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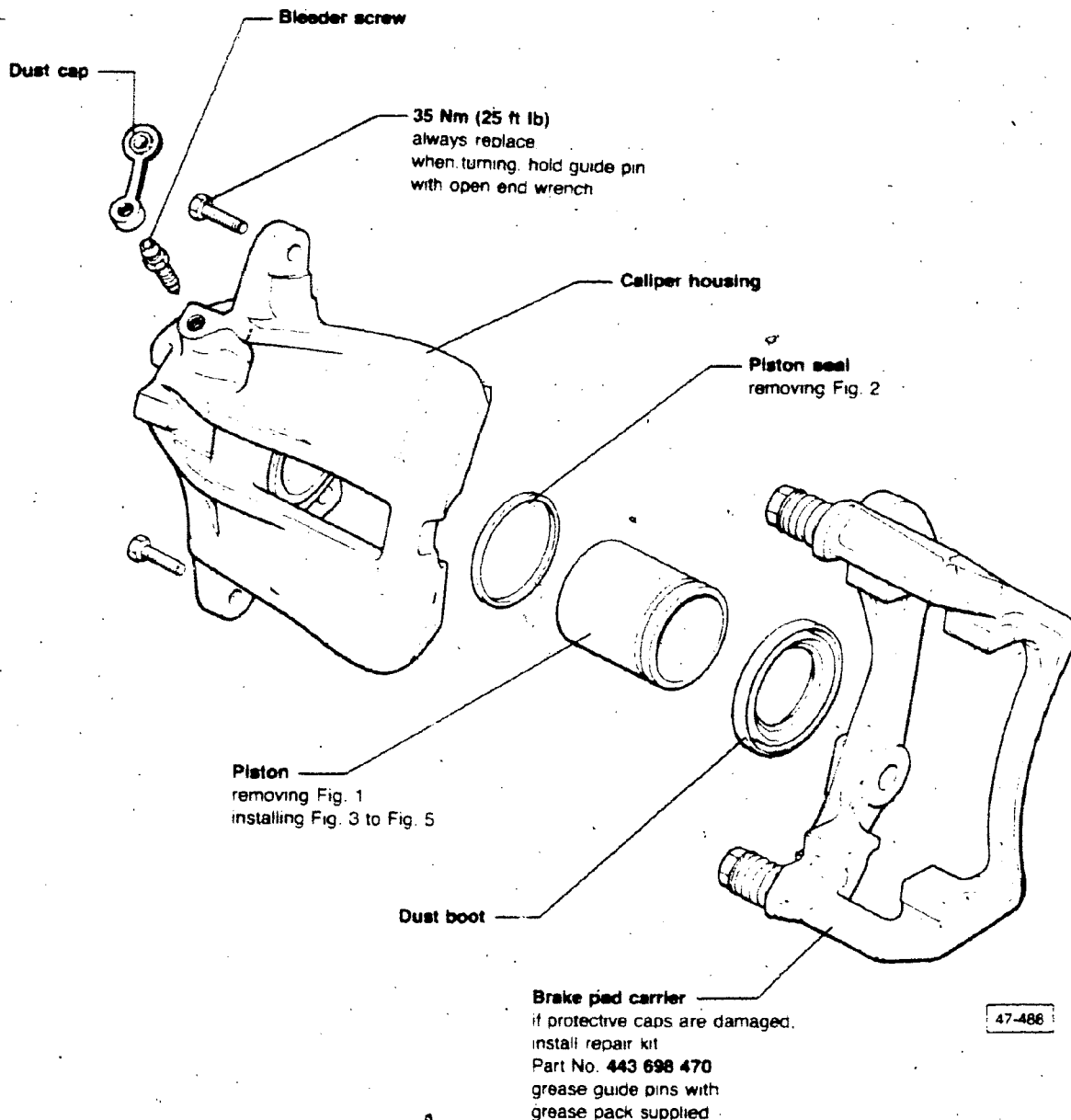
# Brake – Hydraulic Components, Regulator, Booster

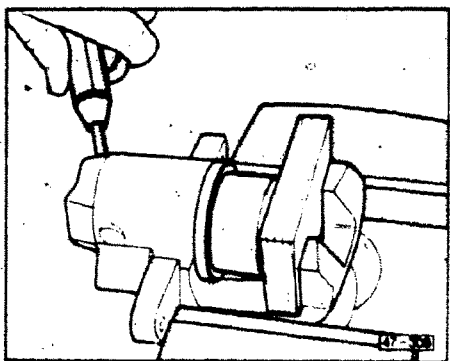
## Note

Use all parts supplied in repair kit when repairing.

## CAUTION

Coat seals and pistons lightly with VW brake cylinder paste or equivalent before installing.

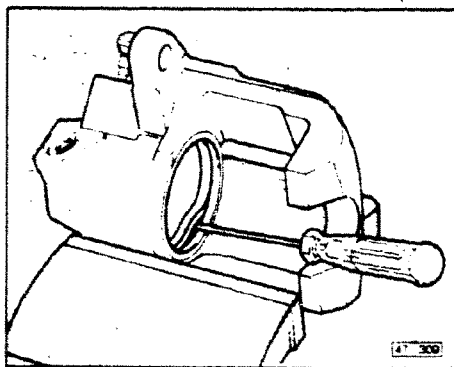




► Fig. 1 Piston, removing

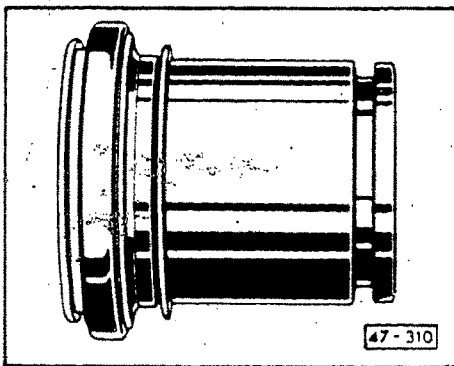
### CAUTION

Place a wooden block in the cylinder housing to prevent damage to the piston. Use only enough air pressure to force piston out.



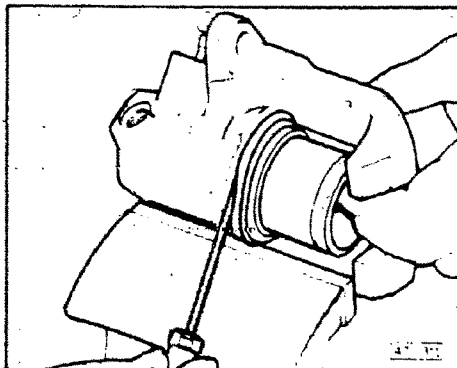
► Fig. 2 Piston seal, removing

- pry out carefully without damaging cylinder bore



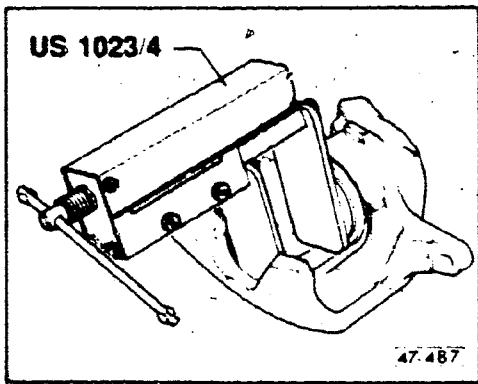
► Fig. 3 Piston, installing

- slide dust boot onto piston



► Fig. 4 Piston, installing

- lubricate piston and cylinder bore lightly with brake cylinder paste
- install piston and insert inner lip of dust boot into groove in brake cylinder



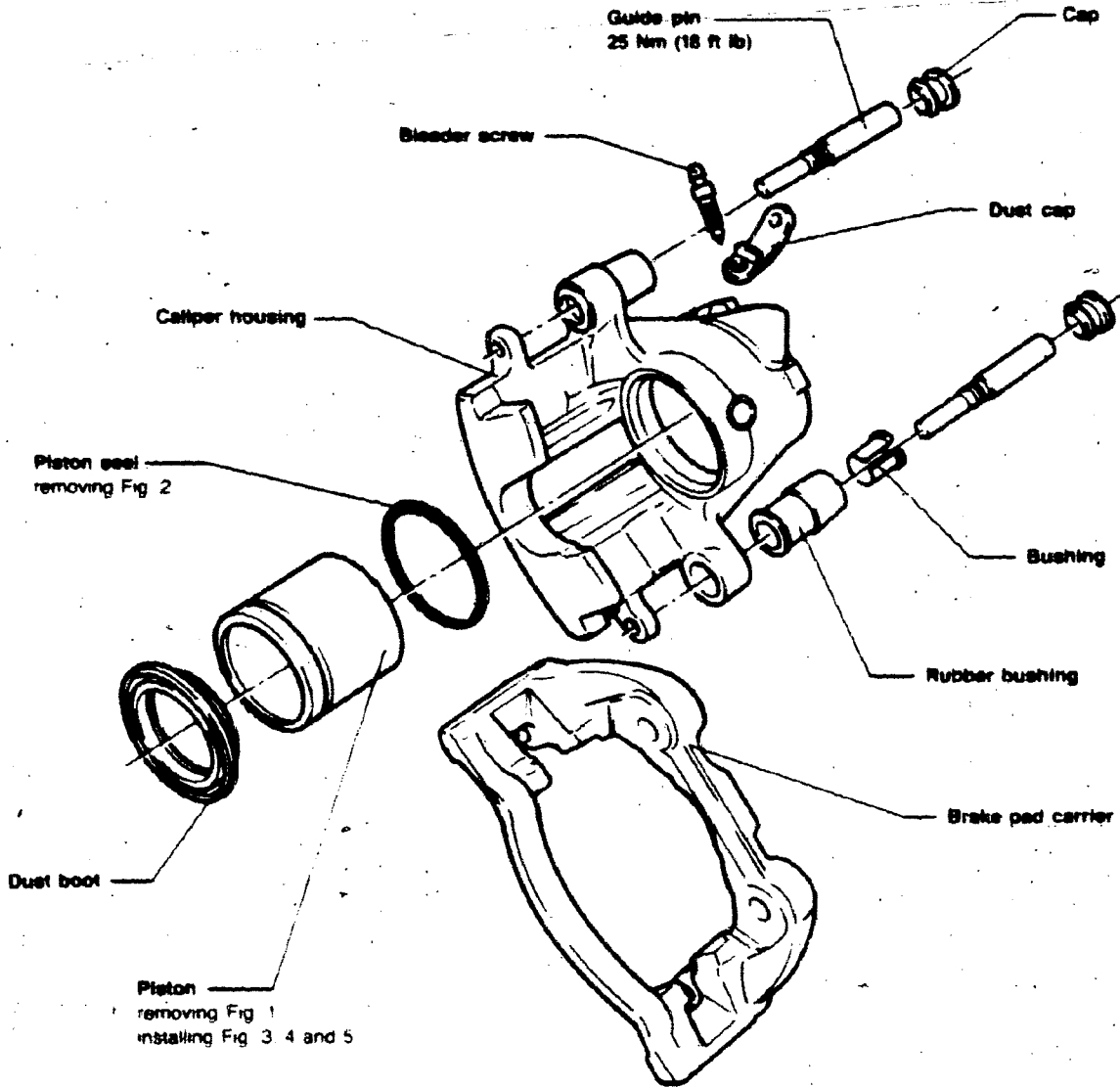
► Fig. 5 Piston, installing

- press piston in as far as it will go

**CAUTION**

Outer lip of dust boot must slip into groove in piston.

# Brake – Hydraulic Components, Regulator, Booster



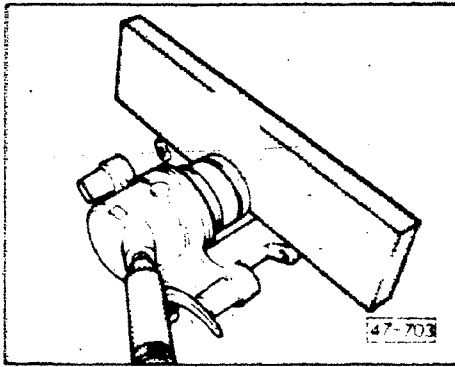
## Note

Always use all parts supplied in repair kit

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E-5

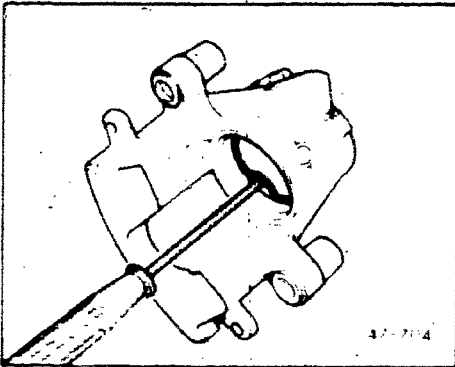
# Brake – Hydraulic Components, Regulator, Booster



► Fig. 1 Piston, removing

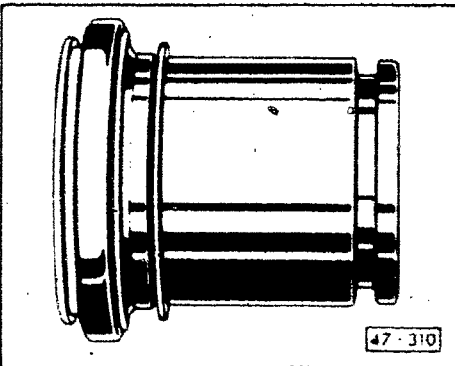
## CAUTION

Place a wooden block in the cylinder housing to prevent damage to the piston. Use only enough air pressure to force piston out.



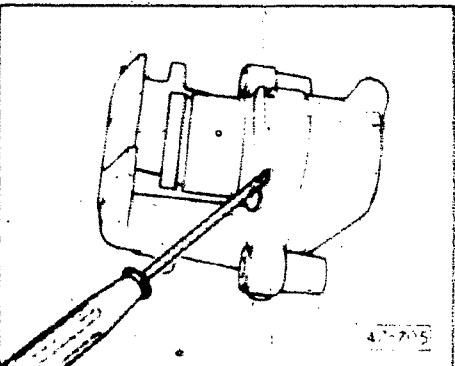
► Fig. 2 Piston seal, removing

- pry out carefully without damaging cylinder bore



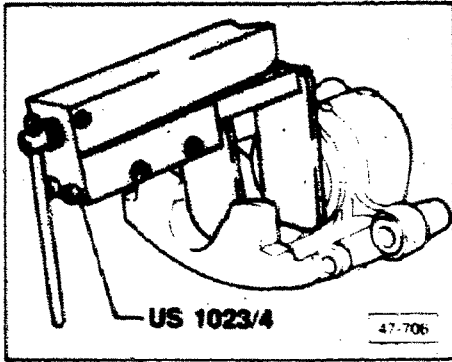
► Fig. 3 Piston, installing

- slide dust cap onto piston



► Fig. 4 Piston, installing

- lubricate piston and cylinder bore lightly with brake cylinder paste
- install piston and insert inner lip of dust boot into groove in brake cylinder



► Fig. 5 Piston, installing

- press piston in as far as it will go

**CAUTION**

Outer lip of dust boot must slip into groove in piston.

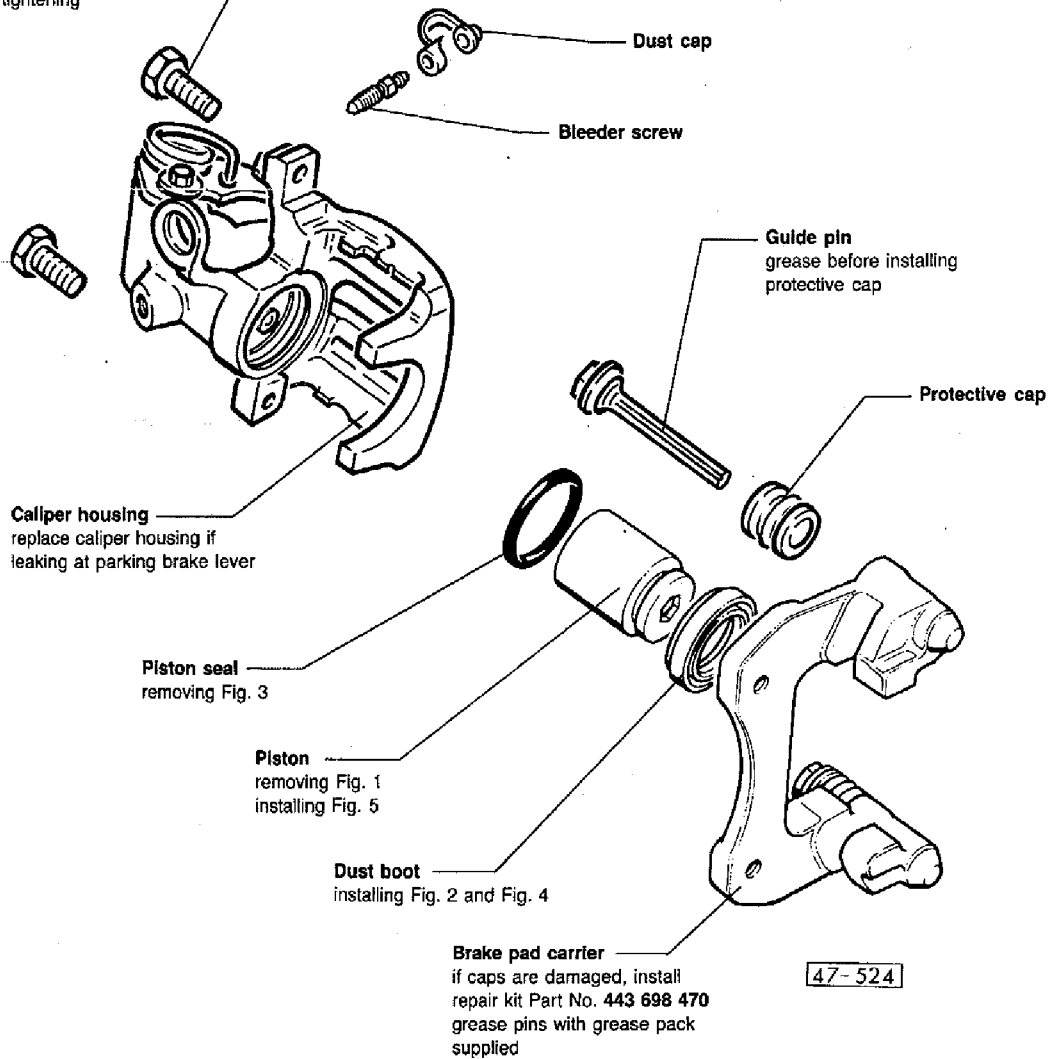
**Note**

Always use all parts supplied in the repair kit.

New brake calipers are supplied filled with brake fluid and bled.

Apply a thin coat of brake cylinder paste to brake cylinders, pistons and seals before installing.

**Self-locking bolts**  
35 Nm (25 ft lb)  
always replace  
hold guide pin when loosening  
and tightening



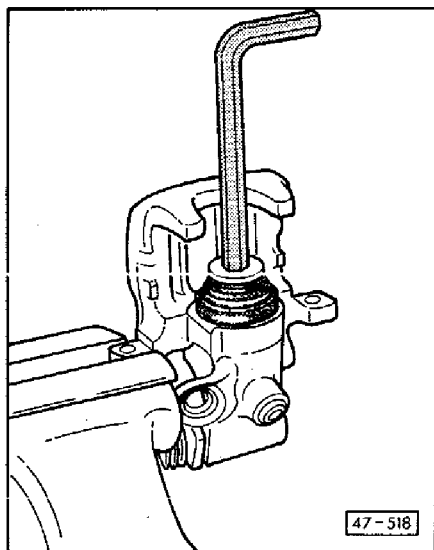
**CAUTION**

During repairs, brake calipers must be bled (without brake pads) before installing. See Fig. 6.

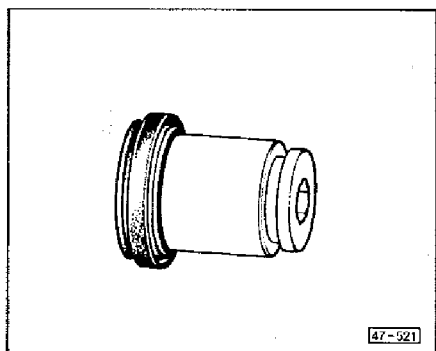
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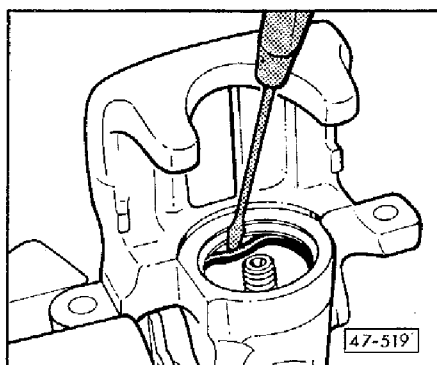
## Brake – Hydraulic Components, Regulator, Booster



► Fig. 1 Piston, removing

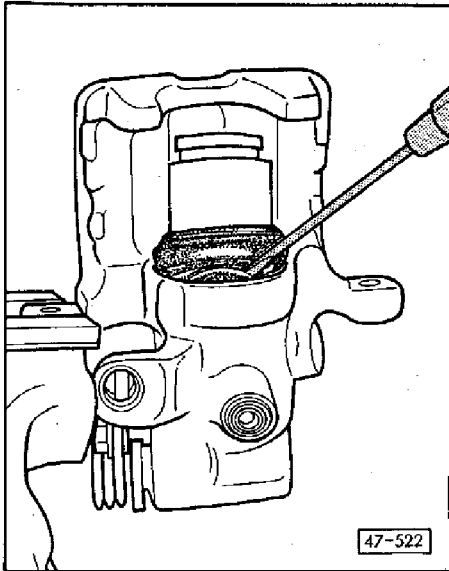


► Fig. 2 Dust boot, installing



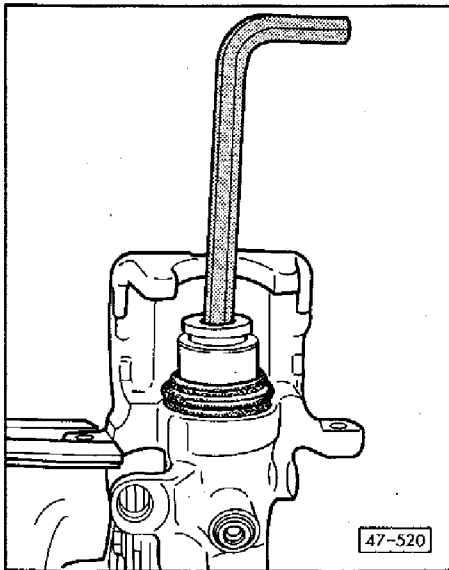
► Fig. 3 Piston seal, removing

- pry out carefully to avoid damaging cylinder bore



► Fig. 4 Piston, installing

- lubricate piston and cylinder bore lightly with brake cylinder paste
- insert inner lip of dust boot into groove of brake cylinder

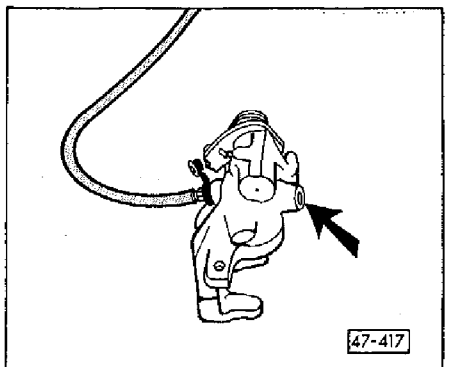


► Fig. 5 Piston, installing

- screw piston into cylinder while pressing down firmly

**CAUTION**

Outer lip of dust boot must slip into groove of piston.



► Fig. 6 Rear brake caliper, pre-bleeding

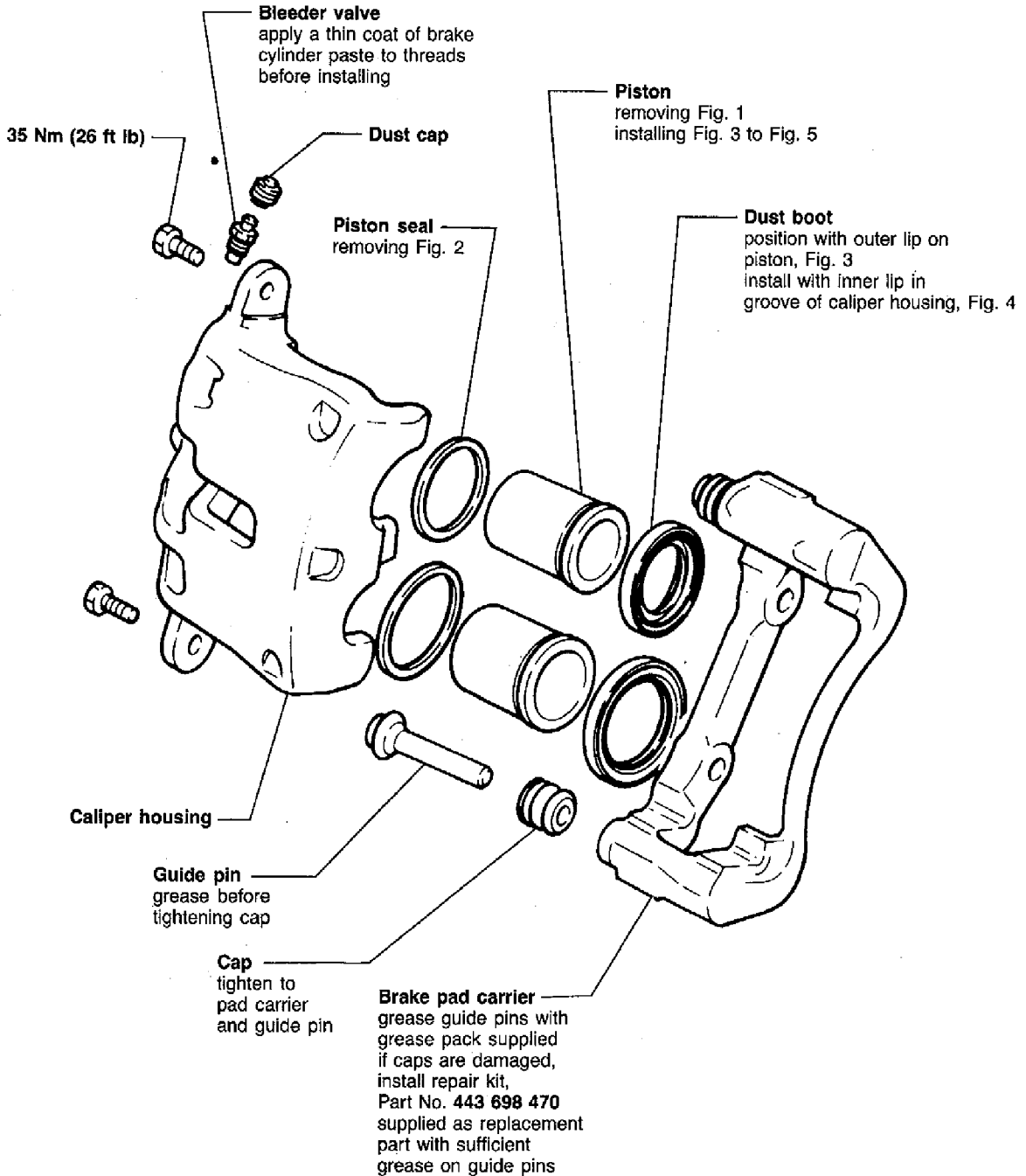
- place caliper in position shown
- open bleeder valve and fill with brake fluid from bleeder container until fluid flows from brake hose connection (**arrows**) without bubbles
- close bleeder valve

# Brake – Hydraulic Components, Regulator, Booster

## CAUTION

Use all parts supplied in repair kit when repairing.

Coat seals and pistons lightly with VW brake cylinder paste or equivalent before installing.



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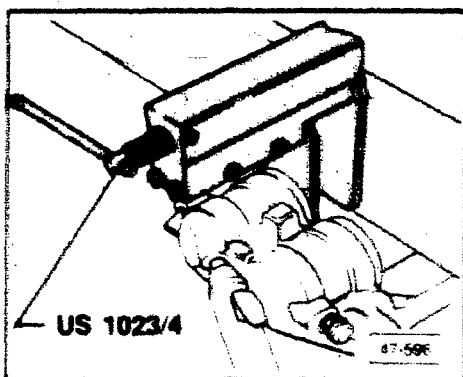
E-11

90 Quattro 20V

Coupe

Double piston caliper

47.10



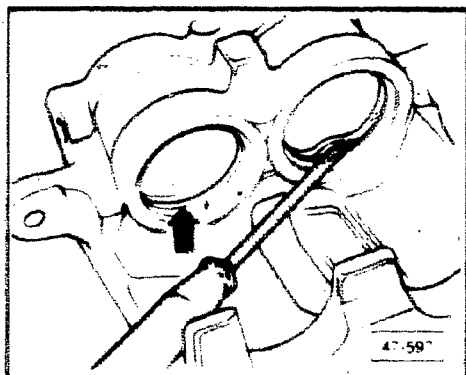
► Fig. 1 Pistons, removing

- press pistons out individually with compressed air

### CAUTION

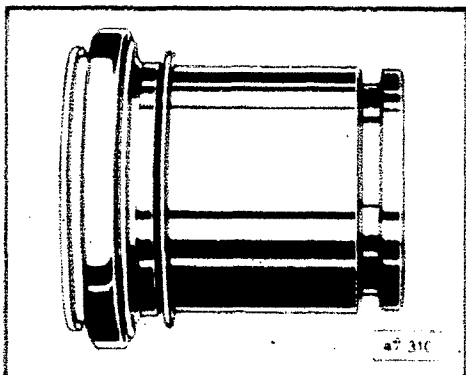
Place a wooden block in the cylinder housing to prevent damage to the piston. Use only enough air pressure to force pistons out.

Only one piston at a time can be pressed out. Secure second piston with US 1023/4 or equivalent.



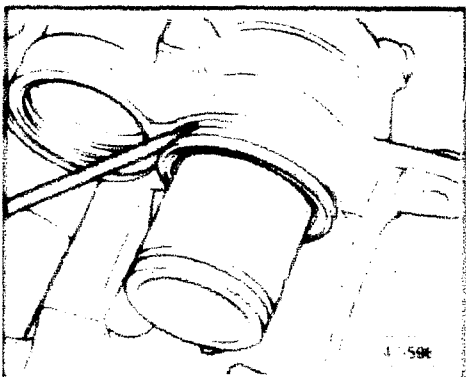
► Fig. 2 Piston seals, removing

- pry seals out carefully without damaging cylinder bore



► Fig. 3 Pistons, installing

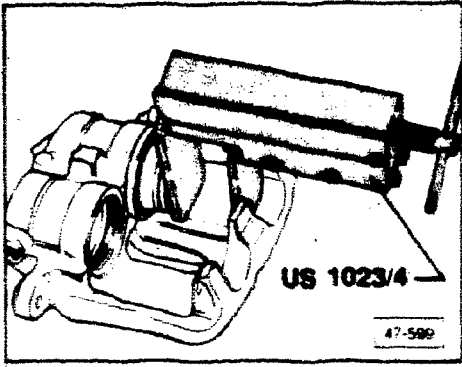
- slide dust boot onto piston



► Fig. 4 Pistons, installing

- lubricate piston and cylinder bore lightly with brake cylinder paste
- install piston and insert inner lip of dust boot into groove in brake cylinder

# Brake – Hydraulic Components, Regulator, Booster

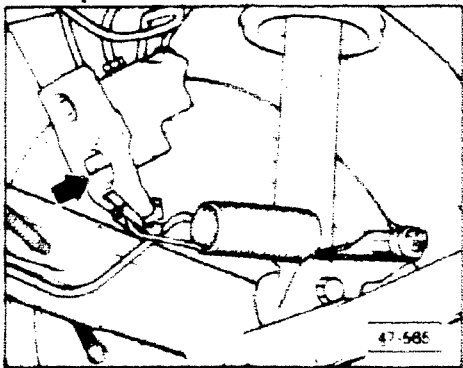


► Fig. 5 Pistons, installing

- center tool on piston and press in

**CAUTION**

Outer lip on dust boot must slip into groove in piston.



## ▶ Brake pressure regulator, checking

### Note

The height sensitive brake pressure regulator is mounted on the body and is controlled by the movement of the rear axle, via a spring.

- depress brake pedal once firmly (vehicle must be on ground)
- release pedal quickly
  - lever on regulator (**arrow**) must move

## Pressure check

### CAUTION

The pressure test must be conducted with the vehicle unloaded (curb weight — no luggage), a full fuel tank and the driver's seat occupied.

### Note

Brake system must be filled with fluid and free of air (properly bled) to check/adjust pressure regulator.

- remove bleeder screws and connect adaptor to left front wheel brake caliper and right rear wheel brake caliper
- connect gauges
- bleed both hoses and gauge with bleeder valve on gauges
- depress brake pedal until gauge on front axle reads 100 bar (1450 psi) and then maintain pressure for five seconds
  - gauge for rear axle must not vary by more than 10 bar (145.0 psi) during this time

### Note

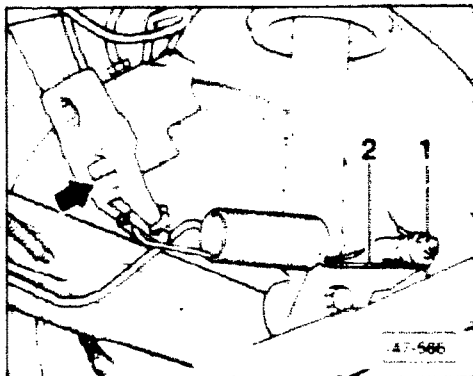
The regulator must be replaced if the specific test results cannot be obtained.

## Brake pressure regulator, adjusting

### Note

Before adjusting pressure regulator, remove plastic roller and lubricate steel bushing under it with white lubricating paste, Part No. AOS 126 000 05.

- lift vehicle off ground so load is taken off rear axle
- press lever on brake pressure regulator (arrow) towards rear of vehicle as far as stop
- loosen nut 1
- adjust roller in slot so spring 2 is under no tension
- tighten nut 1 to 20 Nm (14 ft lb)
- repeat pressure check (vehicle on ground) using the following specifications
  - front axle at 50 bar (725 psi) rear axle must read 32.5-42.5 bar (471-616 psi)
  - front axle at 100 bar (1450 psi) rear axle must read 54.0-71.5 bar (783-1036 psi)



# Brake – Hydraulic Components, Regulator, Booster

## Pressure check

### CAUTION

The pressure test must be conducted with the vehicle unloaded (curb weight — no luggage), a full fuel tank and the driver's seat occupied.

### Note

Brake system must be filled with fluid and free of air (properly bled) to check adjust pressure regulator.

- remove bleeder screws and connect adaptor to left front wheel brake caliper and right rear wheel brake caliper.
- bounce vehicle several times
- connect gauges
- bleed both hoses and gauge with bleeder valve on gauges
- depress brake pedal until gauge on front axle reads 100 bar (1450 psi) and then maintain pressure for five seconds
  - gauge for rear axle must not vary by more than 10 bar (145.0 psi) during this time

### Note

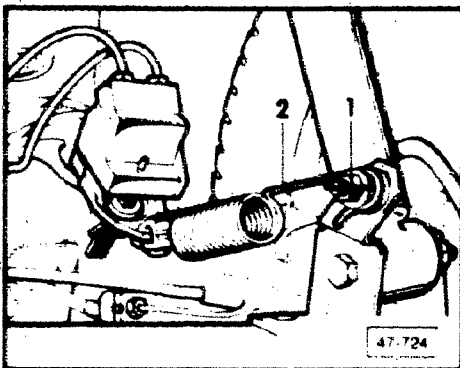
The regulator must be replaced if the specific test results cannot be obtained.

## Brake pressure regulator, adjusting

### Note

Before adjusting pressure regulator, remove plastic roller and lubricate steel bushing under it with white lubricating paste. Part No. **A0S 126 000 05**.

- lift vehicle off ground so load is taken off rear axle
- press lever on brake pressure regulator (arrow) towards rear of vehicle as far as stop
- loosen nut 1
- insert a 1.0 mm diameter drill bit between spring 2 and plastic roller
- tighten nut 1 to 20 Nm (14 ft lb)
- remove drill bit and release lever
- repeat pressure check (vehicle on ground) using the following specifications
  - front axle at 50 bar (725 psi) rear axle must read 23.5-37.5 bar (341-544 psi)
  - front axle at 100 bar (1450 psi) rear axle must read 45-66 bar (652-957 psi)





## Brake booster, checking

- depress brake pedal firmly approximately 20 times with engine **OFF**
- depress brake pedal and hold
- start engine
  - if brake booster is working properly, pedal will fall slightly and then hold

## Brake system, bleeding

### WARNING

Brake fluid is poisonous.

### CAUTION

Brake fluid must not come in contact with paintwork.

Use only new brake fluid which conforms with US specification **FMVSS 116 DOT 4**.

Do not add or mix **DOT 5** silicone type brake fluid with the brake fluid in the vehicle. Severe component corrosion may result. Such corrosion could lead to brake system failure.

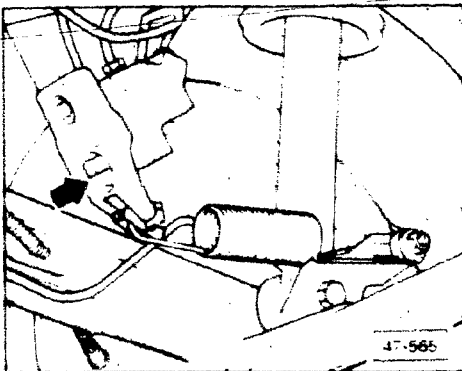
Brake fluid is hygroscopic, i.e., it absorbs moisture from surrounding air and should therefore always be stored in air-tight containers.

- connect **US 1116**
- open bleeder screws in prescribed sequence

- 1 — Brake master cylinder and proportioning valve (ABS only)
- 2 — right rear
- 3 — left rear
- 4 — right front
- 5 — left front

### Note

On vehicles with height sensitive brake pressure regulator, press the regulator lever (**arrow**) firmly towards the rear axle when bleeding the rear brakes



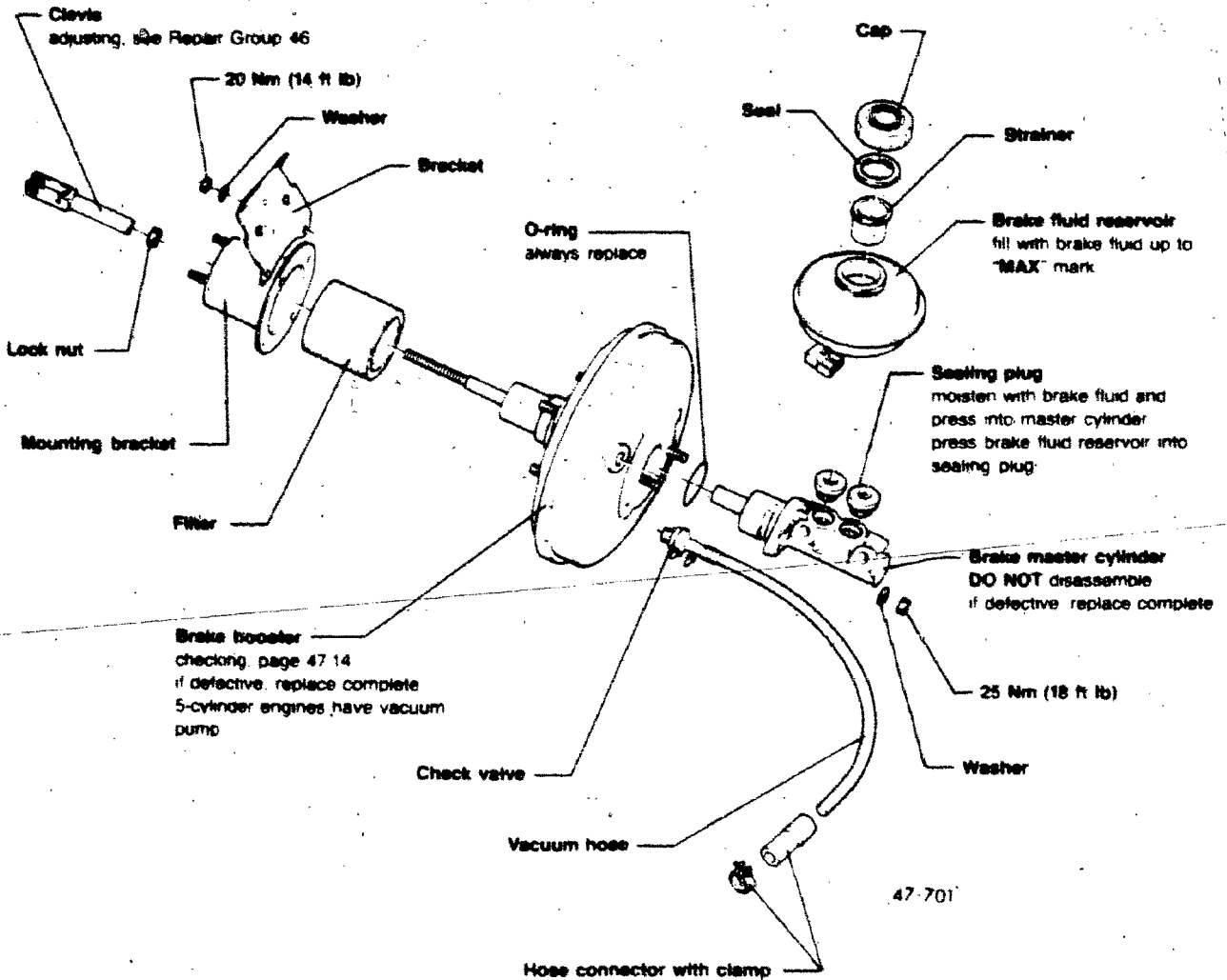
# Brake – Hydraulic Components, Regulator, Booster

## Brake fluid, changing

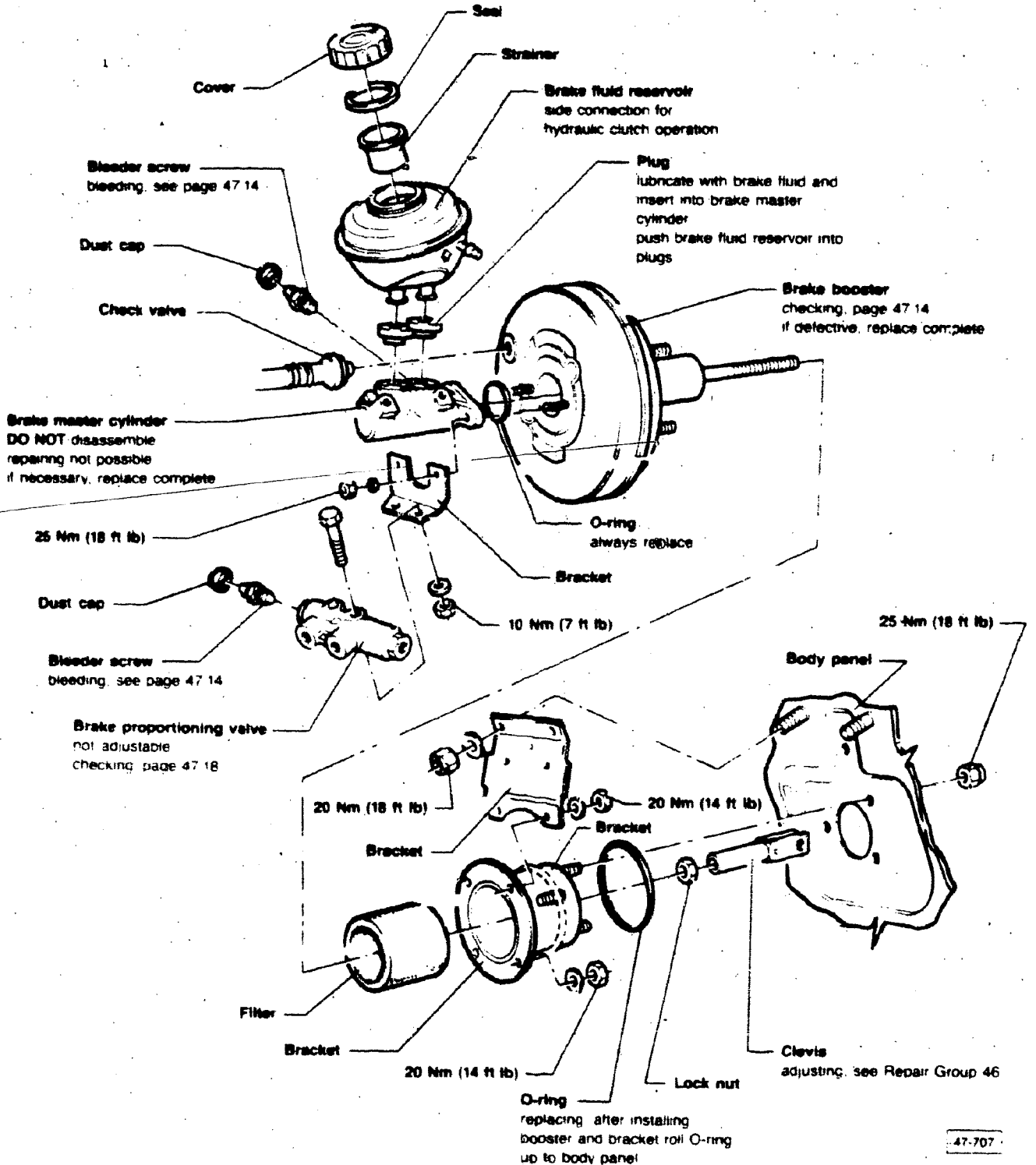
- connect US 1116
- open and close bleeder screws in sequence below and drain off specified amount of brake fluid

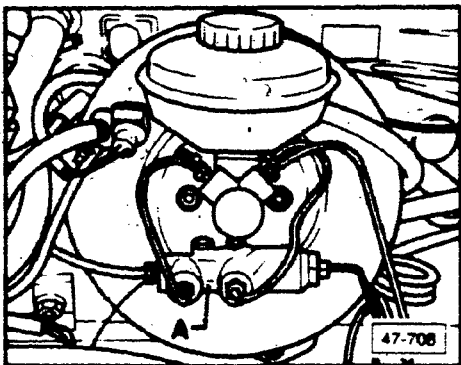
Sequence	Amount of fluid which must flow out:
brake master cylinder brake proportioning valve	250 cm <sup>3</sup> each bleed screw (only with ABS)
rear right	500 cm <sup>3</sup>
rear left	500 cm <sup>3</sup>
front right	500 cm <sup>3</sup>
front left	500 cm <sup>3</sup>

# Brake – Hydraulic Components, Regulator, Booster



# Brake – Hydraulic Components, Regulator, Booster





## ▶ Brake proportioning valve, checking

### Note

The proportioning valve **A** is located under the brake booster.

### Pressure check

- lift vehicle and connect **VW 1310** to left front and left rear brake calipers
- bleed gauges
- depress brake pedal until gauge on front caliper reads 50 bar (725 psi)
  - gauge on rear caliper must read (30-35 bar (435-507 psi))
- increase brake pedal pressure until gauge on front caliper reads 100 bar (1450 psi)
  - gauge on rear caliper must read 45-50 bar (652-725 psi)

### Note

The proportioning valve must be replaced if the specific test results cannot be obtained.

- remove gauges and bleed brake system

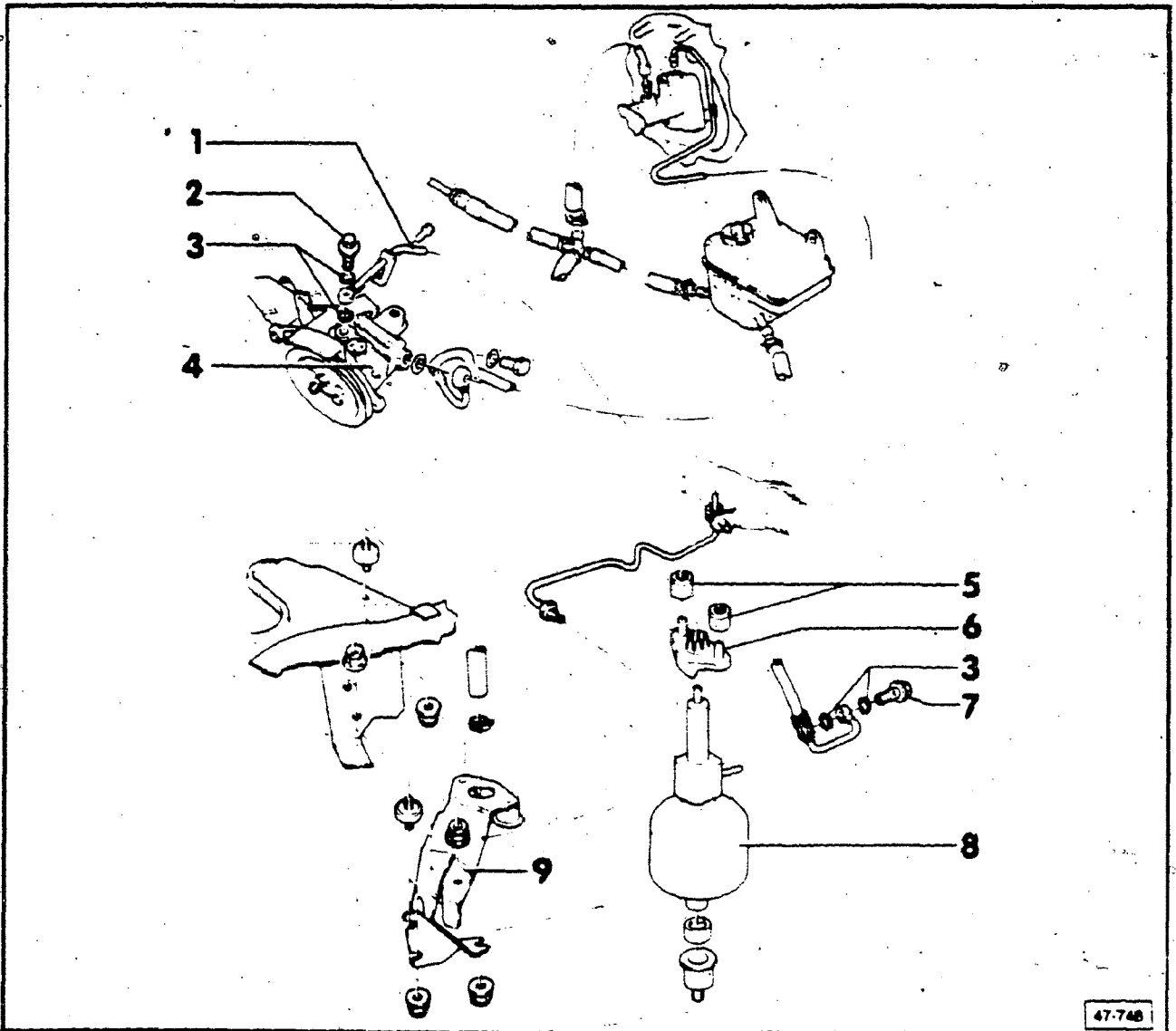
## Hydraulic system changes

Beginning in the 1990 Model Year, the following parts have been modified in vehicles having an hydraulic brake servo:

- high pressure hose
- banjo bolts for high pressure connections to hydraulic pump and pressure accumulator
- O-ring seals for high pressure hose connections
- hydraulic pump
- pressure accumulator
- bracket for pressure accumulator
- bushings for pressure accumulator mounting

These changes were gradually introduced beginning with the following VIN:

Coupe 8B LA 006 861

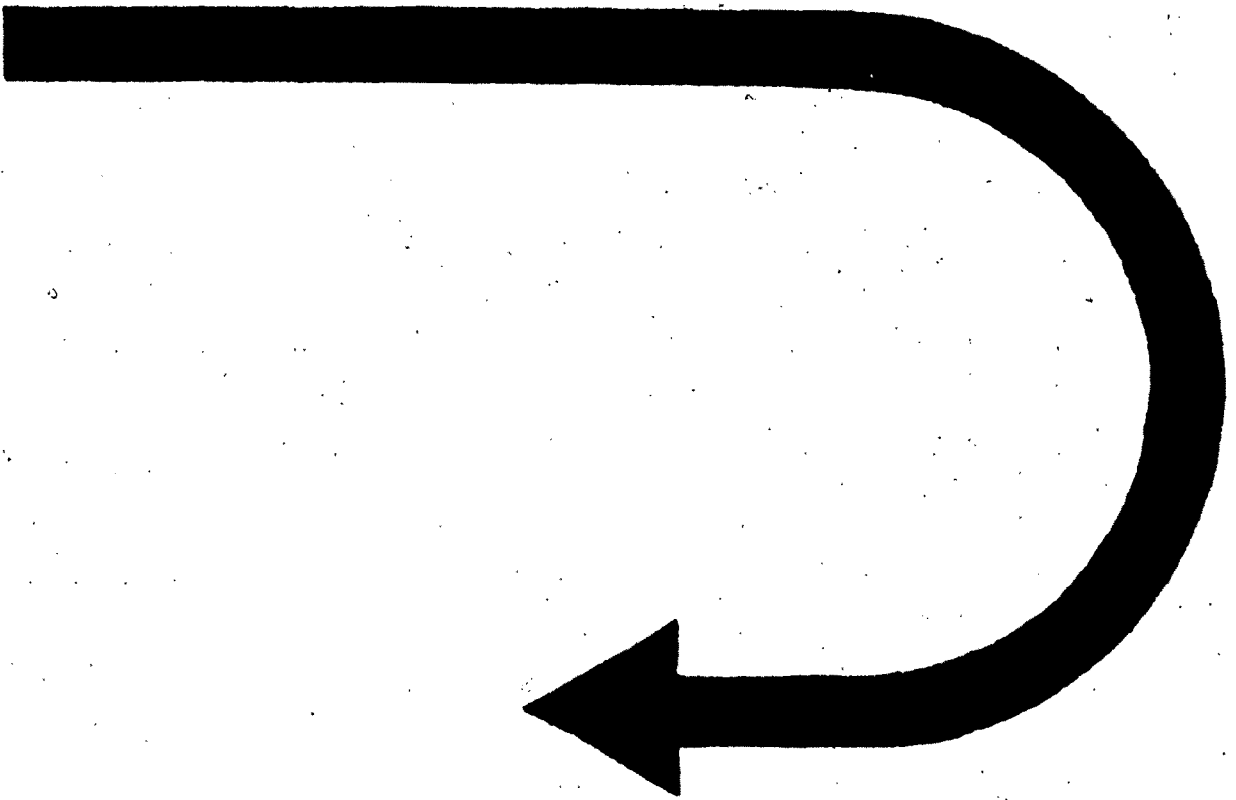


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- |  |  |
|--|--|
| <p><b>1 — High pressure hose</b><br/>with grooves for O-ring seals</p> <p><b>2 — Banjo bolt</b><br/>● with strainer<br/>● M10 x 1 (was M12 x 1.5)<br/>● 30 Nm (22 ft lb)</p> <p><b>3 — O-ring seals</b><br/>● always replace<br/>● previously metal seals</p> <p><b>4 — Hydraulic pump</b><br/>● thread for high pressure hose connection = M10 x 1 (was M12 x 1.5)<br/>● use new metal seals when connecting VW 1354</p> <p><b>5 — Bushings</b><br/>apply acid-free lubricant when installing</p> | <p><b>6 — Mount</b><br/>install bushings and place on accumulator</p> <p><b>7 — Banjo bolt</b><br/>● with strainer<br/>● M10 x 1 (was M12 x 1.5)</p> <p><b>8 — Pressure accumulator</b><br/>● thread for high pressure hose connection = M10 x 1 (was M12 x 1.5)<br/>● gas pressure when new = 78 - 82 bar (1131 - 1189 psi)</p> <p><b>9 — Bracket</b><br/>● for pressure accumulator<br/>● install in vehicle before installing hydraulic lines</p> |
|--|--|



**CONTINUED IN THE  
BEGINNING OF NEXT ROW**





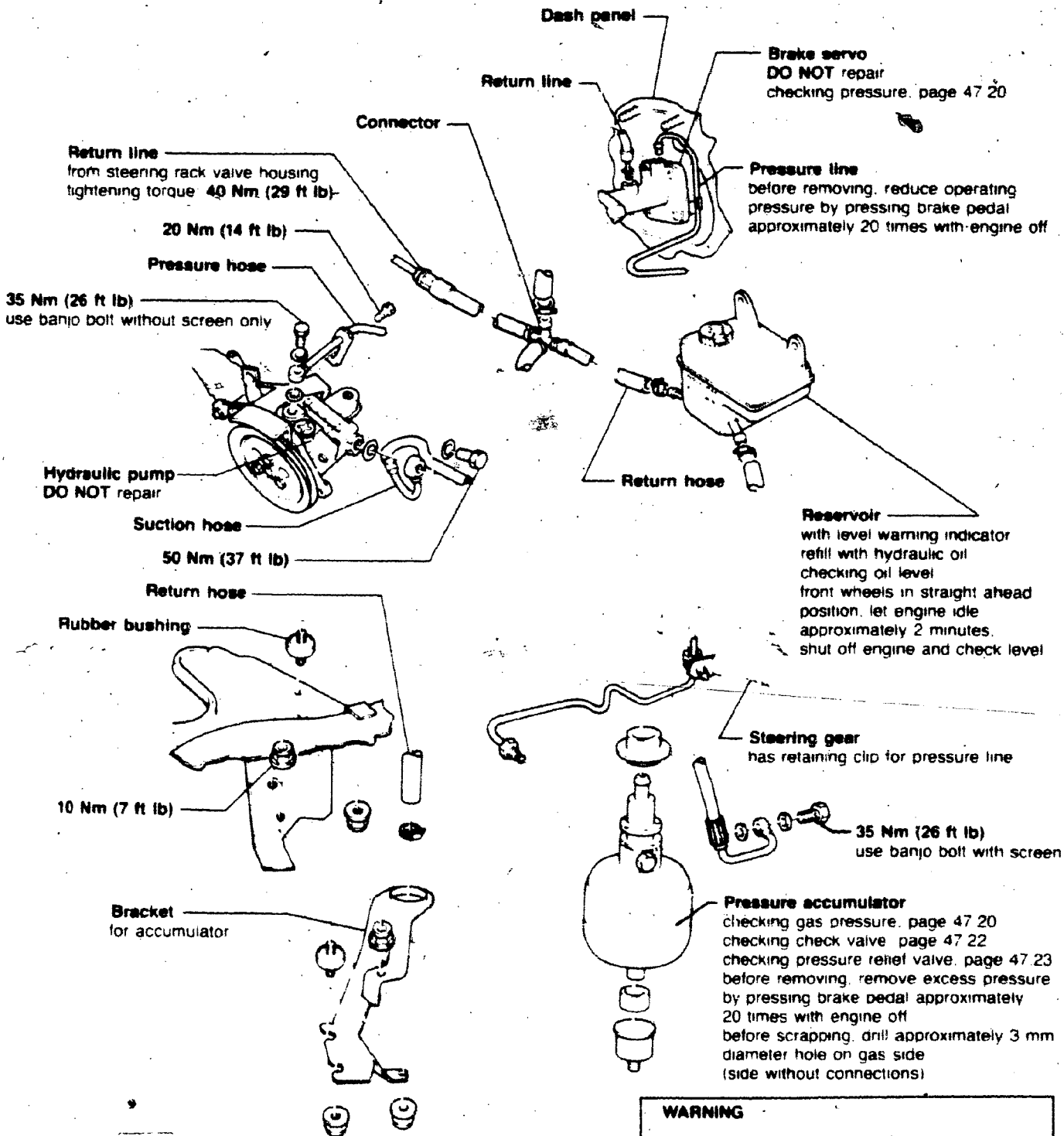
# Brake – Hydraulic Components, Regulator, Booster

## CAUTION

Reservoir must be filled with hydraulic oil.  
Part No. G 000 002.

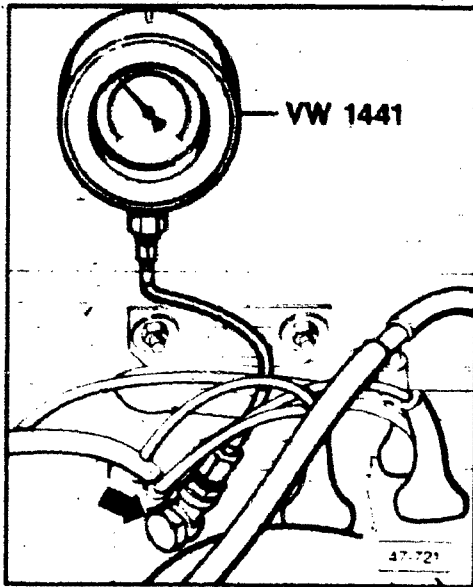
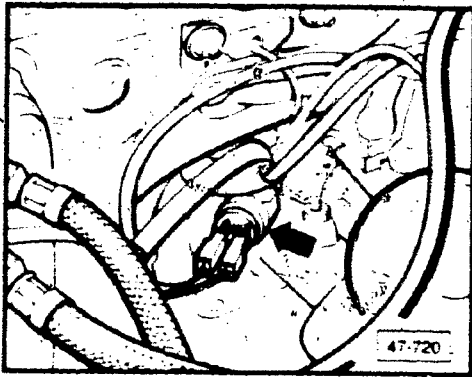
## Note

Always replace sealing rings between connections



## WARNING

Wear safety glasses when drilling into pressure accumulator



## Gas pressure of pressure accumulator, checking

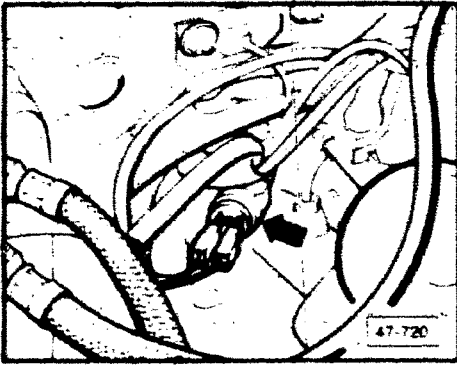
### Note

- gas pressure of new accumulator 78-82 bar (1131-1189 psi) at 20°C (68°F)
- minimum gas pressure 30 bar (435 psi) at 20°C (68°F)
- with engine not running, press brake pedal about 20 times to reduce system pressure
- disconnect wire on warning light switch and remove switch (arrow)
- attach pressure gauge with hollow bolt and copper washers to brake servo unit

### Note

Attach thick copper washer between brake servo unit and banjo fitting and thin copper washer between hollow bolt and banjo fitting.

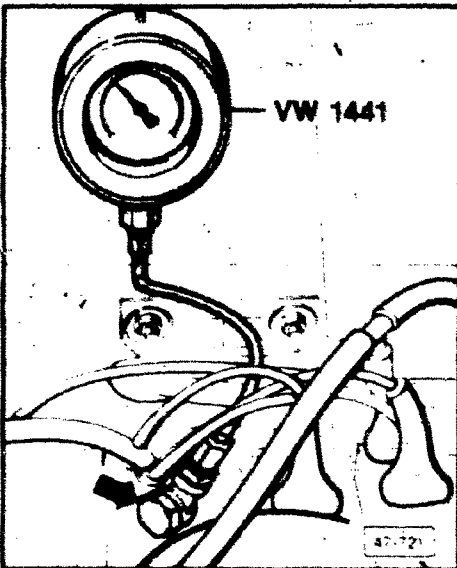
- start engine and let idle until pressure gauge reads approximately 140 bar (2030 psi)
- turn ignition **OFF**
- pump brake pedal until pressure drops slowly
  - pressure reading at which gauge pointer drops down rapidly to "0" is gas pressure of pressure accumulator
  - if pressure is lower than 30 bar (435 psi) accumulator must be replaced
- remove pressure gauge
- install brake light warning switch and reconnect wire connector
- check all connections for leaks



## Operating pressure of hydraulic brake servo, checking

### Test conditions:

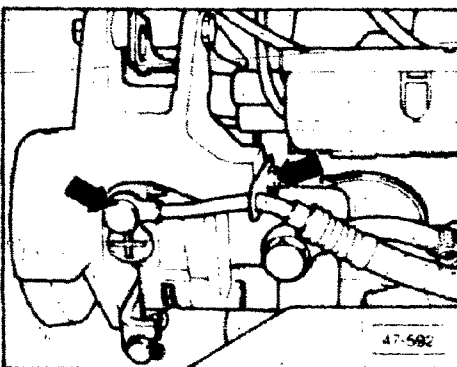
- V-belt tension **OK**
- no leaks in servo system
- with engine not running, press brake pedal about 20 times to reduce pressure in system
- disconnect wires on warning light switch and remove switch (arrow)
- attach pressure gauge with hollow bolt and copper washers to brake servo unit (arrow)



### Note

Attach thick copper washer between brake servo unit and banjo fitting and thin copper washer between hollow bolt and banjo fitting.

- start engine and let idle until pressure gauge reads more than 140 bar (2030 psi)
- if specified pressure is not reached, check delivery rate of central hydraulic pump
- turn ignition **OFF**, leave pressure gauge connected

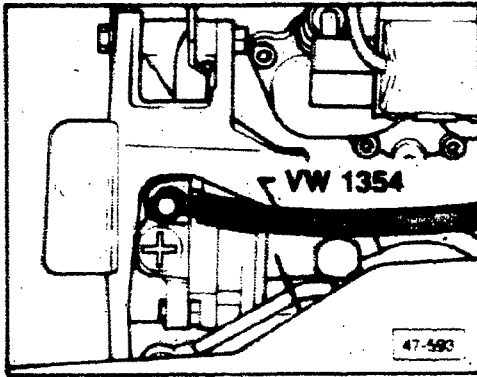


## Delivery rate, checking

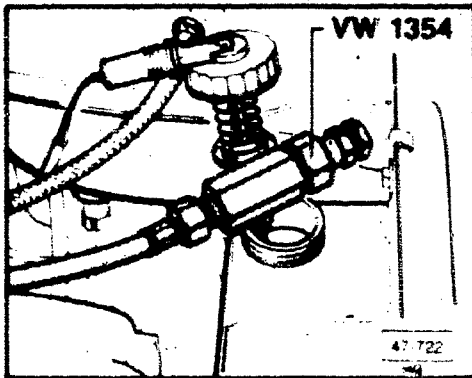
- remove pressure line from hydraulic pump (arrow)

more

# Brake – Hydraulic Components, Regulator, Booster



- connect hose of pressure limiter **VW 1354** to pump, using existing hollow bolt.
- remove cap from fluid reservoir



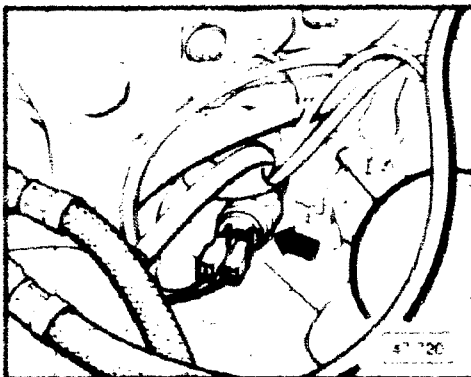
- put end of pressure limiter hose into reservoir
- start engine, let idle until line is bled (no bubbles)
- turn ignition **OFF**
- hold hose into measuring jar
- start engine and let idle
- check delivery rate
  - must be at least 0.3 liters min. (0.3 US qt min)
  - if specification not reached, replace hydraulic pump
  - if delivery rate is **OK**, but operating pressure is still not reached, replace pressure accumulator

- with engine shut off, press brake pedal about 20 times to reduce pressure in system
- remove pressure gauge and pressure limiter
- install brake warning light switch and reconnect wire connectors
- attach pressure line to hydraulic pump
- check all connections for leaks

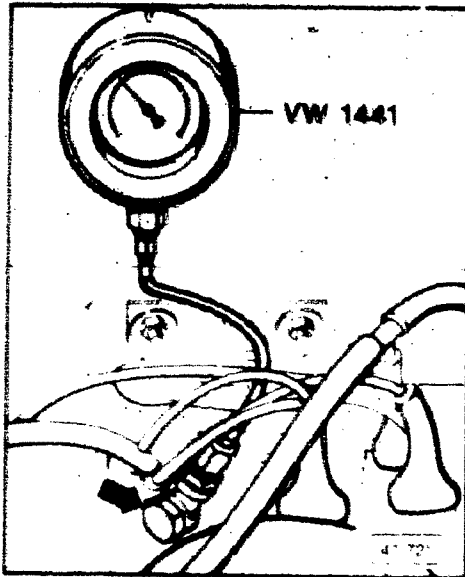
## Pressure accumulator, check valve, checking

### Test condition:

- pump delivery rate **OK**
- no leaks in brake servo unit
- with engine not running, press brake pedal about 20 times to reduce pressure in system
- disconnect wires on warning light switch and remove switch (arrow)



more



- attach pressure gauge with hollow bolt and copper washers to brake servo unit (arrow)

## Note:

Attach thick copper washer between brake servo unit and banjo fitting and thin copper washer between hollow bolt and banjo fitting.

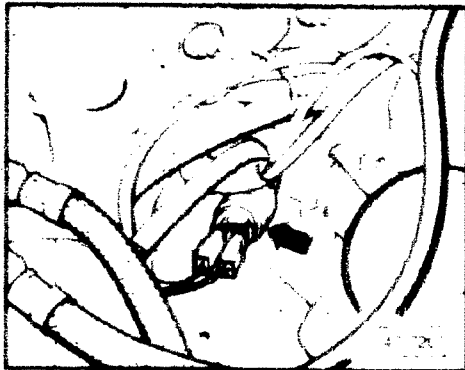
- start engine and let idle until pressure gauge reads approximately 140 bar (2030 psi)
- turn ignition **OFF**
- pump brake pedal until pressure drops to 135 bar (1957 psi)
  - operating pressure should not drop below 130 bar (1885 psi) within 5 minutes
  - if pressure drop is more, check-valve is leaking. Replace pressure accumulator
- with engine not running, press brake pedal about 20 times to reduce operating pressure
- remove pressure gauge
- install brake light warning switch and reconnect wire connectors
- check all connections for leaks

## Pressure accumulator, pressure relief valve, checking

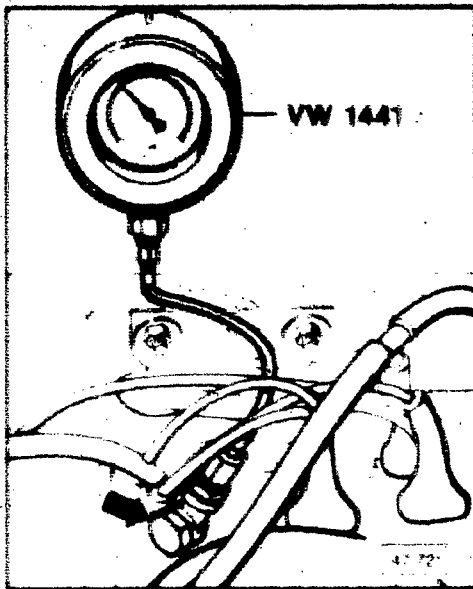
### Test condition:

- pump delivery rate **OK**
- with engine not running, press brake pedal about 20 times to reduce pressure in system
- disconnect wires on warning light switch and remove switch (arrow)

more



# Brake – Hydraulic Components, Regulator, Booster

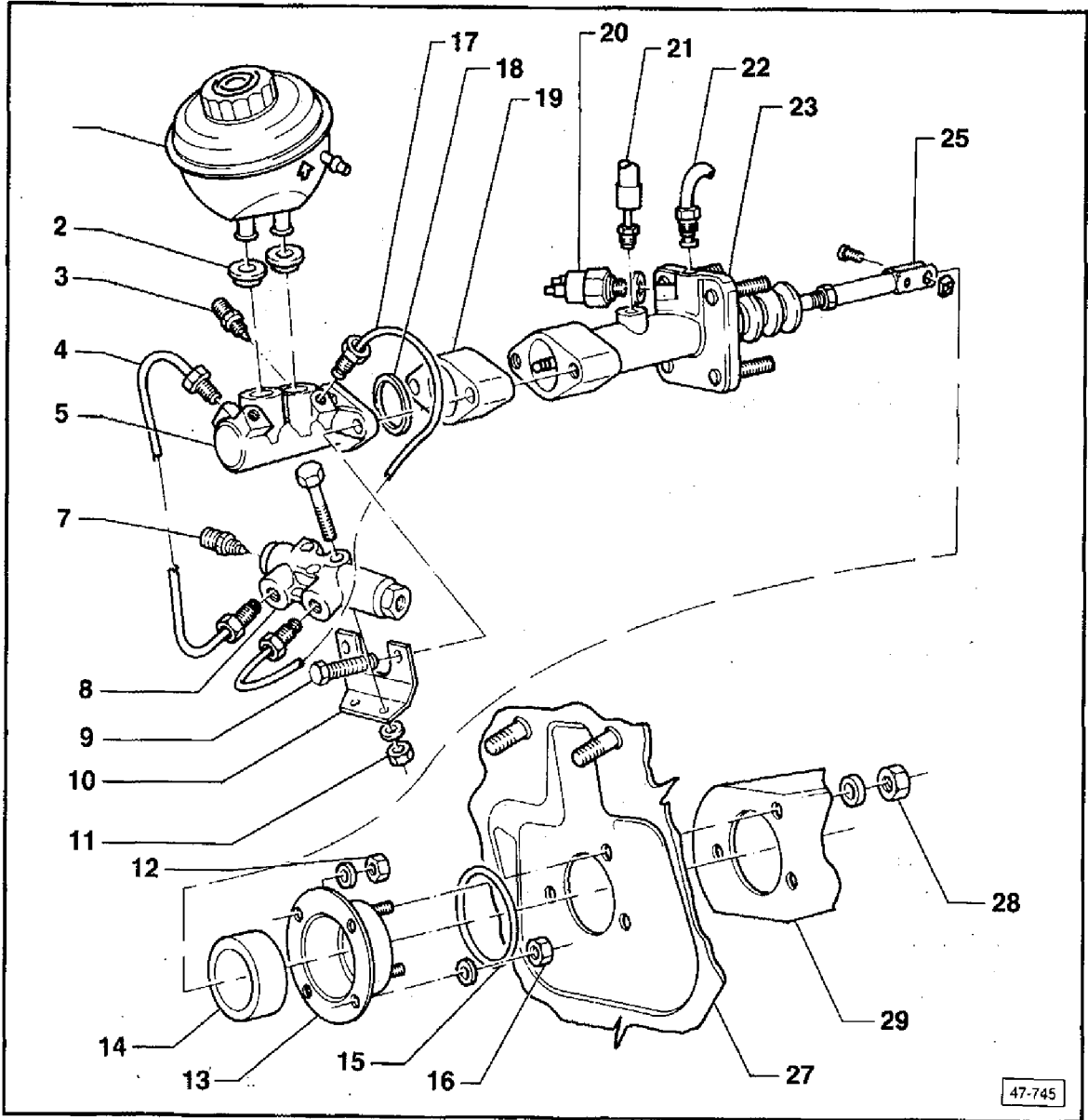


- attach pressure gauge with hollow bolt and copper washers to brake servo unit (arrow)

## Note

Attach thick copper washer between brake servo unit and banjo fitting and thin copper washer between hollow bolt and banjo fitting

- start engine and let idle until pressure gauge reads more than 140 bar (2030 psi)
  - if specification is not reached, pressure relief valve leaking, replace pressure accumulator
- recheck system pressure
- with engine not running, press brake pedal about 20 times to reduce system pressure
- remove pressure gauge
- install brake light warning switch and reconnect wire connectors
- check all connections for leaks



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**CAUTION**

Use only new brake fluid. Note label on brake fluid reservoir.

1 — Brake fluid reservoir  
with level warning indicator

2 — Plug  
lubricate with brake fluid  
insert into brake master cylinder  
press in fluid reservoir

3 — Bleeder valve  
always bleed master cylinder after  
removing/installing  
lubricate threads lightly with  
brake cylinder paste

4 — Brake line

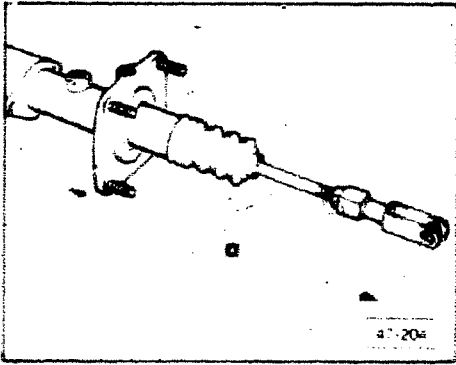
5 — Brake master cylinder  
diameter: 23.81 mm

7 — Bleeder valve  
lubricate threads lightly with brake  
cylinder paste before installing

# Brake – Hydraulic Components, Regulator, Booster

- 8 — Proportioning valve  
not adjustable
- 9 — 25 Nm (18 ft lb)
- 11 — 10 Nm (7 ft lb)
- 12 — 20 Nm (14 ft lb)
- 13 — Bracket
- 14 — Filter
- 15 — O-ring  
install on bracket before installing  
brake servo roll onto dash panel
- 16 — 20 Nm (14 ft lb)
- 17 — Brake line
- 18 — O-ring  
always replace
- 19 — Extension
- 20 — Warning switch  
20 Nm (14 ft lb)  
warning light on instrument panel  
will come on if pressure drops to  
between 127-87 bar (1841-1261 psi)
- 21 — Return line
- 22 — Pressure line  
to accumulator
- 23 — Hydraulic brake servo  
DO NOT press brake pedal with master  
cylinder removed  
checking for leaks  
with engine off loosen return line  
defective servo will drip fluid  
occasional drips are OK
- 25 — Clevis  
adjusting Fig
- 27 — Dash panel
- 28 — 25 Nm (18 ft lb)
- 29 — Pedal bracket





► Fig. 1 Clevis adjusting

$a = 226.0 \pm 0.5 \text{ mm}$   
(8.90 ± 0.020 in.)

**Note**

Clevis must be aligned at right angle to brake servo surface when measuring.