Installation - Operation
Manuels For:
T-T-43 Camp Lejeune, N.C.

Contract # C-5838

TT-43

YORK®

SUNPATH SERIES AIR TO AIR SINGLE PACKAGE HEAT PUMP

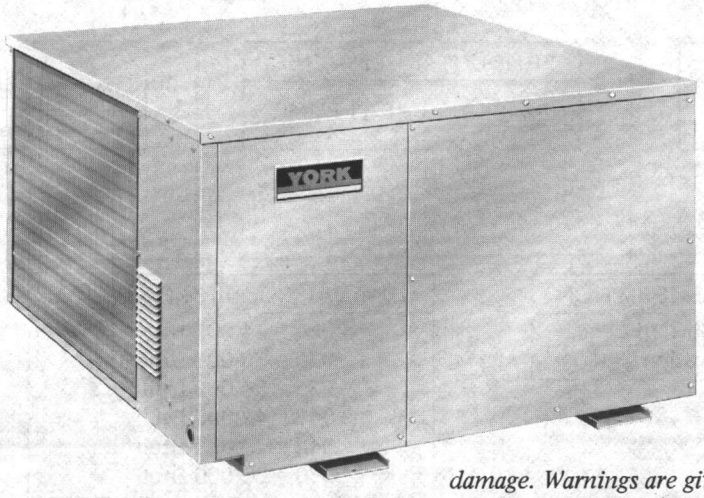
INSTALLATION & OPERATION

Supersedes: 511.05-N1 (683)

511.05-N1Y (784)

035-06914

MODELS: B*SP024 THRU B*SP060



GENERAL

BSP units are self-contained, heat pumps designed for ground level or roof top installation.

All units are shipped with multispeed indoor blower motors ready to be electrically connected to a fan relay. To operate unit, a fan relay must be provided by field installing either the fan relay accessory or a supplementary electric heater accessory. See Fig. 6.

Heaters are available in 5, 10, 12, 15, 20, 25, 30, and 35 KW sizes. Only 15KW size available in 460V for four and five ton units.

NOTE: Only certain size heaters may be used with each unit size. Be sure you are installing the appropriate heater.

See Form 690.21-N1 for permissible unit and heater combinations.

A manual changeover thermostat 2TH11702224 and an automatic changeover thermostat 2TH11702424 are available and one or the other must be used for the system to function properly when wiring and ducting have been completed.

If a start kit is needed, it must be the start kit 2SA06701006 specifically designed for this unit. See Form 515.21-SU1.

THESE UNITS SHOULD BE INSTALLED IN ACCORDANCE WITH ALL NATIONAL AND LOCAL SAFETY CODES.

NOTE: The Installer should pay particular attention to the words: NOTE, CAUTION, and WARNING. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

LIMITATIONS

The maximum and minimum conditions for installation and operation of heat pump systems must be observed to assure a system that will give maximum performance with minimum service. See Tables 1, 2 and 3.

TABLE 1 — APPLICATION LIMITATIONS

Current Characteristics	Ambient Air Temp. On Outdoor Coil				Temp. Air On Indoor Coil			
	Min. °DB		Max. °DB		Min.		Max.	
	Cool	Heat	Cool	Heat	°WB Cool	°DB Heat	°WB Cool	°DB Heat
208/230-1-60 208/230-3-60 460-3-60	40	–10*	115	75	57	50**	71	80

*Below –10°F unit operates automatically with resistance heat only.

**Operation below this temperature is permissible for short period of time when required to bring the heated area up to 50°F.

TABLE 2 — INDOOR AIR FLOW LIMITS

Model	BSP 24	BSP 30	BSP 36	BSP 42	BSP 48	BSP 60
Minimum CFM	640	800	960	1120	1280	1650
Maximum CFM	960	1200	1440	1680	1920	2300

See also Form 690.21-N1 for Electric Heat vs Air Flow Limitations.

NOMENCLATURE

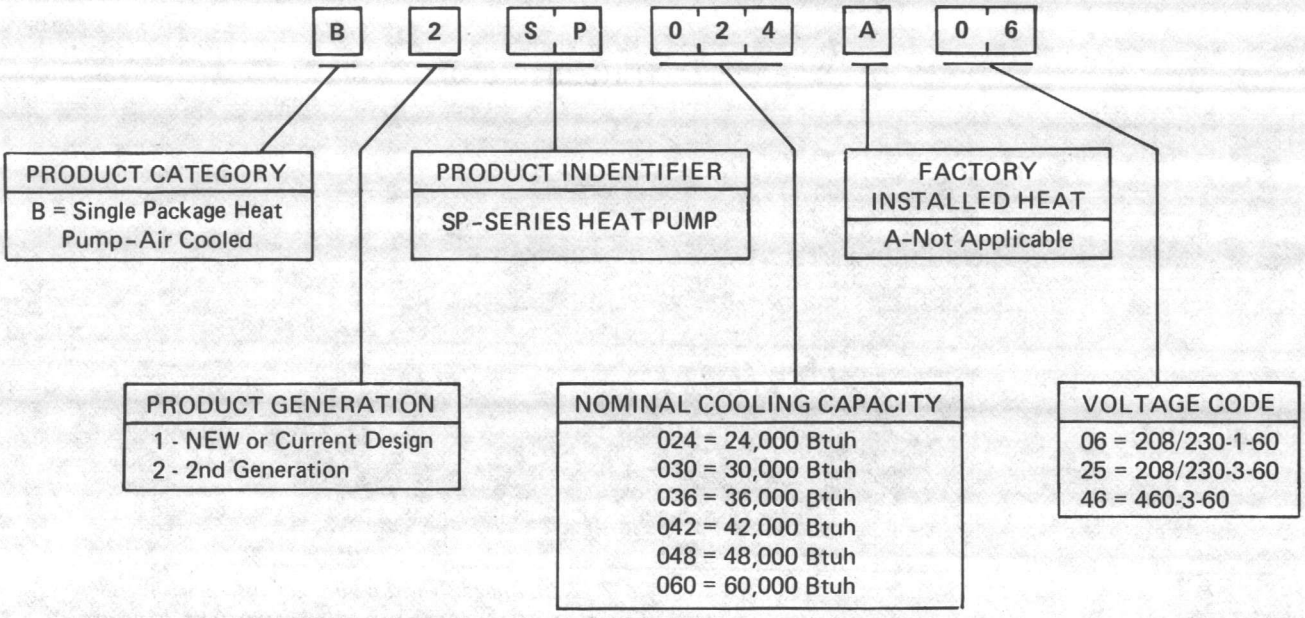


TABLE 3 — ELECTRICAL DATA

MODEL	UNIT POWER SUPPLY[1]	COMPRESSOR*		EVAPORATOR* BLOWER MOTOR		CONDENSER* FAN MOTOR		FOR COMPRESSOR & CONDENSER MOTOR ONLY			
		RLA[2]	LRA	FLA	LRA	FLA	LRA	MIN. CIRCUIT AMPACITY	MAX. DUAL ELEMENT FUSE SIZE (Time Delay)	MIN. FIELD** WIRE SIZE AWG	MAX. WIRE SIZE AWG
B2SP024A06	230-1-60 208-1-60	11.9	63	1.5	2.25	1.3 1.3	3.4 3.4	16.2	25	12	8
B2SP030A06	230-1-60 208-1-60	15.4	80	3.0	6.6	2.0 2.2	5.2 5.2	21.5	35	10	8
B2SP036A06	230-1-60 208-1-60	19.1	83.5	3.3	6.6	2.0 2.2	5.2 5.2	26	35	10	8
B2SP036A25	230-3-60 208-3-60	11.3	66	3.3	6.6	2.0 2.2	5.2 5.2	17	25	12	12
B1SP042A06	230-1-60 208-1-60	23.0	95.4	4.5	8.5	2.5 2.8	7.5 7.5	32	40	8	8
B1SP042A25	230-3-60 208-3-60	13.7	82	4.5	8.5	2.5 2.8	7.5 7.5	20	25	12	12
B1SP048A06	230-1-60 208-1-60	27.0	114	4.8	8.5	2.5 2.8	7.5 7.5	37	45	8	8
B1SP048A25	230-3-60 208-3-60	16.8	84	4.8	8.5	2.5 2.8	7.5 7.5	24	30	10	10
B1SP048A46	460-3-60	8.2	42	2.3	4.1	1.6	4.2	11.9	20	14	10
B2SP060A06	230-1-60 208-1-60	30.7	125	5.2	9.6	2.5 2.7	7.6 7.6	41.1	60	6	6
B2SP060A25	230-3-60 208-3-60	21.4	115	5.2	9.6	2.5 2.7	7.6 7.6	29.5	50	10	10
B2SP060A46	460-3-60	11.3	50	3.0	5.8	1.6	4.55	15.7	25	12	10

[1] Voltage Min.—Max. Utilization Range "A" in accordance with ARI Standard 110. 208/230V models: 187 - 252. (Unit may operate satisfactorily to 187 volts if outdoor ambient is not 109°F, and indoor return air is not over 71°F wb.) 460V models: 432 - 504.

[2] Rated Load Amps

*Data as shown on unit data plate, evaporator, and condenser fan motors are all 208/230-1-60 or 460-1-60.

**Based on 60°C insulated wire, 3% voltage drop, and maximum length of 100 feet.
USE ONLY COPPER CONDUCTORS.

INSTALLATION OF ACCESSORIES

FAN RELAY

If the Electric Heat Accessory is not used, the Fan Relay Accessory 2FR06700106 or 2FR06700146 (460V) must be installed.

When the fan relay accessory is used, the unit as well as all duct work and plenum are designed for zero clearance to combustible material.

1. Remove blower access panel from unit.
2. *NOTE – Motor leads are held to the blower by a plastic tie. DO NOT DISTURB.*
3. Remove cover panel from the fan relay accessory control box.
4. Install the fan relay accessory box over the rectangular opening in the discharge duct and fasten in two locations using screws provided. Before securing make sure low voltage terminal block is so oriented nearest the blower motor.
5. See the wiring label and the remainder of this instruction to select and connect the appropriate fan motor lead to the fan relay accessory receptacle.
6. See accessory wiring diagram on control box cover and electrical data on unit data plate to install other field wiring.
7. Reinstall covers removed.
8. Mark an X in block 2FR06700106 or 2FR06700146 on dataplate.

ELECTRIC HEAT

The electric heat accessory installs similarly to fan relay with heating elements extending through the opening in the discharge air duct. See Form 690.21-N1 to install electric heat accessory.

NOTE: The electric heat accessory should be installed before the supply air duct is attached to the supply air opening flanges, where practical.

REFRIGERATION SYSTEM

All units are factory charged with Refrigerant 22.

Do not remove the flare caps from the access valve connections except when necessary for servicing the system.

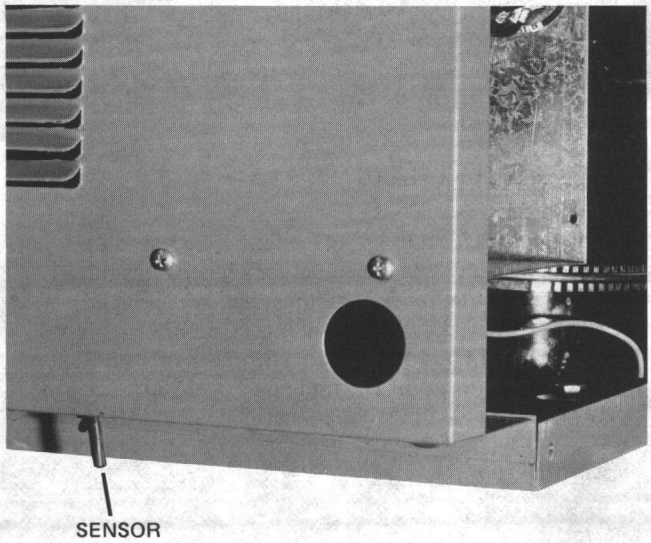
CAUTION: Do Not connect manifold gauges to line unless trouble is suspected. Connecting gauges will result in a loss of charge (3/4 oz. per each connection of a standard manifold gauge).

LOCATION

Location is usually predetermined. Check with owner's or dealer's initial installation plans. If it has not been decided, consider the following in choosing a suitable location:

1. All limitations previously mentioned and clearances should be observed.
2. In areas where there will be significant snow accumulation, the unit should be elevated sufficiently to prevent blockage of the air entrances by snow. (See MOUNTING.)
3. Precautions should be taken to locate the unit and ductwork so that supply air does not short-circuit to the return air.
4. The structural strength of the unit supports must be adequate.

CAUTION: Do not damage sensor extending beneath compressor corner of unit during handling operations. See below.



Unit should be isolated from rain gutters to avoid possible wash out of foundation.

Normal operating sound may be objectionable if unit is placed directly under windows of certain rooms (bedroom, study, etc.).

	Refrigerant-22 Charge								
BSP Models	024	030	036	042	048	048A46	060A06	060A25	060A46
Charge Lbs./Oz.	4/2	5/3	7/0	6/3	8/0	8/14	11/2	12/2	11/7

MOUNTING

GROUND INSTALLATIONS

For ground level installation, a substantial level concrete slab with footers extended below the frost line should be provided. See Fig. 1 for unit base dimensions.

ELEVATED INSTALLATION

Check weather bureau or local utility for snow accumulations in snow belt areas. Provide sufficient space under unit for free drainage of condensate and to prevent snow accumulations from blocking the outdoor coil.

Normally this drainage may be allowed to drain directly onto the ground. A gravel bed is recommended to prevent mud splashing.

WARNING: Ice build-up resulting from periodic defrosting of outdoor coil can produce slippery footing. Condensate should not be allowed to drain directly onto areas that would allow ice build-up resulting in personal injury.

Unit may be elevated as shown in Fig. 1 or other suitable means providing adequate support.

If unit is to be installed on a hot sun exposed roof or a black-topped ground area, the unit should be raised sufficiently above the roof or ground to avoid taking the accumulated layer of hot air into the condenser.

ROOF INSTALLATIONS

For roof installation use 4" x 4" timbers, treated for weather resistance, steel channel, or I beams to support the unit above the roof. They must be long enough to distribute the load over the building structure to safely carry the weight and shimmed to form a level foundation for the unit. The use of the timber or steel supports also serves to eliminate moisture collecting beneath the base of the unit which might induce deterioration of the unit base or the roof.

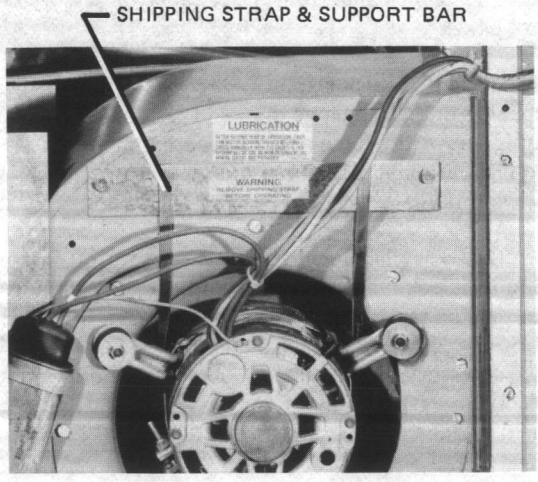
CLEARANCE

The unit must be installed with sufficient clearance for air entrance to the outdoor coil, for air discharge, and for servicing access. Refer to Fig. 1 for minimum clearances.

UNIT PREPARATION

After the unit is in place, loosen, but do not remove the compressor hold down bolts.

CAUTION: Remove shipping strap and support bar from indoor blower motor on models BSP24 through BSP48 prior to operating unit. See below.

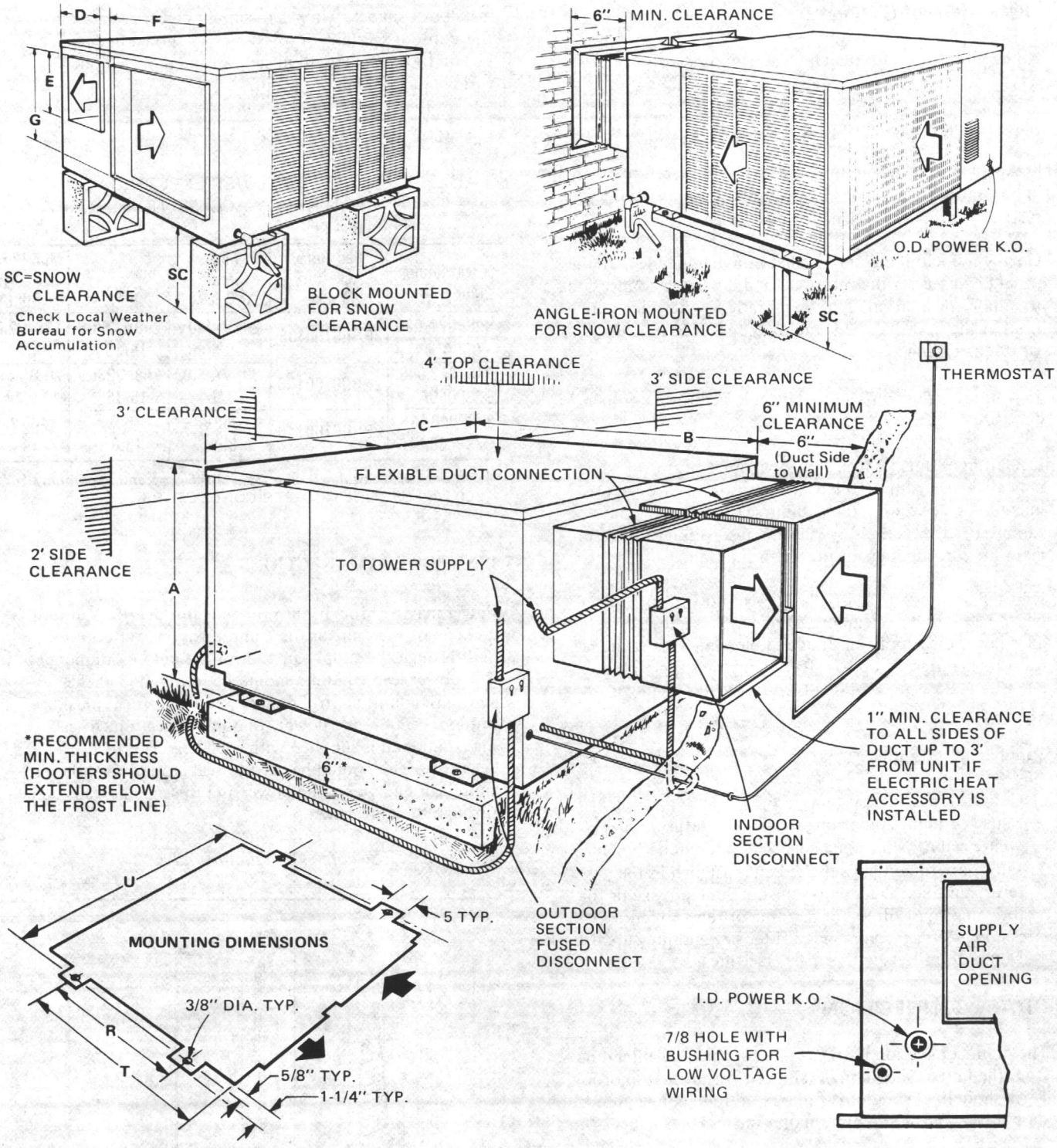


FILTERS

Filters must be field supplied and installed in the return air duct work. Refer to Fig. 8 for filter size.

Filters must be cleaned or replaced when they become dirty. Inspect at least once per month. The frequency of cleaning depends upon the hours of operation and the local atmospheric conditions. Clean filters keep unit efficiency high and prolong heat pump unit life.

CAUTION: Equipment should never be operated without filters.



Model	A†	B	C	D	E	F	G	H	R	T	U	Weight	
												Oper.	Ship.
B2SP 24	24	43	40-1/2	13-1/16	12-1/8	14	18-7/8	21-3/16	23-1/8	30-3/4	41-3/4	318	344
B2SP 30	24	46	51	13-1/16	12-1/8	28	18-7/8	21-3/16	28-3/8	35-3/8	52-1/4	348	381
B2SP 36	24	46	51	13-1/16	12-1/8	28	18-7/8	21-3/16	28-3/8	35-3/8	52-1/4	385	418
B1SP 42	29	48	58	16-5/8	12-7/16	30-1/16	23-13/16	25-1/8	29-1/2	38-9/16	59	420	460
B1SP 48	29	48	58	16-5/8	12-7/16	30-1/16	23-13/16	25-1/8	29-1/2	38-9/16	59	445	489
B2SP 60	29	51-1/16	65	16-5/8	12-7/16	38	23-13/16	25-1/8	27-13/16	37-9/16	66	564*	611*

†Not including 3/4" rail.

*B2SP060A46: Oper. = 557, Ship. = 604

FIG. 1 — TYPICAL MOUNTING AND DIMENSIONS

DUCT CONNECTIONS

Air supply and return may be handled in one of several ways best suited to the installation.

The vast majority of problems encountered with combination heating and cooling systems can be linked to improperly designed or installed duct systems. It is therefore highly important to the success of an installation that the duct system be properly designed and installed.

On any job, cloth collars or other non-flammable material should be used for the return air and discharge connections to minimize transmission of vibration. The duct connections at the unit shall be completely sealed to insure weatherproofing.

The supply air opening should be enlarged to the proper duct size by use of a transition.

Insulation of ductwork is a must where it runs through an unheated space during the heating season or through an uncooled space during the cooling season. The use of a vapor barrier is required to prevent absorption of moisture from the surrounding air into the insulation.

If installation of an Electric Heat Accessory is anticipated, be sure a minimum clearance of one inch is allowed on all sides of the supply air duct and plenum. This clearance must be maintained up to 3 feet along the supply air duct. See Fig. 1. Pressure drop for Electric Heater is shown in Fig. 7.

Supply and return may be a:

1. Conventional duct system.
2. Single combination ceiling supply and return grille where ceiling heights are sufficient and unobstructed.
3. Filters are to be field supplied and installed in the return air duct. Duct work must include provisions for the removal of filters for cleaning or replacement. See Fig. 8 for recommended filter size and pressure drop. Do not use filters with smaller face areas.

DRAIN CONNECTION

The drain connection is a 7/8 O.D. copper tube extending from the unit as shown in detail drawings at the top of Fig. 1. All drain lines should be full size of drain connection and should be trapped a minimum of 2 inches.

ELECTRICAL CONNECTIONS

Refer to wiring diagram on compressor compartment cover. See Table 3 for compressor section electrical data such as unit ampacity, fuse size, and minimum and maximum voltage. Refer to Installation of Accessories section for information on fan relay or electric heat kits. Indoor section electrical data is listed below in Table 4.

All wiring must comply with local and National Electrical Code requirements.

READ and *HEED* all unit caution labels.

Install disconnect switches to supply power to indoor and outdoor section control boxes, as shown in Fig. 1. Locate the switches within sight of the unit. All outdoor wiring must be weather-proof.

Check power supply for proper voltage.

TABLE 4 — INDOOR BLOWER ELECTRICAL DATA (FAN RELAY ACCESS./NO ELECTRIC HEAT)

Heat Pump Model No.	Fan Relay Accessory Model	Min. Circuit Ampacity	Max. Fuse Size[2]	Min. Wire[1] Size — AWG 60°C
B2SP024,030, 036A	2FR06700106	208V/230V 5/5	208V/230V 15/15	208V/230V 14/14
B1SP042,048, B2SP060A	2FR06700106	208V/230V 7/7	208V/230V 15/15	208V/230V 14/14
B1SP048A46, B2SP060A46	2FR06700146	460V 3.0	460V 15.0	460V 14

[1] Based on 60°C insulated wire, 3% voltage drop and maximum of 100 feet. USE ONLY COPPER CONDUCTORS.
[2] Or circuit breakers.

LINE POWER CONNECTIONS

Power may be brought into the unit through the outdoor coil end of the unit for the compressor and outdoor fan, and through the supply air end for the indoor components. The power lead conduits should be terminated at the appropriate unit control boxes. See Fig. 2 for typical outdoor section line power conduit connection. A sealing compound is supplied with each heater or relay accessory. This should be used to seal around the holes in supply air end where the power and thermostat leads come through the unit panel.

CAUTION: Use copper conductors only.

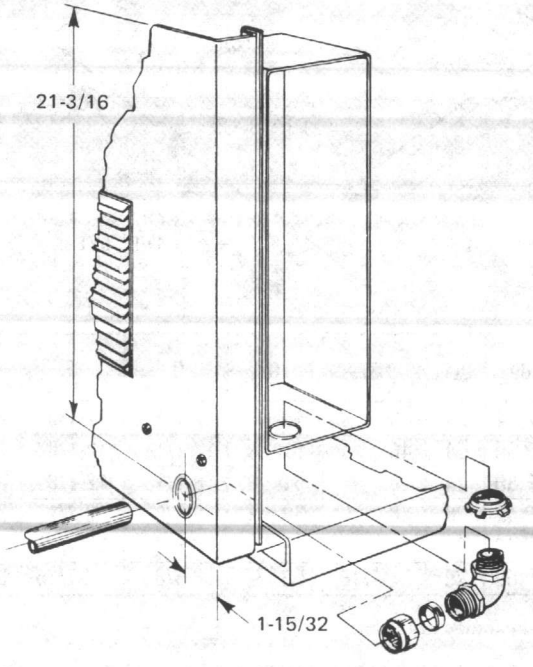


FIG. 2 — O.D. LINE POWER CONDUIT CONNECTION

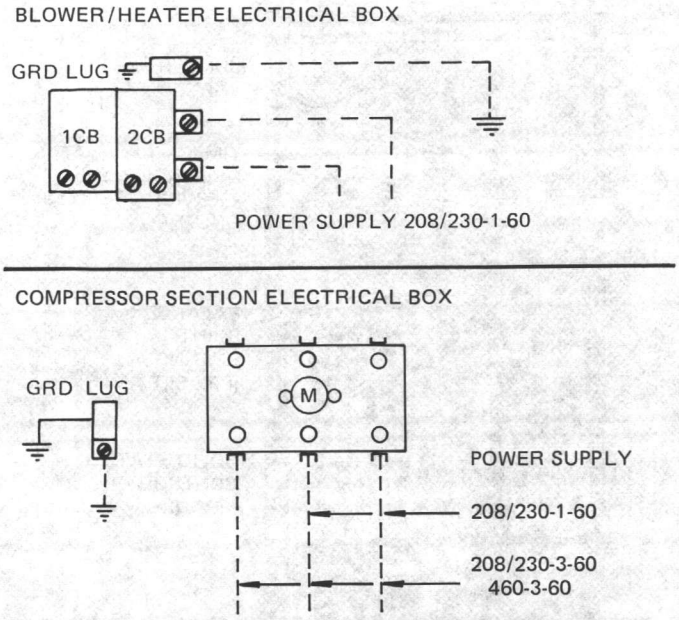


FIG. 3 – MAIN POWER SUPPLY WIRING CONNECTIONS

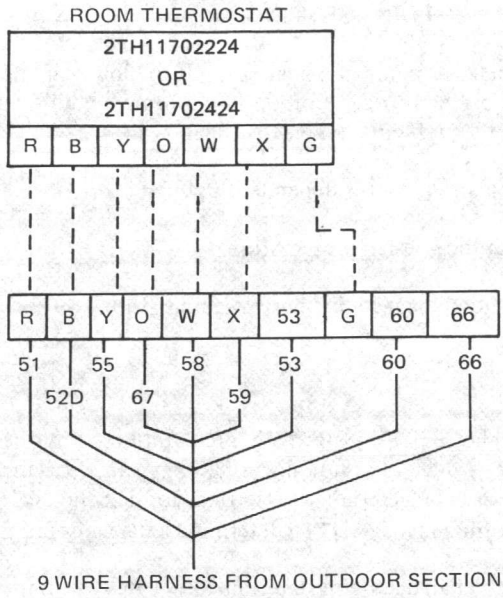


FIG. 4 – LOW VOLTAGE WIRING CONNECTIONS

———— FACTORY WIRING
– – – – – FIELD WIRING

LOW VOLTAGE CONTROL CONNECTIONS

Low voltage wiring enters the unit in the same area as the indoor section power line knockouts. Use the smaller hole with bushing to bring low voltage wiring into the unit. See Fig. 4 above and make connections shown.

CAUTION: On 208V applications the wire connected to the 240V transformer terminal must be moved to the 208V terminal of the transformer. See Fig. 6.

FAN MOTOR SPEED CONNECTIONS

Select speed required, to obtain desired CFM at the total duct system static pressure. See Table 5.

Higher efficiencies will be obtained if the indoor air volume is as high as possible provided (1) the CFM does not exceed the value listed in the limitations section, and (2) the sound level is not objectionable.

Connect one of the wire taps selected from Table 5 and the yellow tap to the speed tap receptacle shown in Fig. 6. Unused taps must remain taped.

NOTE: Motor leads are held to the blower by a plastic tie. DO NOT DISTURB.

ROOM THERMOSTAT

Single stage cooling – 2 stage heating low voltage thermostats. Either Part number 2TH11702224 (Manual changeover) or 2TH11702424 (Auto. Changeover), *MUST BE* used with these heat pump systems.

Locating one of these thermostats in the conditioned area, places complete control of the system in the hands of the owner from one attractively styled instrument. It may be set for (1) fan operation only; (2) cooling only with continuous or automatic fan operation; (3) heating only with continuous or automatic fan operation; (4) complete shutdown of the system. (Items 2 & 3 apply to manual thermostat).

An "Emergency Heat" position is provided with the "Heat-Off-Cool" switch of the manual changeover thermostat and with the "OFF–AUTO" switch of the Automatic changeover thermostat. In the "Emergency Heat" position the thermostat will provide electric resistance heat only, in the event that the refrigeration system is not operating. The compressor will not run in the "Emergency Heat" position. A pilot light on the thermostat will indicate that the switch is on "EM HT". The thermostat should be located about 5 ft. above the floor, where it will be exposed to normal room air circulation. Do not place it on an outside wall or where it is exposed to the radiant effect from exposed glass or appliances, drafts from outside doors or supply air grilles.

The cooling and heating anticipators are non-adjustable for either thermostat.

BALANCE POINT SETTING

The balance point of a heat pump is the lowest temperature at which the refrigeration cycle can heat the building, unaided by supplemental electric heaters.

The balance point is dependent upon –

1. Outdoor design temperature.

2. Building heat loss at design temperature.

3. Unit capacity.

The balance point is normally pre-determined by the dealer. If dealer has not already given you the balance point or balance point wire setting, contact the dealer or see Form 511.05-AD1 to determine balance point.

With the balance point determined, locate the jumper wire factory set at the 35 degree terminal. See Fig. 5. If this is not the correct setting move the wire to the terminal that is equal to or higher than the balance point.

For example, if balance point is determined to be 29°F, the jumper wire should be placed on terminal 31.

This determines the outdoor temperature at which the supplemental heat can be energized (In this case 31°F). For low operating cost, the supplemental heaters should not be energized if the heat pump can supply the required heat.

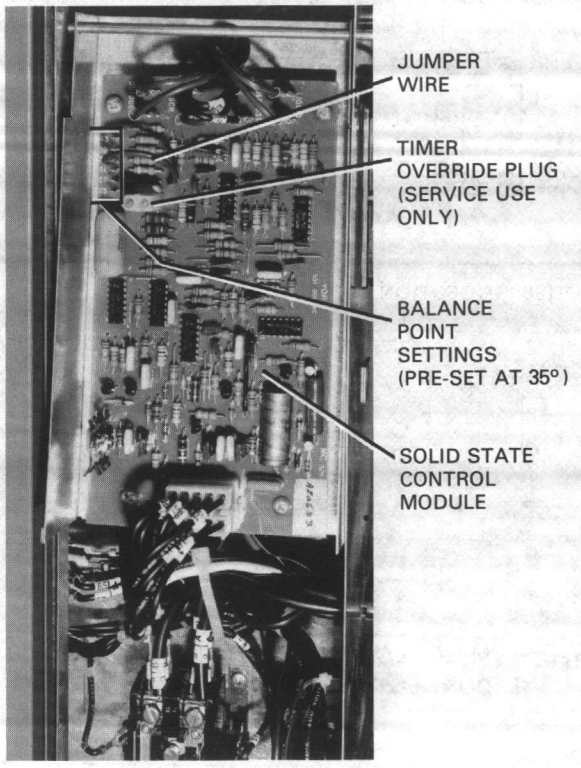
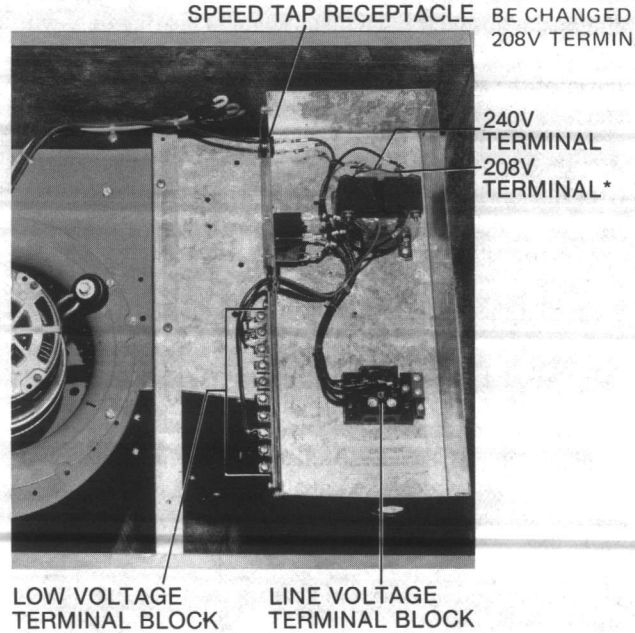


FIG. 5 – BALANCE POINT SETTING LOCATION

FAN RELAY OPERATION

*FOR 208V APPLICATIONS THE LOW VOLTAGE WIRE CONNECTION TO THE 240V TERMINAL MUST BE CHANGED TO THE 208V TERMINAL.



HEATER/FAN RELAY OPERATION

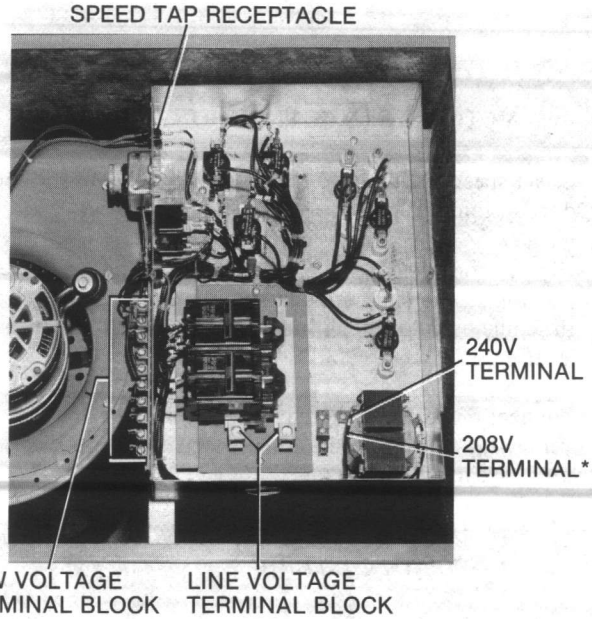


FIG. 6 – FIELD WIRING CONNECTIONS

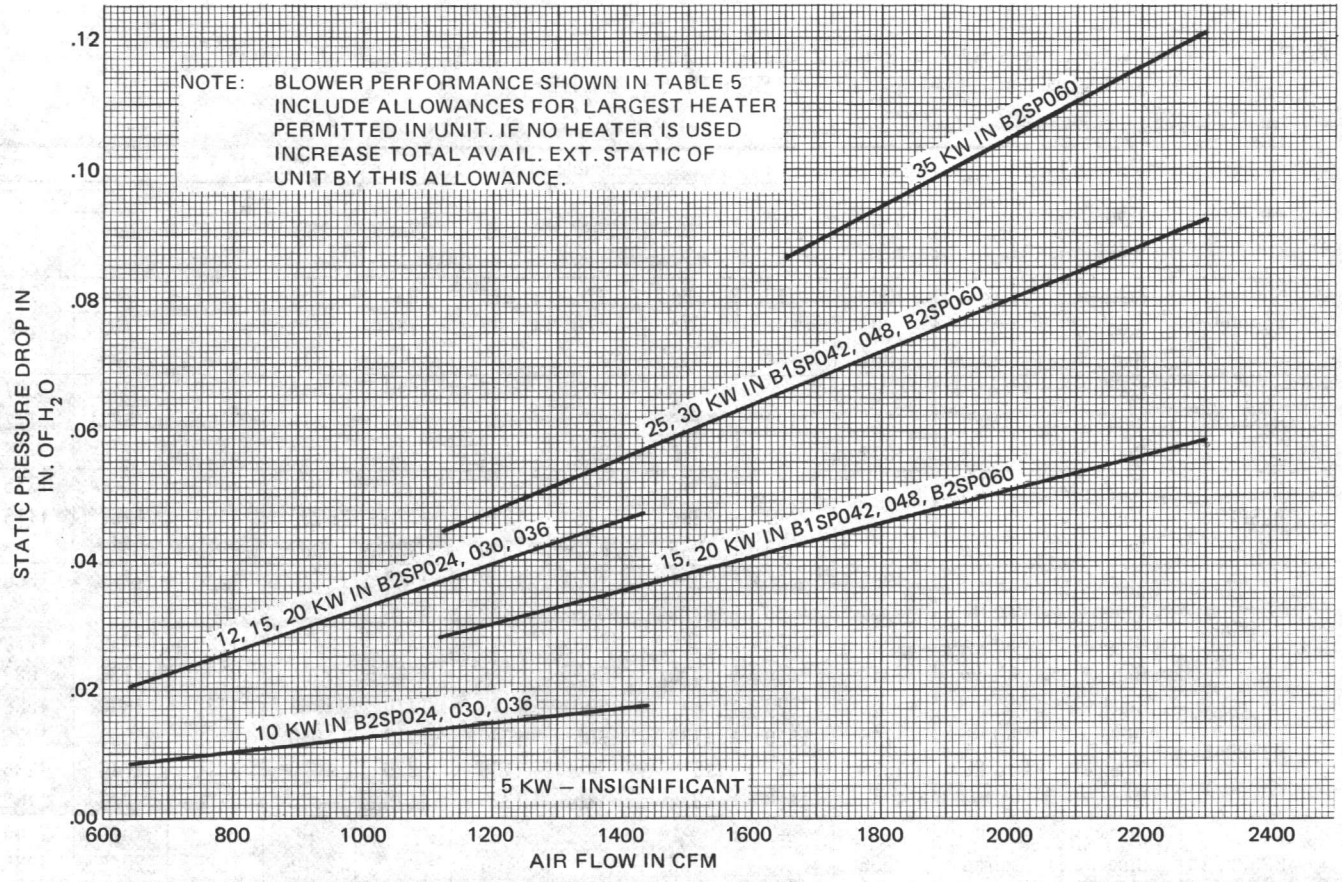


FIG. 7 — ELECTRIC HEATER – STATIC PRESSURE DROP

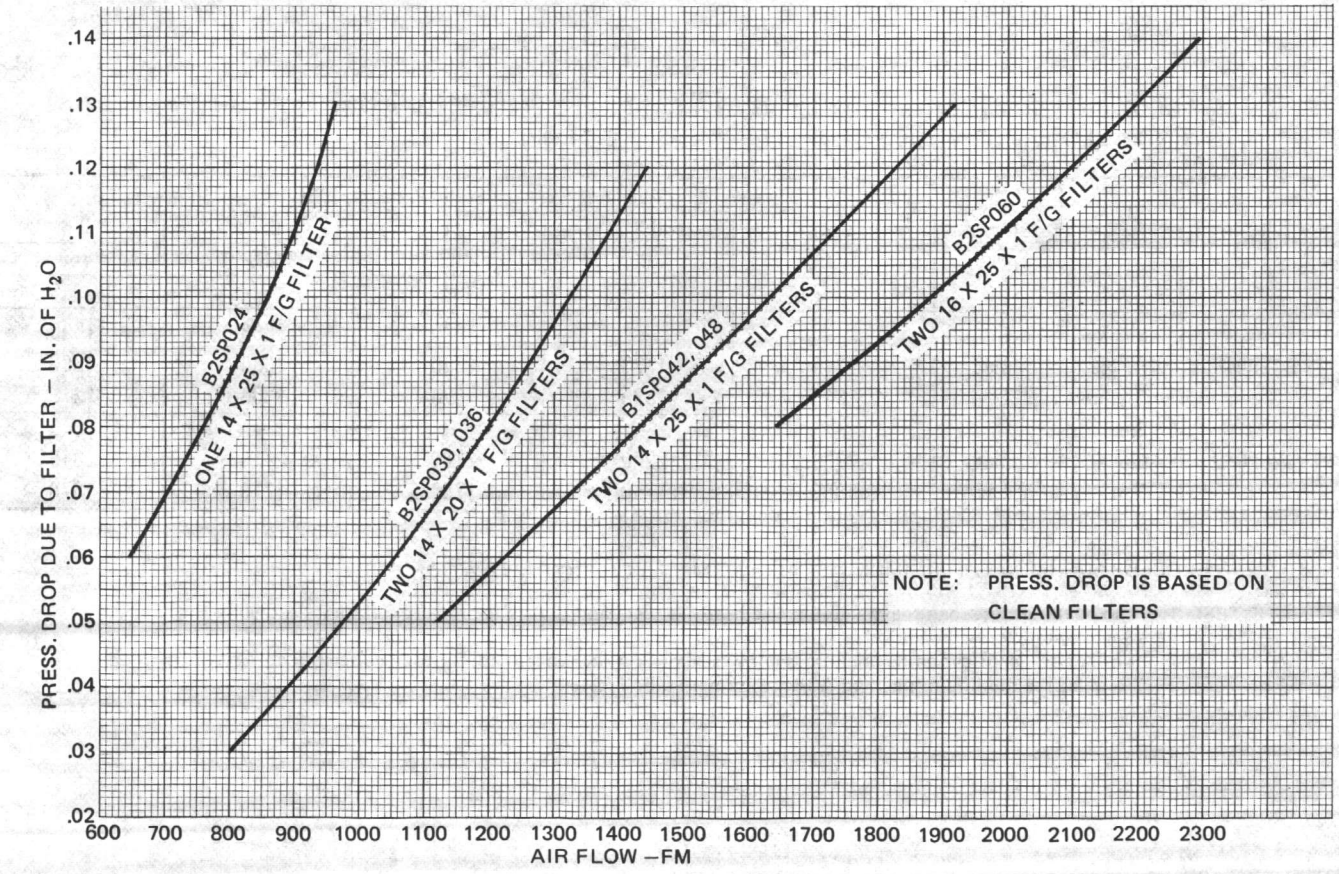


FIG. 8 — RECOMMENDED FILTER SIZE AND STATIC PRESSURE DROP

TABLE 5 – BLOWER PERFORMANCE – @ 230 V AND 208 V WITH LARGEST ELECTRIC HEATER (NO ALLOWANCE MADE FOR FILTER PRESSURE DROP)

Model	Wire Tap Color	Blower Speed	Available External Static Pressure, IWG									
			0.2		0.3		0.4		0.5		0.6	
			230	208	230	208	230	208	230	208	230	208
			CFM									
B2SP024	Black	Hi	1003	910	964	876	914	835	856	782	784	712
	Blue	Med	909	806	874	776	832	734	778	–	710	–
	Red	Low	844	734	812	705	766	–	712	–	–	–
B2SP030	Black	Hi	–	–	–	1160	1127	1090	1043	1010	943	907
	Blue	Med	1188	1129	1126	1066	1056	996	976	908	867	772
	Red	Low	1072	986	1010	924	941	850	860	756	745	–
B2SP036	Black	Hi	–	–	–	–	–	–	–	–	–	1375
	Blue	Med	–	1240	1380	1215	1335	1185	1295	1155	1250	1115
	Red	Low	1125	985	1085	945	1040	903	983	850	918	–
B1SP042	Black	Hi	1990	1815	1935	1785	1878	1750	1815	1710	1745	1660
	Violet	Med Hi	1735	1535	1723	1518	1700	1495	1660	1465	1610	1433
	Orange	Med Low	1555	1325	1535	1315	1515	1305	1490	1290	1458	1270
	Red	Low	1340	1110	1330	1105	1320	1100	1308	1090	1285	1080
B1SP048	Black	Hi	–	1825	–	1800	1925	1770	1868	1730	1800	1680
	Violet	Med Hi	1745	1520	1723	1505	1690	1488	1650	1460	1600	1425
	Orange	Med Low	1528	1355	1515	1345	1498	1330	1470	1310	1440	1285
	Red	Low	1345	1160	1335	1170	1325	1175	1303	1168	1275	1150
B2SP060	Black	Hi	–	–	–	–	–	–	–	–	2310	2145
	Blue	Med	2235	–	2200	–	2160	–	2110	1885	2045	1835
	Red	Low	1800	1565	1780	1550	1750	1530	1713	1500	1670	1465

– BLOWER PERFORMANCE – @ 460 V WITH LARGEST ELECTRIC HEATER (NO ALLOWANCE MADE FOR FILTER PRESSURE DROP)

Model	Wire Tap Color	Blower Speed	Available External Static Pressure, IWG				
			0.2	0.3	0.4	0.5	0.6
			460	460	460	460	460
			CFM				
B1SP048	Black	Hi	–	–	1925	1868	1800
	Purple	Med	1745	1723	1690	1650	1600
	Orange	Low	1345	1335	1325	1303	1275
B2SP060	Black	Hi	–	–	–	–	2310
	Blue	Med.	2235	2200	2160	2110	2045
	Red	Low	1800	1780	1750	1713	1670

EXCEEDS MAXIMUM OR MINIMUM AIR FLOW LIMITS. FOR EXTRAPOLATION ONLY.

NOTES: 1. If no heater or less than the maximum size heater is used, add the static pressure difference shown in Fig. 7 to available static pressure above.
2. "For A.R.I. Certification testing, use the lowest blower motor speed tap, for each voltage to obtain the certified C.F.M. at the minimum specified A.R.I. External Static Pressure."

OPERATION

CRANKCASE HEATER OPERATION

On single phase units, the crankcase heater is energized whenever the compressor is not running. On three phase units, the heater operates continuously. Check heater for proper operation. Be careful, the heater is quite hot. The heater should be energized at least 8 hours before the thermostat is set to operate the compressor.

COOLING OPERATION

Cooling operation is the same as any conventional air conditioning unit. The reversing valve is energized during the cooling cycle. See Fig. 9 to trace flow of refrigerant through the system.

HEATING OPERATION

In the heating cycle discharge gas is pumped to the indoor coil which is now the condenser. The outdoor coil becomes the evaporator. The reversing valve is de-energized.

SYSTEM SEQUENCE OF OPERATION
(Based on manual changeover thermostat.)

WITH POWER TO UNIT AND THERMOSTAT IN COOLING POSITION.

1. Reversing valve is energized through thermostat system switch to position refrigerant circuit for cooling operation.
2. If fan switch is in "ON" position, a circuit is made through blower relay providing continuous blower operation.
3. Solid State YORKGUARD starts time delay period. At end of 5 minutes, unit is ready for operation.
4. When thermostat cooling contact closes, a circuit is made through the YORKGUARD to energize contactor and start the unit. With fan switch in "AUTO" position, a circuit is made from thermostat cooling contact through blower relay to provide blower operation.
5. Unit will cycle in response to thermostat signal to provide cooling as needed.
6. After unit has stopped from a cooling cycle or power interruption, the YORKGUARD will not permit unit to start again for 5 minutes. (This protects compressor by providing refrigerant circuit equalization.)
7. If discharge pressure reaches 400 psig or discharge temperature reaches 275°F, the YORKGUARD will stop outdoor section and put system on lockout. The emergency light on thermostat will be energized, alerting homeowner that a malfunction has occurred.
8. Assuming the control causing lockout has automatically reset, restore operation by:
   a. Turn thermostat dial beyond satisfied position and return to original setting. OR
   b. Turn thermostat system switch to "OFF" position and return to cooling position. OR
   c. Interrupt line power or 24 volt control circuit power to indoor section.

   The system should restart within 5 minutes.

WITH POWER TO UNIT AND THERMOSTAT IN HEATING POSITION.

1. Reversing valve is de-energized to position refrigerant circuit for heating. Indoor coil functions as condenser and outdoor coil functions as evaporator.
2. If fan switch is in "ON" position, a circuit is made through blower relay providing continuous blower operation.
3. Solid State YORKGUARD starts time delay period. At end of 5 minutes, unit is ready for operation.
4. When first stage of thermostat heating contact closes, a circuit is made through the YORKGUARD to energize contactor and start the unit. With fan switch in "AUTO" position, a circuit is made from thermostat heating contact through blower relay to provide blower operation.
5. Unit will cycle in response to thermostat signal to provide heating as needed.
6. After unit has stopped from a heating cycle or power interruption, the YORKGUARD will not permit unit to start again for 5 minutes. (This protects compressor by providing refrigerant circuit equalization.)
7. If discharge pressure reaches 400 psig, discharge temperature reaches 275°F or system tries to go on defrost cycle, the YORKGUARD will stop outdoor section and put system on lockout. The emergency light on thermostat will be energized, alerting homeowner that a malfunction has occurred.
8. To restore operation after lockout (If control causing lockout has automatically reset) –
   a. Turn thermostat dial beyond satisfied position and return to original setting. OR
   b. Turn thermostat system switch to "OFF" position and return to heating position. OR
   c. Interrupt line power or 24 control circuit power to indoor section. (This method will reset YORKGUARD and subject unit to 5 minute delay.)
9. Supplemental electric heaters are energized by second stage of heating thermostat, YORKGUARD will permit operation of supplemental heaters below balance point. At all outdoor temperatures above balance point, supplemental heaters are not permitted to operate.

10. Supplemental heater operation with outdoor temperature below balance point –
    a. With second stage of heating thermostat contact closed, a circuit is made through YORKGUARD to energize control sequencers. Control sequencers will energize supplemental heaters in 5KW steps to permit power loading of electric lines in small increments. Each KW heater is protected by automatic reset thermal limit switch and a back-up fusible link.
    b. When second stage of heating thermostat becomes satisfied, contact will open to de-energize supplemental heaters. Control sequencers will de-energize supplemental heaters in 5KW steps in reverse order of energizing.

11. DEFROST CYCLE –
    a. Frost and ice which forms on the outdoor coil during the heating cycle must be defrosted when it blocks the air flow through the coil.
    b. A defrost cycle is initiated when defrost switch (Air pressure differential) has been closed for 12 seconds (This delay eliminates affect of wind gusts) and liquid temperature is 39°F or lower.
    c. YORKGUARD energizes defrost relay which –
        (1) Energizes reversing valve to switch refrigerant circuit to cooling cycle.
        (2) Stops outdoor fan.
        (3) Energizes first step of supplemental heat to prevent cold drafts in conditioned space.
    d. Defrost cycle is terminated when liquid line temperature exceeds 75°F or by the override timer. (This permits defrost termination if wind velocity does not permit liquid line temperature reaching 75°F.)
    e. YORKGUARD de-energizes defrost relay to return unit to normal heating cycle.
    f. If unit tries to defrost within 5 minutes after completing a defrost cycle, Yorkguard will stop unit and lock it out. See 8 above to reset.

12. OPERATING BELOW – 10°F OUTDOOR TEMP.
    a. At – 10°F outdoor temperature, compressor operation cannot be justified due to small amount of heat generated.
    b. YORKGUARD senses – 10°F outdoor temperature and performs the following functions –
        (1) De-energizes compressor circuit.
        (2) Energizes standby heat (if installed) under control of second stage of heating thermostat. (Supplemental heat remains under control of second stage of heating thermostat.)
        (3) Indoor blower will operate under control of first stage of thermostat.

13. OPERATION IN EMERGENCY HEAT POSITION –

    When switch on thermostat is placed in emergency heat position –

    a. Emergency light is energized.
    b. Compressor circuit is locked out.
    c. Supplemental and standby (if installed) heaters will be controlled by first stage of heating thermostat.
    d. Indoor blower will operate on demand for heat and cycle off with the last heater element when in "AUTO" position.

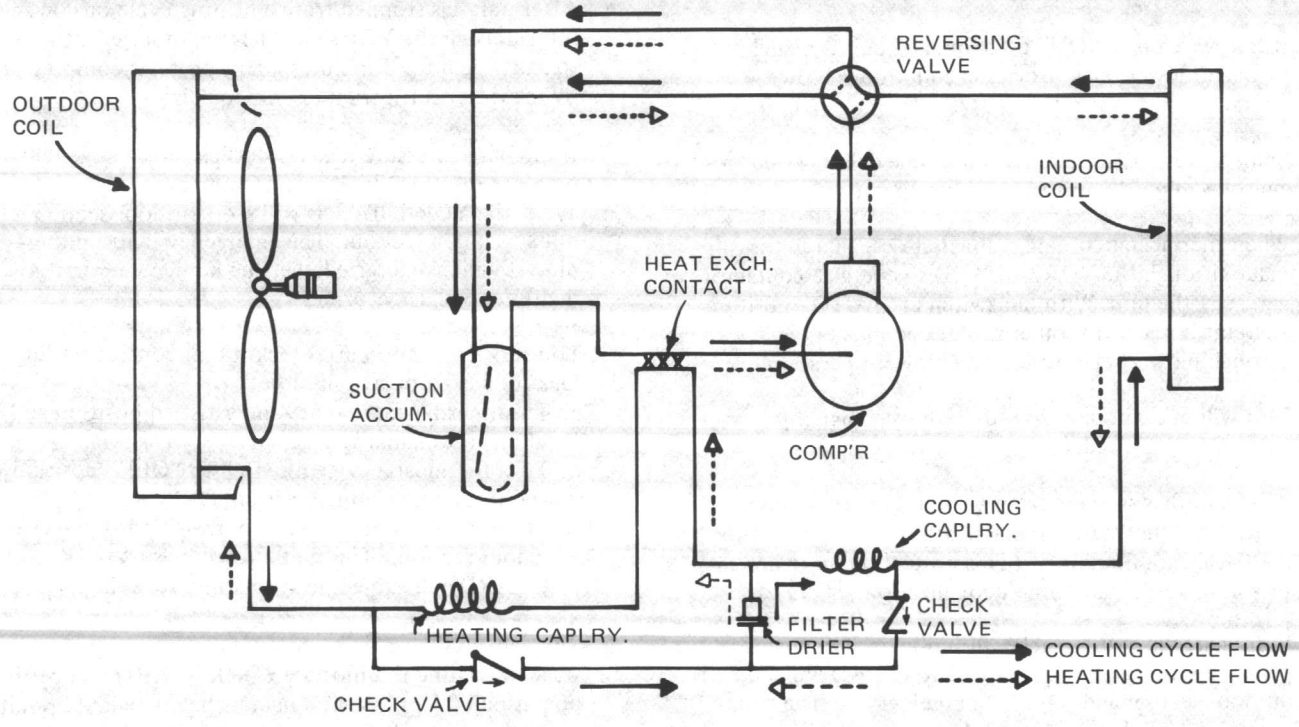


FIG. 9 – TYPICAL HEAT PUMP FLOW DIAGRAM (UNIT COIL FEEDS VARY)

SECURE OWNER'S APPROVAL

WHEN THE SYSTEM IS FUNCTIONING PROPERLY SECURE THE OWNER'S APPROVAL. Instruct the owner or the operator how to start, stop the system and adjust temperature setting. The defrost operation should also be explained. The owner should also be instructed about the 5 minute off cycle timer.

NOTICE TO OWNER:

If lockout occurs (emergency light is on), see "OPERATION" pages 11 and 12 of instructions before calling a serviceman. Snow or debris removal, or filter replacement may be all that is necessary to return system to normal operation.

COMPRESSOR CRANKCASE HEATERS

Instruct the owner that the compressor is equipped with a crankcase heater to prevent refrigeration migration to the compressor. The heater is energized only when the unit is not running (except 3 phase units). If the main switch is disconnected for long periods of shut down, no attempt should be made to start the unit for 8 hours after the switch has been connected. This will allow sufficient time for all liquid refrigerant to be driven out of the compressor.

An extra warning label pertaining to supplying power to the crankcase heater is supplied with the installation instructions of the outdoor unit. This should be attached to the disconnect switch where the occupant is most likely to see it.

MAINTENANCE

CLEANING OUTDOOR COIL SURFACE

Dirt should not be allowed to accumulate on the outdoor coils or other parts in the air circuit. Cleaning should be as often as necessary to keep the coils clean. Use a brush, vacuum cleaner attachment, or other suitable means.

OILING FAN MOTOR

Two fan motors are located in the heat pump, one to drive the indoor blower and the other to drive the outdoor fan. Some motors are provided with permanent lubrication and require no maintenance. Others are equipped with lubrication ports that are closed with plugs. After the second year of heat pump operation, inspect both motors to determine whether or not lubrication ports are provided. If so, these motors should be lubricated annually thereafter with 100 drops (1 teaspoonful) of S.A.E. 20 SD or SE rated oil. Replace the plugs after lubrication.

CONDENSING DRAIN

In the fall of the year the condensate drain trap shown in Fig. 1 should be sealed against air leakage by filling the trap with automotive antifreeze (ethylene glycol).

This is done to prevent the infiltration of cold air into the unit when condensate would not normally be present in the trap.

Failure to seal trap will result in a slight loss in heating capacity.

TABLE 6 – KEY RENEWAL PARTS INFORMATION

VOLTAGE CODE: 06 = 230-1-60, 25 = 208/230-3-60, 46 = 460-3-60

Item	Description	B2SP024	B2SP030	B2SP036	B1SP042	B1SP048	B2SP060
1	Compressor 06	015-01798 -000	015-01803 -000	015-01804 -000	015-01802 -000	015-01986 -002	015-01599 -002
	25	–	–	015-01568 -000	015-01786 -000	015-01987 -002	015-01596 -002
	46	–	–	–	–	015-01988 -002	015-01597 -002
2	Outdoor Fan Motor (208/230-1-60)	024-19891	024-19892	024-19892	024-20080	024-20080	024-20079
	(460-1-60)	–	–	–	–	024-21291	024-21659
3	Outdoor Fan Blade	026-21986	026-21913	026-21912	026-22243	026-22243	026-22241
4	Outdoor Fan Capacitor (208/230)	024-20062	024-20062	024-20062	024-20062	024-20062	024-20065
	(460)	–	–	–	–	024-21057	024-20046
5	Run Capacitor, Compressor	024-21048	024-21049	024-21052	024-21052	024-21052	024-21053
6	Indoor Blower Motor (208/230-1-60)	024-19150	024-19151	024-19151	024-19152	024-19152	024-19153
	(460-1-60)	–	–	–	–	024-21290	024-20777 -002
7	Indoor Blower Wheel	026-21210	026-21210	026-21211	026-21211	026-21211	026-16381 -140
8	Indoor Motor Capacitor (208/230)	024-20045	024-20063	024-20063	024-20046	024-20046	024-20051
	(460)	–	–	–	–	024-20046	024-21219
9	Transformer (1T) 40VA (208/230)	025-18452	025-18452	025-18452	025-18452	025-18452	025-18452
	(460)	–	–	–	–	025-19242	025-19242
10	Blower Relay (2R) (208/230)	024-17956	024-17956	024-17956	024-17956	024-17956	024-17956
	(460)	–	–	–	–	024-21292	024-21292
11	Contactor 06	024-19107	024-19107	024-19107	024-19111	024-19111	024-18056 -004
	25	–	–	024-18056 -002	024-18056 -002	024-18056 -002	024-18056 -003
	46	–	–	–	–	024-18056 -002	024-18056 -002
12	Defrost Relay	024-19138 -001	024-19138 -001	024-19138 -001	024-19138 -001	024-19138 -001	024-19138 -001
13	Logic Module	031-00251	031-00251	031-00251	031-00251	031-00251	031-00251
14	Ambient Sensor	031-00054 -002	031-00054 -002	031-00054 -002	031-00054 -002	031-00054 -002	031-00054 -002
15	Liquid Sensor	031-00045 -002	031-00045 -002	031-00045 -002	031-00045 -002	031-00045 -002	031-00045 -002
16	Discharge Sensor	031-00045 -002	031-00046 -002	031-00046 -002	031-00047 -001	031-00047 -001	031-00047 -001
17	High Pressure Control	025-17620 -007	025-17620 -007	025-17620 -007	025-17620 -007	025-17620 -007	025-17620 -007
18	Defrost Switch	024-19110 -003	024-19110 -007	024-19110 -008	024-19110 -007	024-19110 -007	024-19110 -007
19	Reversing Solenoid Coil	025-19843	025-19843	025-21425	025-21425	025-21425	025-21425
20	Outdoor Coil	363-67537	363-67248	363-67241	363-68119	363-67931	363-67931
21	Indoor Coil	363-67538	363-67247	363-67241	363-68116	363-67937	363-68431

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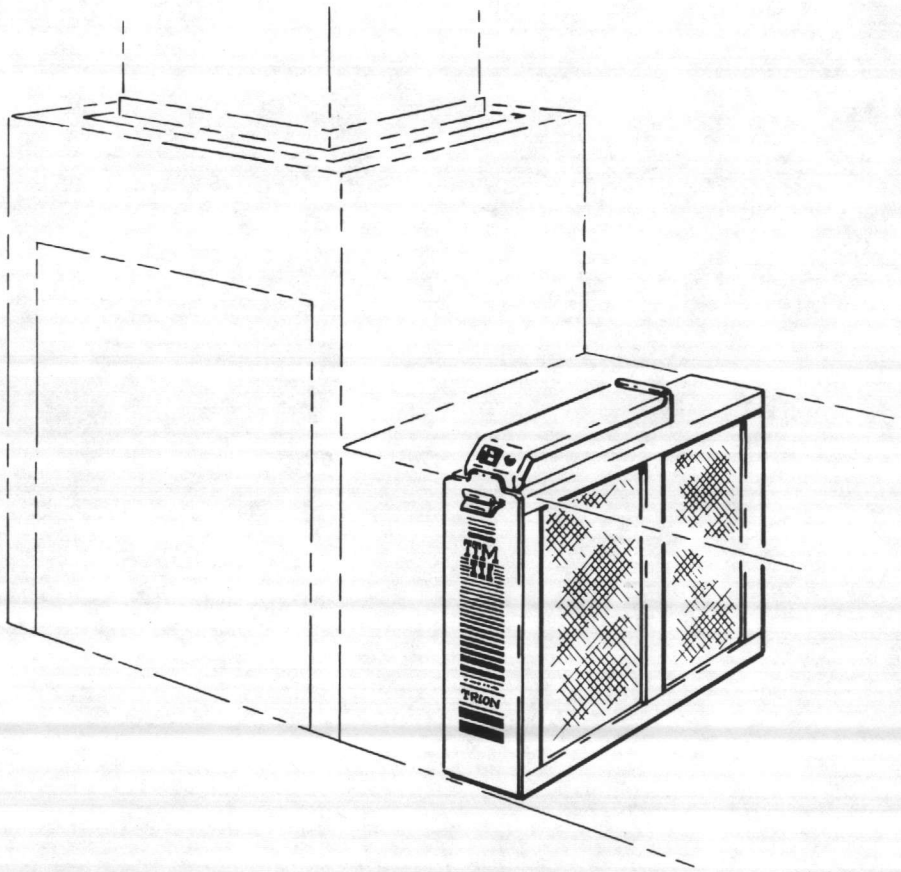
BorgWarner
Air Conditioning

TRION

DUCT MOUNT
ELECTRONIC AIR CLEANER

MANUAL FOR

- **INSTALLATION**
- **OPERATION**
- **SERVICE**



CAUTION:

Read rules and instructions carefully for safe operation.
Exercise the usual precautions when working with high voltage.

TABLE OF CONTENTS

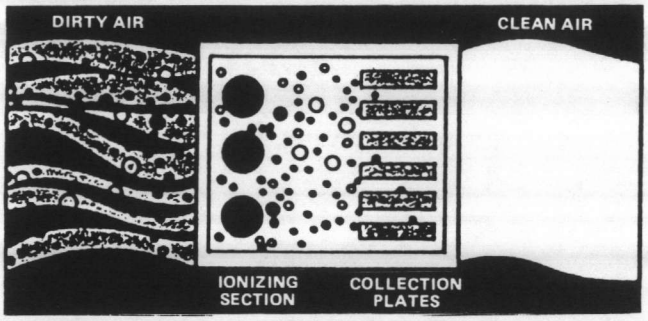
This manual provides information for location, installation, operation and service. Before installation and use of the air cleaner, carefully read these instructions to insure maximum benefits from the unit and to avoid needless service cost that can result from improper installation.

I. INTRODUCTION

This electronic air cleaner is technically known as a two-stage electrostatic precipitator. It is designed to remove airborne particles – dust, dirt, smoke – from indoor air.

Air movement through the unit is controlled by the heating and/or air conditioning system blower. As dirty air enters the unit it passes through a pre-filter. The pre-filter strains out carpet lint, pet hair and other large particles by direct impingement.

The pre-filtered air then passes through a two-stage electrostatic precipitator. In the first stage of electrical operation, all airborne particles, even of submicroscopic size, are electrically charged (positive) as they pass through the ionizer. In the second stage of operation, the charged particles pass into an electrical field established between a series of parallel plates, forming the negative element of the field. Here the positively charged particles are attracted to the plates.



SPECIFICATIONS			
Model	434460 (TTM-III 1400)	434461 (TTM-III 2000)	434462 (Trim T)
Rated Capacity	1400 CFM (2520 m^3/hr.)	2000 CFM (3600 m^3/hr.)	1400 CFM (2520 m^3/hr.)
Max. Pressure Drop	.085 in. w.g. @ 1400 CFM (21.2 Pa. @ 2520 m^3/hr.)	.14 in. w.g. @ 2000 CFM (34.9 Pa. @ 3600 m^3/hr.)	.085 in. w.g. @ 1400 CFM (21.2 Pa. @ 2520 m^3/hr.)
Cell Weight	(2) 9½ lbs. each (4.3 kg.)	(2) 11 lbs. each (4.9 kg.)	(2) 5 lbs. each (2.3 kg.)
Unit Weight	43 lbs. (19.5 kg.)	49 lbs. (22.2 kg.)	30 lbs. (13.6 kg.)
Power Consumption	48 watts maximum	48 watts maximum	48 watts maximum
Electrical Input	120 Volts, 60 Hertz, 1 Phase	120 Volts, 60 Hertz, 1 Phase	120 Volts, 60 Hertz, 1 Phase
Electrical Output	2.0 MA @ 6800 VDC	2.0 MA @ 6800 VDC	2.0 MA @ 6800 VDC

II. PLANNING THE INSTALLATION

Location

Because air handling systems vary greatly in arrangement and style, factors such as accessibility, ambient temperature ratings, transitions and other requirements must be carefully considered.

The unit must be readily accessible for periodic inspection and cleaning of the protective screens and electronic cells to maintain maximum efficiency and trouble-free operation. When selecting the unit location for a single pre-filter unit, allow a minimum of 25" clear space in front of the access panel and 12" of clear space above the power pack cover plate for component removal and service space. For double pre-filter unit allow a minimum of 18" clear space in front of the access panel and 12" of clear space above the power pack cover plate for component removal and service space.

The air cleaner must be wired to operate in conjunction with the system blower.

The air cleaner can only remove the airborne contaminants delivered to it by the ventilating system. To obtain maximum efficiency, adjust the system blower controls for continuous or as near continuous operation as practical.

Air Conditioning

Whenever possible, install the electronic air cleaner upstream of the cooling coils.

Humidifiers

Location of the system humidifier is important to the operation of the air cleaner.

When an evaporative type humidifier is used, it may be installed between the furnace warm air duct and the return air duct without affecting the electronic air cleaner. Atomizing and spray type humidifiers should be installed downstream of the air cleaner. If it must be installed upstream, allow at least 6' between air cleaner and humidifier.

Outdoor Air

When outdoor air is added to the return air duct, sufficient heat should be added to maintain the return air temperature at 40° F (4° C) minimum. Lower temperatures can cause ionizer wire failure under certain conditions.

CAUTION: Only a trained, experienced serviceman should install this electronic air cleaner. Power supply should be disconnected before installation and a thorough checkout of the unit installation should be completed before unit operation.

THIS AIR CLEANER SHOULD NOT BE INSTALLED ON THE HOT AIR SIDE OF DUCT-TYPE SYSTEMS

NE PAS INSTALLER CE FILTRE ELECTROSTATIQUE DANS LE COURANT D'AIR CHAUD D'UN APPAREIL DE CHAUFFAGE

Sheet Metal Installation

The electronic air cleaner is adaptable to all new or existing residential forced air furnace or cooling systems.

Transitions

If the air duct does not fit the air cleaner cabinet opening: (1) gradual transitions are recommended to reduce air turbulence thru the air cleaner to maximize efficiency. (2) Not more than 20° (about 4" per running foot) of expansion should be used on each side of the transition fitting.

Turning Vanes

If the air cleaner is installed adjacent to a 90° duct elbow, add turning vanes inside the duct to improve the air distribution across the face of the air cleaner.

III. INSTALLATION

1. Remove unit access panel, and slide the lint screen(s) and ionizing-collecting cells out of the cabinet. Place them safely aside with the owners manual and warranty registration card.
2. Locate the cabinet in the cold air return duct so that all of the return air flows thru the unit. It may be positioned for air flow in any direction: horizontal, left or right, vertical, up or down, or at an angle to the duct work. Maintain adequate space in front of the unit (18") for component removal and above the power pack (12") for service. Holes are provided for duct work attachment. The .140" holes are sized for number eight sheet metal screws and will also accommodate a number six sheet metal screw or 1/8" rivet. If the adjoining duct work is flanged, install the screws so that the screw heads are inside the cabinet to permit easy installation of lint screen and any after filter accessory. When adjoining duct work has been secured, seal seams air tight with duct tape or caulking.
3. Reinstall the lint screen on the air entering side of the cabinet.
4. A positioning screw is located inside the bottom of the cabinet to index the installation of the ionizing-collecting cells in the proper position with respect to airflow. The screw must be installed in the hole provided closest to the air leaving side of the cabinet. Install the screw in the proper hole, seal the hole not used with duct tape and reinstall the cells. The directional arrows on the cell end plates must point in the direction of airflow.
5. Reinstall cabinet access panel.

IV. ELECTRICAL WIRING

1. Remove power pack cover plate.
2. Wire unit to 120 volt, 60 Hertz, 1 phase supply so that the air cleaner is energized only in conjunction with system blower. (See typical diagrams.) (Page 4)

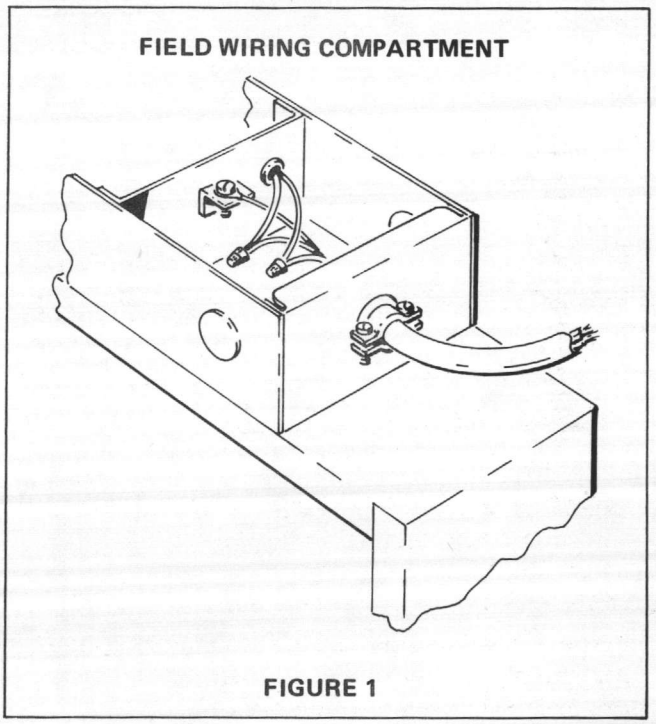
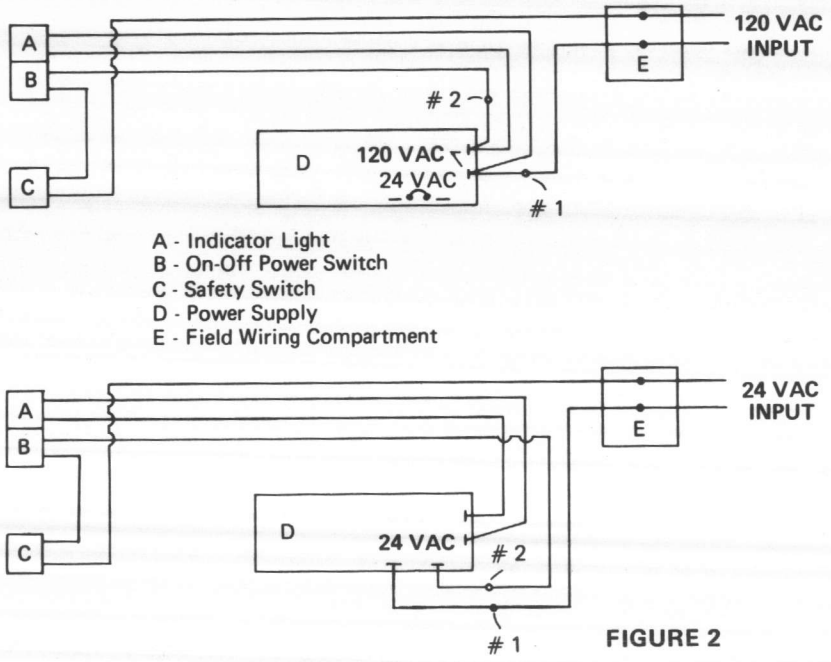


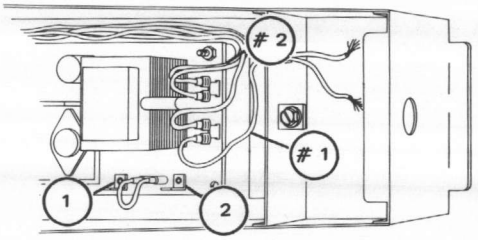
FIGURE 1

INPUT POWER
120 Volt To 24 Volt Conversion

3. An alternate power source for this unit is a 24 volt AC, 40 VA, Class 2 transformer (furnished by others). When the 24 volt supply is used, it is necessary to move the two primary power leads (marked # 1 and # 2), located at the 120 VAC terminals on the power supply. Those leads must be moved to corresponding numbers on the power supply. (Ref. Figure 2)



FACTORY WIRED 120 VAC



24 VOLT FIELD CHANGE OPTION

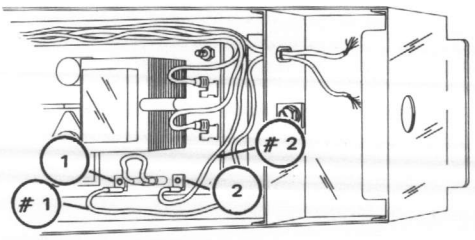
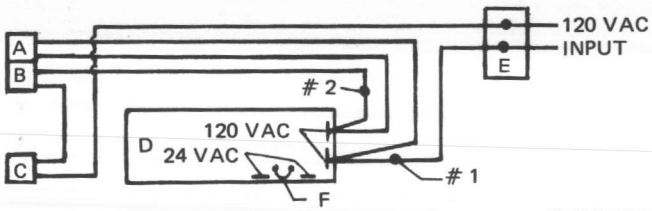
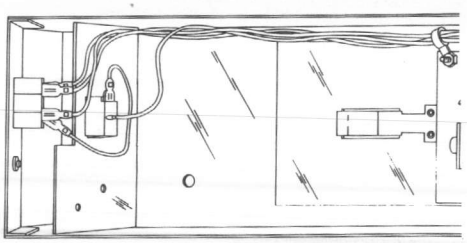


FIGURE 2

AIR FLOW SENSOR



FACTORY WIRED

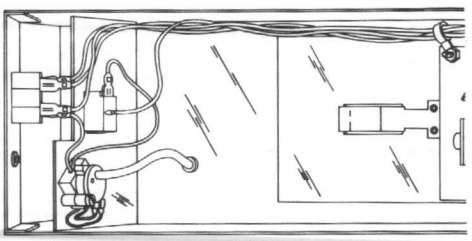


A - Indicator Light
B - On-Off Power Switch
C - Safety Switch
D - Power Supply
E - Field Wiring Compartment
F - Jumper
G - Air Flow Sensor

INSTRUCTIONS

1. Install air flow sensor in holes provided in high voltage barrier.
2. · Replace hole plug in the bottom of the power pack enclosure with bushing.
   · Remove cell from unit and insert tube up through bushing and secure to air flow sensor.
3. Disconnect jumper from power supply and discard.
4. Connect leads from these two terminals on the power supply to the two terminals on the air flow sensor.

AIR FLOW SENSOR CHANGE OPTION



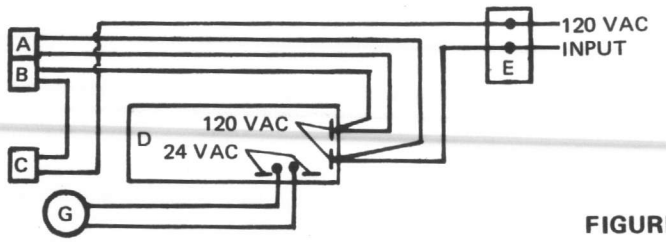


FIGURE 3

When connecting an air cleaner to operate in conjunction with a multispeed motor, a device such as a sail switch, pressure differential switch or an extra 120 VAC double pole, double throw relay must be used. (Ref. Figure 4). An air flow sensor and static switch can also be used (Ref. Figure 3), available from Trion as an optional accessory.

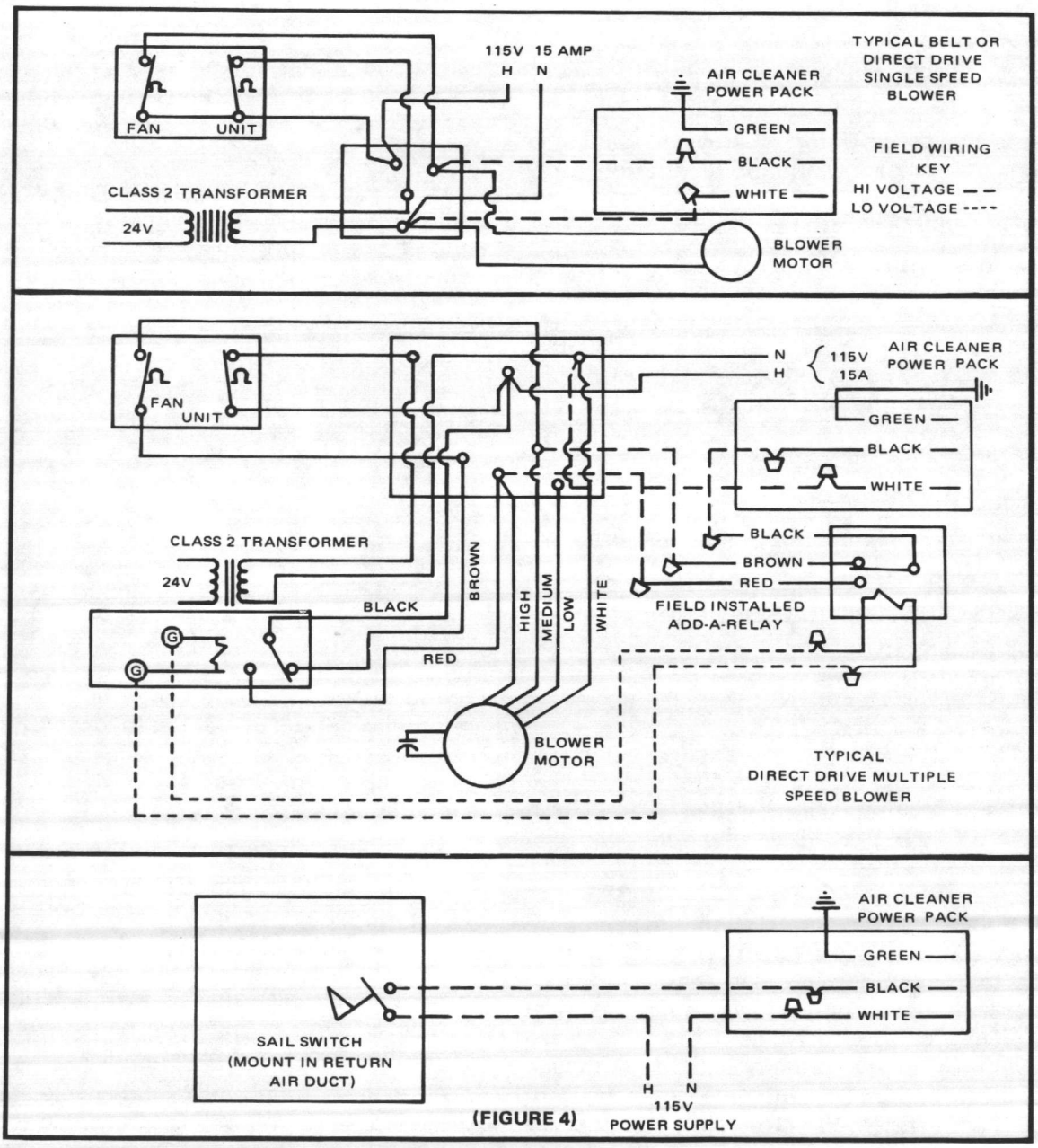
WARNING

IMPROPER FIELD WIRING WILL VOID ALL WARRANTIES ON THIS PRODUCT.

NOTE: DIRECT WIRING TO A MULTI-SPEED BLOWER MOTOR WILL CAUSE FAILURE OF THE POWER SUPPLY IN THIS UNIT.

PLEASE REFER TO THE FOLLOWING TYPICAL WIRING DIAGRAMS FOR PROPER INSTALLATION.

REMOVE CARDBOARD PACKING INSERT FROM TOP OF COLLECTING CELLS.



(FIGURE 4)

V. SYSTEM CHECK OUT

After installing the unit, move the On/Off switch to the "ON" position. (Be sure system blower is "on".)

A. Both the On/Off indicating light (amber) and the performance indicating light (red) should now be on.
   1. On/Off indicating light shows unit has line voltage (24 or 120 volts).
   2. Performance indicating light (red) shows high voltage output.

B. Check to see if indicating light goes out under the following conditions:
   1. When system blower is off.
   2. When the power switch is in the "OFF" position.
   3. When access panel is removed.

C. Refer to Quick Reference Trouble Chart (Page 10) if detailed trouble shooting is required.

D. See that owner/operator is provided with the owners manual and warranty registration card.

VI. TROUBLE SHOOTING

The following instructions are for use by qualified personnel only:

WARNING: THE FOLLOWING PROCEDURES WILL EXPOSE HAZARDOUS HIGH VOLTAGE. DISCONNECT POWER BEFORE PROCEEDING.

Recommended Service Tools

- Test light, 120 VAC Neon.
- Screw driver, 8" common with insulated handle.
- Needle nose pliers.
- Ohmmeter, 10,000 (Plus) OHM Range.
- Kilovolt meter, 10,000 (Plus) KVDC. Positive Polarity Range

A. Indication Of Electrical Trouble

The performance indicating light (red) is wired into the circuit so that it will monitor both the primary and secondary circuits. (Electrically, the ionizing-collecting cell is a component in the secondary circuit.)

When the unit is in normal state of operation, system fan running, access door in place, control switch in the "ON" position, and the performance indicating light goes "out", there is an electrical problem. The problem may be either a shorted secondary or an open primary circuit. Although the failure of the performance indicating light itself should not be overlooked, this condition is unusual. The light is neon and reliable.

B. Isolating Electrical Trouble To Major Components

When the unit is in a normal state of operation and the performance indicating light goes "out", the trouble can be readily isolated to either the ionizing-collecting cells or power pack. Turn the unit "off", remove both ionizing-collecting cells, close the access panel and turn unit "on". If the light remains "off" with the cells removed, the trouble is in the power supply or in the primary circuit to the power supply.

If the performance indicating light is on — trouble is in the cells.

C. Electrical Troubles & Their Corrections

1. PRIMARY CIRCUIT CHECK

If there is supply line voltage at the service connections and no input voltage to the power supply, the outage can be located by checking operation of the safety switch and control switch as well as the interconnecting wiring, with a test light.

Refer to circuit diagram, Figure 6. If there is power to the line side of either switch, and no power on the load side when the switch is closed, the switch is defective and should be replaced.

CAUTION:

- EXERCISE PRECAUTION WHEN WORKING WITH HIGH VOLTAGE.
- WHEN THE CIRCUIT HAS BEEN DE-ENERGIZED, ALWAYS DISCHARGE ANY RESIDUAL CURRENT IN THE SECONDARY CIRCUIT WITH AN INSULATED HANDLE SCREWDRIVER.
- ALWAYS GROUND POWER SUPPLY AND IONIZING-COLLECTING CELL WHEN BENCH TESTING.

If performance indicating light (red) indicates a service problem, check one of the following:
There are two areas in the secondary circuit that service problems originate:

The Power Supply
The Ionizing-Collecting Cell

The cell, which is removed from the unit periodically to wash away the collected dirt, is more susceptible to physical damage through handling, than the power supply. The cell, also contains one component, the ionizing wires, which due to their function, have to be designed with a minimum of structural support and are therefore susceptible to breakage.

The power supply, like other electrical items exposed to "high voltage" is susceptible to the usual

stresses.

Trouble related to either of these two items, is readily shown by the performance indicating light (red) and can be easily and quickly isolated to one, or the other, by a simple procedure.

2. POWER SUPPLY CHECK

a. Without DC High Voltage Meter

If there is primary power to the power supply and the secondary output voltage is absent or low, the power supply is defective. A fast simple check can be made by drawing an arc, with an insulated handle screwdriver between common ground (power pack housing) and the hi-voltage output terminal (C). A good power supply will produce a pronounced arc where a defective one will produce no arc at all or a very weak one.

b. With DC High Voltage Meter

Take reading with the high voltage meter at cell contact point. Should range 8.5 KV or higher (without cell connected).

If voltage is above 8.5 KV, the problem is in the cell (see cell checkout procedure).

If voltage is below 8.5 KV (without cell connected), the problem is in the power supply.

Proceed as follows:

1. Check for loose wires; if loose wire found, reconnect.
2. Remove power pack from the unit.
3. If defective power supply is indicated, replace.

INPUT: The electronic air cleaner should be wired to operate only when the system blower is on.

OUTPUT: This is a high frequency solid state circuit designed for electronic air cleaners with high performance reliability.

– 2 milliamps

– 6.6 ± .6 KVDC (with cell connected)

– 8.8 ± .8 KVDC (without cell connected)

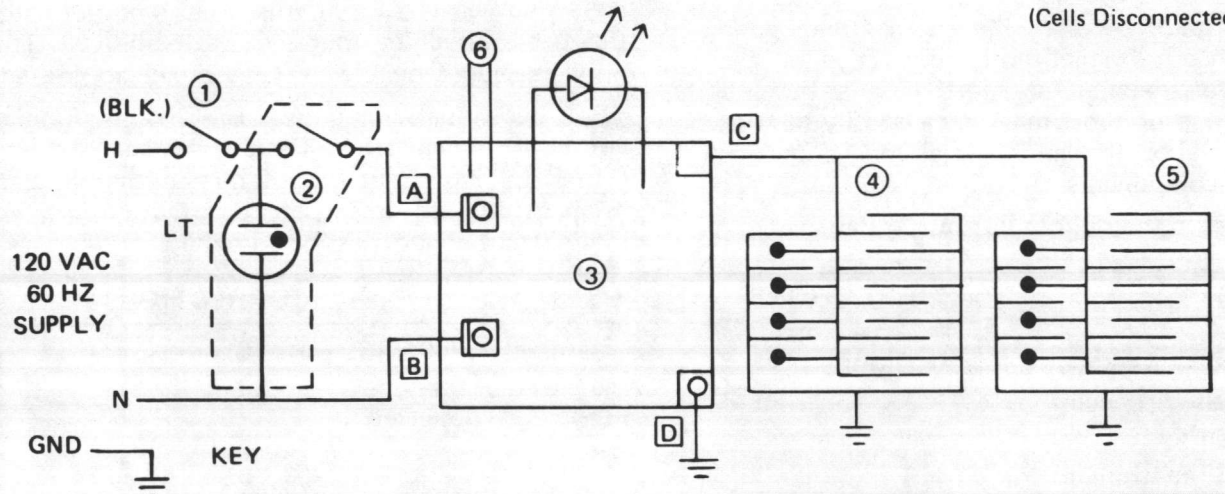
HIGH FREQUENCY POWER SUPPLY

The following are approximate resistance values. ± 20%

Test Points	Resistance
A to B	20 Ohms
D to C	500 Meg Ohms

The following are approximate DC output voltage at 120 VAC

Test Points	Secondary DC Voltage
D to C	Adj. to 6600 ± 600 VDC (Cells Connected)
D to C	8800 VDC ± 800 V (Cells Disconnected)



KEY

1. Safety Interlock Switch
2. On-Off Switch & Power Indicating Light
3. High Frequency Power Supply
4. Ionizing-Collecting Cell # 1
5. Ionizing-Collecting Cell # 2
6. Air Flow Switch OPTIONAL

WARNING: When bench testing power supply always attach ground wire.

FIGURE 5

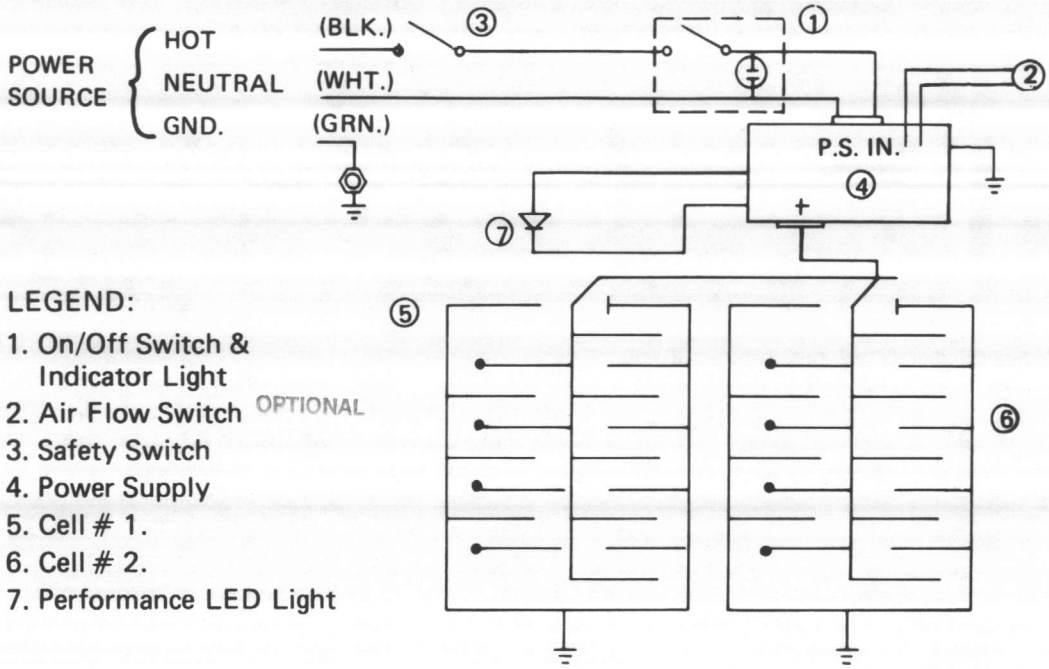


FIGURE 6

3. IONIZING-COLLECTING CELL CHECK

The cell is electrically energized through a contact terminal located at the top center of a cell. The ionizing wires and every other collector plate are electrically charged while each interleaving plate is grounded.

If the space between the charged and ground components is bridged with conductive or semi-conductive material, a short circuit develops. The bridging or short may be caused by damaged components or foreign material lodged between or on the components.

Most troubles in the cell can be visually detected.

D. Other Troubles

THEIR SYMPTOMS AND CORRECTIONS

1. ARCING NOISE

When an arcing noise is noted, it is usually located in the DC high voltage circuit. The ionizing-collecting cell is part of this circuit and normally the trouble will be found to be in the cell. The noise is caused by high voltage arcing to ground.

An occasional arcing noise is normal and inherent in all precipitators. These occasional arcs are caused by large particles of dirt in the air such as a cigarette ash, insect, etc. Constant or repeated intermittent arcing must be corrected.

CAUSES	CORRECTIONS
Loose ionizing wire(s)	Repair or replace
Excessively dirty cell components	Clean
Damaged (bent) plates of ionizing	Straighten or replace
Defective or loose high voltage lead or contact assembly	Repair, replace
Improper ground	Check ground and correct if necessary
Excessive dirt build-up	Wash
Large pieces of foreign matter lodged between plates	Remove
Very dirty insulators	Clean
Broken ionizing wires	Remove all pieces of broken wires and replace
Excessively bent or misaligned components due to mishandling	Straighten or replace
Externally broken or cracked insulators	Replace

2. HISSING NOISE

A hissing noise (or frying sound) usually stems from a loose high voltage connection or from an improper ground. The reduction in the designed spacing usually is caused by bends or deformities in the cell from mishandling.

Check for:

CAUSES	CORRECTIONS
Damaged (bent) plates of ionizer	Straighten or replace
Loose ionizing wires	Repair or replace
Defective high voltage contact assembly	Repair or replace
Dirty cell or large piece of foreign material between plates	Clean
Poor connection between cell and contact assembly	Repair
Loose high voltage wiring	Repair
Improper ground	Check and correct if necessary

3. HUMMING NOISE

The ionizing wires have a normal tendency to vibrate when charged. On some occasions, when atmospheric conditions are just right and the humidity is exceptionally low, the vibration is aggravated to the point where an audible hum can be noted. It is usually noted more in the northern sections of the country during the winter months. This condition can be further aggravated if the ionizing-collecting cell is very dirty. The condition is self-correcting when the relative humidity is increased or can be alleviated by washing the cell.

4. RADIO AND/OR TELEVISION INTERFERENCE

This trouble is not common but when occurring is usually due to either a continuous high voltage "leak or discharge", or from the absence of a good common electrical ground. Refer to checks listed under 1. Arcing Noise and 2. Hissing Noise.

5. WHITE DUST

One of the most difficult service calls to handle is the complaint of the presence of white dust. The majority of these complaints are from residential users. In many instances, the statement is made, "We have more dust now than we ever had". These service calls are difficult because the limitations of the installation must be explained.

White dust actually can be described as "clean dirt". Where it is noticed, an examination will show the user that it is largely lint. It is most noticeable on dark furniture, and is usually found in homes containing new furnishings such as carpeting, drapes, etc., which give off more lint than such items that have been used and cleaned for some time. The amount of lint generated is increased by activity in the air; especially by children, pets and heavy house traffic.

Visible lint particles, like cigarette ashes, are heavy as compared to the extremely small, individual dirt particles which make up cigarette smoke. Their weight causes the lint particles to "fall out" on furniture, floors, etc., just as cigarette ashes fall to the floor while cigarette smoke particles remain suspended in the air. Dirt particles, such as heavy pieces of lint or ash, which do not remain airborne, never reach the electronic air cleaner and the unit cannot remove these air particles.

Fortunately, the black, greasy dirt particles with the damaging staining power are light in weight, remain in the air stream, and do reach the electronic air cleaner. It is their removal from the air that keeps the lint clean, and therefore, more visible.

There is no question that the electronic air cleaner is capable of collecting lint in addition to other atmospheric contaminants. This is easily confirmed by examining the air entering side of the ionizing-collecting cell before it is washed. You will note that along with the black, greasy dirt collected, there are lint particles that did stay airborne long enough to reach the electronic air cleaner.

Lint from new furnishings will decrease with wear. The length of time depends on the amount and type of fabric in the furnishings and the air circulation. In some areas, a bedroom for example, a lint condition may always remain.

Normally, continuous fan operation (24 hours a day) will minimize this problem. If this cannot be accomplished, the controls should be set as near continuous fan operation as possible. In some instances the use of a two speed fan motor is advantageous.

Cold air returns should not be restricted in any manner, particularly from rooms in which lint is prevalent. If the returns in these rooms are blocked, the return air will seek another, longer path. In traveling a greater distance, lint fallout is increased.

Actually, the presence of large, clean lint particles is further proof that the air cleaner is doing its superior air cleaning job. Electronic air cleaners are dependent on the movement of air currents to

bring the dirt particles to the unit for their removal. Weighty, non-airborne particles such as cigarette ashes weigh too much to remain in the air currents while other particles, such as cigarette smoke, remain suspended and are carried to the electronic air cleaner for removal.

6. OZONE

Under normal operating conditions all electrostatic air cleaners produce minute quantities of ozone as an incidental by-product, as do televisions and other electrical appliances. The design of the unit has been tested and is far below the published permissible limits. The level of detection (when it is noticed) varies from individual to individual, some being more susceptible than others.

Usually a new unit will produce more ozone than one that has been in operation for several weeks. This is due to the normal amount of sharp corners or manufacturing burrs on the ionizing-collecting cell. The voltage working on these areas however, tends to round them-off, thereby they are self-correcting.

An ionizing-collecting cell that has been damaged, where the designed spacing between electrically charged and ground components has been decreased, may also produce an abnormal amount of ozone.

If there appears to be excess ozone, check for:

CAUSES	CORRECTIONS
Damaged (bent) plates	Straighten or replace
Loose ionizing wires	Repair or replace
Dirty cell	Clean
Loose high voltage connections	Repair or replace
Unit "ON" when system fan is not running	Set fan for continuous operation or wire so unit will operate only when system fan is running.

VII. MAINTENANCE AND WASHING

Listed below are the instructions as stated in the Owners Manual.

Maintenance

When to wash: Periodically the dirt collected by the unit must be removed. The frequency of washing will depend on the amount of dirt present in the air in the locality.

The washing frequency best suited for the unit can be determined by examining the dirt collecting components at three week intervals. As the dirt begins to collect, there will be a light film, then a very definite collection will be evident at a later examination. When there is a noticeable build-up of dirt, it is time to wash the collecting cell.

In most areas the collecting cell should be washed about every 3 months.

NOTE: Dirt build-up on the ionizing-collecting cell should not be confused with dirt stains. Dirt stains are normal and do not affect efficiency.

Steps for washing:

1. Turn ON/OFF indicating light switch "OFF".
2. Remove door, slide out lint screen and cells and install door.
3. Place components in automatic dishwasher, stationary tub, shower stall or over floor drain. Use hot soapy water and rinse thoroughly. As an aid to drying, rinse with clear hot water. Allow components to dry thoroughly. (Ionizing wires are easily broken. Handle the cells with care.)
4. Remove door and slide lint screen in retaining channel on air entering side of cabinet.
5. Slide cells into cabinet with directional "airflow" arrow pointing in direction of airflow.
6. Replace door.
7. Turn ON/OFF indicating light switch "ON".
8. If arcing noise occurs due to wet cells, turn ON/OFF indicating light switch "OFF" and allow more drying time. The ON/OFF indicating light switch will glow with the system blower in operation. If there are any problems, refer to the Quick Reference Trouble Chart (IX on page 10).

VIII. ORDERING PARTS

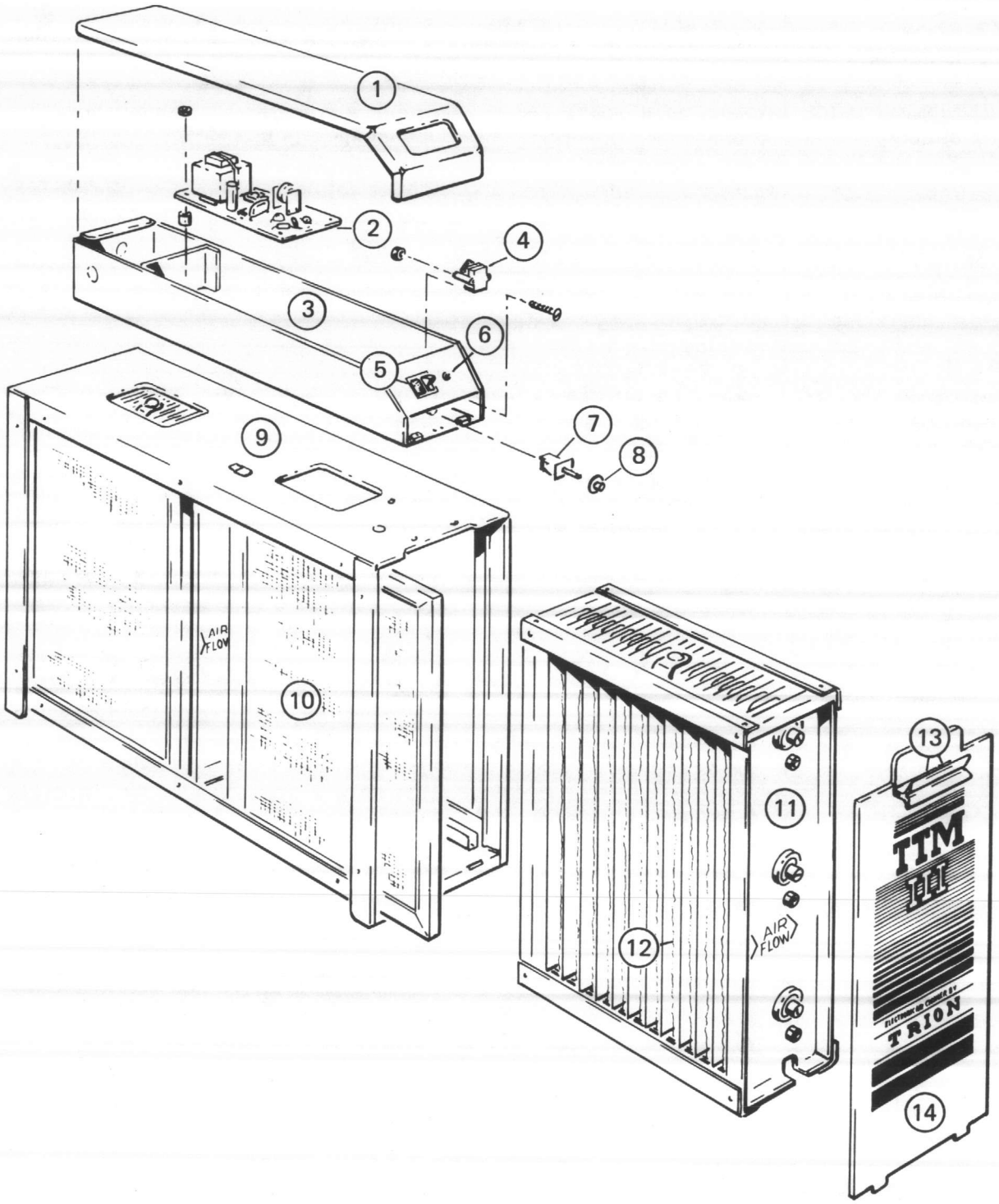
When ordering replacement parts or spare parts, state the Unit Model No. and Serial Number. These numbers are shown on the data plate located on the inside of the access panel.

Complete parts lists are available upon request. Orders will be filled in accordance with the terms and conditions of current price sheets.

SERVICE

IX. QUICK REFERENCE TROUBLE CHART

Condition or Symptom	Trouble Description	Probable Location	Possible Cause	Correction
On/Off Indicating Light (Amber) Out	Open Primary Circuit	Primary Wiring	No power from service connection to power supply	Obtain power
		On/Off switch	Blower not on Loose wiring Defective wiring	Energize blower Repair Replace
On/Off Indicating Light (Amber) Out	Light out but unit working	Power Indicating Light	Defective Light	Replace
Performance Indicating Light (Red) Out	Short Circuit	Power Supply	Defective Power Supply	Replace
Performance Indicating Light (Red) Dim	Short Circuit	Power Supply	Defective Power Supply	Replace
		Cell	Broken Ion Wire Excessive Dirt Object between plates Damaged (bent) plates Damaged (bent) ionizer Broken insulator	Remove & replace Wash Remove Straighten or replace Straighten or replace Replace
Cracking Noise	Objectionable Noise	Cell	Loose Ionizing Wire Dirty Cell Damaged (bent) plates Damaged (bent) ionizer	Replace Wash Straighten or replace Straighten or replace
Loud Hissing Noise	Same	Cell Hi-Voltage	Dirty Cell Loose Hi-Voltage Connection Insufficient Ground	Wash Correct Correct
Radio and/or TV Interference	Same	Cell Hi-Voltage Connection	Improper Ground Loose Hi-Voltage Connection	Correct Correct
Odor of Ozone	Same		See page 9	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AIR FLOW
AIR FLOW
TTM III
TRION

PARTS LIST

Ref. No.	Trim-T Part No.	TTM-III 1400 Part No.	TTM-III 2000 Part No.	Part Description
1	334370-001	334370-001	334370-001	Power Pack Cover
2	331845-201	331845-201	331845-201	High Frequency Power Supply
3	434381-001	434381-001	434381-001	Power Pack Assembly
4	132319-001	132319-001	132319-001	Mini Switch Air Flow Sensor (Optional)
5	234861-001	234861-001	234861-001	Switch W/ Light
6	134516-001	134516-001	134516-001	LED Performance Light Assembly
7	231082-001	231082-001	231082-001	Pushbutton Switch
8	132122-001	132122-001	132122-001	Pushbutton Cap (On Safety Switch)
9	334373-001	334362-002	334362-001	Cabinet Assembly
10	320297-009	320297-008	320297-007	Pre-Filter
11	422167-503	422085-501	422086-501	Cell, Ionizing-Collecting
12	220111-021	220111-020	220111-029	Ionizing Wire Assembly
13	135104-001	135104-001	135104-001	Handle
14	334634-001	334632-001	334633-001	Front Panel Door Assembly
Not Shown	234458-002	234458-002	234458-002	Contact Board Assembly
Not Shown	133548-001	133548-001	133548-001	LED Mounting Clip
Not Shown	227833-005	227833-003	227833-004	Charcoal Filter (Optional)

TRION, INC.

101 McNEILL ROAD · P.O. BOX 760 · SANFORD, NORTH CAROLINA 27331-0760
PHONE: (919) 775-2201 · TWX: (510) 920-0675

TRION LTD.

BRUNEL GATE, WEST PORTWAY INDUSTRIAL ESTATE
ANDOVER, HAMPSHIRE, ENGLAND
TELEX 47265, PHONE ANDOVER (0264) 64622

Form No. 61-0171

Printed In USA

INSTALLATION INSTRUCTIONS & PARTS MANUAL

GAS UNIT HEATERS WITH ELECTRONIC IGNITION

MODELS 3E366A THRU 3E368A, 3E379A THRU 3E381A, 3E406, 3E407, 3E369 THRU 3E375, 3E382 THRU 3E386

FORM 5S2486 08262

DAYTON ELECTRIC MANUFACTURING CO. CHICAGO 60648

0683/148/1M

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE DAYTON FUEL-TRIMMER GAS UNIT HEATER!
RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

Design certified by A.G.A. and C.G.A. for use with natural and propane gases. Complies with ANSI Standard Z83.8b Unit Heaters.

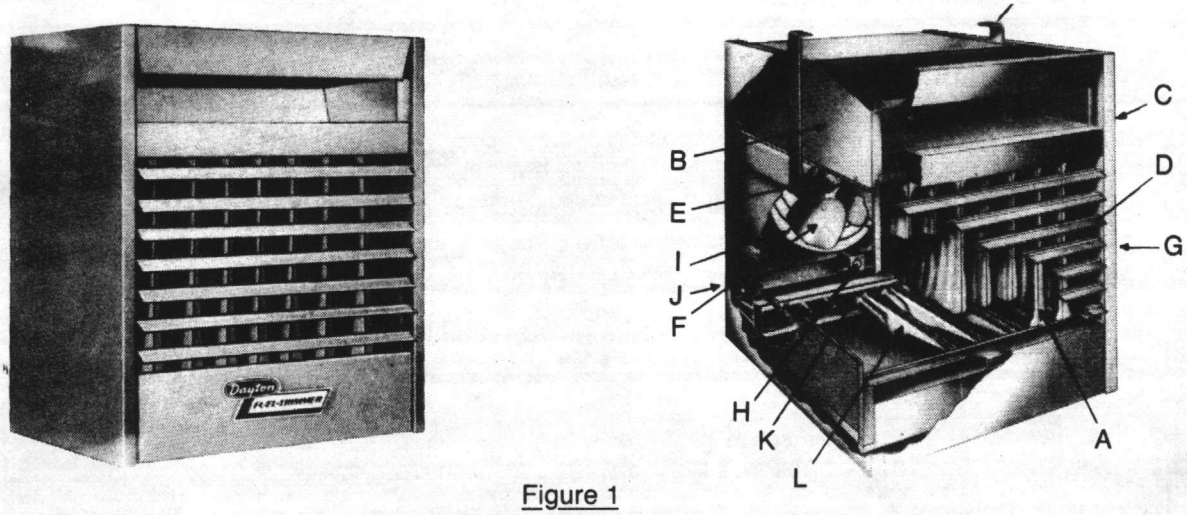


Figure 1

Description

The Dayton Fuel-Trimmer gas unit heater is a factory assembled, low static pressure type propeller fan heater designed to be suspended within the space to be heated. THESE HEATERS ARE NOT TO BE CONNECTED TO DUCTWORK.

FEATURES OF THE GAS UNIT HEATER

A. HEAT EXCHANGER: 20 gauge aluminized steel tubes; two vertical seams. Heat exchanger tubes "MIG" welded to heat exchanger top and bottom. Panels made of 18 gauge aluminized steel. Quality design assures long life.
B. DRAFT DIVERTER: Made of corrosion resistant aluminized steel.
C. HOUSING: 20 gauge steel with pre-painted spice brown enamel finish.
D. LOUVERS: Independently adjustable for maximum air distribution. Stops prevent closure of louvers.
E. MOTOR: Automatic reset thermal protection. 115V, 60 Hz. Specially designed for each heater.
F. FAN: Dynamically balanced, aluminum air foil blade assures quiet, efficient operation.
G. FAN SWITCH: Has built-in heat anticipator to assure positive fan delay (Not shown).
H. LIMIT SWITCH: Prevents excessive outlet air temperature.
I. FAN & MOTOR SUPPORT: Exclusive vibration isolators provide true in-shear rubber isolation between fan and heater assuring quiet operation.
J. DUAL AUTOMATIC GAS VALVE (NOT SHOWN): 24 VAC gas control valve with pilot gas and main gas solenoid valves. Pilot valve also serves as redundant main gas valve.
K. AIR SHUTTERS: Individually adjustable; friction locked, manually rotated air shutter adjustment.
L. BURNERS: Stamped aluminized steel with stainless steel port protectors for maximum efficiency.
M. HANGERS: Two point suspension with 9/16" dia. hanging holes provided at the top of the unit.

TRANSFORMER: 24 VAC transformer standard (Not shown).
IGNITER (NOT SHOWN): 24 VAC pilot ignition and safety device. (Part of dual automatic valve on some models.)

Specifications & Performance Chart

NATURAL GAS		PROPANE GAS		NATURAL AND PROPANE GAS								
MODEL NO.	GAS INLET	MODEL NO.	GAS INLET	BTUH INPUT	CFM	FAN DIA.	MOTOR HP	FLUE	HT.	OVERALL WIDTH	DEPTH	SHP. WT.
3E366A	1/2"	3E379A	1/2"	30,000	440	8-3/4"	1/100	4"R,H	25¾"	14"	27-5/8"	58
3E367A	1/2"	3E380A	1/2"	45,000	800	12"	1/30	4"R,H	25¾"	14"	27-5/8"	76
3E406	1/2"	3E407	1/2"	60,000	1050	14"	1/30	5"R,H	25¾"	17-1/2"	27-5/8"	100
3E368A	1/2"	3E381A	1/2"	75,000	1100	14"	1/30	5"R,H	25¾"	17-1/2"	27-5/8"	110
3E369	1/2"	3E382	1/2"	100,000	1350	14"	1/20	6"R,V	31"	17-7/8"	32-1/2"	173
3E370	1/2"	3E383	1/2"	125,000	1500	16"	1/20	6"R,V	31"	20-5/8"	32-1/2"	195
3E371	1/2"	3E389	1/2"	150,000	2000	16"	1/12	7"R,H	36"	20-5/8"	34-1/4"	217
3E372	1/2"	—		175,000	2300	18"	1/8	7"R,H	36"	23-3/8"	34-1/8"	236
3E373	1/2"	3E385	1/2"	200,000	2400	18"	1/6	8"R,H	36"	26-1/8"	34-1/8"	248
3E374	3/4"	—		225,000	2500	18"	1/6	8"R,H	36"	28-7/8"	34-1/8"	273
3E375	3/4"	3E386	1/2"	250,000	2850	18"	1/4	8"R,H	36"	31-5/8"	34-1/8"	301

R = Round V = Vertical H = Horizontal

Gas Pipe Sizing Chart

MAXIMUM CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR
Water Column and 0.6 Specific Gravity Gas
(Based upon a Pressure Drop of 0.3 Inch)

NOMINAL IRON PIPE SIZE (INCHES)	LENGTH IN FEET													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/2	132	92	73	63	56	50	46	43	40	38	34	31	28	26
3/4	278	190	152	130	115	105	96	90	84	79	72	64	59	55
1	520	350	285	245	215	195	180	170	160	150	130	120	110	100
1-1/4	1050	730	590	500	440	400	370	350	320	305	275	250	225	210
1-1/2	1600	1100	890	760	670	610	560	530	490	460	410	380	350	320
2	3050	2100	1650	1450	1270	1150	1050	990	930	870	780	710	650	610
2-1/2	4800	3300	2700	2300	2000	1850	1700	1600	1500	1400	1250	1130	1050	980
3	8500	5900	4700	4100	3600	3250	3000	2800	2600	2500	2200	2000	1850	1700
4	17500	12000	9700	8300	7400	6800	6200	5800	5400	5100	4500	4100	3800	3500

1. Determine required CU.FT/HR. by dividing BTUH input from rating plate by 1,000.
2. FOR NATURAL GAS: Select pipe size directly from chart.
3. FOR PROPANE GAS: Multiply CU.FT/HR. from Step #1 by 0.633 before entering chart.

General Safety Information

1. **Installation must be made in accordance with local codes, or in absence of local codes, with ANSI Standard Z223.1 (N.F.P.A. No. 54) National Fuel Gas Code.** All of the ANSI and NFPA Standards referred to in these installation instructions are the ones that were applicable at the time the design of this appliance was certified. The ANSI Standards are available from the American Gas Association, 1515 Wilson Boulevard, Arlington, Virginia 22209. The NFPA Standards are available from the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts 02110. The heaters are designed for use in airplane hangars when installed in accordance with ANSI/NFPA No. 409-1979 and in public garages when installed in accordance with NFPA No. 88A-1979 and NFPA No. 88B-1979.
2. **No alterations are to be made on this equipment.**

   WARNING: DISCONNECT POWER BEFORE SERVICING ANY COMPONENT OR COMPONENT PART.
3. **Make certain that the power sources conform to the requirements of the heater.**

Installation

1. HEATER LOCATION: Location of unit heaters is related directly to the selection of sizes. Basic rules to follow:
   a. Mounting height: As a general rule, unit heaters should be installed 8 feet above the floor. Less efficient air distribution results at higher levels. Of course, there are exceptions to this principle. Occasionally unit heaters must be mounted at 12 to 16 feet above the floor to clear obstacles. In this case, it is advisable to use centrifugal blower heaters. One exception to the minimum mounting height would be in a school classroom if permitted by local codes, or other structures where ceiling heights are 10 feet or less.
   b. Unit heaters should be installed in airplane hangars and public garages as follows: In airplane hangars, units must be at least 10 feet above the upper surface of wings or engine enclosures of the highest aircraft to be stored in the hangar and 8 feet above the floor in shops, offices, and other sections of the hangar where aircraft are not stored or housed. Refer to ANSI/NFPA No. 409-1979.
   c. In public garages, unit heaters must be at least 8 feet above the floor. Refer to NFPA No. 88A-1979 and NFPA No. 88B-1979.
   d. Air distribution: Direct air towards areas of maximum heat loss. When multiple heaters are involved, circulation of air around the perimeter is recommended (where heated air flows along exposed walls). Satisfactory results can also be obtained where multiple heaters are located toward the center of the area with heater air directed toward the outside walls. Be careful to avoid obstacles and obstructions which could impede cool air distribution patterns. Heat throw distances as well as examples of heater location are presented (see HEATER LOCATION).
   e. **Locations to avoid: Unit heaters should not be installed within corrosive or inflammable atmospheres. Avoid locations where extreme drafts can affect burner operation. Do not locate any gas fired heater where air for combustion contains chlorinated vapors or acid fumes.**

   NOTE: Unit heater sizing should be based upon heat loss calculations where unit heater output equals or exceeds heat loss.

STANDARD UNIT HEATER APPLICATIONS

Distance from floor to bottom of unit HT.	APPROXIMATE DISTANCE OF HEAT THROW (FEET) Size Unit — BTU Input (Multiply by 1000)														
	30	45	60	75	100	125	150	175	200	225	250	300	350	400
8′	20	33	33	40	56	60	65	70	75	80	85	100	105	112
10′	NR	28	28	35	49	52	57	61	65	69	74	87	90	97
12′	NR	NR	NR	NR	45	47	51	55	59	63	67	79	83	89
15′	NR	NR	NR	NR	NR	NR	45	49	52	56	60	70	74	80
20	NR	NR	NR	NR	NR	NR	NR	NR	46	50	54	63	66	70

NR=Not Recommended

HEATER LOCATION

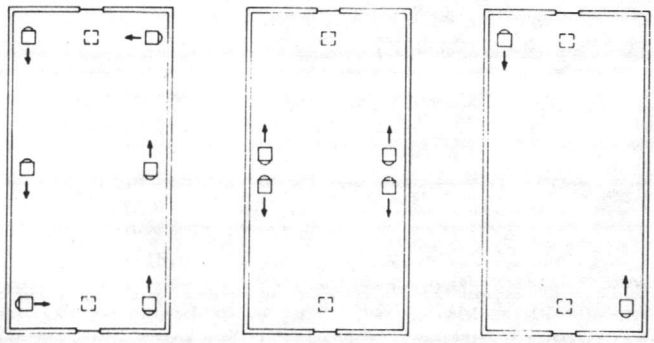
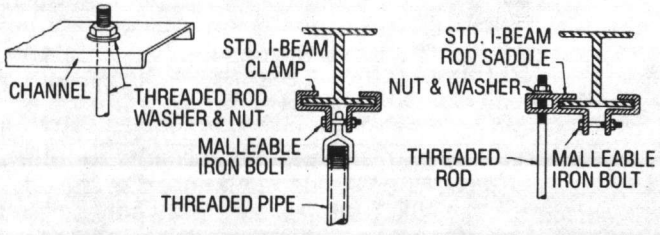


Figure 2

2. CLEARANCES: Every gas appliance should be located with respect to building construction and other equipment so as to permit access to the appliance. Clearance between the vertical walls and the vertical sides of the appliance shall be no less than 18 inches. Minimum clearance between the top of the appliance and the ceiling is 6 inches. Minimum clearance from combustibles to the bottom of the unit is 18 inches. This bottom clearance should be maintained for access to the burners as well. The minimum clearance from combustibles to the flue collector is 6 inches. Adequate clearance must be maintained around air openings into the combustion chamber.

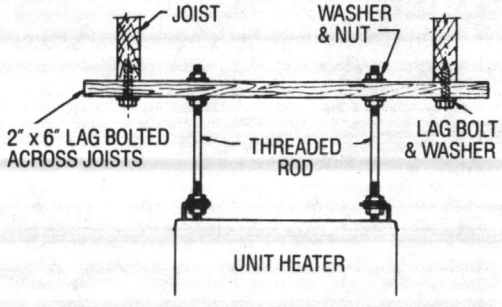
*STEEL CONSTRUCTION



*ALL HANGING HARDWARE & WOOD BY OTHERS

Figure 3

*WOOD CONSTRUCTION JOISTS



*ALL HANGING HARDWARE & WOOD BY OTHERS

Figure 4

Installation (Continued)

3. AIR FOR COMBUSTION: Appliances shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and the maintenance of ambient temperature at safe limits under normal conditions of use. Appliances shall be located in such a manner as not to interfere with proper circulation of air within the confined space. When buildings are so tight that normal infiltration does not meet air requirements, outside air shall be introduced per Sections 1.3.4.2 and 1.3.4.3 of ANSI Z223.1 for combustion requirements. A permanent opening or openings having a total free area of not less than one square inch per 5,000 BTUH of total input rating of all appliances within the space shall be provided.
4. The unit heater must be hung level from side to side and front to back, from the two balanced suspension points. When the suspension is completed, proceed with the following:
   a. GAS CONNECTIONS: (See Figures 5 & 7)
   This unit heater must be connected to a gas supply capable of supplying its full rated capacity at a pressure not less than 5" WC or greater than 14" WC for natural gas. For propane gas service, the **manifold pressure** must be 10" WC. A regulator (not supplied) must be field installed at LP tank to assure pressure is not greater than 14" WC. The connecting pipe should be sized in accordance with the ANSI Standard Z223.1 National Fuel Gas Code. See gas pipe sizing chart for proper size of gas supply piping. The gas piping supplied by the unit heater manufacturer has been tested for leaks. A ground joint union and a manual gas valve should be installed ahead of the unit heater controls to permit servicing. It is recommended that pipe compound which is resistant to the action of liquified petroleum gases be used. **The gas supply piping and all factory unit piping should be checked for gas leaks with a soapy water solution or some other approved method, but never with matches or any other source of ignition. A drip leg must be installed ahead of the unit. A ⅛-inch N.P.T. plugged tapping accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the appliance.**

   HEATER INSTALLATION FOR USE WITH PROPANE (BOTTLED) GAS MUST BE MADE BY A QUALIFIED L.P. GAS DEALER OR INSTALLER. HE WILL INSURE THAT PROPER JOINT COMPOUNDS ARE USED FOR MAKING PIPE CONNECTIONS; THAT AIR IS PURGED FROM LINES; THAT A THOROUGH TEST IS MADE FOR LEAKS BEFORE OPERATING HEATER; AND THAT IT IS PROPERLY CONNECTED TO THE PROPANE GAS SUPPLY SYSTEM.

   b. ELECTRICAL CONNECTIONS: (See Figures 7, 8 & 9)
   Standard units are shipped for use on 115 volt, 60 hertz single phase electric power. Check the motor nameplate and electrical rating on the transformer before energizing the unit heater electrical system. The wiring of the unit heater conforms to the standard as set forth in ANSI Standard Z83-8,a,b. The external wiring must conform to the National Electrical Code and applicable local codes. It is recommended that the electrical power supply to the unit heater be provided from a fused, separate, and permanently live electrical circuit. This unit must be electrically grounded according to the National Electric Code, ANSI/NFPA No. 70-1981. See thermostat connections.

   The transformer supplied with this unit heater is internally fused. Any overload or short circuit will ruin the transformer. DO NOT USE A SCREWDRIVER ACROSS THE TERMINALS TO CHECK FOR POWER. Use a voltmeter.

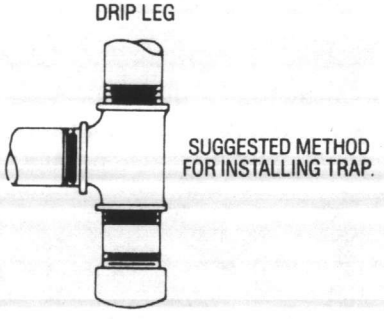


Figure 5

   c. VENTING: (See Figure 6)
   All unit heaters must be vented. They should be vented with a UL listed Type B Vent, a factory built chimney, or a lined brick and mortar chimney that has been constructed in accordance with the National Building Code. The horizontal section of the vent connector should slope upwards from the heater at the rate of 1/4" per foot. The venting should comply with Section 1.5, "Venting of Appliances", of ANSI Z223.1 (Installation of Gas Appliances and Gas Piping). The venting system should be checked to determine whether or not there is adequate draft to assure proper venting of the appliance.

   Other considerations to which governing codes should be applied are: vent clearances from combustible materials, vent termination above the roof, dilution air for venting, and combined vents.

   In buildings where negative pressures are created by exhaust fans or other causes, the negative pressure will cause downdraft conditions in a gravity vent. Here "Make-up Air Heaters" should be specified. Do not try to use Powered Vents to overcome a negative pressure problem.

Installation (Continued)

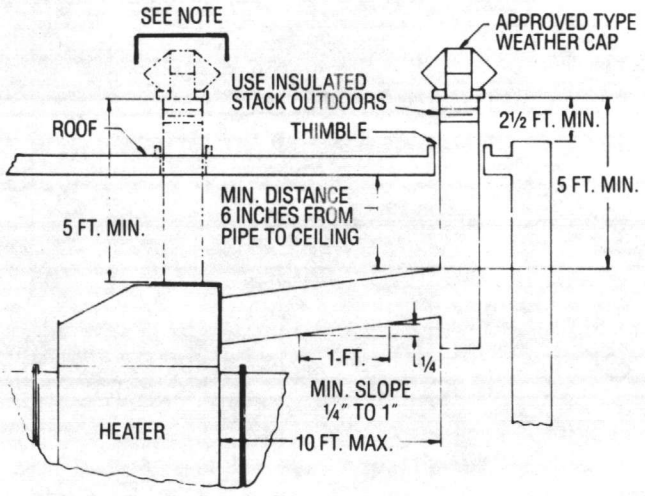


Figure 6

NOTE: FOR 30,000 to 125,000 MODELS ONLY.

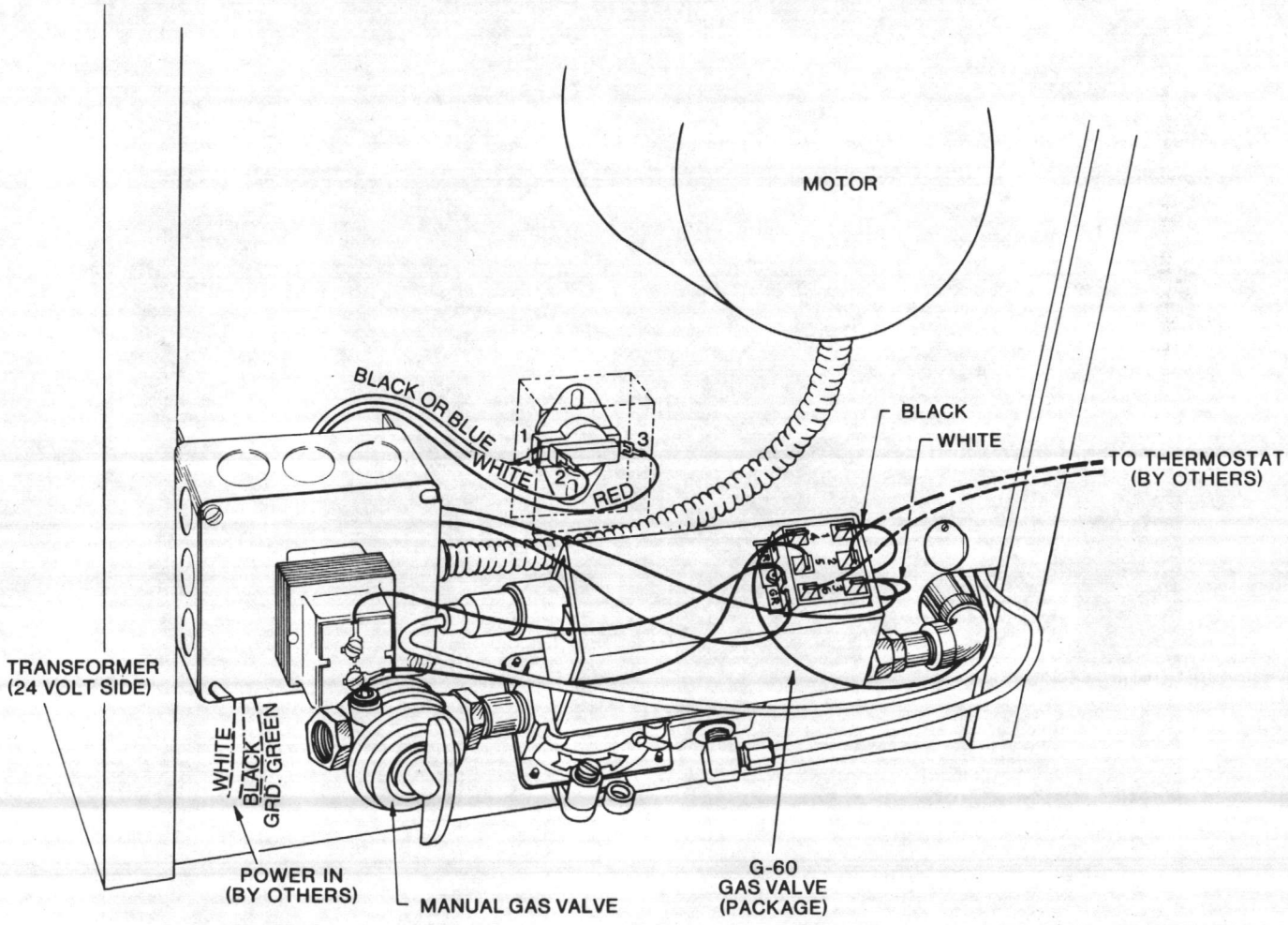


Figure 7 — Valve Transformer & Thermostat Connections

Installation (Continued)

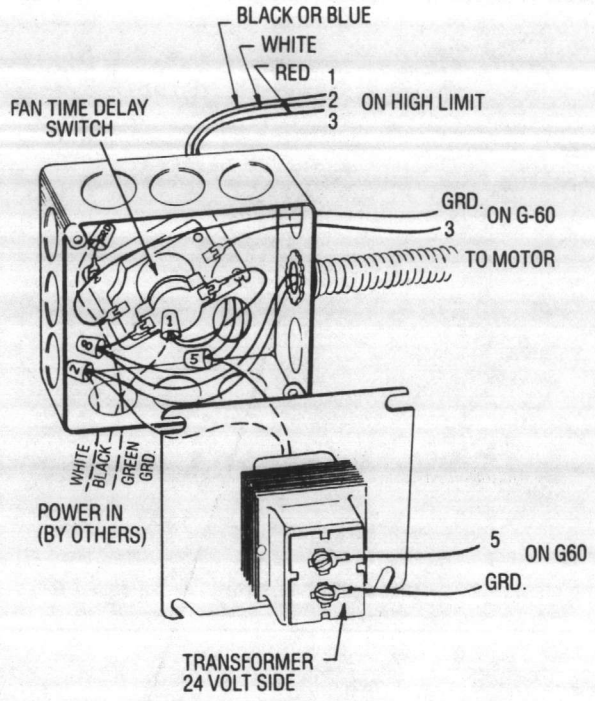


Figure 8 — Wire Connections

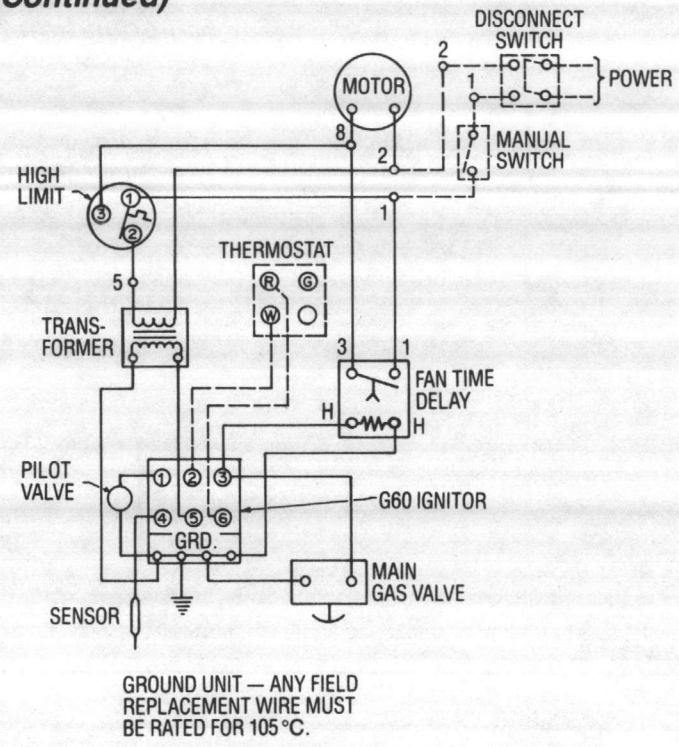


Figure 9 — Wiring Schematic

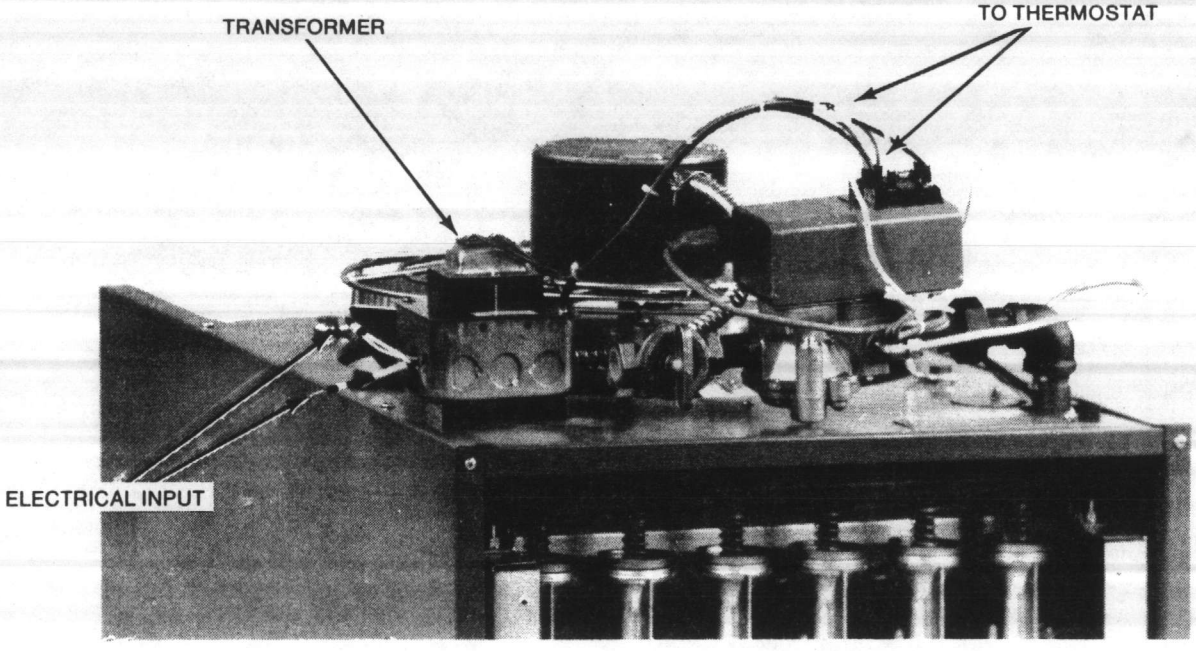


Figure 10

Operation

EXPLANATION OF CONTROLS

a. The unit heater is equipped with a dual automatic gas valve and electric ignition device (separate from the gas valve on some models) which provide the following functions:
   (1) Pilot solenoid valve is energized and pilot is electrically ignited when thermostat calls for heat.
   (2) Electronic circuitry proves that pilot flame is established, then energizes main gas solenoid valve.
   (3) When thermostat is satisfied, main gas solenoid valve and pilot solenoid valve are de-energized, stopping all flow of gas.
   (4) Pilot solenoid valve also functions as a main gas valve to provide redundancy.
   (5) Pressure regulator provides proper and steady gas pressure to the main burners.
   (6) Manual shut off valve for service and long term shut-down. (Separate from the automatic valve on some models.)

b. The limit switch interrupts the flow of electric current to the main gas valve in case the heater becomes overheated.

c. The fan switch delays the operation of the fan until the heater is warmed; then keeps the fan running after the gas has been turned off until the useful heat has been removed. The start-up fan delay must not exceed 90 seconds from a cold start.

d. The wall thermostat is a temperature sensitive switch which turns the main gas valve on or off to control the temperature of the space being heated. It must be mounted on a vibration-free, vertical surface away from air currents, in accordance with the instructions furnished with the thermostat.

2. INITIAL LIGHTING INSTRUCTIONS

a. Open the manual valve supplying gas to the unit heater and, with the union connection loose, purge air from gas line. Tighten union and check for gas leaks.

b. Open manual valve on unit heater.

c. Turn on electrical power.

d. Unit should be under control of thermostat. Turn thermostat to highest point and determine that pilot and main burners ignite. Turn thermostat to lowest point and determine that pilot and main burners are extinguished.

e. If pilot adjustment is required, remove pilot adjustment seal cap and adjust pilot screw to obtain proper flame. Clockwise rotation decreases pilot flame size. Replace cap.

f. Turn thermostat to desired position.

3. Check gas input rate as follows:

IMPORTANT: Never overfire this unit heater, as unsatisfactory operation or short life may result.

a. Turn off all gas appliances that use gas through the same meter as the unit heater.

b. Turn gas on to the unit heater.

c. Clock the time in seconds required to burn one cubic foot of gas by checking the gas meter.

d. Insert the time required to burn one cubic foot of gas in the formula below and compute the input rate.

$$\frac{3600 \text{ (Sec. Per Hr.)} \times \text{Btu/Cu. Ft.}}{\text{Time (Sec.)}} = \text{INPUT RATE}$$

EXAMPLE: Assume the Btu content of 1 cubic foot of gas equaled 1000 and that it takes 12 seconds to burn one cubic foot of gas.

$$\frac{3600 \times 1000}{18} = 200{,}000 \text{ Btuh}$$

NOTE: If computation exceeds or is less than 95% of gas Btuh input rating (See Specifications), adjust gas pressure.

4. Gas pressure adjustment:

a. NATURAL GAS: Best results are obtained when the unit heater is operating at its full input rating with the manifold pressure of 3.5″ WC. Adjustment of the Pressure Regulator is not normally necessary since it is preset at the factory. However, field adjustment may be accomplished as follows:
   (1) Attach manometer at pressure tap plug below control outlet.
   (2) Remove regulator adjustment screw cap, located on combination gas valve/igniter.
   (3) With small screwdriver, rotate adjustment screw counterclockwise to decrease or clockwise to increase pressure.

   CAUTION: Do not force beyond stop limits!

   (4) Replace regulator adjustment screw cap.

b. PROPANE GAS: An exact manifold pressure of 10.0″ WC must be maintained for proper operation of the unit heater. If the unit is equipped with a pressure regulator on the combination gas valve, follow steps (1) through (4) above. If the unit is not so equipped, the propane gas supply system pressure must be regulated to attain this manifold operating pressure.

5. Ratings of gas appliances are based on sea level operation and need not be changed for operation at elevations up to 2,000 feet. For operation at elevations above 2,000 feet, input ratings should be reduced at the rate of 4 percent for each 1,000 feet above sea level.

6. After the unit heater has been operating for at least 15 minutes, adjust the primary air flow to the burners as follows: Turn friction locked, manually rotated air shutters clockwise to close; counterclockwise to open.

   For correct air adjustment, close air shutter until yellow tips in flame appear. Then open air shutter to the point just beyond the position where yellow tipping disappears.

   CAUTION: There may be momentary and spasmodic orange flashes in the flame. This is caused by the burning of airborne dust particles, and is not to be confused with the yellow tipping, which is a stable or permanent situation, when there is insufficient primary air.

Operation (Continued)

7. If the thermostat employed has an adjustable heat anticipator, adjust anticipator to match current rating of main gas valve. This rating is stamped on the gas valve. Move the indicator on the scale to correspond with this rating, and the anticipator will be properly adjusted for optimum comfort with most types of heating systems.

   A slightly higher setting to obtain longer "burner-on" times (and thus fewer cycles per hour) may be desirable on some systems. Proceed as follows:

   a. If the nominal heater setting is 0.4, adjust to 0.45 setting and check system operation; adjust to 0.5 setting and recheck, etc., until the desired "burner-on" time is obtained. If the nominal setting is 0.2, adjust to 0.23 or 0.25 to achieve the desired burner-on time.

   b. If the room temperature overshoots the thermostat setting excessively, decreasing the "burner-on" time may result in more constant temperature. To accomplish this, adjust the anticipator setting from the nominal 0.4 down to 0.35, or from the nominal 0.2 down to 0.18, and recheck operation.

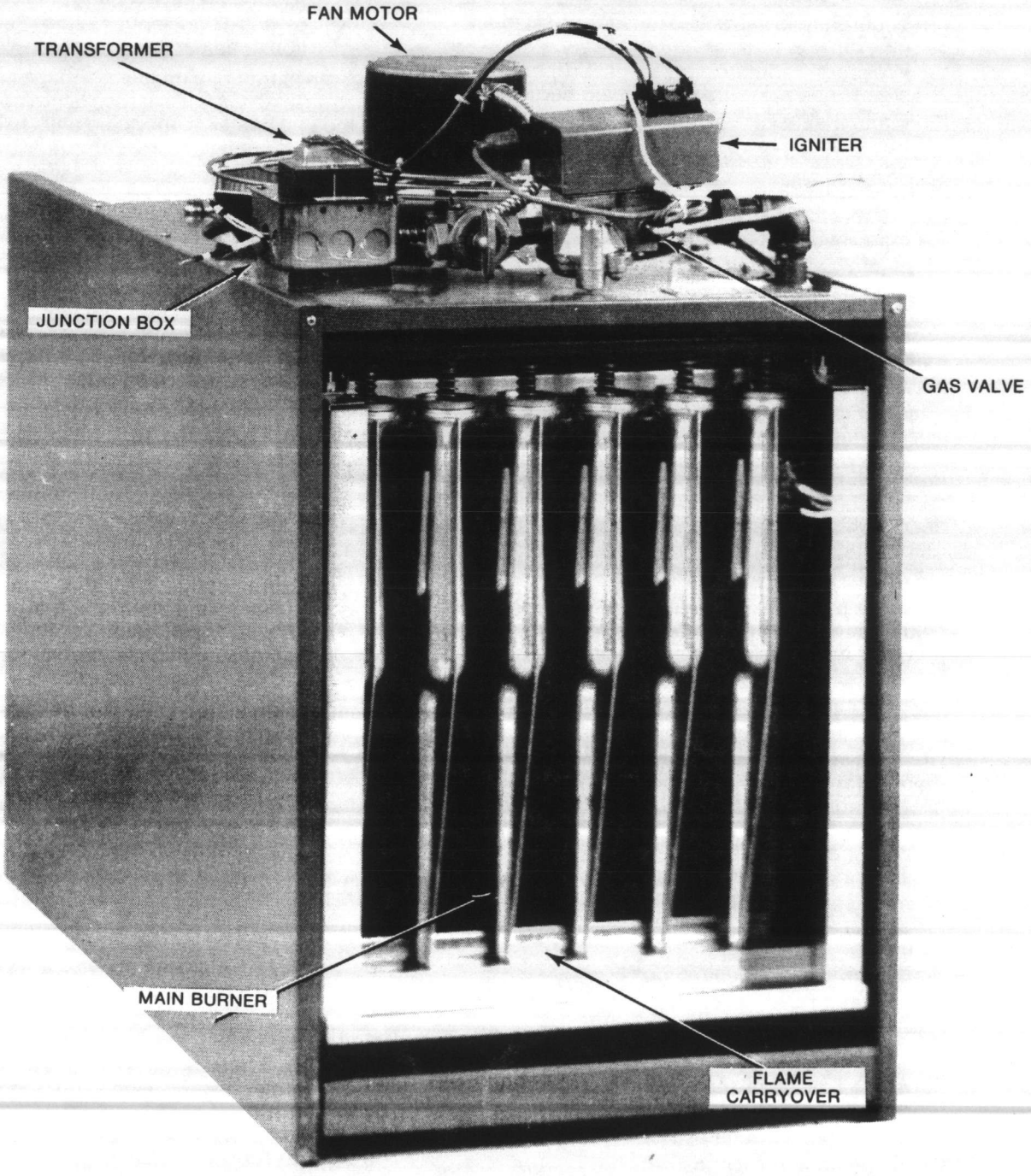


Figure 11

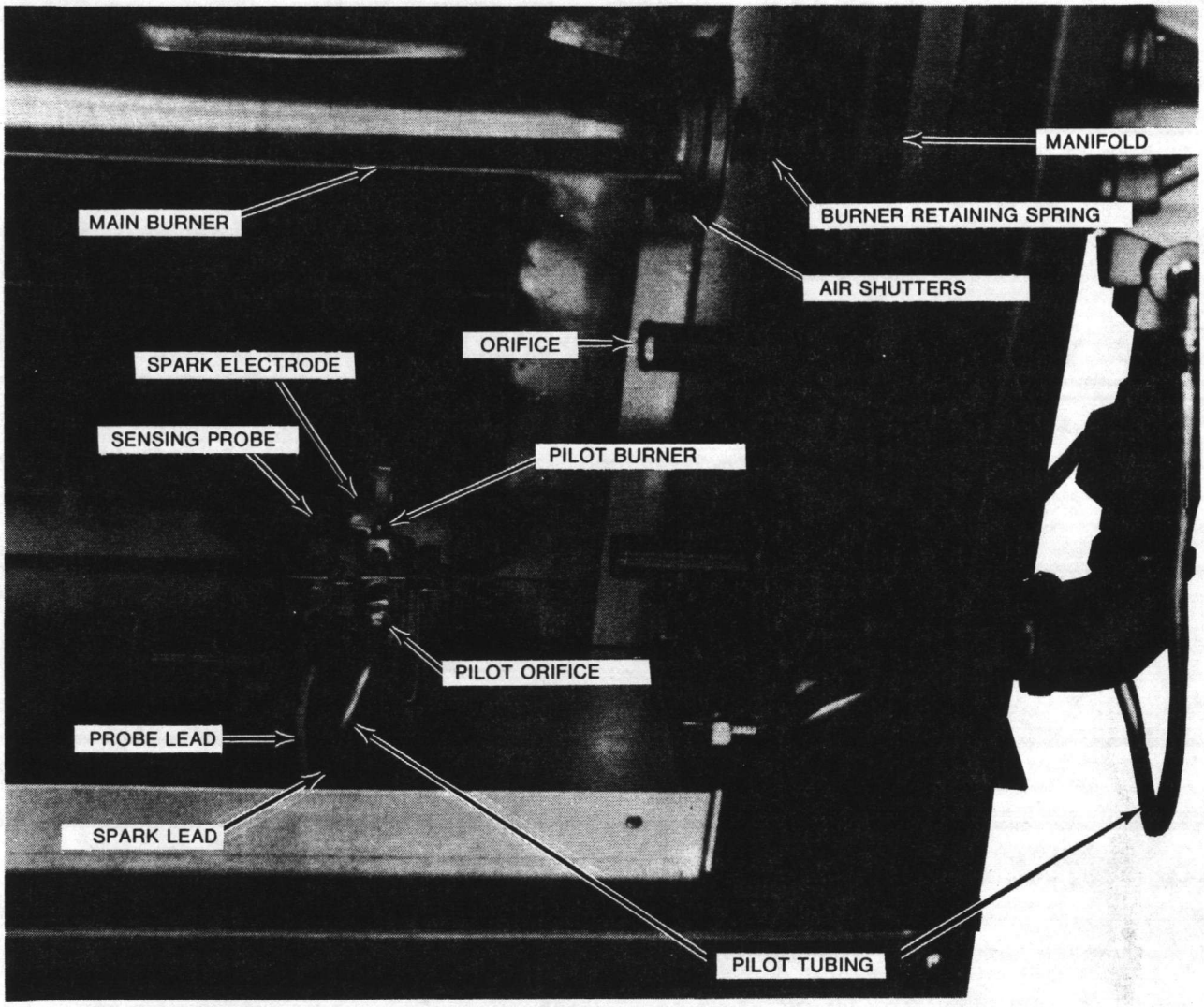


Figure 12

Maintenance

WARNING: DISCONNECT ALL POWER SOURCES RELATED TO THE INSTALLATION BEFORE SERVICING ANY COMPONENT.

1. Inspect fan blade and guard for accumulation of lint or other foreign material. Clean as appropriate to maintain efficient air flow.
2. Check lubrication instructions on motor. If oiling is required, add 3 to 4 drops of electric motor oil to the motor as follows, depending on service:
   a. Light Duty — After 3 years or 25,000 hours of operation.
   b. Average Duty — Annually after 3 years or 8,000 hours of operation.
   c. Heavy Duty — Annually after 1 year or at least every 1500 hours of operation.

   CAUTION: Do not over oil!
3. To clean or replace the main burners, turn off both electric power supply and gas supply to the unit heater and proceed as follows:
   a. Remove bottom panel.
   b. Compress spring by moving burner toward manifold, slide opposite end of burner downward from locating slot while retaining spring is still compressed.
   c. Pull burner away from heater.
4. Replace all parts in reverse order.

MAIN BURNERS

Trouble Shooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
A. Flame lifting from burner ports.	1. Pressure regulator set too high. 2. Defective regulator. 3. Burner orifice too large.	1. Reset manifold pressure. Refer to Operation. 2. Replace regulator section of combination gas valve or complete valve. 3. Check with local gas supplier for proper orifice size and replace. Refer to Operation.
B. Flame pops back.	1. Excessive primary air. 2. Burner orifice too small.	1. Close air shutter. Refer to Operation. 2. Same as A-3.
C. Noisy flame.	1. Too much primary air. 2. Noisy pilot. 3. Irregular orifice causing whistle or resonance. 4. Excessive gas input.	1. Close air shutter. Same as B-1. 2. Reduce pilot gas. Refer to Operation. 3. Replace orifice. 4. Reset manifold pressure. Same as A-1, -2, or -3.
D. Yellow tip flame (some yellow tipping on propane gas is permissible).	1. Insufficient primary air. 2. Clogged main burner ports. 3. Misaligned orifices. 4. Clogged draft hood. 5. Air shutter linted. 6. Insufficient combustion air.	1. Open air shutters. Refer to Operation. 2. Clean main burner ports. 3. Replace manifold assembly. 4. Clean draft hood. 5. Check for dust or lint at air mixer opening and around the air shutter. 6. Clean combustion air inlet openings in bottom panel. See Installation.
E. Floating flame.	1. Blocked venting 2. Insufficient combustion air.	1. Clean flue. Refer to Installation. 2. Same as D-6.
F. Gas odor.	1. Blocked venting. 2. Drafts around heater. 3. Gas leak. 4. Negative pressure in building.	1. Same as E-1. 2. Eliminate drafts. Refer to Installation. 3. Check piping. Refer to Installation. 4. See Installation.

Trouble Shooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
G. Delayed ignition.	1. Excessive primary air. 2. Main burner ports clogged near pilot. 3. Pressure regulator set too low. 4. Pilot decreases in size when main burners come on. 5. Pilot flame too small. 6. Drafts around heater. 7. Improper venting.	1. Same as B-1. 2. Clean main burner ports. 3. Reset manifold pressure. Refer to Operation. 4. Supply piping is inadequately sized. Refer to Installation. 5. Clean pilot orifice. Refer to Operation. 6. Same as F-2. 7. Refer to Installation.
H. Failure to ignite.	1. Main gas off. 2. Lack of power at unit. 3. Thermostat not calling for heat. 4. Defective limit switch. 5. Improper thermostat or transformer wiring at gas valve/igniter. 6. Defective gas valve/igniter. 7. Defective thermostat. 8. Defective transformer.	1. Open all manual gas valves. 2. Replace fuse or turn on power supply. 3. Turn up thermostat. 4. Check limit switch with continuity tester. If open, replace limit switch. 5. Check wiring per diagrams. 6. Replace gas valve/igniter. 7. Check thermostat and replace if defective. 8. Be sure 115 volts is supplied to the transformer primary then check for 24 volts at secondary terminal before replacing.
I. Condensation of water vapor.	Improper venting.	Refer to Installation.
J. Burner won't turn off.	1. Poor thermostat location. 2. Defective thermostat. 3. Improper thermostat or transformer wiring at gas valve/igniter. 4. Short circuit. 5. Defective or sticking gas valve. 6. Excessive gas supply pressure.	1. Relocate thermostat away from drafts. 2. Replace thermostat. 3. Check wiring per diagrams. 4. Check operation at valve. Look for short and correct, such as staples piercing thermostat wiring. 5. Replace gas valve. 6. Refer to Operation.
K. Rapid burner cycling.	1. Draft on pilot. 2. Defective igniter control. 3. Loose electrical connections at gas valve, igniter, pilot, or thermostat. 4. Excessive thermostat heat anticipation. 5. Fan motor turning too slowly. 6. Poor thermostat location.	1. Same as F-2. 2. Replace igniter. 3. Tighten all electrical connections. 4. Adjust thermostat heat anticipation for longer cycles. Refer to Operation. 5. Clean fan blade, oil fan motor, check voltage to fan motor (should be 115 VAC). Refer to Maintenance. 6. Relocate thermostat (Do not mount thermostat on unit).

MOTOR AND FAN

Trouble Shooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
L. Noisy.	1. Fan blades loose. 2. Bearings dry. 3. Fan blade dirty. 4. Vibration isolators deteriorated.	1. Replace or tighten. 2. Oil bearings on fan motor. 3. Clean fan blade. 4. Replace vibration isolators.

LIMIT — FAN SWITCH — AUTOMATIC PILOT — AUTOMATIC VALVE — FAN OPERATION

M. Pilot will not light or will not stay lit.	1. Main gas off. 2. Improper spark gap at pilot. 3. Defective spark cable. 4. Defective gas valve/igniter control. 5. Pilot adjustment screw on automatic gas valve turned too low. 6. Air in gas line. 7. Incorrect lighting procedure. 8. Dirt in pilot orifice. 9. Extremely high or low gas pressure. 10. Bent or kinked pilot tubing. 11. Drafts around unit.	1. Open all manual valves. 2. Adjust to 0.10 inch. 3. Replace. 4. Replace. 5. Increase size of flame. Refer to Operation. 6. Disconnect pilot line from the pilot burner. Bleed air from the gas supply line. 7. Follow lighting instructions adjacent to gas valve. 8. Remove pilot orifice. Clean with compressed air or solvent. (Do not ream.) 9. Refer to Operation. 10. Replace pilot tubing. 11. Same as F-2.

LIMIT — FAN SWITCH

N. Fan will not run.	1. Loose wiring. 2. Defective motor overload protector or defective motor. 3. Defective fan switch.	1. Check and tighten all wiring connections per diagrams. 2. Replace motor. 3. Jumper fan switch terminal nos. 1 and 3, and replace switch if defective.
O. Fan motor turns on and off while burner is operating.	1. Fan switch heater element improperly wired. 2. Defective fan switch. 3. Motor overload protector cycling on and off. 4. Motor not properly oiled.	1. Be sure fan switch heater terminals are connected to gas valve per diagrams. (See page 5). 2. Replace fan switch. 3. Check motor amps against motor nameplate rating, check voltage, replace fan motor if defective. 4. Oil motor.
P. Fan motor will not stop.	1. Improperly wired fan control. 2. Pilot not lit while thermostat calls for heat. 3. Defective fan switch.	1. Check all wiring at fan switch and top of gas valve against diagrams. 2. Light pilot. 3. Replace fan switch.

POOR HEATING RESULTS

Trouble Shooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Q. Not enough heat.	1. Incorrect gas input. 2. Heater undersized. 3. Thermostat malfunction. 4. Heater cycling on limit control.	1. Refer to Operation. 2. This is especially true when the heated space is enlarged. Have the heat loss calculated and compare to the heater output (80% of input). Your gas supplier or installer can furnish this information. If heater is undersized, add additional heaters. 3. Replace thermostat. 4. There should be no ducts attached to the front of this heater. Check air movement through heat exchanger. Check voltage to fan motor, clean fan blade and heat exchanger, and oil fan motor.
R. Too much heat.	1. Thermostat malfunction. 2. Heater runs continuously.	1. Replace thermostat. 2. Same as K-3, -4, -5 and -6.
S. Cold air is delivered on start up.	1. Fan switch heater element improperly wired.	1. Same as P-1.
T. Cold air is delivered during heater operation.	1. Incorrect manifold pressure or input. 2. Voltage to unit too high.	1. Refer to Operation. 2. Check motor voltage with fan running. Should be 115 volts AC.

LIMITED WARRANTY

Dayton Fuel-Trimmer gas unit heaters, Models 3E366A thru 3E368A, 3E379A thru 3E381A, 3E406, 3E407, 3E369 thru 3E375, 3E382 thru 3E386, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use (rental use excluded) for one year after date of purchase. This warranty does not cover damages caused by operating the unit in a corrosive atmosphere containing chlorine, fluorine, or any other damaging chemical compounds. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be repaired or replaced at Dayton's option. For warranty claim procedures, see "Prompt Disposition" below. This warranty gives purchasers specific legal rights, and purchasers may also have other rights which vary from state to state.

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Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within warranty. For any product believed to be defective within warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. If product was damaged in transit to you, file claim with carrier.

DAYTON ELECTRIC MFG. CO., 5959 W. HOWARD STREET, CHICAGO, ILLINOIS 60648

Replacement Parts List

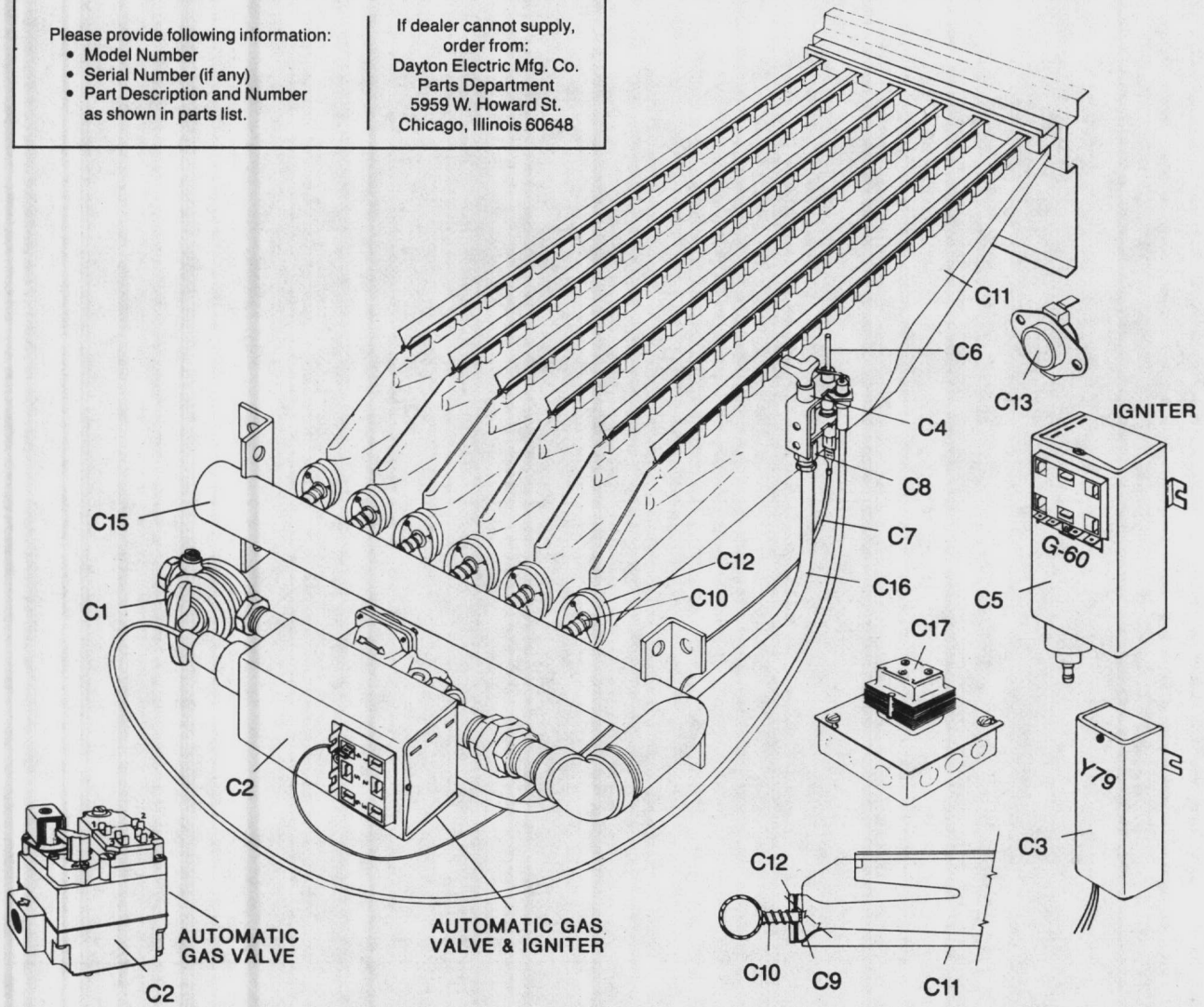
REF. NO.	DESCRIPTION	FOR SIZES (MBH)	30	45	60	75	100	125	150	175	200	225	250
		N	3E366A	3E367A	3E406	3E368A	3E369	3E370	3E371	3E372	3E373	3E374	3E375
		P	3E379A	3E380A	3E407	3E381A	3E382	3E383	3E384	—	3E385	—	3E386
1	Heat exchanger		114	115	116	117	104	105	106	107	108	109	110
2	Draft diverter		214	215	216	217	204	205	206	207	208	209	210
3	Burner drawer (only)		—	—	—	—	304	305	306	307	308	309	310
C1	Manual gas valve	N	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	—	—
		P	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13	GAS13
C2	Automatic gas valve	N	GAS19/30-75N	GAS19/30-75N	GAS19/30-75N	GAS19/30-75N	GAS1/25-200	GAS1/25-200	GAS1/25-200	GAS1/25-200	GAS1/25-200	GAS18/225-400	GAS18/225-400
		P	GAS19/30-75L	GAS19/30-75L	GAS19/30-75L	GAS19/30-75L	GAS1/25-300L	GAS1/25-300L	GAS1/25-300L	GAS1/25-300L	GAS1/25-300L	GAS1/25-300L	GAS1/25-300L
C3	Lockout relay	N	—	—	—	—	—	—	—	—	—	—	—
		P	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400	GAS16/25-400
C4	Pilot burner	N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N	GAS5/25-400N
		P	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L	GAS5/25-400L
C5	Igniter	N	—	—	—	—	—	—	—	—	—	GAS4/225-400	GAS4/225-400
		P	—	—	—	—	—	—	—	—	—	—	—
C6	Probe assembly		GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400	GAS6/25-400
C7	Probe lead		GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400	GAS7/25-400
C8	Pilot orifice	N	413	413	413	413	413	413	413	413	413	413	413
		P	413P	413P	413P	413P	413P	413P	413P	413P	413P	413P	413P
C9	Burner orifice (set)	N	414A	414B	414C	414D	417	418	419	420	421	422	423
		P	414AP	414BP	414CP	414DP	417P	418P	419P	420P	421P	422P	423P
C10	Burner springs (set)		424A	424B	424C	424D	426	427	428	429	430	431	432
C11	Main burners (set)		433A	433B	433C	433D	436	437	438	439	440	441	442
C12	Air shutters (set)		443A	443B	443C	443D	445	446	447	448	449	450	451
C13	High limit switch		452	452	452	452	452	452	452	452	452	452	452
C14	Fan time delay*		453	453	453	453	453	453	453	453	453	453	453
C15	Burner manifold		454A	454B	454C	454D	457	458	459	460	461	462	463
C16	Pilot tubing		464	464	464	464	464	464	464	464	464	464	464
C17	Transformer 115/24		4X746	4X746	4X746	4X746	4X746	4X746	4X746	4X746	4X746	4X746	4X746
	mounting plate		4X748	4X748	4X748	4X748	4X748	4X748	4X748	4X748	4X748	4X748	4X748
P14	Motor		501	502	502	502	504	505	506	507	508	509	510
P15	Fan guard		511	511A	512	512	514	515	516	517	518	519	520
P16	Fan blade		521	521A	522	522	524	525	526	527	528	529	530
P17	Hardware		531A	531	531	531	531	531	531	531	531	531	531

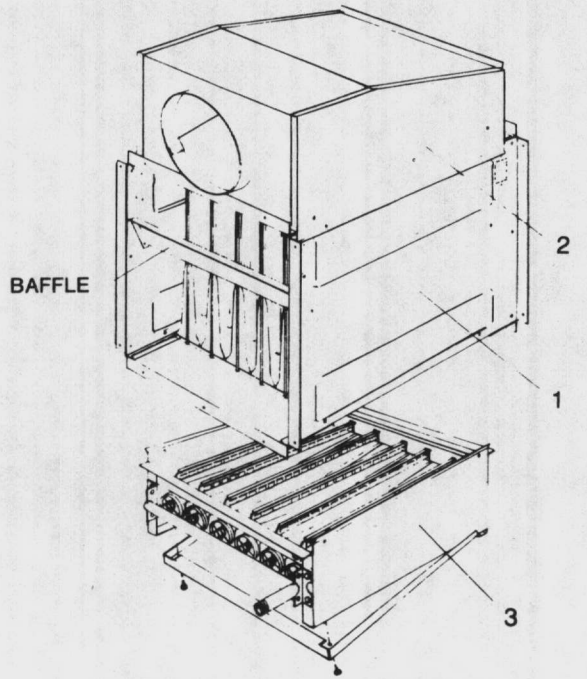
* Not shown

ORDER REPLACEMENT PARTS THROUGH DEALER FROM WHOM PRODUCT WAS PURCHASED

Please provide following information:
- Model Number
- Serial Number (if any)
- Part Description and Number as shown in parts list.

If dealer cannot supply, order from:
Dayton Electric Mfg. Co.
Parts Department
5959 W. Howard St.
Chicago, Illinois 60648





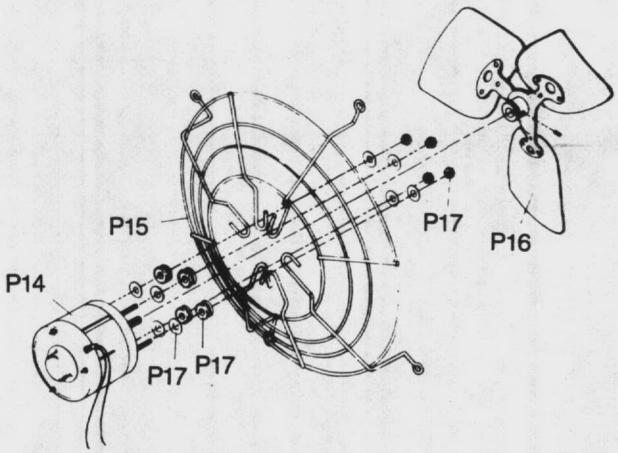


Figure 13 — Replacement Parts Illustration

Service Record

DATE	MAINTENANCE PERFORMED	REPLACEMENT COMPONENTS REQUIRED

SUBMITTAL DATA

MODEL KVEDB, ~~KVEBC AND KVEBB~~
CENTRIFUGAL DOME EXHAUSTER

CENTRIFUGAL ROOF EXHAUSTER
DIRECT ~~and BELT DRIVEN~~

ENGINEERED FOR VALUE

Air Control Products Roof Exhausters are specifically disigned to optimize air handling efficiency, reduce turbulance for low air noise and optimize manufacturing processes to provide extended service and high reliability.

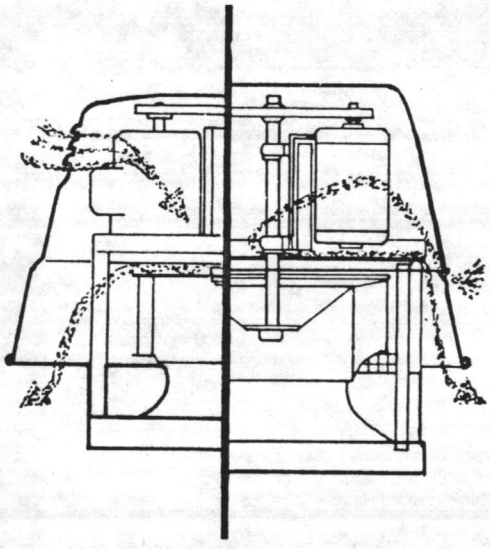
POSITIVE MOTOR VENTILATION

Air Control Proudcts unique design provides a second impeller, integal with the fan impeller hub. This impeller draws large amounts of fresh air into the separate motor compartment, cooling the motor and drive assembly while insuring complete isolation from the exhaust air stream. Positive motor ventilation, as illustrated below, enables the use of cost effective open motors in the most difficult environments.

Features

STANDARD CONSTRUCTION

- Spun aluminum venturi, motor cover, and fan hoods.
- Median foil blades.
- Deep venturi inlet.
- Bird screen.
- Safety disconnect.
- ~~Adjustable V-belt drives~~.
- Integral overload protection on single phase motors.
- High efficiency, non-overloading backward inclined impellers.



POSITIVE VENTILATION

QUALITY DESIGN

- Prelubricated, sealed, pillow block ball bearings are selected for 200,000 hour average operation.
- Structural rigidity is assured by a drive support design that transmits loads to the base.
- Rotating components are isolated from the structure to prevent noise transmission.
- ~~Drives~~ are adjustable with oil resistant static conducting ~~belts with generous service~~ factor.
- Motors and drives are out of the air stream.

CERTIFIED AIR and SOUND DATA

AMCA tested and licensed to bear the AMCA seal for both air and sound assured specified performance.

amca CERTIFIED RATINGS
AIR and SOUND PERFORMANCE
AIR MOVEMENT AND CONTROL ASSOCIATION, INC.

F-1

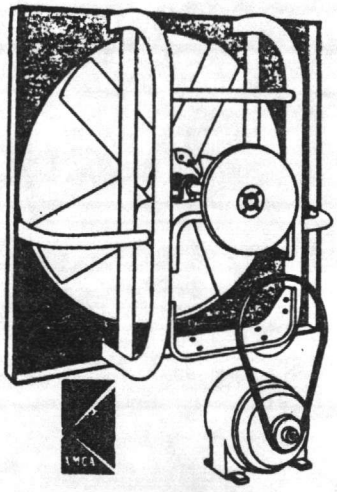
PRODUCT DATA

MODEL ABV

BELT DRIVE SIDEWALL PROP FAN

LOW PRESSURE BELT DRIVE FAN

ASSEMBLY, INSTALLATION, AND MAINTENANCE INSTRUCTIONS

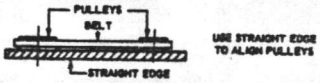


ASSEMBLY

1. Make necessary electrical connections to motor per motor manufacturer's instructions.

THE FOLLOWING APPLIES TO UNITS SHIPPED LESS MOTOR:

2. Assemble motor to motor base.
3. Place pulley on motor, align with fan pulley, and tighten motor pulley set screw.
4. Place "V" belt over motor and fan pulley. "V" belt should only be under enough tension to prevent slippage. Check belt tension by pressing belt with finger; deflection should be ½" at mid-point. If adjustment is necessary, loosen motor base hardware and slide up or down to achieve proper belt tension.



WARNING

1. Shaft and sheaves must be aligned.
2. "V" belt should not be over-tightened.
3. Check all hardware for tightness (especially motor mounting screws and propeller set screws).
4. Make certain unit is wired for proper rotation and electrical characteristics.

INSTALLATION

Depending on type of installation desired:

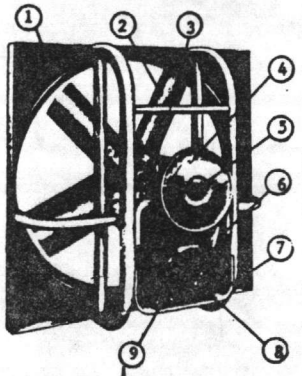
1. Construct a framed opening with inside dimensions "AxA" or "CxC". Cut wall oversize to allow for width of framing lumber.
2. Install fan as indicated and secure fan in place using bolt holes provided in fan mounting flange.

MAINTENANCE

1. Keep all parts clean and free from excess grease and oil.
2. Adjust belt tension after first two weeks of operation and check every six months or more often if usage is severe. Belt tension adjustment should permit ½" deflection on each side of belt at midpoint between center lines.
3. After checking belt tension, check all nuts, bolts and fasteners for tightness with particular attention to propeller setscrew.

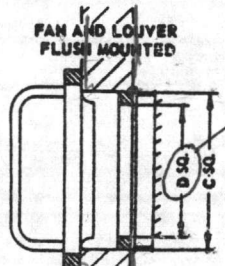
LUBRICATION

1. Motors requiring lubrication (with fittings on bearing hub) should be lubricated every three years with light ball-bearing grease – Mobilux #2 or equal.
2. Fan bearings that are one inch and smaller are permanently lubricated. Fan bearings 1¼" and larger should be greased every two years with Mobilux #2, light ball-bearing grease or equal. All bearings pre-lubricated at factory.

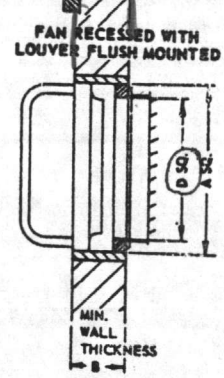


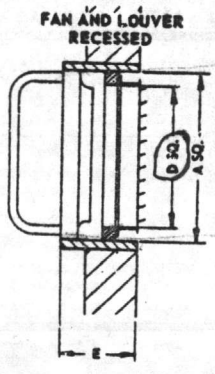
DIMENSIONAL DATA

SIZE	24	30	36	42	48	54	60	72
A	27⅞	34⅛	40⅛	47⅛	54⅛	58¼	65¼	78¼
B	6¼	7	8½	8½	9	10½	10½	10½
C	26½	33½	39¼	45½	52¼	55¼	62	75
D	24¼	30¼	36¼	42¼	48¼	54¼	60¼	72¼
E	10¾	11¼	12¾	12¾	13¾	16	16	16



Is your louver size





WHEN ORDERING REPLACEMENT PARTS, INCLUDE THE FOLLOWING INFORMATION:

- PROPELLER → Number of Blades, Diameter, Type, Material and Bore Size.
- MOTOR → NEMA Frame Size, Make, HP, RPM, and Electrical Characteristics.
- BELT → Catalog Number Marked On Old Belt.
- SHEAVE → Make, Pitch Diameter, Outside Diameter, Bore, Groove Width, and Number of Grooves.

MOTORS REQUIRING REPAIRS SHOULD BE REFERRED TO NEAREST AUTHORIZED SERVICE STATION. ALL MOTORS USED ARE PRODUCTS OF MANUFACTURERS WITH NATIONWIDE SERVICE FACILITIES.

FIGURE INDEX	PARTS LIST DESCRIPTION
1	Frame Assembly
2	Propeller Assembly
3	Bearing
4	Fan Pulley
5	Shaft
6	V-Belt
7	Motor Base
8	Motor Pulley
9	Motor

IMPORTANT WHEN ORDERING PARTS IT IS NECESSARY THAT YOU INCLUDE THE FOLLOWING INFORMATION:

(1) From nameplate on unit: COMPLETE NAMEPLATE DATA

(2) From original factory acknowledgement: UNIT TYPE, SIZE, AND ACKNOWLEDGEMENT NUMBER

BV 0780001 IND