Lab Activity

Service Valves and System Access

Objectives

After completing this lab activity, you will be able to:

- Locate and identify the different service valves throughout an HVACR system.
- Remove and install Schrader valves for system evacuation, replacement, and other procedures.
- Install a saddle-type piercing valve onto an HVACR system.
- Set service valves in the four different positions for various procedures and proper system operation.
- Properly remove service lines from an HVACR system with minimal refrigerant loss.

Introduction

Service calls require technicians to access and manipulate the systems they encounter. This requires an understanding of service valves, Schrader valves, and piercing valves. Another sign of professionalism is minimizing the amount of refrigerant lost through attaching and disconnecting gauges to a system. This also will be covered.

Text Reference

Chapter 7, Equipment and Instruments for Refrigerant Handling and Service and Chapter 8, Working with Refrigerants.

Equipment

The following tools and equipment are needed to perform these activities:

- 1 Gauge manifold with refrigerant lines and quick-connect fittings
- 1 Schrader valve removal tool
- 1 Saddle-style piercing valve
- 1 Service valve wrench
- 1 Set of screwdrivers
- 1 Set of hex keys
- Emery cloth or fine sandpaper

Safety Review

Follow all safety procedures specified by your instructor and specified in any appropriate manufacturer’s information. The following are some additional safety-related items to keep in mind:

- Wear safety glasses at all times.
- Never use slip-joint pliers, tongue-and-groove pliers, pump pliers, vise grips, or similar tools on brass. Always use properly sized wrenches. Use the right tool for the job.
- Keep in mind that refrigerant tubing lines have different temperatures. Be careful what you touch.
**Service Valve Identification**

Follow the steps of this procedure on several different HVACR systems available.

1. Locate the low-side service valve. Between the evaporator and condenser, each system will have two different copper lines. The larger is the suction line, and the smaller is the liquid line. The low-side service valve should be along the suction line. During system operation, the suction line will be cool to cold.

2. Locate the high-side service valve. It should be along the liquid line. Often it is on the outlet of the condenser. During system operation, the liquid line will be warm.

Note that some HVACR systems have more than one high-side valve. These serve different functions. A high-side valve located between the compressor and condenser is a discharge service valve. Since a discharge service valve is at the outlet of the compressor, it circulates the compressed, hot-gas vapor. This valve and the discharge line will be very hot and should not be touched. Use an infrared thermometer to see how hot it is.

A high-side valve located between the liquid receiver and the liquid line is the liquid receiver service valve or king valve. A high-side service valve that is less common may be found between the condenser and liquid receiver, called the queen valve.

3. Repeat the steps above on different types of systems around the lab.

**Schrader Valve Removal and Installation**

Schrader valve removal tools are used to remove a Schrader valve from a system or service valve. This may be done for several reasons. If a Schrader valve is defective or leaking, it should be replaced. Schrader valve removal tools can be used to replace a Schrader valve without having to recover the system’s refrigerant charge. They can also be used to remove a Schrader valve for faster system evacuations. Pulling a vacuum can be done more quickly when a Schrader valve has been removed. Below is a general procedure for removing Schrader valves; however, always refer to manufacturer instructions for detailed instructions, as Schrader valve removal tools may vary.

1. If possible, turn the service valve stem to isolate the access port from the rest of the system.
2. Remove the access port cap and attach the Schrader valve removal tool to the access port.
3. Push the removal tool’s stem forward and turn slowly to catch and hold the Schrader valve.

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4. Turn the removal tool’s stem counter-clockwise until the Schrader valve comes loose from its place.
5. Pull the removal tool’s stem outward to remove the Schrader valve from the system.
6. Close the ball valve on the removal tool to isolate the removal tool from the rest of the system.

Now the Schrader valve may be examined to determine if it needs to be replaced or the system may be pulled into a vacuum without the Schrader valve obstructing the vacuum pump. To install a Schrader valve back into place, follow these instructions in reverse. Do not overtighten the Schrader valve. Comfortably snug is sufficient to ensure a tight seal.

**Using Saddle-Type Piercing Valves**

1. Review any manufacturer instructions with the piercing valve.
   - Find a straight length of system tubing that is round with no dents or other irregularities that would make it difficult to form a seal. This section of tubing should also have enough space around it in which to use proper tools and attach a gauge hose.
   - Clean the tubing using a fine emery cloth or fine sandpaper and remove any dust.
2. Place the piercing valve over appropriately sized system tubing.
3. Determine the correct sleeve insert to fit the line that will be tapped.
4. Fit and secure the piercing valve and sleeve insert snugly along the tubing.
5. Attach the gauge manifold hose to the fitting on the piercing valve.
6. Follow manufacturer instructions for piercing the line.
7. When properly tapped, the gauge needle should react to pressure in the line.

**Service Valve Positions**

![Diagram of service valve positions](image)

There are four positions in which a service valve may be set. Each of these positions has a purpose and is used depending on the location of the service valve and the procedure being performed.

The normal position for service valves is back seated. In this position, the valve stem is pulled back as far as it will go. HVACR systems operate normally with service valves back seated, as the refrigerant flows through the system unimpeded.

1. To back seat a service valve, turn the valve stem counter-clockwise as far as possible. This blocks off and isolates the access port from the rest of the system.

The opposite position of being back seated is being front seated. In this position, the valve stem is turned clockwise as far as it will go. This position blocks off one of the service valve’s refrigerant connections.
A passage between the remaining refrigerant connection and the access port is open. When a liquid receiver service valve (king valve) is front seated, the system can be pumped down for service.

2. To front seat a service valve, turn the valve stem clockwise as far as possible. While one refrigerant connection is blocked, the other refrigerant connection is open to the service valve’s access port.

When a system must operate and a technician needs to read pressure, the service valve is cracked open. Cracked open is when the service valve is turned just enough to lift the valve off the back seated position. This allows the refrigerant to flow relatively unimpeded and also opens the access port to the system.

3. To crack open a service valve, start at the back seated position and turn the valve stem 1/16 to 1/8 turn clockwise.

A similar position to being cracked open is mid-position. Mid-position is when the valve is not front seated or back seated but positioned halfway between these two positions. This position is similar to being cracked open. All three service valve openings are accessible.

4. To place a service valve in mid-position, begin at the back seated position and turn the valve stem clockwise two full turns.

5. Back seat the service valve to return the system to normal operation.

**Removing Service Lines with Minimal Refrigerant Loss**

This procedure is intended to reduce the amount of refrigerant lost from connecting a gauge manifold to a system. The refrigerant measured on the high-side that is trapped in the hoses is bypassed through the gauge manifold into the low side of the system. This is performed on a system that is running and has a gauge manifold already connected and reading the pressures.
Name ____________________________________________

1. With the system still running, back seat the high-side service valve by turning its valve stem counter-clockwise all the way back.

2. Crack open both hand wheels on the gauge manifold. The high-pressure gauge reading should drop, and the compound gauge reading should rise temporarily. By opening both valves, higher pressure refrigerant is bypassed into the low side. Both gauges should equalize and read low-side pressure.

3. Back seat the low-side service valve by turning its valve stem counter-clockwise all the way back.

4. Shut down the system.

5. Remove the hoses from the service valves.

6. Place covers back on the service valves.