



**REPAIR MANUAL
MANUEL DE RÉPARATION
REPARATURANLEITUNG
MANUAL DE REPARACIÓN
MANUALE RIPARAZIONE**

This document has been printed from mydoc

MANITOU BF

Head office: 430, Rue de l'Aubinière
44150 Ancenis - FRANCE
Share capital: 39,548,949 euros
857 802 508 RCS Nantes
Tel: +33 (0)2 40 09 10 11
www.manitou.com

La présente brochure n'est fournie qu'à titre consultatif, toute reproduction, copie, représentation, captation, cession, distribution, ou autre, partiellement ou en totalité, sous quelque format que ce soit est interdite. Les schémas, les dessins, les vues, les commentaires les indications, l'organisation même du document qui sont rapportés dans la présente documentation, sont la propriété intellectuelle de MANITOU BF. Toute infraction à ce qui précède est susceptible d'entraîner des condamnations civiles et pénales. Les logos ainsi que l'identité visuelle de l'entreprise sont la propriété de MANITOU BF et ne peuvent être utilisés sans autorisation expresse et formelle. Tous droits réservés.

This manual is for information purposes only. Any reproduction, copy, representation, recording, transfer, distribution, or other, in part or in whole, in any format is prohibited. The plans, designs, views, commentaries and instructions, even the document organization that are found in this document, are the intellectual property of MANITOU BF. Any violation of the aforementioned may lead to civil and criminal prosecution. The logos as well as the visual identity of the company are the property of MANITOU BF and may not be used without express and formal authorization. All rights are reserved.

Die vorliegende Broschüre dient allein zur Beratung. Nachdruck, Fotokopieren, Vervielfältigung, Darstellung, Erfassung, Überlassung, Verbreitung oder Sonstiges (ganz oder teilweise) in jeglicher Form sind verboten. Die Entwürfe, Zeichnungen, Bilder, Darstellungen, Ansichten, Kommentare, Hinweise und der Aufbau der Druckschrift selbst, die in der vorliegenden Dokumentation enthalten sind, sind geistiges Eigentum von MANITOU BF. Alle Verstöße gegen das Vorstehende können zu straf- oder zivilrechtlicher Verfolgung führen. Die Logos und Markenzeichen sowie Unternehmens- und Produktbezeichnungen sind Eigentum von MANITOU BF und dürfen ohne ausdrückliche Genehmigung nicht verwendet werden. Alle Rechte vorbehalten.

Este folleto se ofrece a título meramente informativo y queda prohibida su reproducción, copia, representación, captación, cesión, distribución y demás, parcial o total, en el formato que sea. Los esquemas, dibujos, vistas, comentarios, indicaciones, la organización misma del documento aportado en esta documentación son propiedad intelectual de MANITOU BF. Cualquier infracción a lo antedicho puede acarrear condenas civiles y penales. Los logotipos y la identidad visual de la empresa son propiedad de MANITOU BF y no pueden utilizarse sin su autorización expresa y formal. Reservados todos los derechos.

Il presente manuale è fornito esclusivamente a titolo di consultazione; è vietata qualsiasi riproduzione, copia, rappresentazione, acquisizione, cessione, distribuzione o altro, parziale o totale, e in qualsivoglia formato. Gli schemi, i disegni, le viste, i commenti, le indicazioni e l'organizzazione stessa del documento, riportati nella presente documentazione, sono proprietà intellettuale di MANITOU BF. Qualsiasi violazione a quanto riportato sopra è passibile di condanna civile e penale. I loghi e l'identità visiva dell'azienda sono di proprietà di MANITOU BF e non possono essere utilizzati senza previa autorizzazione espressa e formale. Tutti i diritti sono riservati.

GENERAL INSTRUCTIONS AND SAFETY NOTICE

Group 00 (General characteristics and safety)	1-1
---	-----

ENGINE

Groupe 10 (Engine)	2-1
--------------------------	-----

OPTIONS - ACCESSORIES

Groupe 110 (Options - Attachments)	3-1
--	-----

TRANSMISSION

Groupe 20 (Transmission)	4-1
--------------------------------	-----

BRAKE

Groupe 40 (Brake)	5-1
-------------------------	-----

TELESCOPIC BOOM

Groupe 50 (Boom)	6-1
------------------------	-----

HYDRAULIC

Groupe 70 (Hydraulic)	7-1
-----------------------------	-----

ELECTRICITY

Groupe 80 (Electricity)	8-1
-------------------------------	-----

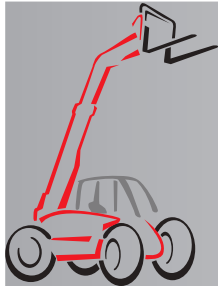
DRIVER CAB

Groupe 85 (Driver s cab)	9-1
--------------------------------	-----

GENERAL



- **GENERAL INSTRUCTIONS AND SAFETY NOTICE**
- **GENERAL CONTROL AND ADJUSTMENT**



GENERAL INSTRUCTIONS AND SAFETY NOTICE

pages

PREAMBLE	2
MAINTENANCE POSITION	3
RULES FOR MAINTENANCE	4

PREAMBLE

This chapter deals with the general instructions and safety notice during inspection and maintenance work.

Other instructions and warnings are indicated in each chapter concerned.

In order to reduce accident risks, make sure to:

- Follow the instructions in the truck operating and maintenance manual.
⇒ This manual should be found in all trucks.
- Please follow all safety instructions.
- Use the appropriate tools for any work to be performed.
- Use original Manitou spare parts.

Any non-compliance increases the risk of accidents occurring which may lead to causing grievous bodily harm and even death.

An efficient, dependable and profitable combination will be formed if the operator follows the safety manual correctly and the machine is serviced properly.

When you see this symbol:



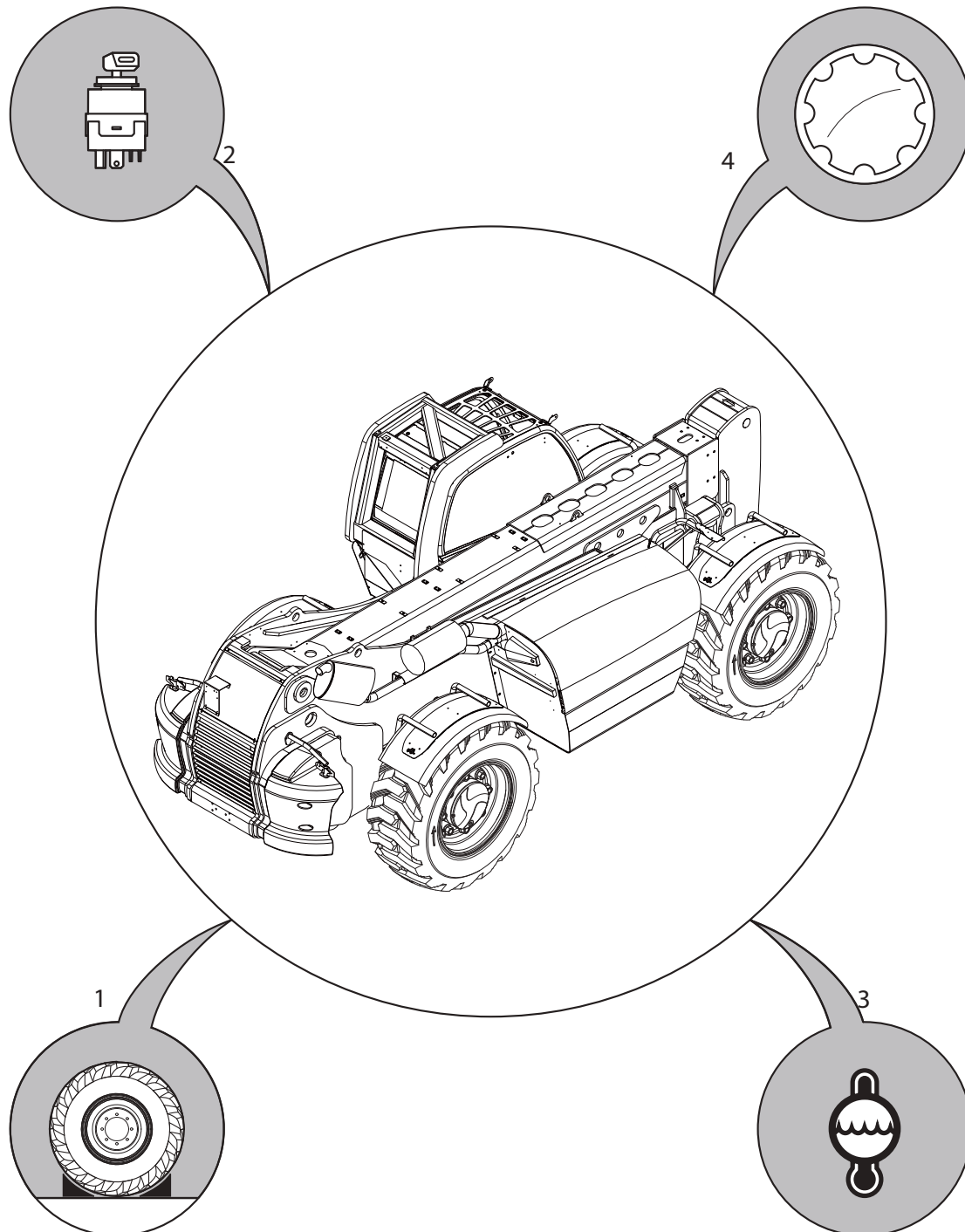
It means: Warning! Be careful! Your safety, somebody else's or the safety of the lift truck itself is at risk.

The manufacturer cannot predict all possible risky situations. Consequently, the safety instructions given in the safety manual are not exhaustive.

At any time, as an operator, you must envisage, within reason, the possible risk to yourself, to others or to the lift truck itself when you repair, service or drive it.

Manitou cannot be held responsible for the use of any lifting devices, tools or operating methods other than those specified.

MAINTENANCE POSITION



Before any intervention:

- 1 - Place the machine on a flat surface and chock the wheels.
- 2 - Turn off the engine and remove the ignition key.
- 3 - Let the machine cool down.
- 4 - Take all the pressure out of the circuits concerned.

RULES FOR MAINTENANCE

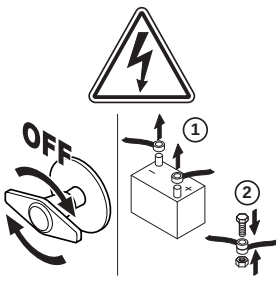


Do not carry out any work on the machine unless you have followed a suitable training course and have the knowledge required for it.

Make sure you have taken into consideration all the indicator plates on the machine and in the instruction manual.



Be careful not to burn yourself when touching hot liquids or parts when operations have to be done before the machine has had time to cool down.

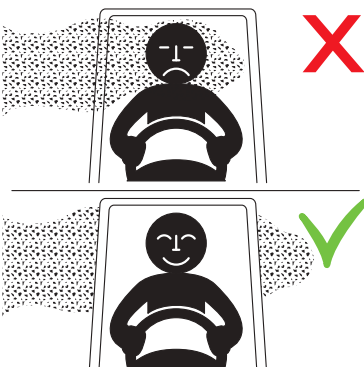


Before carrying out any operation on an electrically powered component, activate the battery cut-off.

If the telehandler does not have a battery isolating switch, disconnect the battery terminals then gather them.



Before carrying out any welding operations, think of disconnecting computers.



A machine operating in a contaminated environment should be specifically equipped. Moreover, local safety notices deal with maintenance and repair work on such machines.

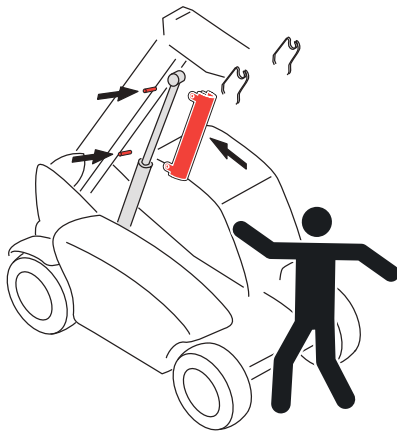


Never step on a part of the machine that has not been designed for it.



Never wear clothes, jewelry or objects that could get caught during work and cause accidents.

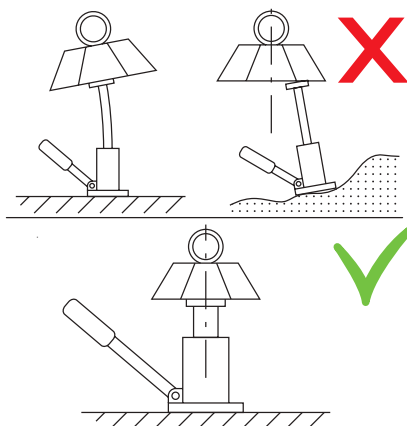
Always wear protection glasses, gloves, safety shoes as well as any other protection required for the work to be carried out.



When carrying out maintenance operations near a mobile object, make sure it is securitized.

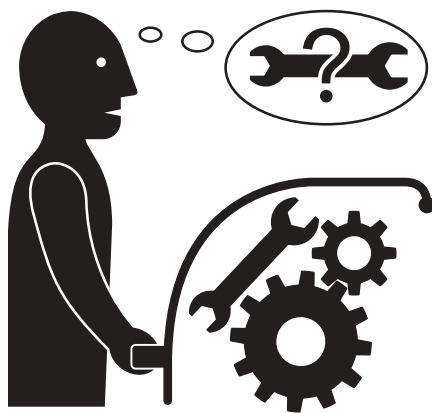


When changing, or draining oils or fuel, or any other operation with liquids, solids, gases that are harmful to the environment, make sure the necessary precautions are taken to avoid contaminating the environment.



When lifting or shoring a component of the machine, make sure the equipment used is suitable for at least the load for which it is subjected by the component and that it meets the national standards for lifting devices.

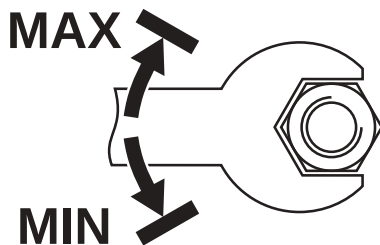
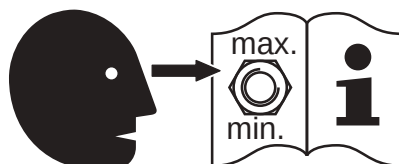
When using a jack, make sure it is used on a flat, uniform surface, is sturdy enough to support the load, that its lifting capacity is sufficient and that it is correctly placed and positioned under the machine.



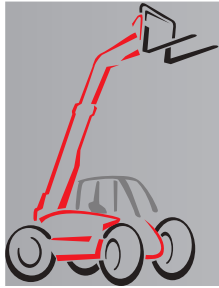
Make sure no object or tool which could cause an accident is left in the machine.



Never control any leaks using a hand.



Never adjust a component to over the maximum capacity indicated by the manufacturer.



GENERAL CONTROL AND ADJUSTMENT

pages

STANDARD TIGHTENING TORQUES	2
--	----------

STANDARD TIGHTENING TORQUES

Standard tightening torque to be used when not otherwise indicated in the removal and refitting operations:

- The following tightening torques are given for hexagon head screws without flanges and cylinder head hexagon socket screws.
- The torques are given for a friction coefficient $\mu = 0,20$ corresponding to dry-fitted zinc-plated fasteners and for torque tools having a $\pm 20\%$ class C tightening torque accuracy (equivalent to pneumatic screwdrivers).

NF E 25-030-1 Screw / Nut connection :

Tightening torque in N·m ($\pm 20\%$)					
$\emptyset \times$ "coarse" pitch	Grade 8.8	Grade 10.9	$\emptyset \times$ "fine" pitch	Grade 8.8	Grade 10.9
M3 x 0,5	1	1,5	-	-	-
M4 x 0,7	2,4	3,5	-	-	-
M5 x 0,8	4,8	7,1	-	-	-
M6 x 1	8,2	12,1	-	-	-
M8 x 1,25	20	30	M8 x 1	22	32
M10 x 1,5	40	59	M10 x 1,25	43	63
			M10 x 1	46	68
M12 x 1,75	69	102	M12 x 1,5	74	108
			M12 x 1,25	78	115
M14 x 2	111	163	M14 x 1,5	123	181
M16 x 2	175	256	M16 x 1,5	190	279
M18 x 2,5	240	352	M18 x 1,5	279	410
M20 x 2,5	341	501	M20 x 1,5	391	574
M22 x 2,5	470	691	M22 x 1,5	531	780
M24 x 3	588	864	M24 x 2	659	967
M27 x 3	874	1284	M27 x 2	965	1418
M30 x 3,5	1181	1735	M30 x 2	1351	1984
M33 x 3,5	1614	2371	M33 x 2	1821	2674
M36 x 4	2068	3037	-	-	-

 **For hexagon screws with flanges:**
Apply an increased torque of +10%.
(Standard NF E 25-030-1)



 **Where washers are used, the following coefficient is to be applied (FD E 25-502) :**

- **Smooth tapered washer (CL): +5%**
- **Spring (or Grower) washer without jaws (W) : +10%**
- **Conical, internal teeth (CDJ-JZC) : +15%**

ENGINE



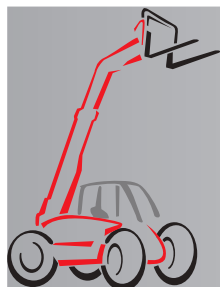
- **ENGINE COMPONENTS LOCATION**
- **ENGINE CONTROL AND ADJUSTMENT**
- **ENGINE REMOVAL**
- **ENGINE REFIT**

- **ENGINE CHARACTERISTICS AND SPECIFICATIONS**
- **ENGINE CONTROL AND ADJUSTMENT**



647370EN

**(ENGINE OM 904 LA
120-150-175-CV EURO 3)**



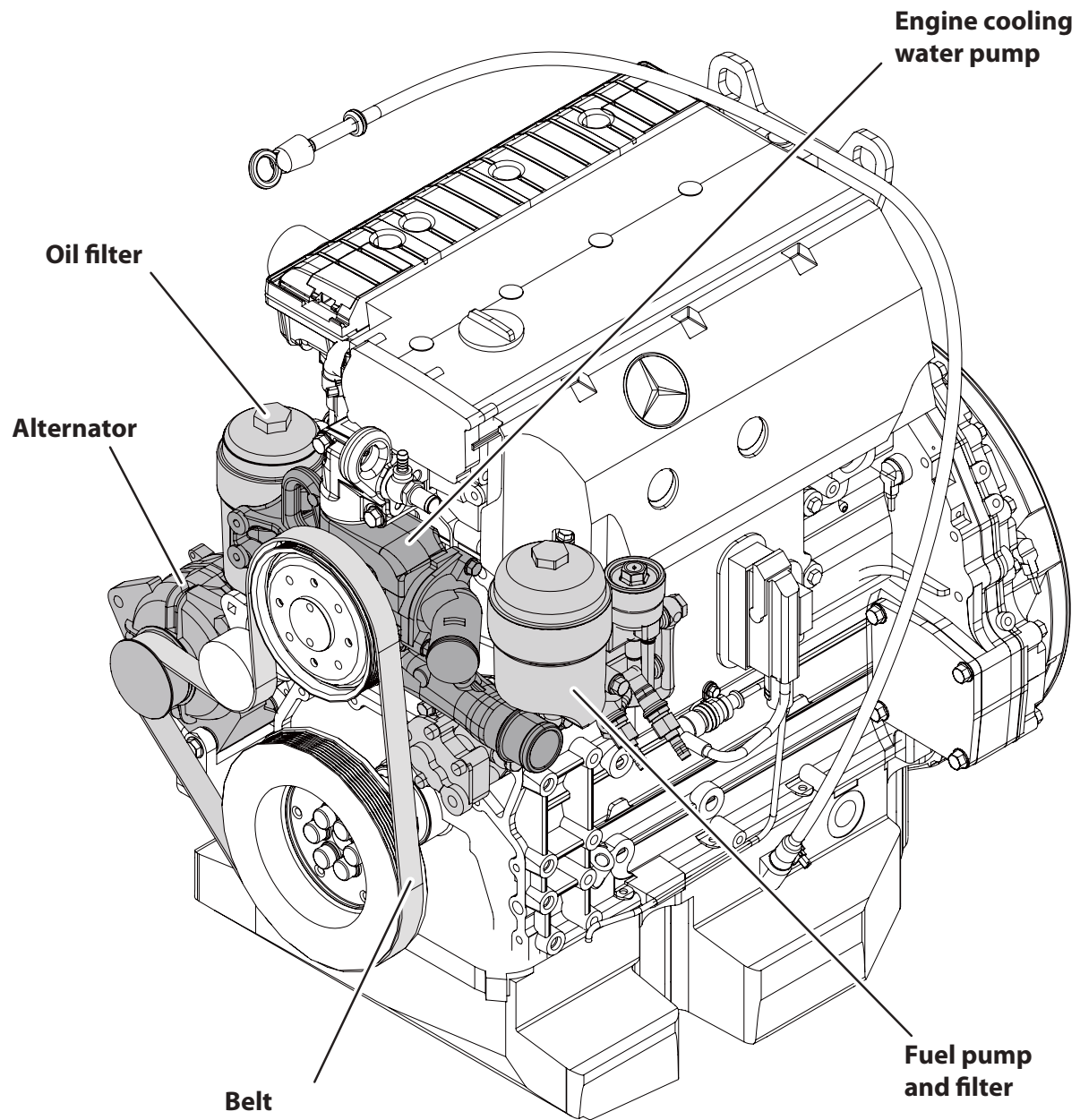
ENGINE COMPONENTS LOCATION

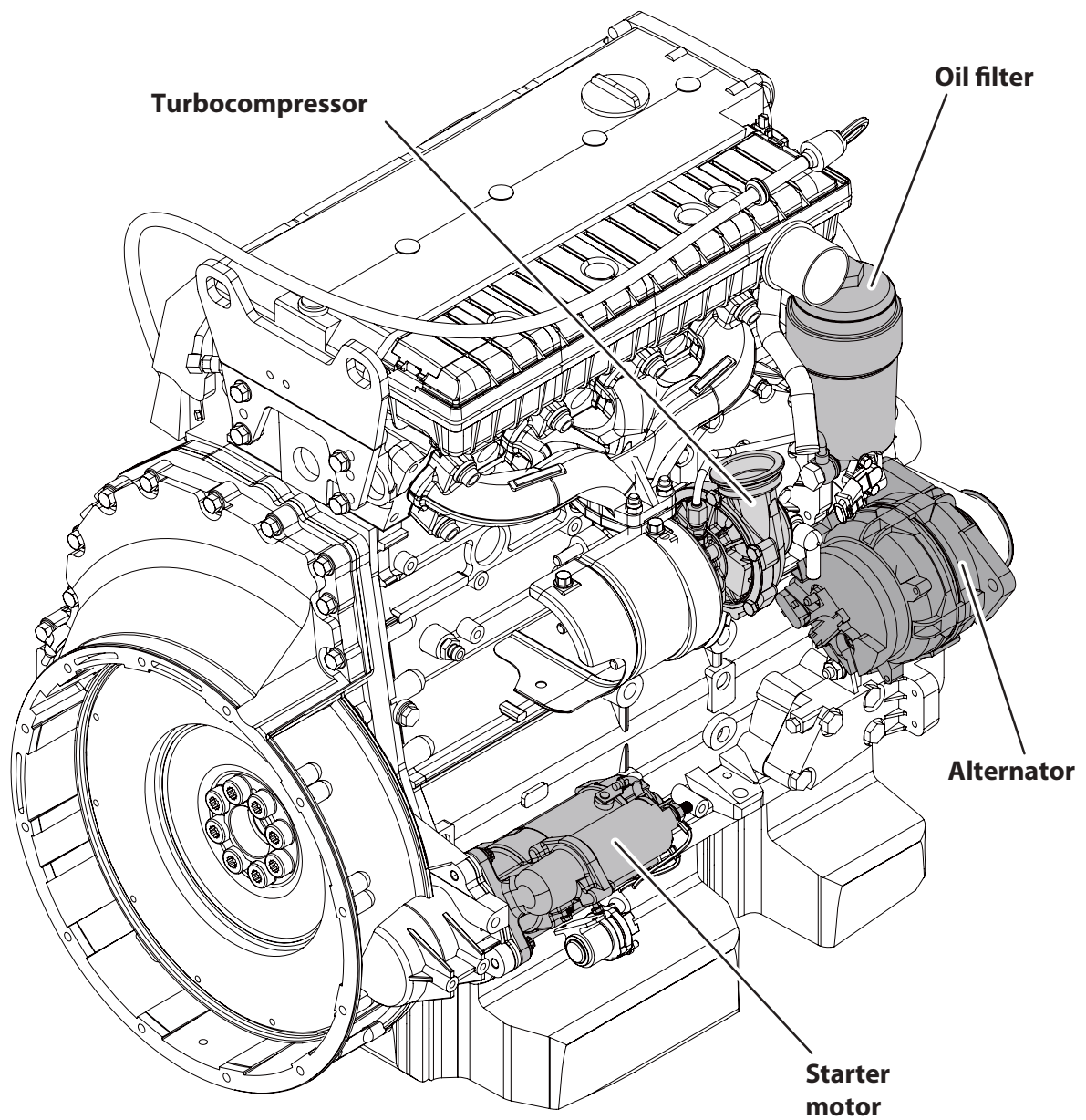
page

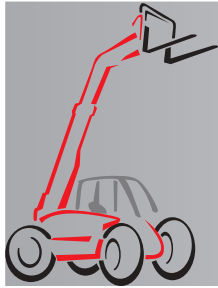
MERCEDES ENGINE.....	2
-----------------------------	----------

MERCEDES ENGINE

10







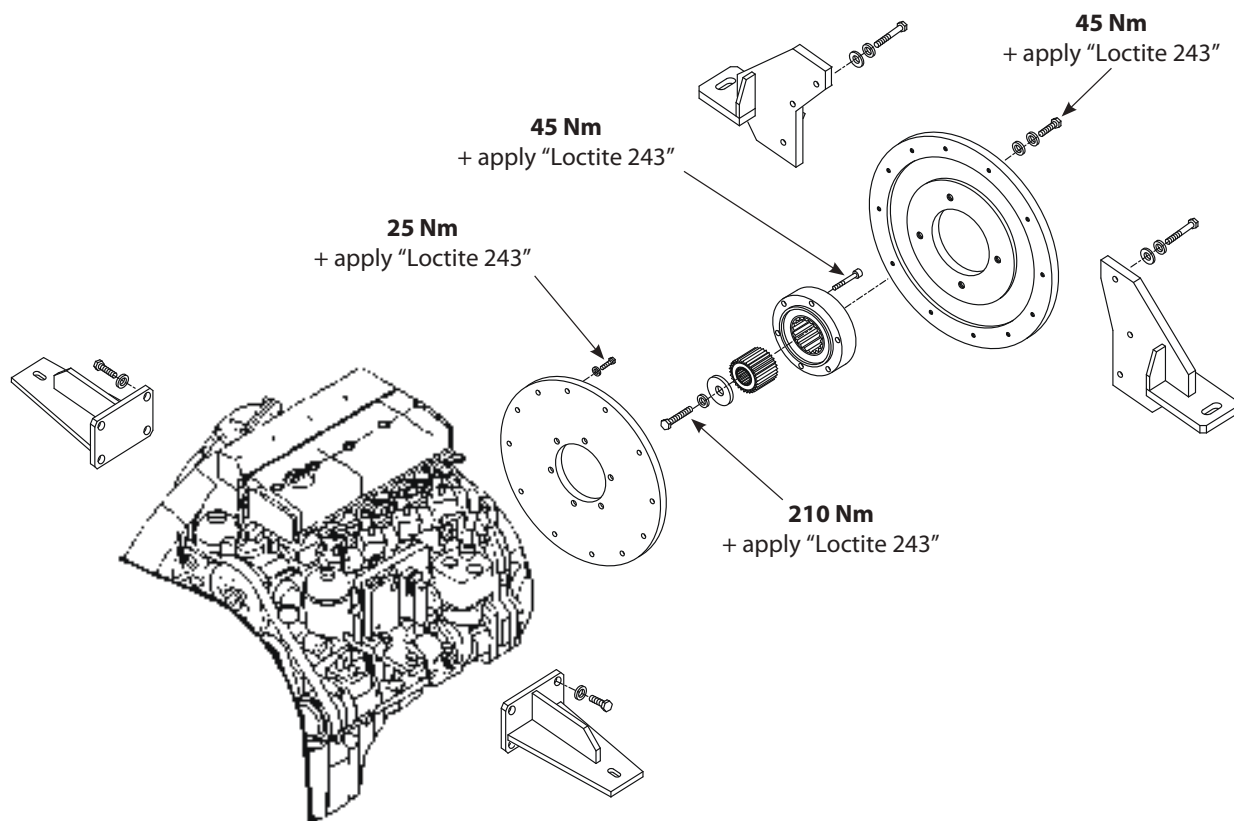
ENGINE CONTROL AND ADJUSTMENT

	page
ENGINE TIGHTENING TORQUE	2
– ASSEMBLING THE ENGINE	2
– FUEL CIRCUIT	2

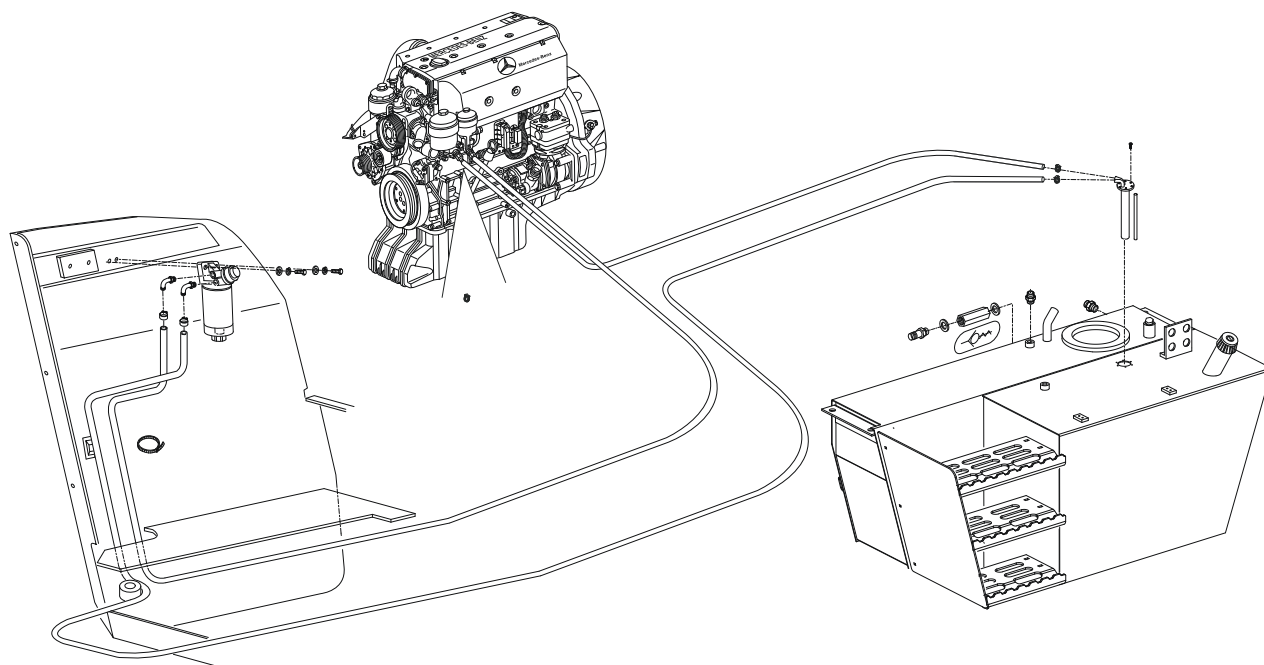
ENGINE TIGHTENING TORQUE

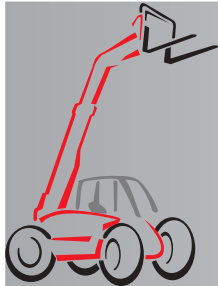
10

ASSEMBLING THE ENGINE



FUEL CIRCUIT



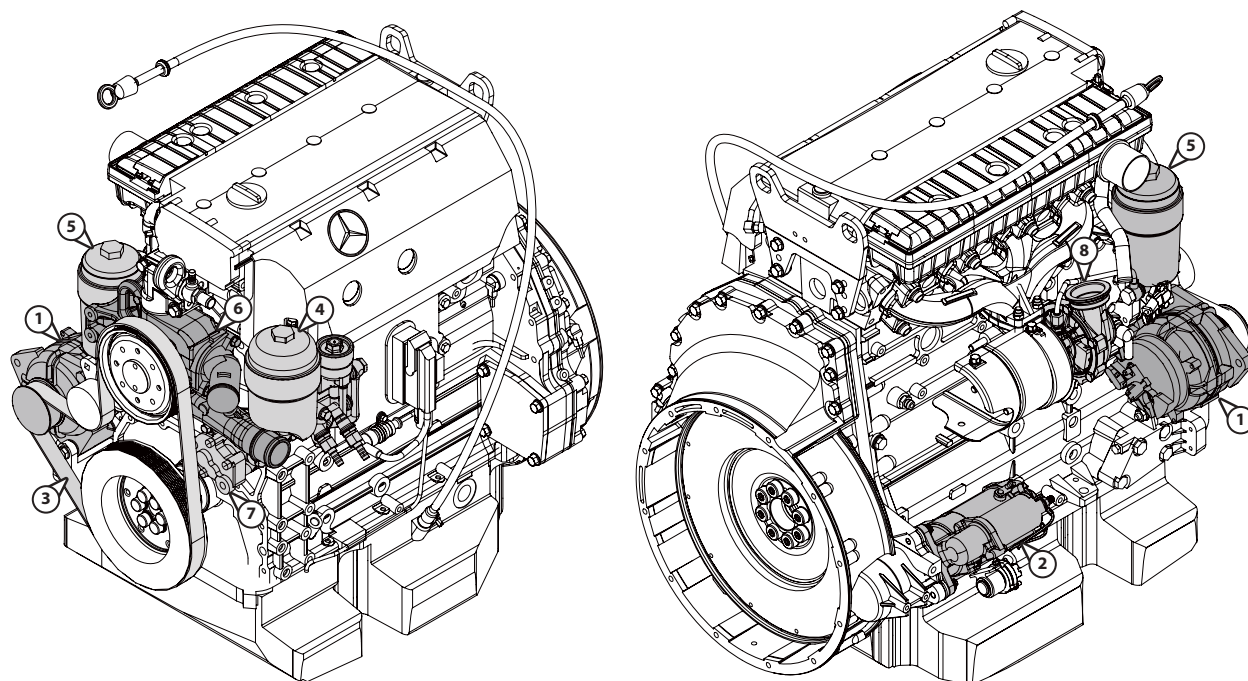


ENGINE REMOVAL

	page
REMOVING THE ENGINE COMPONENTS	2
PREPARATION AND SAFETY INSTRUCTIONS.....	2
– A - REMOVING THE ALTERNATOR BELT.....	3
– B - REMOVING THE ALTERNATOR	4
– C - REMOVING THE STARTER MOTOR.....	6
– D - REMOVING THE OIL FILTER	7
– E - REMOVING THE FUEL OIL FILTER AND PUMP.....	8
– F - REMOVING THE ENGINE COOLING WATER PUMP	9
– G - REMOVING THE TURBOCOMPRESSOR	12
REMOVING THE ENGINE	16
– DISASSEMBLY ORDER.....	16
– REMOVING THE RADIATOR MOTOR.....	17
– REMOVING THE RADIATOR	19
– REMOVING THE ENGINE	21

REMOVING THE ENGINE COMPONENTS

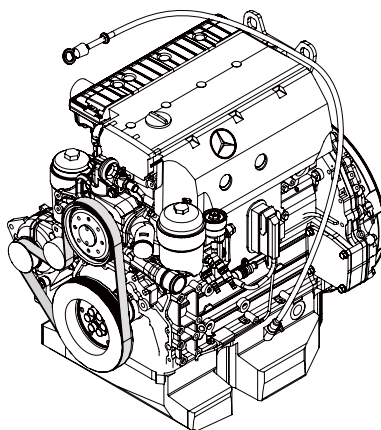
10

Legend:

- 1 - Alternator
- 2 - Starter motor
- 3 - Alternator belt
- 4 - Fuel filter
- 5 - Oil filter
- 6 - Engine cooling water pump
- 7 - Fuel pump
- 8 - Turbocompressor

PREPARATION AND SAFETY INSTRUCTIONS

Deactivate the ignition key and disconnect the negative pole from the battery.

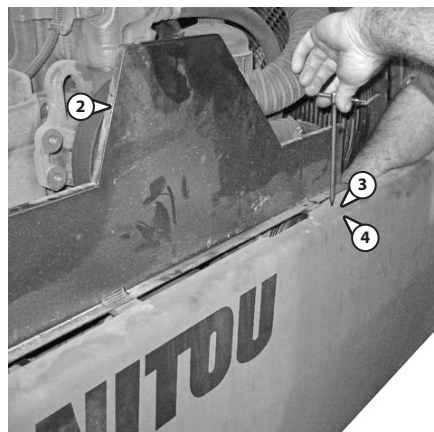


A - REMOVING THE ALTERNATOR BELT

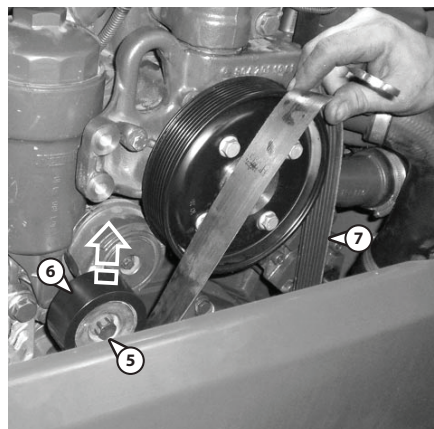
Open the hood (Ref. 1) of the engine compartment.

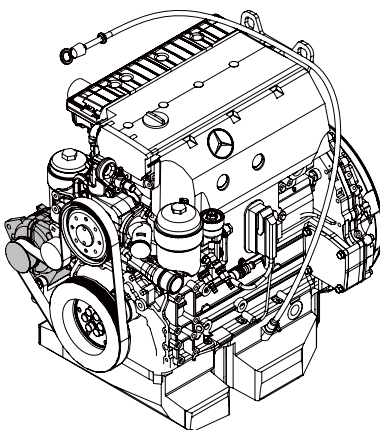


Remove the guard (Ref. 2) after unscrewing the screws (Ref. 3) and the nuts (Ref. 4).



Insert an unlocking lever on the screw (Ref. 5), tilt the belt tensioner roller upwards (Ref. 6) and remove the belt (Ref. 7).

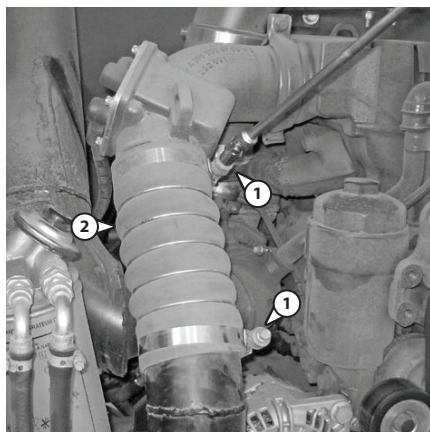




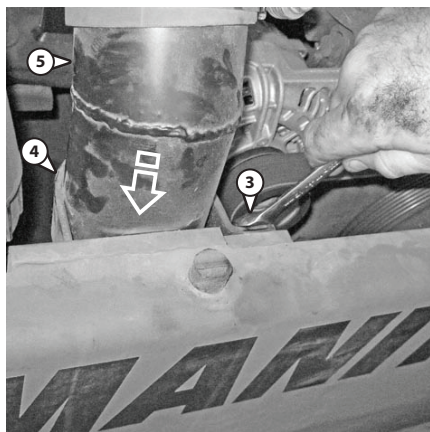
B - REMOVING THE ALTERNATOR

Carry out operation A.

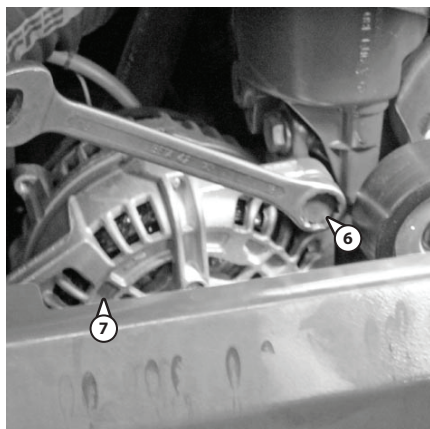
Slacken the clamps (Ref. 1) and remove the hose (Ref. 2) positioned on the air cooling radiator tube.

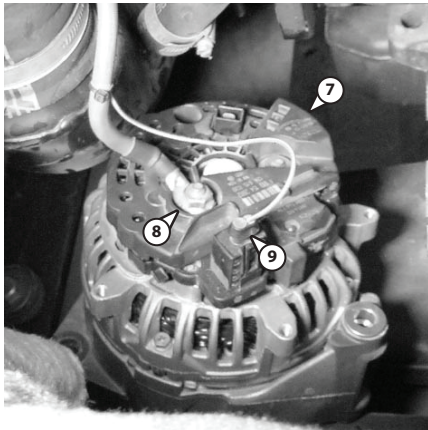


Slacken the screws (Ref. 3) and remove the bracket (Ref. 4) which supports the air cooling radiator tube (Ref. 5), move the tube downwards to make it easier to access the alternator.

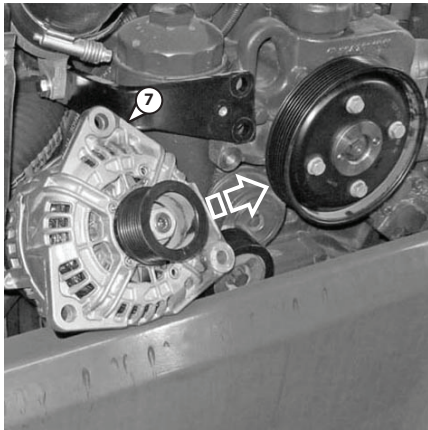


Slacken the screws (Ref. 6) which secure the alternator (Ref. 7) to the engine.

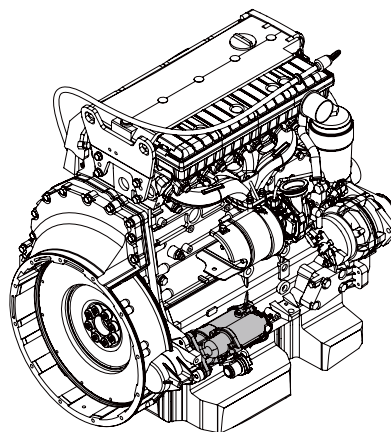




Disconnect the electric wires (Ref. 8 and 9) for connection to the alternator (Ref. 7).

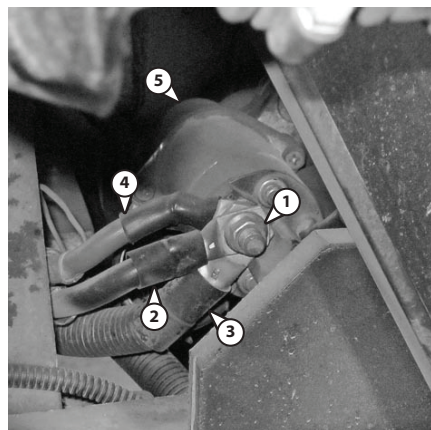


The alternator can now be removed (Ref. 7) from the engine.

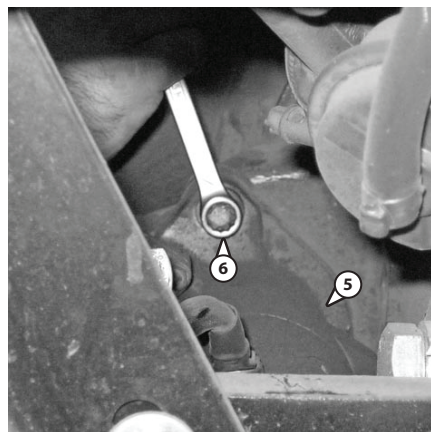


C - REMOVING THE STARTER MOTOR

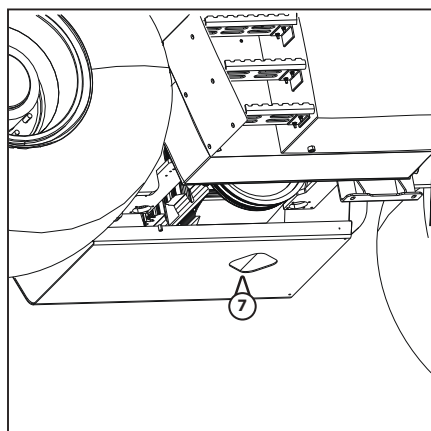
Slacken the nut (Ref. 1) and remove the electric wires (Ref. 2-3-4) for the starter motor connection (Ref. 5)

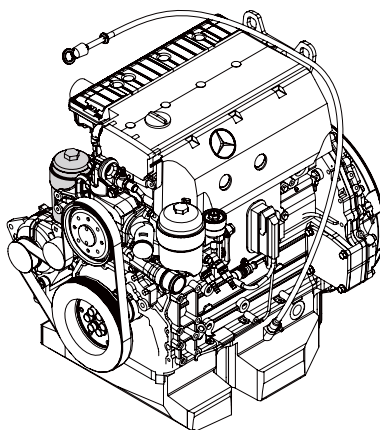


Slacken the screws (Ref. 6) and remove the starter motor (Ref. 5) from the engine base.



Remove the starter motor (Ref. 5) from the slot (Ref.f) under the engine compartment.

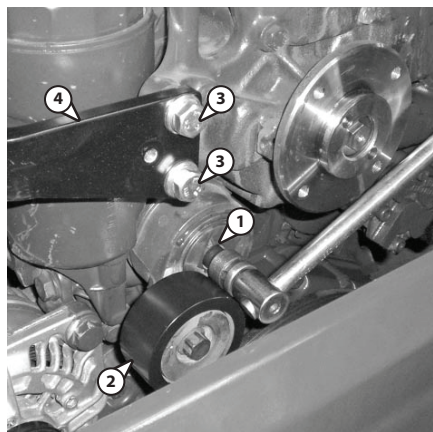




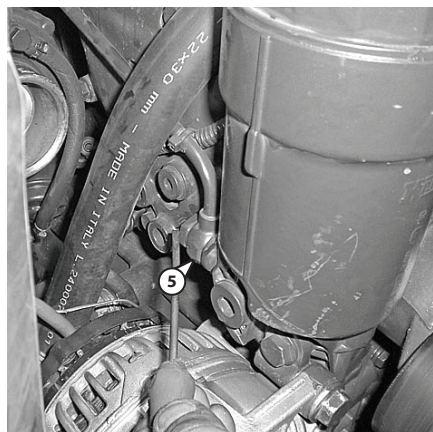
D - REMOVING THE OIL FILTER

Carry out operation B.

Slacken the screw (Ref. 1) and remove the belt tensioner (Ref. 2).
Slacken the screws (Ref. 3) and remove the bracket (Ref. 4).

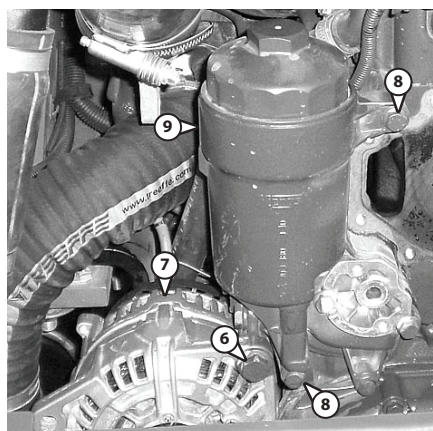


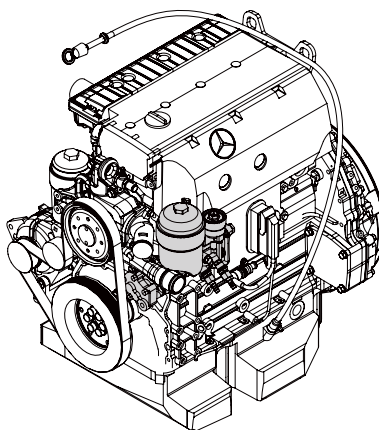
Disconnect the oil inlet pipe (Ref. 5) .
Fix the pipe using a clamp so that it does not slip in the bottom part of the engine housing and oil does not leak out.



Slacken the screw (Ref. 6) to free the alternator (Ref. 7) and rotate it downwards.

Slacken the screws (Ref. 8) which block the oil filter (Ref. 9) on the engine supports and remove the filter from the engine.

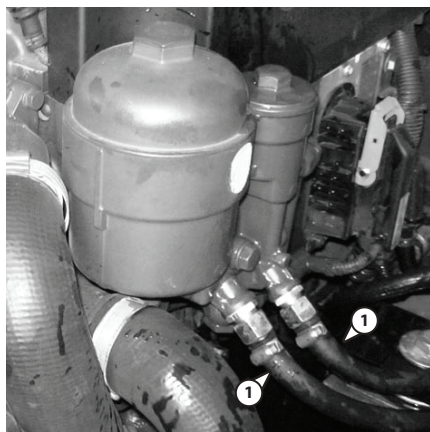




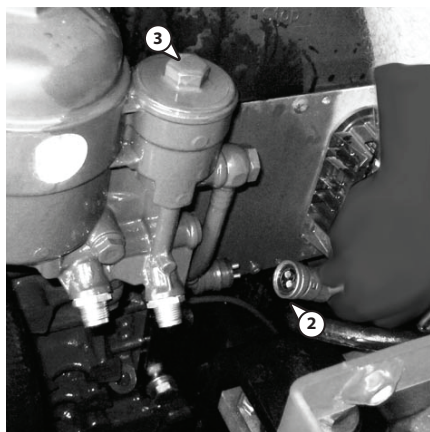
E - REMOVING THE FUEL OIL FILTER AND PUMP

Carry out operation A.

Disconnect the fuel incoming and outgoing tubes (Ref. 1) from the filter, taking care to keep these facing upwards to avoid draining the tank.

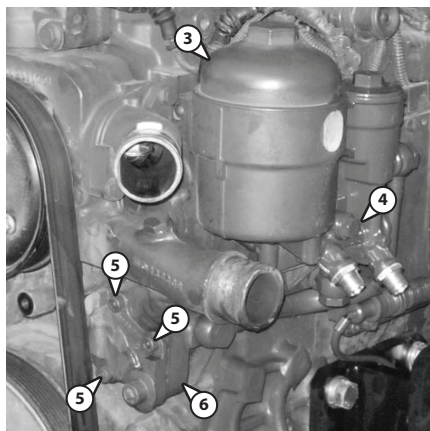


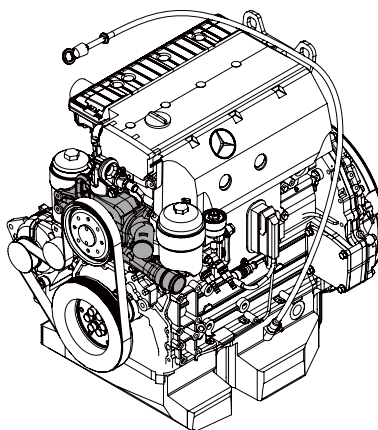
Disconnect the connector (Ref. 2) from the fuel filter (Ref. 3).



Slacken the screws (Ref. 4) and remove the fuel filter (Ref. 3) from the engine.

Slacken the screws (Ref. 5) and remove the fuel pump (Ref. 6) from the engine.

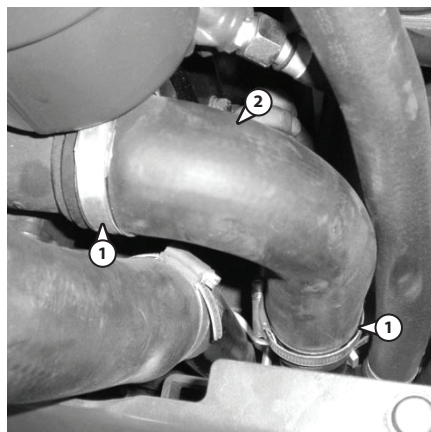




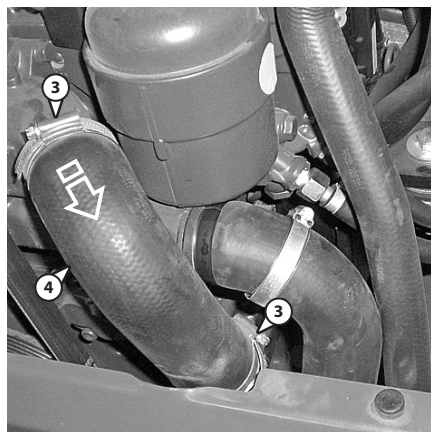
F - REMOVING THE ENGINE COOLING WATER PUMP

Carry out operation A.

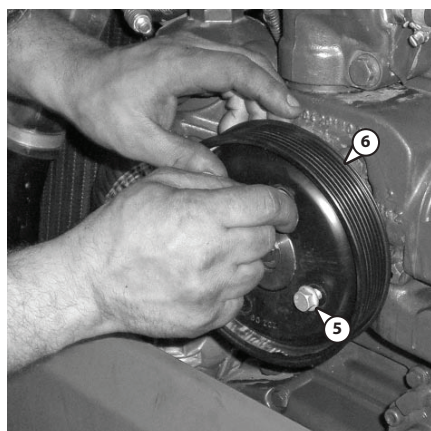
! Carry out the operations on the cooling system only if the coolant temperature is below 30°C.



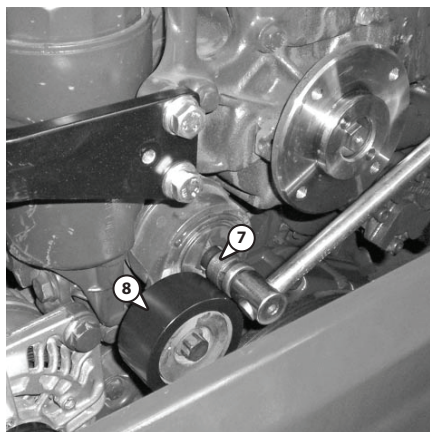
Slacken the 2 clamps (Ref. 1) on the lower hose (Ref. 2). Place suitable sized containers to hold the quantity of liquid to be collected under the engine compartment. Disconnect the lower hose (Ref. 2) from the pump, slowly discharge overpressure from the system, let the liquid drain out of the cooling system, and empty it completely.



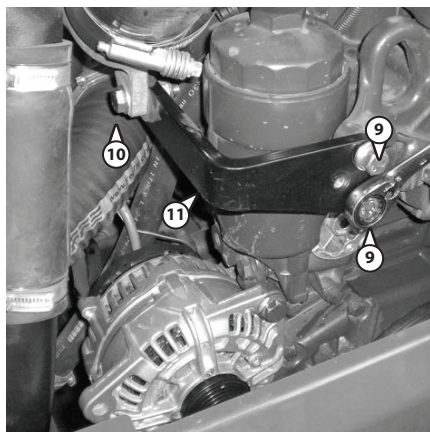
Slacken the 2 clamps (Ref. 3) on the upper hose (Ref. 4) and disconnect it from the pump.



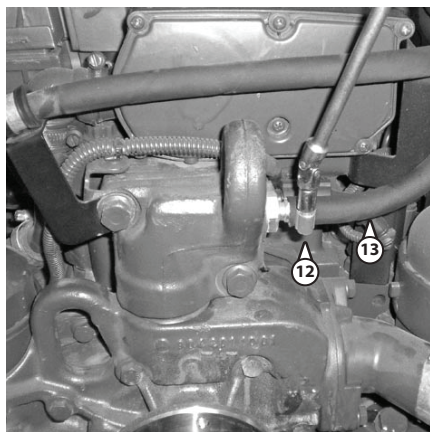
Slacken the 4 screws (Ref. 5) and remove the pulley (Ref. 6).



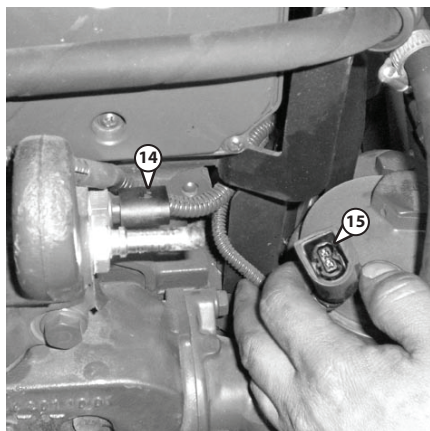
Slacken the screw (Ref. 7) and remove the belt tensioner (Ref. 8).



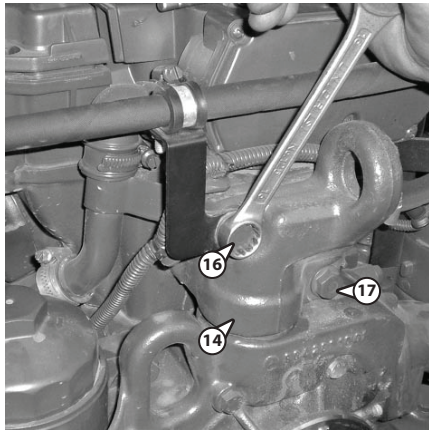
Slacken the screws (Ref. 9 and 10) and remove the bracket (Ref. 11).



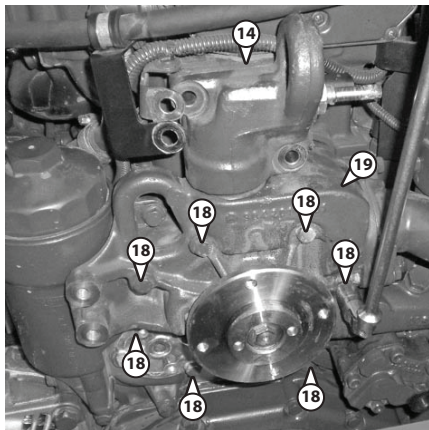
Slacken the clamp (Ref. 12) and disconnect the drainage tube (Ref. 13) from the thermostatic valve.



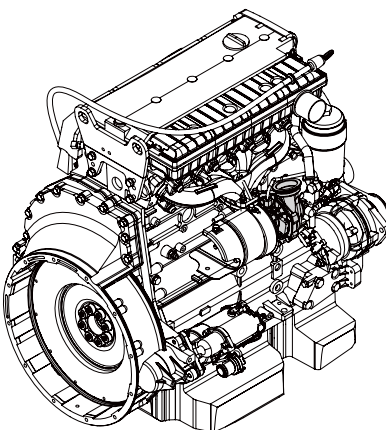
Disconnect the temperature sensor (Ref. 15) from the thermostatic valve (Ref. 14).



Slacken the screws (Ref. 16 and 17) which block the thermostatic valve (Ref. 14).

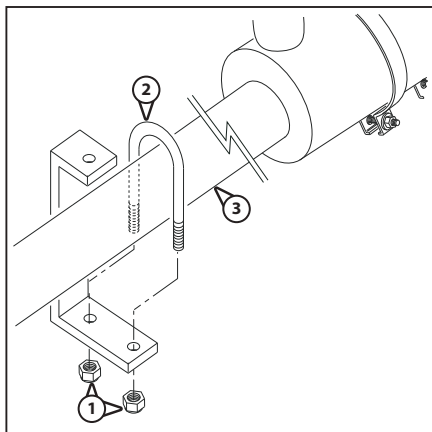


Slacken the 7 screws (Ref. 18) remove the pump (Ref. 19) and the thermostatic valve (Ref. 14).

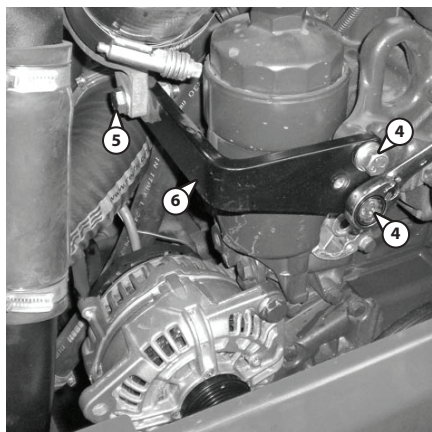


G - REMOVING THE TURBOCOMPRESSOR

Slacken the 2 nuts (Ref. 1) and remove the 2 brackets (Ref. 2) which secure the air suction duct (Ref. 3).



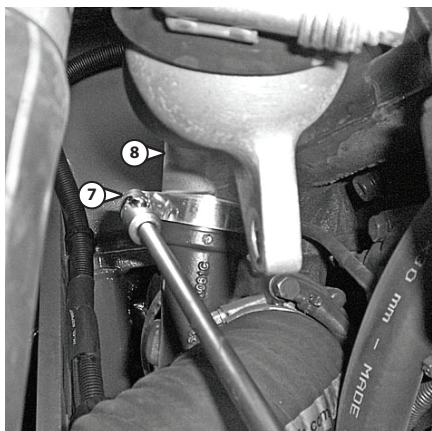
Slacken the screws (Ref. 4 and 5) and remove the bracket (Ref. 6).

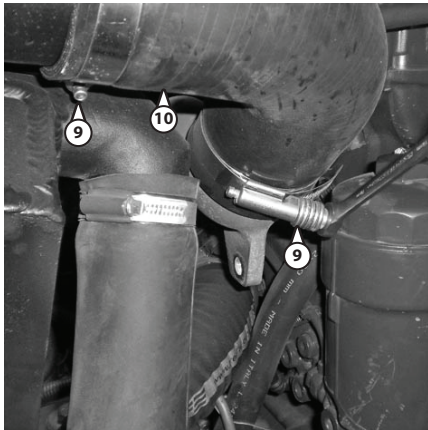


Slacken the clamp (Ref. 7) and remove the hose (REF. 8).

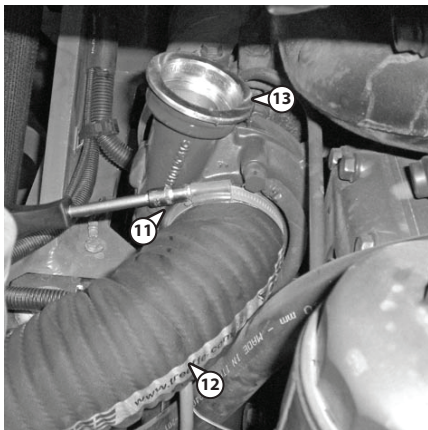


Fit caps on all the ducts to prevent foreign bodies from entering the circuits.

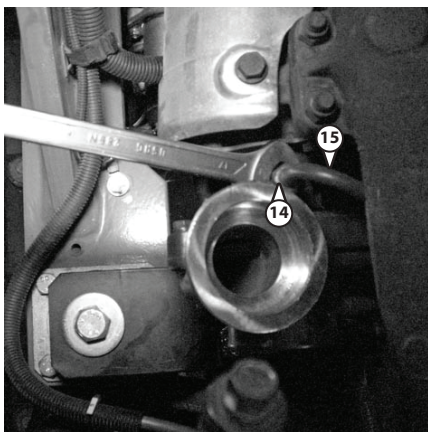




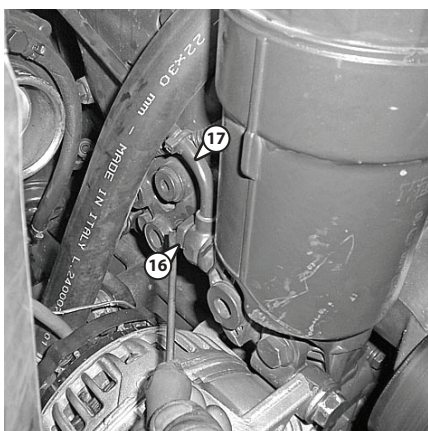
Slacken the 2 clamps (Ref. 9) and remove the suction hose (Ref. 10) on the air radiator.



Slacken the clamp (Ref. 11) and remove the suction hose (Ref. 12) from the turbocompressor (Ref. 13).

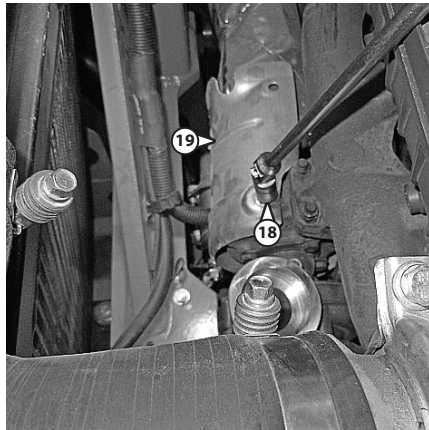


Unscrew the fitting (Ref. 14) and remove the lubrication delivery tube (Ref. 15) from the turbocompressor.

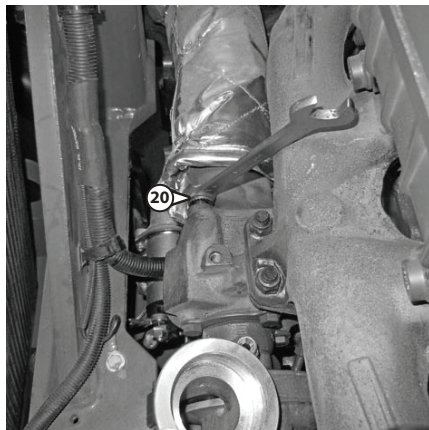


Unscrew the fitting (Ref. 16) and remove the lubrication delivery tube (Ref. 17).

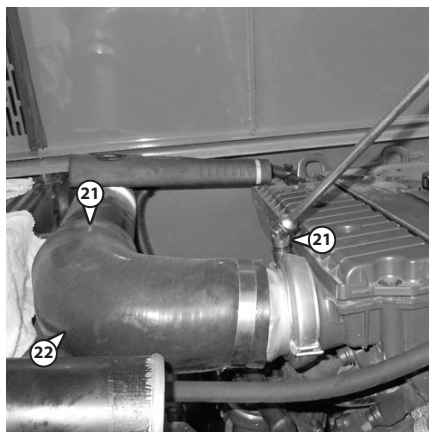
10



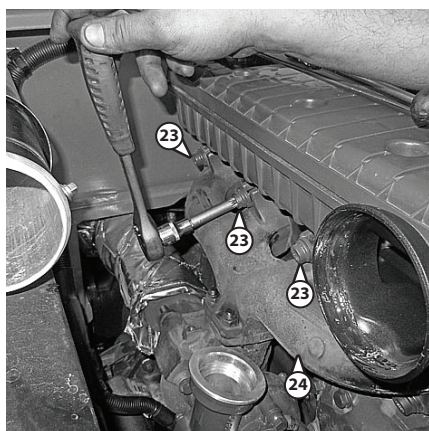
Slacken the 4 screws (Ref. 18) and remove the cover plate (Ref. 19) from the exhaust manifold.



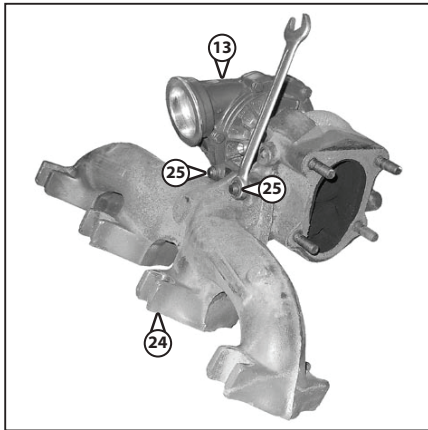
Slacken the screws (Ref. 20) which block the turbocompressor.



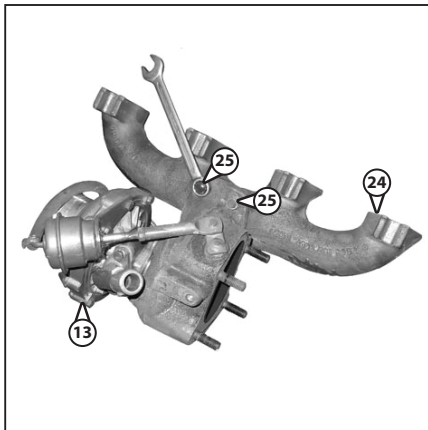
Slacken the 2 clamps (Ref. 21) and remove the suction hose (Ref. 22) from the engine.



Slacken the 8 screws (Ref. 23) and remove the exhaust manifold (Ref. 24).



Slacken the nuts (Ref. 25) and remove the turbocompressor (Ref. 13) from the exhaust manifold (Ref. 24).



REMOVING THE ENGINE

DISASSEMBLY ORDER

10

Step 1

DISASSEMBLING THE RADIATOR MOTOR



Step 2

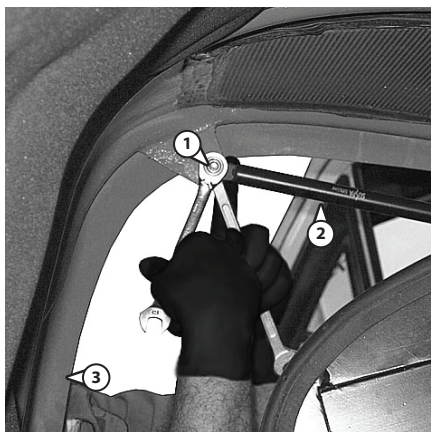
DISASSEMBLING THE RADIATOR



Step 3

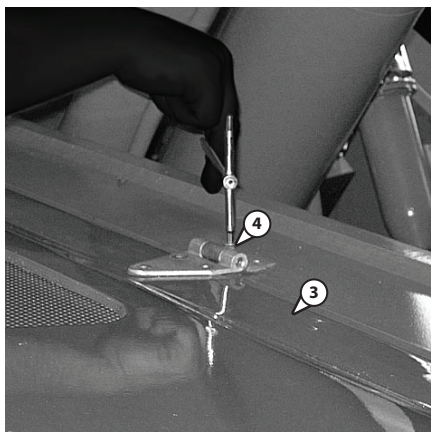
DISASSEMBLING THE I.C. ENGINE



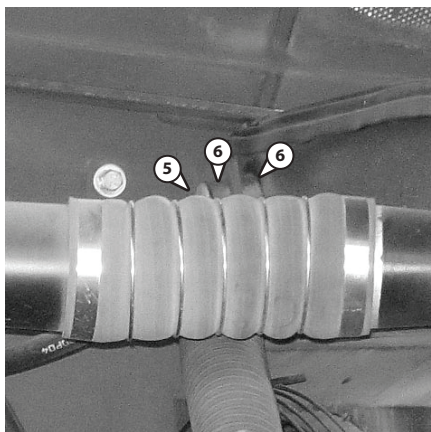


REMOVING THE RADIATOR MOTOR

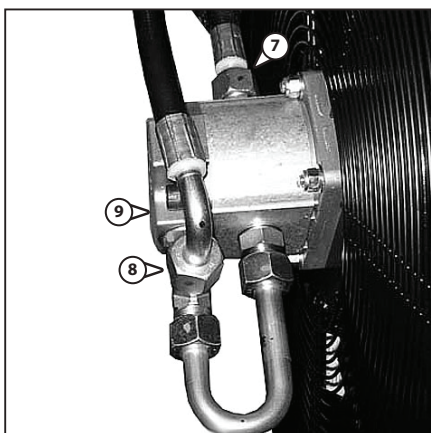
Slacken the screw (Ref. 1) to release the gas spring (Ref. 2) from the engine hood (Ref. 3).



Slacken the screws (Ref. 4) and remove the hood (Ref. 3) from the vehicle.

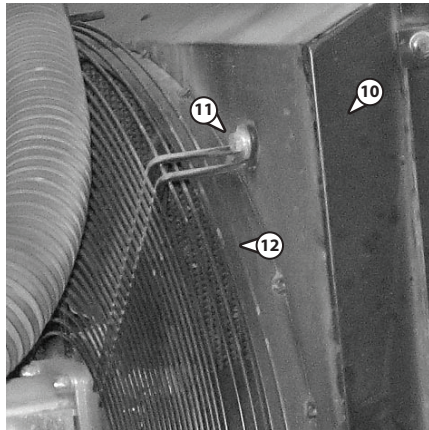


Slacken the screws (Ref. 5) and remove the silent blocks (Ref. 6) also in the lower part of the radiator.

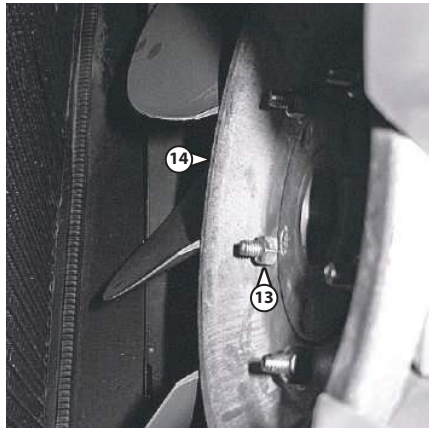


Disconnect the feed pipe (Ref. 7) and drainage pipe (Ref. 8) from the hydraulic motor (Ref. 9).
Keep the pipes facing upwards to prevent the oil from flowing out.

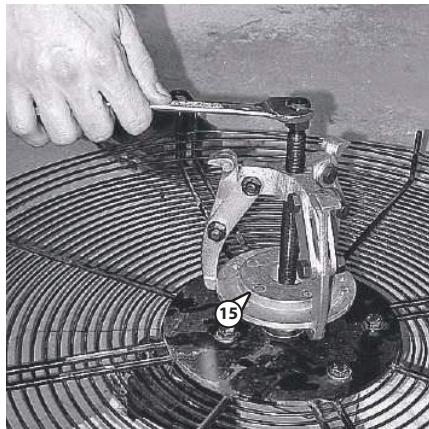
10



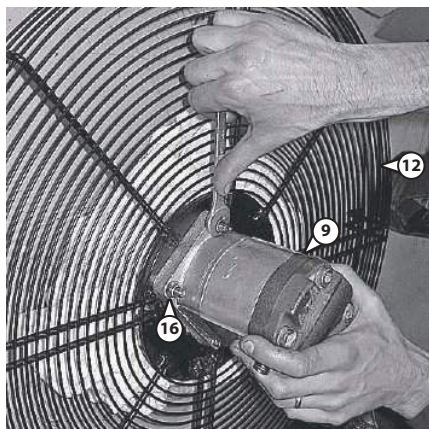
Secure the radiator (Ref. 10) to an overhead crane and incline it as far as possible from the side opposite the engine. Slacken the screws (Ref. 11) and remove the grille (Ref. 12).



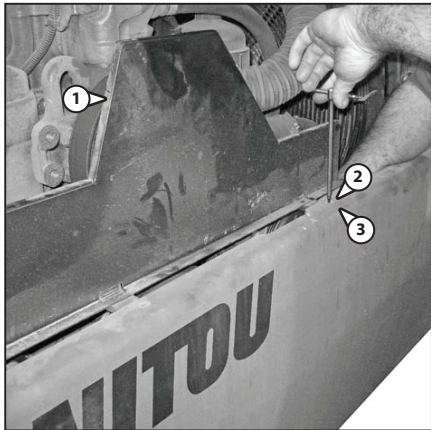
Slacken the nuts (Ref. 13) used for fitting the fan (Ref. 14).



Remove the fan hub (Ref. 15).

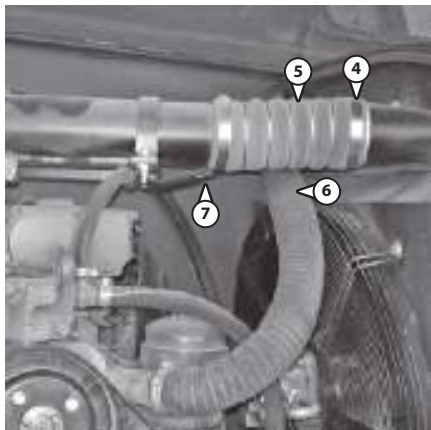


Slacken the fixing screws (Ref. 16) and remove the hydraulic motor (Ref. 9) from the grille (Ref. 12).

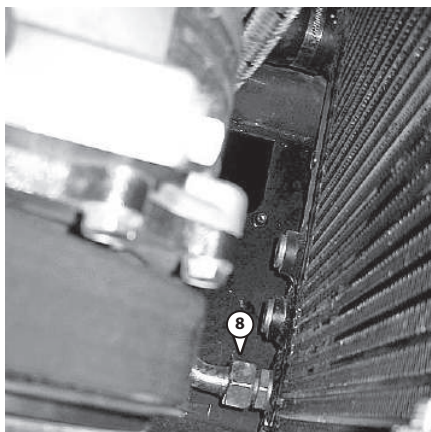


REMOVING THE RADIATOR

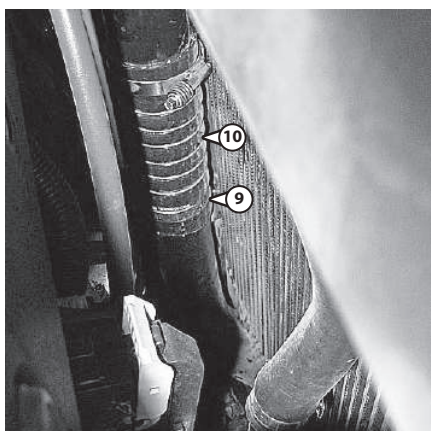
Carry out the "Disassembling the radiator motor" operation. Remove the guard (Ref. 1) after unscrewing the screws (Ref. 2) and the nuts (Ref. 3).

10

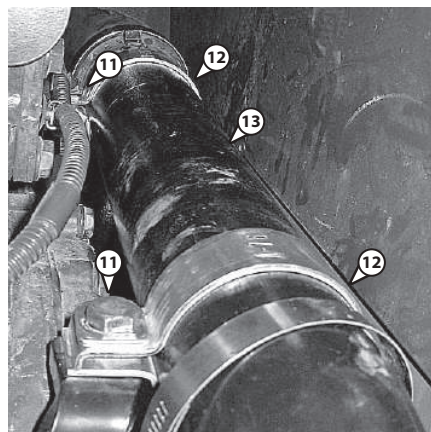
Slacken the clamp (Ref. 4) and remove the hose (Ref. 5). Also disconnect pipes (Ref. 6 and 7) from the radiator.



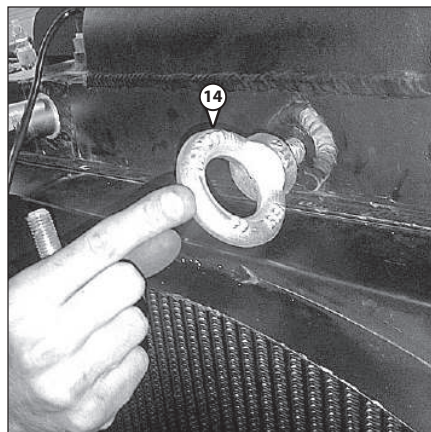
Disconnect the tube (Ref. 8).



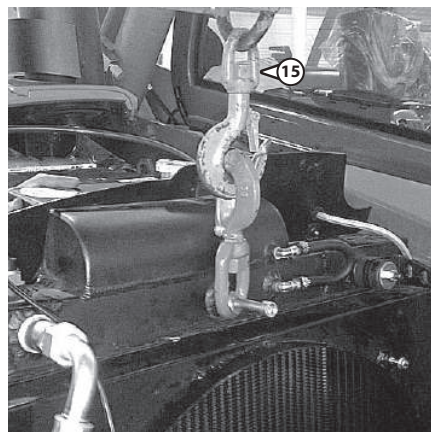
Slacken the clamp (Ref. 9) and remove the hose (Ref. 10).



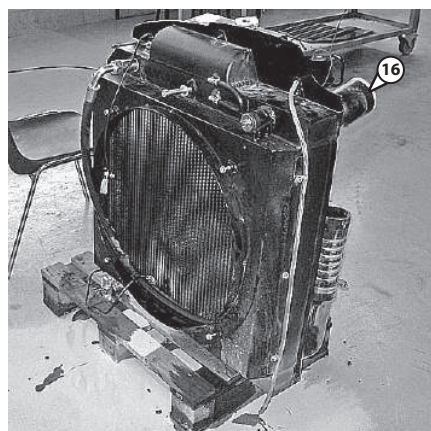
Slacken the screws (Ref. 11) to remove the clamp (Ref. 12) and remove the tube (Ref. 13).



Position the eyebolt (Ref. 14) on the radiator.



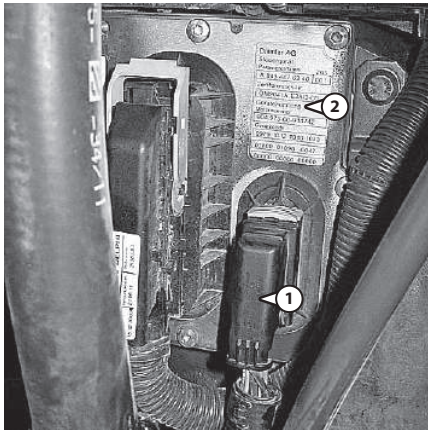
Connect the overhead crane (Ref. 15) to the radiator to remove it.



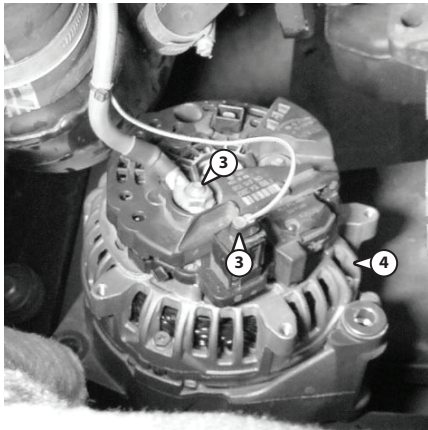
Remove the radiator (Ref. 16) from the vehicle, and place it on a pallet.

REMOVING THE ENGINE

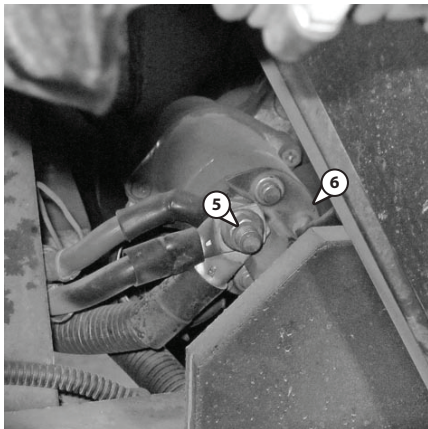
Disconnect the plug (Ref. 1) from the engine control unit (Ref. 2).



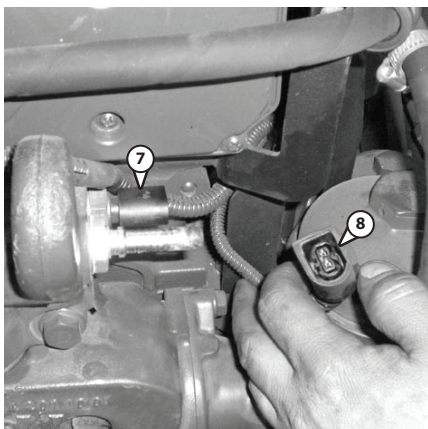
Disconnect all the electrical connections (Ref. 3) from the alternator (Ref. 4).

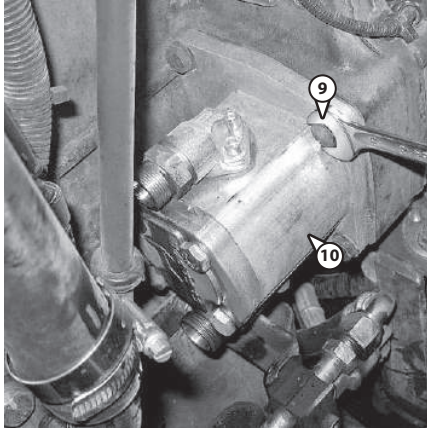


Disconnect all the electrical connections (Ref. 5) from the starter motor (Ref. 6).

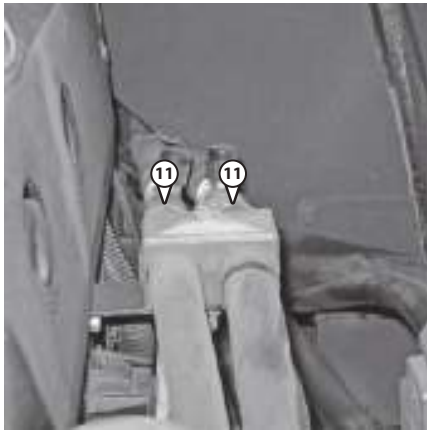


Disconnect the temperature sensor (Ref. 8) from the thermostatic valve (Ref. 7).

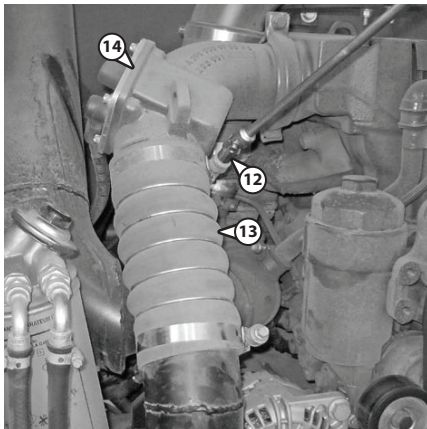




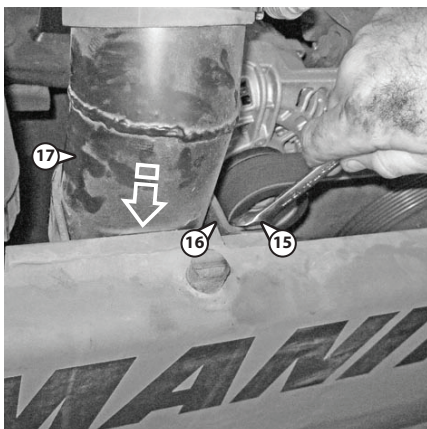
Slacken the screws (Ref. 9) and remove the hydraulic pump (Ref. 10).



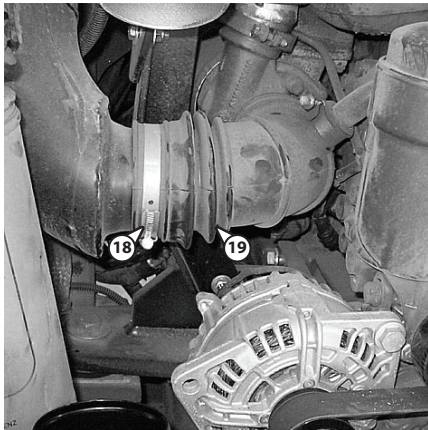
Disconnect the tubes (Ref. 11) for the air conditioner.



Slacken the clamp (Ref. 12) and remove the hose (Ref. 13) from the suction duct (Ref. 14).



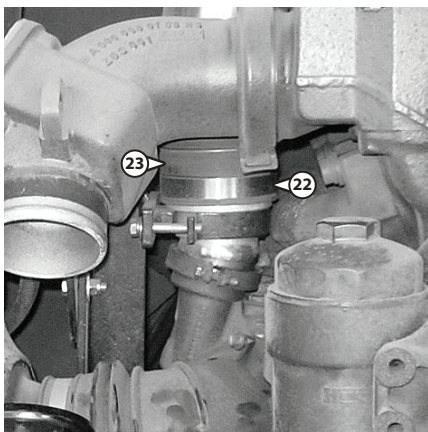
Slacken the screws (Ref. 15) and remove the bracket (Ref. 16) which supports the radiator pipe (Ref. 17).
Shift the pipe downwards to make it easier to remove the engine.



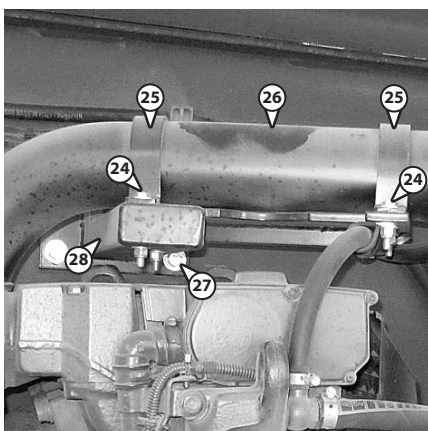
Slacken the clamp (Ref. 18) and remove the hose (Ref. 19) for the exhaust gases.



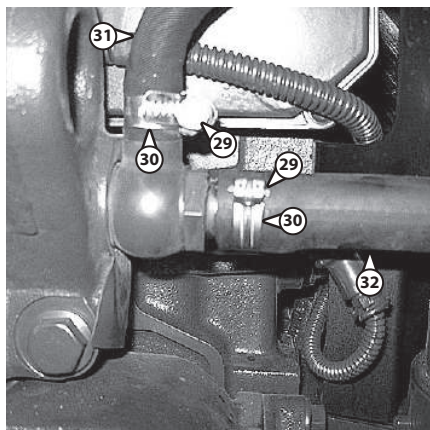
Slacken the clamp (Ref. 20) and remove the hose (Ref. 21) entering the radiator.



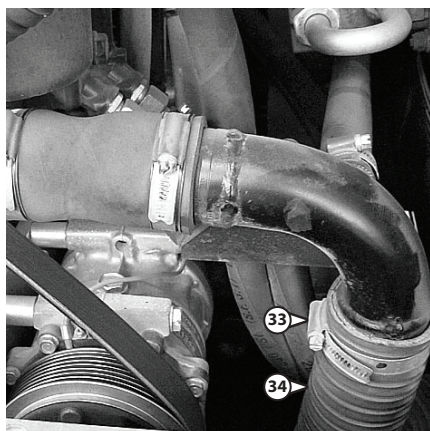
Slacken the clamp (Ref. 22) and remove the hose (Ref. 23) from the turbocompressor.



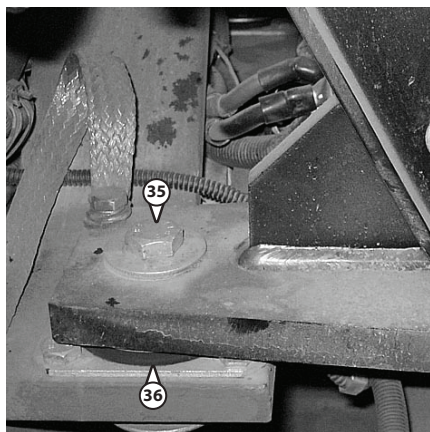
Slacken the screws (Ref. 24) and remove the brackets (Ref. 25).
Remove the cooling system pipe (Ref. 26).
Slacken the screws (Ref. 27) and remove the support (Ref. 28) from the vehicle.



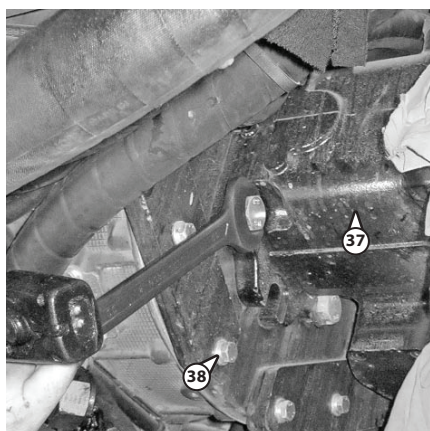
Slacken the screws (Ref. 29) and slacken the clamps (Ref. 30). Disconnect the upper (Ref. 31) and lower (Ref. 32) heating pipes.



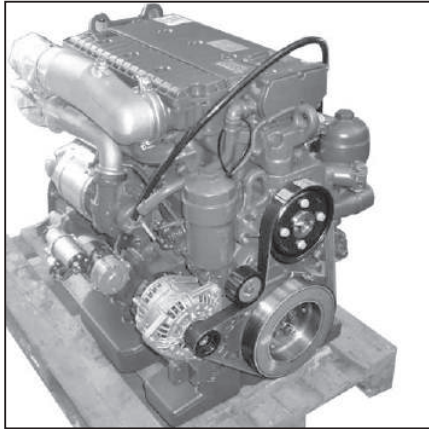
Slacken the clamp (Ref. 33) and remove the hose (Ref. 34) from the water pump.



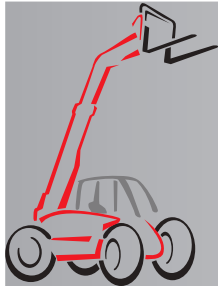
Secure the engine to the overhead crane and slacken the screws (Ref. 35) which fix the engine to the chassis. Remove the four silent blocks (Ref. 36).



Place a hydraulic jack under the hydraulic pump (Ref. 37). Slacken the screws (Ref. 38) which block the engine.



Remove the engine with the help of the overhead crane and place it on a pallet.



ENGINE REFIT

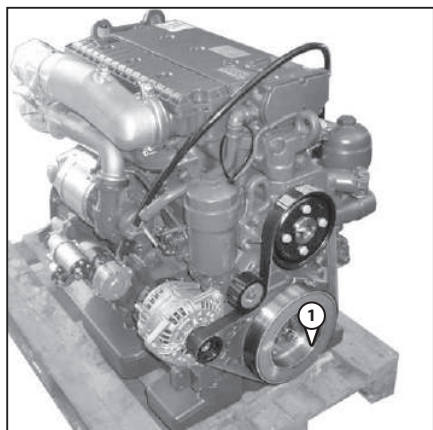
	page
REINSERTING THE ENGINE	2
– REASSEMBLY ORDER	2
– REINSERTING THE ENGINE	3
– REINSERTING THE RADIATOR	7
– REINSERTING THE RADIATOR MOTOR.....	9
REINSERTING THE ENGINE COMPONENTS	11
PREPARATION AND SAFETY INSTRUCTIONS.....	11
– A - REINSERTING THE TURBOCOMPRESSOR	12
– B - REINSERTING THE ENGINE COOLING WATER PUMP	16
– C - REINSERTING THE FUEL OIL FILTER AND PUMP	19
– D - REINSERTING THE OIL FILTER.....	20
– E - REINSERTING THE STARTER MOTOR.....	21
– F - REINSERTING THE ALTERNATOR	22
– G - REINSERTING THE ALTERNATOR BELT	24

REINSERTING THE ENGINE

REASSEMBLY ORDER

10

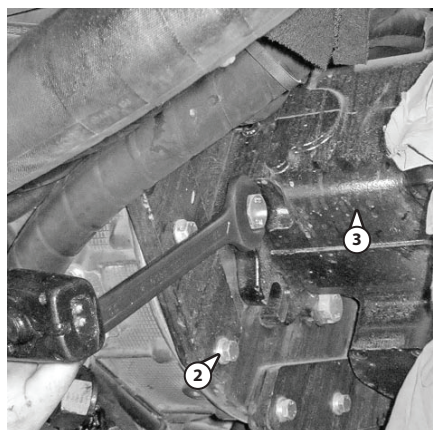
Step 1**REINSERTING THE I.C. ENGINE****Step 2****REINSERTING THE RADIATOR****Step 3****REINSERTING THE RADIATOR MOTOR**



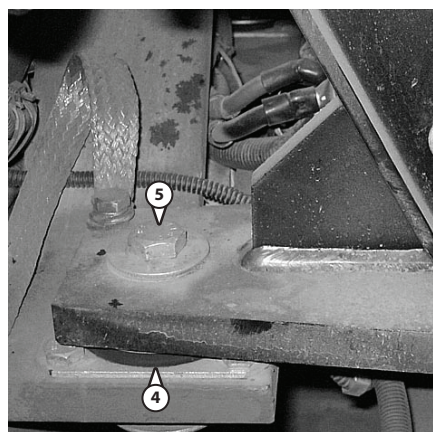
REINSERTING THE ENGINE

Secure the engine (Ref. 1) to an overhead crane and reposition it on the vehicle.

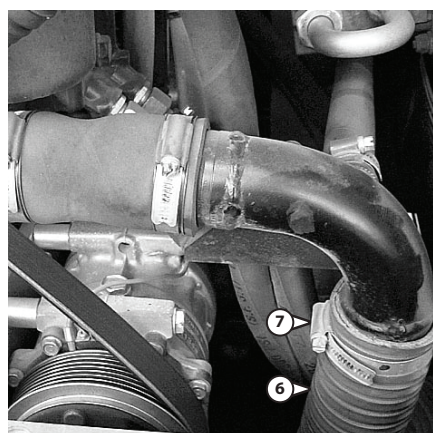
10



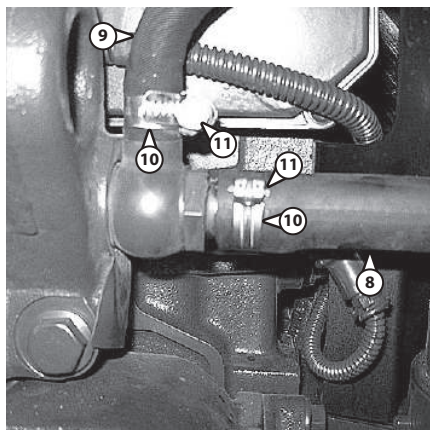
Fit the screws (Ref. 2) to block the engine and remove the hydraulic jack, positioned under the hydraulic pump (Ref. 3) during the disassembly.



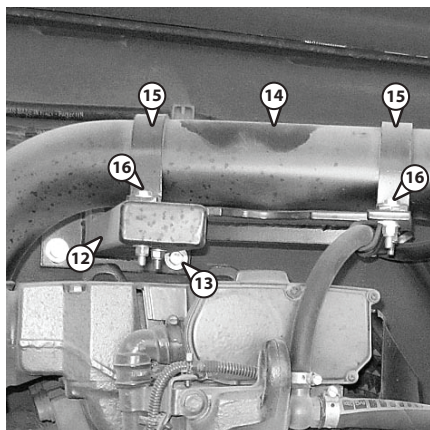
Using an overhead crane, insert the four silent blocks (Ref. 4) and fix the engine to the chassis by means of the screws meant for the purpose (Ref. 5).



Insert the hose (Ref. 6) on the water pump and tighten the clamp (Ref. 7).

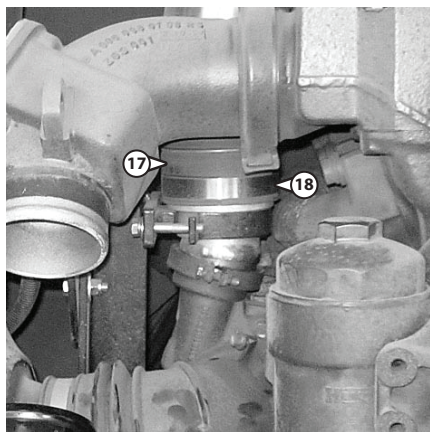


Connect the upper (Ref. 8) and lower (Ref. 9) heating pipes. Tighten the clamps (Ref. 10) by tightening the screws (Ref. 11).

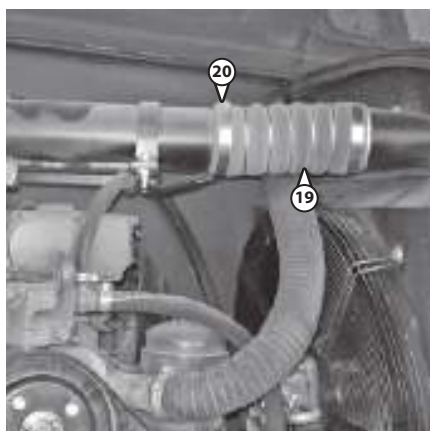


Fit the support (Ref. 12) on the vehicle by means of the screws (Ref. 13).

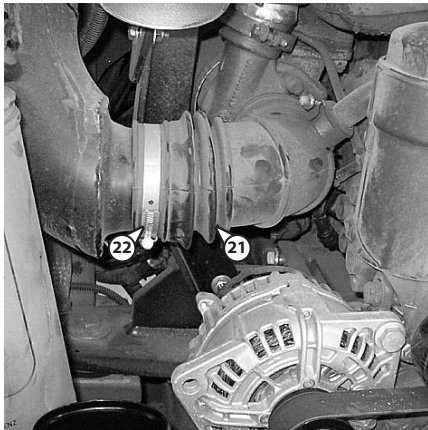
Insert the cooling system pipe (Ref. 14) and tighten the brackets (Ref. 15) by means of the screws (Ref. 16).



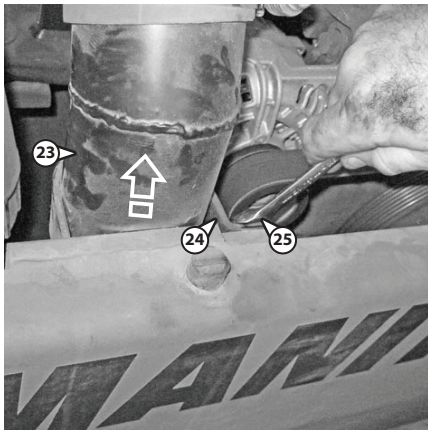
Insert the hose (Ref. 17) on the turbocompressor and tighten the clamp (Ref. 18).



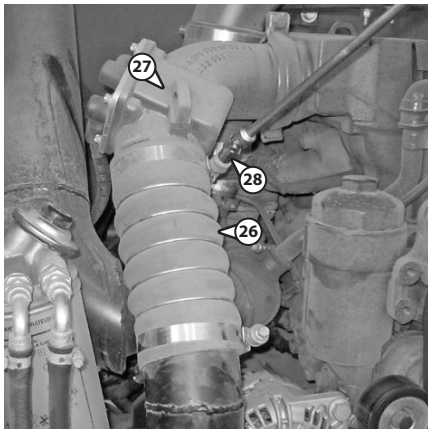
Insert the hose (Ref. 19) on the radiator pipe and tighten the clamp (Ref. 20).



Insert the hose (Ref. 21) for the exhaust gases and tighten the clamp (Ref. 22).



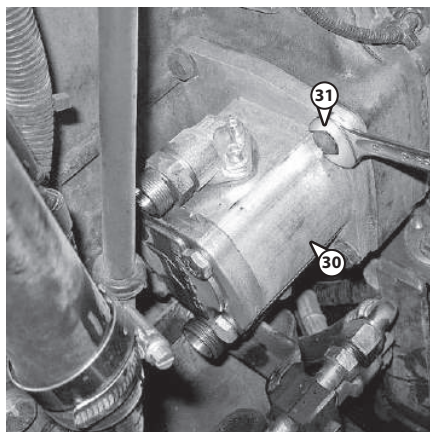
Restore the radiator pipe (Ref. 23) to its position. Fit the bracket (Ref. 24) by means of the screws (Rif. 25) to block the pipe.



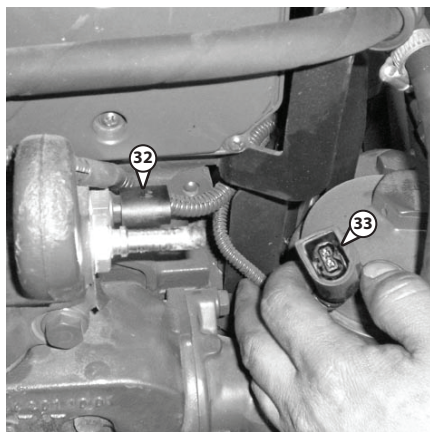
Insert the hose (Ref. 26) on the suction duct (Ref. 27) and tighten the clamp (Ref. 28).



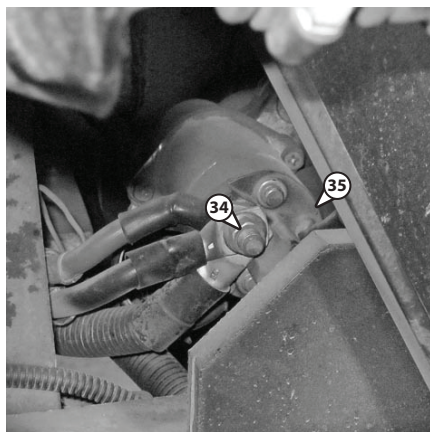
Connect the tubes (Ref. 29) for the air conditioner on the compressor.



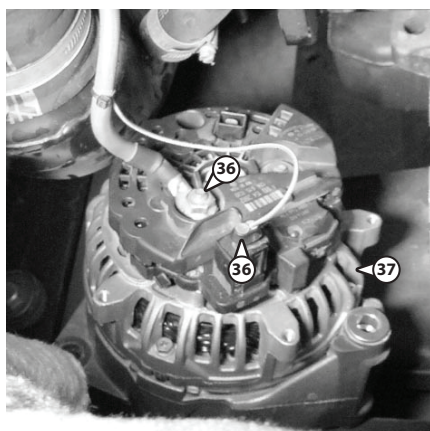
Insert the hydraulic pump (Ref. 30) and fit the screws (Ref. 31).



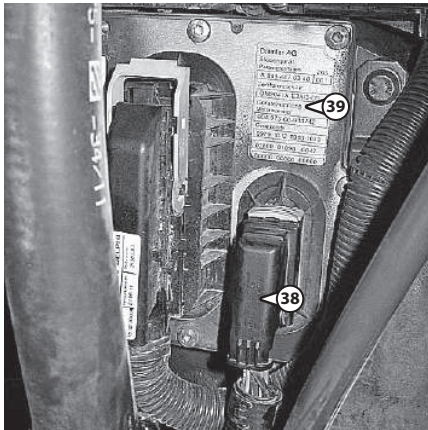
Connect the temperature sensor (Ref. 33) to the thermostatic valve (Ref. 32).



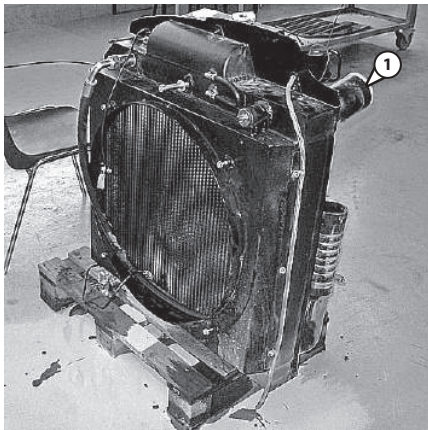
Connect all the electrical connections (Ref. 34) on the starter motor (Ref. 35).



Connect all the electrical connections (Ref. 36) on the alternator (Ref. 37).

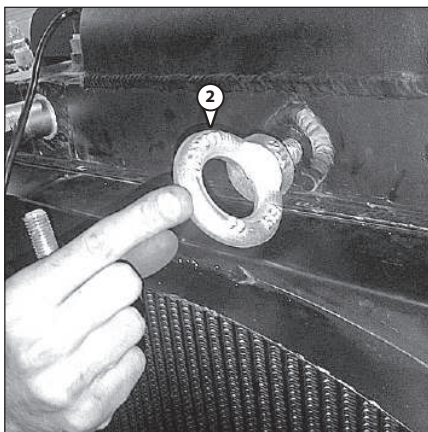


Connect the plug (Ref. 38) on the engine control unit (Ref. 39).

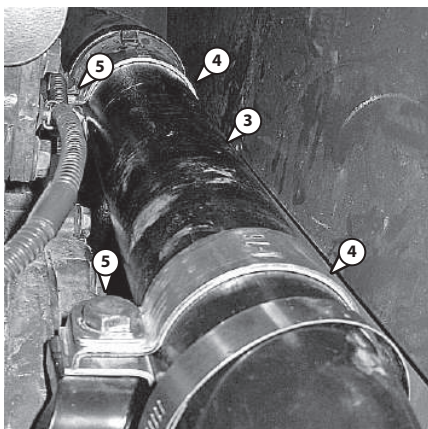


REINSERTING THE RADIATOR

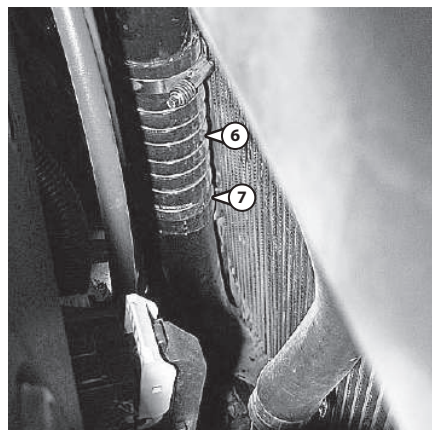
Insert the radiator (Ref. 1) on the vehicle with the help of an overhead crane.



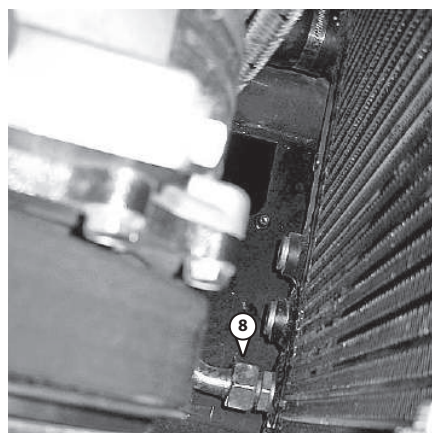
Remove the eyebolt (Ref. 2) from the radiator.



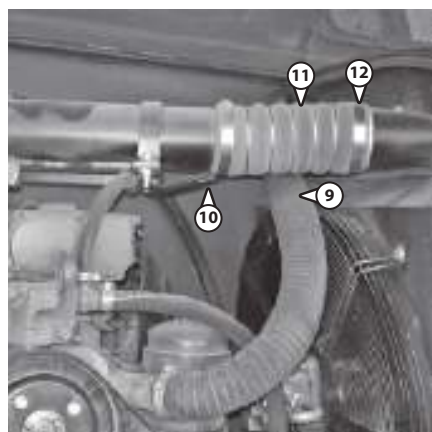
Insert the pipe (Ref. 3) and fit the brackets (Ref. 4) using the screws (Ref. 5).



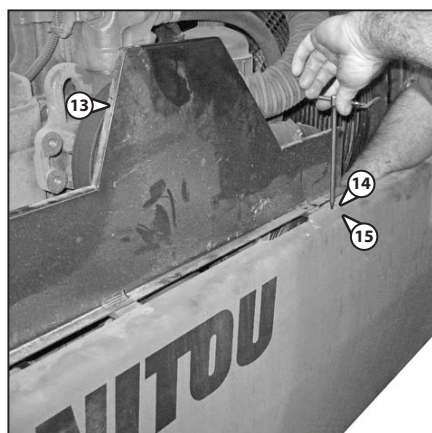
Insert the hose (Ref. 6) and screw the clamp (Ref. 7).



Connect pipe (Ref. 8).



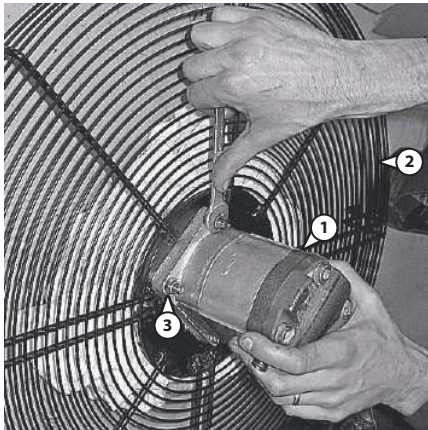
Reconnect the pipes (Ref. 9 and 10) on the radiator.
Insert the hose (Ref. 11) and screw the clamp (Ref. 12).



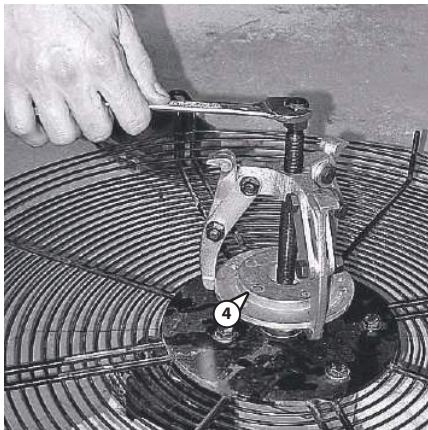
Carry out the "Reassembling the radiator motor" operation.
Fit the guard (Ref. 13) by means of the screws (Ref. 14) and the nuts (Ref. 15).

REINSERTING THE RADIATOR MOTOR

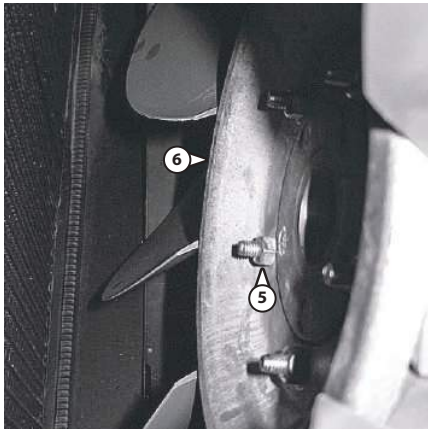
Inserting the hydraulic motor (Ref. 1) on the grille (Ref. 2) and fix by means of screws Ref. 3).



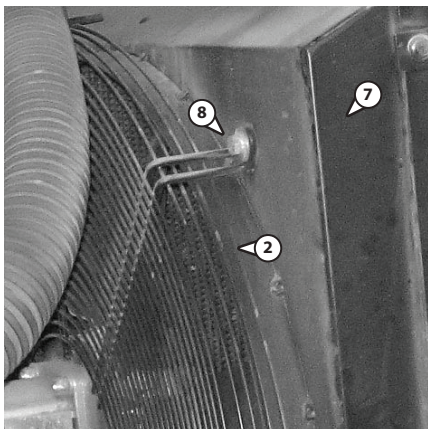
Insert the fan hub (Ref. 4).

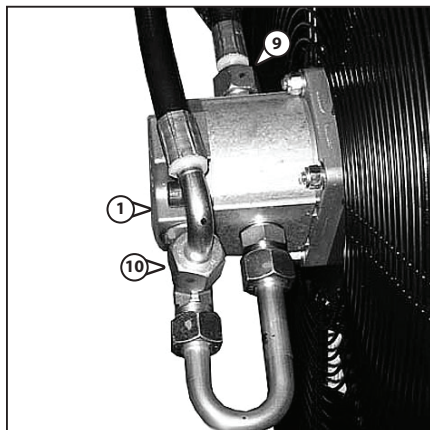


Tighten the nuts (Ref. 5) used for fitting the fan (Ref. 6).

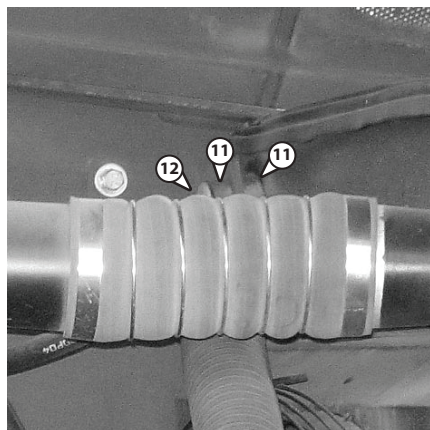


Refit the grille (Ref. 2) by means of the screws (Ref. 8) on the radiator (Ref. 7) and restore the radiator to its position with the help of the overhead crane.

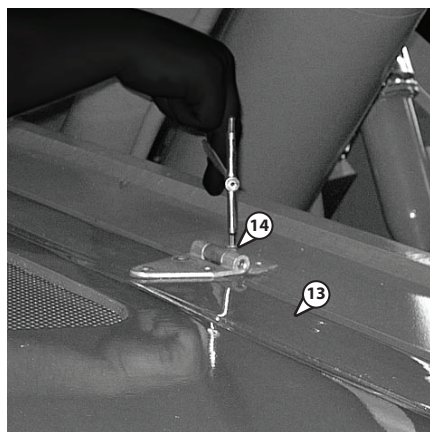




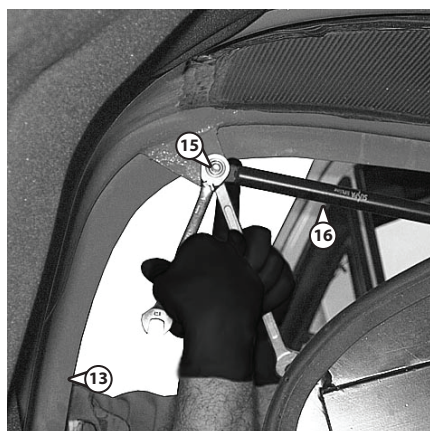
Reconnect the feed pipe (Ref. 9) and drainage pipe (Ref. 10) of the hydraulic motor (Ref. 1).



Fit the silent blocks (Ref. 11), also in the lower part of the radiator, using the screws (Ref. 12).



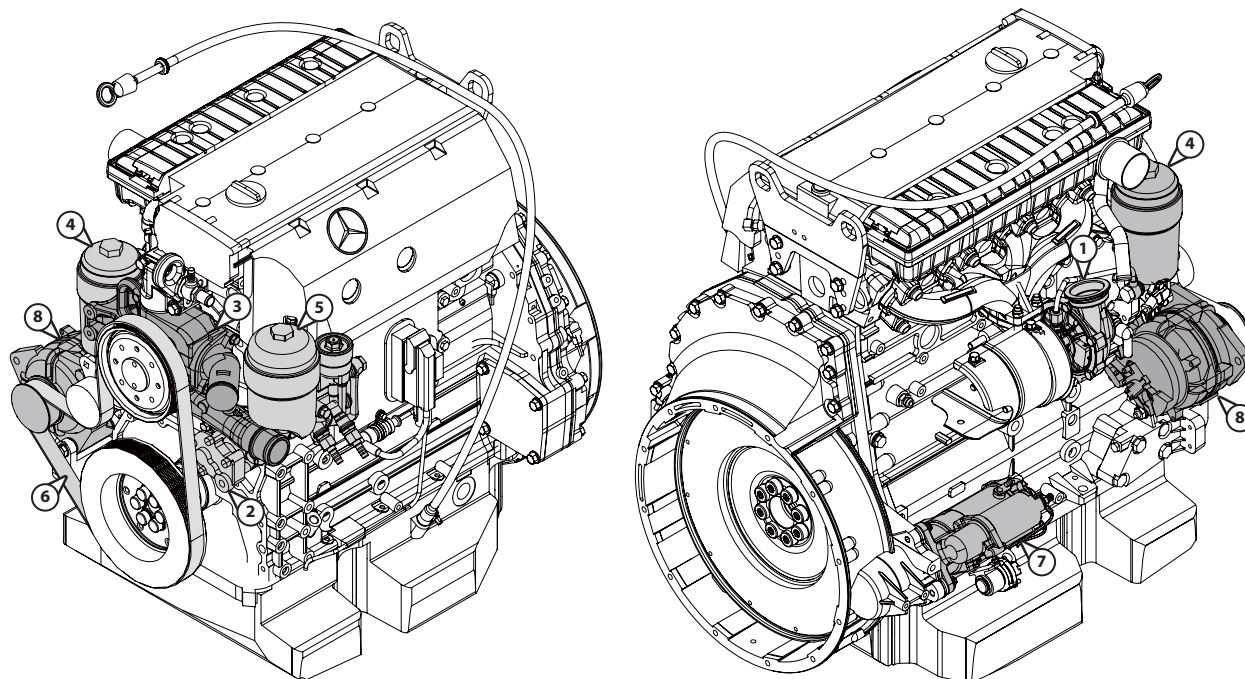
Fit the hood (Ref. 13) on the vehicle by means of the screws (Ref. 14).



Fit the screw (Ref. 15) to block the gas spring (Ref. 16) on the engine hood (Ref. 13).

REINSERTING THE ENGINE COMPONENTS

10

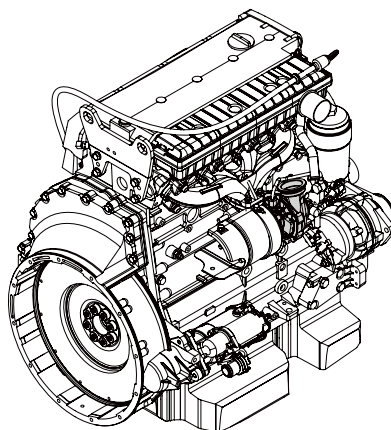


Legend:

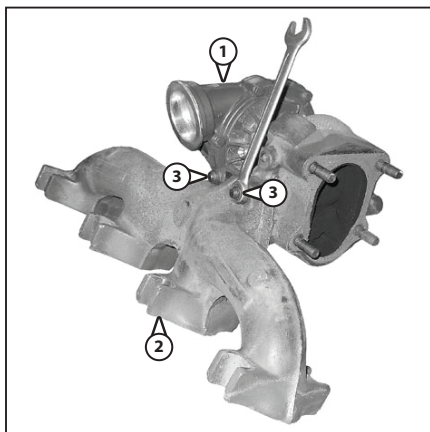
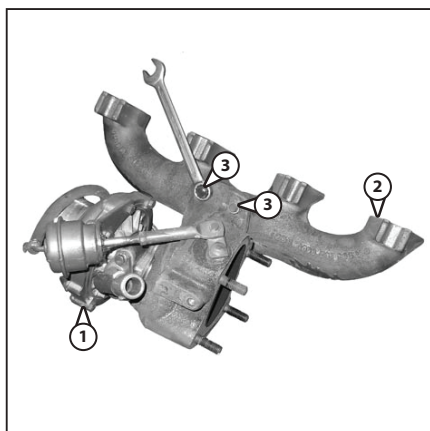
- 1 - Turbocompressor
- 2 - Fuel pump
- 3 - Engine cooling water pump
- 4 - Oil filter
- 5 - Fuel filter
- 6 - Alternator belt
- 7 - Starter motor
- 8 - Alternator

PREPARATION AND SAFETY INSTRUCTIONS

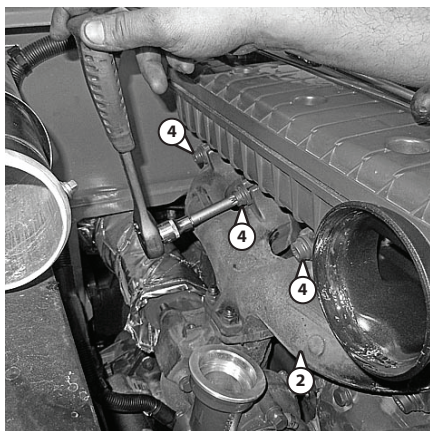
Deactivate the ignition key and disconnect the negative pole from the battery.

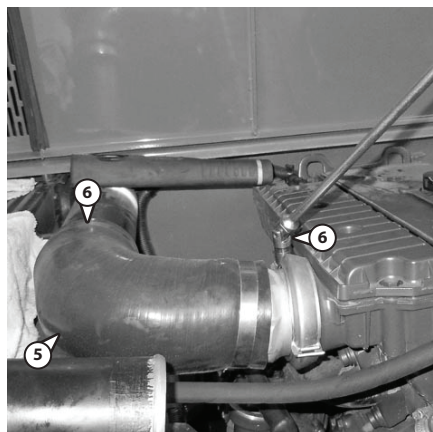
**A - REINSERTING THE TURBOCOMPRESSOR**

Refit the turbocompressor (Ref. 1) on the exhaust manifold (Ref. 2) by screwing the nuts (Ref. 3); use a 30 Nm tightening torque.

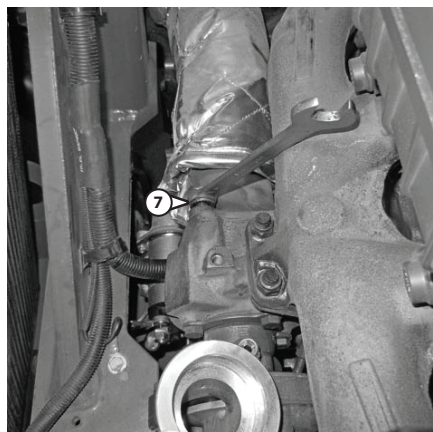


Refit the exhaust manifold (Ref. 2) on the engine base using the 8 screws (Ref. 4); use a 30 Nm tightening torque.

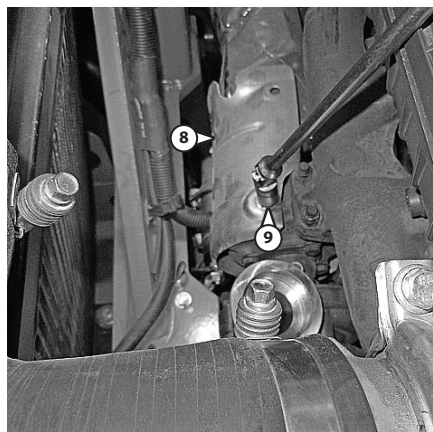




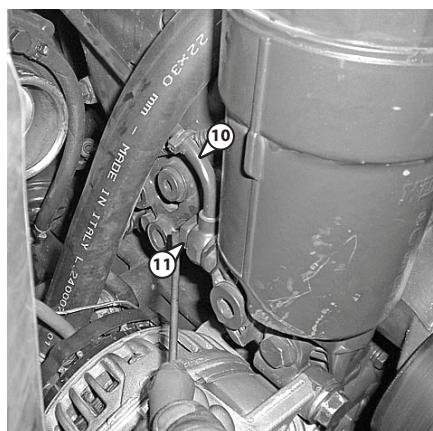
Reconnect the suction hose (Ref. 5) to the engine and tighten the 2 clamps (Ref. 6).



Block the turbocompressor to the engine by tightening the screws (Ref. 7).

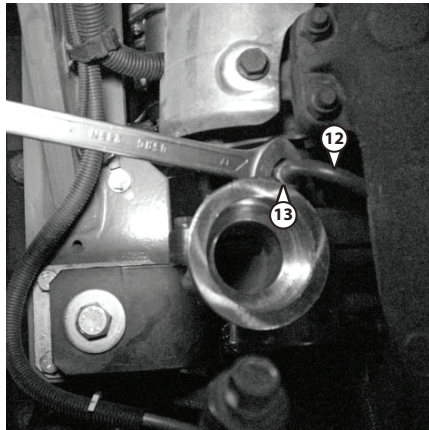


Refit the cover plate (Ref. 8) on the exhaust manifold by means of the 4 screws (Ref. 9).

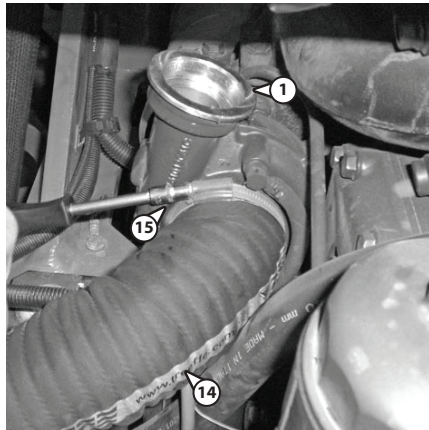


Refit the lubrication extraction pipe (Ref. 10) by screwing in the fitting (Ref. 11).

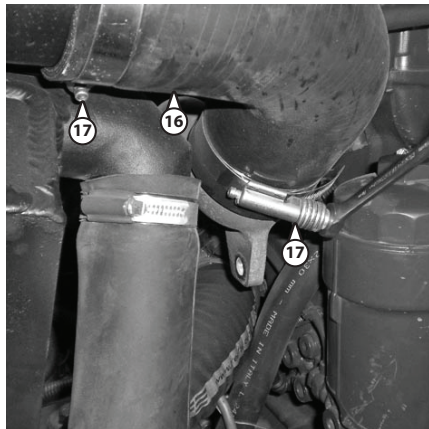
10



Refit the lubrication delivery pipe (Ref. 12) on the turbocompressor by screwing in the fitting (Ref. 13).



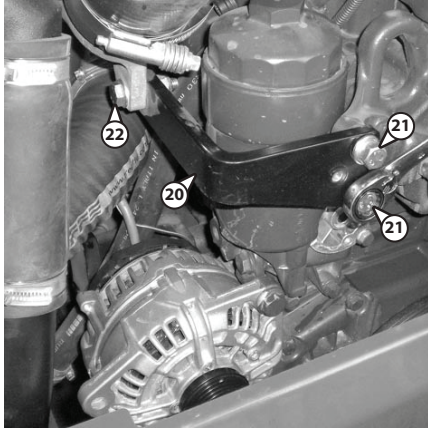
Refit the suction hose (Ref. 14) on the turbocompressor (Ref. 1) and tighten the clamp (Ref. 15).



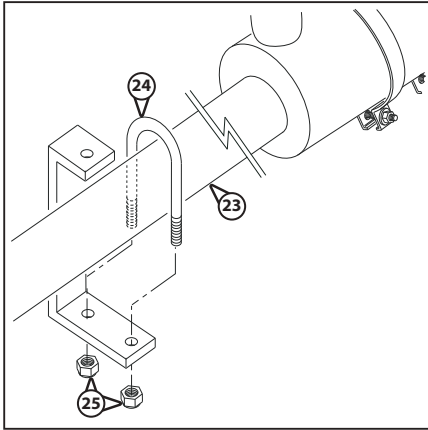
Refit the suction hose (Ref. 16) on the air radiator and tighten the 2 clamps (Ref. 17).



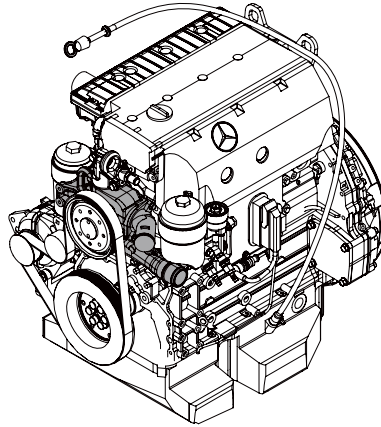
Refit the hose (Ref. 18) and tighten the clamp (Ref. 19).



Refit the bracket (Ref. 20) on the air unit by means of the screws (Ref. 21 and 22).

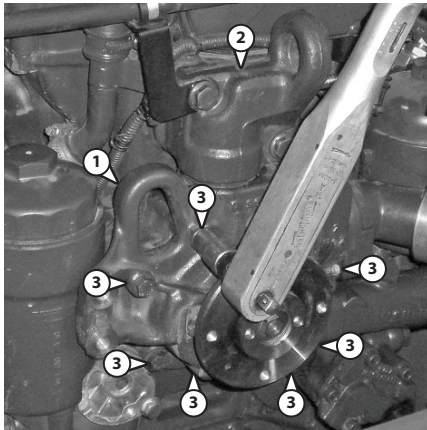


Refit the air suction pipe (Ref. 23) locking it by means of the 2 brackets (Ref. 24) and the two nuts (Ref. 25).

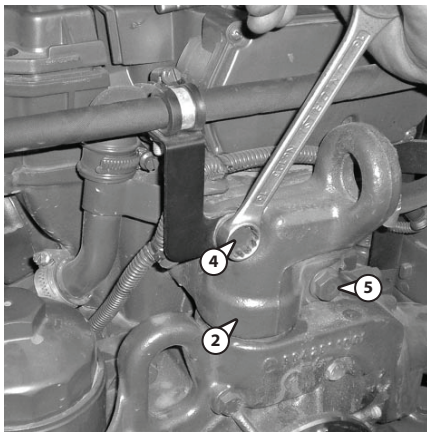


B - REINSERTING THE ENGINE COOLING WATER PUMP

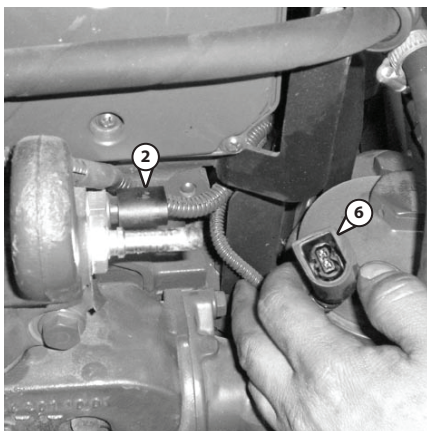
Replace the gaskets with new ones, refit the pump (Ref. 1) and the thermostatic valve (Ref. 2) on the engine by means of the 7 screws (Ref. 3), on which Loctite threadlock must be applied; use a 25 Nm tightening torque.

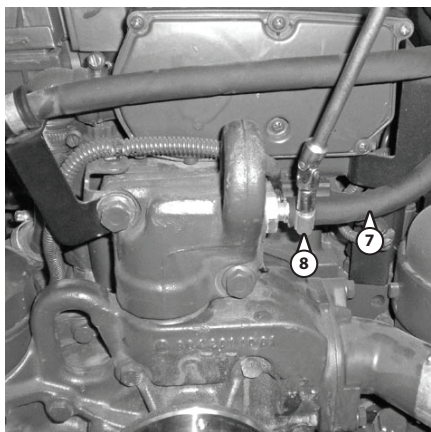


Refit the thermostatic valve (Ref. 2) on the pump by means of the screws (Ref. 4 and 5) on which Loctite threadlock must be applied; use a 25Nm tightening torque.

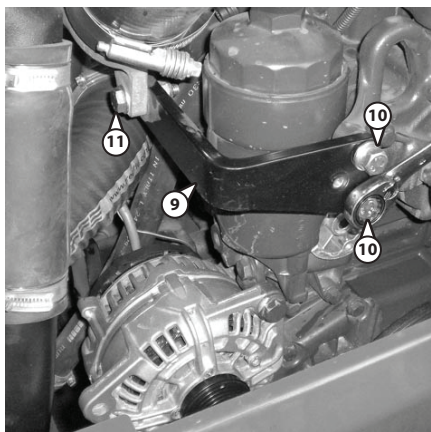


Reconnect the temperature sensor (Ref. 6) on the thermostatic valve (Ref. 2).

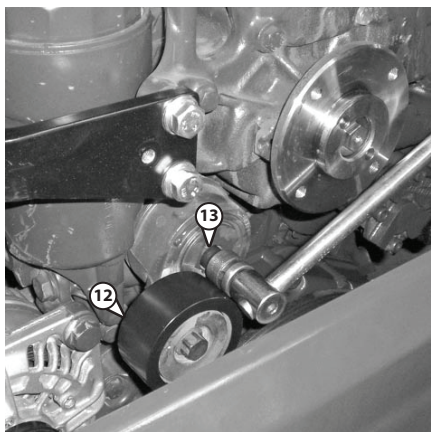




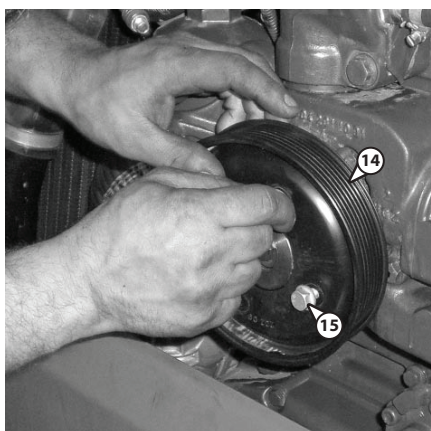
Refit the exhaust pipe (Ref. 7) on the thermostatic valve and tighten the clamp (Ref. 8).



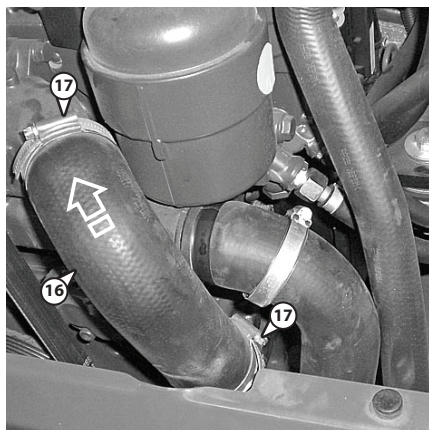
Refit the bracket (Ref. 9) on the air unit by means of the screws (Ref. 10 and 11).



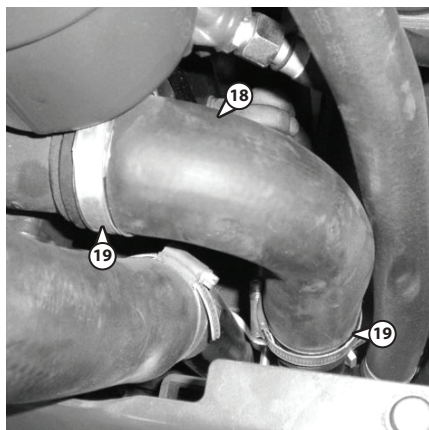
Refit the belt tightener (Ref. 12) by means of screws (Ref. 13) on which Loctite threadlock must be applied, using a 50 Nm tightening torque.



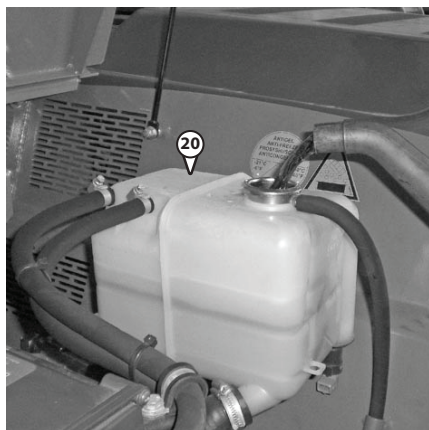
Refit the pulley (Ref. 14) by means of the screws (Ref. 15) on which Loctite threadlock must be applied.



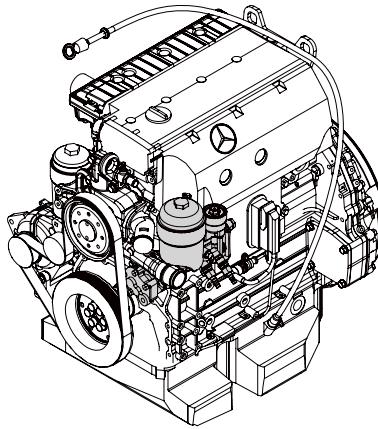
Reconnect the upper hose (Ref. 16) on the pump and screw the 2 clamps (Ref. 17) back on.



Reconnect the lower hose (Ref. 18) on the pump and screw the 2 clamps (Ref. 19) back on.



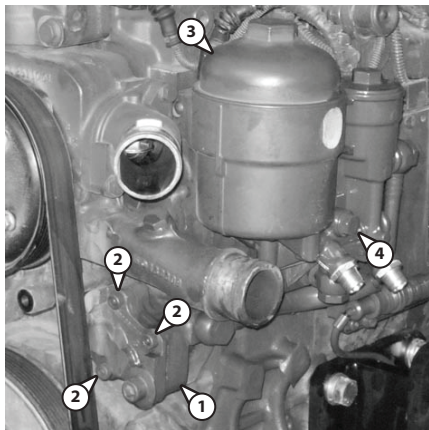
Fill the cooling system tank (Ref. 20) with the liquid concerned; the liquid level must be between the two notches indicating the minimum and maximum levels (approx. 18 litres). Remove the containers from under the engine compartment.



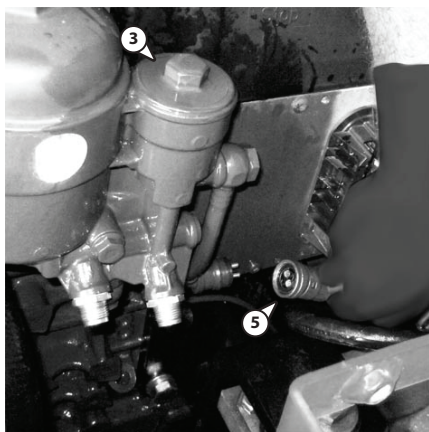
C - REINSERTING THE FUEL OIL FILTER AND PUMP

Reposition the fuel pump (Ref. 1) on the engine by means of the screws (Ref. 2).

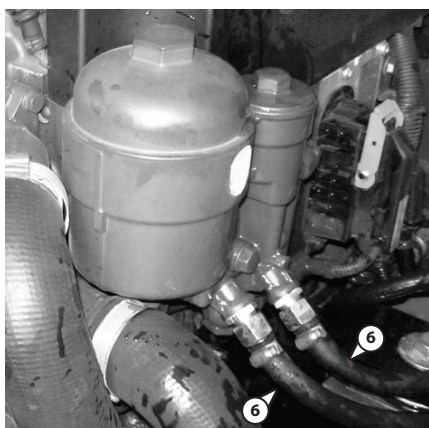
Reposition the fuel filter (Ref. 3) on the engine by means of the screws (Ref. 4).

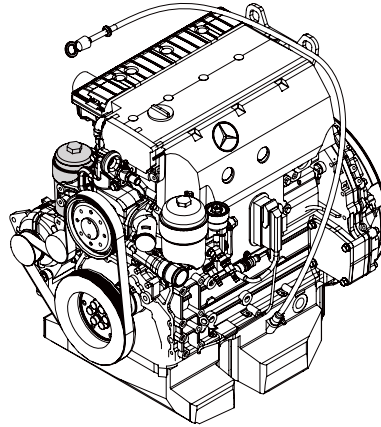


Reconnect the connector (Ref. 5) on the filter (Ref. 3).

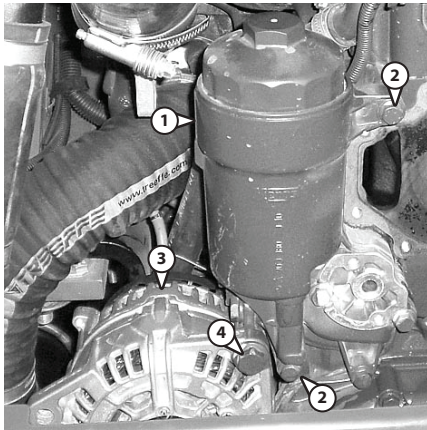


Reconnect the fuel inlet and outlet pipes (Ref. 6) to the filter (Ref. 3).



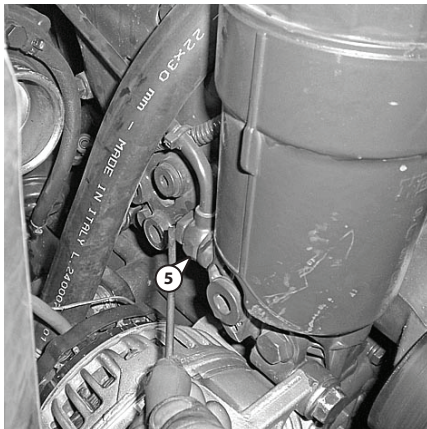


D - REINSERTING THE OIL FILTER

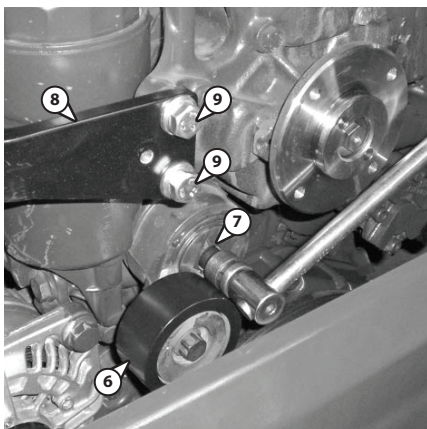


Reposition the filter (Ref. 1) on the engine supports by means of the screws (Ref. 2).

Restore the alternator (Ref. 3) to the correct position and tighten the screws (Ref. 4).

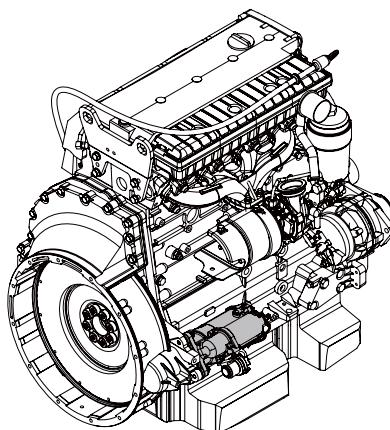


Release the oil inlet pipe (Ref. 5) from the clamp by means of which it is fixed in the disassembly phase and refit it on the filter (Ref. 1).



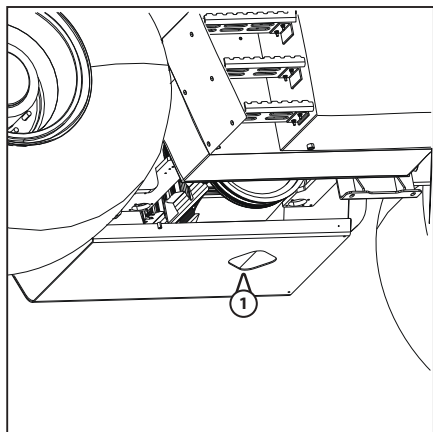
Reposition the tensioner (Ref. 6) using the screw (Ref. 7).

Reposition the bracket (Ref. 8) using the screws (Ref. 9).

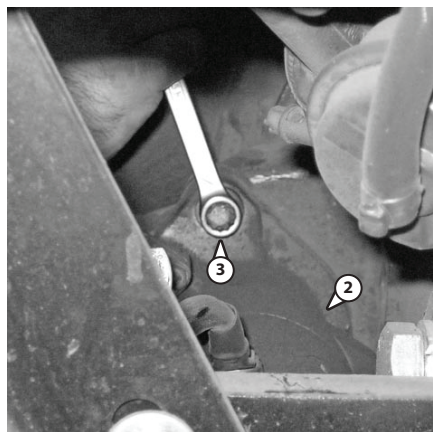


E - REINSERTING THE STARTER MOTOR

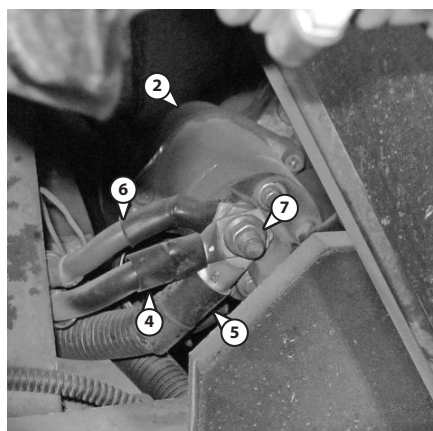
Reposition the starter motor by passing it through the slot (Ref. 1) under the engine compartment.

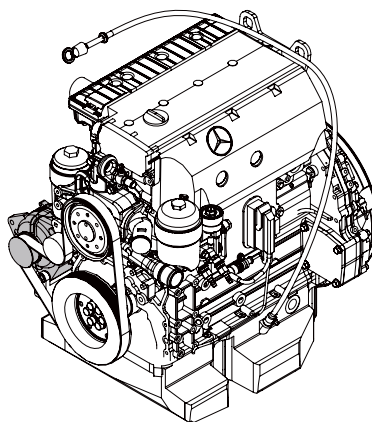


Refit the starter motor (Ref. 2) by means of the screws (Ref. 3) on the engine base.



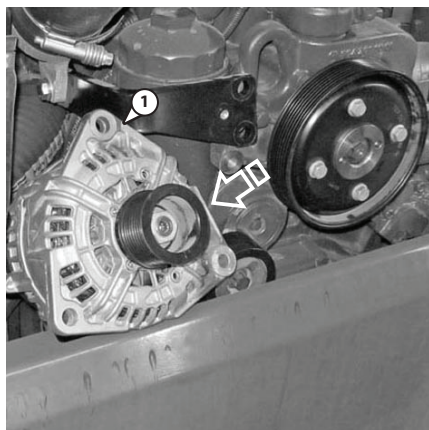
Reconnect the electric wires (Ref. 4-5-6) to the starter motor (Ref. 2), locking it by means of the nut (Ref. 7).



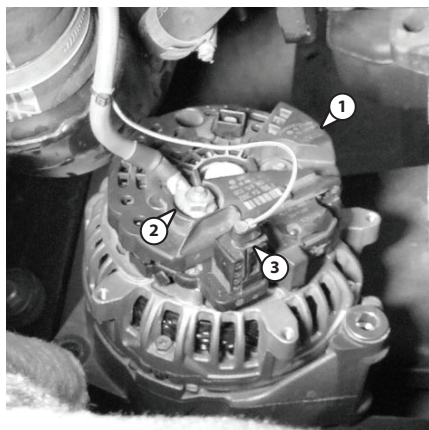


F - REINSERTING THE ALTERNATOR

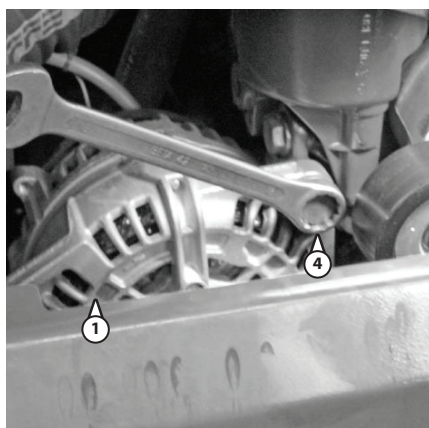
Reposition the alternator (Ref. 1).

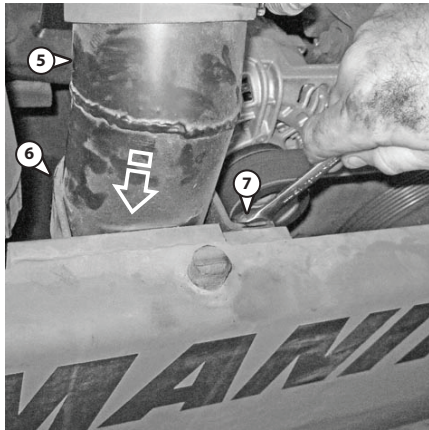


Reconnect the electric wires (Ref. 2 and 3) for connection to the alternator (Ref. 1).

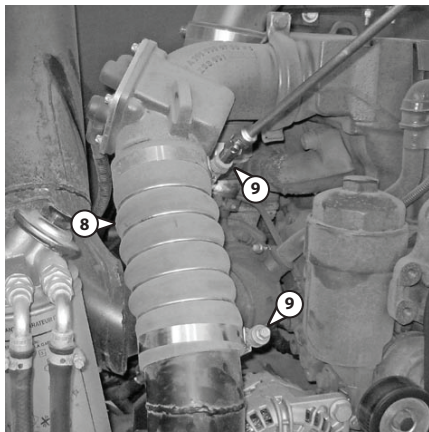


Block the alternator (Ref. 1) to the engine by means of the screws (Ref. 4).

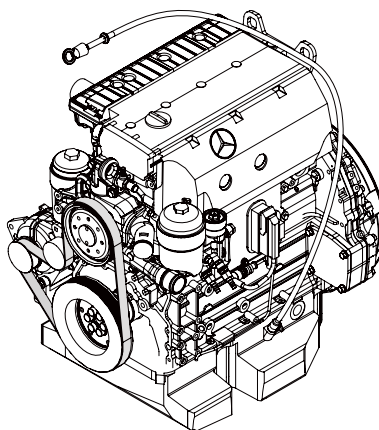




Block the air cooling radiator pipe (Ref. 5) by means of the bracket (Ref. 6), using the screws of (Ref. 7).



Refit the hose (Ref. 8) on the air cooling radiator pipe and tighten the clamps (Ref. 9).

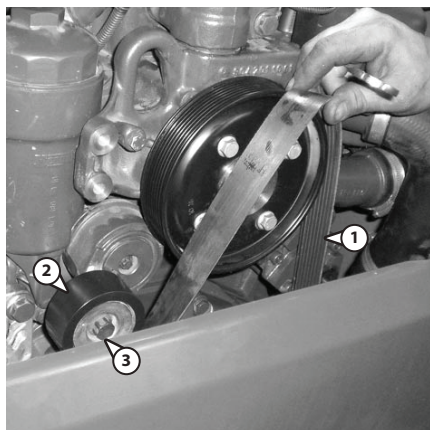


G - REINSERTING THE ALTERNATOR BELT

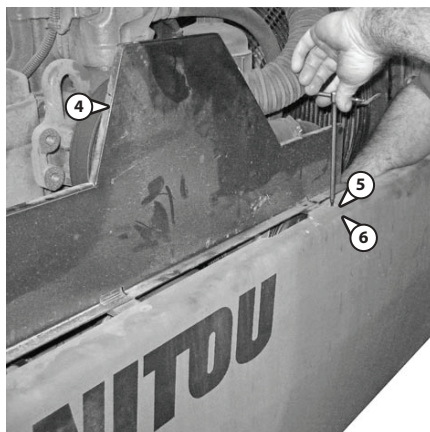
Refit the belt (Ref. 1) on all the pulleys with the exception of the belt tightener roller.

Lift the belt tensioner roller (Ref. 2) by means of a lever positioned on the screw (Ref. 3), apply the belt, then bring the belt tensioner roller backwards.

Remove the release lever and check to ensure the belt is housed correctly on the pulleys.



Refit the guard (Ref. 4) by means of the screws (Ref. 5) and nuts (Ref. 6).



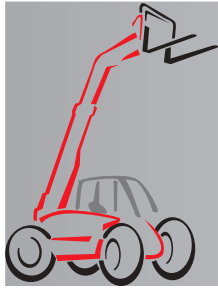
Close the hood (Ref. 7) of the engine compartment.



OPTIONS - ATTACHMENTS

- **OPTIONS - ATTACHMENTS
CHARACTERISTICS AND SPECIFICATIONS**
- **OPTIONS - ATTACHMENTS COMPONENTS
LOCATION**
- **OPTIONS - ATTACHMENTS CONTROL AND
ADJUSTMENT**



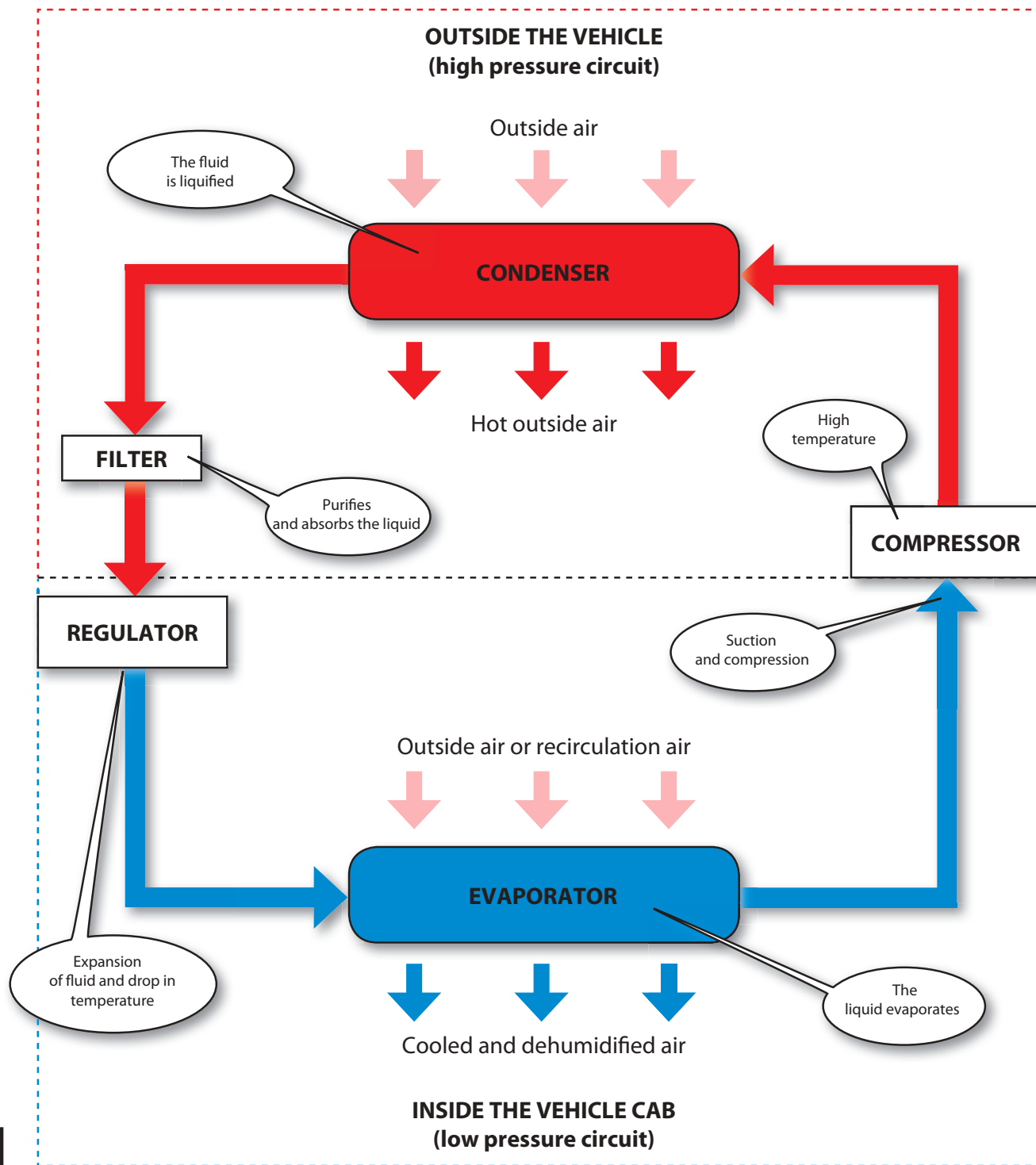


OPTIONS - ATTACHMENTS CHARACTERISTICS AND SPECIFICATIONS

	page
OPERATING PRINCIPLE	2
DESCRIPTION OF THE WORKING	3
FLUID CIRCUIT	4
DESCRIPTION OF THE COMPONENTS	5

AIR CONDITIONER

OPERATING PRINCIPLE



DESCRIPTION OF THE WORKING

The air conditioning system reduces the ambient temperature inside the vehicle cab, removing and dispersing the heat from inside towards the outside.

This heat exchange is made possible by using a coolant R134a, the properties of which make it possible to obtain very low temperatures at low pressure in expansion and the other way around, very high temperatures at medium pressure, by means of the compression process.

The properties of the fluid are used by following the cycle in a closed circuit the principle of which is:

Step 1: Compression

The fluid, in gaseous state at low pressure and low temperature, is sucked in and compressed by the compressor (Ref. 1) which sends it, at high pressure and high temperature, to the condenser.

Step 2: Condensation

The fluid passes through the condenser (Ref. 2) to transmit its heat, by means of a fan, outside the vehicle. When passing through the condenser, the fluid is liquified, maintaining a high temperature and high pressure. It is then filtered in a dehydrator (or drier) (Ref. 3).

Step 3: Release

The fluid enters an expansion valve (Ref. 4) in which it is subjected to very great reduction of the pressure and temperature, preserving the liquid state.

Step 4: Evaporation

The fluid flows through the evaporator (Ref. 5) to absorb heat from the air in the cab and vapourizes while at the same time maintaining a low pressure and temperature.

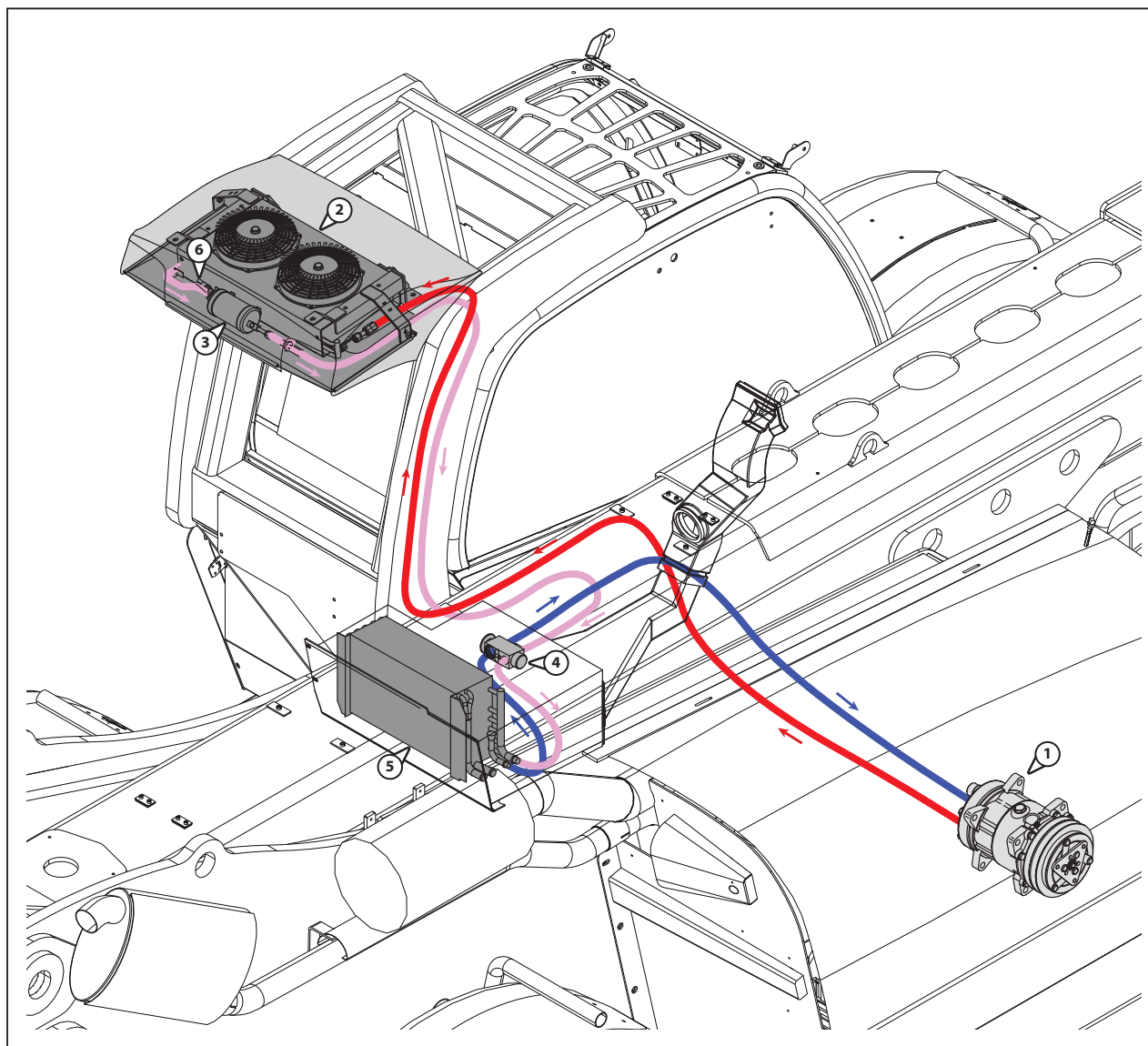
The air from the cab, pushed by the engine fan, cools and loses humidity in contact with the evaporator. The condensate from the air is then drained and discharged outside the vehicle.

The high and low pressure circuit is controlled by means of a pressure switch HP and LP (Ref. 6) fitted directly on the drier filter.

Its safety functions are as follows:

Complete stop of the air conditioner if the pressure drops below 2 bar or exceeds 27 bar.

FLUID CIRCUIT



- Fluid in gaseous state at high pressure and high temperature.
- Fluid in liquid state at high pressure and high temperature.
- Fluid in liquid state at low pressure and low temperature.

DESCRIPTION OF THE COMPONENTS

The compressor

The compressor (Ref. 1) is the organ which makes it possible to:

- convey the fluid through the suction circuit, in a gaseous state, from the evaporator at low pressure and low temperature.
- compress the fluid and transmit it at high pressure and temperature to the condenser.

The condenser

The condenser (Ref. 2) is a heat exchanger which transmits the heat recovered by the evaporator by means of the fan to the outside and causes condensation of the fluid at high pressure.

The receiver (or drier) filter

The filter (Ref. 3) is the main protective element of the system. Its functions are as follows:

- To filter out solid particles, if any, carried by the fluid, as they could damage the compressor or block the regulator.
- Dehumidify the fluid oil and protect the circuit elements from:
 - ⇒ corrosive agents,
 - ⇒ freezing of the moisture at the regulator outlet to prevent blocking of the system.
- Keep the fluid in the liquid state thereby forming a buffer tank to compensate for pressure variations, if any. It thus contributes to absorbing pressure variation that may be generated by the compressor.

The "binary" pressure switch (Ref. 6)

Connected to the receiver filter, it is the safety element of the plant, and is sensitive to pressure variations. It ensures safety of the system against very low pressure values or very high pressure values by acting directly on the compressor clutch:

- Action against low pressures (<2 bar) because of lack of coolant, a leak or a block in the circuit downline.
- Action against high pressures (> 27 bar) because of incorrect cooling of the condenser, excess coolant or a block in the circuit upline.

The expansion valve

The expansion valve (Ref. 4) is connected to the evaporator inlet.

- Expansion causes the pressure and temperature of the fluid to fall, thus cooling the air passing through the evaporator.
- The flow is regulated in such a manner as to calibrate the amount of fluid to make sure it is completely vapourized on coming out of the evaporator.

The evaporator

The evaporator (Ref. 5) is a heat exchanger provided with a valve and a fan.

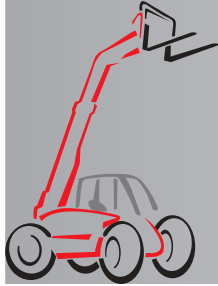
The fan sucks in air (cold) through the evaporator, the moisture in the air condenses on the evaporator fins, cools the air and pushes it out.

This heat exchange allows the coolant to evaporate at low pressure.

The antifreeze thermostat

The electric thermostat is connected to a probe fitted between two fins of the evaporator.

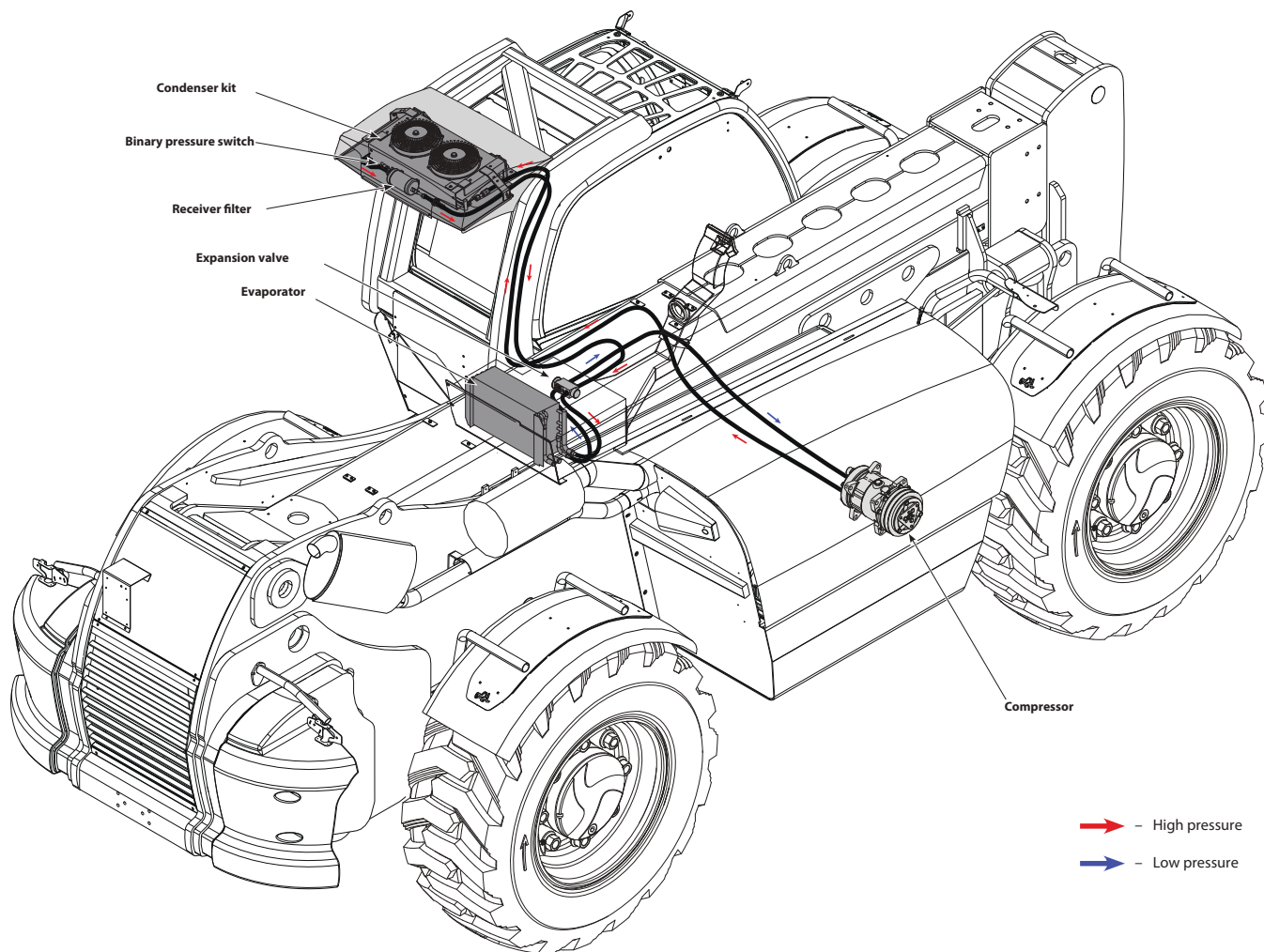
A temperature variation of the evaporator causes a variation in the resistance of the setting of the thermostat which acts on the compressor clutch relay.



OPTIONS - ATTACHMENTS COMPONENTS LOCATION

	page
POSITION OF AIR CONDITIONING COMPONENTS	3
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 10120 - 10160	4
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 10120 - 10160	5
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 UP TO VEHICLE 25061 - 760717, MHT 10210 UP TO VEHICLE 25668 - 761105	6
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 UP TO VEHICLE 25061 - 760717, MHT 10210 UP TO VEHICLE 25668 - 761105	7
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 STARTING FROM VEHICLE 25989 - 760997, MHT 10210 STARTING FROM VEHICLE 25989 - 760997 .	8
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 STARTING FROM VEHICLE 25989 - 760997, MHT 10210 STARTING FROM VEHICLE 25989 - 760997 .	9

POSITION OF AIR CONDITIONING COMPONENTS



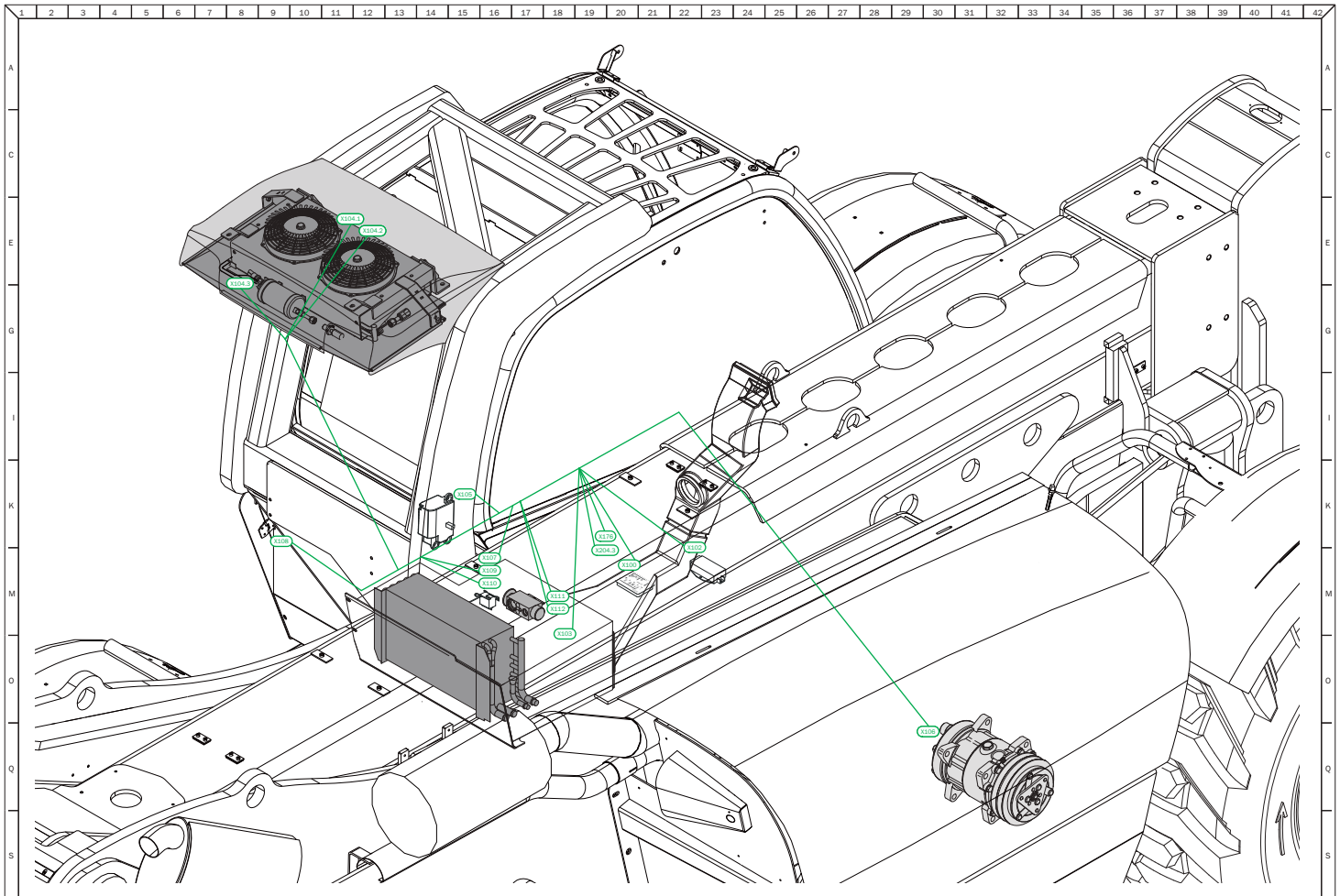
POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 10120 - 10160

Electrical connectors			
Ref.	Description	Position on the diagram	Observations
X100	Control unit connector	M20	
X102	Fans activation control unit connector	K22	
X103	Drier filter connector	M18	
X104.1	Solenoid valve 1 connector	E11 / E12	
X104.2	Solenoid valve 2 connector	E12	
X104.3	Air conditioning pressure switch	E8	
X105	Recirculation connector	K15	
X106	Compressor connector	Q30	
X107	Unit power supply connector	M16	
X108	External temperature sensor connector	K9	
X109	Fan connector	M16	
X110	Fan connector	M16	
X111	Mixer valve connector	M18	
X112	Mixer valve connector	M18	
X176	Heating panel	K19 / K20	
X204.3	Gnd	M19 / M20	

**POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 UP
TO VEHICLE 25061 - 760717, MHT 10210 UP TO VEHICLE 25668 - 761105**

Electrical connectors			
Ref.	Description	Position on the diagram	Observations
X100	Control unit connector	M20	
X102.p	Fans activation control unit connector	K22	
X102.s	Fans activation control unit connector	K22	
X103	Drier filter connector	M18	
X104.1	Solenoid valve 1 connector	E11 / E12	
X104.2	Solenoid valve 2 connector	E12	
X104.3	Air conditioning pressure switch	E8	
X105	Recirculation connector	K15	
X106	Compressor connector	Q30	
X107	Unit power supply connector	M16	
X108	External temperature sensor connector	K9	
X109	Fan connector	M16	
X110	Fan connector	M16	
X111	Mixer valve connector	M18	
X112	Mixer valve connector	M18	
X176	Heating panel	K19 / K20	
X204.3	Gnd	M19 / M20	

**POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 UP
TO VEHICLE 25061 - 760717, MHT 10210 UP TO VEHICLE 25668 - 761105**

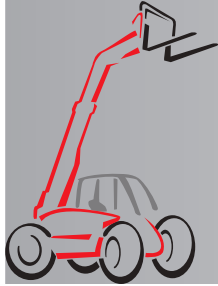


(07/03/2012)

110-03-M184EN

**POSITION OF AIR CONDITIONING ELECTRICAL CONNECTORS MHT 7140-990, MHT 10180 STARTING
FROM VEHICLE 25989 - 760997, MHT 10210 STARTING FROM VEHICLE 25989 - 760997**

Electrical connectors			
Ref.	Description	Position on the diagram	Observations
X100	Control unit connector	M20	
X102	Fans activation control unit connector	K22	
X103	Drier filter connector	M18	
X104.1	Solenoid valve 1 connector	E11 / E12	
X104.2	Solenoid valve 2 connector	E12	
X104.3	Air conditioning pressure switch	E8	
X105	Recirculation connector	K15	
X106	Compressor connector	Q30	
X107	Unit power supply connector	M16	
X108	External temperature sensor connector	K9	
X109	Fan connector	M16	
X110	Fan connector	M16	
X111	Mixer valve connector	M18	
X112	Mixer valve connector	M18	
X176	Heating panel	K19 / K20	
X204.3	Gnd	M19 / M20	
RL1		M19	
FUS.1		O18	
FUS.2		O19	
FUS.3		O18	
FUS.4		O19	



OPTIONS - ATTACHMENTS CONTROL AND ADJUSTMENT

	page
INSTRUCTIONS FOR ASSEMBLING THE AIR CONDITIONER	2
FEATURES OF COOLANT R134A	4
PRECAUTIONS FOR HANDLING R134A	4
FILLING COOLANT IN THE AIR CONDITIONING SYSTEM	5
FILLING METHOD	5
CHECKING THE WORKING	6
– AIR CONDITIONER CONTROLS	6
– ADJUSTING THE AIR CONDITIONING PRESSURES.....	9

AIR CONDITIONER

INSTRUCTIONS FOR ASSEMBLING THE AIR CONDITIONER

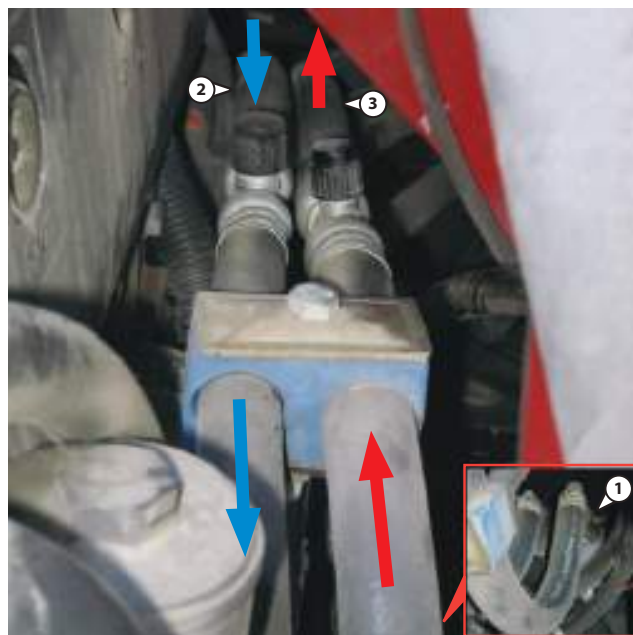
Carry out the assembling operations in a dry, dust-free area. Use PAG ISO 100 SP 20 COMPRESSOR oil for lubricating all the gaskets and sealing surfaces before assembly.

Description	Type	Tightening torque
Condenser outlet - filter inlet pipe	M6	16 N.m
Filter outlet - expansion valve inlet pipe	M6	16 N.m
Compressor outlet - cab inlet pipe	M8	25 N.m
Cab outlet - condenser inlet pipe	M8	25 N.m
Expansion valve outlet - cab inlet pipe	M10	33 N.m
Cab outlet - compressor inlet pipe	M10	33 N.m

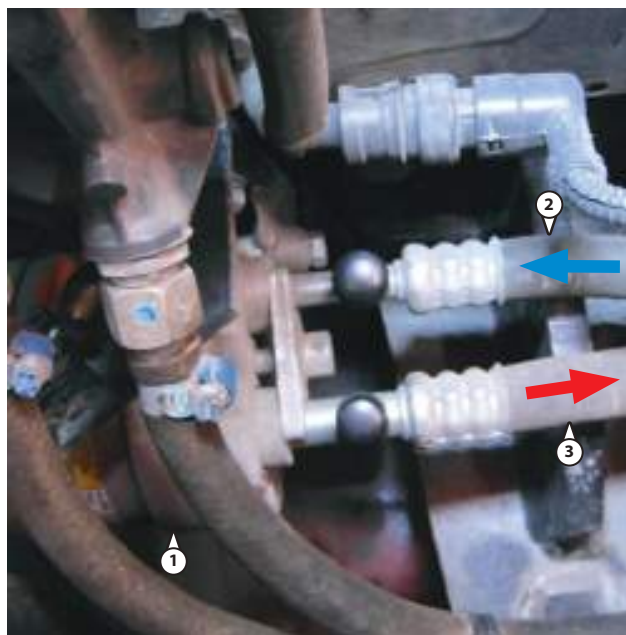
Compressor connection:

Legend:

- 1 - Compressor
- 2 - Cab outlet/compressor inlet pipe
- 3 - Compressor outlet/cab inlet pipe



Vehicle MHT 10120

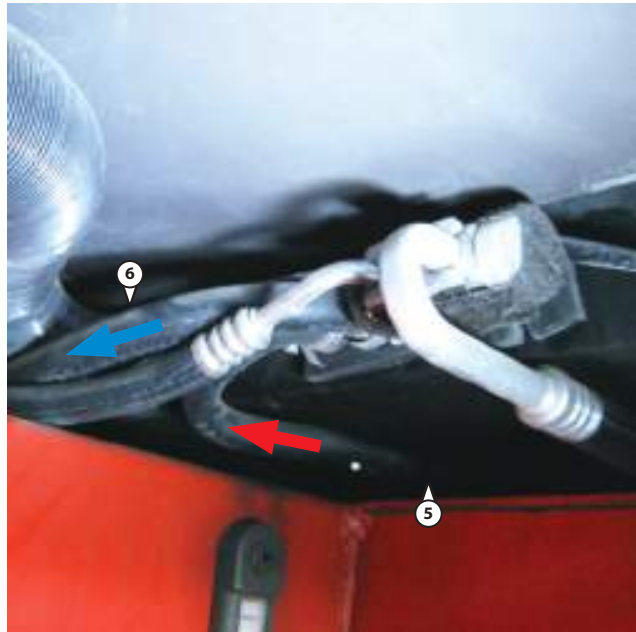
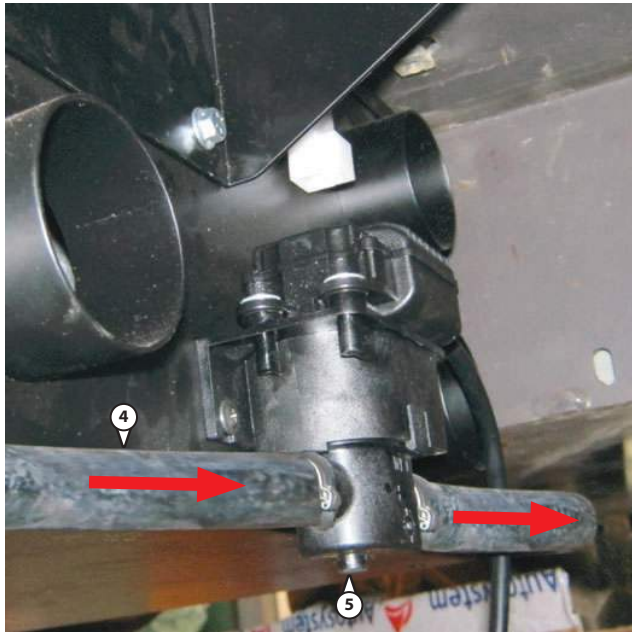


Vehicles MHT 7140 - 990 - 10160 - 10180 - 10210 - 10225

Connection to mixer valve:

Legend:

- 4 - Feed pipe
- 5 - Mixer valve
- 6 - Return pipe



FEATURES OF COOLANT R134a

Description	Hydrofluorocarbon
Use	Coolant
Chemical features	Tetrafluoroethane 134a
Chemical formula	CH ₂ F-CF ₃
Physical state	Liquified gas
Colour	Colourless
Odour	Slightly ethereal
Boiling point (at atmospheric pressure)	- 26.5 °C
Melting point	- 101 °C
Density at 25°C	1.21 kg/l
Critical pressure	40.7 bar
Critical temperature	+ 101 °C
Weight in vapour state	5 times heavier than air
1 kg in liquid state less than 1 bar	200 l in gaseous state
Solubility of water in product	0.097% in weight
Thermal decomposition	Starting from 110 °C
Hazardous decomposition products	Halides of hydrogen and traces of carbonyl halides
Hazardous reactions	With alkaline metals and alkaline-earth metal salts in powder form (Al-Zn-Be ...)
Flash point	Non-flammable (very stable)
Ignition temperature	Above 75 °C
Explosiveness limit	less than or more than none
Ozone depletion potential	None, ODP=0

PRECAUTIONS FOR HANDLING R134a

- 1 - Personal protection:** Safety goggles and rubber gloves.
- 2 - First aid:** In case of inhalation remove immediately to fresh air, administer oxygen and give artificial respiration depending on the degree of the emergency (do not administer drugs). Get medical attention. In case of contact with eyes, flush eyes with plenty of water for 15 minutes and get medical attention. In case of contact with the skin, flush with plenty of clean water and remove contaminated clothing.
- 3 - Storage conditions:** Store the R134a liquid in a cool, dry well-ventilated place.
- 4 - Handling:** Only in well-ventilated places.
- 5 - Accidental release measures:** In case of exposure of liquid R134a to fire, wear breathing apparatus.

FILLING COOLANT IN THE AIR CONDITIONING SYSTEM

Coolant:	R134a
Refilling equipment:	Refilling station
Quantity of fluid:	1200 gr $\pm$ 50 gr
PAG ISO 100 SP20 Oil:	No oil must be added. Just check to make sure there are 135ml of oil in the compressor.

FILLING METHOD

Before using a filling station, consult the relevant user handbook for the device.

Filling liquid in the circuit for the first time (duration 56 minutes)

- 1 - Connection of station to circuit (about 1 minute).
- 2 - Generation of vacuum in fluid circuit (minimum 45 minutes).
 - Reach vacuum pressure - 0.75 bar in 10 minutes at the most,
 - Maintain the vacuum pressure - 0.99 bar max dehumidification for at least 30 minutes,
 - Checking for leaks, at least 5 minutes.
- 3 - Filling operation (maximum 10 minutes).

Filling liquid after an operation (duration 90 minutes)

- 1 - Preparation (approx. 15 minutes).
 - Connect the station to the circuit.
 - Run the engine at 800 to 1200rpm.
 - At the same time start up the air conditioner at maximum speed.
 - Switch the vehicle off after 10 or 15 minutes.
- 2 - Recovery (approx. 15 minutes).

Has the purpose of recovering and recycling gas, oil and impurities present in the circuit.
Carry out the fluid recovery cycle from the station.
- 3 - Wait for 3 to 4 minutes to allow recovery of micro-freezers of oil and moisture.
- 4 - Bleed the recovered oil (about 1 minute).
- 5 - Steps 1, 2 and 3 can be repeated if pressure formation is noticed during steps 2 and 3.
- 6 - Generation of vacuum in fluid circuit (minimum 45 minutes).
 - Reach vacuum pressure - -0.75 bar in 10 minutes or less,
 - Maintain the vacuum pressure - 0.99 bar max dehumidification for at least 30 minutes,
 - Checking for leaks, at least 5 minutes.
- 7 - Filling operation (maximum 10 minutes).

Excess liquids (duration 15 minutes) with the vehicle engine running

- 1 - Preparation (approx. 10 minutes).
 - Connect the station to the circuit.
 - Run the engine at 800 to 1200rpm.
 - At the same time start up the air conditioner at maximum speed.
- 2 - Additional filling (approx. 5 minutes).

 ***In the open air, liquid R134a is a colourless odourless gas heavier than air and in certain conditions it can be hazardous for humans. Always recover the coolant from the refilling station.***

CHECKING THE WORKING

The following checks must be performed with the vehicle engine switched on.

AIR CONDITIONER CONTROLS

 ***The air conditioner works only when the telescopic lift is started up. With the air conditioner running, always work with the doors and windows closed.***

In winter: To ensure the correct working and complete efficacy of the air conditioning system, start up the compressor once a week, even if it is only for short periods, to allow lubrication of the internal gaskets.

At low temperatures: Heat the engine before starting up the compressor to allow the coolant in the liquid state, collected at the bottom of the compressor circuit, to get transformed into gas under the action of the heat given out by the engine; in the liquid state the coolant can damage the compressor.

 ***If the air conditioner is not working properly, have it checked by your dealer (see: 3 - MAINTENANCE: F - EVERY 2000 HOURS OF OPERATION). Never attempt to repair faults yourself.***



A - Control unit

Legend of functions:

- 1 - Decrease internal temperature
- 2 - Increase internal temperature
- 3 - Temperature indicator setting
- 4 - Indicator 1^a fan speed
- 5 - Indicator 2^a fan speed
- 6 - Indicator 3^a fan speed
- 7 - Fan speed increase command
- 8 - Fan speed decrease command
- 9 - Internal air temperature sensor
- 10 - °C / °F conversion and vice versa
- 11 - External temperature reading command
- 12 - Recirculation command
- 13 - Compressor exclusion
- 14 - Automatic function reset



To switch off the unit, press the «Fan speed reduction command» button (Ref. 8) to deactivate the fan completely; to switch it back on again, press the «Fan speed increase command» button (Ref. 7).

ERROR CODES

In case of a fault that affects the automatic regulation, the control unit displays an error code consisting of the letter **E** followed by a number which identifies the type of fault according to the following Table::

- E 1** external air temperature sensor (E.T.) interrupted.
- E 2** external air temperature sensor (E.T.) short circuit..
- E 3** cab air temperature sensor (I.T.) interrupted..
- E 4** cab air temperature sensor (I.T.) short circuit.
- E 5** mixed air temperature sensor (M.T.) interrupted.
- E 6** mixed air temperature sensor (M.T.) short circuit.

Since automatic regulation is not possible, the keys for increasing and decreasing the internal temperature are used to change the position of the mixer, while the fan speed is fixed at the 2^a speed.

If the error is solved, the control unit resumes normal operation only after resetting the + key.

AIRCONDITIONING PLANT – CHECKING THE WORKING

Electronic control of the temperature (E.AC.C.)

To check to ensure the correct working of the heating and cooling system, make sure the engine is started up with the hoods closed, at ambient temperature between +15°C and 30°C and the engine cooling fluid sufficiently hot.

If the ambient temperature is higher or lower than these values, the system automatically adjusts itself in the maximum cooling or maximum heating conditions.

1 - Checking the water regulator valve

Press the cab internal temperature increase/decrease button, the water regulator valve shifts to the maximum heating **HI** or maximum cooling **LO** condition.

Make sure the mixed air temperature changes accordingly.

2 - Checking the mixed air temperature sensor

If the sensor is defective, the following error codes appear on the display:

E5 = Mixed air temperature sensor (MT) open.

E6 = Mixed air temperature sensor (MT) short circuit.

3 - Checking the cab internal air temperature sensor

If the sensor is defective, the following error codes appear on the display:

E3 = Internal air temperature sensor (IT) open.

E4 = Internal air temperature sensor (IT) short circuit.

4 - Operating the compressor

On pressing the ECON button, the relative LED lights up and switches off alternately and the compressor is activated and deactivated, respectively, by means of the electromagnetic clutch.

5 - External air inlet and recirculation command

On pressing the Recirculation button, the relative LED lights up indicating the condition of ventilation with recirculating air. On pressing the recirculation button again, the LED switches off indicating the condition of ventilation with external air inlet.

6 - Fan speed command

The cab ventilation can be adjusted at three fan speeds: minimum, medium and maximum.

7 - °C and °F selection

When the relative LED is Off, the temperature is indicated in °C, when the LED is On the temperature is read in °F (Fahrenheit).

The maximum cab temperature value setting is 37°C or 99°F.

8 - External temperature sensor connector

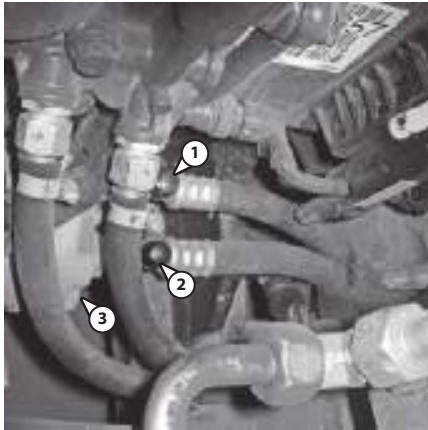
On pressing the external temperature button (Ref. 11), the external temperature value appears on the display.

If the sensor is defective, the following error codes appear on the display:

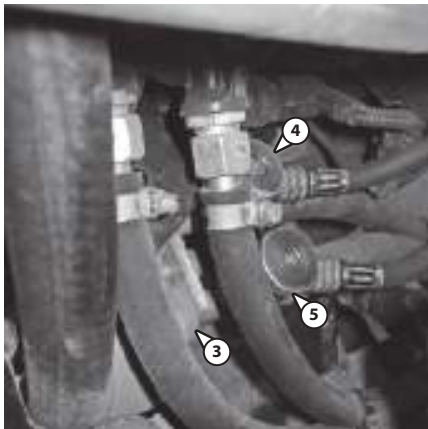
E1 = External air temperature sensor (ET) open.

E2 = External air temperature sensor (ET) short circuit.

ADJUSTING THE AIR CONDITIONING PRESSURES



Remove the caps (Ref. 1 and 2) on the compressor connections (Ref. 3).

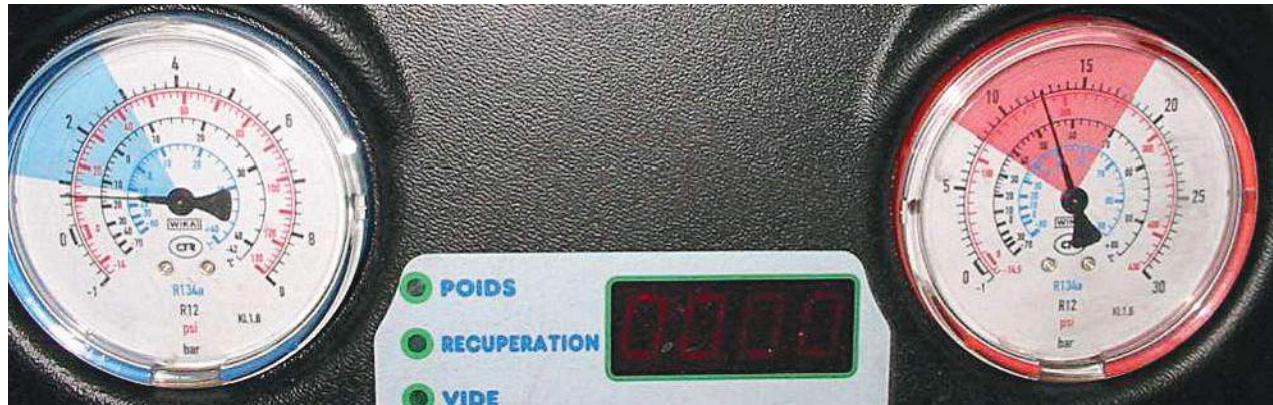


Connect the high pressure (Ref. 4) and low pressure (Ref. 5) pipes of the refilling station on the compressor (Ref. 3).

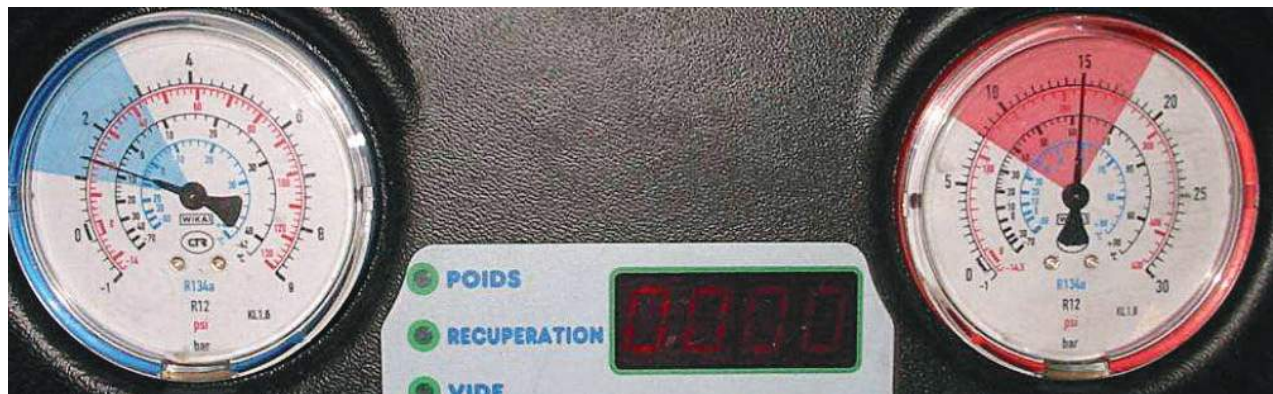
- Start up the vehicle engine.
- Switch on the air conditioner as follows:
 - Select air diffusion speed "I" by means of the fan knob.
 - Press the air conditioning switch so that the LED lights up.
 - Adjust the temperature regulation knob to maximum cold
 - Open all the diffuser spouts.
 - Set minimum speed (approx. 800 rpm)
 - Wait for at least 5 minutes to allow the circuit to stabilize.
 - Check the low pressure **LP** and high pressure **HP** values of the circuit to make sure they are between:
- 0.5 bar and 2 bar in low pressure **LP**,
- 6 bar and 20 bar in high pressure **HP**,

Examples:

LP=0.8 bar and **HP**=12.5 bar.



LP=1.4 bar and **HP**=15 bar.



Note:

These values are indicative and can change according to the ambient temperature and the type of vehicle.

TRANSMISSION

- **TRANSMISSION SCHEMATIC DIAGRAMS**
- **TRANSMISSION COMPONENTS LOCATION**
- **TRANSMISSION CONTROL AND ADJUSTMENT**
- **TRANSMISSION REMOVAL**
- **TRANSMISSION REFIT**
- **SPECIFIC TRANSMISSION TOOLING**



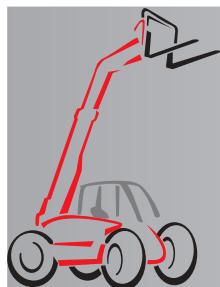
- **TRANSMISSION CHARACTERISTICS AND SPECIFICATIONS**
- **TRANSMISSION CONTROL AND ADJUSTMENT**

 **647030DE/EN**
(PUMP SERIES A4VG)

 **647031FR/EN**
(ENGINE A6VM SERIE 63)

 **647375**
(GEAR DANA SERIES 360/59)

 **647379**
(GEAR DANA SERIES 357/216)



TRANSMISSION SCHEMATIC DIAGRAMS

20

page

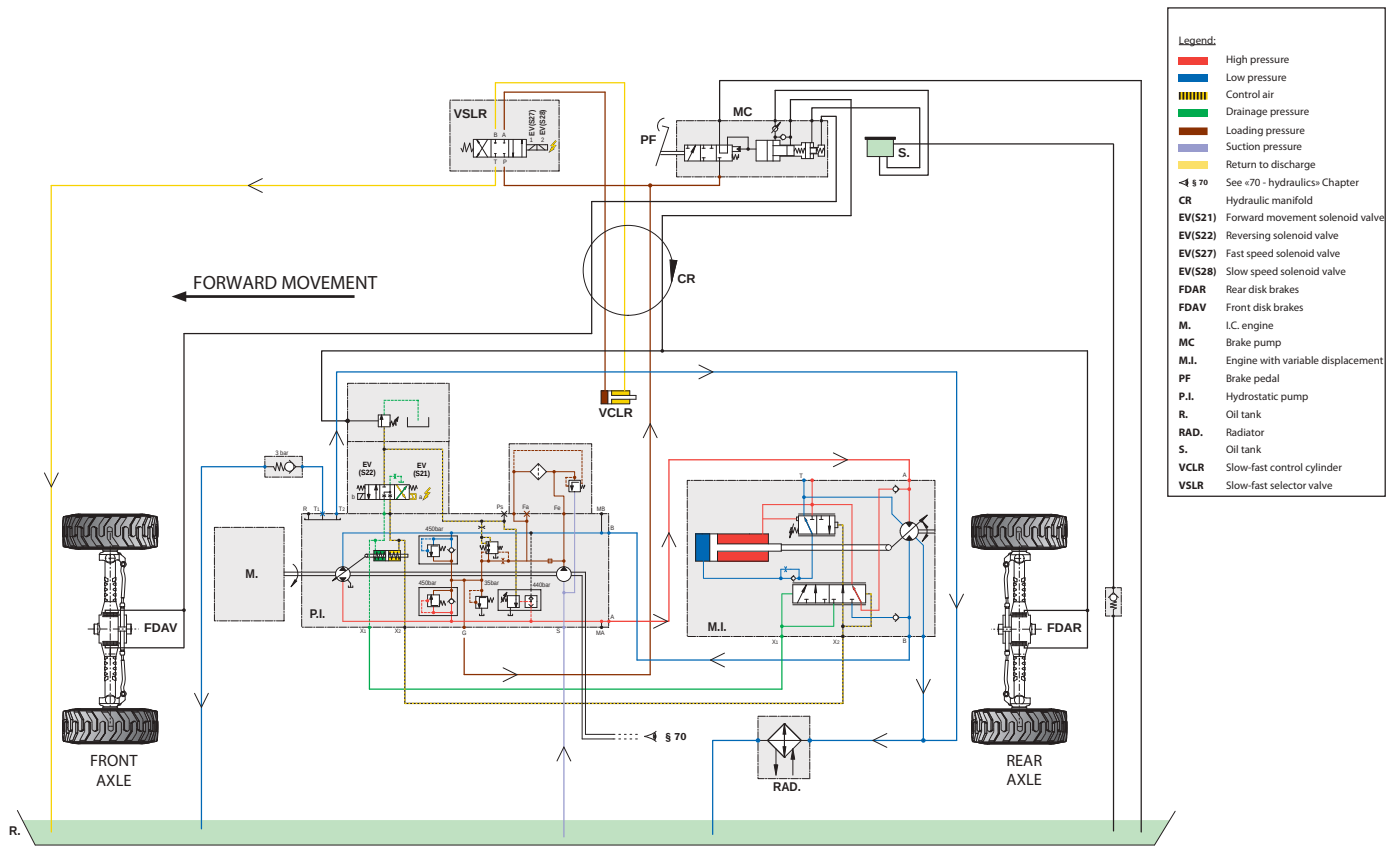
REXROTH HYDROSTATIC TRANSMISSION LAYOUT FORWARD MOVEMENT . . . 3

REXROTH HYDROSTATIC TRANSMISSION LAYOUT REVERSING MOVEMENT . . . 4

REXROTH HYDROSTATIC TRANSMISSION LAYOUT FORWARD MOVEMENT

TRANSMISSION SCHEMATIC DIAGRAMS

3



(06/06/2012)

20-02-M184EN

