Indoor Airflow and Airflow Adjustments

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in unit damage.

For cooling operation, the recommended airflow is 350 to 450 cfm for each 12,000 BTU/h of rated cooling capacity. For heating operation, the airflow must produce a temperature rise that falls within the range stamped on the unit rating plate.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Disconnect electrical power to the unit and install lockout tag before changing blower speed.

NOTE: Be sure that all supply–and return–air grilles are open, free from obstructions, and adjusted properly. Airflow can be changed using the User Interface.

Table 8 shows the temperature rise in each heating mode. Refer to these tables to determine the desired heating airflow for the system being installed. (See Table 9 for wet coil pressure drop).

Airflow can be changed by changing the lead connections of the blower motor. Refer to Table 3 for motor lead color coding (208/230V).

Model sizes 24, 36, 42 and 60 are factory wired for low speed. Model sizes 30 and 48 are factory wired for medium speed.

To change the speed of the indoor fan motor (IFM), remove the fan motor speed leg lead from the blower relay (BR). This wire is attached to terminal blower motor (BM) of the integrated gas control (IGC) board for single–phase units. To change the speed, remove and replace with lead for desired blower motor speed. Insulate the removed lead to avoid contact with chassis parts.

Table 3 – Color Coding for 208/230V Motor Leads

Black = High Speed
Blue = Medium Speed
Red = Low Speed

Continuous Fan Operation

The continuous fan operates at the same fan speed as cooling operation.

Cooling Sequence of Operation

With the room thermostat SYSTEM switch in the COOL position and the FAN switch in the AUTO position, the cooling sequence of operation is as follows:

1. When the room temperature rises to a point that is slightly above the cooling control setting of the thermostat, the thermostat completes the circuit between thermostat terminal R to terminals Y and G.
2. The normally open contacts of energized contactor (C) close and complete the circuit through compressor motor (COMP) to condenser (outdoor) fan motor (OFM). Both motors start instantly.

   NOTE: 3–phase, scroll compressors will run backwards if not wired correctly. Unit must be checked to ensure proper compressor 3–phase power lead orientation. If not corrected within 5 minutes, the internal protector will shut off the compressor. To change the rotation of the compressor, swap any two of the three power leads. When turning backwards, the difference between compressor suction and discharge pressures will be minimal.
3. The set of normally open contacts of energized relay BM close and complete the circuit through evaporator blower (indoor) fan motor (IFM).

NOTE:The cooling cycle remains on until the room temperature drops to a point that is slightly below the cooling control setting of the room thermostat. At this point, the thermostat breaks the circuit between thermostat terminal R to terminals Y and G. These open circuits deenergize contactor coil C. The condenser and compressor motors stop. After a 30 second delay, the blower motor stops. The unit is in a standby condition, waiting for the next call for cooling from the room thermostat.

MAINTENANCE

To ensure continuing high performance and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This unit should be inspected at least once each year by a qualified service person. To troubleshoot unit, refer to Tables 11, 12, and 13 – Troubleshooting Charts.

NOTE TO EQUIPMENT OWNER: Consult your local dealer about the availability of a maintenance contract.

⚠ WARNING

PERSONAL INJURY AND UNIT DAMAGE HAZARD

Failure to follow this warning could result in personal injury or death and unit component damage.

The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment, other than those procedures recommended in the Owner's Manual.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow these warnings could result in personal injury or death:

1. Turn off electrical power to the unit before performing any maintenance or service on this unit. Install lock-out tag.
2. Use extreme caution when removing panels and parts.
3. Never place anything combustible either on or in contact with the unit.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper operation.

Errors made when reconnecting wires may cause improper and dangerous operation. Label all wires prior to disconnecting when servicing.

The minimum maintenance requirements for this equipment are as follows:

1. Inspect air filter(s) each month. Clean or replace when necessary.
2. Inspect indoor coil, drain pan, and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect blower motor and wheel for cleanliness at the beginning of each heating and cooling season. Clean when necessary. For first heating and cooling season, inspect blower wheel bi-monthly to determine proper cleaning frequency.
4. Check electrical connections for tightness and controls for proper operation each heating and cooling season. Service when necessary.
5. Ensure electric wires are not in contact with refrigerant tubing or sharp metal edges.
6. Check and inspect heating section before each heating season. Clean and adjust when necessary.
7. Check flue hood and remove any obstructions, if necessary.

Air Filter

NOTE: Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 2 for recommended filter sizes.

Inspect air filter(s) at least once each month and replace (throwaway-type) or clean (cleanable-type) at least twice during each cooling season and twice during the heating season, or whenever the filter becomes clogged with dust and lint.

Evaporator (Indoor) Motor and Blower

NOTE: All motors are pre-lubricated. Do not attempt to lubricate these motors.

For longer life, operating economy, and continuing efficiency, clean accumulated dirt and grease from the blower wheel and motor annually.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Disconnect and tag electrical power to the unit before cleaning and lubricating the blower motor and wheel.

To clean the blower motor and wheel:

1. Remove and disassemble blower assembly as follows:
   a. Remove unit access panel.
   b. Disconnect motor lead from blower relay (BM). Disconnect yellow lead from terminal L2 of the contactor.
   c. On all units remove blower assembly from unit. Remove screws securing blower to blower partition and slide assembly out. Be careful not to tear insulation in blower compartment.
   d. Ensure proper reassembly by marking blower wheel and motor in relation to blower housing before disassembly.
   e. Loosen set screw(s) that secures wheel to motor shaft, remove screws that secure motor mount brackets to housing, and slide motor and motor mount out of housing.
2. Remove and clean blower wheel as follows:
   a. Ensure proper reassembly by marking wheel orientation.
   b. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower wheel vanes.
   c. Remove caked-on dirt from wheel and housing with a brush. Remove lint and/or dirt accumulations from wheel and housing with vacuum cleaner, using soft brush attachment. Remove grease and oil with mild solvent.
   d. Reassemble wheel into housing.
   e. Reassemble motor into housing. Be sure setscrews are tightened on motor shaft flats and not on round part of shaft.
   f. Connect motor lead to blower relay (BM). Connect yellow lead to terminal L2 of the contactor
   g. Reinstall unit access panel.
3. Restore electrical power to unit. Start unit and check for proper blower rotation and motor speeds during heating and cooling cycles.

Induced Draft (Combustion Air) Blower

Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during the heating season. For the first heating season, inspect blower wheel bimonthly to determine proper cleaning frequency.

To inspect blower wheel, remove draft hood assembly. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel as follows:

1. Remove unit access panel (see Figure 17).

2. Remove the 5 screws that attach induced-draft motor mounting plate to blower housing (see Figure 19).
3. Slide the assembly out of the blower housing (see Figure 19). Clean the blower wheel. If additional cleaning is required, continue with Steps 4 and 5.
4. To remove blower wheel, remove 2 setscrews.
5. To remove motor and cooling fan assembly, remove 4 screws that hold blower housing to mounting plate.
6. To reinstall, reverse the procedure outlined above.

Flue Gas Passageways

To inspect the flue collector box and upper areas of the heat exchanger:

1. Remove the induced draft blower assembly according to directions in the Induced Draft Blower Assembly section.
2. Remove the 11 screws holding the flue collector box cover (see Figure 18) to the heat exchanger assembly. Inspect the heat exchangers.
3. Clean all surfaces, as required, using a wire brush.

Limit Switch

Remove unit access panel. Limit switch is located on the blower partition.

Burner Ignition

Unit is equipped with a direct spark ignition 100 percent lockout system. Ignition module is located in the control box (see Figure 18). Module contains a self-diagnostic LED. During servicing, refer to Table 5 or unit label diagram for LED interpretation.

If lockout occurs, unit may be reset by either momentarily interrupting power supply to unit or by turning selector switch to OFF position at the thermostat.

Main Burners

At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames and adjust, if necessary.

Removal of Gas Train

To remove the gas train for servicing:

1. Shut off main gas valve.
2. Shut off power to unit and install lockout tag.
3. Remove unit access panel (see Figure 17).
4. Disconnect gas piping at unit gas valve.
5. Remove wires connected to gas valve. Mark each wire.
6. Remove ignitor and sensor wires at the ignitor module.
7. Remove the mounting screw that attaches the burner rack to the unit base (see Figure 18).
8. Slide the burner rack out of the unit (see Figures 18 and 20).
9. To reinstall, reverse the procedure outlined above.

Outdoor Coil, Indoor Coil, and Condensate Drain Pan

Inspect the condenser coil, evaporator coil, and condensate drain pan at least once each year.

The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs, that interfere with the airflow through the condenser coil.

Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner, using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent and water solution. Rinse coils with clear water, using a garden hose. Be careful not to splash water on motors, insulation, wiring, or air filter(s). For best results, spray condenser coil fins from inside to outside the unit. On units with an outer and inner condenser coil, be sure to clean between the coils. Be sure to flush all dirt and debris from the unit base.

Inspect the drain pan and condensate drain line when inspecting the coils. Clean the drain pan and condensate drain by removing all foreign matter from the pan. Flush the pan and drain trough with clear water. Do not splash water on the insulation, motor, wiring, or air filter(s). If the drain trough is restricted, clear it with a “plumbers snake” or similar probe device.

FIGURE 17 Unit Access Panel

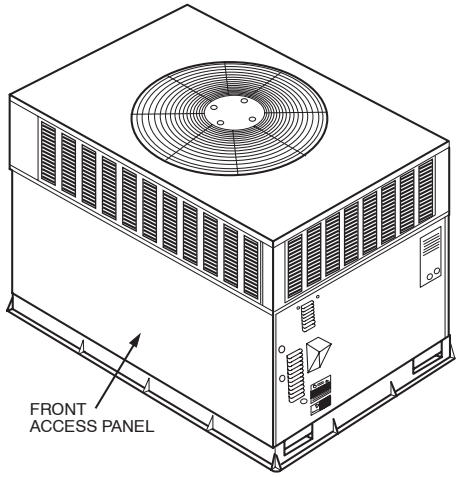


FIGURE 18 Blower Housing and Flue Collector Box

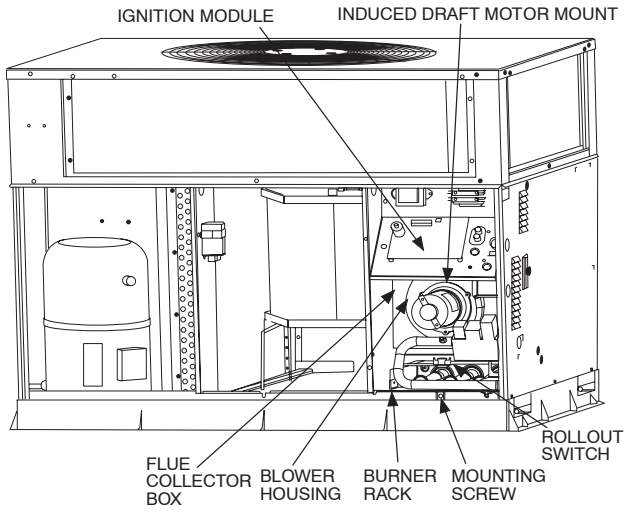


FIGURE 19 Removal of Motor and Blower Wheel

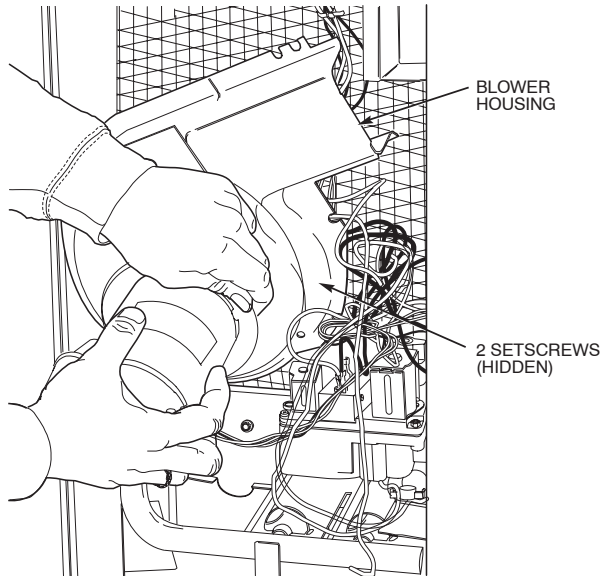
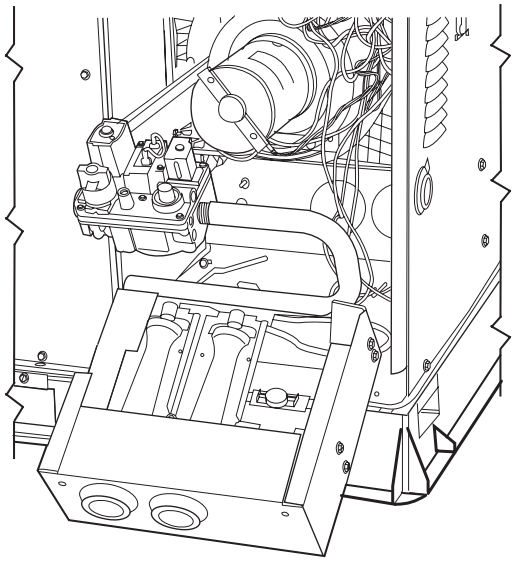


FIGURE 20 Burner Rack Removed



Outdoor Fan

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in damage to unit components.

Keep the condenser fan free from all obstructions to ensure proper cooling operation. Never place articles on top of the unit.

1. Remove 6 screws holding discharge grille and motor to top cover.
2. Turn motor/grille assembly upside down on top cover to expose fan blade.
3. Inspect the fan blades for cracks or bends.
4. If fan needs to be removed, loosen setscrew and slide fan off motor shaft.
5. When replacing fan blade, position blade so that the hub is ⅛" (3.2mm) away from the motor end (⅛" (3.2mm) of motor shaft will be visible).
6. Ensure that setscrew engages the flat area on the motor shaft when tightening.
7. Replace grille.

Electrical Controls and Wiring

Inspect and check the electrical controls and wiring annually. Be sure to turn off the electrical power to the unit.

Remove access panel to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any smoky or burned connections are noticed, disassemble the connection, clean all the parts, re-strip the wire end and reassemble the connection properly and securely.

After inspecting the electrical controls and wiring, replace all the panels. Start the unit, and observe at least one complete cooling cycle to ensure proper operation. If discrepancies are observed in operating cycle, or if a suspected malfunction has occurred, check each electrical

component with the proper electrical instrumentation. Refer to the unit wiring label when making these checks.

NOTE: Refer to the Cooling Sequence of Operation in this document to understand proper control operation.

Refrigeration Circuit

Annually inspect all refrigerant tubing connections and the unit base for oil accumulations. Detecting oil generally indicates a refrigerant leak.

⚠ WARNING

EXPLOSION, SAFETY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could result in personal injury, death or property damage.

System under pressure. Relieve pressure and recover all refrigerant before system repair or final unit disposal. Use all service ports and open all flow-control devices, including solenoid valves.

If oil is detected or if low cooling performance is suspected, leak-test all refrigerant tubing using an electronic leak-detector, halide torch, or liquid-soap solution. If a refrigerant leak is detected, refer to the Check for Refrigerant Leaks section.

If no refrigerant leaks are found and low cooling performance is suspected, refer to the Checking and Adjusting Refrigerant Charge section.

Gas Input

The gas input does not require checking unless improper heating performance is suspected. If a problem exists, refer to the Start-Up section.

Evaporator Airflow

The heating and/or cooling airflow does not require checking unless improper performance is suspected. If a problem exists, be sure that all supply- and return-air grilles are open and free from obstructions, and that the air filter is clean. When necessary, refer to the Indoor Airflow and Airflow Adjustments section to check the system airflow.

R-410A Items

Metering Device (Thermostatic Expansion Valve)

This metering device is a hard shutoff, balance port TXV. The TXV maintains a constant superheat at the evaporator exit resulting in higher overall system efficiency.

Pressure Switches

Pressure switches are protective devices wired into control circuit (low voltage). They shut off compressor if abnormally high or low pressures are present in the refrigeration circuit. These pressure switches are specifically designed to operate with R-410A systems. R-22 pressure switches must not be used as replacements for the R-410A system.

Loss of Charge Switch

This switch is located on the liquid line and protects against low suction pressures caused by such events as loss of charge, low airflow across indoor coil, dirty filters, etc. It opens on a pressure drop at about 20 psig. If system pressure is above this, switch should be closed. To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

NOTE:Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 psi. Never open system without breaking vacuum with dry nitrogen.

High-Pressure Switch

The high-pressure switch is located in the discharge line and protects against excessive condenser coil pressure. It opens at 650 psig.

High pressure may be caused by a dirty outdoor coil, failed fan motor, or outdoor air recirculation. To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

Copeland Scroll Compressor (R-410A Refrigerant)

The compressor used in this product is specifically designed to operate with R-410A refrigerant and cannot be interchanged.

The compressor is an electrical (as well as mechanical) device. Exercise extreme caution when working near compressors. Power should be shut off, if possible, for most troubleshooting techniques. Refrigerants present additional safety hazards.

⚠ WARNING

FIRE/EXPLOSION HAZARD

Failure to follow this warning could result in personal injury or death and/or property damage.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

The scroll compressor pumps refrigerant throughout the system by the interaction of a stationary and an orbiting scroll. The scroll compressor has no dynamic suction or discharge valves, and it is more tolerant of stresses caused by debris, liquid slugging, and flooded starts. The compressor is equipped with an anti-rotational device and an internal pressure relief port. The anti-rotational device prevents the scroll from turning backwards and replaces the need for a cycle protector. The pressure relief port is a safety device, designed to protect against extreme high pressure. The relief port has an operating range between 550 psi (26.34 kPa) and 625 psi (29.93 kPa) differential pressure.

⚠ WARNING

EXPLOSION, ENVIRONMENTAL SAFETY HAZARD

Failure to follow this warning could result in personal injury, death or equipment damage.

This system uses R-410A refrigerant which has higher operating pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gauge set, hoses, and recovery system must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer.

Compressor Oil

The Copeland scroll compressor uses Mobil 3MAF POE oil. Copeland Ultra 22 CC should be used if additional oil is needed in the field. Mobil Arctic EAL22CC or ICI Emkarate RL22 or 32CF oil may be used to recharge these compressors if Ultra 22 is not available.

This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

Servicing Systems on Roofs with Synthetic Materials

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials.

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device, coil, accumulator, or reversing valve.

Synthetic Roof Precautionary Procedure

1. Cover extended roof working area with an impermeable polyethylene (plastic) drip cloth or tarp. Cover an approximate 10 X 10 ft. (3.1 m X 3.1 m) area.
2. Place terry cloth shop towel inside unit immediately under component(s) to be serviced and prevent lubricant run-offs through the louvered openings in the unit base.
3. Perform required service.
4. Remove and dispose of any oil contaminated material per local codes.

Liquid Line Filter Drier

This filter drier is specifically designed to operate with R-410A. Use only factory-authorized components. Filter drier must be replaced whenever the refrigerant system is opened. When removing a filter drier, use a tubing cutter to cut the drier from the system. Do not unsweat a filter drier from the system. Heat from unsweating will release moisture and contaminants from drier into system.

R-410A Refrigerant Charging

Refer to unit information plate and charging chart. Some R-410A refrigerant cylinders contain a dip tube to allow liquid refrigerant to flow from cylinder in upright position. For cylinders equipped with a dip tube, charge R-410A units with cylinder in upright position and a commercial metering device in manifold hose. Charge refrigerant into suction-line.

TROUBLESHOOTING

Use the Troubleshooting Guides (see Tables 11, 12, and 13) if problems occur with these units.

STARTUP CHECKLIST

Use Start-Up checklist to ensure proper start-up procedures are followed.

Table 8—Dry Coil Air Delivery* - Horizontal and Downflow Discharge (Deduct 10% for 208 Volts)

Model	Heating Rise Range	Motor Speed		External Static Pressure (Inches Water Column)								
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PGD324040	20 – 50 (11 – 28)	Low[1]	Watts	311	309	304	301	286	290	286	280	– –
			CFM	935	885	820	757	686	583	423	263	– –
			Heating Rise °F	32	34	37	40	44	NA	NA	NA	NA
			°C	18	19	20	22	24				
		Medium	Watts	411	405	398	390	379	357	357	345	327
			CFM	1195	1155	1100	1028	957	868	769	647	365
			Heating Rise °F	25	26	27	29	31	35	39	46	NA
			°C	14	14	15	16	17	19	22	26	
		High	Watts	528	518	509	492	477	467	447	435	421
			CFM	1484	1421	1368	1279	1185	1088	970	853	712
			Heating Rise °F	20	21	22	23	25	28	31	35	42
			°C	11	12	12	13	14	15	17	20	23
PGD324060	35 – 65 (19 – 36)	Low[1]	Watts	311	309	304	301	286	290	286	280	– –
			CFM	935	885	820	757	686	583	423	263	– –
			Heating Ris °F	48	51	55	59	NA	NA	NA	NA	NA
			°C	27	28	30	33					
		Medium	Watts	411	405	398	390	379	357	357	345	327
			CFM	1195	1155	1100	1028	957	868	769	647	365
			Heating Rise °F	38	39	41	44	47	52	59	NA	NA
			°C	21	22	23	24	26	29	33		
		High	Watts	528	518	509	492	477	467	447	435	421
			CFM	1484	1421	1368	1279	1185	1088	970	853	712
			Heating Rise °F	NA	NA	NA	35	38	41	46	53	63
			°C				20	21	23	26	29	35
PGD330040	20 – 50 (11 – 28)	Low	Watts	311	309	304	301	286	290	286	280	– –
			CFM	935	885	820	757	686	583	423	263	– –
			Heating Rise °F	32	34	37	40	44	NA	NA	NA	NA
			°C	18	19	20	22	24				
		Me-dium[1]	Watts	411	405	398	390	379	357	357	345	327
			CFM	1195	1155	1100	1028	957	868	769	647	365
			Heating Rise °F	25	26	27	29	31	35	39	46	NA
			°C	14	14	15	16	17	19	22	26	
		High	Watts	528	518	509	492	477	467	447	435	421
			CFM	1484	1421	1368	1279	1185	1088	970	853	712
			Heating Rise °F	20	21	22	23	25	28	31	35	42
			°C	11	12	12	13	14	15	17	20	23
PGD330060	35 – 65 (19 – 36)	Low	Watts	311	309	304	301	286	290	286	280	– –
			CFM	935	885	820	757	686	583	423	263	– –
			Heating Rise °F	48	51	55	59	NA	NA	NA	NA	NA
			°C	27	28	30	33					
		Me-dium[1]	Watts	411	405	398	390	379	357	357	345	327
			CFM	1195	1155	1100	1028	957	868	769	647	365
			Heating Rise °F	38	39	41	44	47	52	59	NA	NA
			°C	21	22	23	24	26	29	33		
		High	Watts	528	518	509	492	477	467	447	435	421
			CFM	1484	1421	1368	1279	1185	1088	970	853	712
			Heating Rise °F	NA	NA	NA	35	38	41	46	53	63
			°C				20	21	23	26	29	35
PGD336060	25 – 55 (14 – 31)	Low[1]	Watts	439	429	415	401	395	380	356	339	329
			CFM	1242	1170	1089	994	917	837	702	570	442
			Heating Rise °F	36	38	41	45	49	54	NA	NA	NA
			°C	20	21	23	25	27	30			
		Medium	Watts	503	491	479	461	450	436	418	404	389
			CFM	1320	1244	1162	1081	1005	897	767	662	541
			Heating Rise °F	34	36	39	42	45	50	NA	NA	NA
			°C	19	20	22	23	25	28			
		High	Watts	641	627	623	609	601	588	571	559	548
			CFM	1362	1288	1205	1119	1033	933	826	714	580
			Heating Rise °F	33	35	37	40	44	48	54	NA	NA
			°C	18	19	21	22	24	27	30		

- refer to Notes at the end of the table -

Model	Heating Rise Range	Motor Speed		External Static Pressure (Inches Water Column)								
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PGD336090	40 – 70 (22 – 39)	Low[1]	Watts	439	429	415	401	395	380	356	339	329
			CFM	1242	1170	1089	994	917	837	702	570	442
			Heating Rise °F	54	58	62	68	NA	NA	NA	NA	NA
			°C	30	32	34	38					
		Medium	Watts	503	491	479	461	450	436	418	404	389
			CFM	1320	1244	1162	1081	1005	897	767	662	541
			Heating Rise °F	51	54	58	62	67	NA	NA	NA	NA
			°C	28	30	32	35	37				
		High	Watts	641	627	623	609	601	588	571	559	548
			CFM	1362	1288	1205	1119	1033	933	826	714	580
			Heating Rise °F	50	52	56	60	65	NA	NA	NA	NA
			°C	28	29	31	34	36				
PGD342060	25 – 55 (14 – 31)	Low[1]	Watts	559	540	522	503	483	464	445	425	406
			CFM	1405	1370	1330	1283	1230	1171	1106	1034	957
			Heating Rise °F	32	33	34	35	37	38	41	44	47
			°C	18	18	19	19	20	21	23	24	26
		Medium	Watts	665	647	629	609	589	567	545	521	497
			CFM	1593	1552	1505	1452	1394	1330	1260	1184	1102
			Heating Rise °F	28	29	30	31	32	34	36	38	41
			°C	16	16	17	17	18	19	20	21	23
		High	Watts	815	795	775	754	734	715	695	676	656
			CFM	1764	1710	1652	1591	1525	1456	1383	1306	1225
			Heating Rise °F	26	26	27	28	30	31	33	34	37
			°C	14	14	15	16	16	17	18	19	20
PGD342090	40 – 70 (22 – 39)	Low[1]	Watts	559	540	522	503	483	464	445	425	406
			CFM	1405	1370	1330	1283	1230	1171	1106	1034	957
			Heating Rise °F	48	49	51	53	55	58	61	65	NA
			°C	27	27	28	29	30	32	34	36	
		Medium	Watts	665	647	629	609	589	567	545	521	497
			CFM	1593	1552	1505	1452	1394	1330	1260	1184	1102
			Heating Rise °F	42	43	45	46	48	51	54	57	61
			°C	24	24	25	26	27	28	30	32	34
		High	Watts	815	795	775	754	734	715	695	676	656
			CFM	1764	1710	1652	1591	1525	1456	1383	1306	1225
			Heating Rise °F	NA	NA	41	42	44	46	49	52	55
			°C			23	24	25	26	27	29	31
PGD348090	25 – 55 (14 – 31)	Low	Watts	627	617	607	584	567	548	528	503	480
			CFM	1550	1530	1493	1461	1414	1361	1320	1250	1177
			Heating Rise °F	44	44	45	46	48	50	51	54	NA
			°C	24	24	25	26	27	28	28	30	
		Me-dium[1]	Watts	771	755	734	711	690	665	639	607	572
			CFM	1798	1771	1734	1687	1645	1595	1530	1449	1355
			Heating Rise °F	38	38	39	40	41	42	44	47	50
			°C	21	21	22	22	23	24	25	26	28
		High	Watts	969	941	908	887	858	827	804	767	748
			CFM	2124	2071	2000	1944	1876	1811	1735	1647	1555
			Heating Rise °F	32	33	34	35	36	37	39	41	43
			°C	18	18	19	19	20	21	22	23	24
PGD348115	35 – 65 (19 – 36)	Low	Watts	627	617	607	584	567	548	528	503	480
			CFM	1550	1530	1493	1461	1414	1361	1320	1250	1177
			Heating Rise °F	56	56	58	59	61	63	65	NA	NA
			°C	31	31	32	33	34	35	36		
		Me-dium[1]	Watts	771	755	734	711	690	665	639	607	572
			CFM	1798	1771	1734	1687	1645	1595	1530	1449	1355
			Heating Rise °F	48	49	50	51	52	54	56	60	64
			°C	27	27	28	28	29	30	31	33	35
		High	Watts	969	941	908	887	858	827	804	767	748
			CFM	2124	2071	2000	1944	1876	1811	1735	1647	1555
			Heating Rise °F	41	42	43	44	46	48	50	52	55
			°C	23	23	24	25	26	26	28	29	31
PGD348130	40 – 70 (22 – 39)	Low	Watts	627	617	607	584	567	548	528	503	480
			CFM	1550	1530	1493	1461	1414	1361	1320	1250	1177
			Heating Rise °F	63	64	65	67	69	NA	NA	NA	NA
			°C	35	35	36	37	38				
		Me-dium[1]	Watts	771	755	734	711	690	665	639	607	572
			CFM	1798	1771	1734	1687	1645	1595	1530	1449	1355
			Heating Rise °F	54	55	56	58	59	61	64	67	NA
			°C	30	31	31	32	33	34	35	37	
		High	Watts	969	941	908	887	858	827	804	767	748
			CFM	2124	2071	2000	1944	1876	1811	1735	1647	1555
			Heating Rise °F	46	47	49	50	52	54	56	59	63
			°C	26	26	27	28	29	30	31	33	35

- refer to Notes at the end of the table -

Model	Heating Rise Range	Motor Speed		External Static Pressure (Inches Water Column)								
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PGD360090	25 – 55 (14 – 31)	Low[1]	Watts	786	769	754	736	722	705	684	658	616
			CFM	2027	1960	1901	1821	1759	1693	1616	1513	1354
			Heating Rise °F	33	34	36	37	38	40	42	45	50
			°C	19	19	20	21	21	22	23	25	28
		Medium	Watts	873	849	833	815	798	782	763	748	704
			CFM	2095	2026	1962	1887	1817	1748	1679	1583	1439
			Heating Rise °F	32	33	34	36	37	39	40	43	47
			°C	18	19	19	20	21	21	22	24	26
		High	Watts	1012	993	981	963	948	927	904	886	846
			CFM	2184	2109	2036	1963	1886	1812	1729	1647	1496
			Heating Rise °F	31	32	33	34	36	37	39	41	45
			°C	17	18	18	19	20	21	22	23	25
PGD360115	35 – 65 (19 – 36)	Low[1]	Watts	786	769	754	736	722	705	684	658	616
			CFM	2027	1960	1901	1821	1759	1693	1616	1513	1354
			Heating Rise °F	43	44	45	47	49	51	53	57	64
			°C	24	24	25	26	27	28	30	32	35
		Medium	Watts	873	849	833	815	798	782	763	748	704
			CFM	2095	2026	1962	1887	1817	1748	1679	1583	1439
			Heating Rise °F	41	43	44	46	47	49	51	54	60
			°C	23	24	24	25	26	27	29	30	33
		High	Watts	1012	993	981	963	948	927	904	886	846
			CFM	2184	2109	2036	1963	1886	1812	1729	1647	1496
			Heating Rise °F	39	41	42	44	46	48	50	52	58
			°C	22	23	24	24	25	26	28	29	32
PGD360130	40 – 70 (22 – 39)	Low[1]	Watts	786	769	754	736	722	705	684	658	616
			CFM	2027	1960	1901	1821	1759	1693	1616	1513	1354
			Heating Rise °F	48	50	51	54	55	58	60	64	NA
			°C	27	28	28	30	31	32	34	36	
		Medium	Watts	873	849	833	815	798	782	763	748	704
			CFM	2095	2026	1962	1887	1817	1748	1679	1583	1439
			Heating Rise °F	47	48	50	52	54	56	58	62	68
			°C	26	27	28	29	30	31	32	34	38
		High	Watts	1012	993	981	963	948	927	904	886	846
			CFM	2184	2109	2036	1963	1886	1812	1729	1647	1496
			Heating Rise °F	45	46	48	50	52	54	56	59	65
			°C	25	26	27	28	29	30	31	33	36

***** Air delivery values are without air filter and are for dry coil (See Wet Coil Pressure Drop table).

1 Factory-shipped heating/cooling speed

NA - Not allowed for heating speed

Note: Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.

Table 9—Wet Coil Pressure Drop

MODEL SIZE	STANDARD CFM (S.C.F.M.)														
	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
	Pressure Drop (inches water column)														
24	0.030	0.037	0.044	0.053	0.063	-	-	-	-	-	-	-	-	-	-
30	-	0.037	0.044	0.053	0.063	0.072	0.081	0.105	-	-	-	-	-	-	-
36	-	-	-	0.05	0.061	0.072	0.08	0.09	0.11	-	-	-	-	-	-
42	-	-	-	-	0.044	0.051	0.059	0.065	0.072	0.080	0.088	0.095	0.105	-	-
48	-	-	-	-	-	-	0.044	0.050	0.053	0.059	0.066	0.072	0.077	0.086	-
60	-	-	-	-	-	-	-	-	-	0.079	0.087	0.095	0.102	0.113	0.123

Table 10—Filter Pressure Drop Table

FILTER SIZE	CFM																		
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
	Pressure Drop (inches water column)																		
20 x 24 x 1	—	—	—	—	0.09	0.1	0.11	0.13	0.14	0.15	0.16	—	—	—	—	—	—	—	—
24 x 30 x 1	—	—	—	—	—	—	—	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
24 x 36 x 1	—	—	—	—	—	—	—	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.12	0.13	0.14	0.14

Table 11—Troubleshooting Guide - Cooling

SYMPTOM	CAUSE	REMEDY
Compressor and condenser fan will not start.	Power failure	Call power company
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	Defective contactor, transformer, or high-pressure, loss-of-charge or low-pressure switch	Replace component
	Insufficient line voltage	Determine cause and correct
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly
	Thermostat setting too high	Lower Thermostat temperature setting below room temperature
Compressor will not start but condenser fan runs	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace
	Compressor motor burned out, seized, or internal overload open	Determine cause Replace compressor
	Defective run/start capacitor, overload, start relay	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker Determine cause
	Low input voltage (20% low)	Determine cause and correct
Three-phase scroll compressor has a low pressure differential	Scroll compressor is running backwards	Swap any two of the three power supply leads to the unit and remeasure pressures
Compressor cycles (other than normally satisfying UI)	Refrigerant overcharge or undercharge	Recover refrigerant, evacuate system, and recharge to capacities shown on rating plate
	Defective compressor	Replace and determine cause
	Insufficient line voltage	Determine cause and correct
	Blocked outdoor coil	Determine cause and correct
	Defective run/start capacitor	Determine cause and replace
	Faulty outdoor fan motor or capacitor	Replace
	Restriction in refrigerant system	Locate restriction and remove
Compressor operates continuously	Dirty air filter	Replace filter
	Unit undersized for load	Decrease load or increase unit size
	Thermostat temperature set too low	Reset Thermostat
	Low refrigerant charge	Locate leak, repair, and recharge
	Air in system	Recover refrigerant, evacuate system, and recharge
	Outdoor coil dirty or restricted	Clean coil or remove restriction
Excessive head pressure	Dirty air filter	Replace filter
	Dirty condenser coil	Clean coil
	Refrigerant overcharged	Recover excess refrigerant
	Air in system	Recover refrigerant, evacuate system, and recharge
	Condenser air restricted or air short-cycling	Determine cause and correct
Head pressure too low	Low refrigerant charge	Check for leaks, repair, and recharge.
	Restriction in liquid tube	Remove restriction
Excessive suction pressure	High heat load	Check for source and eliminate
	Compressor valves leaking	Replace compressor
	Refrigerant overcharged	Recover excess refrigerant
Suction pressure too low	Dirty air filter	Replace filter
	Low refrigerant charge	Check for leaks, repair and recharge
	Metering device or low side restricted	Remove source of restriction
	Insufficient evaporator airflow	Increase air quantity Check filter–replace if necessary
	Temperature too low in conditioned area	Reset Thermostat
	Outdoor ambient below 55°F (12.7°C)	Install low-ambient kit
	Filter drier restricted	Replace filter

Table 12—Troubleshooting Guide–Heating

SYMPTOM	CAUSE	REMEDY
Burners will not ignite	Water in gas line	Drain. Install drip leg.
	No power to furnace	Check power supply fuses, wiring or circuit breaker.
	No 20–v power supply to control circuit	Check transformer. NOTE: Some transformers have internal over–current protection that requires a cool–down period to reset.
	Mis–wired or loose connections	Check all wiring and wire nut connections
	Misaligned spark electrodes	Check flame ignition and sense electrode positioning. Adjust as necessary.
	No gas at main burners	1. Check gas line for air. Purge as necessary. NOTE: After purging gas line of air, wait at least 5 minutes for any gas to dissipate before attempting to light unit. 2. Check gas valve.
Inadequate heating	Dirty air filter	Clean or replace filter as necessary
	Gas input to furnace too low	Check gas pressure at manifold match with that on unit nameplate
	Unit undersized for application	Replace with proper unit or add additional unit
	Restricted airflow	Clean or replace filter. Remove any restriction.
	Limit switch cycles main burners	Check rotation of blower, temperature rise of unit. Adjust as necessary.
Poor flame characteristics	Incomplete combustion results in: Aldehyde odors, carbon monoxide, sooting flame, floating flame	1. Tighten all screws around burner compartment 2. Cracked heat exchanger. Replace. 3. Unit over–fired. Reduce input (change orifices or adjust gas line or manifold pressure). 4. Check burner alignment. 5. Inspect heat exchanger for blockage. Clean as necessary.

Table 13—Troubleshooting Guide–LED Error Codes

SYMPTOM	CAUSE	REMEDY
Hardware failure (LED OFF)	Loss of power to control module (IGC)*.	Check 5-amp fuse son IGC*, power to unit, 24-v circuit breaker, and transformer. Units without a 24-v circuit breaker have an internal overload in the 24-v transformer. If the overload trips, allow 10 minutes for automatic reset.
Fan ON/OFF delay modified (LED/FLASH)	High limit switch opens during heat exchanger warm-up period before fan-on delay expires. Limit switch opens within three minutes after blower-off delay timing in heating mode.	Ensure unit is fired on rate; ensure temperature rise is correct. Ensure unit's external static pressure is within application guidelines.
Limit switch faults (LED 2 flashes)	High temperature limit switch is open.	Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate. Clean or replace filters.
Flame sense fault (LED 3 flashes)	The IGC* sensed flame that should not be present.	Reset unit. If problem persists, replace control board.
4 consecutive limit switch faults (LED 4 flashes)	Inadequate airflow to unit.	Check the operation of the indoor (evaporator) fan motor and that supply-air temperature rise agrees with range on unit nameplate information.
Ignition lockout (LED 5 flashes)	Unit unsuccessfully attempted ignition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that fame sense and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induced-draft motor fault (LED 6 flashes)	IGC does not sense that induced-draft motor is operating.*	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 - White PIN 2 - Red PIN 3 - Black
Rollout switch fault (LED 7 flashes)	Rollout switch has opened.	Rollout switch will automatically reset, but IGC* will continue to lockout unit. Check gas valve operation. Ensure that induced-draft blower wheel is properly secured to motor shaft. Inspect heat exchanger. Reset unit at unit disconnect.
Internal control fault (LED 8 flashes)	Microprocessor has sensed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC*.
Temporary software lockout (LED 9 flashes)	Electrical interference impeding IGC software	Reset 24-v. to control board or turn thermostat off, then on again. Fault will automatically reset itself in one (1) hour.

***WARNING ⚠:** If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that my be present before handling new control board. The IGC is sensitive to static electricity and my be damaged if the necessary precautions are not taken.

IMPORTANT: Refer to Table 12-Troubleshooting Guide-Heating for additional troubleshooting analysis.

LEGEND

IGC-Integrated Gas Unit Controller

LED-Light-Emitting Diode

R-410A QUICK REFERENCE GUIDE

- R-410A refrigerant operates at 50% - 70% higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- R-410A systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.
- Manifold sets should be 750 psig high-side and 200 psig low-side with 520 psig low-side retard.
- Use hoses with 750 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- R-410A, as with other HFC refrigerants, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Do not use liquid line filter-driers with rated working pressures less than 600 psig.
- Do not install a suction line filter-drier in liquid line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter-driers and service valves with wet cloth when brazing.
- A liquid line filter-drier is required on every unit.
- Do not use with an R-22 TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, break vacuum with dry nitrogen and replace all filter-driers.
- Do not vent R-410A into the atmosphere.
- Observe all **WARNINGS**, **CAUTIONS, NOTES,** and **bold** text.

START-UP CHECKLIST
(Remove and Store in Job File)

1. Preliminary Information

Model Number:_____

Serial Number:_____

Date:_____

Technician:_____

2. Pre-Start-Up

____ Verify that all packing materials have been removed from unit

____ Check all electrical connections and terminals for tightness

____ Check gas piping for leaks

____ Check that the indoor (evaporator) air filter is clean and in place

____ Verify that the unit installation is level

____ Check blower (indoor) and propeller (outdoor) for location in housing/orifice (no rubs) and set screw tightness

3. Start-Up

Electrical

Supply Voltage (measured):_____

Compressor Amps (measured):_____

Indoor (evaporator) motor amps:_____

Temperatures

Outdoor (condenser) air temperature (dry bulb): _____

Indoor return air temperature: (dry bulb)_____(wet bulb):_____

Indoor supply air - cooling: (dry bulb)_____(wet bulb):_____

Indoor supply air - heating: (dry bulb)_____

Gas heat temperature rise:_____

____ Verify temperature rise is within acceptable temperature rise range using airflow chart

Pressures

Gas inlet pressure (inches water column):_____

Gas manifold pressure (inches water column):_____

Refrigerant suction pressure during cooling (psi):_____

Refrigerant discharge pressure during cooling (psi):_____

____ Verify proper refrigerant charge using charging chart