

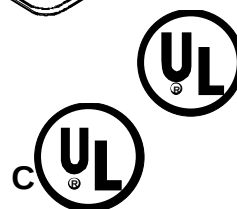
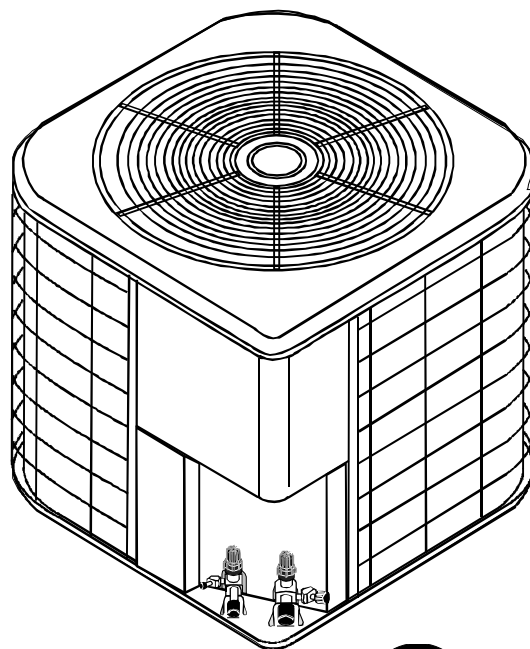
REMOTE COOLING CONDENSING UNITS

with R-410A

Installation Instructions

Contents

Safety Instructions	2
General	3
SHIPPING AND HANDLING	3
LOCATION AND CLEARANCES	3
ROOFTOP INSTALLATION	3
FACTORY-MATCHED INDOOR COILS WITH TXV KITS	3
TXV INSTALLATION	3
APPLICATION NOTE	3
Refrigeration Piping	4
REFRIGERANT VAPOR AND LIQUID LINE SIZING	4
R-410A INSTALLATION CONSIDERATIONS	4
REFRIGERANT VAPOR AND LIQUID LINE ROUTING	4
FILTER DRIER INSTALLATION	4
SIGHT GLASS CONNECTIONS	4
SWEAT CONNECTIONS	4
Safe Refrigerant Handling	5
BACKSEATING SERVICE VALVES	5
LEAK TESTING	6
SYSTEM EVACUATION	7
LINE SET REFRIGERANT CHARGE	8
FACTORY CHARGE RELEASE INTO SYSTEM	8
Electrical Connections	8
WIRING	8
System Startup	9
FINAL CHARGE ADJUSTMENT	9
Final Checks	10
Troubleshooting	10
System Checklist	11
R-410A QUICK REFERENCE GUIDE	12
Pressure vs. Temperature Chart	13
Subcooling Reference Table	14



RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION.

ATTENTION INSTALLING PERSONNEL

As a professional installer you have an obligation to know the product better than the customer. This includes all safety precautions and related items.

Prior to actual installation, thoroughly familiarize yourself with this Instruction Manual. Pay special attention to all safety warnings. Often during installation or repair it is possible to place yourself in a position which is more hazardous than when the unit is in operation.

Remember, it is your responsibility to install the product safely and to know it well enough to be able to instruct a customer in its safe use.

Safety is a matter of common sense...a matter of thinking before acting. Most dealers have a list of specific good safety practices...follow them.

The precautions listed in this Installation Manual are intended as supplemental to existing practices. However, if there is a direct conflict between existing practices and the content of this manual, the precautions listed here take precedence.

Safety Instructions

RECOGNIZE SAFETY SYMBOLS, WORDS, AND LABELS

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



WARNING

WARNING - Hazards or unsafe practices which **COULD** result in severe personal injury or death.



CAUTION

CAUTION - Hazards or unsafe practices which **COULD** result in minor or moderate personal injury, product damage, property damage.



WARNING

To avoid personal injury, shock, or death, ensure the electrical disconnect switch(es) is (are) in the OFF position before installing, modifying, or servicing the unit. Lock out and tag the switch with a suitable warning label. Wiring must conform with NEC or CEC and all local codes.



WARNING

To avoid possible explosion, death, or injury, practice safe handling of refrigerants. R-410A systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.



Safety Guidelines

1. Allow only qualified, experienced technicians to install or service this unit.
2. Install the system in accordance with all local codes. If no local codes exist, follow National Codes (NEC in the U.S., CEC in Canada).
3. Open the electrical disconnect switch(es) before electrically connecting the unit.
4. Before operating the unit, be certain it is properly grounded.
5. The unit contains refrigerant gas under pressure. Avoid puncturing or breaking any tubing.
6. Before operating the unit, complete the refrigerant connections.

General

These installation instructions cover the installation of remote cooling condensing units. See the outdoor unit specification sheet for information regarding accessories.

NOTE: Local codes usually require that a disconnect switch be located near the unit. Do NOT locate the disconnect switch on the unit itself.

SHIPPING AND HANDLING

All cooling units are securely packed in shipping containers approved by the International Safe Transit Association. Check the carton upon arrival for external damage. If damage is found, file a request in writing for inspection by the carrier agent immediately. The carrier is responsible for making prompt inspection of damage and for a thorough investigation of each claim. The distributor or manufacturer will not accept claims from dealers for transportation damage. If no damage is found, carefully remove all shipping material and properly dispose of it.

Keep the unit as upright as possible. Laying the unit on its side or top could cause equipment damage.

LOCATION AND CLEARANCES

This unit is for outdoor installation only. The unit cannot be completely enclosed. At least one side must be unrestricted. Refer to Figure 1 for clearances from the sides and top of the unit to walls and other objects.

NOTE: These minimum clearances do not guarantee adequate service access. Sufficient clearances for servicing the unit(s) must be provided.

If installing two or more units at the same location, allow at least 24 inches between the units when using the 6"-12"-12" guidelines in Figure 1. The space between two units may be reduced to 12" if the clearances in Figure 1 are increased to 12"-24"-24".

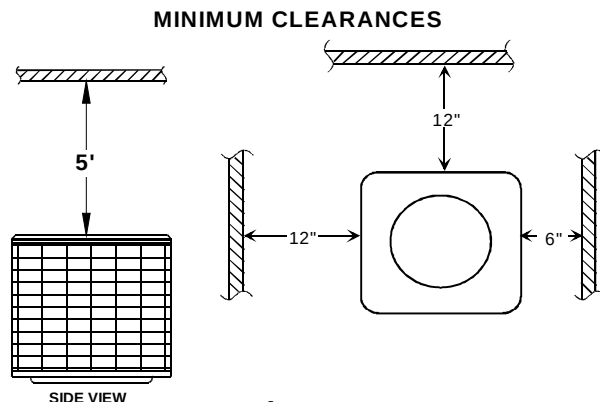


Figure 1
Minimum Clearances

DO NOT locate the unit:

- Directly under a vent termination for a gas appliance.
- Within 3 feet of a clothes dryer vent.
- Where water could rise into the unit.
- Where the noise would prove to be a nuisance to the customer (i.e. windows, patios, decks, etc.)

AVOID:

- Direct tubing contact with water pipes, ductwork, floor joists, wall studs, floors, and walls.
- Suspending refrigerant tubing from joists and studs with rigid wire or straps that would come in contact with tubing.

DO:

- Leave slack between structure and unit to absorb vibration.
- When passing refrigerant tubes through the wall, seal the opening with RTV or a pliable silicon-based caulk.
- Ensure that the vapor and liquid line tube diameters are appropriate for unit capacity.
- Avoid unnecessary turns and bends by running refrigerant tubing as directly as possible.

DO locate the unit:

- In accordance with the minimum clearances described in Figure 1.
- To minimize the length of refrigerant piping required.
- To provide adequate service clearances.
- On a level concrete pad (or other sturdy, weather resistant platform).
- So that it is isolated from the building structure to avoid transmission of vibrations.

NOTE: Short runs of refrigerant piping are better than long runs. Locate the unit to provide safe access for future maintenance and service. If possible, discuss unit location with the owner before proceeding.

Service valve connections are oriented at a 45° angle to the unit. Either side of the unit adjacent to the valves can be conveniently located toward the house.

ROOFTOP INSTALLATION

Before installing this unit on a roof, ensure that the roof will support the weight of the unit, its platform, and the service personnel. For the unit weight, see the outdoor unit specification sheet (all weights are approximate). If there is doubt about the adequacy of the roof, contact a qualified architect or structural engineer before installing the unit. Ensure the unit is placed on a level, weather-resistant platform.

FACTORY-MATCHED INDOOR COILS WITH TXV KITS

Install factory-recommended evaporator coils as listed in the sales literature and ARI.

TXV INSTALLATION

Install only the factory-approved TXV kit specified on the unit specification sheet and service label. **DO NOT USE AN R-22 TXV.** Install the TXV according to the instructions included in the kit.

APPLICATION NOTE

For proper performance, the indoor equipment and ductwork must be adequate for moving about 400 CFM of indoor air for every ton of cooling capacity to be installed. If they are not, modify the ductwork or indoor equipment accordingly.

Refrigeration Piping

REFRIGERANT VAPOR AND LIQUID LINE SIZING

Refer to the outdoor unit specification sheet for the required vapor and liquid line tubing sizes. The listed sizes in the specification sheet are suitable for line lengths of fifty feet or less and indoor coil elevations of no more than forty feet above or below the outdoor unit. **NOTE:** Unit performance is affected by vapor line tubing size. A larger than required vapor line tubing inhibits oil return to the unit. A smaller than required vapor line tubing size decreases unit performance by up to 10%.

If longer runs and greater elevations are required, refer to the *Line Set Guidelines* section in the service manual or contact your Amana distributor for assistance.

Check the indoor coil liquid and vapor line diameter. A bushing or coupling may be needed to match with the line sizes used.

R-410A INSTALLATION CONSIDERATIONS

Drain any residual mineral oil from the existing system and line sets. Pay particular attention to low areas where oil may collect. Traps must be drained of oil. R-410A systems tolerate only a small amount of mineral oil.

NOTE: Avoid contact between tubing and structure

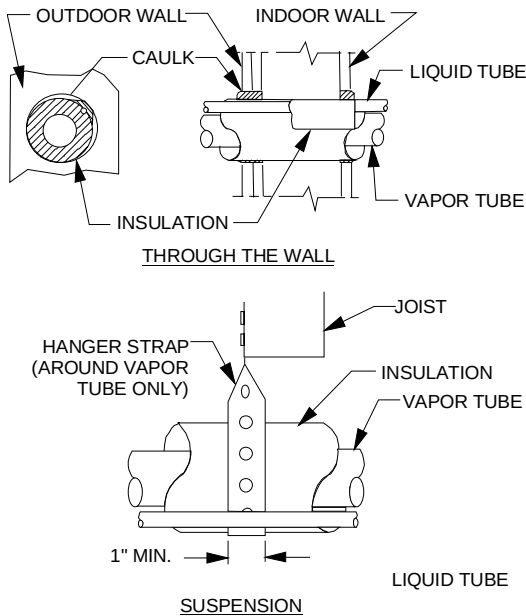


Figure 2
Connecting Tubing Installation

REFRIGERANT VAPOR AND LIQUID LINE ROUTING

The unit vapor line must be insulated with an insulation that includes a vapor barrier.

The unit liquid line must be outside the vapor line insulation. If any part of the liquid line runs through an area that will be hotter than 120°F, that part must be insulated.

Avoid burying refrigerant lines. If you must bury them, first dig the trench so it gradually slopes toward the compressor (at least 1 inch per 10 feet). Then, insulate the liquid and

suction lines separately. Enclose all underground portions of the refrigerant lines in waterproof material (conduit or pipe). If the lines must pass under or through a concrete slab, be sure they are adequately protected.

- Seal the holes where the refrigerant piping enters the building and support piping as necessary (see Figure 2).
- Be careful not to kink or dent the refrigerant lines. Kinked or dented lines will cause poor performance or compressor damage.

FILTER DRIER INSTALLATION



CAUTION

To prevent damage to the unit, a filter drier must be installed in the liquid line.

Install the filter drier shipped with the unit near the outdoor unit. A new filter drier (properly sized and rated for R-410A) must be installed with new outdoor units in order for the compressor warranty to remain valid. Any time the refrigeration system has been opened for service, a new properly-sized filter drier rated for R-410A must be installed.

IMPORTANT NOTE: If the unit is to be installed on a system with a TXV metering device, remove indoor coil piston (orifice) to avoid damaging the unit,



CAUTION

Do not leave system open to atmosphere any longer than necessary for installation. The compressor POE oil is extremely susceptible to moisture absorption and could cause compressor failure. Ensure ends of tubing are sealed before and during installation.

SIGHT GLASS CONNECTIONS

Install the sight glass shipped with the outdoor unit in the 3/8" liquid line, preferably near the indoor coil. In this location, the sight glass can provide a visual check on the activity of the subcooled liquid and its moisture content. It is not intended to give an indication of a full system charge.

SWEAT CONNECTIONS

NOTE: When brazing, use a brazing alloy of 2% minimum silver content. Do not use flux.

Before brazing connections, ensure the refrigerant line ends are cut square, deburred, cleaned, free of nicks or dents and round. Any other condition would increase the change of refrigerant leakage.

During brazing, wrap the component with a wet rag, or use a thermal heat trap compound recommended by the compound manufacturer, to avoid overheating the service valve, TXV valve, or filter drier while brazing. "Sweep" the

refrigerant line with nitrogen or inert gas during brazing to prevent the formation of copper-oxide inside the refrigerant lines. The POE oils used in R-410A applications will clean any copper-oxide present from the inside of the refrigerant lines and spread it throughout the system, this may cause a blockage or failure of the TXV.

After brazing, quench the joints with water or a wet cloth to prevent overheating of the service valve. Inspect the paint finish of the filter drier. The finish must be intact after brazing. If the paint of the steel filter drier has been burned or chipped, repaint or treat with a rust preventative. This is especially important on suction line filter driers which are continually wet during the unit operation.

Safe Refrigerant Handling



WARNING

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

While these items will not cover every conceivable situation, they should serve as a useful guide.



WARNING

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

- **Never sniff a refrigerant.**
- **Never purge refrigerant into an enclosed room or space. In fact, all refrigerants must, BY LAW, 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, get 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-410A to an R-410A cylinder. R-410A operates at 50 to 70% higher than standard R-22 systems. Service equipment used must be listed or certified for R-410A.**
- **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.**

BACKSEATING SERVICE VALVES

This condensing unit is equipped with backseat valves to ensure safe handling of the high-pressure R-410A refrigerant. The unit is shipped with the valve front seated (downward position) to contain the factory charge in the unit. Like standard sweat valves, the line set tubing can be brazed to the field connections of the valve and be accessed by the gauge ports. Unlike standard valves, the backseat valve has the following unique features and requirements:

- The stem cap is installed finger-tight and does not require torque for sealing the stem.
- The stem is sealed primarily by backseating and torquing the valve. See *Final Charge Adjustment* section for torque values.
- The stems have a 5/16" square head on the vapor valve and 1/4" on the liquid valve.
- The stem has a packing seal instead of an O-ring. The packing nut can be tightened if necessary to prevent leakage during servicing. The torque value for the packing nut is 7.5 ft-lbs. Do not overtighten.
- Gauge hoses can be connected and disconnected without the presence of system pressure. The gauge port is isolated from the system if the stem is backseated.

- The gauge ports have a standard core valve, which can be removed and replaced while the stem is backseated.
- The gauge ports have a non-standard hose connection size. Factory-recommend gauge hoses are required to connect to the gauge ports.

LEAK TESTING



WARNING

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



CAUTION

To avoid injury or refrigerant leakage, backseat the service valves before removing the port cap and when connecting and disconnecting manifold hoses.

1. Before testing ensure both hand valves on the gauge manifold are closed relative to the center port (i.e., turned IN all the way.)
2. Attach the gauge manifold to the service valves on the unit (see Figure 3). Check the stem packing nuts for tightness. The nuts should be torqued (clockwise) to no more than 7.5 ft lbs. Do not overtighten.

Do not open the unit service valves.

Do not use refrigerant from the unit for leak testing. The refrigerant in your unit has been precisely measured at the factory for optimum performance.



Figure 3
Backseating Service Valves



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.

3. Connect a dry nitrogen cylinder to the center port on the gauge manifold.

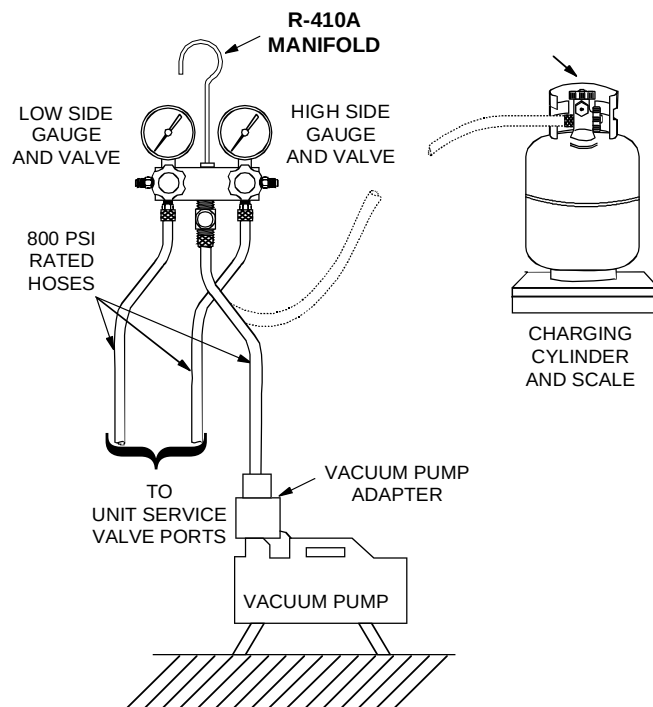


Figure 4
Deep Evacuation Method

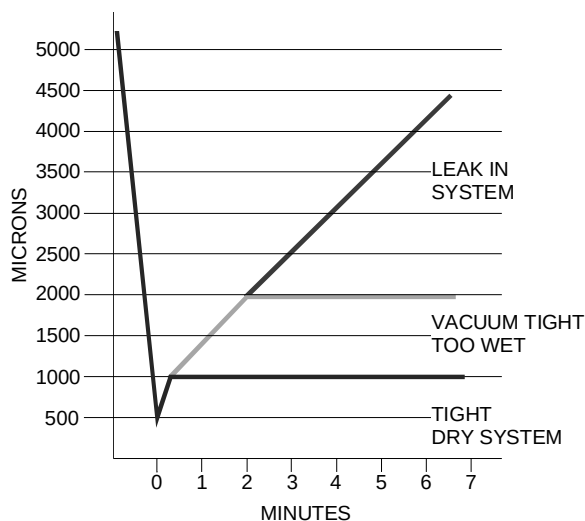


Figure 5
Deep Vacuum Graph

4. Open the hand valve a minimal amount on the line coming from the nitrogen cylinder.
5. Open the high pressure valve on the gauge manifold. Pressurize the refrigerant lines and the indoor coil to 150 psig (1034 kPa). To reach 150 psig, you may need to further open the hand valve on the nitrogen cylinder.



WARNING

To avoid possible explosion or equipment damage, do not exceed 150 psig when pressure testing.

6. Close the valve on the nitrogen cylinder and disconnect it from the gauge manifold.
7. Check for leaks. Apply a soap solution on all connections and joints. If you see bubbles, you have a leak. Mark these locations.

NOTE: If you use an electronic leak detector to test for leaks, ensure the electronic leak detector used is capable of sensing HFC-type refrigerants. Also, add a trace of R-410A to the system (if permitted by current EPA regulations) before testing.

8. Using the gauge manifold, carefully release the nitrogen from the system. If leaks are found, repair them. After repair, repeat the above pressure test. If no leaks exist, proceed to system evacuation.

SYSTEM EVACUATION

NOTE: Service valves are backseating-type valves.

Your system is shipped with the valve stem(s) front seated (closed) and caps installed. Do not open these valves until the system is completely evacuated. There are two ways that your system can be evacuated: the Deep Vacuum Method or the Triple Evacuation Method. Use the Triple Evacuation Method when the vacuum pump being used will only pump down 28 inches of mercury vacuum and your system does not contain liquid water; otherwise, use the following method.

Deep Vacuum Method

1. Connect the vacuum pump, R-410A manifold set with vacuum hoses, and charging cylinder as shown. Ensure the vacuum pump used is capable of pulling a vacuum of 250 microns. Begin with all valves fully closed.
2. Confirm proper pump and gauge operation. Open the shutoff valve which leads to the high vacuum gauge manifold. Start the pump. When the compound gauge (low side) reading drops approximately 29 inches of vacuum, open the valve to the thermocouple vacuum gauge and evacuate until the gauge reads 250 microns or less.
3. Close the valve to the thermocouple vacuum gauge. This avoids potential gauge damage from “pegging the meter”.
4. Open the high and low side valves on the gauge manifold. Keeping the valve on the charging cylinder closed, open the valve on the gauge manifold that leads to the cylinder.
5. Evacuate the system to about 29 inches Hg as measured by the compound (low side) gauge.

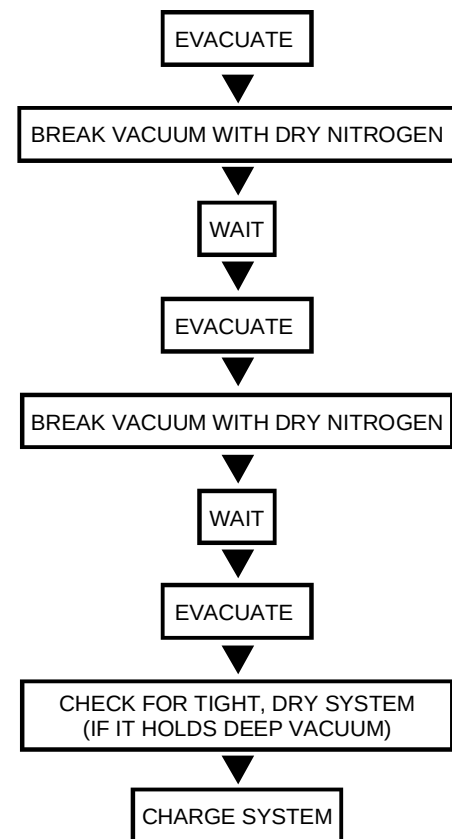


Figure 6
Triple Evacuation Method

6. Open the valve to the thermocouple vacuum gauge. Evacuate until the gauge reads 250 microns or less.
7. Close the valve to the vacuum pump. Wait five minutes, then check the pressure on the thermocouple vacuum gauge (Figure 5).
 - a. If the pressure is not more than 1000 microns, the system is leak-free and properly evacuated. Proceed to Step 9.
 - b. If the pressure rises, but holds at about 2000+ microns, moisture and noncondensibles are still present. Open the valve to the vacuum pump, and go back to Step 7.
 - c. If the pressure rises above 5000 microns, a leak is present. Go back to “Leak Testing” section above.
8. Close the valve to the thermocouple vacuum gauge. Close the valve to the vacuum pump. Shut off the pump.

Triple Evacuation Method

1. Pump system down to 28 inches of mercury and allow pump to continue operating for an additional 15 minutes.
2. Close manifold gauge valves and shut off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.

4. Close manifold valves and allow system to stand for one hour. During this time, dry nitrogen will be able to diffuse throughout the system absorbing moisture.
5. Repeat this procedure as indicated in Figure 6. System will then be free of any contaminants and water vapor.

LINE SET REFRIGERANT CHARGE

Following evacuation of the low side, add additional R-410A to the line set, if needed. The condensing unit is factory-charged to include a system with a 3/8" x 25' liquid line. This is a 14 oz. allowance. If additional charge is needed, add this prior to releasing the factory charge into the low side. If less charge is needed, recover the excess R-410A during final charge adjustment. Use the factors below to determine the installed liquid line charge needed.

- 1/4" OD LIQUID LINE = .20 oz. per foot
- 5/16" OD LIQUID LINE = .36 oz. per foot
- 3/8" OD LIQUID LINE = .55 oz. per foot
- 1/2" OD LIQUID LINE = 1.07 oz. per foot

IMPORTANT: Use only refrigerant which is certified to meet ARI Standard 700. Used refrigerant may cause compressor damage, and will void the warranty. (Most portable machines cannot clean used refrigerant well enough to meet this ARI Standard.)

NOTE: R-410A refrigerant cylinders contain a dip tube which allows liquid refrigerant to flow with the cylinder in an upright position. R-410A refrigerant should be charged in the upright position with the liquid gradually metered into the unit.

FACTORY CHARGE RELEASE INTO SYSTEM

1. Remove the service valve stem caps
2. Check tightness of the stem packing nut. Torque to 7.5 ft-lbs. Do not overtighten.
3. Open the service valve by rotating the 1/4" liquid and 5/16" suction square stems counterclockwise. When the stems reach the top position, turn the stems in the closed, clockwise, direction about 1/2 turn so that the manifold gauges can be read. Once electrical connections are made the system is ready for startup.

Electrical Connections



WARNING

To avoid personal injury, shock, or death, open the electrical disconnect switch before electrically connecting the unit. Wiring must conform with NEC or CEC and all local codes.

Local codes will usually require that a disconnect switch be located near the unit. Do not locate the disconnect switch on the unit itself.

The wiring diagram for this unit can be found on the control box door. Refer to Figure 7 for field wiring connections.



Figure 7
Unit Control Panel



WARNING

To avoid the risk of fire or equipment damage, use only 75°C minimum-rated copper conductors.



WARNING

Consult the National Electrical Code or a qualified electrician for proper wire size. Undersized wires could cause poor equipment performance, equipment damage, or fire.



WARNING

To avoid electrical shock, injury, or death, wiring to the unit must be properly grounded.

WIRING

Wire size is important to ensure proper unit operation. The size must be sufficient to carry the minimum circuit ampacity listed on the unit serial data plate. Amana recommends sizing the wires to limit the voltage drop to a maximum of 2% from the main breaker or fuse panel to the outdoor unit. Consult the NEC, CEC, and all local codes to determine the correct wire gauge and necessary length of run for proper wiring.

1. To connect unit to power supply, route the power supply and ground wires through the high voltage entrance in the unit.
2. Connect the ground wire to the ground lug and power supply wires to the contactor.
3. Route the low voltage wiring through the low voltage entrance in the unit.

4. Connect the low voltage wires to the terminal strip (if present) or to the wire leads. Route the low voltage wire through the wire tie provided in the unit for restraint.
5. Connect thermostat to unit. If a proper room thermostat is not already present, install one at a suitable indoor location.

Consult the instructions packaged with the thermostat for mounting and location instructions. Typical wiring for a gas furnace is shown in Figure 8. The thermostat instructions may include "typical wiring" for other types of indoor equipment.

6. Check all factory wiring connections to ensure none were loosened during shipping and handling.

NOTE: Some indoor furnaces for cooling operation will require that fan relay and/or a 40VA transformer be added. For proper cooling performance, the indoor equipment and ductwork must be capable of moving 400 CFM of indoor air for every ton of cooling capacity to be installed. If it is not, modify the ductwork or indoor equipment accordingly.

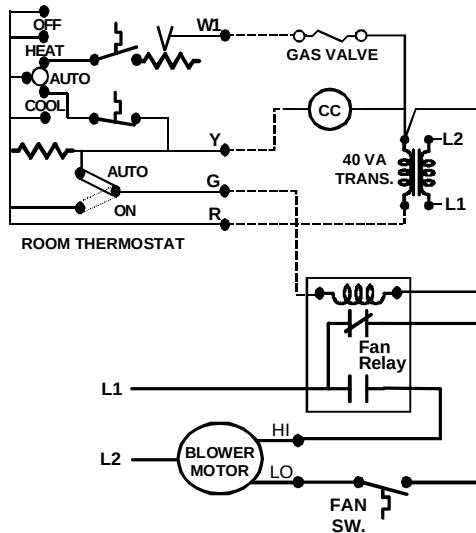


Figure 8
Gas Furnace Wiring (typ.)

System Startup



CAUTION

To prevent compressor damage or personal injury:

- Do not overcharge system with refrigerant.
- Do not operate unit in a vacuum or at negative pressure.
- Do not disable the low pressure switch.
- Use care when handling scroll compressors, dome temperatures could be hot.



CAUTION

To prevent personal injury, wear safety glasses, protective clothing, and gloves when handling refrigerant



CAUTION

To prevent personal injury, fully backseat (turn counterclockwise) valve stem before removing gauge port caps and connecting and disconnecting manifold gauge hoses. Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

IMPORTANT!

During all installation and service work, follow all regulations of the Environmental Protection Agency (EPA). This system uses R-410A - an HFC [Hydrofluorocarbon]. Violation of EPA regulations may result in fines or other penalties.

Never operate the compressor with the suction valve closed to "test the compressor's pumping efficiency". In some cases, this can result in serious compressor damage and loss of warranty coverage.

1. If manifold gauge set hoses are connected, proceed to step 3. Otherwise, connect the gauge hoses. Ensure the service valve stems are fully backseated and the manifold gauge set hoses to the service valve ports.
2. Rotate the valve stems one-half turn clockwise so pressure can be read by the manifold gauges.
3. Close electrical disconnects to energize system.
4. If the outdoor temperature is 60°F or higher, set room thermostat to COOL and fan control to ON or AUTO. Set the temperature control well below room temperature. Operate unit for 15 minutes. Check system refrigerant charge.

FINAL CHARGE ADJUSTMENT

Run the unit for approximately 15 minutes to stabilize the refrigerant pressures. The following guidelines and methods are used to check operation and to ensure that the refrigerant charge is within limits:

- Obtain the service data table for the outdoor model which is on the specification sheet in the literature packet, and on a label inside the control box cover.
- Measure the suction and liquid pressures at the service valves, the liquid line temperature at the outdoor unit, and the outdoor unit amps. For reference to the table, measure the outdoor ambient temperature, and the indoor wet and dry bulb temperatures.
- Determine the required subcooling from the specification sheet or data label. See the service manual for

the proper subcooling adjustments required for long line sets or coil elevations. This information applies to systems with a TXV.

- Adjust R-410A charge to obtain the required subcooling to within 2 degrees Fahrenheit. That is, add charge when the liquid subcooling is more than two degrees below requirement, and recover charge when two degrees above the requirement. The subcooling reference table in the appendix is used to help find the liquid temperature needed to obtain the target subcooling, at the liquid pressure reading.
- Check the liquid sight glass. Visually check to assure that the subcooled liquid reaches the indoor coil, and that moisture content is not excessive.
- Compare suction pressure with performance data. The suction pressure depends on which coil model is installed, and the indoor air flow and wet bulb. Do not adjust refrigerant based on suction pressure, unless there is a gross undercharge.
- Compare the liquid pressure to the specification data. Liquid pressure depends on the suction pressure, outdoor temperature, and the liquid subcooling. Charge adjustments should be based on the required subcooling determined above.
- Check the outdoor unit amps to the specification data. The amp reading will track with the liquid pressure.

If the system is performing properly, fully backseat and torque valve stems per the chart below.

Tubing Size	Torque (Foot-Pounds)
3/8	9.0
3/4, 7/8	23.5

1. Remove the manifold gauge hoses from the valve ports.
2. Reinstall service port cores and caps. Ensure caps are only finger-tight.
3. Perform a final refrigerant leak test on the valves and sweat connections.
4. Return the thermostat to the desired settings.

Final Checks

- Ensure all wiring and tubing are secure in the unit before adding panels and covers.
- Securely fasten all panels and covers.
- Leave Owner's Manual with owner. Explain system operation and periodic maintenance requirements outlined in manual.
- Fill out dealer installation checklist and place in customer file.

Troubleshooting

(QUALIFIED SERVICER ONLY)

When troubleshooting, check for clean coils, clean filter(s), and proper airflow. Indoor airflow should be 350 to 450 CFM per ton of cooling, based on the size of the outdoor unit. The most common way of establishing indoor airflow is heating temperature rise. Indoor airflow will then be (heating output of equipment) / (1.1 x temp. rise). In other cases, measurement of external static pressure is helpful. For details, see the Installation Manual for your indoor equipment.

If further information is needed, see the Remote Cooling Service Manual.

System Checklist		
	1	Is the system clearly marked as containing R-410A refrigerant? (Labels are located on both the indoor coil case and remote unit.)
	2	Does the condenser fan blade rotate freely, and is it tight on the shaft?
	3	Does the refrigerant tubing flex freely and not touch another tube to cause rub through?
	4	Are both indoor and outdoor sections level?
	5	Are the units properly supported?
	6	Is outdoor section properly located on concrete base or equivalent?
	7	Are the refrigerant lines correctly installed according to the relative position of the outdoor and indoor sections?
	8	Is the refrigerant tubing properly supported by isolation hangers?
	9	Is the system completely free of refrigerant leaks?
	10	Has the system been properly evacuated?
	11	Does the system have the correct R-410A refrigerant charge?
	12	Is the outdoor unit protected by the correct size time delay type fuses or breakers in the indoor power box?
	13	Are the power supply wires to units the correct size?
	14	Are all electrical connections tight?
	15	Does the compressor sound normal?
	16	Check the amperage on the indoor blower motor. Is it within the limits shown on the nameplate of the motor?
	17	Are all access panels installed and secured?
	18	Do controls function properly?
	19	Check the voltage with unit running. Does it check within the tolerance of 207 to 253V for 230V, or 198 to 228V? If using 208V power indoors, have you modified the transformer wiring as necessary?
	20	Has the air flow across the indoor coil been checked and adjusted?
	21	Has the air distribution system been balanced? Are all grilles, diffusers, and dampers properly adjusted and locked?
	22	Has the system operated at least 30 minutes before leaving the job?
	23	Does the owner understand the operation of the unit and the thermostat?
	24	Does the owner know where the filters are located?
	25	Does the owner know when and how the filter(s) should be cleaned or changed?
	26	Have the registration cards been filled out and mailed?
	27	Does the owner know whom to call for service?
	28	Has the User's Guide been filled out and left with the owner?

R-410A QUICK REFERENCE GUIDE

- R-410A refrigerant operates at 50-70 percent higher pressures than R-22. Ensure that the servicing equipment and replacement components used are designed to operate with R-410A.
- R-410A refrigerant cylinders are rose colored.
- R-410A refrigerant cylinders have a dip tube which allows liquid to flow out of cylinder in upright position.
NOTE: Recovery cylinder service pressure rating must be 400 psig, DOT RBA400 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 800 psig high side and 250 psig low side with 550 psig low side retard.
- Use hoses with 800 psig service pressure rating.
- R-410A requires a different set of gauges than those used for R-22.
- R-410A requires Amana matched indoor/outdoor systems.
- Leak detectors should be designed to detect HFC refrigerant.
- R-410A, as with other HFCs, is only compatible with POE oils.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- Vacuum pumps will not remove moisture from oil.
- An R-410A listed liquid line filter drier is required on every unit.
- 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.
- Wrap all filter driers and service valves with wet cloth when brazing.
- Do NOT use an R-22 TXV.
- If indoor unit is equipped with an R-22 TXV, it must be changed to an R-410A TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, evacuate then break vacuum with dry nitrogen and replace filter driers.
- Do not vent R-410A into the atmosphere.
- Do not use capillary tube coils.
- Observe all **warnings, cautions, and bold** text.

Pressure vs. Temperature Chart R-410A

PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
12	-37.7	114	37.8	216	74.3	318	100.2	420	120.7	522	137.6
14	-34.7	116	38.7	218	74.9	320	100.7	422	121.0	524	137.9
16	-32.0	118	39.5	220	75.5	322	101.1	424	121.4	526	138.3
18	-29.4	120	40.5	222	76.1	324	101.6	426	121.7	528	138.6
20	-36.9	122	41.3	224	76.7	326	102.0	428	122.1	530	138.9
22	-24.5	124	42.2	226	77.2	328	102.4	430	122.5	532	139.2
24	-22.2	126	43.0	228	77.8	330	102.9	432	122.8	534	139.5
26	-20.0	128	43.8	230	78.4	332	103.3	434	123.2	536	139.8
28	-17.9	130	44.7	232	78.9	334	103.7	436	123.5	538	140.1
30	-15.8	132	45.5	234	79.5	336	104.2	438	123.9	540	140.4
32	-13.8	134	46.3	236	80.0	338	104.6	440	124.2	544	141.0
34	-11.9	136	47.1	238	80.6	340	105.1	442	124.6	548	141.6
36	-10.1	138	47.9	240	81.1	342	105.4	444	124.9	552	142.1
38	-8.3	140	48.7	242	81.6	344	105.8	446	125.3	556	142.7
40	-6.5	142	49.5	244	82.2	346	106.3	448	125.6	560	143.3
42	-4.5	144	50.3	246	82.7	348	106.6	450	126.0	564	143.9
44	-3.2	146	51.1	248	83.3	350	107.1	452	126.3	568	144.5
46	-1.6	148	51.8	250	83.8	352	107.5	454	126.6	572	145.0
48	0.0	150	52.5	252	84.3	354	107.9	456	127.0	576	145.6
50	1.5	152	53.3	254	84.8	356	108.3	458	127.3	580	146.2
52	3.0	154	54.0	256	85.4	358	108.8	460	127.7	584	146.7
54	4.5	156	54.8	258	85.9	360	109.2	462	128.0	588	147.3
56	5.9	158	55.5	260	86.4	362	109.6	464	128.3	592	147.9
58	7.3	160	56.2	262	86.9	364	110.0	466	128.7	596	148.4
60	8.6	162	57.0	264	87.4	366	110.4	468	129.0	600	149.0
62	10.0	164	57.7	266	87.9	368	110.8	470	129.3	604	149.5
64	11.3	166	58.4	268	88.4	370	111.2	472	129.7	608	150.1
66	12.6	168	59.0	270	88.9	372	111.6	474	130.0	612	150.6
68	13.8	170	59.8	272	89.4	374	112.0	476	130.3	616	151.2
70	15.1	172	60.5	274	89.9	376	112.4	478	130.7	620	151.7
72	16.3	174	61.1	276	90.4	378	112.6	480	131.0	624	152.3
74	17.5	176	61.8	278	90.9	380	113.1	482	131.3	628	152.8
76	18.7	178	62.5	280	91.4	382	113.5	484	131.6	632	153.4
78	19.8	180	63.1	282	91.9	384	113.9	486	132.0	636	153.9
80	21.0	182	63.8	284	92.4	386	114.3	488	132.3	640	154.5
82	22.1	184	64.5	286	92.8	388	114.7	490	132.6	644	155.0
84	23.2	186	65.1	288	93.3	390	115.0	492	132.9	648	155.5
86	24.3	188	65.8	290	93.8	392	115.5	494	133.3	652	156.1
88	25.4	190	66.4	292	94.3	394	115.8	496	133.6	656	156.6
90	26.4	192	67.0	294	94.8	396	116.2	498	133.9	660	157.1
92	27.4	194	67.7	296	95.2	398	116.6	500	134.0	664	157.7
94	28.5	196	68.3	298	95.7	400	117.0	502	134.5	668	158.2
96	29.5	198	68.9	300	96.2	402	117.3	504	134.8	672	158.7
98	30.5	200	69.5	302	96.6	404	117.7	506	135.2	676	159.2
100	31.2	202	70.1	304	97.1	406	118.1	508	135.5	680	159.8
102	32.2	204	70.7	306	97.5	408	118.5	510	135.8	684	160.3
104	33.2	206	71.4	308	98.0	410	118.8	512	136.1	688	160.8
106	34.1	208	72.0	310	98.4	412	119.2	514	136.4	692	161.3
108	35.1	210	72.6	312	98.9	414	119.6	516	136.7	696	161.8
110	35.5	212	73.2	314	99.3	416	119.9	518	137.0		
112	36.9	214	73.8	316	99.7	418	120.3	520	137.3		

*Based on ALLIED SIGNAL Data

REQUIRED LIQUID LINE TEMPERATURE						
LIQUID PRESSURE AT SERVICE VALVE (PSIG)	REQUIRED SUBCOOLING TEMPERATURE (°F)					
	8	10	12	14	16	18
189	58	56	54	52	50	48
195	60	58	56	54	52	50
202	62	60	58	56	54	52
208	64	62	60	58	56	54
215	66	64	62	60	58	56
222	68	66	64	62	60	58
229	70	68	66	64	62	60
236	72	70	68	66	64	62
243	74	72	70	68	66	64
251	76	74	72	70	68	66
259	78	76	74	72	70	68
266	80	78	76	74	72	70
274	82	80	78	76	74	72
283	84	82	80	78	76	74
291	86	84	82	80	78	76
299	88	86	84	82	80	78
308	90	88	86	84	82	80
317	92	90	88	86	84	82
326	94	92	90	88	86	84
335	96	94	92	90	88	86
345	98	96	94	92	90	88
354	100	98	96	94	92	90
364	102	100	98	96	94	92
374	104	102	100	98	96	94
384	106	104	102	100	98	96
395	108	106	104	102	100	98
406	110	108	106	104	102	100
416	112	110	108	106	104	102
427	114	112	110	108	106	104
439	116	114	112	110	108	106
450	118	116	114	112	110	108
462	120	118	116	114	112	110
474	122	120	118	116	114	112
486	124	122	120	118	116	114
499	126	124	122	120	118	116
511	128	126	124	122	120	118