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Service Category: Vehicle Interior	Section: Heating/Air Conditioning	
Model Year: 2008	Model: ES350	Doc ID: RM00000114700PX
Title: AIR CONDITIONING: REFRIGERANT: ON-VEHICLE INSPECTION (2008 ES350)		

ON-VEHICLE INSPECTION

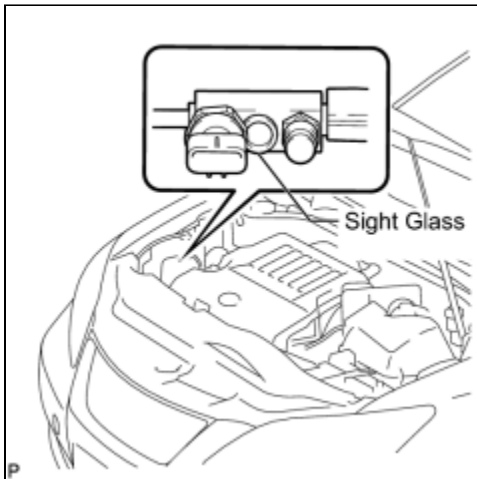
1. INSPECT REFRIGERANT VOLUME

(a) Check the sight glass on the air conditioning tube & accessory assembly.

(1) Prepare the vehicle according to the chart below.

ITEM	CONDITION
Vehicle door	Fully open
Temperature setting	MAX COLD
Blower speed	HI
A/C	ON

(2) Compare the sight glass to the following chart.



ITEM	SYMPTOM	AMOUNT OF REFRIGERANT	CORRECTIVE ACTIONS
1	Bubbles exist	Insufficient*	<ol style="list-style-type: none"> 1. Check for gas leakage and repair if necessary 2. Recharge with proper amount of refrigerant
2	No bubbles exist	Empty, insufficient, or excessive	Refer to 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	<ol style="list-style-type: none"> 1. Check for gas leakage and repair if necessary 2. Evacuate the AC system and recharge with the proper amount of refrigerant
4	Considerable temperature difference between compressor inlet and outlet	Proper or excessive	Refer to 5 and 6
5	Immediately after air conditioning is turned off, refrigerant remains clear	Excessive	<ol style="list-style-type: none"> 1. Recover refrigerant 2. Evacuate the AC system and recharge with the proper amount of refrigerant
	Immediately after air		

6	conditioning is turned off, refrigerant foams and then becomes clear	Proper	-
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*: Bubbles in the sight glass with the vehicle's interior temperature above 35°C (95°F) can be considered normal if cooling is sufficient.

2. INSPECT REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

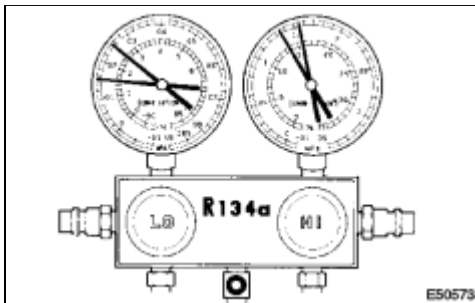
HINT:

This is a method where a manifold gauge set is used to help locate the problem.

(a) Read the manifold gauge pressure when the following conditions are established.

Test conditions:

- Temperature at the air inlet with the switch set at RECIRC is 30 to 35°C (86 to 95°F).
- Engine is running at 1,500 rpm.
- Blower speed control switch is at "HI".
- Temperature control dial is at "COOL".
- A/C switch is ON.
- Doors are fully open.
- Ignition switch is in a position that enables the AC compressor to run.

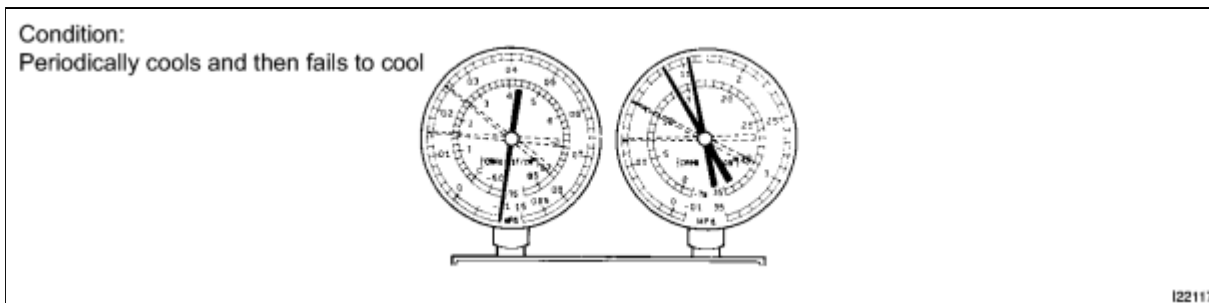


(1) Normally functioning refrigeration system

Gauge reading

PRESSURE SIDE	REFRIGERANT VOLUME
Low	0.15 to 0.25 MPa (1.5 to 2.5 kgf/cm ² , 21.3 to 35.5 psi)
High	1.37 to 1.57 MPa (14 to 16 kgf/cm ² , 199.1 to 227.5 psi)

(2) Moisture is present in refrigeration system.



SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
During operation,	Moisture in AC system will freeze at the expansion valve orifice, causing the refrigeration	<ul style="list-style-type: none"> • Cooler dryer integrated into condenser tank in 	<ol style="list-style-type: none"> 1. Replace cooler dryer 2. Remove moisture in

pressure on low pressure side cycles between normal and vacuum

cycle to temporarily stop
After the system stops, and warms up again, the ice will melt and normal operation will be temporarily restored

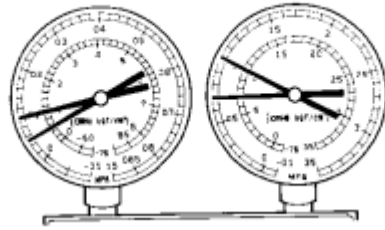
oversaturated state

- Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant

system by repeatedly evacuating air
 3. Supply a proper amount of new refrigerant

(3) Insufficient cooling

Condition: Cooling system does not function effectively.

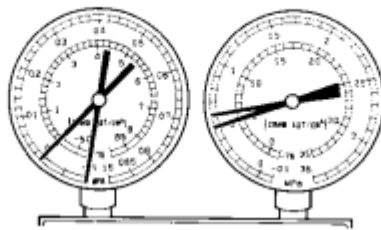


I22118

SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> Pressure is low on both low and high pressure sides Bubbles are seen through sight glass continuously Insufficient cooling performance 	Gas leakage from the refrigeration system	<ul style="list-style-type: none"> Insufficient refrigerant Refrigerant leaking 	<ol style="list-style-type: none"> Check for gas leakage and repair if necessary Supply a proper amount of new refrigerant If the gauge indicates a pressure of close to 0, then it will be necessary to evacuate the system after repairing the leak

(4) Poor circulation of refrigerant

Condition: Cooling system does not function effectively.

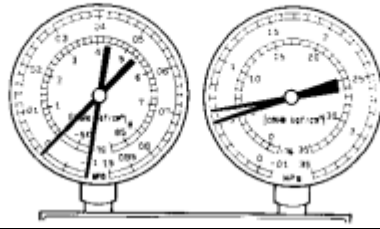


I22118

SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> Pressure is low on both low and high pressure sides Frost exists on pipe from condenser to unit 	Refrigerant flow is obstructed by dirt inside the pipes of the condenser core	Receiver is clogged	Replace condenser

(5) Refrigerant does not circulate.

Condition: Cooling system does not function. (Sometimes it may function.)

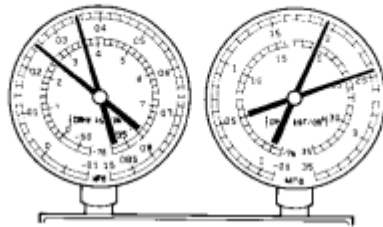


I22120

SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> • Vacuum is indicated on low pressure side and very low pressure is indicated on high pressure side • Frost or condensation is seen on piping on both sides of receiver/drier or expansion valve 	<ul style="list-style-type: none"> • Refrigerant flow is obstructed by moisture or dirt in refrigeration system • Refrigerant flow is disrupted by gas leaking internally through the expansion valve 	Refrigerant does not circulate	<ol style="list-style-type: none"> 1. Check the expansion valve 2. Replace expansion valve 3. Replace condenser 4. Evacuate air and supply a proper amount of new refrigerant 5. For internal gas leak at expansion valve, replace expansion valve

(6) Refrigerant is overcharged or cooling effectiveness of condenser is insufficient.

Condition: Cooling system does not function.



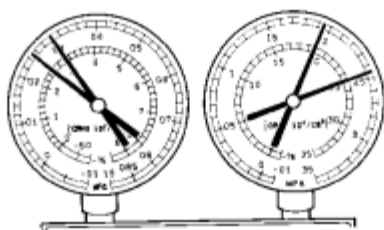
I22121

SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> • Pressure is too high on both low and high pressure sides • No air bubbles are seen through sight glass even when engine rpm lowers 	<ul style="list-style-type: none"> • Unable to develop sufficient performance due to excessive use of refrigeration system • Cooling effectiveness of condenser is insufficient 	<ul style="list-style-type: none"> • Excessive refrigerant in cycle → excessive refrigerant was added during recharging • Condenser cooling effectiveness is insufficient → condenser fins are clogged at cooling fan 	<ol style="list-style-type: none"> 1. Clean condenser 2. Check the operation of the condenser cooling fan 3. If 1 and 2 are normal state, check the amount of refrigerant and supply proper amount of refrigerant

(7) Air is present in refrigeration system.

Condition: Cooling system does not function.

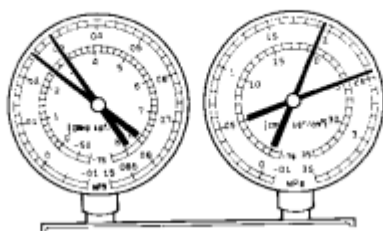
NOTE: These gauge indications occur when the refrigeration system opens and the refrigerant is charged without vacuum purging.



SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> • Pressure is too high on both low and high pressure sides • The low pressure piping is too hot to touch • Bubbles can be seen through sight glass 	Air in system	<ul style="list-style-type: none"> • Air present in refrigeration system • Insufficient vacuum purging 	<ol style="list-style-type: none"> 1. Check compressor oil to see if it is dirty or insufficient 2. Evacuate the system and recharge it with new or purified refrigerant

(8) Expansion valve malfunction

Condition: Insufficient cooling

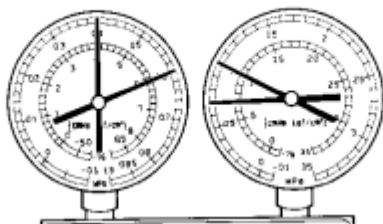


22123

SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS
<ul style="list-style-type: none"> • Pressure is too high on both low and high pressure sides • Frost or a large amount of condensation on piping on low pressure side 	Expansion valve may be sticking	<ul style="list-style-type: none"> • Excessive refrigerant in low pressure piping • Expansion valve opened too wide 	Check expansion valve

(9) Insufficient compressor compression

Condition: Insufficient cooling



SYMPTOM	PROBABLE CAUSE	DIAGNOSIS	CORRECTIVE ACTIONS

- Pressure is too high both on low and high pressure sides
- Pressure is too low on high pressure side

Internal leak in compressor

- Low compression
- Leak from a damaged valve, or parts may be broken

Replace compressor

Gauge readings (Reference)

