

J. STARTUP AND OPERATION

J.4.2.1. Measuring Air Temperature and Liquid Line Temperature

Measuring air temperature:

1. Insert a thermometer in the supply air duct as close to the unit as possible.
2. Insert a thermometer in the return air duct as close to the filters as possible.
3. If preferred, use the locations shown in **Figure J.4.2.1. – A: Line Temperature Measurement Location** instead of the supply/return ductwork.
4. Operate the unit for a minimum of 15 minutes in cooling mode.
5. When the thermometer in the supply air duct stops changing (approximately five minutes), subtract the return air temperature from the supply air temperature. This is the cooling mode temperature difference.

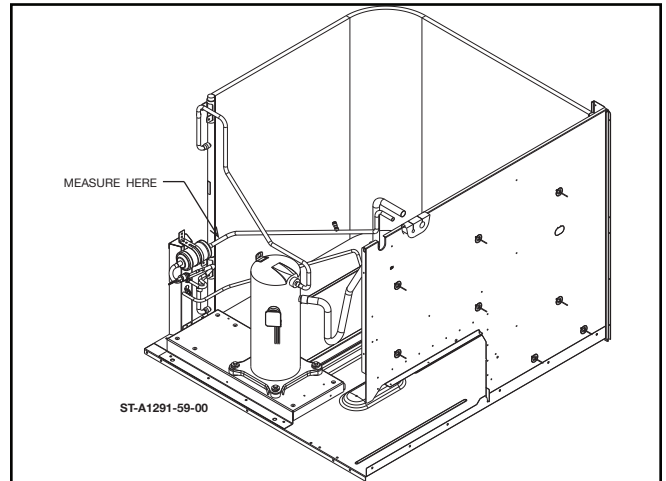
If the measured temperature difference is not reducing, or if the return air is not reaching the thermostat set point, the air flow is too low. Airflow must be increased by either removing the restrictions in the duct system, or by changing the air flow. See **Section J.3.2. Air Flow Measurements and Adjustments** for changing air flow.

IMPORTANT: Some high-efficiency filters have a greater than normal resistance to airflow. This can negatively affect airflow. BE SURE TO CHECK THE AIRFLOW if using any filter other than the factory-provided filter.

Measuring line temperature:

1. Attach a thermometer or thermocouple to the liquid refrigerant line right after the filter-dryer. See **Figure J.4.2.1. – A: Line Temperature Measurement Location**.
2. Operate the unit for a minimum of 15 minutes in cooling mode.
3. When the measurement of the temperature stops changing (approximately five minutes), record the temperature.

Figure J.4.2.1. – A: Line Temperature Measurement Location



J.4.3. Measuring Compressor Electrical Loads

See **Appendix B** towards the end of this manual for Compressor Electrical Data.

J. STARTUP AND OPERATION

J.5. Checking Heating Operation

J.5.1. Gas Furnace

J.5.1.1. Measuring and Adjusting Supply Gas Pressures

The maximum gas supply pressure to the furnace should be 10.5" WC for natural gas and 13.0" WC for LP gas the minimum gas supply pressure for purposes of input adjustments to the furnace should be 5.0" WC for natural gas and 11.0" WC for LP gas.

The inlet pressure tap is on the input side of the gas valve. A calibrated manometer is required to measure gas pressure readings accurately.

1. Ensure the gas is shut off to the furnace at the manual gas valve installed outside the unit.
2. Loosen (do NOT remove) the inlet pressure tap using a 3/32" allen-head wrench; see **Figure G.1.4. -A**.
3. Connect a manometer to the pressure tap. The pressure tap requires a 5/16" I.D. hose
A kit is available from Prostock Replacement Parts which includes the following:
A. 3/32" allen-head wrench
B. 5/16" to 1/4" I.D. hose reducer fitting
C. Short piece of 5/16" I.D. hose

Kit part number is: **F0092-100300S1**

4. Turn on the gas supply and operate the furnace and all other gas-fire units on the same gas line as the furnace.
5. Note or adjust the line gas pressure to give:
A. 5" – 10.5"W.C. for natural gas
B. 11" – 13"W.C. for LP gas
6. Shut off the gas at the manual gas-valve and remove the manometer and hose.
7. Tighten the allen-head screw in the inlet pressure tap using a 3/32" allen-head wrench.
8. Turn ON the gas supply and check for gas leaks using an approved leak detector. Do NOT use a flame of any kind to check for leaks. Repair any leaks and repeat.

If the supply gas line pressure is above the specified ranges, install an in-line gas regulator to the furnace for the natural gas units. For LP gas furnace, have the LP supplier reduce the line pressure at the regulator.

If the supply gas line pressure is below the specified ranges, either remove the restrictions in the gas supply piping or enlarge the gas pipe for a natural gas furnace; see **Table G.1.6. - A**. For LP gas furnaces have the LP supplier adjust the line pressure at the regulator; see **Table G.3. - A**.

J.5.1.2. Measuring and Adjusting Manifold Gas Pressures

The manifold pressure should be set at 3.5" WC high fire, 1.8" WC low fire, for natural gas and 10.0" W.C. high fire and 4.9" W.C. low fire for LP gas. Only small variations in the gas flow should be made by means of the pressure regulator adjustment. In no case should the final manifold pressure vary more than ± 0.3 " WC for natural gas and ± 0.5 " WC for LP gas from the above specified pressures.

1. Ensure the gas is shut off to the furnace at the manual gas valve installed outside the unit.
2. Loosen (do NOT remove) the manifold pressure tap using a 3/32" allen-head wrench; see **Figure G.1.4. -A**.
3. Connect a manometer to the pressure tap. The pressure tap requires a 5/16" I.D. hose
A kit is available from Prostock Replacement Parts which includes the following:
D. 3/32" allen-head wrench
E. 5/16" to 1/4" I.D. hose reducer fitting
F. Short piece of 5/16" I.D. hose

Kit part number is: **F0092-100300S1**

4. Turn on the gas supply and operate the furnace by applying a heat call
5. Note or adjust the line gas pressure to give:

	High Fire	Low Fire
Natural Gas	3.50" (± 0.3) W.C.	1.80" (± 0.3) W.C.
LP Gas	10.0" (± 0.5) W.C.	4.90" (± 0.5) W.C.

6. To adjust the manifold pressure regulators, remove the regulator caps.
7. Turn the adjustment screw clockwise to increase pressure, or counterclockwise to decrease the outlet pressure.
8. Securely replace the regulator caps.
9. Shut off the gas at the manual gas-valve and remove the manometer and hose.
10. Tighten the allen-head screw in the outlet pressure tap using a 3/32" allen-head wrench.
11. Turn ON the gas supply and apply a heat call to the furnace. Then check for gas leaks using an approved leak detector. Do NOT use a flame of any kind to check for leaks. Repair any leaks and repeat.

J. STARTUP AND OPERATION

METER TIME IN MINUTES AND SECONDS FOR NORMAL INPUT RATING OF FURNACE QUIPPED FOR NATURAL GAS									
INPUT (BTU/HR)	METER SIZE (FT ³ /REV)	HEATING VALUE OF GAS (BTU/FT ³)							
		900		1000		1050		1100	
		MIN	SEC	MIN	SEC	MIN	SEC	MIN	SEC
75,000	ONE	0	43	0	48	0	50	0	53
	TEN	7	12	8	0	8	24	8	48
100,000	ONE	0	32	0	36	0	38	0	40
	TEN	5	24	6	0	6	18	6	36
120,000	ONE	0	27	0	30	0	32	0	33
	TEN	4	30	5	0	5	15	5	30
RATE (BTU/HR) = $\frac{\text{HEATING VALUE OF GAS X 3600}}{\text{TIME (IN SECONDS) FOR 1 CUBIC FOOT OF GAS}}$									

J.5.1.3. Verifying BTU Performance and Capacity

Checking furnace input is important to prevent over-firing beyond its design rated input. **NEVER SET INPUT ABOVE THAT SHOWN ON THE RATING PLATE FOR ELEVATIONS UP TO 2,000 FT.** Use the following table or formula to determine input rate. Start the furnace and measure the time required to burn on cubic foot of gas. Prior to checking the furnace input, make certain that all other gas appliances are shut off, with the except for pilot burners. Time the meter with only the furnace in operation.

The factory installed orifice on a furnace are sized for natural gas having a heating value of 1050 BTU/cu.ft and a specific gravity of 0.60.

Since heating values vary geographically, the manifold pressure and/or gas orifice size may need to be changed to adjust the furnace to its nameplate input. Consult the local gas utility to obtain the yearly average heating value. Refer to section **G.4.2.6. Orifice Selection and High Altitude Adjustments** for more information.

NOTE: Refer to the High Altitude Section of this manual and the National Fuel Gas Code for high altitude rate adjustment above 2,000 ft.

To change the orifice spuds, shut the manual gas-valve and remove the gas manifold. Replace all the orifice with correct sizes based on the Orifice Selection Charts, and carefully replace the manifold in its position.

J.5.1.4. To Shut Down Furnace

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove control door.
4. Move control switch/knob on the gas valve to the "OFF" position.
5. Replace control 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. FAILURE TO DO SO CAN RESULT IN AN EXPLOSION OR FIRE CAUSING PROPERTY DAMAGE, SEVERE PERSONAL INJURY OR DEATH!

J. STARTUP AND OPERATION

J.5.1.5. Checking Air Temperatures

The importance of proper air flow over the heat exchanger cannot be over emphasized. One of the most common causes of heat exchanger failure is over-heating due to low air flow.

To determine whether the heating air flow is correct, follow the steps to check the temperature rise.

1. Insert a thermometer in the supply air duct as close to the furnace as possible yet out of a direct line from the heat exchanger. (See **Figure J.3. – A: Static Pressure and Air Temp Measurement Location**)
2. Insert a thermometer in the return air duct as close to the filters as possible.
3. Operate the furnace for a minimum of 15 minutes in the gas heat mode.
4. When the thermometer in the supply air duct stops rising (approximately five minutes), subtract the return air temperature from the supply air temperature. The difference is the temperature rise.
5. Compare the measured temperature rise to the approved temperature rise range listed on the furnace name plate or in **Appendix E: Heating Performance**.

If the measured temperature rise is above the approved range, the air flow is too low. Airflow must be increased by removing the restrictions in the duct system, or by changing the air flow. If the measured temperature rise is below the approved range, the air flow is too much. Check the duct sizing or see Section **J.3.2. Air Flow Measurements and Adjustments**.

IMPORTANT: Some high-efficiency filters have a greater than normal resistance to airflow. This can adversely affect furnace operation. **BE SURE TO CHECK THE AIRFLOW** if using any filter other than the factory-provided filter.

J.6. Safety Checks

At all times the manufacturer's maintenance and service guidelines must be followed. If in doubt, contact the manufacturer's technical support for assistance.

Before leaving the installation site the following safety checks must be completed:

- Ensure all electrical components in this system are approved by the manufacturer.
- Confirm the actual refrigerant charge complies with the minimum room size requirements outlined in **Appendix F. A2L Refrigerant Installation Safety Data**
- Ensure that the ventilation machinery and outlets are operating correctly and are not obstructed.
- If an indirect refrigerant circuit is being used, the secondary circuit must be checked for the presence of refrigerant.
- Ensure that all the equipment labels and markings are visible and legible. Markings, labels, and signs that are illegible must be corrected.
- Confirm that any refrigerating pipe or components are installed in a position where they are unlikely to be exposed to corrosion, unless the refrigerant-containing components are constructed of corrosion-resistant materials or are protected from corrosion.

K.1. Air Flow Charts and Information

See **Appendix C** towards the end of this manual for Air Flow Performance Data.

K.2. Air Flow Adjustments

K.2.1. Blower Speed for 3–5 Ton Units

See **Section J.3.2. Air Flow Measurements and Adjustments** on how to increase the blower speed and increase airflow for the 3–5T units.

K.2.2. Blower Motor Controller for 5 ton High Static 460V and all 6 ton units.

See **Section J.3.2. Air Flow Measurements and Adjustments** on how to increase the blower speed and increase airflow on the 5 Ton High Static 460V and 6 Ton units that use a Blower Motor Controller.

K.2.3. Economizer Adjustments

Do not Fix a minimum position on an economizer, set the minimum position through the control board only. See the instructions provided with the economizer for more info. The part numbers for these instructions are listed in section **D.4.1. Economizer Information.**

M. REHEAT

M.1 Dehumidification System Information

With the factory installed dehumidification option, in addition to a thermostat or space temperature sensor that is normally present, an indoor relative humidity sensor is installed in the occupied space and connected to the Rooftop Unit Controller (RTU-C) which then controls the capacity of the cooling coil to remove moisture from the supply air and maintain space relative humidity below an adjustable limit visible on the RTU-C display.

The default value is the ASHRAE recommended limit of 60% RH. With this option, a refrigerant reheat coil is installed downstream from the evaporator coil. When the space humidity is too high and reheat is energized, this coil uses some of the heat that is normally rejected to the outside by the condenser coil to instead reheat the cold air from the evaporator coil just enough to avoid overcooling the space. Providing “neutral air” to the occupied space.

On a two-stage system, it is possible for both a thermostat and humidistat to register readings above set point. Under this condition, the system runs in the high stage dehumidification cycle, and the motor operates on high speed. This provides dry conditioned air.

Because the demand for dehumidification can be different from the cooling demand, the unit will first satisfy the demand for cooling and then if the space humidity is still too high, dehumidification mode is energized. When in dehumidification mode, the supply air leaving the unit will be near the entering air temperature, but at a much lower humidity. The unit will exit the dehumidification mode when the humidity set point is satisfied; or if the load is increased, it will return to normal cooling mode.

Reheat is not available during the gas-heating mode.

Figure M.1. – A

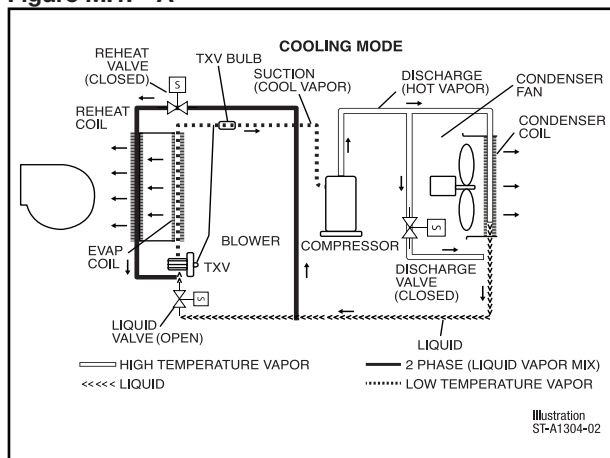


Figure M.1. – A shows the refrigerant path during the normal cooling mode. The liquid refrigerant leaves the TXV with the sudden pressure drop causing the liquid to expand to a vapor and absorbing the heat from the supply air going through the evaporator coil. The refrigerant vapor then travels to the compressor where it is elevated to a higher pressure and temperature.

The superheated refrigerant vapor next carries the heat to the outside coil where the heat is then rejected and the refrigerant condenses into a subcooled liquid where the process repeats itself.

Figure M.1. – B

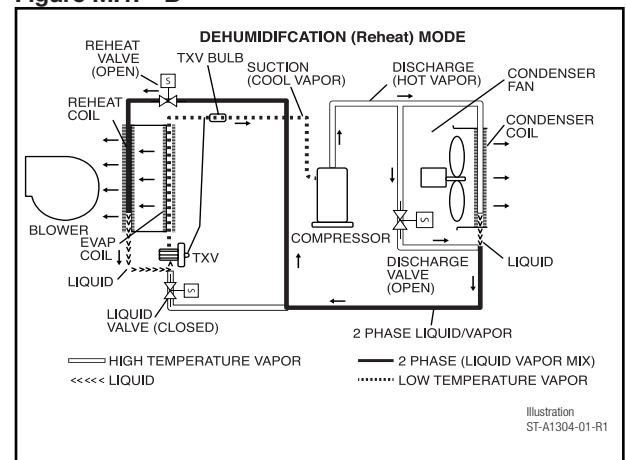


Figure M.1. – B shows the refrigerant path during the reheat mode. When the reheat cycle is energized by the RTU-C, the reheat solenoid valve, upstream of the reheat coil opens. The liquid solenoid valve ahead of the TXV, closes. The discharge solenoid valve, in the compressor discharge line, opens. The liquid refrigerant leaves the TXV with the sudden pressure drop causing the liquid to expand to a vapor and absorbing the heat from the supply air going through the evaporator coil. The refrigerant vapor then travels to the compressor where it is elevated to a higher pressure and temperature. The refrigerant next carries the heat to a parallel path between the outside condenser coil and a bypass circuit. Some of the heat is rejected outdoors. The ratio of heat rejected outdoors versus indoors is controlled by an outdoor fan motor controller (OFMC) that monitors the two phase temperature and varies the fan speed. This 2-phase refrigerant vapor is then sent to the reheat coil. As the refrigerant travels through the reheat coil is condenses into a subcooled liquid where the process repeats itself.

M.2 Humidity Sensor Installation

The Humidity control unit requires the use of a zone mounted humidity sensor. The sensor should be located in the conditioned space, approximately 5ft from the floor, on an interior wall. Take care to locate it away from direct sunlight and away from air flow from vents or drafts from doors. The humidity sensors output is a 0–10VDC signal and will be connected to the DDC Control.

The Rheem ZNS–5 meets the requirement and includes an optional space temperature sensor. The control wiring should be a minimum of 18AWG Solid Copper wire with 5 Conductors and is connected from the DDC Control to the sensor as follows:

RED = R to V+ (+24VAC)

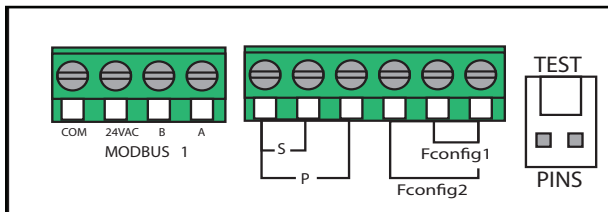
GREEN = Field Config 1 & 2 (Right most terminal) to GROUND

BLUE = Field Config 2 (3rd terminal from right) to VOut

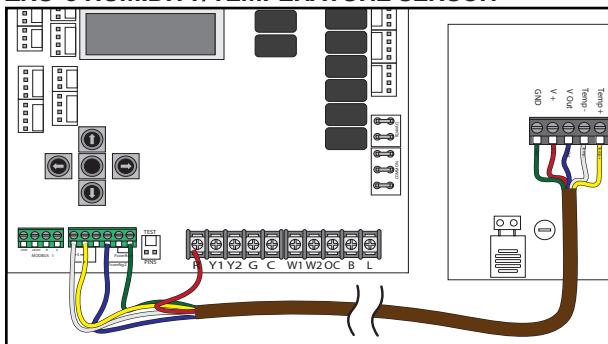
WHITE = S & P (Left most terminal) to Temp –

YELLOW = S (2nd terminal from left) to Temp+

See the installation instructions for additional details.



ZNS–5 HUMIDITY/TEMPERATURE SENSOR



HONEYWELL DUCT MOUNTED HUMIDITY SENSOR

This optional wires the same except the temperature sensor connects directly to a Honeywell Thermostat.

RED = R to V+ (+24VAC)

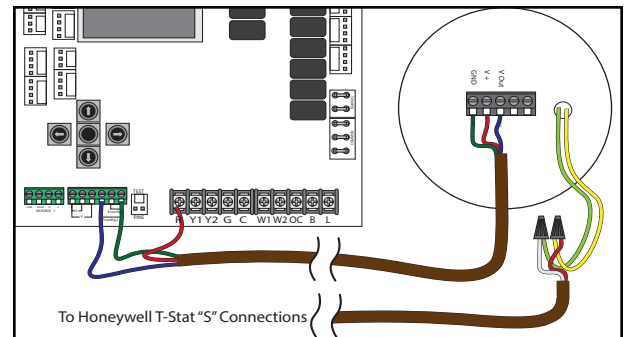
GREEN = Field Config 1 & 2 (Right most terminal) to GROUND

BLUE = Field Config 2 (3rd terminal from right) to VOut

Other = Honeywell S– Terminal to Yellow Wire

Other = Honeywell S+ Terminal to Green Wire

See the installation instructions for additional details.



M. REHEAT

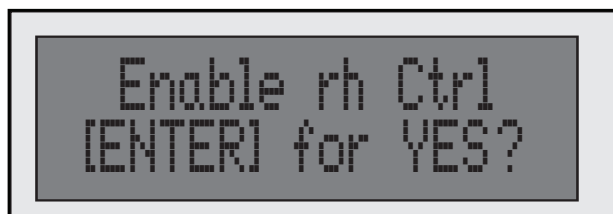
M.3 Humidity Control Settings and Configuration

The Clear Control is designed to operate in conjunction with the zone sensor discussed earlier in the guide. These are the steps to verify the zone sensor and adjust the humidity set-point and operating modes. The system can be programmed to a humidity level as low as 35%, and can be set to run dehumidification as part of the cooling cycle or as a stand alone system regardless of the cooling or fan call status from the thermostat, recommended.

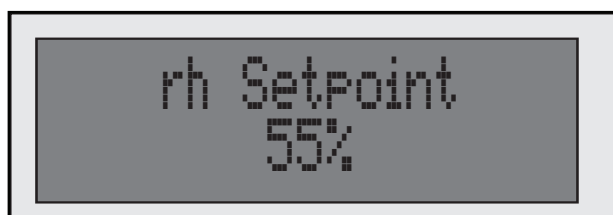


NOTICE: The system will not operate the humidity control when the outdoor ambient temperature is below 60°F, this is because the humidity control uses hot refrigerant bypassed from the outdoor coil,. When the ambient temperature is too low, insufficient heat will be retained in the refrigerant to properly operate the Reheat system for proper dehumidification. The Reheat system in this packaged unit is not designed for industrial or process applications, it is intended for human comfort zones.

Navigate through the Clear Control menu to "Humidity Control" it should say Enabled. If it says "Disabled" press the Enter button twice to Enable rh Control.



Next set the desired Relative Humidity Set-point. This set-point will be where the control will run the associated dehumidification cycles to bring the humidity in the zone down to this percentage.

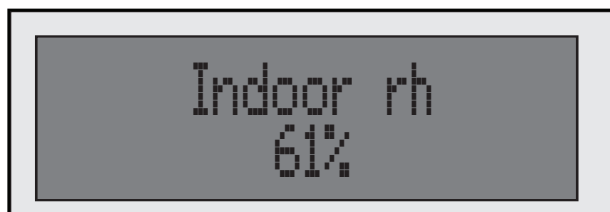


Now set the Reheat Mode, there are three functions to choose from, Reheat in Occupied, will only run dehumidification when there is a Fan or Cooling Call. Reheat in Unoccupied, will on run dehumidification when there is no fan or cooling call; Reheat ALL, (recommended) will run reheat based on the humidity reading regardless of the thermostat operation.



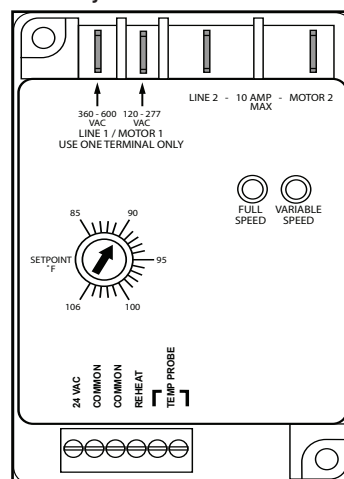
Checking the Humidity Sensor reading, Navigate to Humidity Control then down to Indoor rh, this will display the reading from the humidity zone sensor. If this shows "4%" then it means that the zone sensor is not connected properly or malfunctioning.

Verify a 0–10VDC signal across the Field Config 2 terminals on the control board. 10VDC = 100%, 5VDC = 50%.



The humidity control system is also equipped with an Outdoor Fan Motor Controller, OFMC, this controller changes the speed of the outdoor fans to allow for more or less heat in the bypassed refrigerant used to operate the reheat system. Adjustments to the OFMC are not needed unless undesirable operation occurs.

Consult the Installation instructions provided with the system for details on the OFMC operation and adjustments.



N.1. Diagnostics Chart

N.1.1. Cooling Diagnostics Chart

▲ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE SERVICING. CONTACTOR MAY BREAK ONLY ONE SIDE. FAILURE TO SHUT OFF POWER CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Unit will not run	- Power off or loose electrical connection - Thermostat out of calibration—set too high - Failed contactor - Blown fuses - Transformer defective - High pressure control open (if provided) - Interconnecting low voltage wiring damaged	- Check for correct voltage at compressor contactor in control box - Reset - Check for 24 volts at contactor coil – replace if contacts are open - Replace fuses - Check wiring—replace transformer - Reset—also see high head pressure remedy—The high pressure control opens at 450 PSIG - Replace thermostat wiring
Condenser fan runs, compressor doesn't	- Loose connection - Compressor stuck, grounded or open motor winding open internal overload. - Low voltage condition - Low voltage condition	- Check for correct voltage at compressor – check & tighten all connections - Wait at least 2 hours for overload to reset. If still open, replace the compressor. - At compressor terminals, voltage must be within 10% of rating plate volts when unit is operating. - Add start kit components
Insufficient cooling	- Improperly sized unit - Improper airflow - Incorrect refrigerant charge - Air, non-condensibles or moisture in system - Incorrect voltage	- Recalculate load - Check – should be approximately 400 CFM per ton. - Charge per procedure attached to unit service panel. - Recover refrigerant, evacuate & recharge, add filter drier - At compressor terminals, voltage must be within 10% of rating plate volts when unit is operating.
Compressor short cycles	- Incorrect voltage - Defective overload protector - Refrigerant undercharge	- At compressor terminals, voltage must be $\pm 10\%$ of nameplate marking when unit is operating. - Replace – check for correct voltage - Add refrigerant
Registers sweat	Low evaporator airflow	Increase speed of blower or reduce restriction – replace air filter
High head—low vapor pressures	- Restriction in liquid line, expansion device or filter drier - Flow check piston size too small - Incorrect capillary tubes - TXV does not open	- Remove or replace defective component - Change to correct size piston - Change coil assembly - Replace TXV
High head—high or normal vapor pressure – Cooling mode	- Dirty condenser coil - Refrigerant overcharge - Condenser fan not running - Air or non-condensibles in system	- Clean coil - Correct system charge - Repair or replace - Recover refrigerant, evacuate & recharge
Low head—high vapor pressures	- Defective Compressor valves - Incorrect capillary tubes	- Replace compressor - Replace coil assembly
Low vapor – cool compressor – iced evaporator coil	- Low evaporator airflow - Operating below 65°F outdoors - Moisture in system	- Increase speed of blower or reduce restriction – replace air filter - Add Low Ambient Kit - Recover refrigerant – evacuate & recharge – add filter drier
High vapor pressure	- Excessive load - Defective compressor	- Recheck load calculation - Replace
Fluctuating head & vapor pressures	- TXV hunting - Air or non-condensibles in system	- Check TXV bulb clamp – check air distribution on coil – replace TXV - Recover refrigerant, evacuate & recharge
Gurgle or pulsing noise at expansion device or liquid line	Air or non-condensibles in system	Recover refrigerant, evacuate & recharge

N. DIAGNOSTICS

N.1. Diagnostics Chart

N.1.2. Heating Diagnostics Chart

▲ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE SERVICING. CONTACTOR MAY BREAK ONLY ONE SIDE. FAILURE TO SHUT OFF POWER CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Induced draft blower motor (IDM) does not start	- No 208/230 Vac to IDM - Faulty low voltage transformer - Wired incorrectly - No line voltage to integrate furnace control (IFC) - Faulty IDM	- Check the wiring from the board to the motor - check for power at the motor - replace the IFC - Replace transformer - Check wiring per the diagram in the I&O - Check unit power connect - check power at L1 and L2 - Replace the IFC - If IDM is receiving power and will not start, replace the IDM
Ignitor will not spark	- Bad wire or corroded ignitor - Negative pressure switch not closing - Open rollout limit - Open limit control - Ignitor is not grounded - Ignitor wired incorrectly - Faulty IFC	- Check wire for damage - check the connection to the high voltage spark tower - replace corroded ignitor - Check for blocked hose - check for exhaust blockage - check that the negative pressure on the IDM is enough to close pressure switch - replace pressure switch - Check for blockage in the intake, heat exchanger, and exhaust - clear blockage and reset limit - Check temperature rise (see general data in I&O) - check for proper airflow - check for proper gas pressure - replace the limit - Check that ignitor is firmly secured to burner assembly - Check wiring per the diagram in the I&O - Replace IFC
No ignition/burner will not light	- No inlet pressure - Gas valve is not receiving 24 V - Gas valve is not opening - Orifice is blocked	- Check for gas pressure - Check wiring from IFC to gas valve - check for power at the gas valve - replace IFC - Replace valve - Remove orifice and clean - replace orifice if it is damaged
Flame not sustained	- Flame sense wired incorrectly - Flame sense damage or not in correct position - Flame sense dirty or corroded - Microamps are low or not present - Unit is not properly grounded - Faulty IFC	- Check wiring per the diagram in the I&O - Check flame sense position - replace flame sense - Clean flame sense with steel wool - Check for 4 microamps - replace flame sensor - Check unit grounding - correct bad grounding - Replace IFC
Indoor blower motor (IBM) does not start after 30 seconds	- No 208/230 Vac across IBM motor terminals on the IFC - Dead capacitor - Faulty IBM	- Check the wiring per the diagram in the I&O - replace IFC - Replace capacitor - Replace IBM
Heating does not stop after call for heat has been satisfied	- Thermostat wired incorrectly/faulty thermostat - Faulty valve	- Check thermostat wiring is correct - check that thermostat is operating correctly - replace thermostat - Remove gas valve lead and check if valve closes - replace valve
After 5 second post-purge, IDM stops, or IBM does not stop running after off delay (specified in furnace section of I&O)	- Open limit control - Open rollout limit	- Check temperature rise (see general data in I&O) - check for proper airflow - check for proper gas pressure - replace the limit - Check for blockage in the intake, heat exchanger, and exhaust - clear blockage and reset limit

N.2. Alarm Codes – Full List

Alarm Codes		
CODE	Description	FAULT LEVEL
0	STAND BY	None
c	COMPRESSOR ON – Low (Flashing if in time delay)	None
C	COMPRESSOR ON – High (Flashing if in time delay)	None
E	Economizer Cooling – No Compressor	None
F	CONTINUOUS FAN	None
h	GAS HEAT ON – LOW-FIRE	None
H	GAS HEAT ON –HIGH-FIRE	None
4	Comfort Alert Code 4 for Compressor Circuit 1	Shutdown
5	Comfort Alert Code 5 for Compressor Circuit 1	Shutdown
6	Comfort Alert Code 6 for Compressor Circuit 1	Shutdown
7	Comfort Alert Code 7 for Compressor Circuit 1	Shutdown
8	Comfort Alert Code 8 for Compressor Circuit 1	Shutdown
9	Comfort Alert Code 9 for Compressor Circuit 1	Shutdown
11	FAILED IGNITION	Problem
12	LO FLAME SENSE	Warning
13	FLAME LOST	Problem
14	UNEXPECTED FLAME	Shutdown
15	HIGH-FIRE GAS VALVE IMPROPER VOLTAGE	Problem
20	REFRIGERANT LOW PRESSURE SWITCH OPEN – CIRCUIT 1	Problem
21	REFRIGERANT LOW PRESSURE SWITCH OPEN – CIRCUIT 2	Problem
22	MAIN LIMIT OPEN	Problem
29	REFRIGERANT HIGH PRESSURE SWITCH OPEN – CIRCUIT 1	Problem
30	REFRIGERANT HIGH PRESSURE SWITCH OPEN – CIRCUIT 2	Problem
33	MRLC (Rollout Limit) OPEN	Problem
34	Comfort Alert Code 4 for Compressor Circuit 2	Shutdown
35	Comfort Alert Code 5 for Compressor Circuit 2	Shutdown
36	Comfort Alert Code 6 for Compressor Circuit 2	Shutdown
37	Comfort Alert Code 7 for Compressor Circuit 2	Shutdown
38	Comfort Alert Code 8 for Compressor Circuit 2	Shutdown
39	Comfort Alert Code 9 for Compressor Circuit 2	Shutdown
40	Refrigerant Leak Detection System	Shutdown
42	Invalid Thermostat Selection	Warning
44	LOW-FIRE NEGATIVE PRESSURE CONTROL CLOSED	Problem
46	LOW-FIRE NEGATIVE PRESSURE CONTROL OPEN	Problem
49	FREEZE SWITCH OPEN – CIRCUIT 1	Problem
50	FREEZE SWITCH OPEN – CIRCUIT 2	Problem
55	2nd stage COMBUSTION PRESSURE SWITCH CLOSED	Problem
57	HIGH-FIRE NEGATIVE PRESSURE CONTROL CLOSED	Problem
59	Condensate Drain Plugged	Shutdown
61	HIGH-FIRE NEGATIVE PRESSURE CONTROL OPEN	Problem, Shutdown
83	Condenser Coil Temp Sensor Fail-OAT	Problem
84	Outdoor Air Temperature Sensor Fail-OAT	Problem
88	Emergency Stop Fault	Shutdown
93	CONTROL Fault	Shutdown
97	Smoke Detection	Shutdown

N. DIAGNOSTICS

N.2.1. Cooling Alarm Codes and Diagnostics

All Core Command come standard with a 7-segment diagnostic display. During standby mode with no fault codes present, the display will read "0" (zero). During normal thermostat heating, cooling or continuous fan operation, a letter will be displayed to describe the mode of operation as follows:

C = Cooling

F = Continuous Fan Operation

H = Gas Heating Operation

When the control senses a fault present, it will display a code to help in diagnoses. A list of normal operating codes and potential fault codes follows:

Alarm Codes – Cooling Only		
CODE	DESCRIPTION	FAULT LEVEL
0	Standby	None
c	Compressor On – Low (Flashing If In Time Delay)	None
C	Compressor On – High (Flashing If In Time Delay)	None
E	Economizer Cooling – No Compressor	None
F	Continuous Fan	None
4	Comfort Alert Code 4 For Compressor Circuit 1	Shutdown
5	Comfort Alert Code 5 For Compressor Circuit 1	Shutdown
6	Comfort Alert Code 6 For Compressor Circuit 1	Shutdown
7	Comfort Alert Code 7 For Compressor Circuit 1	Shutdown
8	Comfort Alert Code 8 For Compressor Circuit 1	Shutdown
9	Comfort Alert Code 9 For Compressor Circuit 1	Shutdown
20	Refrigerant Low Pressure Switch Open – Circuit 1	Problem
29	Refrigerant High Pressure Switch Open – Circuit 1	Problem
49	Freeze Switch Open – Circuit 1	Problem
59	Condensate Drain Plugged	Shutdown
83	Condenser Coil Temp Sensor Fail-Oct	Problem
84	Outdoor Air Temperature Sensor Fail-Oat	Problem
88	Emergency Stop Fault	Shutdown
93	Control Fault	Shutdown
97	Smoke Detection	Shutdown

The method for displaying a two-digit fault is to display the first digit for one second immediately followed by the second digit – which is also displayed for a duration of one second. A ½ second pause is then displayed. Cycle repeats

until the fault is cleared. Each fault is flashed (displayed) a minimum of two times even if the fault condition has cleared before the fault can be displayed twice.

Normal Operation Mode:

0	Displayed anytime there is no fault present and no thermostat call present
c	COMPRESSOR ON – Low (Flashing if in time delay)
C	COMPRESSOR ON – High (Flashing if in time delay)
E	When the system uses Economizer Cooling with No Compressor
F	Displayed anytime thermostat calls for continuous fan

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Cooling Only		
CODE	DESCRIPTION	FAULT LEVEL
0	STANDBY	None
c	COMPRESSOR ON – Low (Flashing if in time delay)	None
C	COMPRESSOR ON – High (Flashing if in time delay)	None
E	Economizer Cooling – No Compressor	None
F	CONTINUOUS FAN	None
4	Comfort Alert Code 4 for Compressor Circuit 1	Shutdown
	ALARM Designation: Locked Rotor Circuit 1	
	DESCRIPTION:	
	1. Circuit 1 shutdown and retry after Anti-Short Cycle Delay (ASCD) Maximum is 3 attempts.	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Low line voltage	
	2. Excessive Refrigerant in compressor	
	3. Seized bearings in compressor	
5	Comfort Alert Code 5 for Compressor Circuit 1	Shutdown
	ALARM Designation: Open Circuit 1	
	DESCRIPTION:	
	1. Circuit 1 shutdown and retry after ASCD.	
	Note: This alarm is sent by the Comfort Alert Module only after the fault has been sensed for a minimum of 4 hours.	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Condensing unit power disconnect is open	
	2. Compressor circuit breaker or fuses are open	
6	Comfort Alert Code 6 for Compressor Circuit 1	Shutdown
	ALARM Designation: Missing Phase Circuit 1	
	DESCRIPTION:	
	1. Circuit 1 shutdown	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Compressor fuse is open on one phase	
	2. Broken wire or connector on one phase	
	3. Compressor motor winding is damaged	
	4. Utility supply has dropped one phase	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Cooling Only		
CODE	DESCRIPTION	FAULT LEVEL
7	Comfort Alert Code 7 for Compressor Circuit 1	Shutdown
	ALARM Designation: Reverse Phase Circuit 1	
	DESCRIPTION:	
	1. Run outdoor and indoor fans continuously for circuit 1 and change mode of operation to Unoccupied Auto. This procedure prevents the Space Temperature from reaching extreme values.	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Compressor running backward due to supply phase reversal	
8	Comfort Alert Code 8 for Compressor Circuit 1	Shutdown
	ALARM Designation: Welded Contactor Circuit 1	
	DESCRIPTION:	
	1. Circuit 1 shutdown	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Compressor contactor has failed closed	
	2. Thermostat demand signal not connected to module	
9	Comfort Alert Code 9 for Compressor Circuit 1	Shutdown
	ALARM Designation: Low Voltage Circuit 1	
	DESCRIPTION:	
	1. Circuit 1 Shutdown and wait for voltage to return to operational levels.	
	SOLUTION/STATUS/Possible – Troubleshooting Information	
	1. Control circuit transformer is overloaded	
	2. Low line voltage to compressor	
20	DESCRIPTION: REFRIGERANT LOW PRESSURE SWITCH OPEN – CIRCUIT 1	Problem
	CAUSE:	
	1. Low evaporator airflow	
	2. Refrigerant undercharge	
	3. Restriction in liquid line, expansion device or filter drier	
	4. Operating below 65°F outdoors	
	5. Moisture in system	
	SOLUTION: The solution will depend on the cause.	
	1. Increase speed of blower or reduce restriction – replace air filter	
	2. Check for leaks – add refrigerant	
	3. Remove or replace defective component	
	4. Add Low Ambient Kit	
	5. Recover refrigerant – evacuate & recharge – add or replace filter drier	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Cooling Only		
CODE	DESCRIPTION	FAULT LEVEL
29	DESCRIPTION: REFRIGERANT HIGH PRESSURE SWITCH OPEN – CIRCUIT 1	Problem
	CAUSE:	
	1. Restriction in liquid line, expansion device or filter drier	
	2. Refrigerant overcharge	
	3. Condenser fan not running	
	4. Air or non-condensibles in system	
	SOLUTION: The solution will depend on the cause.	
	1. Recover refrigerant – evacuate & recharge remove or replace defective component	
	2. Remove refrigerant	
	3. Check voltage, Run Capacitor & Outdoor Motor Repair or replace	
	4. Recover refrigerant, evacuate & recharge	
40	REFRIGERANT LEAK DETECTION SYSTEM	Shutdown
	DESCRIPTION:	
	1. The refrigerant leak detection system detects an event and mitigation procedure occurs.	
	2. The mitigation procedure is triggered when no event occurs.	
	SOLUTION: The solution will depend on the cause.	
	1. Check for refrigerant leaks	
49	FREEZE SWITCH OPEN – CIRCUIT 1	Problem
	DESCRIPTION:	
	1. Occurs when sensors are either open or shorted.	
	SOLUTION: The solution will depend on the cause.	
	1. Replace the sensor	
	2. Check sensor is installed correctly on control	
59	Condensate Drain Plugged	Shutdown
	DESCRIPTION:	
	1. Condensate line is blocked water inside of unit	
	SOLUTION: The solution will depend on the cause.	
	1. Remove blockage	
	2. Remove condensate pan and clean	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Cooling Only		
CODE	DESCRIPTION	FAULT LEVEL
83	Condenser Coil Temp Sensor Fail–OCT	Problem
	DESCRIPTION:	
	1. No defrost operation, but unit continues to operate in either heating or cooling.	
	SOLUTION: The solution will depend on the cause.	
	1. Extreme temperatures	
	2. Replace the sensor	
84	Outdoor Air Temperature Sensor Fail–OAT	Problem
	DESCRIPTION:	
	1. No defrost operation, but unit continues to operate in either heating or cooling.	
	2. The heat source continues to be heat pump, independently of the outdoor air temperature	
	SOLUTION: The solution will depend on the cause.	
	1. Extreme temperatures	
88	Emergency Stop Fault	Shutdown
	DESCRIPTION:	
	1. Complete shutdown	
	SOLUTION: The solution will depend on the cause.	
	1. Cannot be cleared by the 'Clear All Alarms" command. Must be cleared by changing the Emergency Stop Fault network value.	
93	CONTROL Fault	Shutdown
	DESCRIPTION:	
	1. Internal Control fault.	
	SOLUTION: The solution will depend on the cause.	
91	Smoke Detection	Shutdown
	DESCRIPTION:	
	1. RTU–C reads the smoke detection input as open — complete shutdown.	
	SOLUTION: The solution will depend on the cause.	
	1. If not due to a fire, Replace the sensor, Check sensor is installed correctly on control	
	2. Check Smoke Detection Circuit, if no Smoke Detector is installed, ensure Economizer Smoke Bypass plug is installed	

N. DIAGNOSTICS

N.2.2. Heating Alarm Codes and Diagnostics

All Core Commands come standard with a 7-segment diagnostic display. During standby mode with no fault codes present, the display will read “0” (zero). During normal thermostat heating, cooling or continuous fan operation, a letter will be displayed to describe the mode of operation as follows:

C = Cooling

F = Continuous Fan Operation

H = Gas Heating Operation

When the control senses a fault present, it will display a code to help in diagnoses. A list of normal operating codes and potential fault codes follows:

Alarm Codes – Heating Only		
CODE	DESCRIPTION	FAULT LEVEL
0	STANDBY	None
F	CONTINUOUS FAN	None
h	GAS HEAT ON – LOW-FIRE	None
H	GAS HEAT ON – HIGH-FIRE	None
11	FAILED IGNITION	Problem
12	LO FLAME SENSE	Warning
13	FLAME LOST	Problem
14	UNEXPECTED FLAME	Shutdown
15	HIGH-FIRE GAS VALVE IMPROPER VOLTAGE	Problem
22	MAIN LIMIT OPEN	Problem
33	MRLC (Rollout Limit) OPEN	Problem
42	INVALID THERMOSTAT SELECTION	Warning
44	LOW-FIRE NEGATIVE PRESSURE CONTROL CLOSED	Problem
46	LOW-FIRE NEGATIVE PRESSURE CONTROL OPEN	Problem
55	High-Fire NEGATIVE PRESSURE CONTROL CLOSED	Problem
57	HIGH-FIRE NEGATIVE PRESSURE CONTROL OPEN	Problem, Shutdown
61	BLOWER FAULT – NO RUN	Shutdown
97	SMOKE DETECTION	Shutdown

The method for displaying a two-digit fault is to display the first digit for one second immediately followed by the second digit – which is also displayed for a duration of one second. A ½ second pause is then displayed. Cycle repeats

until the fault is cleared. Each fault is flashed (displayed) a minimum of two times even if the fault condition has cleared before the fault can be displayed twice.

Normal Operation Mode:

0	Displayed anytime there is no fault present and no thermostat call present
F	Displayed anytime thermostat calls for continuous fan
h	Lower-case “h” displayed anytime thermostat calls for low-fire heat
H	Upper-case “H” displayed anytime thermostat calls for high-fire heat

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Heating Only		
CODE	FAILED IGNITION	FAULT LEVEL
11	DESCRIPTION: This fault is displayed when a failed ignition has occurred three times in a row. The Core Command will enter a one-hour lockout following the third ignition attempt.	Problem
	CAUSE:	
	1. Flame sense rod is unable to sense flame	
	2. Gas valve is turned OFF.	
	3. The ignitor is not working properly.	
	4. The Core Command is not working properly	
	5. Burner flame is not carrying over from first burner to the last.	
	SOLUTION: the solution will depend on the cause.	
	1. Clean or replace flame sense rod. Confirm flame sense is in burner flame. Check wire and all connections between flame sense and Core Command. Make sure furnace is properly grounded.	
	2. Turn gas valve ON.	
	3. Replace or reposition the ignitor. Refer to section G.1.4 for proper ignitor location. Check wire and all connections between ignitor and Core Command.	
12	LOW FLAME SENSE	Warning
	DESCRIPTION: Furnace operation will continue in low and high-fire modes. This problem may be elevated to the level of fault code “13” or “11” if flame cannot be sensed at all.	
	CAUSE:	
	1. Most common cause is that the flame sense rod may need cleaning.	
	2. Flame sense rod may not be properly connected.	
	3. Wiring between the rod and furnace control may be shorted or opened.	
	SOLUTION:	
	1. Clean or replace flame sense rod.	
	2. Check wire and all connections between the flame sense and Core Command.	
	3. Make sure the furnace is properly grounded.	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Heating Only		
CODE	FLAME LOST	FAULT LEVEL
13	DESCRIPTION: If flame is lost after it is established, subsequent ignition attempts will follow and normal operation should resume.	Problem
	CAUSE:	
	1. Most common cause is that the flame sense rod may need cleaning.	
	2. May not be properly connected.	
	3. Wiring between flame sense and Core Command may be shorted or opened.	
	4. Improperly mounted	
	5. Improperly grounded.	
	6. Burner flame pattern may be unstable.	
	SOLUTION:	
	1. Clean or replace the flame sense rod.	
	2. Check wire and all connections between the flame sense and Core Command.	
	3. Confirm flame sense rod is in the flame. See section G.1.4 for proper flame sense location.	
	4. Confirm furnace is properly grounded.	
	5. Check that all burner assembly components are properly installed. Confirm that burner flame is steady and directed down the center of tube. If turbulence is noted, check for air leaks between the burner and blower compartment.	
14	UNEXPECTED FLAME	Shutdown
	DESCRIPTION: this fault should rarely if ever be seen in the field. Furnace will not operate with this fault present.	
	CAUSE:	
	1. Field mis-wiring of 24VAC to the gas valve main solenoid.	
	2. Faulty gas valve stuck in the “OPEN” position.	
	3. Faulty furnace Core Command (signal improperly sensed when it should not be sensed at all).	
	SOLUTION:	
	1. Correct wiring	
	2. Replace the gas valve.	
	3. Replace the Core Command.	
15	HIGH-FIRE GAS VALVE IMPROPER VOLTAGE	Problem
	DESCRIPTION: High-fire coil energized during call for low-fire heat. This fault should rarely if ever be seen in the field.	
	CAUSE: Gas valve relay contacts on Core Command welded shut. Hi and low-fire miswired.	
	SOLUTION:	
	1. Replace Core Command if gas valve wiring is correct	
	2. Turn off power to unit. Use a pin remover to reverse locations for BLUE and WHITE/BLACK wires in 3-pin connector.	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

Alarm Codes – Heating Only		
CODE	MAIN LIMIT OPEN	FAULT LEVEL
22	DESCRIPTION: The furnace will not operate in gas heat mode.	Problem
	CAUSE:	
	1. No airflow or dead blower	
	2. Insufficient airflow	
	3. Faulty limit control	
	4. Loose or faulty wiring.	
	5. Incorrect blower tap	
	6. Furnace input is too high.	
	SOLUTION:	
	1. Check for proper blower operation. If a blower motor fault has occurred fault code “61” should also be present. Check the wiring to the motor then the motor.	
	2. Check filters and ductwork. Determine static pressure and confirm it is not above published values found in the Checking and Adjusting Airflow section.	
	3. Replace the limit control	
	4. Check wiring and connections.	
	5. Confirm proper blower speed taps for high and low-fire.	
	6. Insure properly sized burner orifices are installed. Check manifold pressure at high and low-fire and compare to values found in Measuring and Adjusting Manifold Gas Pressures section. Check rate and compare to nameplate input, high and low-fire. Adjust as necessary.	

N. DIAGNOSTICS

Fault Codes with Descriptions and Solutions:

	MRLC (Manual Reset Limit Control) OPEN	FAULT LEVEL
33	DESCRIPTION: The MRLC is also known as the rollout limit. There are two rollout limits on (–)GEC gas units. When one or more of these limits open, they must be manually reset to the closed position. This fault can occur when burner flames are not directed down the center of the burner tube and roll out into the burner assembly. This fault indicates a serious problem that must be repaired before furnace operation can continue.	Problem
	CAUSE:	
	1. Faulty limit.	
	2. Loose or faulty wiring.	
	3. Damaged heat exchanger	
	4. Insufficient combustion air or blocked flue pipe.	
	5. Overfired condition.	
	6. Air leak between burner and blower compartment.	
	SOLUTION:	
	1. Replace limit if limit will not reset. Observe flame pattern for normal operation after limit has been replaced.	
	2. Check wiring and connections. Replace and/or repair as necessary	
	3. Confirm that burner flame is steady and directed down center of burner tube. If flame turbulence is evident, note if turbulence began when indoor blower motor was energized. This could be an indication of a damaged heat exchanger, i.e. breached primary tube or loose wedge joint.	
40	4. Confirm louvered panels are unobstructed. Confirm flue pipe is unobstructed.	Shutdown
	5. Insure properly sized burner orifices are installed. Check manifold pressure at high and low-fire and compare to values found in Measuring and Adjusting Manifold Gas Pressures section. Check rate and compare to nameplate input, high and low-fire. Adjust as necessary.	
	6. Check that all burner assembly components are properly installed. Confirm that burner flame is steady and directed down the center of tube. If turbulence is noted, check for air leaks between the burner and blower compartment.	
	REFRIGERANT LEAK DETECTION SYSTEM	
	DESCRIPTION:	
	1. The refrigerant leak detection system detects an event and mitigation procedure occurs.	
	2. The mitigation procedure is triggered when no event occurs.	
	SOLUTION: The solution will depend on the cause.	
	1. Check for refrigerant leaks	
	2a. Organic compounds could be falsely triggering mitigation procedure. Check the installation location for potential contaminants.	
	2b. The sensor is faulty; replace the sensor	