MODULE CONTENT

| Unit of Competency | **DIAGNOSE AND REPAIR MANUAL AIR CONDITIONER SYSTEM** |
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| Module Title | **DIAGNOSING AND REPAIRING MANUAL AIR CONDITIONER SYSTEM** |
| Module Descriptor | This unit covers the knowledge, skills and attitudes required to diagnose and repair the manual air conditioner system. |
| Nominal Duration | **hours** |
| Summary of the Learning Outcomes: | |
| Upon completion of this module the student must be able to: | |
| LO1. Prepare to diagnose and repair manual air conditioning system | |
| LO2. Diagnose manual air conditioning system | |
| LO3. Repair manual air conditioning system | |
| LO4. Complete work processes | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 3**

**REPAIR MANUAL AIR CONDITIONING SYSTEM**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Repair manual air conditioning system | If you have some problem with the content of the information sheet don’t hesitate to approach your Trainer.  If you feel that you are now knowledgeable on the content of the information sheet, you can now answer the self-check provided in the module. |
| Answer Self-Check 3.1-1 on Repair manual air conditioning system | Try to answer the Self-check without looking at the Answer Key  Compare your answer to Answer Key 3.1-1 |
| Observe Trainer’s demonstration on Task Sheet 3.1-1 on Repair manual air conditioning system | Listen carefully and attentively so that you may be able to perform a task correctly  Ask questions if are in doubt for clarification |
| Perform the Task Sheet 3.1-1 on Repair manual air conditioning system | Remember the step-by-step procedure of the Repair manual air conditioning system |
| Evaluate the performance using the Performance Criteria Checklist 3.1-1 | Repeat the task in case fail to meet the criteria |

**INFORMATION SHEET 1.1-1**

**REPAIR MANUAL AIR CONDITIONING SYSTEM**

**Learning Objectives:**

After reading this **Information Sheet**, you must be able to:

1. Performed troubleshooting.
2. Carried out diagnostic tests.
3. Identified faults and its causes.
4. Reported findings.
5. Accomplished checklist.
6. Applied safety practices.

**CAR AIR CONDITION SYSTEM**

**5 Common Car AC System Problems And Solutions**

Your car’s AC System may be something you take for granted — until you encounter a problem. Whether it’s taking too long to cool the air inside your car or your windows are not defogging properly, some of your car’s air conditioning problems can become costly if you don’t take the proper precautions.

Proper maintenance starts by visiting the Christian Brothers Automotive Jackson service center. Some common problems can be taken care of quickly with regular maintenance, so make sure you keep an eye on frequent problem areas.

**DO YOU KNOW HOW YOUR CAR’S AC SYSTEM WORKS?**

Since the first “weather conditioners” offered to limousine and luxury car owners in New York City back in the ‘30s, the car air conditioning system has served to eliminate humidity and heat trapped inside the passenger compartment. This service is now a standard car feature.

The AC system works by using a belt that allows the air conditioning compressor to compress a refrigerant and pump it throughout the AC system. The refrigerant is pressed through a valve that reduces pressure and temperature and then moves through the evaporator in the passenger compartment, delivering cool, dry air.

**COMMON CAR AC SYSTEM PROBLEMS YOU SHOULD CHECK FOR**

**1. Is The Air Cooling?**

Your car’s AC system may not be cooling for many reasons, but some of the most frequent causes are:

• Low Refrigerant level – did you know it diminishes by 15% each year?

• Broken condenser

• Compressor has cracked or damaged belt, defective clutch, inactive pressure switches or idle valves

**2. Do You Hear A Strange Noise?**

Noise usually comes from a dying compressor, but some other common causes can be a cross-contaminated refrigerant or the use of the wrong lubricant. Holes or other broken parts could also be the source of the problem.

3. Does It Feel Moist Inside The Vehicle?

The common cause for moist air inside your car is usually moisture or debris trapped inside your air conditioning system.

4. Does The Air Smell?

When your car’s air conditioning system has not been used for a while (especially during the winter season), microorganisms such as bacteria and fungus can begin to populate and produce a foul smell.

5. Is Something Leaking?

Watch for leaks coming from your AC system since leaking refrigerant is a dangerous chemical that can harm the environment as well as your car’s engine.

HOW TO REGULARLY MAINTAIN YOUR CAR’S AC SYSTEM

Detection and repair of any issue in your car’s air conditioning system could prevent additional damage that will in turn save you time and money.

To maintain your AC system:

CHECK THE AIR CONDITIONING COMPRESSOR BELT FOR CRACKS AND DAMAGE ON A REGULAR BASIS

WATCH FOR ANY LEAKS OR DAMAGE IN THE AIR CONDITIONING SYSTEM

REGULARLY CHECK THE FUNCTION OF THE AIR CONDITIONING SYSTEM AND OTHER COMPONENTS

EMPTY OUT THE REFRIGERANT FROM THE SYSTEM

DO A VACUUM TEST ON THE AIR CONDITIONING SYSTEM

RECHARGE YOUR CAR’S AIR CONDITIONING SYSTEM BY USING THE RIGHT REFRIGERANT TYPE AND QUANTITY AS SPECIFIED BY THE MANUFACTURER

PERFORM REGULAR SERVICE ON AIR CONDITIONING SYSTEM COMPONENTS INCLUDING THE COMPRESSOR, CONDENSER, EVAPORATOR, AND ELECTRICAL CONTROLS

As a general guideline, you should have your Christian Brothers Automotive Jackson service center inspect your AC system every 12,000 miles (or 12 months) in order to ensure your air conditioning is working properly and efficiently.

# How To Flush Car AC System

Driving around the Valley without air conditioning is miserable, especially since some summer days can reach blazing temperatures as high as 120 degrees. If your air conditioning system experiences the unfortunate circumstance of failure, you will want to have your system repaired properly so that you can keep your cool.

One common cause of air conditioning troubles is compressor failure. When the compressor fails it sends shards of metal and plastic debris into the system. These bits and pieces of debris can be a detriment to the A/C system, blocking small passages and causing more damage to other components and potentially destroying the new compressor.

An [AC system flush](https://www.sundevilauto.com/services/ac-service/) is the best way to ensure debris is removed from the system.

## What is a Car AC System Flush?

An A/C system flush is a necessary procedure to ensure the air conditioning system is clean and free from any contaminants. Any foreign objects in the AC system can cause blockages and prevent the compressor from operating efficiently. Even the smallest amount of foreign debris in the system can restrict the flow of refrigerant and oil.

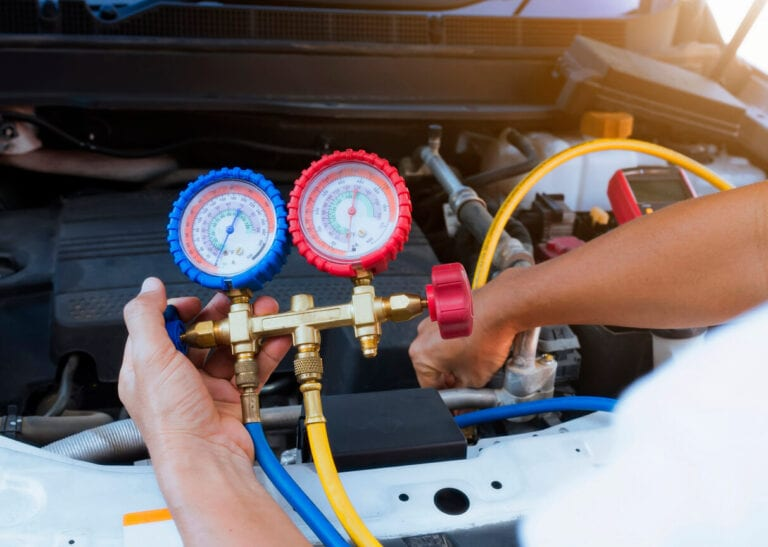
Your vehicle’s engine needs oil to keep moving parts lubricated and to prevent failure. Similar to the engine, the air conditioning compressor, the only moving component within the system, requires oil to prevent failure.

Oil travels throughout the system carried by the refrigerant and has direct contact with the condenser, accumulator, hoses, evaporator, and tubes. If any debris particles enter the system, all components are at risk for damage. Flushing the AC removes the contamination and protects vital A/C parts.

Be sure to have the AC flushed if the system is contaminated or whenever the AC compressor is removed or replaced in your vehicle.

## How To Flush A Car AC System

While performing an AC System flush can certainly be done by the DIYer, you may want to leave this one to the professionals. A/C compressor replacements are costly and by performing a flush yourself, you risk damaging the system and potentially causing even more damage, which will result in more money for repairs.



## How an Air Conditioning Flush is performed:

1. A technician will connect the manifold gauges to the proper fittings. A specialized machine will begin to evacuate the system until the pressure drops to 0 psi. Once the pressure is reduced, the vehicle is ready for the next step.
2. The technician will then remove the refrigerant hose from both the high and low sides of the condenser. Fresh fluid will be poured into the high-side inlet on the condenser. Subsequently, compressed air will be added into the high-side, forcing dirty fluid from the outlet hole in the condenser, until all debris and contaminants are removed from the system. There are some condensers that have internal tubing that are unable to be flushed and instead must be replaced.
3. The technician will then remove the mounting bracket that secures the accumulator as well as the orifice tube/expansion valve. Once removed, the technician will visually inspect the orifice tube/expansion valve for any debris or signs of damage and replace as necessary.
4. A new accumulator and orifice/expansion valve will be secured to the mounting bracket.
5. Now that the system is free from debris and reassembled, the technician will need to reintroduce refrigerant into the system. Once the system is recharged to the acceptable specification and the correct pressure is set, the technician will remove the machine, replace caps onto each fitting, and continue to run the air conditioner for about 10 minutes to ensure refrigerant is able to circulate throughout the system.

# **How to Recharge Your Car Air Conditioning**

Car AC refrigerant has to be recharged occasionally. Add more refrigerant to your AC system to keep your car cool in hot weather.

When your car’s air conditioning (AC) begins to lose power and doesn’t blow cool air, it may be time for an AC recharge. Recharging your AC means adding more refrigerant to your AC system to allow the air to start blowing cold again.

Important to know: recharging your AC is a temporary fix to a likely bigger problem. If your system is indeed missing refrigerant, your air conditioning system has a leak and needs to be inspected and repaired with a certified mechanic. Refrigerant does not evaporate in an airtight system, so air must be leaking in.

* **Note**: Some older vehicles cannot have their AC unit recharged. These vehicles generally fall before the year 1995 and use an R12 refrigerant no longer made. The only option is AC replacement.

Though an ac recharge can be completed at home, it is still considered a more professional repair, as it contains work with hazardous liquid and is best left for a certified mechanic.



## **Recharge your AC in 7 easy steps:**

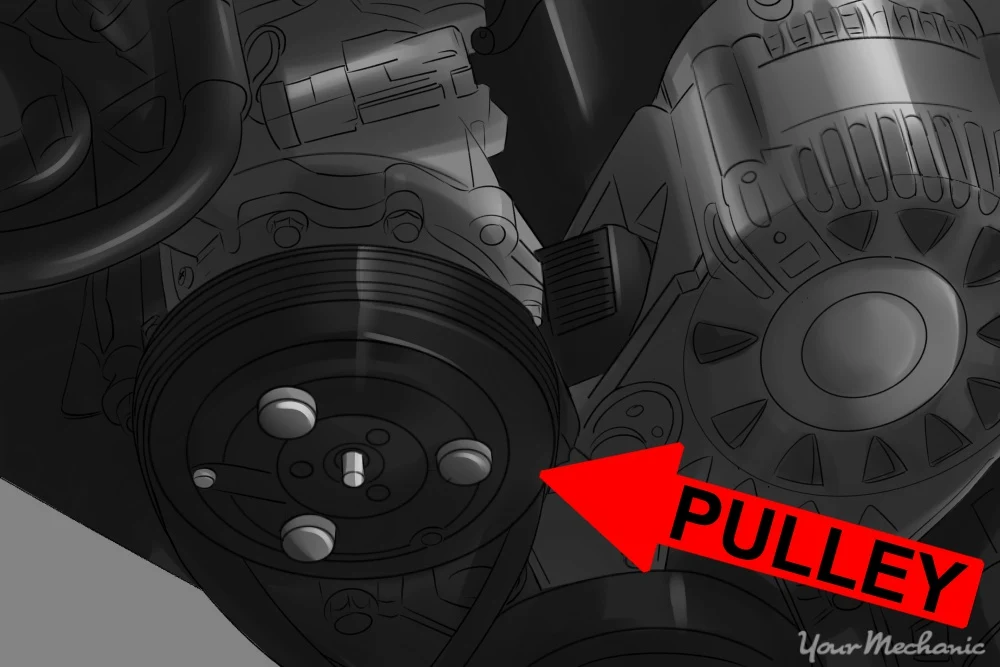
Because of the sensitivity of this procedure, we will explain how to use the AC recharge kits. They have shown to be the most effective and safest option in comparison to trying to repeat a mechanic’s role at home.

**Materials Needed:**

* [AC dispenser with trigger and low side gauge](http://www.amazon.com/ACP-100CA-Professional-Formula-Solution-Refrigerant/dp/B007USCMD8/ref=sr_1_1?s=automotive&ie=UTF8&qid=1452804346&sr=1-1&keywords=ac+dispenser)
* Meat thermometer
* Refrigerant (12-28 ounces, depending on vehicle requirement. This information is located on the underside of the hood).
* Safety glasses and gloves
* **Tip**: Always wear safety glasses when performing work under the hood. It is especially important to be careful to not get any refrigerant on your skin as it freezes quickly and is very painful. Please be sure to follow all instructions that are included with your AC recharge kit and read every canister’s warnings carefully.

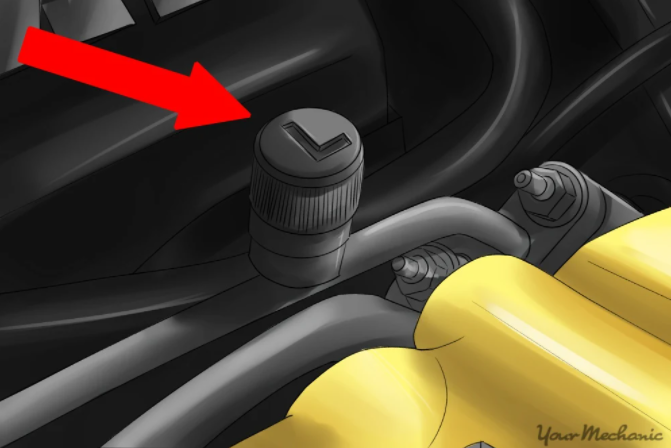
**Step 1: Turn on your AC**. Start your car and turn your AC to Max or High.

**Step 2: Determine if AC compressor is engaging**. An AC compressor is a device driven by the accessory belt that converts the refrigerant from liquid to gas. The compressor has a clutch at the end of it that should be spinning with the accessory belt when the AC is on high. Look for these pulleys moving.



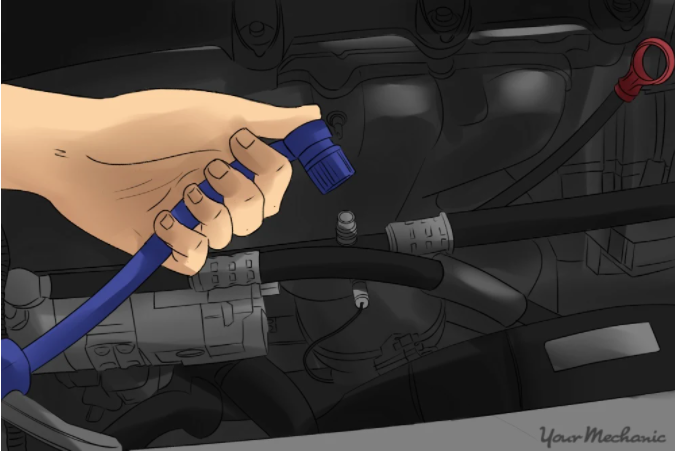
* If the clutch on the compressor is indeed engaging, then it is likely that the system is low on refrigerant, especially if the air is still blowing slightly cold. You will still want to move ahead with testing the pressure before adding refrigerant.
* If the clutch is not engaging the compressor, then the AC system is either very low on refrigerant, there is an electrical problem, or the compressor itself has failed. Adding more refrigerant after pressure testing will allow you to know which of these the cause is.

**Step 3: Test the pressure**. To test the pressure, turn the vehicle off and locate the low side pressure port. The low side pressure service port is generally located on the passenger side of the engine bay. It will have a black or grey cap on it with the letter “L”.



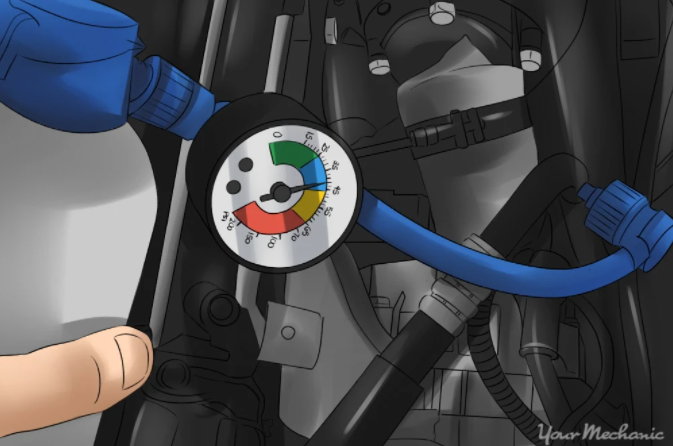
* **Tip**: If you are having a hard time finding it, try locating the two aluminum pipes that are coming out of the firewall (the metal wall behind the engine) and trace the larger-diameter pipe until you find the service port.

**Step 4: Attach the recharge hose from the kit**. To attach the recharge hose, place the quick-connect fitting — found on the end of the recharge hose — over the port and push down firmly until you hear it click into place.

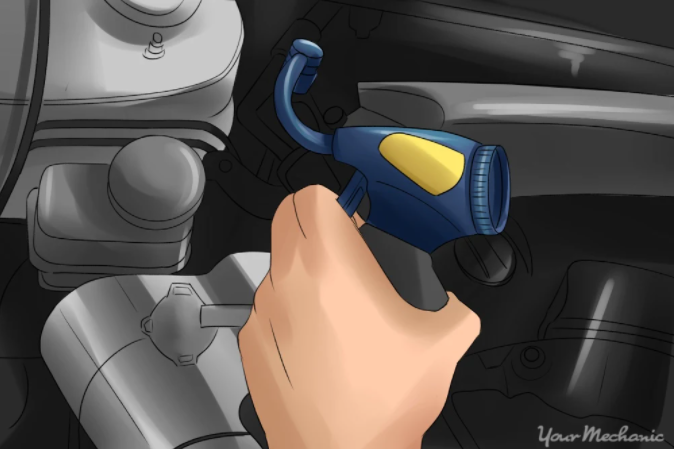


* Be careful not to pull the trigger at this time as this will release refrigerant from the AC system into the atmosphere.

**Step 5: Restart the vehicle and monitor the gauge**. Restart the vehicle and make sure the air conditioner is on the highest settings. Begin to monitor the gauge by watching for the AC compressor to engage the clutch. Once the compressor is engaged, if the low side pressure is under 40 psi, it is verified that the AC system is undercharged. You want the reading to be as close to 40 psi as possible.



**Step 6: Thread the refrigerant can onto the recharge hose**. Threading the can onto the hose allows you to slowly top off the AC system with liquid refrigerant. Once the can is installed, hold the can upright and squeeze the trigger for 5 to 10 seconds to add the refrigerant to the system. After you release the trigger, check the pressure gauge to be sure you are not overcharging the system.



* Proceed until you are as close to 40 psi as possible.

**Step 7: Return to the inside of the car and check the temperature**. Using a thermometer, insert it into one of the AC vents on the driver’s side, near the steering wheel, and note the temperature. A fully charged system will blow air as cold as 28 degrees. This can vary slightly depending on ambient temperature as well as whether the vehicle has been stationary.



* If the pressure is over 40psi, that is considered “high” low side pressure. This can be caused by overcharging the system or if the compressor itself is malfunctioning. If the pressure is reading high, it is time to seek professional mechanic help, as repairs may be necessary.

**You have successfully recharged your AC!** Your AC should be running colder now and your drive should be much nicer.

* **Warning**: It must be stressed that if your refrigerant was low to begin with, there is little doubt that there is a system leak. AC repairs are highly specialized and this sort of repair needs to be [addressed by a professional](https://www.yourmechanic.com/services/coolant-is-leaking-inspection) for proper procedures and practice, as well as keeping the refrigerant from leaking into the atmosphere and polluting the air we breathe.