

Index

087 3-speed Automatic

Accelerator operating mechanism

- bearing bracket 37.16
- pedal operation, adjusting 37.17
- pull rod, installing 37.16
- push rod length 37.18
- repairing 37.15

Final drive

- lubricant capacity 37.3
- repair instructions 37.5

Selector lever/cable

(Shiftlock II, from VIN: 44 KN 006 505)

- assembly 37.8
- checking function 37.11
- lever housing 37.10
- lever switch 37.10
- solenoid switch 37.10
- troubleshooting 37.12

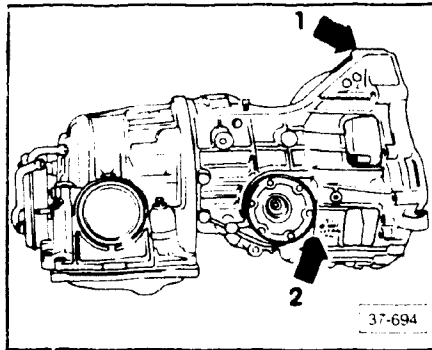
Technical data

- chart 37.4

Transmission

- control, repairing 37.20
- identification 37.2
- lubricant capacity 37.3
- main pressure, checking 37.24
- removing/installing 37.21
- repair instructions 37.5
- shift points, checking 37.23
- stall speed, checking 37.23

Automatic Transmission – Controls, Assembly

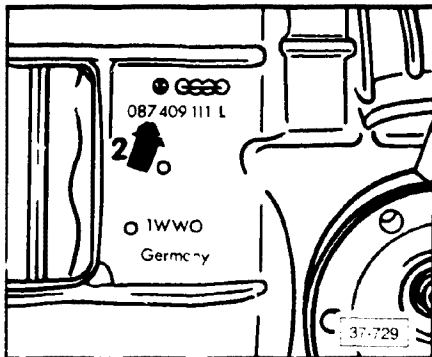


Transmission identification

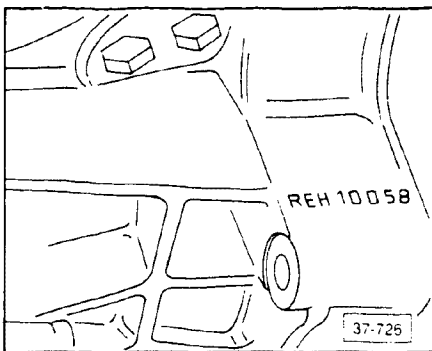
The 087 automatic transmission is used with the 5-cylinder engine in the Audi 100 200. See technical data, page 37.4 for applications.

Identification codes, locations

- code letters (**arrow 1**)
- 087 automatic transmission (**arrow 2**)



- 087 automatic transmission (**arrow 2**)



Transmission code letters and manufacture data

- location (**arrow 1**)

Example:

REH	10	05	8
code letters	day	month	year
of manufacture '88			

Note

The transmission code letters are also listed on the vehicle data stickers.

Automatic Transmission – Controls, Assembly

Lubricant capacities

Transmission

Capacities	Transmission	Automatic transmission
Dry fill Refill Lubricant	6 Liters (6.35 qt) approximately 3 liters (3.17 qt) ATF-Dexron	087

Final drive

Capacities	Final drive	Automatic transmission
Dry fill Refill Lubricant	1 liter (1.06 qt) Check oil level at 15,000 mile intervals use only: Synthetic oil Part No. G 052 145 A2 (SAE 75W/90)	087

Automatic Transmission – Controls, Assembly

Technical data

Transmission				
Code letters		REH		REE
Manufacture date		11-87		11-87
Automatic transmission		087 for 5-cylinder engines		
Torque converter				
Code letter		Q		N
Valve body				
Code letters		FNB		FMC
Manufacture date		11-87		11-87
Number of splined plates forward clutch		inner 5	outer 4	inner 5 outer 4
Number of springs		24		16
Number of splined plates direct/reverse clutch		inner 4	outer 4	inner 4 outer 4
Number of splined plates 1st gear clutch		inner 4	outer 4	inner 4 outer 4
Brake band first tighten, then loosen		2-1/2 turns		2-1/2 turns
Engine application				
Type		Audi 100/200		Audi 100/200
Engine		2.3L 100 kw (134 HP)		2.22 L Turbo 121 kw (162 HP)
Transmission ratios				
Final drive		39:12 = 3.25		37:12 = 3.08
1st gear		2.71		
2nd gear		1.50		
3rd gear		1.00		
Reverse gear		2.43		
ATF cooler		return flow 5-row		return flow 5-row

Repair instructions

The greatest possible care and cleanliness should be observed whenever attempting transmission repairs. It is also very important to use the appropriate tool in order to assure successful repairs. The basic safety rules should be followed at all times.

Several individual repair procedures (also listed in other locations in the repair manual) are summarized below.

Transmission/final drive

- transmission — when changing, refill with ATF
- final drive — when changing, refill with new transmission oil and check ATF

Note

Make sure bushings are properly seated when installing.

Gaskets/seals

- clean all mating faces thoroughly and apply sealant Part No. **D 000 300**
 - apply sealant evenly (not too thick)
- replace O-rings
- replace radial lip-type seals
 - before installing, lightly coat outside diameter with transmission oil
 - fill space between sealing lips with grease
- check transmission oil level or ATF fluid level after installing seals, and correct if necessary

Lock rings/circlips

- do not overextend lock rings. Replace if necessary
- be sure lock ring lies against base of groove

Automatic Transmission – Controls, Assembly

Bolts/nuts

- loosen/tighten cover and housing bolts/nuts evenly, in a diagonal sequence
- tightening torques are specified for uncoiled bolts or nuts
- replace all self-locking bolts and nuts

Bearings

- install needle bearings with inscribed side (greater sheet metal thickness) facing drift
- install all bearings with transmission oil
 - apply oil very carefully for turning torque measurements
- heat tapered roller bearing inner races to 100°C (212°F) before installing
- do not interchange outer and inner races of similar size bearings
- tapered roller bearings that are not on a shaft should always be replaced as a set, supplied from the same manufacturer

Adjustment shims

- measure adjustment shims in several locations with a micrometer
- check for burrs or damage. Only install shims without flaws

Inner splined plates

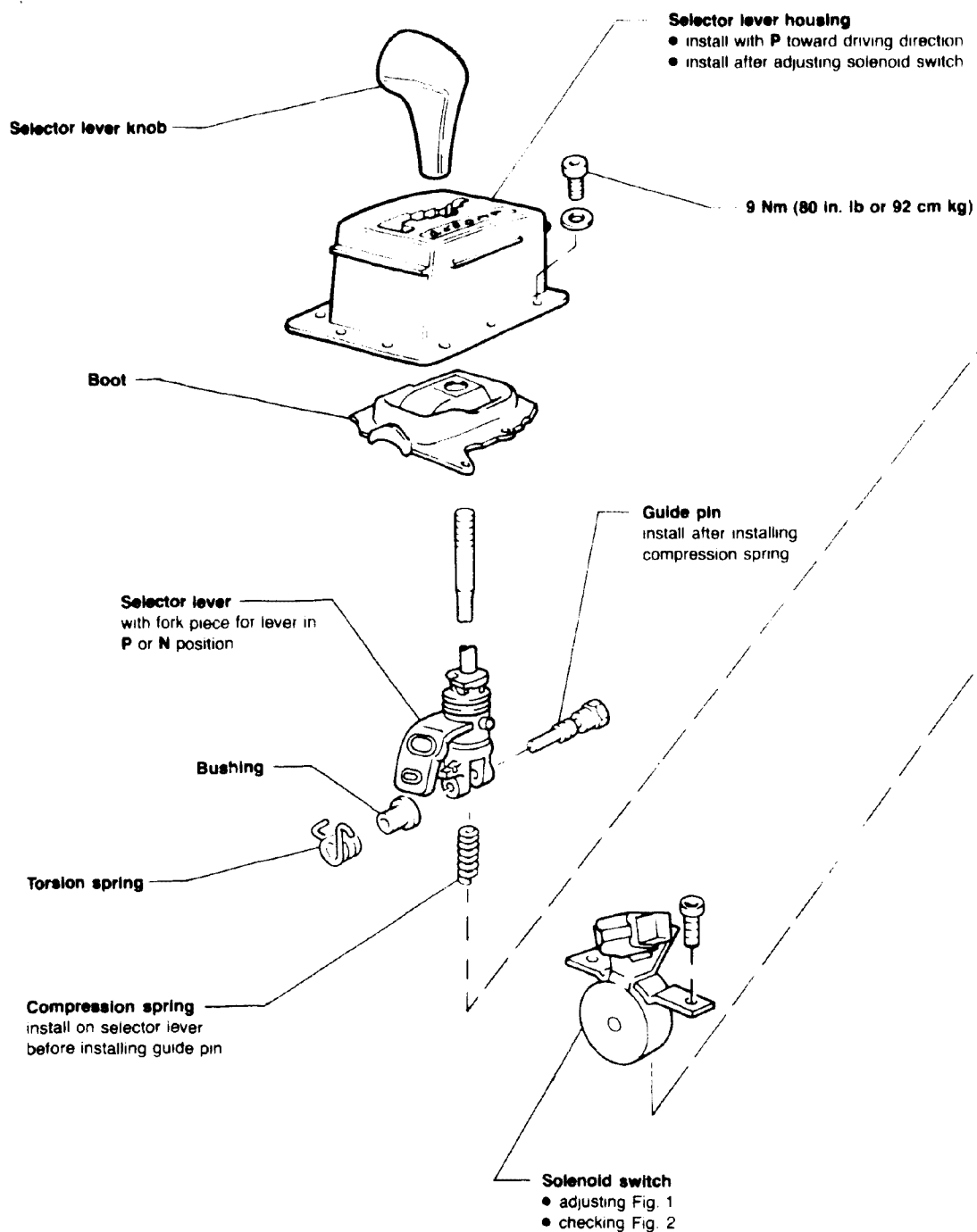
- place new inner splined plates in ATF for 15 minutes before installing

Replacing components

- see Repair Group 39

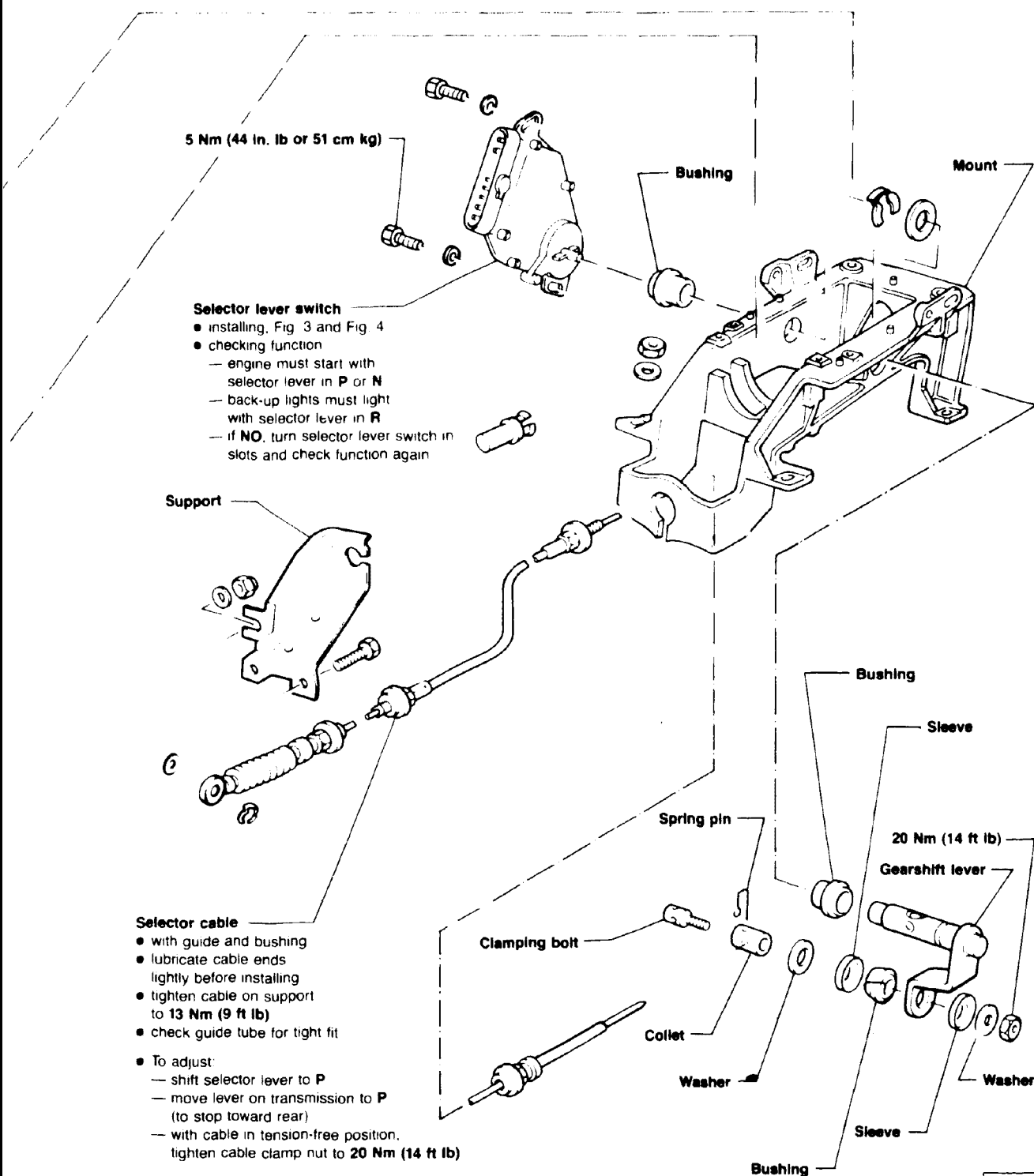
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Automatic Transmission – Controls, Assembly

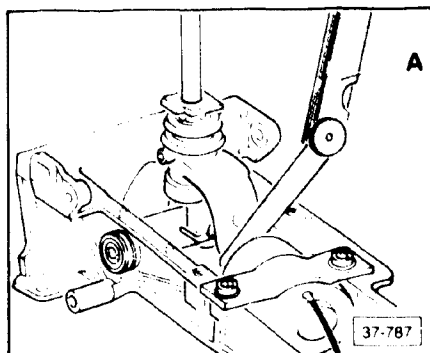


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Automatic Transmission – Controls, Assembly

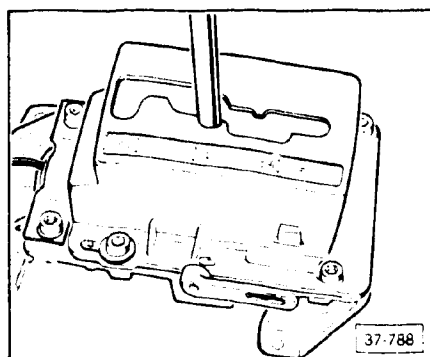


Automatic Transmission – Controls, Assembly



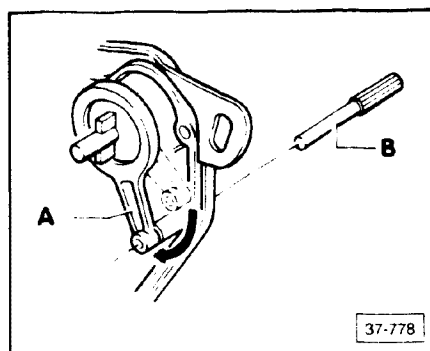
► Fig. 1 Solenoid switch, adjusting

- place gauge **A**, 1.0 mm thick, between selector lever and solenoid switch
- push solenoid switch against gauge with selector lever in **R** position, and tighten switch to 10 Nm (7 ft lb)



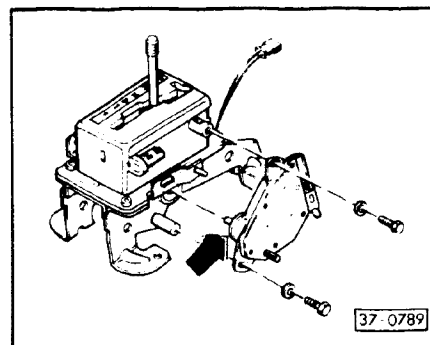
► Fig. 2 Selector lever housing to shift lever, adjusting

- center lower bore of fork piece after installing solenoid switch, and supply voltage to switch
 - solenoid pin locks fork piece
- install gearshift lever housing so selector lever is in position **N** relative to housing



► Fig. 3 Selector lever switch, installing

- install lever **A** with pin or drill bit. **B** = 4.0 mm diameter, through housing bore



► Fig. 4 Selector lever switch, installing

- shift selector lever to position **N**
- install selector lever switch so mount (**arrow**) locks into lever shaft
- tighten mounting bolts to 5 Nm (44 in. lb or 51 cm kg)
- remove pin or drill bit

Note

After installing the lever switch, check for correct functioning.

Automatic Shift Lock II. checking function

- shift selector lever to **P** and turn ignition **ON**
 - brake pedal not depressed
selector lever locked; cannot be shifted out of **P**
 - brake pedal depressed
selector lever can be shifted out of **P** position
- shift selector lever to **N** and turn ignition **ON**
 - brake pedal not depressed
selector lever locked; cannot be shifted out of **N**
 - brake pedal depressed
selector lever can be shifted out of **N**

Note

At speeds over 5 km/h (3.7 mph) and when shifting to **N**, the selector lever must not lock. The lever must allow shifting to a driving position without depressing the brake pedal.

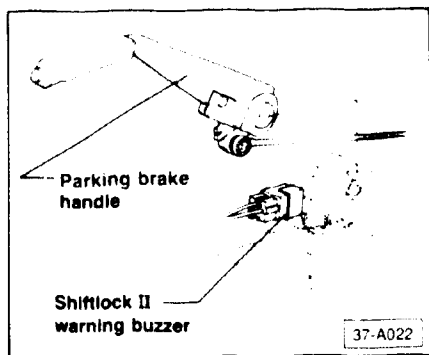
At speeds under 5 km/h (3.7 mph) and when shifting to **N**, the selector lever must not lock until after one (1) second has elapsed. The selector lever then cannot be shifted until the brake pedal is depressed.

Automatic Transmission – Controls, Assembly

Shiftlock II, troubleshooting from VIN 44 KN 006 505

Test requirements

- fuse **S12 OK**
- brake lights **OK**
- interior light delay control unit **OK**
- gear selector lever properly adjusted



Checking Shiftlock II warning buzzer

- move selector lever to R, N, D, 2 or 1 position
- open driver's door

• warning buzzer does **NOT** sound

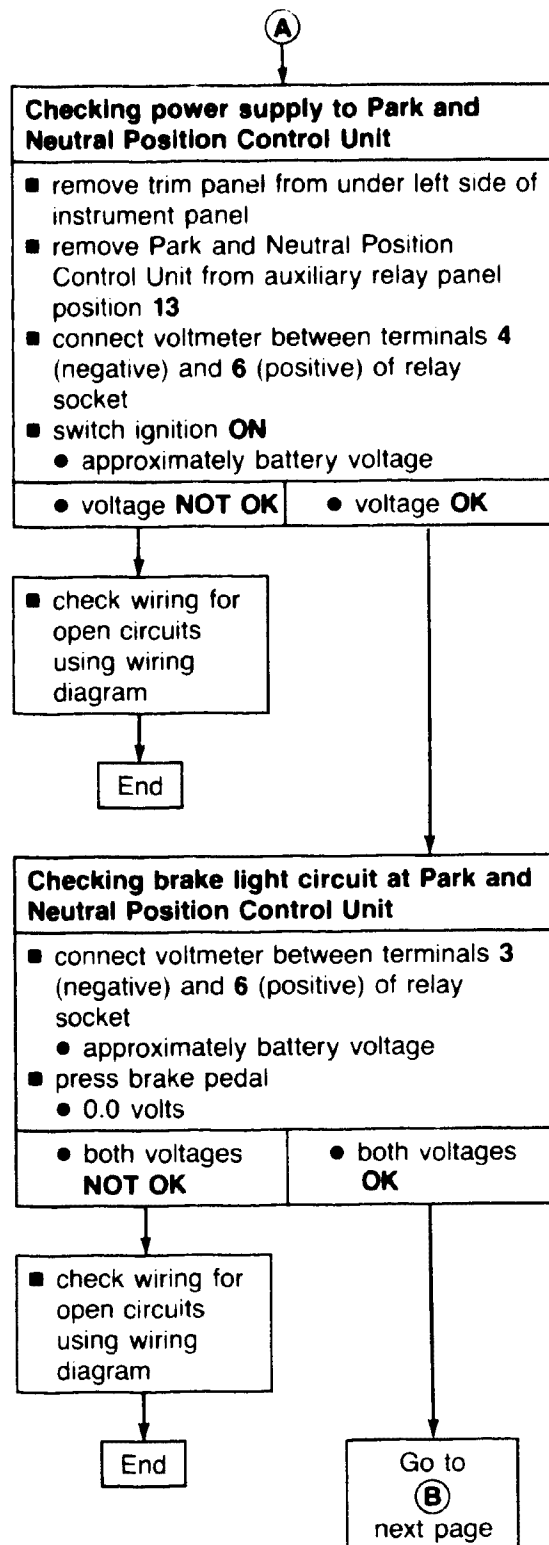
• warning buzzer sounds

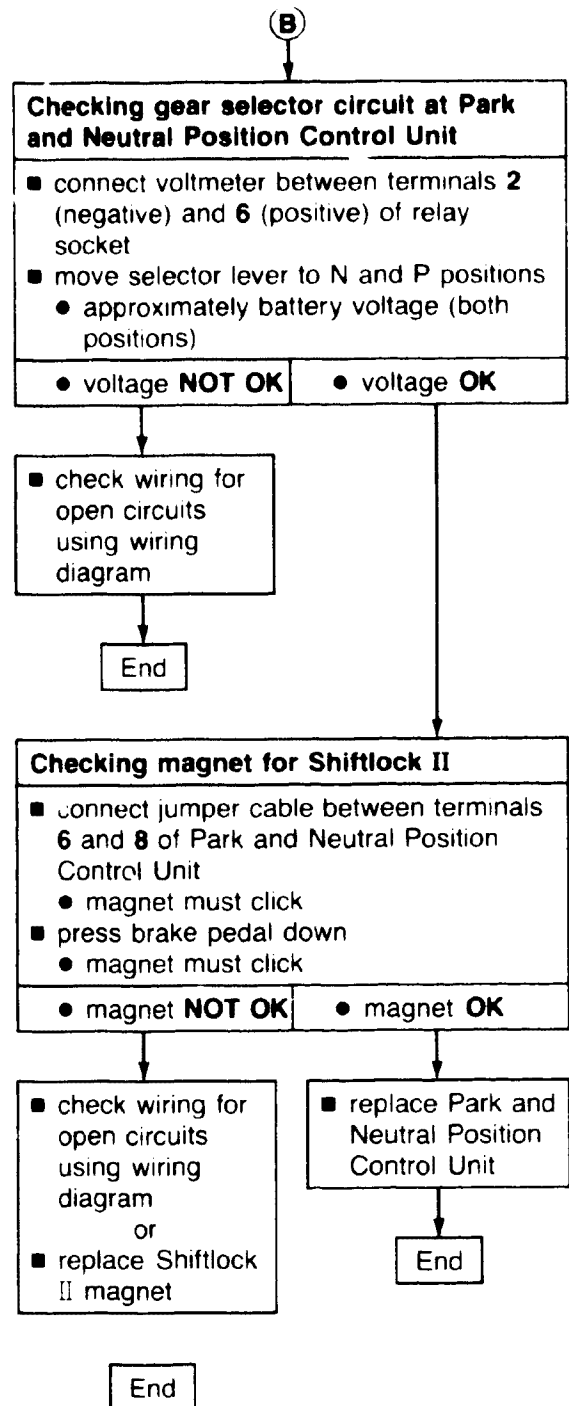
- check wiring for open circuits using wiring diagram
or
replace warning buzzer

End

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next page

Automatic Transmission – Controls, Assembly

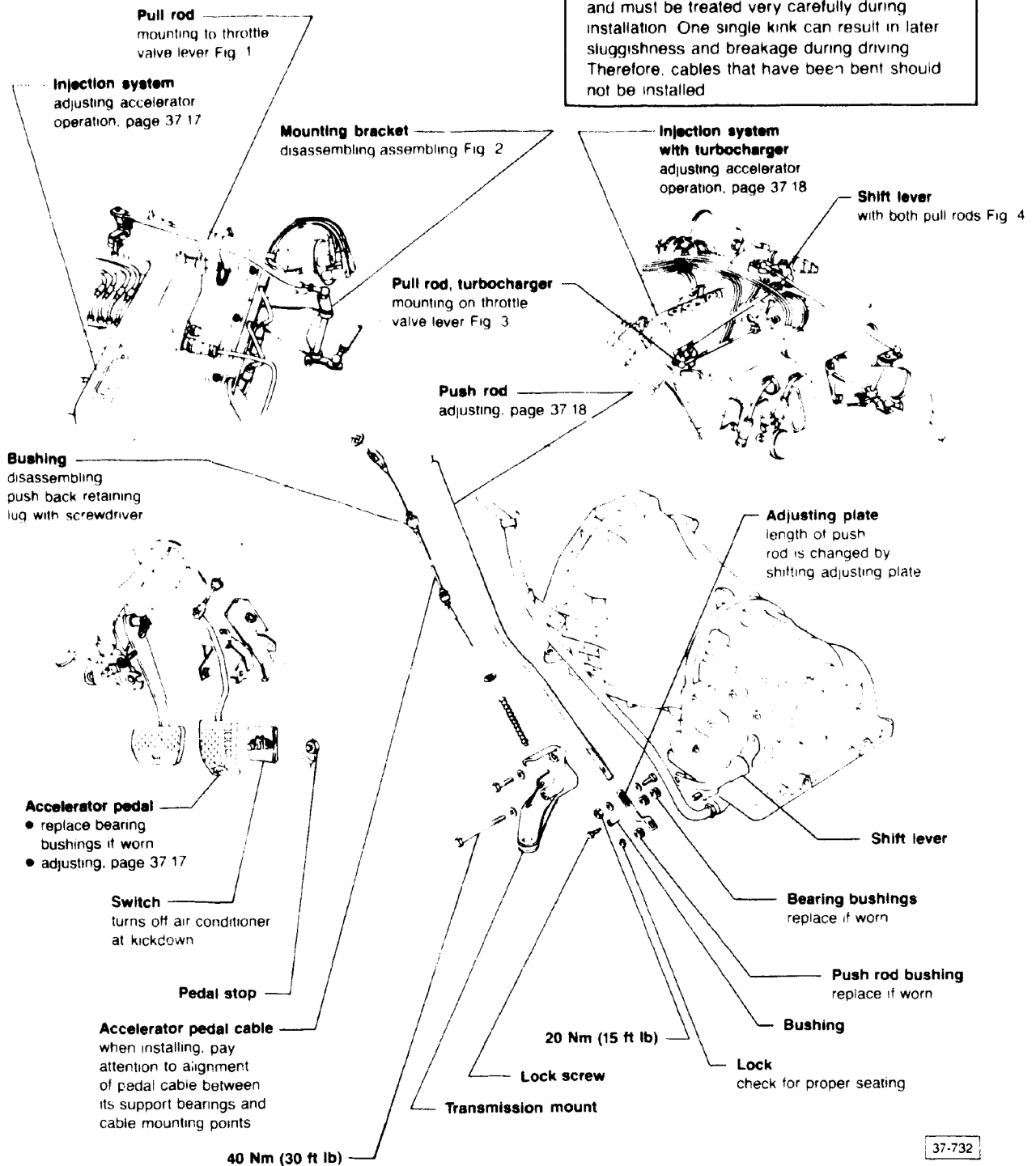




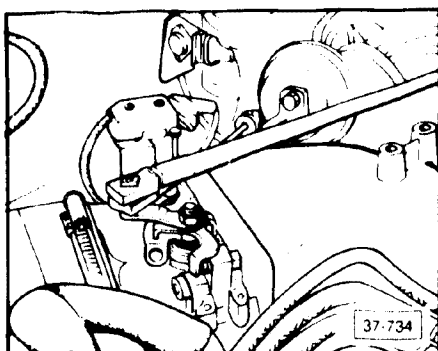
Automatic Transmission – Controls, Assembly

WARNING

Accelerator cable is very sensitive to kinking and must be treated very carefully during installation. One single kink can result in later sluggishness and breakage during driving. Therefore, cables that have been bent should not be installed.

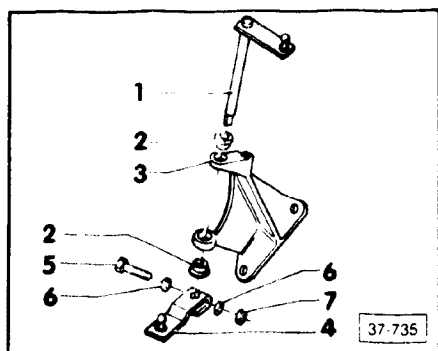


Automatic Transmission – Controls, Assembly



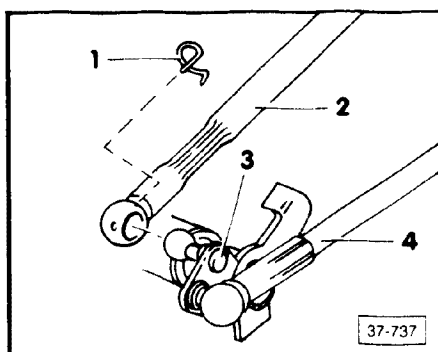
► Fig. 1 Pull rod, installing

- install on throttle valve lever



► Fig. 2 Bearing bracket, disassembling/ assembling

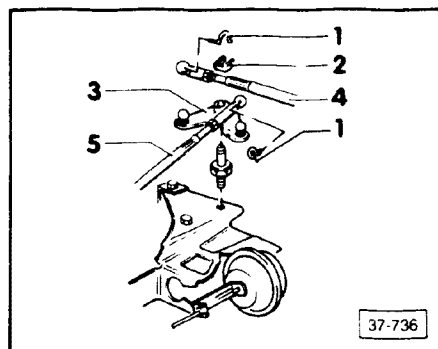
- 1 — lever for pull rod
- 2 — bushing
- 3 — bearing bracket
- 4 — lever for push rod
- 5 — bolt
- 6 — washer
- 7 — nut



► Fig. 3 Throttle valve lever pull rod, installing

- for vehicles with turbocharger

- 1 — safety stirrup
- 2 — pull rod from throttle valve lever to shift lever
- 3 — throttle valve lever
- 4 — push rod for speedometer control systems



► Fig. 4 Shift lever with both pull rods

- for vehicles with turbocharger

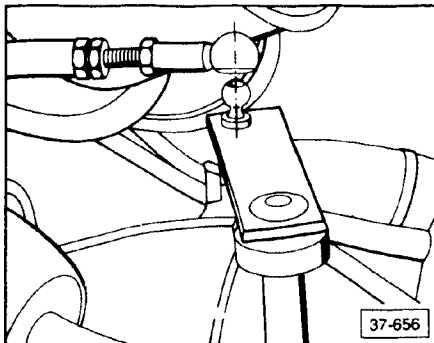
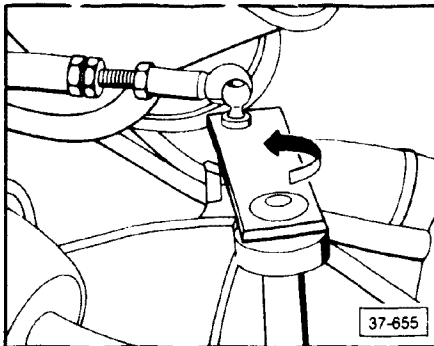
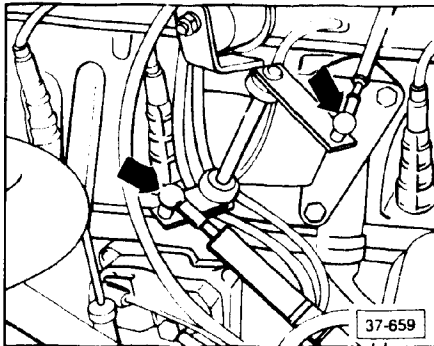
- 1 — safety stirrup
- 2 — lock for shift lever
- 3 — shift lever
- 4 — pull rod from shift lever to bearing bracket
- 5 — pull rod from shift lever to throttle valve lever

Accelerator pedal operation, adjusting

Note

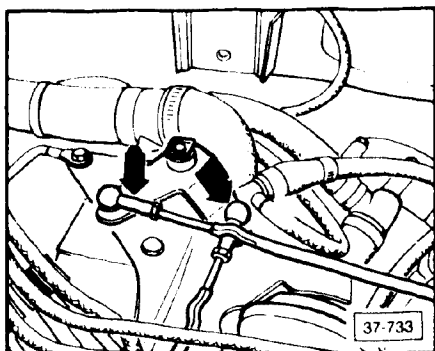
The accelerator control is to be adjusted so that at closed throttle (idle), the operating lever on the transmission is at the no throttle position. If adjustment is wrong, shift speeds will be too high at partial throttle and main pressure will be too high at idle.

- put selector lever in **P** position
- apply parking brake
- adjust accelerator control in idle position with closed throttle
- disconnect pull rod from the levers of the routing guide
 - first remove locks on ball sockets
- disconnect rods for cruise control system
- loosen lock nut on pull rod



- position lever for pull rod approximately 1 mm (0.04 in.) before stop
- install pull rod (without tension)
 - ball socket must be twisted accordingly
 - throttle valve lever must contact stop

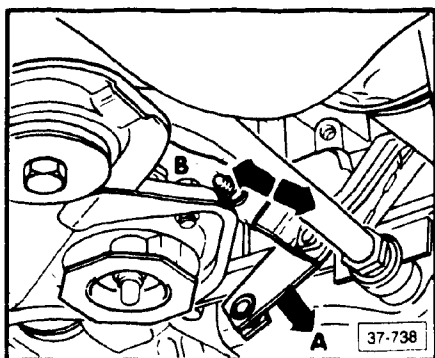
Automatic Transmission – Controls, Assembly



Note

Vehicles with turbocharger have 2 pull rods. Use the following procedure to adjust pull rods on vehicles.

- loosen lock nuts on both pull rods
- position pull rod lever approximately 1 mm (0.04 in.) before stop
- install pull rods by steadily turning in and out of both ball ends (**arrows**)
- secure lock nuts



Push rod length, adjusting

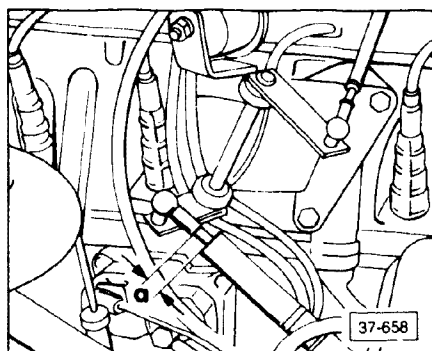
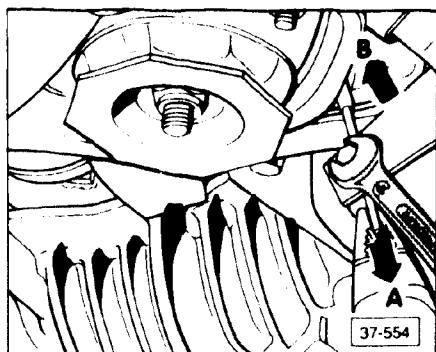
- loosen bolt **B**
- push operating lever into no throttle position (**arrow A**)
 - throttle valve lever must contact idle stop
- tighten bolt **B**
- adjust push rod length by shifting adjusting plate

Note

The push rod must be installed on the operating lever without tension.

- remove push rod from operating lever
- depress accelerator pedal to stop (2nd technician required)
- depress operating lever to kickdown stop (**arrow B**)
- use pliers to pull accelerator pedal cable in direction of arrow (**arrow A**) and fasten
- check whether the operating lever is in contact with kickdown stop. If necessary, readjust gas pedal cable
- install push rod onto operating lever and secure

Automatic Transmission – Controls, Assembly



Adjustment, checking

- check throttle valve lever on idle stop
 - the operating lever must be in no throttle position
- depress accelerator pedal to full throttle pressure point (no kickdown)
 - throttle valve lever must be in contact with full throttle stop
 - do not compress over-center spring
- push accelerator cable through full throttle position to stop (kickdown)
 - transmission operating lever must be in contact with stop
 - over-center spring a must be compressed in the push rod approximately 8 mm (0.32 in.)
- release accelerator pedal

Vehicles with cruise control

- install rod system for cruise control, tension-free
 - readjust if necessary

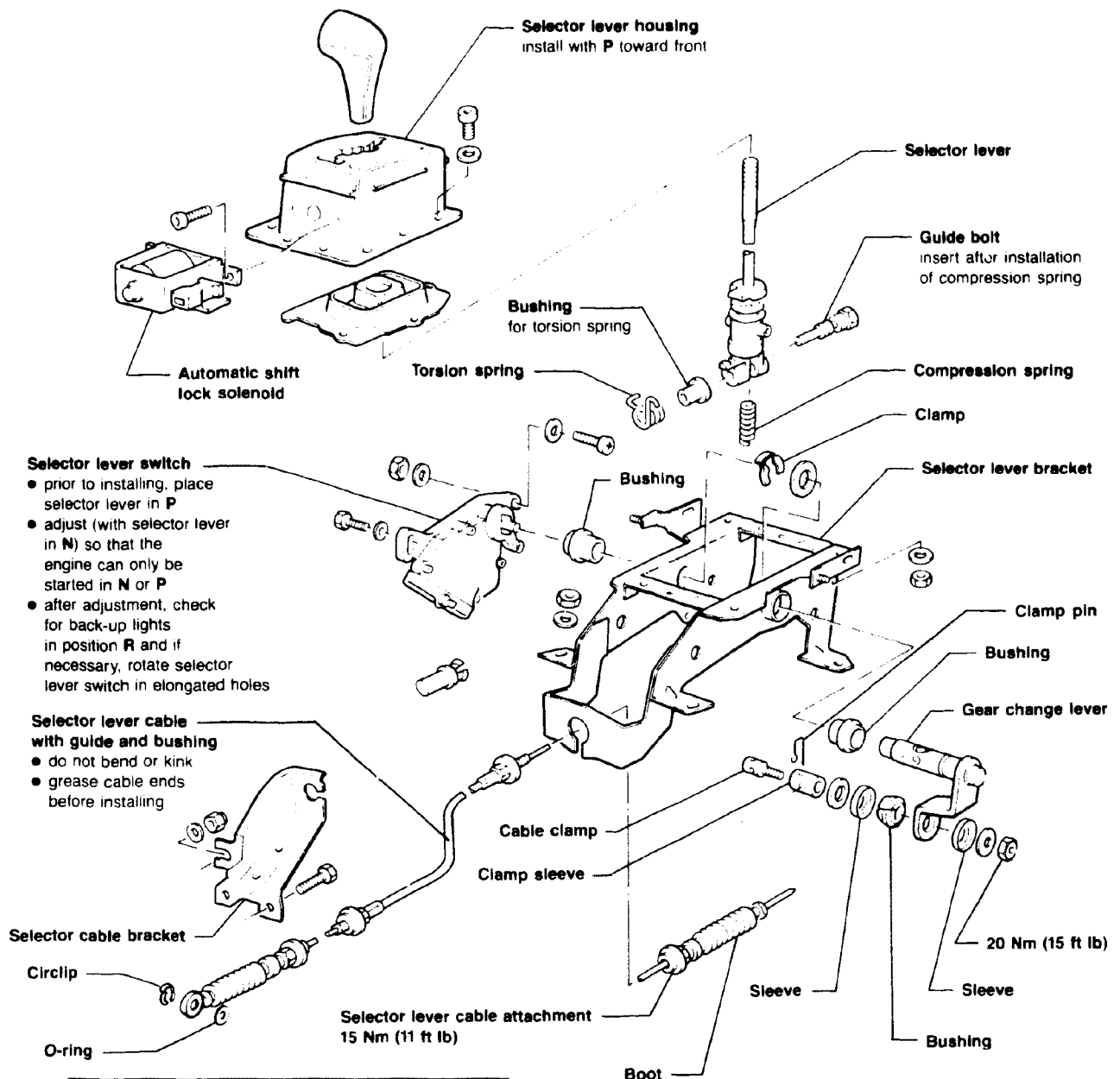
Automatic Transmission – Controls, Assembly

Note

Prior to repair work on the shift control assembly, the center console (see repair manual Group 70) and the rear heater air duct must be disassembled

CAUTION

Before working on a running engine, always place selector lever at P and apply parking brake.



CAUTION

Foot brake must be applied before selector lever can be moved out of P.

37-730

Automatic Transmission – Controls, Assembly

Transmission, removing/installing

Removing

- disconnect battery ground strap
- remove upper engine/transmission bolts
- disconnect transmission ground strap
- install engine support **10-222 A**
- raise vehicle
- remove front engine support bolts
- remove front exhaust pipe
- remove starter
- remove 3 torque converter bolts
(4 bolts on turbo vehicles)
- remove torque converter cover plate
- clamp off coolant hoses between engine and transmission
- remove hose clamps to ATF cooler
- remove coolant hose from pipe
- remove cover plates for transmission mount and drive shaft
- detach axle shafts from transmission and tie up
- loosen ATF filler tube
- remove selector lever cable support and disconnect cable from transmission
- vehicles with seat belt tensioning system, remove cable guide
- disconnect accelerator rod
- disconnect accelerator cable and remove from transmission support
- remove both transmission supports from transmission mount
- raise transmission with hoist
- remove right and left transmission supports
- lower hoist and raise engine with engine support
 - this will slightly tilt the transmission, making it easier to remove
- remove remaining lower engine/transmission bolts
- separate transmission from engine
- push right shaft toward front
- remove transmission carefully and secure torque converter from falling out

Automatic Transmission – Controls, Assembly

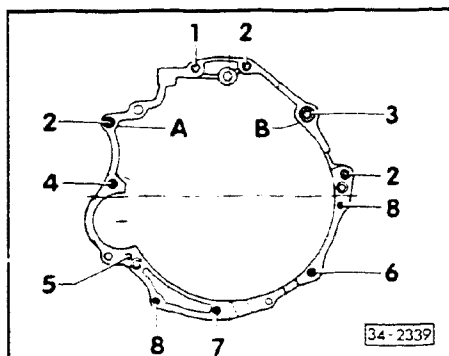
CAUTION

Before installing an engine, be sure that the dowel sleeves are in place (see items **A** and **B** in next illustration).

For some replacement transmissions paired with 5-cylinder engines, an offset dowel sleeve (Part No. 012 301 153) may be required.

When installing a new engine, check for the presence of a bushing in the crankshaft. This bushing must be driven in **first**, before installing the drive plate.

Part numbers are for reference only. Always check with your Parts Department for latest information.



Installing

Proceed in reverse order of removing and note the following:

- install torque converter before installing transmission
- place converter carefully on one-way clutch support
 - do not tilt or misalign converter
- while pushing torque converter into place, turn converter back and forth to engage splines of pump shaft
 - torque converter must be seated up to stop on one-way clutch support

- check accelerator operation adjustment
- check selector lever cable, page 37.8

Tightening torques

Axle shaft to flange 80 Nm (59 ft lb)
Torque converter bolts 30 Nm (22 ft lb)

Transmission bracket on transmission 40 Nm (30 ft lb)
Transmission mount on support 60 Nm (44 ft lb)

Tightening torques

Position	Bolt size	Quantity	Nm (ft lb)
1	M12 x 67	1	65 (48)
2	M12 x 80	3	65 (48)
3	M12 x 90	1	65 (48)
4	M12 x 100	1	65 (48)
5	M10 x 120	1	65 (48)
6	M10 x 50	1	45 (33)
7	M10 x 38	1	45 (33)
8	M8 x 40	2	25 (18)

Items **A** and **B** are dowel sleeves for centering.

Shift points, checking

Check the shift points if the transmission shifts into the next gear too early or too late.

Drive the vehicle in all gear ranges under all possible road conditions. Do not road test if there is obvious mechanical damage.

Note

When checking shift points, note that speedometer readings may vary due to permissible manufacturing tolerances.

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

Note

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

087 transmission code letters REH

Shift points in mph (km/h)		
Shift	Full throttle	Kickdown
1-2	21-32 (34-52)	46-52 (75-84)
2-3	53-67 (86-108)	82-88 (132-142)
3-2	38-40 (62-65)	77-85 (125-137)
2-1	13-17 (21-28)	37-43 (60-69)

087 transmission code letters REE

Shift points in mph (km/h)		
Shift	Full throttle	Kickdown
1-2	22-32 (31-52)	48-57 (77-92)
2-3	59-69 (96-112)	85-93 (137-150)
3-2	46-56 (74-90)	80-90 (129-143)
2-1	14-18 (23-30)	36-46 (59-74)

Automatic Transmission — Controls, Assembly



37-216

Main pressure, checking

Check main pressure only if defect cannot be found during other checks.

- attach gauge with 0-10 bar (0-145 psi) scale to connection (**arrow**)

Selector lever position	Accelerator pedal position	Main pressure bar (psi)
D	idle speed*	2.90-3.00 (42-44)
Test condition: accelerate to 50 km/h (31 mph), release accelerator pedal (idle speed) and check pressure on gauge		

Selector lever position	Accelerator pedal position	Main pressure bar (psi)
D	full throttle*	REH 6.80-6.90 (98-100)
		REE 7.30-7.40 (106-107)

*perform these tests on a dynamometer

Selector lever position	Accelerator pedal position	Main pressure bar (psi)
R	idle speed	9.00-10.00 (131-145)
Test condition: vehicle stationary		

- if specified values are not reached, check for the following faults (next page):