



CONDENSING UNIT INSTALLATION INSTRUCTIONS

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CONDENSING UNIT SAFETY



Recognize this symbol as a safety precaution.

Recognize Safety Symbols, Words and Labels

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is the owner's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of serious personal injury or death, property damage and/or product damage.

WARNING

Hazards or unsafe practices could result in property damage, product damage, **severe** personal injury or death.

CAUTION

Hazards or unsafe practices may result in property damage, product damage, **personal injury** or death.

CAUTION

Hazards or unsafe practices may result in property or product damage.

WARNING

Installation and repair of this unit should be performed **ONLY** by individuals meeting the requirements of an "Entry Level Technician" as specified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI). Attempting to install or repair this unit without such background may result in product damage, personal injury or death.



WARNING

HIGH VOLTAGE!

Disconnect **ALL** power before servicing.
Multiple power sources may be present.

Failure to do so may cause property damage, personal injury or death.



INSTALLATION REQUIREMENTS

These instructions are intended as a general guide only for use by qualified persons and do not supersede any national or local codes in any way. The installation must comply with all state and local codes as well as the National Electrical Code.

- The condensing unit is designed and approved for outdoor use only.
- The condensing unit must be installed with no ductwork in the airstream. The outdoor fan is not designed to operate against any additional static pressure.

WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.
- If an indoor leak is suspected, thoroughly ventilate the area before beginning work.
- Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.
- Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.

WARNING

To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.

WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- Ensure the cylinder is free of damage which could lead to a leak or explosion.
 - Ensure the hydrostatic test date does not exceed 5 years.
 - Ensure the pressure rating meets or exceeds 400 lbs.
- When in doubt, do not use cylinder.

IMPORTANT: The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants in this unit. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. These regulations may vary by jurisdiction. A certified technician must perform the installation and service of this product. Should questions arise, contact your local EPA office.

This product is designed and manufactured to permit installation in accordance with national codes. It is the installer's responsibility to install this unit in accordance with national codes and/or prevailing local codes and regulations.

Tools and Parts

Gather the required tools and parts before starting installation. Read and follow the instructions provided with any tools listed here.

Tools Needed

- Torch
- 1/4" (6.4 mm) nut driver
- Vacuum pump
- Micron gauge
- 5/16" (7.6 mm) nut driver
- Gauge set for R-410A refrigerant
- Nitrogen system

Parts Needed

Check local codes and HVAC supplier. Check existing electrical supply, and read "Electrical Requirements," "Location Requirements," "System Requirements" and "Connect Refrigerant Lines."

NOTE: Some condensing units do not contain a factory-installed filter dryer. With those units, a properly sized filter dryer must be field installed in the liquid (high pressure) line set between the outdoor condensing unit and indoor evaporator unit.

System Requirements

Condensing unit system matches are derived from actual laboratory testing of matched systems. It is recommended that only matching equipment be used to ensure proper operation and efficient performance.

- The designed system matches are listed in the condensing unit specification sheets and on the condensing unit refrigerant charging instructions located on the back of the service access panel. In order to maintain the SEER rating, this condensing unit must be matched to the correct indoor section.
- Refrigerant charging instructions include a list of matching indoor equipment with the proper thermal expansion device size and amount of refrigerant charge required.
- This condensing unit has been factory charged with a quantity of refrigerant (R-410A) sufficient for a matched indoor coil and a maximum 15 ft (4.6 m) of refrigerant line.
- This condensing unit has been designed and manufactured to meet criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper airflow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and airflow instructions. Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.
- A filter dryer approved for use with R-410A refrigerant is installed in the condensing unit.
- If this condensing unit is equipped with a crankcase heater, it should be energized 24 hours before the condensing unit is started to avoid compressor damage as a result of slugging.
- Use only polyol ester oils if oil must be added to the system. Mineral oil is not compatible with refrigerant.

Indoor System Thermal Expansion Device

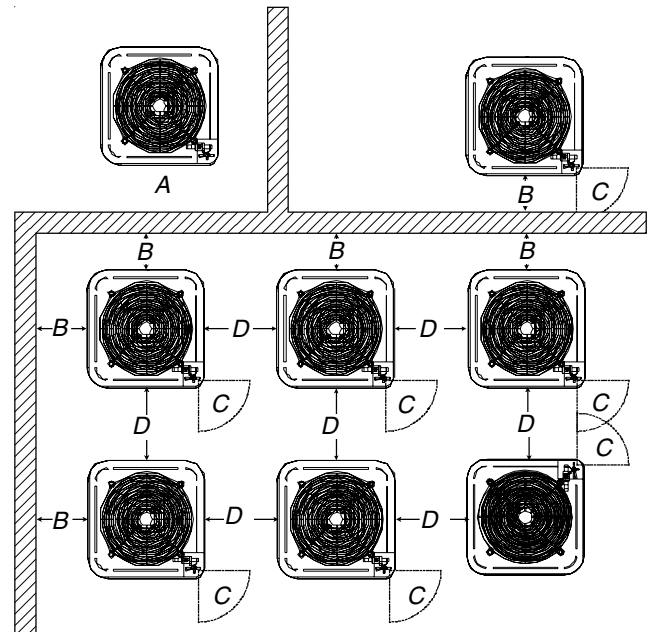
- Check the indoor coil thermal expansion device to see whether it matches the required expansion device for the indoor coil and condensing unit being installed. Use only an thermal expansion device that is manufactured to operate with R-410A refrigerant.
- Refer to the refrigerant charge label located on the inside of the condensing unit access panel for the correct thermal expansion device size required.
- Replace the thermal expansion device with the correct one if it is not already installed in the indoor coil. Instructions for replacing the thermal expansion device are provided with the indoor coil.

Location Requirements

- This condensing unit is designed to be located outdoors with sufficient clearance for free entrance to the inlet and discharge air openings. The location must also allow for adequate service access. See "Installation Clearances."
- Where possible, select a location for the condensing unit which is shaded from the direct rays of the sun most of the time. North or east locations are usually most desirable. Position the condensing unit to avoid direct contact with water, snow or ice from a roofline overhead.

- The condensing unit must be installed on a solid, level mounting pad that will not settle or shift. Isolate the pad from the building structure to avoid possible transmission of sound or vibration from the condensing unit into the conditioned space.
 - The condensing unit foundation should be raised to a minimum of 3" (7.6 cm) above finish grade. In areas which have prolonged periods of temperatures below freezing, and/or snowfall, the condensing unit should be elevated above the average snow line.
 - Avoid placing the condensing unit near areas such as sleeping quarters or study rooms. Normal operating sound levels may be objectionable if the condensing unit is placed near certain rooms.
 - Where possible, the top of the condensing unit should be completely unobstructed.
 - If vertical conditions require placement beneath an obstruction, there should be a minimum of 5 ft (1.5 m) between the top of the condensing unit and the obstruction.
- NOTE:** The specified dimensions meet requirements for air circulation only. Consult all appropriate regulatory codes prior to determining final clearances.
- Avoid corner installations if possible.
 - Either side adjacent to the valves can be placed toward the structure provided the side away from the structure maintains minimum service clearance.

Installation Clearances—Single or Multiple Unit Installation



- A. Not recommended
 B. 10" (25.4 cm)
 C. 18" (45.7 cm)
 D. 20" (50.8 cm)

Rooftop Installation

- Check that the roof structure can support the weight of the condensing unit.
- Keep the weather-tight integrity of the roof during and after installation.
- Vibration-absorbing pads or springs can be installed between the condensing unit legs or frame and the roof mounting assembly to reduce noise vibration.

Electrical Requirements

WARNING

To avoid the risk of injury, electrical shock or death, the furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of the National Electric Code (NEC).

IMPORTANT: The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants in this unit.

Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. These regulations may vary by jurisdiction. A certified technician must perform the installation and service of this product. Should questions arise, contact your local EPA office.

This product is designed and manufactured to permit installation in accordance with national codes. It is the installer's responsibility to install this unit in accordance with national codes and/or prevailing local codes and regulations.

NOTE: All outdoor wiring must be suitable for outdoor use. Use copper conductors only.

- All field wiring must be done in accordance with National Electrical Code requirements, applicable requirements of UL, or local codes, where applicable.
- Electrical wiring, disconnect means and over-current protection are to be supplied by the installer. Refer to the rating plate for the maximum over-current protection, minimum circuit ampacity, and operating voltage. See the wiring diagrams in "Make Electrical Connections."

INSTALLATION INSTRUCTIONS

Inspect Shipment

This condensing unit is shipped in one package, completely assembled and wired. The thermostat is shipped in a separate carton when ordered.

- Check the condensing unit rating plate to confirm specifications are as ordered.
- Upon receipt of equipment, inspect it for possible shipping damage. Examine the condensing unit inside the carton if the carton is damaged.
- If damage is found, it should be noted on the carrier's freight bill. Damage claims should be filed with the carrier immediately. Claims of shortages should be filed with the seller within 5 days.

NOTE: If any damages are discovered and reported to the carrier, do not install the condensing unit, because your claim may be denied.

Flush Refrigerant Lines

Refrigerant lines must be flushed by a licensed, EPA certified refrigerant technician in accordance with established procedures.

NOTES:

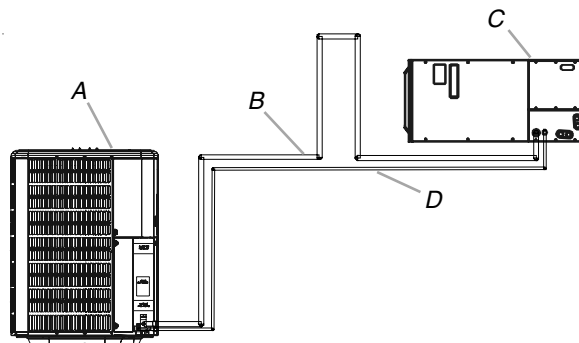
- R-410A outdoor systems are not recommended for use with indoor systems that have used R-22 as the refrigerant. However, if this condensing unit is being matched with an approved line set which was previously charged with R-22 refrigerant, the line set must be flushed prior to installation. See your local distributor for an appropriate flushing kit.
- Check the refrigerant lines for size and length. See "Connect Refrigerant Lines."

- Polyol ester (POE) oils are used in Whirlpool units charged with R-410A refrigerant. Residual mineral oil from the R-22 system can act as an insulator, inhibiting proper heat transfer. It can also clog the thermal expansion device, reducing system performance and capacity.
- Where possible, drain as much residual compressor oil from the existing systems, lines, and traps. Pay close attention to low areas where oil may collect.

System Installation

Mounting Evaporator Coil Above Condensing Unit

When mounting the evaporator coil above the condensing unit, an inverted loop in the suction line adjacent or near the connection to the evaporator coil is required. The top of the loop must be slightly higher than the top of the evaporator coil.



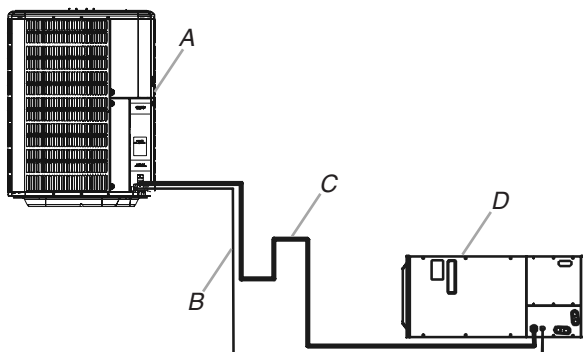
A. Condensing unit
B. Suction line

C. Evaporator coil
D. Liquid line

Mounting Condensing Unit Below Evaporator Coil

When mounting the condensing unit above the evaporator coil, oil traps are required at equal intervals along the suction line.

- Install 1 oil trap for a height difference of 15 ft to 25 ft (4.6 m to 7.6 m) between indoor and outdoor units.
- Install 2 oil traps for a height difference of 26 ft to 50 ft (7.9 m to 15.2 m) between indoor and outdoor units.
- Install 3 oil traps for a height difference of 51 ft to 100 ft (15.5 m to 30.5 m) between indoor and outdoor units.
- Install 4 oil traps for a height difference of 101 ft to 150 ft (30.8 m to 45.7 m) between indoor and outdoor units.



A. Condensing unit
B. Liquid line
C. Suction line
D. Evaporator coil

Insulation is necessary to avoid condensation from forming and dripping from the suction line. Armflex (or satisfactory equivalent) with $\frac{3}{8}$ " (1 cm) minimum wall thickness is recommended. In severe conditions (hot, high humidity areas), $\frac{1}{2}$ " (1.3 cm) insulation may be required. Insulation must be installed in a manner which keeps tubing from damage and contamination.

Connect Refrigerant Lines

Refrigerant lines must be connected by a licensed, EPA certified refrigerant technician in accordance with established procedures.

IMPORTANT:

- Connecting refrigerant lines must be clean, dehydrated, refrigerant-grade copper lines. Condensing units should be installed only with specified line sizes for approved system combinations with elevation differences up to 15 ft (4.6 m) and total length of up to 50 ft (15.2 m). See the Suction Line Sizes and Liquid Line Sizes charts later in this section.
- Avoid sharp bends or possible kinking in the refrigerant lines during installation as this may cause a reduction in performance.
- To avoid contamination of the refrigerant system, do not remove the caps from the lines or system connection points until connections are ready to be completed.
- In condensing unit systems, horizontal suction lines should be slightly sloped toward the condensing unit. Piping must avoid dips or low spots, which can collect oil.

Connect Liquid and Suction Lines

CAUTION

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

WARNING

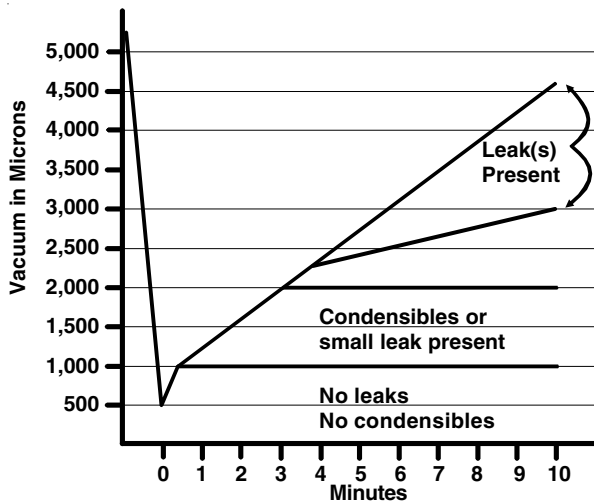
To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

1. Route the suction and liquid lines from the fittings on the indoor coil to the fittings on the condensing unit. Run the lines in as direct a path as possible, avoiding unnecessary turns and bends.
2. For product efficiency, be sure that the suction line is insulated over the entire exposed length and that both suction and liquid lines are not in direct contact with floors, walls, ductwork, floor joists, or other piping.
3. Remove valve cores.
4. Wrap the service valves with a wet rag or an approved thermal trap.
5. If a filter dryer is not provided, install a filter dryer in the liquid line between the outdoor condensing unit and the indoor evaporator coil.
NOTE: To reduce oxidation from forming and contaminating the system, purge the line set/coil with nitrogen (1 to 2 psig) during the brazing process.
6. Connect the suction and liquid lines, using a brazing compound. Braze with an alloy of silver or copper and phosphorus with a melting point above 1,100°F (593°C).
NOTE: Do not use soft solder.
7. Make sure indoor coil has been put in place according to the Installation Instructions and is connected to the refrigerant lines.
8. Replace valve cores.
9. Pressurize the lines and indoor coil with a pressure not to exceed 20 psig.
10. Leak test the lines with a pressure not to exceed 20 psig.
11. Connect the vacuum pump with 250 micron capability to the service valves.

12. Evacuate the system to 250 microns or less using the suction and liquid service valves.

NOTE: Using both valves is necessary since some compressors create a mechanical seal separating the sides of the system.

13. Close the pump valve and hold the vacuum for 10 minutes. Typically the pressure will rise during this period.

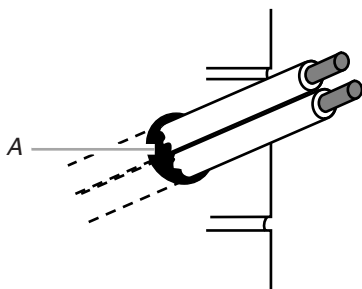


- If the pressure rises to 1,000 microns or less and remains steady, the system is considered leak-free; proceed to start-up.
- If the pressure rises above 1,000 microns but holds steady below 2,000 microns, moisture and/or non condensables may be present or the system may have a small leak. Return to Step 12. If the same result is encountered, check for leaks as previously indicated and repair as necessary. Repeat the evacuation.
- If the pressure rises above 2,000 microns, a leak is present. Check for leaks as previously indicated and repair as necessary. Repeat the evacuation.

14. Open the suction and liquid service valves fully.

15. Insulate the suction line with refrigerant line insulation material of 1/4" (6.4 mm) or more wall thickness.

16. Pack insulating material around refrigerant lines where they penetrate the structure to avoid damage to the lines and to minimize vibration transmission.



A. Insulating material around refrigerant lines

Suction Line Sizes

Installations exceeding 74 ft (22.6 m) are not recommended.

Condensing Unit Tons	Line Set Size— inches (cm) OD		
1.5	5/8 (1.6)	3/4 (1.9)	3/4 (1.9)
2	5/8 (1.6)	3/4 (1.9)	3/4 (1.9)
2.5	5/8 (1.6)	3/4 (1.9)	7/8 (2.2)
3	3/4 (1.9)	7/8 (2.2)	1 1/8 (2.9)
3.5	7/8 (2.2)	1 1/8 (2.9)	1 1/8 (2.9)
4	7/8 (2.2)	1 1/8 (2.9)	1 1/8 (2.9)
5	7/8 (2.2)	1 1/8 (2.9)	1 1/8 (2.9)
Line Set Length	Less than 25 ft (7.6 m)	25 ft (7.6 m) to 49 ft (14.9 m)	50 ft (15.2 m) to 74 ft (22.6 m)

Liquid Line Sizes

Installations exceeding 74 ft (22.6 m) are not recommended.

Condensing Unit Tons	Line Set Size— inches (cm) OD		
1.5	1/4 (0.6)	3/8 (1)	3/8 (1)
2	1/4 (0.6)	3/8 (1)	3/8 (1)
2.5	1/4 (0.6)	3/8 (1)	3/8 (1)
3	3/8 (1)	3/8 (1)	3/8 (1)
3.5	3/8 (1)	3/8 (1)	3/8 (1)
4	3/8 (1)	3/8 (1)	3/8 (1)
5	3/8 (1)	3/8 (1)	3/8 (1)
Line Set Length	Less than 25 ft (7.6 m)	25 ft (7.6 m) to 49 ft (14.9 m)	50 ft (15.2 m) to 74 ft (22.6 m)

Make Electrical Connections

WARNING

To avoid the risk of injury, electrical shock or death, the furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of the National Electric Code (NEC).

IMPORTANT:

- Electrical wiring, disconnect means and over-current protection are to be supplied by the installer. Refer to the rating plate for the maximum over-current protection, minimum circuit ampacity, and operating voltage. See the wiring diagrams later in this section.
- Install an adequately sized branch circuit disconnect, according to the NEC, within sight of and readily accessible from the condensing unit.
- The cable or conduit and fittings connected from the disconnect to the condensing unit shall be rated for outdoor use.

Electrical Connections

Refer to Wiring Connection Diagram—Single Phase 208/230 Volt later in this section.

WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing.

Multiple power sources may be present.

Failure to do so may cause property damage, personal injury or death due to electric shock.

Wiring must conform with NEC or CEC and all local codes. Undersized wires could cause poor equipment performance, equipment damage or fire.



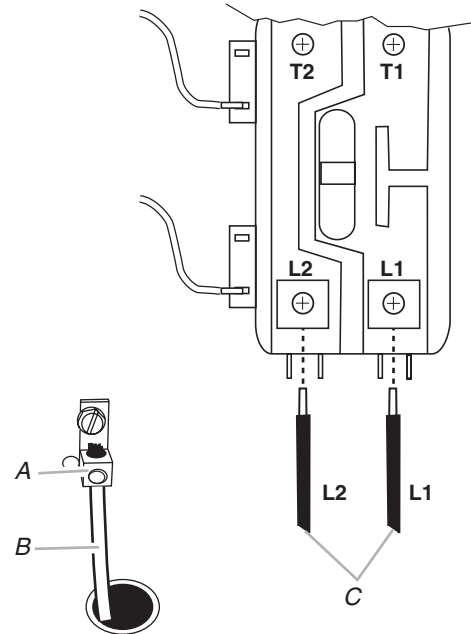
WARNING

To avoid the risk of fire or equipment damage, use copper conductors.

NOTICE

Units with reciprocating compressors and non-bleed TXV's require a Hard Start Kit.

1. Disconnect power.
2. Remove control box cover.
3. Connect the field supply wires L1 and L2 to contactor terminals T1 and T2.
4. Connect ground wire to ground lug.



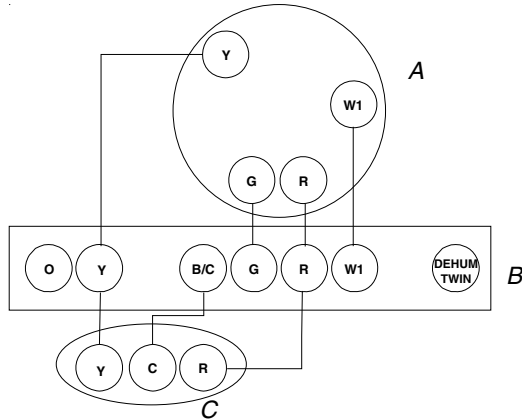
A. Ground lug
B. Field supply ground wire
C. 208/230 volt field supply wires

5. Connect low voltage circuit.

Typical Wiring Connection—Low Voltage Circuit

Condensing unit control wiring requires 24-Volt minimum, 25VA service from the indoor transformer. Low voltage wiring for 2-stage units depends on the thermostat used and the number of control wires between the indoor unit and the condensing unit. Route the control wires through the low voltage port and terminate in accordance with the wiring diagram provided inside the control panel cover.

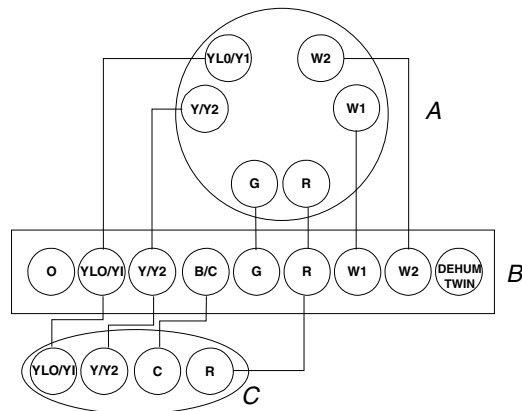
Single-Stage Thermostat with 3 Low Voltage Wires to Condensing Unit



- A. Thermostat—single-stage heating with single-stage cooling
 B. Furnace or air handler
 C. Condensing unit

NOTE: For 2-stage condensing units, refer to the Installation Instructions supplied with the variable-speed indoor units for field wiring connections.

2-Stage Thermostat with 4 Low Voltage Wires to Condensing Unit



- A. Thermostat—2-stage heating with 2-stage cooling
 B. Furnace or air handler
 C. OD unit

Charge Refrigerant Lines

WARNING

REFRIGERANT UNDER PRESSURE!
 Failure to follow proper procedures may cause property damage, personal injury or death.

CAUTION

Use care when handling scroll compressors. Dome temperatures could be hot.

CAUTION

POSSIBLE REFRIGERANT LEAK
 To avoid a possible refrigerant leak, open the service valves until the top of the stem is $\frac{1}{8}$ " (3.2 mm) from the retainer.

WARNING

REFRIGERANT UNDER PRESSURE!

- Do not overcharge system with refrigerant.
- Do not operate unit in a vacuum or at negative pressure.

Failure to follow proper procedures may cause property damage, personal injury or death.

Charge Using Weigh-In Method (Fixed Orifice/Thermal Expansion Device Systems)

Use this method if the system is void of refrigerant, or if the outdoor ambient temperature is cool.

1. Locate and repair any leaks.
2. If necessary, recover the refrigerant from the condensing unit.
3. Conduct a leak check, then evacuate as previously outlined.
4. Weigh in the charge according to the total amount shown on the condensing unit nameplate.

NOTE: If weighing facilities are not available or if the condensing unit is being charged during warm weather, follow one of the other charging methods.

IMPORTANT:

- Refrigerant charge adjustment will be required for line set lengths greater than 15 ft (4.6 m) and for non system-matched evaporator coils.
- The condensing unit is factory-charged with the proper refrigerant charge amount for a matching evaporator and 15 ft of refrigerant line. Refer to the condensing unit rating plate for the exact amount of this factory charge.
- Adjustment of the refrigerant charge will be necessary based on the system combination and line length. To adjust the refrigerant size for increased line lengths, add the following amount of refrigerant.

For line set lengths greater than 15 ft (4.6 m), add refrigerant by weighing in 0.60 oz per ft of 3/8" (1 cm) O.D. liquid line or 0.23 oz per ft of 1/4" (6.4 mm) O.D. liquid line.
- If necessary, adjust the refrigerant charge for compatibility with the evaporator coil.

Charge Verification

NOTES:

- Do not overcharge the system with refrigerant.

 **CAUTION**

Prolonged operation at suction pressures less than 20 psig for more than 5 seconds will result in overheating of the scrolls and permanent damage to the scroll tips, drive bearings and internal seal.

 **CAUTION**

Operating the compressor with the suction valve closed will void the warranty and cause serious compressor damage.

 **CAUTION**

Use refrigerant certified to ARI standards. Used refrigerant may cause compressor damage, and will void the warranty. Most portable machines cannot clean used refrigerant to meet ARI standards.

NOTICE

Violation of EPA regulations may result in fines or other penalties.

- Used refrigerant may cause compressor damage, and will void the warranty.
 - Most portable machines cannot clean used refrigerant to meet ARI standards.
 - Violation of EPA regulations may result in fines or other penalties.
 - Operating the compressor with the suction valve closed will void the warranty and cause serious compressor damage.
1. Check that the outdoor temperature is 60°F (15.6°C) or higher.
 2. Set the room thermostat to COOL.
 3. Set the fan switch to AUTO.
 4. Set the temperature control well below the room temperature.
 5. After the system has stabilized according to the start-up instructions, check the subcooling and superheat. See “Chargeby System Superheat—Fixed Orifice Metering” and “Chargeby System Subcooling—TXV Metering.”

Charge by System Superheat—Fixed Orifice Metering

1. Purge the gauge lines.
2. Connect the service gauge manifold to the base-valve service ports.
3. Run the system at least 10 minutes to allow the pressure to stabilize.
4. Temporarily install a thermometer on the suction (large) line near the suction line service valve with adequate contact. Insulate the thermometer for the best possible reading.
5. Refer to the following System Superheat table for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.
6. Disconnect the manifold set. Installation is now complete.

NOTE: Superheat Formula = Suction Line Temperature - Saturated Suction Temperature

System Superheat

Ambient Condenser Inlet Temperature—°F (°C) Dry-Bulb	Return Air Temperature—°F (°C) 50% RH									
	Dry bulb	Wet bulb	Dry bulb	Wet bulb	Dry bulb	Wet bulb	Dry bulb	Wet bulb	Dry bulb	Wet bulb
	65 (18)	54 (12.2)	70 (21.1)	58 (14.4)	75 (23.9)	63 (17.2)	80 (26.7)	67 (19.4)	85 (29.4)	71 (21.7)
115 (46.1)	***	***	***	***	***	***	***	***	***	5
100 (37.8)	***	***	***	***	***	***	***	5	***	6
95 (35)	***	***	***	***	5	***	5	5	***	9
90 (32.2)	***	***	***	***	5	***	5	10	***	11
85 (29.4)	***	***	5	***	5	***	5	12	***	17
80 (26.7)	5	***	5	***	5	***	5	18	***	20
75 (23.9)	5	***	5	***	5	***	10	20	***	22
70 (21.1)	5	***	5	***	6	***	15	24	***	25
65 (18.3)	5	***	10	***	10	***	20	25	***	29
60 (15.6)	8	***	15	***	15	***	21	28	***	31
***	Flooded region									

Saturated Suction Pressure Temperature

Suction Pressure	Saturated Suction Temperature °F (°C)	Suction Pressure	Saturated Suction Temperature °F (°C)
PSIG	R-410A	PSIG	R-410A
50	1 (-17.2)	78	20 (-6.7)
52	3 (-16.1)	80	21 (-6.1)
54	4 (-15.6)	85	24 (-4.4)
56	6 (-14.4)	90	26 (-3.3)
58	7 (-13.9)	95	29 (-1.7)
60	8 (-13.3)	100	31 (-0.6)
62	10 (-12.2)	110	36 (2.2)
64	11 (-11.7)	120	41 (5)
66	13 (-10.6)	130	45 (7.2)
68	14 (-10)	140	49 (9.4)
70	15 (-9.4)	150	53 (11.7)
72	16 (-8.9)	160	56 (13.3)
74	17 (-8.3)	170	60 (15.6)
76	19 (-7.2)		

Charge by System Subcooling—TXV Metering

Single Stage Application

- Purge the gauge lines.
- Connect the service gauge manifold to the base-valve service ports.
- Run the system at least 10 minutes to allow the pressure to stabilize.
- Temporarily install a thermometer on the suction (large) line near the suction line service valve with adequate contact. Insulate the thermometer for the best possible reading.
- Check the subcooling and superheat. Systems with TXV application should have a subcooling of $7 \pm 2^\circ\text{F}$ (1°C) and superheat of 7°F to 9°F (-13.9°C to -12.8°C).
 - If the subcooling and superheat are low, adjust TXV to 7°F to 9°F (-13.9°C to -12.8°C) superheat. Check subcooling.

NOTE: To adjust the superheat, turn the valve stem clockwise to increase and counterclockwise to decrease.
 - If the subcooling is low and the superheat is high, add charge to raise the subcooling to $7 \pm 2^\circ\text{F}$ (1°C). Check superheat.
 - If subcooling and superheat are high, adjust TXV valve to 7°F to 9°F (-13.9°C to -12.8°C) superheat. Check subcooling.
 - If subcooling is high and superheat is low, adjust TXV valve to 7°F to 9°F (-13.9°C to -12.8°C) superheat and remove charge to lower the subcooling to $7 \pm 2^\circ\text{F}$ (1°C).

NOTE: Do not adjust the charge based on the suction pressure unless there is a gross undercharge.
- Disconnect the manifold set. Installation is now complete.

Two Stage Application

Run the condensing unit on low-stage cooling for 10 minutes until refrigerant pressures stabilize. Follow the guidelines and methods below to check the unit operation and ensure that the refrigerant charge is within limits. Charge the unit on low stage.

- Purge the gauge lines.

NOTE: Subcooling Formula = Saturated Liquid Temperature - Liquid Line Temperature

Saturated Liquid Pressure Temperature

Liquid Pressure	Saturated Liquid Temperature °F (°C)	Liquid Pressure	Saturated Liquid Temperature °F (°C)
PSIG	R-410A	PSIG	R-410A
200	70 (21.1)	375	112 (44.4)
210	73 (22.8)	405	118 (47.8)
220	76 (24.4)	415	119 (48.3)
225	78 (25.6)	425	121 (49.4)
235	80 (26.7)	435	123 (50.6)
245	83 (28.3)	445	125 (51.7)
255	85 (29.4)	475	130 (54.4)
265	88 (31.1)	500	134 (56.7)
275	90 (32.2)	525	138 (58.9)
285	92 (33.3)	550	142 (61.1)

- Connect the service gauge manifold to the base-valve service ports.
- Run the system at least 10 minutes to allow the pressure to stabilize.
- Temporarily install a thermometer on the liquid (small) line near the liquid line service valve with adequate contact. Insulate the thermometer for the best possible reading.
- Check the subcooling and superheat. Systems with TXV application should have a subcooling of 5°F to 7°F (-15°C to -13.9°C) and superheat of 7°F to 9°F (-13.9°C to -12.8°C).
 - If the subcooling and superheat are low, adjust TXV to 7°F to 9°F (-13.9°C to -12.8°C) superheat. Check subcooling.

NOTE: To adjust the superheat, turn the valve stem clockwise to increase and counterclockwise to decrease.
 - If the subcooling is low and the superheat is high, add charge to raise the subcooling to 5°F to 7°F (-15°C to -13.9°C). Check superheat.
 - If subcooling and superheat are high, adjust TXV valve to 7°F to 9°F (-13.9°C to -12.8°C) superheat. Check subcooling.
 - If subcooling is high and superheat is low, adjust TXV valve to 7°F to 9°F (-13.9°C to -12.8°C) superheat and remove charge to lower the subcooling to 5°F to 7°F (-15°C to -13.9°C).

NOTE: Do not adjust the charge based on the suction pressure unless there is a gross undercharge.

WARNING

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant into the atmosphere. Recover all refrigerant during system repair and before final unit disposal.

- Disconnect the manifold set. Installation is now complete.

Saturated Liquid Pressure Temperature

Liquid Pressure	Saturated Liquid Temperature °F (°C)	Liquid Pressure	Saturated Liquid Temperature °F (°C)
PSIG	R-410A	PSIG	R-410A
295	95 (35)	575	145 (62.8)
305	97 (36.1)	600	149 (65)
325	101 (38.3)	625	152 (66.7)
355	108 (42.2)		

Complete Installation

1. Operate the condensing unit for a period of at least 15 minutes to allow for pressures and temperatures to stabilize.
2. If condensing unit does not appear to be functioning correctly, have condensing unit checked by a person certified by the EPA to handle refrigerant.

TROUBLESHOOTING

Problem

No Cooling

Cause/Test Method and/or Solution

- | | |
|---|---|
| <ul style="list-style-type: none"> ■ System will not start | <ul style="list-style-type: none"> ■ Power failure. Test voltage. ■ Blown fuse. Inspect fuse size and type. Replace, if needed. ■ Loose connection. Inspect connection. Tighten if needed. ■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed. ■ Faulty thermostat. Test continuity of thermostat and wiring. Replace, if needed. ■ Faulty transformer. Check control circuit with voltmeter. Replace, if needed. ■ Compressor stuck. Use test cord. ■ Faulty compressor contactor. Test continuity of coil and contacts. Replace, if needed. |
| <ul style="list-style-type: none"> ■ Compressor will not start—fan runs | <ul style="list-style-type: none"> ■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed. ■ Shorted or open capacitor. Test capacitor. ■ Internal compressor overload open. Test continuity of overload. ■ Shorted or grounded compressor. Test motor windings. ■ Faulty compressor contactor. Test continuity of coil and contacts. Replace, if needed. ■ Low voltage. Test voltage. ■ Unbalanced power, 3PH. Test voltage. |
| <ul style="list-style-type: none"> ■ Compressor and condenser fan will not start | <ul style="list-style-type: none"> ■ Blown fuse. Inspect fuse size and type. Replace, if needed. ■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed. ■ Faulty thermostat. Test continuity of thermostat and wiring. Replace, if needed. ■ Faulty transformer. Check control circuit with voltmeter. Replace, if needed. ■ Faulty compressor contactor. Test continuity of coil and contacts. Replace, if needed. ■ High pressure control open. Reset and test control. |
| <ul style="list-style-type: none"> ■ Evaporator fan will not start | <ul style="list-style-type: none"> ■ Blown fuse. Inspect fuse size and type. Replace, if needed. ■ Loose connection. Inspect connection. Tighten if needed. ■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed. ■ Open overload. Test continuity of overloads. ■ Faulty thermostat. Test continuity of thermostat and wiring. Replace, if needed. ■ Shorted or open capacitor. Test capacitor. ■ Faulty fan relay. Test continuity of coil and contacts. ■ Faulty evaporator fan motor. Repair or replace. ■ Shorted or grounded fan motor. Test motor windings. |

Problem

No Cooling**Cause/Test Method and/or Solution**

- | | |
|--|--|
| <ul style="list-style-type: none">■ Condenser fan will not start | <ul style="list-style-type: none">■ Loose connection. Inspect connection. Tighten if needed.■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed.■ Open overload. Test continuity of overloads.■ Shorted or open capacitor. Test capacitor.■ Shorted or grounded fan motor. Test motor windings. |
| <ul style="list-style-type: none">■ Compressor runs—goes off on overload | <ul style="list-style-type: none">■ Loose connection. Inspect connection. Tighten if needed.■ Shorted or broken wires. Test circuits with ohmmeter. Replace if needed.■ Shorted or open capacitor. Test capacitor.■ Shorted or grounded compressor. Test motor windings.■ Compressor stuck. Use test cord.■ Faulty compressor contactor. Test continuity of coil and contacts. Replace, if needed.■ Low voltage. Test voltage.■ Overcharge of refrigerant. Recover part of charge.■ Unbalanced power, 3PH. Test voltage.■ Wrong type of expansion valve. Replace valve.■ Expansion valve restricted. Replace valve.■ Undersized expansion valve. Replace valve.■ Inoperative expansion valve. Check valve operation. Replace if needed. |
| <ul style="list-style-type: none">■ Compressor cycles on overload | <ul style="list-style-type: none">■ Low voltage. Test voltage.■ Shortage of refrigerant. Test for leaks. Add refrigerant.■ Restricted liquid line. Replace restricted part.■ Overcharge of refrigerant. Recover part of charge.■ Noncondensibles. Recover charge. Evacuate and recharge.■ Recirculation of condensing air. Remove obstruction to airflow.■ Unbalanced power, 3PH. Test voltage.■ Wrong type of expansion valve. Replace valve.■ Expansion valve restricted. Replace valve.■ Undersized expansion valve. Replace valve. |
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Problem

Unsatisfactory Cooling**Cause/Test Method and/or Solution**

- | | |
|---|---|
| <ul style="list-style-type: none">■ System runs continuously—little cooling | <ul style="list-style-type: none">■ Shortage of refrigerant. Test for leaks. Add refrigerant.■ Restricted liquid line. Replace restricted part.■ Undersized liquid line. Replace line.■ Not enough air across indoor coil. Speed blower. Check duct static pressure.■ Infiltration of outdoor air. Check windows, doors, vent fans, etc.■ System undersized. Refigure cooling load.■ Inefficient compressor. Test compressor efficiency.■ Expansion valve restricted. Replace valve.■ Undersized expansion valve. Replace valve.■ Inoperative expansion valve. Check valve operation. Replace if needed. |
|---|---|

Problem

Unsatisfactory Cooling**Cause/Test Method and/or Solution**

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- | | |
|---|--|
| <ul style="list-style-type: none">■ Too cool and then too warm | <ul style="list-style-type: none">■ Faulty thermostat. Test continuity of thermostat and wiring. Replace, if needed.■ Improper cooling anticipator. Check resistance of anticipator.■ Improperly located thermostat. Relocate thermostat.■ Airflow unbalanced. Readjust air volume dampers. |
| <ul style="list-style-type: none">■ Not cool enough on warm days | <ul style="list-style-type: none">■ Undersized liquid line. Replace line.■ Not enough air across indoor coil. Speed blower. Check duct static pressure.■ Noncondensibles. Recover charge. Evacuate and recharge.■ Recirculation of condensing air. Remove obstruction to airflow.■ Infiltration of outdoor air. Check windows, doors, vent fans, etc.■ System undersized. Refigure cooling load.■ Wrong type of expansion valve. Replace valve.■ Expansion valve restricted. Replace valve.■ Undersized expansion valve. Replace valve. |
| <ul style="list-style-type: none">■ Certain areas too cool, others too warm | <ul style="list-style-type: none">■ Not enough air across indoor coil. Speed blower. Check duct static pressure.■ Infiltration of outdoor air. Check windows, doors, vent fans, etc.■ Airflow unbalanced. Readjust air volume dampers. |
| <ul style="list-style-type: none">■ Compressor is noisy | <ul style="list-style-type: none">■ Overcharge of refrigerant. Recover part of charge.■ Broken internal parts. Replace compressor.■ Broken valves. Test compressor efficiency. Replace if needed.■ Oversized expansion valve. Replace valve.■ Expansion valve bulb loose. Tighten bulb bracket.■ Loose hold-down bolts. Tighten bolts. |
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Problem

System Operating Pressures**Cause/Test Method and/or Solution**

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- | | |
|--|--|
| <ul style="list-style-type: none">■ Low suction pressure | <ul style="list-style-type: none">■ Faulty evaporator fan motor. Repair or replace.■ Shortage of refrigerant. Test for leaks. Add refrigerant.■ Restricted liquid line. Replace restricted part.■ Undersized liquid line. Replace line.■ Undersized suction line. Replace line.■ Not enough air across indoor coil. Speed blower. Check duct static pressure.■ Expansion valve restricted. Replace valve.■ Undersized expansion valve. Replace valve.■ Inoperative expansion valve. Check valve operation. Replace if needed. |
|--|--|
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Problem

System Operating Pressures**Cause/Test Method and/or Solution**

- | | |
|-------------------------|---|
| ■ Low head pressure | ■ Shortage of refrigerant. Test for leaks. Add refrigerant.
■ Restricted liquid line. Replace restricted part.
■ Inefficient compressor. Test compressor efficiency.
■ Expansion valve restricted. Replace valve. |
| ■ High suction pressure | ■ Too much air across indoor coil. Reduce blower speed.
■ Overcharge of refrigerant. Recover part of charge.
■ Inefficient compressor. Test compressor efficiency.
■ Oversized expansion valve. Replace valve.
■ Expansion valve bulb loose. Tighten bulb bracket. |
| ■ High head pressure | ■ Shorted or grounded fan motor. Test motor windings.
■ Overcharge of refrigerant. Recover part of charge.
■ Noncondensibles. Recover charge. Evacuate and recharge.
■ Recirculation of condensing air. Remove obstruction to airflow. |
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NOTICE

Units with reciprocating compressors and non-bleed TXV's require a Hard Start Kit.

SYSTEM MAINTENANCE

- Leaves and other large obstructions should be removed from the condensing unit surfaces without damaging the fin surface of the coil.
- Routinely clean or change the indoor air filter. Should the indoor coil become dirty, thus restricting airflow, call a qualified service person to clean the coil surface.
- An annual inspection by a qualified person should be performed to ensure continued high-quality performance.

ASSISTANCE OR SERVICE

If you need further assistance, you can write to the below address with any questions or concerns:

Whirlpool® Home Cooling and Heating
14610 Breakers Drive
Jacksonville, FL 32258

Please include a daytime phone number in your correspondence.

Accessories

To order accessories, contact your Whirlpool® Home Cooling and Heating dealer.

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