"MOTOR TRADER" Service Data

No. 365

VOLKSWAGEN-1961 MODEL

Manufacturers : Volkswagenwerk, A.G. Wolfsburg, Germany

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V OLKSWAGEN cars have been in production for many years. In the early days of their history, development and modification was a slow and lengthy process compared with the fast-moving improvements which have taken place in post-war years. Any article, especially of this nature and condensed size, could not be expected to give precise details of more than one model, and it is for this reason that we are publishing the details and repair procedure for the current model only.

1961 cars, example is illustrated above, have a general resemblance to earlier cars of the series; but it cannot be over emphasized that by virtue of the different application of various components the servicing techniques in some cases are **entirely different** and so this data sheet only applies to the 1961 series.

Mechanical layout is relatively simple. The flat-four horizontally opposed air-cooled engine is rear mounted and is an integral part of the transmission and final drive unit. All four forward gears are synchromesh and transmit the drive to the rear wheel final drive unit. Suspension is by independent torsion bars at the front and rear, and steering is of the direct acting worm and sector type.

Cars are identified by chassis and engine serials, also by an identification plate. The chassis number is stamped on a plate fixed to the backbone of the chassis and is revealed on removal of the rear seat. Engine serials (seven figure) are embossed on the crankcase side of the generator support flange; above and to the left of the dipstick. The identification plate is found on the valance behind the spare wheel in the front luggage compartment.

Special tools have been designed to speed up and generally facilitate service work. A list of those considered essential is set out on p. iii and it should be borne in mind that many service operations may be found difficult or impracticable without them. Before attempting service work, it is advisable to possess the requisite complement of special tools.

Service policy of the company is that, where possible or practicable, service work should be carried out through VW dealers, who are properly staffed and equipped to carry out all repair and overhaul work on VW cars. This is a policy much in line with that applied by British manufacturers.

Threads and hexagons are all of the Metric thread series classification. To avoid any confusion whatever, readers will note that our tabular data quoted in these papers gives dimensions, clearances and tolerances in metric and English units and that where such dimensions are quoted in the text matter of this article, similar notation is used.

As is the case with most manufacturers, but particularly in the case of this car maker, it is insisted that none but genuine VW spare parts be used. There is a complete range of spares available from most dealers, but reference to the U.K. distributors, VW Motors, Ltd., St. John's Wood, London, quoting the chassis and engine serials of the car will confirm the availability of any specific part or parts.



DISTINGUISHING FEATURES. Similar in general lines to earlier models, the 1961 car is immediately identified by the flashing indicator lamps on front wing tops. Headlamps are fully recessed in front wings, and chrome nave plates are fitted.

ENGINE

Mounting

The engine has no separate mountings and is bolted direct to the transmission case at the clutch housing joint face by two nuts and bolts and two studs and nuts. The transmission is mounted to the frame

The transmission is mounted to the frame by a rubber cushion at the front end and a rubber cushioned carrier at the rear. Carrier is bolted up to body extension by one 27mm bolt at each side. Additional mounting rubber is nipped up by two nuts and bolts to body frame at front end of transmission case.

Removal

Engine may be removed without transmission and final drive. To remove transmission it will be necessary to remove engine first. Jack up vehicle and place on stands so that car is clear of ground by three feet (approx.). Disconnect earth strap from battery, turn fuel tap "off" and open engine cover. Take off air cleaner and engine rear cover plate. Disconnect cables, pipes and wires connected to engine unit and generator. Loosen mounting screw on distributor support and turn unit so that vacuum chamber will clear rear cover plate when engine unit is removed. Disconnect both heating control cables and loosen flexible heater pipes from engine. Remove fuel pipe at engine end. Unscrew nuts of lower engine mounting bolts. withdraw accelerator cable from conduit

Unscrew nuts of lower engine mounting bolts, withdraw accelerator cable from conduit tube. Place jack beneath engine and remove nuts from upper mounting bolts. Raise jack until platform contacts engine and manœuvre engine until clutch release plate clears main drive shaft. Lower jack and tilt unit down rear end and withdraw from vehicle. Care should be taken to see that clutch components are not damaged during this stage of the procedure.



Insets right show, upper: the operative positions of the floor mounted gearlever, and, below, the siting of thesteering column mounted controls. The bonnet lock referred to in the key, operates the front bonnet wherein are the fuel tank, spare wheel and tools. Access to the engine compartment at the rear is gained by turning the unlocked engine cover panel handle.

ii VOLKSWAGEN-1961 MODEL

DE	Held VW No.				
T-Wrench 10 mm	n				106
Box wrench 10 m	m				109
Special wrench 30	6mm wi	ith guid	e plate		112
Two open end wr	enches	27 mm		10.00	113
Two open end wr	enches	32 mm	2.12	+++	113a
T-Wrench 8 mm	square	socket		100	114
Fuel pump wrenc	h 14 m	m		122	126a
Fuel pump wrend	ch 13 n	nm			126b
Key 10 mm				***	157
Oil pressure swit	ch wrei	nch 27 i	mm		159
Oil pressure swit	ch wrei	nch 24 i	mm		159a
36 mm socket				1.2.2	163a
Socket wrench fo	or cylin	der hea	d nuts		165
8ocket				1010	170
Wrench, oil drain	n plug. 1	17 mm			172
Oil nump extracto	07		200	312	201
Extractor		1455	255		202
Extractor hooks				1000	202a
Extractor ring	100		335	231	202c
Extractor hooks				100	202d
Thrust nad		100	33	- CC -	2026
Thrust nad					2021
Thrust nad		355	323	33	2024
Thrust nad					202m
Extractor books			255	100	2025
Ean pullay artrac	tor			***	2025
Crankehaft oil eas	al inetal	lington	1		204h
Clutch pilot	ai motai	ining too	1	277	210*
Driving slaava			20		244
Driving Siccas	111	+ 1 *	1.55	1222	0450
Frotractor Tio rod and roma					2408
Fire rou end remo	ver	***		12.55	2001
ruei pump push r	oo gau	ge			3288
ruei pump pusn	roo gau	ige			3280

Installation is reverse of dismantling pro-cess, following points being observed: Install engine only, with rear cover plate removed. Reposition distributor when replacing engine. Centralize clutch plate with special mandrel VW 219. Check over clutch mechanism and replace defective parts, if any. Examine needle bearing in flywheel gland nut for wear and repack with 10 grams (.3502) Universal Grease. Lubricate: —starter shaft bush, drive pinion, and flywheel ring gear with Universal Grease and main drive shaft splines and spigot with transmission oil. Clean trans-mission case and engine flange. To ease entry of main drive shaft into clutch plate and gland unit needle bearing rotate engine at V-belt and engage a gear to steady drive shaft. Installation is reverse of dismantling pro-

gland unit needle bearing rotate engine at V-belt and engage a gear to steady drive shaft. When mounting engine, insert lower mounting bolts in their respective holes in transmission case flange. Press engine against flange and ensure good seatings. Tighten upper and lower bolts slightly and then fully.

Cylinders and Crankcase

Horizontally opposed, each pair of cylinders is spigot mounted in either half of crankcase, which is split vertically and of light metal cast-ing. Crankcase halves are machined in pairs ing. Crankcase halves are machined in pairs and replacement must be made in pairs. Any of the four cylinders, finned for air-cooling is interchangeable. They can be replaced separately, or together with corresponding pistons. Each pair of cylinders has a detach-able cylinder head, also of light metal die-costing Combustion chombargace fitted with casting. Combustion chambers are fitted with

To remove cylinders, after cylinder head removal, take out valve pushrods and tubes, deflector plate below, and lift off. When replacing, care should be taken to ensure that checks for wear are made and that, if necessary, the replacement should be of similar bore size to other three.

Crankshaft

Crankshaft Four main bearings, carried in either half of crankcase. No. 2 bearing (from clutch end) is split. No. 1 is lead coated and takes crank end float. Flywheel, with starter ring gear is retained by gland nut and dowelled to crankshaft by four dowel pins. Timing and distributor drive gears are keyed on to shaft by Woodruff keys and retaining ring, together with fan pulley, which is bolted to crank end. Oil thrower and return thread provide oil seal at front, and oil seal is fitted at rear of flywheel. Bearings are thick-walled alloy prefinished to size, no hand fitting permissible. When replacing bearings place Nos. 1, 3, and 4 in left-hand half of crankcase so that dowel holes and oil holes register with oil passages in crank-

case. Dowel hole in No. 1 bearing must be towards flywheel. Note: Crankshaft dowel holes should be checked for wear. If worn, remove crank, insert drill and jig (VW 231 c/d), drill new holes 7.8 mm dia. 45 deg offset and ream out to 8 mm. When refitting crankshaft slide No. 3 main bear-ing into position, followed by Woodruff key for crankshaft timing gear and distributor drive gear. Check gears for tooth contact. for cranshalt thring gear and distributor drive gear. Check gears for tooth contact. Heat gear to 80 deg C in oil bath and press on to shaft followed by spacer. Check dis-tributor drive gear for wear, heat to 80 deg C and press on to shaft, and fit circlip slide on No. 4 main bearing. Fit oil thrower to shaft, concave face outwards (to crankshaft pulley) insert Woodruff key. insert Woodruff key.

Connecting Rods

H-section stampings, big ends split hori-zontally, small ends bushed for fully floating gudgeon pins. Thin-wall steel-backed lead-indium lined bearings located by tabs in rods and caps. Rod shoulders are machined for heads of high tensile steel con-rod bolts. As with main bearings, crankcase must be split and crankshaft removed for removal of rods.

Rods are balanced and difference in weight between any two in one set must not be in excess of 5 grams (2.8dr.). If necessary, shoulders and sides of heavier rods should be ground to achieve this tolerance.

Gudgeon pins should be light push fit in new bushes at room temperature.

Rods and caps are numbered and should be assembled with numbered sides together. Retaining bolts should be tightened to torque figure of 5 mkg (36 lb/ft).

Flat-topped aluminium alloy, solid skirts ground for clearance. Two compression rings and one scraper ring, all fitted above gudgeon pin. Fully floating gudgeon pins retained in piston bosses by circlips.

retained in piston bosses by circlips. Pistons are graded and marked for size as follows: Size grade, grade of size marked by paint dot, arrow and word "vorn" stamped or indented, which must point to flywheel when fitting piston, weight grade marked by paint line and grade of weight indicated by symbols—brown colour= "under"—and grey="over" weight. All these marks, colours, symbols and letters appear on piston crowns. When refitting pistons to cylinders ensure

When refitting pistons to cylinders ensure that compression rings are fitted with mark-ings "top" or "oben" uppermost and that ring gaps are properly established (see data tables) and spaced at approx. 120 deg around piston.

Oversize piston ring sets available for use in service to cure excessive oil consumption. oversize gudgeon pins, bushes reamed to size, are also available in 003 mm steps, coloured for identification; black small, white med., and green oversize.

Cylinders must be removed for piston re-moval and refitting—see previous section under "Cylinders and Crankcase."

Camshaft

Helical drive gear at front end, shaft runs in three plain bearings machined in each half of crankcase. Removal achieved by parting crankcase when shaft may be lifted out.

When installing, care should be taken to see that cams and journals are free from burrs and abrasions. One timing gear tooth is centre punched for timing and when resimilarly marked crankshaft gear teeth. Check backlash of timing gear to be nil— .052 mm (.002in). Various sizes of camshaft

gears are available to secure this tolerance and are marked -1, 0, +1, +2, etc., on their inner face.

This indicates in .001 mm the variation in pitch radius from standard pitch radius on gears marked "0." These size markings should not be confused with the timing mark on other side of gear.

E	NGIN	E DAT	ГА
General			
Туре		1000	horiz. opposed
No. of cylinders		1440	4
Bore x stroke: mm		C8.64.2	77×64
in		200	3.031 × 2.520
Capacity: c.c.			1192
cu in	***		72.74
R.A.C. rated h.p.	2010	1000	14.6
Max. b.h.p. at r.p.m			34 @ 3600 (DIN)
Max. torque at r.p.r	n.	***	8.4 mkg. @ 2400
Compression ratio			7.0 : 1

CRANKS	AFT AND CON.	RODS
	Main Bearings	Crankpins
Diameter Nos. 1 and 3 No. 4 Length	2.5591-2.5598in 1.9685-1.9695in —	Ξ
Running clearanc main bearings f big ends End float: main b big ends Undersizes Con. rod centres No. of teeth on pinion	e: Nos. 1-3 earings starter ring gear	.0010039in .00190040in .0007003in .00260049in .004016in .25, .50 mm not quoted
PIS	TONS AND RING	GS
Clearance (skirt) Oversizes Max. wt. variation Gudgeon pin: diameter (mark fit in piston fit in con. rod	00 n per set 5 g ed white) 19. pu	140022in mm. and 1 mm. 997-20 mm* sh fit at room temp. ly floating
	Compression	Oil Control
No. of rings Gap Side clearance in grooves: top lower Width of rings	2 .012018in .00260036in .00180028in	1 .010016in .001002in
Oversize marked	green-20.001-20.	004 mm.
	CAMSHAFT	1.00

bearing joarnan anameter	 13000-13000111
length	
Bearing clearance	 .00080021in
End float up to	 .00240045in
Eng. 5067817	 .00120033in
Timing gear backlash	 Nil to .002in

	VALVES	•	The second se
	Ini	et	Exhaust
Head diameter Stem diameter Face-angle (approx.)	1.24in .3133 45°	12in	1.18in .31183114in 45°
Spring length: free			1.89in
at load			102 ± 4lb

Tappets and Rockers

Plain cylindrical tappets sliding in crank-case. Remove after parting crankcase for dismantling. Short pushrods operate inlet and exhaust valve rockers for each pair of cylinders. Rockers, offset are carried on hollow tubular shaft supported in two retain-ing blocks in each cylinder fitted either side of shaft retaining block. Lateral movement of rockers controlled by packing washers and shims and each is retained in lateral location

of rockers controlled by packing washers and shims and each is retained in lateral location by spring clip on shaft. Adjustment provided by threaded ball ended screw in each rocker, which contacts valve stem and ball ends should rest centric-ally in rocker arm sockets. To ensure valve rotation during operation, rocker arm ad-justing screws should contact valve stem slightly offset to right (see sketch). Indi-vidual rockers and shafts may be removed after taking out retaining blocks and removal of spring clips and washers. Valve adjustment should be made in fol-lowing order: 1st—2nd—3rd—4th cylinder, and when each respective piston is on TDC

of compression stroke. Adjustment for valve timing should only be made with engine cold and at outside temperature of 20 deg C ($\delta R^{\circ} E$). Clearance should be

and at outside temperature of 20 deg C (68° F). Clearances should be as set out in data tables, p. vii. To time valves, mark position of TDC No. 1 cylinder on crankshaft pulley 16 mm (.47in) to right of timing mark. Make another mark 3 mm (.12in) to the left of TDC mark. Adjust valve clearance of No. 1 cylinder valves to 1 mm (.04in). Crank engine clockwise. Inlet valve should open when mark on crankshaft pulley lines up with vertical crankcase joint faces. Alteration of camshaft gear position by one tooth alters valve timing by approx. 22 mm (.87in).

Valves

100

Overhead, in-line for each pair of cylin-ders. Inlet valves larger than exhaust. Exders. Inlet valves larger than exhaust. Ex-haust valves fractionally longer than inlet and narrower in stem diameter (see data tables), but of similar face angle. Valves not interchangeable. Valve seat inserts pressed into cylinder heads and may be recut to 45 deg providing that outer edge of 15 deg cham-fer does not exceed outer diameter of valve seat insert. seat insert.

Seat width:

Inlet—1.3-1.6 mm (.051-.063in). Exhaust—1.7-2.0 mm (.067-479in). Valve guides are chill fit in cylinder heads,

chamfered at inner ends. Guide replacement is not advisable for this reason. If stem/guide maximum clear-ance is exceeded, cylinder head should be

renewed. Valves have single coil springs locating on seats around upper ends of guides and are retained by caps and split cone cotter fixings.

Lubrication

Gear-driven pump recessed on engine Grankcase casting. Oil cooler fitted, and when replacing after engine overhaul should be pressure tested to 6 kg/em³. Relief valve fitted in crankcase casting. In unloaded con-dition spring should be 62-64 mm long. Pump may be extracted for overhaul after removal of securing nuts and gears. Back-lash of gears should be .03-.08 mm (.0012-.0031in) and endfloat .066-.183 mm (.0026-.0072in).

.0072in). Pump is driven from camshaft and circu-

Pump is driven from camshaft and circu-lation is via oil cooler and delivered under pressure to main and big end bearings through drilled passages in crankshaft. Oil is fed to camshaft bearings through drillings in crankcase and through hollow pushrods to rocker arms and valve gear. Cylinder walls, pistons and con. rods are lubricated by splash and mist. Pressure switch in circuit, and warning light gives indication of low pressure, below .3-.6 kg/em³ (4.3-8.5 lb/sq in).

Ignition

Coil and distributor which incorporates vacuum advance mechanism. Before attempting to time engine firing to

Before attempting to time engine firing to 10 deg BTDC, contact breaker points gap must be checked. Crankshaft has two tim-ing marks. One, 10 deg BTDC, is the right-hand mark in DOR and the other, 7 deg BTDC, is left-hand mark in DOR. Initially, timing is set to 10 deg BTDC, but alternative position is provided for use when low octane fuel is used. Note: on pulleys which have only one mark at 7½ deg BTDC, a second mark should be made, with small file 4 mm .16in to the right of the first.

small file 4 mm .16in to the right of the first. To time engine, crank round until right-hand pulley mark lines up with vertical crankcase joint and rotor arm is in firing position for No. 1 cylinder, see mark on dis-tributor base rim. Loosen distributor clamp and connect one lead of 6v test lamp to No. 1 terminal of ignition coil and other to earth. Switch ignition "on" and rotate distributor body clockwise until contact points are closed and then anti-clockwise until points just begin to open and test lamp lights. Tighten distributor clamp in this position and replace rotor arm and cap. Do not attempt to use stroboscopic timing lamp devices or to time the engine when hot, i.e., oil temperature in excess of 50 deg C.

TRANSMISSION

Clutch

Single dry plate clutch, with sintered car-bon thrust release bearing. Operation is by cable and access to clutch unit in service is obtained after removal of engine unit as detailed in engine section. Adjust so that there is pedal free play clearance of 10-20 mm (.4-.8in). Adjustment is provided at cable end by nut and locknut.

Gearbox and Rear Axle

Four-speed gearbox, synchromesh on all forward gears, remote control centre lever operating. Synchromesh devices consist of clutch gear, shifting plates, stop ring and operating sleeve. When operating sleeve is moved towards gear to be engaged, sleeve is moved towards gear to be engaged, shifting plates bring coned surface of stop ring into contact with coned face of gear. The faster-moving gear carries synchronizing stop ring around until ring is stopped by shifting plates, bringing stop ring gear teeth out of line with internally cut spline of oper-ating sleeve. Braking takes place between the two coned surfaces and when exact syn-chronization speed is reached, splines of operating sleeve engage with teeth of supchronization speed is reached, splines of operating sleeve engage with teeth of syn-chronizer stop ring and then with clutch teeth of gear, these are chamfered for easier en-gagement. Clutch adjustment and proper free-play of pedal is very important since cases of synchromesh failure have been traced to faulty clutch operation.

Final Drive

Helical cut drive pinion and crown-wheel Helical cut drive pinion and crown-wheel with differential bevel gears which transmit the drive, via two swing axles to the rear wheels. Drive is taken forwards from engine and clutch unit to gearbox and from main-shaft of gearbox rearwards to final drive pinion and crown-wheel. Since gearbox and final drive unit are in one transmission unit, we depart from our usual practice, and describe these items, and servicing together.

To Remove Rear Axle and Gearbox

Note: If it is required to dismantle rear axle on removal from car, loosen axle shaft nuts before lifting vehicle. Disconnect earth strap from battery, raise

vehicle and support on trestles. Remove engine unit (see Engine section). Take off engine unit (see Engine section). Take off rear wheels and disconnect brake hoses at rear. Detach brake cables at handbrake, re-moving handbrake complete and cables from conduits. Loosen dust sleeves and remove lower shock absorber mounting bolts. Mark position of spring plate in relation to axle shaft bearing housing with chisel on spring plate in line with groove in axle shaft bearing housing. (Note: It is not necessary to mark parts as above if a new unit is to be in-stalled, since rear wheels will have to be reset in any case.) Remove rear axle shaft bearing housing bolts.

Disconnect clutch cable from operating shaft lever, slide off rubber boot and with-draw cable and sleeve from bracket on left-hand final drive cover. Unhook accel-erator cable from retainer on gear carrier and disconnect cable from terminals on starter motor. Remove frame end inspection cover under rear seat. Take off rear screw of shift-ing rod coupling and move gearlever to withing rod coupling and move gearlever to with-draw coupling from transmission shift rod. Remove nuts at front rubber mounting on transmission case. Place trolley jack under vehicle and clamp axle cradle (VW 609) to venice and clamp axie cradie (vw 609) to axie. Remove two bolts at transmission car-rier (27 mm) and draw out axie to rear of car. Replacement is reversal of above pro-cedure; care being taken to see that if a new rear axie is being fitted, mounting rub-bers are not distorted during bolt tightening, and new and bolts are tightened to speciand nuts and bolts are tightened to speci-

and nuts and bolts are tightened to speci-fied torques. When refitting it should be noted that fitting clearance between flat end of axle shaft (measured across ball shaped sides) and inner diameter of differential side gear is .03-.1 mm (.0012-.004in). Axle shafts and side gears are graded and marked in three groups and should be mated accord-ingly. They are paint marked blue, pink, They are paint marked blue, pink, ingly.

VOLKSWAGEN-1961 MODEL iii

and green (blue--smallest and green largest with side gear inner diameter) blue and pink marked components only available as spares. Rear axle shaft run out should be checked to be .05 mm (.002in). Fitting clearance of half-shaft/fulcrum plates/differential side gear is .035-.244 mm (.0014-.0096in). Axle tube nuts should be tightened to 2 mkg (14 lb/ft). (14 lb/ft).

To Dismantle Gearbox

Remove transmission carrier attachment screws and take off carrier. Take off selector screws and take off carrier. Take off selector mechanism housing by removal of securing nuts after taking off mounting nuts. Prise off lock plates of drive pinion and main drive shaft nuts. Lock box by engaging two gears and remove drive pinion and main drive shaft nuts with lock plates. Remove gear carrier stud nuts, earth strap and accelerator cable. Turn transmission case so that left-hand final drive cover is uppermost. Remove exposed stud nuts of final drive cover and then cover by using tool VW 297. Thrust plate of this tool is placed on differential housing flange and spindle is fixed to two axle tube retainer studs. Place spindle and axle tube retainer studs. Place spindle and thrust plate on right-hand side cover and press out final drive differential. Note shims which will be present, for reassembly.

Loosen retaining ring for reverse gear on main drive shaft, slide reverse gear rear-wards and screw main drive shaft apart. Take off reverse gear and withdraw rear mainshaft towards rear, preserving oil seal. Remove right-hand final drive cover. Prise up lockplates of drive pinion ball bearing retainer ocreus and remove core and push out transmission using tool No. VW 296. Note number, thickness and position of shims.

shims. Remove snap ring and reverse drive gear from reverse gear shaft. Take out Wood-ruff key, withdraw gear shaft and thrust washer from transmission case. Remove spacer sleeve securing screw for reverse gear shaft needle bearings. Drive out bearings (reverse shaft) with drift and remove securing screw needle bearing/main drive shaft. Drive out main drive shaft. Remove ball bearing from both left- and right-hand driver covers, also clutch release bearing and operating shaft. shaft.

To Dismantle Gear Carrier

Remove reverse selector fork with sliding gear from reverse lever. Remove, preserve, and note thickness of drive pinion ball bear-ing shims. Place carrier in vice, loosen lock-ing screws of 1st/2nd and take out selector forks (1st/2nd first). Place rubber band around operating sleeve of 1st/2nd gear and main drive shaft. Place into cradle VW 452 and use this with tools, Nos. VW 412 and VW 434 to remove gear trains from carrier. VW 434 to remove gear trains from carrier. Force should be applied to mainshaft, and drive pinion guided to avoid tilting which would damage gears or needle bearing in gear carrier. Remove securing screw and press out drive pinion needle bearing. Press out main drive shaft ball bearing with similar press and using packing pieces VW Nos. 401 and 441 also Nos 408 and 433 press and using packing pieces V and 441 also Nos. 408 and 433.

Position carrier in vice with soft jaw clamps Position carrier in vice with soft jaw clamps and remove reverse lever guide screw. With-draw reverse gear selector shaft and remove reverse lever guide. Take out selector shaft (1st/2nd) and remove reverse lever from sup-port. Also remove 3rd/4th gear selector shaft with plungers and detent balls. Re-move springs with small screwdriver. It is not usually necessary to remove reverse lever support. support.

To Assemble

To Assemble Reverse dismantling process, but note following points: Detent springs should be checked and replaced, if necessary. Free length: 25mm (lin); wear limit: 23 mm (.9in). Force necessary to overcome detent ball grooves on selector shafts should be 15-20kg (33-44 lb) approx. Insert detent springs through holes for selector shafts. Top halves of detent spring bores are withour bushes and so detent springs for 1st/2nd and reverse gears are best replaced by inserting into top halves first. Install reverse selector shaft including

Install reverse selector shaft including

iv Volkswagen-1961 Model

reverse lever and reverse lever guide. Replace selector shafts for 1st/2nd and 3rd/4th gears also two interlock plungers. Engage gear to check action. When engaging 1st or 2nd gears, other two selector shafts should be locked. Check needle bearing for drive pinion and ball bearing for main drive shaft, replace as necessary and secure drive pinion needle bearing after installation in gear carrier.

Place gear carrier on support and press on main drive shaft ball bearing. Check selector forks for wear. Clearance between forks and operating sleeves should be .1-.3 mm (.004.012in). Check main drive shaft and pinion. Press transmission into gear carrier, having previously positioned selector fork for 3rd/ 4th gears. When pressing in, drive pinion should be lifted slightly and care taken to see that selector fork for 3rd/4th gear is not jammed on selector shaft. Fully insert selector shaft into fork beforehand.

Note: When pressing transmission into position, drive pinion and main drive shaft should be held together by placing a rubber band around operating sleeve for 1st and 2nd gears and main drive shaft.

Install 1st/2nd selector fork, attach reverse

gear selector fork with reverse sliding gear on to reverse lever, and adjust selector forks. To do this, use of tool No. VW 294 speeds the work. Adjustment of 1st/2nd and reverse selector fork alters in accordance with adjustment of the drive pinion, so drive pinion adjustment must be made beforehand. Place transmission with drive pinion shims and gasket for gear carrier on gear shift test appliance VW 294, attach gear carrier with four screws. Tighten drive pinion ball bearing retainer with two screws diagonally opposed to 5 mkg (26 ft/lb). Push crank of test rig on to splines of main drive shaft



so that main drive shaft is locked by crank handle. Engage 1st or 2nd gears. Tighten main drive shaft nut with torque wrench to 12 mkg (11 lb/ft). Loosen nut and re-tighten to 5 mkg (26 lb/ft). Tighten drive pinion nut to torque of 3 mkg (22 lb/ft) and lock up. Attach gearchange mechanism and shifting handle. Set selector forks so that they move freely in operating sleeve in neutral and engaged positions. Set reverse gear selector fork so that reverse sliding gear is centred between operating sleeve and 2nd gear of main drive shaft with 2nd gear engear of main drive shaft with 2nd gear en-

gaged and properly engages with reverse gear on drive pinion with reverse gear engaged. Locking screws of selector forks should be tightened to a torque of 2.5 mkg (18 lb/ft), and reverse lever guide screw to 2 mkg

and reverse lever guide screw to 2 mkg (14 lb/ft). Note: When reassembling, the drive pinion concave washer must be adjusted to give a spring travel of $.17 \pm .01$ mm ($.008 \pm .0004$ in). This washer exerts approx. 100 kg (220lb) pressure on 3rd gear and clutch gear for 1st and 2nd gear. It also reduces oscillation of these parts fitted to the drive pinion. tion of these parts fitted to the drive pinion





Diagram showing order of tightening cylinder head stud nuts. See also table of "Nut Tightening Torque Data." Leit: Tightening order up to I mkg, right : from I mkg to fully tight.

with a minimum backlash of .05 mm (.002in). Failure to observe this will result in noisy axle if washer is too tightly seated and with-out backlash. Shims are available to achieve correct clearance and are available .15, .2, .25, .3, .4, .6, .8, 1.0, and 1.2 mm thick.

Differential Gear

When assembling, crownwheel retaining screws should be tightened to 6 mkg (43 lb/ ft), and locked up with wire. Pinions and crownwheels are matched in pairs, identity stamped on pinion head. Backlash is .017-.25 mm (.0067-.0098in) and replacement **must** be in pairs. Usually, it is only neces-sary to readjust crownwheel when parts have heen replaced which directly affect the adjustsary to readjust crownwheel when parts have been replaced which directly affect the adjust-ment. It is sufficient to readjust crownwheel if differential housing, a final drive cover or a differential bearing have been replaced. The crownwheel and pinion must be reset if the transmission case, gear set or the drive pinion ball bearing have been replaced. Both final drive covers should be installed with preload of .14 mm (.0055in). After cal-culating shim thickness, a preload of .07 mm must be imposed on both sides. Differential gear should not be serviced without full range of necessary special tools, gauges and distance pieces.

Drive Shafts (to remove)

Take off brake drum, bearing cover and brake back plate. Pull off rear wheel ball bearing. Take off nuts at axle tube retainer and remove gasket and plastic packing. Re-move differential side gear locking ring and take out thrust washer, followed by axle shaft. Take out differential side gear and fulcrum plates from housing. Installation is reverse process, but follow-ing tolerances should be adhered to in all

cases.

Flat end of axle shaft/inner dia. of diff. side gear: .1 mm (.0012-.004in). Rear axle shaft and diff. side gear tolerance groups.

Paint mark	Side gear inner diameter	Axle shaft outer diameter
Blue	59.97-60.00 mm	59.90-59.94 mm
Pink	60.01-60.04 mm	59.95-59.97 mm
Green	(2.3620-2.3638in) 60.05-60.07 mm (2.3642-2.3650in)	(2.3614–2.3622in) (2.3614–2.3622in)

Only side gears and axle shafts marked blue and pink are supplied as spares. Paint marks on side gears are in recessed face, and axle shafts are ringed by colour strips 6in from flat end. Axle shaft run out is .05 mm (.002in) max.

and clearance between axle shaft/fulcrum plates/dift. side gear is .035-.244 mm (.0014-.0096in). Oversize fulcrum plates available. Maximum end play of axle tube is .2 mm .008in). Iighten retaining nuts to torque of 2 mkg (14 lb/ft).

Composite view showing all the major components of the 1961 VW car. Units are arranged to show as much detail as possible and in relative position to each other. Text on this page and throughout the article refers to this central illustration.

vi VOLKSWAGEN-1961 MODEL

Component Mode	l Bulb	Part No.
Lamps: Head		
R.H.D	A 6V 45/40W	N 17 705 1
L.H.D.	B 6V 35/35W	W 17 701 1
Export France	Hella	
Long range drivir	g	
27	E 64 25W	
Fog 27	E 64 25W	
Reverse 27	E 64 25W	
No. plate illumina	-	
tion 27-20	K 6V 10W	N 17 7231
Side 27-20	H 6V 1.5W	N 17 7201
Stop tail 27-20	8 6V 20/5 W	N 17 736 1
Front flasher	. R 6V 20W	N 17 730 1
Rear flasher	. 8 6V 20/5W	N 17 736 1
Panel	Combined with	
	lights	111 941 53
	lights	111 941 531D
Ignition warning		
(red)	. Red light	111 925 233
Main beam warnir	g	
(blue)	. Blue light	N 17 722 1
Flasher warning (re	d	
arrow)	Red flashing	
	arrow	N 17 722 1
Petrol reserve valu	e 3 positions	
	mechanical	111 209 021 D
Reflector	Inc. in tail	
	light	111 945 241
Switches:		
Choke	. Automatic	
Dipper	. Foot operated	111 941 56 1A
Direction indicate	r flashing self-	
	cancelling 18W	113 953 511A
Horn push	half ring	113 951 531C
Interior		143 947 111
Ignition (starter)	combined	111 905 8034
Panel light	Combined with	
· anor ngint ·	light switch	111 941 531D
Starter push	Burton	111 905 805B
Stop light	Hydraulic on-	
	eration	113 945 515
Winer	electrical self-	
** IPVI *** *		
	narking.	

CHASSIS

Brakes

Hydraulic on all four wheels, leading and Handtrailing shoes in all wheel drums. brake operates separate unit in each rear wheel brake assembly.

To adjust front wheel brakes, jack up each wheel in turn and apply footbrake to position shoes in drum. Insert screwdriver through hole in wheel and brake drum and turn starwheel adjuster to right to lock shoes in drum, backing off to obtain clearance so that drum

is quite free to revolve. Rear wheel brakes have similar starwheel adjuster, and cable operation by handbrake actuates lever and connecting link so applying both shoes in each drum. Adjustment described also adjusts handbrake lever travel.

Rear Suspension

Independent, torsion bar. Inner ends of each bar are anchored to centre of frame cross member by splined tube welded *in situ*. Outer ends of torsion bars (splined) carry radius arms, hubs are rubber mounted. Rear

radius arms, hubs are rubber mounted. Kear axle tubes are mounted to inner ends of radius arms. Rubber stop is screwed to radius arm and axle shaft bearing housing. Torsion bars are removable for replace-ment, but are **not** interchangeable, being handed from side to side. Arrow marks are stamped on ouside face showing torque direction direction.

Front Suspension

Front Suspension Unit comprises two tubes rigidly joined and secured to frame head by four bolts. Torsion bar is pivoted in each and anchored to prevent twisting and lateral movement. Ends of torsion bars are attached to links which pivot in fibre bushing and needle bear-ings in cross tube. Outer ends of bars are connected to links by adjustable pins, free to pivot. Stub axles swivel on king pins, which pass through bushes in torrian arm link. A thrust washer is fitted between upper end of stub axle and torsion bar link.

To Remove Axle

Raise front of car, remove road wheels. Turn off fuel tap, disconnect operating rod from tap and take off fuel hose. Remove

cover behind instrument panel and luggage compartment and take out fuel tank. Jack up car and place on trestles. Disconnect brake hoses at back plates and plug with conveniently sized wood plugs. Remove conveniently sized wood plugs. Remove steering damper from axle tube bracket. Take off speedometer cable at front wheel and off speedometer cable at front wheel and loosen steering column clamp. Pull off horn cable and withdraw steering column with steering wheel from steering coupling. Unlock and unscrew securing nuts with special tool VW 266f and pull off tie rod joints and remove rods. Remove two body mounting bolts. Prise up lockplates and remove from axle mounting bolts. Lower bolts may be removed more easily if block of wood is used as lever between axle tube and stabilizer. Axle, complete, may then be removed from car. Replacement is reversal of this pro-cedure, tighten mounting bolts to torque of 5.0-6.0 mkg (36-43 lb/ft), and body bolts to 3 mkg (21 lb/ft). Bleed brakes and adjust after axle replacement; also check front-end geometry. geometry.

To Dismantle Axle

Parts should be removed in following se-quence. Brake drums, backplates, track rod ends and steering damper, torsion bar links and stub axles, shock absorbers, torsion arms and stabilizers and torsion bars. Hubs are integral with drums and max, permissible radial run-out is 25 mm (.010 in). Bearing adjustment is critical and is correct when thrust washer at outer bearing can just be moved laterally with large screwdriver and no bearing fact is guident whom drums is proched bearing float is evident when drum is rocked. New lockplates etc. must be used and inner nut tightened, initially to 4 mkg (29 lb/ft), lockplate installed, outer nut screwed in and inner nut backed off 72 deg and outer nut tightened to achieve condition as above.

To Adjust Torsion Arm Link Pins

Raise front of car and remove weight from road wheels. Back off pinch bolts at torsion bar eyes. Fully tighten link pins and then back off $\frac{1}{8}$ of a turn. Retighten link pins until first light resistance of shoulder making contact is felt; this is slackening angle of 10-12 deg. If adjustment has no effect, replace shims. Tap ends of link pins to free tension caused between parts when pins were fully tightened. Tighten pinch bolts in torsion arm eyes. N.B. Always check toe-in after adjusting link pins. Raise front of car and remove weight from

Torsion Arm-Removal

Parts must be removed as follows: torsion Parts must be removed as follows: torsion arm link, stub axle, shock absorber, stabilizer, lock nuts and setscrews securing torsion bar, rubber stop and upper arm is free for removal. To check, usual tests for parallelism and twist should be applied, use of the gauge VW 2826 enables clearances to be measured and these are .2 mm (.008 in) at the test faces. Upper and lower arms are not interchangeable.

Installation is reverse of previous process. Bearings should be checked for wear and parts renewed as necessary. Torsion bar ends are not welded in 8-leaf bars outer edges of square holes are peened over to prevent outer split leaves moving forwards. A 14 mm chisel should be used for peening.

Mounting angles of torsion bars are: Upper $40^{\circ} \pm 1^{\circ}$ Lower 51° 30° $\pm 1^{\circ}$. When replacing bars, new unit must have same number of leaves as old one, and use of different ber of leaves as old one, and use of different mounting angles will cause suspension to "bottom" with unpleasant riding effects. Torsion bars may be removed and replaced with axle *in situ*. Fitting clearance between torsion bars and bushes is .20-.27 mm (.008-.011 in). Ream bushes to following dimen-sions when refitting:—

Torsion Arm	1—Bushes 2—Reaming dimension
From Chassis No. 2921552 26.95–37 mm dia. (1.4539–1.4547in)	1–27.15–37.20 mm dia. (1.4626–1.4646in) 2–37.20–37.25 mm dia.

Supplement to "Motor Trader," 26 April 1961

Glutch Make Type Springs: n o			
Type		Fileb	la 8 Cash
Springs: no	••••	sdn	eis & sach
		6	
colour free length		grey	heled
Centre springs: no		not q	uotea
colour }		none	
Driven plate run-out (max.)		.030ir	
loaded		1.16ir	
at load	1	121-1	321b
Release plate run out (max))	.004!r	
Clutch assy unbalance (max))	.21 02	c in
GEARBO	оx		
Туре		synch	romesh
No. of forward speeds		3 80 -	1
2nd		2.06	1
3rd		1.32	1
Rev.		3.88	1
FINAL DE	RIVE		
Туре		sb dri	ive swing-
Crownwheel/bevel pinion tee	th	ing ha	alf axles std)
BRAK	ES		,
Туре	1	hydi	aulic
	F	ront	Rear
Drum diameter	9.06	Bin	9.06in
Lining: length	1		1 101-
thickness No. of rivets per shoe	.16i 8	in	.16in 8
TORSION E	BARS		
	F	rant	1
	6	TUIL	Rear
o, of leaves upper and lower	8		Rear
lo. of leaves upper and lower Rear torsion bar divided	8	-	Rear 24 mm di
lo. of leaves upper and lower Rear torsion bar divided SHOCK AB:	8 SORB	ERS	Rear 24 mm di
lo. of leaves upper and lower Rear torsion bar divided SHOCK AB: Make	SORB	ERS Boge or Sachs	Rear 24 mm di Fitchels &
lo. of leaves upper and lower Rear torsion bar divided SHOCK AB: Make Type	80RB	ERS Boge or Sachs Telesco	Rear 24 mm di Fitchels &
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lo. of leaves upper and lower Rear torsion bar divided SHOCK AB: Make Type Service Make Type Adjustments: column end float cross shait end float tross shait end float	8 SORB 	ERS Boge or Sachs Telescoj hydraul replacei X X. Worm : none grubscri cocknut	Rear 24 mm di Fitchels & pic ic nent and sector ew and
lo. of leaves upper and lower Rear torsion bar divided SHOCK AB: Make Type Service STEERING Make Common and float column end float cross shaft end float tross shaft end float Column and float cross shaft end float tross shaft end float Column and float	8 SOR B	ERS Boge or Sachs Telescolu replacet X V.W. Worm a none grubscrrt jocknut	Rear 24 mm di Fitchels & pic ic nent and sector ew and
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Steering:

Worm and sector steering unit, adjustable worm carried in ball bearings in box and hemispherical sector freely located in concave recess of sector shaft. Track rods are con-nected to drop arm ends and transmit motion to steering arms of front wheels. Two types of steering damper in current use; two tele-scopic tubes (Stabilus) and compensator cylinder at rightangles to damper body with chrome plated piston rod. Stabilus type only is suitable for R.H.D. vehicles.

Shock Absorbers

Double acting telescopic hydraulic units are fitted to front and rear of the vehicle. Ensure that, if replaced, correct units are used.

Supplement to "Motor Trader," 26 April 1961



VOLKSWAGEN-1961 MODEL vii

-Engine valve timing diasee adjacent table of "Tune-up Data" for. further det ails. A0 (EO) ESÓC UT (BD.C) ELECTRICAL EQUIPMENT AND TEST DATA FOR VOLKSWAGEN SEDAN 1961 Model Exide 6 v. Part No. 3XNF13L 3XNF13R Capacity at 10-hour rate 76 ampere-hour. Capacity at 20-hour rate 85 ampere-hour. Specific gravity of electrolyte corrected to 60°F. (15.5°C.). Climates Climates normally under 90°F. frequently over 90°F. Fully charged 1.270-1.290 1.210-1.230 Half discharged 1.190-1 210 1.130-1.150 Completely discharged 1.110-1.130 1.050-1.070 To correct 8.G. readings taken at temperatures other than 60° F. deduct 0.002 from observed 8.G. reading for every 5°F. below 60°F. and add 0.002 for every 5°F. above 60°F. GENERATOR Model Bosch LJ/REG/180/6/2,500/L3. | Part No. VW113903021C. Two-pole, two-brush shunt wound, ventilated machine. machine. Rotation (drive end): anti-clockwise. Brush spring tension: 450-600 gr. Field resistance: 1.2 plus .12 ohm. Cut-in speed 1,540 r.p.m. at 6.2-6.8 generator volts. Maximum output 40 amp. at 3,250 r.p.m. and 6 volts on resistance load .15 ohm (240 watt. max.). Fit new brushes when worn to engravure on brush. Model Bosch RS/TAA 160/6/1 | Part No. 111903801C. Cut-out. Gut-out. Gut-in voltage: 6.2-6.8. Drop-off voltage: 2.5-5.5 amps reverse current. Voltage Regulator. Open circuit setting at ambient temperature of 20°C. (68°F.) and generator speed of 3,000 r.p.m. 7.3-8.0. For every 10°C. (18°F.) above 20°C., Subtract 1 volt from above setting. For every 10°C. (18°F.) above 20°C., Subtract 1 volt from above setting. For every 10°C. (20°C., add 1 volt. Current Regulator. Contacts to open at 31 amps. STARTING MOTOR Model Bosch EE00/3/6L49 (Part No. VW113911021A Four-pole, four-brush, 2 series 2 parallel field. Drive: direct screw push and roller ratchet. Rotation (drive end): anti-clockwise. Brush spring tension: 800-900 grams. Lock torque: 9.8 lb-ft. with 540 amp. and 4.0 volts. Torque at 1,000 r.p.m.: 8.5 lb-ft. with 260 amp. and 4.5 volts. DISTRIBUTOR Model Bosch VJU4BR8 | Part No. 111905205F. Model Bosch VJU4BR8 | Part No. 111905205F. Contact breaker gep setting: .016in. Contact breaker spring tension, measured at contacts: 400-500 grams. Contacts: closed period: 52-56 deg. Contact set. Part No. SP183. Condenser capacity: .025 mid (approx.). Rotation (drive end): anti-clockwise. Max. centrifugal advance (crank degrees): 6-9 deg. No advance below: 420-710 r.p.m. Centrifugal advance (crank degrees): 4-6 deg. No advance below: 80-140 mm Hg. IGNITION COIL Model Bosch TE6 B4 | Part No. 111905105C. Primary resistance. Running current at 1,000 r.p.m.: 11.5 watts. WINDSCREEN WIPER Model Bosch WS/GA6A9 | Part No. 111955 111A Light running current: 4 amp. (Normal speed). Wiping speed: 55 c.p.m. (Normal speed). HORN Model Bosch Part No. 111951 111A Type: High frequency. Current consumption: 30-35 watts. (each horn). Fuse ratings: all 8 amp. | Part No. N17 121 1

See col. i, p.vi for Lamp, Bulb and Component data.



MAINTENANCE DIAGRAM KEY TO

NUT TIGHTENING TORQUE DATA

lb/ft

22

14

25-27 217 36

40-47

50-54

22-29

36-43 47-54

18-22 36-43

21-25

14

DAILY 1. Engine sump-check and top up.

EVERY 1,500 MILES

- **Torsion bars** 2
- 3.

ENGINE

Fan nut

AXLE

case..

- King pins Torsion bar link pins Tie rod ends 5
- 6. Door hinges, lock mechanism etc .-- oil can

grease gun

Bolt Size

M10 M28x15 M9X1 M12X1.5 M12X1.5

M18X1.5

M14X1.5 M18X1.5

M18X1.5 M12X1.5

M10 M12X1.5

M10X1.5

M8

M.10

M.8

EVERY 3,000 MILES

Nuts for crankcase halves

Nuts for crankcase halves Bolts/nuts for crankcase halves Cylinder head nuts Flywheel gland nut Connecting rod bolt Fan nut

Fan nut Generator pulley nut Spark plug threaded insert Spark plug Oil drain plug FRONT AXLE Steering wheel nut Steering drop arm bolt Steering gear case mounting clamp nut

Clamp nut Front axle at frame Bolts and nuts for shock ab-sorbers at shock absorber

mounting plate and radius

TRANSMISSION AND REAR

Bolts/nuts for transmission

- 7. Battery 8. Transmission 9. Steering box

- 10. Engine oil strainer } clean 11.
- 12.
- Fuel pump filter } clean Fuel pump filter } Engine sump—drain and refill Distributor—oil shaft bearing, auto advance mechanism, contact breaker pivot, smear cam 13.
- 14
- 15.
- meenanism, contract prove shear character with grease. Brake cables } grease gun Carburettor controls, shafts and fast idle 16. cam—oil can 17. Door and hood cover locks—oil can

EVERY 15,000 MILES

Ring gear bolts Drive pinion nut (Standard transmission)

Nut for pinion assy. (synchro-mesh transm.), new lock-washer From Ghassis No. 1 454 551

From Chassis No. 1 454 55 and 234 4001 Main Drive Shaft nut Selector fork locating screw R3verse selector fork screw... Rear axle shaft nut

Nuts and bolts for spring

plates—type 1 Spring plate mounting bolts/ reduction gear case—Type 2

BRAKES AND WHEELS

Brake back plate bolts Brake hose unions Brake line unions

Body mounting bolts Body mounting bolts Body mounting bolts

Oil drain plug

Wheel disc bolts Stop light switch BODY

Transmission-change oil and clean mag-netic drain plugs. 18.

M 10

M18X1.5

M22X1.5

M22X1.5

M16X1.5

M24X1.5

M12X1.5

M12X1.5 M18X1.5

M10X1.5

M10X1 M10X1 N12X1.5

M10X1

M10X2.5

M8 M12X1.5

M7X12

8M

43

36

80-87

58-65

30-36

18 14

217

72-87

72-87

29-32

11-18 11-18 65-79

9

22

14 22

	FILL	-UP I	DATA	
			Pints	Litres
Engine sump			4.4	2.5
Gearbox Rear axle			3.5	2
Cooling system Fuel tank	····		8.8 gall.	40
front rear }1-2 oc	cupan	ts*	16lb/sq in 20lb/sq in	1.1 kg/cm ² 1.4 kg/cm ²
*3-5 occupants †From dry4.4	Fron Rear pts.	t: 17 b, r: 23 b	sq in (1.2 k) sq in (1.6 k)	g/cm²) g/cm²)

Wheelbase	149.4			7ft 10}in
Track: front	1.14		1444	4ft 3.4in
rear			14.00	4ft 2.7in
Turning circle	200	222	322	36ft
Ground clearance (min)			6in
Tyresize: front }	332	-	-	5.60-15
Overall length				13ft 4.2in
Overall width		122	222	5ft 0.6in
Overall height			14.94	4ft 11.1in
Kerb weight	100	6.0	3.1	1.631lb
Max, gross laden w	eight			2.469lb

FRONT-END SERVICE DATA					
Castor	000 000	100	2° 30' + 15'		
Camber			0° 40' ± 30'		
King pin in	clination		4° 20'		
Toe-in (unia	aden)		0.04120in		
No. of turns	lock to lock		2 ¹ / ₂ in (approx)		
Adjustment	s: castor)		chime		
	camber ∫		5111115		
toe-in	Sia - Sia	34	screwed track rod ends		

le,

LUBRICANTS RECOMMENDED

LUBRICATION POINTS	SHELL	B.P.	CASTROJ.	VACUUM	ESSO
Engine	X-100 20/20W Multi- grade 10/30	B.P. Energol-Visco- Static 10/30	Castrolite	Mobiloil Special 10/30	Essolube 20 HD or Esso Extra 20/30
Transmission Case, Steering Gear	Dentax 90	Energol SAE 90	Castrol ST	Mobilube C90	Esso Gear Oil 90
Front Axle, Tie Rod Ends, Front Wheel Bearings, Brake Cables, Pedal Bearing, Gear Shift Lever, Ignition Distributor Cam Door and Hood Locks	Retinax A	Energrease L2	Castrolease CL	Mobilgrease Ml'	Esso Multi-Purpose Grease H

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