SULLAIR

HEAT RECOVERY – EES
SERIES 12, 16, 20, 20/16 & 25
(40 TO 200 HP)

OPERATOR'S MANUAL AND PARTS LIST

Part Number 250041–369
eSullair Corporation

NOTES

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NOTES

SAFETY

1.1 GENERAL

Sullair Corporation and its subsidiaries design and manufacture all of their products so they can be operated safely. However, the responsibility for safe operation rests with those who use and maintain these products. The following safety precautions are offered as a guide which, if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment.

The compressor should be operated only by those who have been trained and delegated to do so, and who have read and understood this Operator's Manual. Failure to follow the instructions, procedures and safety precautions in this manual may result in accidents and injuries.

NEVER start the compressor unless it is safe to do so. **DO NOT** attempt to operate the compressor with a known unsafe condition. Tag the compressor and render it inoperative by disconnecting and locking out all power at the source so others, who may not know of the unsafe condition, will not attempt to operate it until the condition is corrected.

Install, use and operate the compressor only in full compliance with all pertinent OSHA regulations and all applicable Federal, State, and Local codes, standards and regulations.

DO NOT modify the compressor and/or controls in any way except with written factory approval.

While not specifically applicable to all types of compressors, most of the precautionary statements contained herein are applicable to most compressors and the concepts behind these statements are generally applicable to all compressors.

1.2 PERSONAL PROTECTIVE EQUIPMENT

Prior to installing or operating the compressor, owners, employers, and users should become familiar with, and comply with, all applicable OSHA regulations and any applicable Federal, State and Local codes, standards, and regulations relative to personal protective equipment, such as eye and face protective equipment, respiratory protective equipment, equipment intended to protect the extremities, protective clothing, protective shields and barriers and electrical protective equipment, as well as noise, exposure, administrative and/or engineering controls and/or personal hearing protective equipment.

1.3 PRESSURE

A. Install an appropriate flow–limiting valve between the service air outlet and the shut–off (throttle) valve, either at the compressor or at any other point along the air line, when an air hose exceeding !/2" (13mm) inside diameter is to be connected to the shut–off (throttle) valve, to reduce pressure in case of hose failure, per OSHA Standard 29 CFR 1926.302(b)(7).

B. When the hose is to be used to supply a manifold, install an additional appropriate flow–limiting valve between the manifold and each air hose exceeding !/2" (13mm) inside diameter that is to be connected to the manifold to reduce pressure in case of hose failure.

C. Provide an appropriate flow–limiting valve at the beginning of each additional 75 feet (23m) of hose in runs of air hose exceeding !/2" (13mm) inside diameter to reduce pressure in case of hose failure.

D. Flow–limiting valves are listed by pipe size and rates CFM. Select appropriate valves accordingly, in accordance with their manufacturer's recommendations.

E. Do not use air tools that are rated below the maximum rating of the compressor. Select air tools, air hoses, pipes, valves, filters and other fittings accordingly. Do not exceed manufacturer's rated safe operating pressures for these items.

F. Secure all hose connections by wire, chain or other suitable retaining devices to prevent tools or hose ends from being accidently disconnected or expelled.

G. Open fluid filler cap only when compressor **is not running and the receiver is not pressurized.** Shut down the compressor and bleed the sump (receiver) to zero internal pressure before removing the cap.

H. Vent all internal pressure prior to opening any line, fitting, hose, valve, drain plug, connection or other component, such as filters and line oilers, and before attempting to refill optional air line anti–icer systems with antifreeze compound.

I. Keep personnel out of line with and away from the discharge opening of hoses or tools or other points of compressed air discharge.

J. Use air at pressure less than 30 PSIG (207 kPa) for cleaning purposes, and then only with effective chip guarding and personal protective equipment per OSHA Standard 29 CFR 1910.242(b).

K. Do not engage in horseplay with air hoses as serious injury or death may result.

1.4 FIRE AND EXPLOSION

A. Clean up spills of lubricant or other combustible substances immediately, if such spills occur.

B. Shut off the compressor and allow it to cool. Then keep sparks, flames and other sources of ignition away, and do not permit smoking in the vicinity when checking or adding lubricant or when refilling air line anti–icer systems with antifreeze compound.

C. DO NOT permit fluids, including air line anti–icer system antifreeze compound or fluid film, to accumulate on, under or around acoustical material, or on any external surfaces of the air compressor or on internal surfaces of the enclosure. Wipe down using an aqueous industrial cleaner or steam clean

as required. If necessary, remove acoustical material, clean all surfaces and then replace acoustical material. Any acoustical material with a protective covering that has been torn or punctured should be replaced immediately to prevent accumulation of liquids or fluid film within the material. **DO NOT** use flammable solvents for cleaning purposes.

D. Disconnect and lock out all power at the source prior to attempting any repairs or cleaning of the compressor, or of the inside of the enclosure, if applicable.

E. Keep electrical wiring, including all terminals and pressure connectors, in good condition. Replace any wiring that has cracked, cut, abraded or otherwise degraded insulation or terminals that are worn, discolored or corroded. Keep all terminals and pressure connectors clean and tight.

F. Keep grounded and/or conductive objects such as tools away from exposed live electrical parts such as terminals to avoid arcing which might serve as a source of ignition.

G. Remove any acoustical material or other material that may be damaged by heat or that may support combustion and is in close proximity, prior to attempting weld repairs.

H. Keep suitable fully charged Class BC or ABC fire extinguisher or extinguishers nearby when servicing and operating the compressor.

I. Keep oily rags, trash, leaves, litter or other combustibles out of and away from the compressor.

J. DO NOT operate the compressor without proper flow of cooling air or water or with inadequate flow of lubricant or with degrated lubricant.

K. DO NOT attempt to operate the compressor and compressor in any classification of hazardous environment unless the compressor has been specifically designed and manufactured for that duty.

1.5 MOVING PARTS

A. Keep hands, arms and other parts of the body and clothing away from couplings, fans and other moving parts.

B. Do not attempt to operate the compressor with fan, coupling or other guards removed.

C. Wear snug fitting clothing and confine long hair when working around this compressor, especially when exposed to hot or moving parts.

D. Keep access doors, if any, closed except when making adjustments.

E. Make sure all personnel are out of and/or clear of the compressor prior to attempting to start or operate it.

F. Disconnect and lock out all power at source and verify at the compressor that all circuits are de–energized, to minimize the possibility of accidental start up or operation, prior to attempting repairs or adjustments. This is especially important when compressors are remotely controlled.

G. Keep hands, feet, floors, controls and walking surfaces clean and free of fluid, water, or other liquids, to minimize the possibility of slips and falls.

1.6 HOT SURFACES, SHARP EDGES AND SHARP CORNERS

A. Avoid bodily contact with hot fluid, hot coolant, hot surfaces and sharp edges and corners.

B. Keep all parts of the body away from all points of air discharge.

C. Wear personal protective equipment including gloves and head covering when working in, on or around the compressor.

D. Keep a first aid kit handy. Seek medical assistance promptly in case of injury. **DO NOT** ignore small cuts and burns as they may lead to infection.

1.7 TOXIC AND IRRITATING SUBSTANCES

A. DO NOT use air from this compressor for respiration (breathing) except in full compliance with OSHA Standards 29 CFR 1910 and any other Federal, State or Local codes or regulations.

B. DO NOT use air line anti–icer systems in air lines supplying respirators or other breathing air utilization equipment and **DO NOT** discharge air from these systems into unventilated or other confined areas.

C. Operate the compressor only in open or adequately ventilated areas.

⚠ DANGER

Death or serious injury may result from inhaling compressed air without using proper safety equipment. See OSHA standards on safety equipment.

D. Locate the compressor or provide a remote inlet so that it is not likely to ingest exhaust fumes or other toxic, noxious or corrosive fumes or substances.

E. Coolants and lubricants used in this compressor are typical of the industry. Care should be taken to avoid accidental ingestion and/or skin contact. In the event of ingestion, seek medical treatment promptly. Wash with soap and water in the event of skin contact.

F. Wear goggles or a full face shield when adding antifreeze compound to air line anti–icer systems.

G. If air line anti–icer system antifreeze compound enters the eyes or if fumes irritate the eyes, they should be washed with large quantities of clean water for fifteen (15) minutes. A physician, preferably an eye specialist, should be contacted immediately.

H. Do not store air line anti–icer system antifreeze compound in confined areas.

I. The antifreeze compound used in air line antifreeze systems contains methanol and is toxic, harmful or fatal if swallowed. Avoid contact with the skin or eyes and avoid breathing the fumes. If swallowed, induce vomiting by administering a tablespoon of salt in each glass of clean, warm water until vomit is clear, then administer two teaspoons of baking soda in a glass of clean water. Have patient lay down and cover eyes to exclude light. Call a physician immediately.

1.8 ELECTRICAL SHOCK

A. This compressor should be installed and maintained in full compliance with all applicable Federal, State and Local codes, standards and regulations, including those of the National Electrical Code, and also including those relative to equipment grounding conductors, and only by personnel that are trained, qualified and delegated to do so.

B. Keep all parts of the body and any hand–held tools or other conductive objects away from exposed live parts of electrical system. Maintain dry footing, stand on insulating surfaces and **DO NOT** contact any other portion of the compressor when making adjustments or repairs to exposed live parts of the electrical system. Make all such adjustments or repairs with one hand only, so as to minimize the possibility of creating a current path through the heart.

C. Attempt repairs in clean, dry and well lighted and ventilated areas only.

D. DO NOT leave the compressor unattended with open electrical enclosures. If necessary to do so, then disconnect, lock out and tag all power at the source so others will not inadvertently restore power.

E. Disconnect, lock out, and tag all power at the source prior to attempting repairs or adjustments to rotating machinery and prior to handling any ungrounded conductors.

1.9 LIFTING

A. compressors to be lifted by helicopter must be supported by slings. In any event, lift and/or handle only in full compliance with OSHA standards 29 CFR 1910 subpart N.

B. Inspect lifting bail and points of attachment for cracked welds and for cracked, bent, corroded or otherwise degraded members and for loose bolts or nuts prior to lifting.

C. Make sure entire lifting, rigging and supporting structure has been inspected, is in good condition and has a rated capacity of at least the weight of the compressor. If you are unsure of the weight, then weigh compressor before lifting.

D. Make sure lifting hook has a functional safety latch or equivalent, and is fully engaged and latched on the bail or slings.

E. Use guide ropes or equivalent to prevent twisting or swinging of the compressor once it has been lifted clear of the ground.

F. DO NOT attempt to lift in high winds.

G. Keep all personnel out from under and away from the compressor whenever it is suspended.

H. Lift compressor no higher than necessary.

I. Keep lift operator in constant attendance whenever compressor is suspended.

J. Set compressor down only on a level surface capable of safely supporting at least its weight and unit loading.

K. When moving the compressor by forklift truck, utilize fork pockets if provided. Otherwise, utilize pallet if provided. If neither fork pockets nor pallet are provided, then make sure compressor is secure and well balanced on forks before attempting to raise or transport it any significant distance.

L. Make sure forklift truck forks are fully engaged and tipped back prior to lifting or transporting the compressor.

M. Forklift no higher than necessary to clear obstacles at floor level and transport and corner at minimum practical speeds.

N. Make sure pallet–mounted compressors are firmly bolted or otherwise secured to the pallet prior to attempting to forklift or transport them. **NEVER** attempt to forklift a compressor that is not secured to its pallet, as uneven floors or sudden stops may cause the compressor to tumble off, possibly causing serious injury or property damage in the process.

1.10 ENTRAPMENT

A. If the compressor enclosure is large enough to contain a person, and if it is necessary to enter it to perform service or adjustments, inform other personnel before doing so, or else secure and tag the access door in the open position to avoid the possibility of others closing and possibly latching the door with personnel inside.

B. Make sure all personnel are out of compressor before closing and latching enclosure doors.

Section 2
DESCRIPTION

2.1 INTRODUCTION

The Sullair Integral Heat Recovery System is a means of recovering energy which is expended while producing compressed air. This energy can be converted into a usable source of heat. The heat is stored in the compressor cooling air as it passes over the compressor motor, fluid cooler and aftercooler. Latent heat rejected when moisture is condensed from the compressor air in the aftercooler may also be recovered. The compressor cooling air can then be used as preheated make–up air or heating air for plants, warehouses, etc. Heat may also be rejected from the system when it is not required.

⚠ DANGER

Any make–up air introduced into a heating or ventilation system by this system must be of breathing air quality as defined by applicable codes, laws or regulations.

Because the heat recovery system is built into the compressor package it requires a minimal amount of installation labor. The system has been designed so that use of auxiliary blowers is not needed as long as good duct design is practiced (See Section 4.4).

Should any questions arise which cannot be answered in the following text, call your nearest Sullair office or the Sullair Corporation Service Deparatment.

2.2 APPLICATION CONSIDERATIONS

A. GENERAL

The Sullair EES is designed primarily to recover the heat of compression in the form of heated make–up air. Maximum energy utilization, minimum cost of installation, and therefore maximum return on investment will be realized by using the EES in this fashion. For every cubic foot of outside air brought into a building by this EES, another cubic foot of air that would have infiltrated into the building at outside temperature will be eliminated. The fuel savings result from the plant's primary heating system **not** having to heat that cubic foot of air at outside temperature up to the temperature of the heated space.

It is possible for the EES system to operate efficiently as a heating system; that is, where air is drawn and heated to some higher temperature (say 90_F [32_C]), then the hot air distributed through–out the heated space. However, this usually requires greater capital investment in the form of a larger ductwork system to distribute the heated air.

As a preheated make–up air system, air is brought in from the outside at some low temperture (say 40_F [14_C]), heated approximately to the heated space temperature (say 65_F [18_C]), and then released to the heated space at one point. Since the air is close to heated space temperature, there is little advantage in distributing this air throughout the plant.

In either case, the same BTU's are recovered, but in the make–up air system, significant reductions in the installed cost are possible. This is the key to the popularity of the Sullair EES Integral Heat Recovery System.

B. PROCESS HEATING

It is also possible to utilize the waste–heat of compression for some process heating applications, such as drying parts, etc. This type of application will usually net a greater return on investment because the heat can be used year round. If this is the case, you may want to contact your local Sullair distributor for application assistance.

C. MULTIPLE COMPRESSOR INSTALLATIONS

For multiple machine installations, it is usually less expensive to manifold all or most of the ductwork, rather than run separate ducts for each machine. Care should be taken in the design of such a system, because unlike duct elbows and straight duct, divided flow duct fittings (tees, crosses, laterals, and wyes) have different performance characteristics depending on whether they are diverging flow or converging flow. Generally speaking, ductwork on the inlet side of the compressor may be treated as a supply system, and ductwork on the discharge side of the compressor may be considered as an exhaust system. (Refer to Section 4.4 for more information). It is good design practice to size all ducts such that when all compressors are running there will be constant velocity in all ducts.

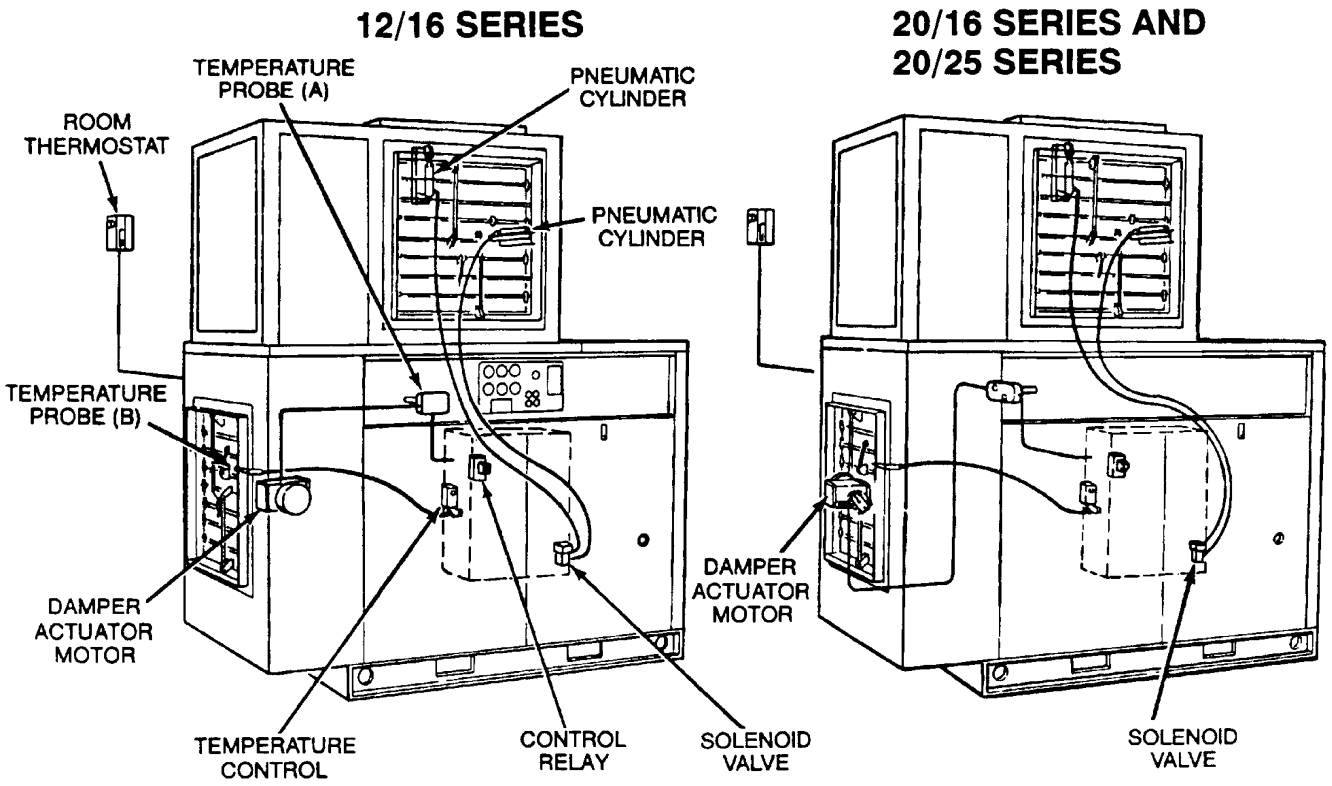
D. COMPRESSORS IN UNHEATED SPACES

It is quire feasible to locate the Sullair compressor with Integral EES in unheated spaces with minimum modifications, because heated air is automatically bypassed to maintain a thermostatically controlled temperature in the compressor enclosure, thereby allowing aftercooled compressors to run reliably in even sub–zero temperatures. However, provisions must be made to prevent freezing when the compressor is not running. A heated trap should be used, and the condensate drain should be heat traced and insulated. The section of pipe conveying compressed air from the compressor to the heated space should be insulated. Some compressor fluids may not be suitable because of excessively high viscosity on a completely cold start–up. More information on compressor lubricants can be found in the Compressor Manual, or by contacting your local Sullair Distributor.

E. COMPRESSORS IN ENCLOSED SPACES

When one or more compressors are located in an enclosed space, no special room ventilation is required, other than the usual ductwork. However, if other heat–affected equipment is also located in the enclosed space (transformers, instrumenta-

Figure 2–1 Sullair Integral Heat Recovery System



tion, etc.), it may be necessary to provide auxiliary ventilation to prevent excessive heat buildup.

F. BOOSTER FANS

The internal circulating fan on the EES is oversized to allow for a generous amount of external ductwork, and it is almost always possible to design the system ductwork in such a way that a booster fan will not be required. However, a booster fan will be the only practical solution in some applications. If this is the case, the following guidelines should be observed:

- Booster fans should be selected based on air flow of 6,000 CFM 12 series; 7,500 CFM 16 series; 14,000 CFM 20/25 series, at a static pressure rating equal to the ductwork static pressure restriction minus .50 inches 12/16 series, and .75 inches 20/25 series. W.G.
- Manufacturer's fan ratings are based on an idealized test procedure, and some de–rating might be required depending on how the fan is applied.
- Tube–axial type fans are the most commonly used type of booster fans.
- The selected fan should be non–overloading; i.e. if the fan discharge or inlet is shut off, the fan drive motor should not overload.

2.3 DESCRIPTION OF COMPONENTS

Refer to Figure 2–1. The basic components of the Sullair Integral Heat Recovery System are shown. The complete package includes the **upper exhaust plenum**; **damper panels** for outdoor air, recovered heated air, bypass air, and rejected heated air; **two temperature probes**; **two pneumatic cylinders; room thermostat; damper actuator motor; solenoid valve;** and a **temperature controller.**

The following text explains the functional description of these components.

TEMPERATURE PROBE (A) MIXED AIR

Refer to Figure 2–2. Probe A is mounted in the compressor enclosure, where it monitors the temperature of the mixture of bypass and outdoor air.

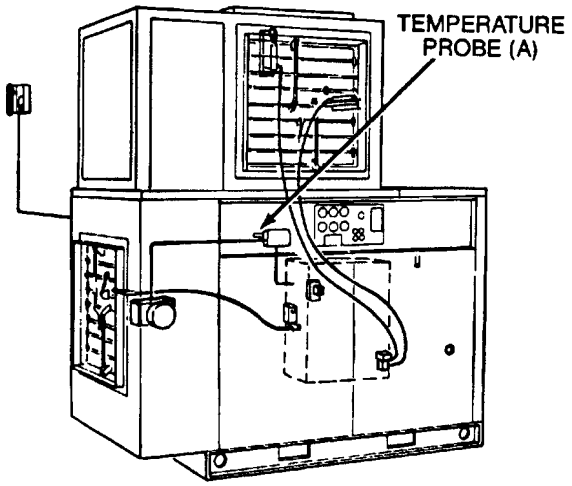
The damper motor actuator will modulate so that the set mixed air temperature will be maintained. This is a thermistor type of temperature probe.

TEMPERATURE PROBE (B) OUTSIDE AIR

Refer to Figure 2–3. This probe monitors the outdoor air temperature. When the outdoor temperature exceeds the set value on the outdoor air changeover temperature controller, an electrical signal is sent to the solenoid valve and the heated cooling air will be rejected outdoors and the outdoor air damper will be opened fully (See Solenoid Valve for further explanation).

Section 2
DESCRIPTION

Figure 2–2 Temperture Probe (A)



ROOM THERMOSTAT

Refer to Figure 2–4. This thermostat monitors the temperature of the heated space. If the set value on this thermostat is exceeded, an electrical signal is sent to the solenoid valve and the heated cooling air will be rejected outdoors (See Solenoid Valve for further explanation).

Figure 2–3 Temperature Probe (B)

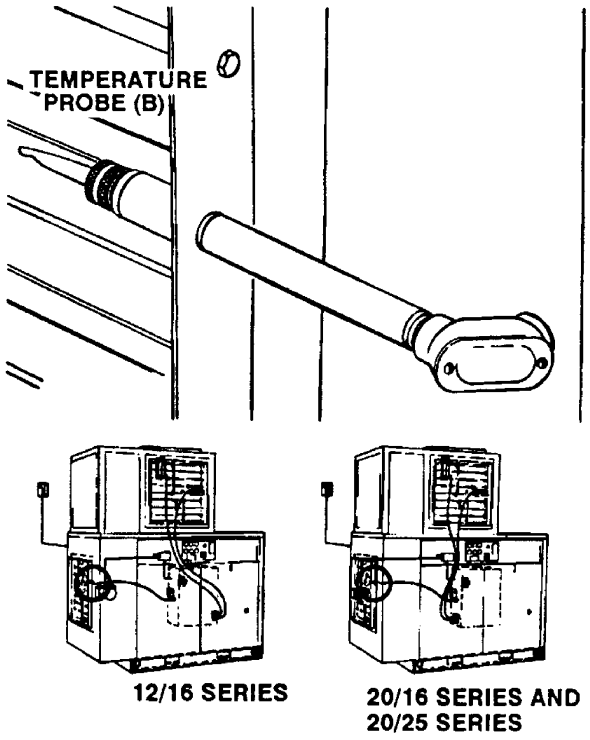
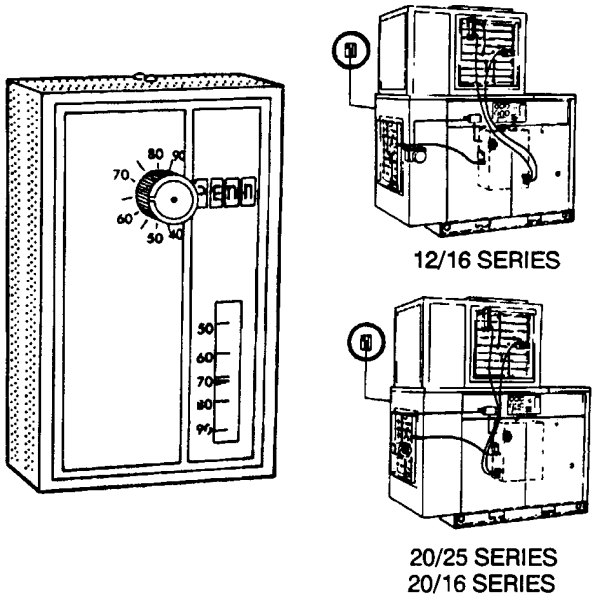


Figure 2–4 Room Thermostat



SOLENOID VALVE, PNEUMATIC CYLINDER, CYLINDER RETURN SPRING

Refer to Figure 2–5. The four–way solenoid valve controls the pneumatic cylinders, which, with the return springs, control the movements of the rejected and recovered air dampers.

When the compressor is not running the return springs maintain the reclaimed and rejected dampers in a closed position (See Figure 2–6).

When the compressor is running and the room thermostat and the outside air temperature probe (B) indicate a low temperature, the solenoid valve will allow air, at line pressure, to pass to the recovered air damper pneumataic cylinder. The cylinder force overcomes the return spring, fully opening the recovered air damper directing all heated cooling air to the heated space (See Figure 2–7).

When the valve receives and electrical signal due to a rise in temperature at either room thermostat or the outdoor air temperature probe (B), air will be exhausted from the recovered air damper cylinder and the return spring will close the recovered air damper simultaneously. Air, at line pressure, will be allowed to pass to the rejected air damper pneumatic cylinder. The cylinder force overcomes the return spring fully opening the rejected air dampers directing all heated cooling air outdoors (See Figure 2–8).

MOTOR ACTUATOR

Refer to Figure 2–9. The motor actuator positions the outdoor and bypass air dampers. It utilizes and electrical signal which is a function of the temperature sensed by Probe (A) or Probe (B). A spring within the actuator maintains the outdoor air damper in a closed position when the compressor is not running.

Figure 2–5 Pneumatic Cylinder and Solenoid Valve

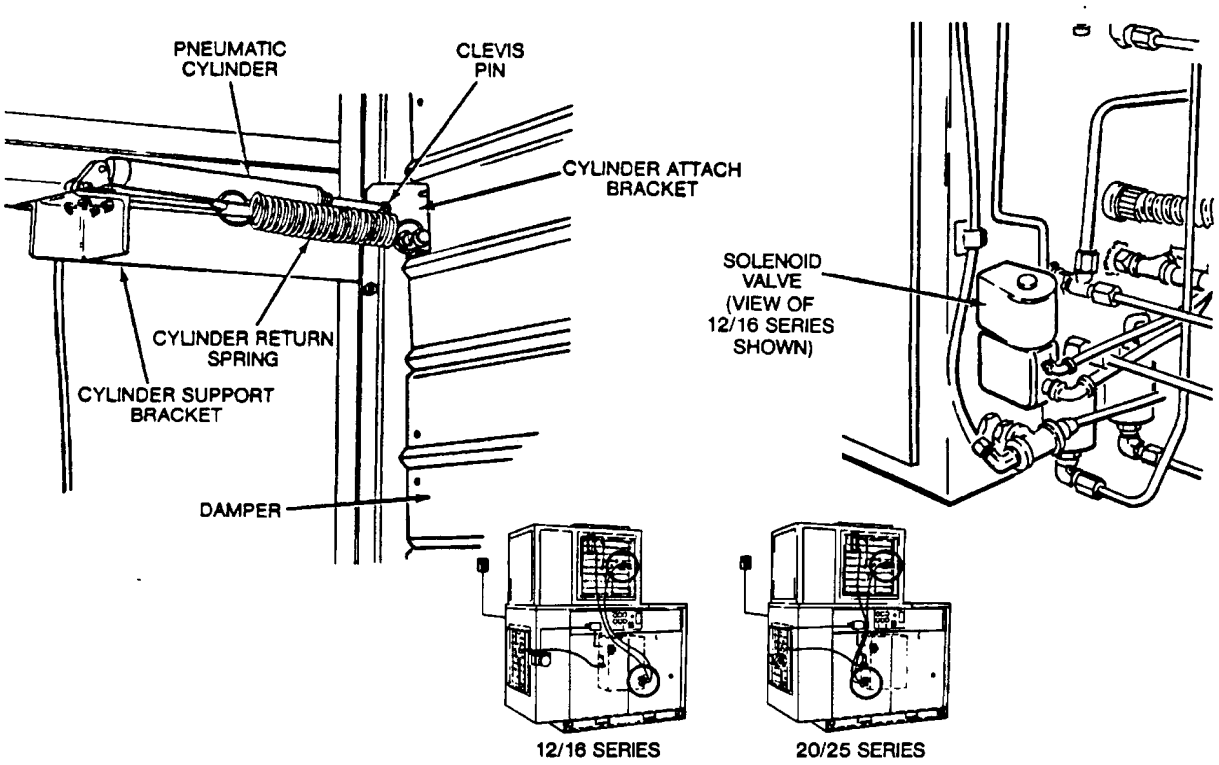


Figure 2–6 No Power

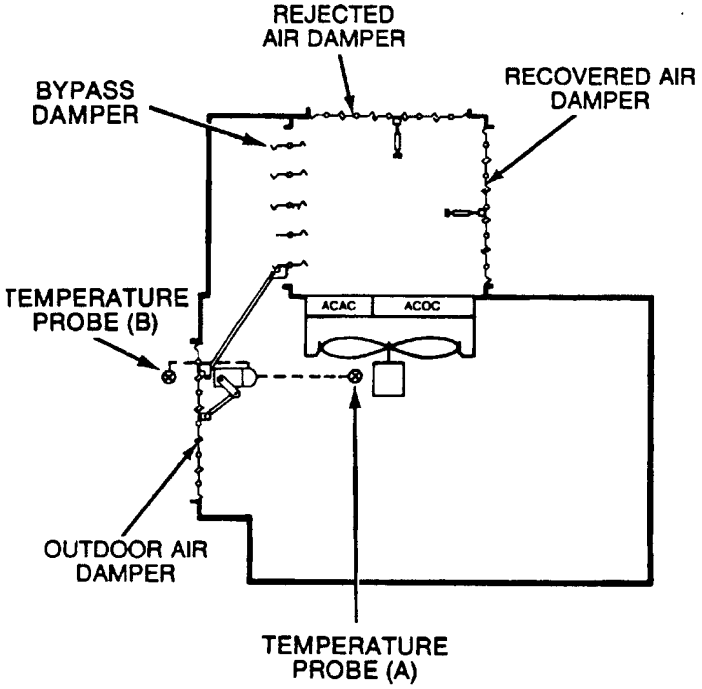


Figure 2–7 Low Room Temperature

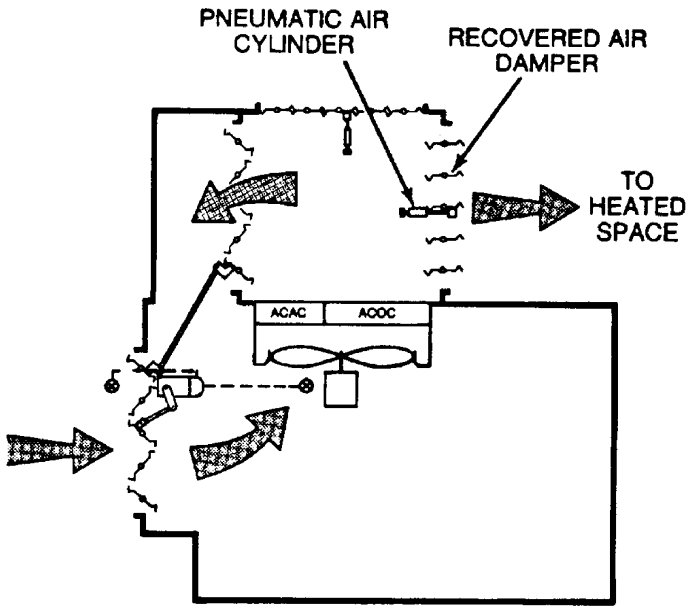


Figure 2–8 High Room Temperature

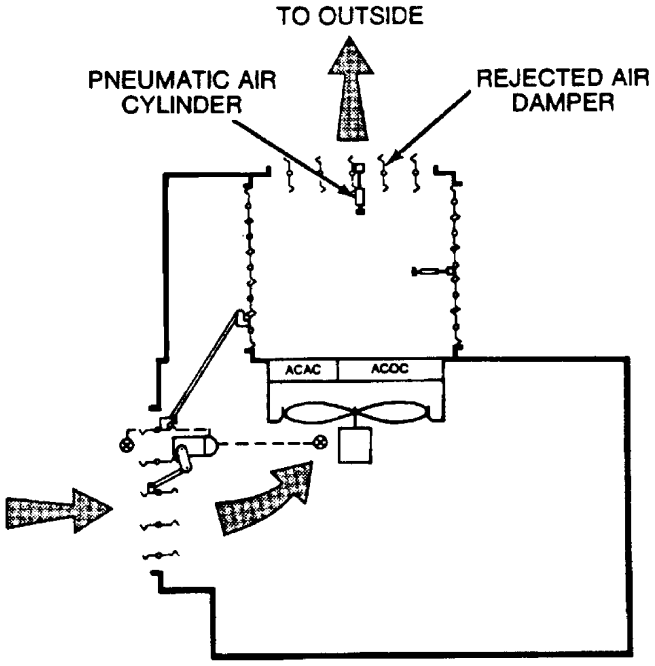
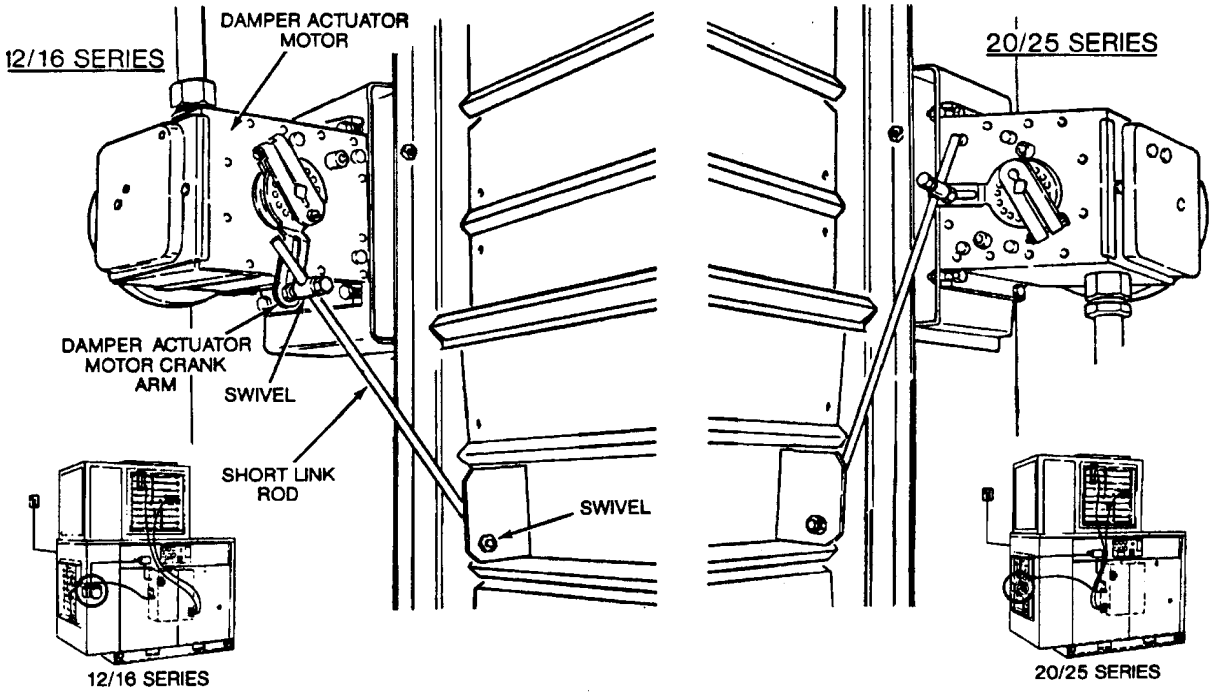


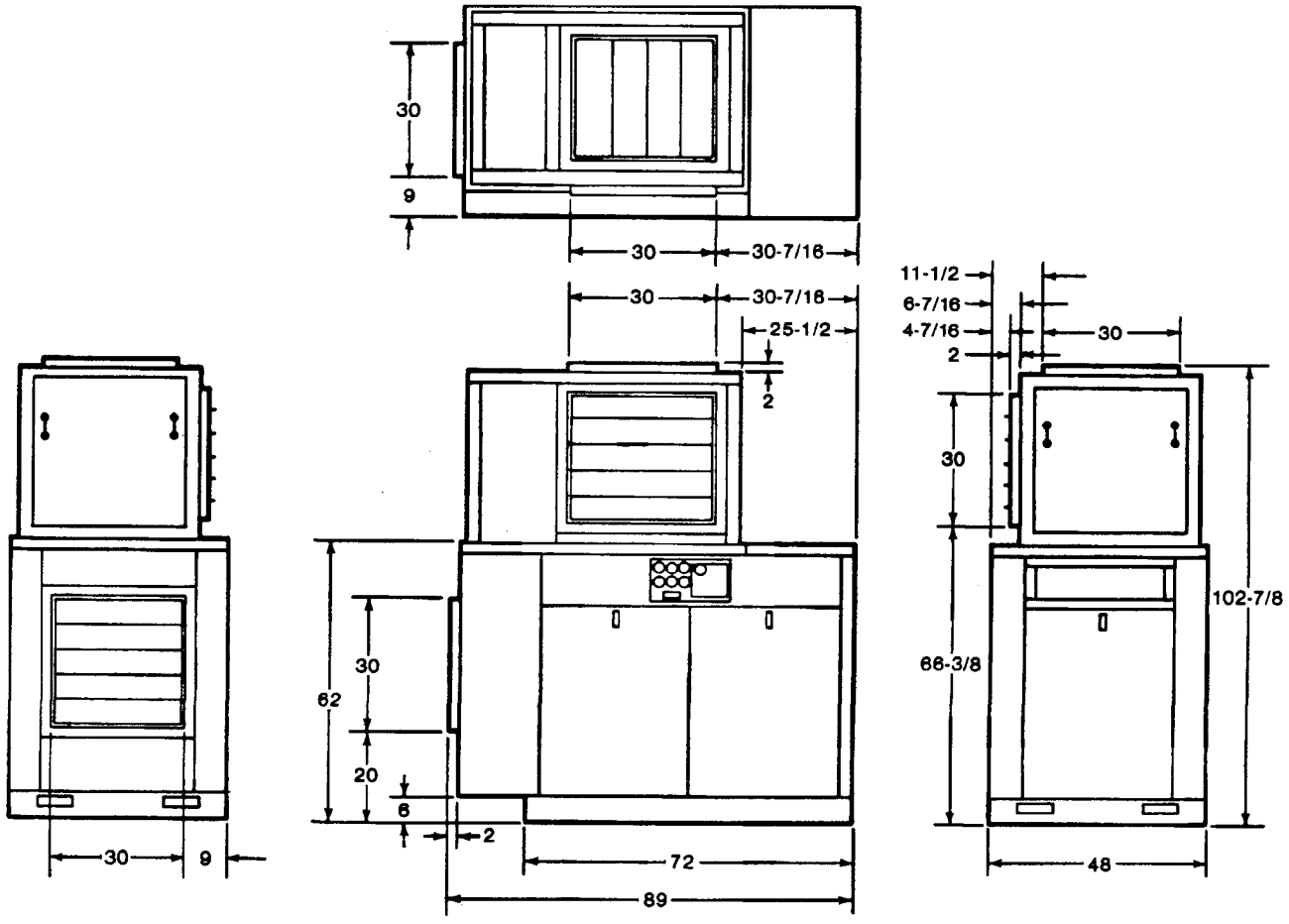
Figure 2–9 Damper Actuator Motor



Section 3
SPECIFICATIONS

SPECIFICATIONS Series 12/16

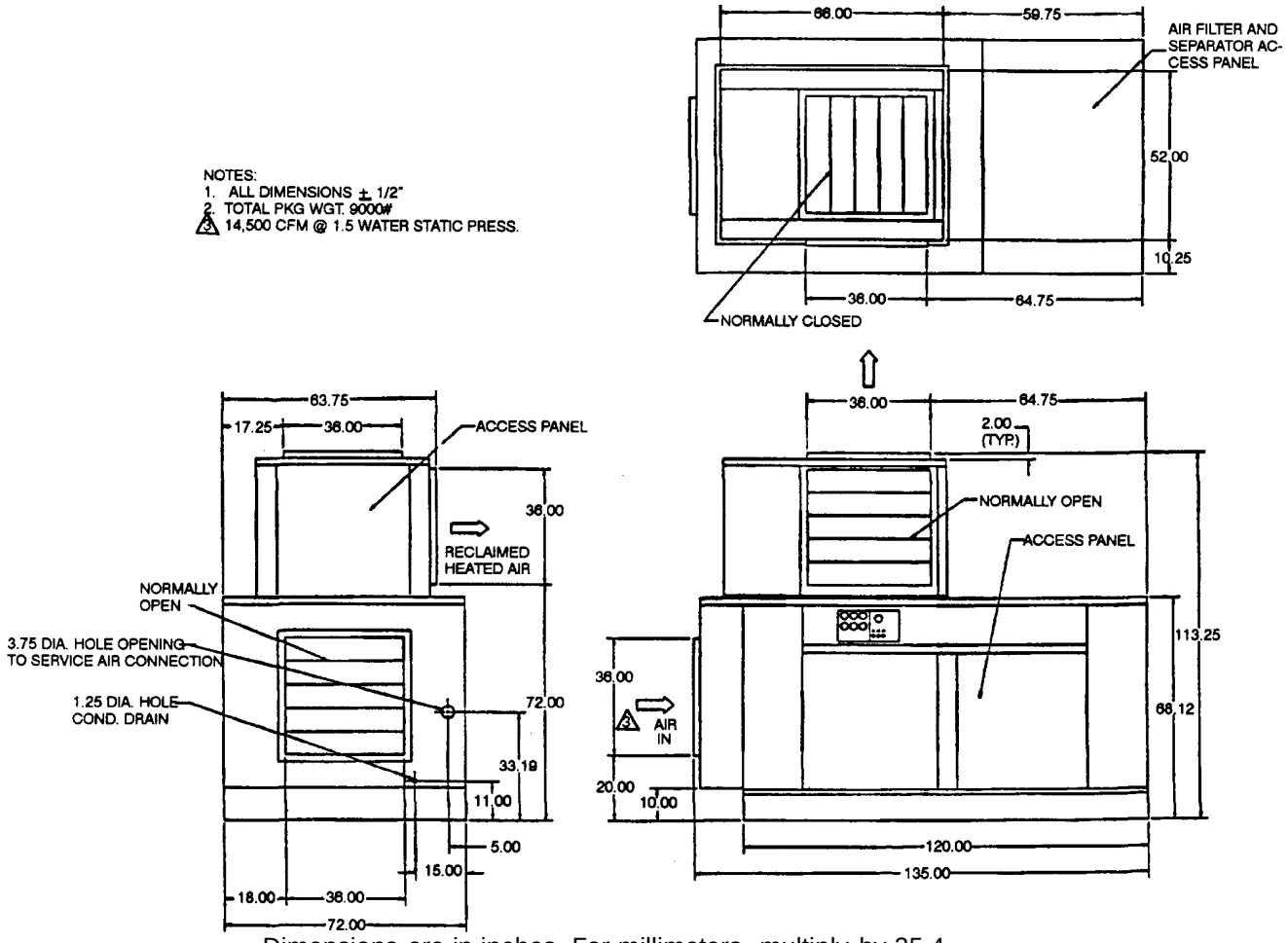
Compressor Power Range	40 to 75 HP
Fan Diameter	24” (12 Series), 26” (16 Series)
Fan Power	3 HP
Temperature Controllers	
Electrical	120VAC Input/24VA Output 50/60HZ
Enclosure	Nema 1
Mixed Air Range	10_ to 90_F (–12_ to 32_C)
Outdoor Air Changeover Range	20_ to 90_F (–6_ to 32_C)
Room Thermostat	
Electrical	120VAC
Range	40_ to 90_F (4_ to 32_C)
Solenoid Valve	
Electrical	120VAC/60HZ
Enclosure	Nema 1
AIR VOLUME (@ .50” Water Gauge Duct Restriction)	6,000 CFM 12 Series 7,500 CFM 16 Series



Dimensions are in inches. For millimeters, multiply by 25.4

SPECIFICATIONS Series 20/16

Compressor Power Range	100 to 250 HP
Fan Diameter	36”
Fan Power	7!@HP
Temperature Controllers	
Electrical	120VAC Input/24VA Output 50/60HZ
Enclosure	Nema 1
Mixed Air Range	10_ to 90_F (−12_ to 32_C)
Outdoor Air Changeover Range	20_ to 90_F (−6_ to 32_C)
Room Thermostat	
Electrical	120VAC
Range	40_ to 90_F (4_ to 32_C)
Solenoid Valve	
Electrical	120VAC/60HZ
Enclosure	Nema 1
AIR VOLUME (@ .75” Water Gauge Duct Restriction)	14,000 CFM

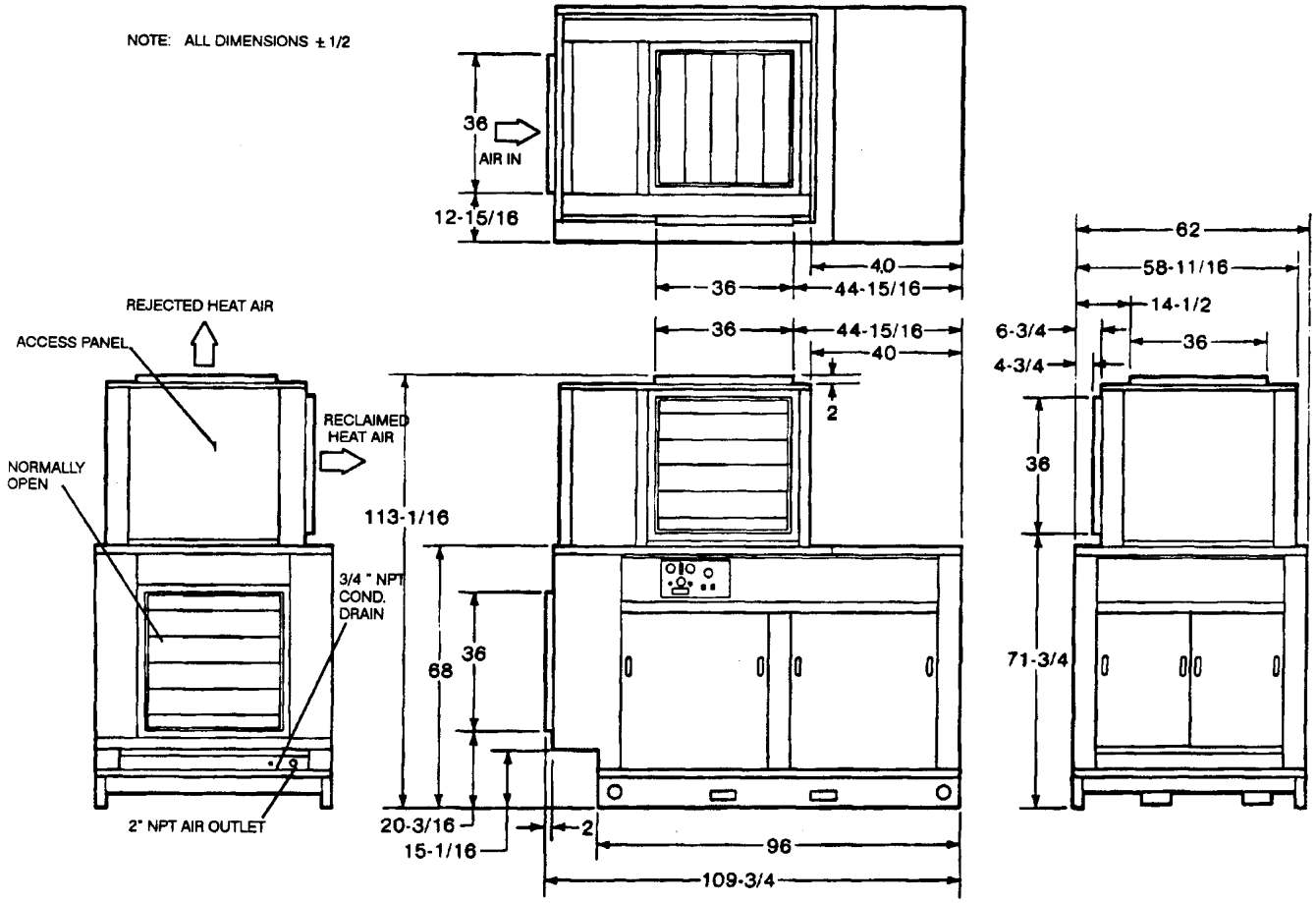


Dimensions are in inches. For millimeters, multiply by 25.4

Section 3
SPECIFICATIONS

SPECIFICATIONS Series 20/25

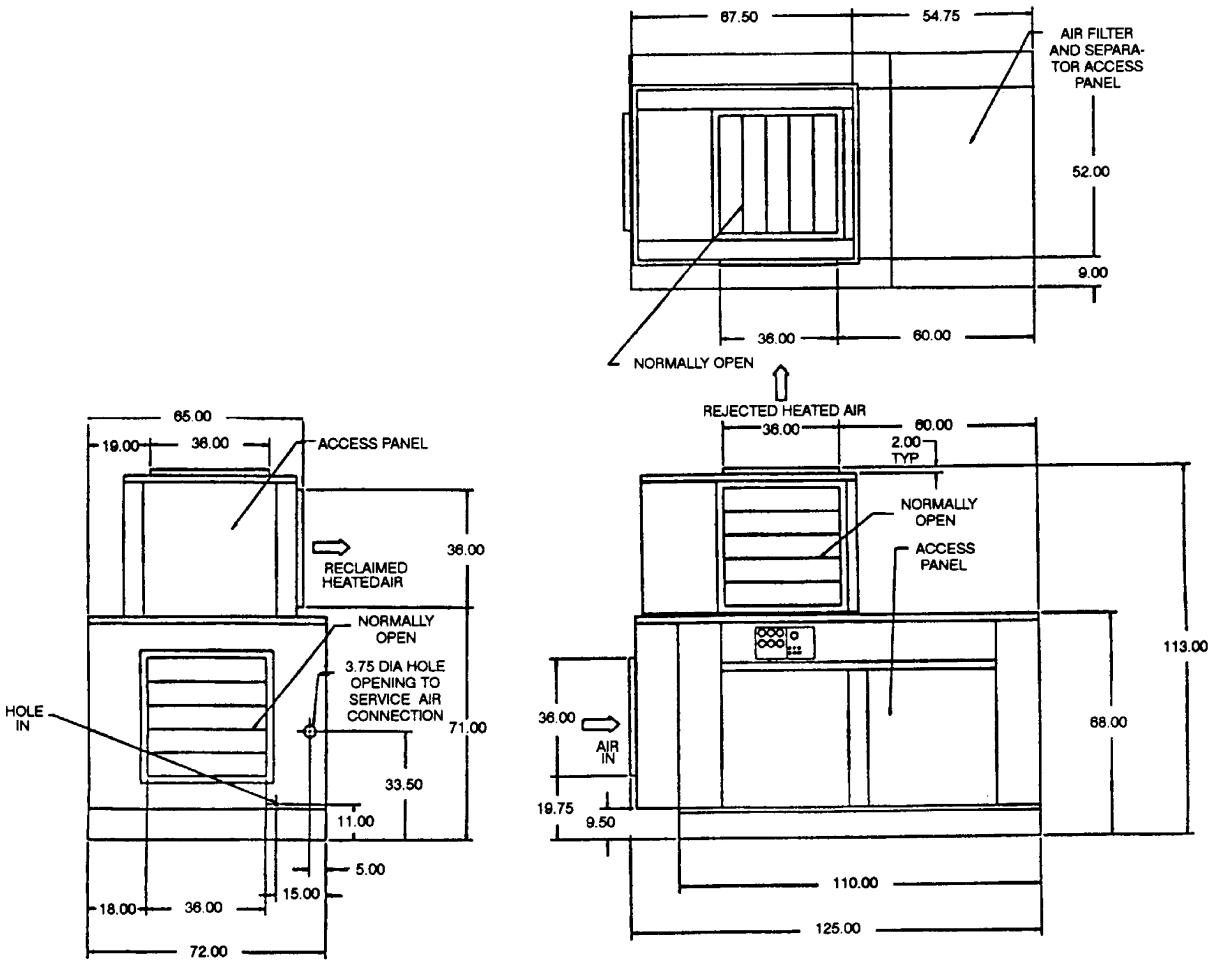
Compressor Power Range	100 to 250 HP
Fan Diameter	36”
Fan Power	7!@HP
Temperature Controllers	
Electrical	120VAC Input/24VA Output 50/60HZ
Enclosure	Nema 1
Mixed Air Range	10_ to 90_F (−12_ to 32_C)
Outdoor Air Changeover Range	20_ to 90_F (−6_ to 32_C)
Room Thermostat	
Electrical	120VAC
Range	40_ to 90_F (4_ to 32_C)
Solenoid Valve	
Electrical	120VAC/60HZ
Enclosure	Nema 1
AIR VOLUME (@ .75” Water Gauge Duct Restriction)	14,000 CFM



Dimensions are in inches. For millimeters, multiply by 25.4

SPECIFICATIONS Series 25–200

Compressor Power Range	200 HP
Fan Diameter	36”
Fan Power	7!@HP
Temperature Controllers	
Electrical	120VAC Input/24VA Output 50/60HZ
Enclosure	Nema 1
Mixed Air Range	10_ to 90_F (–12_ to 32_C)
Outdoor Air Changeover Range	20_ to 90_F (–6_ to 32_C)
Room Thermostat	
Electrical	120VAC
Range	40_ to 90_F (4_ to 32_C)
Solenoid Valve	
Electrical	120VAC/60HZ
Enclosure	Nema 1
AIR VOLUME (@ .50” Water Gauge Duct Restriction)	14,000 CFM



Dimensions are in inches. For millimeters, multiply by 25.4

Section 4
INSTALLATION

4.1 LOCATION AND ASSEMBLY OF COMPRESSOR

Upon delivery, check your compressor and integral heat recovery system for any damage which may have occurred during shipment. Any damage should be noted on the delivery receipt and a damage claim filed with the shipper.

Because of the height of the assembled package, the system is normally shipped partially disassembled. To re–assemble the unit, use the following instructions as a guideline.

A. Remove the packing materials from the upper exhaust plenum and place it on top of the compressor, lining up the bolt holes. Attach the upper exhaust plenum to the compressor, using the eleven %16" x #4 capscrews provided.

B. Connect the bypass air damper to the outside air damper using the %16" dia. x 42" (12/16 Series), 48" (20/25 Series), long linkage rod provided, making sure the dampers are in the position shown in Figure 4–1. The outdoor air damper should be fully closed and the bypass damper should be fully open. (the linkage rod may be trimmed to length using a hacksaw.) The linkage rod should be passed through the holes in the appropriate damper swivels, and the clamp bolts on the swivels should be tightened when the linkage rod is in position (Make sure the linkage rod is not trimmed too much to allow for linkage adjustment.)

C. At this point it must be determined where it is desired to place the rejected air damper and the recovered air damper to suit the system ductwork. Any damper may be exchanged with any access panel in positions 1 through 4 (Figure 4–1) by removing the four retaining bolts in each, and exchanging panels. Observe the following suggestions/limitations:

- Dampers should be installed with blades horizontal.
- If a damper panel is placed in position 4, and ductwork attached, this could restrict service access to the compressor air/fluid separator.
- It is suggested that the rejected air damper be placed in position 1.
- After the dampers have been positioned, the nylon tubing must be connected between the solenoid valve and the pneumatic cylinders. The rejected air damper cylinder should be connected to Port B on the solenoid valve. The reclaimed air damper cylinder should be connected to Port A on the solenoid valve.

D. After the compressor is in place, seal all unused holes in the compressor cabinet and base frame. This is to insure that cooling air can only enter the compressor cabinet through the outside air damper.

4.2 THERMOSTAT PLACEMENT

Refer to Figure 4–2. Install the room thermostat (Refer to room thermostat description in Section 2.3) in the space to be heated in a location where it will sense a representative temperature and be safe from physical damage or tampering.

4.3 ELECTRICAL PREPARATION

Interior electrical wiring is performed at the factory. Required customer wiring is minimal, but should be done by a qualified electrician in compliance with OSHA, National Electric Code, and any other applicable local electrical codes concerning isola-

Figure 4–1 Damper Linkage

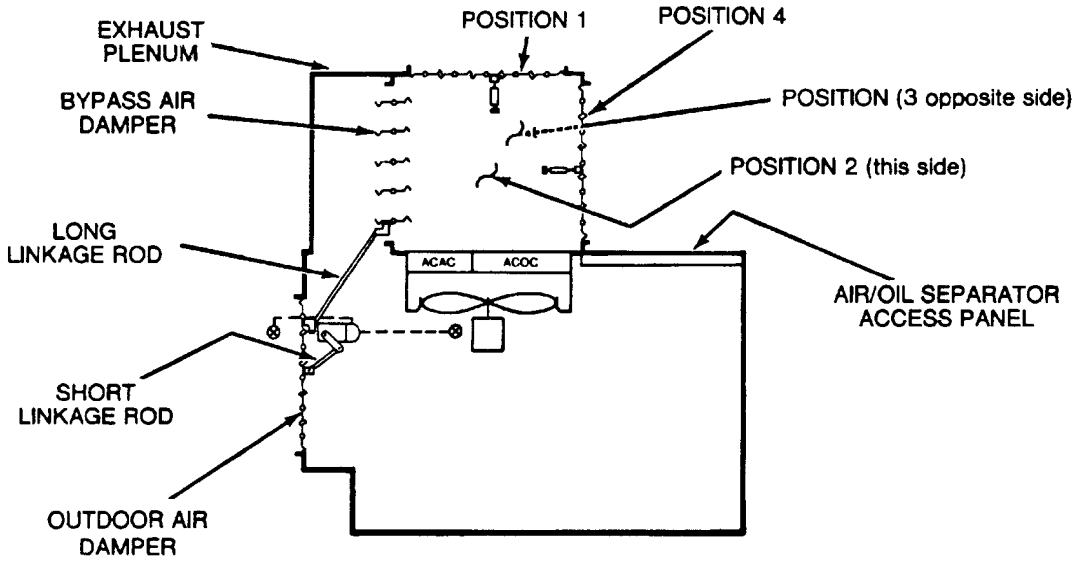
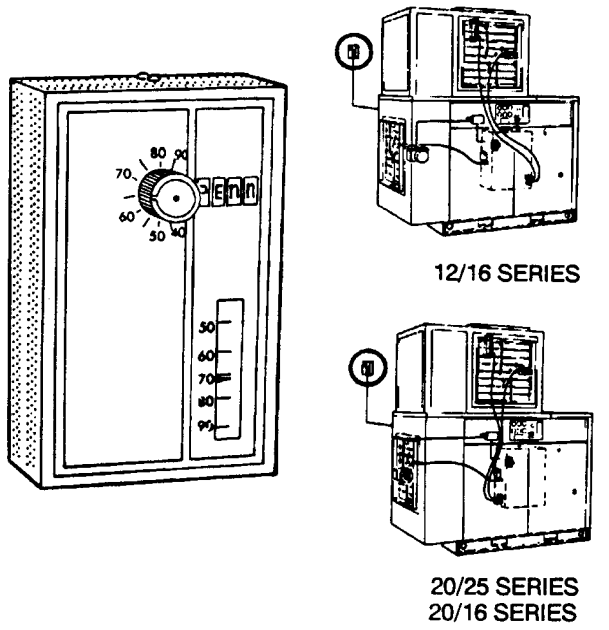


Figure 4–2 Room Thermostat



tion switches, fused disconnects, etc. Refer to Figure 4–3 for the internal heat recovery system wiring diagram.

4.4 DUCTWORK

A. TYPE OF DUCT

Traditionally, duct systems are rectangular and constructed of light gauge, galvanized steel. However, in recent years, round section galvanized steel and round or rectangular section fiberglass products have found increased use because of generally lower installed costs. Galvanized steel, flat, oval and cross section duct are also available.

The best type of duct system to use should be evaluated on an individual basis because each installation has its own unique requirements and problems. Generally, round section sheet metal duct will produce the lowest installed cost. Because of the large air volumes, low velocities and low pressures normally encountered in this type of duct system, the lightest gauge duct available is usually used.

For compressors located in a heated space, it is recommended that the duct carrying cold, outdoor air be insulated to prevent wintertime, (exterior of the duct) water condensation (sweating). If the exterior of the duct is insulated, a vapor barrier should be used. If the interior of the duct is insulated, this will affect the air handling performance of the duct and should be accounted for in the ductwork static pressure calculations. For compressors located in an unheated space where the recovered air is ducted to a heated space, that portion of the duct exposed to low ambient temperatures should be insulated to prevent excessive heat loss. For compressors mounted in a space that is also air–conditioned in summer, the summer rejected air duct should be insulated to reduce the air conditioning load.

B. DUCTWORK STATIC PRESSURE CALCULATION

The static pressure loss imposed by the ductwork must be calculated. The static pressure loss must

Figure 4–3 Wiring Diagram

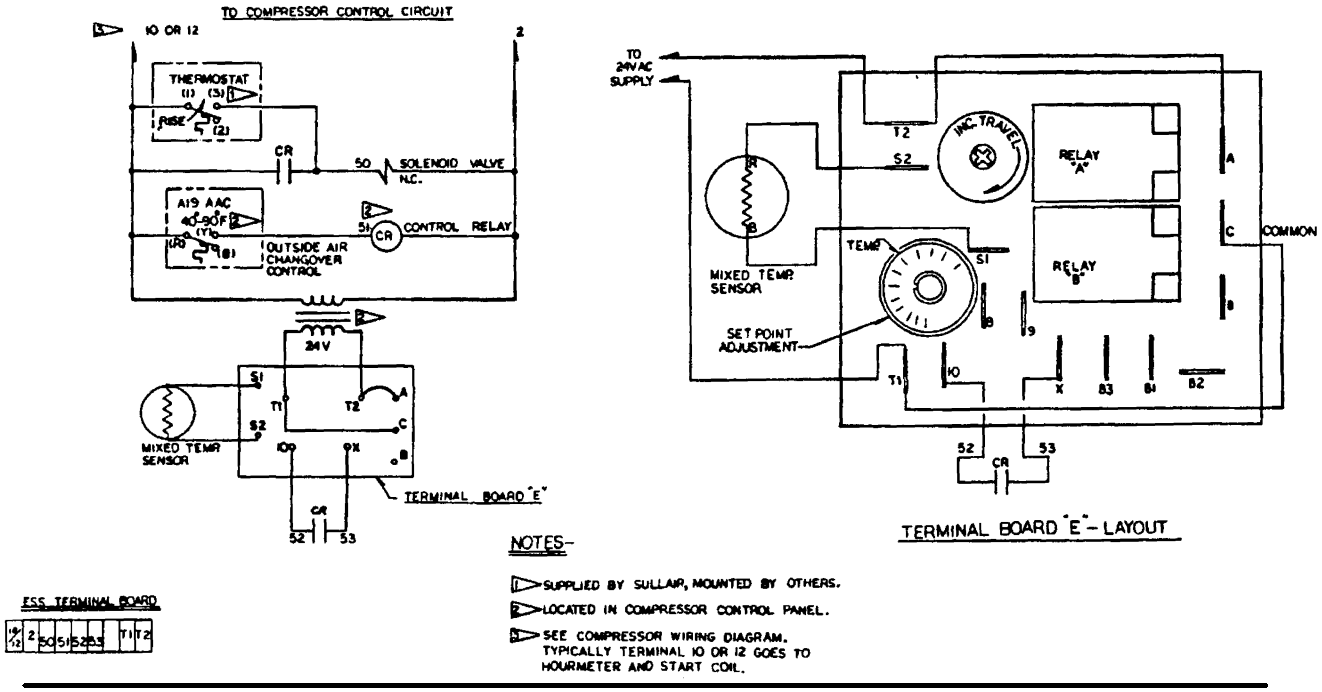


Table 1 Duct Size Conversion

DUCT SIZE (INCHES)	EQUIVALENT ROUND DUCT DIAMETER (INCHES)
18 X 36	27
18 X 42	29
18 X 48	31
18 X 54	33
18 X 60	34
18 X 66	36
18 X 72	37
24 X 24	26
24 X 30	29
24 X 36	32
24 X 42	34
24 X 48	37
24 X 54	39
24 X 60	40
30 X 30	33
30 X 36	36
30 X 42	39
30 X 48	41
30 X 54	44
30 X 60	46
36 X 36	39
36 X 42	42
36 X 48	45
36 X 54	49
36 X 60	50
42 X 42	46
42 X 48	49
42 X 54	52
48 X 48	52
48 X 54	56
54 X 54	59
54 X 60	62
60 X 60	66
60 X 72	73
72 X 72	79

not exceed .5” for 12/16 Series, .75” for 20/25 Series, of water at 6,000 CFM for 12 Series; 7,500 CFM for 16 Series; 14,000 for 20/25 Series. Static pressure loss is calculated using the total of the inlet duct loss and discharge duct loss.

The following text, tables and formulas will show how to calculate the ductwork static pressure loss for your machine. A worksheet has been included to help in the calculation.

The following three steps must be taken to ensure the adequacy of an installation’s ductwork design.

1. A total static pressure loss must be calculated for each branch by summing the static pressure losses for every component of that branch.

2. A total system static pressure loss is calculated by adding the greater of the two discharge duct static pressure losses to the inlet duct static pressure loss.

3. If total system pressure loss exceeds .5” for 12/16 Series, .75” for 20/25 & 20/16 Series of water, the ductwork must be redesigned. To reduce the amount of system static pressure loss, the following changes will have the greatest effect:

a) Increase in duct size.
b) Increase in the radius of elbows and tees.
c) Addition of turning vanes to tees and elbows.
d) Avoid the use of abrupt duct size changes.
e) Redesign the entrances and exits for the system.

C. COMPONENT STATIC PRESSURE LOSS CALCULATION – STRAIGHT DUCT STATIC PRESSURE LOSS

1. The volume of air to be handled by the ductwork is 6,000 CFM for 12 Series, 7,500 CFM for 16 Series, 14,000 for 20/25 & 20/16 Series.

2. If your ductwork is square or rectangular, find the equivalent round duct diameter from Table 1.

3. Using Figure 4–4, find the static pressure loss for 100 feet of straight duct.

4. (A) Find the actual static pressure loss in the straight duct using the following equation:

$$\frac{\text{Ft. of Straight Duct (I)}}{100} \times \text{Static Press. (Fig. 4–4)} = \text{Static Pressure Loss}$$

(I) Because fitting static pressure losses are “zero length” losses, calculation of amount of straight duct should be from the intersections of the center lines of the straight duct sections.

(B) Duct Fitting Static Pressure Loss

Step 1. The volume of air to be delivered through the fitting is 6,000 CFM for 12 Series, 7,500 CFM for 16 Series, 14,000 CFM for 20/25 & 20/16 Series.

Step 2. Calculate the area through which the air is flowing. Be sure this area corresponds to the area used in Table 3 for calculating the loss coefficient.

For Rectangular Duct:

$$Area = \frac{Width\ (I)\ X\ Height\ (I)}{144}$$

For Round Duct: = .00545 X (Diameter [*I*])@ (*I*) In inches

Step 3. Calculate the air velocity through the component:

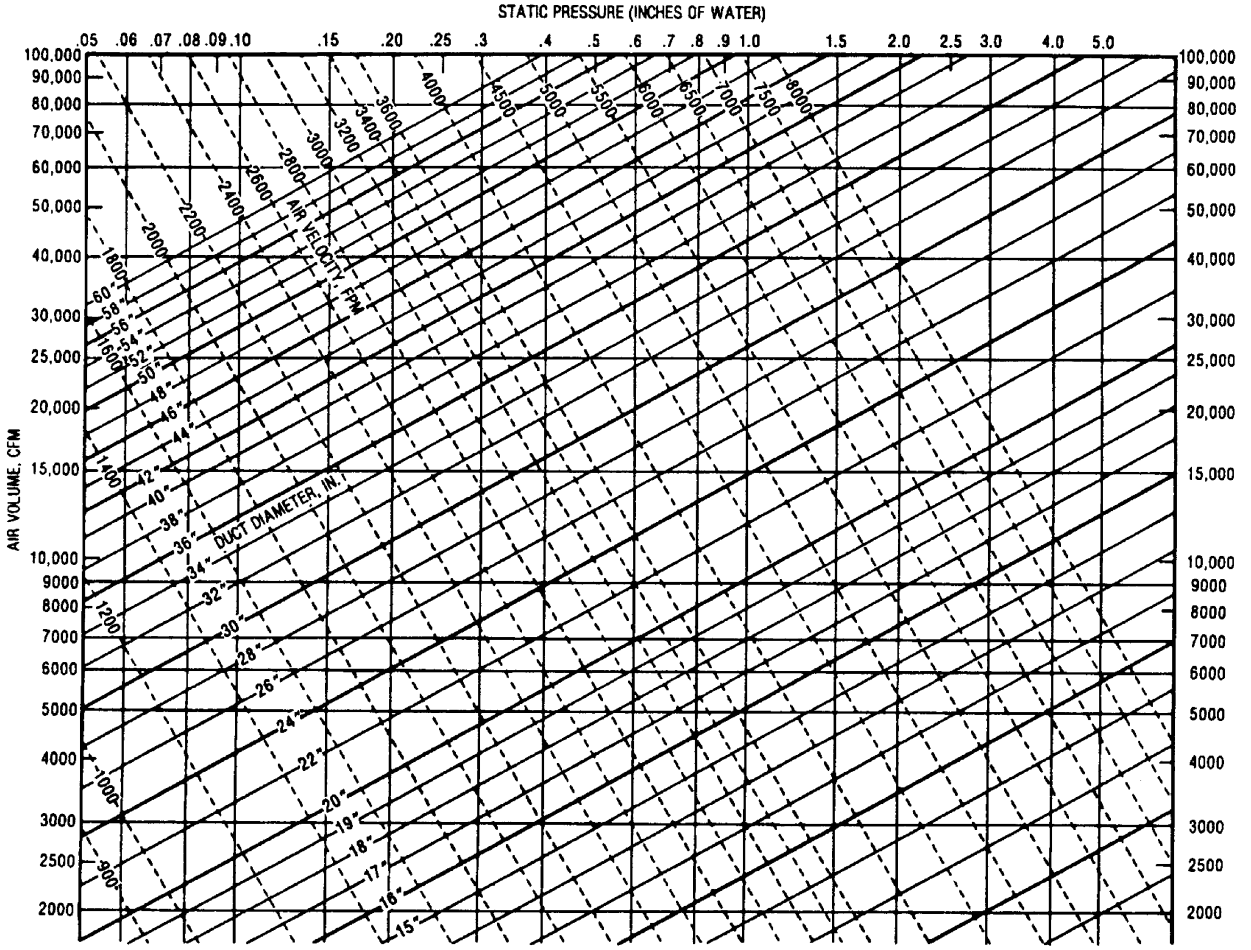
$$Velocity\ (II) = \frac{CFM\ (From\ Step\ \#1)}{AREA\ (From\ Step\ \#2}$$

(*II*) In feet per minute

Step 4. Select the proper loss coefficient from Table 2. Be sure that the loss coefficient corresponds to the area calculated in Step #2.

EXAMPLE: Refer to Table 2. If A1 was calculated, C1 should be the loss coefficient used.

Figure 4–4 Static Pressure Loss



Step 5. Calculate the static pressure loss for the fitting using the following equation:

$$C\,(III)\;X\;\left(\frac{Velocity(ft./min.)}{4005}\right)^{2}\;=\;StaticPressureLoss$$

(*III*) Use C, C1, C2, or C0 as indicated in Table 3.

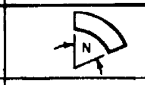
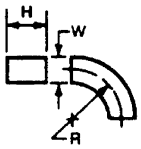
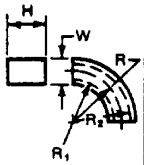
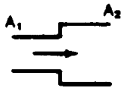
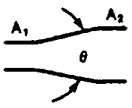
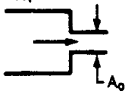
Step 6. Repeat Steps 2 through 5 for each fitting. The calculations for each fitting and section of straight duct should be tabulated on the worksheet provided at the end of Section 4.4.

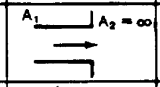
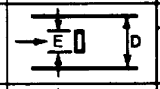
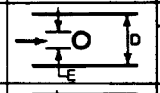
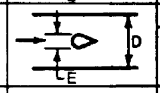
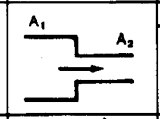
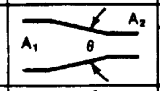
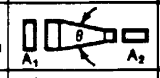
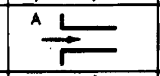
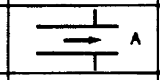
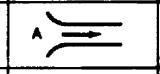
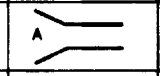
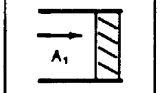
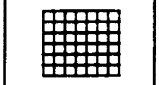
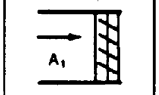
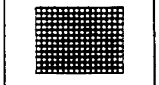
Step 7. Total the static pressure loss for each duct branch.

Table 2

Type	Illustration Conditions	Loss Coefficient		
		A1/A2	C1	C2
Abrupt expansion	A1 A2	0.1	0.81	81
		0.2	0.64	16
		0.3	0.49	5
		0.4	0.36	2.25
		0.5	0.25	1.00
		0.6	0.16	0.45
		0.7	0.08	0.18
		0.8	0.04	0.06
		0.9	0.01	0.01

Table 3

TYPE	ILLUSTRATION	CONDITIONS	LOSS COEFFICIENT
N, degree		Rectangular or round; with or without vanes	C $\frac{N}{90}$
90-degree round section		R/D Miter 0.5 0.75 1.0 1.5 2.0	C 1.30 0.90 0.45 0.33 0.24 0.19
90-degree rectangular section		H/W R/W 0.25 Miter 0.25 0.75 1.0 1.5 0.5 Miter 0.5 0.75 1.0 1.5 1.0 Miter 0.5 0.75 1.0 1.5 4.0 Miter 0.5 0.75 1.0 1.5	C 1.25 1.25 0.60 0.37 0.19 1.47 1.10 0.50 0.28 0.13 1.50 1.00 0.41 0.22 0.09 1.38 0.96 0.37 0.19 0.07
90-degree square section with splitter vanes		R/W R_1/W R_2/W Miter 0.5 0.5 0.4 0.7 0.6 1.0 1.0 1.5 Miter 0.3 0.5 0.5 0.2 0.4 0.75 0.4 0.7 1.0 0.7 1.0 1.5 1.3 1.6	C 0.70 0.13 0.12 0.45 0.12 0.10 0.15
Miter with turning vanes		Plate vanes Formed vanes	0.35 0.10
Miter tee with vanes		Consider equal to a similar elbow. Base loss on entering velocity.	
Radius tee			
Abrupt expansion		A_1/A_2 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9	C_1 0.81 0.64 0.49 0.36 0.25 0.16 0.08 0.04 0.01
Gradual expansion		θ 5° 7° 10° 20° 30° 40°	C_f 0.17 0.22 0.28 0.45 0.59 0.73
Square edge orifice exit		A_o/A_1 0.0 0.2 0.4 0.6 0.8 1.0	C_o 2.50 2.44 2.26 1.96 1.54 1.00

TYPE	ILLUSTRATION	CONDITIONS	LOSS COEFFICIENT
Abrupt exit		$\frac{A_1}{A_2}$ =0	C_1 1.00
Bar across duct		E/D 0.10 0.25 0.50	C 0.7 1.4 4.0
Pipe across duct		E/D 0.10 0.25 0.50	C 0.20 0.55 2.00
Streamlined strut across duct		E/D 0.10 0.25 0.50	C 0.07 0.23 0.90
Abrupt contraction, square edge		A_2/A_1 0.0 0.2 0.4 0.6 0.8	C_2 0.34 0.32 0.25 0.16 0.06
Gradual contraction		θ 30° 45° 60°	C 0.02 0.04 0.07
Equal area transformation		$A_1 = A_2$ θ ≤14°	C 0.15
Flanged entrance		A = ∞	C 0.34
		A = ∞	C 0.85
Formed entrance		A = ∞	C 0.03
Cone entrance		A = ∞	C 0.22
Louver		A = ∞	C_1 1.6
Grill		A = ∞	C_1 1.6
Louver and screen		A = ∞	C_1 2.0
Register		A = ∞	C_1 4.0
Intake		A = ∞	C_1 1.0

DUCTWORK STATIC PRESSURE LOSS WORKSHEET

COMPONENT	AIR FLOW (CFM)	DUCT AREA (SQ. FT.)	AIR VELOCITY (FPM)	C, C1, C2 or C0	$\left(\frac{V}{4005}\right)^2$	EQUIVALENT RD. DUCT DIAMETER	DUCT LENGTH (FT.)	STATIC PRESSURE LOSS

DUCT BRANCH _____

Section 5
OPERATION

5.1 INLET DAMPER LINKAGE ADJUSTMENT

The inlet dampers (outside air inlet and bypass dampers) are positioned by the motor actuator to maintain a constant mixed air temperature. The operation of these two dampers is opposed; i.e. when one is open, the other is closed. The motor actuator is a spring return type, and will return the outside air inlet damper to a fully closed position when the compressor is not running. To adjust the inlet damper linkage, perform the following steps in sequence:

NOTE

Too many starts may result in motor damage. If there are questions, contact the motor manufacturer.

A. When looking at the motor actuator from the end which is driving the damper, the crank arm should be in the 6:30 for the 12/16 Series, 4:30 for the 20/25 and 20/16 Series, positon (Refer to Figure 5−1). If it is not, the crank arm should be removed from the damper actuator and re−installed in the correct position. The compressor should be **OFF** for this check.

B. With the compressor not running, adjust the active length of the short link rod by loosening the lock bolt of the swivel mounted on the crank arm, until the outside air damper is closed. (The crank arm swivel should be attached to the crank arm at the largest radius that the crank arm adjusting slot will allow). If this adjustment cannot be achieved because of binding of the long link rod connecting the outside air and bypass dampers, it should be temporarily loosened. Tighten both swivels on the short link rod securely.

C. With the compressor not running, adjust the active length of the long link rod (using the swivels) so the bypass damper is fully open.

D. Place the outdoor air temperature change over control at its minimum position (Refer to Figure 5−3). Replace cover. Set the room thermostat at its minimum temperature setting and start compressor, observing the movement of the outdoor air damper and the bypass damper. Within 60 seconds of start up, the outdoor air damper should be opened fully and the bypass damper should be closed fully. Rotation of either damper should not exceed 90_, and the damper actuator motor should not be stalled by the linkage. If the bypass damper does not fully open, or the damper actuator motor stalls, proceed to the next step. Otherwise, the inlet damper linkage is now correctly adjusted.

E. With the compressor not running remove the motor actuator cover. This will expose the travel adjustment screw on the motor actuator. Refer to Figure 5−2. Start the compressor, again observing the movement of the outside air damper and bypass damper. The travel adjustment screw on the motor actuator should be adjusted so that the outdoor air damper opens fully; counterclockwise to reduce travel, or clockwise to increase travel, as required.

If the motor actuator becomes stalled before the

Figure 5−1 Damper Actuator Motor

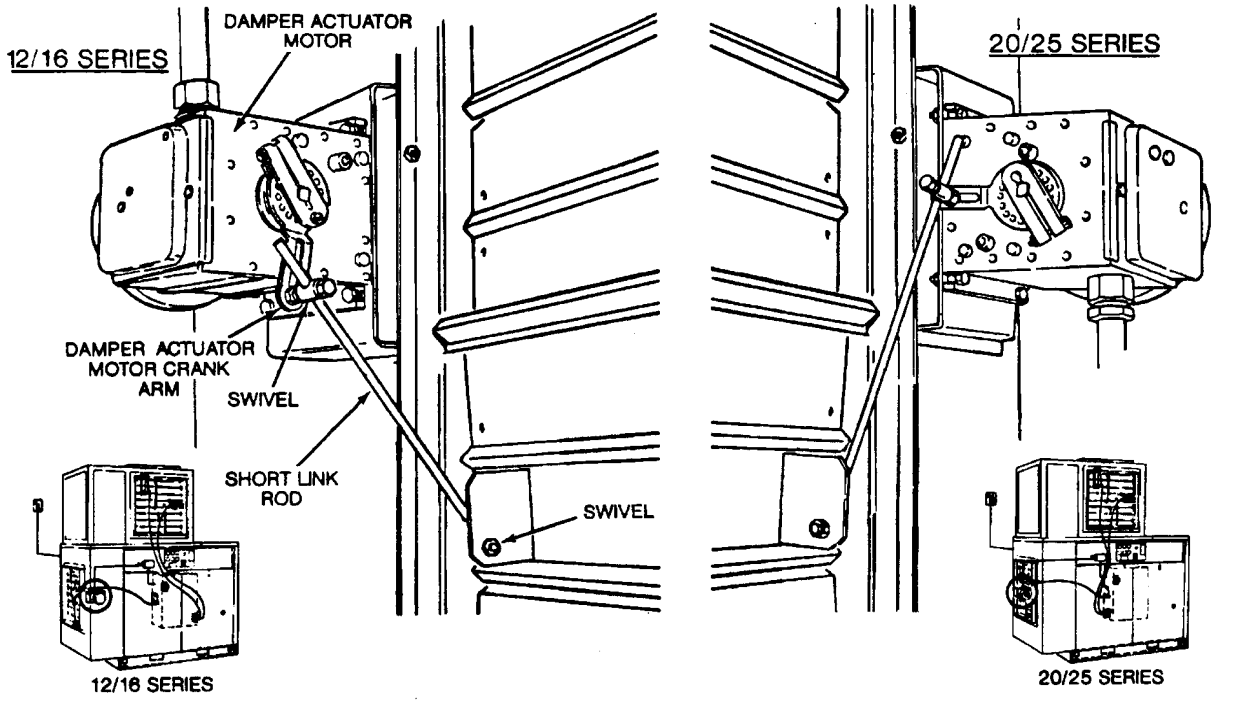


Figure 5–2 Actuator Travel Adjustment

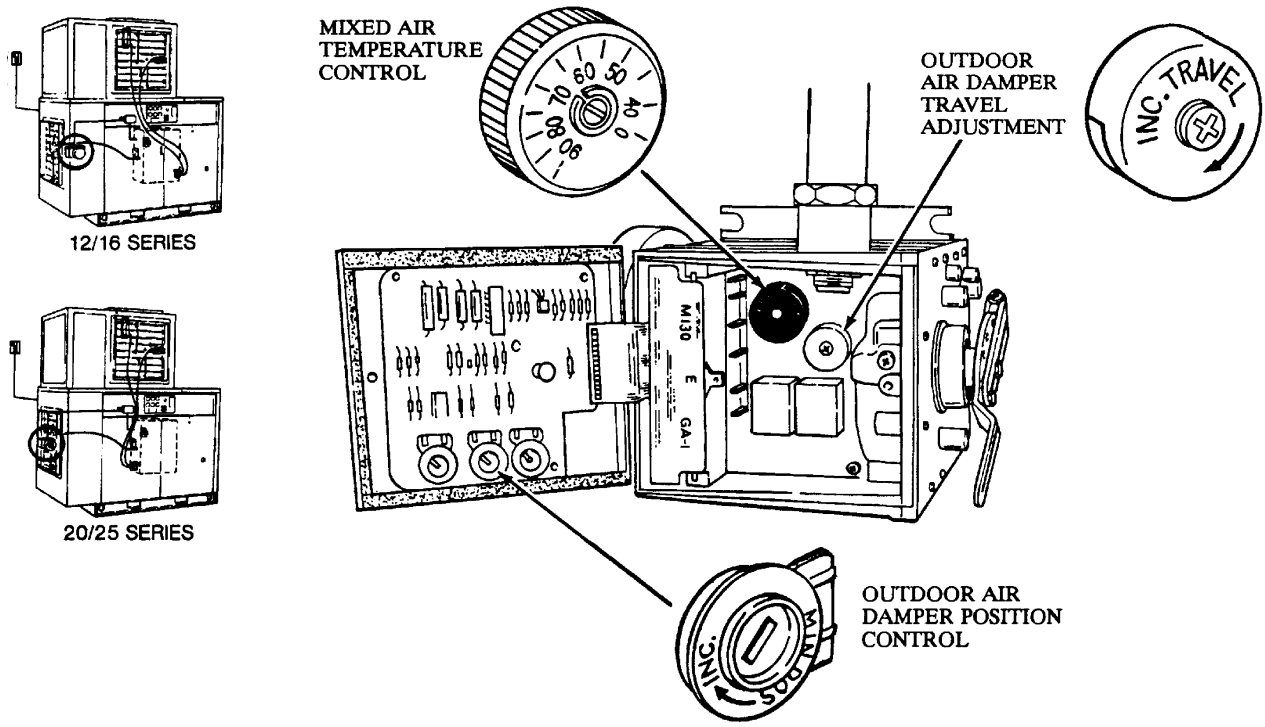


Figure 5–3 Outdoor Air Changeover Adjustment

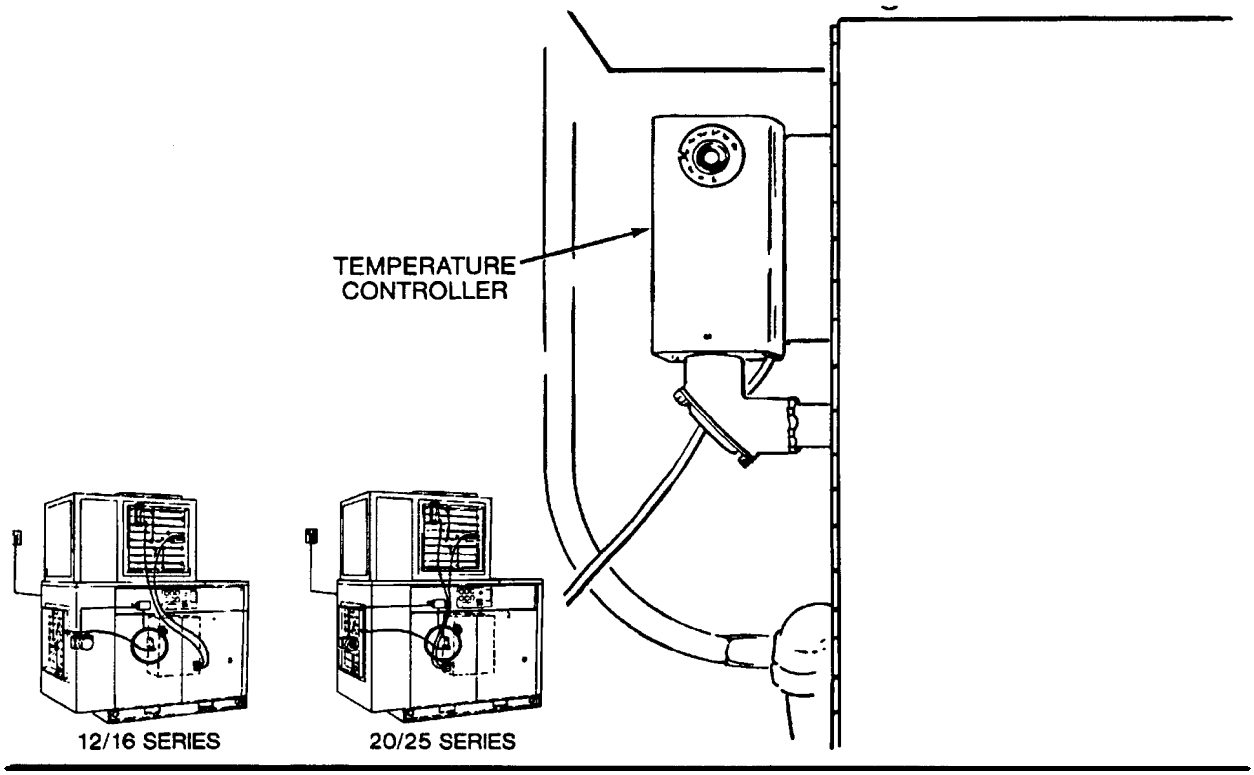
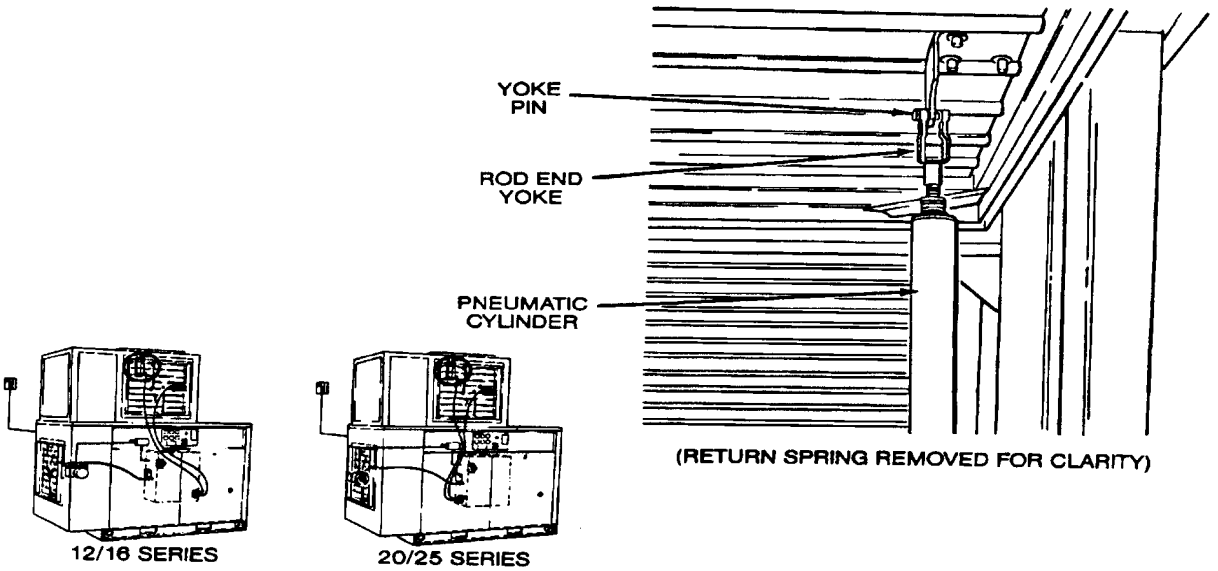


Figure 5–4 Discharge Damper Adjustment



outdoor air damper fully opens by the bypass damper closing too soon, loosen the swivel on the top end of the long link rod. When the outdoor air damper is fully open, close the bypass damper manually and retighten the swivel. Shut off the compressor. The spring return in the motor actuator should pull the outdoor air damper fully closed, and the bypass damper fully open. At this point the inlet dampers should be properly adjusted.

5.2 DISCHARGE DAMPER LINKAGE ADJUSTMENT

The discharge dampers (rejected air damper and recovered air damper) are factory adjusted and should not require re–adjustment. However, if components are replaced or adjustment is otherwise required, perform the following adjustment:

A. Refer to Figure 5–4. With the compressor off and the pneumatic air cylinder in its retracted position, temporarily unhook the return spring. After removing the cotter pin and clevis pin and loosening the jam nut, screw the rod end yoke farther onto or off (as required) the pneumatic cylinder rod end so that when the clevis pin is replaced, the damper is completely closed. Replace the clevis and cotter pins, retighten the jam nut, and replace the return spring.

5.3 SETTING OF CONTROLS

A. MINIMUM OUTDOOR AIR DAMPER MINIMUM POSITON ADJUSTMENT

Refer to Figure 5–2. This adjustment is made using the minimum position dial which is located in the motor actuator cover. Follow the instructions below for adjustment.

1. Place the outdoor air changeover dial air control dial at highest setting.
2. Place the mixed air control dial (located in the motor actuator) at the desired mixed air temperature.
3. Immerse the mixed air temperture Probe (A) in the coldest medium available; bucket of ice, dry ice, etc.
4. Turn the minimum position dial until the outdoor air damper blades are open approximately 15_. This insures that there will always be some fresh air introduced into the plant.

B. ROOM THERMOSTAT

The setting of the room thermostat will determine the maximum temperture for the space to be heated. Set the thermostat to the desired maintained temperature for this space.

C. MIXED AIR CONTROL

Refer to Figure 5–2. Set the mixed air control using the mixed air control adjusting dial. This setting controls the temperature of the mixture of bypass and outdoor air (air to the coolers). Set it to the temperature desired to be maintained. See Figure 5–5 to determine the heated air temperature rise across the compressor for various compressor sizes and loading conditions. The temperture at which heated air will be discharged to the heated space will be the mixed air temperature plus the air temperature rise shown in Figure 5–5.

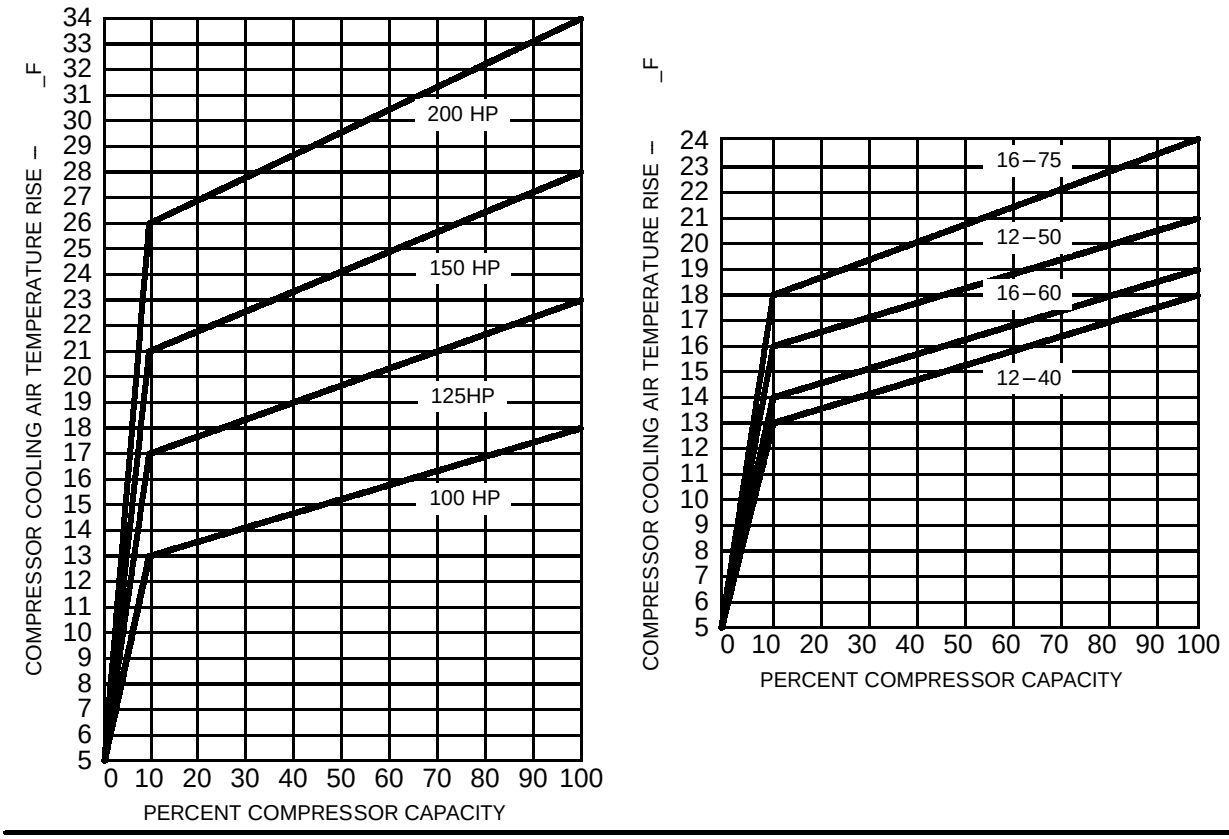
D. OUTDOOR AIR CHANGEOVER TEMPERTURE

Refer to Figure 5–3. Set this control dial at the outdoor air temperature at which it is desired to reject all heated air and to use all outdoor air for compressor cooling.

5.4 TROUBLESHOOTING

The information contained in the troubleshooting chart has been compiled from data gathered from

Figure 5–5 Heated Air Temperature Rise for Compressor



field service reports and factory experience. It contains symptoms and usual causes for the service problems described. However, **DO NOT** assume tht these are the only problems that may occur. All available data concerning the trouble should be systematically analyzed before undertaking any repairs or component replacement procedures.

A detailed visual inpsection is worth performing for almost all problems. Doing so may prevent damage to the compressor. Always remember to:

1. Check for loose wiring.
2. Check for damaged piping.
3. Check for parts damaged by heat or an electrical short circuit, usually noticeable by discoloration or burnt odor.

Should your problem persist after making the recommended check, consult your nearest Sullair representative or the Sullair Corportion factory toll free at 1–800–348–2722.

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
REJECTED AIR AND RECLAIMED AIR DAMPERS WILL NOT CYCLE	Defective Room Thermostat	Replace.
	Room Thermostat Improperly Wired	Rewire.
	Room Thermostat Not Wired	Wire.
	Defective Solenoid Valve	Replace.
	Broken Air Cylinder Return Spring	Replace.
	Broken Air Line Between Solenoid Valve and Air Cylinder	Repair.

TROUBLESHOOTING (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
REJECTED AIR AND RECLAIMED AIR DAMPERS WILL NOT CYCLE (cont)	Defective Outdoor Air Changeover Temperature Controller	Check function and replace if necessary.
	Improperly Set Outdoor Air Changeover Temperature Control	Reset.
REJECTED AIR AND RECLAIM AIR DAMPERS ONLY PARTIALLY OPEN AND CLOSE	Solenoid Valve Piped Incorrectly to Air Cylinder	Repipe.
	Leak in Line from Air Cylinder to Solenoid Valve	Repair.
	Incorrect Solenoid Valve Installed on Machine	Replace.
	Inadequate Compressor Discharge Line Pressure	Provide instrument air.
EXHAUST AIR COOLER THAN DESIRED ROOM TEMPERATAURE	Too Much Outdoor Air is Being Used to Cool Compressor	Adjust outdoor air minimum position dial.
	Defective Mixed Air Temperature Control	Replace.
	Improperly Adjusted Damper Linkage	Readjust.
EXHAUST AIR WARMER THAN DESIRED	Improperly Set Mixed Air Temperature Control Dial	Reset.
	Defective Mixed Air Temperature Control	Replace.
	Defective Motor Actuator	Replace.
	Insufficient Motor Actuator Travel	Adjust travel.
	Improperly designed ductwork	Redesign.
	Improperly Adjusted Damper Linkage	Readjust.
OUTDOOR AIR DAMPER WILL NOT OPEN OR FULLY OPEN WHEN OUTDOOR AIR CHANGE–OVER SETTING IS EXCEEDED	Defective Control Relay	Replace.
	Improperly Wired Relay or Tempera–ture Controller	Rewire.
	Improperly Adjusted Motor Actuator Travel	Reset.
	Defective Outdoor Air Changeover Temperature Contoller	Replace.
REJECTED AIR DAMPER WILL NOT OPEN WHEN ROOM THERMOSTAT SETTING IS EXCEEDED	Defective Room Thermostat	Service room thermostat.
	Defective Solenoid Valve or Room Thermostat	Replace.
	Room Thermostat is Improperly Wired	Rewire.
REJECTED AIR DAMPER WILL NOT CLOSE WHEN COMPRESSOR IS OFF	Defective Solenoid Valve	Replace.
	Broken Air Cylinder Return Spring	Replace.
	Insufficient Lubrication of Damper Blade Pivot Pins	Relubricate.
COMPRESSOR FLUID TEMPERATURE IS TOO HIGH	Improper Ductwork Design or Install–ation	Correct.
	Bypass Damper Not Closing Fully	Readjust inlet damper linkage.
OUTDOOR AIR DAMPER WILL NOT CLOSE WHEN COMPRESSOR IS OFF	Broken Return Spring in Motor Actuator	Replace motor actuator.

TROUBLESHOOTING (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
OUTDOOR AIR DAMPER WILL NOT CLOSE WHEN COMPRESSOR	Insufficient Damper Pivot Pin Lubrication	Relubricate.
IS OFF (cont)	Improperly Adjusted Damper Linkage	Readjust.

NOTES

6.1 PROCEDURE FOR ORDERING PARTS

Parts should be ordered from the nearest Sullair Representative or the Representative from whom the compressor was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the address below.

When ordering parts always indicate the **Serial Number** of the dryer. This can be obtained from the Bill of Lading for the compressor or from the Serial Number Plate located on the dryer.

SULLAIR ASIA, LTD.
Sullair Road, No. 1
Chiwan, Shekou
Shenzhen, Guangdong PRV.
PRC POST CODE 518068
Telephone: 755–6851686
Fax: 755–6853473

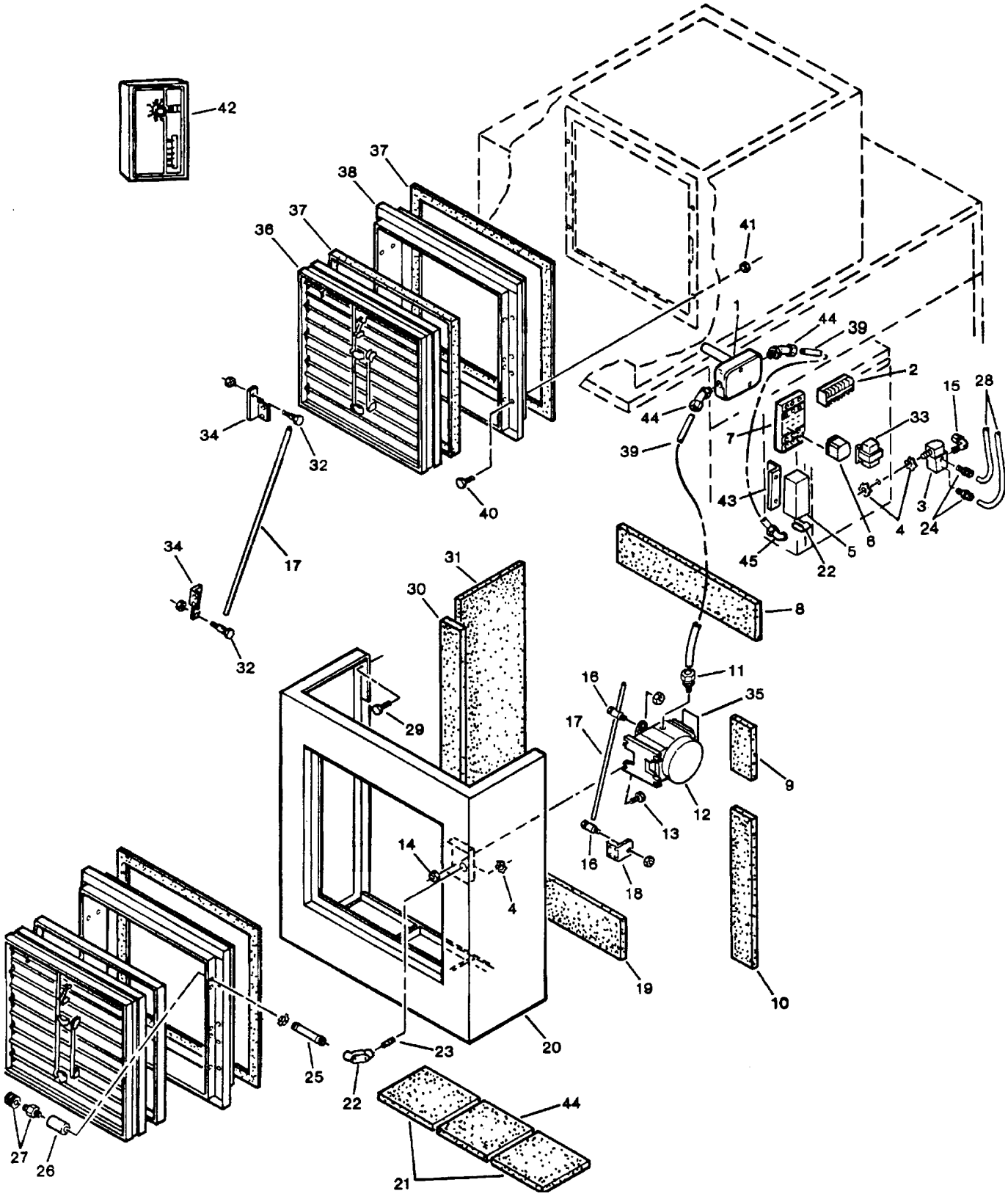
SULLAIR EUROPE, S.A.
Zone Des Granges BP 82
42602 Montbrison Cedex, France
Telephone: 33–477968470
Fax: 33–477968499

SULLAIR CORPORATION
Subsidiary of Sundstrand Corporation
3700 East Michigan Boulevard
Michigan City, Indiana 46360 U.S.A.
Telephone: 1–219–879–5451
Fax: (219) 874–1273
Fax: (219) 874–1835 (Parts)
Fax: (219) 874–1205 (Service)

Section 7

ILLUSTRATIONS AND PARTS LIST

6.2 LOWER CANOPY – HEAT RECOVERY SYSTEM



6.2 LOWER CANOPY – HEAT RECOVERY SYSTEM

key number	*description*	*12, 16, 20 & 25 Series (Unless Otherwise Noted) part number*	*quantity*
1	sensor, temperature	250016–274	1
2	block, terminal and track	041493	3
3	valve, solenoid 4–way	047020	1
4	locknut, conduit !2@	847200–050	4
5	control, temperature	250016–273	1
6	relay, 120V 3PDT	045496	1
7	socket, pin	045497	1
8	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–019 N/A	1 N/A
9	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–025 N/A	1 N/A
10	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–024 N/A	1 N/A
11	connector, straight !2@	846400–050	2
12	actuator, motor/damper	250016–276	1
13	capscrew, !4@–20 x 1”	829104–100	4
14	nut, hex locking !4@–20	825504–145	4
15	elbow, tube–M 90_!4@ x !4@	810504–025	1
16	swivel, control !4@–28	409031	2
17	rod, link %16”	409032	2
18	bracket, actuator/damper	224696	1
19	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–020 N/A	1 N/A
20	panel, end (12/16 Series) Spanel, end (20/25 Series)	250017–618 016588	2 1
21	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–021 N/A	2 N/A
22	elbow, corner 90_ !2@	846915–050	2
23	nipple, pipe !2@ x 2”	822108–020	1
24	connector, hose !4@ x !4@	813604–250	2
25	nipple, pipe !2@ x 6”	822108–060	1
26	coupling, pipe !2@	806230–020	1
27	connector, cord !2@	241585	1
28	hose, nylon !4@	842215–004	12
29	screw, body bolt %16” x #4@	829705–075	24
30	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–023 047823–151	2 2
31	panel, fiberglass (12/16 Series) Spanel, fiberglass (20/25 Series)	250020–026 047823–150	2 2

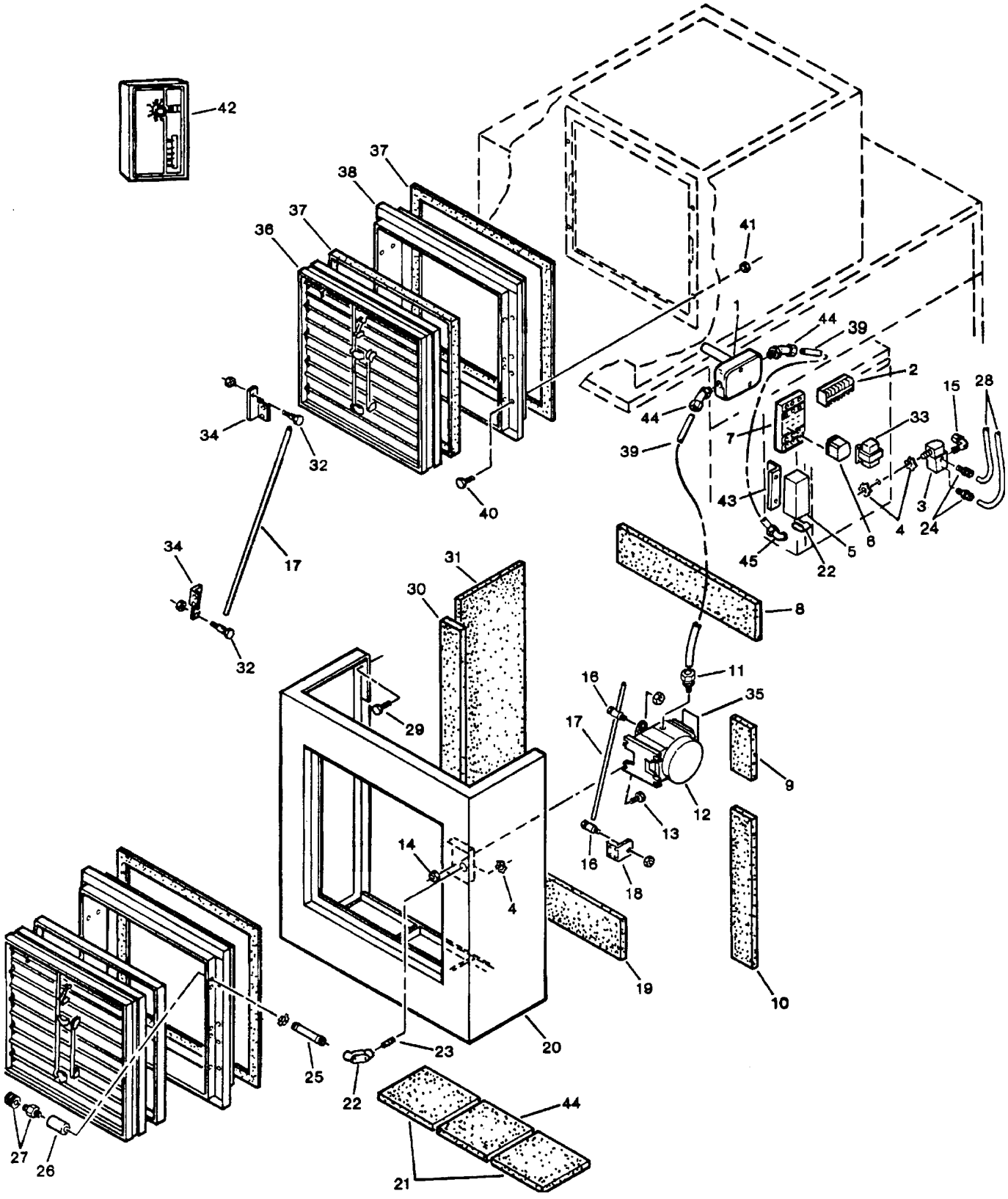
(Continued on Page 31)

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF DRYER

Section 7

ILLUSTRATIONS AND PARTS LIST

6.2 LOWER CANOPY – HEAT RECOVERY SYSTEM



6.2 LOWER CANOPY– HEAT RECOVERY SYSTEM (CONTINUED)

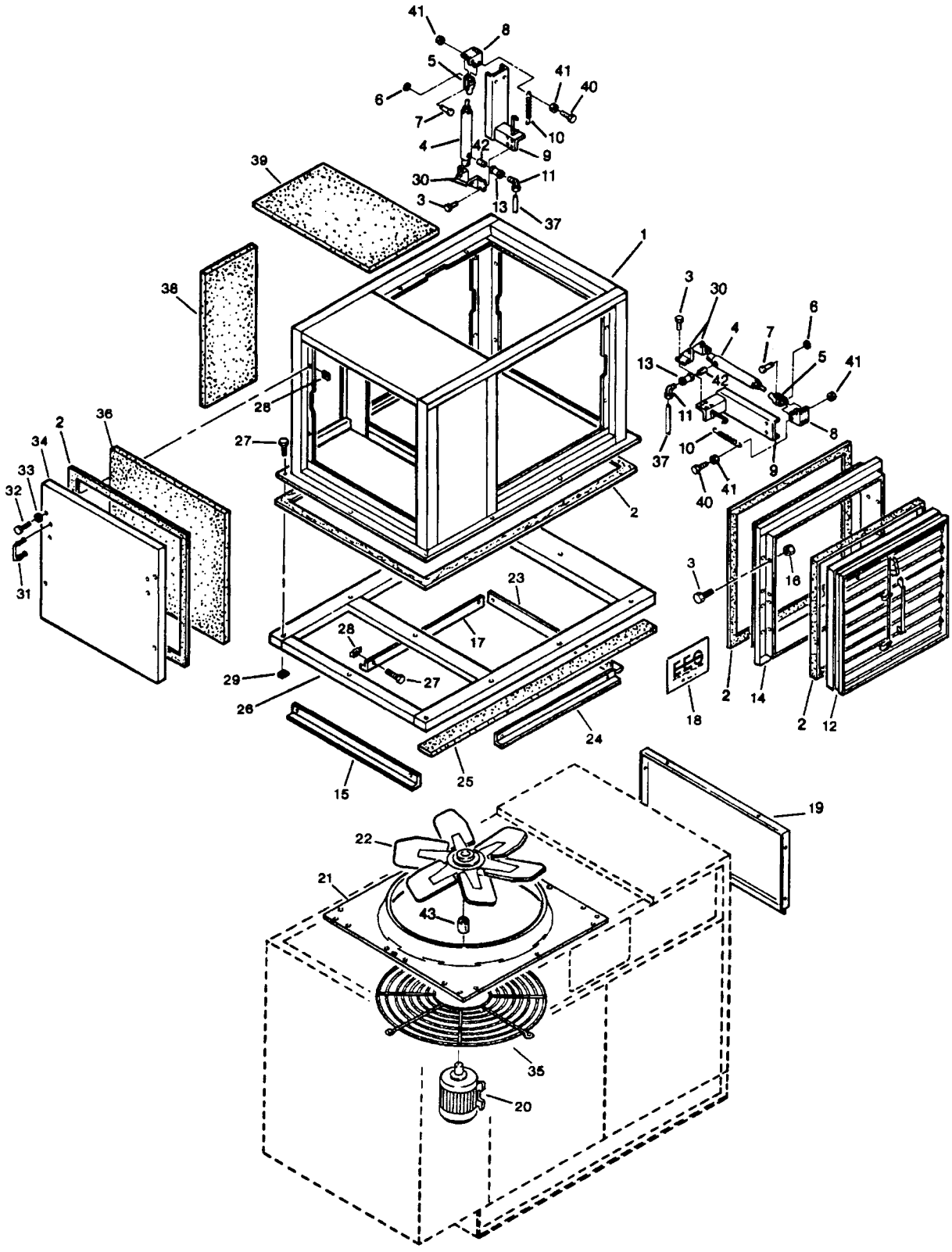
key number	*description*	*12, 16, 20 & 25 Series (Unless Otherwise Noted) part number*	*quantity*
32	swivel, control %16"–24	409030	2
33	transformer, control 24V	250016–280	1
34	bracket, damper control	224694	2
35	controller, motor actuator	250016–275	1
36	damper, 30" x 30" (12/16 Series)	250017–554	4
	Sdamper 36" x 36" (20/25 Series)	408952	4
37	weatherstrip, felt !8@ x 1" (12/16 Series)	043502	225 ft.
	Sweatherstrip, felt !8@ x 1" (20/25 Series)	043502	250 ft.
38	panel, damper 30" x 30" (12/16 Series)	250017–879	4
	Spanel, damper 36" x 36" (20/25 Series)	019951	4
39	conduit, flexible !2@	846215–050	10 ft.
40	capscrew, %16"–18 x 2!2@	828605–250	32
41	nut, hex flanged %16"–18	825305–283	40
42	thermostat, damper	241904	1
43	bracket, temperature controller	250016–869	1
44	elbow, 45_ lq–tite !2@	846500–050	2
45	elbow, 90_ lq–tite !2@	846600–050	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF DRYER

Section 7

ILLUSTRATIONS AND PARTS LIST

6.3 UPPER CANOPY – HEAT RECOVERY SYSTEM



6.3 UPPER CANOPY – HEAT RECOVERY SYSTEM

key number	*description*	*12, 16, 20 & 25 Series (Unless Otherwise Noted) part number*	*quantity*
1	enclosure, discharge (12/16 Series)	250017–590	1
	Senclosure, discharge (20/25 Series)	019949	1
2	weatherstrip, felt !8@ x 1”	043502	57 ft.
3	screw, body bolt %16” x !2@	829705–050	32
4	cylinder, pneumatic	241906	2
5	yoke, rod end	040138	2
6	pin, cotter !16” x #4@	827101–075	2
7	pin, yoke	040065	2
8	bracket, air cylinder	224695	2
9	bracket, air cylinder	016414	2
10	spring, extension	241909	2
11	elbow, 90_ !8@ p to !4@ hose	813704–125	2
12	damper, 30” x 30” (12/16 Series)	250017–554	4
	Sdamper 36” x 36” (20/25 Series)	408952	4
13	coupling, !8@	801215–005	2
14	panel, damper 30” x 30” (12/16 Series)	250017–879	4
	Spanel, damper 36” x 36” (20/25 Series)	019951	4
15	angle, seal 40/50HP (12/16 Series)	250018–294	1
	Sangle, seal 60/75HP (12/16 Series)	250018–105	1
	Sangle, seal (20/25 Series)	234198	1
16	nut, hex flanged %16”–18	825305–283	40
17	angle, seal 40/50HP (12/16 Series)	250018–293	1
	Sangle, seal 60/75HP (12/16 Series)	250018–106	1
	Sangle, seal (20/25 Series)	233871	1
18	decal, EES	250001–033	2
19	panel, enclosure end (12/16 Series)	250018–647	1
	Spanel, enclosure end (20/25 Series)	019950	1
20	motor, 3 HP (12/16 Series)	041035	1
	Smotor, 7!2@ HP (20/25 Series)	250029–340	1
21	panel, venturi 24” fan 70/50HP (12/16 Series)	250018–329	1
	Spanel, venturi 26” fan 60/75HP (12/16 Series)	250018–183	1
	Spanel, venturi 36” fan (20/25 Series)	245579	1
22	fan, 24” 40/50HP (12/16 Series)	049971	1
	Sfan, 26” 60/75HP (12/16 Series)	241908	1
	Sfan, 36” (20/25 Series)	409106	1
23	angle, seal (12/16 Series)	240018–105	1
	Sangle, seal (20/25 Series)	234198	1
24	angle, seal 40/50HP (12/16 Series)	250018–292	1
	Sangle, seal 60/75HP (12/16 Series)	250018–106	1
	Sangle, seal (20/25 Series)	233871	1

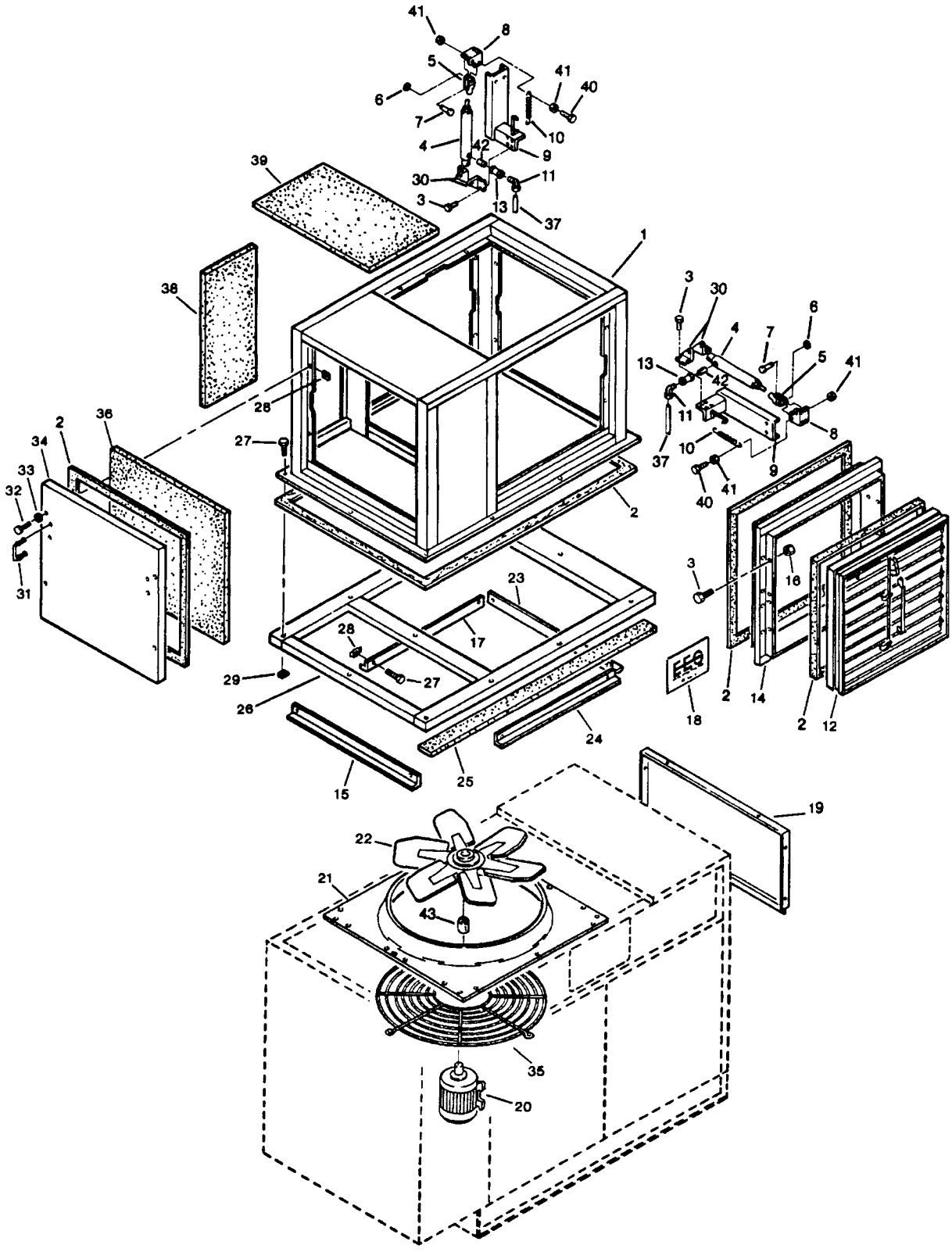
(Continued on Page 35)

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF DRYER

Section 7

ILLUSTRATIONS AND PARTS LIST

6.3 UPPER CANOPY – HEAT RECOVERY SYSTEM



6.3 UPPER CANOPY – HEAT RECOVERY SYSTEM (CONTINUED)

key number	*description*	*12, 16, 20 & 25 Series (Unless Otherwise Noted) part number*	*quantity*
25	panel, fiberglass (12/16 Series Only)	250020–017	1
26	frame, roof (12/16 Series)	250017–667	1
	Sframe, roof (20/25 Series)	019952	1
27	screw, body bolt %16" x #40	829705–075	24
28	nut, retainer %16"–18	861405–092	15
29	nut, retainer %16"–18	861505–140	5
30	bracket, cylinder	241907	2
31	handle, retractable	405087	4
32	capscrew, hex %16" x 2!20	828605–250	16
33	washer, plain %16"	823705–071	16
34	panel, access (12/16 Series)	250017–895	3
	Spanel, access (20/25 Series)	233870	3
35	guard, fan 24" (12/16 Series)	241079	1
	Sguard, fan 26" (12/16 Series)	250006–220	1
	Sguard, fan 36" (20/25 Series)	248744	1
36	panel, fiberglass (12/16 Series)	250020–018	3
	Spanel, fiberglass (20/25 Series)	047823–149	3
37	hose, nylon !40	842215–004	24 ft.
38	panel, fiberglass (12/16 Series)	250020–016	2
	Spanel, fiberglass (20/25 Series)	047823–152	2
39	panel, fiberglass (12/16 Series Only)	250020–017	1
40	capscrew, hex !40–20 x #40	829104–075	4
41	nut, hex lock !40–20	825504–145	4
42	nipple, pipe close !80	823102–000	2

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF DRYER

WORLDWIDE SALES AND SERVICE

R

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