INTRODUCTION

GENERAL

This manual has been prepared as a guide for installing, operating, and maintaining AirPak 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 words: *NOTE, CAUTION,* and *WARNING.* Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and / or equipment damage may result if installation, operation and maintenance procedures are not handled properly.

DESCRIPTION

The YORK AirPak introduces a new level of quality, flexibility and serviceability to the HVAC industry. See Figure 1.

QUALITY

Double wall panels are insulated with a full 2 inches of insulation. Solid or perforated lining is available as an option throughout the unit to meet a variety of applications.

The AirPak coil (IAQ) drain pan is designed to meet the intent of Indoor Air Quality (IAQ) requirements. The pan is 4" deep with a V-shaped design that minimizes standard condensate. The pan is fully insulated with a minimum of 2" to give the pan the thermal protection it requires.

FLEXIBILITY

For maximum flexibility, the AirPak is based on a segmented design concept. The unit construction is unitized, built as a single unit, for greater unit integrity. The unit may be split per customer defined needs if required, to meet various shipping and job site requirements.

SERVICEABILITY

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

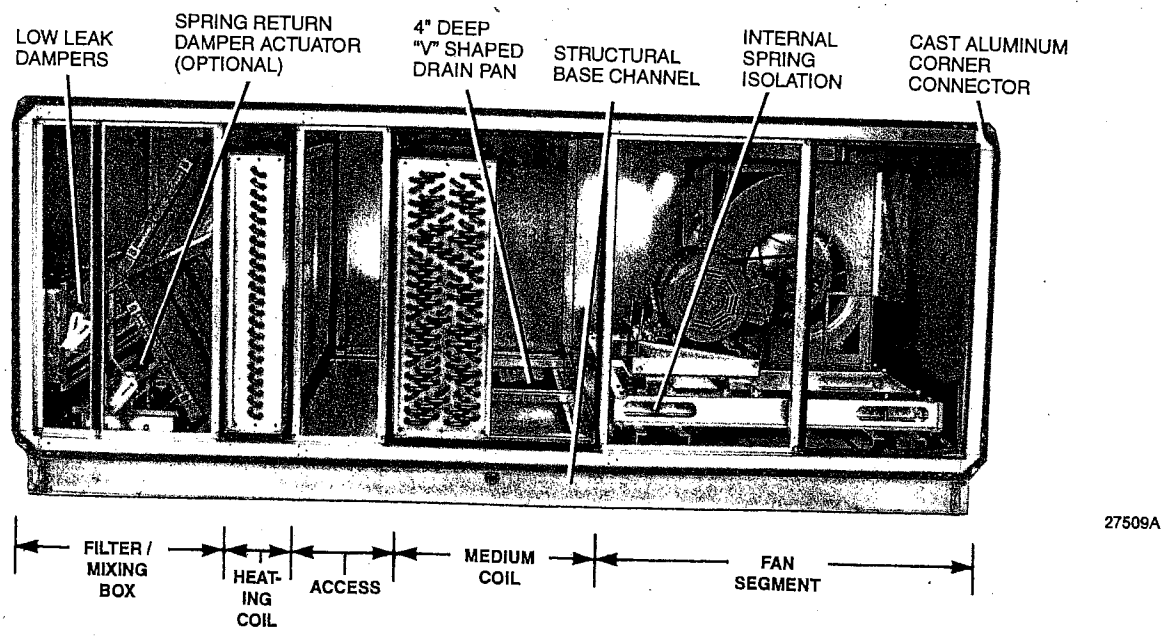


FIG. 1 – AIRPAK WITH PANELS REMOVED

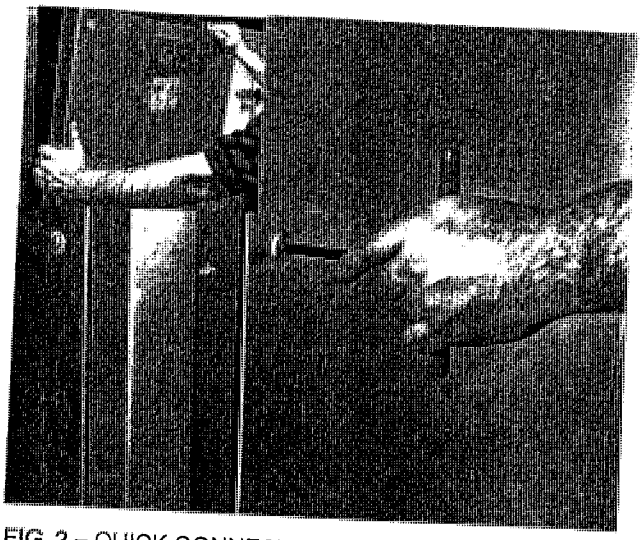


FIG. 2 – QUICK CONNECT FASTENER (OPTIONAL)

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

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

OPTIONS

QUICK CONNECT FASTENER (OPTIONAL)

The Quick Connect Fastener is the key to the panel removal system. The latch is operable with a simple 5/16" hex wrench. The motion of the latch is 180 degrees. The first 90 degrees moves the lever arm to a sealing position on the frame and the second 90 degrees pulls the latch snug, creating the panel seal. See Figure 2.

Panels are normally secured with screws.

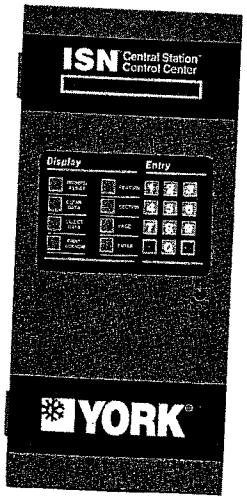


FIG. 3 – ISN CONTROL CENTER

FACTORY PACKAGED CONTROLS (OPTIONAL)

The factory supplied AirPak control center includes power supplies, actuators (including valve actuators) and transducers that are provided as part of the air handling unit See Figure 3.

The AirPak control center is suitable for anticipated ambient conditions (NEMA 1 Enclosure) -20°C to 70°C (or with optional heater -40°C to 70°C).

The complete control system may include the following auxiliary control devices, factory mounted and wired, where applicable: damper actuators, temperature sensors, differential pressure transmitters, differential pressure switches, low limit thermostats, control valves and actuators. Control valve junction box shall be factory mounted. Control valve leads are factory marked to match terminal strip in the junction box. However, all control valves are shipped loose for field installation.

All wiring to the units must comply with national and local electrical codes. The installer shall furnish all wiring and a fused disconnect switch must, for safety reasons, be installed within sight of the unit.

The units system may contain factory mounted, wired, adjusted and tested controls required to operate and protect the unit. The control panel is a microprocessor based electronic-type providing accurate control. The panel operates on a 115-1-60 voltage with the optional capability of displaying diagnostic indicators such as:

- Power ON
- Heat ON
- No Air Flow
- Dirty Filter
- Supply Fan ON

The panel also includes safety cut-outs, malfunction alarm and optional freezestat control. The unit is capable of being remotely monitored by an optional hand held digital display monitor. The control system includes the following safety controls:

Control Devices

All control devices except control valves, space temperature sensor, and the outdoor air temperature sensor, (only if no outdoor air damper section is provided) are factory installed and wired in accordance with NEC codes. All control wiring Class II. Wiring is contained in the integral unit framing members.

Wiring and Power Supplies

Control panel wiring and power supplies are complete except for 120 VAC power wiring by electrical contractor and remote mounted devices. Wires crossing shipping splits are shipped loose with numbered plug in connectors for easy field connection.

Kits are provided for field installation of static pressure pickup for space static, outdoor air static and remote duct static required for the control application. Kits include probe appropriate mounting hardware. One quarter inch fire PVC tubing or equivalent should be provided (mechanical) contractor.

Temperature Sensors

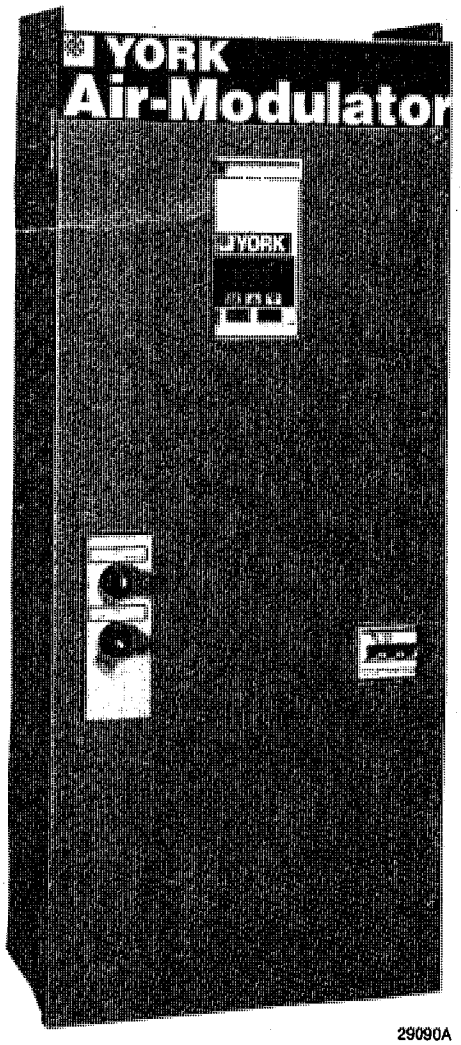
Four wire space temperature sensors will be provided by the factory for field installation by (electrical) contractor. Two 24 VAC power wires and (2) 0-10 VDC control wires should be run to each valve actuator from the terminal strip provided in the control panel.

Valve Actuators

Valve actuators should be field wired by (electrical) contractor. Two 24 VAC power wires and (2) 0-10 VDC control wires should be run to each sensor from the terminal strip provided in the control panel.

INTEGRATED SYSTEMS NETWORK

The YORK Integrated Systems Network (ISN) is the complete integration of air side, chiller, and building automation controls. YORK Factory-Packaged Controls make it easy to upgrade from a group of air handling units operating individually to an ISN airside system, with all the units operating in concert. That's because each unit is able to share information with all the other units on the network.



29090A

FIG. 4 – AIR-MODULATOR

STAND-ALONE OR NETWORK CONTROL

YORK Factory-Packaged Controls offer you the flexibility of stand-alone or network control. Each unit has an integral time clock and a full-featured array of optimization and diagnostic function. Included with the controls is the capability to tie into a YORK Integrated Systems Network (ISN). For further information, see Form 450.11-EG1 and 450.11-NO1.

VARIABLE FREQUENCY DRIVE

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 relationship between fan speed and fan horsepower. With the Air-Modulator, any given 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! See Figure 4. The minimum fan speed will vary with the fan selection and controls scheme.

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 which results 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 control shaft which extends to the outside of the fan. See Figures 5 and 6.

RECEIVING

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

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.

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.

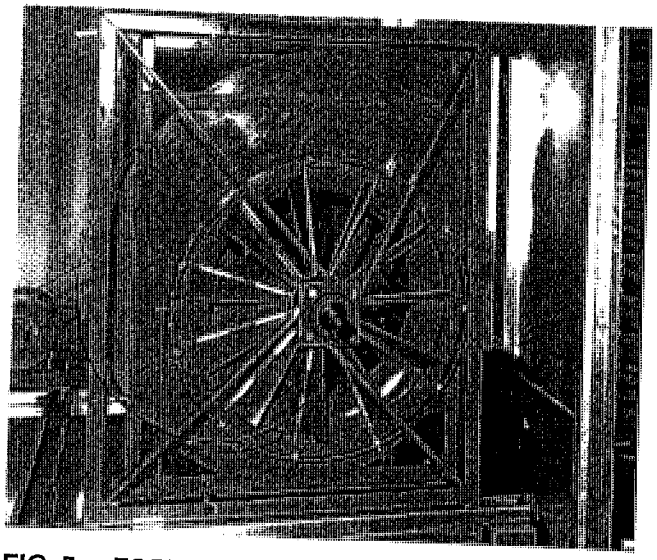


FIG. 5 – FORWARD CURVED FAN WITH VARIABLE INLET VANES

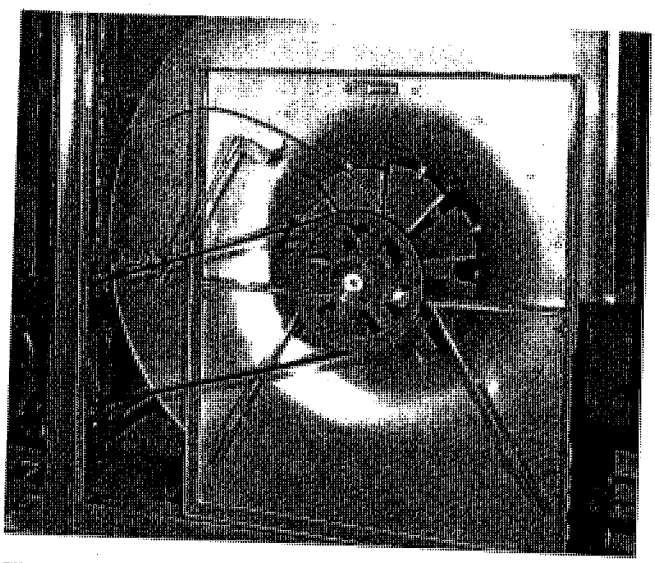


FIG. 6 – AIRFOIL FAN WITH VARIABLE INLET VANES

NOMENCLATURE

AIR FLOW

AP – 120 – FS – 15 x 11 – (AF) (MB)

Unit Type

AP - AirPak

Unit Size

35	305
60	360
80	400
105	500
120	580
150	660
170	800
215	1000
250	

Fan Segment

FS - Supply Fan (Standard)
FS II - Supply Fan (Class II)

FE - Exhaust Fan (Standard)
FE II - Exhaust Fan (Class II)

FR - Return Fan (Standard)
FR II - Return Fan (Class II)

FP - Plenum Fan (Standard)
FP II - Plenum Fan (Class II)

Accessories

AB - Air Blender
AF - Angle Filter (2" & 4")
AT - Attenuator (3', 5', 7')
BF - Bag Filter (21" & 32")
CF - Carbon Filter
DI - Diffuser
DP - Discharge Plenum
EB - External Face & Bypass
EE - Economizer
EF - Filter / Economizer
EH - Electric Heat (24" & 36")
FD - Face Damper
FF - Flat Filter (2" & 4")
FM - Filter / Mixing Box (2" & 4")
HC - Heating Coil (8")
HF - HEPA Filter
IB - Internal Face & Bypass
IC - Integral Face & Bypass
IO - Inlet / Outlet
LA - Long Access (24")
LC - Long Coil
MA - Medium Access (18")
MB - Mixing Box
MC - Medium Coil
MZ - Multi-Zone
OF - Open Return Filter (2" & 4")
RF - Rigid Filter (12")
SA - Short Access (12")
SC - Short Coil
VC - Vertical Coil (20")
VP - Vertical Plenum
XC - Extra-Long Coil (36")

Fan Size

FC Fans		AF Fans		SWSI Plenum Fans	
9 x 4	20 x 15	13	24	20	40
9 x 6	20 x 18	15	27	24	44
10 x 7	22 x 20	16	30	27	49
10 x 10	25 x 22	18	33	30	54
12 x 12	27 x 25	20	36	33	60
15 x 11	30 x 27	22	40	36	66
15 x 15	30 x 30		44		
18 x 18	33 x 33				

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 stored out of doors, prior to installation within the building, special care should be taken to cover and protect the units from dust, rain, snow, and rodents. The units should be protected from constant exposure to rain and snow.

CAUTION: 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 unit distortion.
3. The unit must also be protected when setting on floor level to prevent 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 the 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.**

NOTE: Long-term storage compliance records must be available to YORK should a failure occur during the warranty period. The standard warranty of 12 months from start-up, but not to exceed 18 months from date of shipment applies. However, start-up and first operation after long-term storage must occur within 24 months from the date of shipment for warranty to apply. (Refer to Warranty, Form 50.05-NM2).

NOTE: Failure to perform the long-term storage requirements and properly log these required procedures 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.

WARNING: 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.

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

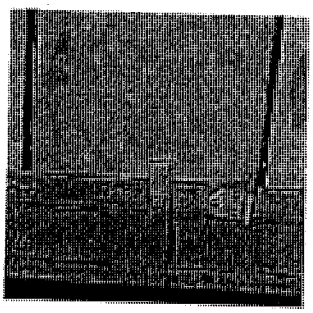
VARNING: If an optional Smoke/Fire Damper is provided, Safety Controls must be provided to stop the fan and prevent pressure build-up (over pressurization).

WARNING: NEVER attempt to open a unit door while the unit is in operation.

DOOR STOP – Positive pressure segments are equipped with a "Positive Pressure Door Stop". The door stop prevents the access door from swinging outward when opened during positive pressure applications.

The Door Stop operates as follows:

- User opens door latches on the positive pressure door.
- Door stop limits the movement of the door.
- Some pressure is relieved and the user should now be further aware that the door is under positive pressure.
- User moves the door stop with their foot (to the parallel position) and the door is allowed to open. The door stop swings like a pendulum and always returns to the perpendicular position.
- The door stop must be moved to the parallel position to close the door.
- The door latch returns to its original perpendicular position. (as seen in photo)



NOTE: The Positive pressure door stop is required for the safety of service personnel. Do not remove from the unit.

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.

INSTALLATION

LOCATION

The floor and foundation on which the units are to be located should be rigid, flat and level. The structure should be capable of supporting the weight of the unit including the water or refrigerant within the coils. Add shims if necessary to level the unit due to variations in the floor. Acoustical treatment of the area around the units should be according to good engineering practice as related to the immediate surroundings.

CLEARANCES

Allow sufficient clearance area around the unit for removing the access panels and various parts of the unit. A minimum clearance equal to the width of the unit is recommended on one side of the unit for removing the coil or fan assembly.

RIGGING

AirPak units are shipped on skids with segments bolted together as determined by truck or rail size limitations. Figure 7 illustrates the proper rigging to be used in moving the units. Check the nameplate on the unit to determine the complete model number. Refer to the nomenclature and the unit submittals to figure the approximate rigging weights. Operating weights plus safety factors must be included in accordance with good design practice. Straps or chains should be sized to carry the weight being handled.

The straps and / or chains should be fastened through the lifting lugs located at the bottom of the unit. All lifting lugs must be used to lift and rig the unit. The lifting lugs along with the use of spreader bars help to distribute the weight evenly.

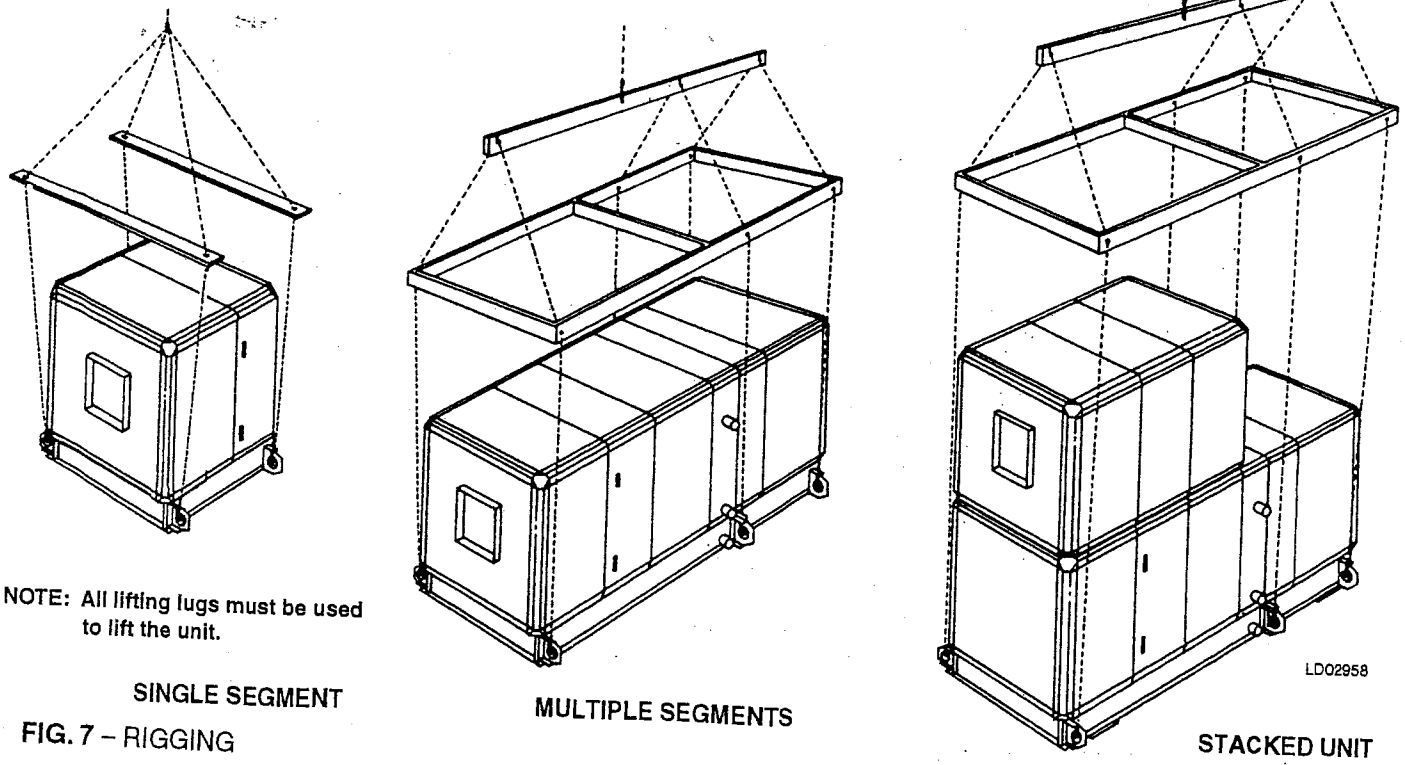
Care should be used in lifting the units. Lifting cables should not be attached to the top of the unit or damage may occur as well as create a hazard to those handling the unit.

WARNING: It is important not to drop the units. To do so may permanently damage the ball bearings, fan shaft, or loosen the coils from the mountings.

The skids and the protective coverings over the duct openings should not be removed until the units are located in the area of installation. It is imperative that the coverings over the openings remain in place until just prior to the time when the duct work is connected to the unit or until the mating sections are joined.

PRE-ASSEMBLY PLANNING PRIOR TO UNIT ARRIVAL

AirPak units must be placed on a level, flat floor that can support the weight of the unit (with coils full of water or refrigeration). The location of the units must be accessible and allow for movement of sections through doorways and / or wall openings.



NOTE: **All lifting lugs must be used to lift the unit.**

SINGLE SEGMENT

MULTIPLE SEGMENTS

STACKED UNIT

FIG. 7 – RIGGING

ASSEMBLY OF UNITS

One of the most critical operations in the construction of an air handling unit is the jobsite assembly of segments that must be shipped separately. Segments are identified as types (eg. FS-SA) and numbered (1 of 4, 2 of 4, etc.) and are assembled in order. Check each section data plate for this information.

Remove the plastic shipping covers and angles (used for supporting open segments during shipment) before attempting to reattach each segment. Each segment is mated together by attaching the bottom and top raceways together using the "splice connectors" and the 3/8" hex head bolts which are provided in the loose hardware package. See Figure 8.

Assemble the segments as per the following:

1. Set the 1st segment in place.
2. Loosen or remove panels at the end of the segments to be joined.
3. Move the 2nd segment close to the 1st. Use a fork truck to push the segment or use pipe to roll the 2nd segment close to the first.
4. Use a come-along by attaching to the lifting lugs provided at the bottom of each segment.
5. Check that the bottom splice connectors on the 1st segment are aligned with the bottom raceway of the 2nd.

   NOTE: The top splice connectors are shorter than the bottom, allowing the bottom to mate first.

6. Pull the 2nd segment to the 1st using the come-along until the splice connectors mate.

   NOTE: Bend the end tabs of the splice connectors inward; this will make up for a slight misalignment.

7. Check that the splice connectors on the top of the 1st segment is aligned with the top raceway of the 2nd.

   NOTE: Larger units may require top panel support in the center; a 2 x 4 placed inside the unit will hold the panel up and out of the way.

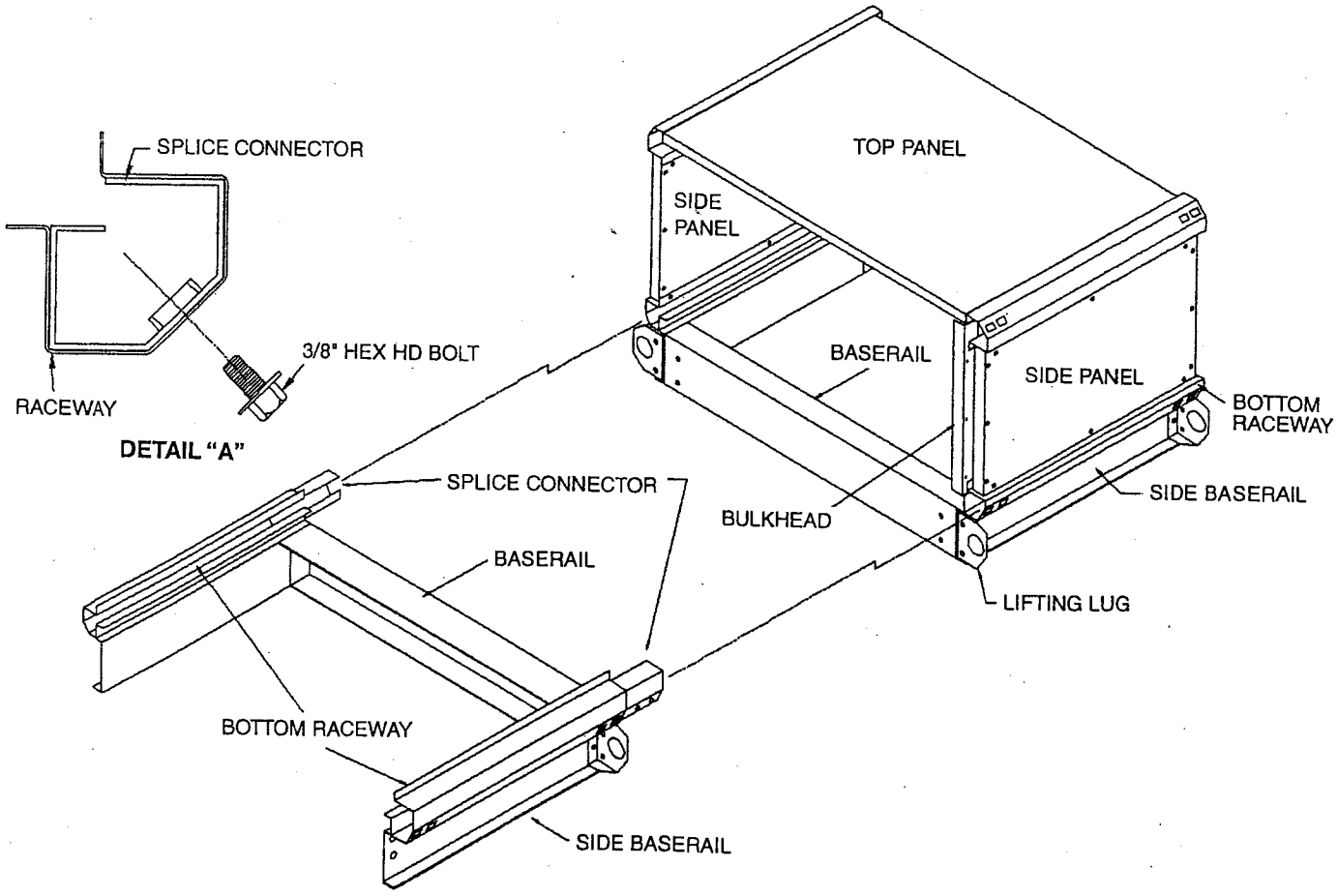


FIG. 8 – FIELD SEGMENT ASSEMBLY

8. Complete the pull of the 1st and 2nd segments together, aligning the holes on the raceway; attach using the 3/8" bolts provided to complete the attachment.

CAUTION: Be careful not to damage factory installed gasketing.

9. Reinstall loose panels.

10. Repeat steps 2 thru 9 for 3rd, 4th , etc. segments (see Figure 9 for complete assembly view).

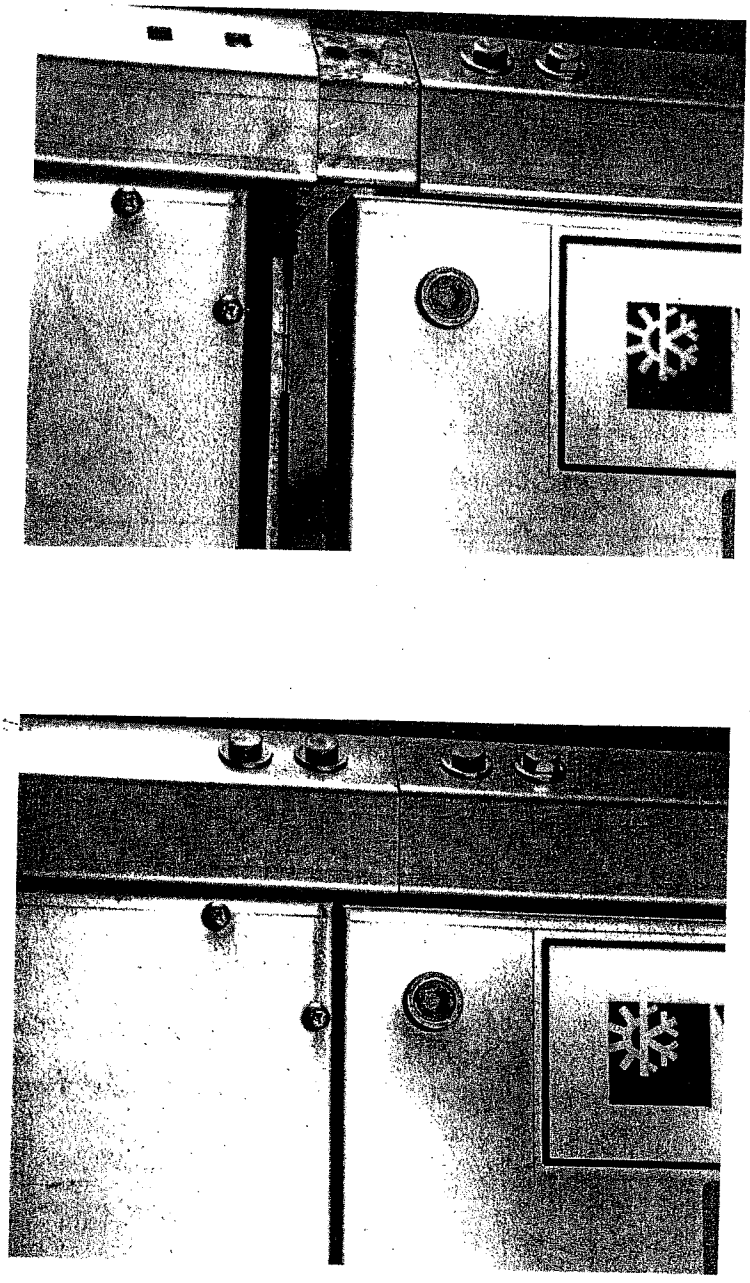


FIG. 9 – PANEL SEGMENT ASSEMBLY

REMOVING SHIPPING TIE-DOWNS

AirPaks are held down during shipment with 2 bolts at each corner. See Figure 10.

CAUTION: The tie-down bolts, nuts, etc. must be removed completely to release the isolators before the units are operated.

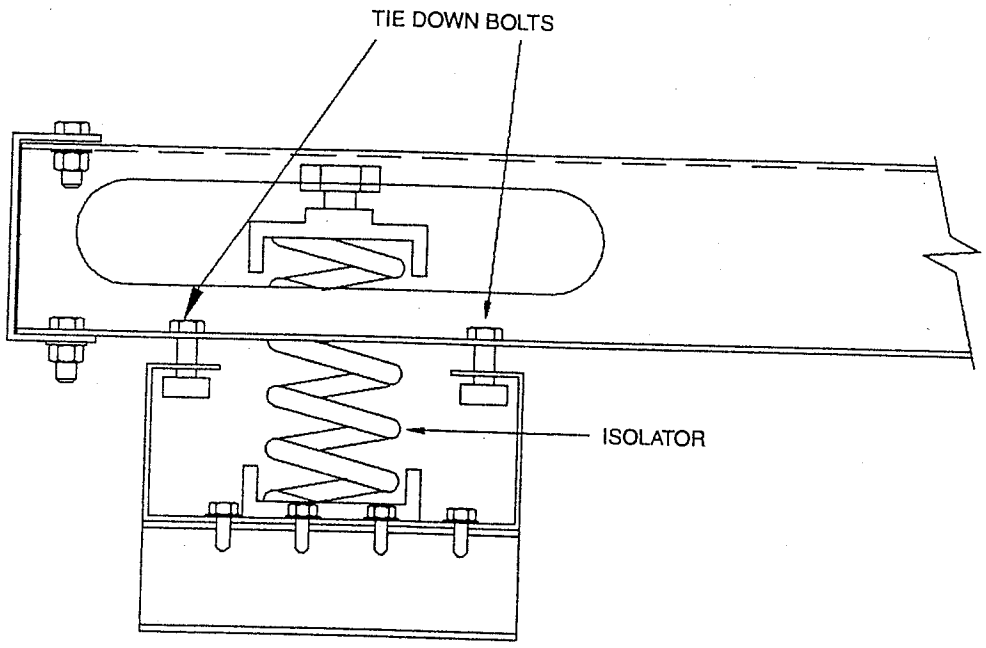


FIG. 10 – FAN AND MOTOR ISOLATOR SUPPORT FRAME

ISOLATOR ADJUSTMENT

Check blower and motor frame for correct height and that the frame is level. If not, adjust as described below.

To adjust isolators: Refer to Figure 11. First loosen cap screw on top of adjustment bolt. Second, turn adjustment bolt to raise or lower the unit frame. Third, check the operational height and levelness of the frame. Repeat this procedure until operational height and frame is level. Re-tighten the cap screw on the top of adjusting bolt.

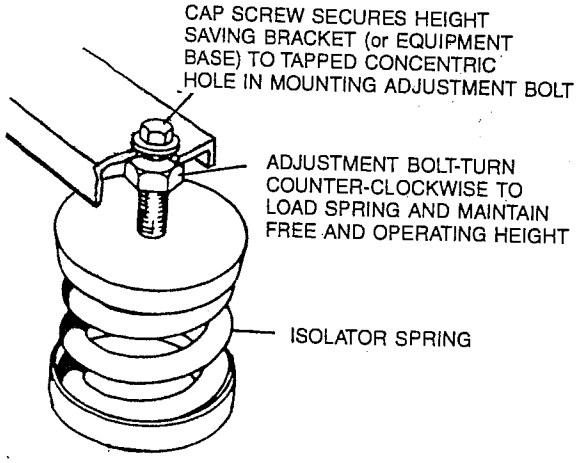


FIG. 11 – SPRING ISOLATOR

SEISMIC SNUBBER

Figure 12 shows seismic snubber restraint option on fan and motor isolator support frame.

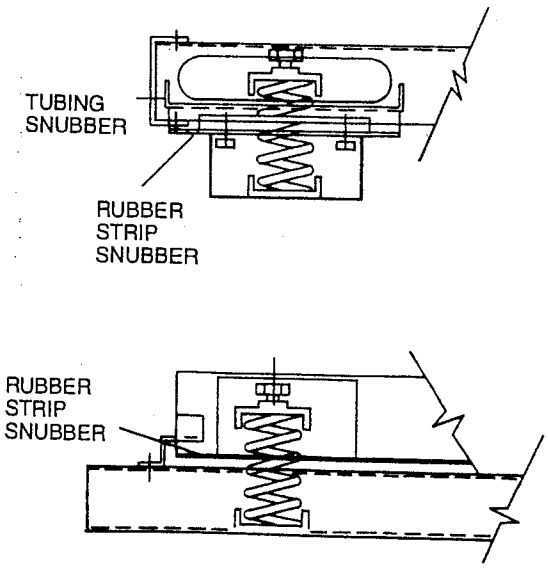


FIG. 12 – SEISMIC SNUBBER

THRUST RESTRAINT

Fan segments are cabinets containing a fan and motor. They can develop extremely high thrusts that are equal to the suction area proportional to TSP multiplied by the negative head plus the positive pressure multiplied by the discharge area. These forces act horizontally opposite to the air flow. Thrust restraints are provided for all fans when the air thrust exceeds 15% of the equipment weight when the fan discharge is rear. See Figure 13. Any other fan orientation does not require restraints due to one of several reasons:

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

Note for Rear Discharge Orientation

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

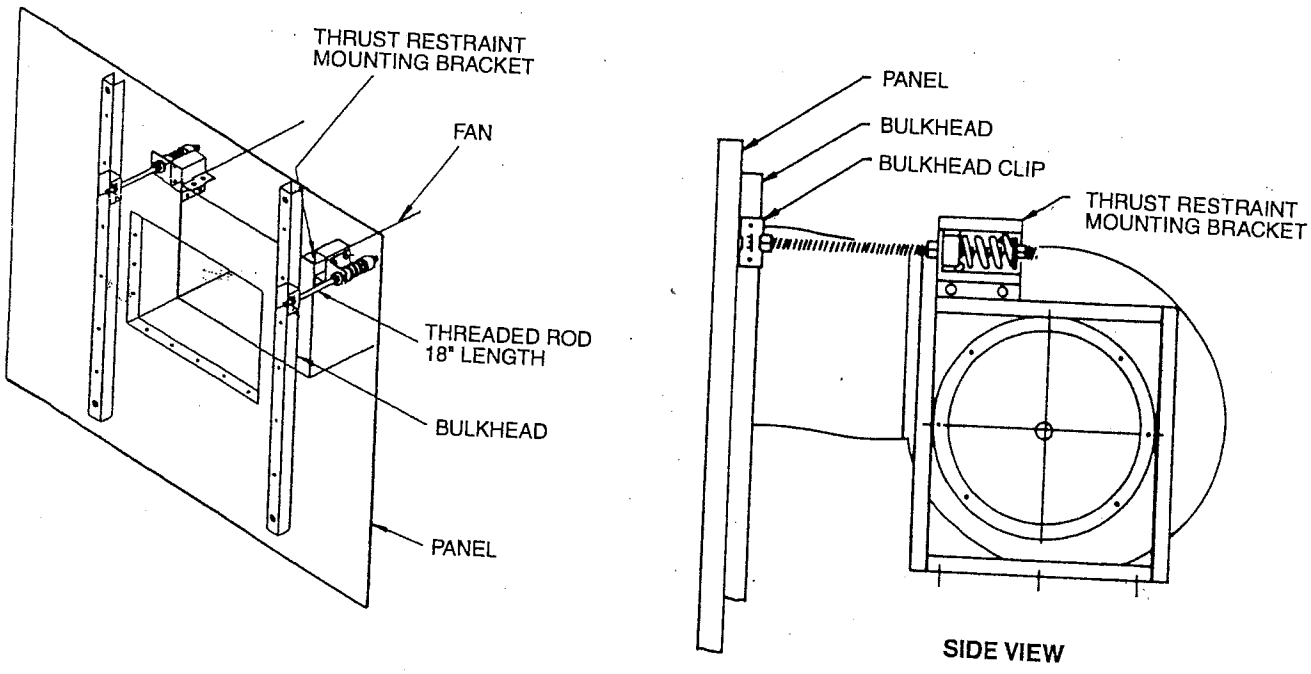


FIG. 13 – SUPPLY FAN THRUST RESTRAINT

CEILING SUSPENDED UNITS

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

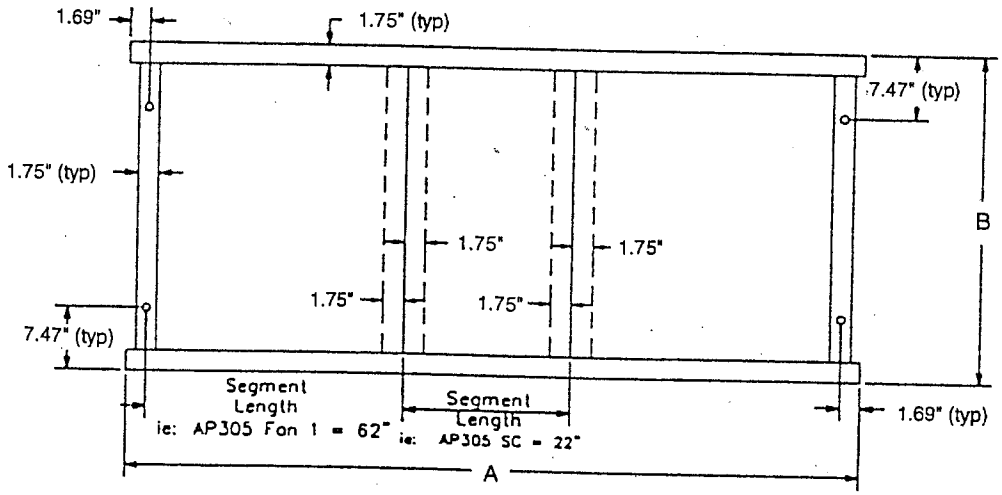
1. Never use the unit lifting lugs for field suspension.
2. Support units from the bottom of the base rail. Never from top of unit.
3. Units can be supported with structure positioned in the direction of airflow and/or perpendicular to the direction of airflow (see Figure 14).
4. All unit weights are "shipping weights" (not operating weights) and should be considered "approximate". Operating weights + safety factors must be included in accordance with good design practice.
5. Considerations must be made for operating conditions (thrust loads, etc.).
6. Suitable safety factors must be used.
7. These recommendations are NO SUBSTITUTE for a design professional.
8. Field located supports should not conflict with doors and coil connections.

Structure Positioned Perpendicular to Airflow – The units must be supported (at a minimum) in the following locations:

- Both ends.
- At each shipping split.
- Upstream and downstream of each cooling coil segment.
- The maximum distance between supports must be less than 6 feet.
- All supports should run the entire width of the unit.

Structure Positioned in the Direction of Airflow – The unit base must be supported continuously, on both sides of the unit.

BASE RAIL DETAIL



PLAN VIEW

A = [Total Unit Length minus 2.625"]

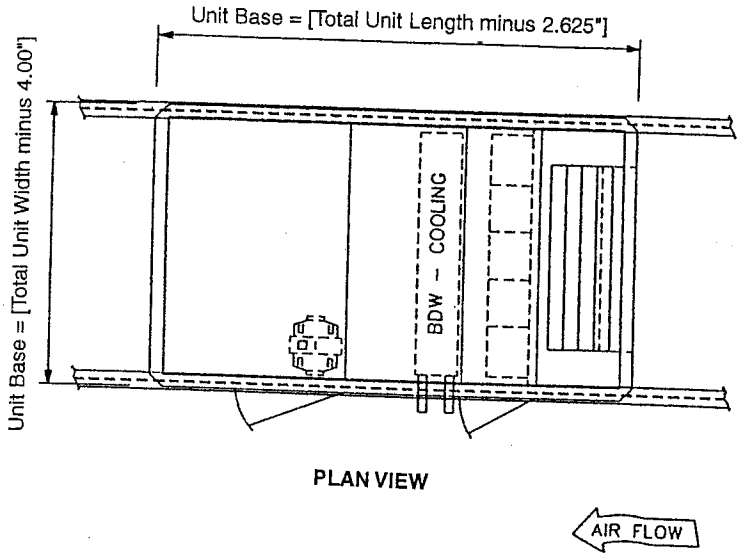
B = [Total Unit Width minus 4.00"]

NOTE: Intermediate baserails will be located on the centerline of all shipping splits and both sides of any of the following segments:

SC – MC – LC – XC – IC

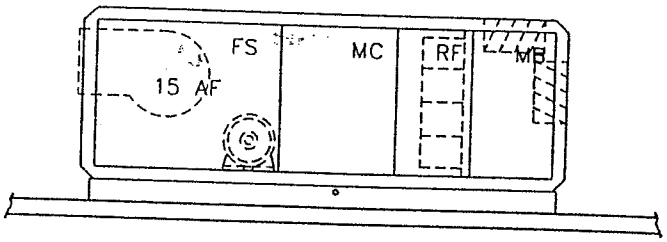
FIG. 14 – CEILING SUSPENDED UNIT

STRUCTURE PARALLEL TO AIRFLOW



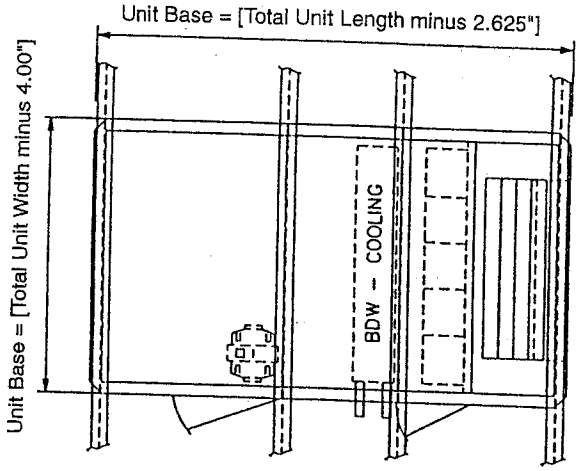
PLAN VIEW

AIR FLOW



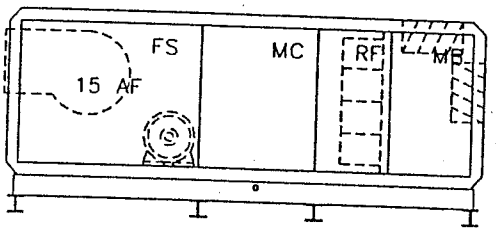
ELEVATION VIEW

STRUCTURE PERPENDICULAR TO AIRFLOW



PLAN VIEW

AIR FLOW



ELEVATION VIEW

(All dimensions ± 1/2", Subject to change without notice.)

FIG. 14 – CEILING SUSPENDED UNIT (Cont'd.)

VERTICAL COIL UNITS

Vertical Coil Unit may or may not be factory assembled. Field assembled units are shipped with the top-tier segment skidded. This top-tier segment is equipped with angle brackets bolted to the bottom raceway. See Figure 15.

These brackets are used for rigging and finally to secure the top segment to the bottom segment. Eye bolts (furnished by others) should be connected to the center hole in the angle brackets to accept rigging hooks. See Figure 16. After final alignment, bolt the two brackets with the 1/2 inch hardware supplied.

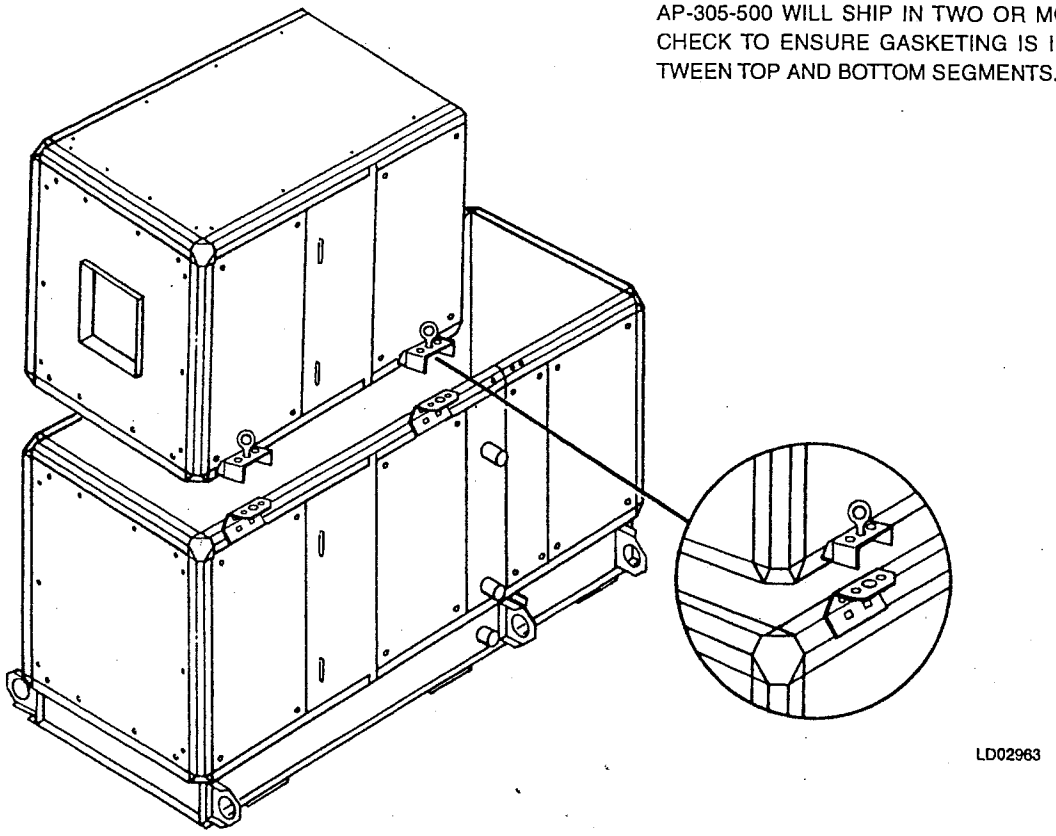
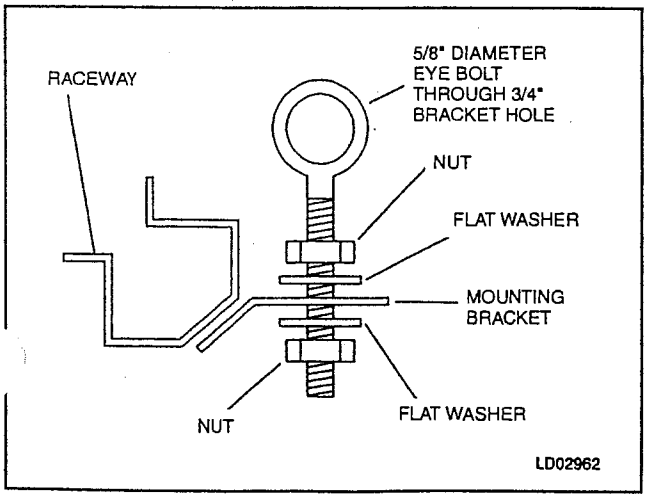


FIG. 15 – VERTICAL COIL UNIT



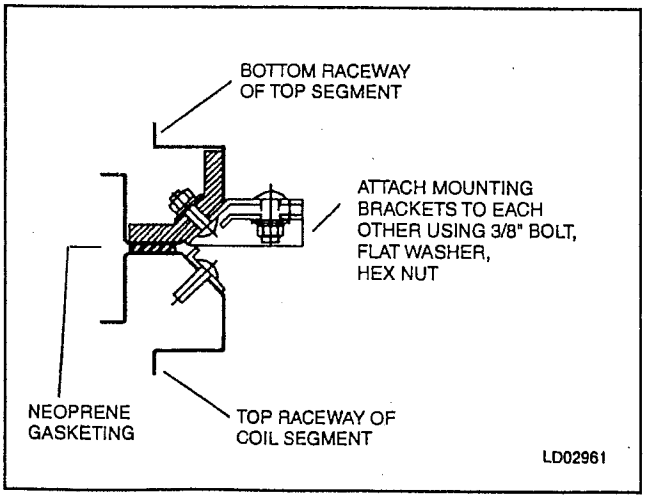


FIG. 16 – USING BRACKET AS LIFTING LUG

VARIABLE INLET VANE

Optional variable inlet vanes may be provided on fans. The field installed control actuator is attached to a single shaft and provides for the synchronous control of the inlet vanes on both sides of the fan. The interconnecting linkage between the two vane assemblies is factory supplied. The actuator and mounting bracket may be field-supplied. Actuator may be mounted to any suitable structural member. See Figure 17.

Slots are in the actuator crankarm and the jackshaft crankarm to allow linkage adjustment from the maximum to minimum stroke. After adjusting the actuator and linkage bar to the proper stroke, verify that both vane assemblies move from the fully open to the fully closed position.

CAUTION: Do not force vanes past full open or closed position.

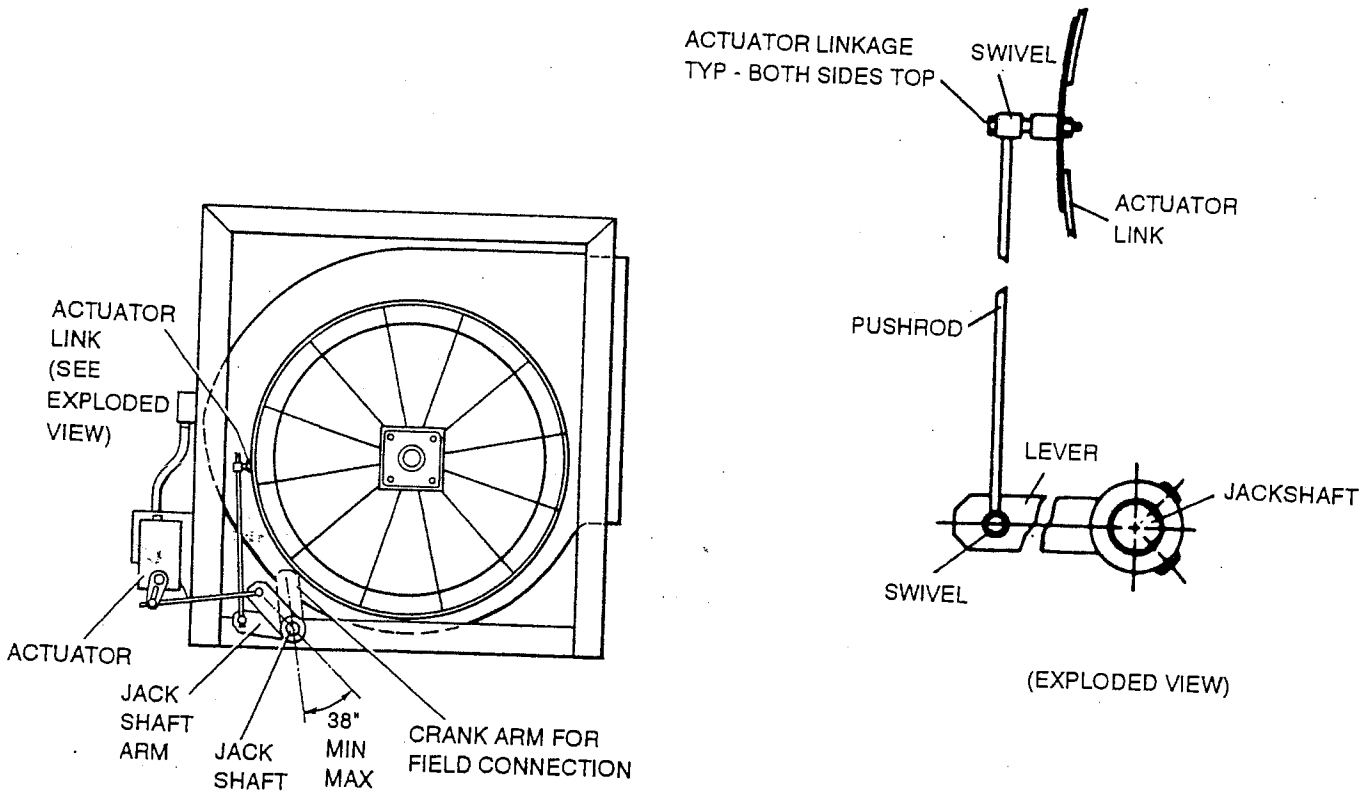


FIG. 17 – TYPICAL ACTUATOR LINKAGE "FC" FAN

Instructions for Checking Unit with Variable Inlet Vanes Prior to Start-Up of Unit

1. Ease of Operation – Prior to the installation of the electric or pneumatic operator motor, check the ease of operation of the vanes by moving the operator arm back and forth manually. If the vanes are difficult to turn, check to see that no foreign material has lodged in the assembly during shipment. Lubricate the bearings with SAE 30 oil. Wipe away any accumulation of dirt from the bearing prior to oiling.

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 rod between the main jack shaft and jack shaft arm on the vanes must always be at an angle of at least 38 degrees with respect to the jack shaft arm to which it is attached. If not, the operator motor will tend to push against the shaft rather than create a rotational motion necessary to open and close the vanes. See Figure 18.

4. Position of Vanes – When completely open, the 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 arm on the main shaft and the motor should be made as stated above. The travel of the Operator Motor Arm should be adjusted so that it is somewhat less than the travel of the arm of the main shaft. The Pneumatic or Electric Operator Motor should never be adjusted so that a force is placed on the unit jack shaft arm when the vanes are either completely open or closed.

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 at least 25% open to avoid additional load and wear on components.

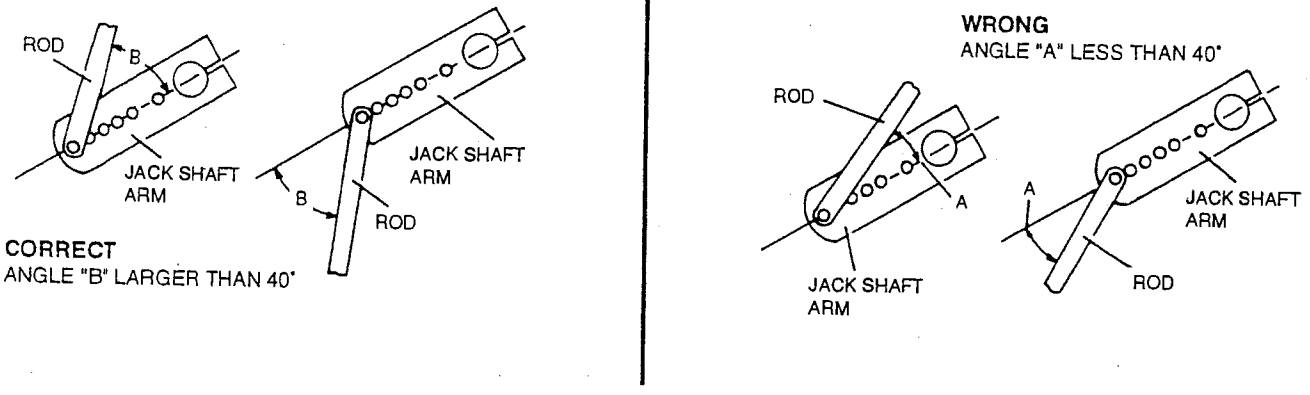


FIG. 18 – JACK SHAFT ARM POSITION

MIXING BOX (MB) AND FILTER / MIXING BOX (FM)

AIR FLOW CONTROL DAMPERS

Linkage design and / or damper linkage may not be provided by YORK. Air flow control dampers may be operated with pneumatic or electric actuator / controllers. These items should be set up in accordance with control manufacturers instructions. On units with factory installed controls / actuators, YORK does assume responsibility for the controls / actuators. See Figure 19.

Typical Actuators / Operator Locations

The actuator motor and damper jack shaft should be at minimum 14 inches and maximum 3 - 4 feet apart. On shafts that are less than 14 inches apart, the linkage may be difficult to adjust. If the shafts are more than 4 feet apart, the long connecting rod may lack stiffness to operate the dampers.

Damper Linkage Adjustment

After power has been supplied to the unit, the dampers should be checked to make sure they operate freely and close tightly, adjustment to the linkage may be required.

Linkage Readjustment (example)

1. Turn the minimum outside air adjuster to the 100% outside air position. All return air damper blades should be fully closed. Be sure that the spring return damper actuator has completed its stroke (stopped running). If not, loosen the drive rod bolt and let the damper motor drive the crankarm until the motor stops running. Re tighten the drive rod bolt to secure the drive rod.

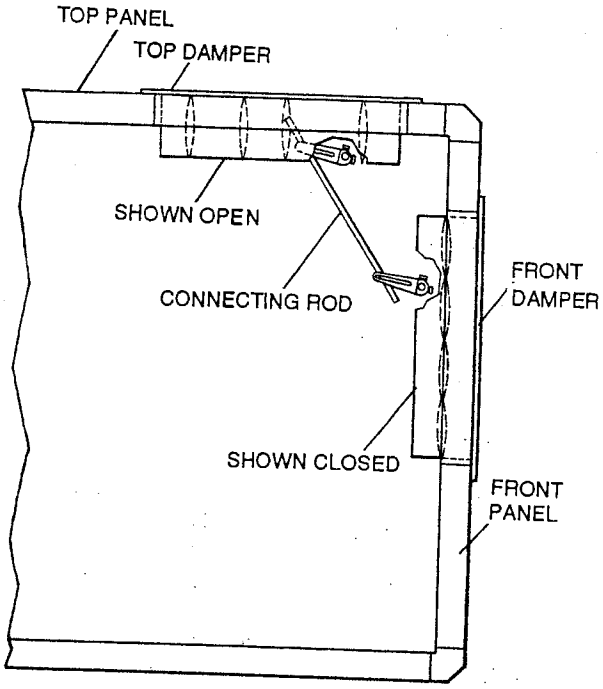
2. Turn the minimum outside air adjuster to the 0% outside air position. All outside air damper blades should be fully closed. The linkage connecting the outside air and the return air dampers must move freely.

3. Return the minimum outside air adjuster to the 100% outside air position and check for complete freedom of linkage movement as the return air dampers close.

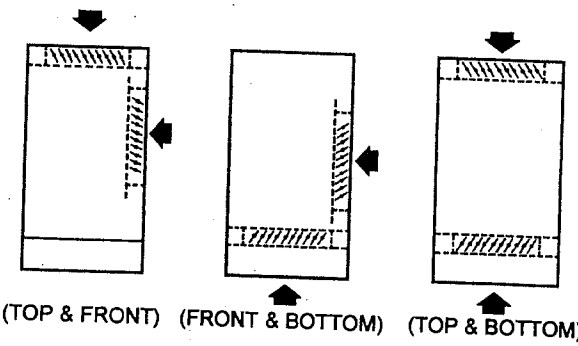
4. Set the minimum outside air for the minimum ventilation requirement of the job.

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.

On standard face and bypass dampers, the face damper is opposed blade while the bypass damper is parallel blade. The two damper sections are interlocked and provide a single control point.



DAMPER ARRANGEMENTS



NOTE: When adjusting linkage one damper must be fully open and the other damper must be fully closed.

INTERNAL FACE & BYPASS DAMPER (IB)

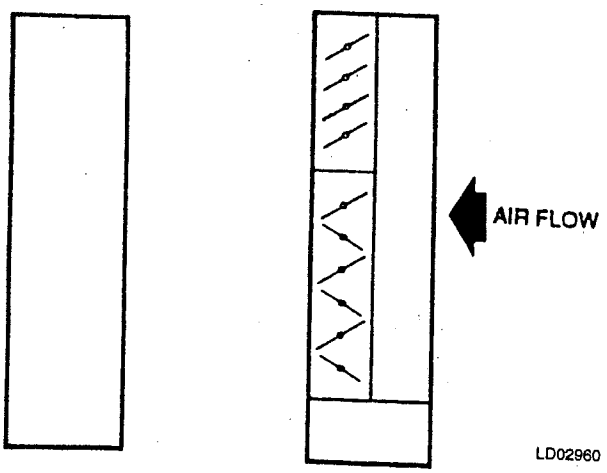


FIG. 19 – CONTROL DAMPERS

DIFFUSER SEGMENT (DI)

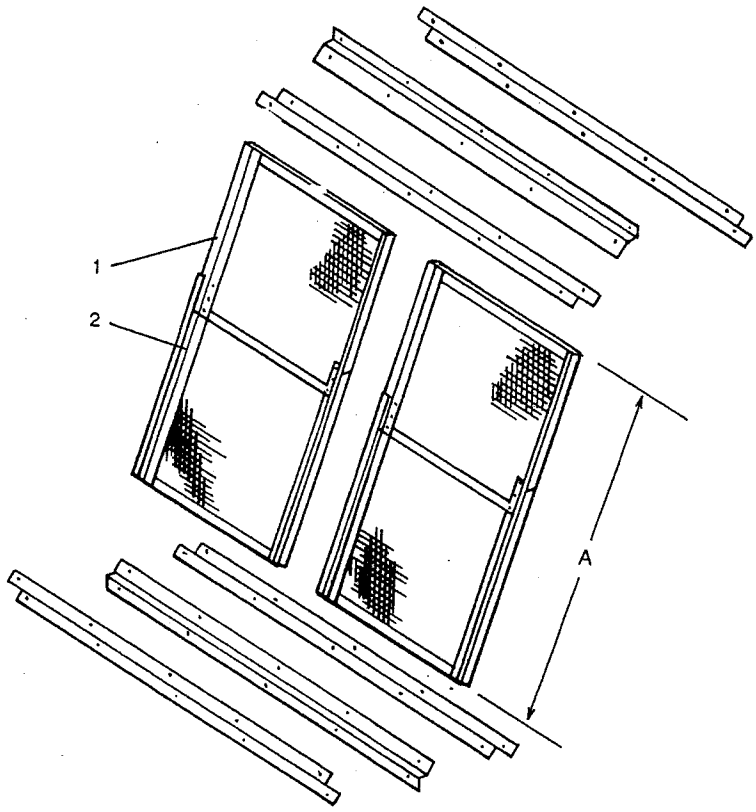
Assembly Instructions

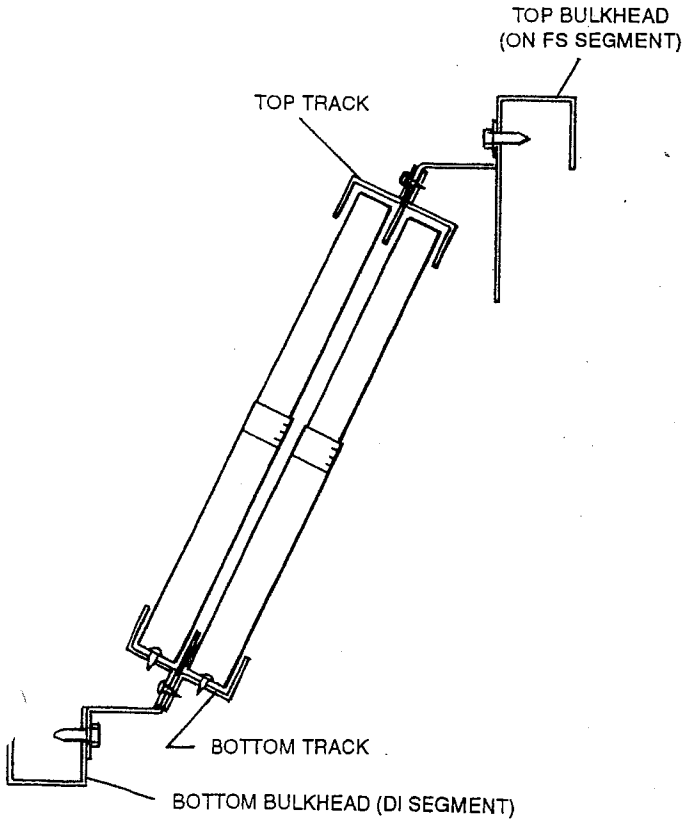
AP35-500:

1. Diffuser frame assemblies factory assembled and shipped loose.
2. Slide frame into single track; secure to bottom track with 1/4" screw.

AP580-1000:

1. Assemble 1 inside 2 extending complete frame assembly to top and bottom tracks. Attach 1 and 2 together with 1/4" type AB 3/4" length screws. (See Figure 20.)
2. Two complete frame assemblies provided per track, for total of 4. Secure completed frame assembly to bottom track with 1/4" screw.





DIFFUSER SCREEN SIZES

UNIT SIZE	"A" DIM . (In.)
AP580	81.6
AP660	81.6
AP800	98.5
AP1000	115.8

DIFFUSER FRAME ASSEMBLY

UNIT SIZE	QUANTITY
AP35-80	2
AP105-120	3
AP150-1000	4

FIG. 20 – ASSEMBLY OF DIFFUSER SEGMENT

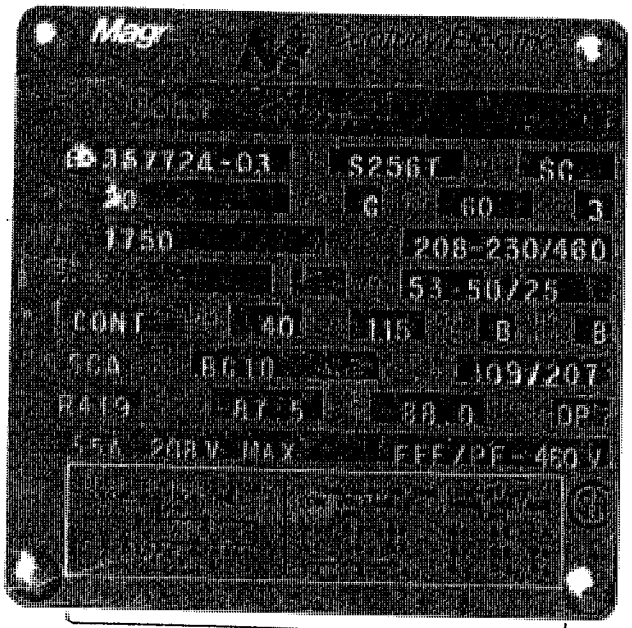
ELECTRIC HEAT (EH)

The EH instruction is included with the unit documents in the fan segment.

ELECTRIC WIRING

NOTE: All wiring must conform to the National Electrical Code (NEC) and possible local Codes that may be in addition to the NEC.

The installer shall furnish all wiring and a fused disconnect switch must, for safety reasons, be installed within sight of the unit.



POWER CONNECTION DIAGRAM

FIG. 21 – TYPICAL MOTOR DATA AND CONNECTION DIAGRAM

A motor connection diagram may be found on the inside of the motor terminal box or on a tag attached to the motor to permit fan belt adjustment. See Figure 21.

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

1. Whenever possible, electrical conduit should be run to the inside of the unit.
2. Electrical conduit connections made to exposed junction boxes on units should be made on the bottom of the box. Installation should comply with code requirements.

MOTORS

CAUTION: Do Not Operate The Fan Motor Until Lubrication Has Been Checked And Drive Adjusted.

"T" frame motors will operate within a 10 percent tolerance from the nameplate voltage. If the motor operates at a higher voltage, the motor will draw full load current at no load conditions.

CAUTION: Fan motor and steam valve controls should be interlocked to prevent high cabinet temperatures in the event of motor failure on draw-thru units.

CAUTION: All exposed electrical connections should be checked for tightness prior to the actual startup. Many of the connections contain several wires 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 over emphasized.

ACOUSTICAL CONSIDERATIONS

With any mechanical system, a certain amount of vibration and noise is generated. To ensure a successful installation of these units, YORK has provided the following:

1. Internal spring isolators for fan (Standard).
2. Internal flex connection at fan discharge (Standard).

CAUTION: If a return air duct is to be used with an externally spring isolated unit, a flex connector must be field supplied on the return duct.

INVERTER / MOTOR SOUND LEVEL

Motors operating in the airstream require that proper considerations be given to the noise generated by the Inverter Driven Motor.

To avoid unsatisfactory noise levels in the final installation, many factors should be considered at the design stage. Acceptable noise criteria must be established. An annoying level of noise is often a matter that depends on the activity in the area, the nature of the noise, and the relationship of the listening location.

CAUTION: Use of inverters other than YORK'S Air Modulator may require that the Inverter manufacturer make field adjustments to set up their Inverter(s) for fan duty.

AIR SYSTEM

All duct work should be designed and installed according to AMCA or SMACNA Guidelines.

DUCT CONNECTION GUIDELINES

All intake and discharge air duct connections to the unit may be made directly to units which have internal spring isolators and flexible fan collars. Duct turns and transitions must be made carefully to hold friction loss to a minimum. Duct elbows should contain splitters or turning vanes. See Figure 22.

Duct work connected to the fan discharge should run in a straight line for at least 2-1/2 equivalent outlet diameters and should not be reduced in cross sectional area, see Figure 23. A duct turn should 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.

These losses are referred to as "system effects". For more details on this subject, refer to A.M.C.A. Standard 201, titled "Fan and Systems".

SOUND AND VIBRATION

All air handling units generate some sound and vibration, that may or may not require some special treatment. 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.

No flex connection is required on the supply ductwork that is connected to the fan outlet. There is an internal flex connection supplied as standard on these units.

COIL PIPING

GENERAL

All HVAC system piping should be installed in accordance with local codes and ordinances. The piping should be designed with a minimum number of bends and changes in elevation to keep costs to a minimum and unit performance to a maximum.

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.

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.

CAUTION: 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.

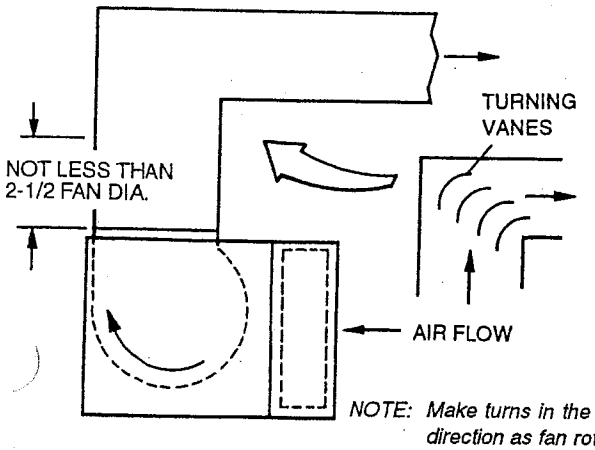


FIG. 22 – RECOMMENDED DISCHARGE DUCT ARRANGEMENT WHEN TURNS ARE REQUIRED

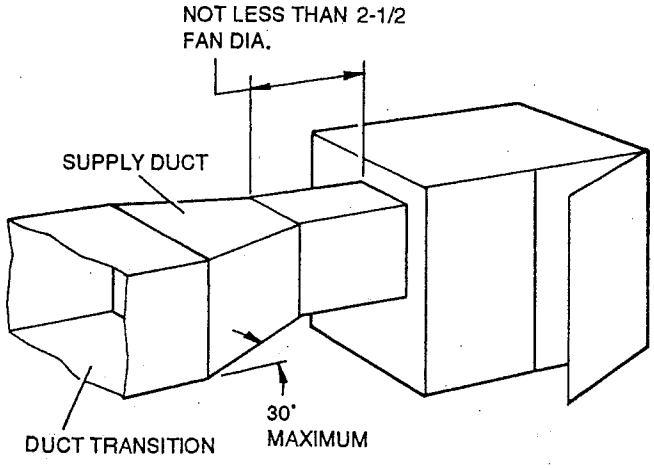


FIG. 23 – DUCT CONNECTIONS

WATER COILS - DRAINABLE WATER

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

Positive coil freeze protection must be used in installations where any part of the water coil is subjected to temperatures of 32 degrees or lower. This may be accomplished by using a suitable antifreeze solution. If the coil is not in use, it is recommended that the coil be completely drained and the inside of the tubes blown dry with compressed air. Other means of protection such as the full constant flow of water can be used, however, YORK will not be responsible for water coils damaged by freezing.

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

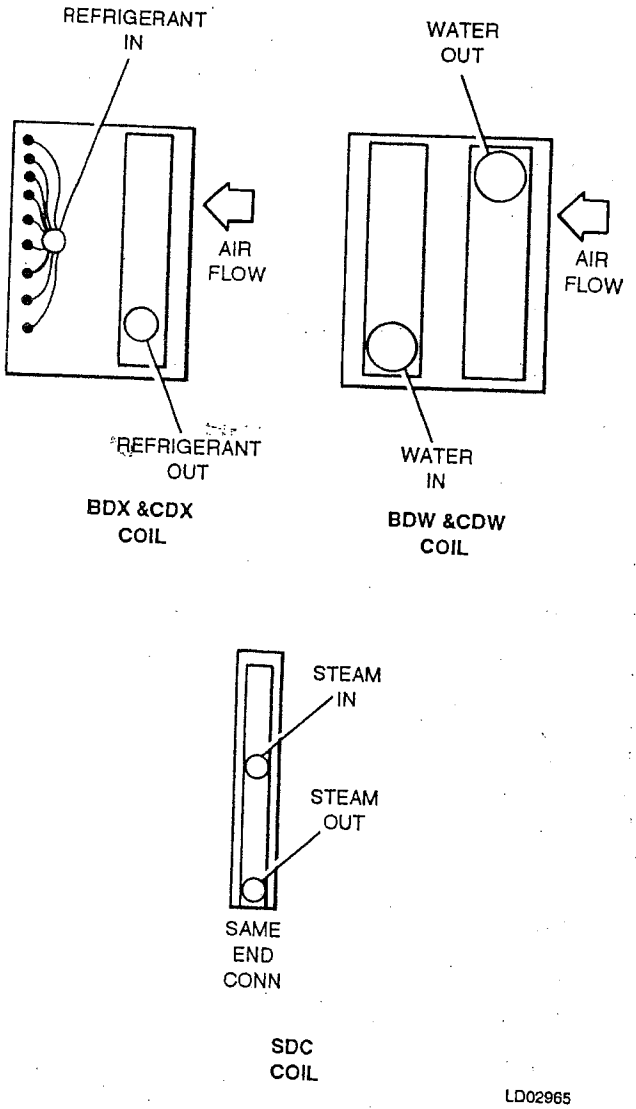


FIG. 24 – FACTORY COIL CONNECTIONS

A closed water circulating system must have an expansion tank and / or water pressure relief valve to avoid exceeding coil design pressures resulting from the thermal expansion of the water.

HOT WATER COILS

The temperature rise of the air leaving the coil is dependent on the air flow across the coil, the gallons of water flowing through the coil and the entering water temperature into the coil. Consult the submittal for each specific job for the above information.

CAUTION: Before making standard field piping connections, refer to Figure 24 which identifies the factory coil connections.

STEAM DISTRIBUTING COILS

Do not bush or reduce the coil return pipe size. Use a full size return pipe to the bottom of a dirt pocket. The supply pipe may be reduced at the coil connection if necessary. Install the coil casing level with the return down. The Standard Steam coils are pitched in the casing for both horizontal and vertical air flow, thus ensuring good condensate drainage when the unit is level. A coil must be sufficiently elevated to allow a 12 inch minimum drop between the return connection on the coil and the trap. A greater than 12 inch drop is required for protection from freezing. The return main should be located below the trap. Refer to Figure 25 & 26.

STEAM CONTROL

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

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

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

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

STEAM TRAPS

Float and Thermostatic (F & T) traps are recommended for all low or medium pressure applications. Use thermostatic traps

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

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

FREEZING CONDITIONS

Standard Steam coils must be provided with a continuous steam supply (10 psig minimum) if operated with the entering air below 35 degrees F. The steam supply must not be throttled. Use a steam distributing coil for a modulated steam supply type of control.

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

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

WATER TREATMENT

Any copper tube coils may be attacked by acid condensate. The practice of boiler water treatment should include CO_2 removal to assure longer tube life.

FREEZE PROTECTION

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

1. For all year operation, ethylene glycol and other antifreeze solutions 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 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 degrees F below zero at sea level.

4. Also refer to ASHRAE and ARI guidelines.

NOTE: 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.

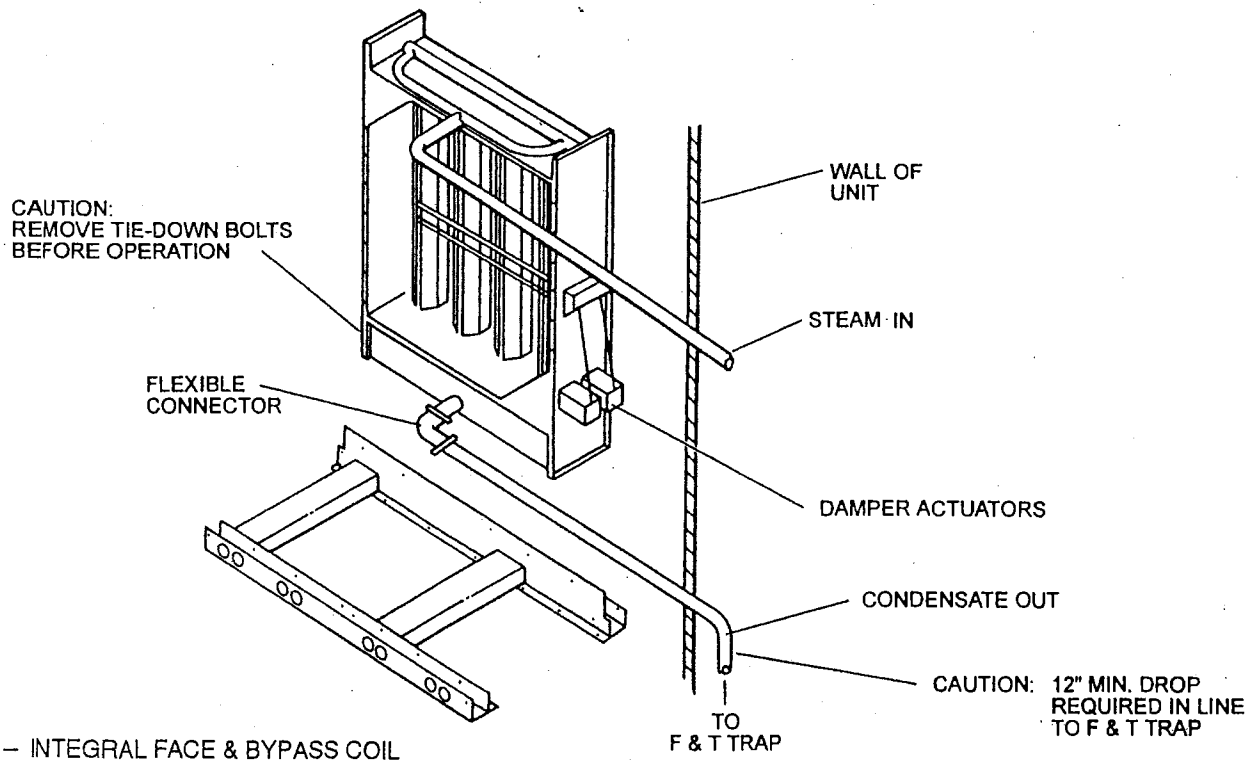
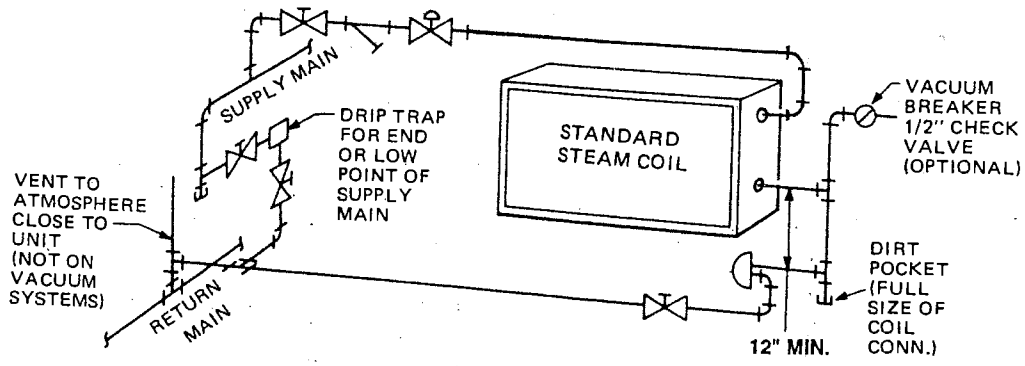
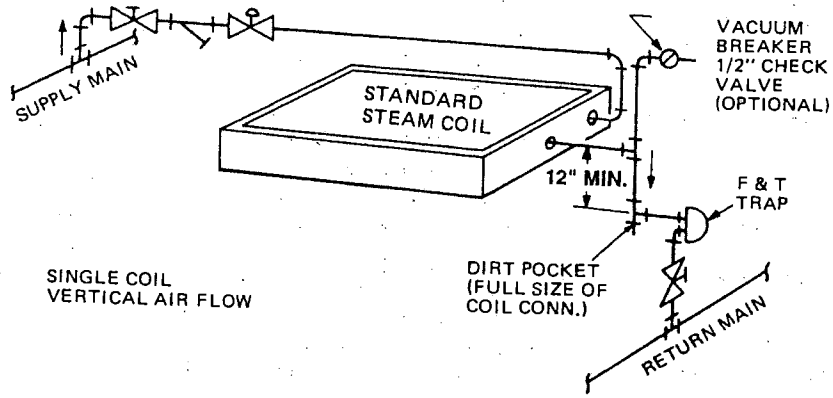
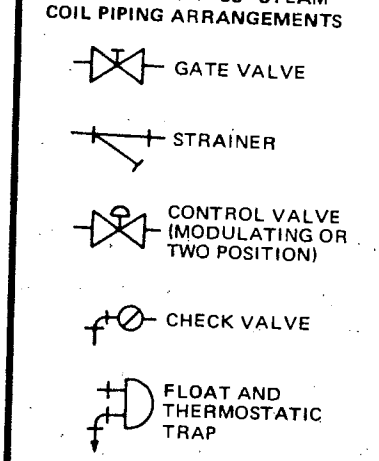
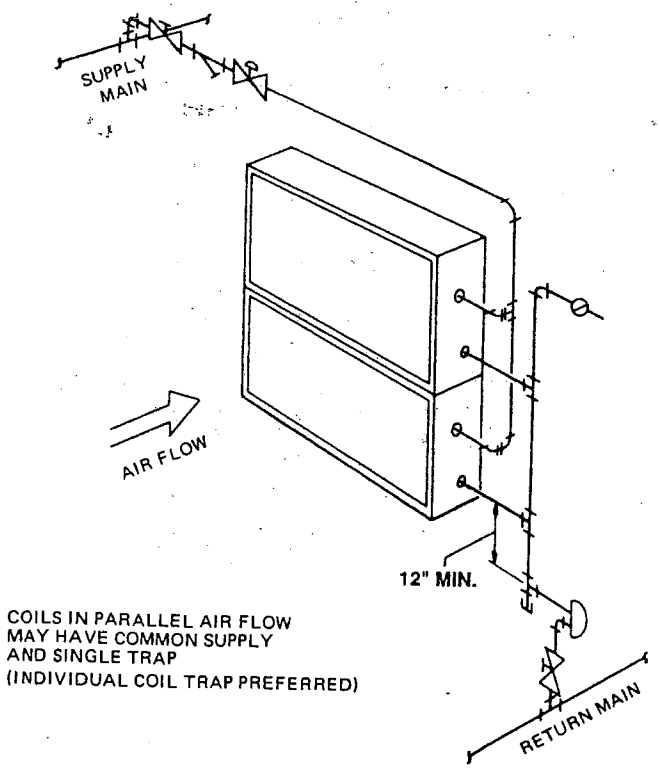


FIG. 25 – INTEGRAL FACE & BYPASS COIL (VERTICAL TUBES, STEAM SHOWN)









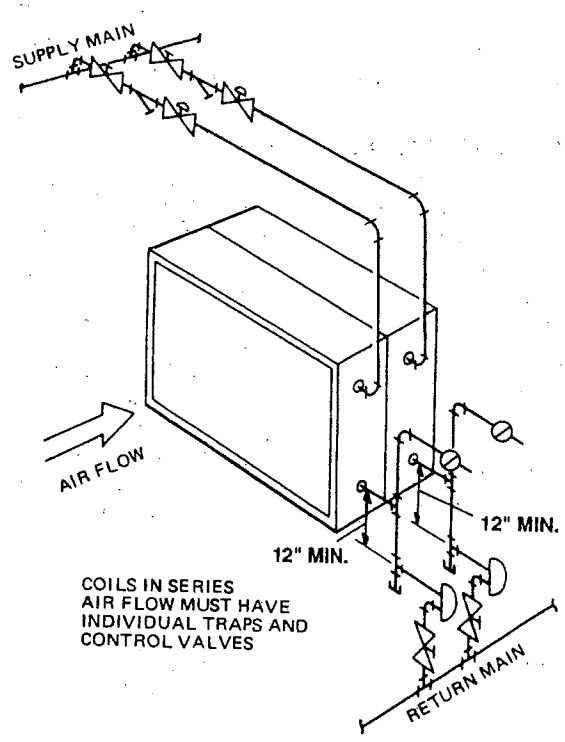
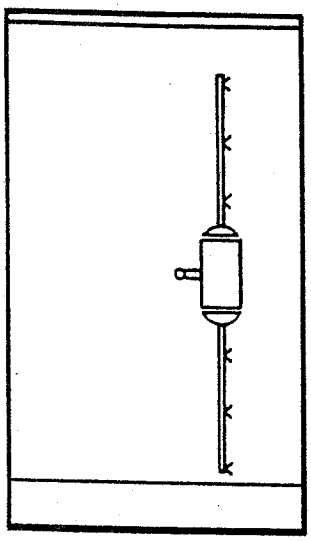


FIG. 26 – STEAM COIL PIPING ARRANGEMENTS

YORK INTERNATIONAL



NOTE: Steam separators and strainers will be shipped loose for field installation

FIG. 27 – STEAM HUMIDIFIER SEGMENT

HUMIDIFIERS

Improper operation and control of humidifiers resulting from improper design considerations by the HVAC System Designer may damage internal components such as motor, shaft, bearings, etc. See Figure 27.

CAUTION: The amount of humidification, moisture / water inside the unit must be controlled by proper location and control of system components.

DIRECT EXPANSION COILS (DX)

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

CAUTION: Direct-expansion coils are shipped charged with nitrogen. Release pressure from each coil split through valves in protective caps before removing caps.

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

The orientation of the refrigerant distributor is not critical but the distributor tubes must not be kinked or bent in a non-uniform configuration. Refer to Figure 28.

An individual expansion device must be provided for each coil or circuit. 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 valve manufacturer's recommendations, allowing approximately 35 psi pressure drop throughout the coil and distributor at full load. Do not oversize the valve. Follow the valve manufacturer's instructions on the location of the thermostatic bulb. Proper expansion valve operation is necessary in order to realize the rated coil capacity.

When a DX type coil is operated with a suction temperature below 32 degrees 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.

The venture type 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.

The lower split of face split coils should be *first on, last off.*

Row split coils utilize special interlaced circuits (as shown in Figure 29): either split of these row split coils can be *first on, last off.*

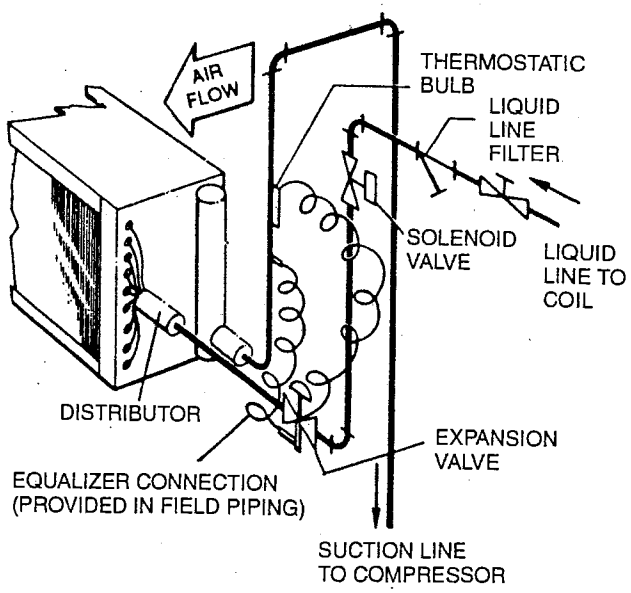


FIG. 28 – TYPICAL DX COIL PIPING ARRANGEMENT

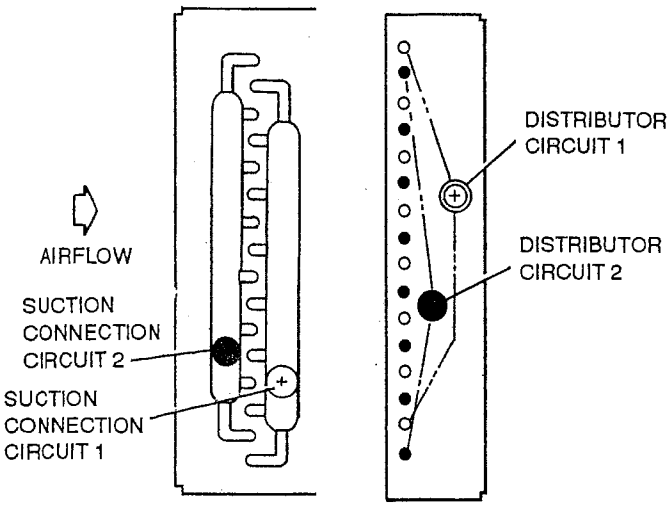


FIG. 29 – TYPICAL INTERLACED CIRCUIT COIL

AIR VELOCITY THROUGH COILS

The air velocity flowing through chilled water and direct expansion coils must not exceed 550 feet per minute to prevent carry-over. Air velocity which is very low may result in a low load situation on the cooling coil which will effect compressor operation. Airflow (CFM) and velocity (FPM) can be adjusted by changing fan pulley sizes.

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 should be installed to prevent this condensate water build-up. See Figure 30. On initial start-up, it may be necessary to fill the trap manually, or after the unit has operated sufficiently for some time to allow a small amount of condensate to collect in the drain pan, turn off the unit, and the trap will automatically fill.

Condensate Drain Trap And Line Installation

Install a trapped condensate drain line at unit drain connection according to all governing codes. See Figure 30.

CAUTION: Unused drain connections on off-side of unit must be capped or plugged.

For Draw-Thru Application, the "H" dimension must be at least 1/2 inch greater than negative static pressure in the unit drain pan area. 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:

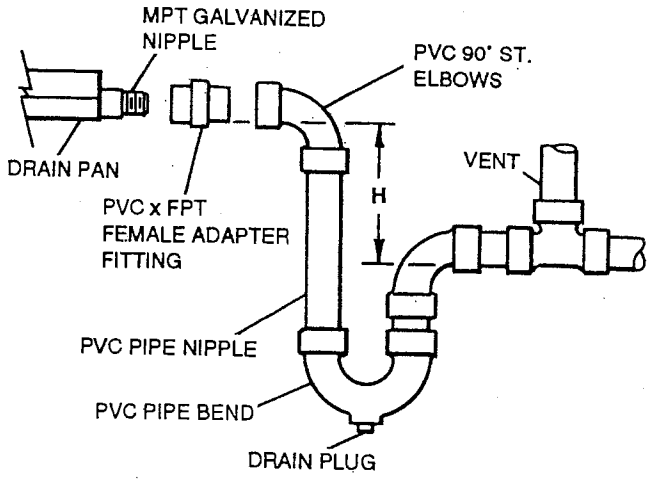
Negative Static Pressure	=	5.5"
Minimum of 1/2"	=	.5"
"H" Dimension	=	6.0"

For blow-thru units, the same principles apply, but the leaving pipe must be as shown in Figure 31 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 32.

CAUTION: Unused Drains fittings on off-side of unit MUST be "capped" or "plugged" to close unused Drain.



CAUTION: *"H" dimension **must** be at least 1" greater than negative (inches) pressure (IWG) in drain pan.*

NOTE: Negative pressure inside coil segment. Line made with PVC fittings, (copper may be used).

FIG. 30 – DRAIN TRAP PIPING FOR DRAW-THRU UNIT

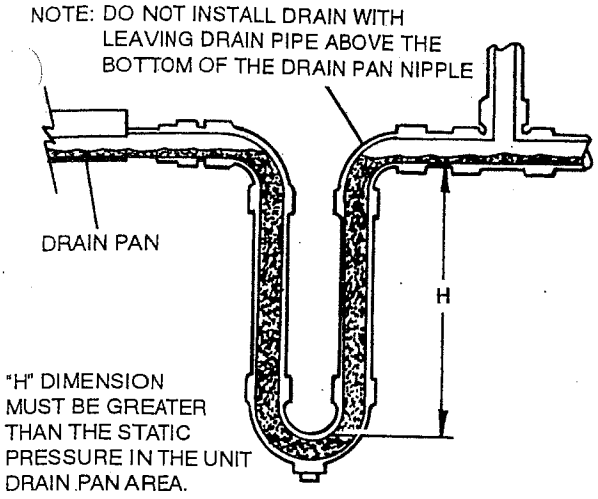


FIG. 31 – DRAIN TRAP SHOWING PIPING FOR BLOW-THRU UNIT (Positive Pressure in Coil Segment)

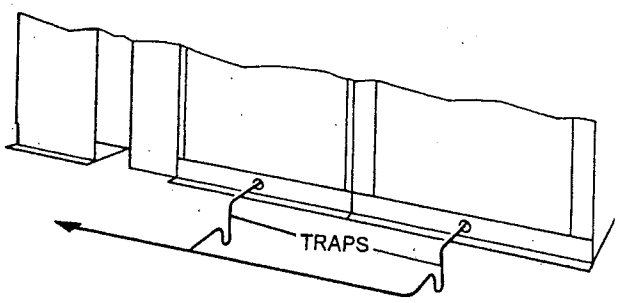
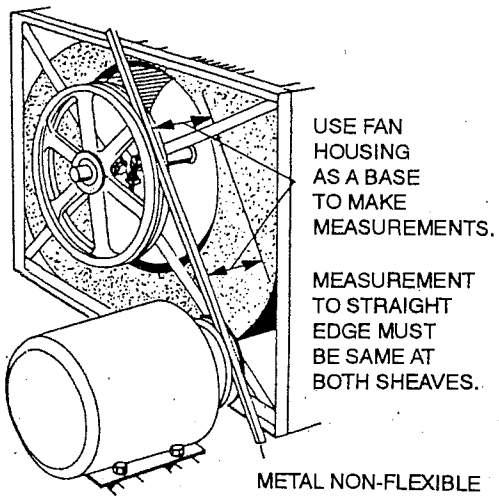


FIG. 32 – COMBINING DRAIN LINES



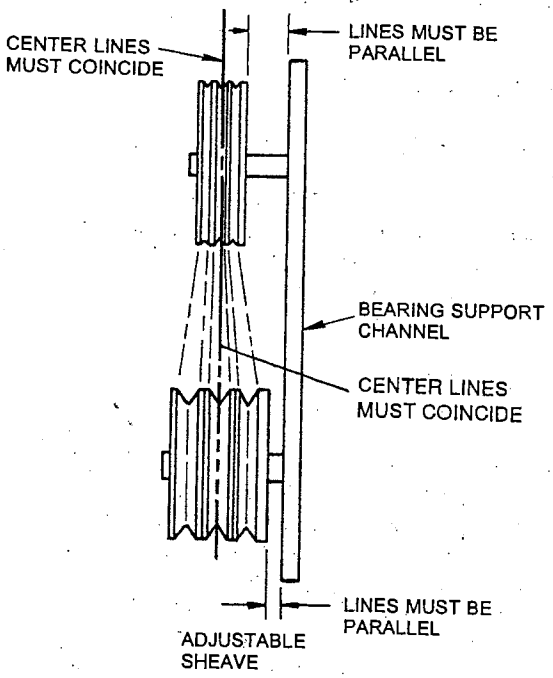


FIG. 33 – SHEAVE ALIGNMENT

Elevating Unit for Gravity Floor Drain Connections

On AirPak units, the installer must provide a means of pumping or draining coil condensate water away from the unit. The installer may have to elevate the unit to ide space below the bottom frame of the unit to in- properly designed drain trap(s) to permit gravity flow of condensate water from the drain pan.

BELTS AND SHEAVES

Improper sheave alignment and belt tension are the most frequent causes of excessive vibration as well as shortened belt and bearing life. It is important to install the fan sheave as close as practical to the bearing. Adjust the motor sheave to align with the fan sheave with the use of a straight edge. For multiple groove sheaves, use the

center groove of the motor sheave and align this center groove with the center groove of the fan sheave. See Figure 33. Adjust the belt tension as described in the maintenance section of this instruction. Belt tension is very important on notched belts and tension requirements are different. As shown on label located on the fan housing.

NOTE: Refer to Figure 34 which shows an adjustable mounting base that is used to adjust belt tension.

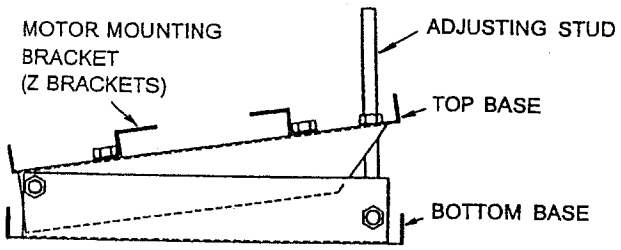


FIG. 34 – ADJUSTABLE MOTOR MOUNTING BASE

LOCKING RING VARIABLE SPEED SHEAVES

This type of sheave 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 35 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 set screw (7). The locking ring cap screws (4) are tightened on BOTH sides to lock the entire sheave into a rigid unit.

NOTE: After system is air balanced, YORK recommends replacing adjustable drive with fixed drive.

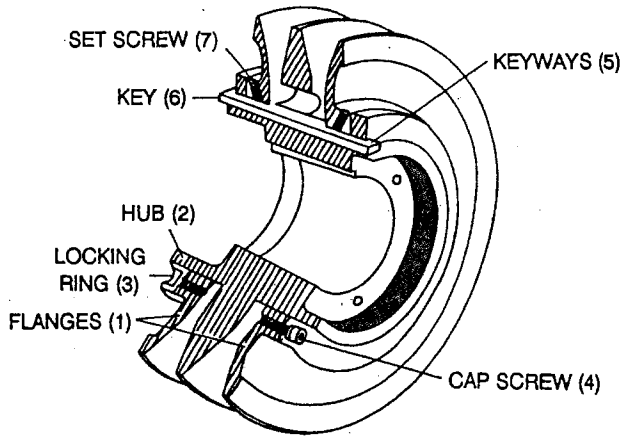


FIG. 35 – LOCKING RING VARIABLE SPEED SHEAVE

OPERATION

START-UP CHECK LIST

- ☐ Unit received undamaged
- ☐ Equipment received as ordered
- ☐ Unit located properly for service
- ☐ Spring isolators properly adjusted
- ☐ Shipping restraints removed
- ☐ Check electrical supply voltage & electrical connections
- ☐ Check fan wheel and drive sheaves set screws
- ☐ Check drive alignment
- ☐ Check bearings and locking collars set screws
- ☐ Rotate wheels and motors to assure freedom of movement
- ☐ Check condensate drain traps
- ☐ Check air filters
- Check proper fan rotation
- ☐ Check belts for proper belt tension
- ☐ Check damper operation
- ☐ Check doors and latches

PRE-OPERATIONAL CHECK

1. Lock out the electrical power to prevent accidental fan operation. Check the 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 placed in the filter section, with end seals in place.
2. Recheck the tightness of the isolator mounting hardware, set screws and locking collars on the bearings, and the motor mount adjusting nuts.
3. Rotate the fan shaft by hand to make sure that it is free and no obstructions have been incurred during shipment or installation.
4. Check the bearings for proper lubrication by referring to the bearing manufacturer's instructions. At the same time, if the bearings contain locking collars, make sure that the locking collars have been locked in the direction of the fan rotation.
5. Recheck the sheave alignment with a straight edge and the belt tension for proper values. Be sure that the adjustable motor sheave adjustment is locked.
6. Remove the various damper linkages from the operators and rotate them by hand to insure 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 motor operators of the various linkages to make sure that the motors do not overdrive the connected dampers in such a way as to cause damage.
7. After the above items have been checked, apply power to the motor for a short interval to observe that the motor is rotating in the proper direction as indicated by the arrow on the side of the unit. Also check motor speed with a tachometer.

   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 36.

NOTE: Fan manufacturers describe the rotation of the fan impeller as being "clockwise" or "counter-clockwise" – for CENTRIFUGAL fans when viewing the DRIVE SIDE (see AMCA Standard 2406).

WARNING: Should any unusual vibration or noise occur, stop the unit immediately and recheck all items.

If the vibration continues, the belts should be removed from the drive and the motor 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 which are a part of the enclosure. These vibrations can tend to rein-

force 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 make-up 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 this 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 and drive set screws, and tighten where required.

TEMPERATURE LIMITATIONS

Standard motors (Class B Insulation) – 104°F.

Motor with Class F Insulation – 140°F.

Power Wiring – 140°F. Controls & Wiring – 140°F.

Prefilters – 150°F. High Efficiency Filters – 200°F.

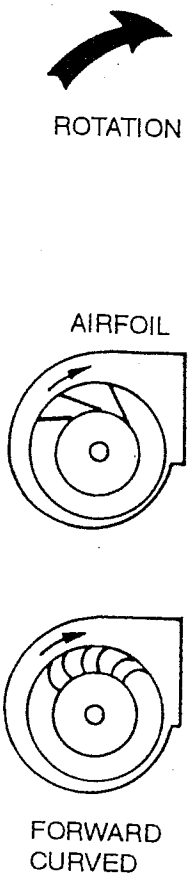


FIG. 36 – TYPES OF CENTRIFUGAL FAN IMPELLERS

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.

Removable 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, check the cleanliness of the filters and replace or clean air required. See Tables 5 thru 8. Examine the damper and operator linkages to insure that each is free and operating smoothly.

Lubrication

Fan bearings on the AirPak 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 37 and Table 1.)

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

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 manufacturers 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.

Relubricate Type Bearings – 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 abrasives. 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. (See Table 1.) Lubricate bearings as required by the severity of required duty.

Motor Bearing Lubrication

Follow the motor manufacturer's recommendation. Check the motor nameplate for proper lubricant. (See Table 2.)

Relubricatable Type Bearings must be relubricated periodically to assure long life. The length of intervals between greasing is dependent on the running speed and atmospheric conditions.

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.

CAUTION: 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 is 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 SAE 30 oil.

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

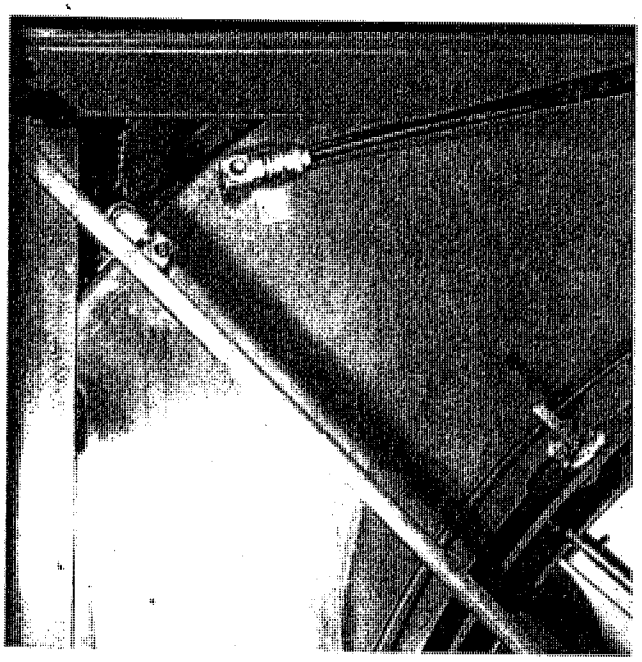


FIG. 37 – LUBRICATION LINES

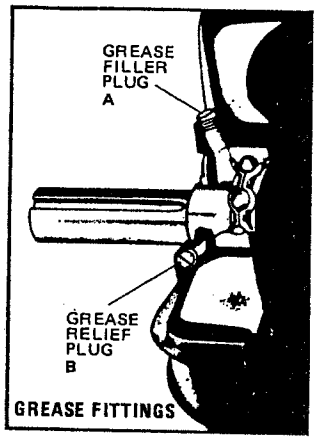
TABLE 1 – RELUBRICATABLE TYPE FAN BEARING CONDITIONS AND GREASING INTERVALS

SPEED	TEMPERATURE	CLEANLINESS	GREASING INTERVAL
500 RPM	Up to 150°F	Clean	2 to 6 Months
1000 RPM	Up to 210°F	Clean	2 Weeks to 2 Months
1500 RPM	Over 210°F	Clean	Weekly
Any Speed	Up to 150°F	Dirty	1 Week to 1 Month
Any Speed	Over 150°F	Dirty	Daily to 2 Weeks
Any Speed	Any Temp.	Very Dirty	Daily to 1 Week

TABLE 2 – MOTOR RELUBRICATION SCHEDULE

MOTOR ENCLOSURE TYPE	FRAME SIZE	STANDARD SERVICE	SEVERE SERVICE
"O.D.P.R." OPEN DRIP PROOF	182T THRU 404T	18 MOS.	6 MOS.
"T.E.F.C." TOTALLY ENCLOSED FAN COOLED	254T THRU 405T	1 YEAR	4 MOS.

NOTE: High Efficiency Motor Frame Sizes may vary from Frame Specifications Listed.



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 other 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 valves should be inspected at least annually to verify that they are working properly.

For further details please review the IOM for humidifiers which is enclosed with the unit.

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. Refer to Figure 34.

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, overload blower and motor bearings, shortening their life expectancy. A belt tensioned too tight 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. Used belts will always be longer because of stretching and new belts should never be installed singularly.

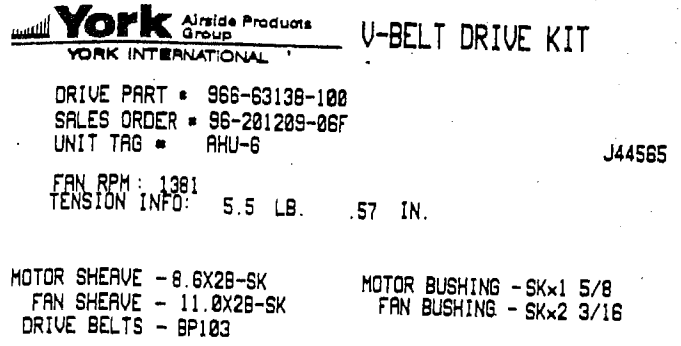


FIG. 38 – TYPICAL LABEL ON BELT TENSIONING

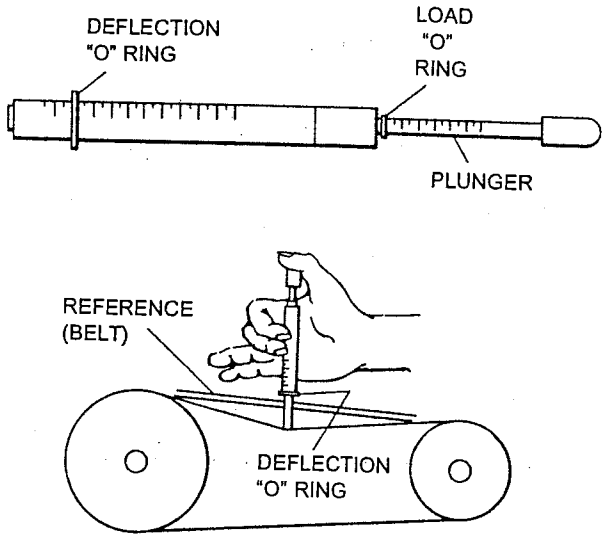


FIG. 39 – BELT TENSIONING GAUGE

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.

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.

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 38.

Use the belt tension gauge shown in Figure 39 to properly tension belts. Use the 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

FORWARD CURVED FANS

The forward curved fan wheel must be removed through the discharge opening. The location of the clamps, fan wheel, shaft must be marked so each of these components can be re-assembled in the same location. See Figure 40. This will preserve the balance of the rotating assembly. Proceed with the following steps:

1. Remove the belts from the drive.
2. Loosen the fan retaining screws in fan hub and completely remove them from the fan.
3. Thoroughly clean the shaft journal around both bearings and between the bearing and the end of the shaft.
4. Remove the fan sheave.
5. On the end of the shaft opposite the drive, loosen the set screws or remove the locking collar so the shaft is free to turn in the bearing.
6. Remove the bolts from the bearing housing and slip the bearing off the shaft.
7. Loosen the set screws or remove the locking collar from the bearing on the drive end.
8. Remove the bolts from the bearing housing flanges on the drive end. The shaft will drop slightly when these are removed. The wheel should be supported by wood blocking between the shaft and housing. Access for blocking the wheel is through fan discharge opening.
9. Slip the shaft out the drive end until it is free and clear of the fan. In replacing the wheel, follow the reverse order.

If a new fan wheel is installed, align the mark on the center disk of the wheel with the mark on the clamp. Make sure the bearing locking collar, if used, is installed per the instructions. Instructions are also packed with each replacement bearing if new ones are required. The wheel should be placed in the housing and the hub bolts / screws torqued to correct values.

NOTE: If excessive vibrations is evident upon start-up, the rotating assembly must be re balanced before the fan is placed in service.

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 41. 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.
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 to 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 re install 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.
2. Make certain any set screws are not obstructing the bearing bore.

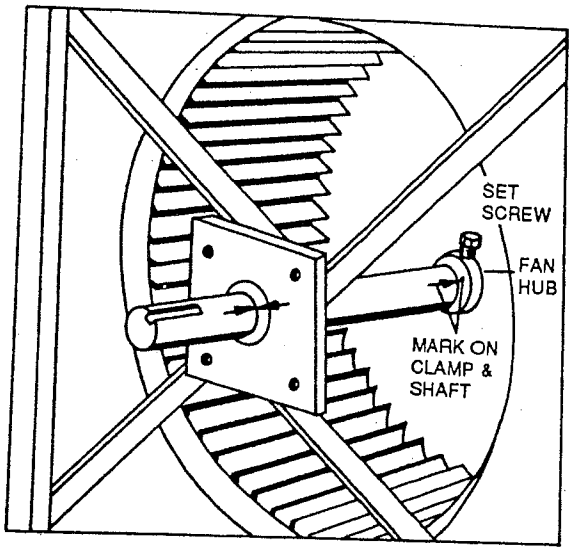
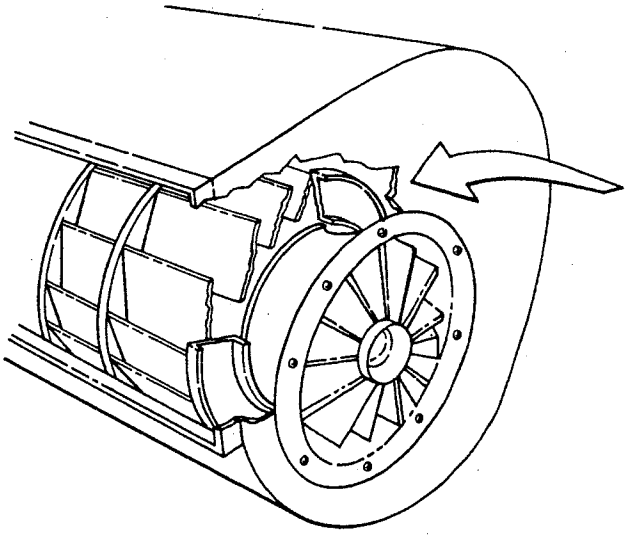


FIG. 40 – FC FAN SHAFT AND WHEEL MARKING



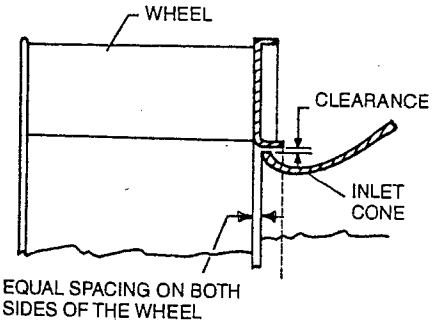


FIG. 41 – AIRFOIL INLET VANE AND CONE ASSEMBLY

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, lockwashers 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.

NOTE: 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.

)r to installing the bearing on the shaft, it should be worked ınd in the housing to make sure that self alignment will be .ained 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 ` `pecial information. Figure 42 is a typical bearing with a `ew type locking device. The various locking devices can ~ classified under basic types: eccentric locking type, concentric locking type, and skwezloc type.

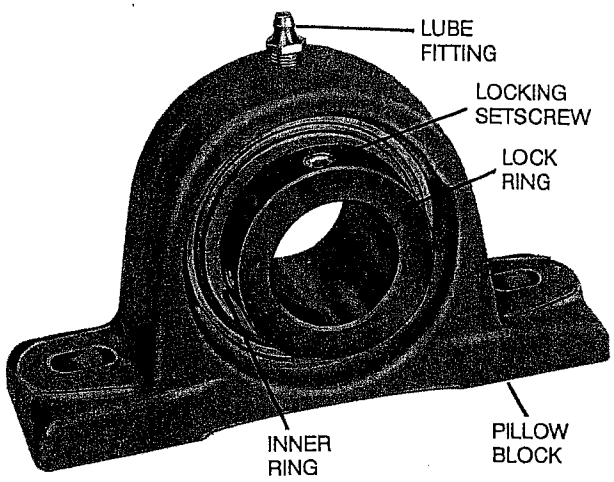


FIG. 42 – BEARING WITH SETSCREW TYPE LOCKING DEVICE

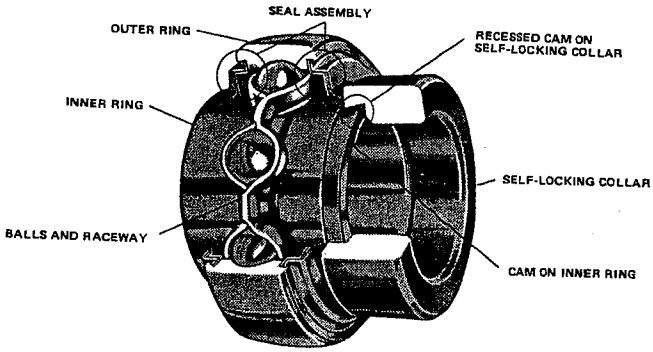


FIG. 43 – BEARING WITH ECCENTRIC CAM

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. This is typical of Fafnir. See Figure 43.

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.

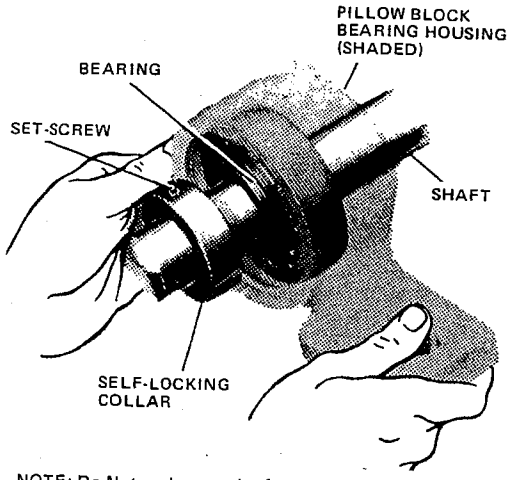
The self-locking collar is placed on the shaft with its cam adjacent to the cam on the end of the bearing's wide inner ring. In this position, with collar and bearing cams disengaged, the collar's bore is concentric with that of the bearing's inner ring. The wide inner ring is loose on the shaft. By 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 44. 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 shift rotation.

As a final step, the set screw is tightened. Torque per Table 3. 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.



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

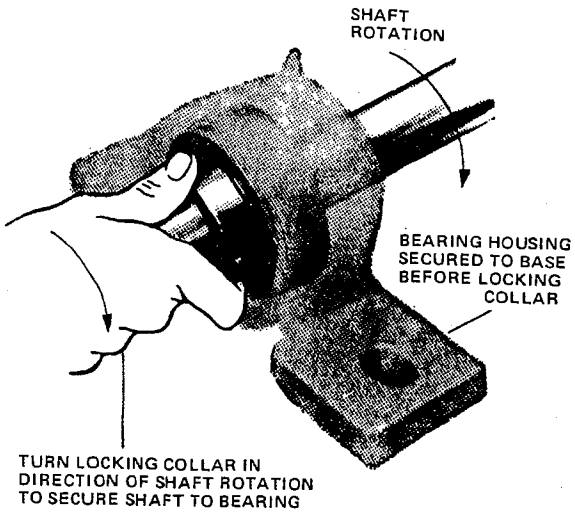


FIG. 44 – ECCENTRIC CAM LOCKING COLLAR BEARING INSTALLATION

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 3 – 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

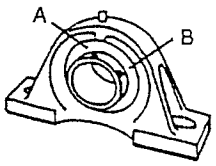
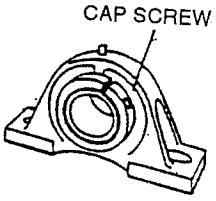


TABLE 4 – TORQUE FOR TIGHTENING SKWEZLOC COLLAR SCREW

SET SCREW SIZE	HEX./ TOR./ WRENCH SIZE	MIN. TORQUE	
		INCH LBS.	FOOT LBS.
# 8 - 32 UNC-3A	1/8	63 - 70	5.3 - 5.8
10 - 24 UNC-3A	9/64	81 - 90	6.8 - 7.5
1/4 - 20 UNC-3A	3/16	162 - 180	13.5 - 15.0
5/16 - 18 UNC-3A	1/4	360 - 400	30.0 - 33.3



CONCENTRIC TYPE

There are several methods used to lock concentric type bearing locking devices to the shaft.

Set Screw Locking

The simplest method utilized is a bearing inner race with set screws. Another type has separate lock ring with set screw. The set screws lock the ring and bearing inner race to the shaft. See Figure 45.

Tighten set screws securely onto the shaft. See Table 3 for torque values.

Skwezloc Locking

The optional SKWEZLOC locking unit is assembled on the shaft. Then, slide the collar into position on the extended end of the inner race seating it squarely against the shoulder. Tighten the capscrew to the torque indicated in Table 4. Do not exceed the indicated torque value. Refer to Figure 46.

CAUTION: 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).

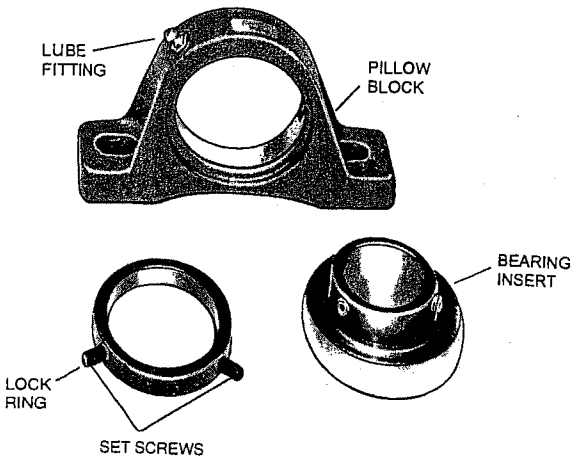


FIG. 45 – CONCENTRIC TYPE BEARING

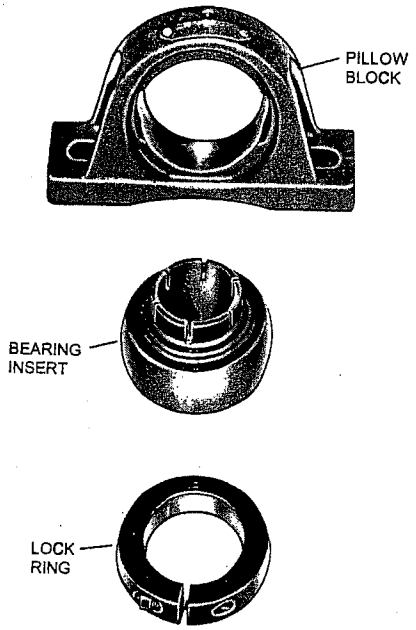


FIG. 46 – CONCENTRIC TYPE SKWEZLOC COLLAR

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 coil and the panels at each end of the coil. In cases where coils are stacked, one on top of the other, the coils can be moved 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 hand connections, face the unit from the return air inlet section as shown in Figure 47.

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 instructions 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.

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

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.

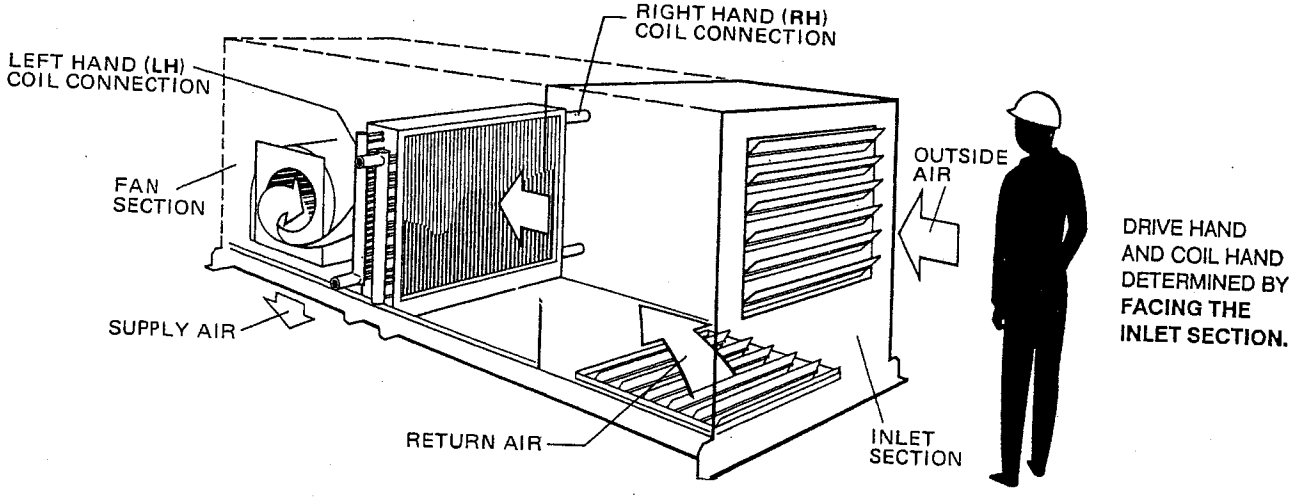


FIG. 47 – DETERMINING LEFT OR RIGHT HAND COIL CONNECTIONS / DRIVE SIDE

Check condensate drain pans for algae every three months. If algae growth is found, consult a water treatment specialist for proper chemical treatment.

VIBRATION LEVELS

Should excessive vibration develop, check the following possibilities: (1) Build-up of dirt or foreign matter on wheel; (2) Bolts on bearings, housings or driver loose; (3) V-belt drives improperly aligned, belts must have proper tension, sheaves must be balanced; (4) Check bearing locking collars for tightness; (5) Check wheel set screws; (6) Foreign matter entered fan causing damage to wheel, shaft or bearings. (7) Vibration may be coming from a source other than the fan. stop the fan and determine if the vibration still exists. Disconnect the driver motor from the fan and operate it or by itself to determine if it produces vibration.

FILTERS

INSERTING FILTERS

1. Check quanitity and size of filters. Refer to Table 5, 6, 7 and 8.
2. Check that the gasketing in the bag filter channel is in place.
3. Always load filters from bottom row to top.
4. On bag filters, leave paper banding in place until filters are installed; then remove. Install filters so that foam gasket on filter frame is perpendicular to filter rack.

NOTE: On unit sizes 105, 120, 150, and 170 the bottom row of bag filters could be installed with the pleats horizontally.

5. Prefilters are to be installed on upstream side of bag filters. Airflow arrows must point downstream (in direction of airflow).

MAINTENANCE AND REPLACEMENT

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

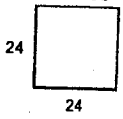
TABLE 5 – FLAT FILTER SIZES AND QUANTITIES

		UNIT SIZE															
		35	60	80	105	120	150	170	215	250	305	360	400	500	580	660	800	1000
Area (sq. ft.)		4.0	6.0	8.0	11.1	13.3	16.7	17.8	22.2	24.0	32.0	40.0	41.7	50.0	60.0	66.0	82.7	108.8
Filter Size	12" x 24"		1															
	16" x 20"					6		8								3	3	
	16" x 25"				4		6											
	20" x 20"								8				15					14
	24" x 20"											12		15			5	21
	24" x 24"	1	1	2						6	8				15	15	15	

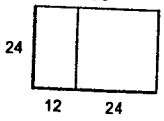
NOTES:
1. See the filter configurations below for specific filter arrangements.
2. Flat filters are side-loaded.
3. Open return filters are front-loaded.

INDICATES BLOCKOFF

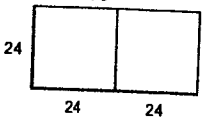
SIZE 35



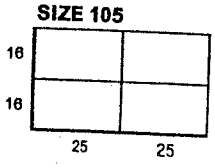
SIZE 60



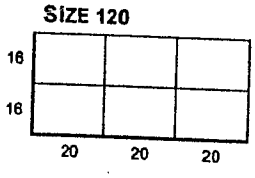
SIZE 80



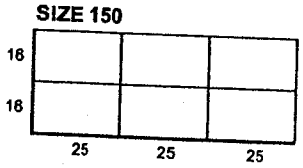
SIZE 105



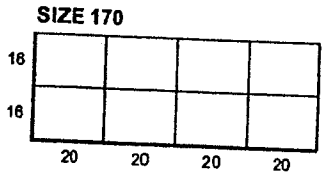
SIZE 120



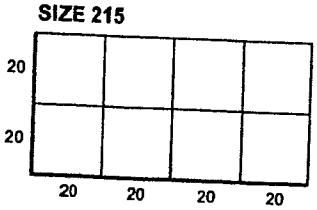
SIZE 150



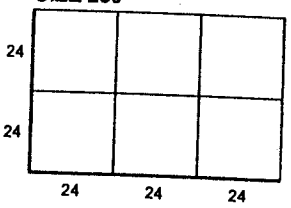
SIZE 170



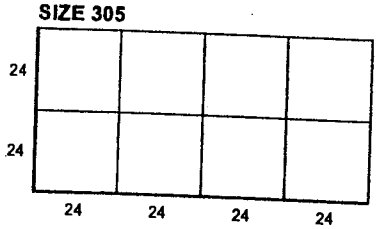
SIZE 215



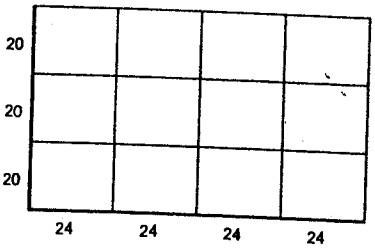
SIZE 250



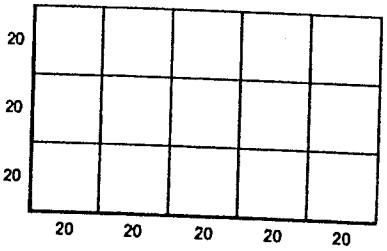
SIZE 305



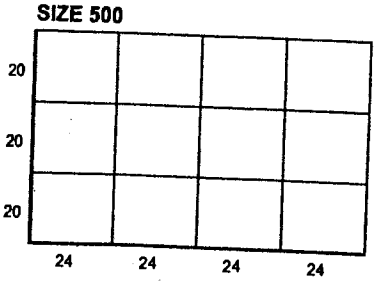
SIZE 360



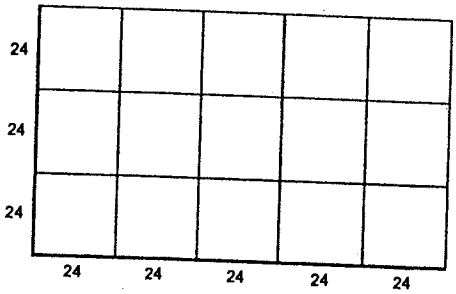
SIZE 400



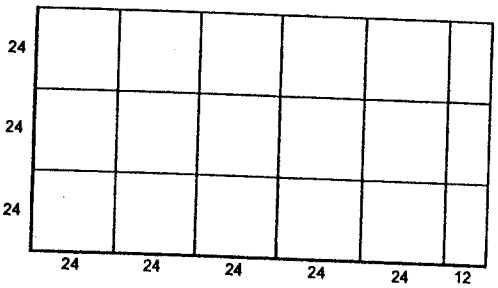
SIZE 500



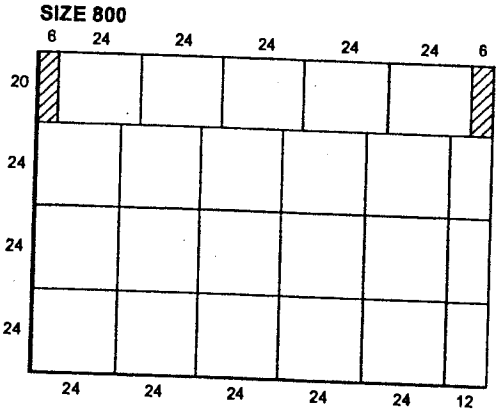
SIZE 580



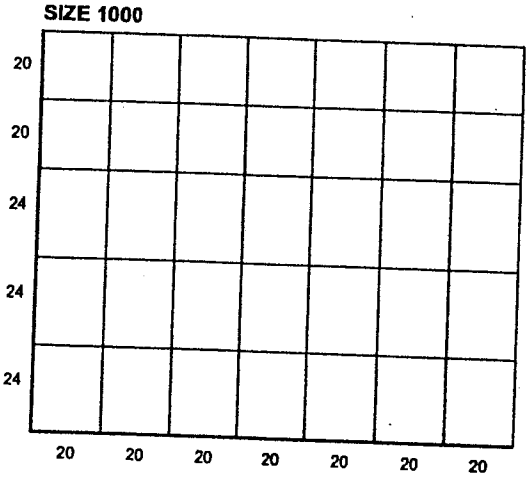
SIZE 660



SIZE 800



SIZE 1000



LD02953

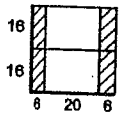
TABLE 6 – ANGLE FILTER SIZES AND QUANTITIES

		UNIT SIZE															
		35	60	80	105	120	150	170	215	250	305	360	400	500	580	660	800	1000
Area (sq. ft.)		4.4	8.9	11.1	15.6	16.7	21.1	22.2	29.2	35.6	42.2	50.0	55.6	66.7	80.0	88.0	133.3	140.0
Filter Size	12" x 24"																	
	16" x 20"	2	4		2		2			16	4					4		
	16" x 25"								8		12							
	20" x 20"			4	4	6	6	8				8		24			48	
	20" x 24"																	42
	20" x 25"								2			8	16					
	24" x 24"														20	20		

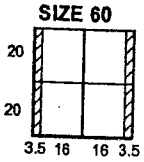
NOTES:
1. See the filter configurations below for specific filter arrangements.
2. Angle & filter / mixing box filters are side-loading.

INDICATES BLOCKOFF

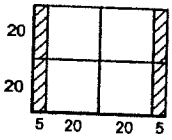
SIZE 35



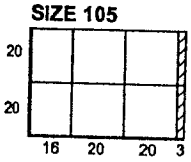
SIZE 60



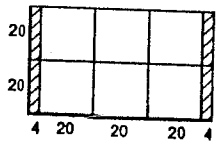
SIZE 80



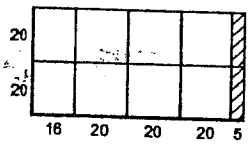
SIZE 105



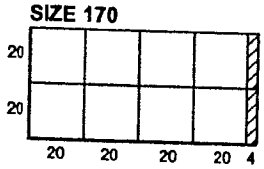
SIZE 120



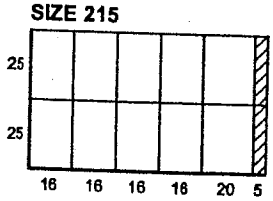
SIZE 150



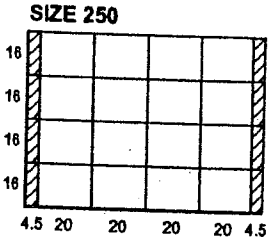
SIZE 170



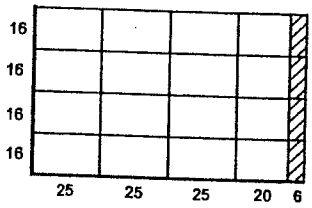
SIZE 215



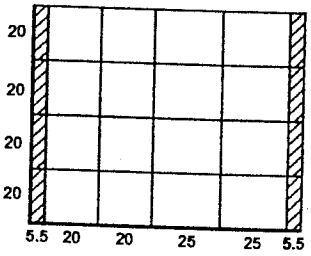
SIZE 250



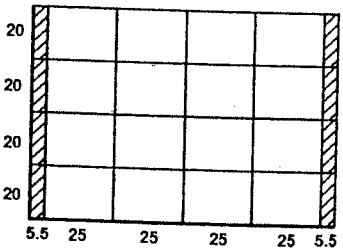
SIZE 305



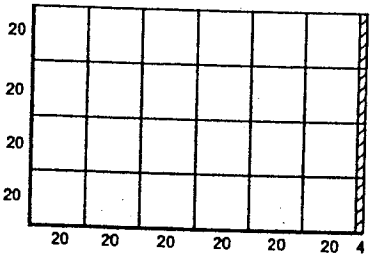
SIZE 360



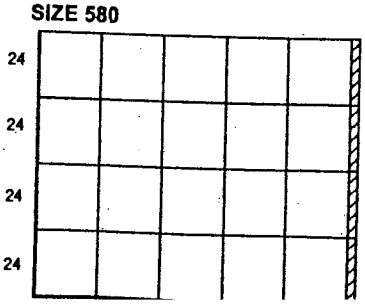
SIZE 400



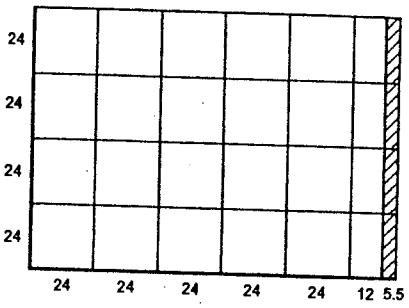
SIZE 500



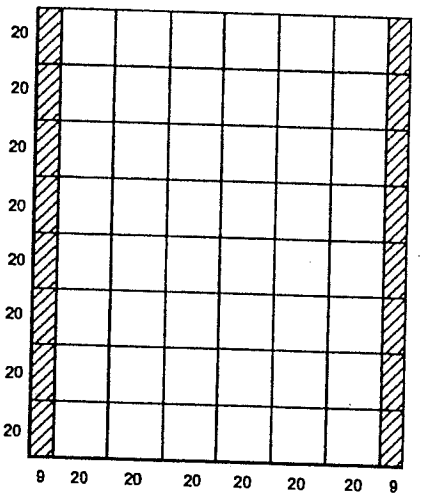
SIZE 580



SIZE 660



SIZE 800



SIZE 1000

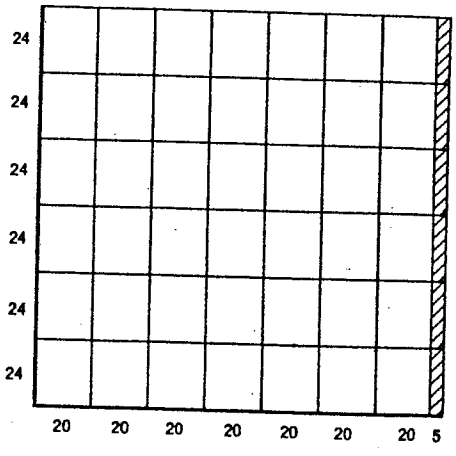


TABLE 7 – BAG FILTER / RIGID FILTER SIZES AND QUANTITIES

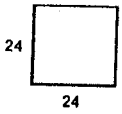
		UNIT SIZE															
Area (sq. ft.)		35	60	80	105	120	150	170	215	250	305	360	400	500	580	660	800	1000
		4.0	6.0	8.0	12.0	12.3	16.0	17.1	22.2	24.0	32.0	40.0	41.7	50.0	60.0	66.0	82.7	108.8
Filter Size	12" x 24"		1		2	2	3	3										
	20" x 20"					3		4	8							3	3	
	24" x 20"				2		3						15					14
	24" x 24"	1	1	2						6	8	12		15			5	21
															15	15	15	

NOTES:
1. Filter sizes are dimensioned width by height (W x H). Example: Filter size 12 x 24 = 12" wide by 24" high filter.
2. See the filter configurations below for specific filter arrangements.
3. Bag, rigid & pre-filter filters are all side-loading.

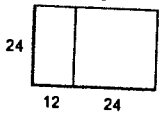
INDICATES BLOCKOFF

Bag & Rigid Filters with a pre-filter require 2 sets of Blockoffs.
One set for the Pre-filter Track & one for the Final Filter Track.

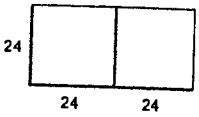
SIZE 35



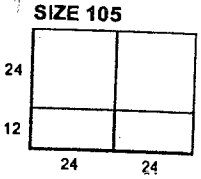
SIZE 60



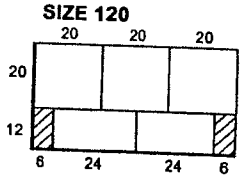
SIZE 80



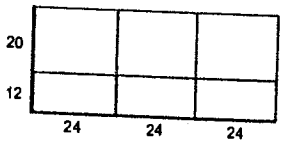
SIZE 105



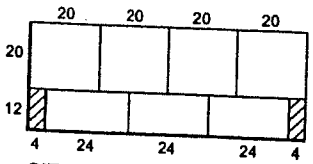
SIZE 120



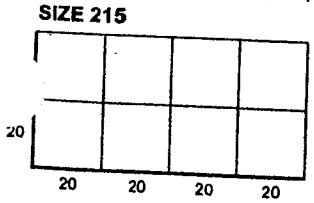
SIZE 150



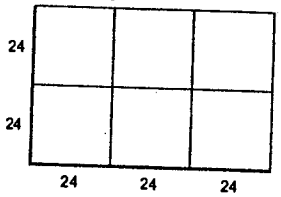
SIZE 170



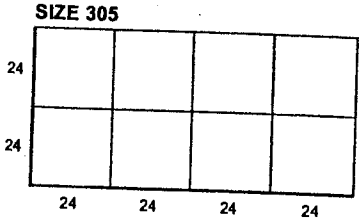
SIZE 215



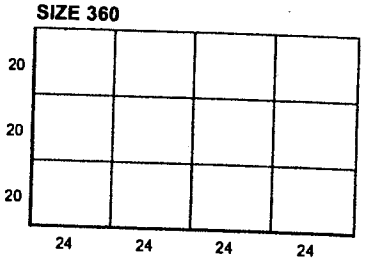
SIZE 250



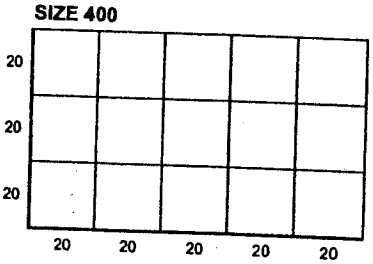
SIZE 305



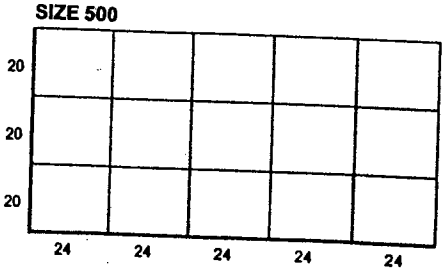
SIZE 360



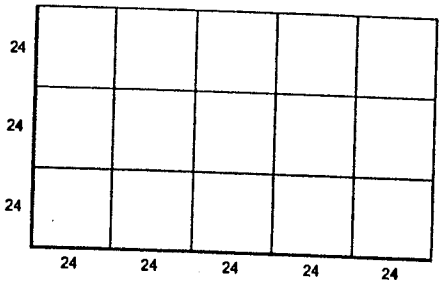
SIZE 400



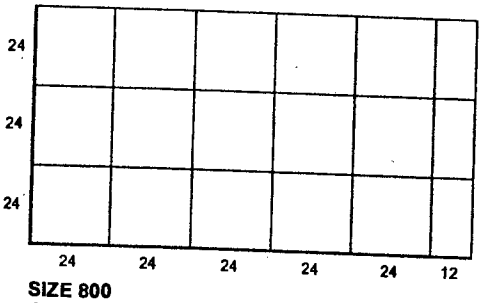
SIZE 500



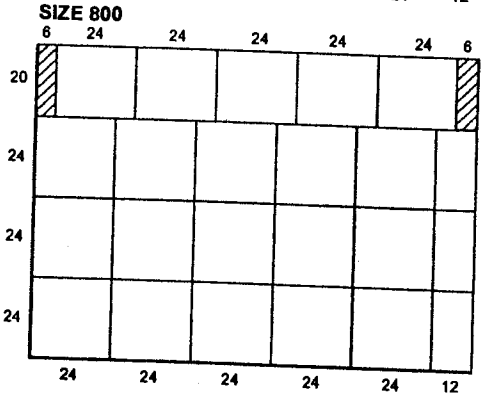
SIZE 580



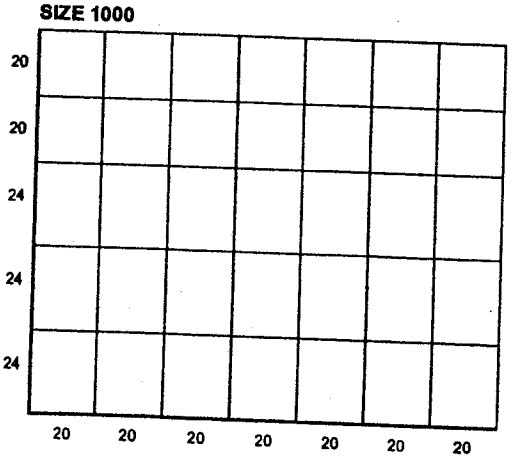
SIZE 660



SIZE 800



SIZE 1000

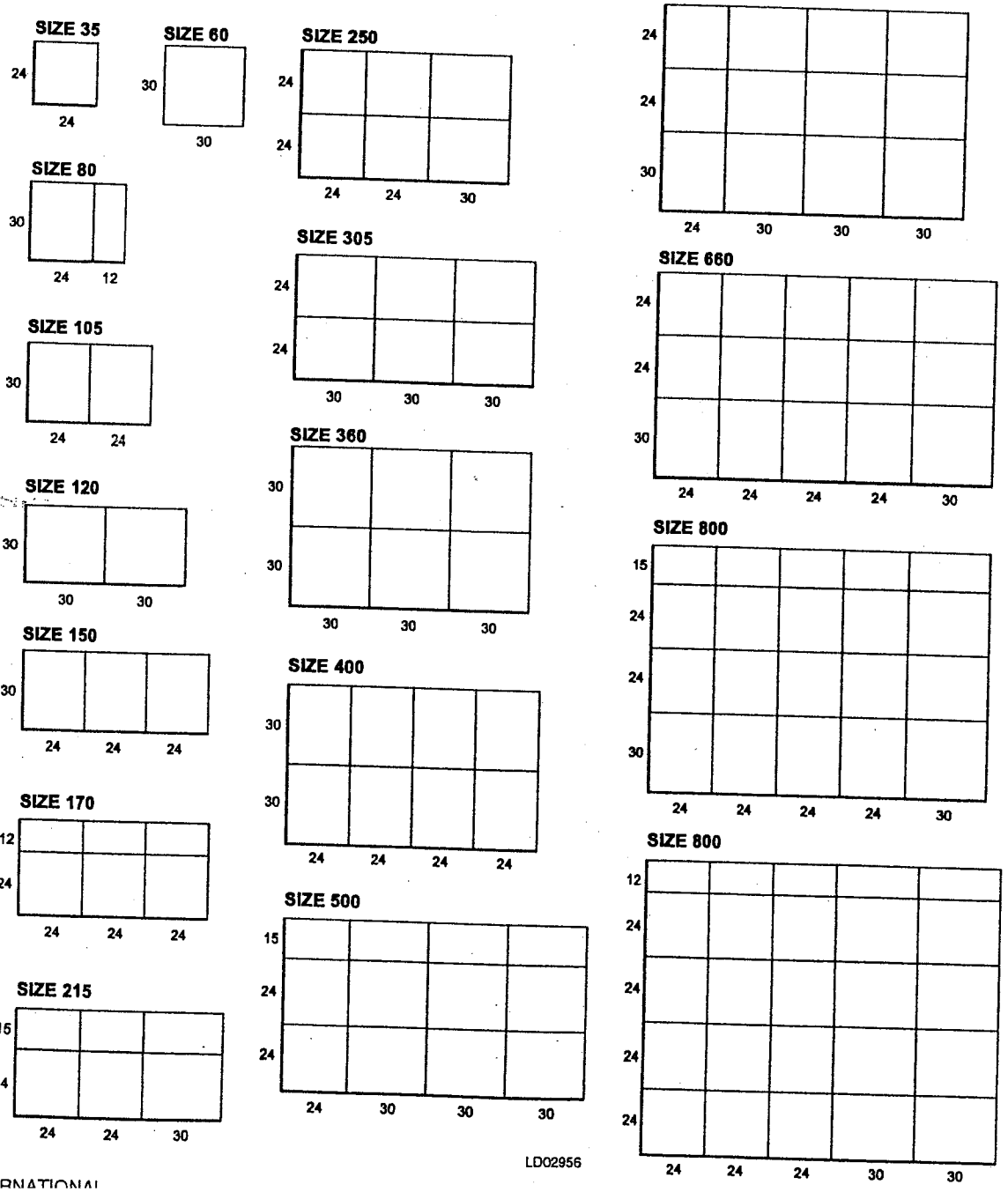


LD02955

TABLE 8 – HEPA FILTER SIZES AND QUANTITIES PER UNIT SIZE

		UNIT SIZE															
		35	60	80	105	120	150	170	215	250	305	360	400	500	580	660	800	1000
Area (sq. ft.)		4.0	6.2	7.5	10.0	12.5	15.0	18.0	21.1	26.0	30.0	37.5	40.0	49.8	61.7	68.2	81.3	98.9
Max CFM		2,000	3,125	3,750	5,000	6,250	7,500	9,000	10,563	13,000	15,000	18,750	20,000	24,938	30,875	34,125	40,888	49,500
Filter Size	24" x 24"	1						3	2	4				2	2	8	8	12
	24" x 12"																	
	12" x 24"							3										3
	15" x 24"								2					1			4	
	15" x 30"								1					3			1	
	24" x 30"								1	2	6			6	6	2	2	8
	12" x 30"																	2
	30" x 24"			1	2		3						8		1	4	4	
	30" x 30"		1			2						6			3	1	1	
	30" x 12"			1														

NOTES:
1. See the filter configurations below for specific filter arrangements.
2. For further details, see the HEPA filter IOM enclosed with unit.

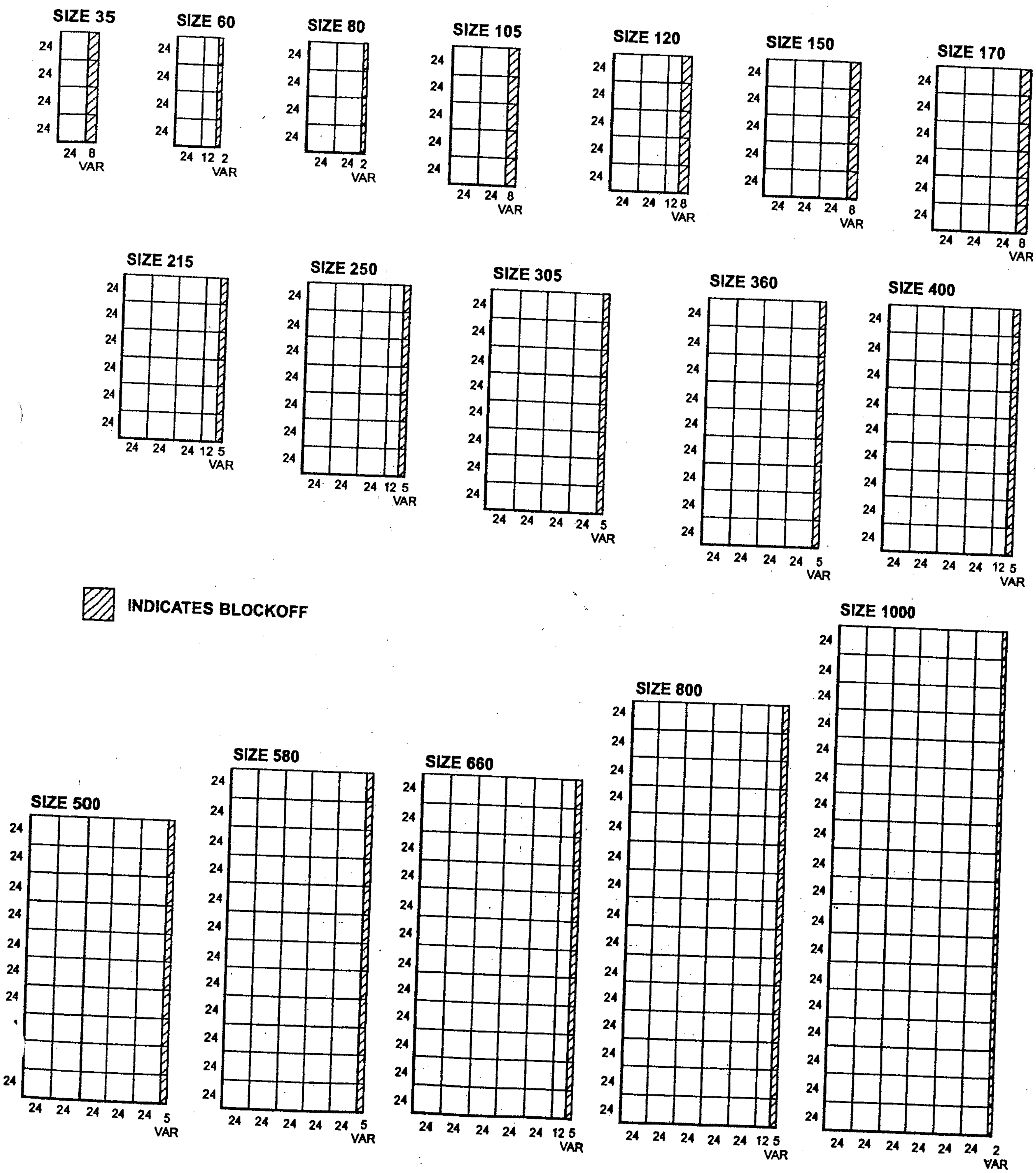


LD02956

TABLE 9 – CARBON FILTER SIZES AND QUANTITIES PER UNIT SIZE

	UNIT SIZE																
	35	60	80	105	120	150	170	215	250	305	360	400	500	580	660	800	1000
AREA (sq.ft.)	16	24	32	40	50	60	72	84	98	128	144	162	200	240	264	330	432
24" x 24"	4	4	8	10	10	15	18	18	21	32	36	36	50	60	60	75	108
24" x 12"		4			5			6	7			9			12	15	

NOTES: 1. See the filter configurations below for specific filter arrangements.
2. Carbon filters are side loading.



LD02513

FACTORY PACKAGED CONTROLS

Refer to the Introduction Section of the manual if your unit is equipped with Factory Packaged Controls. Also refer to Form 450.11-NO1 for installation and startup instructions.

NOTE: Field provided controls are installed and warranted by others. (Refer to the YORK Sales order to determine if the controls were provided by YORK).

ELECTRIC HEATERS

At least once a year at start of operating season or whenever unit is serviced, check field and factory-made electrical connections for tightness.

1. Check tightness of all electrical connections.
2. Remove heater circuit fuses and clean holders.
3. Turn on power to activate transformer.
4. Start-up unit fans. Check airflow and switches. Refer to base unit instructions as required.
5. Set thermostats so that heater contactors will operate.
6. Shut off unit power.
7. Reinstall fuses. Be sure fuses are tight in holders.
8. Turn on unit power and heater power.

CAUTION: Electric shock hazard. Disconnect power before entering or servicing unit. More than one disconnect switch may be required to deenergize the equipment.

FREEZE PROTECTION

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

1. For all year operation, ethylene glycol and other antifreeze solutions 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 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 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 conditions, 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.

SERVICE

TROUBLESHOOTING

An HVAC air system includes the air handling unit and the entire air circuitry through which the air flows. Included in the system are such components as duct work, fittings, branch duct, dampers, heat exchangers, filters, 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 Figure 48. 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.

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. Refer to Figure 49.

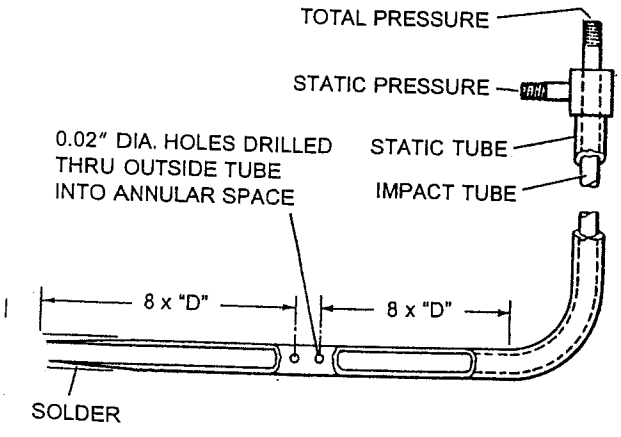


FIG. 48 – CONSTRUCTION OF PITOT TUBE

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, an the technician should have one or more instruments to cover the range of 0 to 8 inches of water, Refer to Figure 50.

MAGNEHELIC PRESSURE GAUGE

"Magnehelic" is not a generic term but is registered by Dwyer Instrument Company. The magnehelic gauge is a diaphragm-operated gauge 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 loosing 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. Refer to Figure 51.

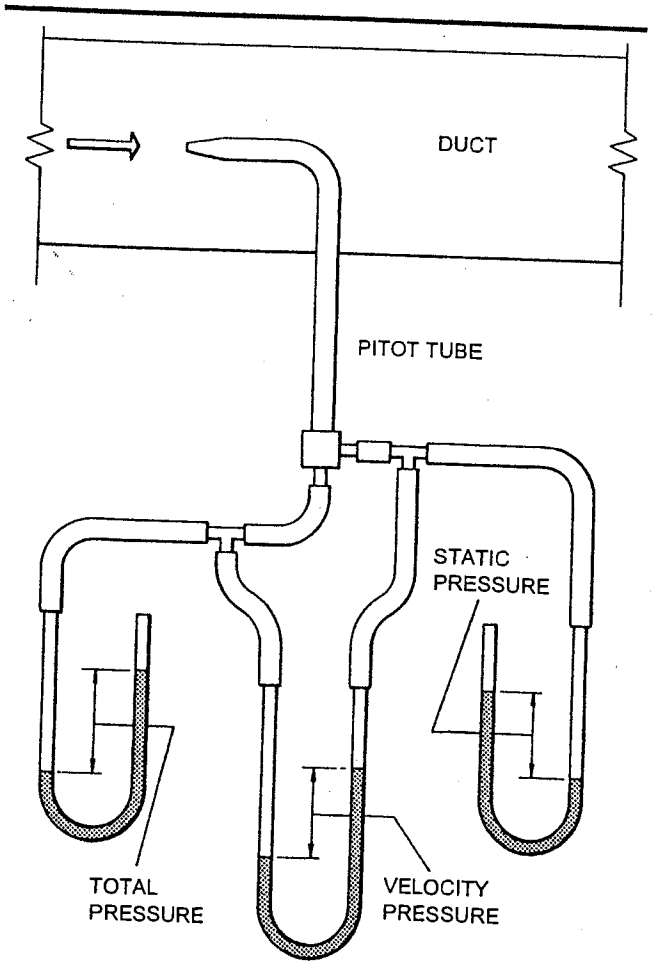


FIG. 49 – PITOT TUBE CONSTRUCTION

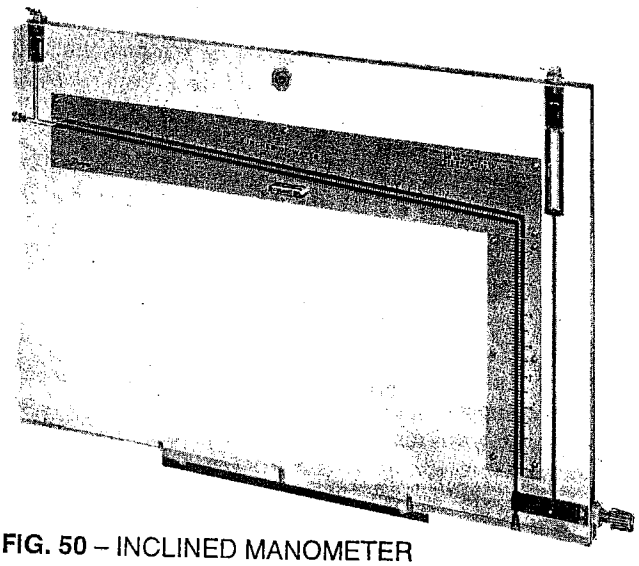


FIG. 50 – INCLINED MANOMETER

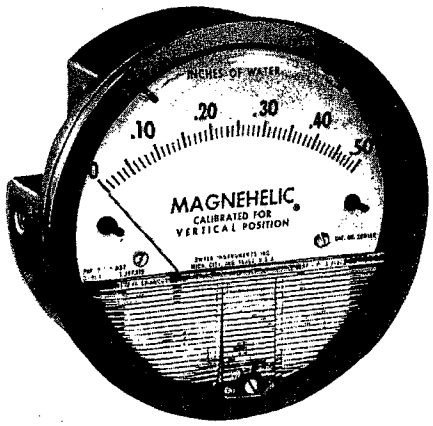


FIG. 51 – MAGNAHELIC PRESSURE GAUGE

"U" TUBE MANOMETER

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

Instruments employing this principle are called manometers. The simplest form is the basic and well known U-tube manometers. See Figure 52. This device indicates the difference between two pressures or between a single pressure and atmosphere, when one side is open to atmosphere.

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

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

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 16 inch range. See Figure 53.

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 of the Vp can be measured. For example, if a Pitot tube manometer hook-up reads 0.250 in. water, we substitute for the above equation:

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

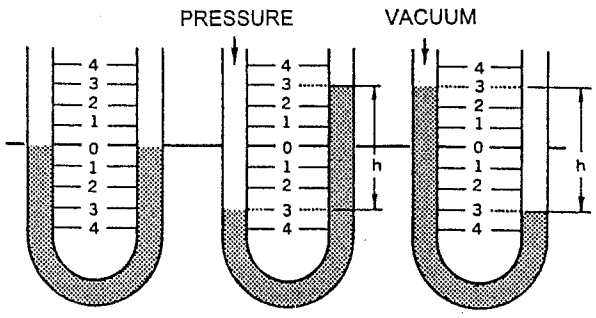


FIG. 52 – "U" TUBE MANOMETERS

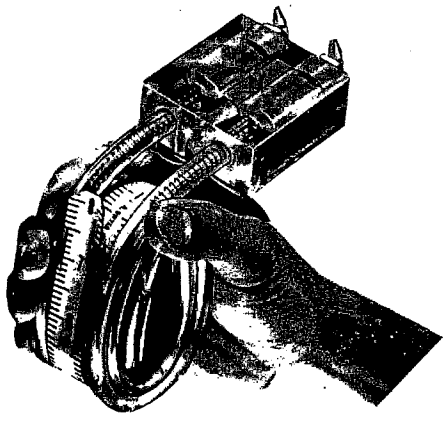


FIG. 53 – TUBE MANOMETER

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 a supply system will read a positive pressure, the inlet side of the fan in an exhaust system 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 gage, and the total pressure opening connected to the high pressure side of the gage, 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 ference between total pressure and the velocity pressure. should be remembered, however, that in an actual duct stem, 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 54.

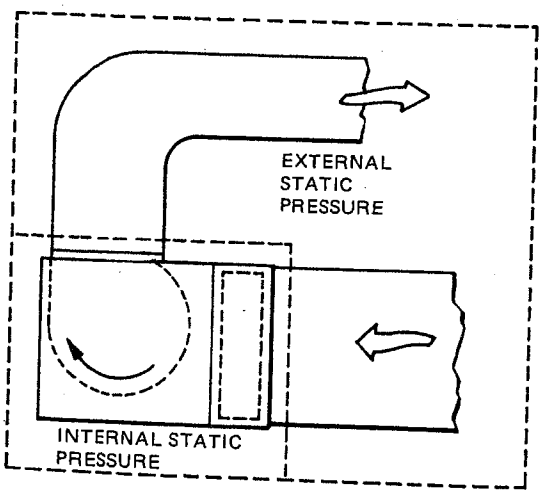


FIG. 54 – STATIC PRESSURE - AIR SYSTEM

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 static 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 trobleshooting 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 required:

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 (In. of Water)
   - F. Temperature Differential Across Cooling Coil (Degrees F)
   - 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 a separate meter or a clamp-on type AMP meter.
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 chart which follows:

TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE — SOLUTIONS
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 re-install 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. Re-align 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.
	Dampers closed and / or splitter rod disconnected. Open dampers and connect splitter rod.
	Registers closed. Open registers.

PROBLEM	POSSIBLE CAUSE — SOLUTIONS
CFM LOWER THAN REQUIRED	Fire damper(s) closed. Open fire damper(s).
	Insulating duct liner loose. Re-attach 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.
	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.
	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 ODP motors blow out internal ventilation passages with air pressure and eliminate external interference to motor ventilation. For TEFC motors clean external ventilation system and check motor ventilation fan.
	High ambient temperature over 40°C or 105°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.

PROBLEM	POSSIBLE CAUSE — SOLUTIONS
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.

YORK®

USA Proud Sponsor of the 2002 U.S. Olympic Team

36USC380

P.O. Box 1592, York, Pennsylvania USA 17405-1592

Form 100.09-NOM1 (498)
Supersedes: 100.09-NOM1 (795)

Tele. 800-861-1001
www.york.com

RPC 15M 401 4.16
Code: SP

YORK®

LIMITED WARRANTY APPLIED SYSTEMS

SERVICE POLICY | Supersedes: 50.05-NM2 (1188) | Form 50.05-NM2 (1298)

WARRANTY ON NEW EQUIPMENT

York International Corporation ("YORK") warrants all equipment and materials of its manufacture, or installation or start-up services in connection therewith, against defects in workmanship and material for a period of one year from date of initial start-up or eighteen (18) months from date of shipment, whichever occurs first. Subject to the exclusions listed below, YORK, at its option, will repair or replace, FOB point of shipment, such YORK products or components as it finds defective. On materials or components furnished by YORK, but manufactured by others, YORK will extend the same warranty it receives from the manufacturer.

Exclusions: Unless specifically agreed to in the contract documents, this warranty does not include the following costs and expenses:

1. Labor to remove or reinstall any equipment, materials, or components.
2. Shipping, handling, or transportation charges.
3. Cost of refrigerants.

No warranty repairs or replacements will be made until payment for all equipment, materials, or components has been received by YORK.

WARRANTY ON RECONDITIONED OR REPLACEMENT MATERIALS

Except for reciprocating replacement compressors, which YORK warrants for a period of one year from date of shipment, YORK warrants reconditioned or replacement materials, or installation or start-up services in connection therewith, against defects in workmanship or material for a period of ninety (90) days from date of shipment. Subject to the exclusions listed below, YORK will replace, FOB point of shipment, such materials or parts as YORK finds defective. However, where reconditioned or replacement materials or parts are placed on equipment still under the original new equipment warranty, then such reconditioned or replacement parts are warranted only until the expiration of such original new equipment warranty.

Exclusions: Unless specifically agreed to in the contract documents, this warranty does not include the following costs and expenses:

1. Labor to remove or reinstall any equipment, materials, or components.
2. Shipping, handling, or transportation charges.
3. Cost of refrigerant.

No warranty repairs or replacements will be made until payment for all equipment, materials, or components has been received by YORK.

ALL WARRANTIES AND GUARANTEES ARE VOID IF:

1. Equipment is used with refrigerants, oil, or antifreeze agents other than those authorized by YORK.
2. Equipment is used with any material or any equipment such as evaporators, tubing, other low side equipment, or refrigerant controls not approved by YORK.
3. Equipment has been damaged by freezing because it is not properly protected during cold weather, or damaged by fire or any other conditions not ordinarily encountered.
4. Equipment is not installed, operated, maintained and serviced in accordance with instructions issued by YORK.
5. Equipment is damaged due to dirt, air, moisture, or other foreign matter entering the refrigerant system.
6. Equipment is not properly stored, protected or inspected by the customer during the period from date of shipment to date of initial start-up.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, EXPRESS OR IMPLIED IN LAW OR IN FACT, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE WARRANTIES CONTAINED HEREIN SET FORTH BUYER'S SOLE AND EXCLUSIVE REMEDY IN THE EVENT OF A DEFECT IN WORKMANSHIP OR MATERIALS. IN NO EVENT SHALL YORK'S LIABILITY FOR DIRECT OR COMPENSATORY DAMAGES EXCEED THE PAYMENTS RECEIVED BY YORK FROM BUYER FOR THE MATERIALS OR EQUIPMENT INVOLVED. NOR SHALL YORK BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES. THESE LIMITATIONS ON LIABILITY AND DAMAGES SHALL APPLY UNDER ALL THEORIES OF LIABILITY OR CAUSES OF ACTION, INCLUDING, BUT NOT LIMITED TO, CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE) OR STRICT LIABILITY. THE ABOVE LIMITATIONS SHALL INURE TO THE BENEFIT OF YORK'S SUPPLIERS AND SUBCONTRACTORS.

YORK®

USA Proud Sponsor of the 1998 U.S. Olympic Team

36USC380

P.O. Box 1592, York, Pennsylvania USA 17405-1592

Form 50.05-NM2 (1298)
Supersedes: 50.05-NM2 (1188)

VTAC 7

RELIANCE ELECTRIC

HVAC Drive

Submittal Summary Sheet

January, 1999

Reliance Electric VTAC 7 - HVAC Submittal Summary Sheet		
Project Name: [redacted]		
Tag #: AHU-1&2	Contractor PO #:	Rep Reference #:

Standard Features

- Ratings from 1-400 HP at 460 Volt and 1-100 HP at 208 volt Flux Vector Quiet Control for HVAC.
- Digital AC Variable Speed Drive with advanced electronics reliably control your HVAC fan or pump from Reliance Electric, a leader in Motor and Drive technology.
- Pre-Engineered commonly specified kits for the HVAC market. Complete U.L.™ 508 listing as a package with these drives and all factory engineered for easy contractor mounting and wiring.
- IGBT transistor technology for reliable quiet motor operation. 1 to 75 HP 8 kHz carrier frequency without derating the drive. Option for 100-150 HP 8 kHz carrier frequency rating.
- Selectable PWM carrier frequency for system acoustical tuning characteristics.
- Power matched premium efficient motors that meet the National Energy Law. Guaranteed motor performance to withstand any high drive generated voltage.
- All drive packages are Y2K compliant.
- PI Loop option in version 6.03 software.
- Designed to comply with IEEE 519-1992 Harmonic Distortion Standard.
- Compact size for maximum mounting density.
- Simple LED keypad for drive set up, control, fault indication, and metering.
- RS232 port for host computer configuration and monitoring. Optional cards for EMS network connection capabilities.
- Configurable I/O for maximum system connection capacities.
- U.L.and NEC approved electronic motor overload protection.
- NEMA 1 enclosure. 1-60 HP optional NEMA 12 plenum rated enclosure to meet "UL95" standard.
- Motor Current Limit and Regenerative voltage limits.
- Standard Digital Keypad Function:
  - Start/Stop
  - Remote/Local
  - Digital Speed Selection in Local Mode
  - Password Protection
  - LED display of Motor Speed, Volts, Amps, Hz, kW, DC Bus volts and Input Speed Reference
  - Elapsed Time Meter
- Start into rotating (windmilling) motor without decelerating or tripping.
- Simple connection to fire and life safety systems. Smoke and Fire purge as well as freezestat and other selectable interlocks.
- ISO 9001 Drive Manufacturer.
- Vector control for accurate speed control and "trip free" operation.
- 0-20 mA or 0-10 VDC speed reference inputs and selectable 0-20 mA or 0-10 VDC output proportional to speed or load.
- Adjustable Auto Restart (number of restarts and time delay between attempts are selectable). Display indicates when controller is attempting a restart.
- Frequency avoidance bands widths enables the drive to lock out mechanical resonance points.
- "S" curve acceleration and deceleration for smooth speed transitions and high inertia fan wheels.

Variable Speed Drive - Full Load Efficiencies

Drive HP	Drive Input Voltage	Power Module Watt Loss	Efficiency @ 8 kHz	Efficiency @ 4 kHz	Efficiency @ 2 kHz
1	208 Volts	60	91.9%	92.6%	92.9%
2	208 Volts	100	93.3%	93.8%	94.1%
3	208 Volts	140	93.7%	94.2%	94.5%
5	208 Volts	180	95.2%	95.6%	95.8%
7.5	208 Volts	210	96.3%	96.6%	96.7%
10	208 Volts	250	96.7%	96.9%	97.1%
15	208 Volts	375	96.7%	96.9%	97.1%
20	208 Volts	600	96.0%	96.3%	96.5%
25	208 Volts	600	96.8%	97.0%	97.2%
30	208 Volts	800	96.4%	96.7%	96.9%
40	208 Volts	960	96.8%	97.0%	97.2%
50	208 Volts	1200	96.8%	97.0%	97.2%
60	208 Volts	1200	97.3%	97.5%	97.6%
75	208 Volts	1780	96.8%	97.1%	97.6%
100	208 Volts	1780	97.6%	97.8%	97.9%
1	460 Volts	60	91.9%	92.6%	92.9%
2	460 Volts	100	93.3%	93.8%	94.1%
3	460 Volts	140	93.7%	94.2%	94.5%
5	460 Volts	180	95.2%	95.6%	95.8%
7.5	460 Volts	210	96.3%	96.6%	96.7%
10	460 Volts	250	96.7%	96.9%	97.1%
15	460 Volts	375	96.7%	96.9%	97.1%
20	460 Volts	600	96.0%	96.3%	96.5%
25	460 Volts	600	96.8%	97.0%	97.2%
30	460 Volts	800	96.4%	96.7%	96.9%
40	460 Volts	960	96.8%	97.0%	97.2%
50	460 Volts	1200	96.8%	97.0%	97.2%
60	460 Volts	1200	97.3%	97.5%	97.6%
75	460 Volts	1780	96.8%	97.1%	97.6%
100	460 Volts	1780	97.6%	97.8%	97.9%
125	460 Volts	2000	97.9%	98.0%	98.1%
150	460 Volts	3200	97.1%	97.4%	97.5%
200	460 Volts	3290	N/A	98.0%	98.1%
250	460 Volts	4160	N/A	97.8%	97.9%
300	460 Volts	5100	N/A	97.7%	97.9%
350	460 Volts	6150	N/A	97.6%	97.8%
400	460 Volts	7000	N/A	97.7%	97.8%

VTAC 7

RELIANCE ELECTRIC

HVAC Drive

VFD Unit Description

Project Name:	[redacted]
Engineer:	
Contractor: Alpha Mechanical	Date submitted: 2/20/01

Equipment Input Voltage: 208 Volt / 460 Volt / 3-Phase, 60 Hz						
HP	20 (14.9)	40 (21.2)	20 (14.9)	40 (29.8)	HP (kW)	
Quantity	1	1	1	1		
VTAC 7 Drive (See Below for Std. Features)						
Motor HP	20 (14.9)	40 (29.8)	20 (14.9)	40 (29.8)		
Motor RPM	1800	1800	1800	1800		
Tagging	AHU-1R	AHU-1S	AHU-2R	AHU-2S		
Input Line Fuses	x	x	x	x		
Main Input Disconnect	x	x	x	x		
Single Motor Overload						
Second Motor Overload						
Motor HP						
Motor HP						
P to E (Pneumatic Follower)						
Electronic Process Follower						
0-20 mA						
0-10 VDC						
115 VAC Control						
0-20 mA / 0-10 VDC Output						
Contactor Bypass-to-Line (See Below for Std. Features)	x	x	x	x		
Smoke Purge Relay Circuit						
Line Reactor	x	x	x	x		
Isolation Transformer						
Johnson Metasys N2 Card						
Mod Bus Card						
NEMA 1 Enclosure						
NEMA 12 Enclosure						

Standard Controller Features:

- Local Operator's Keypad Control
- Digital Fault Display with Time Stamp
- Digital Display of Motor Speed, Volts, Amps, Hz., kW, Input Signal, Elapsed Time
- Critical Frequency Avoidance
- Adjustable Auto-restart
- Eight Pre-set Speeds
- RS232 Communications Port
- Auto/Manual Selection
- Local/Remote Selector Switch
- Control System Interface I/O
- Interlock Inputs for Fire & Life Safety Interface
- Low Cost Option Allows up to 250' of Cable Between Drive and Motor
- Quiet Motor Operation
- Surface Mount Printed Circuit Boards

Contactor Bypass Features:

- Drive Output Isolation Contactor
- Bypass Contactor
- Drive Only Disconnect
- VFD-Off-Bypass Selector Switch
- VFD and Bypass Pilot Lights

Other Options:

- Power Matched Energy Efficient Motors
- Automatic Bypass-to-Line
- Super Remote Meter Interface
- Control & Communication Software 3000 (Windows-Based Version 3.1 or Later)
- Interface Cable

Rockwell Automation

VFD Unit Description

Job Name MEDICAL/DENTAL CLINIC - LOS ANGELES

Unit Designation	VFD HP	Max Controller Amps	Motor HP
AHU-1 Return	20 (14.9)	27.0	20 (14.9)
AHU-1 Supply	40 (29.8)	54.0	40 (29.8)
AHU-2 Return	20 (14.9)	27.0	20 (14.9)
AHU-2 Supply	40 (29.8)	54.0	40 (29.8)

HVAC Drive

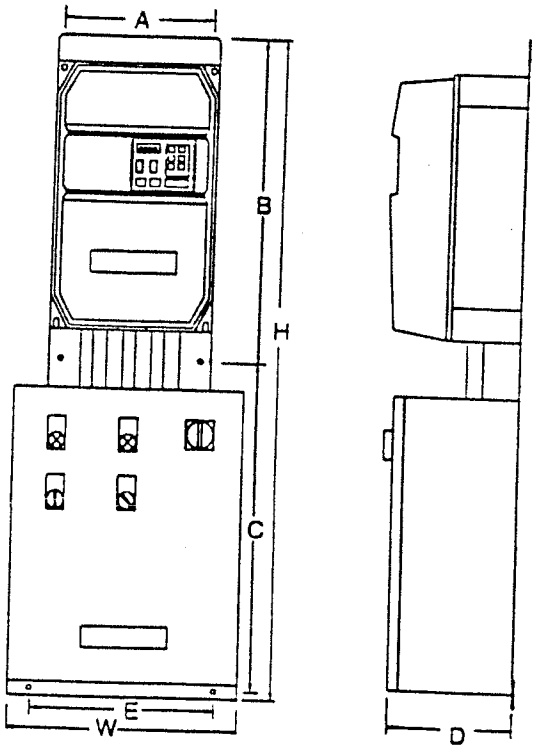
Submittal

Drive and Three-Phase Input Line Reactor

Style "B+"

- ☑ Optional Door Interlocked Main Input Disconnect Switch.
- ☑ Optional Input Line Fuses
- ☑ Optional Contactor Bypass

DIMENSIONS



This drawing represents a typical unit with remote/local and bypass cover control.

OUTSIDE DIMENSIONS inches (mm)

HP @ 208 Volt	Type	H	W	D	WT (kg)
1-5	Wall	37.5"	16"	10.21"	50 lbs
7.5	Wall	40"	16"	10.21"	56 lbs
10	Wall	49.94"	24"	13.28"	64 lbs
15-25	Wall	60.94"	24"	13.28"	73 lbs

HP @ 460 Volt	Type	H	W	D	WT
1-5	Wall	37.5"	16"	10.21"	50 lbs
7.5-10	Wall	40" (1016)	16" (406)	10.21" (260)	56 lbs (25.4)
15-20	Wall	45" (1143)	16" (406)	10.21" (260)	73 lbs (33.1)
25	Wall	54.94"	24"	13.28"	92 lbs
30-40	Wall	60.69" (1542)	24" (610)	13.78" (350)	175 lbs (79.4)
50-60	Wall	66.69"	24"	13.78"	210 lbs

MOUNTING FASTENER LOCATIONS

HP @ 208 Volt	A	B	C	E
1-5	7.75"	14"	22.5"	15"
7.5	10.05"	16.5"	22.5"	15"
10	10.05"	16.5"	32.44"	23"
15-25	10.34"	21.5"	32.19"	22.5"

HP @ 460 Volt	A	B	C	E
1-5	7.75"	14"	22.5"	15"
7.5-10	10.05"	16.5"	22.5"	15"
15-20	10.34"	21.5"	22.5"	15"
25	10.34"	21.5"	32.44"	23"
30-40	13.5"	27"	32.44"	23"
50-60	13.5"	27"	38.44"	22.5"

HVAC Drive

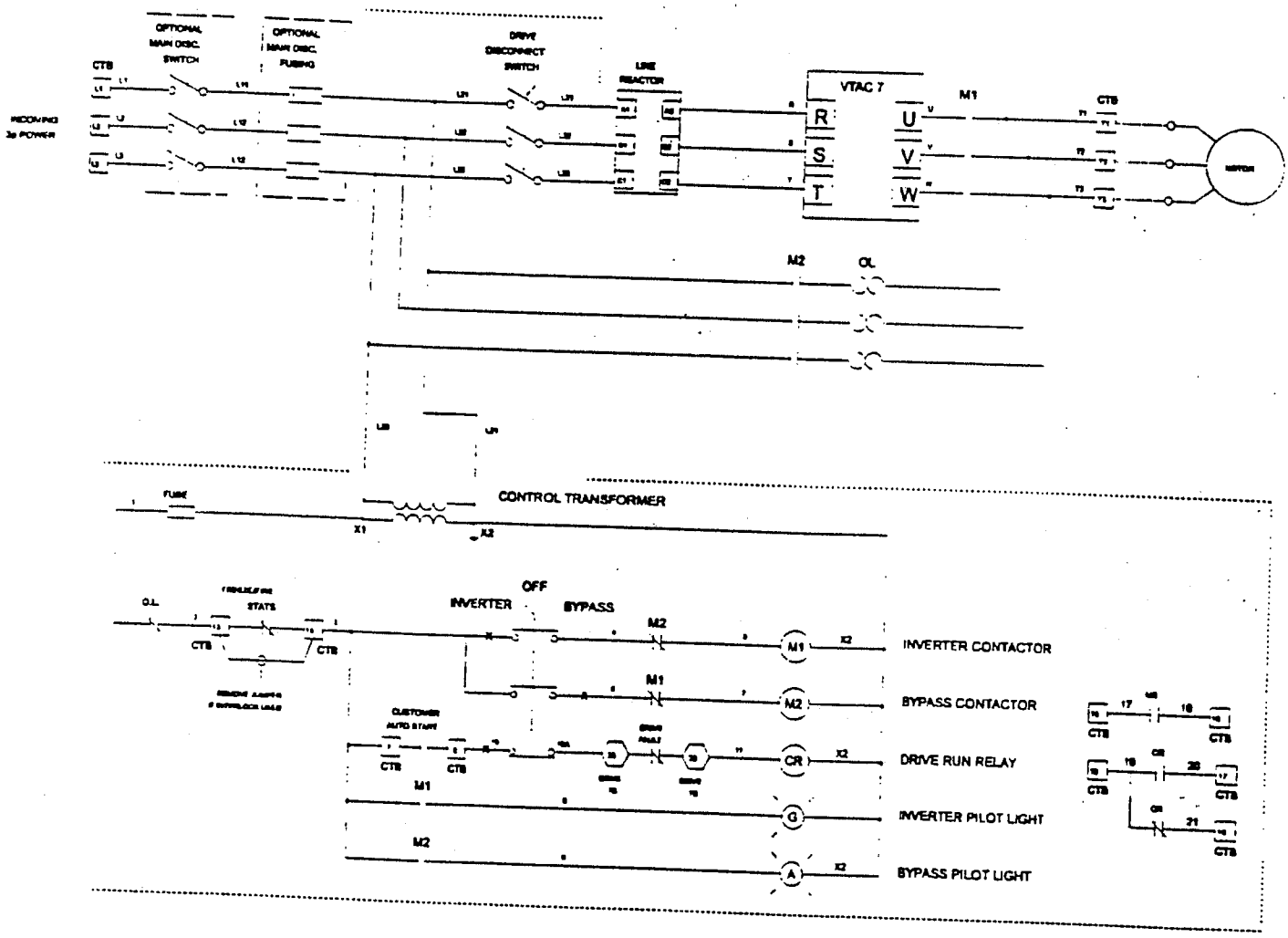
Submittal

Drive and Three-Phase Input Line Reactor

Style "B+"

- ☑ Optional Main Input Disconnect Switch
- ☑ Optional Input Line Fuses
- ☑ Optional Contactor Bypass

SCHEMATIC - ALL HP SIZES



HVAC Drive

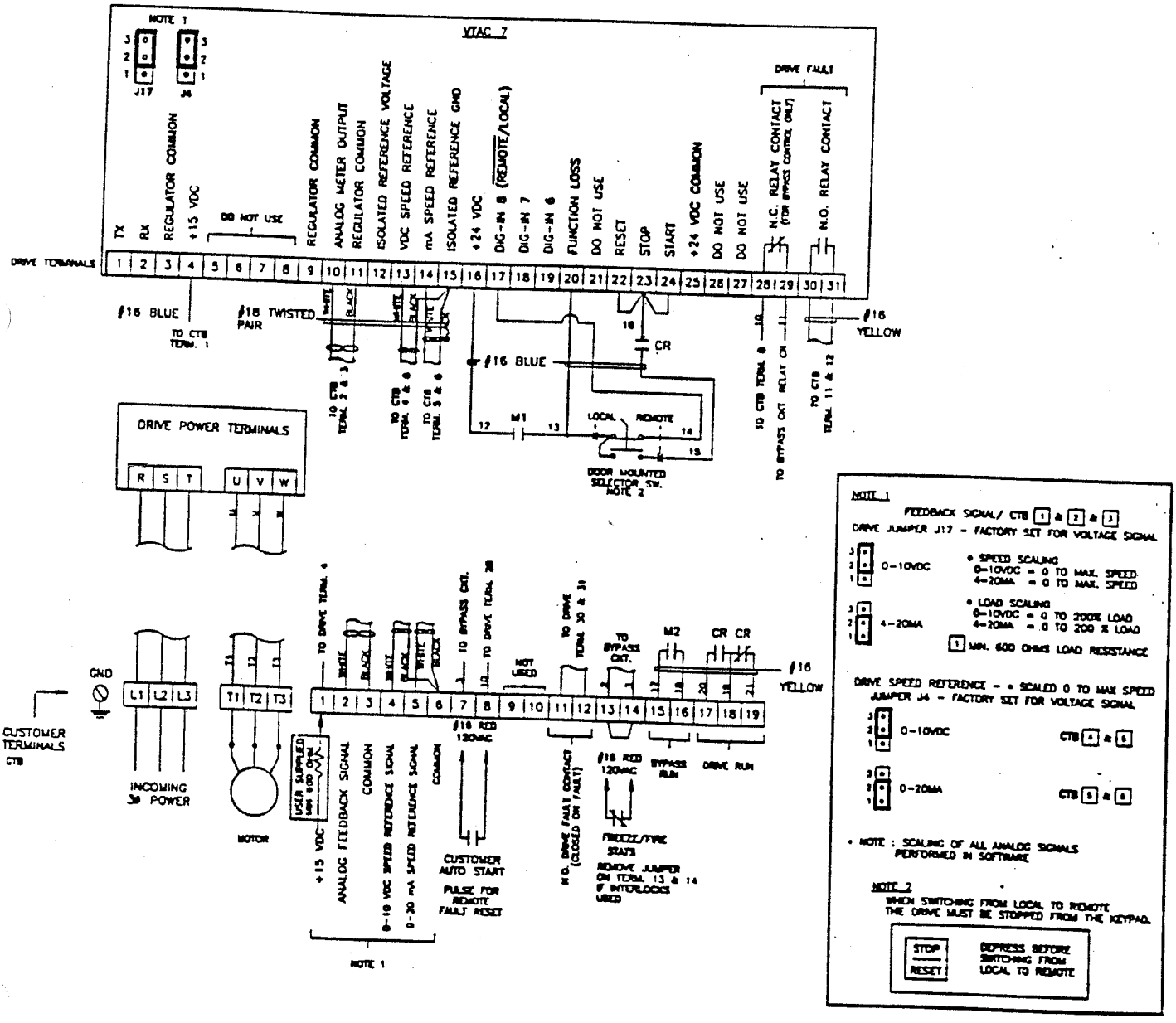
Submittal

Drive and Three-Phase Input Line Reactor

Style "B+"

☑ Optional Main Input Disconnect Switch
☑ Optional Input Line Fuses
☑ Optional Contactor Bypass

USER WIRING - ALL HP SIZES



HVAC Drive

Submittal

Maximum Power Wire Sizes

208 Volt Wire Sizes for 1-100 HP Drives

Type of Wiring	Terminals	Maximum Wire Size	
AC Input/Output Power	R/L1, S/L2, T/L3 U/T1, V/T2, W/T3	1-10 HP 15-20 HP 25 HP	8 AWG 4 AWG 4 AWG
		30 HP 40 HP 50 HP	1 AWG 2 AWG 1 AWG
		60 HP 75 HP 100 HP	1/0 AWG 3/0 AWG 4/0 AWG
Ground	Ground Terminal	1-10 HP 15-20 HP 25-40 HP	8 AWG 4 AWG 8 AWG
		50-60 HP 75 HP 100 HP	6 AWG 4 AWG 2 AWG

460 Volt Wire Sizes for 1-400 HP Drives

Type of Wiring	Terminals	Maximum Wire Size	
AC Input AC Output	R/L1, S/L2, T/L3 U/T1, V/T2, W/T3	1-10 HP 15-20 HP 25-50 HP	8 AWG 8 AWG 4 AWG
		60 HP 75-100 HP 50 HP	1/0 AWG 4/0 AWG 1 AWG
		60 HP 75-100 HP 125-150 HP	1/0 AWG 4/0 AWG 2/0 AWG (2X)
		200-400 HP	350 MCM (2X)
Ground	GND GND GND GND PE GND PE GND	1-10 HP 15-20 HP	8 AWG 8 AWG
		25-50 HP 60 HP 75-100 HP AC Ground	4 AWG 1/0 AWG 2 AWG
		75-100 HP DC Ground 125-150 HP AC 200-400 HP	8 AWG 4/0 AWG 350 MCM (2X)

VTAC 7
HVAC DRIVE

Backed By A Worldwide Service Organization

- Reliance Electric employs 300 Service Engineers in 60 locations throughout the US and Canada.
- Factory Authorized Reps for Startup and Service assistance.
- Numerous Factory Repair Parts stocking centers nationwide.

Simple Documentation Packages for Submittals and Installation

- Standard submittal drawings for engineering review and approval.
- Dimensions and contractor wiring connection drawings for ease of installation.
- Cad Cam files available for system design.
- Instruction Manual D2-3347 for installation and maintenance.

SERVICE CONDITIONS

Elevation ..... to 3300 ft (1000 meters)
Derate 3% for every 1000 ft. above 3300
Ambient Temperature Range
Cabinet ..... 0°C to 40°C (32°F to 104°F)
Atmosphere Non-Condensing Relative
Humidity 5–95%
A-C Line Voltage Variation ..... Rated Input Voltage plus or minus 10%
A-C Line Short Circuit Withstand .....
30,000 A with Fuse Protection
A-C Line Frequency Variation
(50/60Hz) ..... 48–62 Hz
Storage Temperature ..... –40°C to 65°C
(–40°F to 149°F)

RATINGS @ 460 VOLTS

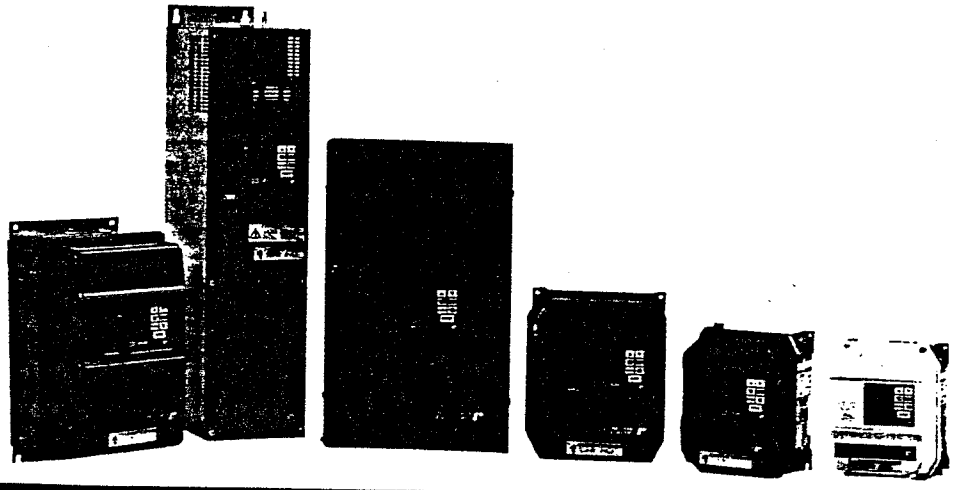
HP	Drive Input KVA	Rated Output Amps	Drive Model Number
1	2	2.1	1H4150
2	3.3	3.4	2H4150
3	5.1	5.3	3H4150
5	7.9	8.2	5H4150
7.5	10.7	11.1	7H4150
10	13.7	14.2	10H4150
15	20.2	21.0	15H4150
20	26.1	27.0	20H4150
25	29.5	30.4	25H4150
30	35	39	30H4150
40	46.2	54	40H4150
50	57.3	67	50H4150
60	71.7	78	60H4150

RATINGS @ 208 VOLTS

HP	Drive Input KVA	Rated Output Amps	Drive Model Number
1	1.3	5.1	1H2150
2	2.5	8.5	2H2150
3	3.7	12.3	3H2150
5	6.6	21	5H2150
7.5	10	26.9	7H2150
10	13.2	35	10H2150
15	19.8	53.9	15H2150
20	25.9	70.1	20H2150

Note: NEMA 12 Models use XXHX250 Number Format.

Note: All current ratings are @ 8 KHz carrier frequency and have a maximum continuous overload of 110%.



VTAC7 HVAC Drives

1-400 HP

Replacement Parts Kits

DRIVE

Power Module Drive Kits - 460VAC		
HP	Model Number	List Price $
*30	HDRK030	$2,200
*40	HDRK040	2,450
*50	HDRK050	2,600
*60	HDRK060	3,350
75	HDRK075	3,450
**100	HDRK100	3,950
**125	HDRK125	4,850
**150	HDRK150	5,000
***200	HDRK200	7,950
***250	HDRK250	8,650
***300	HDRK300	11,050
***350	HDRK350	11,650
***400	HDRK400	12,700

* Kits include: (3) IGBT's, (1) Power PCB, (1) Diode Bridge, (4) Input Capacitor, (2) Fans.

** Kits include: 75HP- (3) IGBT's, (1) Power PCB, (1) Diode Bridge, (8) Input Capacitor
100HP- (6) IGBT's, (1) Power PCB, (1) Diode Bridge, (12) Input Capacitor
125-150HP-(6)IGBT's,(1)PowerPCB,(1)DiodeBridge,(16)InputCapacitor

*** Kits Include: (1) Phase Module Assembly, (3) Power PCB, (3) SCR Diode, (18) DC Bus Capacitor, (1) Blower Motor

Regulator Board Kit		
All HP's	Model Number	List Price $
	H-MPCBK-ALL	$1,300

For 1-25HP VTAC 7 drives only, individual parts are available. Entire drives should be purchased to service the Power Module.

FUSES

Main Input Line Fuses (Qty 3) 208 VAC		
HP	Model Number	List Price
1	2FUS001	$135
2	2FUS002	135
3	2FUS003	135
5	2FUS005	135
7.5	2FUS007	165
10	2FUS010	165
15	2FUS015	215
20	2FUS020	215

Main Input Line Fuses (Qty 3) 460 VAC		
HP	Model Number	List Price
1	4FUS001	$135
2	4FUS002	135
3	4FUS003	135
5	4FUS005	135
7.5	4FUS007	135
10	4FUS010	135
15	4FUS015	165
20	4FUS020	165
25	4FUS025	215
30	4FUS030	215
40	4FUS040	215
50	4FUS050	340
60	4FUS060	340
75	4FUS075	340
100	4FUS100	575
125	4FUS125	575
150	4FUS150	575
200	4FUS200	755
250	4FUS250	755
300	4FUS300	1,571
350	4FUS350	1,571
400	4FUS400	1,571

Discount Symbol - RE1FD

DISCONNECT

se kits include Door Interlocked MID which includes handle, rod, MID.

Door Interlocked MID Kit for 460VAC		
HP	Model Number	List Price
1	4MI0001	$767
2	4MID002	767
3	4MID003	767
5	4MID005	767
7.5	4MID007	767
10	4MID010	767
15	4MID015	923
20	4MI0020	923
25	4MID025	1,420
30	4MID030	1,420
40	4MID040	1,420
50	4MID050	2,720
60	4MID060	2,720

Door Interlocked MID Kit for 460VAC		
HP	Model Number	List Price
*75	4MI0075 4MID075F	$3,013
*100	4MID100 4MID100F	5,433
*125	4MI0125 4MID125F	5,433
*150	4MI0150 4MID150F	5,433
**200	4MID200	
**250	4MID250	
**300	4MID300	
**350	4MID350	
* *400	4MID400	

Standard MID Kit for 460VAC		
HP	Model Number	List Price
1	4MID001S	$303
2	4MID002S	303
3	4MID003S	303
5	4MID005S	303
7.5	4MID007S	303
10	4MID010S	303
15	4MID015S	303
20	4MID020S	333
25	4MID025S	397
30	4MID030S	397
40	4MID040S	397

* When requesting the 75HP - 150HP you must specify whether the disconnect is fused or non-fused.
These kits include a standard door mounted MID which includes a handle and MID effective _____

BYPASS

These kits include: Drive Contactor, Bypass Contactor, Motor Overload.

Bypass Kit 460 VAC		
HP	Model Number	List Price
1	BYP001	$1,090
2	BYP002	1,090
3	BYP003	1,100
5	BYP005	1,100
7.5	BYP007	1,100
10	BYP010	1,190
15	BYP015	1,270
20	BYP020	1,675
25	BYP025	1,675
30	BYP030	1,855
40	BYP040	2,115
50	BYP050	2,115
60	BYP060	3,070
75	BYP075	4,290
100	BYP100	7,175
125	BYP125	7,990
150	BYP150	10,427
*200	BYP200	11,590
*250	BYP250	12,110
*300	BYP300	24,375
*350	BYP350	24,375
*400	BYP400	39,749

Bypass Kit 460 VAC Including Drive Only Disconnect		
HP	Model Number	List Price
200	BYP200D	$14,415
250	BYP250D	14,935
300	BYP300D	27,200
350	BYP350D	27,200
400	BYP400D	42,574

* 200-400HP floor mount drives: Does not include a 2DS3400 for drive only disconnect.

** These kits include Drive Contactor, Bypass Contactor, Motor Overload, and Drive Only Disconnect.

CONTROL

These kits include two position selector switch and a contact block, a three position selector switch and a contact block, a green and yellow pilot light and two contact blocks, and finally a control relay with socket base. These parts are standard for all horsepowers.

Standard for all HP'sControl Kit for Option Box	
Model Number	CON000
List Price	$425

Discount Symbol - RE1FD

TRANSFORMER

These kits include one transformer and one fuse.

Control Transformer Kit 460 VAC		
HP	Model Number	List Price
1	4CT001	$230
2	4CT002	230
3	4CT003	230
5	4CT005	230
7.5	4CT007	230
10	4CT010	230
15	4CT015	230
20	4CT020	230
25	4CT025	230
30	4CT030	230
40	4CT040	$235
50	4CT050	235
60	4CT060	235
75	4CT075	235
100	4CT100	$245
125	4CT125	245
150	4CT150	245
200	4CT200	$295
250	4CT250	295
300	4CT300	$350
350	4CT350	350
400	4CT400	350