

64 Heating and air conditioning

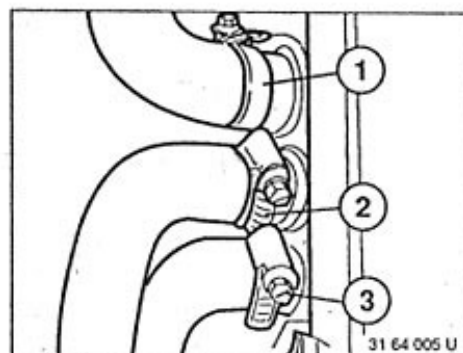
64 11 205	Heater (IHKA) – remove and install	64-	11/1
207	Heater core – replace	64-	11/3
210	Heater blower motor – remove and install	64-	11/4
260	Additional water pump – replace	64-	11/7
271	Water valve – remove and install (refer to 64 11 260)	64-	11/7
355	Blower for inside sensor – remove and install	64-	11/8
590	Blower final stage – replace	64-	11/9
750	Heater controls – remove and install and disassemble	64-	11/10
755	Face panel – replace	64-	11/11
63 99 . . .	Light bulb for heater controls – replace	64-	11/11
64 11 765	Heating control unit – replace	64-	11/12
64 31 010	Microfilter – replace	64-	31/1
	Refrigerant circuit	64-	50/1
	Service station (R 12)	64-	50/2
64 50 009	Air conditioner – discharge and charge	64-	50/3
	Air conditioner – suck out refrigerant	64-	50/4
	Discharging air conditioner	64-	50/5
	Charging air conditioner	64-	50/6
	Detecting leaks	64-	50/6
	Cleaning refrigerant	64-	50/7
	Troubleshooting with help of pressure test	64-	50/8
	Air conditioner power test	64-	50/9
	Function of refrigerant circuit	64-	50/10
	Service device (SECU 134)	64-	50/11
64 50 009	Air conditioner – evacuate and charge	64-	50/12
	Air conditioner – draw off fluid	64-	50/13
	Air conditioner – evacuate	64-	50/14
	Charging the system	64-	50/15
	Perform leak check	64-	50/16
	Cleaning refrigerant	64-	50/17
	Troubleshooting using pressure measurement	64-	50/18
	Air conditioner power check	64-	50/19
64 51 000	Evaporator – clean	64-	51/1
510	Evaporator – remove and install	64-	51/2
64 52 020	Compressor for air conditioner – replace	64-	52/1
061	Compressor coupling – replace	64-	52/2
64 53 510	Drier flask for air conditioner – remove and install/replace	64-	53/1
550	Condenser for air conditioner – remove and install/replace	64-	53/2
	Function of leakage sensor	64-	90/1

64 11 205 REMOVING AND INSTALLING HEATER (IHKA)

Draw refrigerant out of air conditioner (see operating instructions of pertinent equipment).

Remove complete dashboard – see Group 51.

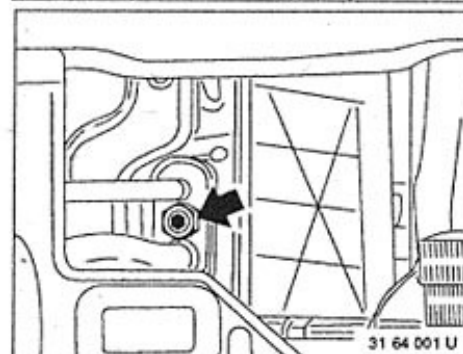
Remove complete wiper console – see Group 61.



Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

Note:

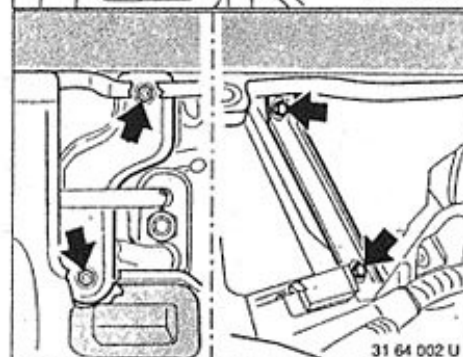
Clean heater pipes with compressed air carefully to prevent coolant in the passenger compartment while removing the heater.



Unscrew nut.

Installation:

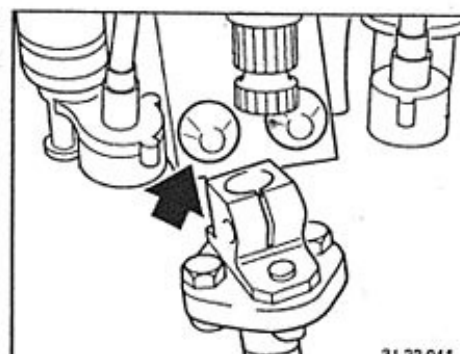
Tightening torque*.
Replace O-rings.



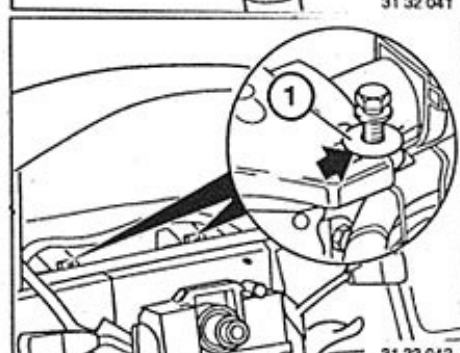
Unscrew left and right bolts.

Note:

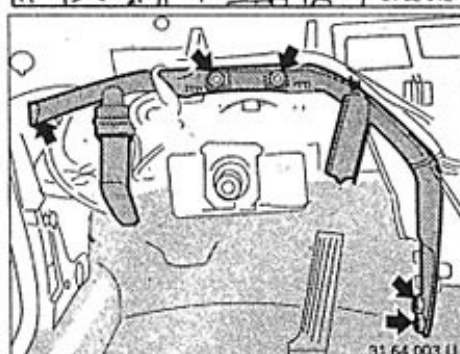
Only the right bolts are shown in the picture.



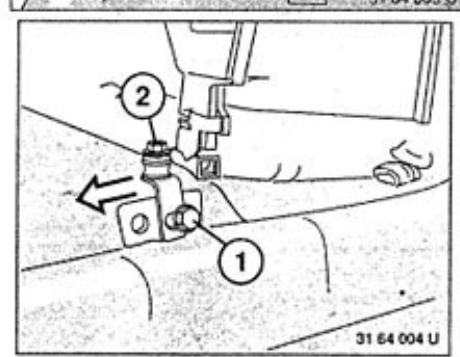
Remove shear-off screw from steering column.



Unscrew screws and lower steering column.

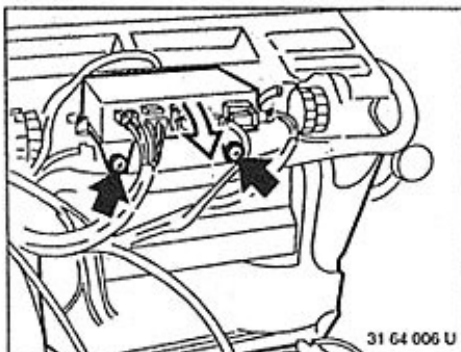


Unscrew screws and pull clamp forward slightly.

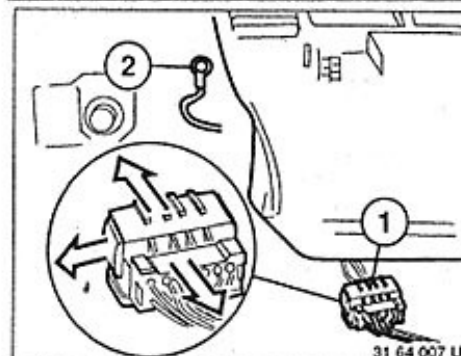


Unscrew screw (1) and nut (2) on left and right sides and pull out brackets.

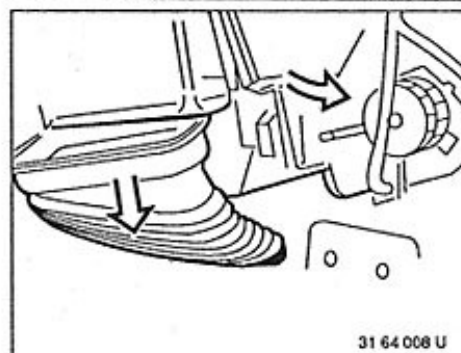
* See Specifications



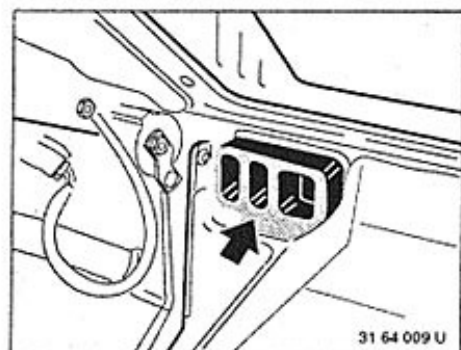
Unscrew screws and place control unit for electric steering column control aside.



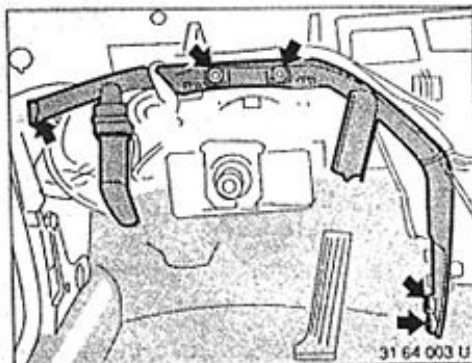
Disconnect plug (1).
Unscrew ground lead (2).



Lift out left and right air ducts.
Remove heater.

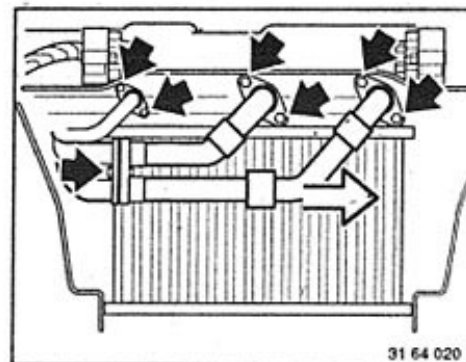


Installation:
Brush out pipe opening with tire mounting paste.



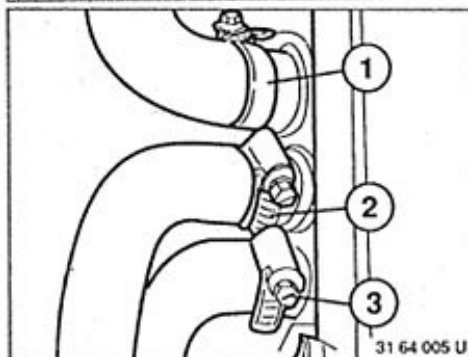
64 11 207 REPLACING HEATER CORE

Remove complete dashboard – see Group 51.



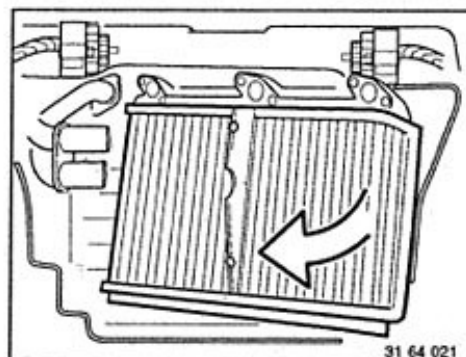
Loosen screws and take off heater pipes.

Installation:
Replace O-rings.

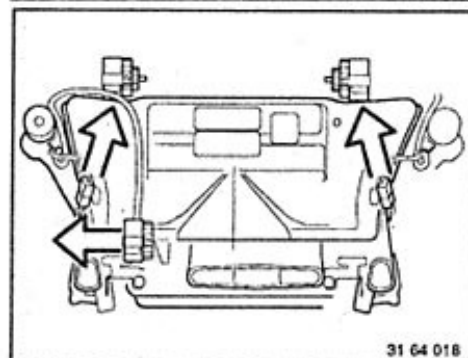


Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

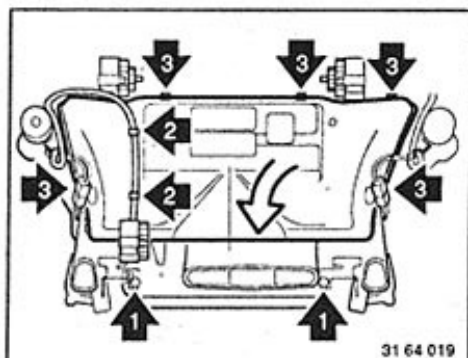
Note:
Blow through heater pipes with compressed air carefully to keep coolant out of the passenger compartment when removing the heater core.



Lift out heater core from the right side.

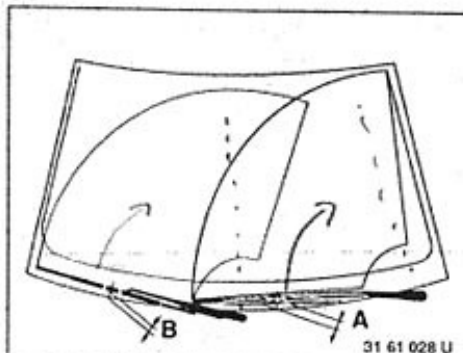


Pull off plugs on both inside temperature sensors.

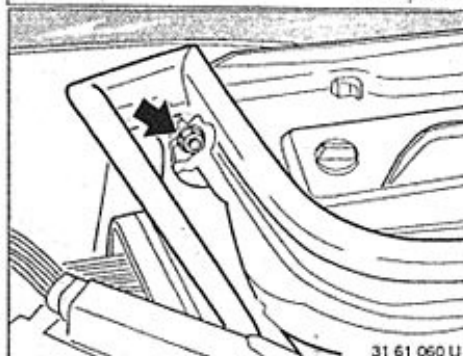


Unscrew screws (1).
Loosen cable strap (2) and retainers (3).
Take off cover.

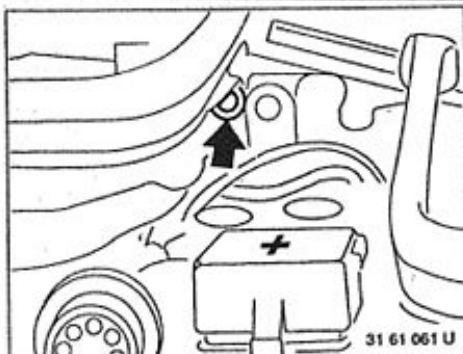
Installation:
Check for correct seating of cover to prevent uncontrolled wind noise.



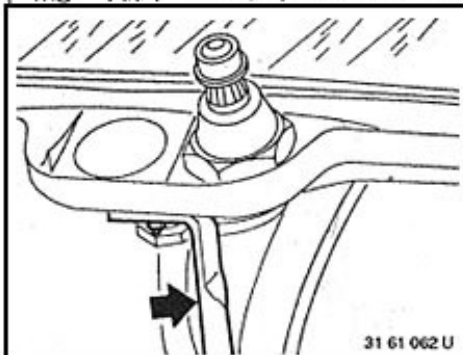
31 61 028 U



31 61 060 U



31 61 061 U



31 61 062 U

64 11 210 REMOVING AND INSTALLING MOTOR FOR HEATER (BLOWER)

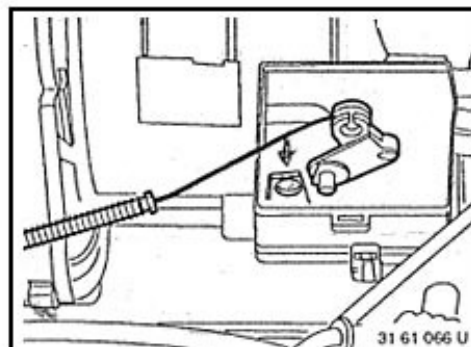
Run wipers to parked position.
Switch off from wiper speed 1.
Remove windshield wiper arms – see 61 61 100.

Important!

Set air volume control wheel to zero and switch ignition on and off before disconnecting the cable, in order to have the drive motor close the air flaps. Disconnect battery ground leads.

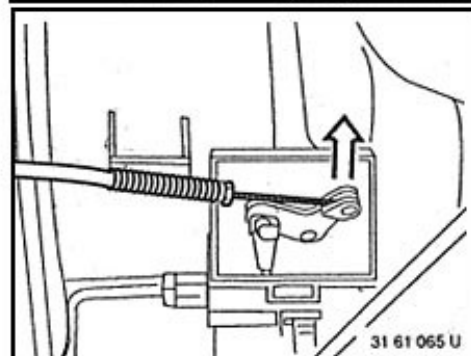
Unscrew screw.
Take of air box cover.

Unscrew screw.
Pull out air box from above.



31 61 066 U

Remove prop.

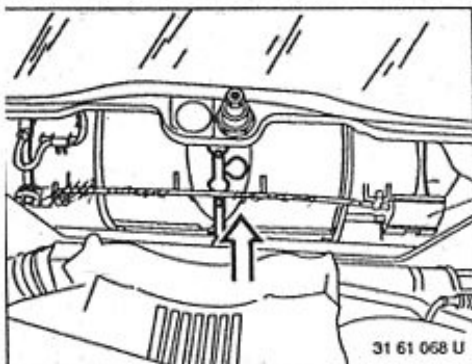


31 61 065 U

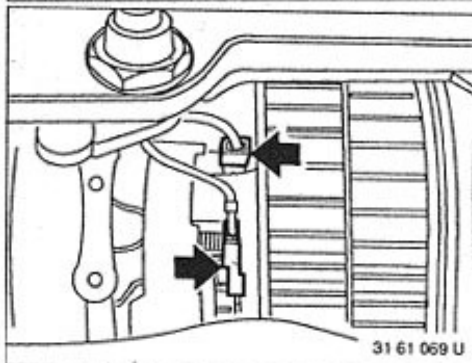
Disconnect cables fully.

Disconnect linkage.

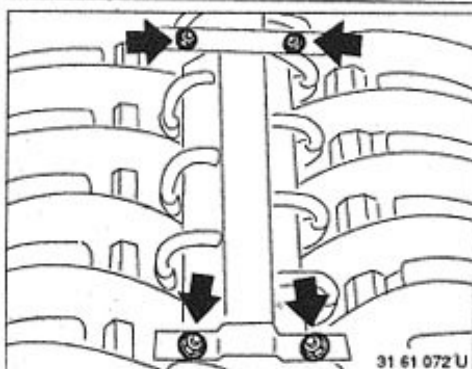
Disconnect cable.



Pull temperature sensor out of eyelet.

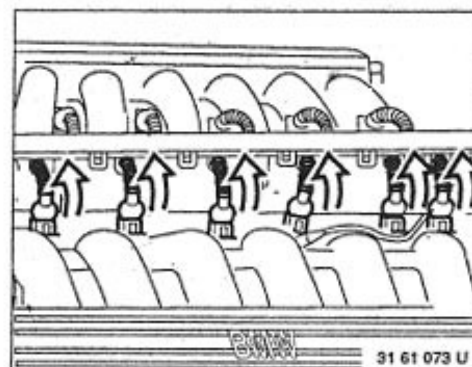


Take off retaining strap.

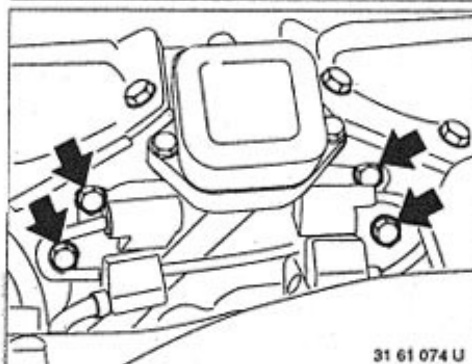


Remove cover.
Pull plug off of blower.
Remove cover on fuel injectors.

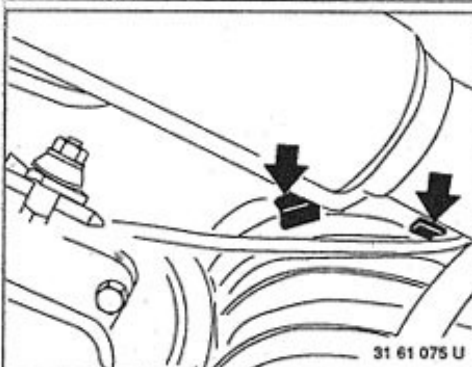
Unscrew electric lead duct of fuel injectors.
Unscrew screws.



Disconnect leads of fuel injection plate on right side.

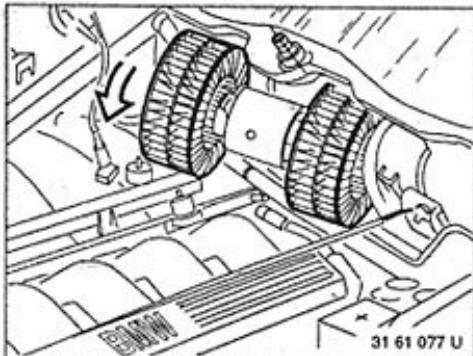


Unplug pulse and TDC senders.
Unscrew bracket.

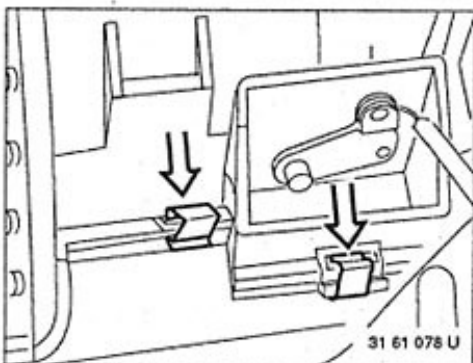


Unclip leads to the oxygen sensors in holders on bottom of the transmission bell housing.

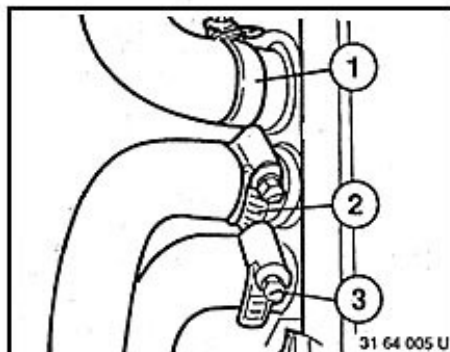
Unclip leads on firewall.
Clips are located underneath electric lead duct of electronic box for fuel injectors.



Tie electric lead duct of fuel injectors aside.



**Remove blower.
Insert an approx. 2 mm (0.079") thick
mandrel in retaining strap of the
blower motor and pry out retaining
strap.**



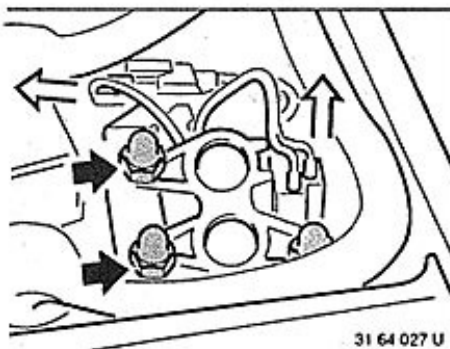
64 11 260 REPLACING ADDITIONAL WATER PUMP

Remove air box – see 64 11 210.
Loosen hose clamps on heater hoses (1 ... 3) and pull off hoses.

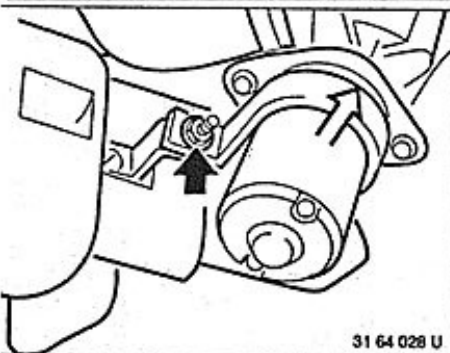
Disconnect feed hose on additional water pump.

64 11 271 REMOVING AND INSTALLING WATER VALVE

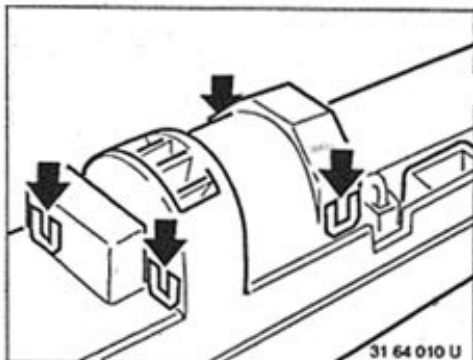
See 64 11 260.



Pull off plug.
Unscrew screws and lift out water valve complete with pump.



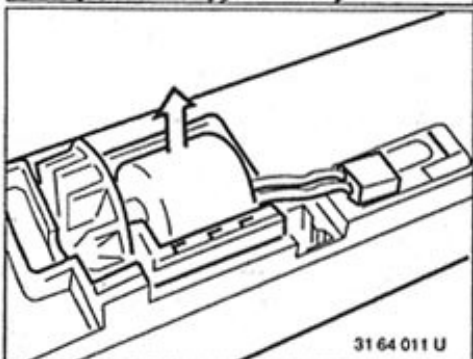
Loosen clamp and unscrew screw.
Remove pump.



**64 11 355 REMOVING AND INSTALLING
INSIDE SENSOR BLOWER**

Remove heater controls – see
64 11 750.

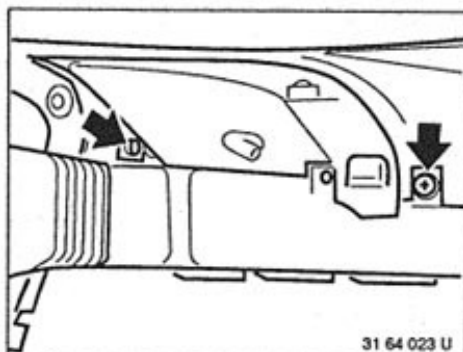
For removal of the sensor blower lift re-
tainers on cover slightly and take off
the cover.



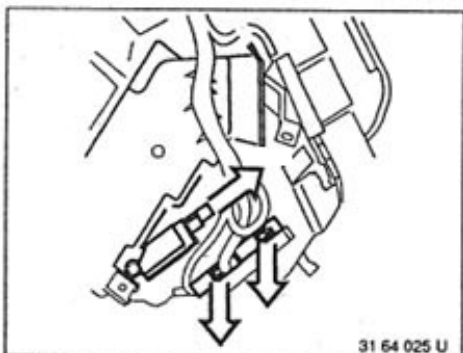
Pull off plug and take out sensor
blower.

64 11 590 REPLACING FINAL STAGE FOR BLOWER

Remove glove box - refer to Group 51.
Check the final stage prior to replacing it - refer to Car Electric/Electronic Test Plan.

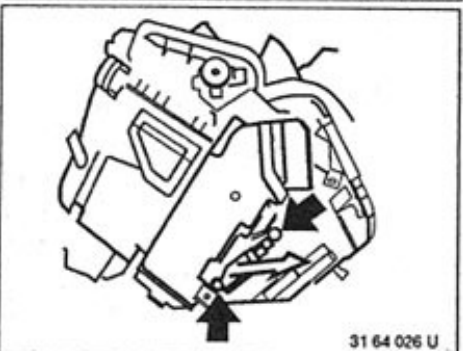


Unscrew screws and lift air duct out.

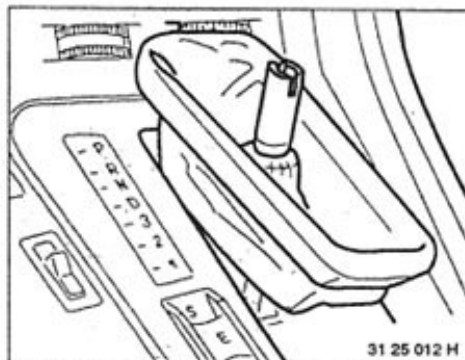


Pull wires off of control unit and final stage.

Note:
Heater remains installed and was removed for this picture only for better understanding.



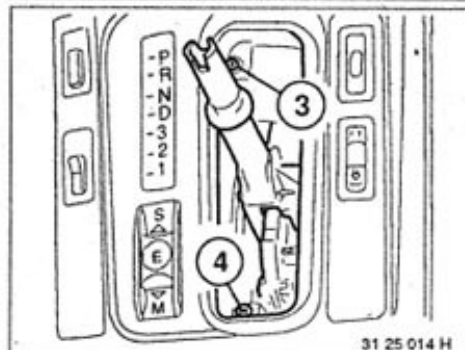
Unscrew screws and pull final stage out.



64 11 750 DISASSEMBLING AND ASSEMBLING HEATER CONTROLS

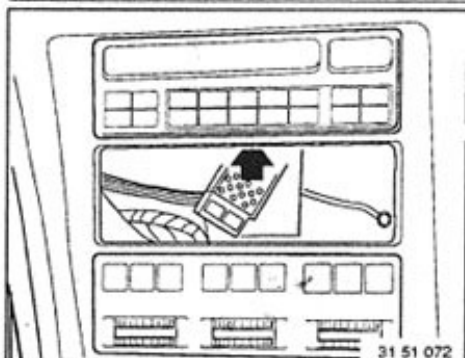
Unclip and pull cover upwards.

Note:
Selector lever handle remains installed.

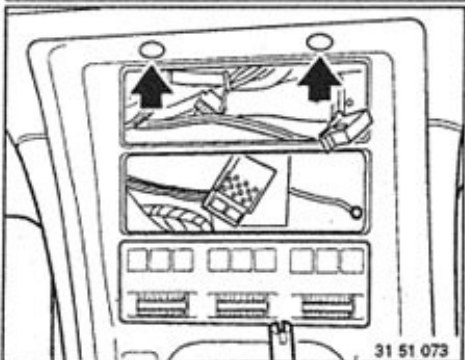


Unscrew screws (3 and 4) and lift cover out upwards.
Disconnect plug.

Note:
Only screw (4) is installed in cars with manual transmission.

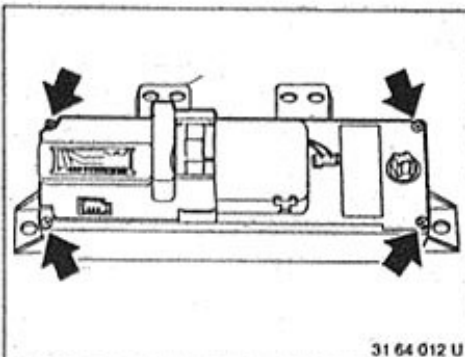


Remove mask for radio opening or radio - refer to Group 65.
Press clip in at middle and pull the multi-function display out.
Disconnect plug.



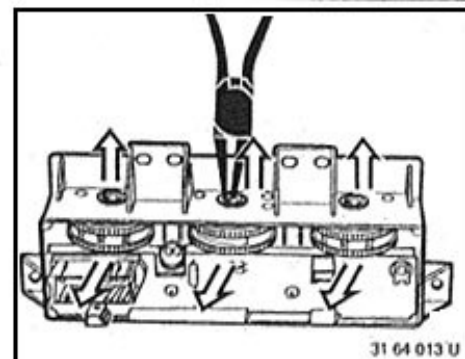
Lift caps out.
Unscrew screws and lift trim panel.
Disconnect plugs from heater controls.

Unscrew control unit at trim panel.



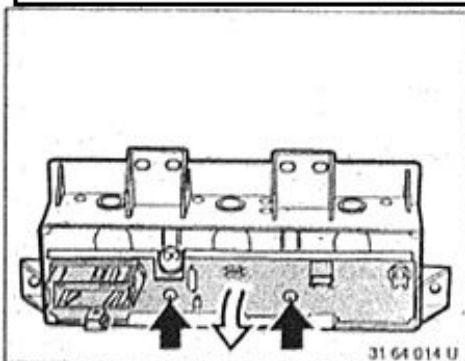
64 11 755 REPLACING FRONT PANEL

Remove heater controls – see 64 11 750.
Unscrew screws and take off cover.

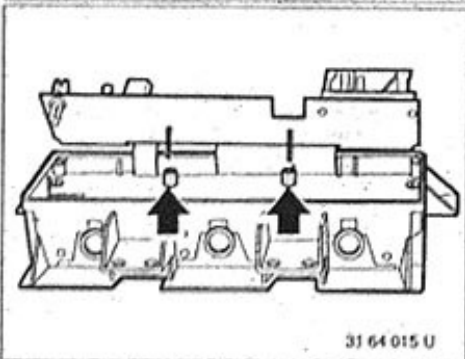


Push back retainers on pins and pull out pins and control wheels.
Pull off push button from front.

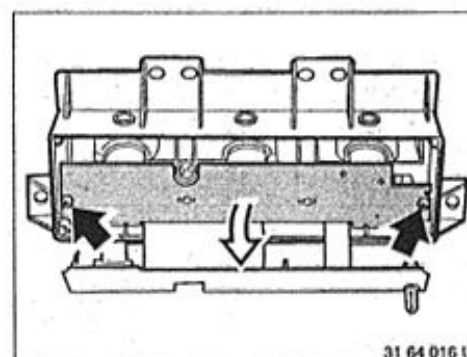
Installation:
Check for correct positioning of control wheels to potentiometers.



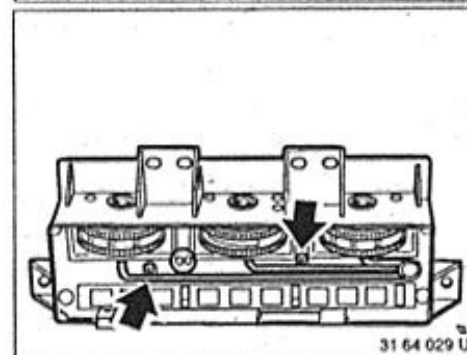
Unscrew screws and fold up upper printed circuit board section.



Don't forget the spacers when installing.



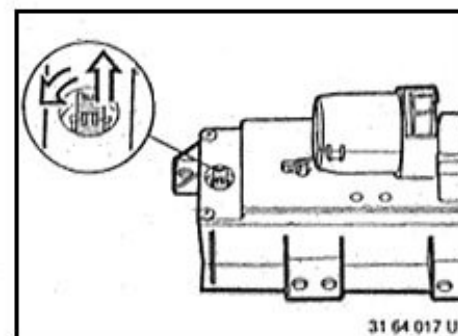
Unscrew screws and remove both printed circuit boards.



63 99 ... REPLACING LIGHT BULB FOR CONTROL PANEL

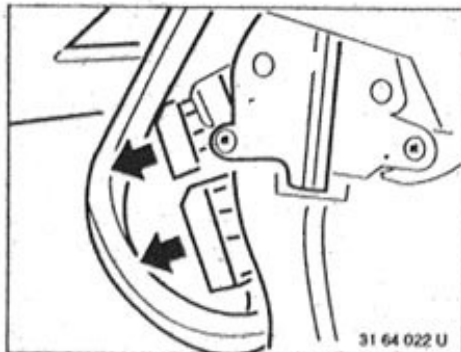
Remove plate for center console – see Group 51.

Twist and remove bulb holder.

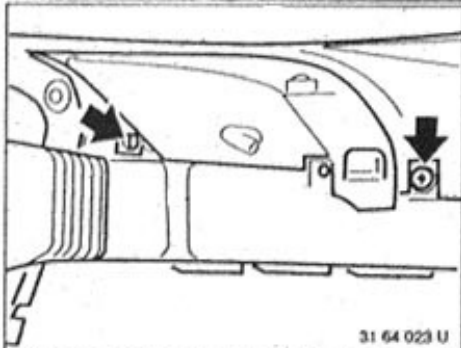


**64 11 765 REPLACING CONTROL UNIT
FOR HEATER**

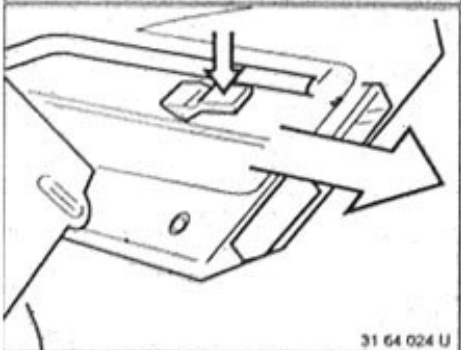
First check the control unit prior to removal – see 64 10 010.



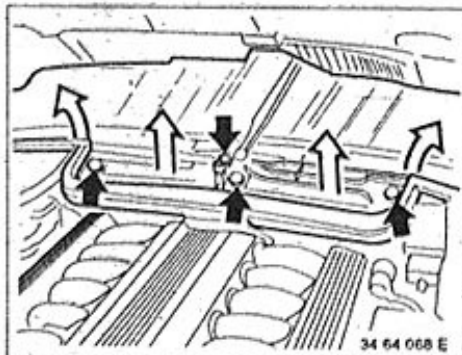
Pull off left and right plugs on control unit.



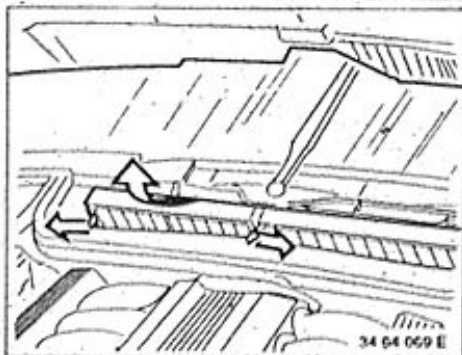
Unscrew screws and lift out air duct.



Press down on retainer and pull out control unit.

**64 31 010 REPLACING MICROFILTER**

Run wiper arm to upright position.
Unscrew screws.
Lift rubber seal slightly at side and lift
cover out upwards.



Spread clips apart on left and right sides.
Tilt microfilter forward and pull it out
upwards.

DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION

After switching on the air conditioner the refrigerant circuit is activated in that the solenoid clutch receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 6 to 10 grams for R 12 or 10 to 16 grams for R 134 a systems.

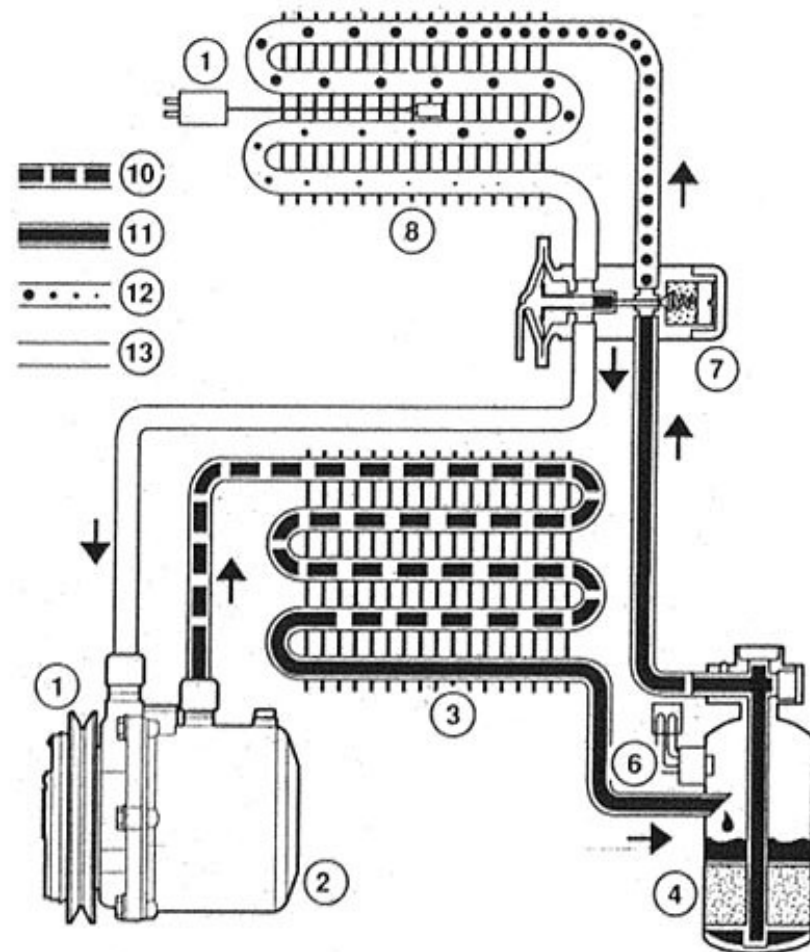
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air – respectively circulated air – flowing past the cold evaporator, with blower support, is cooled accordingly and delivered into the passenger compartment via nozzles.

The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.

Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and could cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.

It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that it switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure pressostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure pressostat switches the second stage of an addition fan on at a pressure of about 18 bar.

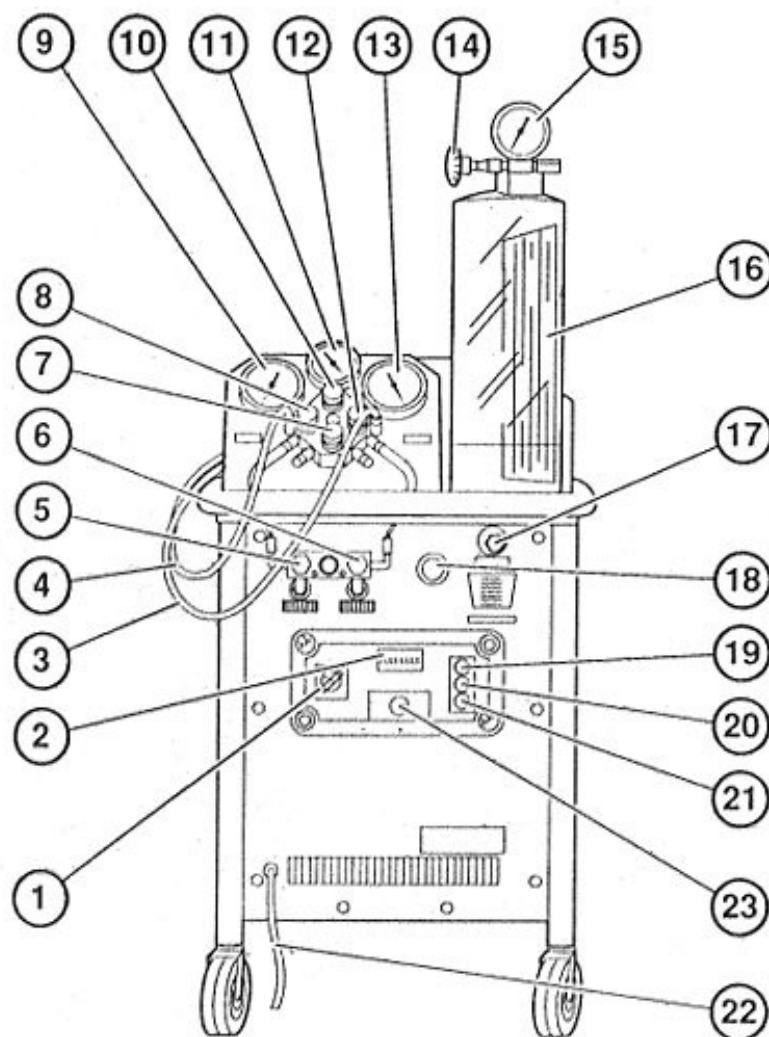
In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



36 64 002 U

- 1 Solenoid clutch
- 2 Compressor
- 3 Condenser
- 4 Drier
- 6 Safety switches
(high/low pressure pressostats)

- 7 Expansion valve
- 8 Evaporator
- 9 Temperature switch
- 10 High pressure gas
- 11 High pressure liquid
- 12 Low pressure liquid
- 13 Low pressure gas



SERVICE STATION (R 12)

- 1 Main switch
- 2 Operation hour counter
- 3 High pressure hose
- 4 Low pressure hose
- 5 Refrigerant inlet valve
- 6 Refrigerant outlet valve
- 7 Vacuum pump valve
- 8 Low pressure valve
- 9 Low pressure gage
- 10 Vacuum meter valve
- 11 Vacuum meter
- 12 High pressure valve
- 13 High pressure gage
- 14 Charging cylinder valve
- 15 Charging cylinder high pressure gage
- 16 Charging cylinder with scale
- 17 Refrigerant drain valve
- 18 Moisture indicator
- 19 Control lamp - yellow
- 20 Control lamp - red
- 21 Control lamp - green
- 22 Power supply cord
- 23 Charging cylinder push button switch

64 50 009 DISCHARGING AND CHARGING AIR CONDITIONER

Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant Frigen R 12 or Frigen R 134a gradually as from the beginning of 1991.

Important!

R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

Frigen R 12 is very dangerous for the environment because of fluorochlorohydrocarbons (FCH) and must be drawn out, cleaned and refilled in a system with a service station. Frigen R 134 A does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperature, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. Frigen is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation – especially in working pits – which would not be readily noticed since the gas has no color or odor. Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant circuit) are required for perfect air conditioner operation.

Frigen R 12 and even more so R 134 A take on moisture very quickly. Plug opened pipes, condenser, evaporator, compressor or drier with plugs immediately.

Important!

Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated. In addition, refrigerants decompose at high temperature or when exposed to open flame. Decomposed products are injurious to health. Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

Important!

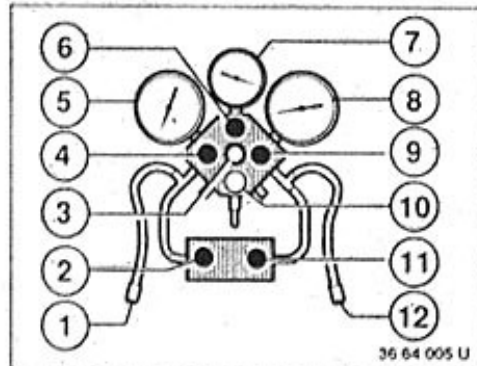
After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

The following procedures describe sucking, discharging and charging air conditioners with help of a SECU service station from the company "Behr". Refer to pertinent operating instructions for changes in the service station design.

Prior to starting any operation, the service station must be brought into basic setting. Basic setting means: All shut-off valves of the service station and both hose valves must be closed.

Important!

When using a different service station, refer to the pertinent operating instructions.

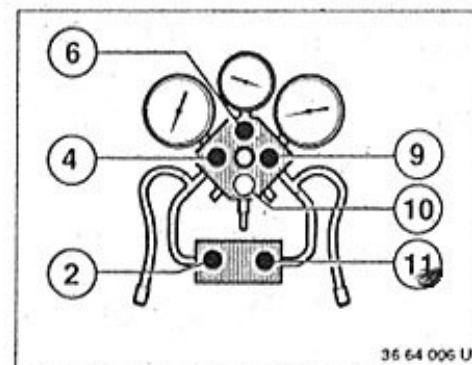


SUCKING REFRIGERANT OUT OF AIR CONDITIONER:

Description of pressure gage assembly

- 1 Low pressure hose (blue)
- 2 Refrigerant inlet valve
- 3 Sight glass
- 4 Low pressure valve
- 5 Low pressure gage
- 6 Vacuum meter valve
- 7 Vacuum meter
- 8 High pressure gage
- 9 High pressure valve
- 10 Vacuum pump valve
- 11 Refrigerant outlet valve
- 12 High pressure hose (red)

36 64 005 U

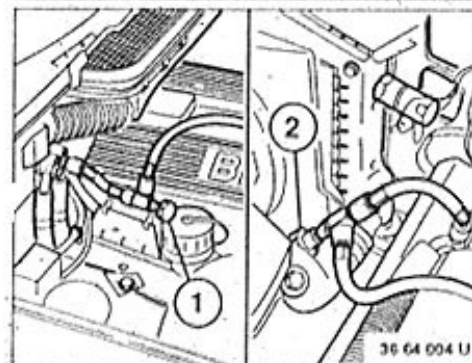


36 64 006 U

First suck out the service station to ensure that there is no residual refrigerant in the service station.

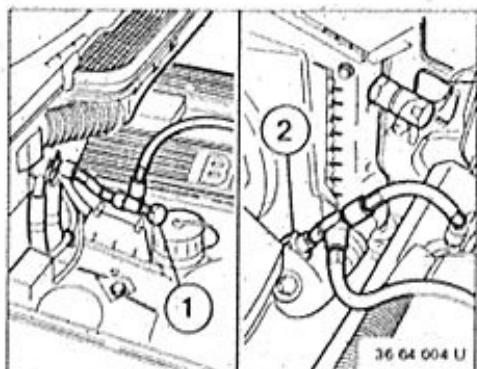
Open valves (2, 4 and 9) and start the sucking operation.

After the service station has been switched off, write or note the volume of refrigerant in the charging cylinder (Information is required for fault finding to evaluate the system).



36 64 004 U

Open valves (1 and 2) on vehicle. Operate start button again and suck refrigerant out of the entire system. The air conditioner system of the vehicle is empty when the service station is again switched off.



36 64 004 U

Bring service station into basic setting (refer to page 64-50/3).
 Connect service station to vehicle.
 Connect blue hose to low pressure side (thick pipe).
 Connect red hose to high pressure side (thin pipe).

Bring service station into basic setting (refer to page 64-50/3).

Read present volume on the charging cylinder.

Open valve (14) slowly and let about 200 to 300 grams of refrigerant run into the system.

Open valve (17) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.

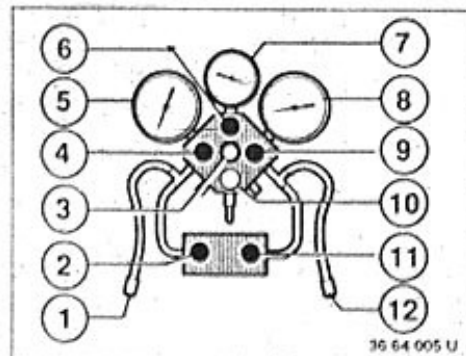
If there is no more oil in the catch tank, it will close automatically.

Measure amount of drained refrigerant oil.

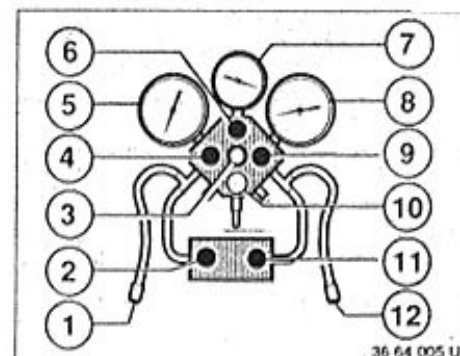
Suck out system again afterwards and bring into basic setting.

Important!

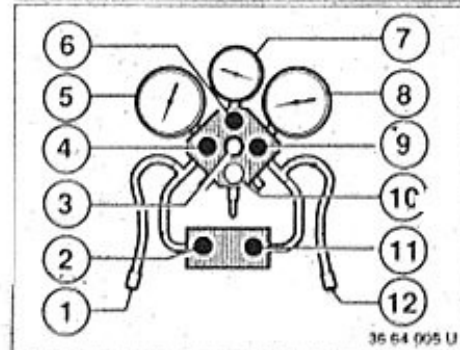
Never reuse drained refrigerant oil and dispose it as special refuse.

**DISCHARGING AIR CONDITIONER:**

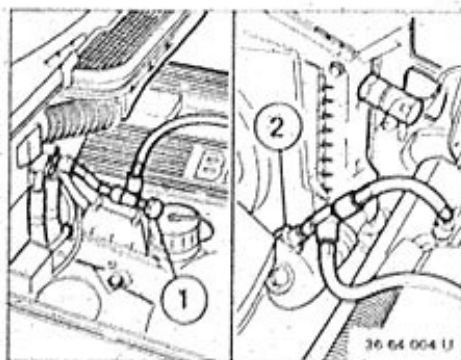
Bring service station into basic setting (refer to page 64-50/3).
 Open valves (4, 6, 9 and 10).
 Switch on vacuum pump. This only discharges the service station.
 Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (7) must then be above or below the zero. This strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The service station has a leak if the zero point is not approximately reached or vacuum is not built up.
 Close valve (10) and switch off vacuum pump after reaching maximum vacuum.
 The service station does not leak if the pressure does not rise after about 1 to 2 minutes.
 Afterwards set needle of vacuum meter (7) to zero (with adjusting screw on top of the vacuum meter) and close valve (6).



Switch on vacuum pump and using the suction pipe suck the previously measured amount of new refrigerant oil out of the measuring cup into the system. Switch off vacuum pump as soon as the total amount of oil is in the system, in order to avoid sucking in "moist" air. Reconnect high pressure hose to connection (12) and open valve (9). Switch on vacuum pump again and discharge system at least 30 minutes.



After discharging, close valve (10) and switch off vacuum pump.
 There is no longer moisture in the system if the needle of vacuum meter (7) remains at 0 over a period of at least 3 to 5 minutes. However, if the needle rises in small jumps this is indication of water drops which are evaporating and causing the pressure to rise. In such a case discharging must be continued.



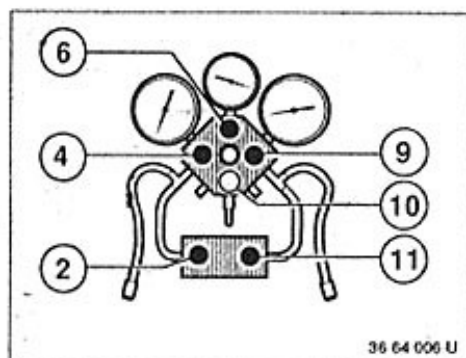
Open valves (1 and 2) slowly.
 Then discharge the entire system briefly.



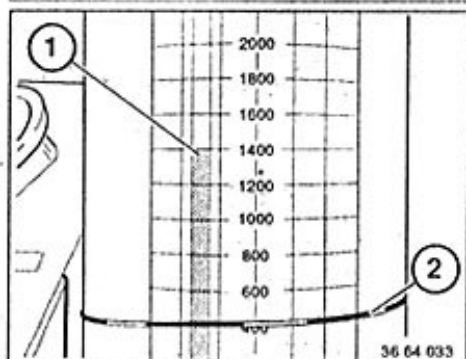
Close valve (9) and switch vacuum pump off.
 Unscrew high pressure hose from pressure gage assembly and connect to the supplied suction pipe.

CHARGING SYSTEM:

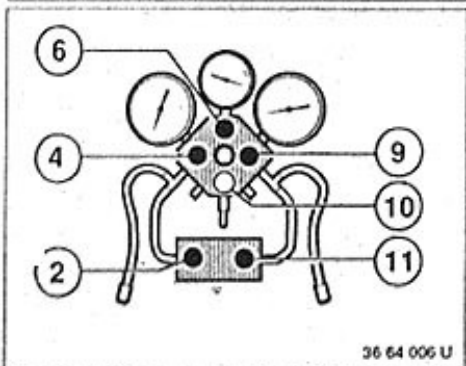
Requirements for correct charging are a sufficient amount of refrigerant and pressure in the charging cylinder of at least 9 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater or cleaning the refrigerant.



Bring service station into basic setting.
Open valves (4 and 9).
Open valve (11) briefly and close again, so that refrigerant can flow up to the charging hoses.

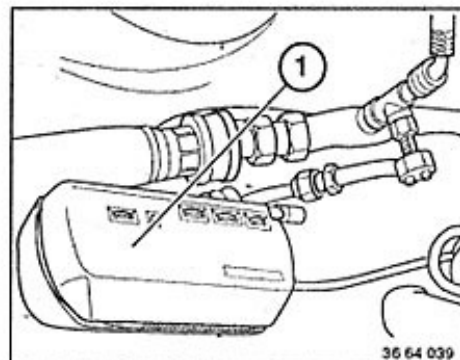


Read charging cylinder level (1), subtract specified charging volume* from this value and mark new volume level with a rubber band (2).



Open valves (1 and 2) on the charging hoses. Then open valve (11) again and observe the level in the charging cylinder. If there is approximately correct charging volume* in the system, close and open valve (11) in steps until the correct volume is in the system.

* Refer to Specifications

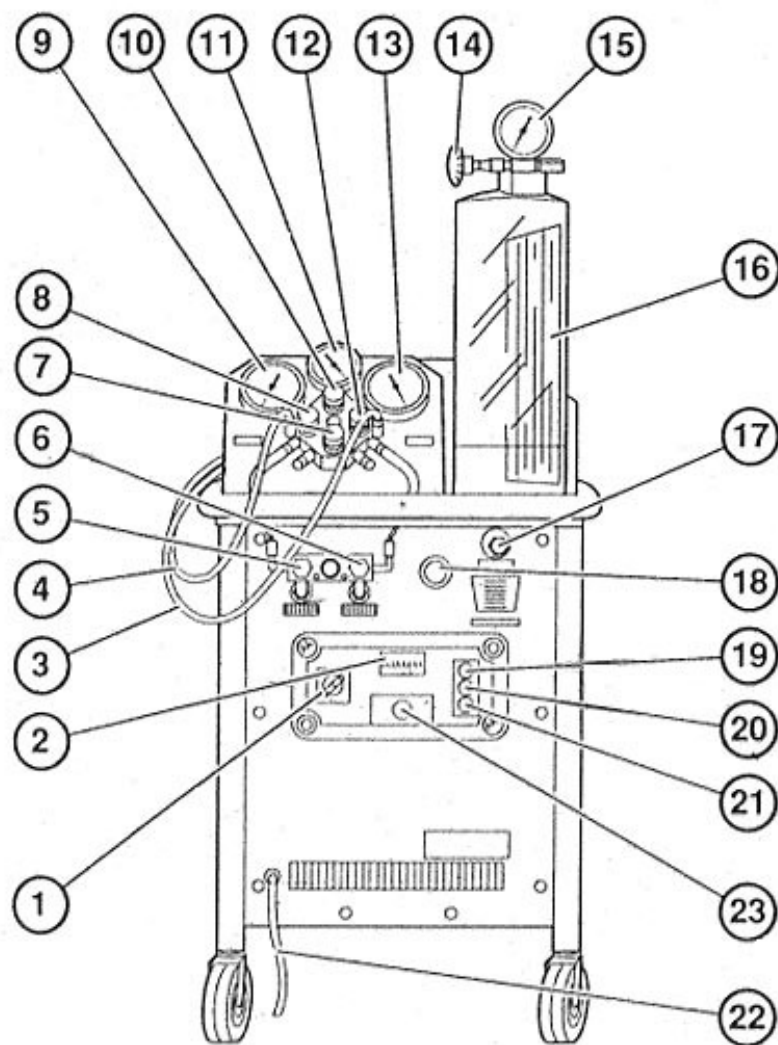
**DETECTING LEAKS:**

Calibrate leak detector (1)** according to the operating instructions.
Check air conditioner for leaks with leak detector (1).
Tighten loose pipes and eliminate leaks.

Note:

Always check below an assumed point of leakage as refrigerant is heavier than air.
Suck refrigerant oil out of system again after finishing the leak test and eliminating leaks.

** Refer to Workshop Equipment

**CLEANING REFRIGERANT:**

Bring service station into basic setting (refer to page 64-50/3).

Open valve (14) on charging cylinder slightly (1 to 1 and 1/2 turns).

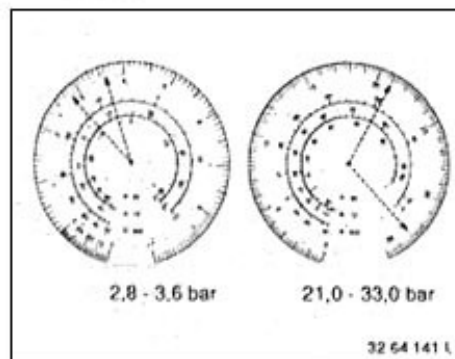
Switch on suction and let cleaning run at least ten minutes.

Close valve (14) and wait until the compressor is automatically switched off.

In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (18) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows.

1. Insufficient/excessive pressure in intake of the compressor. This is applicable, if the charging cylinder valve is opened too little or too much.
2. Excessive pressure (> 17 bar) in charging cylinder. This means non-condensable gas in the circuit. In this case close valve (14) and discharge the non-condensable gas via the Schrader valve on the charging cylinder or wait until refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on suction until there is no longer refrigerant in the service station and the compressor is switched off automatically.

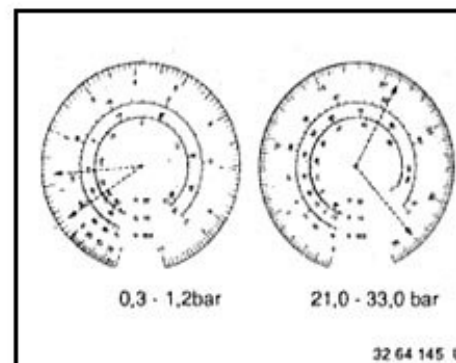


TROUBLESHOOTING BY MEASURING PRESSURE:

High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

Remedy:

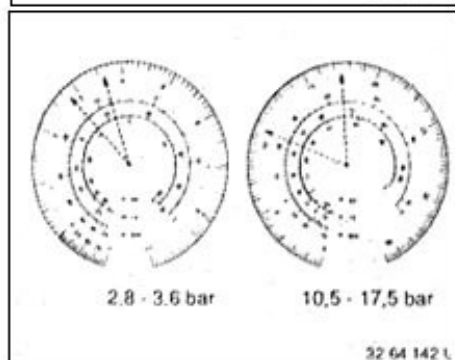
Suck out refrigerant, discharge and recharge system, clean condenser and check additional fan, replacing if necessary.



Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

Remedy:

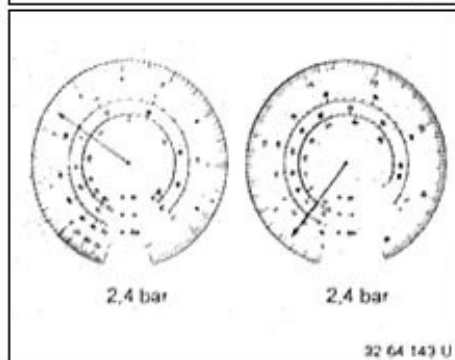
Check condenser, drier and expansion valve.



High inlet pressure and normal outlet pressure indicate a defective compressor.

Remedy:

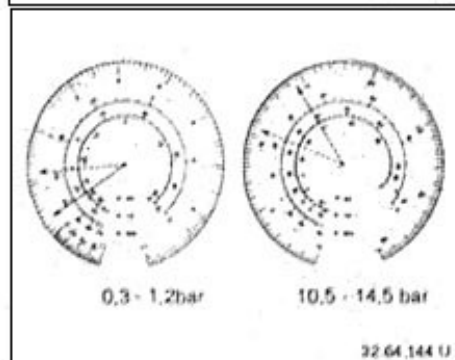
Replace compressor.



Compressor does not run with equal inlet and outlet pressures.

Remedy:

If icing-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64). Otherwise check magnetic coupling mechanically (slips).



Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

Remedy:

1. Check whether evaporator has ice; then check evaporator sensor.
2. Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume*, check flow of expansion valve; then discharge and recharge system.

Refer to Specifications

AIR CONDITIONING EFFICIENCY TEST

Several conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature approx. 50° C

Ref. Point 1:

Connect Modic or BMW Service Tester to vehicle and have the evaporator temperature displayed.

Ref. Point 2:

Install a thermometer approx. 5 cm below the vehicle's roof liner at B-pillar height and place the display unit facing out.

Ref. Point 3:

Set the heater to maximum heating. Switch the air conditioner on and set it to recirculated air mode. Set vehicle blower to stage 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2000 rpm.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Evaporator and passenger compartment temperature will now be measured and subtracted from each other. There should be a difference of approximately 40° C.

If this difference in temperature is not reached, the Service Station must be connected and the intake pressure measured. If the intake pressure is less than 1.5 bar, proceed as described for measuring pressure with excessively low intake pressure.

DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION

After switching on the air conditioner the refrigerant circuit is activated in that the magnetic coupling receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 6 to 10 grams in R 12 systems or 10 to 15 grams in R 134a systems.

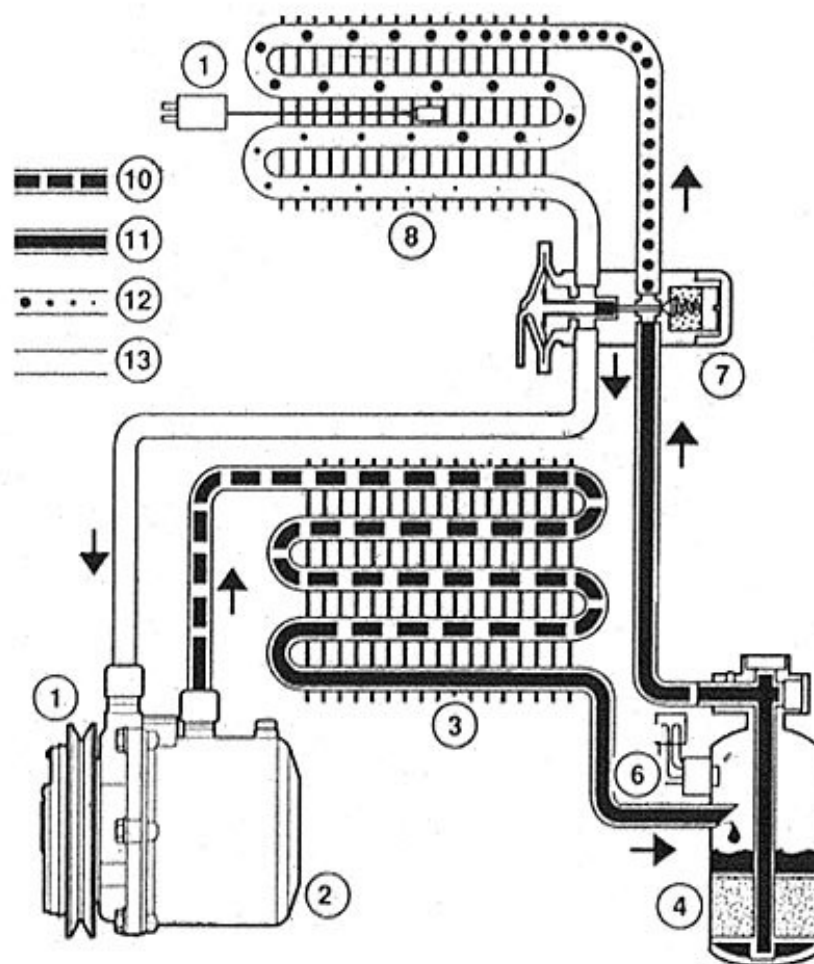
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air - respectively circulated air - flowing past the cold evaporator, with blower support, is cooled accordingly and delivered into the passenger compartment via nozzles.

The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.

Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and could cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.

It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that it switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure pressostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure pressostat switches the second stage of an additional fan on at a pressure of about 18 bar.

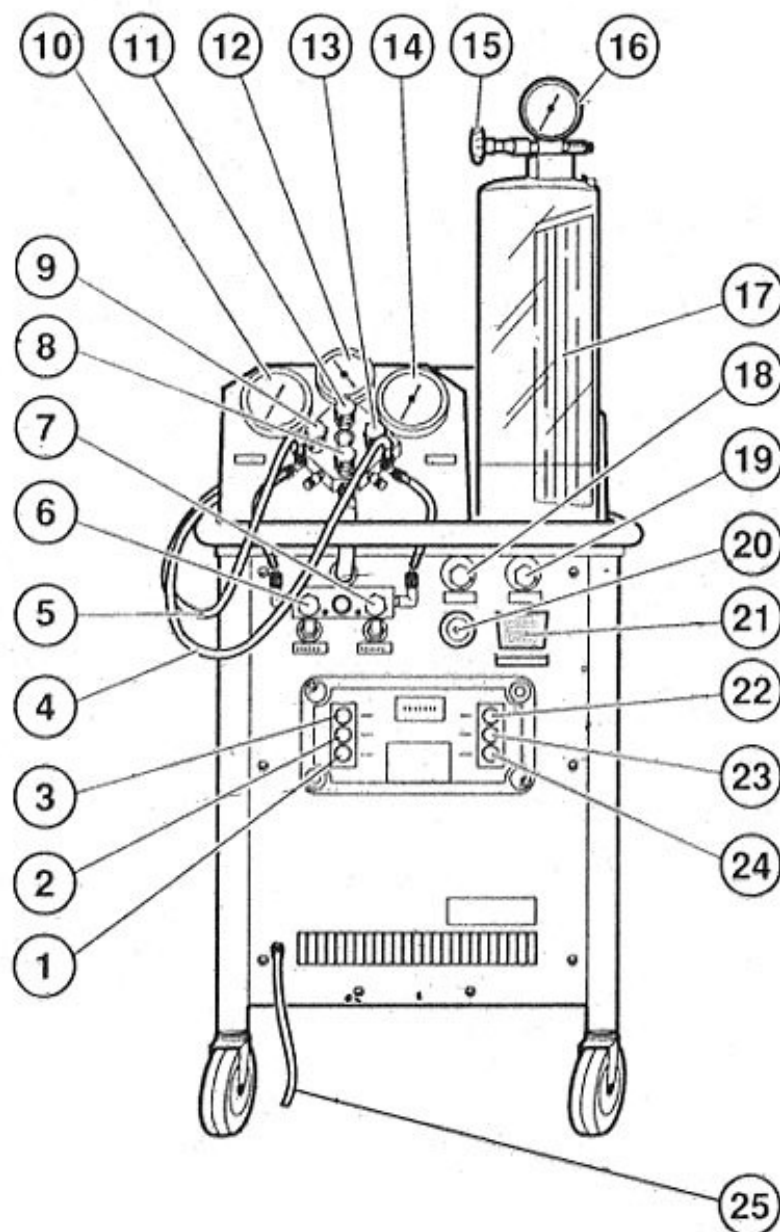
In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



35 64 002 U

- 1 Magnetic coupling
- 2 Compressor
- 3 Condenser
- 4 Drier
- 5 Safety switches (high and low pressure pressostats)

- 7 Expansion valve
- 8 Evaporator
- 9 Temperature switch
- 10 High pressure gas
- 11 High pressure liquid
- 12 Low pressure liquid
- 13 Low pressure gas



SERVICE STATION (SECU 134)

- 1 Main switch
- 2 SUCKING/CLEANING switch
- 3 SUCKING end control lamp
- 4 High pressure hose
- 5 Low pressure hose
- 6 Refrigerant inlet valve
- 7 Refrigerant outlet valve
- 8 Vacuum pump valve
- 9 Low pressure valve
- 10 Low pressure gage
- 11 Vacuum meter valve
- 12 Vacuum meter
- 13 High pressure valve
- 14 High pressure gage
- 15 Charging cylinder valve
- 16 Charging cylinder high pressure gage
- 17 Charging cylinder with scale
- 18 Refrigerant oil filler valve
- 19 Refrigerant oil drain valve
- 20 Moisture Indicator
- 21 Measuring cup
- 22 VACUUM PUMP switch
- 23 Red control lamp
- 24 HEATER switch
- 25 Power cord

64 50 009 DISCHARGING AND CHARGING AIR CONDITIONER

Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant Frigen R 12 or Frigen R 134a gradually as from the beginning of 1991.

Important!

R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

Frigen R 12 is very dangerous for the environment because of fluorochlorohydrocarbons (FCH) and must be drawn out, cleaned and refilled in a system with a service station. Frigen R 134 A does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperature, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. Frigen is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation – especially in working pits – which would not be readily noticed since the gas has no color or odor.

Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant circuit) are required for perfect air conditioner operation.

Frigen R 12 and even more so R 134 A take on moisture very quickly. Plug opened pipes, condenser, evaporator, compressor or drier with plugs immediately.

Important!

Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated.

In addition, refrigerants decompose at high temperature or when exposed to open flame. Decomposed products are injurious to health.

Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

Important!

After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

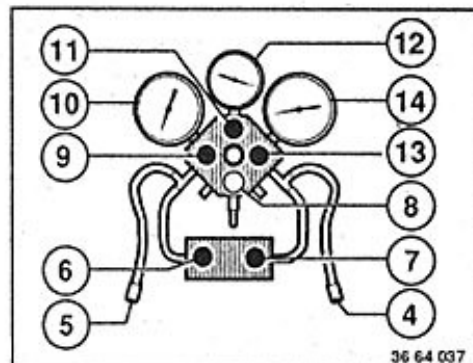
The following procedures describe sucking, discharging and charging air conditioners with help of a SECU 134 service station from the company "Behr". Refer to pertinent operating instructions for changes in the service station design.

Prior to starting any operation, the service station must be brought into basic setting.

Basic setting means: All shut-off valves of the service station and both hose valves must be closed.

Important!

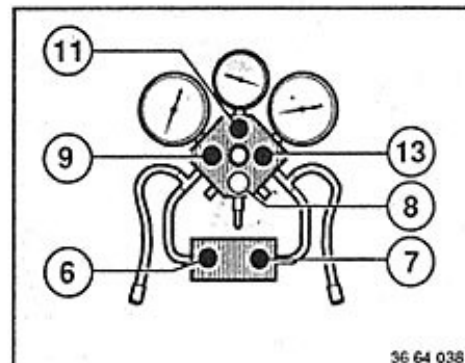
When using a different service station, refer to the pertinent operating instructions.



SUCKING REFRIGERANT OUT OF AIR CONDITIONER:

Description of pressure gage assembly

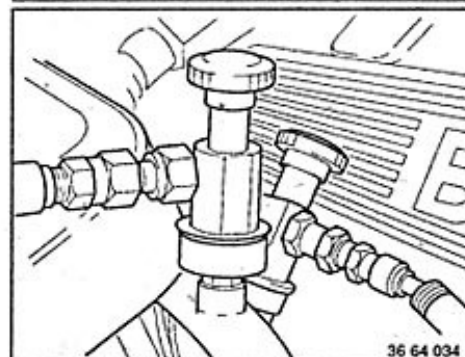
- 4 High pressure hose (red)
- 5 Low pressure hose (blue)
- 6 Refrigerant inlet valve
- 7 Refrigerant outlet valve
- 8 Vacuum pump valve
- 9 Low pressure valve
- 10 Low pressure gage
- 11 Vacuum meter valve
- 12 Vacuum meter
- 13 High pressure valve
- 14 High pressure gage



First suck out the service station to ensure that there is no residual refrigerant in the service station.

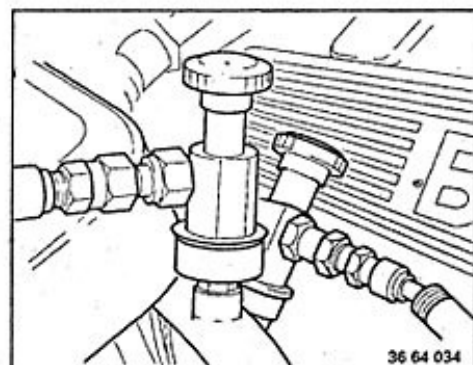
Open valves (6, 9 and 13) and start the sucking operation.

After the service station has been switched off, write or note the volume of refrigerant in the charging cylinder (information is required for fault finding to evaluate the system).

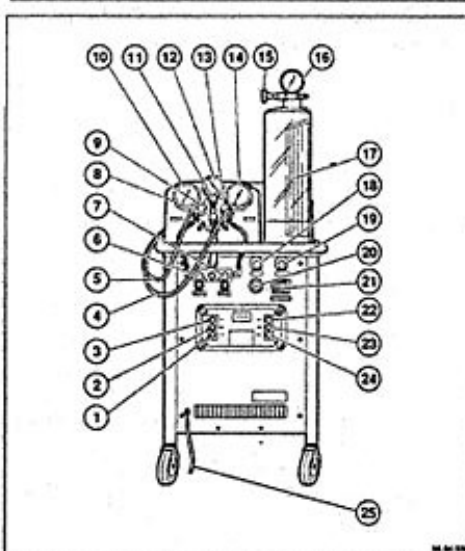


Open valves at the quick-action couplings. Operate start button again and suck refrigerant out of the entire system.

The air conditioner system of the vehicle is empty when the service station is again switched off.



Bring service station into basic setting (refer to page 64-50/12).
Connect service station to vehicle.
Connect blue hose to low pressure side (thick pipe).
Connect red hose to high pressure side (thin pipe).
The quick-action couplings are different in diameter to avoid mixing them up.



Bring service station into basic setting (refer to page 64-50/12).

Read present volume on the charging cylinder.

Open valve (15) slowly and let about 200 to 300 grams of refrigerant run into the system.

Open valve (19) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.

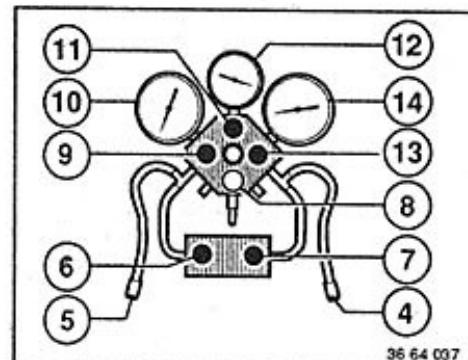
If there is no more oil in the catch tank, it will close automatically.

Measure amount of drained refrigerant oil. Suck out system again afterwards and bring into basic setting.

Important!

Never reuse drained refrigerant oil and dispose it as special refuse.

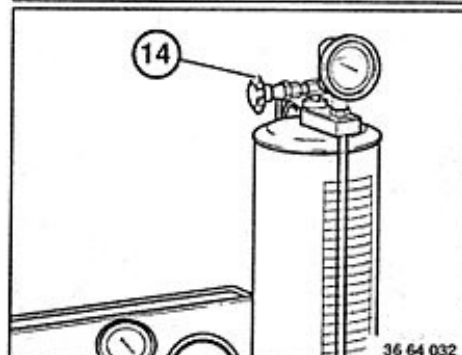
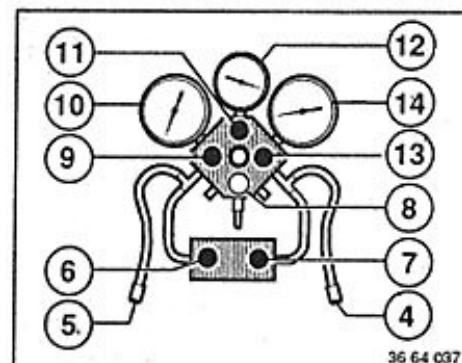
After discharging the system must again be filled with the same amount of new refrigerant oil plus 10 cm³.

**DISCHARGING AIR CONDITIONER:**

Bring service station into basic setting (refer to page 64-50/12).
 Open valves (8, 9, 11 and 13).
 Switch on vacuum pump. This only discharges the service station.
 Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (12) must then be above or below the zero. This strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The service station has a leak if the zero point is not approximately reached or vacuum is not built up.
 Close valve (8) and switch off vacuum pump after reaching maximum vacuum.
 The service station does not leak if the pressure does not rise after about 1 to 2 minutes.
 Afterwards set needle of vacuum meter (12) to zero (with adjusting screw on top of the vacuum meter) and close valve (11).

Open the valves slowly.
 Then discharge the entire system briefly.

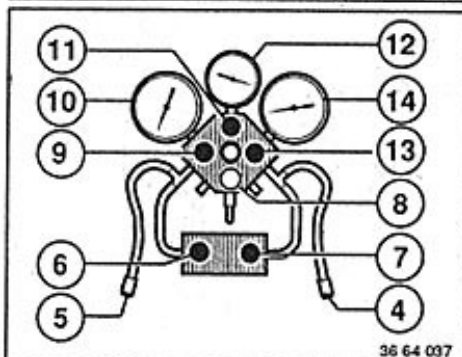
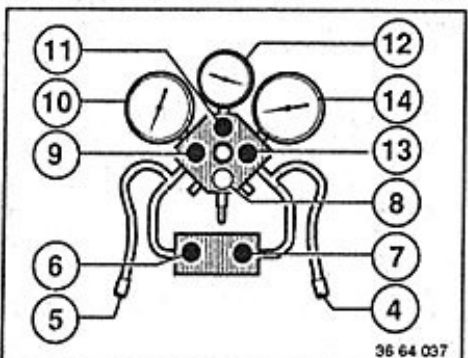
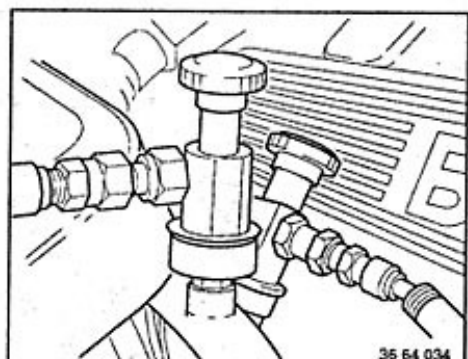
Open valve (11) if low pressure gage (12) is at 0 bar.



Switch on vacuum pump and using the suction pipe suck the previously measured amount of new refrigerant oil out of the measuring cup into the system. Switch off vacuum pump as soon as the total amount of oil is in the system. In order to avoid sucking in "moist" air. Reconnect high pressure hose to connection (4) and open valve (13). Switch on vacuum pump again and discharge system at least 30 minutes.

The previously sucked out refrigerant can be cleaned simultaneously to the discharging process.
 This requires opening valve (14) slightly (1 to 1 1/2 turns) and switching on suction.

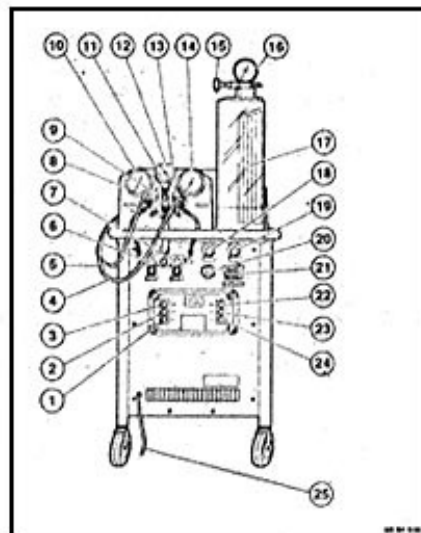
Important!
 Stop the cleaning process after about 10 to 15 minutes. Discharging still runs.



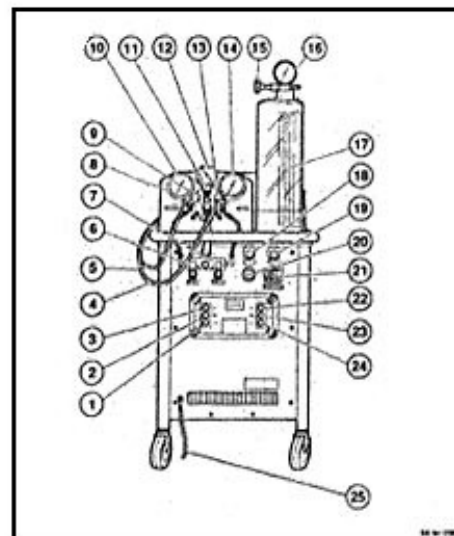
After discharging, close valve (8) and switch off vacuum pump.
 There is no longer moisture in the system if the needle of vacuum meter (12) remains at 0 over a period of at least 3 to 5 minutes. However, if the needle rises in small jumps this is indication of water drops which are evaporating and causing the pressure to rise. In such a case discharging must be continued.

CHARGING SYSTEM:

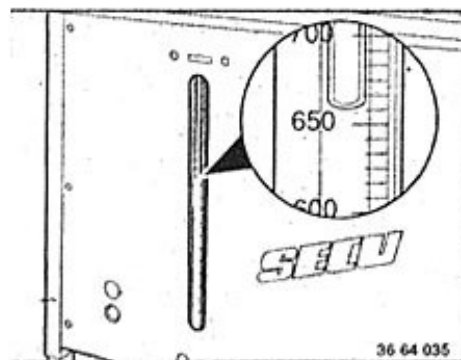
Requirements for correct charging are a sufficient amount of refrigerant and pressure in the charging cylinder of at least 9 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater or cleaning the refrigerant.



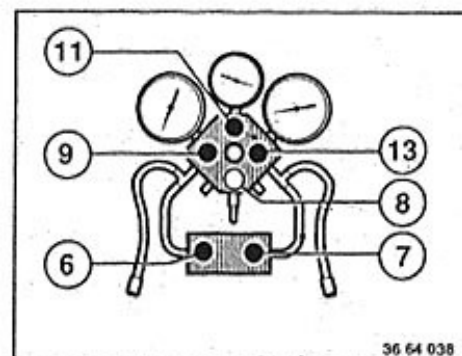
Before charging the system it will be necessary to replace the amount of oil taken out by sucking the refrigerant out. Bring service station into basic setting for this purpose (refer to page 64-50/12). Open valve (15) on the charging cylinder slowly until the white control lamp (3) goes out.



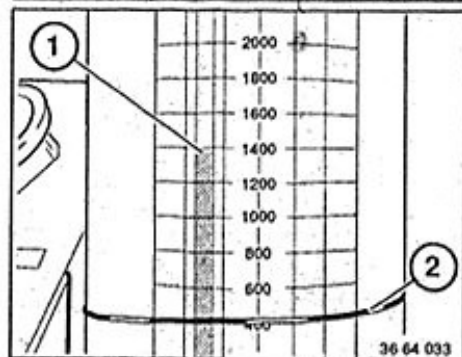
Open and close valve (18) carefully several times until there is the same amount of oil in the system plus 10 cm³. Observe the scale while charging.



Open the valves on the charging hoses. Read the amount of oil from the scale of the oil reservoir.

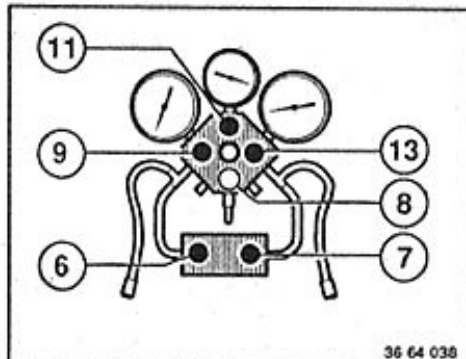


Bring service station into basic setting (refer to page 64-50/12). Open valves (9 and 13). Open valve (7) briefly and close again, so that refrigerant can flow up to the charging hoses.

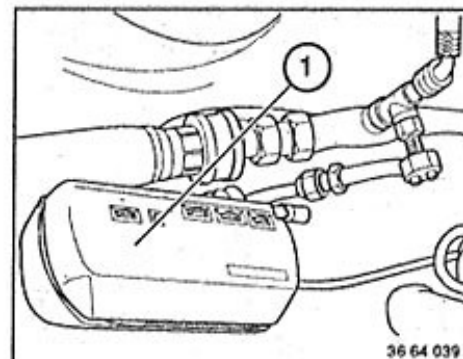


Read charging cylinder level (1), subtract specified charging volume* from this value and mark new volume level with a rubber band (2).

* Refer to Specifications



Open the valves on the charging hoses. Then open valve (7) again and observe the level in the charging cylinder. If there is approximately correct charging volume* in the system, close and open valve (7) in steps until the correct volume is in the system.



DETECTING LEAKS:

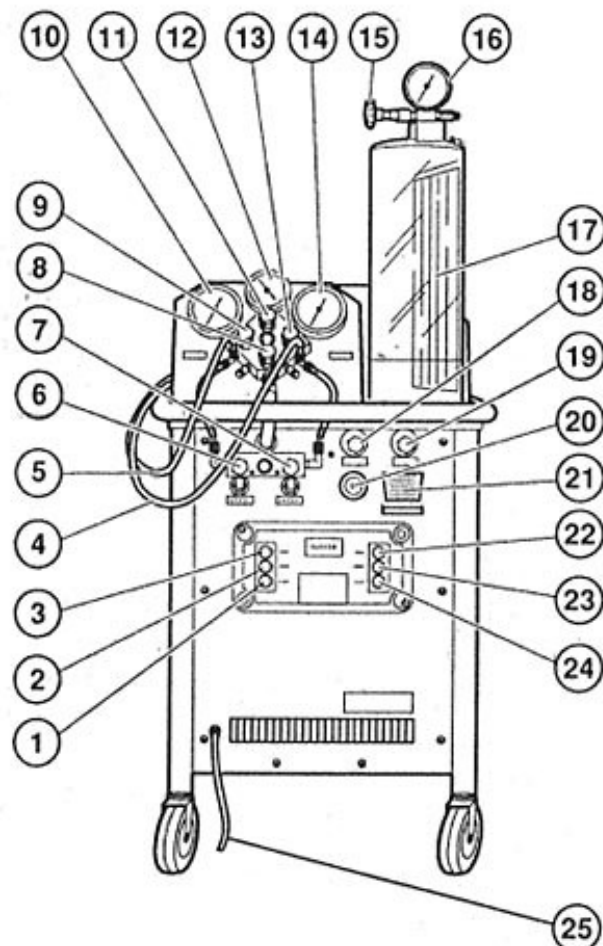
Calibrate leak detector (1)** according to the operating instructions. Check air conditioner for leaks with leak detector (1). Tighten loose pipes and eliminate leaks.

Note:

Always check below an assumed point of leakage as refrigerant is heavier than air. Suck refrigerant oil out of system again after finishing the leak test and eliminating leaks.

* Refer to Specifications

** Refer to Workshop Equipment



36 64 036

CLEANING REFRIGERANT:

Bring service station into basic setting (refer to page 64-50/12).

Open valve (15) on charging cylinder slightly (1 to 1 and 1/2 turns).

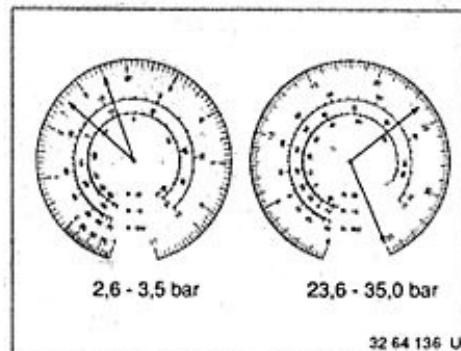
Switch on suction (2) and let cleaning run at least ten minutes.

Close valve (15) and wait until control lamp (3) lights up the compressor is automatically switched off.

In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (20) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows.

1. Insufficient/excessive pressure in intake of the compressor. This is applicable, if the charging cylinder valve is opened too little or too much.
2. Excessive pressure (> 17 bar) in charging cylinder. This means non-condensable gas in the circuit. In this case close valve (15) and discharge the non-condensable gas via the Schrader valve on the charging cylinder or wait until refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on suction until there is no longer refrigerant in the service station and the compressor is switched off automatically.

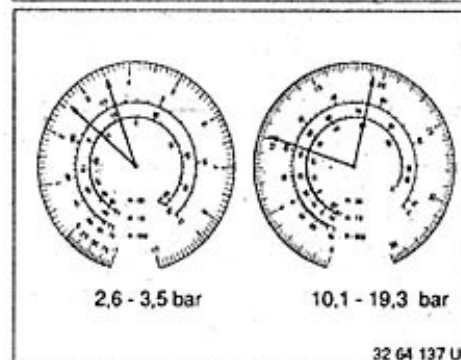


TROUBLESHOOTING BY MEASURING PRESSURE:

High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

Remedy:

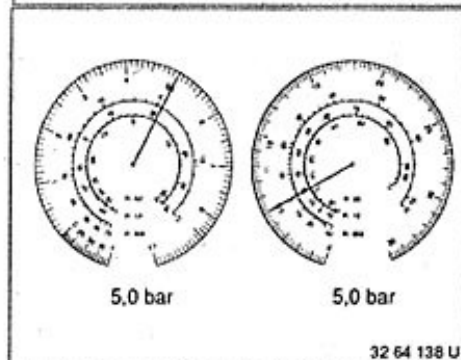
Suck out refrigerant, discharge and recharge system, clean condenser and check additional fan, replacing if necessary.



High inlet pressure and normal outlet pressure indicate a defective compressor.

Remedy:

Replace compressor.

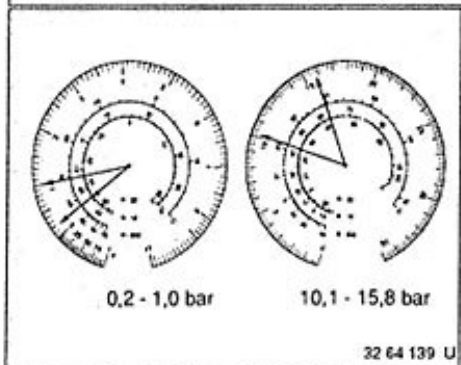


Compressor does not run with equal inlet and outlet pressures.

Remedy:

If icing-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64).

Otherwise check magnetic coupling mechanically (slips).

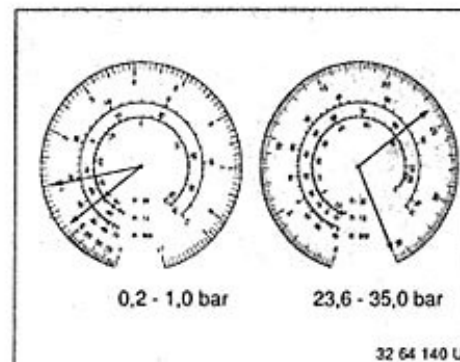


Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

Remedy:

1. Check whether evaporator has ice; then check evaporator sensor.
2. Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume*, check flow of expansion valve; then discharge and recharge system.

* Refer to Specifications



Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

Remedy:

Check condenser, drier and expansion valve.

AIR CONDITIONING EFFICIENCY TEST

Several conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature approx. 50° C

Ref. Point 1:

Connect Modic or BMW Service Tester to vehicle and have the evaporator temperature displayed.

Ref. Point 2:

Install a thermometer approx. 5 cm below the vehicle's roof liner at B-pillar height and place the display unit facing out.

Ref. Point 3:

Set the heater to maximum heating. Switch the air conditioner on and set it to recirculated air mode. Set vehicle blower to stage 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2000 rpm.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Evaporator and passenger compartment temperature will now be measured and subtracted from each other. There should be a difference of approximately 40° C.

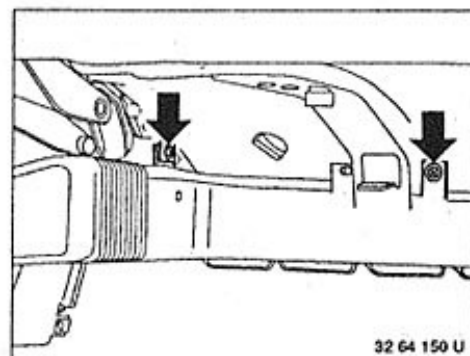
If this difference in temperature is not reached, the Service Station must be connected and the intake pressure measured. If the intake pressure is less than 1.5 bar, proceed as described for measuring pressure with excessively low intake pressure.

64 51 000 CLEANING EVAPORATOR

It could happen that bacteria settle on the fins of the evaporator. This is caused by the condensation water which collects on the fins after switching the compressor off. There could temporarily be an unpleasant odor in the car when the compressor is switched on again. Consequently the evaporator should be cleaned at regular intervals.

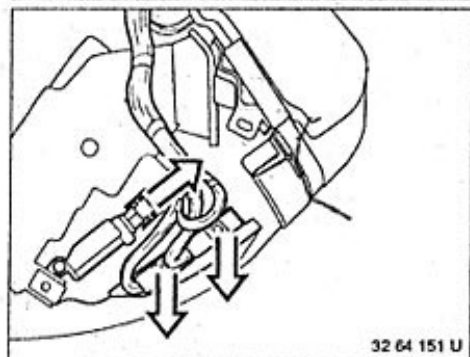
Note:

It is recommended to drive the car to a washbay and do the cleaning there, as the water will run out through the drain holes in the transmission tunnel.



32 64 150 U

Remove the glovebox - refer to Group 51. Unscrew screws and fold the air duct down.

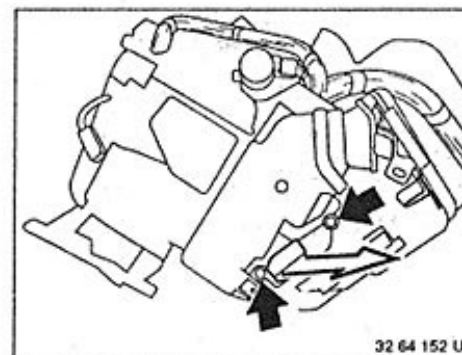


32 64 151 U

Disconnect wires from the control unit and final stage.

Note:

The heater remains installed and was only removed in this picture for better understanding.

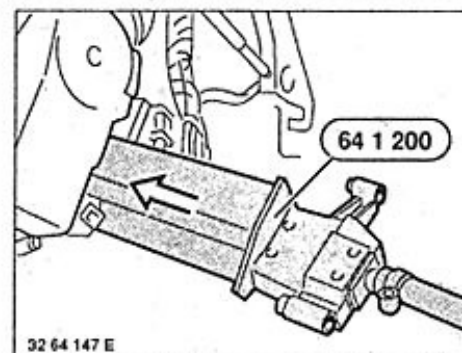


32 64 152 U

Unscrew screws and pull the final stage out.

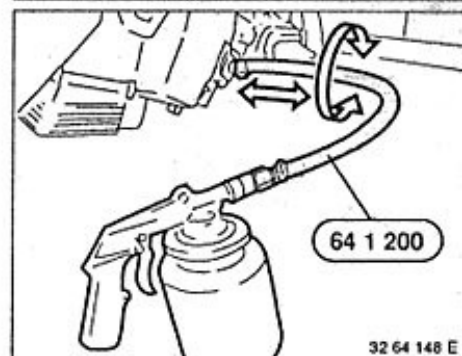
Important!

Cars with Microfilter:
Unscrew cover, pull the microfilter out and reinstall the cover.



32 64 147 E

Slide Special Tool 64 1 200 into the final stage opening and secure.



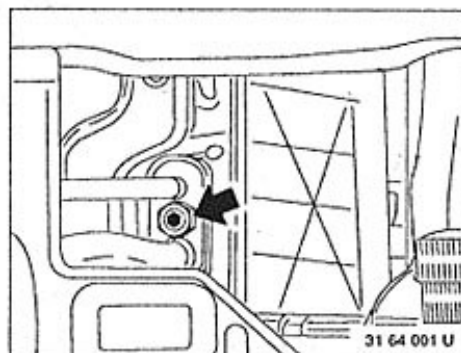
32 64 148 E

Apply about 1 liter of 5 per cent cleaning solution* onto the evaporator by moving the spray nozzle pipe back and forth uniformly. Leave the cleaning solution on the evaporator for about 10 to 15 minutes. Afterwards rinse off the evaporator with a large amount of water (at least 6 liters of water).

* Refer to Service Information

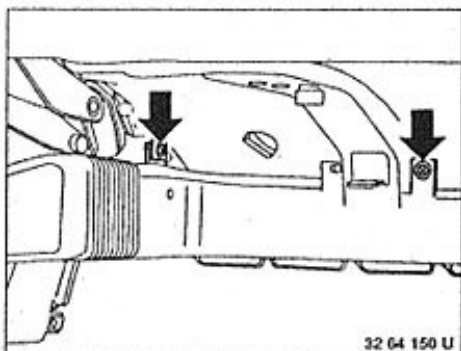
64 51 510 REMOVING AND INSTALLING EVAPORATOR

Suck the refrigerant out of the air conditioner with help of a service station (refer to 64 50 009 or the operating instructions supplied with pertinent service station).
Remove wiper console - refer to Group 61.

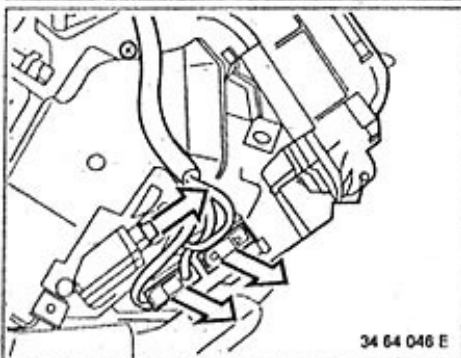


Unscrew nut.

Installation:
Replace O-rings.
Tightening torque*.

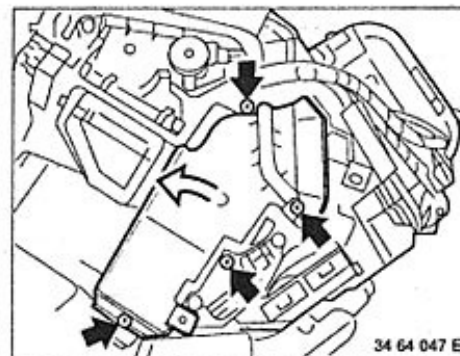


Remove the glovebox - refer to Group 51.
Unscrew screws and remove the air duct.

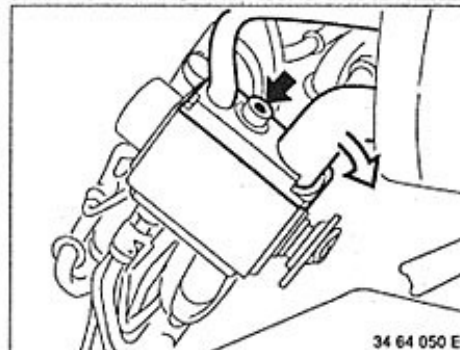


Pull all plugs off of the control unit and final stage and lay the wire harness on top.

* Refer to Specifications

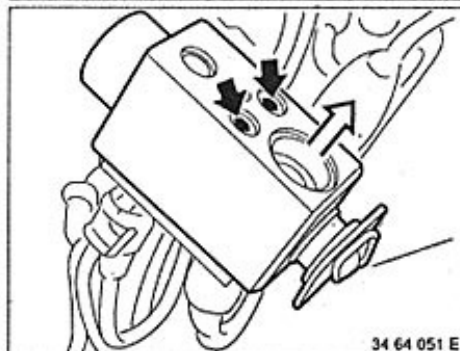


Unscrew screws and lift cover out.



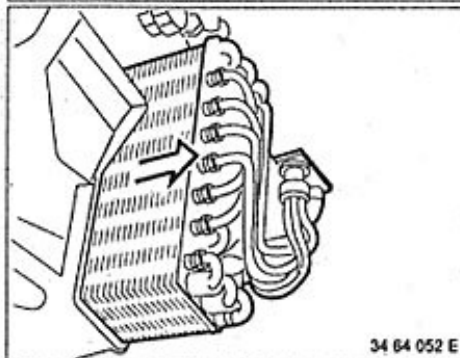
Unscrew screw and remove the double-pipe.

Installation:
Replace the O-rings.

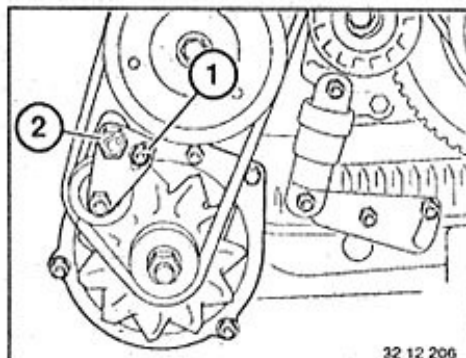


Unscrew screws and remove the expansion valve.

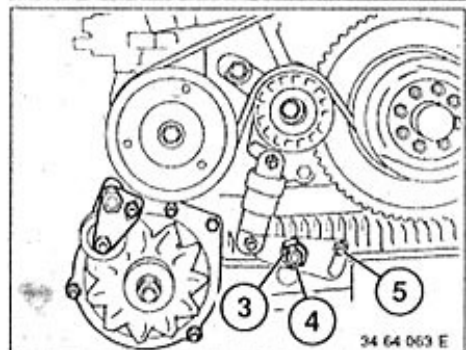
Installation:
Replace the O-rings.



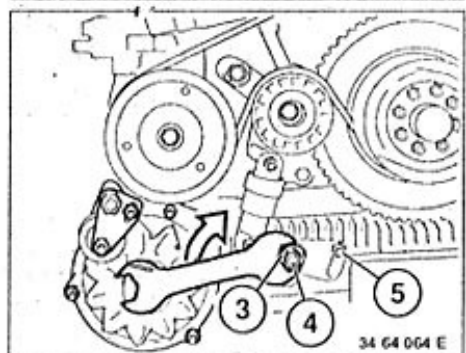
Pull the evaporator out.

**64 52 020 REPLACING AC COMPRESSOR**

Remove engine splash guard.
If applicable, loosen nut (1) and bolt (2) and take the ribbed drive belt off of the additional alternator.

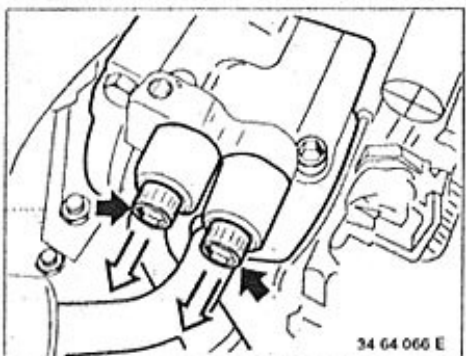


Loosen nuts (4 and 5) on the tensioning roller and take the ribbed drive belt off of the compressor.



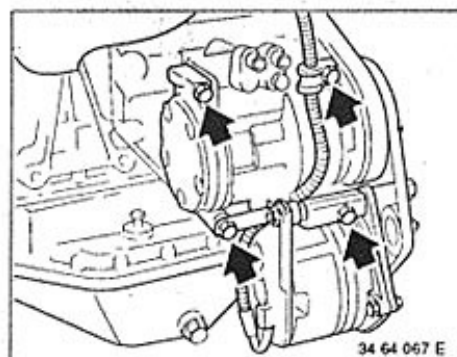
Installation:
Turn the tensioning roller on hexagon (3) as far as stop, then tighten nut (5) first and finally nut (4).

Tightening torque = 24 Nm.

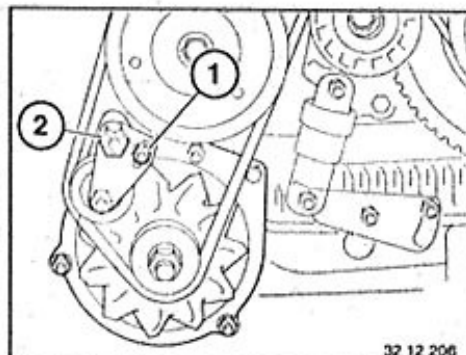


Unscrew couplings and remove intake and pressure pipes.

Installation:
Replace O-rings.

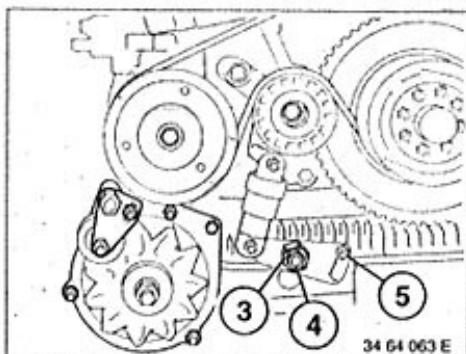


Unscrew bolts.
Disconnect plug.
Lift compressor out downwards.

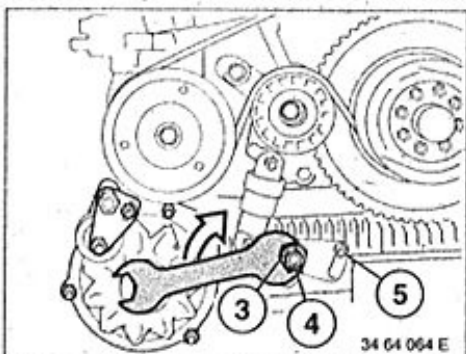


64 52 061 Replacing compressor coupling

Remove underbody protection from engine.
If necessary, unfasten nut (1) and screw (2) and remove Vee belt from auxiliary alternator.

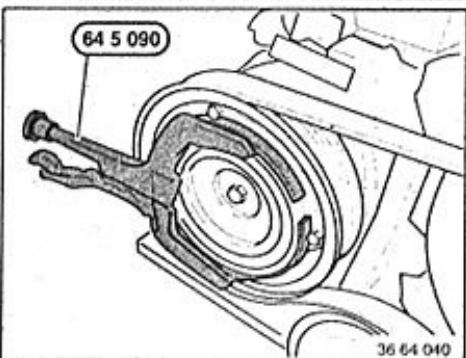


Loosen nuts (4 and 5) on tensioning roller and remove Vee belt from compressor.

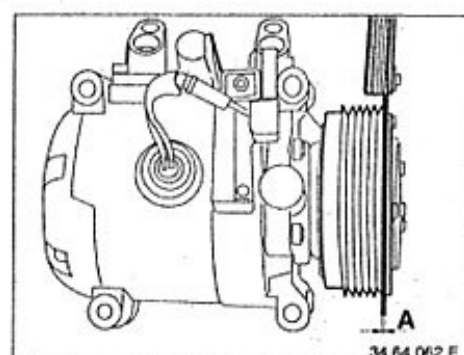


Installation:
Rotate tensioning roller on hex head (3) to limit position, then tighten nut (5) followed by nut (4).

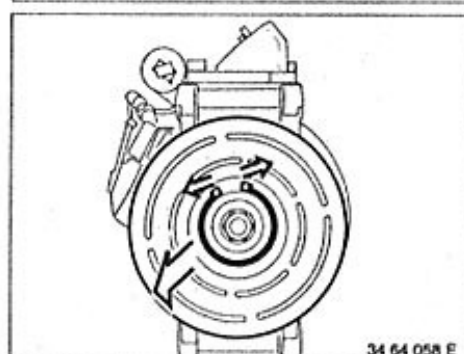
Tightening torque = 24 Nm



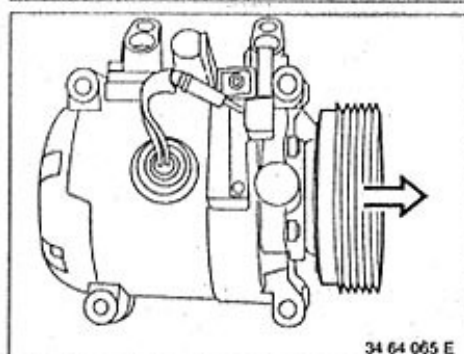
Grip drive plate with special tool 64 5 090, unfasten screw (1) and remove drive plate.



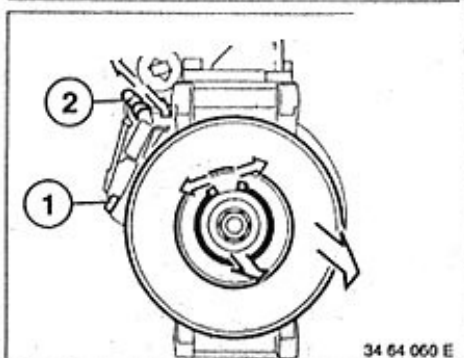
Installation:
Check that clearance between drive plate and pulley is correct: A (0.5 ... 0.8 mm). If necessary, adjust using shims.



Prise open retaining ring and remove



Remove pulley.



Prise open retaining ring and remove. Unfasten screw (1), disconnect plug connection (2) and remove magnetic coil.

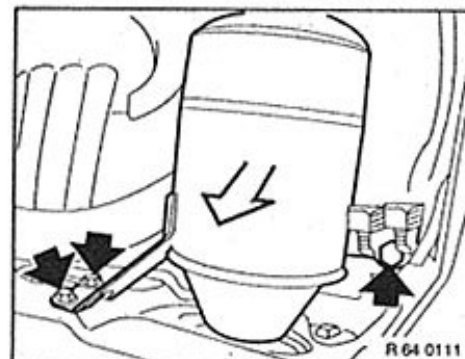
64 53 510. Removing and installing / replacing drier flask for air conditioner

Note:

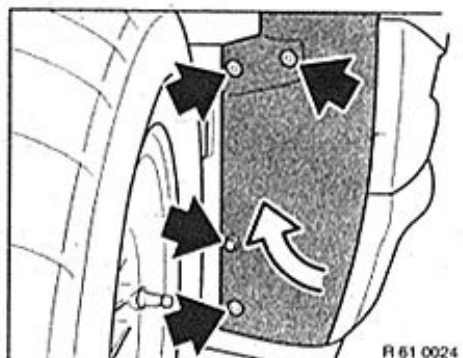
Provided that the air conditioner is operational and does not leak, there is no need to replace the drier flask at regular service intervals.

The drier flask must always be replaced without fail if

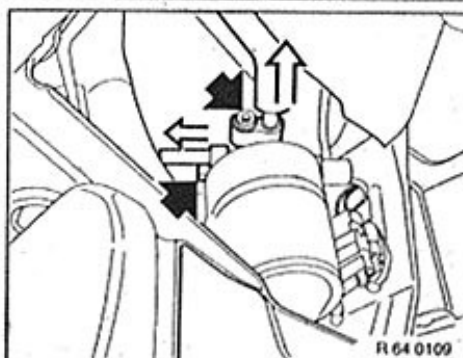
- there is any dirt in the refrigerant circuit (e.g. compressor seized),
- if system leaks and there is no refrigerant left in the circuit,
- the refrigerant circuit was open for longer than 24 hours during a repair job.



Unfasten screws and remove drier flask.

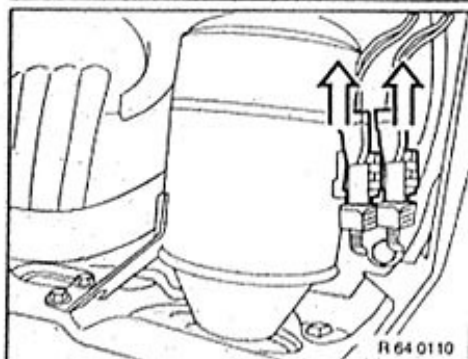


Air conditioner drained,
refer to 64 50 009
Remove right front wheel. Unfasten screws on
front right wheel arch trim and remove trim
panel.



Unfasten screws and remove lines.

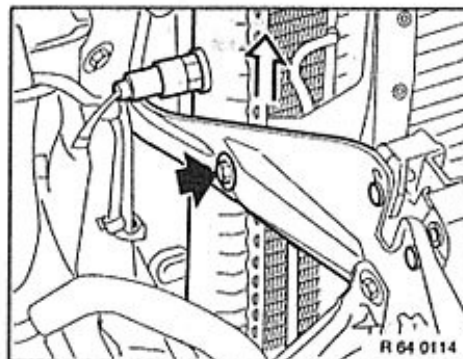
Installation:
Replace O-rings.



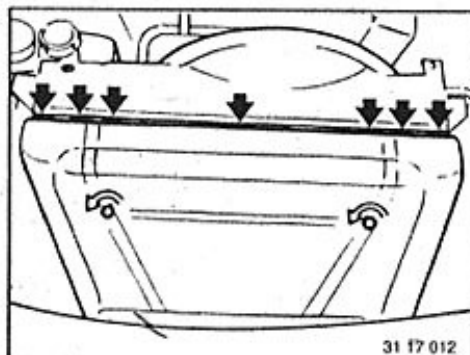
Remove connector.

64 53 550 Removing and installing / replacing air conditioner condenser

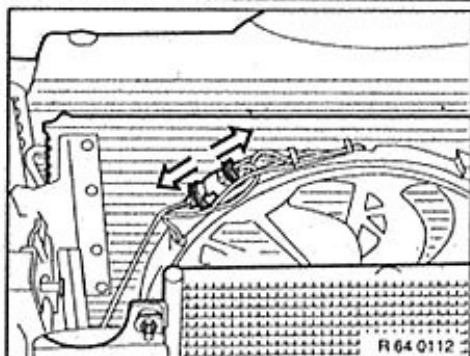
Air conditioner drained,
refer to 64 50 009
Completely remove both pop-up headlights,
refer to 63 12 090



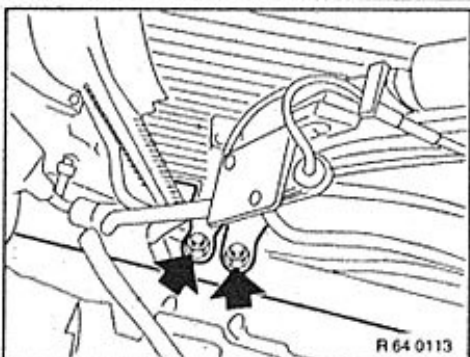
Unfasten screws left and right on condenser
and pull out upwards condenser.



Remove complete air guide.



Disconnect plug connection.



Unfasten screws and remove lines.

Installation:
Replace O-rings.

OPERATION OF LOCK SENSOR

The lock sensor consists of a control unit and speed sensor (lock sensor) on the AC compressor.

This lock sensor is installed only in models with the M 70 engine (750, 850) because the AC compressor and water pump are driven by the same ribbed drive belt. If the ribbed drive belt tears or jumps off of the pulley when the compressor locks, the engine cooling system would also fail. This is prevented by the electronics of the lock sensor control unit. It continuously monitors engine speed and compressor speed and immediately switches the magnetic clutch of the compressor off when there is more than 30 % slip. This control unit also monitors coolant temperature and at first times the compressor in case of overheating and switches it off later if the temperature rises further.

After starting the engine and exceeding an engine speed of 600 rpm for the first time the control unit is activated, the compressor is switched on, engine speed is continuously compared with compressor speed and coolant temperature is measured. If during a measuring period of 200 milliseconds slip is recognized once at high speed or slip is recognized three times at low speed, the compressor will be switched off.

Important!

The compressor can only be switched on again if the engine is started again. In case of fault and when a mechanical defect of the compressor cannot be found, check whether brief slip has occurred while driving through a puddle (wet ribbed drive belt).

Monitoring of the coolant temperature takes place parallel to monitoring of slip. If the coolant temperature exceeds the 117° C mark with rising tendency, the compressor will be timed, i.e. the magnetic clutch of the compressor will be switched off for 20 seconds every 40 seconds. If this measure causes the coolant temperature to drop below 114° C, the compressor will again be switched on continuously. However, if it rises again to 120° C, the compressor will be switched off until it is below the 114° C mark.

