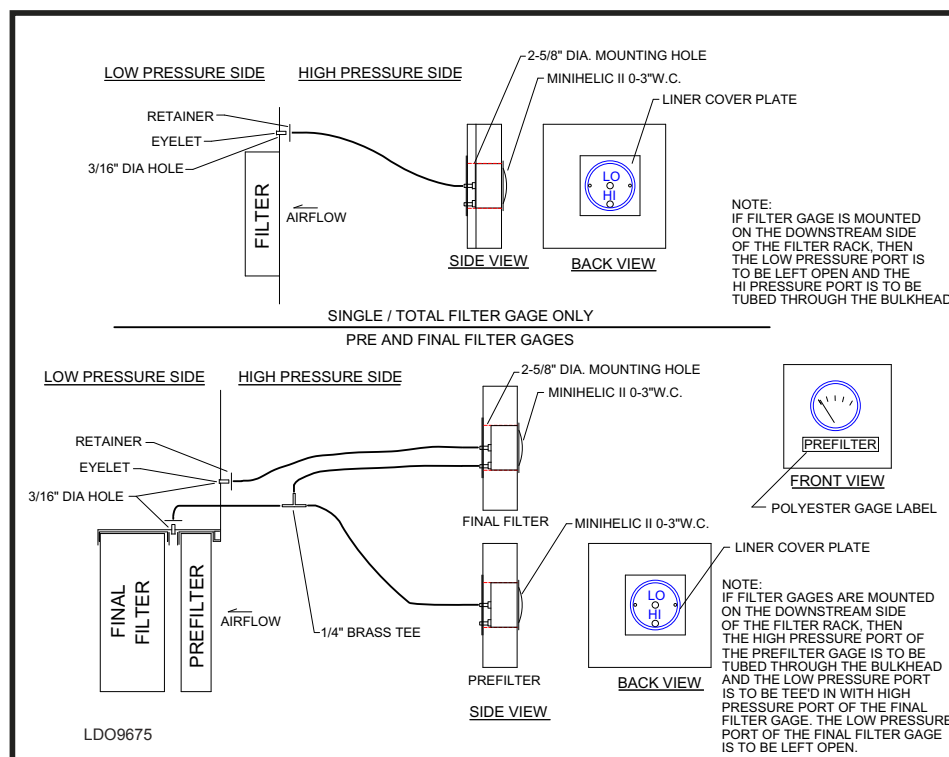


FIG. 5-41 – FILTER GAGE DIAGRAMS

ENERGY RECOVERY WHEEL**Tools Required**

- Standard Mechanic's Hand Tools
- Metric Allen Wrenches
- Hammer
- Drift
- Metric Socket Wrench Set w/ Extension.
- Metric Box Wrench Set

Materials Required

- Replacement Motor and Hardware Kit
- Replacement Belts
- Replacement Segment

Replacing Wheel Segments

Disconnect electrical power before servicing Energy Recovery Wheel.



Always keep hands away from bearing support beam when installing or removing segments. Failure to do so could result in severe injury to fingers or hand.

Wheel segments are secured to the wheel frame by a segment retainer. The retainer pivots on the wheel rim and is held in place by a segment retainer catch (see Figure 5-43).

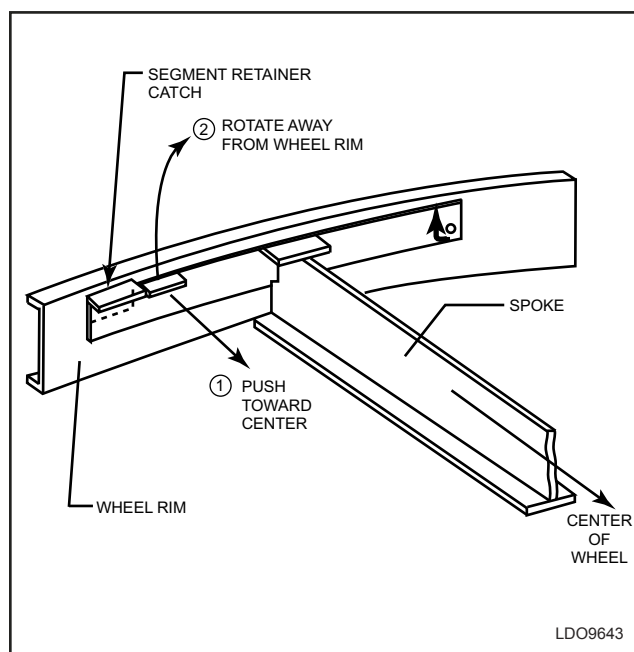


FIG. 5-43 – SEGMENT RETAINER

Removal Of Segments

See Figure 5-44

1. Disengage segment retainer from segment retainer catch (usually two per retainer) by pushing toward the center of the wheel.
2. Rotate segment retainer away from wheel rim.

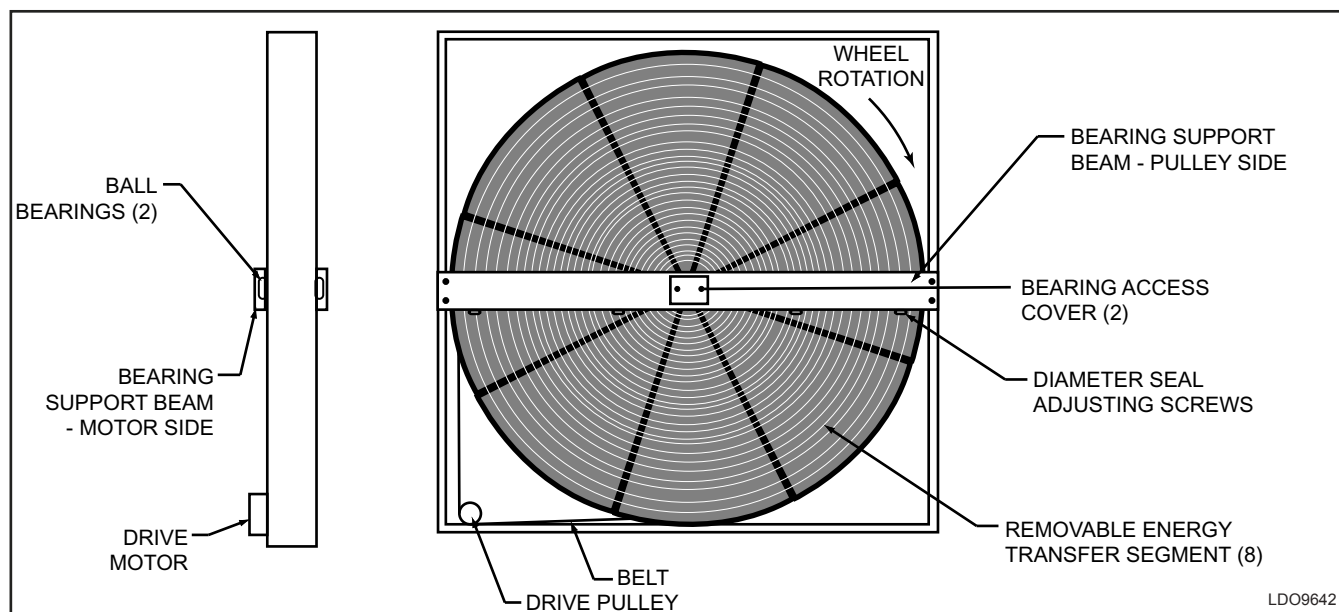


FIG. 5-42 – ENERGY RECOVERY WHEEL, PULLEY SIDE

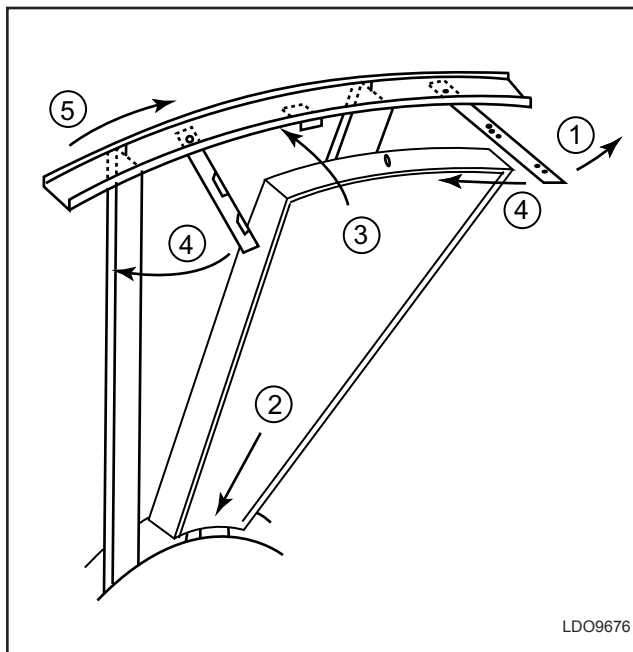


FIG. 5-44 – SEGMENT INSTALLATION

3. Pulling the segment by its two outer corners, remove the segment. It may be necessary to use a flat blade screwdriver to nudge the segment from the wheel rim. Be careful not to damage the wheel rim.
4. Rotate the segment retainer into the wheel rim so that the wheel can be rotated to access other segments.
5. It is advisable to rotate the wheel 180°. Remove the second segment in the same manner as the first. Continue removing segments in this manner until all are removed.

Installation Of Segments

See Figure 5-44

1. Unlock two segments retainers (one on each side of the selected segment opening).
2. With the embedded stiffener facing the motor side, insert the nose of the segment between the hub plates.
3. Holding segment by the two outer corners, press the segment towards the center of the wheel and inwards against the spoke flanges. If hand pressure does not fully seat the segment, insert the flat tip of a screwdriver between the wheel rim and outer corners of the segment and apply downward force while guiding the segment into place.

4. Close and latch each segment retainer under segment retaining catch.
5. Slowly rotate the wheel 180°. Install the second segment opposite the first for counterbalance. Rotate the two installed segments 90° to balance the wheel while the third segment is installed. Rotate the wheel 180° again to install the fourth segment opposite the third. Repeat this sequence with the remaining four segments.

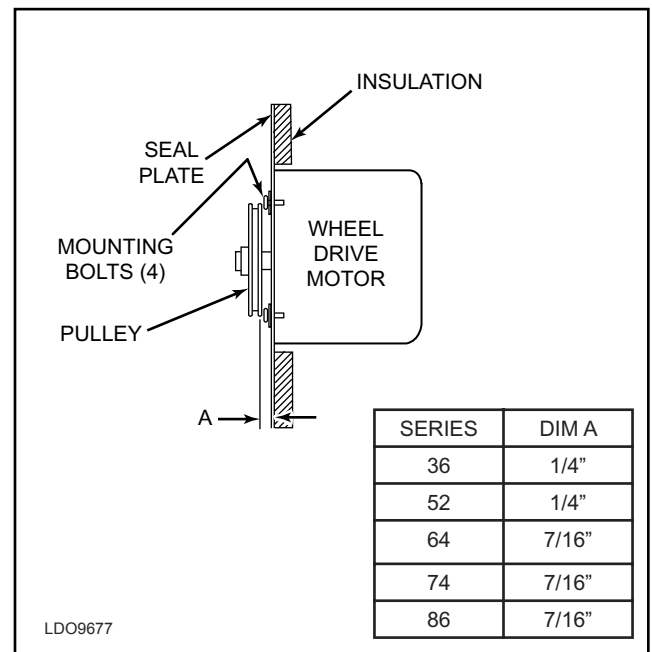


FIG. 5-45 – PULLEY LOCATION

Wheel Drive Motor & Pulley Replacement

See Figure 5-45

1. Disconnect power to wheel drive motor.
2. Remove belt from pulley and position temporarily around wheel rim.
3. Loosen set screw in wheel drive pulley using allen wrench and remove pulley from motor drive shaft.
4. While supporting weight of drive motor in one hand, loosen and remove four (4) mounting bolts.
5. Install replacement motor with hardware kit supplied.
6. Install pulley to dimension shown in Figure 5-45 and secure set screw to drive shaft.
7. Stretch belt over pulley and engage in groove.
8. Follow start-up procedure in Section 3.

Belt Replacement**Models ERC-36" Thru 110"**

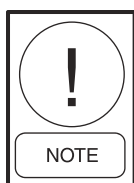
Replacement consists of wrapping the belt around the wheel rim, joining the ends by means of a single link connector, and stretching the belt around the wheel drive pulley.

1. Confirm the model number on the replacement belt kit matches the model number on the energy recovery cassette label.
2. Remove any remnant of old belt from cassette.
3. At location near pulley, attach the hook end of belt to wheel rim with tape, making sure that narrow side of "V" belt is positioned against rim and link is covered by the tape (see Figure 5-46).



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FIG. 5-46 – ATTACHING THE HOOK END OF BELT TO WHEEL RIM WITH TAPE



Later models of ERC-74 and larger diameter wheels have a belt guide channel on the outer surface of the wheel rim into which the belt must be positioned.

4. Rotate the wheel clockwise while feeding belt onto wheel rim (be careful not to twist belt) until taped end returns to pulley location. Remove tape from wheel.
5. Link belt ends together with belt wrapped around wheel (see Figure 5-47)



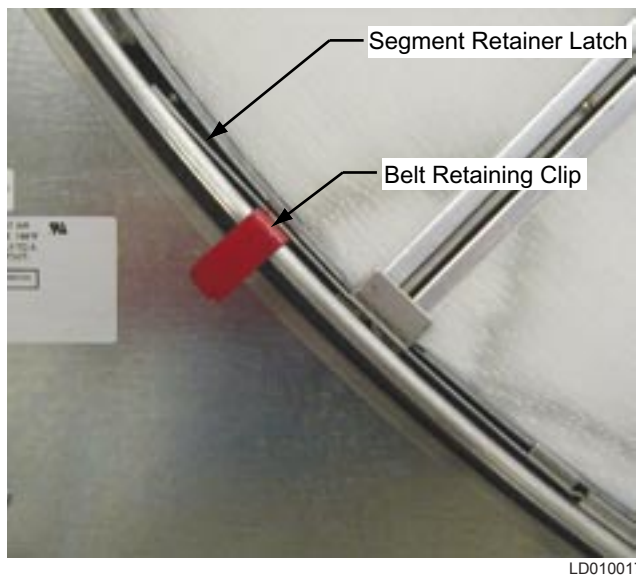
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FIG. 5-47 – LINK BELT ENDS TOGETHER

6. Rotate wheel clockwise to position single link connector approximately 180° from pulley location.
7. At pulley location, insert the right angle belt retaining clip near spoke and between segment retainer latch and wheel rim as shown in Figure 5-48.



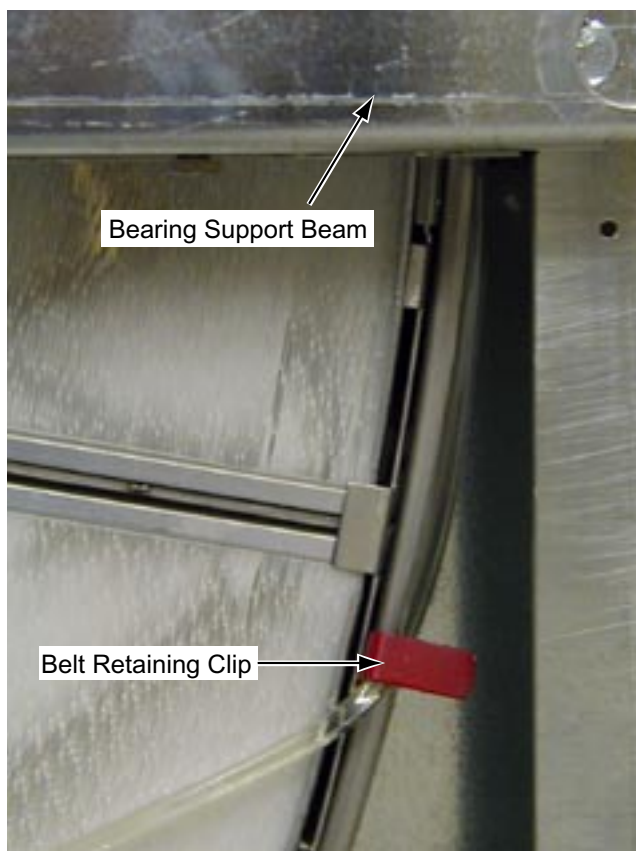
IMPORTANT: To avoid release of segment retainer latch do not insert retaining clip on other side of spoke.



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FIG. 5-48 – INSERT RIGHT ANGLE BELT RETAINING CLIP

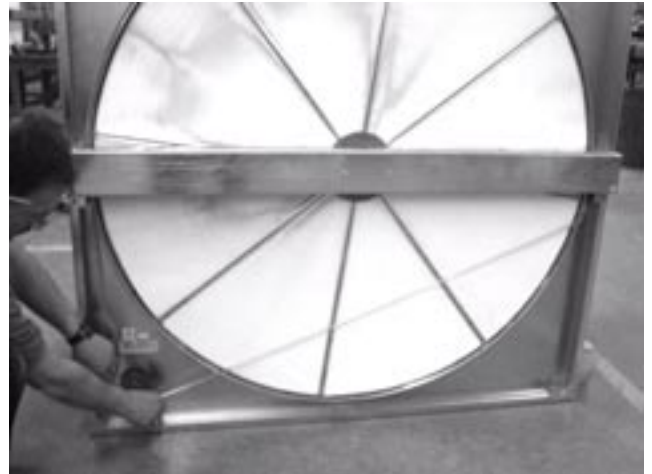
8. Rotate wheel counterclockwise until belt retaining clip is within a few inches of the bearing support beam (see Figure 5-49).



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FIG. 5-49 – RETAINING CLIP WITHIN A FEW INCHES OF THE BEARING SUPPORT BEAM

9. Lift and remove the belt from the wheel rim between a point opposite the pulley and belt retaining clip and stretch over pulley (see Figure 4-50).



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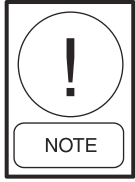
FIG. 5-50 – STRETCHING BELT OVER PULLEY

10. Rotate wheel clockwise until the belt is fully stretched onto pulley and wheel rim.
11. Remove belt retaining clip and rotate wheel by hand two rotations while observing that belt is not twisted as it enters pulley, and is tracking midway between outer edge of rim and seal plate, or in belt guide channel where provided.
12. Apply power to cassette and observe belt tracking under power.

TABLE 5-7 – CROSS REFERENCE; CONTINUOUS TO SINGLE LINK BELT/BELT PULLEY KITS

All Kits Includes V-belt, Belt Retaining Clip (Red) and Foil Tape. Contact local York Service to order parts.

SINGLE LINK BELT				
MODEL	WIDTH	DESCRIPTION	OLD NUMBER	NEW NUMBER
ERC-3615	1-1/2"	Single Link V-Belt Type" 3-L"	18160002	18160002B
ERC-3622	3"	Single Link V-Belt Type" 3-L"	18360006	18360006B
ERC-3623	1-1/2"	Single Link V-Belt Type" 3-L"	18160002	18160002B
ERC-3628	3"	Single Link V-Belt Type" 3-L"	18360006	18360006B
ERC-4128	3"	Single Link V-Belt Type" 3-L"	18410010	18410010B
ERC-4136	3"	Single Link V-Belt Type" 3-L"	18410010	18410010B
ERC-4634	3"	Single Link V-Belt Type" 3-L"	18460005	18460005B
ERC-4639	1-1/2"	Single Link V-Belt Type" 3-L"	18460005	18460005B
ERC-4646	3"	Single Link V-Belt Type" 3-L"	18460005	18460005B
ERC-5230	1-1/2"	Single Link V-Belt Type" 3-L"	181770B	181770C
ERC-5245	1-1/2"	Single Link V-Belt Type" 3-L"	181770B	181770C
ERC-5248	3"	Single Link V-Belt Type" 3-L"	18520017	18520017C
ERC-5262	3"	Single Link V-Belt Type" 3-L"	18520017	18520017C
ERC-5856	3"	Single Link V-Belt Type" 3-L"	18580010	18580010B
ERC-5860	1-1/2"	Single Link V-Belt Type" 3-L"	18580010	18580010B
ERC-5874	3"	Single Link V-Belt Type" 3-L"	18580011	18580010B
ERC-6445	3"	Single Link V-Belt Type" 3-L"	18640032	18640032B
ERC-6475	3"	Single Link V-Belt Type" 3-L"	18640032	18640032B
ERC-6488	3"	Single Link V-Belt Type" 3-L"	18640032	18640032B
ERC-6876	3"	Single Link V-Belt Type" 3-L"	18680010	18680010B
ERC-68100	3"	Single Link V-Belt Type" 3-L"	18680010	18680010B
ERC-7460	3"	Single Link V-Belt Type" 3-L"	18740050	18740050B
ERC-7490	3"	Single Link V-Belt Type" 3-L"	18740050	18740050B
ERC-74122	3"	Single Link V-Belt Type" 3-L"	18740050	18740050B
ERC-81110	3"	Single Link V-Belt Type "A"	18810010	18810010B
ERC-81146	3"	Single Link V-Belt Type "A"	18810010	18810010B
ERC-86125	3"	Single Link V-Belt Type "A"	18860005	18860005B
ERC-86170	3"	Single Link V-Belt Type "A"	18860005	18860005B
ERC-92135	3"	Single Link V-Belt Type "A"	18920037	18920037B
ERC-92180	3"	Single Link V-Belt Type "A"	18920037	18920037B
ERC-99160	3"	Single Link V-Belt Type "A"	18990010	18990010B
ERC-99215	3"	Single Link V-Belt Type "A"	18990010	18990010B
ERC-104195	3"	Single Link V-Belt Type "A"	18040010B	18040010C
ERC-104250	3"	Single Link V-Belt Type "A"	18040010B	18040010C
ERC110220	3"	Single Link V-Belt Type "A"	18100010B	18100010C
ERC-110290	3"	Single Link V-Belt Type "A"	18100010B	18100010C
SINGLE LINK BELT AND PULLEY KITS				
ERC-36	1-1/2"	Belt/Pulley Kit Prior to 9813	NA	18360041A
ERC-36	1-1/2"	Belt/Pulley Kit 9814-0032	NA	18360042A
ERC-52	1-1/2"	Belt/Pulley" 3-L" - Link V-Belt prior to 9806	18520031B	18520031C
ERC-52	1-1/2"	V-Belt Link "3-L"/Pulley Kit 2.6 pitch	181769B	181769C
ERC-52	1-1/2"	Motor Repl/ERC 52 w/2.0 pitch pulley and 3L Link Belt	18520009B	18520009C
ERC-64	3"	Belt/Pulley Kit (2) 3/16" to (1)3L" Linked V-Belt	18640027B	18640027C
ERC-74	3"	Belt/Pulley Kit (2 3/16" to (1)3L" Linked V-Belt	18740037B	18740037C
ERC-74	3"	"3L" LinkedBelt/Pulley Kit for ERC-7460/7490/74122	18740060	18740060B

INSTALLING DOOR SAFETY CHAIN.

This procedure instructs how to install a door safety chain in high pressure areas when an inward swinging door is not possible.

Tools Required

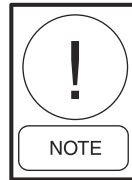
- Standard mechanic's hand tools

Material Required

- Self drilling screws, 1/4"-10 x 3/4", P/N 021-17722-000
- Steel Security Chain, P/N TAC2401012000
- Bolt Snaps, P/N TAC2401013000
- Steel Staple Plate, P/N TAC2401014000
- Cold Shuts, P/N TAC2401015000
- Fender Washer, .313", P/N TAC3303006000

Procedure

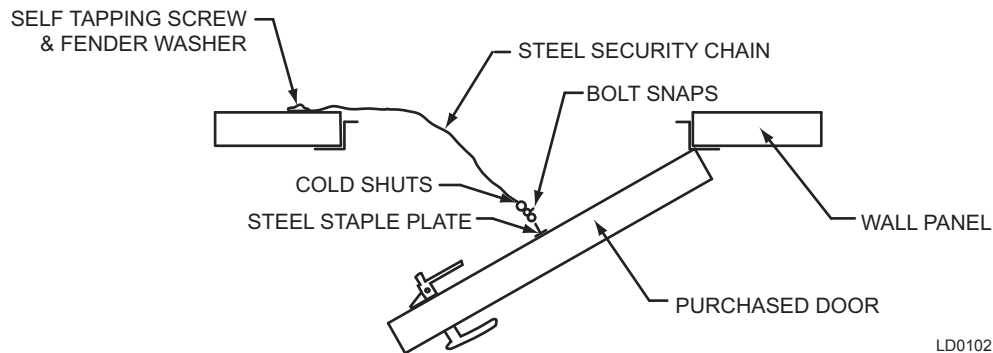
1. Attach chain to wall panel liner with a 1/4" x 3/4" self tapping screw and fender washers.
2. Attach chain, cold shut and eye snap *as shown if Fig. 5-51.*
3. Attach staple plate to door and liner with self tapping screw.



Door gap needs to be approximately 4" wide to allow access to unclasp the snap.



Center the staple plate vertically in the door. Do not interfere with the latches.



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FIG. 5-51 – SECURING DOOR CHAIN ASSEMBLY

TABLE 5-8 – TROUBLESHOOTING TIPS

DRIVE NOISE	Sheave(s) not tight on shaft(s) (motor or fan). Tighten sheave(s).
	Belts hitting belt guard. Adjust or tighten belt guard mounts.
	Belts loose. Adjust to proper tension. Belts should be checked twice during first days operation and periodically thereafter.
	Belts too tight. Adjust to proper tension.
	Belts are wrong cross section to fit sheaves. Install proper belts.
	Belts not matched in length on multi-belt drive. Install matched belts.
	Misaligned sheaves. Align sheaves properly.
	Belts worn. Replace belts.
	Motor, base or fan not securely anchored. Anchor loose components as required.
	Belts oily or dirty. Clean or replace belts.
BEARING NOISE	Defective bearing. Repair or replace bearing.
	Bearing needs lubrication. Lubricate bearing as required.
	Bearing loose on bearing support. Tighten bearing support bolts.
	Bearing loose on shaft. Tighten bearing to shaft.
	Bearing misaligned (check alignment binding.) Align properly.
	Foreign material inside bearing. Disassemble, inspect and clean or replace bearing as required.
	Fretting corrosion between bearing inner race and shaft. Clean or replace bearing as required.
HIGH VELOCITY AIR NOISE	Duct work too small. Increase duct sizes to obtain proper air velocity.
	Fan running too fast. Check for proper fan RPM.
	Static pressure lower than expected. Reduce fan speed to obtain desired flow rate.
	Objects which are installed in a high velocity airstream can generate noise. This includes flow sensors, turning vanes etc.
	Registers and grilles too small. Install correct registers and grilles as required.
RATTLE OR WHISTLING NOISE IN AIR STREAM	Dampers obstructed. Remove obstruction.
	Diffusers obstructed. Remove obstruction.
	Loose dampers or splitters. Tighten as required.
	Loose grilles. Tighten grilles as required.
	Sharp elbow(s). Install elbow(s) with larger turning radius.
	Sudden expansion or contraction of duct work. Install proper duct work transitions.
	Turning vanes loose or not properly installed. Tighten and / or reinstall as required.

Continued on next page

TABLE 5-8 – TROUBLESHOOTING TIPS (cont.)

CFM LOWER THAN REQUIRED	Fan wheel installed backwards. Install in correct position.
	Fan wheel rotating backwards. Reverse any two power leads to fan, to change rotation.
	Fan wheel not centered in inlet cones. Realign fan to center of inlet cones.
	Fan speed too slow. Check for proper fan RPM.
	Actual duct system has more resistance to flow than originally designed. Enlarge duct work or remove restrictions to match design requirements.
	Dampers closed and / or splitter rod disconnected. Open dampers and connect splitter rod.
	Fire damper(s) closed. Open fire damper(s).
	Registers closed. Open registers.
	Insulating duct liner loose. Reattach loose duct liner.
	Leaks in supply ducts caused by open seams or holes in duct work. Repair seams and / or leaks in duct system.
	Air filters dirty or clogged. Remove clogging debris and / or clean filters.
	Coils dirty or clogged. Remove clogging debris and / or clean coils.
	System not balanced properly. Balance system per design specifications. Pay close attention to External Static Pressure "Design" Vs. "Actual".
	Not enough length of straight duct at fan outlet before turn or restriction. Increase length of straight duct at fan outlet or increase fan RPM to offset performance loss. Note: Observe fan RPM limits per manufacturers guidelines.
	Obstructions in fan discharge duct. Remove obstructions.
CFM higher Than Required	Oversized duct work. Reduce duct sizes or decrease fan RPM to obtain desired flow.
	Unit access door open. Close all unit access doors.
	System not balanced properly. Balance system per design specifications. Pay close attention to External Static Pressure "Design" Vs. "Actual".
	Registers or grilles not installed. Install all registers and grilles per design specifications.
	Unit air filters not in place. Install air filters.
Motor-high current draw	Take ammeter readings on all three phases of motor to verify accuracy of ammeter.
	High line voltage. Consult power company. Could possibly reduce voltage by using lower transformer tap.
	Motor overloaded. Reduce load or use larger HP motor.
	Low line voltage. Consult power company. Could possibly increase voltage by using high transformer tap.
	Re check air distribution system and air balance report for low static pressure or air leaks in the unit or duct work.

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TABLE 5-8 – TROUBLESHOOTING TIPS (cont.)

Motor unbalanced current draw	Unbalanced line voltage due to power supply, unbalanced electrical system loading in building, high resistance connection or undersized power supply lines. Carefully check voltage across each phase at the motor terminals with a quality, properly calibrated voltmeter. If the voltage per phase is more than 1 % out of balance, the current will be out of balance by an even greater percentage.
	If in doubt as to whether the problem is with the motor or incoming power supply lines perform the following test: Rotate all three input power lines to the motor by one position - i.e., move line #1 to motor lead #2, line #2 to motor lead #3 and line #3 to motor lead #1. If the unbalanced current draw pattern follows the input power lines the problem is the power supply. Correct the voltage balance of the power supply. If the unbalanced current draw pattern follows the motor leads the problem is a defective motor. Replace motor.
Motor-excessive voltage drop	Excessive starting or running load. Reduce load or install larger motor.
	Inadequate power supply. Consult power company.
	Undersized power supply lines. Increase supply line sizes.
	High resistance connections. Eliminate poor connections.
MOTOR - RUNS EXCESSIVELY HOT	Motor overloaded. Reduce load or install larger motor.
	Blocked ventilation. For ODP motors blow out internal ventilation passages with air pressure and eliminate external interference to motor ventilation. For TEFC motors clean external ventilation system and check motor ventilation fan.
	High ambient temperature over 40°C or 105°F. Reduce ambient temperature or provide outside source or cooler air.
	Unbalanced current draw. Balance supply voltage. Check motor leads for tightness.
	Motor single phase condition. Eliminate single phasing problem.
MOTOR -WILL NOT START	Motor single phase condition. Shut power off. Eliminate single phasing condition. Check motor leads for tightness.
	Rotor or bearings locked or frozen. Shut power off. Check shaft for freeness of operation. Replace bearings. Check overload relay sizing and verify overload relays are in each of the 3 phases of the starter.
MOTOR -RUNS NOISY UNDER LOAD	Motor single phase condition. If motor cannot be restarted it is single phased. Eliminate single phasing condition.
	Motor single phase condition. Check overload relay sizing and verify overload relays are in each of the 3 phases of the starter.
	Motor shaft bearing damaged. Replace bearing.
	Supply voltage high or inconsistent supply frequency. Adjustable frequency controllers can generate motor noise.
MOTOR – LOAD SPEED CONSIDERABLY BELOW NAMEPLATE SPEED	Motor overloaded. Reduce load or increase voltage.
	Excessively low voltage. A reasonable overload or voltage drop will reduce motor speed only 1 - 2%. A drop of any greater magnitude would be questionable.
	Inaccurate method of measuring RPM. Check motor using another RPM measuring device or method.

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TABLE 5-8 – TROUBLESHOOTING TIPS (cont.)

MOTOR - EXCESSIVE VIBRATION	Motor mounting loose. Check motor mounting and be sure it is tight and solid.
	Load unbalanced. Disconnect belt and restart motor. If vibration stops, the load is unbalanced. Balance the load.
	Remove drive sheave and tape 1/2 key in shaft keyway and restart motor. If vibration stops the sheave is unbalanced. Replace sheave.
	If after checking all other options above and motor still has excessive vibration, the motor is unbalanced. Replace motor.
MOTOR - NOISY BEARINGS	Bearing produces smooth mid-range hum. Normal fit, bearing is OK.
	High whine. Internal fit of bearing too tight. Replace bearing and check it.
	Low rumble. Internal fit of bearing too loose. Replace bearing, check fit.
	Rough clatter. Bearing destroyed. Replace bearing. Avoid mechanical damage, excessive greasing, wrong grease, solid contaminants and water running into motor.
MOTOR - MECHANICAL NOISE	Determine if noise is from motor or fan. Isolate motor from fan and check difference in noise level.
	Fan noise transmitted to motor through drive. Reduce fan noise or dampen noise transmission to motor.
	Be sure fan vibration isolator shipping brackets are removed. If still in place remove shipping brackets to allow vibration isolation of fan and motor.
NO ELECTRIC HEAT	Manual reset thermal cutout in electric heater control circuit tripped. Check reason for tripping and correct. Reset manual cutout switch.
	Air flow switch interlock not closed. Check air flow sensing tube for proper location in airstream and for possible damage. Repair or replace air flow switch and / or sensing tube as required.
	Broken electric heating element. Replace element.
	Heat limiters blown. Replace heat limiters.
	Electric heater circuit fuses blown. Replace fuses.
	Defective electric heating circuit contactor. Repair or replace contactor as required.
NO HOT WATER OR STEAM HEAT	Defective hot water or steam valve actuator motor. Replace actuator motor.
	Broken control linkage from actuator to valve assembly. Repair or replace actuator linkage.
	Defective hot water or steam control valve. Replace valve.
WATER CARRY-OVER FROM WETCOOLING COIL ONTO FLOOR, MOTOR OR FAN HOUSING	Airflow too high – See “CFM HIGHER THAN REQUIRED”.
	Drain Pan full – See “DRAIN PAN NOT PROPERLY DRAINING”.
	Water spraying out of Drain Pan – “DRAIN PAN NOT PROPERLY DRAINING”.
	Coil Bulkhead penetrations – Be sure any field penetrations are sealed.
	If Intermediate Drain Pans on the coil face are present – Be sure they drain properly, checking for debris and damage.
	Check Auxiliary Drain Pans under coil headers – Be sure they drain properly into the Main Drain Pan, checking for debris or damage.

Continued on next page

TABLE 5-8 – TROUBLESHOOTING TIPS (cont.)

WATER INSIDE UNIT	If unit shipped in more than one piece – Be sure these field reassembly joints are properly sealed against rain water and air leaks.
	If field piping or electrical conduits penetrate the unit – Be sure they are sealed properly. The electrical conduits must be sealed internally to prevent air flow and moisture condensation.
DRAIN PAN NOT PROPERLY DRAINING	Be sure trap is installed and of correct size and construction.
	Be sure unit is installed level on curb, steel or pad.
	Check the segment which houses the Drain Pan. Be sure it is under the correct pressure (positive or negative) and that pressure does not exceed the design for that segment per the design data sheet in the submittal.
PRE-FILTERS ARE WET	If Outside Air Hoods are shipped loose – Be sure they are properly installed and sealed at top flange. Some hoods may be shipped with mist eliminators or prefilters to be mounted in the hood openings when hoods are being installed.
	If unit has Outside Air Opening – Be sure air flow does not exceed the design for Outside Air per the design data sheet in the submittal.
FILTERS OUT OF FILTER RACK	Check for dirty filters. Filters may load much more rapidly if construction is on going in the immediate area, if certain area vegetation releases airborne substances or if insect swarms are present.
	Check for wet filters or snow loading – See PRE-FILTERS ARE WET.
	Check for damage to the filter racks, filter frames, filter headers or filter tracks.
	Check for missing filter clips or latches when required.
	Be sure air pressure drop (APD) across the filters does not exceed design – See Engineering Guide form 100.10-EG2, "FILTER APD".
AIR MODULATOR (AIRMOD) WILL NOT OPERATE	Verify external safety circuit is wired in at correct terminals and it has continuity.
	Verify control signal is wired in (or piped in if pneumatic) at correct terminals and is of correct type.
	Refer to Installation, Operation, Programming, Troubleshooting and Technical support information packed inside Airmod.
AIR LEAKS	
UNIT SWEATING	
DAMPERS NOT OPERATING PROPERLY	

continued on next page

TABLE 5-8 – TROUBLESHOOTING TIPS (cont.)

FAN VIBRATION	Misalignment of drive components.
	Loose foundations or mounting structure. (Resonances).
	Foreign material attached to rotating components.
	Damaged rotating components. (Bearings, shaft, fan, wheel, sheaves).
	Broken, loose or missing setscrews.
	Loose belts.
	Vibration may be coming from a source other than the fan. Stop the fan and determine if the vibration still exists. Disconnect the driver motor from the fan and operate it by itself to determine if it produces vibration.
	Water accumulating in airfoil blades.
	Fan is operating in stall or unstable flow region (see fan curve)..
	Loose bolts on bearings, housing, hub or sheaves.
	Loose locking device on bearing.
	Finally, have the vibration professionally analyzed.

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6.0 WIRING SCHEMATICS



External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control panel cabinet. Devices such as relays, switches, transducers and controls may not be installed inside the control panel. No external wiring is allowed to run through the control panel. All wiring must be in accordance with YORK's published specifications and must be performed only by qualified YORK personnel. YORK will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this will void the manufacturer's warranty and cause serious damage to property or injury to persons.



Rotating parts and electrical shock hazards exist. Lock out and tag out the fan motor(s) and heat power disconnects before servicing. York service personnel should refer to the "YORK Field Service Employee Safety Manual", 50.05-SM1. Independent contractors refer to OSHA Lockout/Tag out Standard, 29 CFR 1910.147. Failure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this IOM.



The purpose of drawings in this section is to aid in installation, startup and troubleshooting. Actual wiring configuration may deviate from these drawings and are subject to change without notice.

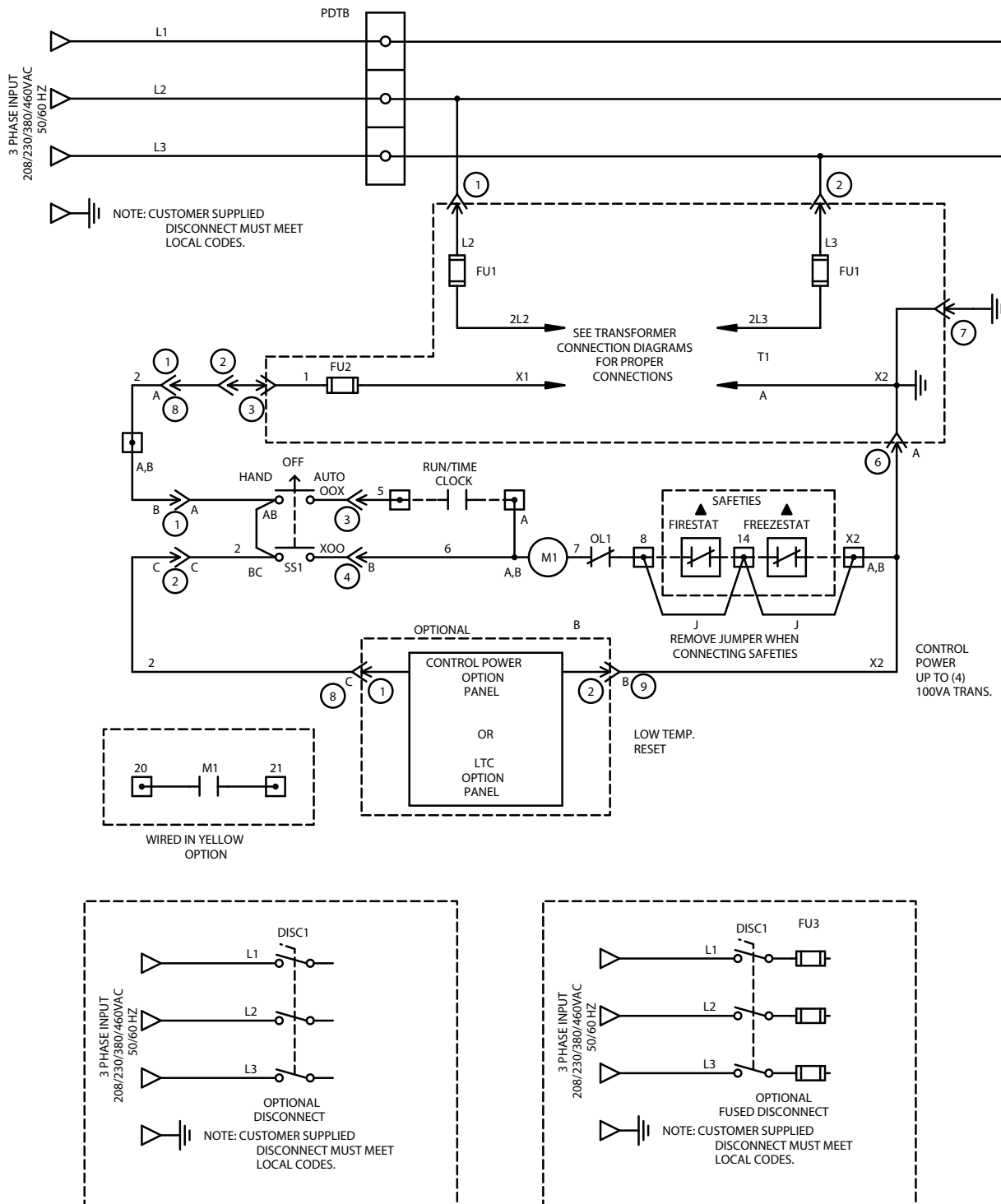


FIG. 6-1 – FULL VOLTAGE STARTER (204194)

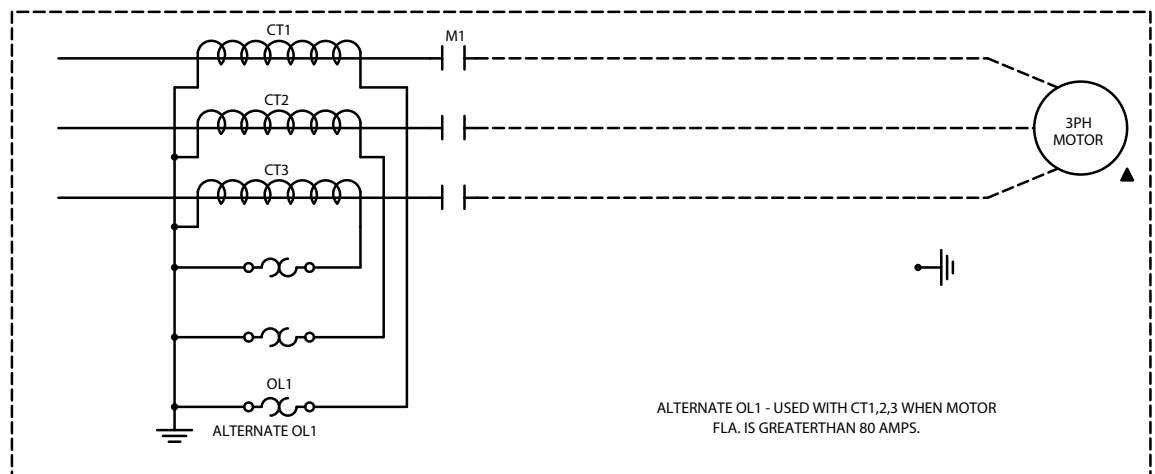
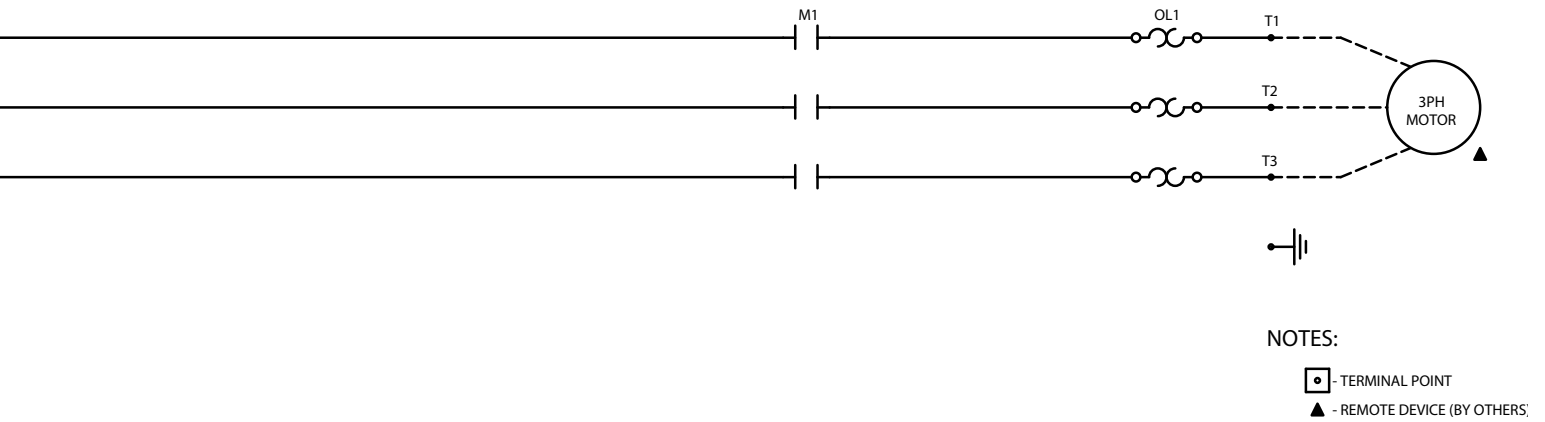


FIG. 6-1 (CONT.) – FULL VOLTAGE STARTER (204194)

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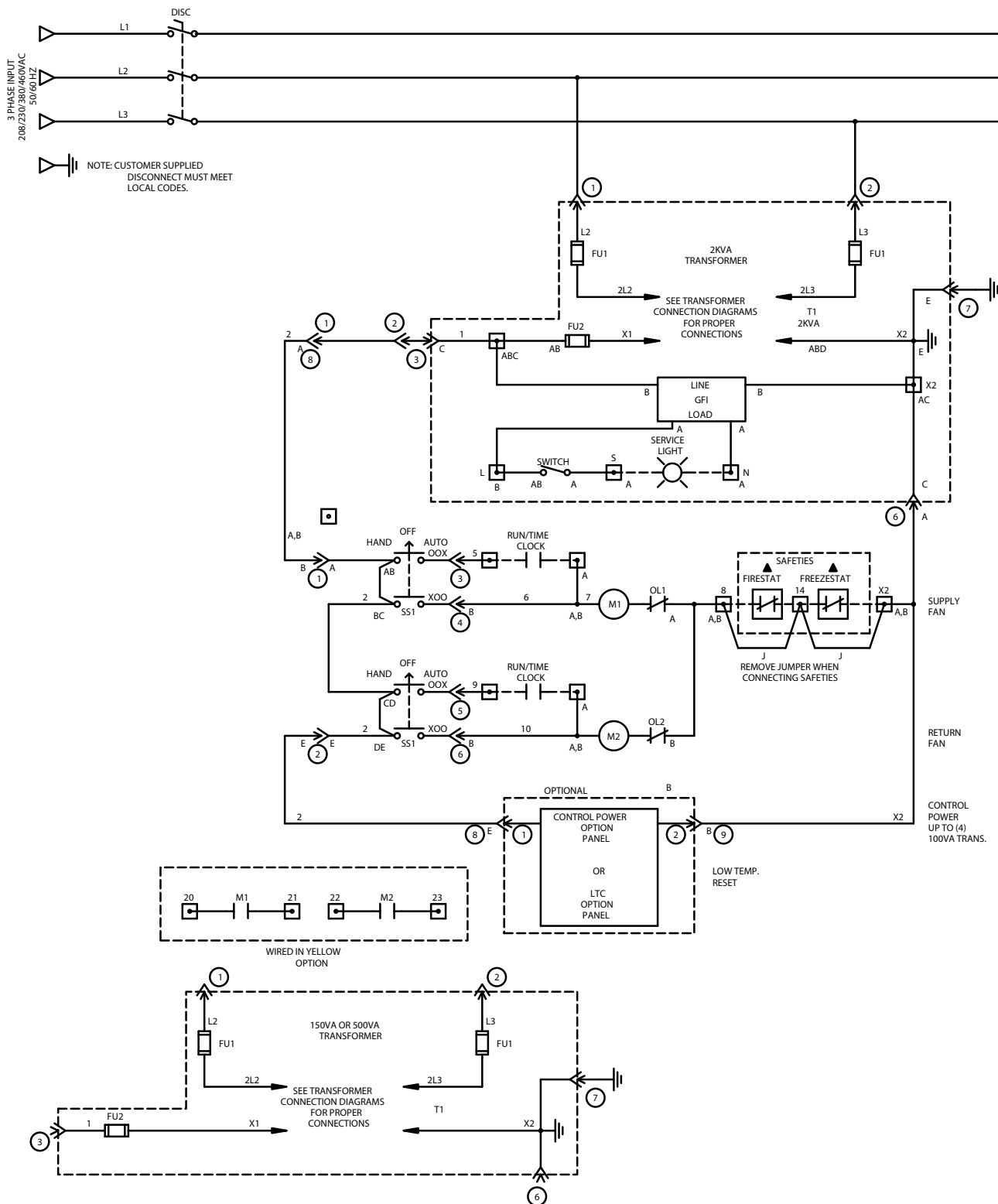


FIG. 6-2 – FULL VOLTAGE STARTER WITH SINGLE POINT POWER CONNECTION (204195)

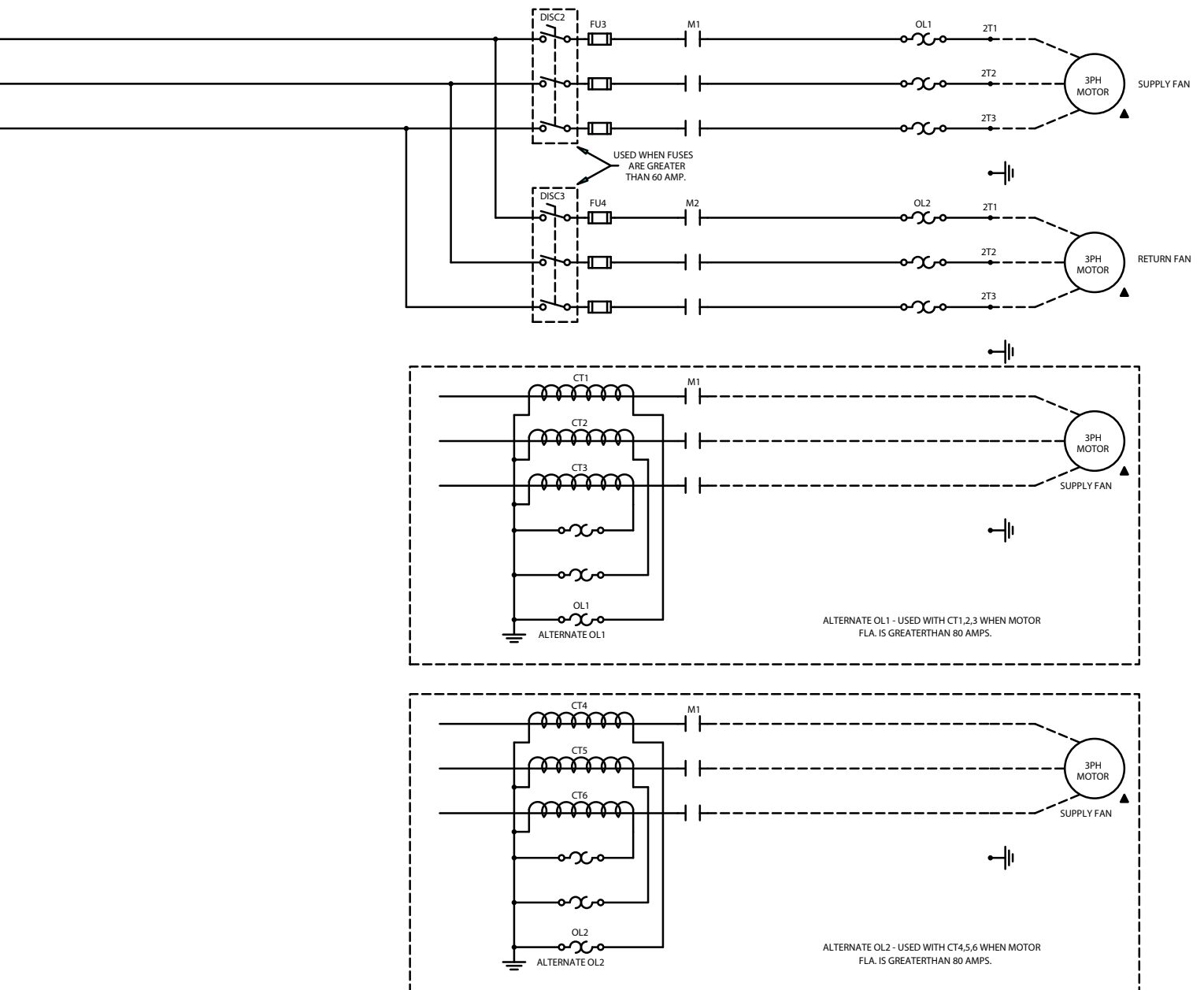
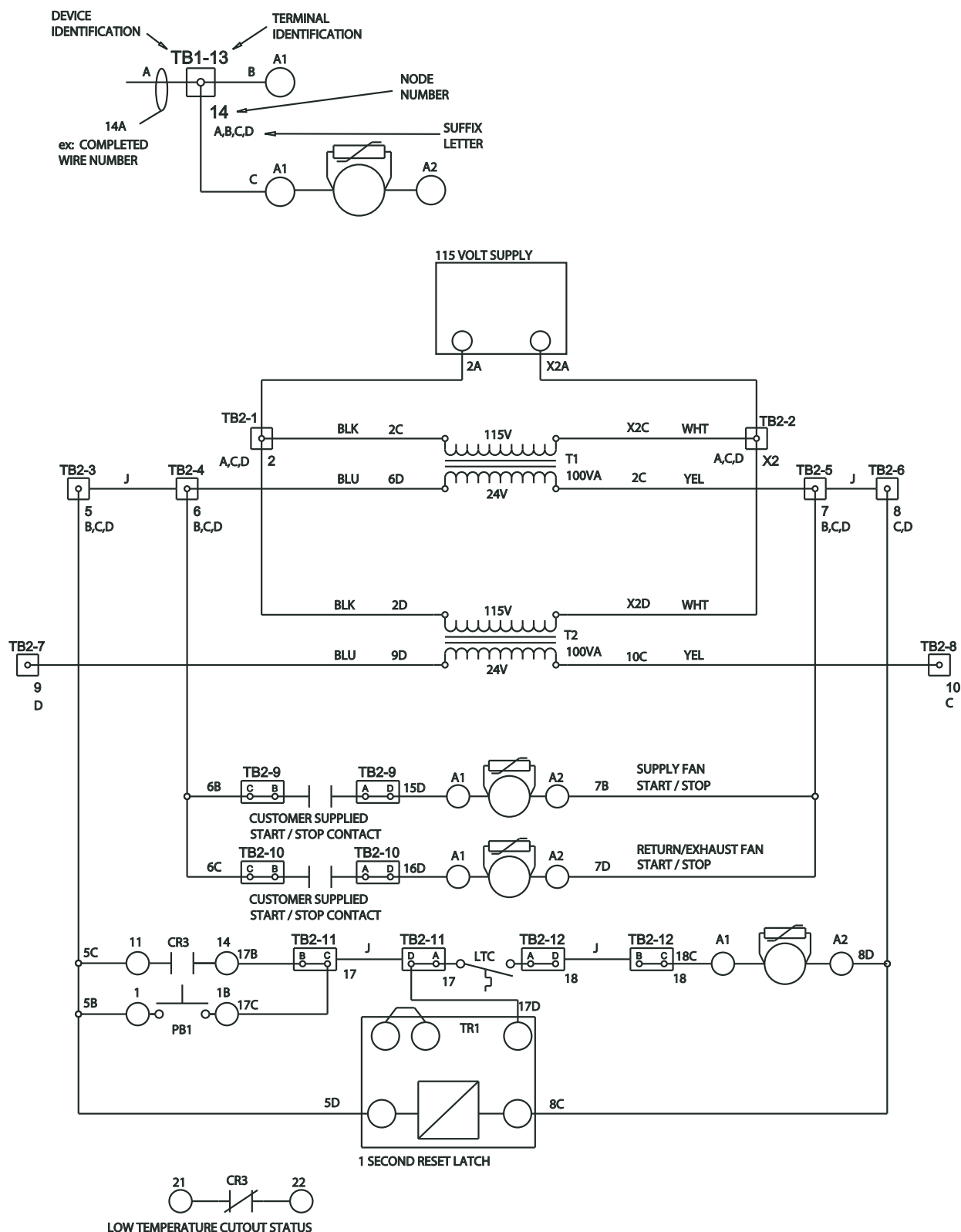


FIG. 6-2 (CONT.) – FULL VOLTAGE STARTER WITH SINGLE POINT POWER CONNECTION (204195)



- NOTES:
1. THIS DRAWING IS A TYPICAL AS WIRED DRAWING AND IS NOT CREATED ON A PER UNIT ORDER BASIS, ONLY FACTORY PROVIDED OPTIONS ARE SHOWN.
 2. THE LOW VOLTAGE TRANSFORMERS IN THE CONTROL ENCLOSURE ARE FOR FACTORY PROVIDED END DEVICES ONLY.

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FIG. 6-3 – YORK SOLUTION FPC WIRING (204197)

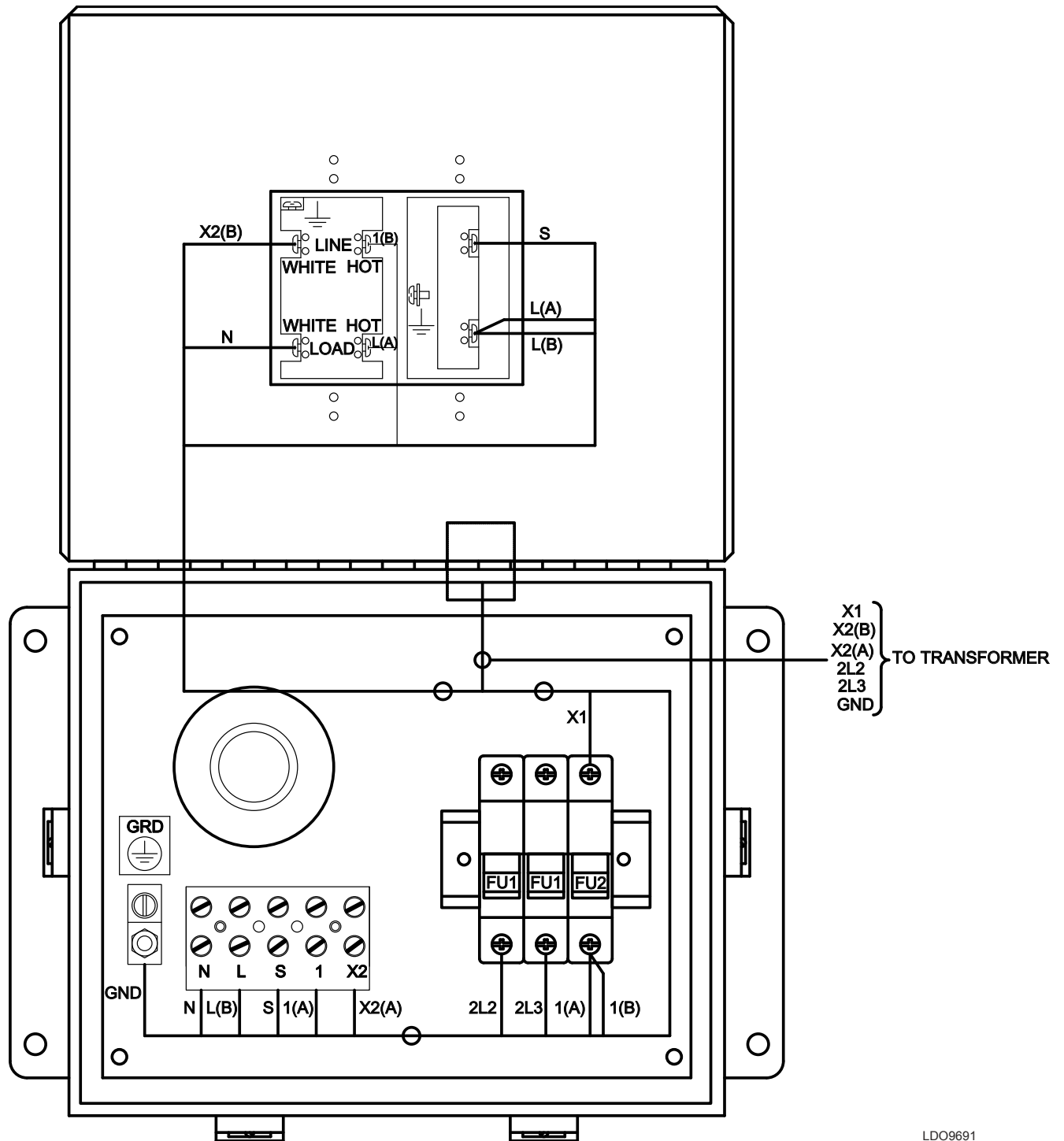


FIG. 6-4 - TRANSFORMER ENCLOSURE WIRING DETAIL SHOWN OPEN

