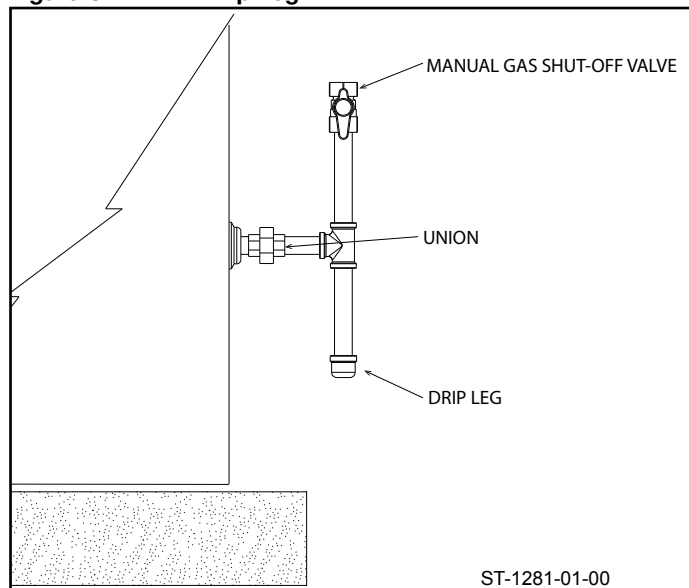


G.2.1. Drip Leg Requirement

When connecting the supply gas to the gas valve, install a drip leg/sediment trap in compliance with the International Residential Code G2419.4.

Figure G.2.1. – A: Drip Leg



G.2.2. Purging Gas Lines

It may be necessary to purge any air from the gas lines prior to operation. This can be done through the gas pressure tap on the gas valve or at a union in the gas line. Follow best practices to purge the gas line. Ensure all fittings are sealed and tight after purging.

G.2.3. Leak Testing

To check for gas leaks, use a soap and water solution or other approved method. **DO NOT USE AN OPEN FLAME.**

G.3. LP Conversion

⚠ WARNING: DO NOT use an open flame to check for leaks. The use of an open flame can result in fire, explosion, property damage, personal injury or death.

⚠ WARNING: This unit is equipped at the factory for use on natural gas only. Conversion to LP gas requires a special kit supplied by the distributor or manufacturer. Mailing addresses are listed on the furnace rating plate, parts list and warranty. Failure to use the proper conversion kit can cause fire, carbon monoxide poisoning, explosion, personal injury, property damage or death.

NOTE: The valve can be converted to use liquefied petroleum (LP) gas by replacing the high and low fire pressure regulator springs with the conversion kit springs. The LP kit springs allow the regulator to maintain the proper manifold pressure at high and low fire for LP gas.

NOTE: Order the correct LP conversion kit from the furnace manufacturer.

See Conversion Kit Index shipped with unit and table below for proper LP kit number.

A qualified technician must perform furnace conversion to LP gas.

Model Number	Kit Number U.S./Canadian
(-)GED 150k, 205k, 225 k	FP39

G.3.1. Orifice Installation

LP Gas is a manufactured gas that has consistent heating value across most regions. The Sea Level input should still be reduced by 4% per thousand ft. above 2,000 feet and the orifice size must be selected based on the reduced input selection chart in High Alt. Instruction Section.

To change orifice spuds for conversion to LP:

1. Shut off the gas supply and remove gas connection to the gas valve.
2. Remove the gas manifold.
3. Replace the natural gas orifices with LP orifices.
4. Reassemble in reverse order.
5. Refer to section **J.5.1.1. Measuring and Adjusting Supply Gas Pressures** for confirming inlet pressure and adjusting manifold pressure.

⚠ WARNING: LP tanks from local LP supplier must not be used to store anything (such as fertilizer) except LP gas. This includes all delivery vessels (LP trucks). If material other than LP gas is used in the same vessels/tank as the LP gas, the LP gas can become contaminated and damage the furnace. This will void the manufacturer's warranty. Contact the supplier to make sure fertilizer is not used in the same tanks used to store and deliver LP gas.

G. GAS

Table G.3 - A

LP GAS PIPE CAPACITY TABLE (CU FT/HR)												
Maximum capacity of pipe in thousands of BTU/hr of undiluted liquified petroleum gases (at 11.0" W.C. inlet pressure)												
(Based on a Pressure Drop of 0.5" W. C.)												
Nominal Iron Pipe* Size, Inches	Length of Pipe, Feet											
	10	20	30	40	50	60	70	80	90	100	125	150
1/2	275	189	152	129	114	103	96	89	83	78	69	63
3/4	567	393	315	267	237	217	196	182	173	162	146	132
1.0	1,071	732	590	504	448	409	378	346	322	307	275	252
1-1/4	2,205	1,496	1,212	1,039	913	834	771	724	677	630	567	511
1-1/2	3,307	2,299	1,858	1,559	1,417	1,275	1,181	1,086	1,023	976	866	787
2.0	6,221	4,331	3,465	2,992	2,646	2,394	2,205	2,047	1,921	1,811	1,606	1,496
Example (LP): Input BTU requirement of unit, 120,000 Equivalent length of pipe, 60 ft. = 3/4" Inside Diameter required												
*Schedule 40 metallic pipe. Reference the National Fuel Gas Code NFPA 54, ANSI Z223.1- Pipe Sizing for more information.												

G.4. Operation and Testing

G.4.1. Warnings

⚠ WARNING: DO NOT attempt to manually light this furnace with a match or any open flame. Attempting to do so can cause an explosion or fire resulting in property damage, personal injury or death.

⚠ WARNING: The spark ignitor and ignition lead from the ignition control are high voltage.

Keep hands or tools away to prevent electrical shock. Shut off electrical power before servicing any of the controls. Failure to adhere to this warning can result in personal injury or death.

⚠ WARNING: Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the furnace. Failure to do so can result in an explosion or fire causing severe personal injury or death!

G.4.2. First Time Operation

G.4.2.2. Normal Furnace Sequence Of Operation

1. Thermostat initiates call for heat.
2. Core Command runs self-diagnostic. Core Command confirms the Main Limit Control (MLC) is closed; the Negative Pressure Control (NPC) is open and checks Manual Reset Limit Controls (MRLC) for continuity.
3. Core Command energizes Induced Draft Motor (IDM).
4. Core Command confirms NPC is closed.
5. If NPC is closed, the Core Command starts a 30-second prepurge.

6. Following 30 second prepurge, the Core Command energizes the Spark Electrode (SE) up to 7 seconds or until the Remote Flame Sensor proves burner flame. Core Command de-energizes the SE and begins the 20-second blower ON delay.

7. The furnace will respond to thermostat command following 20-second blower ON delay.

Sequences - system doesn't light or doesn't sense flame:

• NPC Remains Open After the IDM is Energized:

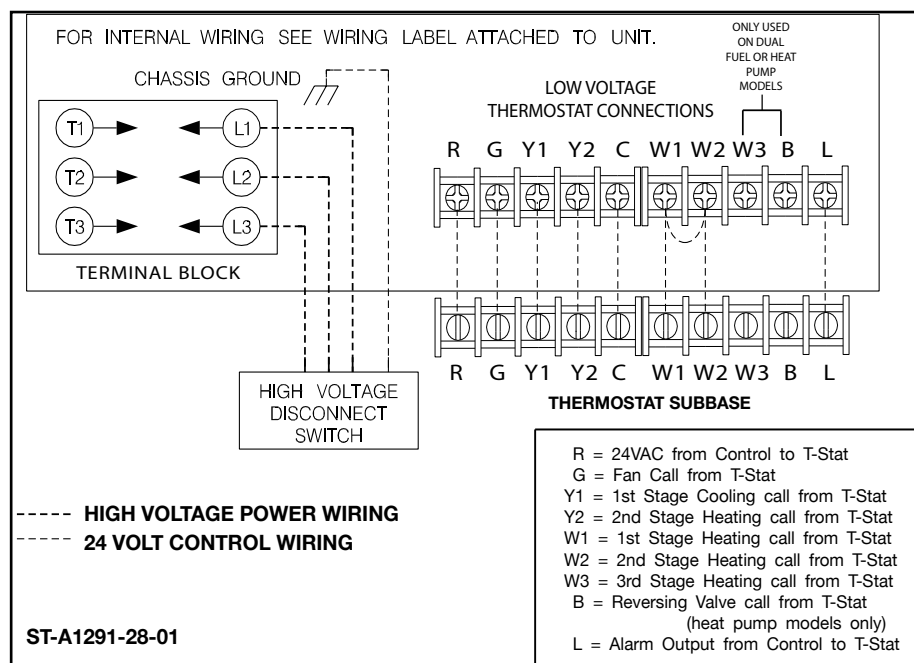
1. The IDM will run for 60 seconds in an attempt to close the NPC. IDM is de-energized then energized and the ignition attempt is repeated.
2. After four attempts to close the NPC, the system will enter a 1-hour lockout period.

• Failed Ignition or Core Command Doesn't Sense Flame:

1. Following the 30-second prepurge period, the SE and gas valve are energized up to 8 seconds.
2. If flame is not sensed during the 8-second period after the gas valve is energized, the gas valve and SE are de-energized.
3. IDM is de-energized and the Core Command verifies that the NPC is open. Once the NPC is confirmed open, the Core Command will begin a second ignition attempt.
4. The system will attempt three tries at ignition. Following a third failed attempt the system will enter a 1-hour lockout period.

G.4.2.3. Single-Stage Thermostat and Auto-Staging: 208/230V, 460V, & 575V

Application where a single-stage thermostat is used with this two-stage furnace. Furnace will run at low-fire input for a 15 minute period. If thermostat demand is not satisfied, Core Command will automatically stage to high fire until thermostat demand is met. To accommodate auto-staging, simply secure a jumper wire between W1 and W2 on the Core Command. See **Figure G.4.2.3. - A** for details.



G.4.2.4. Gas Pressure Testing and Adjustment

Refer to **Section J.5.1.1.** for detailed instructions on testing and adjusting gas pressure.

G.4.2.5. Flame inspection

Inspect burner flame after the indoor blower motor is energized. Burner flame should be directed down the center of primary heat exchanger tube with little or no lifting. Carry-over flame should not impinge on center panel. Any flame turbulence could be an indication of an air leak between the burner and heat exchanger compartment or a partially blocked burner orifice.

Natural Gas Flame: almost completely blue with some yellow in the center of the flame.

LP Gas Flame: predominantly a blue flame with some yellow tipping.

G.4.2.6. Orifice Selection and High Altitude Adjustments

Notice: Derating of the heating input for high altitude in the field is unlawful in Canada (refer to CAN/CGA 2.17). Units installed in altitudes greater than 2,000 feet (610 meters) must be shipped from the factory or from a factory authorized conversion station with the heating input derated by 10% so as to operate properly in altitudes from 2,000 - 4,500 feet (610 - 1,373 meters).

NATURAL GAS AT HIGH ALTITUDES

Furnaces installed above 2,000 feet require the furnace to be de-rated 4% per thousand feet above sea level.

IMPORTANT: Factory installed orifices are calculated and sized based on a sea level Natural Gas heating value of 1050 BTU per cubic ft.

NOTE: Orifices are available through your local distributor. Reference the following tables for approximate orifice sizing.

The following are examples of orifice sizing using the "Flow of Gas Through Fixed Orifices" section in the National Fuel Gas Code.

For a simplified estimation of orifice size based on gas heating value and elevation, the following tables may be used. However, calculations are the best method.

G. GAS

Example: 900 BTU/ft3 Regional Natural Gas Heating Value

$$I/H = Q$$

$$25000 / 900 = 27.78 \text{ ft}^3$$

I = Sea Level input (per burner): 25000

H = Sea Level Heating Value: 900

Q = 27.78 ft³ Natural Gas per hour.

From Table E1.1a of National Fuel Gas Code, 2015 (3.5" w.c.).

Orifice required at Sea Level: #40 from the National Fuel Gas Code.

Orifice required at 5000 ft. elevation (4% de-rate per thousand ft): #42

Orifice required at 8000 ft. elevation (4% de-rate per thousand ft.): #44

Example: 1050 BTU/ft3 Regional Natural Gas Heating Value

$$I / H = Q$$

$$25000 / 1050 = 23.81 \text{ ft}^3$$

I = Sea Level input (per burner): 25000

H = Sea Level Heating Value: 1050

Q = 23.81 ft³ Natural Gas per hour.

From the National Fuel Gas Code, (3.5" w.c.).

Orifice required at Sea Level: #43 From the National Fuel Gas Code,

Orifice required at 5000 ft. elevation (4% de-rate per thousand ft.): #45

Orifice required at 8000 ft elevation (4% de-rate per thousand ft): #47

ORIFICE ORDERING INFORMATION

Orifice sizes are selected by adding the 2-digit drill size required in the orifice part number. Drill sizes available are 39 through 64; metric sizes available 1.10mm (-90) and 1.15mm (-91):

Orifice Part Number 62-22175-(drill size)

Example 1:

60 drill size orifice required

Example 2:

1.15mm drill size orifice required

NATURAL GAS ORIFICE SELECTION BASED ON HEATING VALUE & ELEVATION* HIGH ALTITUDE

Notes:

1. Furnaces are factory equipped with orifices sized for 1050 sea level heating value gas.
2. Installer must be aware of the local heating value (sea level standard) to use the chart below.
3. This chart is based on the National Fuel Gas Code (NFGC) and based on natural gas with a specific gravity of 0.60
4. The recommended orifices below allow the furnace to operate within 10% of design rate. However, NFGC calculations are the best method.
5. Furnace operation is optimized when operating at design rate. Installer is responsible to verify rate.

NATURAL GAS ORIFICE SELECTION BASED ON HEATING VALUE & ELEVATION*

22,800 BTU/burner

		ELEVATION								
Grey Cells Indicate Factory Orifice Size		Sea Level to 2,000'	2001' to 3,000'	3,001' to 4,000'	4,001' to 5,000'	5,001' to 6,000'	6,001 to 7,000'	7,001' to 8,000'	8,001' to 9,000'	9,001' to 10,000'
Gas Heat- ing Value (BTU/ft3) @ Sea Level**	1,100	44	45	45	45	46	47	47	48	48
	1,050	43	44	44	44	45	45	46	47	47
	1,000	43	43	44	44	45	45	46	47	47
	950	42	42	43	43	43	44	44	45	46
	900	42	42	43	43	43	44	44	45	46
	850	40	41	42	42	42	43	43	44	44
	800	39	40	41	41	42	42	43	43	44
	750	37	38	39	39	40	41	42	42	43
	700	36	37	38	38	39	40	41	41	42

20,800 BTU/burner (50 HZ model)

		ELEVATION								
Grey Cells Indicate Factory Orifice Size		Sea Level to 2,000' FT	2001' to 3,000' FT	3,001' to 4,000' FT	4,001' to 5,000' FT	5,001' to 6,000' FT	6,001 to 7,000' FT	7,001' to 8,000' FT	8,001' to 9,000' FT	9,001' to 10,000' FT
Gas Heating valve (BTU/ft3)	1100	46	47	47	47	48	48	49	49	50
	1050	45	46	47	47	47	48	48	49	49
	1000	44	45	45	45	46	47	47	48	48
	950	43	44	44	44	45	45	46	47	47
	900	43	44	44	44	45	45	45	47	47
	850	42	42	43	43	43	44	44	45	46
	800	41	42	42	42	43	43	44	44	45
	750	40	41	42	42	42	43	43	44	44
	700	38	39	40	41	41	42	42	43	43

19,000 BTU/burner (50 HZ model)

		ELEVATION								
Grey Cells Indicate Factory Orifice Size		SEA LEVEL TO 2,000 FT	2,001 TO 3,000 FT	3,001 TO 4,000 FT	4,001 TO 5,000 FT	5,001 TO 6,000 FT	6,001 TO 7,000 FT	7,001 TO 8,000 FT	8,001 TO 9,000 FT	9,001 TO 10,000 FT
Gas Heat- ing valve (BTU/ft3)	1100	47	48	48	49	49	49	50	50	51
	1050	46	47	47	47	48	48	49	49	50
	1000	45	46	47	47	47	48	48	49	49
	950	45	46	47	47	47	48	48	49	49
	900	44	45	45	45	46	47	47	48	48
	850	43	44	44	44	45	45	46	47	47
	800	43	44	44	44	45	45	46	47	47
	750	42	42	43	43	43	44	44	45	46
	700	40	41	42	42	42	43	43	44	44

* Tables are derived from the National Fuel Gas Code. To determine the correct orifice for your installation consult the National Fuel Gas Code

** Be sure to use sea level heating value. Heating value may be obtained from a local utility, heating value must be converted to sea level equivalent in order to use this table.

G. GAS

LP GAS AT HIGH ALTITUDES

NOTICE: The conversion shall be carried out by a manufacturer's authorized representative, in accordance with the requirements of the manufacturer, provincial, or territorial authorities having jurisdiction and in accordance with the requirements of the CSA b149.1 Or CSA b149.2 Installation codes.

NOTE: Keep any parts removed during LP conversion procedure stored with the product literature for future use.

LP Gas is a manufactured gas that has consistent heating value across most regions.

The NFGC guidelines are used with the following exception:

The recommended LP Gas high altitude orifice selections differ slightly in that the NFGC LP orifice chart, as they are not accurate for these products. The National Fuel Gas Code LP orifices are based on an 11" of water column pressure at the orifice, which differs from products that use 10" of water column at the orifice. This difference requires a deviation from the NFGC orifice size recommendations. The Sea Level input should still be reduced by 4% per thousand ft. and the orifice size must be selected based on the reduced input in the following tables.

LP Gas BTU/hr per Burner based on Orifice Size & Elevation

Orifice Pressure: 10" W.C.

BTU/hr per burner	Electrical Frequency	ELEVATION								
		SEA LEVEL TO 2,000 FT	2,001 TO 3,000 FT	3,001 TO 4,000 FT	4,001 TO 5,000 FT	5,001 TO 6,000 FT	6,001 TO 7,000 FT	7,001 TO 8,000 FT	8,001 TO 9,000 FT	9,001 TO 10,000 FT
25,000 BTU/hr	60 HZ models	54	54	54	54	55	55	56	56	56
22,800 BTU/hr		54	55	55	55	55	55	56	56	56
20,800 BTU/hr	50 HZ models	55	55	55	56	56	56	56	56	57
19,000 BTU/hr		56	56	57	57	57	58	59	59	60

LP Gas BTU/hr per Burner based on Orifice Size & Elevation

Orifice Pressure: 10" W.C.

BTU/hr per burner	ELEVATION	
	Sea Level to 2,000'	2,001' to 3,000'
20,000 BTU/hr	55	56
25,000 BTU/hr	54	54

J. STARTUP AND OPERATION

J.1. Final Inspection

J.1.1. Check for Refrigerant Leaks

Before beginning any work on the system or conducting any hot work, ensure that the area is in the open or that it is adequately ventilated. Ventilation must continue while the unit is being worked on. Ventilation is required to safely disperse any released refrigerant into the atmosphere.

Inspect the unit for any damage to the coils and tubing that could cause a leak.

Under no circumstances shall potential sources of ignition be used to search for or detect refrigerant leaks. A halide torch or any other detector using a naked flame must not be used.

Electronic leak detectors may be used to detect refrigerant leaks, but the sensitivity may not be accurate and may need recalibration to accurately detect R-454B. Before use, ensure that the detector is not a potential ignition source and is suitable for R-454B.

Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and must be calibrated to R-454B.

Leak detection fluids are also suitable but do not use detergents containing chlorine. Examples of leak detection fluids are the bubble method and fluorescent method agents.

If a leak is suspected, all naked flames must be extinguished.

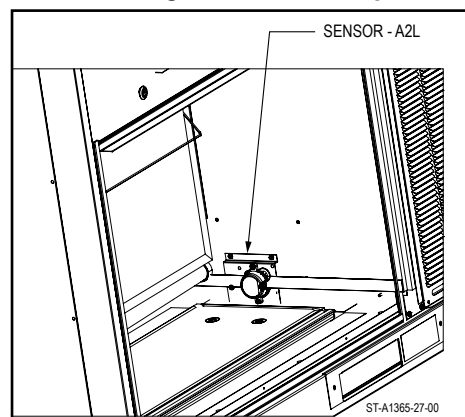
If a refrigerant leak is found that requires brazing, all of the refrigerants must be removed from the system.

J.1.1.1. Refrigerant Leak Detection System

The refrigerant leak detection system will continuously monitor the air for a refrigerant leak. If the leak detection system detects a leak, the system will begin mitigation procedures: the blower will turn on and the compressors will shut down. Note: Gas or electric heat functions may continue during mitigation.

At the end of 15 years or if the refrigerant leak detection system becomes inoperable, the leak detection system must be replaced with components specified by the unit's manufacturer. Refer to the manufacturer's website for replacement components. Refer to the alarm code diagnostics section for refrigerant leak detection system error codes.

Figure J.1.1.1. – A: Refrigerant Detection System Location



If a vertical field-installed economizer will also be installed during the unit installation, the A2L leak detection sensor must be relocated by completing the following steps:

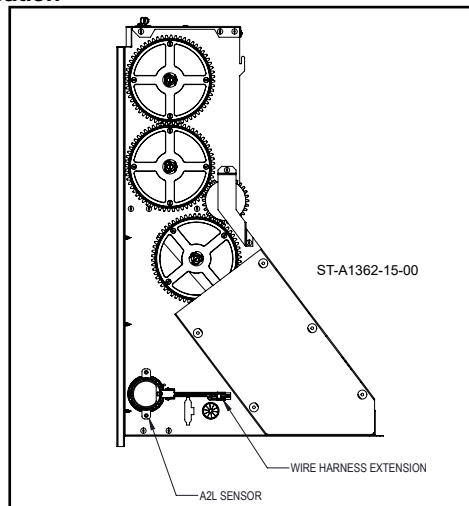
1. Remove the indoor coil access panel assembly and the filter access panel assembly.
 2. Disconnect the wire harness attached to the A2L refrigerant detection sensor.
 3. Uninstall the A2L refrigerant detection sensor from the bracket by removing the screws securing the sensor to the bracket.
 4. Using the same screws, mount the A2L refrigerant detection sensor to the economizer as shown in **Figure J.1.1.1. – B: Alternate Refrigerant Leak Detection System Location**.
- NOTE:** **Figure J.1.1.1. – B** does not depict every economizer/A2L refrigerant detection sensor available for use in this unit, and only shows one potential unit configuration.
5. Connect the extension harness provided with the field-installed economizer to the wire harness that was disconnected in Step 2. The wire harness will still be connected to the bracket.
 6. Route the wire harness along the bulkhead to the unit exterior for visibility.
 7. Install the economizer partway, with approximately 4 inches extended outside the unit, leaving access to the A2L refrigerant leak detection sensor. Then, connect the wire harness.

CAUTION: Do not pull the wire harness as this may cause damage to the harness and break the wire ties that hold the wire harness in place.

8. Complete the field-installed economizer's installation according to the economizer Installation and Operation Manual shipped with the accessory.

J. STARTUP AND OPERATION

Figure J.1.1.1. – B: Alternate Refrigerant Detection System Location



J.1.1.2. Operation When a Leak is Detected

When the unit receives a signal from the A2L refrigerant detection system (RDS), circulation airflow is activated, and the control board will display an error (for DDC units) or a fault code (for Non-DDC units). The following mitigation actions will also be activated:

1. Energize the indoor blower of the appliance to deliver indoor airflow at or above the minimum airflow. See **Appendix F – A2L Refrigerant Installation Safety Data**.
 - a. The fans will be energized following the input signal to turn on the fan(s)
2. The system de-energizes compressor operation.
3. Activate additional mechanical ventilation, if applicable.

The above-mentioned actions will continue for at least 5 minutes after the leak detection system begins mitigation. If the leak is no longer detected, the leak detection system will reset. If the leak is still present, mitigation actions will continue for another 5 minutes. This cycle will repeat until no leak is detected.

For DCC units, user-selectable Fan Off Delay will remain in effect after the A2L RDS triggers the mitigation procedure.

J.1.1.3. Removal and Evacuation of Refrigerant

The refrigerant charge must be recovered into R-454B recovery cylinders. The unit system must be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants, such as R-454B, again. DO NOT USE compressed air or oxygen for purging R-454B refrigerant systems.

Refrigerant purging is achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to the atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to the atmospheric pressure to enable work to take place.

The outlet for the vacuum pump must not be close to any potential ignition sources.

Ventilation is required during removal and evacuation.

When breaking into the refrigeration circuit for any reason, this procedure must be followed:

1. Ensure there is no power to the unit.
2. With an accurate scale, ½ oz., set the refrigerant recovery cylinder in the upright position.
3. Connect the recovery cylinder to the unit using the service valves.
4. Evacuate refrigerant from the unit until the vacuum pump reads a minimum of 500 microns.
5. Purge the refrigeration circuit with inert gas until there is no refrigerant within the system.
6. Evacuate the circuit again.
7. Once all inert gas is removed, pull a vacuum on the unit to check for any leaks in the system.
8. If leaks are present, spray a soapy substance over the refrigeration circuit. Bubbles will help locate the leak.
 - a. Patch the leak and pull a vacuum again.
 - b. If leaks are still detected, repeat steps seven and eight.
9. If no leaks are present, charge the system as directed in the next section.
10. Remove the vacuum pump from suction, discharge, and liquid shut-off.

J.1.2. Check Level of Unit

Refer to **Section C.6.2** for setting/checking the level of the unit.

J. STARTUP AND OPERATION

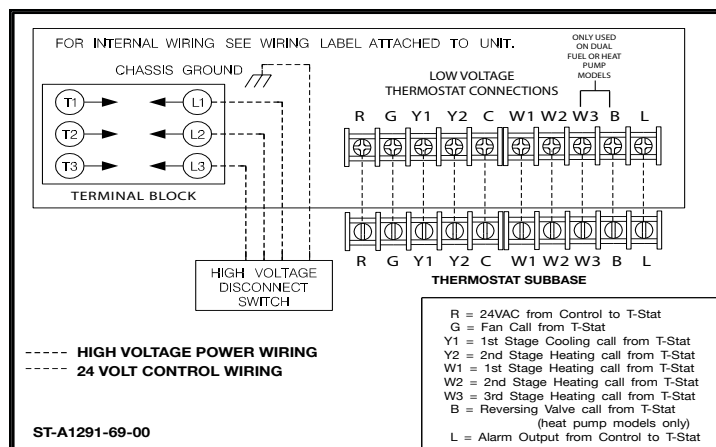
J.1.3. Check Electrical Connections for Proper Torque

Use an Inch Pound rated torque wrench to ensure proper torque. DO NOT CONFUSE THIS WITH A FOOT POUND RATED WRENCH, damage will occur.

Recommended torques for securing wiring:

- To the contactor: 40 in-lb.
- From the T-stat to the control board: 8.0 in-lb.

Figure J.1.3. – A: Where to Wire for Thermostat



J.1.4. Check Control Cables For Proper Connection

Verify all cables are seated and connected in the unit as some might come loose during shipping and transport.

J.1.5. Check Filter Installation

Verify that filters are seated and oriented correctly in the unit as some might come displaced during shipping and transport. Refer to **Section D.3.** for more information on filters and filter installation.

J.1.6. Check Condensate Drain Installation

Verify the Condensate Drain Trap is a minimum of 3 inches deep, plus the Blower Fan Static Pressure. Verify the Outlet of the drain trap is a minimum of 3 inches below the outlet of the drain pan.

Ensure the outlet of the trap is routed to a suitable drain location as required by local code. Refer to **Section C.5.** and **Figure C.5.1 – A** for more information.

J.1.7. Check Blower Compartment for Accessories

Open all compartments to ensure there are no tools or other misc parts remaining in the unit from setup. This is most important on the blower section to avoid damage to the blower assembly.

J.1.8. Check Wiring

After completing refrigerant removal, evacuation, and charging, check that the internal and field wiring will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects, taking into account the effects of aging or continual vibration from sources such as compressors or fans.

J.1.9. Check For Gas Leaks

Double-check for any gas leaks on the installed piping. Refer to **Section G.2.3.** for more information.

J. STARTUP AND OPERATION

J.2. Turning on Power for the First time

J.2.1. Checking for Proper 3-Phase Voltage

Verify that proper power has been supplied to the unit. This is critical for correct operation of the compressor.

J.2.2. Check For Proper Phase

J.2.2.1. Standard Blower Rotation

Verify that the compressor is running correctly.

J.2.2.2. VFD Blower Rotation

As a reminder, all units with a VFD driven blower motor will have the correct rotation, even if the phase to the unit is wired incorrectly. See [Section E.3.4.1. Checking Phase with VFD Drive](#) for more information.

J.2.3. Checking Low (Control) Voltage

Use a voltmeter to measure the low voltage and low voltage amp draws during operation. Accessories, such as remote smoke detectors and excessive wire length, can increase the amp draw on the low voltage wiring. Verify that the total amp draw on the 24VAC side is less than 0.3A in full operation. Refer to [Figure F. – A](#) for proper low voltage wire lengths.

J.2.4. Units with a Blower VFD

No adjustments required for installation or operation of this unit.

J.2.4.1. VFD Mode

The following VFD brands and models could be installed in the unit.

- Control Tech C200
- Schneider ATV320U or ATV320U
- Delta MS23, MS43, or MS53
- Mitsubishi FR-E860, FR-E840, or FR-E860
- Yaskawa CIMR-VU2A, CIMR-VU4A or CIMR-ZU5A

J.2.4.2. Replacement

The VFD is horsepower and voltage specific. Therefore, replacement must be the same model as the existing. A preprogrammed VFD is recommended and available from ProStock. A non-programmed VFD set up exactly as instructed in the [VFD I&O Manual](#) programming guide may also be used.

J.2.4.3. General Information

The purpose of the VFD is to allow low airflow in Fan Only (G) and First-Stage Cooling (Y1) operation of a two-stage unit. Unit air balancing should be performed at 100% airflow (60 Hz at VFD) during a Y2 call by adjusting the blower motor sheave. First-Stage Cooling and Fan Only speeds are independently adjustable at the RTU-C. The VFD display will indicate an equivalent value in Hz (i.e. Low Cool adjusted to 60% at RTU-C will display as 36Hz at the VFD). A 20 second (adjustable at the VFD) ramp-up or ramp-down is used whenever the blower speed is increased or decreased. Low speed blower operation first ramps to 75%, to close fan proving switch, before ramping to the desired speed. Since the VFD operates on 24VDC control voltage, a blower relay (with 24VAC across the coil) is used to turn the VFD on. Blower speeds are rechanged via Modbus communication from the RTU-C.

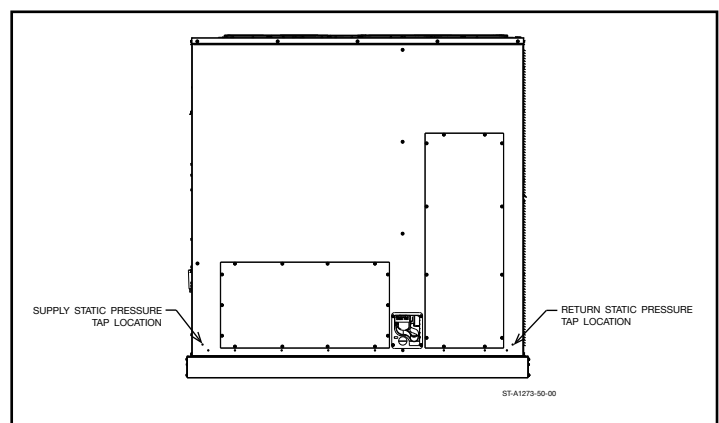
For more information see [VFD I&O Manual](#) shipped with the unit.

J.3. Checking and Adjusting Air Flow

For Economizer and Diffuser Pressure Drop Data, please refer to the end of [Appendix C: Airflow Performance Data](#).

For the minimum rated airflows for this unit's base models, see [Appendix F – A2L Refrigerant Installation Safety Data](#).

Figure J.3. – A: Static Pressure and Air Temperature Measurement Location



J. STARTUP AND OPERATION

J.3.1. Static Pressures and Measurements

- To measure the static pressure of the system, find the locating dimples near the supply/return duct openings, and drill a hole to the size necessary for the test probe. The location of these dimples are shown in **Figure J.3. - A.**
- NOTE: After taking airflow measurements, seal these openings per best practice to prevent airflow leakage and water entry into the unit.
- NOTE: Drilling test tap locations in other panels or doors could put the test probe in a turbulent zone, providing false readings.

J.3.1.1. Using Tools

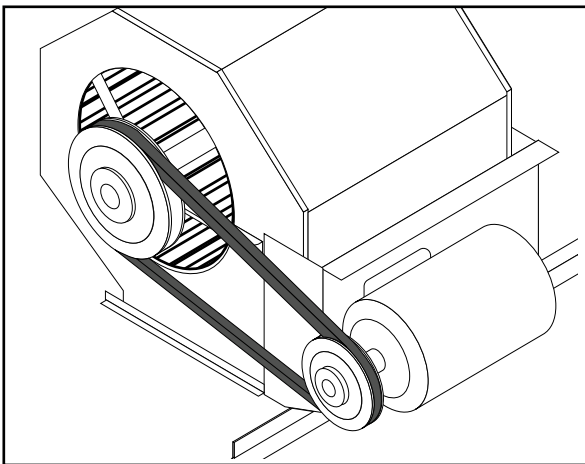
Use a calibrated monometer to measure the static pressure of the blower. Insert the meter probe into the tap location. Make sure any economizer or outside air dampers are closed and run the fan at the maximum, full speed setting. Record the reading for the return air and supply air separately.

J.3.2. Air Flow Measurements and Adjustments

- Measure the supply/ return static to get the unit static pressure by drilling out the simple locations shown in **Figure J.3.2 - A.**
- Take the measured static pressure and match to the static listed on the airflow table to find your CFM.

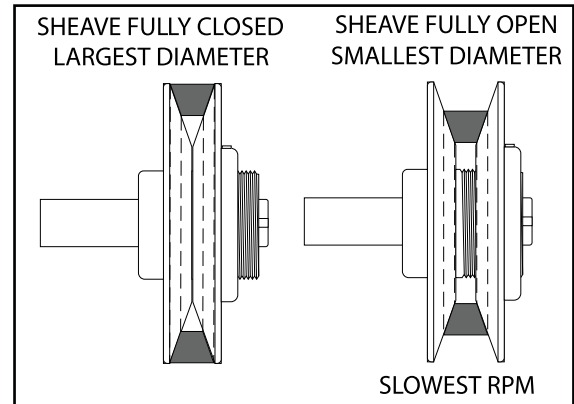
Use the charts and guide provided in the Installation and Operation instructions provided with the unit to calculate the airflow, against the measured static pressures and number of turns on the adjustable blower sheave. Verify the measured air flow against the charts.

Figure J.3.2. – A: Blower Assembly and Motor



If adjustment is needed, turn off the power to the entire system, and adjust the adjustable blower motor sheave. To do this, loosen the belt tension and remove the belt. Using an Allen wrench to loosen the set screw on the end of the adjustable blower sheave, turn the blower sheave in until it is fully closed.

Figure J.3.2. – B: Adjustable Blower Motor Sheave



Using the charts determine the total number of turns needed on the sheave. Make those turns in half turn increments, once set, align the set screw with the Flat section on the sheave threads. Tighten the set screw to secure the sheave.

Reinstall the belt and tension properly and power on the system. Allow the thermostat to call for cooling or heating, make sure the VFD ramps the blower to the correct speed.

Once the fan is at full speed, measure the air flow and static pressure, compare against the charts. If additional adjustment is needed, repeat the adjustment procedure.

J.3.2.1. Adjusting Fresh Air Flow with Economizer

See the above sections for measuring airflow, and refer to the I&O included with the Economizers for more information on adjusting airflow.

These I&Os can also be found on the manufacturer's website.

J.3.2.2. Adjusting Fresh Air Flow with Damper

All dampers are field installed accessories. See the above sections for measuring airflow, and refer to the I&O included with the fresh air dampers for more information on adjusting airflow.

Refer to local building codes for any fresh air requirements.

These I&Os can also be found on the manufacturer's website.

J. STARTUP AND OPERATION

J.4. Checking Cooling Operation

COOLING SEQUENCE OF OPERATION

A. Call for first-stage cooling.

1. The zone thermostat contacts close, and a call for first-stage cooling is initiated.
2. Inputs 'Y1' and 'G' to the control are energized.
3. The control senses input to 'Y1' and 'G'. After a 1 second delay, the control energizes both the indoor blower and first-stage compressor.
4. The control enters the normal operating loop where all inputs are continuously checked.
5. Zone thermostat is satisfied.
6. The blower will continue to run for a preset period of time after the zone thermostat is satisfied.
7. The control goes into standby mode displaying a "O".

B. Call for second-stage cooling. After first-stage cooling established; starting from A6.

1. If a call for second-stage cooling is initiated after a call for first-stage cooling is established, the control energizes 'Y2' and energizes the second-stage compressor.
2. Then the control enters the normal operating loop where all inputs are continuously checked.

C. Second-stage satisfied and first-stage still called for; starting from B2.

1. 'Y2' is de-energized and the second-stage compressor is de-energized.

D. First-stage and second-stage called simultaneously.

1. The zone thermostat contacts close, and a call for first and second-stage cooling is initiated.
2. Inputs 'Y1', 'Y2' and 'G' to the control are energized.
3. The control senses 'Y1', 'Y2' and 'G'. After a 1 second delay, the control energizes the indoor blower, and the first and second-stage compressors.

E. First-stage and second-stage removed simultaneously.

1. Upon a loss of 'Y1' and 'Y2', the compressor is de-energized. The control de-energizes the indoor blower relay, and cuts off the blower after an indoor blower delay.
2. The control goes into standby mode displaying a "O".

CONTINUOUS FAN MODE

A 'G' input only indicates a zone thermostat call for continuous indoor blower operation.

TIME DELAY BYPASS for non-DDC units

The Time Delay Bypass resets the ICC (Integrated Compressor Control) from any lockout mode or bypasses compressor anti-short cycle delay timer. To bypass the time delay, press the SW1 button with an insulated probe for 1 second and then release.

FAULT RECALL OPERATION for non-DDC units

To enter FAULT RECALL mode, press the SW1 button with an insulated probe for 2 seconds and release. Upon entering and exiting the FAULT RECALL mode, the top bottom segments of the 7-segment display will be activated. The ICC will automatically scroll through the stored faults on the 7-segment display. Each fault is displayed one time with the top segment of the 7-segment display activated between faults. Each fault is displayed with the most recent fault displayed first. An "O" will be displayed when no faults are stored. The ICC will automatically exit the FAULT RECALL mode after displaying stored faults.

An example of one LPC fault and one HPC fault scrolled on the display is shown as: -21-23

CLEAR FAULT HISTORY for non-DDC units.

To clear FAULT HISTORY, press the SW1 button with an insulated probe for 5 seconds and release. T

The top and bottom segments of the 7-segment display will be activated and flash to indicate the history has been cleared.

Example: =====

TEST MODE for DDC Units

For units with DDC, there is a "Run Test" mode that will aid in diagnostics during installation.

Please refer to the **Clear Control I&O**.

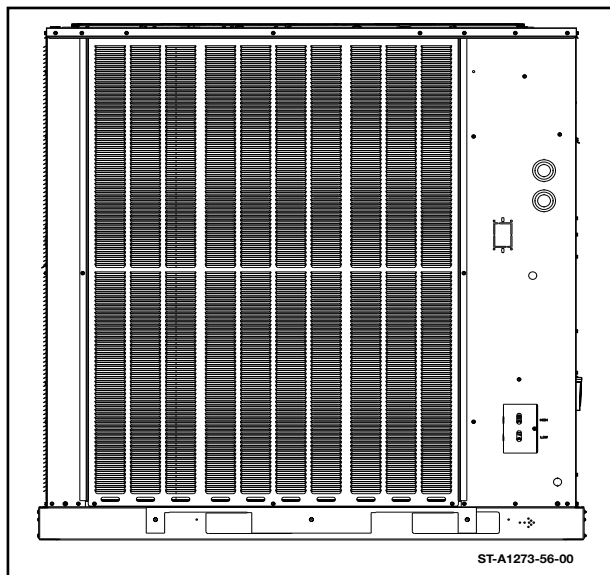
J. STARTUP AND OPERATION

J.4.1. Checking Refrigerant Pressures

This unitary packaged system comes fully charged and tested with R-454B refrigerant from the factory. Adjustment of the refrigerant charge is not required. If the unit is suspected of not having the proper refrigerant charge, any adjustment must not exceed 2% of the total refrigerant weight listed on the rating plate of the unit and should not supersede correctly weighed-in refrigerant.

See **Section C.2.1. Tools Required For Installing And Servicing R-454B Models.**

Figure J.4.1. -A: Service Port Location



J.4.1.1. Refrigerant Pressure Charts

See **Appendix G** towards the end of this manual for Refrigerant Pressure Charts.

J.4.2. Checking Sub Cooling for Adjusting Charge Weight

When breaking into the refrigeration circuit for any reason the procedure included in section **J.1.1.3. Removal and Evacuation of Refrigerant** must be followed.

Prior to recharging the system, complete a leak check and purge the system with inert gas as detailed in **J.1.1.3. Removal and Evacuation of Refrigerant**.

See **Appendix G** towards the end of this manual for Refrigerant Charging Charts.

Note: Factory charge chart and/or design target subcooling are for gross charge verification.

Charge verification instructions:

1. Allow the unit to operate for 15 minutes before checking or adjusting the charge.
2. Ensure that the contamination of different refrigerants does not occur when using

charging equipment. Hoses or lines must be as short as possible to minimize the amount of refrigerant contained in them.

3. Ensure that the unit is properly grounded.
4. Return air temperature must be within comfort conditions (72°F - 82°F).
5. Remove caps from the high-side and low-side pressure service fittings.
6. Cylinders must be kept in an upright position for the entirety of the testing and charging procedure.
7. Record the following measurements:
 - a. High-side pressure at service fitting
 - b. Liquid line temperature
8. Using R-454B refrigerant saturation T-P tables, find the corresponding refrigerant saturation temperature relative to the measured high-side pressure.
9. To determine subcooling, subtract the liquid line temperature measured in Step 7 from the saturation temperature found in Step 8.
10. Compare the subcooling result from Step 9 to the subcooling table located on the unit or in the I&O manual.
11. If the subcooling value from Step 9 is more than 1°F above the value listed in the subcooling table, remove charge to match the value listed in the table, $\pm 0.5^\circ\text{F}$.
 - a. Take extreme care not to overfill the refrigerating system.
12. If the subcooling value from Step 9 is more than 1°F below the value listed in the subcooling table, add charge to match the value listed in the table, $\pm 0.5^\circ\text{F}$.
 - a. Take extreme care not to overfill the refrigerating system.

After charging is complete, a leak test must be done. Before leaving the site an additional leak test must also be done at the end of the installation. Refer to **J.1.1.3. Removal and Evacuation of Refrigerant**.

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.

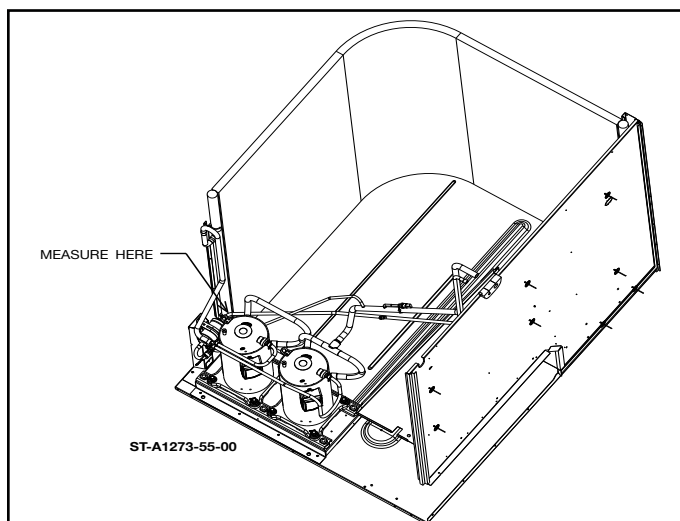
If the measured temperature difference is not reducing, or if the return air is not reaching the thermostat set point, the air flow is too low. Airflow must be increased by either removing the restrictions in the duct system, or by changing the air flow. See **Section J.3.2. Air Flow Measurements and 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.5. Checking Heating Operation

J.5.1. Gas Furnace

J.5.1.1. Measuring and Adjusting Supply Gas Pressures

The maximum gas inlet pressure to the furnace should be 10.5" WC for natural gas and 13.0" WC for LP gas the minimum gas inlet 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. Remove the inlet pressure tap plug using a 3/16" allen wrench; see Figure G.1.4. –A.
3. Install a 1/8" NPT pressure tap fitting and tighten using a 7/16" open end wrench.
4. Connect manometer using 1/4" I.D. hose over the pressure tap fitting.
5. Turn on the gas supply and operate the furnace and all other gas-fire units on the same gas line as the furnace.
6. Note or adjust the inlet gas pressure to give:
 - A: 5" - 10.5" W.C. for natural gas
 - B: 11" - 13" W.C. for LP gas
7. Shut off the gas at the manual gas-valve a remove the manometer and hose.

J. STARTUP AND OPERATION

8. Replace 1/8" NPT pressure tap fitting with the pressure tap plug and tighten using a 3/16" allen wrench.

9. 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 inlet 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 inlet pressure at the regulator.

If the supply gas inlet 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 inlet 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, 1.7" 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. Remove the manifold pressure tap plug using a 3/16" allen wrench; see **Figure G.1.4. - A**.

3. Install a 1/8" NPT pressure tap fitting and tighten using a 7/16" open end wrench.

4. Connect manometer using 1/4" I.D. hose over the pressure tap fitting.

5. Turn on the gas supply and operate the furnace by applying a heat call.

6. Note or adjust the manifold gas pressure to give:

C. 3.5" (± 0.3 ") W.C. high fire, 1.7" (± 0.3 ") W.C. low fire for natural gas

D. 10.0" (± 0.5 ") W.C. high fire and 4.9" (± 0.5 ") W.C. low fire for LP gas

7. To adjust the pressure regulators, remove adjustment screw cover.

8. Using the 3/32" allen wrench, turn the adjustment screw clockwise increase pressure, or counterclockwise to decrease the outlet pressure.

9. Replace the adjustment screw cover.

10. Shut off the gas at the manual gas-valve and remove the manometer and hose.

11. Replace 1/8" NPT pressure tap fitting with the pressure tap plug and tighten using a 3/16" allen wrench.

12. 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.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 exception of pilot burners.

Time the meter with only the furnace in 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) = $\frac{\text{HEATING VALUE OF GAS} \times 3600}{\text{TIME (IN SECONDS) FOR 1 CUBIC FOOT OF GAS}}$									

J. STARTUP AND 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 info.

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.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 H. 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 7.5-12.5 Ton Units

See **Section J.3.2. Air Flow Measurements and Adjustments** on how to increase the blower speed and increase airflow for the 7.5-12.5T units.

K.3. Economizer Adjustments

An economizer is designed to provide fresh air into the building and offer the potential for “Free” cooling when the outdoor temperature and humidity conditions are favorable to help save energy in the overall operation of the unit.

Having a properly operating economizer is important. See the instructions provided with the Economizer for the proper setup and operation of the system. Some models will feature a self-contained control module for programming and setup, others may use the control board, such as the Clear Control™ DDC, for managing the operation of the economizer.

Do not bypass the economizer or “fix” the dampers blades in an open position when the unit is off, this will cause the potential for undesired operations and conditions in the space.

M. HUMIDITY CONTROL

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.

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

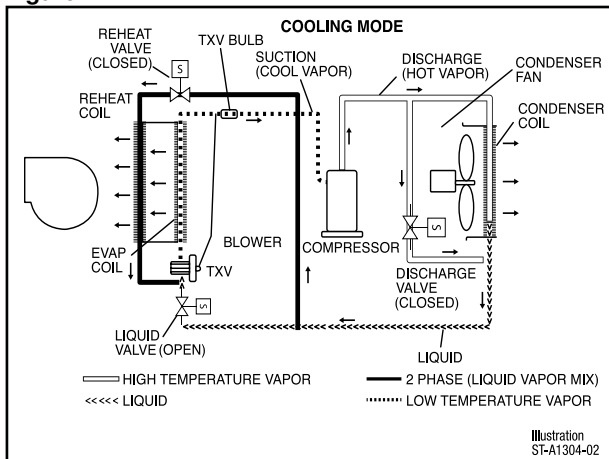


Figure M.1. - A shows the refrigerant path during the normal cooling mode. The liquid refrigerant leaves the TXV with the sudden pressure drop causing the liquid to expand to a vapor and absorbing the heat from the supply air going through the evaporator coil. The refrigerant vapor then travels to the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

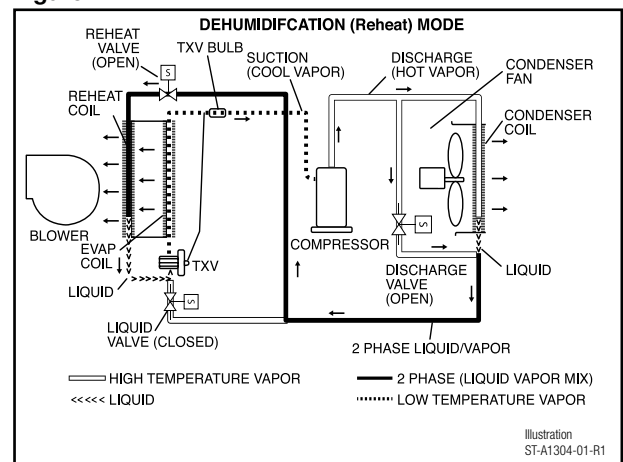


Figure M.1. - B shows the refrigerant path during the reheat mode. When the reheat cycle is energized by the RTU-C, the reheat solenoid valve, upstream of the reheat coil opens. The liquid solenoid valve ahead of the TXV, closes. The discharge solenoid valve, in the compressor discharge line, opens. 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 it condenses into a subcooled liquid where the process repeats itself.

M. HUMIDITY CONTROL

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)

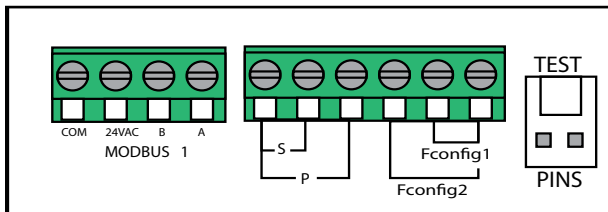
GREEN = Field Config 1 & 2 (Right most terminal) to GROUND

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

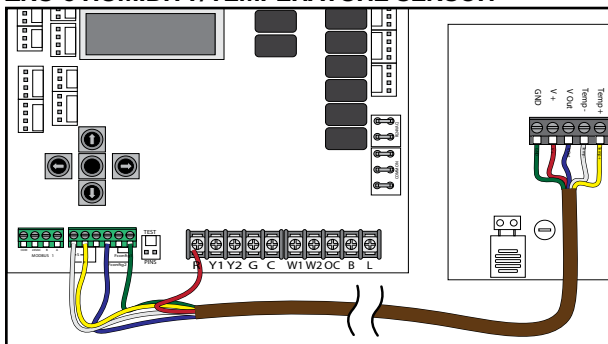
WHITE = S & P (Left most terminal) to Temp -

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)

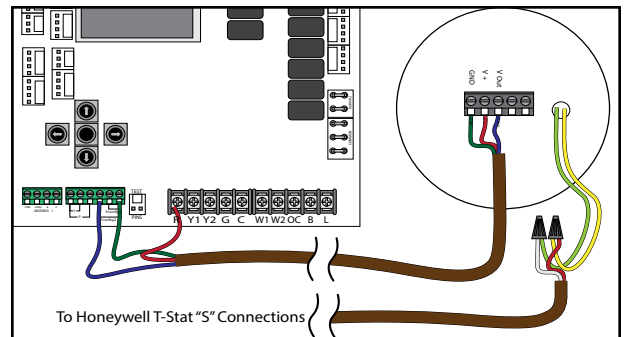
GREEN = Field Config 1 & 2 (Right most terminal) to GROUND

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

Other = Honeywell S- Terminal to Yellow Wire

Other = Honeywell S+ Terminal to Green Wire

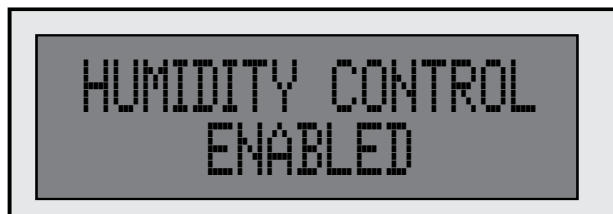
See the installation instructions for additional details.



M. HUMIDITY CONTROL

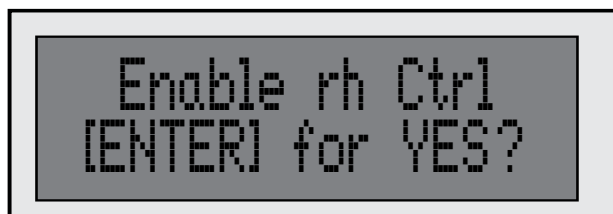
M.3. Humidity Control Settings and Configuration

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.

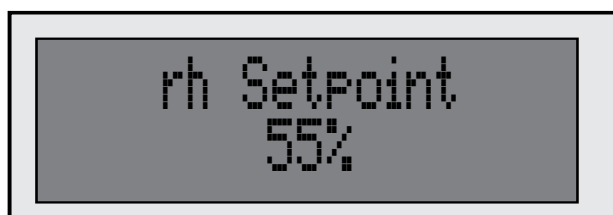


NOTICE: The system will not operate the humidity control when the outdoor ambient temperature is below 60°F, this is because the humidity control uses hot refrigerant bypassed from the outdoor coil,. When the ambient temperature is too low, insufficient heat will be retained in the refrigerant to properly 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.

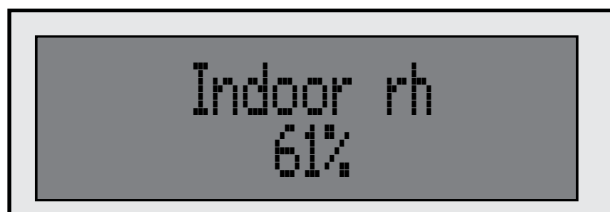


Now set the Reheat Mode, there are three functions to choose from, Reheat in Occupied, will only run dehumidification when there is a Fan or Cooling Call. Reheat in Unoccupied, will on run dehumidification when there is no fan or cooling call; Reheat ALL, (recommended) will run reheat based on the humidity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



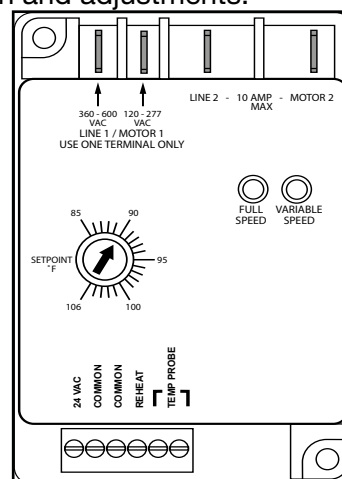
Checking the Humidity Sensor reading, Navigate to Humidity Control then down to Indoor rh, this will display the reading from the humidity zone sensor. If this shows "4%" then it means that the zone sensor is not connected properly or malfunctioning.

Verify a 0-10VDC signal across the Field Cnfg 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 - Defective 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- - Replace thermostat wiring"
Condenser fan runs, compressor doesn't	- Run capacitor defective (single phase only) - Loose connection - Compressor stuck, grounded or open motor winding open internal overload. - Low voltage condition	- Replace - 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."
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 [188.78 L/s] 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 - Room thermostat set too low	- Increase speed of blower or reduce restriction - replace air filter - Raise thermostat set point
High head-low vapor pressures	- Restriction in liquid line, expansion device or filter drier - Flow check piston size too small - Incorrect capillary tubes	- Remove or replace defective component - Change to correct size piston - Change coil assembly
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
High head-high or normal vapor pressure - Heating mode	- Low air flow - condenser coil - Refrigerant overcharge - Air or non-condensibles in system - Dirty condenser coil	- Check filters - correct to speed - Correct system charge - Recover refrigerant, evacuate & recharge - Check filter - clean coil
Low head-high vapor pressures	Defective Compressor valves	Replace compressor
Low vapor - cool compressor - iced evaporator coil	- Low evaporator airflow - Operating below 65°F outdoors - Moisture in system - Liquid line limiting refrigerant flow	- Increase speed of blower or reduce restriction - replace air filter - Add Low Ambient Kit - Recover refrigerant - evacuate & recharge - add filter drier - Replace drier
High vapor pressure	- Excessive load - Defective compressor	- Recheck load calculation - Replace
Fluctuating head & vapor pressures	- Severe overcharge - Air or non-condensibles in system	- Adjust refrigerant charge - 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.1.2. Gas 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	2ND STAGE 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	1ST. STAGE COMBUSTION PRESS SWITCH CLOSED	Problem
46	1ST. STAGE COMBUSTION PRESS SWITCH 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	2ND STAGE COMBUSTION PRESSURE SWITCH OPEN	Problem, shutdown
59	Condensate Drain Plugged	Shutdown
61	BLOWER FAULT - NO RUN	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