

11 Engine

11 00 039	Compression of all cylinders – check	11-00/1
	General Information	11-00/1
00 00 249	BMW engine oil service (replacing engine oil and filter)	11-00/2
11 00 050	Engine – remove and install	11-00/3
11 12 002	Cylinder head cover, right or left – remove and install / seal	11-12/1
105	Cylinder head, left – remove and install	11-12/1

11 Engine

11 13 010	Oil pan upper section – remove and install or replace	11-13/1
11 14 102	Upper timing case – remove and install, seal or replace	11-14/1
110	Lower timing case cover – remove and install, seal or replace	11-14/1
115	Lower timing case – remove and install, seal or replace	11-14/2
11 23 031	Vibration damper hub – replace	11-23/1
11 28 010	Alternator drive belt – replace	11-28/1
11 31 002	Camshaft, left or right – replace	11-31/1
051	Timing chain – replace	11-31/1
11 33 062	Hydraulic valve clearance compensators – replace	11-33/1
11 51 000	Water pump – remove and install or replace	11-51/1
11 53 000	Coolant thermostat – remove and install or replace	11-53/1
11 61 056	Sealing flange for intake manifold, left or right – replace	11-61/1
11 62 145	Exhaust manifolds – remove and install or replace	11-62/1

11-00/1

GENERAL INFORMATION

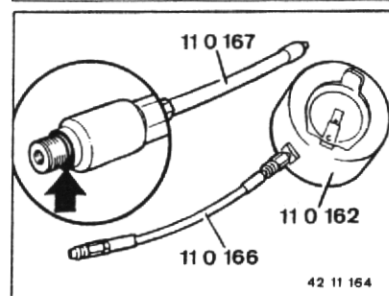
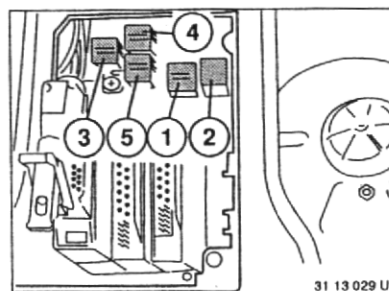
Arrangement of Cylinders:

Cylinders 1 ... 6 are on the right-hand side of the car as seen looking forward in car (beginning with cylinder no. 1 at the front end).

Cylinders 7 ... 12 are on the left-hand side of the car as seen looking forward in car (beginning with cylinder no. 7 at the front end).

Air intake manifold, throttle valve necks and air cleaner with air mass sensor for a concerned bank of cylinders are, however, located on the opposite side in each case.

- Procedures are applicable for both banks of cylinders. There will be descriptions of procedures for separate cylinder banks only when this is necessary.
- An engine (cylinder head) with installed hydraulic valve clearance compensating elements must not remain turned upside down longer than 10 minutes. Hydraulic valve clearance compensating elements may only be transported or stored standing upright. Hydraulic valve clearance compensating elements (drag levers) must not rattle during a trial run of the engine after finishing repairs. If necessary, the engine must be run longer at speeds up to max. 2,000 rpm until this rattling stops.
- Disassembling and repairing the engine will be described below in chronological sequence. Job positions given in the list of contents will make it easier to take up work again after an interruption or find various points. They only describe the actual removal or installation and not the entire job scope.



11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS

Caution!

Stop power supply to ignition coils (disconnect terminals 1 on ignition coils) – dangerous high tension voltage!

Pull off both fuel pump relays (1 and 2).

Location:

Electronic box.

Unscrew all spark plugs (also refer to 12 12 011).
Screw Special Tool 11 0 167 in tapped bore for spark plug by hand and connect Special Tools 11 0 162 and 11 0 166.

Note:

Check that seal is in perfect condition.

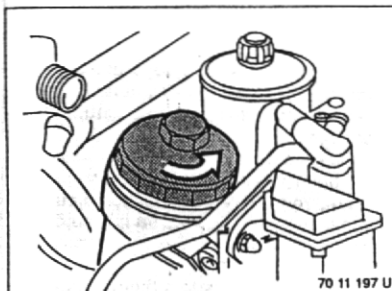
Depress accelerator pedal and operate starter until the compression no longer rises.

Value of all cylinders should not deviate by more than 0.5 bar (7 psi).

Specification:

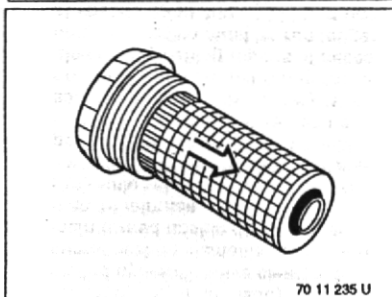
10 ... 12 bar (142 ... 171 psi).

11-00/2



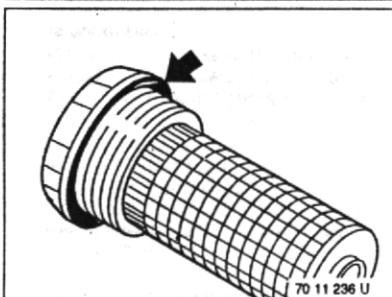
**00 00 249 BMW ENGINE OIL SERVICE
(Replacing Engine Oil and
Oil Filter)**

Oil should be replaced at operating temperature.
Let oil run out of the oil filter into the oil pan by unscrewing the oil filter cap.

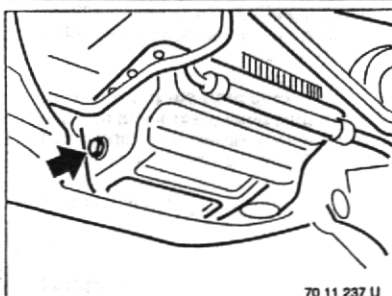


Pull oil filter off of oil filter cap.

Installation:
Check installed direction of filter.
Filter must engage in the cap.



Installation:
Replace O-ring on oil filter cap.



Loosen oil drain plug after oil has run out of the oil filter housing.
Drain or draw out oil.

Installation:
Replace seal.
Tightening torque*.

* See Specifications

Pour in engine oil*.
Start and run engine at high speed (approx. 2,500 rpm) until the oil control lamp goes out (after approx. 5 sec.).
Stop engine and check oil level (car on level floor).

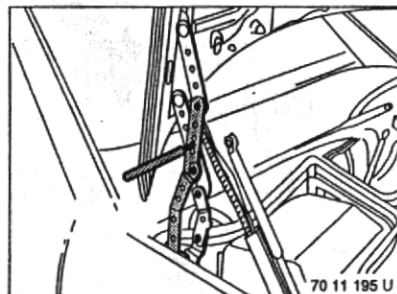
* See Operating Fluids for oil grade.
* See Specifications for oil volume.

11-00/3

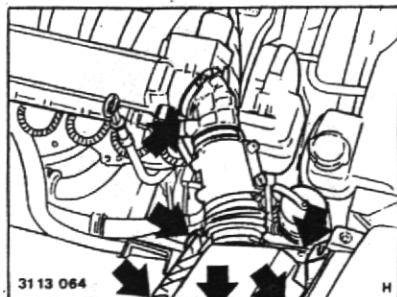
11 00 050 REMOVING AND INSTALLING ENGINE

Remove transmission – see Group 23 or 24.
Remove radiator and expansion tank – see Group 17.

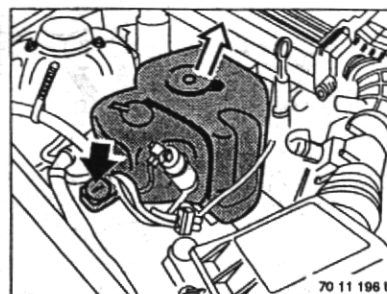
Caution!
To avoid damaging heater connections on the engine compartment wall, Special Tool 00 0 200 used for transmission removal or Special Tool 11 0 010 must remain installed until the engine is suspended on Special Tool 11 0 000.



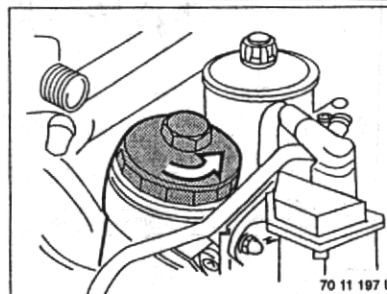
Raise hood to mounting position.



Remove air mass sensor complete with intake bellows and upper air cleaner section on left and right sides.

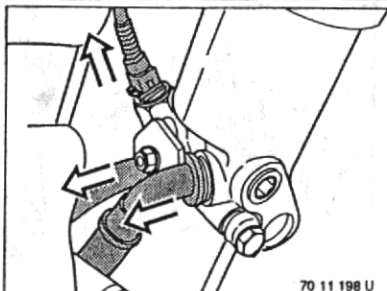


Unscrew and place windshield washing fluid tank aside.

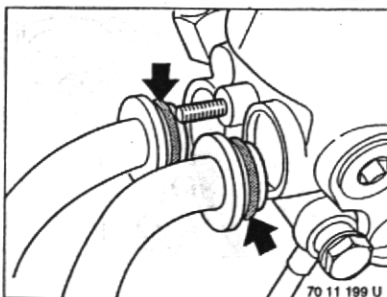


Let oil run out of the oil filter into the oil pan by unscrewing the oil filter cap.

Installation:
Replace gasket.

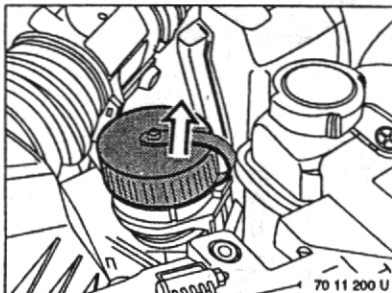


Unscrew oil pipes on oil filter.
Pull off plug.

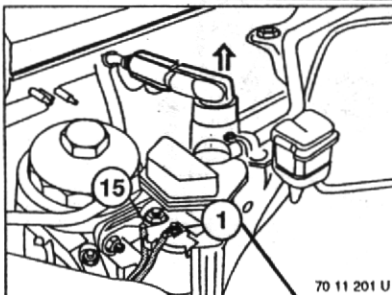


Installation:
Replace seals.

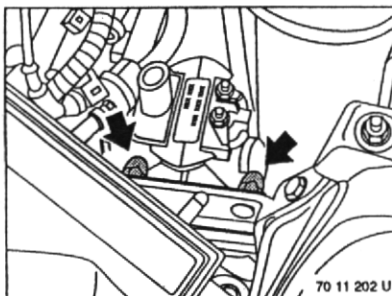
11-00/4



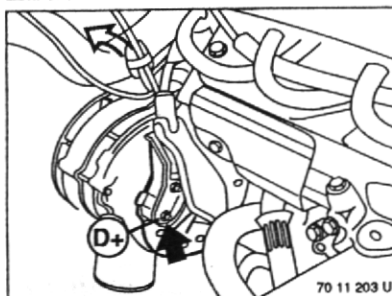
Unclip diagnostic plug.



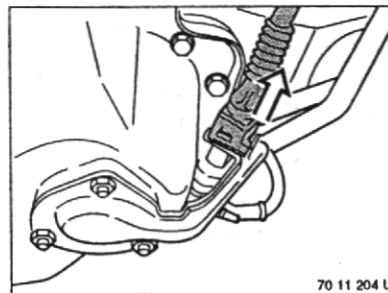
Disconnect ignition leads and connections on left and right ignition coils.



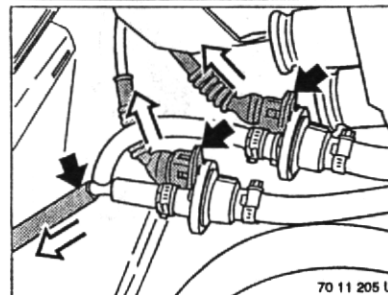
Unscrew right ignition coil.



Unscrew lead for D+ (thin lead) on the alternator and pull out of rubber cap.

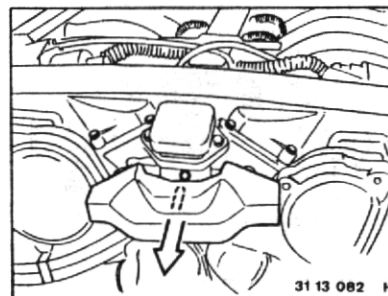


Disconnect oil level sender plug.

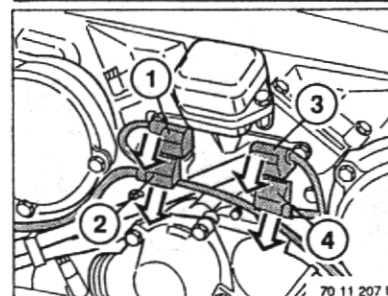


Pull both plugs off of tank venting valves.
Disconnect hose.

Important!
Don't mix up plugs.



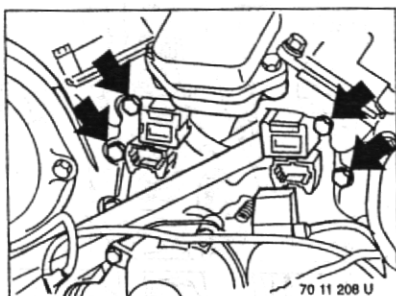
Pull off oil catching tray



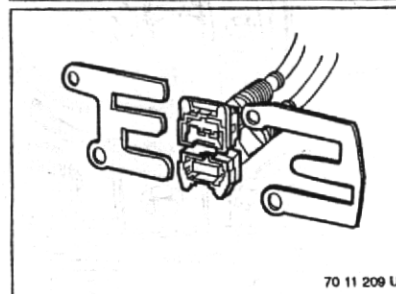
Pull off plugs (1 ... 4).

Installation:
1 = Pulse sender Cyl. 1 ... 6
2 = Cyl. Identifier Cyl. 1 ... 6
3 = Cyl. Identifier Cyl. 7 ... 12
4 = Pulse sender Cyl. 7 ... 12

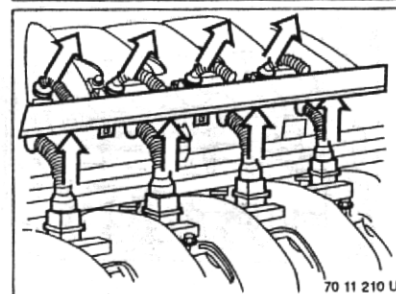
11-00/5



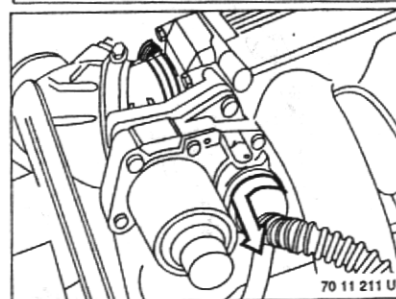
Unscrew bracket.



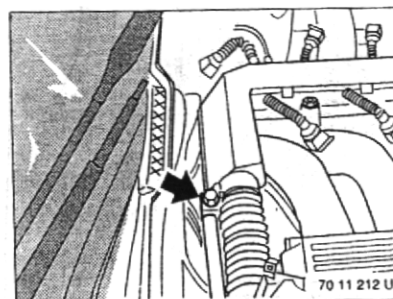
Pull plugs out of holders.



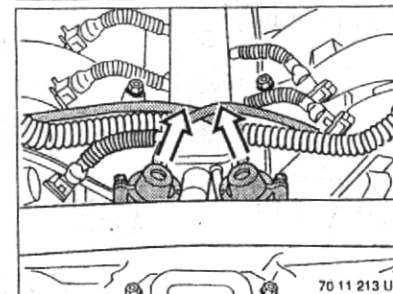
Pull plugs off of fuel injectors.



Disconnect plugs on left and right throttle valve assemblies.

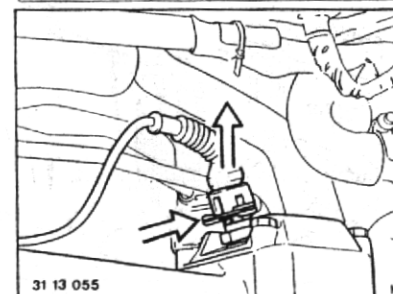


Unscrew electric lead duct on rear end of engine.

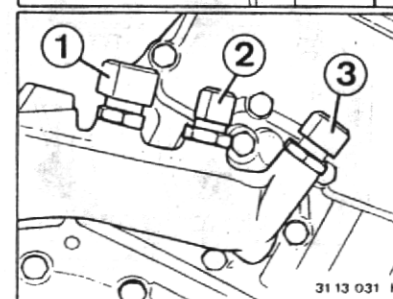


Pull vacuum hoses off of pressure regulators.

Installation:
Note arrangement of hoses.

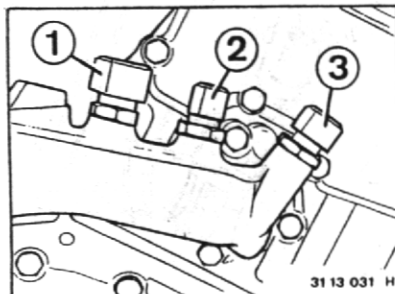


Pull off both plugs on air intake manifold.

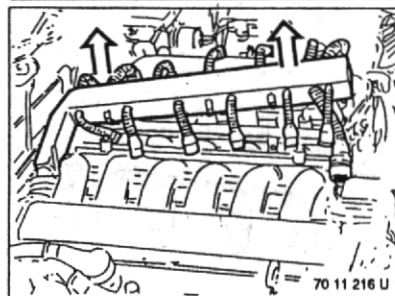


Pull off plugs on temperature sensors on rear end of engine.

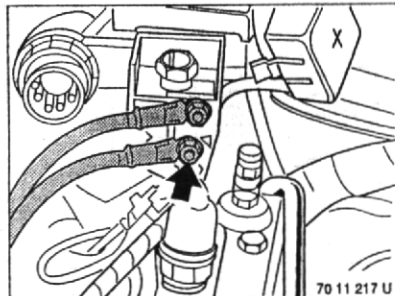
11-00/6



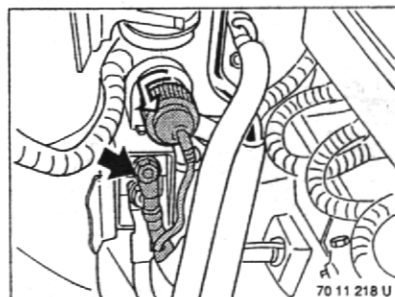
- Arrangement:
- 1 Temperature sensor - DME
 - 2 Temperature sensor - EML
 - 3 Temperature sensor - temp. gage



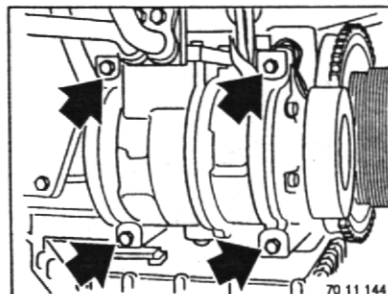
Lift off and move back electric lead duct.



Unscrew connection for alternator on B+ connection point.

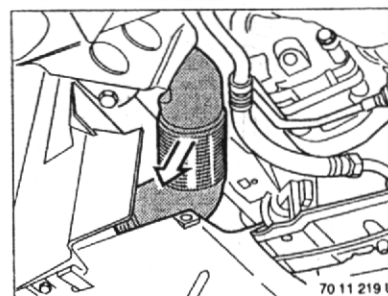


Unscrew connections for starter at connection point on right wheel house.

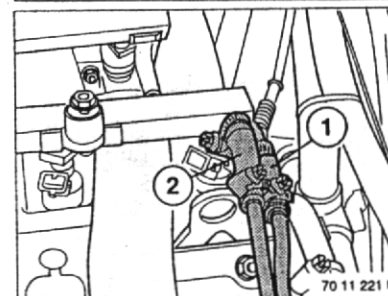


Unscrew AC compressor on engine.

Note:
Hoses remain connected.
Mount side of AC compressor on wheel house.

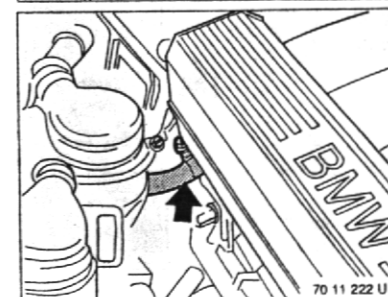


Unscrew cool air guide for alternator.



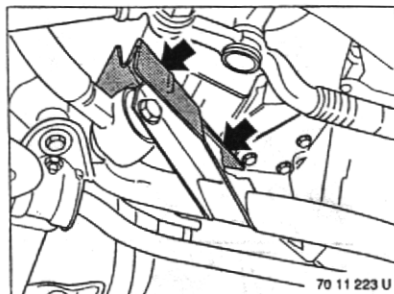
Unscrew fuel pipes (1 ... 2)

Installation:
Arrangement of Fuel Pipes:
1 = Cylinders 1 ... 6
2 = Cylinders 7 ... 12

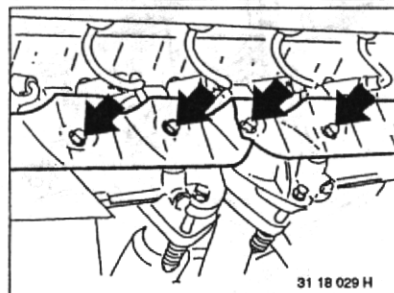


Unscrew fuel return pipe on rear end of engine to the right.

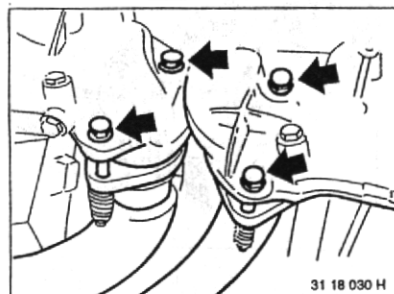
11-00/7



Unscrew heat shields on left and right thrust struts.



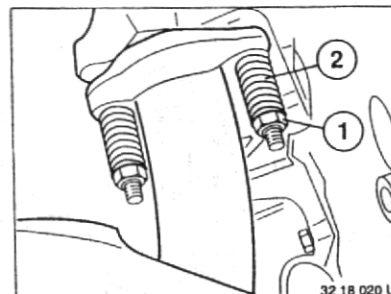
Unscrew heat shields on right exhaust manifolds.



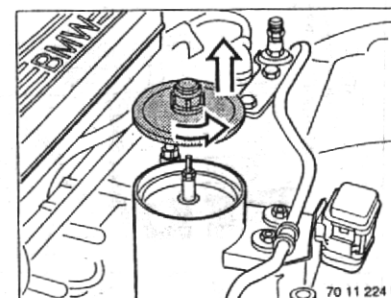
Unscrew right exhaust pipes on exhaust manifolds and remove.



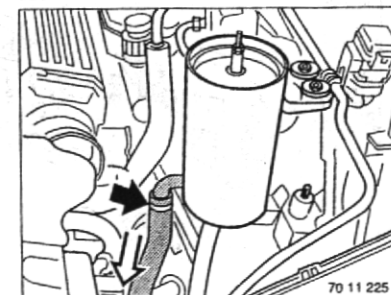
Important!
Tighten exhaust pipes only after installation of the engine and complete exhaust assembly.



Installation:
Replace self-locking nuts.
Lubricate tapers of flanges with CRC** copper paste.
Press springs (2) flat uniformly by tightening nuts (1) with a torque of 10 Nm (7 ft. lbs.).
Loosen nuts (1) 1 and 1/2 turns afterwards.
Flanges must be parallel to each other after finishing installation.
Springs must not be pressed flat.
The pipe with compensator must be tightened last due to the danger of torsion.



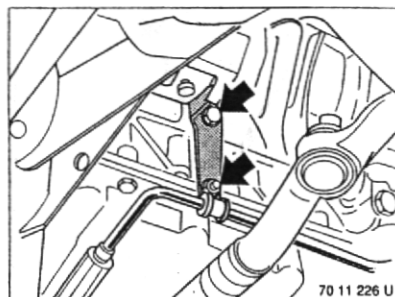
Draw oil out of power steering pump's supply tank.



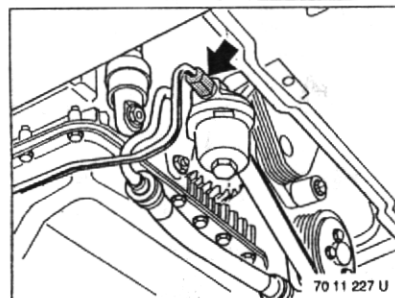
Unscrew hose on supply tank.

** Source of Supply: HWB

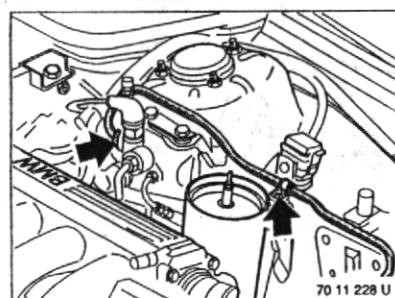
11-00/8



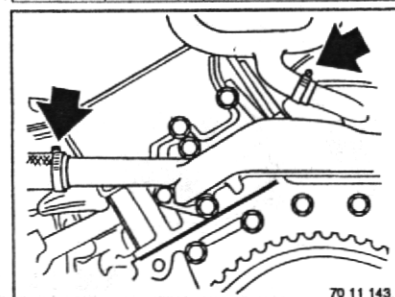
Unscrew holder for ASC+T pipe and starter support on engine block. Lift out starter.



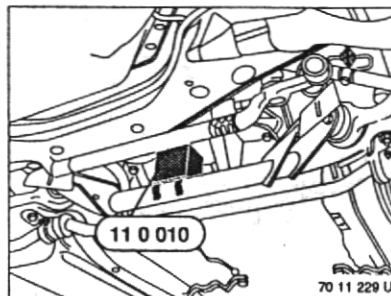
Unscrew pipe for ASC+T on filter.



Unscrew holder and hydraulic fluid pipe on power flow regulator.

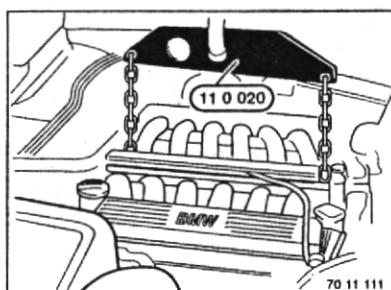


Disconnect heater hoses on coolant manifold and coolant pipe between the heater wall and engine.

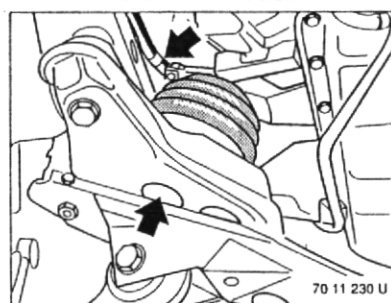


Caution!

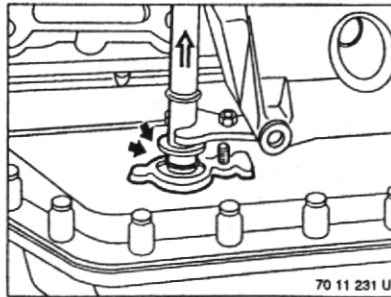
Special Tool 11 0 010 must be inserted before removing Special Tool 00 0 200, as otherwise the engine would bear on and could damage the connectors of the heater.



Remove Special Tool 00 0 200. Attach Special Tool 11 0 000 on suspension holders.



Unscrew ground strap on right engine support arm. Unscrew left and right engine mounts.

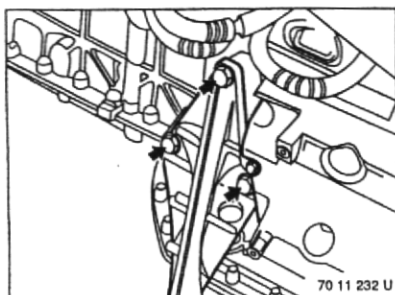


Remove guide tube for oil dipstick.

Installation:

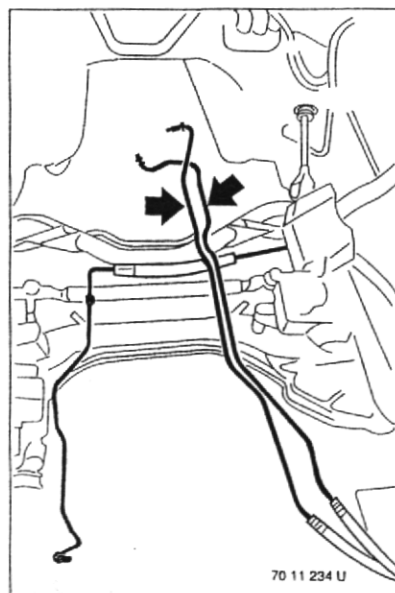
Check position of seal and washer.

11-00/9



Lift engine slightly and unscrew right engine bracket.

**Lift engine and turn rear end to the right.
Guide left exhaust pipes past the steering spindle while lifting out the engine.**



Installation:
Cars with Automatic Transmission:
Place oil cooler pipes in correct position before installing the engine.

11-12/1

11 12 002 REMOVING AND INSTALLING / SEALING LEFT OR RIGHT CYLINDER HEAD COVER

Remove following parts:

- Intake air manifold (11 61 056 without "both sealing surfaces")
- Protective cover for distributor cap and ratchet strap
- Cylinder head cover and gasket

11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD

Remove following parts:

- Engine (11 00 050)
- Support arm for left engine mount
- Left and right take-ups for assembly stand
- Engine in assembly stand
- Left rear exhaust manifold heat shield installed sometimes
- Left split pipe on manifold
- Injection pipe with left and right fuel injectors
- Ignition lead pipes on left and right manifolds
- Left and right distributor caps
- Left and right manifolds with noise suppressors
- Left and right valve covers / gaskets
- Left and right distributor arm/adaptor housings with gaskets
- Alternator drive belt tensioner
- Timing case cover with gasket
- Timing chain tensioner
- Upper timing chain guide rail
- Left and right camshaft sprockets
- Engine turned to TDC, held, timing checked
- Left timing chain guide rail
- Upper timing case with gasket
- Rear coolant connector with gasket and O-ring
- Left cylinder head bolts, tightening torque and 120° torque angle
- Left cylinder head with gasket
- Measure piston protrusion
- Clean crankcase
- Clean cylinder head
- Clean piston crowns

11 13 010 REMOVING AND INSTALLING
OR REPLACING UPPER OIL
PAN SECTION

Remove following parts:

- Transmission (23 00 025, 24 00 024)
- Clutch pressure plate on drive plate
(only manual transmissions)
- Windshield washing fluid tank
- Oil dipstick guide tube
- Both nuts on bottom engine mounts
- Splash guard
- Drain and fill engine oil
- Level sender plug
- Lower oil pan section
- Clean sealing surfaces
- Level switch
- O-ring
- AC compressor drive belt tensioner
- Drain hose from oil filter to oil pan
- Flywheel
- Ride level control oil pipe holder
- Power pump holder on oil pump
- Turn engine to TDC
- Connector on oil pump
- Sprocket on oil pump and adjust
- Oil pump
- Heat oil pan and scavenging pipe
- Staybolts for oil pump
- Correct power steering oil level
- Run up ride level control

11-14/1

11 14 102 REMOVING AND INSTALLING, SEALING OR REPLACING UPPER TIMING CASE

Remove following parts:

- Both cylinder head covers
- Oil catch tray on timing case cover
- Fan
- Distributor caps left and right, Ignition leads
- Distributor arms, adapters and distributor housings left and right
- Alternator drive belt and tighten
- Alternator drive belt tensioner
- Upper timing case cover and gasket
- Set and hold engine in TDC
- Chain tensioner
- Adjust chain tensioner
- Upper chain guide rail
- Both sprockets
- Check timing
- Left guide rail
- Upper timing case and gasket

11 14 110 REMOVING AND INSTALLING, SEALING OR REPLACING LOWER TIMING CASE COVER

Remove following parts:

- Upper timing case (11 14 102)
- Lower oil pan section
- Coolant hose on thermostat housing left, right, upper
- Coolant hose on expansion tank bottom
- Coolant hoses on radiator
- Fill coolant
- AC compressor drive belt tensioner
- Pulley on water pump
- Vibration damper on hub
- Wrench on hub (ST 11 2 230)
- Central bolt for hub
- Hub with puller (ST 00 7 501)
- Upper oil pan section loosened partially
- Timing case cover with seal and gasket (ST 11 1 210, 11 1 220)

ST = Special Tool

11-14/2

11 14 115 REMOVING AND INSTALL-
ING, SEALING OR REPLAC-
ING LOWER TIMING CASE

Remove following parts:

- Upper timing case (11 14 102)
- Lower oil pan section
- Lower timing case cover (11 14 110)
- Water pump
- Replace O-ring
- Tensioning rail and chain
- Lower timing case and gasket
(ST 11 1 210, 11 1 220)

ST = Special Tool

11-23/1

**11 23 031 REPLACING HUB FOR
VIBRATION DAMPER**

Remove following parts:

- Fan
- Splash guard
- Water pump pulley
- AC compressor drive belt tensioner
- Tighten drive belt
- Alternator drive belt tensioner
- Tighten drive belt
- Vibration damper on hub
- Hub with puller (ST 00 7 501)
- Radial oil seal (with puller)
- Wrench for hub (ST 11 2 230)

ST = Special Tool

11-28/1

11 28 010 REPLACING ALTERNATOR
DRIVE BELT

Remove following parts:

- Oil catch tray on timing case
- Fan
- Drive belt

11-31/1

11 31 002 REPLACING LEFT OR RIGHT
CAMSHAFT

Remove following parts:

- Upper timing case cover
- Drag lever
- Oil pipe for camshaft
- Bearing caps for camshaft

11 31 051 REPLACING TIMING CHAIN

Remove following parts:

- Lower timing case cover (11 14 110)
- Set engine to TDC
- Tensioning rail and chain

11-33/1

11 33 062 REPLACING ALL HYDRAULIC
VALVE CLEARANCE COM-
PENSATING ELEMENTS

Remove following parts:

- Both cylinder head covers
- Fan
- Drag lever with (ST 11 3 180)
- Hydraulic valve clearance compensating elements

ST = Special Tool

1. Remove the cylinder head covers.
2. Remove the fan.
3. Remove the drag lever with (ST 11 3 180).
4. Remove the hydraulic valve clearance compensating elements.
5. Install the new hydraulic valve clearance compensating elements.
6. Install the drag lever with (ST 11 3 180).
7. Install the fan.
8. Install the cylinder head covers.

11-33/1
The 11-33/1 is a special tool.

11-51/1

11 51 000 REMOVING AND INSTALLING
OR REPLACING WATER
PUMP

Remove following parts:

- Splash guard
- Fan
- Alternator drive belt tensioner
- AC compressor drive belt tensioner
- Pulley on water pump
- Coolant hose on thermostat housing
left, top and right
- Vibration damper and hub
- Coolant - drain and fill
- Cover for thermostat housing
- Water pump with O-rings

11-53/1

11 53 000 REMOVING AND INSTALLING
OR REPLACING COOLANT
THERMOSTAT

Remove following parts:

- Splash guard
- Coolant - drain and fill
- Fan
- Cover for thermostat housing

11-61/1

11 61 056 REPLACING SEALING
FLANGE FOR LEFT OR
RIGHT INTAKE AIR
MANIFOLD

Remove following parts:

- Air box complete on firewall
- Cover for fuel injectors
- Upper air cleaner section with air mass sensor
- Plugs on left and right throttle valve assemblies
- Plugs for fuel injectors
- Plugs for pulse sender and cylinder identifier
- Electric plate partially
- Injection pipe complete on manifold
- Fuel feed pipes
- Fuel return pipes
- Fuel injectors with vaseline
- Windshield washing fluid tank if necessary
- Ignition leads on manifold
- Intake air manifold
- Both sealing flanges

11-62/1

11 62 145 REMOVING AND INSTALLING
OR REPLACING ALL
EXHAUST MANIFOLDS

Remove following parts:

- Upper air cleaner section with air mass sensor left
- Clamp on split pipe left and right
- Heat shields on manifolds left
- Heat shield on steering gear
- Manifold/split pipe bolts left
- Front manifold with gaskets (left)
- Rear manifold with gaskets (left)
- Nuts on staybolts
- Staybolts for left manifolds in head
- Upper air cleaner section with air mass sensor right
- Windshield washing fluid tank
- Oil dipstick guide tube
- Heat shields on manifolds right
- Front manifold with gaskets (right)
- Rear manifold with gaskets (right)
- Nuts on staybolts
- Staybolts for right manifolds in head