34 Brakes

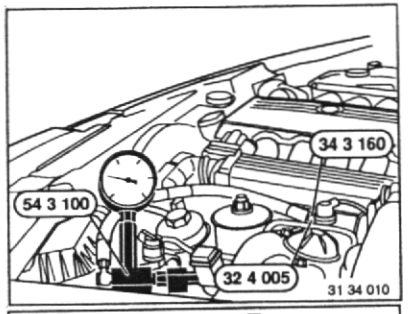
34 00 015	Brake booster – check	34–00/1
	Power flow regulator – check	34–00/2
019	Brakes – check (high and low pressure test)	34–00/2
047	Brakes (ABS) – bleed	34–00/3
	Automatic stability control plus traction (ASC + T) – design and description	34–00/4
	Brake action – check without tester	34–00/5
040	ASC + T mineral oil circuit – fill	34–00/6
...	ASC + T mineral oil circuit – bleed	34–00/6
048	Brakes – fill/bleed (cars with ABS / ASC + T)	34–00/7
...	Brakes – fill (cars with ASC + T)	34–00/9
34 10 014	Parking brake – adjust	34–10/1
34 11 000	Front brake pads – remove and install	34–11/1
519	Front brake calipers – remove and install	34–11/1
552	Front brake calipers – overhaul	34–11/2
220	Front brake disc – remove and install	34–11/3
599	Front brake disc – check runout and thickness deviation	34–11/3
667	Front brake discs – fine grind (both sides)	34–11/3
34 21 200	Rear brake pads – remove and install	34–21/1
745	Rear brake calipers – remove and install	34–21/1
812	Rear brake calipers – overhaul	34–21/2
320	Rear brake disc – remove and install	34–21/3
879	Rear brake disc – check runout and thickness deviation	34–21/3
947	Rear brake discs – fine grind (both sides)	34–21/3
	Brake master cylinder – description	34–31/1
34 31 500	Brake master cylinder – remove and install	34–31/2
34 32 362	Brake pipes – replace	34–32/1
941	Brake hoses, front – replace	34–32/1
991	Brake hoses, rear – replace	34–32/1
	H-31 System – check	34–33/1
34 33 505	Brake booster – remove and install	34–33/2
100	Power flow regulator – remove and install	34–33/3
110	Hydraulic reservoir – remove and install	34–33/3

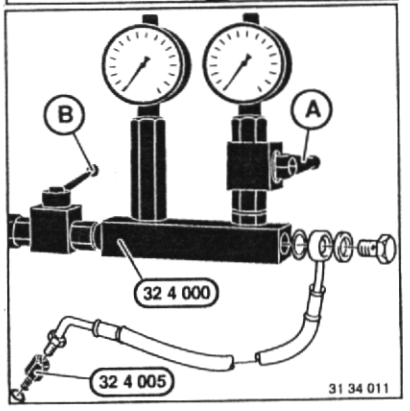
34 Brakes

34 41 000	Parking brake lever – remove and install	34–41/1
	Parking brake lever layout	34–41/2
100	Parking brake cable – remove and install	34–41/3
220	Parking brake shoes – remove and install	34–41/3
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34 51 520	ABS hydraulic control unit – remove and install or replace	34–51/1
	ABS components	34–51/2
525	ASC + T hydraulic control unit – remove and install or replace	34–51/3
540	ASC + T filter – remove and install / clean	34–51/4

34 Brakes

	ASC + T oil circuit	34–52/1
34 52 510	ABS/ASC control unit – replace	34–52/2
61 12 510	Pulse sender (speed sensor for ABS/ASC), front – remove and install or replace	34–52/3
522	Pulse sender (speed sensor for ABS/ASC), rear – remove and install or replace	34–52/3
	Automatic stability control (pipe layout from ABS hydraulic control unit to ASC + T hydraulic control unit)	34–52/4
61 31 570	Relay on ABS hydraulic control unit – replace	34–52/5
	ABS / ASC + T layout	34–52/6
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	ASC + T wiring diagram	34–52/8
	ASC + T displays and operating modes	34–52/9
	ASC + T action diagram / plunger hydraulics	34–52/10



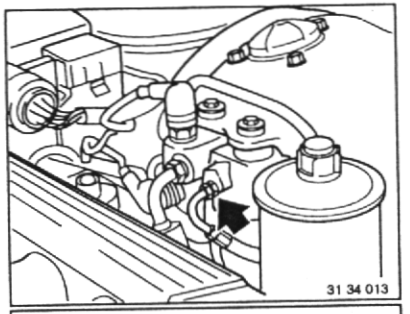


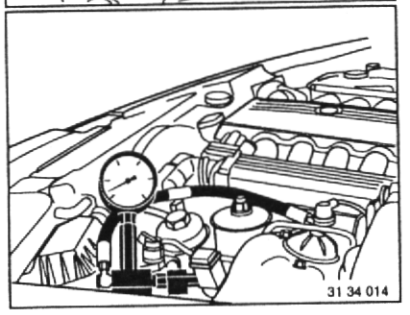
34 00 015 CHECKING BRAKE BOOSTING SYSTEM

Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the engine stopped and a force equal to full stop braking.
Pull off wires and unscrew hydraulic switch.
Mount Special Tools 34 3 160 and 32 4 005.

Installation:
Tightening torque*.

Connect pressure tester 32 4 000 or alternatively 54 3 100 on Special Tools 34 3 160 and 32 4 005.

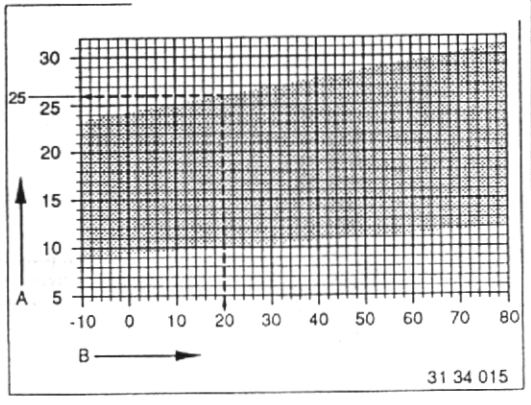




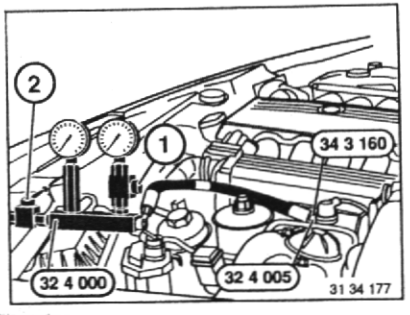
If the reservoir pressure (pressure gage) drops by more than 5 bar (71 psi) within 5 minutes, disconnect the return line on the power flow regulator.
If leak oil runs out of the return line bore on the power flow regulator, the power flow regulator leaks and must be replaced.
If no leak oil runs out and the reservoir pressure still drops, the brake booster has an internal leak and must be replaced.

Hydraulic Reservoir Function Test:
Operate the brake pedal about 20 times to drop the reservoir pressure (pressure gage) to zero.
Start engine and observe the pressure gage, which should immediately show a value from the diagram.
If this value is not reached or exceeded, replace the hydraulic reservoir.

Gas Charging Pressure / Hydraulic Reservoir Temperature Diagram



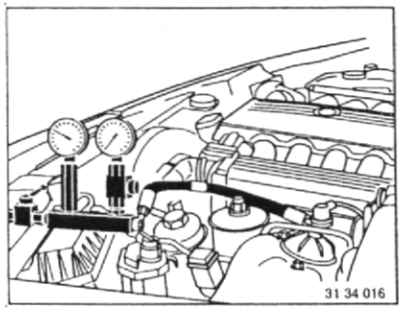
A Gas charging pressure in bar
B Hydr. reservoir temperature in °C
Permissible gas charging pressure of hydraulic reservoir depending on pertinent temperature conditions.



Close both valves (1 and 2).

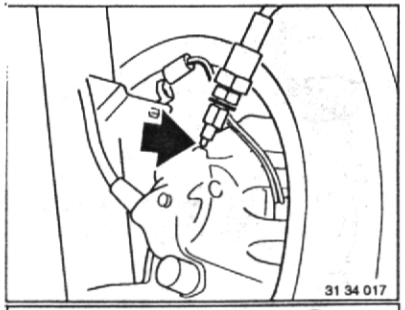
Checking Power Flow Regulator and Brake Booster for Leaks:
Start engine and observe the pressure gage.
Stop engine after reaching the upper switching-off pressure*.

* See Specifications



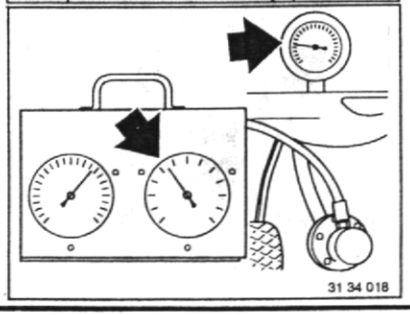
Checking Function of Power Flow Regulator:

Start engine. Pressure continues rising up to the upper switching-off pressure*. Drop the reservoir pressure (pressure gage) to switching-on pressure* by operating the brake pedal with the engine running. Afterwards the power flow regulator switches again to "charging reservoir" (pressure rises again). Replace the power flow regulator, if test values are not reached. Drop the reservoir pressure (pressure gage) to zero by operating the brake pedal about 20 times.
Remove pressure tester and check oil level in supply tank.



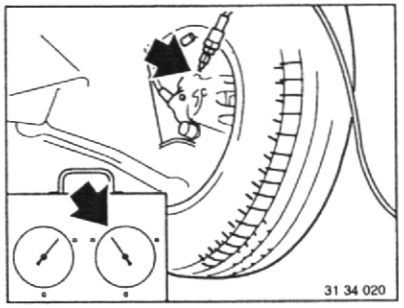
Checking Function of Brake Booster with Tandem Brake Master Cylinder:

Unscrew bleeder screw on caliper. Connect and bleed a pressure tester.



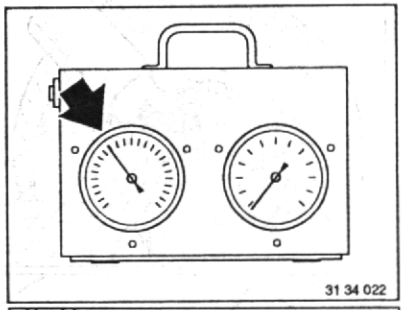
Mount a pedal force meter on brake pedal. Apply a force* on brake pedal with the engine running (full hydraulic reservoir). In so doing the hydraulic line pressure of the service brakes must reach the specified value*. The brake booster must be replaced, if thee values are not reached with the service brakes in perfect operating condition.
Note:
This test does not include the service brake leak test.

* See Specifications



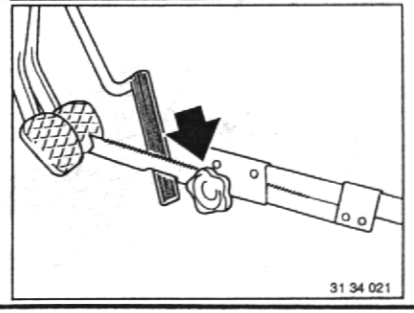
34 00 019 CHECKING SERVICE BRAKE (HIGH AND LOW PRESSURE TESTS)

High Pressure Leak Test:
Discharge the hydraulic reservoir by operating the brake pedal 20 times with the engine stopped and a force equal to full stop braking.
Test both brake circuits.
1st circuit = front right and rear left
2nd circuit= front left and rear right
Unscrew bleeder screw of the 2nd brake circuit. Connect and bleed a pressure tester.



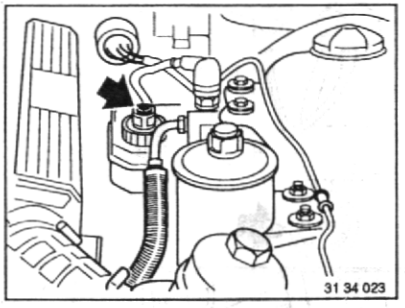
Apply a force* on the brake pedal. In so doing the hydraulic line pressure of the service brakes must show specified pressure*. Pressure may drop by max. 8 % after 2 minutes. Perform same test on the 1st brake circuit.

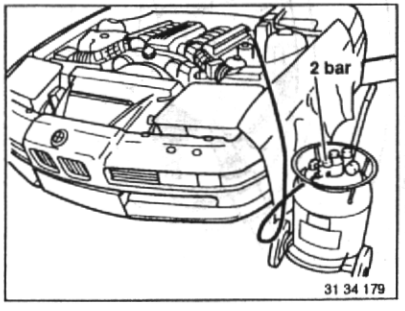
Caution!
Engine must be stopped for the high pressure leak test.



Low Pressure Test:
Test both brake circuits. Take back the pedal prop until testing pressure in the brake system is 2 to 5 bar (28 to 71 psi). Car and tester must remain still, since any motion would produce wrong readings. Pressure must remain constant during the 5 minute test. Check rubber parts, if the pressure drop is considerable. Bleed calipers after finishing the test.

* See Specifications





34 00 047 BLEEDING BRAKES WITH ABS

Important!
Bleeding brakes of cars with ASC+T – see 34 00 ...
Brake fluid* must be replaced annually. Brake fluid is hygroscopic and consequently takes on moisture in the air through a hole in the brake fluid tank. This can drop the brake fluid boiling point to 160 ... 180° C (320 ... 350° F).

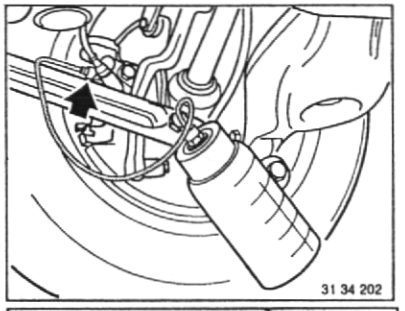
Caution!
Keep brake fluid off of painted car parts – it would damage the paint finish.

Connect bleeder on the brake fluid tank. Refer to operating instructions supplied with pertinent equipment. Charging pressure must not exceed 2 bar (28 psi).**

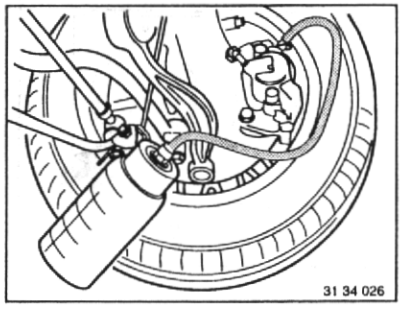
Installation:
Check the cap seal.

Important!
Don't use air flushing.

Depress and hold down the brake pedal.



Connect bleeder hose with bottle on bleeder screw and open bleeder valve on wheel brake, beginning at right rear. Release brake pedal and then operate it 12 times against the stop.



Hold brake pedal down in floored position.
Close bleeder valve.
Release the brake pedal.

Repeat these steps at left rear, right front and left front, as described for right rear.

* **See Group 34 in Operating Fluids for approved brake fluid.**
** **See Workshop Equipment/Planning**

AUTOMATIC STABILITY CONTROL AND TRACTION (ASC + T)

Purpose of ASC + T:
- Easier moving off for driver
- Guarantee of directional stability and steerability
- Improvement of traction (+ T)
- Information for driver

Description of Operation:
The system has the task of regulating the slip of driven wheels to the lowest possible value regardless of the road surface condition.

Engine torque is reduced via DME (ignition timing correction) and EML (throttle valve correction) during regulation. If this is not sufficient, the drive wheel rotating too fast will be slowed down by the wheel brake via a hydraulic element of the plunger hydraulic unit.

The system is switched on automatically after starting the engine and can be switched off manually. The ASC lamp is off with the system switched on.

The ASC lamp in the instrument cluster flashes to inform the driver when regulation has been activated.
If the ASC lamp is on continuously, the system was switched off automatically because of a fault or was switched off manually.

Note:
Troubleshooting – see Car Electric/Electronic Test Plan.

Important!
Pull off the ASC + T control unit plug before starting the engine for the first time after working on the oil supply tank, tandem pump, high pressure filter, ASC + T hydraulic control unit and corresponding connection lines.
Reconnect control unit plug with the ignition turned off after the engine has run 1 minute.

Switch off ASC+T when testing on a brake roller test stand pr dynamometer test stand!

Brake Engaging Function Test without Tester

(car on lifting platform) "wheels clear floor"

Test Step:
Left rear wheel turns freely,

Engage "NEUTRAL".

Start engine.

Regulate engine speed to 2,000 ± 100 rpm with help of accelerator pedal or EML adapter, Special Tool 12 7 010 – also refer to 12 70 500.

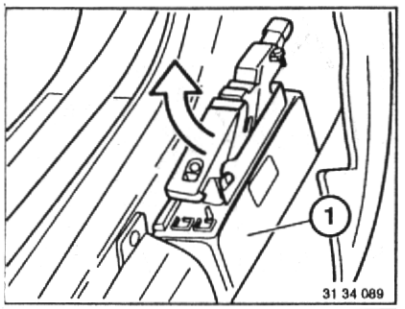
Left rear wheel accelerated quickly in forward direction by hand (possibly hold right rear wheel for test).

Reaction:
Left rear wheel is braked noticably.

Test Step:
Repeat test with right rear wheel.

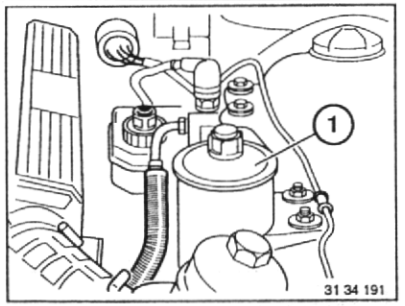
34 00 040 FILLING ASC + T MINERAL OIL CIRCUIT

1. Filling Procedures
The mineral oil circuit must always be filled after filling the brake system.



Step 1:
Turn ignition off.
Disconnect ABS/ASC + T control unit (1) on wire connector.

Location:
In side member, inside of driver's side left.



Step 2:
Fill mineral oil circuit with Pentosin CHF 7.1 via a mineral oil supply tank (1) manually.

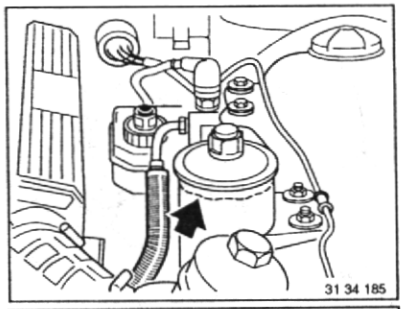
Important!
Also refer to filling and bleeding power steering in 32 13 006.

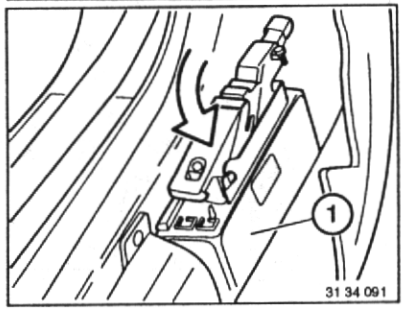
Step 3:
Start and run engine at idle speed for 60 seconds (all pipes/hoses are filled).

34 00 . . . BLEEDING ASC + T MINERAL OIL CIRCUIT

1. Bleeding Procedures
The mineral oil circuit (plunger primary circuit) must always be bled before bleeding the brake circuits.

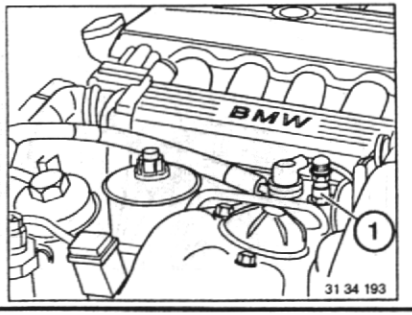
Important!
Correct the fluid level while bleeding.



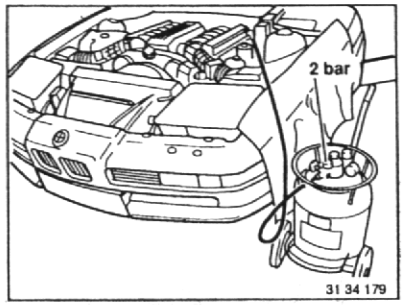


Step 1:
Reconnect the ASC + T/ABS control unit (1).

Step 2:
Start and run engine at idle speed at least 30 seconds (ASC + T plunger reservoir is charged).



Step 3:
Loosen bleeder screw (1) on the ASC+T plunger hydr. control unit.
Catch escaping mineral oil in a suitable container.
Tighten bleeder screw again when escaping mineral oil is without air bubbles (after approx. 15 seconds.
Correct fluid level in mineral oil tank (see Group 32).

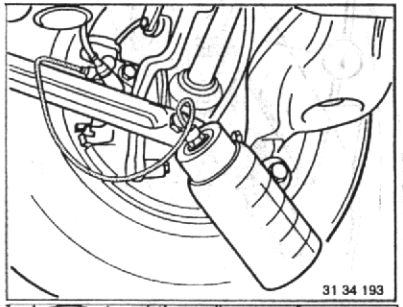


34 00 048 FILLING AND BLEEDING BRAKES OF CAR WITH ABS/ASC + T

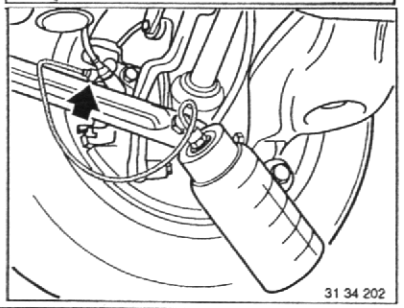
Important!
If only the brake fluid is replaced, bleed as described for ABS – see 34 00 047.

Note:
Brake circuits (plunger secondary circuits) must always be bled after bleeding the mineral oil circuit.

Note:
Refer to general specifications – see 34 00 047.

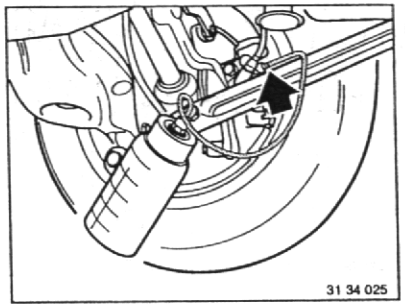


Step 1:
Connect bleeder* according to instructions (2 bar/28 psi charging pressure). Connect bleeder hose with bottle on bleeder valve of wheel brake, beginning at right rear.

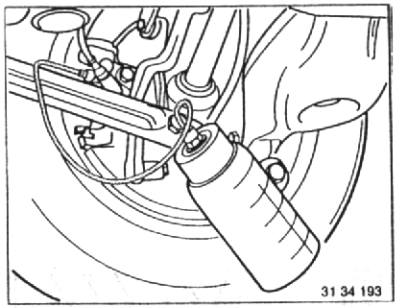


Step 2:
Open right rear bleeder connection and flush brake circuit for 120 seconds (flushing volume: approx. 100 cc).

* See Workshop Equipment/Planning

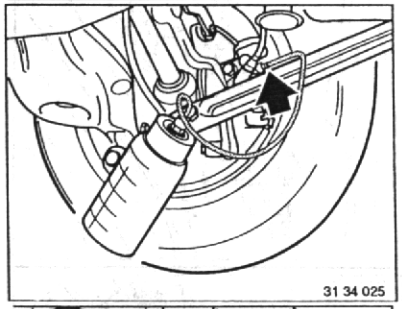


Step 3:
Repeat step 2 on left rear wheel.

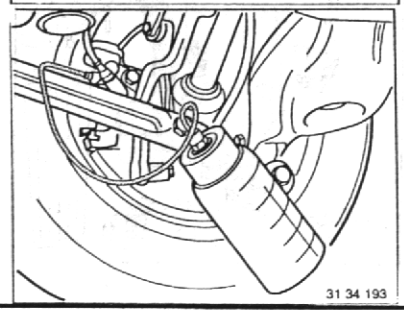


Step 4:
Operate brake pedal 20 times to the following plan with an active bleeder and opened right rear bleeder screw.
- **Depress pedal quickly.**
- **Hold pedal down for 2 to 3 seconds.**

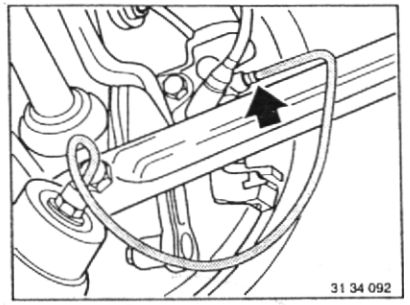
(Time for entire procedure: about 120 seconds / flusing volume: approx. 120 cc)



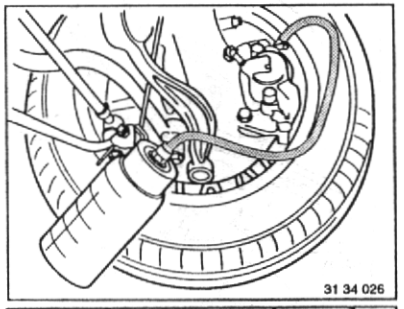
Step 5:
Repeat step 4 on left rear wheel.



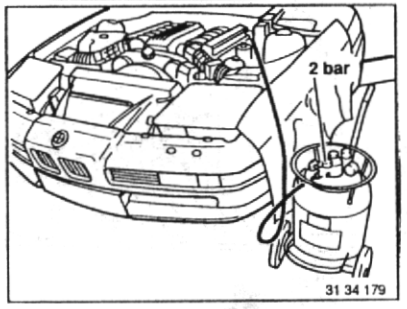
Step 6:
Build up pressure to about 100 ... 110 bar (1425 ... 1560 psi) per brake pedal (= hard pressure point on brake pedal, brake booster control point) with an active bleeder and closed bleeder screw, then open right rear bleeder screw and close it again. Repeat this step 10 times (time for entire procedure = about 60 seconds / flushing volume = approx. 75 cc).



Step 7:
Repeat step 6 on left rear wheel.



Step 8:
If filling* of car is replaced, repeat steps 2, 4 and 6 in analogous manner for left front and right front wheels.

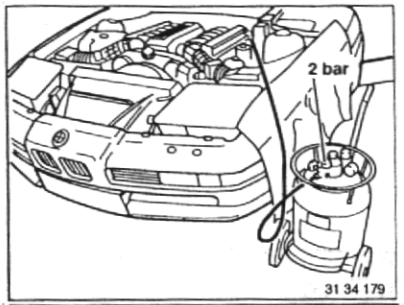


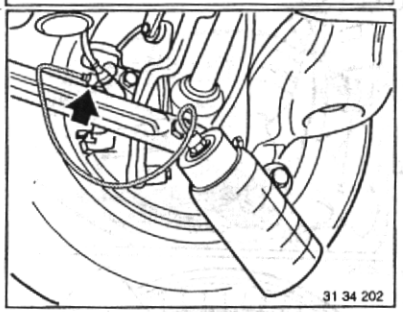
Step 9:
Disconnect bleeder on brake fluid tank. Check brake fluid level, correcting if necessary.

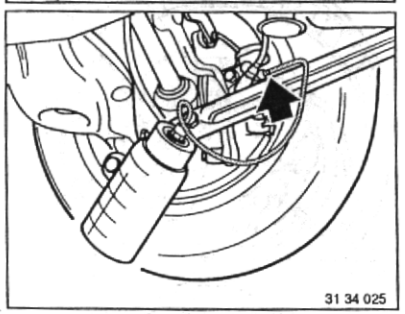
Important!
Store brake fluid only in original containers.

Caution!
Never refill containers or use them for other liquids. Danger of poisoning if swallowed. Keep containers closed and stored out of reach of children.

* **See Group 34 of Operating Fluids for approved brake fluid.**







34 00 048 FILLING BRAKE SYSTEM OF CARS WITH ASC + T

Step 1:
Connect bleeder (2 bar / 28 psi charging pressure) on brake fluid tank to instructions and activate it.

Step 2:
Open right rear wheel bleeder screw and wait until brake fluid without air bubbles runs out before closing the bleeder screw.

Step 3:
Repeat step 2 on left rear wheel.
If filling of car is replaced, repeat again on left front and right front wheels.

34 10 014 ADJUSTING PARKING BRAKE

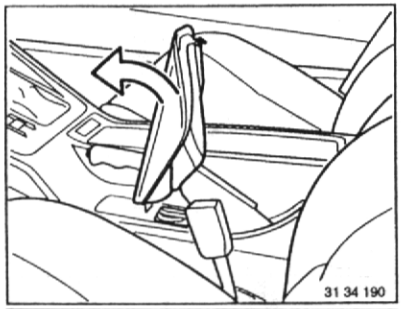
Note:
The parking brake system, which is completely independent of the service brakes, is subjected to only limited wear since the parking brake is not applied in normal driving situations. Consequently friction torque drops, e.g. because of brake drum corrosion or dirty liners. The force required for operation will increase proportionally. To reach optimum effeciency from the parking brake, normally it will be sufficient to drive the car max. 400 meters (1300 feet) with the parking brake applied (lever pulled until resistance is felt and then one catch further).

A requirement is that both parking brake cables move easily.
Parking brake must be adjusted when parking brake lever can be pulled up by more than 8 teeth.

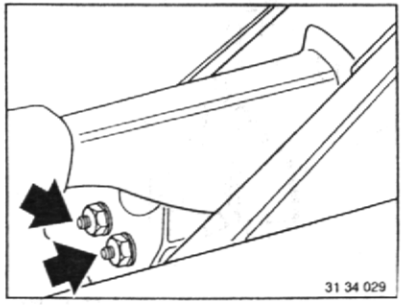
ndbremssystem unterliegt nur
e im normalen Fahrbetrieb nicht
B. durch Korrosion der Brems-

Betätigungskräfte.
rreichen, genügt es in der Regel, wenn das Fahr-
ls Widerstand spürbar und eine Raste weiter

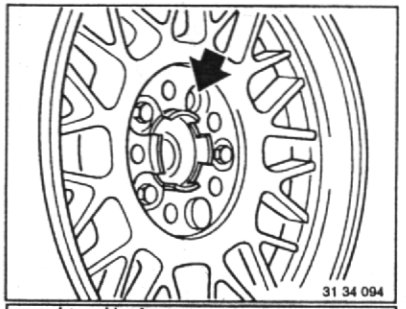
Voraussetzung ist, beide Handbremsbowdenzüge müssen leichtgängig sein.
Die Handbremse muß nachgestellt werden, wenn sich der Handbremshebel mehr als 8 Zähne anziehen läßt.


31 34 190

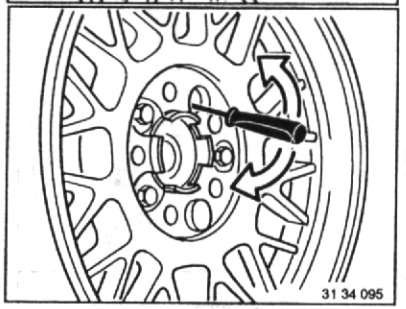
Lift out cover sleeve.


31 34 029

Unscrew adjusting nuts.
Use Special Tool 34 1 030.

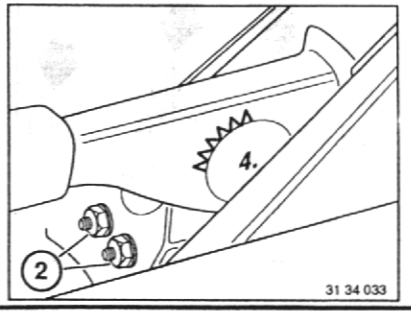

31 34 094

Unscrew and remove one wheel bolt on each rear wheel.
Turn wheel to adjusting position.


31 34 095

Turn adjusting nut clockwise until it is no longer possible to turn the wheel. Then back off adjusting nut 4 to 6 teeth.
Wheels must turn easily.

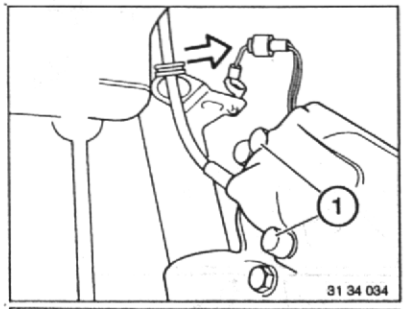
Important!
Remove rear wheels (see 36 10 300), if adjusting nuts are hard to turn.
If applicable, remove brake discs.



31 34 033

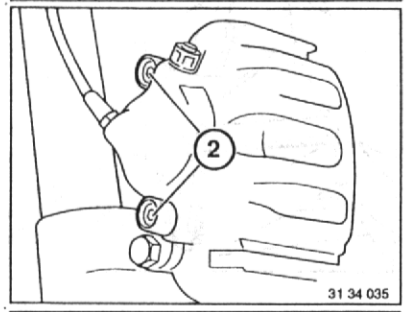
Pull up parking brake lever 4 teeth and turn adjusting nuts (2) until the left and right rear wheels can just barely be turned uniformly.
Lock adjusting nuts with locknuts.
Release the parking brake lever and check whether the wheels can be turned easily.

Note:
Parking brake control lamp must light up at 2nd tooth; correct the setting if necessary.



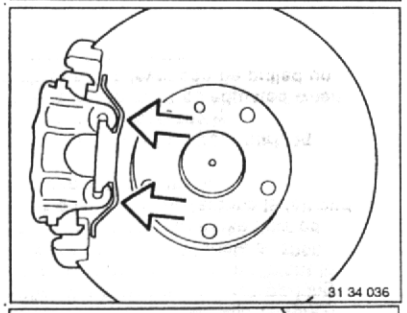
34 11 000 REMOVING AND INSTALLING FRONT BRAKE PADS

Remove front wheels.
Press off plastic caps (1).
Left:
Pull off plug for brake pad wear indicator.

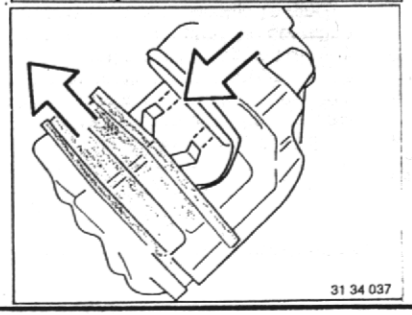


Unscrew guide bolts (2).

Installation:
Only clean guide bolts – don't lubricate them.
Inspect threads.
Replace guide bolts not in perfect condition.
Tightening torque*.

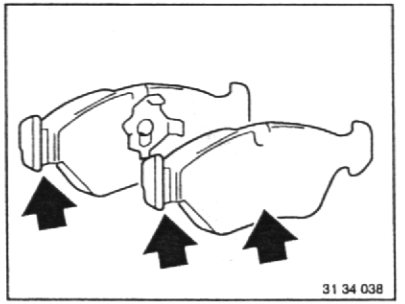


Press off clamp.
Pull off brake caliper forward.

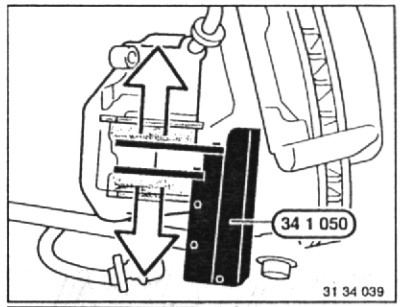


Take off outer brake pad.
Inner brake pad is located with a spring in the piston.

* See Specifications

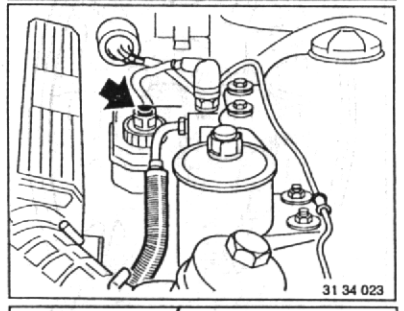


Important!
The brake pads of both brake calipers on one axle must always be replaced together.
Check make*.
Apply a light coat of Plastilube** on the backs of brake pads at points of brake piston contact.



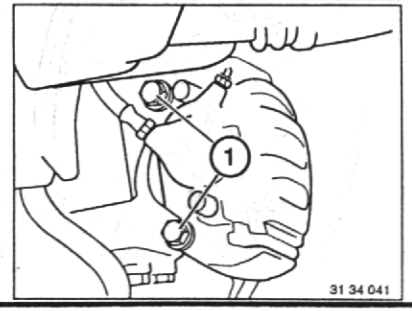
Installation:
Push back piston completely with Special Tool 34 1 050.
Clean brake pad guides and recesses with a brush**.

Caution!
Extract pad abrasion – never remove by blowing it off. Check dust cover for damage. Lubricate guides lightly with Plastilube**.



34 11 519 REMOVING AND INSTALLING FRONT BRAKE CALIPER

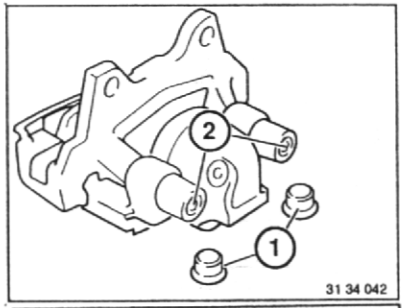
Remove front wheel.
Draw off brake fluid with a syringe reserved exclusively for use with brake fluid.
Disconnect brake pipe.



Unscrew bolts (1).
Left:
Unplug the brake pad wear indicator.
Pull off brake caliper forward.

Installation:
Tightening torque*.
Bleed brakes – see 34 00 047.

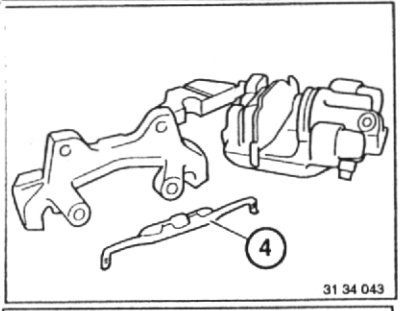
* See Specifications
** Source of Supply: HWB



34 11 552 OVERHAULING FRONT BRAKE CALIPERS
(use repair kit)

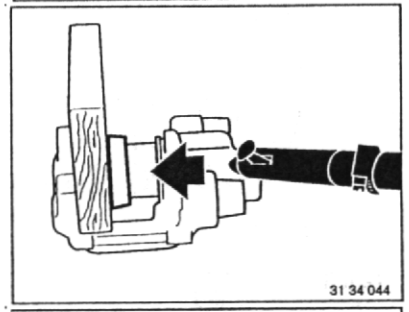
Remove caliper – see 34 11 519.
Press off plastic caps (1).
Unscrew guide bolts (2).

Installation:
Only clean guide bolts – don't lubricate them.
Check guide bolts, replacing if necessary.
Tightening torque*.



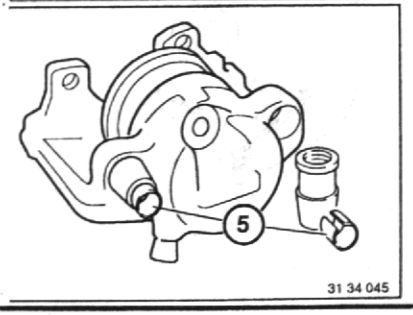
Disassemble caliper.
Remove brake pads.

Installation:
Press out brake pads completely before inserting spring (4).



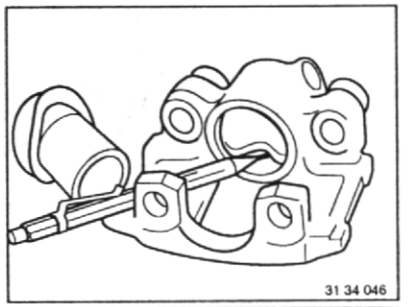
Press off rubber cap and clamping ring.
Place a liner (piece of hard wood, hard felt or something similar) in caliper recess to protect the piston.
Press out piston with compressed air applied through the connection bore.

Caution!
10 bar (142 psi) air pressure produces a force of about 1250 N (275 lbs.).



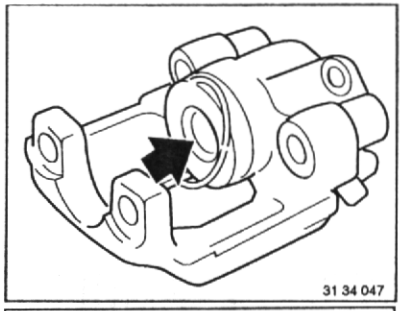
Check guide sleeves (5), installing guide sleeves from the repair kit if necessary.

* See Specifications

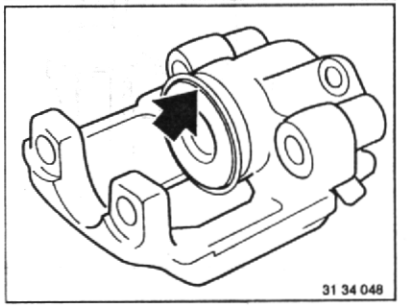


Remove seal carefully with a plastic needle.
Clean cylinder bores and parts with alcohol and dry with compressed air.
Inspect cylinder bore, piston and flange surfaces thoroughly for damage.
Machining of cylinders and pistons is not approved.

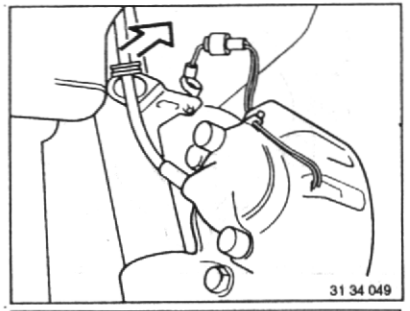
Installation:
Give all parts a light coat of ATE brake cylinder paste and install.



First pull rubber cap on to the piston.
Press in piston with a piece of hard wood, being careful not to cant the piston.

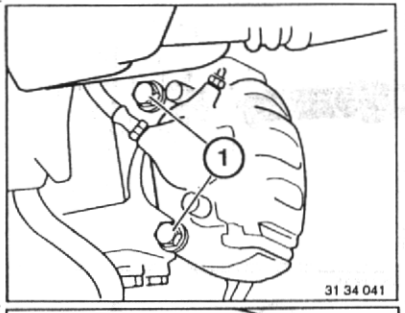


Pull rubber cap over edge of cylinder bore and secure with the clamping ring.
Assemble the BRAKE caliper.



34 11 220 REMOVING AND INSTALLING FRONT BRAKE DISC

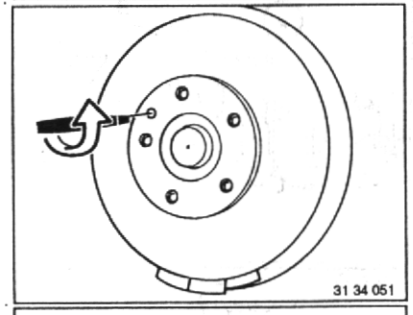
Remove front wheel – see 36 10 300.
Pull rubber grommet out of bracket.



Unscrew and suspend caliper (1) from car on a piece of wire.

Important!
Brake pipe remains connected.

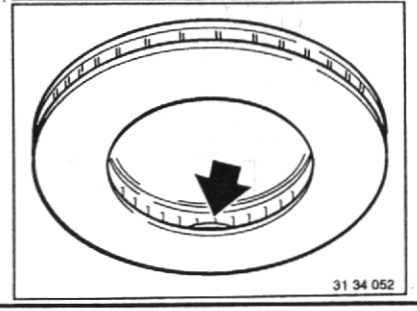
Installation:
Tightening torque*.



Unscrew bolt and take off brake disc.

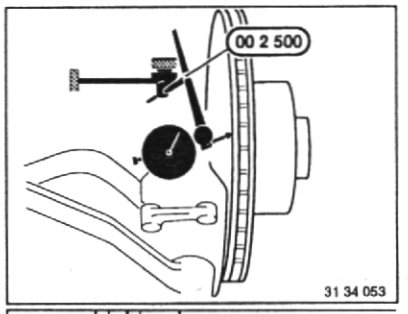
Installation:
Tightening torque*.

Important!
Always replace both brake discs of one axle together.



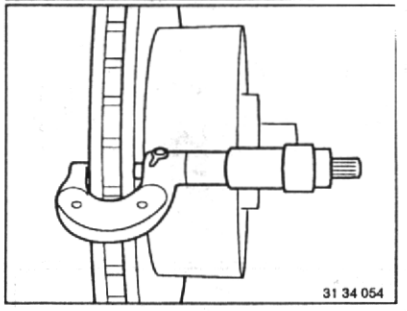
Important!
Inboard vented brake discs are balanced.
Never remove or reposition the balance clamps.

* See Specifications



34 11 599 CHECKING FRONT BRAKE DISC FOR RUNOUT AND THICKNESS DEVIATION
– Front Wheel Removed –

Specified wheel bearing play is a requirement.
Mount brake disc with two M 12 x 1.5 bolts.
Unscrew and suspend caliper from car on a piece of wire – brake pipe remains connected.
Mount Special Tool 00 2 500 with adapter, Special Tool 33 1 420, and check runout* of brake disc with a dial gage or dial gage with magnetic stand.

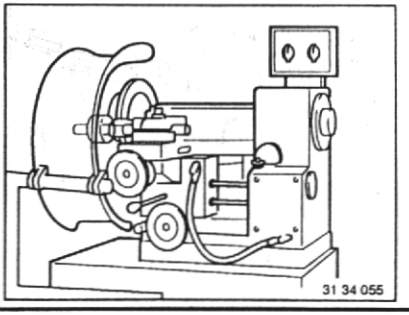


Measure the thickness deviation* at about 8 points within the braking surface with a micrometer.

34 11 667 FINE GRINDING FRONT BRAKE DISCS
– Brake Discs Removed –

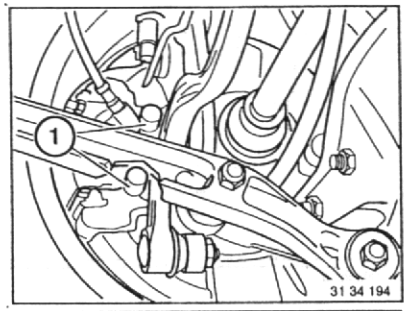
Important!
Always fine grind both sides of both brake discs on one axle.
Check minimum thickness*.

Installation:
Always replace both brake discs of one axle together when replacement is necessary.



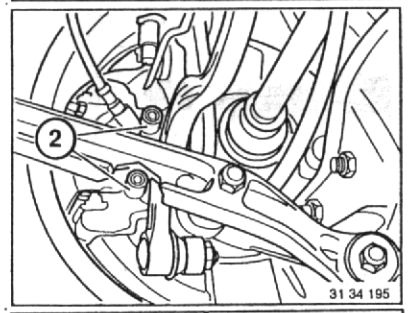
Machine:
See Workshop Equipment/Planning files.

* See Specifications



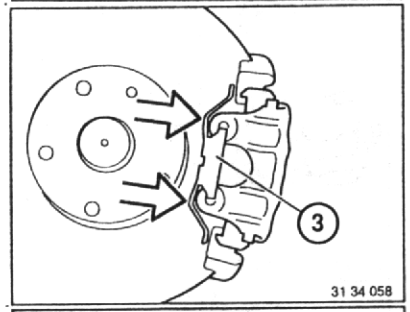
34 21 200 REMOVING AND INSTALLING REAR BRAKE PADS

Remove rear wheels.
Press off plastic caps (1).
Right:
Pull off plug for brake pad wear indicator.

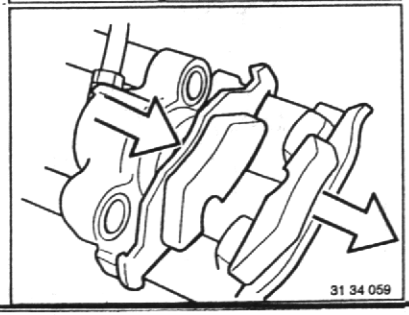


Unscrew guide bolts (2).

Installation:
Only clean guide bolts – don't lubricate them.
Replace guide bolts which are not in perfect condition.
Tightening torque*.



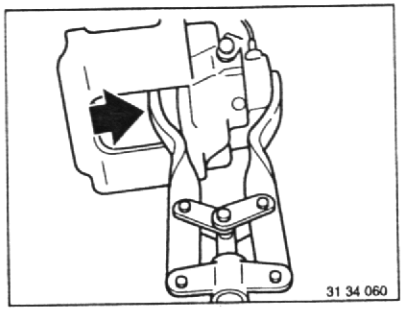
Press out clamp (3).
Pull off caliper toward rear.



Take off outer brake pad.
Inner brake pad is located in the piston together with a spring.

Important!
Always replace all brake pads of both brake calipers on one axle.
Lubricate brake piston contact surfaces lightly with Platilube**.

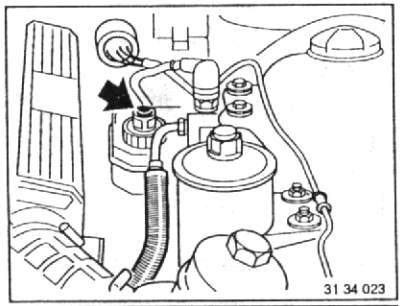
* See Specifications
** Source of Supply: HWB



Installation:
Push back piston completely.
Clean brake pad guides and recesses with a brush**.

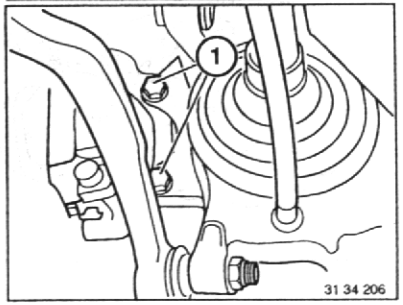
Caution!
Extract pad abrasion – don't blow if off.

Check dust cover for damage.
Lubricate guides lightly with Plastilube**.



34 21 745 REMOVING AND INSTALLING REAR BRAKE CALIPER

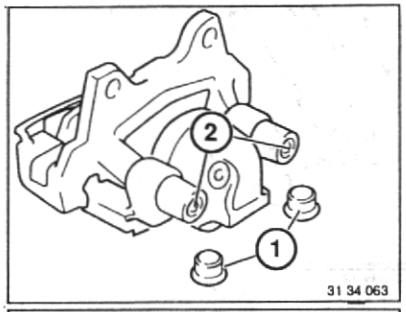
Remove rear wheel.
Draw off brake fluid with a syringe reserved exclusively for use with brake fluid.
Disconnect brake pipe.



Unscrew bolts (1).
Unplug the brake pad wear indicator.
Pull off caliper forward.

Installation:
Tightening torque*.
Bleed brakes – see 34 00 047.

* See Specifications
** Source of Supply: HWB

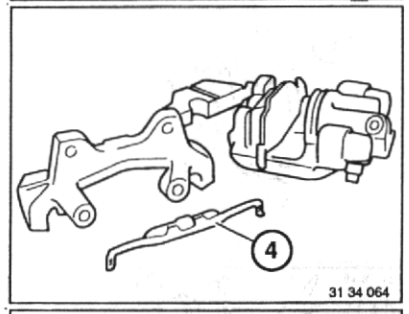


34 21 812 OVERHAULING REAR BRAKE CALIPERS (Use Repair Kit)

Remove rear calipers – see 34 21 220.
Press off plastic caps (1).
Unscrew guide bolts (2).

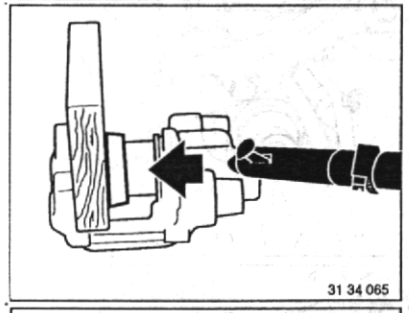
Note:
Unscrew lower guide bolts with Special Tool 34 1 010.

Installation:
Only clean guide bolts – don't lubricate them.
Check guide bolts, replacing if necessary.
Tightening torque*.



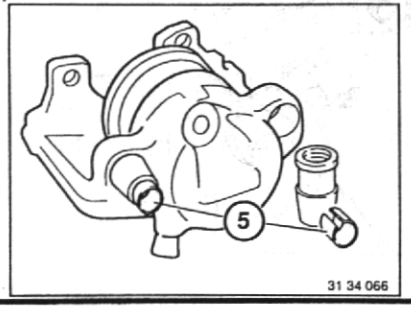
Disassemble caliper.
Take out brake pads.

Installation:
Press out brake pads completely before inserting spring (4).



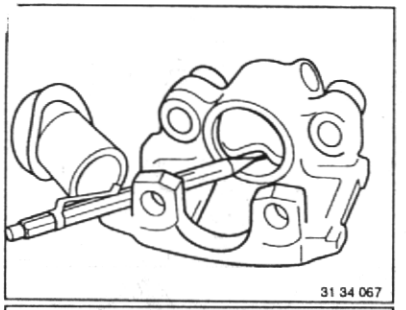
Press off rubber cap and clamping ring.
Place liner (piece of hard wood, hard felt or something similar) in the caliper recess to protect the piston.
Press out piston with compressed air applied through the connection bore.

Caution!
10 bar (142 psi) air pressure produces a force of about 1250 N (275 lbs.).



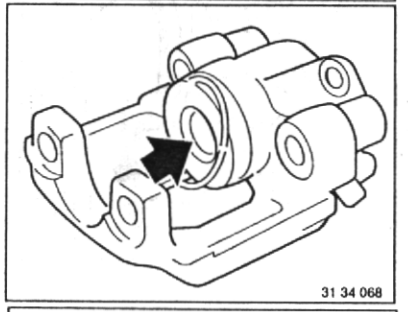
Check guide sleeves (5), installing guide sleeve from the repair kit if necessary.

* See Specifications

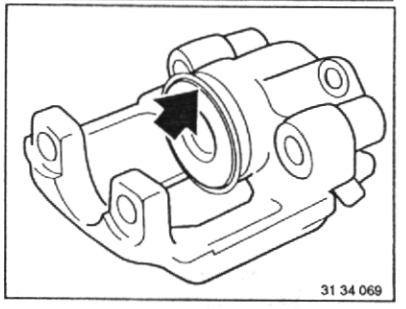


Remove seal carefully with a plastic needle.
Clean cylinder bores and parts with alcohol and dry with compressed air.
Inspect cylinder bore, piston and flange surfaces throughly for damage.
Machining of cylinders and pistons is not approved.

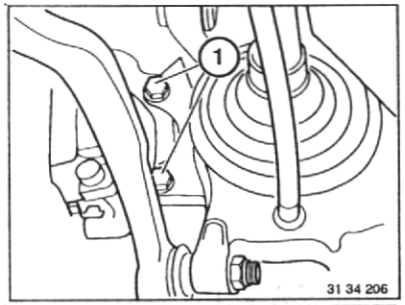
Installation:
Give all parts a light coat of ATE brake cylinder paste and install.

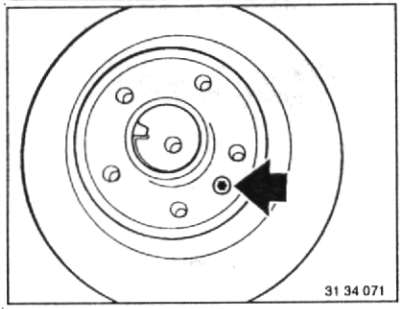


First pull rubber cap on to the piston.
Press in piston with a piece of hard wood, being careful not to cant the piston.



Pull rubber cap over edge of cylinder bore and secure with a clamping ring.
Assemble the caliper.



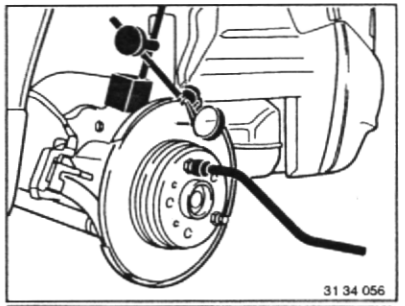


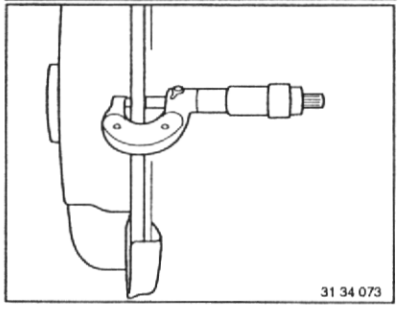
34 21 320 REMOVING AND INSTALLING REAR BRAKE DISC

Remove rear wheel – see Group 36.
Unscrew bolts (1).

Pull off caliper toward rear and suspend from car on a piece of wire.
Brake pipe remains connected.
Unscrew bolt and take off brake disc.

Important!
When replacement is necessary, always replace both brake discs of one axle.
Adjust parking brake – see 34 10 014.
Breaking In Parking Brake After Replacing Brake Discs:
Car must be broken in in three phases.
Phase 1: 5 x full stop braking from 50 km/h (30 mph).
Phase 2: Brakes allowed to cool off.
Phase 3: 5 x full stop braking from 50 km/h (30 mph).





34 21 879 CHECKING REAR BRAKE DISC FOR RUNOUT AND THICKNESS DEVIATION – Rear Wheel Removed –

Remove caliper – see 34 21 220.
Mount brake disc with two bolts.
Mount magnetic stand with dial gage on upper control arm and check brake disc for runout*.

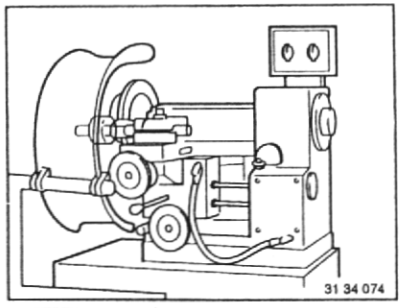
Measure thickness deviation* at about 8 points within the braking surface with a micrometer.

Installation:
Tightening torque*

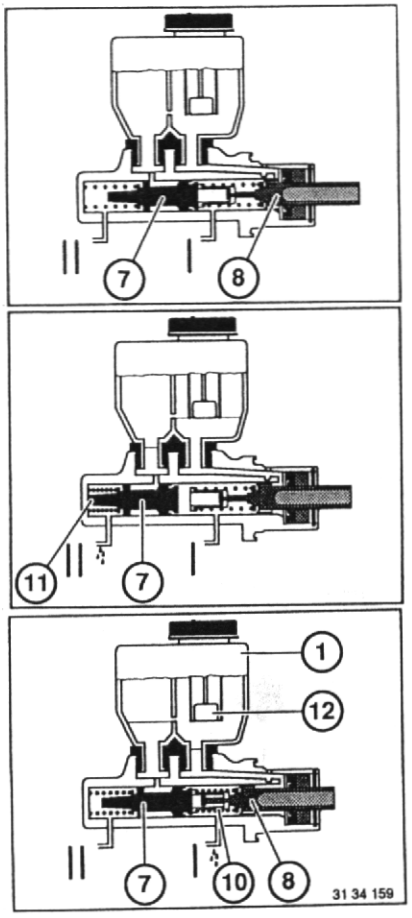
34 21 947 FINE GRINDING REAR BRAKE DISCS – Brake Discs Removed –

Important!
Always fine grind both sides of both brake discs on one axle.
Check minimum thickness*.

Installation:
When replacement is necessary, always replace both brake discs of one axle.



* See Specifications
** See Workshop Equipment/Planning

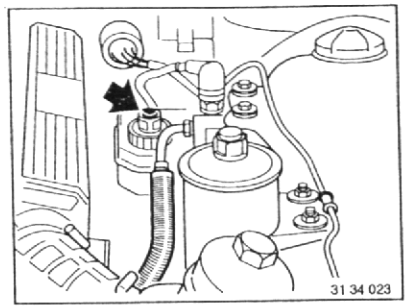


DESCRIPTION OF BRAKE MASTER CYLINDER OPERATION

The operating force applied on push rod piston (8) produces hydraulic braking pressure in the first pressure chamber of the tandem master cylinder and the connected brake circuit I. This pressure also acts on the second, intermediate piston and moves it in the tandem master cylinder. In this manner (almost) equal hydraulic braking pressure is also produced in the second pressure chamber and connected brake circuit II.

If braking pressure cannot be built up due to an assumed leak in brake circuit II, intermediate piston (7) is pushed out of the first pressure chamber without mentionable resistance (only low spring force has to be overcome) by an initially low hydraulic pressure far enough that pin (11) of the intermediate piston bears on the bottom of the cylinder. Stroke of the first pressure chamber is held in this position and normal braking pressure can be built up in this brake circuit. Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.
If brake circuit I (push rod piston brake circuit) leaks due to an assumed damage, so that braking pressure can no longer be built up, push rod piston (8) is pushed so far without mentionable resistance (only low spring force has to be overcome) until it bears on stop sleeve (10). In this manner there is mechanical connection with intermediate piston (7), so that normal braking pressure can be built up in brake circuit II (intermediate piston brake circuit). Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.

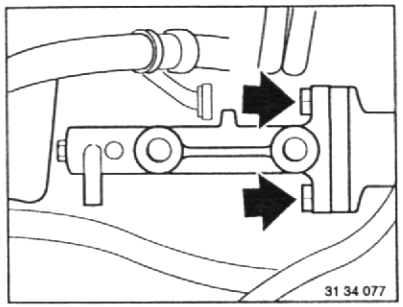
A tandem master cylinder can be operated direct via the brake pedal or via a brake booster (hydraulically, with vacuum or pneumatically).
Connection of brake circuits on a tandem master cylinder depends on the brake circuit division of a pertinent car.
Brake fluid tanks (1) on the tandem master cylinder contains the brake fluid reservoir and corrects the hydraulic fluid level in the brake system.
They are normally divided into two supply chambers (one for each brake circuit) and can be equipped with an electric float warning device (12) for indication of brake fluid loss.



34 31 000 REMOVING AND INSTALLING BRAKE MASTER CYLINDER

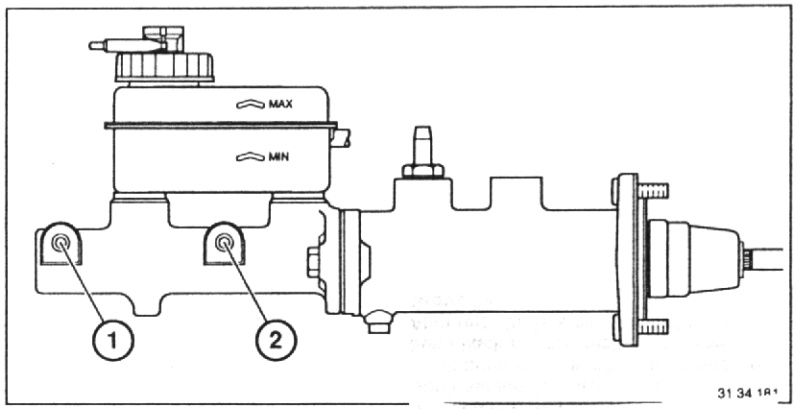
Draw brake fluid take out of tank with a standard syringe.
Pull off brake fluid tank.

Installation:
Bleed brakes – see 34 00 047.



Unscrew tandem brake master cylinder on the brake booster.

Installation:
Tightening torque*.
Only install a brake master cylinder with the same diameter – identification is located raised on the body.

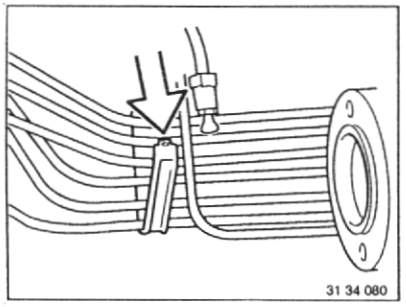


Disconnect brake pipes.
Brake Circuit 1: front right + rear left
Brake Circuit 2: front left + rear right

Installation:
Tightening torque*.

* See Specifications

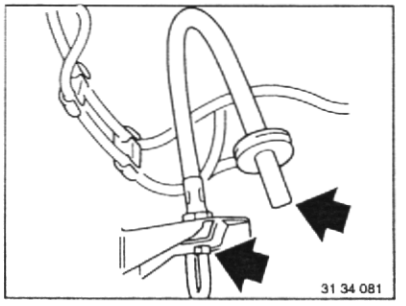
* See Specifications



34 32 362 REPLACING ALL BRAKE PIPES

Brake pipes are now only supplied in straight version and correct length with connecting nipples.

Use the removed pipe as a template for bending.
Use bending tool**.
Don't damage surface of pipe.
Don't bend pipes sharply or attempt to bend back an incorrectly bent pipe.
Also refer to Service Information of Group 34.

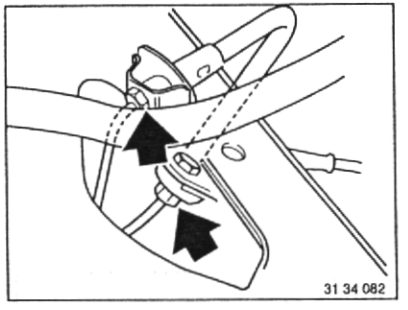


34 32 941 REPLACING ALL FRONT BRAKE HOSES

Draw brake fluid out of tank with a syringe reserved exclusively for use with brake fluid.
Disconnect brake hose.

Installation:
Never twist brake hose while installing.
Bleed brakes – see 34 00 047.
Tightening torque*.

Important!
Also refer to filling and bleeding brakes in cars with ABS/ASC+T.



34 32 991 REPLACING ALL REAR BRAKE HOSES

Draw brake fluid out of tank with a syringe reserved exclusively for use with brake fluid.
Disconnect brake hose.

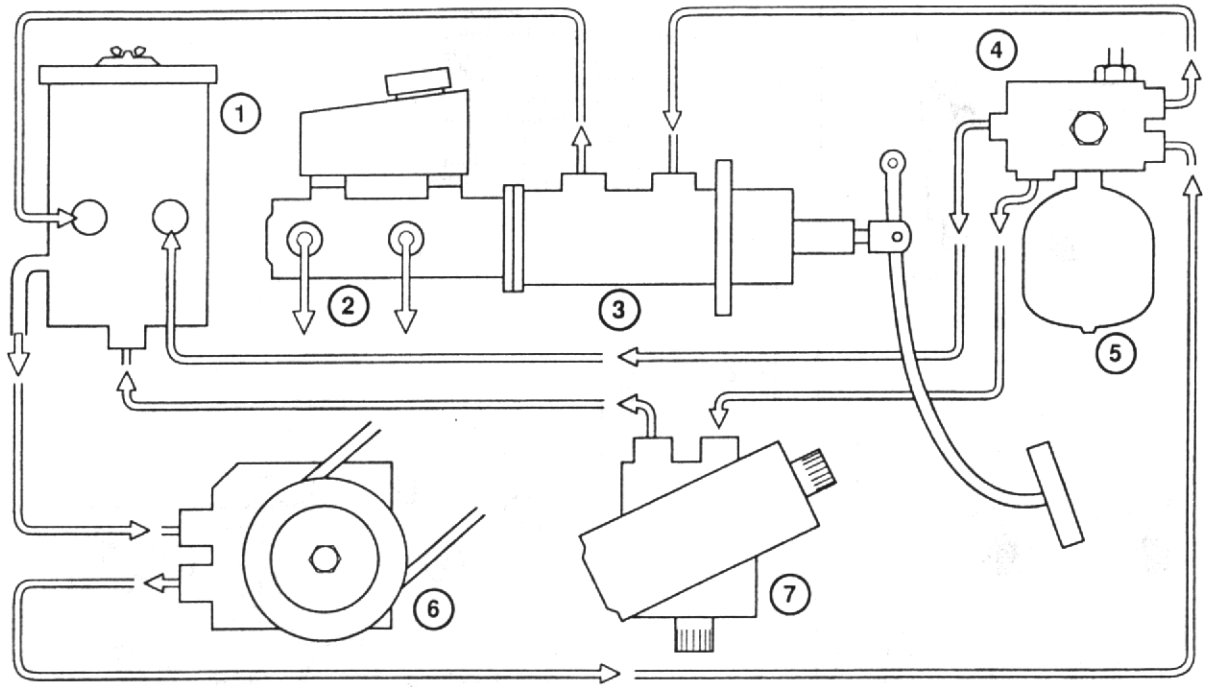
Installation:
Never twist brake hose while installing.
Bleed brakes – see 34 00 047.
Tightening torque*.

Important!
Also refer to filling and bleeding brakes in cars with ABS/ASC+T.

** Source of Supply: HWB

* See Specifications

1 = Supply tank
2 = Tandem master cylinder and tank
3 = Hydraulic booster
4 = Pressure controlled flow regulator
5 = Hydraulic reservoir
6 = Power steering



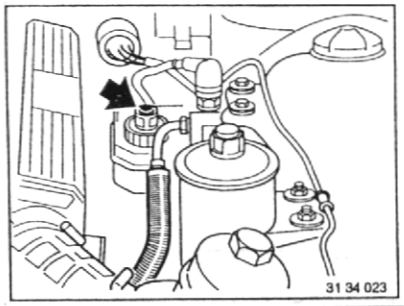
31 34 158

DESCRIPTION OF ENTIRE H 31 SYSTEM

The power flow regulator (or pressure controlled flow regulator) taps a slight delivery flow = 0.7 ltr. (1.5 pints)/minute from the operating circuit of the power steering (circulating system) and charges the hydraulic reservoir in a pressure range without impairing the function of the power steering.
The hydraulic oil volume stored under pressure is available for the booster to support the operating force and is called by operating the bolted standard tandem brake master cylinder.
If the power steering pump fails, sufficient reserve pressure will be stored in the hydraulic reservoir to be able to execute several braking actions with full brake boosting support.
After consumption of this reserve pressure, the brakes can still be applied, but without boost and therefore with considerably more force on the brake pedal.

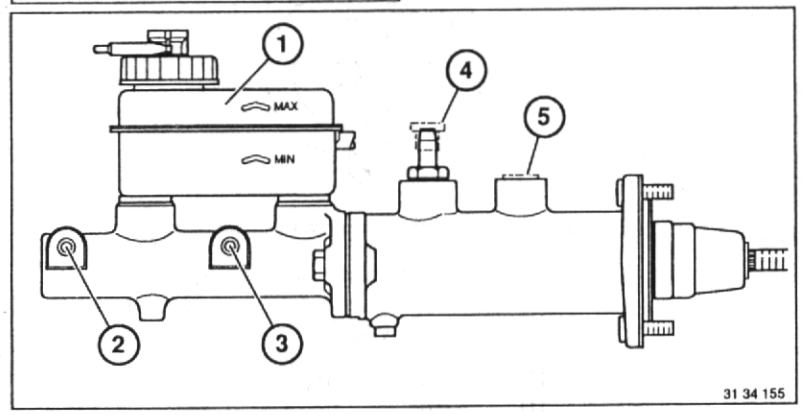
FUNCTION TEST

Operate brake pedal 20 times with the engine stopped.
Hold brake pedal down and start engine.
System is okay, if brake pedal gives.
If brake pedal does not give, there could be a fault in the power steering pump, power flow regulator, hydraulic reservoir or hydraulic brake booster.



34 33 505 REMOVING AND INSTALLING BRAKE BOOSTER WITH BRAKE MASTER CYLINDER

Discharge hydraulic reservoir by operating brake pedal about 20 times with same force required for full stop braking and with the engine stopped.
Draw brake fluid out of tank with a syringe reserved exclusively for use with brake fluid.
Disconnect plug.



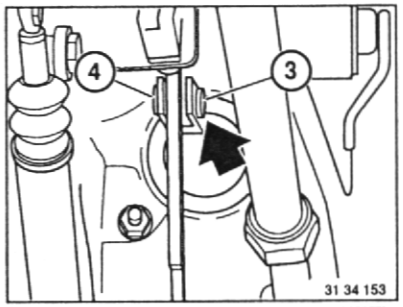
Disconnect brake pipes (2 and 3).

1 Supply tank (pulled off)
2 Brake pipe front right (left rear brake circuit)
3 Brake pipe front left (right rear brake circuit)
4 Booster return
5 Pressure pipe from power flow regulator

Pull off hose for clutch hydraulic system.

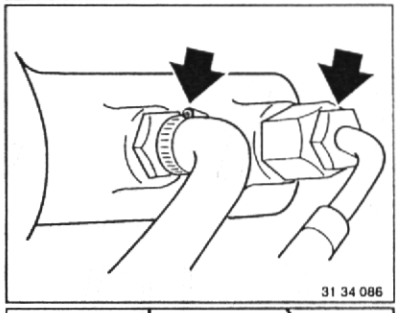
Installation:
Tightening torque*.
Bleed brakes – see 34 00 047.
Cars with ASC+T – see 34 00 ...

* See Specifications



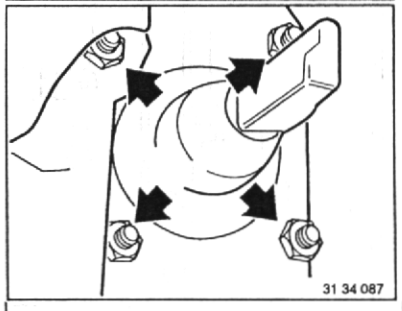
Remove dashboard trim panel at bottom left – see 51 45 180.
Press off clip (3) and pull out pin (4).

Installation:
Stop light switch (self-adjusting) – see Group 61.



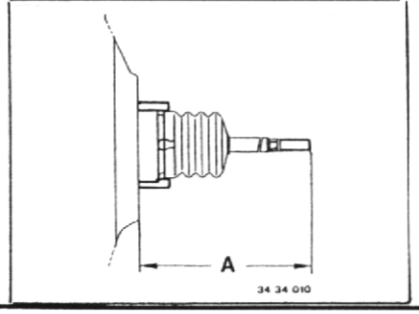
Unscrew hydraulic hoses on brake booster.

Installation:
Make sure that all pipes and hoses are clean before connecting.
Tighten return pipe with Special Tool 34 3 153 and pressure pipe with Special Tool 34 3 152, both in conjunction with a torque wrench.
Tightening torque*.



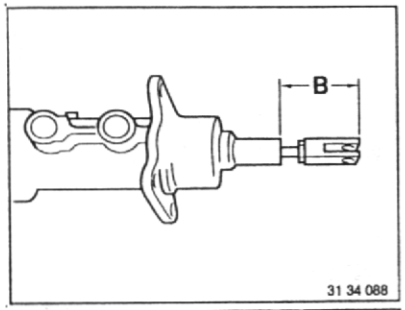
Unscrew brake booster on pedal console.
Remove brake booster and tandem brake master cylinder.

Installation:
Replace self-locking nuts.
Tightening torque*.

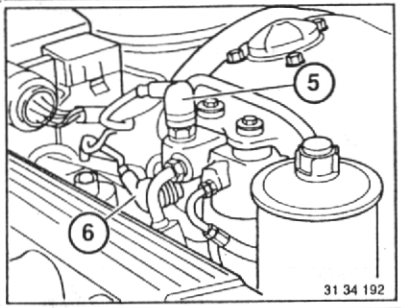


Basic setting distance A = 143 ± 1 mm (5.630 ± 0.039") measured from firewall to center of swivel head/operating pin – also refer to Group 35.

* See Specifications

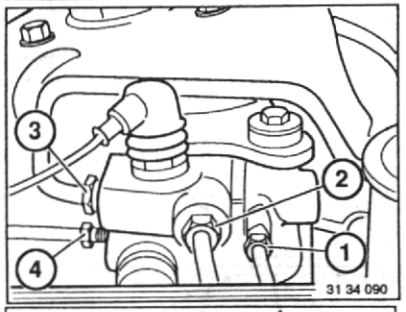


Installation:
Unscrew swivel on brake booster. Install swivel on new brake booster and adjust to same distance B.
If necessary, check control distance A on brake pedal in installed state – see 35 21 000.

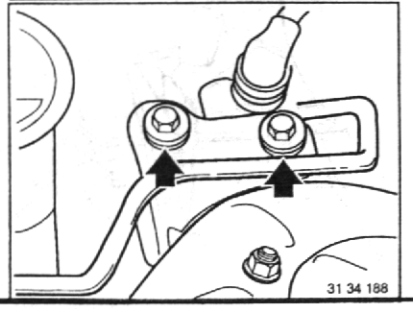


34 33 100 REMOVING AND INSTALLING POWER FLOW REGULATOR

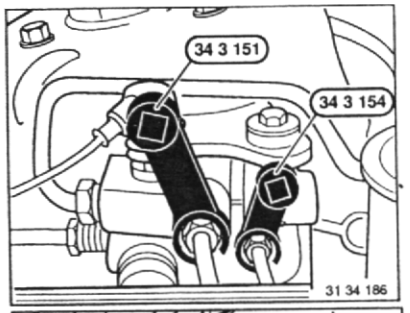
Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the force required for full stop braking and with the engine stopped.
Pull off wires on circulating pressure warning switch (5) and hydraulic pressure switch (6).



Unscrew
pipe (1) from power flow regulator to tank,
pipe (2) from power flow regulator to power steering gear,
pipe (3) from power flow regulator to power steering pump and
pipe (4) from power flow regulator to brake booster.

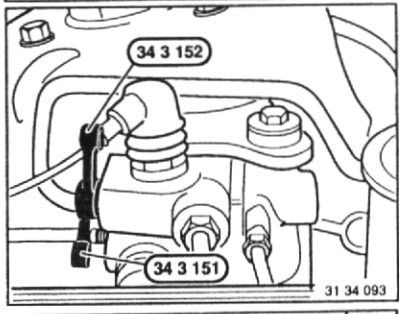


Unscrew power flow regulator mounting bolts.



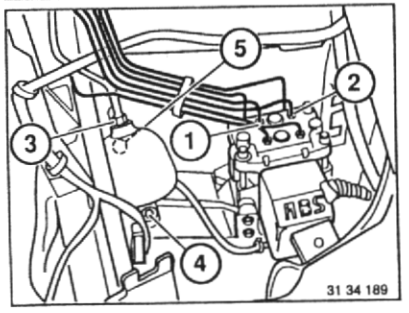
Important!
Fine particles of dirt could impair the function of the power flow regulator in the H 31 system, which in turn could lead to failure of hydraulic steering and braking support.
Make sure that all pipes and hoses are clean before connecting.

Installation:
Tighten pipe (1) with Special Tool 34 3 154, pipes (2 and 4) with Special Tool 34 3 151 and pipe (3) with Special Tool 34 3 152, in each case together with a torque wrench.
Tightening torque*.
Bleed power steering – see 32 13 006.



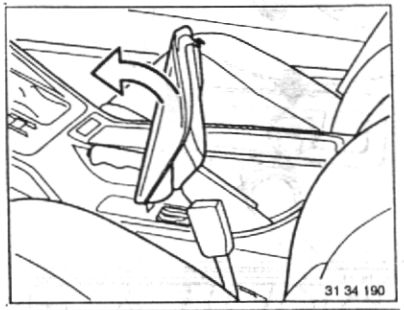
34 33 110 REMOVING AND INSTALLING HYDRAULIC RESERVOIR

Discharge pressure – see 34 33 100.
Remove left front wheel house trim panel – see Group 51.
Unscrew coupling nuts (3).
Unscrew bolts (4 and 5).



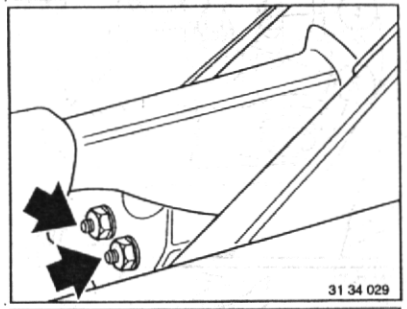
Installation:
Hydraulic reservoir tightening torque*.

* See Specifications

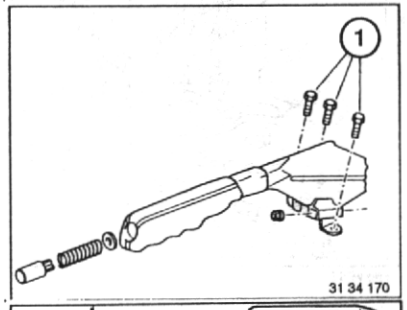


34 41 000 REMOVING AND INSTALLING PARKING BRAKE LEVER

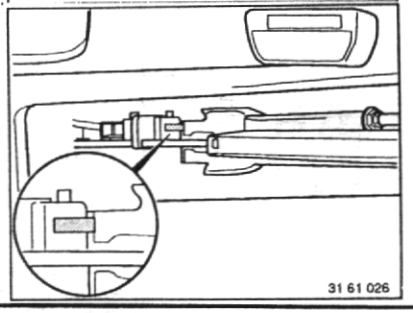
Lift out cover.
Remove tunnel tray – see Group 51.



Unscrew adjusting nuts on parking brake cables.



Unscrew bolts (1).
Remove parking brake lever.

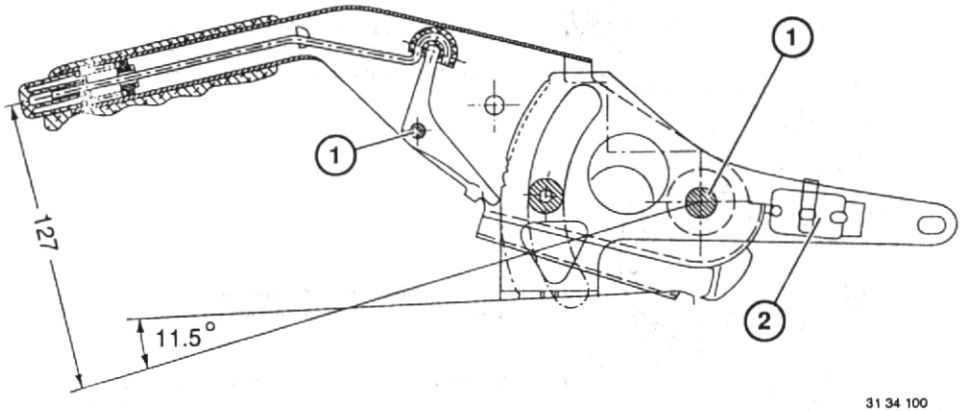


Be careful not to damage the warning switch during removal or installation.
Checking warning switch setting – see Group 61.

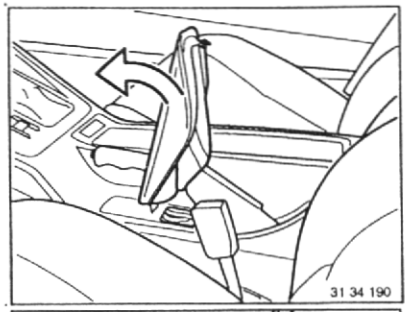
Installation:
Adjust parking brake – see 34 10 014.

PARKING BRAKE LEVER

(1) = Riveted
(2) = Switch for parking brake control lamp

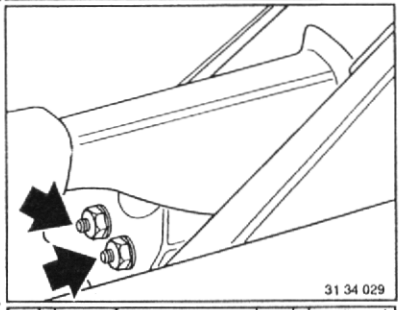


31 34 100



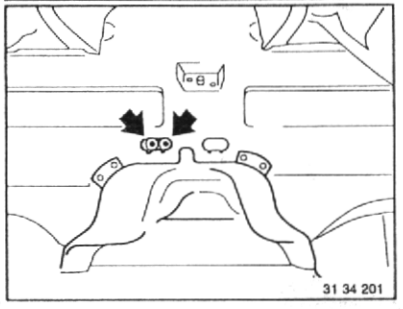
34 41 100 REMOVING AND INSTALLING PARKING BRAKE CABLES

Lift out cover.



Unscrew adjusting nuts on parking brake cables.

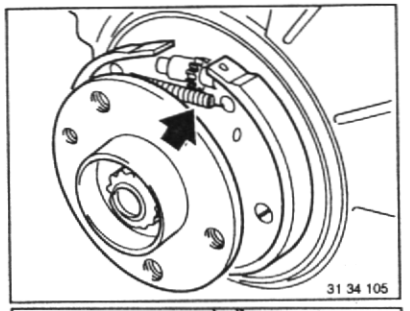
Installation:
Adjust parking brake – see 34 10 014.



Pull parking brake cables out of guides.

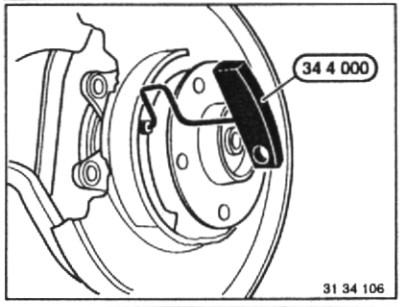
Installation:
Release parking brake lever when guiding in the parking brake cables.

Take parking brake cables out of expander lock – see 34 41 220.
Remove parking brake cables.

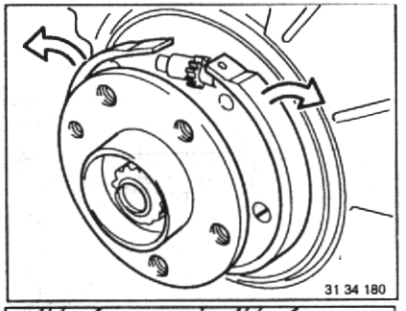


34 41 220 REMOVING AND INSTALLING PARKING BRAKE SHOES

Remove rear brake disc – see 34 21 320.
Disconnect upper return spring with a brake spring pliers.

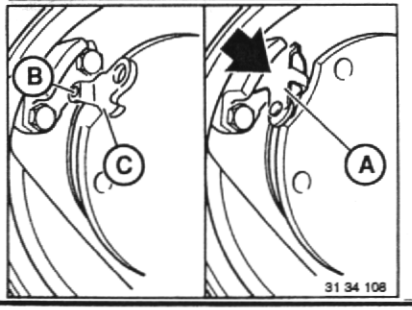


Turn retaining springs 90° and disconnect with Special Tool 34 4 000.



Pull brake shoes apart at top and take off downward.

Important!
Check that pin does not fall out of the expander lock.
Replacing Liners:
Break in to same procedures as for brake discs – see 34 21 320.



Removing/Installing/Checking Expander Lock:
Pull part A forward.
Press out part B.
Pull out part C.

Caution!
Extract liner abrasion – don't blow it off.

Installation:
Coat sliding surfaces and pin thinly with Molykote Paste G.
Adjust parking brake – see 34 10 014.

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brakes pull to one side	a) Tire inflation pressure incorrect b) Uneven tire tread wear c) Oil on pads/liners d) Pad/liner type not as specified e) Caliper recesses dirty f) Rear wheel geometry incorrect g) Corrosion in calipers h) Shock absorbers without action i) Pad of one caliper worn k) Pad glazed	a) Correct tire inflation pressure b) Change or replace tires c) Replace brake pads/liners and eliminate cause d) Replace brake pads/liners e) Remove, clean and install calipers f) Check/adjust wheel alignment g) Remove and install, repair or replace calipers h) Check or replace shock absorbers i) Replace brake pads; check calipers k) Replace brake pads; check calipers
Brakes excessively hot while driving	a) Compensation bore in master cylinder clogged b) No play between push rod and master cylinder piston c) Rubber parts swollen from contact with wrong type of brake fluid d) Vent hole in brake fluid tank clogged e) Corroded calipers f) Parking brake lever not released fully	a) Check or replace master cylinder b) Adjust push rod c) Replace master cylinder or remove and install, repair or replace brake calipers d) Clean brake fluid tank e) Remove and install, repair or replace calipers f) Check parking brake and parking brake cables, repairing if necessary
Braking effect insufficient inspite of great force on pedal Brake pedal travel - normal - short - long	a) Brake pads coated with oil or burnt; wrong type of brake pads b) Brake booster malfunctions c) One brake circuit failed due to leaks or damage	a) Replace brake pads b) Check brake boosting system c) Check brake system for leaks

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brake pedal motion too soft and spongy	a) Air in brake system b) Insufficient brake fluid in brake fluid tank c) Overheated brake fluid - vapoor lock due to excessive water content in brake fluid or excessive brake loads	a) Add or replace brake fluid and bleed brakes b) See a) c) See a)
Brake pedal travel excessive even though brakes have been bled and adjusted	a) Primary cup in master cylinder damaged b) Separating cups on floating piston of tandem master cylinder leak c) Leak in brake system	a) Overhaul or replace brake master cylinder b) See a) c) Check brake system for leaks
Uneven pad wear	a) Wrong type of brake pads b) Caliper recesses dirty, caps damaged c) Corrosion in calipers d) Rubber ring for piston control swollen	a) Replace brake pads b) Remove and install, repair or replace calipers c) See b) d) See b)
Brake pads worn at angle	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Corrosion in calipers d) Brake disc wear angular e) Pads worn less than minimum thickness	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Remove and install, repair or replace calipers d) Grind or replace brake discs e) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized brake pads, pads stuck on brake disc	a) Caliper recesses dirty, caps damaged b) Corrosion in calipers c) Compensation bore in master cylinder clogged	a) Remove and install, repair or replace calipers b) See a) c) Overhaul or replace master cylinder
Brakes squeal or knock	a) Wrong type of brake pads b) Caliper recesses dirty c) Brake disc not aligned with caliper d) Brake disc runout e) Excessive thickness deviation within braking surface f) Rust on edges of brake discs g) Pads loose h) Wheel bearing play excessive	a) Replace brake pads b) Remove and install, repair or replace calipers c) Check caliper installation and caliper guide bolts d) Check brake disc runout, replacing discs if necessary e) Measure brake disc thickness and grind or replace f) Grind or replace brake discs g) Replace brake pads h) Replace wheel bearings
Brake pedal dead travel excessive	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface e) Brake system has a leak f) Air in brake system g) Wrong type of brake pads	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure brake thickness deviation and grind or replace discs e) Check brake system for leaks f) Bleed brakes g) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in calipers	a) Caliper recesses dirty, caps damaged b) Brake disc not aligned with caliper c) Corrosion of pistons in calipers	a) Remove and install, repair or replace calipers b) Check caliper installation and caliper guide bolts c) See a)
Pulsating effect on brake pedal	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure disc thickness and grind or replace
Parking brake effect insufficient	a) Oil on brake shoes b) Excessive dead travel between brake shoes and brake drums c) Excessive dead travel in cables d) Cables maladjusted e) Corroded transmitting elements	a) Replace brake liners and eliminate cause b) Adjust parking brake c) See b) d) See b) e) Remove and install parking brake and expander locks; check cables, replacing if necessary

1. ANTIBLOCK SYSTEM (ABS) – DESCRIPTION AND DESIGN

DESCRIPTION

The basis of a braking action is the friction between the tires and road surface. To brake a vehicle the tires have to transmit a frictional force to the road surface. In so doing there will be slip between the tires and road surface, i.e. the tire peripheral velocity will be slower than the road speed of the vehicle.

Figure 730 34 112 shows the relation between the frictional force and slip for a typical case on a dry road surface. The transmitted braking force reaches its maximum value in shaded area A. This is also the control range of ABS. When a wheel is locked, i.e. when there is 100 % slip, the frictional force will normally be lower than when a wheel is rolling.

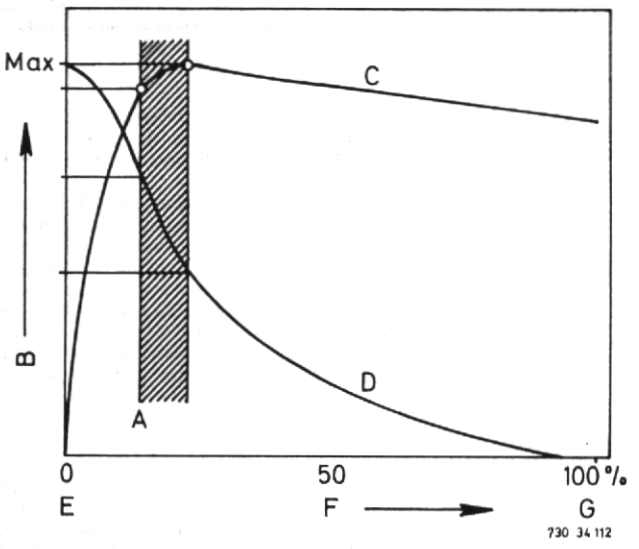
Consequently the ABS must control the brake pressure in the wheel brake cylinder in such a manner that the slip remains in the shaded area, because here the highest frictional force is available.

The amount of slip, with which there is maximum frictional force, and the amount of frictional force itself depend chiefly on the tires (type, treads, rubber composition), the road surface (material, surface condition, wet, ice), the road speed and the slip angle of the wheels.

The ABS detects the frictional conditions between the tires and road surface prevailing at the moment. It automatically adjusts to each change in road surface/tire relation and makes use of the highest coefficient of friction, without that the vehicle slips or skids because of wheel locking.

Non-uniform friction conditions between the separate wheels will be held under control just as also instantaneous changes in the road surfaces, e.g. through patches of ice.

BRAKING AND LATERAL FORCES IN RELATION TO SLIP



A ABS operating range
B Braking and lateral force
C Braking force
D Lateral force
E Rolling wheel
F Slip
G Locked wheel

DESIGN

ABS consists of a control unit, hydraulic unit, speed sensors and a wire harness. Components are described separately below.

Speed Sensors:
Each speed sensyr has a gear wheel, which runs past the permanently magnetized edge of the speed sensor and is installed in the wheel hub.
The rotary motion of the wheels is recorded by inductive sensors and an electric signal is sent to the electronic control unit.

Electronic Control Unit:
The electronic control unit is located in the car's side member, see layout drawing on page 52/6. In a small multi-channel computer acceleration, deceleration and slip factors are derived from the electric signals of the speed sensors, which are proportional to wheel velocity. By logical connection of these factors there are control commands for the electromagnetically operated valves in the hydraulic unit.

The signal processing in the computer determines the control behavior of the system. The expected degree of dependability is based on digital engineering with highly integrated circuitry.

The control unit contains electronic monitoring circuits, which control the function prior to each trip and the ABS wire harness with equipment constantly during a trip. If the control unit detects a defect in the wire harness or electrical part of the equipment, the monitoring circuit will switch off the ABS and guarantee normal use of the brake system. An ABS indicator lamp reports this condition to the driver.

Hydraulic Unit:
The hydraulic unit is located in the engine compartment and integrated in the conventional brake system.
To control the brake pressure in the wheel brake cylinders, the brake hydraulic unit has three-way valves which permit three brake pressure conditions.
Pressure build-up, pressure holding and pressure drop. These three pressure phases adapt themselves in the sequences and length to the requirements of the desired control characteristic and power flow between the road surface and tires.
In principle control procedures are as follows.
As soon as wheel deceleration or slip indicates the locking of a wheel, the brake pressure is first held. If the wheel still tends to lock, the pressure will be dropped so long until the wheel accelerates or the slip limit is exceeded. Afterwards the pressure is raised again and the control phases begin from new.
An electrically driven return delivery pump returns the brake fluid taken from the wheel brake cylinder while dropping the pressure to the appropriate brake circuit.
The pump is designed as a two-piston pump so that the circuits of a dual brake circuit system remain fully separated.

Wire Harness:
The control unit is connected with the speed sensors and electric part of the hydraulic unit via a special wire harness for the sake of signal input and order output. These wires as well as electric power supply are integrated in the main wire harness.

2. DESCRIPTION OF AND CHECKING ABS INDICATOR LAMP

The ABS indicator lamp lights up after switching on the ignition.
The indicator lamp should go out again when the engine is started, if ABS is okay.

These procedures are repeated each time the ignition is switched off and on.

The causes for erroneous indication (indicator lamp doesn't light up, doesn't go out or comes on while driving – even occasionally) can be read in the fault memory – see Car Electric/Electronic Test Plan.

The control unit will automatically switch to "normal braking" when there is an electric or electronic fault in ABS/ASC.
This means the car can still be braked, but without control (the wheels could lock!).

3. GENERAL INFORMATION ON REPAIRS AND THE BRAKE SYSTEM

a) Disconnect plug on the electronic control unit (ignition switched off) when welding with an electric welder.

b) When painting, the electronic control unit can be subjected to max. 95° C (203° F) briefly or to max. 85° C (185° F) for a longer period (about 2 hours).

c) The battery terminals must be tightened perfectly after reinstallation of the battery.

d) After replacement of the ABS hydraulic control unit, ASC+T hydraulic control unit, electronic control unit, pulse senders/sensors or the wire harness as well as after performance of jobs (e.g. repair of accident damage, the fault memory must be read and the entire system checked according to the Car Electric/Electronic Test Plan.
It is important that brake pipes and hoses are routed correctly.

e) After each job on the brake system, the brakes must be bled and High / low pressure tests carried out. A function test is required additionally in cars with ASC+T.
Check all connection points for leaks.

f) Brake cleaning solutions must always be kept out of the brake system when cleaning brake components with a brake cleaner.
Chlorinated hydrocarbons contained in many brake cleaning products of various manufacturers would lead to corrosion of brake components.
Even the most minute traces of brake cleaner residue must be avoided.

Note:
Only use cleaners approved by BMW.

* Source of Supply: HWB

AUTOMATIC STABILITY CONTROL (ASC)

Description

Automatic Stability Control (ASC) is a control system to improve active safety in that it reduces the slip of driven wheels on roads with insufficient traction (prevents spinning of the wheels).

It employs Electronic Engine Power Control (EML) and Digital Motor Electronics DME) for regulation.

The sensors of ABS are used to recognize the speed of individual wheels.

ASC is integrated with ABS in one control unit, but is a completely independent system.

While ABS exploits the maximum friction force while braking the car, this is reached with ASC while accelerating.

As soon as the driven wheels turn 0.25 km/h (0.15 mph) faster than the non-driven wheels, ASC regulates the throttle valve position smaller via EML. In order to have fast regulation, the ignition timing is retarded in steps or there is ignition blend-out by DME. DME also adapts the fuel injection signal to protect the engine and catalyst.

ASC is combined with Engine Drag Torque Control (MSR), which prevents sliding of the driven wheels in case of sudden engine overrun.

Engine Drag Torque Control (MSR)

Again with the help of wheel sensors ASC recognizes the difference in speed between driven (engine braked) wheels and non-driven (unbraked) wheels. ASC switches off overrun cut-out when values are below the slip limits.

Displaying and Switching Logic

The system is switched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or it had been switched off by hand.

Troubleshooting:
See Car Electric/Electronic Test Plan.

AUTOMATIC STABILITY CONTROL PLUS TRACTION (ASC + T)

General

This system has the task of regulating the slip of driven wheels to the lowest possible value regardless of road surface conditions.

During regulation the engine torque is reduced with help of DME (ignition timing control) and EML (throttle valve control). If this measure is not sufficient, the driven wheel turning too fast is slowed down by the wheel brake via a hydraulic element.

Displaying and Switching Logic

The system isswitched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or was switched off by hand.

Safety Information

ASC must be switched off before testing a car on a brake or dynamometer test stand.

Either the ignition or ASC must be switched off before towing a car with a lifted front end.

Throttle Valve Control by EML

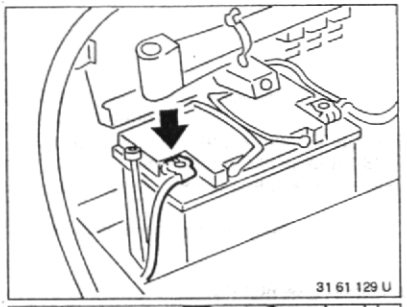
The throttle valve is regulated with help of Electronic Engine Power Control (EML).
If unwanted drive slip occurs during a certain driving situation, ASC calculates the maximum transmittable drive torque and informs EML about the throttle valve position required for the duration of regulation.
EML continuously reports the current throttle valve position to ASC via the DKV wire. If the throttle valve angle has to be reduced, EML receives this information via the DKR wire. If a larger throttle valve angle is requested by ASC, this is reported via the DKE wire to EML (only when a control unit with engine drag torque control is installed in the car).

Ignition Timing Control by DME

Retarding the ignition timing is another measure for reduction of the engine torque.
In ASC mode (regulation) Digital Motor Electronics (DME) receives a digital signal from ASC and retards the ignition timing afterwards.
Troubleshooting:
See Car Electric/Electronic Test Plan.

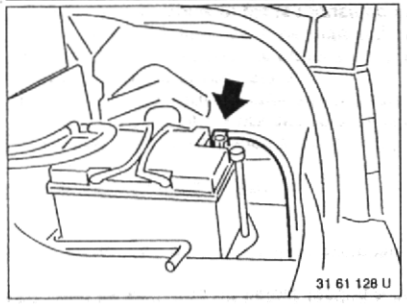
Zündwinkelverstellung über DME

Eine weitere Maßnahme zur Reduzierung des Motordrehmoments ist die Verstellung des Zündzeitpunktes nach spät.
Im ASC-Betrieb (Regelung) erhält die Digitale Motor Elektronik (DME) ein digitales Signal vom ASC und verstellt daraufhin den Zündzeitpunkt nach spät.
Fehlersuche: Siehe Prüfanleitung Fahrzeugelektrik/-elektronik



34 51 520 REMOVING AND INSTALLING OR REPLACING HYDRAULIC CONTROL UNIT (FOR ABS)

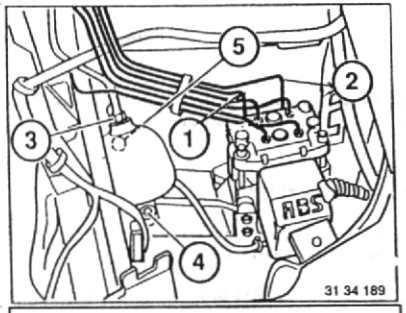
Disconnect ground leads ofboth batteries in trunk, left rear in picture.



Disconnect ground lead of right rear battery.

Important!
Fault memories are cancelled by disconnecting the battery.

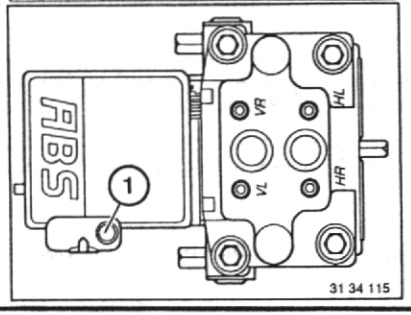
Remove left front headlight – see Group 63.
Remove air cleaner – see Group 13.
Remove brake cooling air guide – see Group 52.



Unscrew brake pipes (1 and 2).

Installation:
Pipe (1) to rear brake master cylinder
Pipe (2) to front brake master cylinder

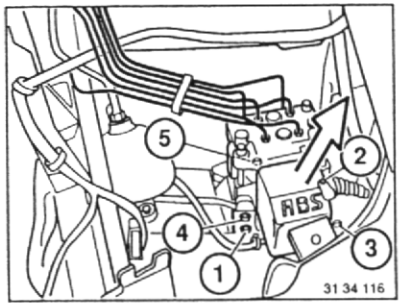
Caution!
Catch escaping brake fluid and keep it off of clothes or painted parts.



Unscrew VL / VR / HL / HR brake pipes.
Unscrew bolt (1) and take off cover.

Installation:
Don't mix up pipes (mark):
VL to brake caliper front left
VR to brake caliper front right
HL to brake caliper rear left
HR to brake caliper rear right

Important!
Keep open pipes and connections clean (insert plugs).



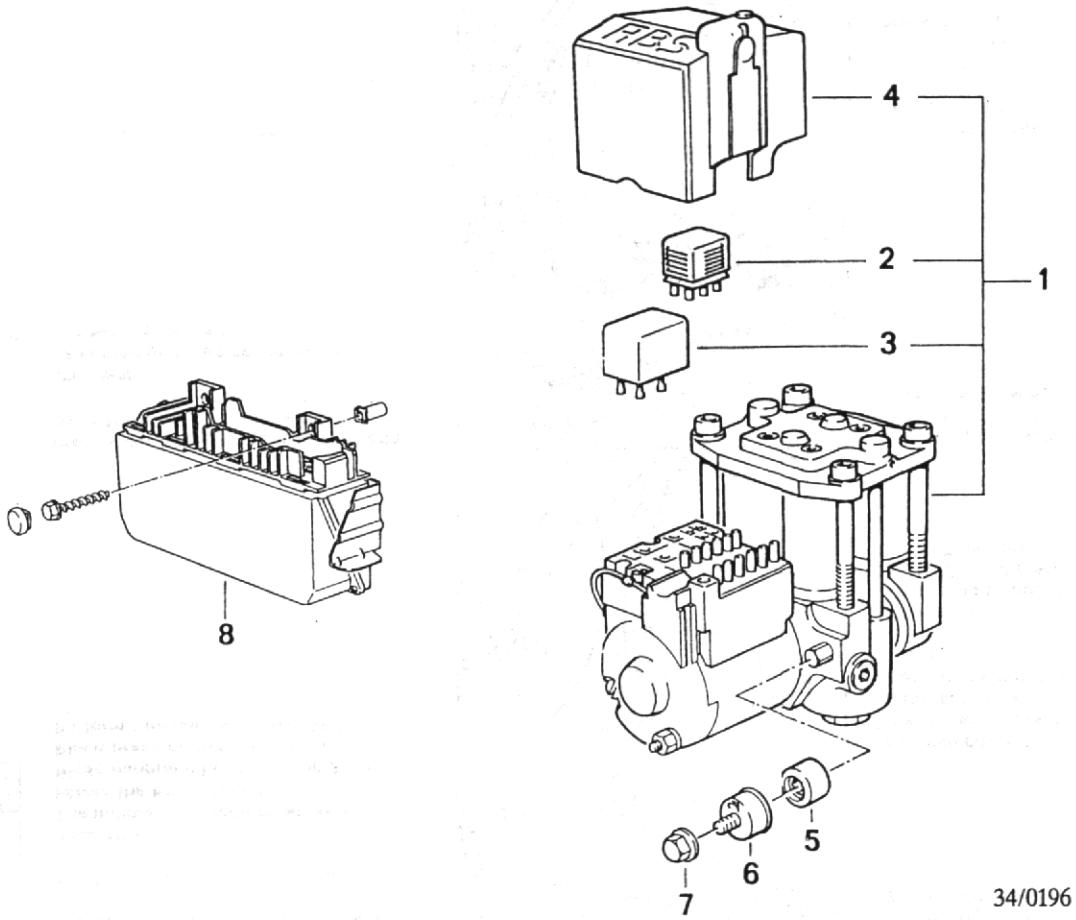
Unscrew nuts (3 ... 5).
Disconnect ground lead (1).
Unscrew screw (2) on cover and lift out.
Pull off multiple pin plug.

Installation:
Bleed brakes – see 34 00 ...

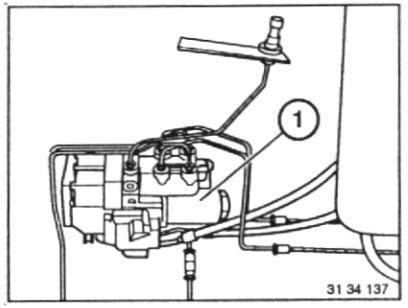
Check ABS/ASC – see reading flashing code fault output / Car Electric/Electronic Test Plan.

Servicing ABS:
Basically ABS does not require service. Brake pipes to and from the hydraulic control unit must be checked for correct routing and leaks together with the general brake system.

ABS / ASC COMPONENTS



1 Hydraulic control unit
2 Valve relay
3 Motor relay
4 Cover
5 Rubber sleeve
6 Sleeve cover
7 Cap
8 ABS/ASC control unit or ASC+T control unit

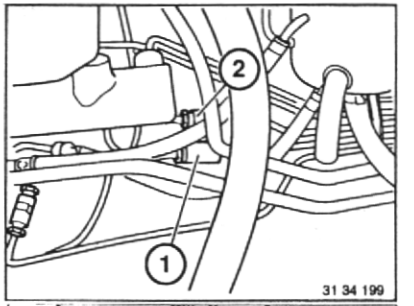


34 51 525 REMOVING AND INSTALLING HYDRAULIC CONTROL UNIT FOR ASC+T
– Brake Booster and Brake Master Cylinder Removed –

Disconnect positive connection point.

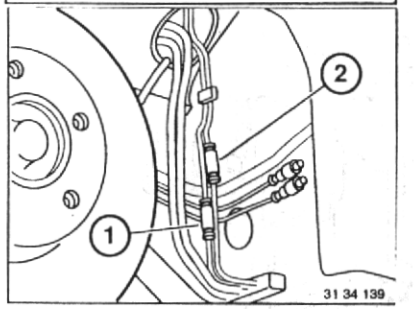
1 = Plunger hydraulic control unit

Installation:
The mineral oil circuit must be bled before the brake circuit.
Bleed mineral oil circuit – see 34 00 ...
Bleed brake circuit – see 34 00 ...
Perform function test – see 34 00 ...



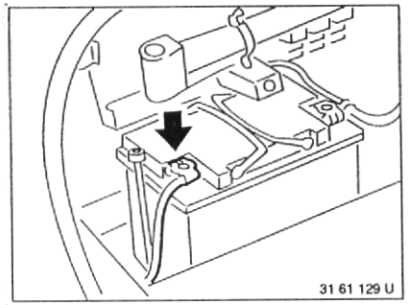
Disconnect left rear ABS brake pipe (2) and right rear ABS brake pipe (1) on connectors with different pipe codes.

Installation:
Tightening torque* for
1 = HR (right rear) = M 12 x 1
2 = HL (left rear) = M 10 x 1



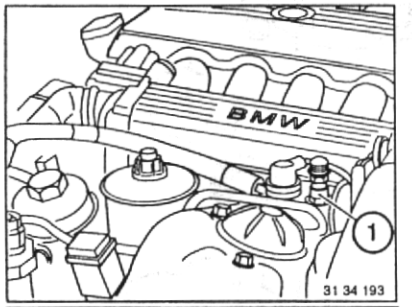
Remove cover on firewall at left front.
Disconnect left rear brake pipe (2) and right rear brake pipe (1) of brake calipers on connectors with different pipe codes.

Installation:
Tightening torque* for
1 = HRZ (right rear) = M 12 x 1
2 = HLZ (left rear) = M 10 x 1

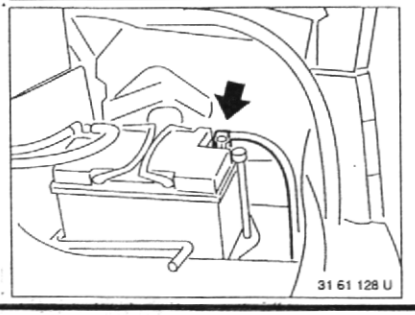


Disconnect both ground leads of batteries in trunk – left rear in picture.

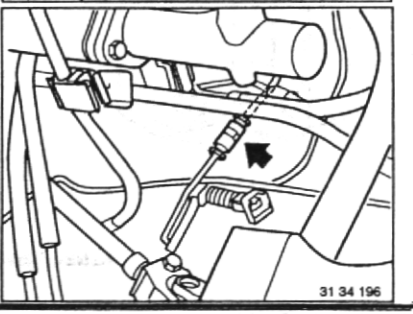
Important!
Fault memories are cancelled by disconnecting the battery.



Discharge pressure at bleeder screw (1) of the plunger unit.
Disconnect bleeder pipe.



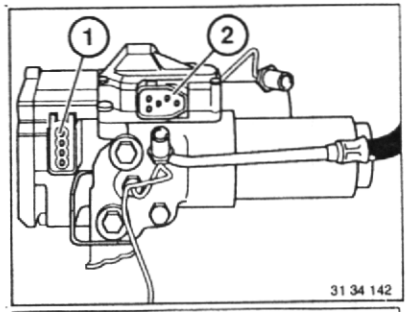
Right rear battery ground lead.



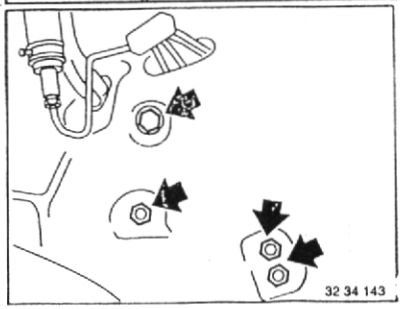
Disconnect pressure pipe from the tandem pump on the connector.

Installation:
Tightening torque* for
pressure pipe = M 12 x 1

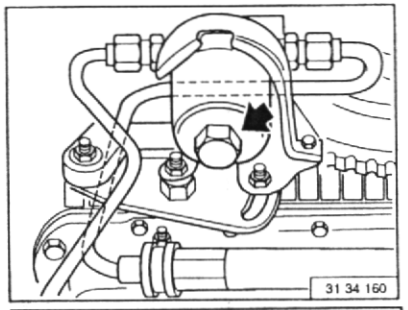
* See Specifications



Pull off solenoid valve plug (1) and pressure sensor plug (2).

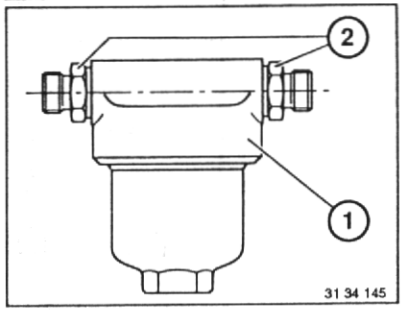


Unscrew plunger hydraulic control unit mounting bolts on the wheel house.



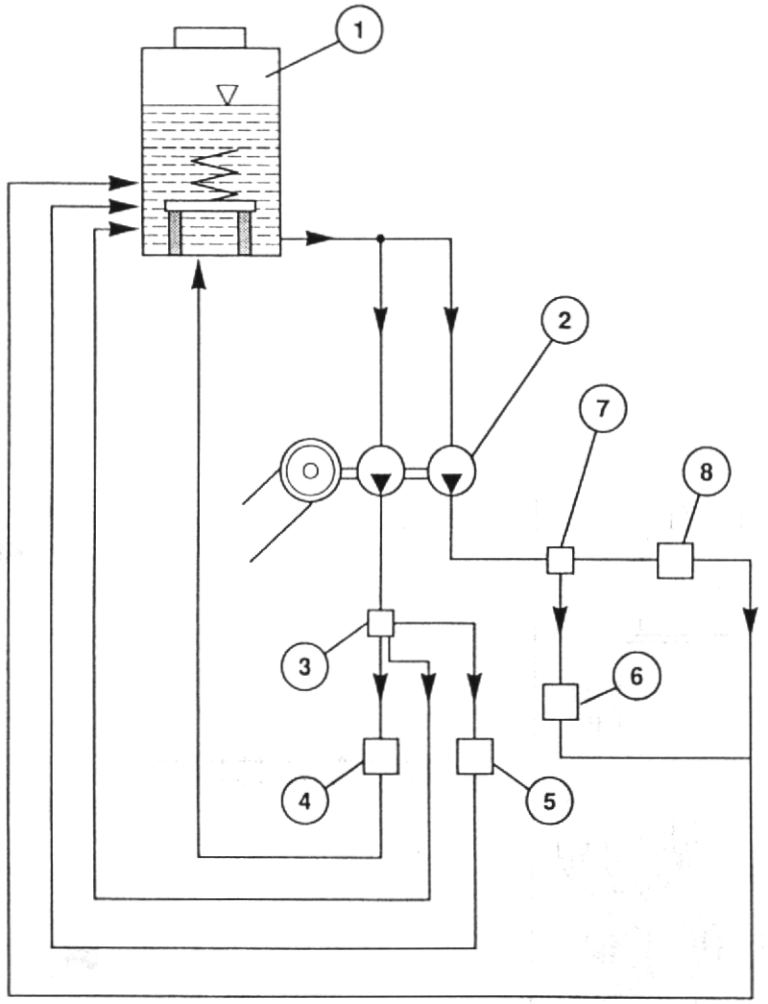
34 51 540 REMOVING AND INSTALLING ASC+T FILTER

Unscrew filter bell housing.
Replace filter element and O-ring.
Filter replacement intervals – see Group 00.



Installation:
Tightening torque for
1 = 15 Nm (11 ft. lbs.)
2 = 39 Nm (28 ft. lbs.)

ASC + T OIL CIRCUIT

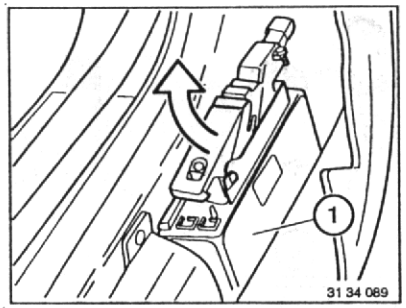


1 Tank
2 Dual pump
3 Charging valve
4 Power steering
5 Brake booster
6 ASC plunger
7 ASC charging valve
8 Ride level height control

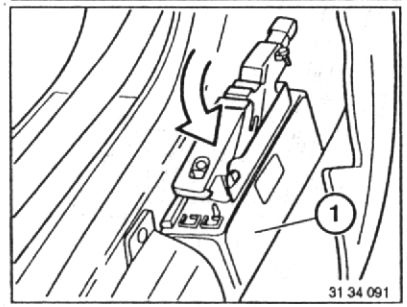
34 52 510 REPLACING CONTROL UNIT FOR ABS / ASC

Detach cover in left front driver's footwell partially – see Group 51.

Caution!
Remove (and install) control unit only after switching off the ignition.



Control unit (1):
Push back retainer and pull off multiple-pin plug on the right side and disengage on the left side.
Unscrew control unit on body.

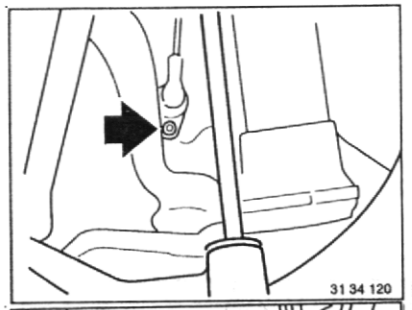


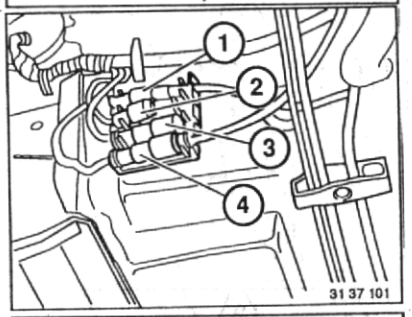
Control unit (1):
Check for correct connection when replacing a control unit.
The multiple-pin plug has a tab on the left side, for which the control unit must have an opening.

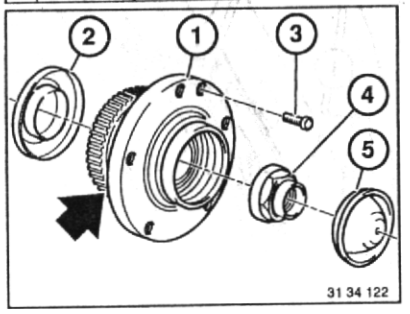
Installation:
Engage left side of plug first and then press the right side into the retainer.
Check ABS/ASC – see reading fault memory in Car Electric/Electronic Test Plan.
Check control unit number*.
Also refer to Service Information of Group 34.

Electric wires for ABS / ASC are fully integrated in the main wire harness.

* See Specifications







61 12 510 REMOVING AND INSTALLING OR REPLACING FRONT PULSE SENDERS (SPEED SENSORS FOR ABS/ASC)

Switch off ignition.
Unscrew socket head screw.
Lift lead out of clips.
Pull out pulse sender.

Installation:
Check seal, replacing if necessary.
Lubricate pulse sender and housing with Molykote Longterm 2 prior to installation.

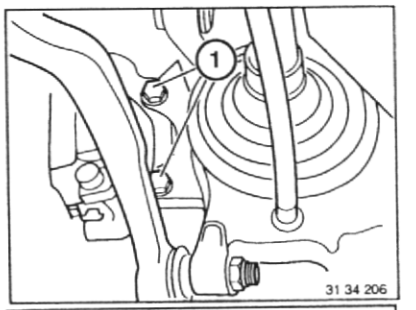
When replacing a front pulse sender, unscrew front side panel cover, open protection box on the firewall and disconnect ABS plug.

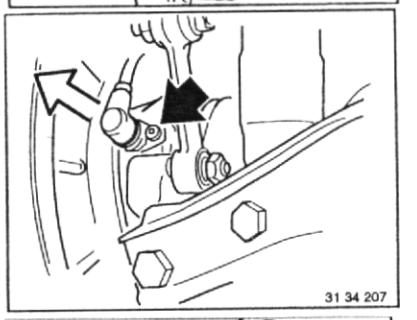
1 = ABS plug
2 = Not used
3 = Not used
4 = EDC plug

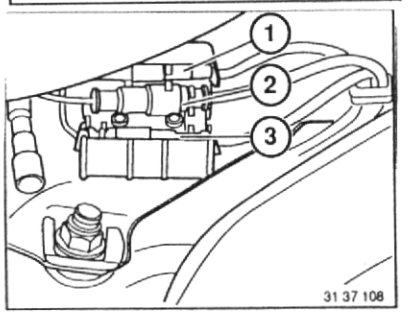
Removing and installing/Replacing Front Pulse Gear for ABS:
Teeth of the pulse gear are integrated in the front wheel hub.
See replacing wheel hub in 31 21 180.

1 Bearing unit (hub)
2 Grease cap
3 Bolt
4 Collar nut
5 Cap

Installation:
Spacing is given by the take-up bore in the case of front pulse senders.
Check ABS/ASC – see reading fault memory in Car Electric/Electronic Test Plan.







61 12 522 REMOVING AND INSTALLING OR REPLACING REAR PULSE SENDERS (SPEED SENSORS FOR ABS/ASC)

Switch off ignition.
Remove rear wheel – see 36 10 300.
Remove brake caliper – see 34 21 ...

Unscrew socket head screw.
Lift lead out of clips.
Pull out pulse sender.

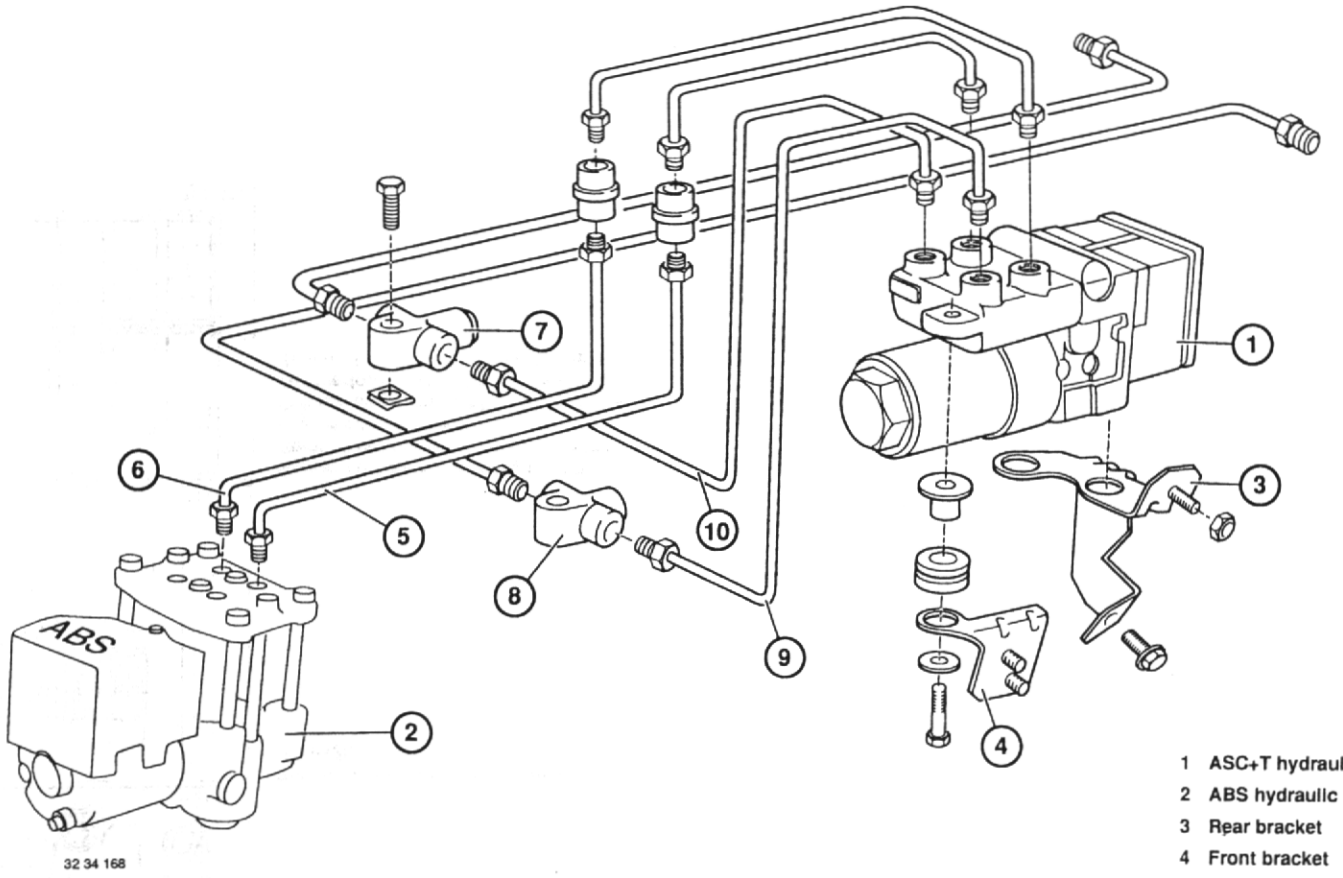
Installation:
Check seal, replacing if necessary.
Lubricate pulse sender and housing with Molykote Longterm 2 prior to installation.

Replacing Rear Pulse Sender:
Take lead out of clips.
Open protection box on rear axle carrier.
Disconnect plug.
Unscrew pulse sender.

Important!
Don't damage the rubber grommet.

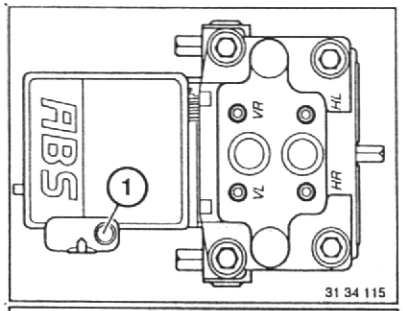
Removing and installing/Replacing Rear Pulse Gear:
Rear pulse gear is integrated in the drive flange.
See replacing drive flange hub in 33 41 151.

AUTOMATIC STABILITY CONTROL (Pipe Routing from ABS Hydraulic Unit to ASC+T Hydraulic Unit)



1 ASC+T hydraulic control unit
2 ABS hydraulic control unit
3 Rear bracket
4 Front bracket
5 Left rear pipe (M 10 threads)
6 Right rear pipe* (M 12 threads)
7 Right rear connector (M 12 x 1)
8 Left rear connector (M 10 x 1)
9 Right rear pipe (RZ)
10 Left rear pipe (RZ)

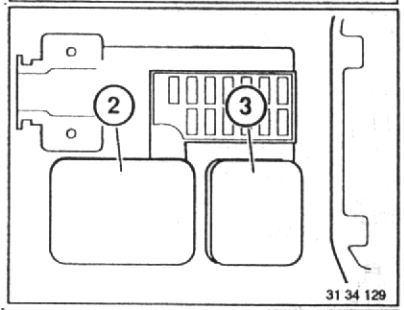
* ABS end (M 10 threads)



31 34 115

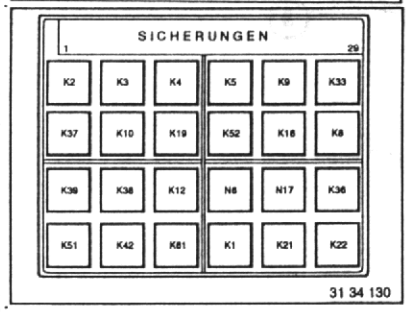
61 31 570 REPLACING RELAYS ON HYDRAULIC CONTROL UNIT (FOR ABS)

Unscrew screw.
Pull off cover.



31 34 129

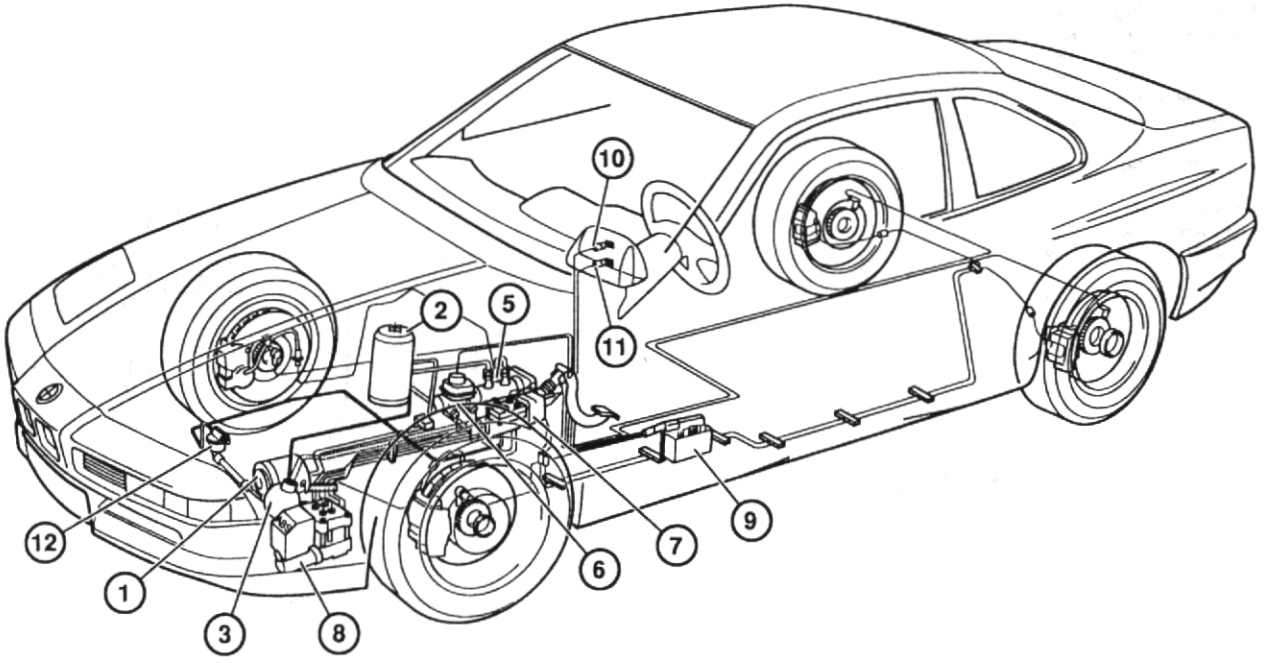
Pull out motor relay (2) or valve relay (3).



31 34 130

Replacing Electronic Relay for ABS:
Remove cover from relay plate in the engine compartment.
Pull out and replace ABS electronic relay/overload cutout K 10 (Bosch) with Special Tool 61 1 250 – see Group 61.

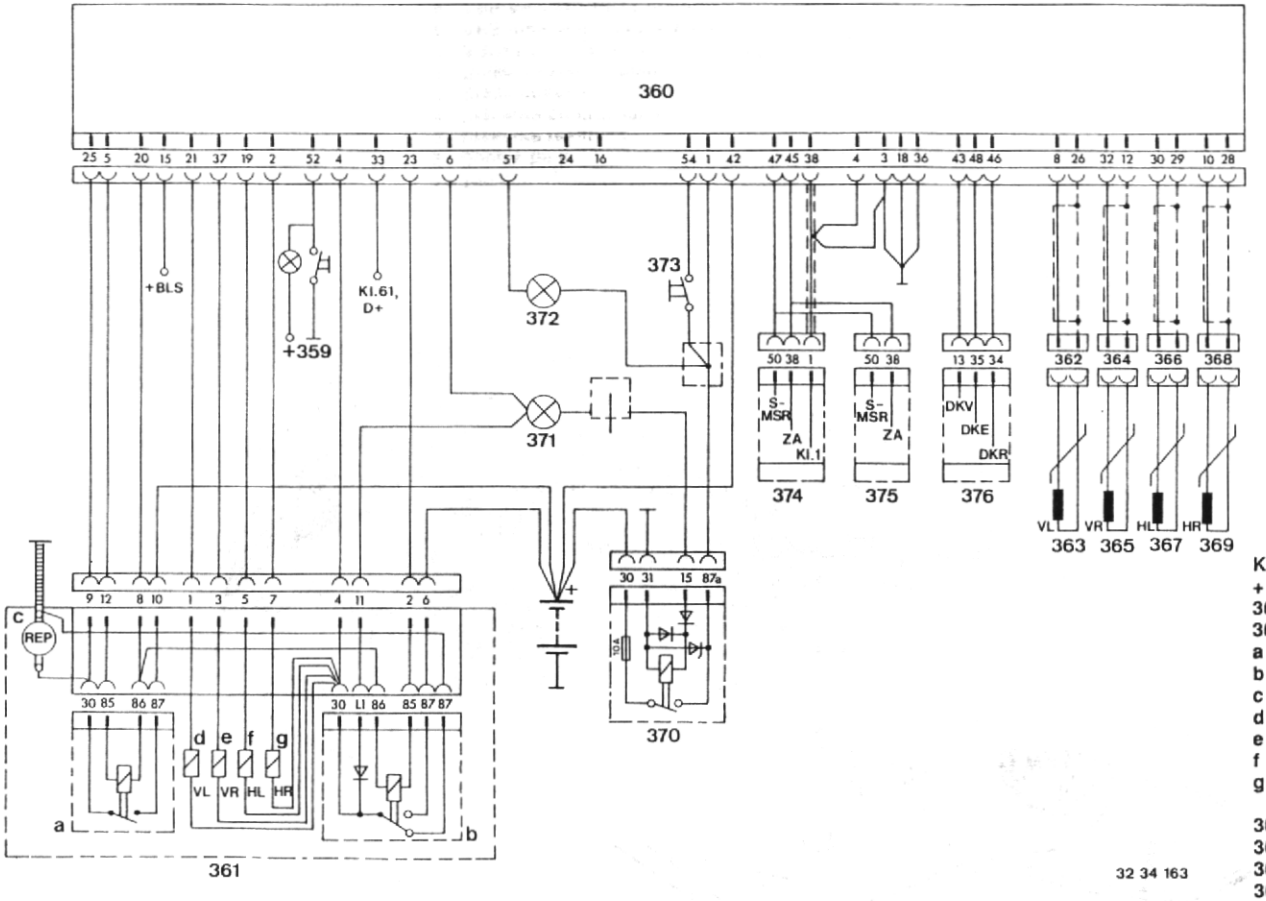
LAYOUT OF ABS/ASC+T



31 34 157

1 Tandem hydraulic pump
2 Supply tank
3 Pressure reservoir
4 Pressure control valve
5 Brake booster
6 Brake master cylinder
7 ASC+T (plunger hydr. control unit)
8 ABS (hydraulic control unit)
9 ABS/ASC or ASC+T control unit
10 ASC (control lamp)
11 ABS (control lamp)
12 ASC+T hydraulic filter

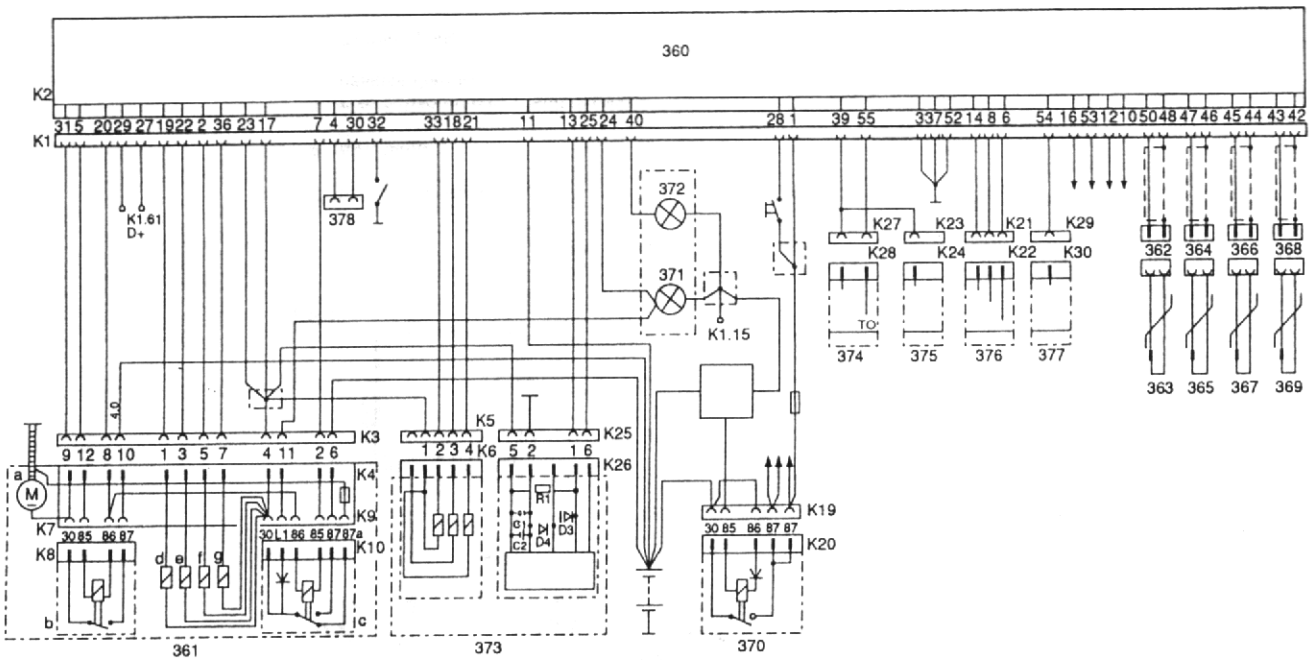
WIRING DIAGRAM FOR ABS/ASC-DKZ (Since 9.88)



32 34 163

KL 61	Terminal 61 (charge control)
+ BLS	Stop light switch
360	Electronic control unit
361	Hydraulic control unit
a	Return delivery pump motor
b	Motor relay
c	Valve relay
d	Valve - left front
e	Valve - right front
f	Valve - left rear
g	Valve - right rear
362	Conn. -signal sender left front
363	Signal sender left front
364	Conn. - signal sender right front
365	Signal sender right front
366	Conn. - signal sender left rear
367	Signal sender left rear
368	Conn. - signal sender right rear
369	Signal sender right rear
370	Master relay (DME)
371	ABS lamp

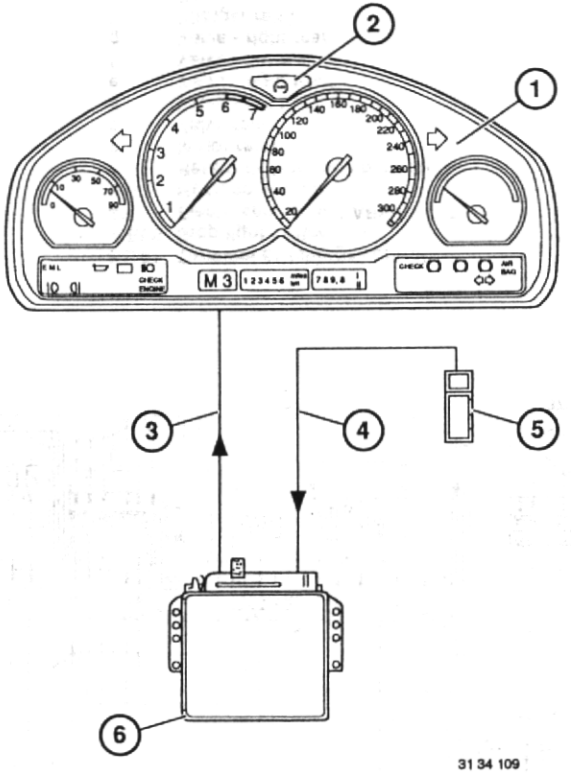
WIRING DIAGRAM FOR ASC+T



31 34 169

KL 61	Terminal 61 (charge control)
+ BLS	Stop light switch
360	Electr. control unit ABS/ASC+T
361	Hydr. control unit
a	Return delivery pump motor
b	Motor relay
c	Valve relay
d	Valve - left front
e	Valve - right front
f	Valve - left rear
g	Valve - right rear
h	Plunger relay
i	Pressure sender relay
362	Conn. - signal sender left front
363	Signal sender left front
364	Conn. - signal sender right front
365	Signal sender right front
366	Conn. - signal sender left rear
367	Signal sender left rear
368	Conn. - signal sender right rear
369	Signal sender right rear
370	Master relay (DME)
371	ABS lamp
372	ASC lamp
373	Plunger hydraulic control unit
374	DME
375	DME
376	EML
377	Transmission control
378	Diagnosis
379	DME

ASC+T DISPLAYING AND SWITCHING MODE



1 Instrument cluster

2 ASC lamp

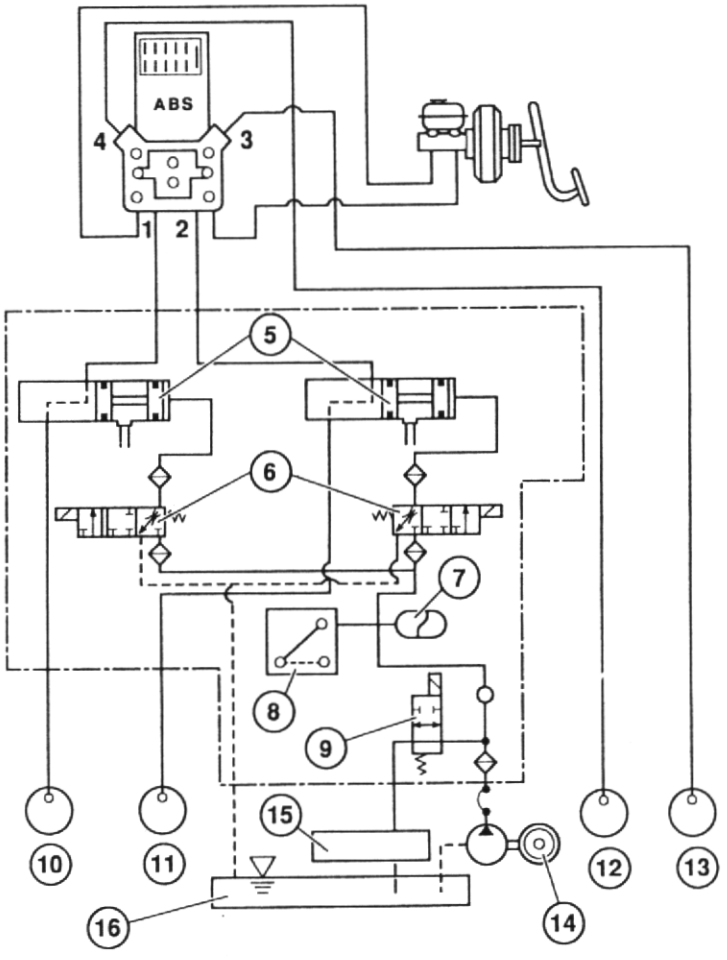
3 ASC active display / fault display / passive display

4 Switching signal

5 ASC passive push button switch

6 Control unit

PLUNGER HYDRAULIC DIAGRAM
ASC+T
(Diagonal Brake Circuit Division)



1 Right rear pipe
2 Left rear pipe
3 Right front pipe
4 Left front pipe
5 Plunger piston
6 Solenoid valves
7 Pressure reservoir
8 Pressure switch
9 Charging valve
10 Right rear brake
11 Left rear brake
12 Left front brake
13 Right front brake
14 Tandem pump
15 Consumer
16 Oil supply tank