

34 Brakes

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34 Brakes

ABS — troubleshoot 34 - 35

34 00 009 BRAKE TEST ON TEST STAND

Inspect condition and treads of tires and also check/correct tire inflation pressure prior to testing the brakes.

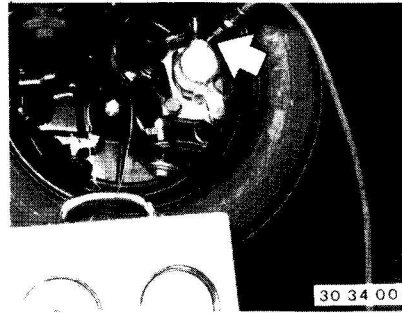
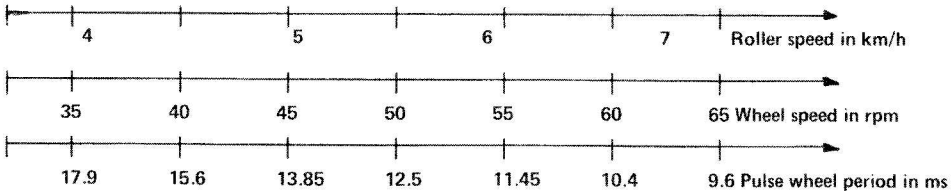
The brakes should have operating temperature, i.e. brake discs/drums should be warm and dry by way of braking the car several times.

Comply with operating instructions supplied with pertinent test stand in order to avoid damage on the car or system as well as injury of personnel.

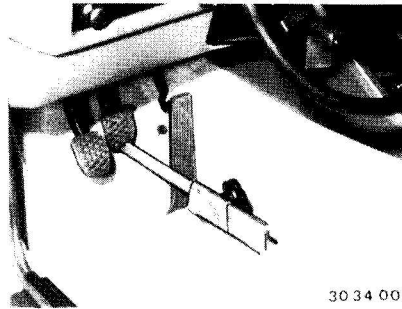
Important!

Cars with four driven wheels (325 iX) must not be tested on a brake test dynamometer longer than 60 seconds or faster than 7.5 km/h (4.5 mph), in order to avoid damaging the central lock. In other words the total testing time for the front axle, rear axle and parking brake must not exceed 60 seconds. If testing has to be repeated, wait at least 30 minutes to have the central lock cool down.

If not specified and guaranteed by the manufacturers, the precise roller speed of a brake test dynamometer must be checked with a '3' series car fitted with ABS, but without all wheel drive. Drive car on to dynamometer, connect BMW service tester and see ABS nominal value microfiche for connections. Select ABS test step 03 dynamic/speed sensor and switch on the dynamometer. Conversion of displayed ms:



30 34 001



30 34 002

34 00 519 CHECKING SERVICE BRAKES IN HIGH AND LOW PRESSURE TESTS

High Pressure Leak Test.

Perform test on both brake circuits.

1. Brake circuit front left and right

2. Brake circuit rear left and right

Unscrew bleeder screw.

Connect and bleed pressure tester.

Do not run engine.

Apply load* on brake pedal and hold brake pedal down with a pedal prop.

Max. pressure drop after 2 minutes is 8 %.

Important!

High pressure leak test must be performed with the engine stopped.

Low Pressure Test:

Perform test on both brake circuits.

Release pedal prop that test pressure in brake system is 2 to 5 bar (28 to 71 psi).

Car and tester must remain still, since movement would cause incorrect test results.

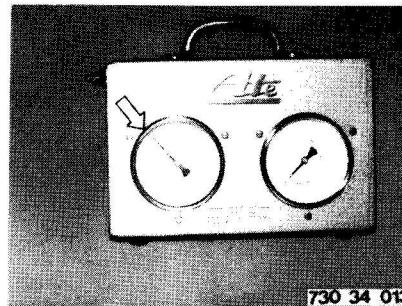
Pressure should remain constant during 5 minute test.

If pressure drops considerably, inspect all rubber parts.

Bleed brake calipers and wheel brake cylinders after finishing test.



30 34 125



730 34 013

* See Specifications

34 00 046 BLEEDING BRAKES

Brake fluid* must be replaced annually. Brake fluid is hygroscopic and consequently takes on moisture in the air through the vent hole in brake fluid tank.

This could drop brake fluid boiling point from + 240° C (464° F) to + 160 ... 180° C (320 ... 356° F).

Check gasket (arrow).

Caution!

Keep brake fluid off of painted car parts – paint finish would be damaged.

Connect bleeder on brake fluid tank.

Check operating instructions supplied with bleeder.

Charging pressure must not exceed 2 bar (28 psi).

Rear Wheel Brakes (Drums):

Connect bleeder hose with bottle on bleeder screw.

Unscrew bleeder screw.

Tighten bleeder screw when escaping brake fluid is without air bubbles.

Rear Wheel Brakes (Discs):

Connect bleeder hose with bottle on bleeder screw.

Unscrew bleeder screw.

Tighten bleeder screw when escaping brake fluid is without air bubbles.

* See Service Information of Gr. 00

Front Wheel Brakes:

Connect bleeder hose with bottle on bleeder screw.

Unscrew bleeder screw.

Tighten bleeder screw when escaping brake fluid is without air bubbles.

34 00 047 BLEEDING BRAKES WITH ABS

Connect bleeder on brake fluid tank.

Check operating instructions supplied with bleeder.

Note:

Do not use air flushing.

Press and hold brake pedal down.

Connect bleeder hose with bottle on bleeder screw and open bleeder valves on wheel brakes, beginning at rear right.

Release brake pedal and operate 12 times against stop.

Hold brake pedal in down position.

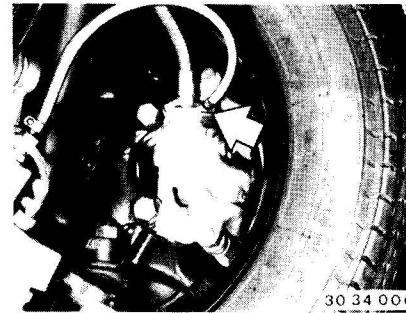
Shut bleeder valves.

Release brake pedal.

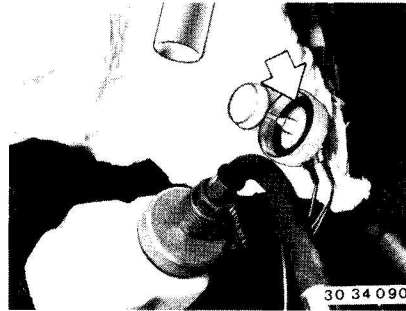
Repeat bleeding on rear left, front right and front left.



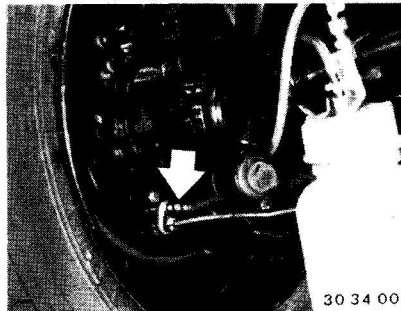
20 34 028



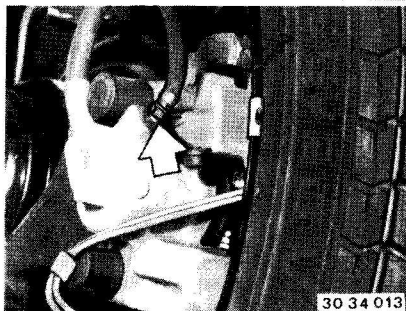
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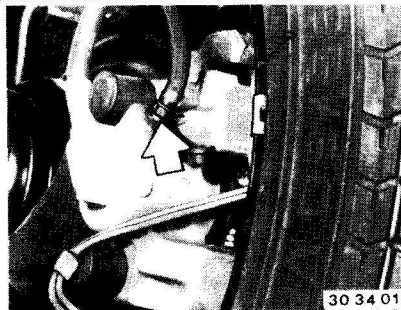
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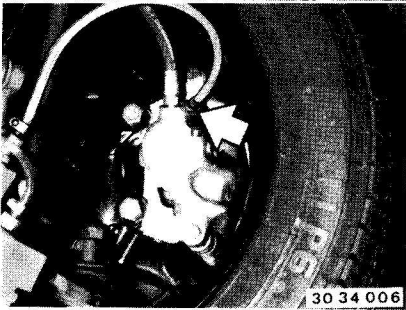
30 34 005



30 34 013



30 34 013



30 34 006

34 10 014 ADJUSTING PARKING BRAKE

Requirements:

Both parking brake cables move easily and automatic slack control functions correctly. Parking brake needs to be adjusted when the parking brake lever can be pulled up by more than 8 teeth.

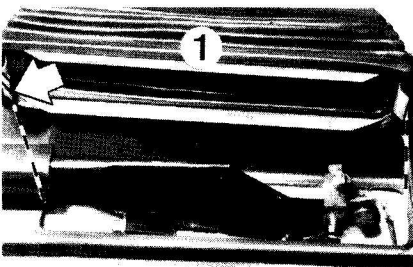
Discs:

Note:

The parking brake system, which is completely independent of the service brakes, is only subjected to limited wear since the parking brake will not be needed during normal car operation. This consequently reduces the friction torque, e.g. caused by corrosion of brake drums or contamination of liners.

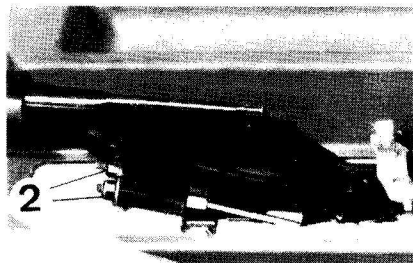
The force required for operating will increase proportionally.

To acquire optimal parking brake efficiency, it will normally be sufficient to drive the car from the parking lot to the workplace max. 400 meters (1300 feet) with the parking brake applied (pull up lever until resistance is felt and then one further catch) before adjusting the parking brake.



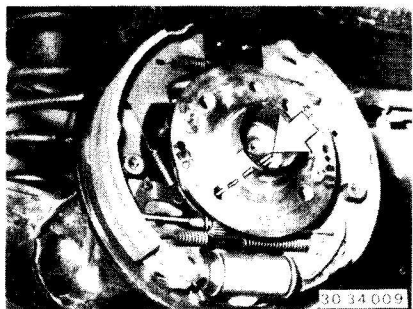
30 34 007

Lift out front clamp.
Pull off rubber cap (1).
Disconnect rear clamp.



30 34 008

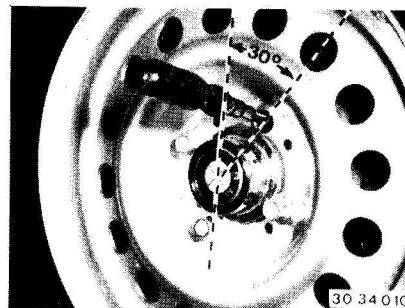
Unscrew adjusting bolts (2).



30 34 009

Drums:

Operate brake pedal several times. Basic clearance will be adjusted automatically. This is indicated by a clicking noise on the rear wheels. Function of automatic slack control can be checked through a wheel bolt bore.

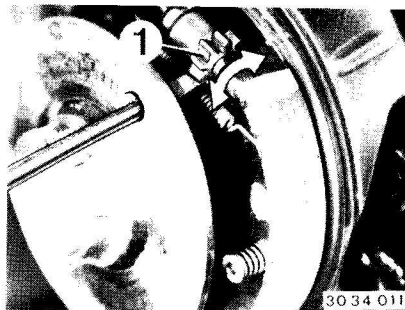


30 34 010

Unscrew one wheel bolt on each rear wheel and remove. Turn wheels that each tapped bore is approx. 30° behind the perpendicular on top.

Installation:

Tightening torque*.



30 34 011

Turn adjusting nut (1) with a screwdriver to move out the parking brake shoes and prevent the brake disc from turning. Then loosen adjusting nut by 3 or 4 threads. Left adjusting nut turned up to tighten. Right adjusting nut turned down to tighten. Brake disc must turn easily.



30 34 012

Brake Cable Adjustment:

Pull up parking brake lever by 5 teeth and adjust adjusting nuts (2) enough that left and right rear wheels can just be turned and both uniformly. Release parking brake lever and check whether wheels can be turned easily. The indicator lamp should go out when the parking brake is released with the ignition on. Adjust switch (3), if necessary.

* See Specifications

34 11 000 REMOVING AND INSTALLING FRONT BRAKE PADS

Remove front wheels — see 36 10 300.
Pull off brake pad wear indicator plug on left side.



30 34 018

Drive out pin of brake pad wear indicator carefully.
Check circlip (5) when reusing.
Replace pad wear indicators with ground off plastic part.

Unscrew bolt (2).
Important!
Replace self-locking bolt.
Counterhold on guide pin.
Installation:
Tightening torque*.

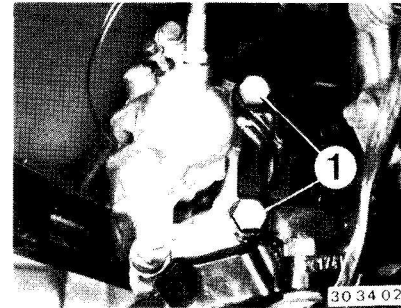


30 34 019

34 11 520 REMOVING AND INSTALLING FRONT BRAKE CALIPERS

Remove front wheel — see 36 10 300.
Draw off brake fluid with a syringe which is used exclusively with brake fluid.
Disconnect brake line.
Installation:
Bleed brakes — see 34 00 046/047.

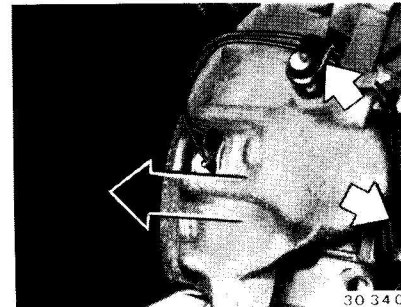
Turn up brake caliper.
Remove brake pads.



30 34 020

Unscrew caliper mounting bolts (1).
Installation:
Tightening torque*.

Installation:
Check pads and pad thickness*.
Push back brake pistons completely.
Important!
Be careful not to damage dust cover on brake piston when assembling.
Check dust cover.
Check installed position of springs (4).

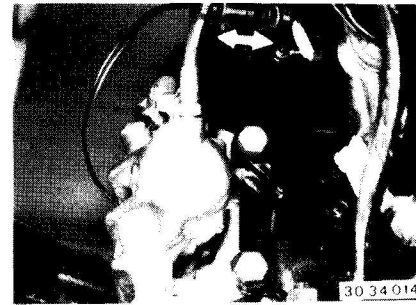


30 34 021

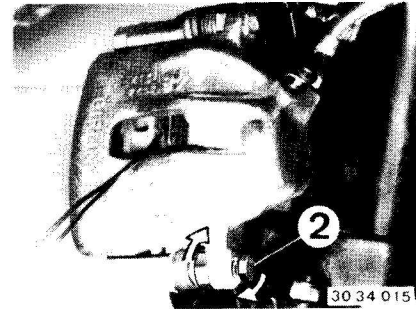
Pull off brake pad wear indicator plug on left side.
Pull off caliper toward rear.
Installation:
Make sure of correct location of brake pad wear indicator wires with tab of dust cap — rubbing of the wires on the wheel rim must always be prevented!

* See Specifications

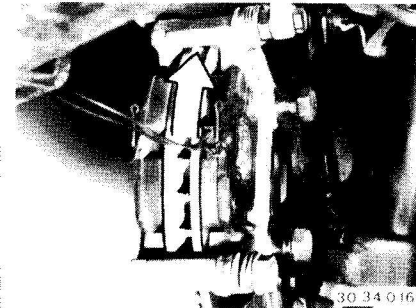
* See Specifications



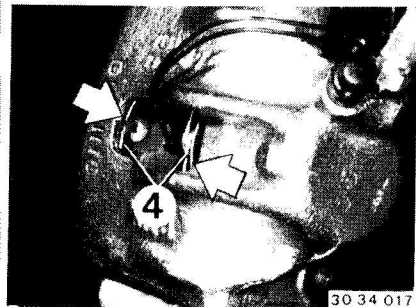
30 34 014



30 34 015



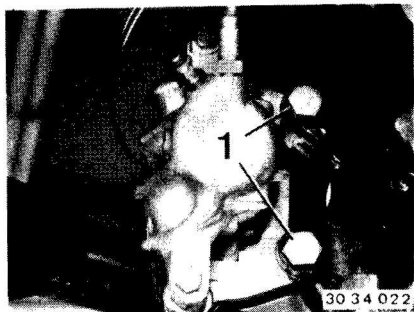
30 34 016



30 34 017

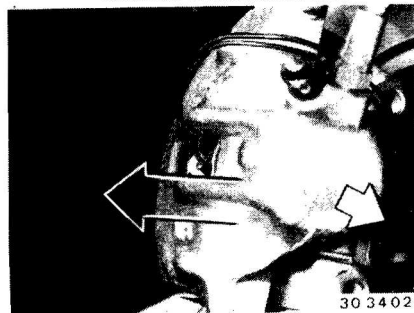
34 11 220 REMOVING AND INSTALLING FRONT BRAKE DISCS

Remove and install front wheels 36 10 300.
 Unscrew caliper mounting bolts (1).
Installation:
 Tightening torque*.



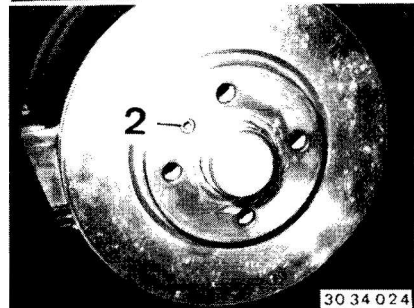
30 34 022

Unplug brake pad wear indicator on left side.
 Pull off caliper toward rear and suspend with a piece of wire.



30 34 021

Unscrew bolt (2).
 Take off brake disc.
 Tool: wrench socket 34 1 020.



30 34 024

* See Specifications

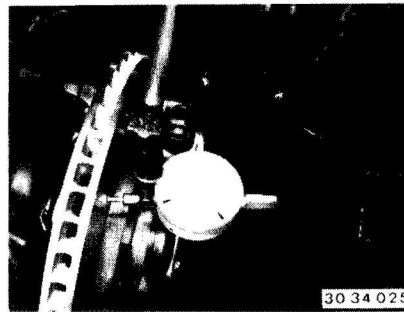
34 11 599 CHECKING FRONT BRAKE DISC FOR RUNOUT AND DIFFERENCE IN THICKNESS

– FRONT WHEEL REMOVED –

Requirement: wheel bearings okay.
 Mount dial gauge holder and check lateral runout* of brake disc with dial gauge.

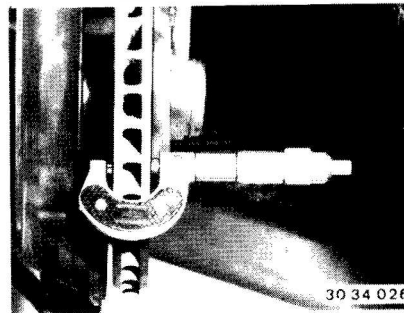
Note:

Mount brake disc with two M 12 x 1.5 bolts.



30 34 025

Measure difference in thickness* within braking surface at about 8 points with a micrometer.



30 34 026

34 11 667 GRINDING FRONT BRAKE DISCS

– BRAKE DISCS REMOVED –

Important!

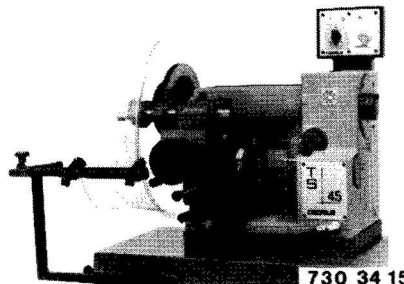
Always fine grind both sides of both brake discs on one axle.

After machining to minimum thickness *) install only one more set of brake pads. Note the wear limit *) of brake discs.

Installation:

Even if only one brake disc has to be replaced, always replace both brake discs of one axle.

See also SI Group 34.



730 34 152

* See Specifications

34 21 530 REMOVING AND INSTALLING BRAKE SHOES OF REAR WHEEL

Remove rear wheel.
Unscrew bolt.

Remove brake drum by loosening parking brake cables and unscrewing automatic slack control enough that brake drum can be pulled off.

Push in return springs and turn 90°.

Disconnect bottom return spring at front.
Pull brake shoes out of wheel brake cylinder.
Disconnect top return spring at front.
Remove front brake shoes with automatic slack control.

Disconnect parking brake cable.
Remove rear brake shoes.
Replace brake shoes by exchanging.
See Service Information of Group 34.

Installation:

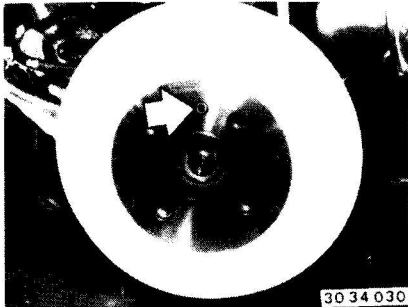
Always replace all four brake shoes and use same make*.
Also replace return springs and thermo clip when replacing brake shoes.

Arrangement of Automatic Slack Control:
Adjusting pinion on left side has right-hand threads (R) and left-hand threads (L) on right side.

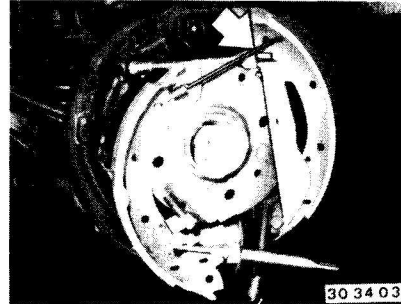
Thermo clip must engage (arrow).
Note bends of return springs.

Unscrew adjusting pinion.
Check function and movement of automatic slack control.
If applicable, clean and give threads of push rod a light coat of grease.

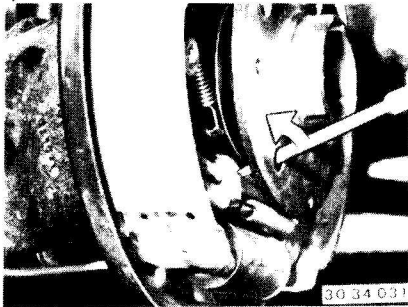
* See Specifications



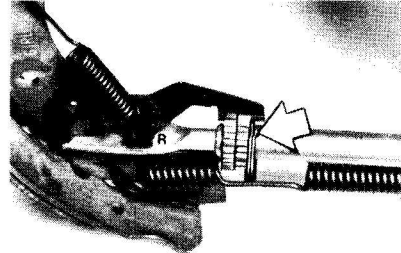
30 34 030



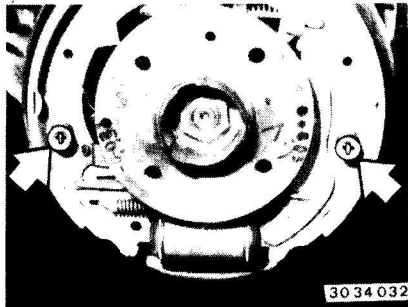
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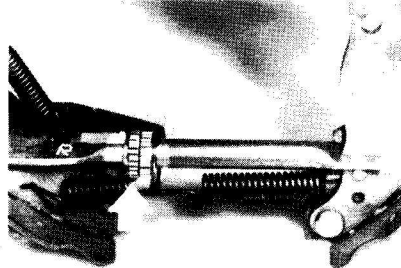
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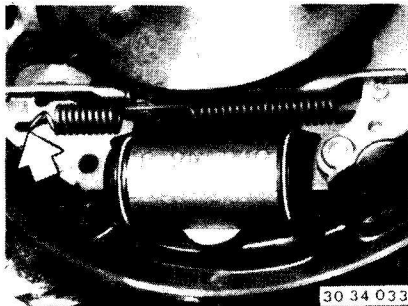
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30 34 032



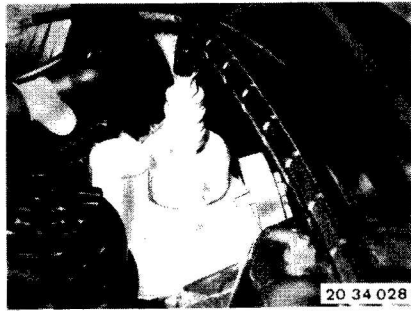
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30 34 033

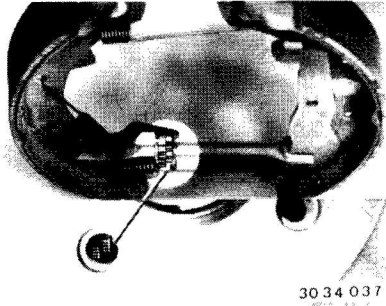
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If brakes have to be bled, this must be done before adjusting the parking brake.

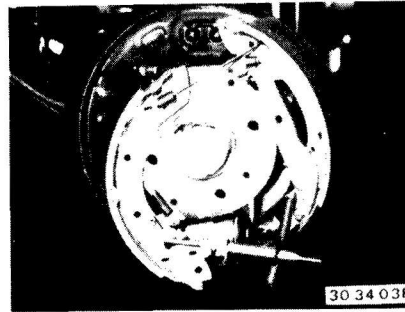


20 34 028

Adjust basic clearance by operating brake pedal.
A click will be heard on the rear wheel brakes until reaching the basic clearance.
Adjust parking brake 34 10 014.



30 34 037

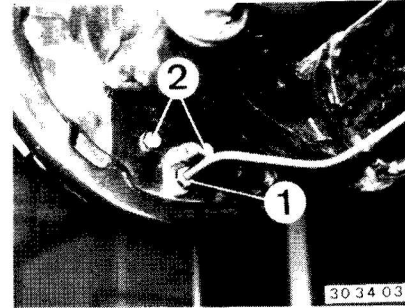


30 34 038

34 21 600 REMOVING AND INSTALLING WHEEL BRAKE CYLINDER

Remove and install brake shoes 34 21 530.
Draw off brake fluid with a syringe which is used exclusively with brake fluid.

Installation:
Bleed brakes 34 00 046.



30 34 039

Unscrew brake line (1) and bolts (2) on wheel brake cylinder.

34 21 200 REMOVING AND INSTALLING REAR BRAKE PADS

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

Unscrew guide bolts (2).
Installation:
 Check condition of guide bolts and threads, replacing guide bolts if necessary.
 Tightening torque*.

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

Remove outer brake pad.
 Inner brake pad is located in piston (4) with a spring.
Installation:
 Push back pistons completely.

* See Specifications

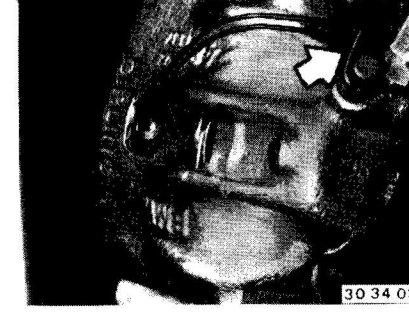
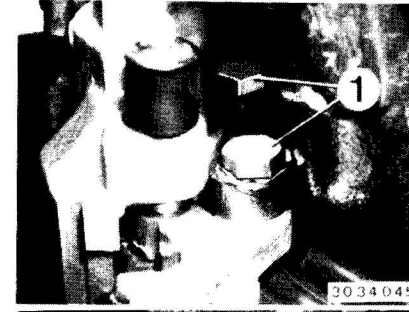
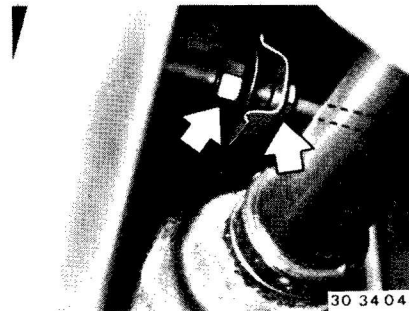
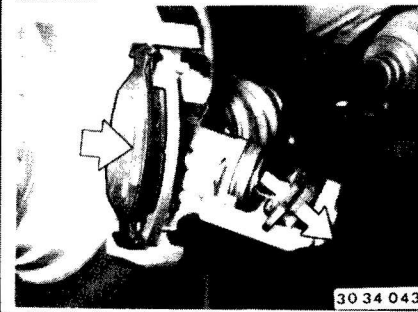
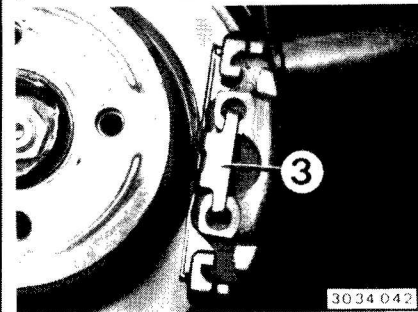
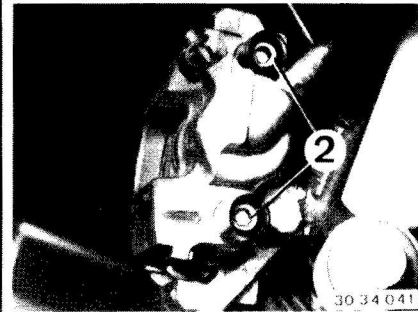
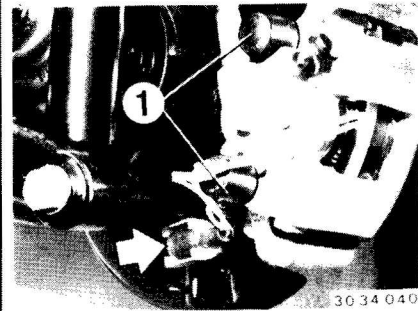
34 21 745 REMOVING AND INSTALLING REAR BRAKE CALIPER

Remove rear wheel.
 Draw off brake fluid with a syringe which is used exclusively with brake fluids.
 Disconnect brake line.
Installation:
 Bleed brakes — see 34 00 046/047.

Unscrew bolts (1).
 Right Side:
 Pull off brake pad wear indicator plug.
 Pull off caliper toward rear.
Installation:
 Tightening torque*.

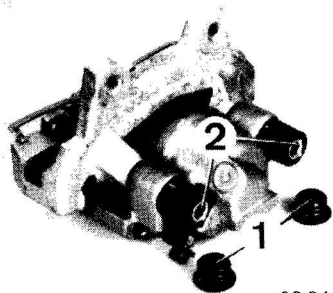
Important!
 Check routing and securing of wire for brake pad wear indicator.
 Check for secure holding with tab of dust cap.
 Rubbing of wire on wheel rim must always be avoided.

* See Specifications



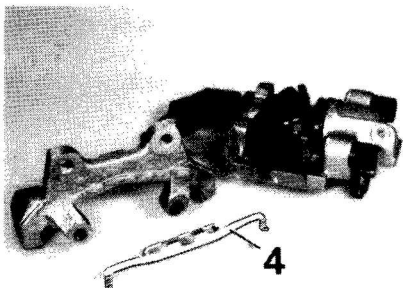
34 21 292 OVERHAULING REAR BRAKE CALIPERS CALIPERS - USE REPAIR KIT -

Remove and install rear brake caliper
34 21 220.
Press off plastic caps (1).
Unscrew guide bolts (2).



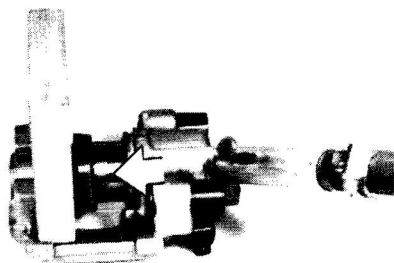
28 34 040

Disassemble caliper.
Remove brake pads.
Installation:
Push brake pad toward outside completely
before inserting spring (4).



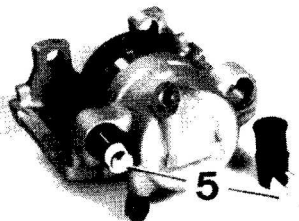
28 34 041

Press off rubber guard and clamping ring.
Place a liner (hard wood, hard felt or similar
material) in caliper recess to protect the piston.
Press out piston with compressed air applied
through connection bore.
Caution!
10 bar (140 psi) air pressure is equal to a force
of about 1250 N (275 lbs.).

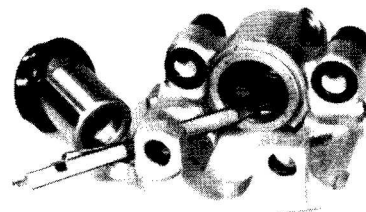


28 34 042

Check dowel sleeves (5), replacing with dowel
sleeves from repair kit if necessary.



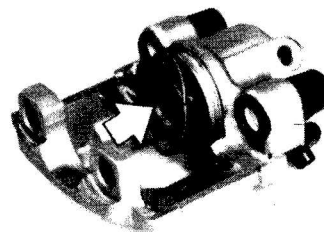
28 34 043



28 34 044

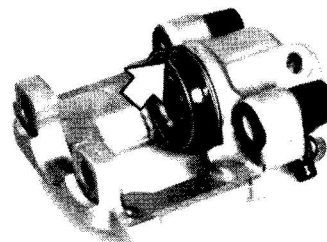
Remove seal carefully with a plastic needle.
Clean cylinder bores and parts with alcohol and
dry with compressed air.
Inspect pistons and flange surfaces thoroughly
for damage.
Machining of cylinder bores and pistons is not
approved.
Installation:
Give all parts a light coat of ATE brake cylinder
paste and install.

First pull rubber guard on to piston.
Don't cant piston.
Press in piston with a piece of hard wood.



28 34 045

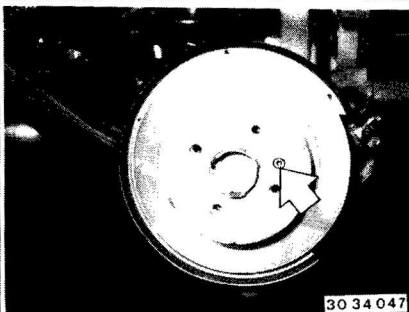
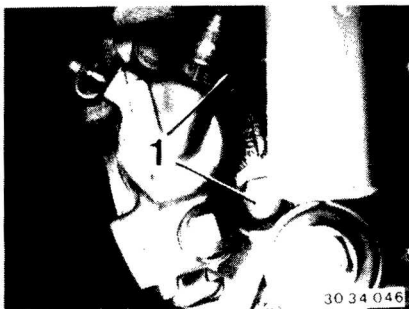
Pull rubber guard over edge of cylinder bore
and secure with a clamping ring.
Assemble caliper.



28 34 046

34 21 320 REMOVING AND INSTALLING REAR BRAKE DISC

Remove and install rear wheel.
Unscrew bolts (1).



Pull off caliper toward rear and suspend with a piece of wire.
Brake line remains connected.
Unscrew bolt and take off brake disc.

Important!

Always replace both brake discs of one axle, even if only one disc has to be replaced.
Adjust parking brake 34 10 014.

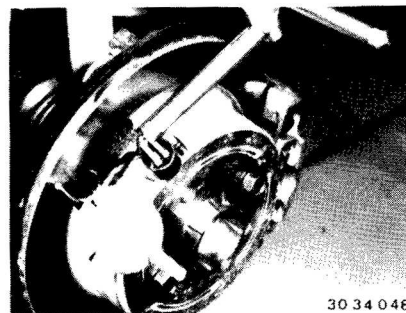
Breaking In Parking Brake After Replacing Brake Discs:

Car must be broken in in 3 phases.

Phase 1: 5 full stop braking actions from 50 km/h (30 mph).

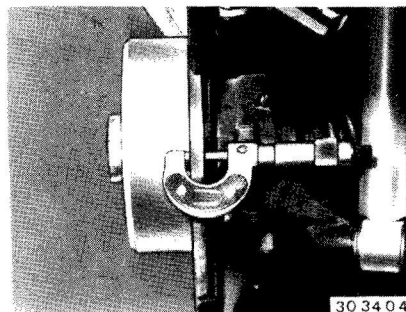
Phase 2: Let brakes cool down.

Phase 3: 5 additional braking actions from 50 km/h (30 mph).



34 21 879 CHECKING REAR BRAKE DISC FOR RUNOUT AND DIFFERENCE IN THICKNESS – REAR WHEEL REMOVED –

If necessary, remove caliper 34 21 220.
Mount brake disc with two bolts.
Mount dial gauge holder and check lateral runout* of brake disc with dial gauge.



Measure difference in thickness* within braking surface at about 8 points with a micrometer.

Installation:

Tightening torque*.

34 21 947 GRINDING REAR BRAKE DISCS – BRAKE DISCS REMOVED –

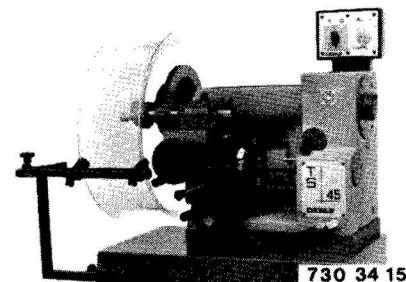
Important!

Always fine grind both sides of both brake discs on one axle.

After machining to minimum thickness *) install only one more set of brake pads.
Note the wear limit *) of brake discs.

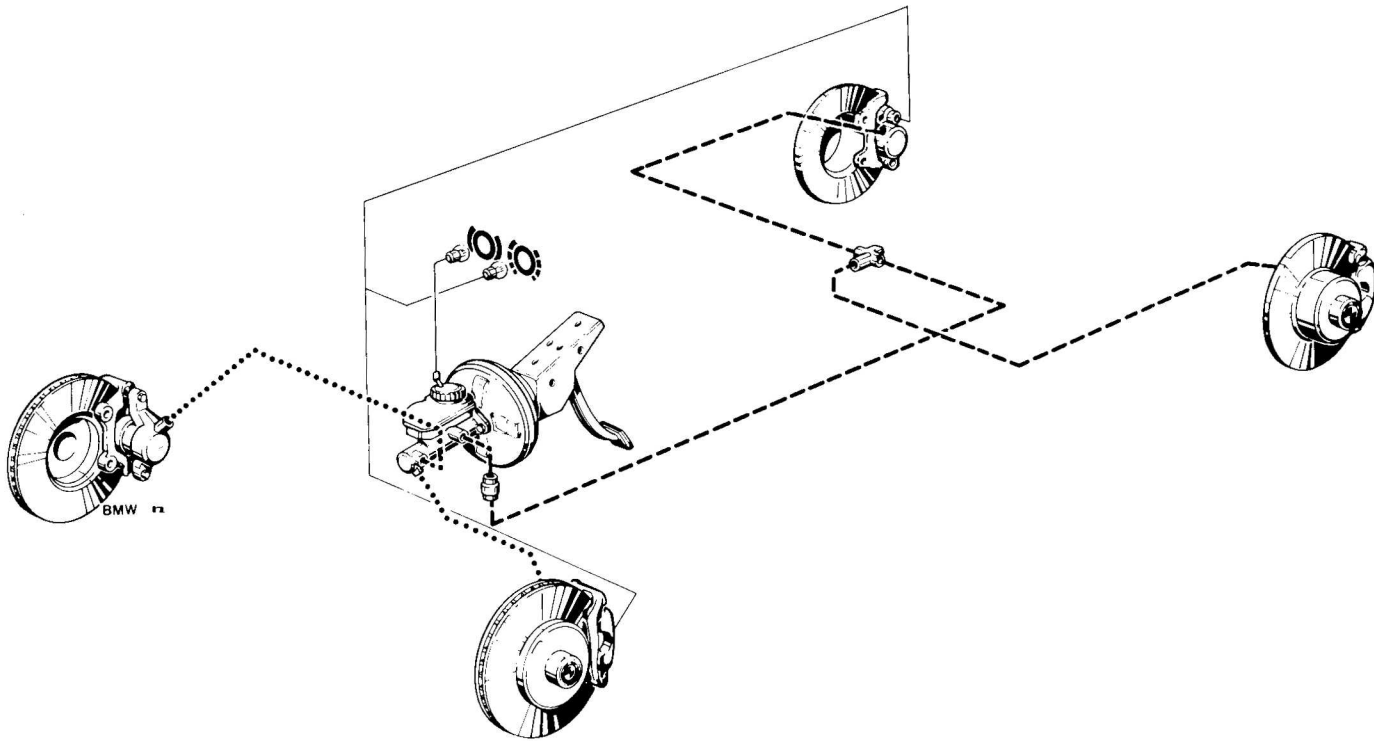
Installation:

Always replace both brake discs of one axle, even if only one brake disc has to be replaced.
See also SI Group 34.

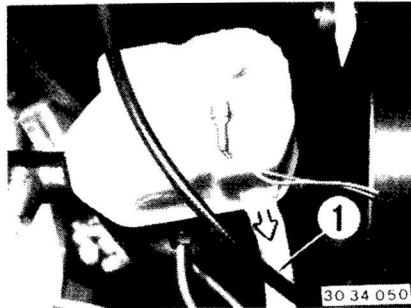


34 - 10a

BRAKE LINE ROUTING LAYOUT - E 30



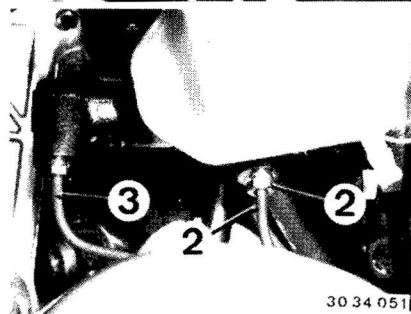
34 31 000 REMOVING AND INSTALLING BRAKE MASTER CYLINDER



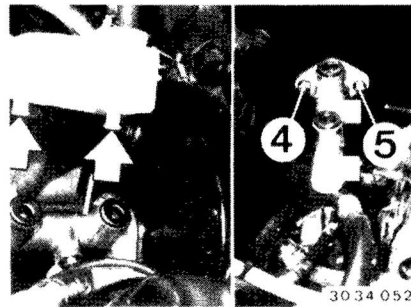
Draw off brake fluid in tank with a syringe used exclusively with brake fluids.
Pull off plug.
Pull off clutch hydraulic hose (1).

Installation:

Bleed brakes 34 00 046.



Disconnect brake lines (2 and 3).



Pull off tank.

Unscrew mounting bolts (4 and 5).

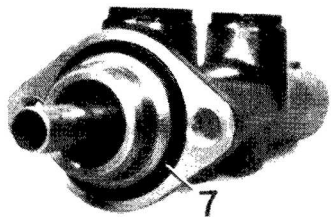
Installation:

Check rubber seal and connections.

Installation:

Check rubber ring (7).

If sealing is not perfect, the building up of vacuum will be impaired.



30 34 051

Description of Tandem Brake Master Cylinder:
Operating the brake pedal will move pistons (1 and 4) forward.

Primary cups (2 and 5) slide over compensation bores (3 and 6).

Now there is equal pressure in chambers A and B.

Dual Circuit System:

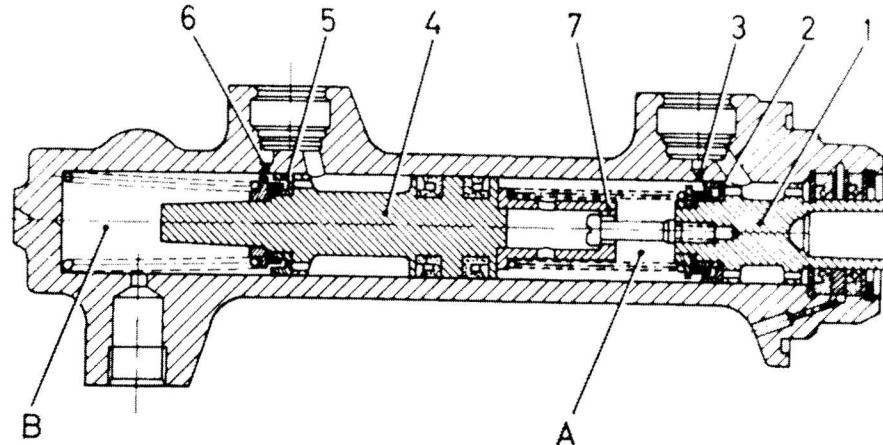
Chamber A serves right and left front.

Chamber B serves right and left rear.

If a brake circuit fails, the brake pedal travel will increase considerably.

If the second brake circuit fails, the pressure building up in chamber A will act on piston (1) to move piston (4) in the pressureless chamber B against the tandem brake master cylinder housing and restore function of the first brake circuit.

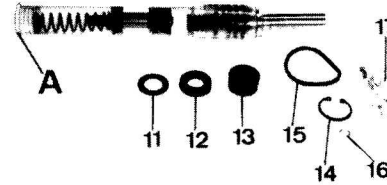
If the first circuit fails, piston (1) will be pressed against spring cap (7) in pressureless chamber A and the second brake circuit will function normally via chamber B.



34 31 012 OVERHAULING BRAKE MASTER CYLINDER

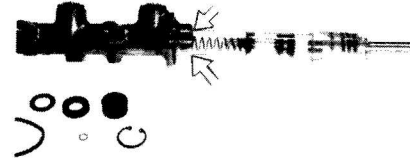
Remove and install tandem brake master cylinder 34 31 000. Replacement parts are not available for brake master cylinders with a recessed stop pin (ABS).

Give cylinder bore a very thin coat of ATE brake cylinder paste. Remove large plugs from assembly sleeve. Slide short sleeve section on long sleeve pipe far enough that stop washer (11), secondary cup (12), plastic bushing (13), circlip (14), seal (15), aluminum seal (16) and silicone grease (17) can be removed.



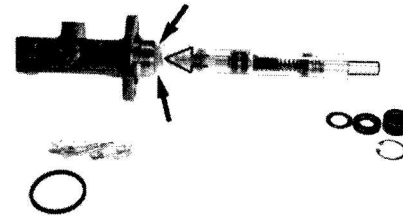
28 34 085

Clamp cylinder housing in a vise fitted with aluminum jaws. Guide assembly sleeve with long sleeve pipe into cylinder bore.



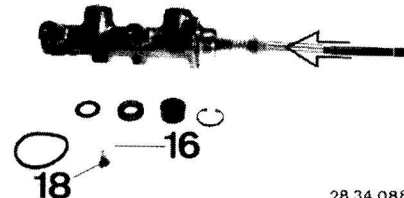
28 34 086

Push stepped short sleeve pipe into cylinder bore against shoulder and hold.



28 34 087

Push contents of assembly sleeve into cylinder bore carefully with a suitable mandrel until the intermediate piston touches the bottom of the cylinder.

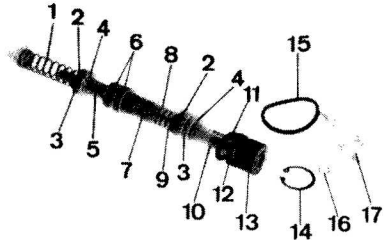


28 34 088

Important!

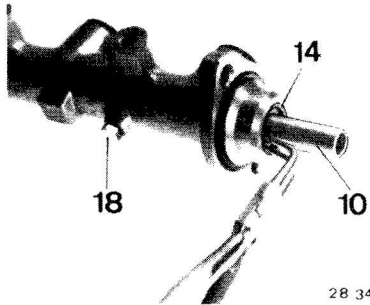
Use repair kit:

(1) spring, (2) support, (3) primary cup, (4) fill-in washer, (5) intermediate piston, (6) separating cup, (7) stop sleeve, (8) spring, (9) screw, (10) push rod piston, (11) stop washer, (12) secondary cup, (13) plastic bushing, (14) circlip, (15) seal, (16) aluminum seal and (17) silicone grease.



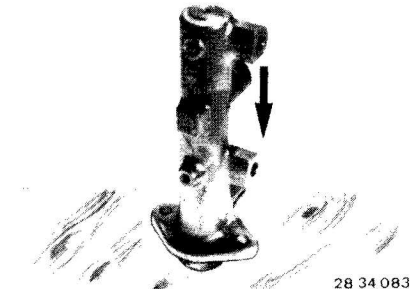
28 34 084

Apply light pressure on push rod piston (10), lift out circlip (14) and unscrew stop screw (18). Release push rod piston (10) slowly and pull out.



28 34 094

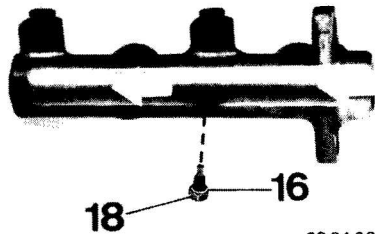
Knock out intermediate piston by knocking housing on a piece of wood lightly. Clean cylinder housing and other parts not contained in the repair kit with alcohol and dry with compressed air. Tandem brake master cylinders with surface damage in the cylinder bore may not be reused. Check whether all connecting, compensating and feeding bores are clean.



28 34 083

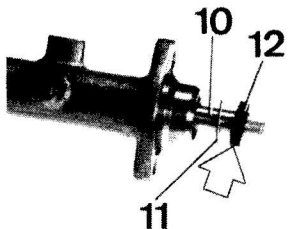
34-13

Hold intermediate piston against stop firmly and screw in screw (18) with a new aluminum ring (16). Tighten stop screw (18) with a torque of 5 to 8 Nm (3.7 to 5.7 ft. lbs.).



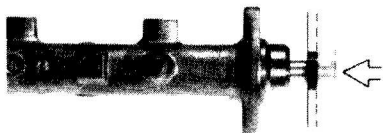
28 34 089

Let push rod piston (10) come back carefully. Push on stop washer (11). Coat secondary cup (12) with silicone grease and install. Let short stepped section of assembly sleeve protrude and slide it over secondary cup (12), while holding cup with two fingers.



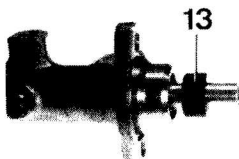
28 34 090

Adjust secondary cup flush with long sleeve pipe and push complete assembly sleeves into cylinder bore. Push in long sleeve pipe carefully up to point of resistance.



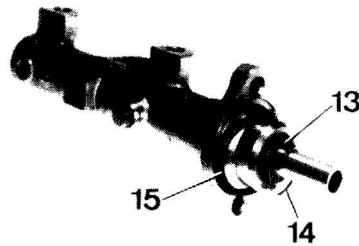
28 34 091

Hold long sleeve pipe and pull back short sleeve section. Remove complete assembly sleeve. Give plastic bushing (13) a light coat of silicone grease and push it on push rod piston in cylinder bore.



28 34 092

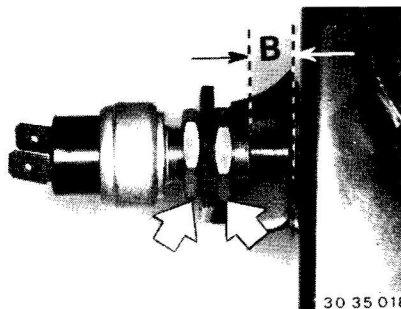
Press in push rod piston (10) and plastic bushing (13). Install circlip (14) with a special circlip pliers. Circlip must have perfect seat in groove of cylinder bore. Install new seal (15) before mounting on the brake booster.



28 34 093

34 31 104 ADJUSTING BRAKE LIGHT SWITCH

Adjust brake light switch with nut (1) and lock nut (2) that with the brake pedal released the contact button will be visible by distance A = 5 to 6 mm (0.197 to 0.236").



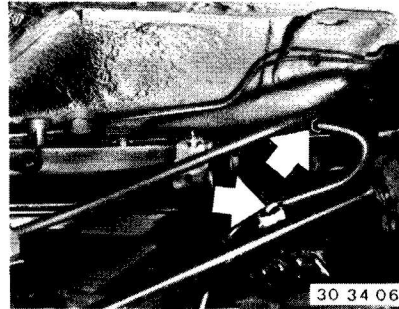
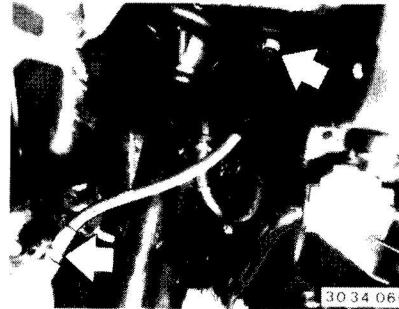
30 35 018

34-14

34 32 361 REPLACING ALL BRAKE LINES

Brake lines are only available from Parts in straight version and correct length with connecting nipples.

Use the removed brake line as a template for bending.
Use special bending tool*.
Don't damage finish of brake lines; don't bend lines too sharply and don't bend back lines.
Also refer to Service Information of Group 34.



34 32 381 REPLACING FRONT BRAKE HOSE

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.

Disconnect brake hose.

Installation:

Never twist brake hose when installing.

Bleed brakes 34 00 046.

Tightening torque*.

34 32 451 REPLACING REAR BRAKE HOSE

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.

Disconnect brake hose.

Installation:

Never twist brake hose when installing.

Bleed brakes 34 00 046.

Tightening torque*.

34 33 000 REMOVING AND INSTALLING BRAKE BOOSTER WITH TANDEM BRAKE MASTER CYLINDER

Function Test:

Operate brake pedal 10 times with engine stopped. Hold brake pedal down and start engine. If brake pedal gives, system is okay. If brake pedal does not give, check valve, vacuum hose and/or rubber ring between tandem brake master cylinder and brake booster could be defective. Engine vacuum could be insufficient or brake booster filter completely clogged.

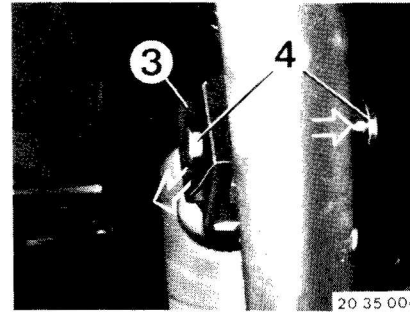
Checking Engine Vacuum for Brake Booster:
Detach vacuum hose on brake booster. Install vacuum tester 34 3 100 between brake booster and check valve.

Check vacuum when decelerating from an engine speed of 3,000 rpm and engine having operating temperature.
Minimum value: - 0.35 bar (- 5 psi).
Repeat test several times.
Minimum value for specified idle speed and engine with operating temperature:
- 0.50 bar (- 7 psi).

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.
Pull off plugs.
Pull off clutch hydraulic hose (1).

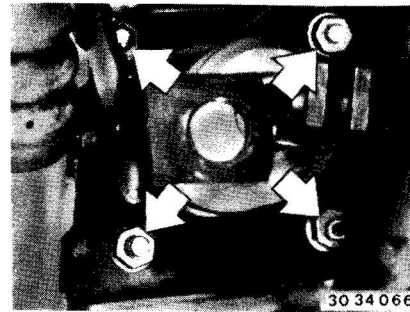
Disconnect brake lines (2 and 3).
Brake lines 2)
front left) 1st brake circuit
front right)

Brake line 3)
rear right) 2nd brake circuit
rear left)



20 35 004

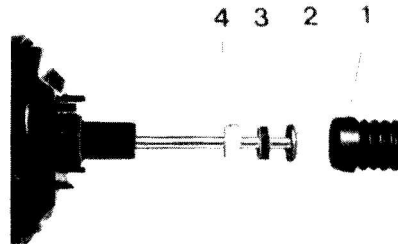
Remove and install instrument panel trim at bottom left 51 45 180.
Disconnect spring.
Press off clip (3) and pull out pin (4).



30 34 066

Detach brake booster on pedal base. Remove brake booster with master cylinder forward.

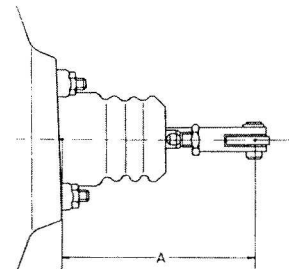
Installation:
Tightening torque*.
Adjust stop light switch 34 31 104.



30 34 067

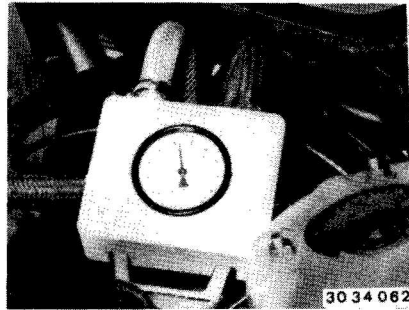
If filter in brake booster is clogged, remove cap (1), holder (2), damper (3) and filter (4).

Installation:
Clean damper (3) and filter (4).
Turn slots of damper (3) and filter (4) to be offset to each other by 180°.

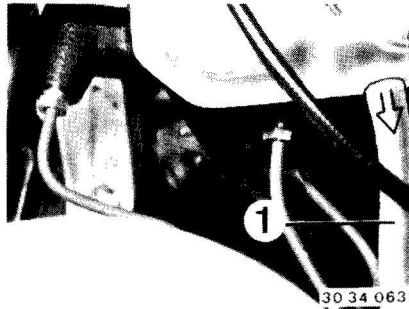


Basic adjustment distance A on piston rod = 125 mm (4.921").
Adjust brake pedal - see Group 35.

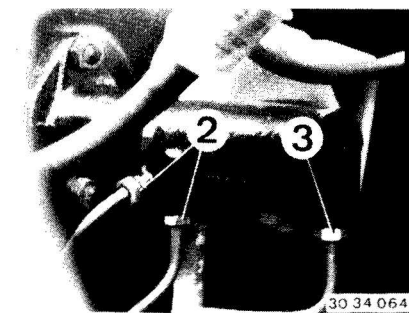
* See Specifications



30 34 062



30 34 063



30 34 064

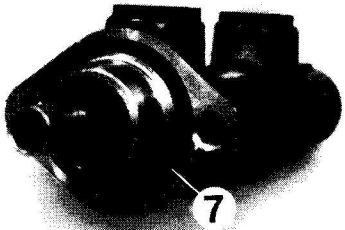
34 33 000 REPLACING BRAKE BOOSTER

Remove and install brake booster with tandem brake master cylinder 34 33 000.
Detach tandem brake master cylinder on brake booster.

Installation:

Tightening torque*.

Check rubber ring (7) between tandem brake master cylinder and brake booster, replacing if necessary.



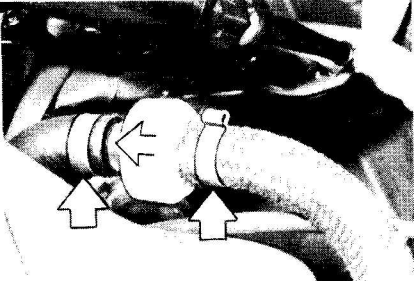
30 34 053

34 33 051 REPLACING CHECK VALVE FOR BRAKE BOOSTER

Detach vacuum hose on check valve (1).

Installation:

Replace clamp, if necessary.



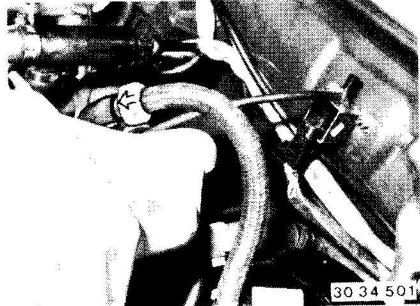
30 34 500

Loosen clamps and take off check valve.

Installation:

Arrow or black side faces intake manifold.

Replace clamp if necessary.



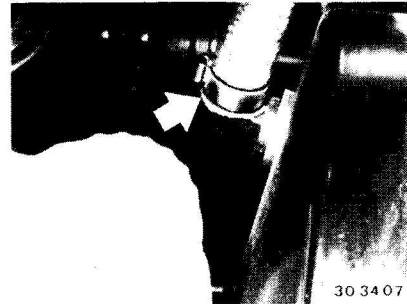
30 34 501

34 33 071 REPLACING VACUUM HOSE FOR BRAKE BOOSTER

Disconnect vacuum hose on brake booster.

Installation:

Replace clamp if necessary.

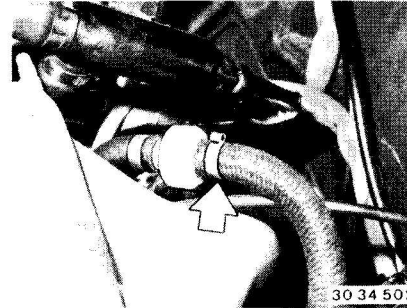


30 34 071

Disconnect vacuum hose on check valve (1).

Installation:

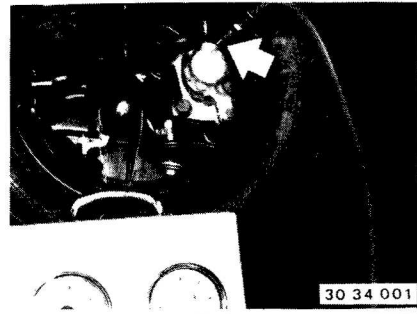
Replace clamp if necessary.



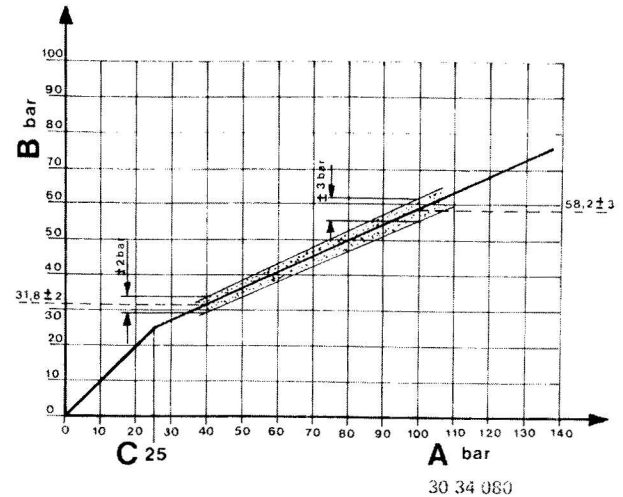
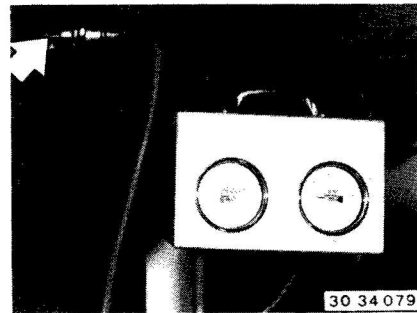
30 34 502

34 34 099 CHECKING FUNCTION OF BRAKE FORCE REGULATOR

Remove and install front wheel 36 10 300.
Remove and install rear wheel 36 10 320.
Connect one high pressure meter in front axle
brake circuit.
Bleed high pressure meter.



Connect second high pressure meter in rear
wheel brake bleeder screw.
Bleed high pressure meter.



Operate brake pedal firmly at least 5 times.
Hold brake pedal pressed down with a pedal
prop.

Up to a pressure of 25 bar (355 psi) both high
pressure meters should display the same value.
As from a pressure of 25 bar (355 psi) the
pressure of the rear wheel brake cylinder should
drop according to the diagram.

A = Inlet pressure

B = Outlet pressure

C = Switching over pressure

Example:

Inlet pressure (= front axle pressure)

Pressure I	Pressure II
40 bar (569 psi)	100 bar (1422 psi)

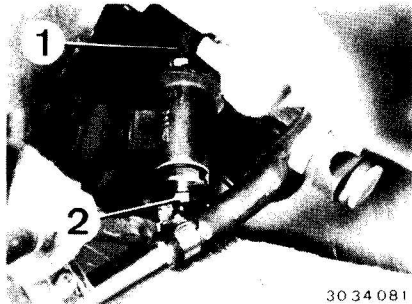
Outlet pressure (= rear axle pressure)

Pressure I	Pressure II
31.8 bar (452 psi)	58.2 bar (828 psi)

If necessary, take mean value from three measure-
ments.

If measured values deviate from specified values,
replace the brake force regulator.

34 34 100 REMOVING AND INSTALLING BRAKE FORCE REGULATOR



30 34 081

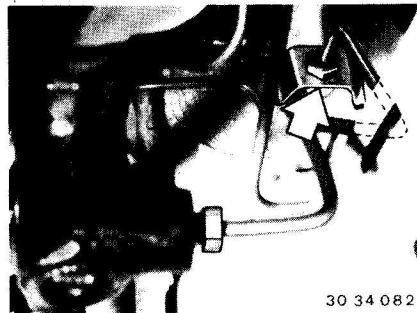
Draw off brake fluid in tank with a syringe used exclusively with brake fluids.

Disconnect lines (1 and 2).

Installation:

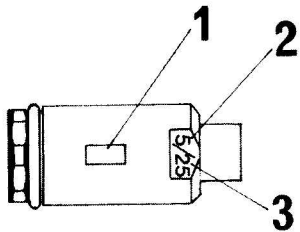
Tightening torque*.

Bleed brakes 34 00 046.



30 34 082

Remove clamp and brake force regulator.



30 34 083

Check codes when replacing a brake force regulator.

(1) Calendar day / year number

(2) Reduction $\hat{=}$ (e.g. 0.45)

(3) Switching over pressure

34 41 000 REMOVING AND INSTALLING PARKING BRAKE LEVER

Take off rubber cap (1) by pulling up clamp at front and lifting out at rear.

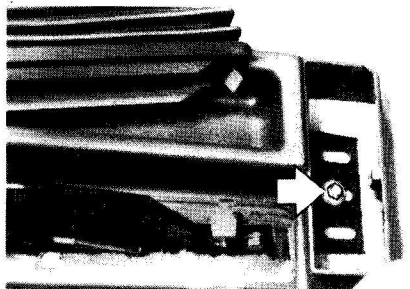
Lift out rear ashtray.
Unscrew bolt.
Disconnect console by pushing back and remove.

Unscrew nuts (2) on parking brake cables.

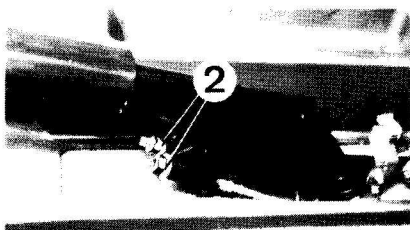
Unscrew bolts (3 ... 5).
Remove parking brake lever.



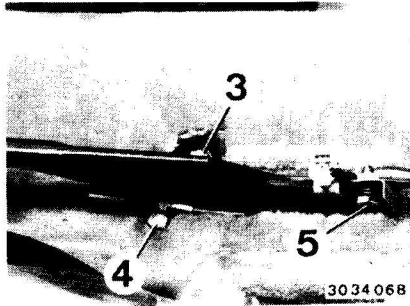
30 34 073



30 34 074



30 34 075



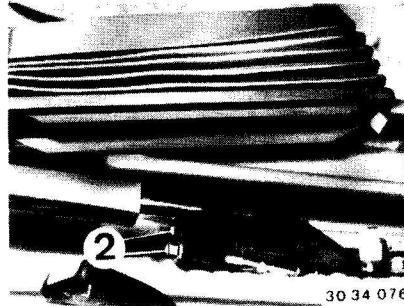
30 34 068

34 41 100 REMOVING AND INSTALLING PARKING BRAKE CABLE

Remove and install brake shoes 34 21 530.
Take rubber cap off of parking brake lever by pulling up clamp at front and lifting out at rear.
Unscrew nuts (2) on parking brake cable.

Disconnect parking brake cable on semi-trailing arm.

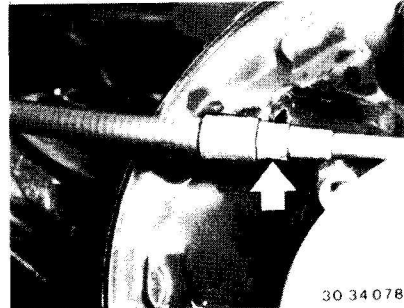
Compress locking clamp.
Disconnect parking brake cable on brake back-plate and pull out.
Installation:
Make sure clamp fits correctly.



30 34 076



30 34 077



30 34 078

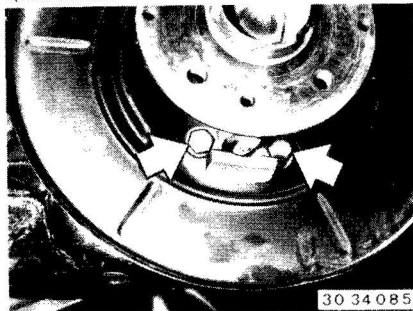
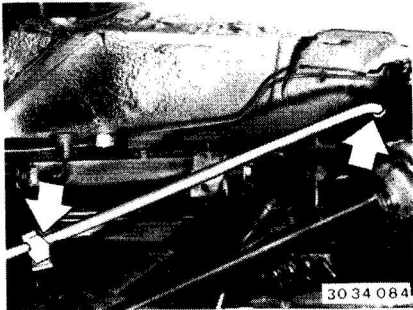
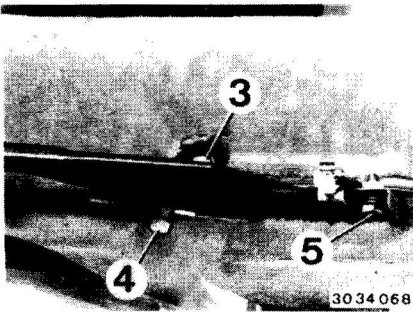
34 41 100 REMOVING AND INSTALLING PARKING BRAKE CABLE - REAR DISC BRAKES -

Remove and install spreader for parking brake shoes 34 41 250.

Remove and install parking brake lever 34 41 000.

Installation:

Adjust parking brake 34 10 014.



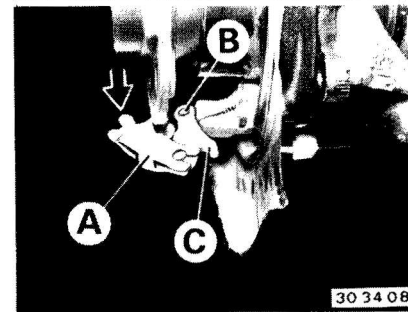
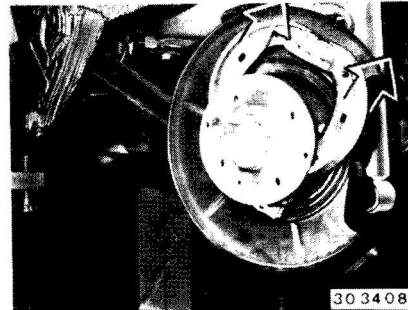
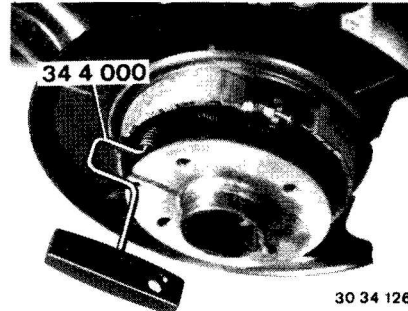
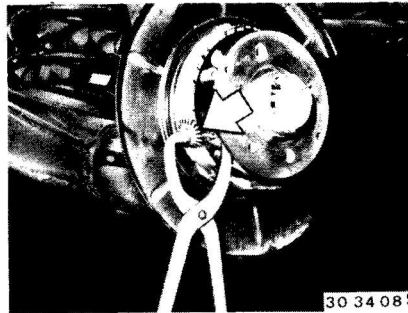
Disconnect parking brake cable on swinging arm.

Pull parking brake cable out of protective tube.

Installation:

Cable holder must rest on protective tube.

Disconnect support for parking brake cable. Pull out parking brake cable.



34 41 200 REMOVING AND INSTALLING PARKING BRAKE SHOES

Remove and install rear disc brake 34 21 300. Disconnect bottom return spring with brake spring pliers.

Installation:

Check return spring, replacing if necessary. Adjust parking brake 34 10 014.

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

Spread brake shoes apart at bottom and lift off from above.

Breaking In Parking Brake After Replacing Brake Shoes:

Car must be broken in in three phases.

Phase 1: 5 full stop braking actions from 50 km/h (30 mph).

Phase 2: Let brakes cool down.

Phase 3: 5 additional braking actions from 50 km/h (30 mph).

34 41 250 CHECKING / REMOVING AND INSTALLING SPREADER

Remove and install parking brake shoes 34 41 200.

Pull off part A toward rear.

Press out pin B.

Pull out part C.

Installation:

Give sliding surfaces and pins a thin coat of Molykote G paste.

Adjust parking brake 34 10 014.

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brakes pull to one side	<ul style="list-style-type: none"> 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) Guide bolts dirty or damaged g) Rear wheel alignment maladjusted h) Corrosion in calipers or wheel cylinders i) Shock absorbers without action k) Pad of one caliper worn l) Pad glazed 	<ul style="list-style-type: none"> 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) Replace guide bolts g) Check wheel alignment h) Remove and install, repair or replace calipers and/or wheel cylinders i) Check or replace shock absorbers k) Replace brake pads and check calipers l) Replace brake pads and check calipers
Brakes excessively hot while driving	<ul style="list-style-type: none"> 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) Cross spring broken g) Parking brake lever not released fully 	<ul style="list-style-type: none"> a) Check or replace master cylinder b) Adjust push rod c) Overhaul or replace master cylinder d) Clean brake fluid tank e) Remove and install, repair or replace calipers f) Replace cross spring g) 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	<ul style="list-style-type: none"> a) Brake pads oil splattered or burnt; wrong type of brake pads b) Brake booster malfunctions – engine vacuum insufficient c) One brake circuit failed due to leaks or damage 	<ul style="list-style-type: none"> a) Replace brake pads b) Check power brake system – check engine (valves, cylinder head, gasket, etc.) 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 – vapor 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 brake 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 or wheel cylinders d) Rubber ring for piston control swollen	a) Replace brake pads b) Remove and install, repair or replace calipers or wheel cylinders 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 or wheel cylinders d) Brake disc wear angular e) Pads worn less than minimum thickness f) Spring force insufficient g) Guide bolts damaged	a) Replace wheel bearings b) Check caliper installation c) Remove and install, repair or replace calipers or wheel cylinders d) Grind or replace brake discs e) Replace brake pads f) Replace spring g) Replace guide bolts

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized brake pads, pad does not move off of brake disc	a) Dirty caliper recesses, damaged protective caps b) Corrosion in calipers c) Compensation bore in master cylinder clogged	a) Remove and install, repair or replace calipers b) Remove and install, repair or replace calipers c) Overhaul or replace master cylinder
Brakes squeal or rattle	a) Wrong type of pads b) Dirty caliper recesses c) Spring force insufficient d) Brake disc not aligned with caliper e) Brake disc runout f) Excessive thickness difference within braking surface g) Brake drums out-of-true h) Knocking brake drums i) Dirt and dust in brake drums k) Liner wear excessive or one-sided l) Rust edges on brake discs m) Pad loose n) Wheel bearing play excessive	a) Replace brake pads b) Remove, clean and install calipers c) Replace springs d) Check caliper installation e) Check brake disc runout, replacing if necessary f) Measure brake disc thickness; grind or replace discs g) Grind or replace brake drums h) Grind or replace brake drums i) Clean and check brake drums k) Replace brake shoes l) Grind or replace brake discs m) Replace brake pads n) 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 difference within braking surface e) Brake system leaks f) Air in brake system g) Pads/liners not specified type h) Automatic brake shoe slack control malfunctions	a) Replace wheel bearings b) Check caliper installation c) Check brake disc runout, replacing discs if necessary d) Measure brake disc thickness; grind or replace discs e) Check brake system for leaks f) Bleed brake system g) Replace brake pads and/or liners h) Remove and install brake shoes; repair slack control

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in caliper	<ul style="list-style-type: none"> a) Caliper recesses dirty, caps damaged b) Brake disc not aligned with caliper c) Corrosion of pistons in calipers or wheel cylinders 	<ul style="list-style-type: none"> a) Remove and install, repair or replace calipers b) Check caliper installation c) Remove and install, repair or replace calipers or wheel cylinders
Pulsating effect on brake pedal	<ul style="list-style-type: none"> a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness difference within braking surface 	<ul style="list-style-type: none"> a) Replace wheel bearings b) Check caliper installation c) Check brake discs for runout, replacing if necessary d) Measure brake disc thickness and grind or replace discs
Parking brake effect insufficient	<ul style="list-style-type: none"> a) Parking brake shoes splattered with oil b) Excessive dead travel between brake shoes and brake drums c) Excessive dead travel in cables d) Cables maladjusted e) Corroded transmitting elements 	<ul style="list-style-type: none"> a) Replace brake liners and eliminate cause b) Adjust parking brake c) See b) d) See b) e) Remove and install parking brake and spreader locks; check cables, replacing if necessary

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.

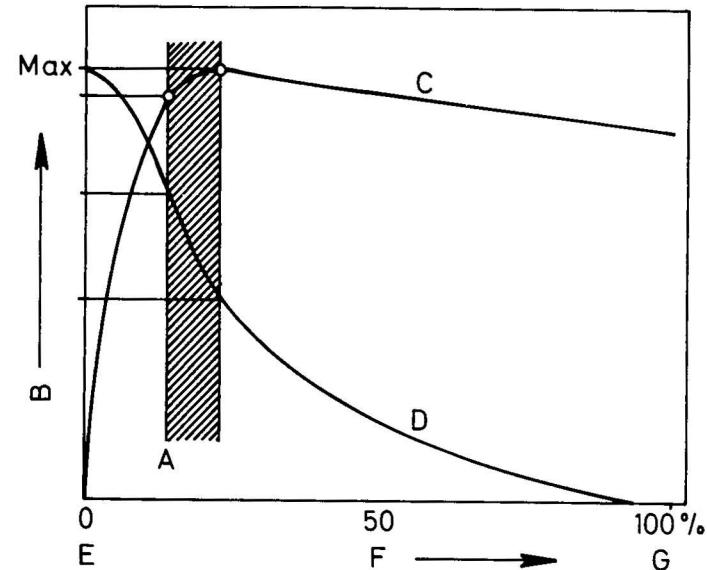
At the same time there will then be sufficient lateral cornering force to guarantee steering and directional stability.

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 lock.

Non-uniform friction conditions between separate wheels will be held under control just as also instantaneous changes in road surface condition, 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:

The ABS consists of a control unit, hydraulic unit, speed sensors and a wire harness.
Description of Separate Components:

Speed Sensors:

Each speed sensor 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 passenger compartment below the instrument panel on the left-hand side.

In a small multi-channel electronic computer acceleration, deceleration and slip factors are derived from the electric signals of the wheel velocity. By logical connection of these factors there are control demands 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 guarantees 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 was added to the conventional brake system.

To control the brake pressure in the wheel brake cylinders, the brake hydraulic unit has the three-way valves which permit three brake pressure conditions.

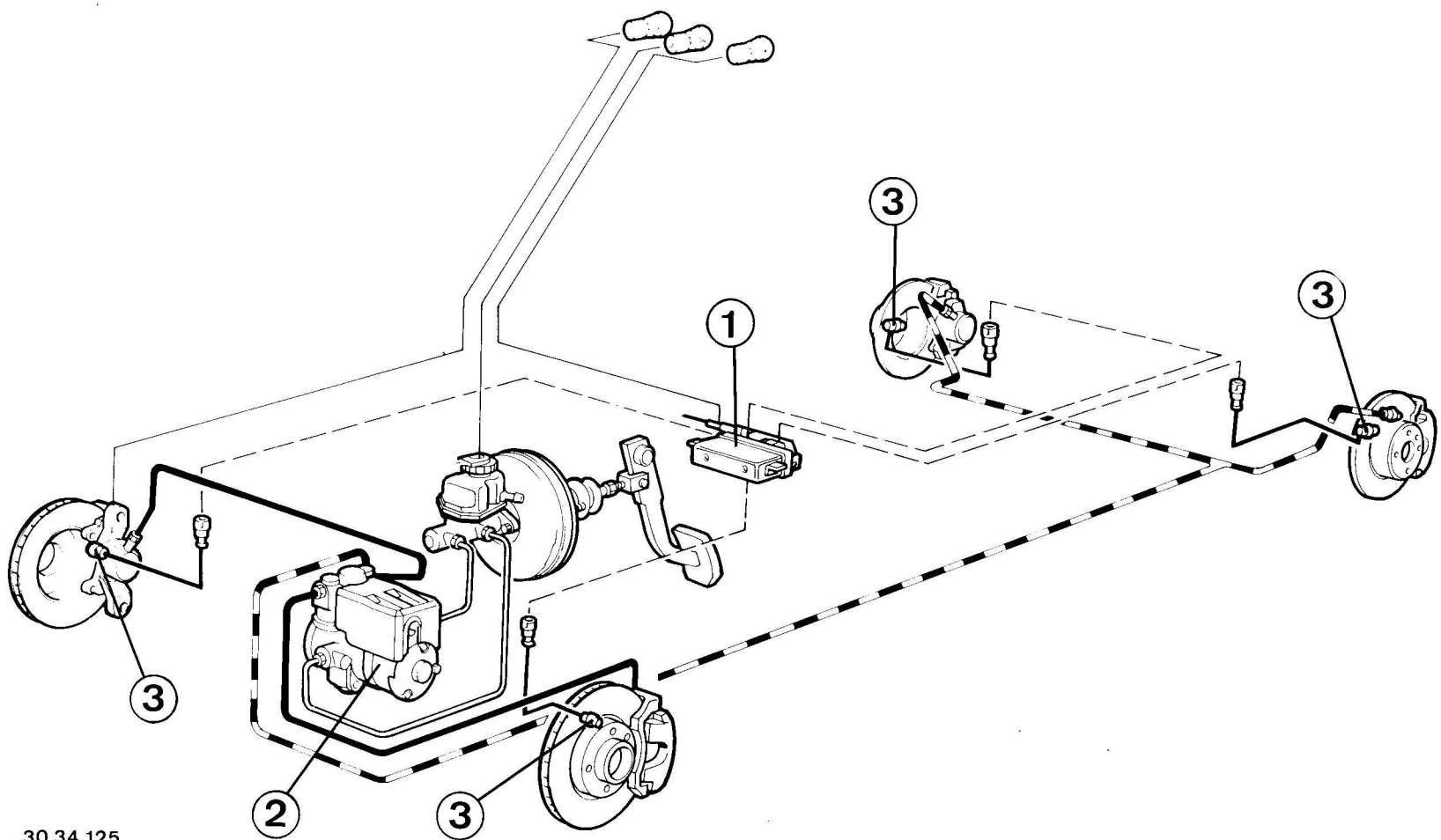
Pressure build-up, pressure holding and pressure drop. These three pressure phases adapt themselves in the sequences and length to the requirements of the desired control characteristic and power flow between the road surface and tires. In principle the control procedures are as follows. As soon as a 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 an 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 as well as power supply.

ABS LAYOUT DRAWING



30 34 125

- 1 = Electronic control unit
- 2 = Hydraulic unit
- 3 = Pulse sensors

DESCRIPTION OF AND CHECKING ABS INDICATOR LAMP

The ABS indicator lamp comes on after turning on the ignition. The indicator lamp should go out when the engine has started, if the ABS is okay.

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

The causes for erroneous indication (indicator lamp doesn't come on, doesn't go out or comes on while driving — even occasionally — can be found with the help of a BMW service tester and a brake test dynamometer.

Important!

Each started test step must be finished completely without a break!

The control unit will automatically switch to "normal braking" when there is an electric or electronic defect in ABS.

This means the car can still be braked, but without control (the wheels could lock!). The defective system will be indicated by a continuously burning ABS indicator lamp in the instrument panel.

Note:

BMW 325 iX with Four Driven Wheels:

First measure resistance on acceleration pick-up and power supply wire, see 34 52 000, prior to checking ABS, if ABS lamp comes on while driving.

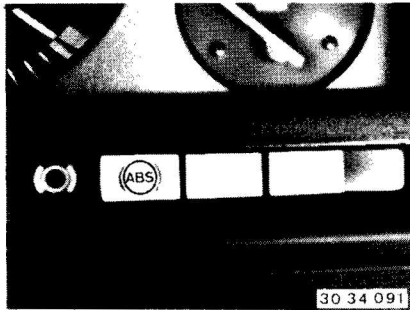
Check throttle valve positioner, see 13 54 130, when comfort is impaired, e.g. shaking or stopping of engine during ABS regulation.

The ABS test on a brake test dynamometer (test steps 8, 9 and 10) may not be performed on BMW 325 iX cars.

GENERAL INFORMATION ON REPAIRS AND THE BRAKE SYSTEM

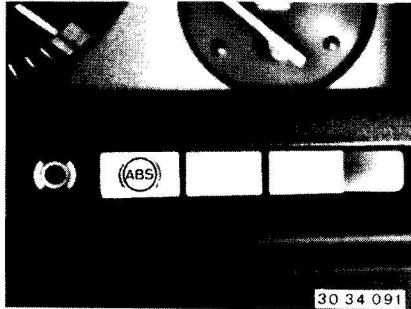
Basically the ABS does not require servicing, however, the following must be observed when working on cars with ABS.

- a) Remove plugs from the electronic control unit and turn off ignition when welding with an electric welder.
- b) When painting, the electronic control unit can be subjected to max. 95° C (203° F) briefly and to max. 85° C (185° F) for a longer period (about 2 hours).
- c) If the battery had been removed, the battery terminals must be tightened on the end poles perfectly after reinstallation of the battery.
- d) After replacement of the hydraulic unit, the control unit, the speed sensors and the wire harness as well as after performance of jobs which are in contact with ABS equipment (e.g. repair of accident damage), the entire antilock system has to be checked with the BMW service tester. It is important that brake lines be routed correctly.
- e) After each job on the brake system, the brakes must be bled and high/low pressure tests carried out. Check all connection points for leaks.

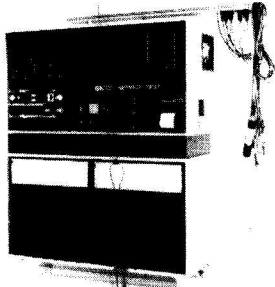


34 50 000 CHECKING ABS

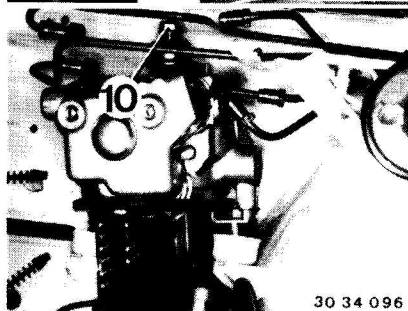
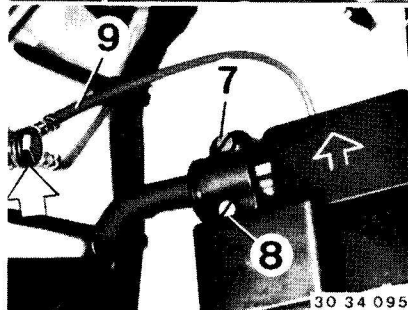
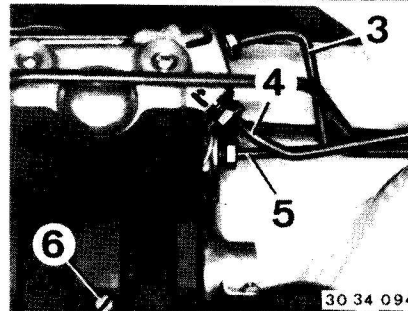
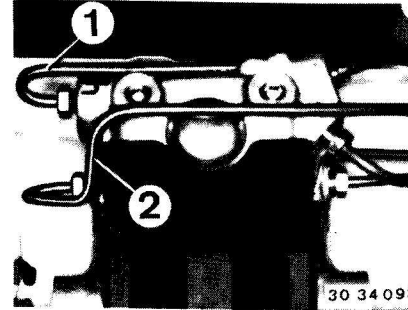
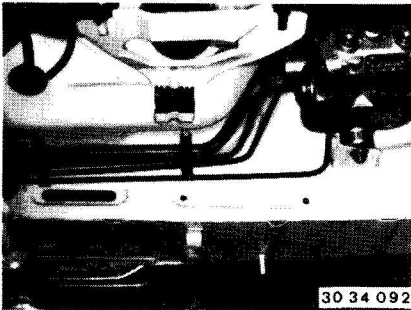
An electronic circuit in the control unit monitors ABS constantly. The system has to be checked, if the ABS lamp does not go out or does not come on after turning on the ignition or when repairs were made on the ABS.



Function is checked with a BMW service test unit. The tester is connected on the wire harness and control unit with a special plug. See ABS nominal value microfiche for diagram of connections.
Important!
Each started step must be finished completely, without a break.



Servicing ABS:
Basically the ABS does not require servicing. Check brake lines to and from the hydraulic unit for correct routing and leaks together with the general brake system.

34 51 520 REMOVING AND INSTALLING/
REPLACING HYDRAULIC
UNIT ASSEMBLY (FOR ABS)

Disconnect battery ground lead.
Remove air cleaner 13 71 000.
Remove headlight cover.
Disconnect lines (1 and 2).

Installation:

Line (1 = rear) to brake pressure regulator.
Line (2) to rear brake master cylinder.

Important!

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

Disconnect lines (3 = left, 4 = right and 5).
Unscrew bolt (6) and take off cover.

Installation:

Line (3) to left front brake caliper.
Line (4) to right front brake caliper.
Line (5) to front brake master cylinder.
Don't mix up lines (mark if necessary).

Important!

Keep open lines and connections clean by inserting plugs.

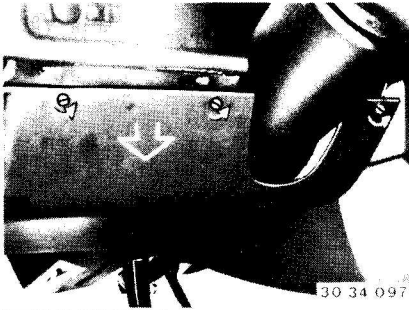
Unscrew bolts (7 and 8).
Pull off multiple pin plug.
Disconnect ground wire (9).

Loosen nut (10).
Pull up and remove hydraulic unit.

Installation:

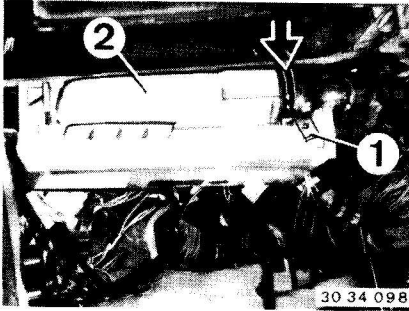
Bleed brakes 34 00 046.

Check ABS with BMW service test unit — see 34 50 000.

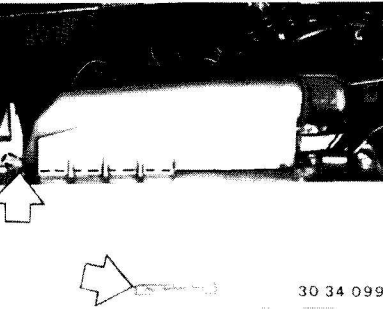


34 52 510 REPLACING CONTROL UNIT (FOR ABS)

Remove instrument panel trim at bottom left.
Caution!
Always turn off ignition before removing or installing control unit.

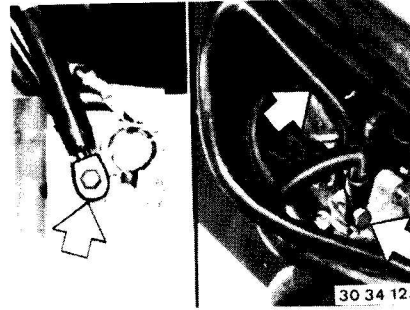


Push back clamp (1) and pull out multiple pin plug (2) to the right, and then disengage it to the left.
Unscrew control unit on body.



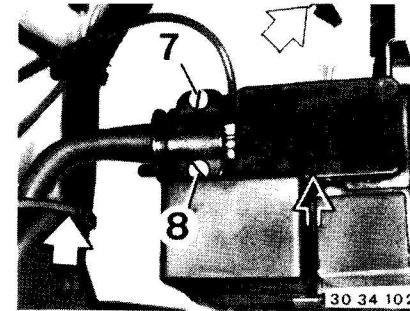
Check for correct connection when replacing control unit.
The multiple pin plug has a tab on the left side, for which the control unit must have an opening.
Important!
Only use a control unit with the correct code number*.
Installation:
First engage left side of plug and then press right side into clamp.
Check ABS.

* See Specifications

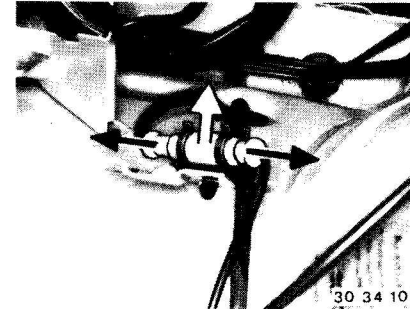


61 11 530 REPLACING WIRE HARNESS (FOR ABS)

Disconnect battery ground lead.
Disconnect lead on battery positive terminal and lay back to left side in engine compartment. 325:
Disconnect battery ground lead (battery in trunk).
Disconnect cable on positiv terminal, in engine compartment on rear panel.



Unscrew cover on hydraulic unit.
Unscrew bolts (7 and 8).
Pull off multiple pin plug on hydraulic unit carefully (plastic pins).
Loosen wire straps.

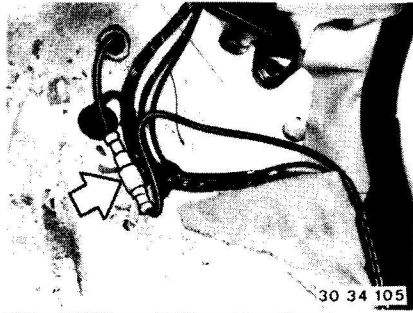


Remove left and right headlight covers.
Disconnect both plugs for pulse sensors in engine compartment.
Loosen wire straps.

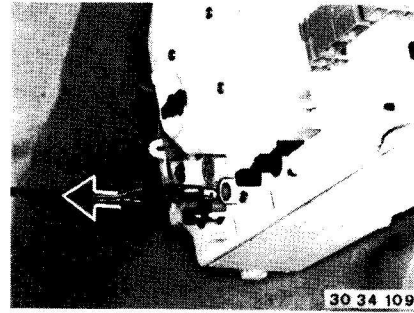


Pull out right wire to left side of engine compartment.

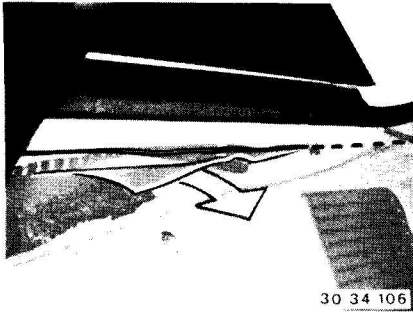
34-31



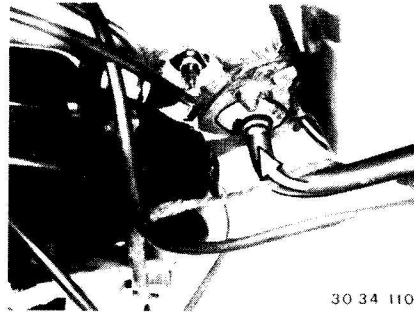
Remove both front seats 52 10 000.
Remove rear seat cushion 52 20 010.
Disconnect both plugs for rear pulse sensors.



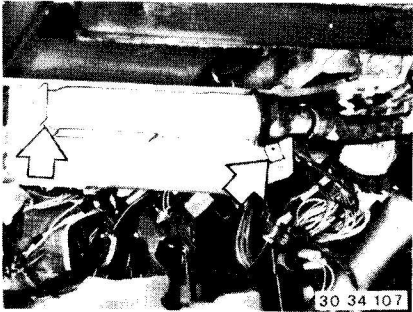
Pull indicator lamp with bulb holder out of instrument cluster.



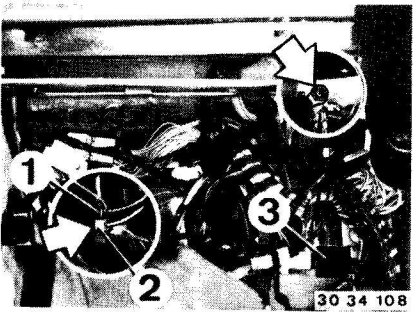
Detach carpets and trim panels as required.
Lay back left and right wires toward front.



Remove fuse box.
Push wire harness into passenger compartment.



Remove instrument panel trim at bottom left.
Pull off multiple pin plug on control unit.
Installation:
First engage left side of plug and then press right side into clamp.



Disconnect ground lead on body.
Pull off plugs (1 and 2).
Pull off electronic relay (3).

DESCRIPTION AND DUTY OF ACCELERATION PICK-UP (325 iX)

Description:

In the acceleration pick-up there are two mercury switches, one each for forward and reverse drive, which are installed in longitudinal direction of car at an angle to the horizontal. The series connected mercury switches provide closed contact in horizontal position (resistance less than 1 k-ohm).

Negative acceleration (braking) of the car or inclination of the acceleration transmitter will displace the mercury filling and cause the contact to open (resistance greater than 2.5 M-ohms).

The glass tube is inclined in such a manner, that braking deceleration of 35 to 45 % is necessary to open the contact.

The braking deceleration value for forward drive can be simulated by inclining the acceleration pick-up from 19.5 to 24° (with Special Tool 34 5 150 this is equal to 26.5 to 33.0 mm (1.043 to 1.299")).

The switching point for reverse drive does not have to be adjusted.

Duty:

BMW 325 iX (all wheel drive) is the first standard production car to have permanent all wheel drive with constantly switched central and rear axle locks and also a continuously effective ABS.

So that all three systems can be effective simultaneously, a sensor is required to provide information on the road condition (higher or lower traction).

The acceleration pick-up performs this duty in the BMW 325 iX (all wheel drive).

The ABS control unit will decide between various data fields depending on the switch condition (open or closed mercury switches), and consequently consider the traction condition of a street or road.

Defective Indicator:

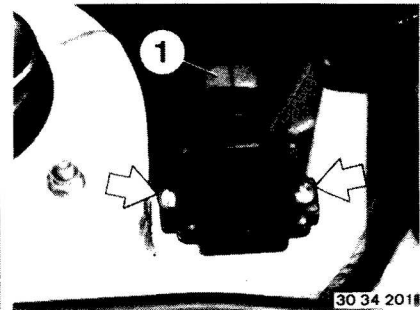
If an open switch condition (resistance greater than 2.5 M-ohms) is reported to the ABS control unit over a period of time longer than 20 seconds, the ABS switches off and reports this to the driver with a warning lamp in the instrument cluster.

34 52 520 REMOVING AND INSTALLING
OR REPLACING ACCELERATION
PICK-UP

Replacing:

Pull off plug (1).
Remove shear-off screws (only drilling out
is approved).

Installation:
Adjust acceleration pick-up.



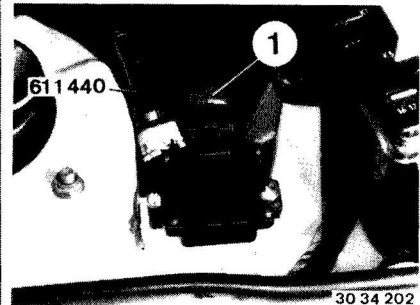
30 34 201

34 52 000 CHECKING ACCELERATION
PICK-UP FOR ABS

Checking (Switch):

Pull off plug (1).
Connect Jetronic test lead 61 1 440 on
acceleration pick-up.
Connect ohmmeter (M 06) of BMW service
tester.

Nominal value: less than 1 k-ohm.

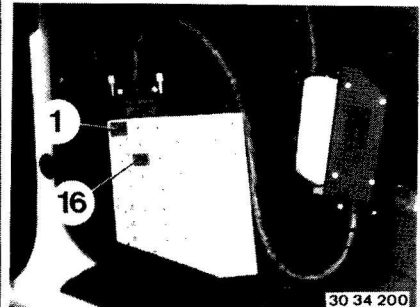


30 34 202

If Necessary, Checking (Switch with Wire and
Plug):

Connect universal adapter* on wire harness
from ABS control unit.
Measure resistance between connections
(1 and 16).

Nominal value: less than 1 k-ohm.
Ignition must be turned off while measuring.



30 34 200

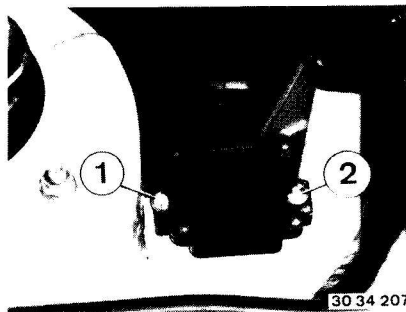
* Source: HWB

(cont. of 34 52 520)
Acceleration Pick-up for ABS:

Adjusting

Requirements:

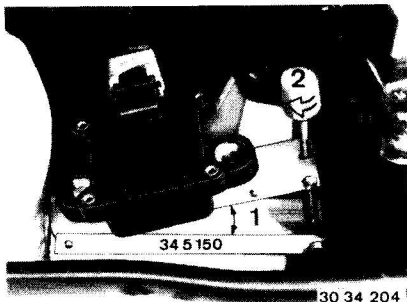
- Car parked on level ground (workshop floor).
- Car including trunk empty.
- Fuel tank full (or equal weight in trunk).
- Tire inflation pressure correct.



If the measured actual value is smaller than the nominal value, install the shim on mounting point (1).
If the measured actual value is larger than the nominal value, install the shim on mounting point (2).

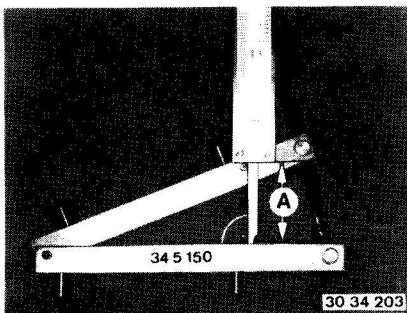
Place Special Tool 34 5 150 with acceleration pick-up (in installed position) and test lead 61 1 440 on console in car.
Connect ohmmeter (M 06) of BMW service tester with test lead.
Nominal value: less than 1 k-ohm.
Increase angle (1) of special tool with screw (2) so long, until ohmmeter displays more than 2.5 M-ohms.

Install shim of determined thickness between the console and special tool.
Recheck switching point.
If switching point is now within tolerances, remove special tool and install acceleration pick-up with shim and shear-off screws.
Tighten shear-off screws and lock by shearing off the heads.
Tightening torque: 6 to 8 Nm (4.5 to 5.5 ft.lbs.).

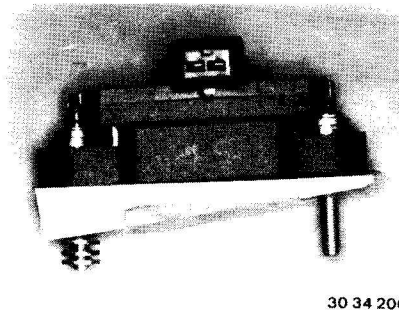


Remove Special Tool 34 5 150 and measure distance (A).
Compare actual value with nominal value table.
If measured value is within tolerances, install acceleration pick-up without shim.
If measured value is not within tolerances, determine thickness of shim.

Nominal Value Table
checking acceleration pick-up.



Examples:	
Actual value	35.6 mm (1.401")
Maximum value	33.0 mm (1.299")
Min. shim thickness	2.6 mm (0.102")



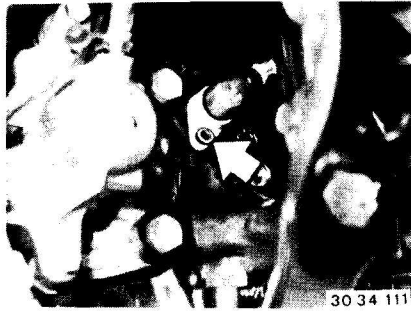
Distance "A" in mm
26.5
33.0

or

Actual value	35.6 mm (1.401")
Minimum value	26.5 mm (1.043")
Max. shim thickness	9.1 mm (0.358")

Permissible switching tolerance of acceleration pick-up in car

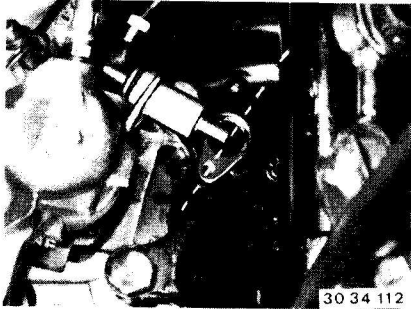
A maximum of one wedge and three shims (a = 1 mm / 0.039") may be used on one mounting bolt to correct the switching point of the acceleration pick-up in the car.
If the switching point of an acceleration pick-up in the car is beyond the maximum shim range, the console must be corrected.
The wedge, Part No. 34 51 1 156 827, is equal to 4.9 ... 5.3 mm (0.193 to 0.209").



**61 12 510 REMOVING AND INSTALLING/
REPLACING ONE FRONT
PULSE (SPEED) SENSOR FOR
ABS**

Turn off ignition.
Unscrew socket head bolt.

30 34 111

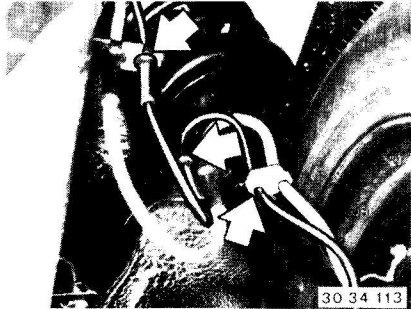


Pull out pulse sensor.

Installation:

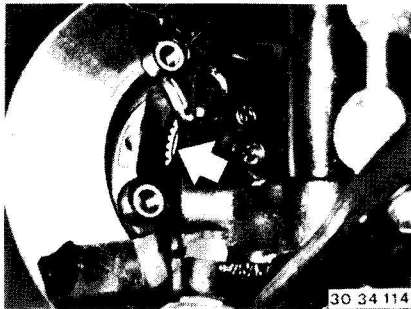
Check pulse sensor for damage, replacing if necessary.
Lubricate pulse sensor and housing with Molykote Longterm 2 prior to installation.
The spacing of pulse sensors is given by the take-up bores.

30 34 112



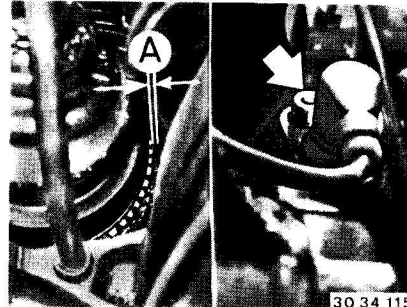
Replacing Pulse Sensor:
Disconnect plug in engine compartment.
Push wires down.
Lift out wires.
Check ABS — see 34 50 000.

30 34 113



Removing and Installing/Replacing Front
ABS Pulse Wheel:
The front pulse wheel can only be replaced
together with the bearing assembly.
See Replacing Wheel Hub — 31 21 180.

30 34 114



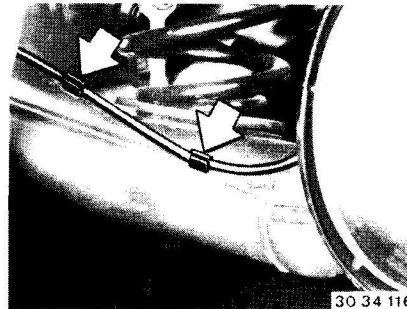
30 34 115

**61 12 520 REMOVING AND INSTALLING/
REPLACING ONE REAR
PULSE (SPEED) SENSOR FOR
ABS**

Turn off ignition.
Remove rear wheel 36 10 300.
Unscrew socket head bolt.

Installation:

The distance* between pulse sensor and pulse wheel (A) is given by design and cannot be adjusted.
However, it is necessary to visually inspect the pulse wheel for dirt or damage.

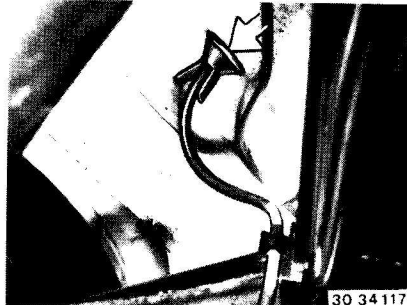


30 34 116

Lift out wires.
Pull out pulse sensor.

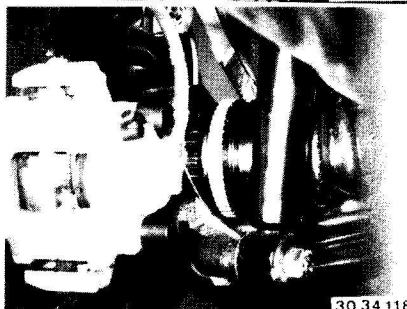
Installation:

Check pulse sensor for damage, replacing if necessary.
Lubricate pulse sensor and housing with Molykote Longterm 2 prior to installation.



30 34 117

Replacing Pulse Sensor:
Remove rear seat cushion 52 20 010.
Disconnect pulse sensor plug.
Pull out rubber grommet and wires.
Remove pulse sensor.
Important!
Don't damage the rubber grommet.



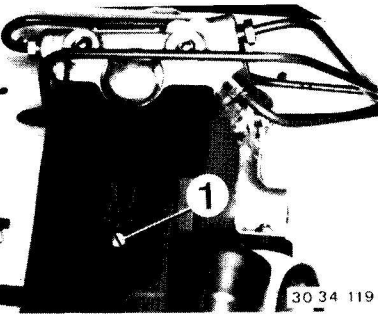
30 34 118

Removing and Installing/Replacing Rear
ABS Pulse Wheel:
The rear pulse wheel can only be replaced
together with the rear output shaft.
See Removing and Installing Output Shaft —
33 21 000.

* See Specifications

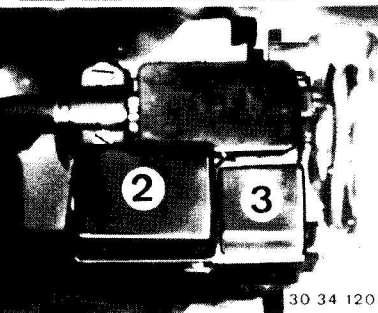
61 31 570 REPLACING RELAY ON HYDRAULIC UNIT (FOR ABS)

Unscrew screw (1).
Pull off cover.

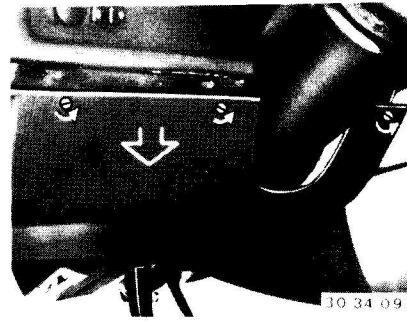


30 34 119

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



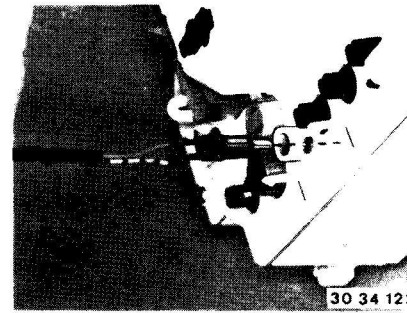
30 34 120



30 34 097

62 99 080 REPLACING INDICATOR LAMP (FOR ABS)

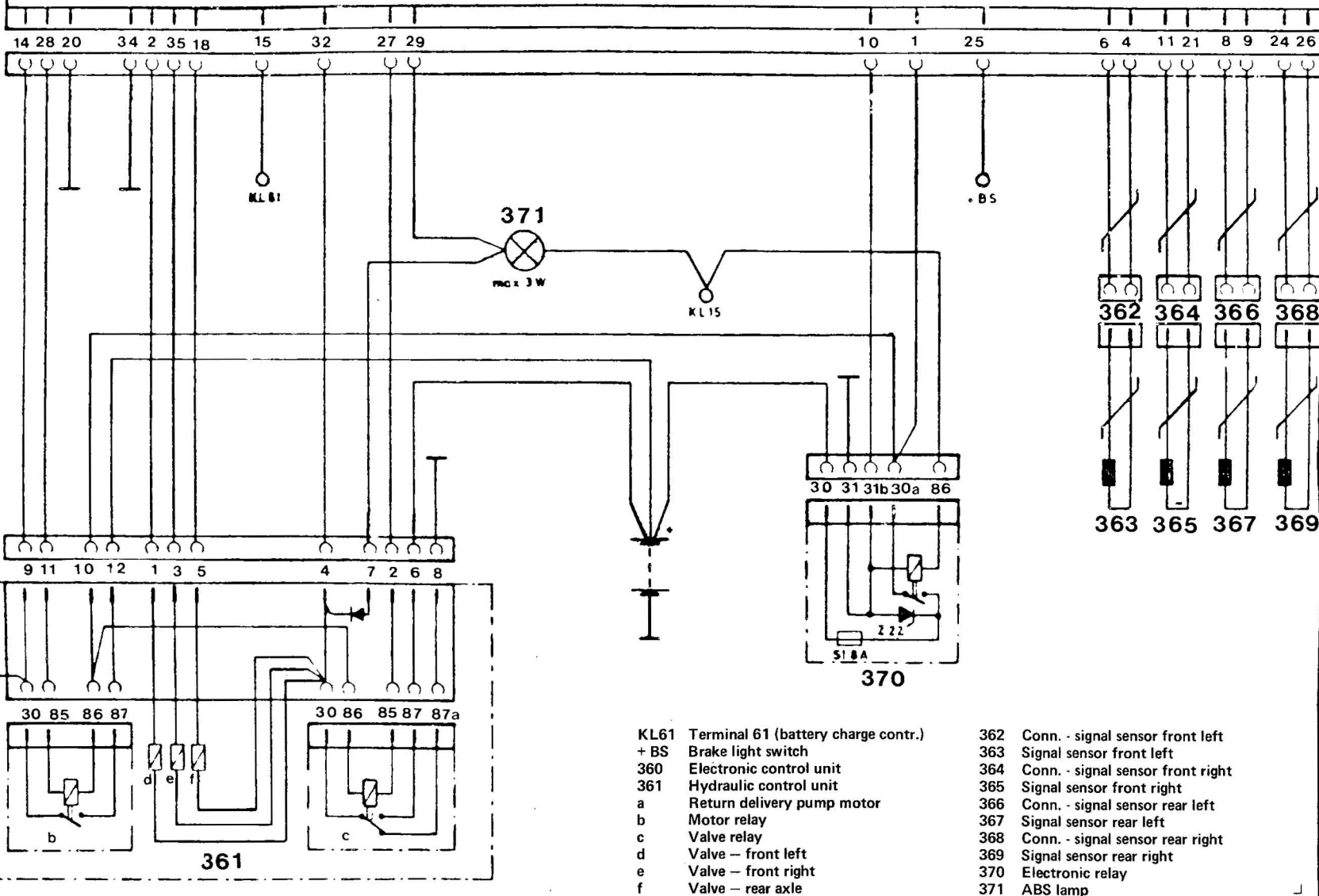
Remove instrument panel trim at bottom left.



30 34 122

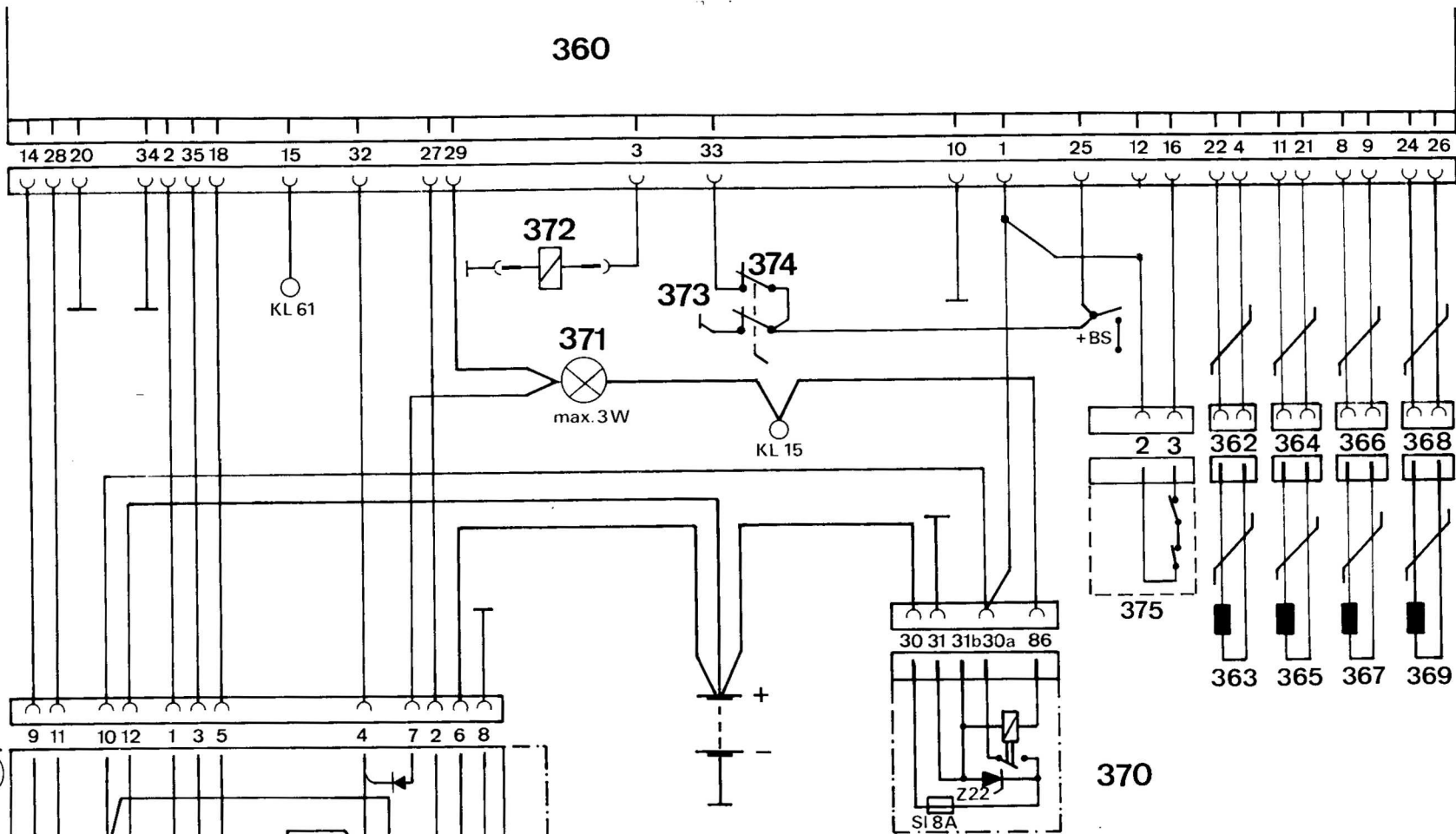
Pull indicator lamp with bulb holder out of instrument cluster.

360



- | | | | |
|------|-------------------------------------|-----|-----------------------------------|
| KL61 | Terminal 61 (battery charge contr.) | 362 | Conn. - signal sensor front left |
| + BS | Brake light switch | 363 | Signal sensor front left |
| 360 | Electronic control unit | 364 | Conn. - signal sensor front right |
| 361 | Hydraulic control unit | 365 | Signal sensor front right |
| a | Return delivery pump motor | 366 | Conn. - signal sensor rear left |
| b | Motor relay | 367 | Signal sensor rear left |
| c | Valve relay | 368 | Conn. - signal sensor rear right |
| d | Valve - front left | 369 | Signal sensor rear right |
| e | Valve - front right | 370 | Electronic relay |
| f | Valve - rear axle | 371 | ABS lamp |

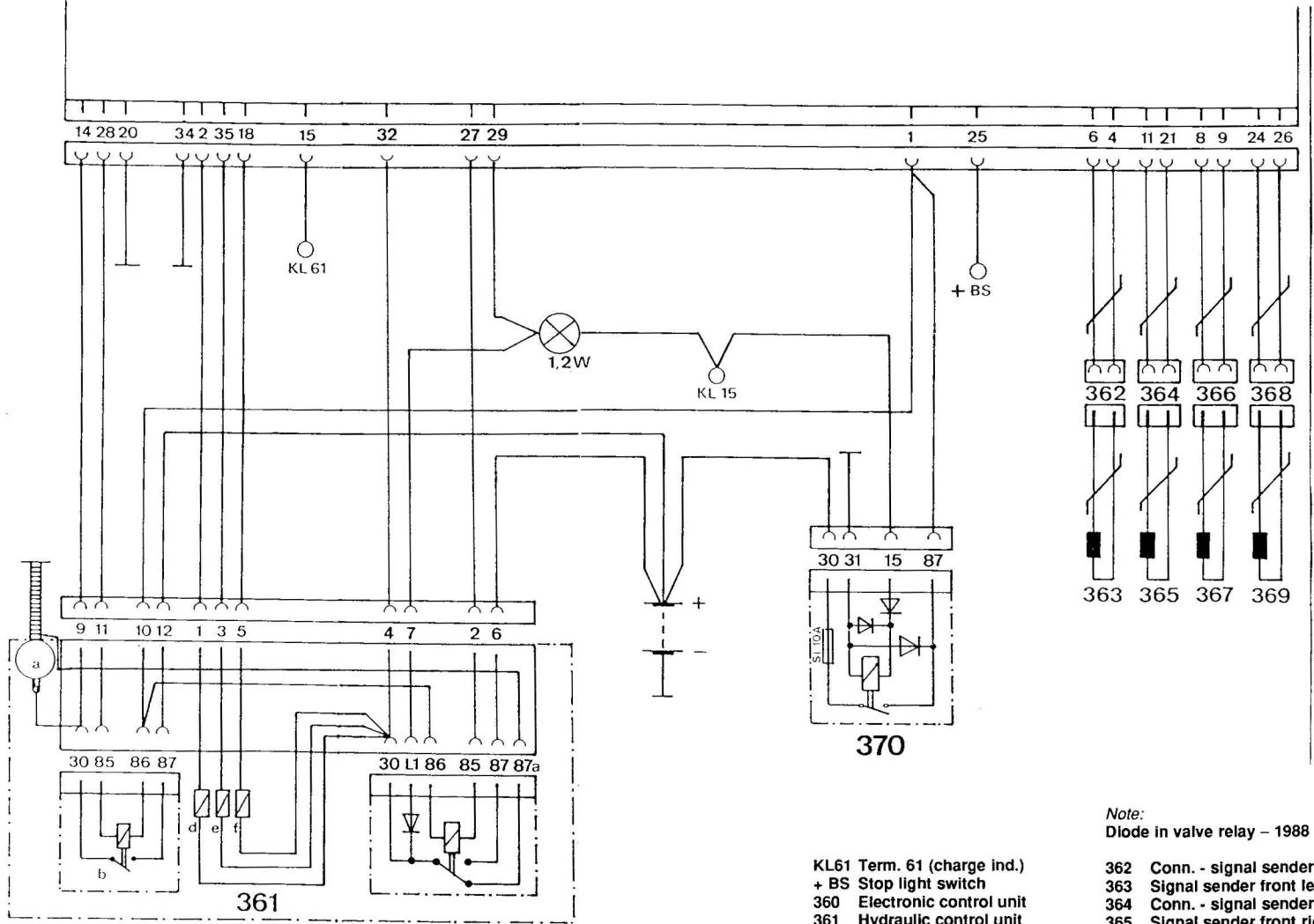
360



- KL61 Term. 61 (charge ind. lamp)
- + BS Brake light switch
- 360 Electronic control unit
- 361 Hydraulic control unit
- a Engine return delivery pump
- b Engine relay
- c Valve relay
- d Valve – front left
- e Valve – front right
- f Valve – rear left
- 362 Signal sensor conn. – front left
- 363 Signal sensor – front left

- 364 Signal sensor conn. – front right
- 365 Signal sensor – front right
- 366 Signal sensor conn. – rear left
- 367 Signal sensor – rear left
- 368 Signal sensor conn. – rear right
- 369 Signal sensor – rear right
- 370 Electronic relay
- 371 ABS lamp
- 372 Idle enrichment
- 373 Cruise control
- 374 Clutch switch
- 375 Acceleration transmitter

WIRING DIAGRAM FOR ABS SYSTEM 2B
 Introduced Gradually Since 8/87

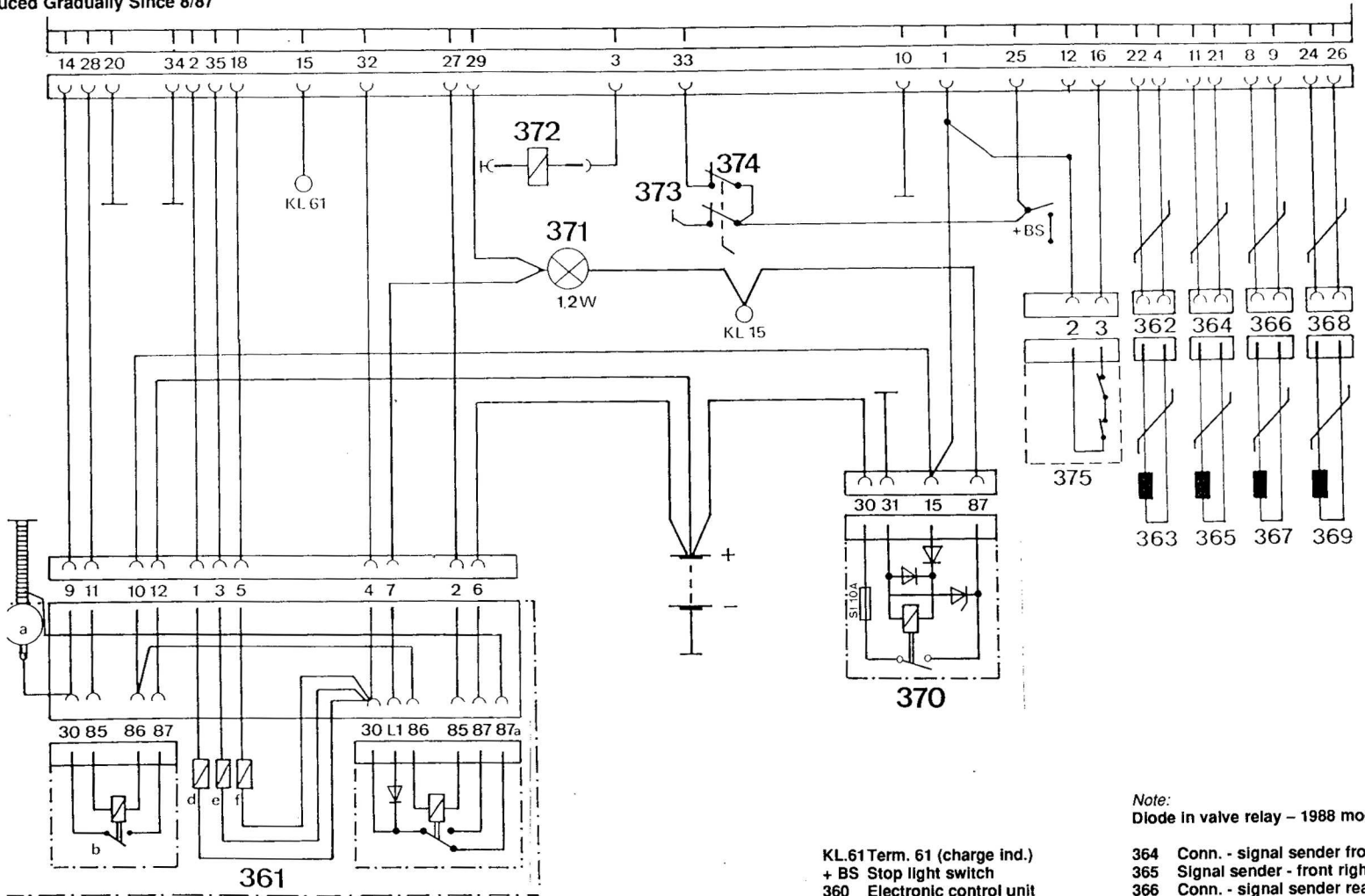


- KL61 Term. 61 (charge ind.)
- + BS Stop light switch
- 360 Electronic control unit
- 361 Hydraulic control unit
- a Return delivery pump motor
- b Motor relay
- c Valve relay
- d Valve - front left
- e Valve - front right
- f Valve - rear axle

- Note:*
 Diode in valve relay - 1988 models
- 362 Conn. - signal sender front left
 - 363 Signal sender front left
 - 364 Conn. - signal sender front right
 - 365 Signal sender front right
 - 366 Conn. - signal sender rear left
 - 367 Signal sender rear left
 - 368 Conn. - signal sender rear right
 - 369 Signal sender rear right
 - 370 Electronic relay
 - 371 ABS lamp

34 - 34c

WIRING DIAGRAM FOR ABS SYSTEM 325 IX Introduced Gradually Since 8/87



Note:
Diode in valve relay - 1988 models

- | | |
|--------------------------------------|---------------------------------------|
| KL.61 Term. 61 (charge ind.) | 364 Conn. - signal sender front right |
| + BS Stop light switch | 365 Signal sender - front right |
| 360 Electronic control unit | 366 Conn. - signal sender rear left |
| 361 Hydraulic control unit | 367 Signal sender rear left |
| a Return delivery pump motor | 368 Conn. - signal sender rear right |
| b Motor relay | 369 Signal sender rear right |
| c Valve relay | 370 Electronic relay |
| d Valve - front left | 371 ABS lamp |
| e Valve - front right | 372 Idle speed booster |
| f Valve - rear left | 373 Cruise control |
| 362 Conn. - signal sender front left | 374 Clutch switch |
| 363 Signal sender front left | 375 Acceleration sender |

TROUBLESHOOTING ABS

Note: No overvoltage protection relay since 1989 models (except for four wheel drive); now integrated in ABS control unit (Control Unit No. 0265 103 041).

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
01 Wire harness Speed sensors	Speed sensoes (DF)	Turn off ignition for single tests, control unit not connected.	Group 34
	front left	<ol style="list-style-type: none"> 1. Check front left plug connection (visual inspection). 2. Disconnect front left plug, DF reading must then be > 999 k-ohms; DF reading lower: fault in wire harness. 3. Check flow in wires 4 and 6 (325IX: 22): bridge front left plug on wire harness side; DF reading should then be < 1 ohm; DF reading higher: fault in wire harness. 4. Measure resistance at plug on speed sensor side (M 06). Specifications not reached: replace front left speed sensor. 	61 11 530 61 12 510
	front right	<ol style="list-style-type: none"> 1. and 2. as above, however front right plug connection. 3. Check flow in wires 11 and 21: bridge front right plug on wire harness side, DF reading should then be < 1 ohm; DF reading higher: fault in wire harness. 4. As above: replace front right speed sensor. 	61 11 530 61 12 510
	rear left	<ol style="list-style-type: none"> 1. and 2. as above, however rear left plug connection. 3. Check flow in wires 8 and 9: bridge rear left plug on wire harness side, DF reading should then be < 1 ohm; DF reading higher: fault in wire harness. 4. As above, replace rear left speed sensor. 	61 11 530 61 12 520
	rear right	<ol style="list-style-type: none"> 1. and 2. as above, however rear right plug connection. 3. Check flow in wires 24 and 26: bridge rear right plug on wire harness side, DF reading should then be < 1 ohm; DF reading higher: fault in wire harness. 4. As above: replace rear right speed sensor. 	61 11 530 61 12 520
	Speed sensor resistance to ground	<ol style="list-style-type: none"> 1. Visual inspection for line and wire damage (connection to vehicle ground - insulation resistance). 2. Disconnect speed sensor plugs in order for reading > 999 k-ohms: replace pertinent speed sensor. 3. Reading remains < 999 k-ohms: fault in wire harness. 	61 12 510/520 61 11 530
	Speed sensor resistance to B +	<ol style="list-style-type: none"> 3. Reading remains < 999 k-ohms: fault in wire harness. 	61 11 530
	Safety lamp	<p>Also refer to test step 03 when testing speed sensors!</p> <p>Bridge connections 30a and 86 on electronic relay plug.</p> <p>Reading > 80 ohms: ABS indicator lamp faulty or poor contact. Check or replace lamp. Check connections on lamp and term. 15.</p> <p>Reading < 10 ohms: check wires 1 and 29 for ground out.</p> <p>Measure between connection 86 on electronic relay plug and wire 29 on control unit plug.</p> <p>Repeat test with connected diagnosis plug for "wrong connection" display (better ground connection with tester).</p>	62 99 080

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
02 Wire harness Relays Valves		Turn off ignition for single tests, control unit not connected.	Gr. 34
	Valve relay coil resistance	Check plug connections on hydraulic unit (plugs, relays). Replace valve relay. Measured value reading > 100 ohms: break in wire to valve relay. (from ignition switch wire 27, wires in hydraulic unit) Measured value reading: < 50 ohms = short circuit in wire to valve relay (wires 1 and 27, wires in hydraulic unit).	61 31 570 61 11 530 34 51 520
	Motor relay coil resistance	Check plug connections on hydraulic unit (plugs, relays). Replace motor relay. Measured value reading > 58 ohms: break in wire to motor relay (from ignition switch wire 28, wires in hydraulic control unit). Measured value reading < 34 ohms: short circuit in wire to motor relay (wires 1 and 28, wires in hydraulic unit).	61 31 570 61 11 530 34 51 520
	Valve resistance	Specifications not reached on all three valves: First check wire 32 for breaks or short circuit. Pull off plugs on hydraulic unit.	
	front left	Measure resistance direct on hydraulic unit between wires 1 and 4. Specification not reached: replace hydraulic unit. Check wire 2 from hydraulic unit plug to control unit plug for breaks or short circuit.	34 51 520 61 11 530
	front right	Measure resistance direct on hydraulic unit between wires 3 and 4. Specifications not reached: replace hydraulic unit. Check wire 35 from hydraulic unit plug to control unit plug for breaks or short circuit.	34 51 520 61 11 530
	rear	Measure resistance direct on hydraulic unit between wires 5 and 4. Specifications not reached: replace hydraulic unit. Check wire 18 from hydraulic unit plug to control unit plug for breaks or short circuit.	34 51 520 61 11 530
	(rear right)	Measured resistance in wire harness adapter (4a), no measured value from car. Repeat test with connected diagnosis plug for "wrong connection" display (better ground connection with tester.)	

34 - 37

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
03 Dynamic speed sensor test	Speed sensors (DF) front left front right rear left rear right	<p data-bbox="737 110 1083 127">Wire harness and control unit connected.</p> <p data-bbox="737 198 861 215">1. Cycle time</p> <p data-bbox="737 244 1168 281">Cycle time < specified value: wheel turns too fast. Cycle time > specified value: wheel turns too slow.</p> <p data-bbox="737 310 1229 372">Visual inspection: Excessive clearance between speed sensor and pulse wheel. Speed sensor loose or dirty, check installation.</p> <p data-bbox="737 398 1065 457">Check arrangement of wheel with gage. Hold opposite wheel on rear axle. Replace speed sensor.</p> <p data-bbox="737 505 803 522">2. Pulse</p> <p data-bbox="737 548 1203 629">Wheel rotation not uniform enough. Check pulse wheel teeth (condition, dirt). Check clearance between speed sensor and pulse wheel. Replace pulse wheel.</p>	<p data-bbox="1539 110 1621 127">Group 34</p> <p data-bbox="1539 332 1628 369">61 12 510 61 12 520</p> <p data-bbox="1539 442 1676 459">61 12 510 / 520</p> <p data-bbox="1539 613 1676 630">61 12 510 / 520</p>

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
04 Dynamic voltage		<i>Caution!</i> Turn off Ignition before pulling off a plug and measuring resistance.	Group 34
	Voltage between wires 1 and 10	Ignition turned on. Engine running. Battery charged, check. Voltage drop checked at: battery connection (+ and -), term. 15 and from Ignition lock to electronic relay connection, from relay to control unit wire 1.	
	Stab. voltage betw. wires 12 and 10	Check function of electronic relay. Replace control unit. Also refer to test step 05 test line 2.	34 52 510
	Valve relay home contact voltage drop	1. Replace valve relay. 2. Ground connection has excessive transition resistance or break. 3. Check flow in following wires: wire 8 from ground to hydraulic unit plug. From hydraulic unit wire 8 to wire 87a, flow from wire 4 to valve relay term. 30, from wire 4 to multiple pin plug (control unit) wire 32.	61 31 570
	Valve relay opening contact voltage drop	1. Replace valve relay. 2. Check flow in following wires: wire 6 from term. B + to hydraulic unit plug, from wire 6 to valve relay wire 87, from wire 2 to multiple pin plug (control unit) wire 27, from hydraulic unit wire 2 to valve relay wire 85, from wire 86 (valve relay) to wire 86 (motor relay) and wire 10, from hydraulic unit wire 10 to electronic relay term. 30a or 30. Without overvoltage protection relay to DME master relay term. 87a.	
	Motor relay operating contact voltage drop	1. Replace motor relay. 2. Check ground terminals of pump motor for tight fit and transmission resistance. 3. Check flow in following wires: from term. B + to plug hydraulic unit wire 12, from multiple pin plug (control unit) wire 14 to hydraulic unit plug, from wire 9 in hydraulic unit to motor relay term. 30 and positive terminal on pump motor. 4. Pump motor faulty: replace hydraulic unit.	61 31 570 34 51 520
	Safety circuit Lamp, diode	Check wire 29 from multiple pin plug (control unit) to hydraulic unit plug for break and voltage drop. Check plug connection on indicator lamp. Valve relay plugged in? Pull off hydraulic unit plug. Diode test between wires 7 and 4 (M 09) - replace hydraulic unit. Diode now in valve relay since 1988 models / replace valve relay. Measure on valve relay between pins 30 and L1. Excessive voltage drop or break in wires: replace wire harness.	34 51 520 61 11 530

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
05 Dyn./Ground/ Overvoltage/ Bits		<i>Caution!</i> Turn off ignition before pulling off a plug and measuring resistance.	Group 34
	Voltage between wires 1 and 10	Turn on ignition. Run engine. Battery charged, check.	
	Ground wire 10	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 10 to ground connection. Replace electronic relay, if necessary.	61 11 530
	Ground wire 20	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 20 to ground connection.	61 11 530
	Ground wire 34	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 34 to ground connection.	61 11 530
	Wire 14/return delivery pump ground	Check ground connection on battery console. Check ground connection on return delivery pump. Check flow in ground wire. Check flow in multiple pin plug on wire harness (control unit) wire 14 to plug on hydraulic unit and wire 9 to term. 30 in hydraulic unit. If there is power flow break: replace wire harness. Wire power flow okay: replace hydraulic unit, see test step 08 ABS pump.	61 11 530 34 51 620
	Overvoltage protector	Replace electronic relay (watch above mentioned points!). No overvoltage protection relay since 1989 models.	34 52 510
	Test cycle	Replace control unit (watch above mentioned points!). If motor relay only switches (clicks) at intervals without the pump motor running, the voltage will briefly drop excessively due to the high switching on power at the feed wires from the battery. Repeat test with engine running. See test step 04 and test steps 06 / 07.	34 52 510
	Fault simulation	Replace control unit (watch above mentioned points!).	34 52 510

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
06 Control unit/ simulation – front wheels			Group 34
	Voltage between wires 1 and 10	Turn on ignition. Run engine Battery charged (check).	
	(solenoid) left pressure build-up drop hold	Due to high switching on power, possibly repeat test with engine running. Replace control unit and repeat test step. If in test steps 08, 09 and 10 valves do not switch or pump does not run: replace hydraulic unit.	34 52 510 34 51 520
	right pressure build-up drop hold	Due to high switching on power, possibly repeat test step with engine running. Replace control unit and repeat test step. If in test steps 08, 09 and 10 valves do not switch or pump does not run: replace hydraulic unit.	34 52 510 34 51 520

Only the pressure building-up and pressure holding phases (2 A) can be checked in 325 iX cars because of the changed activation times in the control unit. Irregular values will be displayed on adapter B in switch position (5 A).

It might be necessary to repeat this test step to reach the nominal values due to the high switching-on power and short switching phase.

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
07 Control unit/ simulation — rear wheels	Voltage between wires 1 and 10	Turn on ignition. Run engine. Battery charged, check.	Group 34
	(solenoid) pressure build-up drop hold	Due to high switching on power, possibly repeat test step with engine running. Replace control unit and repeat test step. If in test steps 08, 09 and 10 valves do not switch or pump does not run: replace hydraulic unit.	34 52 510
		Only the pressure building-up and pressure holding phases (2 A) can be checked in 325 iX cars because of the changed activation times in the control unit. Irregular values will be displayed on adapter B in switch position (5 A).	
		It might be necessary to repeat this test step to reach the nominal values due to the high switching-on power and short switching phase.	

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
08 ABS return delivery pump	Voltage between wires 1 and 10.	Ignition turned on. Engine running. Battery charged (check).	Group 34
	Front left right left/right	Due to high switching on power, possibly repeat test step with engine running. Refer to test steps 05, 06 and 07. Testing the ABS requires the conventional brake system to be okay: bled properly, brake line connections tight, brake pads okay, master and wheel cylinders okay. Watch uniformity of wheels on one axle. Observe relation between wheel – reading.	
	Rear left/right	Brake lines mixed up on hydraulic unit. Replace hydraulic unit.	34 51 520

This test step may not be performed on a dynamometer for 325 iX cars, since the total loading time for the central lock in the transfer box must not exceed 60 seconds at a wheel speed of max. 7.5 km/h (4.5 mph). Refer to brake test dynamometer in 34 00 009.

34-43

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
09 Hydraulic unit pressure drop	Voltage between wires 1 and 10	Turn on ignition. Run engine. Battery charged, check.	Group 34
	Front left right left/right	Due to high switching on power, possibly repeat test step with engine running. Refer to test steps 05, 06 and 07.	
	Rear left/right	Testing the ABS requires the conventional brake system to be okay: bled properly, brake line connections tight, brake pads okay. Watch uniformity of wheels on one axle.	
		Replace hydraulic unit.	34 51 520
		This test step may not be performed on a dynamometer for 325 iX cars, since the total loading time for the central lock in the transfer box must not exceed 60 seconds at a wheel speed of max. 7.5 km/h (4.5 mph). Refer to brake test dynamometer in 34 00 009.	

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
10 Hydraulic unit pressure build-up pressure hold	Voltage between wires 1 and 10	Turn on ignition. Run engine. Battery charged (check).	Group 34
	Front left right left/right	Due to high switching on power, possibly repeat test step with engine running. Refer to test steps 05, 06 and 07.	
	Rear left/right	Testing the ABS requires the conventional brake system to be okay: bled properly, brake line connections tight, brake pads okay. Watch uniformity of wheels on one axle.	
		Check lines to and from hydraulic unit for leaks. Replace hydraulic unit.	34 51 520

This test step may not be performed on a dynamometer for 325 iX cars, since the total loading time for the central lock in the transfer box must not exceed 60 seconds at a wheel speed of max. 7.5 km/h (4.5 mph). Refer to brake test dynamometer in 34 00 009.

TROUBLESHOOTING ABS – 325 iX (ABS Lamp Comes On After Repeated Cancellation By Starting Engine)

Fault Diagnosis (Engine Switched Off)	Possible Cause	Correction (or Testing Instructions)
Control lamp immediately after starting engine	Hydraulic control unit, operating voltage . . . power supply Acceleration sender has ground contact	Service Tester Check pin 16 on ABS wire harness plug for ground contact.
Control lamp 15 to 20 seconds after starting engine (car stopped, engine running at idle speed)	Break in "idle speed boost" current path	Break in connection between ABS wire harness plug pin 3 and solenoid ground
Control lamp at high engine speed of stopped car (or longer lasting ABS control after stopping car) (> 1 second)	Dispersion in sensor wire	Check routing of wires for ABS sensors
Control lamp after exceeding approx. 12 km/h (7.5 mph)	Return delivery pump motor, electronics	Service Tester
Control lamp about 15 to 20 seconds after moving off (road speed > 3 km/4 = 2 mph)	Break in acceleration sender current path Sensor fault (break in wire)	Pin 16 on ABS wire harness plug or connections 2 and 3 on acceleration sender – check plug connections in particular – Service Tester