

## START-UP

### Lighting Instructions

#### For Your Safety, Read Before Operating

#### **WARNING**

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

These furnaces are equipped with an ignition device which automatically lights the burners. **Do not try to light the burners by hand.**

**Before operating**, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

#### What to do if you smell gas:

- Do not try to light any appliances.
- Extinguish any open flame.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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 gas control which has been under water.

**IMPORTANT: Refer to the Lighting Instruction label on the furnace for instructions on operating the specific controls used on your unit.**

#### To Start Furnace:

#### **CAUTION**

Be sure the manual gas control has been in the "OFF" position for at least 5 minutes before starting the unit. Do not attempt to manually light the burners.

1. Set the room thermostat to lowest setting.
2. Remove burner access door.
3. Move the gas control knob to the "ON" position. Use only your hand to turn the gas control knob; never use tools. If the knob will not turn by hand, don't try to repair it; call a qualified service technician. **Force or attempted repair may result in a fire or explosion.**
4. Replace the burner access door.
5. Turn on the electrical power to the furnace.
6. Set the room thermostat to a point above room temperature to light the burners. After the burners have ignited, set the room thermostat to desired temperature.

#### To Shut Down Furnace:

1. Set the room thermostat to the lowest setting.
2. Turn off all electric power to the furnace.
3. Remove burner access door.
4. Shut off the gas by moving the gas control knob to the "OFF" position.
5. Replace the burner access door.

#### **WARNING**

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

## OPERATION

### Sequence of Operation

#### **Heating**

During a call for heat the thermostat closes the R-W circuit of the control board. The control board verifies limit switches are closed and pressure switch is open. The induced draft blower relay closes causing the blower to run. As vent pressure is developed by the induced draft blower, the pressure switch closes. After a 15-second pre-purge, the control energizes the hot surface ignitor. After the 7-second warmup time, the control energizes the gas valve causing the burners to ignite. The hot surface ignitor is de-energized 3 seconds after the valve opens. If flame is sensed during this time the valve remains energized and the control starts the 30-second heat blower "on" delay.

As heating demand is met, the thermostat de-energizes the R-W circuit. The control de-energizes the gas valve causing the burners to shut off. The induced draft blower shuts off after a 15-second post-purge delay. The circulating air blower will continue to operate until the user-selectable heat blower "off" delay expires. The control return to standby mode once the heat blower "off" delay expires.

#### **Fan "On"**

During a fan "on" call, the thermostat energizes the R-G circuit of the control board, immediately causing the fan to energize the heat speed. The fan remains energized as long as the thermostat calls for fan "on" operation.

If a call for heat is energized during a fan "on" call, the fan continues to operate at the heat speed. If a call for cooling is energized during a fan "on" call, the fan switches to cooling speed.

At the end of the fan "on" call the thermostat de-energizes the R-G circuit of the control, causing the fan to be de-energized immediately.

#### **Cooling**

During a call for cooling, the thermostat energizes the R-Y circuit of the control board. After a 1-second cooling "on" delay, the control energizes the cooling fan speed. If the fan is already energized, it remains running and does not de-energize for the 1-second cooling fan "on" delay.

The call for cooling has priority over continuous fan operation while a call for heating has priority over both a call for cooling or continuous fan. Ignition lockouts for any reason do not affect cooling operation.

As cooling demand is met, the thermostat de-energizes the R-Y circuit of the control board. After a 60-second cooling "off" delay, the control de-energizes the cooling speed fan. At the end of the cooling "off" delay period, the control returns to the standby mode.

#### **Controls**

Following is a description of the operation of some of the controls used in this furnace. All models use one of each control, except as noted.

#### **Pressure Switch**

The pressure switch is a normally open switch that monitors combustion air flow. Inadequate air flow resulting from excessive venting system restriction or a failed combustion blower will cause the switch to remain open.

#### **Rollout Switch**

The rollout switch is a normally closed switch that opens when abnormal temperatures exist in the burner area. This can be caused by a restricted heat exchanger causing burner flame to "roll out" into the vestibule area or burner box.

This switch must be manually reset by pushing the button on top to restore furnace operation.

#### **Primary Limit Control**

This is a normally closed control that opens if abnormally high circulating air temperatures occur. It is an automatic reset control.

#### **Auxiliary Limit Control**

This is a normally closed control that opens under abnormal "reverse air flow" conditions that could occur in a counterflow or horizontal installation if the circulating blower fails. It is an automatic reset control.

CG90TB & CG92TB models have two auxiliary limit controls.

CG90UB upflow models do not include an auxiliary limit control.

#### **Interlock (Blower Door) Switch**

When the blower door is removed, the interlock switch breaks the power supply to the burner controls and blower motor. The switch operation must be checked to confirm it is operating correctly.

### Integrated Ignition/Blower Control Board

The integrated ignition/blower control board operates all functions of the furnace and any accessories connected to it. These models feature user-selectable blower "off" delay times (60, 90, 120, and 180 seconds) that are factory set to provide a 120-second blower "off" delay on heating (see connection diagram on page 33).

Refer to the furnace wiring diagram while using the following procedure to change motor speed:

1. Turn off electrical power to the unit.
2. Connect the desired speed tap for cooling on the control board.
3. For heating speed, check the temperature rise and, if necessary, adjust blower speed tap to maintain temperature rise within the range shown on the furnace rating plate.

To use the same speed tap for both heating and cooling, install a piggyback terminal on the speed tap using a short jumper. Wire 1/4" quick connect terminals on both ends to jumper the "HEAT" and "COOL" speed on the control board.

4. The remaining speed taps must be connected to dummy terminals marked "PARK" on the control board.

### Checking and Adjusting Gas Input

The minimum permissible gas supply pressure for the purpose of input adjustment is 5" W.C. for natural gas and 11" W.C. for propane gas. This furnace requires conversion for use with propane (see **Accessories** section on page 29 for correct kit). The maximum inlet gas supply pressure is 10.5" W.C. for natural gas and 13" W.C. for propane.

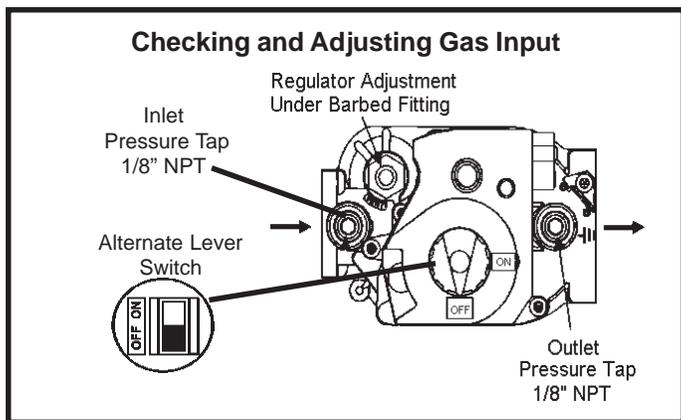


Figure 38

Gas input must never exceed the value shown on the furnace rating plate. The furnace is equipped for rated input at manifold pressures of 3.5" W.C. for natural gas or 10.0" W.C. for propane gas.

To measure inlet or outlet pressure, remove plug from desired pressure tap (inlet or outlet) as shown in Figure 38 and connect a water manometer or gauge to the proper pressure tap.

To adjust the regulator, disconnect the hose and remove the barbed fitting in the downstream side of the gas valve. Turn the adjusting screw on the regulator clockwise to increase pressure and input; counterclockwise to decrease pressure and input.

Replace the barbed fitting and reconnect the hose after adjusting the regulator. Be sure to replace the inlet and outlet pressure tap plugs after testing and/or adjusting gas input.

 **CAUTION**

The furnace rate must be within +/- 2% of the appliance rating input.

**For Natural Gas:** Check the furnace rate by observing the gas meter, when available, making sure all other gas appliances are turned off. The test hand on the meter should be timed for at least one revolution. Note the number of seconds for one revolution.

$$\text{BTU/HR INPUT} = \frac{\text{Cubic Feet Per Revolution}}{\# \text{ Seconds Per Revolution}} \times 3600 \times \text{Heating Value}$$

The heating value of the gas can be obtained from the local utility company.

**For Propane Gas:** The only check for the furnace rate is to properly adjust the manifold pressure using a manometer and Table 4 on page 29. Typical manifold set point for installations at altitudes from 0 to 4500 feet above sea level is 10.0" W.C.

### Temperature Rise

Check the temperature rise and, if necessary, adjust blower speed to maintain temperature rise within the range shown on the unit rating plate.

### High Altitude

In both the United States and Canada, this furnace is approved for operation at altitudes from 0 to 4500 feet above sea level without any required modifications. From 4500 to 7500 feet, the gas manifold pressure needs to be adjusted according to the information shown in Table 4 on page 29.

To adjust the manifold pressure, refer to previous section **Checking and Adjusting Gas Input**. For installations above 7500 feet, refer to the latest issue of the National Fuel Gas Code and/or contact your Technical Services Support.

For installations above 4500 feet, fill in the appropriate information on the furnace label that has the words **“This furnace was converted on.....”**.

Manifold Pressure vs. Altitude					
Altitude (ft.)	Natural Gas		Propane (LP)		Input Factor
	Heating Value * (Btu/ft <sup>3</sup> )	Manifold Pressure (in. w.c.)	Heating Value * (Btu/ft <sup>3</sup> )	Manifold Pressure (in. w.c.)	
2000	948	3.50	2278	10.00	0.9666
3000	914	3.50	2196	10.00	0.9499
4000	881	3.50	2116	10.00	0.9332
4500	865	3.50	2077	10.00	0.9249
5000	849	3.29	2039	9.41	0.8900
5500	833	3.27	2000	9.35	0.8790
6000	818	3.25	1964	9.29	0.8680
6500	802	3.23	1927	9.24	0.8570
7000	787	3.21	1891	9.18	0.8460
7500	771	3.19	1853	9.12	0.8350

\* Consult local utility for actual heating value.

Furnace Input = Input Factor x Nameplate Input

Above 7500 feet, refer to the National Fuel Gas Code and/or contact your Technical Service Support.

**Table 4**

For installation above 4,000 ft refer to section **Vent Pipe Size and Length** on page 7 and Figure 4 on page 8 vent pipe sizing.

## MAINTENANCE



### WARNING

#### ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD

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

Improper servicing could result in dangerous operation, serious injury, death, or property damage.

- Before servicing, disconnect all electrical power to furnace.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing.

It is recommended that this furnace be inspected by a qualified service technician at the beginning of each heating season.

#### **Filters**

Filters should be checked at least every 6 weeks. Disposable filters should be replaced when dirty, and cleanable filters should be cleaned regularly. It is important to keep the air filters clean, as dirty filters can restrict airflow and the blower and induced draft motors depend upon sufficient air flowing across and through them to keep from overheating.

#### **Lubrication**

The blower motor and induced draft motor are pre-lubricated by the manufacturer and do not require further lubricating attention. However, the motors should be cleaned periodically to prevent the possibility of overheating due to an accumulation of dust and dirt on the windings or on the motor exterior.

#### **Condensate Collection and Disposal System**

Check the condensate drain line periodically for blockage. Visual inspection of condensate flow can be done easily while the furnace is in operation. Use a flashlight to illuminate the discharge end of the condensate drain that is placed in the sewer opening. If the condensate drain line becomes blocked or plugged, the furnace will not operate properly.

#### **Burners**

Light the burners and allow to operate for a few minutes to establish normal burning conditions. Observe the burner flames. Compare this observation to Figure 39 to determine if proper flame adjustment is present. Flame should be predominantly blue in color and strong in appearance. Check that all burners are lit, and that the flame does not impinge on the sides of the heat exchanger.

Distorted flame or yellow tipping of the natural gas burner flame, or long yellow tips on propane, may be caused by lint accumulation or dirt inside the burner or burner ports, at the air inlet between the burner and manifold pipe, or obstructions over the burner orifice.

Use a soft brush or vacuum to clean the affected areas.

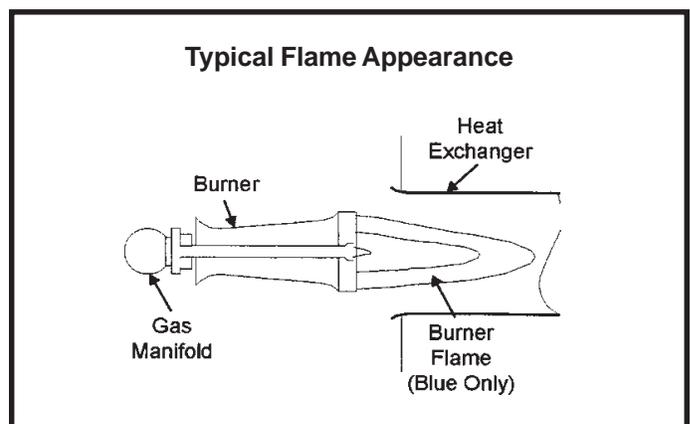


Figure 39

## REPAIR PARTS

The following repair parts are available from the local distributor. When ordering parts, include the complete furnace model number and serial number which are printed on the rating plate located on the furnace.

### Control Group

Transformer  
High limit control  
Auxiliary limit (if used)  
Gas valve  
Integrated ignition/blower control board  
Flame sensor  
Pressure switch  
Blower door interlock switch  
Combustion blower assembly  
Flame rollout protector switch  
Hot surface igniter

### Heat Exchanger Group

Heat exchanger – primary  
Heat exchanger – secondary  
Condensate drain pan

### Blower Group

Blower housing assembly  
Blower wheel  
Blower motor  
Blower motor mount  
Blower motor capacitor

### Burner Group

Gas manifold  
Burner orifices  
Burners

## ACCESSORIES

ALPKT572	Natural Gas to Propane Conversion Kit (CG90UB & CG90TB)
ALPKT574	Natural Gas to Propane Conversion Kit (CG90CB, CG92TB & CG95TB)
ANGKT557	Propane to Natural Gas Conversion Kit (CG90UB & CG90TB)
ANGKT556	Propane to Natural Gas Conversion Kit (CG90CB, CG92TB & CG95TB)
ATWIN579	Twinning Kit
ABASE512	Combustible Floor Base (17.5" cabinets)
ABASE568	Combustible Floor Base (21.0" cabinets)
ABASE569	Combustible Floor Base (24.5" cabinets)

### Concentric Vent Kits

ACVK2	For US Applications, only For Canadian Application use IPEX Kit #196005 locally available *
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\* For a local IPEX Canadian Customer Service Center and kit availability call IPEX at 1-866-473-9462.

## CONTROL DIAGNOSTICS

### **Troubleshooting**

The following visual checks should be made before troubleshooting:

1. Check to see that the power to the furnace and the integrated ignition/blower control board is on.
2. The manual shutoff valves in the gas line to the furnace must be open.
3. Make sure all wiring connections are secure.
4. Review the **Sequence of Operation** (see page 27).

Start the system by setting the thermostat above the room temperature. Observe the system's response. Then use the information provided in this section to check the system's operation.

The furnace has a built-in, self-diagnostic capability. If a system problem occurs, a fault code is shown by an LED on the control board. The control continuously monitors its own operation and the operation of the system. If a failure occurs, the LED will indicate the failure code. The flash codes are presented in Table 5.

### **Fault Code History Button**

The control stores the last five fault codes in memory. A pushbutton switch is located on the control (see Figure 40 on page 33). When the pushbutton switch is pressed and released, the control flashes the stored fault codes. The most recent fault code is flashed first; the oldest fault code is flashed last.

To clear the fault code history, press and hold the pushbutton switch in for more than 5 seconds before releasing.

Failure Codes	
LED Status	Fault Description
LED Off	No power to control or control hardware fault detected
LED On	Normal operation
1 Flash	Flame Present with gas valve off
2 Flashes	Pressure switch closed with inducer off
3 Flashes	Pressure switch open with inducer on
4 Flashes	High limit switch open
5 Flashes	Rollout switch open
6 Flashes	Pressure switch cycle lockout
7 Flashes	Lockout due to no ignition
8 Flashes	Lockout due to too many flame dropouts
9 Flashes	Incorrect line voltage phasing

Table 5

HOT SURFACE  
IGNITOR

S2  
P2

YEL  
YEL

INDUCED  
DRAFT  
BLOWER

S1  
P1

60  
90  
120  
180  
BLOWER OFF  
DELAY TIMING

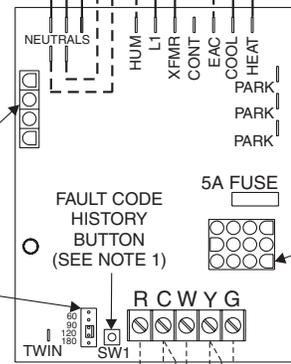
THERMOSTAT & SUB-BASE  
HEAT ANTICIPATOR  
.60 AMP

GRN  
WHT  
BLK  
120/1/60  
INTERLOCK  
SWITCH

— LINE VOLTAGE - FACTORY  
- - - LINE VOLTAGE - FIELD  
— LOW VOLTAGE - FACTORY  
- - - LOW VOLTAGE - FIELD

CIRCULATION  
BLOWER

WHT (NEUT)  
RED (LO)  
\* ORN (MED/LO)  
BLU (MED)  
YEL (MED/HI)  
BLK (HIGH)  
\* NOT ON ALL MODELS



WHT  
BLK/WHT STRIPE  
YEL  
YEL/BLK STRIPE  
TRANSFORMER

IF USED

ORN  
ROLLOUT  
SWITCH

ORN

RED  
BLUE  
MV  
MV  
GAS  
VALVE

FLAME  
SENSOR

GRY

WHITE

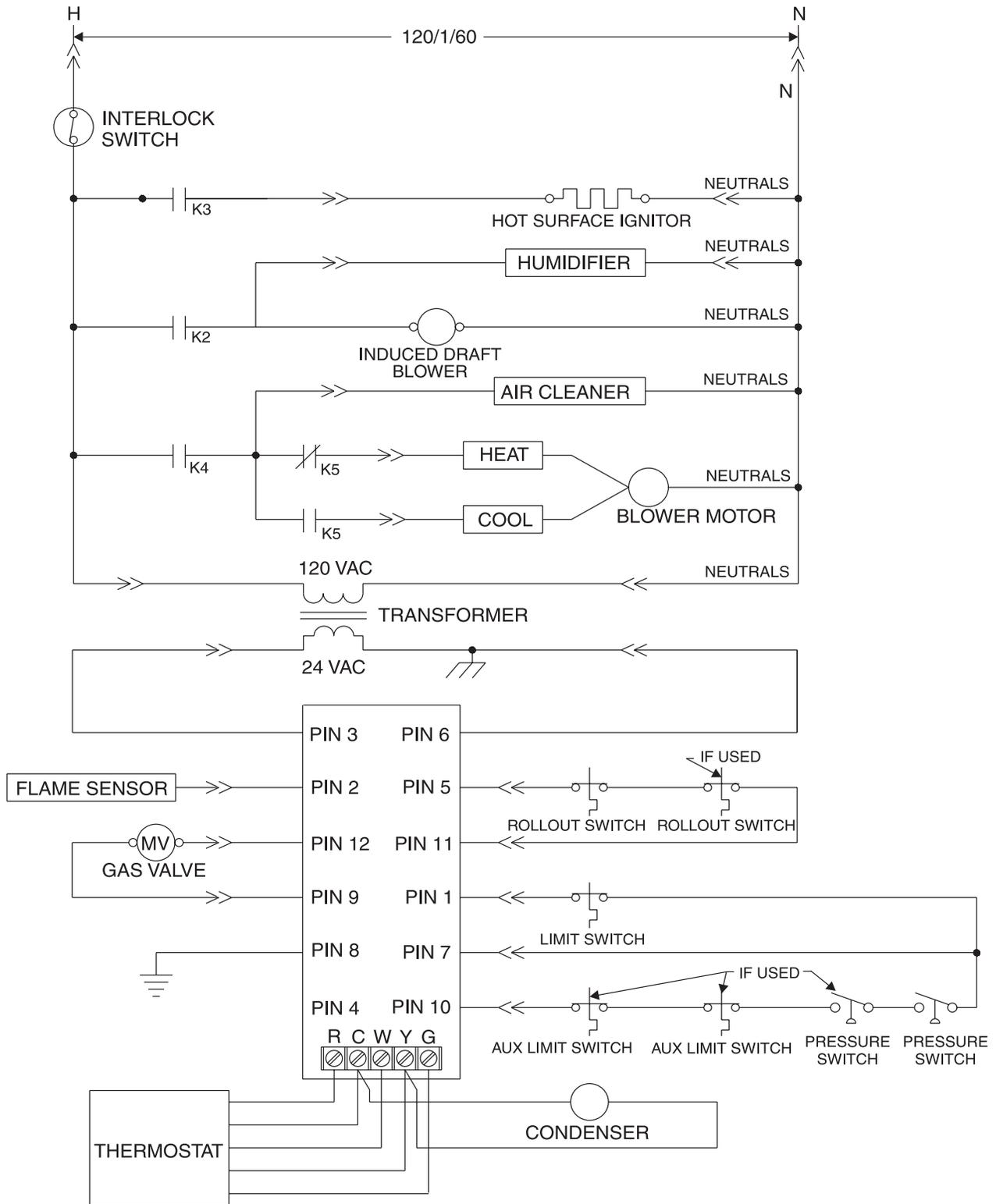
BROWN

VLT

1. PRESS AND RELEASE FAULT CODE HISTORY BUTTON TO DISPLAY FAULT CODES. TO ERASE CODES, PRESS AND HOLD BUTTON IN FOR MORE THAN 5 SECONDS.
2. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE FURNACE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMP. RATING OF AT LEAST 90°C.
3. DO NOT CONNECT C (COMMON) CONNECTION BETWEEN INDOOR UNIT AND THERMOSTAT EXCEPT WHEN REQUIRED BY THE INDOOR THERMOSTAT. REFER TO THE THERMOSTAT INSTALLATION INSTRUCTIONS.
4. CHECK CODES FOR PROPER WIRING AND CIRCUIT PROTECTION BEFORE INSTALLATION.

Connection Diagram  
P/N 45198-006

Figure 40



**Schematic Diagram  
P/N 45198-006**

**Figure 41**