Automatic Transmission Controls Assembly

Quick Data

Transmission 090 (except code letters NH)

lubricant capacity
dry fill.....6.0 L (6.4 US qt)
refill.....3.0 L (3.2 US qt)
type .....ATF DEXRON® or DEXRON® II
oil pan bolt .....20 Nm/14 ft lb

Transmission 090 (code letters NH only)

code letters
transmission.....NH*
torque converter.....Z
valve body.....FF
*with ATF cooler

gear ratios
first.....2.71
second.....1.50
drive.....1.00
reverse.....2.43
final drive.....4.09

lubricant capacity transmission
dry fill.....6.0 L (6.4 US qt)
refill.....3.0 L (3.2 US qt)
type .....ATF DEXRON® or DEXRON® II
final drive
dry fill.....1.25 L (1.3 US qt)
refill.....filled for life, not changed
type .....Hypoid gear oil GL-5 (SAE 90 MIL-L2105B)

Index

Technical Data

- code letters
- application
- number of splined plates and springs
- gear ratios

Transmission code letters	NG		NH	
date of manufacture from to	06/79 10/82		10/82	
Type No.	090			
Torque converter code letter	Z[1]		Z	
Valve body code letters	AH	BH	FF	FFA
date of manufacture from to	06/79 07/80	07/80 10/82	10/82 01/85	01/85
Forward clutch number of splined plates	inner 4	outer 3	inner 4	outer 3
Direct/Reverse clutch number of springs	24		24	
number of splined plates	inner 4	outer 4	inner 4	outer 4
1st/reverse gear clutch number of splined plates	inner [2] 4	outer [2] 4	inner 4	outer 4
2nd gear brake band first tighten, then loosen:	2½ turns		2½ turns	
Application to engine	2.0 ltr. air-cooled 67 bhp SAE net		1.9 ltr. water-cooled 82 bhp SAE net	
Final drive ratio	45:11 = 4:09			
Gear ratios 1st gear	2.55		2.71	
2nd gear	1.45		1.50	
3rd gear	1.00		1.00	
Reverse	2.46		2.43	
ATF cooler			forward flow 3-row	

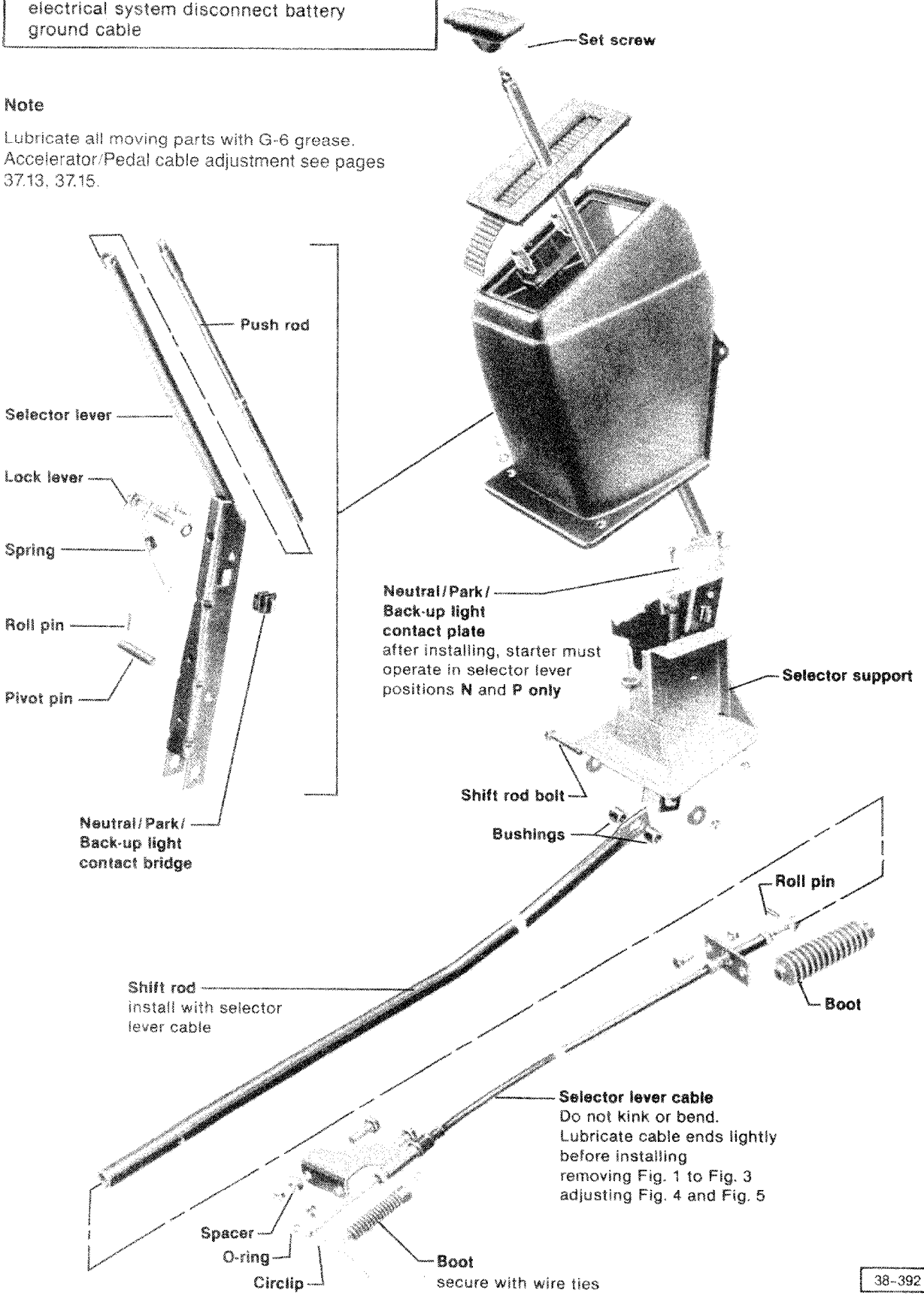
1 up to build date 03/27/81 = code letter D
2 up to build date 10/1/81 = 5 inner and 5 outer plates

CAUTION

Before starting to work on any part of electrical system disconnect battery ground cable

Note

Lubricate all moving parts with G-6 grease.
Accelerator/Pedal cable adjustment see pages 37.13, 37.15.



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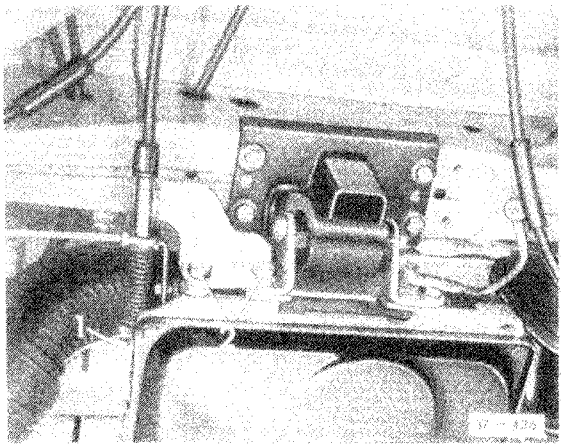


Fig. 1 Selector lever cable, removing

— remove circlip 1
— remove selector lever cable bracket 2

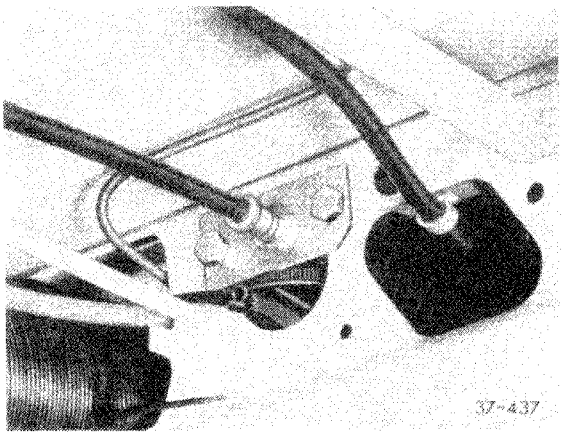


Fig. 2 Selector lever cable, removing

— remove bracket for selector lever cable/shift rod

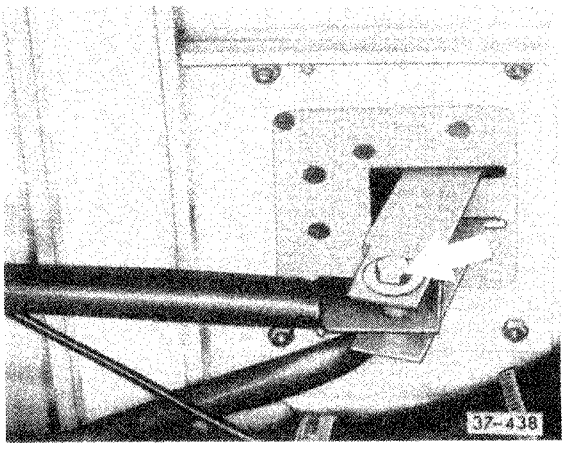


Fig. 3 Selector lever cable, removing

— remove shift rod bolt (arrow)
— guide shift rod with selector lever cable to rear
— press roll pin out of shift rod
— separate selector lever cable from shift rod

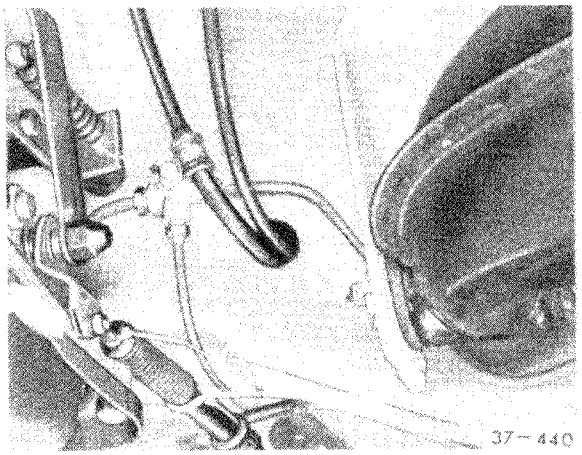


Fig. 4 Selector lever cable, adjusting

— loosen shift rod bolt (Fig. 3)
— shift selector lever into position **P**
— push transmission operating lever to rear (arrow), into **P** position

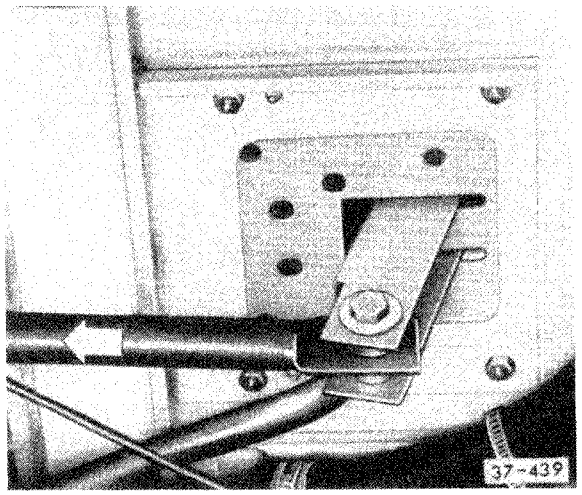


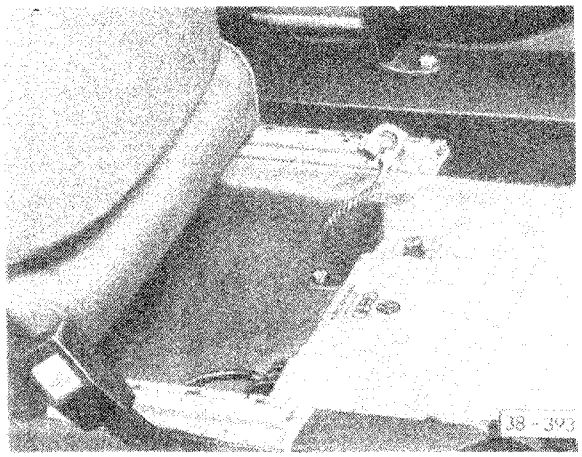
Fig. 5 Selector lever cable, adjusting

— push shift rod to rear (arrow)
— tighten shift rod bolt

Automatic transmission, removing
(except transmission 090—code letters NH)

Engine installed

Work sequence

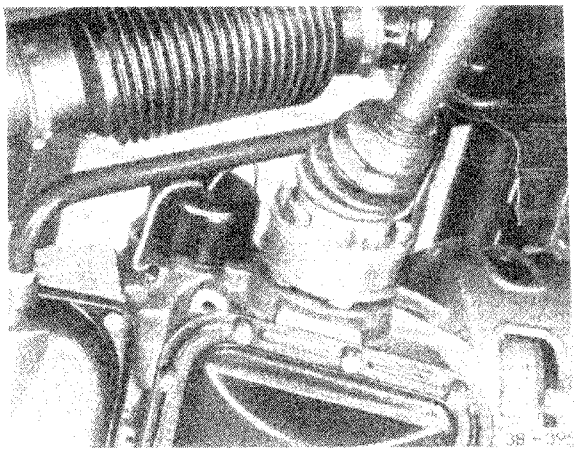


— remove battery ground strap
— remove fan housing grille

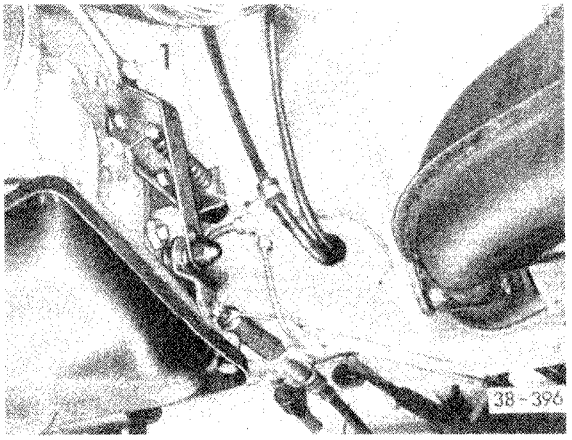
Note

To gain access to torque converter bolts, crankshaft must be rotated until each bolt appears in hole on top of transmission housing (arrow)

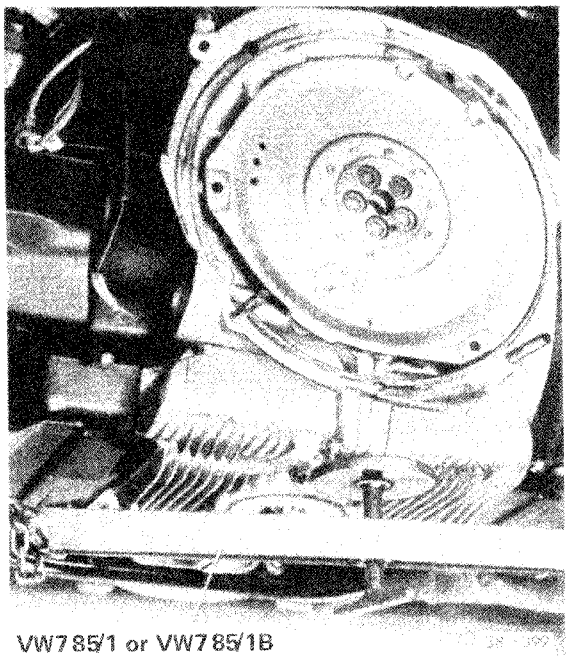
— remove three torque converter bolts through hole (arrow) on top of transmission housing
  • use adaptor 3052, extension and T-handle to turn crankshaft
  • pin on tool must engage in recess of cooling fan hub



— disconnect both drive shafts from transmission
— disconnect wires from starter
— remove starter
— loosen bracket for ATF dipstick tube

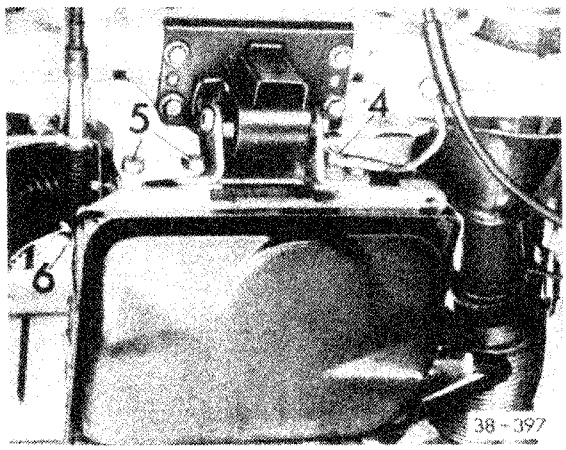


— disconnect accelerator linkage **1**
— pry off accelerator cable **2**
— remove circlip from selector lever cable **3**

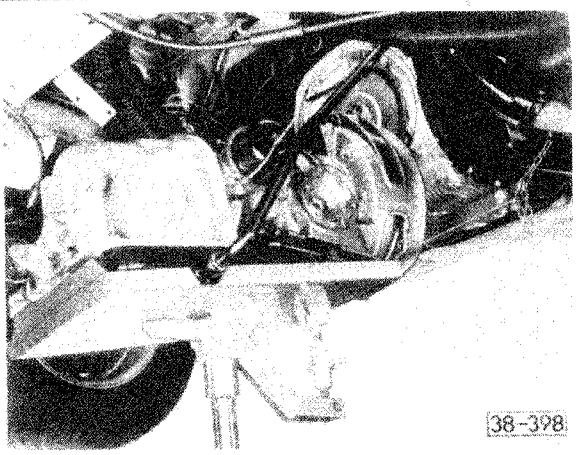


VW785/1 or VW785/1B

— install engine support tool VW 785/1 as shown



— remove ground strap 4
— remove mounting bracket 5 and selector lever cable 6



— support transmission with lifting tool US 618 and US 618/5
— remove rear transmission mount from body (4 bolts)
— remove lower engine/transmission bolts
— lower transmission out of vehicle

CAUTION

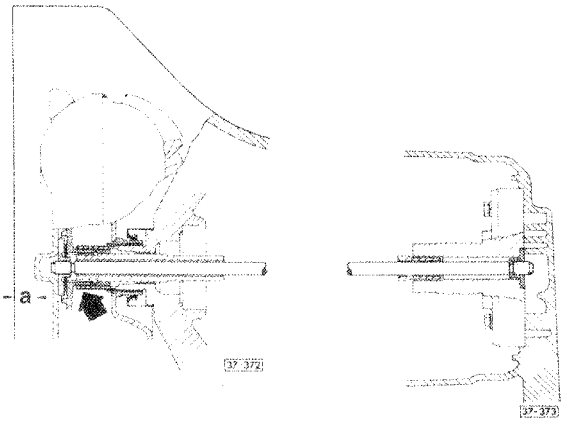
When lowering transmission out of vehicle, converter must be secured so it does not slide off transmission

Automatic transmission, installing

(except transmission 090—code letters NH)

Engine installed

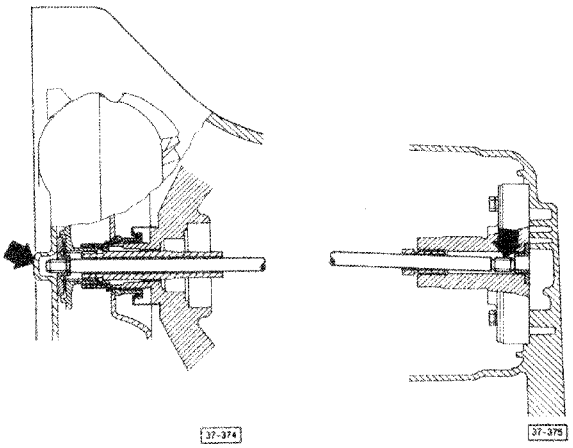
Proceed in reverse order of removing and note following:



Note

When attaching transmission to engine, torque converter must be fully seated on one-way clutch support (arrow) and can be turned by hand.
When converter is properly seated,
a = 10mm (3/8 in.)

— go to next page



CAUTION

If torque converter (left arrow) should slip off of one-way clutch support, it could pull oil pump shaft out of oil pump (right arrow). This could cause serious damage when bolting transmission to engine

— tighten lower engine/transmission bolts to 30 Nm (22 ft lb)

Note

While tightening engine/transmission bolts, turn torque converter to check for proper seating on one-way clutch support

— tighten 4 rear transmission mount bolts to body
— attach ATF dipstick tube
— install starter

— tighten drive shaft bolts to 45 Nm (33 ft lb)
— tighten upper engine/transmission bolts to 30 Nm (22 ft lb)
— tighten torque converter bolts to 30 Nm (22 ft lb)

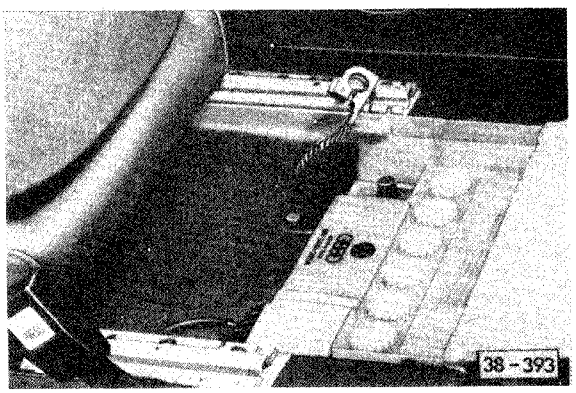
— install fan housing grille
— attach ground strap to transmission/body
— check selector lever cable adjustment (see page 37.3)
—check accelerator/pedal adjustment (see page 37.13)

Automatic transmission, removing

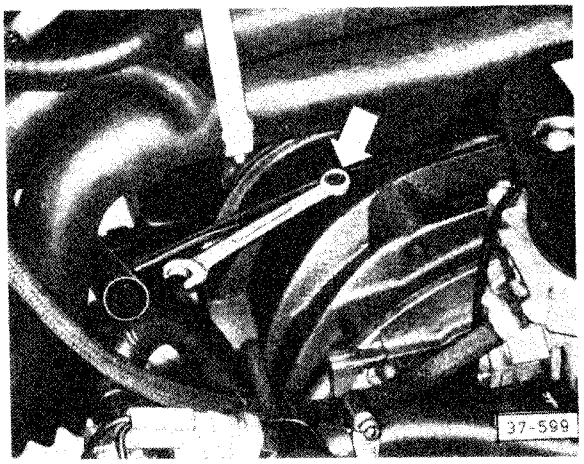
(transmission 090—code letters NH only)

Engine installed

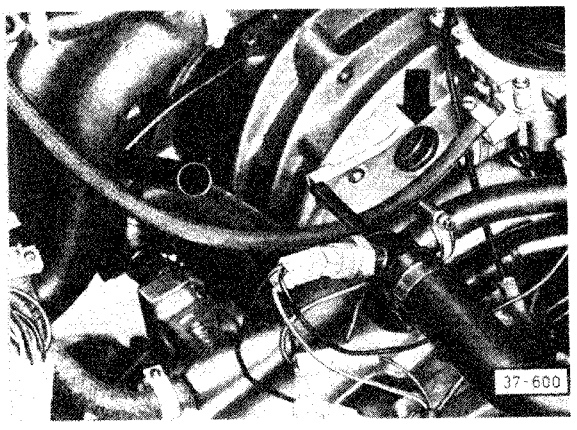
Work sequence



— disconnect battery ground strap
— remove upper engine/transmission bolts



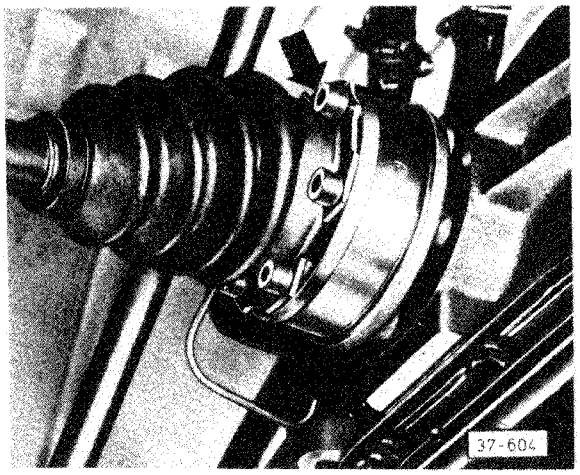
— remove ATF dipstick
— remove bolt (arrow) for ATF dipstick tube bracket



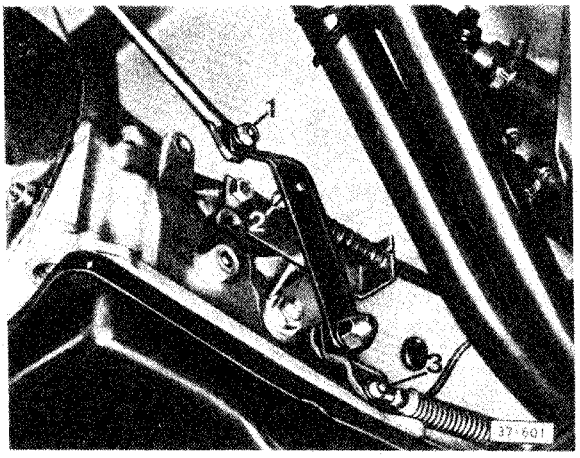
— remove three torque converter bolts through hole (arrow) on top of transmission housing

Note

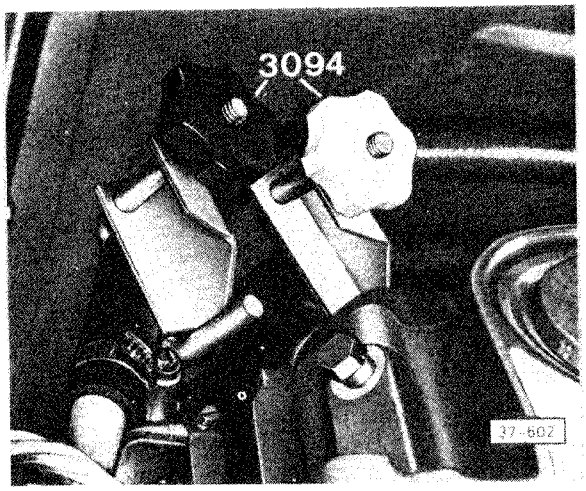
Crankshaft must be rotated to gain access to torque converter bolts



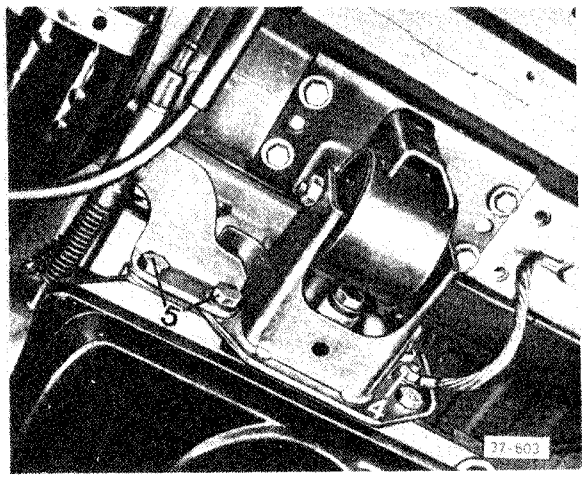
— disconnect both axle shafts from transmission flanges
— disconnect wires from starter
— remove starter



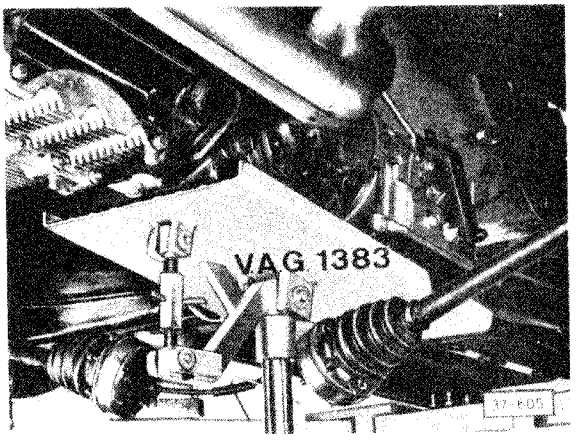
— disconnect push rod from transmission kickdown lever by removing nut **1**
— pry off ball socket **2** for accelerator cable and remove cable from bracket
— remove circlip **3** for selector lever cable to disconnect cable



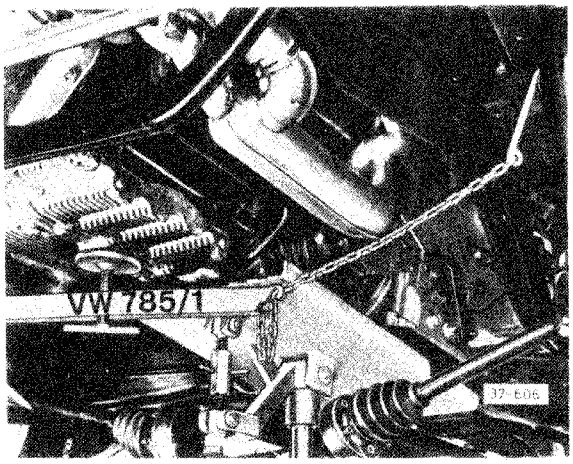
— clamp coolant hoses and remove



— disconnect ground strap **4**
— remove mounting bracket bolts **5** and selector lever cable



— support transmission with US 4470



— support engine with VW 785/1 or VW 785/1B
— remove rear transmission mount from body (4 bolts)
— lower transmission slightly and remove lower engine/transmission bolt

CAUTION

Torque converter must be secured from sliding off transmission when lowering transmission out of vehicle.

— separate transmission from engine
— lower transmission carefully out of vehicle

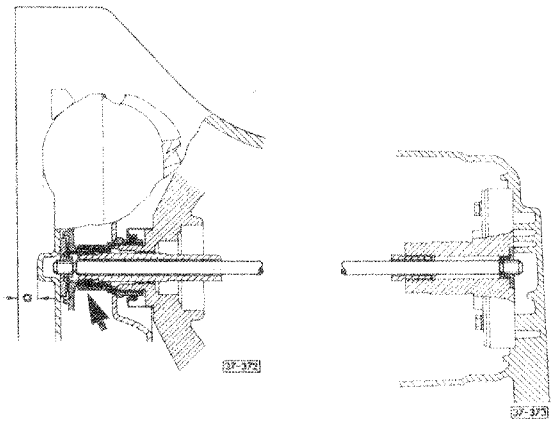
Automatic transmission, installing

(transmission 090—code letters NH only)

Engine installed

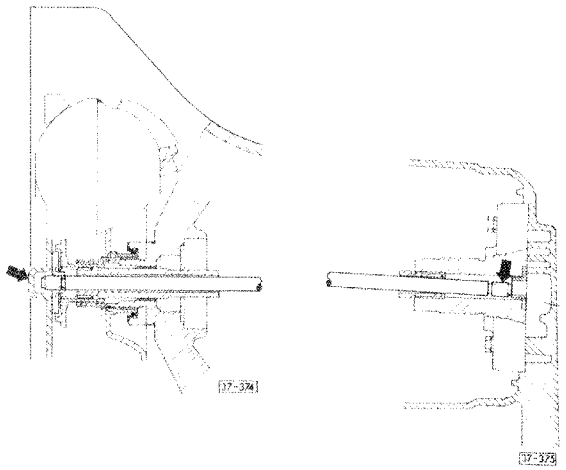
Work sequence

Proceed in reverse order of removal and note following:



Note

When attaching transmission to engine, torque converter must be fully seated on one-way clutch support (arrow) and able to be turned by hand. When torque converter is properly seated, **a** = 10 mm (3/8 in)



CAUTION

If torque converter (left arrow) should slip off of one-way clutch support, it could pull oil pump shaft out of pump (right arrow). This could cause serious damage when bolting transmission to engine.

— tighten lower engine/transmission bolts to 55 Nm (41 ft lb)

Note

While tightening engine/transmission bolts, turn torque converter to check for proper seating on one-way clutch support.

— tighten four rear transmission mount bolts to body to 40 Nm (30 ft lb)
— tighten axle shaft bolts to 45 Nm (33 ft lb)
— tighten upper engine/transmission bolts to 55 Nm (41 ft lb)
— tighten torque converter bolts to 30 Nm (22 ft lb)
—check selector lever cable and accelerator linkage adjustment (see pages 37.14, 37.15)

ATF, filling

CAUTION

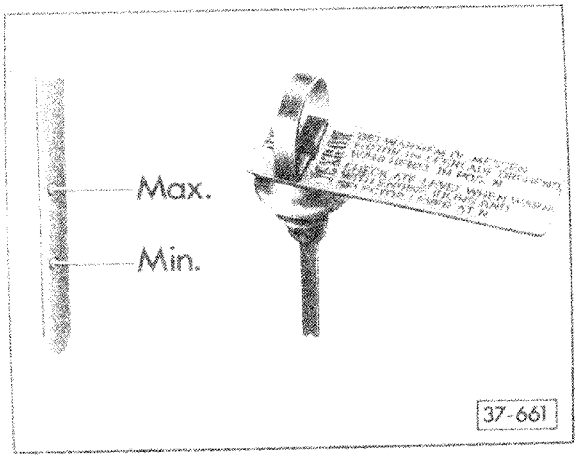
Automatic transmission fluids labeled **DEXRON®** or **DEXRON II®** must be used. All makes or brands of **DEXRON®** ATF may be mixed with one another. Do not use additives.

Tiny particles, dirt or even lint can clog transmission valves. Use only clean funnel and hose to add ATF and wipe dipstick only with clean lint-free cloth

— refill transmission with approved type ATF fluid through ATF dipstick tube with funnel and hose
  • refill capacity 2.5 ltr (2.6 US qt)
— set parking brake, start engine
— move selector lever through all gear positions
— check ATF level and top up to lower mark if necessary
— warm up ATF and check fluid level again
  • must be between two marks on dipstick

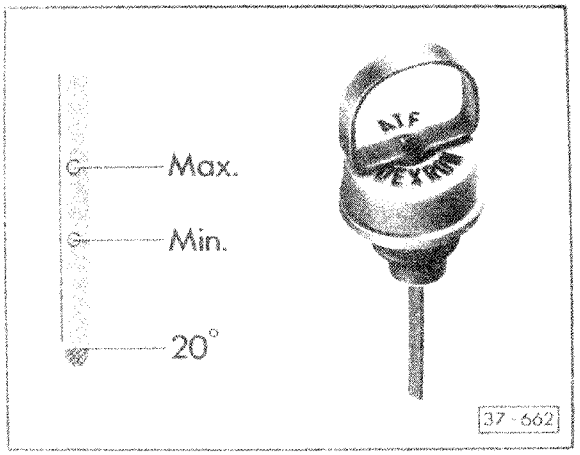
ATF level, checking

- ATF at operating temperature of approx. 60°C (attained after driving approx. 6 miles after a cold start)
- vehicle on a level surface
- parking brake engaged
- selector lever at "P"
- engine idling
- use a lint-free cloth to wipe dipstick



Current ATF dipstick

- difference between Min./Max. marks: 0.35 qts. (0.33 L)
- when cold, fill to below the Min. mark, warm up to operating temperature and fill to between marks



New ATF dipstick

- difference between Min./Max. marks: 0.24 qts. (0.23 L)
- when cold, fill to 20°C mark, warm up to operating temperature and fill to between marks

CAUTION

Do **NOT** overfill. Too much ATF can cause damage and must be drained.

Use only ATF marked DEXRON. Do **NOT** use any lubricant additives.

The ATF used in production vehicles has changed in composition and color from that used in previous years (1980-84).

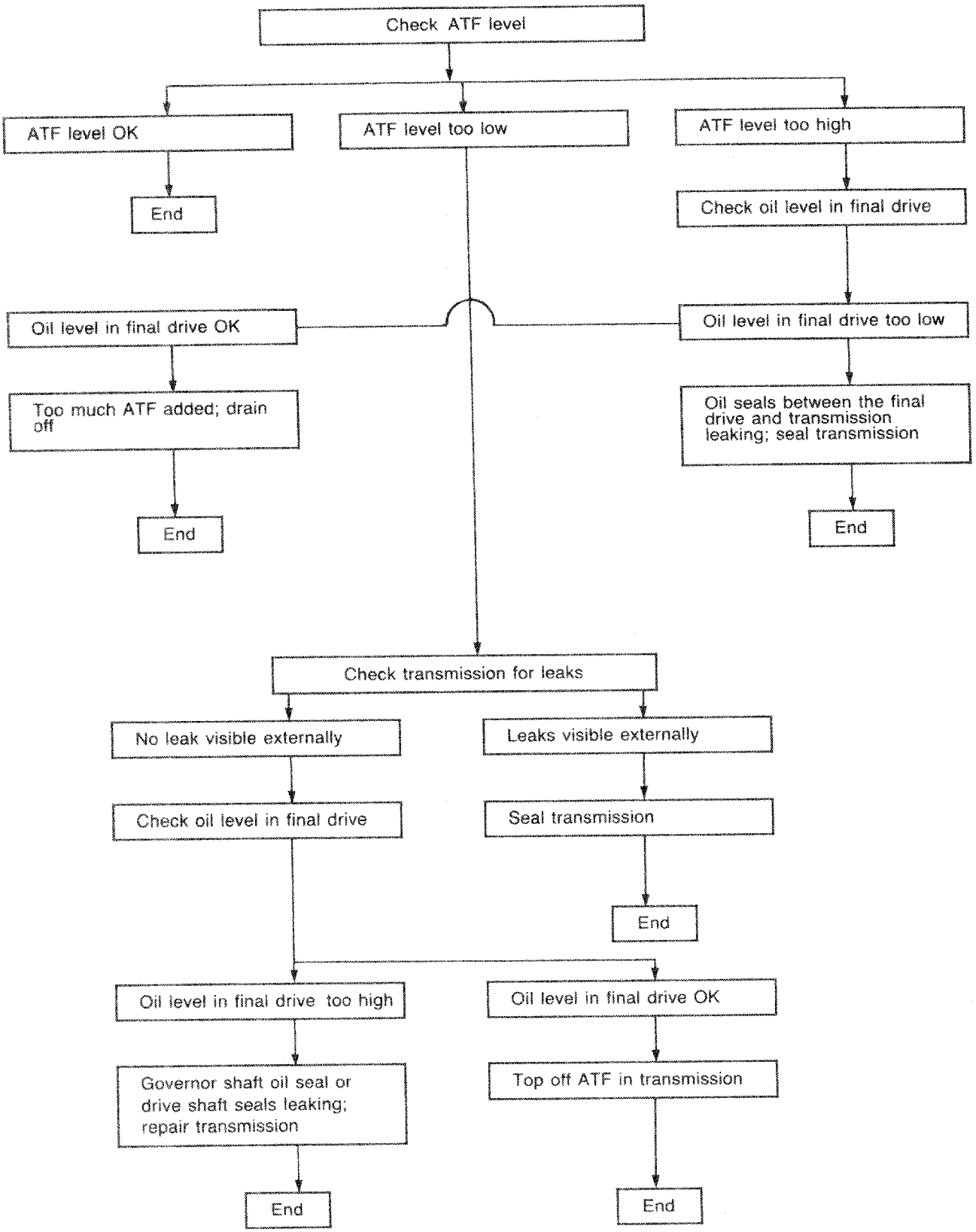
previous color: red

new color: red/brown

The new ATF discolors to black/brown after only short running times. This discoloration has no effect on the quality of the fluid. Changing the fluid is necessary at the recommended service intervals only.

The new ATF and types of ATF DEXRON used previously can be mixed.

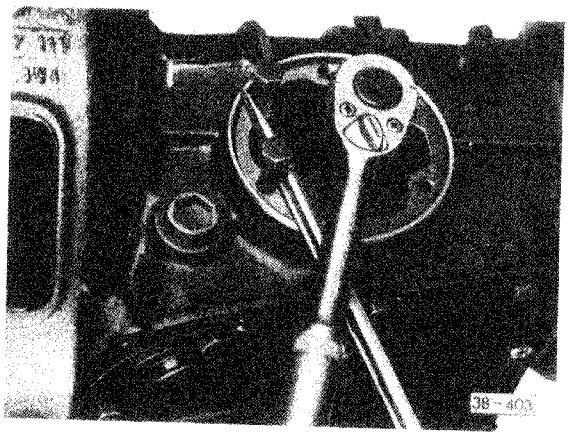
ATF level, checking/troubleshooting



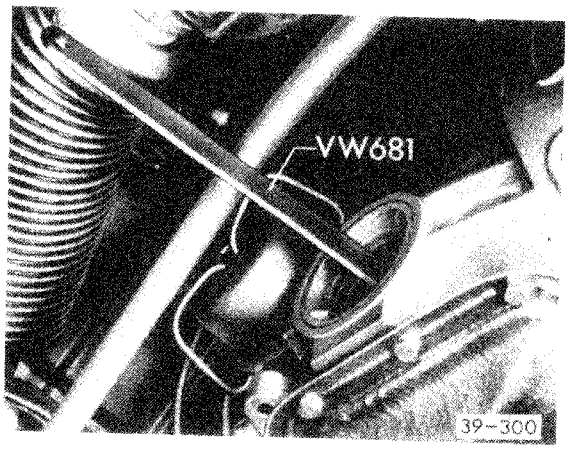
Final drive oil seals, replacing
(Transmission installed)

Work sequence

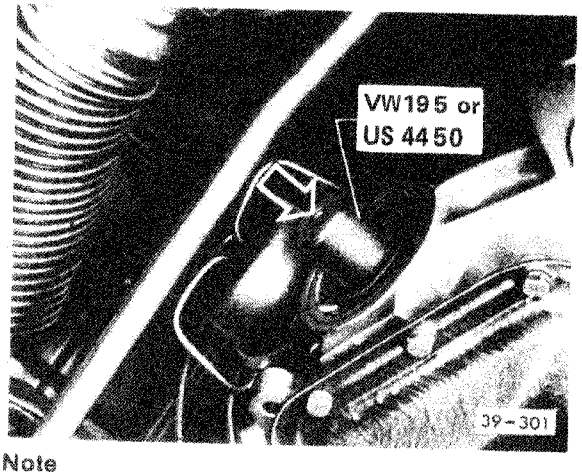
— detach drive shaft from flange



— place drip pan underneath
— remove drive shaft flange



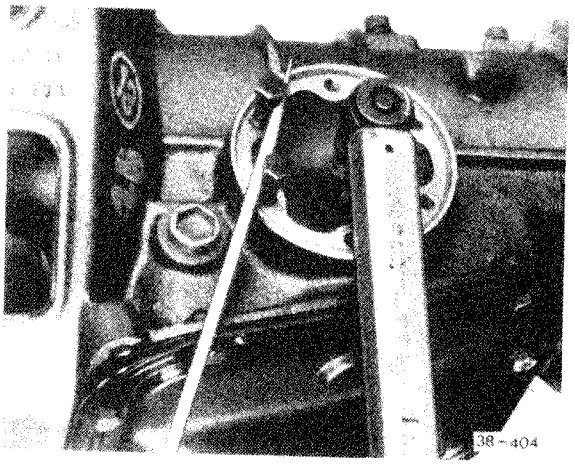
— pry out seal



Note

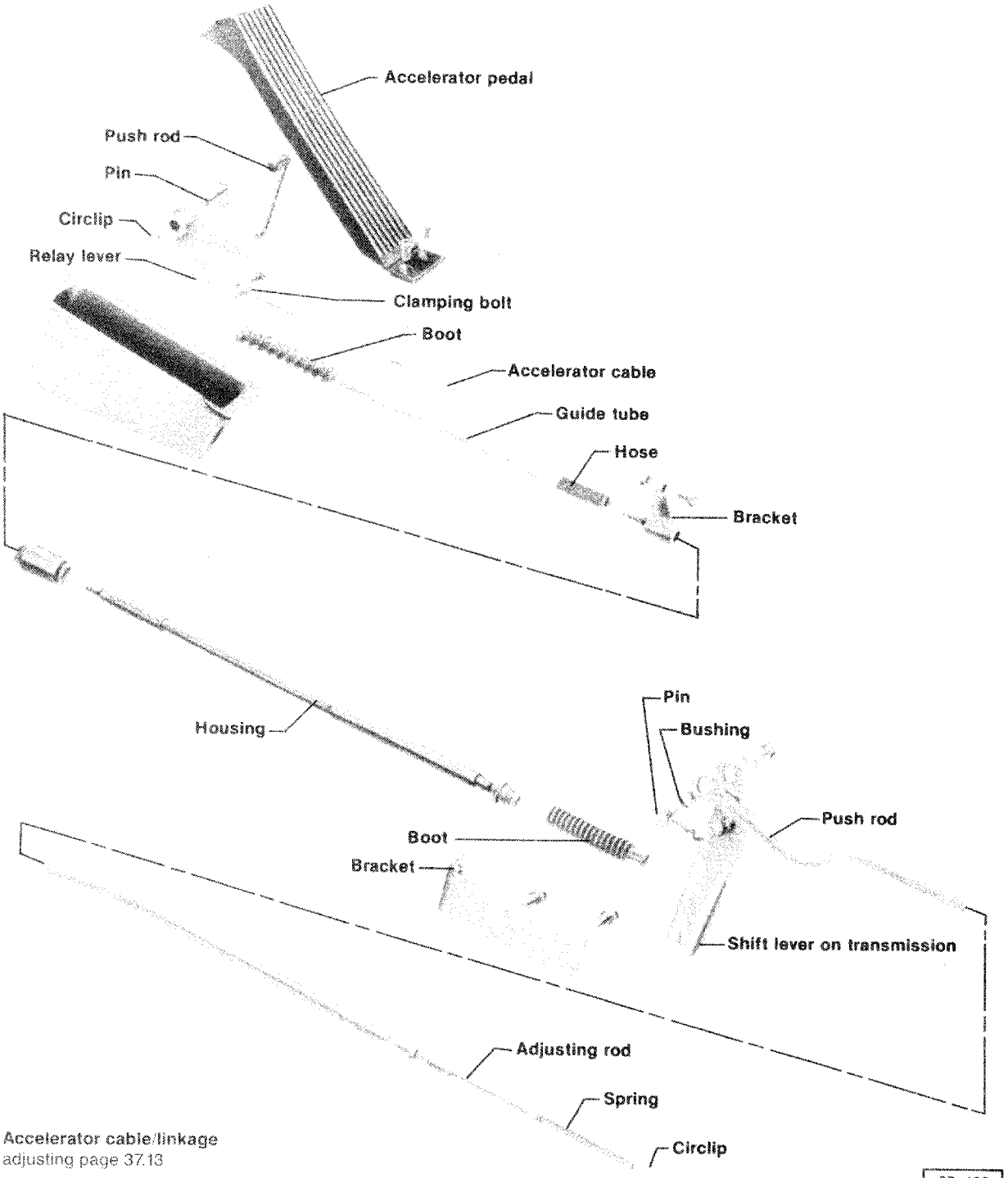
When installing oil seals, fill space between seal lips with multi-purpose grease

— drive seal in until fully seated



— tighten drive flange bolt to 25 Nm (18 ft lb) and drive shaft mounting bolts to 45 Nm (33 ft lb)
— check transmission oil level and add if necessary

Accelerator linkage
(except transmission 090—code letters NH)



Accelerator cable/linkage
adjusting page 37.13

Accelerator linkage/cable adjustment, checking
(except transmission 090—code letters NH)

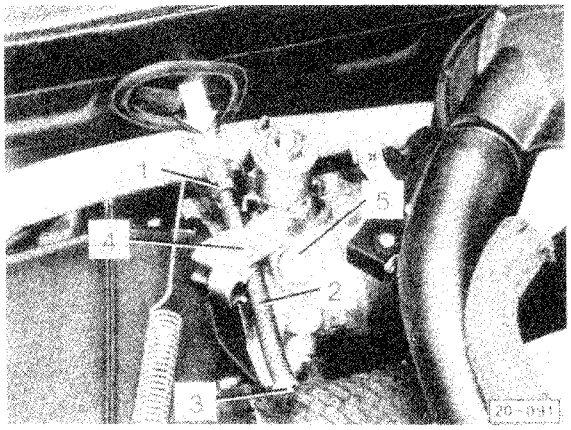
Work sequence

— depress accelerator pedal to full throttle position
  • throttle valve lever must contact stop, but kickdown lever on transmission must **not** be in kickdown position
— press accelerator pedal beyond full throttle to floor
  • override spring must be tensioned and kickdown lever on transmission must be in kickdown position

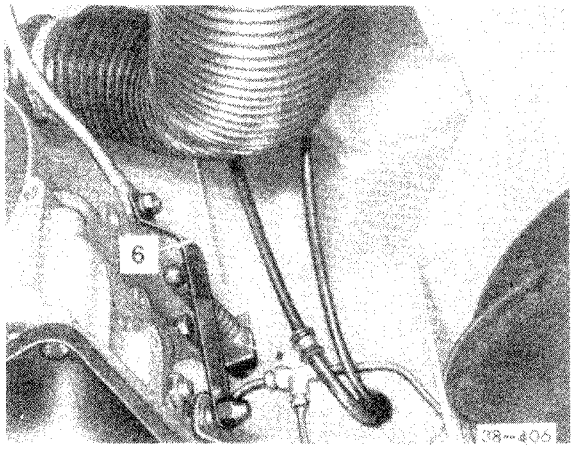
if **NO**, adjust as follows:

Accelerator linkage/cable, adjusting

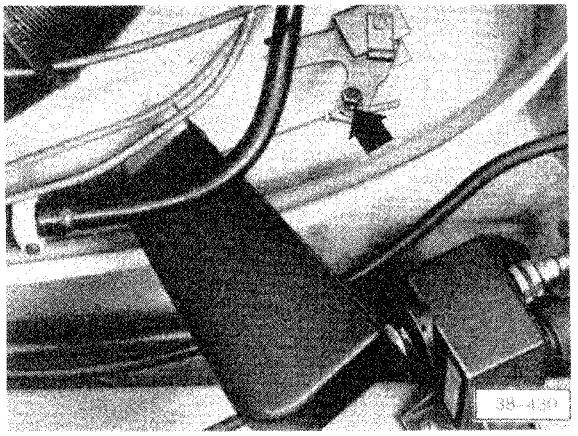
Work sequence



— loosen nut **1**
— remove override spring **2**
— start engine and let idle
— adjust idle speed at screw **5** (see Repair Group 24)
— shut engine **OFF**
— press accelerator rod in direction of arrow to stop
— turn adjusting rod **3** with screwdriver until shoulder of adjusting rod just contacts pivot of throttle lever **4**
— reinstall override spring **2**
— start engine and check idle speed
  • adjust if necessary by turning rod **3**
— lock adjusting rod **3** in position with nut **1**

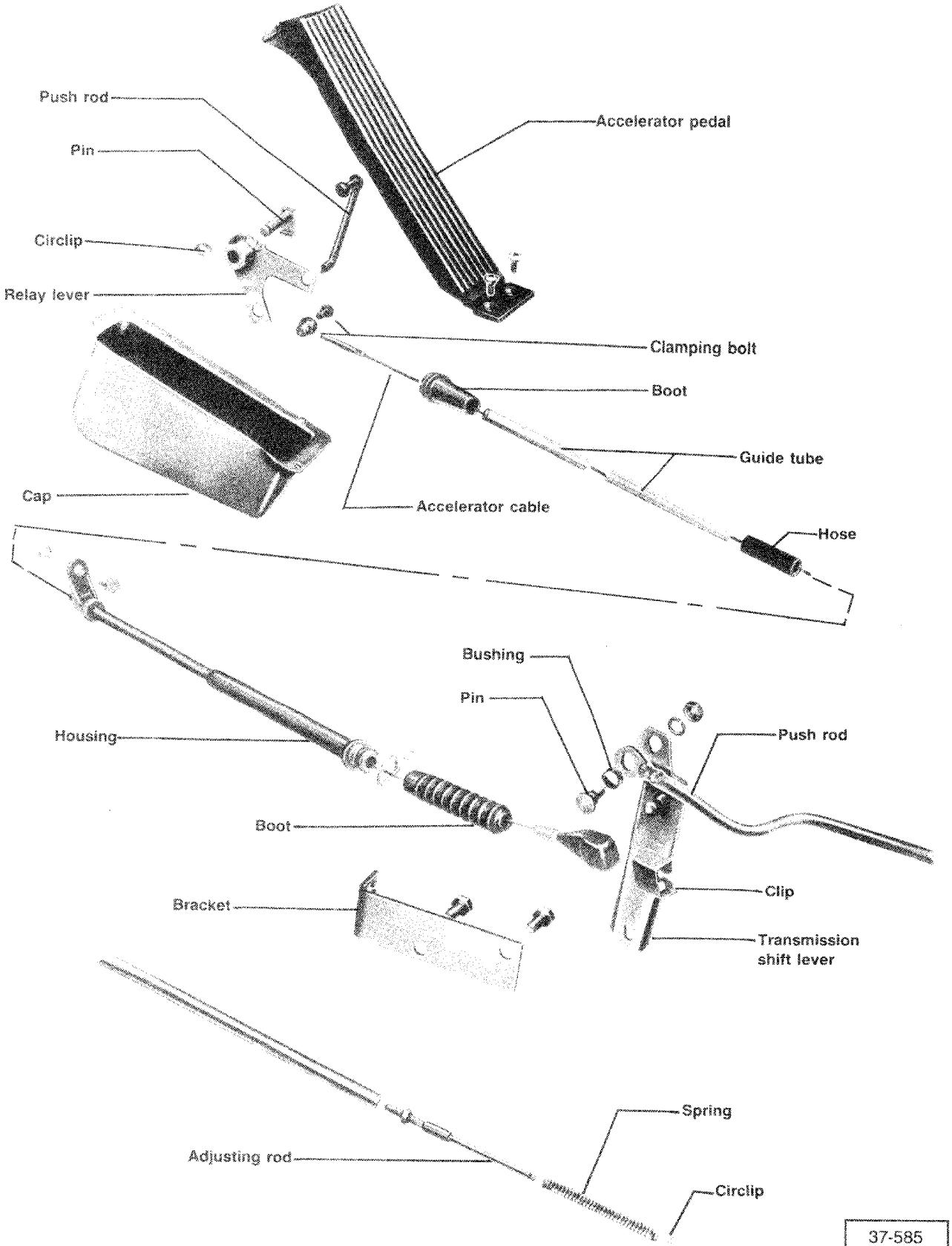


— press accelerator pedal to floor
  • lever **6** must be in kickdown position (arrow), with approx. 1-2mm (1/32-3/32 in.) free play between lever and stop
— release accelerator pedal
— lever must be in idle position (out of kickdown)



— if necessary, adjust accelerator cable at clamping bolt (arrow)

Accelerator linkage
(transmission 090—code letters NH only)



37.14 Accelerator linkage
(trans. 090—code letters NH only)

Accelerator linkage/cable adjustment, checking

(transmission 090—code letters NH only)

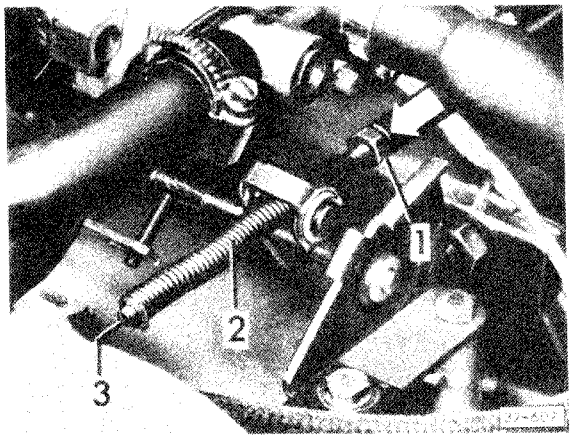
Work sequence

— depress accelerator pedal to full throttle position
  • throttle valve lever must contact stop, but kickdown lever on transmission must **not** be in kickdown position
— press accelerator pedal beyond full throttle to floor
  • override sping must be compressed and kickdown lever on transmission must be in kickdown position

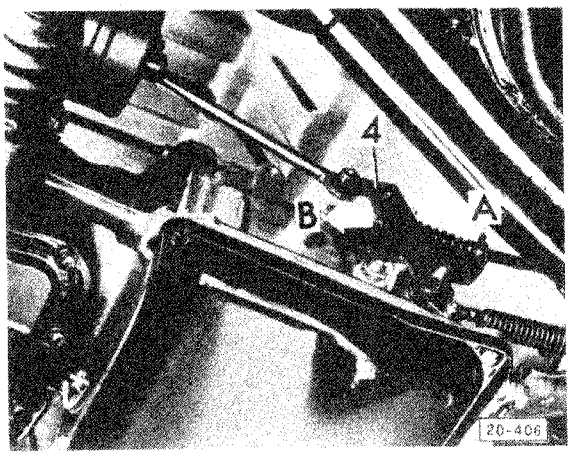
If **NO**, adjust as follows:

Accelerator linkage/cable, adjusting

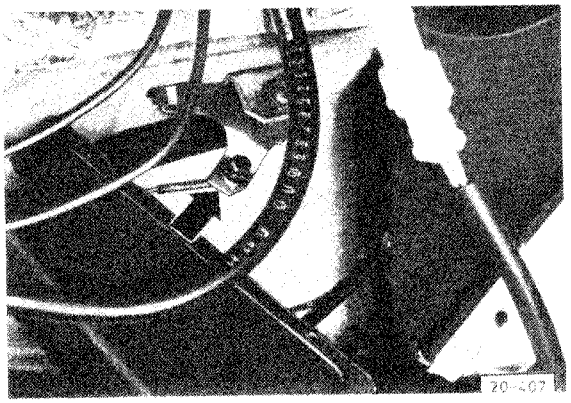
Work sequence



— loosen nut **1**
— remove override spring **2**
— start engine and run at idle
— check and adjust idle if necessary (see Repair Group 24)
— shut engine **OFF**
— pull accelerator rod in direction of arrow to stop (closed throttle position)
— turn adjusting rod **3** with screwdriver until shoulder of adjusting rod just contacts pivot of throttle lever
— reinstall override spring **2**
— start engine and check idle speed
— if necessary, adjust idle speed by turning rod **3**
— lock adjusting rod **3** in position with nut **1**



— press accelerator pedal to floor
  • kickdown lever **4** must be in kickdown position on stop (arrow **A**)
— release accelerator pedal
  • kickdown lever **4** must be in closed throttle position on stop (arrow **B**)



— if necessary, adjust accelerator cable at clamping bolt (arrow)

Transmission operation, checking

CAUTION

All work on vehicle calling for running engine must be done with selector lever at **N** or **P** and parking brake applied. Only exceptions are pressure test and stall speed test

Note

For proper transmission operation, engine idle speed, ignition timing, etc. must be correct

Poor engine output because of incorrect adjustments or worn parts may give impression of problems with automatic transmission

Before checking operation, try to find out how problem developed and whether any repairs had been done before

Trouble is often caused by out of adjustment selector lever cable/accelerator cable, low ATF level or improperly tuned engine

Before performing tests, do general checks **A** and road test **E.** If problem still exists, proceed with tests **B** to **E**

A — General Checks

— check engine idle speed, ignition timing
— check for leaks (ATF or hypoid oil), external damage, loose or missing screws, etc.

B — Transmission fluid level, checking

— check that vehicle is level
— place selector lever in **P** and apply parking brake. Idle engine. (ATF must be lukewarm)
— check that ATF level is between two marks on dipstick

- difference between upper and lower marks is approx. 0.5 ltr (0.5 US qt)

— add ATF fluid if necessary

CAUTION

Tiny particles, dirt or even lint can clog transmission valves. Use only clean funnel and hose to add ATF and wipe dipstick only with clean lint-free cloth

- do not overfill, too much fluid will upset operation of transmission

— check smell and appearance of ATF. Burnt smell may indicate burnt friction linings and trouble in control system

CAUTION

Automatic transmission fluids labeled **DEXRON®** or **DEXRON II®** must be used. All makes or brands of **DEXRON®** ATF may be mixed with one another. Do not use additives.

Tiny particles, dirt or even lint can clog transmission valves. Use only clean funnel and hose to add ATF and wipe dipstick only with clean lint-free cloth

C — Final drive oil level, checking

- final drive oil level must be up to edge of oil filler hole
- if level is too high or too low it may indicate transfer of oil between transmission and final drive

D — Stall speed test

Note

Check stall speed only if vehicle shows poor performance or poor acceleration

- engine must be warm

— connect tachometer (use adapter to avoid damage to electronic ignition, see Repair Group 28)
— start engine and hold vehicle firmly with parking brake and foot brake
— put selector lever in **D** and depress accelerator pedal briefly to full throttle
— check that engine now runs between

- 1950 and 2250 rpm (stall speed) for all automatic transmissions except 090—code letters NH
- 2450 and 2750 rpm (stall speed) for automatic transmissions 090—code letters NH only

CAUTION

Do not continue stall speed test longer than time required to read tachometer. Maximum stall speed test time 5 seconds. If necessary to repeat test, wait at least 20 seconds.

Note

Normal stall speed will drop 125 rpm per 3200 ft altitude. Stall speed will also drop slightly at high ambient air temperature

— if stall speed is not as specified, refer to troubleshooting table as follows:

Effect	Cause
Stall speed too high	forward clutch or one-way clutch for 1st gear slipping **Note** If stall speed rpm in range **D** is too high repeat test in range **1** • if stall speed rpm is within specifications one-way clutch for 1st gear is defective • if stall speed rpm is still too high, forward clutch is defective
Stall speed too low **a**—if approx. 200 rpm below specified figure **b**—if approx. 400 rpm below specified figure	 poor engine performance (ignition timing, fuel injection, compression) stator one-way clutch defective (replace torque converter)

E — Road test

Note

Vehicle should be driven in all gear ranges and under all possible road conditions. Do not road test if there is obvious mechanical damage

Shift Points in km/h (mph)

Transmission 090 up to transmission No. 16 07 0 (except code letters NH)		
Shift	**Full throttle**	**Kickdown**
1-3	26-33 (16-21)	48-52 (30-32)
2-3	67-72 (42-45)	88-91 (55-57)
3-2	41-48 (25-30)	84-86 (52-53)
2-1	19-22 (12-14)	43-47 (27-29)

Transmission 090—code letters NH only		
Shift	**Full throttle**	**Kickdown**
1-2	25-40 (16-25)	50-53 (31-33)
2-3	59-74 (37-46)	85-87 (53-55)
3-2	43-58 (27-36)	80-83 (50-52)
2-1	17-22 (11-14)	39-42 (24-26)

Transmission 090—1981 (from transmission No. 17 07 0 except code letters NH)

—see page 37.19

Note

When checking shift points, speedometer readings may vary within permissible manufacturing tolerances.

— note shift points and compare to chart above. Shifts should be smooth and should take place quickly and without lag in power transmission
— listen for any sign of engine speedup between shifts which indicates slipping brake bands or clutches
— after road test, check transmission for fluid leaks

Note

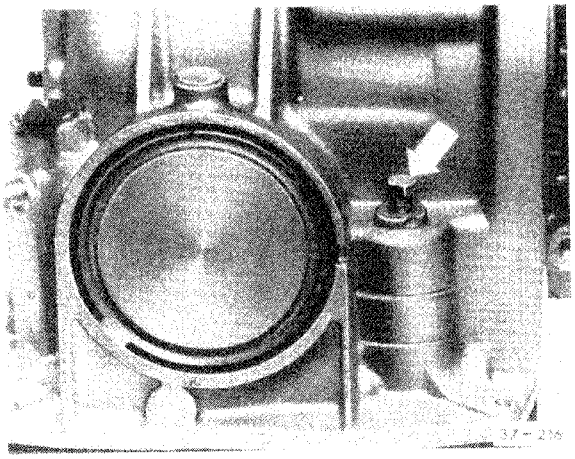
If shift points are incorrect or transmission does not kick down, check accelerator cable adjustments.

F — Pressure test

Note

Pressure test only if defect cannot be found during other checks.

This test will locate defects in ATF circuit (internal leakage, wear, sticking control valves or dirt in ATF system)



• gauge connection (arrow)

— go to next page

Test procedure

— connect gauge with 0-10 kg/cm² (0-142 psi) scale
— measure three different main pressures as follows:

Selector lever position	Accelerator pedal position	Main pressure kg/cm² (psi)	Test conditions
D	idle speed	2.90-3.00 (41-43)	accelerate up to 50 km/h (31 mph), release gas pedal (idle speed) and check pressure on gauge*
	full throttle	5.85-5.95 (83-85)	*
R	idle speed	7.62-8.22 (108-117)	vehicle stationary

*These tests should be carried out on dynamometer

If specified values are not reached, check following:

Fault	Remedy
oil pump defective	check pump for wear, replace if necessary
oil leaks at seals and sealing surfaces or leakage in housing	check for leaks, particularly at valve body transfer plate
sticking control valve	disassemble and clean valve body, check valves for free movement

Clutch and brake band operation

This table shows which shift components are in operation in various gears.

It provides basis for determining which shift components are not working properly when complaints are made of poor acceleration, faulty shifting or general transmission defects.

Example: No drive in 3rd and R gears. Possible cause; D + R clutch does not work (must be applied)

Selector lever position	1	2 or D	2 or D	D	R
Gears	1st	1st	2nd	3rd	Reverse
Forward clutch	applied	applied	applied	applied	released
D + R clutch	released	released	released	applied	applied
1st + R gear brake plates	applied	released	released	released	applied
2nd gear brake band	released	released	applied	released	released
One-way clutch	inactive	holding	overrun	overrun	inactive

Automatic Transmission 090-1981

modifications from transmission No. 17 07 0
(except transmission 090—code letters NH)

Shift points in km/h (mph)

Transmission code letters	Shift	Full throttle	Kickdown
NG	1-2 2-3 3-2 2-1	25-36 (16-22) 60-76 (37-47) 43-60 (27-37) 17-20 (11-12)	49-52 (30-32) 89-90 (55-56) 84-86 (52-53) 44-47 (27-29)

Main pressure in bar (psi)

Transmission code letters	Selector lever position		
	Drive idle speed*	Drive full throttle	Reverse idle speed
	speed higher than 50 km/h (32 mph)	—	car stationary
NG	2.9-3.0 (41-42)	5.85-5.95 (83-84)	9.1-9.7 (129-138)

*Carry out this test on a dynamometer:
—accelerate up to 50 km (32 mph)
—release accelerator pedal (idle speed)
—check pressure on gauge