

COMPRESSOR DRIVE BELT

Tension adjustment (Op. 50 200 10)

The tension and condition of the belt transmitting drive from the engine to the compressor is particularly important as regards the correct operation of the air conditioning system.

This drive belt therefore requires careful attention as follows:

- 1) Fit the belt correctly.
- 2) Check the tension.
- 3) Check the condition of the belt.

Fitting the compressor drive belt

When first fitted, the belt must not be forced, pulled with a screwdriver, or rolled over the edge of the pulley, as this would stretch the less deformable fabric in the belt thus causing subsequent breakage of the other fabrics.

When first fitted, the belt must more installed at a greater tension than normal to compensate for initial stretching during the running-in period. The belt must therefore be checked again after 50 hours of operation and adjusted to the normal tension.

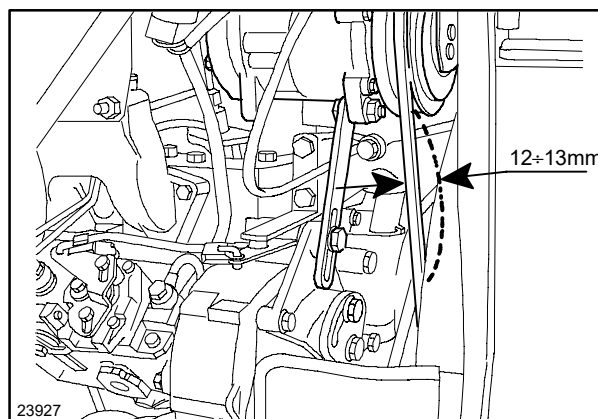
This check is absolutely essential as if the belt is too taut, in addition to damaging the pulley bearings, it will cause premature fatigue of the reinforcement fabrics and thus early deterioration of the belt.

If on the contrary the belt is too slack, it will start to slip and overheat, and it will therefore wear out very quickly.

Checking compressor drive belt tension

Check the tension only when the belt is cool (at a temperature below a 40 °C (104 °F)).

Check the tension by applying a load of 78÷98 N (17.6450÷22.0562 lb) to the centre of the belt run indicated in the figure: the belt should deflect $\approx 12\div13$ mm (0.0394÷0.0426 ft).



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Periodic checking of drive belt

When checking the tension, also check the amount of drive belt wear.

The main problems are as follows:

- a) **Belt shiny** : smooth sides may slip on pulleys.
- b) **Belt cracked** : may break suddenly due to splits on the inner surface caused by excessive flexure.
- c) **Worn sides** : with the sides worn or the inner surface cracked, the belt can break at any moment.
- d) **Belt impregnated with grease** : the belt will wear more rapidly as the grease will cause softening of the internal part.

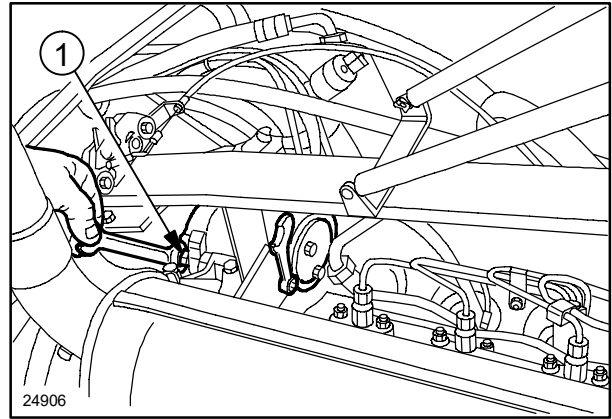
Take the following action:

- a) If the belt is too slack, tension it correctly; if the belt is very hot, renew it.
- b) If cracking is deep, extending to half the thickness of the belt, renew the belt.
- c) Renew the belt.
- d) If the belt is very hot.

If the belt squeaks when running, check the tension and adjust if necessary. If the noise continues, renew the belt.

If the belt has been over-stretched and it is not possible to tension it sufficiently, renew it.

8. Loosen the bolt (1) securing the compressor to the engine and remove the drive belt from the pulleys.

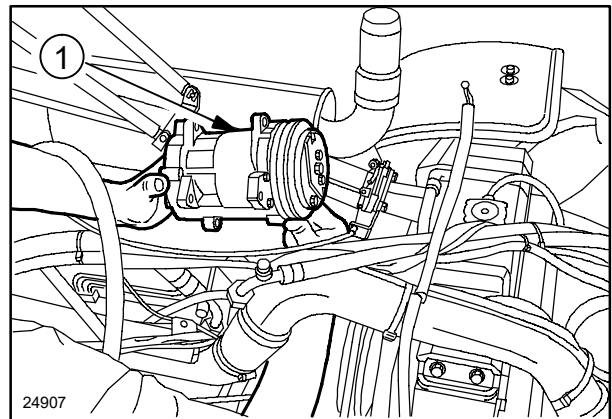


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9. Remove the compressor bolt (1) and recover the compressor.

To refit proceed as follows:

- Refit the compressor, the support/belt tensioner arm. Reconnect the earth lead..
- Refit the right-hand guard.
- Reconnect the two flexible pipes to the compressor.
- Connect the negative battery lead.
- Evacuate the air conditioning system and charge with HFC 134a refrigerant, using the evacuation/charging station **294030** as described on page 24.
- Close the hood.



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COMPRESSOR OIL – TYPE AND QUANTITY

The tractor is equipped with a SANDEN SD 7H15 compressor for refrigerant R134a.

The compressor is filled during assembly with 185cm³ (11.29in.³) of PAG SP 20 lubricating oil.

In case of top up or oil change only use this type of oil.

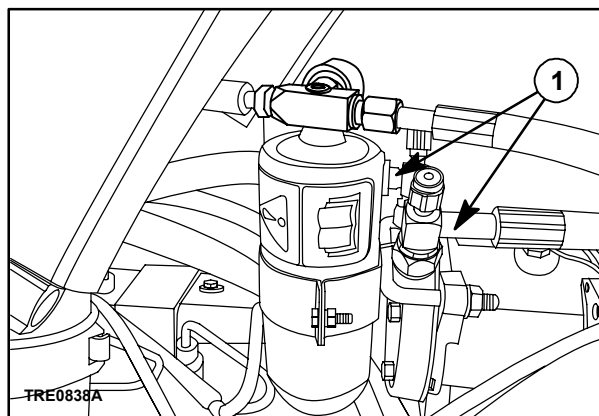
It is not necessary to check the compressor oil level unless the system develops significant gas leaks.

Warning – If the system develops significant leaks of R134a refrigerant, there will also be a significant loss of compressor oil PAG SP20. It will therefore be necessary to check the compressor oil level, bearing in mind that, on average, only 130 ÷ 135 cm³ (7.93 ÷ 8.24 in.³), of the total quantity of lubricating oil (185 cm³ (11.29 in.³)) will be present in the compressor, as the remaining 50–55 cm³ (3.05–3.36 in.³) will be in circulation through the various system components. For problems of this type, we recommend that you seek assistance from an authorised service centre.

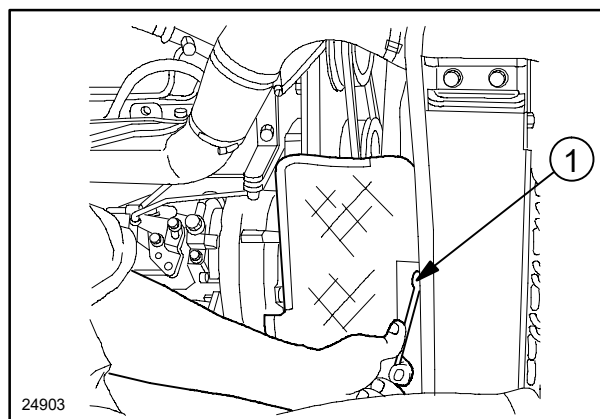
COMPRESSOR**Removal–Refitting (Op. 50 200 04 – 50 200 26)****DANGER**

Recover the refrigerant from the system adhering to the safety instructions reported on page 2.

1. Recover the refrigerant from the system using station **294048** as described on page 22.
2. Raise the hood.
3. Disconnect the negative battery lead.
4. Disconnect the flexible pipes (1) from the compressor.
5. Remove the right-hand guard retaining screws (1).

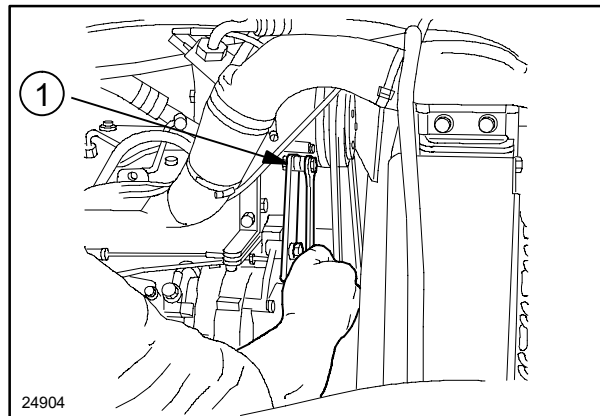


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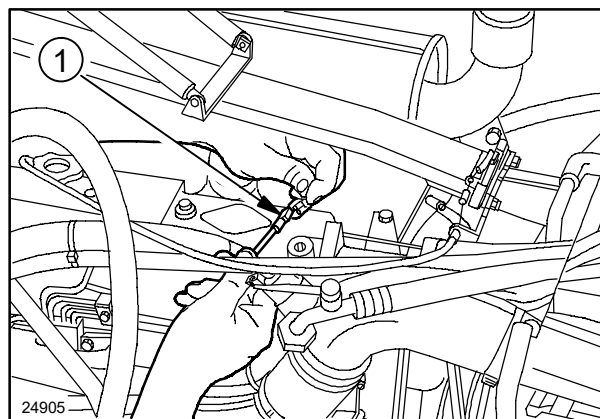
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6. Remove the two securing nuts (1) of the compressor belt tensioner arm.



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7. Disconnect the earth lead (1) from the compressor.

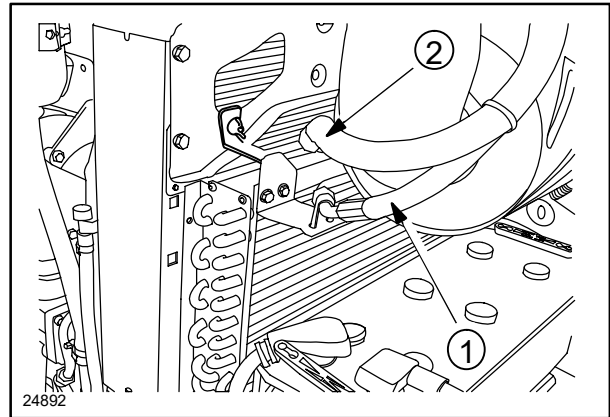


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CONDENSER**Replacement (Op. 50 200 04 – 50 200 72)****DANGER**

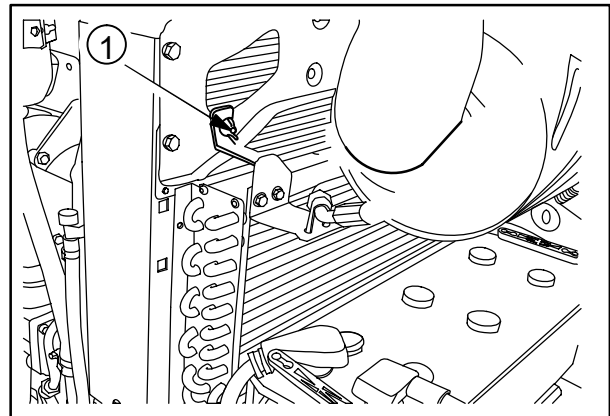
Recover the refrigerant from the system adhering to the safety instructions on page 2.

1. Disconnect the negative battery lead.
2. Recover the refrigerant from the system using the station **294048** as described on page 22.
3. Detach the flexible refrigerant delivery (1) and return pipes (2) from the condenser.



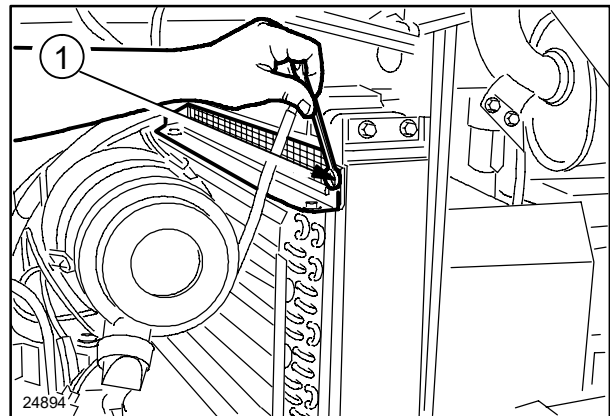
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4. Unscrew the wingnut (1) securing the condenser.



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5. For tractors equipped with front mudguards, remove the two screws (1) securing the top bracket of the condenser (for tractors without front mudguards turn the steering wheel to full right-hand lock and withdraw the condenser from the right-hand side of the tractor).

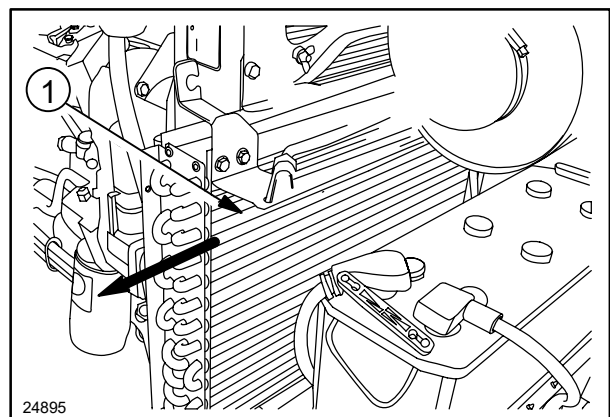


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6. For tractors with front mudguards, remove the condenser group (1) with the top bracket.

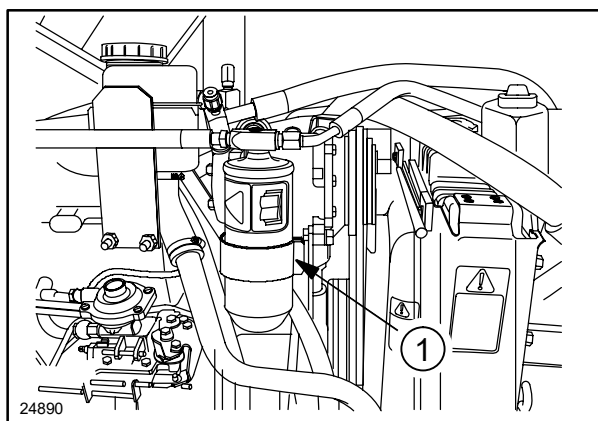
To refit proceed as follows:

- Refit the condenser and the relative bracket, and secure the condenser with the wingnut and the bracket with the two retaining screws.
- Reconnect the two flexible pipes to the condenser.
- Connect the negative battery lead.
- Evacuate the air conditioning system and charge with HFC 134 a refrigerant, using the evacuation/charging station **294030** as described on page 24.
- Close the hood.



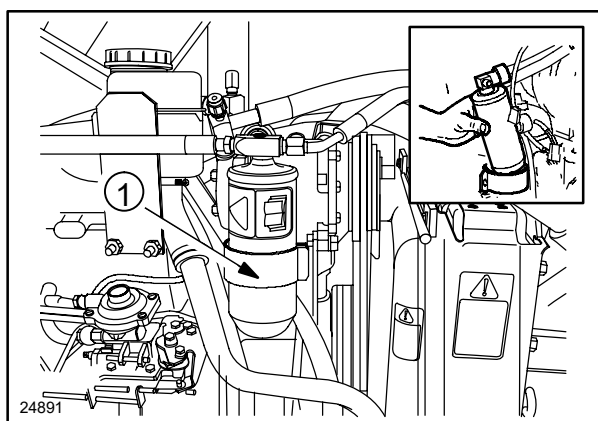
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7. Remove the screw (1) securing the receiver–drier band clamp.



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8. Recover the complete receiver–drier (1).



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To refit proceed as follows:

- Replace the receiver–drier in the support clamp.
- Reconnect the two flexible return and delivery pipes. Connect the electrical connections on the filter.
- Connect the negative battery lead.
- Evacuate the system then charge with HFC 134a refrigerant, using the evacuation/charging station **294030**, as described on page 24.
- Close the hood.

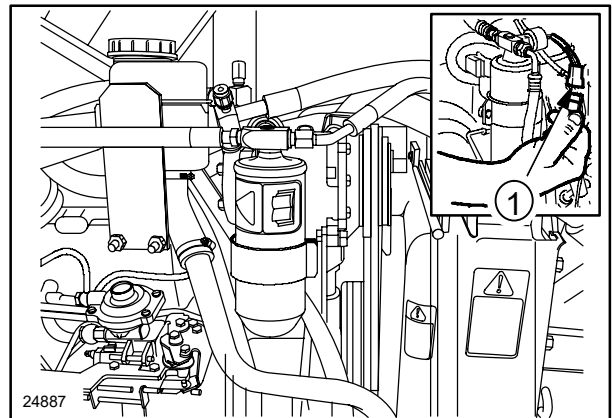
RECEIVER-DRIER

Replacement (Op. 50 200 04 – 50 200 74)

**DANGER**

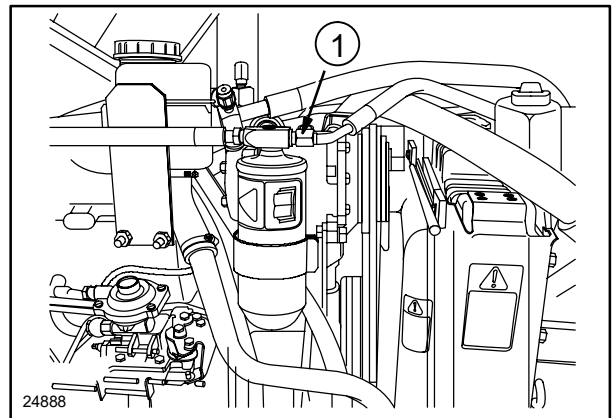
When recovering the refrigerant from the system adhere to the safety instructions on page 2.

1. Recover the refrigerant from the system using station **294048** as described on page 22.
2. Detach the exhaust pipe and raise the hood.
3. Disconnect the negative battery lead.
4. Disconnect the electrical connector (1) from the receiver-drier.



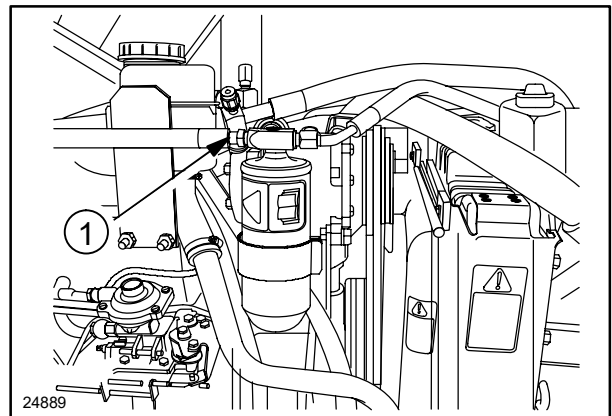
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5. Detach the flexible pipe (1) connecting the condenser to the receiver-drier.



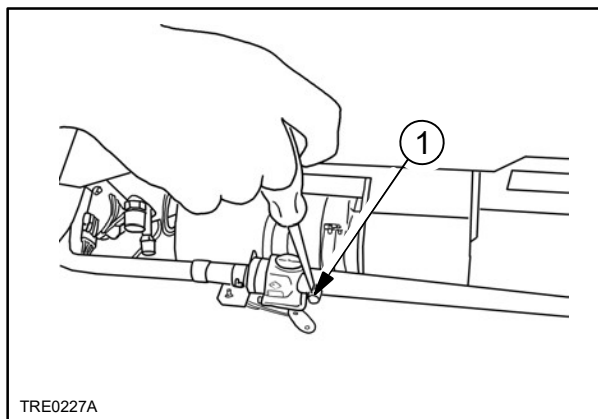
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6. Detach the flexible pipe (1) connecting the receiver-drier to the evaporator.



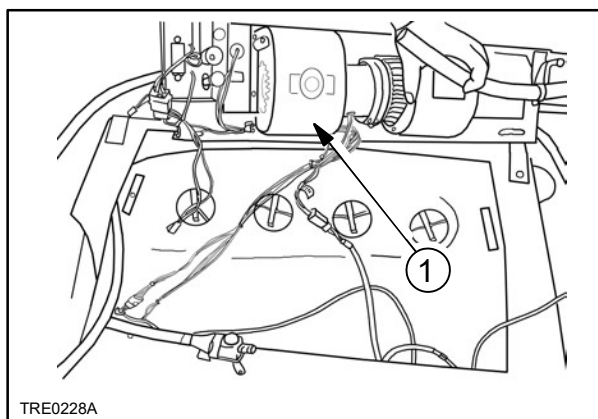
39

10. Remove the bracket (1) that secures the pipe.



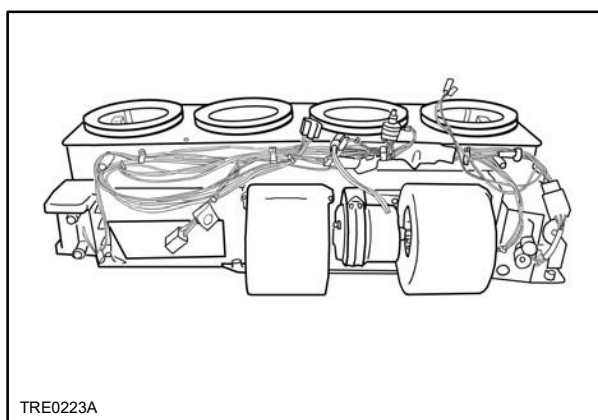
34

11. Remove all electric connectors and take off the A/C assembly (1) completely.



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12. A/C assembly is shown in fig 36.

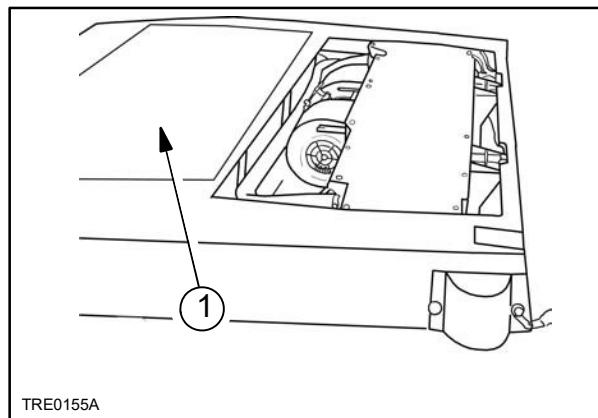


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13. To reassemble, clean all parts and proceed as follows:

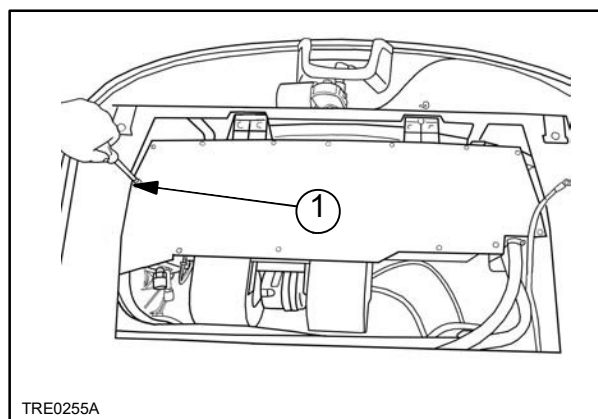
- Refit A/C assembly completely and refit all electric connectors.
- Assembly the bracket that secures the heater pipe.
- Assembly the heater pipe connections refit the pipes.
- Refit A/C assembly inlet & outlet pipes.
- Refit A/C assembly fastening screws.
- Refit top cover plate.
- Assembly the cab roof.
- Refit the 4 cab roof retaining bolts.
- Pour the previously drained coolant back into the radiator.
- Reconnect the negative battery lead.
- Charge the air conditioning system with HFC 134 a refrigerant, using the evacuation/ charging station **294030** as described on page 24.

6. Remove plate fastening screws and take of the plate (1)



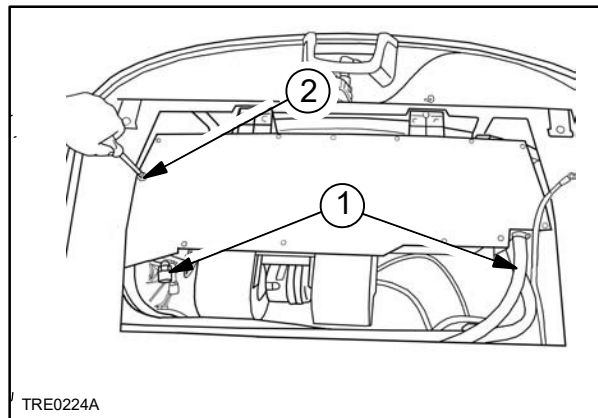
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7. Remove A/C assembly fastening screws (1).



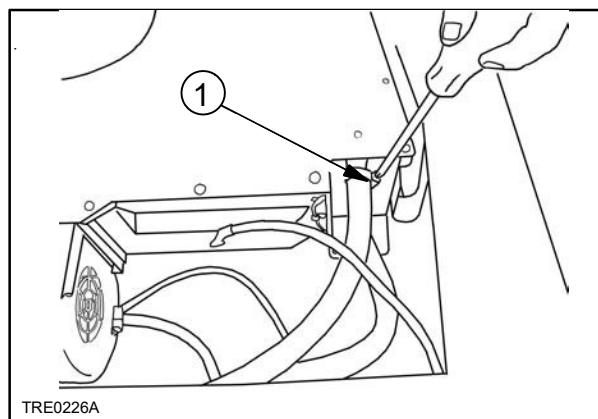
31

8. Remove A/C inlet and outlet pipes (1). Remove front retaining screws (2).



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9. Remove heater pipe connections (1) and take off the pipes.

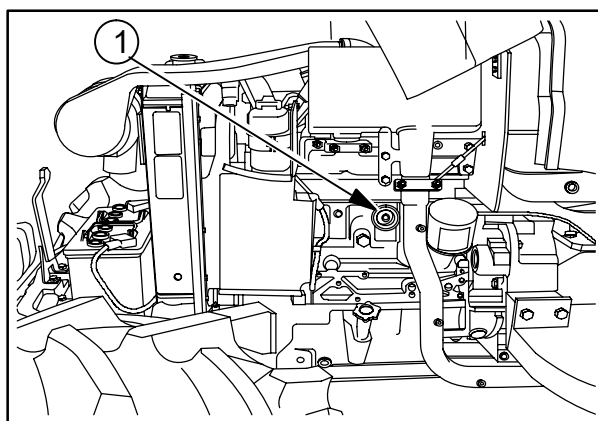


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**AIR CONDITIONING AND HEATING
PIPES****Replacement (Op. 50 200 04 – 50 206 56 –
50 206 51– 50 206 66 – 50 200 40 – 50 200 60)****DANGER**

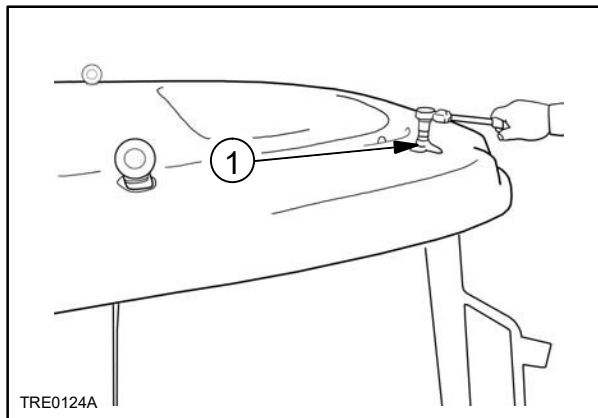
When recovering refrigerant from the system adhere to the safety rules on page 2.

1. Disconnect the negative battery lead.
2. Recover the refrigerant from the system using the recovery/recycling station **294048** as described on page 22.
3. Drain off approx. 3 litres (0.6599 gall. Imp.) of coolant from the drain plug (1) on the engine block.



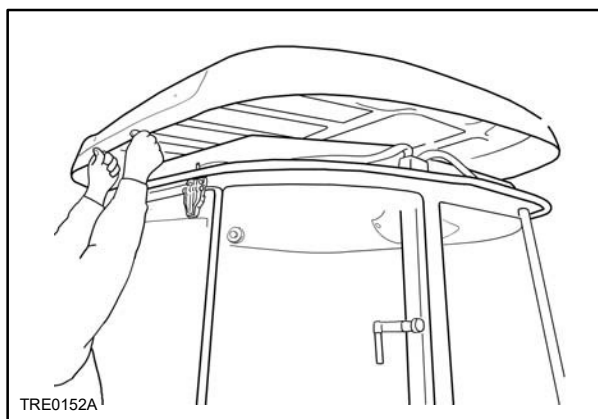
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4. Remove the 4 cab roof retaining bolts (1).



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5. Remove the cab roof as shown in the figure 29.



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MAINTENANCE OF THE AIR CONDITIONING SYSTEM

At the start of the season in which the system will be used, check that the system is functioning correctly and efficiently.

If the system has been out of use and charged for a prolonged period, oil may have flowed out of the compressor to other parts of the system and consequently this oil must be returned to the compressor.

To do this, start the engine and run it at approximately 1500 rpm for about 10 minutes.

Switch on the ventilation fan at maximum speed. Turn control knob (2, fig. 9) to switch on the air conditioning.

Check that the relative temperatures of the external ambient air and the air flowing out of the vents inside the cab correspond to the values indicated in the table on page 29.

If so, the system is operating efficiently, and a visual inspection of the main components will be sufficient:

1) COMPRESSOR: check the mountings, drive belt tension and oil level.

2) CONDENSER: check mounting, and that the fins are free from excessive deposits. Straighten any bent fins using the special comb **293831**.

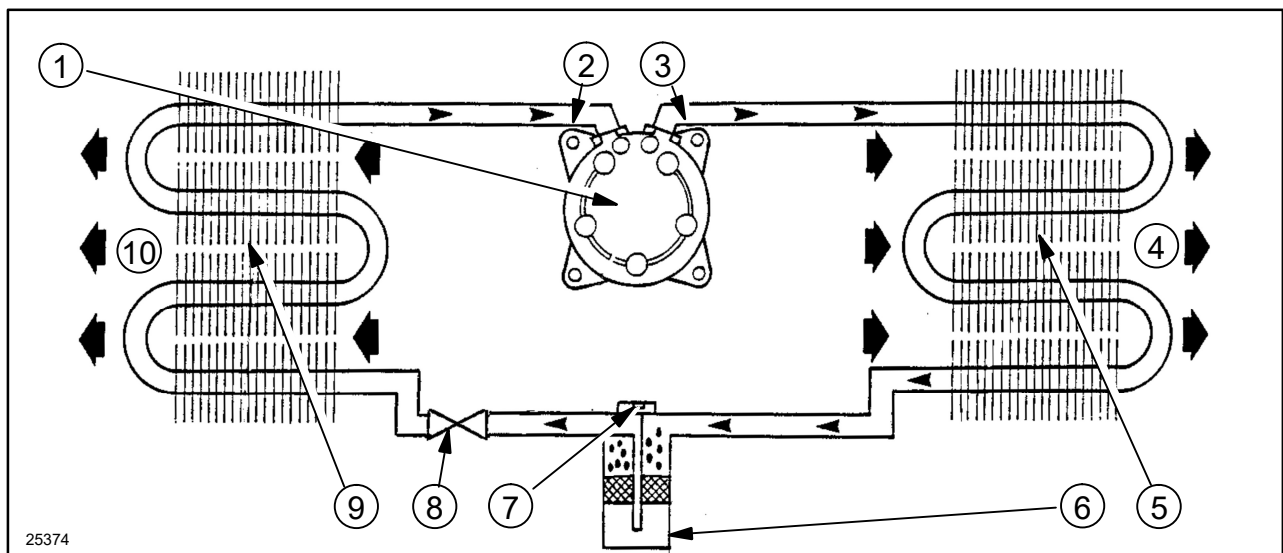
Note – Carry out the same checks on the EVAPORATOR (9) and CONDENSER (5).

3) RECEIVER-DRIER: the sight glass on the receiver-drier can provide useful information regarding system operation; see page 27. Replace the receiver-drier after the system has been repaired on two occasions.

4) EXPANSION VALVE: does not require maintenance; in the case of malfunction, check the valve and thermostatic sensor as described on pages 17 and 18 or refer to specialised personnel of service network.

If the temperature of the air at the vent outlets does not conform to the indications given in the table on page 29, proceed with the system fault diagnosis procedure outlined on page 31.

Warning – Should one or more system components require replacement, in all cases it will be necessary to carry out the recovery, recycling and charging operations described on pages 22 to 27.



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Schematic of the air conditioning system.

- | | |
|------------------------------------|--|
| 1. Compressor. | 6. Receiver-drier. |
| 2. Suction line (low pressure). | 7. Sight glass. |
| 3. Discharge line (high pressure). | 8. Expansion valve with thermostatic sensor. |
| 4. Hot air. | 9. Evaporator. |
| 5. Condenser. | 10. Cool, dehumidified air. |

AIR CONDITIONING SYSTEM**Testing for leaks with leak detector 294036 and elimination of leaks (Op. 50 200 06)**

With the system charged and the pressure gauges connected, proceed as follows:

1. Start the engine.
2. Set the ventilation fan to maximum speed.
3. Turn knob (2, fig. 9) to switch on the air conditioner.
4. Bring the engine up to a speed of approximately 1500 rpm.
5. Switch on the electronic leak detector.
6. Move the probe around all pipe connections and all possible points of leakage:

— The presence of refrigerant, and thus a leak, is signalled by an increase in the frequency of the audible signal.

Not – Refrigerant is heavier than air, and so it is easier to detect below the leak rather than above it.

7. If leaks are found in the pipe connections, tighten the fittings to eliminate them.
-

Warning – If any of the system components requires replacement, it is always necessary to perform the recovery, recycling and charging operations described on pages. 22 to 27.

AIR CONDITIONING SYSTEM FAULT DIAGNOSIS SUMMARY

There are three main ways in which the system can malfunction:

- the system does not work at all;
- the system does not provide sufficient cooling;
- the compressor operates irregularly.

Bearing in mind that insufficient cooling may also result from causes external to the air conditioning system, generally a mechanical check and visual inspection will provide useful information about the efficiency of the system.

This information can then be completed by electrical testing.

If at this stage the problem has still not been identified, it will be necessary to carry out a more detailed search by analysing the pressure readings in the various parts of the system.

Visual inspection of components

These checks are to be carried out with the engine stopped and with the heating and air conditioning system switched off.

- Check the compressor mountings and the relative support, pulley alignment, belt tension..
- Look for visible signs of refrigerant leakage (presence of oil on fittings).
- Look for visible leaks of liquid refrigerant.
- Inspect the condition of the pipes, particularly those in contact with the engine, as well as pipe fittings/connectors and hose clamps.
- Check that the evaporator, the heater matrix, and the condenser are clean and remove any foreign bodies.
- Check the condition and position of the thermostatic sensor (fig. 13) in the evaporator.
- Check that external air intakes are not blocked.
- Check the condition of the condensate discharge pipes.

CHECKING FOR REFRIGERANT LEAKS USING AN ELECTRONIC LEAK DETECTOR

Leak detector (294036)

The leak detector **294036** is supplied in its own carrying case which also contains the two power supply batteries, the sensitivity test phial and an ear plug connection for audible leak indication.

The instrument consists of a hand-held unit with a flexible probe which houses the sensing tip.

To orient the flexible probe, first slacken off the locking ring on the lower left-hand corner of the case.

The front of case mounts the sliding on/off switch, the red indicator led, and the audible leak indicator.

The rear of the case mounts the ear plug connection socket. The battery compartment also houses a sensing tip and a number of spare felt pads.

Use

Switch the unit ON: start looking for leaks; the frequency and the amplitude of the audible signal will increase if gas is detected.

In areas affected by gas leaks, switch the instrument on and off; the detector will automatically select a new acoustic level.. Perform this test each time the instrument is to be used.

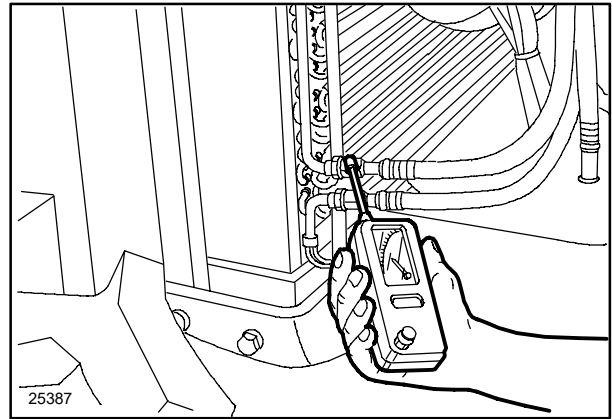
Hold the sensing tip near the open phial to test sensitivity; when the instruments starts to emit a signal, switch it on and then off.

Refrigerant leak test

In this stage the instrument automatically regulates its sensitivity in accordance with the presence of gas in the environment around the sensing tip, and the test is performed solely by means of the on/off switch.

In ventilated areas, it can be extremely difficult to trace a large leak due to the rapid dispersion of gas from the source; in this case, place screens around the suspected source to enable more precise localisation of the leak.

In cases where large leaks obscure the presence of smaller leaks, locate and repair the large leaks first, and then locate the small leaks.



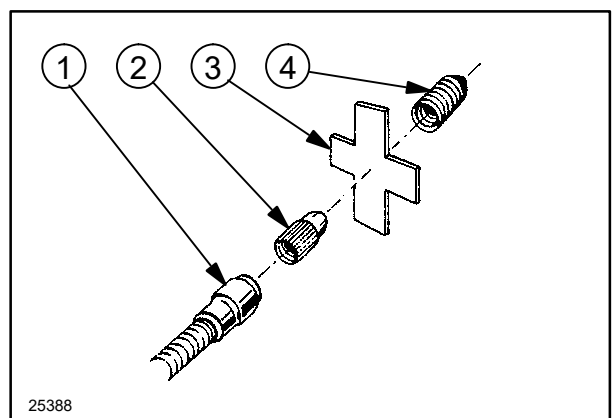
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Maintenance

Always make sure that the instrument is switched off before replacing the sensing tip. To remove the tip, unscrew it in a counter-clockwise direction. Fit a new tip and a new felt pad, screwing them in a clockwise direction onto the flexible probe.

Do not switch on the instrument unless the sensing tip is firmly screwed on to the end of the flexible probe.

On fitting the tip, check that there is no grease or dirt in the connecting hole between the probe and the tip.

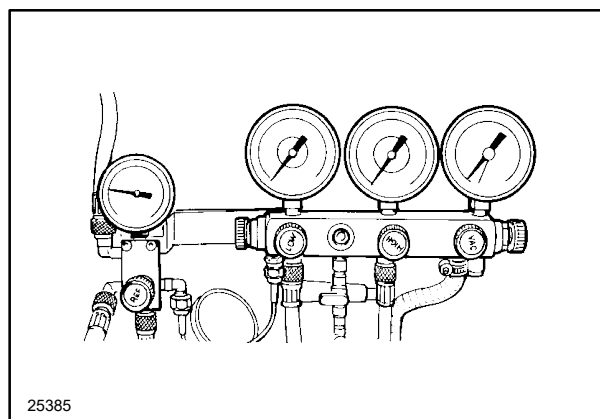


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Leak detector probe

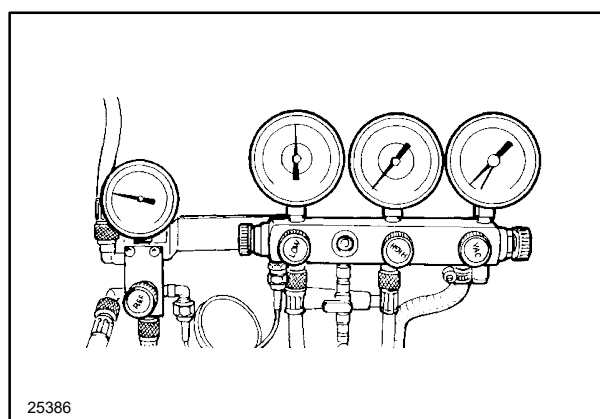
1. Flexible probe.
2. Sensing tip.
3. Felt pad.
4. Cover.

- Pressure gauge readings with cocks (4 – 10 – 22, fig. 16) open, cylinder (31) with 2000 gr (4.4112 lb) of refrigerant, red and blue service pipes connected to tractor system, cocks (16) open, compressor off and cock (9) closed (check on vacuum meter that no pressure drops occur over a period of 5 minutes).



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- Pressure gauge readings (start of charging – end of charging). All previously opened cocks are to be closed, with the exception of (4 and 3, fig. 16), compressor off. The level of refrigerant in the charging cylinder can be seen to drop; proceed until only 600 gr of refrigerant remain in the charging cylinder (1400 transferred). The reading of vacuum meter (8) remains the same from the beginning to the end of the charging operation.



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Checking the temperature of the air coming out of the vents inside the cab.

If the temperature of the air measured at the vents is within the value range indicated in the table for the

external ambient air temperatures specified, the system is functioning efficiently.

If the temperature of the air at the vents exceeds the maximum value indicated in the table, refer to the fault diagnosis guide in the following pages.

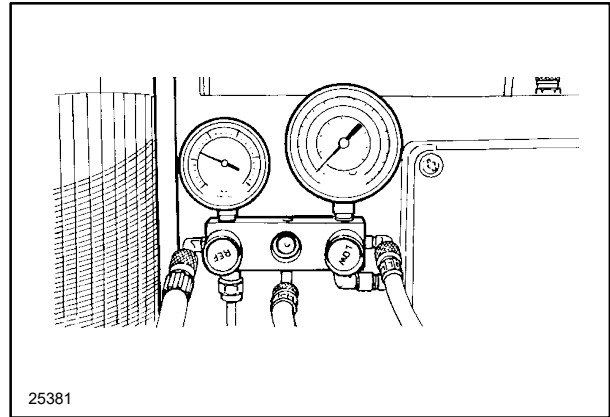
AIR CONDITIONING SYSTEM OPERATING TEMPERATURE VARIATIONS

External ambient temperature	20 °C (68 °F)	27 °C (80.6 °F)	28 °C (82.4 °F)	35 °C (95 °F)	36 °C (96.8 °F)	43 °C (109.4 °F)
Temperature of air at vent outlets (inside cab)	4 – 8 °C (39.2–46.4 °F)		6 – 12 °C (42.8–53.6 °F)		12 – 20 °C (53.6–68 °F)	

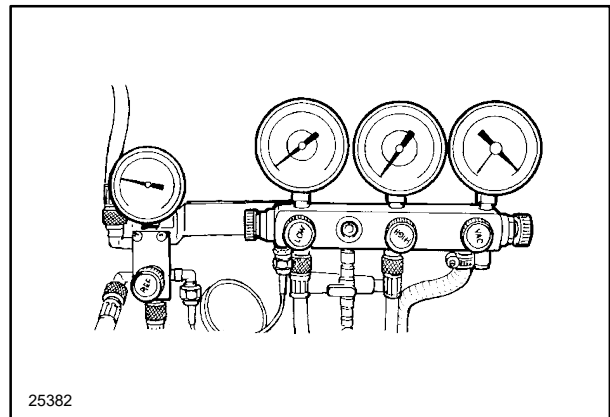
SUMMARY OF THE AIR CONDITIONING SYSTEM CHARGING OPERATIONS

Note – The pressure readings reported below are valid for an ambient temperature of 25 °C (77 °F).

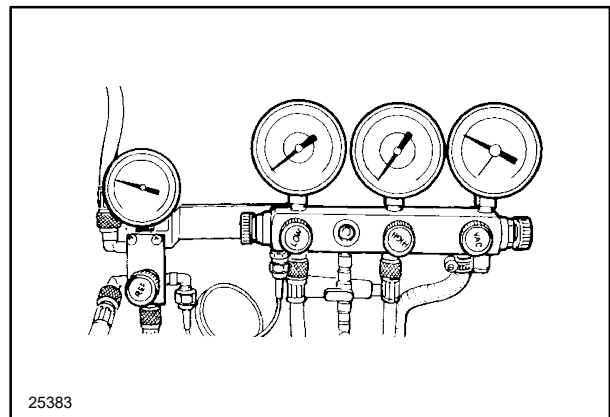
- Pressure gauge readings on completion of refrigerant recovery and recycling operation.
- pressure gauge readings with cocks (4 – 10 – 22 and 9, fig. 16 page 25) open, cylinder (31) with 2000 gr (4.4112 lb) of refrigerant, red and blue service pipes connected to tractor system, cocks (16) closed and compressor off.
- Pressure gauge readings with cocks (4 – 10 – 22 and 9, fig. 16) open, cylinder (31) with 2000 gr of refrigerant, red and blue service pipes connected to tractor system, cocks (16) open and compressor on (initial evacuation stage).
- Pressure gauge readings with cocks (4 – 10 – 22 and 9, fig. 16) open, cylinder (31) with 2000 gr (4.4112 lb) of refrigerant, red and blue service pipes connected to tractor system, cocks (16) open and compressor on (final stage of evacuation after 30 minutes).



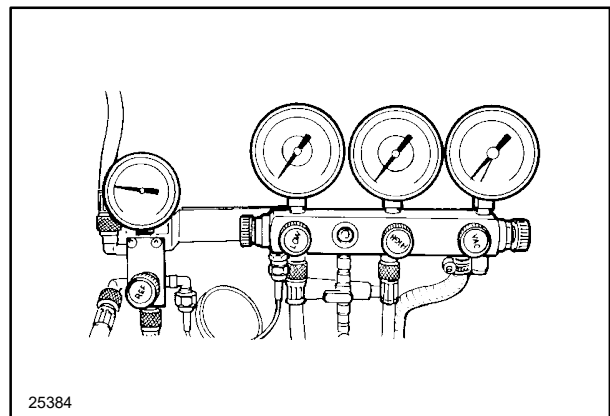
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FUNCTION TESTING OF CAB AIR CONDITIONING SYSTEM (Op. 50 200 03)

With the pressure gauges connected to the system in the manner described previously and the cocks closed, proceed as follows:

1. Start the engine and bring it up to a speed of 1500 rpm.
2. Set the cab ventilation fan (1, fig. 9) to the maximum speed.
3. Turn knob (2, fig. 9) to switch on the air conditioning.

After about 15 minutes of operation, take the following readings:

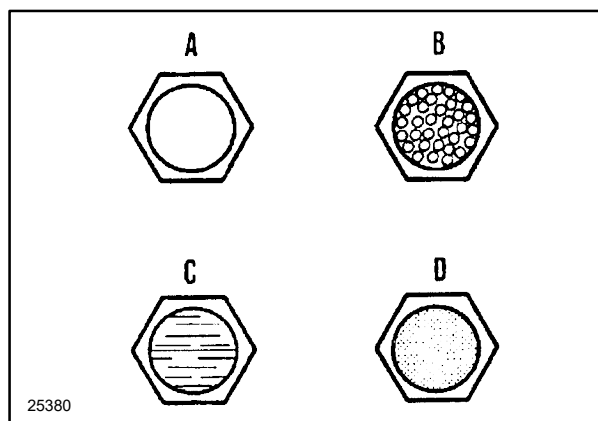
4. Pressure on suction side of compressor as indicated by low pressure gauge.
5. Pressure on discharge side of compressor, as indicated on high pressure gauge.
6. Ambient air temperature.
7. Ambient relative humidity.
8. Temperature of air leaving vents inside the cab.

The pressure values will depend on the external ambient conditions and the altitude.

The system is to be considered as functioning correctly if the pressure readings are within the value ranges indicated on page 3, and the temperature readings are within the value ranges indicated on page 29.

9. Check also the temperature of the low and high pressure sides of the system:

- the high pressure side, from the compressor discharge to the expansion valve on the evaporator, should be uniformly hot to the touch;
- the low pressure side, from the evaporator outlet to the suction side of the compressor, should be uniformly cold to the touch. There should not be excessive condensation on the suction pipe and the low pressure pipe connector on the compressor.



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10. Check that the compressor does not make undue noise; there should be an audible click when the drive is engaged..

The sight glass on the receiver–drier can provide useful information about system operation.

The four main possible conditions of the sight glass are shown in figure 17.

A. Glass clear: indicates that the system is correctly charged, or that there is no refrigerant in the system (in the latter case the cooling action of the evaporator would be absent). In some cases, the glass may be clear when the system has been charged with an excessive quantity of refrigerant; in this case it would be necessary to check the pressure readings.

B. Bubbles: the formation of vapour or foam bubbles indicates that the system contains an insufficient quantity of refrigerant or the presence of air in the system; bubbles may also be seen on switching on the system and on disengagement of the electromagnetic clutch.

C. Threads of oil: indicates a lack of refrigerant and that the compressor oil is circulating the system.

D. Fluid appearance not uniform, streaky: indicates that the drying agent in the filter has escaped, as a result of the containment discs breaking,, and is circulating in the system.

47. Rotate the outer casing (30) so that pressure value indicated on the graduated scale corresponds with the value shown on pressure gauge (2).
48. When the refrigerant in the cylinder has reached the required level, as indicated on the glass rod (29), close the cock of the external cylinder, the cock on the charging pipe (24) and cock (27).

Note – If excessive time is required to transfer refrigerant from the external cylinder to cylinder (31), slightly open valve (1) and discharge air from the cylinder (31); the pressure reading on gauge (2) should not exceed 5 bar.

Evacuation of the cab air conditioning system (previously discharged using the recovery/recycling station)

49. Remove the caps from the service valves on the suction and discharge lines of the compressor.

Refer to figure 16 and proceed as follows:

50. Connect the blue service pipe (17) to the valve on the low pressure side of the compressor marked "S".
51. Connect the red service pipe (15) to the valve on the high pressure side of the compressor marked "D".
52. Open the quick-fit cocks (16).
53. Open cocks (4 – 9 – 10 – 22).
54. Start the pump by turning switch (19) to position "I" and evacuate the system for at least thirty minutes; pressure gauges (5 – 6 – 8) should show a negative reading. If the evacuation procedure does not function correctly, check all connections.
55. Close cock (9), switch off the pump by turning switch (19) to position "0" and check the vacuum seal for at least five minutes using vacuum meter (8). This done, close all cocks.

Charging the cab air conditioning system (after evacuation) with new oil

If no refrigerant leaks, whether major or minor, have ever been found in the system, on recharging, replace the contaminated oil previously recovered in operations (25 and 26, page 24) with the same quantity of new oil. If, on the contrary, significant leaks have occurred in the past, proceed with the compressor oil level check procedure.

Refer to figure 16 and proceed as follows:

56. Pour the oil into the graduated oil meter of kit **294043**.
57. Connect the oil meter to the oil meter (20).
58. Close cocks (4 and 10).
59. Set switch (19) to position "2" to switch on the refrigerant heater on cylinder (31).
60. Open cock (12) and the cock on the graduated oil meter.
61. Check the quantity of oil flowing from the oil meter, and once the required quantity has been reached, close cocks (12) and the cock on the oil meter, and remove the graduated meter.

Charging the cab air conditioning system with refrigerant (after evacuation)

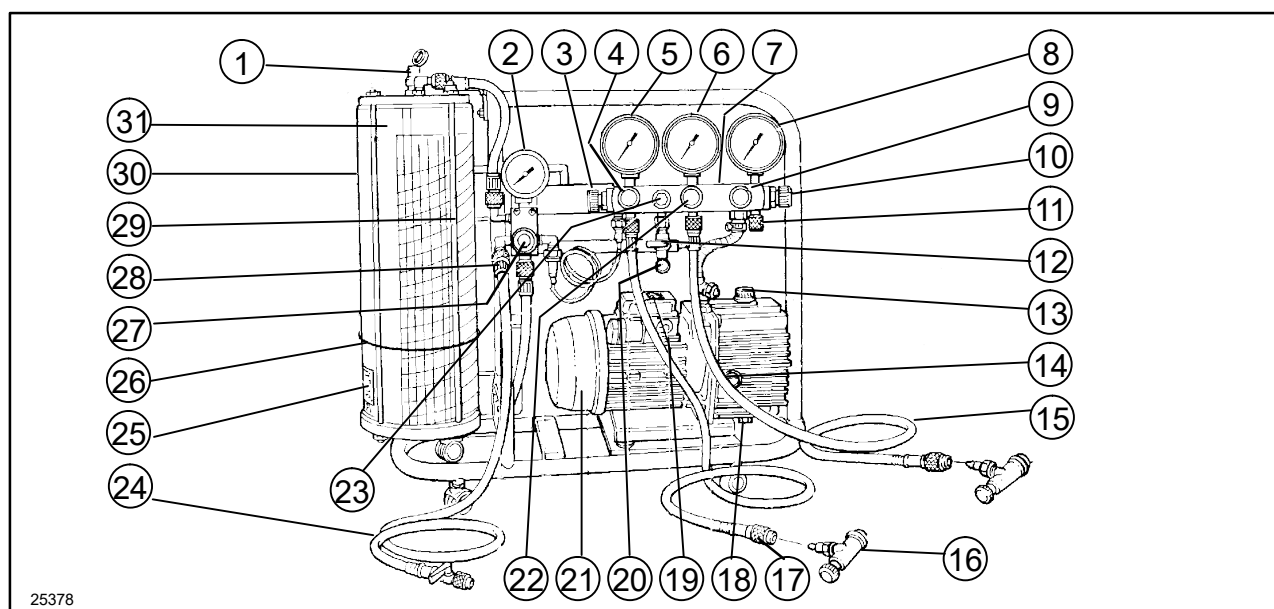
Note – The quantity of refrigerant to be put into the system is 1600 grams (3.5274 lb) (refrigerant R134a).

Refer to figure 16 and proceed as follows:

62. Keep switch (19) in position 2, with the refrigerant heater in cylinder (31) on, and heat the refrigerant for approx. 10 ÷ 15 minutes to facilitate transfer from the cylinder to the air conditioning system on the tractor.
63. According to the refrigerant type, rotate the outer casing (30) so that the graduated scale and the pressure values correspond with the pressure reading on gauge (2).
64. Move the external ring (26) along the cylinder glass to mark the quantity of refrigerant to be charged.
65. Open cock (22) and charge from the high pressure side.
66. Open cock (3), charge approx. 300 grams (0.6617 lb) of refrigerant, close cock (3) and check for leaks.
67. If there are no leaks, continue charging up to the prescribed quantity.
68. On completion of charging, turn switch (19) back to position "0", close cocks (3 and 22), disconnect pipes (17 and 15), and replace the caps on the service valves.

Carry out functional tests with the system set to maximum performance levels, as described below.

38. Check that all the cocks of the evacuation/charging station are closed, with the exception of cock (27).
39. Check that the stations are switched off with switches (5 and 19) in position "0".
40. With reference to figure 15, turn switch (5) to position "2" HEATING CYLINDER to switch on the refrigerant heater installed on cylinder (19), to facilitate the transfer of refrigerant to cylinder (31) of the evacuation/charging station.
41. On completion of the refrigerant transfer operation, close all the cocks with the exception of cock (9, fig. 15) and switch off the recovery/recycling station by turning the switch (5) to position "0".
42. Check the quantity of refrigerant in the graduated cylinder (31).
43. From the total quantity of refrigerant required in the air conditioning system indicated in the note on page 26, calculate the quantity of refrigerant that must be added to the cylinder (31) to make up the total amount required.
44. Transfer refrigerant from the external cylinder to the graduated cylinder (31) proceeding as follows.
45. Connect the yellow pipe (24) to connector (28) and to the external cylinder containing the refrigerant (upside down if not equipped outlet valve).
46. Open the cock on the external cylinder, the cock on the charging pipe (24) and cock (27).



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16

Evacuation/charging station.

- | | |
|--|---|
| 1. Safety valve. | 17. Blue service pipe for connection to suction side of compressor. |
| 2. Cylinder pressure gauge. | 18. Oil drain plug. |
| 3. Refrigerant charging cock. | 19. On/Off switch (I), heater (II). |
| 4. Low pressure side cock (LOW). | 20. Oil meter connector. |
| 5. Low pressure gauge. | 21. Vacuum pump. |
| 6. High pressure gauge (red). | 22. High pressure side cock (HIGH). |
| 7. %way pressure gauge manifold. | 23. Sight glass. |
| 8. Vacuum meter. | 24. Yellow service pipe. |
| 9. Vacuum test cock (VAC). | 25. Cylinder heater. |
| 10. Vacuum meter test cock. | 26. External ring. |
| 11. Vacuum meter safety valve. | 27. Refrigerant transfer cock (REF). |
| 12. Oil charging cock. | 28. Refrigerant transfer connector. |
| 13. Oil filler cap. | 29. Glass rod. |
| 14. Sight glass. | 30. Outer casing (Plexiglas). |
| 15. Red service pipe for connection to discharge side of compressor. | 31. Refrigerant charging cylinder. |
| 16. Quick-fit cocks. | |

Note – The circular sector of the humidity indicator (15, fig. 15) must remain green throughout the recycling operation.

If the colour of the sector tends to vary between yellow and green, or turns completely yellow, this means that the filter is saturated with moisture and therefore must be replaced.

23. On completion of the decontamination operation, close the yellow cock (18–REF) and continue to recover the refrigerant. The compressor will stop automatically when the pressure gauge (2) shows a reading of –0.3 bar (–4.35 psi).
24. Close the cock (6–LOW), the two cocks on the ends of the yellow (16) and blue (11) service pipes, disconnect pipes (16 and 11) and switch off the station, turning switch (5) to position "0".

Discharge of recovered oil

The presence of contaminated recovered oil can be seen in the distillation cylinder (4). The recovered oil must always be discharged and disposed of according to local regulations.

Proceed as follows:

25. Slowly open the yellow cock (7) and discharge the recovered oil in the graduated container.
26. If no refrigerant leaks, whether major or minor, have ever been detected in the system, on recharging, replace the contaminated oil with same quantity of new oil (see page 26).

Transfer of decontaminated refrigerant from cylinder (10) to an external cylinder

If for any reason the decontaminated refrigerant is not to be put back into the air conditioning system immediately, for reasons of safety it must be transferred from cylinder (19) to a homologated refillable gas container.

Proceed as follows:

27. Check that all the cocks are closed with the exception of cock (9) and that the station is switched off. Check that the container (cylinder) is large enough to contain all the refrigerant to be transferred without exceeding the permitted safety level.
28. Connect the end of the yellow service pipe (16) without the cock to the free connector on the left-hand side of the pressure gauge manifold,

and connect the other end (with the cock) to the red connector of the external cylinder.

29. Set switch (5) to position "2" HEATING CYLINDER to switch on the refrigerant heater fitted to the cylinder (19) so as to facilitate the transfer of the refrigerant from the cylinder to the external cylinder.
30. Open the yellow cock (18–REF), the yellow cock on the service pipe and red cock on the external cylinder.
31. On completion of the transfer, close all cocks and switch off the station by turning switch (5) to position 0.

Evacuation and charging the cab air conditioning system using the evacuation/charging station 294030.

Note – Operations 32 ÷ 34, must only be carried out if the graduated cylinder (31) is empty of refrigerant.

Evacuation of the graduated cylinder (31) of the evacuation/charging station

Refer to figure 16 and proceed as follows:

32. Close cocks (4, 22 and 27).
33. Open cocks (3, 9 and 10).
34. Start the pump by turning switch (19) to position "1" to evacuate the cylinder (31). After 5 minutes close cocks (3, 9 and 10) and switch off the pump.

Charging the graduated cylinder (31) of the evacuation/charging station

If the decontaminated refrigerant in the recovery/recycling station is to put back into the tractor air conditioning system immediately, it must be transferred from cylinder (19, fig. 15) to cylinder (31, fig. 16) of the evacuation/charging station, proceeding as follows:

35. With reference to figure 16, connect the end (without cock) of the yellow service pipe (24) to the free connector (28) on the left-hand side of the pressure gauge manifold of the evacuation/charging station..
36. Connect the other end (with cock) of the service pipe to the free connector (17, fig. 15) on the left-hand side of the pressure gauge manifold of the recovery/recycling station.
37. With reference to figure 15, check that all the cocks of the recover/recycling station are closed with the exception of cocks (9 and 18) and that on the pipe (16).

Recycling recovered refrigerant

On completion of the recovery operation, the refrigerant, which has already been through an oil separation process, must now be completely decontaminated.

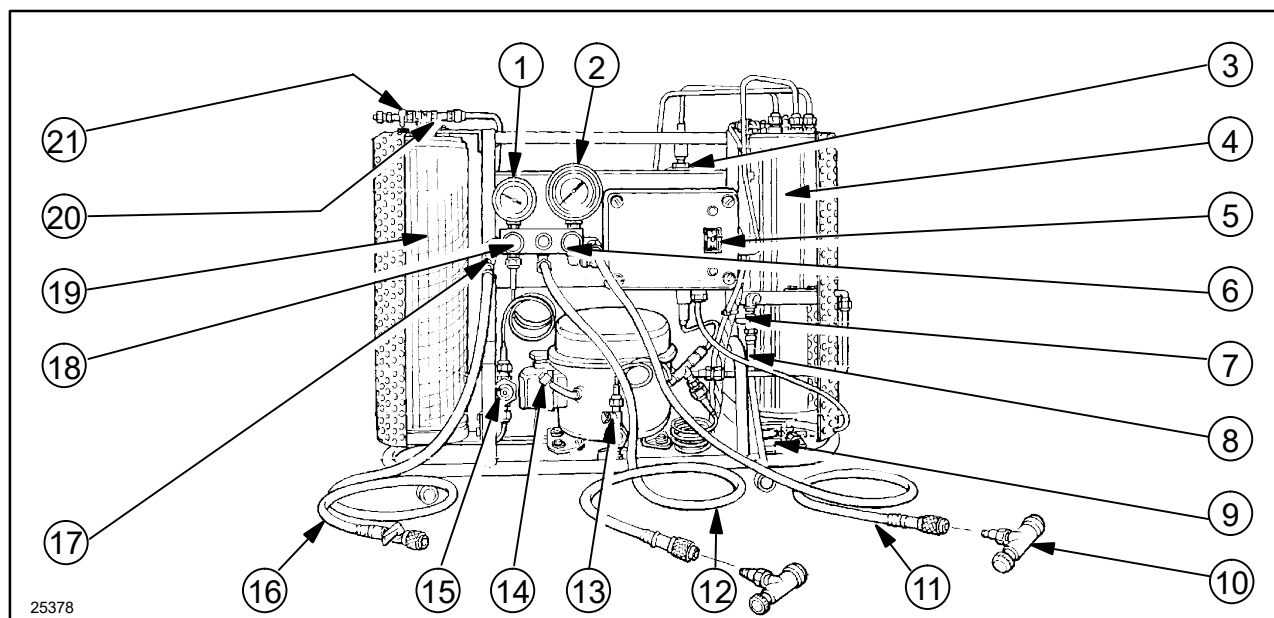


WARNING

At this stage the recovered refrigerant has not yet been completely decontaminated and therefore must not be used in the air conditioning system in this condition.

Proceed as follows:

17. All cocks must be closed, with the exception of cock (9, fig. 15) and the station must be switched off – switch (5) in position "0" and green indicator light off.
18. Connect the end of the yellow service pipe (16) without the cock to the free connector (17) located on the left-hand side of the pressure gauge manifold.
19. Connect the 2 ends of the yellow (16) and blue (11) pipes with connector supplied.
20. Slowly open the cock (18-REF) and the blue cock (6-LOW) on the pressure gauge manifold, and the cocks on the two previously connected service pipes (16 and 11).
21. Set switch (5) to position "1" (RECOVERY) – green indicator light on.
The recovery compressor will start to operate and the refrigerant will pass from the graduated cylinder to the recovery circuit (distillation cylinder, filter and compressor) and then return to the graduated cylinder.
22. Continue the operation until the circular sector of the humidity indicator (15) turns green.
If after 15 minutes the circular sector of indicator (15) still has not turned green, replace the filter (3) as described on page 20.



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Refrigerant recovery and recycling station

1. Cylinder pressure gauge.
2. Recovery control pressure gauge.
3. Anti-acid and decontamination filter.
4. Recovered refrigerant/oil distillation cylinder.
5. Switch.
6. Refrigerant inlet control cock (LOW).
7. Recovered oil discharge cock (yellow).
8. Recovered oil discharge pipe.
9. Oil return to compressor control cock (yellow).
10. Quick-fit connectors.
11. Blue service pipe for connection to suction side of compressor.
12. Red service pipe for connection to discharge side of compressor.
13. Recovered compressor oil discharge cock.
14. Recovery compressor service valve (suction).
15. Humidity indicator.
16. Yellow service pipe for refrigerant transfer.
17. Fitting for refrigerant transfer.
18. Cock (REF) for refrigerant transfer and recycling.
19. Refrigerant cylinder.
20. Safety valve.
21. Cylinder (gaseous stage) discharge cock (yellow).

AIR CONDITIONING SYSTEM**Dehydration, recharging and refrigeration check
(Op. 50 200 04)****Recovery of refrigerant from the cab air conditioning system using the recovery/recycling station 294048**

Note – the recovery operation can be performed more quickly and completely if the system is previously heated, as heat will cause the refrigerant to evaporate and thus be more easily evacuated from the system.

Refer to figure 15 and proceed as follows:

1. If possible, operate the air conditioning system for a few minutes with the tractor engine running and the hood down, so that the heat produced is gradually transferred to the various components in the system, thus allowing any pockets of very cold fluid in the system to evaporate.
2. Stop the engine.

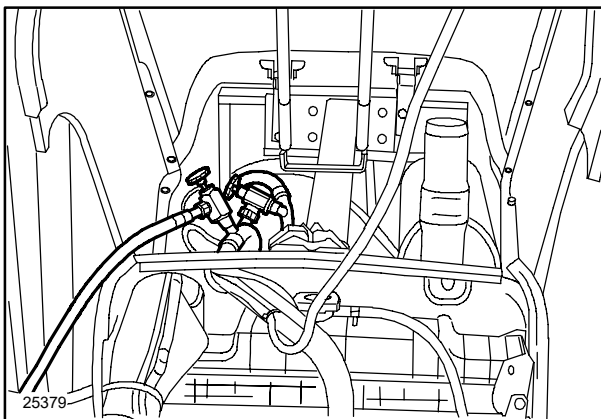


DANGER



The recovery operation must only be performed with the tractor engine stopped.

3. If the charging cylinder (19) already contains refrigerant, check that there is still sufficient free volume to contain all the refrigerant in the system (maximum cylinder capacity is 2 kg (4.4112 lb)); if not, transfer the excess refrigerant to an external cylinder in the manner described on page 24.
4. Connect the station's supply lead to a power outlet.
5. Make sure that all cocks are closed except the service cock (9).



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6. Remove the caps from the service valves installed on the suction and discharge lines of the compressor.

7. Connect the blue service pipe (11) to the valve on the suction (low pressure) side of the compressor (marked "S").
8. Connect the red service pipe (12) to the valve on the discharge (high pressure) side of the compressor (marked "D").
9. Switch on the cab ventilation fan at maximum speed to assist the transfer of heat between the ambient air and the evaporator coil.
10. Open cock (10) on pipe (12).
11. Slowly open cock (6–LOW) on the pressure gauge manifold. Pressure gauge (2) will indicate the presence and pressure of any refrigerant in the system; if the needle is near the "0", the system is empty.
12. Set switch (5) to position "1" (RECOVERY) – green indicator light will illuminate. The recovery compressor will now start.

During the recovery operation, the refrigerant will pass through the distillation cylinder (where it will be separated from the oil) and into the decontamination filter (where it will be partially cleaned of impurities) to arrive finally in the graduated cylinder.

The compressor will stop automatically when the pressure gauge (2) indicates a pressure of –0.3 bar (–4.35 psi).

13. Wait a few minutes to allow any pockets of liquid refrigerant left in the system to evaporate and be evacuated.
14. Check the pressure gauge (2): if the pressure has risen above the previous value of –0.3 bar (–4.35 psi), the station will automatically start a second recovery operation; if on the contrary the pressure has remained near the value obtained during the first recovery operation, this indicates that all the refrigerant has been removed from the system and therefore the operation is complete.

Note – If after 10 minutes of operation the station has not recovered more than 1 kg (2.2056 lb) of refrigerant, check pressure gauge (1). If the pressure reading is over 10 bar (145 psi) open cock (21) and discharge air, then check that pressure gauge (1) does not exceed a maximum of 10 bar (145 psi) throughout the entire recovery operation.

15. Close all the cocks except cock (9), disconnect the service pipes (11 and 12) from the air conditioning system compressor and switch off the station.
16. Switch off the cab ventilation fan.

Check filter connections for leaks (3)

Refer to figure 15 and proceed as follows:

10. To check for leaks at the connections of the previously replaced filter (3) open the yellow service cock (9) on the distillation cylinder (4).
11. Perform a brief recycling operation on the refrigerant contained in the cylinder (19), proceeding as described in the operations 18÷21, on page 23 and check with a leak detector for leaks at the connections of the new filter.
12. Record the operation on the appropriate service report card.

Changing the compressor oil in the recovery/recycling station

Refer to figure 15 and proceed as follows:

Warning –The oil in the compressor of the recovery/recycling station should be replaced with new oil (**code 293825**) every 12 months to maintain the station's refrigerant treatment capacity and to protect the compressor.

1. Open cock (13), and drain the oil into a container to be disposed of in accordance with local regulations for waste oil disposal.
2. Close cock (13).
3. Remove the caps from the service valves (14) on the side of the compressor and (13) on the sight glass.
4. Connect the service pipe of the evacuation station (**294030**) to valve (14) and connect a pick-up pipe from kit **294043** to valve (13) on the sight glass.
5. Perform the evacuation operation with the pump in operation. The new oil can be aspirated from an external container by means of the pick-up pipe.
6. Once the compressor has been filled with correct quantity of oil (half-way up the sight glass) close valve (13), disconnect the pick-up pipe, and replace the cap on service valve (13). Continue the evacuation for approx. 30 minutes.
7. On conclusion, close the cocks, switch off the pump, disconnect the service pipe and replace the cap on service valve (14).

8. Record the operation on the appropriate service report card.

EVACUATION/CHARGING STATION (294030)**Description** (Refer to figure 16)

The station is designed for the evacuation and subsequent charging of refrigerant in the cab air conditioning systems.

The system must first be evacuated to remove any moisture and impurities.

The new refrigerant from the external cylinder is transferred to the graduated cylinder before being pumped into the air conditioning system.

Technical characteristics

Double-acting, ballasted, rotary vacuum pump (21) in oil bath.

Charging cylinder (31) with maximum level indicator and graduated scale for measurement of quantity of refrigerant.

5-way pressure gauge manifold with 2 pressure gauges (5 and 6) and 1 vacuum meter.

294044 flexible service pipes (17, 15 and 24) with safety cocks:

Power supply: 220V (50 Hz).

Maintenance**Check level and change oil in pump of evacuation/charging station (periodic check)**

Refer to figure 16 and proceed as follows:

Periodically check the level and condition of the oil. Drain off the old oil, if necessary, through plug (18). Old oil must be disposed of in accordance with local regulations.).

Remove cap (13) and fill the vacuum pump (21) with new oil of the type indicated by the pump manufacturer up to the half-way line on the sight glass (14).

REFRIGERANT RECOVERY-RECYCLING AND EVACUATION-CHARGING STATIONS



WARNING



Never under any circumstances use recovery/recycling or evacuation/charging stations designed for a different refrigerant than that used in the system, as the different chemical compositions of different types of refrigerant render them incompatible with each other.

When connecting the stations to the system service valves, always connect the low pressure blue pipes (11, fig. 15, or 17, fig. 16) to the service valve on the suction side of the compressor (S–Suction), and the high pressure red pipes (12, fig. 15, or 15, fig. 16) to the service valve on the discharge side of the compressor (D–Discharge).

Important: check the seals in the pipe connectors (11, 12, 16, fig. 15), or (15, 17, 24, fig. 16) and replace if faulty. (kit 294052)

Remember that the pipe fittings fitted with seals are to be hand-tightened only without forcing, otherwise the seal will be damaged.

RECOVERY AND RECYCLING STATION (294048)

Description (Refer to figure 15)

The station is designed for the recovery and recycling of refrigerants used in the cab air conditioning systems.

The recovered refrigerant is first separated from the system oil by means of a process of vaporisation which takes place in a suitable container.

In the filter section, the acidity is neutralised, moisture is absorbed and solid particles are screened out.

The decontaminated refrigerant is then stored in the metering cylinder.

TECHNICAL CHARACTERISTICS

Recovery compressor equipped with oil level indicator, discharge valve and service connection.

294042 anti-acid decontaminating filter (3), with a high moisture absorption capacity.

Refrigerant/oil distillation cylinder (4) with heating element, automatic device for return of oil to the recovery station compressor and automatic flow control valve for refrigerant entering the station.

Graduated cylinder (19) for recovered refrigerant, 2.2 kg (4.8524 lb) capacity, with heater and a safety valve.

2-way pressure gauge unit, with refrigerant flow indicator and pressure gauges (1 and 2) controlling the pressure in the cylinder and at the inlet.

294053, Humidity indicator (15) for checking the decontaminated refrigerant.

Low pressure switch for automatic cycling of the compressor.

Graduated container for the discharge of recovered contaminated oil.

Switch (5) 1–0–2 for recovery and cylinder heating.

Indicator lights.

294044 flexible service pipes (11, 12 and 16) with safety cocks.

Recovery capacity: 200 grams/minute
(0.4411 lb/minute).

Power supply: 220 V (50 Hz).

Maintenance

Replacement of refrigerant decontamination filter (3)

Refer to figure 15 and proceed as follows:

Warning – Every 12 months or earlier if the humidity indicator (15) turns yellow and stays yellow throughout the recovery/recirculation stage, renew the filter (3).

6. Close all the valves including the yellow service valve (9) installed below the distillation cylinder (4).
7. If refrigerant is present in the circuit set pushbutton (5) to position "1" and carry out the refrigerant recovery operation. The compressor will stop automatically when the pressure gauge (2) drops to –0.3 bar (–4.35 psi).
8. Remove and replace the contaminated filter (3).
9. Carry out a normal evacuation operation for about 30 minutes using the evacuation/charging system (**294030**) proceeding as follows: connect the pipe (17, fig. 16) to the service valve (14, fig. 15), open the cock installed on the pipe itself and cocks (4, 10 and 9, fig. 16). On completion of the evacuation operation, close cocks (4, 10 and 9), the cock on the pipe (17) and disconnect pipe (17).

Evaporator**WARNINGS REGARDING SERVICING AND REPAIR OF THE AIR CONDITIONING SYSTEM**

The cycle is completed inside the evaporator.

The refrigerant leaving the expansion valve is a low temperature, low pressure mixture of vapour and liquid.

As it passes through the evaporator it absorbs heat from the ambient air, vaporises and, having performed its cooling function, is aspirated by the compressor as a vapour.

The operation of the evaporator is controlled by the expansion valve which delivers the exact quantity of refrigerant needed to produce the required air conditioning effect.

The evaporator performs the opposite function to the condenser, but its basic construction is the same, the only differences being its overall dimensions and the layout of the internal pipes.

The evaporator also performs another function: dehumidification of the cab.

The air passing over the evaporator contains a certain quantity of moisture, and this must be kept within certain limits for operator comfort.

Part of the moisture condenses on the fins evaporator and is thus removed from the air.

The centrifugal fan draws the ambient air through the fins of the evaporator (where it is cooled and dehumidified) and into the cab.

The housing around the evaporator is equipped with a condensate trap from which the condensate is carried outside the vehicle through discharge tubes.

Switching on the air conditioning system when the ambient temperature is low can damage the compressor. Only operate the air conditioner when the engine is hot and the temperature inside the cab is at least 20 °C (68 °F).

When disassembling pipes, plug the ends with plastic caps to prevent moisture and dust getting inside.

Handle the tube of the thermostatic sensor with great care to avoid damage which could prevent the entire system from operating correctly.

When unscrewing pipe fittings and unions, always use two spanners to avoid undue torsion.

Do not use engine oil of any type to lubricate the system or the compressor.

Do not leave the compressor oil container open. Make sure that the cap is replaced and fully tightened. The oil will absorb moisture, which is harmful to the system.

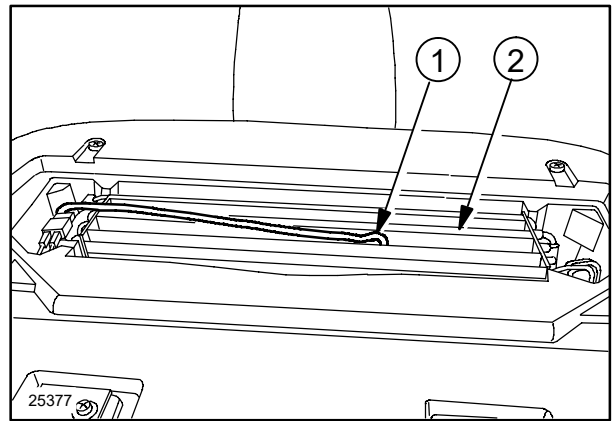
Do not transfer compressor oil from its original container to another.

Do not add any substances to the refrigerant or compressor oil. Any additives might contain elements incompatible with the refrigerant and thus alter its characteristics.

Check that the thermostatic sensor is correctly inserted between the fins of the evaporator.

Thermostatic switch (ANTIFROST)

The thermostatic switch is a safety device equipped with a sensor (1) which is inserted between the fins of the evaporator (2) where it constantly monitors the temperature.



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The bulb of the sensor (1) is filled with a special gas which expands or contracts according to the temperature and thus acts on a membrane connected to a complex mechanism which opens or closes a switch in the electrical circuit of the magnetic clutch to switch the compressor on or off as required.

The thermostatic sensor (1) thus prevents ice from forming on the evaporator and obstructing the flow of air into the cab.

For this reason it is very important to insert the sensor (1) between the fins of the evaporator (2) as shown in figure 13.

Note – In case of malfunction, replace the entire thermostatic switch.

Thermostatic expansion valve

Serves to reduce the pressure of the refrigerant as it enters the evaporator so that it can change state and thus remove heat from the surrounding air.

The expansion valve performs two basic functions:

- metering: the calibrated orifice (6, fig. 12) in the valve body creates a difference in the pressure of the refrigerant at the inlet (4) (liquid state) and the outlet (7) (mixed liquid/vapour); the calibrated orifice (6) also serves to atomise the refrigerant to facilitate subsequent evaporation;
- modulation: inside the valve body a thermostatic sensor controls the valve aperture so that the right quantity of refrigerant enters the evaporator to ensure complete evaporation.

If the thermostatic sensor (2, fig. 12) detects an increase in the cab temperature, the flow of refrigerant is increased.

A drop in the temperature or an increase in the compressor capacity (due to an increase in the engine speed) will cause a reduction in the flow of refrigerant into the evaporator.

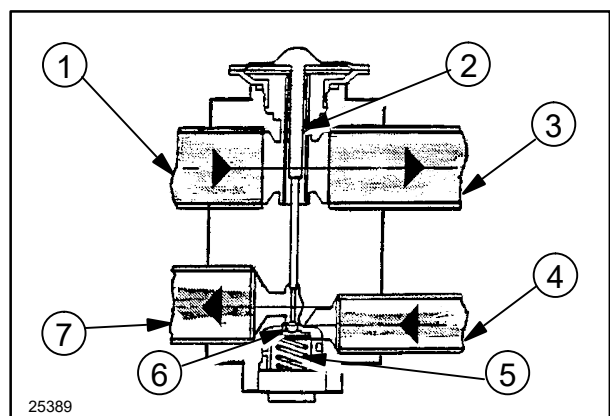
The expansion valve is installed on the evaporator inlet fitting (7), and as the internal refrigerant flow control system is completely automatic, it requires no special maintenance.

To perform functional testing, with the system is fully charged, check that the system operating pressures are those indicated on page 3.

Note – In case of malfunction, replace the valve.

Expansion valve block.

1. From evaporator outlet.
2. Thermostatic sensor.
3. To compressor suction inlet.
4. From receiver–drier.
5. Spring.
6. Calibrated orifice and ball.
7. To evaporator inlet.



Condenser

In the condenser the refrigerant is transformed from a vapour to a liquid state.

As this occurs by transfer of the heat from the refrigerant to the ambient air, the condenser functions in a similar way to the engine radiator.

The condenser consists of a series of tubes through which the refrigerant circulates and a finned block which is pressed onto the tubes to cover them completely in thin aluminium fins to help dissipate heat to the ambient air.

The condenser is installed in front of the engine cooling radiator so as to benefit from the air flow caused by forward motion of the tractor.

Receiver–drier

The receiver–drier, installed between the condenser and the expansion valve, performs two basic functions, acting as a filter to remove dirt and moisture from the refrigerant and as a temporary storage container during variable charge stages.

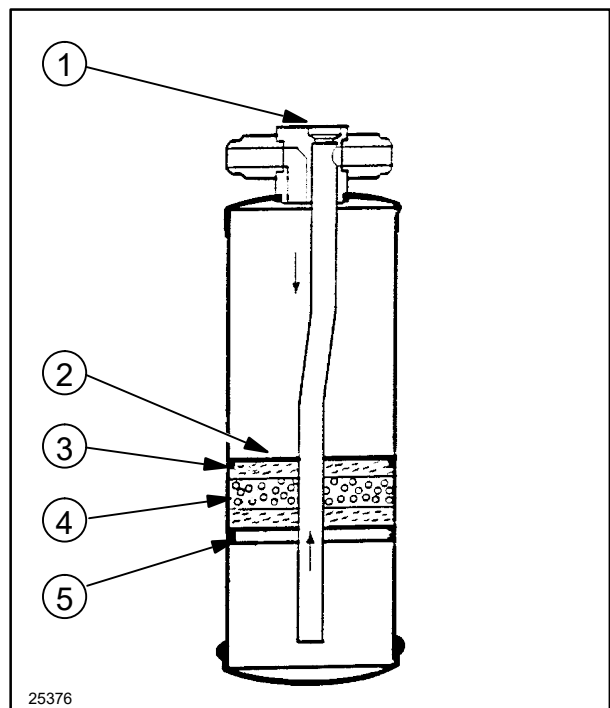
Water in the system can cause corrosion and damage to system components.

For this reason the filter contains substances to absorb humidity.

Solid contaminants, such as sand, metal particles resulting from wear of compressor components, oxides, particles from the pipes, etc., can cause damage to the system and therefore must be removed by suitable filters.

Receiver–drier

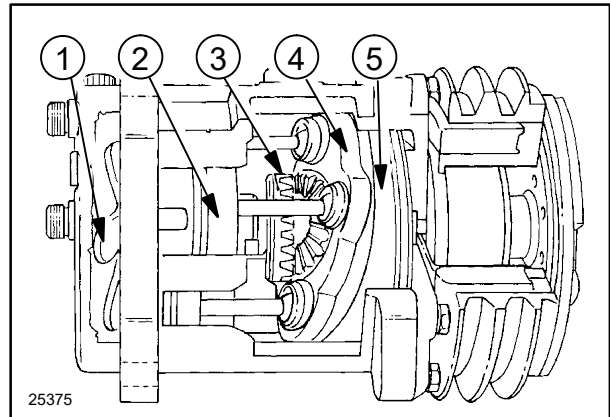
1. Sight glass.
2. Upper screen.
3. Disc.
4. Drying agent.
5. Lower screen.



MAIN COMPONENTS OF THE AIR CONDITIONING SYSTEM

Axial flow reciprocating piston compressor SANDEN SD 7H15

1. Combined inlet and discharge valve.
2. Piston with seal ring.
3. Drive gear.
4. Swash-plate.
5. Cam rotor.



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Compressor

The compressor serves to pressurise the refrigerant and force it through the system.

SANDEN SD 7H15

Axial reciprocating piston type, driven from the engine crankshaft via a v-belt.

The operating principle of the compressor is as follows:

The swashplate (4), on which pivot the ball ends of the connecting rods of the pistons (2), rests on the cam rotor (5).

As the cam rotor rotates it exerts a continuous thrust on the swashplate which cannot rotate as it is held by the fixed gear (3).

The angle of the swashplate relative to the axis of rotation causes the pistons to reciprocate in their bores.

A reed valve (1) in the cylinder head with seven lobes (one for each piston) controls the inlet and discharge stages of the cylinders.

The automatic opening and closing of these valves is obtained by preloading of the reeds.

The rotating parts of the compressor are lubricated by special oil, inserted during assembly, some of which circulates through the system mixed with the refrigerant.

USE OF THE AIR CONDITIONING SYSTEM

The air conditioning system provides cool, dehumidified air or warm dehumidified air.

To operate the system proceed as follows.

Warning – The air conditioning system is not operational when the engine is not running as the compressor is driven by the engine.

SWITCHING ON THE AIR CONDITIONING

With the engine running, turn knob (2, fig. 9) to start the air conditioning.

Warning – Before switching on the conditioner, always switch on the fan.
When the fan control knob is in the "off" position, the air conditioning cannot function.

After a few minutes of operation, liquid visible in the sight glass (7, fig. 3) on top of the filter should be clear and free of bubbles. If not, consult the specialised personnel at your dealer.

ADJUSTMENT

To obtain correct cab air conditioning, when the system is in operation keep the recirculation vents open and keep the doors, hatch and rear window closed.

To lower the temperature and, at the same time, the humidity of the air inside the cab, turn knob (2, fig. 9) counter-clockwise until the desired temperature is obtained.

Warning – Before starting the engine, check that the air conditioning knob (2 fig. 9) is in the "off" position.

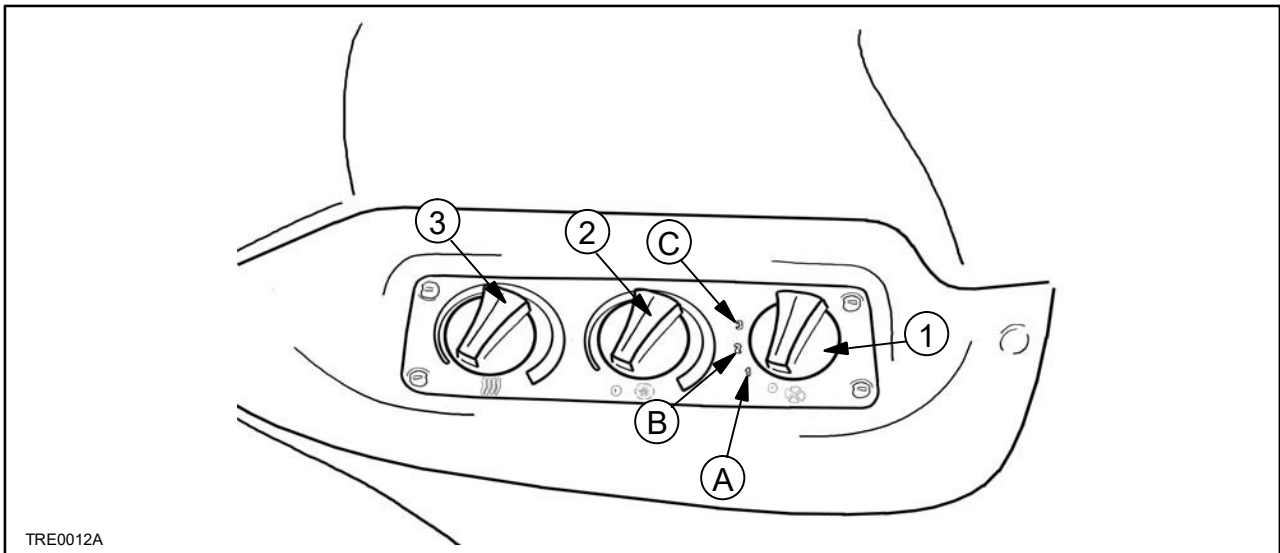
Note –When working in very dusty conditions, to increase the pressure inside the cab to prevent dust entering, it is advisable to close the recirculation vents.

If you wish to use the dehumidifying function without lowering the air temperature, turn knob (2, fig. 9) clockwise to obtain the desired temperature.

After prolonged operation in hot sunshine, to bring the air inside the cab back to the optimum temperature, without the tractor moving switch on the air conditioner and open the rear window or hatch to discharge the hot air.

SWITCHING OFF THE AIR CONDITIONING SYSTEM

Before stopping the engine, always switch off the air conditioner by turning knob (2, fig. 9), then turn the fan control knob (1, fig. 9) to the "off" position.



9

CAB AIR CONDITIONING CONTROLS

SWITCHING ON THE AIR CONDITIONING AND TEMPERATURE CONTROL

Air conditioning and temperature control button.

Operational when ignition switch is in the starting position.

With fan control knob (1, fig 9) in positions A–B or C, turn knob (2, fig 9) to switch on the air conditioning.

Heating control knob (fig 4)

Turn the knob (1) fully clockwise for maximum heating.

Turn knob (1) fully counter-clockwise to shut off the flow of water to the heater and thus switch the heating off.

3-speed fan control knob

Operational when ignition switch is in starting position.

- A. Low speed .
- B. Medium speed.
- C. High speed.

Note – To pressurise the cab see the chapter **Ventilation** on page 11 of this section.

HEATING

The heating control knob (1, fig. 4) allows the operator to regulate the temperature of the air by increasing or decreasing the circulation of coolant from the engine.

The fan control switch (1, fig 7) allows the operator to adjust the quantity of air blown into the cab through the vents (3, fig 5)

Temperature control knob (1)

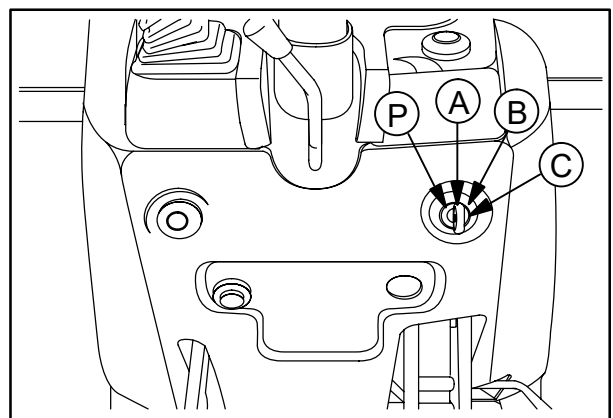
- Turned fully counter-clockwise = minimum temperature (circulation of hot water shut off).
- Turned fully clockwise = maximum temperature (circulation of hot water fully open).

Note – The total capacity of the cooling system (*including the cab heating system) is 14 litres in the JX60 model or 16 litres in JX70, JX80, JX90 and JX95 models.

IGNITION SWITCH

The ignition switch (1) can assume four different positions:

- A.** No circuits powered (key can be removed). Engine stop: automatic operation of fuel injection shut-off device.
- B.** Predisposition for engine starting. Turn signals and instruments operational. Various devices powered.
- C.** Start engine: key returns automatically to position (B) when released.
- P.** Parking lights on, control panel illuminated, auxiliary lights switch powered (key can be removed).



CAB HEATING AND VENTILATION CONTROLS**VENTILATION**

Turn on cab ventilation by operating switch (2) fig. 4 and direct the air flow as required by positioning the front vents (3, fig. 5).

The operator may select outside air or inside air by adjusting the rear air recirculation vents (1, fig. 6) which can assume two positions.

- vents closed: air is drawn from outside the cab through the lateral filters.
- vents open: the greater part of the air is drawn from inside the air through the vents.

Fresh air drawn into the cab from outside is always filtered.

With the fan in operation, and the doors, windows and recirculation vents closed, the pressure inside the cab is greater than the external pressure and thus air can only enter the cab through the lateral filters after it has been suitably filtered.

Note – To increase the pressure inside the cab, select outside air only (air recirculation vents 1, fig. 6 closed).

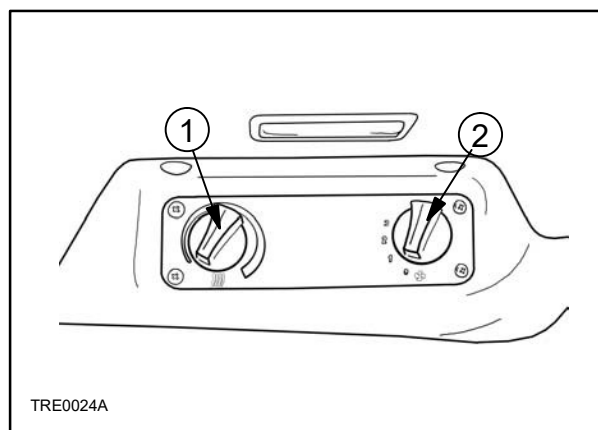
Fan

The fan control switch (1, fig. 7) is powered when the ignition switch (fig. 8) is in position **B**.

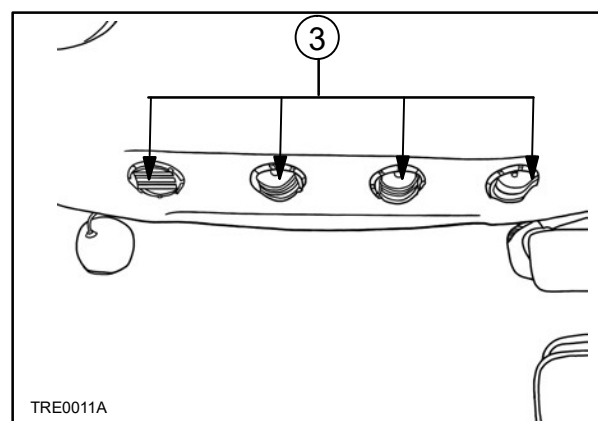
- A.** Low speed.
- B.** Medium speed.
- C.** High speed.

Air filter**DANGER**

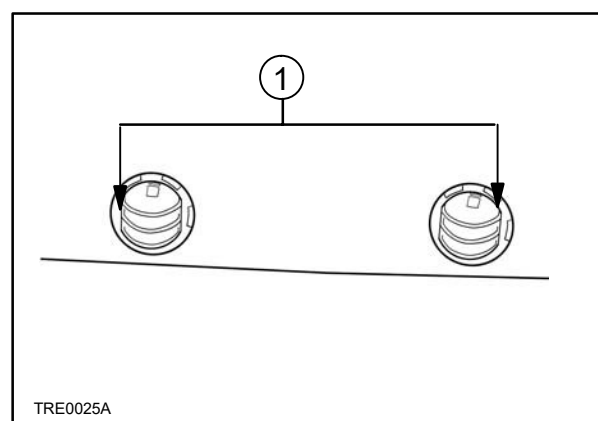
Remember that the filters of the cab provide no protection against antiparasitic chemicals in general. Therefore complete protection against these products can only be achieved by the adoption of additional specific safety measures for the individual product. This applies to all types of filter, for which the prescriptions for use and maintenance must be followed scrupulously. Even the use of active carbon filters does not exempt the operator from adopting the personal safety precautions recommended for the product in question.



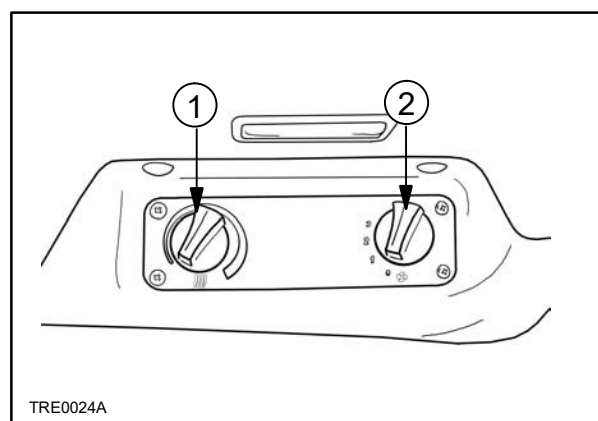
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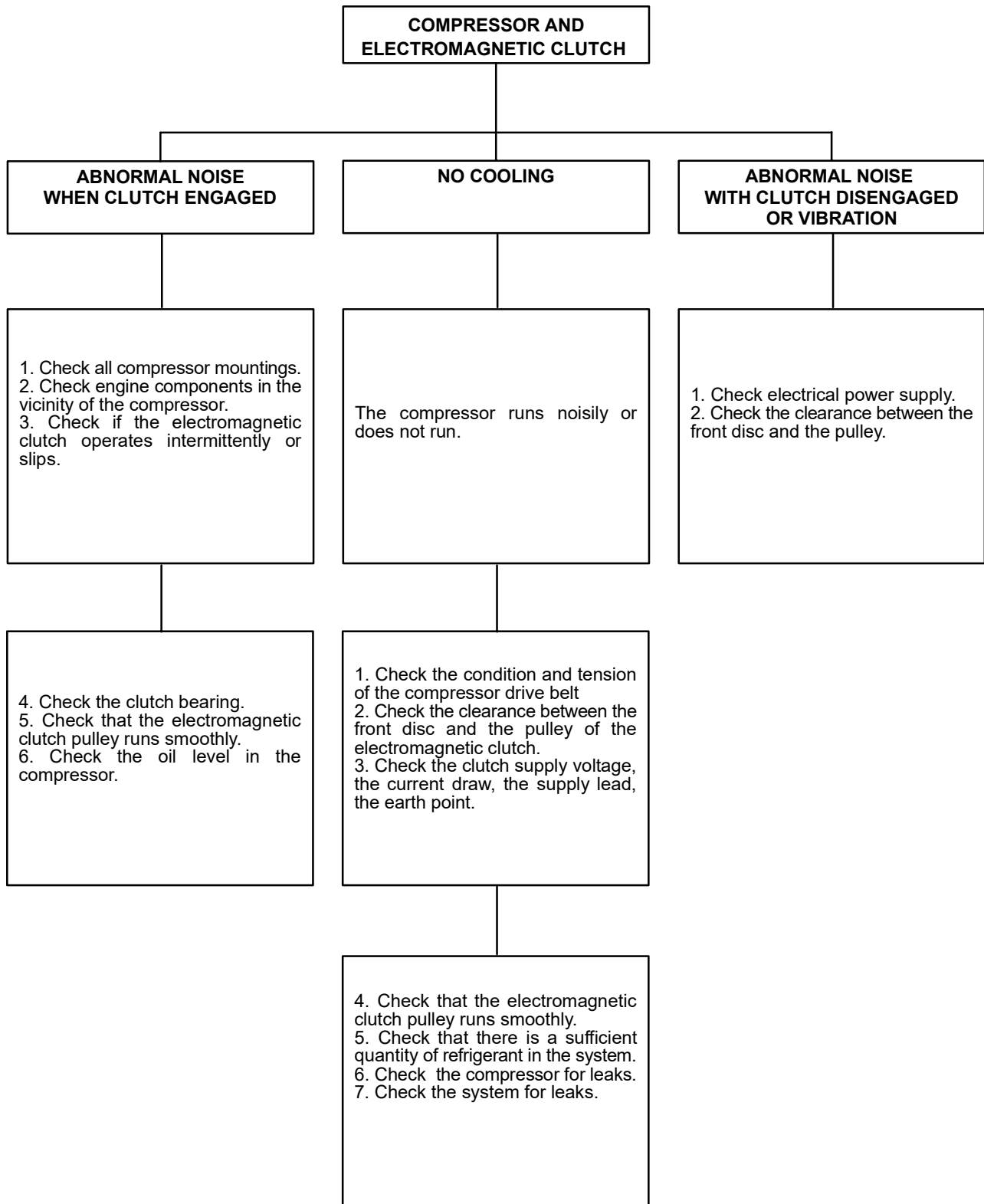


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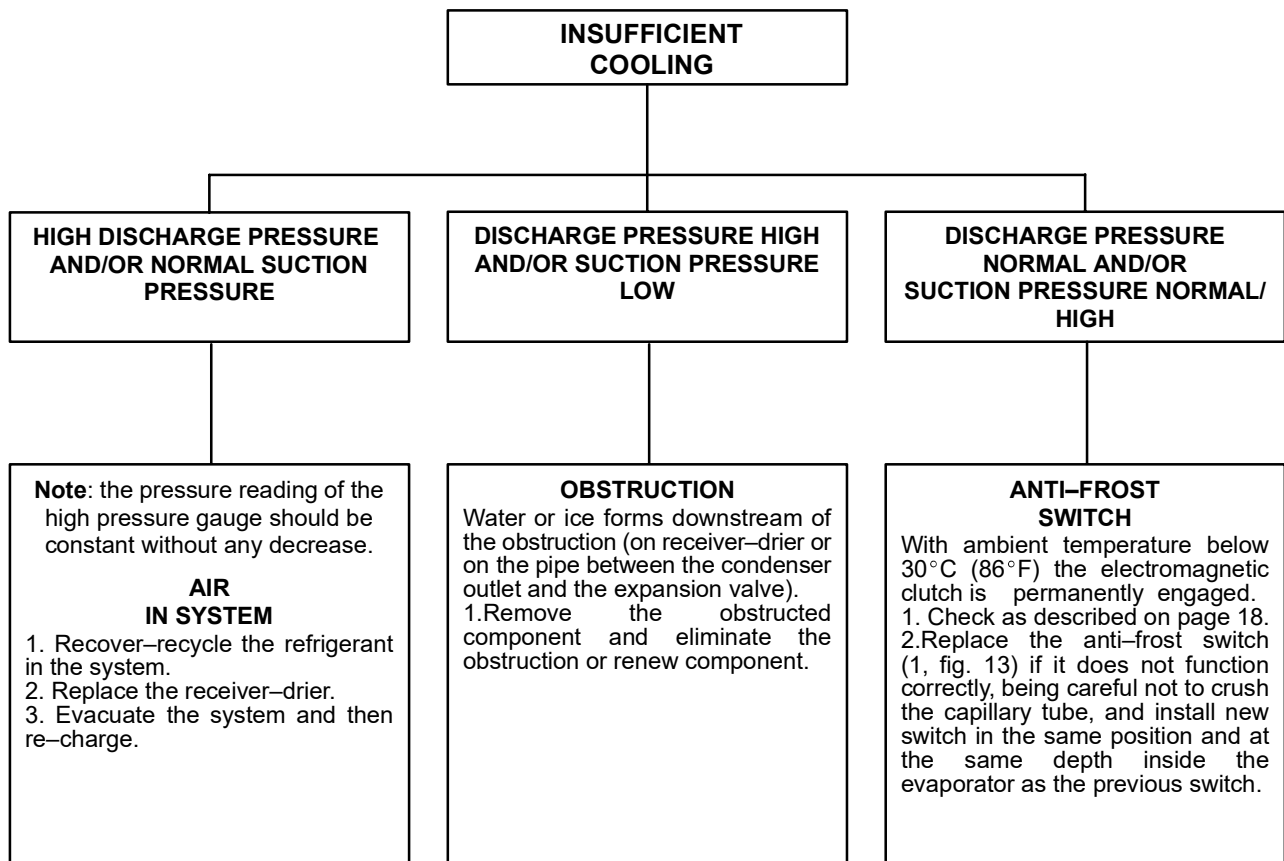


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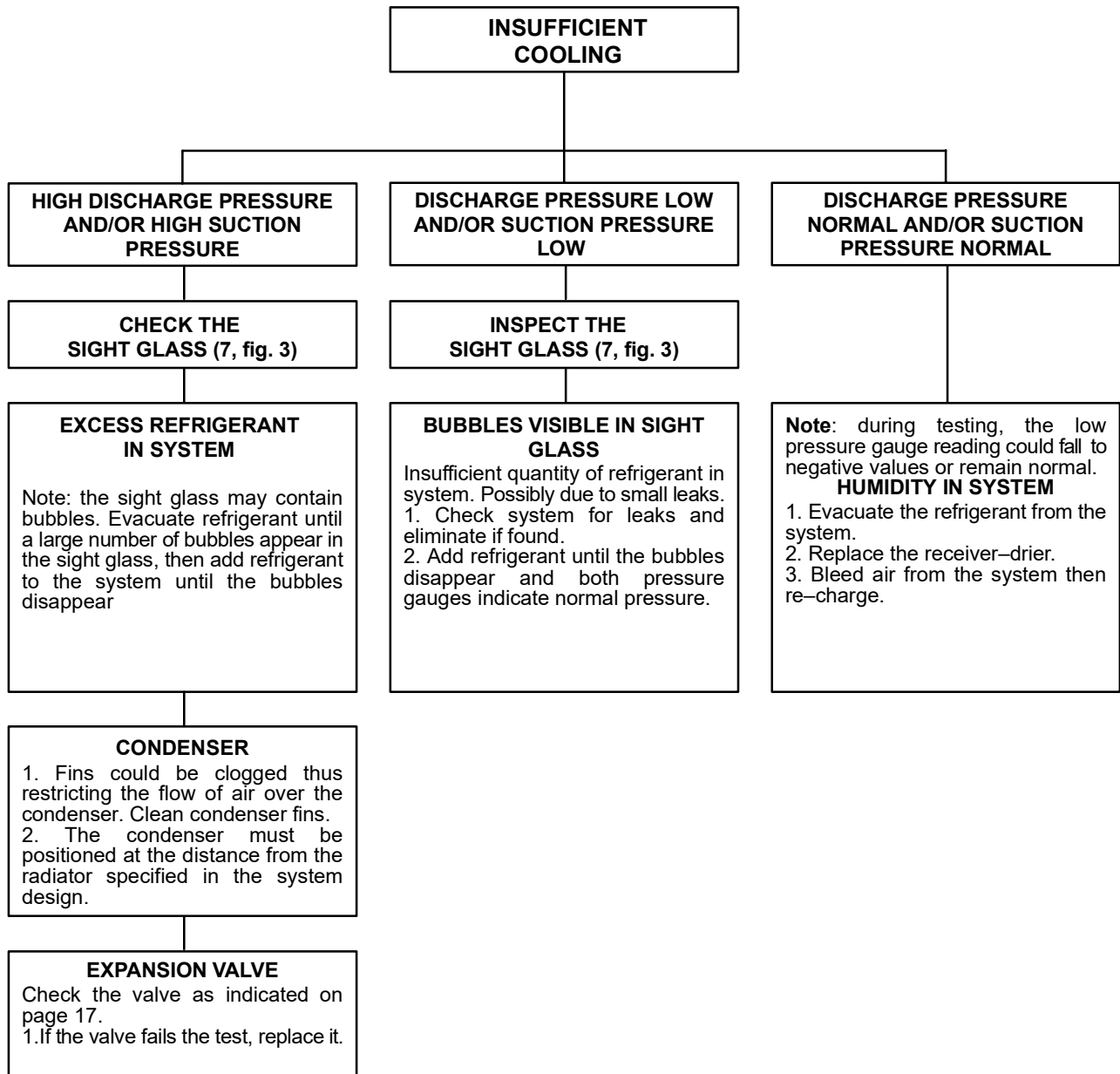
AIR CONDITIONING SYSTEM FAULT DIAGNOSIS (cont.)

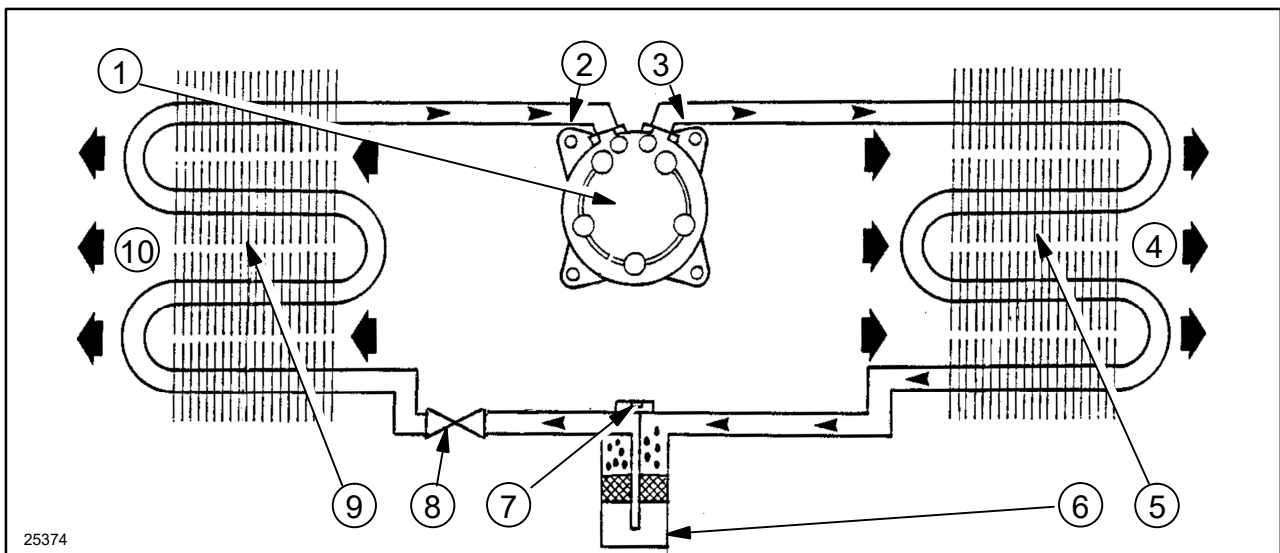
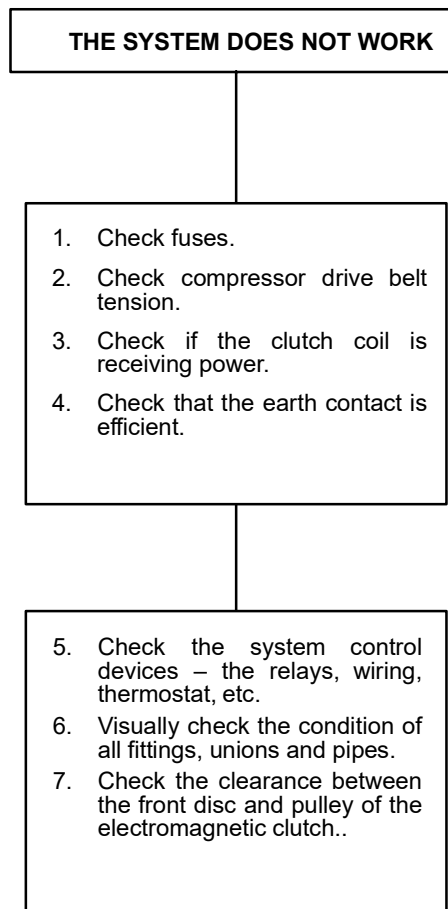


AIR CONDITIONING SYSTEM FAULT DIAGNOSIS (cont.)



AIR CONDITIONING SYSTEM FAULT DIAGNOSIS (cont.)



AIR CONDITIONING SYSTEM FAULT DIAGNOSIS

3

Schematic of air conditioning system.

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Compressor. 2. Compressor inlet pipe (low pressure). 3. Compressor outlet pipe (high pressure). 4. Hot air. 5. Condenser. | <ol style="list-style-type: none"> 6. Receiver–drier. 7. Sight glass. 8. Expansion valve with thermostatic sensor. 9. Evaporator. 10. Cool, dehumidified air. |
|--|--|

There are five main components of the air conditioning system:

1. **compressor;**
2. **condenser;**
3. **receiver–drier;**
4. **expansion valve;**
5. **evaporator.**

To understand the operating cycle of the system, follow the flow of the refrigerant starting from the compressor (1).

The compressor draws in refrigerant in vapour form at a pressure of $0.5 \div 3$ bar ($7.25 \div 43.51$ psi) and it compresses it to a pressure of $16 \div 24$ bar ($232.06 \div 348.09$ psi).

The refrigerant, heated by compression to hot vapour with a temperature of $60 \div 120$ °C ($140 \div 248$ °F), enters the condenser coil (2) located forward of the engine radiator.

The air flow passing over the condenser fins and tubes produced by the forward movement of the tractor cools the refrigerant.

This action cools the refrigerant to the point of condensation between $40 \div 60$ °C ($104 \div 140$ °F)

(depending on the ambient temperature) which thus changes its state from a vapour to a liquid.

The refrigerant, in liquid state at high pressure, is purified by passing through the receiver–drier (3) from where it flows to the expansion valve (4), which restricts the flow of refrigerant and thus reduces its pressure.

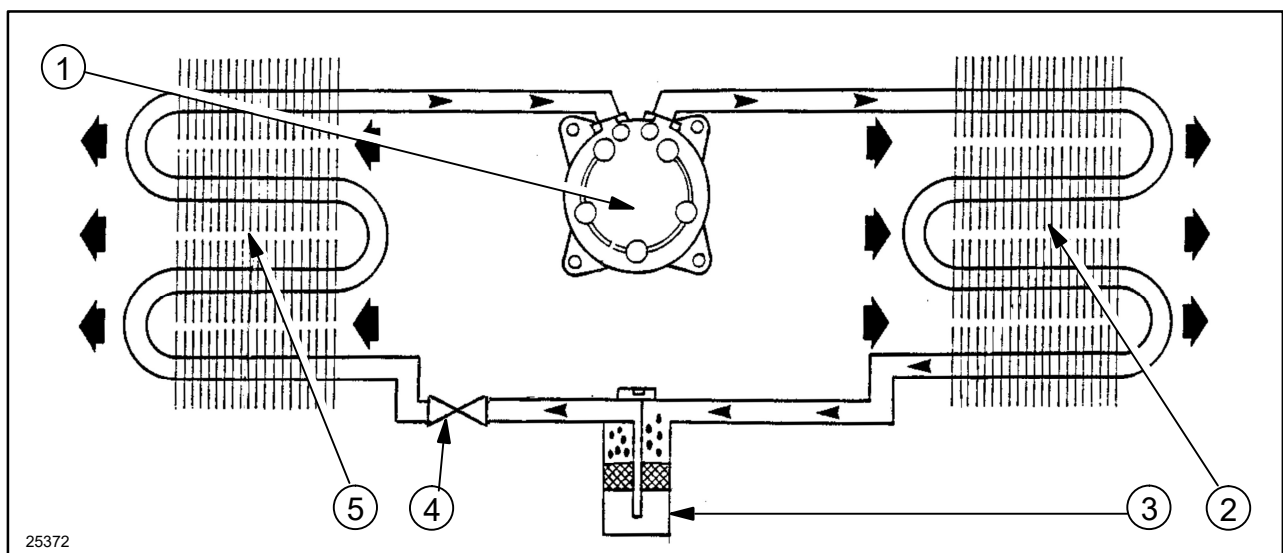
As it passes through the expansion valve (4), part of the refrigerant is transformed into vapour and the low temperature mixture of vapour and liquid thus formed enters the evaporator (5).

Here the electric fan causes a continuous circulation of the cab air over the fins of the evaporator (5), helping the refrigerant to absorb heat from the air and thus change completely from a liquid to vapour.

The evaporation process removes heat from the air passing over the evaporator (5) and thus reduces the temperature inside the cab.

The flow of air over the cold surface of the evaporator (5) also condenses some of the moisture in the air and therefore reduces the humidity in the cab.

On leaving the evaporator (5) at $0 \div 15$ °C ($32 \div 59$ °F), the low pressure mixture is aspirated by the compressor (1) to repeat the cycle.



2

Simplified system diagram

- | | |
|--------------------|--|
| 1. Compressor. | 4. Expansion valve with thermostatic sensor. |
| 2. Condenser. | 5. Evaporator. |
| 3. Receiver–drier. | |

OPERATING PRINCIPLES

The function of the air conditioning system is to create and maintain optimum working conditions inside the tractor cab.

These conditions regard four main factors:

- temperature;
- humidity;
- speed;
- purity of the air in the cab.

Obviously "ideal" conditions will vary from person to person, and so it is not possible to specify optimum values for the above factors; however, we can specify a range of values within which the majority of people will feel most comfortable.

As regards temperature and humidity, it is possible to define a zone, known as the "comfort zone", within which the temperature–humidity combination corresponds to pleasant environmental conditions.

From the diagram it can be seen that humidity should be within the range of 30% to 70% (below 30% there is excessive dehydration of the mucous tissues of the nose and throat, while above 70% the subject has an uncomfortable sensation of dampness in many areas of the body) whereas temperature can vary between 18 and 28°C (64.4 and 82.4°F).

The air flow speed must not be so high as to cause discomfort; speeds of 0.07 – 0.25 m/s (0.2296 – 0.8200 ft/s) are normally acceptable

As regards the purity of the air, there are no precise limits, but it is important to remember that the human metabolism alters the composition of the surrounding air, increasing the humidity and the quantity of carbon dioxide, while decreasing the percentage of oxygen, etc..

By drawing in small quantities of fresh air from outside the cab, it is possible to eliminate impurities in the air, particularly important in the case of agricultural tractors, where dust from earth, hay etc. can cause extreme discomfort, by installing dry filters on the external air inlets.

Air conditioning systems in tractors and agricultural vehicles in general thus serves to neutralise the heat and humidity generated in the cab by controlling the temperature and humidity of the air in –or drawn into– the cab to create comfortable working conditions for the operator.

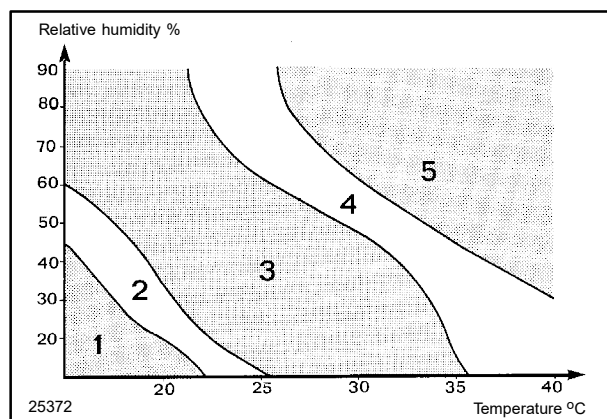
The operating principle of an air conditioner is similar to that of a domestic refrigerator: to cool an environment, heat must be removed by means of a physical process (evaporation of a liquid) which absorbs heat from the surrounding air.

The liquid used in this process, known as the refrigerant, is product with a high refrigeration coefficient, low toxicity, which mixes well with lubricating oil.

The various components of the system are connected by suitable pipes which ensure that the pressure of the system is maintained.

Simplified psychrometric diagram

1. Sensation of unbearable cold.
2. Sensation of cold.
3. Comfort zone.
4. Sensation of heat.
5. Sensation of unbearable heat.



TOOLS REQUIRED FOR SERVICING THE AIR CONDITIONING SYSTEM

Warning – The operations described in this section cannot be carried out without the ESSENTIAL tools marked (X) in the following list.

To work in safety and to obtain the best possible results whilst saving both time and energy, we recommend that the other specific tools in the list are also used.

List of specific tools for the various operations in this section	
X 294030	Evacuation and charging station
X 294048	Recovery and recycling station
294044	Set of flexible hoses for 294030 and 294048
294043	Tool kit for 294030
294042	Receiver–drier for 294048
294036	Gas leak detector with audible leak indication
293826	Athermal tape for expansion valve
X 293831	Combs for cleaning and straightening the fins on the condenser and evaporator
293825	Oil for pumps of stations 294030 and 294048

CAB AIR CONDITIONING SYSTEM CHARACTERISTICS

SANDEN SD 7H15 Compressor	
Number of cylinders	7
Total displacement cm ³ (in. ³)	155 (9.46)
Maximum speed rpm	6000
Weight kg (lb)	6,5 (14.33)
Quantity of lubricating oil cm ³ (in. ³)	185 (11.29)
Type of lubricating oil (code)	PAG SP 20

Air conditioning system	Gas HFC134a
Quantity of HFC–134a refrigerant gr (lb)	1600 (3.5274)
System delivery side pressure bar (psi)	16–24 (232.06 – 348.09)
System suction side pressure bar (psi)	0,5–3 (7.25–43.51)
Pressure switch setting (high pressure) bar (psi)	25 (362.59)
Pressure switch setting (high pressure) bar (psi)	2 (29.01)
Temperature of refrigerant fluid at outlet of compressor °C(°F)	60–120 (140–248)
Temperature of refrigerant fluid at outlet of condenser °C(°F)	40–60 (104–140)
Temperature of refrigerant fluid at outlet of evaporator °C(°F)	0–15 (32–59)
Maximum capacity of electric centrifugal fan I, II, III speed . m ³ /min (in. ³ /min)	3,5–8,5 (21.36–51.87)

Remember that altitude affects pressure, as shown in the table on the right.
To obtain the effective pressure in the system, subtract the corresponding correction value from the pressure gauge reading.

Altitude (m) s.l.m.	Absolute atmospheric pressure (psi)	Correction (psi)
0	14.63	0
300	14.13	– 0.50
600	13.64	– 1.00
900	13.14	– 1.49
1200	12.64	– 2.00
1500	12.14	– 2.50
1800	11.64	– 3.00
2100	11.25	– 3.39
2400	10.85	– 3.82

CAB AIR CONDITIONING SYSTEM



SAFETY



Refrigerant must be handled with extreme care to avoid injury; always wear safety gloves and goggles.

Liquid refrigerant can cause freezing of the skin and serious damage to the eyes, even blindness in some cases.

Keep refrigerant containers away from heat sources, as the increase of internal pressure due to heating could cause the container to explode.

In contact with a naked flame or hot metal surfaces the refrigerant may give off a toxic gas. If inhaled this gas can cause serious harm.

To avoid the possibility of accidents take the simple precautions described below.

The operation of emptying the system must be carried out in a well-ventilated area, well away from any naked flames.

During the charging and emptying operations, take the necessary precautions to protect the face and above all the eyes from accidental contact with refrigerant.

In case of accident, proceed as follows:

- if has entered the eyes, wash immediately with a few drops of mineral oil, then wash them thoroughly with a solution of boric acid and water (one spoonful of acid in 1/4 cup of water) and seek medical assistance immediately.

- freezing of the skin caused by contact with liquid refrigerant can be treated by gradually warming the injured area with cold water followed by application of a greasy cream. Seek medical assistance.

- the air conditioning system contains a mixture of refrigerant and oil under high pressure; under no circumstances loosen pipe fittings/couplings or work on pipes without having first evacuated the system.

- for the same reason, never unscrew the compressor oil level plug when the system is charged.

- do not heat the refrigerant container. Above 50°C (122°F) the pressure increases very rapidly.

- keep the air conditioning system away from heat sources to prevent possible explosion due to the increase of pressure in the system.

When transferring refrigerant from one container to another, only use homologated liquid refrigerant containers equipped with safety valves.

Never fill liquid refrigerant containers over 80% of their maximum capacity.

Do not modify the settings of safety valves and the control devices.

Never connect the recovery/recycling and evacuation/charging stations to electrical power outlets with voltages other than those specified; do not leave the stations powered on unless they are to be used immediately.

SECTION 50 –AUXILIARY UNITS**Chapter 1 – Auxiliary units****CONTENTS**

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