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Repair Manual

Supplement 6 3/89
BMW 318i — M3 US

Does not cover 320i

Order No. 01 57 9 599 728
Please replace the entire contents,
filling the enclosed sheets
according to groups after the
pertinent register sheets.



Repair Manual

BMW 318 i. . M 3 US - E 30

3/89

00 Maintenance and General Data

| | |
|--|-------|
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| BMW Maintenance System | |
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INTRODUCTION

This repair manual microfilm is to assist you in performing the necessary maintenance and repair work expertly and correctly. It must be placed at the disposal of shop foremen and mechanics, and will complement the practical and theoretical training offered by our Service training schools.

Specifications and adjusting values are shown on the technical data and nominal value microfilms.

This repair manual microfilm is in reference to a standard production car free from accident damage and not subsequently modified in any way.

The group system has been adopted from the flat rate manual.

The job numbers used in the text are meant for use as cross reference. They will frequently contain job procedures, which must not be used for extension of the flat rates. They are only provided to make the finding of repair procedures easier.

The individual page numbering, for example 32 - 6, means:

32 - main group
6 - page number (in ascending numerical order)

The special tools essential for correct repair work are summarized on the special tool microfilm, Order No. 01 99 9 699 422. Their use is illustrated in the descriptions of the various repair jobs.

The removal work is described for each repair job in this manual. If installation does not take place in the reverse order of work, an "installation" note is provided.

In addition to the improvements supplied to you regularly in the form of "Service Information", you are recommended to consult the parts microfilms for additional illustrated data.

**BAYERISCHE MOTOREN WERKE AG
SERVICE DEPARTMENT**

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Service Division

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TOWING

Please conform with local and national legislative measures concerning the towing of vehicles as applicable.

Turn the ignition key to position "1" to unlock the steering wheel and be able to use the turn signals, horn and possibly windshield wipers.

Since the brake booster only works with the engine running, greater force will be required on the brake pedal of cars with a brake booster when the "engine is stopped".

The towing cable should be elastic to protect the towing and towed vehicles. Consequently only use plastic fiber cables or cables with elastic links.

Cars with Automatic Transmission:

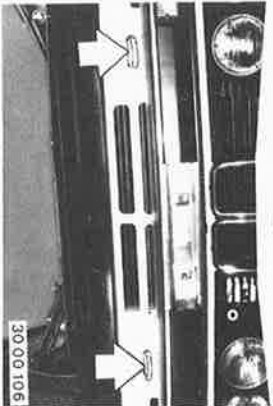
Selector lever in "N".

Max. towing speed: 50 km/h (30 mph).

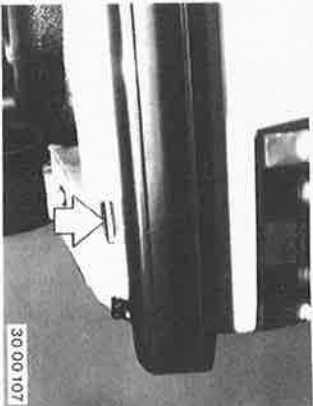
Max. towing distance: 40 to 50 kilometers (25 to 30 miles)

If the car has to be towed further than 50 km (30 miles) add an extra liter (2 pints) of ATF than the specified oil volume for automatics or remove the propeller shaft.
After repairing the car it is absolutely essential to correct the ATF volume to the specified amount.

Front Towing Eyes



Rear Towing Eyes



General Information

| 00 00 009 Pre-Delivery Inspection | General Information | | | | Important Instructions! | |
|---|---------------------|----------------|----------------|---|-------------------------|--|
| | Repair Manual | Specifications | Nominal Values | Service Information | | Owner's Manual |
| <p>Check engine oil level (check for dilution of lubricating oil), replacing oil and oil filter if necessary</p> <p>Check seal of filler cap</p> <p>Check tension of V-belts</p> <p>Check coolant hoses for leaks and correct routing</p> <p>Check tightness of hose clamps</p> <p>Check coolant level and antifreeze protection correcting if necessary</p> <p>Check battery acid level, adding distilled water if necessary</p> <p>Check tightness of battery terminals</p> <p>Check spark plugs and replace or clean and adjust electrode gaps</p> <p>M 3: change spark plugs</p> <p>Check fuel lines, tank, tank cap and filter for tight fit and leaks</p> <p>Check fuel injection parts for tight fit or leaks</p> <p>Check exhaust system for correct installation</p> | | | | <p>Gr. 00, Gr. 11 *)</p> <p>Gr. 00, Gr. 17 *)</p> | <p>+</p> <p>+</p> | <p>Use approved oil only!</p> <p>Visual inspection</p> <p>Visual inspection</p> <p>Longterm antifreeze and corrosion inhibitor</p> <p>Visual inspection</p> <p>Visual inspection</p> |
| | | Gr. 12 | | | | Visual inspection |
| | | | Gr. 12 | | | Visual inspection |

*) After Introduction of: Operating-Fluids-File

BMW MAINTENANCE SYSTEM

00 00 210 1200 Mile Inspection

| General Information | | | | | | Important Remarks! |
|--|----------------|-----------------|------------------------------|----------------|--|--------------------|
| Repair Manual | Technical Data | Nominal Values | Service Information | Owner's Manual | | |
| Read out diagnostic system. Replace engine oil and oil filter at operating temperature | | | Gr. 00, Gr. 11 *) | + | Use approved oil only | |
| Check and adjust valve clearance except M 3 | Gr. 11 | Gr. 11 | Gr. 00, Gr. 17 *) | + | Longterm antifreeze and corrosion inhibitor | |
| Check coolant hoses and connections as well as heater hoses for leaks; check coolant level and concentration, correcting if necessary | Gr. 23 | | Gr. 00/23, Gr.23*) | + | Use approved oil only | |
| Replace oil in manual transmission and transfer case, 325 iX only, at operating temperature (not applicable to automatic transmission) | Gr. 23/24 | | Gr. 00/23/24 Gr. 23/24 *) | + | Use approved ATF only | |
| Check ATF level in transmission or synthetic oil level, correcting if nec. | | | | | Visual inspection | |
| Check exhaust system and catalytic converter for correct installation, routing, damage or leaks | | | | | Tightening torque, check locks and cotter pins | |
| Tighten nuts and bolts of chassis: Steering, brake callipers and wheel bolts | | Gr. 32/33/34/36 | | | | |
| Check power steering for leaks and oil level, correcting if nec. | Gr. 32 | | | | | |

*) After Introduction of: Operating-Fluids-File

BMW MAINTENANCE SYSTEM

00 00 220 BMW Inspection I

| General Information | | | | | | Important Remarks! |
|---|----------------|----------------|---------------------|----------------|--|--------------------|
| Repair Manual | Technical Data | Nominal Values | Service Information | Owner's Manual | | |
| Check manual transmission oil level (transfer case, 325 iX only) for tightness. | Gr. 23 | | Gr. 00, Gr. 23 *) | | Use approved oil only | |
| Check power steering for leaks and oil level, correcting if necessary | Gr. 32 | | Gr. 00, Gr. 32 *) | | Tightening torque/visual inspection of cotter pins | |
| Check condition of suspension, tie rods, front axle joints, drop arms and coupling | Gr. 31 | | | | | |
| Check mechanical steering play, in straight ahead position | Gr. 32 | | Gr. 00, Gr. 33 *) | | Use approved oil only | |
| Check final drive oil level, correcting if necessary | | | | | | |
| Remove and install front and rear disc brake pads, check total thickness, if necessary replace, check surface condition of brake discs. Lubricate aluminum wheel rim centers | Gr. 34 | Gr. 34 | Gr. 36 | | | |
| Check fluid level in tank for hydraulic brake and clutch systems correcting if necessary Important: replace brake fluid annually at latest. | Gr. 34 | | Gr. 00, Gr. 34 *) | | Use approved brake fluids only | |
| Check brake calipers and dust boots for leaks | Gr. 34 | | Gr. 00 | | Visual inspection | |

*) After Introduction of: Operating-Fluids-File

BMW MAINTENANCE SYSTEM

00 00 220 BMW Inspection I

General Information

Repair Manual

Technical Data

Nominal Values

Service Information

Owner's Manual

Important Remarks!

Check function of following equipment:
 Lights: headlights, parking lights, backup lights, license plate lights, interior light and delay system, glove box light, engine compartment light and trunk light.
 Indicators: turn signals, hazard lights, stop lights, horn, headlight flasher and dimmer switch.
 Check aiming of headlights, correcting if necessary.
 Test check control, panel operation, ABS and SRS lights.

Fill supply tank for windshield washing system, check antifreeze protection, check intensive washer fluid level.
 Add intensive washer fluid if necessary.
 Check function of windshield wiper/wash system and aiming of spray jets

Check instruments: lights, control lights, heater and air conditioner blower and rear window defogger

Check condition and function of seat belts

Final inspection and test drive with check of operational safety: brakes, steering, clutch or automatic transmission and mirrors, break in parking brake

Gr. 63

Gr. 00

+

Gr. 34

Important!
 The Service Indicator (SI) must be reset after completion of inspection I as follows.

Switch off all electrical equipment.
 Turn on ignition.
 Do not run engine.
 Plug SI-R** with Adapter** in diagnoses socket.
 Push in and hold recessed, red INSPECTION button - green lamp (function control) comes on.
 Red lamp also comes on after approx. 3 sec. and goes out after approx. 12 seconds.
 Release inspection button - green lamp goes out.
 Checking Service Indicator (SI):
 All five green diode lights must be on.
 Yellow and possibly red diodes as well as INSPECTION sign should go out.

* SI-R = Service Indicator resetter, Order No. 62 1 100
 ** Adapter, Order No. 62 1 140



62 1 100

20 00 006



32 00 016

Caution: On systems with Politec brake linings increased braking effect
 See Rep. Manual Gr. 34 10 014
 breaking in p. brake

BMW MAINTENANCE SYSTEM

General Information

00 00 230 BMW Inspection II = Inspection I + Additional Jobs

Replace final drive (and front axle oil 325 iX) oil at operating temperature

Check condition of dust covers on output shafts

Car with rear brake discs: check parking brake liner thickness

Repair Manual

Technical Data

Nominal Values

Service Information

Owner's Manual

Important Remarks:

Use approved oil only

Gr. 00, Gr. 33 *)

Gr. 34

Gr. 34

Gr. 34

Gr. 34

Important!

The Service Indicator (SI) must be reset after completion of inspection II as follows:

- Switch off all electrical equipment
- Turn on ignition.
- Do not run engine.

Plug SI-R * with Adapter ** in diagnosis socket.

Push in and hold recessed, red INSPECTION button - green lamp (function control) comes on.

Red lamp also comes on after approx. 3 sec. and goes out after approx. 12 seconds.

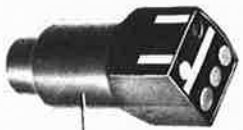
Release inspection button - green lamp goes out.

Checking Service Indicator (SI):

All five green diode lights must be on.

Yellow and possibly red diodes as well as INSPECTION sign should go out.

* SI-R = Service Indicator resetter, Order No. 62 1 100
 Adapter, Order No. 62 1 140



62 1 100

20 00 006

*) After Introduction of: Operating-Fluids-File

BMW MAINTENANCE SYSTEM

00 00 249 BMW Engine Oil Service

Engine oil and oil filter - replace at operating temperature

Important!
The Service Indicator (SI) must be reset after completion of the oil service as follows:

Switch off all electrical equipment.
Turn on ignition.

Do not run engine

Plug SI-R * with Adapter ** in diagnosis socket.

Push in and hold yellow OILSERVICE 1) button - green lamp (function control) comes on.

Yellow lamp also comes on after approx. 10 sec. and goes out after approx. 3 seconds.

Release oil service button - green lamp goes out.

Checking Service Indicator (SI) after 10 seconds:

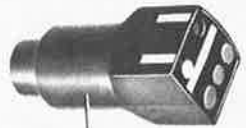
All five green diode light should come on.

Yellow (possibly red) diode and OILSERVICE sign must go out.

- * SI-R = Service indicator resetter, Order No. 62 1 100.
- ** Adapter, Order No. 62 1 140.
- 1) *Caution!* Resetting with the wrong button cannot be corrected. Service intervals would be mixed up - also refer to BMW Technik information of Group 62

General Information

| Repair Manual | Technical Data | Nominal Values | Service Information | Owner's Manual | Important Remarks |
|---------------|----------------|----------------|---------------------|----------------|-----------------------|
| | | | Gr. 00, Gr. 11 *) | | Only use approved oil |



62 1 100

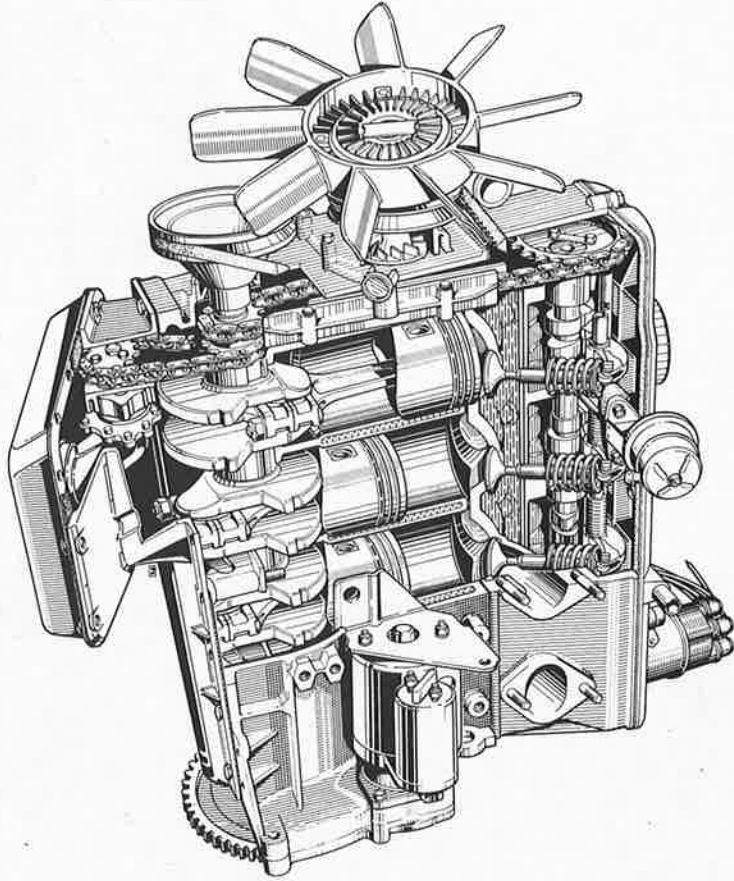
20 00 006

*) After Introduction of: Operating-Fluids-File

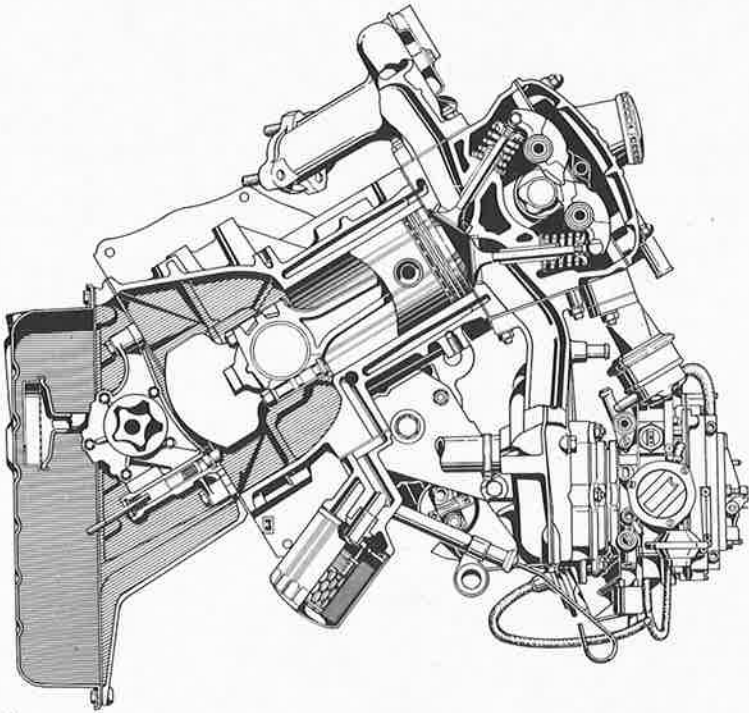
11 Engine

Type 318 I/A - US - E 30:

| | | |
|-----------|---|------------------------------|
| 11 00 006 | Diagnosis with BMW Service Tester | see nominal value microfiche |
| 039 | Compression of all cylinders - check | 11-2 |
| 050 | Engine - remove and install | 11-3 |
| 091 | Engine - exchange | 11-6 |
| 11 12 000 | Cylinder head cover - remove and install | 11-6 |
| 100 | Cylinder head - remove and install | 11-7 |
| 101 | Cylinder head gasket - replace | 11-10 |
| 561 | Valve guide - replace (valve removed) | 11-11 |
| 595 | Valve guide - check for wear | 11-11 |
| 600 | Valve guide - ream | 11-11 |
| 607 | Valve seats and valves - machine (cylinder head disassembled) | 11-11 |
| 719 | Cylinder head mating surface - grind (cylinder head disassembled) | 11-12 |
| 729 | Cylinder head - check for cracks in water test (cylinder head disassembled) | 11-12 |
| 11 13 010 | Oil pan upper section - remove and install / replace | 11-13 |
| 020 | Oil pan lower section - remove and install / replace | 11-13 |
| 11 14 100 | Timing case cover, upper - remove and install / seal | 11-14 |
| 120 | Timing case cover, lower - remove and install / seal | 11-14 |
| 141 | Radial oil seal in lower timing case cover - replace | 11-15 |
| 605 | Radial oil seal in clutch end cover - replace | 11-15 |
| 11 21 000 | Crankshaft - remove and install | 11-16 |
| 120 | Crankshaft pulley - remove and install | 11-17 |
| 501 | Crankshaft - replace (crankshaft removed) | 11-18 |
| 531 | Crankshaft main bearing shells - replace (engine disassembled) | 11-18b |
| 571 | Pilot bearing in crankshaft - replace | 11-19 |
| 11 22 000 | Flywheel - remove and install | 11-20 |
| 051 | Drive plate for torque converter - replace | 11-20 |
| 541 | Starter gear ring - replace | 11-20 |
| 11 24 521 | Connecting rods - replace (pistons removed) | 11-21 |
| 571 | Connecting rod bearing shells - replace (engine disassembled) | 11-21 |



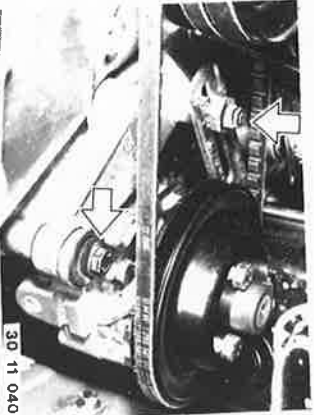
BMW 318i - M 10 B 18



11-3

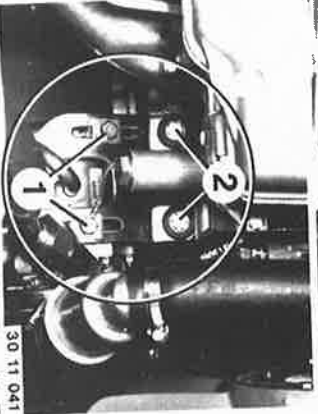
11 00 050 REMOVING AND INSTALLING ENGINE

Remove transmission s. Gr. 23/24
Detach power steering pump.
Pressure hoses remain connected.
Installation:
Tighten drive belt and check tightness with Special Tool 11 5 020.



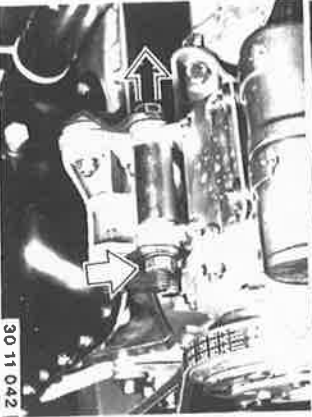
30 11 040

Unscrew bolts (1).
Remove bolts (2).



30 11 041

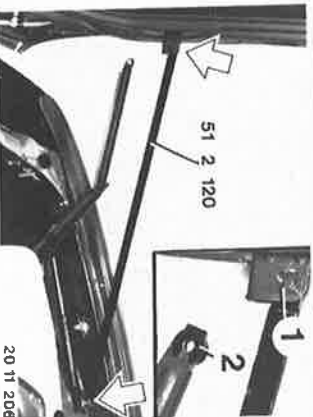
Unscrew bolt and remove compressor.
Refrigerant hoses remain connected.
Installation:
Tighten drive belt and check tightness with Special Tool 11 5 020.



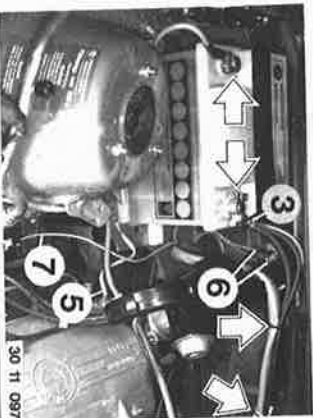
30 11 042

Remove radiator 17 11 000.
Disconnect prop and gas pressure spring and apply Special Tool 51 2 120.

Important!
Use locks (1).
Installation:
Insert plastic part (2).

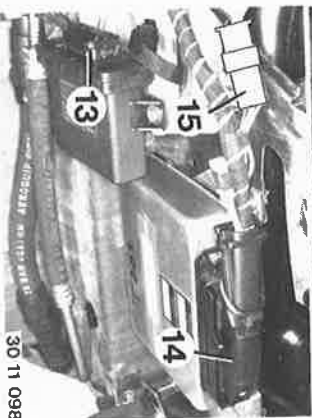


20 11 206



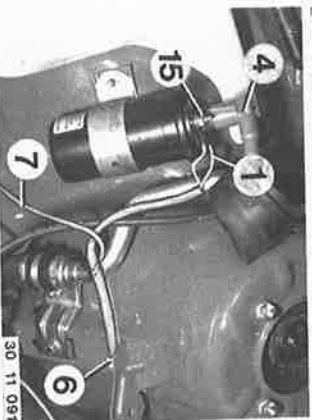
30 11 097

Disconnect battery ground and positive leads.
Disconnect wire (3).
Unscrew ground wire (5).
Open wire straps.
Pull off plug (6) on temperature sensor.
Disconnect plug (7) for oxygen sensor.



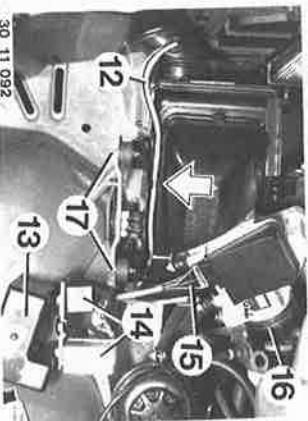
30 11 098

Remove trim in glove box.
Pull off plug (13) on idle control unit and plug (14) on L-Jetronic control unit.
Disconnect wire (15).
Push out wire harness into engine compartment.



30 11 091

Pull off wire (4) on ignition coil and disconnect wires (1 and 15).
Take wires out of clips (6).
Disconnect wire (7).



30 11 092

Disconnect wire (12).
Lift off cap (13) and remove relay (14).
Pull off plug (15).
Open hose strap (16).
Loosen nuts (17) and take off air cleaner.

11 Engine

BMW M 3 — Engine S 14 Z

| | | |
|-----------|---|-----------|
| 11 00 039 | Compression of all cylinders — check | 11 - 51 |
| 050 | Engine — remove and install | 11 - 52 |
| 11 12 000 | Cylinder head cover — remove and install | 11 - 53 |
| 100 | Cylinder head — remove and install | 11 - 53a |
| 595 | Valve guide — check for wear (valve removed) | 11 - 54 |
| 600 | Valve guide — ream out (valve removed) | 11 - 54 |
| 607 | Valve seats and valves — machine (valves removed) | 11 - 55 |
| 719 | Cylinder head sealing surface — grind (cylinder head disassembled) | 11 - 55 |
| 729 | Cylinder head — check for cracks in water test (cylinder head disassembled) | 11 - 55a |
| 11 13 010 | Oil pan upper section — remove and install | 11 - 56 |
| 020 | Oil pan lower section — remove and install | 11 - 56 |
| 11 14 105 | Radial oil seal in distributor housing — replace | 11 - 58 |
| 120 | Timing case cover, lower — remove and install/seal | 11 - 58 |
| 141 | Radial oil seal in lower timing case cover — replace | 11 - 59 |
| 605 | Radial oil seal in clutch end cover — replace | 11 - 59 |
| 11 21 000 | Crankshaft — remove and install | 11 - 60 |
| 120 | Crankshaft pulley — remove and install | 11 - 61 |
| 501 | Crankshaft — replace (crankshaft removed) | 11 - 61 b |
| 531 | Crankshaft main bearing shells — replace (engine disassembled) | 11 - 62 |
| 571 | Pilot bearing in crankshaft — replace | 11 - 63 |
| 11 22 000 | Flywheel — remove and install | 11 - 63 |
| 541 | Starter gear ring — replace | 11 - 63 |

11-6

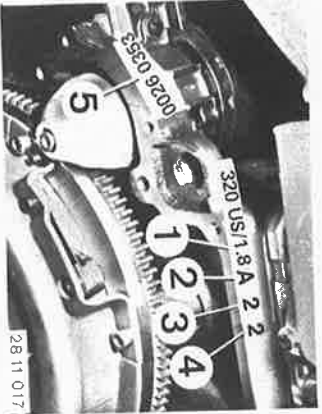
11 00 091 INSTALLING EXCHANGE ENGINE

Remove engine 11 00 050.

Exchange Engine Identification on Crankcase:

- 1 = Type designation *****
- 2 = "A" for exchange or "N" for new
- 3 = Manufacturing month
- 4 = Manufacturing Year (1982)

Stamp engine number (5).



28 11 017

Knock in supplied oil dipstick guide tube (see 11 43 101) and transfer parts from old engine to exchange engine.

Fill engine with oil****.

Important!

On cars with an automatic transmission the pilot bearing must be installed in crankshaft (see 11 21 571).

11 12 000 REMOVING AND INSTALLING CYLINDER HEAD COVER

Detach hose (8).

Remove cylinder head cover.

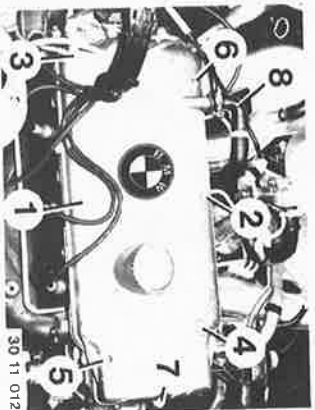
Installation:

Tighten nuts and bolts in order of 1 through 7.

Tightening torque*

Also bolt holder for ignition lead.

Check gasket, replacing if necessary.



30 11 012

Install engine.

If necessary, adjust ignition timing 12 11 004.

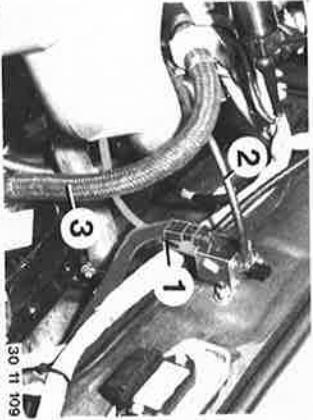
Adjust engine idle speed/CO 13 00 054.

Run engine warm.

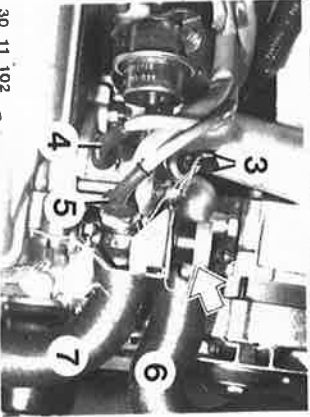
**** See Service Information of Gr. 00
***** See BMW Technik of Gr. 11

* See Specifications

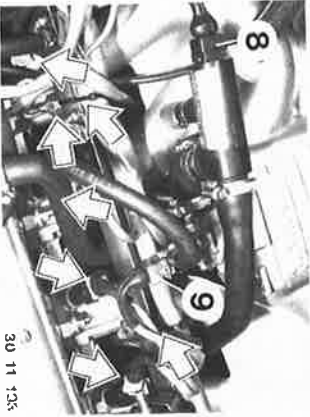
11-8



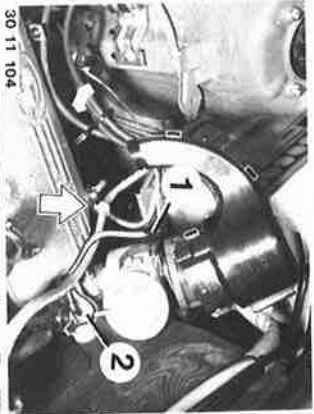
Pull off vacuum hose (1) for intake manifold and vacuum hose (2) for distributor. Disconnect vacuum hose (7).



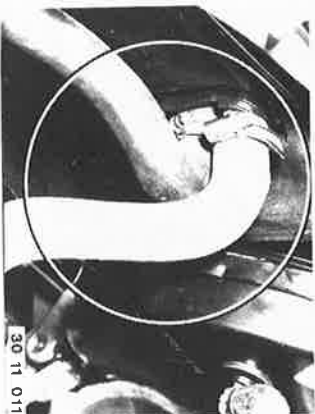
Disconnect diagnosis plug. Pull off plugs (3 ... 5). Disconnect wires on alternator. Disconnect coolant hoses (6 and 7).



Pull off plugs (8 and 9). Disconnect plug on starter. Pull off plugs on fuel injectors and open wire straps.



Remove distributor cap and pull off spark plug caps. Pull off plugs (1 and 2). Disconnect wire harness.



Disconnect coolant hoses.

11 Engine

M 20 B 25 / B 27:

| | | |
|-----------|---|-----------|
| 11 00 039 | Compression of all cylinders - check | 11 - 101 |
| 050 | Engine - remove and install | 11 - 102 |
| 050 | Engine - remove and install (since 1988 models) | 11 - 104a |
| 091 | Engine - exchange | 11 - 104 |
| 11 11 160 | Bearings for oil pump drive shaft - replace | 11 - 105 |
| 11 12 000 | Cylinder head cover - remove and install | 11 - 105 |
| 100 | Cylinder head - remove and install | 11 - 106 |
| 100 | Cylinder head - remove and install | 11 - 108a |
| 101 | Cylinder head gasket - replace | 11 - 109 |
| 240 | Radial oil seal in end cover - replace | 11 - 110 |
| 561 | Valve guide - replace (valve removed) | 11 - 110 |
| 595 | Valve guide - check for wear | 11 - 110 |
| 600 | Valve guide - ream out | 11 - 111 |
| 607 | Valve seats and valves - machine (cylinder head disassembled) | 11 - 111 |
| 719 | Cylinder head mating surface - grind (cylinder head disassembled) | 11 - 111 |
| 729 | Cylinder head - check for cracks in water test (cylinder head disassembled) | 11 - 112 |
| 11 13 000 | Oil pan - remove and install | 11 - 112 |
| 11 14 175 | Front end cover - remove and install | 11 - 113 |
| 180 | Radial oil seals in front end cover - replace | 11 - 113 |
| 605 | Radial oil seal in clutch end cover - replace | 11 - 114 |
| 11 21 000 | Crankshaft - remove and install | 11 - 114 |
| 501 | Crankshaft - replace (crankshaft removed) | 11 - 115 |

11-10

11 12 101 REPLACING CYLINDER HEAD GASKET



30 11 064

Remove cylinder head 11 12 100. Clean sealing surfaces on cylinder head and crankcase with a sealant remover** and a hard wood scraper. Check levelness with a standard steel ruler, grinding cylinder head sealing surface if necessary — see 11 12 719.

Installation:

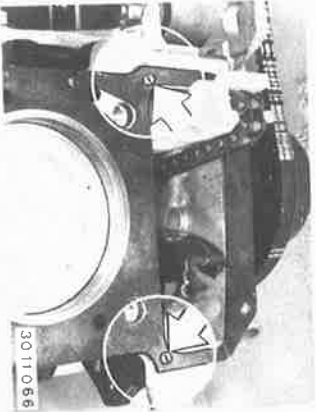
Only use original cylinder head gaskets, the holes and openings of which for the coolant are matched precisely.

A gasket of original thickness or a 0.3 mm (0.012") thicker gasket, to prevent reduction in combustion chamber size, can be installed on a ground cylinder head.

Identification:

Stamped codes:
1.8 / 1.8E / 2.0 / 2.0E.

Important!
Coat bores with a brush-on universal sealant/Three Bond Silicone 1207* before installation of the timing case cover.

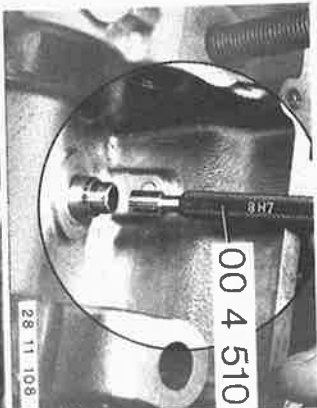


30 11 066

11 12 561 REPLACING VALVE GUIDES

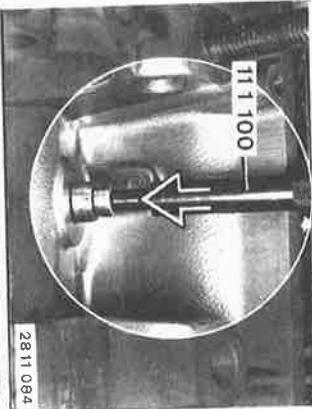
— Valves Removed —

Check wear* of valve guides with Special Tool 00 4 510.



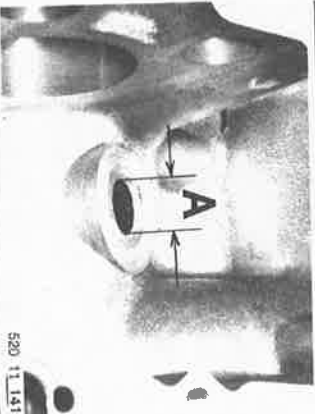
28 11 108

If the permissible wear limit is exceeded, drive out valve guide (old) into combustion chamber with Special Tool 11 1 100.



28 11 064

Inspect bore (A) in the cylinder head with Special Tool 00 4 520. If the permissible diameter is exceeded, ream out the bore with standard reamers and install an oversize* valve guide.

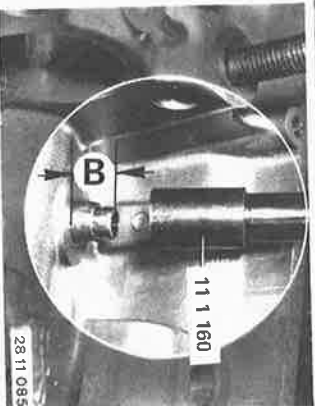


520 11 151

Heat* cylinder head. Drive valve guide into cylinder head from the camshaft side with Special Tool 11 1 160. Stepped end of valve guide faces camshaft.

Important!

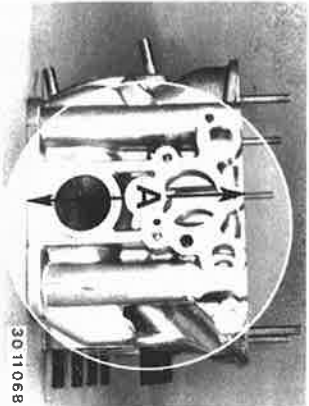
Bore in special tool determines protrusion B* of the valve guide. Ream out the valve guide to the specified inside diameter* with Special Tool 00 4 500. Machine valve seat — see 11 12 607.



28 11 085

* See Specifications

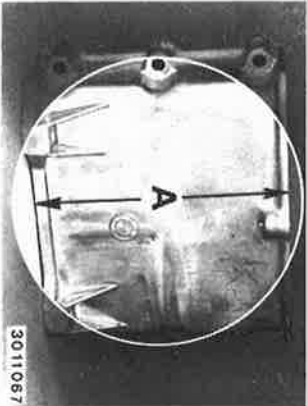
11-12



30 11 068

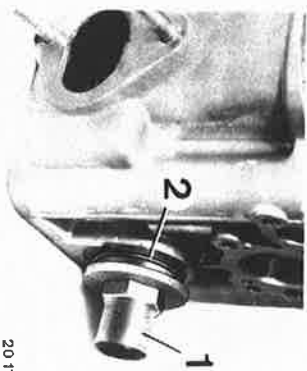
11 12 719 GRINDING CYLINDER HEAD SEALING SURFACES — CYL. HEAD DISASSEMBLED —

When grinding cylinder head mating surface, not more than 0.3 mm (0.012") may be taken away from total cylinder head thickness $A = 129 \pm 0.1$ mm (5.079 \pm 0.004"). Install a 0.3 mm (0.012") thicker gasket on a ground cylinder head (also refer to 11 12 101).



30 11 067

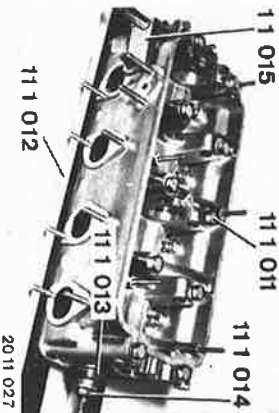
Upper timing case cover must be ground accordingly after grinding cylinder head.



20 11 050

11 12 729 CHECKING CYLINDER HEAD FOR CRACKS IN WATER TEST — CYL. HEAD DISASSEMBLED —

Unscrew bolt (1).
Installation:
Replace seal (2).



20 11 027

Mount rails 11 1 012 on cylinder head with bolts 11 1 011.
Plug off water circuit on cylinder head with Special Tools 11 1 015, 11 1 013 and 11 1 014.



20 11 028

Apply compressed air to cylinder head.
Test pressure: 4.5 bar (64 psi).
Place cylinder head in water bath and check for cracks.
Note:
If necessary, relax water bath with a detergent.

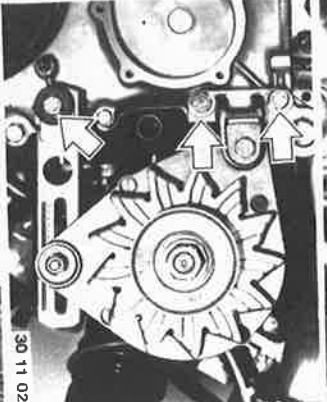
11-14

11 14 120 REMOVING AND INSTALLING/ SEALING LOWER TIMING CASE COVER

Disconnect battery ground lead.
Remove upper timing case cover 11 14 100.
Disconnect wires on alternator.
Unscrew bolt on engine block.



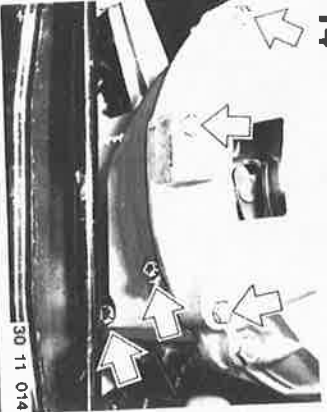
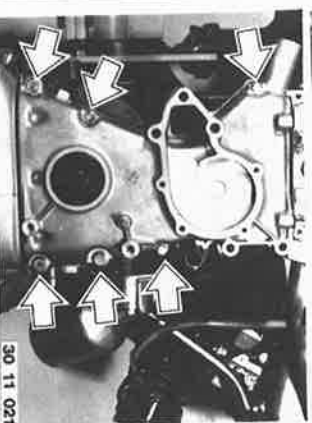
Unscrew alternator with console and
tensioning bar



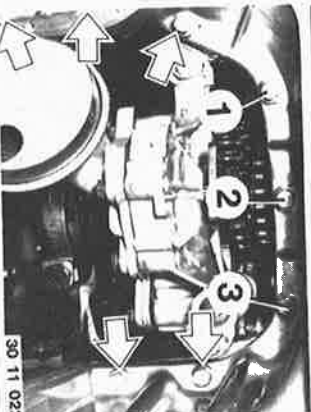
Loosen drive belt.
Unscrew bracket (1).
Pressure hoses remain connected.
Installation:
Tighten drive belt and check tightness with
Special Tool 11 5 020.



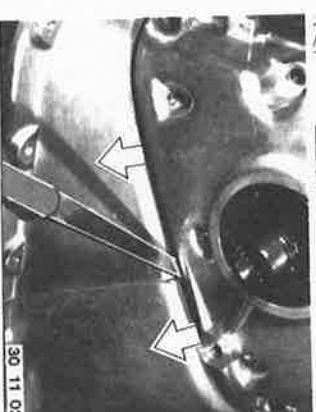
Remove water pump 11 51 000.
Remove crankshaft pulley 11 21 120.
Remove piston for chain tensioner 11 31 090.
Unscrew remaining bolts on timing case
cover.



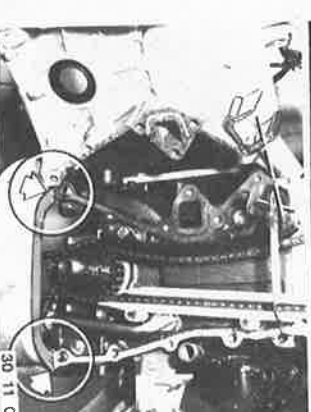
Unscrew reinforcement plate.
Unscrew lower oil pan section — see 11 13 020.



Unscrew bolts (1 ... 3).
Loosen remaining oil pan bolts.
Installation:
Install bolts (1 ... 3) with Loctite No. 270**.



Pry oil pan gasket off of timing case cover
carefully with a knife.
If oil pan gasket is damaged, remove oil pan
— see 11 13 000.



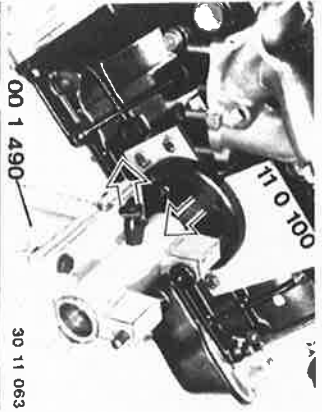
Remove timing case cover.
Installation:
Coat mating surfaces between oil pan and
crankcase with a brush-on universal sealing
compound**.
Important!
Holder for tensioning piston must extend into
the oil pocket.

** Source: HWB

11-16

11 21 000 REMOVING AND INSTALLING CRANKSHAFT

Remove engine 11 00 050.
Uncrew engine mounts.
Mount crankcase on assembly stand 00 1 490 with Special Tool 11 0 100.



00 1 490

30 11 063

Remove clutch 21 21 000.
Remove cylinder head 11 12 100.
Remove timing chain 11 31 051.
Remove oil pump 11 41 000.
Check axial play* before removing the crankshaft.
Check/replace thrust bearing, if maximum permissible play is exceeded.

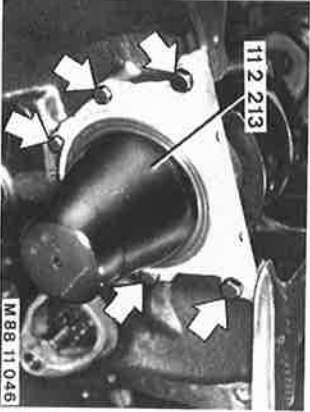


00 2 510

28 11 047

Remove flywheel 11 22 000.
Uncrew end cover.

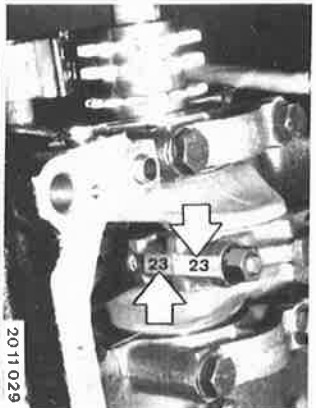
Installation:
Replace gasket.
Use Special Tool 11 2 213 to avoid damage on the radial oil seal.
Cut off gasket on the oil pan sealing surface.



11 2 213

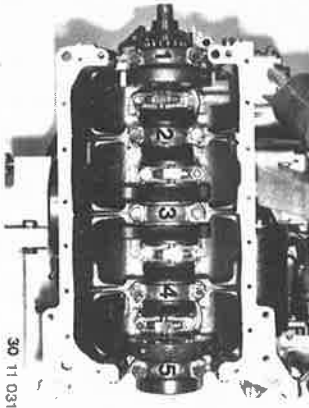
MB8 11 046

* See Specifications



20 11 029

Uncrew conrod bearing caps.
Installation:
Replace conrod bearing shells and measure conrod bearing play, see 11 24 571.
The pairing code (0 ... 99) must be the same on the connecting rod and cap.
Tightening torque*.



30 11 031

Uncrew crankshaft bearing caps and lift out the crankshaft.
Installation:
Bearing cap no. 1 is on the sprocket end.
Install bearing shells and check bearing play, see 11 21 531.
Installation:
Measure axial play with the crankshaft installed — loosen thrust bearing no. 3 again.
Center the thrust bearing by applying knocks from a plastic hammer on the front and rear ends of the crankshaft.
Tighten thrust bearing again to correct torque.
Measure axial play*.

Clean the oil and water bores again thoroughly to remove casting sand, if the crankcase is replaced.

* See Specifications

11-18

11 21 501 REPLACING CRANKSHAFT - Crankshaft Removed -

Note:
A replacement crankshaft is supplied complete with corresponding bearing shells for main and control bearings.

Crankshaft is surface treated and may only be reground in the factory.

Reground crankshafts are marked with stripes of paint.

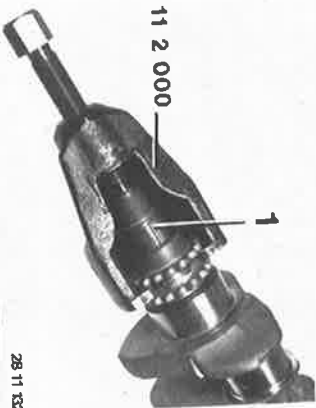
Control Bearing Journal (A)
1 paint stripe Size 1 *
2 paint stripes Size 2 *

Main Bearing Journal (B)
1 paint stripe Size 1 *
2 paint stripes Size 2 *

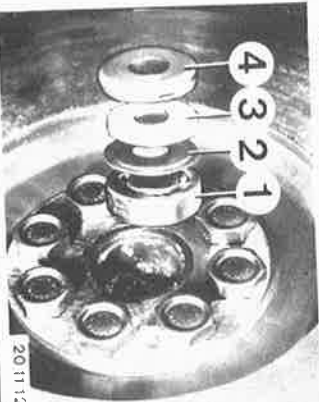
Transferring Sprocket:
Lift out woodruff key (1).

Pull off sprocket with Special Tool 11 2 000.

Installation:
Heat sprocket to max. 200° C (390° F) for installation.



28 11 132



20 11 128

Cars with Manual Transmission:
Install pilot bearing for the transmission main shaft.

Installed Order:
Ball bearing (1), cover (2), felt ring (3) and capsule (4).

Insert cover (2) with embossment facing out.

* See Specifications

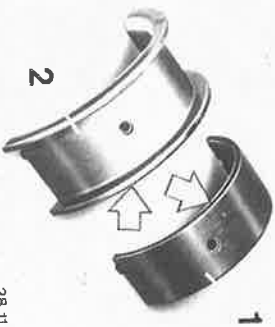


20 11 148

Replacement crankshafts are only supplied with bearing shells of double classification.
A crankshaft is marked with red or blue paint because of the main bearing journal tolerances.



28 11 167



28 11 053

1 = Bearing shell 1-2-4-5
2 = Bearing shell 3 (pilot bearing)

The color code is located on the side of a bearing shell.

Check the ground size of main bearing journals.

Installing Instructions:
Only place bearing shells with "red" marks in the crankcase (regardless of the old color code mark on the crankcase).
Install bearing shells in bearing caps depending on the color code of the crankshaft main bearing journals - "red" or "blue".



M 88 11 060

11-18b

11 21 531 REPLACING CRANKSHAFT MAIN BEARING SHELLS - Engine Disassembled -

A crankshaft is marked with red or blue paint depending on main bearing journal tolerances.



28 11 167



28 11 053

- 1 = Bearing shell 1-2-4-5
- 2 = Bearing shell 3 (pilot bearing)

Color code mark is located on the side of a bearing shell.

Check ground size of main bearing journals.

Install bearing shells in crankcase with same color code as the dot of paint on the gonsole.

Install both bearing shells according to the crankshaft color code, if the color code mark on the crankcase is washed off.

Install bearing shells in bearing caps with the same color code as for the crankshaft.

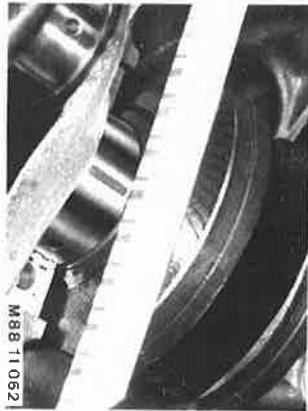
Install crankshaft.

Place Type PG-1 Plastigage on crankshaft wiped clean of oil and tighten bearing caps with correct torque*. Do not turn the crankshaft.

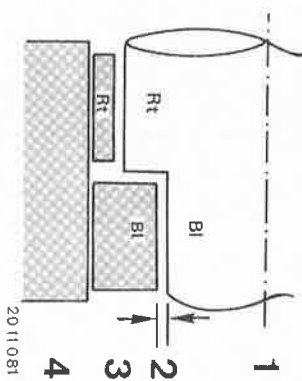
Source of Supply for Plastigage:

CARTOOL
Alfred-Brehm-Sir. 5
D-9070 Ingolstadt

* See Specifications



M88 11 052



2011 081

Remove bearing caps.
Read bearing play* by measuring the width of the flattened Plastigage with help of the supplied scale.
Correct bearing play by installing new bearing shells, bearing shells of different machined size or with different color code.

Survey of Color Code/Shaft Diameter/
Bearing Shell Thickness*

Double Classification Color Codes:

Rt = red
Bl = blue

- 1 Crankshaft diameter
- 2 Bearing play
- 3 Bearing shell thickness
- 4 Console diameter

* See Specifications



M88 11 061



M88 11 060

11-20

11 22 000 REMOVING AND INSTALLING FLYWHEEL

Remove clutch 21 21 000.
Hold flywheel with Special Tool 11 2 160.
Unscrew bolts and take off the flywheel.

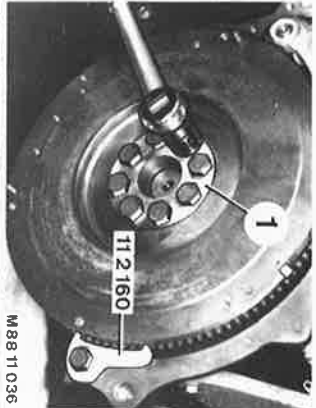
Installation:

Clean the tapped holes.
Use washer (1).
Replace and install new expansion bolts with Loctite No. 270**.

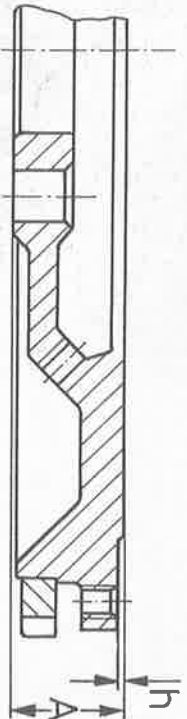
Important!

Only coat threads of the bolts.
Tightening torque*.

Check axial runout* of flywheel.



The friction surface may be machined to minimum thickness A*.
If grinding the friction surface reduces the distance "h" to zero, the flange surface (distance "h") has to be machined.



11 22 051 REPLACING DRIVE PLATE FOR TORQUE CONVERTER

Remove transmission 24 00 020.
Hold flywheel with Special Tool 11 2 160.
Unscrew expansion bolts.
Replace drive plate (1).

Installation:

Clean the tapped holes.
Replace and install the new expansion bolts with Loctite No. 270**.

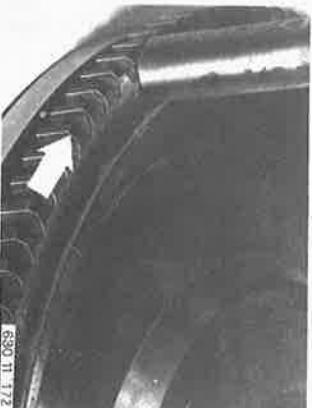
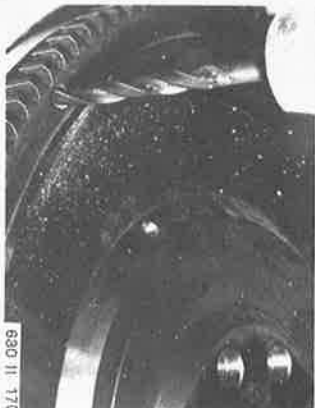
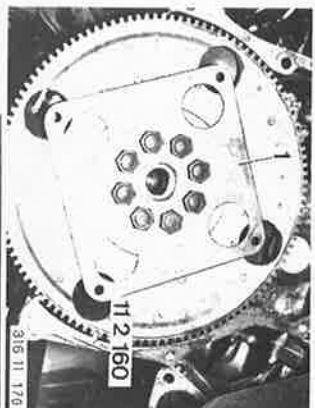
Important!

Only coat threads of the bolts.
Tightening torque*.

11 22 541 REPLACING STARTER GEAR RING

Drill a 6 mm (0.236") diameter hole about 8 mm (0.315") deep below a tooth gap to make breaking the gear ring easier.

Break the gear ring with a chisel applied at the drilled point.



Installation:
Heat a new starter gear ring to 200 ... 230° C (395 ... 445° F), checking the temperature with a thermocolor pencil.
Tooth bevel faces the engine.
Move on starter gear ring to fit firmly all around with a brass mandrel.

* See Specifications

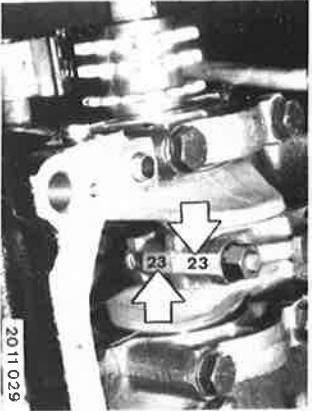
** Source: HMB

* See Specifications

** Source: HMB

11-22

11 25 000 REMOVING AND INSTALLING PISTON



20 11 029

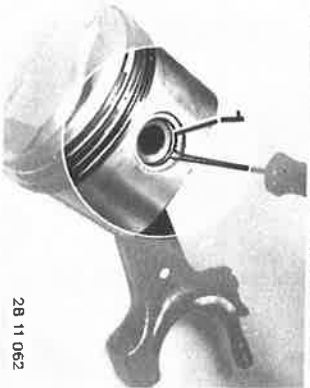
Remove engine and take off cylinder head, oil pan and oil pump.
Take off control bearing cap and press out piston with connecting rod upwards.

Important!
Mark installed position of connecting rod to crankshaft, if it is not necessary to replace control bearing shells.

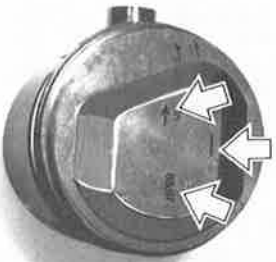
Remove circlip (1).
Press out piston pin.

Installation:
Piston pins and pistons are matched and must not be mixed up.

Important!
If there is excessive play between piston pin and control bushing (sounds like acceleration knock), check control bushing diameter, replacing connecting rod or bushing.



28 11 062



30 11 032

Only install piston of same make and same weight class.
Weight class is stamped with "+", "-" or "..." in piston crown.
Check machined size (piston diameter).
Identifications:

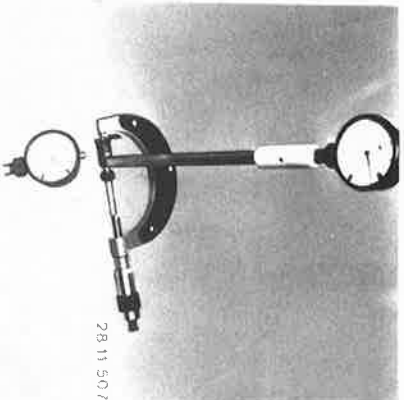
| Type | E* | Piston Cone Height mm (in.) | Diameter mm (in.) |
|-------|-----|--------------------------------|----------------------|
| 318 i | 9.3 | 6.9 (0.272) | 89 (3.504) |
| 318 i | 9.0 | 3.6 (0.142) | 89 (3.504) |

Check piston installed clearance*.

| Model | Make | Checkpoint | mm (in.) |
|-------|-------|---------------|----------|
| 318 i | Mahle | 14.00 (0.551) | |
| | KS | 30.85 (1.215) | |
| | Alcan | 15.5 (0.610) | |

28 11 064

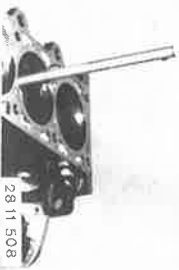
* See Specifications



28 11 507

Set internal gauge to zero with measured piston diameter on the micrometer.

Measure cylinder bore at bottom, center and top in forward and rotating directions with the internal gauge.
Check piston installed clearance*.



28 11 508

Lubricate piston and piston rings with oil.
Offset piston ring end gaps 120° to each other.
Compress piston rings with Special Tool 11 2 260.



28 11 065

11 2 260

Install piston that arrow faces timing chain.
Install connecting rod 11 24 521.

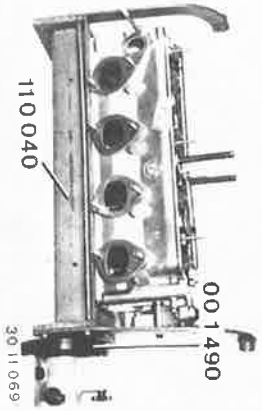
28 11 066

* See Specifications

11-24

11 31 000 REMOVING AND INSTALLING CAMSHAFT

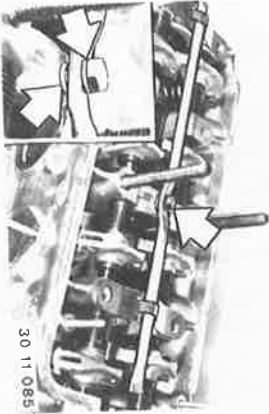
Remove cylinder head 11 12 100.
Mount cylinder head on Special Tool 11 1 040.



Detach oil line.

Installation:

Check installed position of seals.
Tightening torque*.



Adjust valve clearance of all valves to maximum value.

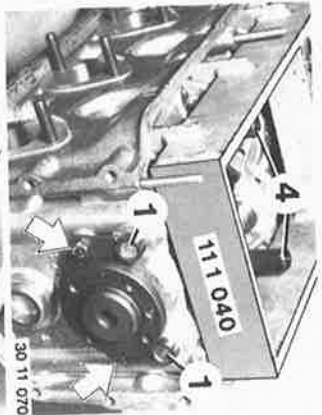
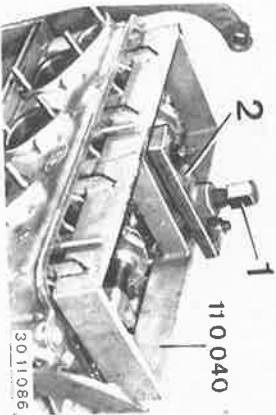
Mount Special Tool 11 1 040 and press down rocker arms.

Important!

Clamping bolt (1) is off-center.
To prevent contact between valve heads, mount clamp (2) that the short end faces exhaust manifold.

Installation:

Adjust valve clearance 11 34 004.



Insert dowel pins (4) and unscrew guide plate.

Installation:

Replace loose plug (1) and install with Loctite No. 270*.

Camshaft should still turn easily after installation of the guide plate.

Pull out camshaft carefully.

Installation:

Turn camshaft before releasing the special tool until notch on camshaft flange is aligned with cast boss on cylinder head.

Camshaft Identification:

2 = 2640 standard version.

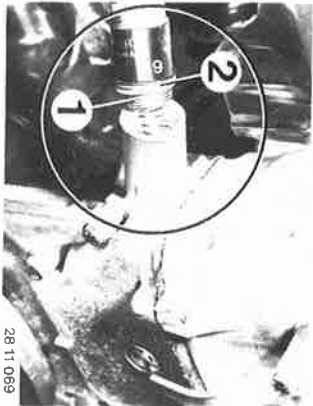


* See Specifications

* Source: HWB

11-26

11 31 090 REMOVING AND INSTALLING CHAIN TENSIONER PISTON



28 11 089

Unscrew plug (1).

Caution!

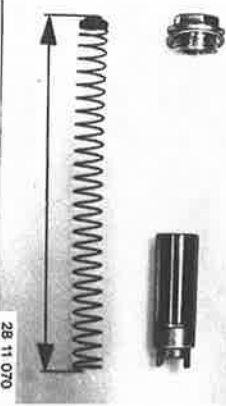
Strong spring force.

Remove spring and piston.

Installation:

Replace seal (2).

Installation:
Check spring length*.
Tapered end of coil spring faces plug.



28 11 070

Checking Piston:

Check free movement of ball (3) by shaking.

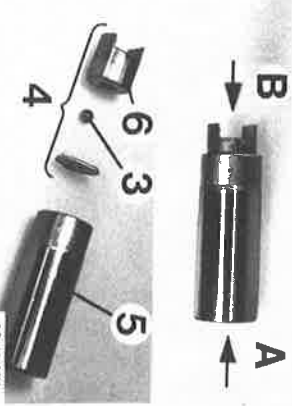
Check function of valve by blowing air

— in direction A = closed and

— in direction B = opened.

If applicable, drive valve (4) out of sleeve (5) and clean.

Make sure vent slots (6) are not clogged.



28 11 071

To bleed piston, remove cylinder head cover 11 12 000.

Loosen plug (1) and move tensioning rail (6) back and forth until oil runs out at plug (1) and resistance can be felt.

Points Causing Unusual Chain Noise:

a) Piston bleed insufficiently.

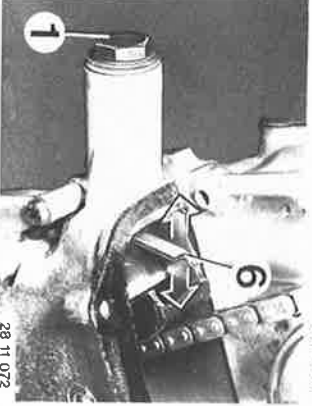
b) Piston seized.

c) Vent slots clogged.

d) Ball valve in piston malfunctions.

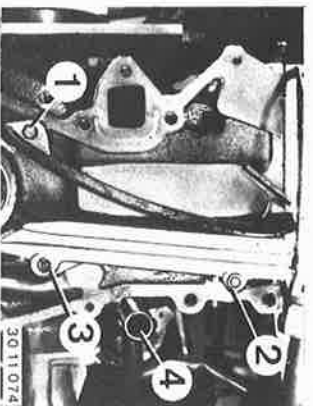
e) Spring force excessive or insufficient.

* See Specifications



28 11 072

11 31 601 REPLACING TENSIONING RAIL/ GUIDE RAIL — TIMING CHAIN REMOVED —



30 11 074

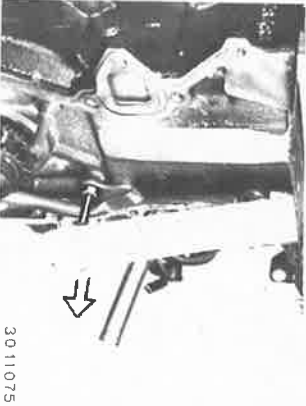
Remove circlips (1 ... 3).
Disconnect water pipe (4) on holder.

Swing in and remove tensioning rail.



30 11 072

Pull off guide rail on bottom bearing pin.



30 11 075

Swing guide rail aside and remove.



30 11 076

11-28

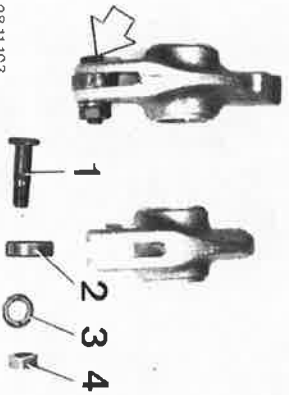
11 33 031 REPLACING ROCKER ARMS

Remove rocker arms 11 33 020.
Replace worn rocker arms or rocker arms with loose slides.
Loose slides will be noticed as excessively loud valve noise.



28 11 102

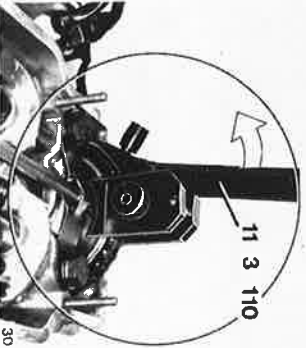
Transfer setscrew (1), eccentric (2), washer (3) and nut (4) to new rocker arm.
Replace a worn eccentric.
Important!
Setscrew and nut have M 6 x 0.75 fine threads.
Bore faces out and thick side down.
Bevelled side of setscrew faces tab on rocker arm.



28 11 103

11 34 004 ADJUSTING VALVE CLEARANCE

Remove cylinder head cover 11 12 000.
Crank engine with Special Tool 11 3 110.



30 11 006

Adjusting order is same as firing order (1-3-4-2) in compression top dead center (TDC).
Adjust valve clearance* between valve and eccentric after loosening nut (1).



28 11 120

Tighten nut (1) with Special Tools 11 1 150 and 00 2 050.
Tightening torque*.



28 11 121

11 34 509 CHECKING ALL VALVES FOR LEAKS — CAMSHAFT REMOVED —

Spark plugs remain installed.
Fill combustion chamber with gasoline outdoors or indoors while conforming with fire prevention measures.
If gasoline runs past the valves, inspect valves and valve seats.
Remove and install valves 11 34 550.
Machine valve seats 11 12 607.

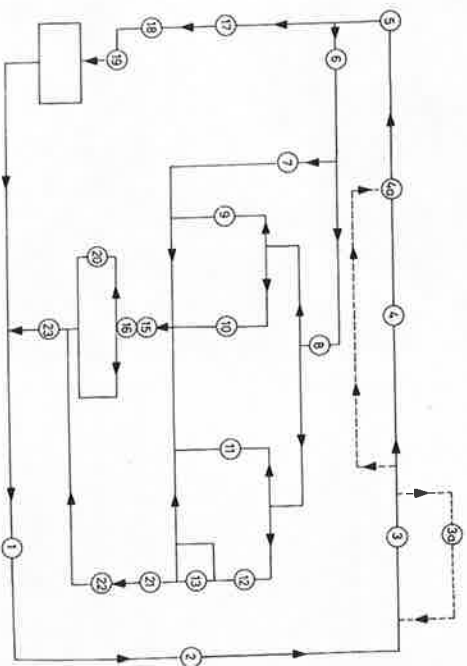
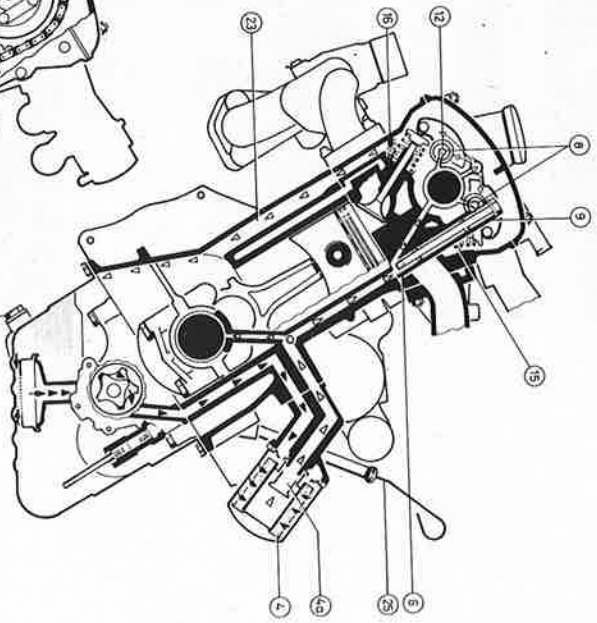
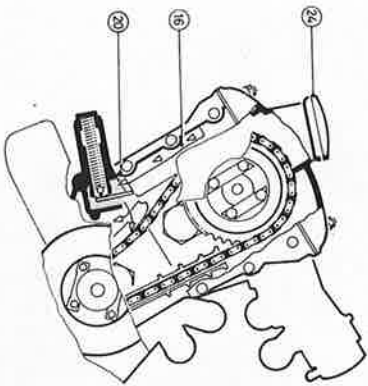
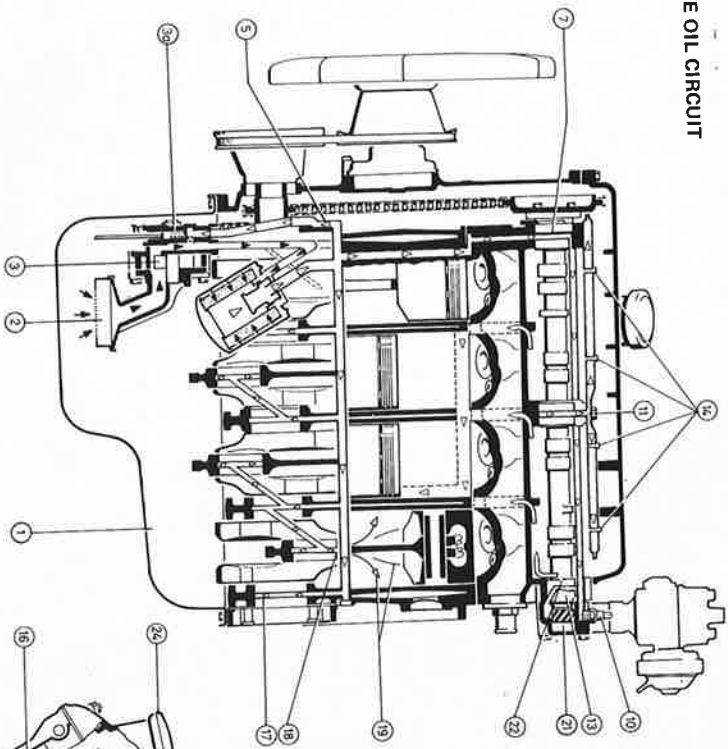


28 11 122

* See Specifications

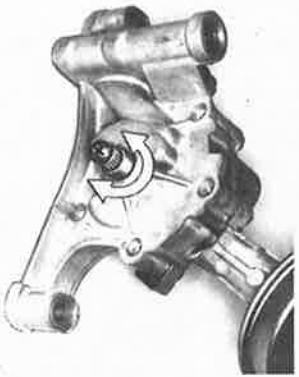
ENGINE OIL CIRCUIT

11-30



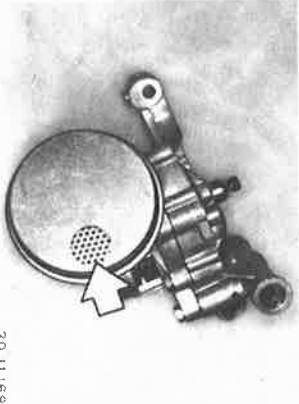
316 11 362

- ▶ Unfiltered oil
- ▶ Filtered oil
- 1 Oil pan
- 2 Intake with filter screen
- 3 Oil pump
- 3a Pressure relief valve
- 4 Oil filter
- 4a Safety valve
- 5 Main distribution bore
- 6 Oil bore in cylinder head
- 7 Camshaft bearings
- 8 Rocker arm shaft
- 9 Rocker arm bearings (intake valves)
- 10 Oil pressure transmitter
- 11 Camshaft bearings
- 12 Rocker arm bearings (exhaust valves)
- 13 Camshaft bearings
- 14 Oil spray tube
- 15 Valve guide
- 16 Overflow from cylinder head
- 17 Crankshaft bearings
- 18 Control bearings
- 19 Spray oil
- 20 Pocket/chain lubrication
- 21 Oil sump/distributor drive
- 22 Overflow bore
- 23 Oil drain bore
- 24 Oil filler neck
- 25 Oil dipstick
- 26 Oil drain plug



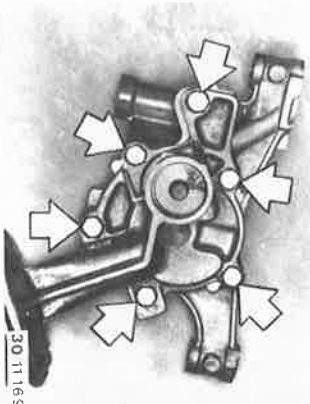
Checking and Servicing:
Turn drive shaft to check whether oil pump runs easily.

30 11 167



Clean oil filter screen.

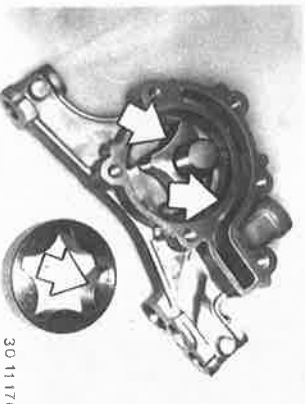
30 11 168



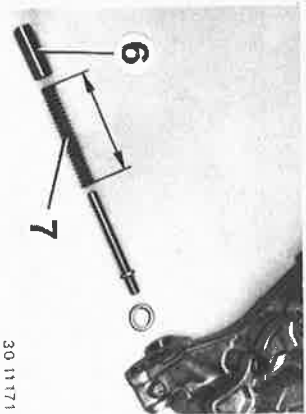
Disassemble oil pump.

30 11 169

Check oil pump for wear
- Scoring in body
- Wear on rotors

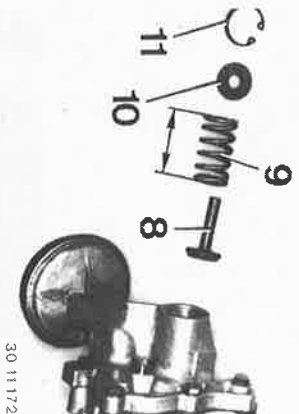


30 11 170



The pressure relief valve is located in the main bore and regulates the engine oil pressure*. see 11 40 000.
Check whether piston (6) runs easily.
Check length of spring (7) = 88 mm (2.677").

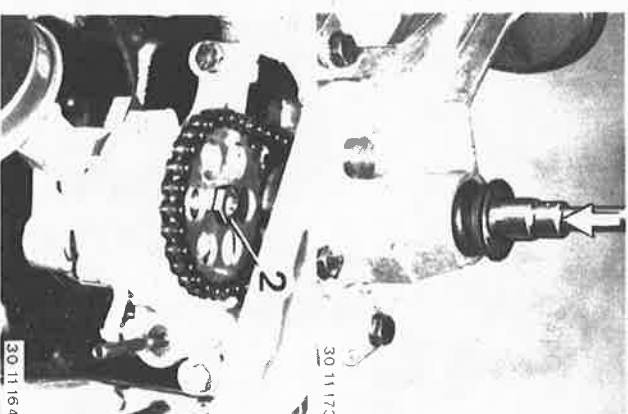
30 11 171



The 8 bar (114 psi) overload valve regulates the oil pressure in front of the oil filter and prevents oil filter leakage.
Check fit of piston (8).
Check length of spring (9) = 44 ± 0.4 mm (1.732 ± 0.016").

30 11 172

Installation:
Press in spring (9) and washer (10) with a wrench socket and install circlip (11).



30 11 173

30 11 164

11 41 151 REPLACING OIL PUMP DRIVE CHAIN

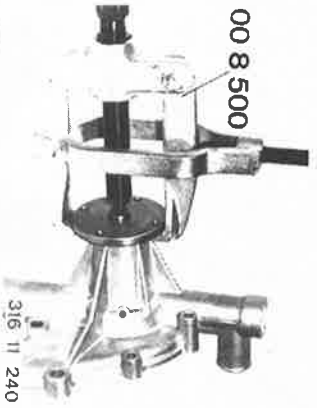
Remove oil pan bottom section 11 13 020.
Remove timing chain 11 31 051.
Unscrew nut (2) and take off sprocket.
Installation:
Check sprockets for wear.
Adjust chain tightness, see 11 41 000.
Chains with green mark are longer than chains with a red mark.
Tightening torque*.

* See Specifications

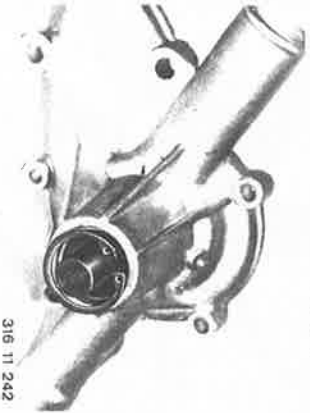
11-34

11 51 502 OVERHAULING WATER PUMP

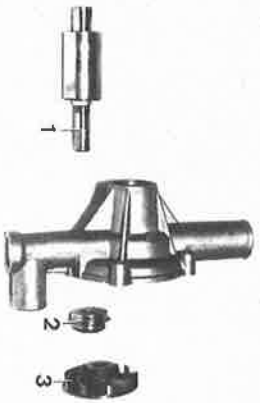
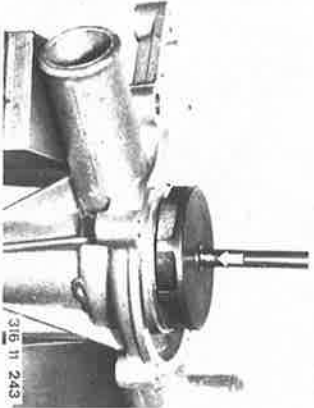
Pull off hub with Special Tool 00 8 500 from Kuikko.



Remove circlip.

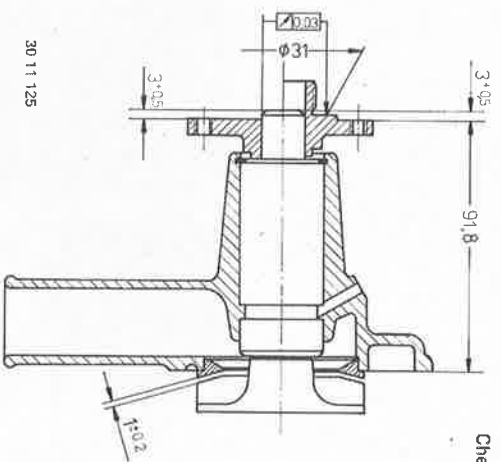


Press out water pump bearing.



Replace bearing (1) and seal (2).
Check impeller (3), replacing if necessary.
Installation:
Press in bearing (1) against stop.
Press on impeller (3).

Check dimensions after assembling.



11-36

11 78 010 CHECKING OPERATION OF OXYGEN SENSOR

Run engine approx. 30 seconds at a speed of 3,000 rpm before checking.

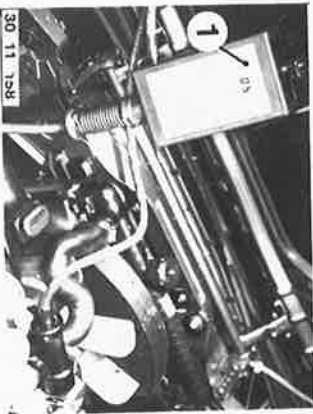
If checking is not finished after about 5 minutes, heat oxygen sensor by running engine approx. 30 seconds at 3,000 rpm again.

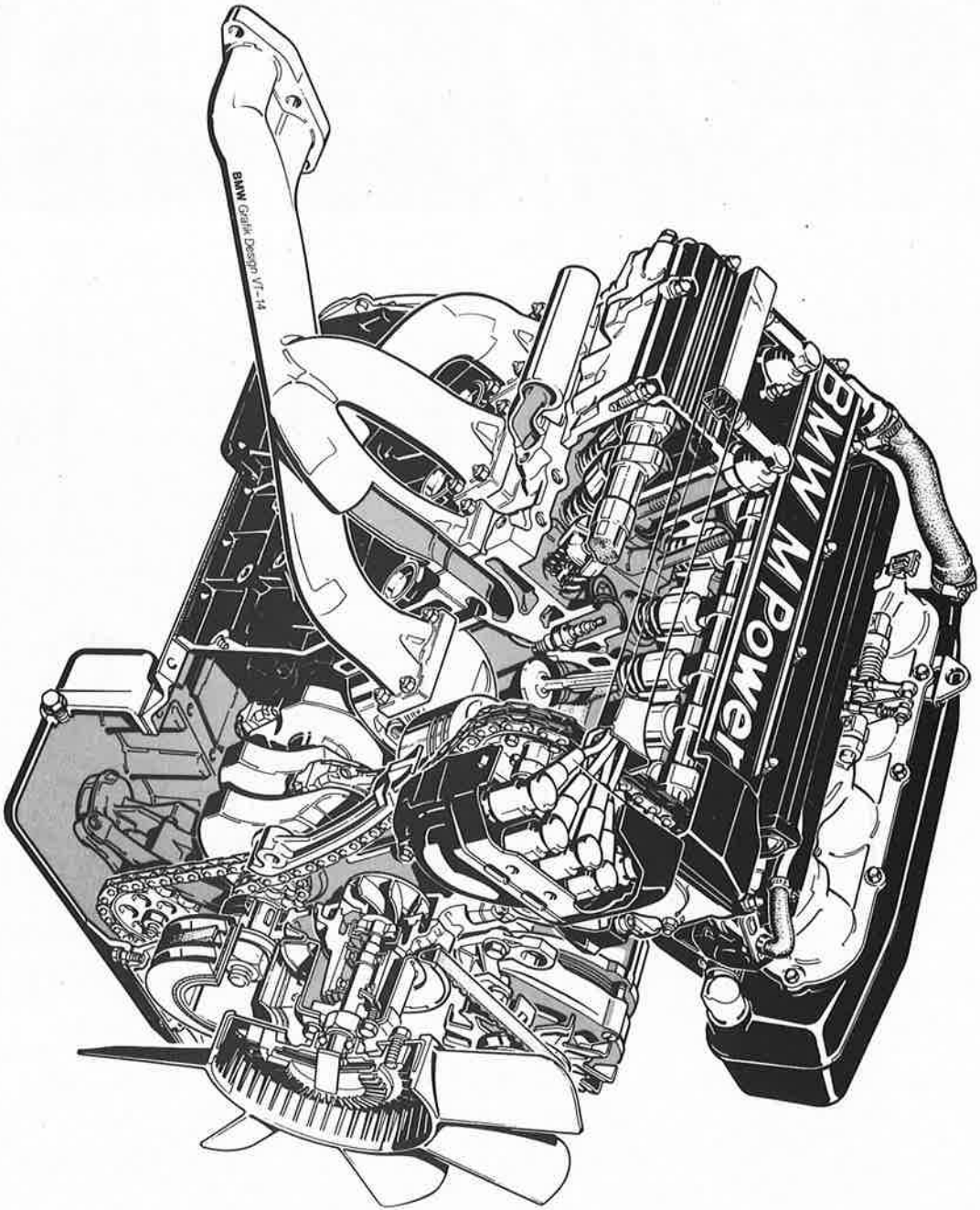
Connect mixture control unit 12 6 400 on the diagnosis plug.

Oxygen sensor is okay, if the LED (1) flashes at least every 3 seconds after waiting approx. 10 seconds.

LED Does Not Flash (Oxygen Sensor Not Operating):

- Oxygen sensor is dirty (oil/soot) or does not have correct operating temperature = 350° C (662° F).
- Heat oxygen sensor again by running engine at fast speed.

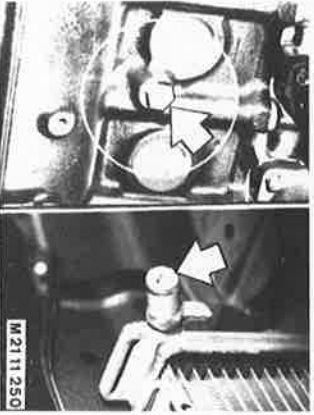




11-52

11 00 050 REMOVING AND INSTALLING ENGINE

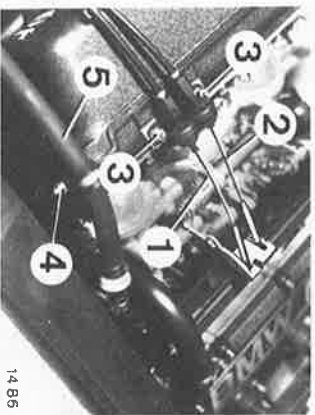
Disconnect battery ground lead.
 Remove transmission — see Group 23.
 Remove splash guard.
 Drain coolant on engine and radiator.
Installation:
 Fill and bleed cooling system — see Group 17.



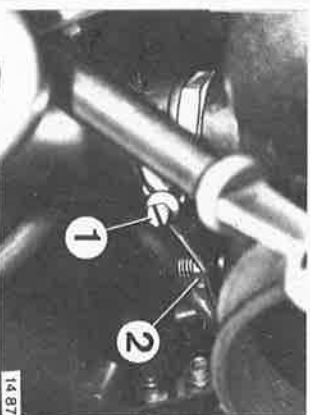
Loosen hose clamp (1) and hose clamp for intake hose (next to radiator).
 Pull off hoses.
 Pull off plugs (2 and 3) and place leads aside.
 Loosen nuts (4 and 5) and remove air cleaner.



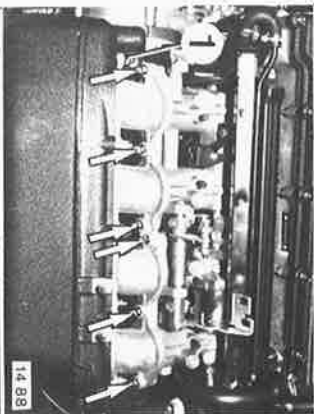
Disconnect accelerator cable (1) and cruise control cable (2).
 Unscrew nuts (3) on holder and lay cables with holder aside.
 Unscrew nut (4).
 Pull off clamp and lift out vacuum hose (5) in the brake booster.



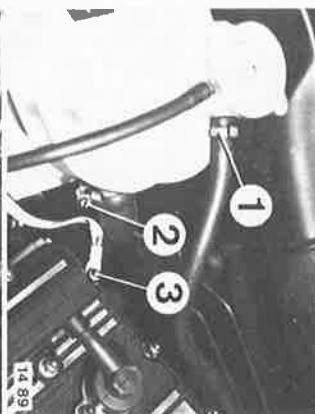
Loosen hose clamp (1) and pull off hose on intake manifold.
 Unscrew nut (2) on intake manifold brace.



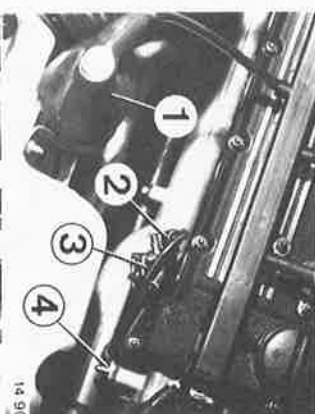
Loosen hose clamp (1) and pull off hose.
 Unscrew nuts and take off intake manifold.
Installation:
 Check O-rings, replacing if necessary.
 Tightening torque: 9 Nm (6.5 ft. lbs.).



Loosen hose clamps (1 and 2) and pull off hoses on coolant expansion tank.
 Unscrew nut (3) and take off ground strap.



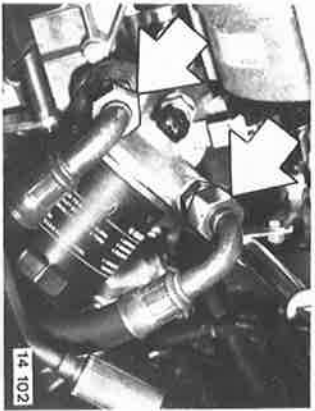
Pull off ignition lead (1) on ignition coil.
 Pull off plugs (2 and 3).
 Unscrew nut (4) and lay lead aside on opposite end of engine.



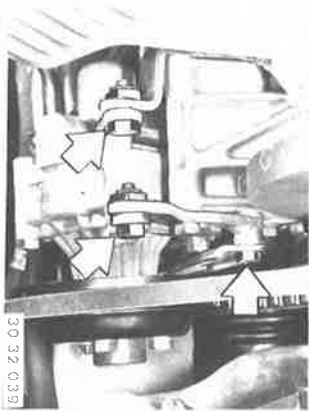
Disconnect leads (1 and 2) on alternator.
 Unscrew nuts (3 and 4) and take off leads



11-52b



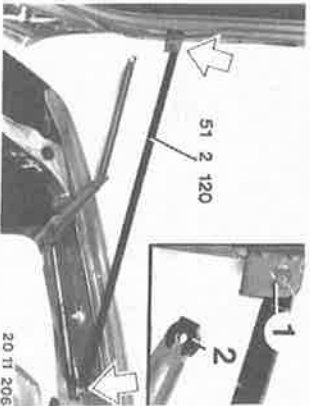
Unscrew both oil cooler pipes on oil filter housing.
 Remove fan — see 11 52 000.
 Remove radiator — see Group 17.
 Disconnect ground lead on oil pan.
Installation:
 Tightening torque for oil cooler pipe coupling nuts = 35 Nm (25 ft. lbs.).



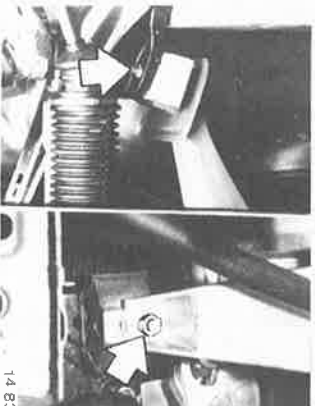
Unscrew power steering pump on holder (hydraulic lines remain connected) and suspend from wire aside.
Installation:
 Check drive belt tightness with Special Tool 11 5 021.



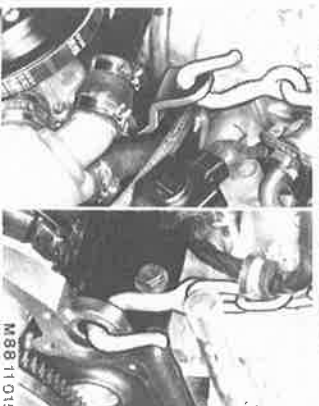
Unscrew A/C compressor on holder (refrigerant hoses remain connected) and suspend from wire aside.
Installation:
 Check drive belt tightness with Special Tool 11 5 021.



Disconnect support arm and gas pressure prop and install Special Tool 51 2 120 to hold the engine hood.
Caution!
 Use retainer (1).
Installation:
 Insert plastic part (2).

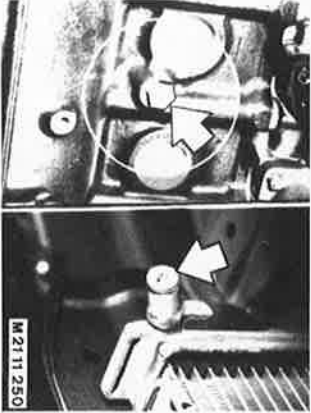


Unscrew engine mounts on front axle carrier.
 Left — Unscrew at top.
 Loosen at bottom.
 Right — Loosen at top.
 Unscrew at bottom
Installation:
 Tightening torque: 45 Nm (32.5 ft. lbs.).



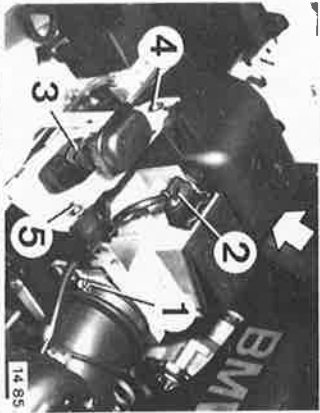
Connect Special Tool 11 0 000 on engine and lift out engine.

11-53a

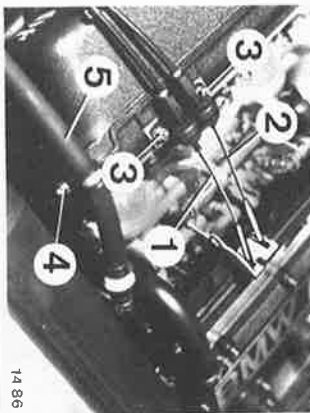


11 12 100 REMOVING AND INSTALLING CYLINDER HEAD

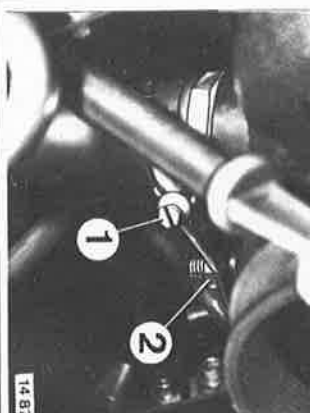
Disconnect battery ground lead.
Remove splash guard.
Drain coolant on engine and radiator.
Installation:
Fill and bleed cooling system — see Group 17.



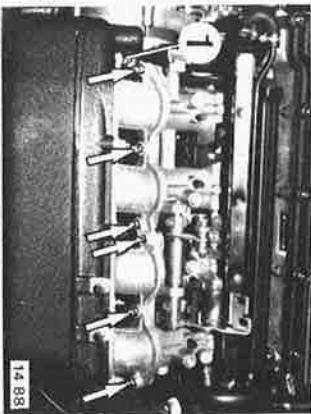
Loosen hose clamp (1) and hose clamp for intake hose (next to radiator) and pull off hoses.
Pull off plugs (2 and 3) and lay leads aside.
Loosen nuts (4 and 5) and remove air cleaner.



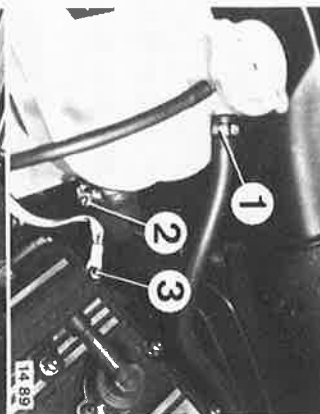
Disconnect accelerator cable (1) and cruise control cable (2).
Unscrew nuts (3) on holder and place cables with holder aside.
Unscrew nut (3), pull off clamp and lift vacuum hose (4) out of brake booster.



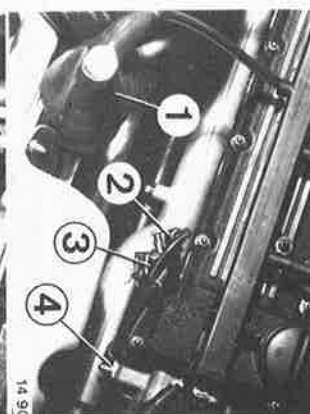
Loosen hose clamp (1) and pull hose off of intake manifold.
Unscrew nut (2) on intake manifold brace.



Loosen hose clamp (1) and pull off hose. Unscrew nuts and take off intake manifold.
Installation:
Check O-rings, replacing if necessary.
Tightening torque: 9 Nm (6.5 ft. lbs.).



Loosen hose clamps (1 and 2) and pull off hoses on coolant expansion tank.
Unscrew nut (3) and take off ground strap.



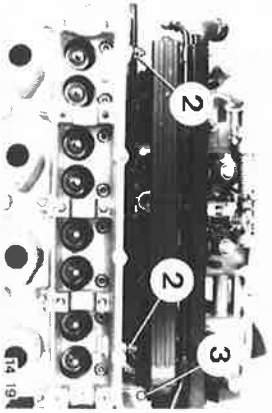
Pull off ignition lead (1) on ignition coil.
Pull off plugs (2 and 3).
Unscrew nut (4) and place lead on opposite end of engine.



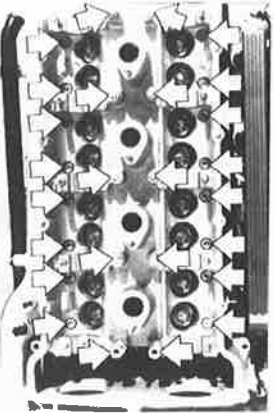
Pull off plugs (1 and 2).
Pull vacuum hose (3) off of pressure regulator.
Unscrew screw (4) and take off lead with holder.

11-53c

Remove pipe (2).
Unscrew bolt (3).



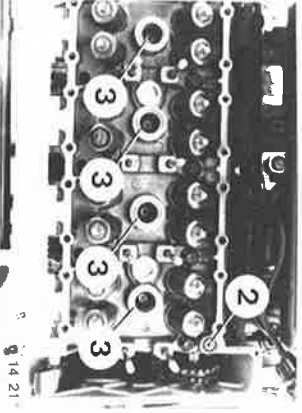
Remove timing case.



14 20

Installation:

Replace O-ring (2) in oil bore.
Check O-rings (3), replacing if necessary.
Coat sealing surfaces with Three Bond 12 07**.
Tighten bolts uniformly.
Tightening Torque:
M 7 = 15 + 2 Nm (11 + 1 ft. lbs.)
M 8 = 21 + 1 Nm (15 + 0.5 ft. lbs.)



14 21

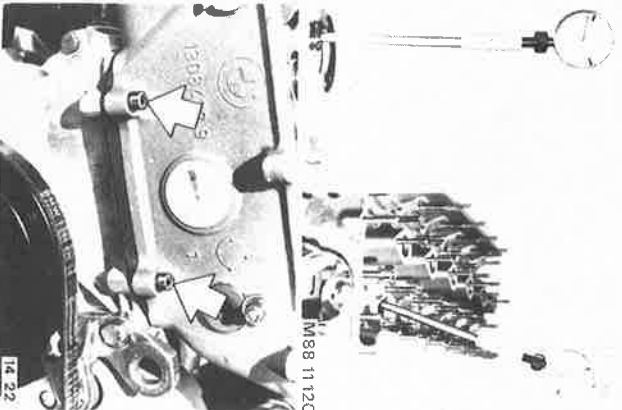
Measure tappet clearance:
Measure tappet diameter with a micrometer.



M 88 11 119

** Source of Supply: HWB

M 88 11 120



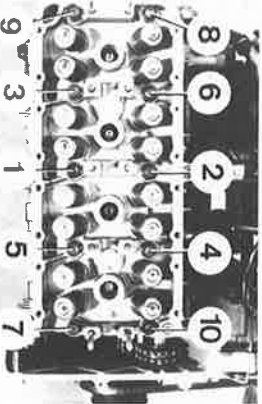
14 22

Unscrew bolts.

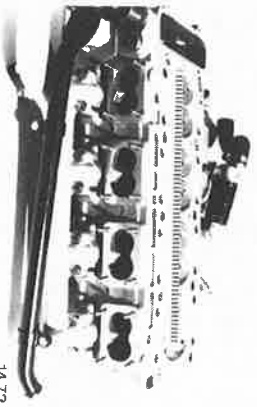
Unscrew cylinder head bolts in order of 10 to 1 and lift off the cylinder head.

Installation:

Clean holes in crankcase and cylinder head bolts — lubricate cylinder head bolts with oil.
Clean sealing surfaces on cylinder head and crankcase thoroughly — using a gasket remover** and hard wood scraper.
Check levelness with a standard steel ruler.
Replace cylinder head gasket.
Check arrangement of tensioning rails while mounting the cylinder head.
Tighten bolts in order of 1 to 10 in three steps.
Step 1: 50 + 2 Nm (36 + 1 ft. lbs.)
Step 2: 80 + 2 Nm (58 + 1 ft. lbs.)
Wait 15 minutes!
Step 3: 100 + 2 Nm (72 + 1 ft. lbs.)



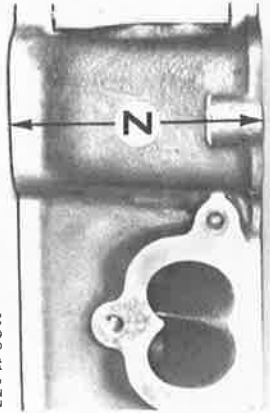
14 23



14 72

** Source of Supply: HWB

11-55



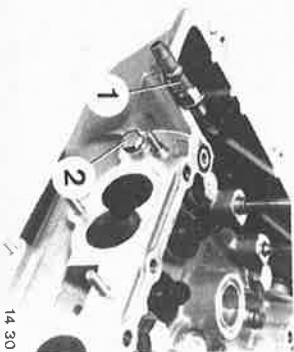
M 38 11 077

11 12 719 GRINDING CYLINDER HEAD SEALING SURFACE
 — Cyl. Head Disassembled —
 Approval has not yet been given for grinding cylinder heads.
 The cylinder head may be cleaned by whetting on a surface plate.



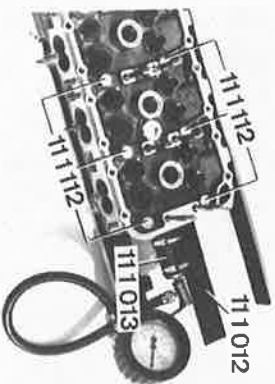
14 29

11 12 729 CHECKING CYLINDER HEAD FOR CRACKS IN WATER TEST
 — Cyl. Head Disassembled —
 Bolt on Special Tool 11 1 111.



14 30

Unscrew connector (1).
 Plug opening with bolt (2) -- copper bolt from M 30 exhaust manifold.



14 31

Bolt on Special Tools 11 1 012 with Special Tools 11 1 112.
 Install Special Tool 11 1 113.
 Apply air pressure to cylinder head — 2 bar (28 psi) testing pressure — place cylinder head in a water bath and check for cracks.
Note:
 If necessary, relax the water bath with a detergent.

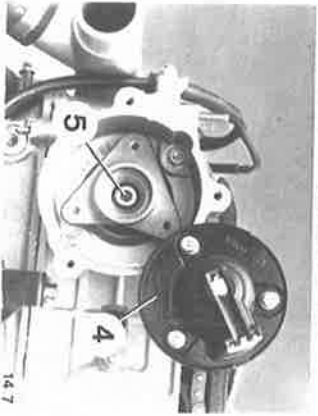
11-56

11 14 105 REPLACING RADIAL OIL SEAL IN DISTRIBUTOR HOUSING

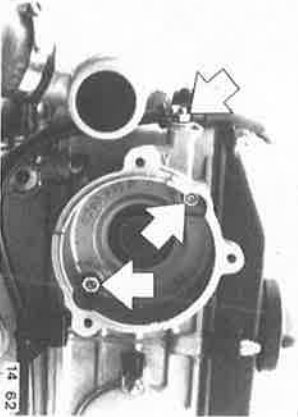


Unscrew ignition lead tube.
Remove distributor cap.

Unscrew distributor rotor (4).
Unscrew adapter (5).



Unscrew distributor housing.
Installation:
Check O-ring, replacing if necessary.



00 5 550



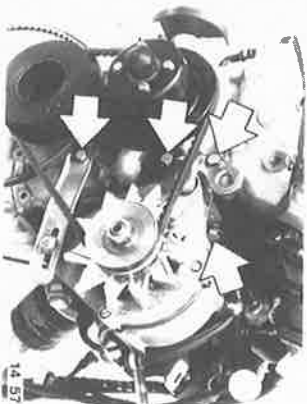
Lift out radial oil seal.
Drive in new radial oil seal with Special Tool
00 5 550.
Lubricate sealing lip with oil.

14 61

11 14 120 REMOVING AND INSTALLING/ SEALING LOWER TIMING CASE COVER

Disconnect battery ground lead.
Remove air cleaner with air flow sensor.

Unscrew alternator.
Installation:
Tighten drive belt and check tightness with
Special Tool 11 5 020.



Unscrew power steering pump.
Hoses remain connected.

Installation:
Tighten drive belt and check tightness with
Special Tool 11 5 020.

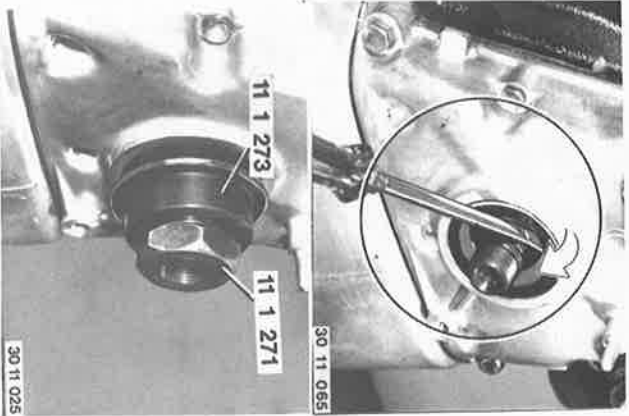


14 58

11-58

11 14 141 REPLACING RADIAL OIL SEAL IN TIMING CASE COVER

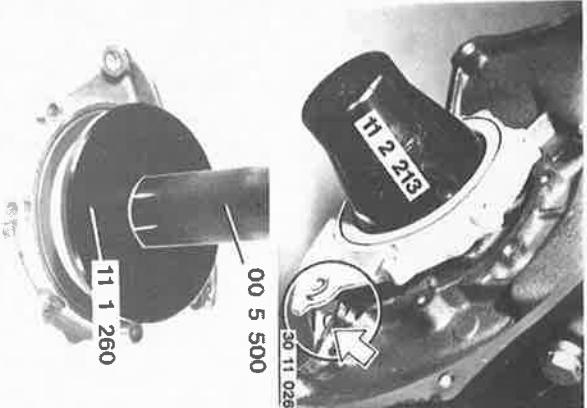
Remove pulley on crankshaft — see 11 21 120.
Lift out radial oil seal with a screwdriver.



Lubricate sealing lip of radial oil seal with oil.
Press in radial oil seal flush with Special Tools
11 1 273 and 11 1 271.

11 14 605 REPLACING RADIAL OIL SEAL IN CLUTCH END COVER — Transmission Removed —

Remove flywheel — see 11 22 000.
Drain engine oil.
Loosen oil pan.
Loosen gasket in area of end cover/oil pan joint
carefully with a knife.
Remove end cover.
Press radial oil seal out of end cover.



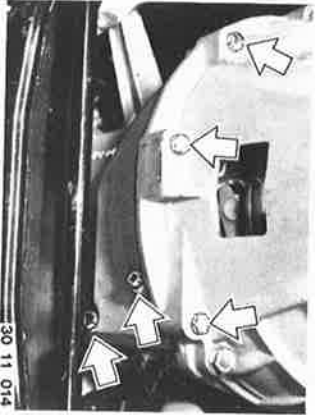
Installation:
Replace gasket.
Remove oil pan — see 11 13 000 — if oil pan
gasket was damaged.
Coat end cover/oil pan joint with Three Bond
Silicone 1207**.
Use Special Tool 11 2 213 to avoid damaging
the radial oil seal.
Add engine oil***.
Use Special Tools 11 1 260 and 00 5 500 to
press in the radial oil seal.
Press in new radial oil seal with approx. 1 to 2
mm (0.039 to 0.079") offset toward the inside
in contradiction to the standard seal, which was
installed flush.
Lubricate sealing lip with oil.

** Source: HWB
*** See Service Information of Gr. 00

11-60

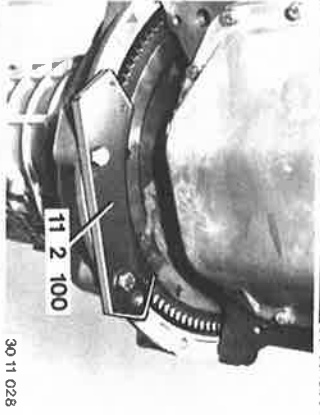
11 21 120 REMOVING AND INSTALLING PULLEY ON CRANKSHAFT

Unscrew reinforcement plate.



30 11 014

Hold flywheel with Special Tool 11 2 100.

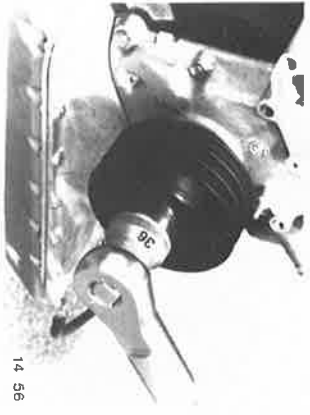


11 2 100

30 11 028

Unscrew nut on pulley.
Pull off pulley.

Installation:
Tightening torque*.



14 56

Installation:
Check for correct installed position of woodruff key (1).



30 11 030

* See Specifications

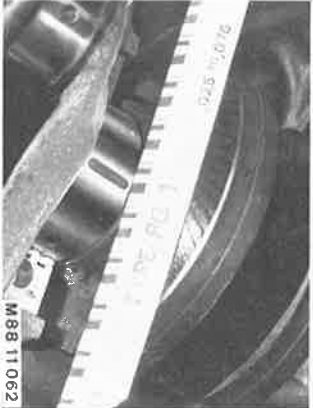
11-61a



Install crankshaft.
Place Type PG-1 Plastigage on crankshaft wiped clean of oil and tighten bearing caps with the correct torque*. Do not turn the crankshaft.

Source of Supply for Plastigage:
CARTOOL
Alfred-Brehm-Str. 5
D-8070 Ingolstadt

Remove bearing caps.
Read bearing play* by measuring the width of the flattened Plastigage with help of the supplied scale.
Correct the bearing play by installing new bearing shells, bearing shells of a different machined size or with different color code marks.



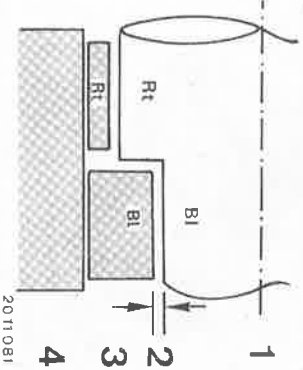
Survey of Color Code/Shaft Diameter/
Bearing Shell Thickness*

Double Classification Color Codes:

Rt = red

Bl = blue

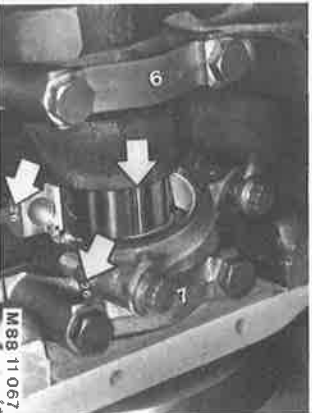
- 1 Crankshaft diameter
- 2 Bearing play
- 3 Bearing shell thickness
- 4 Console diameter



Replacing Control Bearing Shells:
Red or blue control bearing shells are installed standard depending on the color code mark on the connecting rod for a pertinent crankshaft ground size.
Only install the red bearing shells of a pertinent ground size supplied with a replacement crankshaft.

30 32

* See Specifications



Place Type PG-1 Plastigage on control bearing journals wiped clean of oil in BDC position.
Mount control caps – pair codes and grooves of bearing shells are on the outside.

Source of Supply for Plastigage:
CARTOOL
Alfred-Brehm-Str. 5
D-8070 Ingolstadt

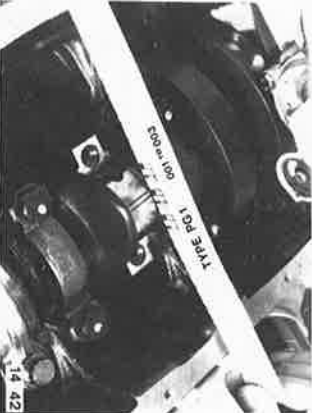
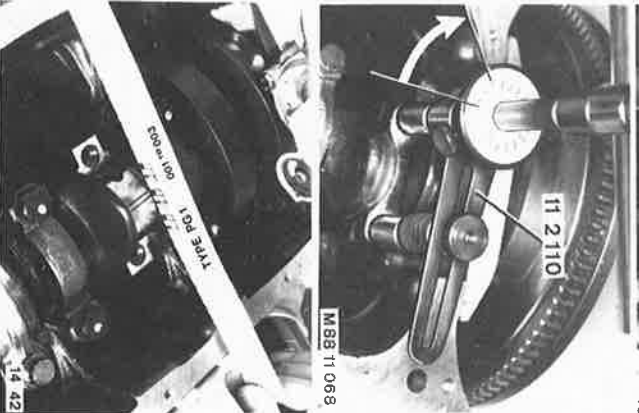
Tighten bolts (use old control bolts).
Do not turn the crankshaft.
Remove control bearing caps.

Tightening Torque of Control Bolts:

- Step 1 10 Nm (7 ft. lbs.)
 - Step 2 30 Nm (22 ft. lbs.)
 - Step 3 60° + 2° torque angle
- Control bearing play: 0.024 to 0.064 mm (0.0009 to 0.0025").

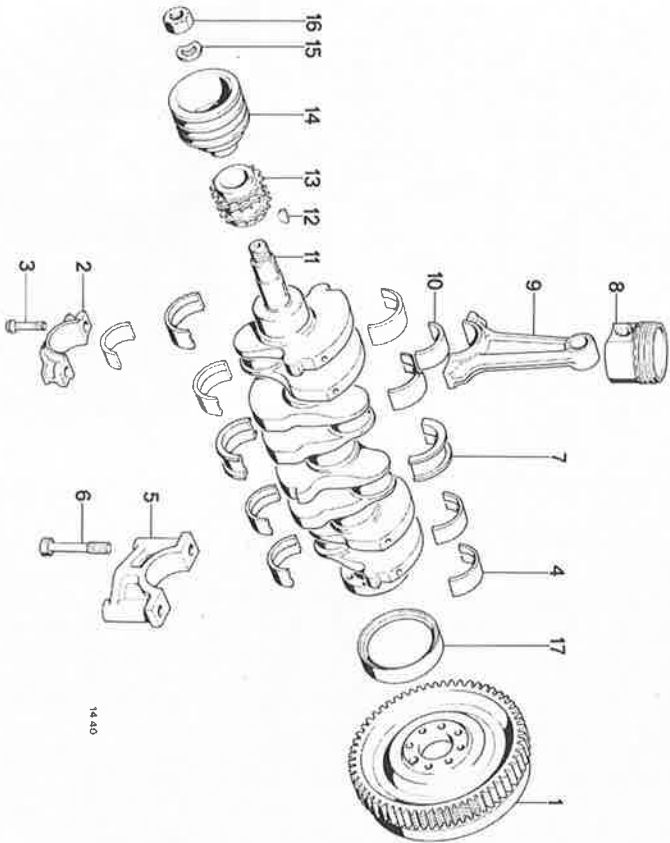
Installation:
Use new control bolts for final installation.

Check control bearing play by measuring width of the flattened Plastigage with help of the supplied scale.



14 422

11-62



Crankshaft Survey

- 1 Flywheel
- 2 Control cap
- 3 Control bolt
- 4 Main bearing shell
- 5 Main bearing cap
- 6 Main bearing cap bolt
- 7 Thrust bearing
- 8 Piston
- 9 Connecting rod
- 10 Control bearing shell
- 11 Crankshaft
- 12 Woodruff key
- 13 Sprocket set
- 14 Vibration damper
- 15 Washer
- 16 Nut
- 17 Radial oil seal



11 21 571 REPLACING PILOT BEARING IN CRANKSHAFT

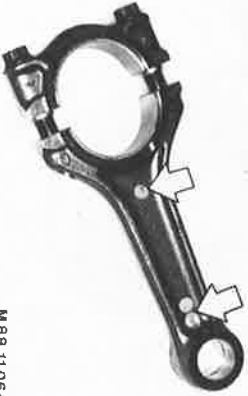
Remove clutch — see 21 21 000.
 Pull out ball bearing with Special Tool 11 2 010.

Installed Order:
 Ball bearing (1), cover (2), felt ring (3) and capsule (4).
 Install cover (2) with the embossment facing out.

Fill bore in crankshaft with approx. 1 gram (0.035 oz.) of lubricating grease. Drive in pilot bearing with Special Tools 11 2 030 and 00 5 500.

11 24 521 REPLACING CONNECTING RODS

— Pistons Removed —



M 88 11 064

Only install connecting rods of same weight class in one engine.
Weight class is shown on the connecting rod by a certain number and color of paint dots.
Connecting rods may not be machined.

Piston pin must slide through the conrod bushing under light pressure.
Install conrod bearing shells — see 11 24 571.



M 88 11 065

11 24 571 REPLACING CONROD BEARING SHELLS

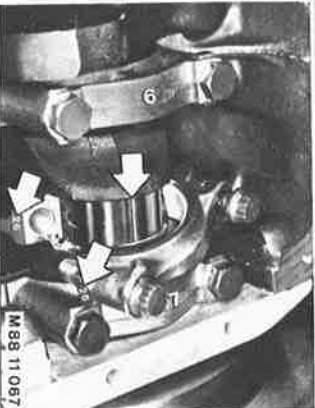
— Engine Disassembled —



M 88 11 066

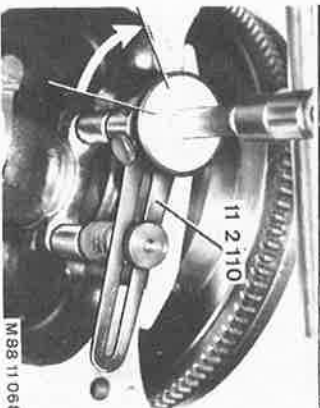
Install one each yellow bearing shell in connecting rod and conrod cap or one blue bearing shell in connecting rod and one red bearing shell in conrod bearing cap.
Check the machined size (conrod bearing dia.).

Plane Type PG-1 Plastigage on conrod bearing journal wiped clean of oil in BDC position.
Mount conrod bearing cap — code and grooves of bearing shells on exhaust side.
Source of Plastigage:
CARTOOL
Alfred-Brehm-Str. 5
D-8070 Ingolstadt



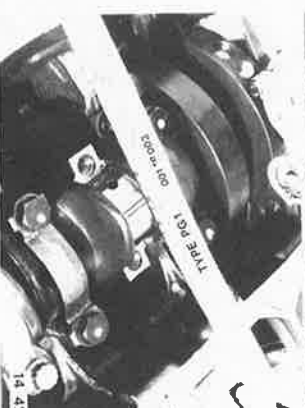
M 88 11 067

Tighten bolts — use old conrod bolts.
Don't turn the crankshaft.
Remove conrod bearing cap.
Measure width of flattened Plastigage to check the conrod bearing play, with help of the supplied scale.



M 88 11 068

Correct bearing play by installing new bearing shells or bearing shells with different machined size or different color code.
Replace conrod bolts for final installation.
Conrod bolt tightening torque:
Step 1 10 Nm (7 ft. lbs.)
Step 2 30 Nm (22 ft. lbs.)
Step 3 60 + 20° torque angle
Conrod bearing play: 0.024 to 0.064 mm (0.0009 to 0.0025").



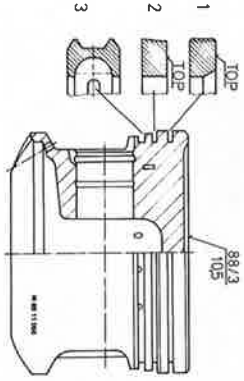
M 88 11 069

11-66

11 25 651 REPLACING PISTON RINGS OF ONE PISTON

— Piston Removed —

Remove piston rings with a piston ring
plier.



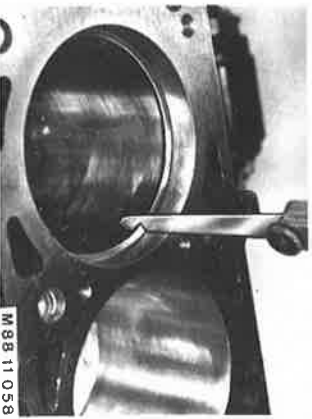
Installation:
Install piston rings with "TOP" facing the
piston crown.

- 1 Plain compression ring
- 2 Bevelled face compression ring
- 3 Oil scraper ring with rubber lined spring

Measure side clearance*.



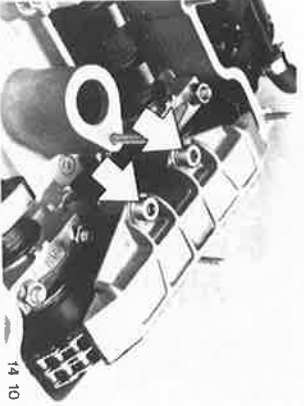
Measure end clearance*.



* See Specifications

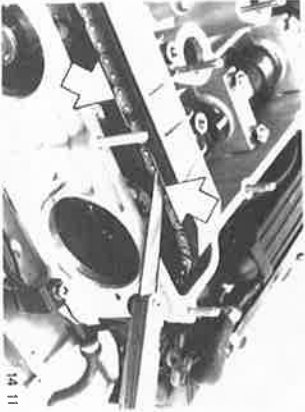
11-68

Unscrew guide rail.



14 10

Installation:
Center guide rail with a feeler gage.



14 11

Turn crankshaft with Special Tool 11 3 020 to position cylinder no. 1 to TDC — cylinder no. 4 overlaps.

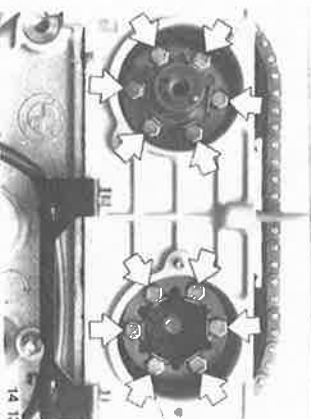
Caution!
Never crank the engine after removing the timing chain.



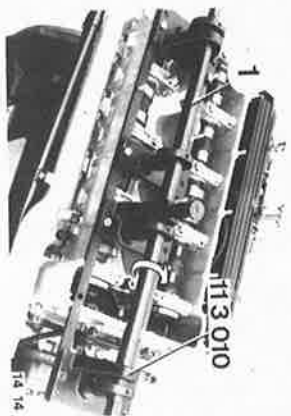
14 12

Remove chain tensioner — see 11 31 090. Open lockplates and unscrew sprockets.

Installation:
Tightening torque: 9 + 1 Nm (6.5 + 0.5 ft. lbs.).



14 13

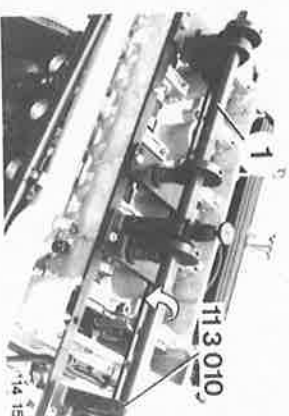


14 14

Mount Special Tool 11 3 010 on timing case. Turn shaft (1) up to the arrest — camshaft is held down for removal of bearing caps. Unscrew camshaft bearing caps.

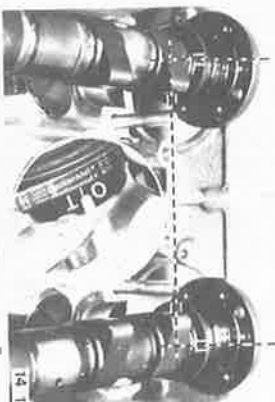
Loosen the arrest and relax the camshaft. Remove Special Tool 11 3 010. Mark camshafts "E" or "A" and remove.

Installation:
Camshafts are identical for exhaust and intake sides.
Install an used camshaft in the same direction.



14 15

Installation:
Turn crankshaft to TDC. Install camshaft that one each groove faces up and inward — TDC position.



14 16

Mount Special Tool 11 3 010 on timing case. Hold camshaft in TDC position with Special Tool 11 3 020 and turn shaft (1) up to the arrest — camshaft is held down for installation of bearing caps.



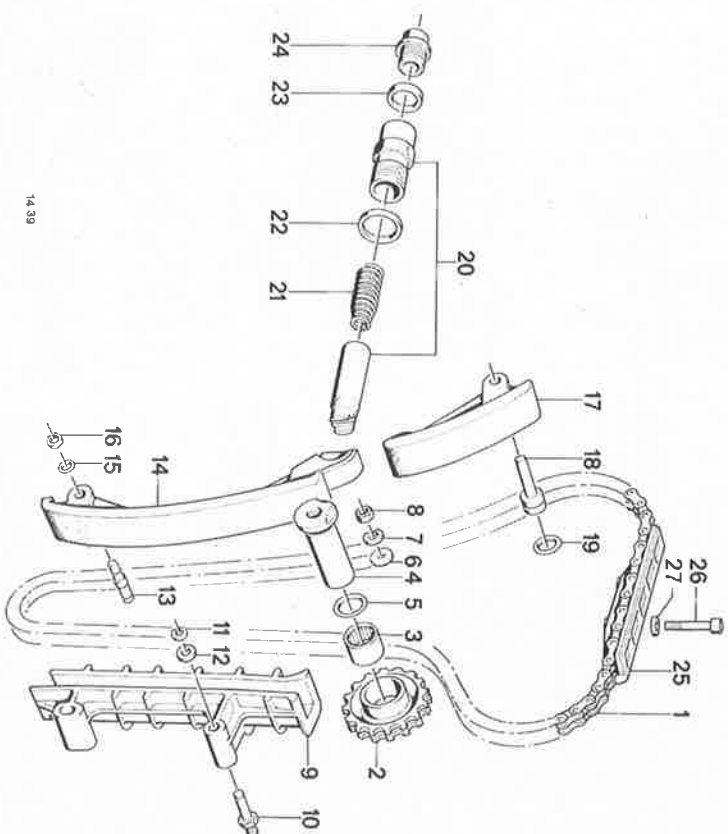
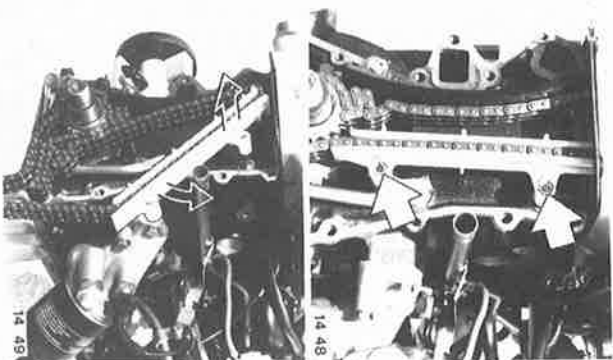
14 43

11-70

11 31 051 REPLACING TIMING CHAIN

Remove lower timing case cover — see 11 14 110.
 Remove sprockets on camshafts — see 11 31 000.

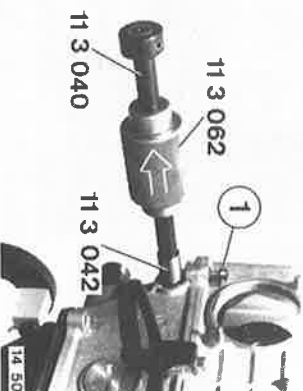
Remove lockwashers.



14 39

Valve Timing

- 1 Double-row timing chain
- 2 Sprocket (guide wheel)
- 3 Needle sleeve
- 4 Shaft
- 5 O-ring
- 6 Washer
- 7 Spring washer
- 8 Hexagon nut
- 9 Guide rail
- 10 Shaft bolt
- 11 Lockwasher
- 12 Washer
- 13 Shaft bolt
- 14 Tensioning rail, lower (head removed)
- 15 Lockwasher
- 16 Circlip
- 17 Tensioning rail, upper (chain removed)
- 18 Shaft bolt
- 19 O-ring
- 20 Chain tensioner piston and cylinder (matched)
- 21 Spring
- 22 Seal
- 23 Seal
- 24 Plug
- 25 Guide rail
- 26 Bolt
- 27 Washer

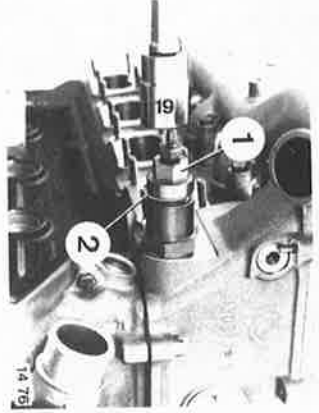


11 31 ... REMOVING AND INSTALLING UPPER TENSIONING RAIL

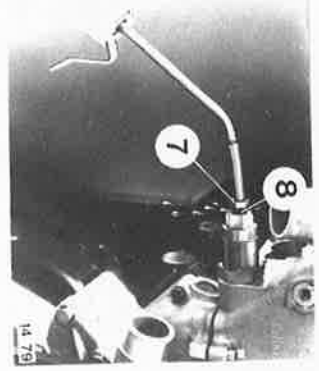
Remove timing chain — see 11 31 051.
 Unscrew bolt (1) partially.
 Screw on Special Tools 11 3 040, 11 3 042 and 11 3 062.
 Knock out the shaft.
Installation:
 Check O-ring, replacing if necessary.
 Check tensioning rail arrangement!

11-72

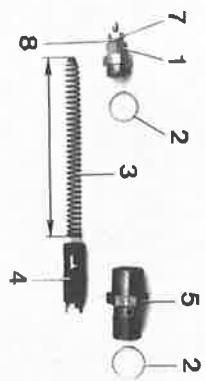
11 31 090 REMOVING AND INSTALLING PISTON FOR CHAIN TENSIONER



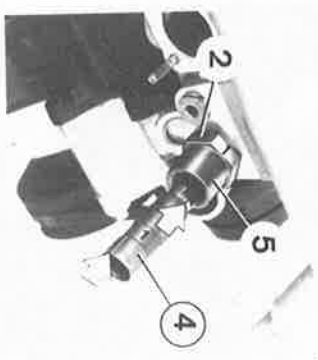
Unscrew plug (1).
Caution!
 Strong spring pressure.
 Remove spring (3) and piston (4).
Installation:
 Replace seal (2).



Unscrew nipple (7) — replace O-ring (8) if necessary.
 Add engine oil, until oil runs out of nipple (7).
 Tighten nipple (7).



Installation:
 Check length of spring (3).
 Nominal value: 159 ± 0.5 mm
 (6.260 ± 0.020 "¹).
 Conically wound end of spring faces plug (1).
 Tightening torque for:
 — plug (1) 40 ± 2 Nm (29 ± 1.5 ft. lbs.)
 — cylinder (5) 50 ± 2 Nm (36 ± 1.5 ft. lbs.)



Piston (4) and cylinder (5) are matched* — code 1 or 2.
 Only install parts with same code.
 Install cylinder with groove facing back (as seen looking forward in car) and piston with groove facing up.
 Guide piston opening into tensioning rail.

* See Specifications

11-74

11 34 550 REMOVING AND INSTALLING VALVES

— Cylinder Head Removed —

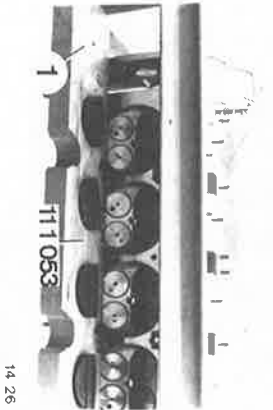
Unscrew spark plugs.
Mount cylinder head on Special Tool 11 1 065 with Special Tools 11 1 054. Screw on Special Tool 11 1 065.
Installation:
Tightening torque for spark plugs: 20 ± 5 Nm (14.5 ± 3.5 ft. lbs.).



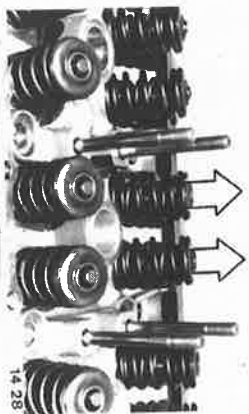
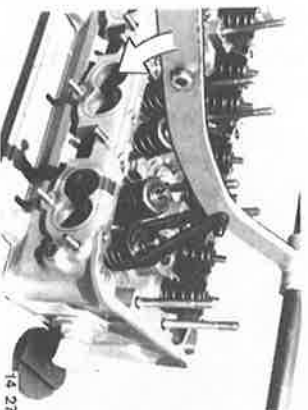
Screw on Special Tool 11 1 051.
Mount Special Tools 11 1 068, 11 1 052 and 11 1 067.



Place Special Tool 11 1 053 (tray) in the assembly stand — pull out rubber part (1).

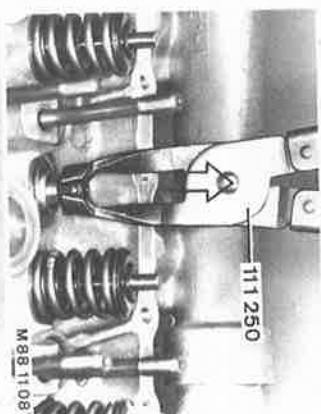


Compress valve springs and remove valve collets.

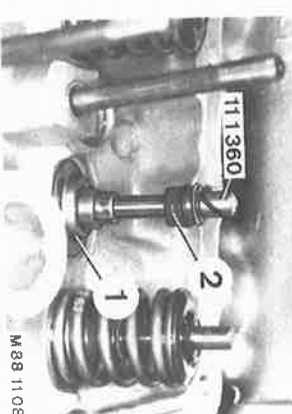


Remove upper spring retainer and double spring set.
Take tray out of assembly stand and pull out valve.

Installation:
Lubricate valve guide and valve stem with oil.

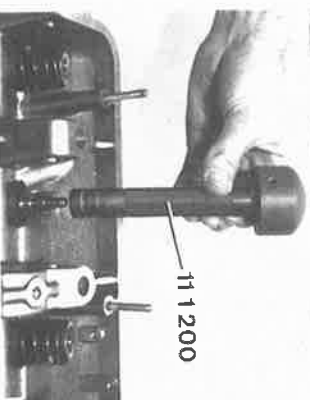


Pull off valve stem seal with Special Tool 11 1 250.
Check valve guide for wear — see 11 12 595.

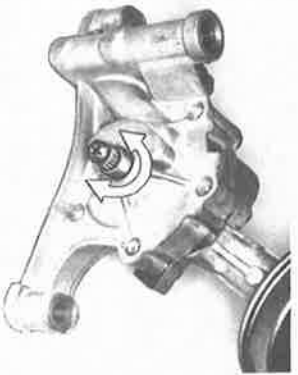


Install valve and insert Special Tool 11 1 053 (tray).
Insert lower spring retainer (1).
Use Special Tool 11 1 360 to avoid damaging the valve stem seal.
Lubricate valve stem seal (2) with oil and install.
Source for Special Tool Sleeves:
CARTOOL
Alfred-Brehm-Str 5
D-8070 Ingolstadt

Press on valve stem seal with Special Tool 11 1 200 by hand.
Special Tool 11 1 200 has two diameters — for 7 and 8 mm (0.275 and 0.315") valve stem seals.



11-76



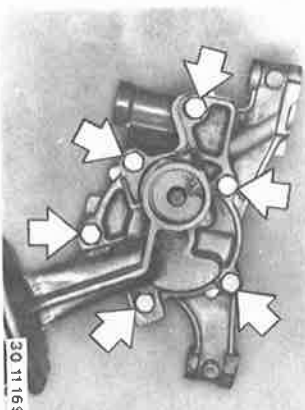
30 11 167

Testing and Servicing:
Check whether oil pump runs easily by turning the drive shaft.



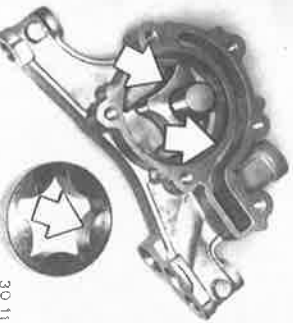
30 11 168

Clean oil filter screen.



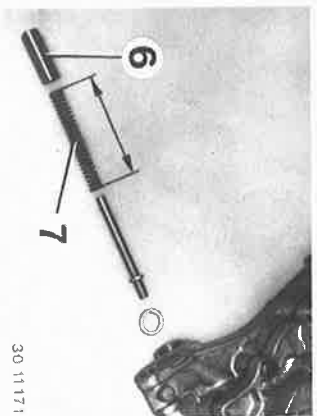
30 11 169

Disassemble oil pump.



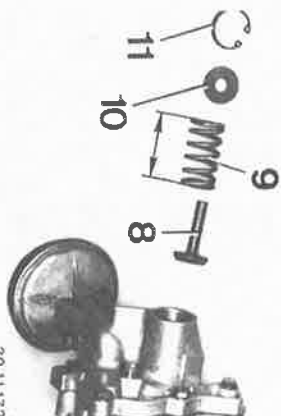
30 11 170

Check oil pump for wear.
— Scoring in body
— Wear on rotors



30 11 171

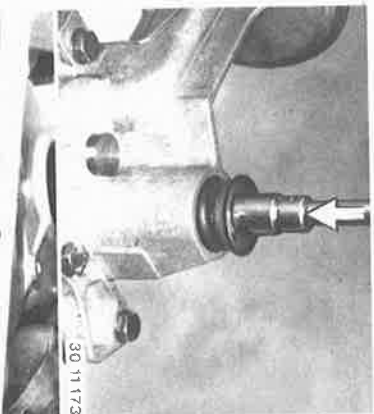
The pressure safety valve is located in the main bore and regulates the engine oil pressure* — see 11 40 000.
Check whether piston (8) moves easily.
Check length of spring (7) = 68 mm (2.677").



30 11 172

Pressure safety valve (8 bar = 114 psi) regulates the oil pressure in front of the oil filter and prevents oil filter leakage.
Check seat of piston (8).
Check length of spring (9) = 44 ± 0.4 mm (1.732 ± 0.016 ").

Installation:
Press in spring (9) and washer (10) with a wrench socket and install circlip (11).



30 11 173

11 41 151 REPLACING OIL PUMP DRIVE CHAIN

Remove lower oil pan section — see 11 13 020.
Remove timing chain — see 11 31 051.
Unscrew nut (2) and take off sprocket.

Installation:
Check sprockets for wear.
Adjust chain tightness — see 11 41 000.
Chains with green code are longer than chains with a red code.
Tightening torque: 25 to 30 Nm (18 to 22 ft. lbs.)



14 65

* See Specifications

11-78

11 43 101 REPLACING GUIDE TUBE FOR OIL DIPSTICK

Install guide tube with Loctite No. 270** and drive in against the stop.



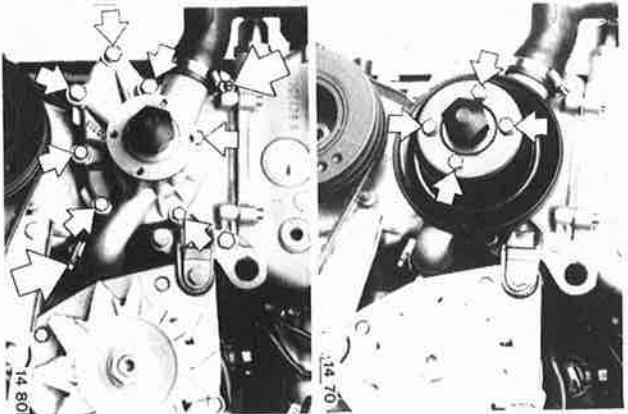
11 51 000 REMOVING AND INSTALLING WATER PUMP

Drain coolant.
If applicable, remove fan cowl and fan – see 11 52 000.
Take off drive belt and remove pulley.

Installation:
Add coolant****.
Tighten drive belt – check tightness with Special Tool 11 5 020.

Loosen hose clamps.
Remove water pump.

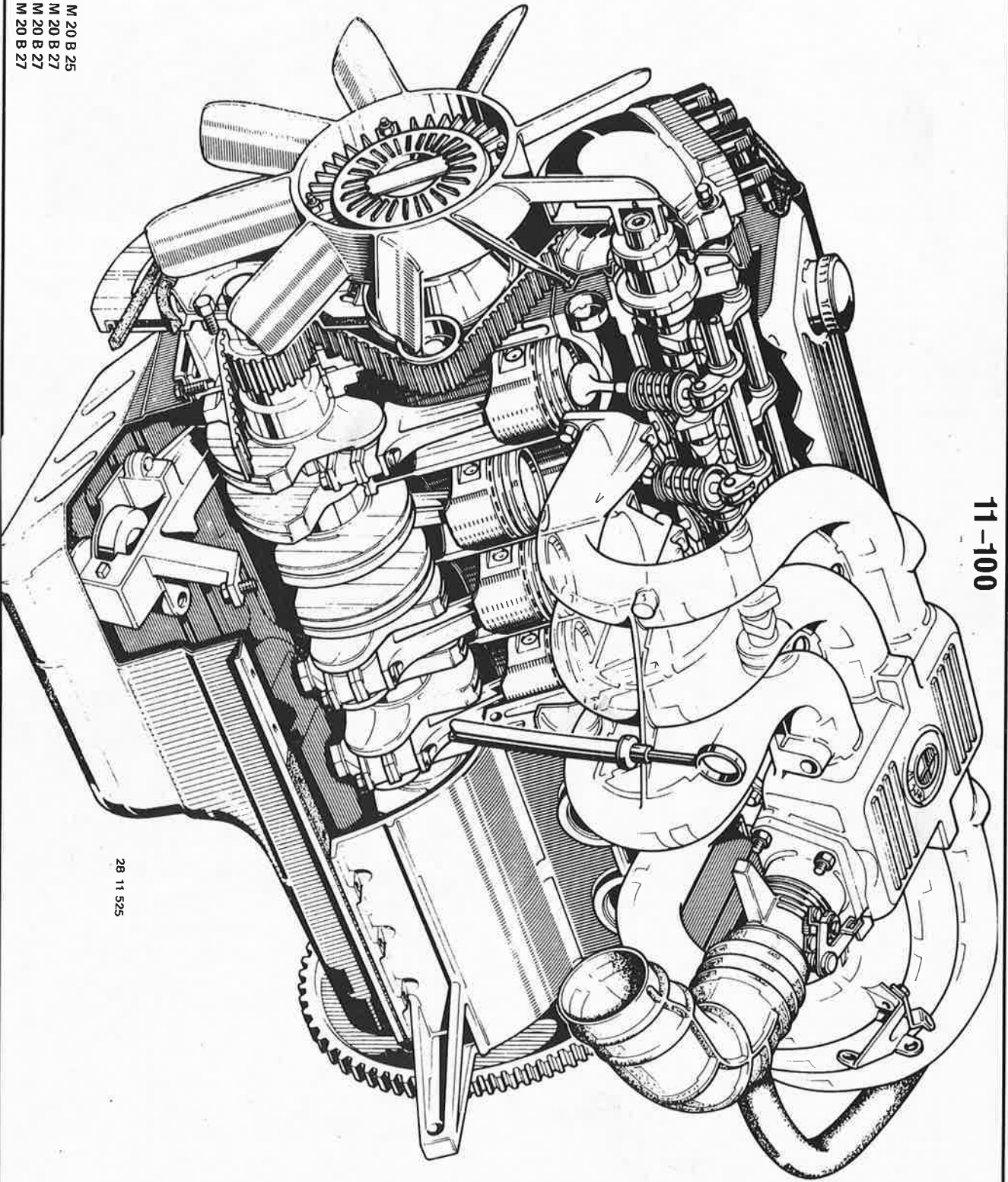
Installation:
Replace gasket.



** Source: HWB

*** See Service Information of Gr. 00

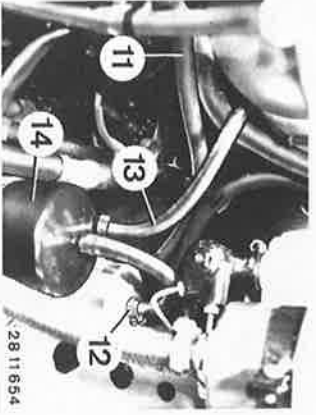
11-100



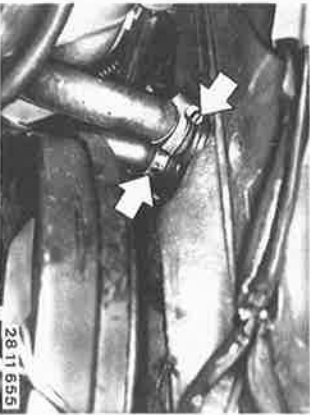
BMW 325 i - M 20 B 25
BMW 325 - M 20 B 27
BMW 325 e - M 20 B 27
BMW 325 es - M 20 B 27

28 11 525

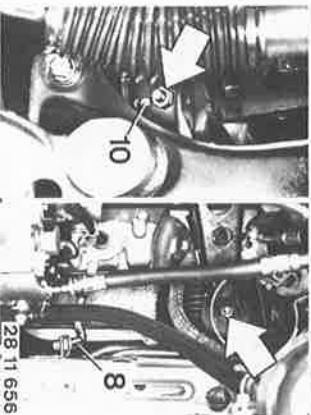
11-104



All Models:
Unscrew fuel lines (11 and 12).
Pull off hose (13) and unscrew filter (14).
Installation:
Use a new squeeze-hose clamp.

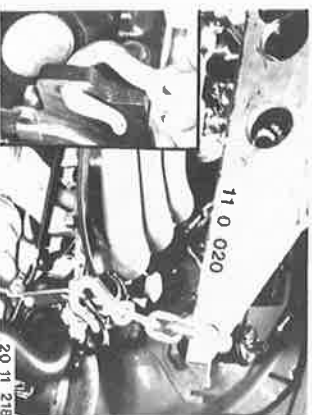


Disconnect water hoses for heater.



Unscrew ground strap (8) and both engine mounts.

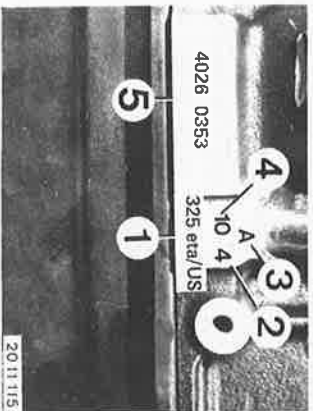
Installation:
Insert guide pin (10) in bore of axle carrier.
Tightening torque*.



Apply Special Tool 11 0 020 and lift out the engine.

Installation:
Adjust engine idle speed and CO level — see 13 00 054.

* See Specifications



11 00 091 EXCHANGING ENGINE

Remove engine — see 11 00 050.
Exchange Engine Identification on the Crankcase:
1 = Type designation/displacement*
2 = Year of manufacture (1984)
3 = "A" for exchange or "N" for new engine
4 = Month of manufacture

Stamp engine number (5).

Drive in supplied oil dipstick guide tube (see 11 43 101) and transfer parts from old engine to exchange engine.
Fill exchange engine with oil**.

Important!
Remove pilot bearing in crankshaft, see 11 21 571, if car has an automatic transmission.

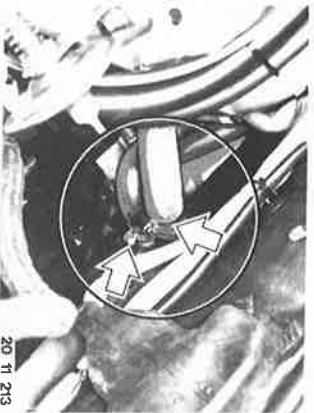
Install engine.
Adjust ignition timing — see 12 11 004.
Adjust engine idle speed and CO level — see 13 00 054.

* See BMW Technik and Service Information of Group 11

** See Service Information of Group 00

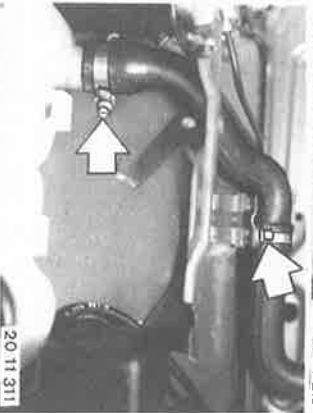
11-104 b

Disconnect water hoses for heater.



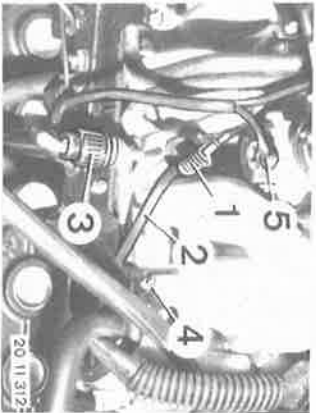
20 11 213

Disconnect coolant hose.



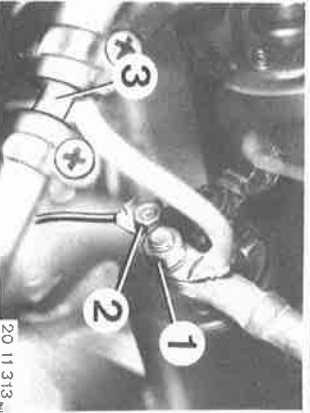
20 11 311

Pull off plug (1).
Pull off fuel hose (2).
Pull off plug (3).
Unscrew bolt (4).
Pull off plug (5).



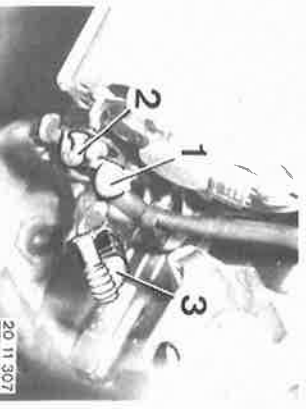
20 11 312

Disconnect leads (1 and 2) on starter and lift out starter.
Disconnect fuel pipe (3).



20 11 313

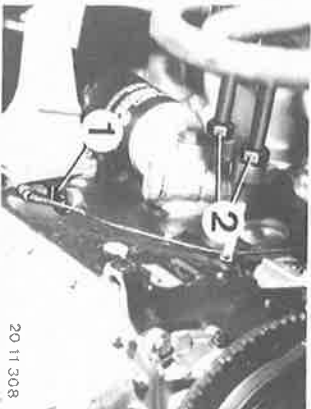
Pull off rubber caps (1 and 2) and unscrew leads on alternator.
Disconnect plug (3).



20 11 307

Pull off ignition leads on ignition coil.
Pull off plug (1) on oil pressure switch.
Loosen lead holding clip underneath the distributor and pull out leads to left side of engine.

Disconnect pipes (2) for oil cooler.
Installation:
Check gaskets, replacing if necessary.
Tightening torque*.



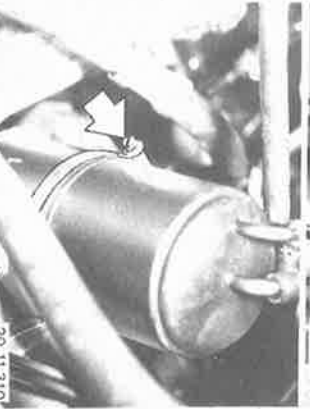
20 11 308

Take off relay box cover.
Lift out relay with socket and lay on engine together with wire harness.



20 11 309

Loosen clamp and remove carbon canister.
Place electric lead plate aside past the oil dipstick guide tube.



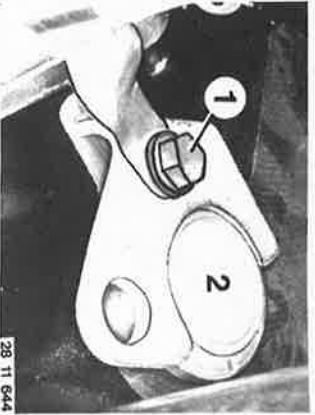
20 11 310

* See Specifications

11-105

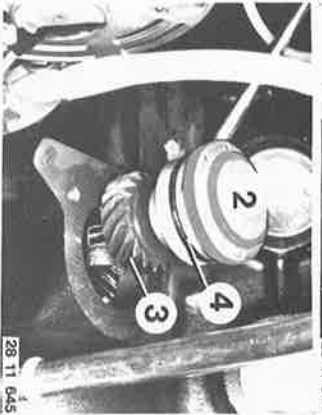
11 11 160 REPLACING BEARINGS FOR OIL PUMP DRIVE SHAFT

Remove oil pump - see 11 41 000.
Unscrew screw (1) and lift off cover (2).

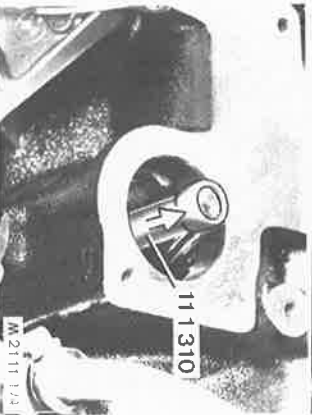


Remove gear wheel (3).

Installation:
Open end of gear wheel shaft faces down.
Check seal (4), replacing if necessary.



Drive out needle bearing from bottom to top with Special Tool 11 1 310.



Installation:
Lubricate needle bearing with grease.
Drive in needle bearing against stop with Special Tool 11 1 300.

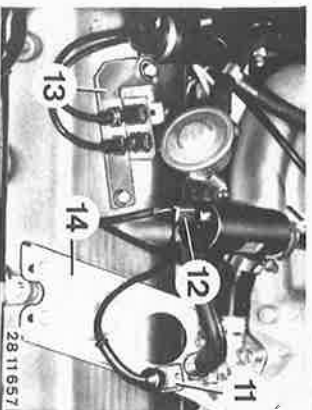


11 12 000 REMOVING AND INSTALLING CYLINDER HEAD COVER

M 20 B 25:
Unscrew support (1).

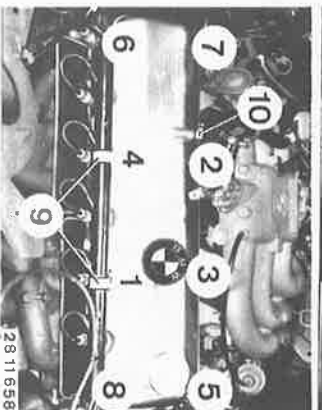


M 20 B 27:
Pull off plugs (11 and 12) and unscrew holder (13).
Unscrew support (14).



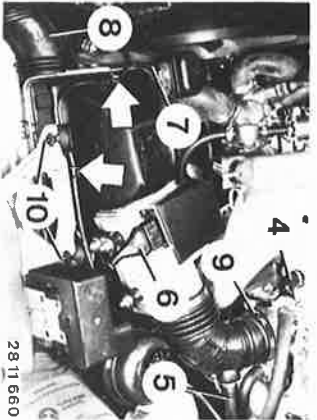
All Models:
Disconnect hose (9).
Unscrew nuts (1 ... 8) and take off cover.

Installation:
Check gasket, replacing if necessary.
Mount the ground strap with nut (6).
Tighten nuts in order of 1 through 8.
Tightening torque*.



* See Specifications

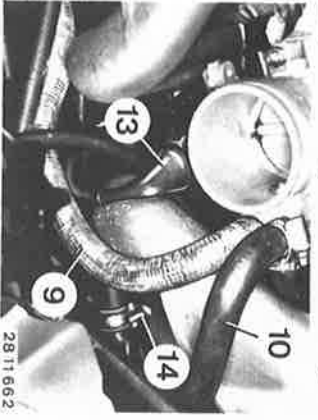
11-107



28 11 660

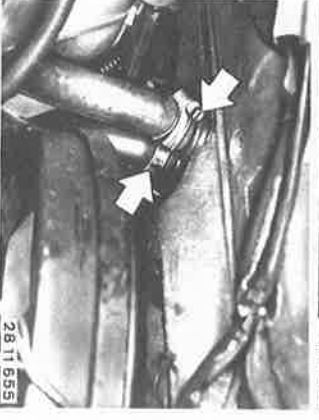
M 20 B 27:
 Pull off vacuum hose (4) and hose (5).
 Pull off plugs (6 and 7) and disconnect wire harness.
 Pull out hose (8) and loosen hose clamp (9).
 Unscrew nuts (10) and remove air cleaner with air flow sensor.

Disconnect hoses (9 and 10).
 Pull off plug (13).
 Unscrew bracket (14).



28 11 662

All Models:
 Disconnect water hoses for heater.



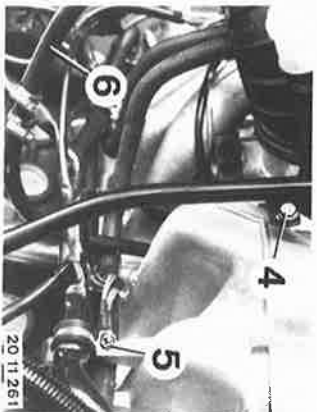
28 11 555

Press down vent tube and lock with Special Tool 11 1 290.

Installation:
 Check seal, replacing if necessary.
 Check for correct fit of vent tube after removing Special Tool 11 1 290.



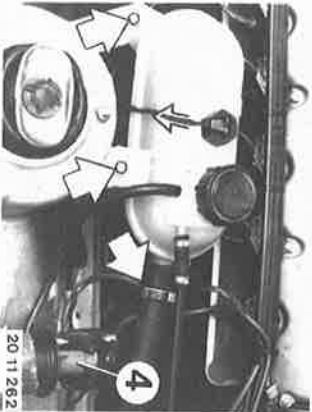
20 11 126



20 11 261

Unscrew oil dipstick tube (4).
 Unscrew holder (5).
 Disconnect fuel hose (6).

Pull off wire (4) on ignition coil.
 Take off coolant expansion tank.



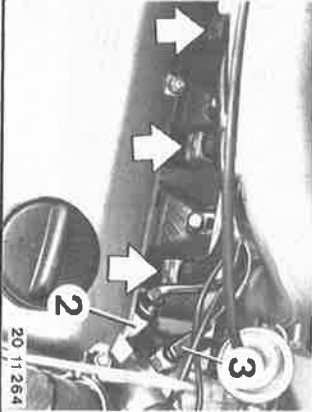
20 11 262

M 20 B 25:
 Pull off plugs on fuel injectors (4/5/6) and pull out wire harness.
 Cars with Four Wheel Drive:
 Pull off hose (1).



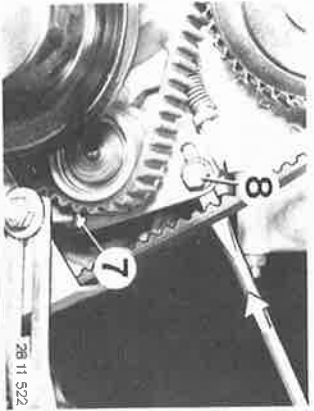
20 11 263

Pull off plugs (2 and 3).
 Pull off wire on oil pressure switch.
 Pull off plugs on fuel injectors (1/2/3).
 Disconnect wire harness and pull in to the left side.



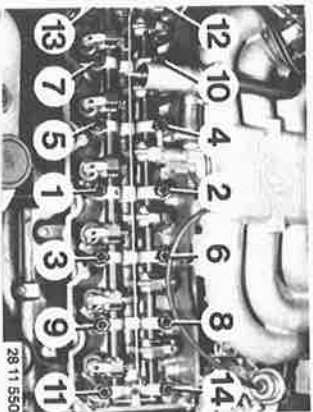
20 11 264

11-108



28 11 522

Loosen bolts (7 and 8).
Press in tensioning roller.
Tighten bolt (6).



28 11 550

Unscrew bolts in order of 14 through 1 and take off the cylinder head.

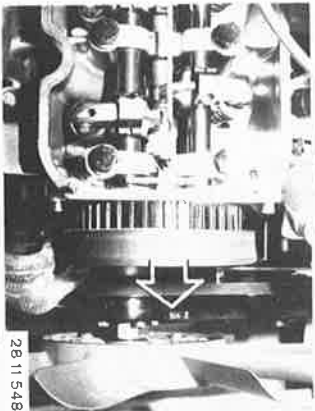
Installation:

Keep oil out of cavities, since otherwise bolts tightened with correct torque might not exert sufficient pressure on the cylinder head and, in addition, the crankcase might be cracked.

Clean cylinder head bolts.

Lubricate threads and bearing surfaces of bolt heads with a light coat of oil.

Replace cylinder head gasket — see 11 12 101.

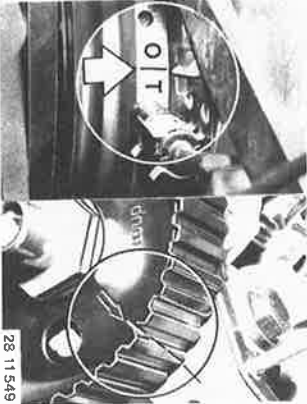


28 11 548

Take off drive belt on camshaft sprocket.
Caution!
Never crank engine after removing drive belt.

Installation:

Always replace drive belt — see 11 31 110.



28 11 549

Installation:

Before installing the cylinder head, turn the camshaft that mark on camshaft sprocket is facing mark on cylinder head.

Cylinder no. 1 is in TDC.

Also install the drive belt in this position.



28 11 551

Tighten bolts in order of 1 through 14 in three steps.

Tightening torque*.

Adjust valve clearance — see 11 34 004.

Adjust engine idle speed and CO level — see 13 00 054.

Tighten cylinder head bolts in the 3rd step

(cylinder head cover removed again after

running engine warm) to torque angle with

Special Tool 11 2 110 regardless of the engine

temperature.

Note:

Cylinder head bolts need not to be retightened after 1,000 km (600 miles).

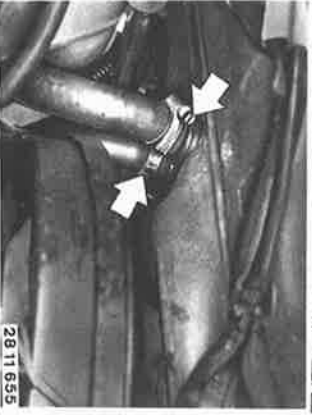
* See Specifications

11-108b



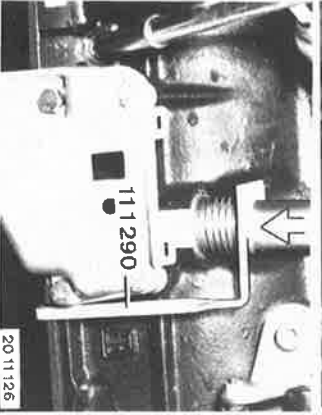
Pull off plug (1).
Disconnect hoses (2 and 3).

20 11 260



Disconnect water hoses for heater.

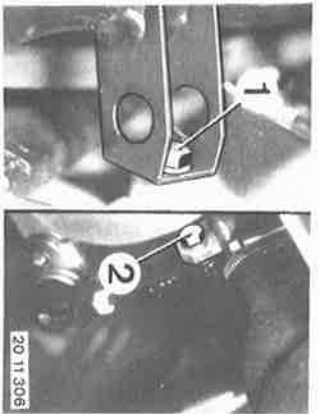
28 11 655



Press down and arrest breather tube with
Special Tool 11 1 290.

Installation:
Check seal, replacing if necessary.
Check for correct seating of breather tube
after removal of Special Tool 11 1 290.

20 11 126



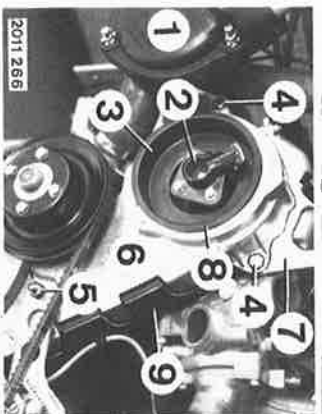
Pull ignition leads off of ignition coil.
Remove fan – see 11 52 000.
Unscrew water pipe bolts (1 and 2) and take
off water pipe.

20 11 506



Remove cylinder head cover – see 11 12 000.
Turn crankshaft to have cylinder no. 1 in TDC
and overlapping valves in cylinder no. 6.

20 11 265

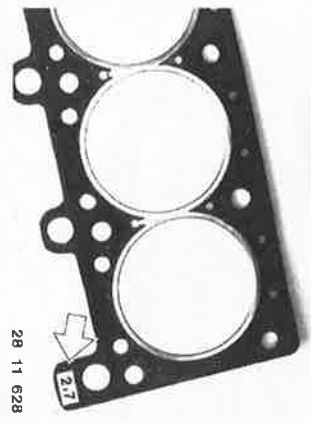


Unscrew distributor cap (1).
Unscrew distributor rotor (2).
Remove cover (3).
Unscrew bolts (4).
Unscrew nut (5).
Remove protective cover (6).
Take off wire clip underneath the distributor
and place leads in front of pulley.
Installation:
Screw on holder (7).
Check rubber ring (8).
Install rubber cover (9).

2011 266

11-109

11 12 101 REPLACING CYLINDER HEAD GASKET



28 11 628

Remove cylinder head — see 11 12 100.
Clean sealing surfaces on cylinder head and crankcase — using sealant remover** and a hard wood scraper.
Check levelness with a standard steel ruler, grinding the cylinder head sealing surface if necessary — see 11 12 719.

Installation:
Only use original cylinder head gaskets, of which the openings for coolant are matched precisely.

| Engine | Stamped Code |
|-----------|--------------|
| M 20 B 25 | 2.5 |
| M 20 B 27 | 2.7 |

Important!
A 0.3 mm (0.012") thicker gasket must be installed after grinding the cylinder head to prevent reduction in combustion chamber size.

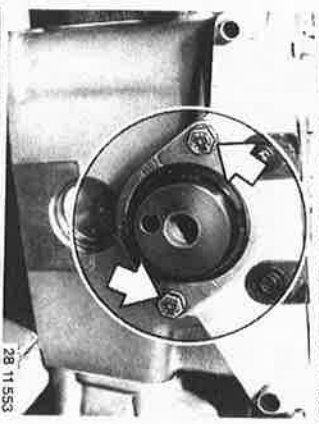


28 11 630

11 12 240 REPLACING RADIAL OIL SEAL IN END COVER

Remove drive belt — see 11 31 110.
Take off sprocket.
Note:
Always replace drive belt — see 11 31 110.

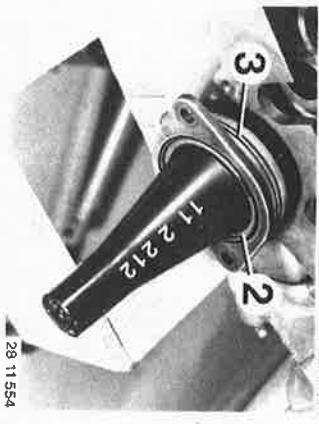
Unscrew cover.



28 11 553

Replace radial oil seal (2) and round cord seal (3).

Installation:
Use Special Tool 11 2 212 to install the cover.



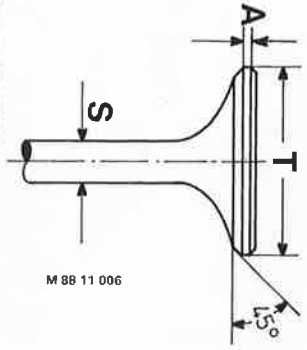
28 11 554

** Source of Supply: HMB

11-111

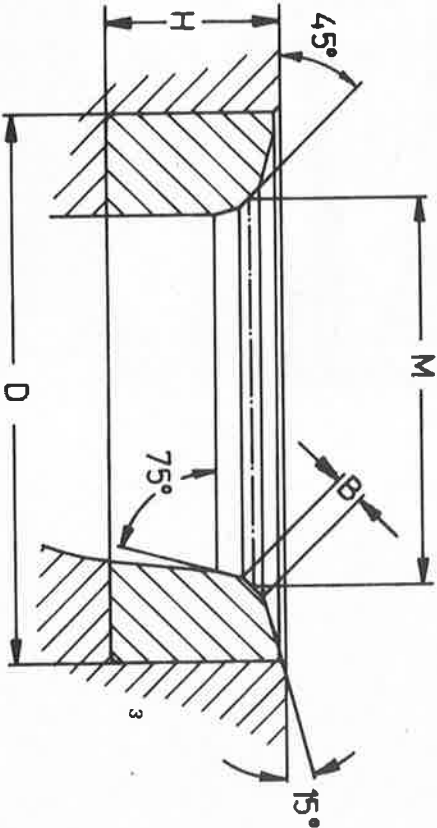
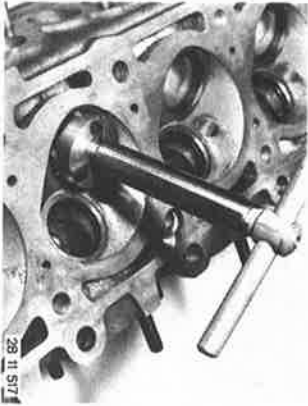
11 12 607 MACHINING VALVE SEATS AND VALVES

— Valves Removed —



The valve has to be replaced, if the minimum edge thickness A* cannot be held.

Produce the valve seat diameter M* and valve seat width B* by machining correction angles* after machining the valve seat angle*. Grind in valves with grinding paste and check for leaks, see 11 34 509.



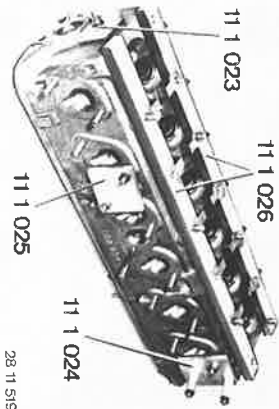
11 12 719 GRINDING CYLINDER HEAD SEALING SURFACE

— Cylinder Head Disassembled —

The original total thickness (A) of the cylinder head is 125.1 ± 0.1 mm (4.925 ± 0.004 ") and not more than 0.3 mm (0.012") may be ground off.
Use a 0.3 mm (0.012") thicker gasket on a reground cylinder head (also refer to 11 12 101)

11 12 729 CHECKING CYLINDER HEAD FOR CRACKS IN WATER TEST

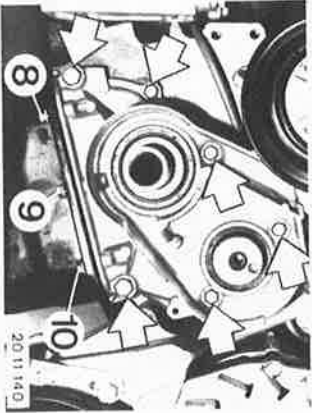
Mount Special Tools 11 1 026 on the cylinder head, using cylinder head bolts.
Close off water circuit on the cylinder head with Special Tools 11 1 023, 11 1 024 and 11 1 025.



Apply compressed air on cylinder head.
Pressure: 4.5 bar (64 psi).
Place cylinder head in a water bath and check for cracks.
Note:
If necessary, relax water bath with a detergent.

* See Specifications

* See Specifications



20 11 140



20 11 141

Unscrew bolts (8 ... 10).
Only loosen the other oil pan bolts.
Loosen oil pan gasket on end cover carefully with a knife.

Take off cover.

Installation:

If oil pan gasket was damaged, remove oil pan and replace gasket — see 11 13 000.

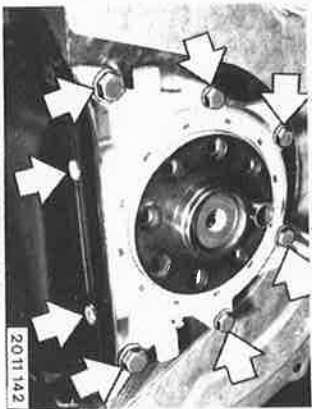
Coat bores of oil pan gasket with a brush-on universal sealing compound/Three Bond Silicone 1207**.

Replace gasket.

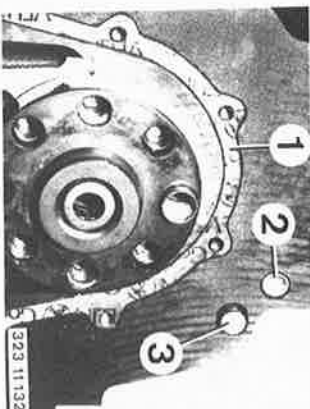
Check radial oil seals, replacing if necessary.

Important!

Always use Special Tools 11 2 211 (crankshaft) and 11 2 212 (intermediate shaft) for installation of the end cover.



20 11 142



323 11 132

11 14 605 REPLACING RADIAL OIL SEAL
IN CLUTCH END COVER
Transmission Removed

Remove flywheel 11 22 000.

Unscrew oil pan/end cover bolts.

Only loosen the other oil pan bolts.

Loosen oil pan gasket on end cover carefully with a knife.

Installation:

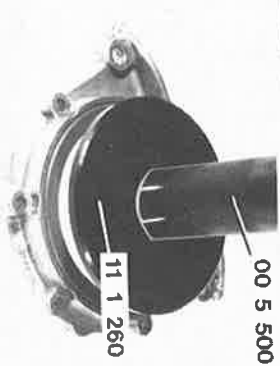
If oil pan gasket was damaged, remove oil pan and replace gasket — see 11 13 000.

Take off end cover.

Replace gasket (1).

Important!

Check cover (2) of main oil bore for leaks, replacing with a new plug (3) if necessary.
Install plug with Loctite No. 270**.



00 5 500

11 1 260

30 11 027



30 11 026

11 14 180 REPLACING RADIAL OIL SEAL
IN END COVER

Remove end cover 11 14 175.

Press radial oil seals out of the cover.

Press in radial oil seals with Special Tools 24 1 050 and 24 1 040.

Press in the new radial oil seals approx. 1 to 2 mm (0.039 to 0.079") deeper, in contradiction to the standard seal which had been installed flush.

Lubricate sealing lips with oil.

Lubricate sealing lips with oil.

** Source: HWB

11-115

11 21 501 REPLACING CRANKSHAFT - Crankshaft Removed -

Note:

A replacement crankshaft is supplied complete with corresponding bearing shells for main and conrod bearings.

Crankshaft Identification:

| Engine | Stroke | Grooves | Code |
|-----------|---------|---------|------|
| M 20 B 20 | 66.0 mm | 1 | U |
| M 20 B 23 | 76.8 mm | - | V |
| M 20 B 25 | 75.0 mm | 3 | X |
| M 20 B 27 | 81.0 mm | 2 | W |

Crankshaft is surface treated and may only be reground in the factory.

Reground crankshafts are marked with stripes of paint.

Conrod Bearing Journal (A)

1 paint stripe

2 paint stripes

Size 1 *

Size 2 *

Main Bearing Journal (B)

1 paint stripe

2 paint stripes

Size 1 *

Size 2 *

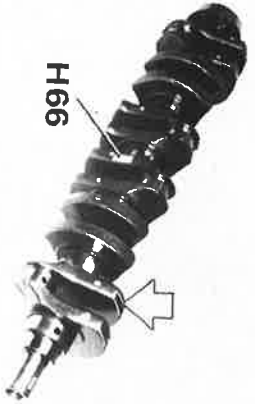
Cars with Manual Transmission:
Install pilot bearing for the transmission main shaft.

Installed Order:

Ball bearing (1), cover (2), felt ring (3) and capsule (4).

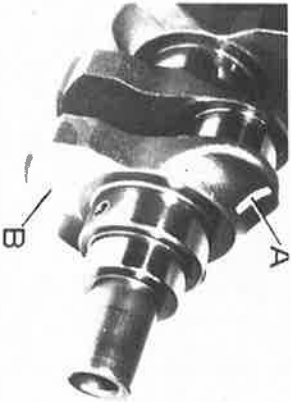
Insert cover (2) with embossment facing out.

Fill bore in crankshaft with approx. 1 gram (0.035 oz.) of lubricating grease. Drive in pilot bearing with Special Tools 11 2 030 and 00 5 500.



H66

28 11 307



M21 11 023



20 11 128

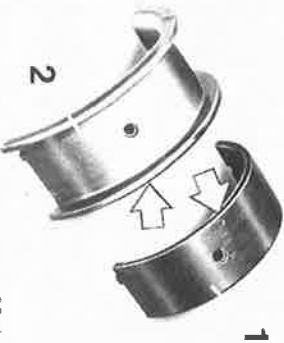


20 11 148

* See Specifications



28 11 306



28 11 053

Crankshaft bearing shells were installed standard with the following color codes for a pertinent ground size.

- Double classification: red/blue (old color codes)
- Triple classification: yellow/green/white (new color codes)

Replacement crankshafts are only supplied with bearing shells of triple classification.

1 = Bearing shell 1-2-3-4-5-7
2 = Bearing shell 6 (pilot bearing)

The color code is located on the side of the bearing shell.

Installing Instructions:

Only place bearing shells with "yellow" marks in the crankcase (regardless of the old color code mark on the crankcase).

Install bearing shells in bearing caps depending on the color code of the crankshaft bearing journals - "yellow-green-white".

Install crankshaft.

Place Type PG-1 Plastilage on crankshaft wiped clean of oil and tighten bearing caps with the correct torque*. Do not turn the crankshaft.

Source of Supply for Plastilage:
CARTOOL
Alfred-Brehm-Str. 5
D-8070 Ingolstadt

* See Specifications



M88 11 060



M88 11 061

11 21 531 REPLACING CRANKSHAFT MAIN BEARING SHELLS - Engine Disassembled -

Crankshaft bearing shells with the following color codes for a pertinent ground size had been installed standard.

- Double classification: red/blue (old color code)
- Triple classification: yellow/green/white (new color code)



28 11 306

- 1 = Bearing shell 1-2-3-4-5-7
- 2 = Bearing shell 6 (pilot bearing)

Color code mark is located on the side of a bearing shell.



28 11 053

Install bearing shells in crankcase with same color code as the dot of paint on the console.

Install both bearing shells according to the crankshaft color code, if the color code mark on the crankcase is washed off.

Install bearing shells in bearing caps with the same color code as for the crankshaft.



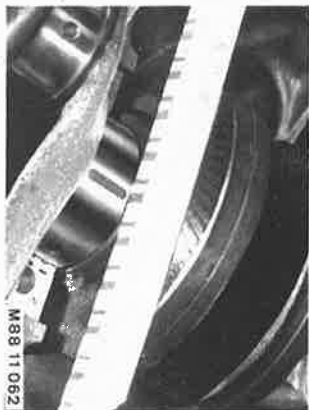
M 88 11 060

Install crankshaft.

Place Type PG-1 Plastigage on crankshaft wiped clean of oil and tighten bearing caps with the correct torque*. Do not turn the crankshaft.

Source of Supply for Plastigage:
CARTOOL
 Alfred-Brehm-Str. 5
 D-8070 Ingolstadt

* See Specifications



M 88 11 062

Remove bearing caps. Read bearing play* by measuring the width of the flattened Plastigage with help of the supplied scale. Correct the bearing play by installing new bearing shells, bearing shells of a different machined size or with a different color code.

Survey of Color Code/Shaft Diameter/
 Bearing Shell Thickness*

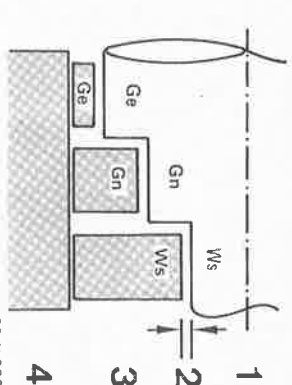
Triple Classification Color Codes:

- Ge = yellow
- Gn = green
- Ws = white

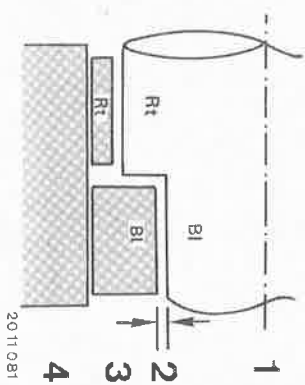
Double Classification Color Codes:

- Ri = red
- Bl = blue

- 1 Crankshaft diameter
- 2 Bearing play
- 3 Bearing shell thickness
- 4 Console diameter



20 11 080



20 11 081

* See Specifications



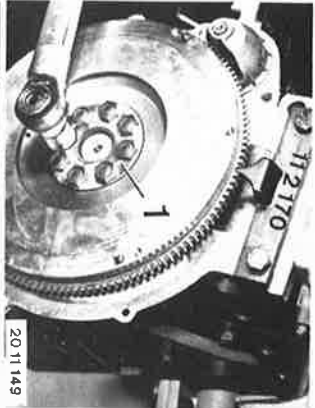
M 88 11 061

11-117

11 22 000 REMOVING AND INSTALLING FLYWHEEL

Remove clutch — see 21 21 000.
Hold flywheel with Special Tool 11 2 170.
Unscrew bolts and take off flywheel.

Installation:
Clean tapped bores.
Insert ring (1).
Replace and install expansion bolts with Loctite No. 270**.
Tightening torque*.



20 11 149

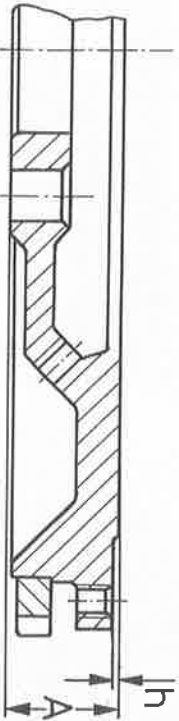
Check flywheel for axial runout*.



28 11 056

Friction surface may be machined to minimum distance A*.

If machining the friction surface reduces distance "h" to zero, the flange surface (distance "h") has to be machined.
The friction surface of a double-mass flywheel cannot be machined.

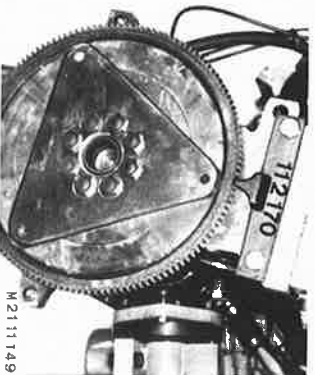


M 88 11 072

11 22 051 REPLACING DRIVE PLATE FOR TORQUE CONVERTER

Remove transmission — see Group 24.
Hold flywheel with Special Tool 11 2 170.
Unscrew bolts and take off flywheel.

Installation:
Clean tapped bores.
Replace and install expansion bolts with Loctite No. 270**.
Tightening torque*.



M 21 11 149

11 22 541 REPLACING STARTER GEAR RING

Drill a 6 mm (0.236") dia. hole about 8 mm (0.315") deep underneath a tooth gap to make breaking the gear ring easier.

Break the starter gear ring at drilled point with a chisel.



630 11 170



630 11 171



630 11 172

Installation:

Heat new starter gear ring to 200 ... 230° C (395 to 445° F), checking temperature with a thermo-color pencil.
Tooth bevel faces the engine.
Drive on starter gear ring to fit tight all around with a brass mandrel.

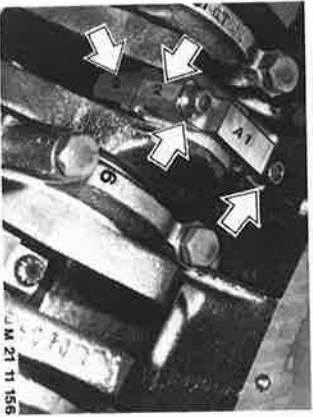
* See Specifications

** Source: HWB

11-119

11 24 521 REPLACING CONNECTING

RODS
— Pistons Removed —



Important!
Only use connecting rods of the same weight group in one engine.
The weight group is stamped in the machined conrod bearing cap surface.
Connecting rods may not be machined!
Check length of connecting rods!

The piston pin must slide through the conrod bushing under light pressure.



M 88 11 065

11 24 571 REPLACING CONNECTING

ROD BEARING SHELLS
— Engine Disassembled —



Install the conrod bearing shells in the rods and caps.
Double Classification:
Install red or blue conrod bearing shells according to the color code on the connecting rods.
Important!
Check machined size (conrod bearing diameter).

Turn to BDC, place Type PG-1 Plastigage on crankshaft wiped clean of oil and mount conrod bearing caps that grooves are on one side. The pairing code (0 to 99) must be the same on the connecting rod and cap.

Source for Plastigage:

Carroll
Alfred-Brehm-Str. 5
D-8070 Ingoisdorf / West Germany

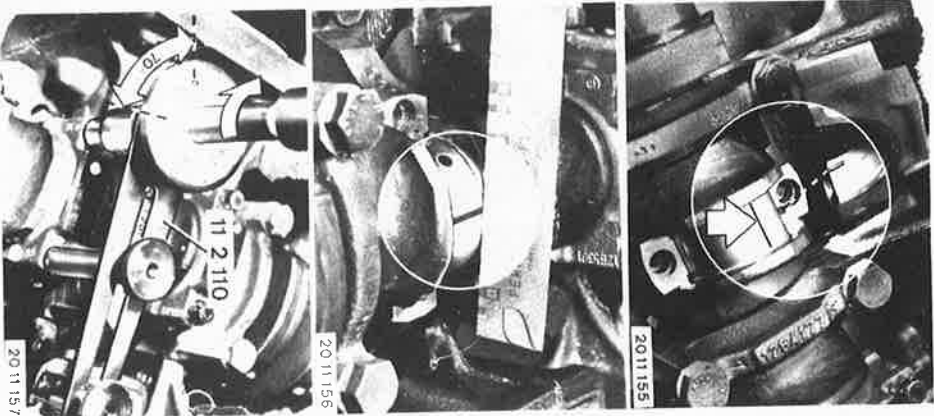
Tighten the bolts in two steps (use the old conrod bolts).
1st step 20 Nm (14.4 ft. lbs.)
2nd step 70° torque angle

Important!

Don't turn the connecting rods or crankshaft. Take off the bearing caps.

Read the bearing play* from the width of the flattened Plastigage with help of the supplied scale.

Correct the bearing play by installing new bearing shells, bearing shells of different machined size or with a different color code. Replace the conrod bolts for final installation and tighten the conrod bearing caps in two steps (see above).



20 11 157

* See Specifications

11-121

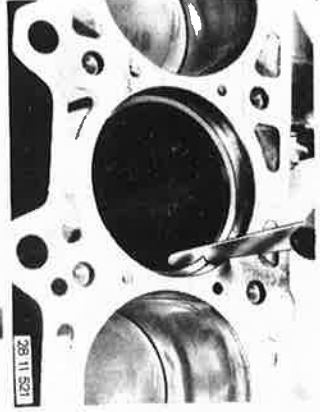
11 25 651 REPLACING PISTON RINGS OF ONE PISTON — PISTON REMOVED —

Measure side clearance* of piston rings.



28 11 509

Remove piston rings and measure end clearance*.



28 11 521

Installation:
Install piston rings that word "TOP" faces piston crown.

- 1 Plain compression ring
- 2 Taper face ring
- 3 Oil scraper ring



28 11 510

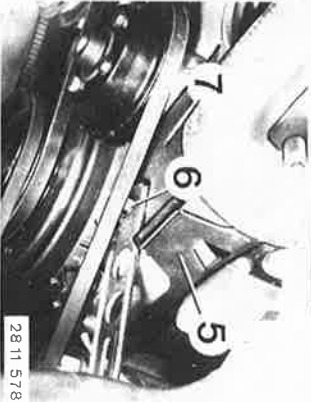
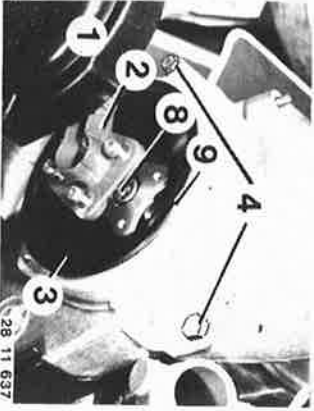
* See Specifications

11-123

11 31 110 REPLACING DRIVE BELT

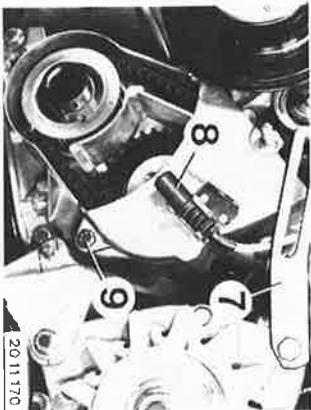
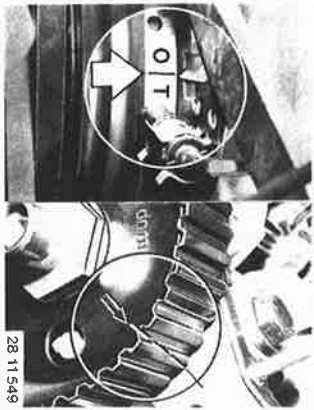
Important!

Always replace an used drive belt, regardless of the driven milles, with a new one each time the tensioning roller is loosened***.



UnscREW distributor cap (1).
UnscREW distributor rotor (2).
Older Version:
UnscREW adapter (8).
Remove cover (3).
UnscREW bolts (4).
Installation:
Check seal (9), replacing if necessary.
Tightening torque*.

Take off rubber guard (5).
UnscREW nut (6).
Remove cover (7).
Re-install adapter (8).



Turn crankshaft to have TDC in cylinder no. 1 (arrow on camshaft sprocket facing mark on cylinder head).
Remove vibration damper - see 11 23 010.

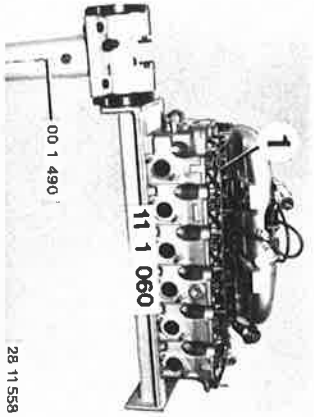
Two Piece Hub/Sprocket:
Remove hub for vibration damper - see 11 23 031.
Swing away tensioning bar (7).
Lift out TDC sender (8).
UnscREW bolt (9) and take off cover.

* See Specifications
*** See Service Information of Gr. 11

11-124

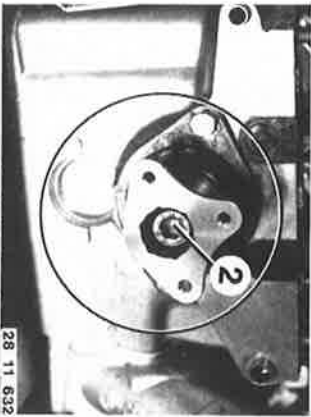
11 33 020 REMOVING AND INSTALLING ROCKER ARM SHAFTS

Remove cylinder head 11 12 100.
Set up Special Tool 11 1 060 on Special Tool
00 1 490 and mount cylinder head with one
cylinder head bolt.



28 11 558

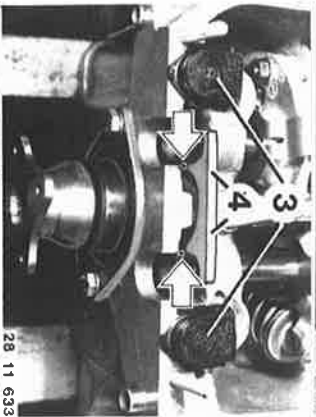
Mount adapter (2) again.
Adjust valve clearance of all valves to greatest
value.



28 11 632

Remove front and rear plugs (3).
Remove guide plate (4).

Installation:
Guide plate (4) must fit in grooves of rocker
arm shafts.



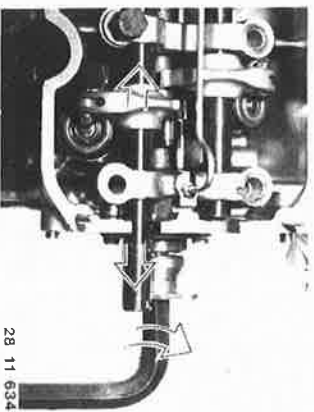
28 11 633

Remove spring clamps.

Installation:
Straight surfaces of spring clamps must fit in
grooves of rocker arm shafts.



28 11 561

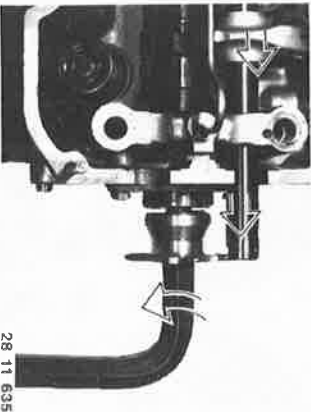


28 11 634

Remove rocker arm shafts.

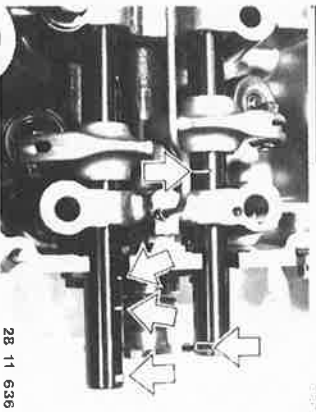
1) Exhaust Side:
Cylinder no. 6 must overlap.
Push in rocker arms of cylinder no. 1 and turn
camshaft on adapter to intake side until rocker
arms (all) are relaxed.
Pull out rocker arm shaft.

2) Intake Side:
Turn camshaft on the adapter to exhaust side
and move rocker arms until all rocker arms are
relaxed.
Pull out rocker arm shaft.
Replace worn (scored) rocker arm shafts and
rocker arms.



28 11 635

Installation:
Install rocker arm shafts that large oil bores
face down to valve guides and small oil bores
as well as grooves for guide plate face in.



28 11 636

11-126

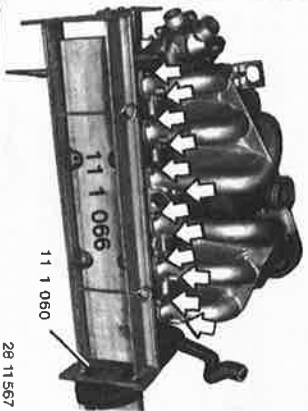
11 34 550 REMOVING AND INSTALLING VALVES

Remove rocker arm shafts 11 33 020. Place tray 11 1 066 in assembly stand 11 1 060.

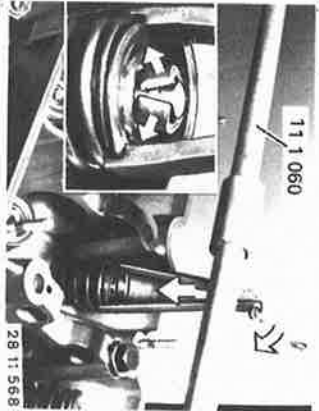
Unscrew intake.

Installation:

Replace gaskets.

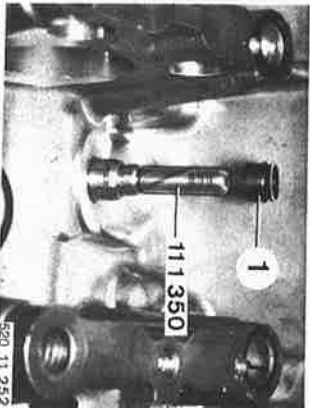
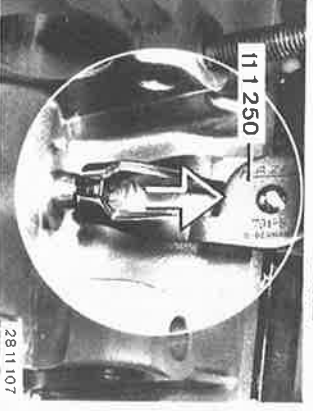


Press down the valve springs with Special Tool 11 1 060 and remove the valve collectors.



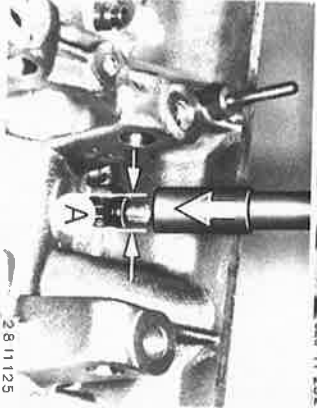
Remove the upper spring retainer, valve springs and lower spring retainer. Take the tray out of the assembly stand and pull out the valve.
Installation:
Only use valve springs with same color code, wire gage size and length.
Lubricate valve guide and valve stem with oil.

Pull off valve stem seal with Special Tool 11 1 250.

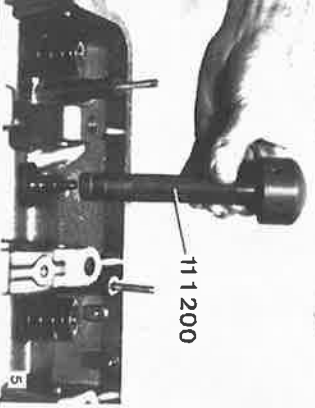


Install valve.
Always use Special Tool 11 1 350 to avoid damage on the valve stem seal.
Lubricate valve stem seal (1) with oil and install.

Source for Special Tool Sleeves:
Cartool
Alfred-Brehm-Str. 5
D. 8070 Ingolstadt / West Germany



"Goetze" Seals:
Press on the valve stem seal to fit tight with Special Tool 11 1 140.
Dia. A = 12,8 mm (0,504").
"Eirring" Seals:
Press on the valve stem seal to fit tight with Special Tool 11 1 080.
Dia. A = 13,5 mm (0,531").



The new, improved valve stem seals (internal grooving) are pressed on by hand with Special Tool 11 1 200.
Special Tool 11 1 200 has two diameters for 7/8 mm (0,276/0,315") valve stem seals.



11 35 020 REMOVING AND INSTALLING DISTRIBUTOR INTERMEDIATE SHAFT

Remove fuel pump 13 31 030.
Remove distributor 12 11 060.
Remove front end cover 11 14 175.
Remove guide plate (1).

Pull out the intermediate shaft (2).

Installation:

Check sprocket, replacing the intermediate shaft if necessary.
The bearings in the crankcase cannot be replaced.

11-128

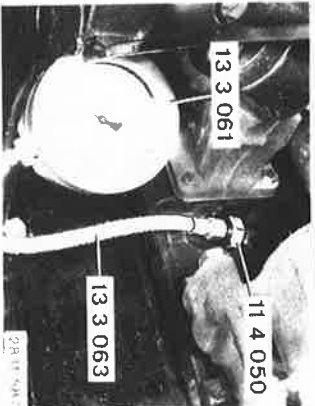
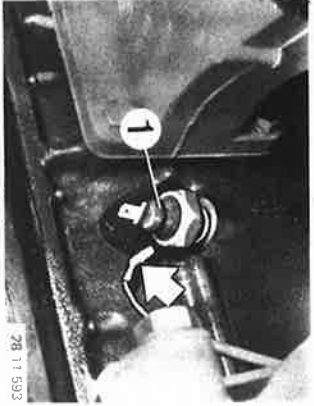
11 40 000 CHECKING ENGINE OIL PRESSURE

Pull off wires on oil pressure switch.

Unscrew oil pressure switch (1).

Installation:

Check gasket, replacing if necessary.



Screw in Special Tool 11 4 050 (adapter).

Connect Special Tools 13 3 063 (hose) and

13 3 061 (pressure tester).

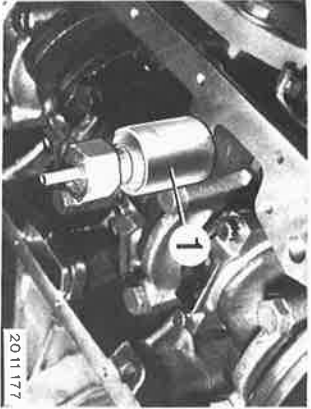
Check oil pressure*.

* See Specifications

11-130

11 41 110 REMOVING AND INSTALLING PRESSURE RELIEF VALVE

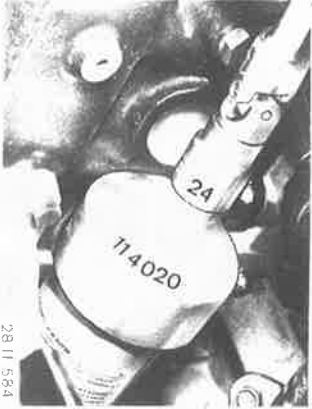
The pressure relief valve is installed in the main bore and regulates the engine oil pressure* after the oil filter.
Remove oil pan 11 13 000.
Unscrew pressure relief valve.
Take off the sleeve (1).



11 42 020 REPLACING FULL FLOW OIL FILTER

Unscrew filter with Special Tools 11 4 020/11 4 650.

Installation:
Give gasket a light coat of oil.
Screw on the oil filter by hand until the gasket touches – then tighten by hand with one half turn.
Add oil, start engine and check oil level and for leaks.
If the engine no longer builds up oil pressure after replacement of the oil filter cartridge, stop the engine, loosen the filter cartridge by approx. 90° and start the engine. Tighten the filter again after oil has run out briefly (bleeding procedure).



11 43 101 REPLACING GUIDE TUBE FOR OIL DIPSTICK

Install the guide tube with Loctite No. 270** and drive it in against the stop.



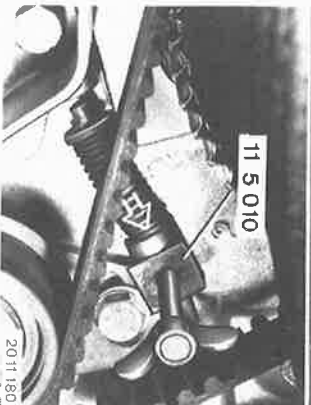
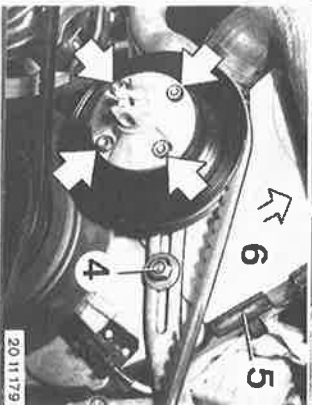
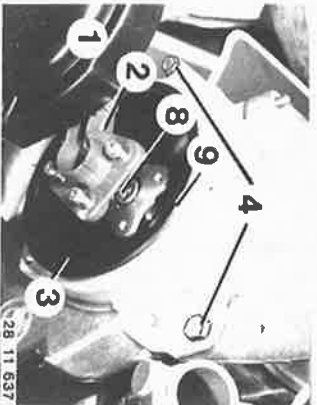
11 51 000 REMOVING AND INSTALLING WATER PUMP

Drain coolant.
Remove distributor cap (1).
Remove distributor rotor (2).
Unscrew adapter (8).
Remove cover (3).
Unscrew bolts (4).
Remove fan 11 52 000.

Installation:
Pour in coolant and bleed the cooling system 17 00 039.
Check seal (9), replacing if necessary.

Remove pulley.
Unscrew nut (4) and take off the drive belt.
Lift out rubber part (5) and pull out the protective cover (6).

Installation:
Tighten the drive belt and check the tightness with Special Tool 11 5 020.



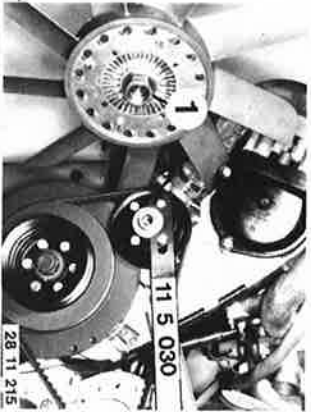
Compress the spring and clamp the pin with Special Tool 11 5 010.
Installation:
Check installed position of the pin to the water pump.

Disconnect coolant hoses (7 and 8).
Remove the water pump.
Installation:
Replace the gasket.



* See Specifications
** Source: HMB

11-132



11 52 000 REMOVING AND INSTALLING FAN

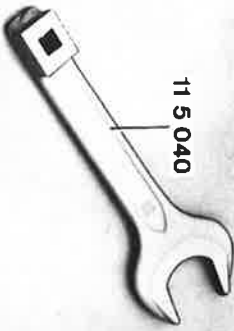
Temperature Dependent Visco Fan Clutch:
Hold pulley with Special Tool 11 5 030 and unscrew the coupling nut (1).

Important!

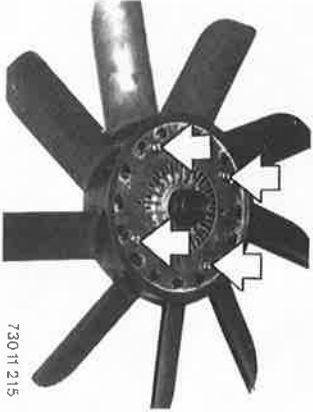
Left-hand threads — nut must be turned clockwise to unscrew.
Tightening torque*.

Installation:

Tighten fan with Special Tool 11 5 040. The 40 Nm (29 ft. lbs.) tightening torque is equal to a 30 Nm (22 ft. lbs.) setting on the torque wrench.



30 11 193



11 52 020 REPLACING FAN CLUTCH

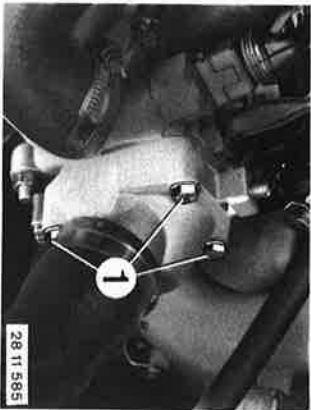
Remove fan — see 11 52 000.

Reasons for Replacing the Fan Clutch:

- Hub has seized — fan of stopped engine cannot be turned or is hard to turn.
- Fan clutch has axial/radial play or is losing oil.

Check the switching points* with a Vibrocord****.

Unscrew the fan mounting bolts and take off the fan clutch.

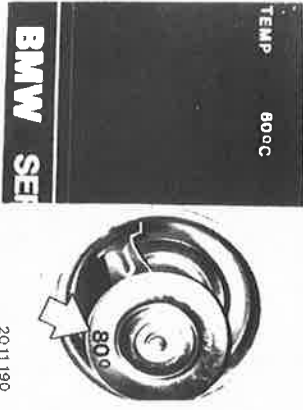


11 53 000 REMOVING AND INSTALLING COOLANT THERMOSTAT

Drain some of the coolant.
Unscrew cover (1).

Installation:

Bleed the cooling system ... see 17 00 039.



Remove thermostat.
Installation:
Clamp on the thermostat faces out.
Replace rubber ring (2).
Since 1986 Models:
New thermostat housing:
Install thermostat no. 1 713 040 (smaller valve seat diameter).

Checking Thermostat:

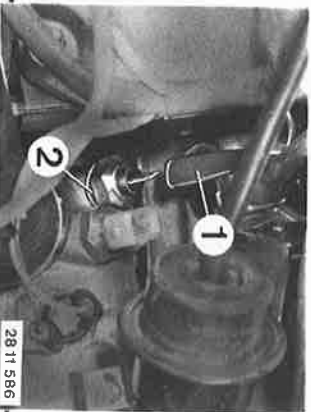
Check whether opening temperature agrees with the value in the Specifications.
Check opening temperature in a hot water bath and compare value with the stamped opening temperature value.

11 53 080 REPLACING TEMPERATURE TRANSMITTER

Pull off wire (1).
Unscrew the transmitter.

Installation:
Replace seal (2).

Bleed the cooling system — see 17 00 039.

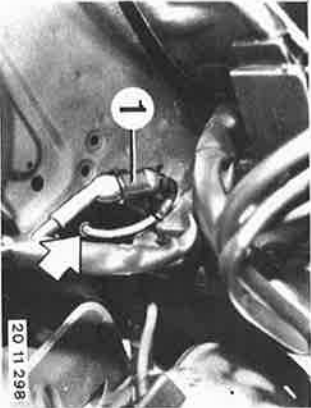


* See Specifications
*** See Workshop Equipment Catalog

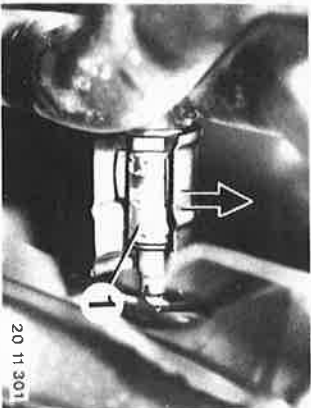
11-134

11 78 510 REPLACING OXYGEN SENSOR

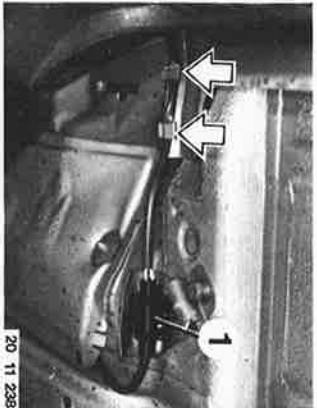
- Do not clean oxygen sensors or let them come in contact with lubricants.
 - Only use AntiSeize** on threads.
 - Cover oxygen sensors when undercoating the car.
- The heated oxygen sensor has to be replaced at intervals of 50,000 miles.



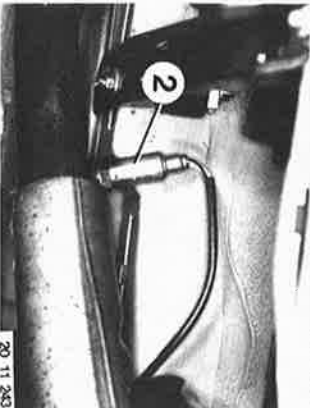
M 20 B 25:
Disconnect plug (1).
Lift leads out of clip.



Pull off cover and remove oxygen sensor (1).



M 20 B 27:
Disconnect plug (1).
Lift out leads.
Installation:
Seal plug (1) with an universal sealing compound for protection against spray water.



Unscrew oxygen sensor (2).

All Models:
Installation:
Coat threads with Anti-Seize** and tighten the oxygen sensor with Special Tool 11 7 020. Tightening torque*.

* See Specifications
** Source: HMB

12 Engine Electrical Equipment

Model 318 i/A

| | |
|---|--------|
| Instructions for working on TCI (transistorized coil-type ignition) | 12- 0 |
| Engine electrical layout | 12- 1 |
| Ignition timing — adjust | 12- 1a |
| Distributor — remove and install | 12- 2 |
| Pulse transmitter in distributor — check | 12- 3 |
| Pulse transmitter in distributor — replace | 12- 3 |
| Vacuum control — replace / check | 12- 4 |
| Spark plug connectors — replace | 12- 5 |
| Ignition coil — check | 12- 6 |
| Ignition coil — replace | 12- 6 |
| TCI control unit — remove and install | 12- 7 |
| Transistor ignition control unit connection plan | 12- 8 |
| Vacuum advance control — check | 12- 9 |
| Vacuum advance control — troubleshoot | 12- 10 |
| TCI — troubleshoot | 12- 20 |
| Alternator — troubleshoot | 12- 40 |
| Alternator and voltage regulator — check | 12- 41 |
| Alternator — remove and install | 12- 42 |
| Alternator drive belt — tighten | 12- 42 |
| Alternator — disassemble and assemble | 12- 43 |
| Ball bearing — replace | 12- 44 |
| Diode plate — replace | 12- 44 |
| Alternator components — inspect | 12- 45 |
| Carbon brushes — replace | 12- 46 |
| Voltage regulator — replace | 12- 46 |
| 12 31 ... | |
| 009 | |
| 020 | |
| 299 | |
| 513 | |
| 581 | |
| 691 | |
| ... | |
| 200 | |
| 12 32 000 | |

12 Engine Electrical Equipment

| | |
|---|------------|
| Models 325 / 325 e / 325 es / 325 i / M 3 | |
| Instructions for working on DME | 12 - 100 |
| Engine electric layout - 1984/1985 models | 12 - 101 |
| Engine electric layout - 1986 models | 12 - 102 |
| Connection plan - engine wire harness plug | 12 - 103 |
| Connection plan - diagnosis plug | 12 - 104 |
| Engine electric layout - 325 i | 12 - 105 |
| Engine electric layout - M 3 | 12 - 106 |
| Relay survey - M 20 | 12 - 107 |
| Connections - engine plug | 12 - 107/1 |
| Connections - engine plug | 12 - 107/2 |
| Connections - 55-pin plug | 12 - 107/3 |
| Holding circuit diagram | 12 - 107/4 |
| Engine electric and DME - troubleshooting | 12 - 108 |
| Engine electric/electronic quick test list | 12 - 108/1 |
| Digital motor electronics (DME) - troubleshooting | 12 - 110 |
| DME troubleshooting test procedures | 12 - 111 |
| Ignition coil | 12 - 112 |
| High tension distributor | 12 - 113 |
| DME control unit and power supply | 12 - 114 |
| Fuel supply | 12 - 114/1 |
| Exhaust system / catalytic converter | 12 - 115 |
| 12 00 | |
| 12 11 | |

12 Engine Electrical Equipment

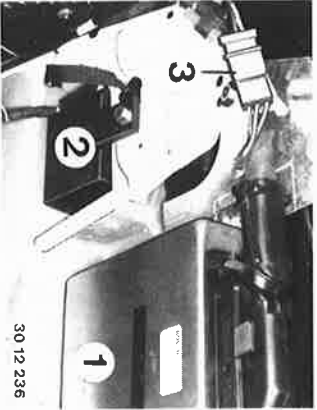
Models 325 / 325 e / 325 es / 325 i / M 3

| | |
|---|----------|
| 12 41 551 Carbon brushes – replace (starter removed and disassembled) | 12 - 155 |
| Diagnosis plug – connection plan | 12 - 160 |
| On-board diagnosis | 12 - 200 |

ENGINE ELECTRICAL LAYOUT

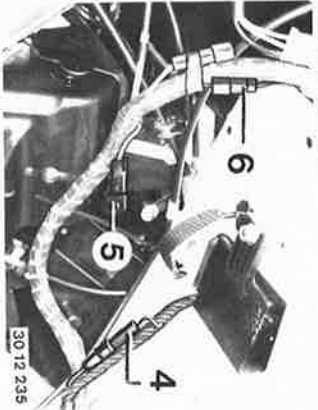
Model 318 :

- 1 Control unit - L-Jetronic (see Gr. 13)
- 2 Control unit - idle speed (see Gr. 13)
- 3 Plug - car electric system, fuel pump relay



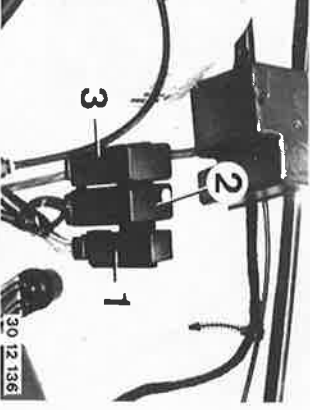
30 12 236

- 4 Plug (white) for transmission versions (wire colors: green/yellow — blue/yellow) — not used for automatics (lean mixture)
- 5 Plug (black) for air conditioner (wire colors: blue/white)
- 6 Plug (red) for control unit coding (wire colors: brown/violet)



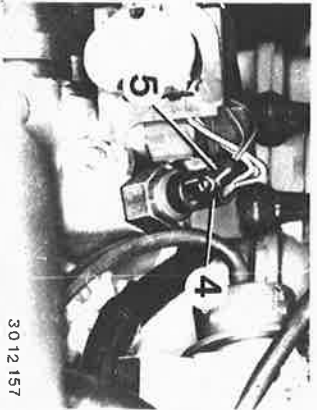
30 12 235

- 1 Relay for fuel injection, fuel pump, oxygen sensor heating
- 2 Relay for idle speed stabilization (see Group 13)
- 3 Relay for ignition switchover



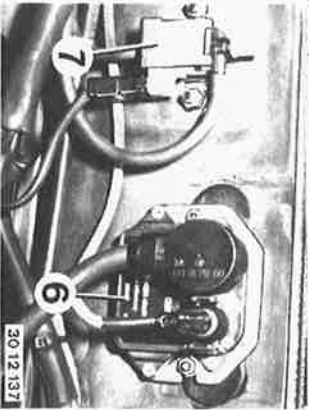
30 12 136

- 4 Temperature transmitter
- 5 Temperature switch for ignition switchover and idle speed control



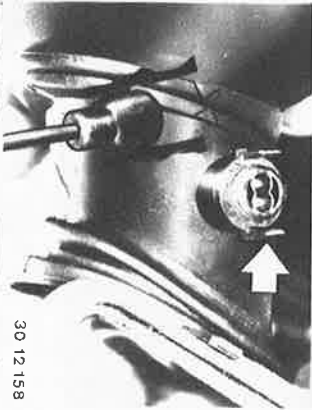
30 12 157

- 6 TCI-S control unit
- 7 Solenoid valve for ignition switchover



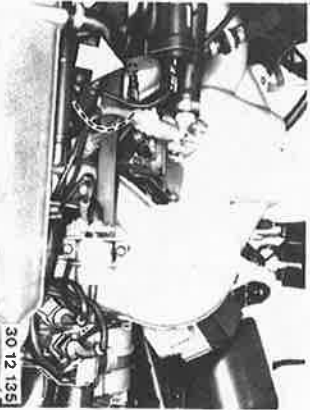
30 12 137

Air temperature sensor for ignition switchover



30 12 158

Ground point for engine electrics



30 12 135

12-2

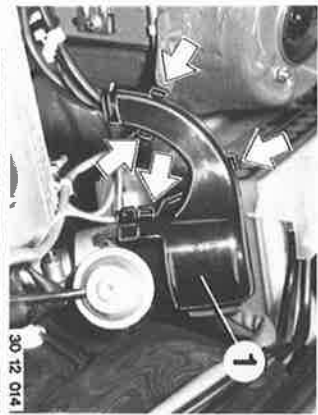
12 11 060 REMOVING AND INSTALLING DISTRIBUTOR

Turn crankshaft to TDC mark (ignition in cylinder no. 1) with a 30 mm wrench socket.



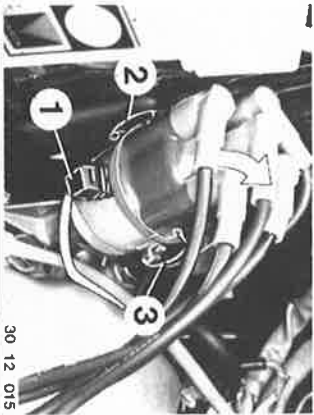
30 11 001

Take off cap (1).



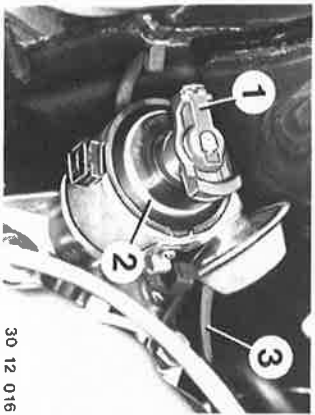
30 12 014

Pull off plug (1).
Lift off clamps (2 and 3).
Remove distributor cap.

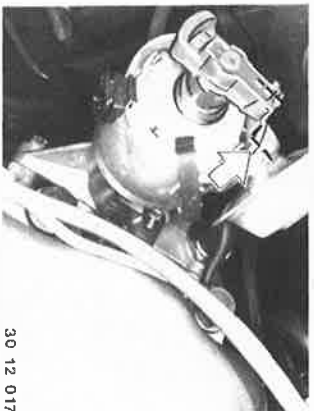


30 12 015

Remove distributor rotor (1) and dust cap (2).
Pull off vacuum hose (3).

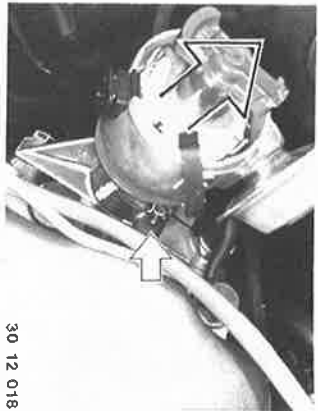


30 12 016



30 12 017

Check position of distributor rotor — it should point to notch on distributor.
Correct by turning crankshaft, if necessary.



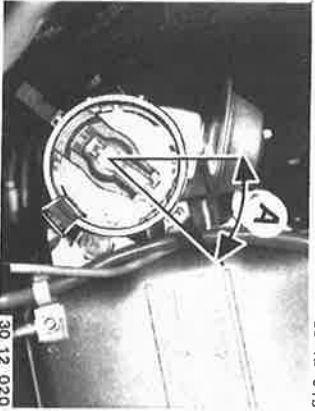
30 12 018

Loosen nut.
Pull out distributor.



30 12 019

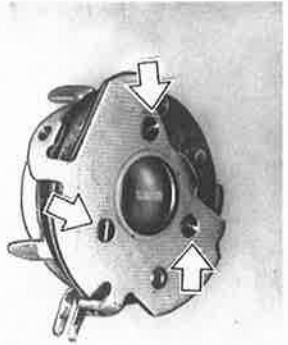
Installation:
Check seal (1), replacing if necessary.



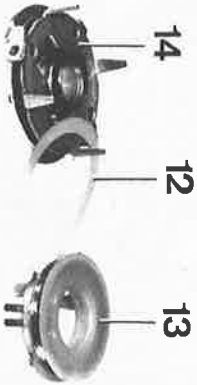
30 12 020

Installation:
Turn distributor rotor clockwise toward mark on housing approx. 30° (A).
Insert distributor.
Adjust ignition timing (see 12 11 005) after finishing installation.

12-4

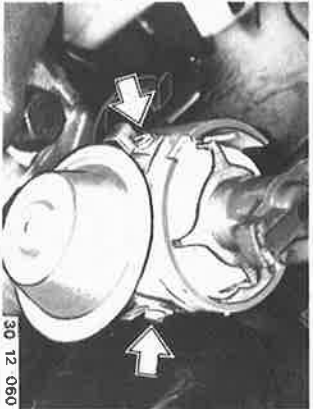


30 12 117



Arrangement:
 12 Insulator
 13 Pulse transmitter
 14 Carrier plate
 Adjust ignition timing (see 12 11 005) after finishing installation.

320 12 047



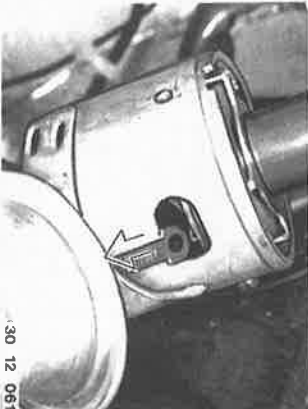
30 12 060

12 11 201 REPLACING VACUUM CONTROL

Take off protective cap and distributor cap. Unscrew and turn distributor for better accessibility.
 Unscrew vacuum control.

Disconnect pull rod from below.

Installation:
 Lubricate eye of pull rod with grease. Check that pivoting plate moves easily after connecting the pull rod.
 Complete installation and adjust ignition timing* — 12 11 005.



30 12 061

Checking:
 Connect BMW service test unit according to operating instructions and perform test step "08 Engine"***.



30 12 073

** Perform test step "06 Engine", if vacuum hose is connected on the intake air manifold.
 Note difference in ignition timing between disconnected and connected vacuum hose — 13 to 17° before TDC on crankshaft.



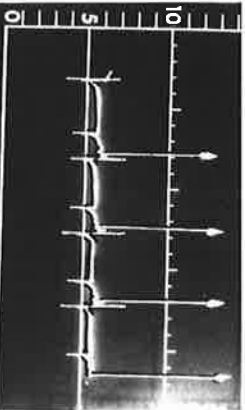
30 12 10C

* See Specifications

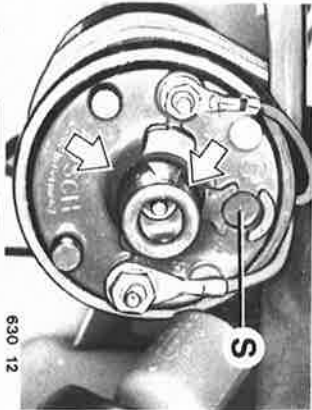
12-6

12 13 009 CHECKING IGNITION COIL

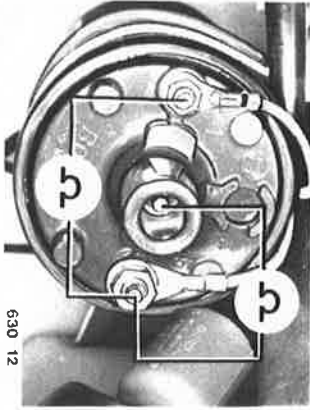
Connect BMW service test unit.
 Carry out engine test step 09.
 Observe oscillograph — ignition voltage and ignition voltage deviation must agree with nominal values**.



Multimeter Test (M 06):
 Measure resistance* of primary coil (term. 1/15) and secondary coil (term. 15/4).



630 12



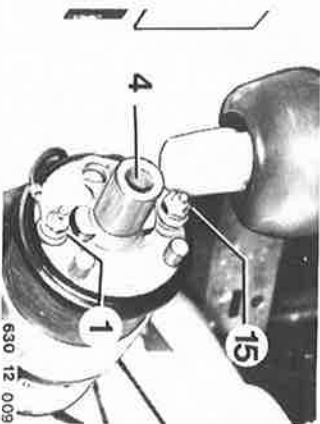
630 12

Check for hairline cracks and signs of burring.
 Check plug (S) for tight fit — if pressed out, replace ignition coil.

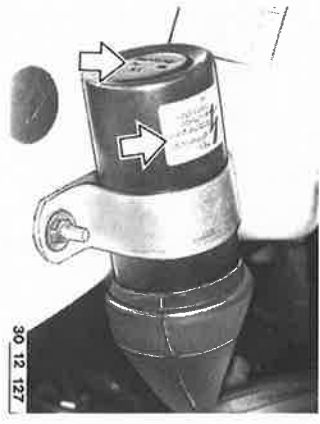
12 13 011 REPLACING IGNITION COIL

Caution!
 Always turn off ignition before working on the ignition system — dangerous high voltage!
 Refer to page 12 - 0 for instructions for working on ignition system.

Pull off protective cap and ignition lead (term. 4).
 Unscrew connections (term. 1 and 15).
 Unscrew holder and take off ignition coil.



630 12 009



30 12 127

Installation:
 Check new ignition coil for correct code number* and color label*.

* See Specifications
 ** See nominal value microfiche

* See Specifications

TRANSISTOR IGNITION CONTROL UNIT CONNECTION PLAN

TCI: Control Unit (Bosch):

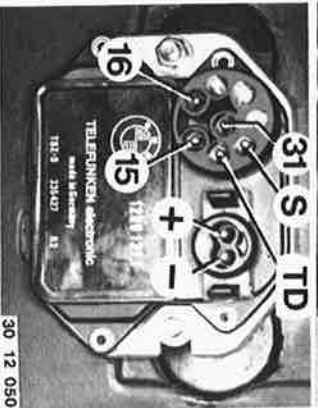
| No. | Terminal | Description |
|-----|----------|-------------------|
| 1 | 1 | To ignition coil |
| 2 | 31 | Ground |
| 3 | -- | Shielding |
| 4 | 15 | Power supply |
| 5/6 | A+/B- | Pulse transmitter |



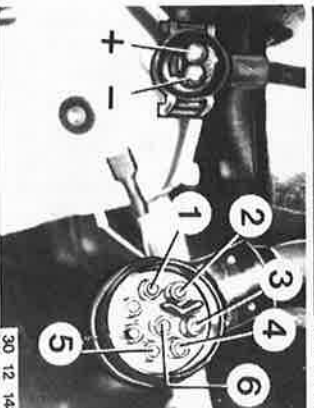
30 12 044

TCI: S Control Unit (Siemens/Telefunken):

| No. | Terminal | Description |
|-----|----------|------------------------------|
| 1 | -- | To ignition coil |
| 2 | 1/16 | Power supply |
| 3 | 15 | -- to fuel pump relay |
| 4 | TD | -- to L-jetronic contr. unit |
| 5 | -- | -- to tachometer |
| 6 | S | To starter term. 50 |
| | 31 | Ground |
| | +/- | Pulse transmitter |



30 12 050



30 12 148

12-10

TROUBLESHOOTING VACUUM ADVANCE CONTROL SYSTEM

If the coolant temperature switch is checked at a temperature below 45° C (113° F), pull off plug on idle control unit (in glove box above L-Jetronic control unit).

Connect vacuum advance control simulator 12 1 460. Run engine at idle speed.

* Lamp "tp" not flashing

- No tp signal.
- No power supply for simulator, L-Jetronic control unit, connections or wire harness defective.
- Engine not running correctly or at all.

* Lamp "MV" not on

- No power supply for simulator.
- Wire harness to simulator defective.
- Vacuum advance control relay defective.

* No advance control

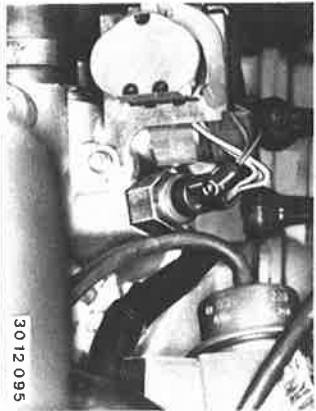
- Vacuum advance control relay defective.
- Connections or wire harness for solenoid defective.

* Ignition timing not reached when vacuum is supplied to advance control box.

- Solenoid defective.
- Vacuum hose leaks.
- Distributor defective.

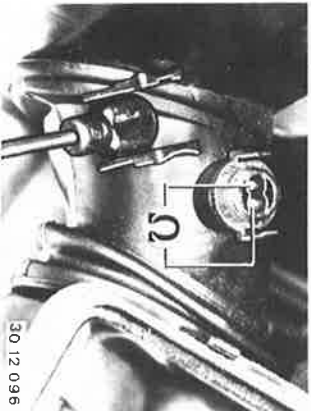


30 12 094



30 12 095

Check resistance* on intake air temperature switch. The switches should be connected during the check with control simulator.



30 12 096

* See Specifications

12-21

Test 2 - Voltage Supply for TCI Control Unit

Pull off plug on control unit and turn on ignition.

Check voltage (approx. 12 V) on connection terminals 15 and 31 (as shown in figures) of plug.

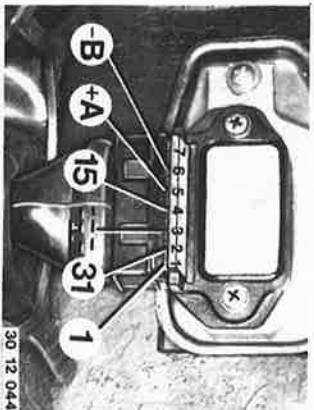
Not okay

Routing of terminal 15u wire*:

Ignition lock - plug connection on wire harness for car electric system - connector (soldered point) in wire harness - engine wire harness plug connection - connector (soldered point) in engine wire harness -

- TCI control unit

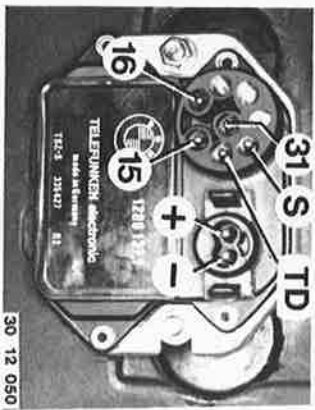
The ground wire is routed to the ground point on air collector (4th cylinder).



30 12 044

TClI Control Unit (Bosch):

| No. | Term. | Description |
|-----|--------|-------------------|
| 1 | 1 | To ignition coil |
| 2 | 31 | Ground |
| 3 | -- | Shielding |
| 4 | 15 | Power supply |
| 5/6 | A+/B-- | Pulse transmitter |

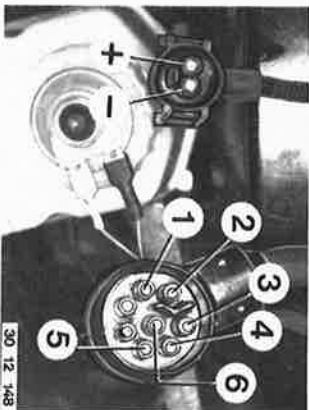


30 12 050

TClI-S Control Unit (Siemens/Telefunken):

(S = ignition timing retard while starting)

| No. | Term. | Description |
|-----|-------|----------------------|
| 1 | -- | To ignition coil |
| 2 | 1/16 | Power supply |
| 3 | 15 | Power supply |
| 4 | TD | - to fuel pump relay |
| 5 | S | - to tachometer |
| 6 | 31 | To starter term. 50 |
| | +/- | Ground |
| | | Pulse transmitter |



30 12 148

* See car or engine electric system wiring diagram.

Test 5 – DISTRIBUTOR CAP / ROTOR and IGNITION LEADS

Bend ignition leads in a tight radius and check for cracks and traces of burning. Check connection and tightness of plugs and connections. → not okay → Replace ignition leads and connections – see 12 12 072.

↓
Check distributor cap and distributor rotor for cracks and traces of burning. Measure resistance * in distributor rotor. → not okay → Replace distributor cap and / or rotor

Test 6 – SPARK PLUGS and CONNECTORS

Measure resistance * of shields and spark plug connectors. → not okay → Replace shielded and / or spark plug connectors – see 12 12 072.
Check for cracks and traces of burning.

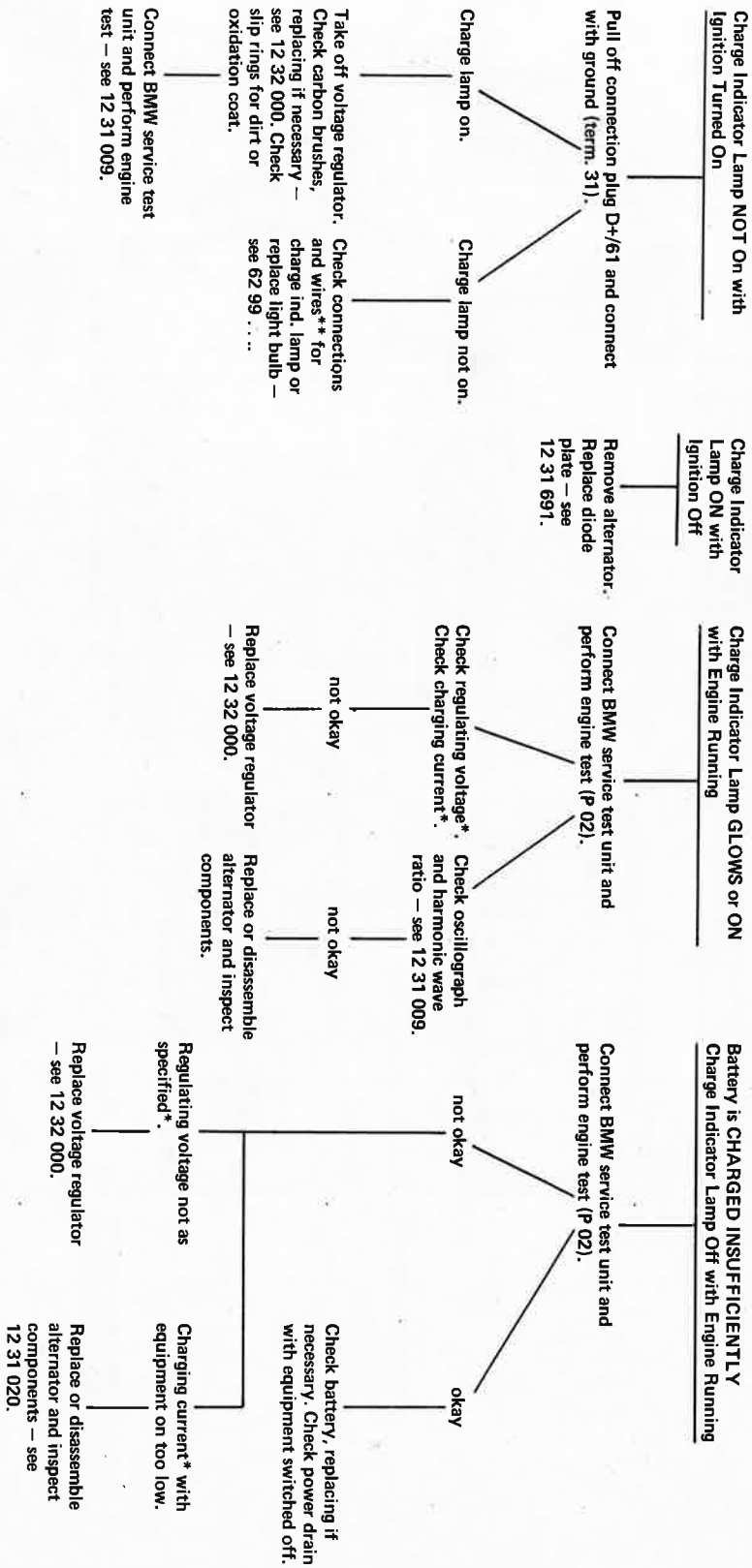
↓
Check spark plugs for electrode erosion and electrode gap *. → not okay → Replace spark plugs – only install specified types *.
Check insulator for traces of burning.

* See specifications

12 - 40

TROUBLESHOOTING ALTERNATOR

Test Requirements: — Correct connections on battery, starter and alternator.
 — Good ground connection between engine and body.
 — Tight drive belt.



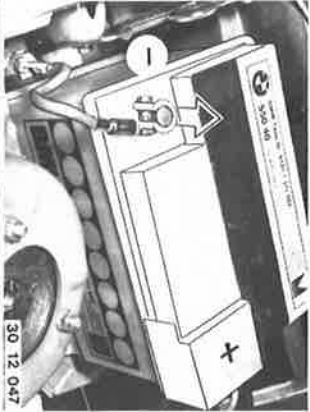
* See Nominal Value Microfilm
 ** See Wiring Diagram

12-42

12 31 020 REMOVING AND INSTALLING ALTERNATOR

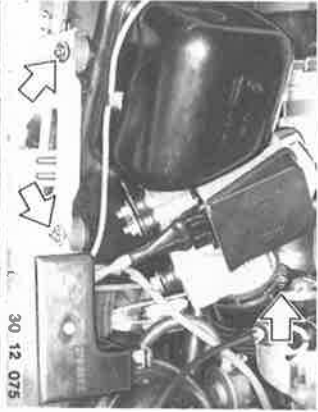
Disconnect battery.

Caution!
Disconnect wire between battery and alternator only when engine is stopped.



30 12 047

Remove air cleaner and air flow sensor.



30 12 075

Unscrew connections B + and D +.
Disconnect ground wire.



30 12 033

Unscrew mounting bolts.
Remove alternator.

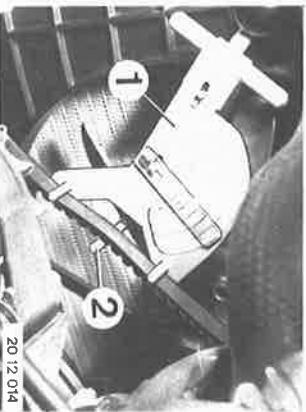


30 12 030

Installation:
Don't forget the ground wire (see arrow).
Tighten drive belt — 12 31 299.

12 31 299 CHECKING / TIGHTENING ALTERNATOR DRIVE BELT

Check drive belt tightness with Special Tool 11 5 020 (1), tightening if necessary.
This requires pulling hook (2) to be in center of teeth.
Indicator must be located in scale above the green or yellow field.



20 12 014

Tighten drive belt.
Unscrew nut (1) and turn tensioning wheel (3) with a torque of approx. 7 Nm (5 ft.lbs.)
Tighten nuts (1).
Recheck tightness with the tester, correcting if necessary.

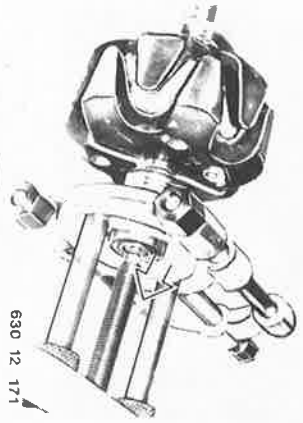


30 12 070

12-44

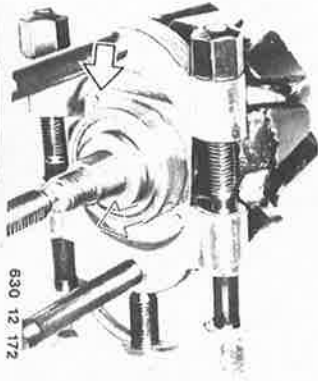
12 31 581 REPLACING BALL BEARING -- Alternator Removed and Disassembled --

Pull off bearing with Special Tool 00 7 500.



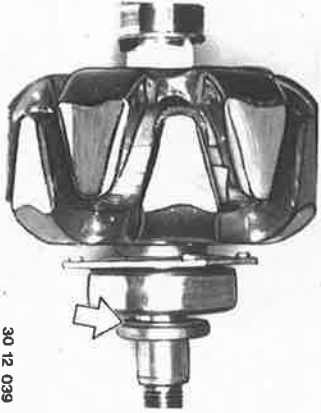
630 12 171

Installation:
Replace cover for bearing, if it had been damaged through application of special tool.



630 12 172

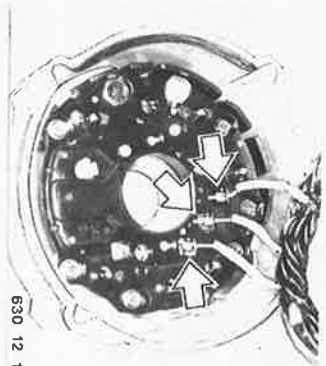
Installation:
Check installed position of washer -- collar faces bearing.



30 12 039

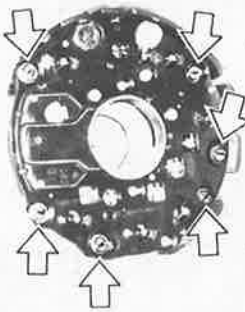
12 31 691 REPLACING DIODE PLATE -- Alternator Removed and Disassembled --

Unsolder stator coil on diode plate.
Caution!
Excessive heat from soldering iron would destroy the diodes.



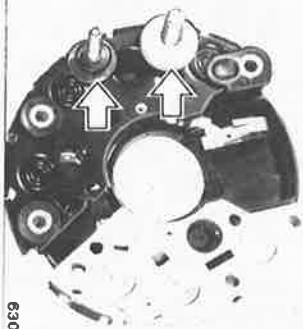
630 12 178

Unscrew bolts.
Remove diode plate.

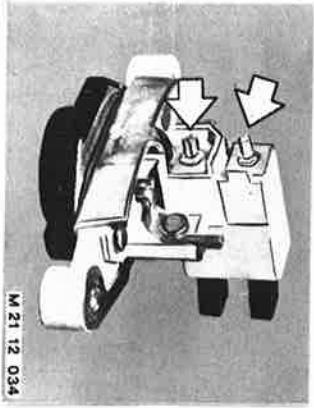


630 12 173

Installation:
Check condition of insulating sleeves and insulators.



630 12 179



M 21 12 034

12 31 200 REPLACING CARBON BRUSHES

Remove voltage regulator 12 32 000. Unsolder leads on carbon brush holder.

Note:
Only use a small amount of solder for soldering to prevent hardening of leads.



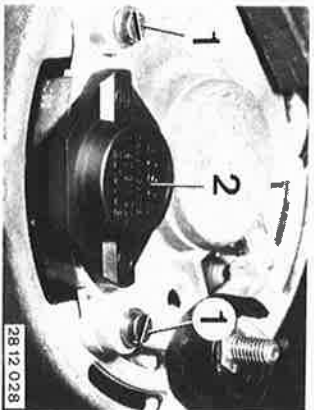
M 21 12 080

Installation:
Check slip rings for wear. If necessary, remove rotor and fine grind as well as polish the slip rings — part of Pos. 12 31 201.



630 12 036

Void excessive out of true. Max. slip ring out of true = 0.03 mm (0.0012").



28 12 028

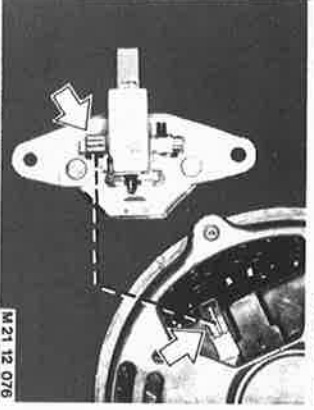
12 32 000 REMOVING AND INSTALLING/REPLACING VOLTAGE REGULATOR

Unscrew bolts (1) and take off regulator (2) carefully.



M 21 12 080

Check slip rings for wear, fine grinding if necessary.



M 21 12 076

Clean contact surfaces and check tension of spring contacts, correcting if necessary.



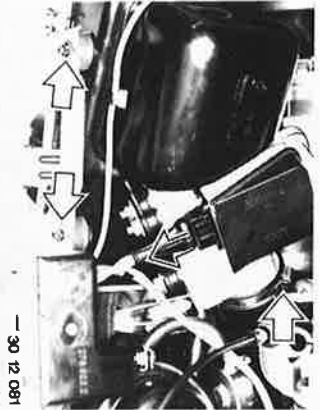
M 21 12 078

Installation:
Mount regulator at first with one bolt screwed in finger tight, then press alternator to final installed position carefully, install and tighten all bolts.

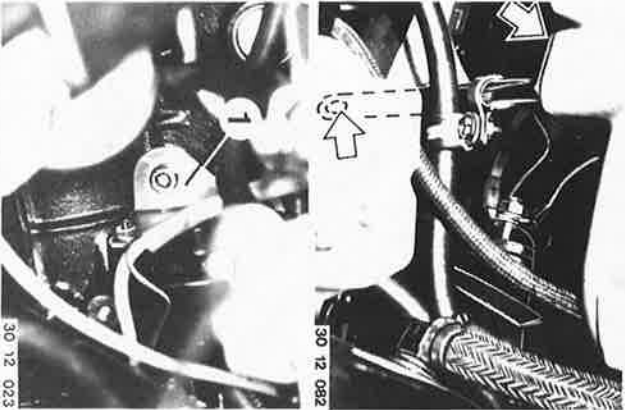
12-51

12 41 020 REMOVING AND INSTALLING STARTER

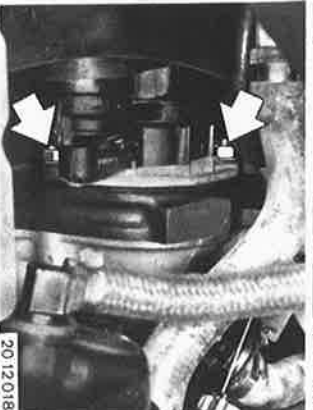
Disconnect battery ground lead.
Remove air cleaner with air flow sensor.



Unscrew bracket for air collector.



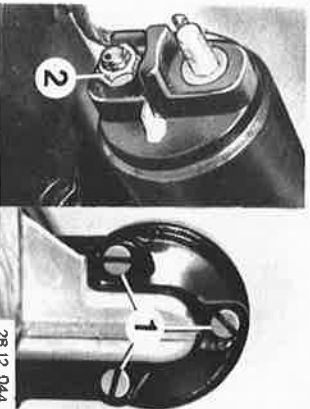
Unscrew holder.
Disconnect lines.



Drain coolant.
Disconnect heater hose, unscrewing coolant pipe if necessary.
Unscrew nuts and remove starter from above.
Installation:
Pour in coolant* and bleed cooling system 17 00 039.

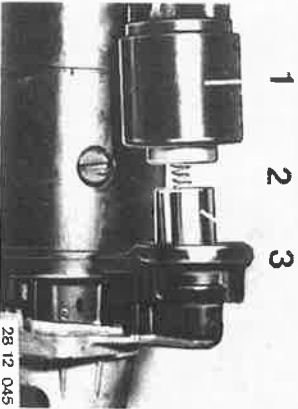
12 41 041 REPLACING SOLENOID SWITCH

Remove and install starter 12 41 020.
Unscrew bolt (1).
Unscrew nut (2).



Remove solenoid switch (1) with spring (2).
Disconnect and remove armature (3).

Installation:
Check armature (3) for wear (scoring, deep spots, etc.), replacing if necessary.
Lubricate with grease before installing.

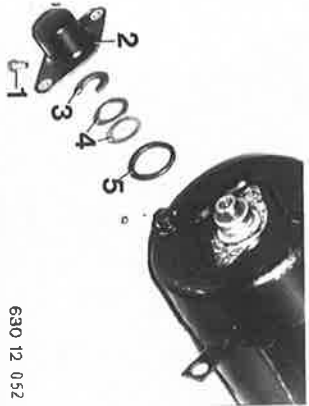


* See Service Information of Gr. 00

12-53

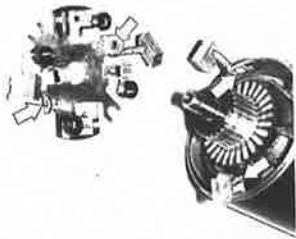
12 41 551 REPLACING CARBON BRUSHES — STARTER REMOVED —

- Unscrew mounting bolts (1).
- Remove dust cap (2).
- Remove lock washer (3), shims (4) and seal (5).
- Installation:*
- Take up axial play* with shims (4).



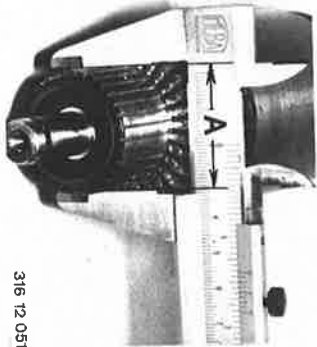
630 12 052

Remove holder and pole housing. Unsolder or cut off all carbon brushes. When soldering in new carbon brushes, make sure that copper leads are not hardened with flowing solder.



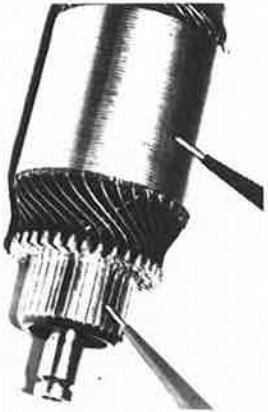
630 12 060

Check commutator for wear, fine grinding if necessary. Diameter must be at least 33.5 mm (1.319"). Machine insulation between plates approx. 0.5 to 0.7 mm (0.020 to 0.028") deep.



316 12 051

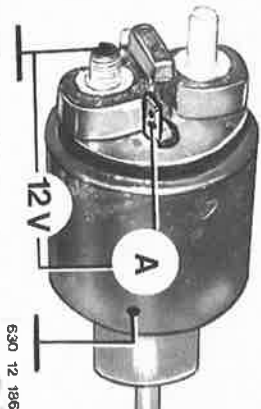
Check armature for shorted turns after repairing.



316 12 053

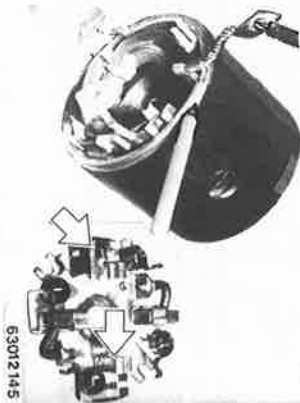
12 41 INSPECTING COMPONENTS OF STARTER — Electric Test —

Check power input* of engaging and holding coils in solenoid switch.



630 12 196

Check exciter coil, carbon brush holder and armature coil for ground contact. Check armature for shorted turns. Use a standard tester.



63012145



316 12 053

* See Specifications

12-101

ENGINE ELECTRIC LAYOUT

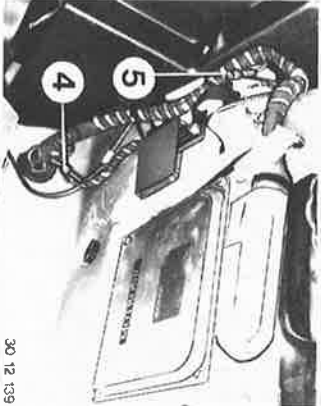
1984/1985 Models:

- 1 Control unit for DME (see Gr. 13)
- 2 Control unit for idle speed (see Gr. 13)
- 3 Plug for car electric system, fuel pump relay



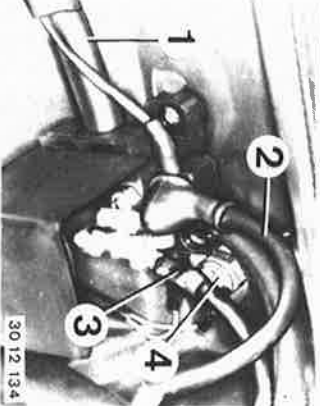
30 12 138

- 4 Plug — transmission versions
(wire colors: green/yellow — blue/brown)
— not used for automatics
(lean mixture)
- 5 Plug — air conditioner
— connected for manuals
(wire colors: blue/white)



30 12 139

- 1 Battery positive lead
- 2 To engine electric system
- 3 To car electric system
- 4 Switch 0° C (32° F) for idle speed control

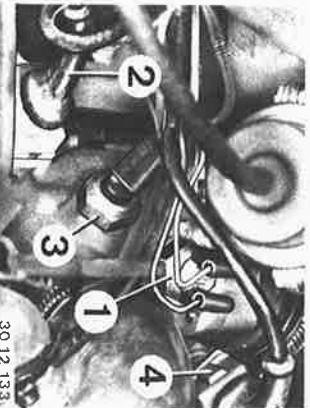


30 12 134

- Relay 1 for fuel pump
Relay 2 for DME
Relay 3 for oxygen sensor heating

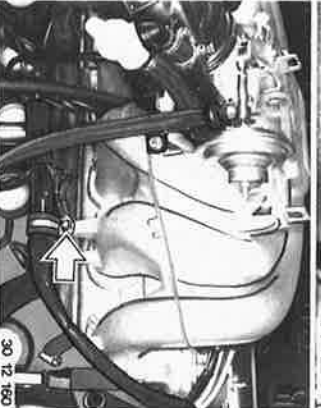


28 1.646



30 12 133

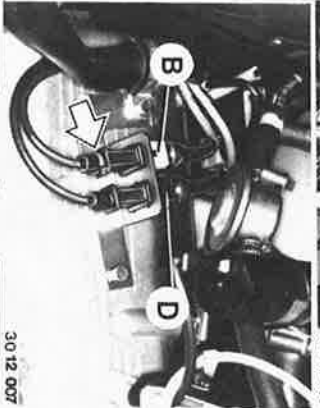
- 1 Temperature switch 45° C (113° F) for idle speed control
- 2 Coolant temperature sensor for DME
- 3 Temperature transmitter
- 4 Temperature time switch



30 12 160

Ground point for engine electric system

Plug for (gray) reference mark sensor (B) and speed sensor (D)



30 12 007

Pressure sensor (see Gr. 13)

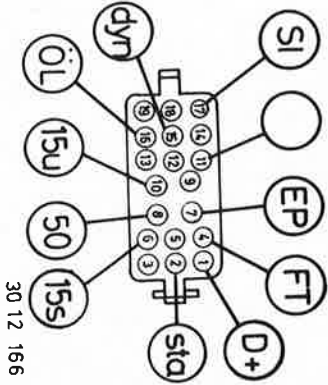
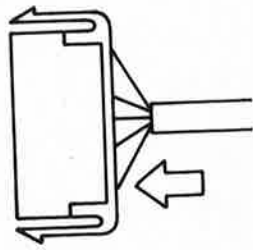


30 12 161

12-103

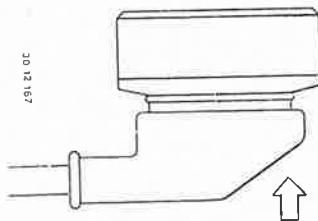
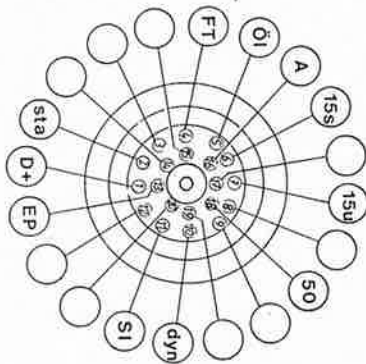
CONNECTION PLAN FOR ENGINE WIRE HARNESS PLUG

Until 1985 Models



| No. | Term. | Description |
|-----|-------|---|
| 1 | D+ | Alternator charge indicator |
| 2 | sta | Oil level static |
| 3 | - | - |
| 4 | FT | Coolant temperature transmitter |
| 5 | - | - |
| 6 | 15s | Power supply with ignition turned on - fuse protection |
| 7 | EP | Electric fuel pump |
| 8 | 50 | Power while starting |
| 9 | - | - |
| 10 | 15u | Power supply with ignition turned on - wire without fuse protection |
| 11 | - | - |
| 12 | - | - |
| 13 | - | - |
| 14 | - | - |
| 15 | dyn | Oil level dynamic |
| 16 | Ol | Oil pressure |
| 17 | SI | Service indicator reset |
| 18 | - | - |
| 19 | - | - |

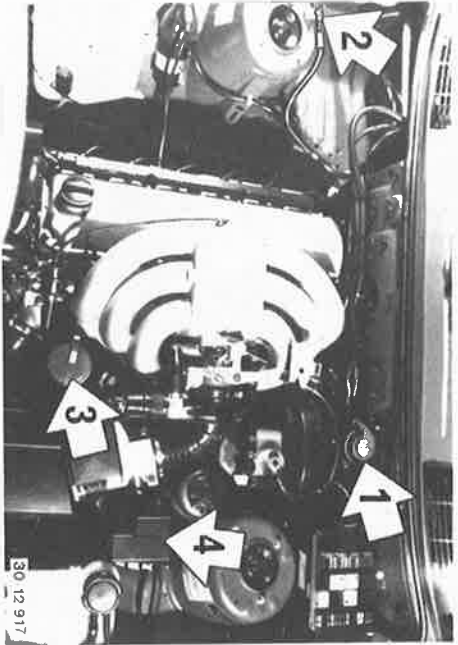
Since 1986 Models



| No. | Term. | Description |
|-----|-------|---|
| 1 | D+ | Alternator charge indicator |
| 2 | sta | Oil level static |
| 3 | - | - |
| 4 | FT | Coolant temperature transmitter |
| 5 | Ol | Oil pressure |
| 6 | 15s | Power with ignition turned on - fuse protection |
| 7 | 15u | Same as 6, but wire without fuse protection |
| 8 | - | - |
| 9 | - | - |
| 10 | dyn | Oil level dynamic |
| 11 | SI | Service indicator reset |
| 12 | - | - |
| 13 | EP | Electric fuel pump |
| 14 | - | - |
| 15 | - | - |
| 16 | A | Diagnosis lead for airbag |
| 17 | - | - |
| 18 | 50 | Power while starting |
| 19 | - | - |
| 20 | - | - |

12-105

Engine Electric Layout
M 20 (M 1.1) / 325 i



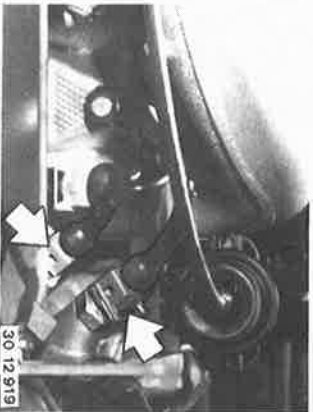
- Layout:
- 1 = Engine wire harness plug
 - 2 = Engine electric/electronic ground point
 - 3 = Diagnosis socket
 - 4 = Relay connection point



Inductive pulse sender

30 12 906

Coolant temperature sensor (DME) blue
Temperature gage



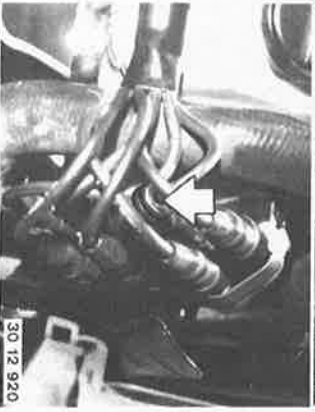
30 12 919

20-pin engine wire harness plug
Installation:
Screw-on cap engages in final position.



30 12 238

Cylinder identifying sender



30 12 920

Relay Survey:
1 = DME
2 = Electric fuel pumps
3 = Oxygen sensor



30 12 914

- Relay Survey:
M 20
1 Master relay
2 Fuel pump relay
3 Oxygen sensor relay



30 12 914

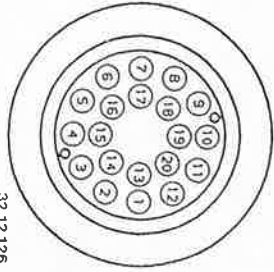


30 12 923

M 20
DME control unit (in glove box)

12-107/1

ENGINE PLUG CONNECTIONS (in Installed Position Seen From Above) M 20



32 12 126

| Pin No. | Description | Wire Colors |
|---------|---|----------------|
| 1 | D+ Generator charge indicator | blue |
| 2 | STAT Oil level static | green/yellow |
| 3 | TXD | |
| 4 | FT Coolant temperature gage | brown/violet |
| 5 | OELD Oil pressure | brown / green |
| 6 | 15 S Voltage with ignition on - fuse protection | green / white |
| 7 | 15 U Same as 6, but lead without fuse | green |
| 8 | T1 DME control unit/idle speed control | white / green |
| 9 | TD Speed signal | black |
| 10 | DYN Oil level dynamic | blue |
| 11 | SI Service indicator reset | white / green |
| 12 | CARB DME control unit/engine plug | green |
| 13 | EKP Electric fuel pump | green / violet |
| 14 | TACH Speedometer signal | black / white |
| 15 | P / N Starter / engine plug | black / green |
| 16 | Airb. Engine plug / diagnosis plug | white / black |
| 17 | | |
| 18 | | |
| 19 | 50 Voltage white starting | black / yellow |
| 20 | PGSP | |
| | FTM | brown |

55 PIN PLUG CONNECTIONS

| Pin Number | M = Ground A = Output E = Input | Connections for Control Unit M 1.1 |
|------------|---------------------------------------|--|
| 20 | A | Ignition term. 1 |
| 38 | E | Interface ASC (S - ASC / S - DWA) |
| 21 | A | Ignition ground |
| 39 | E | Programming voltage input |
| 22 | A | EKP relay and crankshaft reference |
| 40 | E | LLR (ZWD) "locking" |
| 23 | A | A/C compressor switch (S - KO) |
| 41 | A | LLR (ZWD) "unlocking" |
| 24 | M | Air cond. switch (S - AC) |
| 25 | A | Tank venting (AKF valve) |
| 42 | E | Ground for final stages |
| 26 | M | Driving range switch (S - FS) |
| 43 | E | ID (standard interface) |
| 27 | E | Signal LMM |
| 44 | E | Ground LMM |
| 28 | E | Air temperature TANS |
| 45 | E | Cylinder identification |
| 29 | E | Terminal 15 |
| 30 | M | Engine temperature TMOT |
| 46 | E | Oxygen sensor signal |
| 31 | (2) | Ground oxygen sensor |
| 47 | E | Speedometer signal from Instr. cluster |
| 32 | A | IIG connection positive |
| 48 | M | IIG connection B negative |
| 49 | E | Power supply LMM |
| 50 | A | Ground cylinder identification |
| 33 | M | Diagnosis wake lead (S - DIA, RxD) |
| 51 | E | Interface MSR (S - MSR) |
| 34 | A | Ground fuel injectors |
| 52 | A | Transmission tap (S - GE) |
| 35 | A | Fault lamp |
| 53 | E | Idle switch (S - LL) |
| 36 | A | Fuel injector group 2 (cyl. 1, 3, 5) |
| 37 | UB | Fuel injector group 1 (cyl. 2, 4, 6) |
| 19 | M | Full load switch (S - VL) |
| 18 | UB | Fuel injector group 2 (cyl. 1, 3, 5) |
| 17 | A | Fuel injector group 1 (cyl. 2, 4, 6) |
| 16 | A | DME relay (relay 2) |
| 15 | A | DME relay (relay 1) |
| 14 | E | Switch - clutch lockup (S - WK) |
| 13 | A | Perm. pos. (power supply (MOS - RAM)) |
| 12 | E | Battery voltage from DME relay |
| 11 | E | Serial diagnosis lead (TxD) |
| 10 | (2) | Ground electronics of control unit |

Explanations:
 S = Switch
 ASC = Autom. Stability Control
 DWA = Burglar alarm
 EKP = Electric fuel pump
 KW = Crankshaft
 LLR = Idle speed control
 ZWS = Double-coil control
 LMM = Air flow sensor
 HLM = Hot-wire air mass sensor
 IIG = Inductive pulse sender
 MSR = Engine drag torque control
 EV = Fuel injector

(1) I_{max} (0.2 A) / U_{max} (150 V)
 (2) Ground Input without potential

12-108

**TROUBLESHOOTING ENGINE ELECTRIC
AND DME**
Accomplished with BMW Diagnosis Test since
introduction of M 1.1.



Recognizable on increment wheel (1) for
single-sender Motronic.

12-110

SURVEY FOR TROUBLESHOOTING DIGITAL MOTOR ELECTRONICS

— See application information on next page. —

Testing Requirements:
 Engine in perfect running condition (timing, compression, oil carbon deposits, etc.).
 Starting system in perfect condition (battery voltage, starter, ignition lock, etc.).
 Correct fuel in tank (octane rating, leaded/unleaded, dirt, etc.).
 Connections, plugs and ground points according to wiring diagram.
 Refer to "Troubleshooting Fuel Injection" in Group 13 for other test positions.

| TEST POSITION | REFERENCE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---------------|--|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| 1 | Speed sensor/reference mark sensor | | | | | | | | | | | | | | | | | | | | |
| 2 | Ignition coil | | | | | | | | | | | | | | | | | | | | |
| 3 | Spark plugs | | | | | | | | | | | | | | | | | | | | |
| 4 | High voltage distributor | | | | | | | | | | | | | | | | | | | | |
| 5 | Ignition lead connectors and leads | | | | | | | | | | | | | | | | | | | | |
| 6 | DME control unit / Ignition timing | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | |
| 10 | Oxygen sensor/emission control and EGR | | | | | | | | | | | | | | | | | | | | |
| 11 | Active carbon filter/purge valve | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | |
| 13 | Tank vent system | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | | |
| 15 | Fuel supply | | | | | | | | | | | | | | | | | | | | |
| 16 | Intake system | | | | | | | | | | | | | | | | | | | | |
| 17 | Catalytic converter | | | | | | | | | | | | | | | | | | | | |
| 18 | Exhaust system | | | | | | | | | | | | | | | | | | | | |
| 19 | Crankcase vent/air hoses | | | | | | | | | | | | | | | | | | | | |
| 20 | Cooling system | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | | | |

- 1) Cold engine will not start (oil temp. $\leq 20^{\circ}\text{C} / 68^{\circ}\text{F}$)
- 2) Engine starts, but stops again
- 3) Cold engine hard to start (oil temp. $\leq 20^{\circ}\text{C} / 68^{\circ}\text{F}$)
- 4) Warm engine will not start
- 5) Warm engine hard to start
- 6) Erratic idling during warm-up phase
- 7) Idle speed not correct
- 8) Splashing in intake
- 9) Hesitation while accelerating
- 10) Knock when accelerating
- 11) Hesitation while coasting
- 12) Misfiring at constant speed
- 13) Poor acceleration/final output
- 14) Fuel consumption too high
- 15) CO/H/C not correct

12-112

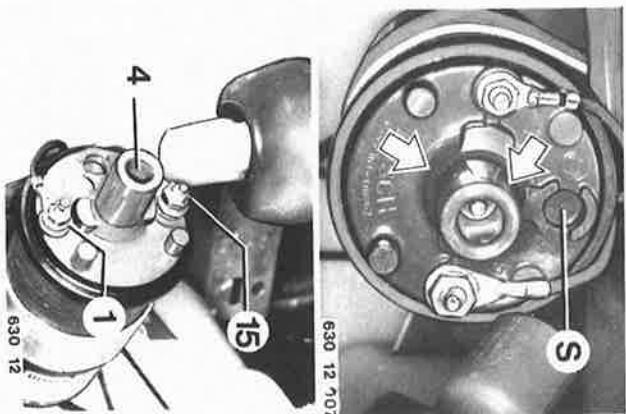
Test 2 – IGNITION COIL

Check wires for tight fit.

Check connection plate and ignition lead contacts for traces of burning, cracks and oxidation.

Check code number* of ignition coil – see 12 13 009.

Check resistance* (M 06) and inductivity* (M 07) of primary and secondary coils – see 12 13 009.



Test 3 – SPARK PLUGS

Check spark plugs for tight fit and leaks.

Check insulator for signs of leakage current.

Check spark plug type* and electrode gap*.
Check resistance*.

* See Specifications

12-112/3

| Testing Connections on Universal Adapter | Test | Corrective Measures |
|---|--|--|
| <p>Pin 1 (term. 1) / ground Ignition final stage</p> | <p>Crank engine with starting motor and check signal with an oscilloscope. Other Tests: Power supply for ignition coil Ignition coil Distributor and leads Spark plugs</p> | <p>Replace DME control unit, if tests up to this point are okay.</p> |
| <p>Pins 17 / 14 Final stage of fuel injectors for cyl. 2-4-6 (M 20)</p> | <p>Check signal with an oscilloscope. Other Tests: Plug connections and leads for fuel injectors Fuel injectors</p> | <p>Replace DME control unit, if tests up to this point are okay.</p> |
| <p>Pins 16 / 14 Final stage of fuel injectors for cyl. 1-3-5 (M 20)</p> | <p>Check signal with an oscilloscope. Other Tests: Plug connections and leads for fuel injectors Fuel injectors</p> | |

12-114

Test 6 - DME CONTROL UNIT AND POWER SUPPLY

Check code number* and manufacturing date* of DME control unit - see Group 13.

Check power supply**:

Pull off plug on control unit and connect universal adapter*** (see illustration) with (35-pin) test lead.

Car wire harness plugs remain connected.

Turn on ignition.

Check voltage of pins**, e.g. on connections 17 (-) and 35 (+).

If test results indicate the necessity to replace the control unit, first make the periphery test with an universal adapter***.

Pull off relay 2 and bridge terminals 87 and 30 with a piece of wire.

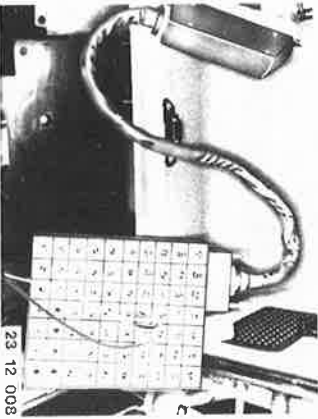
This supplies power to the control unit.

Check activation** for relay 2:

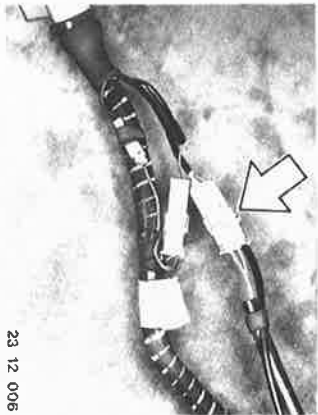
Turn on ignition.

Terminals 85 (-) and 86 (+) should have voltage (approx. 12 V).

If necessary, check ground point and plug connection (near DME control unit) - see figure.



Test 6a - IGNITION TIMING



Check ignition timing¹⁾ (p 06).

no

Replace DME control unit.

* See Specifications

** See engine wiring diagram

*** Source: HWR (= Division of BMW)

1) See nominal value microfiche

Test 17/18 - EXHAUST SYSTEM / CATALYTIC CONVERTER

Check exhaust system and catalytic converter for damage, tight fit and leaks.

Test 19 - CRANKCASE VENT

Check hoses for crankcase vent and oil dipstick for tight fit and leaks.

Test 20 - COOLING SYSTEM

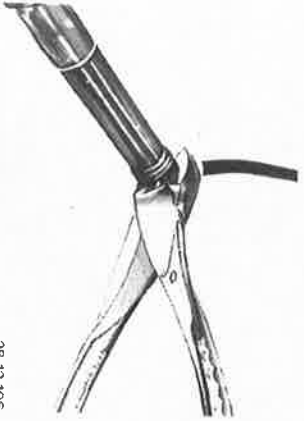
Check coolant level and concentration**.
If necessary, fill and bleed cooling system - see Group 17.

** See Service Information of Gr. 00

12-132/2

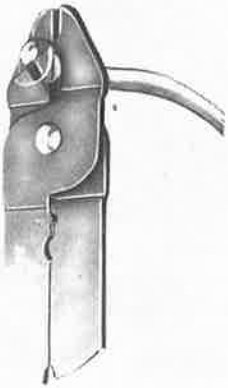
12 12 072 REPLACING ONE SPARK PLUG CONNECTOR

Non-disconnectable version — 30 KV System:
Cut off ignition lead as shown.



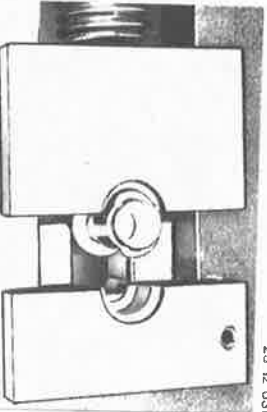
28 12 106

Strip end of ignition lead by 6 mm with a stripping pliers (1.5 mm wire cross section size).



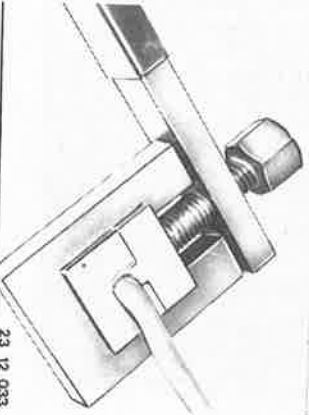
23 12 031

Place connector on ignition lead and insert in Special Tool 12 1 091 as shown.
Move clamping jaws together by turning screw against stop.



23 12 032

After squeezing, release jaws and take out the ignition lead.
Perform tear-out test by hand (tearing-out force: ≥ 200 N / 44 lbs.).



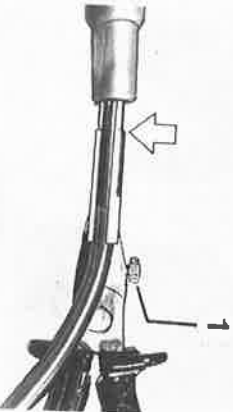
23 12 033

Spray a thin coat of lubricant 12 1 098 on guiding sleeve of Special Tool 12 1 092.



23 12 034

Unscrew screw (1).
Slide in ignition lead against stop (see picture), follow with pliers and slide in ignition lead further until connector is heard to engage.



28 12 109

Tighten screw (1) enough, that the pliers can be pulled back.

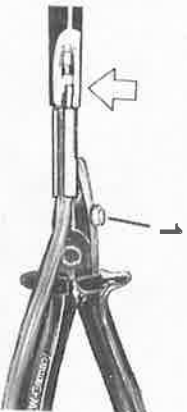
Caution!

Opening the pliers too much could cause the plug receptacle to break.

The plug receptacle is shown cut open for better illustration.

Note:

The required special tools 12 1 091/092/098 are also available as a complete set 12 1 090.

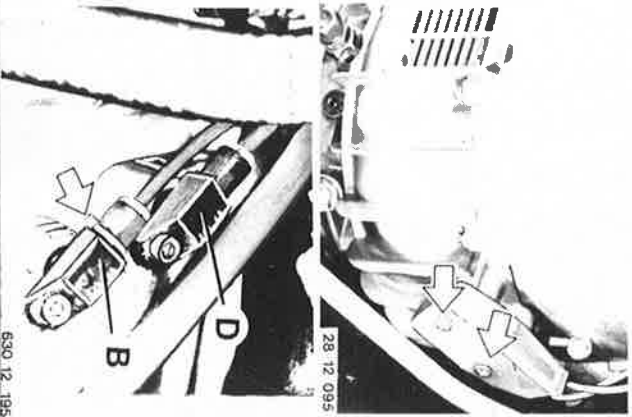


28 12 110

12-134

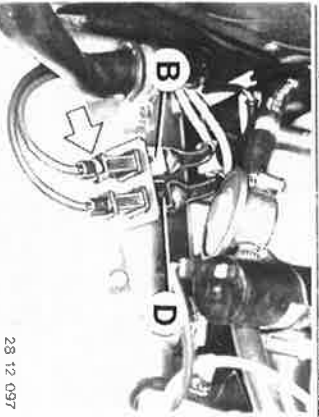
12 14 510 / REPLACING/CHECKING SPEED SENSORS (D) AND REFERENCE MARK SENSORS (B)

UnscREW shield.



UnscREW screws of speed and reference mark sensors (D and B) and pull out sensors.

Installation:
Mark new reference mark sensor (B) with a piece of tape.

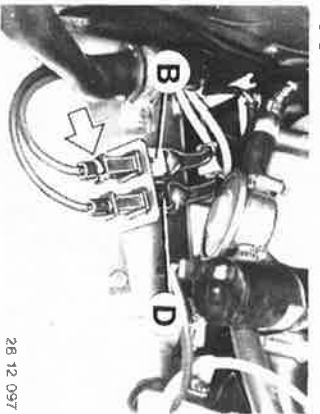
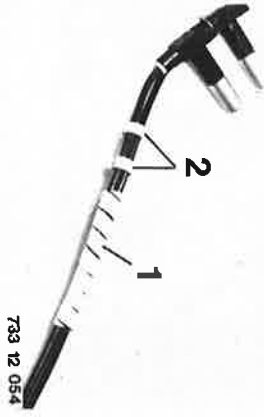


Pull off plugs on speed sensor (D) and reference mark sensor (B).

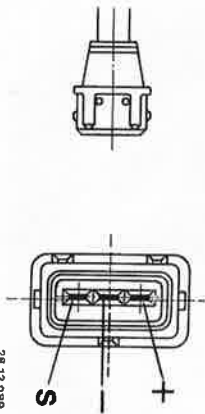
Press plug of sensor lead out of holder.
Installation:
Plug marked with tape belongs to gray plug.

Pull off protective sleeve (1).

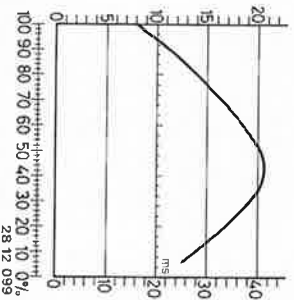
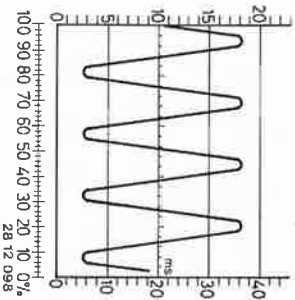
Lift out clip (2).
Installation:
Coat seals with Molykote paste.
Keep grease and dirt off of face surface on sensors.



Measure resistance* of sensor coil (M 06) on + and - of plug.



Connect oscilloscope (M 22/23) on + and - connections of speed sensor.
Turn engine with the starter.
Signal shown in the figure should be displayed.
Only the shape is important when evaluating the signal - not the amplitude height.



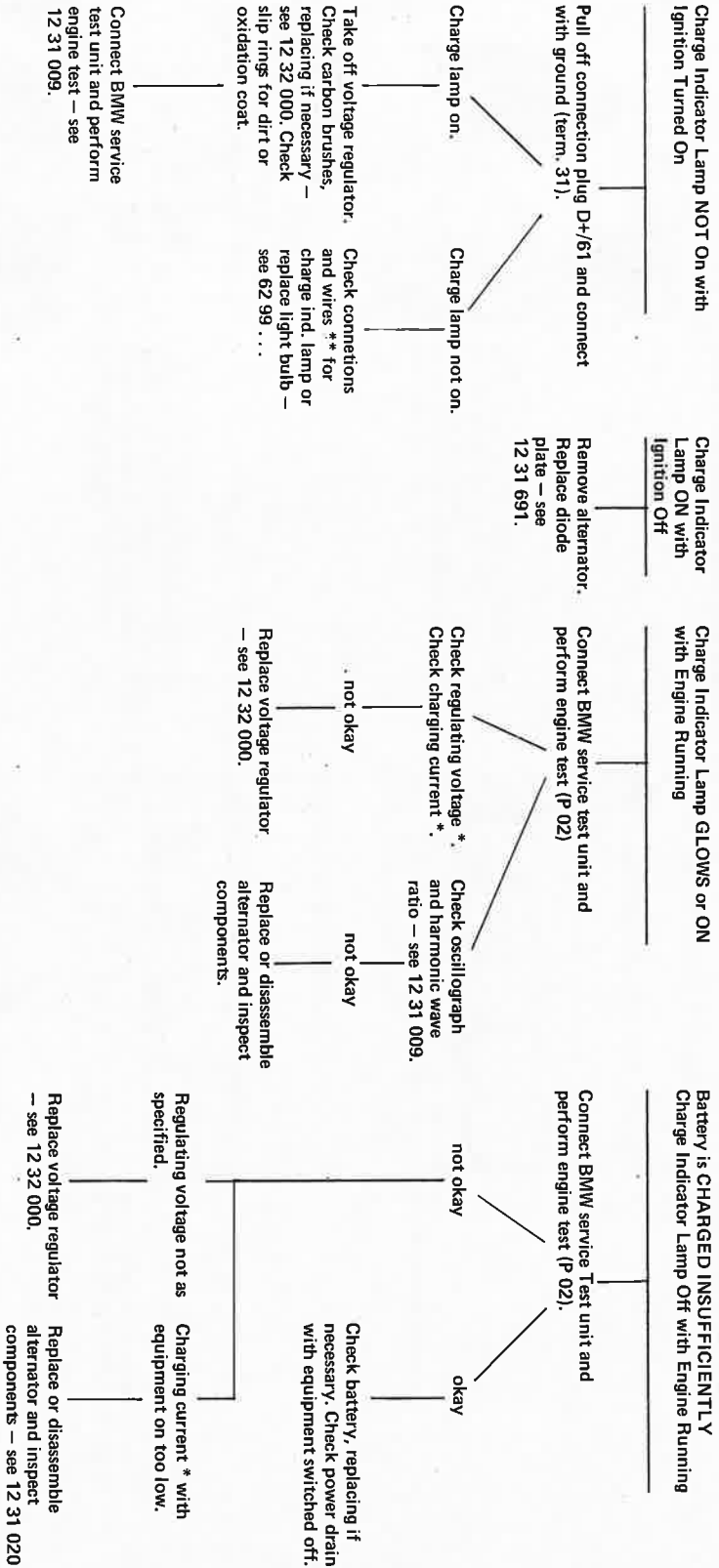
Check reference mark sensor in same manner.
If oscillograph deviates, remove sensor and check for dirt (grease, burrs, dust), cleaning if necessary.
Check reference mark, replacing pin for flywheel if necessary.

* See Specifications

12 - 140

TROUBLESHOOTING ALTERNATOR

Test Requirements:
 — Correct connections on battery, starter and alternator.
 — Good ground connection between engine and body.
 — Tight drive belt.



* See nominal value microfiche
 ** See wiring diagram

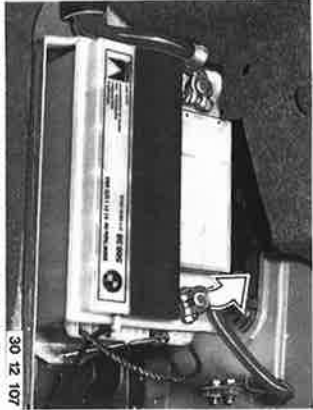
12 - 142

12 31 020 REMOVING AND INSTALLING ALTERNATOR

Unscrew negative terminal on battery (in trunk).

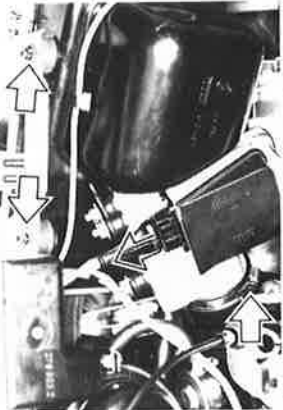
Caution!

Only disconnect leads on battery, alternator and starter when engine is stopped. Also disconnect positive and negative leads when charging battery with a charger.



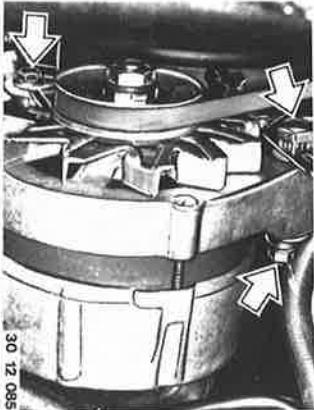
30 12 107

Take off air cleaner with air flow sensor.



30 12 081

Unscrew mounting bolts.

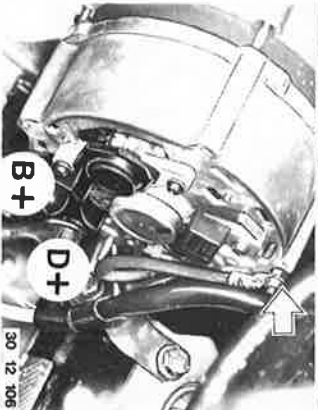


30 12 085

Unscrew leads.
Remove alternator.

Installation:

Tighten drive belt — 12 31 299.
If alternator was replaced, check and, if necessary, discharge gas tank — see Group 61, Pos. 61 21 015.

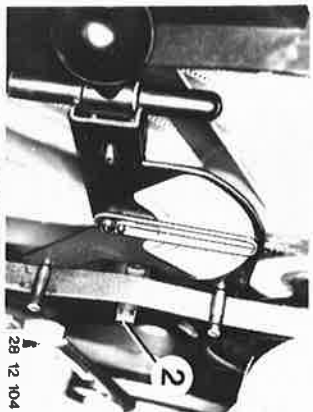


30 12 106

12 31 299 CHECKING/TIGHTENING ALTERNATOR DRIVE BELT

Check tightness of drive belt with tester 11 5 020, adjusting if necessary.

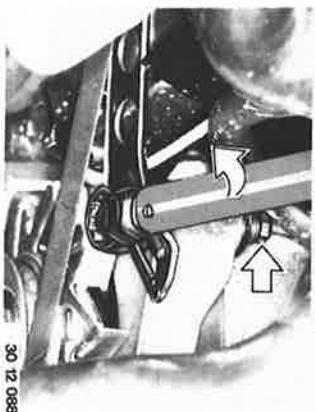
Pulling hook (2) must rest on center of tooth. The tester needle must be in the scale above green or yellow section.



28 12 104

Tightening Drive Belt:

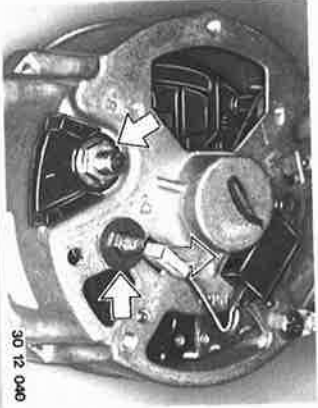
Unscrew nut and turn tensioning wheel with a torque of approx. 7 Nm (5 ft. lbs.).
Tighten nut.
Recheck tightness with tester, correcting if necessary.



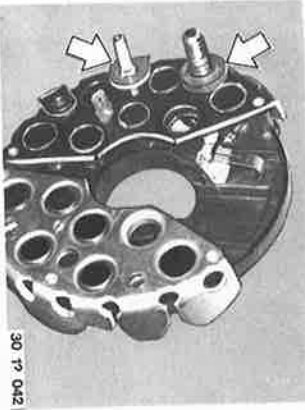
30 12 088

12/142/2

UnscREW shielded capacitor.
UnscREW nuts on B+ and D+ studs.
Take off diode plate with stator coil.



Installation:
Check condition of insulating sleeves and washers, replacing if necessary.



12-143

12 31 ... CHECKING BOSCH ALTERNA-

TOR IN ELECTRIC TEST

— Alternator Disassembled —



M 21 12 083

Check with a BMW Service Tester.

Rotor Coil Break and Shorted Turn Test:

Hold test leads for resistance tests on slip rings.

Alternator

80 A = 2.8 ohms \pm 10 %

65 A = 3.4 ohms \pm 10 %

90 A = 2.9 ohms \pm 10 %

115 A = 2.65 ohms \pm 10 %

140 A = 2.65 ohms \pm 10 %

Rotor Coil Ground Contact Test:

Hold test leads for resistance tests on slip ring and rotor shaft.

Nominal value: ∞ display 999 k-ohms.

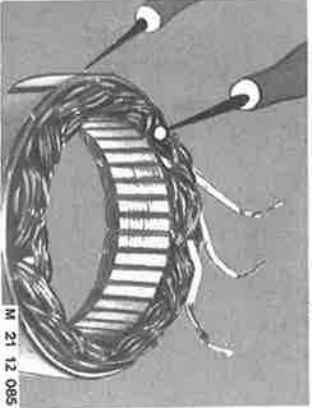


M 21 12 084

Stator Coil Ground Contact Test:

Hold test leads for resistance tests on soldering point and stator (coil carrier).

Nominal value: ∞ equal to display of 999 k-ohms.

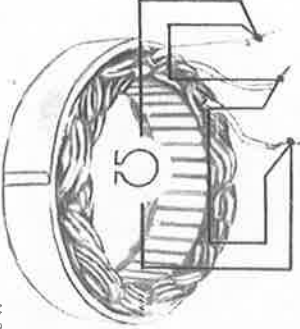


M 21 12 085

Stator Coil Break Test:

Compare resistance values of leads 1/2, 1/3 and 2/3 with an ohmmeter — they should be the same.

Checking for shorted turns can be performed with a standard tester.



M 21 12 086



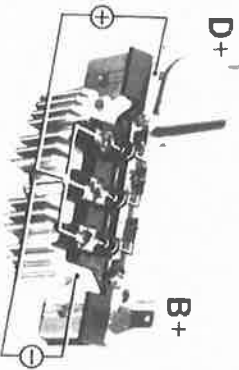
630 12 177

Checking Negative Diodes:

Connect test leads for diode test.

Hold negative lead on cooler and positive lead on one of the negative diode connections.

Display with good diodes: “—” polarity.

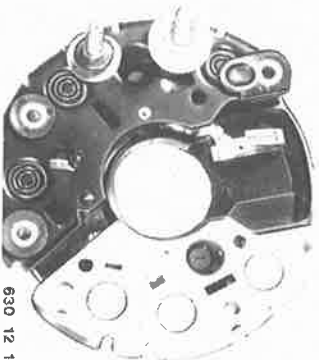


30 12 199

Checking Positive Diodes:

Hold negative lead on B+ stud and positive lead on one of the positive diode connections.

Display with good diodes: “+” polarity.



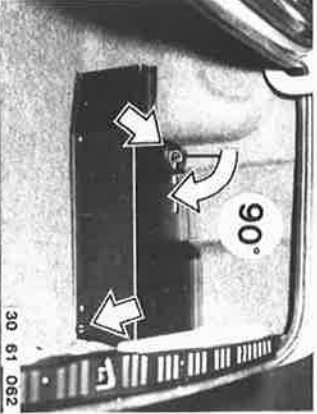
630 12 176

Replace entire diode plate in case of a faulty diode — see 12 31 691.

12-143/2

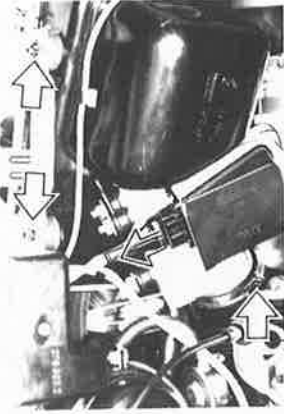
12 32 000 REMOVING AND INSTALLING OR REPLACING VOLTAGE REGULATOR

Unscrew negative terminal on battery (in trunk).



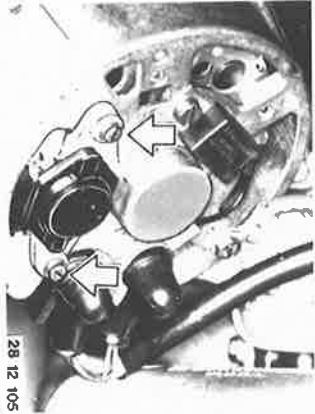
30 61 062

Take off air cleaner with air flow sensor.



— 30 12 061

Unscrew bolts and take off voltage regulator carefully.



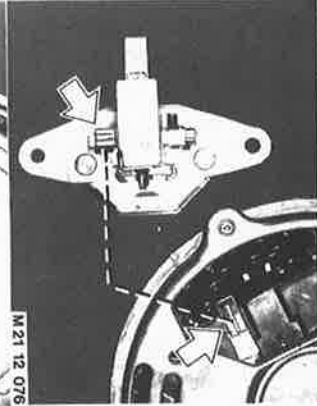
28 12 105

Check slip rings for wear, fine grinding if necessary.



M 21 12 080

Clean contact surfaces and check tension of spring contacts, correcting if necessary.



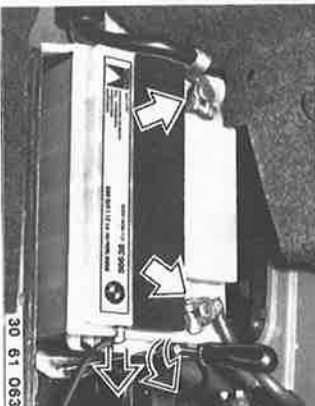
M 21 12 076

Installation:
Mount regulator at first with one bolt screwed on finger tight, then press alternator to final installed position carefully, install and tighten all bolts.

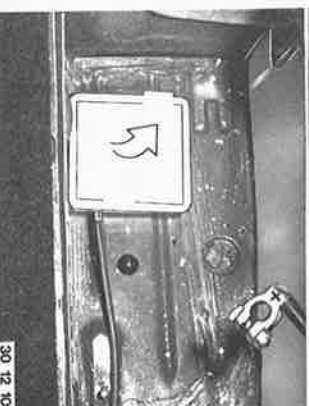


M 21 12 078

Remove battery.
Check gas discharging tank for battery, discharging if necessary — see 61 21 015.



30 61 063



30 12 103

12 - 151

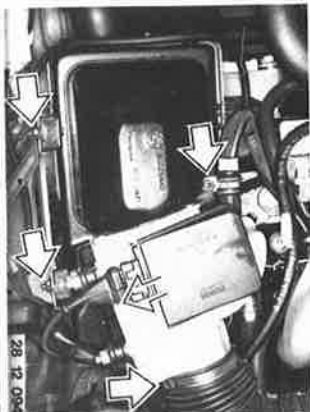
12 41 020 REMOVING AND INSTALLING STARTER

Disconnect positive terminal on connector.



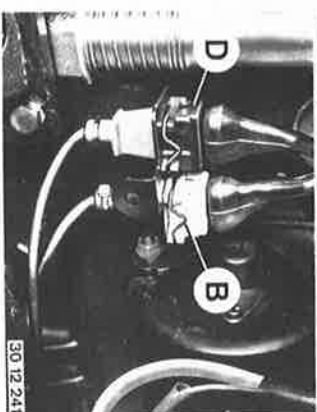
30 12 094

Take off air cleaner with air flow sensor.
M 3:
Remove intake manifold and air cleaner — see 11 61 050.



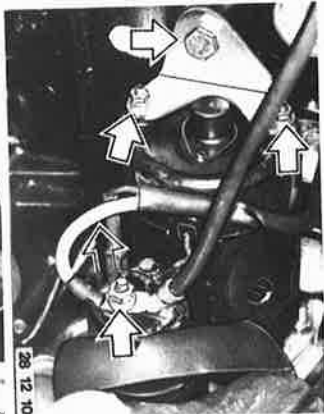
28 12 094

Since 1986 Models:
Disconnect plugs for reference mark sensor B (gray) and speed sensor D.



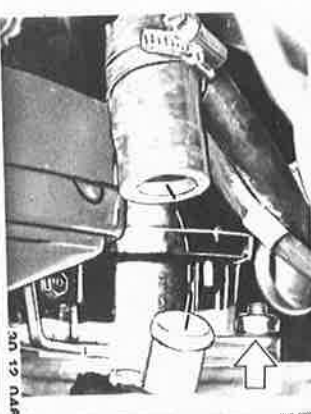
30 12 241

Unscrew support and lines.



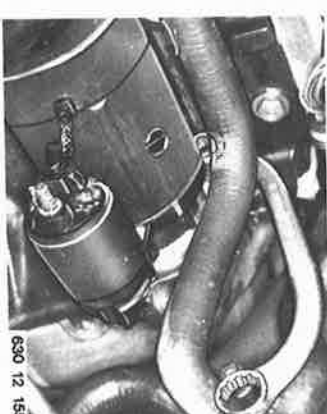
28 12 101

Drain coolant.
Disconnect heater hoses.
Unscrew starter mounting nuts.
Bottom nut could also be unscrewed from below for better accessibility.
Installation:
Pour in coolant*.
Bleed cooling system — see 17 00 039.



28 12 044

Unscrew nuts with a starter wrench**.



630 12 155

* See Service Information of Group 00
** Source of Supply: HWB

12 41 513 DISASSEMBLING AND ASSEMBLING STARTER
— Starter Removed —

Remove solenoid — see 12 41 041.

Unscrew dust cap (2).

Take off retainer (3), shims (4) and seal (5).

Installation:

Check axial play* of armature, correcting with shims if necessary.



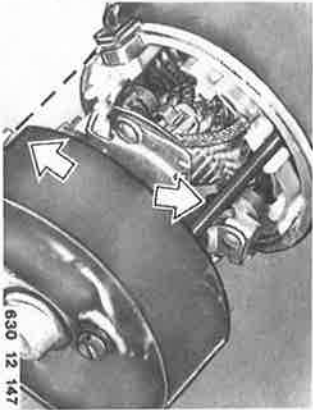
630 12 052

Unscrew housing bolts and take off cover.

Installation:

Align openings for housing bolts and insulator to each other.

Check bearing sleeve, lubricating with oil before installing.

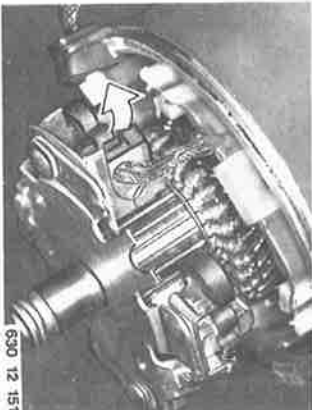


630 12 147

Lift springs and pull out carbon brushes. Remove holder.

Installation:

Check carbon brushes and commutator for wear, repairing if necessary — see 12 41 551.



630 12 151

Remove pole housing. Unscrew engaging lever bolt and remove rubber seal.



630 12 174

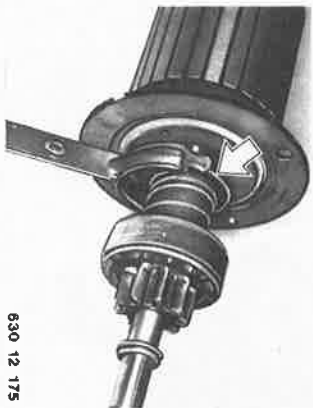
* See Specifications

Lift out armature with drive pinion and engaging fork.

Installation:

Lubricate guide for engaging fork with grease.

Check bearing sleeve in drive bearing bracket, lubricating with oil prior to installation.



630 12 175

Push back bearing race (1) with a piece of suitable pipe.

Pry circlip (2) apart and pull it off of the shaft.

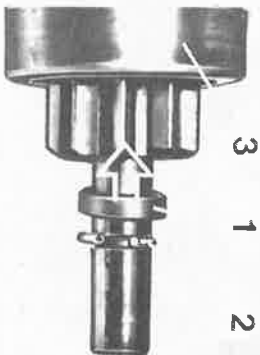
Remove burrs with a file.

Take off drive pinion (3).

Installation:

Use a new circlip (2).

Lubricate bearing surface for drive pinion with grease**.

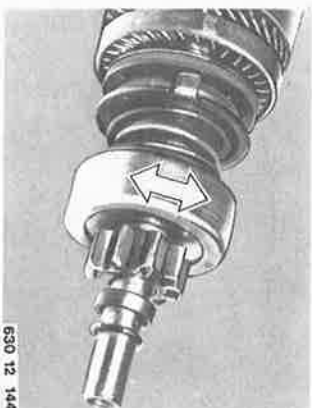


29 12 049

Installation:

Check pinion for wear (on teeth, bearings, one-way clutch), replacing if necessary.

Check sleeve in intermediate bearing, replacing if necessary.



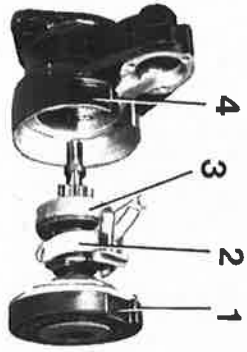
630 12 144



630 12 187

** Source of Supply: HWB

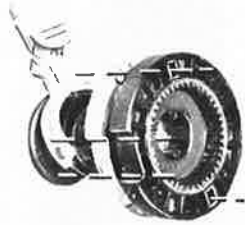
12-154/1



M 21 12 054

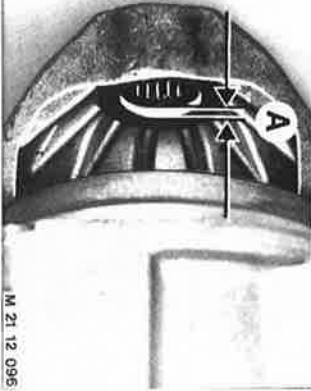
Pull out gearbox unit.
 Take off toothed ring on planet gearbox and release.
 1 Planet gearbox
 2 Release
 3 Pinion
 4 Gearbox case

Installation:
 Openings and bores must be aligned.



M 21 12 057

Check bearing, driving it out with a suitable mandrel if necessary.
Installation:
 Lubricate new bearing with grease and press in. Distance A = approx. 1 mm (0.039").

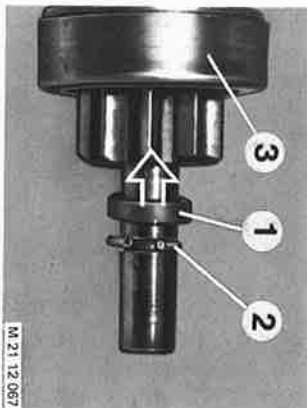


M 21 12 096

Turn drive pinion against stop.
 Pinion will be very easy to turn, if the one-way clutch is worn.
 Check bearing sleeve and teeth of pinion for wear.



M 21 12 087



M 21 12 067

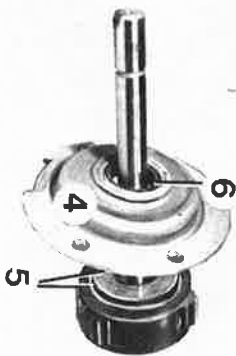
Knock back thrust ring (1).
 Pull off retainer (2) forward.
 Remove burrs if applicable.
 Then take off drive pinion.
Installation:
 Clean bearing surface for pinion thoroughly and lubricate with grease.



M 21 12 059

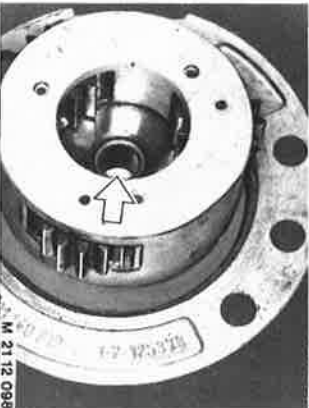
Pull off retainer (1) and take off washers.
 2 Metal washer
 3 Plastic washer

Take off bearing cover (4) and take off washers (5).
 Check bearing sleeve (6), replacing if necessary.
Installation:
 Lubricate sleeve with oil after pressing in.



M 21 12 060

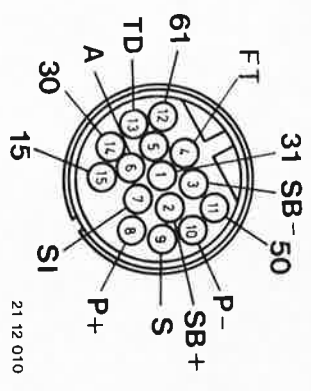
Check bearing sleeve, removing with a suitable puller if necessary.
 Check planet gears for wear.
Installation:
 Lubricate sleeve with oil after pressing in.



M 21 12 098

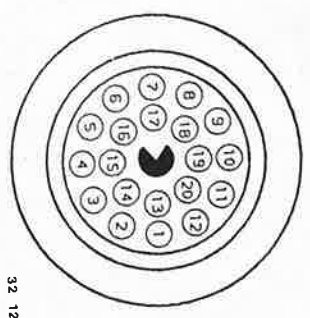
12-160

DIAGNOSIS PLUG CONNECTIONS



| No. | Terminal Designation |
|-----|---|
| 1 | 31 Ground |
| 2 | - |
| 3 | - |
| 4 | FT Temperature gage |
| 5 | L - Engine M 10 B 18 Integrator output for CO adjustments |
| 6 | A - Engine M 30 B 34 Oxygen sensor signal |
| 7 | SI Diagnosis lead for SRS |
| 8 | P+ Service indicator |
| 9 | S Position sender Shielding |
| 10 | P- Position sender |
| 11 | 50 Starting pulse for starter |
| 12 | 61 Alternator charge indicator |
| 13 | 1 Ignition signal |
| 14 | 30 Battery + |
| 15 | 15 Power supply for ignition |

DIAGNOSIS SOCKET CONNECTIONS



| Pin No. | Description | Wire Colors |
|---------|---------------------------------------|----------------|
| 1 | Terminal 1 | black |
| 7 | Service indicator reset | white / green |
| 11 | Terminal 50 | black / yellow |
| 12 | D+ alternator charge indicator | blue |
| 14 | Terminal 30 | red |
| 15 | RXD lead | white / yellow |
| 16 | 15 s voltage with ignition ON | green / white |
| 18 | PGSP for DME control unit programming | green / blue |
| 19 | Terminal 31 | brown |
| 20 | TXD data lead | white / violet |

13 Fuel System

BMW 318 i/A

| | | |
|-----------|---|--------|
| 13 00 054 | Engine idle speed / CO — adjust | 13-005 |
| 13 31 029 | Fuel delivery pressure — check | 13-311 |
| ... | Fuel delivery rate — check | 13-311 |
| 030 | Fuel pump — remove and install | 13-316 |
| 13 32 051 | Fuel filter — remove and install | 13-325 |
| 13 41 000 | Idle control valve — remove and install | 13-410 |
| 010 | Control unit for idle control valve — remove and install | 13-416 |
| ... | Running up safety relay | 13-420 |
| ... | Basic setting of VDO idle speed regulation | 13-421 |
| 13 51 200 | Fuel pressure regulator — remove and install | 13-510 |
| ... | Fuel pressure regulator (fuel injection pressure) — check | 13-510 |
| 13 54 030 | Throttle housing — remove and install | 13-520 |
| 051 | Return springs of throttle shaft — remove and install | 13-531 |
| 13 61 000 | Control unit — remove and install | 13-612 |
| 13 62 000 | Air flow sensor — remove and install | 13-620 |
| 050 | Temperature time switch — remove and install/check | 13-626 |
| 080 | Pressure sensor — remove and install | 13-627 |
| 531 | Coolant temperature sensor — remove and install/check | 13-629 |
| 13 63 544 | Throttle switch — adjust | 13-630 |
| 551 | Throttle switch — remove and install | 13-631 |
| 13 64 030 | Cold start valve — remove and install/check | 13-640 |
| 501 | Fuel injector — remove and install | 13-642 |
| 12 63 051 | Temperature switch 0° C (32° F) — remove and install | 13-700 |

13 Fuel System

Testing instructions for electronic idle regulation 13 - 800
Troubleshooting Fuel Injection 13 - 850

13 Fuel System

| | |
|---|------------|
| Testing Instructions for electronic Idle regulation | 13 - 810 |
| Troubleshooting fuel Injection | 13 - 900 |
| Troubleshooting DME with BMW diagnosing system | 13 - 912 |
| Troubleshooting engine electronics | see Gr. 12 |

13-325

13 32 051 REMOVING AND INSTALLING FUEL FILTER

Note:
Remove fuel filter with fuel feed line and
Special Tool 13 3 010.



28 13 31005

Installation:
Check direction of flow (arrow).

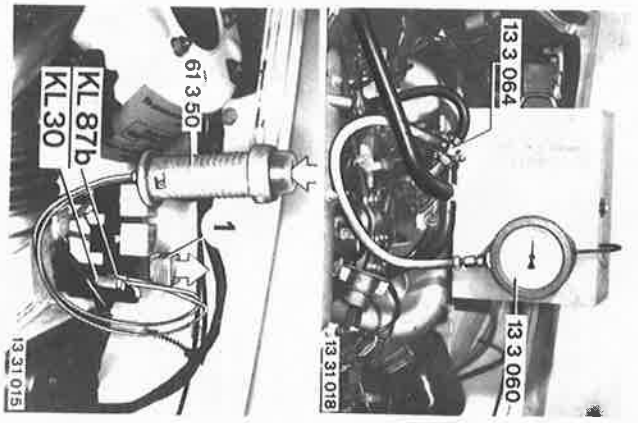


20 13 321

13-311

13 31 029 CHECKING FUEL DELIVERY PRESSURE

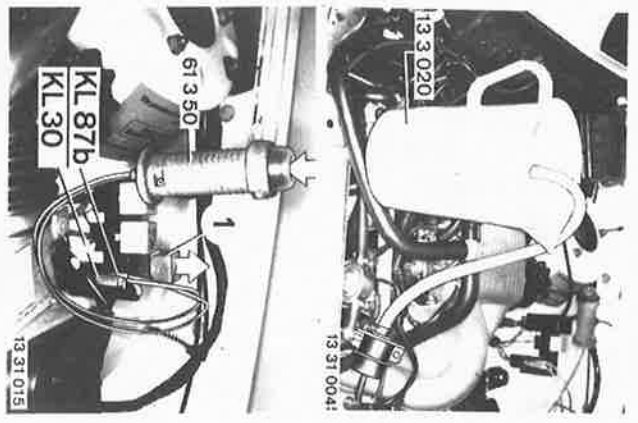
Install pressure tester 13 3 060 with connecting line and T-adaptor 13 3 064 in the fuel feed line — in front of fuel pressure regulator. Plug fuel return line with Special Tool 13 3 010.



Pull off fuel pump relay (1). Bridge terminals 87b and 30 with Special Tool 61 3 050. Check delivery pressure*.

13 31 ... CHECKING FUEL DELIVERY RATE

Unscrew fuel return line and hold end of hose in measuring glass 13 3 020.



Pull off fuel pump relay (1). Bridge terminals 87b and 30 with Special Tool 61 3 050. Check delivery rate*.

* See Specifications of Gr. 16

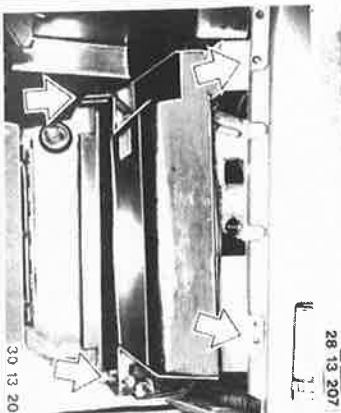
* See Specifications of Group 16

13 41 010 REMOVING AND INSTALLING
IDLE CONTROL UNIT

Open glove box.
Pull out pins (1) of both retaining straps.



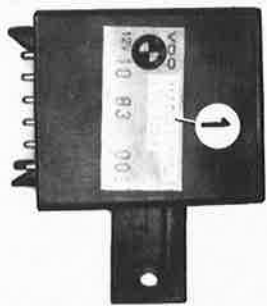
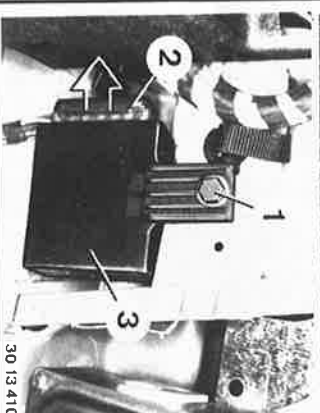
Unscrew screws and remove trim panel.



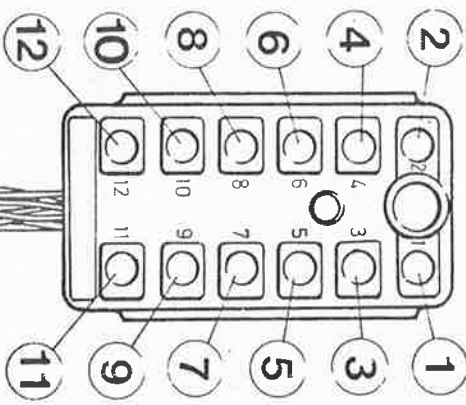
Pull off both plugs for glove box light and lay trim panel aside.



Unscrew bolt (1).
Pull off plug (2).
Remove control unit (3).



Installation:
Check code number (1)*.
Check idle speed**.



30 13 411

Pin Connections of Multiple Pin Plug:

| No. mm2 | Colors | Connection |
|---------|--------|---|
| 1 | 0.75 | BL/RT Idle valve (A) |
| 2 | 1.5 | GN/GE Terminal 15 |
| 3 | 1.0 | GN Terminal 1 |
| 4 | 1.5 | BR Ignition coil |
| 5 | 0.75 | BL/MS Terminal 31 |
| 6 | 0.5 | WS Idle positioner (B) |
| 7 | 0.5 | Temp. switch 45°C (113°F) |
| 8 | 0.5 | Conn. automatic trans. |
| 9 | 0.5 | N/P |
| 10 | 0.5 | BL/MS Air conditioner switch |
| 11 | 0.5 | BL/MS Temp. switch 0°C (32°F) |
| 12 | 0.5 | BR/BL Air cond. magnetic coupling L-Jetronic control unit (pin 2) |

Wire Color Codes

- BL blue
- BR brown
- GE yellow
- GN green
- RT red
- SW black
- WS white

28 13 060

* See Specifications and nominal value microfilm

13-421

13 41 ... MAKING BASIC SETTING OF VDO IDLE CONTROL SYSTEM

Requirements:

- engine at operating temp., oil temperature at least + 60° C (140° F)
- ignition timing and valve clearance okay
- air filter in perfect condition
- all electric equipment switched off
- idle speed CO level correct

Note:

Basic settings do not have to be made at certain intervals.

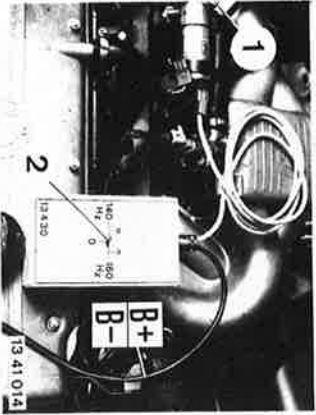
Basic settings can only be made with the metal valve shown in the picture.

This metal valve is interchangeable retroactively since 9.83.

1 = Basic setting screw



13 41 013



Connect tester 13 4 030 on the car battery and idle control valve.

Set switch (2) to 160 Hz.

Run engine at idle speed.

Adjust engine idle speed to 750 + 50 rpm with basic setting screw (1).

Remove tester 13 4 030.

Reconnect engine wire harness plug on the idle control valve.

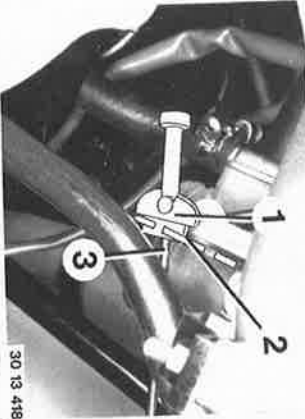
13 54 030 REMOVING AND INSTALLING THROTTLE HOUSING



30 13 417

Open hose clamp (1).
Pull off hose (2).
Pull off hose (3) on throttle housing.

Press adapter (1) out of lever (2).
Disconnect cable (3) on lever (2).
Disconnect cable for automatic transmission.
Disconnect cable for electronic speed control.



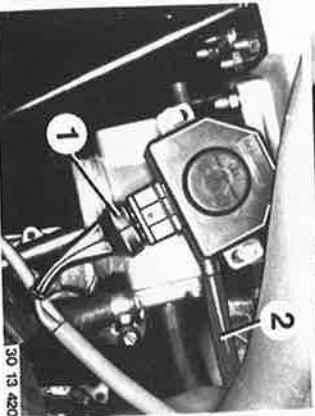
30 13 418

Installation:
Adjust distance A = 1 ... 2 mm (0.039 ... 0.079") with screw (1) when throttle is closed and accelerator pedal is in idle position.



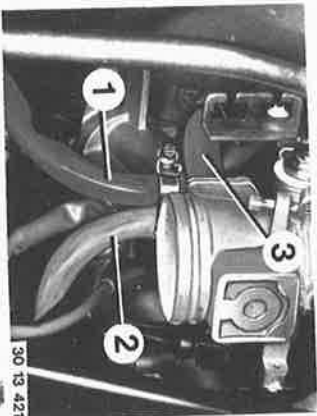
30 13 419

Pull off plug (1) on throttle switch.
Pull off hose (2) for active carbon filter vent.



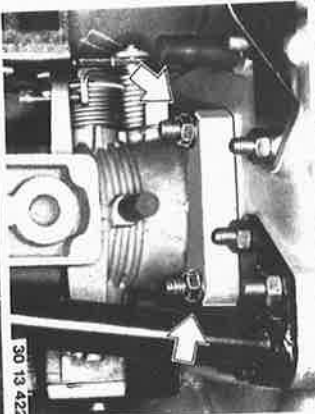
30 13 420

Disconnect water hoses (1 and 2).
Pull off secondary air hose (3).



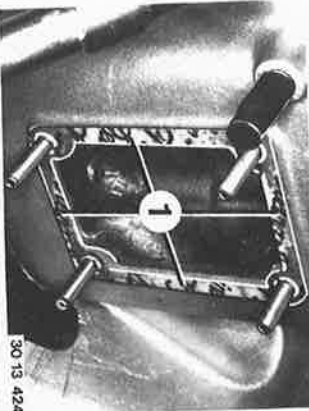
30 13 421

Unscrew bolts (four).
Take off throttle housing.



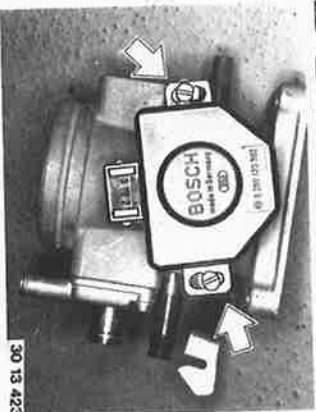
30 13 422

Installation:
Replace gasket (1).



30 13 424

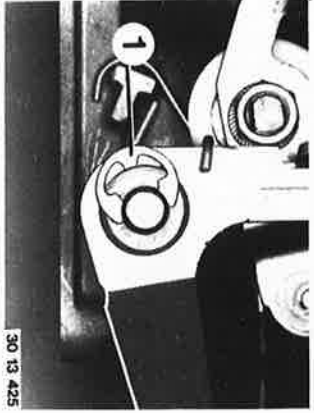
Unscrew bolts.
Remove throttle switch.
Installation:
Adjust throttle switch 13 63 544.



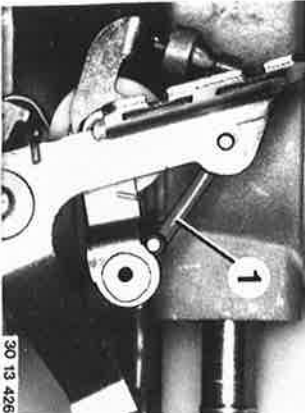
30 13 423

13 54 051 REMOVING AND INSTALLING RETURN SPRINGS FOR THROTTLE SHAFT

(throttle housing removed)
Lift out retainer (1).

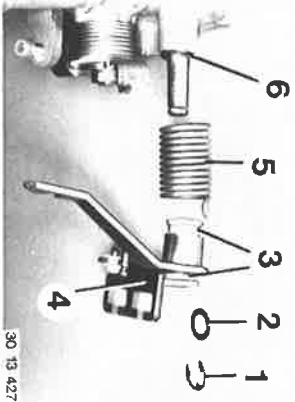


Lift out connecting rod (1).

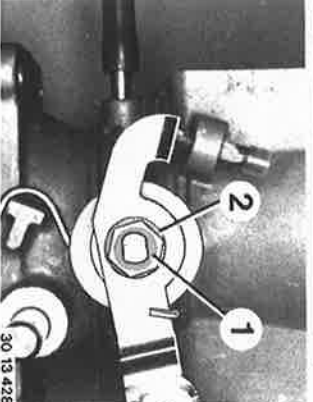


Disconnect spring on operating lever and take off parts.

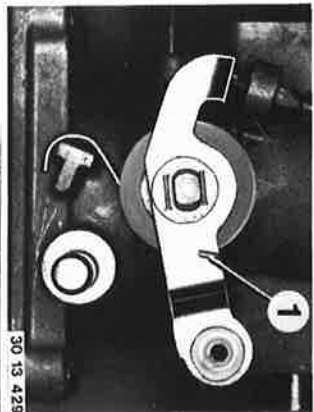
- Installation:*
Tension spring with about 1/2 turn.
- 1 Retainer
 - 2 Washer
 - 3 Bearing sleeve
 - 4 Operating lever
 - 5 Spring
 - 6 Corrugated washer



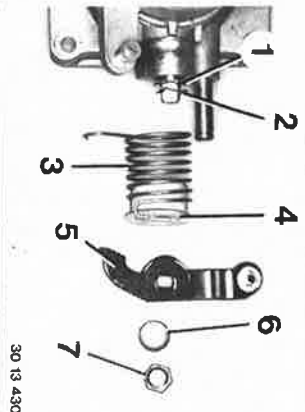
Unscrew nut (1).
Remove lock washer (2).



Disconnect return spring (1) on operating lever.
Installation:
Tension return spring with about 1/2 turn.



- Remove parts.
- 1 Washer
 - 2 Spring washer
 - 3 Spring
 - 4 Bearing sleeve
 - 5 Operating lever
 - 6 Lock washer
 - 7 Nut

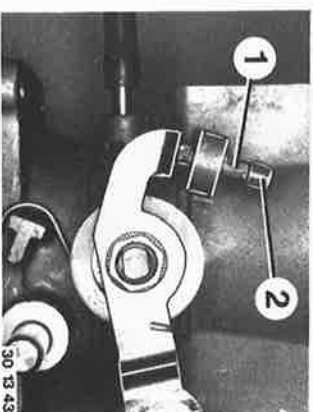


Installation:
Check basic throttle setting, correcting if necessary.

Checking:
A correctly adjusted throttle will produce a slight clearance between housing and throttle. Vacuum bores must be open.



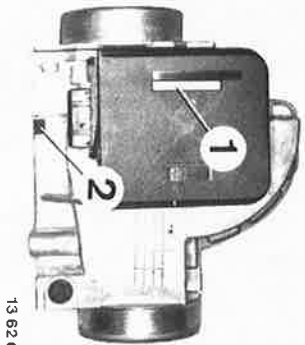
Adjusting (no maladjustment as well as possible):
Adjust throttle by turning screw (1) (slight clearance between housing and throttle).
Lock screw (1) with clear lacquer after finishing adjustments.
Install anti-tamper lock (2) again.



13 -- 620

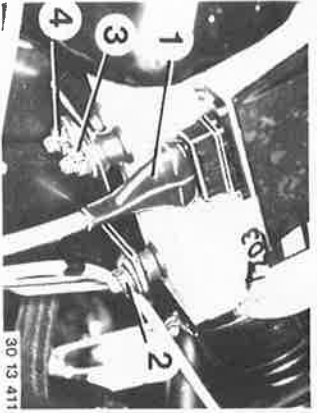
13 62 000 REMOVING AND INSTALLING AIR FLOW SENSOR

Loosen hose clamp (1) and pull off air hose
on air flow sensor.



Installation:
Check code number (1)* and manufacturing
date (2)*.
Check engine idle speed* and CO level*.
Check air flow sensor*.

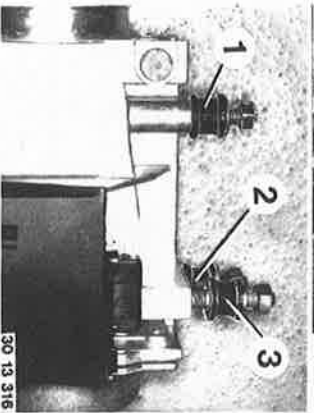
30 13 410



Pull off plug (1).
Loosen nuts (2 ... 4) and take off air flow
sensor.

Installation:
Check seal (1), replacing if necessary.

30 13 315



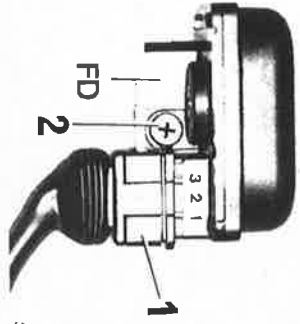
Unscrew silent mounts (1 ... 3) on air flow
sensor.
Check silent mounts, replacing if necessary.

* See Specifications + nominal value microfilm.

13 - 627

13 62 080 REMOVING AND INSTALLING/ CHECKING PRESSURE SENSOR

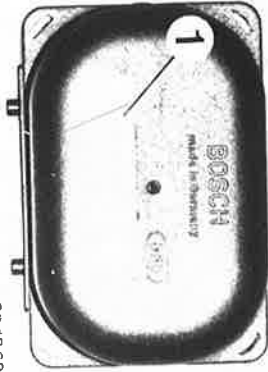
- Pull off plug (1).
- Unscrew screw (2).
- Remove pressure sensor.
- FD = Manufacturing date.



30 13 626

Installation:

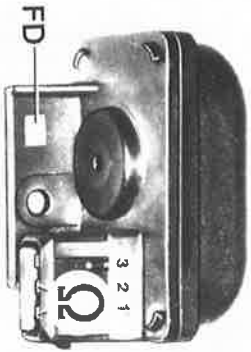
Check code number (1)*.



30 13 627

Checking:

With atmospheric pressure of ≤ 880 mbar there will be resistance of approximately 0 ohms between plug connections (1 and 2). With atmospheric pressure of ≥ 930 mbar there will be resistance of approximately ∞ ohms between plug connections (1 and 2).



30 13 628

* See Specifications

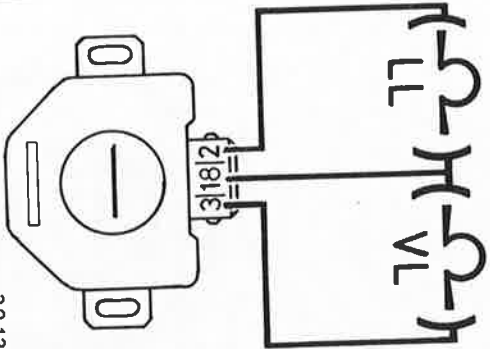
13-630

13 63 544 ADJUSTING THROTTLE SWITCH

Checking Throttle Switch:

There should be approximately 0 ohm between connections (2 and 18) with the throttle closed. With the throttle wide open there should be approximately 0 ohm between connections (3 and 18).

LL = Idle
VL = Full load



30 13 631



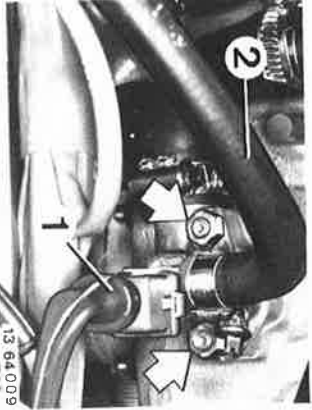
Adjusting

There should be approximately 0 ohm between connections (2 and 18) with the throttle closed. Adjust by loosening screws (1) and turning the throttle switch.

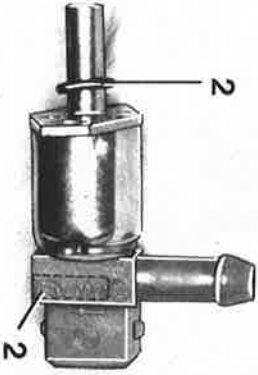
Open throttle after finishing adjustment — resistance should rise immediately to ∞ ohms. When releasing the throttle the resistance should drop back to approximately 0 ohm.

13-640

13 64 030 REMOVING AND INSTALLING COLD START VALVE

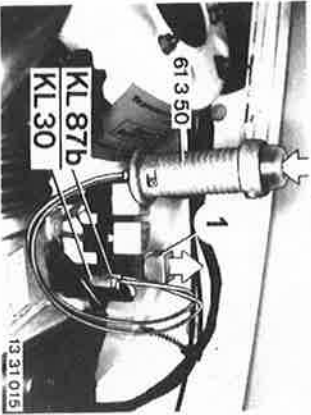


Removing and Installing:
Pull off plug (1).
Disconnect fuel line (2).
Unscrew screws.
Take off cold start valve.

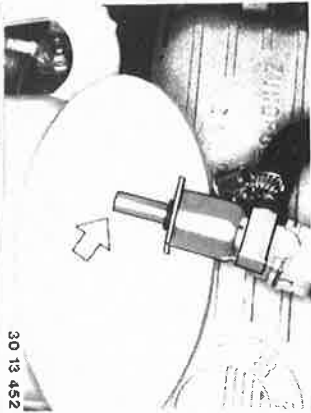


Installation:
Check code number (1)*.
Replace seal (2).

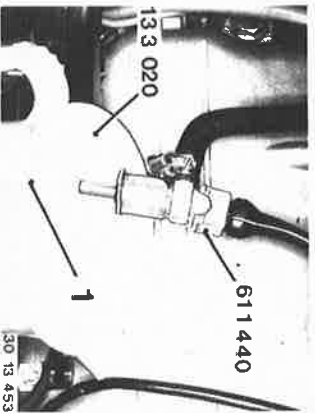
Checking:
Unscrew cold start valve on intake manifold.
Fuel line remains connected.



Checking — L-Jetronic — E 30:
Unscrew cold start valve on intake manifold.
Fuel line remains connected.
Pull off fuel pump relay (1).
Bridge terminals 87b and 30 with Special Tool 61 3 050.
Fuel pump runs.



Leak Test:
Check permissible leak rate*.



Checking Fuel Flow Rate and Spray Angle:
Hold cold start valve in measuring glass 13 3 020.
Plug Jetronic test lead 61 1 440 on cold start valve and connect with B + and B -.
Check fuel flow rate* and spray angle (1)*.

* See Specifications

* See Specifications

13-700

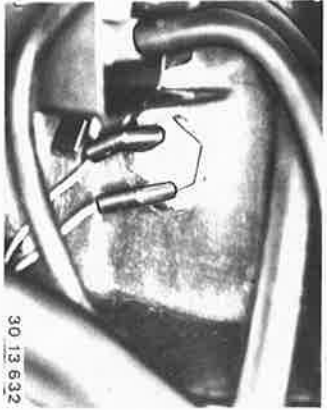
12 63 051 REMOVING AND INSTALLING
0° C (32° F) TEMPERATURE
SWITCH

Pull off plug (1).

Unscrew temperature switch.

Installation:

Tightening torque: max. 30 Nm (22 ft. lbs.).



30 13 632



Installation:
Check code number (1) * and switching
temperature (2) *.

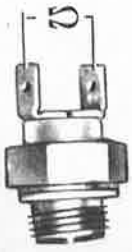
20 13 633

Checking:

Connect ohmmeter (M 60) on temperature
switch.

Ohmmeter must display approx. 0 ohm at
temperature < - 8° C (+ 18° F).

Ohmmeter display should be approx. ∞ ohms
at temperature > 4° C (39° F).



20 13 634

* See Specifications

13-701

13 00 054 CHECKING AND ADJUSTING ENGINE IDLE SPEED AND CO LEVEL

Cars with Catalytic Converter:
Cars with Exhaust Manifold without Test

Points:

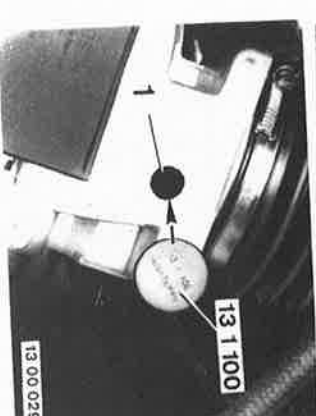
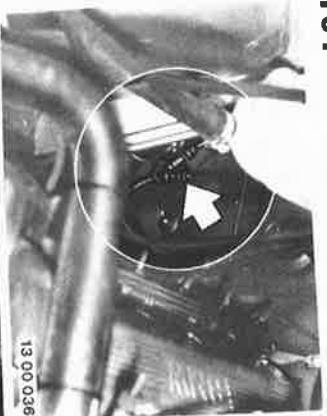
Requirements for All Adjustments:
Engine at operating temperature, i.e. oil
temperature at least 60° C (140° F).
Engine and ignition in good operating
condition.

Valve clearance correct.

Connect BMW Service Tester to operating
instructions (altitude correction box must
be connected).

Mount CO tester in tailpipe.

Switch off exhaust extraction for time of test.



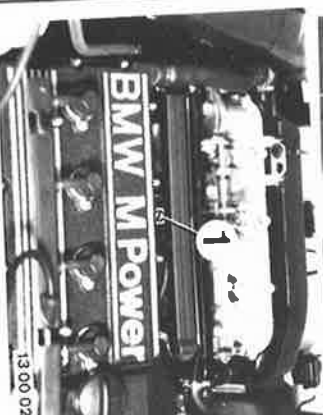
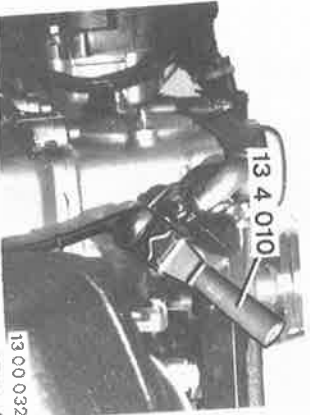
2.) CO Test:
Disconnect oxygen sensor plug.
The idle speed CO level cannot be measured in
the tailpipe = 0 (zero).
CO value displayed:
Remove cap (1) with Special Tool 13 1 011.
Correct CO value to 0 (zero) with Special Tool
13 1 100 applied on adjusting screw on the air
flow sensor.

Refer to next page for synchronization.

Checking Function of Oxygen Sensor

(11 78 010):

Disconnect oxygen sensor plug and correct CO
value to 0.5 to 1.0 % by volume with Special
Tool 13 1 100 applied on adjusting screw on
the air flow sensor (turned clockwise).
Connect oxygen sensor plug.
CO level must go back to 0 (zero).
Disconnect oxygen sensor plug again.
Correct CO level to 0 (zero) with the adjusting
screw (as close as possible to the original value).
Connect oxygen sensor.



Pull off plug on throttle valve switch and
insert Special Tool 13 4 010 in wire plug.

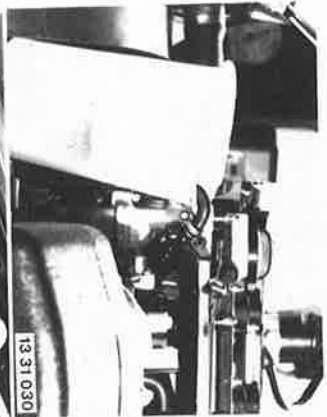
1.) Check engine idle speed.
Adjust engine idle speed with screw (1).

13 00 028

13-710

13 31 029 CHECKING FUEL DELIVERY PRESSURE AND RATE

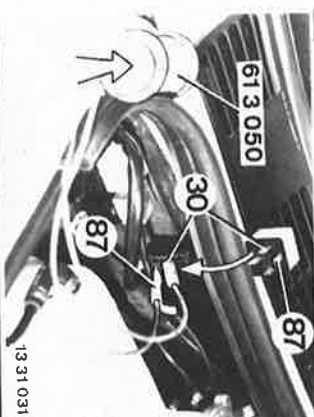
Checking Fuel Pump Delivery Rate:
Disconnect return line and hold end in
Special Tool 13 3 020.



Remove trim on right engine compartment
wall.

Pull off fuel pump relay (1).
Bridge terminals 87 and 30 with Special Tool
61 3 050.

Press the button.
Fuel pump runs.
Check delivery rate*.

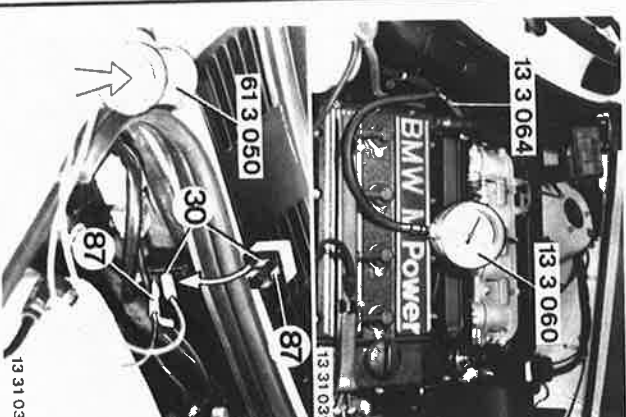


Checking Fuel Pump Delivery Pressure:
Install Special Tools 13 3 060 and 13 3 064
between return line and hose.
Shut fuel return hose with Special Tool
13 3 010.

Remove trim on right engine compartment
wall.

Pull off fuel pump relay (1).
Bridge terminals 87 and 30 with Special Tool
61 3 050.

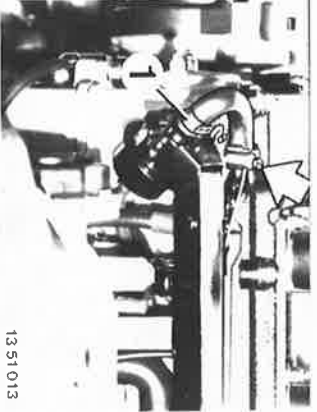
Press the button.
Fuel pump runs.
Check delivery pressure*.



13 31 031

* See Specifications of Gr. 16

13-720



13 51 013

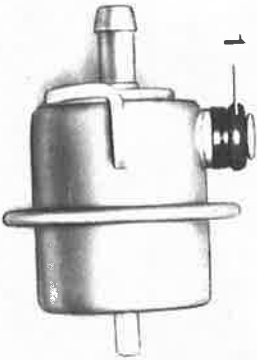
13 51 200 REMOVING AND INSTALLING FUEL PRESSURE REGULATOR

Disconnect fuel hose (1).



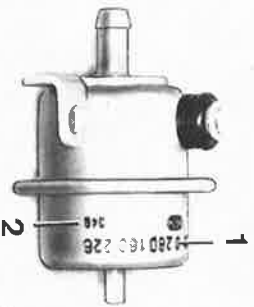
13 51 014

Unscrew bolts.
Pull fuel pressure regulator out of injection pipe.
Pull off vacuum hose (2).



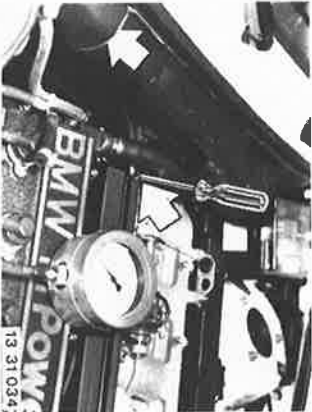
28 13 51005

Installation:
Check seal (1), replacing if necessary.

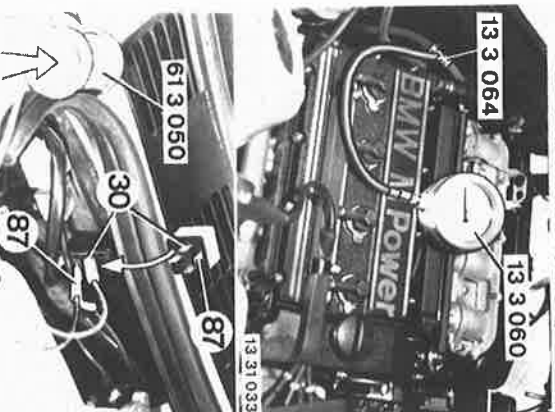


28 13 51001

Installation:
Check code number (1)*,
(2) = Manufacturing date



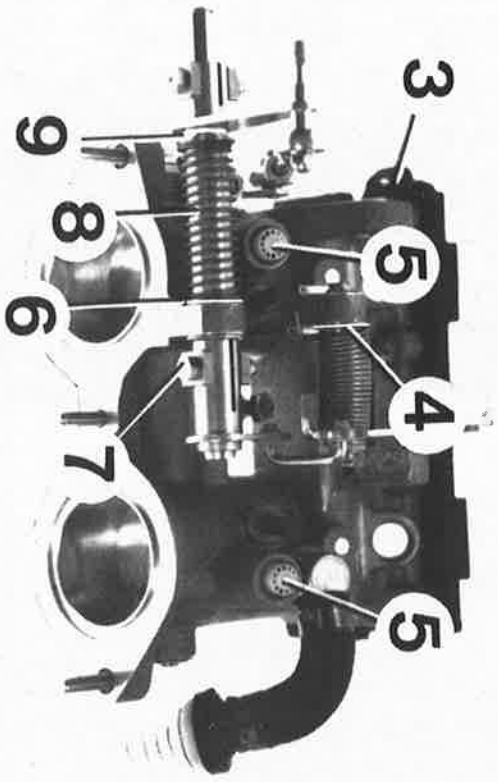
Remove trim on engine compartment wall.



Pull off fuel pump relay (1).
Bridge terminals 87 and 30 with Special Tool 61 3 050.
Press the button.
Fuel pump runs.
Check fuel injection pressure*.

* See Specifications and Nominal Value Microfiche

13-731



1354055

throttle valve housing of cylinders 3 and 4). Replace gasket (3). Lift out retainer (4). Unscrew throttle screws. Check O-rings (5), replacing if necessary. Take off lever bearing (7), sleeves (6), spring (8) and washer (9).

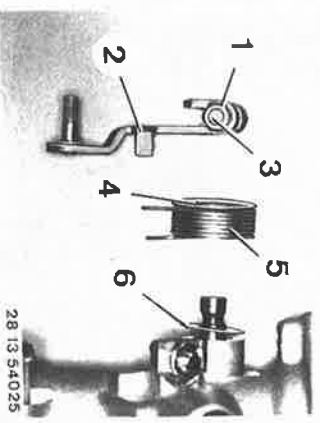
Installation:
Screw in throttle screws carefully until they fit tight and then loosen 1 and 1/2 turns again. Preload spring (8) by about 1/2 turn.

Throttle valve adjustment is optimized and secured with paint in the plant.

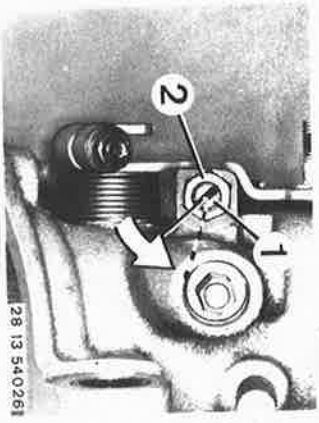
Note:
Throttle valve neck basic adjustments are only necessary after replacing parts, in case of a loose clamping screw or erroneous adjustment.

Unscrew nut (1).
Take off throttle lever (2) and screw (3).
Take off sleeve (4) and spring (5).
Check washer (6).

Installation:
Preload spring (5) with about 1/2 a turn.
Adjusting Conditions:
Component temperature = approx. 20° C (68° F).

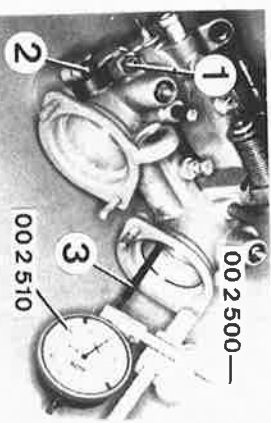


28 13 54025



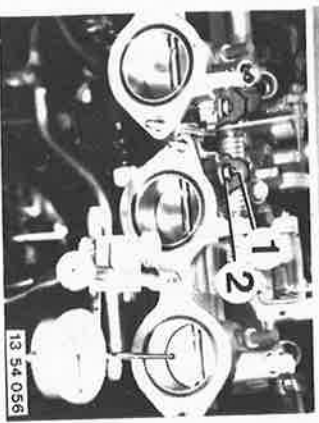
28 13 54026

Loosen nut (2).
Turn idle stop screw (1) about 1/10th of a turn in direction of arrow.
Tighten nut (2) again.



28 13 54027

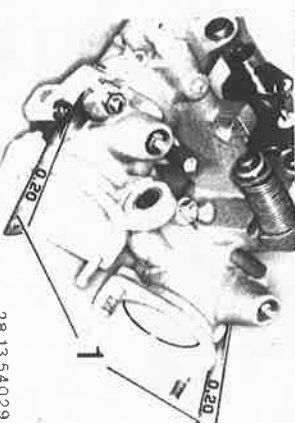
Close throttle valves.
Press throttle lever against idle stop screw (1) and tighten nut (2).
Mount dial gage 00 2 510 (with extension 3) and Special Tool 00 2 500 on the throttle valve neck.
Dial gage tip bears with preload on throttle valve in the lowest possible position.



13 54 056

Loosen nut (2).
Adjust the throttle valve lower edge to 0.1 + 0.05 mm (0.004 + 0.002") with idle stop screw (1) (approx. 1/10th of a turn).
Lock idle stop screw (1) and secure with paint.

Checking Axial Clearance:
A 0.2 mm (0.008") feeler gage blade (1) must fit easily on both left and right sides between the circlip or throttle lever and housing with a closed throttle valve and at room temperature of about 20° C (68° F).
Check whether throttle valve moves easily at operating temperature.



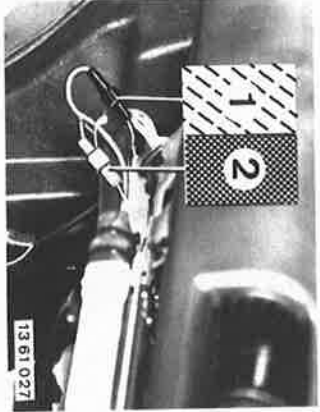
28 13 54029

13-750

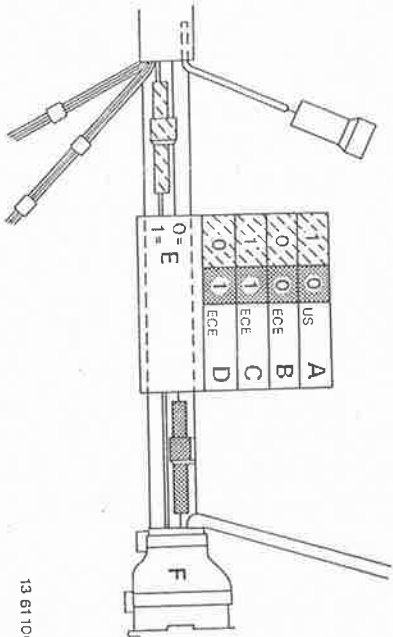
13 61 ... PLUG CONNECTIONS FOR CONTROL UNIT

Plugs (1 and 2) must be disconnected or connected on the control unit plug for operation with unleaded gasoline.

(1) = Black
(2) = Blue



- Plug Connections:
- A) 1 + 0 = unleaded prem. grade US
 - B) 0 + 0 = unleaded reg. grade ECE
 - C) 1 + 1 = leaded prem. grade ECE
 - D) 0 + 1 = unleaded prem. grade ECE
 - E) State of plug connections
 - 0 = disconnected 1 = connected
 - F) To control unit

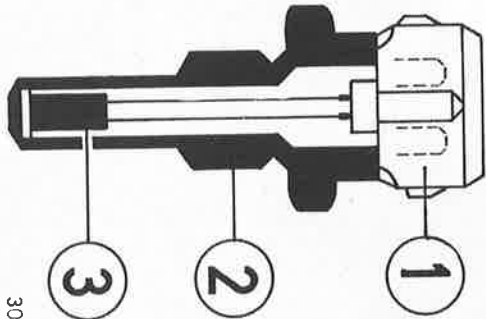


13-762

13 62 531 REMOVING AND INSTALLING/ CHECKING COOLANT TEMPERATURE SENSOR

The temperature sensor measures the engine temperature and sends this information to the control unit as a resistance value. The resistance value drops with rising temperature (NTC).

- 1 = Plug connection
- 2 = Housing
- 3 = NTC resistor



30 13 6225

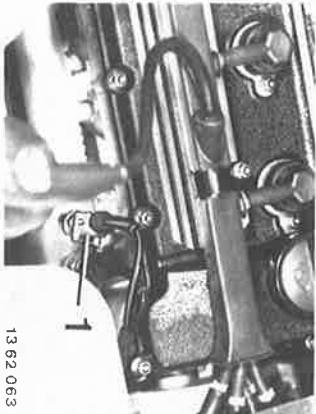
Removing and Installing:

Pull off plug (1).

Unscrew temperature sensor.

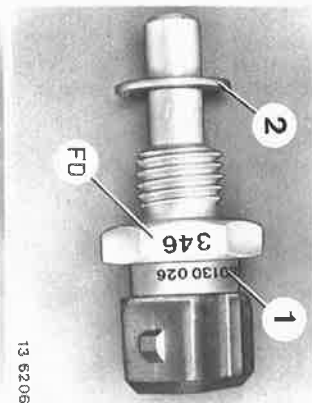
Installation:

Tightening torque*.



13 62 063

* See Specifications



13 62 060

Installation:

Check code number (1)*.

Replace seal (2).

FD = Manufacturing date.

Fill and bleed cooling system (Group 17).

Checking:

Connect Jetric test leads 61 1 440.

Check nominal value* with an ohmmeter.

To check the entire temperature range, remove and place temperature sensor in a water bath, heat bath to testing temperature and check resistance* with an ohmmeter.



13 62 062

* See Specifications

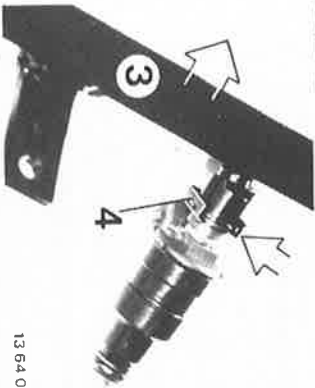
13-781

13 64 501 REMOVING AND INSTALLING ONE FUEL INJECTOR

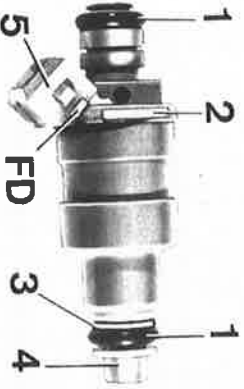
Unscrew screws on injection pipe.



Pull off plug on throttle valve switch (1).
Pull off plug plate (2) on fuel injectors.



Push up injection pipe (3) until fuel injectors
are lifted out of guides on throttle valve
necks.
Lift out retainer (4) and take off fuel
injector.



Installation:
Check O-rings (1), replacing if necessary.
Check code number (2)*.
FD = Manufacturing date
Check position of plastic washer (3).
Check color* of plug receptacle (5) or fuel
injector guard (4).
Only coat O-rings with vaseline or SAE 90
gear lube for installation.

2. CHECKING SPEED SIGNAL AND IDLE SIGNAL FOR IDLE CONTROL UNIT

a) Speed Signal

Connect voltmeter (M 01) between terminals 3 and 4. Turn on ignition. Voltmeter displaying at least 9 volts? — no —> Connect ohmmeter between terminal 3 and socket 13 of the diagnosis socket. Ohmmeter displaying approx. 0 ohm? — no —> Eliminate breaks in green wire.

yes —> Speed signal for idle control unit is okay.

b) Idle Signal

Connect voltmeter (M 01) between terminals 4 and 12. Turn on ignition. Voltmeter displaying at least 9 volts briefly? — no —> Pull off multiple-pin plug on throttle switch. Connect voltmeter (M 01) on center pin contact of plug receptacle and ground. Turn on ignition. Voltmeter displaying at least 9 volts briefly? — no —> Provide power supply to wiring diagram.

yes —> Press down accelerator pedal several centimeters. Turn on ignition. Voltmeter displaying approx. 0 volt? — no —> Adjust or replace throttle switch. Adjust cable.

yes

Important!
After selecting a drive range (cars with automatic transmission) always *only* the nominal speed (750 ± 50 rpm) is regulated (preferred circuit).

4.) Checking Periphery for Air Conditioner Speed

Connect voltmeter (M 01) between terminal 4 and terminal 9. — no —→ Check blue/white wire for breaks with ohmmeter (M 06).
Turn on ignition. Eliminate breaks.
Turn on air conditioner.
Voltmeter displaying at least 9 volts?

yes

→ Connect voltmeter (M 01) between terminal 4 and terminal 11. — no —→ Check blue/black wire for breaks with ohmmeter (M 06).
Turn on ignition. Eliminate breaks.
Turn on air conditioner.
Voltmeter displaying at least 9 volts after solenoid has cut in?

b) Air Temperature Switch

Connect voltmeter (M 01) between terminal 4 and terminal 10. Voltmeter displaying at least 9 volts with an air temperature of $\leq -8^{\circ}$ C (+ 18 $^{\circ}$ F)?

Note: Cars with manual transmission do not have an air temperature switch.

Wire plugs for air temperature switch are connected with each other.

no → Connect ohmmeter (M 06) between terminal 2 and terminal 10. Pull off both wire plugs on air temperature sensor and connect. Ohmmeter displaying approximately 0 ohm?

yes → Eliminate wire breaks.

yes

no → Replace air temperature sensor. Connect ohmmeter (M 06) on both plug connections of air temperature sensor. Ohmmeter displaying approximately 0 ohm with an air temperature of $\leq -8^{\circ}$ C (+ 18 $^{\circ}$ F)?

no → Connect voltmeter (M 01) between terminal 4 and terminal 10. Voltmeter displaying approximately "0" volt with an air temperature of $\geq +4^{\circ}$ C (39 $^{\circ}$ F)?

yes

Air temperature sensor is okay!

no → Replace air temperature sensor. Connect ohmmeter (M 06) on both plug connections of air temperature sensor. Ohmmeter displaying at least 100 k-ohms with an air temperature of $\geq +4^{\circ}$ C (39 $^{\circ}$ F)?

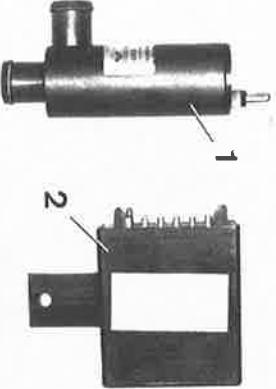
13 - 006

13 00 054 ADJUSTING ENGINE IDLE SPEED / CO

Requirements for All Adjustments:
Engine at operating temperature, i.e. oil temperature at least 60° C (140° F),
ignition timing and valve clearance correct.
All electric equipment switched off.
BMW service test unit connected according to operating instructions.

1) Engine Idle Speed

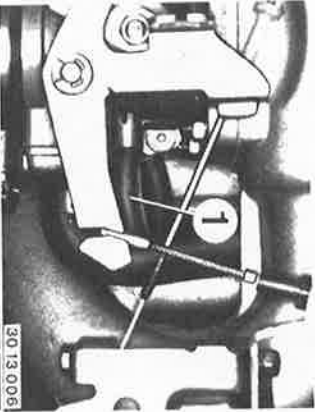
Check engine idle speed*.
Nominal Value Not Reached:
Check idle control valve (1) and control unit (2) for idle regulation, replacing if necessary.
Note:
There is no adjusting screw for idle speed regulation.



13 00 020

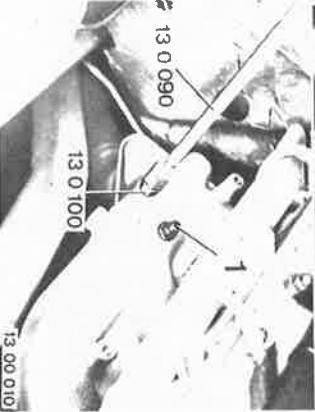
2) CO Test

Pull off hose (1) on throttle housing.
Connections are not plugged.



30 13 006

Unscrew bolts (1).
Connect exhaust tester 13 0 090 on exhaust manifold with help of adapter 13 0 100.
Check idle speed CO level*.



13 00 010

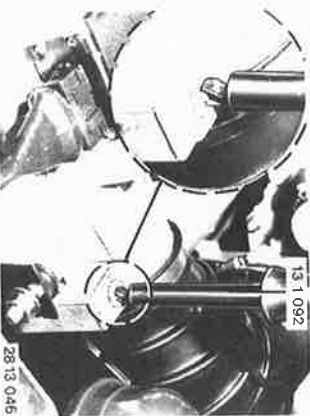
* See Nominal Value Microfiche

Disconnect oxygen sensor plug.



30 13 008

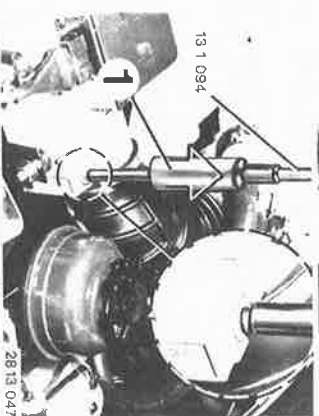
Drill hole in anti-tamper lock with Special Tool 13 1 092.



13 1 092

28 13 046

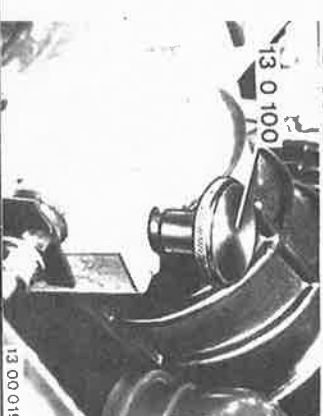
Screw Special Tool 13 1 094 in anti-tamper lock.
Drive special tool and anti-tamper lock out of air flow sensor with impact tool (1).



13 1 094

28 13 047

Adjust idle speed CO level* with Special Tool 13 1 100.



13 0 100

13 00 019

* See Nominal Value Microfiche

13-316

13 31 030 REMOVING AND INSTALLING FUEL PUMP

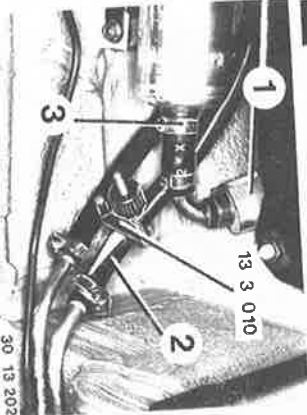
Push back caps (1).
Unscrew nuts (2 and 3) and take off leads.



30 13 201

Pinch suction hose (1) and pressure hose (2) with Special Tool 13 3 010.

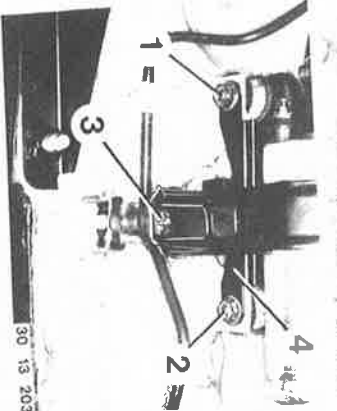
Open hose strap (3) and pull off hoses.
Note:
Don't use squeeze-hose clamps on the pressure hose.



30 13 202

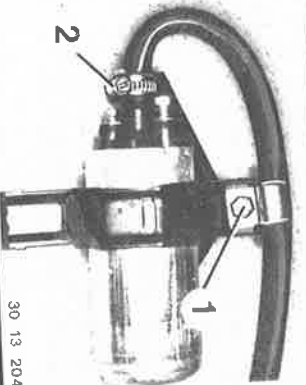
Unscrew nuts (1 ... 3) and take off holder (4).
Take off fuel pump with holder.

Installation:
Check rubber mounts, replacing if necessary.

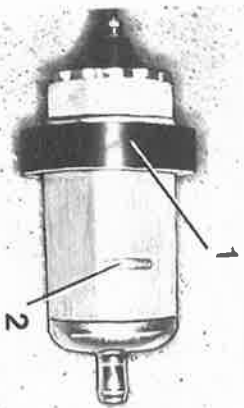


30 13 203

Unscrew screw (1).
Loosen hose strap (2) and pull off fuel hose.
Take fuel pump off of holder.

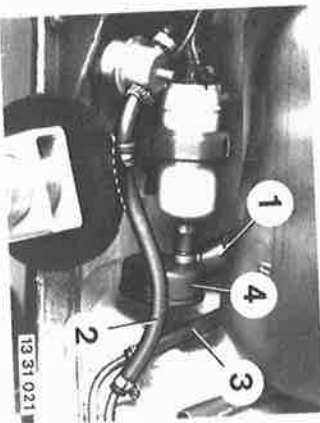


30 13 204



30 13 205

Pull off rubber ring (1).
Installation:
Check code number* (2).



13 31 021

Arrangement of Fuel Pump with Damper Chamber:
1 = Suction hose
2 = Pressure hose
3 = Return hose
4 = Damper chamber

* See Specifications

13 - 201

13 00 060 CHECKING ENGINE IDLE SPEED AND CO LEVEL

- Cars with Cat. Conv. -

M 20 engines with M 1.3 Single Sensor Motronic (recognized on vibration damper with 58 teeth and one gap):

Control unit identification is possible with the BMW diagnosing system.**

Requirements for All Adjustments:

Engine at operating temperature, i.e. oil temperature at least 60° C (140° F).
Valve clearance correct.

Engine and ignition in good operating condition.

BMW Service Tester connected to operating instructions.

Routine checking is not necessary.

1) Engine Idle Speed:

Check engine idle speed**.

See BMW diagnosing system if the nominal value is not reached.
Check intake system for leaks.

Note

There is no idle speed control adjusting screw.

2) CO Level:

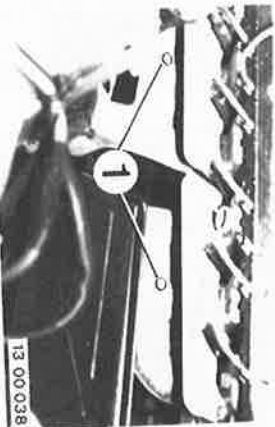
Disconnect oxygen sensor plug.

Unscrew bolts (1). Connect exhaust testers 13 0 090 with adapters 13 0 100 on exhaust manifolds. Check idle speed CO level**. Switch off exhaust extraction for time of test.

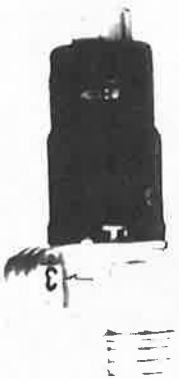
Nominal value not reached and CO level too high: check fuel injectors, fuel pressure and coolant temp. sensor.

CO level too low: check hoses and connections for idle speed control or locate air leakage.

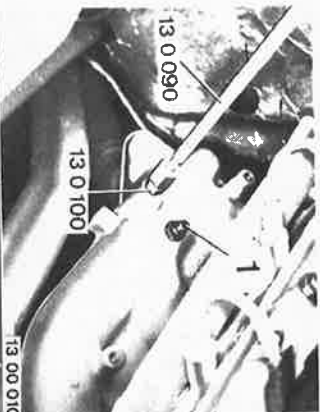
** See Specifications



13 00 038



13 01 017



13 00 010



13 00 034

Important!
Corrections may not be made on the air flow sensor adjusting screw, since this adjustment is the basis for oxygen sensor and idle speed control.

Checking Function of Oxygen Sensor (11 78 010):

Unscrew bolt (1).

Connect exhaust testers 13 0 090 with adapters 13 0 100 on exhaust manifolds.

Switch off exhaust extraction for the time of this exhaust test.

Disconnect oxygen sensor.

Clamp vacuum hose leading to the fuel pressure regulator (not with the engine running).

Start engine.

CO level rises.

Connect oxygen sensor.

CO level must go back to the nominal value.

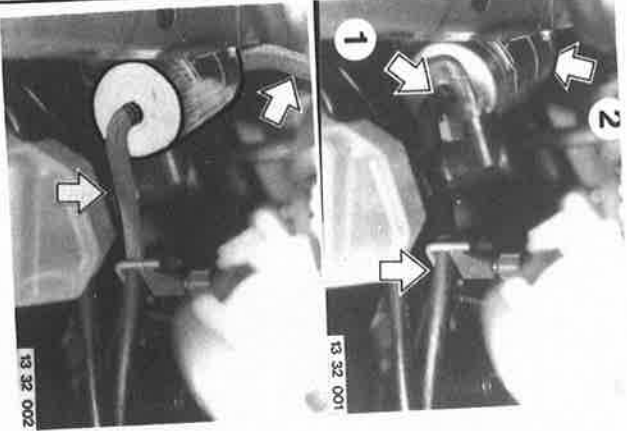
Remove clamp.

13 - 325

13 32 051 REMOVING AND INSTALLING FUEL FILTER

Disconnect fuel feed pipe before and
after the filter with Special Tool
13 3 010.
Unscrew bolts.
Loosen hose clamps (1 and 2).

Pull off fuel hoses.
Remove filter.

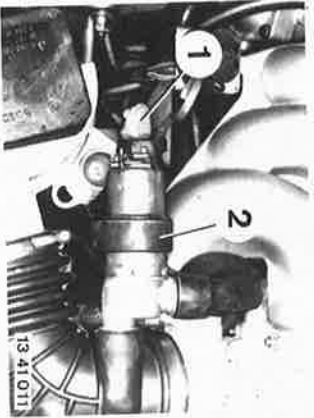


Installation:
Check direction of flow (arrow).

13-412

13 41 000 REMOVING AND INSTALLING IDLE SPEED CONTROL VALVE

(M 20 B 25 - 325 i)
(M 20 B 27 - 525 e since 9.86)
Pull off plug (1).
Disconnect retaining strap (2).
Pull idle speed control valve off of hoses and remove.



Installation:
Check code number (1)*.
Check idle speed*.

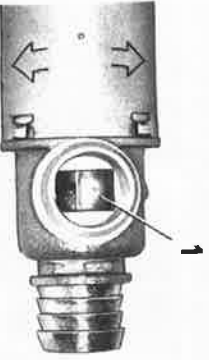


13 41 002

Note:
Operation of the idle speed control valve can be felt after taking hold of valve with a hand (timed power supply).

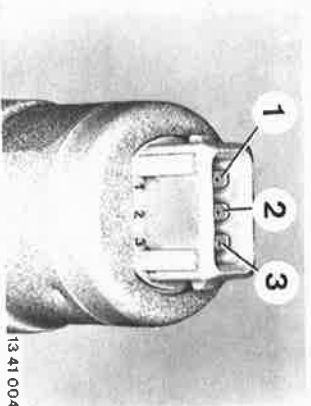
Mechanical Test:

It must be possible to move the rotary piston (1) in the idle speed control valve when turning the idle speed control valve abruptly.



13 41 003

* See Specifications and
Nominal Value Microfiche

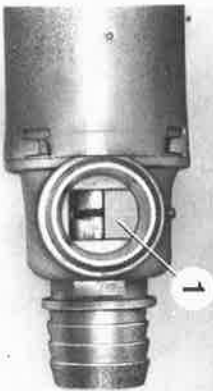


13 41 004

Electric Test:
Measure resistance between terminals (1 and 3).
Nominal values: approx. 40 ohms.
Measure resistance between terminals (2 and 1 or 2 and 3).
Nominal values: approx. 20 ohms each.

Dynamic Test:

Remove idle speed control valve (plug remains connected).
Open or close rotary piston (1) completely.
Turn on ignition.
Rotary piston must take on a position of about 50 % cross section open and maintain this position.



13 41 005

CAUSE

CHECK / CORRECT

Fuel pump running only during starting procedures.

no → Provide power supply (see wiring diagram).

Check power supply of control relay.
Pull off plug on control relay.

a) Connect voltmeter (M 01) between conn. 30 on disconnected control relay plug and ground.
Voltmeter must display battery voltage.

Voltage value okay?
b) Connect voltmeter (M 01) between conn. 15 on disconnected control relay socket and ground.

Turn on ignition.
Voltmeter must display battery voltage.

Voltage value okay?
c) Connect voltmeter (M 01) between conn. 50 on disconnected control relay plug and ground.

Start engine.
Voltmeter should display battery voltage.

Voltage value okay?

Yes

Check ground conn. of control relay:
Connect ohmmeter (M 06) between conn. 31 on disconnected control relay plug and ground.
Ohmmeter should display approx. 0 ohm.
Resistance value okay?

yes

no → Repair wire.
Electric ground (see wiring diagram).

Check speed signal for control relay:
Connect voltmeter (M 02) between conn. 1 on disconnected control relay plug and ground.
Voltmeter should display voltage.
Voltage value displayed?

yes

no → Check ignition system.
Ignition system okay?

yes

Repair wire.

Replace control relay.

yes

no → Replace control relay.

CAUSE

Cold start valve leaks

CHECK / CORRECT

Check cold start valve:

Remove cold start valve (fuel line remains connected).

Plug Jetronic test lead 61 1 440 on cold start valve and connect with B + and ground.

Hold cold start valve in measuring glass 13 3 020.

Pull off plug on control relay.

Connect conn. 87a on disconnected relay socket with B + (fuel pump runs).

Cold start valve must eject correctly.

Cold start valve ejecting?

no → Replace cold start valve.
yes → Disconnect Jetronic test lead on cold start valve.
Cold start valve must not eject.
Cold start valve not ejecting?

CAUSE

CHECK / CORRECT

Throttle switch maladjusted or defective

Check throttle switch: Check throttle switch with BMW service test unit / test step L-Jet. 03. Test values okay?

no → Check wiring (see wiring diagram). Wiring okay? no → Repair wiring.

yes

Adjust or replace throttle switch.

Poor central ground, loose contact or wrong plug connections. → Eliminate trouble.

Throttle will not close → Repair and adjust throttle (see Group 13 in Repair Manual).

Throttle will not open fully → Adjust throttle cable (see 35 41 421 in Repair Manual). Adjust throttle (see Group 13 in Repair Manual).

Basic mixture setting too high → Adjust engine idle speed and CO (see 13 00 054 in Repair Manual).

Basic mixture setting too low. → Adjust engine idle speed and CO (see 13 00 054 in Repair Manual).

Intake system leaks. → Check all air carrying parts for leaks and repair, if necessary.

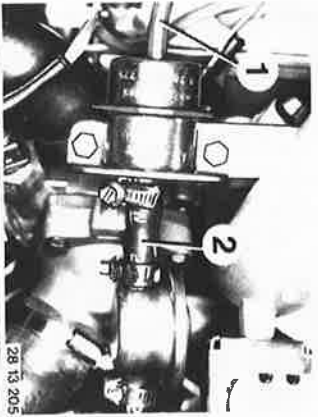
Oil filler cap seal leaks. → Replace oil filler cap.

Oil dipstick seal leaks. → Oil dipstick must be pressed in tight in guide tube. Replace seal.

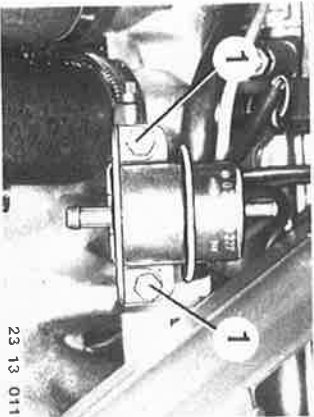
13-511

13 51 200 REMOVING AND INSTALLING FUEL PRESSURE REGULATOR

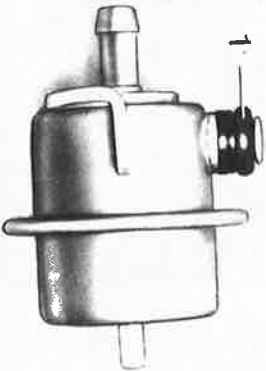
Disconnect air hose (1) and fuel hose (2).



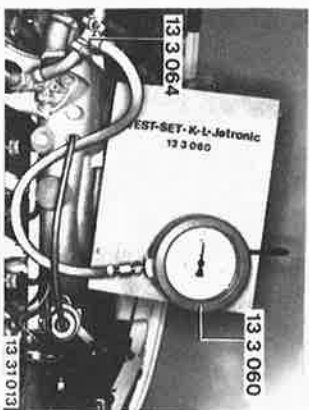
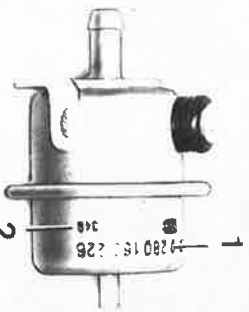
Unscrew bolts (1).
Take off fuel pressure regulator.



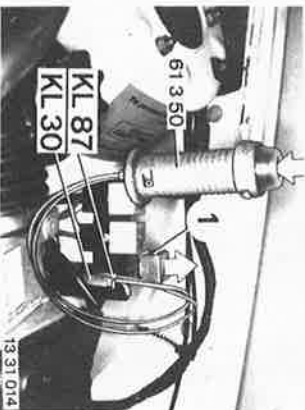
Installation:
Check seal (1), replacing if necessary.



Installation:
Check code number (1)*,
(2) = Manufacturing date



Checking:
Install pressure gage 13 3 060 with connecting line and T-adaptor 13 3 064 in fuel feed line, in front of fuel pressure regulator.

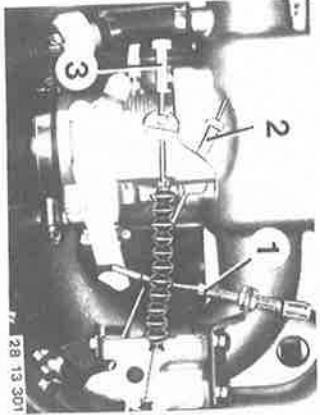


Pull off fuel pump relay (1).
Bridge terminals 87 and 30 with Special Tool 61 3 050.
Fuel injection pressure*.

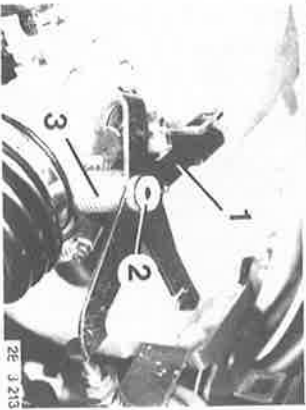
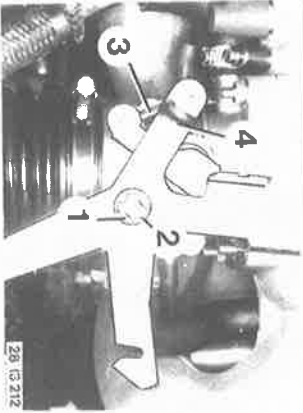
13-532

13 54 051 REPLACING RETURN SPRINGS FOR THROTTLE SHAFT

- Disconnect cables (1 ... 3).
1 = Automatic transmission
2 = Accelerator pedal
3 = Cruise control
- Installation:*
Adjust cables — see Groups 24 / 35 / 65.

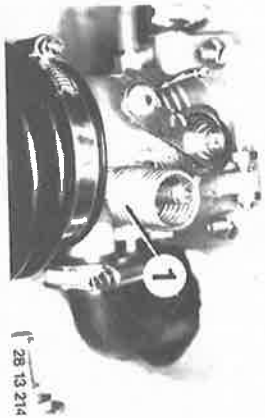


- Remove retainer (1).
Remove washer (2).
Disconnect linkage (3) on lever (4).



- Lift and turn lever (1) to remove tension on spring (3).
Remove lever (1).
Installation:
Check bearing sleeves (2), replacing if necessary.

Take off spring (1).



Important!
Note spring washer (1).



Disconnect spring (1).
Unscrew nut (2).



13-613

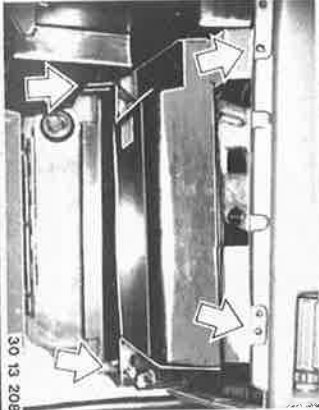
13 61 000 REMOVING AND INSTALLING CONTROL UNIT

Open glove box.
Pull off pins (1) of both retaining straps.



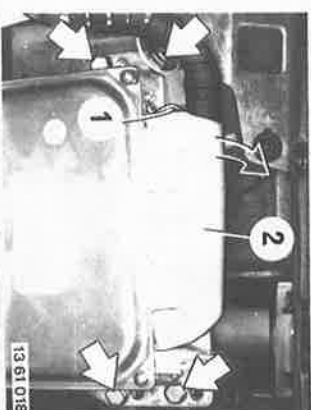
28 13 207

Unscrew trim panel.



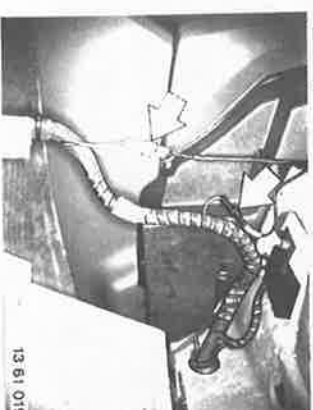
30 13 208

Push back retainer (1) and pull off plug (2).
Unscrew four mounting bolts and take off control unit.

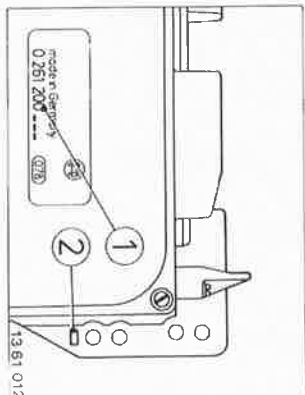


13 61 018

See wiring diagram for plug connections.

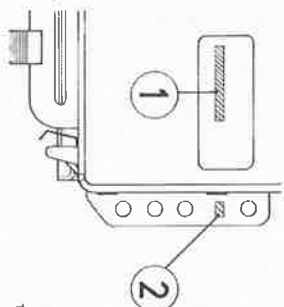


13 61 019



13 61 012

Installation:
Check code number (1)* and manufacturing date (2)*.



13 61 013

* See Specifications + Nom. Value Microfiche

13 - 622

13 62 000 REMOVING AND INSTALLING AIR FLOW SENSOR

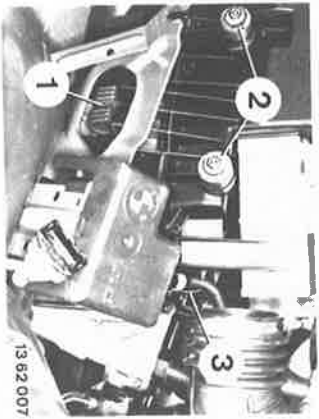


13 62 006:

Since 1985:
Loosen hose strap (1).
Loosen nuts (2).
Pull off hose (4).
Pull off plug (5).

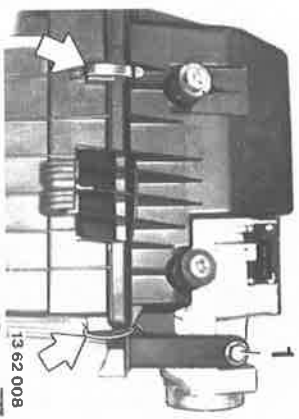
Cut wire strap (3).
Take off complete air cleaner.

Installation:
Check rubber mount (1) and dampers (2),
and make sure of correct fit.



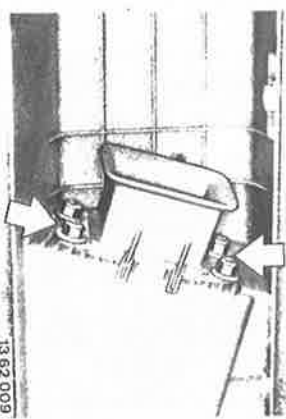
13 62 007:

Open the four clamps.
Unscrew bolt (1).
Take apart housing sections.

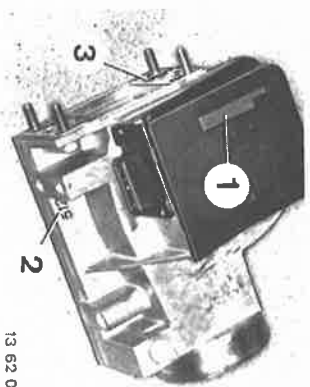


13 62 008:

Unscrew nuts.



13 62 009:



13 62 010:

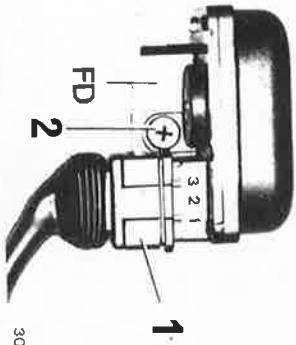
Installation:
Check code number (1)* and manufacturing
date (2)*.
Check engine idle speed* and idle speed CO
level*.
Check gasket (3).
Check air flow sensor*.

* See Specifications and
Nominal Value Microfiche

13 - 627

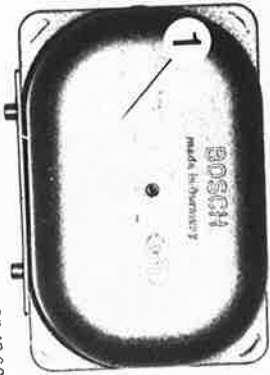
13 62 080 REMOVING AND INSTALLING/ CHECKING PRESSURE SENSOR

Pull off plug (1).
Unscrew screw (2) and take off pressure sensor.
FD = Manufacturing date



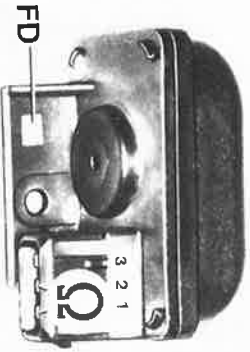
30 13 626

Installation:
Check code number (1)*.



30 13 627

Checking:
There should be approx. 0 ohm between plug connections (1 and 2) with atmospheric pressure of ≤ 880 mbar.
There should be approx. ∞ ohms between plug connections (1 and 2) with atmospheric pressure of ≥ 930 mbar.



30 13 628

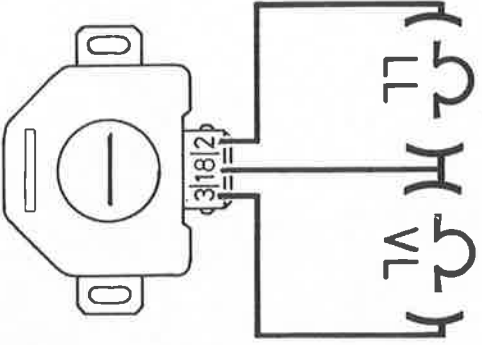
* See Specifications

13-632

13 63 544 ADJUSTING THROTTLE SWITCH

Checking Throttle Switch:
There should be approximately 0 ohm between connections (2 and 18) with throttle closed. With the throttle wide open there must be approximately 0 ohm between connections (3 and 18).

LL = Idle
VL = Full load

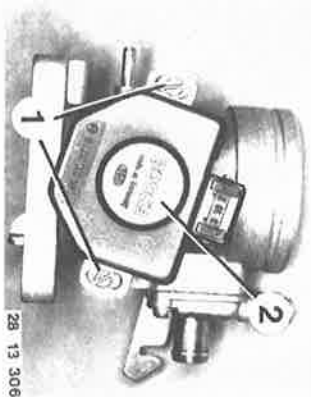


30 13 631



28 13 063

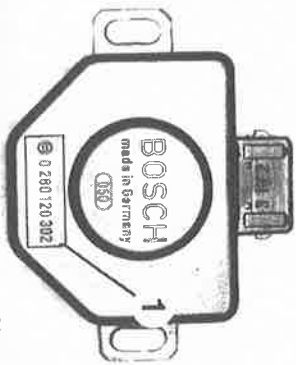
Adjusting:
— Throttle Housing Removed —
There should be approximately 0 ohm between connections (2 and 18) with throttle closed. Adjust by loosening screws (1) and turning the throttle switch.
Open throttle after making adjustment — the resistance value should rise immediately to ∞ ohms.
When releasing the throttle valve, the resistance must drop to approximately 0 ohm.



28 13 306

13 63 551 REMOVING AND INSTALLING THROTTLE SWITCH

Remove throttle housing 13 54 030.
Unscrew screw (1).
Take off throttle switch (2).



30 13 456

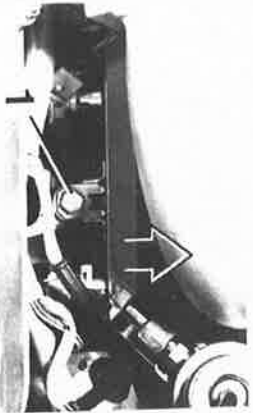
Installation:
Check code number (1)*.
Adjust throttle switch 13 63 544.

* See Specifications

13-643

13 64 501 REPLACING FUEL INJECTORS (New Plug Plate)

Unscrew holder (1).



28 13 055

Unscrew four mounting bolts (1) of the injection pipe. Push up injection pipe until fuel injectors are lifted out of the guide on the intake manifold.

Pull off plug (1) on fuel injector. Lift out retainer (2) and pull fuel injector out of the injection pipe.



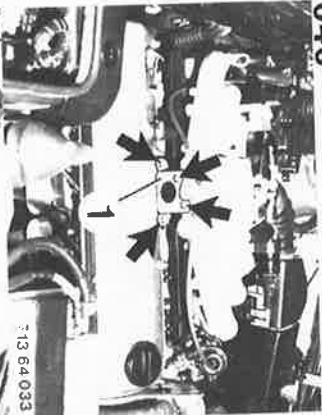
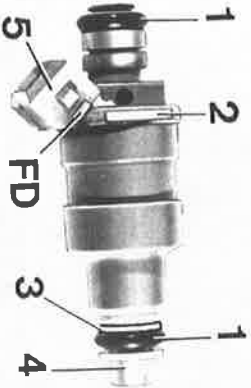
28 13 056

Installation:
Check O-rings (1), replacing when necessary.

Check code number (2)*. Check position of plastic washer (3). Check color* of plug receptacle (5) or injector guard (4). Only coat O-rings lightly with vaseline for installation.

FD = Manufacturing date

30 13 122



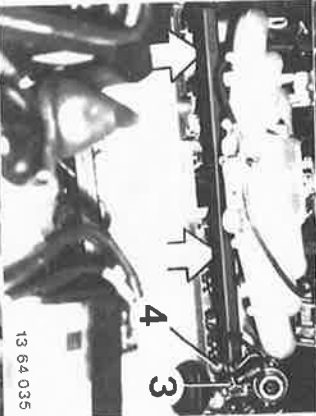
13 64 033

Disconnect plug (2).



13 64 034

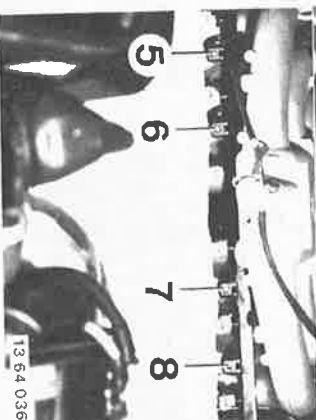
Disconnect coolant temperature sensor plug (3) and DME temperature sensor plug (4). Pull up and remove plug plate.



13 64 035

Unscrew mounting bolts (5 ... 8). Push up injection pipe until fuel injectors are lifted out of the guide on the intake manifold. Remove fuel injectors separately.

Installation:
Check O-rings, replacing if necessary. Only coat O-rings lightly with vaseline for installation.



13 64 036

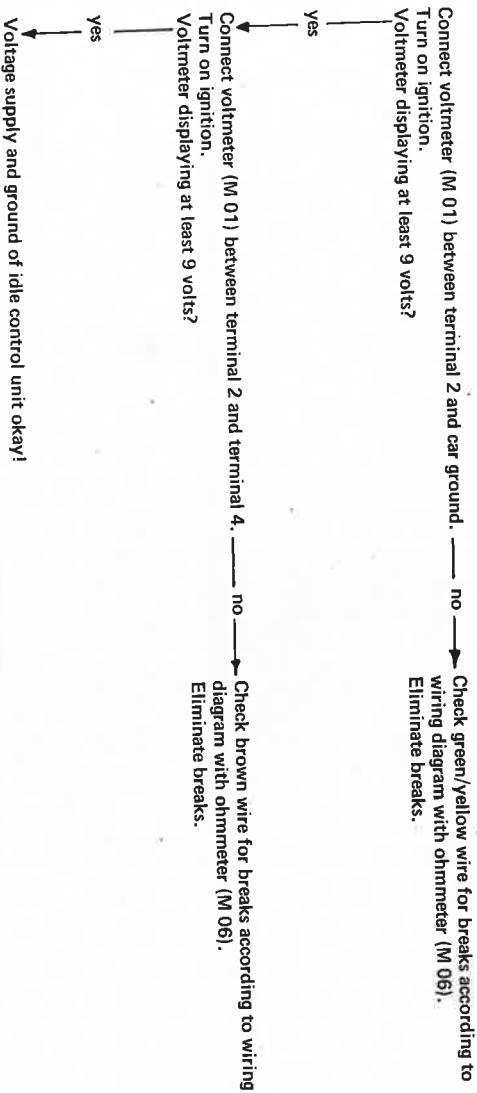
* See Specifications

TROUBLESHOOTING ELECTRONIC IDLE CONTROL (BMW 325 e)

Test Requirements:

Battery charged — battery voltage at least 11.5 volts.
Components must have room temperature = $23 \pm 5^{\circ} \text{C}$ ($73 \pm 9^{\circ} \text{F}$).
Quoted multimeter steps (for example, M 01) refer to the BMW SERVICE TEST.
Measurements are taken on the disconnected plug of the electronic idle control unit.
The following test procedures do not include defects influencing the electronic idle speed control coming from outside the system.

1.) Checking Voltage Supply and Ground of Idle Control Unit



3.) Checking Idle Control Valve

Pull off plug on idle control valve. _____ no → Replace idle control valve.
 Connect ohmmeter (M 06) on idle control valve. Check code number* and color code*
 Ohmmeter displaying 9 to 10 ohms with a component temperature of $23 \pm 5^{\circ} \text{C}$ ($73 \pm 9^{\circ} \text{F}$)?

yes → Connect ammeter (M 03) between idle control valve and _____ no → Check flow of both wires (from control unit to idle wire plug).
 Run engine with operating temperature ** at idle speed. Ammeter displaying 400 to 500 mA? valve) according to wiring diagram with ohmmeter (M 06).
 If there are no breaks, replace control unit.
 Check code number* and color code*.

yes → Run engine with operating temperature** at idle speed. _____ no → Replace idle control valve.
 Pull off wire plug on idle control valve. Check code number* and color code*.
 Engine speed should rise to approx. 2,000 rpm.
 Does engine speed rise?

yes → Reconnect wire plug on idle control valve. _____ no → Replace idle control valve.
 Does speed drop below nominal speed? Check code number* and color code*.

yes → Idle control valve is okay!

* See Specifications
 ** Engine oil temperature at least 60°C (140°F)

5.) Checking Periphery for Warm-up Speed

a) Coolant Temperature Switch

Connect voltmeter (M 01) between terminal 2 and terminal 6. — no —> Turn on ignition. Voltmeter displaying approximately "0" volt with coolant temp. of $\leq 30^{\circ}\text{C}$ (86°F)?

yes

Connect voltmeter (M 01) between terminal 2 and terminal 6. — no —> Turn on ignition. Voltmeter displaying at least 9 volts with coolant temperature of $\geq 48^{\circ}\text{C}$ (118°F)?

Connect ohmmeter (M 06) on "white wire" plug connection of 45°C (113°F) temp. switch and car ground. Ohmmeter displaying at least 100 k-ohms with coolant temp. of $\leq 30^{\circ}\text{C}$ (86°F)?

yes

Check white wire for 45°C (113°F) temperature switch for breaks and eliminate. Check contact pins of 45°C (113°F) temperature switch for tight fit and good contact. Wire and pin contact okay?

yes

Connect ohmmeter (M 06) on "white wire" plug connection of 45°C (113°F) temp. switch and car ground. Ohmmeter displaying approximately "0" ohm with coolant temp. of $\geq 48^{\circ}\text{C}$ (118°F)? — no —> Replace 45°C (113°F) temp. switch. Check code number*.

* See Specifications

Important!
After selecting a drive range (cars with automatic transmission) the nominal idle speed (700 ± 50 rpm) is always regulated.

6.) Preferred Circuit

(cars with automatic transmission)
Connect voltmeter (M 01) between terminal 4 and terminal 7. _____ no → Check blue/brown wire for breaks with ohmmeter (M 06).
Turn on ignition. _____ Eliminate breaks.
Move selector lever of automatic transmission to "N". _____ Check or replace selector lever switch.
Voltmeter displaying at least 9 volts? _____ Voltmeter displaying at least 9 volts?

(cars with manual transmission)
Connect voltmeter (M 01) between terminal 4 and terminal 7. _____ no → Eliminate breaks in blue/yellow wire (from terminal 7
Turn on ignition. _____ to terminal 2).
Voltmeter displaying at least 9 volts?

TEST POSITIONS FOR FUEL INJECTION TROUBLESHOOTING CHART

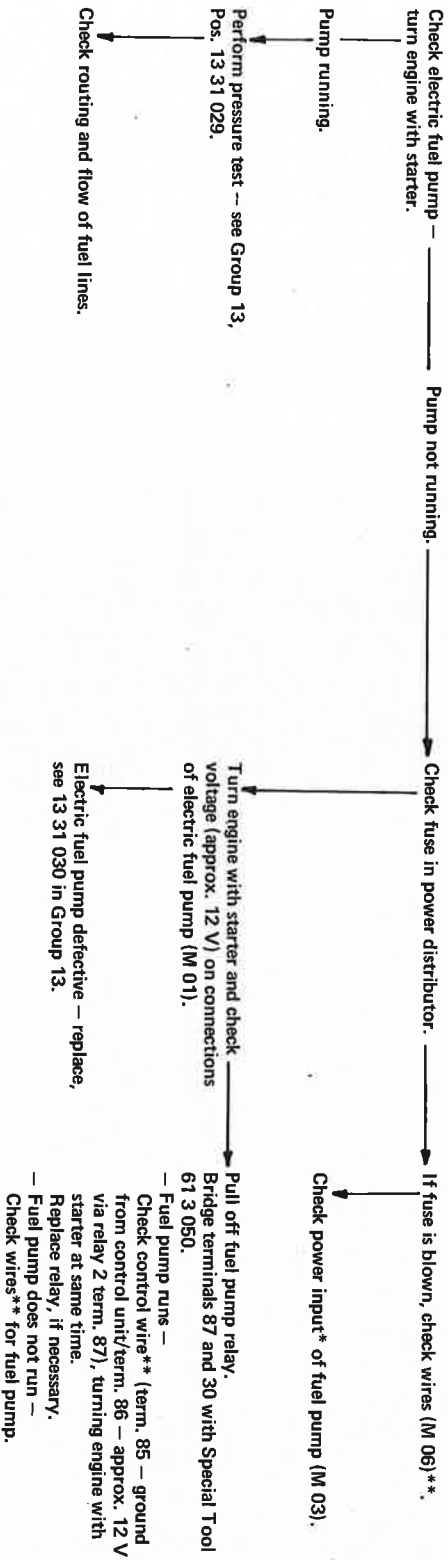
Note:

These points are compiled on the basis of greatest probability, so that under certain circumstances additional tests could be necessary.

Testing instructions refer to the "BMW SERVICE TEST", e.g. engine test step 05 (P 05) or multimeter function (M).
See operating instructions of BMW service test unit for connections.

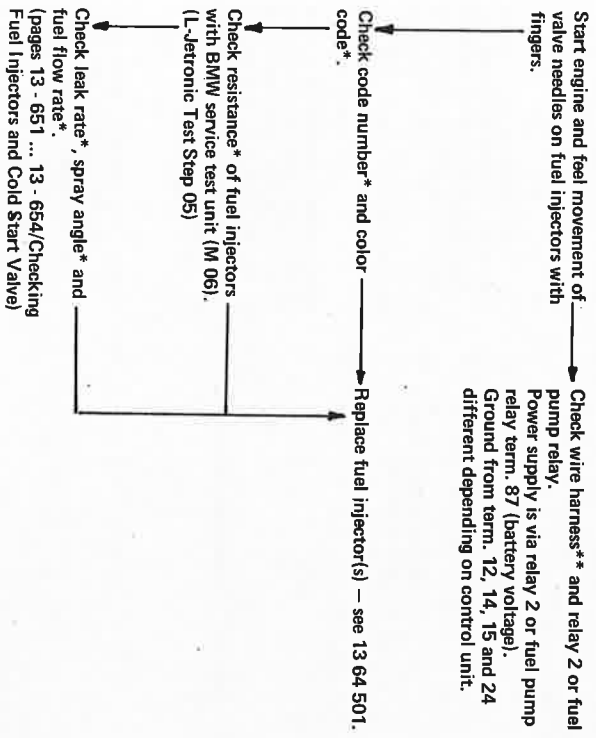
Test Positions 1, 2 and 3 -- FUEL PRESSURE

a) No Pressure



* See Specifications
** See Wiring Diagram

Test Position 6 - FUEL INJECTORS



* See Specifications
** See Wiring Diagram

Test Position 9 - TEMPERATURE TIME SWITCH

Check code number* → Replace temperature time switch.
 Check for tight fit, good contact of → Repair plug contact.
 plug connections and correct level
 of coolant — see Gr. 17 (air bubbles).

Check resistance values* — see → Replace temperature time switch,
 nominal value table (if necessary,
 heat to test temperature in a water
 bath).

Check wires**

NOMINAL VALUE TABLE

| Version | Resistance Values in Ohms Measured Between | | | | |
|---------|---|-----------------------------|------------------------------------|------------------------------------|------------------------|
| | With Temperature Below 0°C | Temperature Above 0°C | Term. G and Ground (Housing) | Term. W and Ground (Housing) | Term. G and Term. W |
| 35° C | + 30 | + 40 | 25 ... 80 | 0 | 25 ... 40 |
| 8 sec. | | | 50 ... 80 | 100 ... 160 | 50 ... 80 |

* See Specifications
 ** See Wiring Diagram

Test Position 12 – THROTTLE SWITCH

13 – 908

Check code number*.
Check switching points – 13 63 544. → Replace throttle switch.
Check connections and wires**.

* See Specifications
** See Wiring Diagram

Test Position 16 - CONTROL UNIT

Check code number* and _____ → Replace control unit, if necessary.
manufacturing date*.

Check tightness of control unit
plug.

Check contact of plug connections.

← Check power supply** and ground
supply**.
(Check control unit with L-Jetronic
test program; not with DME.)

* See Specifications
** See Wiring Diagram

TROUBLESHOOTING DME WITH BMW DIAGNOSING SYSTEM (M 20 Engine)

Insert diskette and connect diagnosing unit on the BMW Service Tester - see operating instructions of BMW DIAGNOSING SYSTEM.

Ignition ON:

Select 01 DME. If applicable carry out brief test (with brief test only display whether there are faults in the system).
Control unit identification appears on the screen after the control unit has taken on the data transmission.

Version E 30 Model Engine Code M 20 B 20 / B 25

MAIN GROUP type of fuel
CODING check - see Specifications or Parts Microfiche
ECE/D country version * *** **
BMW HARDWARE NUMBER ***
SOFTWARE NUMBER * *** **
BOSCH HARDWARE NUMBER * *** **
SOFTWARE NUMBER * *** **
MANUFACTURING CODE ***
Continue to selection survey.

Note:
Also send in a print of the identification (test code) when exchanging a control unit.

Call fault memory - 900.

Status lists may also be called as additional help in troubleshooting.

Status calls

Select 100

Electric fuel pump relay activation

Tank venting valve

Oxygen sensor

Master relay activation

Compressor activation

Air conditioner switch

Drive range P/N (only automatics)

Ignition timing tap (only automatics)

Idle speed switch

Full load switch

Semi-sequential Injection

Relays and valves will be heard and felt when activated.

The switch position shows the ON or OFF position.

Status calls - dynamic
Select 200

| Engine Type | M 20 B 20 | M 20 B 25 |
|---|--------------------------------|-------------|
| Idle speed in rpm ¹⁾ | 760 ± 40 | 760 ± 40 |
| CO level in % by volume ^{1) 2)} | 0.7 ± 0.5 | 0.7 ± 0.5 |
| Ignition timing in crksh. BTDC ¹⁾ | 4 ± 5 | 10 ± 5 |
| Load signal tL in ms ¹⁾ | 2.1 ... 2.5 | 1.9 ... 2.3 |
| Injection time tI in ms ^{1) 3)} | 4.9 ... 5.3 | 4.4 ... 4.8 |
| Shutoff speed in rpm | 6400 ± 40 | 6400 ± 40 |
| Air flow sensor voltage ratio Up/Uv ¹⁾ | 0.2 ... 0.3 % at idle speed | |
| Oxygen sensor voltage | 0.05 to 0.8 V | |

1) Oil temperature > 60° C (140° F) or coolant temperature > 80° C (175° F), no electric equipment switched on, at idle speed.

2) Measured in front of catalytic converter.

3) Valid with semi-sequential Injection. Half this value is valid with parallel Injection (active in diagnosing operation).

Check load signal tL (operating temperature) in car.

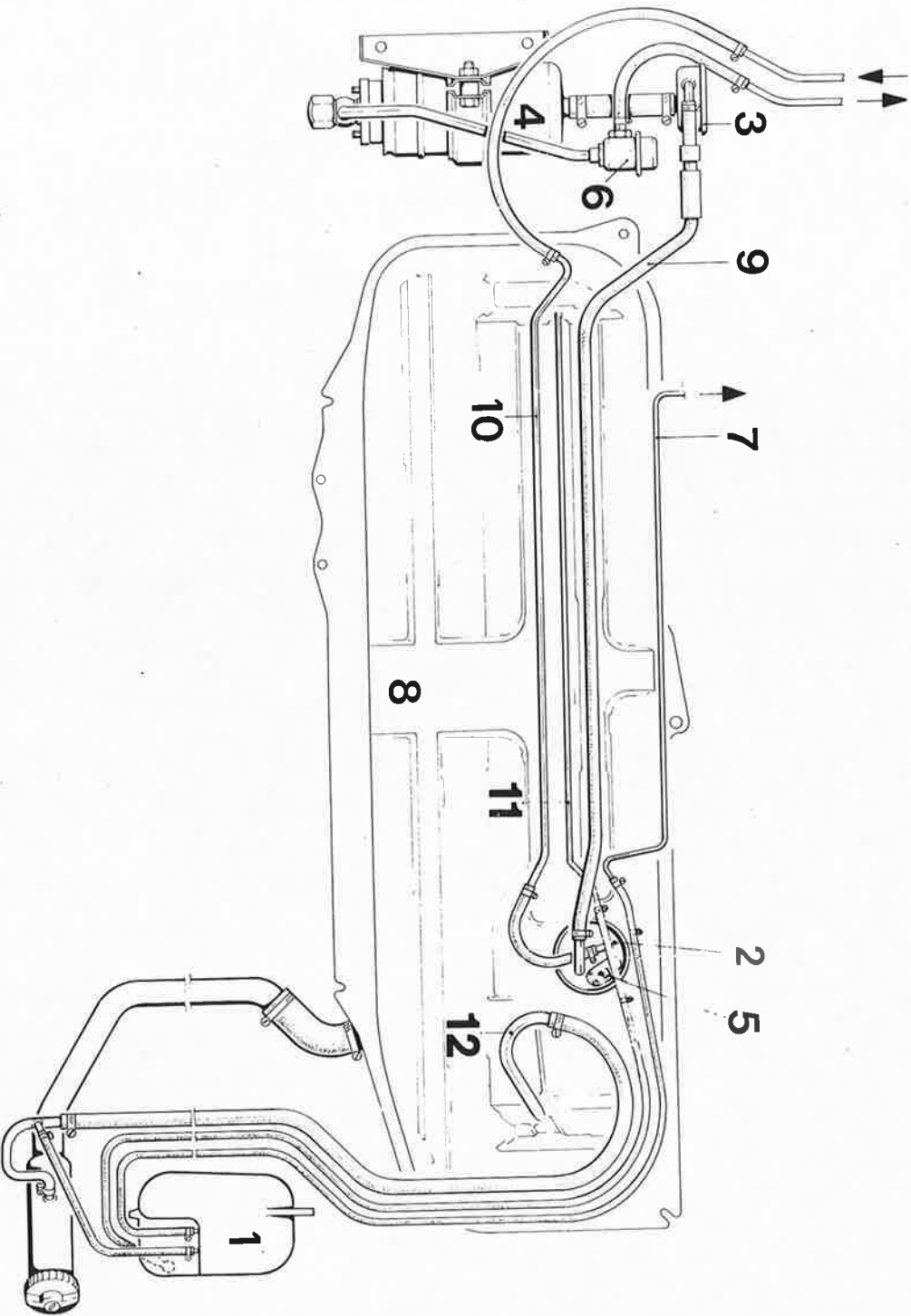
Additional information: see Electrical Troubleshooting Manual (E 34).

16 Fuel Tank and Lines

| | | |
|-----------|--|---------|
| ... | Fuel tank survey — before 1988 models | 16 - 0 |
| 16 11 030 | Fuel tank survey — since 1988 models | 16 - 1 |
| 120 | Fuel tank — remove and install | 16 - 2 |
| ... | Expansion tank for fuel tank venting — replace | 16 - 4 |
| 16 12 002 | Fuel tank venting system — check | 16 - 5 |
| ... | Fuel intake (with integrated transfer pump) — remove and install (before 1988 models) | 16 - 8 |
| ... | Fuel level sender and intake pump — remove and install/dissassemble (since 1988 models) | 16 - 9 |
| 010 | Fuel return pipe — since 1988 models | 16 - 10 |
| ... | Carbon canister — remove and install or replace | 16 - 11 |
| ... | Fuel intake / level transmitter — check | 16 - 11 |

16-0

FUEL SUPPLY - BEFORE 1988 MODELS



- 1 Expansion tank
- 2 Fuel intake
- 3 Damper tank
- 4 Electric fuel pump
- 5 Fuel level transmitter
- 6 Diaphragm damper

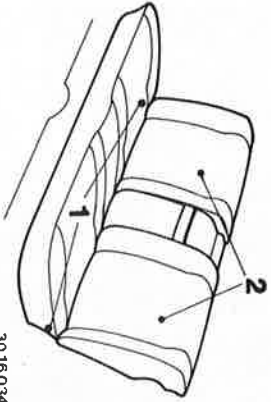
- 7 To carbon canister
- 8 Fuel tank
- 9 Feed hose
- 10 Return hose
- 11 Vent for left tank chamber
- 12 Vent for right tank chamber

30 16 111

16-2

16 11 030 REMOVING AND INSTALLING FUEL TANK

Pull up rear seat cushion and take off insulation sheet.



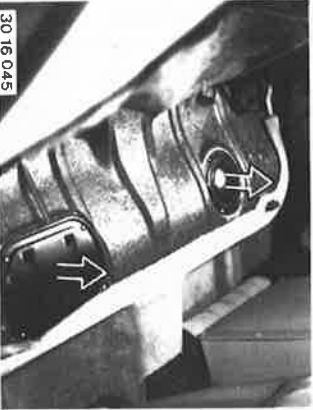
30 16 034

Unscrew cover.
Pull off plug receptacle (1).
Loosen and pull off hoses (1 ... 5).
Installation:
Use new hose clamps.



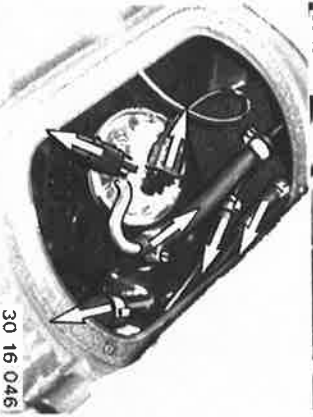
30 16 112

Since 1988 Models:
Unscrew both covers.



30 16 045

Pull off plugs on fuel level transmitter and fuel pump.
Disconnect fuel hoses.



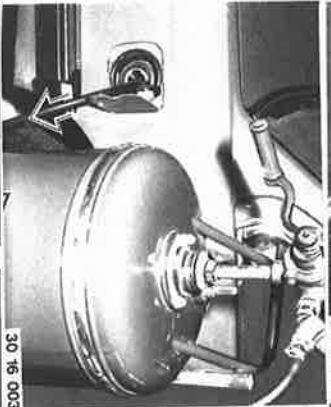
30 16 046

Pull off plug on fuel level transmitter.



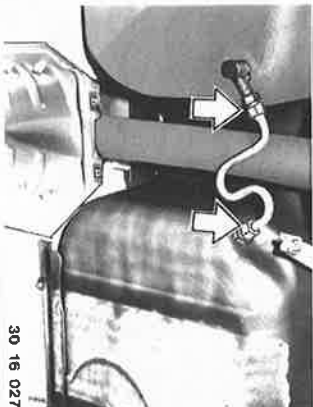
30 16 047

Draw off gasoline with a scavenging pump**.
Caution!
Conform with safety precautions and specifications of pertinent country.



30 16 003

Remove muffler assembly — see 18 12 000.
Remove heat shield and connecting pipe.



30 16 027

Remove propeller shaft — see 26 11 000.
Loosen hose clamp and pull off hose.



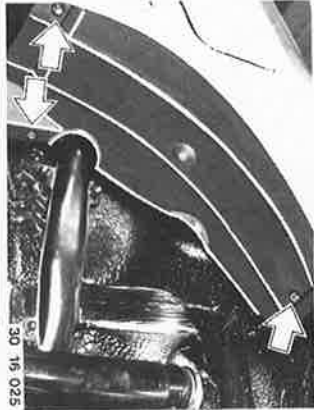
30 16 023

** Source of Supply: HMB

16-4

16 11 120 REPLACING EXPANSION TANK FOR TANK VENTING SYSTEM

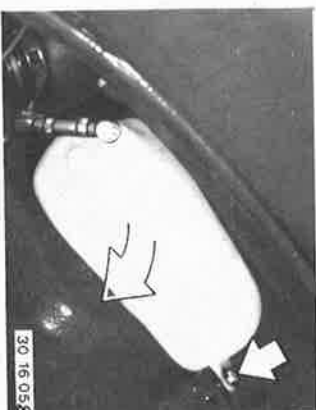
Remove rear wheel — see 36 10 300.
Unscrew wheel house trim panel.
If applicable, draw off gasoline with a
scavenging pump**.



Unscrew expansion tank.
Loosen and pull off hoses.
Installation:
Place pin in guide precisely.
Use new hose clamps.



Since 1988 Models:
Unscrew bolt.
Remove expansion tank.



** Source of Supply: HWB

16-6

(M 20)

1 = Carbon canister

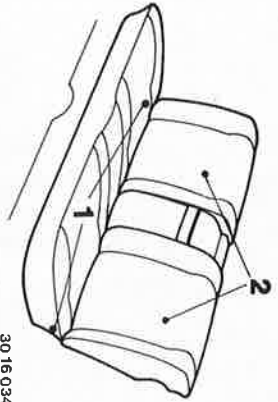
2 = Tank venting valve



16-8

16 12 002 REMOVING AND INSTALLING FUEL INTAKE (with Integrated Fuel Transfer Pump) - Before 1989 Models -

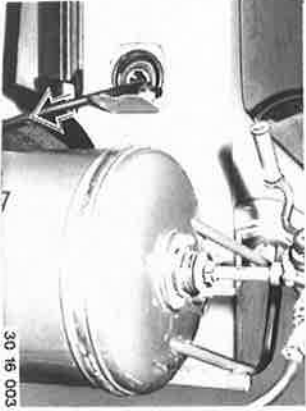
Pull up rear seal cushion (1) and take off insulation sheet.



30 16 034

Draw off about 10 liters (10 quarts) of gasoline from a full fuel tank with a scavenging pump** or unscrew plug and drain this amount.

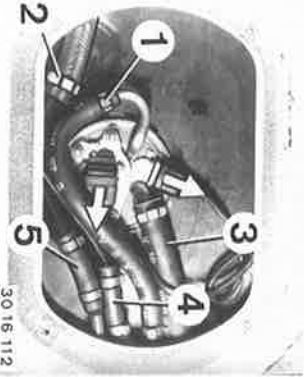
Caution!
Conform with safety precautions and pertinent country legislation.



30 16 003

Unscrew cover.
Pull off plug.
Disconnect hoses (1 and 3).

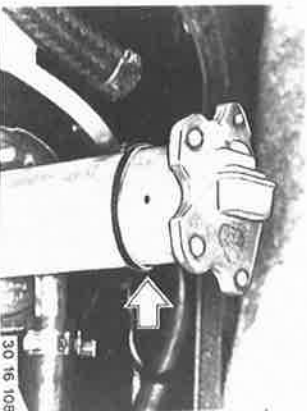
Installation:
Use new hose clamps.



30 16 112

Loosen and pull out fuel level sender slowly.

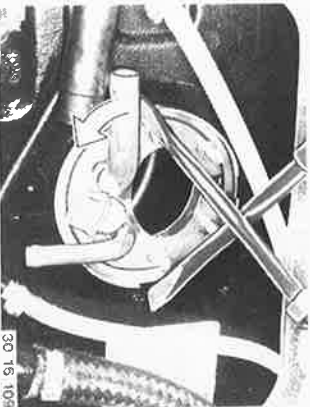
Installation:
Use a new seal.



30 16 108

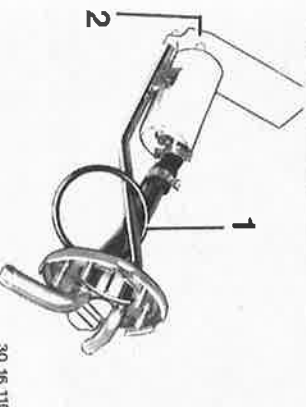
** Source of Supply: HWB

Turn fuel intake counterclockwise and pull out carefully.



30 16 109

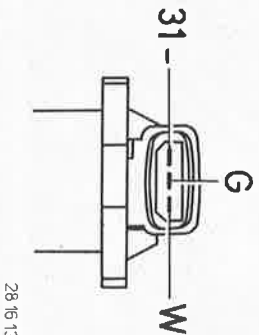
Installation:
Use a new seal (1).
Check filter screen (2) for dirt, cleaning if necessary.



30 16 110

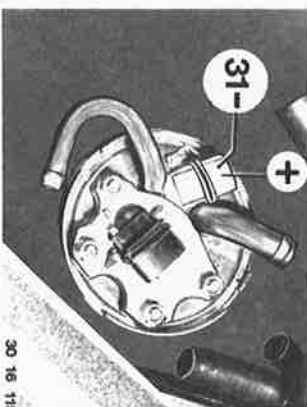
Checking Fuel Level Sender:
Measure resistance* on terminals 31 and G with float in "EMPTY" and "FULL" positions.
Resistance curve must not have breaks.
Connection W must have ground with the float in "EMPTY" position.

G = Sender resistance
W = Warning lamp



28 16 131

Checking Fuel Transfer Pump:
Measure power consumption* of pump.
If necessary, check the delivery pressure*.



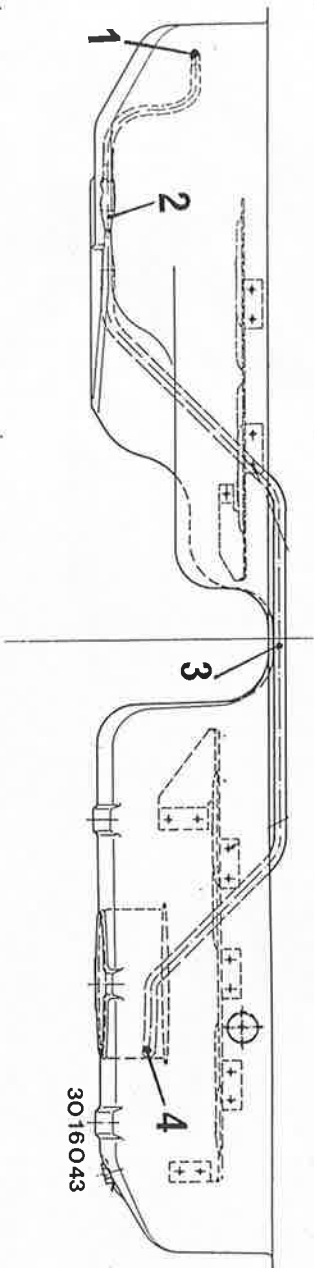
30 16 115

* See Specifications

16-10

16 12 . . . FUEL RETURN PIPE
— Since 1988 Models —

Fuel Tank Survey
(only the bottom tank plate is shown in the
side view for better view)



1 = Return pipe in tank (left tank chamber)

2 = Ejector

3 = Overflow pipe (right tank chamber)

4 = Splash shell



Overflow between the left and right tank
chambers functions to the ejector principle.

1 = Fuel return from engine

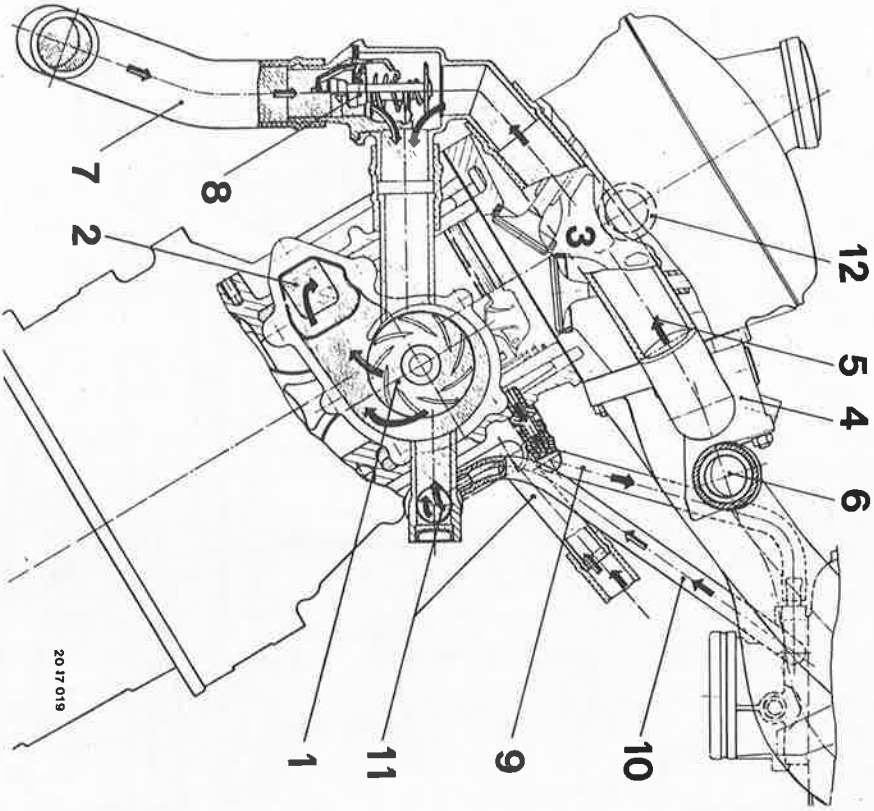
2 = Inlet for fuel from left tank chamber

17 Radiator

| | | |
|-----------|---|--------|
| 17 00 009 | Coolant circuit — BMW 318 i | 17-1 |
| 010 | Coolant circuit — BMW 325 e / 325 i | 17-2 |
| 039 | Cooling system — check for leaks (with tester) | 17-3 |
| 17 11 000 | Leaks between cooling system and combustion chamber — check | 17-3 |
| | Cooling system — bleed | 17-3 |
| | Radiator — remove and install | 17-4 |
| | Radiator — remove and install | 17-4.1 |
| 100 | Oil cooler — remove and install | 17-5 |
| 059 | Coolant expansion tank — remove and install | 17-6 |
| 17 40 000 | Radiator — flush | 17-6.1 |
| | Extra fan assembly — remove and install | 17-7 |

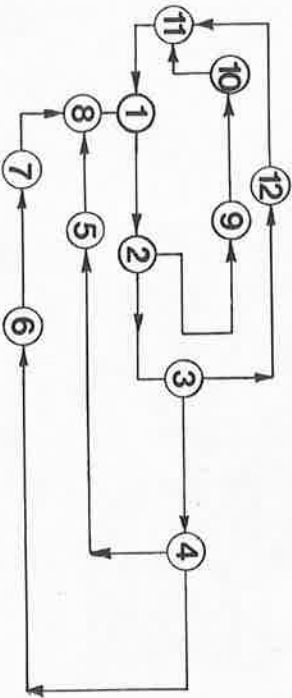
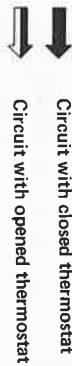
COOLANT CIRCUIT ... BMW 318i

17-1



- 1 Water pump
- 2 Crankcase
- 3 Cylinder head
- 4 Branch flange
- 5 To thermostat
- 6 To radiator

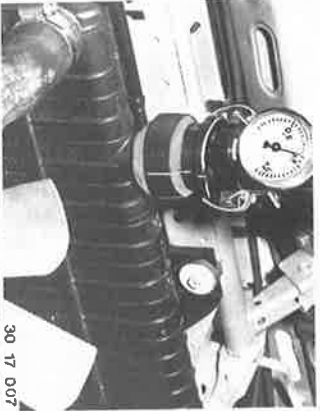
- 7 To radiator
- 8 Thermostat
- 9 To throttle preheating
- 10 Throttle preheating outlet
- 11 To water pump (heater return)
- 12 Heater feed



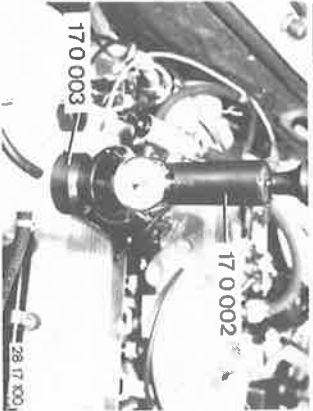
* See Specifications
 ** Source: HWB

17 00 009 CHECKING COOLING SYSTEM FOR LEAKS

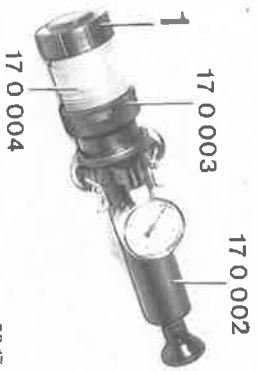
BMW 318 i:
Mount tester 17 0 002 on radiator with adapter 17 0 003 and produce 1 bar (14 psi) pressure.
Cooling system does not have a leak, if there is no considerable pressure drop (max. 0.1 bar or 1.4 psi) after about 2 minutes.



BMW 325 e:
Mount tester 17 0 002 on expansion tank with adapter 17 0 003 and produce 1 bar (14 psi) pressure.
Cooling system does not have a leak, if there is no considerable pressure drop (max. 0.1 bar or 1.4 psi) after about 2 minutes.



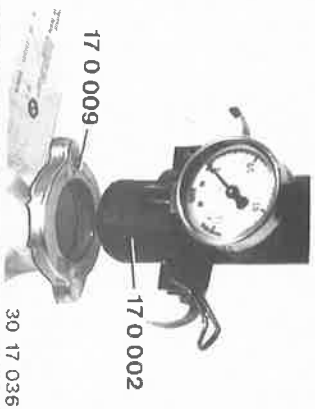
Assemble radiator cap (1), connector 17 0 004, adapter 17 0 003 and tester 17 0 002, and check the opening pressure* of the safety valve.



Lift vacuum valve slightly and check for correct fit.
Check gasket, replacing cap if necessary.

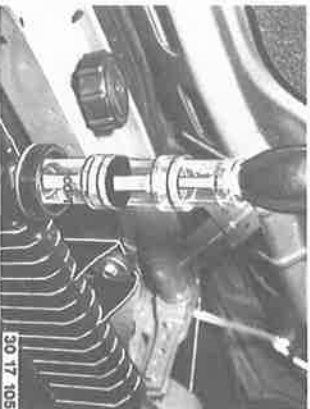


BMW M 3:
Screw adapter 17 0 009 on the expansion tank for connection of tester 17 0 002.



17 00 010 CHECKING FOR LEAKS BETWEEN COOLING SYSTEM AND COMBUSTION CHAMBER

Fill "tester for cylinder head gaskets"*** and carry out test.
Refer to instructions supplied with the tester.



17 00 039 BLEEDING COOLING SYSTEM

BMW 325 e:
Requirements:
Engine at operating temperature.
Heater controls set to "warm".
Engine running at fast idle speed.
Unscrew bleeder screw and tighten again when escaping coolant is without air bubbles.
Keep adding coolant to expansion tank while bleeding.
Use specified coolant**.



Caution!
Danger of injury on turning fan.

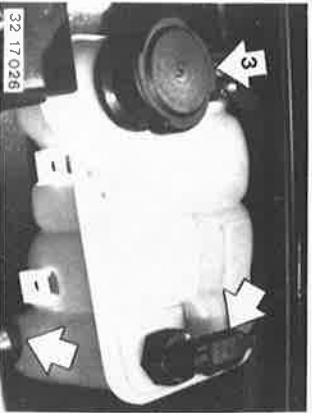
* See Specifications

* See Service Information of Gr. 00
** Source of Supply: HWB

17 - 4/1

17 11 000 REMOVING AND INSTALLING RADIATOR

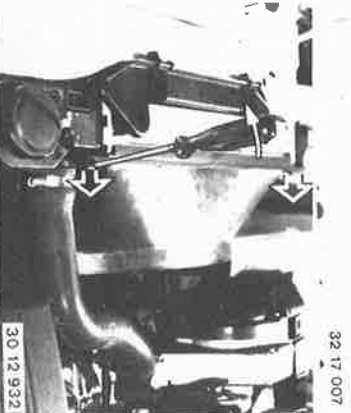
6 Cyl. M 20 / 1988 Models:
UnscREW cap (3) on expansion tank.
Caution:
Danger of scalding when engine is hot!



Loosen drain plug.
Drain coolant, catching if applicable.
Coolant*.
Drain plug tightening torque**.
Caution!
Danger of burns on hot engine.



Press out fan cowl plugs toward rear for M 20 cars.
Remove splash guard if applicable — see 51 47



Disconnect coolant hoses.
Disconnect vent hose.
Installation:
Mount coolant hoses**.



UnscREW upper radiator mounting bolts and lift out radiator.
Installation:
Place radiator on rubber mounts precisely.
Mount coolant hoses**.
Fill cooling system with specified coolant* and bleed — see 17 00 039.

* See Service Information of Gr. 00
** See Specifications

* See Service Information of Gr. 00
** See Specifications

17-6

17 11 100 REMOVING AND INSTALLING COOLANT EXPANSION TANK

Unscrew cap on expansion tank.
Loosen hose clamp (1).
Pull off hose and let coolant run out of tank.

Caution!
Danger of scalding when engine is hot!

Installation:
Add coolant*.
Bleed cooling system – see 17 00 039.

Loosen hose clamp (1).
Pull off hoses (2 and 3).
Unscrew and remove full level sender (4).

Unscrew bolts (1).
Lift out expansion tank.

17 11 100 REMOVING AND INSTALLING COOLANT EXPANSION TANK – 1988 Models –

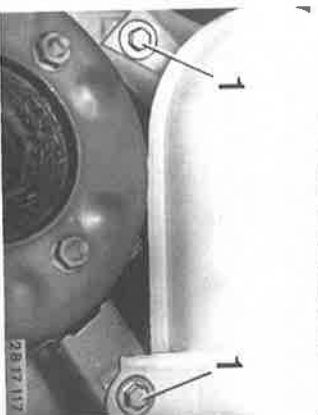
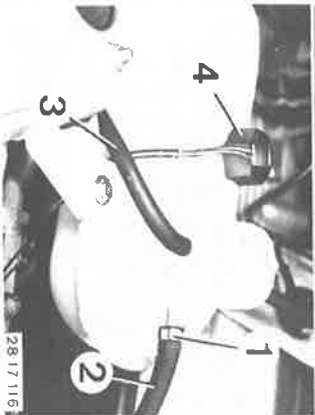
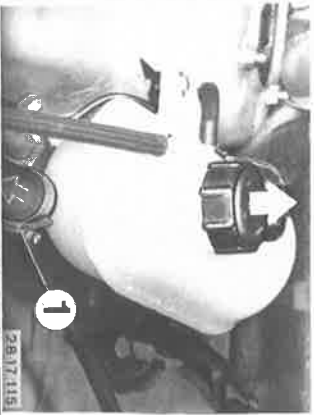
Unscrew cap.

Caution!
Danger of scalding when engine is hot!

Disconnect hose.

Installation:
Replace hose clamps, if necessary.
Tightening torque***.

* See Service Information of Gr. 00
*** See Specifications



Pull rear end of expansion tank out of clips and disengage front end.

Installation:
First slide front end of expansion tank into holder.

Mark on tank shows coolant level at approx. 20° C (68° F) (label).

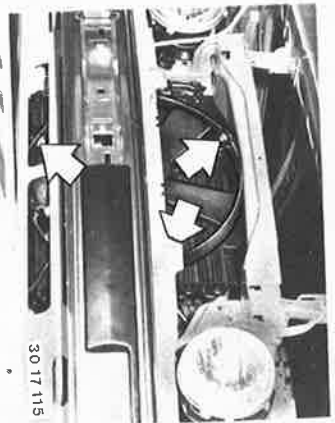
Installation:
Fill cooling system with specified coolant** and bleed – see 17 00 039.

** See Service Information of Gr. 00

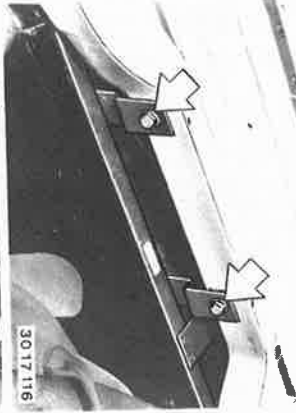
17-7

17 40 000 REMOVING AND INSTALLING EXTRA FAN ASSEMBLY

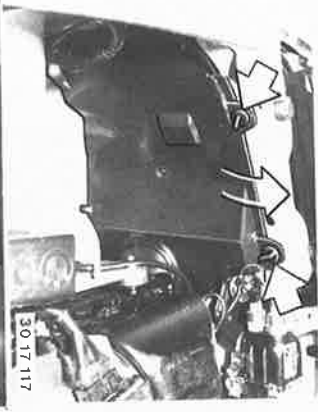
Remove and install radiator 17 11 000.
Remove and install all radiator grill sections
51 13 070.
UnscREW nuts on extra fan.



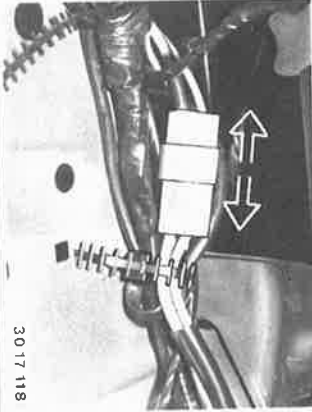
UnscREW condenser.



Lift out trim panel.



Disconnect wire plug.
Tie back condenser and lift out extra fan from
above.



18 Exhaust System

Model 318 i:

| | |
|--|------|
| 18 00 020 Exhaust assembly – remove and install | 18-1 |
| 18 12 031 Final muffler – replace | 18-2 |
| 18 21 011 Pivot sleeves on exhaust carrier – replace | 18-3 |
| 18 32 005 Catalytic converter – remove and install / replace | 18-4 |

Models 325 ... 325 iX:

| | |
|--|------|
| 18 00 020 Exhaust assembly – remove and install | 18-5 |
| 18 12 031 Final muffler – replace | 18-6 |
| 18 32 005 Catalytic converter – remove and install / replace | 18-7 |

Model M 3:

| | |
|---|------|
| 18 00 020 Exhaust assembly – remove and install | 18-8 |
| 18 12 031 Final muffler – replace | 18-8 |
| Exhaust suspension layout | 18-9 |

18 00 020 REMOVING AND INSTALLING EXHAUST ASSEMBLY



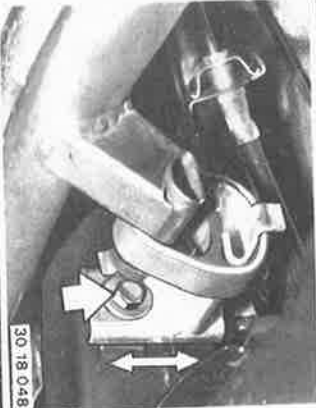
BMW 318i:
 Disconnect oxygen sensor plug (1). Pull out plug downward through the protective tube.
Caution!
 Oxygen sensor must not be damaged. Remove oxygen sensor if there is danger of damaging it.
 Refer to 11 78 012.



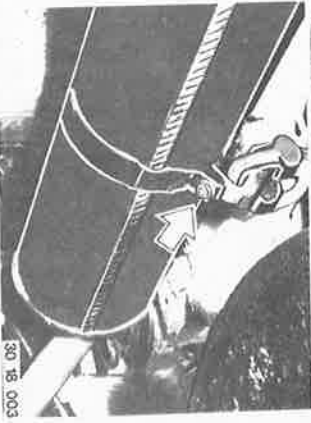
Cars with Automatic Transmission:
 Unscrew nut (2).
Installation:
 Mount the exhaust carrier without tension by adjusting nut (1).

Disconnect suspension on rear axle carrier if necessary.

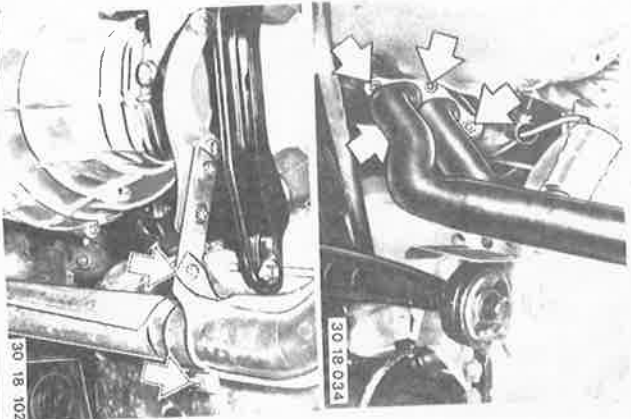
Installation:
 Move holder to adjust only after finishing installation of the exhaust assembly and then tighten to correct torque*.



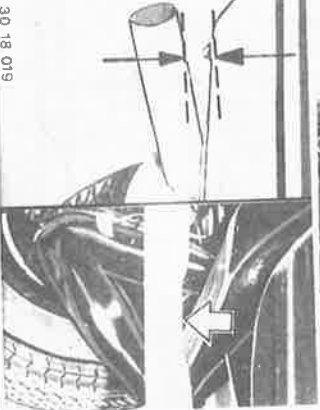
Loosen holder for final muffler.
Installation:
 Torque* holder in such a manner, that rubber ring is preloaded.
 Preload: 6 mm (0.236").
 See exhaust suspension layout drawing.



Take off exhaust assembly.
Installation:
 Check spacing to body and rear axle carrier, correcting if necessary.



Loosen holder for exhaust.
Installation:
 Torque* holder only after finishing installation of assembly (danger of tension!).



* See Specifications

* See Specifications
 ** Source of Supply: HMB

18-3

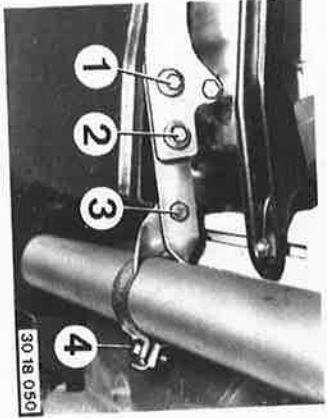
18 21 011 REPLACING PIVOT SLEEVES ON EXHAUST CARRIER

BMW 318 i:

- Unscrew bolts (1 and 2).
- Loosen bolts (3 and 4).

Installation:

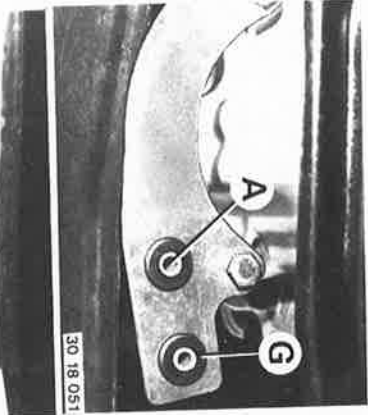
- Tighten bolts and nuts in order of 1 to 4.



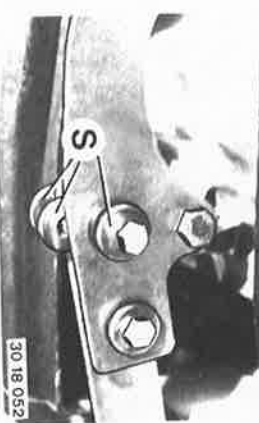
Push out spacers (A) and press out pivot sleeves (G).

Installation:

- Coat pivot sleeves with a lubricant for installation of the spacers.



Install washers (S) as shown in the picture.
Tightening torque*.



* See Specifications

18-5

18 00 020 REMOVING AND INSTALLING EXHAUST ASSEMBLY

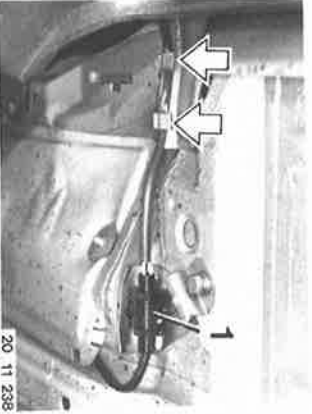
BMW 325 ... 325 iX:

Disconnect oxygen sensor plug (1).
Lift out wire harness.

Floor assembly plug installation.

Installation:

To avoid plug contact problems, seal off plug connection with Three Bond Silicone 1207**.



20 11 238

Disconnect oxygen sensor plug (1).

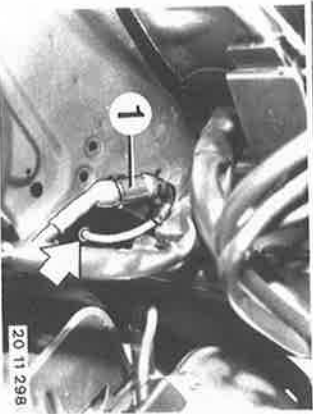
Lift out wire harness.

Right wheel house plug installation.

Caution!

Oxygen sensor must not be damaged.

Remove oxygen sensor if there is danger of damaging it — see 11 78 012.



20 11 298

Unscrew exhaust pipes on manifold.

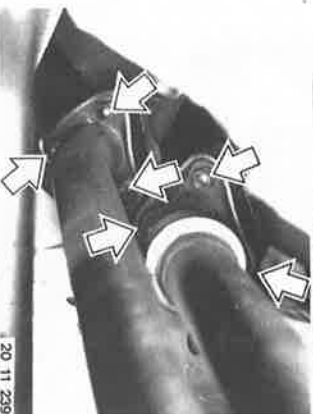
Installation:

Check gaskets, replacing if necessary.

Replace self-locking nuts.

Coat threads with copper paste CRC**.

Tightening torque*.



20 11 239

Unscrew exhaust carrier.

Installation:

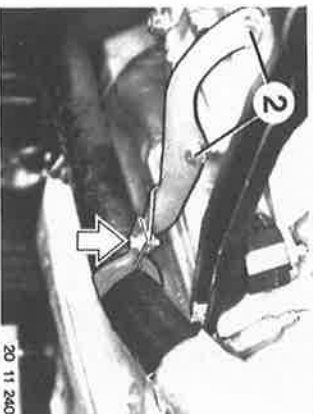
Loosen bolts (2) for installation without tension.

Installation:

Torque holder* only after finishing installation of the exhaust assembly.

(Danger of tension.)

Tightening torque*.



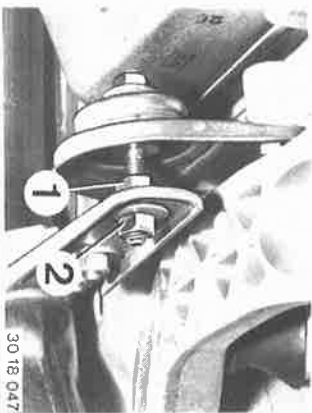
20 11 240

Cars with Automatic Transmission:
Unscrew nut (2).

Installation:

Mount the exhaust carrier without tension by adjusting nut (1).

Tightening torque*.



30 18 047

Loosen holder on rear axle carrier, if necessary.

Installation:

Adjust holder by moving and torque* only after finishing installation of the exhaust assembly.



30 18 048

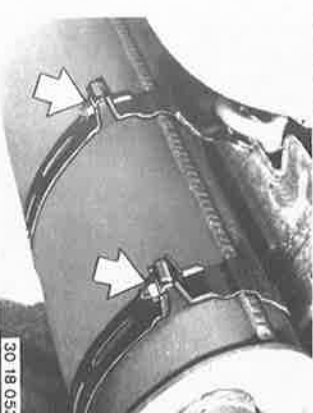
Loosen holder for final muffler.

Installation:

Torque* holder in such a manner, that rubber ring is preloaded.

Preload: 6 mm (0.236").

See exhaust suspension layout drawing.

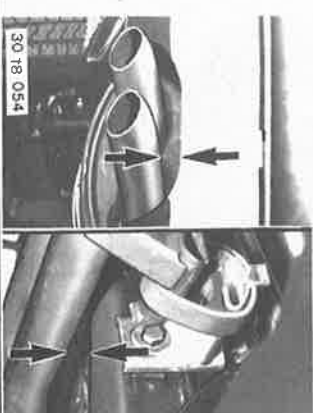


30 18 033

Take off exhaust assembly.

Check installed location.

Provide sufficient spacing to body and rear axle carrier.



30 18 054

* See Specifications

** Source of Supply: HMB

18-7

18 32 005 REMOVING AND INSTALLING OR REPLACING CATALYTIC CONVERTER

6 Cylinder M 20:

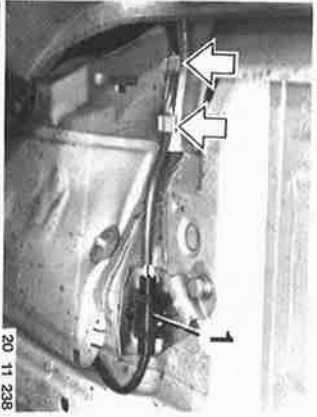
Disconnect oxygen sensor plug (1).

Lift out wire harness.

Installation:

To avoid plug contact problems, seal off the plug connection with Three Bond Silicone 1207**.

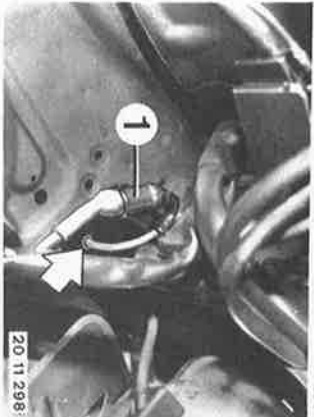
Floor Assembly Plug Installation



20 11 238

Disconnect oxygen sensor plug (1).
Lift out wire harness.

Right Wheel House Plug Installation

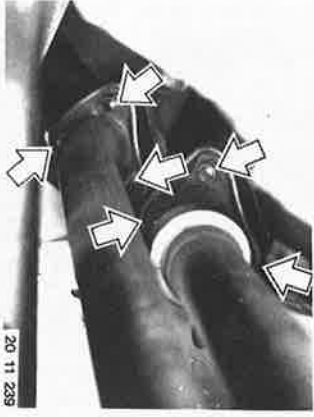


20 11 238

Unscrew exhaust pipes on manifold.

Installation:

Check gaskets, replacing if necessary.
Replace self-locking nuts.
Coat threads with copper paste CRC**.
Tightening torque*.



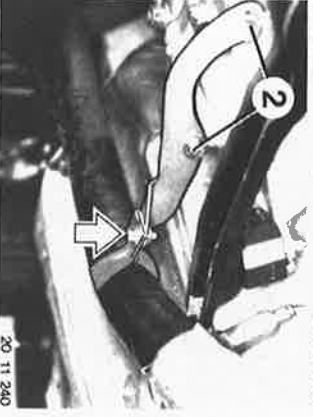
20 11 239

Unscrew exhaust carrier.

Installation:
Loosen bolts (2) for installation without tension.

Installation:

Torque holder to correct torque* only after finishing installation of the exhaust assembly.
(danger of tension)
Tightening torque*.



20 11 240



30 18 047

Cars with Automatic Transmission:

Unscrew nut (2).

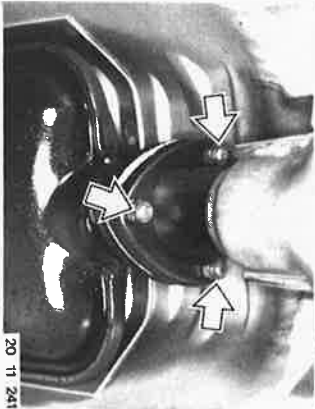
Installation:

Mount the exhaust carrier without tension by adjusting nut (1).
Tightening torque*.

Unscrew catalytic converter on final muffler.

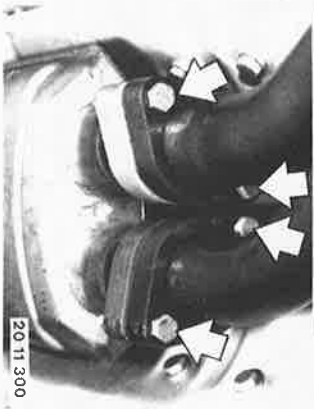
Installation:

Check seals, replacing if necessary.
Replace self-locking nuts.
Tightening torque*.
Three Hole Flange Version



20 11 241

Two Hole Flange Version



20 11 300

* See Specifications
** Source of Supply: HWB

* See Specifications

18-9

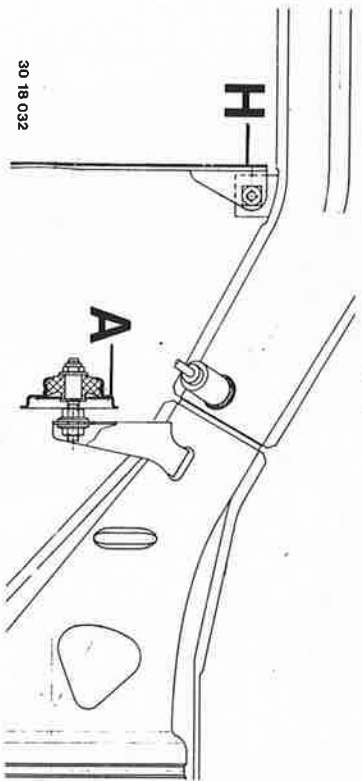
EXHAUST SUSPENSION LAYOUT DRAWINGS

Installation:

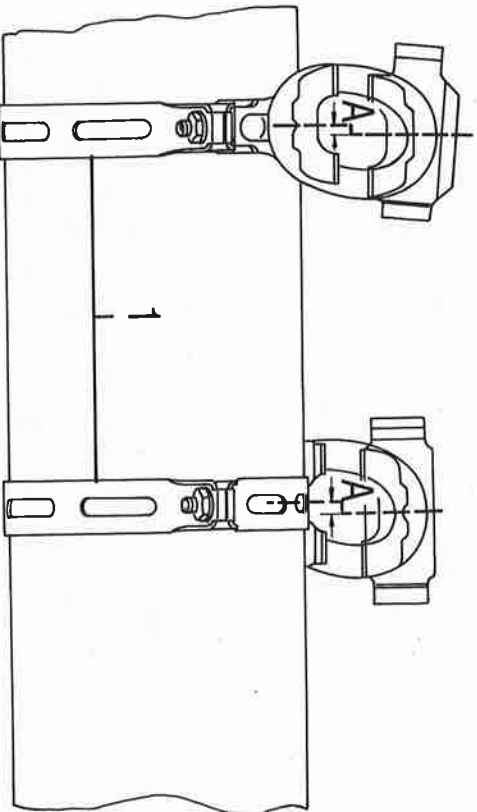
Tighten the exhaust carrier (H or A) only after the exhaust assembly is in correct installed position (danger of tension).

H = Version with manual transmission

A = Version with automatic transmission



Tighten clamps (1) for the final muffler in such a manner, that rubber suspension parts are pre-loaded A = 6 mm (0.236").



30 18 114

