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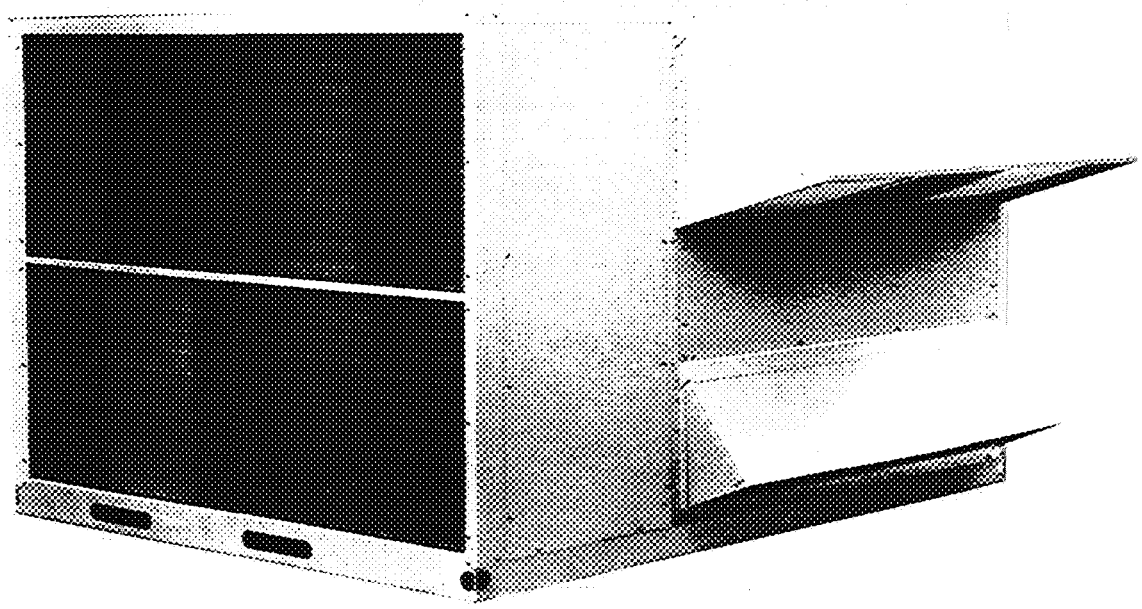
SnyderGeneral

Installation and Maintenance Data

Bulletin No. IM 398-5
August 1992
Part No. 711159A-49

Packaged Rooftop Systems Models CUR160 & CUR201



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NOMENCLATURE

CUR 160 E T H

Commercial Unitary Rooftop Unit

Nominal Capacity
160 = 16 Tons
201 = 20 Tons

Design Vintage

Voltage
T = 460/60/3
F = 208-230/60/3
W = 575/60/3
Q = 380-415/50/3 (No Agency Approval)

Heat Medium
Y = Cooling Only
H = Natural Gas (High Heat)
K = Natural Gas (High Heat, High Altitude)
L = Natural Gas (Low Heat)
J = Natural Gas (Low Heat, High Altitude)
P = Propane
Z = Propane (High Altitude)
S = Steam
W = Hot Water
1—6 = Electric

RECEIVING, INSPECTION & UNPACKING

When the equipment is received all items should be carefully checked against the bill of lading to be sure all crates and cartons have been received. Before accepting delivery, carefully inspect each carton or crate for visible shipping damage. If any damage is noticed, the carrier should make the proper notation on the delivery receipt acknowledging the damage. Make notations of all damage on all copies of the bill of lading and have all copies countersigned by the delivering carrier. The carrier should also fill out a Carrier Inspection Report. The factory Traffic Department should then be contacted. File claim for damage with the carrier. Physical damage to the unit after acceptance is not the responsibility of SnyderGeneral Corporation.

Unpack each carton or crate and verify that all required parts and proper quantities of each item have been received. Refer to drawings for part descriptions. Report shortages or missing items to your local representative to arrange for replacement parts.

Due to availability of carriers and truck space, it is not possible to guarantee that all items will be shipped together. Verification of shipments must be limited to only those items on the bill of lading.

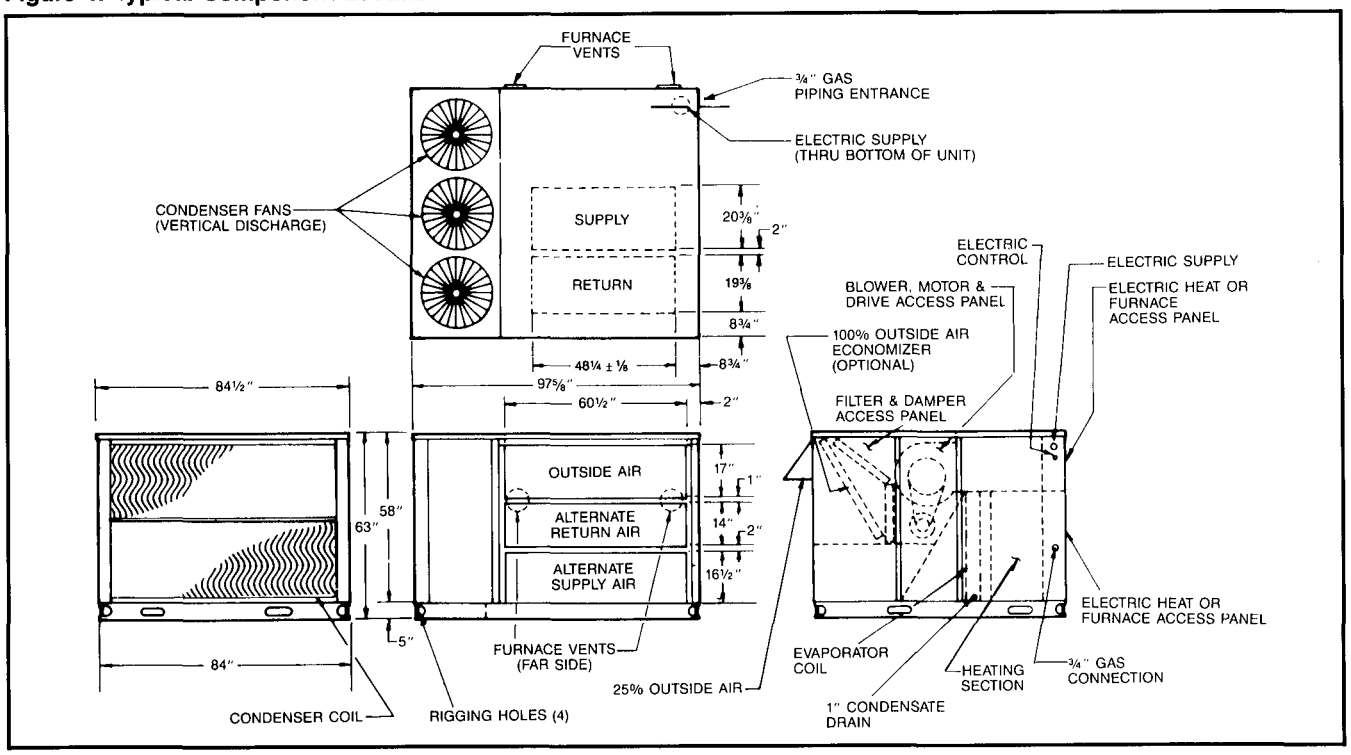
The unit nameplate must be checked to make sure the voltage agrees with the power supply available.

UNIT DESCRIPTION

Rooftop units are shipped fully assembled and factory tested. They are generally installed on a steel roof mounting curb assembly which has been shipped to the jobsite for installation on the roof structure prior to the arrival of the unit.

The model number shown on the unit identification plate identifies the various components of the unit such as refrigeration tonnage, vintage, and voltage as shown above in the nomenclature.

Figure 1. Typical Component Location



INSTALLATION

The installation of this equipment shall be in accordance with the regulations of authorities having jurisdiction and all applicable codes. It is the responsibility of the installer to determine and follow the applicable codes.

Sheetmetal parts, screws, clips and similar items inherently have sharp edges, and it is necessary that the installer and service personnel exercise caution.

This equipment is to be installed by an experienced installation company and fully trained personnel.

The mechanical installation of the packaged rooftop units consist of making final connections between the unit and building services; supply and return duct connections; drain connections (if required) and setup of rainhood over outside air intake opening.

The internal systems of the unit are completely factory installed and tested prior to shipment and no additional field labor is required.

ROOF CURB ASSEMBLY & INSTALLATION

GENERAL

1. Roof curbs are shipped unassembled. Field assembly, leveling and mounting on roof structure are the responsibility of the contractor.
2. All required hardware necessary for assembly is supplied and included in curb assembly.
3. ACRB 0820 is a cantilever curb (condenser end overhang) for 16 and 20 ton units. ACRB 1620 is a full perimeter curb for 16 and 20 ton units. All units are supported by their roof curbs without additional support.
4. Curbs must be supported on at least two parallel sides by roof members. Primary and secondary roof members must not penetrate supply/return duct opening areas.
5. Curb insulation, cant strip and counterflashing to be supplied by contractor. Wood nailing strip and unit isolator furnished and installed by manufacturer.

INSPECTION

1. Before accepting curb delivery, inspect each carton or crate for visible shipping damage. Make notations of all damage on all copies of bill of lading and have all copies countersigned by the delivering carrier. File claim for damage with the carrier.
2. Unpack each carton and verify that all required parts and proper quantities of each item as shown on bill of material have been received. Report shortages or missing items to delivering carrier and notify your local representative to arrange for replacement.

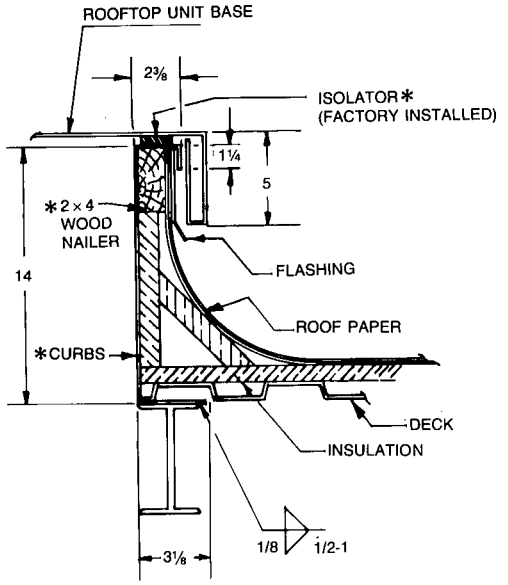
ASSEMBLY

1. Position perimeter pieces, items ① and ②, as shown and in accordance with job requirements. Check lengths of all pieces against bill of material to insure proper placement and assembly (see Figure 3).
   CAUTION: All curbs look similar. To avoid incorrect curb positioning, check job plans carefully and verify markings on curb assembly.
2. Assemble SIDE CHANNELS, item ①, to FRONT & BACK CHANNELS, item ②, using bolts, washers, lock washers and nuts, Items ③ ④ ⑤ ⑥. Hand tighten only at this time.
   NOTE: Flanges on item ① must go outside of item ② and under wood nailer strip.
3. The assembled roof mounting curb should now be checked for squareness. The curb assembly must be adjusted until both diagonal measurements (dimension "C") are equal within a tolerance of ±1/8". All hand-tightened fasteners should now be fully secured (see Figure 4).

Table 1. Curb Dimensions

CURB MODEL	UNIT MODEL	TYPE	A	B	C
ACRB 0820	16 Ton & 20 Ton	Condenser Section Overhang	63 1/8	75 11/16	98 9/16
ACRB 1620	16 Ton & 20 Ton	Full Perimeter	76 11/16	90 1/8	118 5/16

Figure 2.



*Items Furnished By Manufacturer

Figure 3.

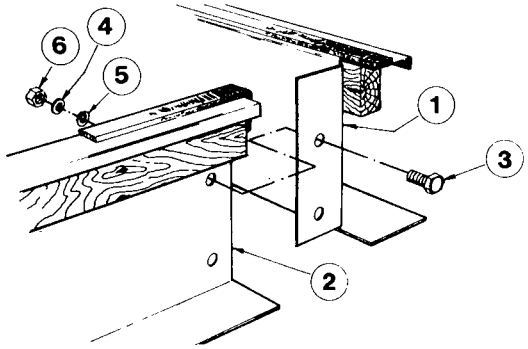
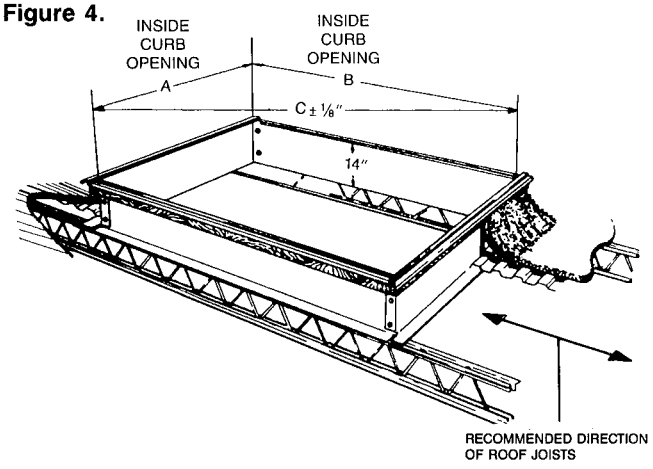


Figure 4.



INSTALLATION & LEVELING

1. Place assembled curb in proper location on roof joists. Recheck for squareness and adjust if required.
2. Curb must be installed level and may require contractor to supply and install shims.
3. One method to achieve level installation is to stretch two diagonal lines across curb and equip them with line levels. There must not be more than 1/8" spacing between the two lines at the point of intersection. Should the lines touch at the intersection, recheck by placing the bottom line on top. Shim curb as required to bring it within the specified tolerance.
4. Attach the squared and leveled curb to the roof structure with welds as shown in Figure 2.

CURB FLASHING

1. The cross section detail in Figure 2 shows the recommended method of flashing which has been approved by the National Roofing Contractors Association.
2. Complete finished roof including counterflashing around curb must be installed prior to setting units on curb.

HANDLING & RIGGING

GENERAL HANDLING

1. To assist in determining rigging requirements, maximum model weights are shown in Table 2.

Table 2.

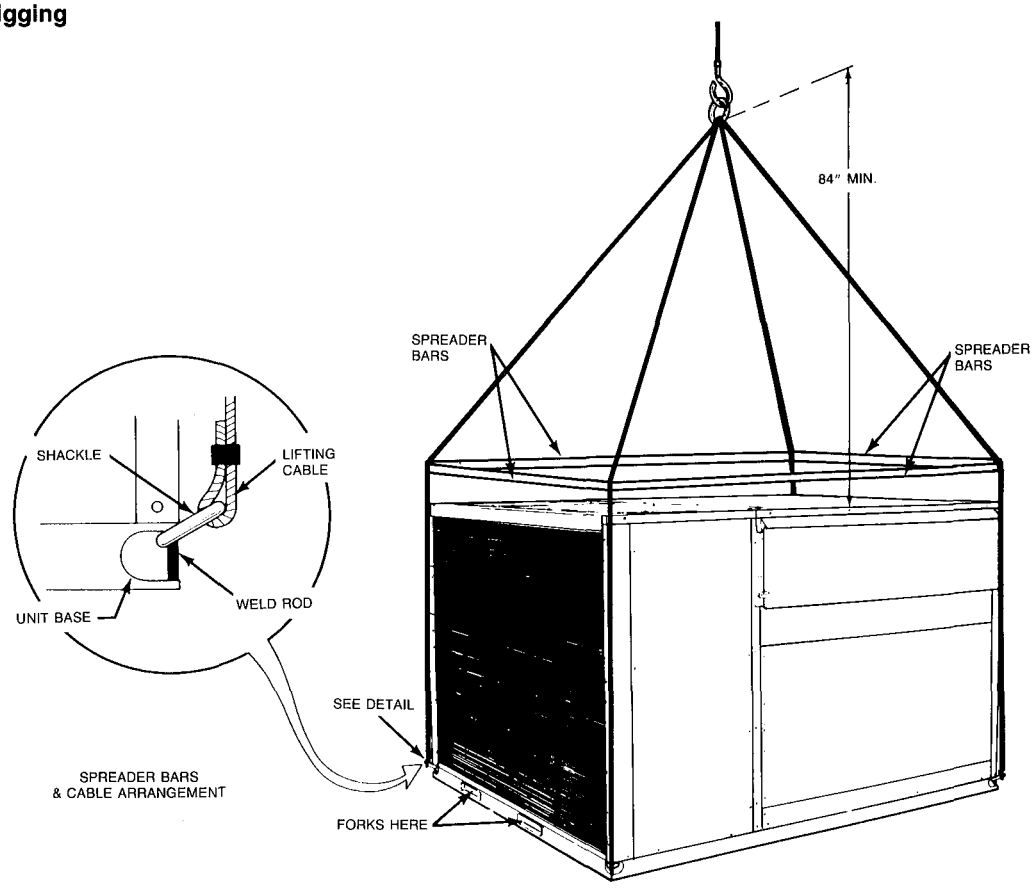
MODEL TYPE	CUR160	CUR201
COOLING ONLY	1780	1971
ELECTRIC HEAT	1820	2011
GAS HEAT	2180	2371
HYDRONIC HEAT	1980	2171

2. Do not stand or walk on unit.
3. Do not drill holes anywhere in panels or in base frame of units.
4. Do not remove any access panels until unit has been installed on roof curb or field supplied structure.
5. Do not roll unit across finished roof without prior approval of owner or architect.

RIGGING DETAILS

1. Units must be lifted by the four (4) lifting holes located at the unit base frame corners.
2. Lifting cables should be attached to the unit with shackles as shown in Figure 5.
3. The distance between the crane hook and the top of the unit must not be less than 84".
4. Four (4) spreader bars must span over the unit to prevent damage to the cabinet by the lift cables. Spreader bars for each unit must be of sufficient length so cables do not come in contact with the unit during transport.
5. Should it be necessary to store unit in a position other than on roof curb, it must be supported on two (2), 4" square rails spanning length of the unit. Unit must be stored in level position. Protect the condenser coil, because it is easily damaged.
6. Provisions for forks have been included in the unit base frame as shown. If unit is moved by fork lift truck, no other fork location is approved. Minimum fork length required is 3 ft. to prevent damage to unit.

Figure 5. Rigging

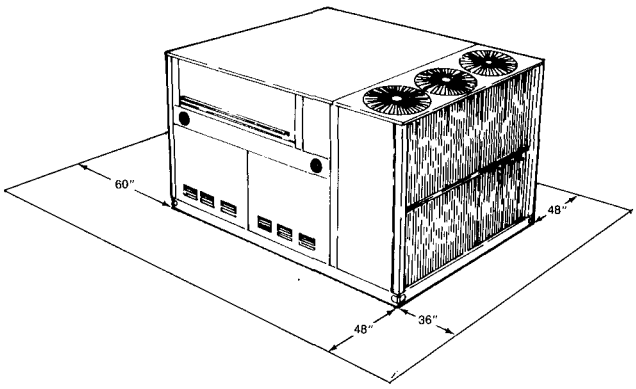


SERVICE CLEARANCES

Adequate clearance around the unit must be kept for safety, accessibility, service and maintenance. As shown in Figure 6, 48″ clearance is required on the rear (furnace and electrical) end of the unit. This clearance must be maintained for compressor removal and, in the case of a furnace unit, for removal of the furnace and to insure proper combustion air and flue gas flow. A clearance of 36″ is required on the condenser side of the unit for an adequate supply of condenser air.

A clearance of 48″ is recommended on the front (outside air) end of the unit for compressor removal and for adequate outside air accessibility in the event that an economizer is used with horizontal supply and return ductwork. A clearance of 60″ on the filter access side of the unit is recommended for fan shaft removal. These clearances are service clearances and are therefore greater than those shown on the unit dataplate. Those shown on the dataplate are minimum clearances for safety and accessibility.

Figure 6. Service Clearances



GAS HEAT UNITS

1. As shown in Figure 6 and as indicated on the unit dataplate, a minimum clearance of 48″ to any combustible material is required on the furnace access side of the unit. All combustible materials must be kept out of this area.
2. This 48″ minimum clearance must also be maintained to insure proper combustion air and flue gas flow. The combustion air intake and furnace flue discharge must not be blocked for any reason, including blockage by snow.
3. Adequate clearances from the furnace flue discharge to any adjacent public walkways, adjacent buildings, building openings or openable windows must be maintained in accordance with the latest edition of the National Fuel Gas Code (ANSI Z223.1) for U.S.A., and CAN/CGA B149.1 and B149.2 for Canada.

   CAUTION: Flue gases are corrosive to certain building materials. Provide adequate clearance or other protection as required.
4. Minimum horizontal clearance of 48″ from the furnace flue discharge to any electric meters, gas meters, regulators and relief equipment is required.

   NOTE: Model CUR160 and 201 rooftop units are designed for outdoor installation only. They may be installed over wood flooring or over Class A, B or C roof covering materials.

UNIT INSTALLATION ON ROOF CURB

UNIT LOCATION

CAUTION: Units may look identical but have significant internal differences. Check specific unit location carefully (referring to plans if necessary) prior to setting unit.

ISOLATOR STRIP

Check top of curb for factory installed isolator strip as shown in Figure 2. Isolator should be firmly applied to the top of each curb piece. If isolator is loose, re-apply using strong weather resistant adhesive.

CURB INSTALLATION

Proper installation requires that the roof curb be firmly and permanently attached to the roof structure. Check for adequate fastening method (welding recommended) prior to setting rooftop unit on curb.

PROTRUSIONS

Inspect curb to insure that none of the utility services (electric, steam, hot water) routed through the curb protrude above the curb. Duct connections will normally be made after unit is set on curb. If duct is prefabricated and installed within the curb prior to setting unit, insure that ductwork does not protrude above curb. DO NOT ATTEMPT TO SET UNIT ON CURB IF PROTRUSIONS EXIST.

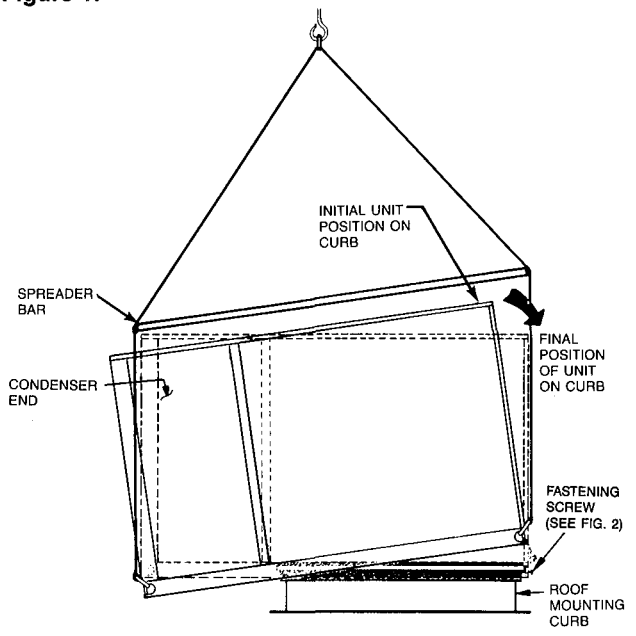
UNIT INSTALLATION

Lower unit carefully onto roof curb. While rigging unit, center of gravity will cause condenser end to be lower than supply/return air end. Bring condenser end of unit into alignment with curb. With condenser end of unit resting on curb member and using curb as fulcrum, lower front end of unit until entire unit is seated on curb.

FASTENING SCREWS

CUR160 and CUR201 units are provided with retaining bolts that must be secured. Bolts are field installed in the base frame on the end opposite the condenser. Tighten bolts until they engage flange on roof curb as shown. SCREWS MUST NOT PENETRATE ROOFING FELTS.

Figure 7.



RIGGING REMOVAL

Remove spreader bars, lifting cables and other rigging equipment. CAUTION: DO NOT ALLOW crane hooks and spreader bars to rest on roof of unit.

DUCT CONNECTIONS

VERTICAL DISCHARGE

Supply and return duct openings are provided in the unit base to permit vertical side-by-side duct installation after unit placement on curb. When side-by-side sheetmetal ducts are constructed in accordance with Figures 8 and 9, they are easily inserted through the unit openings, pulled down to lock over the upward unit flange and require no additional screw or rivet fasteners.

NOTE: Duct installation before unit placement on roof curb is not recommended.

Secure all ducts to building structure. Flexible duct connectors between unit and ducts are recommended. Insulate and weatherproof all external ductwork, joints and all roof openings with flashing and mastic in accordance with local codes. Ducts in unconditioned spaces must be insulated and covered with a vapor barrier.

NOTE: When the optional discharge damper or concentric duct kit is to be used, refer to the respective section in this bulletin.

Figure 8. Model CUR160 and CUR201 With Curb ACRB 0820 & ACRB 1620

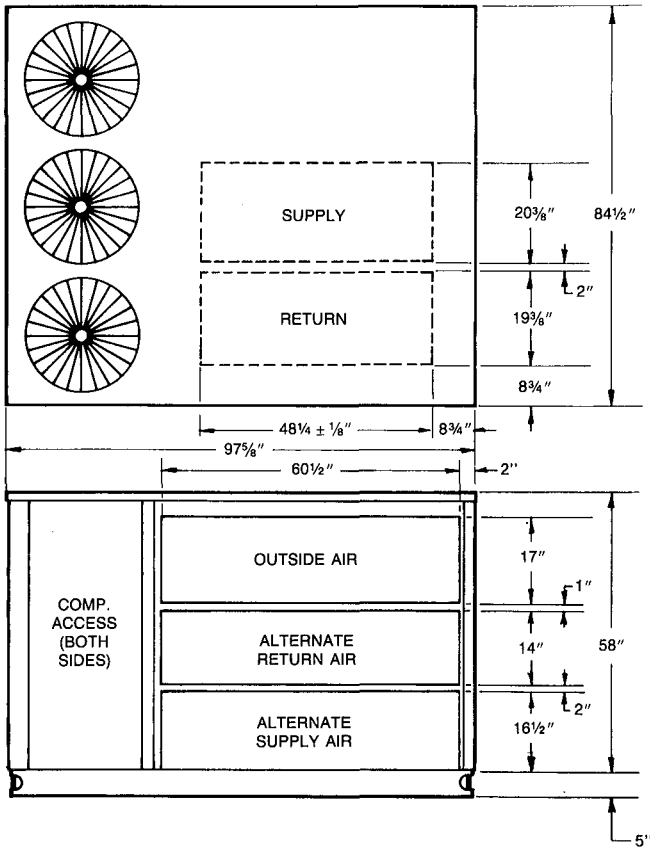


Figure 9. Typical Method of Duct Connections For Bottom Supply & Return Duct Openings

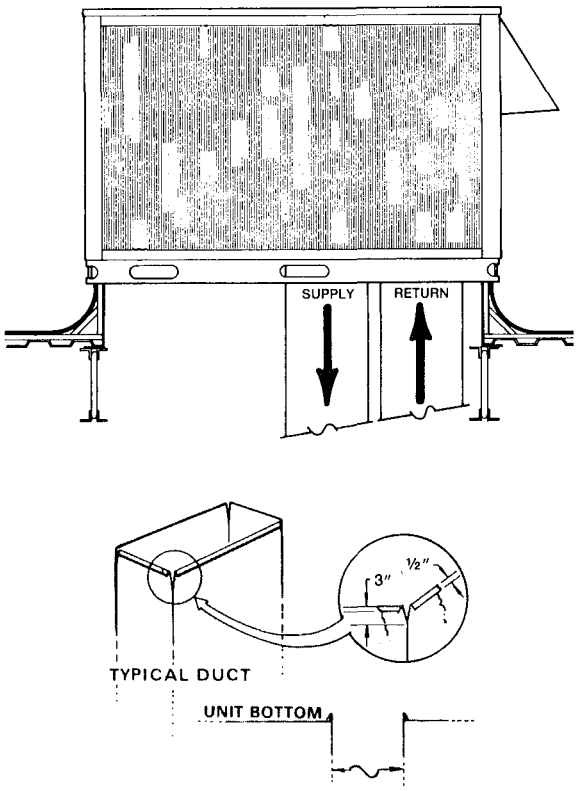
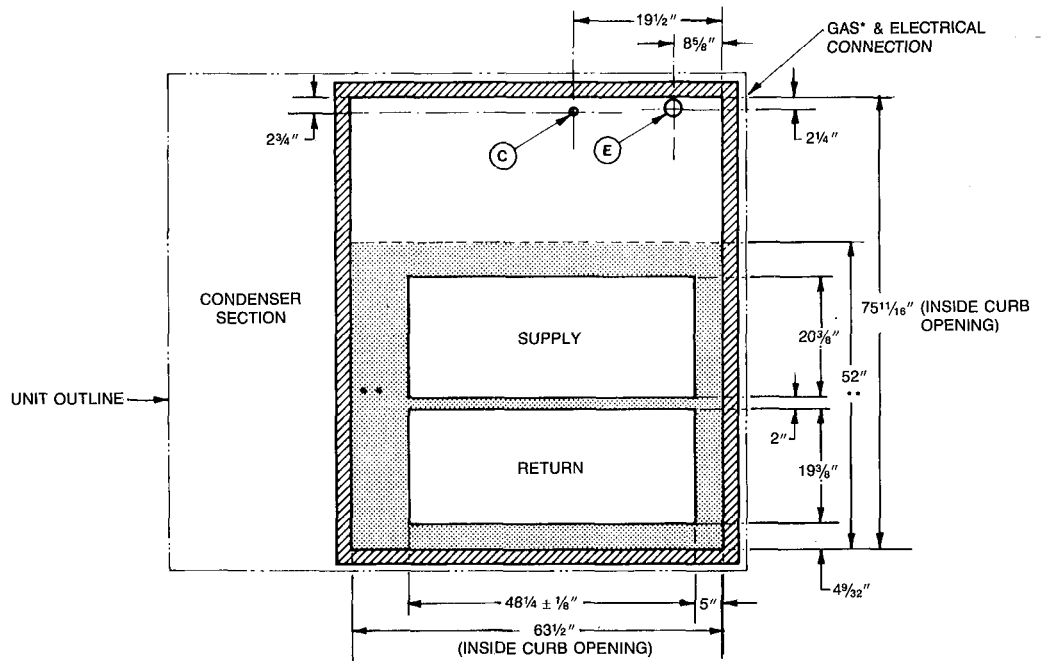
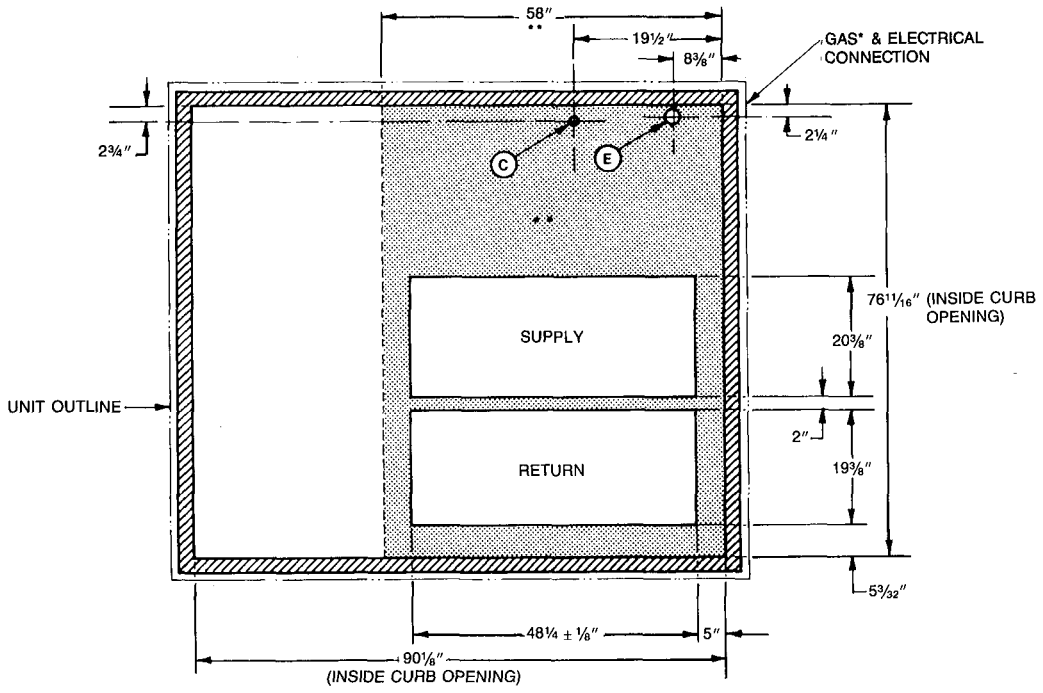


Figure 10. ACRB 0820 Roof Curb (Condenser Section Overhang)



NOTE:
C = Indicates control circuit routing through roof.
E = Indicates power wiring routing through roof.
*On gas heat units, power wiring must be external to curb.
**For supply/return diffuser applications, leave at least the shaded area inside the curb completely free of obstructions, for supply and return duct kit.

Figure 11. ACRB 1620 Roof Curb (Full Perimeter Design)



NOTE:
C = Indicates control circuit routing through roof.
E = Indicates power wiring routing through roof.
*On gas heat units, power wiring must be external to curb.
**For supply/return diffuser applications, leave at least the shaded area inside the curb completely free of obstructions for the supply/return duct kit.

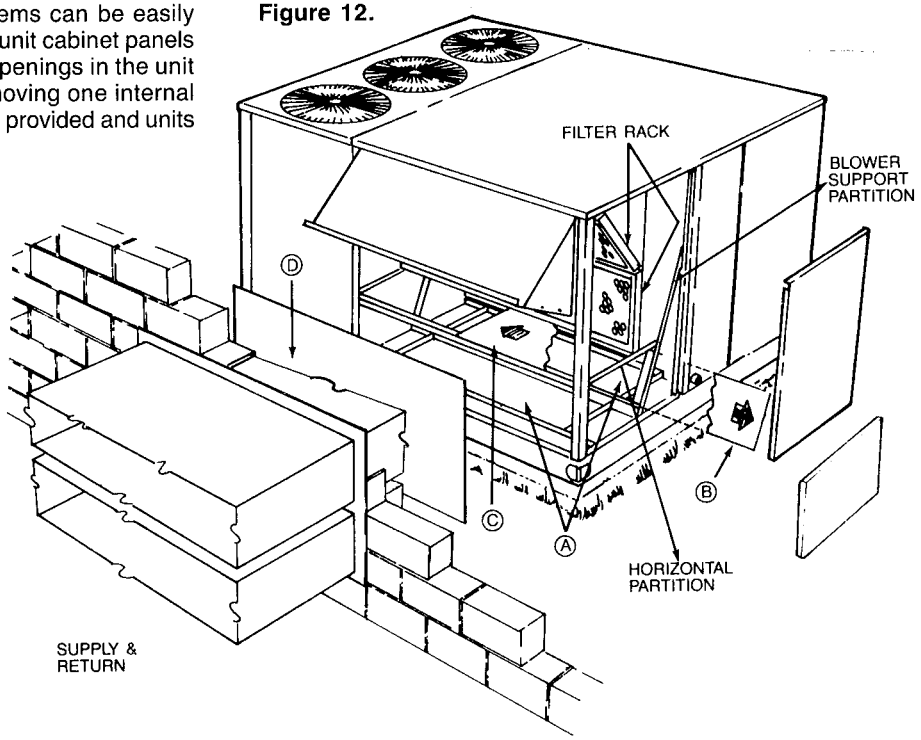
HORIZONTAL DISCHARGE DUCT CONNECTIONS WITHOUT 0 TO 100% ECONOMIZER

Optional horizontal over-under duct systems can be easily accomplished in the field by removing the unit cabinet panels covering the duct openings, sealing the openings in the unit base with field fabricated covers and removing one internal panel. Horizontal duct openings are factory provided and units do not require field cutting.

The following steps are for field conversion:

1. Supply and return openings in base to be sealed by installing contractor (material furnished by others), Item A.
2. Remove slide panel, Item B, located in the blower support partition and relocate in opening in horizontal partition, Item C. Facing of insulation should be free of tears.
3. Remove unit front close-out panel, Item D, and discard. Connect supply and return ducts furnished by installer to supply and return openings on front of rooftop unit.

Figure 12.



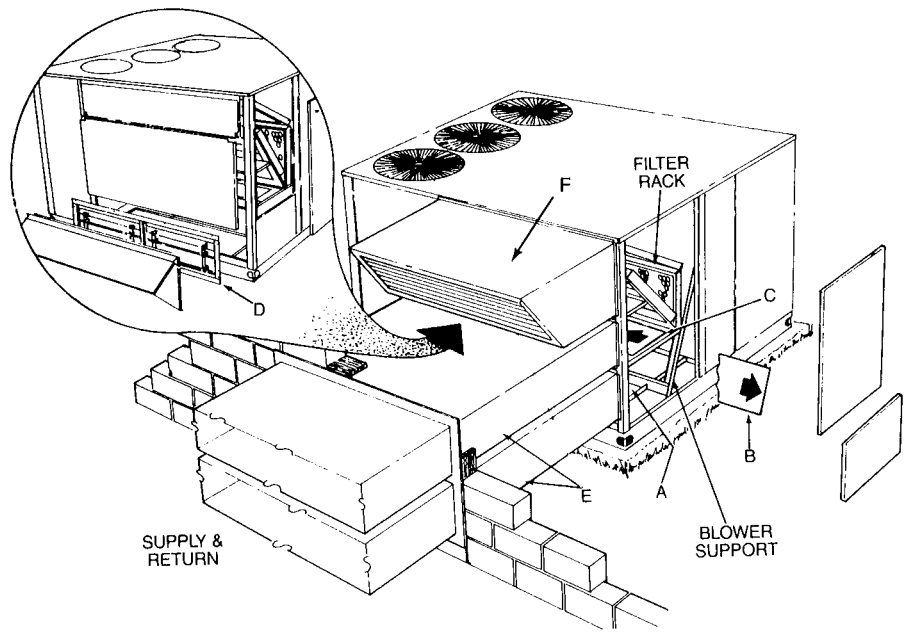
HORIZONTAL DISCHARGE DUCT CONNECTIONS WITH 0 TO 100% ECONOMIZER

The following steps are for field conversion:

1. Supply and return openings in base to be sealed by installing contractor (material furnished by others), Item A.
2. Remove slide panel, Item B, located in blower support partition and relocate in opening in horizontal partition, Item C. Facing of insulation to be free of tears.
3. Remove unit front center close-out panel, pressure relief rainhood, and pressure relief damper from front of unit, Item D. Discard front center close-out panel and retain pressure relief rainhood and damper at this time. Connect supply and return ducts to front of rooftop unit, Item E. Pressure relief damper and its rainhood may be reinstalled in the side of the return air duct.
4. Remove fresh air rainhood from unit and discard. Replace with field installed rainhood (furnished by installer), Item F.

NOTE: The bottom of the rainhood should be sloped toward the inlet so any entering water will drain out. The opening should also be fitted with a bird screen.

Figure 13.



CONCENTRIC SUPPLY/RETURN DUCT*

The concentric supply/return duct system is designed for use in conjunction with packaged rooftop units where it is desired to provide the convenience and low cost of a single cooling outlet for both supply and return air. The concentric supply/return duct system consists of three (3) components:

1. **CONCENTRIC TRANSITION (ACRT 201)**
   These sheetmetal accessories when field assembled provide the necessary conversion from side-by-side to inner and outer supply/return air patterns. The concentric transitions are designed to be field mounted within the roof curbs. No direct connection to the rooftop unit is required. It is recommended that the transitions be installed prior to mounting the unit on the curb.

   CUR160, CUR201 on ACRB 0820 Cantilever Curb With ACRT 201 — As shown in Figure 14, the concentric transition consists of the concentric frame (Item E), the return duct transition (Items A, B, C and D), the curb divider (Item F), horizontal fill-in (Item G), and vertical fill-in (Item H).

   CUR160, CUR201 on ACRB 1620 Full Perimeter Curb With ACRT 201 — As shown in Figure 15, the concentric transition consists of the concentric frame (Item E), the return duct transition (Items A, B, C and D), the curb divider (Item F), and the side curb divider (Item I).

   NOTE TO INSTALLER: The ACRT 201 Transition Kit includes all the parts necessary to adapt the ACRB 0820 and ACRB 1620 curbs. All parts of the kit not used with the particular curb application should be discarded.

2. **DUCT KIT (ADUC 204)**
   Each concentric supply/return duct system is provided with an outer supply duct (Item J) and an inner return duct (Item K). See Figure 16. Each duct is constructed of heavy-duty commerical grade fiberboard with aluminum facing. The ducts come in 4-foot sections (with support channels) and 2-foot sections, totaling 6 feet in length. They are constructed in one or two pieces, and notched at the factory requiring one or two field joints to complete the duct section. Duct sections can be field cut to a shorter length if desired.

3. **DIFFUSER WITH VOLUME CONTROL (ADIF)**
   Referring to Figure 16, Item L, the diffuser is constructed of aluminum for strength and durability and has an attractive finish that will blend with any ceiling style or decor. All diffusers have manual dampers for proper air balancing from all four supply grilles. The return grille is made from high impact plastic and is removable for periodic cleaning. Proper installation of these parts and following procedures in this bulletin is essential to achieve a satisfactory air conditioning system.

Table 3.

ACCESSORY DESCRIPTION	COMMENTS	MODEL DESIGNATION	PART NUMBER
UNIT SUPPORT FRAME	CANTILEVER	ACRB 0820	840311Y-00
	FULL PERIMETER	ACRB 1620	710058A-02
CONCENTRIC SUPPLY/RETURN DUCT SYSTEM (REQUIRES SELECTION OF ITEM 1, 2, 3)	1. CONCENTRIC TRANSITION	ACRT 201	710266A-01
	2. DUCT KIT (6 FT.)	ADUC 204	712755B-01
	3. DIFFUSER	ADIF 202	712754B-01

Figure 14. ACRB 0820 With ACRT 201 Kit

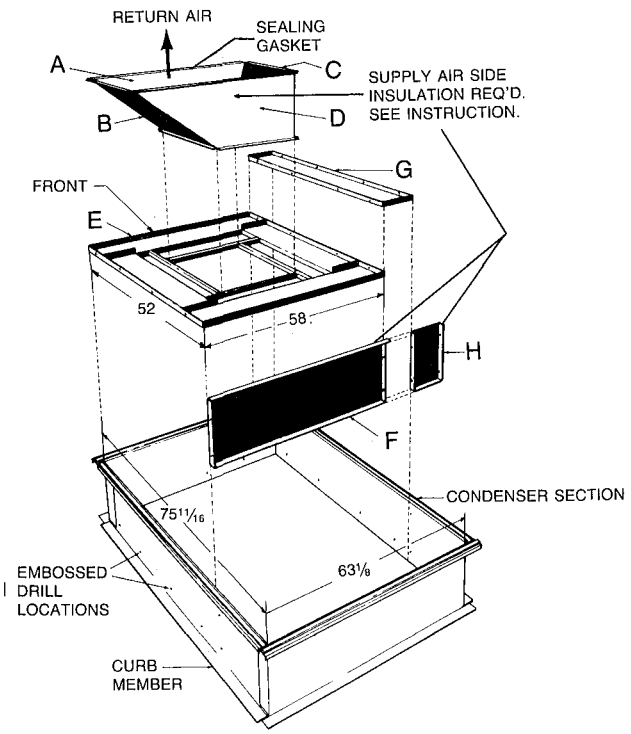
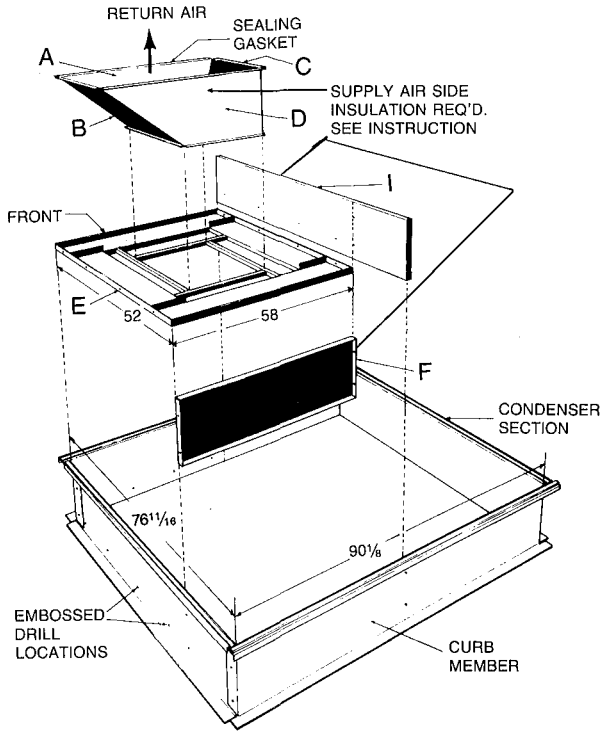


Figure 15. ACRB 1620 With ACRT 201 Kit



*Item not submitted to ETL and CGA.

ASSEMBLY & INSTALLATION OF CONCENTRIC SUPPLY/RETURN

CONCENTRIC TRANSITIONS

The concentric transition is designed for field assembly and installation in the roof curbs. Applications requiring the concentric transition without the roof curb are non-standard and these instructions are not applicable.

Proper installation requires that the concentric transition be installed in the roof curb prior to the curb being roofed in and prior to mounting the rooftop unit on the curb. Installation of the concentric transition after the unit is in place on the curb is possible but not recommended due to the difficulty in achieving proper sealing to prevent air bypass between the unit and the transition.

ACRT 201 ASSEMBLY INSTRUCTIONS USED WITH ACRB 0820 CURB

Step 1: Upon removing the concentric frame from the carton (refer to Figure 16), attach four (4) support brackets (Item M) to the bottom of the concentric frame with pop rivets provided. To each support bracket attach a 4-foot length of #14 or #16 gauge steel wire with a ¼-20-#14 or equal turnbuckle to the other end. Wire and turnbuckles are to be field supplied.

Step 2: Using Figure 14 as an assembly reference, remove the vertical fill-in (Item H) from the shipping carton and attach it to the curb divider (Item F) with two (2) ⅜ × 1 hex bolts, flat washers, lock washers, and ⅜″ hex nuts. Attach curb divider with fill-in (Items F and H) to curb with bolts, washers and nuts provided.

Step 3: Remove from carton and insert the concentric frame (Item E) into curb between curb divider and curb members using embossed drill holes as guide. These embossed drill holes should be drilled using 13⁄64″ drill bit. When concentric frame is located in place, mark flanges on frame and drill 13⁄64″ holes. Attach the concentric frame to the curb members and curb divider with pop rivets provided.

IMPORTANT: The top of the concentric frame must be a uniform 12″ below the top of the curb to insure a proper fit with the rooftop unit.

Step 4: Install horizontal fill-in (Item G) between concentric frame and curb member with pop rivets provided. The mounting of this horizontal fill-in should use the same method as in Step 3.

Step 5: Assemble return duct transition using items A, B, C and D (3⁄16″ pop rivets provided).

Step 6: Attach the assembled return duct transition to the concentric frame using 3⁄16″ pop rivets (provided). Apply sealing gasket to the top surface of the return duct transition as shown in Figure 14. Apply insulation with moisture barrier to the supply air side of the return duct transition and the vertical curb divider (Items F and H), as shown in Figure 14 (insulation to be field supplied).

When properly installed the assembled concentric transition and return duct transition will not protrude above the rooftop mounting curb (except for the sealing gasket).

ACRT 201 ASSEMBLY INSTRUCTIONS USED WITH ACRB 1620 CURB

Step 1. Upon removing the concentric frame from the carton (refer to Figure 16), attach four (4) support brackets (Item M) to the bottom of the concentric frame with pop rivets provided. To each support bracket attach a 4-foot length of #14 or #16 gauge steel wire with a ¼-20-#14 or equal turnbuckle to the other end. Wire and turnbuckles are to be field supplied.

Step 2: Using Figure 15 as an assembly reference, remove curb divider (Item F) from shipping carton and assemble in curb using ⅜″ bolts, flat washers, lock washers and ⅜″ hex nuts provided.

Step 3: Remove from carton and insert the concentric frame (Item E) into curb between curb divider and curb members using embossed drill holes as guide. These embossed drill holes should be drilled using a 13⁄64″ drill bit. When concentric frame is located in place, mark flanges on frame and drill 13⁄64″ holes. Attach the concentric frame to the curb members and curb divider with pop rivets provided.

Step 4: Now install the side curb divider (Item I) between the curb members and against the curb divider (Item F using ⅜ × 1 hex head bolts, flat washers, lock washers, and ⅜″ hex nuts provided. The method for attaching the concentric frame to the side curb divider is the same as in Step 3.

IMPORTANT: The top of the concentric frame must be a uniform 12″ below the top of the curb to insure a proper fit with the rooftop unit.

Step 5: Assemble return duct transition using items A, B, C and D (3⁄16″ pop rivets provided).

Step 6: Attach the assembled return duct transition to the concentric frame using 3⁄16″ pop rivets (provided). Apply sealing gasket to the top surface of the return duct transition as shown in Figure 15. Apply insulation with the moisture barrier to the supply air side of the return duct transition and curb dividers (Items F and I), as shown in Figure 15 (insulation to be field supplied).

When properly installed, the assembled concentric transition and return duct transition will not protrude above the rooftop mounting curb (except for the sealing gasket).

ASSEMBLY INSTRUCTIONS OF THE ADUC 204 DUCT KITS

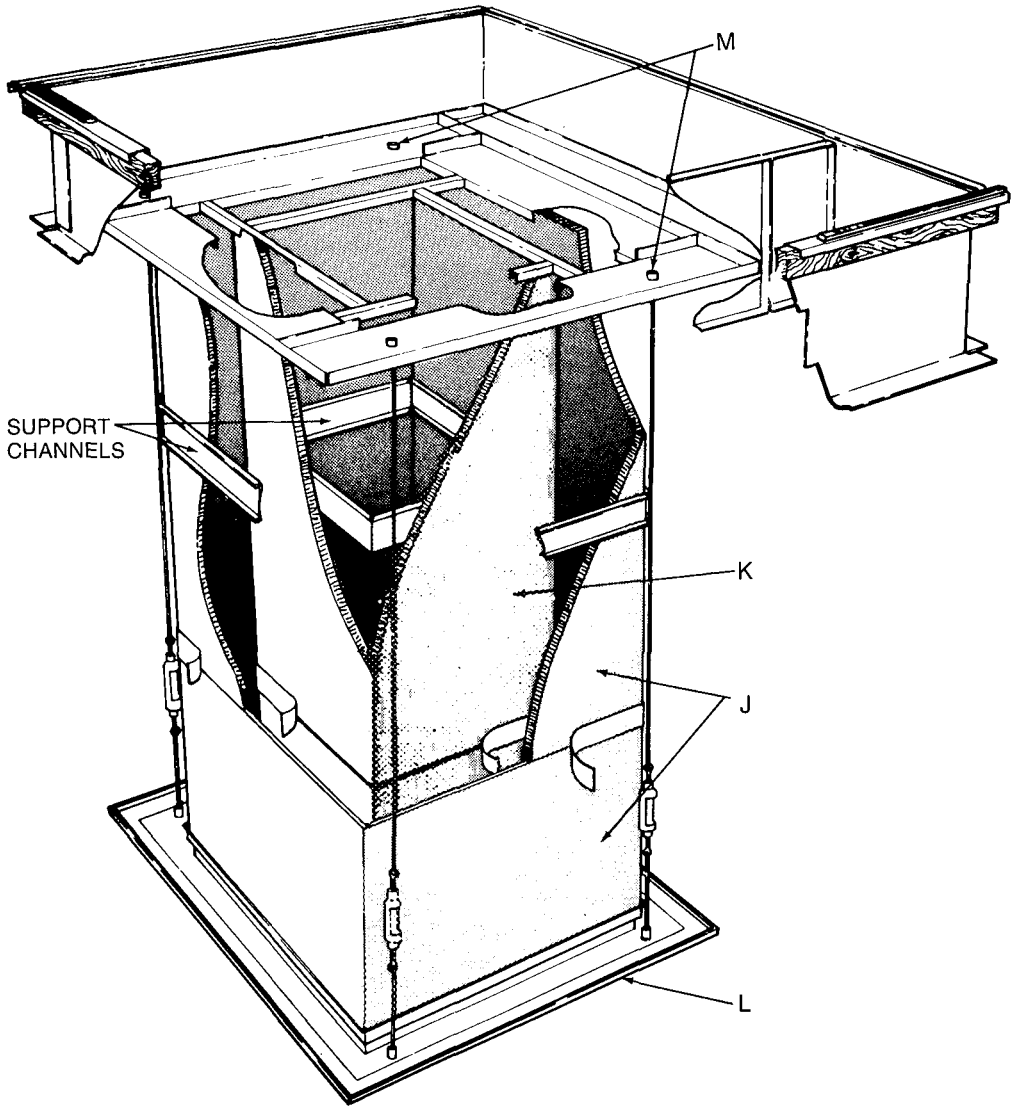
Step 1: Remove the duct boards and support channels from the shipping cartons. Both kits consist of a 4-foot section and a 2-foot section. Connect the lap joint and tape each joint with foil backed tape provided. After ducts have been taped to form a square, install the support channels on inside of return duct (Item K), and over outside of supply duct (Item J). See Figure 16. These support channels should be located in the center of the 4-foot section. If a 6-foot section is required, connect the lap ends of both duct sections (4-foot and 2-foot) together and tape with foil backed tape. Duct kits can be cut to any length for proper fit.

Step 2: After duct kits have been assembled, remove the diffuser (Item L) from shipping carton and lay room side down on a work platform or the floor directly below the rooftop unit. To avoid damage to the diffuser and marring of the finish, it is recommended that the paper wrapping not be completely removed from the diffuser until the installation is complete. If desired, the center return air grille may be removed during installation. Place inner return duct (Item K) on diffuser and seal duct around center flange. Slip outer supply duct (Item J) over inner return duct and lower onto diffuser. Seal duct around outer flange. Attach 4-foot lengths of #14 or #16 gauge steel wire to each support bracket on the ceiling diffuser.

The ceiling diffuser with the duct kits must be hoisted upward through the ceiling until the tops of the ducts meet the concentric transition in the roof curb. Fit the inner and outer ducts into the guide channels of the concentric frame. With the ceiling diffuser and ducts in the proper position, attach the steel wires from the diffuser to the free end of the turnbuckles (attached previously to the wires on the concentric frame). See Figure 16. Take up tension in the wire by adjusting each turnbuckle evenly. Replace return grille if required and remove packaging material used to protect diffuser.

APPLICATION WARNING: Concentric ceiling diffusers require a minimum ceiling installation extending six feet on all sides. Do not apply diffusers without a ceiling.

Figure 16. ADUC 204 Duct Kit



OUTSIDE AIR INTAKE HOOD

25% OUTSIDE AIR MANUAL DAMPER

The outside air intake hood is factory assembled on the rooftop unit. Side hinges between the top and end plates allow the top to be collapsed for shipment. Remove and discard the shipping retainer brackets holding the intake hood. Raise the top plate; the end plates will then swing into position. Fasten the end plates to the unit using sheetmetal screws provided. Adjust the position of the slide damper located behind the outside air intake to permit intake of the desired quantity of air. See Figure 17.

100% OUTSIDE AIR ECONOMIZER

The economizer outside air intake hood for the CUR160 and CUR201 is also collapsed for shipment. Remove and discard the shipping retainer brackets on each end of the hood. Elevate hood and swing out the two hinged ends. The hinged filter rack lifts up and is inserted inside the hood. See Figure 18. Fasten at each end as shown. Insert hood ends against inside edge of retaining angles and fasten with sheetmetal screws. Filter is packed in the compressor, heating or return air sections for shipment.

PRESSURE RELIEF DAMPER HOOD

The pressure relief damper hood is assembled in a similar manner as above but does not have any prefilters.

Figure 17. 25% Outside Air Intake Hood

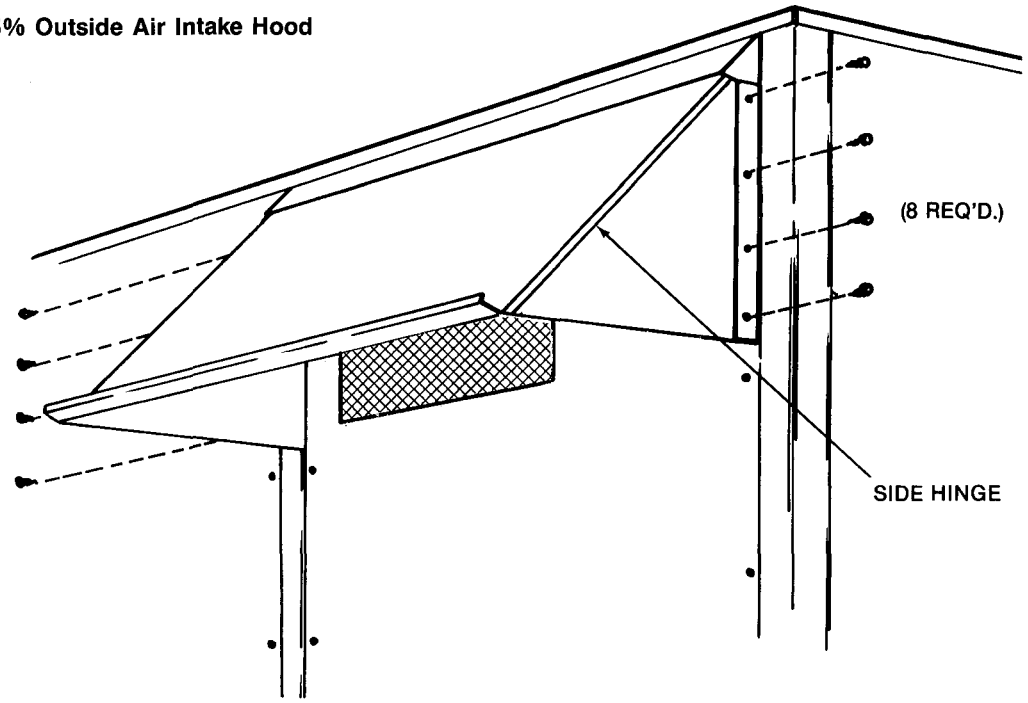
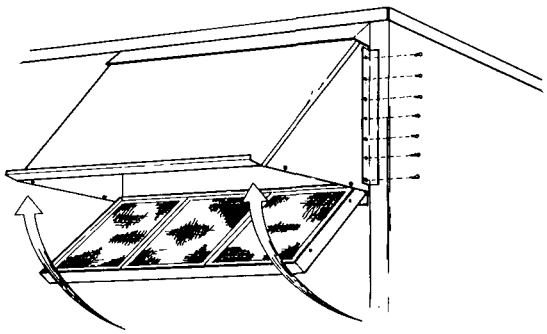


Figure 18. Economizer Outside Air Intake Hood



OPTIONAL DISCHARGE DAMPER — VAV ONLY

For those systems requiring a constant supply duct pressure, the optional discharge damper accessory is available. This assembly (Figure 19), consisting of damper and housing, damper motor, linkage and differential pressure switch, is field installed.

The discharge air damper is controlled by the discharge damper motor, which is positioned by the differential pressure switch to open or close as required by supply air duct pressure. As pressure in the duct increases, the discharge air damper closes (never beyond 60% closed).

The differential pressure control switch is adjustable from 1.1″ to 3.5″ W.C., and will maintain the predetermined duct pressure by repositioning the discharge damper (supply air) in the unit, depending on pressure requirements. The duct pressure is dependent on the positioning of the various zone boxes which are responsive to their respective thermostats.

As explained in "Electrical Installation," the damper motor requires a separate 115 or 230 volt power source. Units equipped with morning warm-up or night setback heating require some low voltage field wiring. Refer to "Low Voltage Control Wiring — VAV Units" section for procedure.

The housing is dimensionally the same as the supply duct opening in the bottom of the unit and is flanged so that it can be installed in the supply duct upstream of any takeoffs.

Four (4) adapter strips are also supplied if it is desirable to connect the damper to the unit supply duct flanges as described previously under "Duct Connections." These four adapter strips are attached to the damper housing with sheetmetal screws as shown in Figure 19.

The damper must be installed so that the damper motor and differential pressure switch are located on the side opposite the return air duct. See Figure 20.

Figure 19. Discharge Damper

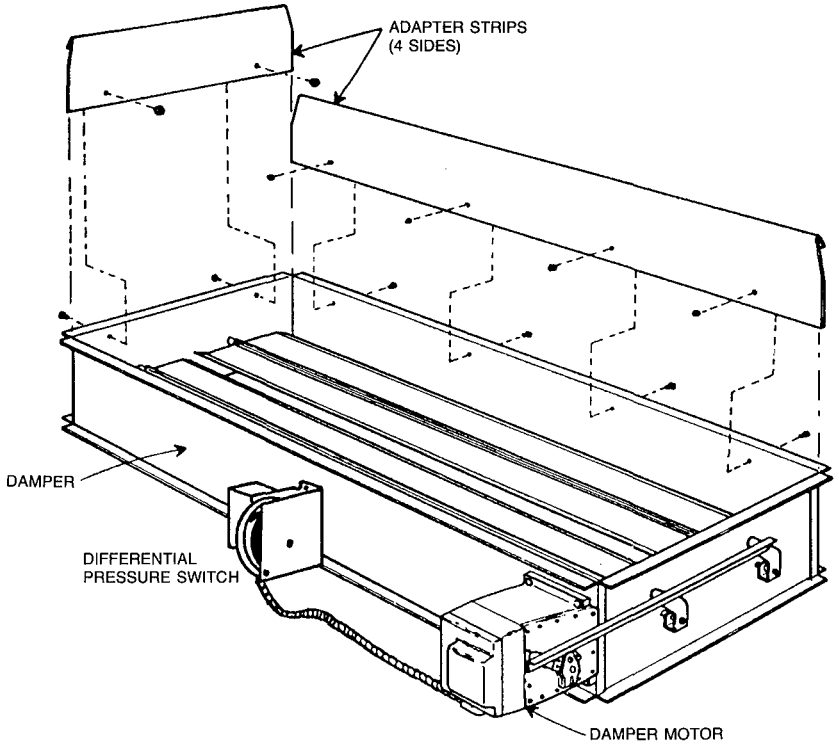
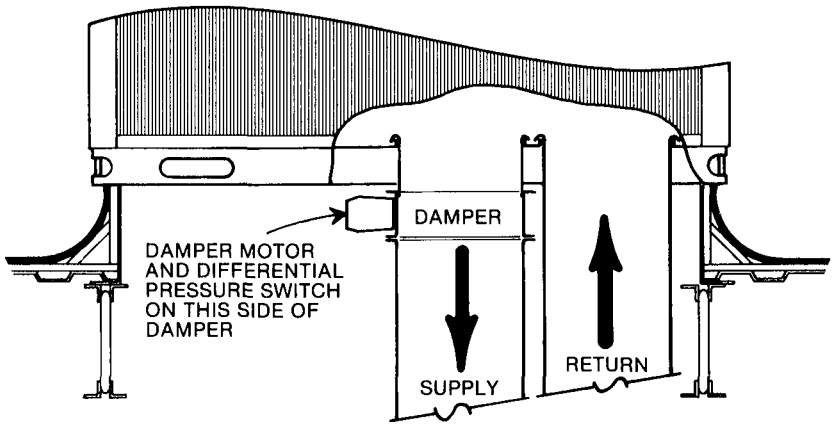


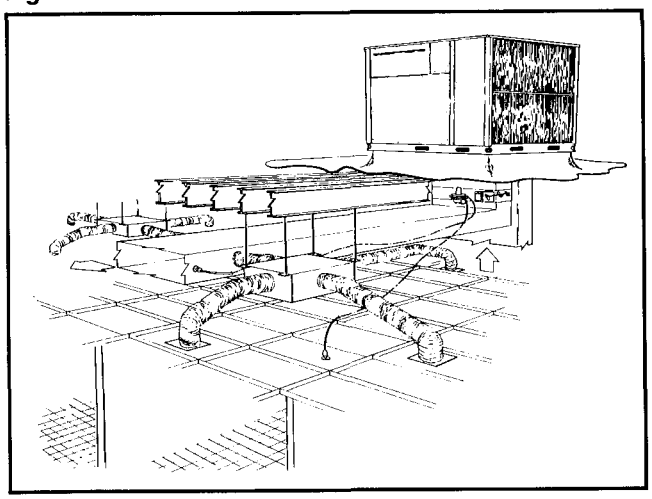
Figure 20.



DIFFERENTIAL PRESSURE SWITCH — VAV ONLY

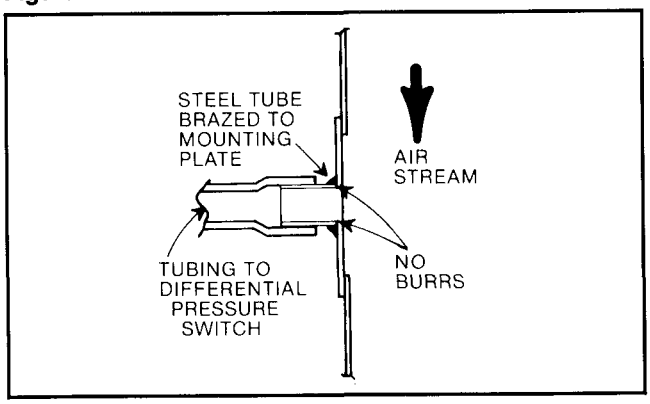
The pressure switch is factory installed on the optional discharge damper. The following instructions should be followed for locating and installing the pressure hoses. See Figure 21.

Figure 21.



The high pressure tube should be installed at a point away from turbulent areas such as elbows, etc. In addition, it is recommended that the tube be installed at a point ½ to ⅔ the total length of the supply duct. The tap in the duct must be free of burrs and constructed so that it is perpendicular to the duct airflow so that it senses static pressure only. (See Figure 22.) Should the duct be lined on the inside surface, you may use a static pressure tip such as the Dwyer A302 (furnished by the installer) in place of fabricating one. It is L-shaped and should be mounted to the duct wall with the point facing the airflow.

Figure 22.



The low pressure hose, which is mounted to sense controlled space pressure, should be located in the space to be controlled such as a corridor or a lobby of the building. This will give you a true pressure difference between the supply and return of the VAV system.

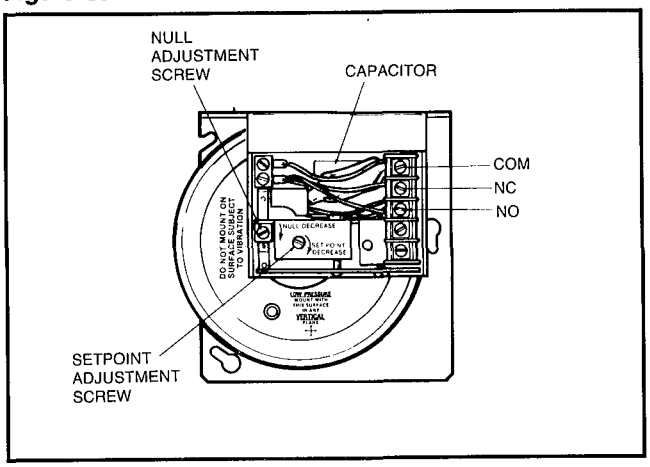
The hoses, both high and low, should be ¼″ I.D. and will be furnished by the installer. This size hose will connect directly to the pressure switch. If the A302 static pressure tip is used, a ¼″ to ⅛″ I.D. adapter will be required.

The factory sets the high pressure switch at 1.9″ W.C. The null or low pressure switch is set at about 0.2″ W.C. differential. If different settings are required, follow the instructions below:

The high actuation setpoint of the Barber-Colman PF-307 switch is indicated on a calibrated scale secured to the range screw enclosure. Resetting is accomplished by simply turning the adjustment screw with a screwdriver to the desired setting on the scale. See Figure 23.

The low actuation point is set by adjusting the span of the null by turning the span adjusting screw on the top of the switch element inside the conduit enclosure. If the null switch is adjusted so that no differential can be obtained, the warranty on the unit is void due to the excessive hunting and unit cycling that will occur.

Figure 23. Differential Pressure Switch



SEQUENCE OF OPERATION

The pressure switch has an adjustable setpoint (1.1″ to 3.5″ W.C.) and an adjustable "null band" (0.06″ to 0.17″ W.C. at minimum setpoint and 0.11″ to 0.31″ W.C. at maximum setpoint). When the sensed pressure rises above the setpoint of the pressure switch, the switch will energize the damper motor in a counterclockwise direction, moving the damper toward a more closed position until the pressure no longer exceeds the switch setpoint. When the sensed pressure falls below the setpoint by more than the "null band span" adjustment, the switch will energize the damper motor in a clockwise direction, thereby moving the damper toward a more open position until the pressure no longer is below the switch setpoint minus the null span adjustment. The sensed pressure can vary within the null zone and no damper motor energization will occur. The null span should be wide enough so there is not excessive hunting.

Example: Pressure switch setpoint: 1.50″ W.C.
Null span adjustment: 0.10″ W.C.

There will be no damper repositioning when the pressure is from 1.40″ to 1.50″ W.C. The damper will be closing when the pressure is over 1.50″ and the damper will be opening when the pressure is below 1.40″ W.C.

The pressure switch is overridden when the R terminal signal is placed on terminal 21 by a night setback thermostat or the morning warm-up relay RW:

1. Relay R9 is energized which removes common signal to differential pressure switch DPS and drives discharge damper motor DD to full open.
2. When damper motor reaches full open, an auxiliary switch in motor will close placing R signal on warm-up thermostat TW which will control heat in two stages.

NOTE: Discharge damper motor will be constantly positioning based on differential pressure switch except when R terminal signal is placed on terminal 21.

When the supply fan is shut down during unoccupied mode, duct pressure drops off and thus the discharge damper opens all the way.

RETURN AIR FAN

Optional return air fans are factory installed and consist of twin backward inclined centrifugal blowers driven by a single heavy-duty motor with adjustable belt drive. The assembly is located in the return air opening of the unit. When a return air fan is used on a VAV system, a field installed tracking damper must be used.

FIELD INSTALLED POWER EXHAUST*

1. Open the packing crate and check to see if all parts have been shipped.
2. Remove filter access door, pressure relief damper, rainhood and close-out partition from rooftop unit. See Figure 24.
3. Install new pressure relief dampers with kit into the front partition so dampers will close by gravity. Screws are provided. See Figure 25.
4. Install new front partition with pressure relief dampers on the rooftop unit, where original close-out panel and pressure relief damper were located. See Figure 26.
5. Locate and install triangular side pieces to front panel with screws provided. Make sure flanges, attached to the front partition, are turned OUT as indicated in Figure 27.

Figure 24.

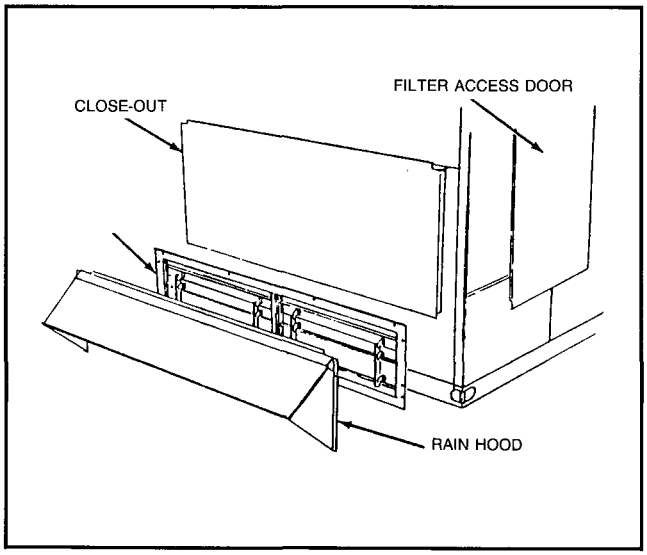


Figure 25.

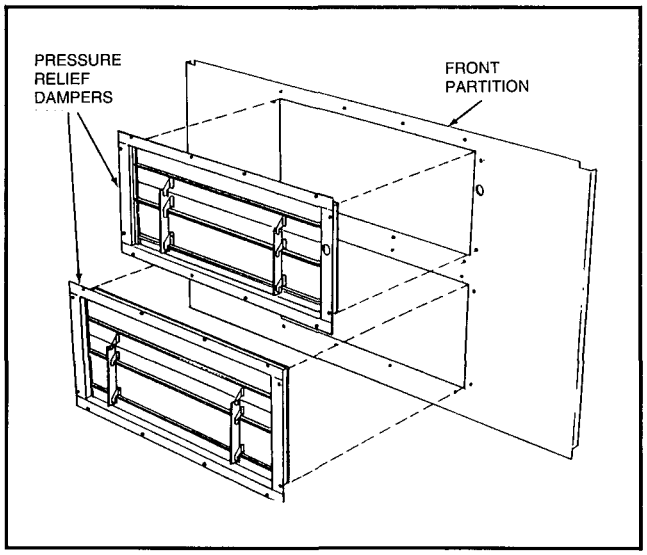


Figure 26.

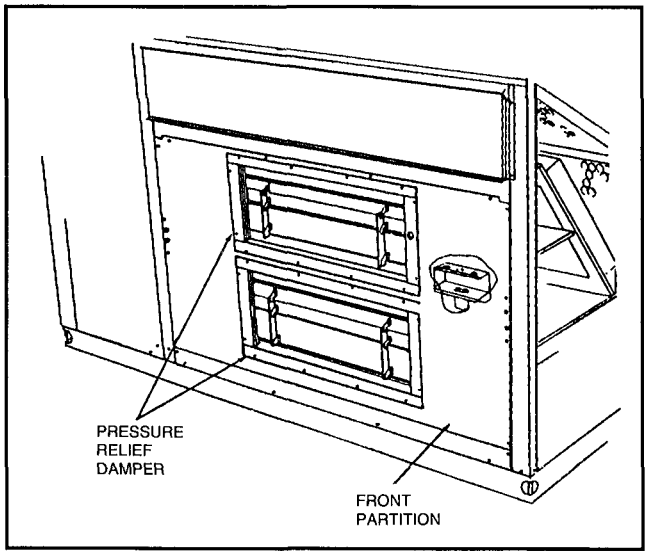
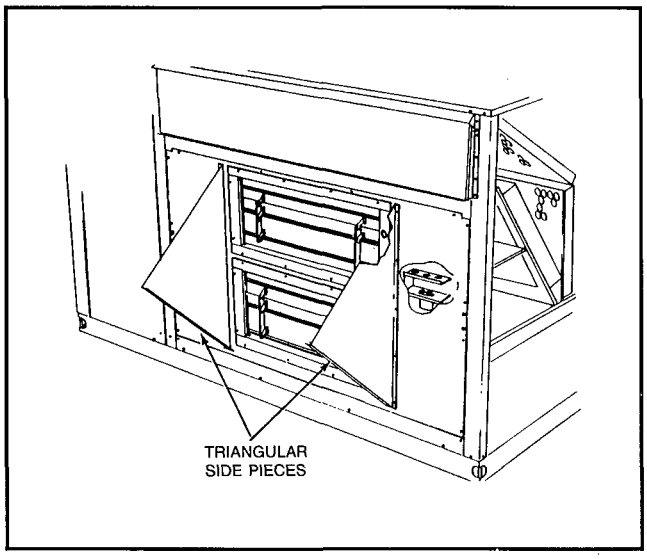


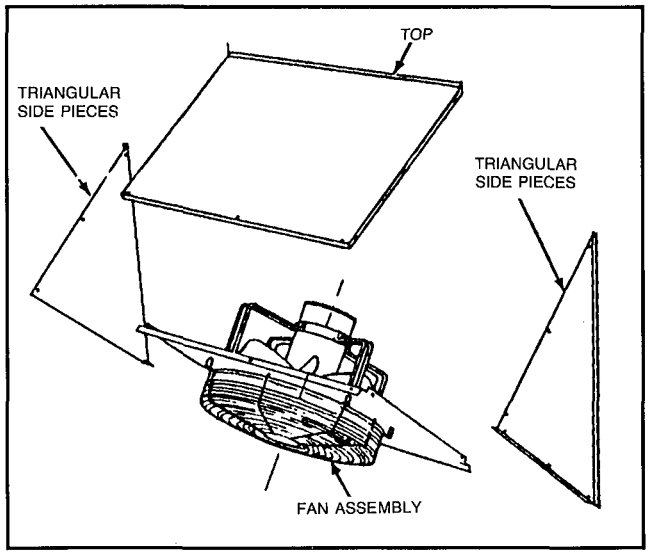
Figure 27.



*Item not submitted to ETL or CGA.

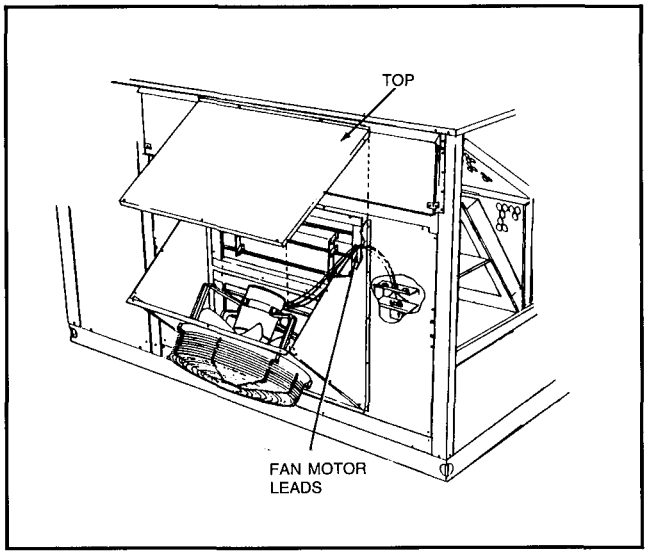
6. Install fan assembly to side pieces making sure that the fan assembly is laying on the flanges that are turned IN on both sides. Secure with screws provided. See Figure 28.
7. Run fan motor leads through hole in front partition to the connection box mounted to the inside of the front partition. See Figure 29.

Figure 28.



8. Install top cover panel on power exhaust assembly with screws provided. See Figure 29.
9. Mount 4 × 4 × 1½″ junction box on partition as shown in Figure 30 (460V units only).
10. Mount mercury bulb bracket to top linkage arm and snap mercury switch into bracket as shown in Figure 30.

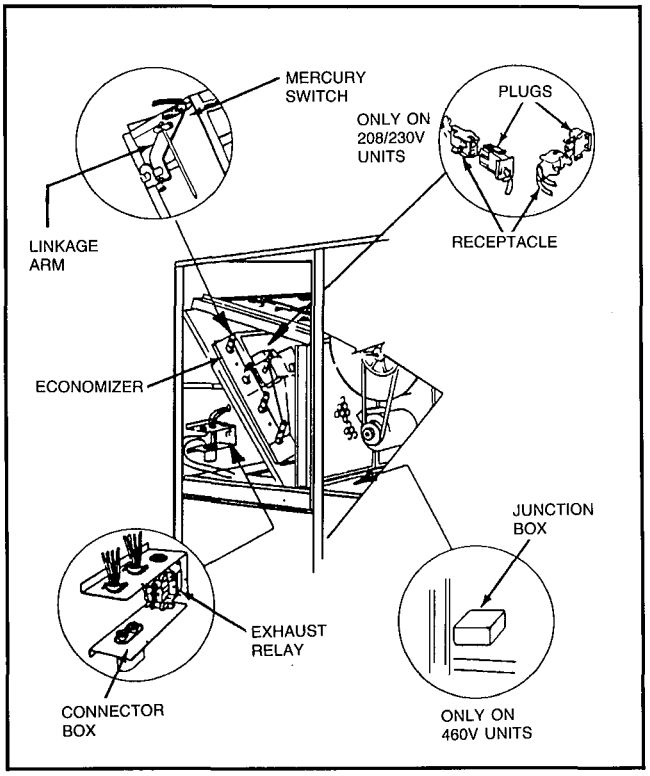
Figure 29.



WIRING FOR 460V UNITS (Wiring Diagram 1)

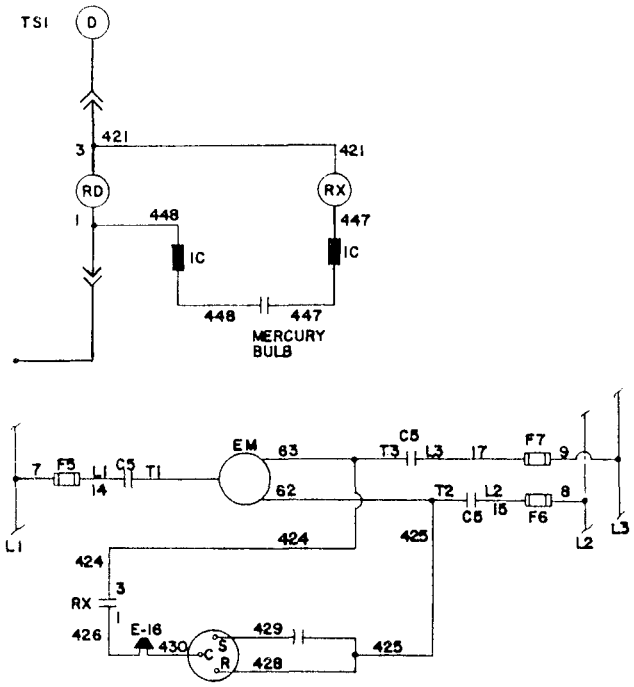
1. Cut lead wires going to evaporator blower motor 24 inches from motor connection point and re-route all six (6) wires to new 4 × 4 × 1½″ junction box mounted in the rooftop unit. Reconnect wires as they were before being cut.
2. Wire 424 from RX relay terminal 3 and wire 425 from exhaust fan capacitor in connection box on front partition, are connected to any 2 of the 3 connections in the junction box.
3. Connect wires 447 and 448 from mercury switch to wires 447 and 448 in kit with in-line connectors. Wire 447 will already be connected to RX relay coil.
4. Wire 448 will connect to terminal 1 on RD relay furnished with rooftop unit.
5. Wire 421, connected to the other RX relay, will jump to terminal 3 on RD relay.
6. Wire 426, terminated at terminal 1 of the RX relay, should be run to the junction box on the front partition and connected by wire nuts to wire 430 from the exhauster fan motor. Wire nuts provided.
7. Connect wire 428 to exhauster fan capacitor on terminal with wire 425.
8. Connect wire 429 to the other terminal of the exhauster fan capacitor. Wire 425 will be alone on this terminal. Check wiring diagram for more detailed instruction.

Figure 30.

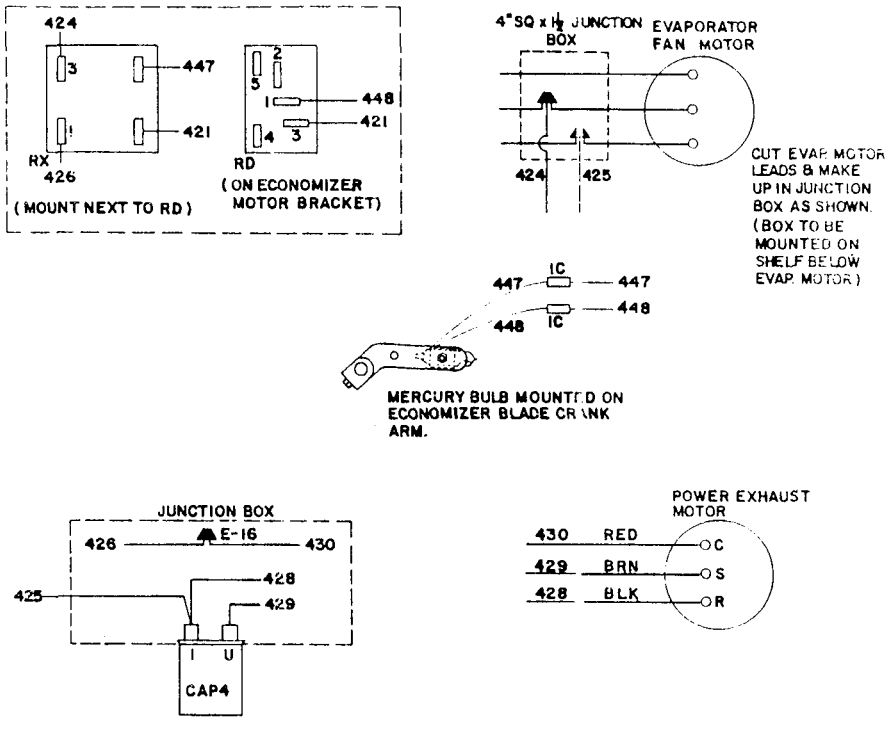


Wiring Diagram 1. Power Exhaust (460V)

SCHEMATIC



PRACTICAL



NOTE:

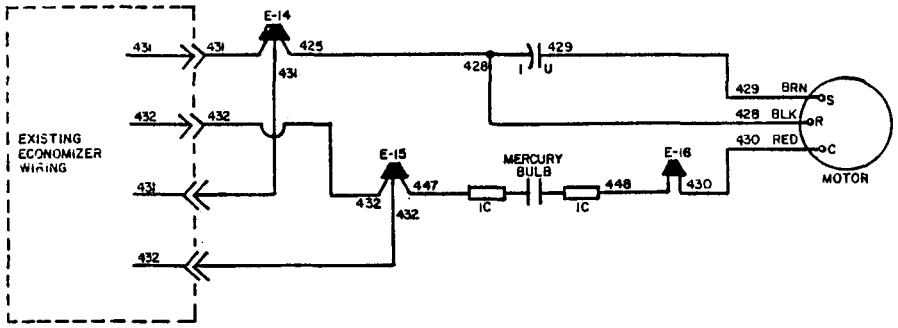
1. Splice wires 425 and 424 into existing wires 62 and 63 as shown.
2. Mount Relay RX on Economizer Relay Bracket next to RD; wire as shown.
3. Mount mercury bulb clip on crankarm. Check bulb and leads for clearance. Set bulb to make as outside air damper opens to approximately 20%.
4. Use wire ties furnished to secure wiring in a safe manner.

WIRING FOR 208/230V UNITS (Wiring Diagram 2)

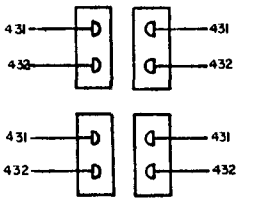
1. Remove cover from connection box. Locate the plug and receptacle on economizer assembly with wire 431 and 432 marked (531 and 532 on VAV units).
2. Disconnect that plug and receptacle, connect the kit plug to existing receptacle and then connect the existing plug to the kit receptacle.
3. Route wires 431 and 432 from the new harness down and across the economizer partition into the connection box mounted on front partition.
4. Connect wires 447 and 448 to leads from mercury switch with in-line connector provided and run to connection box.
5. Inside the connection box, connect wire 432 (both wires) and 447 together with wire nut. Wire nuts provided.
6. Also, connect wire 431 (both wires) with wire 425 using wire nut. Connect wire 448 to motor lead marked 430 using wire nut.
7. Connect motor wire 428 to terminal of capacitor with wire 425 and motor wire 429 to opposite side of capacitor. See wiring diagram for details.

Wiring Diagram 2. Wiring for Power Exhaust Junction Box Assembly (230V)

SCHEMATIC

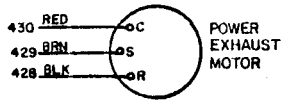


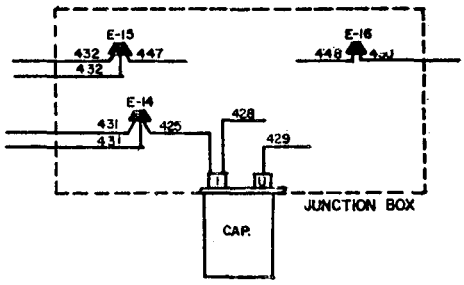
PRACTICAL



* POWER EXHAUST WIRING PLUGS INTO EXISTING 2 PIN PLUGS AT ECONOMIZER MOTOR

* MERCURY BULB MOUNTING





* 1. REPLACE EXISTING FUSES (F3 & F4) WITH FRN-8 FUSES (FURNISHED).
* 2. INSTALL MERCURY BULB ON ECONOMIZER CRANK ARM AND PLUG INTO INLINE CONNECTORS. ADJUST FOR DESIRED MOTOR OPERATION.

* –FIELD WIRING OPERATION

TRACKING DAMPER — VAV ONLY

The tracking damper is designed to maintain a constant pressure in the controlled space. This is an optional accessory and not a mandatory item, provided the building designers can provide some other form of space control. It must be installed in the field.

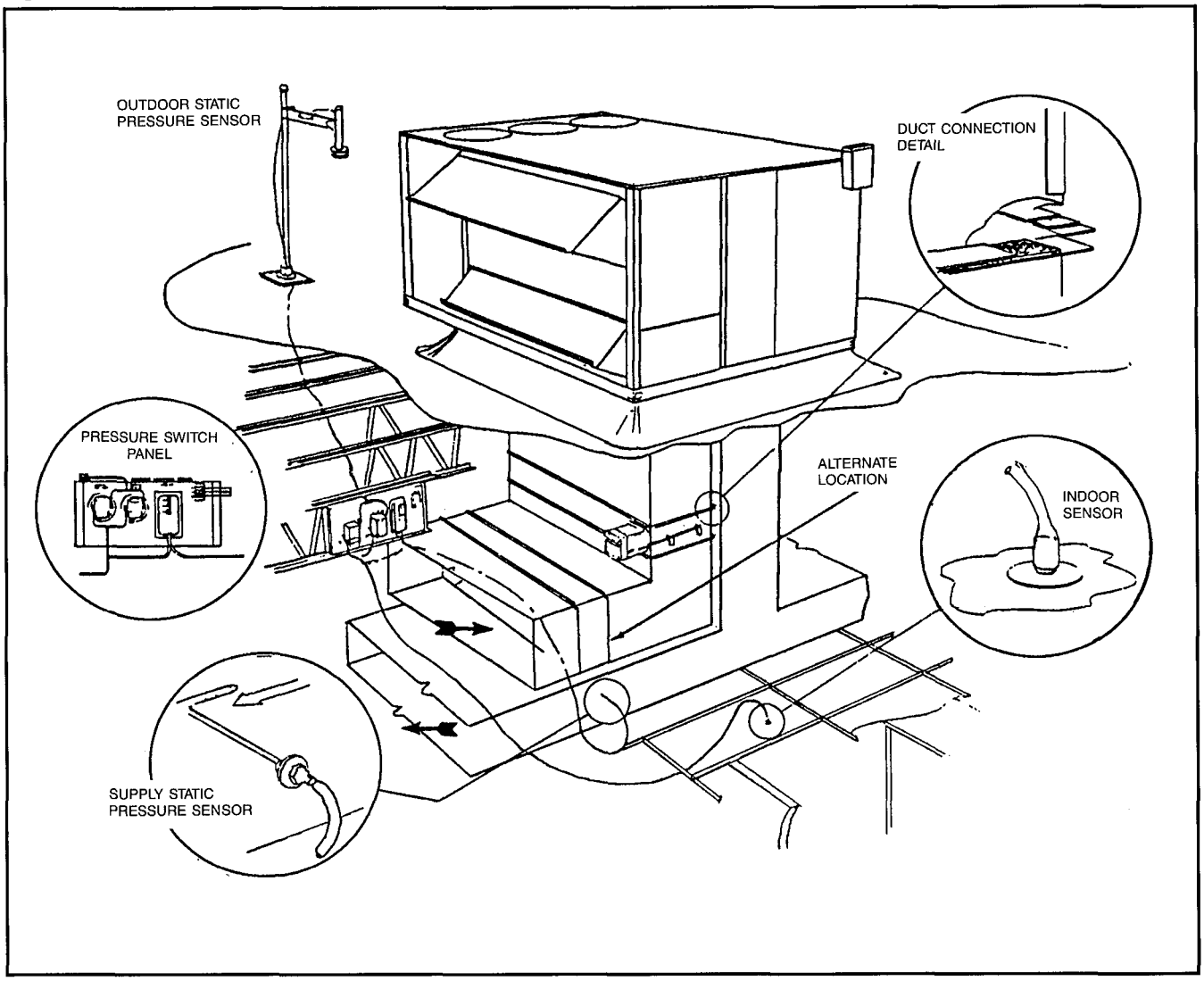
The field installed tracking damper is to be located in the return air duct and is independent, both electrically and pressure-wise, from the rooftop unit. The pressure switch panel must be accessible and mounted in a vertical position and be relatively free of vibration. The following instructions will show in detail how to install the return duct mounted tracking damper.

TRACKING DAMPER INSTALLATION

The tracking damper comes completely assembled with motor and linkage mounted and set by the factory. The damper is designed to be installed in the return duct in a horizontal or vertical position. All dampers have a ¾-inch flange turned out on the sides to make your duct connections. It is recommended that a gasket be put between the damper and the duct at the connection flange to reduce leakage.

IMPORTANT: Position the damper in the ductwork so that the damper motor will not interfere with the roof curb or roof support structure so as to hinder the operation. See Figure 31 for details of installation.

Figure 31.



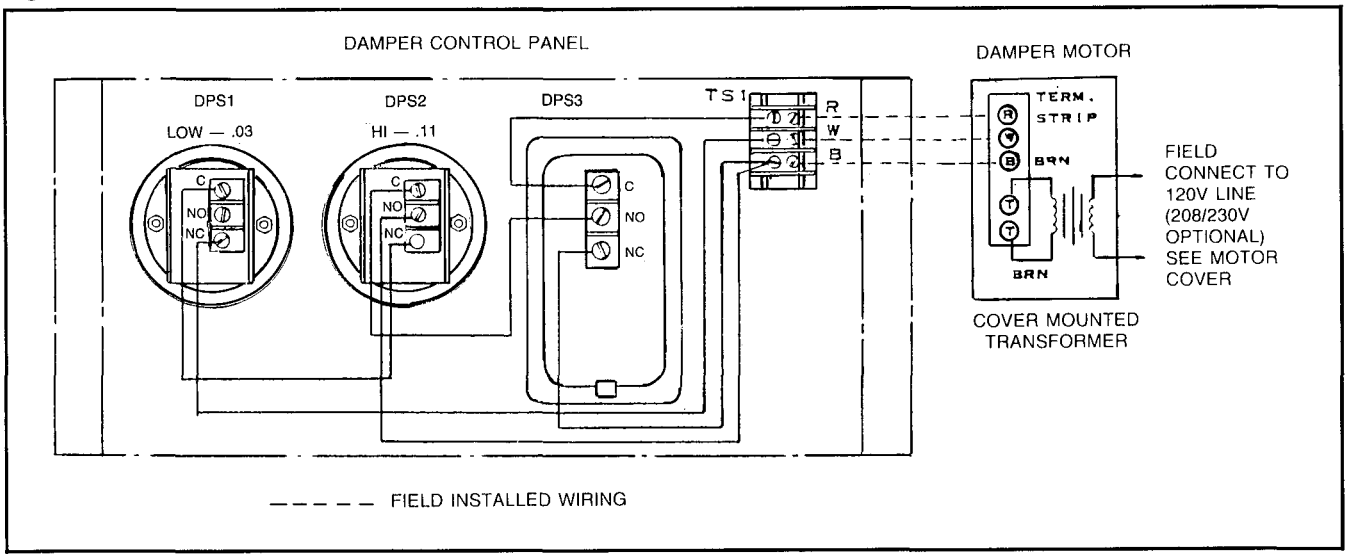
TRACKING DAMPER PRESSURE & ELECTRICAL CONNECTIONS

Electrical Connections

The damper motor is equipped to operate at 120 volts or 240 volts and should be wired as a Class I circuit to the power supply. The motor comes wired for 120 volt connection to a nearby lighting circuit. If desired, a 240 volt power supply may be obtained from the rooftop unit. This will require the motor taps to be changed to operate at 240 volts.

The wiring between the pressure switch panel and the damper motor is 24 VAC and should be wired as a Class II circuit using 16 ga. wire. Terminals on the switch panel and the damper motor are labeled similarly to facilitate wiring. See Figure 32.

Figure 32. Electrical Connection

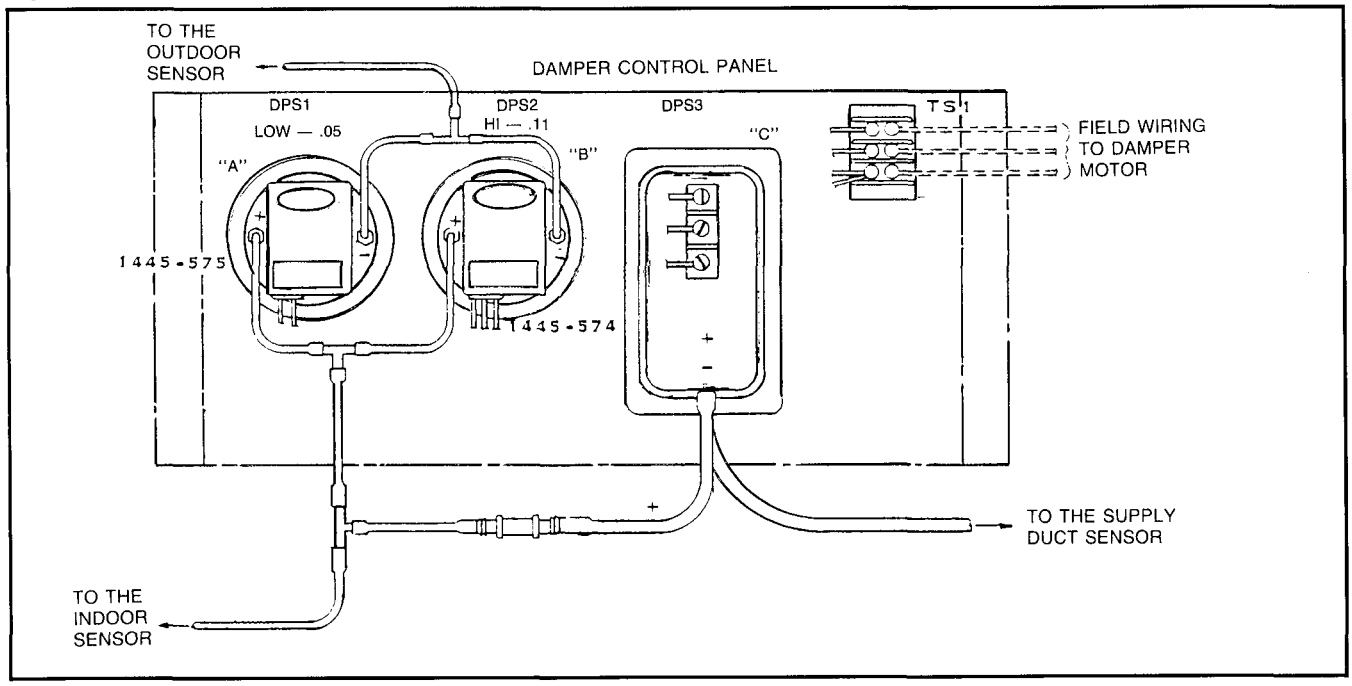


Pressure Switches A, B, and C

All 1/8" I.D. × 3/16" O.D. flexible tubing (except the 50 ft. furnished with the outdoor sensor) is to be supplied by the installer.

The indoor sensor (field supplied or plain end of 1/8" I.D. flex tubing) must be located in the center of the conditioned space such as a corridor or lobby where the pressure sensed will be a good average for that in the space. This tubing is then run to the pressure switch assembly where it is connected to the tee (furnished with kit) which leads to the high pressure taps of switches A and B and to the low pressure tap of switch C. See Figure 33.

Figure 33. Pressure Connection



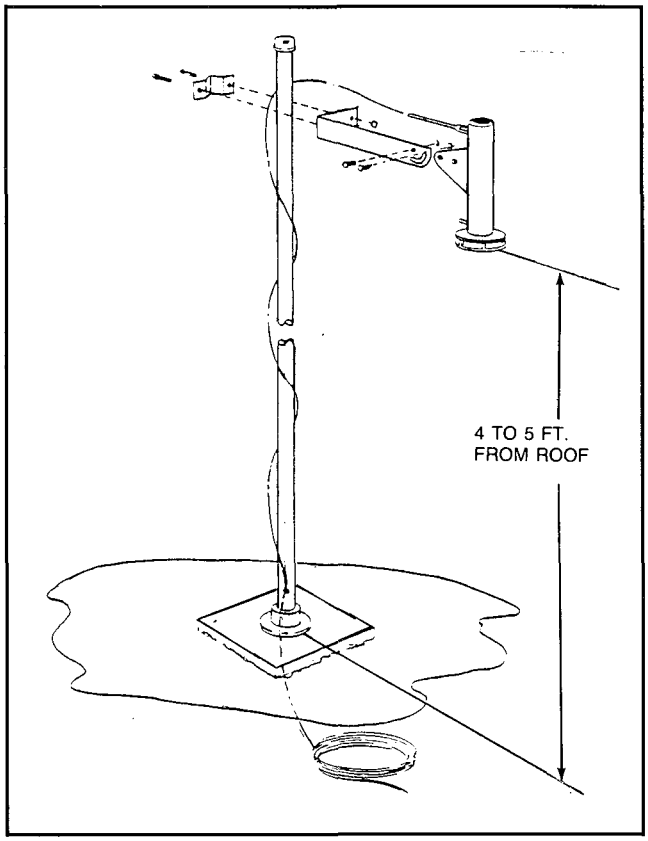
The Dwyer A306 outdoor static pressure sensor and mounting bracket should be mounted on a vertical pole (furnished by installer) so that it is 4 to 5 feet above the center of the roof. See Figure 34.

This elevation is required to keep the sensor above any accumulations of snow. Fifty (50) feet of 1/8″ I.D. flexible tubing is furnished with the sensor and is to be run to the tee on the pressure switch assembly which leads to the low pressure taps of switches A and B.

Finally, 1/8″ I.D. flex tubing must be run from the high pressure tap of switch C to the supply duct static pressure tap (Dwyer 302). This tap must be located away from the discharge damper so that it represents the actual supply duct static pressure. Refer to Figure 31.

It is good practice to put a small amount of cotton in the open end of the outdoor static pressure and indoor static pressure sensor to keep spiders out. Since these openings are sensing very low pressures, be certain that the cotton is not tamped down to the extent that it will generate false pressures.

Figure 34. Outdoor Static Pressure Sensor



SEQUENCE OF OPERATION — FIELD INSTALLED TRACKING DAMPER

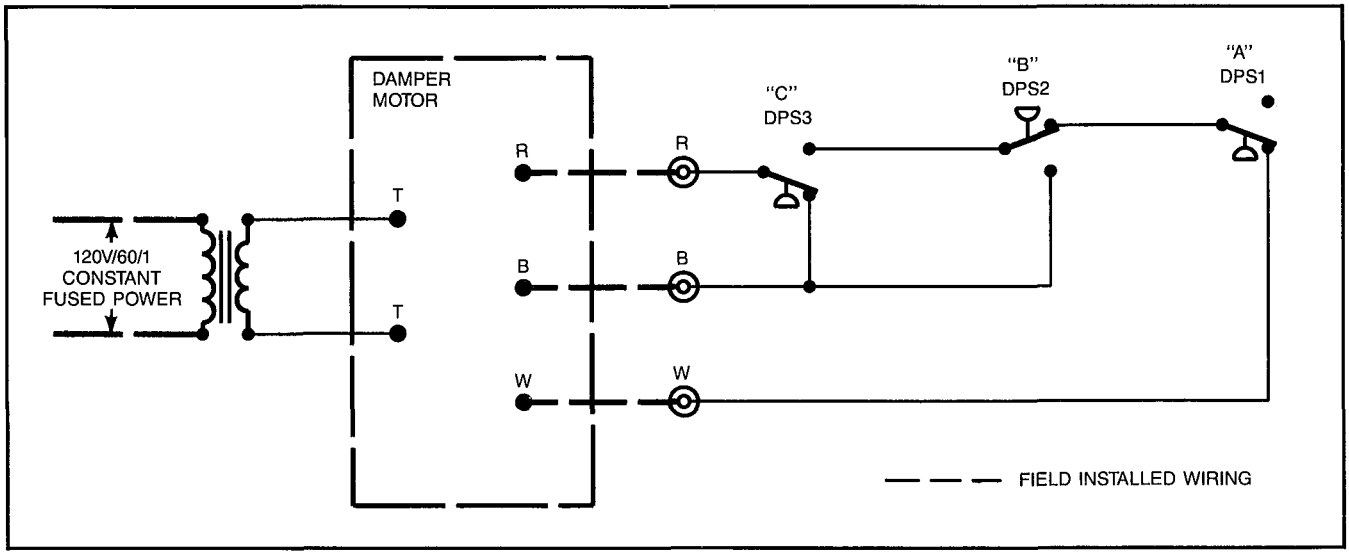
The rectangular Cleveland switch C senses the difference in pressure between the building and the supply duct. When the blower motor of the rooftop unit is not operating, the pressure sensed by pressure switch C will be 0″ W.C., and the damper motor will drive the tracking damper to the open position through the normally closed switch.

When the blower starts and the pressure in the supply duct reaches 0.05″ W.C., the pressure switch C will close its normally open contacts. Closing of the normally open contacts will allow pressure switches A and B to function. Upon start-up, these two normally closed switches act to close the tracking damper, allowing the building to pressurize.

The low pressure switch A will open its normally closed contacts on a rise in pressure above 0.07″ W.C, breaking the damper closing circuit; the dampers will then hold their position. The high pressure switch B will close its normally open contacts on a rise in pressure at 0.11″ W.C., making the damper opening circuit. As the damper opens, the space pressure is reduced. When the space pressure falls below 0.07″ W.C., the high pressure switch B breaks the damper opening circuit and, again, the dampers will hold their position. As the space pressure drops below 0.03″ W.C., the low pressure switch A again makes the damper closing circuit, the tracking damper will begin to close, and the space pressure will increase. The center null band will eliminate any unnecessary hunting.

If the pressure in the supply duct falls below 0.01″W.C. (fan shutdown), pressure switch C overrides switches A and B, and opens the dampers.

Wiring Diagram 3. Field Installed Tracking Damper



ELECTRICAL INSTALLATION

GENERAL INSTRUCTIONS

1. Electrical connections to the packaged rooftop unit consist of a main power supply, low voltage wiring to accessory thermostats, central control panels, and timeclocks. In addition, line voltage to the optional discharge air and tracking dampers must be supplied.
2. All field wiring to the unit must be done in accordance with these instructions, the latest edition and addenda of the National Electrical Code (ANSI/NFPA 70) for U.S.A. and the Canadian Electrical Code for Canada, and all local codes and ordinances.
3. It is recommended that an independent 115V power source be brought to the vicinity of the rooftop unit for portable lights and tools used by the service mechanic.

WARNING: DO NOT TAMPER WITH FACTORY WIRING. Contact your local representative or the factory if assistance is required. The internal power and control wiring of these units is factory installed and each unit is thoroughly tested prior to shipment.

MAIN POWER WIRING

1. The main power supply for the rooftop units will be three phase, three wire. The unit is factory wired for the voltage shown on the dataplate. **NOTE:** If supply voltage is 208V, wire 28 must be moved from the 230V to the 208V tap on primary of transformer TR1.
2. Main power wiring should be sized for the minimum wire ampacity shown on the dataplate.
3. An external weathertight disconnect switch, properly sized for the unit total load, is required for each unit. Field installed disconnects may be mounted in the location shown in Figure 35.

   NOTE: Do not cover dataplate with disconnect switch.
4. Power wiring may enter the rooftop unit through the side (all units) or through the unit base and roof curbs (units without gas heat). Install conduit connectors at the required entrance location. External connectors must be weatherproof.
5. All units must be properly grounded. The ground lug is provided for this purpose. DO NOT use the ground lug for connecting a neutral conductor. The unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition and addenda of the National Electrical Code (ANSI/NFPA 70) for U.S.A. and the Canadian Electrical Code for Canada.
6. Power wiring should be connected to the main power terminal block located within the unit main control box. Power wiring connections on units with factory disconnects should be made at the line side of the disconnect switch.
7. Voltage to the rooftop unit must be within the voltage range indicated on the unit rating plate. Phases must be balanced within 2%. Contact local power company for correction of improper voltage or phase unbalance.

   WARNING: *Failure of unit due to operation on improper line voltage or with excessive phase unbalance constitutes product abuse and may be the cause of severe damage to unit electrical components.*

Figure 35. External Wiring Routing & Entrance Location
COOLING ONLY
COOLING WITH ELECTRIC HEAT
COOLING WITH GAS HEAT (SHOWN)

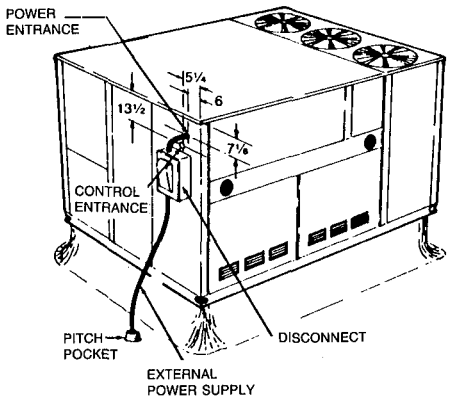


Figure 36. Through-the-curb Wire Routing
COOLING ONLY
COOLING WITH ELECTRIC HEAT

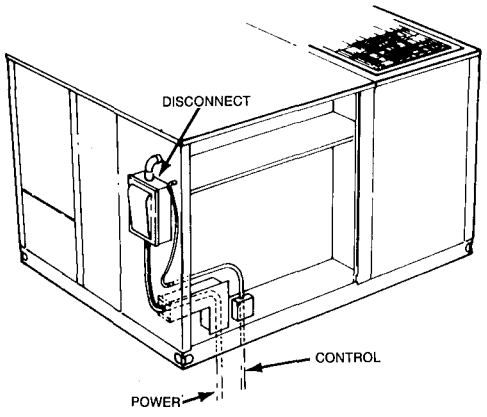
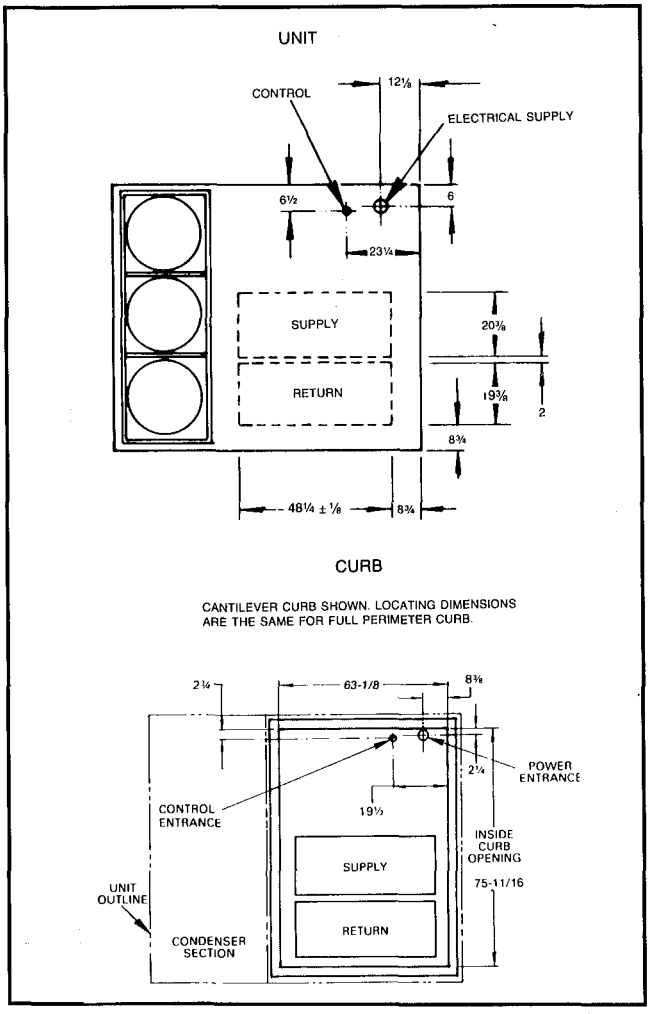


Figure 37. Plan View of Electrical Entrance Locations



LOW VOLTAGE CONTROL WIRING — CONSTANT VOLUME UNITS

Space Thermostat

1. A 24V accessory thermostat is required to be field installed. Thermostats may be furnished locally or purchased with the rooftop unit. Thermostats must be Honeywell Model T874 or equal, with subbase switches for "system" and "fan" as required and having the required number of heating and cooling stages, as shown in Table 4.

Table 4.

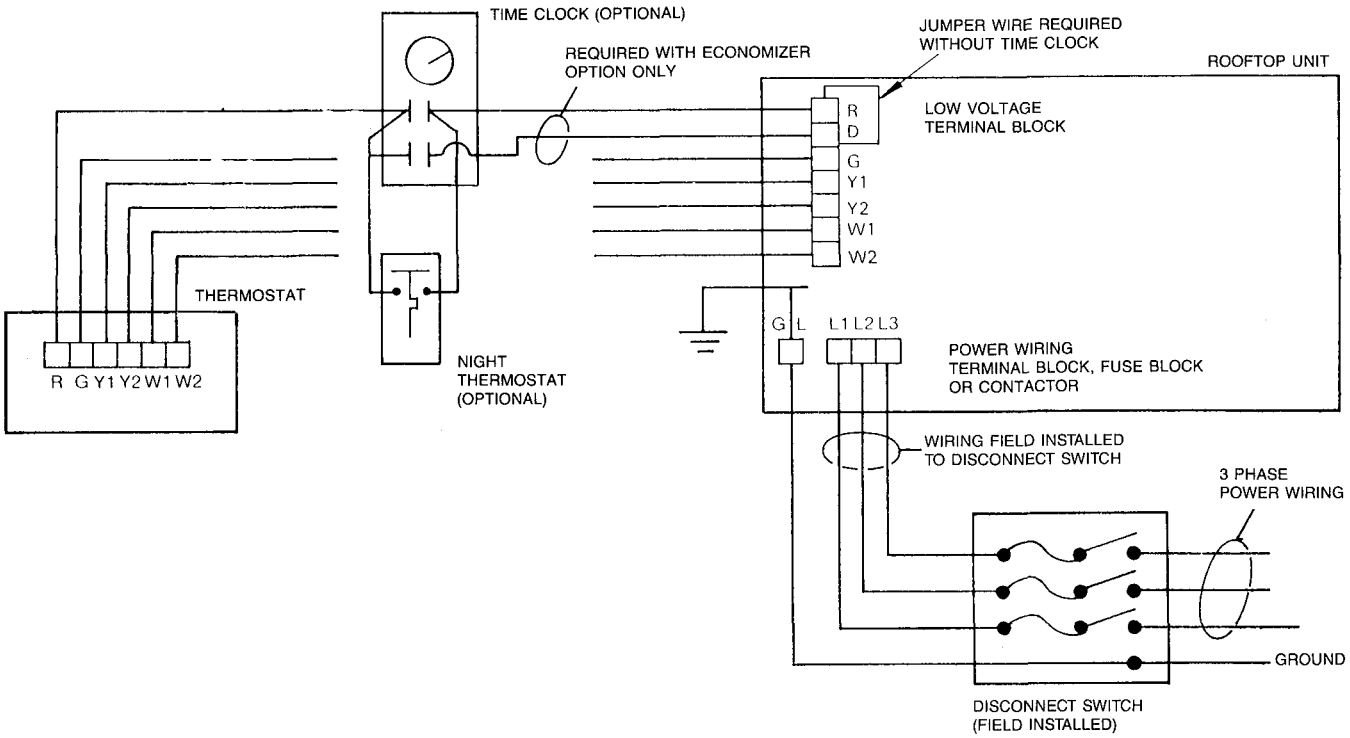
Config.	Cooling Only	Cooling With Heat		
		Nat. Gas	Propane	Electric
No. of Stages	2	2 Cool/2 Heat	2 Cool/1 Heat	2 Cool/2 Heat

2. Thermostats purchased with the rooftop unit are designed for horizontal mounting only on interior walls. Locate thermostat assembly in the conditioned space where it will sense average temperature. Do not locate the device where it would be directly exposed to supply air, sun or external sources of heat that could adversely affect its operation and the rooftop unit performance. Follow mounting instructions packaged with the thermostat.
3. Use #16 AWG wire for 24V control wiring runs not exceeding 100 ft. Use #14 AWG wire for 24V control wiring runs of 101 to 200 ft. Low voltage wiring may be NEC Class 2 when permitted by local codes.
4. Route thermostat wires from subbase terminals to the rooftop unit. Control wiring should enter the unit base pan or side panel and be routed to the low voltage terminal connectors as shown. Certain models are furnished with a junction box and conduit for use in routing control wiring to low voltage terminals.

Night Setback Thermostat & Timeclock (Optional)

1. Rooftop units can be programmed for automatic start/stop operation by means of a field installed timeclock furnished either locally or purchased with the rooftop unit. A night setback thermosat may also be incorporated for reduced temperature unit control during standby periods.
2. Timeclock and night setback field wiring may be routed to the rooftop unit with the space thermostat wiring.
3. Timeclocks require a separate continuous power supply (1 phase) for operation of the timer motor. Timeclocks purchased from the rooftop manufacturer require a 120V/60Hz power supply. Power wiring for the timeclock shall conform with the temperature limitation for Type "T" wire (63°F/35°C rise).
4. Thermostats to be used for night setback may be purchased with the rooftop unit. If provided locally, they must be Honeywell Model T451 or equal. Follow mounting instructions packaged with the thermostat.
5. Rooftop units may be optionally equipped with economizer controls that provide outside air for cooling by means of a motorized damper. **When economizer controls are used in conjunction with a timeclock, a normally open set of timeclock contacts must be wired between unit terminals R and D as shown. When a timeclock (or other control) is not used, a jumper wire must be field installed between terminals R and D.**

Wiring Diagram 4.



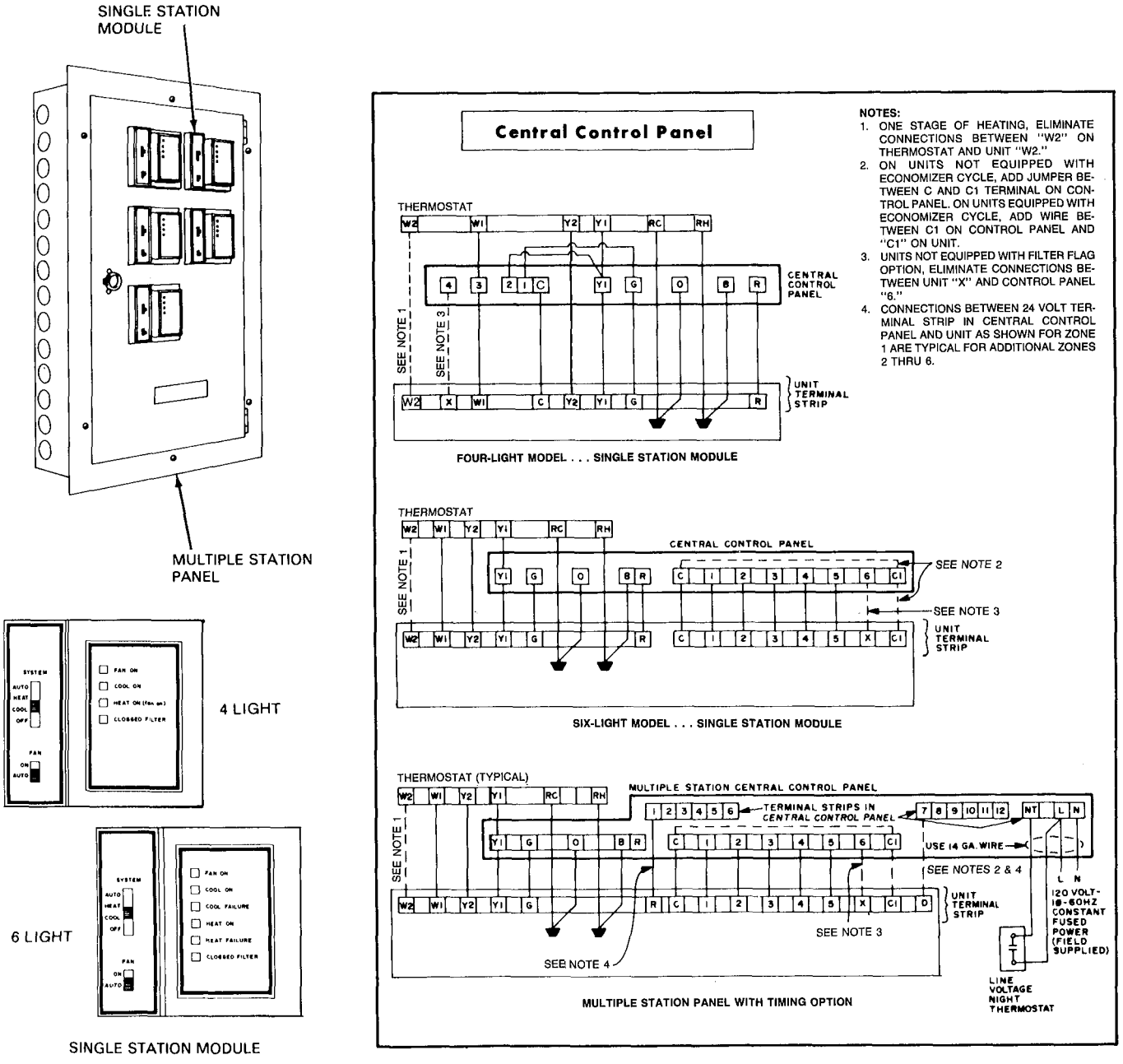
Constant Volume Central Control Panels (Optional)

1. Central control panels may be purchased for use with the rooftop unit and require field installation and wiring. Follow mounting instructions furnished with the central control panel.
2. Wiring between rooftop unit, thermostat and central control panel may be 24V NEC Class 2 when permitted by local codes. Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet.
3. The number of control panel wires per unit will vary with the type of control panel selected. Table 5 is provided as a guide and gives the maximum number of wires. It is recommended that wire bundles be made based on this quantity and unused wires be taped or cut.

Table 5. Central Control Panel Wires

Control Panel Type	4-Light Function Type	5-Light W/Timing Option	6-Light Function/ Malfunction Type	6-Light W/Timing Option
Wires Per Station	8	9	13	14

Figure 38. Field Wiring of Central Control Panels



LOW VOLTAGE CONTROL WIRING — VAV UNITS

No space thermostat is required to control the VAV unit since individual zones are controlled by their own thermostats. Control of these units is accomplished by the use of a discharge air sensor which is built into the unit at the factory.

Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet. Low voltage wiring may be NEC Class 2 where permitted by local codes. Control wiring should enter the unit base pan or side panel and be routed to the low voltage terminal connectors as shown. Certain models are furnished with a junction box and conduit for use in routing control wiring to low voltage terminals.

Night Setback Thermostat & Timeclock (Optional)

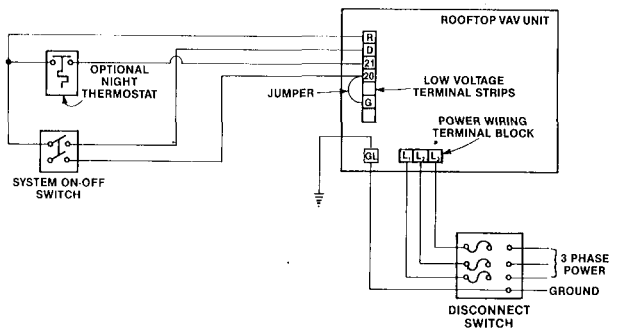
1. Rooftop units can be programmed for automatic start/stop operation by means of a field installed timeclock furnished either locally or purchased with the rooftop unit. A (heating only) may also be incorporated for reduced space temperature control during standby periods.
2. Timeclocks require a separate continuous power supply (1 phase) for operation of the timer motor. Timeclocks purchased from the rooftop manufacturer require a 120V/60Hz power supply. Power wiring for the timeclock shall conform with the temperature limitation for Type "T" wire (63°F/35°C rise).
3. Thermostats to be used for night setback may be purchased with the rooftop unit. If provided locally, they must be Honeywell Model T451 or equal. Follow mounting instructions packaged with the thermostat.
4. When a night setback thermostat is used, some means of opening VAV boxes on a heating call must be provided.

VAV Central Control Panel (Optional)

1. VAV central control panels are equipped with a timeclock and morning warmup control circuitry. They may be purchased for use with the rooftop unit and require field installation and wiring. Follow the mounting instructions furnished with the central control panel. Refer to Wiring Diagrams 7 and 14.
2. Wiring between the rooftop unit and the central control panel may be 24V NEC Class 2 where permitted by local codes. Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet.
3. For VAV operation, the fan switch on the status panel should be kept in the "ON" position at all times.
4. **For status lights on panel to function, the VAV unit must be ordered with the failure relay package option.**
5. When a night setback thermostat is used, some means of opening VAV boxes on a heating call must be provided. One method is shown in Wiring Diagram 14.

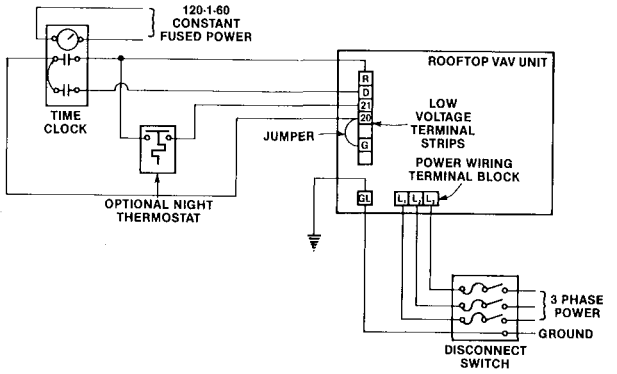
Wiring Diagram 5. Manual On-Off Control

Manual On-Off control of the VAV unit can be accomplished by the use of a double pole-single throw (DPST) switch.

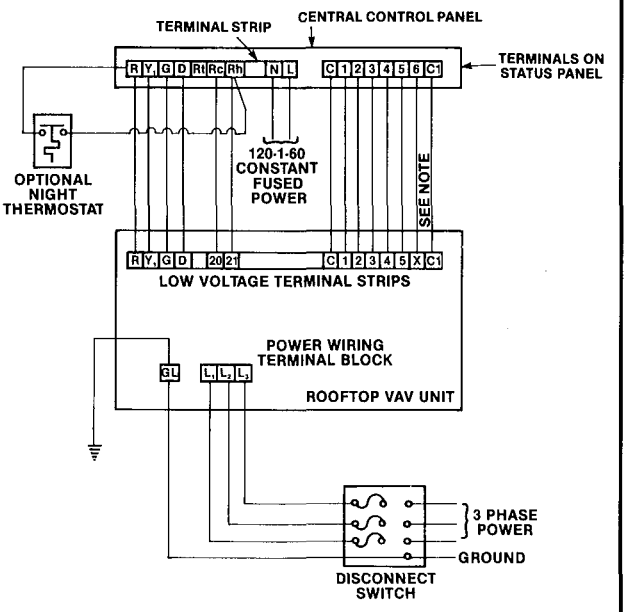


Wiring Diagram 6. Timeclock & Night Setback Control

Automatic On-Off control can be programmed by means of a field installed timeclock furnished either locally or purchased wiht the VAV unit. The addition of an optional night thermostat will offer night setback control during the heating season.



Wiring Diagram 7. Central Control Panel (Optional)



NOTE: Units not equipped with filter flag option, eliminate connections between unit "X" and control panel "6."

Field Installed Discharge Damper

If morning warmup or night setback is desired on VAV rooftop units with heating capability, connections must be made between the discharge damper assembly and the unit. Follow the procedure below and refer to Wiring Diagram 8.

1. Remove wire from discharge damper motor (DD) terminal R1 to differential pressure switch (DPS) terminal C and discard (wire 143).
2. Run a new wire from DD terminal R1 to relay R9 common terminal 4 (wire 149).
3. Run a new wire from DD terminal B1 to relay R9 normally open terminal 6 (wire 151).
4. Run a new wire from DPS terminal C to relay R9 normally closed terminal 5 (wire 150).
5. Run a new wire from red lead on auxiliary switch (inside DD cover) to terminal 21 on TS4 terminal block in the unit control panel (wire 148).
6. Run a new wire from yellow lead on auxiliary switch to terminal 22 on TS4 terminal block (wire 147).
7. Run leads to transformer.

NOTE: On VAV units with gas heat, wires 149, 151 and 150 will run to unit terminals 23, 24 and 25, respectively, instead of relay R9 terminals.

Wiring Diagram 8. Field Installed Discharge Damper Override Circuit

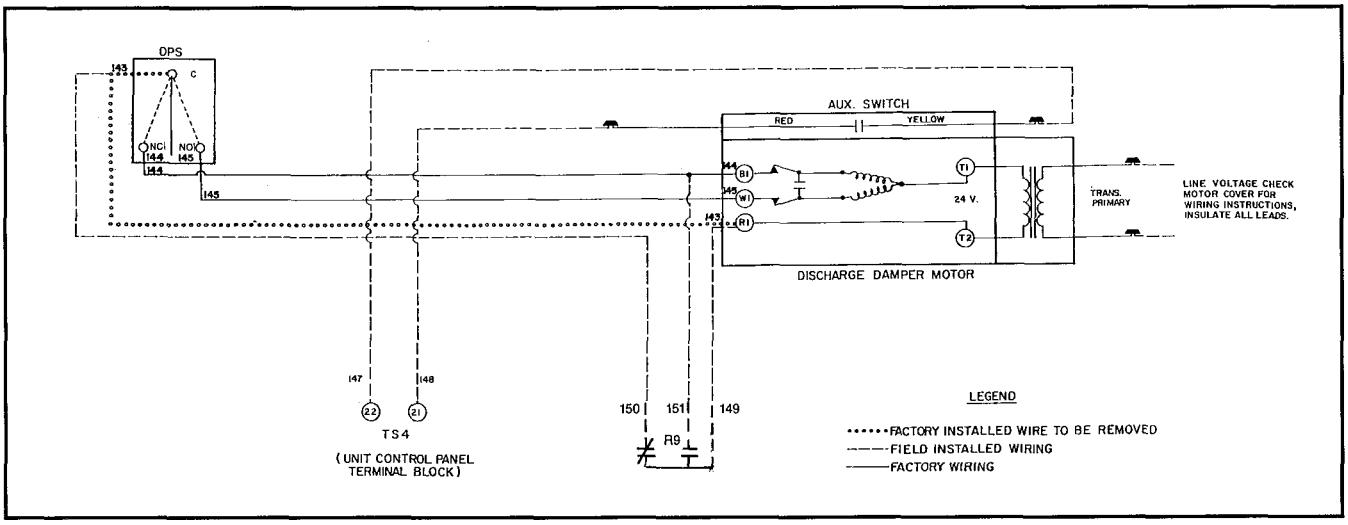
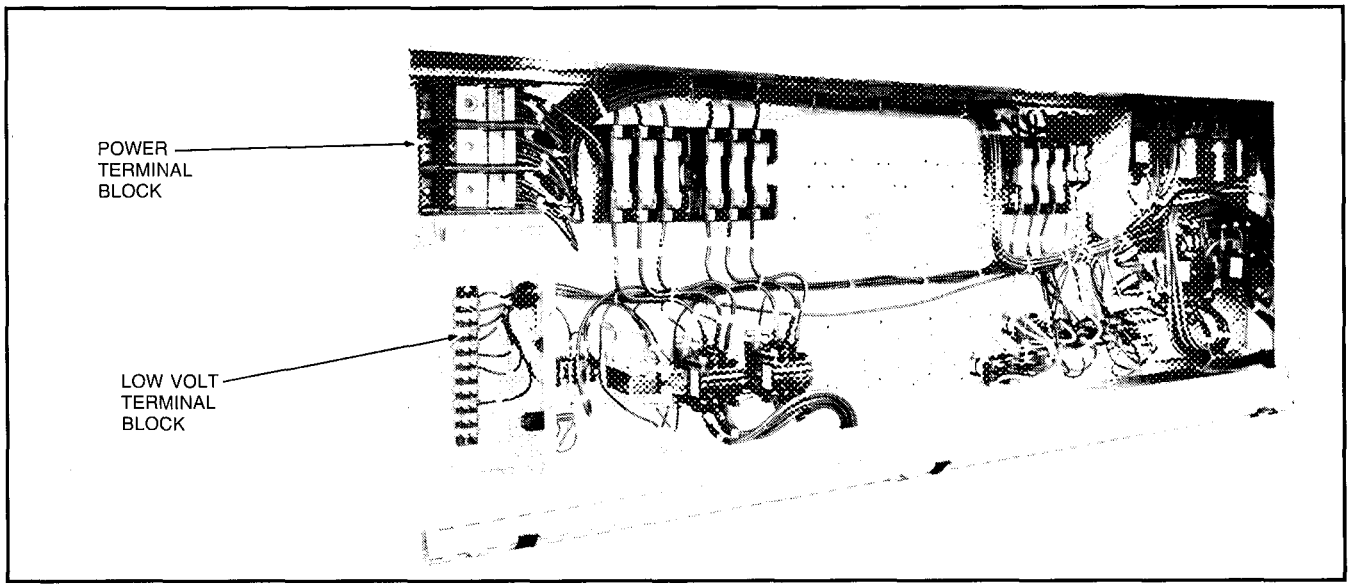


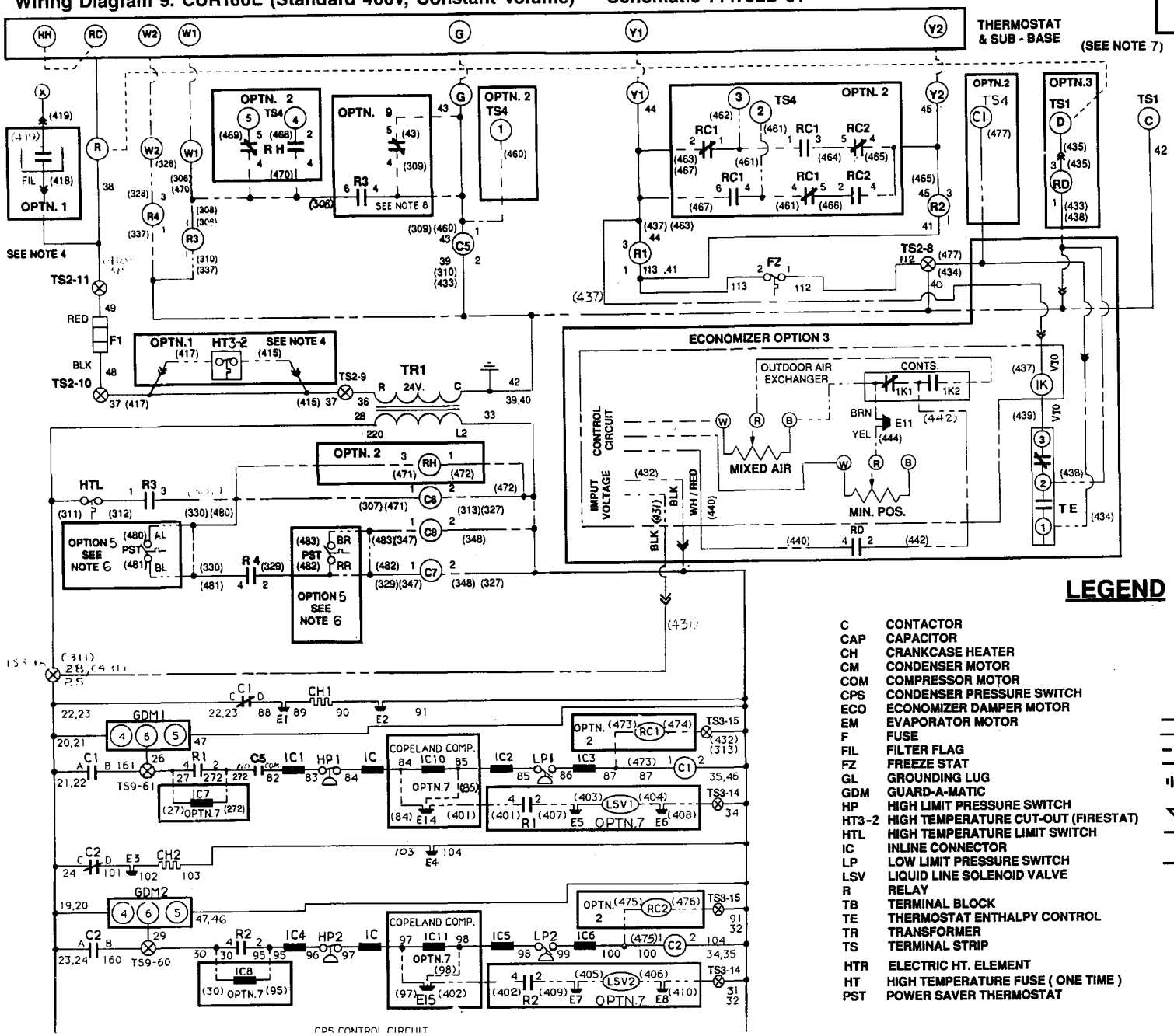
Figure 39. Typical Unit Control Panel

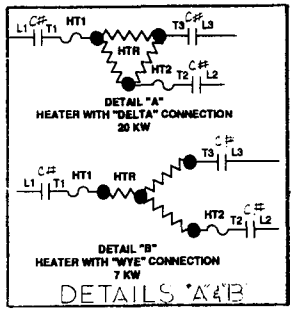


TYPICAL UNIT WIRING DIAGRAMS

Refer to the wiring diagrams on your unit for exact details.

Wiring Diagram 9. CUR160E (Standard 460V, Constant Volume) — Schematic 714702D-01

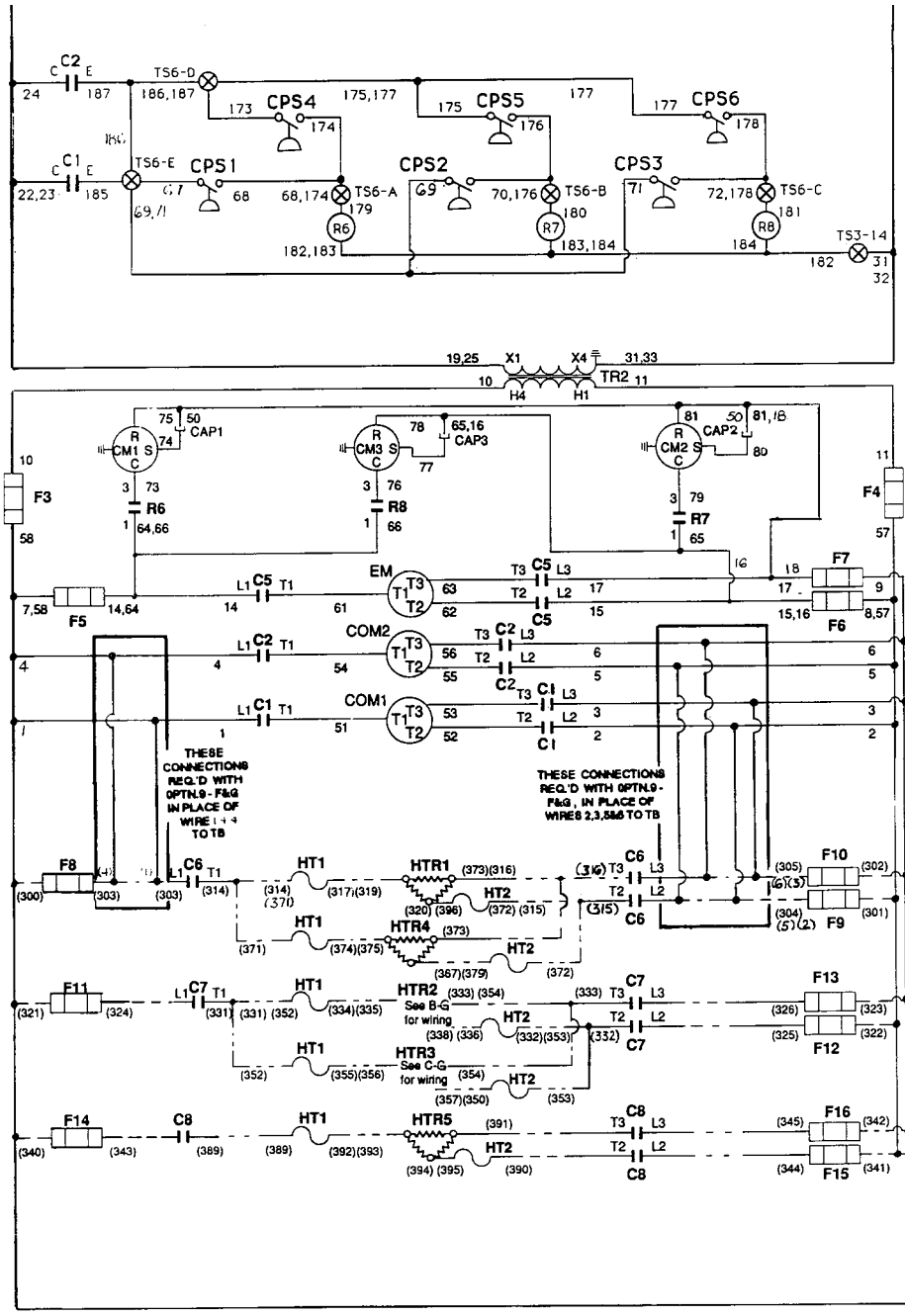




LEGEND

C	CONTACTOR
CAP	CAPACITOR
CH	CRANKCASE HEATER
CM	CONDENSER MOTOR
COM	COMPRESSOR MOTOR
CPS	CONDENSER PRESSURE SWITCH
ECO	ECONOMIZER DAMPER MOTOR
EM	EVAPORATOR MOTOR
F	FUSE
FIL	FILTER FLAG
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
HP	HIGH LIMIT PRESSURE SWITCH
HT3-2	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
LP	LOW LIMIT PRESSURE SWITCH
LSV	LIQUID LINE SOLENOID VALVE
R	RELAY
TB	TERMINAL BLOCK
TE	THERMOSTAT ENTHALPY CONTROL
TR	TRANSFORMER
TS	TERMINAL STRIP
HTR	ELECTRIC HT. ELEMENT
HT	HIGH TEMPERATURE FUSE (ONE TIME)
PST	POWER SAVER THERMOSTAT

POWER WIRE
CONTROL WIRE
FIELD INSTALLED WIRE
OPTIONAL EQUIPMENT WIRE
GROUND BY WIRE
WIRE JOINT
WIRE NUT
PLUG CONNECTOR
( ) OPTION WIRE
COMMON TERMINAL (DOUBLE THROW SWITCH)



NOTES

1. Replacement wire must be the same gauge and insulation thickness,105 C, appliance wiring material.
2. All three phase motors are protected under primary single phasing conditions.
3. Replacement fuses must be buss or equivalent as indicated below:

UNIT R160	CONTROL 24V F1,F2	CONTROL LINE F3,F4	EVAP. MOTOR HP	EVAP. MOTOR F5,6,7	HTG. ELEMENT FUSES F8,9,10	F11,12,13	F14,15,16	F17,18,19	F20,21,22
	GMQ 3 2/10	FNQ-R1	3 5	FRS R25					
20 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35				
27 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 30			
40 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 30			
47 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 60			
60 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 60			
80 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R60	JKS 60			
100 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R60	JKS 60	JKS 30		

4. When firestat option is used, wire no. 37 is to be removed.
5. When economizer option is used , wire no. 40 is to be removed .
6. When power saver option is used, wire 330 and 347 are to be removed .
7. When economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.
8. When electric heat is added to unit , move wire 43 from "C5-1" terminal to "R3-5" terminal .

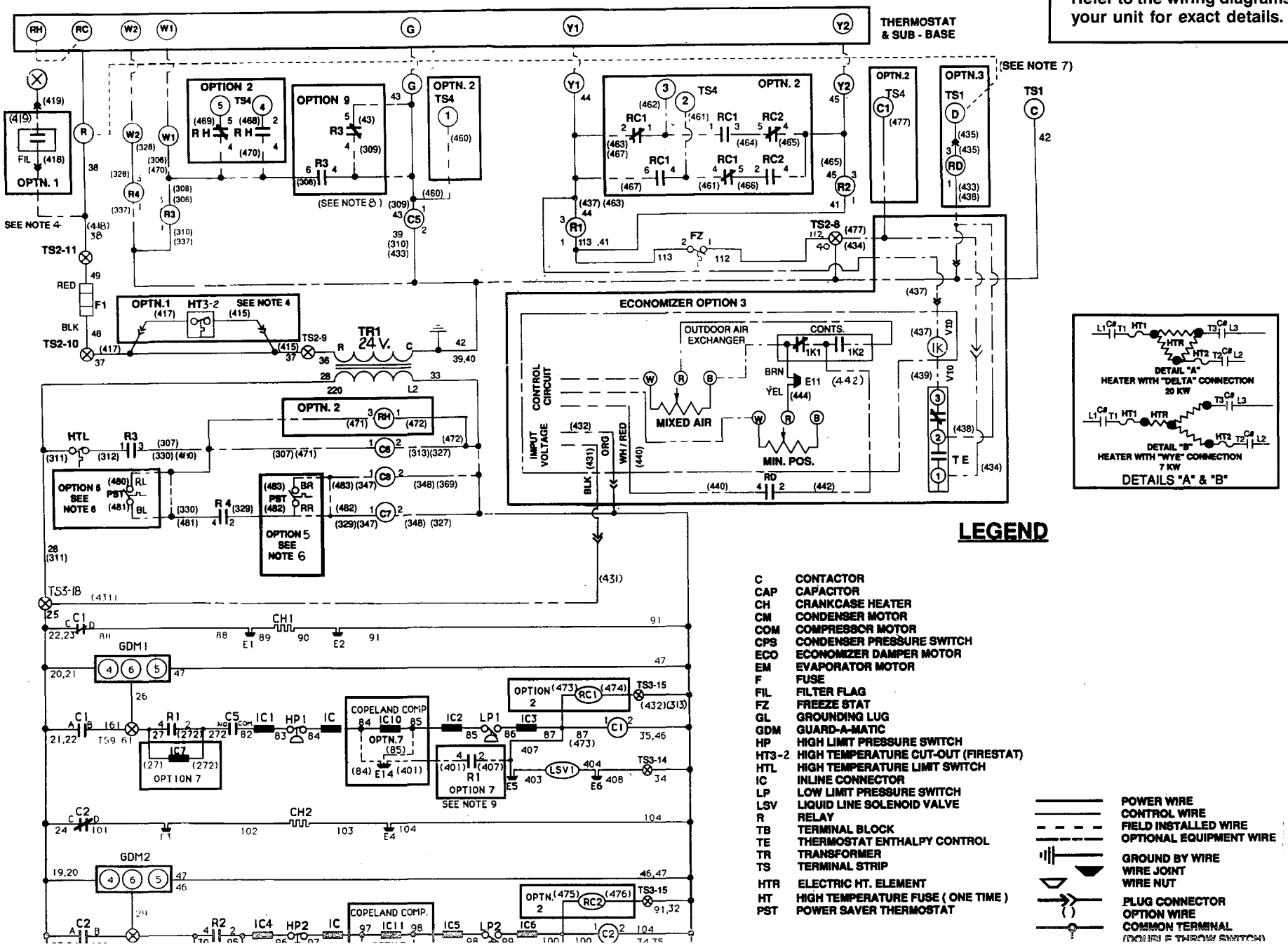
OPTIONS

1 ☐ Firestat and Filter Flag
2 ☐ Failure Relay Package
3 ☐ Economizer (Fresh Air Control)
4 ☐
5 ☐ Power Saver (USED WITH EL.HT.ONLY)
6 ☐ Oversized Evap. Motor
7 ☐ Pump Down
8 ☐

9. ☐ Electric Heat
   - A. 20 KW htr. no. 1 wired per detail "A" (C6)
   - B. 27 KW htr. no. 1 wired per detail "A" (C6)
     htr. no. 2 wired per detail "B" (C7)
   - C. 40 KW htrs. no. 1 and 2 wired per detail "A" (C6 - C7)
   - D. 47 kW htrs. no. 1 and 2 wired per detail "A" (C6 - C7)
     htr. no. 3 wired per detail "B" (C7)
   - E. 60 KW htrs. no.1,2 and 3 wired per detail "A" (C6 - C7)
   - F. 80 KW htrs. no. 1,2,3 and 4 wired per detail "A" (C6 - C7)
   - G. 100 KW htrs. no. 1,2,3,4&5 wired per detail "A" (C6,C7 & CG)

Wiring Diagram 10. CUR201E (Standard 460V, Constant Volume) — Schematic 714714D-01

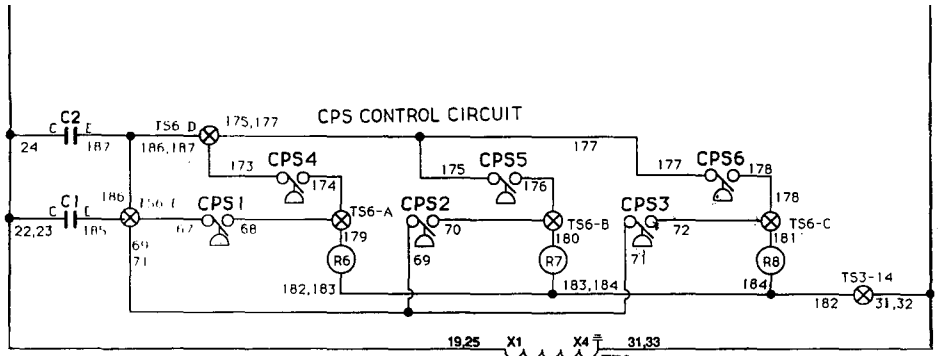
Refer to the wiring diagrams on your unit for exact details.



LEGEND

C	CONTACTOR
CAP	CAPACITOR
CH	CRANKCASE HEATER
CM	CONDENSER MOTOR
COM	COMPRESSOR MOTOR
CPS	CONDENSER PRESSURE SWITCH
ECO	ECONOMIZER DAMPER MOTOR
EM	EVAPORATOR MOTOR
F	FUSE
FIL	FILTER FLAG
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
HP	HIGH LIMIT PRESSURE SWITCH
HT3-2	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
LP	LOW LIMIT PRESSURE SWITCH
LSV	LIQUID LINE SOLENOID VALVE
R	RELAY
TB	TERMINAL BLOCK
TE	THERMOSTAT ENTHALPY CONTROL
TR	TRANSFORMER
TS	TERMINAL STRIP
HTR	ELECTRIC HT. ELEMENT
HT	HIGH TEMPERATURE FUSE (ONE TIME)
PST	POWER SAVER THERMOSTAT

POWER WIRE
CONTROL WIRE
FIELD INSTALLED WIRE
OPTIONAL EQUIPMENT WIRE
GROUND BY WIRE
WIRE JOINT
WIRE NUT
PLUG CONNECTOR
OPTION WIRE
COMMON TERMINAL
(DOUBLE THROW SWITCH)



FIELD POWER CONNECTIONS FOR COOLING PLUS ELECTRIC HEAT WHEN DISCONNECT SWITCH IS SUPPLIED BY OTHERS.

NOTES

1. Replacement wire must be the same gauge and insulation thickness,105 C, appliance wiring material.
2. All three phase motors are protected under primary single phasing conditions.
3. Replacement fuses must be buss or equivalent as indicated below:

UNIT R201	CONTROL 24V F1	CONTROL LINE F3,F4	EVAP. MOTOR HP	EVAP. MOTOR F5,6,7	HTG. ELEMENT FUSES F8,9,10	F11,12,13	F14,15,16	F17,18,19	F20,21,22
	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25					
20 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R35				
27 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R35	JKS 30			
40 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R35	JKS 30			
47 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R35	JKS 60			
60 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R35	JKS 60			
80 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R60	JKS 60			
100 KW	GMQ 3 2/10	FNQ-R1	5 7.5	FRS R25	FRS R60	JKS 60	JKS 30		

4. When firestat option is used, wire no. 37 is to be removed.
5. When economizer option is used , wire no. 40 is to be removed .
6. When power saver option is used, wire 330 and 347 are to be removed .
7. When economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.
8. When electric heat is added to unit , move wire from "C5-1" terminal to "R3-5" terminal .
9. When option 7 " Pump Down " is used remove lead 407 fron C1 coil and connect to R1 relay terminal 2 . also remove lead 409 fron C2 coil and connect to R2 relay terminal 2.

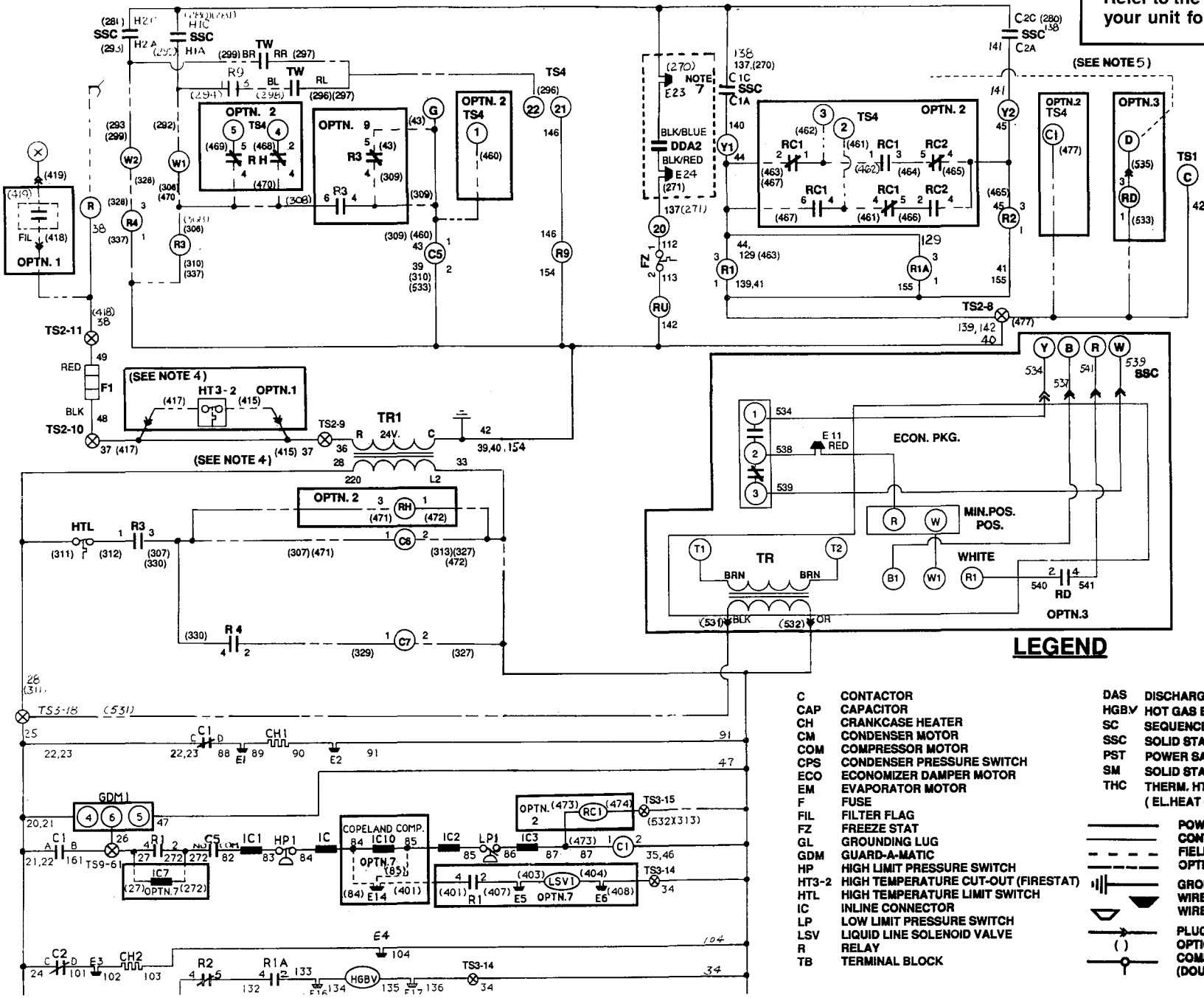
OPTIONS

1 ☐ Firestat and Filter Flag
2 ☐ Failure Relay Package
3 ☐ Economizer (Fresh Air Control)
4 ☐
5 ☐ Power Saver (use with El.Heat only)
6 ☐ Oversized Evap. Motor
7 ☐ Pump Down
8 ☐

9 ☐ Electric Heat
- A. 20 KW htr. no. 1 wired per detail "A" (C6)
- B. 27 KW htr. no. 1 wired per detail "A" (C6)
  htr. no. 2 wired per detail "B" (C7)
- C. 40 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
- D. 47 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
  htr. no. 3 wired per detail "B" (C7)
- E. 60 KW htrs. no.1,2 and 3 wired per detail "A" (C6 & C7)
- F. 80 KW htrs. no. 1,2,3 and 4 wired per detail "A" (C6 & C7)
- G. 100 KW htrs. no. 1,2,3,4&5 wired per detail "A" (C6,C7 & CG

Wiring Diagram 11. CUR160E (Standard 460V, Variable Air Volume) — Schematic 714710D-01

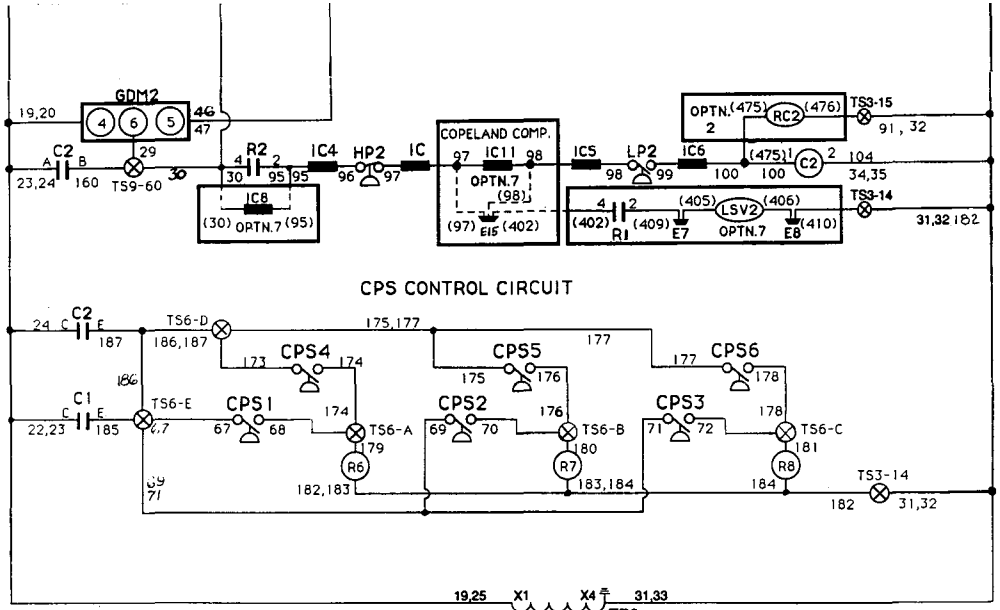
Refer to the wiring diagrams on your unit for exact details.

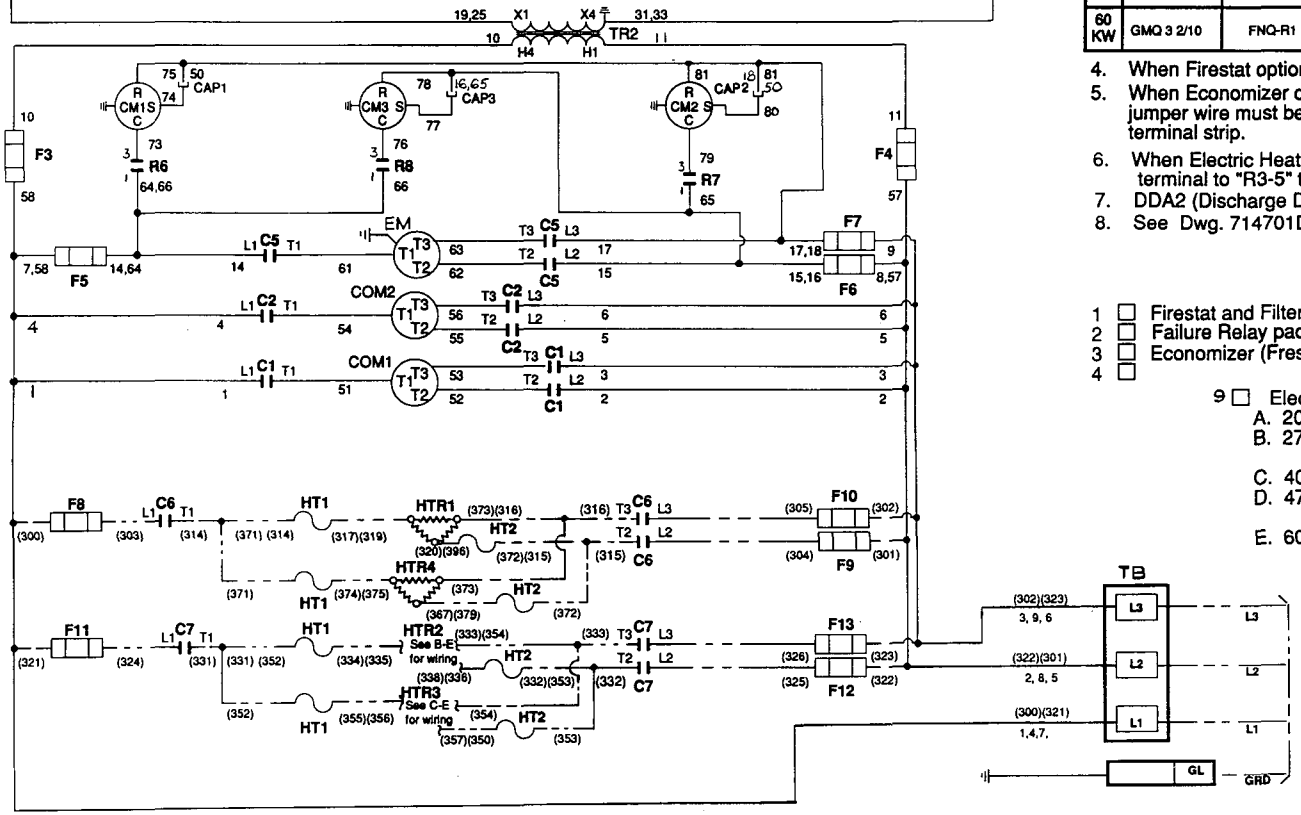


LEGEND

C	CONTACTOR
CAP	CAPACITOR
CH	CRANKCASE HEATER
CM	CONDENSER MOTOR
COM	COMPRESSOR MOTOR
CPS	CONDENSER PRESSURE SWITCH
ECO	ECONOMIZER DAMPER MOTOR
EM	EVAPORATOR MOTOR
F	FUSE
FIL	FILTER FLAG
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
HP	HIGH LIMIT PRESSURE SWITCH
HT3-2	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
LP	LOW LIMIT PRESSURE SWITCH
LSV	LIQUID LINE SOLENOID VALVE
R	RELAY
TB	TERMINAL BLOCK
DAS	DISCHARGE DAMPER SENSOR
HGBV	HOT GAS BYPASS VALVE
SC	SEQUENCE CONTROLLER
SSC	SOLID STATE CONTROLLER
PST	POWER SAVER THERMOSTAT
SM	SOLID STATE MODULE
THC	THERM. HT./COOL CHANGEOVER (EL.HEAT ONLY)

POWER WIRE
CONTROL WIRE
FIELD INSTALLED WIRE
OPTIONAL EQUIPMENT WIRE
GROUND BY WIRE
WIRE JOINT
WIRE NUT
PLUG CONNECTOR
( ) OPTION WIRE
COMMON TERMINAL
(DOUBLE THROW SWITCH)





TE THERMOSTAT ENTHALPY CONTROL
TR TRANSFORMER
TS TERMINAL STRIP

HTR ELECTRIC HT. ELEMENT 1
HT HIGH TEMPERATURE FUSE (ONE TIME)

NOTES

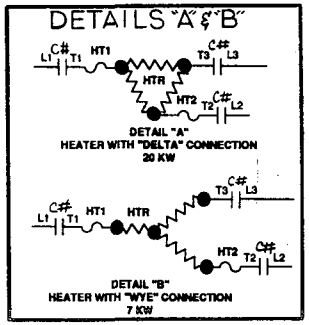
1. Replacement wire must be the same gauge and insulation thickness , 105 C, appliance wiring material.
2. All three phase motors are protected under primary single phasing conditions.
3. Replacement fuses must be buss or equivalent as indicated below:

UNIT R180	CONTROL 24V	CONTROL LINE	EVAP. MOTOR		HTG. ELEMENT FUSES			
	F1,F2	F3,F4	HP	F5,6,7	F8,9,10	F11,12,13	F14,15,16	F17,18,19
	GMQ 3 2/10	FNQ-R1	3 5	FRS R25				
20 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35			
27 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 30		
40 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 30		
47 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 60		
60 KW	GMQ 3 2/10	FNQ-R1	3 5	FRS R25	FRS R35	JKS 60		

4. When Firestat option is used, wire no. 37 is to be removed.
5. When Economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.
6. When Electric Heat is added to unit , move wire 43 from "C5-1" terminal to "R3-5" terminal .
7. DDA2 (Discharge Damper Cam Switch) used with Discharge Damper only .
8. See Dwg. 714701D for SSC details .

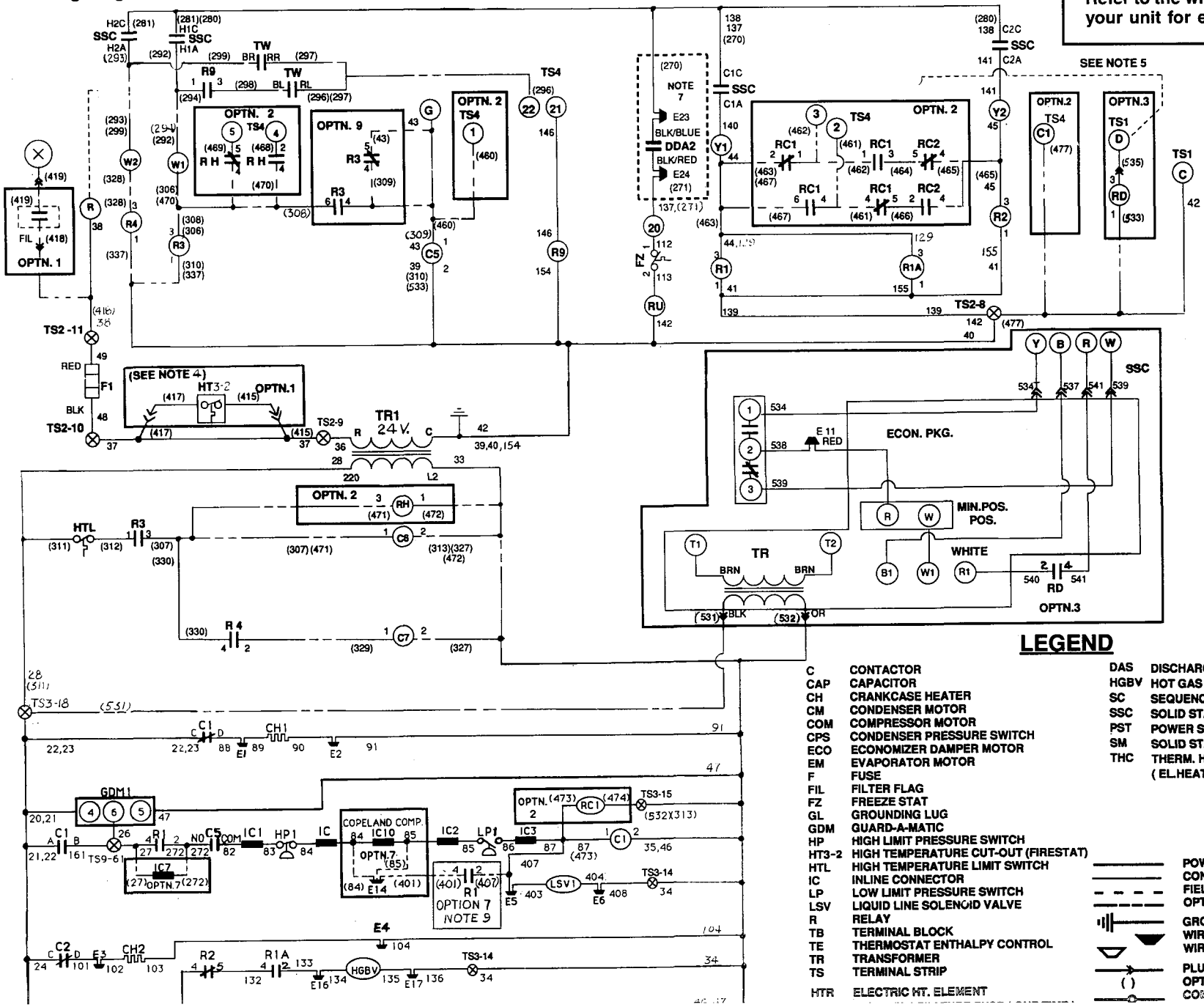
Options

1 ☐ Firestat and Filter Flag
2 ☐ Failure Relay package
3 ☐ Economizer (Fresh Air Control)
4 ☐
5 ☐
6 ☐ Oversized Evap. Fan Motor
7 ☐ Pump Down
8 ☐
9 ☐ Electric Heat
A. 20 KW htr. no. 1 wired per detail "A" (C6)
B. 27 KW htr. no. 1 wired per detail "A" (C6)
htr. no. 2 wired per detail "B" (C7)
C. 40 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
D. 47 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
htr. no. 3 wired per detail "B" (C7)
E. 60 KW htrs. no.1,2 and 3 wired per detail "A" (C6 & C7)



Wiring Diagram 12. CUR201E (Standard 460V, Variable Air Volume) — Schematic 714722D-01

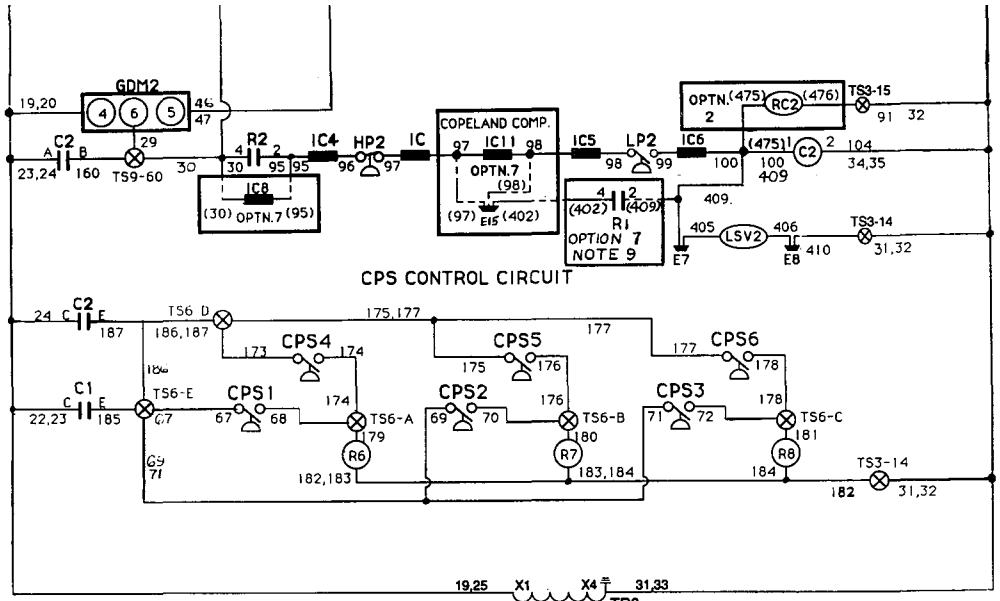
Refer to the wiring diagrams on your unit for exact details.

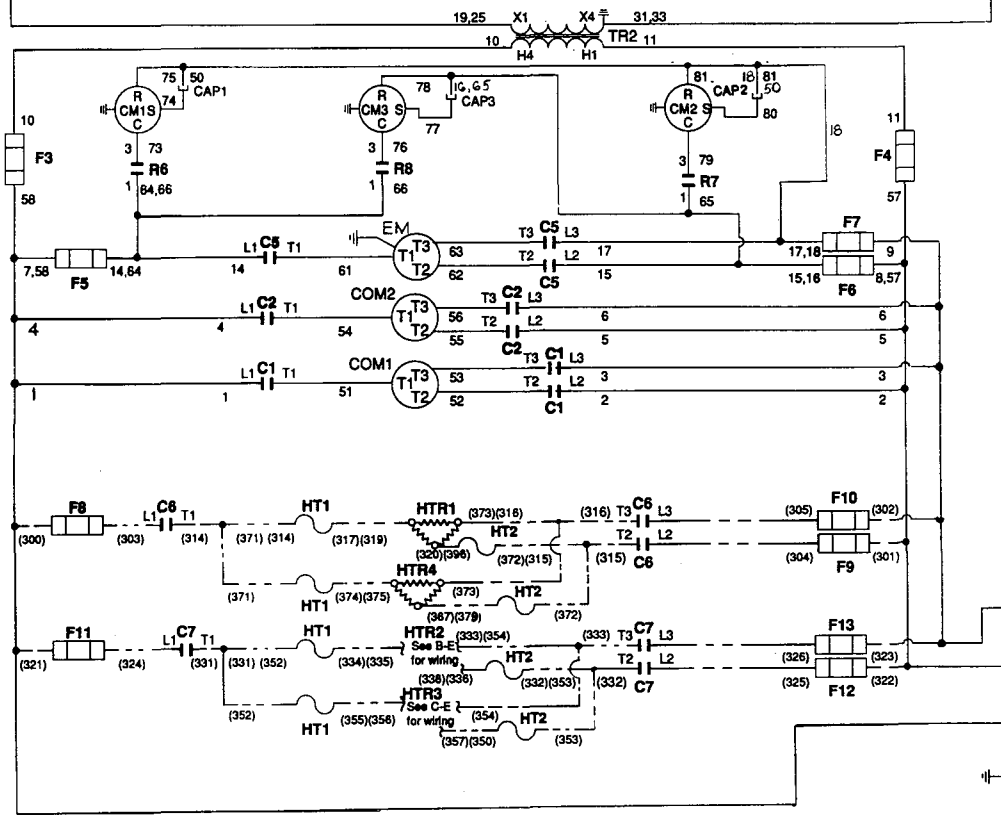


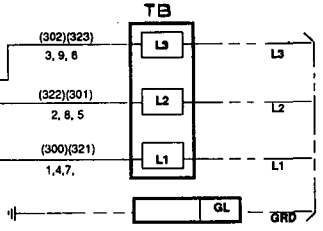
LEGEND

C	CONTACTOR
CAP	CAPACITOR
CH	CRANKCASE HEATER
CM	CONDENSER MOTOR
COM	COMPRESSOR MOTOR
CPS	CONDENSER PRESSURE SWITCH
ECO	ECONOMIZER DAMPER MOTOR
EM	EVAPORATOR MOTOR
F	FUSE
FIL	FILTER FLAG
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
HP	HIGH LIMIT PRESSURE SWITCH
HT3-2	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
LP	LOW LIMIT PRESSURE SWITCH
LSV	LIQUID LINE SOLENOID VALVE
R	RELAY
TB	TERMINAL BLOCK
TE	THERMOSTAT ENTHALPY CONTROL
TR	TRANSFORMER
TS	TERMINAL STRIP
HTR	ELECTRIC HT. ELEMENT
DAS	DISCHARGE DAMPER SENSOR
HGBV	HOT GAS BYPASS VALVE
SC	SEQUENCE CONTROLLER
SSC	SOLID STATE CONTROLLER
PST	POWER SAVER THERMOSTAT
SM	SOLID STATE MODULE
THC	THERM. HT./COOL CHANGEOVER (EL.HEAT ONLY)

POWER WIRE
CONTROL WIRE
FIELD INSTALLED WIRE
OPTIONAL EQUIPMENT WIRE
GROUND BY WIRE
WIRE JOINT
WIRE NUT
PLUG CONNECTOR
OPTION WIRE
( )
COMMON TERMINAL







NOTES

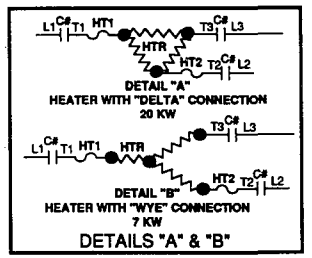
1. Replacement wire must be the same gauge and insulation thickness, 105 C, appliance wiring material.
2. All three phase motors are protected under primary single phasing conditions.
3. Replacement fuses must be buss or equivalent as indicated below:

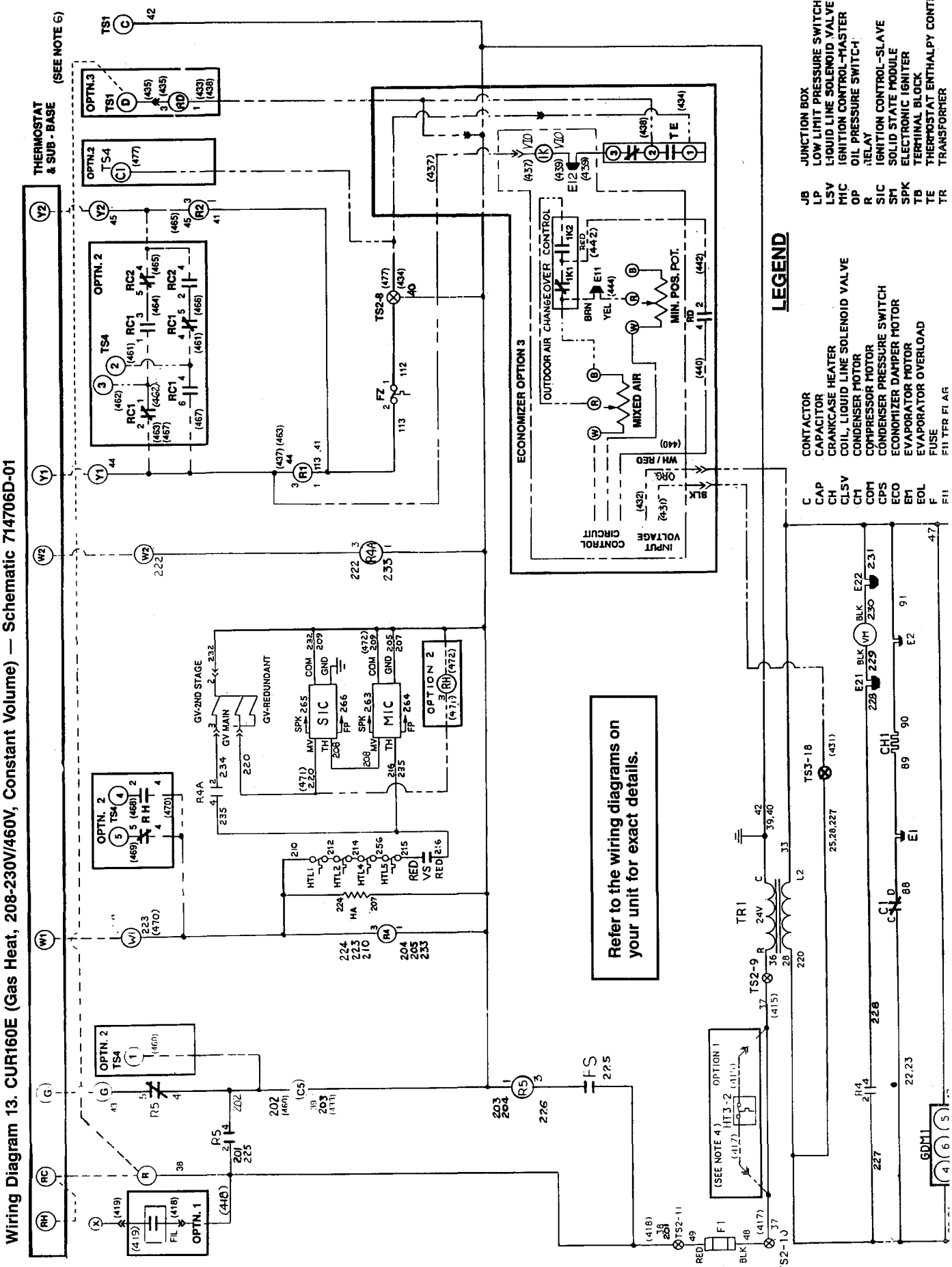
UNIT R201	CONTROL 24V	CONTROL LINE	EVAP. MOTOR		HTG. ELEMENT FUSES			
	F1,F2	F3,F4	HP	F5,6,7	F8,9,10	F11,12,13	F14,15,16	F17,18,19
	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25				
20 KW	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25	FRS-R 35			
27 KW	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25	FRS-R35	JKS 30		
40 KW	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25	FRS-R 35	JKS 30		
47 KW	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25	FRS-R 35	JKS 60		
60 KW	GMQ 3 2/10	FNQ-R 1	5 7.5	FRS-R 25	FRS-R 35	JKS 60		

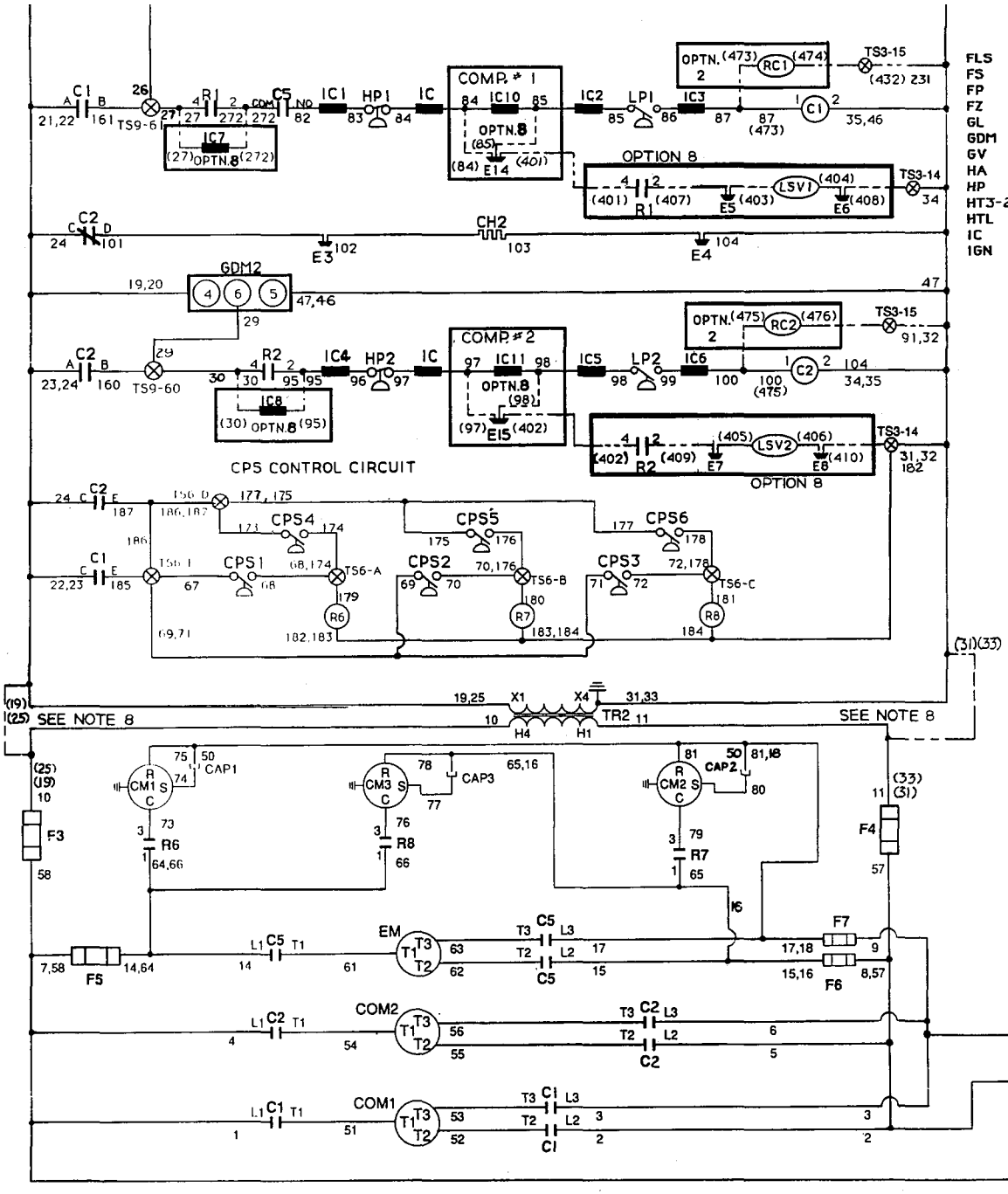
4. When Firestat option is used, wire no. 37 is to be removed.
5. When Economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.
6. When Electric Heat is added to unit, move wire 43 from "C5-1" terminal to "R3-5" terminal.
7. DDA2 (Discharge Damper Cam Switch) used with Discharge Damper only.
8. See Dwg. 714701D for SSC details.
9. When option 7 "pump down" is installed, remove lead 407 from C1 coil and connect to R1 relay terminal 2. Also remove lead 409 from C2 coil and connect to R2 relay terminal 2.

Options

1 ☐ Firestat and Filter Flag
2 ☐ Failure Relay package
3 ☐ Economizer (Fresh Air Control)
4 ☐
5 ☐
6 ☐ Oversized Evap. Motor
7 ☐ Pump Down
8 ☐
9 ☐ Electric Heat
A. 20 KW htr. no. 1 wired per detail "A" (C6)
B. 27 KW htr. no. 1 wired per detail "A" (C6)
htr. no. 2 wired per detail "B" (C7)
C. 40 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
D. 47 KW htrs. no. 1 and 2 wired per detail "A" (C6 & C7)
htr. no. 3 wired per detail "B" (C7)
E. 60 KW htrs. no.1,2 and 3 wired per detail "A" (C6 & C7)




Wiring Diagram 13. CUR160E (Gas Heat, 208-230V/460V, Constant Volume) — Schematic 714706D-01
THERMOSTAT & SUB - BASE
(SEE NOTE 6)
ECONOMIZER OPTION 3
OUTDOOR AIR CHANGEOVER CONTROL
MIXED AIR
MIN. POS. POT.
INPUT VOLTAGE CONTROL CIRCUIT
OPTN. 1
OPTN. 2
OPTN.2
OPTN.3
GV-2ND STAGE
GV MAIN
GV-REDUNDANT
SIC
MIC
OPTION 2
OPTION 1
HTR-2
HTL1
HTL2
HTL4
HTL5
RED VS
HA
TR1
24V
CH1
GDM1
Refer to the wiring diagrams on your unit for exact details.
LEGEND
JB JUNCTION BOX
LP LOW LIMIT PRESSURE SWITCH
LSV LIQUID LINE SOLENOID VALVE
MIC IGNITION CONTROL-MASTER
OP OIL PRESSURE SWITCH
R RELAY
SIC IGNITION CONTROL-SLAVE
SM SOLID STATE MODULE
SPK ELECTRONIC IGNITER
TB TERMINAL BLOCK
TE THERMOSTAT ENTHALPY CONTROL
TR TRANSFORMER
C CONTACTOR
CAP CAPACITOR
CH CRANKCASE HEATER
CLSV COIL, LIQUID LINE SOLENOID VALVE
CM CONDENSER MOTOR
COM COMPRESSOR MOTOR
CPS CONDENSER PRESSURE SWITCH
ECO ECONOMIZER DAMPER MOTOR
EM EVAPORATOR MOTOR
EOL EVAPORATOR OVERLOAD
F FUSE
FU TFR FI AS



FLS	FLAME SWITCH
FS	FURNACE FAN SWITCH
FP	FLAME SENSOR PROBE
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
GV	GAS VALVE
HA	HEAT ANTICIPATOR
HP	HIGH LIMIT PRESSURE SWITCH
HT3-2	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
IGN	IGNITER

TS	TERMINAL STRIP
VM	POWER VENTER MOTOR
VS	VENTER CENTRIFUGAL SWITCH
———	POWER WIRE
———	CONTROL WIRE
- - -	FIELD INSTALLED WIRE
———	OPTIONAL EQUIPMENT WIRE
———	GROUND BY WIRE
	WIRE JOINT
	WIRE NUT
——→	PLUG CONNECTOR
( )	OPTION WIRE
——o	COMMON TERMINAL (DOUBLE THROW SWITCH)

NOTES

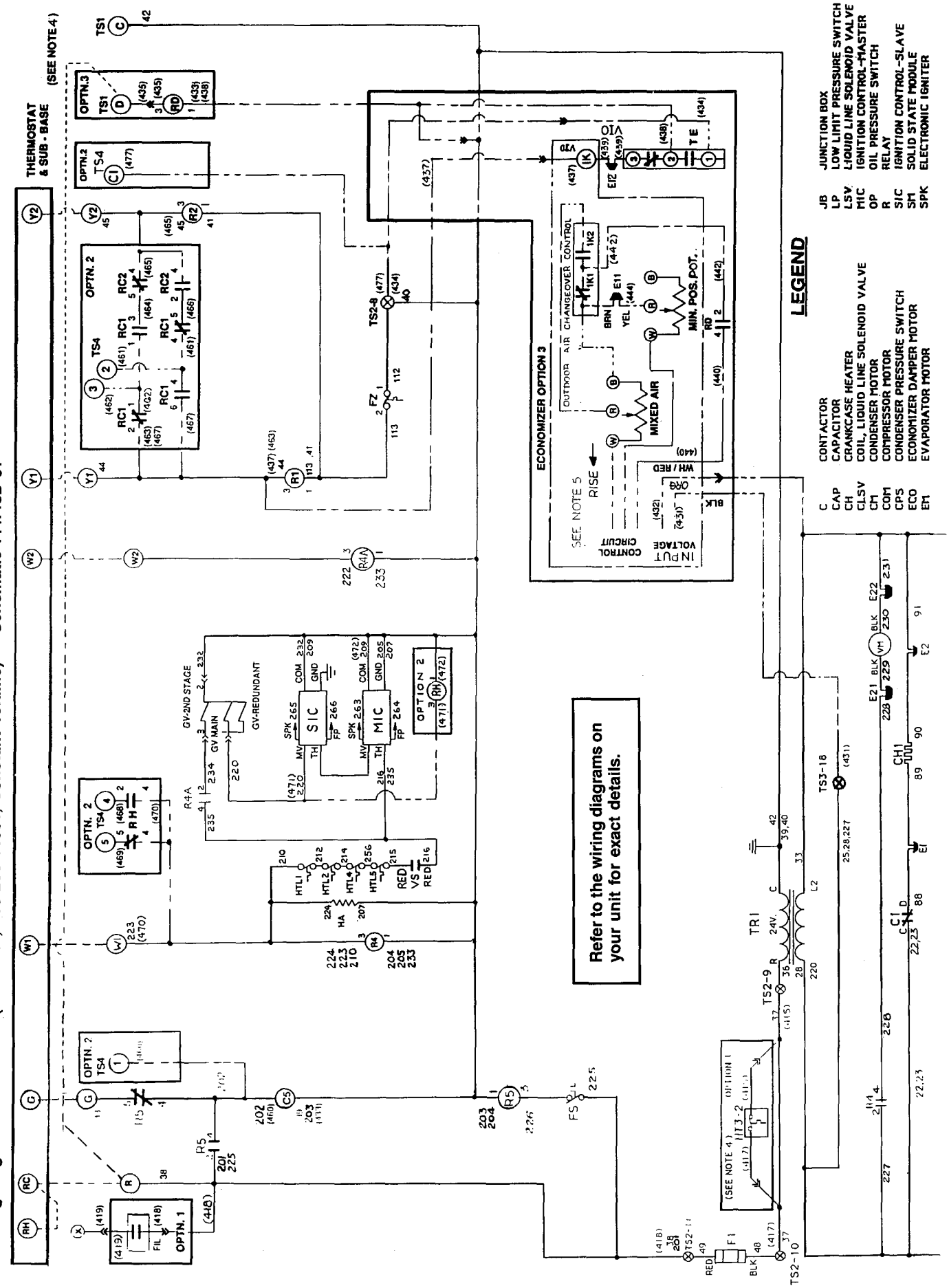
1. **Replacement wire must be the same gauge and insulation thickness , 105 C, appliance wiring material.**
2. **All three phase motors are protected under primary single phasing conditions.**
3. **Replacement fuses must be buss or equivalent as indicated below:**

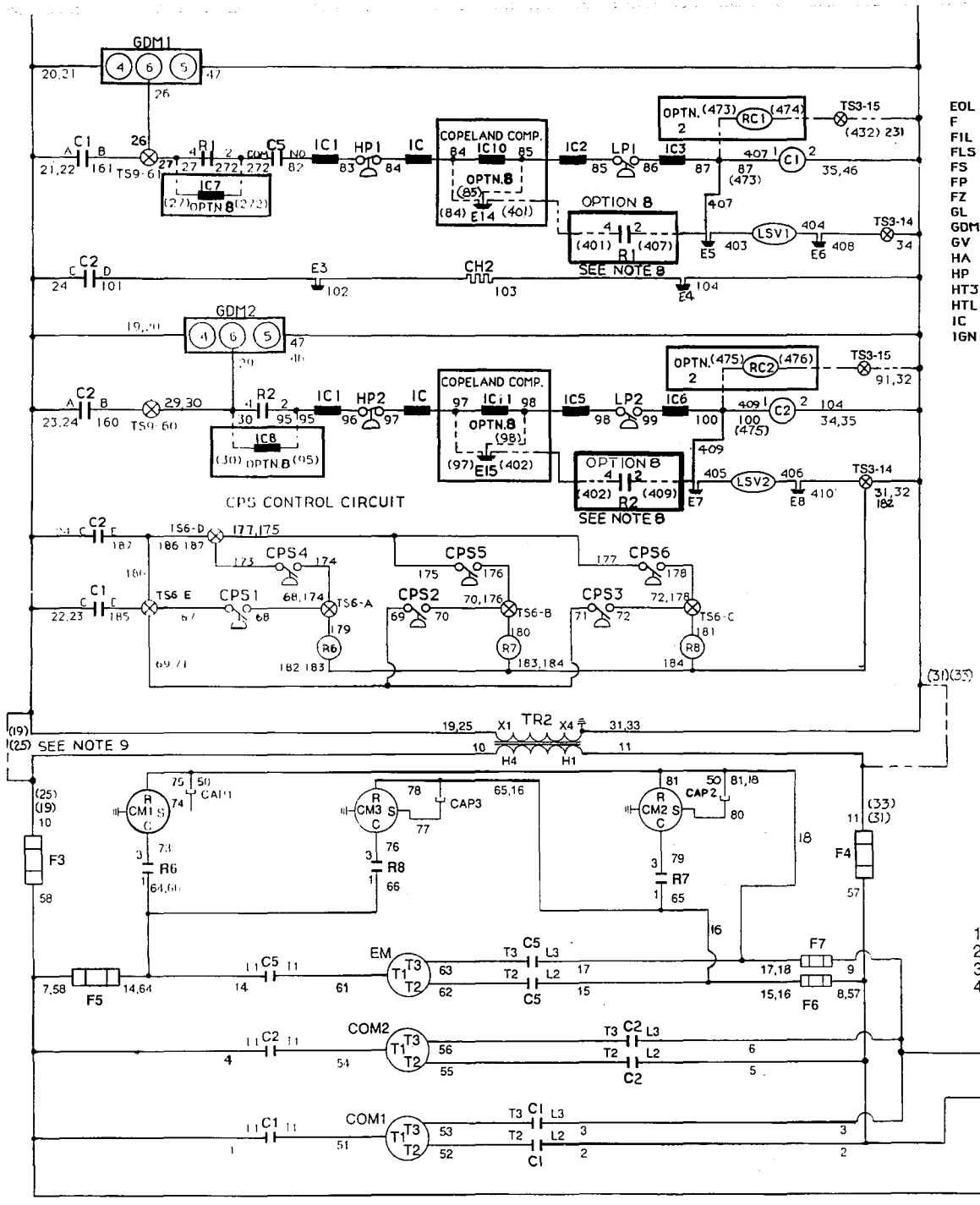
UNIT		VOLTAGE.
160		
F1	GMQ 3 2/10	24V.
F3,F4	FRN 3 2/10	208/230V.
F3,F4	FNQ- R3	460V.
F3,F4	FNQ-R2 1/2	575V.
F5,6,7	FRN-R50	208/230V.
F5,6,7	FRS-R25	460V.
F5,6,7	FRS-R20	575V.

4. **When Firestat option is used, wire no. 37 is to be removed.**
5. **When Economizer option is used , wire no. 40 is to be removed .**
6. **When economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.**
7. **Refer to unit rating plate for maximun fuse size .**
8. Wiring changes for 208-230 units , eliminate TR-2 and wires no. 10 and 11 .

Options

1 ☐	Firestat and Filter Flag	5 ☐	
2 ☐	Failure Relay Package	6 ☐	Oversized Evap. Motor
3 ☐	Economizer (Fresh Air Control)	7 ☐	
4 ☐		8 ☐	Pump Down


Wiring Diagram 14. CUR201E (Gas Heat, 208-230V/460V, Constant Volume) — Schematic 714718D-01
THERMOSTAT & SUB - BASE (SEE NOTE 4)
ECONOMIZER OPTION 3
LEGEND
Refer to the wiring diagrams on your unit for exact details.
JB JUNCTION BOX
LP LOW LIMIT PRESSURE SWITCH
LSV LIQUID LINE SOLENOID VALVE
MIC IGNITION CONTROL-MASTER
OP OIL PRESSURE SWITCH
R RELAY
SIC IGNITION CONTROL-SLAVE
SM SOLID STATE MODULE
SPK ELECTRONIC IGNITER
C CONTACTOR
CAP CAPACITOR
CH CRANKCASE HEATER
CLSV COIL, LIQUID LINE SOLENOID VALVE
CM CONDENSER MOTOR
COM COMPRESSOR MOTOR
CPS CONDENSER PRESSURE SWITCH
ECO ECONOMIZER DAMPER MOTOR
EM EVAPORATOR MOTOR



EOL	EVAPORATOR OVERLOAD
F	FUSE
FIL	FILTER FLAG
FLS	FLAME SWITCH
FS	FURNACE FAN SWITCH
FP	FLAME SENSOR PROBE
FZ	FREEZE STAT
GL	GROUNDING LUG
GDM	GUARD-A-MATIC
GV	GAS VALVE
HA	HEAT ANTICIPATOR
HP	HIGH LIMIT PRESSURE SWITCH
HT3	HIGH TEMPERATURE CUT-OUT (FIRESTAT)
HTL	HIGH TEMPERATURE LIMIT SWITCH
IC	INLINE CONNECTOR
IGN	IGNITER

TB	TERMINAL BLOCK
TE	THERMOSTAT ENTHALPY CONTROL
TR	TRANSFORMER
TS	TERMINAL STRIP
VM	POWER VENTER MOTOR
VS	VENTER CENTRIFUGAL SWITCH

POWER WIRE
CONTROL WIRE
FIELD INSTALLED WIRE
OPTIONAL EQUIPMENT WIRE
GROUND BY WIRE
WIRE JOINT
WIRE NUT
PLUG CONNECTOR
( ) OPTION WIRE
COMMON TERMINAL (DOUBLE THROW SWITCH)

NOTES

1. Replacement wire must be the same gauge and insulation thickness , 105 C, appliance wiring material.
2. All three phase motors are protected under primary single phasing conditions.
3. Replacement fuses must be buss or equivalent as indicated below:

UNIT		VOLTAGE.
201		
F1	GMQ 3 2/10	24V.
F3,F4	FRN 3 2/10	208/230V.
F3,F4	FNQ- R3	460V.
F3,F4	FNQ-R2 1/2	575V.
F5,6,7	FRN-R50	208/230V.
F5,6,7	FRS-R25	460V.
F5,6,7	FRS-R20	575V.

4. When Firestat option is used, wire no. 37 is to be removed.
5. When Economizer option is used , wire no. 40 is to be removed .
6. When economizer option is installed and time clock is not used, jumper wire must be put between terminals "R" and "D" on "TS-1" terminal strip.
7. Refer to unit rating plate for maximun fuse size .
8. When option 8 "Pump Down" is installed , remove lead 407 from C1 coil and connect it to R1 relay terminal #2 . Also remove lead 409 from C2 coil and connect it to R2 relay terminal #2.
9. Wiring changes for 208-230 units , eliminate TR-2 and wires no. 10 and 11 .

Options

1. ☐ Firestat and Filter Flag
2. ☐ Failure Relay Package
3. ☐ Economizer (Fresh Air Control)
5. ☐
6. ☐ Oversized Evap. Motor
7. ☐
8. ☐ Pump Down

GAS SUPPLY PIPING

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the User's Information Manual provided with this furnace. For assistance or additional information, consult a qualified installer, service agency, or the gas supplier.

LOCATION AND INSTALLATION

1. The gas supply piping location and installation to the rooftop unit must be in accordance with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1-1984 and Addenda Z223.1a-1987 for U.S.A., and CAN/CGA B149.1 and B149.2 for Canada, or most recent edition and addenda.

   The furnace must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70-1987 or most recent edition and addenda.

   A manual gas shutoff valve must be field installed external to the rooftop unit. In addition, a ground joint union connection is required between the external shutoff valve and the unit connection to permit removal of controls for servicing.

2. All units are furnished with standard female NPT pipe connections. Connection pipe size for CUR160 and CUR201 units is ¾″ NPT.

   The gas supply piping to the unit must be based on length of run, number of units on the system, gas characteristics, BTU requirement and available supply pressure in accordance with the latest edition of the National Fuel Gas Code (ANSI Z223.1) for U.S.A., and CAN/CGA B149.1 and B149.2 for Canada. The gas connection size at the unit does not establish the size of the supply line.

3. Rooftop units are designed for either natural gas or LP gas. Furnaces are specifically constructed at the factory for either one of these fuels and the fuels are not interchangeable in the field. Check unit dataplate to determine correct fuel.

4. Natural gas main supply pressure should be adjusted to approximately 7.0″ W.C., measured at the unit gas valve. If the gas pressure at the unit is greater than 7.0″ W.C., it is necessary that the contractor furnish and install an external type, positive shutoff service pressure regulator. Unit will not function satisfactorily if gas pressure is less than 5.5″ W.C. or greater than 7.0″ W.C.

   NOTE: A minimum horizontal distance of 48″ is required between the regulator and the furnace flue discharge.

5. LP gas main supply pressure should be at least 8.0″ W.C. and must be no greater than 13.0″ W.C., measured at the unit gas valve.

6. All pipe connections should be sealed with a pipe thread compound which is resistant to the furnace fuel. A soapy water solution should be used to check all joints for leaks.

   A ⅛″ NPT plugged tapping is available on the supply side of the gas valve for test gauge connection for reading supply (main) gas pressure. Another ⅛″ tap is available on the downstream end of the valve for checking manifold pressure.

   The furnace and its individual shutoff valve must be disconnected from the gas supply system during any pressure testing of that system at test pressures in excess of ½ psig (13.8″ W.C.).

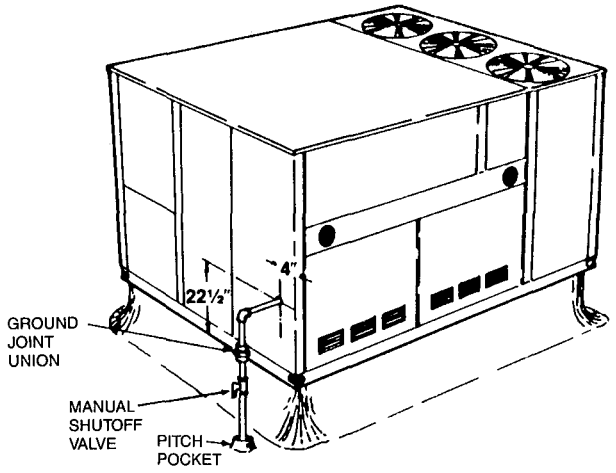
   The furnace must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing equal to or less than ½ psig.

7. There must be no obstruction to prevent the flow of combustion and ventilating air. A vent stack is not required and should never be used. The power ventor will supply an adequate amount of combustion air as long as the air passageways are kept free of any obstructions and the recommended external unit clearances are maintained.

⚠ WARNING

Units equipped with gas heating must not be operated in an atmosphere contaminated with halogenated hydrocarbons; i.e., cleaning solvents, refrigerants, etc. Exposure to these atmospheres may cause severe damage to the gas furnace and result in improper or dangerous operation. Operation of the gas furnace in such a contaminated atmosphere constitutes product abuse and all warranty coverage by the manufacturer is void.

Figure 40. Gas Supply Piping Entrance Location



HYDRONIC PIPING & WIRING*

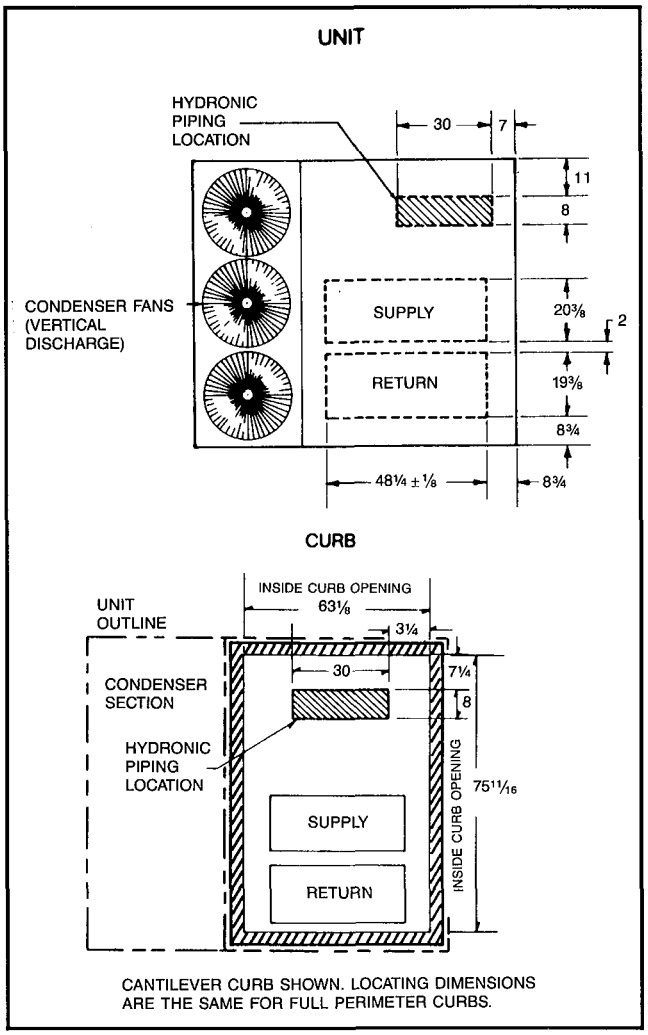
PIPING LOCATION AND INSTALLATION

1. Model CUR160 and CUR201 rooftop units furnished with hot water or steam coils require that supply and return lines be routed inside the curb and through the bottom of the unit. External lines are not recommended due to their exposure to freezing temperatures and interference with panel removal and service.
2. Piping within the rooftop unit should be limited to only supply and return lines plus pipe unions to facilitate coil removal. All controls, service valves, balancing cocks, strainers, etc., should be located within the building.
3. Openings for supply and return lines must be field cut both in the bottom of the unit and in the roof decking. Locate openings within the shaded area indicated in Figure 41.
4. Do not employ pressurized steam return lines. Only atmospheric or vacuum steam return lines may be used. A vacuum breaker must be provided to avoid the possibility of condensate trapping.
5. Coil connection sizes for both hot water and steam are 1½ NPT.
6. Upon completion of piping installations, all pipe openings in the unit must be sealed with plastic or rubber grommet, or with caulking compound to prevent pipe chaffing and air leakage.

CAUTION: Water coils must be protected from freezing (glycol, draining, etc.). Coil failure and water damage which results from freezing is not the responsibility of SnyderGeneral Corporation.

*Item not submitted to ETL or CGA.

Figure 41. Hydronic Piping Location



LOW VOLTAGE CONTROL WIRING

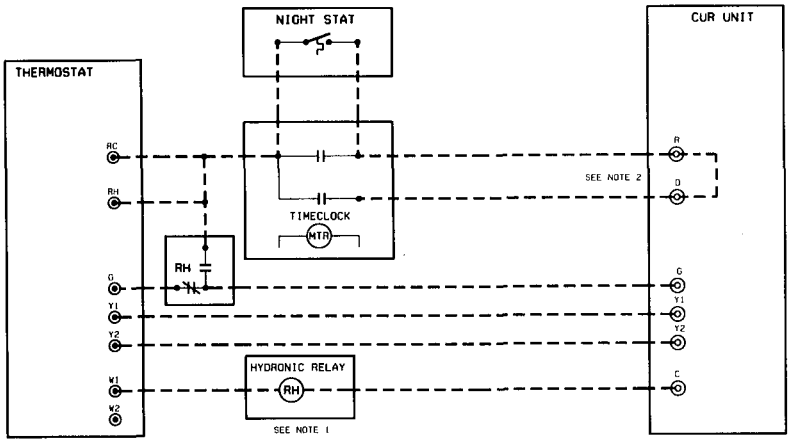
The valve and all controls required to operate it and the supply fan must be field supplied and installed. One method of controlling the fan on a constant volume unit is shown in Wiring Diagram 13.

NOTES:
1. Field supplied relay RH required. Additional RH contacts (not shown) may control hot water or steam valve.
2. If unit is equipped with an economizer, unit terminal D should be connected either to unit terminal R or to timeclock as shown.

LEGEND:

◎ Field Wired To Unit Terminal
◉ Field Wired to Device
– – – – – Field Wiring

Wiring Diagram 15. Typical Method To Control Fan on Hydronic Unit



CONDENSATE DRAIN CONNECTION

The unit is provided with a 1″ condensate drain connection. To insure proper condensate drainage, the unit must be level and a P-trap must be installed in accordance with accepted industry practice.

Drainage of condensate directly onto the roof may be acceptable; refer to local code. It is recommended that a small drip pad of either stone, mortar, wood or metal be provided to prevent any possible damage to the roof.

If condensate is to be piped into the building drainage system, the drain line must penetrate the roof external to the unit. Refer to local codes for additional requirements.

CHECK, TEST & START PROCEDURE

⚠ WARNING

ELECTRIC SHOCK AND MOVING MACHINERY HAZARD. Could cause severe injury or death. Failure to bond the frame of this equipment to the building electrical ground by use of the grounding terminal provided or other acceptable means may result in electrical shock. Disconnect electric power before servicing equipment. Service to be performed only by qualified personnel.

BEFORE START-UP

⚠ WARNING

MOVING MACHINERY HAZARD

DISCONNECT POWER TO THIS UNIT AND PADLOCK AT "OFF" BEFORE SERVICING THE FANS.

This procedure has been prepared as a guide for the proper Check, Test & Start of the rooftop unit.

The Check, Test & Start procedure provides a step-by-step sequence which, if followed, will assure the proper startup of the equipment in the minimum amount of time. Air balancing of duct system is not considered part of the Check, Test & Start of the rooftop unit. However, it is an important phase of any air conditioning system and should be performed upon completion of the Check, Test & Start procedure.

Rooftop units are designed for cooling operation at ambients at or above 0°F. However, the Check, Test & Start procedure at outside ambients below 55°F should be limited to a readiness check of the refrigeration system with the required final check and calibration left to be completed when the outside ambient rises above 55°F.

Tools Required To Perform Check, Test & Start

1. Refrigeration gauge and manifold.
2. Voltmeter.
3. Clamp-on ammeter.
4. Ohmmeter.
5. Test lead. Minimum #16 AWG with insulated alligator clips.
6. Manometer for verifying gas pressure 0 to 20″ W.C.
7. Air temperature measuring device.
8. General refrigeration mechanics' tools.

Temporary Heating or Cooling

If it is planned that the unit will be used for temporary heating or cooling, Check, Test & Start must first be performed in accordance with this bulletin. Failure to comply with this requirement will void the warranty. New filters should be installed after the machines are used for temporary heating or cooling and the coils, fans, and motors checked for unacceptable levels of construction dust and dirt.

Contractor Responsibility

The installing contractor must be certain that:

- All supply and return air ductwork is in place and corresponds with installation instructions.
- All thermostats are mounted and wired in accordance with installation instructions.
- The central control panel (optional equipment) is installed and wired in accordance with installation instructions.
- All electric power, all gas, hot water or steam line connections, and the condensate trap installation have been made to each unit on the job. These main supply lines must be functional and capable of operating all units simultaneously.

Preliminary In Building

Prior to the beginning of Check, Test & Start procedures on the roof, the following steps should be completed in the building.

CAUTION: With the disconnect ON and the thermostat or Solid-State VAV Controller (SSVC) not satisfied, the machine will run. Do not start the machine until all the necessary prechecks and tests have been performed.

1. THERMOSTAT — CONSTANT VOLUME. Set the thermostat in the conditioned space at a point at least 10°F below zone temperature. On cooling only models, set the thermostat system switch on COOL and the fan switch on AUTO. On heating/cooling models, set the thermostat system switch on AUTO and the fan switch on AUTO.
2. CENTRAL CONTROL PANEL (OPTIONAL) — CONSTANT VOLUME. On cooling only models, set the system switch on COOL and the fan switch on AUTO. On heating/cooling models, set the system switch on AUTO and the fan switch on AUTO.
3. MANUAL ON-OFF (OPTIONAL) — VAV. If a manual on-off DPST system switch is used, set it in the ON position.
4. CENTRAL CONTROL PANEL (OPTIONAL) — VAV. Set the system switch on AUTO and the fan switch on ON.
5. TIMECLOCK (OPTIONAL). Set the timeclock in the day or override mode. Set the timeclock on the VAV panel to the override mode only.
6. NIGHT SETBACK THERMOSTAT (OPTIONAL). Set thermostat at a point at least 10°F below zone temperature.

Check of Roof Curb Installation

The proper installation of the unit on the roof curb should be checked. Any deficiencies observed should be noted in a separate report and forwarded to the Service Dept. and the contractor. The unit and curb assembly should have been installed level. The flashing of the roof mounting curb to the roof should be checked, especially at the corners for good workmanship.

Check For Minimum Clearances

A minimum of 48″ clearance must be provided on the main control box side of the unit. A minimum of 36″ clearance is required on all other sides. A clearance of 60″ is desirable on the side opposite the condenser for removal of the fan shaft.

The outside air intake must be remote from all building exhausts. The condenser air intake must be remote from all exhausts to assure full condenser capacity.

For gas heat units, check that the clearances described in the "Service Clearances" section of this bulletin have been provided.

Check & Report Damage

Damaged or missing parts, if any, should be itemized in a separate report stating what action has been initiated by the contractor to correct them. The absence of this information will be the basis for assuming that the unit was complete and in good condition on date of Check, Test & Start.

Check For Obstructions, Fan Clearance, Wiring

During the performance of the Check, Test & Start procedure you will have occasion to work in the various sections of the unit. It is important that you remove extraneous construction and shipping materials that may be found during this procedure.

All fans should be rotated manually to check for proper clearances and make certain that they rotate freely. Bolts and screws that may have jarred loose during shipment to the jobsite should be checked for tightness. All electrical connections should be re-tightened.

Pre-Startup Precautions
It is important to your safety that the unit has been properly grounded during installation. Check ground lug connection in main control box for tightness prior to closing circuit breaker or disconnect switch.

Verify that supply voltage on line side of disconnect agrees with voltage on unit identification plate and is within the utilization voltage range as indicated in Tabie 6.

Table 6.*

SYSTEM VOLTAGE	NAMEPLATE	UTILIZATION VOLTAGE	
		MIN.	MAX.
208-230/60/3	208/230	187	253
480/60/3	460	414	506
575/60/3	575	517	633

*Full load amp rating of the motors must not be exceeded.

SYSTEM VOLTAGE — That nominal voltage value assigned to a circuit or system for the purpose of designating its voltage class.

NAMEPLATE VOLTAGE — That voltage assigned to a piece of equipment for the purpose of designating its voltage class and for the purpose of defining the minimum and maximum voltage at which the equipment will operate.

UTILIZATION VOLTAGE — The voltage at the line terminals of the equipment at which the equipment must give fully satisfactory performance.

Once it is established that supply voltage will be maintained within the utilization range under all system conditions, check and calculate if an unbalanced condition exists between phases. Calculate percent voltage unbalance as follows:

$$\text{③ Percent Voltage Unbalance} = 100 \times \frac{\text{② Max. voltage deviations from average voltage}}{\text{① Average voltage}}$$

GIVEN: Example — With voltage of 220, 216 and 213.

HOW TO USE THE FORMULA:

① Average voltage $= 220 + 216 + 213 = 649 \div 3 = 216$

② Max. voltage deviation from average voltage $= 220 - 216 = 4$

③ Percent Voltage Unbalance $= 100 \times \frac{4}{216} = \frac{400}{216} = 1.8\%$

Percent voltage unbalance must not exceed 2%.

Check Field Duct Connections
Verify that all duct connections are tight and that there is no air bypass between supply and return.

CONTROL SYSTEM CHECK, TEST & START PROCEDURE

Control Voltage Check — Constant Volume
With disconnect switch in the open (off) position, disconnect wires 39, 40, and 42 from low voltage transformer TR1.

Close the disconnect switch to energize TR1 control transformer.

Check primary (208V or 230V) and secondary (24V) of control transformer TR1.

Control Voltage Check — VAV
With disconnect switch in the open (off) position, disconnect wires 39, 40, 42 and 154 from low voltage transformer TR1.

Close the disconnect switch to energize TR1 control transformer.

Check primary (208V or 230V) and secondary (24V) of control transformer TR1.

Thermostat Preliminary Check — Constant Volume
With disconnect switch open and wires 39, 40 and 42 disconnected from TR1 transformer, attach one lead of ohmmeter to terminal R on TS1 terminal block. Touch, in order, other ohmmeter lead to terminals Y1, Y2 and G at TS1 terminal block. There must be continuity from terminal R to terminals Y1, Y2 and G.

R to Y1 indicates first stage cool.
R to Y2 indicates second stage cool.
R to G indicates fan (auto).

Replace wires 39, 40 and 42 on TR1 transformer.

VAV Field Wiring Preliminary Check — VAV
With disconnect switch open and wires 39, 40, 42 and 154 disconnected from TR1 transformer, attach one lead of ohmmeter to terminal R on TS1 terminal block. Touch, in order, the other ohmmeter lead to terminals D, 20 and G at TS1 terminal block. With either the manual system switch closed or the timeclock in day mode, there must be continuity from terminal R to terminals D, 20 and G.

Replace wires 39, 40, 42 and 154 on TR1 transformer.

ECONOMIZER DAMPERS & FILTERS CHECK, TEST & START PROCEDURE

Filter Section Check
Remove filter section access panels and check that filters are properly installed. Note airflow arrows on filter frames.

Economizer Air Cycle Check
Note that since economizer is controlled by outside air temperature and humidity, it may not be possible to perform these checks under certain outdoor air conditions. Refer to Table 7.

Note: If a 230V power exhaust fan is provided, it should energize as return air damper closes.

Caution: If unit is equipped with gas heat and the inside of unit is hot (over 130°F) due to solar gain, the evaporator may be energized by the furnace fan switch. If these conditions exist, the "Evaporator Blower Fan, Return Air Fan & Power Exhaust" check, test and start procedure must be performed before the "Economizer Air Cycle Check" so that the fan may be safely operated.

Constant Volume: Open disconnect switch. **If there is no timeclock, install jumper wire between terminals R and D on TS1 terminal block.** In order to disable mechanical cooling, remove wire 112 from terminal 8 on TS2 terminal block. In order to disable fan, remove thermostat wire from terminal G on TS1 terminal block. Turn minimum position potentiometer to the full closed setting.

To Prove Enthalpy Control Senses High Enthalpy:
1. Set enthalpy control to the D setting.
2. Set mixed air setpoint to the minimum setting.
3. Closed disconnect switch. Fresh air damper should modulate to its minimum position and return air damper should modulate open. (It may not be possible to perform this check if outdoor air enthalpy is low.)

To Prove Mixed Air Sensor Operates Dampers:
1. Set mixed air setpoint to the maximum setting.
2. Set enthalpy control to the A setting.
3. Slowly lower the setpoint temperature of the mixed air control. When the mixed air setpoint is less than the actual mixed air temperature, the outside air damper should modulate toward its open position. (It may not be possible to perform this check if outdoor air enthalpy is high. If it is, go to step 5.)
4. Slowly increase the setpoint temperature of the mixed air control. When the mixed air setpoint is greater than the actual mixed air temperature, the outside air damper

should modulate toward its closed position. Allow damper to continue modulating to its minimum position.
5. Turn minimum position potentiometer toward the full open setting. Outside air damper should modulate open.

Reset mixed air control and enthalpy control to specified setpoints. If setpoints are not specified, it is recommended that the mixed air control be set at 65°F and the enthalpy control be set at C.

Adjust and tighten damper motor and damper blade linkages.

Open disconnect switch. Replace thermostat wire at terminal G on TS1 terminal block and wire 112 at terminal 8 on TS2. Remove jumper wire from terminals R and D only when timeclock is to be used.

VAV: Open disconnect switch. On models equipped with electric heat, set changeover thermostat THC at least 10°F below return air temperature. In order to disable fan, remove field installed wire from terminal G on TS1 terminal block (refer to Wiring Diagrams 5, 6 and 7). To disable mechanical cooling, remove wire 137 from 20 on TS4 terminal block. Turn minimum position potentiometer to the full closed setting.

Note: The "step-and-wait" built into the SSVC will cause the full period of modulation to be several minutes.

To Prove Enthalpy Control Senses High Enthalpy:
1. Set enthalpy control to the D setting.
2. Set SSVC setpoint dial to 40°F.
3. Close disconnect switch. Fresh air damper should modulate to its minimum position and return air damper should modulate open. (It may not be possible to perform this check if outdoor air enthalpy is low.)

To Prove SSVC Discharge Air Sensor Operates Dampers:
1. Set SSVC setpoint dial to 90°F.
2. Set enthalpy control to the A setting.
3. Slowly lower the temperature setting of the SSVC setpoint dial. When this economizer discharge air setpoint (the setpoint dial setting minus one-half the control band setting plus any reset) is less than the actual discharge air temperature, the outside air damper should modulate toward its open position. (It may not be possible to perform this check if outdoor air enthalpy is high. If it is, go to step 5.)
4. Slowly increase the temperature setting of the SSVC setpoint dial. When the economizer discharge air setpoint is greater than the actual discharge air temperature, the outside air damper should modulate toward its closed position. Allow damper to continue modulating to its minimum position.
5. Turn minimum position potentiometer toward the full open setting. Outside air damper should modulate open.

Reset SSVC, enthalpy control and changeover thermostat to specified setpoints. If setpoints are not specified, it is recommended that they be set at 55°F, B and 68°F, respectively.

Adjust and tighten damper motor and damper blade linkages.

Open disconnect switch. Replace wire 137 at terminal 20 on TS4 terminal block. Replace field installed wire at terminal G on TS1 terminal block.

Economizer Fresh Air Damper Setting

The minimum position potentiometer is located on top of the economizer actuator on constant volume units, and just inside the actuator cover on VAV units. It is factory set to provide 15% fresh air. Unless regulated by local codes or unusual conditions exist, a 15% fresh air setting should not be exceeded to maintain optimum heating and cooling efficiency. Determine the fresh air requirement and check position of minimum position potentiometer. Readjust if necessary. Note that 15% fresh air does not correspond to 15% of motor stroke.

Enthalpy Control Setting

The enthalpy control is sensitive to both the temperature and humidity of the outside air entering the unit. The control has a marked scale of setting A through D. When the outside conditions exceed the setting of the control, it resets the dampers to the minimum outside air intake position.

Table 7. Enthalpy Control Settings

CONTROL SETTING	CONTROL POINT (°F) AT		
	20% RH	50% RH	80% RH
A	78	73	67
B	73	68	62
C	68	63	57
D	63	58	51

EVAPORATOR BLOWER FAN, RETURN AIR FAN & POWER EXHAUST — CHECK, TEST & START PROCEDURE

Bearing Check

Prior to energizing any fans, check and make sure that all setscrews are tight so that bearings are properly secured to shafts. If bearings are the eccentric locking type and the eccentric collar has come loose during shipping, the bearing must be resecured to the shaft using the following procedure:
1. Slide the collar up to the bearing and turn it by hand in the direction of shaft rotation until it slips over the inner extension and engages the eccentric.
2. Keep turning the collar in the direction of shaft rotation until the collar and inner ring eccentric grooves lock.
3. Place a punch in the blind hole in the collar and strike it sharply in the direction of shaft rotation to lock the collar and inner ring tightly together. This also tightens the bearing to the shaft.
4. Now tighten the collar setscrew firmly to lock the bearing on the shaft.

Set Evaporator Fan RPM

All evaporator motor sheaves are set at midpoint when tested and shipped from the factory. Actual rpm's must be set and verified with a tachometer. Refer to Tables 9 and 10 for basic unit fan rpm. Refer also to "AIR BALANCING" section on page 51 for additional information.

CONSTANT VOLUME — With disconnect switch open, disconnect thermostat wires at terminals R and G on terminal strip TS1; this will prevent heating and mechanical cooling from coming on. Place a jumper wire across terminals R and G on TS1 terminal block. Close disconnect switch. Evaporator fan motor will operate so rpm can be checked.

VAV — With disconnect switch open, remove wire 137 from terminal 20 on TS4 terminal block; this will prevent heating and mechanical cooling from coming on. Close disconnect switch. Evaporator fan motor will operate so rpm can be checked.

Drive Belt Tension and Alignment Adjustment

Check that the driving and driven sheaves are in alignment and that the shafts are parallel by placing a straightedge across the faces of the sheaves. There should be no gap between the straightedge and the sheaves.

Check drive for adequate run-in belt tension. Use the following procedure to determine the proper belt tension:
1. Measure span length (t) in inches as shown in Figure 42.
2. From Figure 42, the deflection height (h) is always 1/64″ per inch of span length (t). For example, a 32″ span length would require a deflection of 32/64″ or 1/2″.
3. Determine the minimum and maximum recommended pounds force using Table 8.

Find the minimum recommended deflection force for the belt section and type based upon the small sheave diameter and drive ratio. For intermediate diameters and/or drive ratio combinations, the minimum deflection force may be interpolated.
4. Using a spring scale, apply a perpendicular force to any ONE of the belts at the mid-point of the span as shown

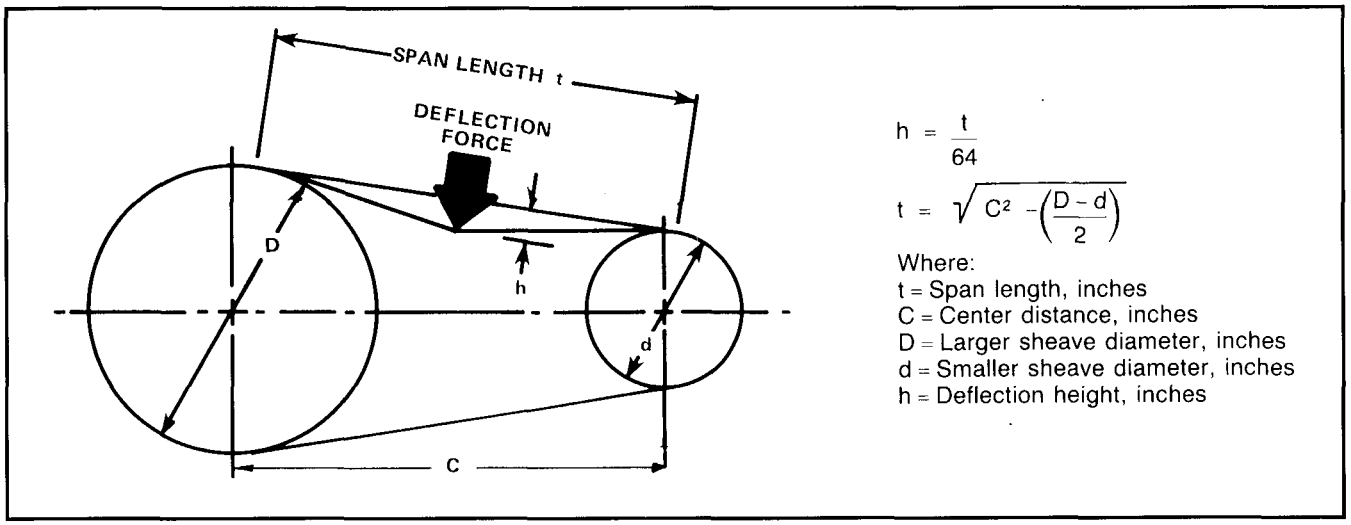
in Figure 42. Compare this deflection force with values found in Step 3.

a. If the deflection force is below the minimum, the belts are too loose and the tension should be increased by increasing the center distance.
b. If the deflection force is higher than the maximum, the belts are too tight and the tension should be decreased.

When new V-belts are installed on a drive, the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall between the minimum and maximum force.

To determine the deflection distance from the normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple-belt drives, an adjacent undeflected belt can be used as a reference.

Figure 42. Drive Belt Tension Adjustment



Evaporator Fan Rotation Check

Check that fan rotates clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse two incoming power cables at TB terminal block. **In this case, repeat "Bearing Check."**

Do not attempt to change load side wiring. Internal wiring assures all motors will rotate in correct direction once evaporator fan motor rotation check has been made.

Electrical Input Check

Make preliminary check of evaporator fan ampere draw and verify that motor nameplate amps are not exceeded. A final check of amp draw should be made upon completion of air balancing of the duct system.

Return Air Fan (Optional Equipment)

If return air fan option is provided, check sheave alignment and belt tension.

Adjustment of the return air fan consists of a visual and fingertip test of the pressure relief dampers to determine if the return air system is in balance with the return air ductwork. With disconnect switch open, make sure that the wiring is set up according to the "SET EVAPORATOR FAN RPM" section above. Close disconnect switch. Evaporator fan and return air fan will start and run.

With fresh air damper closed, return air damper fully open and with both fans operating, carefully inspect the pressure relief dampers. The dampers should be closed. If they are open, the return air fan is running too fast and must be slowed down by adjusting the sheave. If the dampers are closed, they should be just closed and a fingernail placed beneath a blade should easily open the dampers. If the dampers are too tightly closed, the return air fan is running slow and must be speeded up by adjusting the sheave.

After sheave adjustments are made, check amperage draw and verify that nameplate amps are not exceeded. A final check of amp draw should be made upon completion of air balancing of the system.

Table 8. Recommended Pounds of Force Per Belt

BELT SECTION	SMALL SHEAVE DIAMETER (IN.)	DRIVE RATIO			
		1.0 Min.—Max.	1.5 Min.—Max.	2.0 Min.—Max.	4.0 & Over Min.—Max.
A	3.0	2.0—3.0	2.3—3.5	2.4—3.6	2.6— 3.9
	4.0	2.6—3.9	2.8—4.2	3.0—4.5	3.3— 5.0
	5.0	3.0—4.5	3.3—5.0	3.4—5.1	3.7— 5.6
	7.0	3.5—5.3	3.7—5.6	3.8—5.7	4.3— 6.5
B	4.6	3.7—5.6	4.3—6.5	4.5—6.8	5.0— 7.5
	5.0	4.1—6.2	4.6—6.9	4.8—7.2	5.6— 8.4
	6.0	4.8—7.2	5.3—8.0	5.5—8.3	6.3— 9.5
	8.0	5.7—8.6	6.2—9.3	6.4—9.6	7.2—10.8

Power Exhaust (Optional Equipment)

At this time, adjustment of the mercury switch must be made. To adjust mercury switch, remove switch and loosen bracket. Rotate bracket to estimated desired position and tighten (this position is usually at about 20% to 30% outside air). Snap in mercury switch and install filter access panel. Energize the economizer circuit. If desired pressure in controlled space is not obtained, repeat the step above until proper setting is located.

Restoring Connections

CONSTANT VOLUME — With disconnect switch open, remove jumper wire from terminals R and G on TS1 terminal block, and reconnect thermostat wires at terminals R and G on TS1.

VAV — With disconnect switch open, replace wire 137 at terminal 20 on TS4 terminal block.

Table 9. Supply Air Fan Performance Data

MODEL	SCFM	EXTERNAL STATIC PRESSURE (INCHES OF WATER)															
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
160	5200	747	1.60	785	1.80	823	2.02	859	2.24	895	2.40						
	5800	789	2.03	825	2.33	867	2.64	906	2.95	948	3.23	989	3.53	1030	3.83	1071	4.14
	6400	813	2.45	864	2.85	910	3.25	952	3.65	1000	4.05	1040	4.45	1092	4.88	1139	5.29
	7000	854	3.07	904	3.47	952	3.87	998	4.29	1038	4.76	1091	5.12	1143	5.56	1192	5.97
	7600	895	3.69	944	4.09	994	4.49	1044	4.92	1090	5.38	1142	5.78	1194	6.23	1244	6.65
201	6400	813	2.45	864	2.85	910	3.25	952	3.65	1000	4.05	1040	4.45	1092	4.88	1139	5.29
	7200	863	3.35	911	3.72	961	4.10	1010	4.52	1050	5.00	1106	5.32	1162	5.78	1212	6.20
	8000	927	4.02	976	4.45	1026	4.87	1078	5.31	1130	5.75	1178	6.23	1226	6.65	1275	7.10
	8500	980	4.90	1030	5.39	1081	5.82	1133	6.29	1185	6.73	1237	7.32				
	9000	1032	5.78	1084	6.32	1136	6.76	1188	7.26	1240	7.70						

NOTE:
STANDARD MOTOR: CUR160 — 3 hp (all models except 5 hp with 400,000 furnace)
CUR201 — 5 hp
OVERSIZE MOTOR: CUR160 — 5 hp or 7½ hp
CUR201 — 7½ hp
MAXIMUM FAN SPEED: 1200 rpm

FIELD SUPPLIED PULLEYS REQUIRED

DO NOT SELECT IN THESE AREAS — INTERPOLATION ONLY

Table 10. Supply Fan RPM Range

MOTOR HORSEPOWER	RPM RANGE
3	731 — 993
5	875 — 1111
7½	1011 — 1206

Evaporator blower performance data includes internal pressure losses for cabinet, dry evaporator coil, standard throw-away filters and standard plenum. Refer to component pressure drop chart in the product catalog for data on wet evaporator coil, options and accessories.

FOR 208V DO NOT EXCEED SERVICE FACTOR AT 1.00 (3.00 BHP FOR 3 HP MOTOR, 5.00 BHP FOR 5 HP MOTOR, AND 7.50 BHP FOR 7½ HP MOTOR).

Airflow must be adjusted so that temperature rise does not exceed 65°F on electric heat units with 70°F entering air. For gas heat units the airflow must be adjusted so that the external static pressure does not exceed the value listed on the unit dataplate. In addition, the air temperature rise must fall within the ranges given in Table 19.

Table 11. FLA/LRA For Each Motor

MOTOR	UNIT MODEL	HP	208/230V		460V		575V	
			FLA	LRA	FLA	LRA	FLA	LRA
EVAPORATOR MOTOR	CUR160	3	10.0	68	5.0	34	3.6	25.0
	CUR160, 201	5	15.0	88	7.3	44	5.9	35.0
	CUR160, 201	7½	20.0	159	10.5	74	8.0	54.0
CONDENSER FAN MOTOR**	CUR160, 201	⅓	3.0	10	1.5	5	1.1	3.5
RETURN FAN MOTOR	CUR160	2	6.6	39	3.3	20	2.2	15.0
	CUR201	3	8.0	54	4.0	27	3.0	25.0
MOTOR	UNIT MODEL	HP	208/230V		460V		575V	
			RLA	LRA	RLA	LRA	RLA	LRA
COMPRESSOR*	CUR160*	9	34.6	194	17.3	97	13.8	77.2
	CUR201*	10	42.0	207	19.0	104	16.9	82.8

*2 Per Unit; **3 Per Unit

NOTE: For 380/415V, use 460 volt amp values.

SEQUENCER (W7100)
CHECK, TEST & START PROCEDURE — VAV ONLY

Sequencer Control

The SSVC (Solid-State VAV Control) provides on/off control of the steps of mechanical cooling available in the VAV units. Models CUR160 and CUR201 have two steps of cooling and up to two steps of heating available.

The microprocessor-based W7100 discharge air controller maintains the discharge air temperature in variable air volume heating/cooling systems by modulating an economizer and sequencing stages of mechanical heating or cooling.

The discharge air controller is located in the main control panel. The control includes the discharge air temperature setpoint adjustment (40°F to 90°F), a reset adjustment, a control band adjustment, and LED's that show which stages of cooling or heating are energized.

1. On a call for cooling, the discharge air controller will first modulate the economizer open (if outdoor enthalpy is suitable).
2. If additional cooling is required, it will activate the first stage of cooling and, if necessary, the second stage of cooling.
3. Staging is enabled when the signal from R is placed on terminal 20. The SSVC can then energize or de-energize unit cooling through switches Cool 1A and Cool 2A.
4. The control band is centered (one-half of the dial setting above and one-half below) on the discharge air temperature setpoint. **NOTE:** The setpoint will be reduced by one-half the control band setting in economizer mode.
5. The control band setting is adjustable from 2°F to 16°F. Too narrow of a control band will cause short cycling of the mechanical cooling.
6. At the end of a timing period, the microprocessor checks to see if the discharge air temperature is within the control band.
7. If it is below the control band, a stage is turned off. If it is above the control band, a stage is turned on.
8. After a switching action, a 4-minute timer is reset and the microprocessor will not check the discharge air temperature again until this 4-minute period is over.
9. If the discharge air temperature is within the control band, a 30-second timer is reset. As long as the discharge air temperature remains within the control band, the microprocessor will reset the 30-second timer.
10. If it finds the discharge air temperature outside the control band, it will make the appropriate switching action and reset the 4-minute timer.
11. The SSVC is set up at the factory to provide reset of the discharge air temperature from outdoor air temperature. In this situation, as the outdoor temperature drops, the discharge temperature setpoint is increased by adding reset.
12. The amount of reset added to the setpoint setting varies between minimum (zero) and maximum (reset setting) as the outdoor temperature varies between 50°F and 30°F, in economizer mode, or between 90°F and 70°F, in mechanical mode.
13. If reset is not desired, terminals 6 and 7 on the SSVC can be jumped.
14. **Recommended settings for the W7100:**
    a. 55°F on the setpoint adjustment
    b. 10°F/40°F on the reset
    c. 8°F to 10°F on the control band adjustment.
    NOTE: These setpoints assume adequate full load airflow, and also adequate minimum load airflow. Variable air volume systems with direct expansion mechanical cooling should NEVER be allowed to operate with no airflow.

Tempering Control (Electric Heat Only)

When the outdoor air temperature is low, it is possible that the discharge air temperature will be too cold due to the introduction of a minimum quantity of outside air for ventilation. In this situation, when the return air temperature goes below the changeover thermostat (THC) setpoint, the SSVC will go into tempering mode and will stage on heating when the discharge air temperature is less than the SSVC setpoint. If the outdoor air temperature is less than 70°F, the discharge air setpoint will be the sum of the setpoint setting and the reset (heat) setting. The staging operation is the same as above except that, instead of a 4-minute timer, a 2-minute timer is reset after a switching action.

REFRIGERATION SYSTEM
CHECK, TEST & START PROCEDURE

Preliminary Check

Make sure that hold-down bolts on compressors are secure and have not vibrated loose during shipment. Visually check all piping and clamps.

With disconnect swtich in the "off" position, remove the electrical box cover from the compressors and check the power connections for tightness. In the event any connections have vibrated loose in shipment, extreme care must be taken to see that they are properly replaced.

The entire refrigeration system has been factory charged and tested, making it unnecessary to field charge. Factory charges are shown in Table 13 and on the unit dataplate.

CAUTION: Prior to startup of the refrigeration system, the compressor crankcase heaters must have been in operation for at least four (4) hours. All subsequent startups must be preceded by the same four-hour heater operation if the main power to the unit has been interrupted.

Remove seal caps from service valves and install service manifold hoses. On units without optional pumpdown, gauges should read saturation pressure corresponding to ambient temperature.

NOTE: It is necessary to install two (2) sets of service manifolds in order to monitor both refrigeration circuits. *Caution must be taken to avoid "cross-connecting" manifold hoses between systems.*

Refrigeration Sequence Check — Constant Volume

The room thermostat has been previously set 10°F below room temperature; the system switch should still be in the "Cool" or "Auto" position and the fan switch should be in the "Auto" position.

If the unit is equipped with an economizer, set the enthalpy changeover control to the "D" control setting. Remove thermostat wire or unit wire 45 from terminal Y2 on TS1 terminal block and close disconnect switch. The following operational sequence should be observed:

1. Current through primary winding of transformer TR1 energizes 24 volt control circuit; simultaneously, L1 feeds terminal 4 of solid-state protectors GDM1 and GDM2 direct, and L2 feeds terminal 5 initiating the solid-state time delay cycle.
2. After a time delay of approximately 5 minutes ±30 seconds, the system is prepared to respond to the thermostat's call for cooling.
3. When room temperature is above thermostat setting, the thermostat makes R to G and Y1, thereby energizing relay coil R1 and contactor coil C5.
4. Contactor C5 closes its contacts L1 to T1, L2 to T2, L3 to T3 to supply power to evaporator motor EM. Simul-

taneously, relay R1 closes its contacts to energize the first stage compressor control circuit through all safety devices, including solid-state protector contacts 4 and 6.

5. When R1 closes, contactor C1 is energized. Contactor C1 makes contacts L1 to T1, L2 to T2 and L3 to T3, thereby energizing compressor motor COM1.

   CUR201 Only (No Pumpdown): Simultaneously, liquid line solenoid valve LSV1 is energized. It then opens to allow refrigerant to flow to the first-stage half of the evaporator coil. Note: An anti-chatter design will lock out compressor circuits in the event of contactor chatter, and repeat the 5-minute timing cycle.

   CUR201 Only (With Pumpdown): During pumpdown liquid solenoid valve LSV1 is de-energized. It then closes to stop refrigerant flowing to the evaporator coil. Compressor COM1 will continue to move refrigerant from the evaporator coil into the condenser coil until the low pressure switch LP1 breaks (10 ± 4 psi), shutting off COM1. This unit has a recycling pumpdown and will start the compressor COM1 should the low pressure switch LP1 make. A likely cause for this recycling is a faulty solenoid valve LSV1.

6. Contactor C1 will close auxiliary contacts A to B and open C to D. Opening C to D will de-energize crankcase heater; closing A to B will complete and maintain compressor circuit through energized relay R1.

7. Condenser fans CM1, CM2, and CM3 will be activated as required to maintain condenser head pressure through pressure switches CPS1 or CPS4, CPS2 or CPS5, and CPS3 or CPS6, respectively. Refer to Table 12.

8. With all safety devices closed, system will continue the cooling operation until thermostat is satisfied.

9. Replace wire on terminal Y2 at TS1 terminal block. Second-stage cooling will be energized. R to Y2 will close, energizing relay R2 and closing contacts 2-4 to energize contactor C2. Contactor C2 makes contacts L1 to T1, L2 to T2 and L3 to T3, thereby energizing compressor COM2.

   CUR201 Only (No Pumpdown): Simultaneously, liquid line solenoid valve LSV2 is energized. It then opens to allow refrigerant to flow to the second-stage half of the evaporator coil.

   CUR201 Only (With Pumpdown): During pumpdown liquid solenoid valve LSV2 is de-energized. It then closes to stop refrigerant to flow to the evaporator coil. Compressor COM2 will continue to move refrigerant from the evaporator coil into the condenser coil until the low pressure switch LP2 breaker breaks (10 ± 4 psi), shutting off COM2. This unit has a recycling pumpdown and will start the COM2 should the low pressure switch LP2 make. Likely cause for this recycling is a faulty solenoid valve LSV2.

10. When the thermostat is satisfied, it will break R to G, Y1 and Y2, and the above sequence of operation will be reversed. The solid-state protectors will be recycled, and the timing network will initiate the 5-minute time delay.

Refrigeration Sequence Check — VAV

The manual system switch should be in the "ON" position, or, in the case of a central control panel, the system switch should be in the "COOL" or "AUTO" position and the fan switch should be in the "ON" position. Set the SSVC setpoint at a point at least 10°F below the discharge air temperature. Set the enthalpy control to the D setting. On electric heating/cooling models, set the changeover thermostat THC at least 10°F below the return air temperature.

Remove unit wire 45 from terminal Y2 on TS1 terminal strip and close disconnect switch. The following operational sequence should be observed:

1. Current through primary winding of transformer TR1 energizes 24 volt control circuit; simultaneously, L1 feeds terminal 4 of solid-state protectors GDM1 and GDM2 direct, and L2 feeds terminal 5 initiating the solid-state time delay cycle.

   The field connection between terminals 20 and G allows contactor coil C5 to be energized. Contactor C5 closes its contacts L1 to T1, L2 to T2 and L3 to T3 to supply power to evaporator motor EM.

2. After a time delay of approximately 5 minutes ±30 seconds, the system is prepared to respond to the SSVC call for cooling. (At outdoor ambients below 65°F, economizer modulation period may cause delay to be longer.)

3. When discharge air temperature is above SSVC setpoint (plus any reset), Cool 1A contacts close, energizing relay coils R1 and R1A. Relay R1 contacts close, energizing the first stage compressor circuit through all safety devices, including solid-state protector contacts 4 and 6. Relay R1A contacts also close, energizing the hot gas bypass valve HGBV through normally closed contacts of relay R2.

   Note: Hot gas bypass is operated as part of the first stage of mechanical cooling. The control is set to maintain a minimum suction pressure of approximately 56 psig and is operated independently from the temperature controls in the unit. The hot gas bypass circuit is used only when cooling demand is less than the first mechanical cooling stage capacity.

4. Contactor C1 makes contacts L1 to T1, L2 to T2 and L3 to T3, thereby energizing compressor motor COM1.

   CUR201 Only (No Pumpdown): Simultaneously, liquid line solenoid valve LSV1 is energized. It then opens to allow refrigerant to flow to the first-half stage of the evaporator coil. **Note:** An anti-chatter design will lock out compressor circuits in the event of contactor chatter, and repeat the 5-minute timing cycle.

   CUR201 Only (With Pumpdown): During pumpdown liquid solenoid valve LSV1 is de-energized. It then closes to stop refrigerant flowing to the evaporator coil. Compressor COM1 will continue to move refrigerant from the evaporator coil into the condenser coil until the low pressure switch LP1 breaks (10 ± 4 psi), shutting off COM1. This unit has a recycling pumpdown and will start the compressor COM1 should the low pressure switch LP1 make. A likely cause for this recycling is a faulty solenoid valve LSV1.

5. Contactor C1 will close auxiliary contacts A to B and open C to D. Opening C to D will de-energize crankcase heater; closing A to B will complete and maintain compressor circuit through energized relay R1.

6. Condenser fans CM1, CM2, and CM3 will be activated as required to maintain condenser head pressure through pressure switches CPS1 or CPS4, CPS2 or CPS5, and CPS3 or CPS6, respectively. Refer to Table 12.

7. With all safety devices closed, the system will continue the cooling operation until the SSVC is satisfied.

8. Replace wire on terminal Y2 at TS1 terminal block. Second-stage cooling will be energized. SSVC Cool 2A contacts close, energizing relay R2. Contacts 2-4 of relay R2 close, energizing the second stage compressor contactor C2 whose contacts in turn energize the second compressor COM2. Contacts 4-5 of relay R2 open, de-energizing the hot gas bypass valve.

   CUR201 Only (No Pumpdown): Simultaneously, liquid line solenoid valve LSV2 is energized. It then opens to allow refrigerant to flow to the second-stage half of the evaporator coil.

   CUR201 Only (With Pumpdown): During pumpdown liquid solenoid valve LSV2 is de-energized. It then closes

to stop refrigerant flowing to the evaporator coil. Compressor COM2 will continue to move refrigerant from the evaporator coil into the condenser coil until the low pressure switch LP2 breaks (10±4 psi), shutting off COM2. This unit has a recycling pumpdown and will start the compressor COM2 should the low pressure switch LP2 make. A likely cause for this recycling is a faulty solenoid valve LSV2.

9. When the discharge thermostat is satisfied, the above sequence of operation will be reversed. The solid-state protectors will be recycled, and the timing network will initiate the 5-minute time delay.

Table 12. Condenser Pressure (Psig)

UNIT	FAN	CUT IN	CUT OUT	LOCATION
CUR160 CUR201	CM1	225	150	Fan nearest electrical access
	CM2	250	170	Center
	CM3	280	190	Fan furthest from electrical access

Table 13. Refrigerant System Charge (Lbs. R-22)

UNIT MODEL	CHARGE (LBS.)	
	1ST CIRCUIT	2ND CIRCUIT
CUR160	10.0	10.0
CUR201	10.5	10.5

Expansion Valve Superheat Adjustment

It is very important that the expansion valve superheat setting be adjusted to between 8°F and 14°F. Insufficient superheat will cause liquid floodback to the compressor and possible slugging. Excessive superheat will reduce system capacity and shorten compressor life. Turn the adjusting stem clockwise to increase superheat. Adjust the stem (maximum of one turn at a time) and observe the superheat. Allow up to 30 minutes for the system to rebalance at the final superheat setting.

Refrigeration Performance Check

Refrigeration system will be operating normally. Normal operating pressures are shown in Table 15. Check that compressor FLA corresponds to values shown in Table 11. FLA draw can be as much as 25% less than values in Table 11 at low load conditions and low ambient condensing temperatures. Values in Table 11 can be exceeded when ambient temperature is above 104°F.

On CUR201 units, check liquid sightglasses. Glasses should be full and clear at full load conditions.

Remove wires 45 and 44 from terminals Y2 and Y1, respectively, at TS1 terminal block. Allow refrigeration system to shut down normally and then open disconnect switch.

Reconnect wires to terminals Y2 and Y1.

Constant Volume: Set thermostat and enthalpy changeover control to desired setpoints.

VAV: Reset SSVC, enthalpy control and changeover thermostat (if used) to specified setpoints. If setpoints are not specified, 55°F, B and 68°F, respectively, are recommended.

Table 14. Refrig. System Subcooling & Superheat Values

Subcooling at Condenser Outlet	2°F to 8°F*
Superheat at Thermal Expansion Valve Bulb	8°F to 14°F*

*Values based on standard operating conditions of 95°F condenser ambient, 400 cfm/ton at 80°F DB and 67°F WB.

Table 15. Refrig. System — Normal Operating Pressures

SYSTEM PRESSURE (PSIG)	CONDENSING AMBIENT (°F)			
	65	75	95	115
SUCTION	50 to 90			
DISCHARGE	200	240	305	380

DIFFERENTIAL PRESSURE SWITCH CHECK, TEST & START PROCEDURE — VAV ONLY

Set the pressure controller (DPS) to the desired static pressure by observing the calibrated scale secured to the range screw enclosure.

Connect a voltmeter across the W and B terminals of the damper motor, making sure the meter is set to read up to 30 VAC. A reading of zero volts indicates that the motor is not driving. A reading of 28 volts (approximate) indicates that the motor is either driving open or driving closed.

Tee in a pressure gauge in the lines to the pressure switch. Make sure the voltmeter leads and the pressure lines are long enough so that you can close the access door. Start the unit and observe the voltmeter and pressure gauge. When the control is satisfied, the meter reading should fall to zero. Mark down the reading on the pressure gauge as the low actuation point. As the building cools off, the VAV boxes will start to close. This will raise the static pressure to the high actuation point. If this point is too high or too low, adjust the range screw accordingly. Refer to "Differential Pressure Switch" on page 15 for additional information.

If low actuation point is too high or too low, adjust the null adjustment screw. Turn the screw counterclockwise to lower the static pressure and widen the null or turn the screw clockwise to raise the static pressure and close the null. Maximum differential is 0.17″ to 0.31″ W.C., depending on setpoint setting. Do not attempt to set the differential any wider than these maximum values.

CENTRAL CONTROL PANEL CHECK, TEST & START PROCEDURE

The check of the central control panel (optional equipment) simply consists of checking for continuity of certain circuits at TS1 and TS4 terminal blocks with an ohmmeter to verify proper field wiring from the panel to the unit.

With disconnect switch in the OFF position, place leads of ohmmeter as indicated in Table 16. Continuity must exist in all cases; if not, check the wiring and connections.

VAV Unit Control Panel — Sequence of Operation

The VAV remote control panel is designed to provide in-the-space programming of unit operation and to make operation of the unit completely automatic. The panel will operate as follows:

Cooling Only: If the unit was ordered without an optional heating system, the seven-day timeclock will switch the unit from "occupied" (cooling) to "unoccupied" (no cooling), depending on the setting of the timeclock trippers. The time of changeover should be set to suit the occupancy of the building. All remote panels are furnished with a one-hour morning warm-up control timer which is provided to permit the space temperature to return to normal setting prior to activating cooling cycle. Because of the morning warm-up timer, the outside air damper is shut and the unit will not go into the cooling mode for one hour after the timeclock has switched from the "unoccupied" to the "occupied" mode. If it is desired to change the mode from "unoccupied" to "occupied" on an occasional basis, because of overtime or weekend work, it is suggested that the override timer located on the face of the panel be used for this purpose, rather than resetting the timeclock trippers.

Heat/Cool Units: With the timeclock in the "unoccupied" mode, the operation of the unit may be controlled by a field installed night setback thermostat. This thermostat should be located wherever convenient in the occupied space, and should be set to maintain building temperature at the desired night setback level, usually 55°F. The heating system in the unit will cycle on demand of the night setback thermostat.

When the timeclock switches operation from the "unoccupied" mode to the "occupied" mode, the one-hour warm-up timer is activated and control is transferred to the warm-up relay RW and to the two-stage unit mounted return air ther-

mostat TW (factory set at 67°F, field adjustable).

When the unit is in the morning warm-up or night setback mode, the outside air damper is shut. Normally open contacts on relays RW (warm-up mode) or RN (night setback mode) close, energizing terminal 21 and relay R9 within the unit. Relay R9 bypasses the differential pressure switch and causes the discharge damper to open. When the damper is completely open, the auxiliary switch DDA closes, allowing power to flow to the return air thermostat TW. If TW is calling, the first stage heat and blower will be energized by relay R4 and the second stage heat will be energized by relay R5.

Normally open contacts of the warm-up relay RW are terminated on terminals on the VAV control panel designated MW1 and MW2. Similarly, normally open contacts of a field supplied relay RN should be terminated on MW1 and MW2 when night setback is used. If necessary, these contacts may be used to drive open all the zone VAV boxes during the morning warm-up period. (Some means of opening the VAV boxes when the unit heating is energized must be provided.)

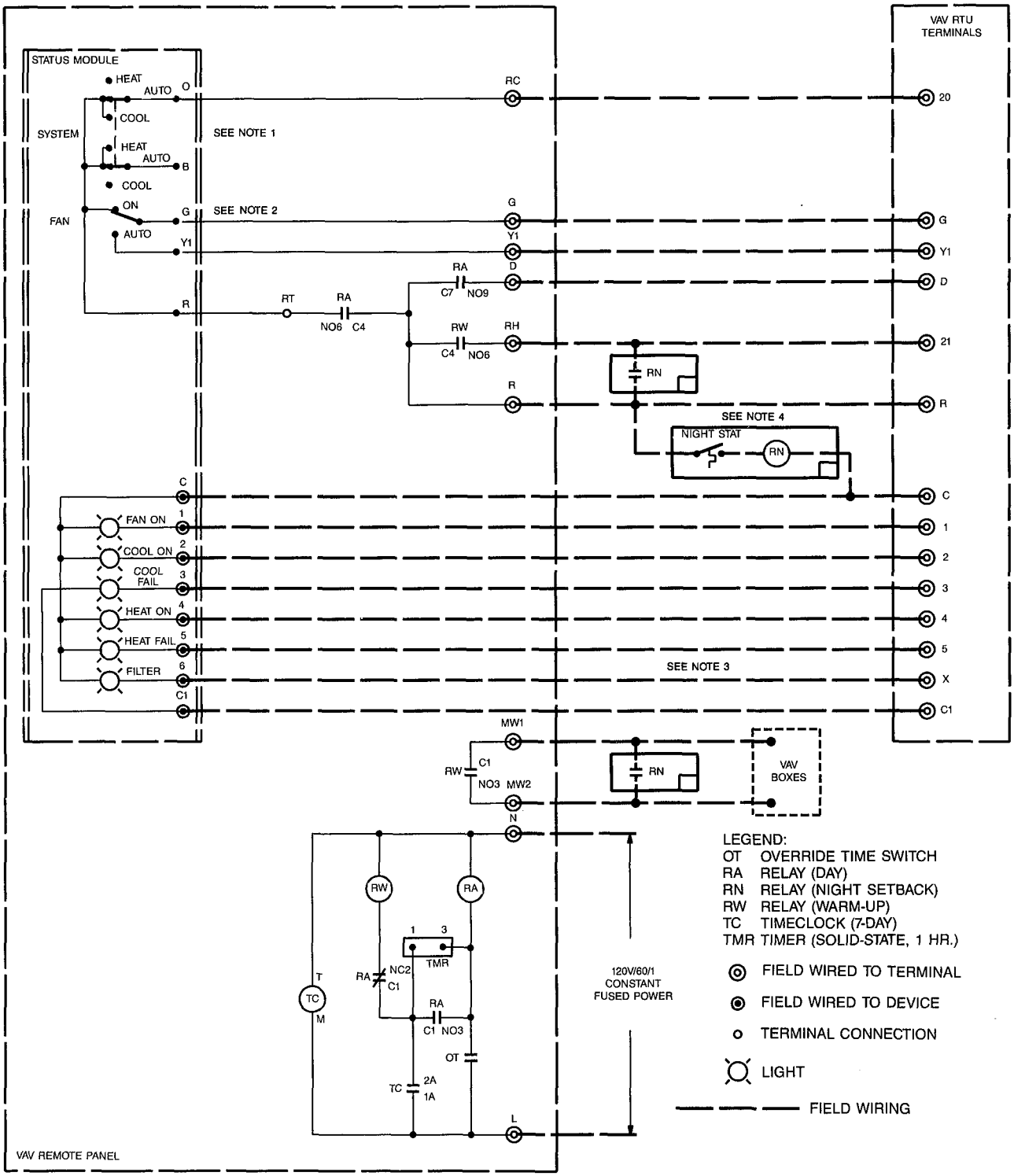
When the warm-up timer has completed its one-hour period, control of the unit is switched to the day relay RA. As a result, the economizer will be enabled and the unit will function under SSVC control. Refer to unit wiring diagram and Wiring Diagrams 7, 8, and 14.

Table 16.

FUNCTION	TERMINALS JUMPED*
FAN ON	C TO 1
COOL ON	C TO 2
COOL FAILURE	C1 TO 3
HEAT ON	C TO 4
HEAT FAILURE	C TO 5
CLOGGED FILTER	C TO X

*Remove factory wiring from unit terminals before checking.
NOTE: All signal lights are not present on all panels.

Wiring Diagram 16. Remote VAV Panel



NOTES:

1. For normal operation, system switch should be in "COOL" or "AUTO" position. "HEAT" position is same as "OFF."
2. For normal VAV operation, fan switch should be in "ON" position.
3. Unit not equipped with filter flag option, eliminate connections between unit "X" and status module "6" terminals.
4. Night setback thermostat and relay RN are field supplied.

GAS HEAT CHECK, TEST & START PROCEDURE

Gas Supply Pressures & Regulator Adjustments

The first step in checking out the gas-fired furnace is to test the gas supply piping to the unit for tightness and purge the system of air using methods outlined in the latest edition of the National Fuel Gas Code (ANSI Z223.1).

Verify that the disconnect switch is in the "OFF" position.

A soapy water solution should be used to check for gas leaks. Since the unit is subject to considerable jarring during shipment, it is extremely important that all gas connections and joints be tested for tightness.

Gas piping downstream from the unit inlet should be checked for leaks during the subsequent sequence check.

The supply gas pressure should be adjusted to 7.0″ W.C. on natural gas and 11.0″ on propane gas with the gas burners operating. If there is more than one unit on a common gas line, the pressures should be checked with all units under full fire. Pressure taps are provided on both the upstream and downstream sides of the gas valve. The normal manifold pressure for full input is 3.5″ W.C. on natural gas and 10.0″ for propane gas. Minimum gas supply pressure is 5.5″ W.C. for natural gas and 8.0″ for propane gas. In order to obtain rating, gas supply pressure must be 11.0″ W.C. for propane gas. The pressure regulator on propane gas models is adjusted for 11.0″ manifold pressure and is intended to prevent overfiring only.

Due to the fact that gas appliances located more than 2000 feet above sea level must be de-rated 4% per 1000 feet of total elevation and that variance in gas heating value and specific gravity require change in manifold pressure to obtain rating, it is mandatory that the input be adjusted at the installation site. **All installations should be made as outlined in the latest edition of the National Fuel Gas Code ANSI-Z223.1 for U.S.A., and CAN/CGA B149.1 and B149.2 for Canada.** The section entitled "Procedures To Be Followed To Place An Appliance in Operation" should be followed. Refer also to the "User's Information Manual" supplied with the unit for additional information on the gas furnace.

Table 17. Heat Exchanger Specifications

MAXIMUM INPUT BTUH	NUMBER OF CELLS	MAXIMUM BTUH PER CELL
300,000	12	25,000
400,000	16	25,000

Table 18.

BURNER ORIFICE	ORIFICE SIZE (DRILL)	
BTUH/CELL	NATURAL GAS	PROPANE OR LP GAS
25,000	40	53
Hi. Alt. Canada 22,500	42	55

⚠ WARNING

Should overheating occur or the gas supply fail to shut off, turn off the manual gas valve to the appliance before shutting off the electrical supply.

Sequence of Operation — Gas Heating

CAUTION: Do not fire gas furnace with burner box cover removed. This is extremely hazardous. Sightglasses are provided to monitor flame.

Constant Volume: With electricity and gas turned on, the thermostat system switch in the "HEAT" or "AUTO" position, and the fan switch in the "AUTO" position, the thermostat will close the circuit between unit terminals R and W1 (R-W1) when the temperature falls below the thermostat setting. This energizes relay R4 and heat anticipator HA.

VAV : Gas heat on VAV rooftop units is used for morning warm-up (if a VAV remote panel is used) or night setback heating only. The SSVC does not control the heating cycle. When the VAV remote panel timeclock initiates the one-hour morning warm-up cycle, it energizes the warm-up relay RW which closes the circuit between the terminals R and 21 (R-21) and energizes relay R9 in the unit. Normally open contacts on RW are supplied for connection to the VAV boxes so that they open fully on a call for heat. A night setback thermostat, if used, should be wired so that it also energizes terminal 21 and opens the VAV boxes on a call for heat. Normally open contacts on relay R9 act to fully open the discharge damper. (Another set of R9 normally open contacts connected to the SSVC act to lock out cooling during a call for heat.) When the discharge damper is open, the end switch DDA closes, supplying power to terminal 22 and the unit mounted warm-up thermostat TW. If TW is calling, power will be supplied to terminal W1 so that relay R4 and the heat anticipator HA will be energized.

All Units: Relay R4 energizes the ventor motor VM. Operation of the ventor motor closes the centrifugal switch VS on the ventor motor. If the temperature is low enough to close the limit controls HTL1, HTL2, HTL4 and HTL5, a "3-try" spark ignition sequence is initiated. Simultaneously, the Master Ignition Control (MIC) is energized, the MIC sparks for ignition on the right bank of burners, the indicator LED flashes once (indicates control is functional) and power is applied to the Slave Ignition Control (SIC) module. The SIC control sparks for ignition on the left bank of burners, the indicator LED flashes once, and the gas valve redundant and first stage operators (W1-C1) are energized.

When the burners are ignited a minimum 2 micro-amp DC current should flow through the flame between the sensor and ground electrodes. When the controller proves that flame has been established, it will keep the gas valve energized and discontinue the ignition spark.

If flame is not sensed by both MIC and SIC modules within 4 seconds, the gas valve is de-energized, the spark is stopped and the MIC control enters the "re-try" mode. In the re-try mode, the MIC control allows the ventor blower to purge for 60 seconds before starting the ignition spark and energizing the SIC and the valve. If flame is not sensed within 4 seconds, the valve is de-energized, the spark is discontinued, and a second re-try is attempted. If the second re-try is unsuccessful, the MIC closes the valve and locks itself out (indicated by a continually flashing LED). The control may be reset by momentarily interrupting power. This can be accomplished by briefly lowering the thermostat setpoint below room temperature, by turning the system switch to OFF or by shutting off the main power to the unit.

NOTE: If indicator LED is on continuously, it is likely that the ignition control has an internal defect. To make sure, interrupt thermostat power for a brief period and then restore. If LED stays on as before, replace the control. If indicator LED flashes, it is likely that something is wrong external to the ignition control.

Natural gas models are equipped with two-stage gas valves. Propane gas models have single-stage valves only. On natural gas models, manifold pressure will be approximately 0.9″W.C. on low fire and 3.5″ on high fire. On propane gas models, manifold pressure will be approximately 10″ W.C. (assuming 11″ W.C. gas supply pressure to the gas valve).

The combined heat from the heat anticipator HA and the burning gas cause the fan control FS to close its contacts (factory set at 130°F, field adjustable), energizing relay R5 which in turn energizes contactor C5 and starts the evaporator motor EM. Operation of the evaporator blower causes air to circulate past the heat exchanger and delivers heated air to the conditioned space.

Constant Volume: On natural gas models, in the event that the temperature at the thermostat continues to fall, the thermostat will also close the circuit between unit terminals R and W2. This will energize relay R4A and close its normally open contacts in series with the second stage of the gas valve. The gas manifold pressure will increase to approximately 3.5″ W.C.

The air supplied to the heated space will increase in temperature.

When the space temperature rises, two-stage thermostats will first open R-W2 and finally R-W1. Single-stage thermostats will open R-W1.

VAV: On natural gas models, in the event that the temperature at the warm-up thermostat continues to fall, the thermostat will also close the contact between terminals 22 and W2. This will energize relay R4A and close its normally open contacts in series with the second stage of the gas valve. The gas manifold pressure will increase to approximately 3.5″ W.C. The air supplied to the heated space will increase in temperature.

When the return air temperature rises, the warm-up thermostat will first open 22-W2 and finally 22-W1.

On night setback operation, the setpoint of the setback thermostat is probably lower than the setpoint of the warm-up thermostat. In this case, the setback thermostat will open R-21 when the space temperature rises. This simultaneously de-energizes both terminals W1 and W2.

All Units: De-energizing terminal W1 will cause the gas valve to close. As the heat exchanger cools, the temperature will decrease at the fan control FS and when the temperature reaches the setpoint (factory set at 100°F, field adjustable), the fan control will open its contacts causing the circulating air blower to stop.

When the building is at normal operating temperature, the fan control should be set so that it shuts off at a temperature only a few degrees above normal return air temperature. This will result in the minimum loss of heat to the outdoors.

The furnace has three types of high temperature limit controls which can shut down the burner. They do not shut down the ventor motor.

The reverse airflow limit control HTL1, adjacent to the blower, is set to open at 110°F and reclose at 100°F. In the event that the temperature at the limit exceeds 110°F after blower shutoff, the limit may be open at the time of a call for heating. If this occurs, the gas will not turn on. The heat anticipator HA is energized and will cause the fan control to turn on, resulting in operation of the evaporator blower. This will cause HTL1 to reset and operation will return to normal.

The limit control HTL2, within the heat exchanger, is set to open at 160°F. If the temperature at HTL2 exceeds 160°F, the burner will shut down and the blower will continue to operate.

The flame rollout limit controls HTL4 and HTL5, mounted on the burner compartment cover, are set to open at 185°F. They have a manual pushbutton reset that cannot be actuated until the limit control has cooled.

Input Rating

It is the responsibility of the contractor to adjust the gas input to the unit. The input rate can be calculated by using the formula:

$$\text{Input Btu/Hr.} = \frac{3600 \times HV}{T}$$

HV=Heating value of fuel=Btu/Ft³ of gas
T=Time in seconds per Ft³ of gas flow as read from gas meter

Adjust input rate by varying the adjustment of the gas pressure regulator. All adjustments must be made with furnace operating at high fire and at normal operating temperature. The furnace should be adjusted to obtain a temperature rise within the range specified on the unit dataplate. Refer to Table 19.

CAUTION: Do not exceed input rating or manifold pressure values on the unit dataplate.

If the input rate on the unit dataplate cannot be attained without exceeding the manifold pressure listed on the dataplate, contact a qualified service agency.

Natural Gas: Natural gas valves have non-adjustable pressure regulators. An external type, positive shutoff service pressure regulator may be required.

Propane Gas: Propane gas valves are equipped with adjustable pressure regulators. Clockwise rotation of the pressure regulator dial increases pressure and gas flow rate. Turn dial counterclockwise to decrease pressure and gas flow rate.

NOTE: Thermal efficiency of the furnace is a product efficiency rating determined under continuous operating conditions independent of any installed system.

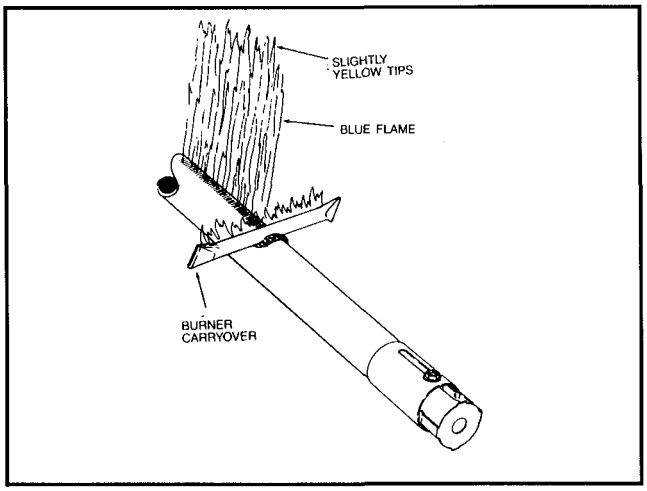
Table 19.

UNIT MODEL	GAS FURNACE INPUT RATING BTU/HR	AIRFLOW NOMINAL FT³/MIN	NOMINAL TEMP. RISE °F	TEMP. RISE RANGE °F
CUR160	300,000 400,000	6,400	34.9 46.6	20 — 50 30 — 60
CUR201	300,000 400,000	8,000	27.9 37.3	20 — 50 30 — 60

Burner Flame Requirements

Burner flame should run the length of the ribbons and be 3″ to 4″ in height. The flame should be blue in color with a slightly yellow tip. If for any reason the flame should lift from the burner, change color to orange, or start rolling out from under the flash shield after ignition, an adjustment is necessary or the heat exchanger needs to be inspected and cleaned. Refer to Figure 43.

Figure 43. Burner Flame



Ignition Electrode & Flame Sensor

The ignition electrode and flame sensor assembly is not field adjustable. There should be a gap spacing of 0.125″ ±0.032″ between the ignition and ground electrodes. Any alterations to this assembly may create a hazardous condition that could cause property damage, personal injury or death.

CAUTION: Do not apply power to the ignition control module unless the ignition electrode assembly is properly connected and grounded or damage to the control module may result.

Primary Air Adjustment

These units have individual primary shutters on each burner. Air shutters must be adjusted to obtain proper air-gas mixture. To gain access to the burners, remove heating access panel and burner box cover. To adjust air shutters, operate unit for at least 15 minutes. Loosen the lock screw and open or close the air shutter. (Each time an adjustment is made, the lock screw must be tightened and the burner box cover must be replaced to observe the burner flame.) If the flame is yellow tipped, open the air shutters to admit more primary air. Open the shutters until the yellow tips just disappear. After

adjustment, recheck the unit from a cold start. Secure shutters in final position by tightening the fastening screw. Refer to Figure 44.

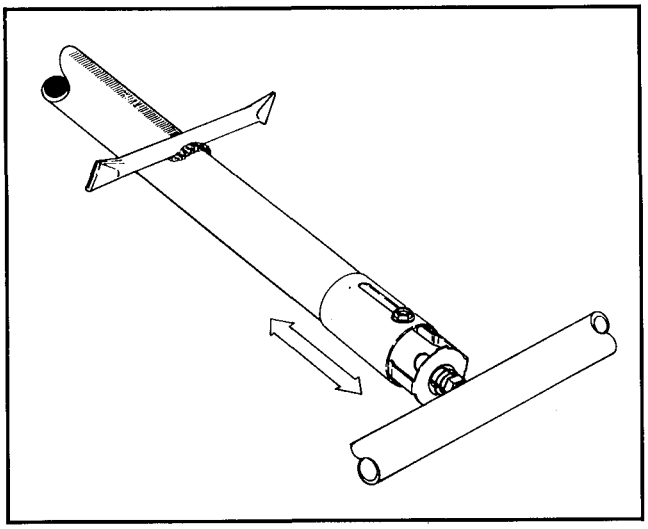
⚠ CAUTION:

Use care in removing burner box cover to avoid damage to gasket material.

⚠ WARNING

Burner box cover and gasket must be completely reinstalled. DO NOT omit any original cover screws.

Figure 44. Air Shutter



ELECTRIC HEAT CHECK, TEST & START PROCEDURE

Wiring Tightness Check

With disconnect switch in the OFF position, check all electric heater connections for tightness. Since the unit is subjected to considerable jarring during shipment, it is extremely important that this check is thorough.

Sequence Check — Constant Volume

Set the thermostat in the conditioned space at a point at least 10°F above zone temperature.

Remove the thermostat wire from terminal W2 at TS1 terminal block and close disconnect switch. The following operational sequence should be observed:

1. First stage heat relay R3 makes and closes contacts 4-6 to energize evaporator motor contactor C5.
2. Contacts 1-3 close to activate heater contactors C6 and C9. While electric heater is operating at first stage, attach thermostat wire to terminal W2 at TS1 terminal block.
3. Second stage heat relay R4 makes and closes contacts 2-4 to activate heater contactors C7, C8 and C10.

NOTE: The number of heater contactors used depends on heating capacity and voltage.

Observe contactors for several cycles. Contactors should cycle first and second stage according to thermostat demand.

Open disconnect switch. Set thermostat temperature levers and subbase switches to desired positions.

Sequence Check — VAV

Set SSVC setpoint and changeover thermostat (THC) to a point at least 10°F above the return air temperature.

Remove wire 293 from terminal W2 at TS1 terminal block and close disconnect switch. The following operational sequence should be observed. Note that the SSVC initiates a two-minute time delay after any switching action.

1. First stage heat relay R3 makes and closes contacts 4-6 to energize evaporator motor contactor C5.
2. Contacts 1-3 close to activate heater contactor C6. While electric heater is operating at first stage, attach wire 293 to terminal W2 at TS1 terminal block.
3. Second stage heat relay R4 makes and closes contacts 2-4 to activate heater contactors C7 and C8.

NOTE: The number of heater contactors used depends on heating capacity and voltage.

Observe contactors for several cycles. Contactors should cycle first and second stage heat according to SSVC demand.

Open disconnect switch.

Set SSVC setpoint and changeover thermostat to desired positions.

THERMOSTAT, NIGHT SETBACK & TIMECLOCK CHECK, TEST & START PROCEDURE

Thermostat Final Check — Constant Volume

With the thermostat fan switch at AUTO, operate the unit through at least one complete cycle with the thermostat system switch at COOL and one cycle with the system switch at HEAT.

Place the fan switch at ON. The fan should run continuously.

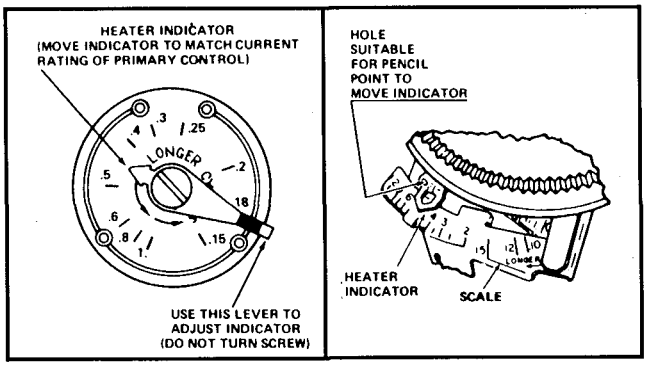
Proper control of the indoor air temperature can only be achieved if the thermostat is calibrated to the heating and/or cooling system. A vital consideration of this calibration is related to the thermostat heat anticipator.

Anticipators for the cooling operation are generally preset by the thermostat manufacturer and require no adjustment.

Anticipators for the heating operation are of two types: preset or adjustable. Those that are preset will not have an adjustable scale and are generally marked accordingly.

Thermostat models having a scale as shown in Figure 45 must be adjusted to each application.

Figure 45. Typical Heat Anticipator



In most cases this adjustment setting can be found in the thermostat instructions. If this information is not available or if the correct setting is questioned, the procedure below should be followed:

1. Wrap 10 loops of single strand, insulated thermostat wire around the prongs of an ammeter. Set the scale to the 1 to 5 or 1 to 6 amp scale.
2. Connect the uninsulated ends of the wire jumper across terminals R and W1 on the subbase. See Figure 46. This test must be performed without the thermostat attached to the subbase.

3. Let the heating system operate in this position for about one minute. Read the ammeter scale. Whatever reading is indicated must be divided by 10 (for 10 loops of wire). This is the setting at which the adjustable heat anticipator should be set.

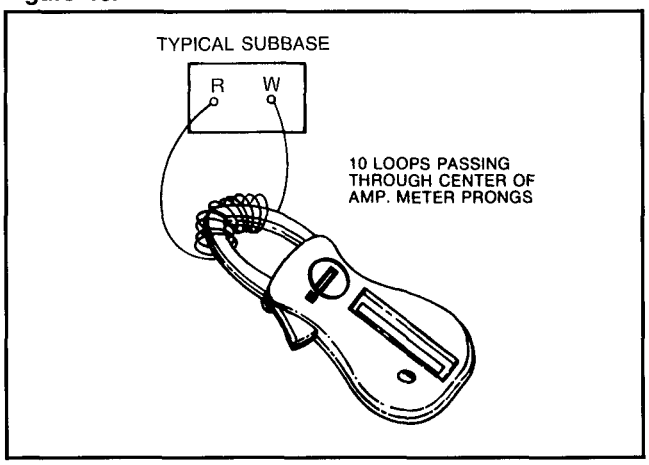
$$\text{Formula: } \frac{\text{Ammeter Reading}}{\text{10 Loops}} = \text{Anticipator Setting}$$

4. If a slightly longer cycle is desired, the pointer should be moved to a higher setting. Slightly shorter cycles can be achieved by moving to a lower setting.
5. On units with two stages of heat, check second stage heat anticipator setting by placing a jumper across terminals R and W1; repeat steps 1 through 3 taking amp reading of R to W2 jumper.
6. Remove the jumper wire(s) and reconnect the thermostat. Check the thermostat in the heating mode for proper operation.

NOTE: The length of the heating cycle can also be affected by the fan limit control settings. The fan "ON" and "OFF" settings should be checked at this point.

Move the thermostat temperature levers and subbase switches to desired positions.

Figure 46.



Night Setback Thermostat Check (Optional Equipment) — Constant Volume

The night setback thermostat controls the unit by jumping the timeclock and completing the circuit through the main thermostat. The unit heating will cycle off the night thermostat setpoint since it is lower than the main thermostat setpoint.

With timeclock contacts open, set night setback thermostat and space thermostat 10°F above zone temperature. Unit should operate on heating cycle.

Restore night thermostat to normal setting (recommend 55°F). Reset space thermostat to desired position.

Night Setback Thermostat Check (Optional Equipment) — VAV

The night setback thermostat controls the unit by completing the circuit from unit thermal R to 21. This effectively bypasses the SSVC control and the unit heating then cycles off the night thermostat setpoint. Before the heat is activated, the discharge damper is driven to the fully open position through relay R9.

CAUTION: When a night setback thermostat is used, some means of opening VAV boxes on a call for heat must be provided.

With timeclock or manual system switch contacts open, set night thermostat 10°F above zone temperature. Unit should operate on heating cycle.

Restore night thermostat to normal setting (recommend 55°F).

Timeclock Check (Optional Equipment)

Manually open and close timeclock contacts to check if it operates unit. Set time dial to correct time. Adjust cut-in and cut-out points.

NORMAL OPERATING CONDITIONS

Once the Check, Test & Start of the unit has been completed, it is necessary to return the unit to normal operating conditions:

- Close all compartments
- Install all external panels
- Remove any jumpers or test equipment
- Restore electrical power to unit

AIR BALANCING

The drives on the supply and return fans are typically set in the middle of the rpm range. The drive motor sheave pitch diameter is field adjustable for the required airflow. Refer to "Drive Adjustments" section below. Refer also to "Return Air Fan" check, test and start procedure on page 41 for additional information.

When the final adjustments are complete, the current draw of the motors should be checked and compared to the full load current rating of the motors. The amperage must not exceed the service factor stamped on the motor nameplate.

The total airflow must not be less than that required for operation of the electric heaters or the furnaces.

The operating balance should be checked with the economizer at full outside air and at minimum outside air.

Upon completion of the air balance, it is a common industry recommendation that the variable pitched motor sheave be replaced with a properly sized fixed sheave. A matching fixed sheave will provide longer belt and bearing life and vibration free operation. Initially, it is best to have a variable pitched motor sheave for the purpose of air balancing, but once the balance has been achieved, fixed sheaves maintain alignment and minimize vibration more effectively.

BUILDING PRESSURIZATION BALANCE — VAV

A building system design will generally have assumed that the VAV terminal boxes will not all be calling for maximum airflow at the same time. Before attempting to balance the unit airflows, determine what the actual design maximum airflow is. In the absence of such information, a reasonable maximum airflow condition can be achieved by closing 20% of the VAV box capacity. The terminal box maximum flow rates must be known in order to determine which boxes to close. The boxes are closed by positioning the corresponding wall thermostats to their highest setting.

Supply Fan Adjustment

1. Set terminal boxes for maximum airflow as described above.
2. Energize the fans; observe that both the discharge and tracking damper actuators begin to operate and allow the system to stabilize at the floating pressure switch setpoint.
3. If the discharge damper actuator drives fully open and there is still insufficient system pressure to satisfy the switch setpoint, the supply fan rpm must be increased. Likewise, if the system stabilizes with the discharge damper actuator less than 75% open, there is excessive airflow and the supply rpm must be reduced. **Caution:** Open main power disconnects before attempting any fan speed adjustments. Severe injury to personnel could result from starting fan while adjusting fan speed.
4. Set all terminal boxes for normal operation.

DRIVE ADJUSTMENTS — MOUNTING & ADJUSTING MOTOR SHEAVES "VM" & "VP" Variable Pitch Key Type Sheaves (See Figure 47)

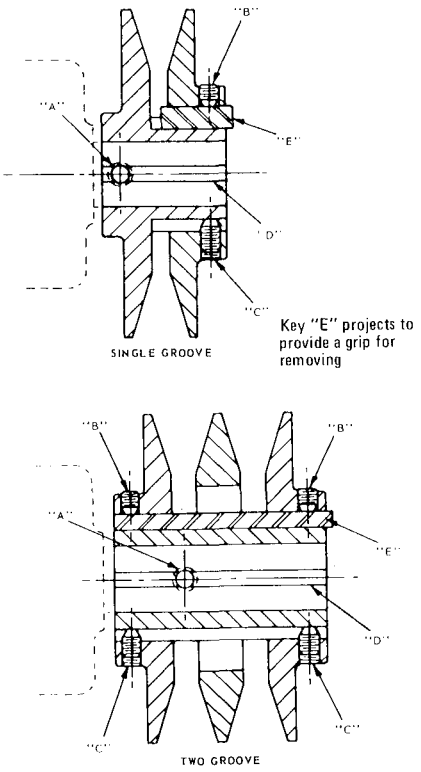
MOUNTING:

1. All sheaves should be mounted on the motor or driving shaft with the setscrew "A" toward the motor.
2. Be sure both driving and driven sheaves are in alignment and that shafts are parallel.
3. Fit internal key "D" between sheave and shaft, and lock setscrew "A" securely in place.

ADJUSTING:

1. Loosen setscrews "B" and "C" in moving parts of sheave and pull out external key "E". (This key projects a small amount to provide a grip for removing.)
2. Adjust sheave pitch diameter for desired speed by opening moving parts by half or full turns from closed position. DO NOT OPEN MORE THAN FIVE FULL TURNS FOR "A" BELTS OR SIX FULL TURNS FOR "B" BELTS.
3. Replace external key "E" and securely tighten setscrews "B" over key and setscrews "C" into keyway in fixed half of the sheave.
4. Put on belts and adjust belt tension. DO NOT FORCE BELTS OVER GROOVES.
5. Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.
6. Two-groove sheaves must have both halves adjusted by the same number of turns from closed position to insure the same pitch diameter.
7. Be sure that all keys are in place and that all setscrews are tight before starting drive. Check setscrews and belt tension after 24 hours service.

Figure 47.



Do not operate sheave with flange projecting beyond the hub end.

PARTS LIST ①

QUANTITY PER UNIT		DESCRIPTION		PART NUMBER
CUR160	CUR201			
2		COMPRESSOR, 208/230V		471353C-04
2		COMPRESSOR, 460V		711409B-01
2		COMPRESSOR, 575V/60/3		712801B-01
	2	COMPRESSOR, 208/230V		471353C-07
	2	COMPRESSOR, 460V		711401B-01
	2	COMPRESSOR, 575V/60/3		712802B-01
2	2	LOW PRESSURE SWITCH		713016C-05
2	2	HIGH PRESSURE SWITCH		713016C-09
1	1	FREEZESTAT		713018C-01
2	2	FILTER-DRIER		712057B-01
	2	SIGHTGLASS		159978B-03
CONDENSER SECTION				
3	3	CONDENSER FAN BLADE		714022D-01
3	3	CONDENSER FAN MOTOR, ⅓ HP, 208/230V		713001C-01
3	3	CONDENSER FAN MOTOR, ⅓ HP, 460V		713002C-01
3	3	CONDENSER FAN MOTOR, ⅓ HP, 575V/60/1		713804C-10
CONDENSER PRESSURE SWITCH				
		CUT-OUT	**CUT-IN**	
2	2	150 PSIG	225 PSIG	712704B-03
2	2	170 PSIG	250 PSIG	712704B-02
2	2	190 PSIG	280 PSIG	712704B-01
EVAPORATOR SECTION				
2	2	BLOWER WHEEL		713039C-01
1	1	BLOWER SHAFT		713061C-01
2	2	BLOWER SHAFT BEARING (3 HP & 5 HP MOTORS)		008299B-04
1	1	DRIVE SIDE BLOWER SHAFT BEARING (7½ HP MOTOR)		206486S-11
1	1	BLOWER SHAFT BEARING (7½ HP MOTOR)		008299B-04
5	5	BLOWER SHAFT KEY, ¼ × ¼ × 1.5		712284B-01
1		MOTOR, 3 HP, 208-230V/460V		713007C-01
1		MOTOR, 3 HP, 575V		713811C-02
1		MOTOR PULLEY		250748A-00
1		BLOWER PULLEY		005508A-00
1		BELT		701875A-01
1	1	MOTOR, 5 HP, 208-230V/460V		713006C-01
1	1	MOTOR, 5 HP, 575V		713810C-00
1	1	MOTOR PULLEY		008923A-00
1	1	BLOWER PULLEY		003712A-00
1	1	BELT		701875A-03
1	1	MOTOR, 7½ HP, 208-230V/460V		713008C-01
1	1	MOTOR, 7½ HP, 575V		713809C-00
1	1	MOTOR PULLEY		007286A-00
1	1	BLOWER PULLEY		490228X-55
1	1	BELT (MATCHED PAIR)		701874A-01
2		TX VALVE		712762B-01
	2	TX VALVE		713028C-01
1	1	TR2, TRANSFORMER, 460V, 300 VA — ELEC. HT. & COOLING ONLY		714012D-01
1	1	TR2, TRANSFORMER, 575V, 300 VA — ELEC. HT. & COOLING ONLY		382539E-31
1	1	TR2, TRANSFORMER, 460V, 500 VA — GAS HEATING ONLY		714012D-02
1	1	TR2, TRANSFORMER, 575V, 500 VA — GAS HEATING ONLY		382539E-32
1	1	TR1, TRANSFORMER, 230/24V, 50VA — ALL UNITS		712712B-01
2		COMPRESSOR CONTACTOR, 208/230V, 40A/3P		713015C-01
2	2	COMPRESSOR CONTACTOR, 460V & 575V, 25A/3P		713014C-01
	2	COMPRESSOR CONTACTOR, 208/230V, 50A/3P		713381C-01
1	1	BLOWER MOTOR CONTACTOR, 30A/3P		714005D-01
2	2	CONDENSER FAN CAPACITOR, 370V, 10 Mf (NOT FOR 575V UNITS)		712190B-01
1	1	CONDENSER FAN CAPACITOR, 440V, 11.5 Mf		712189B-01
3	3	CONDENSER FAN CAPACITOR, 440V, 11.5 Mf — FOR 575V UNITS		712189B-01
2	2	GDM1-2, GUARD-A-MATIC (5 MIN.)		712705B-01
3	3	F5-6-7, FUSE, BLOWER MOTOR, 208/230V		258605C-13
3	3	F5-6-7, FUSE, BLOWER MOTOR, 460V		258604C-08
3	3	F5-6-7, FUSE, BLOWER MOTOR, 5 HP, 575V		258604C-38
3	3	F5-6-7, FUSE, BLOWER MOTOR, 7½ HP, 575V		258604C-07
2	2	F3-4, LINE CONTROL, 208-230V, NON-GAS HEAT		258605C-31
2	2	F3-4, LINE CONTROL, 208-230V, GAS HEAT		258605C-32
2	2	F3-4, LINE CONTROL, 460V & 575V, NON-GAS HEAT		497598B-04
2	2	F3-4, LINE CONTROL, 460V, GAS HEAT		497598B-09

① This is only a partial listing of the replacement parts available. Contact your local sales representative for additional information.

PARTS LIST ①

QUANTITY PER UNIT		DESCRIPTION	PART NUMBER
CUR160	CUR201		
EVAPORATOR SECTION (CONT'D.)			
2	2	F3-4, LINE CONTROL, 575V, GAS HEAT	497598B-08
1	1	F1, FUSE, 24V CONTROL (CONSTANT VOLUME UNIT)	712038B-01
2	2	F1-2, FUSE 24V CONTROL (VAV UNIT)	
RELAYS			
2	2	R1-2, COOLING ONLY, CAV	262130B-00
3	3	R1-1A-2, COOLING ONLY, VAV & R1-2-4, ELECT. HT., CAV	
4	4	R1-1A-2-4, ELECTRIC HEAT, VAV	
5	5	R1-2-4-4A-5, GAS HEAT, CAV	
6	6	R-1-2-2A-4-4A-5, GAS HEAT, VAV	
1	1	R3, ELECTRIC HEAT, CAV & R9, GAS HEAT, VAV (DPDT, 24V)	711405B-01
2	2	R3-9, ELECTRIC HEAT, VAV (DPDT, 24V)	
1	1	RD, ECONOMIZER OPTION (SPDT, 24V)	262130B-00
1	1	RU, VAV OPTION (SPNO, 24V)	711002A-01
3	3	R6-7-8, CONDENSER FAN (SPNO, 208-230V)	712709B-01
GAS HEATING SECTION — UNITS BUILT AFTER NOVEMBER 1989 ONLY			
1	1	GAS VALVE (NATURAL)	712784B-01
1	1	GAS VALVE (PROPANE)	712785B-01
2	2	IGNITOR ELECTRODE & SENSOR	712783B-01
1	1	IGNITION CONTROL,SLAVE	712805B-01
1	1	IGNITION CONTROL, MASTER	497510B-01
1	1	FAN & LIMIT CONTROL	711961B-01
1	1	VENTOR BLOWER WHEEL	712717B-01
1	1	VENTOR BLOWER HOUSING	712052B-01
1	1	VENTOR BLOWER MOTOR	711013A-01
ECONOMIZER			
1	1	DAMPER MOTOR SPRING RET., CONST. VOL. UNIT (HONEYWELL) ②	713781C-01
1	1	DAMPER MOTOR SPRING RET., CONST. VOL. UNIT (WHITE RODGERS) ③	713020C-01
1	1	DAMPER MOTOR SPRING RETURN, VAV UNIT (HONEYWELL)	713054C-01
1	1	MINIMUM POSITION POTENTIOMETER, VAV UNIT	713024C-01
1	1	TRANSFORMER (HONEYWELL DAMPER MOTOR)	712713B-01
1	1	CRANKARM FOR HONEYWELL MOTOR	711980B-01
1	1	CRANKARM FOR WHITE RODGERS MOTOR	711048A-01
1	1	ENTHALPY CONTROL	712011B-01
3	3	PRE-AIR FILTER (PERMANENT)	000915A-00
PUMPDOWN, SUCTION LINE FILTER & HOT GAS BYPASS			
2		LSV1-2, SOLENOID VALVE	350A484H44
2		SOLENOID COIL	350A484H42
	2	LSV1-2, SOLENOID VALVE & COIL	703017B-02
2	2	SUCTION LINE FILTER	713043C-01
1		HOT GAS BYPASS CONTROL VALVE	712177B-01
	1	HOT GAS BYPASS CONTROL VALVE	246841D-04
1		HOT GAS BYPASS SOLENOID VALVE	350A484H35
1		HOT GAS BYPASS SOLENOID COIL	350A484H42
	1	HOT GAS BYPASS SOLENOID VALVE & COIL	703017B-04
1	1	FIRESTAT 135° RETURN AIR	712001B-01
VAV			
1	1	SOLID-STATE VAV CONTROLLER (W7100C)	713022C-01
1	1	DISCHARGE AIR SENSOR (C7100A)	713021C-01
1	1	DIFFERENTIAL PRESSURE SWITCH	497578B-01
1	1	DISCHARGE DAMPER MOTOR	713053C-01
1	1	TRANSFORMER (DAMPER MOTOR)	712713B-01
1	1	TR3, TRANSFORMER, 230/24V, 40VA	467381B-09
POWER RETURN BLOWER			
1		MOTOR, 2 HP (1725 RPM), 208/230 & 460V	713003C-01
1		MOTOR, 2 HP (1725 RPM), 575V	712802C-18
	1	MOTOR, 3 HP (3450 RPM), 208/230 & 460V	713005C-01
	1	MOTOR, 3 HP (3450 RPM), 575V	712803C-18
2	2	BLOWER SHAFT	713060C-01
4	4	SHAFT KEY	712065B-01
2	2	BLOWER CONE	713033C-01
2	2	BLOWER WHEEL	713052C-01
4	4	PILLOW BLOCK BEARING	206486S-12
1	1	CONTACTOR	714003D-01

① This is only a partial listing of the replacement parts available. Contact your local sales representative for additional information.
② This Honeywell motor is used on units with Safety Smoke Control option.
③ When replacing Honeywell spring return motor with a White Rodgers motor, the crankarm must also be ordered.

PARTS LIST ①

QUANTITY PER UNIT CUR180	QUANTITY PER UNIT CUR201	DESCRIPTION	PART NUMBER
POWER RETURN BLOWER (CONT'D.)			
1		MOTOR PULLEY	712174B-01
	1	MOTOR PULLEY	008739X-00
2		BLOWER PULLEY	711104A-01
	2	BLOWER PULLEY	712172B-01
1		BELT (MATCHED PAIR)	712049B-01
	1	BELT (MATCHED PAIR)	712049B-02
FAILURE STATUS OPTION RELAYS (NOTE: THIS IS NOT FOR CUR200 UNITS)			
1	1	RH, SPDT, 24V (GAS HEAT)	262130B-00
2	2	RC2 & RH, SPDT, 208-230V (ELECTRIC HEAT)	712707B-01
1	1	RC2, SPDT, 208-230V (GAS HEAT & COOLING ONLY)	
1	1	RC1, DPDT, 208-230V (ALL UNITS)	712708B-01

①This is only a partial listing of the replacement parts available. Contact your local sales representative for additional information.

MAINTENANCE

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and experienced with this type of equipment. CAUTION: Sharp edges and coil surfaces are a potential injury hazard. Avoid them.

⚠ WARNING

MOVING MACHINERY HAZARD

DISCONNECT POWER TO THIS UNIT AND PADLOCK AT "OFF" BEFORE SERVICING THE FANS.

Preventative maintenance is the best way to avoid unnecessary expense and inconvenience. Have this system inspected at regular intervals by qualified service personnel, at least twice a year. Routine maintenance should cover the following items:

1. Tighten all belts, setscrews, and wire connections.
2. Clean evaporator and condenser coils mechanically or with cold water, if necessary. Usually any fouling is only matted on the entering air face of the coil and can be removed by brushing.
3. Lubricate motor and fan shaft bearings (see below).
4. Align or replace belts as needed.
5. Clean or replace filters as needed (see below).
6. Check refrigerant sightglass. Check for refrigerant leak if sightglass is flashing with steady-state operation of unit (CUR201 only).
7. Check for blockage of condensate drain.
8. Check power and control voltages.
9. Check running amperage.
10. Check operating temperatures and pressures.
11. Check and adjust temperature and pressure controls.
12. Check and adjust damper linkages.
13. Check operation of all safety controls.
14. Examine gas furnaces (see below and the User's Information Manual).
15. Check condenser fans and tighten setscrews.

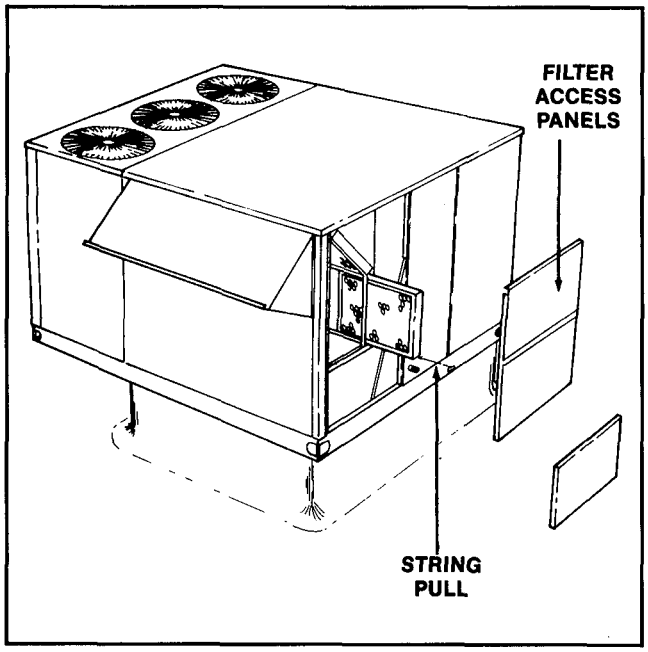
FILTERS

Every application may require a different frequency of replacement or cleaning of dirty filters. Disposable filters must be replaced and permanent (wire mesh) filters must be cleaned at least every three (3) months during operating seasons.

Filters supplied with the units are the disposable type and are as follows:

UNIT SIZE	QUANTITY	FILTER SIZE	PART NUMBER
16, 20 TON UNITS	8	16 x 25 x 2	000161A-00

Figure 48.



Remove the filter access panel on the right side of the unit. See Figure 48. On the 16 and 20 ton units, it will expose only the filter section. The panel is held in place by captive quarter-turn screws.

Filters for the 16 and 20 ton units are four deep and an angle plate with a string-pull is supplied with the unit. To remove the rear filter, pull on the end of the string and the filter will slide out. When replacing filters, make certain that the angle plate is inserted before the first replacement filter is slid in.

LUBRICATION

The ventor motor (gas fired furnace) and the condenser fan motors are permanently lubricated. For lubrication of the compressors, Copeland recommends using Suniso 3GS or Texaco WF32 oils. These oils are compatible if mixed, and are suitable for both high and low temperature systems.

Motor Bearings — Evaporator motor should have grease added after every 2,000 hours of operation. Relubricate while motor is warm and at a standstill. Remove and clean upper

and lower grease plugs. Insert grease fitting into upper hole adding a small amount of clean grease with a low pressure gun. Run motor for ten minutes before replacing plugs.

Caution: Excessive grease will overheat the bearings. Use only a high grade mineral grease with a 200°F safe operating temperature.

Note: Specific greasing instructions may be found on a tag attached to the motor. If special lubrication instructions are shown on the motor nameplate, they will supersede all other instructions.

Fan Shaft Bearings — The bearings are prelubricated and do not require addition of grease at time of installation. If the rooftop unit is equipped with cartridge type bearings, no relubrication is necessary. If the unit has a pillow block type bearing (drive side of 7½ HP unit), it should be relubricated. Lubrication intervals vary with the period of operation and the temperature of the air over the motor. Follow the instructions below.

TEMPERATURE RANGE	CONTINUOUS OPERATION	12-HOUR DAY OPERATION
To 130°F	6 Months	12 Months
To 150°F	4 Months	12 Months
Over 150°F	2 Monhts	6 Monhts

For conditions other than those listed, refer to lubrication label located near lubrication fitting. The following greases are recommended for use on fan shaft bearings:

Recommended Greases

MANUFACTURER	PRODUCT NAME	TEMP. RANGE °F	TEMP. RANGE °C
Texaco Lubricants Co.	Premium RB	-30 to 300	-34 to 149
Keystone Ind. Lubricants	84EP-2	-40 to 200	-40 to 93
Mobil Oil Corporation	Mobilith AW 2	-40 to 325	-40 to 163
Chevron U.S.A. Inc.	SRI-2	-20 to 325	-29 to 163
Exxon Company, U.S.A.	Ronex MP	-40 to 300	-40 to 149
Shell Oil Company	Alvania #2	-20 to 240	-29 to 116

Turn fan wheels while greasing. Where possible observe seals and add grease only until a slight bleeding is noted. DO NOT OVERLUBRICATE; remove any excess to avoid overheating.

GAS FIRED FURNACE INSPECTION AND CLEANING

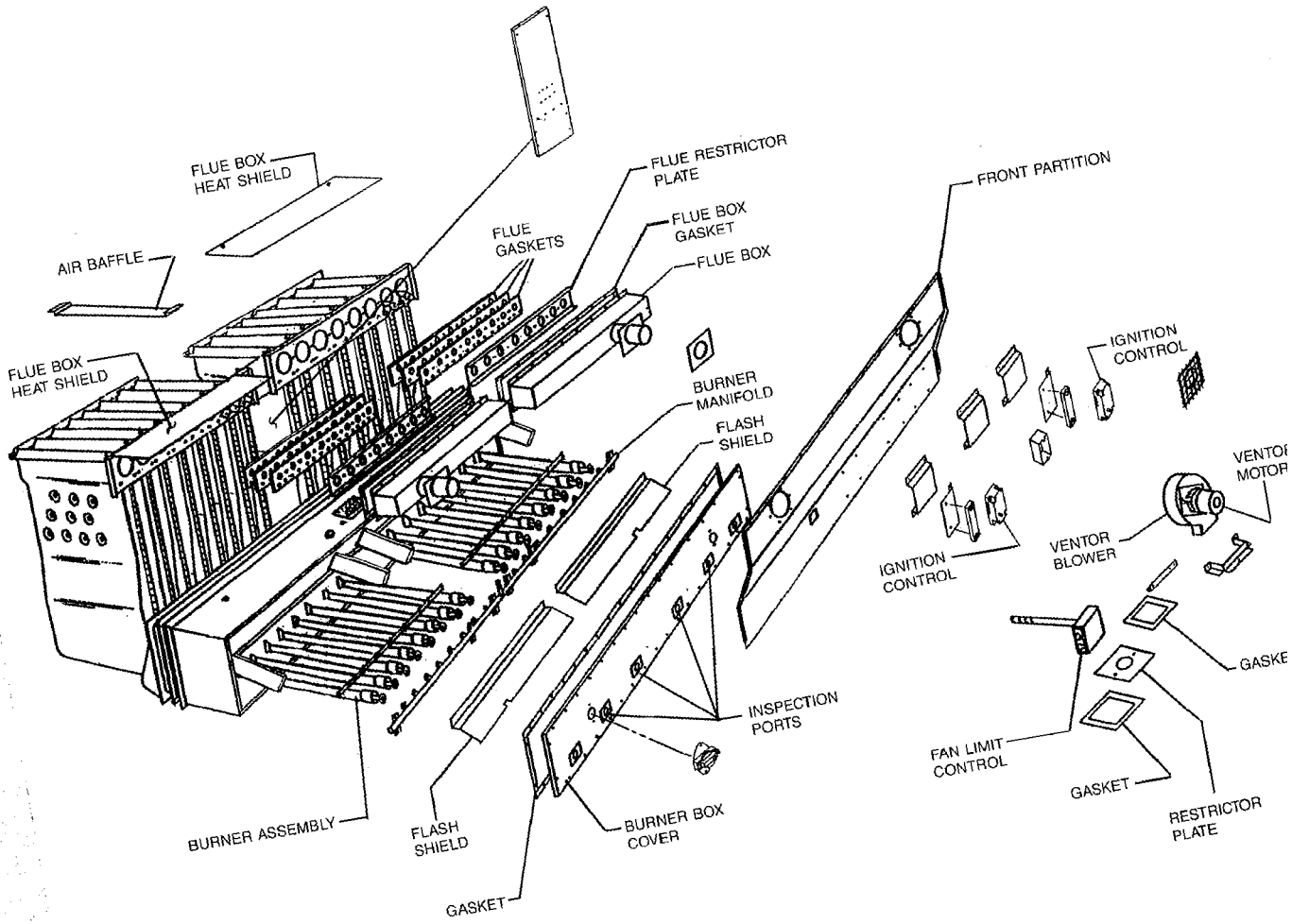
Inspect the vent system for evidence of corrosion or corrosion particles. Refer to Figure 49.

All flue product carrying areas of the furnace, its vent system, and main burners should be examined by a qualified service agency before the start of each heating season. This examination is necessary for continued safe operation. Particular attention should be given to deterioration from corrosion or other sources. The examination is accomplished in the following manner:

1. Disconnect power to the unit.
2. Remove the fan-limit control and the ventor blower so that the front partition can be removed.
3. Remove the screws holding the front partition and pull the panel forward to remove it. Use care to avoid damage to the insulation.
4. The flue box can now be removed taking care to avoid destruction of the gasket since it must be reused when the furnace is reassembled. Similar care must be exercised during the removal of any subsequent gaskets.
5. Remove the restrictor plate and its gasket and then remove the flue baffles in the top of each heat exchanger cell.
6. Now remove the burner box cover at the bottom of the furnace, its gasket and the flash shield.
7. Remove the burners from the unit. Label each one so that they can be reinstalled in the same location as they were originally installed. This especially applies to the burner with the ignition electrode and sensor attached.
8. After the burners have been removed from the unit, tap the end of each one lightly on the ground thereby removing any residue from inside the burner. Run a vacuum over the burner slots to remove any foreign materials.
9. Using a flashlight and mirror, inspect each vertical flue passage for soot. Any accumulation of soot can be removed using a flexible wire brush inserted in the lower openings. At completion, remove any residue that may have dropped to the base of the cells or furnace.
10. If any evidence of deterioration of the heat exchanger or flue passages is evident, contact a qualified service agency.
11. Upon completion of the inspection and clean-up, install all parts in reverse order from which they were removed.
    a. All gaskets should be in good condition prior to reassembly.
    b. Use all screws that were removed. DO NOT reassemble by omitting any screws. All screws are necessary for the integrity and proper performance of the furnace.
12. Inspect and periodically clean the vent outlet (bird screen).

NOTE: Periodic observation of the flame through the inspection ports will aid in the determination of whether the burners or cells require cleaning.

Figure 49. Forced Draft Gas Fired Furnace



CUR160, CUR201 CONTROLS, SETTINGS & FUNCTIONS

DESCRIPTION	FUNCTION	SYMBOL	SETTING	RESET	LOCATION	DIFFERENTIAL
CONDENSER PRESSURE SWITCH	Maintains condenser pressure by cycling the condenser fans in response to condenser pressure.	CPS1 & 4 (violet wire) CPS2 & 5 (yellow wire) CPS3 & 6 (brown wire)	Closes at 225 psig Opens at 150 psig Closes at 250 psig Opens at 170 psig Closes at 280 psig Opens at 190 psig	Auto	Condenser Section on liquid line	75 psig 80 psig 90 psig
COMPRESSOR LOCKOUT TIME DELAY	Prevents short cycling of compressors	GDM1,2	5 Minutes	Auto	Main Control Panel	N/A
HIGH PRESSURE CONTROL	Stops compressor when discharge pressure is too high	HP1,2	Opens at 425±20 psig Closes at 310±10 psig	Auto	Condenser Section on discharge line	115 psig fixed
LOW PRESSURE CONTROL	Stops compressor when suction pressure is too low. Safety device and used for pumpdown.	LP1,2	Opens at 10±4 psig Closes at 40±10 psig	Auto	Condenser Section on suction line	30 psig fixed
LIQUID LINE SOLENOID VALVE	Closes off liquid line for pumpdown (CUR160) and to prevent refrigerant migration (CUR201)	LSV1,2	N/A	N/A	Condenser Section	N/A
HOT GAS BYPASS SOLENOID VALVE	Closes off hot gas line for pumpdown. Opens for hot gas bypass during 1st cooling stage.	HGBV	N/A	N/A	Condenser Section	N/A
SOLID-STATE DISCHARGE AIR CONTROLLER (HONEYWELL W7100)	Measures discharge air temperature to control heating-cooling and economizer staging.	SSC (SSVC)	Setpoint: 55°F Reset: 10°F (cool) Control Band: 10°F Adjustable	Auto	Main Control Box	See Honeywell form 60-2507-2
DISCHARGE AIR SENSOR	Senses discharge air temperature, sends signal to SSC.	DAS	N/A	N/A	Below Main Control Box	N/A
CHANGEOVER THERMOSTAT	Sets discharge air controller in either heat or cool mode.	THC	Adjustable 15 to 90°F Recommended 68°F setpoint	Auto	Economizer Section. (Bulb senses return air)	3.5 to 16°F, adjustable (subtractive)
OUTDOOR RESET SENSOR	Senses outside temperature, sends signal to SSC.	ODR	N/A	N/A	Fresh Air Inlet	N/A
WARM-UP THERMOSTAT	Cycles 2 heating stages during morning warm-up.	TW	Adjustable 0 to 100°F Recommended 68°F setpoint	Auto	Economizer Section. (Bulb senses return air)	3°F fixed per switch; 3 to 10°F interstage between switches, adjustable
DIFFERENTIAL PRESSURE SWITCH	Senses and controls duct static pressure.	DPS	1.1″ to 3.5″ W.C. adjustable	N/A	Main Control Box	0.06″ to 0.17″ W.C. at minimum setpoint; 0.11″ to 0.31″ W.C. at maximum setpoint
DISCHARGE DAMPER AUXILIARY SWITCH	End switch makes when discharge damper opens fully to enable night setback or morning warm-up heat circuit.	DDA	N/A	Auto	Inside Discharge Damper Actuator	N/A
THERMOSTAT ENTHALPY CONTROL	Senses ambient temperature and humidity conditions. Constant Volume Units: It enables either economizer or compressors. VAV Units: It enables economizer only. Compressors are independently controlled.	TE	"B" or as required	N/A	Downstream side of Fresh Air Damper	Temp. — 3.5°F Humidity — 5% Fixed
MINIMUM POSITION POTENTIOMETER	Maintains a minimum opening in economizer damper to provide for ventilation requirements when outside air is unsuitable for cooling.	MPP	As required	N/A	Economizer Section Constant Volume Units: On top of actuator. VAV Units: Inside cover of Honeywell actuator.	N/A

Continued on next page

CUR160, CUR201 CONTROLS, SETTINGS & FUNCTIONS (Cont'd.)

DESCRIPTION	FUNCTION	SYMBOL	SETTING	RESET	LOCATION	DIFFERENTIAL
MERCURY BULB SWITCH	Turns on power exhaust fan when economizer damper opens to setpoint.	MB	To attain desired space pressure, as required.	Auto	On Return Air Damper Linkage	N/A
FILTER FLAG	Indicates filters are clogged. Senses pressure drop across filters.	FIL	0.1" to 0.7" W.C., adjustable	Manual	Economizer—Filter Section	N/A
FREEZESTAT	Protects compressors and evaporator from water freeze-up.	FZ	Opens at 32°F Closes at 56°F	Auto	Downstream side of Evaporator Coil	24°F fixed
FIRESTAT	Cuts power to control circuitry on temperature rise.	HT3	Opens at 135°F	Manual	Economizer Section, next to filter flag	25°F to reset
POWER SAVER THERMOSTAT (ELECTRIC HEAT)	Locks out 2 heating stages until outdoor temperature is below setpoint.	PST	Adjustable 0 to 100°F Set as required	Auto	Economizer Section (bulb senses outdoor air)	3°F fixed per switch; 17°F interstage between switches
HIGH TEMPERATURE LIMIT SWITCH (ELECTRIC HEAT ONLY)	Cuts power to electric heat elements on temperature rise.	HT1,2	Opens at 200°F	Does not reset, must be replaced	Electric Heat Access Panel, below main control panel	N/A
HIGH TEMPERATURE LIMIT SWITCH	Cuts power to heater control circuit.	HTL (Electric) HTL1 (Gas)	Opens at 110°F Closes at 100°F	Auto	Above Heater, next to blower discharge	10°F fixed
GAS VALVE	Controls opening of redundant, stage 1 and stage 2 gas valves.	GV	N/A	N/A	Furnace Section	N/A
VENTOR CENTRIFUGAL SWITCH	Disables gas heat control circuit if ventor motor will not run.	VS	N/A	Auto	Inside Ventor Blower housing	N/A
IGNITOR ELECTRODE & FLAME SENSOR	Ignites main gas and senses flame to prove ignition.	SPK, FP	N/A	N/A	Furnace Section	N/A
IGNITION CONTROL	Creates spark for ignition of main gas.	MIC, SIC	N/A	N/A	Furnace Section	N/A
FAN & HIGH LIMIT CONTROL (GAS HEAT ONLY)	Closes to energize fan when heat exchanger is warm.	FS	Closes at 130°F Opens at 100°F, adjustable	Auto	Furnace Section	30°F, adjustable
	Heat anticipator — heating element to speed closing of FS.	HA	N/A	N/A	Furnace Section	N/A
	Opens heat control circuit on temperature rise.	HTL2	Opens at 160°F Closes at 135°F, adjustable	Auto	Furnace Section	25°F fixed
FLAME ROLL-OUT LIMIT SWITCH (GAS HEAT ONLY)	Senses burner flame roll-out in burner compartment. Cuts power to heat control circuit on temperature rise.	HTL4, 5	Opens at 185°F	Manual	Furnace Section	25°F to reset

SERVICE & WARRANTY PROCEDURE

MOTOR COMPRESSOR

Copeland Refrigeration Corporation has stocking wholesalers who maintain a stock of replacement motor compressors and service parts to serve refrigeration contractors and service personnel as required.

When a motor compressor fails in warranty, the inoperative compressor can be taken to any authorized Copeland wholesaler for an over-the-counter exchange or an advance replacement may be obtained. Credit is issued by the wholesaler for the returned compressor upon receipt and Copeland factory inspection of the inoperative compressor. If that compressor is out of Copeland's warranty, a salvage credit only is allowed. Provide your local sales representative or the SnyderGeneral factory Warranty Claims Department with full details including the unit model and serial numbers, the invoice and the salvage value credit memo copies. SnyderGeneral Corporation will reimburse the difference. In this transaction be certain that the compressor is definitely defective. If a compressor is received from the field that tests satisfactorily, a service fee plus a transportation fee will be charged against its original credit value.

On all out of warranty motor compressor failures, Copeland offers the same field facilities for service and/or replacement as described above. The credit issued on the return compressor will be determined by the repair charge established for that particular unit.

IN-WARRANTY RETURN MATERIAL PROCEDURE

Material other than compressors may not be returned except by permission of authorized factory service personnel. Contact your local sales representative for further "who to contact" information.

A "return goods" tag will be sent to be included with the returned material. Enter the information as called for on the tag in order to expedite handling at our factories and prompt issuance of credits. All parts shall be returned to the factory designated on the return goods tag, transportation charges prepaid.

The return of the part does not constitute an order for replacement. Therefore, a purchase order must be entered through your nearest sales representative. The order should include part number, model number, and serial number of the unit involved.

Following our personal inspection of the returned part, and if it is determined that the failure is due to faulty material or workmanship, credit will be issued on customer's purchase order.

REPLACEMENT PARTS

Replacement parts may be obtained by contacting your local sales representative or parts distributor. If you do not know who to contact, call SnyderGeneral Corporation at (612) 553-5009 for assistance. Refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

PRODUCT WARRANTY — CUR160E, 201E

SnyderGeneral Corporation, hereinafter referred to as the "Company," warrants that it will provide, at the Company's option, either free replacement parts or free repair of component parts in the event any product manufactured by the Company and used in the United States proves defective in material or workmanship within twelve (12) months from initial startup or eighteen (18) months from the date shipped by the Company, whichever comes first. For additional consideration, the Company warrants that for four (4) years following the initial warranty period it will provide, at the Company's option, free replacement parts for the motor-compressor, or, free replacement for any integral component of the motor-compressor which proves defective in material or workmanship. For an additional consideration, the Company warrants that for nine (9) years following the initial warranty period it will provide free replacement of the heat exchanger in gas-fired or oil- fired furnaces which proves defective in material and workmanship. (Extended warranties for motor-compressors and heat exchangers are not applicable unless separately purchased.)

To obtain assistance under the parts warranty, extended motor-compressor warranty, or extended heat exchanger warranty, simply contact the selling agency. To obtain information or to gain factory help, contact SnyderGeneral Corporation, Warranty Claims Department, P.O. Box 1551, Minneapolis, MN 55440; telephone (612) 553-5330.

This warranty constitutes the buyer's sole remedy. It is given in lieu of all other warranties. There is no implied warranty of merchantability or fitness for a particular purpose. In no event and under no circumstances shall the Company be liable for incidental or consequential damages, whether the theory be breach of this or any other warranty, negligence or strict tort.

This parts warranty and the optional extended warranties extend only to the original user. Of course, abuse, misuse, or alteration of the product in any manner voids the Company's warranty obligation. Neither the parts or extended warranty obligates the Company to pay any labor or service costs for removing or replacing parts, or any shipping charges. Refrigerants, fluids, oils, and expendable items such as filters are not covered by this warranty.

The extended warranties apply only to integral components of the motor-compressor or heat exchanger, not to refrigerant controls, electrical controls, or mechanical controls, or to failures caused by failure of those controls.

Attached to this warranty is a requirement for equipment containing motor-compressors and/or furnaces to report start-up information. The registration form accompanying the product must be completed and returned to the Company within ten (10) days of original equipment start-up. If that is not done, the date of shipment shall be presumed to be the date of start-up and the warranty shall expire twelve (12) months from that date.

No person (including any agent, salesman, dealer or distributor) has authority to expand the Company's obligation beyond the terms of this express warranty, or to state that the performance of the product is other than that published by the Company.

SnyderGeneral Corporation 13600 Industrial Park Blvd., P.O. Box 1551, Minneapolis, MN 55440 (612) 553-5330