

Leak testing using dry nitrogen evacuation gas charging oil charging (HFC-134a, HFO-1234yf and blends of HFCs and HFOs)

Objectives: At the end of this exercise you shall be able to

- **check the leakage in the A/C system**
- **recover refrigerant**
- **find out and rectify leakages**
- **evacuating the system**
- **charge the system with refrigerant**
- **performance checking**
- **add oil to compressor and system.**

Requirements			
Tools/Instruments			
• Double and spanner set	- 1 No.	• Digital probe thermometer	- 1 Set.
• Manifold gauge set	- 1 Set.	• Anemometer	- 1 No.
• Vacuum pump/Recycle machine	- 1 No each	Materials	
• Recovery machine	- 1 No.	• Refrigerant R-134	- as reqd.
• Electronic tester	- 1 No.	• Refrigerant oil	- as reqd.
• Two stage nitrogen pressure regulator	- 1 No.	• New thermostatic expansion valve	
• Adaptor	- 1 No.	• Dry nitrogen filled cylinder	
• Refrigerant cylinder R-134a		• PAG oil	- as reqd.
• Recovery cylinder capacity 5 kg	- 1 Set.		

PROCEDURE

TASK 1 : Check the leakage in the AC system

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| <ol style="list-style-type: none"> 1 Run car at 1500 RPM. 2 Check all the joint with thick soap solution. | <ol style="list-style-type: none"> 3 Check all the joint evaporator, condenser fins with Electronic leak detector. |
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TASK 2 : Recover refrigerant

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| <ol style="list-style-type: none"> 1 Disconnect negative cable from battery 2 Disconnect clutch lead wire from wiring harness 3 Connect two flexible hoses from compressor service port to input of R & R Machine. (Recover and recycling machine) 4 Connect output with recovery cylinder putting on weighing machine. 5 Run recovery & recycling machine purge inlet cylinder hose and connect with cylinder. | <ol style="list-style-type: none"> 6 Open recovery cylinder valve, check weight of cylinder how much recovered. 7 Close cylinder valve, when compound gauge shows negative pressure. 8 Switch off R&R machine, close all the valve of machine. 9 Disconnect flexible hoses from compressor service port & recovery cylinder. |
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TASK 3 : Find out and rectify leakages

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| <ol style="list-style-type: none"> 1 Connect hoses with service port and Nitrogen two stage regulator with dry nitrogen fill cylinder. 2 Open nitrogen cylinder valve and operate up to 150 P.S.I close regulator valve. 3 Check all the joint with thick soap solution, trace the spot and mark. | <ol style="list-style-type: none"> 4 Open leakage joint observe position rectify and tight. 5 Fill dry nitrogen again check as previous method. 6 Release dry nitrogen slowly, loosening hoses nut |
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TASK 4 : Evacuating the system

- 1 Connect port hoses with Evacuation and charging unit.
- 2 Connect cylinder without open valve with Evacuation and Charging machine in put port.
- 3 Open all the valve knob of Evacuation & Charging unit.
- 4 When vacuum end-reached as our desired level 500 micron.

- 5 Close out let valve knob of machine, switch off the machine.

Vacuum hold for 10 minutes if vacuum not break perfect vacuum reached without leak.

TASK 5 : Charge the system with refrigerant

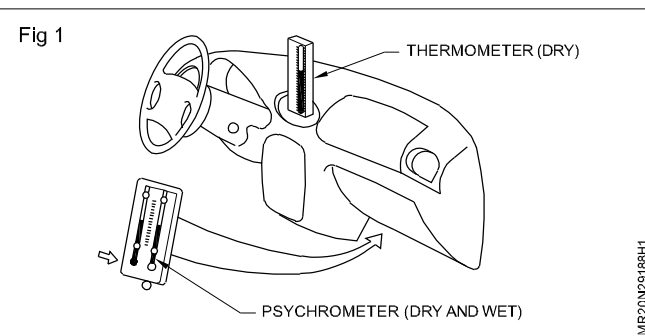
- 1 Close all machine valve.
- 2 Put cylinder on weighing machine open cylinder valve.
- 3 Open in-let and high side valve knob of Evacuating charging unit.

- 4 Allow it to go in high side up to vacuum break, close high side knob and disconnect from discharge port.
- 5 Now open suction port valve knob allow remain refrigerant to go.

TASK 6 : Performance checking

- 1 Connect the manifold gauge to the A/C system in a car.
- 2 Keep all windows and door open.
- 3 Set the controls for maximum cooling.
- 4 Keep the blower at high speed.
- 5 Keep a dry bulb thermostat in the cool air outlet. (Fig 1)

- 9 Calculate the relative humidity from the psychrometer chart by comparing the wet and dry bulb reading.
- 10 Park vehicle out of direct sunlight.
- 11 Connect manifold gauge set. Low pressure 1-3 kg/cm² high press. 12-22 kg/cm²
- 12 Start and run engine at 1500 rpm.
- 13 Set A/C controls to max A/C and maximum cold setting.
- 14 Set blower / fan on high speed.
- 15 Close doors and windows.
- 16 Insert thermometer in centre vent gill temperature 12.4°C.
- 17 Operate system for 10 minutes to allow system to stabilize.
- 18 Measure centre vent output temperature.



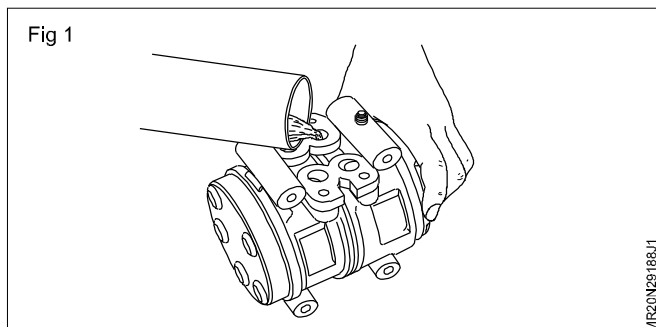
- 6 Place a psychrometer close to the inlet of the cooling unit.
- 7 Check the high pressure gauge reading (200 to 230 psi).
- 8 Check that the reading on the dry bulb thermometer at the air inlet at 25-35°C.

When A/C clutch disengages, low side pressure will increase and high side pressure should decrease.

- 19 Close the cap of service port after checking.

TASK 7: Add oil to the compressor and system adding oil to the compressor

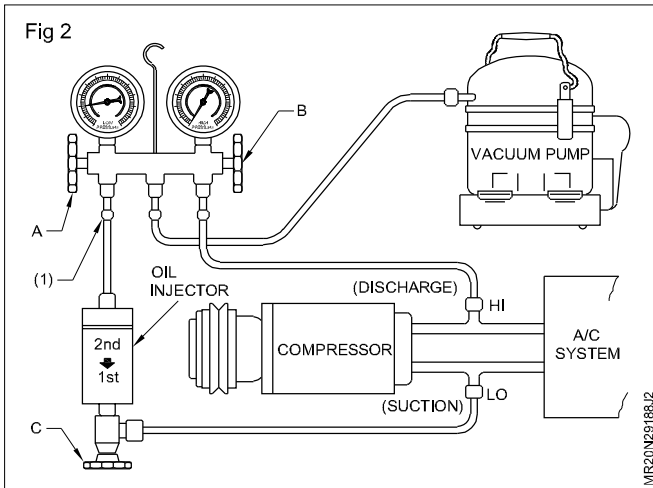
- 1 Discharge the system
- 2 Remove the compressor from the car
- 3 Draw oil by tilting the compressor slightly with care from the suction port.
- 4 Add refrigerant oil through compressor suction port to system capacity, minus the capacity of the components that have not been replaced. Refer Fig 1



Refer the workshop manual for the system quantity and type of oil. (Too little oil will provide in adequate compressor lubrication and cause compressor failure. Too much oil will increase discharge air temperature).

Add oil to the system

- 1 Connect the oil injector in series with the low side test fitting and the low side gauge as shown in the Fig 3.



Engine should be off.

- 2 Turn ON the vacuum pump and open the high side shut off valve on the manifold (B)
- 3 Low side shut off valve on the manifold (A) should be closed.
- 4 Valve 'C' is closed
- 5 Add required amount of oil to the injector (50 cc)
- 6 Secure the injector cap
- 7 Start the vacuum pump
- 8 When the vacuum is 29" Hg or more open the injector valve 'C'.
- 9 Close the high side valve B and open the low side valve A. Oil will be drawn into the low side of the system. If more oil is needed, repeat the sequence.

Refer the workshop manual for the system quantity and type of oil.