90 Plus AFUE Furnace Install & Commissioning

Participant Guide
90 Plus AFUE Furnace I&C

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Agenda

- Suspension, Leveling, Filters, Return Options
- Condensate Drain Trap, Drain Pan, and Lines
- Horizontal Right Side Down
- Horizontal Left Side Down
- Venting
- Gas Valve and Connections
- Electrical Connections
- 24 Volt Thermostat Wiring
- ComfortNet
- Furnace Start Up
- Temperature Rise and Blower Speed Adjust
- Duct Static

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Daikin 90 Plus AFUE Furnace Installation

The new 90 Plus AFUE Furnace can be installed in an upflow, downflow, or horizontal left or right applications.

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Furnace Suspension

- **Suspension from rafters or joists**
  - Use 3/8 threaded rod
  - 2”x2”x1/8” angle iron
- **Crawl space installation**
  - Suspended from floor joists
  - Supported by concrete pad
- **Never install on ground under home, as it could be exposed to water**

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Furnace Leveling

- Leveling ensures proper condensate drainage from the heat exchanger and inducer draft blower.

- Level lengthwise from end-to-end for proper flue pipe drainage.

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Install the furnace with a slight tilt from back to front with the access doors downhill from the back panel.

- Tilt approximately 1/2 to 3/4 inches.
- Allows the condensate from the secondary heat exchanger to flow forward to the recuperator coil front cover, and into drain trap.
Air Filter Locations

Depending on the installation and/or customer preference, differing filter arrangements can be applied.

Possible Upright Upflow

Possible Upright Counterflow

Filter Locations

Air Filters

- Filters must be used with this furnace.
- Filters are not shipped with this furnace, but must be provided, sized, and installed externally by the installer.
- If the furnace is installed without filters, the warranty will be voided.
- NOTE: Change filters before occupants take ownership of a new home!

Filter Sizing Chart

<table>
<thead>
<tr>
<th>Model</th>
<th>Minimum Filter Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM96VC0403B</td>
<td>20 x 24</td>
</tr>
<tr>
<td>DM96VC0603B</td>
<td>20 x 25</td>
</tr>
<tr>
<td>DM96VC0803B</td>
<td>18 x 36</td>
</tr>
<tr>
<td>DM96VC0804C</td>
<td>24 x 30</td>
</tr>
<tr>
<td>DM96VC1005C</td>
<td>24 x 36</td>
</tr>
<tr>
<td>DM96VC1205D</td>
<td>2 (20 x 25)</td>
</tr>
<tr>
<td>DC96VC0403B</td>
<td>20 x 24</td>
</tr>
<tr>
<td>DC96VC0603B</td>
<td>20 x 25</td>
</tr>
<tr>
<td>DC96VC0804C</td>
<td>18 x 36</td>
</tr>
<tr>
<td>DC96VC1005C</td>
<td>24 x 30</td>
</tr>
<tr>
<td>DC96VC1205D</td>
<td>2 (20 x 25)</td>
</tr>
</tbody>
</table>

(Based on 300 ft/min filter face velocity)
Bottom Return Air Opening

- The bottom return air opening on upflow models utilize a “lance and cut” method to remove sheet metal from the duct opening in the base pan.

- Unfold the duct flanges around the perimeter of the opening using a pair of seamer pliers or seamer tongs.

- **WARNING:** Sharp edges. Gloves required.

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Bottom Return Air Opening

Airflow area will be reduced by approximately 18% if duct flanges are not “unfolded”. This could cause performance issues and noise issues.

- Cut Using Tin Snips
- Press Out by Hand
- Scribe Lines Outlining Duct Flanges
- Cut Four Corners After Removing Sheet Metal
Side Return Air Opening

- On upflow units, “guide dimples” locate the side return cutout locations.
- Use a straight edge to scribe lines that will connect the dimples before cutting your opening.
- NOTE: An undersized opening will caused reduced airflow.

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An “auxiliary” drain pan must be installed under the furnace if it’s being installed over a conditioned space.

- Must cover the entire area under the furnace.
- Secondary containment for trap.
- Under furnace and evaporator coil when applicable.

Condensate drain trap is secured to furnace side panels in horizontal applications.

- A minimum clearance of 5.5" below the furnace must be provided for trap installation.
Drain Pan, Trap, and Lines

- The drain trap must be primed prior to furnace startup.
- Fill both sides of the drain trap with water.
- Importance of drain trap priming:
  - Ensures proper furnace drainage upon startup
  - Prohibits the possibilities of flue gases escaping through the drain system.

Drain Trap Installed in Vertical Upflow Furnace

<table>
<thead>
<tr>
<th>Drain Exiting Left Side</th>
<th>Drain Exiting Right Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exiting Left Side</td>
<td>Exiting Right Side</td>
</tr>
</tbody>
</table>

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Horizontal Right Side Down

Condensate Drain Trap Conversion

- All furnace models are shipped with a **factory installed drain trap for vertical installations**.
- Horizontal installs require the **trap to be relocated**.
- Two conversions being covered in this period of instruction:
  - Upflow model installed horizontally with **right side down**.
  - Upflow model installed horizontally with **left side down**.

Remove the clamps from both ends of the drain hoses.

Remove the **two screws** holding the drain trap to the blower deck.

Remove the trap and **two hoses** from the blower deck.
Horizontal Right Side Down

- Remove the two plugs from the right side of the cabinet and install them in the blower deck.
- Locate hose #5 and cut at line “C”.
- Install the cut end of hose #5 from outside of the cabinet through the cabinet drain hole nearest the top of the furnace.

Secure hose #5 to the barbed fitting in the elbow with a red clamp.

Install the “non-grommet” end of hose #11 from the outside of the cabinet through the bottom drain hole.

Install on collector box and secure with a silver clamp.
Horizontal Right Side Down

- Use two silver clamps and secure both hoses to the drain trap.
- The trap outlet faces the front of the furnace.
- Secure the trap to the cabinet using the two original screws removed from the blower deck in the earlier steps.
- Refer to the “Field Supplied Drain” section in the manual for instructions on field supplied/installed drain on outlet of furnace trap.

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Front Cover Pressure Tube (Relocating)

Relocate pressure tube to lower collector box port when:

- **Upflow** model is installed horizontal left side down.
- **Downflow** model is installed horizontal right side down.

Front Cover Pressure Switch Tube

Step 1

- Remove factory installed 6” square tubing that connects the front cover pressure switch, and the top collector box cover port.
Front Cover Pressure Switch Tube

Step 2
- Remove rubber plug from the bottom collector box port.

Step 3
- Install rubber plug on top collector box port.
Front Cover Pressure Switch Tube

Step 4

- Locate the 24” x ¼” square tube in parts/“drain assembly bag” that is shipped with furnace.
- Install one end on the front cover pressure switch, and the other end onto the bottom/lower collector box port.

Front Cover Pressure Switch Tube

Step 5

- Cut off access tubing, and tuck access hose into the furnace compartment close to the inducer draft motor.
Horizontal Left Side Down

- Remove the hose clamps, two screws that hold the trap onto blower deck in prior procedure.
- Remove the two plugs from the left side of the cabinet and reinstall in the blower deck.
- Locate hose #6. Measuring from the non-grommet end, cut off and discard:

  - 1 ½” for a "D" width cabinet
  - 5” for a "C" width cabinet
  - 8 ½” for a "B" width cabinet

Furnace Cabinet Dimensions

Look at model number of your furnace. (11th place)

<table>
<thead>
<tr>
<th>Brand</th>
<th>Configuration</th>
<th>AFUE</th>
<th>Gas Valve</th>
<th>Motor</th>
<th>MBTU/h</th>
<th>Maximum CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>M</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>7 8 9</td>
<td>10</td>
</tr>
<tr>
<td>Minor Revision</td>
<td>A - Initial Release</td>
<td>B - 1st Revision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Revision</td>
<td>A - Initial Release</td>
<td>B - 1st Revision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabinet Width</td>
<td>A - 14&quot;</td>
<td>B - 17.5&quot;</td>
<td>C - 21.5&quot;</td>
<td>D - 24.5&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Horizontal Left Side Down

- Remove the rubber plug from the vent-drain elbow side port.

- Place hose #6 on the vent-drain elbow side port and secure with a silver clamp.
- Remove black drain cap near the lower collector box port, and place on barbed fitting.
- Secure with a red clamp.
Horizontal Left Side Down

- Locate hose #5 and cut 3” from the non-grommet end.
- Insert the cut end of hose #5 through the lower cabinet drain hole furthest from the top of the furnace. (insert from the outside of cabinet in)
- Connect hose #5 & #6 using the 100 degree elbow, (in drain assembly bag) and secure with two red clamps.

Horizontal Left Side Down

- Drain the collector box.
- Install the non-grommet end of hose #11 from the inside of the cabinet, into the cabinet hole closest to the top/air discharge end of the furnace.
- Install on collector box and secure with a silver clamp.
- Use two silver clamps and secure the hoses to the drain trap.
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Direct or Non-Direct Venting

- All furnaces are dual certified, and built with a 2” vent/ intake pipe and connectors.

- Transitioning from 2” to 3” PVC pipe should be done as close to the furnace as possible.

- Do not connect to Type B, BW, or L vent or any vent connector. (metal)

- Must not be vented to any portion of a factory built, or masonry chimney except when used as a pathway for PVC to pass through.
Direct Venting

- Requires both a combustion air intake/vent flue pipe.
- PVC may run horizontally and exit through the side of the building, or vertically and exit through the roof of building.
- PVC may be run through an existing unused chimney.
- PVC must extend a minimum of 12” above the top of the chimney.

Non-Direct Venting

- Requires vent/ flue pipe only.
- PVC may run horizontally and exit through the side of the building or run vertically and exit through the roof of building.
- PVC may be run through and existing unused chimney.
- PVC must extend a minimum of 12” above the top of the chimney.
- The space between the vent pipe and the chimney must be closed with a weather-tight corrosion-resistant flashing.
Non-Direct Venting

- A 90 degree elbow should be **attached to the furnace’s combustion air intake.**

- The 90 degree elbow will guard against inadvertent blockage of the air intake.

Pipe Lengths, Diameters, and Elbows Allowed

- Refer to the table in each manual for applicable length, elbows, and pipe diameter for construction of the vent/ flue pipe system.

- Elbows and/or tees used in the terminations must be included when determining the number of elbows in the pipe system.

<table>
<thead>
<tr>
<th>Unit Input (Btu)</th>
<th>Pipe Size (in.)</th>
<th>Number of Elbows (6)(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>40,000</td>
<td>2 or 2 1/2</td>
<td>120</td>
</tr>
<tr>
<td>60,000</td>
<td>2 or 2 1/2</td>
<td>95</td>
</tr>
<tr>
<td>80,000 &quot;B&quot;</td>
<td>2 or 2 1/2</td>
<td>75</td>
</tr>
<tr>
<td>80,000 &quot;C&quot;</td>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>80,000 &quot;C&quot;</td>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>100,000</td>
<td>2 or 2 1/2</td>
<td>25</td>
</tr>
<tr>
<td>100,000</td>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>120,000</td>
<td>2 or 2 1/2</td>
<td>45</td>
</tr>
<tr>
<td>120,000</td>
<td>3</td>
<td>95</td>
</tr>
</tbody>
</table>
**Vent Terminations**

**Direct and Non-Direct**
- If a 90 or 45 degree elbow is used for termination… it must be pointed downward.
- Must terminate at least 3’ above any forced air inlet located within 10’.

**Non-Direct Vent Termination:**
- At least 4’ below a window
- 4’ horizontally from a door or window or gravity air inlet
  - 1’ above any door, window, or gravity air inlet into any building.

**Direct Vent Terminations**
- Must terminate at least 12” from any opening through which flue gases may enter a building. (door, window, or gravity fed inlet)
- A vent pipe run vertically through a roof must terminate at least 12” above the roof line, and be at least 12” from any vertical wall.
Vent Terminiations

- Also, may not terminate over a public walkway, or over any area where condensate or vapor could cause a nuisance or hazard.

- The combustion air intake termination of a direct vent application should not terminate in an area which is frequently dusty or dirt.

Concentric Vent Terminations (side wall)

- Used with 2” or 3” direct vent systems.

- May be installed with the intake and exhaust pipes located side-by-side or with one pipe above the other.

- Not intended for use with single pipe/ non-direct vent installations.
**Down Venting Upflow Model Furnaces**

- Down venting is for upflow model furnaces only.
- Applicable for homes with crawlspaces and basements.

**Venting (Rubber Coupling)**

**Direct Vent**

- Use Alternate Vent & Combination Air Locations
- Vent Pipe
- Combustion Air Pipe
- Drain Tee on Vent Pipe
- Condensate Disposal (Condensate trapped to prevent flue gas from escaping)
- Slope ¼" per foot min.

**Non-Direct Vent**
Gas Valve

- 24 volt gas valve controlled by the integrated control module.
- Manual ON/ OFF control located on the valve itself.
- The gas piping supplying the furnace must be properly sized based on the gas flow required, specific gravity of the gas, and length of the run.
Natural Gas Capacity of Pipe Chart

<table>
<thead>
<tr>
<th>Pipe Length</th>
<th>Nominal Black Pipe Size</th>
<th>1/2”</th>
<th>3/4”</th>
<th>1”</th>
<th>1 1/4”</th>
<th>1 1/2”</th>
</tr>
</thead>
<tbody>
<tr>
<td>10’</td>
<td></td>
<td>132</td>
<td>278</td>
<td>520</td>
<td>1050</td>
<td>1600</td>
</tr>
<tr>
<td>20’</td>
<td></td>
<td>92</td>
<td>190</td>
<td>350</td>
<td>730</td>
<td>1100</td>
</tr>
<tr>
<td>30’</td>
<td></td>
<td>73</td>
<td>152</td>
<td>285</td>
<td>590</td>
<td>980</td>
</tr>
<tr>
<td>40’</td>
<td></td>
<td>63</td>
<td>130</td>
<td>245</td>
<td>500</td>
<td>760</td>
</tr>
<tr>
<td>50’</td>
<td></td>
<td>56</td>
<td>115</td>
<td>215</td>
<td>440</td>
<td>670</td>
</tr>
<tr>
<td>60’</td>
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<td>50</td>
<td>105</td>
<td>195</td>
<td>400</td>
<td>610</td>
</tr>
<tr>
<td>70’</td>
<td></td>
<td>46</td>
<td>96</td>
<td>180</td>
<td>370</td>
<td>560</td>
</tr>
<tr>
<td>80’</td>
<td></td>
<td>43</td>
<td>90</td>
<td>170</td>
<td>350</td>
<td>530</td>
</tr>
<tr>
<td>90’</td>
<td></td>
<td>40</td>
<td>84</td>
<td>160</td>
<td>320</td>
<td>490</td>
</tr>
<tr>
<td>100’</td>
<td></td>
<td>38</td>
<td>79</td>
<td>150</td>
<td>305</td>
<td>460</td>
</tr>
</tbody>
</table>

\[
\text{CFH} = \frac{\text{BTUH Furnace Input}}{\text{Heating Value of Gas (BTU/Cubic Foot)}}
\]

Gas Connections

- Piping may enter the left or right side of cabinet.
- The installer must supply rigid pipe long enough to reach the outside of the cabinet to seal the grommet cabinet penetration.
- A semi-rigid connector to the gas piping can be used outside the cabinet per local codes.
- 1/2” NPT pipe and fittings are required.
Gas Connections

Note: Union may be inside furnace cabinet where allowed by local codes.

Propane/ L.P. Kits Available

- Manufacturer’s propane gas conversion kits are available.
- The 24 volt gas valve is field convertible for use with propane gas by replacing the regulator spring with a propane gas spring from the appropriate propane gas conversion kit.
- Consult the furnace specification sheet for a listing of appropriated kits.
- All gas to propane conversions must be performed by a qualified installer, or service agency.
## LP Kits

<table>
<thead>
<tr>
<th>Description</th>
<th>LPM-09</th>
<th>LPM-08</th>
<th>LPM-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM97MC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC97MC</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM96VC</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC96VC</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>DM96VE</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM96HS</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>DC96HS</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM92SS</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>DC92SS</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

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Wiring Harness

- Wires are color coded for identification purposes.
- If any of the original wire as supplied with the furnace must be replaced, it must be with wiring material having a temperature rating of at least 105 degree C.
- Must also be a copper conductor.

115 Volt Line Connections

- Check furnace data plate before installing electrical connections.
- Power supply to the furnace must be NEC Class 1, and must comply with all applicable codes.
- Use a SEPARATE fused branch electrical circuit containing properly sized wire, and fuse or circuit breaker.
- An electrical disconnect must be provided at the furnace location.
115 Volt Line Connections

- Connect hot, neutral, and ground wires as shown in the wiring diagram located on the unit’s blower door.
- For direct vent applications, the cabinet opening to the junction box must be sealed air tight.
- Line polarity must be observed when making field connections.
- Line voltage connections can be made through either the right or left side panel.

Checking For Line Polarity

<table>
<thead>
<tr>
<th>Hot Leg (L1)</th>
<th>Common/ Neutral Leg</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 to ground reading 119VAC.</td>
<td>Neutral to ground reading 0.3VAC</td>
</tr>
</tbody>
</table>
Grounding

- Ground wire should run from furnace ground screw located inside the furnace junction box all the way back to the electrical panel.
- **DO NOT** use gas piping as an electrical ground.
- Confirm proper unit grounding:
  - Turn off electrical power to unit.
  - Measure resistance between the neutral (white) and one of the burners.
  - Resistance should be 10 ohms or less.

115 Volt Line Connection of Accessories

**Humidifier**

- Line voltage accessory terminals for controlling power to an optional field supplied humidifier and/or electronic air cleaner.
- Follow the humidifier or air cleaner manufacturers instructions for locating, mounting, grounding, and controlling these accessories.
- The accessory load specifications are as follows:

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Maximum Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidifier</td>
<td>1.0 Amp Maximum at 120 VAC</td>
</tr>
<tr>
<td>Electronic Air Cleaner</td>
<td>1.0 Amp Maximum at 120 VAC</td>
</tr>
</tbody>
</table>
115 Volt Line Connection of Accessories

Integrated Control Module

- Hot Terminal (EAC, HUM)
- Neutral Terminals

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As a two-stage non-communicating furnace, the furnace integrated control module provide terminals for both W1, W2, Y1 and Y2 thermostat connections.

This allows the furnace to support the following system applications:
- Two-stage heating only
- Two-stage heating with single stage cooling
- Two-Stage heating with two-stage cooling

For single stage cooling applications, a “jumper” may be required between “Y1” and “Y2” at the furnace control in order to achieve the desired single stage cooling airflow.

Use of ramping profiles and dehumidification features require a jumper between “Y1” and “O.”
24 Volt Thermostat Wiring

Two-Stage Heat, Single-Stage Cool  Two-Stage Heat, Two-Stage Cool

- Remote Condensing Unit
  - Single-Stage Cooling
- Dehumidistat
  - Optional

24 Volt Dehumidistat Wiring

- The optional usage of a dehumidistat allows the furnace’s circulator blower to operate at a slightly lower speed (85% of desired speed) during a combined thermostat call for cooling and dehumidistat call for dehumidification.
- A dehumidistat applied to this furnace must operate on 24VAC.
24 Volt Dehumidistat Installation

- Turn off power to the furnace.
- Set the dehumidification “ENABLE” dip switch from OFF to ON.
- Secure dehumidistat neutral wire to the terminal marked “DEHUM” on the integrated control module.
- Secure the dehumidistat hot wire to the terminal marked “R” on the furnace integrated control module.

Dual Fuel Applications

- This furnace can be used in conjunction with a heat pump in a dual fuel application.
- A “dual fuel” application refers to a combined gas furnace and heat pump installation.
- Strictly follow the wiring guidelines in the dual fuel kit installation instructions.
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ComfortNet System

- The ComfortNet system is one that includes a ComfortNet compatible furnace, an air conditioner or heat pump, with a CTK04 thermostat.
- A valid ComfortNet system could also be a compatible furnace, CTK04 thermostat, and non-compatible, single stage air conditioner.
- Indoor unit, outdoor unit, and thermostat interact/communicate digitally with one another.
- Two-way communication
ComfortNet System

- The two-way digital communication between the thermostat and subsystems is the key to unlocking the benefits and features of the ComfortNet system.

- **Two way communication** is accomplished using only two wires.
  - Data lines connect to “1” and “2”
  - “R” is 24VAC (hot)
  - “C” is 24VAC (common)

ComfortNet System

- A removable plug connector is provided with the control.

- It is STRONGLY recommended that you do not connect multiple wires into a single terminal.

- Minimum 18 AWG wire no longer than 100’ max length between all components:
  - 100’ b/t indoor and outdoor units
  - 100’ b/t indoor unit and t-stat
ComfortNet System

Four-Wire Indoor and Outdoor Wiring

Typical ComfortNet wiring will consist of four wires between the indoor unit, outdoor unit, and thermostat.

Two-Wire Outdoor, Four-Wire Wiring

- Two wires can be utilized between the indoor and outdoor units.
- For this wiring scheme: only the data lines, (1 & 2) are needed between the indoor and outdoor units.
- A 40VA, 208/230 VAC to 24VAC transformer must be installed in the outdoor unit to provide 24VAC power to the outdoor units electronic control.
ComfortNet System

C-Net Compatible Furnace w/ Non- C-Net Compatible Single Stage AC

- Four wires are **required** between the furnace and thermostat.
- Two wires are **required** between the furnace control and the single stage air conditioner.

ComfortNet System

C-Net Compatible Furnace w/ Non- C-Net Compatible Single Stage AC

- For this system configuration, the “Y1” **terminal** on the integrated furnace control **becomes an output rather than an input**.
- The “Y1” **connection** to the outdoor unit is made using both 4-position thermostat connections in the CTK0* kit.
### Agenda
- Suspension, Leveling, Filters, Return Options
- Condensate Drain Trap, Drain Pan, and Lines
- Horizontal Right Side Down
- Horizontal Left Side Down
- Venting
- Gas Valve and Connections
- Electrical Connections
- 24 Volt Thermostat Wiring
- ComfortNet
- **Furnace Start Up**
  - Temperature Rise and Blower Speed Adjust
  - Duct Static

### Gas Piping Leak Checks
- **Leak test before placing unit into operation.**
- **Use approved chloride-free soap and water solution, electronic combustible gas detector, or other approved testing methods.**
- **WARNING!** Never use a match or open flame to test for leaks.
Gas Pressure Test

Field Test Mode Only
- Allows gas valve pressure to be checked at 100% firing rate.
- Steps to test Gas Pressure:
  - Push the “FAULT RECALL” and “LEARN” push buttons greater than one second.
  - Fault display will go blank.
  - Release buttons within 5 seconds
  - Display will flash “Ft” to indicate that you are now in the “test mode.”
  - The control will force a high capacity demand at this time.

Gas Pressure Test

- Cont:
  - The “Ft” will flash until the furnace has reached 100%.
  - Solid “FT” once 100% capacity is achieved.
  - A 5-minute timer has just started.
- The line pressure supplied to the gas valve must be within the range specified below:
  - Supply pressure can be measured at the gas valve inlet pressure tap.
  - The supply pressure MUST be measured with the burners operating.

<table>
<thead>
<tr>
<th>Inlet Gas Supply Pressure</th>
<th>Natural Gas</th>
<th>Minimum: 4.5” w.c.</th>
<th>Maximum: 10.0” w.c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane Gas</td>
<td>Minimum: 11.0” w.c.</td>
<td>Maximum: 13.0” w.c.</td>
<td></td>
</tr>
</tbody>
</table>
Measuring Gas Supply Pressure

- Turn OFF gas to furnace at the manual gas shutoff valve.
- Connect an appropriate gas pressure gauge at either the gas valve inlet pressure tap or the gas piping drip leg.
- Turn on gas and operate ALL other gas consuming appliances on the same gas supply line.

Measuring Gas Supply Pressure

- Measure furnace gas supply pressure with burners firing. Supply pressure must be within the range specified in the “Inlet Gas Supply Pressure Table.
- If supply pressure differs from table, make the necessary adjustments to the pressure regulator, gas piping size, etc.
- Turn off gas to furnace, disconnect manometer.
Gas Manifold Pressure Measurement and Adjust

- Manifold pressure must be measured **with burners operating**.
- Steps to measure and adjust the manifold pressure:
  - Turn off gas and power to furnace.
  - Attach manometer hose to the **outlet pressure barb** on gas valve.
  - Turn on gas and power to furnace.
  - Close thermostat “R” and “W1” contacts to call for low stage heat.
  - Measure the gas manifold pressure with burners firing.

---

Gas Manifold Pressure Measurement and Adjust

**[(LO) Pressure Regulator Adjust]**

- Remove regulator cover screw from the low (LO) outlet pressure regulator.
- Adjust tower and turn screw clockwise to increase pressure, or counterclockwise to decrease pressure.
- Replace regulator cover screw.
Gas Manifold Pressure Measurement and Adjust

(HI) Pressure Regulator Adjust

- Close thermostat “R” and “W2” contacts to call for high stage heat.
- Remove regulator cover screw from the high (HI) outlet pressure regulator.
- Adjust tower and turn screw clockwise to increase pressure or counterclockwise to decrease pressure.
- Replace regulator cover screw.
- Turn off power and gas to furnace.

Gas Manifold Pressure Measurement and Adjust

Manifold Gas Pressure Chart

<table>
<thead>
<tr>
<th>Range</th>
<th>Natural Gas</th>
<th>Propane Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>(w.c.)</td>
<td>Low Stage</td>
<td>High Stage</td>
</tr>
<tr>
<td></td>
<td>1.6 – 2.2”</td>
<td>3.2 – 3.8”</td>
</tr>
<tr>
<td>Nominal</td>
<td>1.9”</td>
<td>3.5”</td>
</tr>
<tr>
<td>(w.c.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Agenda

- Suspension, Leveling, Filters, Return Options
- Condensate Drain Trap, Drain Pan, and Lines
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- Horizontal Left Side Down
- Venting
- Gas Valve and Connections
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- Furnace Start Up
- Temperature Rise and Blower Speed Adjust
- Duct Static

Temperature Rise

- Temperature rise must be within the range specified on the unit rating plate.
- An incorrect temperature rise may result in condensing or overheating of the heat exchanger.
- An airflow and temperature rise table is provided in the Specification Sheet applicable to your model.
- Determine the temperature rise from furnace data plate, and conduct the following steps to adjust:
Temperature Rise Measurement

- Operate furnace with burners firing for approximately 10 minutes.
- Ensure that all registers and duct dampers are open.
- Place temp sensors in the return and supply ducts.
- Subtract the return air temperature from the supply air temperature to determine the air temperature rise.

Temperature Rise Measurement

- Adjust temperature rise by adjusting the circulator blower speed.
- Increase the blower speed to reduce temperature rise.
- Decrease the blower speed to increase temperature rise.
- Refer to the “Startup Procedure and Adjustment-Circulator Blower Speeds” section of your furnace manual for instructions on how to adjust blower speeds.
Setting Variable Speed Blower Switches

- This furnace may be equipped with a variable speed ECM circulator blower.

- The Specification Sheet applicable to your model provides an airflow table, showing the relationship between airflow (CFM) and external static pressure for the proper selection of heating and cooling speeds.

- The heating blower speed is shipped set at “B”, and the cooling blower speed is set at “D” for variable speed models.

<table>
<thead>
<tr>
<th>Switch Bank: S4</th>
<th>DIP Switch No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Airflow</td>
<td>3 4</td>
</tr>
<tr>
<td>A</td>
<td>OFF OFF</td>
</tr>
<tr>
<td>B*</td>
<td>ON OFF</td>
</tr>
<tr>
<td>C</td>
<td>OFF ON</td>
</tr>
<tr>
<td>D</td>
<td>ON ON</td>
</tr>
</tbody>
</table>

*Indicates factory setting

<table>
<thead>
<tr>
<th>Switch Bank: S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Speed Taps</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D*</td>
</tr>
</tbody>
</table>

*Indicates factory setting

Setting Variable Speed Blower Switches

- Airflow speed adjustments are made at the dip switches located on the integrated control module. (furnace board)

- The 3rd and 4th dip switches down in “Switch Bank: S4” represent the heating airflow setting.

- In the heating “B” factory setting, switch 3 is in the “ON” position, (to the right) and switch 4 is in the “OFF” position. (to the left)
Blower Speed Adjust

- Use the dual 7-segment LED display adjacent to the dip switches to obtain the approximate airflow quantity.
- The airflow quantity is displayed as a number on the display, rounded to the nearest 100 CFM.
- The display alternates airflow delivery indication and the operating mode indication.
- If the airflow being delivered is 1375, CFM, the LED display will indicate a “14.” (for 1400 CFM)

Example 1

- Determine the tonnage of the cooling system installed with the furnace.
- If the cooling capacity is the BTU/hr, divide it by 12,000 to convert the capacity to tons.
- So, if your cooling capacity requirement is 42,000 BTU/hr then 42,000 ÷ 12,000 = 3.5 tons.

Example 2

- Determine the proper air flow for the cooling system.
- Most cooling systems are designed to work with air flows between 350 and 450 CFM per ton.
- 3.5 tons X 400 CFM = 1400 CFM.
### Blower Speed Adjust

#### Example 3

Knowing the furnace model, locate the high stage cooling air flow charts in the furnace “specification sheet” applicable to your model. Look up the cooling air flow determined in example 3 above, and find the required cooling speed and adjust the setting.

1. A *DM96VC0603B* model furnace has been installed with a 2.5ton air conditioning system.
2. The air flow needed is 1000 CFM.
3. Looking at the cooling speed chart/air flow table in your furnace manual for a *DM96VC0603B*, find the air flow closest to 1000 CFM.
4. A cooling airflow of 1007 CFM can be attained by setting the cooling speed to “C”.
5. Cooling speed “C” can be set for your furnace on “Switch Bank: S3” located on the furnace board.
6. “Cooling Speed Tap C” is in positions 1 and 2 of dip switch S3.
7. Position 1 is set to “OFF.”
8. Position 2 is set to “ON.”

---

### Airflow Table from Manual IOD-2008 (2 Stage Heat/ Variable Speed ECM)

<table>
<thead>
<tr>
<th>Model</th>
<th>Tap</th>
<th>Low Stage Cool</th>
<th>High Stage Cool</th>
<th>Low Stage Heat</th>
<th>High Stage Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM96VC0403BN</td>
<td>A</td>
<td>403</td>
<td>596</td>
<td>422</td>
<td>494</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>527</td>
<td>796</td>
<td>471</td>
<td>553</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>675</td>
<td>974</td>
<td>521</td>
<td>601</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>803</td>
<td>1192</td>
<td>574</td>
<td>676</td>
</tr>
<tr>
<td>DM96VC0603BN</td>
<td>A</td>
<td>398</td>
<td>599</td>
<td>667</td>
<td>953</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>557</td>
<td>817</td>
<td>740</td>
<td>1059</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>696</td>
<td>1007</td>
<td>808</td>
<td>1158</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>810</td>
<td>1212</td>
<td>881</td>
<td>1260</td>
</tr>
<tr>
<td>DM96VC0803BN</td>
<td>A</td>
<td>403</td>
<td>629</td>
<td>855</td>
<td>1202</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>540</td>
<td>806</td>
<td>923</td>
<td>1316</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>705</td>
<td>1023</td>
<td>1033</td>
<td>1389</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>819</td>
<td>1230</td>
<td>1063</td>
<td>1396</td>
</tr>
<tr>
<td>DM96VC0804CN</td>
<td>A</td>
<td>513</td>
<td>789</td>
<td>867</td>
<td>1228</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>660</td>
<td>967</td>
<td>939</td>
<td>1337</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>791</td>
<td>1182</td>
<td>1016</td>
<td>1430</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>913</td>
<td>1375</td>
<td>1077</td>
<td>1516</td>
</tr>
<tr>
<td>DM96VC1005CN</td>
<td>A</td>
<td>564</td>
<td>820</td>
<td>1256</td>
<td>1818</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>784</td>
<td>1133</td>
<td>1292</td>
<td>1870</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>982</td>
<td>1464</td>
<td>1316</td>
<td>1910</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>1259</td>
<td>1736</td>
<td>1358</td>
<td>1957</td>
</tr>
</tbody>
</table>
Blower Speed Adjust for Multi Speed ECM Blower

Airflow Table from Manual IOD-2011A (2 Stage Heat, Multi-Speed ECM)

<table>
<thead>
<tr>
<th>Dip Switch Setting DM96VE0302B</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
<td>CFM Rise</td>
</tr>
<tr>
<td>G 870</td>
<td>658</td>
<td>548</td>
<td>469</td>
<td>413</td>
<td>349</td>
<td>293</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>W1 870</td>
<td>21</td>
<td>28</td>
<td>34</td>
<td>40</td>
<td>413</td>
<td>45</td>
<td>349</td>
<td>293</td>
</tr>
<tr>
<td>W2 885</td>
<td>30</td>
<td>32</td>
<td>35</td>
<td>39</td>
<td>621</td>
<td>43</td>
<td>557</td>
<td>508</td>
</tr>
</tbody>
</table>

Factory Setting

<table>
<thead>
<tr>
<th>All DIP Switch Positions</th>
<th>OFF</th>
<th>OFF</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>874</td>
<td>607</td>
<td>612</td>
</tr>
<tr>
<td>Y 1146</td>
<td>1097</td>
<td>1049</td>
<td>1002</td>
</tr>
<tr>
<td>Y 921</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 928</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 1146</td>
<td>1097</td>
<td>1049</td>
<td>1002</td>
</tr>
<tr>
<td>Y 921</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 928</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 1146</td>
<td>1097</td>
<td>1049</td>
<td>1002</td>
</tr>
<tr>
<td>Y 921</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 928</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 1146</td>
<td>1097</td>
<td>1049</td>
<td>1002</td>
</tr>
<tr>
<td>Y 921</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 928</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 1146</td>
<td>1097</td>
<td>1049</td>
<td>1002</td>
</tr>
<tr>
<td>Y 921</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
<tr>
<td>Y 928</td>
<td>868</td>
<td>810</td>
<td>743</td>
</tr>
</tbody>
</table>

ON ON ON ON ON ON ON ON

OFF OFF OFF OFF OFF OFF OFF

“Multi-Speed” blower speeds are adjusted in the 1st, 2nd, and 3rd dip switches in “Switch Bank: S2” represent the cooling airflow setting.

Review the chart in the prior slide that represents multi speed ECM blowers for furnace model DM96VE0302B.

In the high cooling “Y” factory setting, switch 1, 2, and 3 are in the “OFF” position. (to the left)
Setting Multi Speed ECM Blower Switches

- **Example:**

- A cooling capacity requirement is 18,000 BTU/hr. (18,000 ÷ 12,000 = 1.5 tons/600 CFM’s of air)

- Using the chart in your manual, find the closet airflow setting to “600” for a static pressure rating of 0.5.

- You would choose “670” in the next row/section down on the chart.

- Set dip switches to “ON, OFF, OFF”.

<table>
<thead>
<tr>
<th>Switch Bank: S2</th>
<th>DIP Switch No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Airflow</td>
<td>1</td>
</tr>
<tr>
<td>Y*</td>
<td>ON</td>
</tr>
<tr>
<td>Ylo</td>
<td>ON</td>
</tr>
</tbody>
</table>

*Use the “Y” setting only for single stage air conditioners.

---

Setting Multi Speed Blower “Off-Delay”

- The integrated control module (furnace board) provides a selectable heat off delay function.

- The 3rd and 4th dip switches down in “Switch Bank: S1” represent the blower heat off delay timings.

- In the off-delay “150- second” factory setting, switch 3 is in the “ON” position, (to the right) and switch 4 is in the “OFF” position. (to the left)

<table>
<thead>
<tr>
<th>Switch Bank: S1</th>
<th>DIP Switch No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Delay Seconds</td>
<td>3</td>
</tr>
<tr>
<td>90</td>
<td>OFF</td>
</tr>
<tr>
<td>120</td>
<td>OFF</td>
</tr>
<tr>
<td><strong>150</strong></td>
<td><strong>ON</strong></td>
</tr>
<tr>
<td>180</td>
<td>ON</td>
</tr>
</tbody>
</table>

*Indicates factory setting
Agenda

- Suspension, Leveling, Filters, Return Options
- Condensate Drain Trap, Drain Pan, and Lines
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Checking Duct Static

- Refer to your furnace rating plate for the maximum (ESP) external duct static rating.
- Too much external static pressure will result in insufficient air that can cause excessive temperature rise.
- This can cause limit switch tripping and heat exchanger failure.
Checking Duct Static

- The **positive** static reading is taken at the furnace supply outlet, and must be read **between the furnace and the cooling coil**.
- The **negative** static reading is taken at the furnace return duct inlet, and must be read **between the furnace and filter**.
- Take duct static readings through test holes in ducts, and tape up holes once your test is complete.

Checking Duct Static

**Steps to determine total external static pressure:**

- Inspect/replace filter in furnace.
- Install an inclined manometer, magnehelic, or digital manometer into return duct of furnace closest to blower, but downstream of filter.
- Measure the **negative static pressure** of the return duct at the **inlet of the furnace**.
Checking Duct Static

- Measure the **positive static pressure** of the supply duct at the **outlet of the furnace**.

- **Total Static Example:**
  - Negative static pressure: -0.4” w.c.
  - Positive static pressure: 0.2” w.c.
  - Total external static pressure would be: 0.6” w.c.

- The difference between the two numbers is the **total external static pressure on the system**.

QUESTIONS?
1. When installing/ leveling the Daikin 90 Plus furnace, the tilt from back to front should be ___ to ___ inches to allow condensate to drain into drain trap.

A. 1 to 2  
B. 2 to 3  
C. ¼ to ½  
D. ½ to ¾

2. If the Daikin 90 Plus furnace is installed without filters, the warranty will be voided.

A. True  
B. False

3. The condensate trap can be relocated to the outside/ side panel of the furnace. How many inches of clearance are needed for the trap to be installed properly?

A. 6.5 inches  
B. 5.0 inches  
C. 4.5 inches  
D. 5.5 inches

4. The condensate drain trap on the Daikin 90 Plus furnace must be primed prior to furnace start up.

A. True  
B. False

5. In a “horizontal right side down” drain trap conversion, hose number 5 is cut at line ___.

A. E  
B. G  
C. D  
D. C

6. In a “horizontal left side down” drain trap conversion, hose number 6 is cut at different lengths depending on the width of your furnace. How many inches of hose number 6 would be cut off and discarded for a “C” width cabinet?

A. 5 inches  
B. 8 inches  
C. 8.5 inches  
D. 1.5 inches
7. When venting a Daikin 90 Plus furnace, it’s ok to connect to an existing type B, BW, or L metal flue pipe as long as the first 10 feet of flue pipe is PVC.

A. True
B. False (Never connect PVC to metal when constructing a 90 Plus flue)

8. A “non-direct” vent termination should terminate ___ feet horizontally from a door, window, or gravity air inlet.

A. 6 Feet  
B. 1 Foot  
C. 2 Feet  
D. 4 Feet

9. A “direct” vent termination must terminate at least ___ feet from any opening through which flue gases may enter a building.

A. 6 Feet  
B. 10.5 Feet  
C. 12 Feet  
D. 10 Feet

10. The gas piping supplying the furnace must be properly sized based on the gas flow required, specific gravity of the gas, and the _____________.

A. Model number on the furnace.  
B. Length/ distance of the run  
C. Serial number on the furnace  
D. Depends on manufacturer of gas valve

11. An L.P. conversion kit for a Daikin DM97MC or DC97MC (97% modulating) furnace would include a new replacement gas valve, and orifices.

A. True  
B. False
12. When confirming proper unit grounding, resistance should be measured between the neutral (white) wire and one of the burners. Resistance should be ___ ohms.

A. Less than 2 ohms
B. 10 ohms or less
C. 5 ohms
D. 2 ohms

13. When grounding a Daikin 90 Plus furnace in a basement, it’s ok to use a section of gas pipe as a ground.

A. True
B. False  (Ground from the furnace ground screw all the way back to electrical panel; Never connect a ground wire to gas piping)

14. The use of ramping profiles and dehumidification features require a jumper between “Y1” and ____ on the integrated control module.

A. O
B. R
C. G
D. Y2

15. The first step taken when installing a dehumidistat to the integrated control module, is to turn off power to the Daikin 90 Plus furnace.

A. True
B. False

16. When installing a ComfortNet system for Daikin 90 plus furnace, 18 gauge thermostat wiring should be no longer than ____ feet between the indoor and outdoor units.

A. 25 Feet
B. 50 Feet
C. 100 Feet
D. 80 Feet

17. In the ComfortNet system, two way digital communication between the thermostat and subsystems is accomplished by connecting only four (4) wires between each subsystem.

A. True
B. False  (two-wires for communication: 1 and 2)
18. During the gas pressure test, after pushing the “fault recall” and “learn” push buttons, then releasing them within 5 seconds, the fault screen will flash “FT.” What does this mean?

A. A fault has occurred in the furnace.
B. Improper ground. Check grounds, and resume test.
C. The furnace gas valve has malfunctioned.
D. Furnace is now in the test mode.

19. The gas manifold pressure should be measured and adjusted with the burners firing.

A. True
B. False

20. The temperature rise on a Daikin 90 Plus furnace can be adjusted by the blower speed. Decrease the blower speed to _____ temperature rise.

A. Monitor
B. Decrease
C. Reduce
D. Increase

21. The airflow quantity is displayed on the LED display adjacent to the dip switches on the integrated control module. If the furnace airflow being delivered is 1255 CFM, the LED display will indicate a “12” on the screen.

A. True
B. False (rounded up to 1300, so it will display a “13”)

22. Using the airflow table below, what “tap” would you adjust to deliver 1200 CFM’s for furnace model MVC960803BN?

A. Tap C
B. Tap D
C. Tap A
D. Tap B

23. When checking duct static, the negative pressure must be read between the return filter and the furnace blower.

A. True
B. False
24. The first step when checking total external static pressure would be to _________________________.

A. Install inclined manometer, magnehelic, or digital manometer.
B. Turn the furnace on to “fan on.”
C. Inspect/ replace filter in the furnace.
D. Turn the furnace to the highest heat setting.

25. The positive static pressure should be measured at outlet of the furnace after the evaporator coil.

A. True
B. False  (Measure at outlet of furnace, before the evap coil)