YORK®	CURBPAK AIR HANDLING UNITS	
INSTALLATION, OPERATION & MAINTENANCE	New Release	Form 100.10-NOM2 (301)

MODELS CP65 THROUGH CP1030

00466vip

ROOF MOUNTED SINGLE ZONE

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, 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.

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.

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

NOTE is used to highlight additional information which 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 micro panel cabinet. Devices such as relays, switches, transducers and controls may NOT be installed inside the micro panel. NO external wiring is allowed to be run through the micro 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 CurbPak 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 installer should pay particular attention to the following symbols:

Notes are intended to clarify or make the installation easier.

Cautions are given to prevent equipment damage.

Warnings are given to alert the installer that personal injury and/or equipment damage may result if installation, operation and maintenance procedures are not handled properly.

DESCRIPTION

The YORK CurbPak is specifically custom designed for outdoor rooftop application or other specified locations. This unit is of weatherproof design with a roof that slopes 1/4 inch per foot minimum. The roof overhangs the side panels by three (3) inches to prevent water infiltrating the unit. All side panels overhang roof curbs to prevent water leakage. A "U" constructed base

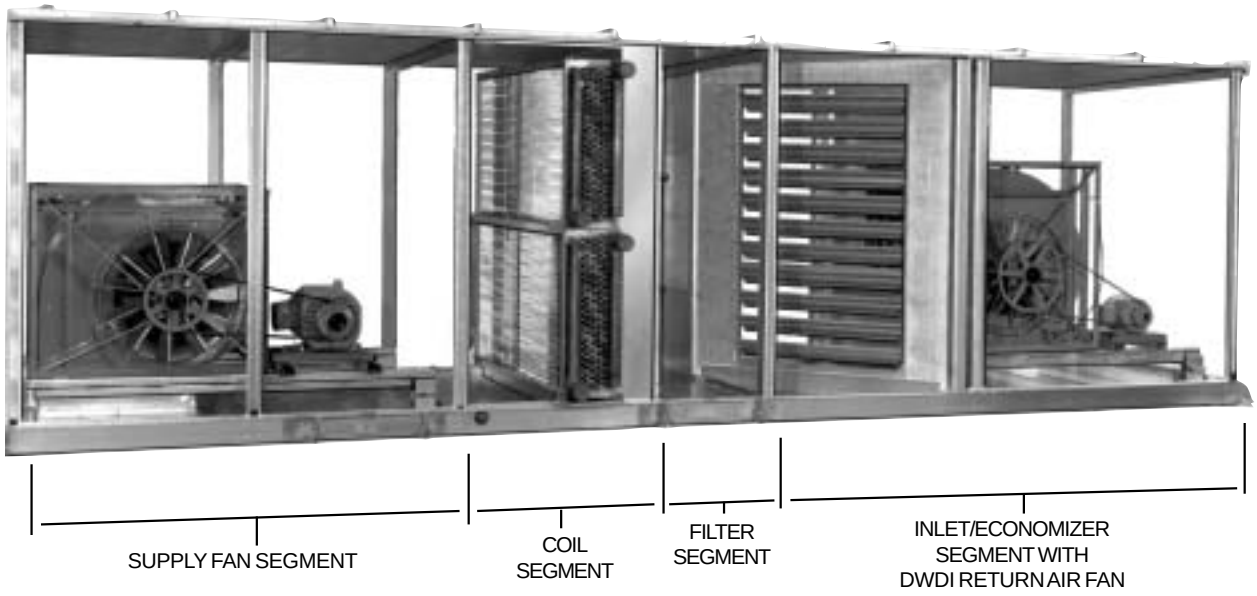

FIG. 1 – CUTAWAY OF CURBPAK SHOWING VARIOUS SEGMENTS

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overhangs a roof curb which meets NRCA Guidelines. A curb gasket is provided as a seal between the curb and the unit base. Heavy gauge lifting brackets are provided to aid in rigging the unit.

The CurbPak features segmented construction and is factory assembled on the unit base. Segment arrangements will vary to suit job application. (See Figure 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. These doors are insulated with glass fiber. All panels are insulated with 2 inch - 1-1/2 lb/cu ft. glass fiber insulation, or the optional 2 inch - 3lb/cu ft. glass fiber insulation. All panels are double wall construction to prevent exposure of insulation.

The fan segment is supplied for down air discharge, or horizontal air discharge, with either a low pressure forward curved fan, medium pressure forward curved fan, or airfoil fan to suit the job application. Optional variable inlet vanes can be supplied as required. Fan motors are supplied for a 200-3-60 or 230/460-3-60 applications. The motor mounts are adjustable. The fan and motor assembly is mounted on a base completely isolated by rubber-in shear isolators or 2" deflection spring isolators. The fan discharge is connected to the cabinet with a flexible canvas sleeve for complete isolation to prevent sound and vibration transmission.

Coil segments are available for many applications utilizing heating and cooling coils. Reduced length, standard length and extended length sections are supplied to suit the application and the number of coils required for the job. The coil segment is supplied with YORK drainable water, direct expansion or standard steam coils, to suit job specifications. Pipe chase enclosures are available to protect coil connections from weather elements.

The optional face and by-pass segment with either low-leak or optional ultra low leak dampers is supplied to direct the air flow to bypass the specified coil for fresh air operation, or through another coil to satisfy application versatility. This segment is used for coil capacity control when coil controlling valves are not used.

The filter segment may be any of the following arrangements: flat filter or angle filter segments; cartridge filter segment with or without prefilter; bag filter segment with or without prefilter; carbon filter segment with or without prefilters; HEPA filter segment.

The air inlet segment may be applied in any one of four different damper arrangements: with 30% outside air and 100% return air; 100% outside air and 100% return air; 100% outside air and 0% return air; or 0% outside air and 100% return air. The dampers are either low leak, or optional ultra low leak design. The outside air intake is protected by a birdscreen. A safety grate over the return air intake is optional.

The YORK CurbPak is ARI certified and supplied in any one of 15 model sizes.

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.

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.

Carefully inspect all shipments immediately upon delivery. When damage is visible, note this fact on the carrier's freight bill and request that the carrier send a representative to inspect the damage. This may be done by telephone or in person, but should always be confirmed in writing.

The shipment should be unpacked in the presence of the agent so that the extent of the damage or loss can be determined. The carrier's agent will make an inspection report and a copy will be given to the consignee for forwarding to the carrier with a formal claim.

Checking Non-Mounted Parts

1. Check the packing list for non-mounted parts. (Typically found in fan segment.)
2. Packing list will note how many and type of parts.
3. Packing list will note in what section of the unit each non-mounted part is located.
4. Shortages must be reported within 10 days after receipt of order.

STORAGE

Short-term Storage

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

1. If the units are to be stored out-of-doors, prior to installation within the building, 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.

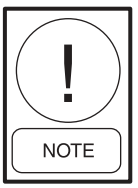
Under no circumstances should outdoor storage be used for a period of more than one week.

2. Store on a firm, flat surface to prevent distortion.
3. 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 to be any period beyond six (6) months from date of shipment. If long-term storage is anticipated, **contact the YORK Sales Office at time of order entry 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.

By adhering to the Long-term Storage procedures, the standard warranty of 12 months from date of startup applies. However, it may not exceed 36 months from date of shipment.



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.

SAFETY PRACTICES

Air Handling Units are designed to provide safe and reliable service when operated within design specifications. To avoid injury to personnel and damage to equipment or property when operating this equipment, use good judgement and follow safety practices as outlined below.

CHECK the assembly and component weights to be sure rigging equipment can handle them safely. Note the centers of gravity and any specific rigging instructions.

NEVER enter an enclosed fan cabinet or reach into unit while the fan is running.

Lock open and tag the fan motor power disconnect switch before working on fan. Take fuses with you and note removal on lock open tag.

Lock open and tag the electric heat power disconnect switch before working on or near heaters.

Check for adequate ventilation so that fumes will not migrate through ductwork to occupied spaces when welding or cutting inside Air Handling unit of HVAC system.

When steam cleaning coils, be sure that the area is clear of personnel to avoid danger.

Do not remove access panel fasteners until fan is completely stopped. Pressure developed by a moving fan can cause excessive force against the panel toward personnel.

Do not work on dampers until their operators or linkage is disconnected.

Be sure fans are properly grounded before working on them.

Secure drive sheaves before working on a fan to ensure that rotor cannot free-wheel.

Do not restore power to unit until temporary walkways inside components have been removed.

Never pressurize equipment in excess of specified test pressures and be sure correct dampers are open.

Protect adjacent flammable material when welding or cutting. Have a fire extinguisher ready for immediate use.

TABLE 1 – SEGMENT IDENTIFICATION (SEE FIG.2)

Supply Fan Segments:

- FS - Supply Fan

  Fan Types:
  - Forward Curved Fan
    - Standard
    - Class II
  - Airfoil
    - Standard
    - Class II

- FP - SWSI Supply Plenum Fan

  Fan Types:
  - Airfoil
    - Standard
    - Class II
  - Backward Incline
    - Standard

Coil Segments:

- SC - Short Cooling Coil (13")
- MC - Medium Cooling Coil (20")
- LC - Long Cooling Coil (27-3/8")
- HC - Heat Only, (8")
- IC - Heat Only, Integral Face & Bypass Coil

Filter Segments:

- FF - Flat Filter (2" & 4")
- AF - Angle Filter (2")
- RF - Rigid Filter (12")
- BF - Bag Filter (21" & 32")
- CF - Carbon Filter
- HF - HEPA Filter

Inlet Segments:

- MB - Inlet w/Dampers
  (0%, 30% or 100% OA – 0% or 100% RA)
- EE - Economizer (100% OA/RA/EA)

Return Fan Segments:

- FR - DWDI Return Fan
- FP - SWSI Horz./Vert. Plenum Return Fan
- FE - FC exhaust Fan

Accessory Segments:

- MA, LA and XA - Access
- AB - Air Blender
- IB - Face & Bypass Damper
- CE - Control Enclosure
- SS - Shipping Split
- DI - Diffuser
- DP - Discharge Plenum
- EF - End Flange
- EH24 - Electric Heat
- HM - Humidifier
- NS - Non-Standard
- AT - Sound Attenuator

TABLE 2 – UNIT NOMENCLATURE

MODEL NUMBER

CP **350** **FC**

UNIT TYPE
CurbPak

UNIT SIZE

65	350
85	400
105	460
125	530
170	680
215	860
250	1030
305	

FAN TYPE
DWDI FC (Forward Curved)
DWDI AF (Airfoil)
SWSI AF (Airfoil)
SWSI BI (Backward Inclined)

CURBPAK MODEL NUMBERS

SERIES C (OLD)	/	SERIES D (NEW)	SERIES C (OLD)	/	SERIES D (NEW)
CP23	/	CP65	CP66	/	CP350
CP24	/	CP85	CP67	/	CP400
CP25	/	CP105	CP86	/	CP460
CP43	/	CP125	CP87	/	CP530
CP44	/	CP170	CP89	/	CP680
CP45	/	CP215	CP910	/	CP860
CP46	/	CP250	CP912	/	CP1030
CP47	/	CP305			

SEGMENT AVAILABILITY

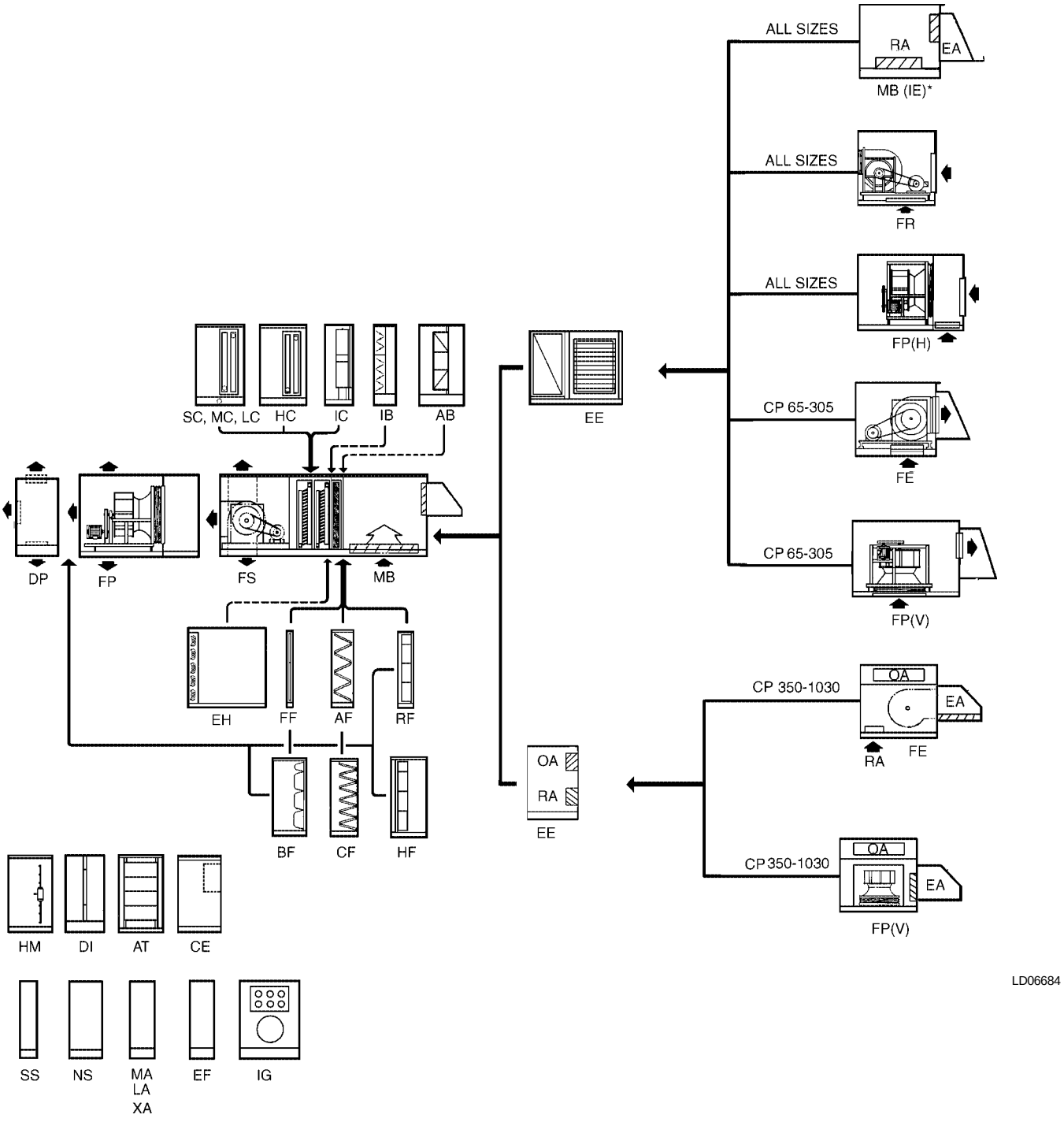


FIG. 2 – (SEE TABLE 1)

INSTALLATION

LOCATION

The CurbPak should be installed on a roof that is structurally strong enough to support the weight of the unit with a minimum of deflection. Extreme caution should be taken when the unit is mounted on a wood structured roof. It is recommended that the unit(s) be installed not more than 15 feet from the main support beam to provide proper structural support and to minimize the transmission of sound and vibration.

Location of unit(s) should also be away from building flue stacks or exhaust ventilators to prevent possible reintroduction of contaminated air through the outside air intakes.

(See Figure 3 for service clearances.)

CAUTION

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.

ROOF PITCH LIMITATIONS (1/2 Inch/Foot)

Although level installations are preferred, YORK units can be installed in any direction on a roof that is pitched up to 1/2 of an inch per foot.

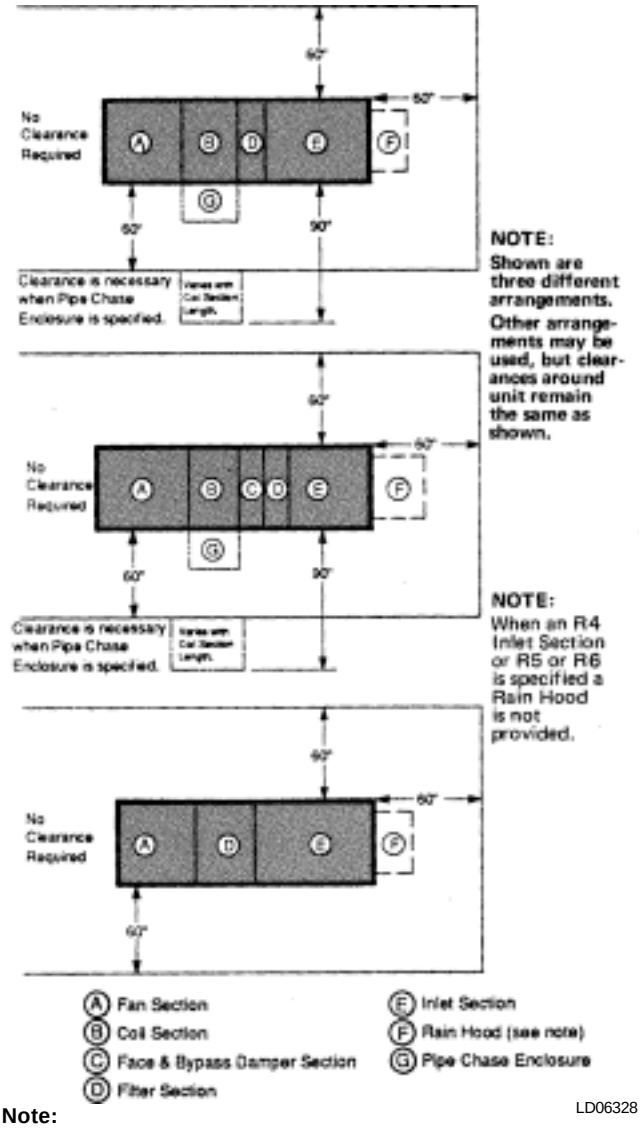
CAUTION

When a unit is to be pitched across its width with the condensate drain connection on the high side, that pitch should be limited to 1/4 of an inch per foot to assure proper drainage of condensate from the drain pan.

When a roof is pitched more than 1/2 of an inch per foot, units should be mounted on structural steel above the finished roof. These units are to be supported as required by the unit sections.

CURB INFORMATION

The curb 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 are



Note:

When an MB 100% R/A, 0% O/A Inlet Section is specified, a Rain Hood is not provided. Clearance on the side of the unit opposite the coil connection should be equal to or greater than the width of the unit to allow for coil removal.

FIG. 3 – SERVICE CLEARANCE

shipped with each curb package. It is important the curb be installed level and square (see roof pitch limitations).

When installing a curb, obtain a copy of the approved submittal, as each unit and actual curb installation may not be identical. Do not use this typical information to install your curb.

NOTE

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

ROOF CURB INSTALLATION

1. **General Information:** The roof curb, which supports the unit, is shipped knocked down with a package of hardware.
2. **Package Contents:**

QUANTITY	DESCRIPTION
24 pcs.	3/8" Bolts, Hex, Head 3/4" Long
24 pcs.	Lock Washers, 3/8" size
24 pcs.	Hex Nuts, 3/8"
18 pcs.	Nails 10D, Galvanized For Corners

NOTE

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

3. **Installation Site:** Area of roof on which curb is to be installed must be level (see Roof Pitch limitations) and structurally adequate to support the combined weight of curb and unit.

NOTE

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

4. **Assembly& Installation Instructions** (See Figures 4 & 5)

NOTE

The roof curb should be assembled on the roof deck.

A. Unpack shipping package and check contents against list of materials and drawings (see Receiving Section)

B. Layout all channel pieces as shown. Make certain that all channel tabs are located on inside of mating channel surface.

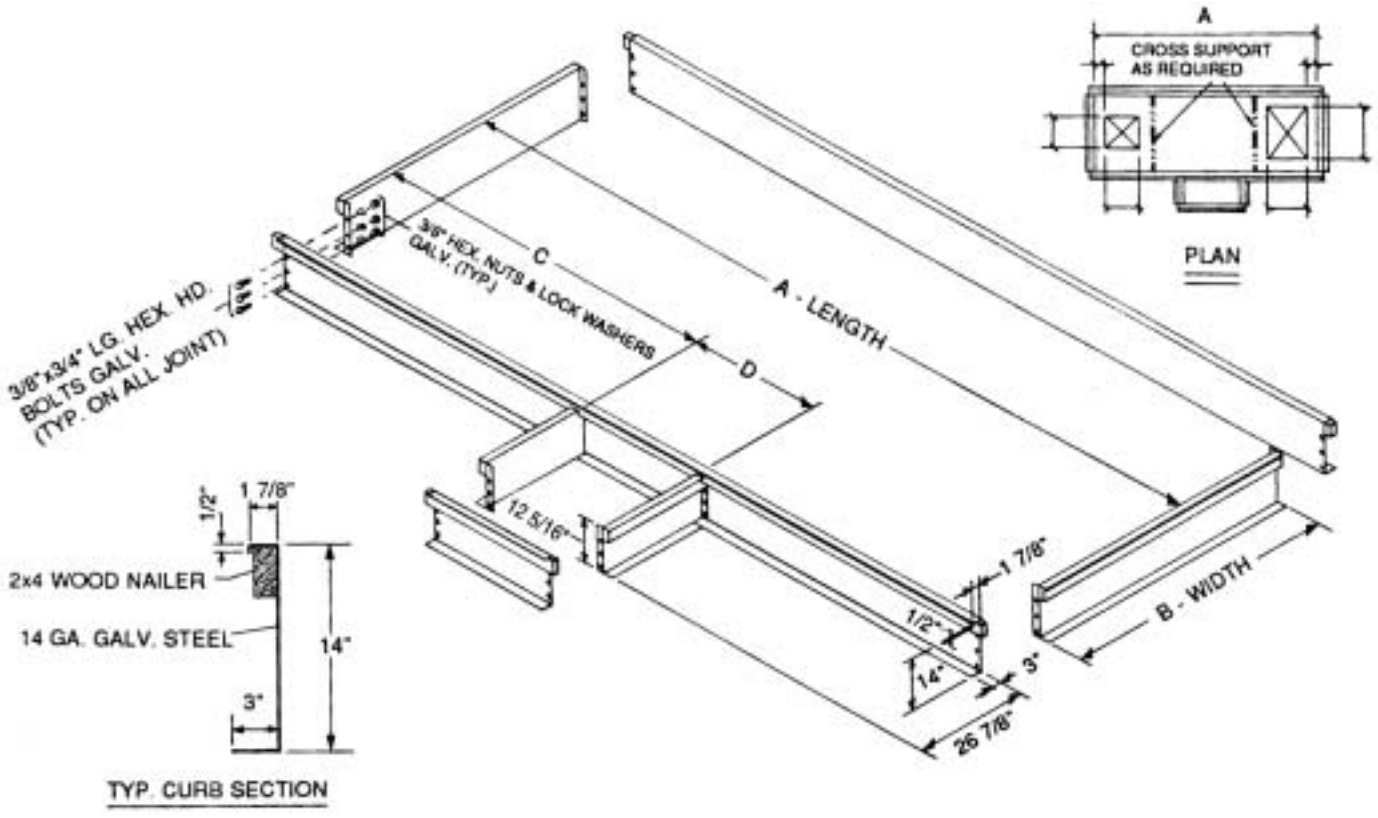
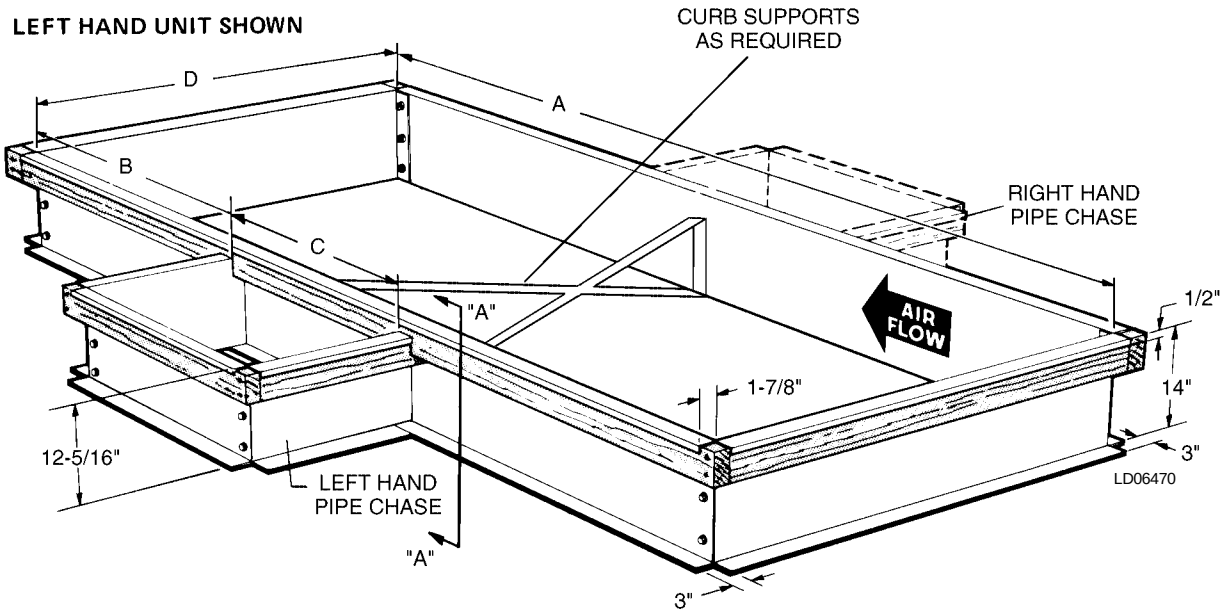


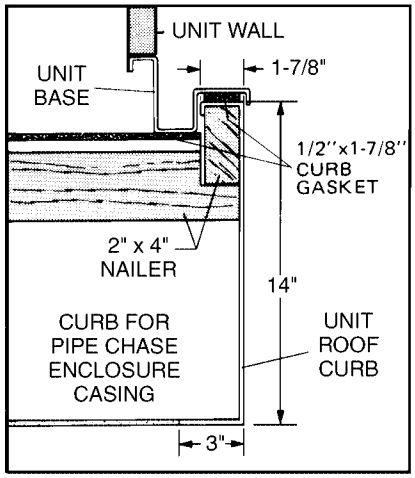
FIG. 4 – CURB ASSEMBLY

ROOF CURB

[TYPICAL DESIGN]

NOTES:
1. Curb, Nailer and Gasket only, furnished by YORK. All other parts furnished "By Others".
2. Roof Curb shipped in pieces for field assembly.
3. Roof Curb must be installed square and level.
4. Curb material is 14 gauge galvanized steel, unpainted for 14", 18", 22"; 12 gauge for 26" & 30" curbs.
5. Curbs must be fully supported by the roof structure.





PIPE CHASE SECTION VIEW
SECTION "A–A"

TABLE 3 – CURB CALCULATION FOR INSIDE DIMENSIONS

A = TOTAL UNIT LENGTH FROM YORKWORKS - 9"
B = TOTAL SEGMENT LENGTH AFTER COIL - 1"
C = COIL SEGMENT LENGTH - 3"
D = UNIT WIDTH - (SEE CHART)

CURB WEIGHT = 8# / FOOT OF CURB PERIMETER (FOR 14" H CURBS)

D = UNIT WIDTH

UNIT	INSIDE WIDTH
65,125	29.75"
85, 170	41.75"
105, 215	53.75"
250, 350, 460	65.75"
305, 400, 530	77.75"
680	101.75"
860	113.75"
1030	137.75"

FIG. 5 – TYPICAL CURB INSTALLATION ASSEMBLED AND CROSS-SECTIONS

NOTE

Make certain that all channel tabs and flanges which may have been distorted in handling are straightened before assembly.

C. Attach channels together to form rectangular perimeter as shown, leaving bolts loose.

D. Attach pipe chase channels as shown, leaving bolts loose.

CAUTION

After the curb is set in place, be sure proper consideration has been given to the air duct openings through the roof. Refer to section on Air Ducts.

The curb installation drawing (See Figure 5, Section A-A) shows a gasket that is mounted between the curb and the unit. This gasket is shipped with the unit "ship loose 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 also 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.

The Curb should be insulated and roofed as required.

NOTE

If equipment is not set in its permanent position and is stored on the ground or other unlevel area, proper provisions must be taken for supporting and protecting the equipment See section for both short and long-term storage.

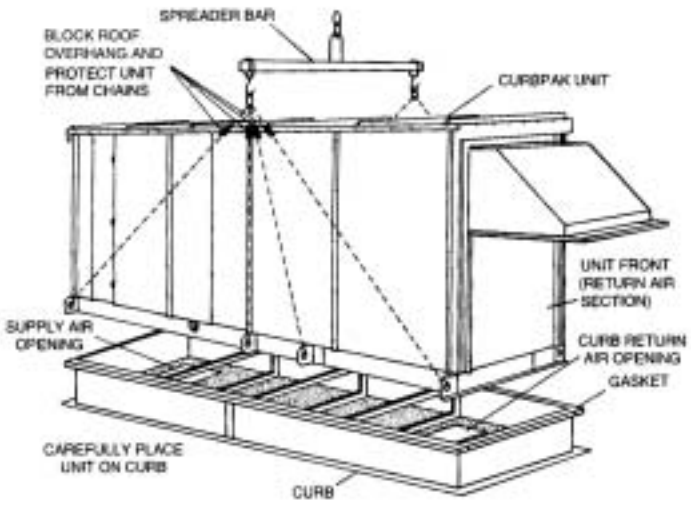


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FIG. 6 – RIGGING

RIGGING

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

Unit segment weights are to be 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. Unit weights are listed with each unit submittal drawing. 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.

Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status.

Spreader bars must be used to prevent damage to the unit casing.

Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the watertight seams in the unit casing. Avoid unnecessary jarring or rough handling.

Proper spreader bars and hoisting straps should be used when rigging. (See Figure 6) 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.

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

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

FIELD ASSEMBLY OF SHIPPING SPLIT SECTION (Prior To Setting Unit)

Follow the steps below in assembly of the shipping split section. (See Figure 7)

1. Before pulling the sections together: A. Remove the cross brace (shipping support) from each section. B. Remove plastic shipping covers and their tagged metal supports.
2. Apply grey **double-faced** tape to the flat surfaces of one section.

Do not apply Butyl tape to both sides of the split. The double thickness will cause the seam caps not to fit properly.

3. The segment opposite the top rail splice channel, that extends from inside the top rail, will need to have the first 3 or 4 screws from the top of the wall panel removed on both sides of the unit. This will aid in bringing the segments together.
4. Slide segments into place, aligning the perimeters of each segment. An aid has been provided for ease of alignment, these are the bolt holes in the lifting brackets at the bottom of the unit. Slide top rail splice channel into the other top rail and bring segments together.
5. Once the segments are together, climb inside the unit and put the splice kit top rail into place. Align holes from splice rail to the top rail, then into the top rail splice channel. This is accomplished by using a drift pin. When the holes are aligned, run a 1/2" self-tapping hex head bolt (supplied) into the holes on both sides of the unit.

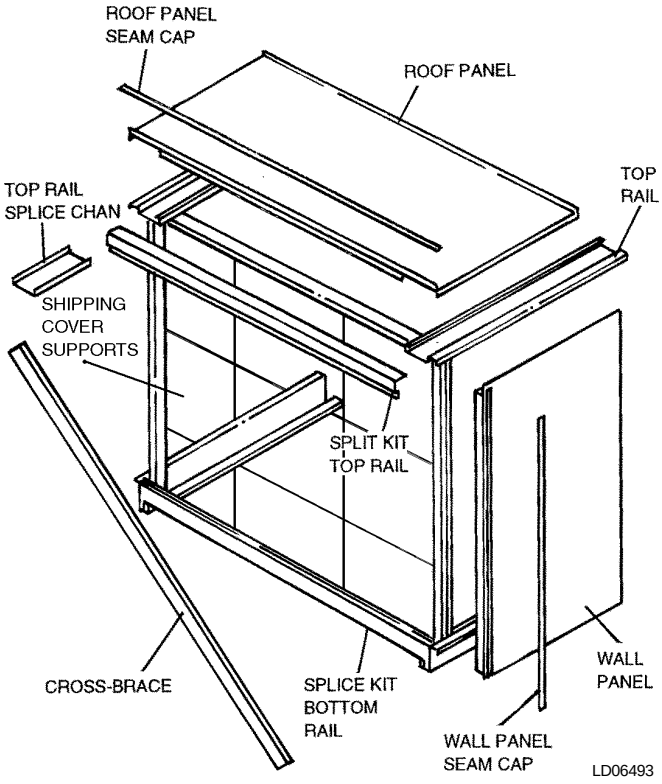

FIG. 7 – SPLICE KIT FOR SHIPPING SPLIT ASSEMBLY

6. In the splice kit top and bottom rail there are holes that should be aligned with the other segment. Place a 1/2" bolt in the adjoining holes using a fender washer on both sides, a lock washer and a nut. Place bolts and hardware into every hole.
7. Replace screws in wall panel that were removed in Step 3.
8. Apply caulking and place roof seam cap onto raised seam. Then bend the end piece down and run a self-drilling screw into the hole supplied.
9. Apply caulking and place wall seam cap onto raised seam. Then run self-tapping phillips head screw into the supplied holes.

2

INSTALLING UNIT ON CURB

1. Units should not be moved over a roof covering but should be lifted from the ground onto the curb or support framework.

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

2. 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.
3. The base of curb mounted units extend beyond the curb.
4. Installation should be in accordance with local code requirements.

ISOLATORS

The standard fan isolation consists of rubber-in shear (See Figure 8) or spring isolators (See Figure 9) mounted under the internal fan assembly.

Optional seismic isolators mounted under the fan are also offered. (See Figures 12 and 13)

Fan Isolators must be prepared for operation:

1 . Loosen tie down bolts and/or remove the shipping blocks from the blower/motor frame.
2. Check blower/motor frame for correct height and that the frame is level.

3. **To adjust isolators:** First loosen nuts on top of adjustment bolt. Then turn adjustment. Next check operational height and level of frame. Repeat this procedure until operational height and frame is level. Finally, tighten nuts.

NOTE

It is the responsibility of the installer to insure vibration free operation, if isolation is not supplied by YORK.

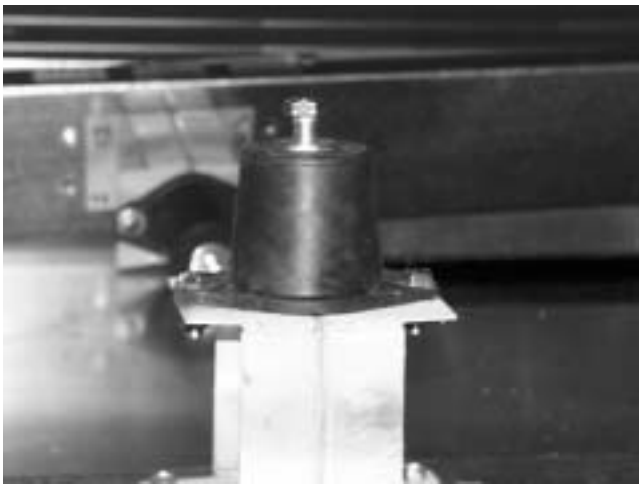

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FIG. 8 – RUBBER-IN SHEAR ISOLATOR - NO ADJUSTMENT

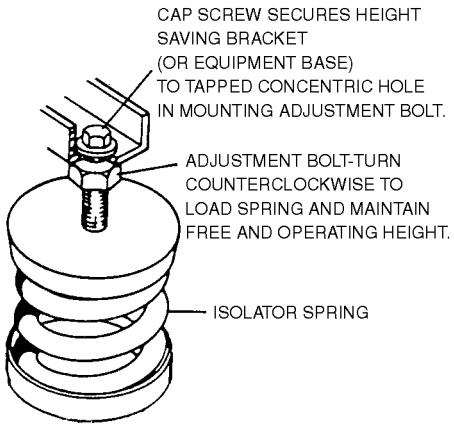

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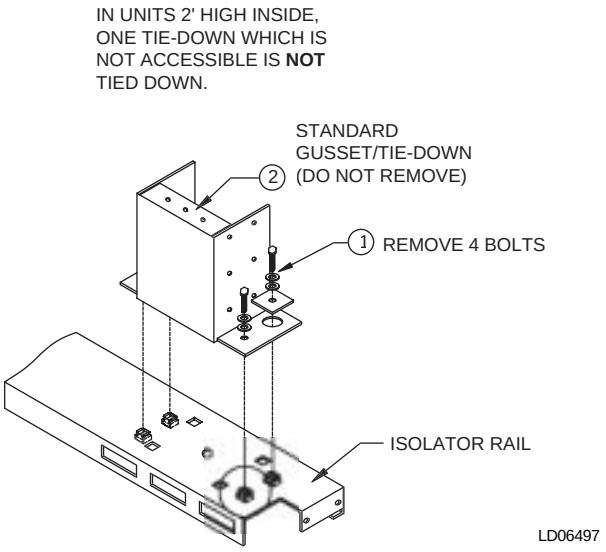
FIG. 9 – SPRING ISOLATOR

AIR SYSTEM

All duct work should be designed and installed according to AMCA Standards. **AMCA Standard 201** requires that the outlet duct be a **minimum of 3 wheel diameters long** and is not greater than 107.5% nor less than 87.5% of the fan outlet area. It also requires that the slope of the transition elements should not be greater than 15% for converging elements, nor greater than 7% for diverging elements.

DUCT CONNECTION GUIDELINES (See Figures 14 and 15)

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. Duct turns and transitions



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STANDARD TIE-DOWN/NO SNUBBER

FIG. 10 – STANDARD TIE-DOWN / NO SNUBBER FOR UNITS CP85 - CP305

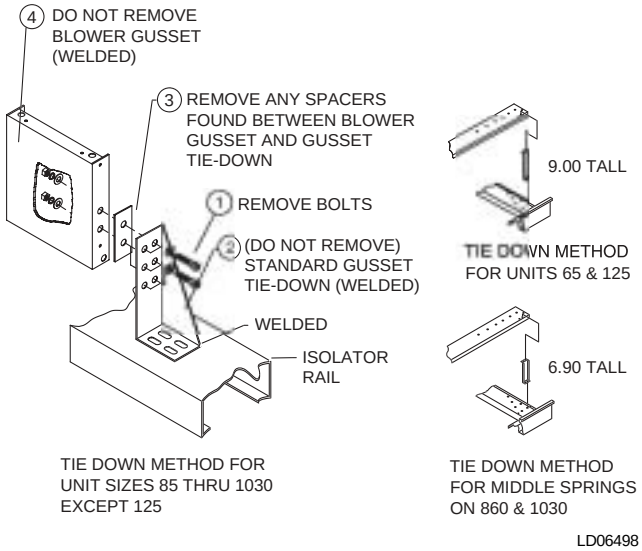

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FIG. 11 – TIE-DOWN METHOD FOR UNIT SIZES CP85 - CP1030

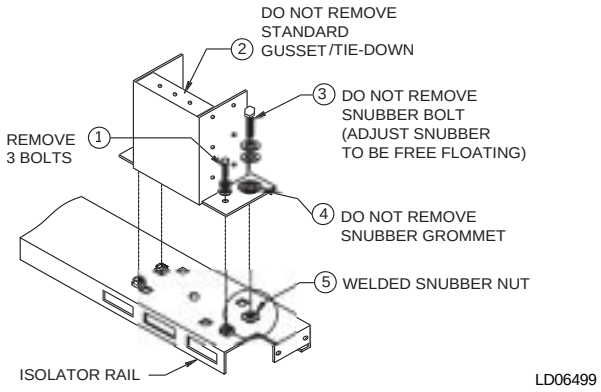

FIG. 12 – STANDARD TIE-DOWN W/SNUBBER FOR UNIT SIZES CP65 - 305

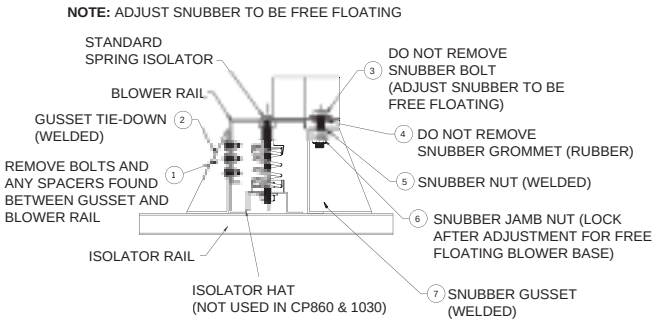

FIG. 13 – SEISMIC SNUBBER FOR UNIT SIZES CP350 - 1030

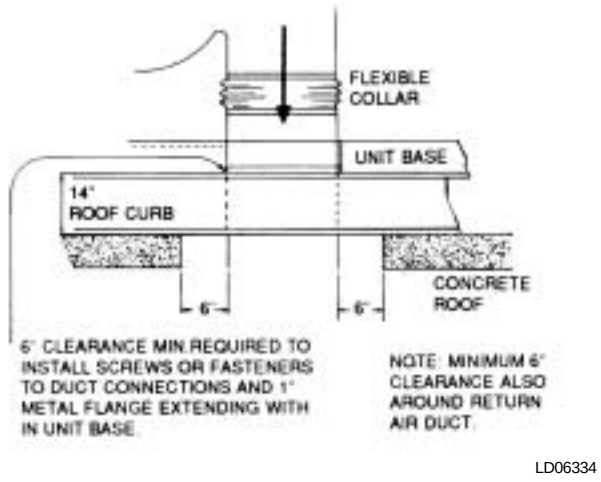

FIG. 14 – DOWN DISCHARGE DUCT CONNECTIONS

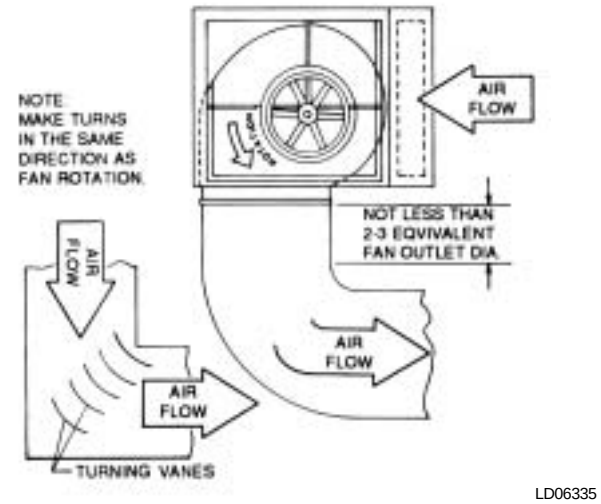

FIG. 15 – RECOMMENDED DISCHARGE DUCT ARRANGEMENT WHEN TURNS ARE REQUIRED

must be made carefully to hold friction loss to a minimum. Avoid short turns, and duct elbows should contain splitters or turning vanes.

Duct work connected to the fan discharge should run in a straight line for at least **two** equivalent outlet diameters and should be reduced in cross sectional area (See Figure 15). **A duct turn should NOT be in the same direction as the fan rotation.** Never deadhead the discharge into the flat surface of a plenum.

CAUTION

Installation of elbows, discharge damper and other abrupt flow area changes installed directly at the fan outlet will cause system losses. These losses must be taken into account during the design phase and must be added to any field measurements.

On curb mounted units with a down discharge, duct connections are contained within the roof curb. (See Figure 14 for dimensions.)

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.

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 on the unit return air inlet. Various reference sources are available regarding acoustic design.

NOTE

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

FRONT DISCHARGE UNIT INSTALLATION

1. Roof penetrations by ducts should utilize counterflashed curbs. (Typical arrangements are shown in Figure 16.)
2. All penetrations into ducts should be sealed watertight. Attachment of supports should use a minimum number of duct penetrations.
3. Duct systems should not be pressurized without sufficient time for curing of sealant systems. Follow sealant manufacturers recommendations for application of the sealant.
4. Adequate clearances between ducts and roof penetration openings should be provided.
5. Ducts should be supported to avoid transfer of duct weight across flexible connections. (See Figure 17)
6. Horizontal ducts should be pitched and provided with drainage outlets as illustrated (by the system designer).
7. Ducts should be installed at a height sufficient to install roofing and flashing.

PIPING

1. Whenever possible, piping should be brought down through the unit within the pipe chase. (See Figures 18 and 19)
2. Where piping is insulated, insulation should not be installed until after the flashing has been completed.

COIL 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 20 showing factory coil connections.)

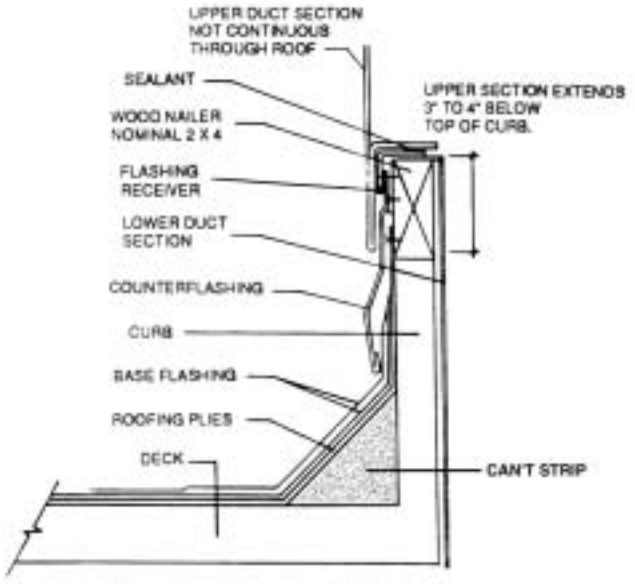

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FIG. 16 – DUCT PENETRATION OF ROOF

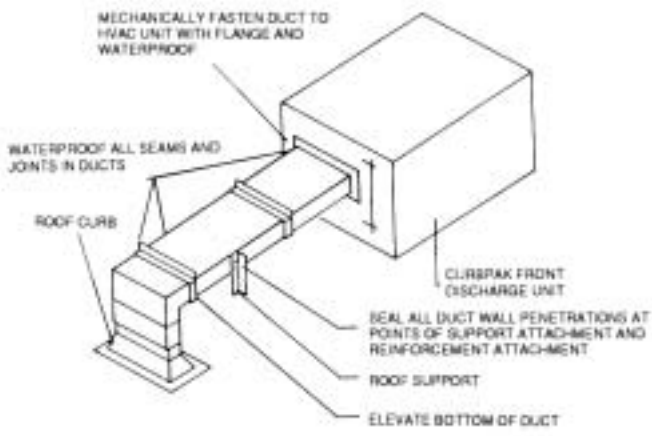

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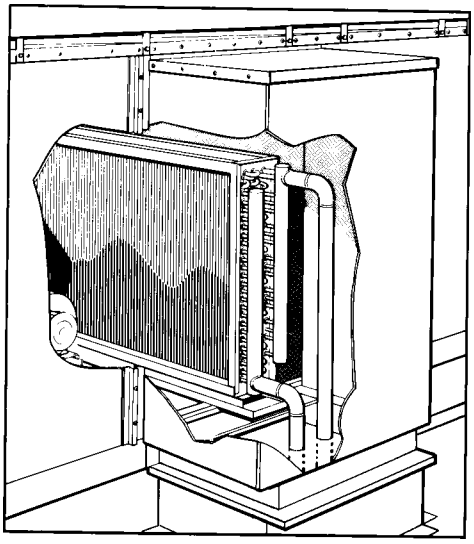
FIG. 17 – ROOF TO DUCT INSTALLATION - HORIZONTAL DISCHARGE

The coils will meet performance ratings only if the air flow is uniform over the face of the coil. 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.

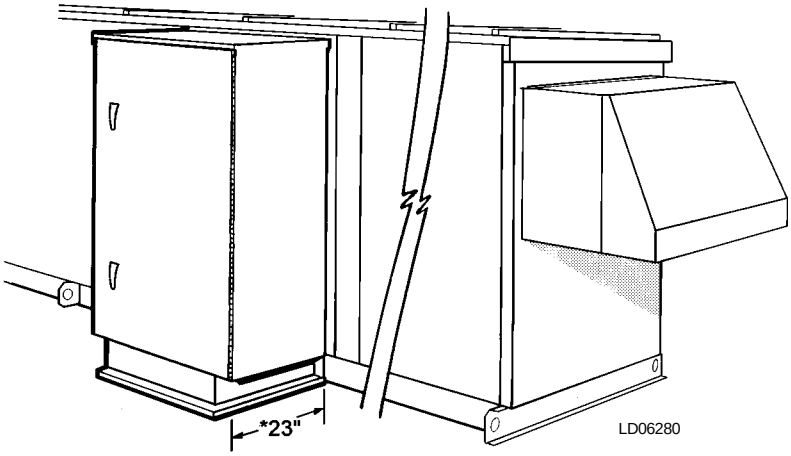
Support all connecting piping independently of the coils. Provide swing joints or flexible fittings in all piping connections, particularly adjacent to heating coils, to absorb expansion and contraction strains. Rigid piping connections can cause coil damage.

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 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 male 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.



Drain connection opposite pipe chase is standard.
A header panel covers entire segment.



NOTE: All pipe chases are factory assembled. Pipe chases for unit sizes 250 and above, will be factory-mounted. Pipe chases on unit sizes will ship loose for field mounting.

* Usable working clearance depth is approximately 18".

All dimensions are approximate and not certified for construction.

FIG. 18 – PIPE CHASE ENCLOSURE

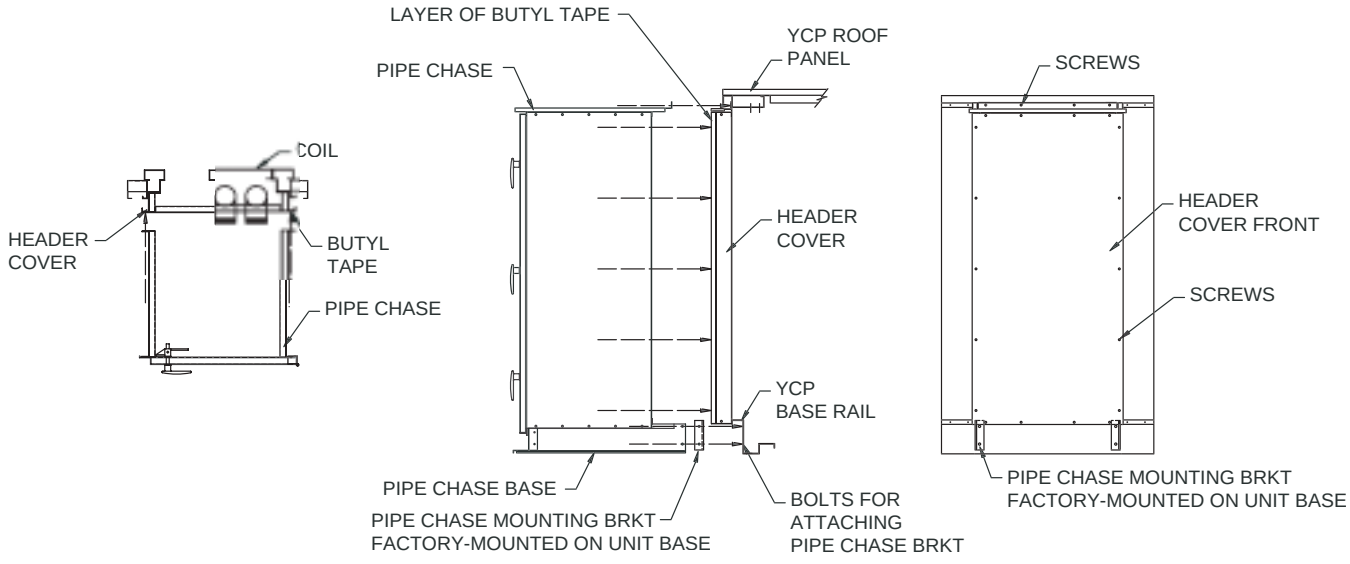


FIG. 19 – PIPE CHASE ENCLOSURE ASSEMBLY FOR UNITS WITH PIPE CHASE SHIPPED LOOSE

PIPE CHASE INSTALLATION

Tools Required

- 3/8" Hex socket
- 12" Extender
- Ladder
- Tapered punch or awl
- Air or electric driver capable of 1800 - 2200 rpm.
- Ship loose package included inside unit. (3/8" x 1" cap screws, 1 tube caulk and 1 roll of butyl tape)
- Tighten all cap screws to 30 in.-lbs. minimum
- Two-man team is recommended, pipe chase weight 100+ lbs.

Procedure

1. Remove and save all 3/8" x 1" cap screws from the header cover.
2. Header cover will remain in place by the butyl tape under the screw holes.
3. Apply 3/4" wide x 1/8" thick butyl tape to face side of the header cover to cover the holes around the perimeter. (Tape provided in package.)
4. Lift pipe chase onto frame (100 lbs.+) and align holes to restart cap screw that were removed from cover. Use awl or tapered punch to align holes to start first few cap screws. Install all cap screws and tighten. Use an extender to install the top row and tighten. Secure the pipe chase base to the mounting brackets located on the unit base frame.
5. Open door and secure pipe chase floor to header cover.
6. Caulk all interior joints of cabinet with Sikaflex 221 to provide air tight seal. (See Figure 19). Caulk provided in ship loose package.
7. Place rubber pad onto the floor of the pipe chase.
8. All holes made into the pipe chase floor must be sealed and insulated to avoid condensation entering into the building.

NOTE

YORK part number for Sikaflex 221 is 013-02966-000.

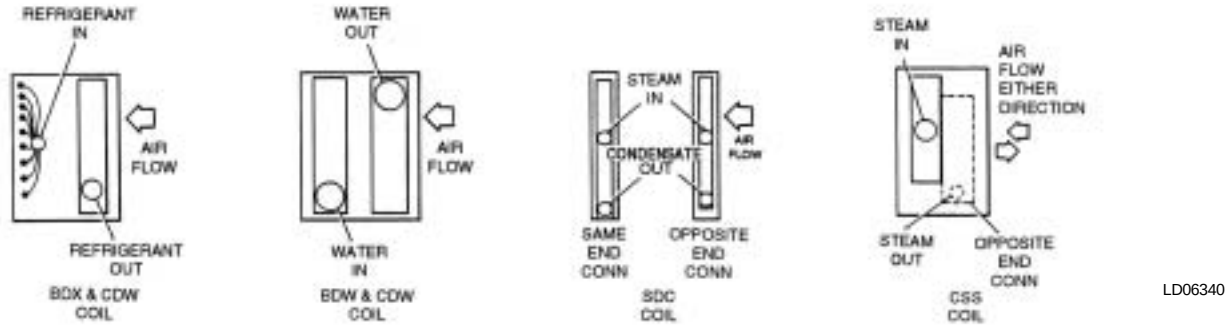


FIG. 20 – FACTORY COIL CONNECTIONS

WATER COILS - DRAINABLE WATER

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

Positive coil freeze protection must be used in installation 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 is use, it is recommended that the coil be completely drained and the inside of the tubes blown dry with compressed air.

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.

Install an air vent in the return header of each coil.

HEATING COILS

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.

When using ethylene glycol or other antifreeze solutions, consult the YORK Sales Engineer for the required derating of each coil. It will be necessary to give the percentage of ethylene glycol required.

STEAM COILS

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

Steam coils available are non-freeze coils and standard steam.

There is no coil that is absolutely free from freezing. For winterizing - See "Freeze Protection" section. Also refer to industry guidelines such as the ASHRAE Handbook and ARI Guidelines.

DIRECT EXPANSION COILS (SPLIT SYSTEM)

Each coil must be installed with the suction header on the entering air face of the coil and with the suction connection at the lower end. The orientation of the refrigerant distributor is not critical but the distributor tubes must not be kinked or bent in a non-uniform configuration. (See Figure 21)

An individual expansion device must be provided for each distributor.

Thermostatic expansion valves 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 manufacturers recommendations, allowing approximately 35 psi pressure drop through 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, therefore, not recommended 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. Suction pressure controlled hot gas bypass valves are available from various control manufacturers to maintain an adequate minimum suction temperature.

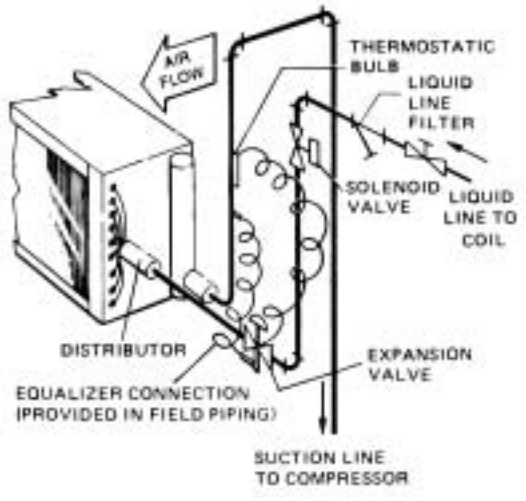


FIG. 21 – TYPICAL DX COIL PIPING

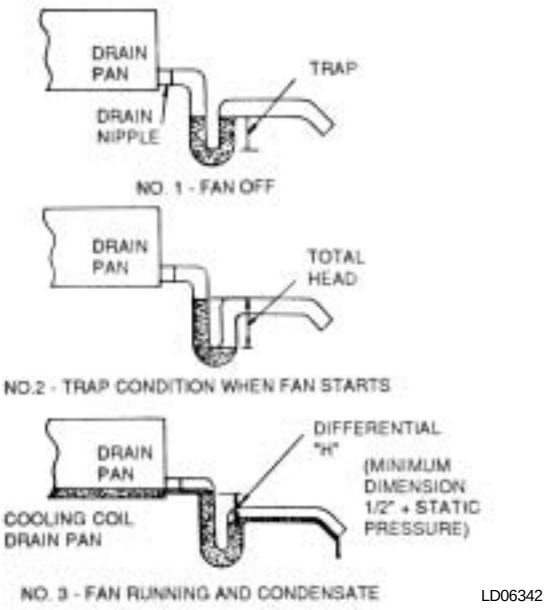


FIG. 22 – DRAIN TRAP SHOWING WATER LOCATION DURING DRAW THROUGH OPERATION STAGES

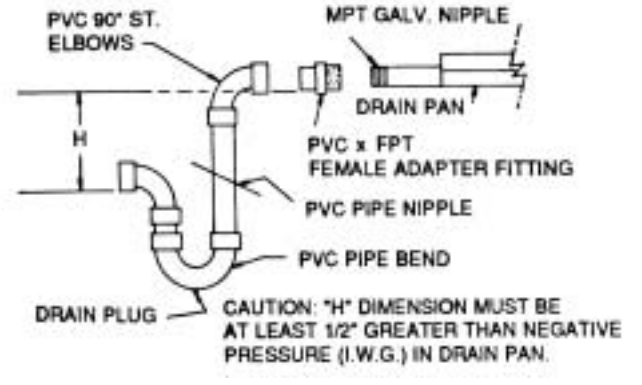


FIG. 23 – DRAIN TRAP PIPING FOR DRAW-THROUGH UNIT

The venturi distributor furnished with YORK DX coils is suitable 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. Performance data has been provided for DX coils utilizing Refrigerant 22. Contact the factory for specific application information for refrigerants other than R-22.

AIR VELOCITY THROUGH COILS

The air velocity flowing through chilled water and direct expansion coils must not exceed specific recommended values, to prevent carryover. Air velocity which is too low will result in a low load situation on the cooling coil which will affect compressor operation. Airflow (CFM) and velocity (FPM) can be adjusted by changing fan pulley sizes and/or S.P.

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 drain pipe 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, overfilling 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 22 and 23) On initial startup, it may be necessary to fill the trap manually or, after the unit has operated sufficiently for a small amount of condensate to collect in the drain pan, turn off the unit, and the trap will automatically fill.

CONDENSATE DRAIN TRAP

Install a trapped condensate drain line at unit drain connection (See Figure 23) according to all governing codes. “H” dimension must be at least 1/2 inch greater than negative pressure (I.W.G.) in unit drain pan. To determine “H” dimension, first determine the negative static pressure in the unit. Always assume the worst conditions, such as dirty filters in the return air circuit to fan.

Example:

Negative Static Pressure	= 5.5"
Minimum of 1/2"	= 0.5"
"H" Dimension	= 6.0"

For blow-thru units, the same principles apply, but the leaving pipe must be as shown in Figure 24 for proper trap design for blow-thru unit.

Determine design negative static pressure. This pressure is not the same as fan total pressure which includes pressure losses downstream as well as upstream from the indoor-air fan. Always assume the worst conditions are possible (such as having return-air filters clogged with dirt) and add 1 inch as a safety factor.

Two drains on same side of unit must be trapped individually before drain lines can be combined and routed to a suitable drain. (See Figure 25)

If a drain connection is not used, then it must be capped. This only applies to the continuous drain pan configuration with a drain connection on each side.

Main coil drain pans and all auxiliary floor drain pans in the unit must be properly trapped and charged with water before the units are started.

BELTS AND SHEAVES

Improper sheave alignment and belt tension are potential causes of excessive noise and vibration, as well as shortened belt and bearing life. (See Figure 26)

AIR FILTERS

All filters are shipped loose within the units. They will be noted on the non-mounted parts packing list. Filters must be field installed. 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 manual. However, when these filters are supplied, installation instructions are shipped with each type.

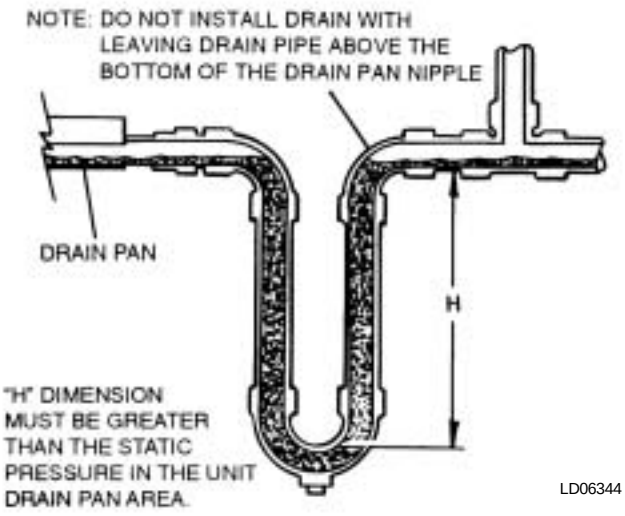


FIG. 24 – DRAIN TRAP SHOWING PIPING FOR BLOW-THROUGH UNIT (Positive Pressure In Unit)

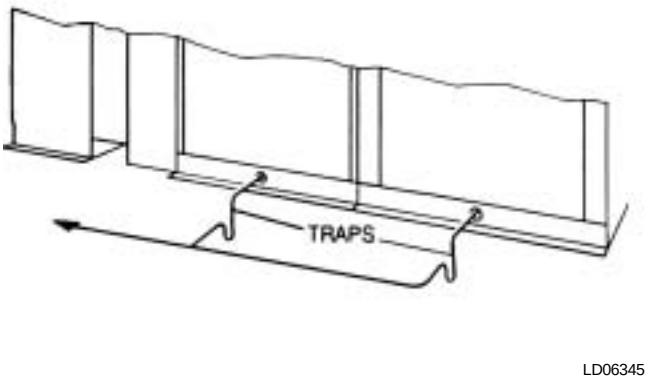


FIG. 25 – COMBINING DRAIN LINES

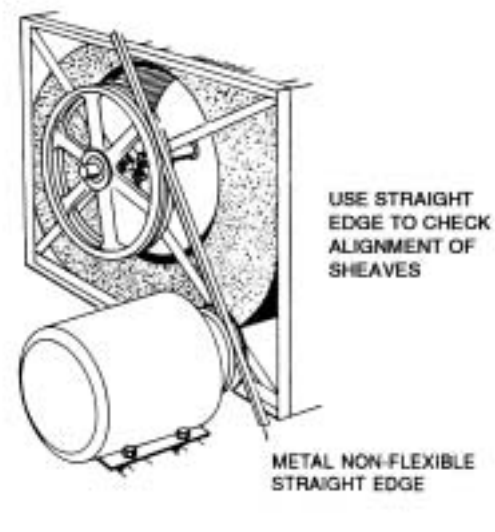


FIG. 26 – SHEAVE ALIGNMENT

DOOR HANDLE ADJUSTMENT

Door Gaskets

At time of startup, the door frame and gasketing should be inspected for possible damage during installation of the equipment.

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:

1. 30% outside air, 100% return air
2. 100% outside air, 100% return air
3. 100% outside air, 0% return air
4. 0% outside air, 100% return air
5. Economizer Section - 100% outside air, 100% return air, 100% exhaust air and mixing damper.

NOTE

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 linkage schemes are to be provided by others when actuators are not factory installed.

NOTE

Linkage design is not provided by YORK when factory packaged controls are not included. Air flow control dampers may be operated with pneumatic or electric actuator/controllers. These items should be set up in accordance with control manufacturer's instructions.

CAUTION

Dampers, operators, 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 operators as this may cause damage to the dampers.

VARIABLE INLET VANES

Inlet vanes may be provided in the intake cones of low and medium pressure fans, for unit sizes 105 through 1030, and airfoil type fans for unit sizes 65 through 1030. The field installed control actuator is attached to a single shaft extending outside the drive end and provides for the synchronous control of the inlet vanes on both sides of the fan. (See Figures 27 and 28)

CAUTION

It is important that the following check list be adhered to or damage can be done to the inlet vanes.

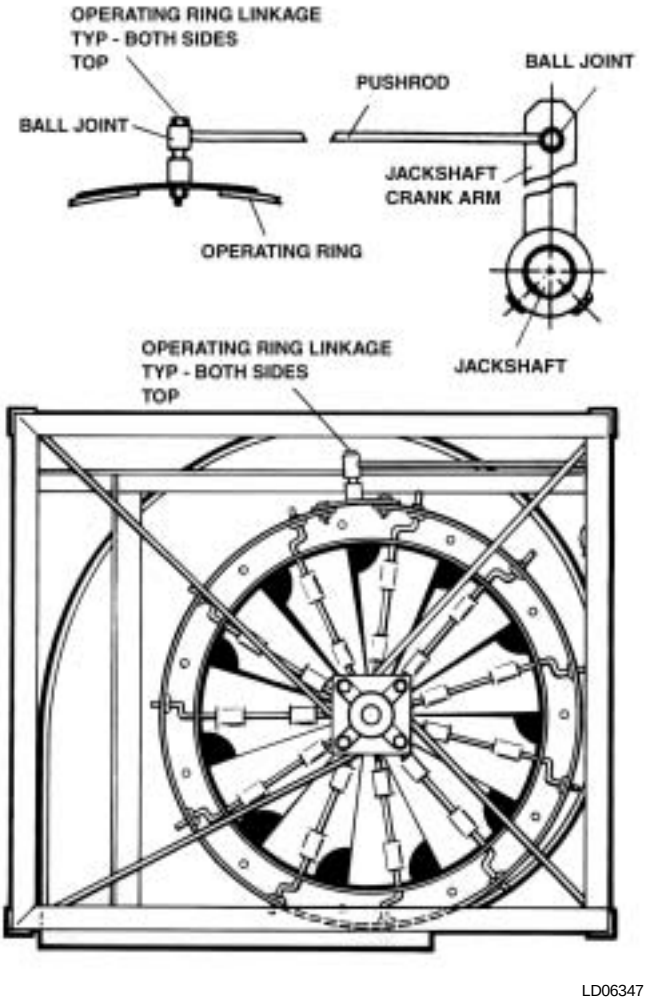


FIG. 27 – TYPICAL VARIABLE INLET VANE COMPONENTS

Instructions For Checking Unit With Variable Inlet Vanes Prior To Startup of Unit

1. **Ease of Operation** - Prior to the installation of the electric or pneumatic operator motor, check the ease of the operation of the vanes by moving the operator arm back and forth by hand. If the vanes are difficult to turn, Neck to see that no foreign material has lodged in the assembly during shipment or installation. Lubricate the bearings with a silicone spray lubricant. Wipe away any accumulation of dust or dirt from the bearings prior to oiling and after lubrication. The bearings are located at each end of the blades and on the control arm. When oiling the bearings, work the control arm back and forth to work the oil into the bearings.
2. **Synchronization of Vanes** - The vane linkage should be adjusted so that the vanes on both sides of the fan operate in unison. When one side is completely closed the other side should also be closed.
3. **Connecting Linkages and Push Rods** - The push rods between the operating ring and the jack shaft crank arm on the vanes must always be at an angle of at least 40 degrees with respect to the jack shaft crank arm to which it is attached. If not, maximum power against rotational motion will be compromised. (See Figure 29)
4. **Position of Vanes** - When completely open, vanes are approximately 75 degrees with respect to the plane of the cones. Do not try to force the vanes open further or damage will occur. The vanes do not always close completely and should never be forced into a completely closed position.
5. **Installation of Operator**- The connecting linkage between the (drive) crank arm on the jack shaft and the actuator should be made as stated above. The travel of the actuator crank arm should be adjusted so that it is somewhat less than the travel of the crank arm of the jack shaft. The Pneumatic or Electric Operator Motor should never be adjusted so that a force is placed on the unit jack shaft crank arm when the vanes are either completely open or closed. (See Figure 30) for the operator torque requirements for each unit.
6. **High Pressure Units** - When vanes are installed in high pressure units (total static pressure in excess of 6 inches of water) the vanes should be adjusted so that complete closure cannot occur. The linkage should be adjusted so that the vanes are always approximately 20% open.

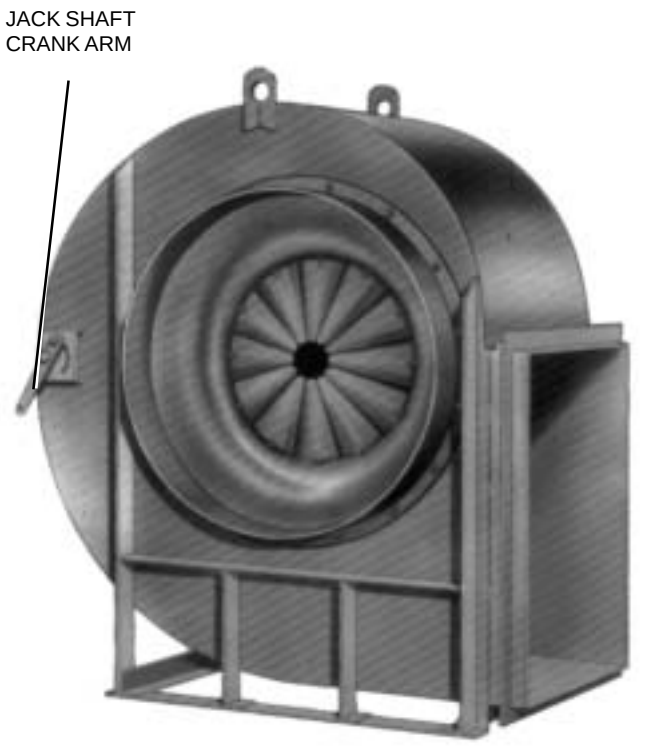


FIG. 28 – VARIABLE INLET VANE INSTALLED IN INLET CONE AIRFOIL FAN

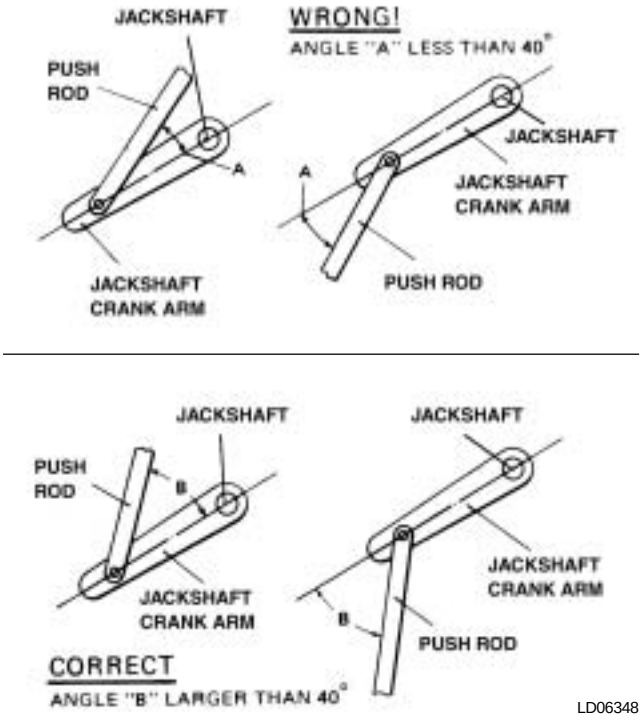


FIG. 29 – JACK SHAFT CRANK ARM POSITION

UNIT SIZE	TORQUE (In/Lbs)
215	180
250	198
305	216
350	240
400	300
460	336
530	396
680	544
860	688
1030	824

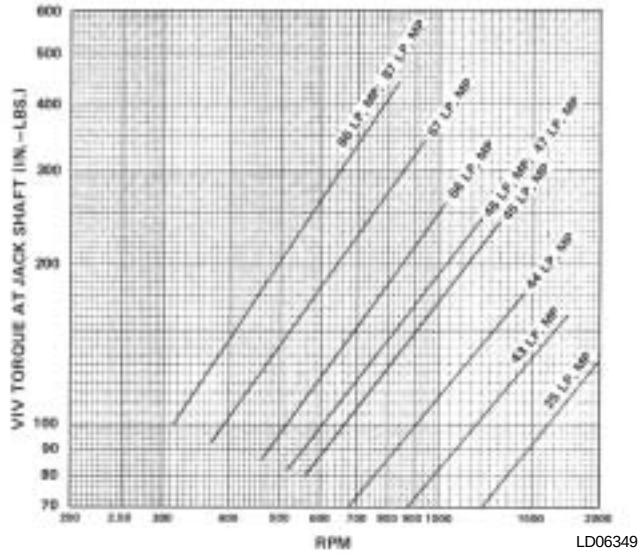


FIG. 30 – TORQUE REQUIREMENTS TO OPERATE VARIABLE INLET VAN (VIV)

TYPICAL CURBPAK 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

Economizer System - Typical

The Economizer System could typically consist of:

1. Outdoor and return air dampers
2. Damper Actuator
3. Enthalpy Control
4. Minimum outdoor air adjustment
5. 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, cooling stages can be energized as needed.

Cooling Operation

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

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.

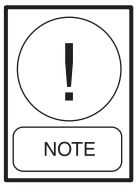
ELECTRICAL INFORMATION

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

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

1. Electrical conduit connections made to exposed boxes on units should be made on the bottom of the box. **Installation should comply with code requirements. The installation should be made watertight.**
2. The installing contractor is responsible for electrical conduit penetrations through the building roof.

Electrical conduits that penetrate the exterior (walls and/or floor) of the unit will need to be internally sealed so that unconditioned air will not be drawn into the unit through the interior of the conduit. This unconditioned air will result in condensation that will fail control components prematurely.



All penetrations through the unit housing, pipe chase or cabinets must be sealed inside and outside.

All exposed 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 through inadequate current handling capacity. This danger cannot be overemphasized.

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FIG. 31 – TYPICAL MOTOR DATA / NAMEPLATE

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. Refer to Motor Data Nameplate for all motor specifications (See Figure 31).

MOTOR CONTROL CONFIGURATION DIAGRAM

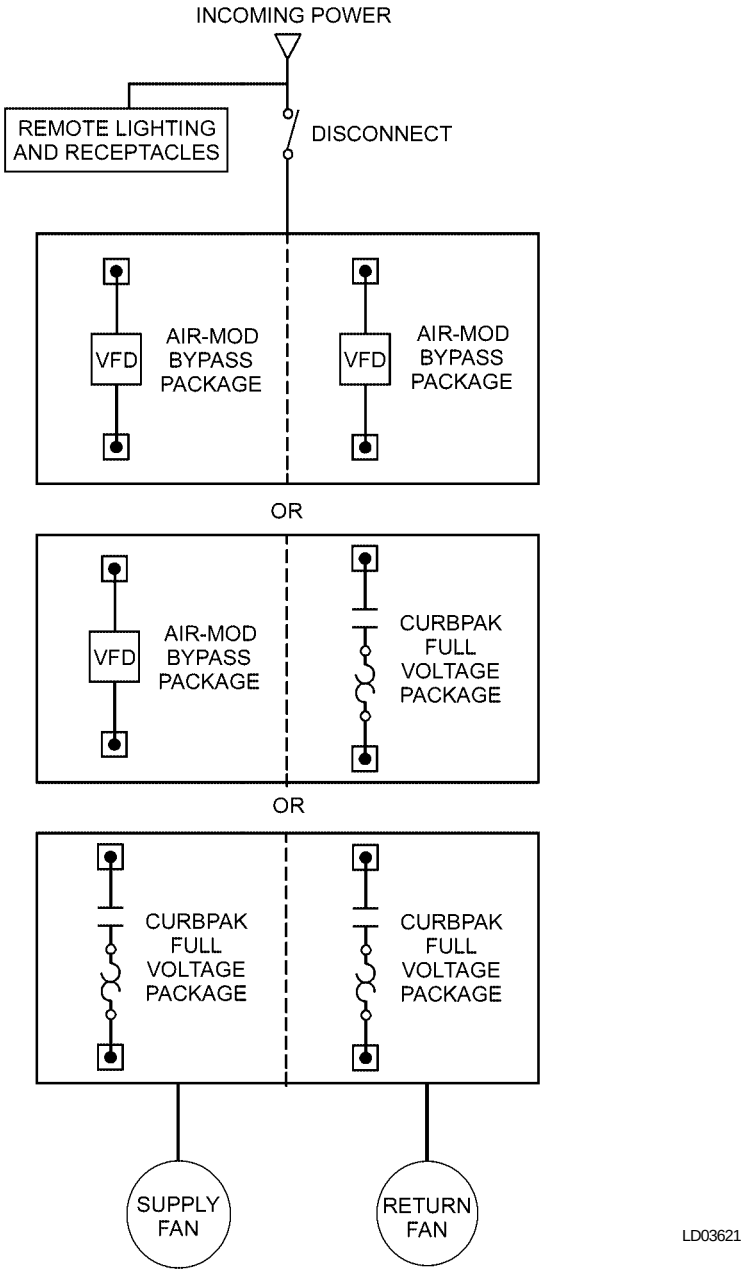
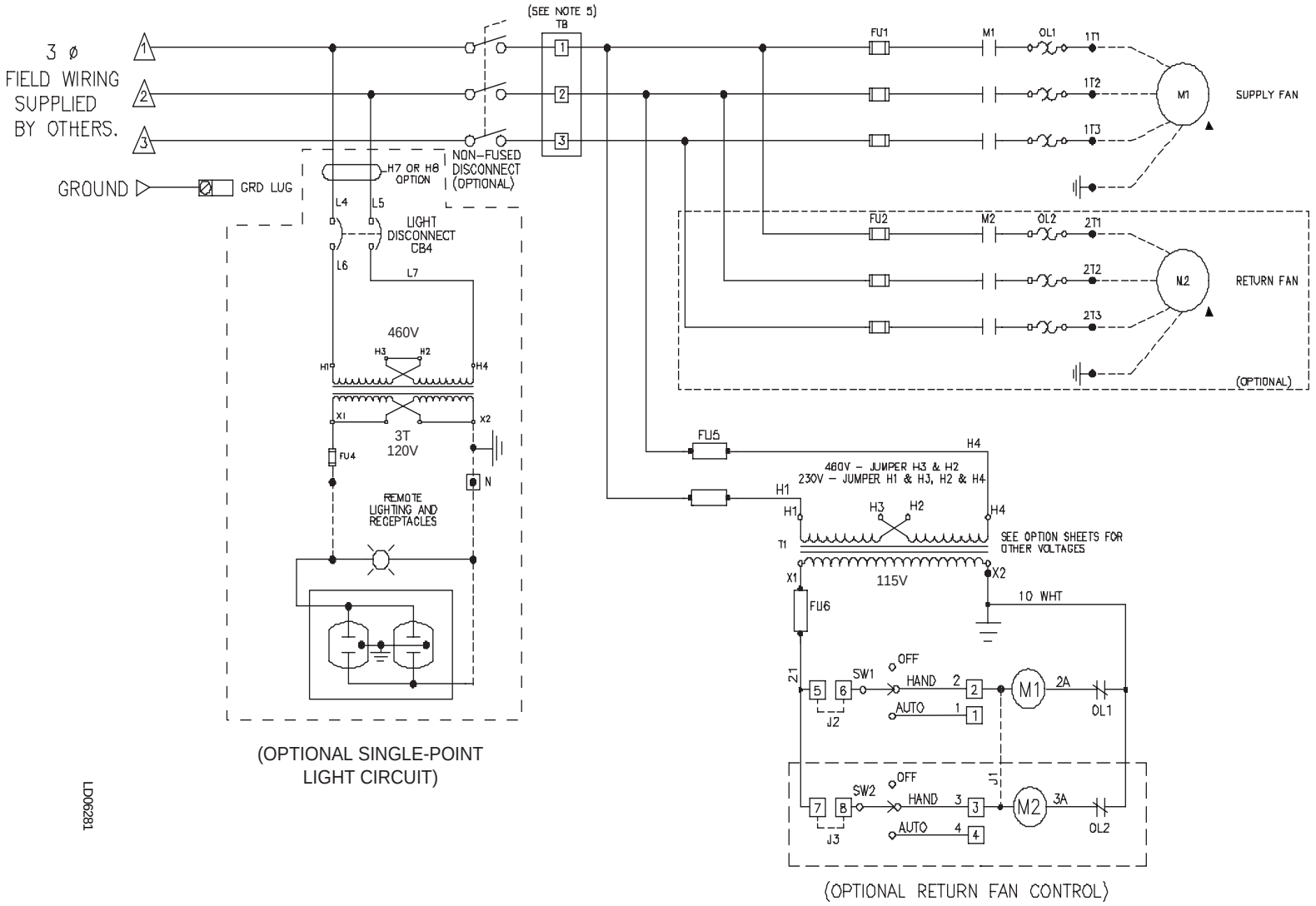


FIG. 32 – MOTOR CONTROL CONFIGURATION DIAGRAM

FIG. 33 – WIRING DIAGRAM STARTER PANEL



WIRING DIAGRAM STARTER PANEL

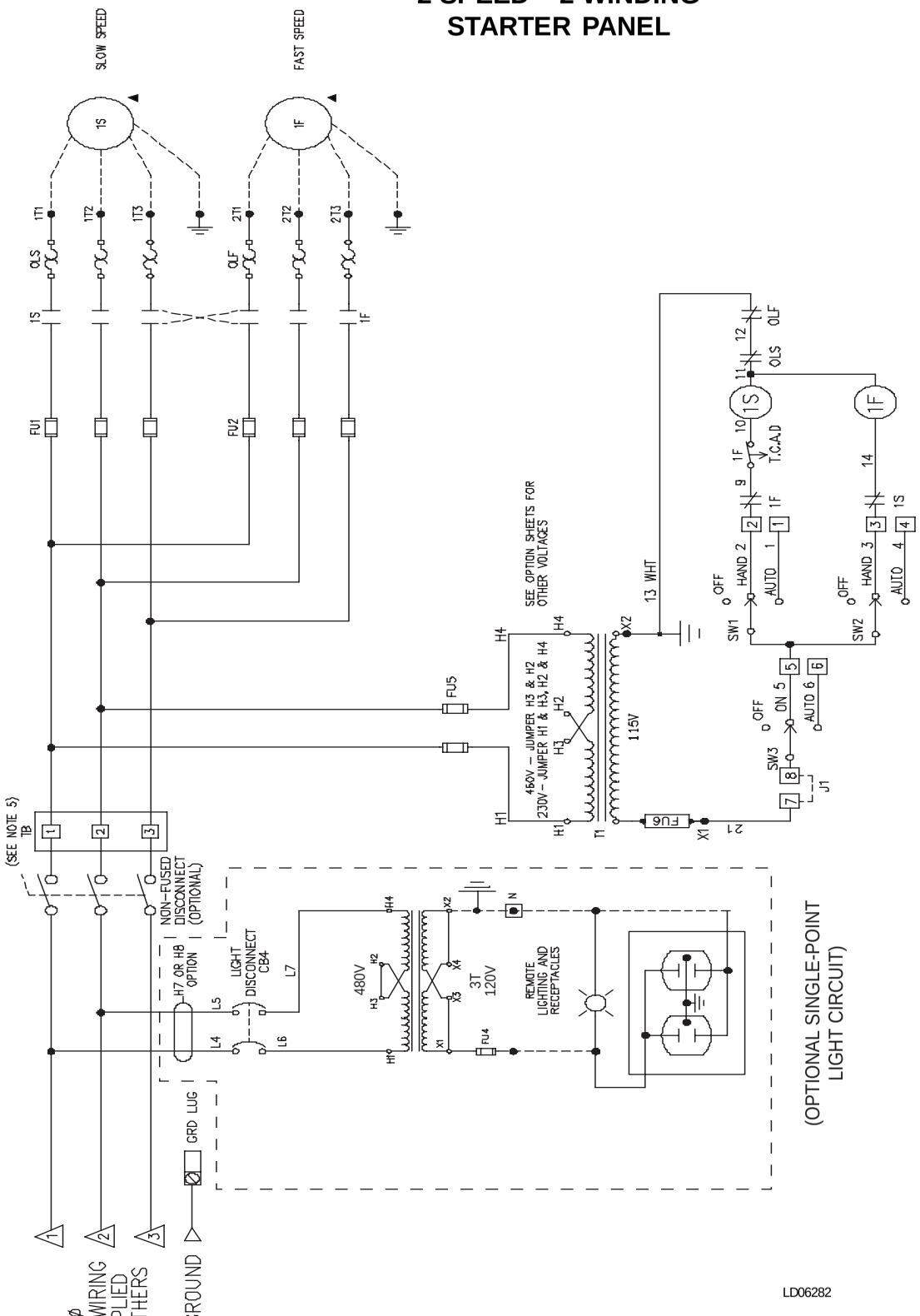
NOTES: 1. Connect remote control signal for starter fan at Terminals 1 & 2. Dry control contact rated at min. 2A / 115V.

2. Connect remote control signal for (optional) return fan at Terminals 3 & 4. Dry control contact rated at min. 2A / 115V.
3. Remove Jumper J1 for independent control of motors.
4. Install safeties between Terminals 5 & 6 or 7 & 8. Remove Jumpers J2 and J3, accordingly.
5. TB not installed if internal rotary (thru-the-door) disconnect is present.
6. TB1 to be used on units when the disconnect is 100 amp, or less. Above 100 amp, L4 & L5 the disconnect lugs are to be tapped.

(NOTE 6)

3T	MAXIMUM FUSE SIZES		120 VOLT CURRENT AVAILABLE	OPTION CODE
	FU4	FU41		
2KVA	20 AMP	NONE	16 AMP	H7

WIRING DIAGRAM
2 SPEED – 2 WINDING
STARTER PANEL

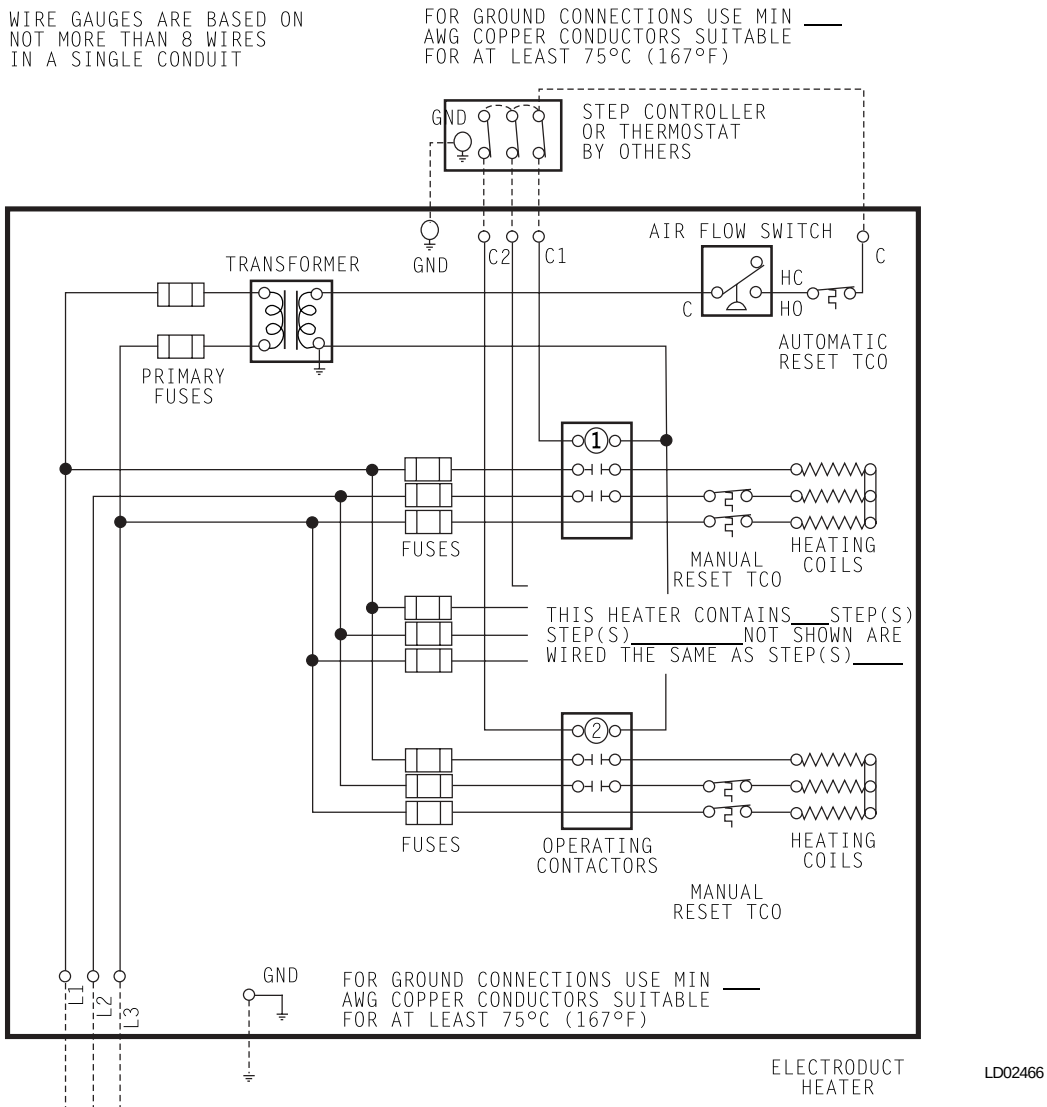


NOTES:
1. Connect remote control signal for slow speed at Terminals 1 & 2. Dry control contact rated at min. 2A / 115V.
2. Connect remote control signal for fast speed at Terminals 3 & 4. Dry control contact rated at min. 2A / 115V.
3. Connect remote control signal for motor stop/start at Terminals 5 & 6.
4. Install safety between Terminals 7 & 8. Remove Jumper J1 accordingly.
5. TB not installed if internal rotary (thru-the-door) disconnect is present.
6. Time delay relay, to adjustable.

FIG. 34 – WIRING DIAGRAM

TYPICAL ELECTRIC HEATER WIRING DIAGRAM

CAUTION: EXTERNAL MULTISTEP THERMOSTAT OR STEP CONTROLLERS MUST BE WIRED SO THAT THE HEATER STAGES ARE TURNED ON SEQUENTIALLY STARTING WITH STAGES 1, 2, 3 . . . AND TURNED OFF SEQUENTIALLY IN THE REVERSE ORDER; i.e. . . . 3, 2, 1.



NOTES:

1. FOR SUPPLY CONNECTIONS, USE MIN AWG COPPER CONDUCTORS SUITABLE FOR AT LEAST 78°C (167°F).
2. SUPPLY VOLTAGE , PHASE , CONTROL VOLTAGE .
3. FIELD TERMINALS SUITABLE FOR USE WITH AWG COPPER CONDUCTORS ONLY.
4. THIS HEATER REQUIRES 1 SUPPLY CIRCUIT OF KW.
5. CONTROL CIRCUIT WIRING TO BE N.E.C. CLASS 1.

POWER: (FACTORY WIRED) _____

POWER: (FIELD WIRED) _ _ _ _ _ _ _ _ _ _ _ _

CONTROL (FACTORY WIRED) _____

CONTROL (FIELD WIRED) _ _ _ _ _ _ _ _ _ _ _ _

FIG. 35 – TYPICAL ELECTRIC HEATER

FACTORY INSTALLED CONTROLS AND ELECTRICAL OPTIONS

YORK has the capability to furnish units with factory installed single point power motor starter panels, disconnects, marine lights, sensors, actuators or complete unit automation. Factory installed wiring greatly reduces installation time and cost. (See Figures 36, 37 and 38)

Factory installed inverters, the YORK Air-Modulator, provide the most efficient and cost effective VAV control in a complete factory package. Factory mounted inverters not only save field labor, but it also assures proper fan balance for vibration free operation. While most fans are balanced for a single speed, fans with inverters are factory balanced to operate over the entire RPM range.

VARIABLE AIR VOLUME APPLICATIONS

Factory-mounted variable frequency drives (YORK Air-Modulator) and variable inlet vanes are available with the YORK CurbPak for Variable Air Volume Applications.

YORK Air-Modulator (Variable Frequency Drive):

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.

Variable Inlet Vanes

Variable inlet vanes are another method of energy efficient fan control. While the fan runs at a constant speed, the inlet vanes modulate the air entering the fan. This produces a reduced air volume resulting in lower operating horsepowers.

The vanes are located within each inlet cone of airfoil fans and adjacent to the inlet ring of forward curved fans.

The vanes consist of a series of radial damper blades which operate in parallel and are controlled by a common shaft which extends to the outside of the fan.

NOTE

Variable Inlet Vane operation will affect coil and air blender performance as well as condensate drainage.

00386VIP

FIG. 36 – YORK AIR-MODULATOR W/OPTIONS PANEL

27442A

FIG. 37 – MOTOR STARTER PANEL

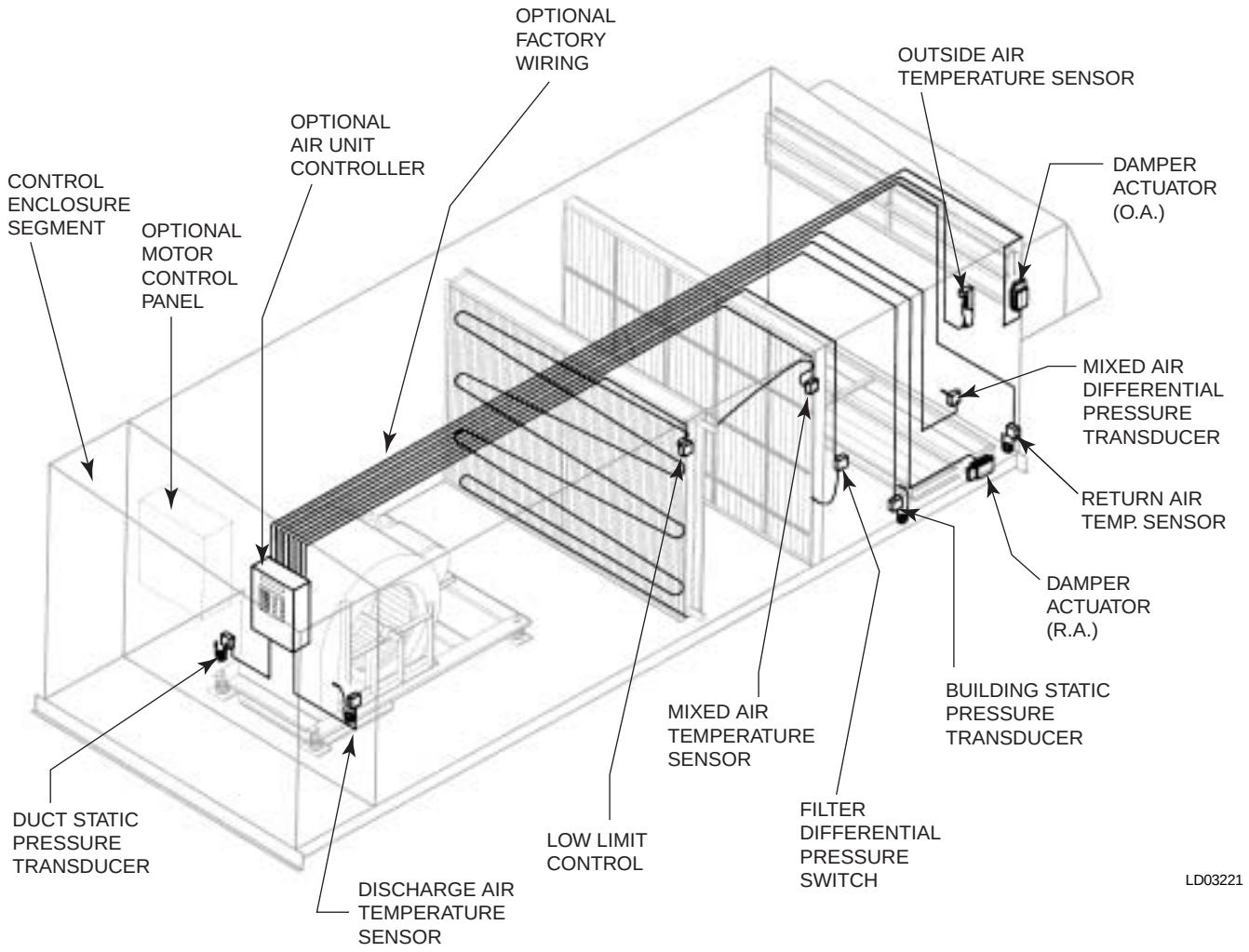


FIG. 38 – TYPICAL CURBPAK W/FACTORY-PACKAGED CONTROLS OR SINGLE POINT MOTOR CONTROL CENTER

2

FACTORY PACKAGED CONTROLS AND MOTOR CONTROL CENTER (SEE FIGURE 38)

Factory Package Controls (FPC) and Motor Starter Panel create a complete factory engineered system. The control system (FPC) is designed specifically for each unit. The control system (FPC), with the appropriate options, can control , monitor and diagnose those points that are necessary to maintain optimum performances.

There are three options available:

- Factory-mounted End Devices
- Factory-mounted End Devices, factory wired to a terminal strip in a single enclosure.
- Factory-mounted End Devices, factory wired to a terminal strip and a controller mounted in a single enclosure.

The YORK Factory-mounted End Devices Package consists of end devices that are pre-engineered, factory installed and tested:

- **Binary Inputs –** On/Off, Open/Close indication.

  Examples: Low Temperature Limit, Filter Status, Fan Status
- **Binary Outputs –** On/Off Control by relay.

  Example: Fan Start/Stop
- **Analog Inputs –** Temperature or pressure reading.

  Examples: Supply Air Temp, Supply Duct Static Pressure
- **Analog Outputs –** 2 to 10 volts DC signal for modulation control.

  Examples: Chilled Water Valve, Damper Actuator, Variable Frequency Drive

For information on Factory Packaged Controls (FPC) see Factory Packaged Controls, Installation Operation and Maintenance Manual.

OPERATION

STARTUP CHECKLIST

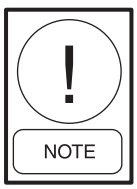
- ❑ Unit received undamaged
- ❑ Equipment received as ordered
- ❑ Unit located properly for service
- ❑ Isolators and thrust restraints properly adjusted (See Figures 8 - 13)
- ❑ Shipping restraints removed (See Figures 8 - 13)
- ❑ Check electrical supply voltage and control supply
- ❑ Check tightness of all electrical terminations
- ❑ Check fan wheel and drive sheaves for tightness of set screws and bushing bolts
- ❑ Check sheave alignment (See Figure 21, page 23)
- ❑ Check bearings and locking collars (See details in "Fan Shaft Bearings" pages 47 - 50)
- ❑ Manually rotate wheels and motors to assure freedom of movement
- ❑ Check condensate drain traps (pages 22 & 23) (See Figures 22 - 25)
- ❑ Check air filters (pages 52 - 58 for details)
- ❑ Check proper fan rotation. Energize momentarily
- ❑ Check belts for tightness (page 45) (See Figures 33 & 34)
- ❑ Check damper operation
- ❑ Check doors and latches for air leaks
- ❑ Check fan motors

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 overamp and become damaged.

PRE-OPERATIONAL CHECK

1. Lock out the electrical power to prevent accidental fan operation. Check inside of the unit and duct work to make sure that no loose nuts, bolts, trash, sheet metal parts, etc., have been left which may be sucked into the fan and result in permanent damage. At the same time, check to make certain that the air filters have been installed in the filter section, with end seals in place.
2. Remove the shipping hold down bolts and shims at the spring isolators. **Note: Do not remove functional bolts from seismic isolators.**
3. Recheck the tightness of the isolator mounting hardware, set screws and locking collars on the bearings, and the motor mount adjusting nuts.
4. Rotate the fan by hand to make sure that it is free and no obstructions have been incurred during shipment or installation.
5. Check the bearings for proper lubrication by referring to the bearing manufacturer's instructions, and page 41 of this manual. At the same time, if bearings contain locking collars, make sure that the locking collars have been locked (pages 47 - 50).
6. Be sure that the adjustable motor sheave adjustment is locked. (See Figure 40)
7. Remove the various damper linkages from the operators and operate them by hand to ensure that movement is free and correct. Where variable inlet vanes are installed in the units, the information given in the Installation Section should be adhered to with corrections made as necessary. Check the actuators of the various linkages to make sure that they do not overdrive the connected dampers in such a way as to cause damage (page 24).
8. Refer to the fan motor manufacturer's instructions attached to the fan motor and check each item for compliance prior to startup.
9. After the above items have been checked, remove lockout and apply power to the motor for a short interval to observe that the fan is rotating in the proper direction as indicated by the arrow on the side of the fan.

   While the impeller is coasting to a stop, see if it is rotating in the proper direction. Make certain the impeller is of the correct rotation for the housing and not installed backwards. Note blade configurations (See Figure 39).



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).

WARNING

If any unusual vibration or noise occurs, stop the unit immediately and recheck all items.

If the vibration continues, the belts should be removed from the drive and the motor be allowed to run unloaded to determine if the motor shaft is possibly bent, if there are defective motor bearings, or if the motor is unbalanced.

All units are dynamically balanced prior to shipment. However, there are certain operating speeds at which the natural frequency of the rotating member is attuned to the natural frequency of certain panels or components which are a part of the enclosure. These vibrations can tend to reinforce each other in such a way that excessive vibration can be encountered under certain conditions. It is difficult to predetermine this condition because it is affected by the mounting arrangement, the various modules used in the makeup of the assembly, and the duct work connections.

If the above check reveals no apparent discrepancies and vibration is still present, the speed of the unit should be lowered approximately 10 percent to determine if a natural frequency is causing the vibration. If the unit contains water coils, they should be filled with water when the check is made.

Under no condition should the units be allowed to continue to operate when excessive unit vibration is apparent. Permanent damage may result which will not be covered under the warranty if the unit is allowed to continue in operation when excessive vibrations are in evidence.

CAUTION

After 24 hours of satisfactory operation, shut down the equipment and check all foundation bolts, shaft bearings, drive set screws and belt tension, and tighten where required.

TEMPERATURE LIMITATIONS

Standard Motors (Class B Insulation) - 104°F
Motors with Class F Insulation - 140°F
Power Wiring - 140°F
Controls & Control Wiring - 140°F
Prefilters - 150°F

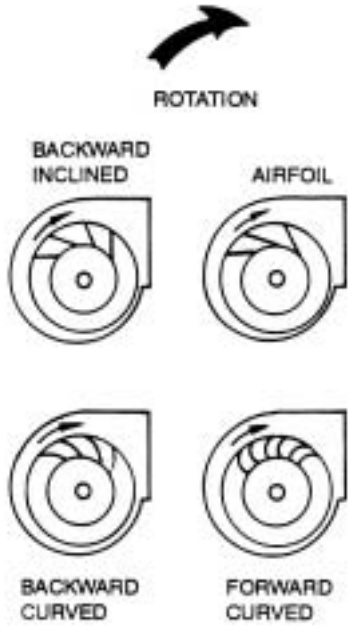


FIG. 39 – TYPES OF CENTRIFUGAL FAN IMPELLERS

High Efficiency Filters - 200°F
Variable Speed Drives - 104°F

STATIC PRESSURE LIMITS

General classification of units low/medium/high static pressure.

Low Pressure Package 0 - 3" I.W.G.

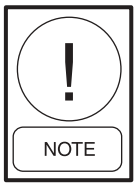
A. Cabinet construction: For static pressure up to 3" I.W.G.
B. All access doors are double wall and open to the outside with door latches, standard flat gasket and standard SS hinges

Medium Pressure Package 3 - 6" I.W.G.

A. Cabinet construction: For static pressure up to 6" I.W.G.
B. All access doors are double wall with bulb gaskets, open in or out with door latches and full height hinges.

High Pressure Package 6 - 9" I.W.G.

A. Cabinet construction: For static pressure up to 9" I.W.G.
B. All access doors are double wall. Doors open with full height hinges, door latches and seals.



Some units may require special construction considerations. YORK reserves the right to modify construction of any units as deemed necessary.

SAFETY CHECK - "WARNING"

Be sure all door latches are secured before starting unit.

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 check made on the air distribution system. Only in those cases where the air flow at the outlets is insufficient to meet specifications should the blower speed be changed. If the air flow is sufficient at the outlets, do not alter blower speed to bring the motor HP up to nameplate rating.

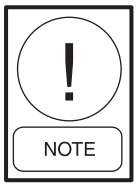
BELTS

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 Maintenance Section.

SHEAVES AND DRIVES

Motor pulleys (both adjustable pitch and fixed pitch, and blower shaft pulleys) are locked in position with either set screws and split taper lock bushings. All set screws and/or taper lock bolts must be checked for tightness and alignment before putting equipment into operation.

All drive belts must also be checked for proper tension. See section Belt Adjustment.



An incorrectly aligned and tensioned belt 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.

LOCKING RING VARIABLE PITCH SHEAVES (See Figure 40)

This type of sheaves consists of two flanges (1) fitted on a threaded hub (2). (In the two-groove sheave this threaded hub is a combined hub and center flange, as shown in Figure 40, where as in the single flange sheave there is no center flange.)

To adjust the pitch diameter turn flanges (1) an equal number of turns. Malleable locking rings (3) are assembled by means of cap screws and lockwashers (4) and are correctly threaded to allow a small gap between the locking rings and flanges.

Sheave adjustment is made on one-quarter turn increments through the use of the keyway (5) on the outside of hub (2) and four keyways in the flanges. A key (6) is inserted through the assembly and held in place with a setscrew (7). The locking ring cap screws (4) are tightened on BOTH sides to lock the entire sheave into a rigid unit.

Subsequent adjustments can be made by loosening the locking ring cap screws (4) (**WARNING - Do not remove these cap screws**), and loosening the setscrews (7) over key (6). The key can then be tightened and adjustment made. Be sure to replace key and tighten set screws and BOTH cap screws (4) before using.

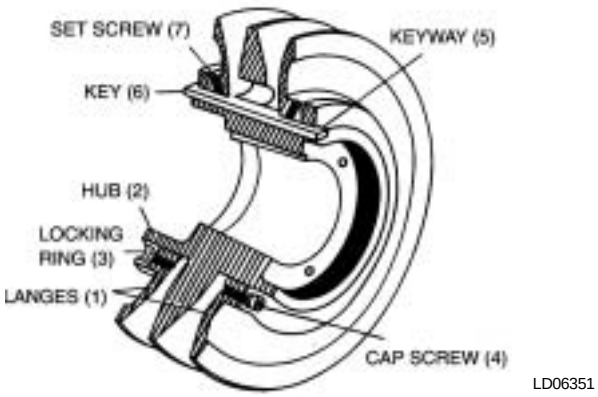


FIG. 40 – LOCKING RING VARIABLE PITCH SHEAVES

TABLE 4 – FORWARD CURVED / AIRFOIL FAN AND MOTOR DATA

UNIT SIZE	FAN			VIV OPTION	MAX. MOTOR HP	MAX. MOTOR FRAME	FAN OUTLET AREA (sq. ft)
	NO.	TYPE	SIZE				
65	1	FC	10 X 10	N/A	7.5	213T	1.03
	2	AF	12	N/A	7.5	213T	1.45
85	1	FC	10 X 10	N/A	7.5	213T	1.03
	2	AF	12	N/A	7.5	213T	1.45
105	1	FC	10 X 10	N/A	7.5	213T	1.03
	2	FC	12 X 12	N/A	10	215T	1.45
	3	FC	12 X 12 (L)	YES	10	215T	1.45
	4	AF	15	YES	15	254T	2.04
125	1	FC	12 X 12	N/A	10	215T	1.45
	2	FC	12 X 12 (L)	YES	10	215T	1.45
	3	FC	15 X 15	N/A	10	215T	2.04
	5	AF	12	N/A	10	215T	1.45
	6	AF	15	YES	15	254T	2.04
170	1	FC	15 X 15	N/A	10	215T	2.04
	2	FC	15 X 15 (L)	YES	15	254T	2.05
	3	FC	18 X 18	N/A	15	254T	2.86
	4	FC	18 X 18 (L)	YES	20	256T	2.86
	5	AF	15	YES	15	254T	2.04
	6	AF	18	YES	20	256T	2.86
215	1	FC	18 X 18	N/A	15	254T	2.86
	2	FC	18 X 18 (L)	YES	20	256T	2.86
	3	AF	15	YES	15	254T	2.04
	4	AF	18	YES	20	256T	2.86
250	1	FC	20 X 20	N/A	25	284T	4.38
	2	FC	20 X 20 (L)	YES	30	286T	4.25
	3	AF	18	YES	20	256T	2.86
	4	AF	20	YES	25	284T	4.38
305	1	FC	20 X 20	N/A	25	284T	4.38
	2	FC	20 X 20 (L)	YES	30	286T	3.25
	3	AF	20	YES	25	284T	4.38
	4	AF	22	YES	30	286T	5.50
350	1	FC	22 X 22	N/A	40	324T	5.50
	2	FC	22 X 22 (L)	YES	40	324T	5.20
	3	AF	22	YES	30	286T	5.50
	4	AF	25	YES	40	324T	6.90
400	1	FC	25 X 25	N/A	50	326T	6.90
	2	FC	25 X 25 (L)	YES	50	326T	6.80
	3	AF	25	YES	40	324T	6.90
	4	AF	28	YES	40	324T	8.70
460	1	FC	25 X 25	N/A	50	326T	6.90
	2	FC	25 X 25 (L)	YES	50	326T	6.80
	3	FC	27 X 27 (L)	YES	50	326T	8.10
	4	FC	28 X 28	N/A	50	326T	8.10
	5	AF	28	YES	40	324T	8.67
	6	AF	32	YES	50	326T	10.91
530	1	FC	28 X 28	N/A	50	326T	8.67
	2	FC	30 X 30 (L)	YES	60	364T	9.40
	3	FC	32 X 32	N/A	60	364T	10.91
	4	AF	28	YES	50	326T	8.67
	5	AF	32	YES	60	364T	10.91

Continued on next page.

TABLE 4 – FORWARD CURVED / AIRFOIL FAN AND MOTOR DATA (CONTINUED)

UNIT SIZE	FAN			VIV OPTION	MAX. MOTOR HP	MAX. MOTOR FRAME	FAN OUTLET AREA (sq. ft)
	NO.	TYPE	SIZE				
680	2	FC	28 X 28	N/A	50	326T	8.67
	3	FC	30 X 30 (L)	YES	60	364T	9.40
	4	FC	32 X 32	N/A	60	364T	10.91
	5	AF	32	YES	60	364T	10.91
	6	AF	36	YES	75	365T	13.74
860	1	FC	30 X 30 (L)	YES	60	364T	9.40
	2	FC	32 X 32	N/A	60	364T	10.91
	3	FC	33 X 3 (L)	YES	60	364T	11.90
	4	FC	36 X 36	N/A	60	364T	13.74
	5	AF	36	YES	75	365T	13.74
	6	AF	40	YES	100	404T	17.27
1030	1	FC	36 X 36	N/A	60	364T	13.74
	2	FC	36 X 36 (L)	YES	60	364T	12.70
	3	FC	40 X 40	N/A	60	364T	17.27
	4	AF	40	YES	100	404T	17.27
	5	AF	44M	YES	100	404T	20.50
	6	AF	49M	YES	100	404T	24.90

NOTE: Horsepower and weights are Class II Fans.

TABLE 5 – FE - FC RETURN FAN SIZES

UNIT SIZE	FAN			VIV OPTION	MAX. MOTOR HP	MAX. MOTOR FRAME	FAN OUTLET AREA (sq. ft)
	NO.	TYPE	SIZE				
350	1	FC	22 X 22	YES	40	324T	5.50
400	1	FC	25 X 25	YES	50	326T	6.90
460	1	FC	28 X 28	YES	50	326T	8.67
530	1	FC	28 X 28	YES	50	326T	8.67
680	1	FC	28 X 28	YES	50	326T	8.67
860	1	FC	32 X 32	YES	60	364T	10.91
1030	1	FC	32 X 32	YES	60	364T	10.91

TABLE 6 – PLENUM FAN AND MOTOR DATA – FP

UNIT SIZE	SWSI (AF) PLENUM FANS						
	FAN			MAX	MAX MOTOR	MAXIMUM FAN	
	SEGMENT NO.	TYPE	SIZE	MOTOR HP	FRAME	TSP	RPM
65	1	BI	13	7.5	213T	7.0	3998
85	1	BI	13	7.5	213T	7.0	3998
	2	BI	15	10	215T	7.0	3598
105	1	BI	15	10	215T	7.0	3598
125	1	BI	16	15	254T	7.0	3271
	2	AF	18	15	254T	7.0	2902
170	1	AF	18	15	254T	7.0	2902
	2	AF	20	20	256T	7.0	2648
	3	AF	22	20	256T	7.0	2381
215	1	AF	22	20	256T	7.0	2381
	2	AF	24	20	256T	7.0	2162
	3	AF	27	25	284T	7.0	1999
250	1	AF	24	20	256T	7.0	2162
	2	AF	27	25	284T	7.0	1999
	3	AF	30	30	286T	7.0	1799
305	1	AF	24	20	256T	7.0	2162
	2	AF	27	25	284T	7.0	1999
	3	AF	30	30	286T	7.0	1799
350	1	AF	30	30	286T	7.0	1799
	2	AF	33	40	324T	7.0	1636
	3	AF	36	50	326T	7.0	1388
	4	AF	40	60	364T	7.0	1258
400	1	AF	33	40	324T	7.0	1636
	2	AF	36	50	326T	7.0	1388
	3	AF	40	60	364T	7.0	1258
	4	AF	44	75	365T	7.0	1138
460	1	AF	36	50	326T	7.0	1388
	2	AF	40	60	364T	7.0	1258
	3	AF	44	75	365T	7.0	1138
530	1	AF	36	50	326T	7.0	1388
	2	AF	40	60	364T	7.0	1258
	3	AF	44	75	365T	7.0	1138
	4	AF	49	100	404T	7.0	1033
680	1	AF	44	75	365T	7.0	1138
	2	AF	49	100	404T	7.0	1033
	3	AF	54	100	404T	7.0	933
860	1	AF	49	75	365T	7.0	1033
	2	AF	54	100	404T	7.0	933
1030	1	AF	49	75	365T	7.0	1033
	2	AF	54	100	404T	7.0	933
	3	AF	60	100	404T	7.0	844

NOTE: 1. Units with SWSI fans are not within the scope of ARI Certification (Standard 430). 2. RPM based on Class II fans 3. All plenum fans will be Class II

TABLE 7 – PLENUM RETURN FAN AND MOTOR DATA – FP(V) ECONOMIZER

UNIT SIZE	SWSI (AF) PLENUM FANS						
	FAN			MAX	MAX MOTOR	MAXIMUM FAN	
	SEGMENT NO.	TYPE	SIZE	MOTOR HP	FRAME	TSP	RPM
65	1	BI	15	3	182T	3	2762
85	1	BI	15	3	182T	3	2762
105	1	BI	15	5	184T	3	2762
125	1	AF	18	5	184T	3	2294
170	1	AF	20	7.5	213T	3	2093
215	1	AF	24	10	215T	3	1708
250	1	AF	27	10	215T	3	1558
305	1	AF	30	15	254T	3	1402
350	1	AF	33	15	254T	3	1275
400	1	AF	36	15	254T	3	1071
460	1	AF	36	20	256T	3	1071
530	1	AF	40	20	256T	3	971
680	1	AF	49	30	286T	3	797
860	1	AF	49	30	286T	3	797
1030	1	AF	49	40	324T	3	797

NOTE: 1. Units with SWSI fans are not within the scope of ARI Certification (Standard 430). 2. RPM based on Class II fans
3. All plenum fans will be Class II

MAINTENANCE

GENERAL

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 units and coils. If a system failure occurs due to improper maintenance during the warranty period, YORK will not be liable for costs incurred to return the unit to satisfactory operation.

Removal access doors have been provided on all units to enhance performance of necessary maintenance and to provide access to various components which in time may require replacement.

PERIODIC MAINTENANCE

Every Month

Every month, check the cleanliness of the filters and replace or clean as required. (See Tables 12 - 14). Examine the damper and operator linkages to insure that each is free and operating smoothly.

Every One To Six Months

Fan Bearing Lubrication (See Table 8) – Fan bearings on the CurbPak units may be equipped with standard and/or optional extended lubrication lines enabling lubrication of both fan bearings from one side of unit. (See Figure 41) Class I fans will have permanently lubricated bearings.

26201A

FIG. 41 – LUBRICATION LINES

For best results, bearings should be relubricated 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 relubricate while bearing is stationary, refer to manufacturer's data for maximum grease capacity for the size bearing.

Relubrication is generally accompanied by a temporary rise in operating temperature. Excess grease will be purged at seals.

Fan Bearing Lubricant – A Lithium./Petroleum base grease conforming to an NLGI grade two 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.

Motor Lubrication and Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a 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.

Motor Bearing Lubricant – A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include: Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

- Maximum operating temperature for standard motors = 110°C.
- Shut-down temperature in case of a malfunction = 115°C.

Lubrication Intervals – Recommended lubrication intervals are shown in Table 9-1. It is important to realize that the recommended intervals of Table 9-1 are based on average use. **Refer to additional information contained in Tables 9-2, 9-3 and 9-4.**

TABLE 8 – FAN BEARING – LUBRICATION INTERVALS

RELUBRICATION SCHEDULE (MONTHS) BALL BEARING PILLOW BLOCKS									
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	1/2	1/4	1/4
2-11/16" THRU 2-15/16"	5	4	3	2	1	1/2	1/2		
3-7/16" THRU 3-15/16"	4	3	2	1	1/2	1/2			

TABLE 9-1 – 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).
Relubrication interval for 6205 bearing is 1550 hrs. (using grease lubrication).
Relubrication interval for 6806 bearing is 720 hrs. (using grease lubrication).

TABLE 9-2 – 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, CORROSION	ALL BEARINGS
LOW TEMPERATURE	<-30°C**		

* Special high temperature grease is recommended (Darmex 707). Note that Darmex 707 grease does not mix with other grease types. Thoroughly clean bearing and cavity before adding grease.

** Special low temperature grease is recommended (Airoshell 7).

TABLE 9-3 – MOTOR BEARING – LUBRICATION INTERVAL MULTIPLIER

SEVERITY OF SERVICE	MULTIPLIER
STANDARD	1.0
SEVERE	0.5
EXTREME	0.1
LOW TEMPERATURE	1.0

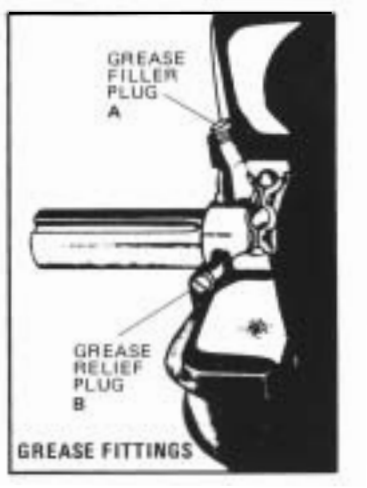


FIG. 42 – GREASE FITTINGS

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TABLE 9-4 – MOTOR BEARING – SIZES AND TYPES

FRAME SIZE NEMA (IEC)	BEARING DESCRIPTION (THESE ARE THE "LARGE" BEARINGS (SHAFT END) IN EACH FRAME SIZE)					
	BEARING	OD Dmm	WIDTH Bmm	WEIGHT OF GREASE TO ADD * OZ. (GRAMS)	VOLUME OF GREASE TO BE ADDED	
					IN^3	TEASPOON
UP TO 210 INCL. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
OVER 210 TO 280 INCL. (180)	6311	120	29	0.61 (17)	1.2	3.9
OVER 280 TO 360 INCL. (225)	6313	140	33	0.81 (23)	1.5	5.2
OVER 360 TO 449 INCL. (280)	NU319	200	45	2.12 (60)	4.1	13.4
OVER 5000 TO 5800 INCL. (355)	NU328	300	62	4.70 (130)	9.2	30.0
SPINDLE MOTORS						
76 FRAME	6207	72	17	0.22 (6.1)	0.44	1.4
77 FRAME	6210	90	20	0.32 (9.0)	0.64	2.1
80 FRAME	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

MOTOR LUBRICATION PROCEDURE

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult you Baldor distributor or an authorized service center if a 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 Baldor distributor or an authorized Baldor Service Center for additional information.

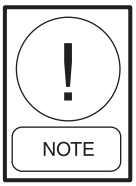
With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

   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 endplate or purge outlet plug.
4. Re-install grease outlet plug.

Without Grease Outlet 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.)



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

3.Assemble motor.

Belt Tension

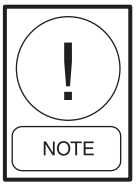
Adjust the belt tension if necessary. Never use a belt dressing on the belts. If belts slip with the proper tension, use a good grade of belt cleanser to clean the belts. Use the procedure outlined under the heading "Belts" for adjusting the tension. (See Figures 43 & 44)

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.

When it is necessary to replace one belt in a given set, the entire set of belts must be replaced.

Every Year

1. Check the fan wheels and inspect the drain pan for sludge and foreign material. Clean if required.
2. Observe the operation of all dampers and make any necessary adjustments in linkage and blade orientation for proper operation.
3. Inspect and lubricate inlet vane bearings with silicone lubricant.



With the exception of the variable inlet vanes, standard damper bearings contain synthetic bushings which do not require lubrication.

VARIABLE INLET VANES

If the unit contains variable inlet vanes, inspect the linkages where necessary. Lubricate the bearings at each end of the VIV blades with SAE 30 oil after cleaning any dust or dirt from around each bearing.

HUMIDIFIERS

Humidifiers should be controlled by a humidistat or means to avoid over-humidification. Whenever steam or raw water is discharged into a system, high-limit humidistat should be used to control the humidifier.

When the system is new, the strainer screen should be inspected at least twice during the first year. If fouled, more frequent inspection and cleaning should be administered.

At least twice a year, verify that the steam trap is functioning properly. A blocked steam trap will be cold. A "blowing" steam trap will be hot for a continuous distance up to 30 feet; it will make noise at intervals; and the discharge pipe will be progressively cooler beginning at the trap.

Control vanes should be inspected at least annually to verify that they are working properly.

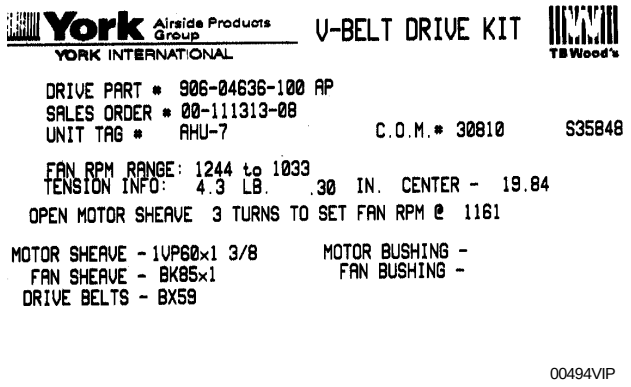


FIG. 43 – TYPICAL DRIVE KIT DATA TAG

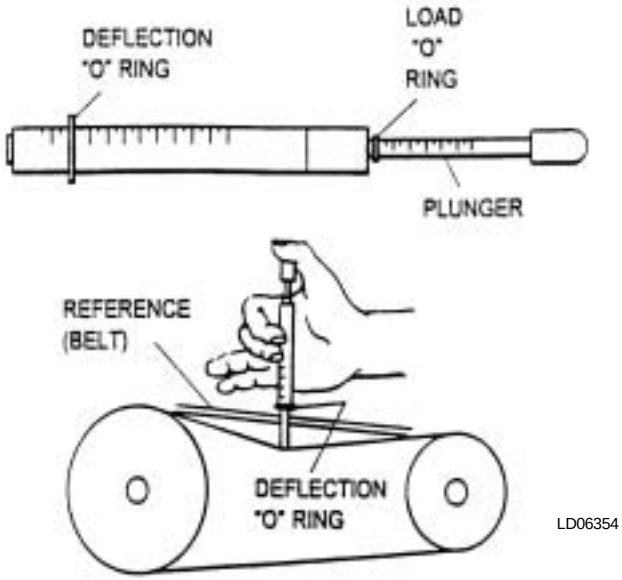


FIG. 44 – BELT TENSIONING GAUGE

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BELTS

Belts 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.

CAUTION

Motor pulleys (both adjustable pitch and fixed pitch, and blower shaft pulleys) are locked in position with either set screws or split taper lock bushings. All set screws and/or taper lock bolts must be checked for tightness and alignment before putting equipment into operation.

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

BELT REPLACEMENT

Always replace belts as a set.

Follow the steps below to replace belts:

1. Release the tension on the belts by loosening the adjusting nuts on the fan motor.
2. Remove old belts and recheck the sheave alignment with a straight edge.
3. Install the new belts on the sheaves.

CAUTION

Never place the belts on the sheaves by using a screwdriver to pry the belt over the rim of the sheave. This will damage the belts permanently.

BELT TENSIONING

Beginning in 1995, important data such as the "Correct Belt Tensioning Data" for each specific unit is shown on the Information Label shown in Figure 43.

Use the belt tension gauge shown in Figure 44 to properly tension belts. Use belt tension data from the label on the unit fan.

CAUTION

Squealing belts during starting is caused by slipping belts that are not tensioned properly.

REMOVAL AND INSTALLATION OF COMPONENTS

WARNING

Disconnect or disable electric motor and lock out.

Forward Curved Fans

NOTE

Fan variations are shown in Figure 39.

The forward curved fan wheel must be removed through the fan discharge opening. The location of other clamps, fan wheel, and shaft must be marked so each of these components can be reassembled in the same location. See Figure 46. This will preserve the balance of the rotating assembly. Proceed with the following steps:

1. Disconnect all duct work 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 set screws on both bearing locking collars. Inspect and, if necessary, replace.
5. Loosen and remove set screws 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 set screw marks on the shaft are fully exposed. File the marks completely smooth. Drive the shaft in the opposite direction and file smooth the set screw 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.

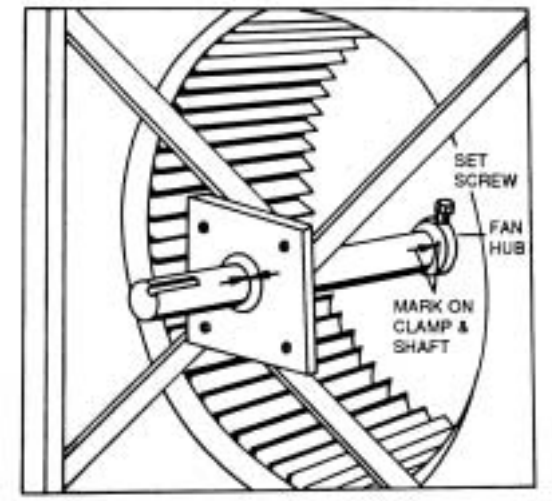

FIG. 45 – FC FAN SHAFT AND WHEEL MARKING

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.
9. Remove the wheel through the discharge or outlet area of the blower housing.
10. Reassemble in reverse order, centering the wheel between the edges of the inlet venturi. If bearings were removed or replaced, be sure to reuse any shim stock found between the mounting support/ plate and bearing housings.
11. Torque all hardware.

NOTE

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.

Maintenance should only be performed by experienced and trained personnel.

Airfoil Wheels

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

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 46) The remaining steps for removing the assembly are the same as those provided in the instructions for removing the forward curved fans.

Fan Motor

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. Mark belt as to position. Remove and set aside belts.
5. Remove motor bracket hold down bolts.
6. Remove motor pulley and set aside.
7. Remove motor.
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. Review the sections on motor and sheave installation. Sheave alignment and belt tensioning discussed previously.
9. Reconnect motor leads and restore power. Check fan for proper rotation as described in Start-Up Check List.

Fan Shaft Bearings

General – When removing and replacing the bearings, care should be taken to ensure that the area where the bearings fit on the shaft does not become scored or damaged. The shaft in this area should be thoroughly cleaned before the bearing is removed and again before the new bearing is installed.

Mounting Details –

1. Check the shaft - it should be straight, free of burrs and full size. Be sure the bearing is not seated on a worn section of shafting.

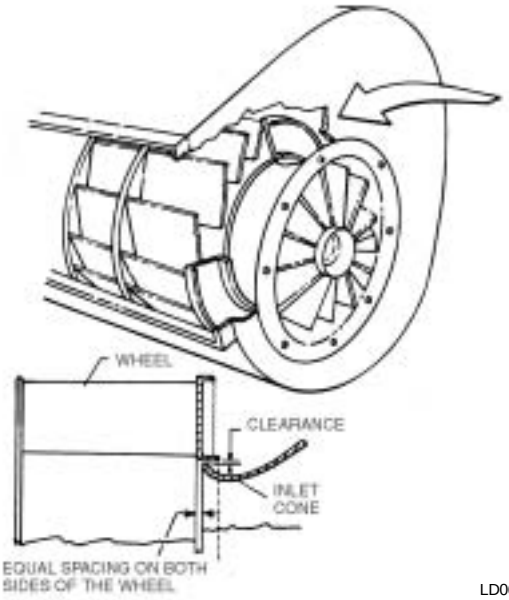

FIG. 46 – AIRFOIL INLET VANE AND CONE ASSEMBLY

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2. Make certain any set screws are not obstructing the bearing bore.
3. Align the bearing in its housing and slide the bearing into position on shaft - never hammer the ends of the inner race. If necessary, use a brass bar or pipe against the inner race to drift bearing into place – never hit the housing as bearing damage may result. Make sure there is lubricant between the bearing outer ring and the housing.
4. Fasten the bearing housing to the unit mounting support with hex head cap screws, washers, new lock washers and hex nuts before securing the bearing to the shaft. This permits the bearing to align itself in position along the shaft and eliminates any possibility of cramping loads.
5. Rotate the shaft to make certain it turns freely.
6. Bearings may employ one of several different methods to lock the bearing to the shaft.

Shaft should be free from burrs. If old shaft is used, be sure a ball bearing is not seated on worn section and shaft is not bent.

There are various degrees of self alignment in bearings of the same manufacturer. The force required for the self alignment of the bearings used in YORK manufactured units has been specified and is closely monitored

at the factory. If it is necessary to purchase a bearing locally, be sure it can be worked around in the housing with a short shaft made of wood or other soft material placed in the bearing.

Prior to installing the bearing on the shaft, it should be worked around in the housing to make sure that self alignment will be obtained where the bearing is installed. After the shaft journal has been inspected for cleanliness, metal chips or burrs, the bearing is slipped, not forced, onto the shaft. Forcing the bearing onto the shaft by the use of flange, pillow block, or outer ring will damage the bearing internally. Force applied in this way transmits the load to the inner race through the balls in the bearing. Since the bearings are not designed for axial loading, the sides of the races in which the balls turn can be damaged. If the bearing cannot be made to slip onto the shaft by pressing on the inner ring of the bearing, check the shaft for burrs. Install the bearing so the part of the inner race which receives the locking collar or contains set screws is toward the outside of the unit.

If the grease fitting must be changed on bearings which utilize a locking pin under the fitting, it is important to see that the locking pin is in place when the fitting is replaced. If an adapter or grease fitting of improper size and length is used, the locking pin may be either too tight or loose and can affect the alignment and relubrication of the bearing.

BEARING LOCKING DEVICES

Various types of locking devices are used to secure bearing(s) to the fan shaft. Refer to the instructions packed with bearings for special information. Figure 47 is a typical bearing with a setscrew type locking device. The various locking devices can be classified under basic types: eccentric locking type, concentric locking type, and Skwezloc type.

Eccentric Type

An eccentric self-locking collar is turned and driven with a punch in the direction of shaft rotation to lock the bearing inner ring to the shaft. (See Figure 48)

When the eccentric collar is engaged to the cam on the bearing inner ring and turned in direction of rotation, it grips the shaft with a positive binding action. The collar is then locked in place with the set screw provided in the collar.

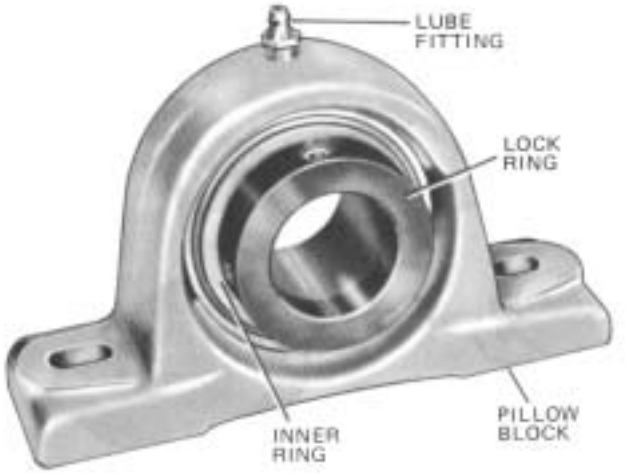


FIG. 47 – BEARING WITH SETSCREW TYPE LOCKING DEVICE

The self-locking collar is placed on the shaft with its cam adjacent to the cam on the end of the bearing's wide inner ring. In this position, with collar and bearing cams disengaged, the collar's bore is concentric with that of the bearing's inner ring. The wide inner ring is loose on the shaft. By turning the collar in the direction of normal shaft rotation, the eccentric recessed cam will drop over and engage with the corresponding cam on the bearing inner, causing it to grip the shaft tightly with a positive binding action. (See Figure 50) Make sure the two cams engage smoothly and the locking collar is down flat against the shoulder of the inner ring. The wide inner ring is now locked to the shaft. Using a punch or similar tool in the drilled hole of the collar, tap the tool lightly to lock the collar in the direction of normal shaft rotation.

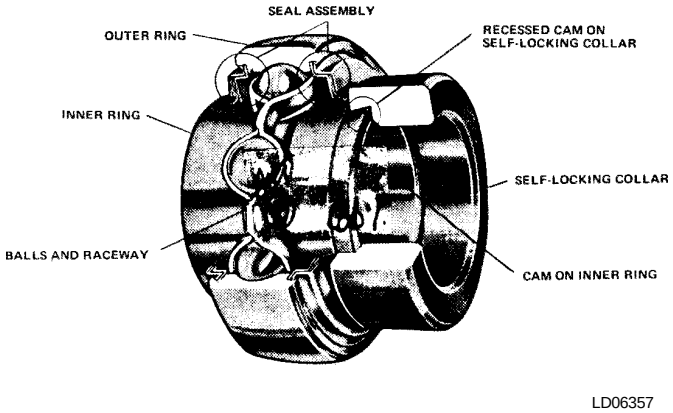


FIG. 48 – BEARING WITH ECCENTRIC CAM

As a final step, the set screw is tightened. Torque per Table 10. It exerts a wedging action to hold the collar always in the engaged position, even under shock and reversing loads.

To disassemble, loosen the set screw and tap the collar in the direction opposite shaft rotation.

NOTE

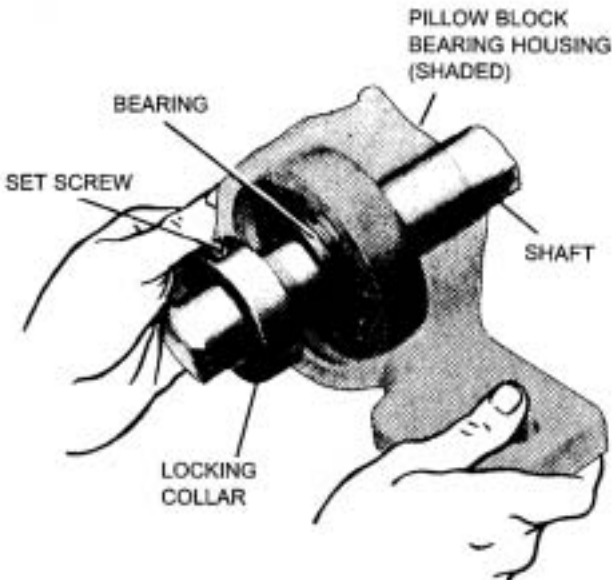
A lock pin is inserted through the lubrication fitting on the "Sealmaster" bearing housing to prevent the bearing from spinning in the housing.

Alternate Torquing of Set Screws –

Step 1 - Torque "A" to 1/2 recommended torque.
Step 2 - Torque "B" to full minimum recommended value.
Step 3 - Torque "A" to full recommended value.

TABLE 10 – TORQUE FOR TIGHTENING SET SCREWS

SET SCREW DIA.	HEX. SIZE ACROSS FLATS	MIN. RECOMMENDED TORQUE	
		INCH LBS.	FOOT LBS.
1/4	1/8	66 - 85	5.5 - 7.2
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 - 37.7
1/2	1/4	504 - 655	42.0 - 54.6
5/8	5/16	1104 - 1435	92.0 - 119.6



CAUTION

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

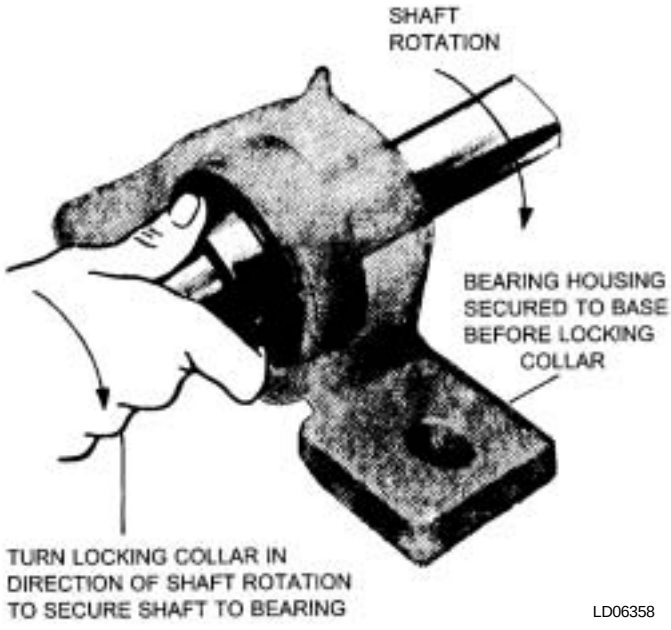


FIG. 50 – BEARING INSTALLATION – ECCENTRIC LOCKING COLLAR

Set Screw Locking Devices – The simplest method utilized is a bearing inner race with set screws. (See Fig. 47) Another type has separate lock ring with set screw. The set screws lock the ring and bearing inner race to the shaft. (See Figure 50)

Tighten set screws securely onto the shaft. See Table 10 for torque values.

After proper installation of the bearing(s), run the unit for 10 to 15 minutes. Shut the unit down and lock it out. Check for proper engagement of locking collar and tightness of set screw(s).

COILS

The coils are fastened at the top and bottom of the end sheets with bolts, nuts, and lock washers. In some configurations, the end sheets are also bolted to supporting channels. Access to the coils is obtained by removing the connecting piping from the coil and the panels at each end of the coil. In cases where two coils are stacked, one on top of the other, the coils can be removed as a single unit or individually. If removed as a single unit, provisions should be accessible for handling the heavier weight and the large size.

To determine if a coil has right or left connections, face the unit from the return air inlet section. (See Figure 53)

For all direct expansion coils it is necessary that the refrigerant be handled in accordance with the Clean Air Act directives and contained. To do this, follow the instruction with the condensing unit according to Federal and Local requirements.

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.

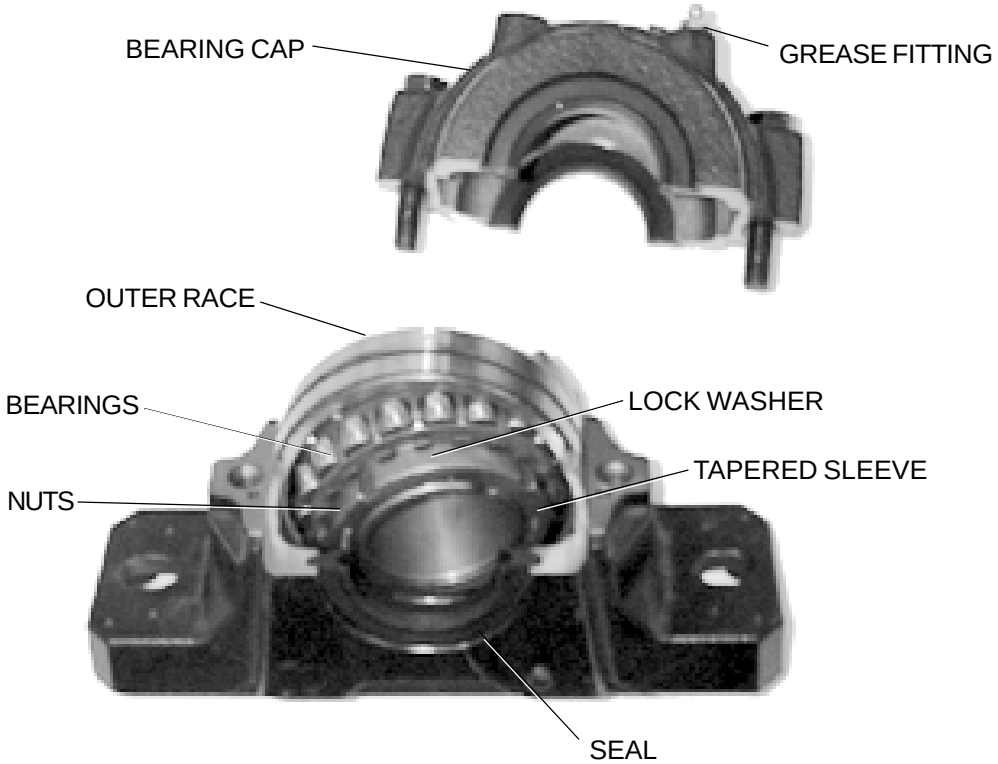


FIG. 51 – SPLIT BEARING

CONDENSATE PAN AND DRAIN LINE

Check the drain pan and drain line periodically to see that condensate water is being properly drained. Faulty water drainage could cause sweating and dripping.

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:

1. 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 CurbPak unit cabinet.
2. Draining each coil and relating piping such as traps and making sure that all low areas also drain.
3. 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°F below zero at sea level.

WINTERIZING DRAIN TRAPS

During the winter months when the cooling system is turned off and the unit is exposed to freezing condition, an antifreeze solution should be poured in the condensate drain trap to prevent freezing and possible damage. The condensate drain trap may also be drained.

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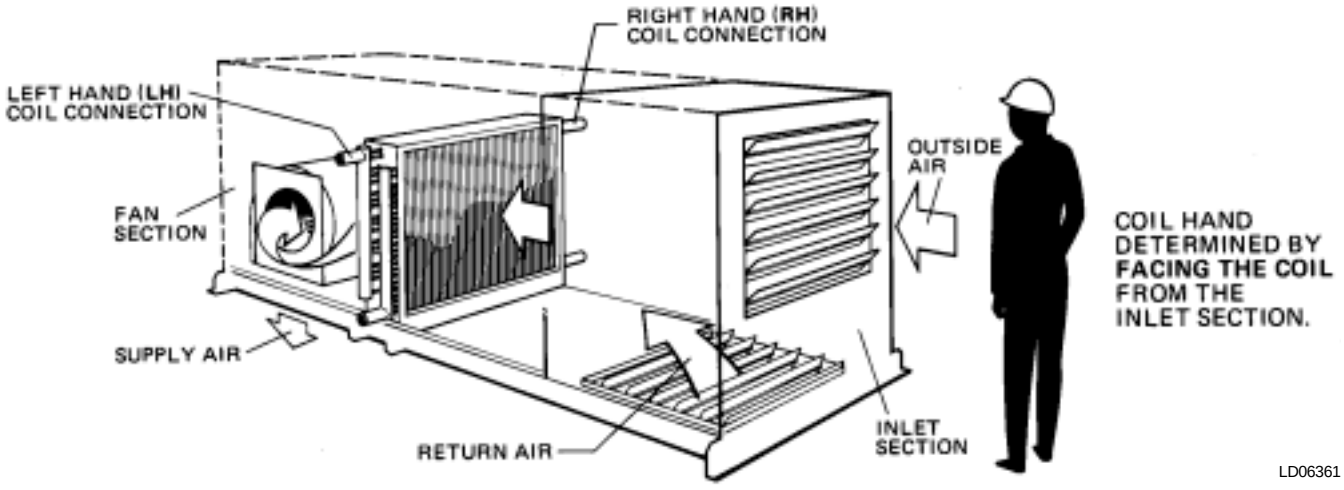

FIG. 53 – DETERMINING LEFT - OR RIGHT-HAND COIL CONNECTION / DRIVE SIDE

TABLE 12 – FILTER SIZES AND QUANTITIES – FLAT, RIGID, BAG & HEPA FILTERS

FILTER SIZES AND QUANTITIES PER UNIT SIZE

		UNIT SIZE														
		65	**85**	**105**	**125**	**170**	**215**	**250**	**305**	**350**	**400**	**460**	**530**	**680**	**860**	**1030**
Area (sq.ft.)		6	8	10	12	16	20	24	28	36	42	48	56	72	90	108
Filter Size	**12 x 24**	1	–	1	2	–	2	–	2	–	3	–	4	4	5	6
	24 X 24	1	2	2	2	4	4	6	6	9	9	12	12	16	20	24

NOTES: 1. See the filter configurations below for specific filter arrangements.
2. Filters are side-loaded, except when in blow through arrangement they are either front or rear loaded. HEPA will always be front loaded.
3. The number in ( ) defines how many rows high with that particular filter pattern.

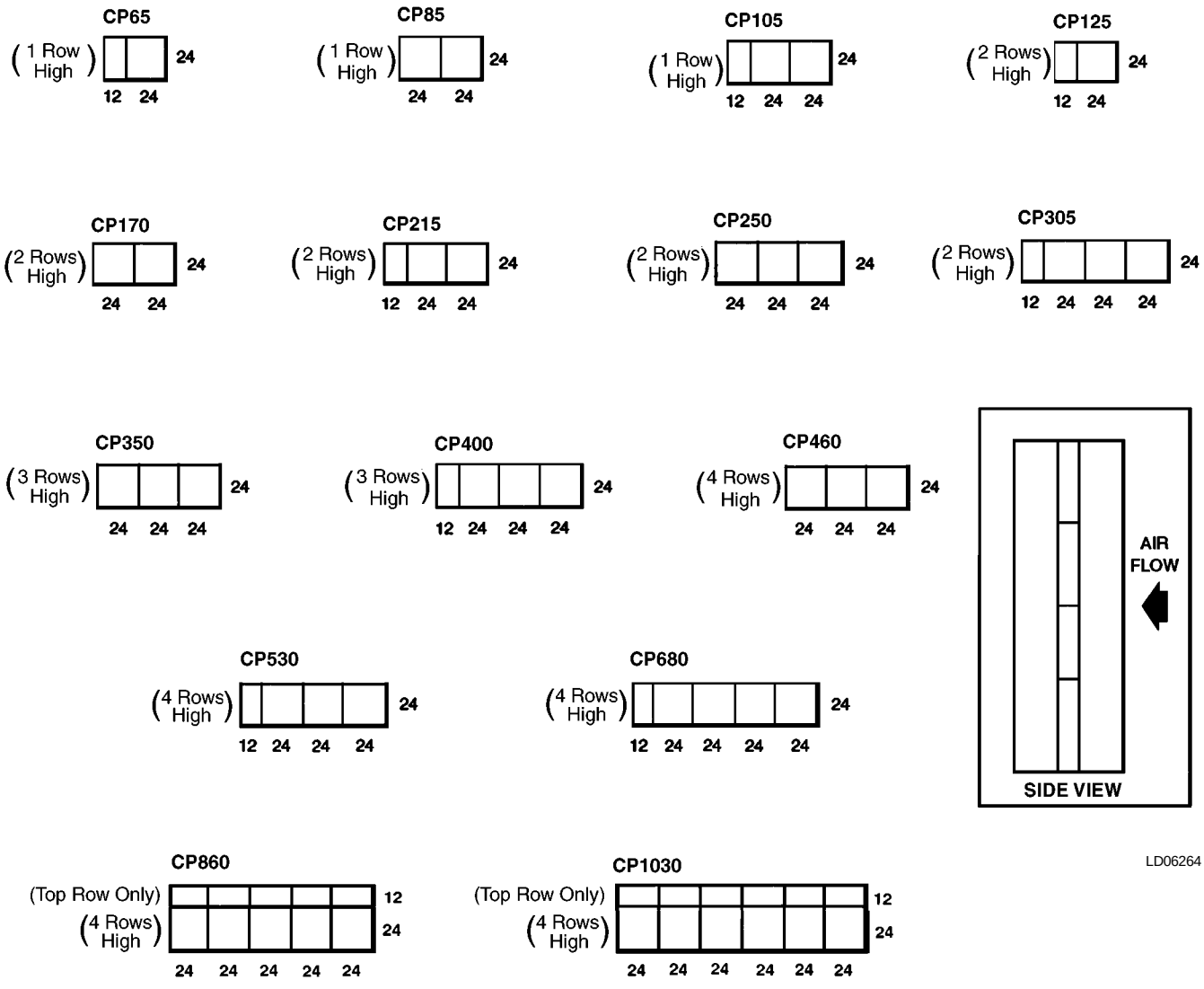

FIG. 54 – FILTERS FOR FF, RF, BF & HF SEGMENTS

TABLE 13 – FILTER SIZES AND QUANTITIES – ANGLE FILTERS

FILTER SIZES AND QUANTITIES PER UNIT SIZE

		UNIT SIZE														
		65	**85**	**105**	**125**	**170**	**215**	**250**	**305**	**350**	**400**	**460**	**530**	**680**	**860**	**1030**
Area (sq.ft.)		12	16	20	24	32	40	48	56	72	84	96	112	144	180	216
Filter Size	**12 x 24**	2	–	2	4	–	4	–	4	–	6	–	8	8	–	–
	24 X 24	2	4	4	4	8	8	12	12	18	18	24	24	32	45	54

NOTES: 1. See the filter configurations below for specific filter arrangements.
2. Filters are side-loaded.
3. The number in ( ) defines how many rows high with that particular filter pattern.

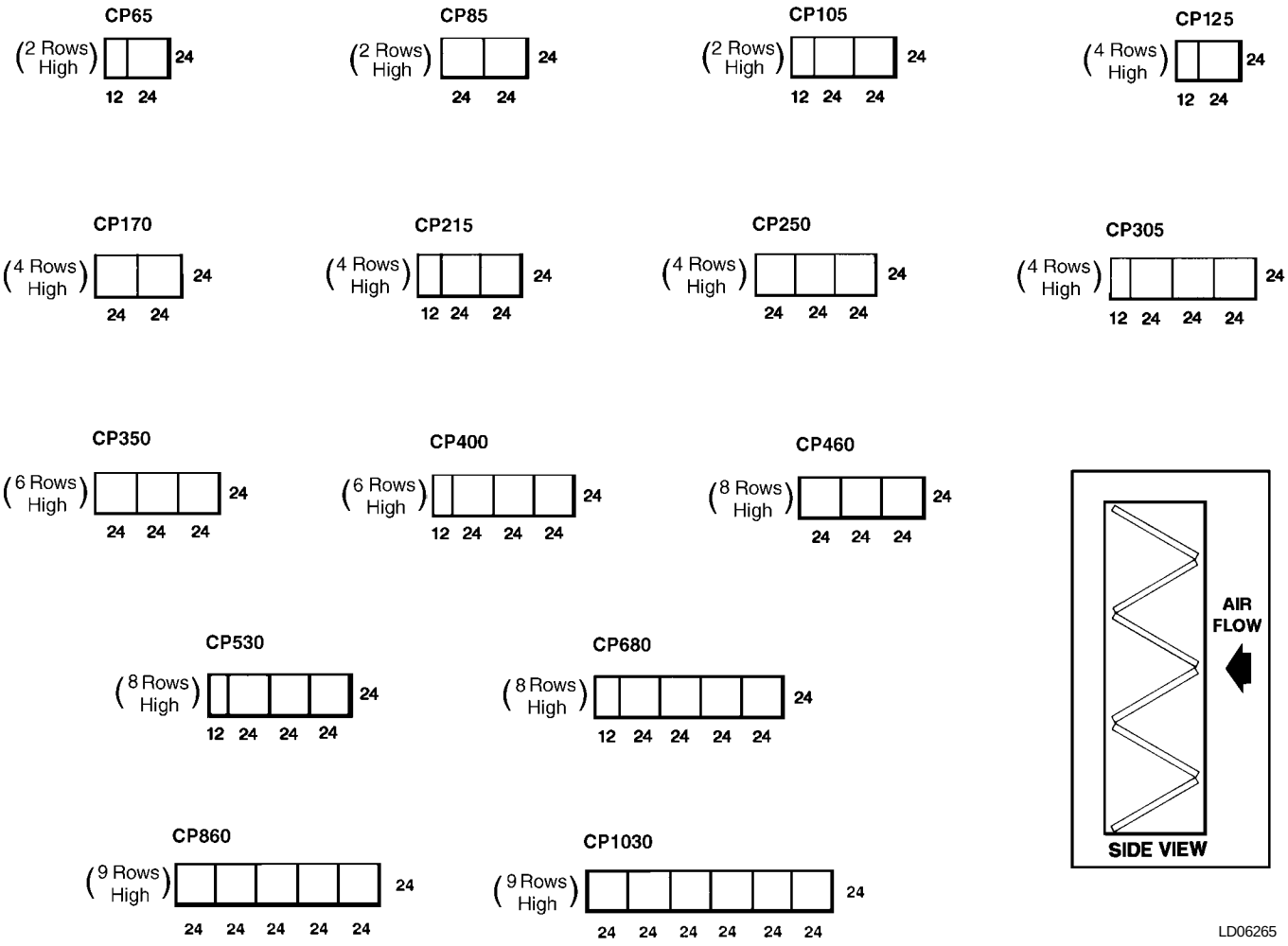

FIG. 55 – FILTERS FOR AF SEGMENT

TABLE 14 – FILTER SIZES AND QUANTITIES – 1 INCH TRAY CARBON FILTERS

FILTER SIZES AND QUANTITIES PER UNIT SIZE

		UNIT SIZE														
		65	**85**	**105**	**125**	**170**	**215**	**250**	**305**	**350**	**400**	**460**	**530**	**680**	**860**	**1030**
Area (sq.ft.)		72	96	120	144	192	240	288	336	432	504	576	672	864	960	1152
Filter Size	**12 x 24**	12	–	12	24	–	24	–	24	–	36	–	48	48	–	–
	24 X 24	12	24	24	24	48	48	72	72	108	108	144	144	192	240	288
Lbs Carbon		155	213	261	309	426	522	639	735	959	1103	1278	1470	1896	2130	2556

NOTES:
1. See the filter configurations below for specific filter arrangements.
2. Filters are side-loaded.
3. Avoid placing carbon filters in high humidity areas.
4. Optional 4" flat filters are available upstream.
5. The number in ( ) defines how many rows high with that particular filter pattern.

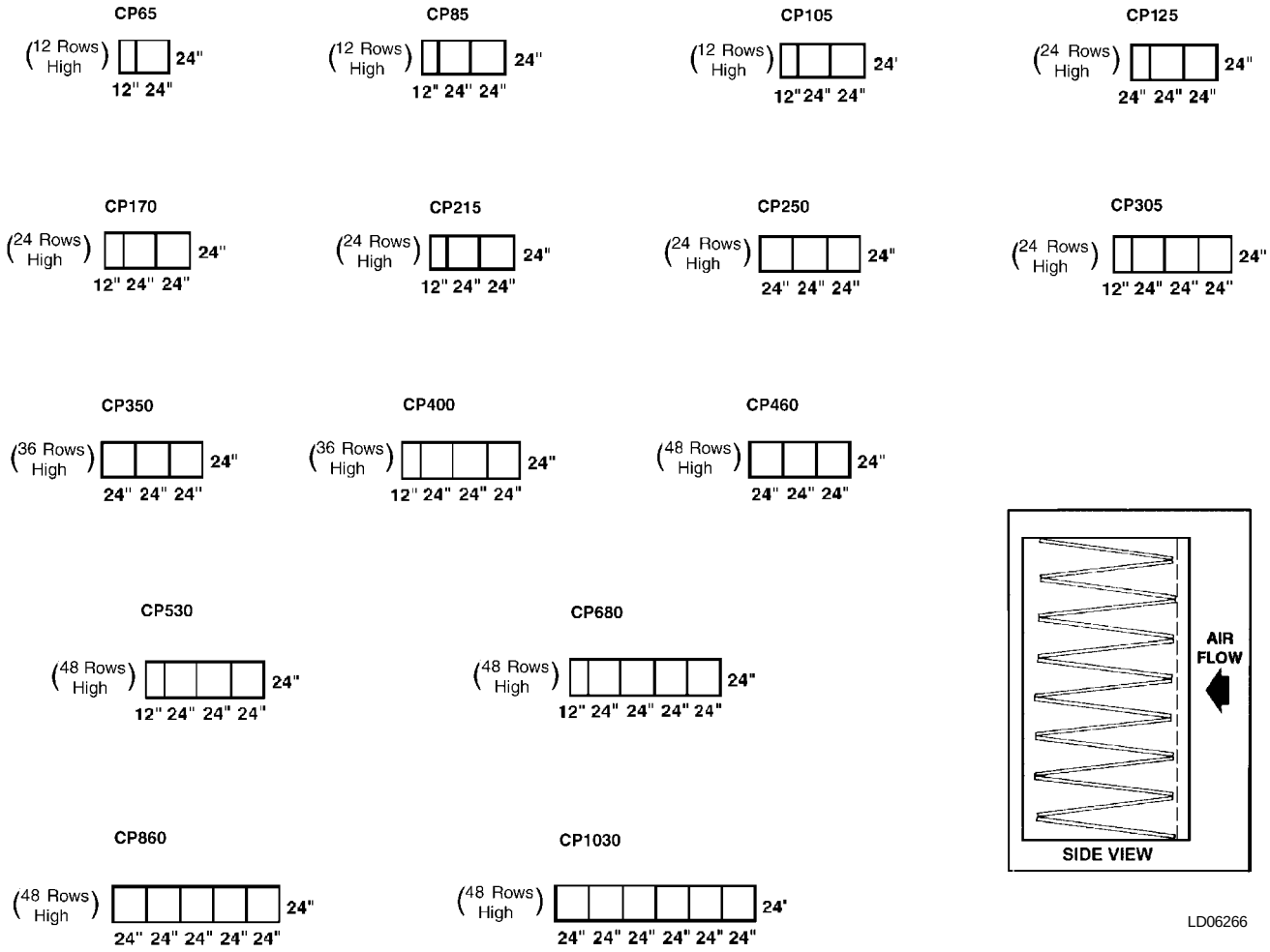

FIG. 56 – FILTERS FOR CF SEGMENT

GASKETED, MODULAR FILTER HOLDING FRAMES AND LATCHES

Universal Holding Frames

AAF 's Universal Holding Frames come in seven standard sizes that can be used individually or may be combined to fit virtually any size filter bank. Each frame includes a gasket to ensure a proper seal between the frame and filter to minimize dirty air bypass. Also included are AAF's unique holding latches designed to hold the filter in place and create a positive seal. The latches are easy to use, requiring only a simple twisting motion to release the filter.

Universal Holding Frames are constructed of galvanized steel. The frames are available in 304 stainless steel, and there is an aluminized steel version for high temperature applications. (Note: 304 stainless and aluminized steel frames are slightly different in appearance but are of the same high quality and durability as the galvanized steel models.) All frames feature holes on each side for bolting or riveting into filter banks.

Seven sizes are available: 24 x 24, 20 x 25, 20 x 20, 16 x 25, 16 x 20, 20 x 24, and 12 x 24. The 2-13/16" deep frame will support all standard combinations of pre and final filters.

High Temperature Applications

Filtration systems for paint curing ovens and other high temperature applications can be served using an aluminized steel Holding Frame constructed without a gasket. The aluminized steel frame will tolerate temperatures up to 900°F. The standard gasket is good for temperatures up to 140°F.

Filter Latches

AAF latches are available to hold a variety of filters and filter combinations, are replaceable, and specifically designed for upstream or downstream servicing. Each latch is annealed to music wire specifications after forming, and commercially zinc plated to provide years of service under varying environmental conditions. The Universal Holding Frame sides feature a unique retaining tab to hold the "L" Series latches. "L" Series latches do not connect to, or disturb, the flat sealing flange and gasket surface.

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NOTE: The Universal frames are constructed of galvanized steel. Also available in 304 stainless steel.

FIG. 57 – UNIVERSAL HOLDING FRAMES & LATCHES

The L-42 and L-44 latches, specifically designed for the VariCel® II filter in combination with prefilter, offer an additional advantage. The latch can be turned to release the prefilter while maintaining a pressure seal on the higher efficiency VariCel II filter.

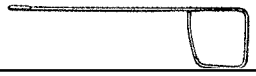
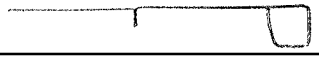
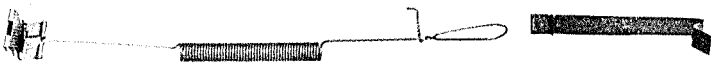
Conversion Latches

AAF sells "Knock On" latches to allow installation of all combinations of AAF filters in other manufacturers' filter holding frames.

Frame Bank Stiffeners

Vertical stiffeners are furnished with larger frame banks to ensure rigidity under normal operating conditions.

TABLE 15 – UNIVERSAL FRAME LATCH SELECTION

Final Filter	Prefilter	Service	Latch**	
1" Nominal or Header Filters DriPak	None	Upstream or Downstream	L-10	
VariCel* VariCel V BioCel* 5700 AmerFrame	2"	Upstream	L-30	
	4"	Upstream	L-50	
2" Nominal Filters AmAir 5700 Renu AmerFrame	None	Upstream or Downstream	L-20	
	2"	Upstream	L-40	
4" Nominal Filters VariCel II AmAir	None	Upstream or Downstream	L-40	
	2"	Upstream	L-42	
	4"	Upstream	L-44	
12" Nominal Filters DH VariCel DH BioCel	None	Upstream or Downstream	SL-12	
	2"	Upstream	SL-12 VP-2	
	4"	Upstream	SL-12 VP-4	

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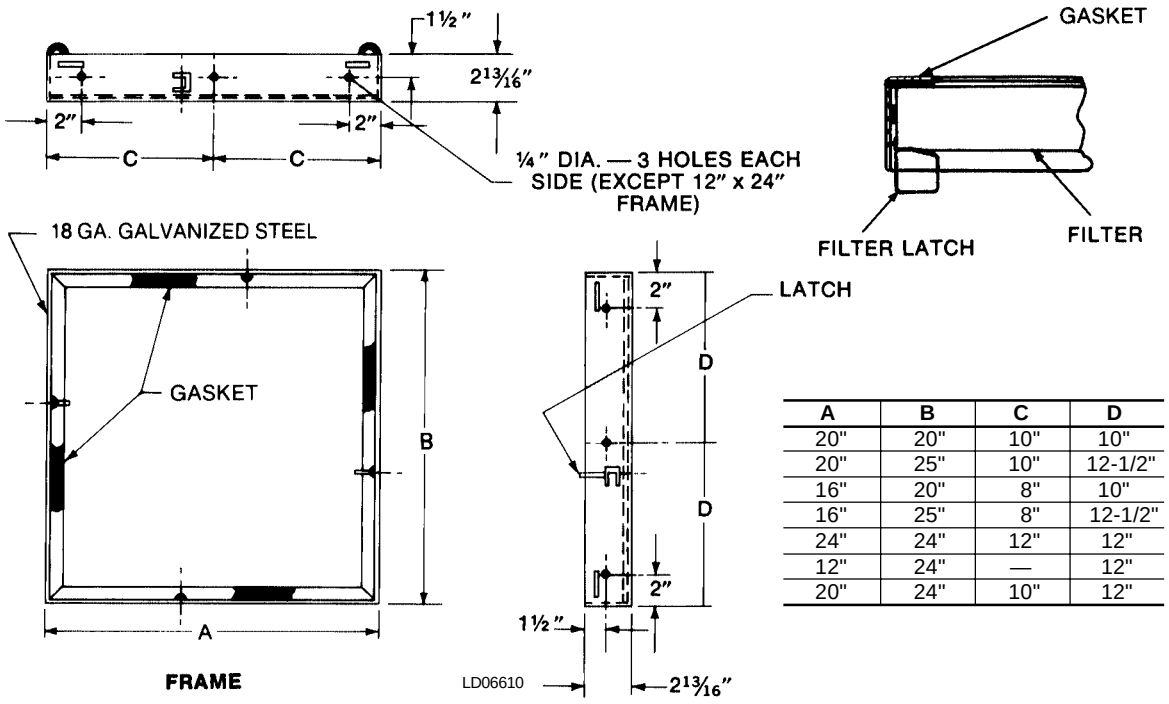
SPECIFICATIONS



A	B	C	D
20"	20"	10"	10"
20"	25"	10"	12-1/2"
16"	20"	8"	10"
16"	25"	8"	12-1/2"
24"	24"	12"	12"
12"	24"	—	12"
20"	24"	10"	12"

FIG. 57A – UNIVERSAL HOLDING FRAMES & LATCHES SPECIFICATIONS

WELDED BEVEL SEAL FRAME

Extruded Aluminum Frames for Gasketed HEPA Filter Installations

The patented Bevel Seal frame is a factory welded, extruded aluminum frame developed specifically for High Efficiency Particulate Air (HEPA) filter installations. The modular frames can be quickly bolted together in any combination. Bevel Seal frames are non-directional and can be installed with filter access from either the air entering or air leaving side. Standard Bevel Seal frames accommodate 24" x 24" gasketed HEPA filters in three thicknesses — 2-3/4", 5-7/8" and 11-1/2".

Frames are available for special size filters. The frames are designed to permit installation of adjacent filters at 3/4" intervals. This design feature maximizes the number of filters that can be installed in a given space and reduces resistance due to frame extrusions.

Two Stage gasket compression prevents leakage

The patented 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.

GASKET PROTECTION

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.

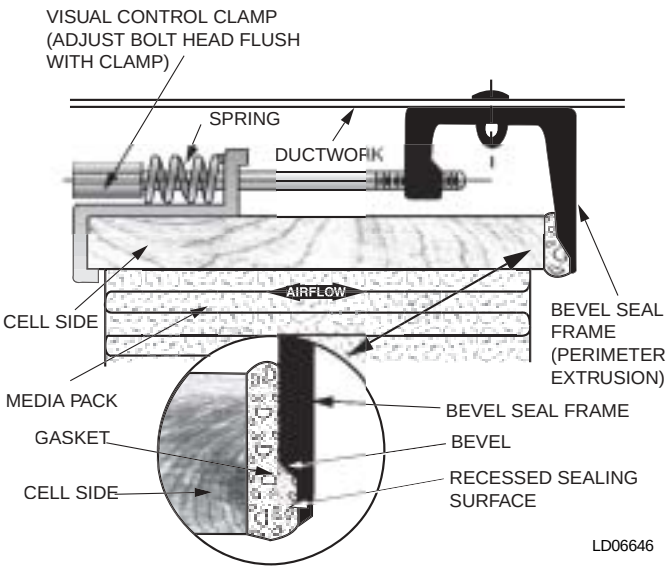


FIG. 59 – WELDED BEVEL SEAL FILTER INSTALLATION

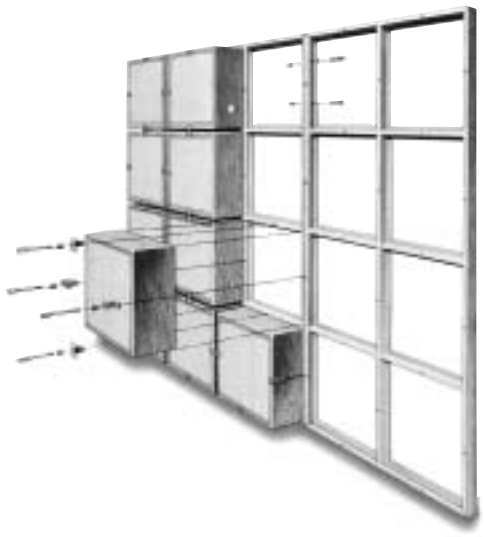


FIG. 58 – BEVEL SEAL EXTRUSION SECTIONS

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Sealing Integrity Assured

The bevel creates sealing integrity by providing a graduated compression of the sealing gasket. The outer edge of the gasket is compressed to a greater degree than the inner portion of the gasket. Having two levels of gasket compression ensures an effective seal will be achieved.

By preventing damage in the recessed sealing surface area, two stage compression
preserves sealing effectiveness should the cellular structure on the outer edge of the gasket be destroyed.

PATENTED VISUAL CONTROL FILTER CLAMPS

HEPA Filter Applications

AAF Visual Control clamps are designed to be used with any conventional gasketed HEPA filter. Located approximately two feet apart, 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.

BEVEL SEAL EXTRUSION SECTIONS

Rugged Construction

HEPA filter installations place great demands on the holding frames. The frames often span large areas, support many filters and accessories, and must be lightweight and easy to install. The frames must provide a barrier to particulate as efficient as the filters themselves.

Bevel Seal frames are constructed of 6063T5 alloy aluminum extrusions. The channel edge extrusion at the periphery of each frame is compatible for interfacing with walls, floors, ductwork and other frames.

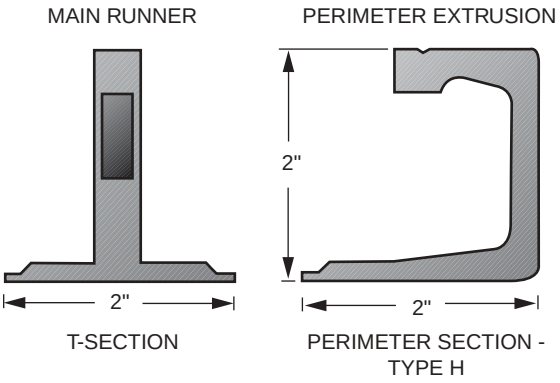

FIG. 60 – HEPA FILTER FRAME CROSS SECTION VIEW

VISUAL CONTROL FILTER CLAMPS

	2-3/4" - 3-3/4" - 4-3/4" ASTROCEL II	5-7/8" ASTROCEL I	11-1/2" ASTROCEL I
SINGLE FILTER CLAMPS (100# SPRING)	YELLOW	RED	RED
DOUBLE FILTER CLAMPS (100# SPRINGS	BLUE	SILVER	SILVER

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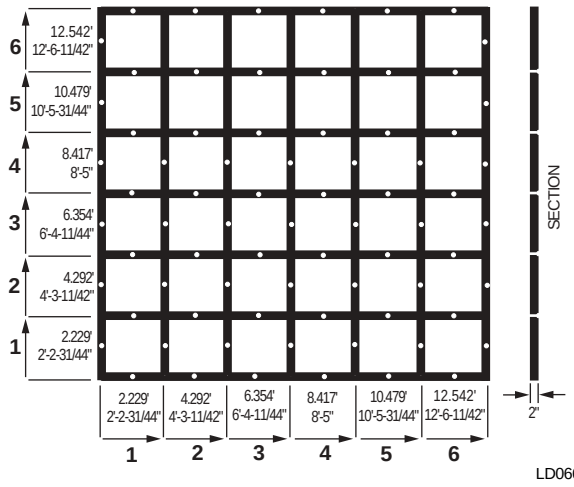
NOTE: The filter clamp springs are color coded to assure proper clamping pressure depending on filter thickness and clamp style.

DIMENSIONS: BEVEL SEAL FRAME BANK

(for 24" X 24" AstroCel HEPA Filters)



NOTE: Filter banks larger than four filters in both the height and width will be made in two sections. The overall height or width of the assembled bank will be 2" greater than indicated above; i.e., 6 x 6 bank would be 12'-6-1/2" x 12'-8-1/2".

FIG. 59A – WELDED BEVEL SEAL FRAME AND CLIPS

SERVICE

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 duct, dampers, heat exchangers, filters, sound traps, coils, elbows, registers, grilles, 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.

1. To produce sufficient pressure or head to accelerate the mass of air from a state of rest to the required velocity, and
2. To 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 61 & 62) 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 (Vp), static pressure (Sp), and total pressure (Tp) within the system.

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 62)

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 63)

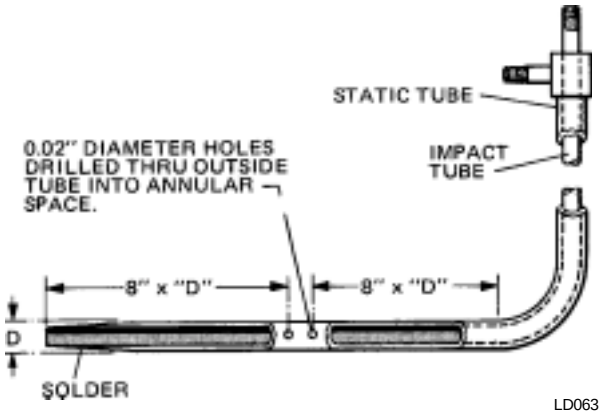


FIG. 61 – CONSTRUCTION OF PITOT TUBE

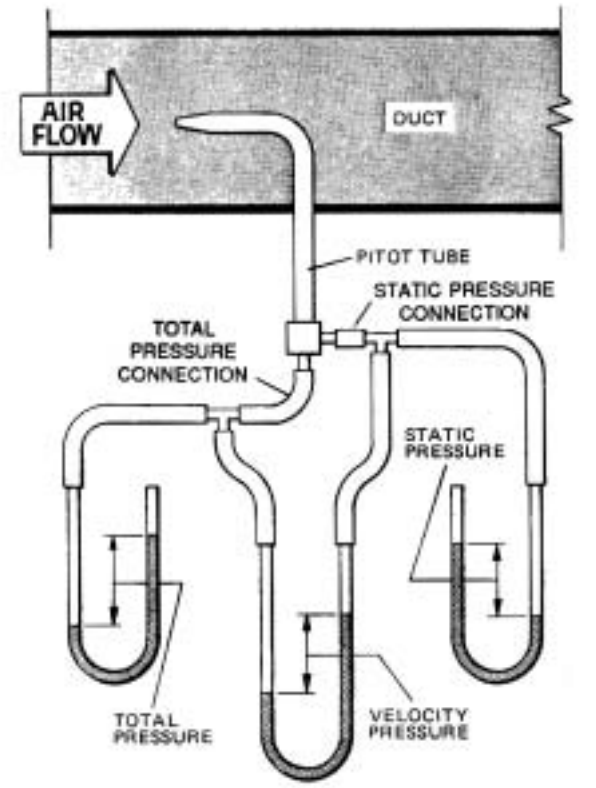


FIG. 62 – PITOT TUBE

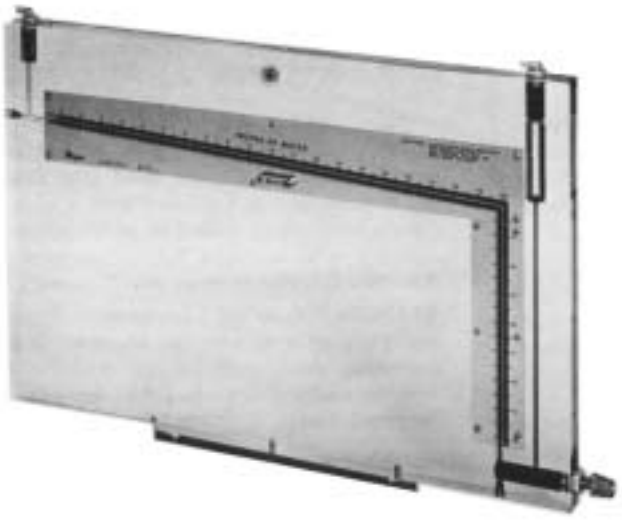


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FIG. 63 – INCLINED MANOMETER

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FIG. 64 – MAGNEHELIC PRESSURE GAUGE

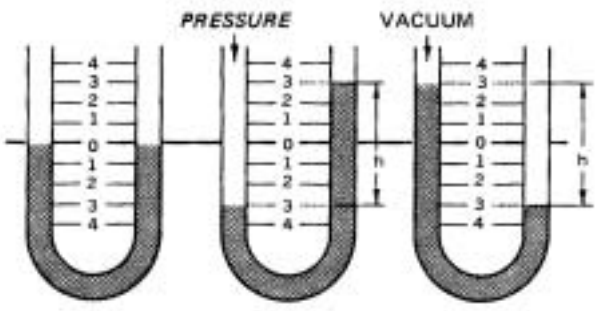

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FIG. 65 – "U" TUBE MANOMETERS

INCLINED MANOMETER

This instrument, also known as a draft gauge, 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 63)

MAGNEHELIC PRESSURE GAUGE

"Magnehelic" is not a generic term but is registered by Dwyer Instrument Company. The magnehelic gauge is a diaphragm-operated gage that has several advantages over a liquid manometer:

1. It need not be leveled to 0 and can be used easily on a ladder or unlevel surface.
2. When hooked up to the Pitot tube it need not be purged of air bubbles as the liquid manometer may.
3. There is less chance of parallax error in reading the dial face.
4. It is easily transported without the chance of losing the liquid charge. 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 64)

"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 65) 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

27928a

FIG. 66 – SLACK-TUBE MANOMETER

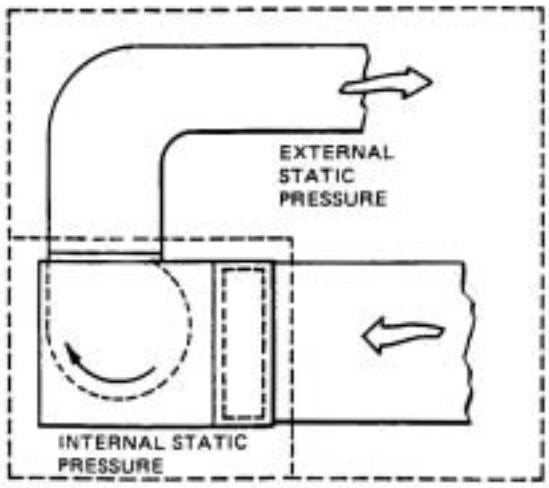

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FIG. 67 – STATIC PRESSURE - AIR SYSTEM

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.

The Dwyer Slack Tube Manometers are as accurate as the finest laboratory "U" gauges, and they are made to roll up compactly for easy carrying and to withstand rough usage. For use on all YORK air units, the manometers should cover at least a 26 inch range. (See Figure 66)

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:

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

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

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:

$$Vp = TP - Sp$$

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 pressure opening connected to

5

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 will 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 duct work is called external static pressure. (See Figure 67)

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

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 as a result of the design of the duct where the area changes. Some of the velocity energy is converted into static pressure energy in the continuing duct work. This conversion of velocity energy to static pressure is called static regain.

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

1. YORK Order No.
2. Job name (not contractor)
3. Unit Model No.
4. Customer's Unit Identification
5. Design Data and Actual Data
   A. Fan RPM
   B. Unit SP (Across Fan)
   C. Unit CFM
   D. Pressure Drop of Water Across Cooling Coil (PSIG)
   E. Air Pressure Drop Across Cooling Coil (inches of Water)
   F. Temperature Differential Across Cooling Coil
   G. Motor Voltage
   H. Motor Amperes
6. For Fan or Motor RPM (Use a Tachometer, Stroboscope or Revolution Counter)
7. The Voltage and Amperes can be obtained by using the appropriate multimeter test device.
8. A sketch of the Duct Configuration would assist us in trying to resolve the problem.
9. The most important item is to provide a detailed explanation of the problem.
10. An orifice is the best method of measuring flow in piping. This is also true in an air system and is the reason for step 5D.

For further assistance in troubleshooting the air unit, refer to the troubleshooting charts on the following pages.

TROUBLESHOOTING

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, 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	Ductwork 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.
	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 ductwork. Install proper ductwork transitions.
	Turning vanes loose or not properly installed. Tighten and / or reinstall as required.
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 ductwork or remove restrictions to match design requirements.

CFM LOWER THAN REQUIRED	Dampers closed and / or splitter rod disconnected. Open dampers and connect splitter rod.
	Registers closed. Open registers.
	Fire damper(s) closed. Open fire damper(s).
	Insulating duct liner loose. Reattach loose duct liner.
	Leaks in supply ducts caused by open seams or holes in ductwork. 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 ductwork. 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.
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 OIDP 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°C. 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.
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.
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 WET COOLING 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.
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 – See Page 22
	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” page 41.
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.

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www.york.com

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