INSTALLATION MANUAL

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See following pages for a complete Table of Contents.

NOTES, CAUTIONS AND WARNINGS

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.

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

PREDATOR®

MAGNUM

SINGLE PACKAGE AIR CONDITIONERS AND SINGLE PACKAGE GAS/ELECTRIC UNITS

DJ150

12-1/2 TON

(10.8 EER)

Tested in accordance with:

CERTIFIED

C US

DESIGN CERTIFIED

MANUFACTURER CERTIFIED TO ARI AS COMPLYING WITH ARI STANDARD 360

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GENERAL

YORK® Predator® Magnum units are single package air conditioners with optional gas heating designed for outdoor installation on a rooftop or slab and for non-residential use. These units can be equipped with factory or field installed electric heaters for heating applications.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas supply (where applicable), and duct connections. The electric heaters have nickel-chrome elements and utilize single-point power connection.

SAFETY CONSIDERATIONS

⚠WARNING

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

Do not use this furnace if any part has been under water. Immediately call a qualified service technician to inspect the furnace and to replace any part of the control system and any gas control which has been under water.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including ANSI Z223.1 or CSA-B149.1- latest edition.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

⚠WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

a. Do not try to light any appliance.

b. Do not touch any electrical switch; do not use any phone in your building.

c. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

d. If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

⚠WARNING

This furnace is not to be used for temporary heating of buildings or structures under construction.

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

REFERENCE

Additional information is available in the following reference forms:

- Technical Guide - DJ150, 036-21484-002
- General Installation - DJ150, 035-19046-002
- Pre-start & Post-start Check List - 035-18466-000
- Economizer Accessory -
  Downflow Factory Installed, 035-18286-000
  Downflow Field Installed, 035-18285-000
  Horizontal Field Installed, 035-18287-000
- Motorized Outdoor Air Damper 035-18283-000
- Manual Outdoor Air Damper (0-100%) 035-18282-000
- Manual Outdoor Air Damper (0-35%) 035-18281-000
- Gas Heat Propane Conversion Kit 035-17374-000
- Gas Heat High Altitude Kit (Natural Gas) 035-17282-000
- Gas Heat High Altitude Kit (Propane) 035-17281-000
- –60°F Gas Heat Kit 035-18216-000
- Electric Heater Accessory 035-17291-001
- Unit Renewal Parts List 035-19085-000

All forms referenced in this instruction may be ordered from:

Standard Register
Toll Free Fax: (877) 379-7920
Toll Free Phone: (877) 318-9675

RENEWAL PARTS

Refer to York's USER'S MAINTENANCE and SERVICE INFORMATION MANUAL Part Number 035-19047-001.

APPROVALS

Design certified by CSA as follows:

1. For use as a cooling only unit, cooling unit with supplemental electric heat or a forced air furnace.
2. *For outdoor installation only.*
3. For installation on combustible material and may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.
4. For use with natural gas (convertible to LP with kit).

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

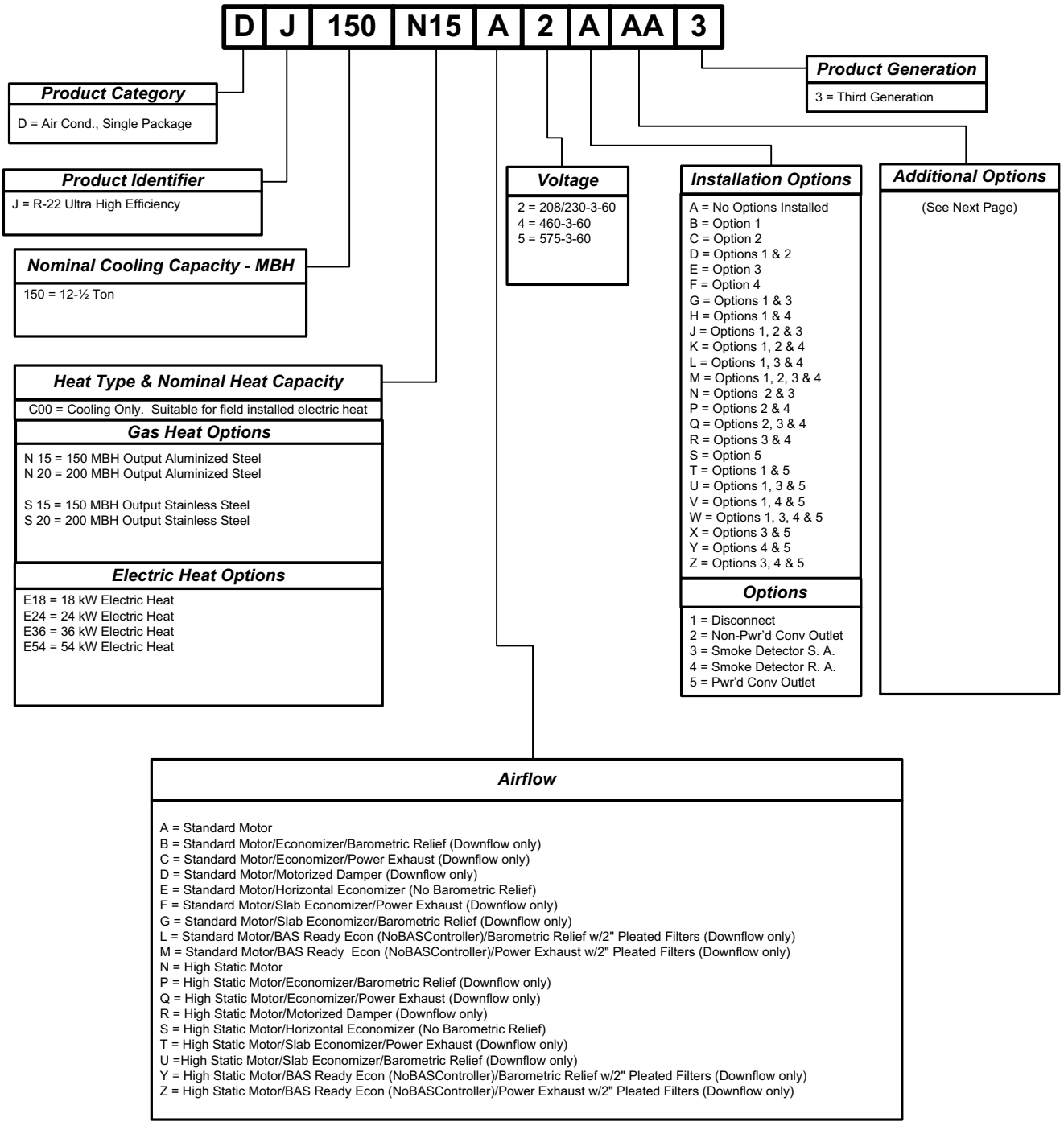
⚠ WARNING

Incorrect installation may create a condition where the operation of the product could cause personal injury or property damage.

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.

NOMENCLATURE

12½ Ton Predator Model Number Nomenclature



NOMENCLATURE, ADDITIONAL OPTIONS:

AA	None
AC	Coil Guard
AD	Dirty Filter Switch
AG	Coil Guard & Dirty Filter Switch
CA	CPC Controller with Dirty Filter Switch & Air Proving Switch
CC	CPC Controller, DFS, APS & Coil Guard
CE	CPC Controller, DFS, APS & Technicoat Cond. Coil
CG	CPC Controller, DFS, APS, Technicoat Cond. Coil, & Coil Guard
CJ	CPC Controller, DFS, APS & Technicoat Evap. Coil
CL	CPC Controller, DFS, APS, Technicoat Evap. Coil, & Coil Guard
CN	CPC Controller, DFS, APS & Technicoat Evap. & Cond Coils
CQ	CPC Controller, DFS, APS, Technicoat Evap. & Cond Coils, & Coil Guard
CV	CPC Controller, DFS, APS, & 2” Pleated Filters
HA	Honeywell Excel 10 Controller with Dirty Filter Switch & Air Proving Switch
HC	Honeywell Excel 10 Controller, DFS, APS & Coil Guard
HE	Honeywell Excel 10 Controller, DFS, APS & Technicoat Cond. Coil
HG	Honeywell Excel 10 Controller, DFS, APS, Technicoat Cond. Coil, & Coil Guard
HJ	Honeywell Excel 10 Controller, DFS, APS & Technicoat Evap. Coil
HL	Honeywell Excel 10 Controller, DFS, APS, Technicoat Evap. Coil, & Coil Guard
HN	Honeywell Excel 10 Controller, DFS, APS & Technicoat Evap. & Cond Coils
HQ	Honeywell Excel 10 Controller, DFS, APS, Technicoat Evap. & Cond Coils, & Coil Guard
JA	Johnson UNT Controller with Dirty Filter Switch & Air Proving Switch
JC	Johnson UNT Controller, DFS, APS & Coil Guard
JE	Johnson UNT Controller, DFS, APS & Technicoat Cond. Coil
JG	Johnson UNT Controller, DFS, APS, Technicoat Cond. Coil, & Coil Guard
JJ	Johnson UNT Controller, DFS, APS & Technicoat Evap. Coil
JL	Johnson UNT Controller, DFS, APS, Technicoat Evap. Coil, & Coil Guard
JN	Johnson UNT Controller, DFS, APS & Technicoat Evap. & Cond Coils
JQ	Johnson UNT Controller, DFS, APS, Technicoat Evap. & Cond Coils, & Coil Guard
NA	Novar ETC-3 Controller with Dirty Filter Switch & Air Proving Switch
NC	Novar ETC-3 Controller, DFS, APS & Coil Guard
NE	Novar ETC-3 Controller, DFS, APS & Technicoat Cond. Coil
NG	Novar ETC-3 Controller, DFS, APS, Technicoat Cond. Coil, & Coil Guard
NJ	Novar ETC-3 Controller, DFS, APS & Technicoat Evap. Coil
NL	Novar ETC-3 Controller, DFS, APS, Technicoat Evap. Coil, & Coil Guard
NN	Novar ETC-3 Controller, DFS, APS & Technicoat Evap. & Cond Coils
NQ	Novar ETC-3 Controller, DFS, APS, Technicoat Evap. & Cond Coils, & Coil Guard
TA	Technicoat Condenser Coil

TC	Technicoat Condenser Coil & Coil Guard
TD	Technicoat Condenser Coil & Dirty Filter Switch
TG	Technicoat Condenser Coil, Coil Guard, & Dirty Filter Switch
TJ	Technicoat Evaporator Coil
TL	Technicoat Evaporator Coil & Coil Guard
TM	Technicoat Evaporator Coil & Dirty Filter Switch
TQ	Technicoat Evaporator Coil, Coil Guard, & Dirty Filter Switch
TS	Technicoat Evaporator & Condenser Coils
TU	Technicoat Evaporator & Condenser Coils & Coil Guard
TV	Technicoat Evaporator & Condenser Coils & Dirty Filter Switch
TY	Technicoat Evaporator & Condenser Coils, Coil Guard, & Dirty Filter Switch

INSTALLATION

INSTALLATION SAFETY INFORMATION

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer and with instructions to retain them for future reference.

1. Refer to the furnace rating plate for the approved type of gas for this furnace.
2. Install this furnace only in a location and position as specified on Page 11 of these instructions.
3. Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when checking all connections, as specified on Pages 8, 24, 25 and 40 of these instructions.
4. Always install furnace to operate within the furnace's intended temperature-rise range with the duct system and within the allowable external static pressure range, as specified on the unit name/rating plate, specified on Page 42 of these instructions.
5. This equipment is not to be used for temporary heating of buildings or structures under construction.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

PRECEDING INSTALLATION

1. Remove the two screws holding the brackets in the front, rear and compressor side fork-lift slots.

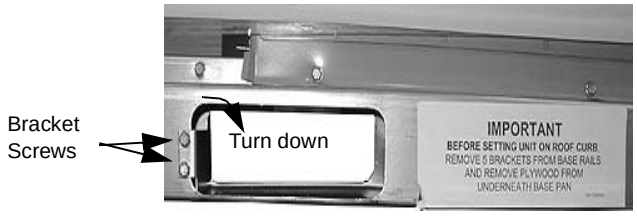


FIGURE 1 - UNIT SHIPPING BRACKET

2. Turn each bracket toward the ground and the protective plywood covering will drop to the ground.
3. Remove the condenser coil external protective covering prior to operation.
4. Remove the toolless doorknobs and instruction packet prior to installation.

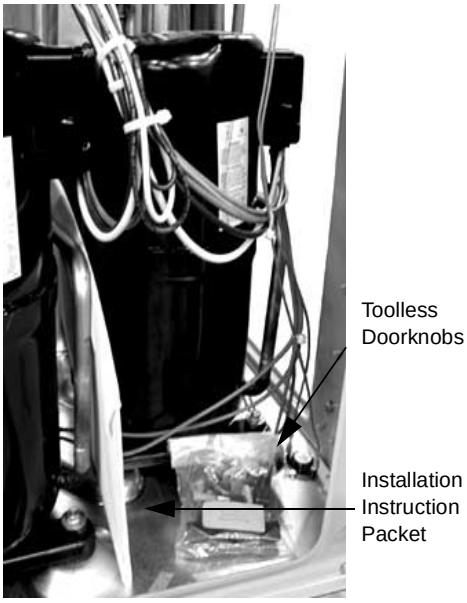


FIGURE 2 - COMPRESSOR SECTION

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state and national codes including, but not limited to, building, electrical, and mechanical codes.

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 PSIG.

Pressures greater than 1/2 PSIG will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 PSIG, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG.

LIMITATIONS

These units must be installed in accordance with the following:

In U.S.A.:

1. National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
2. National Fuel Gas Code, ANSI Z223.1 - Latest Edition
3. Gas-Fired Central Furnace Standard, ANSI Z21.47a. - Latest Edition
4. Local building codes, and
5. Local gas utility requirements

In Canada:

1. Canadian Electrical Code, CSA C22.1
2. Installation Codes, CSA - B149.1.
3. Local plumbing and waste water codes, and
4. Other applicable local codes.

Refer to Tables 1 & 2 for unit application data.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA).

This furnace is not to be used for temporary heating of buildings or structures under construction.

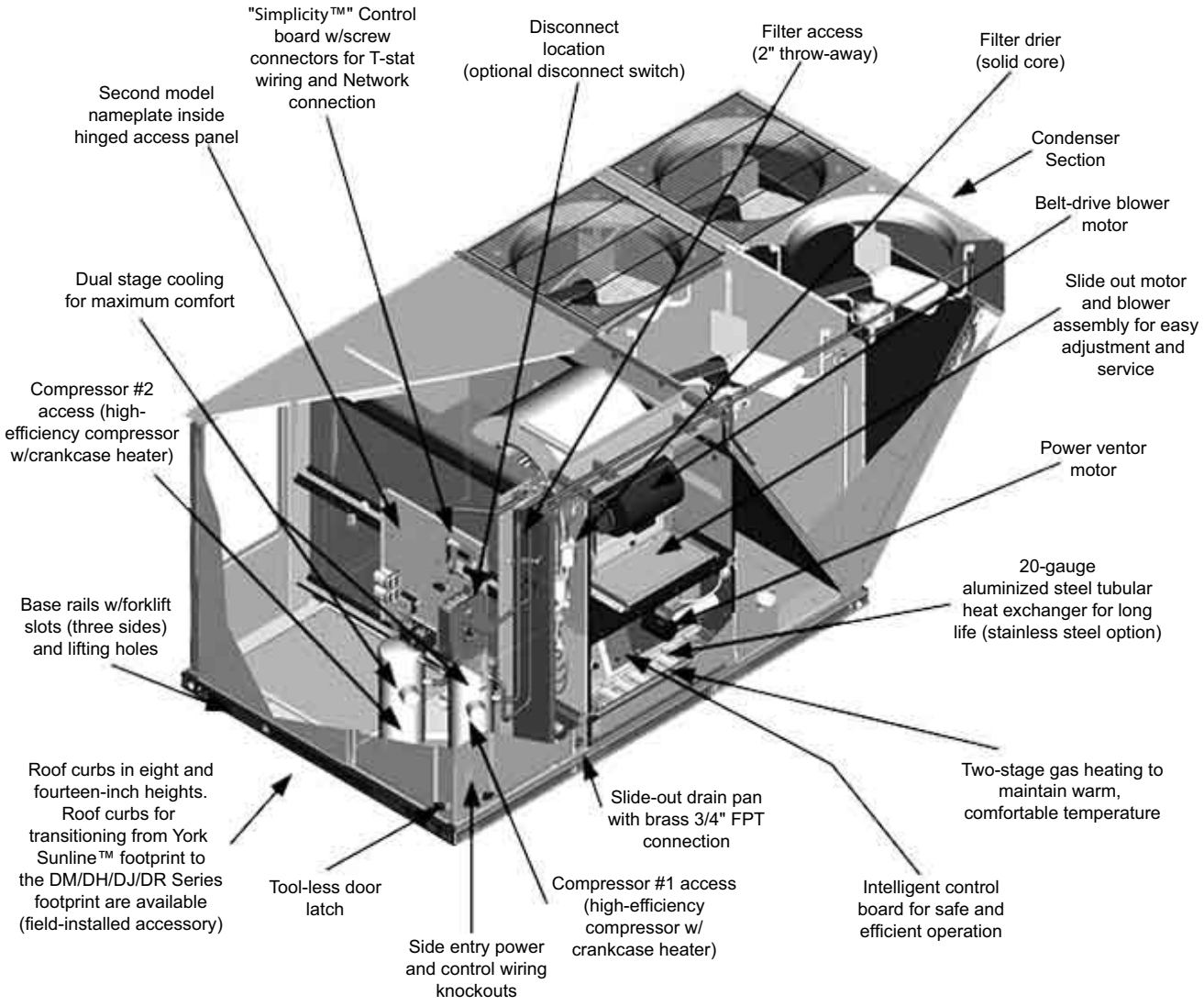


FIGURE 3 - PREDATOR® MAGNUM COMPONENT LOCATION

TABLE 1: UNIT VOLTAGE LIMITATIONS

Power Rating*	Minimum	Maximum
208/230-3-60	187	252
460-3-60	432	504
575-3-60	540	630

*. Utilization range "A" in accordance with ARI Standard 110.

TABLE 2: UNIT TEMPERATURE LIMITATIONS

Temperature	Min.	Max.
Wet Bulb Temperature (°F) of Air on Evaporator Coil	57	72
Dry Bulb Temperature (°F) of Air on Condenser Coil	0*	125

*. A low ambient accessory is available for operation down to -20°F.

LOCATION

Use the following guidelines to select a suitable location for these units:

1. Unit is designed for *outdoor installation only*.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 inches. The length and width should be at least 6 inches greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2" across the entire width and length of unit.

⚠ WARNING

Excessive exposure of this furnace to contaminated combustion air may result in equipment damage or personal injury. Typical contaminates include: permanent wave solution, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, antistatic fabric softeners for clothes dryers, masonry acid washing materials.

RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit.

⚠ CAUTION

If a unit is to be installed on a roof curb other than a YORK roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

⚠ CAUTION

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

LENGTH OF FORKS MUST BE A MINIMUM OF 60 INCHES.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.

The condenser coils should be protected from rigging cable damage with plywood or other suitable material.

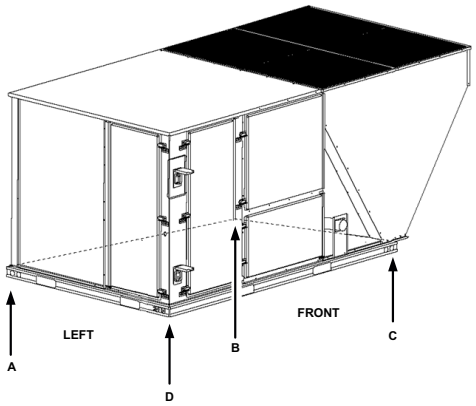


FIGURE 4 - UNIT 4 POINT LOAD

TABLE 3: UNIT WEIGHTS

Model DJ150	Shipping Weight (lb.)	Operating Weight (lb.)
Cooling Unit Only	1415	1400
w/Economizer	85	84
w/Power Exhaust	150	148
w/Gas Heat*	110	110
w/Electric Heat†	49	49

*. 8 Tube Heat Exchanger

†. 54 kW heater

TABLE 4: 4 POINT LOAD WEIGHT

Model	Location (lbs.)*			
	A	B	C	D
DJ150	282	323	424	371

*. Weights include largest gas heat option.

TABLE 5: 6 POINT LOAD WEIGHT

Model	Location (lbs.)*					
	A	B	C	D	E	F
DJ150	184	201	220	289	264	242

*. Weights include largest gas heat option.

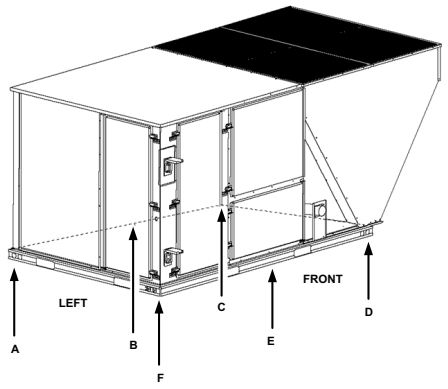


FIGURE 5 - UNIT 6 POINT LOAD

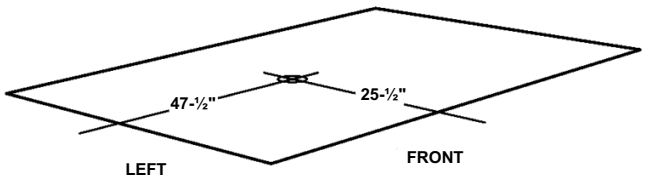


FIGURE 6 - UNIT CENTER OF GRAVITY

CLEARANCES

All units require particular clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 – Latest Edition (in U.S.A.), or Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 (in Canada) - Latest Edition, and/or applicable provisions of the local building codes. Refer to Table 6 for clearances required for combustible construction, servicing, and proper unit operation.

⚠WARNING

Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

⚠WARNING

Excessive exposure to contaminated combustion air will result in safety and performance related problems. To maintain combustion air quality, the recommended source of combustion air is the outdoor air supply. The outdoor air supplied for combustion should be free from contaminants due to chemical exposure that may be present from the following sources.

- Commercial buildings
- Indoor pools
- Laundry rooms
- Hobby or craft rooms
- Chemical storage areas

The following substances should be avoided to maintain outdoor combustion air quality.

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool cleaners
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Anti-static fabric softeners for clothes dryers
- Masonry acid washing materials

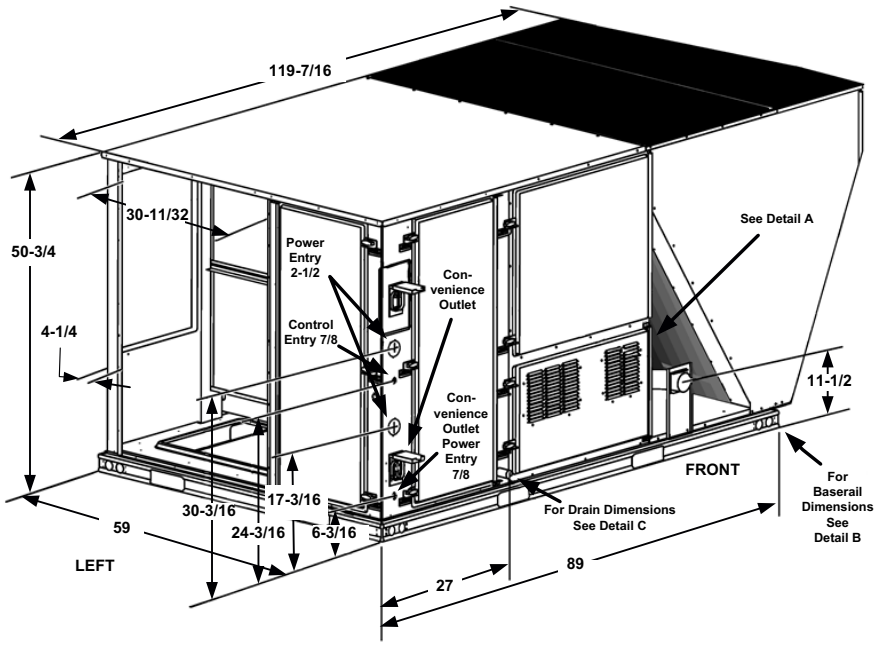
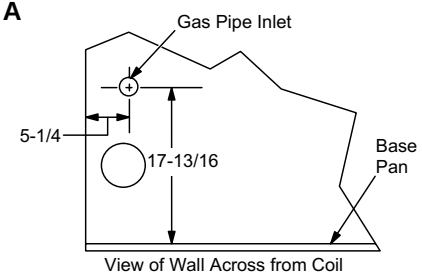
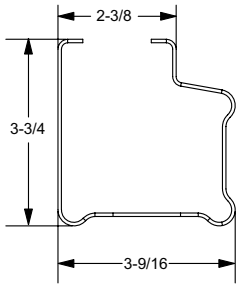


FIGURE 7 - UNIT DIMENSIONS

DETAIL A



DETAIL B



DETAIL C

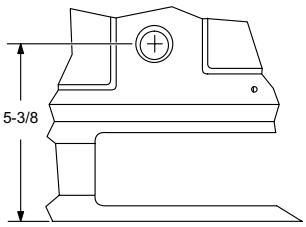


TABLE 6: UNIT CLEARANCES

Top*	72”	**Right**	12”
Front†	36”	**Left**	36”
Rear‡	36”	**Bottom****	0”

*. Units must be installed outdoors. Overhanging structure or shrubs should not obstruct condenser air discharge outlet.

†. The products of combustion must not be allowed to accumulate within a confined space and re-circulate.

‡. To remove the slide-out drain pan, a rear clearance of sixty inches is required. If space is unavailable, the drain pan can be removed through the front by separating the corner wall.

**. Units may be installed on combustible floors made from wood or class A, B or C roof covering materials.

NOTE: A one-inch clearance must be provided between any combustible material and the supply ductwork for a distance of 3 feet from the unit.

NOTE: If the unit includes gas heating, locate the unit so the flue exhaust is at least:

- Three (3) feet above any forced air inlet located within 10 horizontal feet (excluding those integral to the unit).
- Four (4) feet below, four (4) horizontal feet from, or one (1) foot above any door or gravity air inlet into the building.
- Four (4) feet from electric meters, gas meters, regulators, and relief equipment.

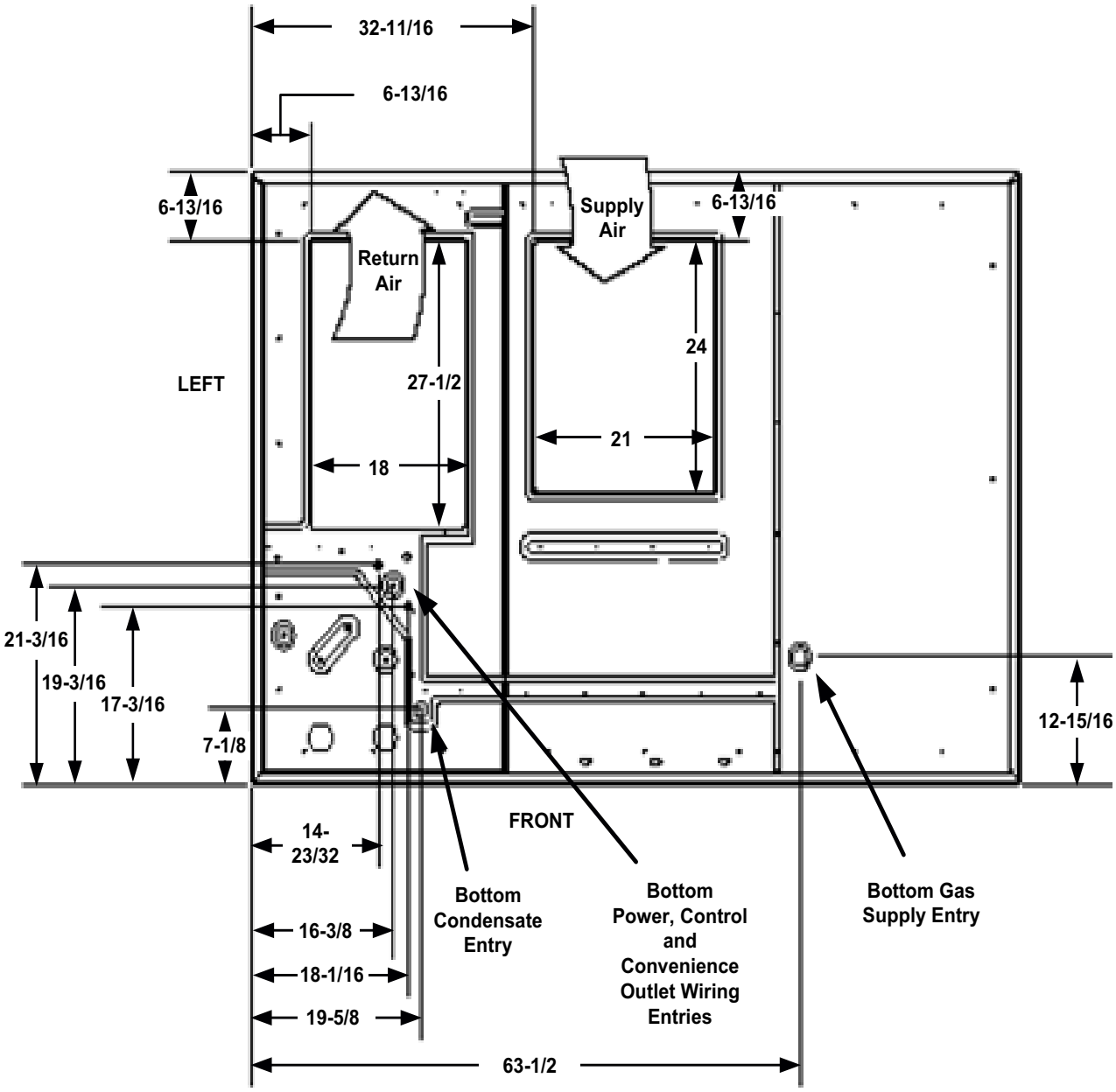


FIGURE 8 - BOTTOM DUCT OPENINGS (FROM ABOVE)

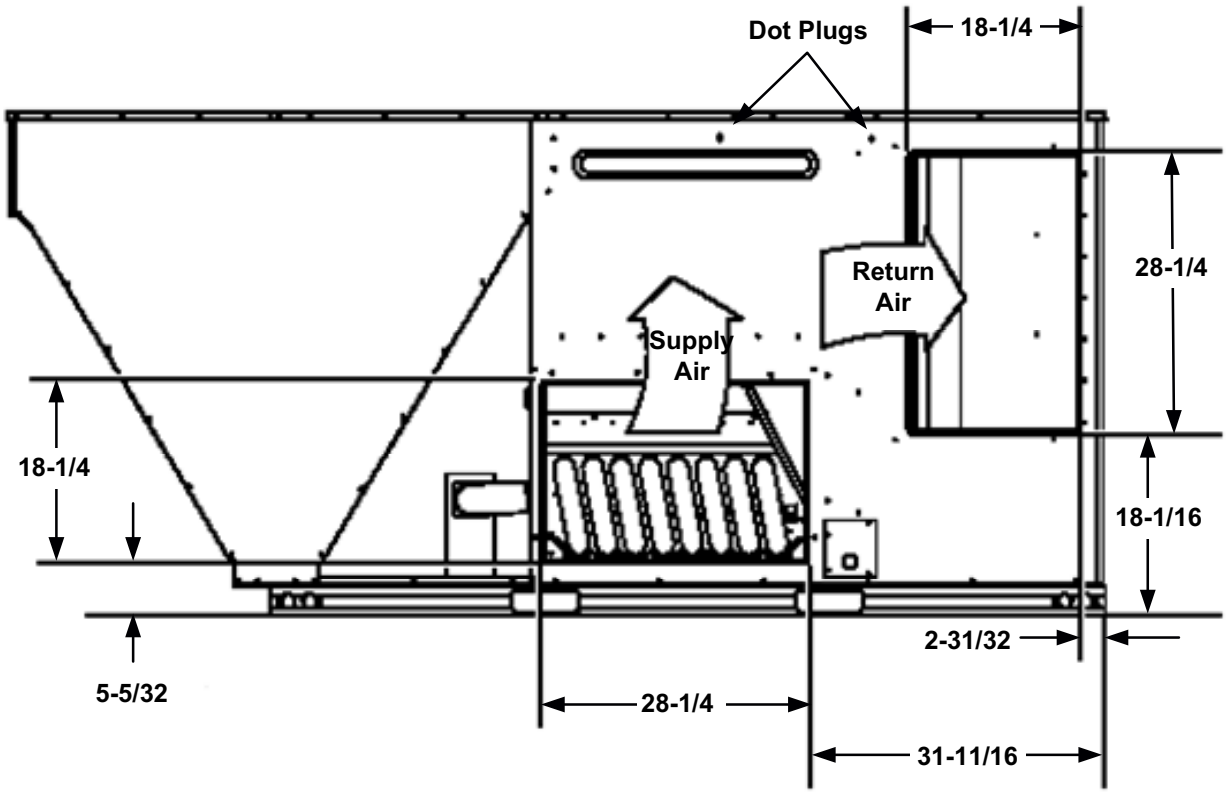


FIGURE 9 - REAR DUCT DIMENSIONS

DUCTWORK

Ductwork should be designed and sized according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

Refer to Figure 8 for bottom air duct openings. Refer to Figure 9 for rear air duct openings.

DUCT COVERS

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For bottom duct application, no duct cover changes are necessary. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective downflow opening. But keep in mind that the supply panel is installed with the painted surface UP, facing the heat exchanger, while the return panel is installed with the painted surface DOWN, facing the downflow duct opening. The supply panel is secured with the bracket (already in place from the factory) and two screws. It's a snug fit for the panel when sliding it between the heat exchanger and unit bottom, but there is room. The return panel is secured with four screws.

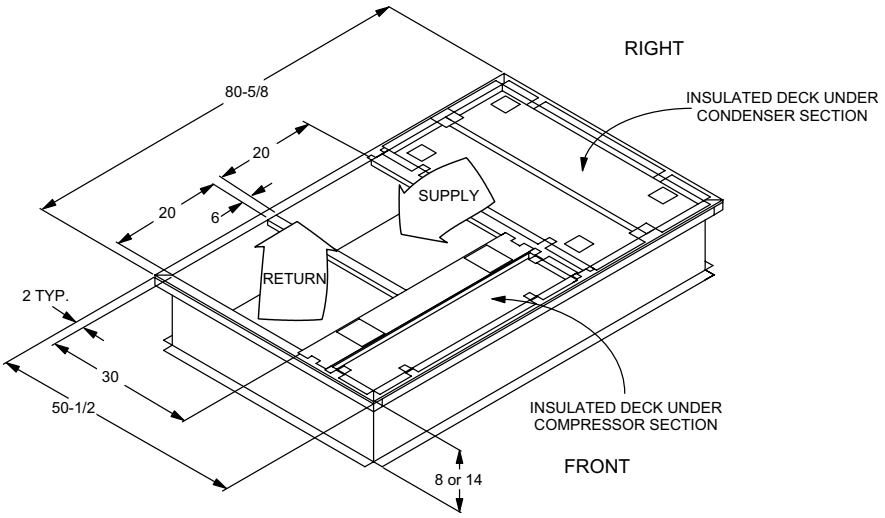


FIGURE 10 - PREDATOR® MAGNUM ROOF CURB DIMENSIONS

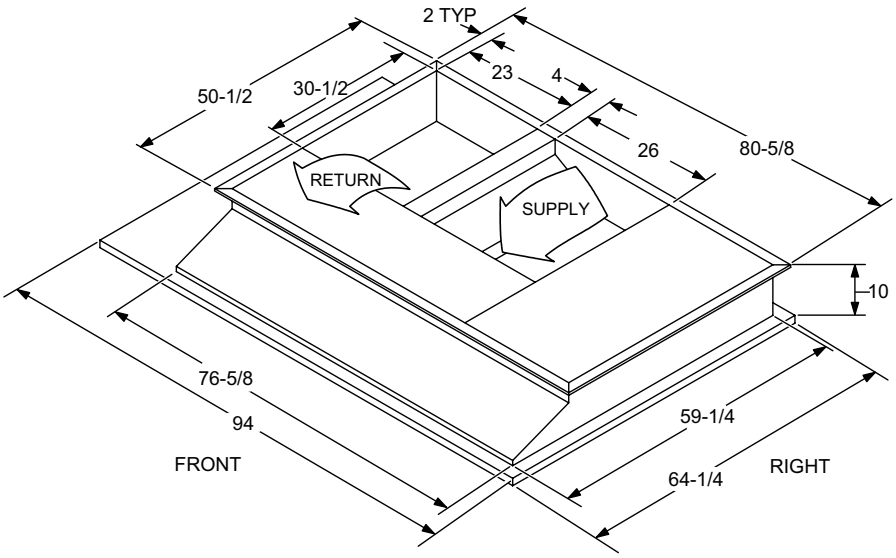


FIGURE 11 - SUNLINE™ TO PREDATOR® MAGNUM TRANSITION ROOF CURBS

⚠ CAUTION

When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.

FIGURE 12 - SIDE PANELS WITH HOLE PLUGS

Note orientation. Panel is “insulation” side up.

FIGURE 13 - RETURN DOWNFLOW PLENUM WITH PANEL

FIGURE 14 - DISCHARGE PANEL IN PLACE

CONDENSATE DRAIN

The side condensate drain is reversible and maybe re-oriented to the rear of the cabinet to facilitate condensate piping. A condensate drain connection is available through the base pan for piping inside the roof curb. Trap the connection per Figure 15. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 inch NPT female connection on the unit to an open drain.

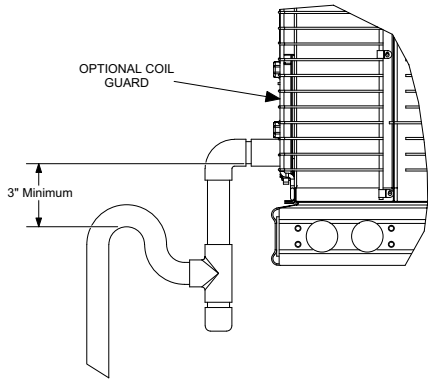


FIGURE 15 - CONDENSATE DRAIN

COMPRESSORS

The compressors are mounted on elastomer insulators. The mounting bolts have been fully tightened for shipping.

⚠ CAUTION

Do not loosen the compressor mounting bolts.

FILTERS

Two-inch filters are supplied with each unit. One-inch filters may be used with no modification to the filter racks. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. All units use four (4) 20”x25”x2” filters. The unit should not be operated without filters properly installed.

⚠ CAUTION

Make sure that panel latches are properly positioned on the unit to maintain an airtight seal.

THERMOSTAT WIRING

The thermostat should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. Seven (7) color-coded, insulated wires should be used to connect the thermostat to the unit. Refer to Table 7 for control wire sizing and maximum length.

TABLE 7: CONTROL WIRE SIZES

Wire Size	Maximum Length*
18 AWG	150 Feet

*. From the unit to the thermostat and back to the unit.

POWER AND CONTROL WIRING

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA No. 70 – Latest Edition (in U.S.A.), current Canadian Electrical Code C221, and/or local ordinances. The unit must be electrically grounded in accordance with NEC and CEC as specified above and/or local codes.

Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

A disconnect must be utilized for these units. Factory installed disconnects are available. If installing a disconnect (field supplied or York International® supplied accessory), refer to Figure 3 for the recommended mounting location.

⚠ CAUTION

Avoid damage to internal components if drilling holes for disconnect mounting.

NOTE: Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical line must be sized properly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

Refer to Figures 16, 17 and 18 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

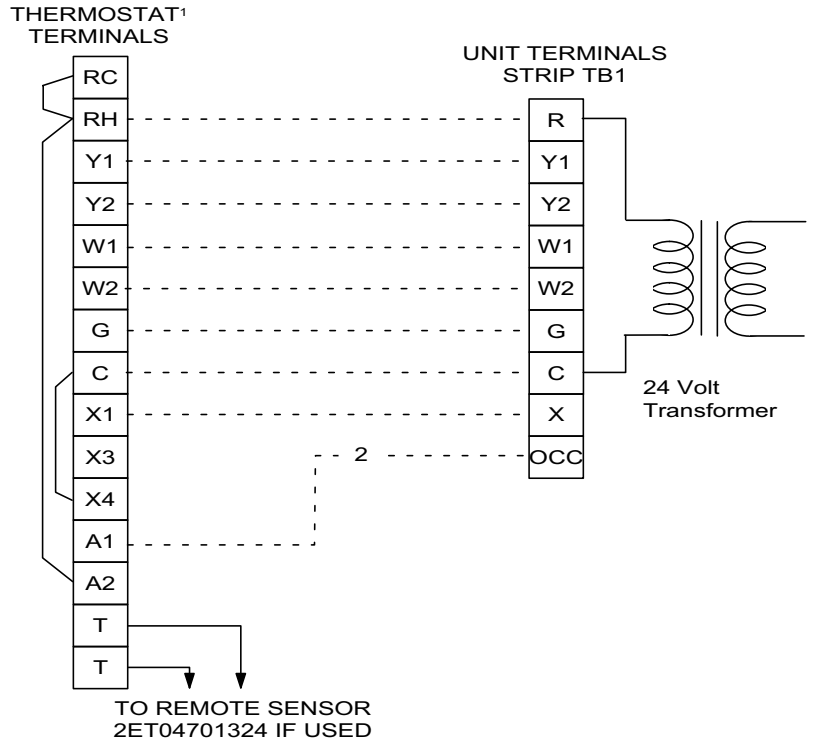
⚠ CAUTION

When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.

POWER WIRING DETAIL

Units are factory wired for the voltage shown on the unit nameplate. Refer to Electrical Data Tables 8 and 9 to size power wiring, fuses, and disconnect switch.

Power wiring is brought into the unit through the side of the unit or the basepan inside the curb.



[1] Electronic programmable Thermostat 2ET0770010024 (includes subbase).
[2] Terminals A1 and A2 provide a relay output to close the outdoor economizer dampers when the thermostat switches to the set-back position.

FIGURE 16 - ELECTRONIC THERMOSTAT FIELD WIRING

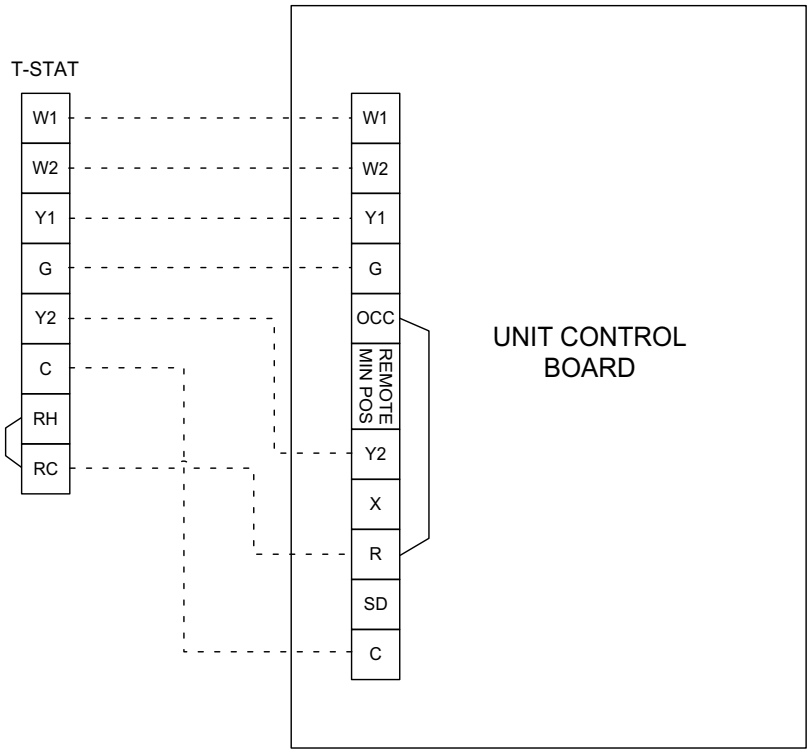


FIGURE 17 - FIELD WIRING 24 VOLT THERMOSTAT

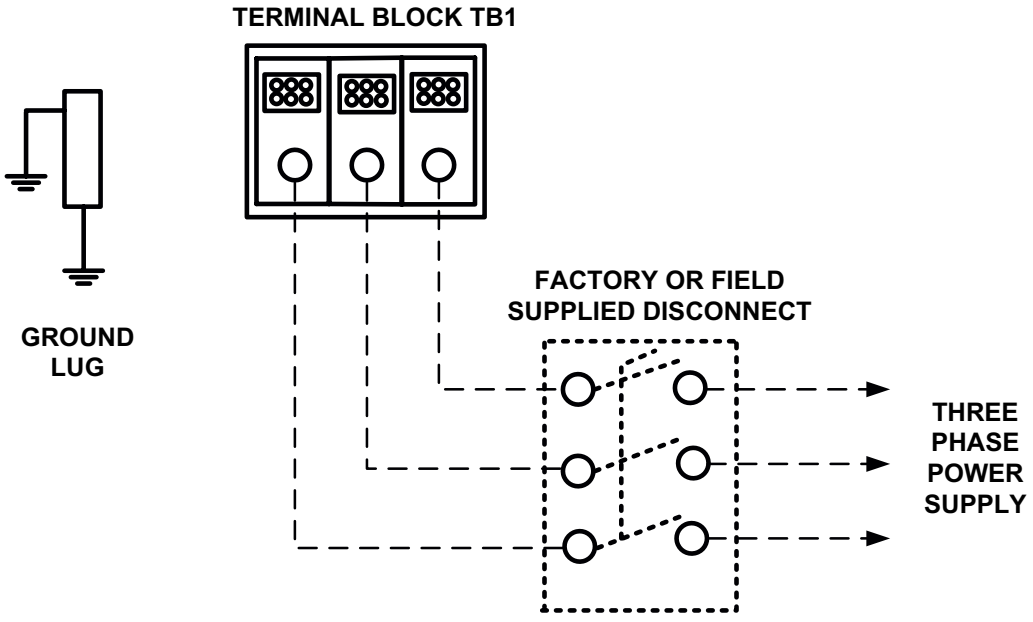


FIGURE 18 - FIELD WIRING DISCONNECT - COOLING UNIT WITH/WITHOUT ELECTRIC HEAT

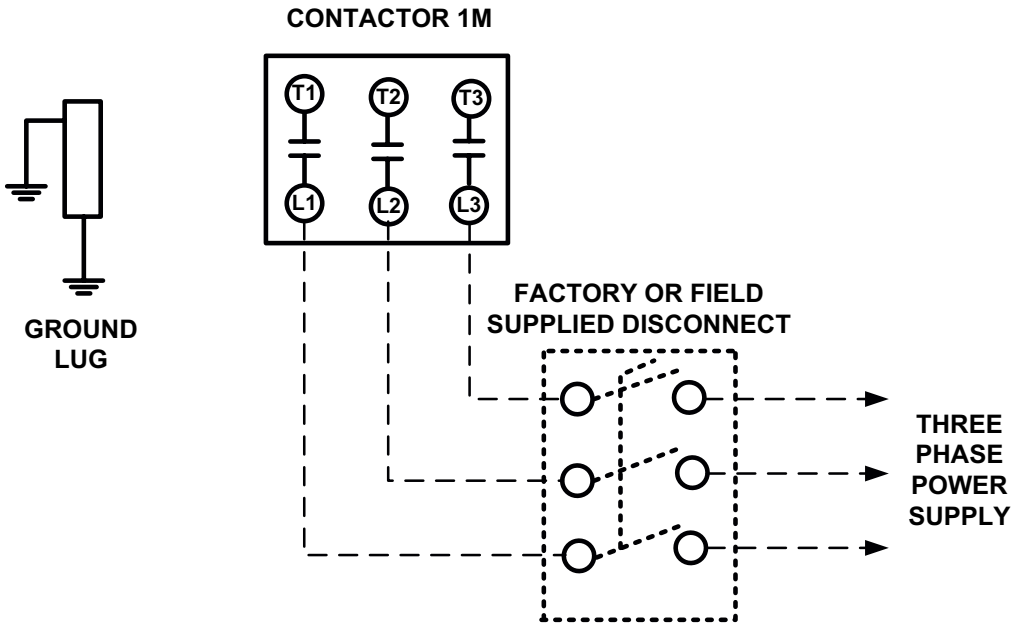


FIGURE 19 - FIELD WIRING DISCONNECT - COOLING UNIT WITH GAS HEAT

TABLE 8: ELECTRICAL DATA DJ150 (12-1/2 TON) WITHOUT POWERED CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	3 HP	5 HP	FLA	FLA				3 HP	5 HP	3 HP	5 HP	3 HP	5 HP	3 HP	5 HP
208	20.0	146.0	1.5	10.9	16.1	5.5	0.0	None	--	--	61.9	67.1	67.4	72.6	80	80	80	90
								2TP04521825	13.5	37.5	61.9	67.1	67.4	73.8	80	80	80	90
								2TP04522425	18.0	50.0	76.1	82.6	83.0	89.5	80	90	90	90
								2TP04523625	25.5	70.8	102.1	108.6	109.0	115.5	110	110	110	125
								2TP04525425	40.6	112.7	154.5	161.0	161.4	167.9	175	175	175	175
230	20.0	146.0	1.5	10.9	16.1	5.5	0.0	None	--	--	61.9	67.1	67.4	72.6	80	80	80	90
								2TP04521825	18.0	43.3	67.8	74.3	74.6	81.1	80	80	80	90
								2TP04522425	24.0	57.7	85.8	92.3	92.7	99.2	90	100	100	100
								2TP04523625	34.0	81.8	115.9	122.4	122.7	129.2	125	125	125	150
								2TP04525425	54.0	129.9	143.5	150.0	150.4	156.9	175	175	175	175
460	8.4	73.0	0.8	5.3	8.1	2.2	0.0	None	--	--	27.4	30.2	29.6	32.4	35	35	35	40
								2TP04521846	18	22.6	33.7	37.2	36.4	39.9	35	40	40	40
								2TP04522446	24	30.1	42.7	46.2	45.5	49	45	50	50	50
								2TP04523646	34	42.7	57.7	61.2	60.5	64	60	70	70	70
								2TP04525446	54	67.8	71.6	75.1	74.3	77.8	80	90	80	90
575	6.7	60.0	0.6	4.1	6.0	1.8	0.0	None	--	--	21.6	23.5	23.4	25.3	25	30	30	30
								2TP04521858	18	18.1	26.8	29.2	29	31.4	30	30	30	35
								2TP04522458	24	24.1	34	36.4	36.2	38.6	35	40	40	40
								2TP04523658	34	34.1	46	48.4	48.3	50.6	50	50	50	60
								2TP04525458	54	54.2	57.1	59.5	59.3	61.7	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 9: ELECTRICAL DATA DJ150 (12-1/2 TON) WITH POWERED CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	3 HP	5 HP	FLA	FLA				3 HP	5 HP	3 HP	5 HP	3 HP	5 HP	3 HP	5 HP
208	20.0	146.0	1.5	10.9	16.1	5.5	10.0	None	--	--	71.9	77.1	77.4	82.6	90	90	90	100
								2TP04521825	13.5	37.5	73.0	79.5	79.8	86.3	90	90	90	100
								2TP04522425	18.0	50.0	88.6	95.1	95.5	102.0	90	100	100	110
								2TP04523625	25.5	70.8	114.6	121.1	121.5	128.0	125	125	125	150
								2TP04525425	40.6	112.7	167.0	173.5	173.9	180.4	175	175	175	200
230	20.0	146.0	1.5	10.9	16.1	5.5	10.0	None	--	--	71.9	77.1	77.4	82.6	90	90	90	100
								2TP04521825	18.0	43.3	80.3	86.8	87.1	93.6	90	90	90	100
								2TP04522425	24.0	57.7	98.3	104.8	105.2	111.7	100	110	110	125
								2TP04523625	34.0	81.8	128.4	134.9	135.2	141.7	150	150	150	150
								2TP04525425	54.0	129.9	156.0	162.5	162.9	169.4	175	175	175	175
460	8.4	73.0	0.8	5.3	8.1	2.2	5.0	None	--	--	32.4	35.2	34.6	37.4	40	40	40	45
								2TP04521846	18	22.6	39.9	43.4	42.7	46.2	40	45	45	50
								2TP04522446	24	30.1	49	52.5	51.7	55.2	50	60	60	60
								2TP04523646	34	42.7	64	67.5	66.7	70.2	70	70	70	80
								2TP04525446	54	67.8	77.8	81.3	80.6	84.1	90	90	90	90
575	6.7	60.0	0.6	4.1	6.0	1.8	4.0	None	--	--	25.6	27.5	27.4	29.3	30	30	30	35
								2TP04521858	18	18.1	31.8	34.2	34	36.4	35	35	35	40
								2TP04522458	24	24.1	39	41.4	41.2	43.6	40	45	45	45
								2TP04523658	34	34.1	51	53.4	53.3	55.6	60	60	60	60
								2TP04525458	54	54.2	62.1	64.5	64.3	66.7	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 10: PHYSICAL DATA

Component		Model DJ150
Evaporator Blower	Blower, Centrifugal (Dia. X Wd. in.)	15 x 15
	Motor, Standard (HP)	3
	Motor, Optional (HP)	5
Evaporator Coil	Rows	4
	Fins per Inch	15
	Height (in.)	40
	Face Area ($ft.^2$ each)	13.2
Condenser Fan (4 per Unit)	Propeller Dia. (in., each)	24
	Motor (HP, each)	1/3
	CFM, Nominal (each)	3000
Condenser Coil (2 per unit)	Rows (each)	2
	Fins per Inch	20
	Height (in. each)	44
	Face Area ($ft.^2$ each)	14.5
Refrigerant Charge	System 1 (lb./oz.)	11/0
	System 2 (lb./oz.)	11/8
Compressors	Quantity	2
	Type	Scroll
Air Filters	Size (Wd. x Ht. x Thickness in.)	25x20x2
	Number Per Unit	4

OPTIONAL ELECTRIC HEAT

The factory-installed heaters are wired for single point power supply. Power supply need only be brought into the single point terminal block.

These CSA approved heaters are located within the central compartment of the unit with the heater elements extending into the supply air chamber.

Fuses are supplied, where required, by the factory. Some kW sizes require fuses and other do not. Refer to Table 11 for minimum CFM limitations and to Tables 8 through 9 for electrical data.

TABLE 11: MINIMUM SUPPLY AIR CFM

Heater	Unit Model Size, Nominal Tons	
kW	Voltage	12.5
		Minimum Supply Air CFM
18	208/230	3750
24		
36		
54		
18	480	3750
24		
36		
54		
18	600	3750
24		
36		
54		

OPTIONAL GAS HEAT

These gas-fired heaters have aluminized-steel or optional stainless steel, tubular heat exchangers with spark ignition.

TABLE 12: GAS HEAT APPLICATION DATA

Unit Size	Unit Opt.	Input (MBH)	Output (MBH)	Temp Rise (°F)
150	15	180	144	10-40
	20	240	192	20-50

GAS PIPING

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. "National Fuel Gas Code" Z223.1 (in U.S.A.) or the current Gas Installation Codes CSA-B149.1 (in Canada) should be followed in all cases unless superseded by local codes or gas utility requirements. Refer to the Pipe Sizing Table 13. The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a one-inch pipe connection at the entrance fitting.

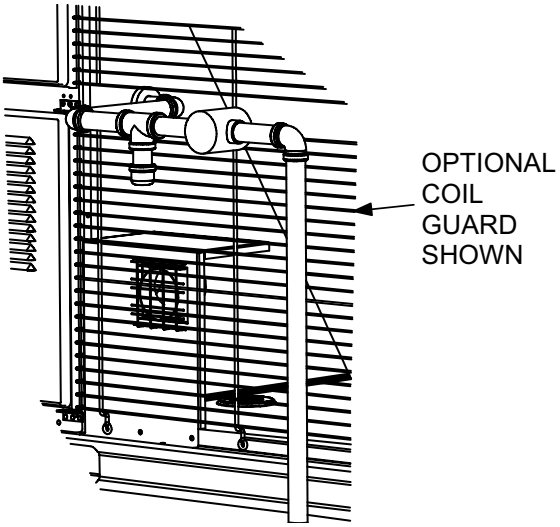


FIGURE 20 - SIDE ENTRY GAS PIPING

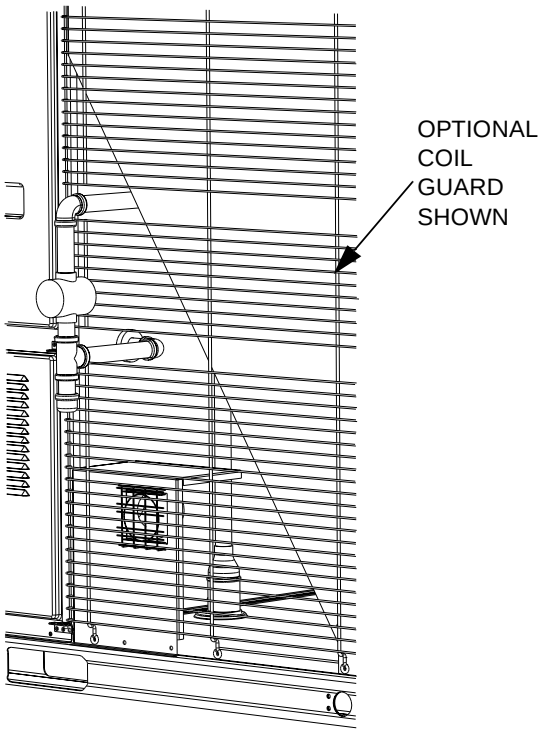


FIGURE 21 - BOTTOM ENTRY GAS PIPING

TABLE 13: GAS PIPE SIZING - CAPACITY OF PIPE

Length of Pipe (ft.)	Nominal Iron Pipe Size		
	3/4 in.	1 in.	1-1/4 in.
10	278	520	1050
20	190	350	730
30	152	285	590
40	130	245	500
50	115	215	440
60	105	195	400
70	96	180	370
80	90	170	350
90	84	160	320
100	79	150	305

NOTE: Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 0.3 inch W.C. and 0.6 specific gravity gas.

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 3/4 inch pipe connection at the entrance fitting. Line should not be sized smaller than the entrance fitting size.

GAS CONNECTION

The gas supply line can be routed within the space and roof curb, exiting through the unit's basepan. Refer to Figure 8 for the gas piping inlet location. Typical supply piping arrangements are shown in Figures 20 and 21. All pipe nipples, fittings, and the gas cock are field supplied or may be purchased in UPG accessory kit #1GP0404.

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.
2. Where required by local codes, a manual shut-off valve must be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only.

⚠WARNING

Natural gas may contain some propane. Propane is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe. Shellac based compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clydes's or John Crane may be used.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out loose particles. Before initial start-up, be sure that all gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under "Limitations".
6. A 1/8-inch NPT plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the unit.
7. After the gas connections have been completed, open the main shut-off valve admitting *normal gas pressure* to the mains. *Check all joints for leaks with soap solution or other material suitable for the purpose.* **NEVER USE A FLAME**.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

⚠ CAUTION

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 PSIG.

Pressures greater than 1/2 PSIG will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 PSIG, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG.

LP UNITS, TANKS AND PIPING

All gas heat units are shipped from the factory equipped for natural gas use only. The unit may be converted in the field for use with LP gas with accessory kit model number 1NP0441.

All LP gas equipment must conform to the safety standards of the National Fire Protection Association.

For satisfactory operation, LP gas pressure must be 10.5 inch W.C. at the unit under full load. Maintaining proper gas pressure depends on three main factors:

1. The vaporization rate which depends on the temperature of the liquid and the "wetted surface" area of the container(s).

2. The proper pressure regulation. (Two-stage regulation is recommended).

3. The pressure drop in the lines between regulators and between the second stage regulator and the appliance. Pipe size required will depend on the length of the pipe run and the total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and LP gas suppliers.

LP gas is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe for LP. Shellac base compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clyde's, or John Crane may be used.

Check all connections for leaks when piping is completed using a soap solution. **NEVER USE A FLAME**.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

VENT AND COMBUSTION AIR

Venting slots in the heating compartment access panel remove the need for a combustion air hood. The gas heat flue exhaust is routed through factory installed exhaust piping with screen. If necessary, a flue exhaust extension may be installed at the point of installation.

FACTORY INSTALLED OPTIONS/ FIELD INSTALLED ACCESSORIES

ELECTRIC HEAT

Electric heaters are available as field installed accessories. Refer to electric heat instructions for installation. These heaters mount in the heat compartment with the heating elements extending into the supply air chamber. All electric heaters are fused and intended for use with single point power supply.

MOTORIZED OUTDOOR DAMPER

The Motorized Outdoor Damper can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Motorized Outdoor Dampers accessories include complete instructions for installation.

ECONOMIZER

The Economizer can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Economizer accessories include complete instructions for installation.

There are two Economizer options:

1. Down Flow application with barometric relief hood standard.

2. Horizontal Flow application that requires the purchase of a barometric relief hood.

POWER EXHAUST

The Power Exhaust can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Power Exhaust accessories include complete instructions for installation.

The Power Exhaust factory installed option is for Down Flow application only.

There are two field installed Power Exhaust accessories:

1. Down Flow application.

2. Horizontal Flow application that requires the purchase of a barometric relief hood.

RAIN HOOD

The following procedure should be used when assembling a rain hood onto a unit.

All of the hood components, including the filters, the gasketing and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet, if the unit has factory installed options. If field installed accessories are being installed all parts necessary for the installation comes in the accessory.

1. Remove the hood components, filters, gasketing and the hardware from the box.

2. Follow the instructions included with the hood to complete the installation.

ECONOMIZER AND POWER EXHAUST SET POINT ADJUSTMENTS AND INFORMATION

Remove the top rear access panel from the unit. Locate the economizer control module, where the following adjustments will be made.

⚠ CAUTION

Extreme care must be exercised in turning all set point, maximum and minimum damper positioning adjustment screws to prevent twisting them off.

MINIMUM POSITION ADJUSTMENT

- Check that the damper blades move smoothly with binding; carefully turn the Minimum Position Adjust screw (found on the damper control module) fully clockwise and then set the thermostat indoor fan switch to the ON position and then OFF or energize and de-energize terminals “R” to “G”.
- With the thermostat set to the indoor fan ON position or terminals “R” to “G” energized, turn the Minimum Position Adjusting screw (located on the damper control module) counterclockwise until the desired minimum damper position has been attained.

ENTHALPY SET POINT ADJUSTMENT

The enthalpy set point may now be set by selecting the desired set point shown in the Enthalpy Set Point Adjustment Figure 22. Adjust as follows:

- For a single enthalpy operation carefully turn the set point adjusting screw (found on the damper control module) to the "A", "B", "C" or "D" setting corresponding to the lettered curve of the Enthalpy Set Point Adjustment Figure 22.
- For a dual enthalpy operation, carefully turn the set point adjusting screw fully clockwise past the "D" setting.

POWER EXHAUST DAMPER SET POINT (WITH OR WITHOUT POWER EXHAUST)

- With no power exhaust option, adjust the Exhaust Air Adjustment Screw fully clockwise. This will allow 2nd stage cooling to operate.
- With power exhaust option, each building pressurization requirement will be different. The point at which the power exhaust comes on is determined by the economizer damper position (Percent Open). The Exhaust Air Adjustment Screw should be set at the Percent Open of the economizer damper at which the power exhaust is needed. It can be set from 0 to 100% damper open.

INDOOR AIR QUALITY AQ

Indoor Air Quality (indoor sensor input): Terminal AQ accepts a +2 to +10 Vdc signal with respect to the (AQ1) terminal. When the signal is below it's set point, the actuator is allowed to modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the AQ signal exceeds it's set point setting and there is no call for free cooling, the actuator is proportionately modulated from the 2 to 10 Vdc signal, with 2 Vdc corresponding to full closed and 10 Vdc corresponding to full open. When there is no call for free cooling, the damper position is limited by the IAQ Max damper position setting. When the signal exceeds it's set point (Demand Control Ventilation Set Point) setting and there is a call for free cooling, the actuator modulates from the minimum position to the full open position based on the highest call from either the mixed air sensor input or the AQ voltage input.

- Optional CO_2 Space Sensor Kit Part # 2AQ04700324
- Optional CO_2 Sensor Kit Part # 2AQ04700424

Replace the top rear access panel on the unit.

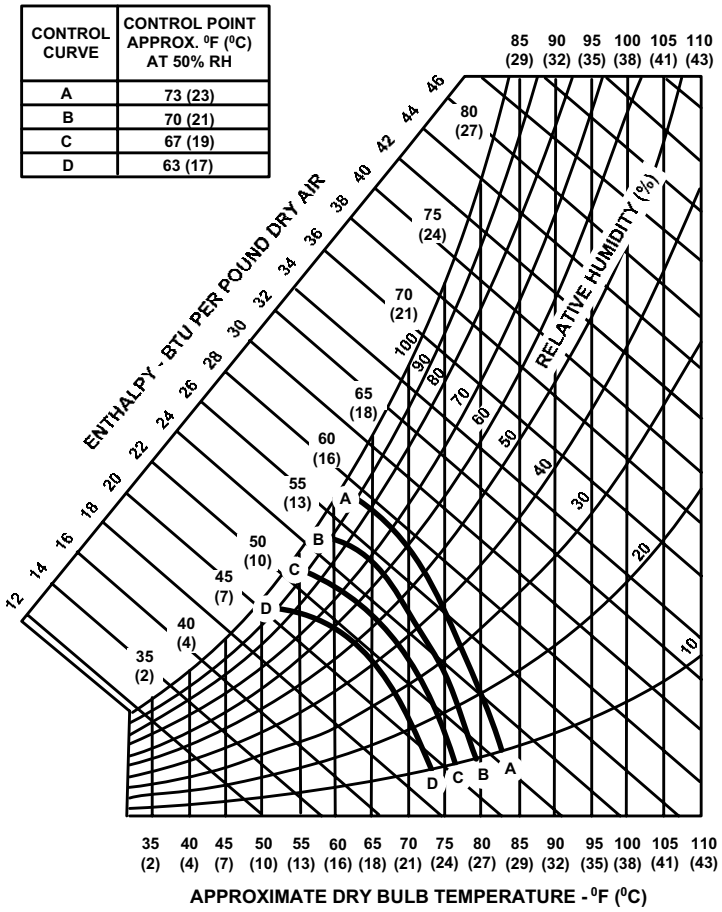


FIGURE 22 - ENTHALPY SET POINT CHART

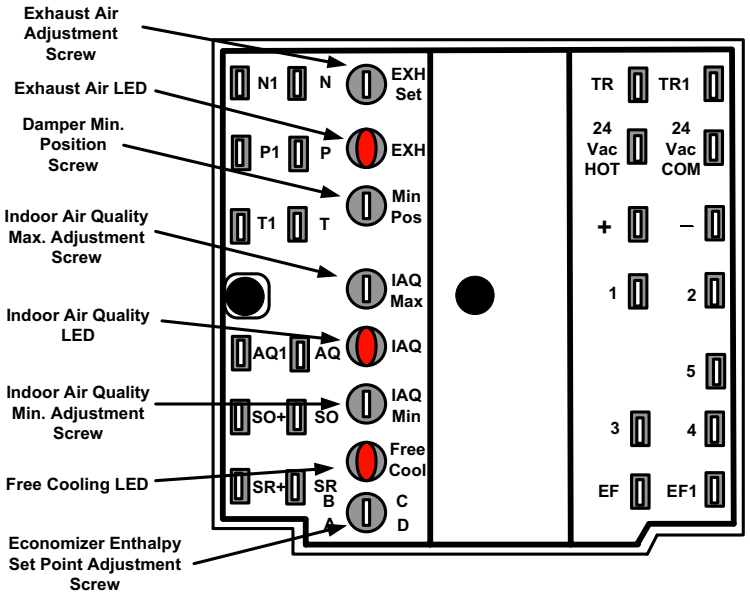


FIGURE 23 - HONEYWELL ECONOMIZER CONTROL W7212

PHASING

Predator® Magnum DJ units are properly phased and protected by a Phase Monitor from the factory. If the unit does not start up, the electrical connection to the unit may be misphased. Check the Phase Monitor for a Red LED, indicating a misphase. Change the phasing of the **Field line connection at the Factory or Field Supplied Disconnect** to obtain a Green LED on the Phase Monitor. (Scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or producing a high noise level, the scroll is misphased.)

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. Do not change the internal wiring to make the blower condenser fans, or compressor rotate correctly.

BLOWER ROTATION

Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased (See 'PHASING').

TABLE 14: SUPPLY AIR LIMITATIONS

Unit	Minimum	Maximum
DJ150	3750	6250

BELT TENSION

The tension on the belt should be adjusted as shown in Figure 24.

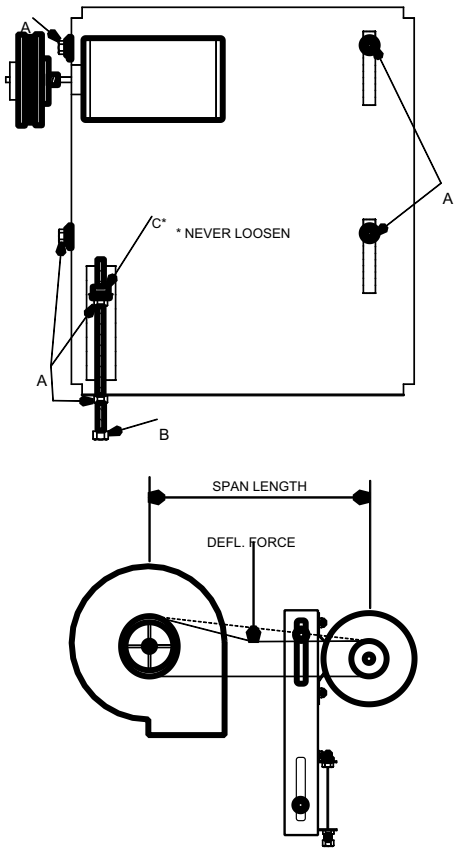


FIGURE 24 - BELT ADJUSTMENT

⚠ CAUTION

Procedure for adjusting belt tension:

1. Loosen six nuts (top and bottom) A.
2. Adjust by turning (B).
3. Never loosen nuts (C).
4. Use belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32") is obtained.

To determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line. The recommended deflection force is as follows:

Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any retensioning should fall between the min. and max. deflection force values.

5. After adjusting retighten nuts (A).

TABLE 15: DJ150, 12-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE* †

ESP‡	TURNS OPEN**																	
	0			1			2			3			4			5		
	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP
0.4	5078	3630	3.89	4809	3103	3.33	4594	3053	3.27	4360	2478	2.66	4090	2093	2.24	3812	1798	1.93
0.6	4865	3456	3.71	4584	2961	3.17	4349	2912	3.12	4106	2318	2.49	3814	1964	2.11	-	-	-
0.8	4642	3284	3.52	4356	2828	3.03	4089	2776	2.98	3840	2137	2.29	-	-	-	-	-	-
1.0	4408	3114	3.34	4124	2705	2.90	3815	2647	2.84	-	-	-	-	-	-	-	-	-
1.2	4164	2947	3.16	3889	2592	2.78	-	-	-	-	-	-	-	-	-	-	-	-
1.4	3910	2787	2.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

†. Blower performance includes two-inch throwaway filters.

‡. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

**. "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

††. W = Watts

TABLE 16: DJ150, 12-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE* †

ESP‡	TURNS OPEN**																	
	0			1			2			3			4			5		
	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP
0.4	5994	5400	5.79	5565	4369	4.69	5488	4169	4.47	5264	3599	3.86	4990	3085	3.31	4738	2812	3.02
0.6	5824	5216	5.59	5368	4186	4.49	5289	3991	4.28	5049	3437	3.69	4763	2937	3.15	4491	2655	2.85
0.8	5641	5022	5.39	5170	4012	4.30	5076	3807	4.08	4822	3272	3.51	4528	2790	2.99	4235	2497	2.68
1.0	5444	4819	5.17	4971	3846	4.12	4847	3618	3.88	4584	3103	3.33	4286	2644	2.83	3969	2340	2.51
1.2	5233	4609	4.94	4771	3687	3.95	4604	3426	3.67	4335	2933	3.15	4035	2499	2.68	-	-	-
1.4	5009	4394	4.71	4571	3537	3.79	4346	3233	3.47	4074	2762	2.96	3777	2356	2.53	-	-	-
1.6	4771	4174	4.48	4370	3395	3.64	4074	3040	3.26	3802	2590	2.78	-	-	-	-	-	-
1.8	4520	3951	4.24	4169	3262	3.50	3786	2850	3.06	-	-	-	-	-	-	-	-	-
2.0	4255	3728	4.00	3966	3137	3.36	-	-	-	-	-	-	-	-	-	-	-	-
2.2	3976	3505	3.76	3763	3020	3.24	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

†. Blower performance includes two-inch throwaway filters.

‡. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

**. "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

††. W = Watts

TABLE 17: DJ150, 12-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE* †

ESP‡	TURNS OPEN**																	
	0			1			2			3			4			5		
	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP
0.4	-	-	-	-	-	-	5201	3162	3.39	4966	2796	3.00	4681	2405	2.58	4355	2054	2.20
0.6	-	-	-	5220	3395	3.64	4942	2980	3.20	4657	2608	2.80	4358	2230	2.39	4007	1890	2.03
0.8	-	-	-	4944	3194	3.43	4661	2806	3.01	4378	2572	2.76	4016	2057	2.21	-	-	-
1.0	5003	3490	3.74	4647	2988	3.20	4380	2636	2.83	4030	2257	2.42	-	-	-	-	-	-
1.2	4724	3290	3.53	4363	2875	3.08	4012	2505	2.69	-	-	-	-	-	-	-	-	-
1.4	4428	3040	3.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

†. Blower performance includes two-inch throwaway filters.

‡. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

**. "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

††. W = Watts

TABLE 18: DJ150, 12-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE* †

ESP‡	TURNS OPEN**																	
	0			1			2			3			4			5		
	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP	CFM	W††	BHP
0.4	-	-	-	6447	5315	5.70	6207	4760	5.1046	5966	4205	4.51	5717	3716	3.98	5470	3307	3.55
0.6	-	-	-	6110	4917	5.27	5965	4464	4.79	5740	4023	4.31	5430	3501	3.75	5126	3054	3.28
0.8	-	-	-	5772	4519	4.85	5741	4274	4.58	5503	3821	4.10	5162	3294	3.53	4849	2870	3.08
1.0	6235	5521	5.92	5628	4407	4.73	5474	4048	4.34	5244	3611	3.87	4882	3101	3.33	4530	2667	2.86
1.2	5881	5137	5.51	5384	4205	4.51	5248	3854	4.13	4941	3387	3.63	4589	2906	3.12	4225	2502	2.68
1.4	5695	4950	5.31	5123	3996	4.29	5014	3670	3.94	4651	3178	3.41	4284	2716	2.91	3858	2280	2.45
1.6	5471	4728	5.07	4919	3828	4.11	4732	3460	3.71	4365	2983	3.20	3951	2516	2.70	3491	2058	2.21
1.8	5242	4514	4.84	4656	3611	3.87	4438	3240	3.47	3998	2740	2.94	3618	2316	2.48	-	-	-
2.0	4954	4231	4.54	4339	3380	3.62	3905	2861	3.07	3631	2497	2.68	-	-	-	-	-	-
2.2	4585	3934	4.22	4022	3149	3.38	-	-	-	-	-	-	-	-	-	-	-	-
2.4	4217	3637	3.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.6	3848	3340	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

†. Blower performance includes two-inch throwaway filters.

‡. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

**. "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

††. W = Watts

NOTES FOR TABLE 15 THROUGH TABLE 18:

- Blower performance includes dry coil and two-inch filters.
- Blower performance for gas heat includes the maximum number of heat tubes available for each tonnage.
- ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

TABLE 19: INDOOR BLOWER SPECIFICATIONS

MODEL	MOTOR					MOTOR SHEAVE			BLOWER SHEAVE			BELT
	HP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
DJ150	3	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
	5	1725	87%	1.15	184T	4.3 - 5.3	1 1/8	1VP56	6.7	1	BK77	BX55

AIR BALANCE

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

CHECKING AIR QUANTITY

METHOD ONE

1. Remove the dot plugs from the duct panel (for location of the dot plugs see Figure 9).
2. Insert eight-inches of 1/4 inch metal tubing into the air-flow on both sides of the indoor coil.

NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil can vary greatly, measuring the pressure drop across a wet coil under field conditions could be inaccurate. To assure a dry coil, the compressors should be de-activated while the test is being run.

NOTE: De-energize the compressors before taking any test measurements to assure a dry evaporator coil.

4. The CFM through the unit with clean 2 inch filters can be determined from the pressure drop indicated by the manometer by referring to Figure 25.
5. To adjust Measured CFM to Required CFM, see 'SUPPLY AIR DRIVE ADJUSTMENT'.
6. After adjustments have been completed, remove the tubes and replace the dot plugs.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

METHOD TWO

1. Drill two 5/16 inch holes, one in the return air duct as close to the inlet of the unit as possible, and another in the supply air duct as close to the outlet of the unit as possible.
2. Insert eight inches of 1/4 inch metal tubing into the air-flow of both return and supply air ducts of the unit.

NOTE: The tubes must be inserted and held in position perpendicular to the airflow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across the unit. This is the External Static Pressure (ESP).
4. Select the indoor blower specifications for the unit from Table 19, 3 or 5 H.P. Motor.
5. Determine the number of turns the variable pitch motor sheave is open.
6. Select the correct blower performance table for the unit from Tables 15 - 18.
7. Determine the unit Measured CFM from the Blower Performance Table, External Static Pressure and number of turns the variable pitch motor sheave is open.
8. To adjust Measured CFM to Required CFM, see 'SUPPLY AIR DRIVE ADJUSTMENT'.
9. After adjustments have been completed, remove the tubes and seal holes.

NOTE: With the addition of field installed accessories repeat this procedure.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

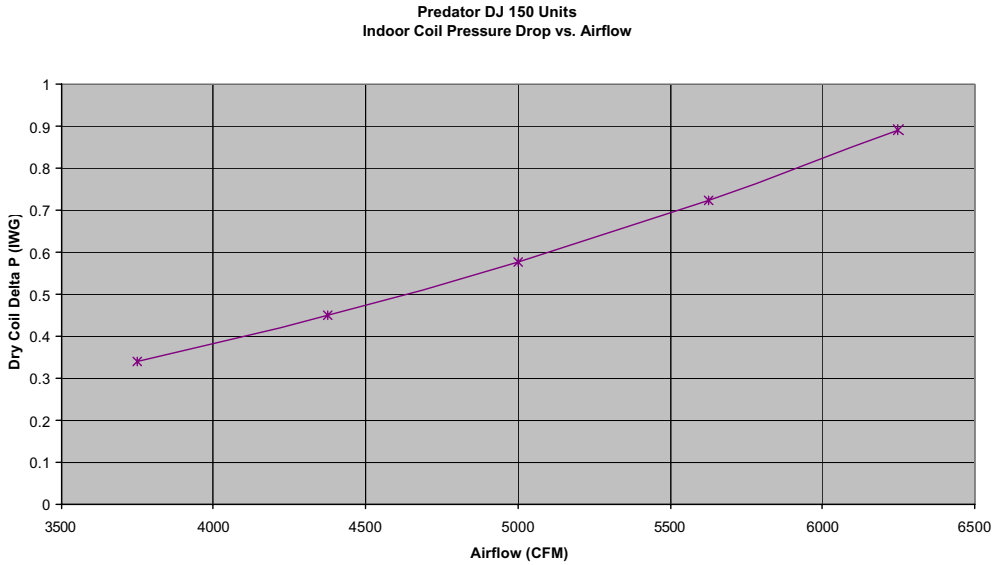


FIGURE 25 - DRY COIL DELTA P

SUPPLY AIR DRIVE ADJUSTMENT

⚠ CAUTION

Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow.

Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described below:

$$\left(\frac{\text{Required CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use the following tables and the DD calculated per the above equation to adjust the motor variable pitch sheave.

EXAMPLE

A 12.5 ton unit was selected to deliver 4,000 CFM with a 3 HP motor, but the unit is delivering 3,800 CFM. The variable pitch motor sheave is set at 2 turns open.

Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{\text{4,000 CFM}}{\text{3,800 CFM}}\right) \bullet \text{4.0 in.} = \text{4.21 in.}$$

Use Table 21 to locate the DD nearest to 4.21 in. Close the sheave to 1 turn open.

New BHP

$= (\text{Speed increase})^3 \bullet \text{BHP at 3,800 CFM}$

$= (\text{Speed increase})^3 \bullet \text{Original BHP}$

= New BHP

New motor Amps

$= (\text{Speed increase})^3 \bullet \text{Amps at 3,800 CFM}$

$= (\text{Speed increase})^3 \bullet \text{Original Amps}$

= New Amps

TABLE 20: ADDITIONAL STATIC RESISTANCE

CFM	Cooling Only*	Economizer† ‡	Electric Heat KW†			
			18	24	36	54
3700	0.20	0.04	0.18	0.21	0.22	0.26
3900	0.23	0.04	0.20	0.23	0.24	0.28
4100	0.25	0.04	0.22	0.25	0.26	0.31
4300	0.28	0.05	0.24	0.28	0.29	0.34
4500	0.30	0.05	0.26	0.30	0.31	0.37
4700	0.33	0.05	0.29	0.33	0.34	0.40
4900	0.36	0.05	0.31	0.35	0.37	0.43
5100	0.39	0.06	0.34	0.38	0.40	0.46
5300	0.42	0.06	0.37	0.41	0.43	0.49
5500	0.45	0.06	0.40	0.44	0.46	0.53
5700	0.48	0.06	0.43	0.47	0.49	0.56
5900	0.52	0.07	0.46	0.50	0.53	0.59
6100	0.56	0.07	0.49	0.53	0.56	0.62
6300	0.60	0.07	0.53	0.56	0.59	0.65

*. Add these resistance values to the available static resistance in the respective Blower Performance Tables.

†. Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.

‡. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

TABLE 21: MOTOR SHEAVE DATUM DIAMETERS

1VM50x7/8 (3 HP Motor)		1VP56x1-1/8 (5 HP Motor)	
Turns Open	Datum Diameter	Turns Open	Datum Diameter
0	**4.4**	1	5.3
1/2	**4.3**	1-1/2	5.2
1	**4.2**	2	5.1
1-1/2	**4.1**	2-1/2	5.0
2	**4.0**	3	4.9
2-1/2	**3.9**	3-1/2	4.8
3	**3.8**	4	4.7
3-1/2	**3.7**	4-1/2	4.6
4	**3.6**	5	4.5
4-1/2	**3.5**	5-1/2	4.4
5	**3.4**	6	4.3

OPERATION

SEQUENCE OF OPERATIONS OVERVIEW

For the Predator® Magnum series of units, the thermostat makes a circuit between "R" and "Y1" for the first stage of cooling.

The call is passed to the unit control board (UCB), which then determines whether the requested operation is available and, if so, which components to energize.

For gas heating, the UCB monitors the "W1" call but does not handle the operation of the gas furnace. An ignition control board controls the gas heater operation. For electric heat units, the UCB passes the call to the electric heater. In both cases, when the "W1" call is sensed, the indoor air blower is energized following a specified heating delay.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

COOLING SEQUENCE OF OPERATION

CONTINUOUS BLOWER

By setting the room thermostat fan switch to "ON," the supply air blower will operate continuously.

INTERMITTENT BLOWER

With the room thermostat fan switch set to "AUTO" and the system switch set to either the "AUTO" or "HEAT" settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

NO OUTDOOR AIR OPTIONS

When the thermostat calls for the first stage of cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The UCB energizes the economizer (if installed and free cooling is available) or the first available compressor* and the condenser fans. For first stage cooling, compressor #1 is energized. If compressor #1 is unavailable, compressor #2 is energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

When the thermostat calls for the second stage of cooling, the low-voltage control circuit from “R” to “Y2” is completed. The control board energizes the first available compressor. If free cooling is being used for the first stage of cooling, compressor #1 is energized. If compressor #1 is active for first stage cooling or the first compressor is locked-out, compressor #2 is energized. In free-cooling mode, if the call for the second stage of cooling continues for 20 minutes, compressor #2 is energized, provided it has not been locked-out.

If there is an initial call for both stages of cooling, the UCB will delay energizing compressor #2 by 30 seconds in order to avoid a power rush.

Once the thermostat has been satisfied, the it will de-energize Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling.

* To be available, a compressor must not be locked-out due to a high or low-pressure switch or freezestat trip and the anti-short cycle delay (ASCD) must have elapsed.

ECONOMIZER WITH SINGLE ENTHALPY SENSOR -

When the room thermostat calls for "first-stage" cooling, the low voltage control circuit from "R" to "G" and "Y1" is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the "AUTO" position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the set point of the enthalpy controller (previously determined), "Y1" energizes the economizer. The dampers will modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the set point, "Y1" energizes compressor #1, condenser fan motor #1, and condenser fan motor #2 (if the ambient temperature is above 60°F).

When the thermostat calls for "second-stage" cooling, the low voltage control circuit from "R" to "Y2" is completed. The UCB energizes the first available compressor If the enthalpy of the outdoor air is below the set point of the enthalpy controller (i.e. first stage has energized the economizer), "Y2" will energize compressor #1. If the outdoor air is above the set point, "Y2" will energize compressor #2.

Once the thermostat has been satisfied, it will de-energize Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continues fan operation the economizer damper goes to the min. position.

ECONOMIZER WITH DUAL ENTHALPY SENSORS -

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

ECONOMIZER (SINGLE OR DUAL) WITH POWER EXHAUST -

This system operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan set point on the economizer control. When the power exhaust is operating, the second stage of mechanical cooling will not operate. As always, the "R" to "G" connection provides minimum position but does not provide power exhaust operation.

MOTORIZED OUTDOOR AIR DAMPERS -

This system operation is the same as the units with no outdoor air options with one exception. When the "R" to "G" circuit is complete, the motorized damper drives open to a position set by the thumbwheel on the damper motor. When the "R" to "G" circuit is opened, the damper spring returns fully closed.

COOLING OPERATION ERRORS

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

HIGH-PRESSURE LIMIT SWITCH

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the associated compressor, initiate the ASCD (Anti-short cycle delay), and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (see Table 28). If the other compressor is inactive, the condenser fans will be de-energized.

LOW-PRESSURE LIMIT SWITCH

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the associated compressor and flash a code (Table 28). If the other compressor is inactive, the condenser fans will be de-energized.

FREEZESTAT

During cooling operation, if a freezestat opens, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a freezestat open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (Table 28). If the other compressor is inactive, the condenser fans will be de-energized.

LOW AMBIENT COOLING

To determine when to operate in low ambient mode, the UCB has a pair of terminals connected to a temperature-activated switch set at 45ºF. When the low ambient switch is closed and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The defrost cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, the UCB will not lock-out the compressors due to a freezestat trip. However, a freezestat trip will de-energize the associated compressor. If the call for cooling is still present at the end of the ASCD and the freezestat has closed, the unit will resume operation.

SAFETY CONTROLS

The unit control board monitors the following inputs for each cooling system:

1. A suction line freezestat to protect against low evaporator temperatures due to a low airflow or a low return air temperature, (opens at 26 ± 5 °F and resets at 38 ± 5°F).
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 380 ± 10 psig and resets at 300 ± 10 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 7 ± 3 psig and resets at 22 ± 5 psig).

The above pressure switches are hard-soldered to the unit. The refrigeration systems are independently monitored and controlled. On any fault, only the associated system will be affected by any safety/preventive action. The other refrigerant system will continue in operation unless it is affected by the fault as well.

The unit control board monitors the temperature limit switch of electric heat units and the temperature limit switch and the gas valve of gas furnace units.

COMPRESSOR PROTECTION

The compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD) is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

FLASH CODES

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 28.

RESET

Remove the call for cooling, by raising thermostat setting higher than the conditioned space temperature. This resets any pressure or freezestat flash codes.

ELECTRIC HEATING SEQUENCE OF OPERATIONS

The following sequence describes the operation of the electric heat section.

Two-stage heating:

a. Upon a call for first stage heat by the thermostat, the heater relay (RA) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor. If the second stage of heat is required, heater relay (RB) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor.

b. The thermostat will cycle the electric heat to satisfy the heating requirements of the conditioned space.

ELECTRIC HEATING OPERATION ERRORS

TEMPERATURE LIMIT

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized.

This limit is monitored regardless of unit operation status, i.e. the limit is monitored at all times.

If the temperature limit opens three times within one hour, it will lock-on the indoor blower motor and a flash code is initiated (See Table 28).

SAFETY CONTROLS

The UCB monitors the temperature limit switch of electric heat units.

The control circuit includes the following safety controls:

LIMIT SWITCH (LS)

This control is located inside the heater compartment and is set to open at the temperature indicated in the Electric Heat Limit Setting Table 22. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

TABLE 22: ELECTRIC HEAT LIMIT SETTING

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
12.5	208/230	18	150
12.5		24	150
12.5		34	150
12.5		54	150
12.5	480	18	150
12.5		24	150
12.5		34	150
12.5		54	150
12.5	600	18	150
12.5		24	150
12.5		34	150
12.5		54	150

FLASH CODES

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 28.

RESET

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature.This resets any flash codes.

ELECTRIC HEAT ANTICIPATOR SETPOINTS

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 23 for the required electric heat anticipator setting.

TABLE 23: ELECTRIC HEAT ANTICIPATOR SETPOINTS

SETTING, AMPS	
W1	W2
0.13	0.1

GAS HEATING SEQUENCE OF OPERATIONS

When the thermostat calls for the first stage of heating, the low-voltage control circuit from “R” to “W1” is completed. A call for heat passes through the UCB to the ignition control board (ICB). The UCB monitors the “W1” call and acts upon any call for heat by monitoring the gas valve (GV). Once voltage has been sensed at the GV, the UCB will initiate the fan on delay for heating, energizing the indoor blower the specified delay has elapsed.

When the thermostat has been satisfied, heating calls are ceased. The GV is immediately closed. The blower is de-energized after the fan off delay for heating has elapsed. The draft motor performs a 30-second post purge.

IGNITION CONTROL BOARD

FIRST STAGE OF HEATING

When the ICB receives a call for first stage of heating, “W1,” the draft motor is energized. Once the draft motor has been proven, a 30-second purge is initiated. At the end of the purge, both main valves of the GV are opened, and the spark ignitor is energized for 10 seconds. The ICB then checks for the presence of flame. If flame is detected, the ICB enters a flame stabilization period. If flame was not detected, both main valves close, and a retry operation begins.

During the flame stabilization period, a loss of the flame for 2 seconds will cause the main valves to close and the retry operation to begin. After the flame stabilization period, a loss of flame for 3/4 second will cause the main valves to close and the retry operation to begin.

At the conclusion of the flame stabilization period, the ICB will operate the gas heat in high fire (both valves open) for an additional 100 seconds (for a total for 120 seconds of high fire operation). After this 100 seconds, the ICB will then use the call for the second stage of heat to control the second main valve of the GV.

When “W1” is satisfied, both valves are closed.

SECOND STAGE OF HEATING

When the ICB receives a call for the second stage of heating, “W2,” the ICB conducts a complete first stage ignition sequence. If this sequence is satisfied, the second main valve of the GV is opened.

When “W2” is satisfied, the second main valve is closed.

RETRY OPERATION

When a flame is lost or is not detected during an attempt to achieve ignition, a retry operation occurs. A 30-second purge is performed between ignition attempts.

If the unit fails after three ignition attempts, the furnace is locked-out for one hour. The furnace is monitored during this one-hour period for unsafe conditions.

RECYCLE OPERATION

When a flame is lost after the flame stabilization period, a recycle operation occurs. If the unit fails after five recycle attempts, the furnace is locked-out for one hour.

GAS HEATING OPERATION ERRORS

LOCK-OUT

A one-hour lockout occurs following three retries or five recycles. During the one-hour lockout, flame detection, limit conditions, and main valves are tested. Any improper results will cause the appropriate action to occur. Recycling the low voltage power cancels the lock-out.

TEMPERATURE LIMIT

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized. When the UCB again senses 24 volts from the temperature limit, the draft motor will perform a 15-second post-purge and the indoor blower will be de-energized following the elapse of the fan off delay for heating.

This limit is monitored regardless of unit operation status, i.e. this limit is monitored at all time.

If the temperature limit opens three times within one hour, it will lock-on the indoor blower motor and flash code is initiated (See Table 28).

FLAME SENSE

Flame sensing occurs at all times. If “W1” is not present and a flame is sensed for 2 seconds, the draft motor is energized and the main valve is kept off. The ICB halts any operation until a flame is not detected. Once the flame detection is lost, the ICB performs a post-purge. Normal operation is allowed concurrently with the purge (i.e. this purge can be considered the purge associated with a call for “W1”).

If “W1” is present, a flame is sensed, but the main valve is not energized, the draft motor is energized until the flame detection is lost. Normal operation is now allowed.

The flame detection circuitry continually tests itself. If the ICB finds the flame detection circuitry to be faulty, the ICB will not permit an ignition sequence. Also, the draft motor is energized. If this failure should occur during an ignition cycle the failure is counted as a recycle.

GAS VALVE

The UCB and ICB continuously monitor the GV.

If the ICB senses voltage at the GV when not requested, the ICB will energize the draft motor. The ICB will not operate the furnace until voltage is no longer sensed at the GV. The draft motor is stopped when voltage is not sensed at the GV.

Any time the UCB senses voltage at the GV without a call for heat for a continuous five-minute period, the UCB will lock-on the indoor blower and a flash code is initiated (Table 28). When voltage is no longer sensed at the GV, the UCB will de-energize the indoor blower following the elapse of the fan off delay for heating.

If voltage has been sensed at the GV for at least 15 seconds during the fan on delay for heating and GV voltage or “W1” is lost, the indoor blower is forced on for the length of the fan off delay for heating.

During a call for heat, if the UCB does not sense voltage at the GV for a continuous five-minute period the UCB will initiate a flash code (Table 28). The indoor blower motor will not be locked-on while there is no GV voltage.

However, if during a normal ignition sequence, the NPC has been tested to be open, IDM energized, NPC closes and then the first stage main valve (MV1) is detected as being on, the ignition sequence stops and the IDM is de-energized. (Since the NPC is wired serially with the main valve relays, de-energizing the IDM will open the NPC). This failure is counted as a recycle and will result in an eventual recycle lockout. If the main valve continues to be energized after the IDM is de-energized the IDM is re-energized. The second stage (MV2) main valve is not monitored for closure after energization.

SAFETY CONTROLS

The UCB monitors the temperature limit switch of gas heat units.

The control circuit includes the following safety controls:

LIMIT SWITCH (LS)

This control is located inside the gas heat compartment and is set to open at the temperature indicated in the Gas Heat Limit Control Settings Table 24. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

AUXILIARY LIMIT SWITCH (ALS)

This control is located inside the supply air compartment and is set to open at the temperature indicated in the Gas Heat Limit Control Settings Table 24. It resets manually. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

The auxiliary limit switch is wired in series with the limit switch. As such, the UCB cannot distinguish the auxiliary limit and the gas heat limit switch operation except the auxiliary is manual reset. Consequently, the control will respond in the same manner as outlined above under “Limit Switch”.

TABLE 24: GAS HEAT LIMIT CONTROL SETTINGS*

# of HX Tubes	Main Limit Setting
6	195°F
8	160°F

*. Rollout = 300°F, Auxiliary Limit = 200°F

The ICB monitors the Pressure and Rollout switches of gas heat units.

The control circuit includes the following safety controls:

PRESSURE SWITCH (PS)

Once the draft motor has reached full speed and closes the pressure switch during a normal ignition sequence, if the pressure sw opens for 2 seconds, the GV will be de-energized, the ignition cycle is aborted, and the ICB flashes the appropriate code. See Table 29 Ignition Control Flash Codes. The draft motor is energized until the pressure switch closes or “W1” is lost.

ROLLOUT SWITCH (ROS)

The rollout switch is wired in series with the pressure switch. As such, the ICB cannot distinguish the rollout switch operation from that of the pressure switch.

Consequently, the control will only respond in the same manner as outlined above under “Pressure Switch”. An open rollout will inhibit the gas valve from actuating.

INTERNAL MICROPROCESSOR FAILURE

If the ICB detects an internal failure, it will turn cease all outputs, ignore inputs, and display the proper flash code for control replacement. The ICB remains in this condition until replaced.

FLASH CODES

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 28.

RESETS

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature. This resets any flash codes.

GAS HEAT ANTICIPATOR SETPOINTS

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 25 for the required gas heat anticipator setting.

TABLE 25: GAS HEAT ANTICIPATOR SETPOINTS

SETTING, AMPS	
W1	**W2**
0.65	0.1

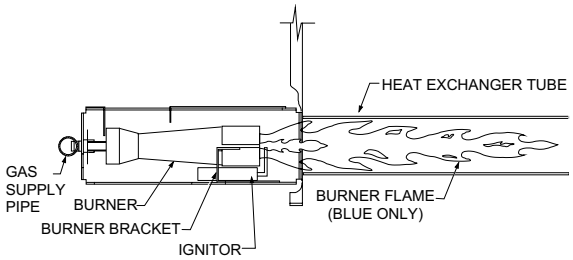


FIGURE 26 - TYPICAL FLAME

START-UP (COOLING)

PRESTART CHECK LIST

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
   - If blower rotation is in the wrong direction. Refer to Phasing Section in general information section.
   - Check blower drive belt tension.
6. Check the unit supply air (CFM).
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.

OPERATING INSTRUCTIONS

1. Turn unit electrical power on.

NOTE: Prior to each cooling season, the crankcase heaters must be energized at least 10 hours before the system is put into operation.

2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors will energize after the built-in time delay (five minutes).
4. The second stage of the thermostat will energize second stage compressor if needed.

POST START CHECK LIST

1. Verify proper system pressures for both circuits.
2. Measure the temperature drop across the evaporator coil.

START-UP (GAS HEAT)

PRE-START CHECK LIST

Complete the following checks before starting the unit.

1. Check the type of gas being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Make sure that the vent outlet and combustion air inlet are free of any debris or obstruction.

OPERATING INSTRUCTIONS

⚠ CAUTION

This furnace is equipped with an intermittent pilot and automatic re-ignition system. DO NOT attempt to manually light the pilot.

LIGHTING THE MAIN BURNERS

1. Turn “OFF” electric power to unit.
2. Turn room thermostat to lowest setting.
3. Turn gas valve counter-clockwise to “ON” position (see Figure 27).
4. Turn “ON” electric power to unit.
5. If thermostat set temperature is above room temperature, the main burners will ignite. If a second stage of heat is called for, the main burners for second stage heat will ignite for the second stage heat.

POST START CHECKLIST

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

2. Check for correct manifold gas pressures. (See 'CHECKING GAS INPUT'.)
3. Check the supply gas pressure. It must be within the limits shown on the rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 13 in. or the operating pressure drop below 5.0 in for natural gas units. If gas pressure is outside these limits, contact the local gas utility or propane supplier for corrective action.

SHUT DOWN

1. Set the thermostat to the lowest temperature setting.
2. Turn "OFF" all electric power to unit.
3. Open gas heat access panel.
4. Turn gas valve clockwise to "OFF" position (See Figure 27).

MANIFOLD GAS PRESSURE ADJUSTMENT

This gas furnace has two heat stages. Therefore, the gas valve has two adjustment screws located under a plastic protective cover. The second stage (100% input) adjustment screw is adjacent to the "HI" marking on the valve and the first stage (60% input) adjustment screw is located adjacent to the "LO" marking on the valve (See Figure 27).

Manifold pressure adjustment procedure.

Adjust second stage (100% input) pressure first, then adjust first stage (60% input) pressure.

1. Turn off all power to the unit.
2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove plastic cap covering HI and LO pressure adjustment screws.
4. Turn on power to the unit.
5. Set thermostat to call for second stage heat and start furnace.
6. If necessary, using a screwdriver, turn the second stage adjustment screw (adjacent to the "HI" marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure. Be sure not to over-fire the unit on second stage.
7. After the high manifold pressure has been checked, adjust the thermostat to call for first stage heat.
8. If necessary, using a screwdriver, turn the first stage adjustment screw (adjacent to the "LO" marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure. Be sure not to under-fire the unit on first stage.
9. Once pressure has been checked, replace the plastic cap covering the HI and LO pressure adjustment screws.

NOTE: When using natural gas, the manifold pressure for second stage (100% input) should be 3.5 IWG ± 0.3. The manifold pressure for first stage (60% input) when using natural gas should be 1.5 IWG ± 0.3.

CHECKING GAS INPUT

NATURAL GAS

This unit has two stages of gas heat. The first stage is 60% of the full fire input and is considered the minimum input for the furnace. The intended input for each furnace is shown in the table below. The following Table applies to units operating on 60 Hz power only.

TABLE 26: GAS HEAT STAGES

# of Burner Tubes	2nd Stage Input (100% Btuh)	1st Stage Input (60% Btuh)
6	180,000	108,000
8	240,000	144,000

To determine the rate of gas flow (second Stage).

1. Turn of all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for Second stage (100% input) heat.

3. Measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.
4. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour. (See example below).
5. If necessary, adjust the high pressure regulator as discussed in the section “Manifold Gas Pressure Adjustment”. **Be sure not to over-fire** the furnace on Second stage. If in doubt, it is better to leave the Second stage of the furnace slightly under-fired. Repeat Steps 1-5.

To determine the rate of gas flow (First Stage)

1. Turn of all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for first stage (60% input) heat.
3. Even when the thermostat is calling for first stage heat, the unit will light on second stage and will run on Second stage for 1 minute. Allow this one-minute time period to expire and be certain the unit is running on first stage.
4. Measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.
5. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour (See example below).
6. If necessary, adjust the low pressure regulator as discussed in the section “Manifold Gas Pressure Adjustment”. **Be sure not to under-fire** the furnace on first stage. If in doubt, it is better to leave the first stage of the furnace slightly over-fired (greater than 60% input). Repeat Steps 1-6.

TABLE 27: GAS RATE CUBIC FEET PER HOUR

Seconds for One Rev.	Size of Test Dial	
	1/2 cu. ft.	1 cu. ft.
10	180	360
12	150	300
14	129	257
16	113	225
18	100	200
20	90	180
22	82	164
24	75	150
26	69	138
28	64	129
30	60	120
32	56	113
34	53	106
36	50	100
38	47	95
40	45	90
42	43	86
44	41	82
46	39	78
48	37	75
50	36	72
52	35	69
54	34	67
56	32	64
58	31	62
60	30	60

NOTE: To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information as it varies widely from area to area).

EXAMPLE:

By actual measurement, it takes 19 seconds for the hand on a 1 cubic foot dial to make a revolution with a 192,000 Btuh furnace running. To determine rotations per minute, divide 60 by 19 = 3.16. To calculate rotations per hour, multiply 3.16 • 60 = 189.6. Multiply 189.6 • 1 (0.5 if using a 1/2 cubic foot dial) = 189.6. Multiply 189.6 • (the Btu rating of the gas). For this example, assume the gas has a Btu rating of 1050 Btu/ft.^{3}. The result of 199,000 Btuh is within 5% of the 192,000 Btuh rating of the furnace.

ADJUSTMENT OF TEMPERATURE RISE

The temperature rise (the difference of temperature between the return air and the heated air from the furnace) must lie within the range shown on the CSA rating plate and the data in Table 25.

After the temperature rise has been determined, the CFM can be calculated as follows:

$$\text{CFM} = \text{Btu Input} \bullet \frac{0.8}{(1.08 \cdot \Delta°\text{F})}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about 6 feet from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise (See 'SUPPLY AIR DRIVE ADJUSTMENT').

NOTE: Each gas heat exchanger size has a minimum allowable CFM. Below this CFM, the limit will open below this rating.

BURNERS/ORIFICES INSPECTION/SERVICING

Before checking or changing burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL POWER TO THE UNIT.

1. Open the union fitting just upstream of the unit gas valve and downstream from the main manual shut-off valve in the gas supply line.
2. Remove the screws holding each end of the manifold to the manifold supports.
3. Disconnect wiring to the gas valves and spark igniter(s). Remove the manifold & gas valve assembly. Orifices can now be inspected and/or replaced.

To service burners, complete step 4.

4. Remove the heat shield on top of the manifold supports. Burners are now accessible for inspection and/or replacement.

NOTE: Reverse the above procedure to replace the assemblies.

Make sure that burners are level and seat at the rear of the gas orifice.

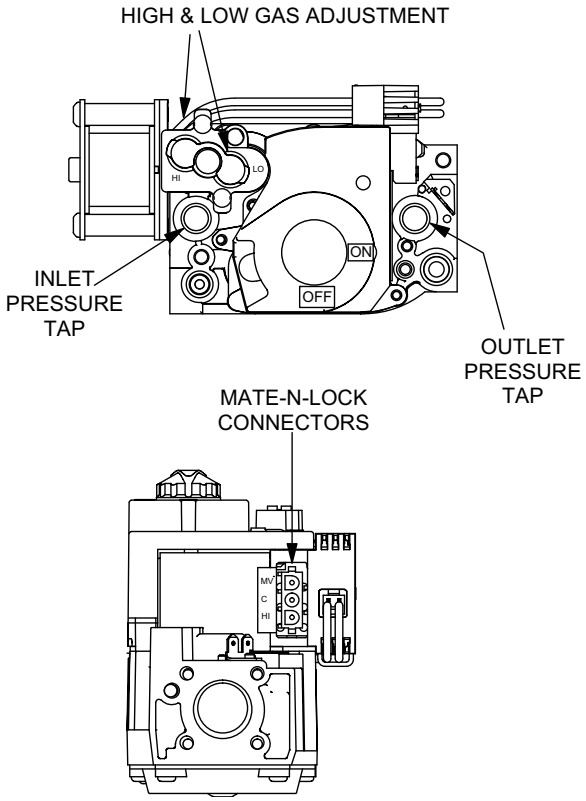


FIGURE 27 - TYPICAL GAS VALVE

CHARGING THE UNIT

The DJ150 (12-1/2 Ton) High Efficiency Unit, uses a TXV metering device. Charge unit to 10º sub-cooling at the TXV.

TROUBLESHOOTING

⚠WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals.

When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

PREDATOR® MAGNUM FLASH CODES

Various flash codes are utilized by the unit control board (UCB) to aid troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control board flashes a 1 second on, 1 second off “heartbeat” during normal operation. This is to verify that the UCB is functioning correctly. Do not confuse this with an error flash code. To prevent confusion, a 1-flash, flash code is not used.

Current alarms are flashed on the UCB LED. The alarm history can be checked by pressing and releasing the ALARMS button on the UCB. The UCB will cycle through the last five (5) alarms, most recent to oldest, separating each alarm flash code by approximately 2 seconds.

In some cases, it may be necessary to “zero” the ASCD for the compressors in order to perform troubleshooting. To reset all ASCDs for one cycle, press and release the UCB TEST button once.

TABLE 28: UNIT CONTROL BOARD FLASH CODES

Flash Code	Description
On Steady	Control Failure - Replace Control
Heart Beat	Normal Operation
1 Flash	Not Applicable
2 Flashes	Control waiting ASCD*
3 Flashes	HPS1 - Compressor Lock out
4 Flashes	HPS2 - Compressor Lock out
5 Flashes	LPS1 - Compressor Lock out
6 Flashes	LPS2 - Compressor Lock out
7 Flashes	FS1 - Compressor Lock out
8 Flashes	FS2 - Compressor Lock out
9 Flashes	Ignition Control Locked Out/ Ignition Control Failure / Limit Switch Trip / No Jumper Plug in Heat Section
10 Flashes	Compressors Locked Out On Low Outdoor Air Temperature*
11 Flashes	Compressors Locked Out Because The Economizer Is Using Free Cooling*
12 Flashes	Fan Overload Switch Trip - Not Applicable On This Unit
13 Flashes	Compressor Held Off Due To Low Voltage*
14 Flashes	EEPROM Storage Failure (Control Failure)
OFF	No Power or Control Failure

*. These flash codes do not represent alarms.

TABLE 29: IGNITION CONTROL FLASH CODES

FLASHES	FAULT CONDITIONS	CHECK
STEADY ON	Control Failure	Control
HEARTBEAT	Normal Operation	
1	Not Applicable	
2	Pressure Switch Stuck Closed	Pressure Switch
3	Pressure Switch Failed To Close	Venter Pressure Switch Vent Blocked
4	Limit Switch Open	Main Limit AUX Limit
5	Flame Present With Gas Off First Stage Gas Valve Energized With W1 Off Second Stage Gas Valve Energized With First Stage Gas Valve Off	Gas Valve
6	Ignition Lockout	Gas Flow Gas Pressure Gas Valve Flame Sensor
STEADY OFF	No Power Or Control Failure	24VAC or Control

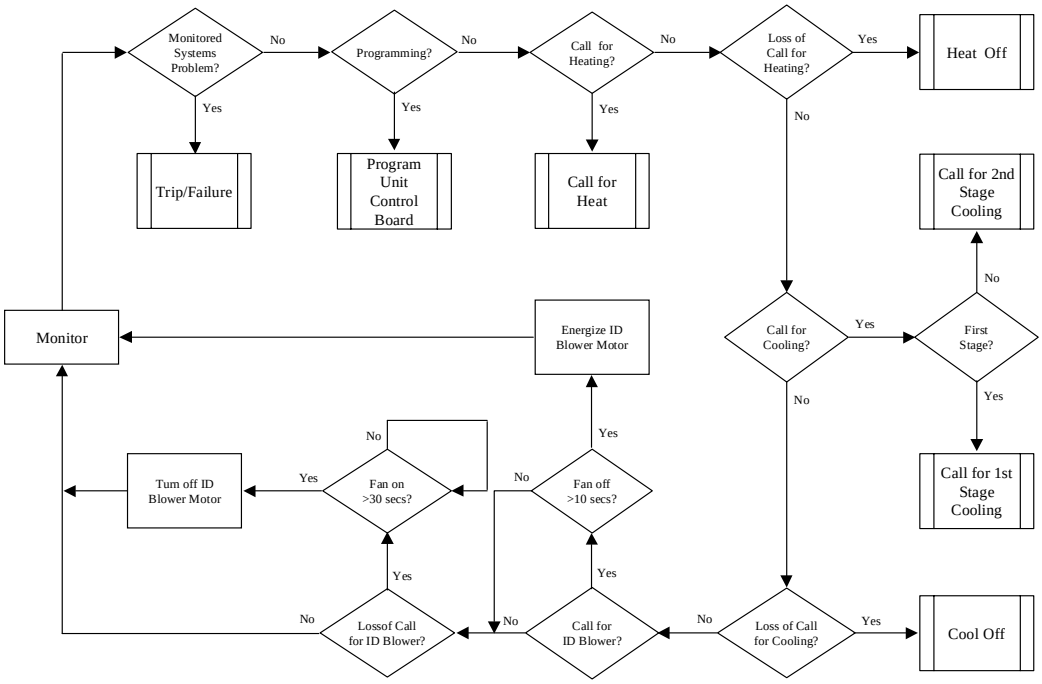


FIGURE 28 - BASIC TROUBLESHOOTING FLOWCHART

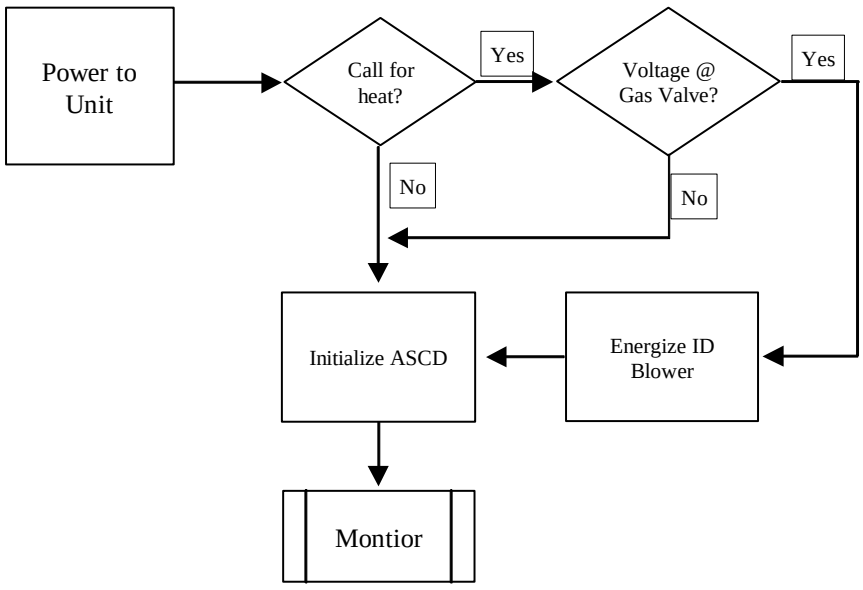
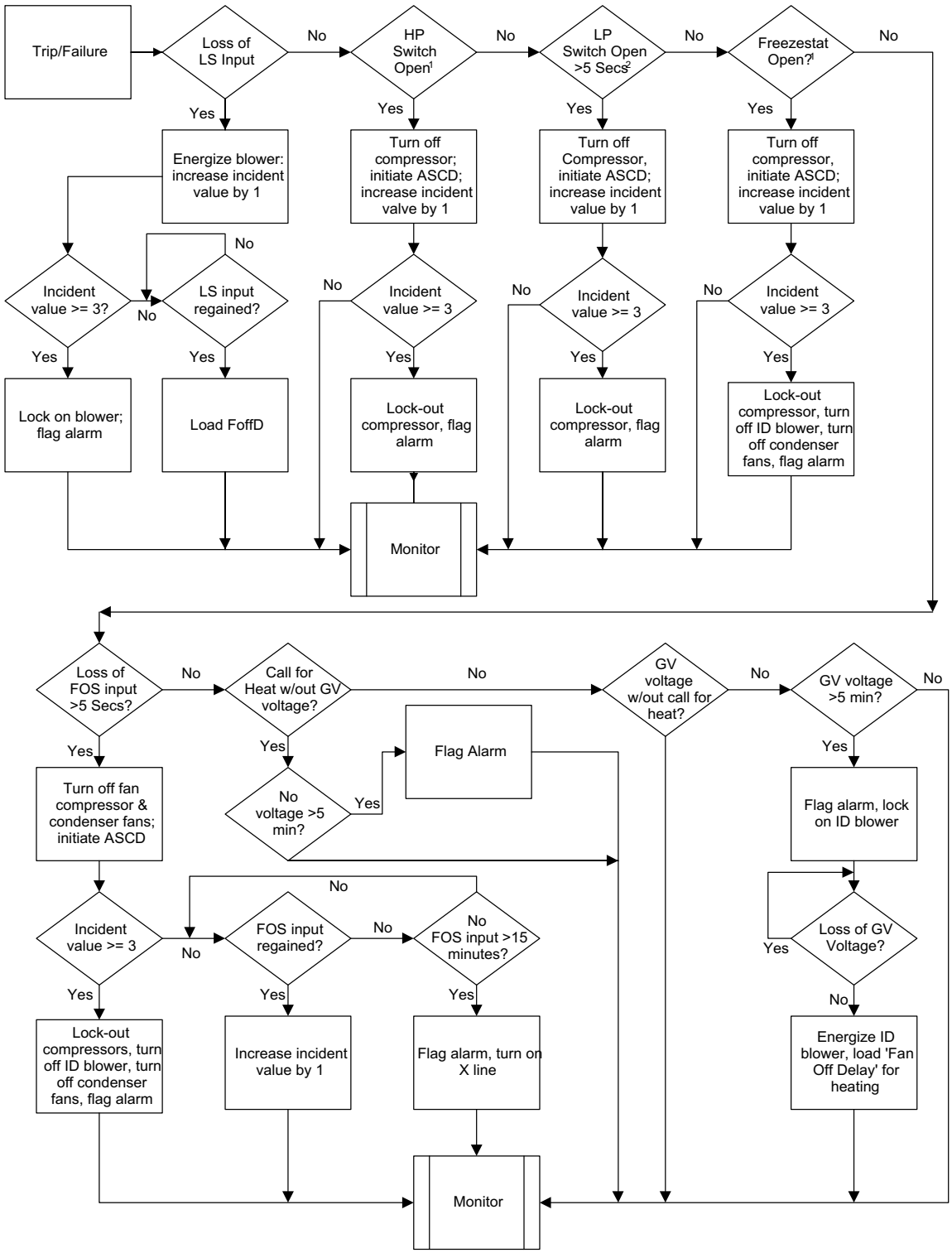


FIGURE 29 - POWER ON FLOW CHART



1 The control board only monitors the input when the compressor really is energized.
2 The low-pressure switch is not monitored for the first 30 seconds of compressor activity. The control board then monitors the switch to ensure it closes. If the switch remains open and additional 30 seconds, the control board turns off the associated compressor and initiates the ASCD. Once it has closed during the start up period, the control board no longer handles the low-pressure switch differently than other inputs.

FIGURE 30 - TRIP FAILURE FLOW CHART

COOLING TROUBLESHOOTING GUIDE

On calls for cooling, if the compressors are operating but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in the “AUTO” position).

1. Turn the thermostat fan switch to the ON position. If the supply air blower motor does not energize, go to Step 3.
2. If the blower motor runs with the fan switch in the ON position but will not run after the first compressor has energized when the fan switch is in the AUTO position, check the room thermostat for contact between R and G in the AUTO position during calls for cooling.
3. If the supply air blower motor does not energize when the fan switch is set to ON, check that line voltage is being supplied to the contacts of the M3, contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
4. If M3 is pulled in and voltage is supplied to M3, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on internal protection. Cancel any thermostat calls and set the fan switch to AUTO. Wait for the internal overload to reset. Test again when cool.
5. If M3 is not pulled in, check for 24 volts at the M3 coil. If 24 volts are present at M3 but M3 is not pulled in, replace the contactor.
6. Failing the above, if there is line voltage supplied at M3, M3 is pulled in, and the supply air blower motor still does not operate, replace the motor.
7. If 24 volts is not present at M3, check that 24 volts is present at the UCB supply air blower motor terminal, “FAN”. If 24 volts is present at the FAN, check for loose wiring between the UCB and M3.
8. If 24 volts is not present at the “FAN” terminal, check for 24 volts from the room thermostat. If 24 volts are not present from the room thermostat, check for the following:
    a. Proper operation of the room thermostat (contact between R and G with the fan switch in the ON position and in the AUTO position during operation calls).
    b. Proper wiring between the room thermostat and the UCB.
    c. Loose wiring from the room thermostat to the UCB.
9. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.
10. If the thermostat and UCB are properly wired, replace the UCB.

On calls for cooling, the supply air blower motor is operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position).

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling and the compressors will not immediately operate. If both stages of cooling are requested simultaneously and the economizer provides free cooling, following a short delay compressor #1 will be energized unless it is locked out. If compressor #1 is locked out, compressor #2 is energized. Compressor #2 is always energized in place of compressor #1 when compressor #1 is requested but locked out.
2. If no economizer is installed or the economizer is not opening to provide free cooling and compressor #1 does not energize on a call for cooling, check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts are present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts is not present from the room thermostat, check for the following:
    a. 24 volts at the thermostat Y1 terminal
    b. Proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2
    c. Loose wiring from the room thermostat to the UCB.
8. If 24 volts is present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have

locked out the compressor for repeat trips. The UCB should be flashing an alarm code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, cancel any call for cooling. This will reset any compressor lock outs.

NOTE: While the above step will reset any lockouts, compressor #1 may be held off for the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.

11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.

12. *For units without economizers*:If 24 volts is present at the Y1 OUT terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.

13. *For units with economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. If nothing is found, the economizer DME may have faulted and is failing to return the 24-volt “call” to the Y1 “ECON” terminal even though the economizer is not providing free cooling. To test, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB’s Mate-N-Lock plug. If compressor #1 energizes, there is a fault in the economizer wiring or DME.

14. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local York distributors can test the UCB for this programming.

15. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.

16. If none of the above correct the error, replace the UCB.

On calls for the second stage of cooling, the supply air blower motor and compressor #1 are operating but compressor #2 is not (the room thermostat fan switch is in the “AUTO” position).

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling. If the second stage of cooling is requested, following a short delay, compressor #1 will be energized unless it is locked out. Typically, compressor #2 is energized only during free cooling if the call for the second stage of cooling persists for 20 minutes.

2. Compressor #2 will not energize simultaneously with compressor #1 if a call for both stages of cooling is received. The UCB delays compressor #2 by 30 seconds to prevent a power surge. If after the delay compressor #2 does not energize on a second stage call for cooling, check for line voltage at the compressor contactor, M2, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.

3. If M2 is pulled in and voltage is supplied at M2, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.

4. If M2 is not pulled in, check for 24 volts at the M2 coil. If 24 volts is present and M2 is not pulled in, replace the contactor.

5. Failing the above, if voltage is supplied at M2, M2 is pulled in, and the compressor still does not operate, replace the compressor.

6. If 24 volts is not present at M2, check for 24 volts at the UCB terminal, C2. If 24 volts are present, check for loose wiring between C2 and the compressor contactor.

7. If 24 volts is not present at the C2 terminal, check for 24 volts from the room thermostat at the UCB Y2 terminal. If 24 volts is not present from the room thermostat, check for the following:

   a. 24 volts at the thermostat Y2 terminal

   b. Proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2

   c. Loose wiring from the room thermostat to the UCB.

8. If 24 volts is present at the UCB Y2 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS2, LPS2, and FS2 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS2 has opened, there will be 24 volts of potential between the LPS2 terminals.

9. If 24 volts is present at the UCB Y2 terminal and none of the protection switches have opened, the UCB may have

locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out,

remove any call for cooling at the thermostat or by disconnecting the thermostat wiring at the Y2 UCB terminal. This will reset any compressor lock outs.

NOTE: While the above step will reset any lock outs, compressor #1 will be held off for the ASCD, and compressor #2 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y2 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.
11. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local York distributors can test the UCB for this programming.
12. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C2 terminal wire and jumper it to the Y2 terminal. DO NOT jump the Y2 to C2 terminals. If the compressor engages, the UCB has faulted.
13. If none of the above correct the error, replace the UCB.

On a call for cooling, the supply air blower motor and compressor #2 are operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position).

1. Compressor #2 is energized in place of compressor #1 when compressor #1 is unavailable for cooling calls. Check the UCB for alarms indicating that compressor #1 is locked out. Press and release the ALARMS button if the LED is not flashing an alarm.
2. Check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts is present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts are not present at the UCB Y1 terminal, the UCB may have faulted. Check for 24 volts at the Y1 ECON terminal. If 24 volts is not present at Y1 “ECON”, the UCB has faulted. The UCB should de-energize all compressors on a loss of call for the first stage of cooling, i.e. a loss if 24 volts at the Y1 terminal.
8. If 24 volts are present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, remove any call for cooling. This will reset any compressor lock outs.

NOTE: While the above step will reset any lock outs, compressor #2 will be held off for the ASCD, and compressor #1 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.
11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.
12. *For units without economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.

For units with economizers:If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. The economizer board may have faulted and is not returning the 24 volts to the Y1 “ECON” terminal even though the economizer is not providing free cooling. To test the economizer board, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB’s Mate-N-Lock plug.

13. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. They can be checked by local York distributors.
14. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.
15. If none of the above correct the error, replace the UCB.

GAS HEAT TROUBLESHOOTING GUIDE

On calls for heating, the draft motor operates and the furnace lights but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in “AUTO” position).

⚠WARNING

The furnace may shut down on a high temperature condition during the procedure. If this occurs, the UCB energize the supply air blower motor until the high temperature limit has reset. Caution should be used at all times as the supply air blower may energize regardless of the room thermostat fan switch position.

1. Place the thermostat fan switch in the “ON” position. If the supply air blower motor energizes, go to Step 10.
2. If the supply air blower motor does not energize when the fan switch is set to “ON,” check that line voltage is being supplied to the contacts of the M3 contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
3. If M3 is pulled in and voltage is supplied at M3, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on inherent protection. Cancel any thermostat calls and set the fan switch to “AUTO”, wait for the internal overload to reset. Test again when cool.
4. If M3 is not pulled in, check for 24 volts at the M3 coil. If 24 volts is present at M3 but M3 is not pulled in, replace the contactor.
5. Failing the above, if there is line voltage supplied at M3, M3 is pulled in, and the supply air blower motor still does not operate, replace the motor.
6. If 24 volts is not present at M3, check that 24 volts is present at the supply air blower motor terminal on the UCB. If 24 volts is present at the UCB terminal, check for loose wiring between the UCB and M3.
7. If 24 volts is not present at the UCB supply air blower motor terminal, check for 24 volts from the room thermostat. If 24 volts is not present from the room thermostat, check for the following:
   a. Proper operation of the room thermostat (contact between R and G with the fan switch in the “ON” position and in the “AUTO” position during operation calls).
   b. Proper wiring between the room thermostat and the UCB.
   c. Loose wiring from the room thermostat to the UCB.
8. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.
9. If the thermostat and UCB are properly wired, replace the UCB.
10. If the blower motor runs with the fan switch in the “ON” position but does not run shortly after the furnace has ignited when the fan switch is in the “AUTO” position, check the room thermostat for contact between R and G during “W1” calls.

On calls for heating, the supply air blower operates but the draft motor does not (the room thermostat fan switch is in the “AUTO” position).

1. The draft motor has inherent protection. If the motor shell is hot to the touch, wait for the internal overload to reset.
2. If the motor shell is cold with the room thermostat calling for heat, check for line voltage at the motor leads. If line voltage is present, replace the draft motor.
3. If line voltage is not present, check for line voltage on the ignition control at the “inducer” terminal draft motor relay (DMR or DMC) contacts in the main control box and check to see if the (DMR or DMC) is pulled in.

The draft motor runs but the furnace does not light and the spark ignitor does not spark.

1. Check for 24 volts at the spark ignitor from the ignition control board (ICB). Check the 24-volt wiring from the ICB to the spark ignitor. Check for 24 volts at the ICB spark ignitor terminal.
2. Check the ground wiring for the ICB and the gas valve is intact and making good electrical connection. Check the ceramic insulator on the spark ignitor for breaks or cracks. Replace the spark ignitor if damaged.
3. With the draft motor running, check for 24 volts at the pressure switch terminal on the ICB. If not present, check for 24 volts on the terminal from the pressure switch. If present, go to step 4. If 24 volts is not present, the either pressure or rollout switch is not closed. Or the draft motor is not sufficiently evacuating the heat exchanger tubes or the pressure switch has failed. Check the operation of the pressure switch. Check the line voltage to the unit; if line voltage is low, call the local power company. If the problem persists, the draft motor may need replacement.
4. If the furnace is hot, it may be out on a high temperature limit open; wait for limit reset.
5. If all are intact replace the ICB.

The draft motor runs and the spark ignitor sparks at the burner, but the burner does not ignite and a gas odor is not detected at the draft motor outlet.

1. Check to ensure gas is being supplied to the unit. Confirm that the gas pressure to the unit is within the proper limits as described in the “POST START CHECKLIST”.
2. Check the voltage at the gas valve and at the gas valve terminals on the ICB. Check all wiring between the ICB and the gas valve. Check to make sure the ground connections are intact.
3. If 24 volts is present, remove the pilot burner and the orifice. The removal procedure is described in “BURNER/ORIFICE INSTRUCTIONS.” Inspect the orifice for obstruction. If it is clear, replace the gas valve.

Main burners light but exhibit erratic flame characteristics.

4. Check the main burner orifices for obstruction and alignment. The removal procedure is described in “BURNER/ORIFICE INSTRUCTIONS.” Clean or replace burner orifices and burners as needed.

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