

### RECEIVING THE UNIT:

Supreme units are completely pre-wired (when specified) and assembled. On receipt of unit, check electrical characteristics (see nameplate) to make sure the unit voltage is compatible with that available on the job site. All separate parts are listed on the shipping order form. Carefully check for all components and damage to any component before signing the freight bill. This unit was pretested at the factory immediately prior to shipping and was in good operating condition at that time.

### I N S T A L L A T I O N

#### CODES:

##### In Canada:

The installation of this unit must be in accordance with:

- a) National Standard of Canada CAN/CGA-B149.1 or .2 - latest edition "Installation Code for Gas Burning Appliances and Equipment", Provincial and Local Codes on units burning gas.
- b) The Canadian Electrical Code, Part 1 - C.S.A Standard C22.1, Provincial and Local Codes.

##### In the U.S.A:

- a) All gas piping must be installed in accordance with the National Fuel Gas Code ANSI/Z223.1 - latest edition. The local authority having jurisdiction should be consulted for local codes and requirements.
- b) All power supply and control wiring to this unit must be installed in accordance with the latest edition of the National Electrical Code (ANSI/NFPA 70 - 1990).

#### **CLEARANCES TO COMBUSTIBLES IN INCHES (MM)**

For Safety and Service, the following minimum clearances on the units shall be observed:

MODEL	TOP	OPPOSITE		CONTROL	
		FRONT	CONTROL PANEL SIDE	BACK	FLOOR
"S"	1" (25)	1" (25)	36" (900)	36" (900)	1" 0 (25) (0)
"D"	48" (1,200)	1" (25)	36" (900)	36" (900)	1" 0 (25) (0)

### Additional Installation Requirements in Canada

The fresh air intake of the make-up air unit located as far as possible away from any exhaust in order to prevent the induction of flammable gases, toxic gases and other deleterious materials. Primary combustion air may be taken the ducts downstream from the burner.

This equipment shall be installed so that no source of flammable vapors, gases or dust shall be within 20 feet horizontally of any unit unless that source is separated from the unit by an enclosure Of vapors resistive materials.

This equipment shall be installed so that the temperature of any adjacent combustible materials shall not exceed 90 Deg. F. above an ambient temperature of 77 Deg. F. or as permitted by CAN1-3.7-77(R1986) and CAN1-3.12-78(R1983).

This equipment shall be installed so that any fire dampers in the duct work are electrically interlocked with the unit (i.e.: damper end switch contact, normally located, between terminals 7 & 8 in series with the exhaust interlock).

This equipment shall be adjusted as to maintain the toxic limits of the tempered air as set out in CAN1-3.7-77(1986) and CAN1-3.12-78(1983).

This equipment shall be installed so that in the event the make-up air shut down causes a hazard to other fuel burning equipment in the building, the unit shall be interlocked to open balancing inlet air dampers.

The purpose of a make-up air unit is to replace air which has been exhausted from a building. The exhaust fan should have a capacity of within 10% of the total make-up air volume. If the unit discharges directly into a booth, the exhaust fan must have a capacity at least equal to the make-up air unit.

On indoor units the fresh air inlet duct shall run straight to the unit a distance at least 1 1/2 times greater than the unit height or 2 times greater than the unit width. Otherwise poor combustion may occur.

All direct fired make-up air units shall be interlocked with the exhaust fan so that the burner may not attempt ignition without a comparable exhaust system operating.

## ADDITIONAL INSTALLATION REQUIREMENTS IN THE U.S.A.

Recirculation of room air may be hazardous in the presence of:

- a) Flammable solids, liquids, and gases.
- b) Explosive material (i.e.: grain dust, coal dust, gunpowder, etc.); and
- c) Substances which may become toxic when exposed to heat (i.e.: refrigerants, aerosols, etc.).

Recirculation units are not recommended in un-insulated buildings where outside temperature falls below 32 Deg. F (0 Deg.C).

If ventilation air is not incorporated as part of the heater, outside ventilation air shall be provided to supply at least 4 CFM (0.019 M3/sec) per 1000 BTU (293 W) per hour of rated input. If a separate mechanical means is used, an interlock shall be provided.

The disconnect must be installed in accordance with Article 430 of the National Electrical Code (ANSI/NFPA 70-1990).

### DAMPER SECTIONS:

Where dampers of any kind are used, the make-up air unit shall be electrically interlocked with the dampers in such a way as to prevent ignition attempt unless the dampers are fully open.

### LIFTING UNIT:

All supreme units are constructed on a heavy base. The frame is extended beyond the length of the unit and is pre-drilled for lifting lugs. Use spreader bars to keep cable away from the unit cabinetry. If the unit is lifted from the bottom (as with a fork lift) take care to lift on the base and not the cabinetry.

### MOUNTING THE UNIT:

Units must be mounted level so that water will not be trapped in the dray pan. Supreme's units are constructed for three types of mounting:

1. **BASE RAILS**-The term rail refers to a channel iron base frame which runs the entire length and width of the unit. Where at all possible, the unit should be supported by a mounting support which is directly below the perimeter channel iron frame of the unit.

2. **FULL ROOF CURB**-The curbs are constructed of heavy gauge galvanized steel, and must be fully insulated on the job site. Wood nailed strips are provided for easy attachment of roof flashing. A neoprene gasket is supplied with the unit and must be field mounted on the curb to seal the joint between the curb and the unit frame.

#### ASSEMBLING THE UNIT:

If the unit and the hood are split and shipped in sections, the sections must be field assembled into one piece. The inlet hood is designed for field installation. Connect the hood on the support flange and attach with self tapping sheet metal screws.

#### GAS INSTALLATION:

Installation must be made in accordance with the requirements of the authorities having jurisdiction.

1. Carefully check the unit name plate for the fuel type, supply pressure, input rating and temperature rise.
2. Gas supply pressure higher than 14" W.C. (3.5 kPa) requires an additional field supplied gas regulator.
3. Gas lines should not be run in a manner which will interfere with unit access. The gas line connection at the heater shall have an approved drip leg with screwed cap and a 1/8" NPT plugged tapping accessible for test gauge connection.
4. On indoor units, any control device (regulator, diaphragm valve, high and low pressure switch, etc.) which requires a bleed or vent line, must be vented to atmosphere in accordance with applicable code.

#### ELECTRICAL INSTALLATION:

All wiring shall be installed in accordance with the requirements of the authorities having jurisdiction. **Do not cut holes in the bottom of outdoor units as the bottom of the unit has been made waterproof.** Both field wiring and internal wiring diagrams are included in the control cabinet of the unit. The power requirements are indicated on the unit name plate. Where field wiring of the control circuit is required, take care to size the field wiring for a maximum 10% voltage drop. The VA rating of the transformer can be assumed to be the maximum load. The disconnect switch must be sized for the ampacity and voltage on the unit

label. The disconnect must be mounted properly and adequately grounded. All field wiring outside the electrical enclosure must be in rigid or flexible conduit. Wiring from unit to remote loads should be routed through the same wall as the power supply (see mechanical drawing). Wiring within the burner enclosure is to be run so that it does not interfere with the servicing of the unit.

Terminal strip with X, Y, Z if for flame rod signal trouble shooting. This is not for 3 phase power connections.

Reconnect all disconnected wiring on the units that were split in 2 or more sections for shipment.

When connecting a power supply to a three phase motor, take care that the three phase wiring gives you the correct motor and blower rotation on all motors.

Replacement wiring must be equivalent to original wire.

See field wiring diagram for requirements for shielded or twisted wire for solid state devices.

#### **START-UP CHECK LIST:**

Provincial and State regulations require that service mechanics who work on combustion equipment must be licensed. The unit should NOT be started or serviced by unqualified personnel.

1. Set all electrical switches and main unit disconnect switch in "OFF" position.
2. Close all unit manual valves and field piping valves.
3. Remove tie-down bolts on blower vibration isolators (if supplied).
4. Check all bearings, drive and blower set screws for tightness.
5. Check drive alignment and belt tension. Refer to Maintenance, page 11.
6. Purge all the air from the gas lines. Check all connections for leaks and correct. Ensure that the inlet pressure agrees with the name plate.
7. Inspect all electrical wiring, both field and factory installed, for loose connections.
8. Turn unit disconnect switch ON (control switch is still off) and check the supply voltage. Voltage must be within 10% of name plate rating. If not, consult the power company and have the voltage condition corrected before unit start-up.

9. Set summer/winter switch in "summer" position and turn unit on/off switch in "on" position.
10. Check all fan motors for correct rotation. If incorrect, reverse rotation.
11. Check the amperage draw of each motor. Refer to name plate for full load amps.
12. Re-check voltage at unit disconnect switch with unit running. If the power is not within 10% of name late, shut unit down and consult power company. Voltage should be within 2% on all phase to phase readings when compared to each other. A 2% voltage difference could cause as much as a 20% current unbalance.

### O P E R A T I O N

**WARNING:** For **emergency shut down** turn the switch "unit On/Off" on the remote box in to the OFF position **and main disconnect switch** on the units' control box in to the OFF position.  
This will shut down the gas and power supply automatically.

### OPERATIONAL CHECK

1. Turn on main and pilot valve up stream of shut-off valves and check for leaks on unit piping.
2. Check for leaks in main and pilot line through fail-safe shut-off valves with firing valves closed. Disconnect burner and its manual valve from the gas supply if a pressure test is done in excess of 1/2 PSIG (2.5 kPa). Connect one end of a hose to the pressure tap between the manual firing valve and fail-safe valve and submerge the other end in a cut of water. If bubbles appear, correct leak.
3. Set the system on/off switch to the "on" position. Switch on the exhaust system to make the exhaust interlock. The damper should begin opening immediately after the manual switches and exhaust interlocks are made. When fully open (takes 150 secnds), the damper blade will make an end switch That will pull in the blower motor starter and start the blower. If the blower fails to start, check and adjust the damper end switch.
4. Open the pilot manual firing valve and switch on the heat switch on the remote panel. The pilot should then ignite or

At least attempt ignition. If an attempt at ignition is made and lockout occurs, visually check a second time to confirm if a pilot is burnt. If the air pressure switches and temperature high limit switch are not properly set, lockout will also occur. The difficulty may be an improper flame detection signal. Check spark rod and flame rod to see if the ceramic is wet, cracked or dirty as any one of these things will cause lockout. Check to see if the gap on the spark igniter is 3/32".

5. After achieving a pilot that burns constantly while the blower is running, check the main gas valves for operation while the main manual firing valve is CLOSED. Switch off the burner. The pilot will then go out. Place a pressure gauge between the automatic valve and the manual firing valve. Switch on the burner. If the pilot comes on and proves properly, the main automatic valve should the open and the gauge should register pressure. If they do not open, check for a wiring error or a defective component.
6. Test for main flame ignition. Place a pressure gauge between the main firing valve and the burner. With the main automatic valve open, manually open the main firing valve from closed to open. Ignition should take place approximately one quarter of a turn from closed to open at which point the pressure gauge will indicate the flow of gas.
7. Do not adjust the main pressure regulator. The firing rate has been factory set and should not require any adjustment. The air temperature rise should be as listed on the name plate. If not, the air volume through the unit should be adjusted. This may be accomplished by adjusting the blower speed. The air temperature rise and unit inlet gas pressure should be measured when the modulating valve is wide open. The modulating valve can be made to stay wide open by turning The modulating temperature control up to its maximum setting And removing its sensing element from the air stream to expose it to a cool ambient temperature. With proper airflow the flame should be approximately 16" long and tipped with a reddish orange flame. If the flame is much longer and mostly yellow, or if the flame is much shorter and florescent blue only, check the trouble shooting guide for the necessary adjustments.
8. Perform a flame supervision check as follows: With the burner in full operational and firing, close the main manual firing valve and the pilot firing valve. The flame safeguard

relay should then lock out and the automatic valves close. To return to normal operation, reset the flame safeguard and open the manual valves.

9. The blower motor and particularly the belt, should be checked After the previous tests and adjustments have been completed. The belts have a tendency to stretch during the first few weeks of operation and may need to be adjusted. The amperage draw of the motor should be checked with an ammeter and should not exceed the rated amperage stated on the motor rating plate. Otherwise, the motor overload wills lockout the motor.

#### COMPONENTS:

The following list is intended to describe the type, function and location of the most commonly used "S" - "D" unit standard and optional components. Refer to component manufacturers bulletins supplied in an envelope with this unit.

1. **SINGLE RANGE DISCHARGE TEMP. SENSOR "S" UNITS:** Provides temperature control of the discharge air when equipped with electronic modulating valve(s) and an amplifier. Temperature control range is 50 Deg. to 90 Deg. F.
2. **DUAL RANGE TEMP. SENSOR ("D" UNITS):** Provides the ability to switch from one discharge to another to provide two different levels of discharge temperature, (60-90 F. paint 80-160 F bake).
3. **MAXITROL AMPLIFIER 1494 C/W SELECTORS TD294E ("D" UNITS), TD94E ("S" UNITS), and TS194.** The appropriate information brochures on these specialized controls have been included in each unit. Only a qualified service person who is familiar with these controllers should service them.
4. **LOW LIMIT (LL) (OPTIONAL):** Shuts the blower off and closes the outside air dampers in the event the discharge air temperature drops below the LTL set point. Sensing bulb is mounted in the discharge air. Also referred to as FREEZESTAT. A low limit should be installed in areas where freeze up protection is needed when the unit has a flame failure.
5. **UNIT ON SWITCH:** Provides remote manual ON-OFF control of the unit.
6. **SUMMER/WINTER SWITCH:** Provides remote manual ON-OFF control of the burner.



7. **DAMPER END SWITCH:** Proves fresh air dampers are in an open position before blower motor is energized.
8. **AIR FLOW SWITCHES:** Low air flow switch proves air flow before the unit can fire and high air flow switch switches the unit off if the air flow is too high.
9. **BAKE PUSH BUTTON:** Activate "BAKE" cycle ("D" models only).
10. **DISCONNECT SWITCH:** Provides a means of disconnecting main power to the unit. May be fused to provide over current protection. May be mounted in unit control panel or on exterior of unit (weatherproof if unit is outdoor type).
11. **MOTOR STARTER:** Provides motor starting means for blower from single phase blower motors. Includes thermal overload protection with manual reset.

#### CONTROL SETTINGS:

Unless indicated otherwise, the following settings of the adjustable type controls are acceptable for most applications:

**Temperature Controller** - maximum allowable temperature setting is  
 90 Deg. F for "S" MODEL and 160  
 Deg. F for "D" MODEL.

**High limit:** 150 Deg. F for "S" model and 200 for "D" model.

#### **SAFETY FEATURES CHECK OUT**

1. **Temperature high limit switch:** The heater shall be fired at rated input with the limit control set at its maximum temperature setting. The outlet temperature shall be established by gradually restricting the circulating air flow until the limit control operates to shut off the fire.
2. **Trial for ignition timing:** Unit shall be put through the normal sequence of starting procedure, but with the manual firing test valves closed. The safety shut off valve shall be de-energized in not more than 4 seconds after being energized.
3. **Flame response time:** Run the unit normally for in 10 minutes. Turn test firing valve off. Safety shut-off valve shall be de-energized in not more than 4 seconds.

## M A I N T E N A N C E

The following maintenance instructions are to be carried out each spring and fall or as otherwise indicated.

1. Electrical:

- A. Check all wiring for loose connection.
- B. Check voltage at unit (while in operation).
- C. Check amperage draw against name plate rating.
- D. All contractors should be inspected to ensure that contacts are clean and are making good contact. If contacts are pitted or burned badly, replace contractor points. Single phasing and motor burnout may result from bad contacts.

2. Belt Adjustment:

For maximum belt life, pulley alignment and belt tension must be properly maintained.

**NOTE:** If belts are too tight, the life expectancy of the motor and blower bearings and the belt are reduced considerably.

Allow 1/64" (0.15 mm) of deflection for each 1" (2.5 cm) of span length.

3. Set Screws:

Check set screws on blower wheel, blower bearings and blower and motor pulleys for looseness on the shaft. Tighten where required. **IT IS IMPORTANT TO PERFORM THIS CHECK BEFORE INITIAL START-UP, AFTER A RUN-IN PERIOD OF 2 TO 4 WEEKS AND THEN ON A REGULAR BASIS OF 4 TO 6 MONTHS.**

4. Lubrication of Blower Bearings:

Most blowers are complete with permanently lubricated sealed bearings which do not require lubrication. Blower bearings with grease nipples are factory packed 30 to 50% full. **Bearings that require lubrication should be greased while the bearing is rotating, with the following quantities of a lithium base lubricant (Shell Albania #3 or equal). DO NOT OVERCHARGE.**

Shaft Id	1	3/16	1	7/16	1	11/16	1	15/16	2	7/16	2	15/16
Inch (mm)	(50)	(62)	(75)	(88)	(100)	(128)	(155)					
Grease	.04	.07	.1	.15	.2	.3	.6					
Oz. (gram)	(1.8)	(3.3)	(4.5)	(6.5)	(9.0)	(13.2)	(27)					

### RECOMMENDATIONS FOR BALL BEARINGS

Bearing Temperature Degrees F (C)	Re-Greasing Interval		
	Clean	Dusty	& Wet
Under 120 (50)	2 1/2 Years	1 Years	4 Months
Under 158 (70)	Yearly	4 Months	1 Month

Refer to the blower manufacturers recommendations for other types of bearings (i.e.: roller bearings, split pillow block bearings).

#### 5. Motor Lubrication

Refer to motor manufacturer for lubrication recommendations. Follow the highlighted blower bearing recommendations above for type and quantity of grease. On motors having grease drain plugs, remove the plugs and operate the motor for 15 minutes before replacing the plugs. **DO NOT OVERCHARGE.**

### RECOMMENDED RE-GREASING INTERVALS

Hours Service Per Day	Up to 7.5 HP Up to 5.6 kW	10 to 40 HP 7.5 to 29.8 kW	Over 40 HP Over 29.8 kW
Less than 12	5 Years	3 Years	1.5 Years
More than 12	2 Years	1 Year	9 Months

**NOTE:** Motors that run in hot or severe dirt or wet conditions should be greased every 6 months.

#### 6. Filters:

Filters should be cleaned every 3 months under normal conditions (more often under abnormal conditions). Units

that have 100% outside air should have filters removed during the winter months in areas that have hour frost. See submittal record for filter quantities, sizes and type.

A. High Velocity Permanent;

It is important that the filters be checked and cleaned regularly during the period immediately following installation, in order to determine the best service interval. To clean, rinse with cold or lukewarm water. Shake off excess water and re-install. These filters do not require an oil adhesive.

B. Throwaway and/or Replaceable Media;

These may be obtained from any Twin Flow representative.

7. Controls:

- A. Clean and recalibrate all controls.
- B. Check controls for proper operation.
- C. Repair or replace any controls found faulty.
- D. Check all damper settings
- E. Replace blown fuses with equivalent size fuse. Failure to do so may result in damage to the unit.

8. Gas Manifold:

It is recommended that one each year the safety devices should be checked. Follow operational check as detailed on page 9.

9. Burners:

It is recommended that the burner be inspected once each year. Remove any scale that may have accumulated on the burner plates. Ensure that the holes on the burner plates and gas orifices are completely clear of foreign material.

**EXTENDED PERIOD SHUT DOWN**

For extended period shut down it is necessary to:

- 1. Lubricate all bearings (blowers, motors and dampers).
- 2. Close all manual valves on the gas lines (pilot and main Including the valve on the main gas supply line outside of the unit.
- 3. Disconnect electrical power on the main disconnect switch (Outside of the control box) by putting it in the OFF position.

4. Release all belts transmitting power to the blower and make them very loose.

#### **RE-STARTING THE UNIT AFTER PROLONGED SHUT DOWN**

To Re-start the unit is necessary to:

1. Put all belts back, tighten them properly and check for damage. If necessary replace them.
2. Check the clearness of the gas openings on the main burner.
3. Check the filters and replace them if dirty or damaged.
4. Open all manual gas valves (pilot and main), including the valve on the main gas supply line outside of the unit.
5. Connect electrical power by putting the switch outside of the control box in to the ON position.
6. Turn "summer/winter" switch in to the summer position.
7. Turn the switch "On/Off" on the remote box in to the ON position.
8. Check the opening of the inlet damper.
9. When the blower motor start working and there is no indication of any problem, turn the switch "summer/winter" in to the WINTER position.
10. This will energize your burner. It is normal to have 4 to 5 attempts to start the unit first time because there is air in the gas line. Between two attempts you should wait one minute and then push "reset button on the fire control.
11. When the flame is established check the color of the flame through observation window. Flame should be blue with yellow margins.
12. Check the settings on the temperature high limit switch.
13. For "D" models push the button "bake" and check the flame.