X1/9 1979 - 1982
SERVICE MANUAL

FIAT

FIAT X1/9

Service Manual

FIAT MOTORS OF NORTH AMERICA, INC.

PRODUCED

BY

FIAT MOTORS OF NORTH AMERICA, INC.
PUBLICATIONS AND TECHNICAL TRAINING DEPT.

The descriptions and illustrations appearing in this book are not binding. Fiat reserves the right to make at any time any changes or modifications to the characteristics of the automobile without necessarily bringing this book up-to-date.

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FOREWORD

This manual has been written to provide basic information for the proper servicing of the X1/9 models.

The information is grouped in sections. Each section is identified by two-digit numbers. Each section covers the service procedures for the individual groups and sub-groups. They are identified by a number. The root of the number is taken from the general sub-group code now being used for the Parts Catalogue and the Service Time Schedule. This number identifies the service time schedule operation, parts catalogue sheet for the part covered by the service procedure, and the service procedure.

HOW TO USE THE MANUAL

The information identification number consists of five digits, as follows:

a) The first two digits identify the section.

b) The third designates the group within the section and is used in conjunction with the first two.

c) The last two digits indicate an assembly or task consisting of several parts. This number identifies the sub-group. It refers to the sub-group in both the Parts Catalog and the Service Time Schedule.

Find the information required as follows:

1) Find the tab index page for the information on the first page of the manual.

2) Find the group and sub-group for the information on the table of contents.

UPDATING THE MANUAL

– Revision sheets are supplied together with a revised "Composition of the Manual" sheet.

– Revision sheets can be of two types:

1) Replacement sheets: In this case the new sheet will carry the same page number as the old one. A notation in the bind margin will read Supersedes page . . . dated . . . "

2) Complementary sheets on topics already dealt with: In this case the additional sheet will carry the same sub-group number as the sheet on which the topic has been first dealt with. The page number will be followed by a letter suffix.

Example: If additional information is needed for information on page 2, the new sheet will be 2A.

FIAT

X1/9

SERVICE MANUAL

CONTENTS

X1/9 1979 - 1982
SERVICE MANUAL

GENERAL INFORMATION - MAINTENANCE - 00

X 1/9

IDENTIFICATION DATA

Chassis Type and Identification Number - Punched on cowl on right side of front luggage compartment (above battery box).

F.M.V. Safety Standard 115 Tag - Type of vehicle and chassis number. Located on left panel top between instrument cluster and windshield.

Chassis Plate - Located on right side of front luggage compartment.

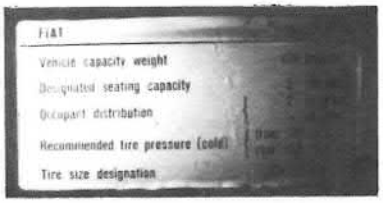
F.M.V. Safety Standard Conformity Tag - Month and year of manufacture, gross vehicle weight rating, gross axle weight rating, chassis number and vehicle type. Located on left door jamb.

Vehicle Emission Control Information Label - Located on left door jamb.

E.P.A. Regulations Conformity Tag - Air pollution control specifications for correct engine tune-up and adjustments. Located in engine compartment on left side.

Engine Type and Identification Number - Punched on crankcase, flywheel side.

F.M.V. Safety Standard 110 Tag - Tire data and vehicle capacity. Located on right door jamb.



TUNE-UP SPECIFICATIONS (VEHICLES WITH CARBURETOR)

Valve clearance (engine cold):		
— Intake	0.011 to 0.014 in. (0.28 to 0.35 mm)	
— Exhaust	0.015 to 0.018 in. (0.38 to 0.46 mm)	
Fuel pump pressure at 4000 rpm	3.5 to 4.3 psi	
Spark plugs:	**Normal**	**Resistor**
— Type ..... AC	42XLS	R42XLS
..... Bosch	W175T30	W175TR30
..... Champion	N9Y	RN9Y
..... Marelli	CW7LP	CW7LPR
— Gap	0.023 to 0.027 in. (0.6 to 0.7 mm)	0.027 to 0.031 in. (0.7 to 0.8 mm)
Ignition timing	5° BTDC at 800 to 850 rpm	
Distributor advance:		
— Centrifugal	23° to 27° at 5500 rpm	
— Total (ignition timing and centrifugal)	28° to 32° at 5500 rpm	
— Vacuum		
with air pump	16° to 18° at 12 in. Hg	
without air pump	26° to 30° at 12 in. Hg	
Idle speed (1)	800 to 900 rpm	
CO level (at idle) (1)	1.0 to 2.0%	

(1) Idle speed and CO must be checked and adjusted with hose to reed valve or check valve pinched off.

TUNE-UP SPECIFICATIONS (VEHICLES WITH FUEL INJECTION)

Valve clearance (engine cold):	
— Intake	0.011 to 0.014 in. (0.28 to 0.35 mm)
— Exhaust	0.015 to 0.018 in. (0.38 to 0.46 mm)
Fuel pump pressure	39 to 45 psi (2.7 to 3.2 bar)
Spark plugs:	
— Type	Champion RN9Y
— Gap	0.027 to 0.031 in. (0.7 to 0.8 mm)
Ignition timing	10° BTDC at 800 to 850 rpm
Distributor advance:	
— Centrifugal	16° to 20° at 3500 rpm
— Total (ignition timing and centrifugal)	26° to 30° at 3500 rpm
— Vacuum	12° to 16° at 11 in. Hg
Idle speed	800 to 900 rpm
CO level (at idle)	0.5 to 0.9%

SPECIFICATIONS

ENGINE

Type:	
— Vehicles with carburetor	
with air pump	138AS.031
without air pump	138AS.040
— Vehicles with fuel injection	138BS.040
Arrangement	Mid transverse
Number of cylinders	Four
Bore	3.40 in. (86.4 mm)
Stroke	2.52 in. (63.9 mm)
Displacement	91.44 cu. in. (1498 cc)
Valve arrangement	Overhead valves. Single overhead camshaft driven by toothed timing belt.
Compression ratio	8.5 to 1
Horsepower rating, SAE net:	
— Vehicles with carburetor	
with air pump	66 at 5250 rpm
without air pump	67 at 5250 rpm
— Vehicles with fuel injection	75 at 5500 rpm
Torque rating, SAE net:	
— Vehicles with carburetor	
with air pump	76 ft. lbs. at 2500 rpm
without air pump	77 ft. lbs. at 2500 rpm
— Vehicles with fuel injection	80 ft. lbs. at 3000 rpm

CLUTCH

Type	Dry single plate, diaphragm spring, hydraulically controlled, with no pedal free travel.

TRANSMISSION

Gears	5 forward, 1 reverse	
Gear ratios to 1:	**1979-80**	**1981-82**
— First	3.583	3.583
— Second	2.235	2.235
— Third	1.454	1.461
— Fourth	1.042	1.033
— Fifth	0.863	0.863
— Reverse	3.714	3.714

DRIVING AXLE

Type	Combined with transmission. Helical-toothed cylindrical gears.
Final drive ratio	13/53 (4.077 to 1)
Power drive to rear wheels	By axle shafts connected to final drive and to wheels through constant-velocity ball joints.

BRAKES

Type	Disc brakes on all four wheels.
Brake discs:	
— Diameter	8.937 in. (227 mm)
— Original thickness	0.421 to 0.429 in. (10.7 to 10.9 mm)
— Minimum thickness after refacing	0.368 in. (9.35 mm)
— Minimum thickness from wear	0.354 in. (9 mm)
Hand brake for parking	Mechanical, acting on rear wheels.

STEERING

Type	Rack and pinion, breakaway column with two universal joints, twin equal length tie rods.
Steering wheel turns, lock to lock	3
Corresponding rack travel	4.6 in. (117 mm)
Turning circle diameter	32.5 ft. (9.9 m)
Front wheel toe-in, unladen	+3/32 to +5/64 in. (+2.5 to +6.0 mm)

FRONT SUSPENSION

Type	Independent, control arm, strut bar, knuckle pillar and strut assembly with integral shock absorber and coil spring.
Caster, unladen	+6°10′
Camber, unladen	0° to -1°

REAR SUSPENSION

Type	Independent, control arm, knuckle pillar and strut assembly with integral shock absorber and coil spring.
Camber, unladen	-0°45′ to -1°45′
Toe-in, unladen	+13/64 to +11/32 in. (+5.0 to +8.5 mm)

WHEELS AND TIRES

Wheel rim type	5J x 13 in.
Tires:	
— Type	165/70 SR 13 in.
— Inflation pressure: Front	29 psi (2.0 kg/cm²)
Rear	32 psi (2.2 kg/cm²)

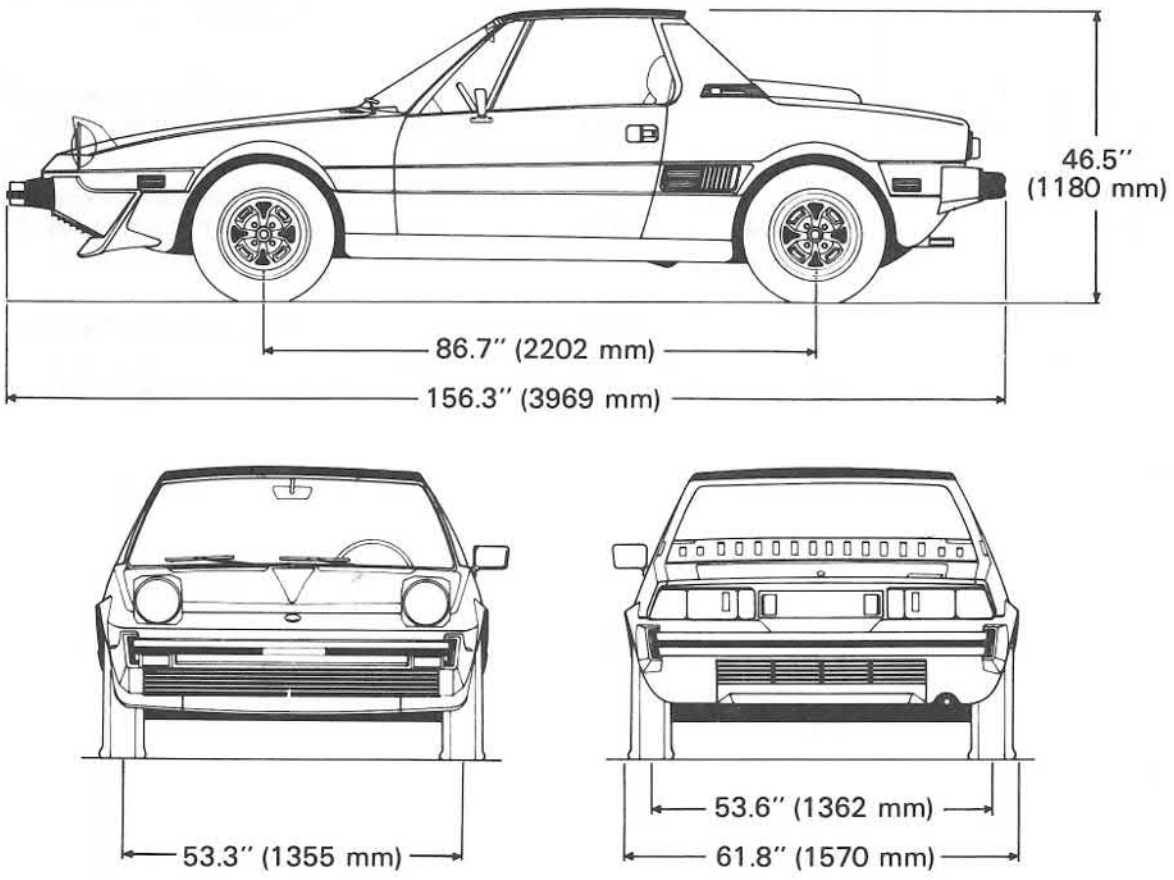
ELECTRICAL SYSTEM

Battery:	
— Voltage	12
— Capacity at 20 hr. discharge rate	60 Ah
Alternator:	
— Continuous current rating	
Bosch	65 amps
Marelli	55 amps
Voltage regulator:	
— Regulating voltage at 77°F (25°C)	13.8 to 14.2
Starter:	
— Type	Direct drive. Direct engagement by solenoid and freewheeling pinon.
— Power rating	
Bosch	0.8 kW
Marelli	0.9 kW
Ignition system:	
— Type	Bosch breakerless electronic
— Spark advance	Centrifugal and vacuum
— Pickup coil resistance	890 to 1285 ohms
— Ignition coil resistance at 68°F (20°C)	
primary	1.1 to 1.7 ohms
secondary	6,000 to 10,000 ohms
— Ballast resistor resistance	0.85 to 0.95 ohms

WEIGHTS

Curb weight:	
— Vehicles with carburetor	
with air pump	2130 lbs.
without air pump	2120 lbs.
— Vehicles with fuel injection	2130 lbs.
For air conditioning, add	80 lbs.
Seating capacity	2 persons
Carrying capacity	430 lbs.

DIMENSIONS



CAPACITIES

UNIT	QUANTITY lt	QUANTITY kg	QUANTITY U.S. Units	REFILL
Fuel tank	47	—	12.2 gals.	Unleaded gasoline with octane rating of at least 91 (Research Method)
Radiator, cylinder jackets and heating system	11.6	—	12.2 qts.	Use 50-50 antifreeze and water mixture
Engine sump and filter (1)	4.1	3.7	4.3 qts.	Low-ash content detergent oils – API Service SE to to MIL-L-46152
Transmission and Axle	3	2.7	3.2 qts.	SAE 90 oil (not EP) containing anti-wear additives
Steering box	0.140	0.127	5.3 ozs.	SAE 90 EP oil or lithium-base grease with molybdenum disulphide
Constant-velocity joints and boots (each)	—	0.100	3.2 ozs.	Lithium-base grease with molybdenum disulphide
Brake hydraulic system	0.440	0.440	1 pt.	DOT 3 Motor Vehicle Brake Fluid to F.M.V.S.S. No. 116
Clutch hydraulic system	0.180	0.180	6.4 ozs.	Same as brake system

(1) Total capacity including sump, filter and lines is 5 qts. (4.7 lt). Amount indicated in table is requirement for periodic oil changes.

X1/9 1979 - 1982
SERVICE MANUAL

ENGINE - 10

PARTS CATALOG, SERVICE MANUAL & SERVICE TIME SCHEDULE CODE

CYLINDER BLOCK-CON-RODS

DESCRIPTION	IN.	MM
Cylinder bore diameter Cylinder bores are graded into classes with 0.004" (0.01 mm) progression.	3.4015 to 3.4035	86.400 to 86.450
Auxiliary shaft bushing seats, diameters: –drive end –inside end	1.5236 to 1.5248 1.3794 to 1.3805	38.700 to 38.730 35.036 to 35.066
Crankshaft main bearing seat diameter	2.1459 to 2.1465	54.507 to 54.520
Length of rear main bearing seat between thrust ring seats	0.8716 to 0.8740	22.140 to 22.200
Big-end bearing housing diameter	1.9146 to 1.9152	48.630 to 48.646
Thickness of standard big-end bearing	0.0603 to 0.0606	1.531 to 1.538
Range of undersize big-end bearings for service	0.010, 0.020, 0.030, 0.040	0.254, 0.508, 0.762, 0.016
Big-end bearings: –fit clearance	0.0014 to 0.0034	0.036 to 0.086
Small-end bore diameter	0.9425 to 0.9438	23.939 to 23.972
Small-end bushing O.D.	0.9455 to 0.9465	24.016 to 20.041
Small-end bushing fit, interference	0.0017 to 0.0040	0.044 to 0.102
Small-end bushing ream bore, fitted Grade 1 Grade 2	0.8663 to 0.8664 0.8664 to 0.8665	22.004 to 22.007 22.007 to 22.010
Piston pin-small-end bushing fit: –clearance of new parts	0.0004 to 0.0006	0.010 to 0.016
Maximum misalignment between c/ls of connecting rod small-end and big-end: measured at 4.92" (125mm) from the shank	±0.0039	±0.10

PISTON – PINS – RINGS

DESCRIPTION	IN.	MM
Diameter of standard service pistons, measured at right angles to C/L of piston pin: –at 1.08" (27.5mm) from piston skirt edge		
Class A	3.3999 to 3.4003	86.360 to 86.370
Class C.	3.4007 to 3.4011	86.380 to 86.390
Class E.	3.4015 to 3.4019	86.400 to 86.410
Maximum difference in weight between pistons	±0.080z	±2.5g
Oversize piston range.	0.0079, 0.0157, 0.0236	0.2, 0.4, 0.6
Piston boss bore diameter		
Grade 1	0.8660 to 0.8661	21.996 to 21.999
Grade 2	0.8661 to 0.8662	21.999 to 22.002
Piston ring groove width		
Top groove	0.0604 to 0.0612	1.535 to 1.555
Center groove	0.0799 to 0.0807	2.030 to 2.050
Bottom groove	0.1562 to 0.1570	3.967 to 3.987
Standard piston pin diameter		
Grade 1	0.8658 to 0.8659	21.991 to 21.994
Grade 2	0.8659 to 0.8660	21.994 to 21.997
Oversize piston pin range for service	0.0079	0.2
Piston ring thickness		
–first: compression ring	0.0582 to 0.0587	1.478 to 1.490
–second: oil ring.	0.0779 to 0.0783	1.978 to 1.990
–third: oil ring with oilways and expander	0.1545 to 0.1553	3.925 to 3.947
Piston fit in bore, measured at right angle to pin, 1.08" (27.5mm) from piston skirt edge		
–clearance of new parts	0.0011 to 0.0019	0.030 to 0.050
Piston pin in boss: clearance of new parts	0.0001 to 0.0003	0.002 to 0.008
Piston ring fit (side clearance)		
–first: compression ring, clearance of new parts	0.0018 to 0.0030	0.045 to 0.077
–second: oil ring, clearance of new parts	0.0016 to 0.0028	0.040 to 0.072
–third: scraper ring, clearance of new parts	0.0011 to 0.0024	0.030 to 0.062
Ring end gap in bore:		
–first: compression ring	0.0118 to 0.0177	0.30 to 0.45
–second: oil ring.	0.0118 to 0.0177	0.30 to 0.45
–third: scraper ring.	0.0098 to 0.0157	0.25 to 0.40
Oversize piston ring range, for service	0.0079, 0.0157, 0.0236	0.2, 0.4, 0.6

CRANKSHAFT – MAIN BEARINGS

DESCRIPTION	IN.	MM
Main bearing journal standard diameter	1.9990 to 1.9997	50.775 to 50.795
Standard main bearing insert thickness	0.0722 to 0.0730	1.834 to 1.840
Main bearing inserts, for service	0.01, 0.02, 0.03, 0.04	0.254, 0.508, 0.762, 1.061
Crankpin standard diameter	1.7913 to 1.7920	45.498 to 45.518
Main bearing-to-journal fit: – clearance of new parts	0.0019 to 0.0037	0.050 to 0.095
Length of rear main bearing journal, shoulder-to-shoulder	1.0620 to 1.0640	26.975 to 27.025
Rear main bearing seat thrust ring thickness	0.0909 to 0.0929	2.310 to 2.360
Thickness of oversize thrust rings	0.0959 to 0.0979	2.437 to 2.487
Crankshaft end play, thrust ring installed: – clearance of new parts	0.0021 to 0.0104	0.055 to 0.265
Max. misalignment of main bearing journals	0.0012*	0.03*
Max. misalignment of crankpins to main bearings journals	±0.014	±0.35
Max. out-of-round of crankshaft journals and crankpins, after grinding	0.0002	0.005
Max. taper of crankpins and journals, after grinding	0.0002	0.005
Squareness of flywheel resting face to crankshaft centerline: – Max. allowable tolerance with dial indicator set laterally at a distance of about 1 11/32" (34mm) from crankshaft rotation axis	0.0010	0.025
Flywheel: – parallel relationship of driven plate face to crankshaft mounting face: max. allowable tolerance	0.0039	0.10
– squareness of above faces to rotation axis: max. allowable tolerance	0.0039	0.10

*Total indicator reading

CYLINDER HEAD

DESCRIPTION	IN.	MM
Valve position	Overhead, inclined 18°	
Operation	Single ohc	
Drive	Toothed belt	
Valve guide bore	0.5492 to 0.5499	13.950 to 13.970
Outside diameter of valve guide	0.5527 to 0.5534	14.040 to 14.058
Valve guide oversize on O.D., for service	0.0079	0.2
Inside diameter of valve guides, fitted in cylinder head	0.3158 to 0.3165	8.022 to 8.040
Valve guide fit in head: – interference	0.0025 to 0.0043	0.063 to 0.108
Valve stem diameter	0.3139 to 0.3146	7.974 to 7.992
Valve stem fit in valve guide: – clearance of new parts	0.0012 to 0.0026	0.030 to 0.066
Valve seat angle in cylinder head	45° ±5′	
Valve face angle	45° 30′ ±5′	
Valve head diameter		
intake	1.4173	36
exhaust	1.3031	33.1
Width of valve seats in cylinder head (contact surface): – intake and exhaust, about	0.0787	2
Inside diameter of valve seats in cylinder head		
intake	1.1811	30
exhaust	1.0531	26.75
Lift on C/L of valve (without play)		
intake	0.3622	9.2
exhaust	0.3641	9.25
Diameter of tappet bores in head	1.4567 to 1.4577	37.000 to 37.025
Outside diameter of tappets	1.4557 to 1.4565	36.975 to 36.995
Fit clearance between tappets and bores in head	0.0002 to 0.0020	0.005 to 0.050
Thickness of cap plates	0.1456 to 0.1850 (in 0.0019 progressions)	3.70 to 4.70 (in 0.05 progressions)

VALVE SPRINGS

	INNER SPRING	OUTER SPRING
Valve spring installed height (A) under a load of 85.7 lbs (38.9 kg)	–	1.417 in (36 mm)
Valve spring installed height (A) under a load of 32.8 lbs (14.9 kg)	1.220 in (31 mm)	–
Valve spring installed height under a load of 131 lbs (59.5 kg)	–	1.043 in (26.5 mm)
Valve spring installed height under a load of 62 lbs (28.1 kg)	.846 in (21.5 mm)	–
Minimum permissible load, referred to height (A)	29.5 lbs (13.5 kg)	79 lbs (36 kg)

VALVE MECHANISM – CAMSHAFT

DESCRIPTION	IN.	MM
Diameter of bearing bores in head:		
– drive end	1.1807 to 1.1816	29.989 to 30.014
– intermediate, drive side	1.8890 to 1.8900	47.980 to 48.005
– middle	1.8968 to 1.8976	48.180 to 48.205
– intermediate, flywheel side	1.9047 to 1.9057	48.380 to 48.405
– flywheel end	1.9126 to 1.9136	48.580 to 48.605
Diameter of camshaft journals:		
– drive end	1.1787 to 1.1795	29.944 to 29.960
– intermediate, drive side	1.8872 to 1.8878	47.935 to 47.950
– middle	1.8951 to 1.8957	48.135 to 48.150
– intermediate, flywheel side	1.9030 to 1.9035	48.335 to 48.350
– flywheel end	1.9108 to 1.9114	48.535 to 48.550
Fit between bores in head and camshaft journals: – fit clearance	0.0012 to 0.0028	0.030 to 0.070
Cam lift: – Inlet	0.362	9.2
– Exhaust	0.364	9.25
Valve clearance:		
– Inlet opens	12° B.T.D.C.	
– Inlet closes	52° A.B.D.C.	
– Exhaust opens	52° B.B.D.C.	
– Exhaust closes	12° A.T.D.C.	

VALVE MECHANISM – TAPPETS

Standard tappet bore diameter		1.417 to 1.418	37.000 to 37.025
Standard tappet O.D.		1.456 to 1.457	36.975 to 36.995
Tappet fit clearance		0.0001 to 0.0019	0.005 to 0.050
Shim thickness		0.146 to 0.185 in 0.002 steps	3.70 to 4.70 in 0.05 steps
Valve clearance			
– for checking valve timing	Inlet	.024	0.60
	Exhaust	.027	0.65
– for general operation adjusted cold	Inlet	.011 to .014	0.28 to 0.35
	Exhaust	.015 to .018	0.38 to 0.46

AUXILIARY SHAFT

DESCRIPTION	IN.	MM
Diameter of bushing bores in crankcase:		
– drive end	1.5236 to 1.5248	38.700 to 38.730
– inside end	1.3794 to 1.3805	35.036 to 35.066
Inside diameter of bushings finished in bores:		
– drive end	1.4041 to 1.4049	35.664 to 35.684
– inside end	1.2598 to 1.2606	32.000 to 32.020
Diameter of shaft journals:		
– drive end	1.4013 to 1.4023	35.593 to 35.618
– inside end	1.2575 to 1.2583	31.940 to 31.960
Fit between bushings and bores in crankcase	interference fit at all times	
Fit between bushings and shaft journals:		
– fit clearance		
drive end	0.0017 to 0.0036	0.044 to 0.091
inside end	0.0016 to 0.0031	0.040 to 0.080

FUEL SYSTEM (VEHICLES WITH CARBURETOR)

Carburetor

Type	2-barrel downdraft with vacuum controlled secondary, mechanical and vacuum accelerator pumps, and an automatic choke
Float level	0.266 to 0.285 in. (6.75 to 7.25 mm)

Fuel Pump

Type	Mechanical
Capacity equal to or greater than	19.8 gal./hr. (75 L/hr.)
Control lever stroke	0.098 in. (2.5 mm)
Fuel pressure at 4000 RPM	3.5 to 4.3 psi

FUEL SYSTEM (VEHICLES WITH FUEL INJECTION)

Fuel Injection System

Type	Bosch L-Jetronic with Lambda sensor
System test pressure	33 to 39 psi (2.3 to 2.7 bar)

Fuel Pump

Type	Electric
Fuel pressure	39 to 45 psi (2.7 to 3.2 bar)

LUBRICATION

Oil Pump	
Type	gear
Pump Drive	by auxiliary shaft
Oil pressure relief valve	built into oil pump
Clearance between gears upper side and cover mating face	0.0008 to 0.0041 in. (0.020 to 0.105 mm)
Clearance between gears and pump housing inside wall	0.004 to 0.007 in. (0.11 to 0.18 mm)
Play between drive and driven gears	0.0059 in. (0.15mm)
Full flow oil filter with by-pass	disposable cartridge type
Low oil pressure indicator sending unit	electric
Oil pressure at 212° F (100° C)	49.7 to 71 psi (3.5 to 5 kg/cm²)

COOLING SYSTEM

Water Pump	
Type	centrifugal, vane type
Pump Drive	Vee belt
Fit between impeller vanes and pump housing	0.031 to 0.051 in. (0.8 to 1.3mm)
Radiator cooling fan drive	electric motor
Cooling fan control	radiator mounted temperature switch
cut-in temperature	92 ± 2° C (198° F)
cutout	87 ± 2° C (189° F)
Thermostat	
– begins opening at	172.4° to 183.2° F (78° to 84° C)
– maximum opening at	194° to 201° F (90° to 94° C)
– travel of valve	0.295 in (7.5mm)
Water temperature indicator	electric (gauge)
Radiator cap valve opening pressure	11 psi (0.8 kg/cm²)
Radiator overflow recovery	plastic expansion tank

TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N·m	Kgm	Ft. Lb.
ENGINE				
Bolt, main bearing cap	M 10 x 1.25	80	8.2	59
Bolt, engine breather	M 8	24.4	2.5	18
Bolt, cylinder head to crankcase				
— 19 mm hex	M 12 x 1.25	See torque procedure on pg. 10-48		
— 17 mm hex	M 10 x 1.25	See torque procedure on pg. 10-51		
Nut, cylinder head to crankcase stud	M 12 x 1.25	93	9.5	69
Bolt, cylinder head extension to cylinder head	M 8	20	2	14
Nut, intake and exhaust manifold to cylinder head	M 8	27	2.8	20
Nut, connecting rod bolt	M 9 x 1	51	5.2	38
Bolt, self-locking, flywheel to crankshaft	M 10 x 1.25	83	8.5	61
Bolt, camshaft sprocket	M 10 x 1.25	83	8.5	61
Nut, bearing to belt tensioner support	M 10 x 1.25	44	4.5	33
Bolt, oil pump shaft drive gear	M 10 x 1.25	83	8.5	61
Nut, drive pulley on crankshaft	M 20 x 1.5	137	14	101
Bolt, alternator lower support to crankcase	M 10 x 1.25	49	5	36
Nut, alternator to lower support	M 10 x 1.25	49	5	36
Nut, self-locking nylon lined, alternator to upper support	M 10 x 1.25	49	5	36
Bolt, air pump to support	M 9	29	3	22
Bolt, air pump support to cylinder head extension	M 8	29	3	22
Bolt, water pump to crankcase	M 8	29	3	22

DESCRIPTION	THREAD	TORQUE FIGURE N·m	Kgm	Ft. Lb.
Bolt, A/C compressor support to crankcase	M 10 x 1.25	49	5	36
Bolt, front bracket to A/C compressor	M 10 x 1.25	49	5	36
Bolt, rear bracket to A/C compressor	M 10 x 1.25	49	5	36
Spark plugs	M 14 x 1.25	37	3.8	27
ENGINE MOUNTS				
Bolt, crosspiece to body	M 10 x 1.25	59	6	43
Bolt, rubber mount to engine	M 8	14.5	1.5	11
Bolt, rubber mount to transmission	M 8	24.4	2.5	18
Nut, rubber mount to transmission	M 8	24.4	2.5	18
Bolt, rubber mount to crosspiece	M 8	24.4	2.5	18
Bolt, engine reaction rod	M 8	24.4	2.5	18

REMOVAL AND INSTALLATION
(Vehicles with Carburetor)

NOTE: Engine and transmission are removed as an assembly through bottom of engine compartment.

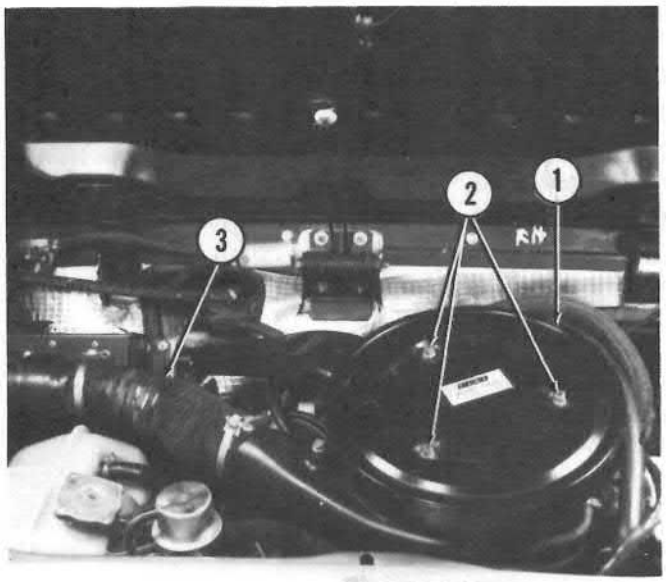
Loosen fuel cap. Remove cap from expansion tank. Drain cooling system.

Loosen clamp holding fresh air duct (3) to fan.

Disconnect hoses from side of air cleaner (1). Remove three nuts (2) and washers holding cover on air cleaner.

Remove four nuts holding air cleaner on carburetor. Lift air cleaner, disconnect hose from bottom and remove air cleaner with fresh air duct.

1. Air cleaner 2. Nuts 3. Fresh air duct



NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

Disconnect battery ground cable.

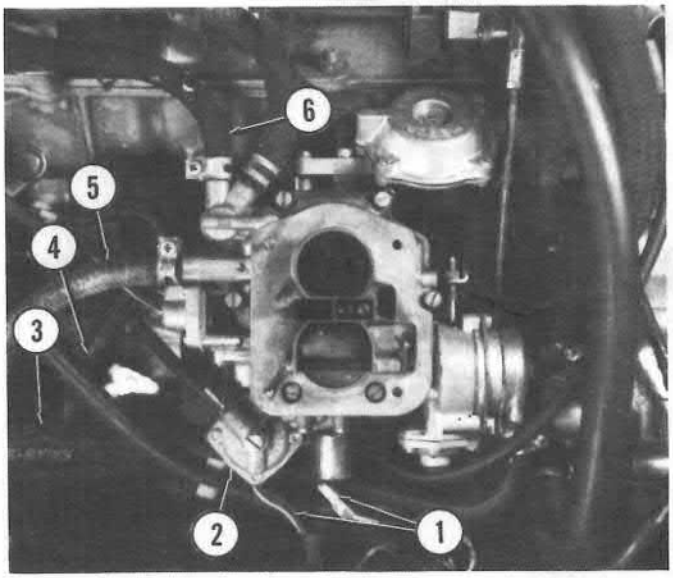
Disconnect fuel return hose (6) and charcoal canister hose (5) from carburetor.

On vehicles with air conditioning, disconnect hose from fast idle valve (2) and unplug compressor clutch wire connector.

Disconnect wires (1) from idle shut-off solenoid and carburetor fan thermoswitch.

Disconnect gulp valve and charcoal canister hoses (3 and 4) from intake manifold.

1. Wires 2. Fast idle valve 3. Hose 4. Hose 5. Hose 6. Fuel hose



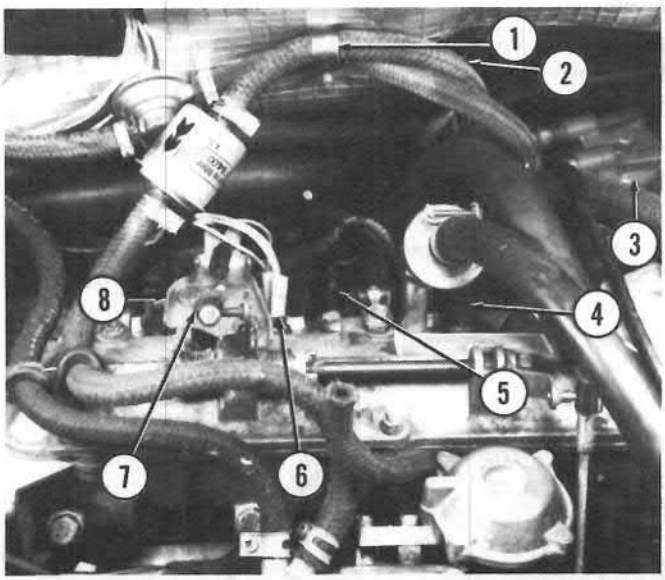
Remove clamp (1) holding fuel hoses to firewall and separate from firewall.

Disconnect fuel inlet hose (2) from fuel pump. Remove distributor cap (3) and rotor.

Disconnect distributor wire connector at distributor. Disconnect wires from gulp valve thermoswitch (6), coolant temperature sending unit (4), and oil pressure sending unit (5).

Disconnect throttle cable by removing spring clip (7) at end of cable and "E" ring at base of bracket (8).

1. Clamp 2. Fuel inlet hose 3. Distributor cap
4. Coolant temperature sending unit 5. Oil pressure sending unit
6. Gulp valve thermoswitch 7. Spring clip 8. Bracket



Loosen clamps and remove coolant hoses (8 and 10) from housing (11).

Disconnect coolant hose (1) at union.

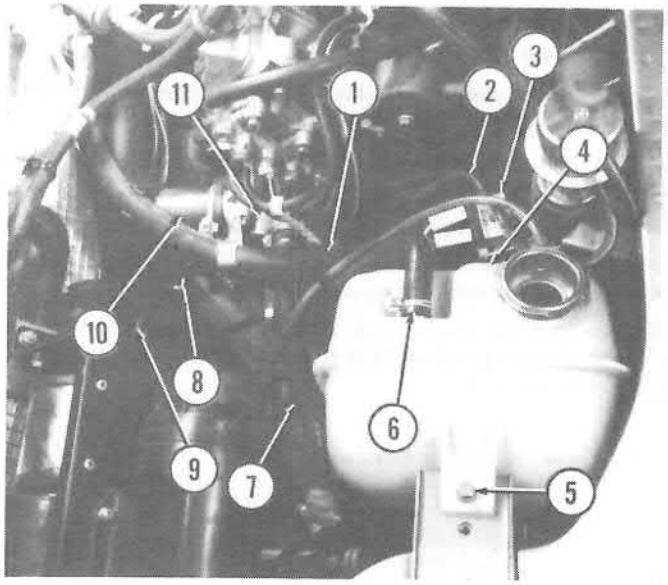
Disconnect two expansion tank hoses (6 and 7) at housing.

Remove bolt (5) and two nuts holding expansion tank (4) and remove tank.

Unplug reverse light switch wire (9) at connector.

Disconnect vacuum hose (2) from electrovalve (3). On air conditioned vehicles, disconnect fast idle electrovalve vacuum hose from vacuum tree.

1. Coolant hose 2. Vacuum hose 3. Electrovalve 4. Expansion tank 5. Bolt 6. Hose 7. Hose 8. Coolant hose 9. Wire 10. Coolant hose 11. Housing



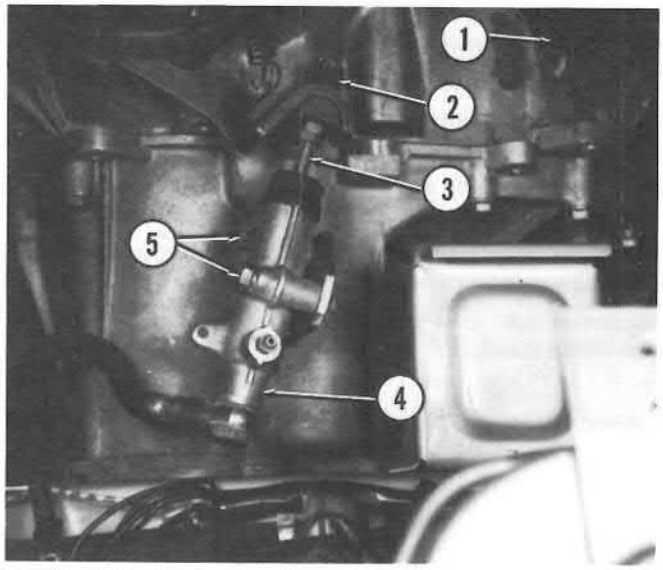
Hold spring (2) compressed and remove cotter pin, spring, and remaining washer from end of operating cylinder rod (3).

Remove two bolts (5) holding cylinder (4) to support plate. Move cylinder out of way.

Disconnect speedometer drive (1) from transmission.

Disconnect wires from starter.

1. Speedometer drive 2. Spring 3. Cylinder rod 4. Operating cylinder 5. Bolts



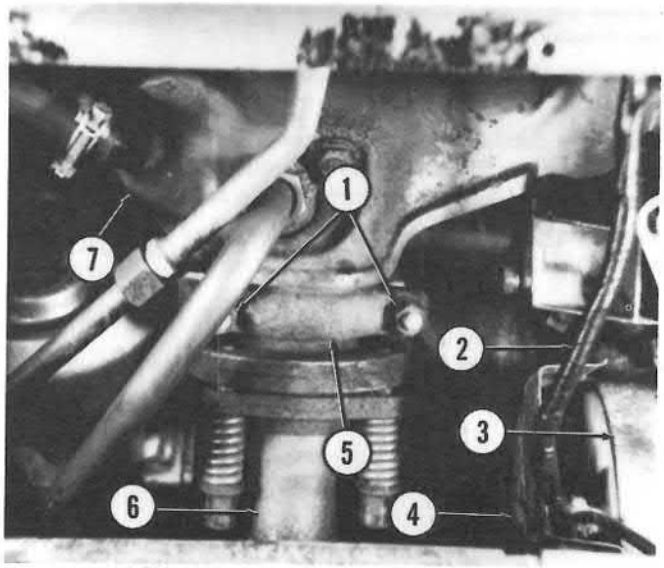
Remove rear access panel from inside trunk.

Remove two nuts (1) and clamp (5) attaching exhaust pipe (6) to manifold (7).

Remove shield (4) from end of alternator (3).

Remove nut and cable (2) from alternator and unplug charge indicator wire connector.

1. Nuts 2. Cable 3. Alternator 4. Shield 5. Clamp 6. Exhaust pipe 7. Manifold

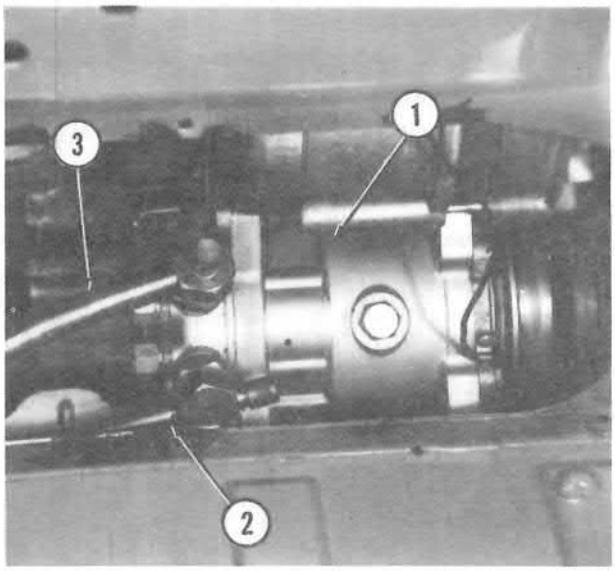


On vehicles with air conditioning, discharge system by slowly bleeding freon to prevent excessive loss of system oil.

WARNING: Wear safety glasses. Do not discharge freon near open flame, a toxic gas may result.

Disconnect high and low pressure lines (2 and 3) from compressor (1). Cap open hoses and fittings.

1. Compressor 2. Line 3. Line

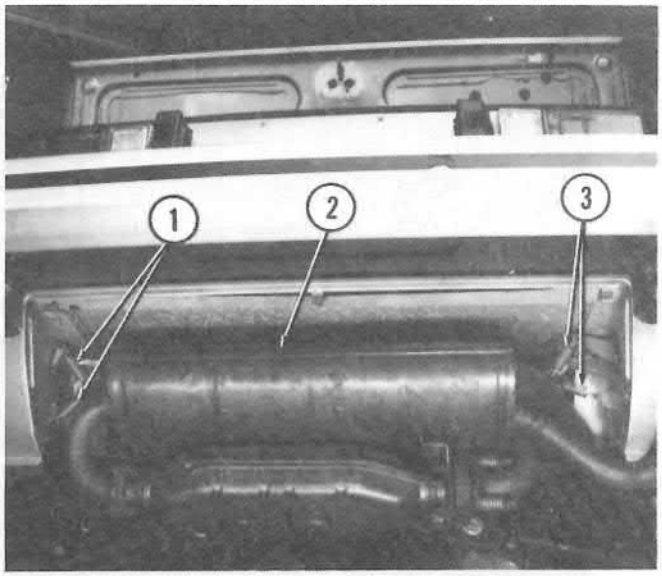


Raise and support rear of vehicle. Remove rear wheels.

Remove six screws and four bolts retaining rear grille assembly and remove rear grille assembly.

Disconnect six springs (1 and 3) supporting muffler (2) and lower complete exhaust system from vehicle.

1. Springs 2. Muffler 3. Springs



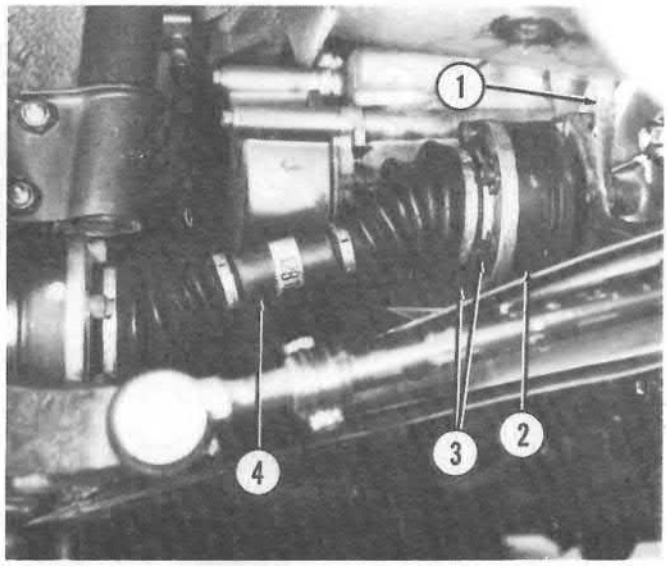
Disconnect ground strap (1) from chassis.

Remove six Allen head bolts (3) from transmission end of left side half-shaft (4).

Repeat above procedure to disconnect right side half-shaft from transmission.

NOTE: Discard Allen bolts and replace with new ones for installation. Torque to 31 ft. lbs. (4.3 kgm).

1. Ground strap 2. Inner CV joint 3. Allen bolts 4. Half-shaft



Remove three protective shields (6 and 15).

Remove two bolts (9) holding transmission link (7) to selector rod (10).

Loosen bolt (5) at transmission end of transmission link. Swing link out of way.

Remove two brake cable support brackets (14) from front control arm brackets (12).

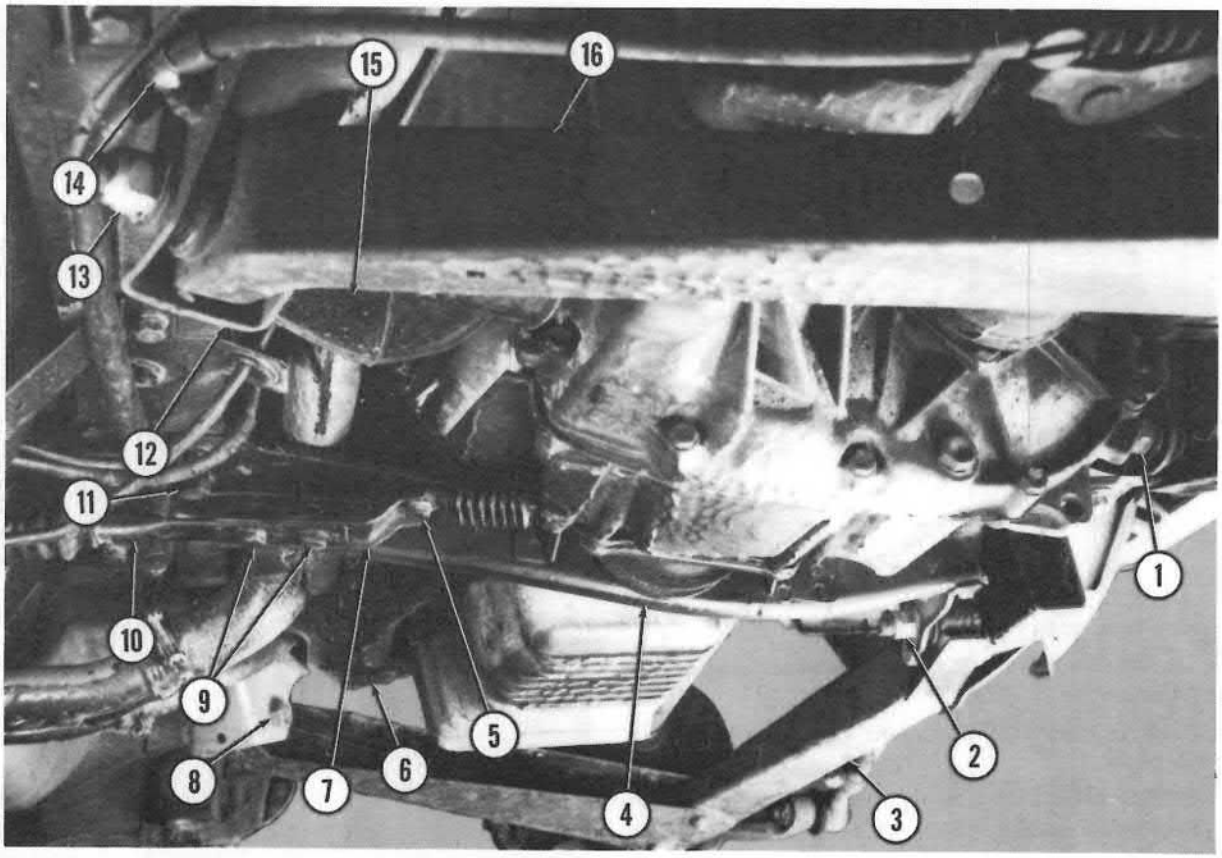
Remove four control arm nuts (1, 2 and 13) and bolts (8), noting number and position of shims between control arms (3 and 16) and mounting brackets. Swing control arms downward and out of their brackets.

NOTE: Suspension assemblies may be removed completely by removing brake calipers and nuts securing strut assemblies at top.

Attach a lift sling A.60592 to engine/transmission lifting eyes and lift slightly.

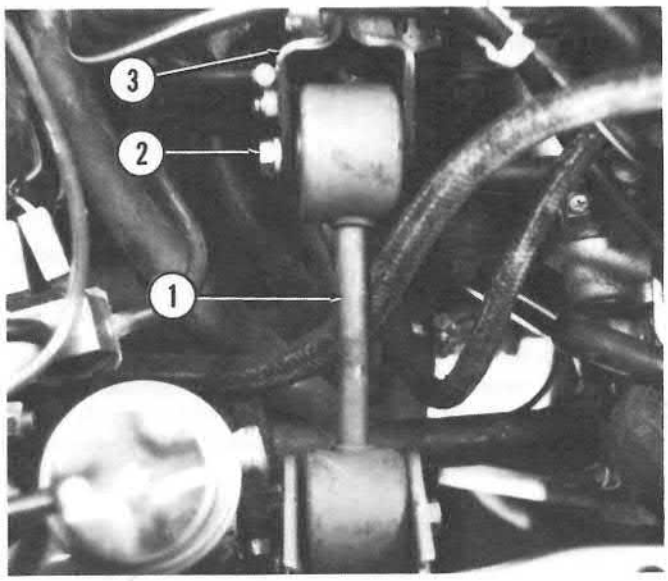
Remove four bolts (11) holding crosspiece (4).

1. Nut 2. Nut 3. Control arm 4. Crosspiece 5. Bolt 6. Shield 7. Link 8. Bolt 9. Bolts 10. Rod 11. Bolt 12. Bracket 13. Nut 14. Bracket 15. Shield 16. Control arm



Remove through bolt (2) holding reaction rod (1) to bracket (3) on engine.

1. Reaction rod 2. Bolt 3. Bracket



Remove coolant hose (1) from water pump.

Remove through bolt (3) holding front engine mount (2).

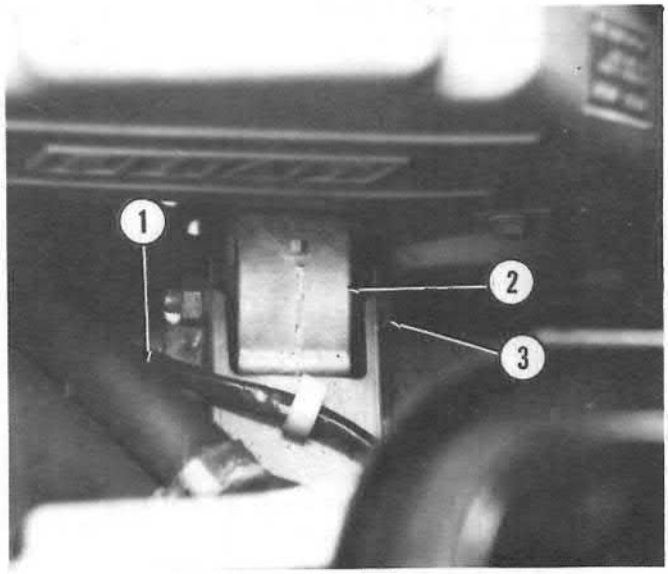
Raise vehicle slightly and rock engine/transmission assembly to clear front engine mount.

Carefully raise vehicle while supporting engine/transmission assembly. Slide assembly out from under vehicle.

Install engine in reverse order of removal. Tighten all nuts and bolts to specifications.

Refill cooling system to proper level and check all lines and hoses for tightness.

1. Coolant hose 2. Engine mount 3. Bolt



REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

NOTE: Engine and transmission are removed as an assembly through bottom of engine compartment.

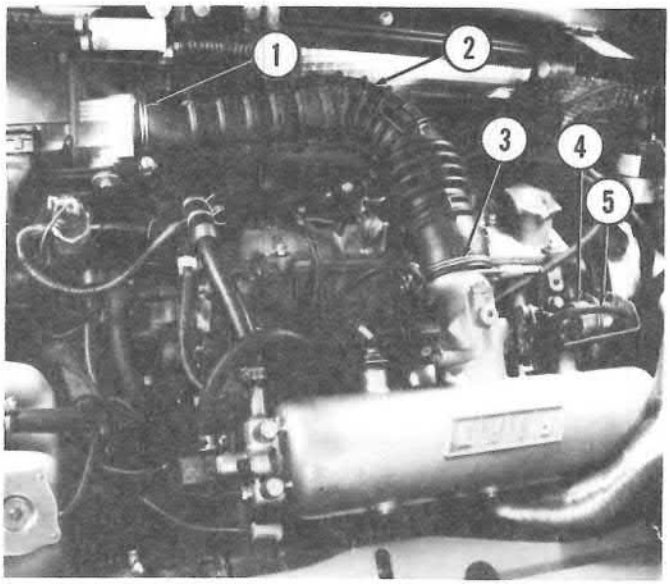
Disconnect battery ground cable.

Loosen fuel cap. Remove cap from expansion tank. Drain cooling system.

Loosen clamps (1 and 3) and remove air supply hose (2) after disconnecting attached vacuum hoses.

Plug openings to prevent dirt from entering.

CAUTION: Relieve fuel system pressure before disconnecting fuel lines. To do this, remove vacuum hose (5) from fuel pressure regulator (4). Connect vacuum pump to regulator and pump vacuum up to 20 inches.

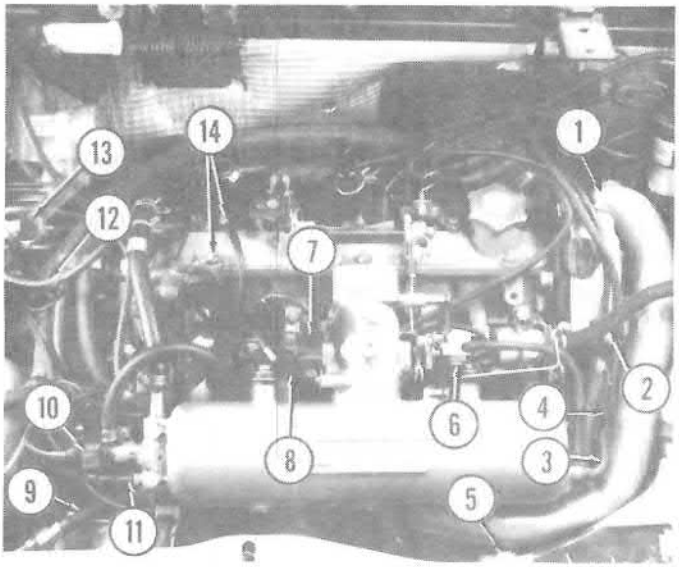


1. Clamp 2. Air supply hose 3. Clamp 4. Fuel pressure regulator
5. Vacuum hose

NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

Disconnect the following electrical connectors: cold start valve (10), ground points (14), throttle switch (7), fuel injectors (8), voltmeter (4), fuel injector fan thermoswitch (6) and, on vehicles with air conditioning, compressor clutch (5). (5).

Also disconnect charcoal canister vacuum hose (11), fuel inlet hose (9), alternator cooling duct (1), fuel return hose (2) and, on vehicles with air conditioning, fast idle electrovalve (13) vacuum hose (12) and vacuum source hose (3).



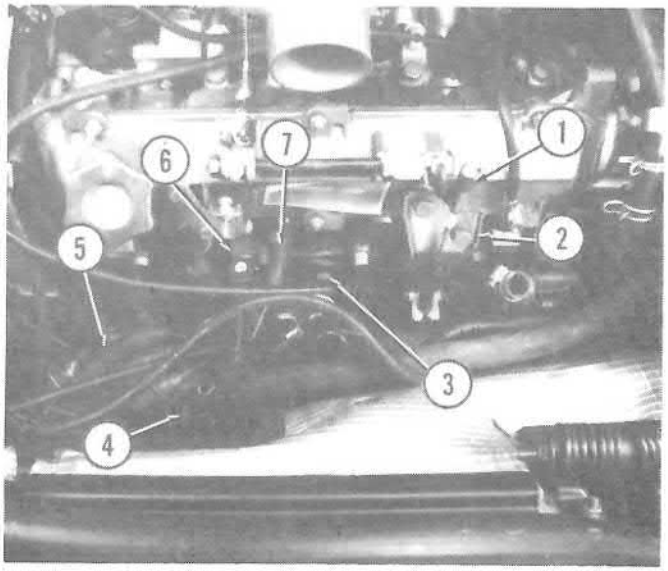
1. Cooling duct 2. Fuel hose 3. Vacuum hose
4. Voltmeter connector 5. Compressor clutch connector
6. Thermoswitch 7. Throttle switch 8. Fuel injector
9. Fuel inlet hose 10. Cold start valve 11. Vacuum hose
12. Vacuum hose 13. Fast idle electrovalve 14. Ground points

Disconnect throttle cable by removing spring clip (1) at end of cable and "E" ring at base of bracket (2).

Disconnect connectors from oil pressure sending unit (3), coolant temperature sending unit (7) and thermotime switch (6).

Remove distributor cap (5) and rotor. Disconnect distributor wire (4) at distributor.

Disconnect wires from starter.



1. Clip 2. Bracket 3. Oil pressure sending unit 4. Distributor wire
5. Distributor cap 6. Thermotime switch
7. Coolant temperature sending unit

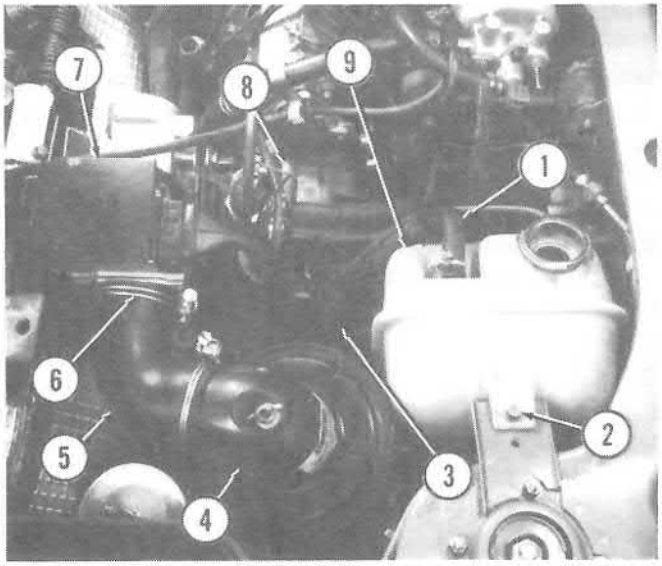
Disconnect two expansion tank hoses (1 and 3) at housing (8).

Remove bolt (2) and two nuts holding expansion tank (9) and remove tank.

Loosen air cleaner hose clamp (6) at air flow sensor (7).

Remove two nuts holding air cleaner to body and remove air cleaner (4) with hose (5).

1. Hose 2. Bolt 3. Hose 4. Air cleaner 5. Hose 6. Clamp
7. Air flow sensor 8. Housing 9. Expansion tank



Unplug reverse light switch wire connector (6).

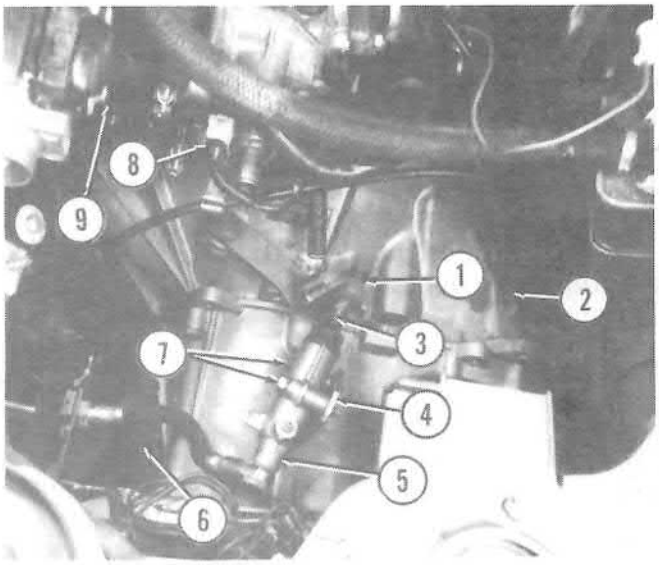
Disconnect coolant temperature sensor connector (8) and auxiliary air regulator connector (9).

Hold spring (1) compressed and remove cotter pin, spring, and remaining washer from end of operating cylinder rod (3).

Remove two bolts (7) holding cylinder (5) to support plate (4). Move cylinder out of way.

Disconnect speedometer drive (2) from transmission.

1. Spring 2. Speedometer drive 3. Cylinder rod 4. Support plate
5. Cylinder 6. Connector 7. Bolts
8. Coolant temperature sensor connector
9. Auxiliary air regulator connector

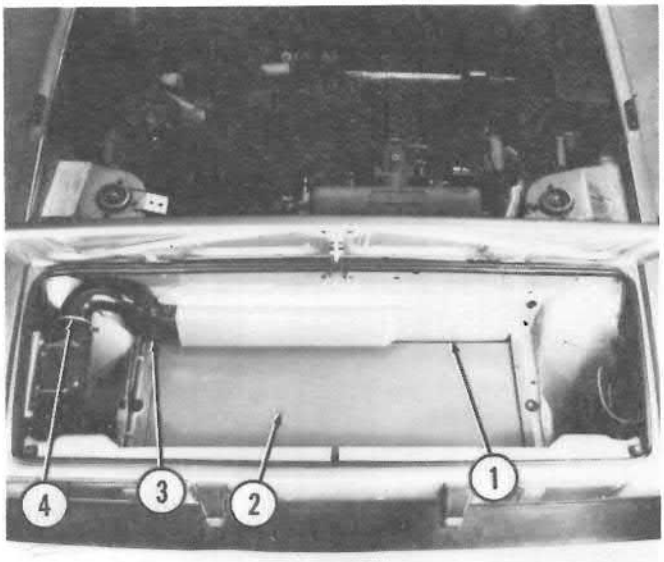


From inside trunk, remove floor mat. Remove three screws retaining insulation panel and remove insulation panel.

Remove four screws holding floor panel (2). Remove floor panel.

Remove 10 screws holding access panel (1). Loosen clamp (4) on cooling duct (3), and remove access panel complete with duct.

1. Access panel 2. Floor panel 3. Cooling duct 4. Clamp



Unplug Lambda sensor connector (6) and remove Lambda sensor (4) from exhaust pipe.

Remove three nuts (5) attaching exhaust pipe to manifold (7).

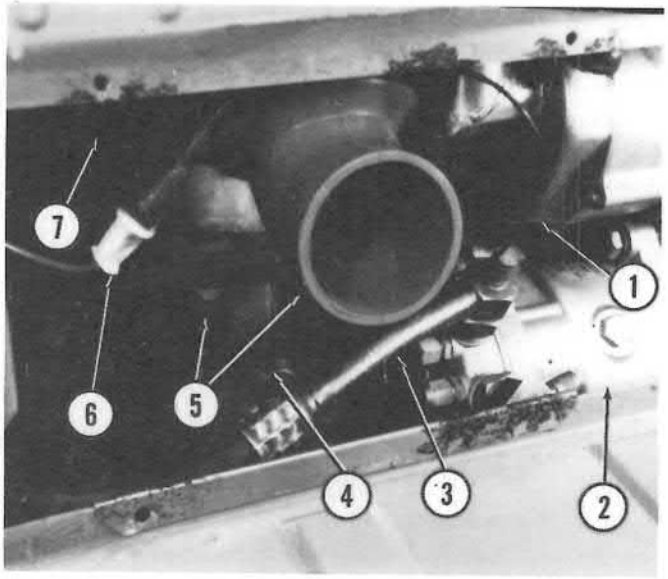
Remove shield (1) from end of alternator. Remove nut and cable from alternator.

On vehicles with air conditioning, discharge system by slowly bleeding freon to prevent excessive loss of system oil.

WARNING: Wear safety glasses. Do not discharge freon near open flame, a toxic gas may result.

Disconnect high and low pressure lines (3) from compressor (2). Cap open lines and fittings.

1. Shield 2. Compressor 3. Line 4. Lambda sensor 5. Nuts
6. Connector 7. Manifold



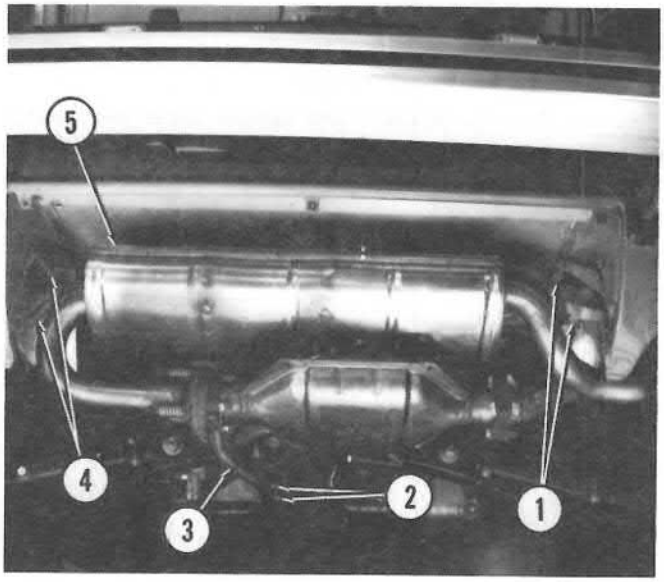
Raise and support rear of vehicle. Remove rear wheels.

Remove six screws and four bolts retaining rear grille assembly and remove grille assembly.

Remove two bolts (2) holding exhaust system support (3) to transmission bracket.

Disconnect six springs (1 and 4) supporting muffler (5) and lower complete exhaust system from vehicle.

1. Springs 2. Bolts 3. Support 4. Springs 5. Muffler



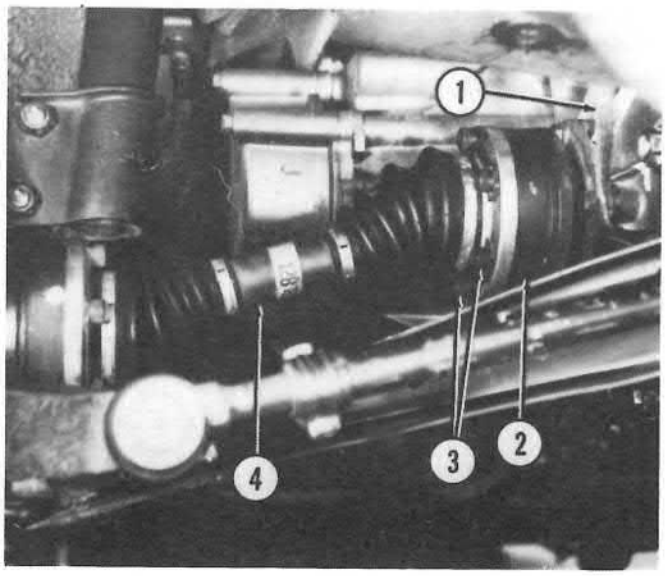
Disconnect ground strap (1) from chassis.

Remove six Allen head bolts (3) from transmission end of left side half-shaft (4).

Repeat above procedure to disconnect right side half-shaft from transmission.

NOTE: Discard Allen bolts and replace with new ones for installation. Torque to 31 ft. lbs. (4.3 kgm).

1. Ground strap 2. Inner CV joint 3. Allen bolts 4. Half-shaft



Remove two bolts holding protective shield under fuel pump and remove shield.

Remove three remaining protective shields (7).

Remove two bolts (8) holding transmission link to selector rod (9).

Loosen bolt (5) at transmission end of transmission link. Swing link out of way.

Remove two brake cable support brackets (13) from front control arm brackets (11).

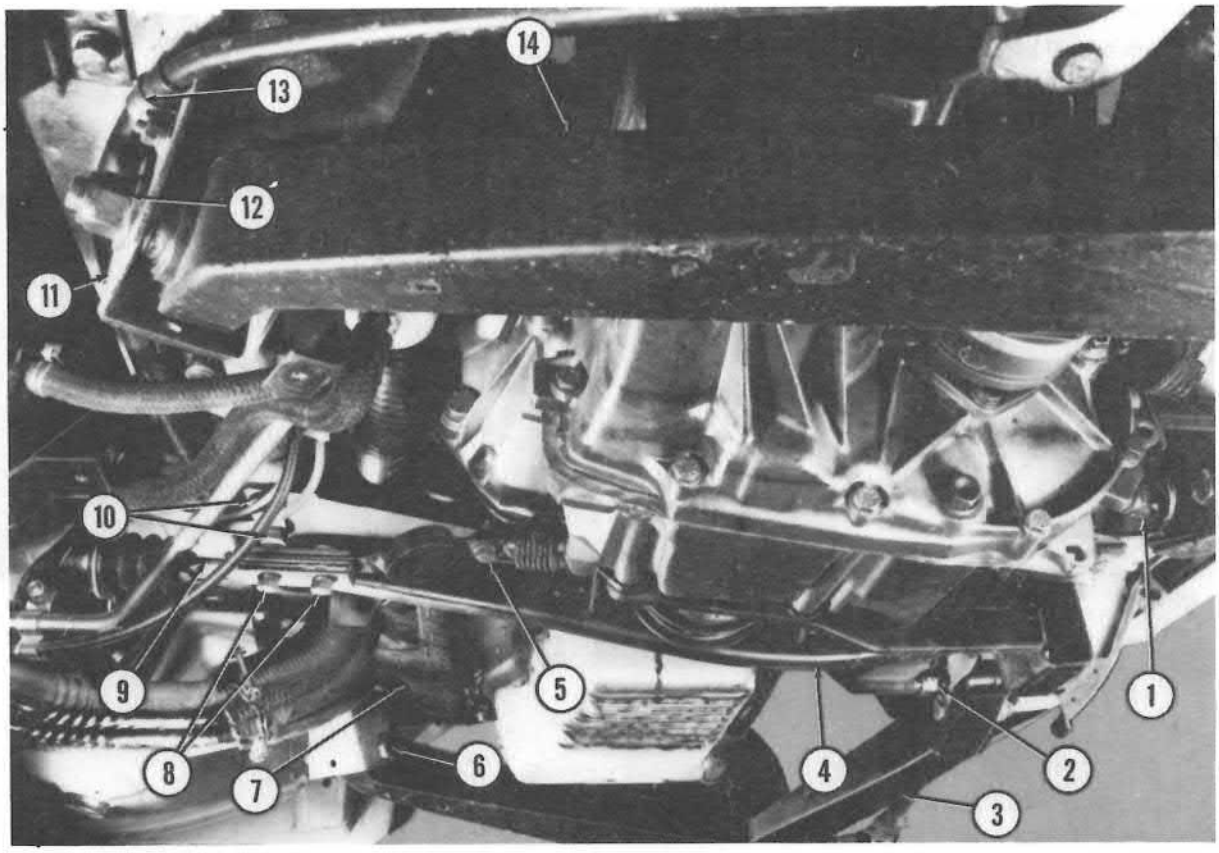
Remove four control arm nuts (1, 2 and 12) and bolts (6), noting number and position of shims between control arms (3 and 14) and mounting brackets. Swing control arms downward out of their brackets.

NOTE: Suspension assemblies may be removed completely by removing brake calipers and nuts securing strut assemblies at top.

Support engine/transmission assembly.

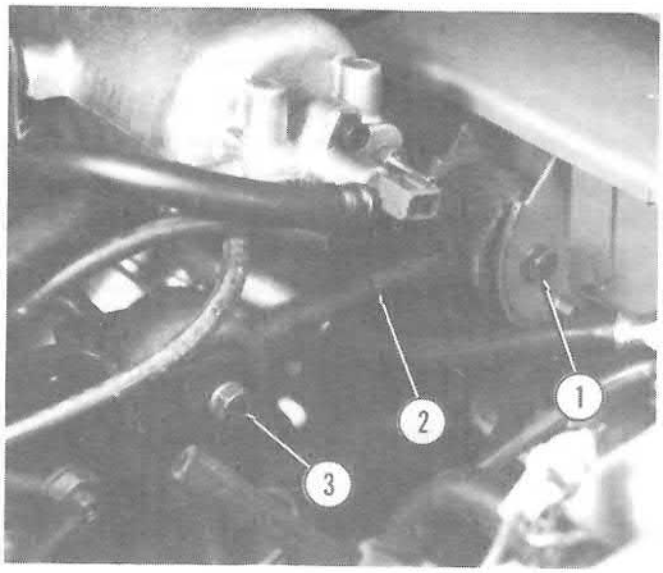
Remove four bolts (10) holding crosspiece (4).

1. Nut 2. Nut 3. Control arm 4. Crosspiece 5. Bolt 6. Bolt 7. Shield 8. Bolts 9. Selector rod 10. Bolts 11. Bracket 12. Nut 13. Bracket 14. Control arm



Remove through bolts (1 and 3) retaining reaction rod to brackets and remove reaction rod (2).

1. Bolt 2. Reaction rod 3. Bolt



Remove coolant hose (2) from water pump.

Remove through bolt (3) holding front engine mount (1).

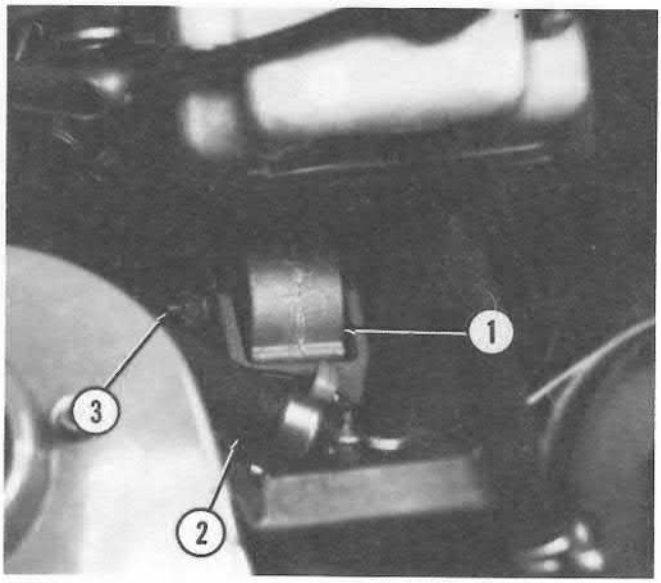
Raise vehicle slightly and rock engine/transmission assembly to clear front engine mount.

Carefully raise vehicle while supporting engine/transmission Slide assembly out from under vehicle.

Install engine in reverse order of removal. Tighten all nuts and bolts to specifications.

Refill cooling system to proper level and check all lines and hoses for tightness.

1. Mount 2. Hose 3. Bolt



DISASSEMBLY

Place engine in a suitable engine stand.

Remove oil dipstick.

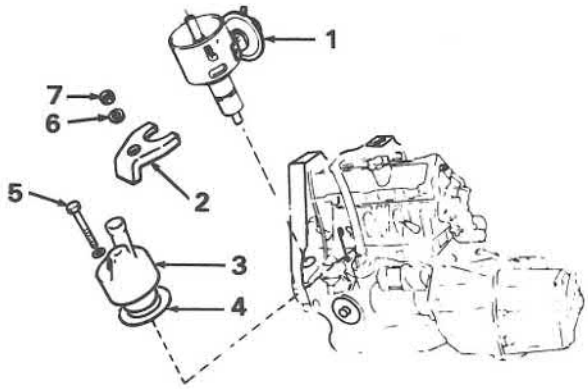
Drain oil and remove oil filter.

Disconnect vacuum line from distributor.

Remove nut (7), lockwasher (6), and clamp (2) holding distributor to engine, and remove distributor (1).

Remove bolt (5) and washer from cyclonic trap (3).

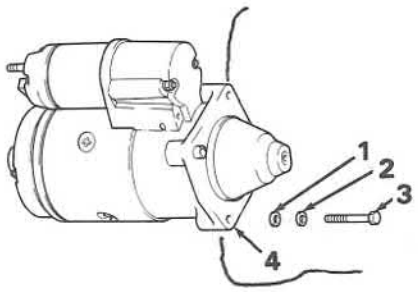
Remove cyclonic trap and gasket (4) with hose attached.



1. Distributor 2. Clamp 3. Cyclonic trap 4. Gasket 5. Bolt
6. Lockwasher 7. Nut

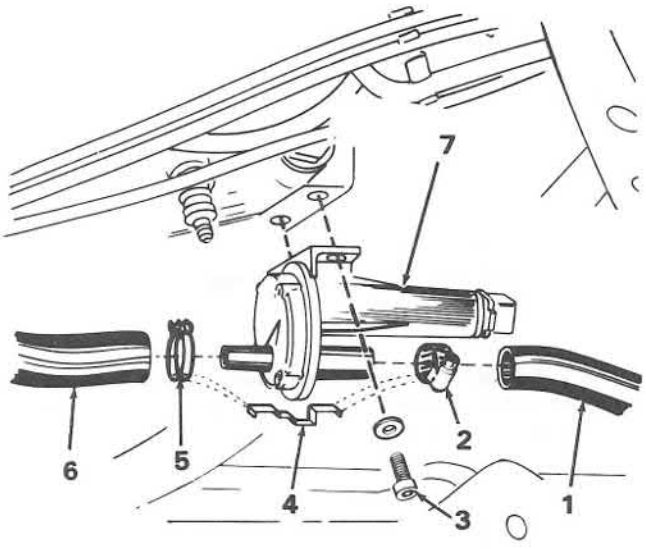
Remove three bolts (3), lockwashers (2), and washers (1) holding starter to transmission.

Remove starter (4) from transmission.



1. Washers 2. Lockwashers 3. Bolts 4. Starter

On vehicles with fuel injection, use a 5 mm hex wrench to remove two bolts (3) holding auxiliary air regulator (7) to cylinder block. Remove regulator with hoses (1 and 6) attached.



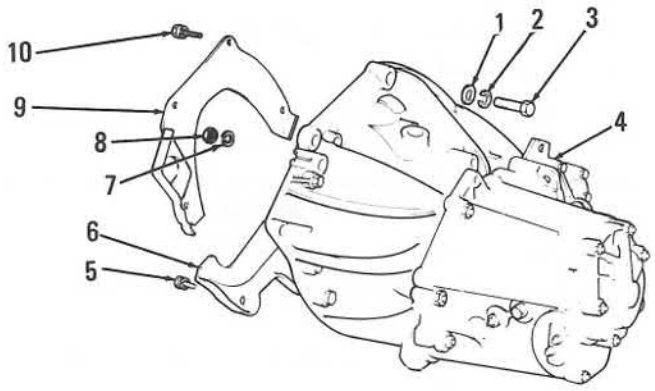
1. Hose 2. Clamp 3. Allen bolt 4. Clip 5. Clamp 6. Hose
7. Auxiliary air regulator

Remove two bolts (5) and remove shield (6) from transmission.

Remove the following: bolt (10), three bolts (3), lockwashers (2), washers (1), nut (8), and washer (7) and separate transmission and shield (9) from engine.

Slowly (a few turns each bolt) remove six bolts to remove clutch assembly from flywheel.

1. Washer 2. Lockwasher 3. Bolt 4. Transmission 5. Bolt 6. Shield 7. Lockwasher 8. Nut 9. Shield 10. Bolt

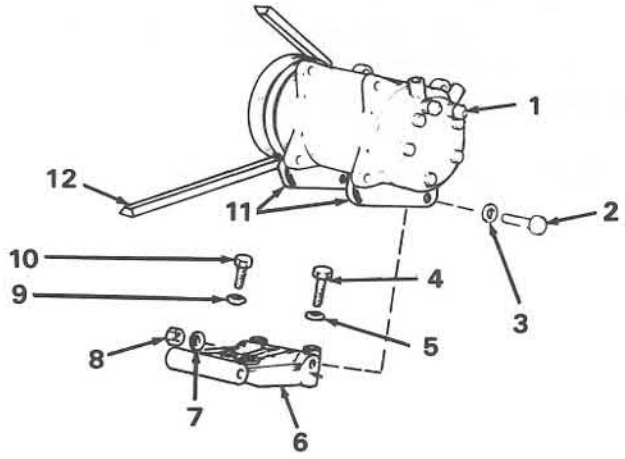


On air conditioned vehicles, remove two nuts (8), washers (7), bolts (2), and washers (3).

Remove belt (12) and compressor (1) complete with brackets (11).

Remove bolts (4 and 10) and lockwashers (5 and 9) to remove mount (6).

1. Compressor 2. Bolt 3. Washer 4. Bolt 5. Lockwasher 6. Mount 7. Washer 8. Nut 9. Lockwasher 10. Bolt 11. Brackets 12. Belt



On vehicles with integral voltage regulator, remove bolt (7), nuts, washers, lockwashers, and bolt (6) holding alternator to engine.

Remove alternator (3).

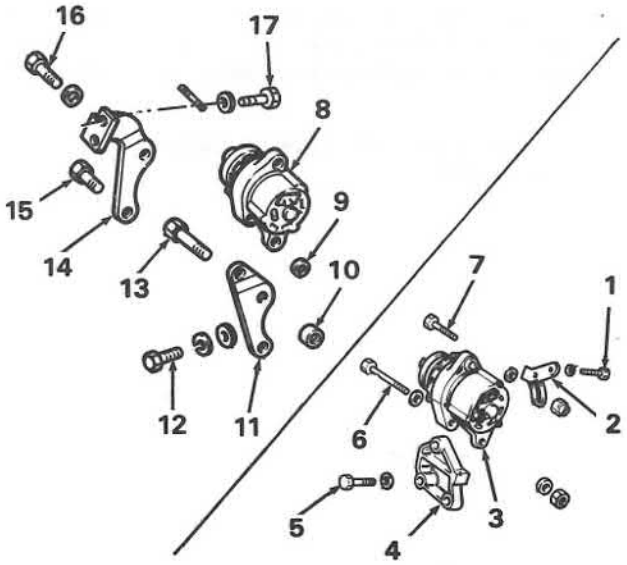
On vehicles with separate voltage regulator, remove bolts, washers, lockwashers holding alternator to engine.

Remove alternator (8).

Remove drive belt.

Remove bolts (5 and 17) to remove mounting brackets (4, 11, and 14).

1. Bolt 2. Bracket 3. Alternator (with integral voltage regulator) 4. Bracket 5. Bolt 6. Bolt 7. Bolt 8. Alternator (with separate voltage regulator) 9. Spacer 10. Spacer 11. Bracket 12. Bolt 13. Bolt 14. Bracket 15. Bolt 16. Bolt 17. Bolt



If equipped with air pump, loosen clamp (12) to disconnect hose (1) from check valve (16).

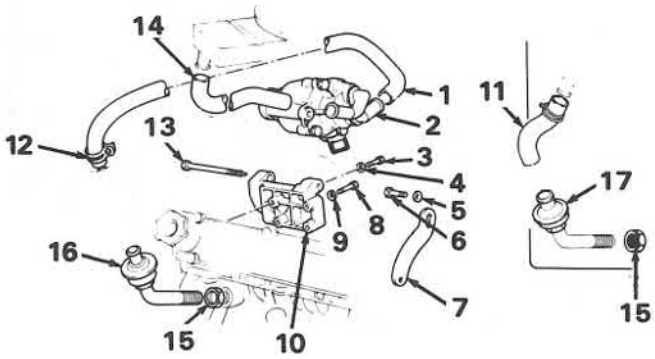
Remove bolt (6), washer (5), and bolt (13) to remove air pump (2) with hoses (1 and 14) attached.

Remove drive belt.

Remove bolts (3 and 8) and washers (4 and 9) to remove mounting bracket (10).

If not equipped with air pump, disconnect hose (11) from reed valve (17).

Remove locknut (15) holding check valve (16) or reed valve (17). Unscrew and remove valve.



1. Hose 2. Air pump 3. Bolt 4. Washer 5. Washer 6. Bolt 7. Bracket 8. Bolt 9. Washer 10. Mounting bracket 11. Hose 12. Clamp 13. Bolt 14. Hose 15. Locknut 16. Check valve (with air pump) 17. Reed valve (without air pump)

If equipped with EGR, remove three nuts (1), bolt (7), and washers (2 and 8) to remove tube (3), spacer (27) and gasket (26).

Remove two nuts (5), washers (6), and shield (4).

Unscrew fitting (25) to remove tube (9).

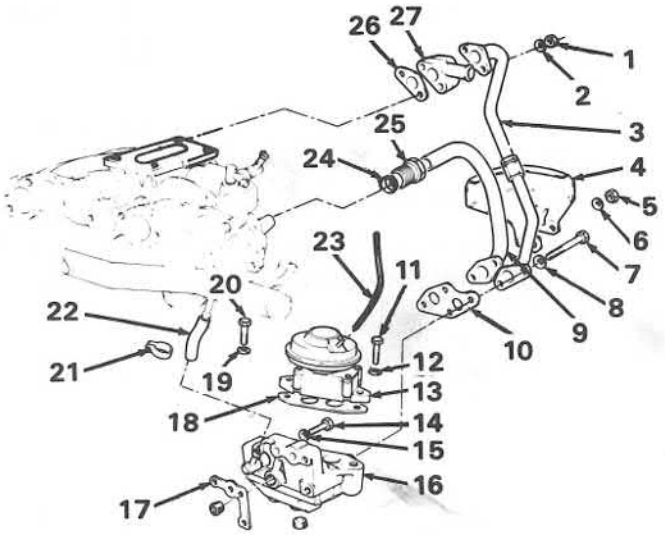
Remove gasket (10) and seal (24).

Disconnect vacuum line (23) from EGR valve (13).

Remove bolts (11 and 20) and washers (12 and 19) to remove EGR valve (13) and gasket (18).

Loosen clamp (21) to disconnect water hose (22) from water manifold.

Remove two bolts (14) and washers (15) to remove mounting base (16) and gasket (17).



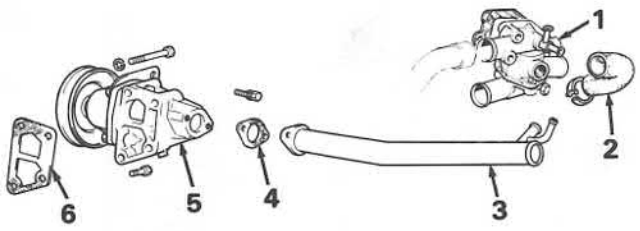
1. Nut 2. Washer 3. Tube 4. Shield 5. Nut 6. Washer 7. Bolt 8. Washer 9. Tube 10. Gasket 11. Bolt 12. Washer 13. EGR valve 14. Bolt 15. Washer 16. Mounting base 17. Gasket 18. Gasket 19. Washer 20. Bolt 21. Clamp 22. Hose 23. Vacuum line 24. Seal 25. Fitting 26. Gasket 27. Spacer

Loosen clamp and remove hose (2).

Remove two bolts and remove water manifold (3) and gasket (4).

Remove four bolts and washers holding water pump (5) to engine. Remove water pump and gasket (6).

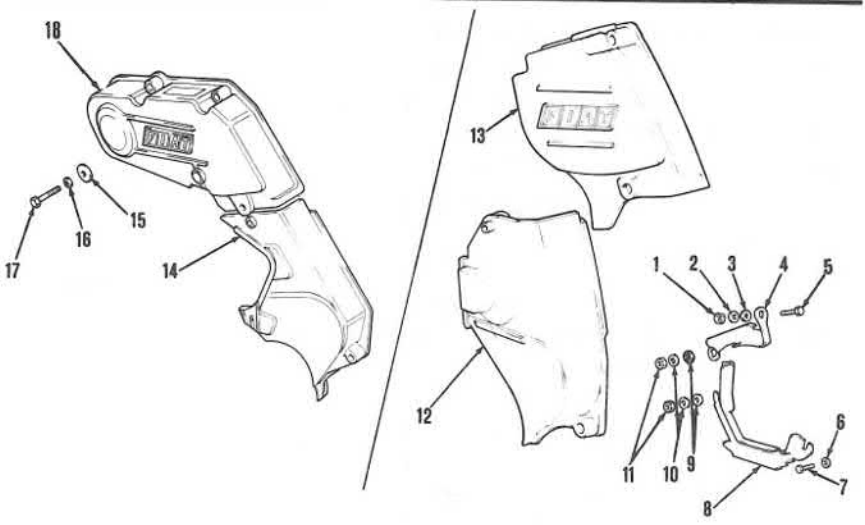
Remove four bolts and washers holding thermostat assembly (1) to engine. Remove thermostat assembly and gasket.



1. Thermostat assembly 2. Hose 3. Water manifold 4. Gasket 5. Water pump 6. Gasket

Remove four bolts (17), lockwashers (16) and washers (15) to remove timing belt covers (12 and 13) (14 and 18 for air pump equipped vehicles).

Remove attaching hardware (1 to 3, 5 to 7, and 9 to 11) to remove shields (4 and 8).



1. Nut 2. Lockwasher 3. Washer 4. Shield 5. Bolt 6. Washer 7. Bolt 8. Shield 9. Washer 10. Lockwasher 11. Nut 12 and 13. Timing belt covers 14 and 18. Timing belt covers (with air pump) 15. Washer 16. Lockwasher 17. Bolt

Stop engine rotation by installing tool A.60640 on flywheel.

Remove two bolts (9) holding timing indicator (10) and remove indicator.

Remove camshaft sprocket bolt (11) and auxiliary shaft sprocket bolt (12).

Remove drive pulley nut (13) using wrench A.50121.

Remove nut (1), washers and spacer (2).

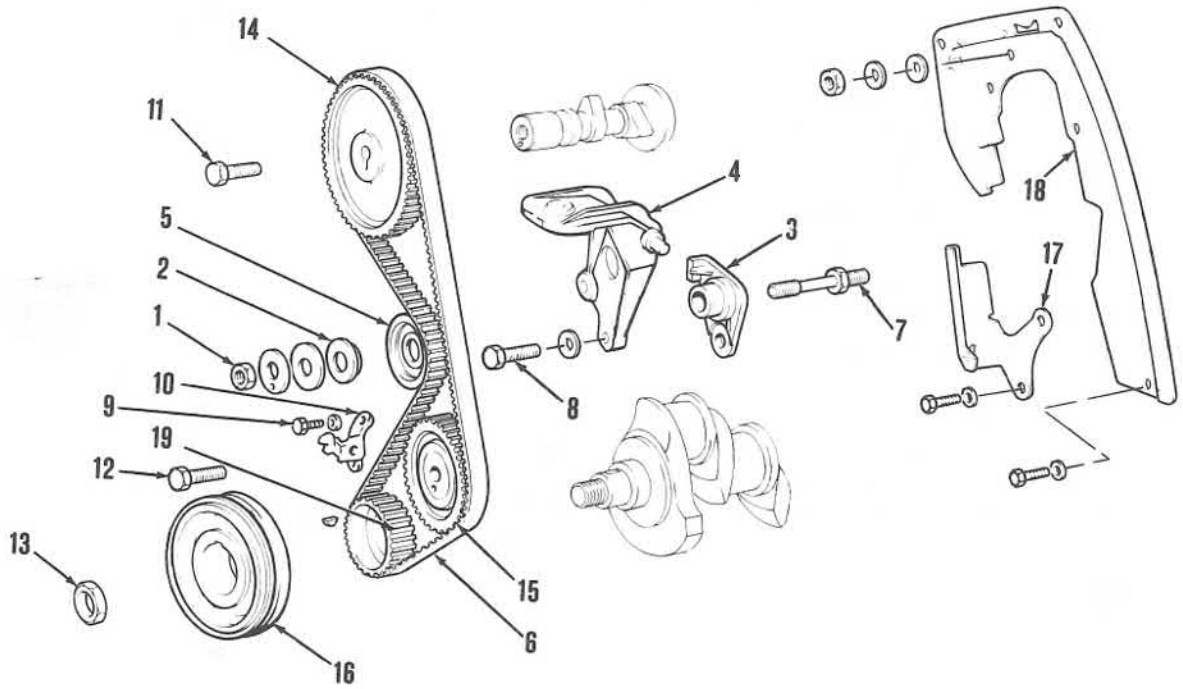
Press bracket (3) against tensioner in right engine mount (4) then remove pulley (5) and timing belt (6).

Remove tensioner support bracket (3) from stud (7), and remove stud.

Remove three bolts (8) holding engine mount (4) and remove mount.

Remove camshaft sprocket (14), auxiliary shaft sprocket (15), drive pulley (16) and belt drive sprocket (19).

Remove nuts and bolts holding belt shields (17 & 18) and remove shields.

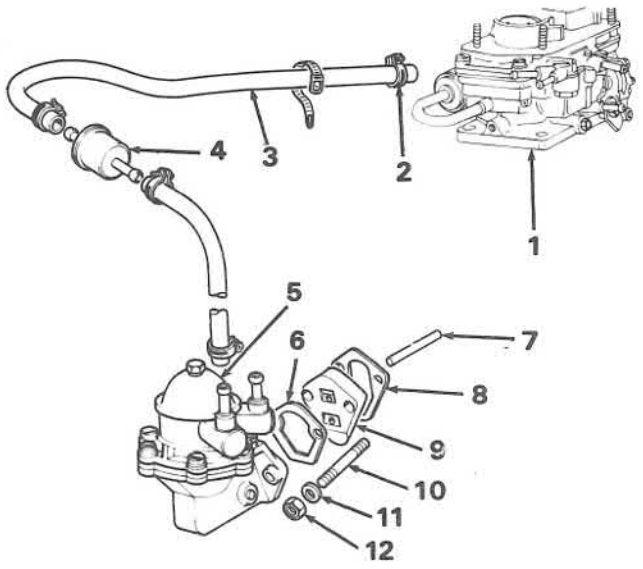


1. Nut
2. Spacer
3. Tensioner support bracket
4. Right engine mount
5. Tensioner pulley
6. Timing belt
7. Stud
8. Bolt
9. Bolt
10. Timing indicator
11. Bolt
12. Bolt
13. Nut
14. Camshaft sprocket
15. Auxiliary shaft sprocket
16. Drive pulley
17. Belt shield
18. Belt shield
19. Belt drive sprocket

On vehicles with carburetor, remove clamp (2) and fuel pump line (3) at carburetor (1). Leave filter (4) and fuel lines attached to pump (5).

Remove two nuts (12) and washers (11) from studs (10) holding pump to engine. Carefully remove pump from engine, being certain that actuating rod (7) is removed. When reassembling, make sure that gaskets (6 and 8) and insulator (9) are installed in order shown.

NOTE: Gasket (8) comes in three different sizes which are used to adjust pump stroke (pressure).



1. Carburetor 2. Clamp 3. Fuel hose 4. Fuel filter 5. Fuel pump 6. Gasket 7. Actuating rod 8. Gasket 9. Insulator 10. Stud 11. Washer 12. Nut

Disconnect water line (1) from thermovalve housing (2) to carburetor (3) at carburetor by loosening clamp (4).

Disconnect main vacuum line (5) by pulling free at vacuum manifold (6).

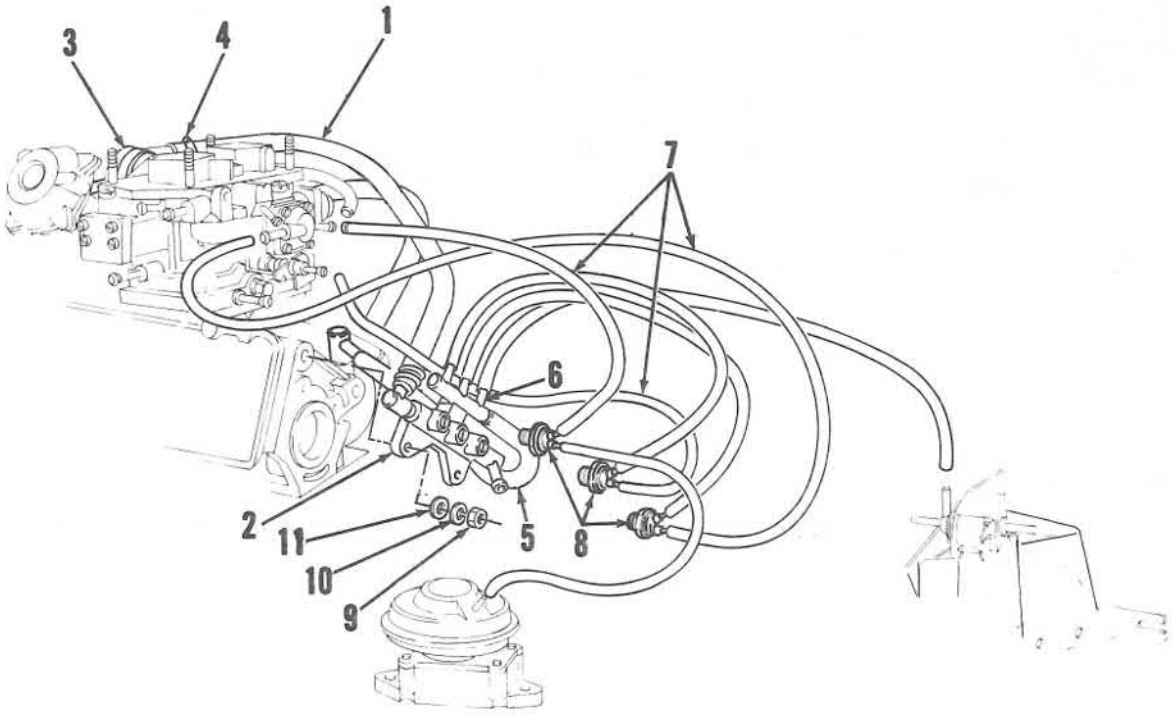
Disconnect vacuum lines (7) to carburetor by pulling free at carburetor.

NOTE: In order to minimize confusion during reinstallation of lines, do not remove thermovalves (8) or vacuum lines from thermovalve housing (2) unless they are to be replaced.

Remove two nuts (9), lockwashers (10) and washers (11).

Remove thermovalve housing (2) with attached lines and vacuum manifold (6).

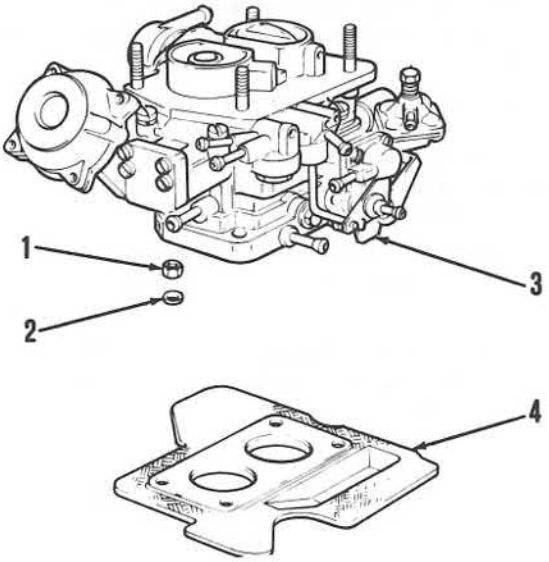
1. Water line 2. Thermovalve housing 3. Carburetor 4. Clamp 5. Main vacuum line 6. Vacuum manifold 7. Vacuum lines 8. Thermovalves 9. Nut 10. Lockwasher 11. Washer



On vehicles with carburetor, remove four nuts (1) and lockwashers (2) holding carburetor (3) and spacer (4) to intake manifold.

Remove carburetor (3) and spacer (4).

1. Nut 2. Lockwasher 3. Carburetor 4. Spacer

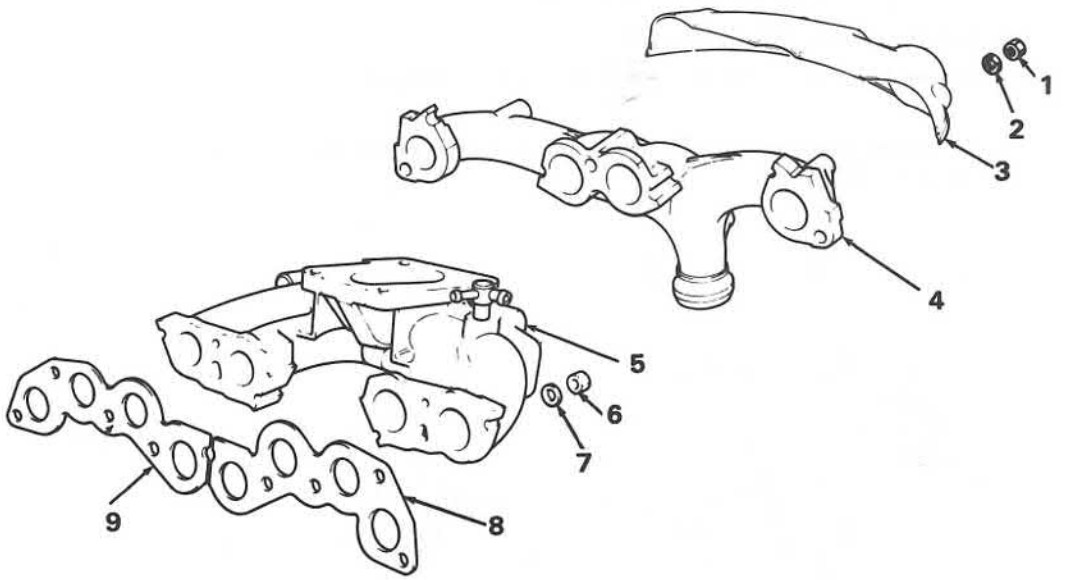


Remove three nuts (1) and washers (2) holding shield (3) to exhaust manifold (4). Remove shield.

Remove seven nuts (6) and washers (7) holding intake (5) and exhaust (4) manifolds to engine.

Remove manifolds and gaskets (8 and 9).

1. Nut
2. Washer
3. Shield
4. Exhaust manifold
5. Intake manifold
6. Nut
7. Washer
8. Gasket
9. Gasket



Using cylinder head tool A.50131, remove five nuts on carburetor side and five bolts on spark plug side.

Carefully remove cylinder head assembly. Lay on wooden blocks to protect open intake and exhaust valves from being bent.

Remove and discard cylinder head gasket.

To disassemble cylinder head, refer to 101.01.

On vehicles with fuel injection, disconnect accelerator cable from linkage.

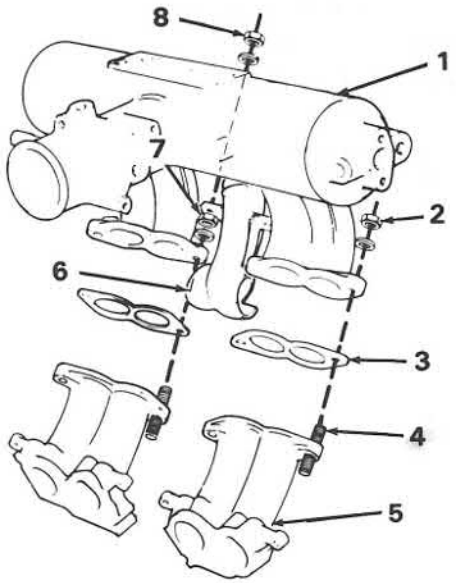
Remove two nuts (8) and washers holding cooling air duct (6) to studs (4) on manifold (5).

Disconnect cooling air hose from duct. Remove duct.

Remove four nuts (2) and washers holding air intake to manifold.

Carefully lift air intake (1) off studs (4) in manifold. Tilt air intake backwards.

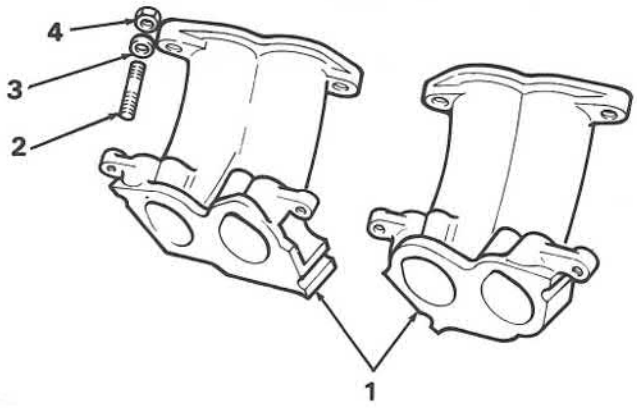
1. Air intake 2. Nut 3. Gasket 4. Stud 5. Manifold
6. Cooling air duct 7. Nut 8. Nut



Remove four nuts (4) and washers (3) holding air intake manifolds (1) to engine.

Remove intake manifolds.

1. Air intake manifolds 2. Stud 3. Washer 4. Nut



Remove three nuts (1) and washers holding shield (3) to exhaust manifold (4).

Remove nuts (5) and washers holding exhaust manifold to engine.

Remove exhaust manifold.

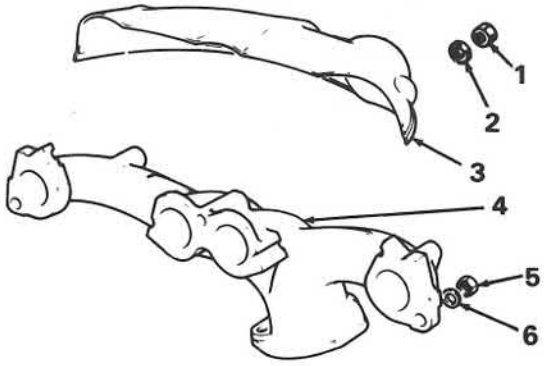
Using tool A.50131 for 19 mm hex bolts and nuts or tool A.50172 for 17 mm hex bolts, remove five nuts or bolts on intake side and five bolts on spark plug side.

Carefully remove cylinder head assembly. Lay on wooden blocks to protect open intake and exhaust valves from being bent.

Remove and discard cylinder head gasket.

To disassemble cylinder head, refer to section 101.01.

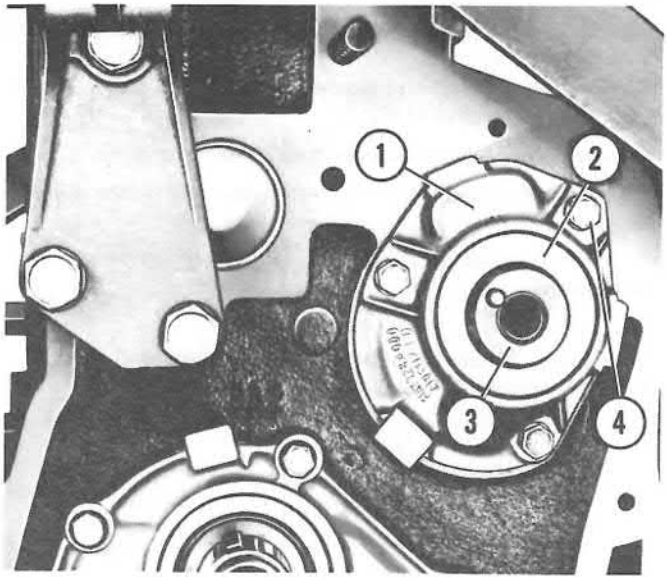
1. Nut 2. Washer 3. Shield 4. Exhaust manifold 5. Nut
6. Washer



Remove three bolts (4) and lockwashers holding auxiliary shaft lock plate (1) and seal (2).

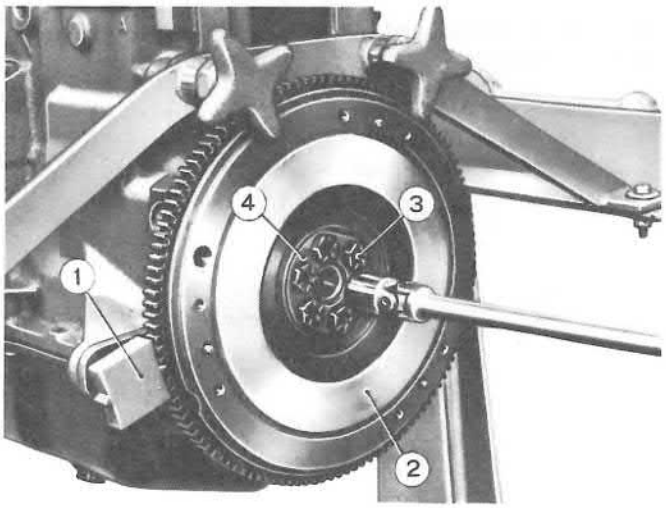
Remove plate/seal and then remove shaft (3).

1. Auxiliary shaft lock plate 2. Seal 3. Auxiliary shaft 4. Bolt



Remove six bolts (3) and washer plate (4) holding flywheel (2) to crankshaft, remove flywheel.

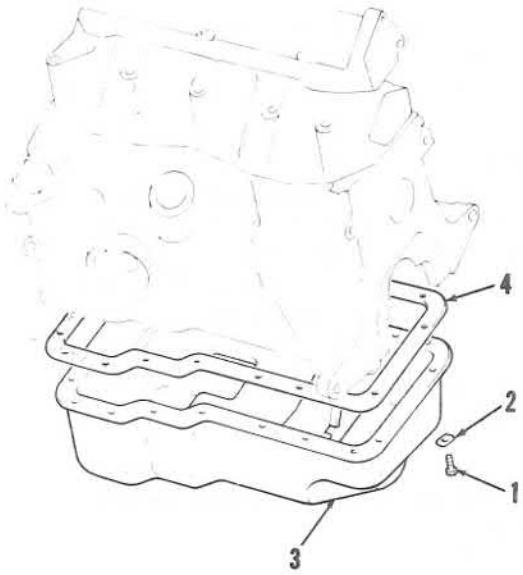
1. Tool A.60640 2. Flywheel 3. Bolt 4. Washer plate



Turn engine upside/down and remove twenty bolts (1) and lockwashers (2) holding oil pan (3).

Remove pan and gasket (4).

1. Bolt 2. Lockwasher 3. Oil pan 4. Gasket



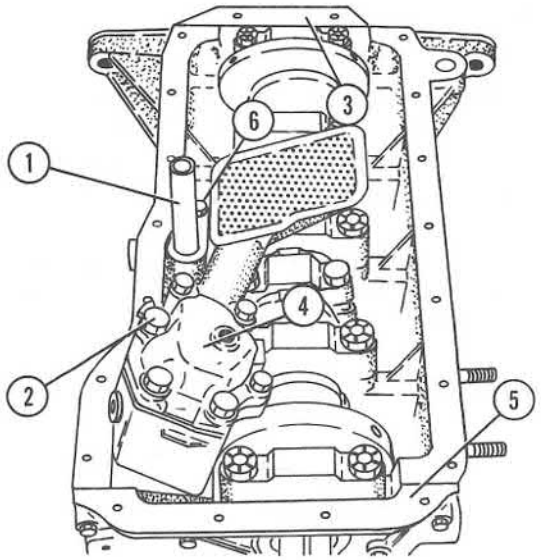
Remove six bolts and lockwashers holding flywheel end cover plate (3). Remove plate and gasket.

Remove five bolts and lockwashers holding timing gear end cover plate (5). Remove plate and gasket.

Remove three bolts (2) and lockwashers holding oil pump assembly (4). Remove pump and gasket.

Remove bolt (6) holding oil return pipe (1) and remove pipe.

1. Oil return pipe 2. Bolt 3. Flywheel end cover plate 4. Oil pump assembly 5. Timing gear end cover plate 6. Bolt



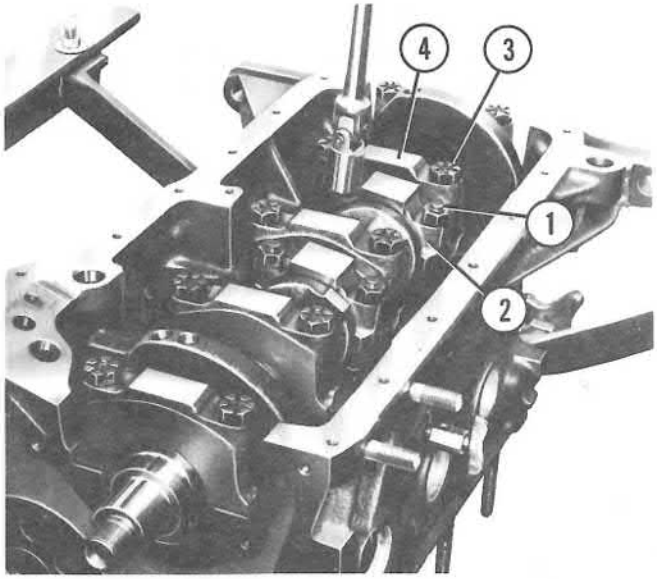
Remove nuts (1) holding connecting rod end caps (2). Remove caps complete with bearing inserts.

Remove four rod-piston assemblies from the top of cylinder block.

NOTE: Turning crankshaft will make this operation easier.

Remove bolts (3) holding main bearing caps (4). Remove caps along with lower bearing inserts.

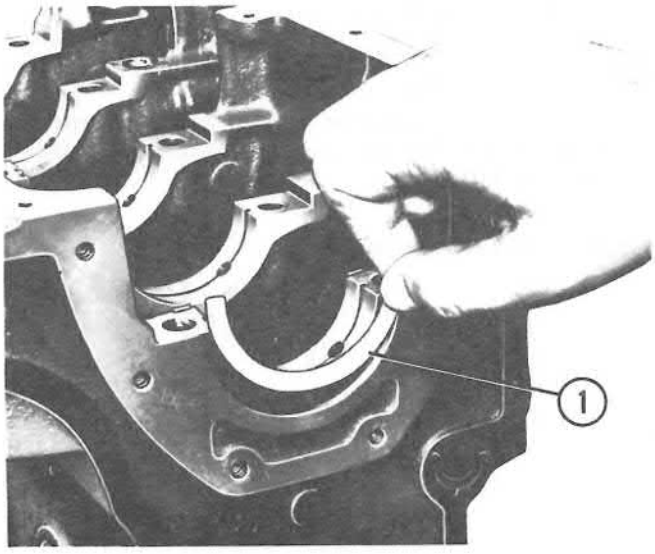
1. Nut 2. Connecting rod end caps 3. Bolt 4. Main bearing caps



Remove crankshaft and take out upper bearing inserts.

Remove two thrust ring halves (1) from saddle bore at flywheel end.

1. Thrust ring halves



ASSEMBLY

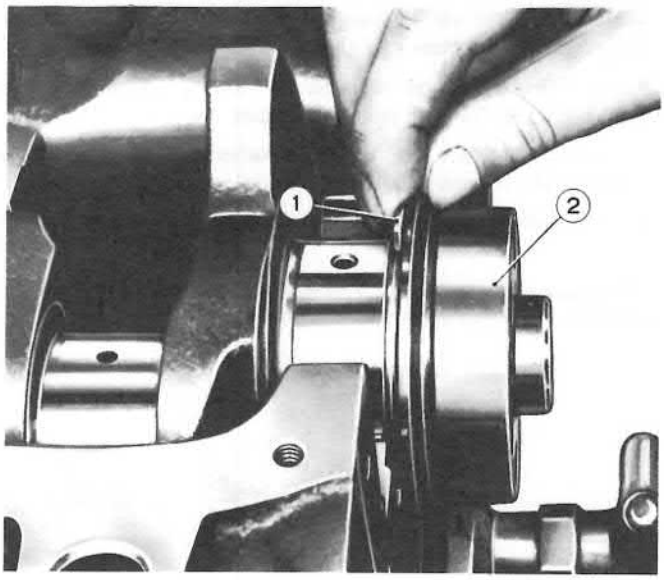
Install cylinder block on workstand.

After thorough lubrication with clean engine oil, put main bearing inserts into position and install crankshaft (2).

NOTE: Before and during installation of crankshaft refer to Crankshaft and Flywheel for procedures and inspections.

The two thrust ring halves (1) are positioned at the flywheel and saddle bore. Thrust rings may be installed before or after mounting crankshaft.

1. Thrust ring half 2. Crankshaft

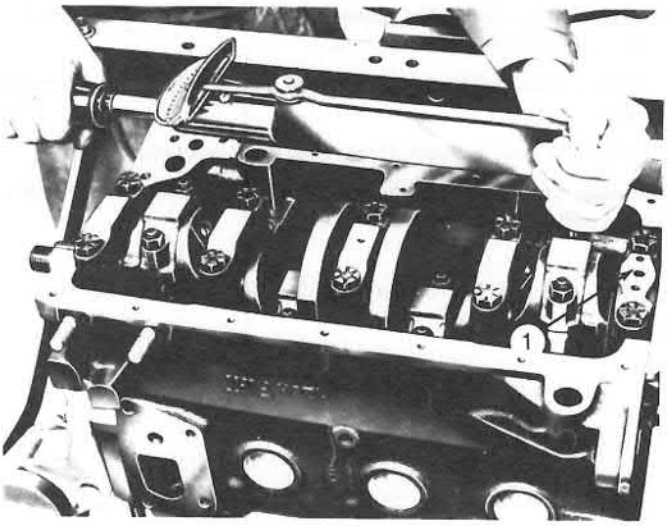


Install main bearing caps (1) and lubricated inserts.

Make sure caps are installed at proper location. Cap without notch is at timing gear end of crankcase, then cap with one notch, etc.

Torque cap bolts to 59 ft. lbs. (8.2 kgm).

1. Main bearing caps

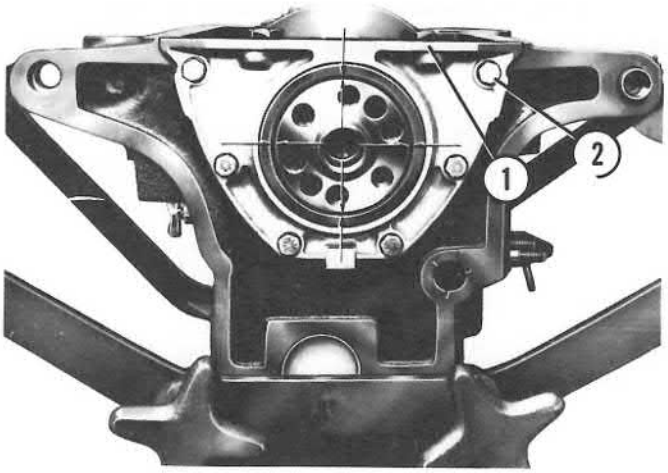


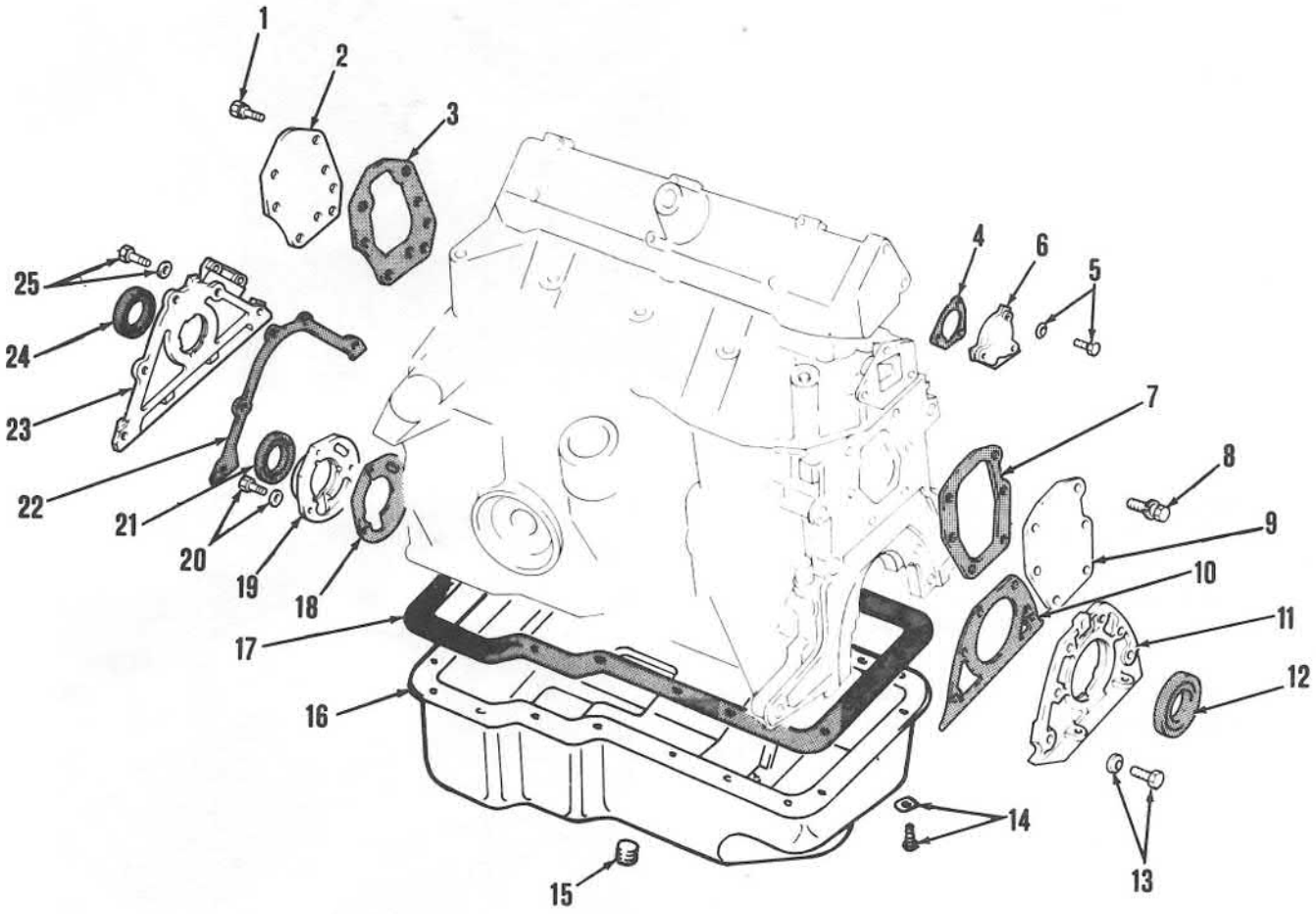
Install new seal and gasket on flywheel end cover plate (1).

Install cover/seal to crankcase with six bolts (2) and lockwashers.

NOTE: Arrows in illustration indicate that with cover installed, the distance between cover seal and crankshaft should be equal all around.

1. Flywheel end cover plate 2. Bolt





1. Bolt and lockwasher
2. Water jacket cover plate
3. Gasket
4. Gasket
5. Bolt and lockwasher
6. Cover plate
7. Gasket
8. Bolt and lockwasher
9. Water jacket cover plate
10. Gasket
11. Flywheel end cover plate
12. Oil seal
13. Bolt and lockwasher
14. Bolt and lockwasher
15. Oil drain plug
16. Oil sump
17. Gasket
18. Gasket
19. Auxiliary shaft lockplate
20. Bolt and lockwasher
21. Oil seal
22. Gasket
23. Timing gear end cover plate
24. Oil seal
25. Bolt and lockwasher

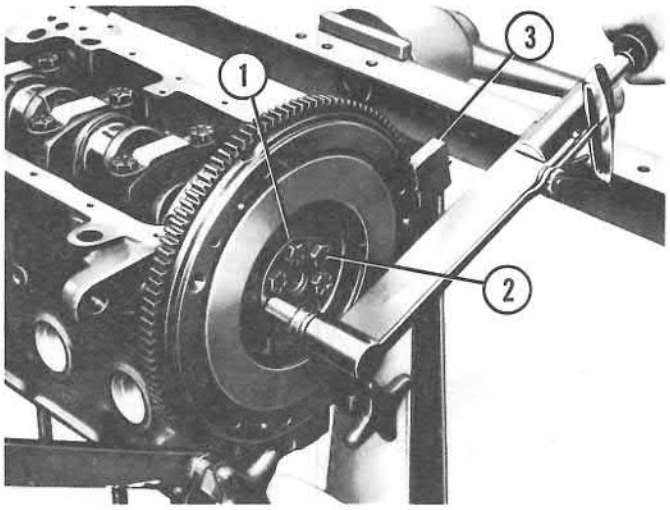
GASKETS AND SEALS

Secure flywheel to crankshaft with washer plate (1) and six bolts (2).

Lock crankshaft against turning with tool A.60640 (3).

Torque bolts to 61 ft. lbs. (8.5 kgm).

1. Washer plate 2. Bolt 3. Tool A.60640

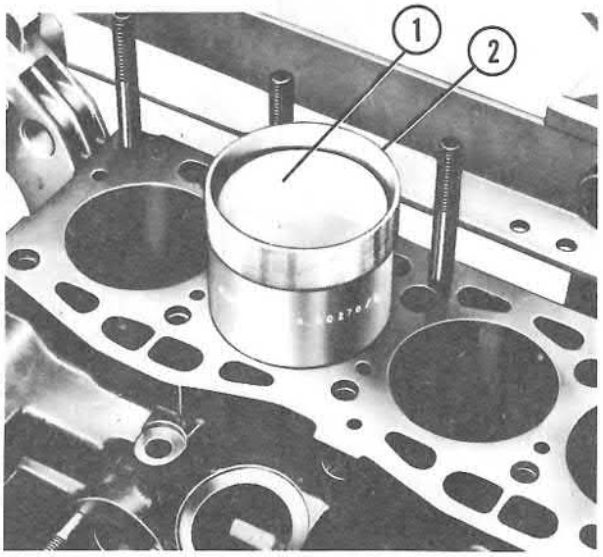


After lubricating pistons (1) and cylinder bores with clean engine oil, install connecting rod-piston assemblies in cylinder bores using appropriate piston ring compressor (2).

NOTE: Before and during installation of connecting rod-piston assemblies, refer to CONNECTING RODS AND PISTONS for procedures and inspections.

Install assemblies in the proper cylinder, according to number stamped on connecting rods and caps. When installation is complete these numbers should face away from auxiliary shaft.

1. Piston 2. Piston ring compressor

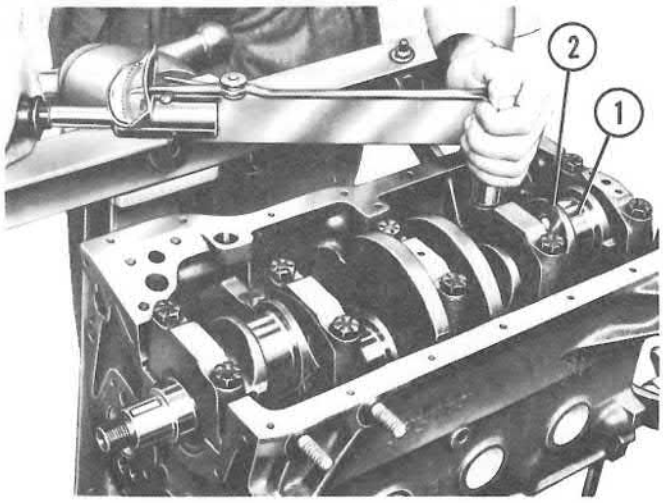


Lubricate bearings and crankpins with clean engine oil.

Attach connecting rods/bearings to crankpins.

Install end caps/bearings (1) and torque nuts (2) to 38 ft. lbs. (5.2 kgm).

1. Connecting rod end caps 2. Nut

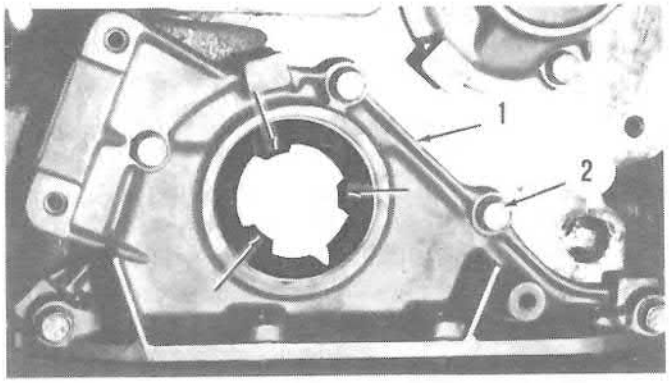


Install new seal and gasket on timing gear end cover plate (1).

Install cover/seal to crankcase with five bolts (2) and lockwashers.

NOTE: Arrows in illustration point to references for controlling centering with respect to crankshaft.

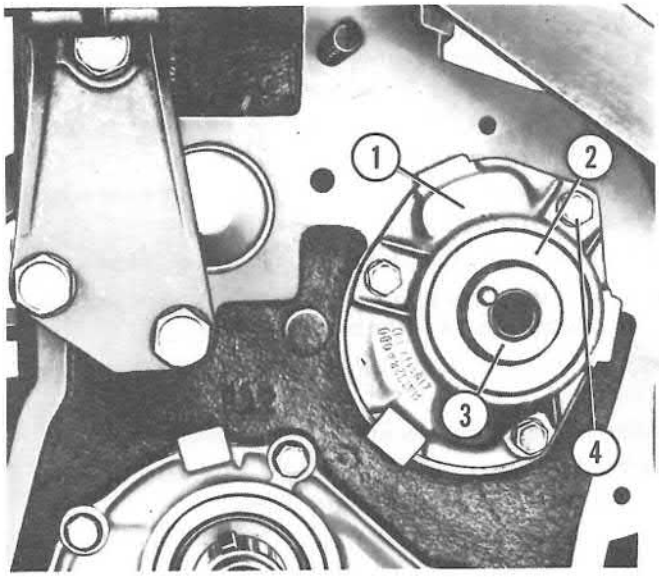
1. Timing gear end cover plate 2. Bolt



Lubricate bushings for auxiliary shaft (3) with clean oil, install shaft. Secure shaft in place with three bolts (4), lockwashers, lockplate (1), new seal (2) and gasket.

Install auxiliary shaft sprocket with bolt and washer, do not torque fully at this time.

1. Lockplate 2. Seal 3. Auxiliary shaft 4. Bolt



Install oil pump (1) and gasket. Before final tightening of bolts (5), install oil pump and distributor drive gear, coupling it to gear on auxiliary shaft.

Temporarily fit distributor (3) into crankcase.

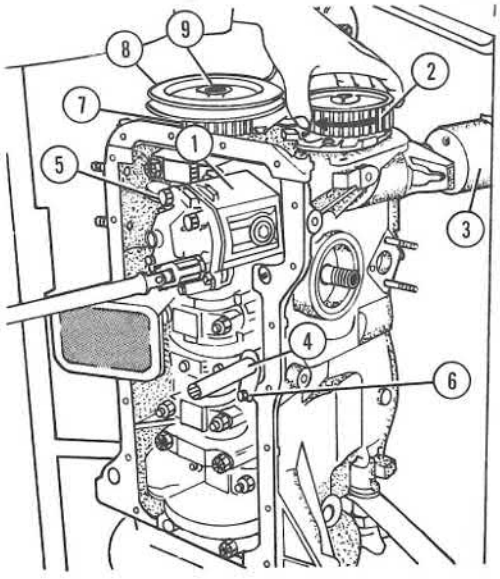
While using sprocket (2) to rotate auxiliary shaft, secure oil pump by tightening the three bolts alternately.

NOTE: If auxiliary shaft binds or crawls during rotation, loosen pump and repeat operation.

Install oil return pipe (4) with one bolt (6) and lockwasher.

Install timing belt drive sprocket (7) and generator drive pulley (8). Install pulley nut (9), and with flywheel blocked, torque nut to 101 ft. lbs. (14 kgm).

1. Oil pump 2. Auxiliary shaft sprocket 3. Ignition distributor
4. Oil return pipe 5. Bolt 6. Bolt 7. Timing belt drive sprocket
8. Generator drive pulley 9. Pulley nut



Install oil sump and gasket with twenty bolts and lockwashers.

Install cylinder head gasket, making sure that word "ALTO" is facing up.

Install head assembly complete with valves, springs, and camshaft bearing assembly.

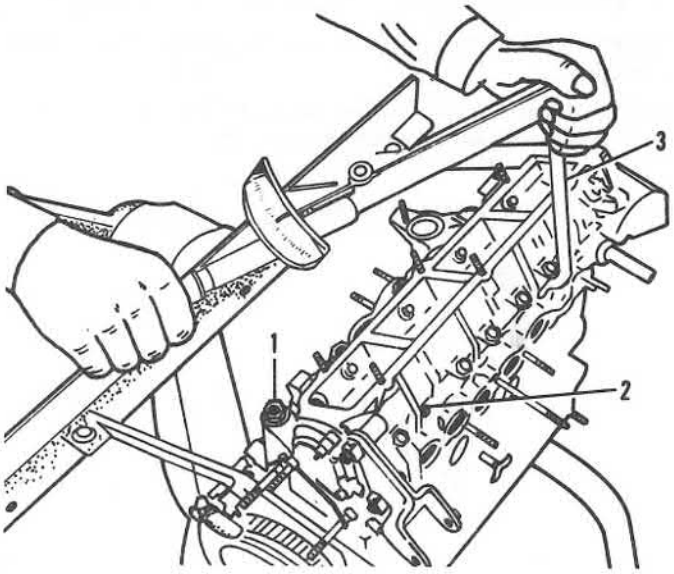
NOTE: Before and during cylinder head installation refer to CRANKCASE AND CYLINDER HEAD Section for procedures and inspections.

On vehicles with 19 mm hex nuts and bolts, install five bolts (1), and nuts (2), and flat washers.

Gradually tighten in sequence shown and in at least two stages. Final torque will be 69 ft. lbs. (9.5 kgm).

Special wrench A.50131 (3) is required for intake side nuts.

1. Bolt 2. Nut 3. Wrench A.50131



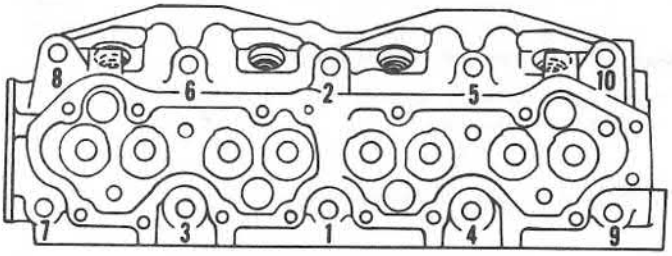
On vehicles with 17 mm hex bolts, torque the bolts as follows:

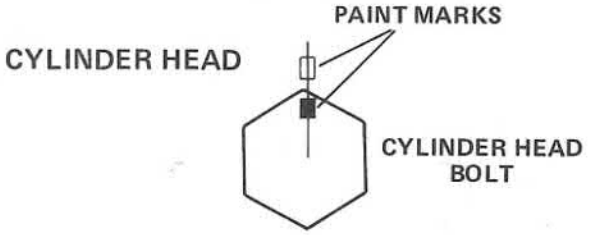
- Lubricate all head bolts and washers with SAE 30 engine oil. Let excess oil drop from bolts and washers for 30 minutes.

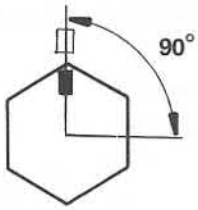
NOTE: In the next steps tighten and torque cylinder head bolts in sequence as shown.

- Using wrenches A.50172, torque all cylinder head bolts to 14.5 ft. lbs. (2 kgm).
- Retorque all cylinder head bolts to 29 ft. lbs. (5 kgm).
- Apply paint marks to one corner of all the head bolts and a corresponding mark to the cylinder head.
- Using wrenches A.50172, tighten all head bolts to a 90° angle (1).
- Retighten all head bolts to a second 90° angle (2).

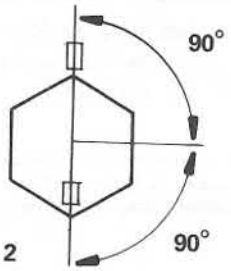
NOTE: All cylinder head bolts must have been tightened a total of 180° in two separate stages.







1



2

Install belt guards (17 and 18).

Install camshaft sprocket (14) with bolt (11) and washer. Do not torque fully at this time.

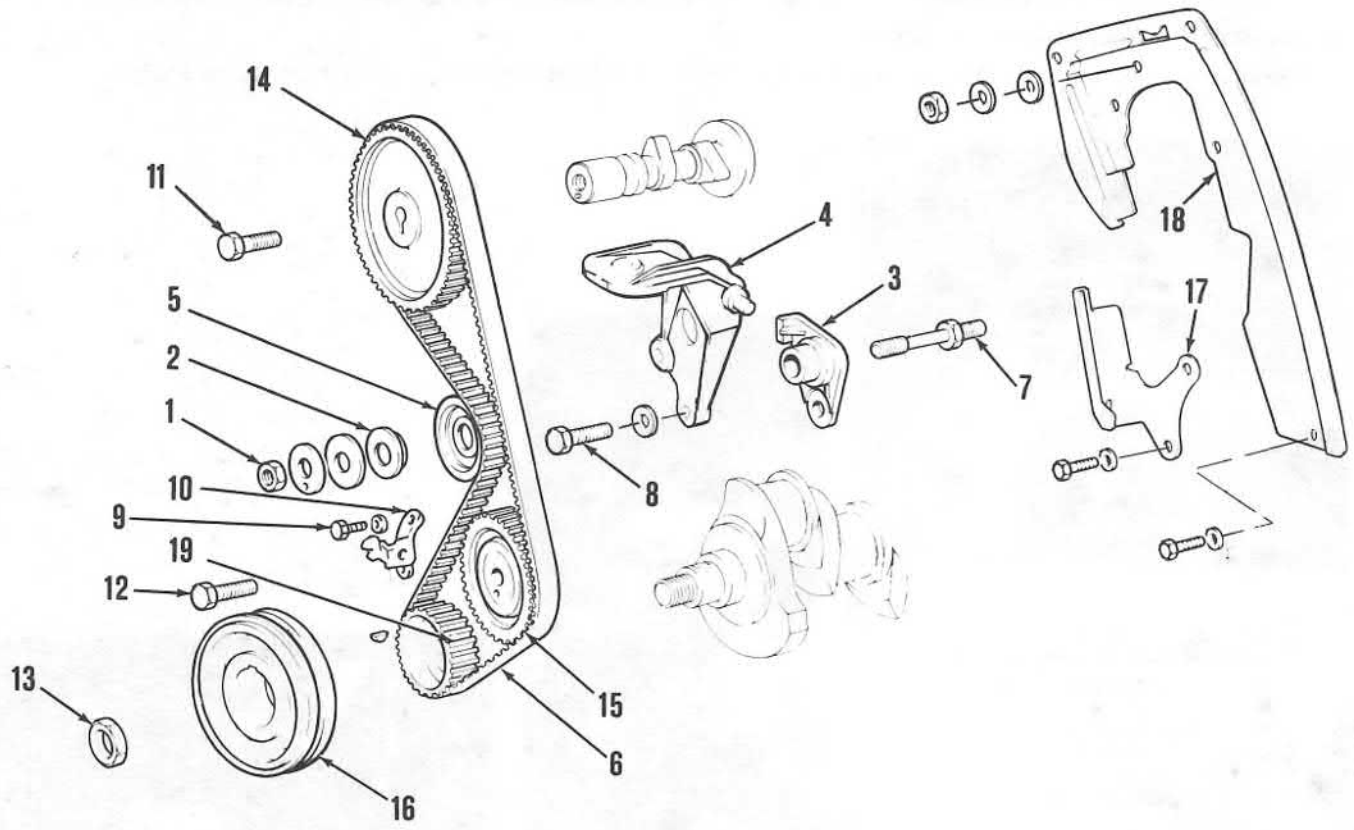
Install right engine mount (4) with three bolts (8) and lockwashers.

Install spring tensioner in its seat in mount.

Install tensioner pulley support stud (7) and bracket (3) to crankcase.

Install tensioner pulley (5) to bracket and lock it temporarily with nut (1), washers and spacer (2).

Install timing indicator (10) with two bolts (9) and lockwashers.



1. Nut
2. Spacer
3. Tensioner support bracket
4. Right engine mount
5. Tensioner pulley
6. Timing belt
7. Stud
8. Bolt
9. Bolt
10. Timing indicator
11. Bolt
12. Bolt
13. Nut
14. Camshaft sprocket
15. Auxiliary shaft sprocket
16. Drive pulley
17. Belt shield
18. Belt shield
19. Belt drive sprocket

Crank engine with tool A.50459 until crankshaft pulley mark (3) is aligned with TDC timing mark (7).

Position camshaft sprocket so that marks (1) and (2) are aligned.

NOTE: Auxiliary shaft sprocket (8) does not have to be aligned.

Move idler pulley in direction of arrow as far as possible and secure in place with nut.

Install timing belt (9) with slack on tensioner side.

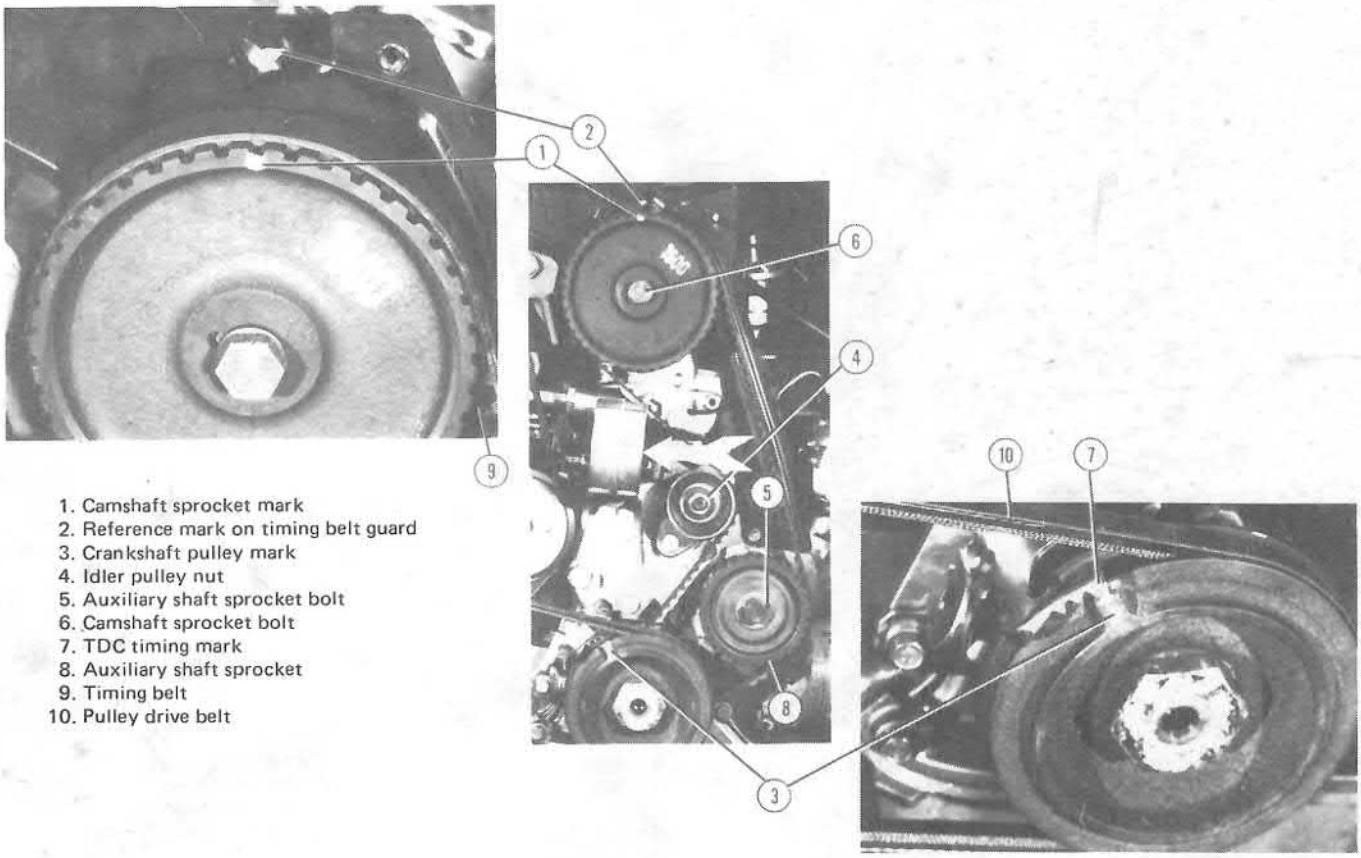
CAUTION: Always install a new timing belt. Timing belts cannot be reused. Under no circumstances must belt tension be adjusted following its initial installation.

Ensure that timing belt teeth are perfectly coupled with sprockets.

Loosen idler pulley nut (4) and tensioner will tighten belt. Torque idler pulley nut in this position to 33 ft. lbs. (4.5 kgm).

Check that timing marks are still correctly aligned.

With flywheel blocked, torque auxiliary shaft sprocket bolt (5) and camshaft sprocket bolt (6) to 61 ft. lbs. (8.5 kgm).

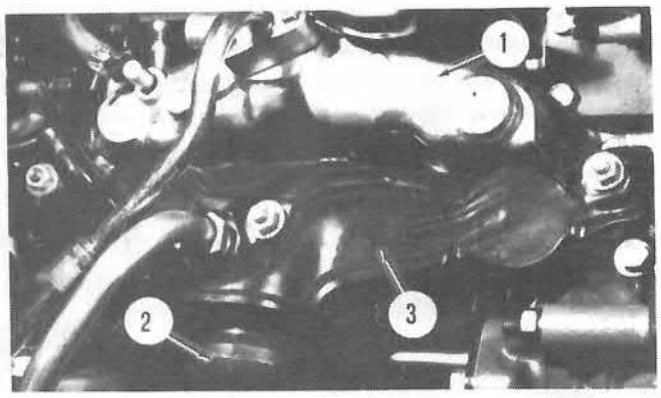


1. Camshaft sprocket mark
2. Reference mark on timing belt guard
3. Crankshaft pulley mark
4. Idler pulley nut
5. Auxiliary shaft sprocket bolt
6. Camshaft sprocket bolt
7. TDC timing mark
8. Auxiliary shaft sprocket
9. Timing belt
10. Pulley drive belt

On vehicles with carburetor, install intake manifold (1), exhaust manifold (2), and gaskets with seven nuts and washers. Torque to 20 ft. lbs. (2.8 kgm).

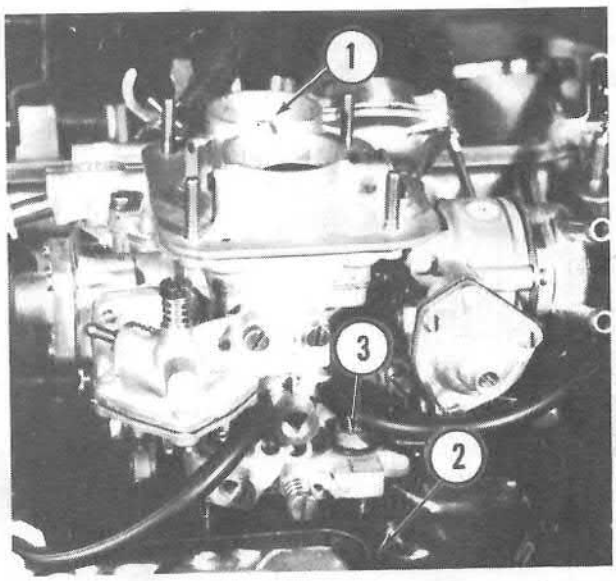
Install shield (3) with three nuts and washers.

1. Intake manifold 2. Exhaust manifold 3. Shield



On vehicles with carburetor, install carburetor (1) and spacer (2) with four nuts (3) and washers.

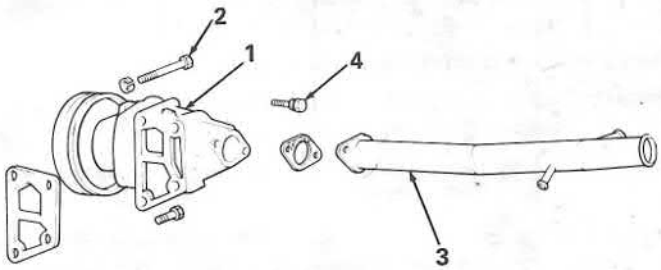
1. Carburetor 2. Spacer 3. Nut



Install water pump (1) and gasket with four bolts (2) and lockwashers. Torque to 22 ft. lbs. (3 kgm).

Install water manifold (3) and gasket with two bolts (4) and lockwashers.

1. Water pump 2. Bolt 3. Water manifold 4. Bolt

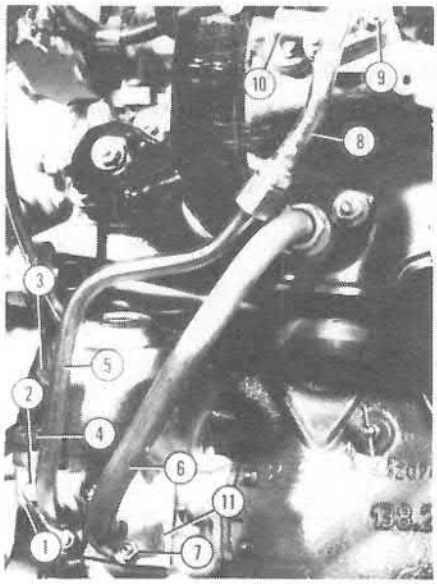


On vehicles with carburetor, install EGR mounting base (1), gasket and tube (5) with two bolts (2) and lockwashers.

Install tube (6) and shield (11) to exhaust manifold fitting and to EGR mounting base with two nuts (9) and lockwashers.

Install EGR valve (3) and gasket with two bolts (4) and lockwashers.

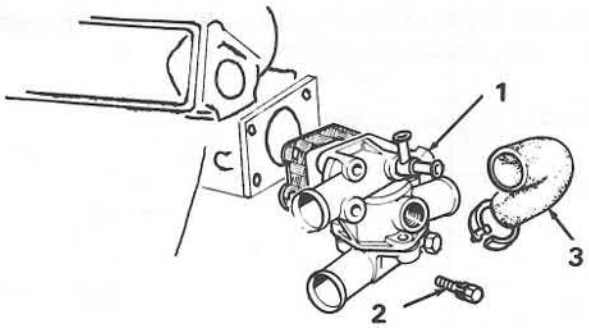
1. EGR mounting base 2. Bolt 3. EGR valve 4. Bolt 5. Tube
6. Tube 7. Nut 8. Tube 9. Nut 10. Spacer 11. Shield



Attach thermostat housing (1) and gasket to cylinder block with four bolts (2) and lockwashers.

Attach water manifold hose (3) to thermostat housing.

1. Thermostat housing 2. Bolt 3. Water manifold hose



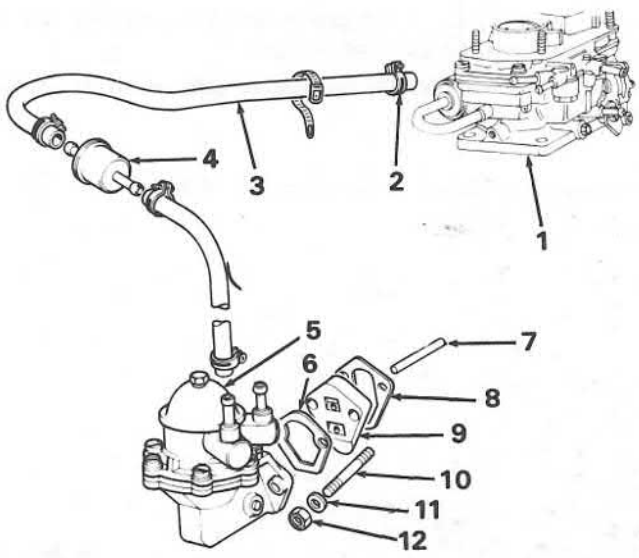
On vehicles with carburetor, install fuel pump (5) with gaskets (6 and 8), insulator (9), and actuating rod (7).

Retain pump to studs (10) with two nuts (12) and washers (11).

NOTE: Gasket (8) comes in three different sizes which are used to adjust pump stroke (pressure).

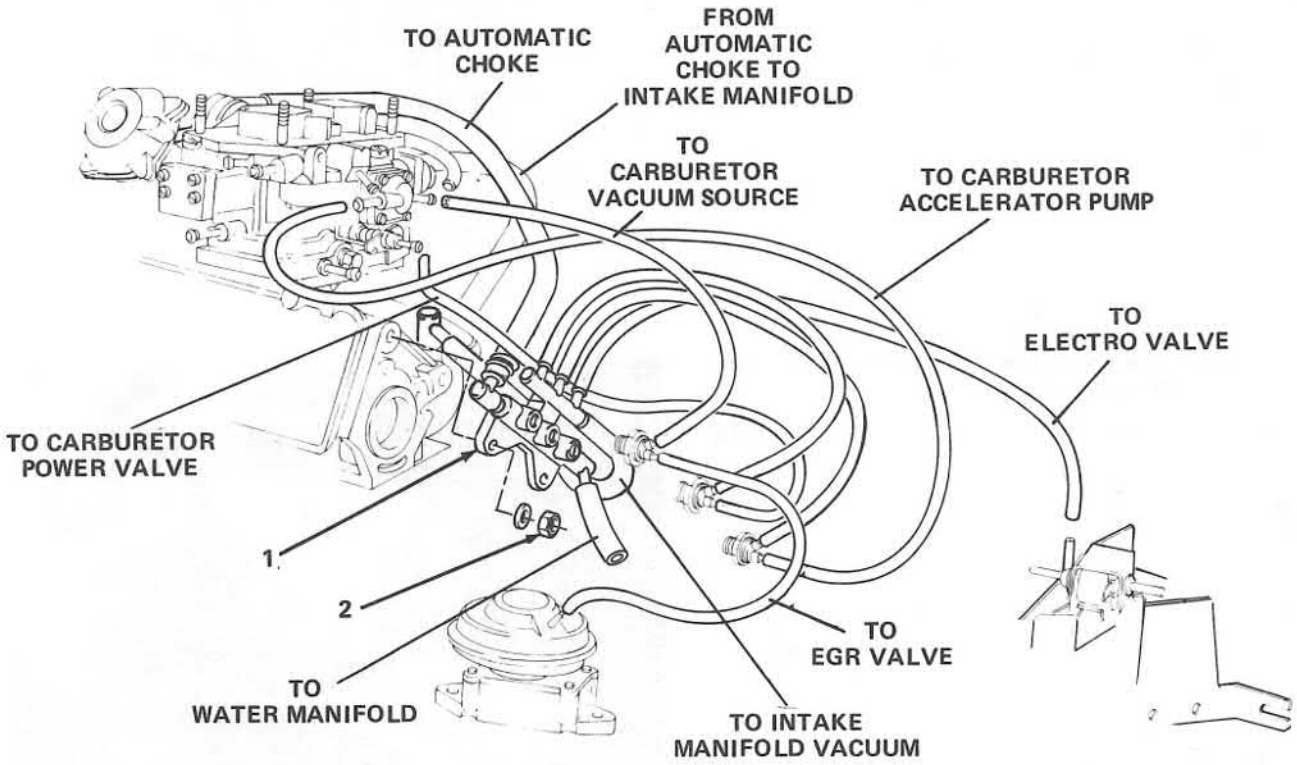
Secure fuel lines (3) and filter (4) to carburetor with clamps (2).

1. Carburetor 2. Clamp 3. Fuel hose 4. Filter 5. Fuel pump
6. Gasket 7. Actuating rod 8. Gasket 9. Insulator 10. Stud
11. Washer 12. Nut



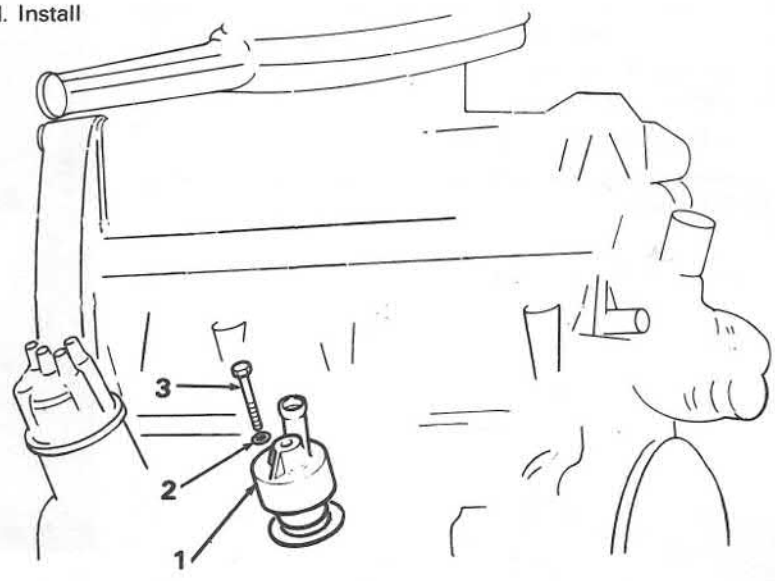
On vehicles with carburetor, install thermovalve housing assembly (1) with two nuts (2) and lockwashers.
Attach vacuum and water lines as shown.

1. Thermovalve housing assembly 2. Nut



Install cyclonic trap (1) in engine with hose attached. Install bolt (3) and lockwasher (2).
Torque to 17 ft. lbs. (2.3 kgm)

1. Cyclonic trap 2. Lockwasher 3. Bolt



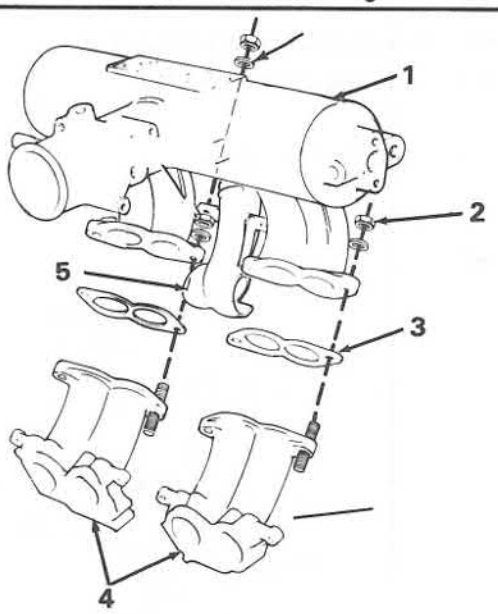
On vehicles with fuel injection, install intake manifolds (4) to cylinder head.

Install air intake (1) and gaskets (3) to intake manifolds with nuts (2) and washers.

Install cooling air duct (5).

Attach auxiliary air regulator to engine with two Allen bolts and washers. Install regulator with hoses attached. Make sure that clip is installed under both clamps.

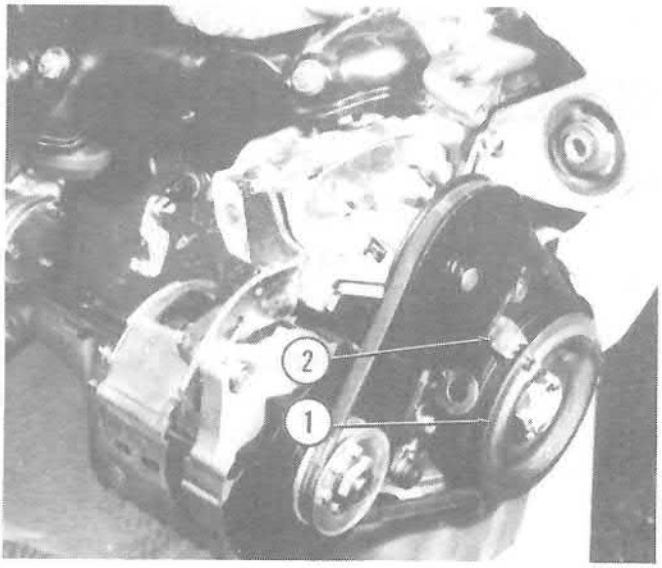
1. Air intake 2. Nut 3. Gasket 4. Intake manifolds
5. Cooling air duct



Install distributor, make sure that cylinder No. 1 is on compression stroke (both valves closed).

Turn crankshaft until notch on pulley (1) is lined up with TDC indicator plate (2).

1. Pulley 2. TDC indicator plate



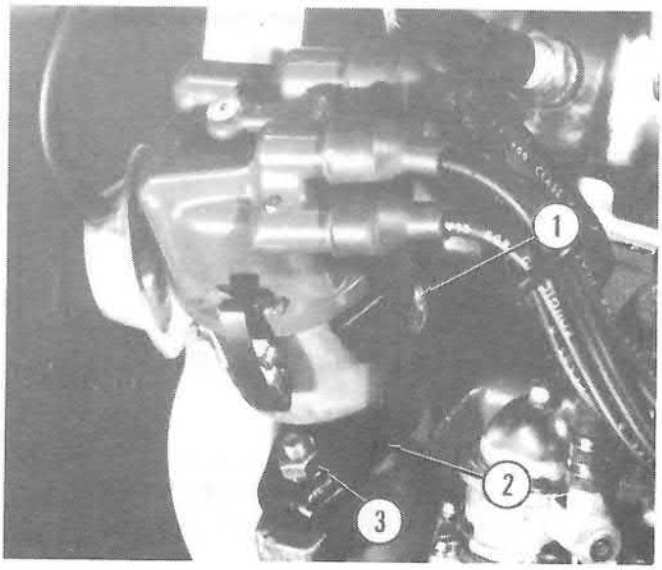
Remove distributor cap and rotate shaft until rotor faces terminal on cap corresponding to cylinder No. ~~1~~ 4!

Without moving the rotor from its original position, insert distributor (1) in crankcase.

Secure distributor with nut (3) and clamp (2).

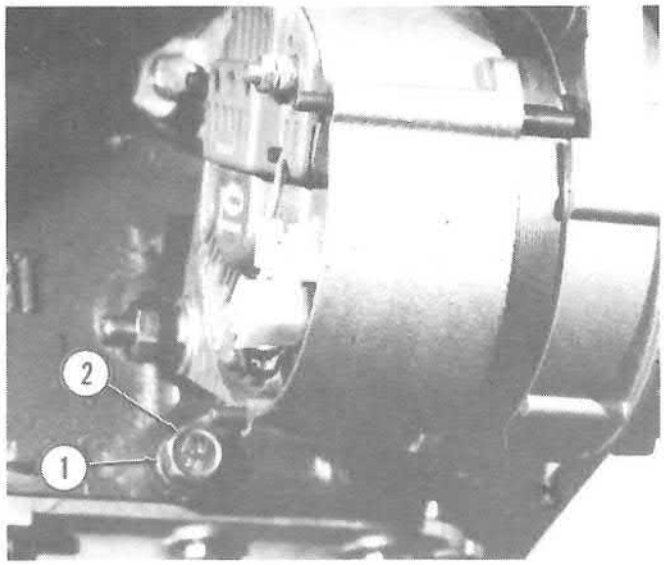
Final adjustment of timing will be accomplished with a timing light. Refer to 551.01.

1. Distributor 2. Clamp 3. Nut



Install alternator support (1) to engine with 4 bolts (2) and torque to 36 ft. lbs. (5 kgm).

1. Alternator support 2. Bolt



Install alternator bracket (4) to water pump housing with two bolts.

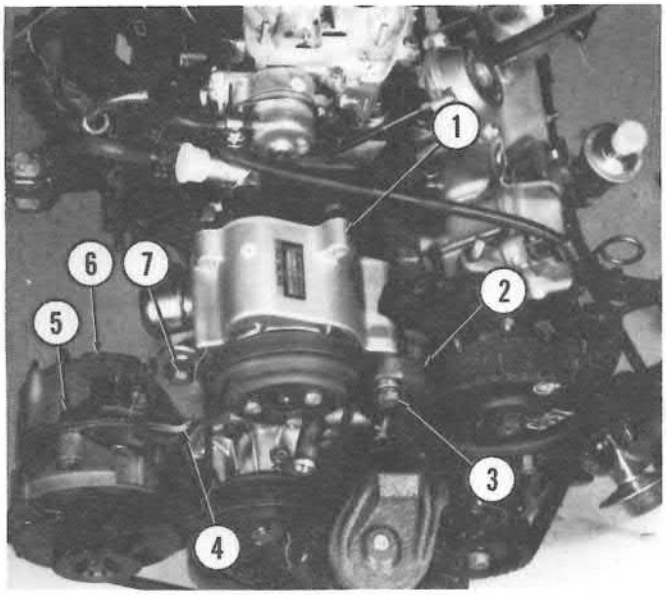
Place alternator (6) on bracket and secure in place with two bolts (5).

If equipped with air pump, install pump support (2) to cam housing with four bolts and torque bolts to 22 ft. lbs. (3 kgm).

Attach air pump (1) to bracket (4) and support (2) and secure in place with two bolts (3 and 7).

To adjust belts, refer to 101.15.

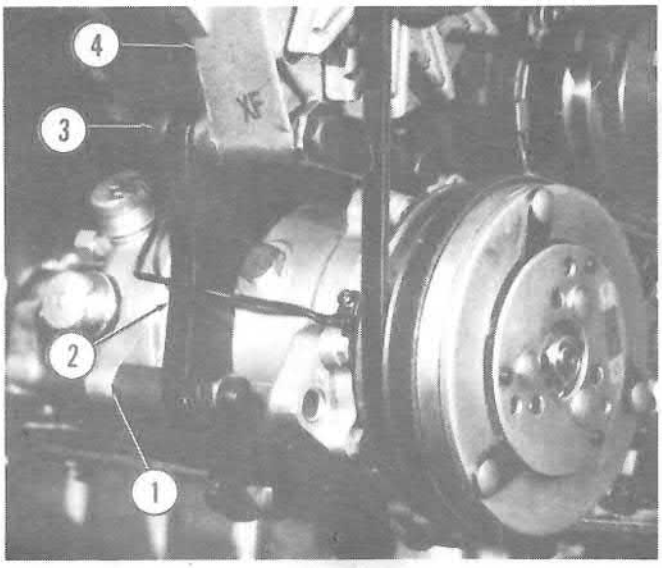
1. Air pump 2. Support 3. Bolt 4. Bracket 5. Bolt 6. Alternator 7. Bolt



If equipped with air conditioning, attach compressor (1) and brackets (2) to support and alternator (4) with bolts, washers, and nuts (3).

To adjust belt, refer to 101.15.

1. Air conditioning compressor 2. Bracket 3. Nut 4. Alternator



CRANKCASE

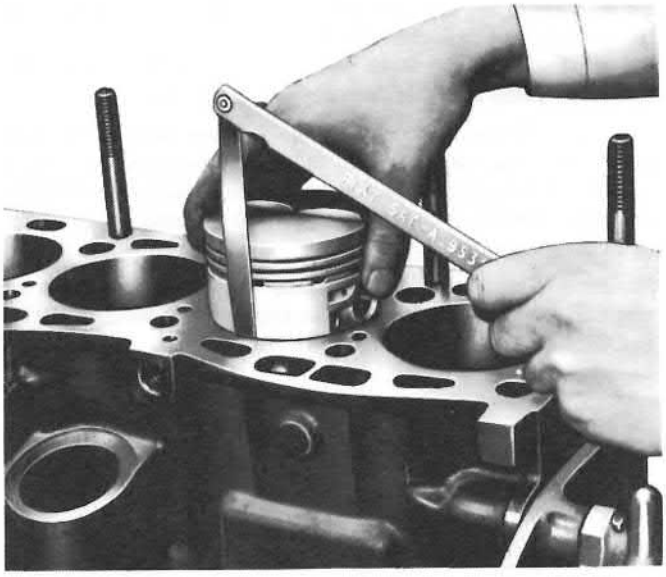
CHECKING CYLINDER BORES

Carefully examine cylinder bore surfaces. If only slight scoring or scratches are found, dress bores.

Use extra fine emery cloth wrapped around a hone.

Make sure piston clearance in bore does not exceed .006 in. (0.15 mm).

NOTE: For a new assembly, the piston clearance in bore, measured at right angle to pin and 1.08 in. (27.5 mm) from piston skirt edge is .0011 to .0019 in. (.030 to .050 mm).



Zero dial indicator (1) using gage A.96148 (2).

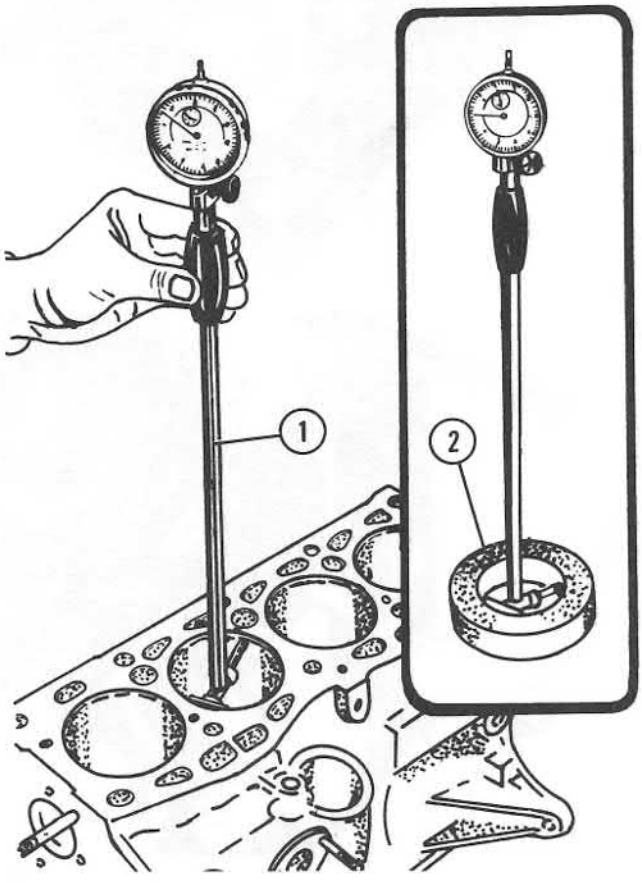
Check cylinder bores at three points, both lengthwise and crosswise. If wear or out of round is such as to require reconditioning, the following should be adhered to.

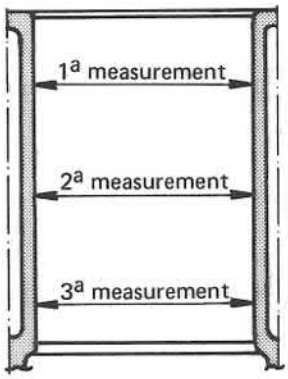
If metal to be removed is less than .006 in. (0.15 mm), honing will do.

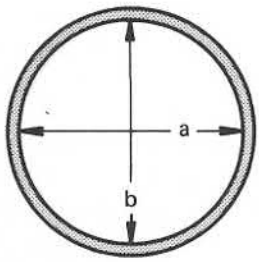
If it exceeds .006 in. (0.15 mm) the cylinder block should be rebored.

Cylinders should not be rebored beyond .0236 in. (0.6 mm).

1. Dial indicator gauge 2. Standard bore gage A.96148



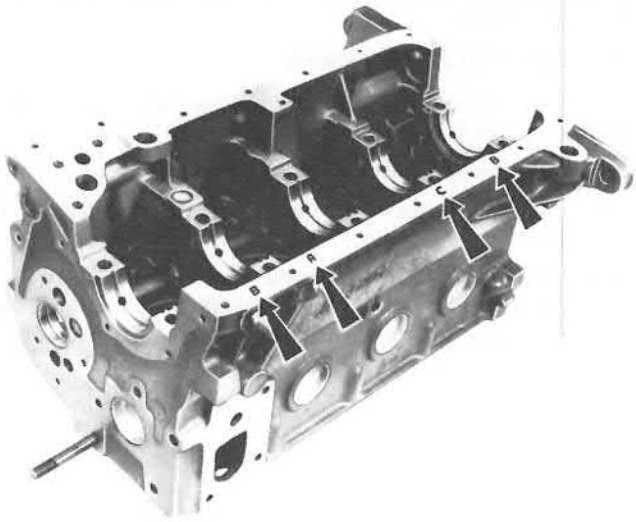




Bores should be reconditioned in relation to diameter of oversize pistons available (.0079, .0157, .0236 in. - 0.2, 0.4, 0.6 mm) and to specified clearance of .0011 to .0019 in. (0.030 to 0.050 mm) between pistons and bores.

As shown, letters are stamped on bottom face of cylinder block, opposite each bore, to indicate their diameter. This is done since the actual bore may vary from 3.4015 to 3.4035 in. (86.400 to 86.450 mm) and bores are selected in .0004 in. (0.01 mm) classes.

Standard pistons are also selected in classes and must be matched with cylinder bores belonging in the same class (Refer to CONNECTING RODS AND PISTONS).



Cylinder Block Gasket Surface

The cylinder block gasket surface may become warped or distorted.

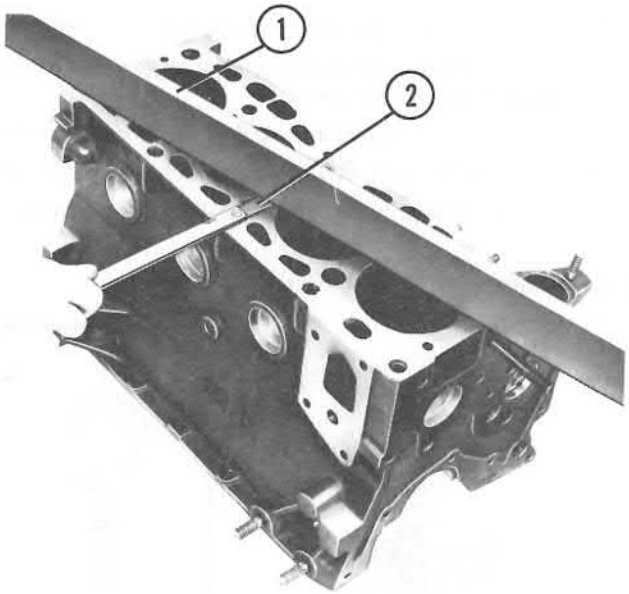
Using a surface plate coated with lampblack, check for spots where metal must be removed to make surface perfectly level.

The check may also be accomplished with a straightedge (1) and feeler gage (2).

The straightedge should be placed in line with the diagonals of cylinder block surface, and lengthwise in the middle.

When refacing cylinder block, care should be taken to remove as little metal as possible.

1. Straightedge 2. Feeler gage



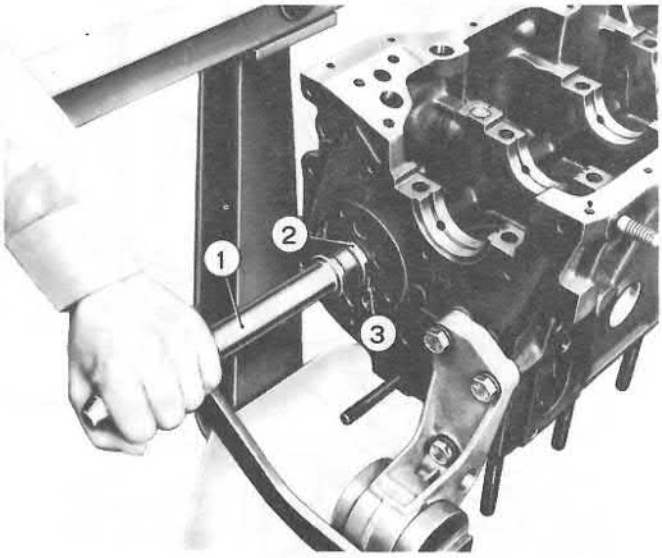
Auxiliary Shaft Bores and Bushings

Check that bushings press fitted in crankcase bores are not out-of-round or loose and that oil holes are in exact alignment with crankcase oilways.

Inner surface of bushings should be smooth and free from scuffing. Replace if damaged.

Should it become necessary to replace bushings, remove old ones from bores using driver A.60372/1/2 (1) for drive end bushing (3) and A.60372/1 for inside bushing.

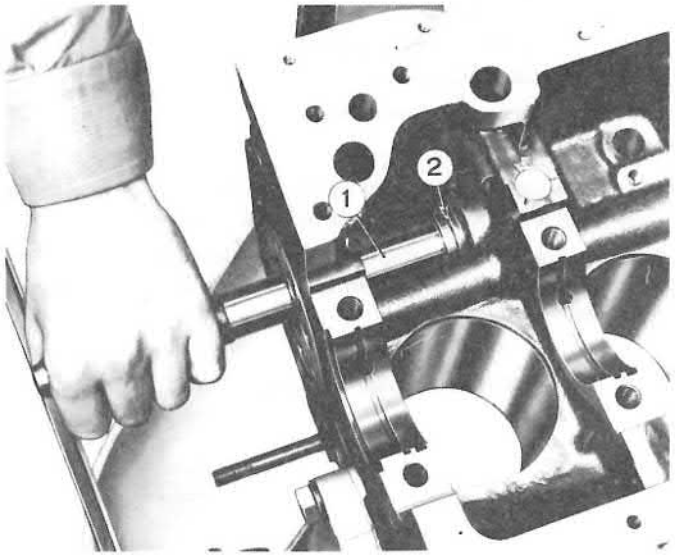
1. Driver A.60372/1 2. Tool A.60372/2 3. Bushing, drive end



Bushings are press fitted to their own bores in crankcase. First install inside bushing (2) using driver A.60372/1 (1) and then drive end bushing using driver A.60372/1/2.

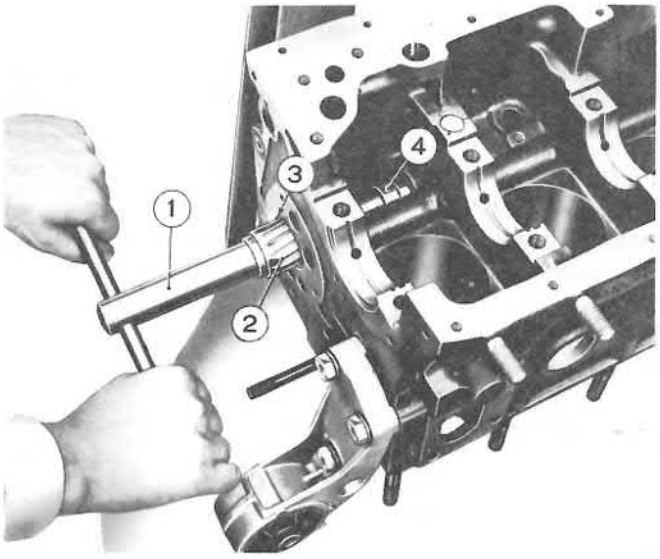
When installing bushings, make sure to position them so that bushing oil hole is perfectly aligned with oil passage from crankcase.

1. Driver A.60372/1 2. Inside bushing



Bushings should be finished reamed using tool A.90365 (1) to specified inside diameter after they have been press fitted in place, to ensure a correct fit and alignment of auxiliary shaft journals (refer to specifications on previous page).

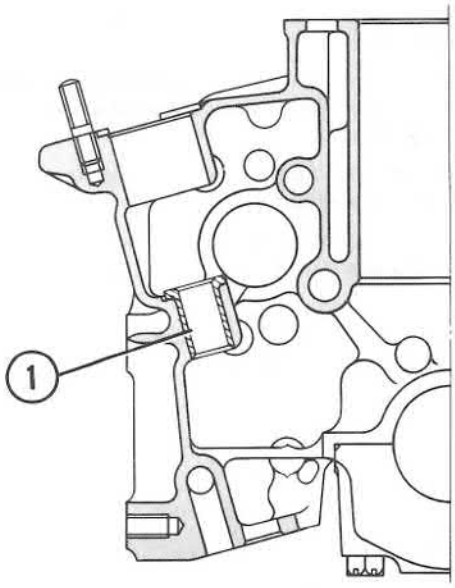
1. Reamer A.90365 2. Cutter 3. Bushing, drive end 4. Centering pin



Distributor and Oil Pump Drive Gear Bushing

Check that bushing (1) has not ovalized or become loose in bore. Inner surface should be smooth and show no traces of wear. Replace if necessary (refer to LUBRICATION).

1. Bushing



CYLINDER HEAD

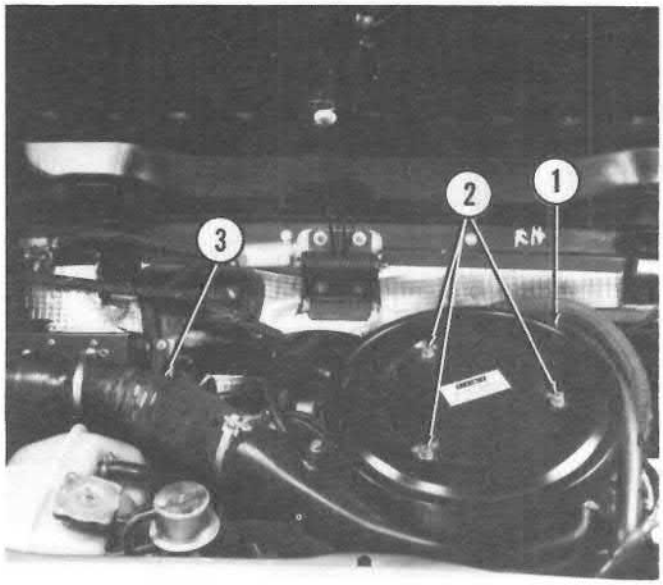
REMOVAL AND INSTALLATION
(Vehicles With Carburetor)

Disconnect battery ground cable.

Drain cooling system.

Disconnect hoses from side of air cleaner (1). Remove three nuts (2) and washers holding cover on air cleaner.

Remove four nuts holding air cleaner on carburetor. Lift air cleaner, disconnect hose from bottom and remove air cleaner with fresh air duct (3).



1. Air cleaner 2. Nuts 3. Fresh air duct

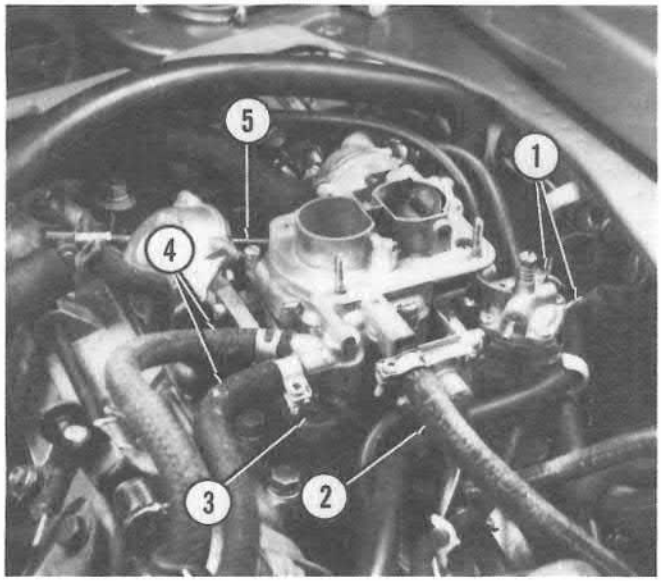
NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

From carburetor, disconnect fuel inlet and return hoses (4), charcoal canister hose (2) and all remaining vacuum and coolant hoses.

Disconnect three electrical connectors (1) from carburetor.

Disconnect throttle linkage (5) at carburetor.

Remove four nuts (3) holding carburetor. Remove carburetor and spacer.



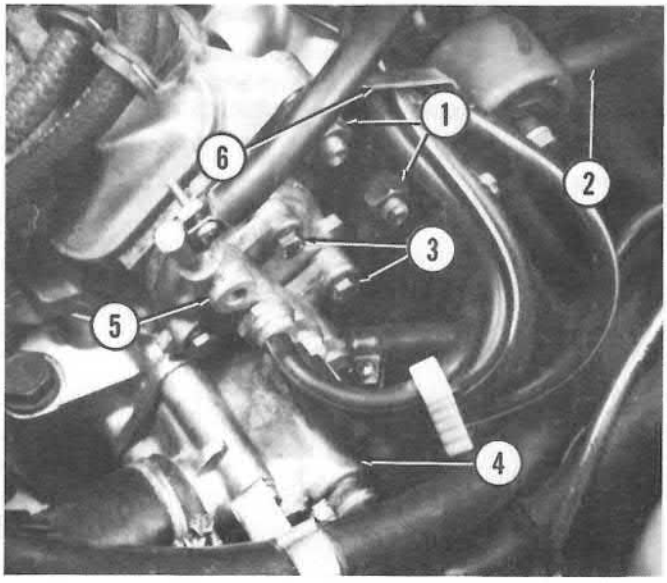
1. Connectors 2. Hose 3. Nut 4. Fuel hose 5. Throttle linkage

Remove two nuts (1) and washers holding reaction rod bracket (6) to cylinder head.

Remove through bolt holding reaction rod (2) to body bracket. Set reaction rod and bracket assembly to one side with vacuum tree and hoses attached.

Remove two bolts (3) holding thermovalve housing assembly (5) and remove it without disconnecting lines from housing.

Remove three bolts and disconnect thermostat housing (4) from head. Coolant hoses can remain attached to housing.



1. Nuts 2. Reaction rod 3. Bolt 4. Thermostat housing
5. Thermovalve housing 6. Bracket

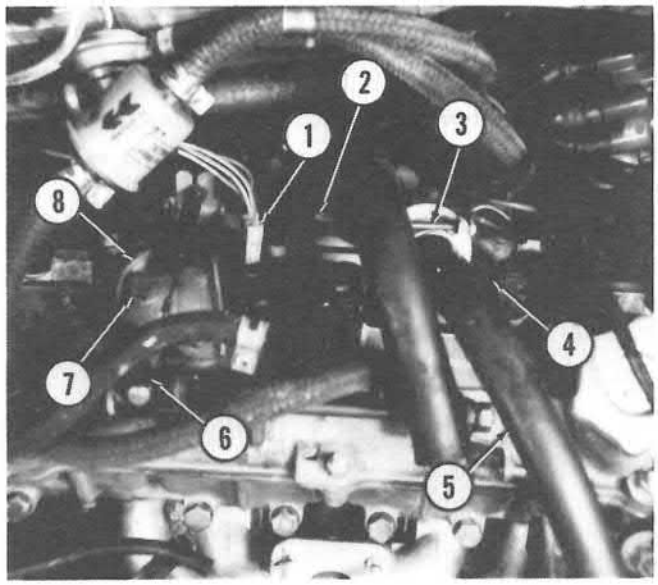
Disconnect spark plug wires (2).

Disconnect wires from gulp valve thermoswitch (1) and coolant temperature sending unit (4).

Disconnect throttle cable by removing spring clip (6) at end of cable and two bolts (7) holding bracket (8) to head.

On vehicles with air pump, disconnect hose (5) from check valve (3).

1. Gulp valve thermoswitch 2. Spark plug wire 3. Check valve
4. Coolant temperature sending unit 5. Hose 6. Clip 7. Bolt
8. Bracket



Removing timing belt cover (one-piece cover) or upper and lower timing belt cover halves (two-piece cover).

Disconnect coolant hose (3) from water pump.

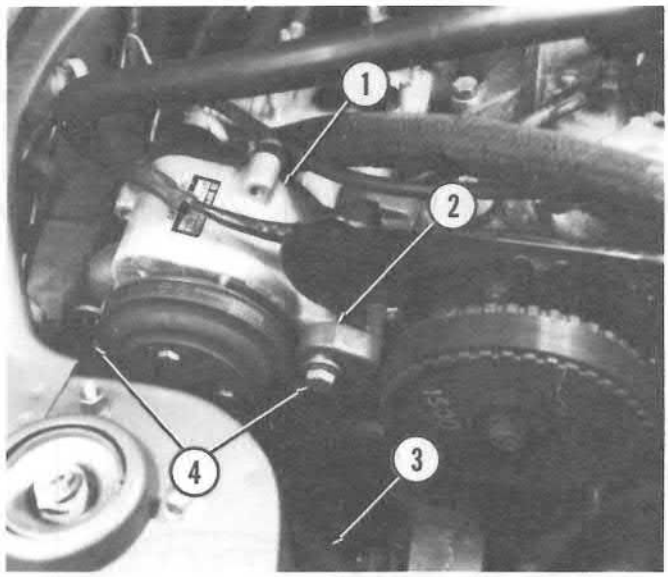
On vehicles with air pump (1), remove two bolts (4) holding air pump and remove pump.

Remove four bolts attaching air pump support (2) to cam housing and remove support.

On vehicles with air conditioning, remove bolts and nuts holding alternator and remove alternator. Alternator may be placed to one side without disconnecting electrical leads.

If alternator bracket is a one-piece assembly attached to both head and block, remove attaching bolts and bracket.

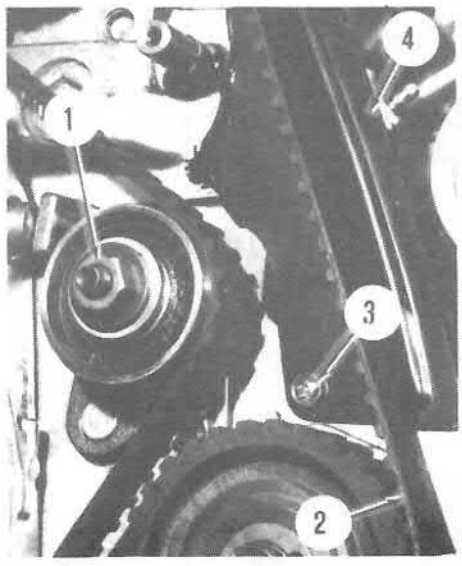
1. Air pump 2. Support 3. Hose 4. Bolt



Loosen tensioner pulley nut (1) and remove timing belt (2) from cam sprocket.

Remove bolts (3) and nuts holding belt guard (4) and remove guard.

1. Tensioner pulley nut 2. Timing belt 3. Bolt 4. Belt guard



Remove rear access panel from inside trunk.

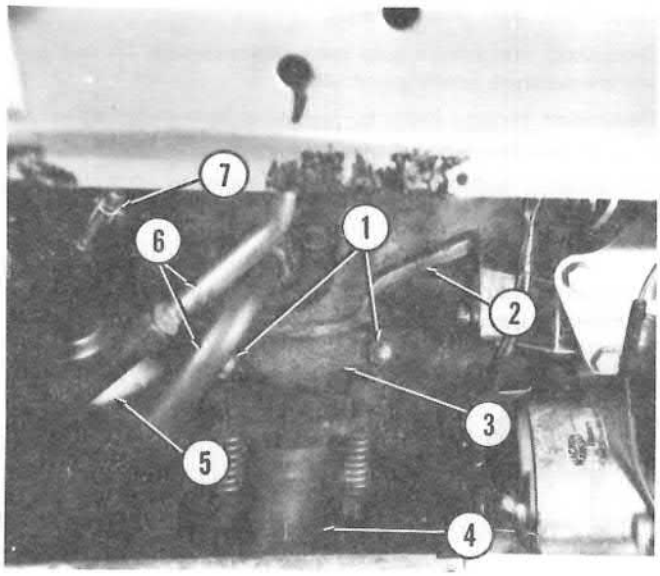
Remove two nuts (1) and clamp (3) attaching exhaust pipe (4) to manifold (2).

Disconnect charcoal canister hose (7) from exhaust manifold.

Disconnect EGR valve lines (6) at EGR valve (5), then disconnect lines at manifolds.

Disconnect remaining hoses from intake manifold.

1. Nuts 2. Manifold 3. Clamp 4. Exhaust pipe 5. EGR valve
6. Line 7. Hose



Remove cylinder head hold down bolts and nuts. Nuts on carburetor side will require special wrench A.50131. Remove head.

Installation is reverse of removal.

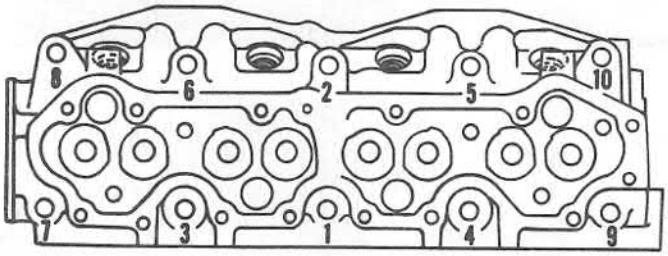
Refer to CAMSHAFT DRIVE (101.06) for timing of valve assembly.

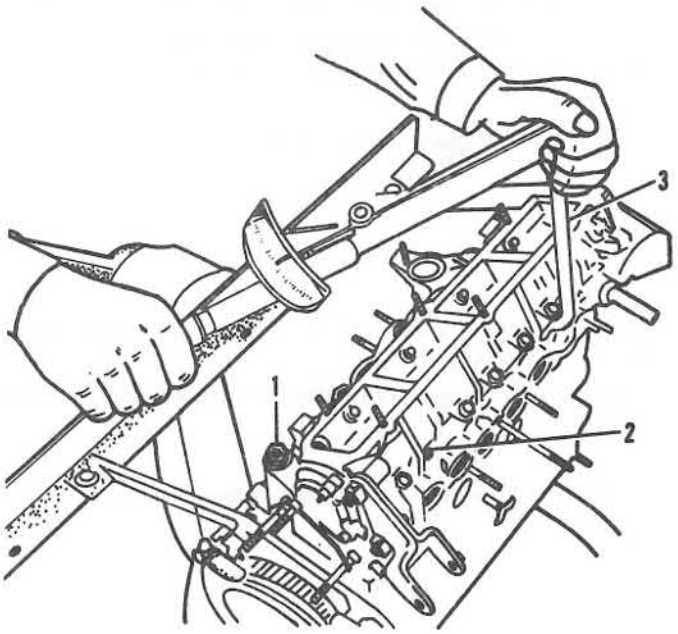
Install all new gaskets. Head gasket is installed with word "ALTO" facing up.

Tighten hold down bolts and nuts in order shown. Torque in at least two stages. Final torque is 69 ft. lbs. (9.5 kgm).

NOTE: If cylinder head has 17 mm hex hold down bolts, refer to torquing procedure on page 10-51.

1. Bolt 2. Nut 3. Wrench A.50131





REMOVAL AND INSTALLATION
(Vehicles with Fuel Injection)

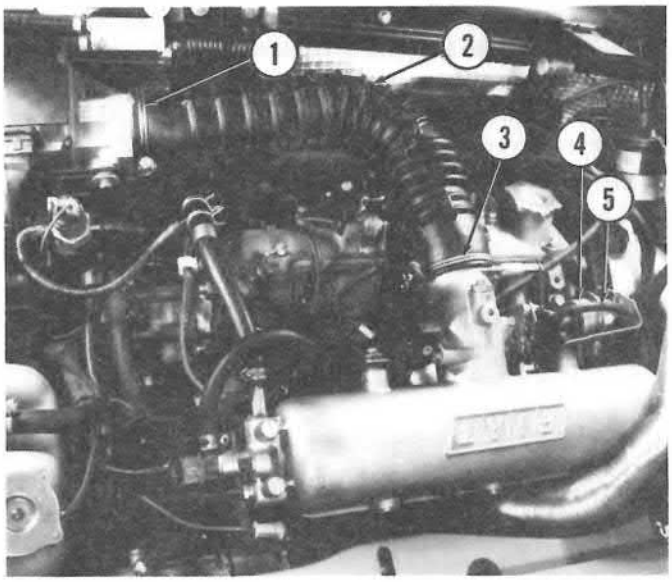
Disconnect battery ground cable.

Drain cooling system.

Loosen clamps (1 and 3) and remove air supply hose (2) after disconnecting attached vacuum hoses.

Plug openings to prevent dirt from entering.

CAUTION: Relieve fuel system before disconnecting fuel lines. To do this, remove vacuum hose (5) from fuel pressure regulator (4). Connect vacuum pump to regulator and pump vacuum up to 20 inches.

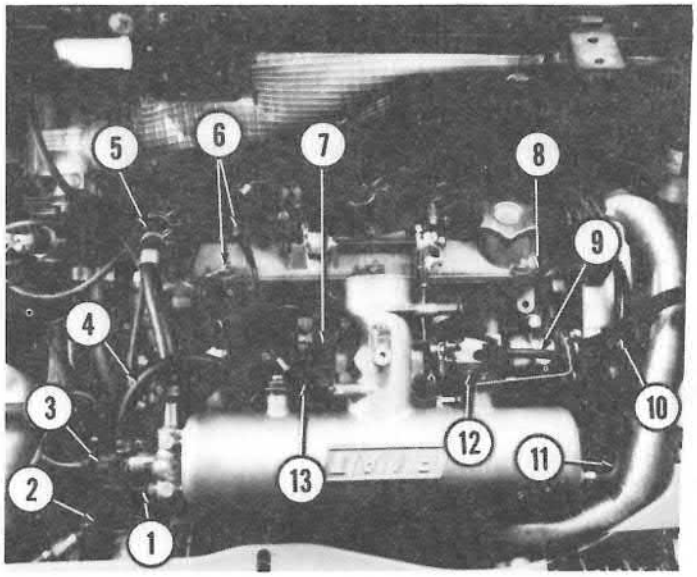


1. Clamp 2. Hose 3. Clamp 4. Fuel pressure regulator
5. Vacuum hose

NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

Disconnect the following electrical connectors: cold start valve (3), ground points (6), throttle switch (7), fuel injectors (13), and fuel injector fan thermoswitch (12).

Also disconnect charcoal canister vacuum hose (1), cold start valve fuel hose (4), fuel inlet hose (2), auxiliary air regulator hose (5), distributor vacuum hose (8), fuel return hose (10), fuel pressure regulator vacuum hose (9) and, on vehicles with air conditioning, vacuum source hose (11).



1. Vacuum hose 2. Fuel hose 3. Cold start valve 4. Fuel hose
5. Vacuum hose 6. Ground points 7. Throttle switch
8. Vacuum hose 9. Vacuum hose 10. Fuel return hose
11. Vacuum hose 12. Injector fan thermoswitch 13. Fuel injectors

Disconnect throttle linkage by removing spring clip from linkage cable end at bellcrank (6).

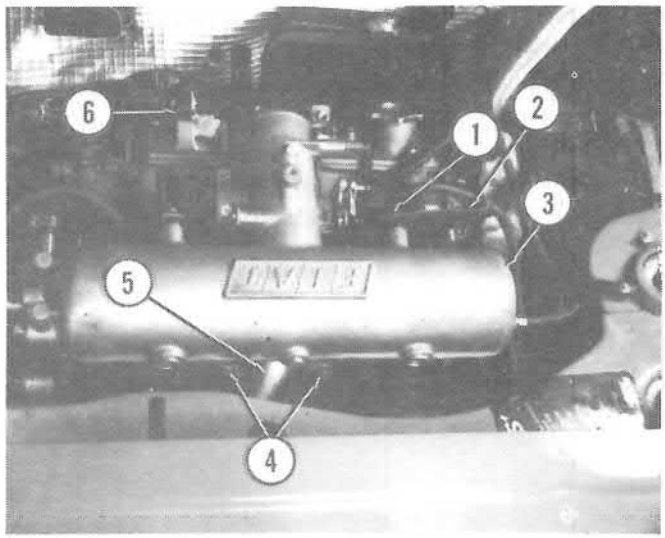
Remove bolt (1) and washers holding fuel pressure regulator bracket (2) to air intake (3).

Remove two nuts (4) and washers holding fuel injector cooling air duct (5) to manifold studs.

Disconnect air hose from duct and remove duct.

Remove four nuts and eight washers holding air intake to manifold.

Carefully tilt air intake backwards off studs and remove from vehicle.



1. Bolt 2. Bracket 3. Air intake 4. Nuts 5. Cooling air duct
6. Bellcrank

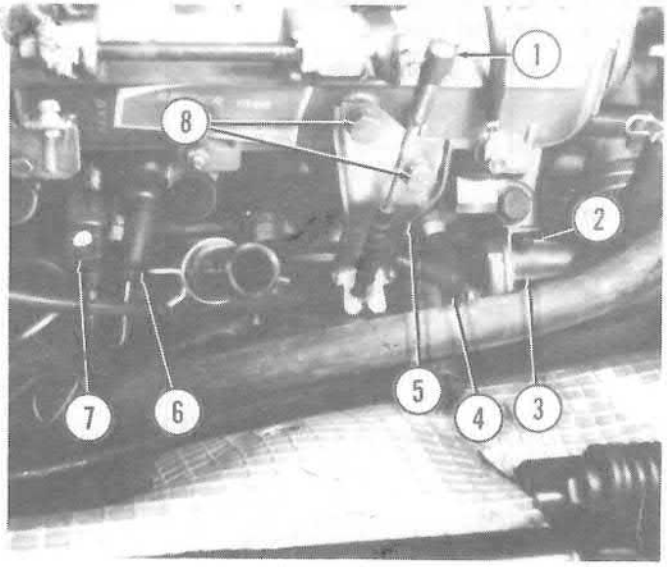
Remove two Allen bolts (2) and pull auxiliary air regulator (3) away from head. Hoses and electrical lead can remain attached to regulator.

Disconnect throttle cable by removing spring clip (1) at end of cable and two bolts (8) holding bracket (5) to head.

Disconnect spark plug wires (4).

Disconnect connectors from coolant temperature sending unit (6) and thermotime switch (7).

1. Spring clip 2. Allen bolt 3. Auxiliary air regulator
4. Spark plug wire 5. Bracket 6. Coolant temperature sending unit
7. Thermotime switch 8. Bolts

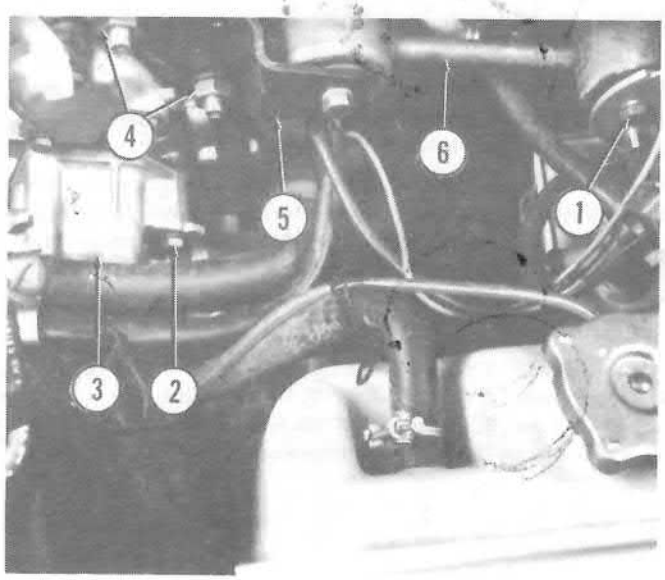


Remove two nuts (4) and washers holding reaction rod bracket (5) to cylinder head.

Remove through bolt (1) holding reaction rod (6) to body bracket. Remove reaction rod and bracket assembly.

Remove three bolts (2) and disconnect thermostat housing (3) from head. Coolant hoses and electrical lead can remain attached.

1. Bolt 2. Bolt 3. Thermostat housing 4. Nuts 5. Bracket
6. Reaction rod



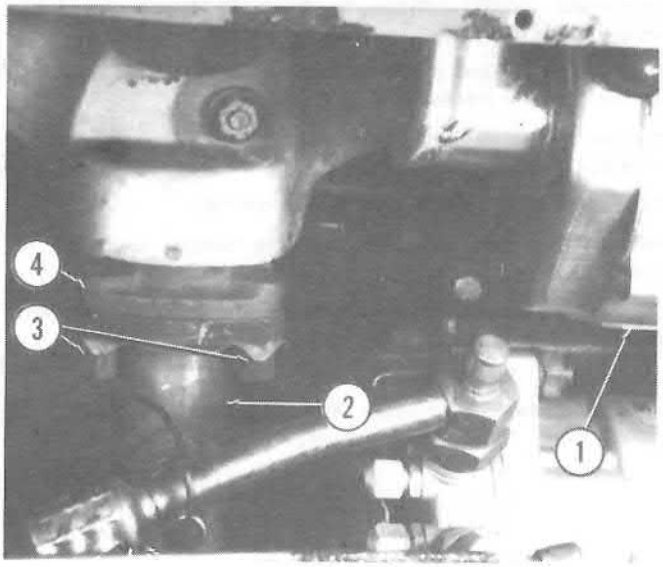
From inside trunk, remove floor mat, insulation panel, floor panel and access panel.

Remove three nuts (3) attaching exhaust pipe (2) to manifold (4).

On vehicles with air conditioning, remove bolts and nuts holding alternator (1) and remove alternator. Alternator may be placed to one side without disconnecting electrical leads.

If alternator bracket is a one-piece assembly attached to both head and block, remove attaching bolts and bracket.

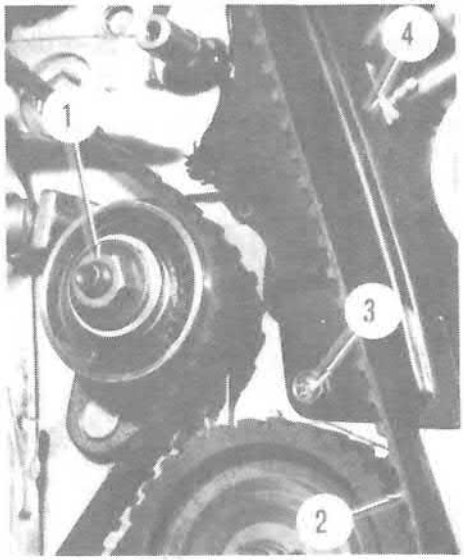
1. Alternator 2. Exhaust pipe 3. Nuts 4. Manifold



Remove upper and lower timing belt cover halves.

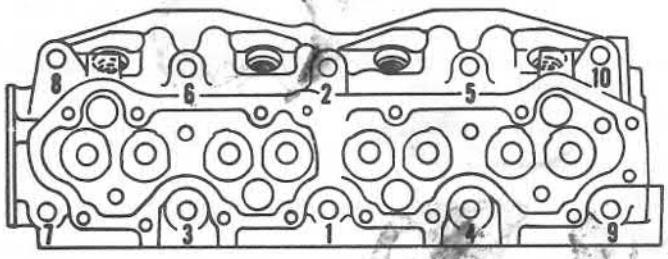
Loosen tensioner pulley nut (1) and remove timing belt (2) from cam sprocket.

Remove bolts (3) and nuts holding belt guard (4) and remove guard.



1. Tensioner pulley nut 2. Timing belt 3. Bolt 4. Belt guard

Remove cylinder head hold down bolts and nuts. Nuts on intake side will require special wrench A.50131. Remove head.



NOTE: Engines built after number 4028877 (without air conditioning) or 4037356 (with air conditioning) are equipped with 17 mm hex bolts. Use special wrench A.50172.

Installation is reverse of removal.

Refer to CAMSHAFT DRIVE (101.06) for timing of valve assembly.

Install all new gaskets. Head gasket is installed with word "ALTO" facing up.

On vehicles with 19 mm bolts and nuts, tighten bolts in order shown. Torque in at least two stages. Final torque is 69 ft. lbs. (9.5 kgm).

On vehicles with 17 mm bolts, lubricate all bolts and washers with SAE 30 engine oil. Let excess oil drip from bolts and washers for 30 minutes.

NOTE: In the next steps, tighten and torque cylinder head bolts in sequence shown.

Using wrenches A.50172 torque all cylinder head bolts to 14.5 ft. lbs. (2 kgm).

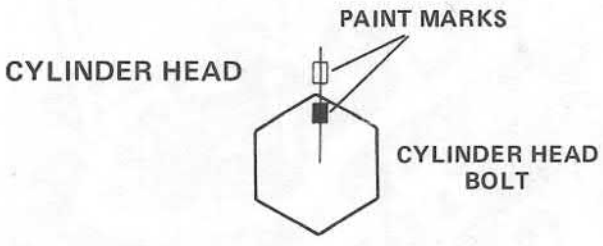
Retorque all bolts to 29 ft. lbs. (4 kgm).

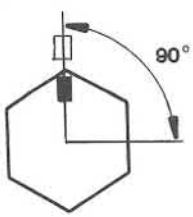
Apply paint marks to one corner of all head bolts and a corresponding mark to the cylinder head.

Using wrenches A.50172, tighten all head bolts to a 90° angle (1).

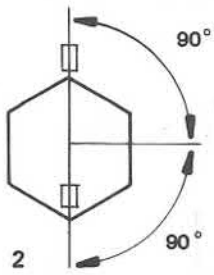
Retighten all head bolts to a second 90° angle (2).

NOTE: All cylinder head bolts must have been tightened a total of 180° in two stages.





1



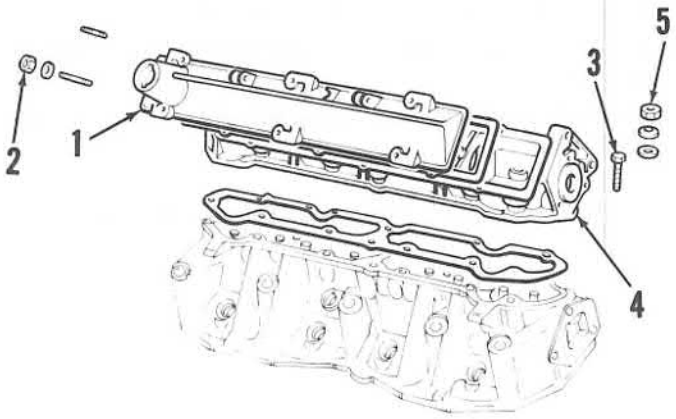
2

DISASSEMBLY AND REASSEMBLY

Remove camshaft housing cover (1) by removing six nuts (2).

Remove intake and exhaust manifolds.

Remove camshaft housing (5) from cylinder head by removing six bolts (3) and six nuts (4).



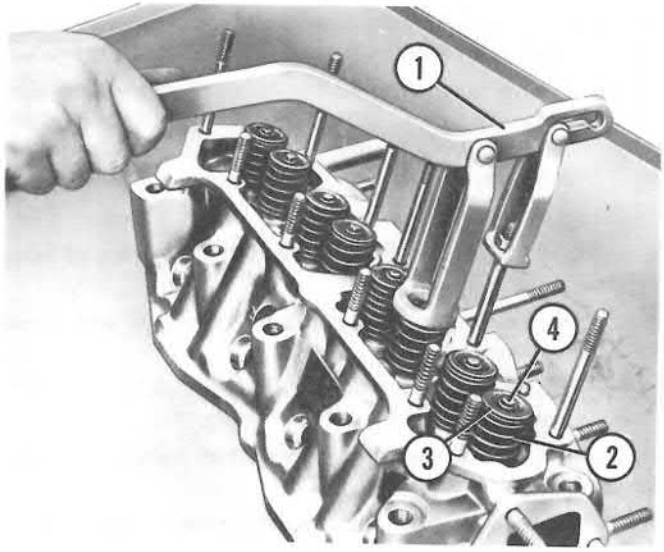
1. Camshaft housing cover 2. Nut 3. Bolt 4. Nut 5. Camshaft housing

Position valve spring compressor (1) A.60311 as shown and compress spring (2) to release spring locks (4) (if spring locks are stuck in grooves carefully tap spring cup (3), taking care not to damage valve stem).

Remove springs and cups.

Remove spark plugs.

Remove oil seals and take out valves from bottom side of head.

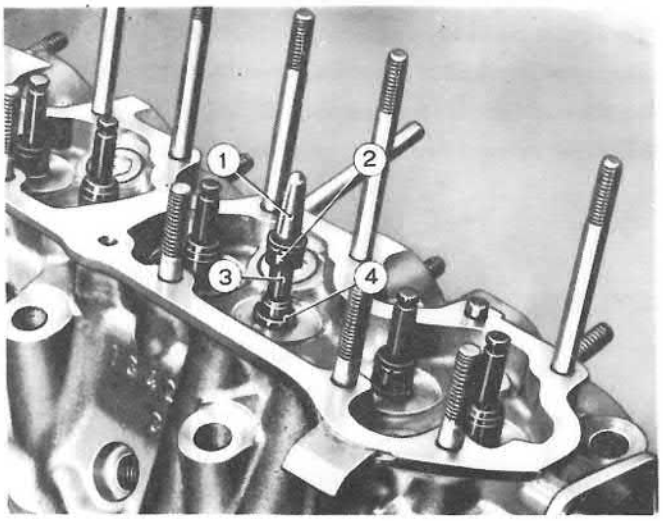


1. Valve spring compressor A.60311 2. Valve spring 3. Spring cup 4. Spring locks

To reassemble head reverse above procedure.

Before installing valve springs, install valve seals (2) on valve guides (4) with pilot A.60313 (1).

Place oil seal on pilot, and mount pilot on valve stem. Press seal down onto upper end of valve guide with installer A.60313/2.



1. Pilot A.60313/1 2. Oil seal 3. Valve stem 4. Valve guide

Cleaning Cylinder Head

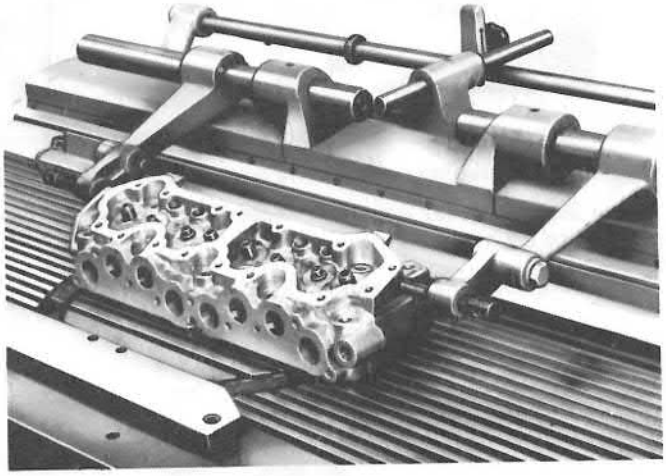
Clean carbon from combustion chambers using wire brush driven by a portable electric drill.

Remove carbon deposits from exhaust ducts and descale water jackets.

Inspect and clean intake ducts and oilways to camshaft lobes and tappets.

Inspecting and Refacing Gasket Surface

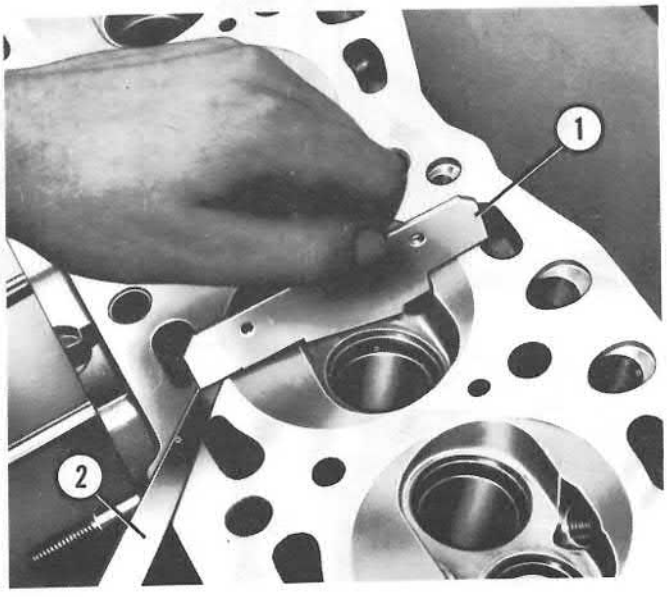
Apply a thin coating of lampblack on a surface plate and run cylinder head mating face over it. The resulting contact pattern should be evenly spread over the whole cylinder head gasket surface. If it is not, there is distortion and the head will have to be refaced on a surface grinder as shown. Be sure to remove only enough stock to correct the faulty condition.



After refacing, combustion chamber depth must be checked with gage A.96238 (1) to make certain it has not been reduced beyond allowable limits.

With gage resting at center of combustion chamber, the gap between gage and gasket surface should not exceed .010 in. (0.25 mm). If gap exceeds .010 in. (0.25 mm), replace head.

1. Depth gage A.96238 2. Feeler gage



Inspecting and Refacing Valve Seats

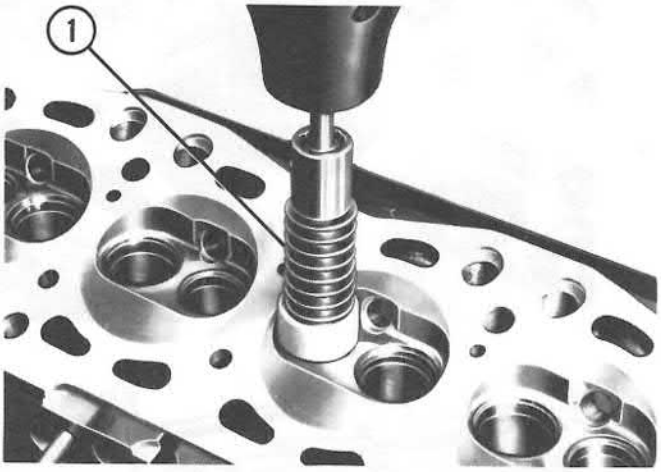
Valve seats must show no evidence of pitting on contact face. If pitted, they must be refaced.

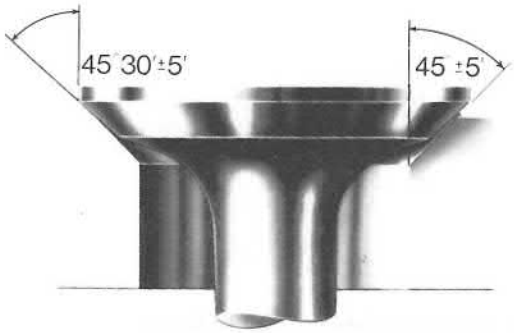
Using appropriate valve guide pilot that provides the tightest fit in guide, fix taper stone assembly (1) to guide.

Make sure taper stone has angle of 45° ± 5' and is new or recently dressed.

Start grinder before stone contacts seat, otherwise seat may be damaged.

1. Taper stone assembly





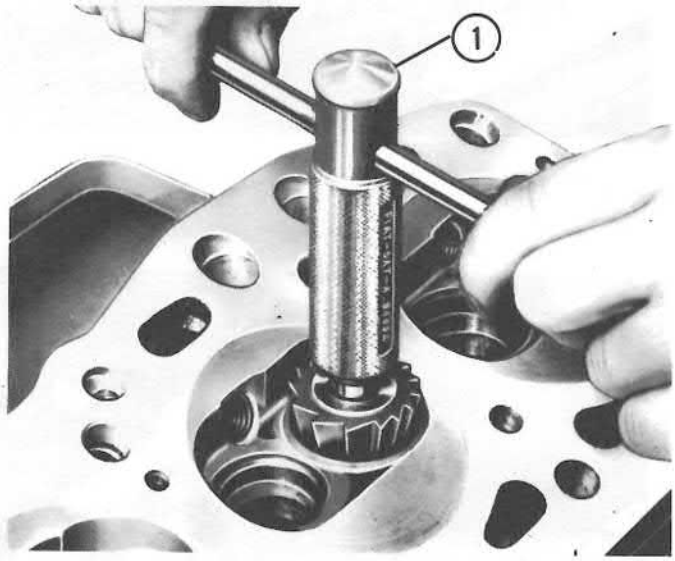
VALVE AND VALVE SEAT ANGLES

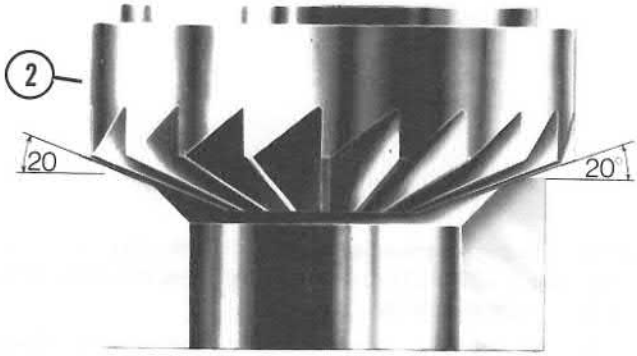
Once valve seats have been refaced, seat width should be narrowed.

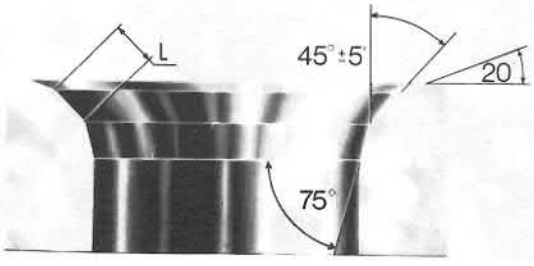
Install reamer assembly (1) on valve guide pilot and carefully ream seat.

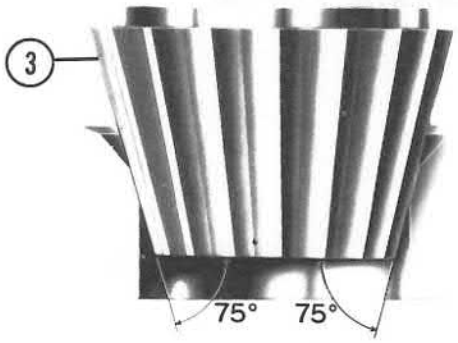
Use a 20° reamer (2) and a 75° reamer (3) alternately until the width of intake and exhaust seats is dimension L = .083 to .087 in. (2.1 to 2.2 mm).

1. Reamer assembly 2. 20° reamer 3. 75° reamer









VALVES

INSPECTING AND REFACING VALVES

Clean carbon from valves with power wire brush.

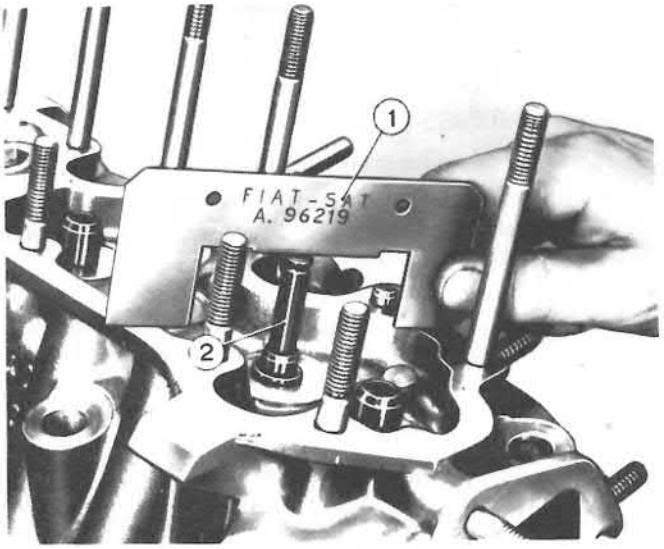
Inspect valve stem for distortion and signs of cracking, replace valve if necessary.

Serviceable valve may be refaced at angle of 45° 30' ± 5'. At completion of refacing, check that thickness of valve head margin (3) is at least .020 in. (0.5 mm).

Should it become necessary to grind valve stem tip to eliminate dishing due to wear or to reduce stem height after refacing, remove only what is necessary.

With each valve reinstalled in its seat, use gage A.96219 (1) to check that stem (2) tip just grazes the gage edge. If there is any interference between stem and gage, reduce stem height by grinding tip.

1. Gage A.96219 2. Valve stem 3. Valve head margin



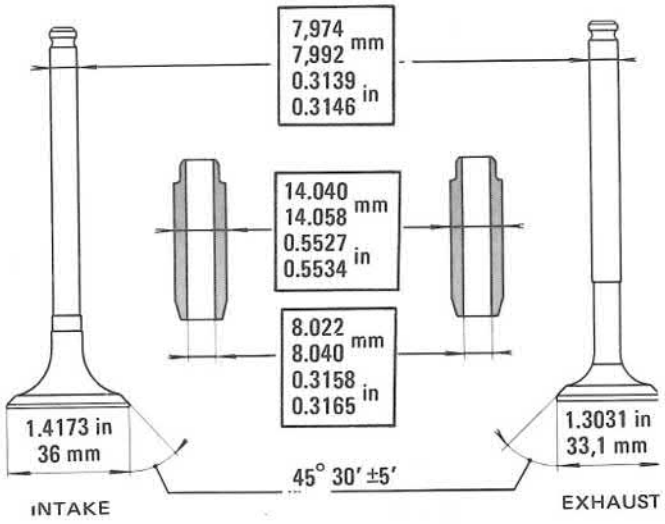
VALVE GUIDES

INSPECTING AND REPLACING VALVE GUIDES

Valve guides are press fitted in their bores with an interference fit of .0025 to .0043 in. (0.063 to 0.108 mm).

They should be replaced when scored or worn or when there is excessive clearance between them and the valve stem, which cannot be corrected by replacing valve.

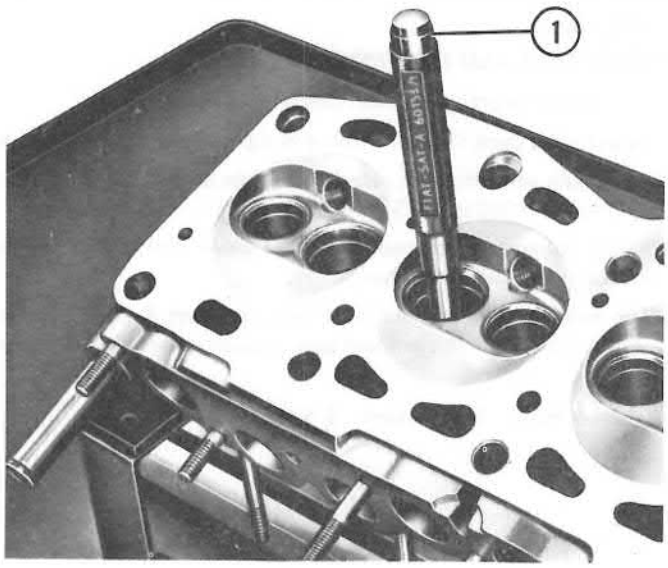
Valve stem fit clearance in guide is .0012 to .0026 in. (0.030 to 0.066 mm) for both intake and exhaust valves, and maximum wear limit is .006 in. (0.15 mm).



When replacing valve guides, use driver A.60395 (1) for disassembly and driver A.60462 for reassembly.

NOTE: Replacement valve guides are prefinished and unless minor damage occurs during assembly no reaming is required. Should damage occur use reamer A.90310 to refinish bore.

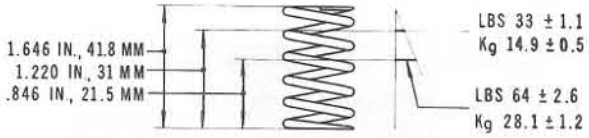
1. Driver A. 60395



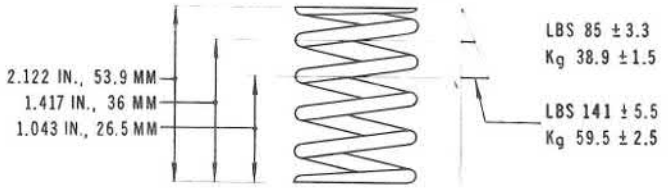
VALVE SPRINGS

Inspect valve springs for cracks or weakening.

Test spring tension using appropriate spring tester; then compare tension and deflection data on tester with specifications shown.



SPECIFICATIONS FOR TESTING VALVE INNER SPRING



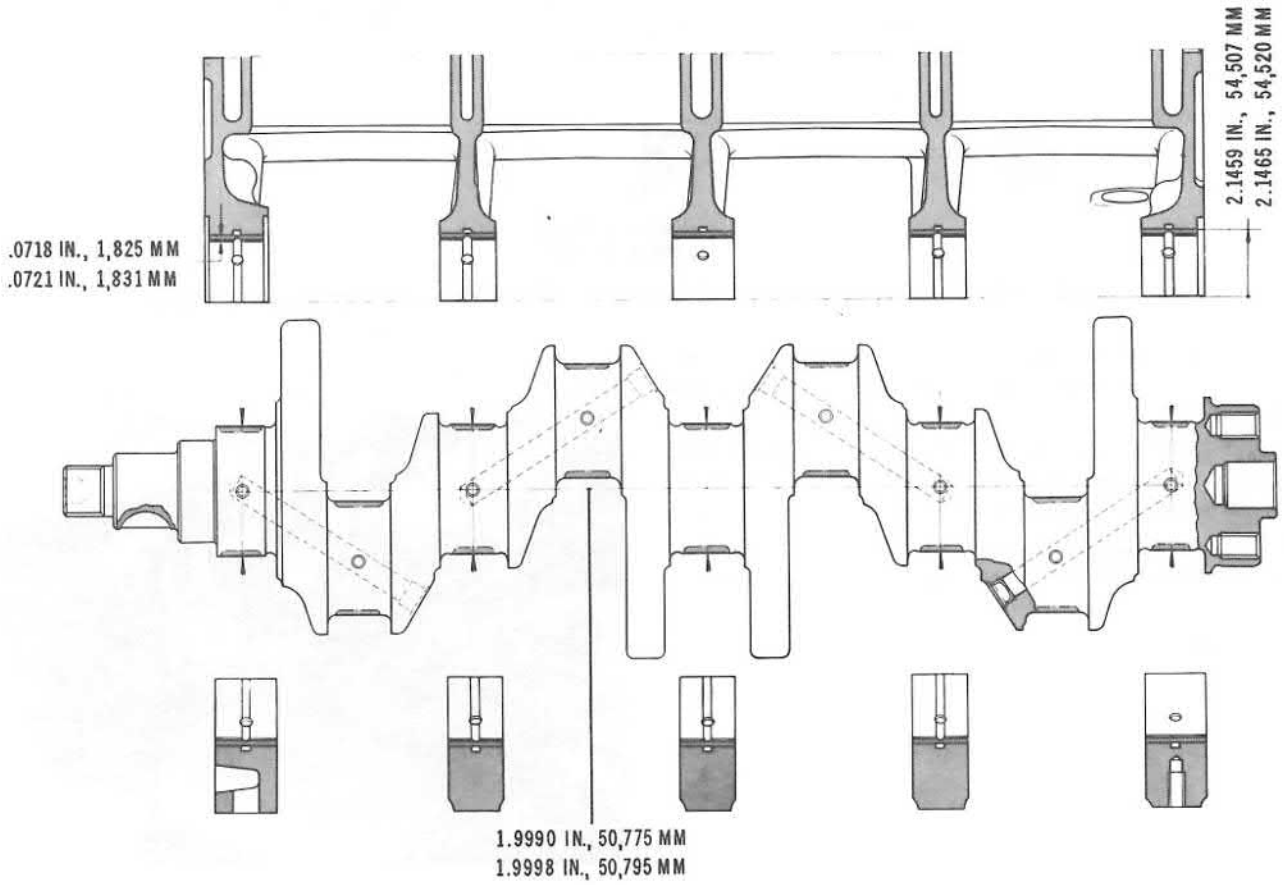
SPECIFICATIONS FOR TESTING VALVE OUTER SPRING

MAIN BEARING JOURNALS AND CRANKPINS

INSPECTION

Carefully inspect crankshaft for cracks on main bearing journals and crankpins as well as on crank arms. If any are detected, crankshaft should be replaced to prevent failure. Should journals show light traces of scuffing, these can be dressed off by using an extra-fine carborundum stone.

If deep scoring is discovered, or if micrometer measurements of journals show an out-of-round condition in excess of .0002 in. (.005 mm), journals will have to be reground to next undersize.



When regrinding journals, be sure to pay special attention to specified fit clearances in relationship to undersize bearing range available for service. Depending on amount of wear, main bearing journals and crankpins should be reground to undersize diameter shown in tables.

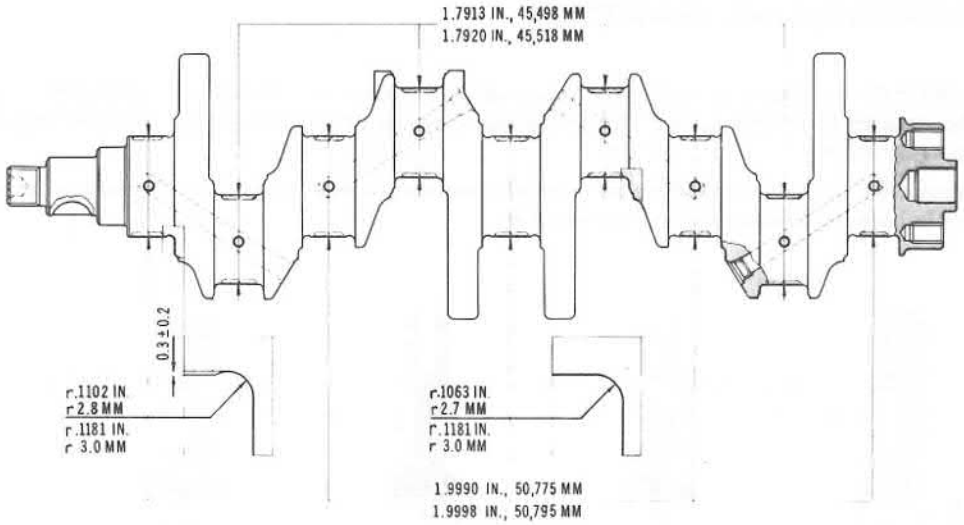
The same journal radius that existed originally should be maintained.

MAIN BEARING THICKNESSES

Standard bearings	Undersize bearings			
	.01 in (0.254 mm)	.02 in (0.508 mm)	.03 in (0.762 mm)	.04 in (1.016 mm)
.0718 in (1.825 mm) to .0721 in (1.831 mm)	.0768 in (1.952 mm) to .0771 in (1.968 mm)	.0818 in (2.079 mm) to .0821 in (2.085 mm)	.0868 in (2.206 mm) to .0871 in (2.212 mm)	.0918 in (2.333 mm) to .0921 in (2.339 mm)

MAIN BEARING JOURNAL DIAMETERS

Standard	Undersize			
	.01 in (0.254 mm)	.02 in (0.508 mm)	.03 in (0.762 mm)	.04 in (1.016 mm)
1.9990 in (50.775 mm) to 1.9998 in (50.795 mm)	1.9890 in (50.521 mm) to 1.9898 in (50.541 mm)	1.9790 in (50.267 mm) to 1.9798 in (50.287 mm)	1.9690 in (50.013 mm) to 1.9698 in (50.033 mm)	1.9590 in (49.759 mm) to 1.9597 in (49.779 mm)



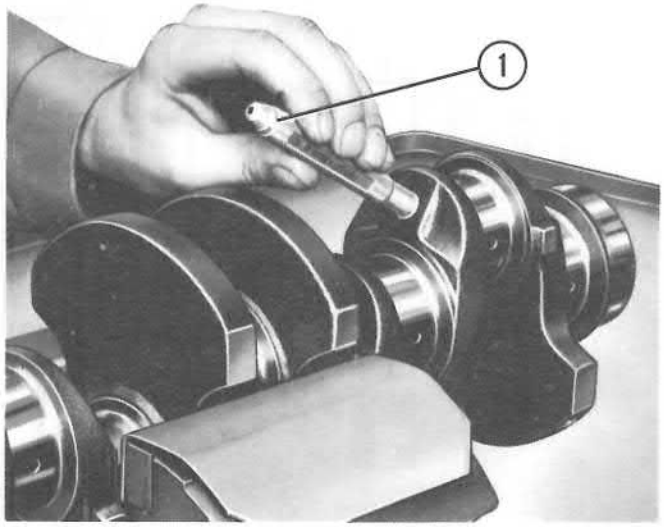
SPECIFICATIONS OF CRANKSHAFT JOURNALS, CRANKPINS AND SHOULDER RADII

After journals have been ground to size and polished, crankshaft must be thoroughly cleaned to remove all metal and abrasive particles.

To clean oilways properly, welch plugs must be removed. Then ream plug bores using reamer A.94016. Thoroughly flush oilways with solvent and blow dry with compressed air.

After completing above operations, drive new welch plugs into place with driver A.86010 (1) and stake them with a punch.

1. Driver A.86010



Checking Crankshaft Balance

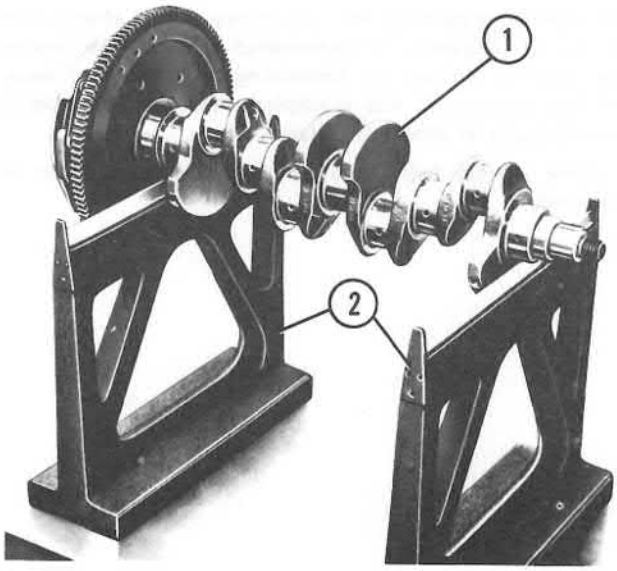
Place two parallel blocks (2) on a surface plate.

Set crankshaft-flywheel-clutch assembly (1) on parallel blocks.

If assembly shows a tendency to roll towards one side, stick some putty on opposite side until assembly stops moving. Weighing amount of putty used will provide an indication of unbalanced weight.

To correct situation, drill holes on flywheel at point D (next figure) as required to remove corresponding weight of metal.

1. Crankshaft-flywheel-clutch assembly 2. Parallel blocks



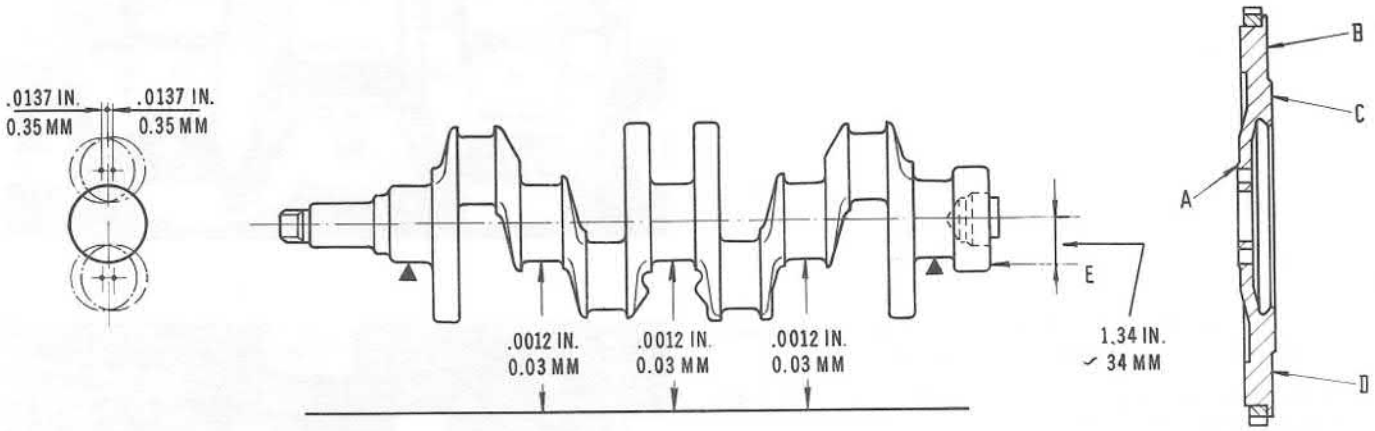
Flywheel and Ring Gear

Inspect condition of ring gear teeth. If there is any obvious damage, replace ring gear.

A hydraulic press should be used to install new ring gear onto flywheel, after heating gear to 176° F (80° C) in an oil bath.

Make sure flywheel contact surfaces with crankshaft and clutch driven disc are smooth and free from scratches or scores. Surfaces should also be perfectly flat and at right angles to flywheel rotation axis.

Rotate flywheel centered on crankshaft: a dial indicator resting at points B and C should not show variations in excess of .004 in. (0.1 mm).



Maximum allowable misalignment of journals and crankpins, and diagram for checking flywheel contact surfaces with clutch disc and crankshaft flange.

(A-B-C-E = points for checking alignment and squareness with respect to rotation axis; D = crankshaft-flywheel-clutch assembly balancing holes.)

Checking Main Bearing Journals and Crankpins for Misalignment

Rest crankshaft ends on two parallel blocks and check the following with a dial indicator.

Main journal misalignment: maximum allowable tolerance .0012 in. (0.03 mm) (total dial gauge reading).

Crankpin misalignment: maximum allowable tolerance, with respect to journals, ± .0137 in. (± 0.35 mm).

Main bearing journal and crankpin out-of-round: maximum allowable tolerance after regrinding, .0002 in. (0.005 mm).

Main bearing journals and crankpins taper: maximum allowable tolerance after regrinding, .0002 in. (0.005 mm).

Squareness of flywheel resting face to crankshaft centerline: when rotating crankshaft, a dial indicator resting laterally some 1.34 in. (34 mm) from crankshaft centerline, should not show variations in excess of .001 in. (0.025 mm).

If inspection of main bearing journals and crankpins alignment reveals distortions, the shaft should be straightened using a hydraulic press, taking care not to subject shaft to excessive stress which could damage its internal structure.

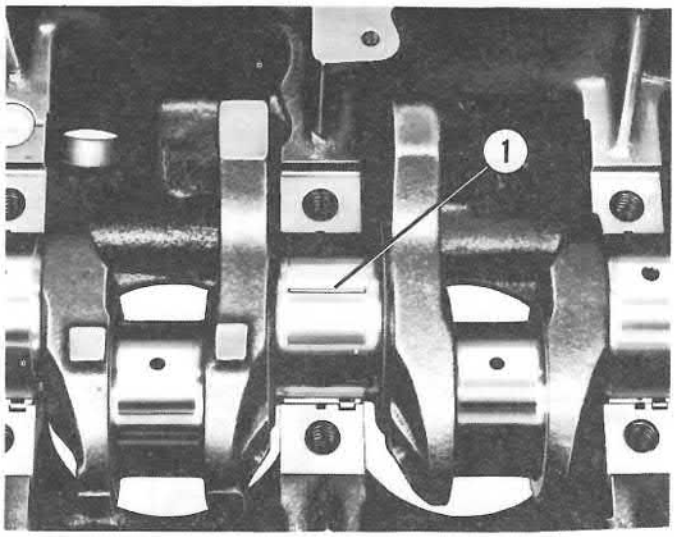
Main Bearings

If inspection shows bearings to be scored or have signs of seizure or abnormal wear, they should be replaced. No reconditioning or adaptation of damaged bearings is possible.

If inspection proves their condition to be satisfactory and fit for further service, check clearances between bearings and journals as follows.

Place a length of calibrated wire (1), such as "Plastigage", along journal being checked.

1. Plastigage wire



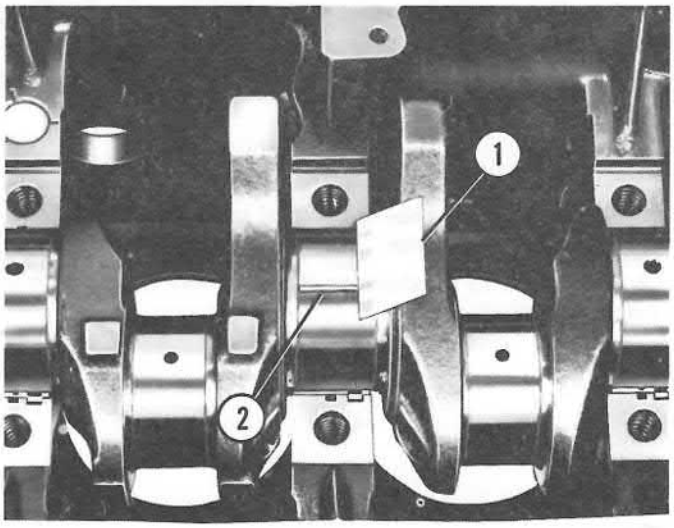
Install caps, complete with bearing shells. Tighten cap mounting screws to a torque of 59 ft. lbs. (8.2 kgm).

Remove caps and using scale on Plastigage envelope (1) measure width of flattened wire (2).

Numbers on envelope show value of existing clearance. Normal clearance between main bearings and crankshaft journals is .0019 to .0037 in. (0.050 to 0.095 mm).

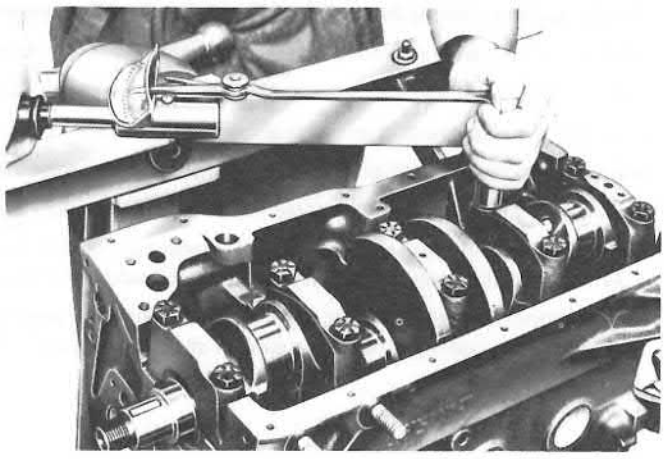
If clearance does not fall within maximum allowable limit of .006 in. (0.15 mm), bearings must be replaced with undersize ones after regrinding crankshaft journals.

1. Measuring envelope 2. Plastigage wire



When checking and replacement procedures have been carried out, install caps and tighten bolts to 59 ft. lbs. (8.2 kgm) torque.

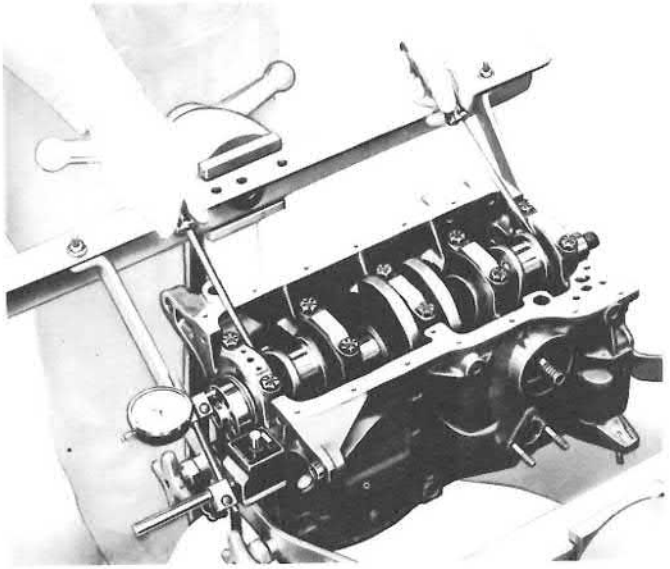
Free crankshaft rotation is an indication that assembly has been performed correctly and bearing clearances conform to specifications.



Crankshaft End Play

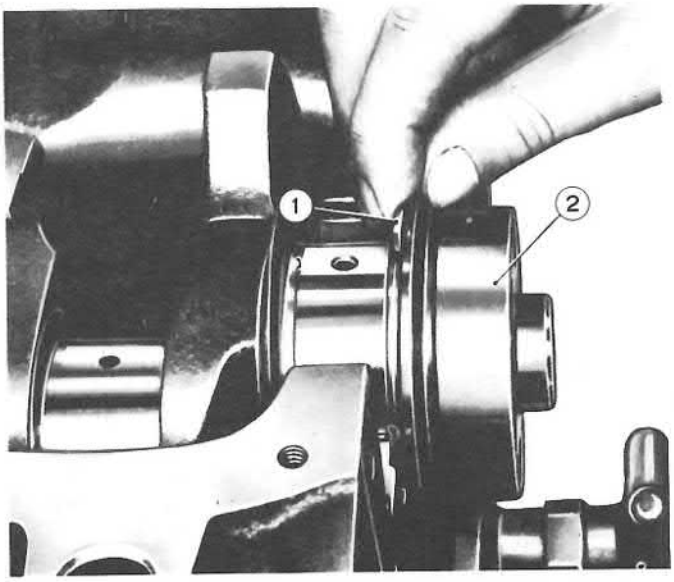
Once crankshaft has been installed, check end play between thrust rings on rear saddle bore and crankshaft shoulders.

Install magnetic base dial gage and wedge two screwdrivers as shown. Using screwdrivers, pry crankshaft back and forth and check dial gage to see if endwise movement falls within .0021 to .104 in. (0.055 to 0.265 mm).



Should end play prove to be more than maximum allowable limit of .0137 in. (0.35 mm), replace thrust rings with .005 in. (0.127 mm) oversize rings.

When installing service thrust rings, make sure that grooves cut on one ring side are facing crankshaft shoulder.

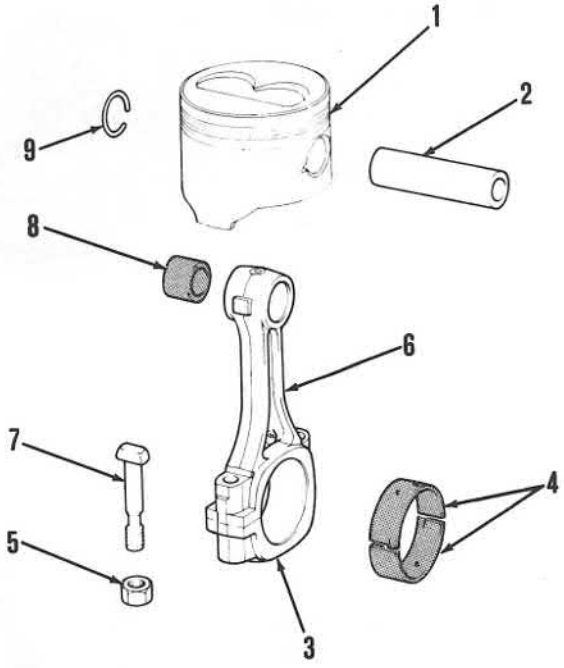


1. Thrust ring 2. Crankshaft

Oil Seals

Two metal cased spring loaded rubber seals are fitted at both crankshaft ends. Whenever crankshaft is being serviced, it is advisable to replace both oil seals.

1. Piston
2. Pin
3. Big-end cap
4. Bearings
5. Cap nut
6. Connecting rod shank
7. Cap bolt
8. Small-end bushing
9. Circlip



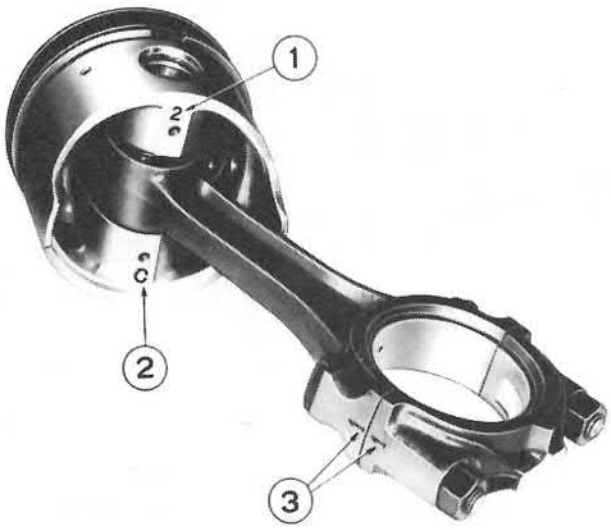
ROD-PIN-PISTON ASSEMBLY

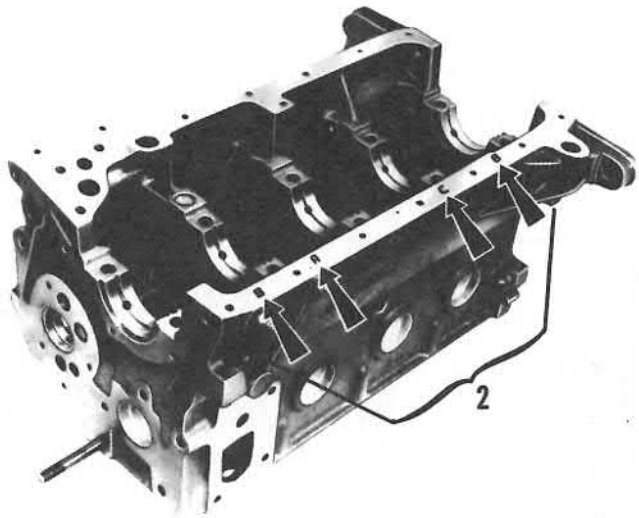
PISTON

CHECKING PISTON CLEARANCE IN CYLINDER BORE AND PIN CLEARANCE IN PISTON

Checking piston clearance in cylinder bore should allow for class selection. Namely, only pistons and bores belonging to same class should be matched.

Standard pistons are selected in three classes, according to piston bore diameter. The same selection applies to piston pins, which must be fitted to pistons belonging to same class. The letter and number showing piston class (2) and piston pin bore class (1) are stamped on underside of piston bosses. Piston pin class is also stamped on pin surface.





1. Piston pin bore class 2. Piston class 3. Matching number of connecting rods to cylinder

Piston pin clearance in boss bore is .0004 to .0007 in. (0.010 to 0.018 mm).

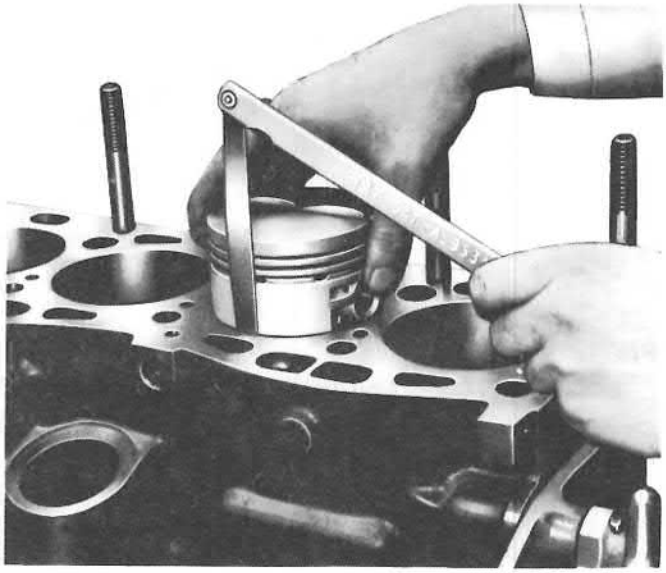
To check pin fit, lubricate pin with light engine oil and insert it into piston bore. If fit is correct, pin should slide in by thumb pressure and when holding piston with pin in vertical position, pin should not fall from piston under its own weight.

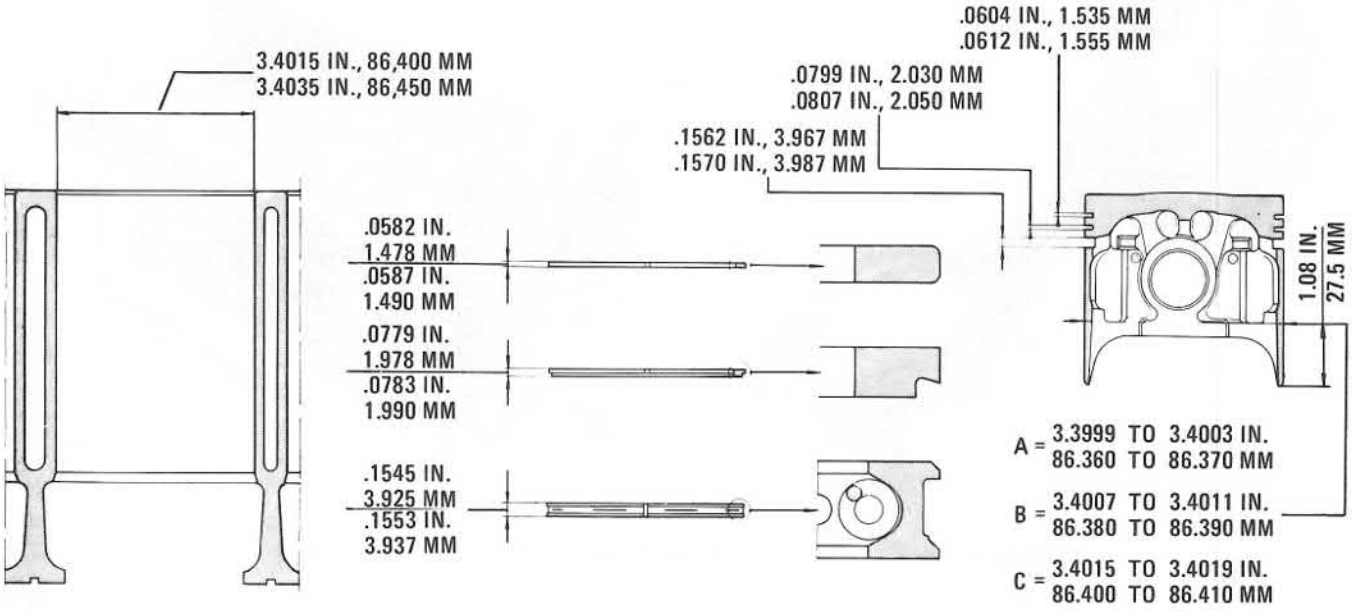
Clearance of pistons in cylinder bores, measured at right angles to the piston pin and 1.08 in. (27.5 mm) from piston skirt edge, is .0011 to .0019 in. (0.030 to 0.050 mm).

Be sure to always add piston skirt wear to cylinder wall wear to determine actual clearance between parts.

Piston clearance in bore must not exceed .006 in. (0.15 mm).

Oversize pistons are available in three oversizes of .0078 – .0157 – .0236 in. (0.2 – 0.4 – 0.6 mm). Oversize pins are only available in .0078 in. (0.2 mm) oversize.





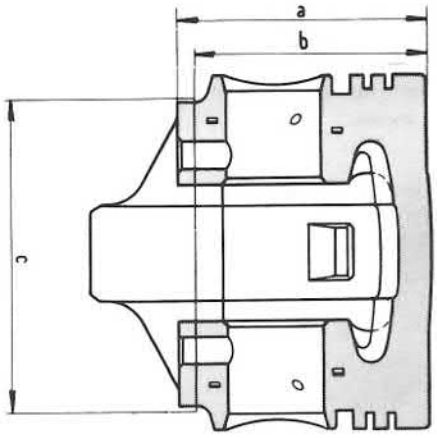
SPECIFICATIONS OF CYLINDER BORE, PISTON AND RINGS

Checking Piston Weight

Before assembly, check that the four pistons have the same weight; maximum permissible tolerance is ± .088 oz. (± 2.5 g).

If four pistons are not available whose weight comes within this tolerance, remove metal from base of piston bosses by milling.

Milling should not be done beyond a depth of .177 in. (4.5 mm) compared to nominal piston height of 2.232 in. (56.70 mm) and milling diameter should be limited to 2.775 in. (70.5 mm).



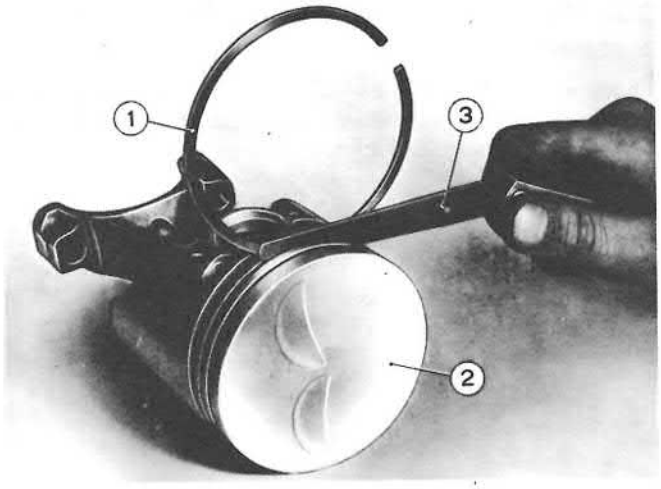
Milling diagram for balancing piston weights.

a = 2.232 in (56.70 mm) nominal piston height.
b = 2.055 in (52.20 mm) minimum height after milling.
c = 2.775 in (70.50 mm) maximum milling diameter.

Piston Ring Side Clearance

Side clearance of piston rings in grooves is checked by installing ring (1) and using feeler gage to measure clearance. Maximum wear limit is .006 in. (0.15 mm).

1. Ring 2. Piston 3. Feeler gage

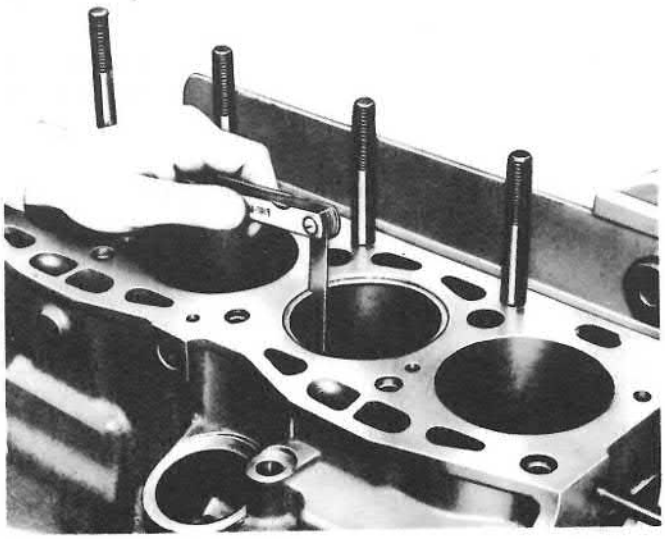


Piston ring fit (side clearance for new parts).

–first: compression ring	0.0018 to 0.0030 in 0.045 to 0.077 mm
–second: oil ring	0.0016 to 0.0028 in 0.040 to 0.072 mm
–third: scraper ring	0.0011 to 0.0024 in 0.030 to 0.062 mm

Ring End Gap

Prior to installing rings on pistons, push them down squarely into bores and check ring end gap, which should correspond to values shown. If gap is less than specified, grind ring ends as required. When installing rings on pistons, stagger end gaps 120° apart.



Ring end gap in bore.

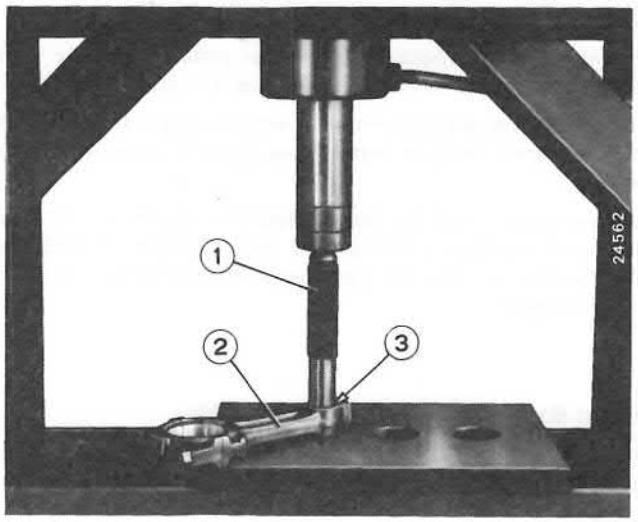
–first: compression ring	0.0118 to 0.0177 in 0.30 to 0.45 mm
–second: oil ring	0.0118 to 0.0177 in 0.30 to 0.45 mm
–third: scraper ring	0.0098 to 0.0157 in 0.25 to 0.40 mm

CONNECTING RODS

REMOVAL AND INSTALLATION OF SMALL-END BUSHING

Bushing is removed and installed on a suitable press with tool A.60054, as shown.

1. Drift A.60054 2. Connecting rod 3. Small-end bushing

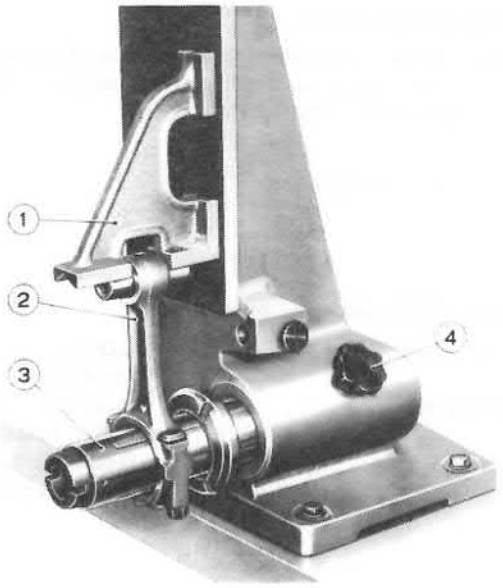


CONNECTING ROD-PIN-PISTON ASSEMBLY

ASSEMBLY

Check alignment of big-end and small-end axis measured at 4.92 in. (125 mm) from shank. Maximum allowable misalignment is ± .004 in. (± 0.10 mm).

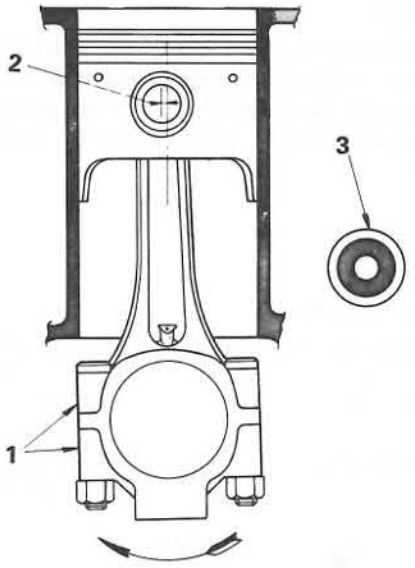
1. Square 2. Connecting rod and pin 3. Expandable blade arbor
4. Arbor lock



Piston bore is .08 in. (2 mm) offset (2).

Position rod to piston so that number stamped on rod (1) faces towards side of piston bore offset and away from auxiliary shaft (3).

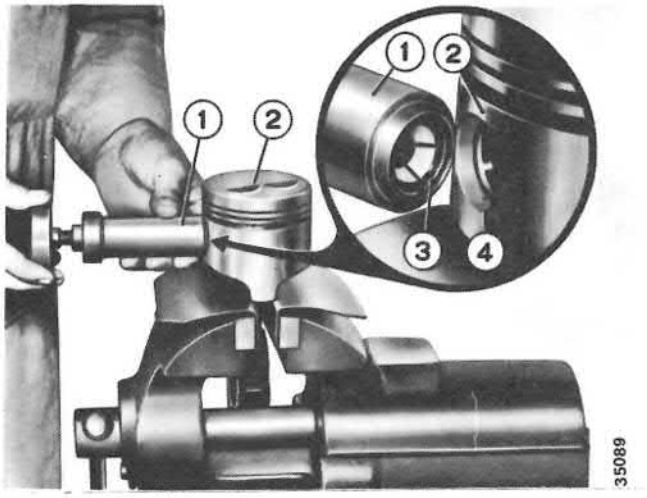
1. Connecting rod to cylinder matching number 2. Piston pin offset
3. Auxiliary shaft



To fit piston pin circlips (3), use tool A.60303 (1) as shown.

After installation, ensure that circlip end gap is not in line with slot provided in piston, to make removal of circlip easier.

1. Tool A.60303 2. Piston 3. Circlip 4. Circlip groove in piston



Connecting Rod Bearings

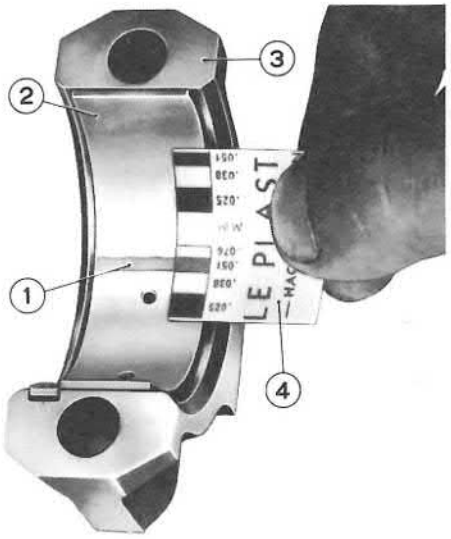
If there is evidence of deep scoring or excessive wear, replace bearing inserts (2).

Check for correct clearance between inserts and crankpins with "Plastigage" method.

Clean parts thoroughly and connect rods to relative crankpins. Place length of plastigage wire (1) along crankpin. Install caps (3) and tighten nuts to 38 ft. lbs. (5.2 kgm) torque.

Remove caps and using scale on envelope (4), measure width of compressed wire. If clearance is between .0014 to .0034 in. (0.036 to 0.086 mm), bearings are fit for service.

1. Plastigage wire 2. Bearing insert 3. Big-end cap 4. Measuring envelope



If clearance is in excess of limits, bearings should be replaced with undersize bearings.

Crankpins must be reground to an undersize such as to restore clearance of .0014 to .0034 in. (0.036 to 0.086 mm).

CRANKPIN DIAMETERS

Standard	Undersizes			
	.01 in (0.254 mm)	.02 in (0.508 mm)	.03 in (0.762 mm)	.04 in (1.016 mm)
1.7913 in (45.498 mm)	1.7813 in (45.244 mm)	1.7713 in (44.990 mm)	1.7613 in (44.736 mm)	1.7513 in (44.482 mm)
1.7920 in (45.518 mm)	1.7820 in (45.264 mm)	1.7720 in (45.010 mm)	1.7620 in (44.756 mm)	1.7520 in (44.502 mm)

CONNECTING ROD BEARING THICKNESSES

Standard	Undersizes			
	.01 in (0.254 mm)	.02 in (0.508 mm)	.03 in (0.762 mm)	.04 in (1.016 mm)
.0603 in (1.531 mm)	.0653 in (1.658 mm)	.0703 in (1.785 mm)	.0753 in (1.912 mm)	.0803 in (2.039 mm)
.0606 in (1.538 mm)	.0656 in (1.665 mm)	.0706 in (1.792 mm)	.0756 in (1.919 mm)	.0806 in (2.046 mm)

REPLACING TIMING BELT

(Engine in car)

CAUTION: Timing belts cannot be reused. Following belt removal or slackening, always renew belt. Under no circumstances must belt tension be adjusted following its initial installation.

Disconnect battery cable. Remove spark plugs. Remove timing belt covers (lower cover bolt must be removed from under vehicle).

Crank engine with tool A.50459 until pulley mark (3) is aligned with TDC indicator (7), and cam sprocket mark (1) is aligned with mark on belt guard (2).

Loosen alternator and A/C compressor (if equipped with A/C) mounting bolts and remove pulley drive belt (10).

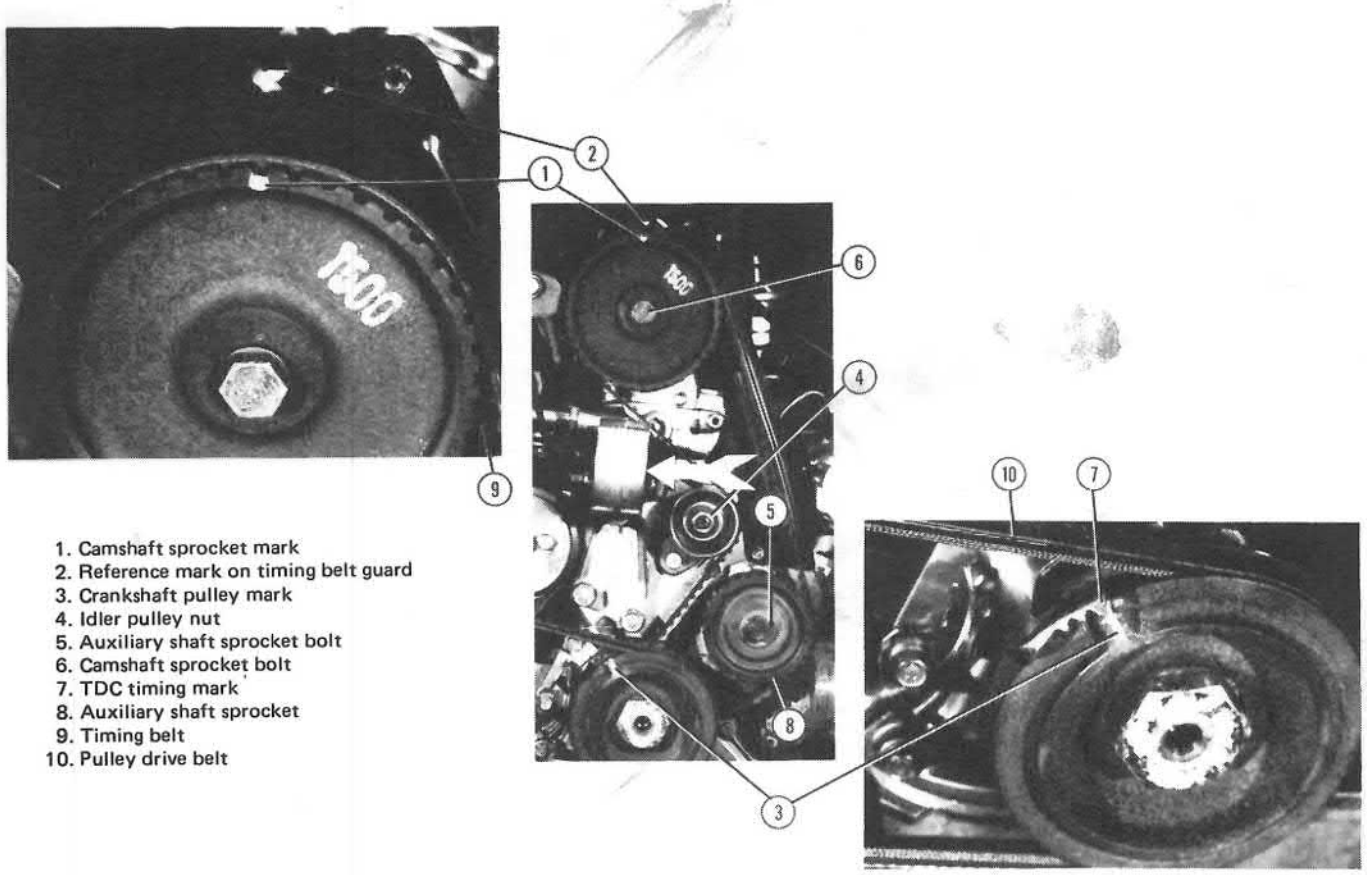
Loosen idler pulley nut (4) and move pulley in direction of arrow as far as possible. Secure in place with nut. Remove belt.

Install new timing belt with slack on tensioner side. Ensure that timing belt teeth are perfectly coupled with sprockets.

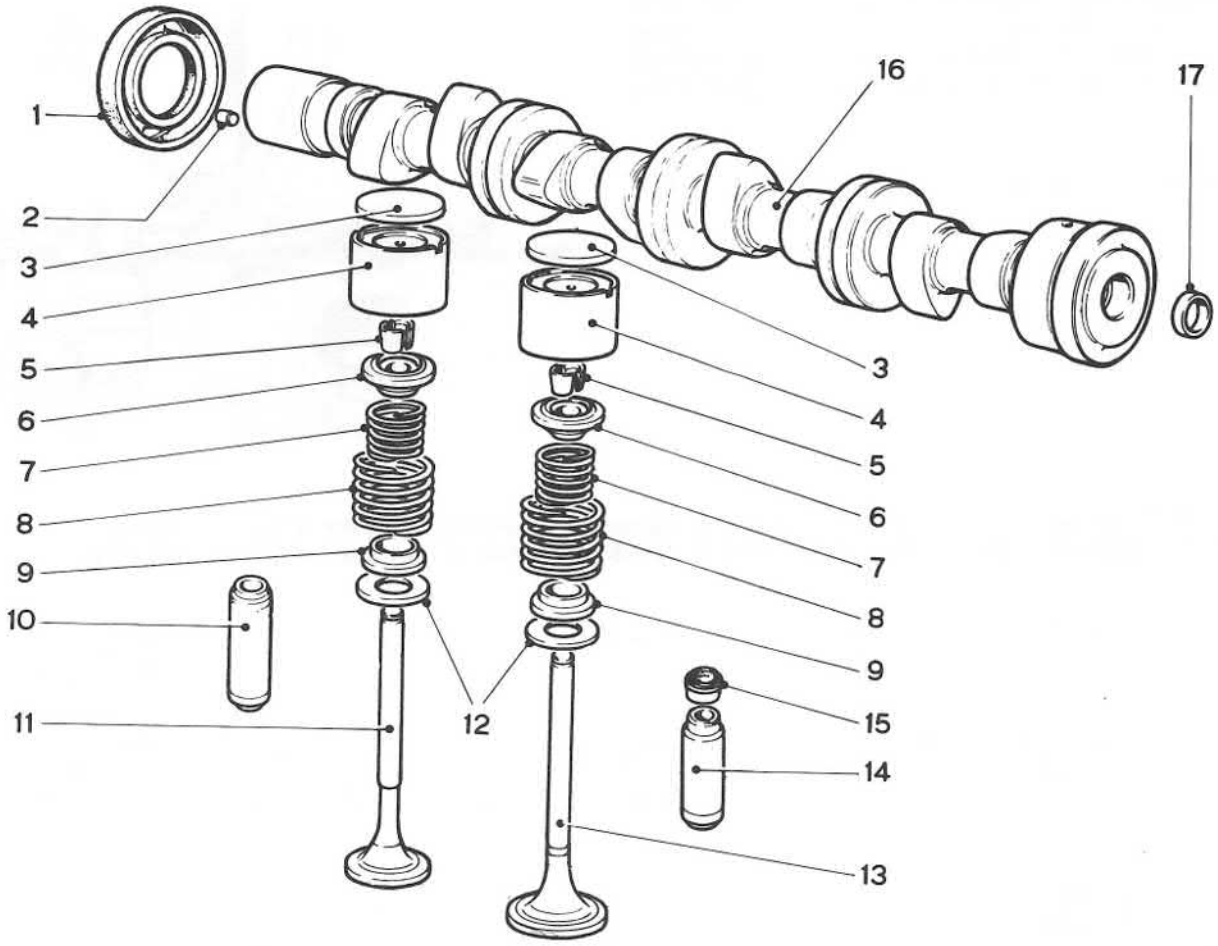
Loosen idler pulley nut and tensioner will tighten belt. Torque idler pulley nut in this position to 33 ft. lbs. (4.5 kgm).

Check that timing marks are still correctly aligned.

Reinstall removed components.



1. Camshaft sprocket mark
2. Reference mark on timing belt guard
3. Crankshaft pulley mark
4. Idler pulley nut
5. Auxiliary shaft sprocket bolt
6. Camshaft sprocket bolt
7. TDC timing mark
8. Auxiliary shaft sprocket
9. Timing belt
10. Pulley drive belt



1. Seal
2. Dowel
3. Plates for adjusting valve clearance
4. Tappets
5. Locks
6. Upper cups
7. Inner springs
8. Outer springs
9. Lower cups
10. Exhaust valve guide
11. Exhaust valve
12. Flat washers
13. Intake valve
14. Intake valve guide
15. Oil seal
16. Camshaft
17. Welch plug

VALVE MECHANISM COMPONENTS

CAMSHAFT HOUSING

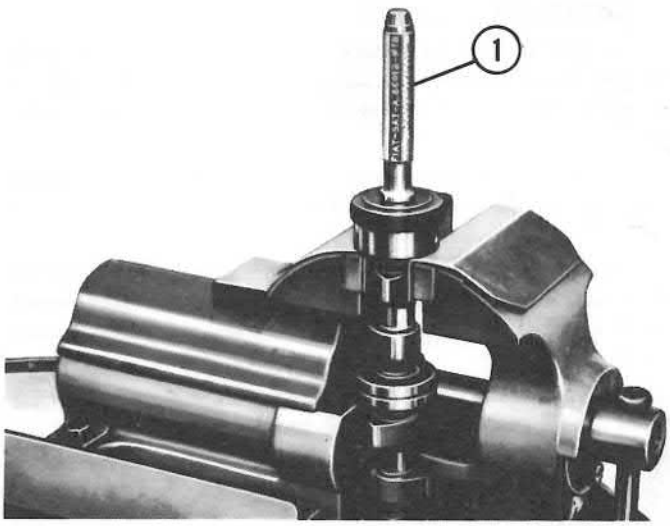
Check that camshaft bores in housing are not out-of-round. Inner surfaces should be smooth and show no signs of seizure; if they do, replace housing.

NOTE: When servicing camshaft it is advisable to replace drive-end seal.

CAMSHAFT

Camshaft journal and lobe surfaces should be absolutely smooth and in perfect condition. Should traces of seizure or scoring be found which cannot be dressed off with an extra-fine abrasive stone, camshaft is not fit for further service and should be replaced.

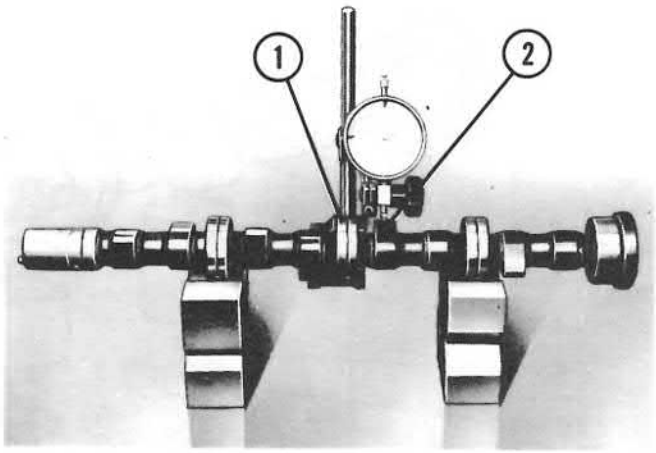
Make sure journal oil holes are not stopped up. To remove camshaft welch plug, use a standard punch; for reassembly use installer A.86018 (1).

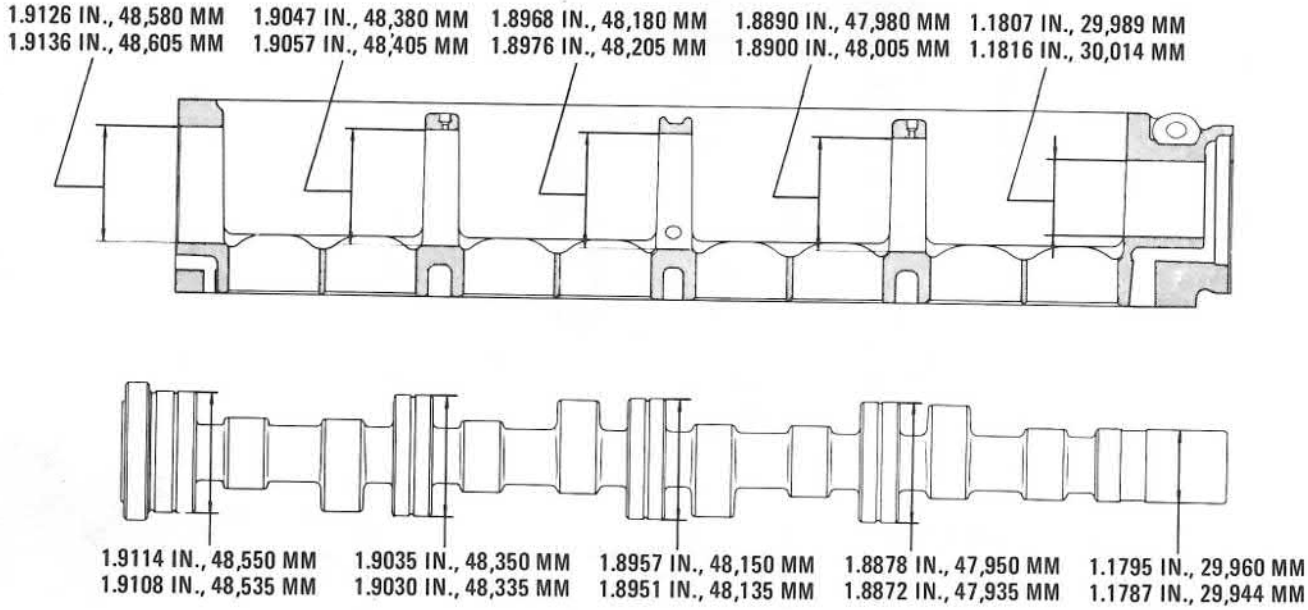


1. Installer A.86018

Rest camshaft on two parallel blocks placed on a surface plate, and check with a dial gage that center journal (1) runout does not exceed .008 in. (0.2 mm). Also check that lobe height (2) is 0.362 in. (9.2 mm) for intake and 0.364 in. (9.25 mm) for exhaust lobes.

1. Center journal 2. Cam lobe





SPECIFICATIONS OF CAMSHAFT AND BORES IN HOUSING

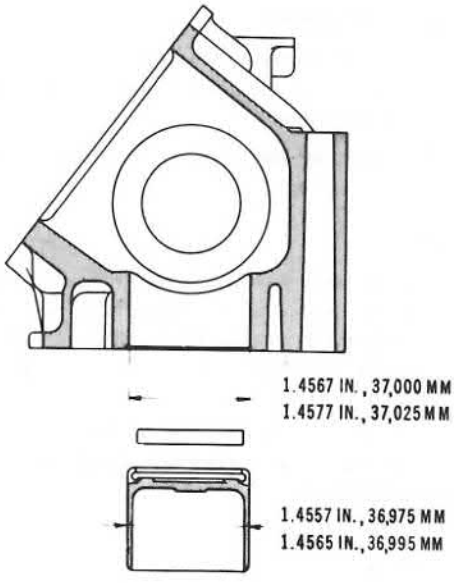
TAPPETS AND PLATES

Make sure tappet plate surface in contact with camshaft lobes is glass-like and shows no signs of dishing or pitting. Minor imperfections can be removed using an extra fine abrasive stone.

Tappet outside surfaces, as well as tappet bores in camshaft housing, should not show evidence of undue wear, taper of scoring.

Check tappet diameter and tappet bore diameter in camshaft housing using micrometers. Values read on micrometers should meet specifications as shown. If they do not, replace worn parts.

Tappet plates are available for service in a range of thickness from .1457 to .1850 in. (3.70 to 4.70 mm) with .002 in. (0.05 mm) increments.



CHECKING AND ADJUSTING VALVE CLEARANCE

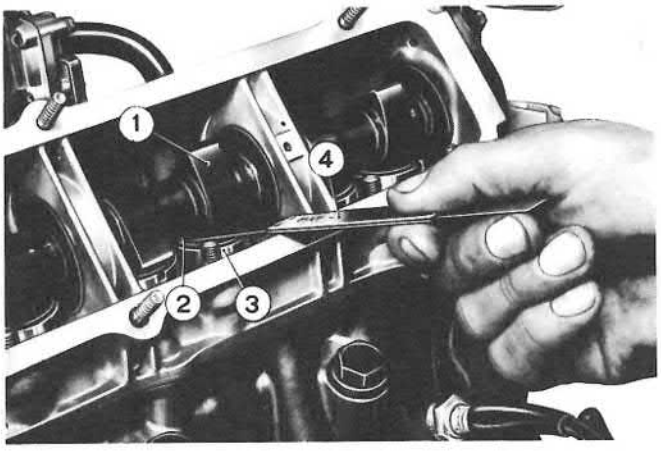
Adjustment of clearance between camshaft lobes and tappets does not require camshaft removal.

Correct clearance with engine cold is; intake valves - .011 to .014 in. (.24 to .32 mm) and exhaust valves - .015 to .018 in. (.34 to .42 mm).

Remove camshaft cover.

Turn crankshaft until lobe (1) controlling tappet (3) being checked is pointing upwards and is at right angles to tappet plate (2).

Using a feeler gage (4), measure clearance between tappet plate and camshaft lobe to determine if plate has become worn.



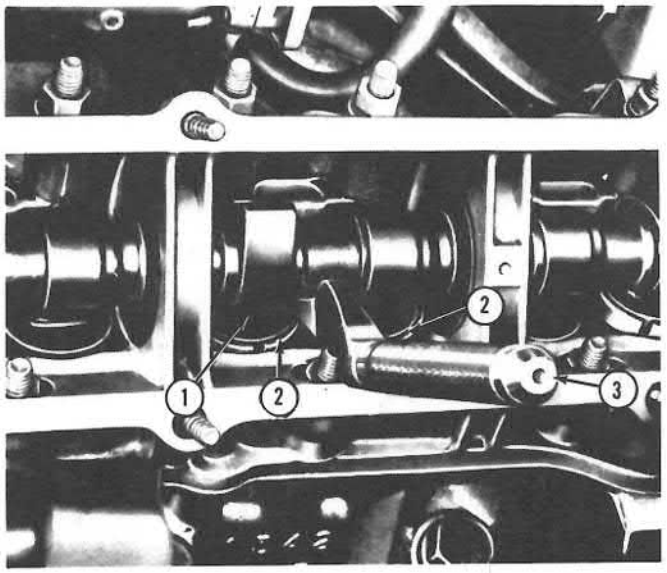
1. Lobe 2. Plate 3. Tappet 4. Feeler gage

NOTE: Remove oil from around tappets with syringe to simplify plate removal. Empty syringe into oil drain passages.

If clearance is not as specified, insert tool A.60421 (3) on both intake and exhaust valve tappets (2). Remove plate (1) from its seat on tappet using pincer A.87001.

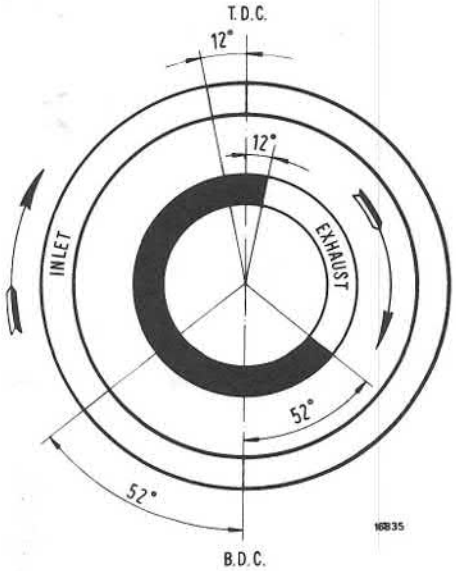
After determining needed thickness, install new plate.

Tappet clearance plates are available for service in a range of thicknesses from .1457 to .1850 in. (3.70 to 4.70 mm) with a difference between each of .002 in. (0.05 mm). The thickness of plate is shown on one of the plates flat surfaces and this should be assembled towards tappet.



Valve Timing Diagram for a Theoretical Tappet Clearance of:

– 0.60 mm, inlet valves
– 0.65 mm, exhaust valves



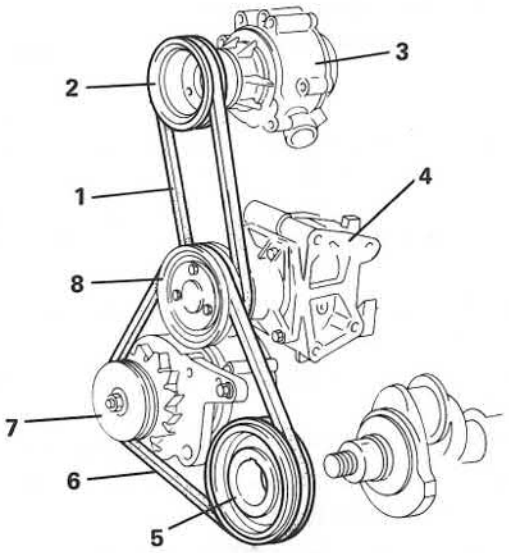
REPLACING AND ADJUSTING DRIVE BELTS

Vehicles With Air Pump, Without A.C.

To replace drive belts, loosen alternator mount bolts. Remove belt (6). Loosen air pump (3) mount bolts. Remove belt (1).

Install new belt on water pump (4) and air pump (3). Fully tighten air pump belt (1) and air pump mount bolts. Check for about ½ inch belt deflection with moderate finger pressure.

Install new belt (6) on crankshaft pulley (5), water pump pulley (8), and alternator pulley (7). Fully tighten belt (6) and alternator mount bolts. Check for about ½ inch belt deflection with moderate finger pressure.



1. Air pump belt 2. Air pump pulley 3. Air pump 4. Water pump 5. Crankshaft pulley 6. Alternator/water pump belt 7. Alternator pulley 8. Water pump pulley

Vehicles With Air Pump and A.C.

To remove compressor belt (6), loosen both compressor and alternator mount bolts. Remove belt (6).

To remove alternator water pump belt (8), remove belt (6) and then belt (8).

To remove air pump belt (1), loosen both air pump (3) and alternator. Remove belt (8) from water pump (4) and then remove belt (1).

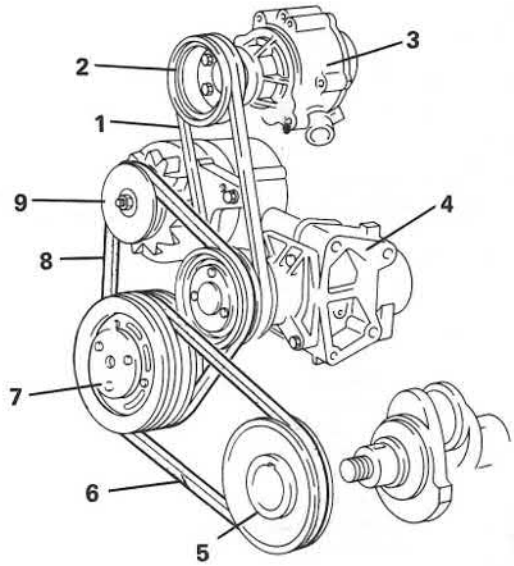
After installing new belts, adjust tension on compressor belt (6) first, if necessary. Adjust tension on belt (8) second and the air pump belt (1).

Belt Tension	Lb.
A.C. compressor belt (6)	90–110
Alternator/water pump belt (8)	75–95
Air pump belt (1)	About 1/8 inch deflection with moderate finger pressure

Run engine for 15 minutes with air conditioning on. Readjust belts.

A.C. compressor belt (6) to 70 to 90 lbs.

Alternator/water pump belt (8) to 50 to 65 lbs.

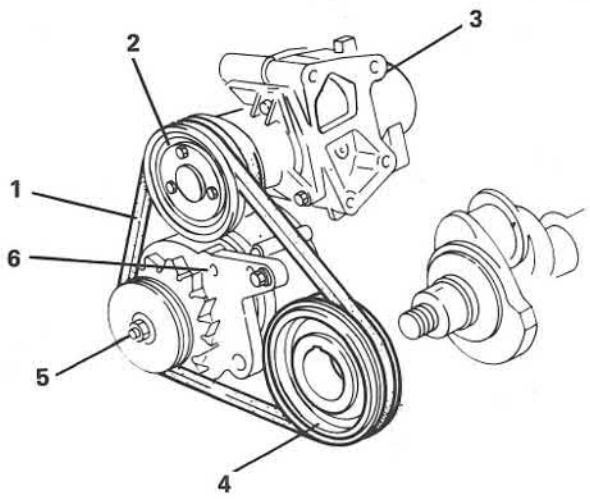


1. Air pump belt 2. Air pump pulley 3. Air pump 4. Water pump 5. Crankshaft pulley 6. Compressor belt 7. Compressor clutch 8. Alternator/water pump belt 9. Alternator pulley

Vehicles Without Air Pump and A.C.

To remove alternator/water pump belt (1), loosen alternator (6) mount bolts.

Install new belt (1) and fully tighten belt and alternator mount bolts. Check for about ½ inch belt deflection with moderate finger pressure.



1. Alternator/water pump belt 2. Water pump pulley 3. Water pump 4. Crankshaft pulley 5. Alternator pulley 6. Alternator

Vehicles With Fuel Injection and A.C.

To remove belts, loosen three nuts (3) and remove water pump belt (2).

If replacing A.C. compressor belt (1), loosen compressor tension bolt and remove lower mount bolt. Slide compressor toward crankshaft pulley and remove belt (1).

Install new compressor belt. Install compressor lower mount bolt. Adjust belt tension to 70 to 90 lbs. and fully tighten compressor bolts.

To install water pump belt (2) loosely slip alternator belt (7) over inner groove of water pump pulley (1).

Remove nuts (3) holding crankshaft outer pulley half (12) and remove pulley half.

CAUTION: Shims will be re-used. Do not discard shims.

Install water pump belt (2) over outer groove of water pump pulley (11) and crankshaft pulley.

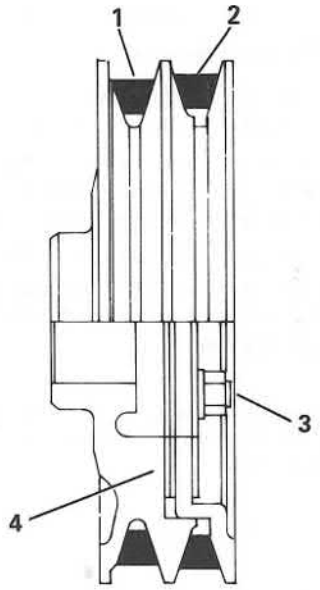
Install original shims and reinstall crankshaft pulley half. Check that water pump belt tension is 60 to 80 lbs.

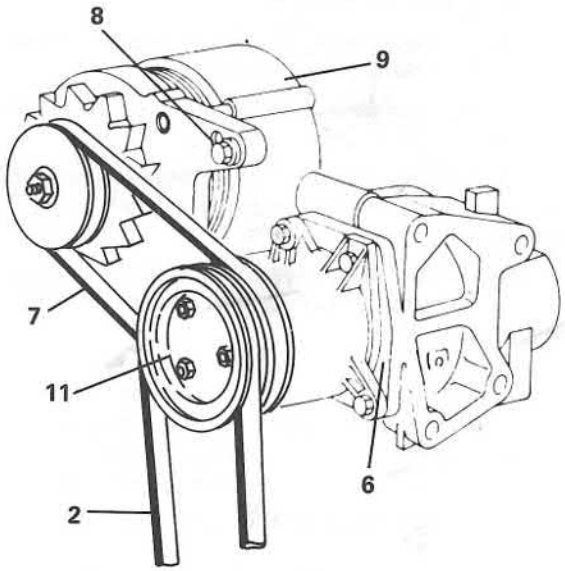
If it is necessary to readjust belt tension, a shim change of 0.5 mm (0.020 in.) causes a change in belt tension of 17 to 22 lbs.

Fully tighten nuts (3).

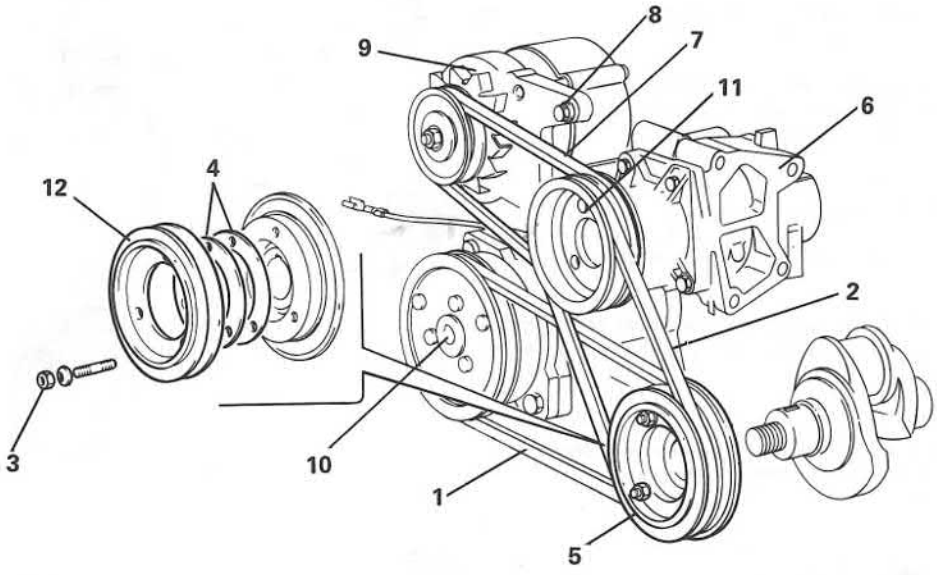
If replacing alternator belt (7), remove water pump belt (2). Loosen alternator tensioner bolt (8) and remove belt.

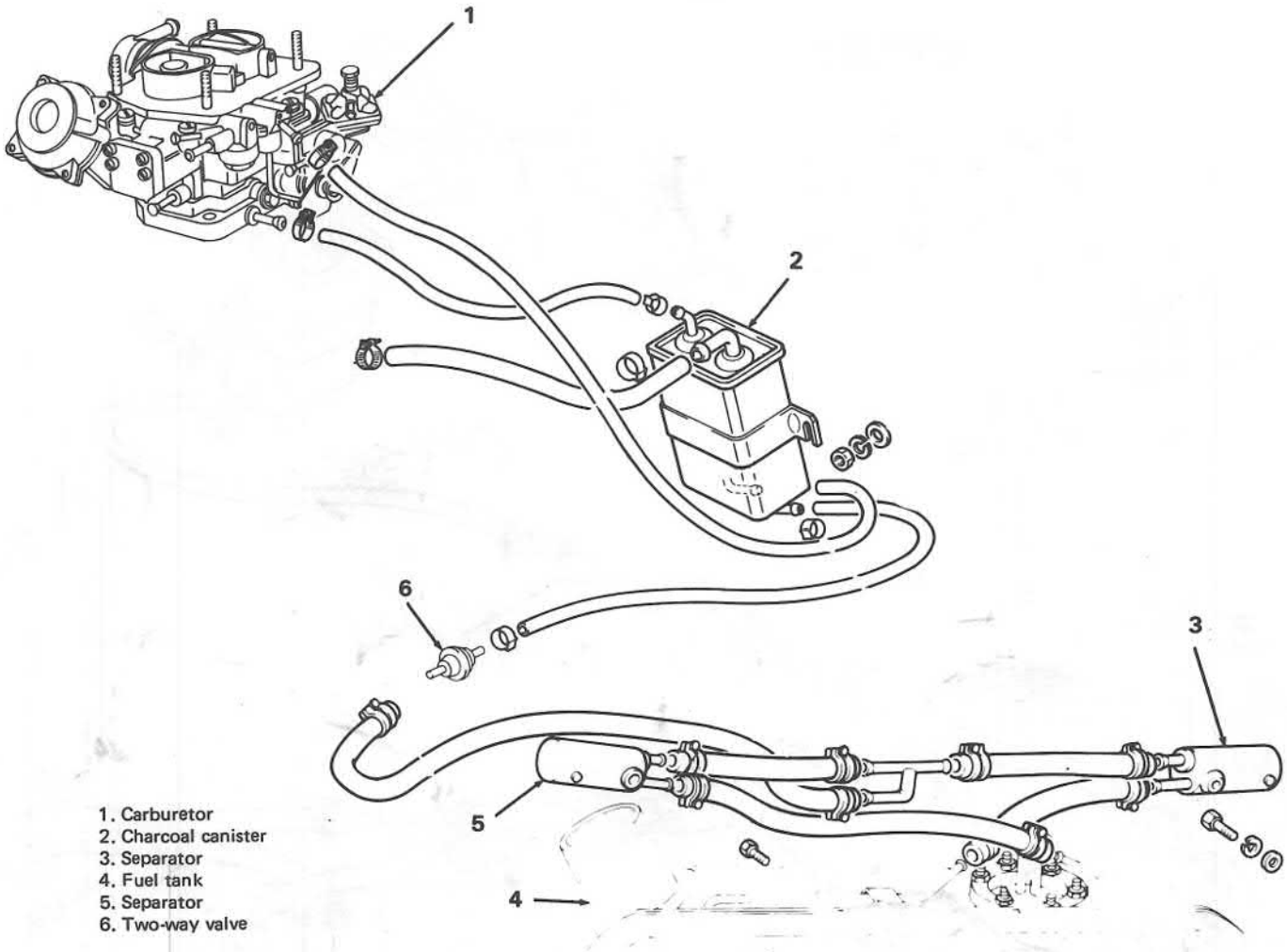
Install new belt and adjust tension to 30 to 50 lbs. Fully tighten alternator bolts. Install water pump belt as directed above.





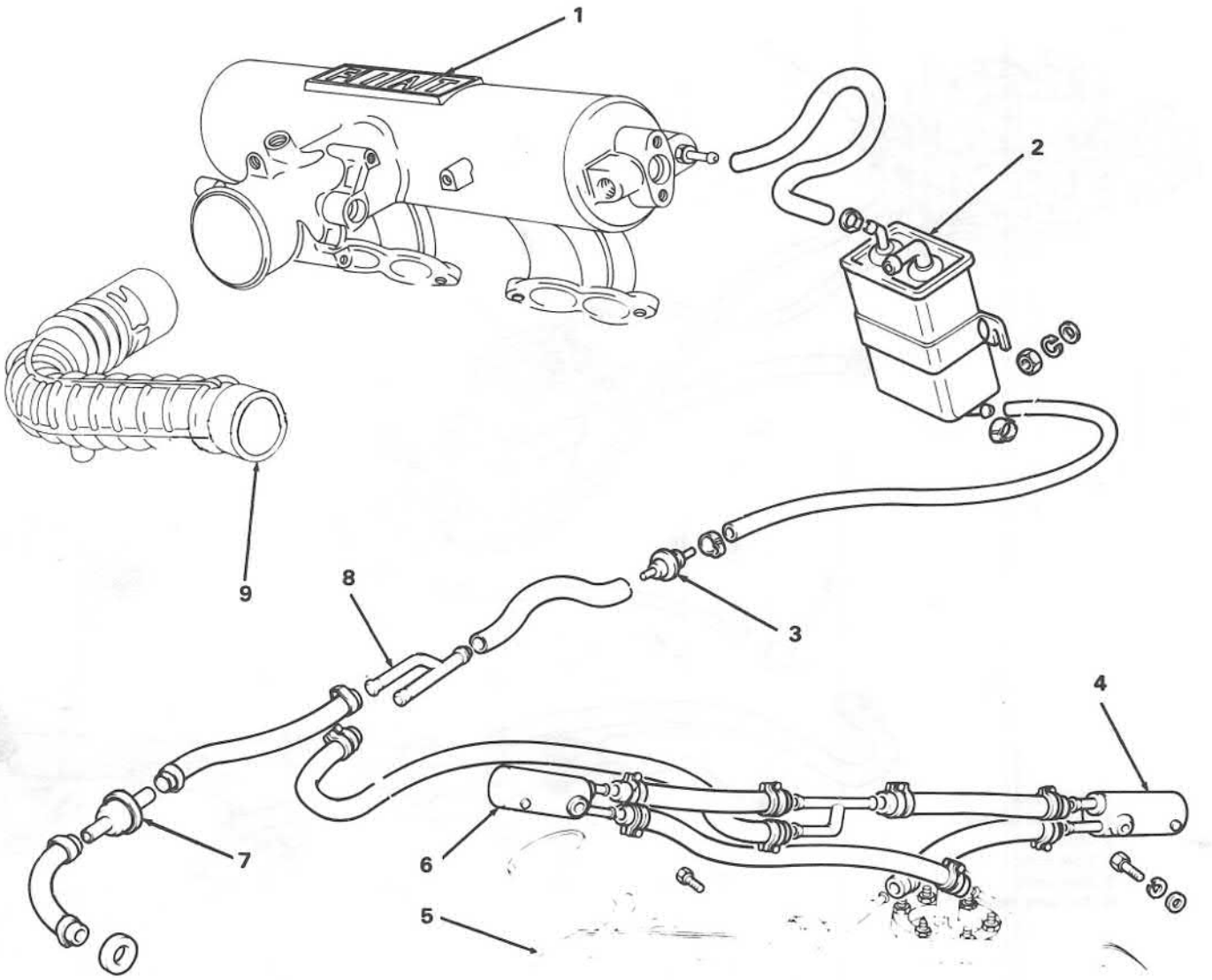
1. A.C. compressor belt
2. Water pump belt
3. Nuts
4. Shims
5. Crankshaft pulley assembly
6. Water pump
7. Alternator belt
8. Tensioner bolt
9. Alternator
10. Compressor
11. Water pump pulley
12. Crankshaft pulley half





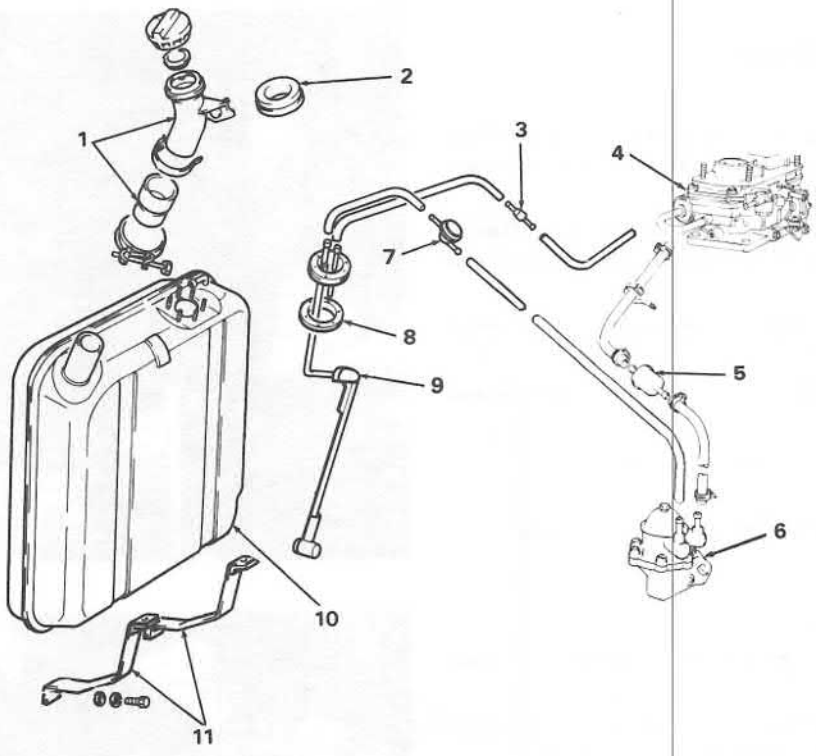
1. Carburetor
2. Charcoal canister
3. Separator
4. Fuel tank
5. Separator
6. Two-way valve

FUEL VAPOR LINES
(VEHICLES WITH CARBURETOR)



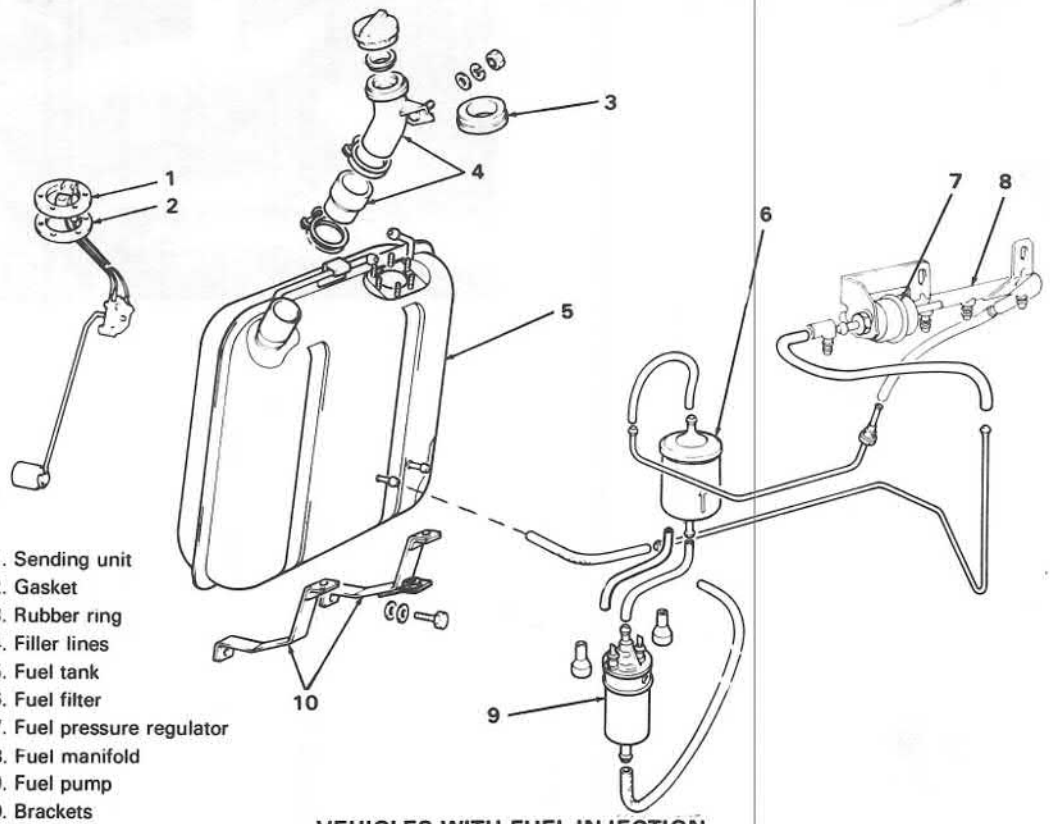
1. Air intake
2. Charcoal canister
3. Two-way valve
4. Separator
5. Fuel tank
6. Separator
7. Two-way safety relief valve
8. "Y" connector
9. Air supply hose

FUEL VAPOR LINES
(VEHICLES WITH FUEL INJECTION)



1. Filler lines
2. Rubber ring
3. Check valve
4. Carburetor
5. Fuel filter
6. Fuel pump
7. Check valve
8. Gasket
9. Sending unit
10. Fuel tank
11. Brackets

VEHICLES WITH CARBURETOR



1. Sending unit
2. Gasket
3. Rubber ring
4. Filler lines
5. Fuel tank
6. Fuel filter
7. Fuel pressure regulator
8. Fuel manifold
9. Fuel pump
10. Brackets

VEHICLES WITH FUEL INJECTION

FUEL TANK AND LINES

FUEL TANK

REMOVAL AND INSTALLATION

Empty all fuel from fuel tank.

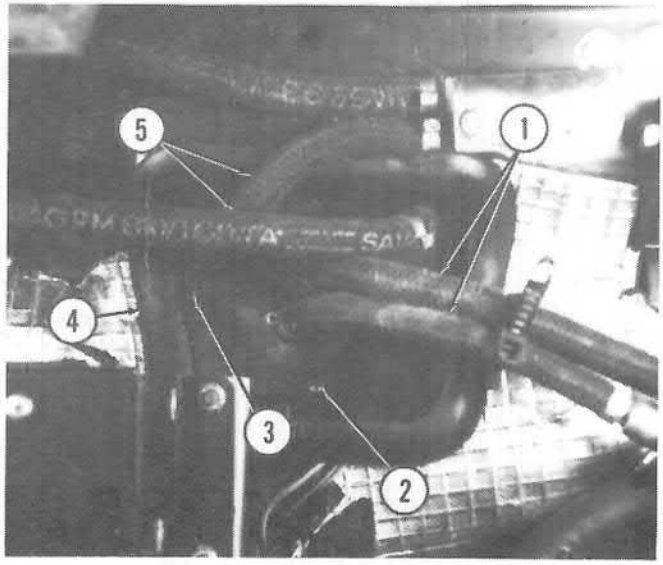
On vehicles with fuel injection, disconnect air hoses from both sides of air flow sensor. Disconnect electrical connector from sensor.

Remove two nuts and two bolts holding sensor bracket to firewall. Remove bracket with air flow sensor attached and set to one side.

Cut hose clamps and disconnect two fuel hoses (1) (carburetor vehicles only) and two vapor hoses (5).

Remove four screws (2 and 3) holding rubber cover (4) and remove cover.

Disconnect three wires from sending unit assembly.



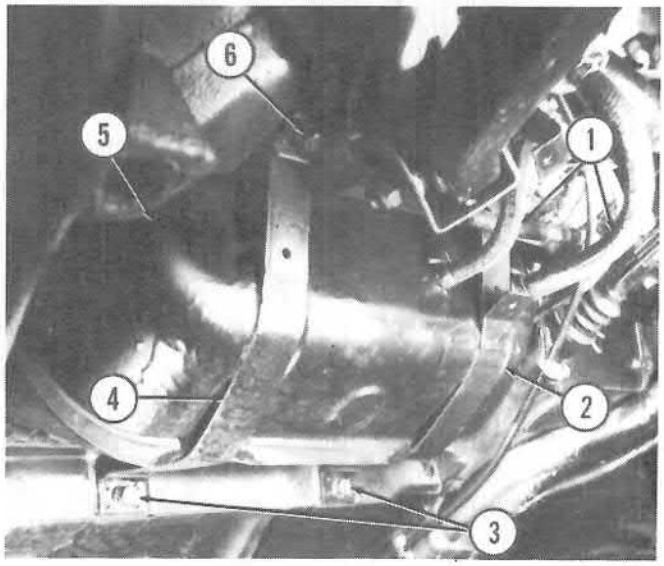
1. Fuel hoses 2. Screw 3. Screw 4. Cover 5. Vapor hoses

Raise and support rear of vehicle.

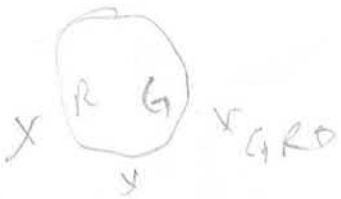
On vehicles with fuel injection, remove protective cover and fuel inlet and return hoses (1).

On all vehicles, support fuel tank (5) and remove bolts (3 and 6) and support straps (2 and 4). Lower tank from vehicle.

Installation is reverse of removal.



1. Fuel hoses 2. Support strap 3. Bolt 4. Support strap 5. Fuel tank 6. Bolts



FUEL PUMP

REMOVAL AND INSTALLATION
(Vehicles With Carburetor)

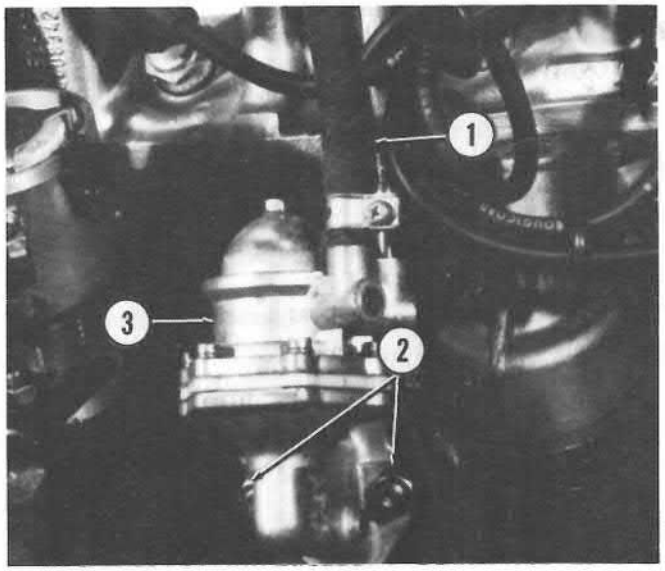
Disconnect and plug fuel hoses (1).

Remove two nuts (2) and washers holding fuel pump (3) to engine.

Remove fuel pump, two gaskets and insulating support.

Installation is reverse or removal.

1. Fuel hose 2. Nuts 3. Fuel pump



INSPECTION

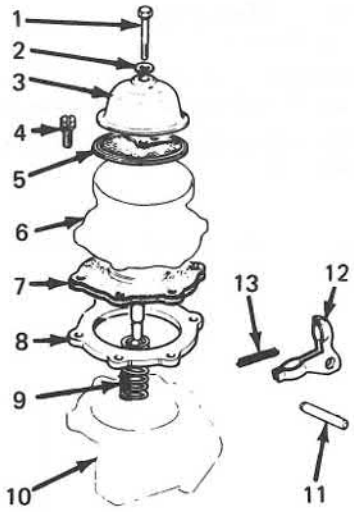
Check attachment screws (4) of upper and lower bodies and cover screw (1) for tightness.

Ensure fuel hoses and filter are not deteriorated or clogged and that diaphragm is not hardened or cracked.

Check for weakness or distortion of control lever and diaphragm springs.

When assembling, coat control lever and pivot with oil. Use new gaskets lightly coated with grease.

1. Cover screw 2. Lockwasher 3. Cover 4. Screw 5. Filter
6. Upper body 7. Diaphragm 8. Spacer 9. Spring 10. Lower body
11. Pivot pin 12. Control lever 13. Spring



ADJUSTMENT

Place outer gasket (2) and insulating support (4) on engine. Place a .012 in. (.3 mm) gasket on support. Install rod (5) in engine.

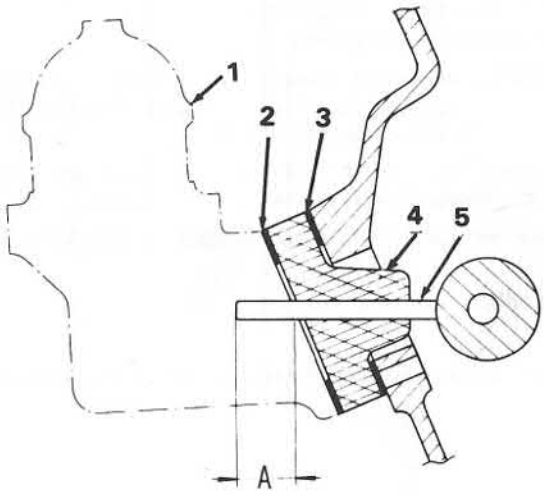
Check that dimension A is .59-.61 in. (15-15.5 mm). Install a thicker or thinner gasket to meet this dimension.

After adjusting the dimension, place inner gasket (3), insulating support and outer gasket on engine.

Install rod (5) in engine, and install fuel pump (1).

NOTE: Gaskets (3) are supplied in .12, .027, and .047 in. (.3, .7, and 1.2 mm) thicknesses.

1. Fuel pump 2. Gasket 3. Gasket 4. Insulating support 5. Rod



REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

CAUTION: Relieve fuel system pressure before disconnecting fuel hoses. Refer to RELIEVING FUEL PRESSURE in Section 102.26.

Raise and support rear of vehicle.

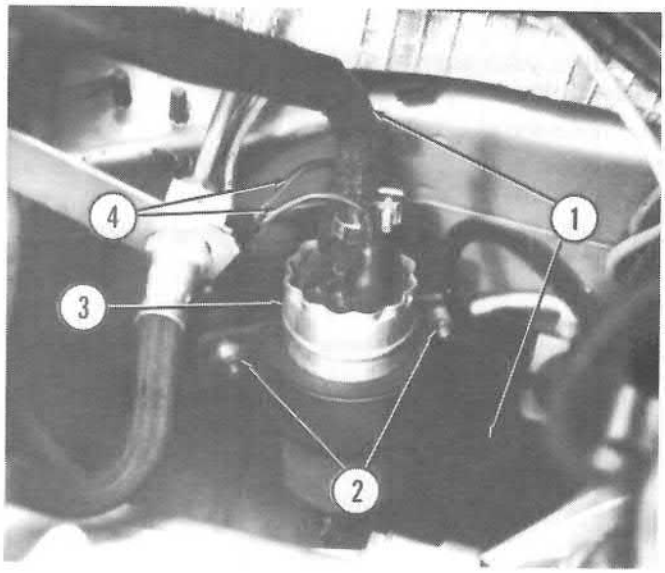
Remove panel protecting fuel pump.

Disconnect and plug fuel hoses (1). Disconnect electrical leads (4) from fuel pump (3).

Remove two nuts (2) retaining fuel pump and remove pump.

Installation is reverse of removal.

1. Fuel hoses 2. Nuts 3. Fuel pump 4. Electrical leads



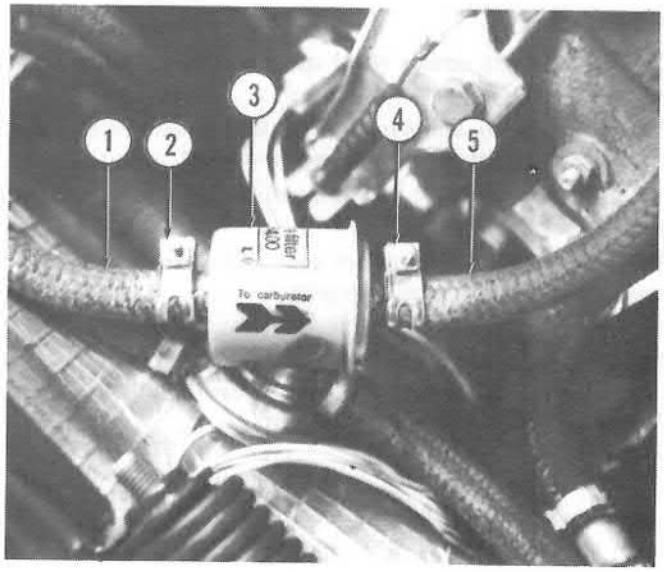
FUEL FILTER

REMOVAL AND INSTALLATION
(Vehicles with Carburetor)

Disconnect fuel inlet (1) and outlet (5) hoses from filter by removing clamps (2 and 4) and pulling hoses off filter (3).

Install new filter with arrow on filter pointing in direction of fuel flow to carburetor.

1. Fuel inlet hose 2. Clamp 3. Fuel filter 4. Clamp
5. Fuel outlet hose



REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

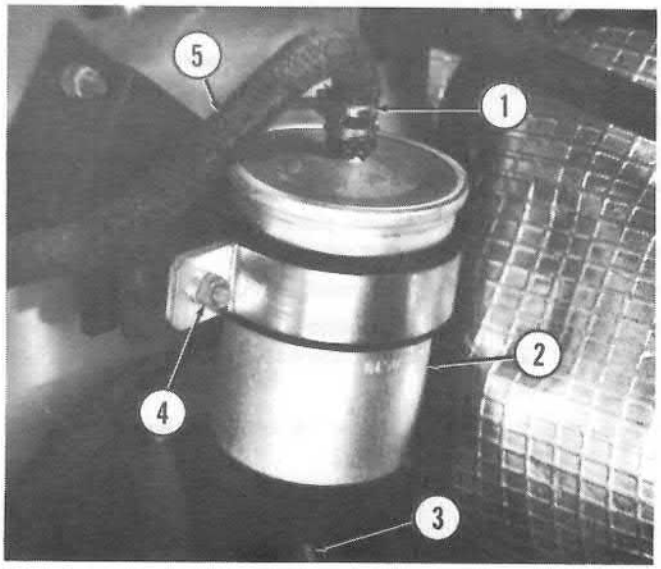
CAUTION: Relieve fuel system pressure before disconnecting fuel hoses. Refer to RELIEVING FUEL PRESSURE in Section 102.26.

Disconnect fuel inlet (3) and outlet (5) hoses from filter by removing clamps (1) and pulling hoses off filter (2).

Remove two nuts (4) holding fuel filter to body, and remove fuel filter.

Installation is reverse of removal.

1. Clamp 2. Fuel filter 3. Fuel inlet hose 4. Nut 5. Fuel outlet hose



AIR CLEANER

REMOVAL AND INSTALLATION
(Vehicles With Carburetor)

Loosen clamp (1) holding fresh air duct (2) to fan.

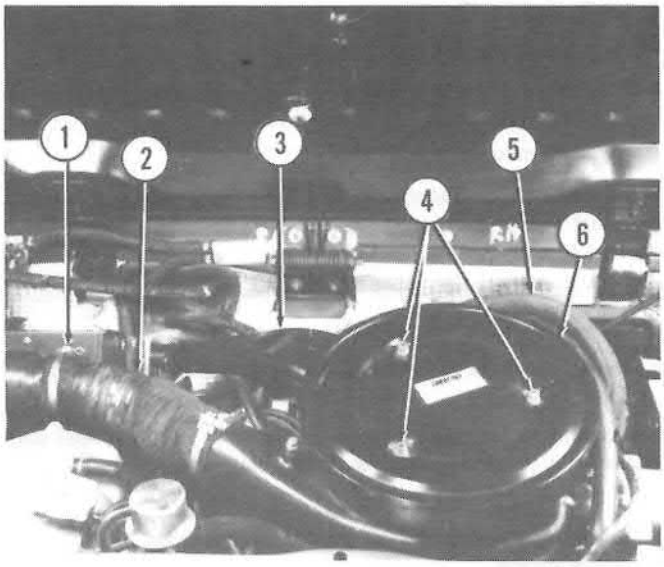
Disconnect hoses (5) from side of air cleaner (3). Remove three nuts (4) and washers holding cover (6) on air cleaner.

Remove filter element.

Remove four nuts holding air cleaner on carburetor. Lift air cleaner and disconnect hose from bottom. Remove air cleaner with fresh air duct attached.

Installation is reverse of removal. Make sure metal bushings are installed in rubber spacer.

1. Clamp 2. Duct 3. Air cleaner 4. Nut 5. Hose 6. Cover



REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

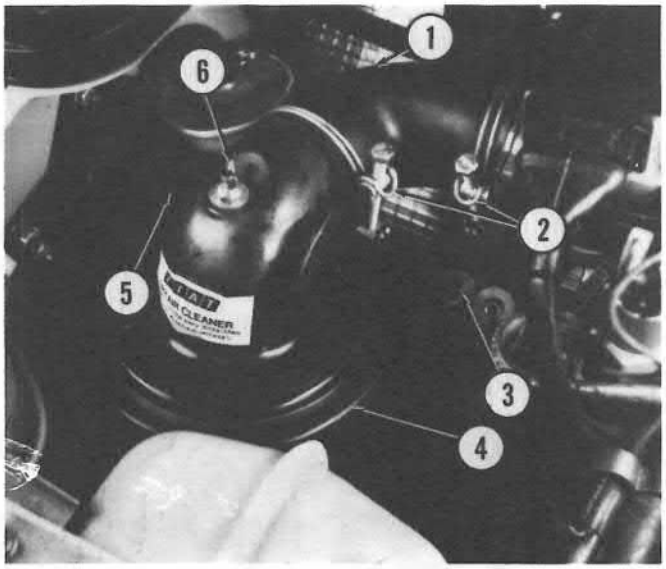
Loosen clamps (2) and remove air supply hose (1).

To remove filter element, remove wing nut (6) and top of air cleaner.

Remove two nuts (3 and 5) holding air cleaner assembly (4) to body and firewall. Remove air cleaner assembly.

Installation is reverse of removal.

1. Air supply hose 2. Clamps 3. Nut 4. Air cleaner assembly
5. Nut 6. Wing nut



CARBURETOR COOLING FAN

REMOVAL AND INSTALLATION

Remove four screws (3 and 5) holding fan duct to fan mounting plate.

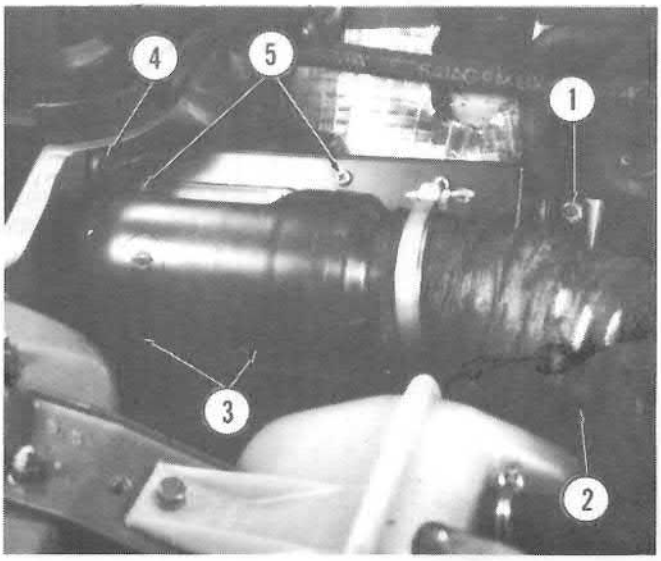
Separate duct from mounting plate with duct hose (2) attached and set to one side.

Disconnect wire at connector.

Remove four nuts (1 and 4) holding mounting plate to body and remove fan assembly.

Install in reverse order. Make sure ground wire is installed under mounting nut.

1. Nut 2. Duct hose 3. Screws 4. Nut 5. Screws



CARBURETOR

REMOVAL AND INSTALLATION

NOTE: Mark lines, hoses, and wires prior to removal to identify for installation.

Remove air cleaner.

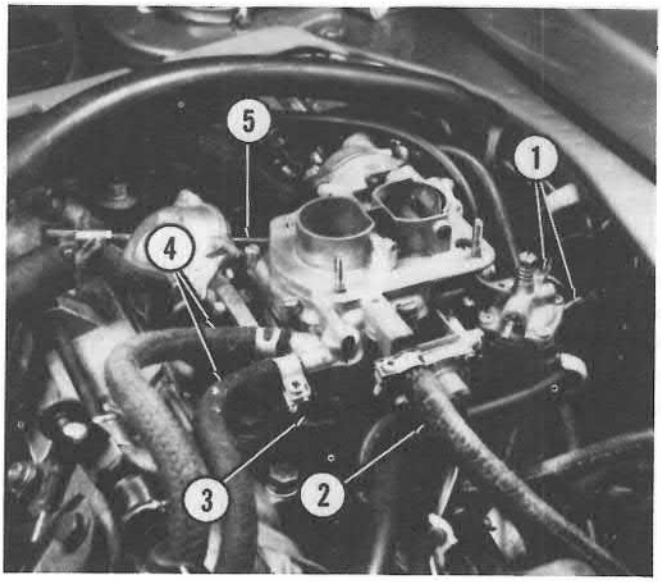
From carburetor, disconnect fuel inlet and return hoses (4), charcoal canister hose (2), and all remaining vacuum and coolant hoses.

Disconnect three electrical connectors (1) from carburetor.

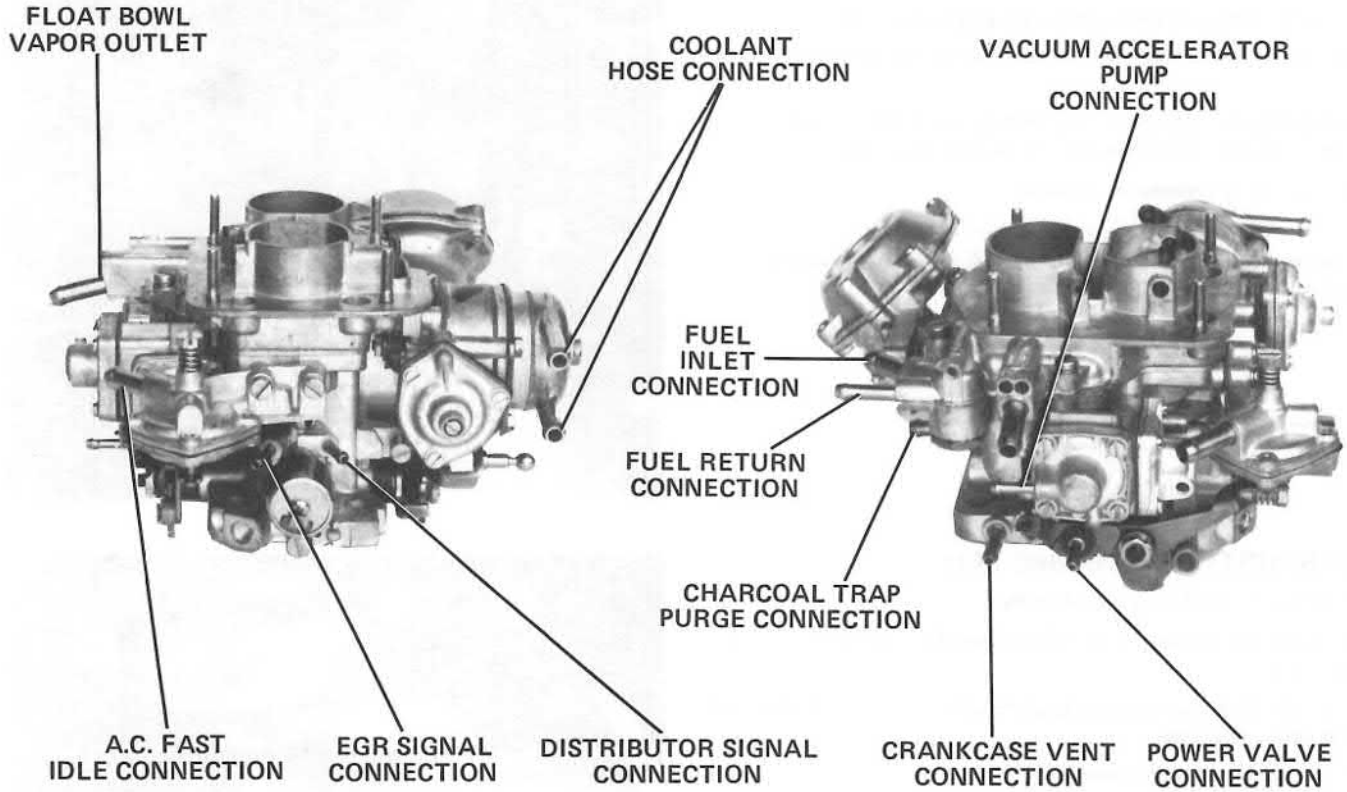
Disconnect throttle linkage (5) at carburetor.

Remove four nuts (3) holding carburetor. Remove carburetor and spacer.

Installation is reverse of removal. Connect vacuum, fuel and water lines to connections as shown below.



1. Electrical connectors 2. Hose 3. Nut 4. Fuel hose
5. Throttle linkage



AUTOMATIC CHOKE

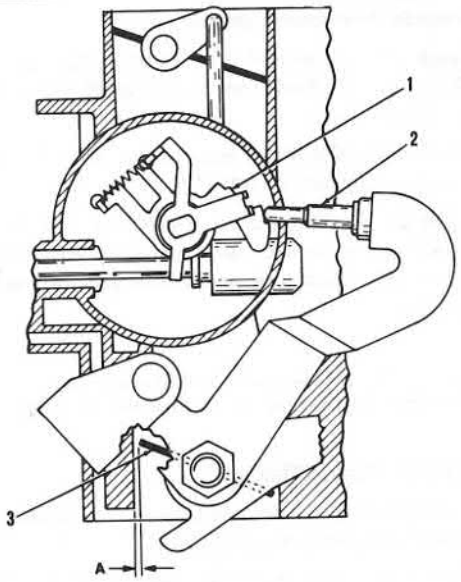
CHECK AND ADJUSTMENT

Remove carburetor from vehicle. Remove three screws holding automatic choke cover and gasket.

Choke Fast Idle

Set fast idle screw (2) on second step of cam (1). Check that primary throttle opening (gap A) is 0.033 to 0.037 in. (0.85 to 0.95 mm). If gap A is not correct, adjust screw (2).

1. Fast idle cam 2. Fast idle adjustment screw
3. Primary throttle plate

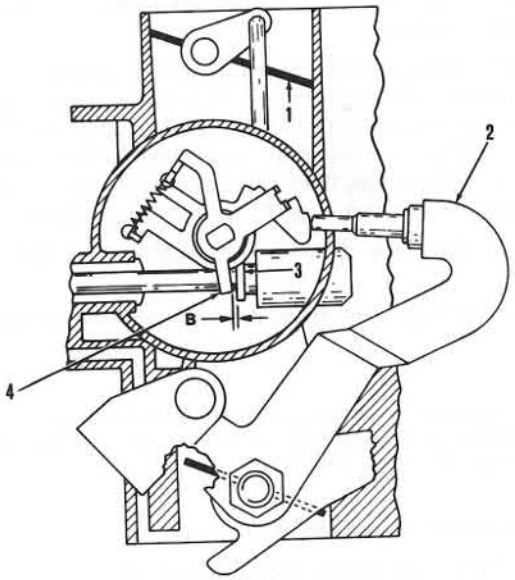


Choke Unloader Lever Clearance

Pull fast idle linkage (2) back. Close choke plate (1). Release linkage (2). Measure gap B between lever (4) and shoulder of bushing (3). A spark plug gap gage of the bent wire type can be used.

Gap should be 0.012 to 0.039 in. (0.3 to 1.0 mm). If gap is not correct, carefully bend tang (4).

1. Choke plate 2. Fast idle linkage 3. Spring 4. Tang

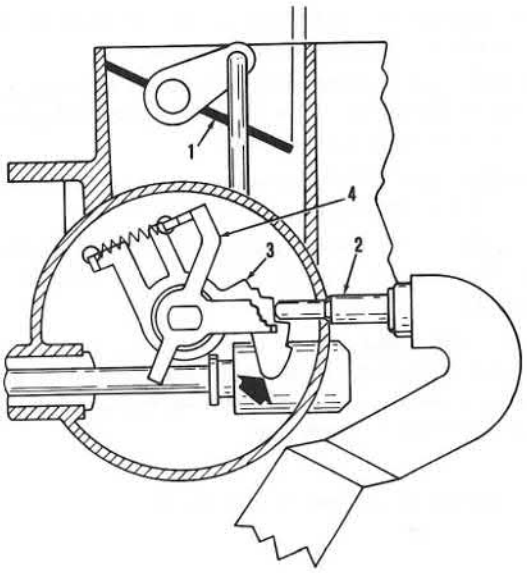


Fast Idle Cam Intermediate Setting

Set screw (2) on third step of cam (3). Make sure screw is in proper contact with third step. If necessary, move cam (3) in direction of arrow.

Check that gap C is 0.098 to 0.118 in. (2.5 to 3.0 mm). If gap C is not correct, bend lever (4).

1. Choke plate 2. Fast idle screw 3. Fast idle cam 4. Lever

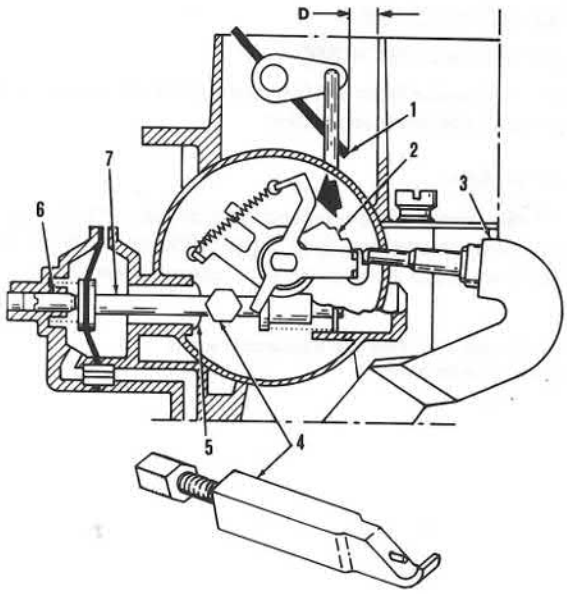


Choke Unloader Minimum Opening

With linkage (3) on second step of cam (2), position tool No. 4460 on rod (7). Push tool to left until rod contacts stop screw (6). Hold it there.

NOTE: Make sure tool is not touching bushing (5) in housing. This would restrict travel of rod (7).

Measure gap D. Gap should be 0.128 to 0.147 in. (3.25 to 3.75 mm). If gap is not correct, adjust travel of rod (7) by turning screw (6). Clockwise to decrease gap-counterclockwise to increase gap.



1. Choke plate 2. Fast idle cam 3. Fast idle linkage
4. Tool No. 4460 5. Bushing 6. Stop screw 7. Rod

FLOAT LEVEL ADJUSTMENT

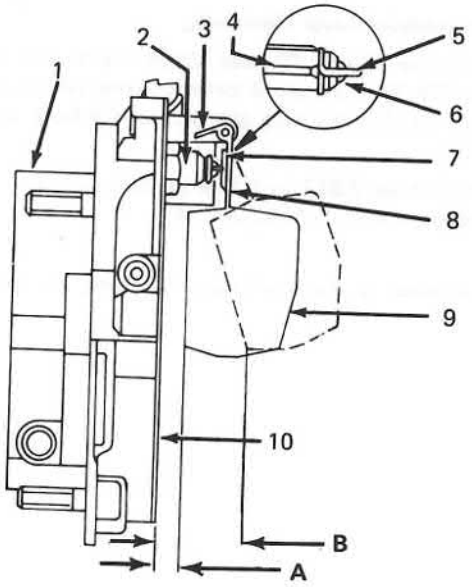
Remove six screws holding carburetor top cover. Carefully remove cover/float assembly and gasket.

Check that needle valve seat (2) is tight in cover. Check that float (9) is free of dents or punctures. Check that float can move freely on hinges.

Hold dual float assembly in vertical position with needle valve lightly seated. Measure distance A between each float and cover gasket. Distance should be .266 to .285 in. (6.75 to 7.25 mm). Make sure floats are same distance from gasket. If not, bend float arm (8). Then if float assembly is not at specified distance, carefully bend tang (7) to obtain adjustment.

To obtain float drop distance B of 0.354 in. (9 mm), bend lug (3).

Carefully replace cover/float assembly and secure with six screws.



1. Caburetor cover 2. Needle valve seat 3. Float drop lug
4 Needle valve 5. Return hook 6. Damper ball 7. Float tank
8. Float arm 9. Float 10. Gasket

CARBURETOR ADJUSTMENT

NOTE: For proper specifications, always refer to EPA Conformity Tag in engine compartment.

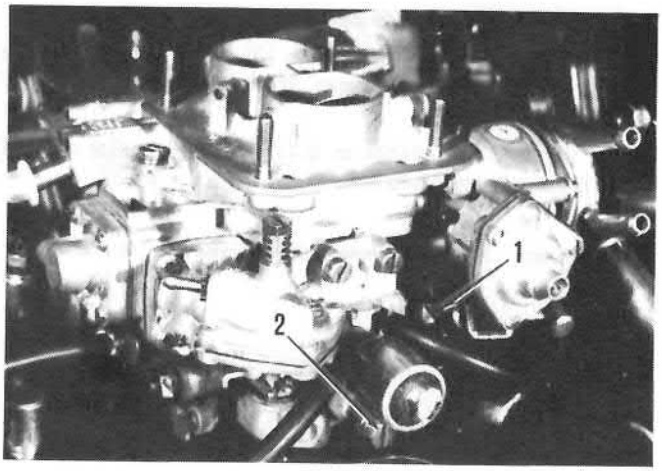
Apply hand brake. Start engine and allow warm up. Insert CO tester probe in tailpipe. Connect a tachometer.

On vehicles without air pump, pinch off the supply line to reed valve. On vehicles with air pump, pinch off air injection supply line upstream of check valve.

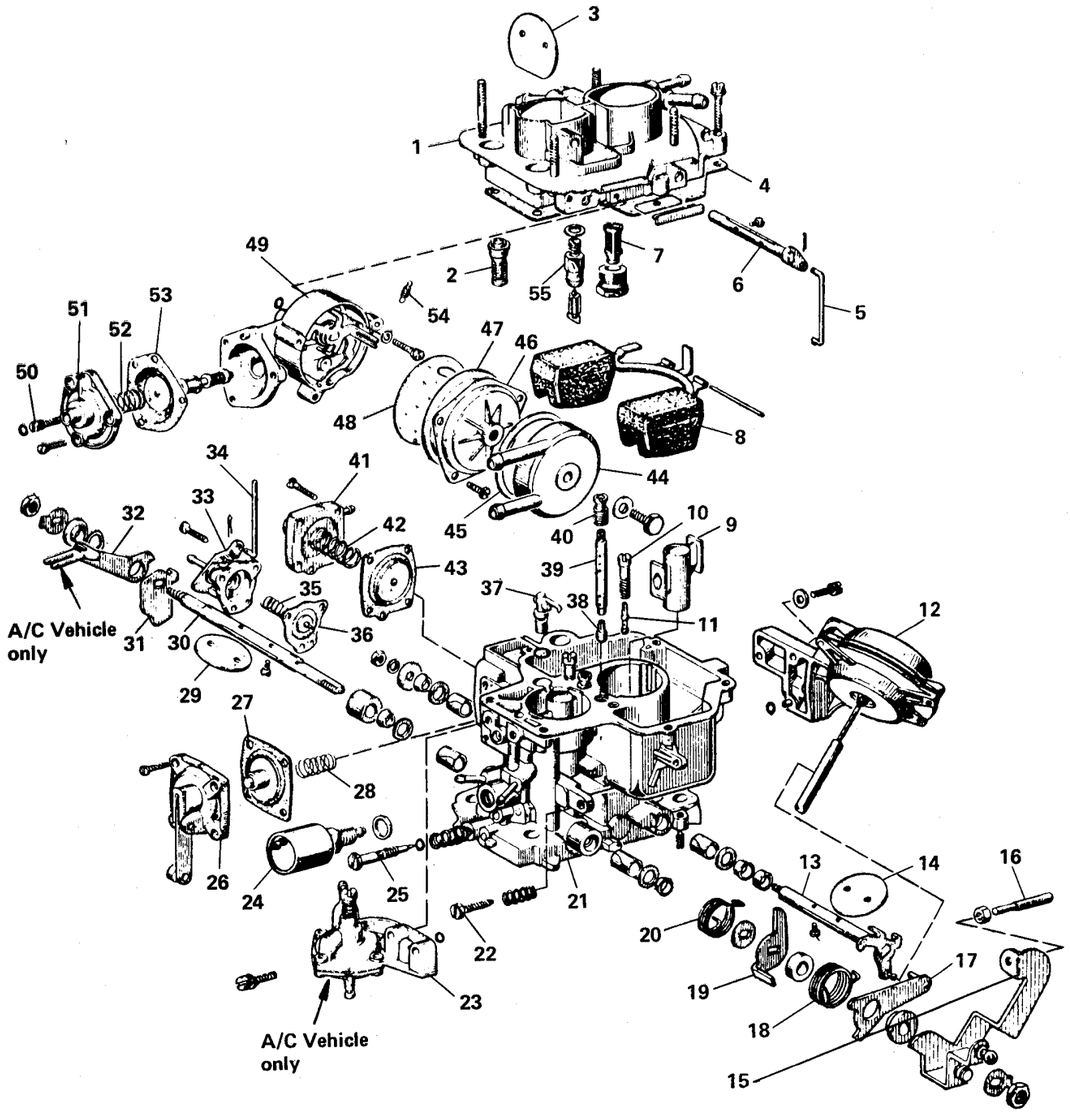
Adjust carburetor idle speed adjusting screw (1) to set engine speed to 800 to 900 rpm.

Adjust idle mixture adjusting screw (2) to set CO to 2.0%. Turn screw clockwise to decrease CO or counter-clockwise to increase CO.

Recheck idle speed and if necessary, repeat adjusting idle speed and mixture to obtain both the proper idle speed and CO reading. Shut engine off. Remove tool used to pinch off air injection hose or supply line.



1. Idle speed adjusting screw 2. Idle mixture adjusting screw



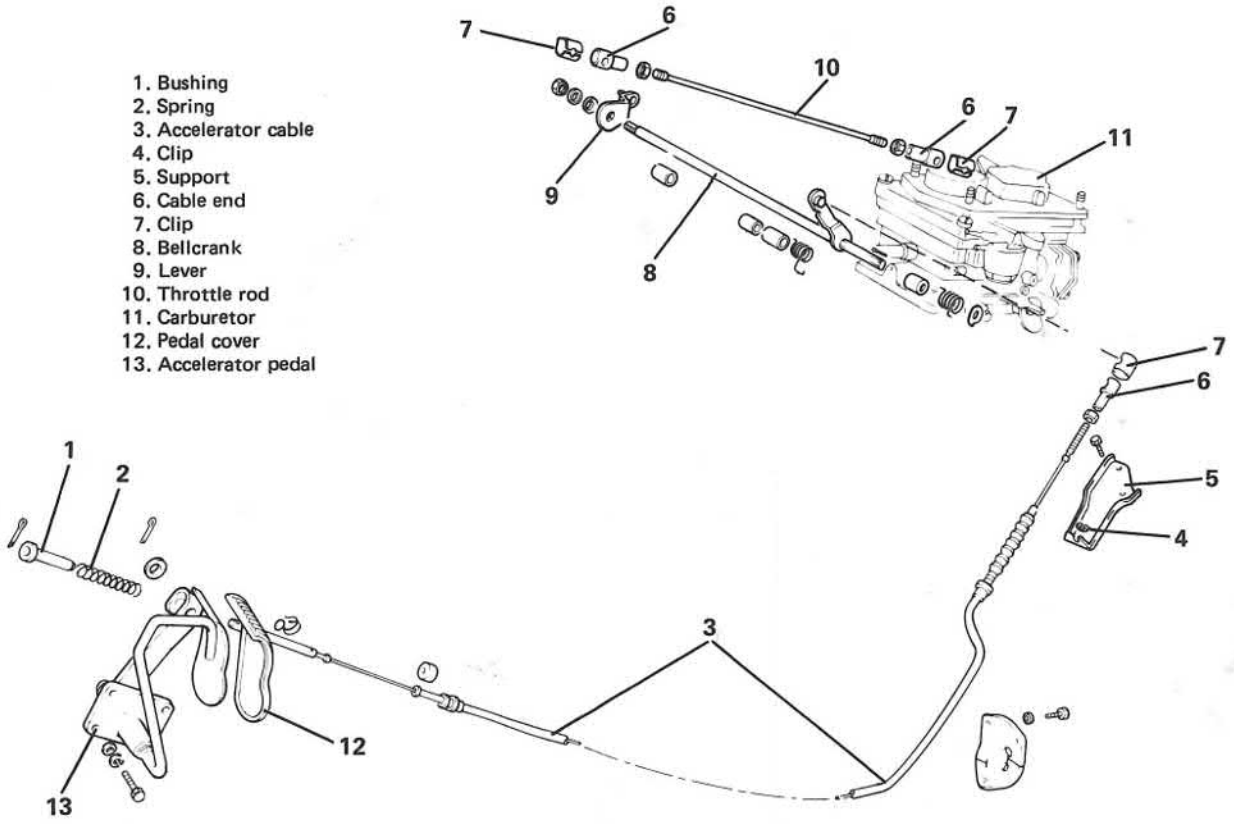
1. Carburetor cover
2. Breather valve
3. Choke plate
4. Gasket
5. Choke linkage
6. Choke plate shaft
7. Filter
8. Float assy
9. Center venturi
10. Idle jet housing
11. Idle jet
12. Secondary throttle vacuum diaphragm assy
13. Secondary throttle shaft
14. Secondary throttle plate
15. Throttle actuating lever assembly
16. Choke fast idle screw
17. Progressive throttle linkage
18. Return spring
19. Stop lever, Primary shaft
20. Return spring
21. Carburetor body assy
22. Idle speed screw
23. Fast idle diaphragm assy (A/C only)
24. Idle shut off solenoid
25. Idle mixture screw
26. Accelerator pump cover
27. Pump diaphragm
28. Diaphragm return spring
29. Primary throttle plate
30. Primary throttle shaft
31. Accelerator pump actuating cam
32. Fast idle control lever (A/C only)
33. Power valve cover
34. Bowl vent valve rod
35. Power valve return spring
36. Power valve diaphragm
37. Accelerator pump jet
38. Main fuel jet
39. Main emulsion tube
40. Main air jet
41. Vacuum accelerator pump cover
42. Vacuum accelerator pump return spring
43. Vacuum accelerator pump diaphragm
44. Automatic choke hot water cover
45. Gasket
46. Automatic choke hot water backing plate
47. Bimetallic spring case
48. Gasket
49. Automatic choke assy
50. Choke unloader adjustment screw
51. Choke unloader cover
52. Choke unloader return spring
53. Choke unloader diaphragm
54. Fast idle cam return spring
55. Needle valve assy

Carburetor Model	Specifications (mm)					
	7/179	7/279	10/179	10/279	7/180	7/280
Primary throat	21	21	21	21	21	21
Secondary throat	22	22	22	22	22	22
Primary venturi	4.00	4.00	4.00	4.00	4.00	4.00
Secondary venturi	4.00	4.00	4.00	4.00	4.00	4.00
Main fuel jet (primary)	1.05	1.05	1.10	1.10	1.05	1.05
Main fuel jet (secondary)	1.10	1.10	1.05	1.05	1.05	1.05
Idle jet (primary)	0.50	0.50	0.50	0.50	0.50	0.50
Idle jet (secondary)	0.05	0.50	0.50	0.50	0.50	0.50
Accelerator pump jet	0.50	0.50	0.50	0.50	0.50	0.50
Air jet (primary)	2.50	2.50	2.40	2.40	2.30	2.30
Air jet (secondary)	1.75	1.75	1.70	1.70	1.80	1.80
Emulsion tube (primary)	F25	F25	F25	F25	F25	F25
Emulsion tube (secondary)	F30	F30	F30	F30	F30	F30
Needle valve	1.75	1.75	1.75	1.75	1.75	1.75

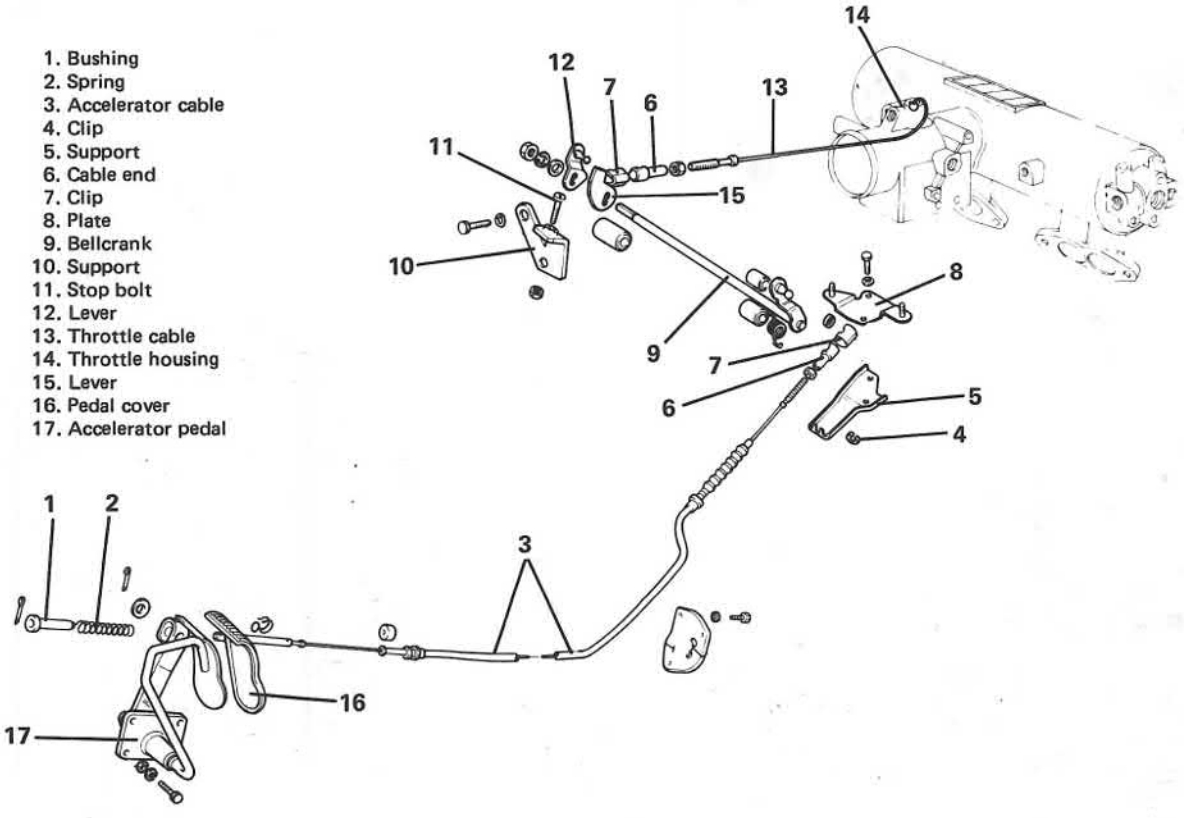
WEBER 28/30 DHTA CARBURETOR

Accelerator Linkage

1. Bushing
2. Spring
3. Accelerator cable
4. Clip
5. Support
6. Cable end
7. Clip
8. Bellcrank
9. Lever
10. Throttle rod
11. Carburetor
12. Pedal cover
13. Accelerator pedal



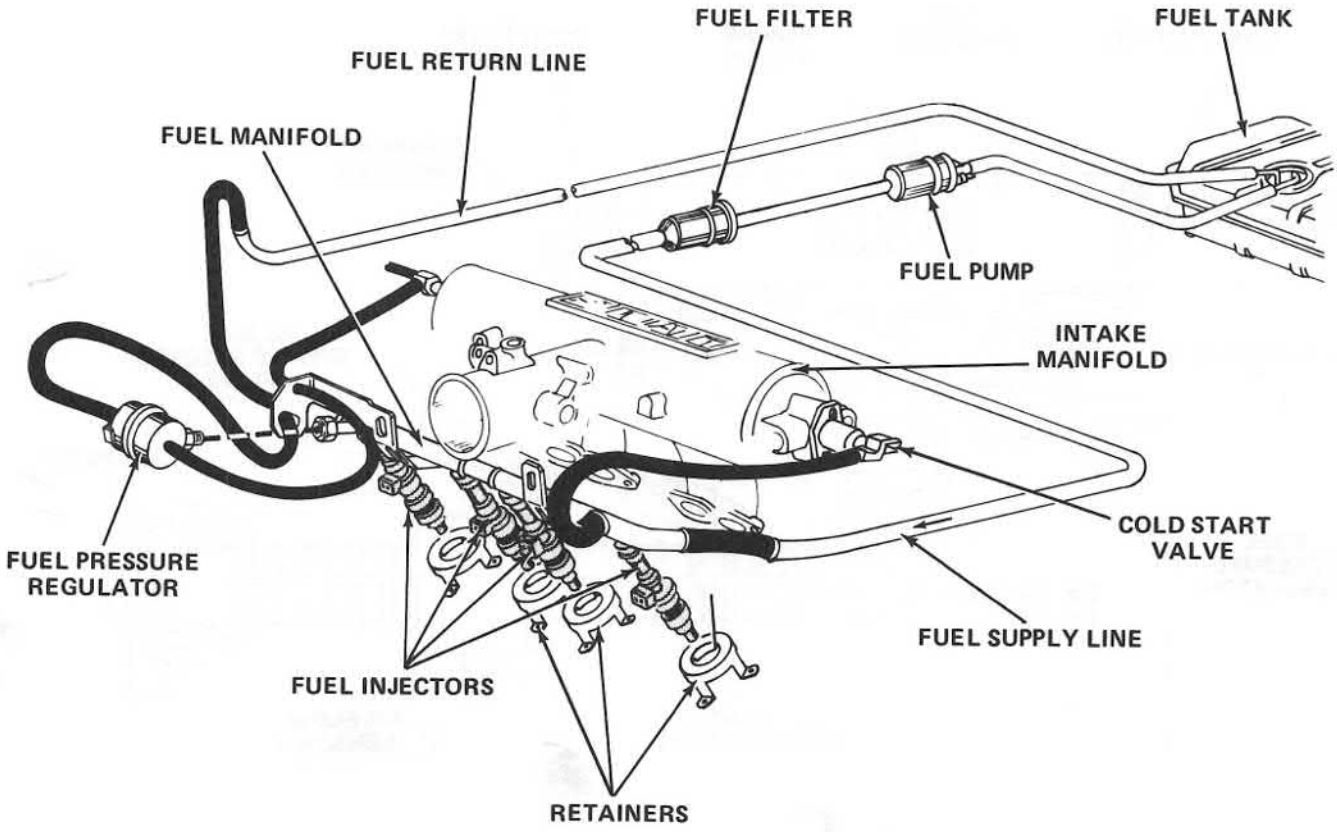
1. Bushing
2. Spring
3. Accelerator cable
4. Clip
5. Support
6. Cable end
7. Clip
8. Plate
9. Bellcrank
10. Support
11. Stop bolt
12. Lever
13. Throttle cable
14. Throttle housing
15. Lever
16. Pedal cover
17. Accelerator pedal



FUEL SYSTEM

The fuel system consists of:

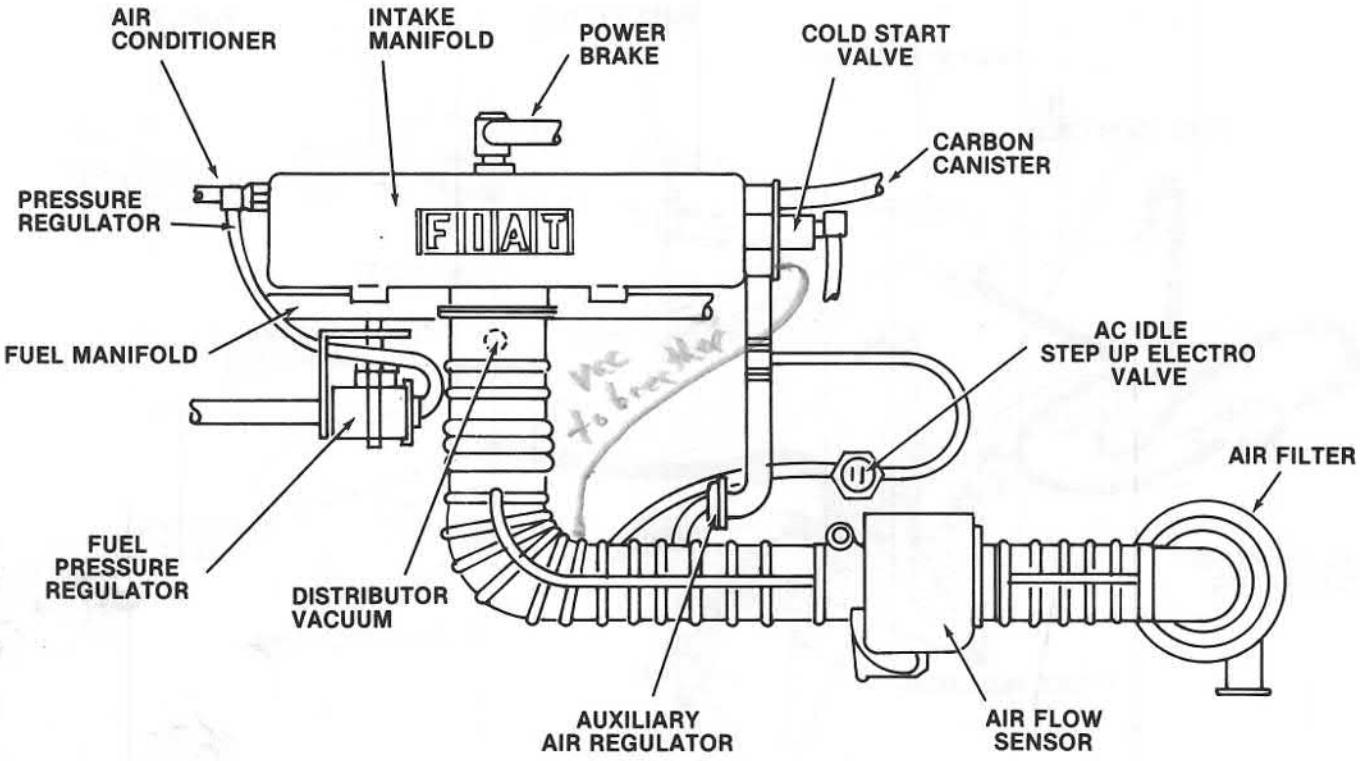
- Fuel tank
- Fuel pump
- Fuel filter
- Fuel manifold
- Pressure regulator
- Injectors
- Cold start valve



AIR INTAKE SYSTEM

The air intake system consists of:

- Air filter
- Air flow sensor
- Auxiliary air regulator
- Vacuum signal for fuel pressure regulator
- Bypass channel for air conditioning



NOTE: Air leaking into the system after the air flow sensor will not be sensed. This will result in a wrong fuel/air mixture and will affect engine operation.

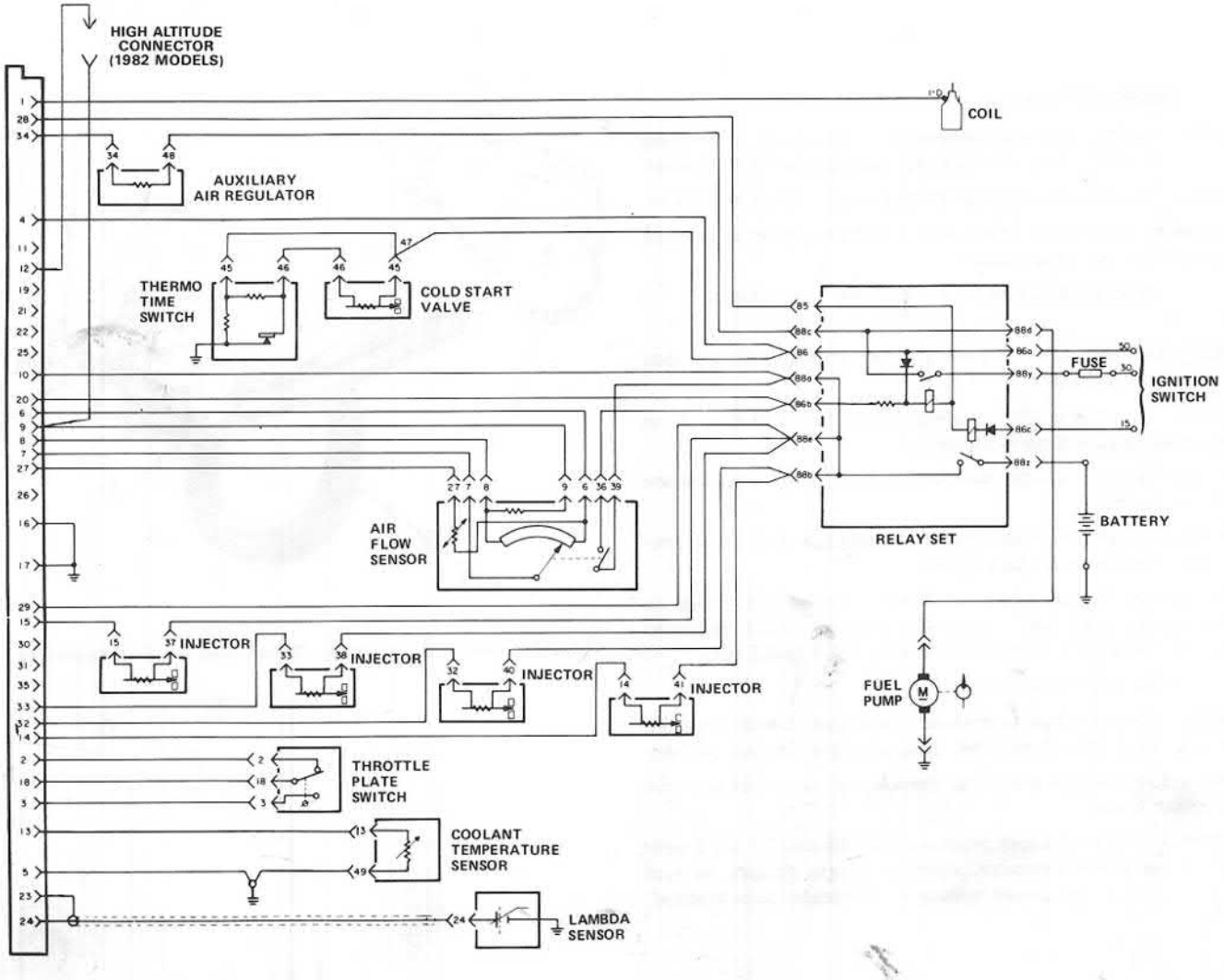
ELECTRICAL SYSTEM

The electrical system consists of:

- Relay set
- Electronic control unit
- Air flow sensor
- Cold start valve and thermo time switch circuit
- Throttle plate switch
- Air temperature sensor
- Coolant temperature sensor

In addition to the fuel injection electrical system, the following items are used:

- Battery
- Ignition coil
- Ignition switch cranking position
- Inline fuse

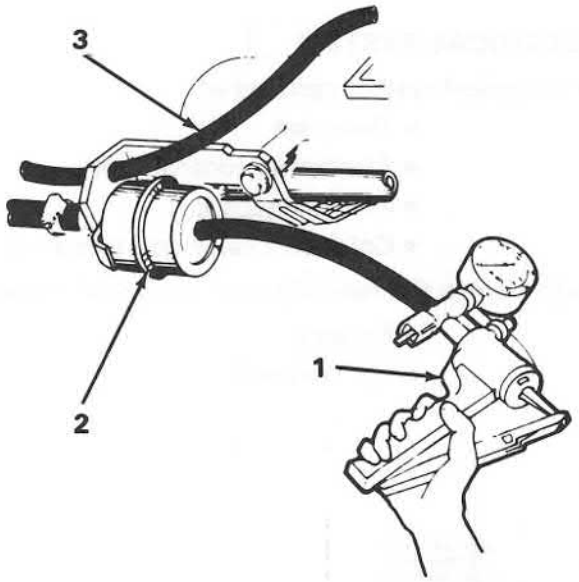


RELIEVING FUEL PRESSURE

CAUTION: Relieve fuel system pressure before disconnecting fuel lines.

Remove vacuum hose (3) from fuel pressure regulator (2).

Connect vacuum pump (1) to regulator (2). Pump vacuum up to 20 inches.



1. Vacuum pump 2. Pressure regulator 3. Vacuum hose

FUEL PRESSURE CHECK

NOTE: Use this check to determine if fuel pump is operating properly and to check for restrictions in fuel lines.

Relieve fuel system pressure as directed in above procedure.

Provide a container to catch any fuel. Use caution to prevent any dirt from entering system.

Loosen clamp holding fuel hose (3) to cold start valve (1). off valve.

CAUTION: Use care in pulling hose off valve. Valve body is plastic.

Connect "Y" fitting (2) on gauge assembly A.95874 (4) to fuel hose. Secure hose with clamp.

Connect hose on gauge assembly to cold start valve. Secure hose with clamp.

Disconnect vacuum hose from fuel pressure regulator. Disconnect hose from air flow sensor.

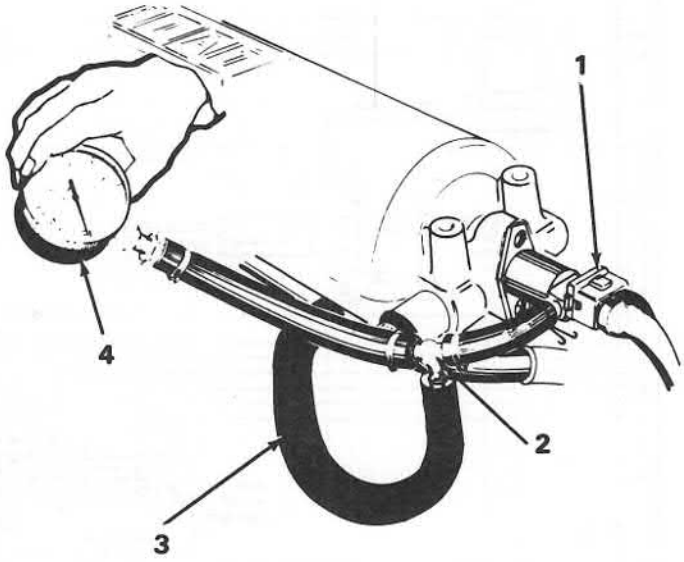
With ignition key switched to "MAR" (on) position, move air flow sensor until fuel pump is energized. Check pressure reading. Pressure should be 33 to 39 psi (2.3 to 2.7 bar).

Start engine and operate at idle.

Connect vacuum hose to pressure regulator. Check pressure reading. Pressure should be approximately 28 psi (2 bar).

Relieve fuel system pressure. Remove gauge assembly and reconnect hoses.

NOTE: Fuel pump output pressure is 39-45 psi (2.7 to 3.2 bar). To check pressure, connect gauge directly to fuel supply line. Leave remainder of system disconnected.



1. Cold start valve 2. "Y" fitting 3. Fuel hose 4. Gauge assembly

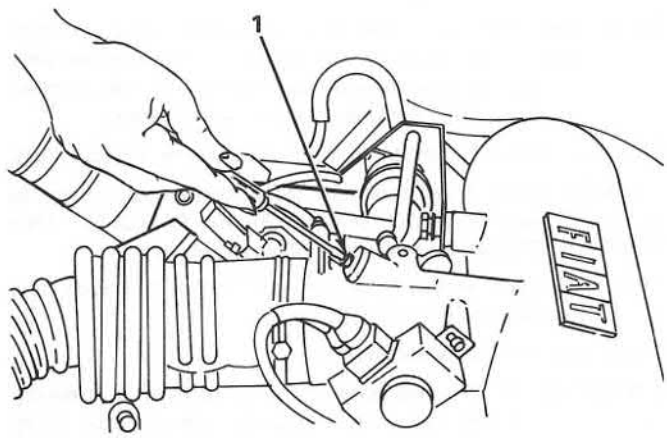
IDLE SPEED ADJUSTMENT

NOTE: Engine must be at normal operating temperature with cooling fan off when adjusting idle speed.

Connect tachometer. Run engine until it reaches normal operating temperature.

Adjust idle speed adjustment screw (1) to obtain 800 to 900 RPM.

1. Idle speed adjustment screw



MIXTURE CHECKING AND ADJUSTMENT

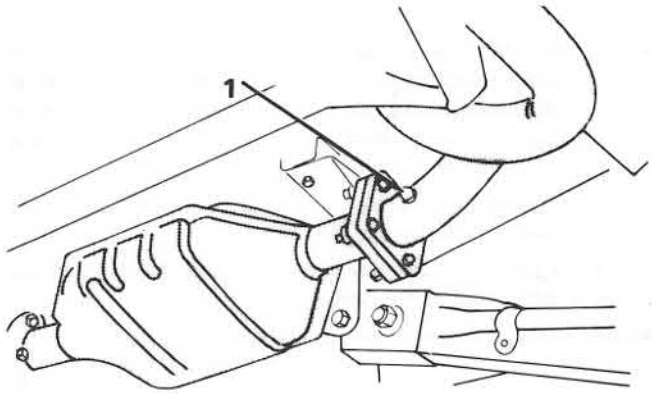
To check mixture, first connect test equipment as follows:

Remove plug (1) from CO pickup fitting. Install adapter probe 4467 in pickup. Connect hose from CO analyzer to probe. Turn analyzer on to allow for proper warmup of equipment.

Start engine and allow it to reach normal operating temperature.

NOTE: Engine is at normal operating temperature when cooling fan has been on twice.

1. Plug

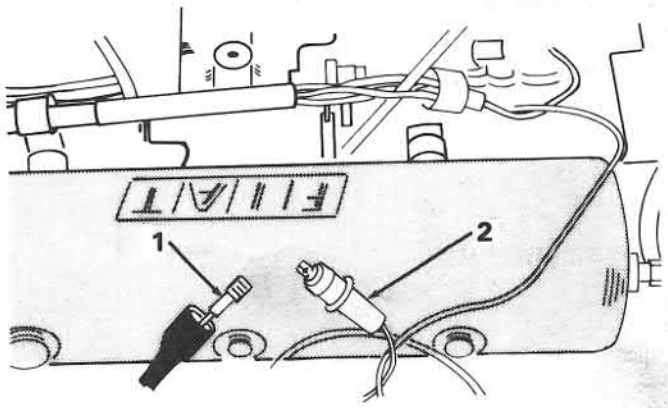


Zero analyzer according to manufacturer's instructions.

Disconnect harness wire (1) from Lambda sensor connector (2), making sure that wire cannot ground out.

Check CO reading. Reading should be 0.5% to 0.9%.

1. Lambda sensor harness wire 2. Lambda sensor connector



To adjust mixture, proceed as follows:

NOTE: On 1981 and later models, Federal law prohibits routine adjustment of mixture. Adjust mixture only if major engine repairs have been performed or main fuel injection components have been replaced.

If mixture screw is concealed by a plastic plug, remove plug.

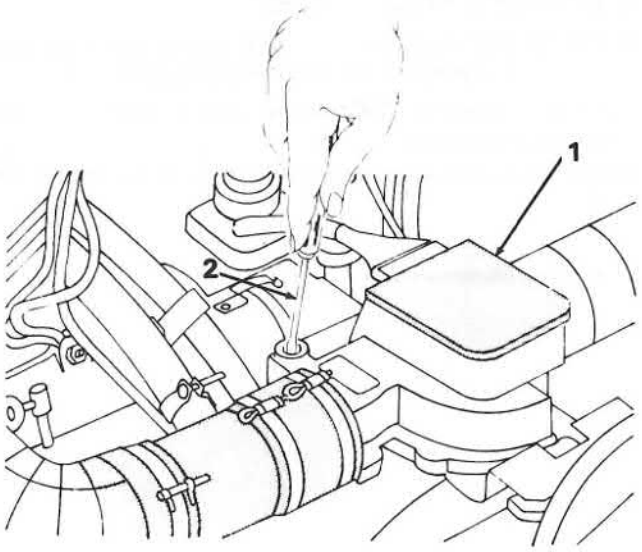
If mixture screw is concealed by an aluminum plug, refer to MIXTURE ADJUSTMENT SCREW PLUG REMOVAL AND INSTALLATION before performing this procedure.

Turn adjustment screw clockwise to increase CO level, and counterclockwise to decrease CO level.

Install plug in air flow sensor (1).

WARNING: In the next step, be very careful in removing probe and installing plug. Exhaust pipe could be very hot.

Remove CO analyzer, remove probe, and install plug in exhaust pickup.



1. Air flow sensor 2. Screwdriver

MIXTURE ADJUSTMENT SCREW PLUG

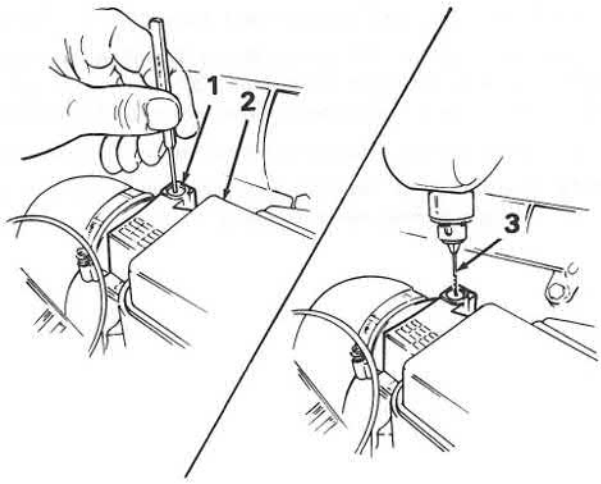
REMOVAL

NOTE: On 1981 and later models, Federal law prohibits routine adjustment of mixture. Remove aluminum adjustment screw plug to adjust mixture only if major engine repairs have been performed or main fuel injection components have been replaced.

Center punch aluminum plug (1) sealing mixture adjustment screw in the air flow sensor (2).

Drill a 3/32 in. (2.5 mm) hole, approximately 9/64 to 5/32 in. (3.5 to 4 mm) deep, in the center of plug.

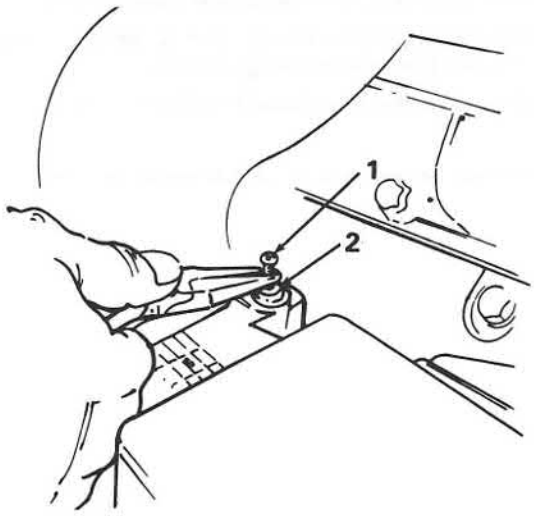
NOTE: Clean all metal shavings from around area.



1. Aluminum plug 2. Air flow sensor 3. 3/32 in. (2.5 mm) drill

Screw a 1/8 in. (3 mm) sheet metal screw (1) into drilled hole.

Grasp the screw with a pair of pliers and lift screw and aluminum plug (2) out from air flow sensor.



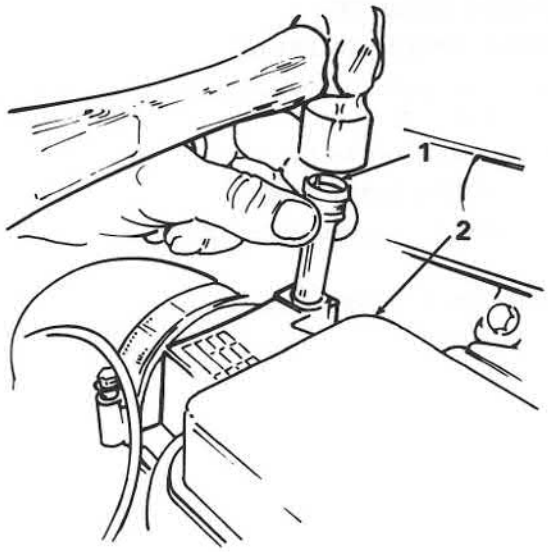
1. ⅛ in. (3 mm) screw 2. Aluminum plug

INSTALLATION

NOTE: To comply with Federal law, replacement plug must be installed after mixture adjustment.

Seat new replacement plug (1) in recess of air flow sensor (2). Use a hammer to drive plug in flush with unit.

1. Plug 2. Air flow sensor



ELECTRONIC CONTROL UNIT

REMOVAL AND INSTALLATION

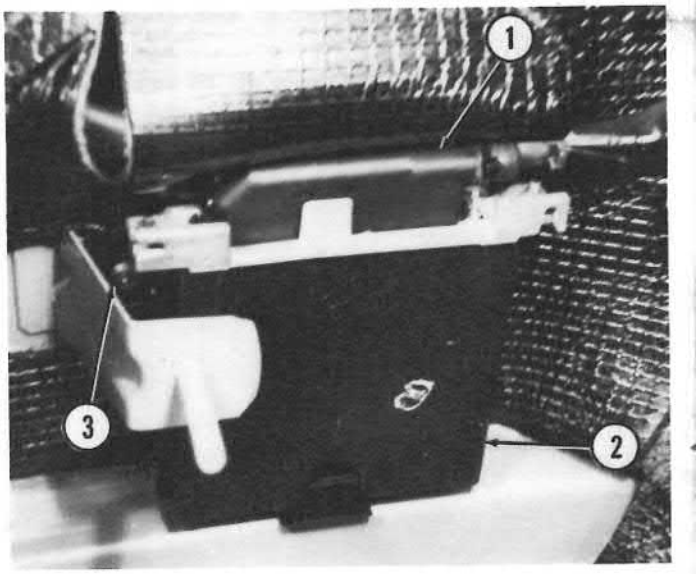
Working behind passenger's seat, remove spare tire cover and spare tire.

Push in clip holding electrical connector (1) to electronic control unit (2), and unplug connector from unit.

Remove two nuts (3) holding control unit to body, and remove control unit.

Install in reverse order.

1. Electrical connector 2. Electronic control unit 3. Nut



FUEL INJECTOR COOLING FAN

REMOVAL AND INSTALLATION

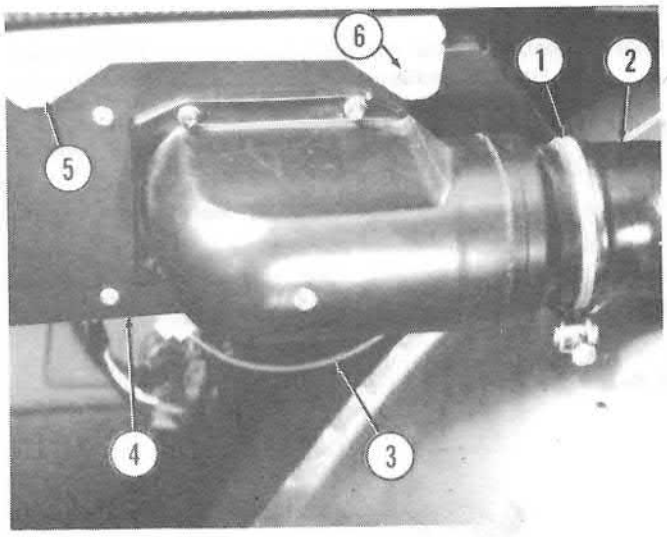
Loosen clamp (1) holding fresh air duct (2) to fan duct.

Disconnect wire (3) at connector.

Remove four bolts (5 and 6) holding fan mounting plate (4) to body and remove fan assembly.

Install in reverse order. Make sure ground wire is installed under mounting bolt.

1. Clamp 2. Fresh air duct 3. Wire 4. Mounting plate 5. Bolt 6. Bolt



LAMBDA SENSOR

REMOVAL AND INSTALLATION

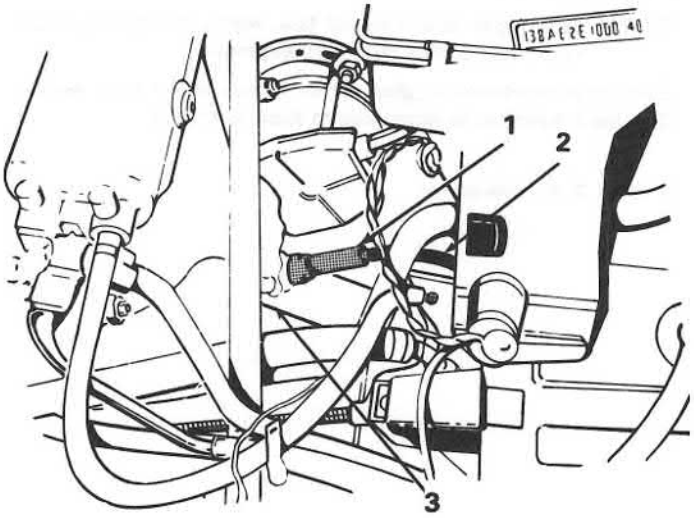
NOTE: The Lambda sensor must be replaced every 30,000 miles.

Allow exhaust system to cool.

Disconnect cable (2) from sensor (1).

Remove sensor from exhaust pipe (3).

1. Lambda sensor 2. Cable 3. Exhaust pipe

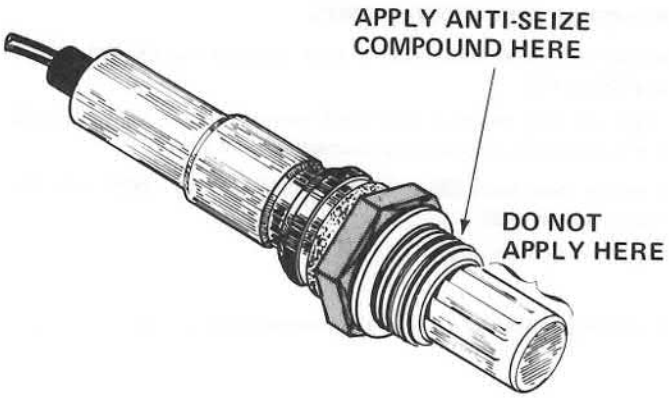


Coat threads of new Lambda sensor with anti-seize, anti-rust grease.

CAUTION: Do not allow grease to get on sensor surface. This will contaminate sensor and require replacement.

Thread sensor into exhaust pipe. Torque sensor to 30 to 36 ft. lbs. (4.2 to 5.0 mkg).

Connect cable to sensor.



INDICATOR RESET

NOTE: Lambda sensor indicator comes on at 30,000 miles to indicate replacement of sensor. To turn indicator off, the switch unit must be reset.

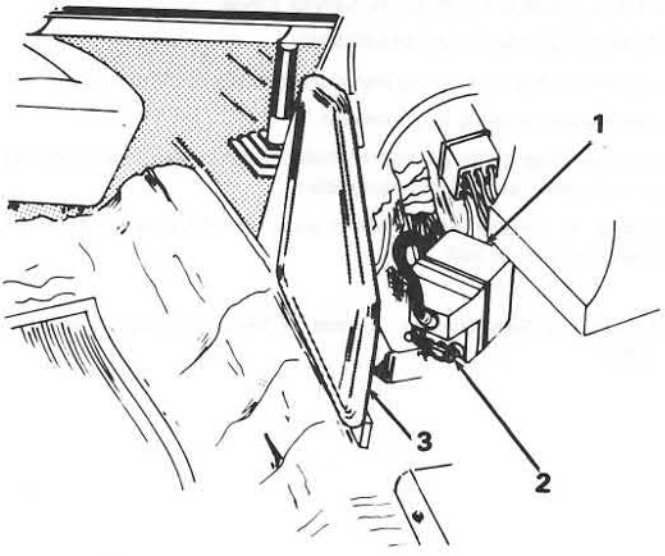
Working from passenger's side footwell, reach behind center console (3) to gain access to switch unit (1).

Remove wire securing cap screw (2). Remove cap screw.

Insert a small screw driver through housing and press on switch contact. Contact will reset to high point on wheel.

Install cap screw. Secure screw with new wire.

1. Switch unit 2. Cap screw 3. Center console



THROTTLE PLATE SWITCH

REMOVAL AND INSTALLATION

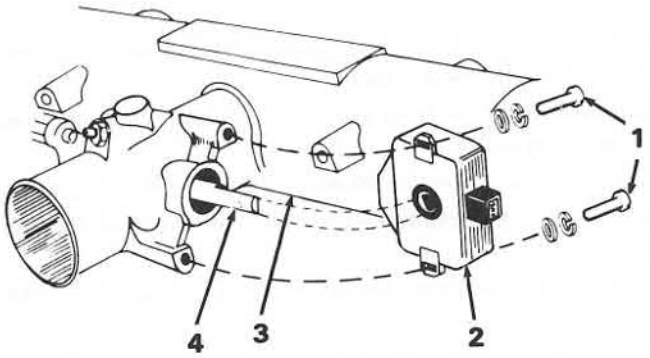
Disconnect electrical connector to throttle plate switch.

Remove two screws (1) and washers holding switch (2) to throttle housing (3).

Remove switch by slowly pulling switch out from housing.

Install in reverse order, making sure switch is properly aligned with throttle shaft (4).

1. Screws 2. Switch 3. Throttle housing 4. Throttle shaft

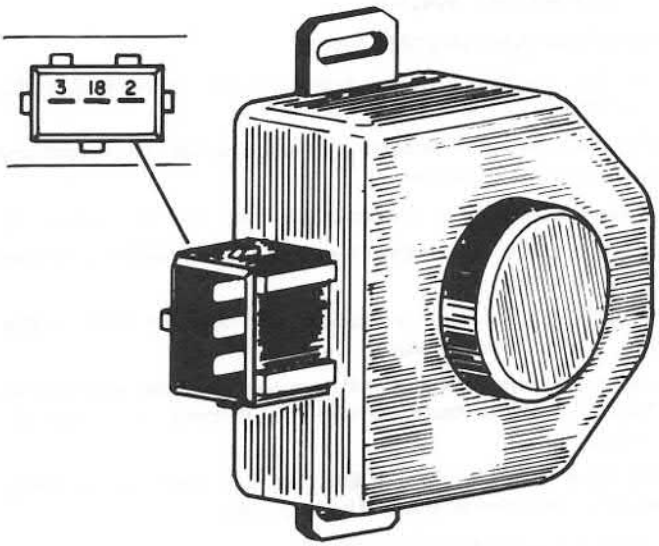


ADJUSTMENT

Make sure idle speed is correct.

Disconnect electrical connector from throttle plate switch.

Connect an ohmmeter between terminals 2 and 18 of the throttle plate switch.



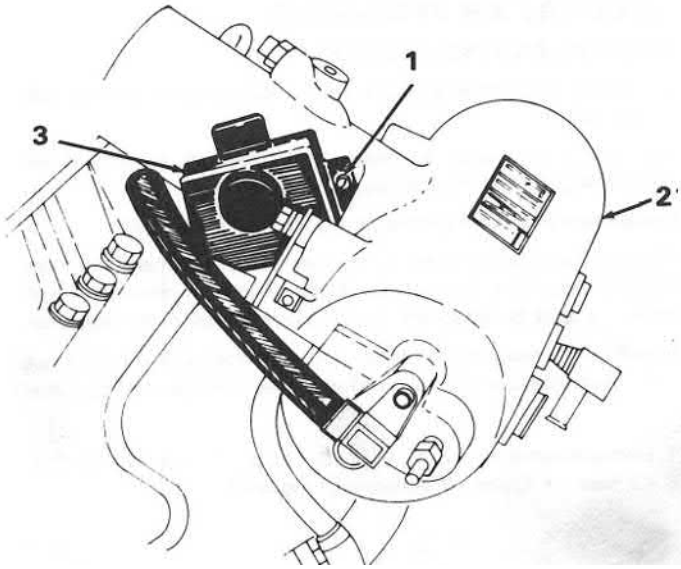
Loosen two screws (1) holding throttle plate switch (3) to throttle housing (2).

With engine off, rotate switch clockwise until ohmmeter indicates a closed circuit.

At the exact point the ohmmeter indicates a closed circuit, tighten the two screws holding switch.

Recheck the adjustment and replace the connector to the throttle plate switch.

1. Screws 2. Throttle housing 3. Throttle plate switch



FUEL PRESSURE REGULATOR

REMOVAL AND INSTALLATION

Relieve fuel pressure as directed under RELIEVING FUEL PRESSURE.

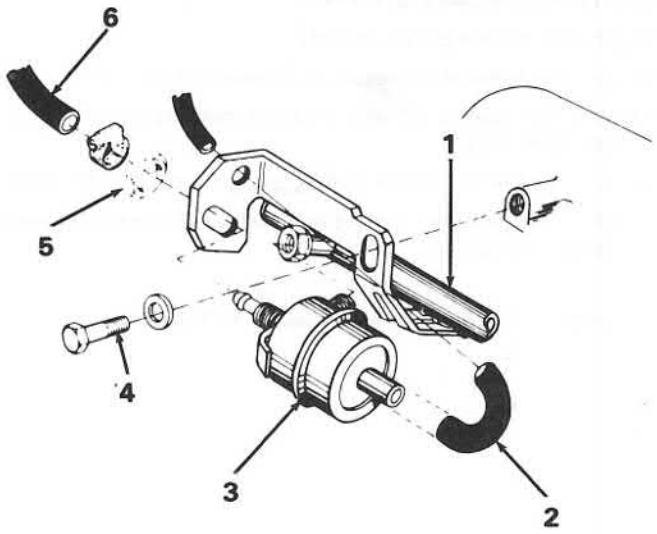
Provide a container to catch any fuel. Use care to prevent any dirt from entering system.

Disconnect vacuum hose (2) and fuel return hose (6) from pressure regulator (3).

Disconnect fuel manifold connection (1) from pressure regulator.

Remove nut (5) holding regulator to fuel manifold. Remove pressure regulator.

Install in reverse order. Check all fuel connections for leaks.



1. Fuel manifold 2. Vacuum hose 3. Pressure regulator 4. Bolt
5. Nut 6. Fuel return hose

COLD START VALVE

REMOVAL AND INSTALLATION

Relieve fuel pressure as directed under RELIEVING FUEL PRESSURE.

Provide a container to catch any fuel. Use care to prevent any dirt from entering system.

Disconnect electrical connector (3) from cold start valve (1).

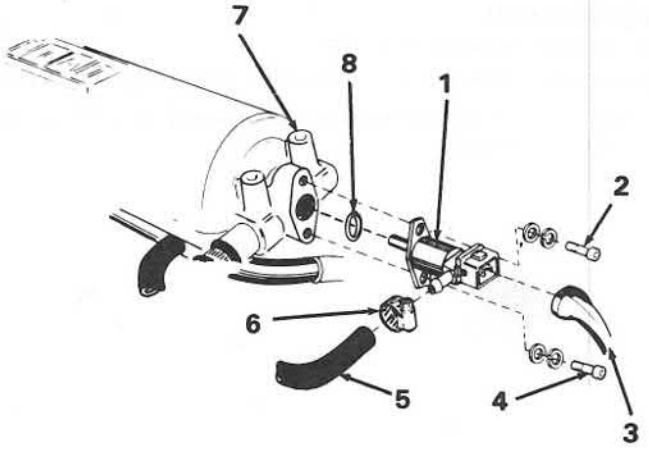
Remove clamp (6) holding fuel hose (5) on valve. Pull fuel hose off valve.

CAUTION: Use care in pulling fuel hose off valve. Valve body is plastic.

Using a 5 mm Allen wrench, remove two screws (2 and 6) holding valve in intake manifold (7). Remove valve and "O" ring (8).

Install in reverse order. Make sure fuel hose is completely installed on valve and hose clamp is tight.

Check fuel connections for leaks.



1. Cold start valve 2. Allen screw 3. Electrical connector
4. Allen screw 5. Fuel hose 6. Clamp 7. Intake manifold
8. "O" ring

AUXILIARY AIR REGULATOR

REMOVAL AND INSTALLATION

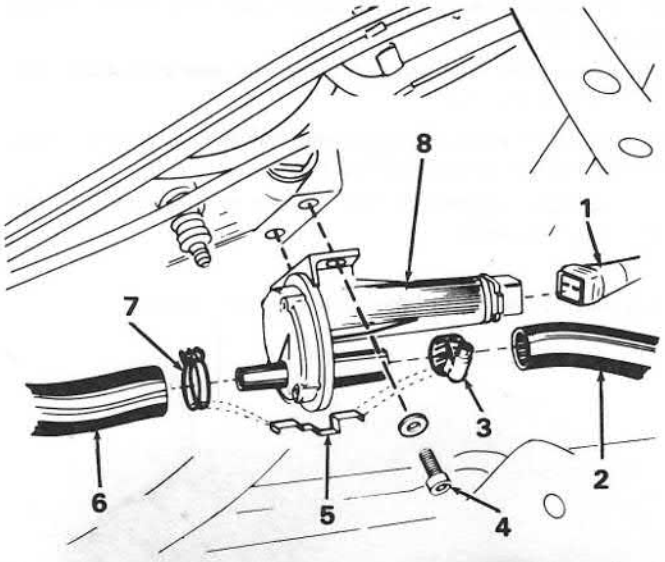
Disconnect regulator air hose from intake manifold near cold start valve.

Disconnect regulator air hose and charcoal canister hose from fitting in bottom of main air supply hose.

Disconnect electrical connector (1) from regulator (8).

Using a 5 mm Allen wrench, remove two bolts (4) and washers holding regulator to cylinder block. Remove regulator with hoses (2 and 6) attached, and remove hoses from regulator.

Install in reverse order. Make sure air hose connections are tight and that clip (5) is installed under clamps on regulator.



1. Electrical connector 2. Air hose 3. Clamp 4. Allen bolt 5. Clip
6. Air hose 7. Clamp 8. Auxiliary air regulator

AIR FLOW SENSOR

REMOVAL AND INSTALLATION

Disconnect both air hoses from each side of air flow sensor (1).

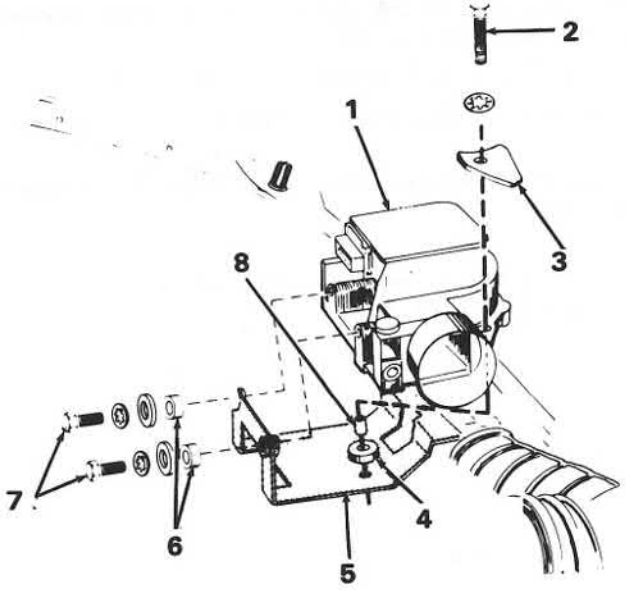
Disconnect electrical connector from sensor.

Remove bolt (2) and lockwasher holding clamp (3) to bracket (5). Remove clamp and spacer (8).

Remove two bolts (7) lockwashers, washers, and bushings (6) holding air flow sensor to bracket. Be careful not to drop washers on either side of rubber bushing under front side of sensor.

Install in reverse order, making sure rubber bushing is installed under sensor and air hose connections are tight.

1. Air flow sensor 2. Bolt 3. Mounting clamp 4. Bushing
5. Bracket 6. Bushings 7. Bolts 8. Spacer



FUEL INJECTORS

REMOVAL

Relieve fuel system pressure as directed under RELIEVING FUEL PRESSURE.

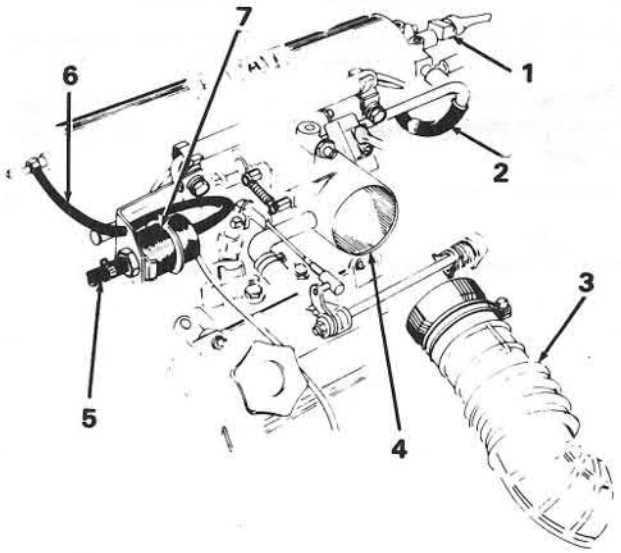
Provide a container to catch any fuel. Use care to prevent any dirt from entering system.

NOTE: Before disconnecting any fuel hoses, place a rag beneath them to catch any spilled fuel.

Disconnect the following: Fuel supply hose (2) from tube, fuel return hose (5) from pressure regulator (7), vacuum hose (6) from pressure regulator, fuel hose from cold start valve (1), and main air supply hose (3) from throttle housing (4).

CAUTION: Use care in pulling fuel hose off of cold start valve. Valve body is plastic.

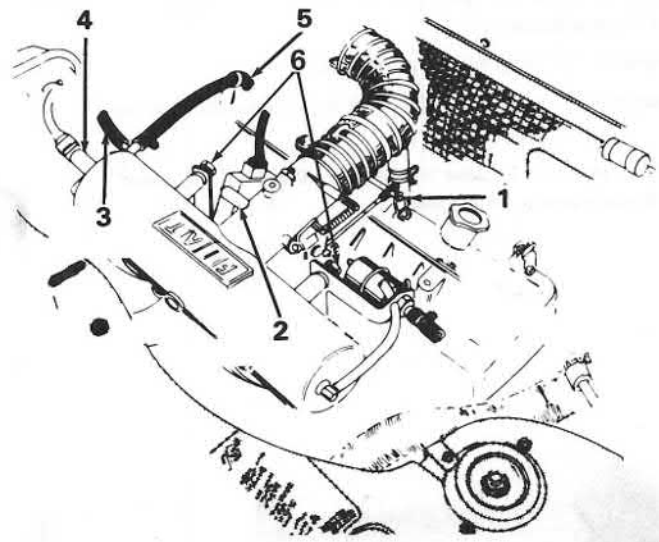
1. Cold start valve 2. Fuel supply hose 3. Main air supply hose
4. Throttle housing 5. Fuel return hose 6. Vacuum hose
7. Fuel pressure regulator



Disconnect the following: accelerator cable (1) from linkage, electrical connectors from throttle plate switch (2) and cold start valve (4), auxiliary air regulator hose (5) from intake manifold, and crankcase evaporative bypass hose (3) from intake manifold.

Remove two bolts (6) holding fuel manifold and pressure regulator to air intake. Remove washers from either side of bushings in fuel manifold brackets.

1. Accelerator cable 2. Throttle plate switch 3. Bypass hose
4. Cold start valve 5. Auxiliary air regulator hose 6. Bolt



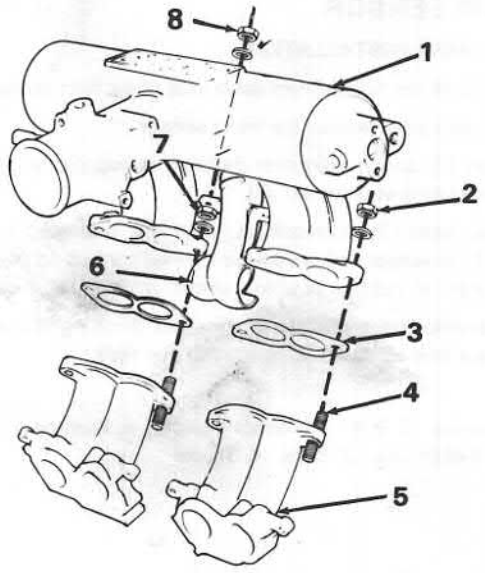
Remove two nuts (8) and washers holding intake manifold cooling air duct (6) to studs (4) on manifold (5).

Disconnect cooling air hose from duct. Remove duct.

Remove four nuts (2) and washers holding air intake to manifold.

Carefully lift air intake off studs (4) in manifold. Tilt air intake backwards.

1. Air intake 2. Nut 3. Gasket 4. Stud 5. Manifold
6. Cooling air duct 7. Nut 8. Nut



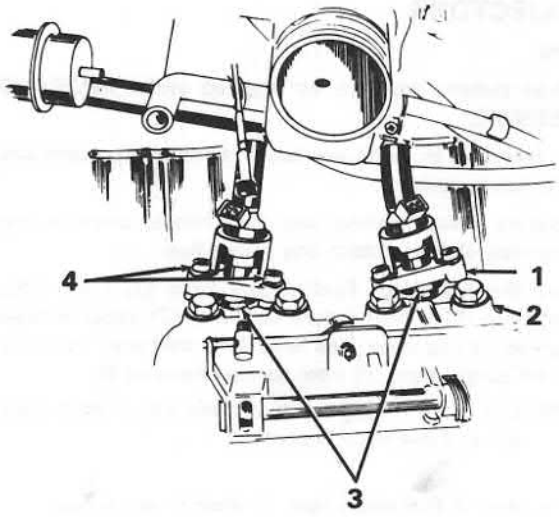
Disconnect electrical connectors from fuel injectors.

Using a 4 mm Allen wrench, remove two bolts (4) and washers holding fuel injectors (3) in intake manifold (2).

Remove fuel injectors and adapters (1) from manifold. Be careful not to damage bushings and "O" rings on injectors and adapters.

Remove fuel manifold.

1. Adapter 2. Intake manifold 3. Fuel injectors 4. Allen bolts

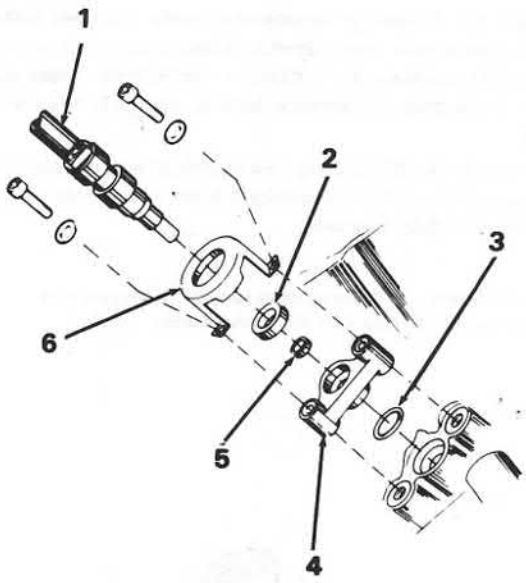


Remove small (5) and large (2) rubber bushings and retainers (6) from injectors (1).

Remove "O" ring (3) from adapter (4).

Inspect bushings and "O" rings for cracks and damage.

1. Fuel injector 2. Large bushing 3. "O" ring 4. Adapter
5. Small bushing 6. Retainer



INSTALLATION

NOTE: When replacing a defective injector, replace both the injector and hose.

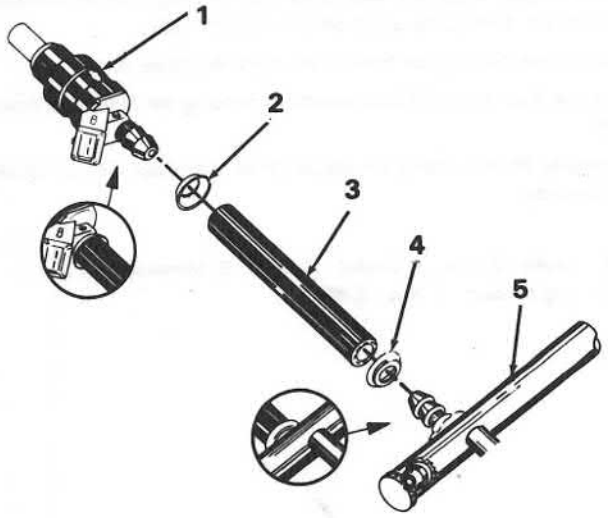
To replace injector (1), pull hose (3) off fuel manifold (5). Use a twisting, rocking motion while pulling on hose.

To replace a damaged hose on a good injector, cut hose at both ends and remove it.

When installing new hose on injector, place collar (2 and 4) over shoulder of injector and manifold.

Push hose on injector and manifold until hose end is inside collar and collar is tight against shoulder.

To complete installation, reverse removal procedure. Make sure retaining bolts are tight. Check all fuel and air connections for leaks.



1. Injector 2. Collar 3. Hose 4. Collar 5. Fuel manifold

THROTTLE PLATE

REMOVAL AND INSTALLATION

NOTE: The upper air intake should be removed for ease of access to throttle plate. Mark lines, hoses and wires prior to removal to identify for installation.

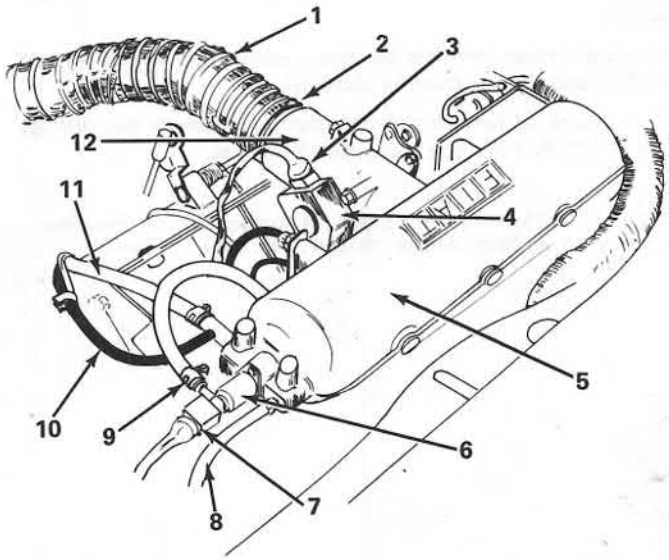
Loosen clamp (2) and disconnect air supply hose (1) from throttle housing (12).

Disconnect electrical connectors (3 and 7) from throttle plate switch (4) and cold start valve (6).

Disconnect vacuum hoses (8, 10, and 11) from air intake (5).

Remove clamp (9) holding fuel hose on cold start valve. Pull fuel hose off valve.

CAUTION: Use care in pulling fuel hose off valve. Valve body is plastic.

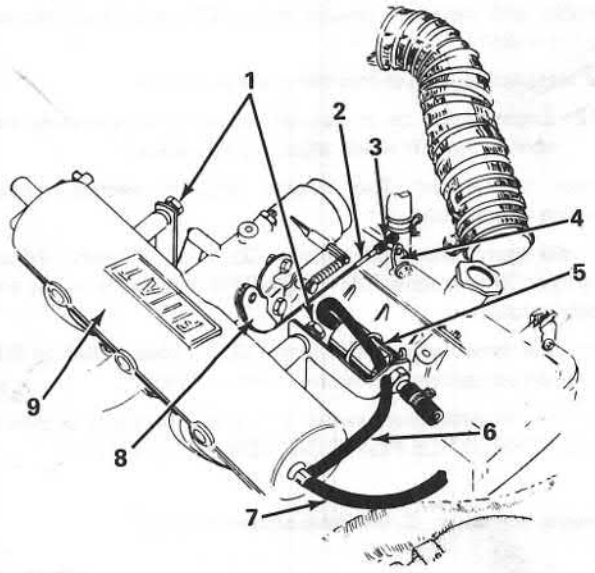


1. Air hose 2. Clamp 3. Connector 4. Throttle plate switch
5. Air intake 6. Cold start valve 7. Connector 8. Vacuum hose
9. Clamp 10. Vacuum hose 11. Vacuum hose 12. Throttle housing

Disconnect throttle shaft cable (2) from linkage (4) by removing spring clip (3). Disconnect cable from throttle lever (8).

Disconnect vacuum hoses (6 and 7) from air intake (9).

Remove two bolts (1) holding fuel manifold and pressure regulator (5) to air intake.



1. Bolt 2. Throttle shaft cable 3. Spring clip 4. Throttle linkage
5. Fuel pressure regulator 6. Vacuum hose 7. Vacuum hose
8. Throttle lever 9. Air intake

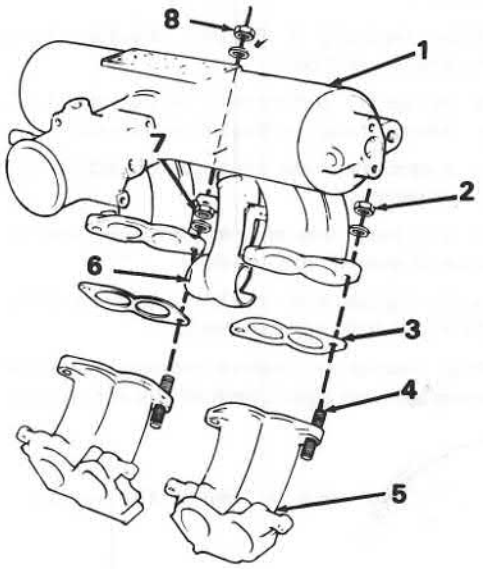
Remove two nuts (8) and washers holding intake manifold cooling air duct (6) to studs (4) on manifold (5).

Disconnect cooling air hose from duct. Remove duct.

Remove four nuts (2) and washers holding air intake to manifold.

Carefully lift air intake off studs (4) in manifold. Tilt air intake backwards.

1. Air intake 2. Nut 3. Gasket 4. Stud 5. Manifold
6. Cooling air duct 7. Nut 8. Nut

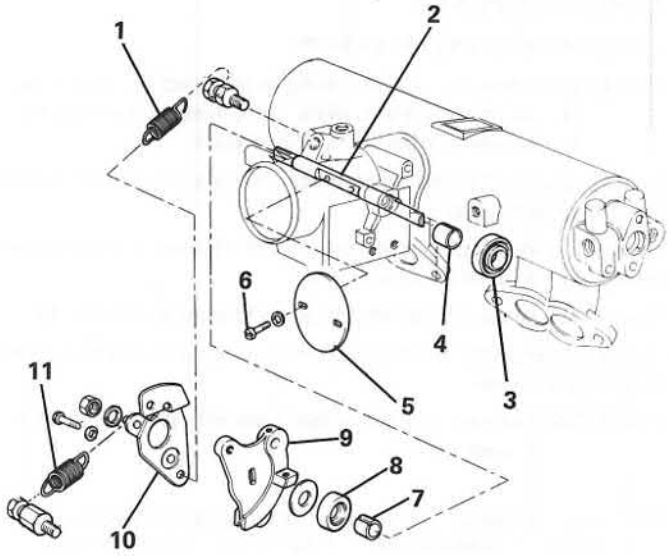


Remove two screws and washers and remove throttle plate switch.

Working through throttle housing, remove two screws (6) and washers and remove throttle plate (5).

If necessary to remove throttle shaft (2), remove two springs (1 and 11). Pull throttle shaft out of housing.

1. Spring 2. Throttle shaft 3. Seal 4. Bushing 5. Throttle plate
6. Screw 7. Bushing 8. Seal 9. Cam 10. Plate 11. Spring



Assemble and install in reverse order. Check all fuel connections for leaks.

After installation, adjust throttle plate as follows:

NOTE: Engine must be at normal operating temperature and cooling fan off when adjusting idle speed.

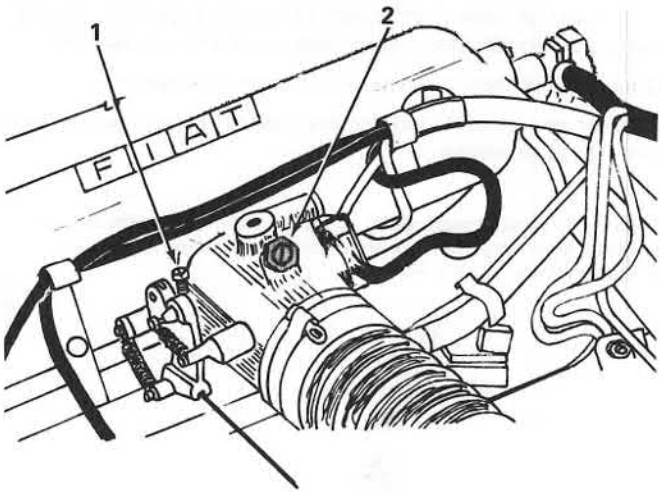
Connect tachometer. Run engine until it reaches normal operating temperature.

Turn idle speed adjustment screw (2) in all the way. Adjust stop screw (1) to obtain 700 to 800 RPM. Hold stop screw and tighten locknut.

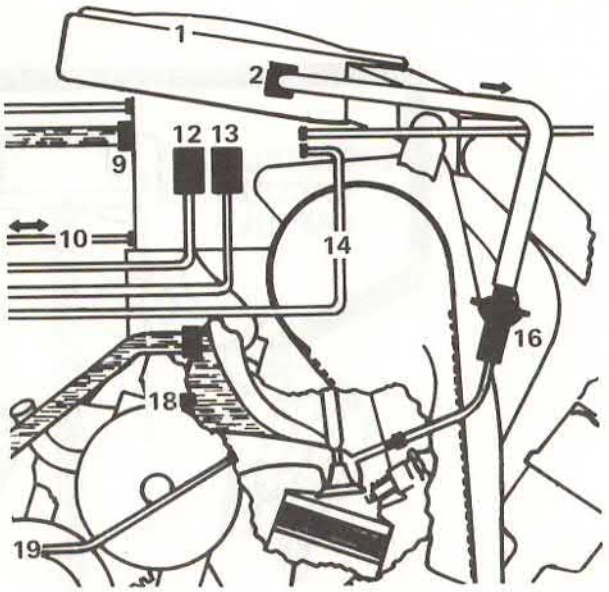
Adjust idle speed adjustment screw (2) to obtain 800 to 900 RPM. Hold adjustment screw and tighten locknut.

Check that throttle plate switch is adjusted properly as directed under THROTTLE PLATE SWITCH ADJUSTMENT.

1. Throttle stop screw 2. Idle speed adjustment screw

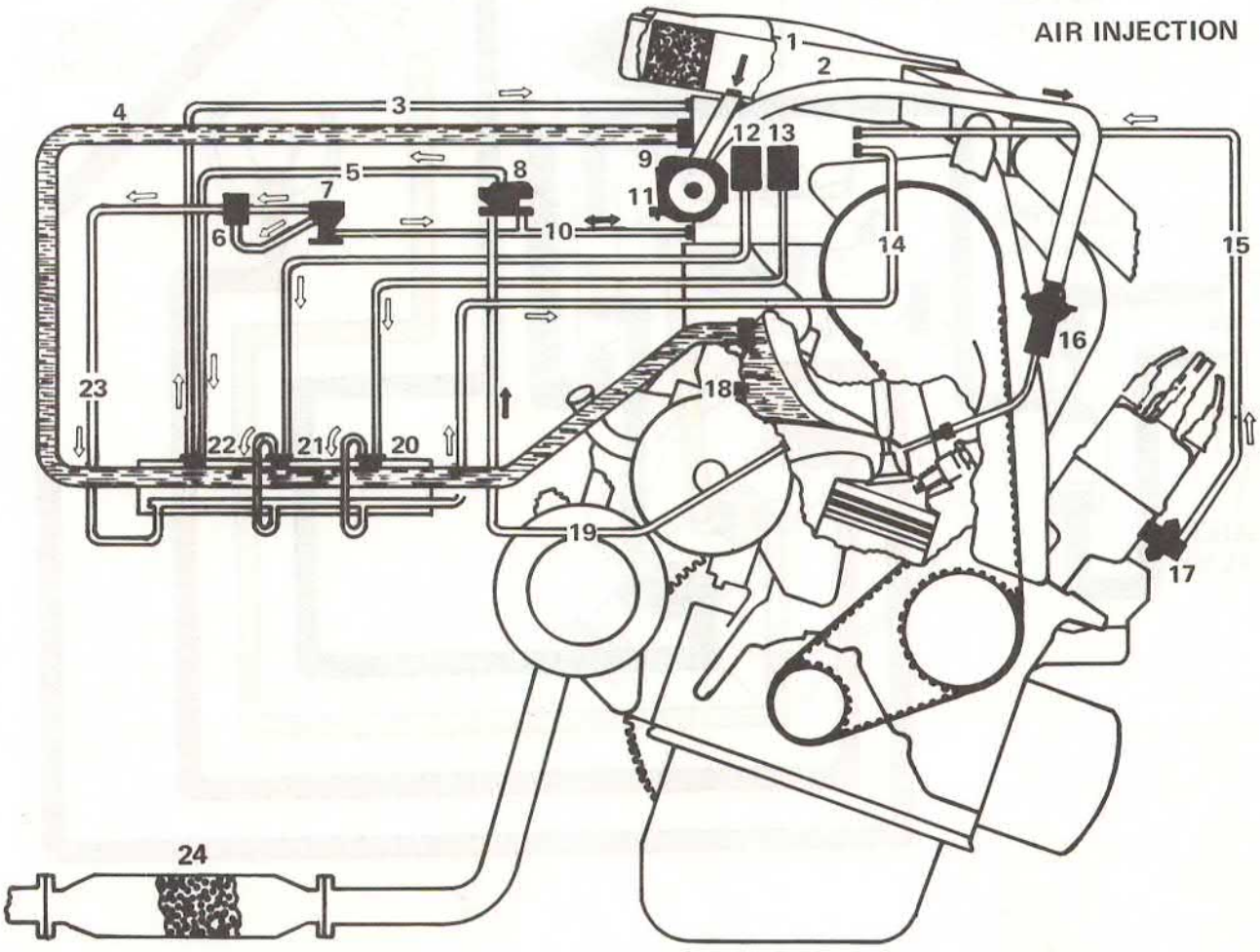


1. Engine air cleaner
2. Air distribution line
3. Vacuum tapping line for thermovalve 22
4. Heated water line for thermovalves and automatic choke
5. EGR valve control line
6. Gulp valve control electrovalve-three-way
7. Gulp valve
8. EGR valve
9. Automatic choke
10. Exhaust gas line from EGR valve to intake manifold and gulp valve line to intake manifold
11. Air pump and pressure relief valve
12. Power valve
13. Vacuum accelerator pump
14. Vacuum tapping lines for electrovalves 6 and thermovalves 20-21
15. Advance capsule vacuum tapping line
16. Check valve (with air pump) reed valve (without air pump)
17. Vacuum advance capsule
18. Electrovalve 6 control thermoswitch
19. EGR valve tapping line
20. Vacuum accelerator pump control thermovalve
21. Power valve control thermovalve
22. EGR valve control thermovalve
23. Electrovalve 6 vacuum tapping line
24. Catalytic converter

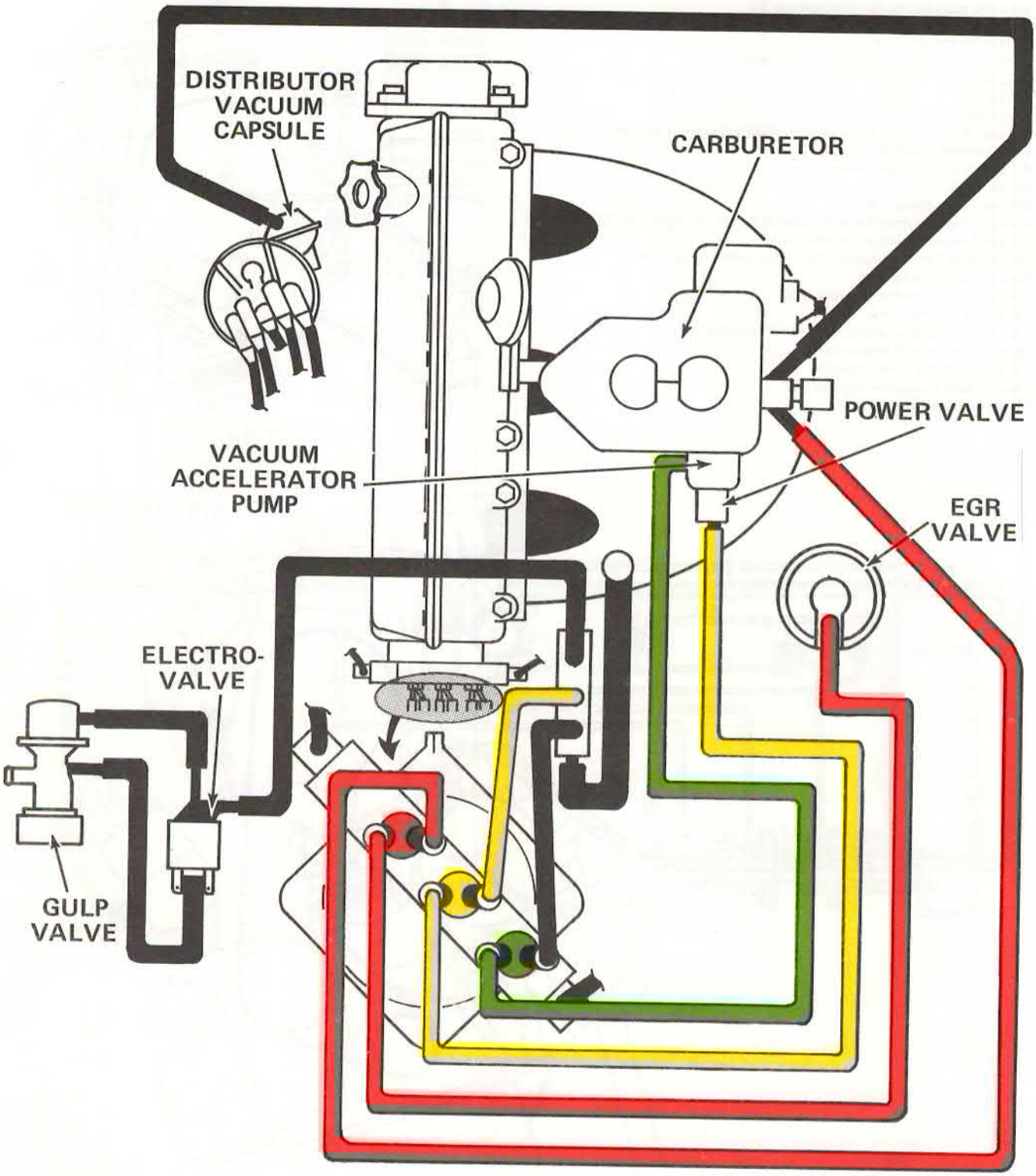


AIR INDUCTION

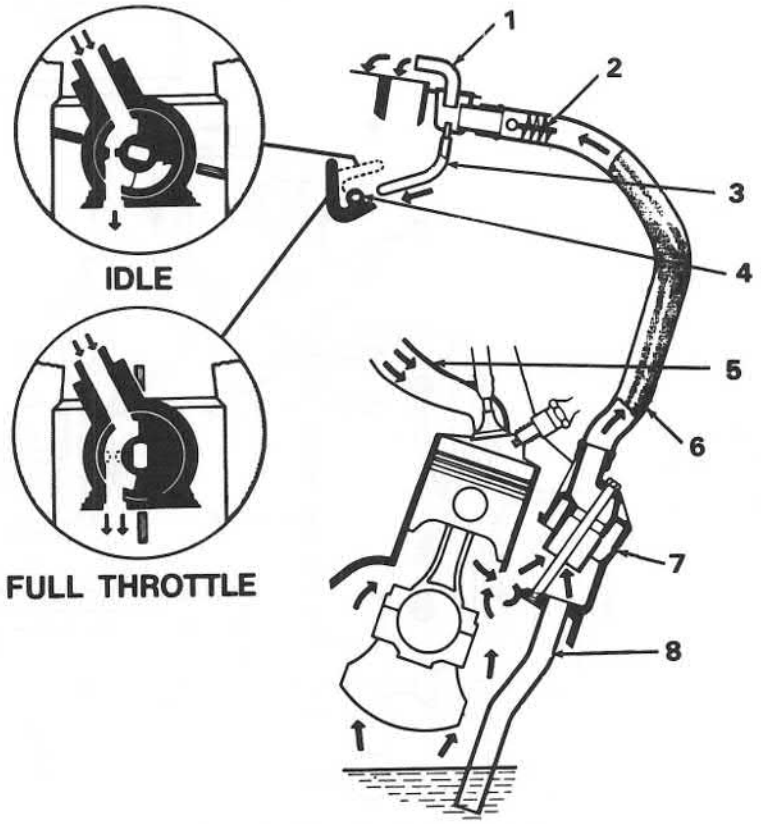
AIR INJECTION



EXHAUST EMISSION CONTROL SYSTEM
(VEHICLES WITH CARBURETOR)

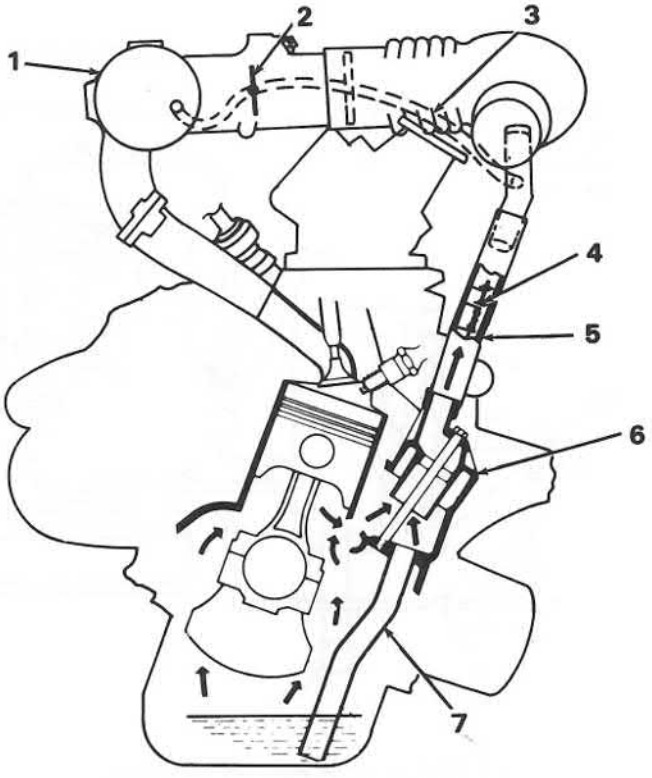


EMISSION VACUUM CONTROLS



1. Outlet
2. Flame trap
3. Bypass
4. Valve
5. Intake
6. Hose
7. Cyclonic trap
8. Return line

VEHICLES WITH CARBURETOR

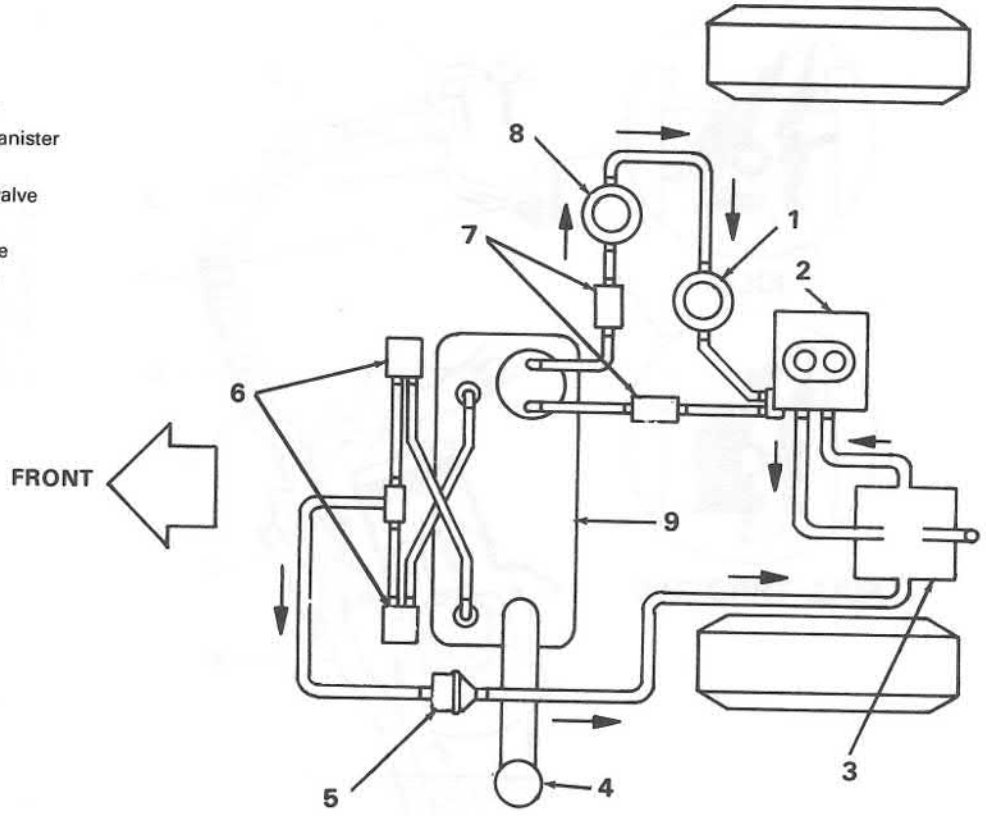


1. Intake manifold
2. Throttle plate
3. Bypass hose
4. Flame trap
5. Hose
6. Cyclonic trap
7. Return line

VEHICLES WITH FUEL INJECTION

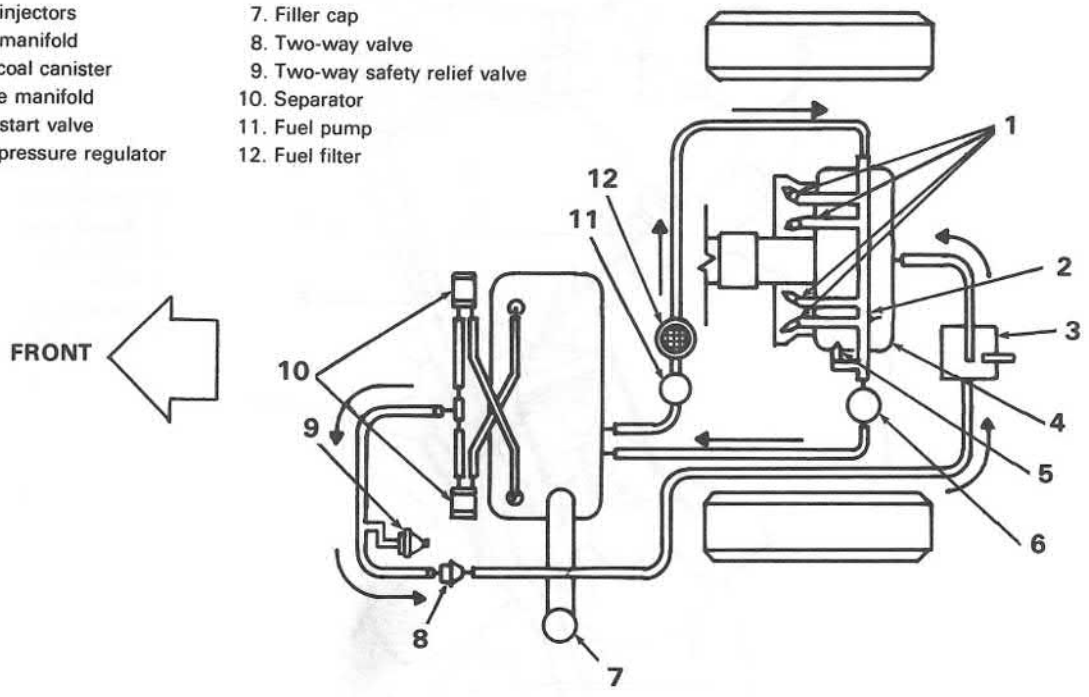
CRANKCASE EMISSION CONTROL SYSTEM

1. Fuel filter
2. Carburetor
3. Charcoal canister
4. Filler cap
5. Two-way valve
6. Separator
7. Check valve
8. Fuel pump
9. Fuel tank



VEHICLES WITH CARBURETOR

1. Fuel injectors
2. Fuel manifold
3. Charcoal canister
4. Intake manifold
5. Cold start valve
6. Fuel pressure regulator
7. Filler cap
8. Two-way valve
9. Two-way safety relief valve
10. Separator
11. Fuel pump
12. Fuel filter



VEHICLES WITH FUEL INJECTION

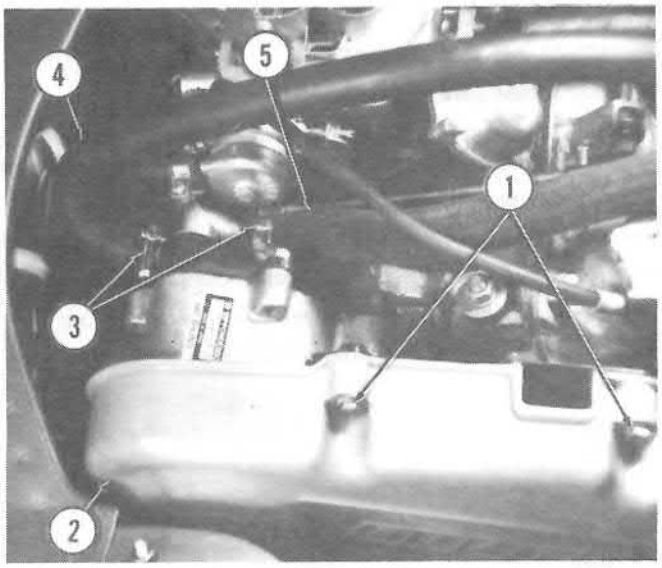
FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

AIR PUMP

REMOVAL AND INSTALLATION

Remove three bolts (1) holding upper half of timing belt cover (2) to engine and remove cover.

Loosen clamps (3) retaining air pump intake (5) and pressure (4) hoses and remove hoses.

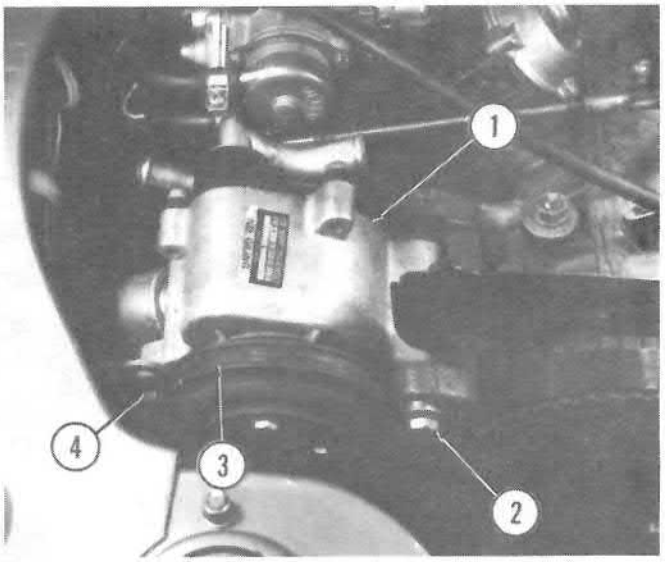


1. Bolts 2. Timing belt cover 3. Clamps 4. Pressure hose
5. Intake hose

Remove adjusting bolt (4) and slip drive belt (3) off of pulley.

Remove pivot through bolt (2) and remove air pump (1).

Installation is reverse of removal. To adjust belt, refer to 101.15.



1. Air pump 2. Pivot bolt 3. Drive belt 4. Adjusting bolt

GULP VALVE

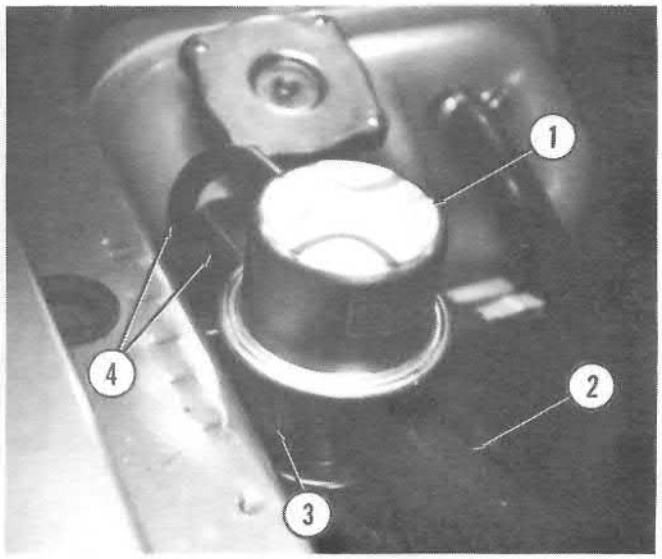
REMOVAL AND INSTALLATION

Remove two vacuum hoses (4) from gulp valve (1).

Remove air hose (2) from gulp valve.

Remove nut (3) and washer holding gulp valve to bracket and remove gulp valve.

Installation is reverse of removal.



1. Gulp valve 2. Air hose 3. Nut 4. Vacuum hoses

EGR VALVE

REMOVAL AND INSTALLATION

Remove access panel from inside trunk.

Remove three nuts (1), bolt (5) and washers to remove tube (2), spacer (21) and gasket (20). Remove two nuts (4), washer and shield (3). Unscrew fitting (19) to remove tube (6). Remove gasket (7) and seal (18).

Disconnect vacuum line (17) from EGR valve (9).

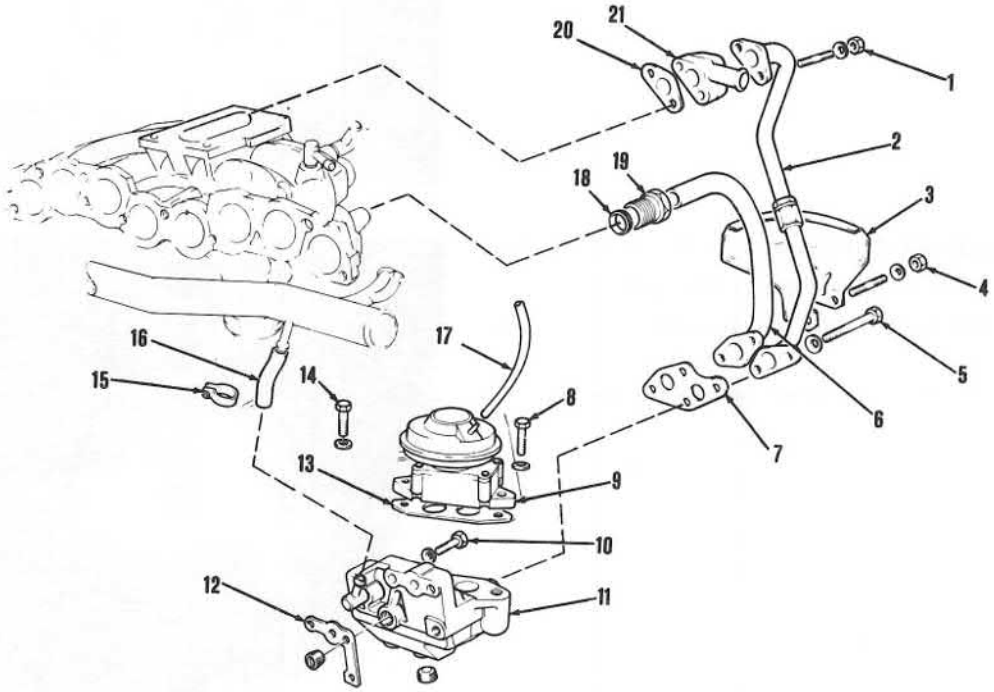
Remove bolts (8 and 14) and washers to remove EGR valve and gasket (13).

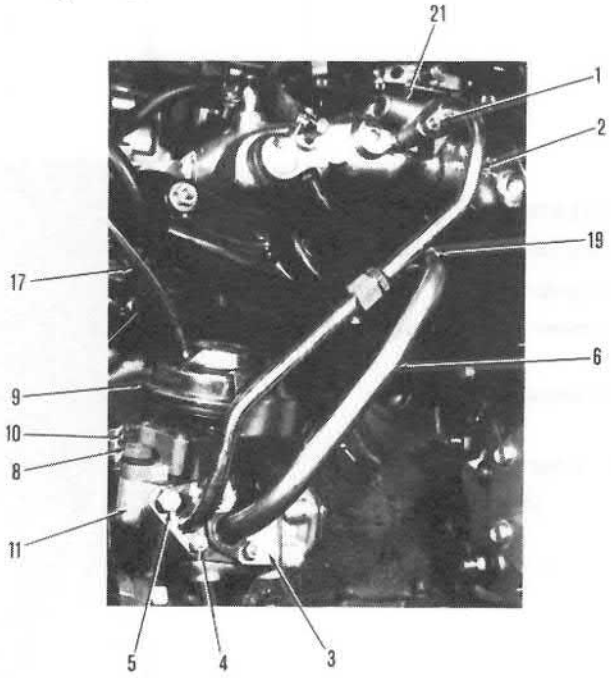
Loosen clamp (15) to disconnect water hose (16) from water manifold.

Remove two bolts (10) and washers to remove mounting base (11) and gasket (12).

Installation is reverse of removal. Replace all gaskets.

1. Nut
2. Tube
3. Shield
4. Nut
5. Bolt
6. Tube
7. Gasket
8. Bolt
9. EGR valve
10. Bolt
11. Mounting base
12. Gasket
13. Gasket
14. Bolt
15. Clamp
16. Water hose
17. Vacuum line
18. Seal
19. Fitting
20. Gasket
21. Spacer





CHECK VALVE OR REED VALVE

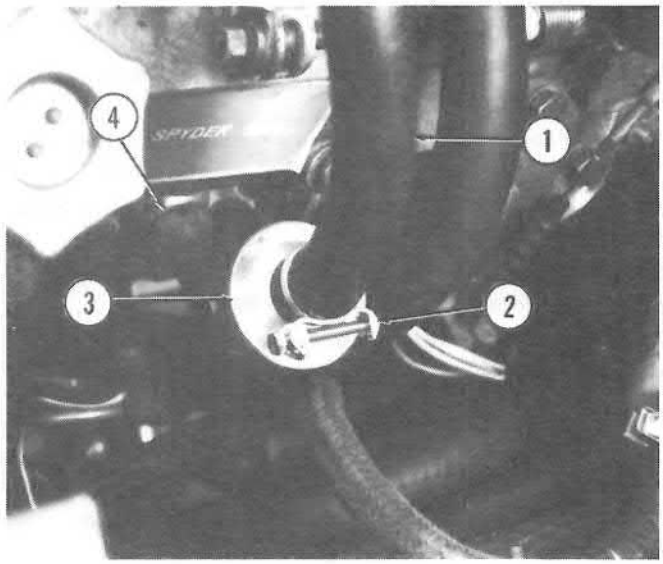
REMOVAL AND INSTALLATION

Remove clamp (2) holding hose (1) to valve (3).

Loosen locknut (4) and unscrew valve from engine.

Installation is reverse of removal.

1. Hose 2. Clamps 3. Valve 4. Locknut



CHARCOAL CANISTER

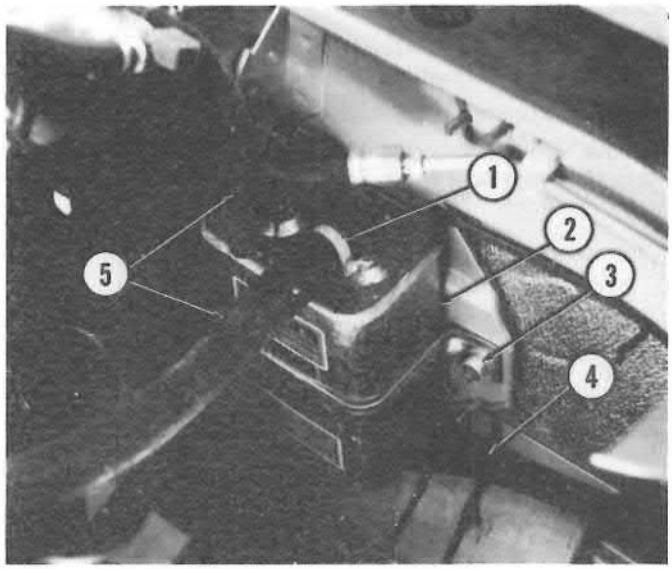
REMOVAL AND INSTALLATION

Cut off clamps (1) retaining vacuum hoses (4 and 5) to charcoal canister (2).

Remove two nuts (3) and washers holding charcoal canister to bracket and remove canister.

Installation is reverse of removal. Use new clamps on vacuum hoses.

1. Clamp 2. Charcoal canister 3. Nut 4. Vacuum hose
5. Vacuum hoses



CATALYTIC CONVERTER

REMOVAL AND INSTALLATION
(Vehicles With Carburetor)

WARNING: Make sure converter has cooled down before working on it.

Straighten lock tabs and remove four nuts (6) and bolts attaching exhaust pipe flange (8) to converter outlet flange (7).

Remove bolt (1) holding support bracket (3) to muffler.

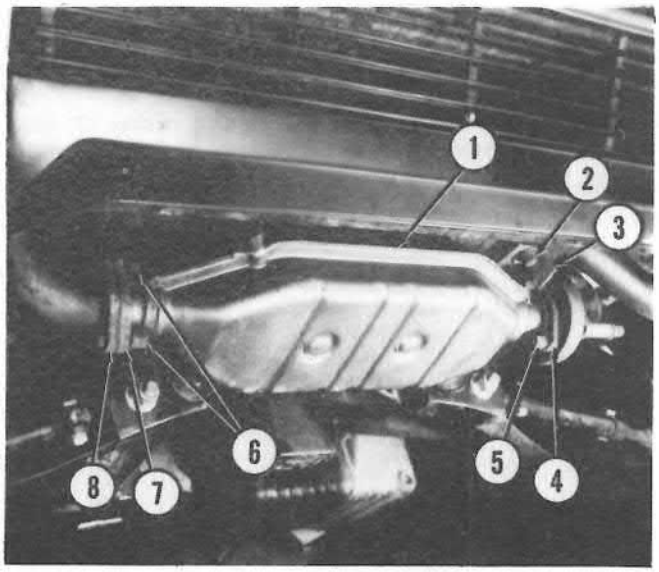
Straighten lock tabs and remove four nuts (5) attaching converter inlet flange (4) to exhaust pipe flange.

Remove support bracket.

Separate exhaust pipe flange and converter outlet flange, then pull converter (1) off of studs and out of vehicle.

Installation is reverse of removal.

1. Catalytic converter 2. Bolt 3. Bracket 4. Inlet flange 5. Nut
6. Nuts 7. Outlet flange 8. Flange



REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

WARNING: Make sure converter has cooled down before working on it.

Straighten lock tabs and remove four nuts (1) and bolts attaching exhaust pipe flange (2) to converter inlet flange (3).

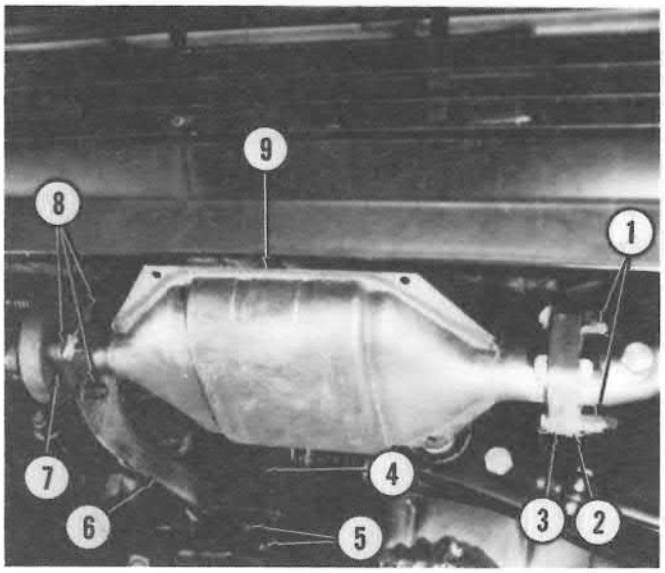
Remove two bolts (5) holding exhaust system bracket (6) to transmission bracket (4).

Straighten lock tabs and remove four nuts (8) attaching converter outlet flange (7) to exhaust pipe flange.

Remove exhaust system bracket.

Maneuver converter (9) off of studs and out of vehicle.

Installation is reverse of removal.



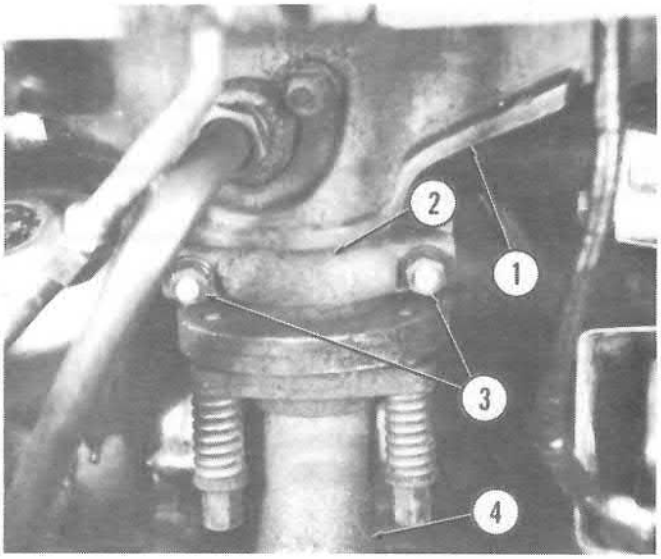
1. Nuts 2. Exhaust pipe flange 3. Converter inlet flange
4. Transmission bracket 5. Bolts 6. Bracket 7. Outlet flange
8. Nuts 9. Catalytic converter

EXHAUST SYSTEM

REMOVAL AND INSTALLATION
(Vehicles With Carburetor)

Remove rear access panel from inside trunk.

Remove two nuts (3) and clamp (2) attaching exhaust pipe (4) to manifold (1).



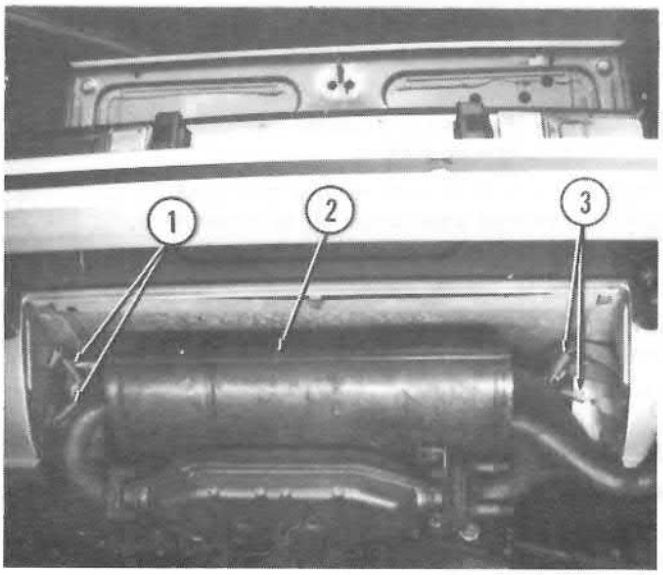
1. Exhaust manifold 2. Clamp 3. Nuts 4. Exhaust pipe

Raise and support rear of vehicle.

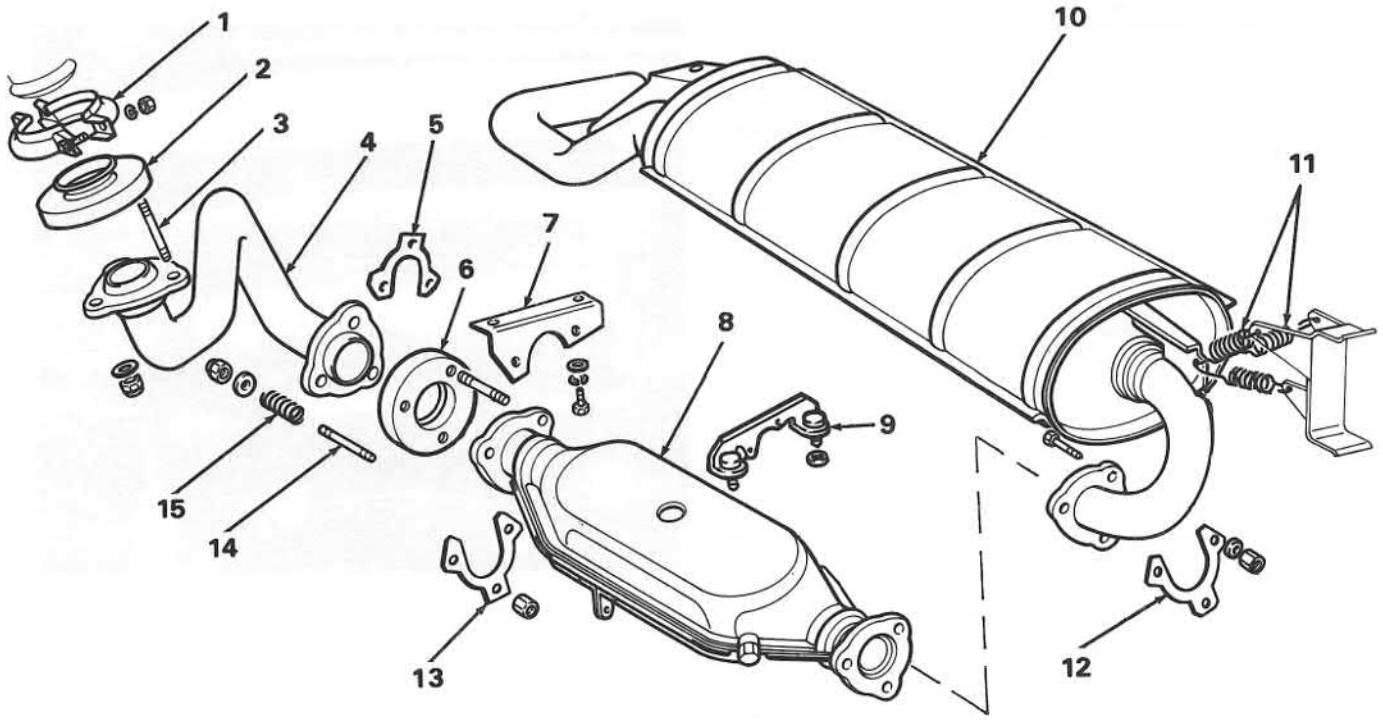
Remove six screws and four bolts retaining rear grille assembly and remove grille assembly.

Disconnect six springs (1 and 3) supporting muffler (2) and lower complete exhaust system out vehicle.

Installation is reverse of removal.



1. Springs 2. Muffler 3. Springs



1. Clamp
2. Flange
3. Stud
4. Exhaust pipe
5. Locking ring
6. Flange
7. Bracket
8. Catalytic converter
9. Bracket
10. Muffler assembly
11. Springs
12. Locking ring
13. Locking ring
14. Stud
15. Spring

EXPLODED VIEW OF EXHAUST SYSTEM (VEHICLES WITH CARBURETOR)

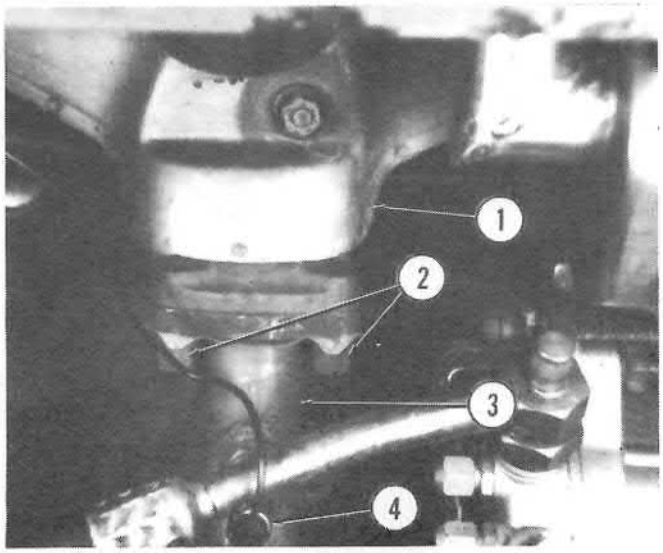
REMOVAL AND INSTALLATION
(Vehicles With Fuel Injection)

From inside trunk, remove floor mat, insulation panel, and access panel.

Unplug Lambda sensor connector and remove Lambda sensor (4) from exhaust pipe (3).

Remove three nuts (2) attaching exhaust pipe to manifold (1).

1. Exhaust manifold 2. Nuts 3. Exhaust pipe 4. Lambda sensor



Raise and support rear of vehicle.

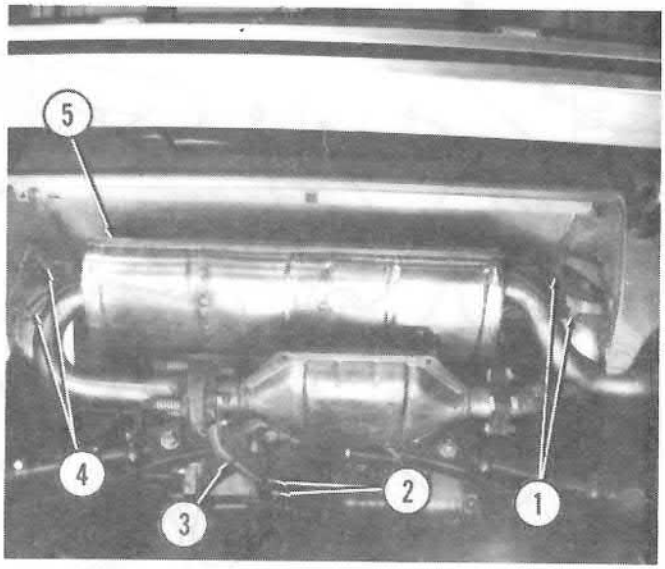
Remove six screws and four bolts retaining rear grille assembly, and remove assembly.

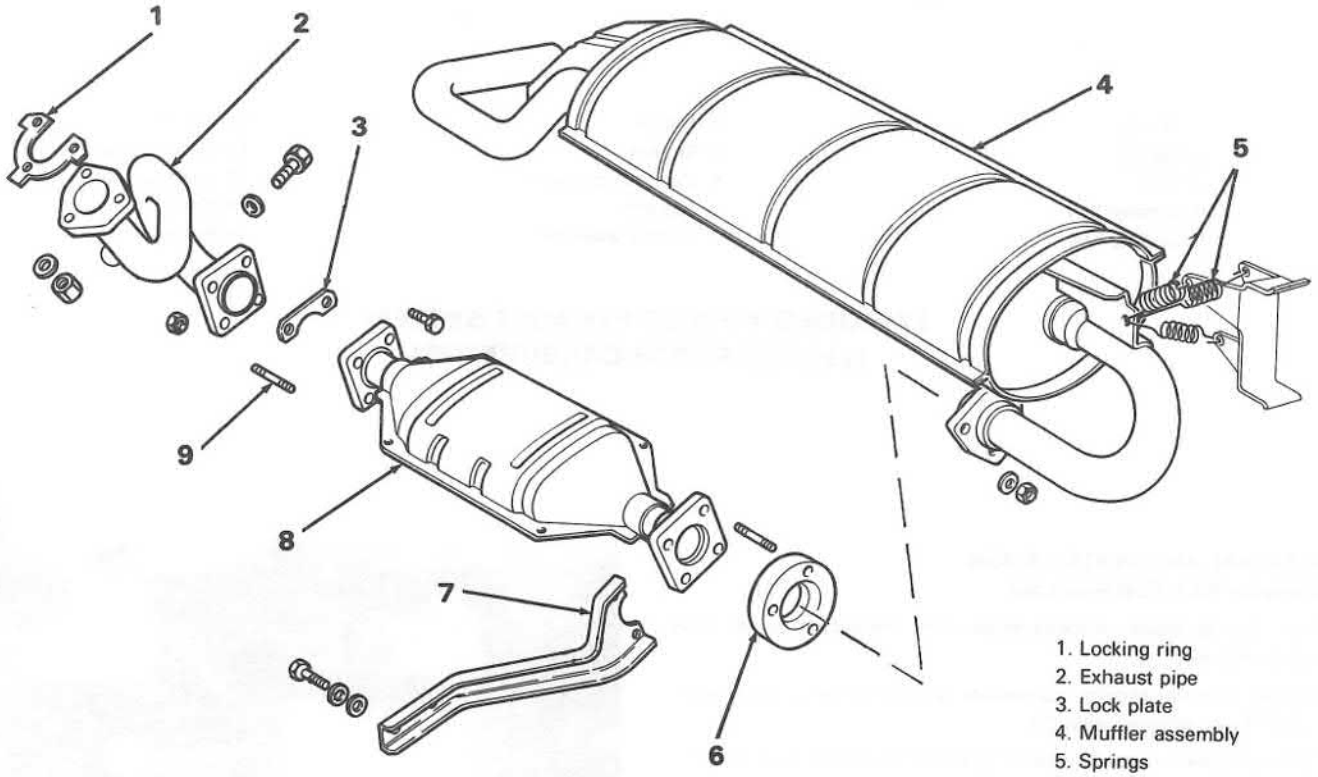
Remove two bolts (2) holding exhaust system support bracket (3) to transmission bracket.

Disconnect six springs (1 and 4) supporting muffler (5) and lower complete exhaust system out from vehicle.

Installation is reverse of removal.

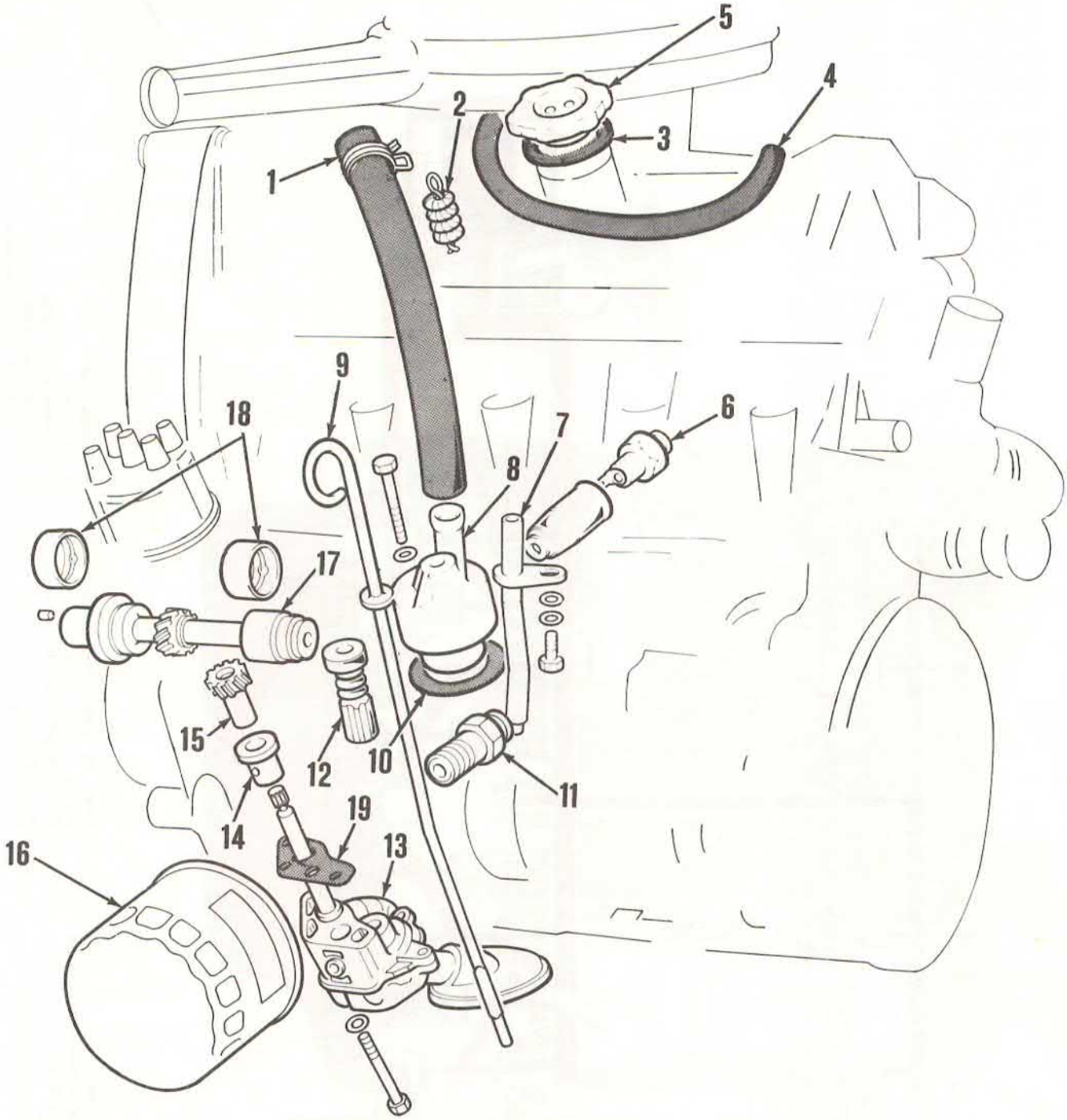
1. Springs 2. Bolts 3. Support 4. Springs 5. Muffler





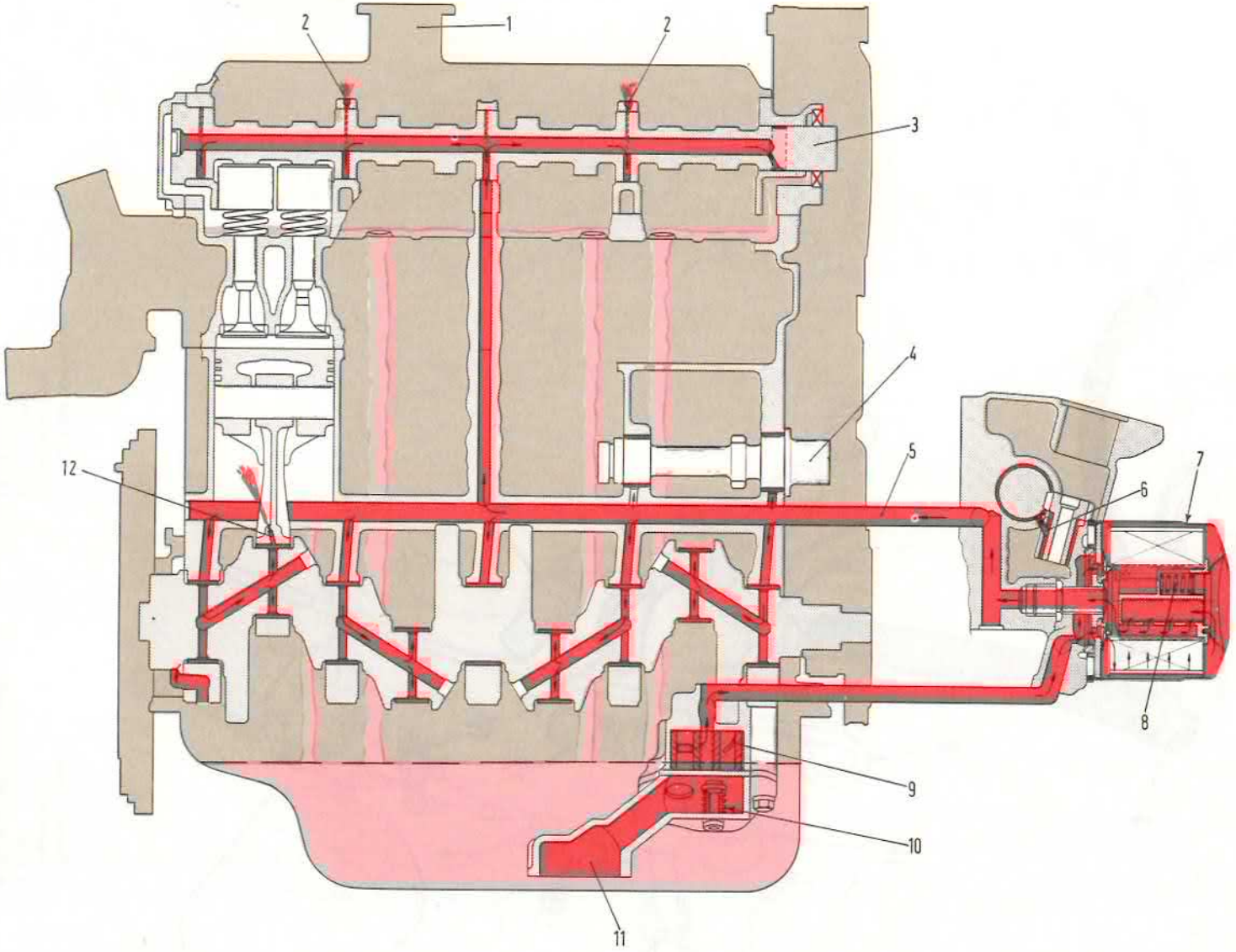
1. Locking ring
2. Exhaust pipe
3. Lock plate
4. Muffler assembly
5. Springs
6. Flange
7. Bracket
8. Catalytic converter
9. Stud

EXPLODED VIEW OF EXHAUST SYSTEM (VEHICLES WITH FUEL INJECTION)



1. Breather hose
2. Flame trap
3. Seal
4. Blow-by gas and oil vapor hose
5. Oil filler cap
6. Oil pressure switch
7. Breather oil return pipe
8. Cyclonic trap
9. Dipstick
10. Gasket
11. Oil filter connector
12. Dipstick seal
13. Oil pump
14. Bushing
15. Oil pump drive gear
16. Oil filter
17. Auxiliary shaft
18. Bushings
19. Gasket

LUBRICATION SYSTEM COMPONENTS

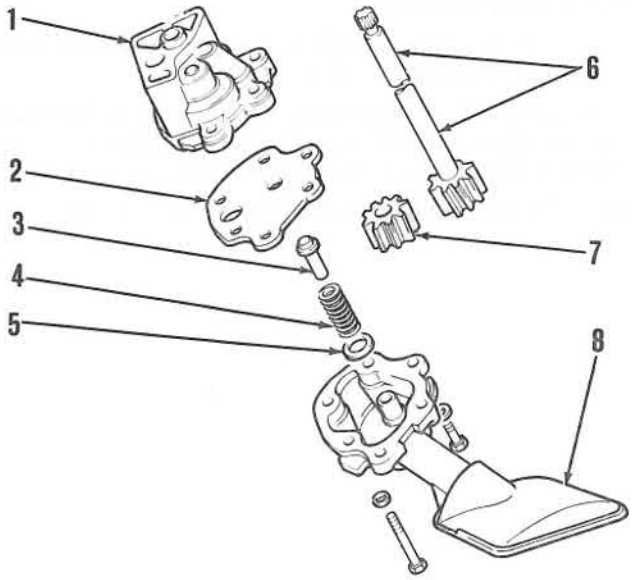


1. Oil filler pipe
2. Oil mist outlets for camshaft lobes and tappets
3. Camshaft
4. Auxiliary units drive shaft
5. Filter to engine components oil line
6. Oil pump and distributor drive gear oil duct
7. Full-flow oil filter
8. By-pass valve
9. Oil pump
10. Oil pressure relief valve
11. Oil pump suction pipe
12. Oil mist outlet for cylinder walls

ENGINE LUBRICATION DIAGRAM

OIL PUMP ASSEMBLY

1. Pump housing
2. Cover plate
3. Pressure relief valve
4. Spring
5. Washer
6. Drive gear
7. Driven gear
8. Oil intake pickup



REMOVAL AND INSTALLATION (Engine in vehicle)

Drain oil sump. Remove bolts and washers holding sump to engine and remove sump.

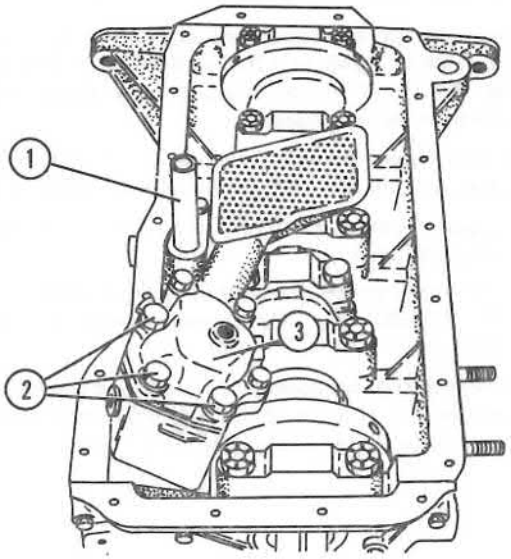
Remove three bolts (2) and washers holding oil pump (3). Remove pump and gasket.

Installation is reverse of removal.

When installing pump, make sure it is seated before tightening bolts.

Clean sump gasket surfaces thoroughly. Install all new gaskets.

1. Oil return pipe from breather 2. Bolt 3. Oil pump



INSPECTION

Carefully clamp pump body in a vise.

Remove three bolts holding pickup housing to pump housing (5) and remove.

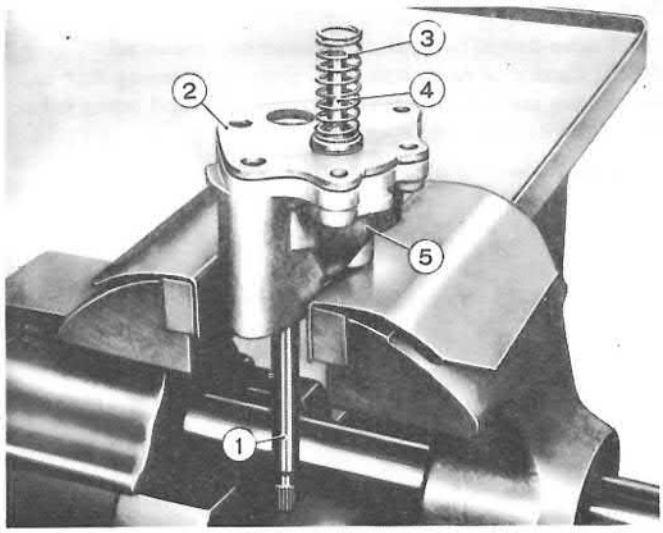
Remove spring (3), relief valve (4) and cover (2).

Slide drive shaft with drive gear and driven gear out of housing.

Clean all disassembled parts in solvent and blow dry with compressed air.

Check housing and cover for cracks. Check intake pickup and oil duct for clogging. Blow clear with compressed air.

1. Pump shaft 2. Cover 3. Spring 4. Relief valve 5. Pump housing

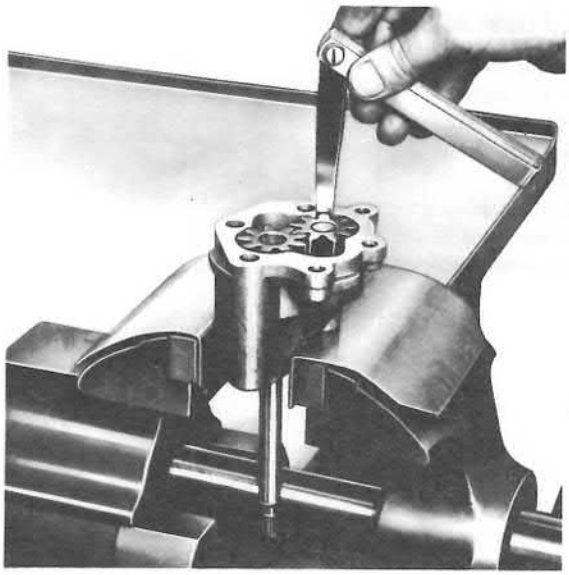


Examine gears for wear.

Backlash between gears is .006 in. (0.15 mm) when new. Maximum allowable clearance is .010 in. (0.25 mm).

Check gear tooth to pump housing clearance with feeler gage as shown. New clearance ranges from .004 to .007 in. (0.11 to 0.18 mm). Maximum allowable clearance is .010 in. (0.25 mm).

Replace housing and or gears if clearances are exceeded.



Check clearance between gears and cover mating face.

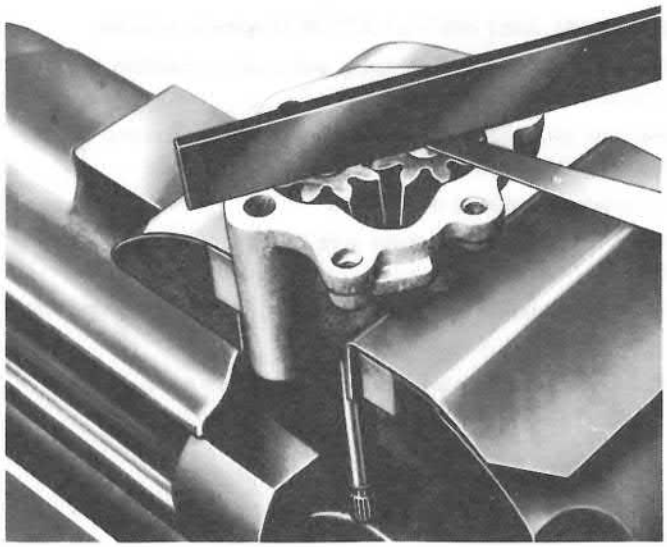
Using a straightedge and feeler gage as shown, clearance range should be .0008 to .0041. in. (.020 to 0.150 mm). If a value of more than .006 in. (0.15 mm) is found, either the gears and or pump housing must be replaced.

To determine if gears are worn, measure their length. The range for new gears is 1.101 to 1.102 in. (27.967 to 28.000 mm).

The drive gear is mounted on its shaft with an interference fit, check for signs of slack.

Clearance between driven gear and its shaft is .0006 to .0022 in. (0.017 to 0.057 mm). Maximum allowable clearance is .004 in. 0.10 mm).

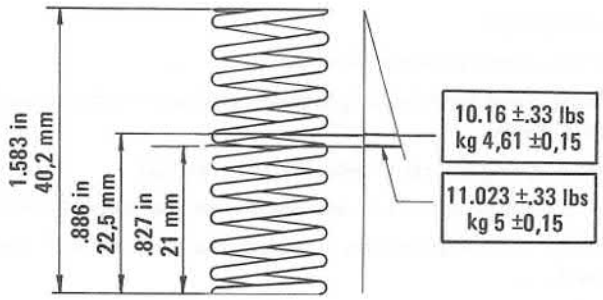
Check clearance between pump drive shaft and pump housing. Clearance range is .0006 to .0023 in. (0.016 to 0.060 mm). Maximum allowable clearance is .004 in. (0.10 mm).

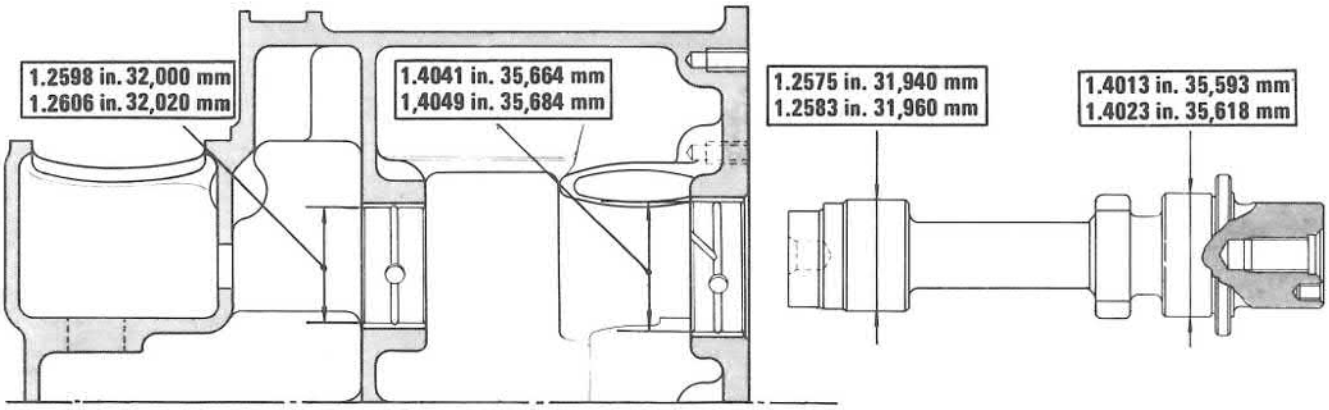


Relief Valve Inspection

Relief valve should be carefully cleaned and inspected.
NOTE: Particular care should be given to ensuring that dirt and residue are removed from between valve and pump housing, otherwise valve may stick.

Check load characteristics of spring as shown.





SPECIFICATIONS OF AUXILIARY SHAFT AND BORES IN BLOCK

AUXILIARY SHAFT

Auxiliary shaft (for oil pump, and ignition distributor on non A/C vehicles) should have an absolutely smooth journal. If signs of scuffing or scoring are found, which cannot be removed by an extra-fine abrasive stone, replacement of shaft is recommended.

Inspect oil pump and ignition distributor drive gear teeth for evidence of chipping or excessive wear. If these are found, replace shaft.

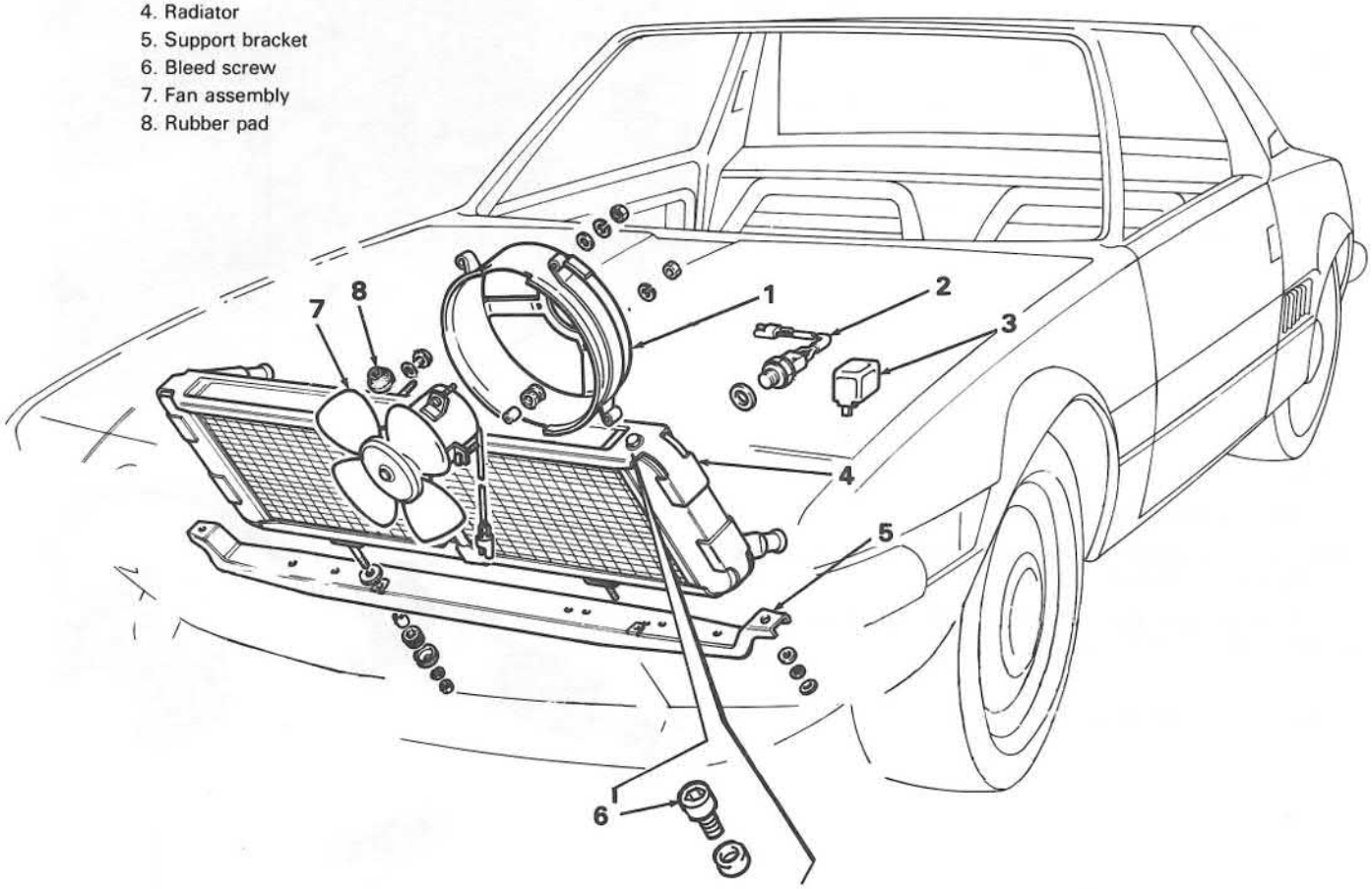
Check that auxiliary shaft journal diameters conform to specifications shown.

AUXILIARY SHAFT JOURNALS AND BUSHINGS FIT SPECIFICATIONS

	Bushing inside diameter (finish reamed)	Auxiliary shaft journal diameter	Clearance
1	1.4041 in (35.664 mm) to 1.4049 in (35.684 mm)	1.4013 in (35.593 mm) to 1.4023 in (35.618 mm)	.0018 in (0.046 mm) to .0036 in (0.091 mm)
2	1.2598 in (32.000 mm) to 1.2606 in (32.020 mm)	1.2575 in (31.940 mm) to 1.2583 in (31.960 mm)	.0016 (0.040 mm) to .0031 in (0.080 mm)

1) Drive end bushing 2) Inside bushing.

1. Fan shroud
2. Thermostatic switch
3. Relay
4. Radiator
5. Support bracket
6. Bleed screw
7. Fan assembly
8. Rubber pad



EXPLODED VIEW OF RADIATOR AND ELECTRIC FAN

RADIATOR

REMOVAL AND INSTALLATION

NOTE: If vehicle is equipped with air conditioning, remove and install as directed in CONDENSER REMOVAL AND INSTALLATION. Refer to 501.03.

Raise and support front of vehicle. Drain cooling system.

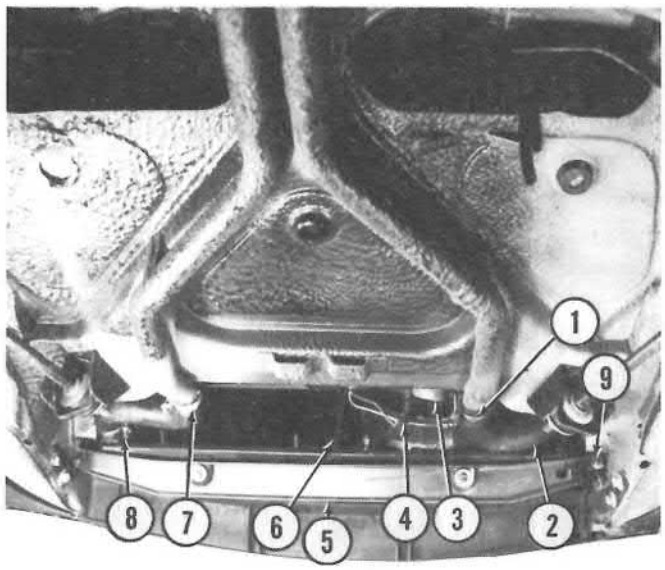
Disconnect connector (4) for electric fan (3).

Disconnect connector for thermostatic switch (8).

Loosen clamps (1 and 7) and disconnect radiator hoses (2).

Remove two nuts (9) holding support bracket (5), and lower radiator out of vehicle complete with fan.

Install in reverse order.



1. Clamp 2. Hose 3. Electric fan 4. Connector 5. Support bracket
6. Radiator 7. Clamp 8. Thermostatic switch 9. Nut

FILLING AND BLEEDING

Remove rubber plug (1) from front of luggage compartment.

Using an 8 mm hex wrench, loosen radiator bleed screw.

Pour coolant slowly into expansion tank until coolant begins to run out of bleed screw. Close bleed screw.

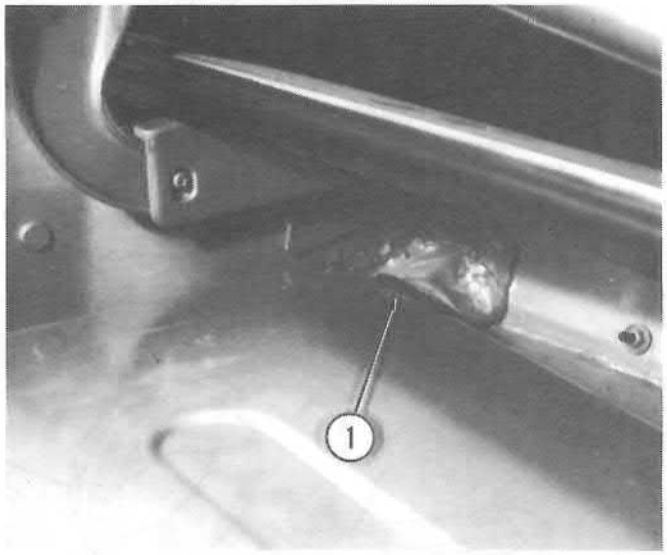
Complete filling of expansion tank.

Start engine and move heater temperature control lever to warmest position.

Accelerate engine to circulate coolant.

Turn engine off. Bleed system through bleed screw until coolant is free of bubbles.

1. Rubber plug



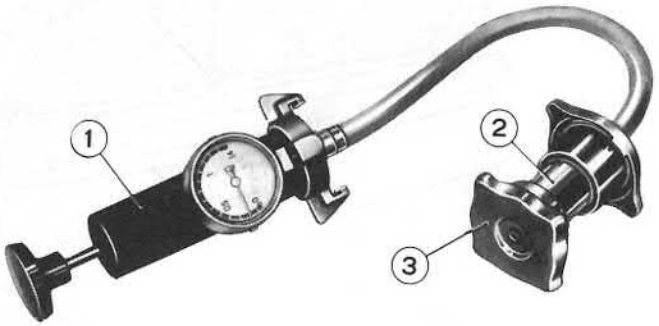
TESTING

Attach tester (1) to expansion tank.

Pump in air until pressure of 14 psi is built up. If system does not hold pressure, check for leaks.

Test cap (3) by applying pressure with tester as shown. Check that vent valve opens at 11 psi.

1. Tester 2. Union 3. Radiator cap



ELECTRIC FAN

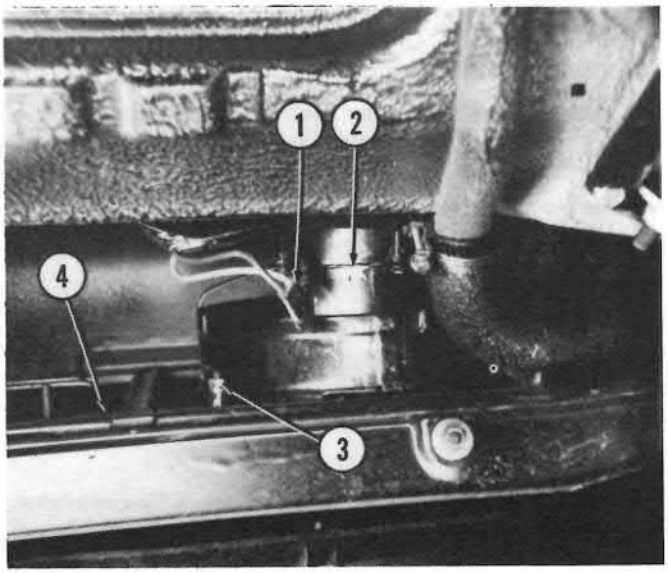
REMOVAL AND INSTALLATION

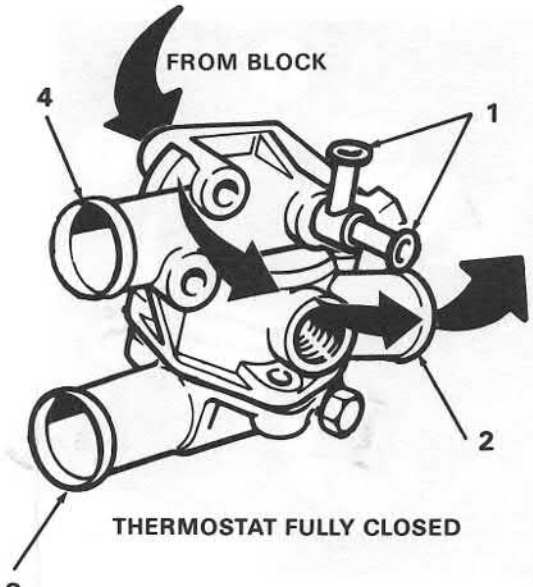
Disconnect connector (1) for fan (2).

Remove four nuts (3) holding fan assembly to radiator (4) and remove fan assembly.

Install in reverse order.

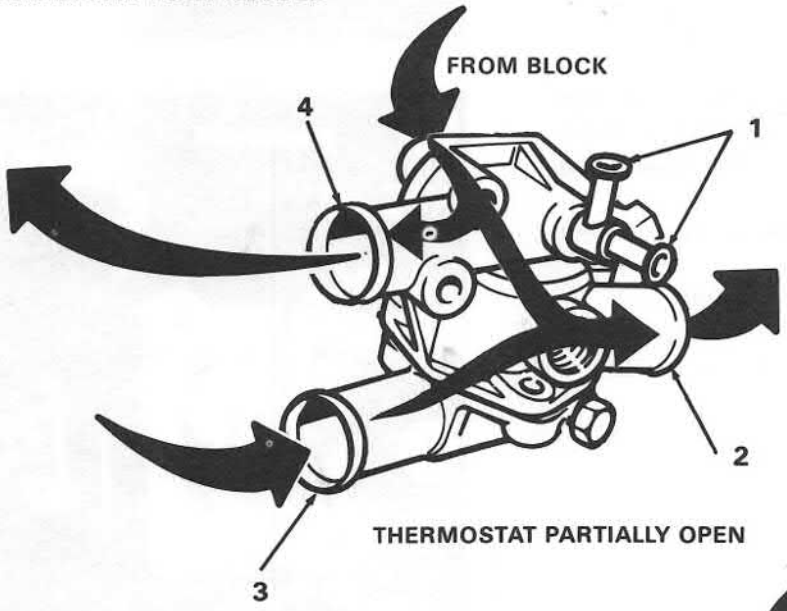
1. Connector 2. Fan 3. Nut 4. Radiator



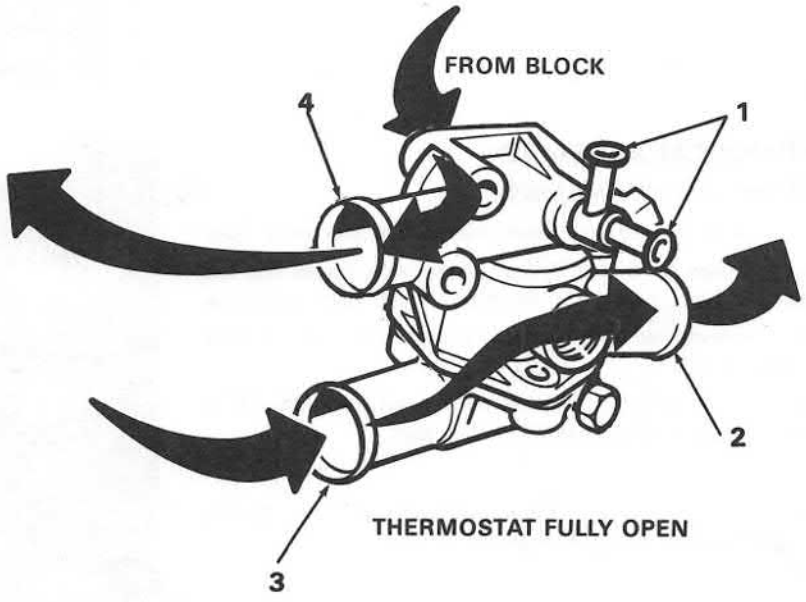


THERMOSTAT FULLY CLOSED

Thermostat starts to open at 172° to 183°F (78° to 84°C).
Thermostat is fully open at 194° to 201°F (90° to 94°C).



THERMOSTAT PARTIALLY OPEN



THERMOSTAT FULLY OPEN

1. Union for coolant reservoir
2. Union for water pump inlet pipe
3. Union for water inlet hose from radiator
4. Union for water outlet hose to radiator

OPERATION OF BYPASS THERMOSTAT

WATER PUMP

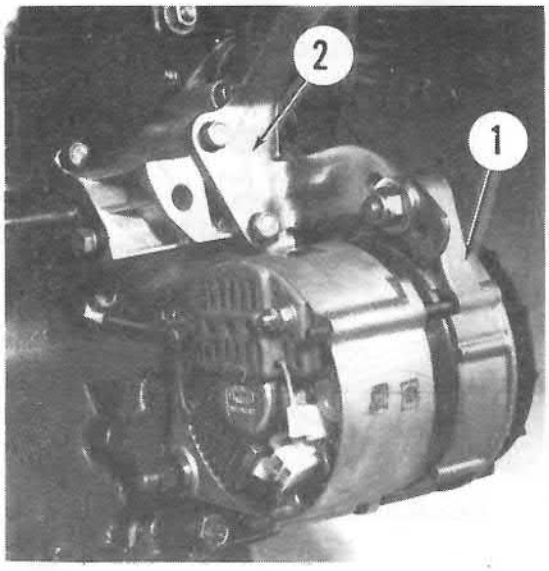
REMOVAL AND INSTALLATION

If equipped with air pump, remove top half of timing belt cover.

Remove air pump and drive belt.

Remove alternator (1), drive belt, and alternator mount (2).

1. Alternator 2. Alternator mount



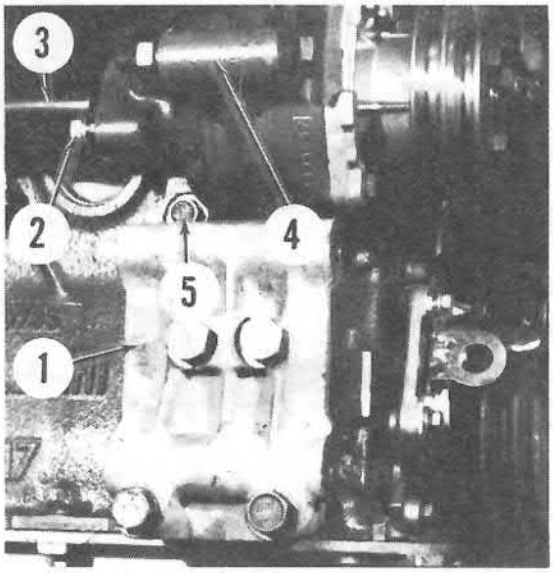
If equipped with air conditioning, remove compressor with hoses attached and set to one side. Remove compressor mount.

Remove two bolts (2) holding water pipe (3) to water pump (4) and disconnect pipe.

Remove four bolts (5) holding pump to block and remove pump and gasket.

Installation is reverse of removal. Use new gaskets.

1. A/C compressor mount 2. Bolt 3. Water pump 4. Bracket
5. Bolt



THERMOSTAT ASSEMBLY

REMOVAL AND INSTALLATION

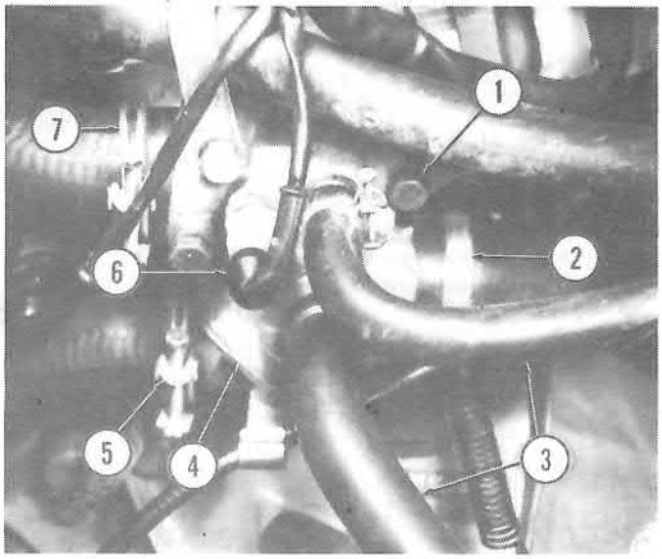
Drain cooling system to below thermostat assembly level.

Remove clamps (2, 5, and 7) from three large hoses and two coolant recovery hoses (3). Remove hoses from assembly.

On fuel injected vehicles, remove coolant temperature sensor connector (6).

Remove three bolts (1) holding thermostat assembly (4) to cylinder head. Remove assembly and gasket.

1. Bolt 2. Clamp 3. Coolant recovery hoses 4. Thermostat assembly
5. Clamp 6. Coolant temperature sensor 7. Clamp

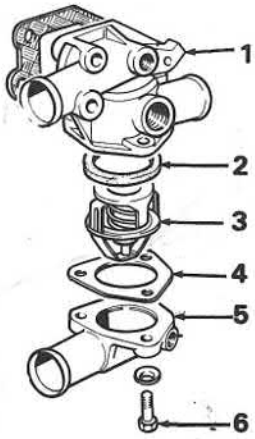


To remove thermostat from assembly, remove three bolts (6) and washers holding housing cover (5) to housing (1).

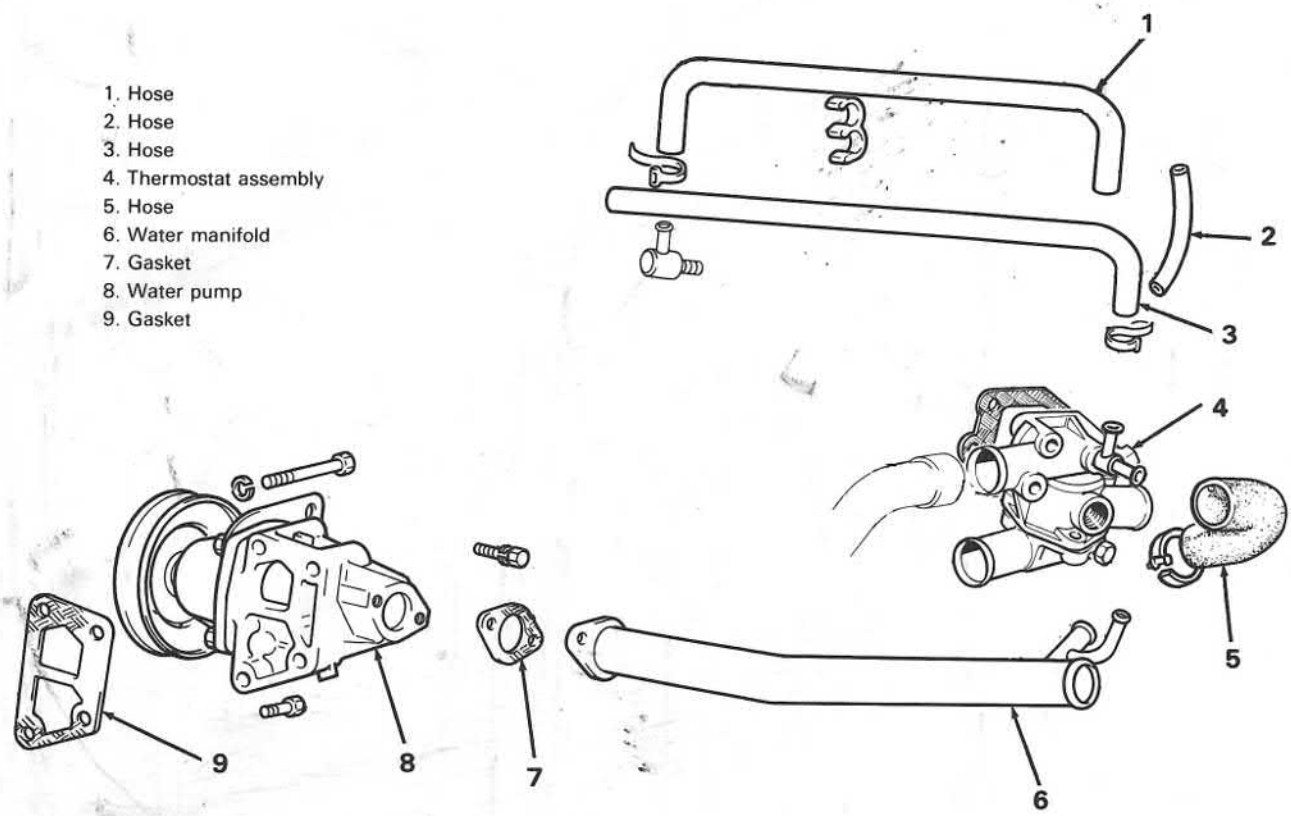
Remove thermostat (3) and seal (2) from housing.

Installation is reverse of removal. Use new gaskets.

1. Housing 2. Seal 3. Thermostat 4. Gasket 5. Housing cover
6. Bolt



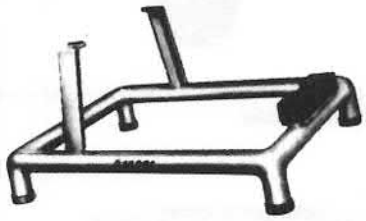
1. Hose
2. Hose
3. Hose
4. Thermostat assembly
5. Hose
6. Water manifold
7. Gasket
8. Water pump
9. Gasket



EXPLODED VIEW OF WATER PUMP AND DUCTS

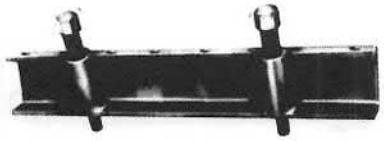
4467 Exhaust gas analyzer adapter for fuel-injected vehicles

4852 A/C belt tension tool



A.10061 Engine stand

A.40026 Extractor for water pump impeller



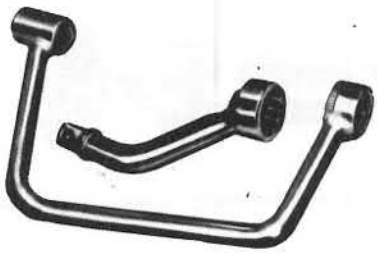
A.40052 Cylinder head extractor

A.50113 Oil sump drain plug spanner

A.50121 Crankshaft pully nut spanner

A.50131 Adapters for tightening 19 mm hex cylinder head nuts, intake side

A.50132 Adapter for tightening camshaft box bolts

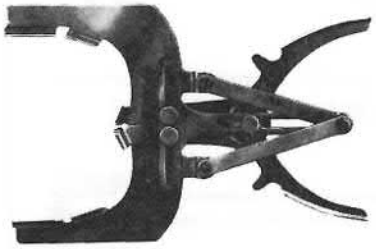


A.50172 Adapters for tightening 17 mm hex cylinder head bolts, intake side

A.60041 Cylinder head support

A.60041/2 Valve leak test tools

A.60054 Drift for removing and inserting small-end bushing



A.60183 Expanding tool for piston rings

A.60303 Tool for inserting gudgeon pin circlips

A.60311 Valve spring compressor

A.60311 Oil filter remover

A.60313 Drift for inserting valve guide seals

A.60326 Drift for removing oil pump distributor drive gear bushing

A.60368 Flange and bushing for positioning crankshaft on grinder

A.60370 Tool kit for testing cylinder head for leaks

A.60372 Drift for removing and fitting auxiliary shaft bushing

A.60373 Tool for removing and fitting water pump pully and positioning impeller

A.60395 Drift for removing valve guides

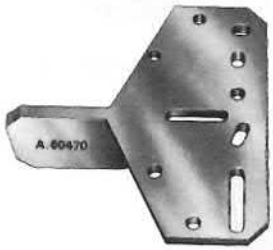
A.60421 Tappet pressure lever

A.60442 Cylinder head base plate

A.60455 Cylinder head support for removing tappet shims

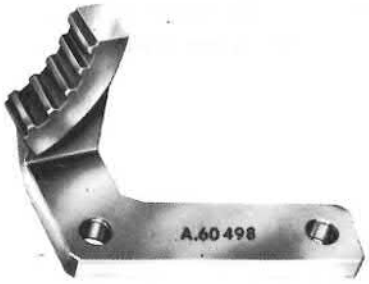
A.60459 Engine cranking tool

A.60462 Drift for fitting valve guides

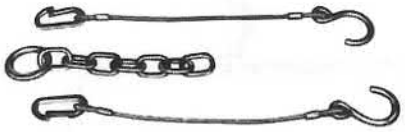


A.60470 Cylinder head support bracket

A.60473 Camshaft sprocket lock

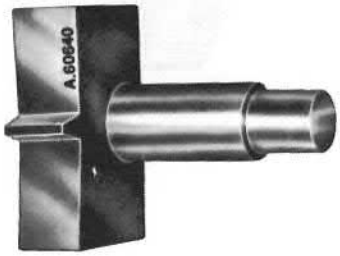


A.60498 Auxiliary shaft sprocket lock



A.60592 Lifting tackle for removing and refitting engine

A.60605 Universal piston ring compressor



A.60640 Flywheel lock

A.61001/27 Engine mounting bracket, valve gear slide, for rotating engine stand

A.601001/231 Engine mounting bracket, flywheel side, for rotating engine stand

A.70577 Support for removing and refitting power unit - Use with hydraulic jack

A.76036 Jumper cables with starter motor attachment terminals for rotating engine during tappet adjustment

A.86010 Drive (10 mm) for fitting crankshaft welch plugs

A.87001 Special pliers for removing tappet shims

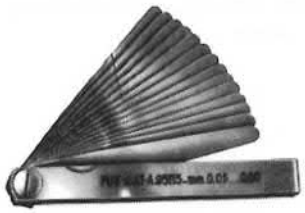
A.90308 Expanding reamer (22 mm) for small-end bushings

A.90310 Finishing reamer (8 mm) for valve guide bores

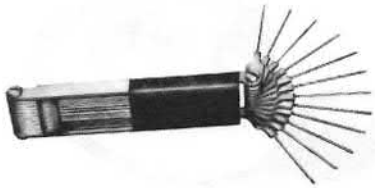
A.90365 Auxiliary shaft bushing reamer

A.94016 Mandril for operating reamer

A.94016/10 Seat cutter (10 mm) for crankshaft plugs (use with A.94016)

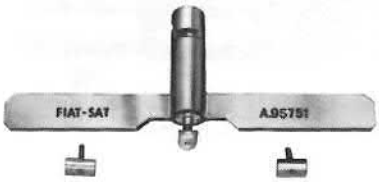


A.95113 Feeler gages for checking tappet clearance



A.95124 Set of calibrated wires for adjusting throttle valve

A.95136 Gage for checking float level



A.95751 Tool for checking toothed timing belt tension

A.96148 Standand bore gage (86 mm)

A.95868 Valve seat tester

A.96219 Gage for checking valve stem height

A.96238 Combustion chamber depth gage

X1/9 1979 - 1982
SERVICE MANUAL

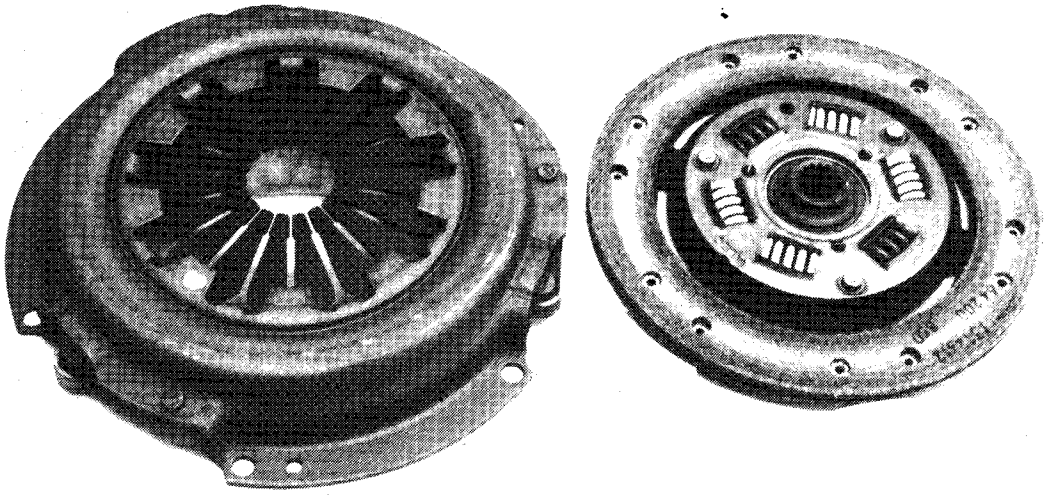
CLUTCH - 18

SPECIFICATIONS

DESCRIPTION	IN.	MM
Type	Dry, single plate, diaphragm spring. Hydraulically controlled. Self-adjusting, with no pedal free travel.	
Clutch disc	With friction linings	
Lining O.D.	7.5	190
Lining I.D.	5.1	130
Max. runout of disc linings	0.008	0.2
Diaphragm spring travel corresponding to a minimum pressure plate travel of not less than .067 in. (1.7 mm)	0.335 to 0.374	8.5 to 9.5
Master cylinder bore	3/4	19.05
Operating cylinder bore	3/4	19.05

TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N·m	Kgm	Ft. Lb.
Bolt, clutch to flywheel	M 8	38.2	3.9	28
Bolt, clutch release fork	M 8	26.5	2.7	19.5
Bolt, operating cylinder	M 8	26.5	2.7	19.5
Bolt, operating cylinder support plate to transmission case	M 8	26.5	2.7	19.5
Nut, master cylinder to support bolt	M 8	24.4	2.5	18



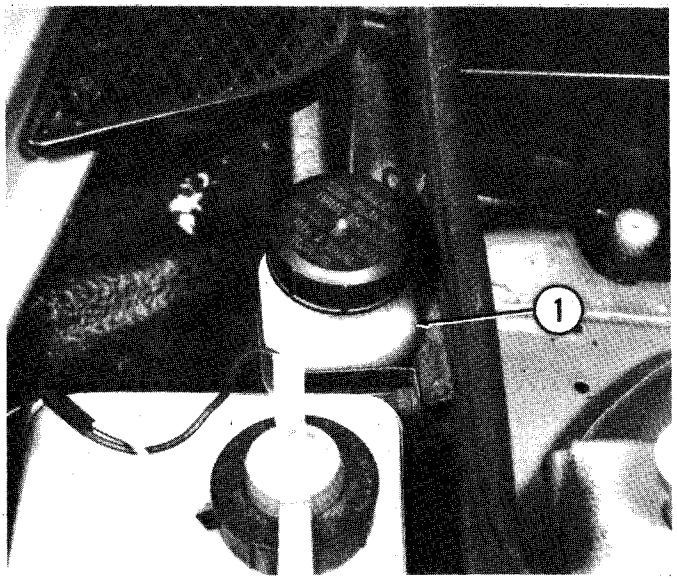
CLUTCH COVER AND CLUTCH DISC

CHECKING FLUID LEVEL

Remove cap from reservoir (1) and check fluid level. Fluid should be up to neck of reservoir.

If level is low, check fluid lines, master cylinder and operating cylinder for leakage.

1. Clutch fluid reservoir



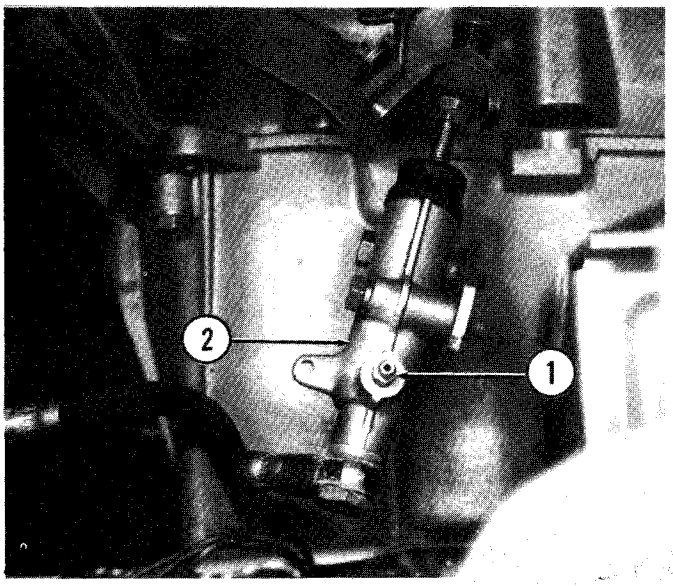
BLEEDING CLUTCH CIRCUIT

Connect a hose to bleeder screw (1) on operating cylinder (2). Place other end of hose in a container filled with fluid. Loosen bleeder screw.

Have an assistant pump clutch pedal until all air bubbles stop.

With pedal held to floor, remove hose and tighten bleeder screw. Fill reservoir.

1. Bleeder screw 2. Operating cylinder

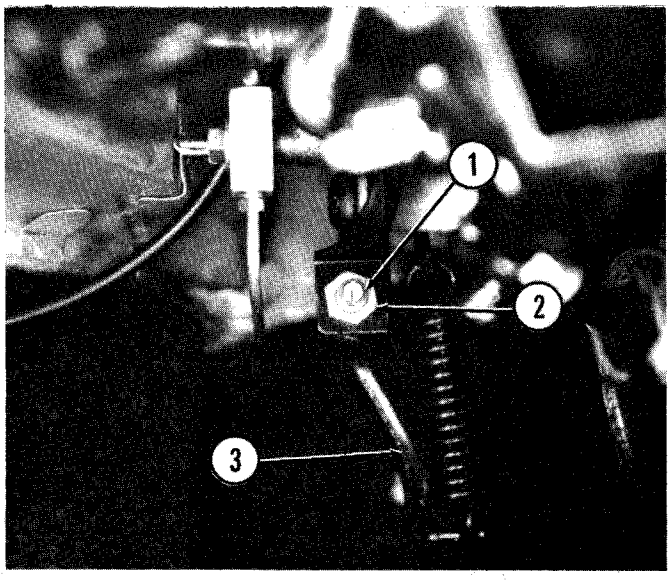


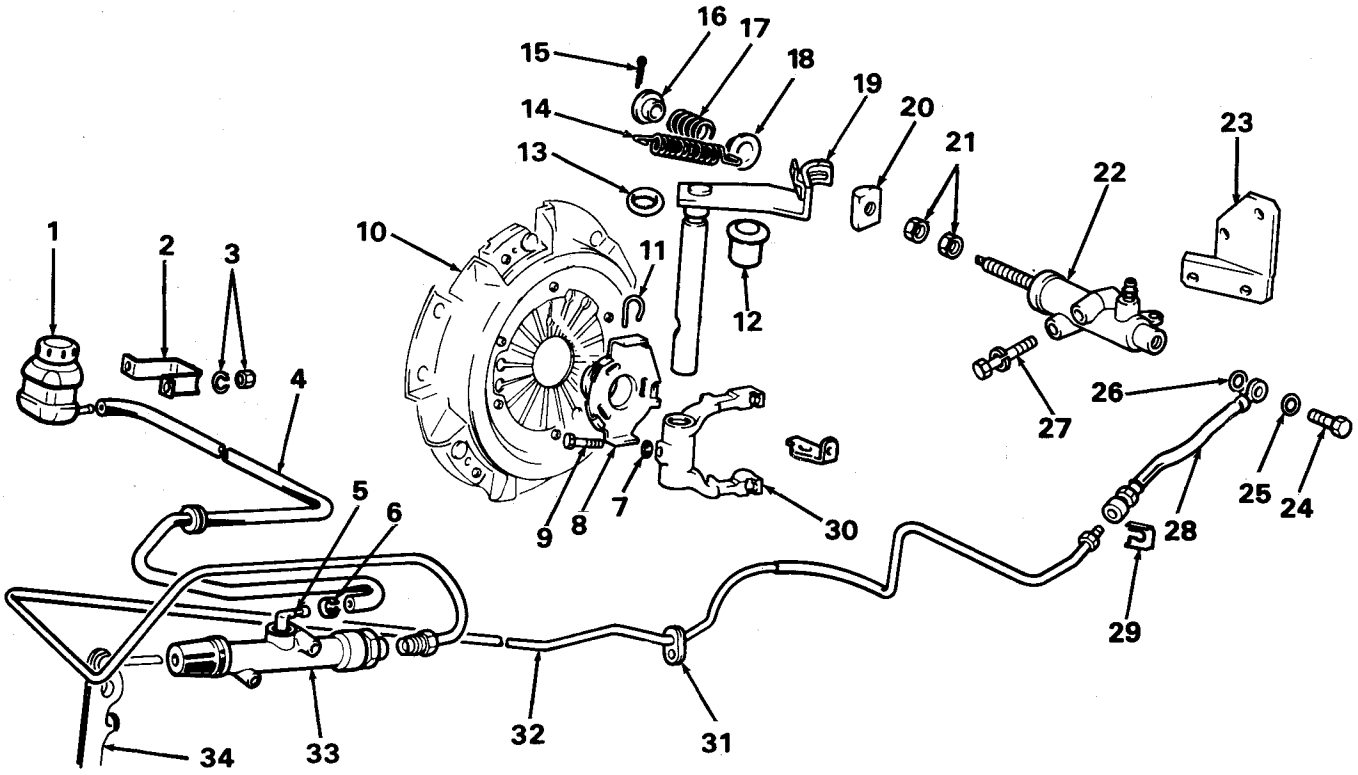
ADJUSTING PEDAL RELEASE TRAVEL

Clutch pedal travel should be about 6.7 in. (170 mm).

If travel is incorrect, loosen locknut (2) and turn screw (1) in or out as necessary to obtain proper pedal travel.

1. Adjustment screw 2. Locknut 3. Clutch pedal





1. Reservoir
2. Bracket
3. Lockwasher and nut
4. Hose
5. Connector
6. Clamp
7. Washer
8. Throwout bearing
9. Bolt
10. Clutch assembly
11. Spring clip
12. Bushing
13. Seal
14. Spring
15. Cotter pin
16. Washer
17. Spring
18. Washer
19. Lever
20. Threaded block
21. Nuts
22. Operating cylinder
23. Support plate
24. Union bolt
25. Gasket washer
26. Gasket washer
27. Bolt and lockwasher
28. Hose
29. Clip
30. Release fork
31. Rubber ring
32. Hydraulic line
33. Master cylinder
34. Clutch pedal

CLUTCH RELEASE CONTROL COMPONENTS

MASTER CYLINDER

REMOVAL AND INSTALLATION

Remove lower steering column cover.

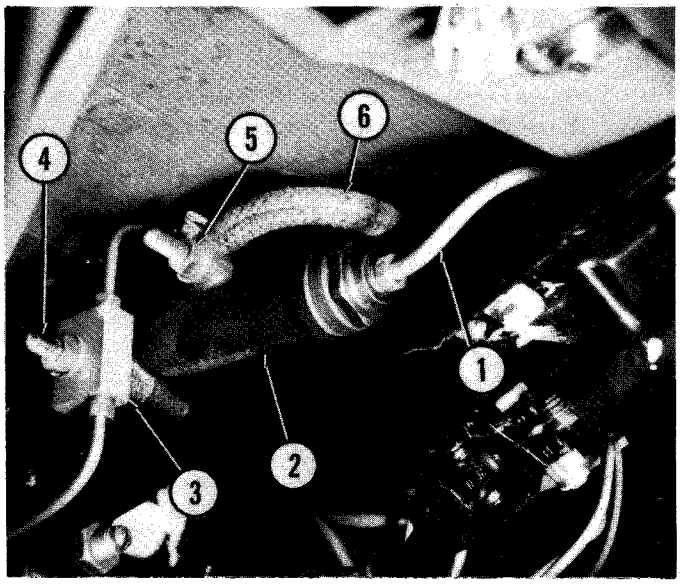
Disconnect hydraulic line (1) from master cylinder (2). Cap line.

Remove two nuts (5) and washers. Slide bolts (4) out until cylinder can be pulled out and off of cylinder rod.

Loosen hose clamp and remove hose (6). Drain fluid into container. Remove master cylinder.

Install in reverse order. Use new hose clamp. Fill reservoir, bleed clutch circuit, and check for leaks.

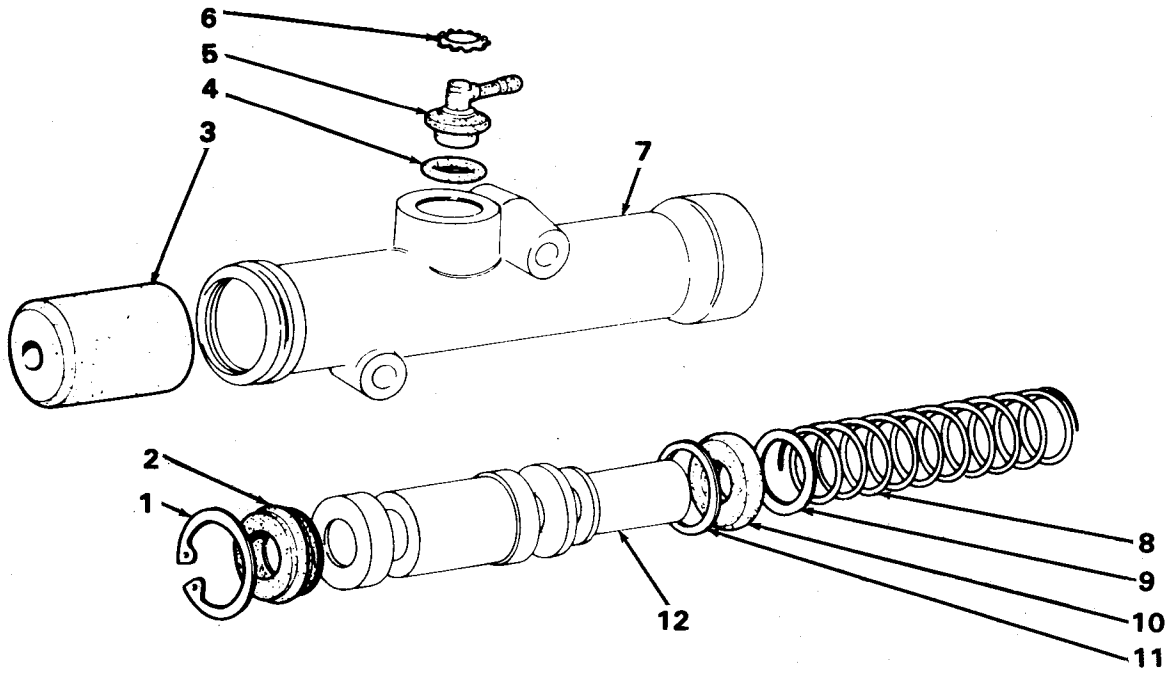
1. Hydraulic line 2. Master cylinder 3. Brake line bracket 4. Bolt 5. Nut 6. Hose



OVERHAUL

Remove boot (3), lock ring (1) and seal (2). Remove remaining internal parts (items 8 through 12) from cylinder (7).

Carefully inspect cylinder bore and piston surfaces. They should have a mirror-like finish without any kind of roughness. The cylinder bore can be honed to prevent leaks or excessive wear of seals and pistons. Do not increase size of bore. Replace seals and boot. Clean all parts with denatured alcohol and lubricate with brake fluid. Reassemble in reverse order of disassembly.



1. Lock ring
2. Seal
3. Boot
4. Gasket
5. Connector
6. Lock plate
7. Cylinder
8. Spring
9. Seal
10. Seal
11. Gasket
12. Piston

EXPLODED VIEW OF MASTER CYLINDER

OPERATING CYLINDER

REMOVAL AND INSTALLATION

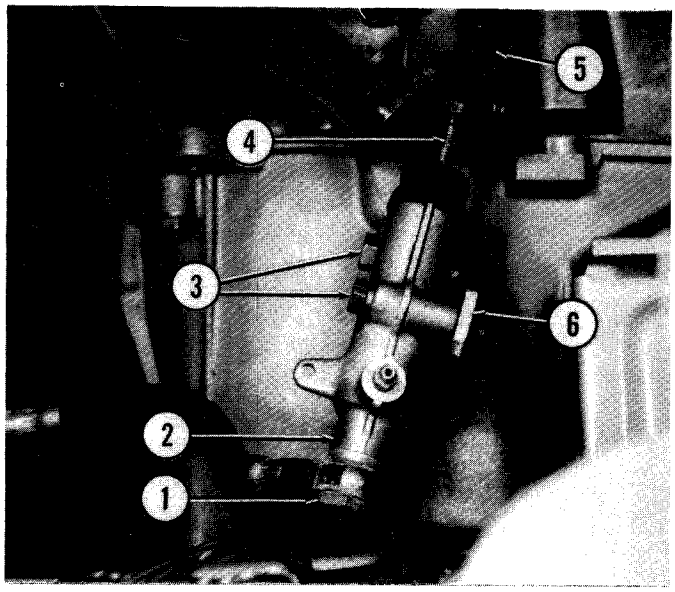
On vehicles with carburetor, remove carburetor cooling duct. On vehicles with fuel injection, remove air cleaner. Refer to 102.04.

Remove union bolt (1) from operating cylinder (2).

Hold spring (5) compressed and remove cotter pin, washer, spring and remaining washer from end of cylinder rod (4).

Remove two bolts (3) and washers holding cylinder to support plate (6). Pull cylinder out.

Install in reverse order. Use new copper gasket washers on union bolt. Bleed cylinder and fill reservoir.

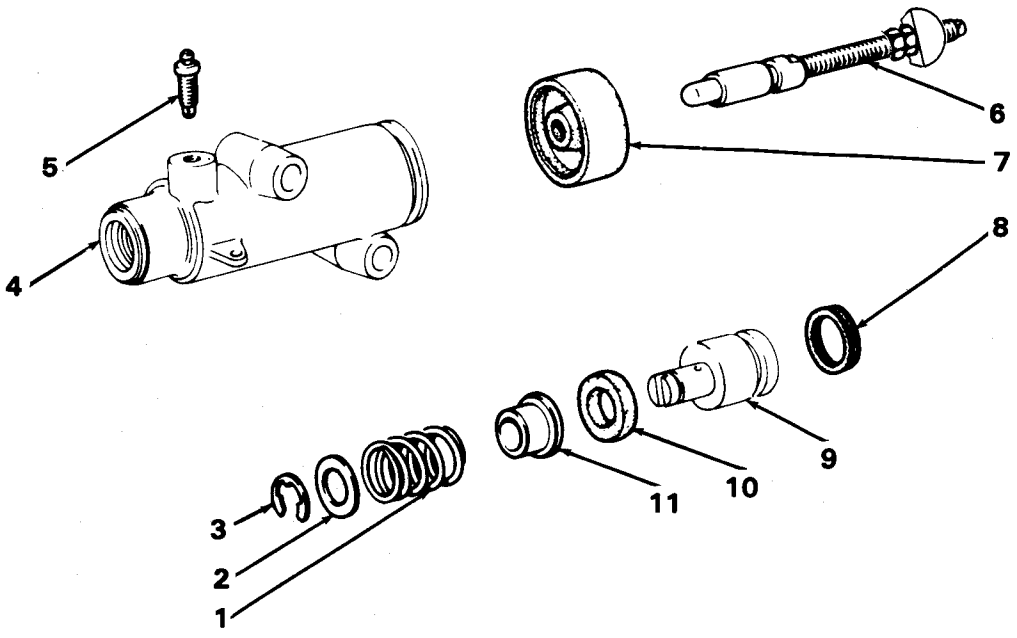


1. Union bolt 2. Operating cylinder 3. Bolts 4. Cylinder rod
5. Spring 6. Support plate

OVERHAUL

Remove bleeder screw (5). Remove cylinder rod (6) and boot (7). Remove remaining internal parts (items 8 through 11 and 1 through 3) from cylinder (4).

Carefully inspect cylinder bore and piston surfaces. They should have a mirror-like finish without any kind of roughness. The cylinder bore can be honed to prevent leaks or excessive wear of seals and pistons. Do not increase size of bore. Replace seals and boot. Clean all parts with denatured alcohol and lubricate with brake fluid. Reassemble in reverse order of disassembly.



1. Spring
2. Washer
3. Lock ring
4. Cylinder
5. Bleeder screw
6. Cylinder rod
7. Boot
8. Seal
9. Piston
10. Seal
11. Bushing

EXPLODED VIEW OF OPERATING CYLINDER

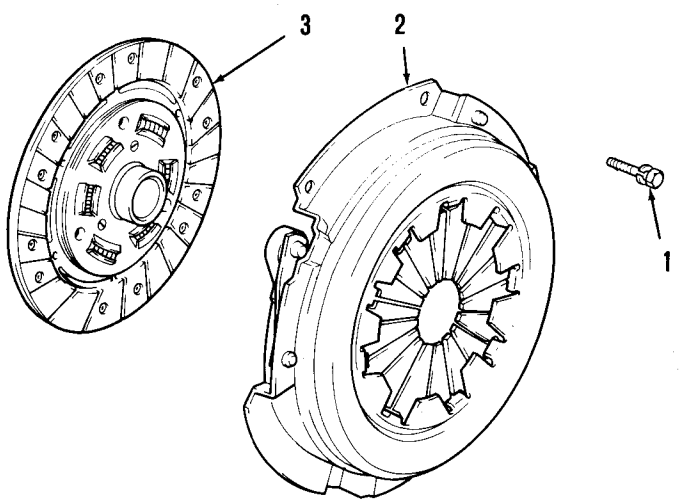
REMOVAL

Remove transmission as specified in Section 21.

If same clutch assembly is to be installed, mark position on flywheel so that correct balance will be maintained.

Remove clutch assembly (2 and 3) by gradually loosening and then removing six bolts (1).

1. Bolt 2. Pressure plate 3. Disc



INSPECTION

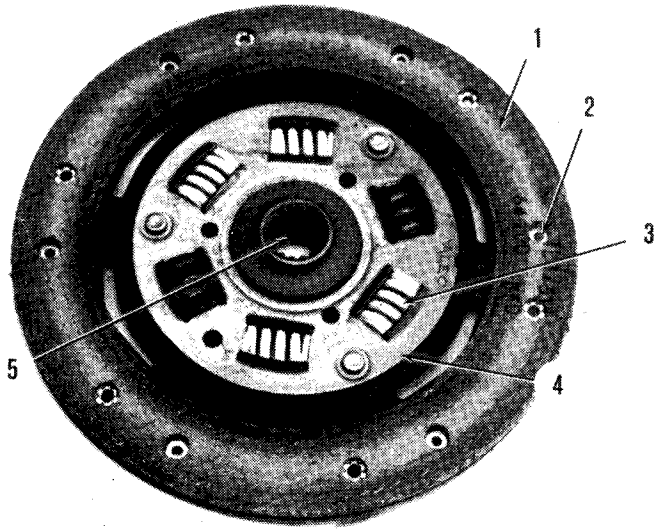
Disc

Check that surface of friction material is not less than 1/16 in. from rivet heads and is not cracked or glazed.

Check that disc is not warped.

Check that springs (3), plate (4) or splines (5) are not damaged. Replace disc if damaged.

1. Friction material 2. Rivet head 3. Spring 4. Plate 5. Splines



Pressure Plate

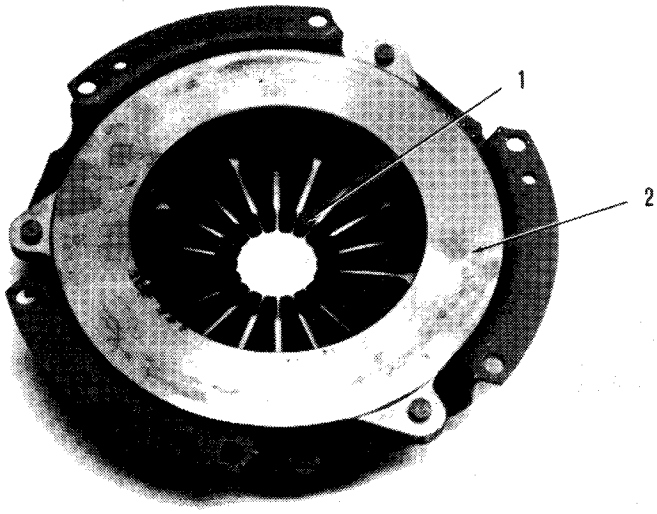
Check that fingers (1) of diaphragm spring are not broken, cracked or misaligned.

Check facing (2) for heat cracks, scoring or burns.

For minor imperfections, dress with medium grit emery cloth. Replace if damaged.

Check mounting hardware for damage. Replace if damaged.

1. Fingers 2. Facing



Flywheel

Inspect flywheel (3) for grooves, gauling, burns or heat cracks.

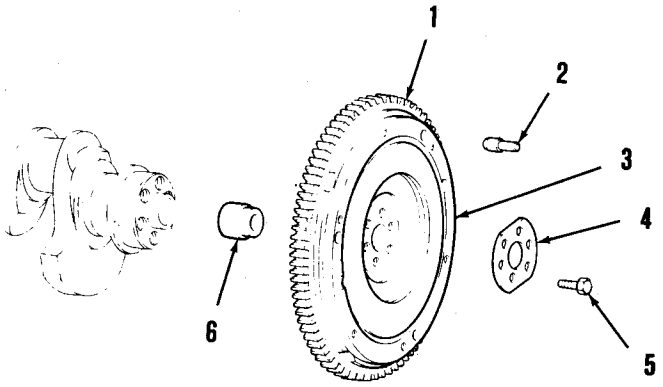
For minor imperfections, lightly dress with medium grit emery cloth. For severe damage, replace flywheel.

Check mounting bolt holes for stripped threads. Repair with helical insert. Do not use oversize bolts, as balance will be affected.

Check pilot bearing (6) for wear. Replace if worn.

Check ring gear (1) for damaged teeth. Replace if considered not serviceable.

1. Ring gear 2. Pin 3. Flywheel 4. Plate 5. Bolt 6. Pilot bearing



Throwout Bearing, Fork and Lever

Check throwout bearing (7) for serviceability. Replace if worn.

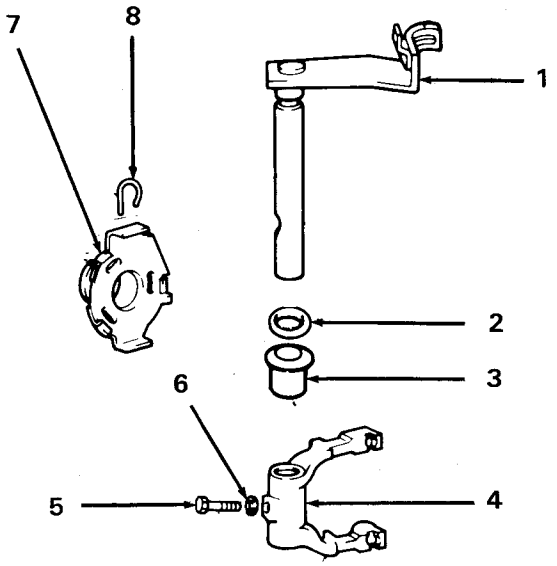
Check that spring clips (8) are properly installed.

Check that lever (1) moves freely and does not bind. If binding, disassemble by removing bolt (5) and lockwasher (6).

Clean bearing surfaces, and check that bushing (3) is not worn. Replace if bushing is worn.

Check that fork (4) is not cracked or worn. Replace if damaged. When replaced, torque bolt (5) to 19.5 ft. lbs. (2.7 kgm).

1. Lever 2. Seal 3. Bushing 4. Fork 5. Bolt 6. Lockwasher
7. Throwout bearing 8. Spring clip



INSTALLATION

If flywheel was removed, torque mounting bolts to 61 ft. lbs. (8.5 kgm).

Make sure clutch and flywheel surfaces are clean. If old clutch assembly is reinstalled, align marks made during removal.

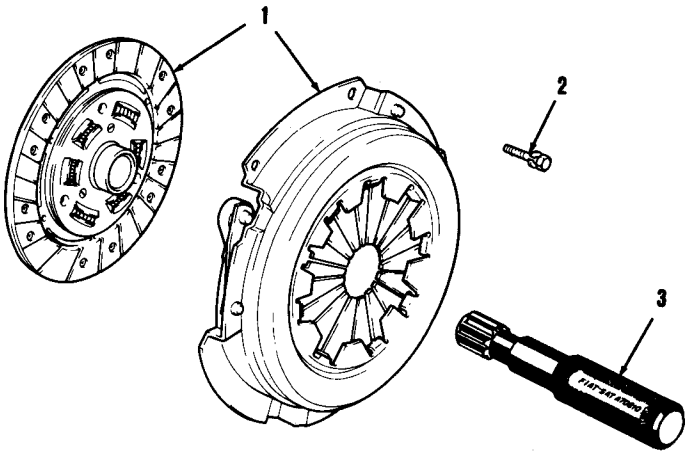
With protruding part of disc facing away from flywheel, loosely assemble clutch assembly (1) on flywheel.

Using pilot tool A.70210 (3), center disc in pressure plate.

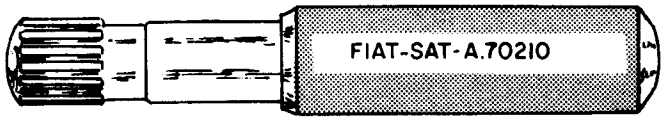
Gradually torque mounting bolts (2) to 28 ft. lbs. (3.9 kgm). Remove pilot tool.

Lightly coat transmission shaft with white grease, then install transmission as specified in Section 21.

1. Clutch assembly 2. Bolt 3. Pilot tool



A.70210 Tool for centering driven plate on flywheel



X1/9 1979 - 1982
SERVICE MANUAL

TRANSMISSION - DIFFERENTIAL - AXLE - 21/27

PARTS CATALOG, SERVICE MANUAL & SERVICE TIME SCHEDULE CODE

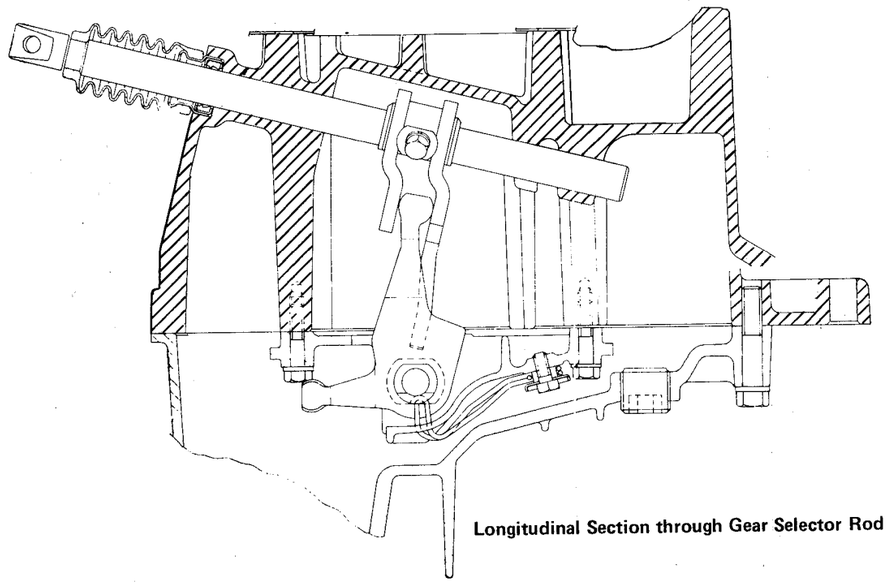
SPECIFICATIONS

Gears	5 forward, 1 reverse	
Synchronizers		
Blocker type, conventional cone	1st and 2nd	
Porsche type	3rd, 4th and 5th	
Gear ratios to 1	**1979-80**	**1981-82**
first	3.583	3.583
second	2.235	2.235
third	1.454	1.461
fourth	1.042	1.033
fifth	0.863	0.863
reverse	3.714	3.714
Backlash between gears	.004 in. (0.1 mm)	
Alignment tolerance of shafts	.002 in. (0.05 mm)	
Clearance between reverse gear shaft and bush fitted to gear	.003 to .006 in. (0.08 to 0.15 mm)	
DRIVING AXLE		
Final drive gear set	Helical, cylindrical	
Final drive ratio	13/53 (4.077 to 1)	
Oil type	SAE 80/90W	
Quantity	3.2 qt. (3.0 lt)	
Differential case bearings	2	
Type of bearings	Tapered roller	
Adjustment for preload of differential case bearings	Through shims	
Pinion to side gears backlash adjustment	NONE	
Power drive to rear wheels	By axle shafts connected to final drive and to wheels through constant-velocity ball joints	

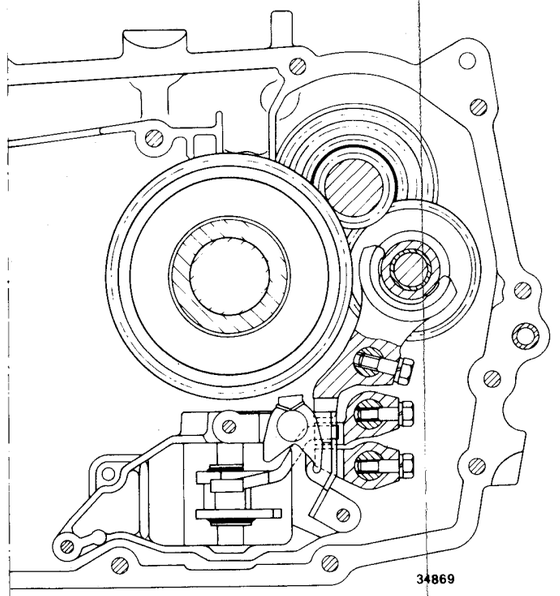
TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N•m	Kgm	Ft. Lb.
TRANSMISSION				
Bolt retaining internal selector and spring cover	M 8	24.4	2.5	18
Lower nut retaining cover to plate	M 6	9.5	1	7
Nut for bolt retaining bell housing to engine	M 12 x 1.25	79	8	58
Nut retaining plate to gearbox	M 6	9.5	1	7
Bolt retaining gearbox cover and plate	M 6	9.5	1	7
Bolt retaining power unit suspension plate, cover, and bracket to gearbox	M 8	24.4	2.5	18
Bolt retaining bell housing to engine	M 12 x 1.5	79	8	58
Bolt retaining starter motor to bell housing	M 8	24.4	2.5	18
Bolt retaining gearbox front cover	M 6	8	8	6
Bolt retaining bell housing to gearbox	M 8	24.4	2.5	18
Bolt retaining reversing shaft plate	M 6	9.5	1	7
Lock nut for 5-speed main and layshaft	M 20 x 1.5	118	12	87
Bolt retaining gearshift fork and lug	M 6	17.6	1.8	13
Bolt retaining crown wheel	M 10 x 1.25	88	9	65
Bolt retaining differential case flange to gearbox housing	M 6	24.4	2.5	18
Bolt retaining bearing retainers to support	M 6	9.5	1	7

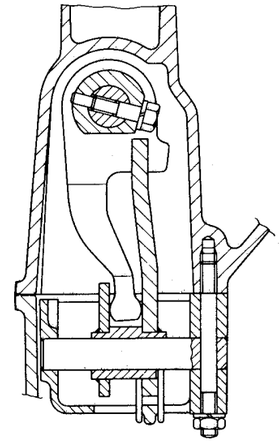
DESCRIPTION	THREAD	TORQUE FIGURE N•m	Kgm	Ft. Lb.
TRANSMISSION EXTERNAL CONTROLS				
Bolt retaining gearshift lever	M 6	19	2	14
Bolt retaining gearshift lever support	M 6	9.5	1	7
Bolt retaining transmission link to transmission rod	M 8	24.4	2.5	18
Bolt retaining transmission link to selector rod	M 8	24.4	2.5	18



Longitudinal Section through Gear Selector Rod

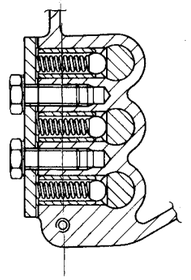


Section through Detent Balls and Reverse Gear Pawl

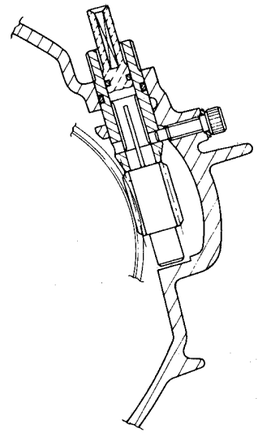


Cross Section through Gear Engagement Lever

Longitudinal Section through Forked Levers and Internal Selector Rods



Section through Detent Springs for Gear Control Rods



Speedometer Sprocket Support Section

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

On vehicles with fuel injection, remove air cleaner. On vehicles with carburetor, remove carburetor cooling duct. Refer to 102.04.

Hold spring (2) compressed and remove cotter pin, washer, spring and remaining washer from end of cylinder rod (3).

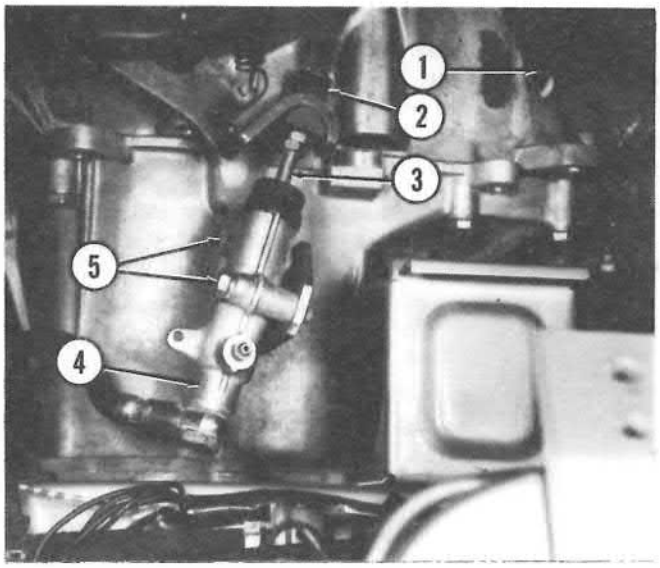
Remove two bolts (5) holding cylinder (4) to support plate. Move cylinder out of way.

Disconnect speedometer drive (1) from transmission.

Install engine support bar A.70526.

CAUTION: Be certain that support is attached to engine and not to transmission.

Remove nuts and bolts holding transmission to crankcase accessible from above.

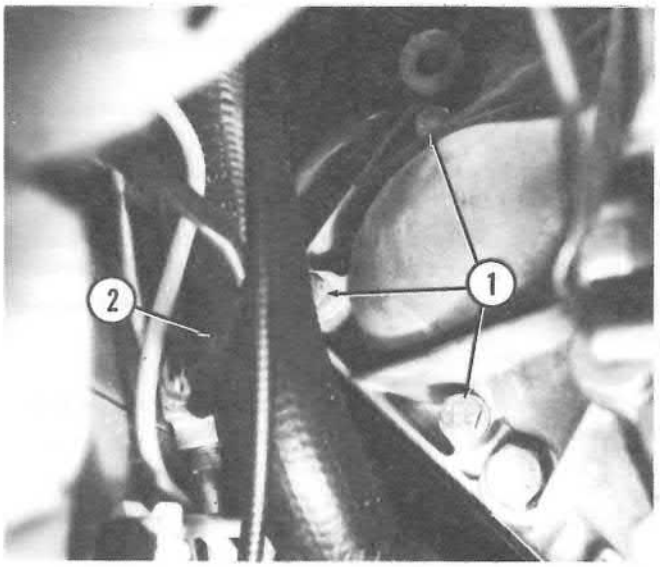


1. Speedometer drive 2. Spring 3. Cylinder rod 4. Cylinder 5. Bolts

Raise vehicle. Remove rear wheels. Remove left side shield.

Disconnect reverse light switch connector (2).

Remove three bolts (1) holding starter to transmission. Move starter out of transmission.



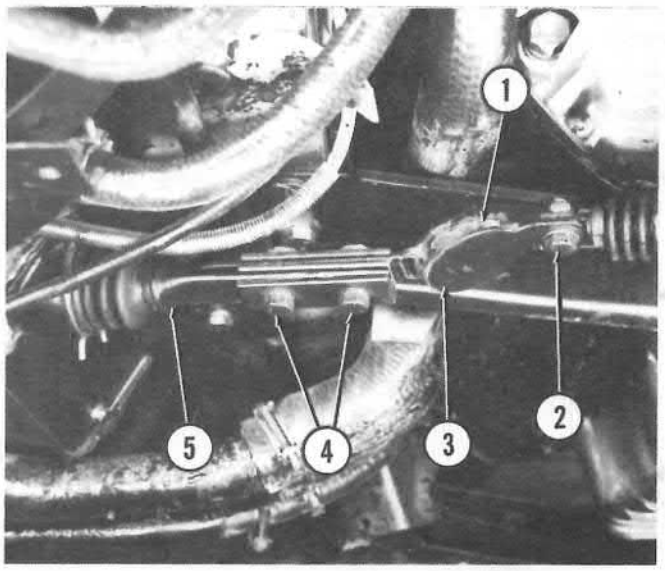
1. Bolts 2. Connector

Using a scribe, mark position of transmission link (3) in relation to gear selector rod (5).

Remove two bolts (4) holding transmission link to selector rod.

Loosen bolt (2) at transmission end of transmission link. Swing link out of way.

NOTE: Transmission link on vehicles with carburetor does not have flexible rubber coupling (1).



1. Flexible coupling 2. Bolt 3. Transmission link 4. Bolts
5. Selector rod

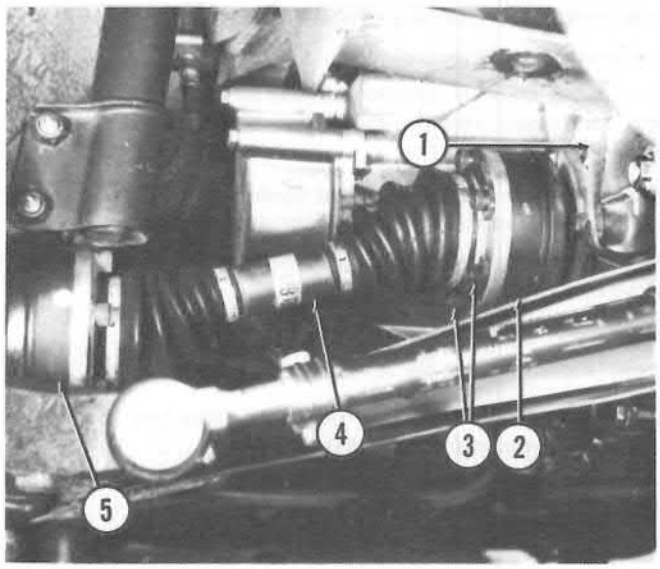
Disconnect ground strap (1) from chassis.

Remove six Allen head bolts (3) from each end of left side half-shaft (4). Remove half-shaft complete with CV joints (2 and 5).

Repeat above procedure to remove right side half-shaft and CV joints.

NOTE: Discard Allen head bolts and replace with new ones for installation. Torque new bolts to 31 ft. lbs. (4.3 kgm).

1. Ground strap 2. Inner CV joint 3. Allen bolts 4. Half-shaft
5. Outer CV joint



Place transmission support under transmission.

On vehicles with fuel injection, remove nuts attaching exhaust system bracket (9) to exhaust flange.

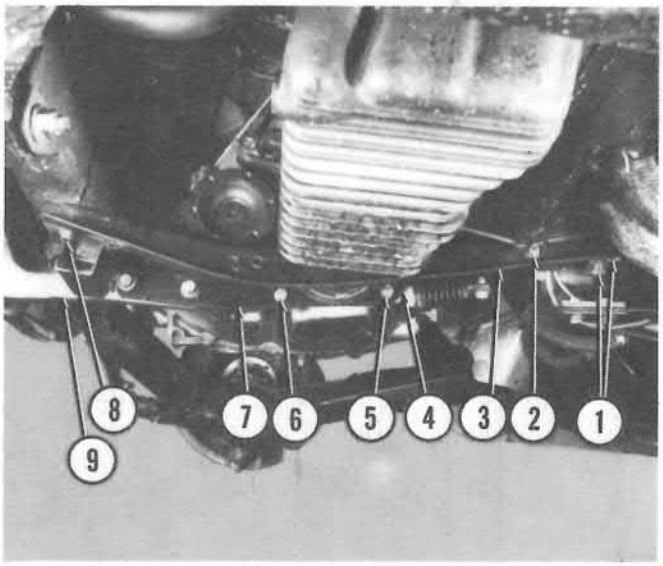
Remove nut (5) and two bolts (6) holding transmission support bracket (7) to transmission.

Loosen nut (2) attaching shield to crosspiece (3). Remove four crosspiece bolts (1 and 8).

Remove crosspiece, transmission support bracket and exhaust system bracket (if so equipped) from vehicle as an assembly.

Remove remaining bolt holding flywheel guard (4) and remove guard.

1. Bolts 2. Nut 3. Crosspiece 4. Flywheel guard 5. Nut 6. Bolt
7. Support bracket 8. Bolt 9. Exhaust system bracket



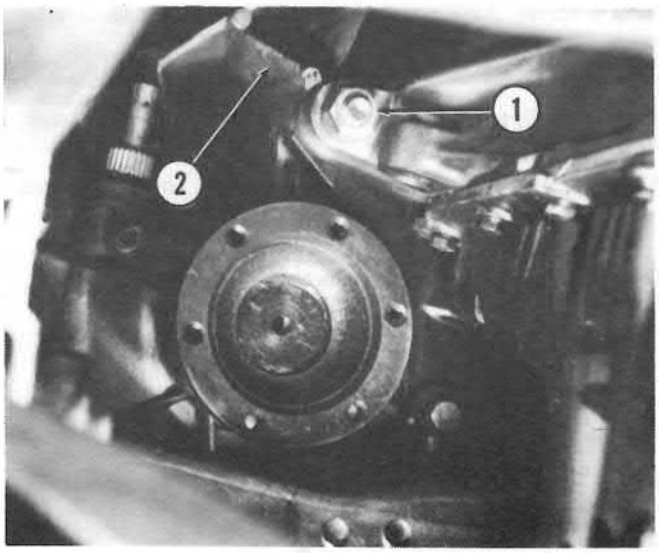
Remove remaining nut (1) and bolts holding transmission to engine.

Lower transmission out from under vehicle.

Install in reverse order.

If difficult gear shifting or jumping out of gear is experienced after installation, adjust gearshift linkage. Refer to 212.21.

1. Nut 2. Transmission



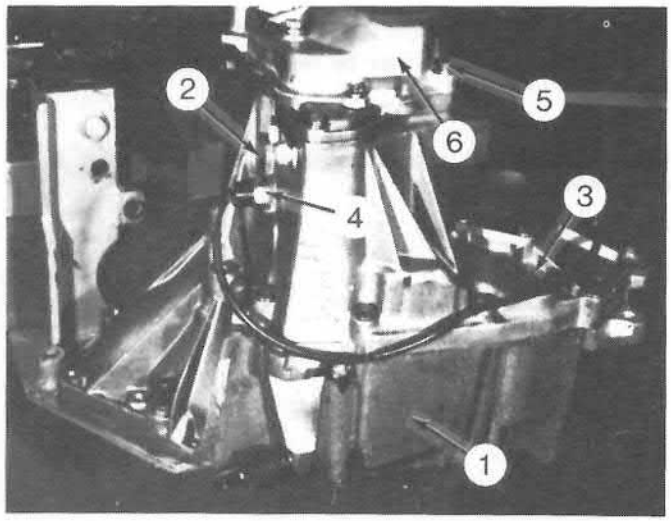
DISASSEMBLY

Install transmission (1) in suitable work stand.

Drain transmission oil through filler (2) and drain (3) openings.

Remove reverse switch (4).

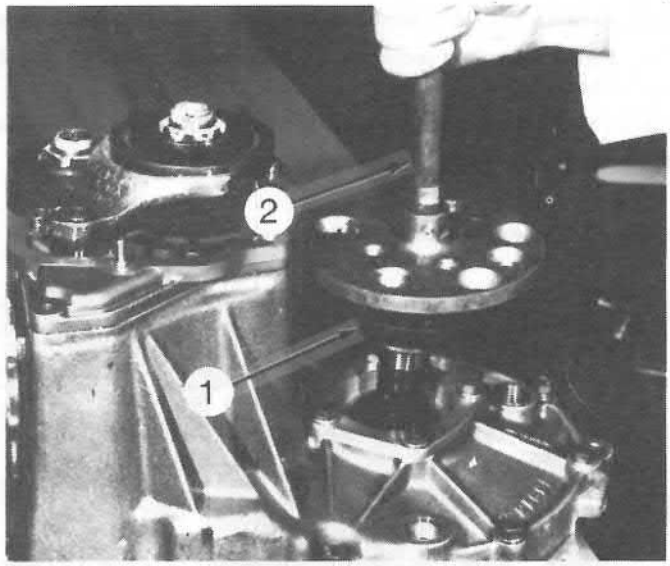
Remove fifth gear cover (6) by removing four bolts (5) and one nut.



1. Transmission 2. Oil filler 3. Oil drain 4. Reverse switch
5. Bolt 6. Fifth gear cover

Remove both axle shafts (1) with side hammer puller (2).

NOTE: Replace axle shaft circlips with new ones for installation.

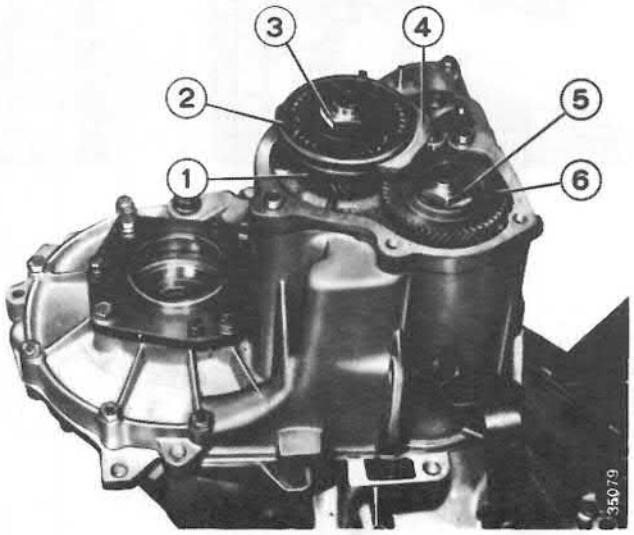


1. Axle shaft 2. Puller

Remove bolt from fifth speed fork (4). Remove fork.

Engage fifth speed manually by pressing sliding sleeve (2) down.

Engage transmission in another gear by moving shift lever. This will lock shafts so that retaining nuts (3 and 5) can be removed. Remove nuts.

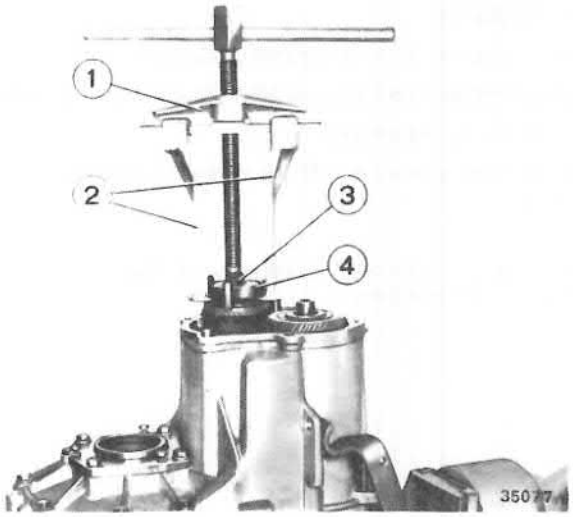


1. Fifth gear 2. Sliding sleeve 3. Retaining nut 4. Fork
5. Retaining nut 6. Drive gear

Remove fifth gear sliding sleeve and syncro hub (4).

Puller A.40005/002 (1) may be required for hub removal as shown.

1. Puller A.40005/002 2. Arms A.40005/302 3. Lay shaft
4. Syncro hub



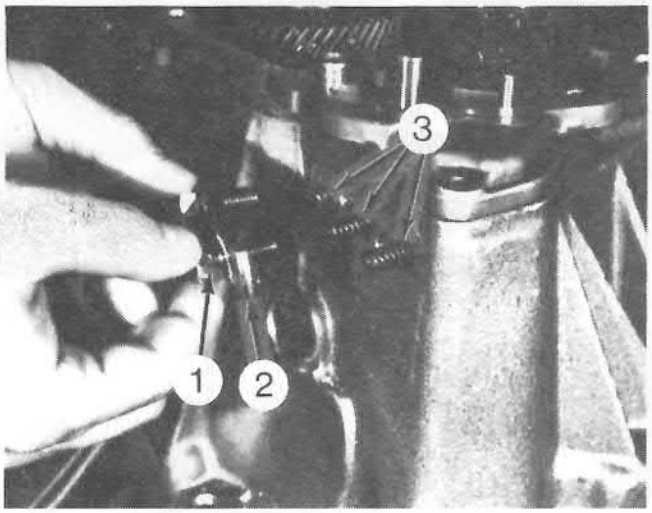
Remove two bolts (1) holding detent spring cover (2). Carefully remove cover so that springs (3) do not fall out.

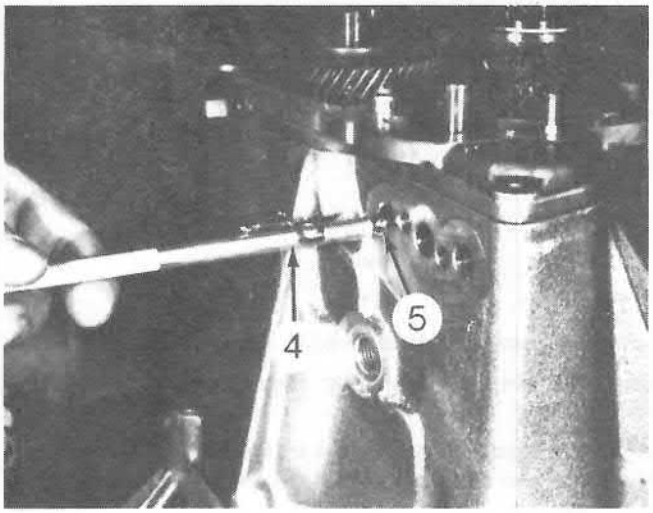
Note color coding and location of springs before removing. If colors are not visible, mark springs so that they will be assembled in same location.

NOTE: Short thick spring is for fifth and reverse rod. On 1980 and up, all springs are same size.

With a magnetic tool (4) remove detent balls (5) as shown.

1. Bolt 2. Detent spring cover 3. Detent springs 4. Magnetic tool 5. Detent ball





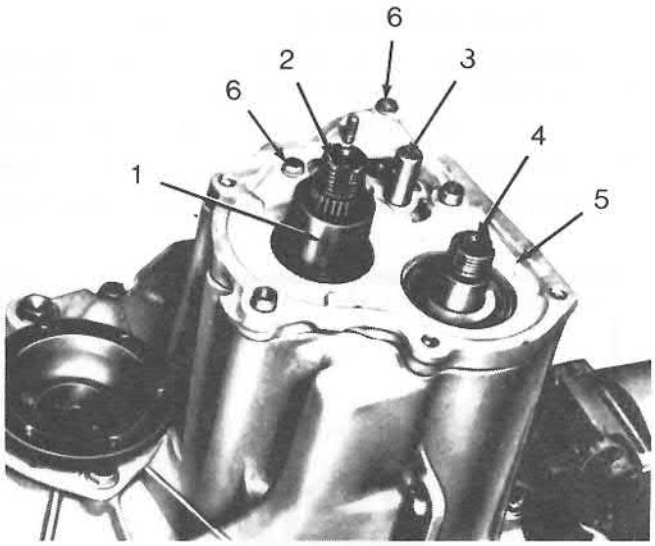
Slide driven gear and drive gear off.

Remove lock key.

Slide fifth gear bushing (1) off.

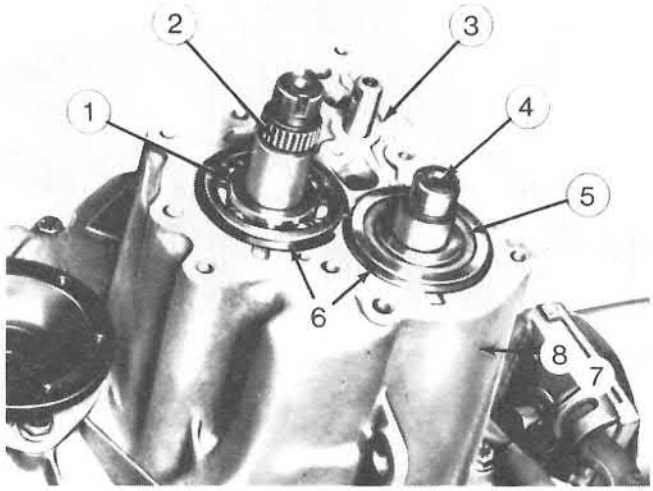
Remove intermediate cover by removing two bolts (6).

1. Fifth gear bushing 2. Layshaft 3. Fifth and reverse gear selector rod 4. Mainshaft 5. Intermediate cover 6. Bolt



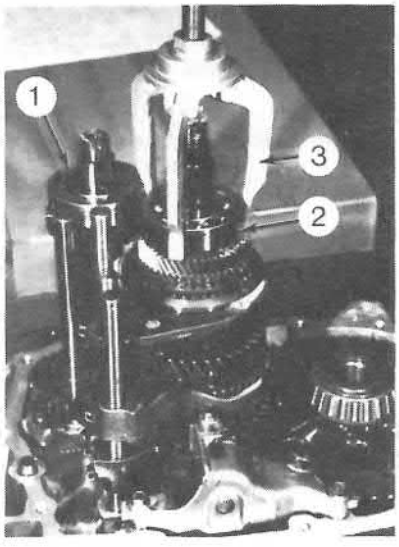
To remove main case (3), first remove bearing snap rings (6). Remove three bolts inside of bell housing and nine bolts (7) on outside of case. Remove main case.

1. Countershaft bearing 2. Countershaft 3. Main case 4. Mainshaft 5. Mainshaft bearing



Remove mainshaft (1) and countershaft (2) bearings with puller (3) as shown. Note that bearing with split bushings is installed on main shaft.

1. Mainshaft bearing 2. Countershaft bearing 3. Puller



Loosen five bolts holding forks (6) to selector rods.

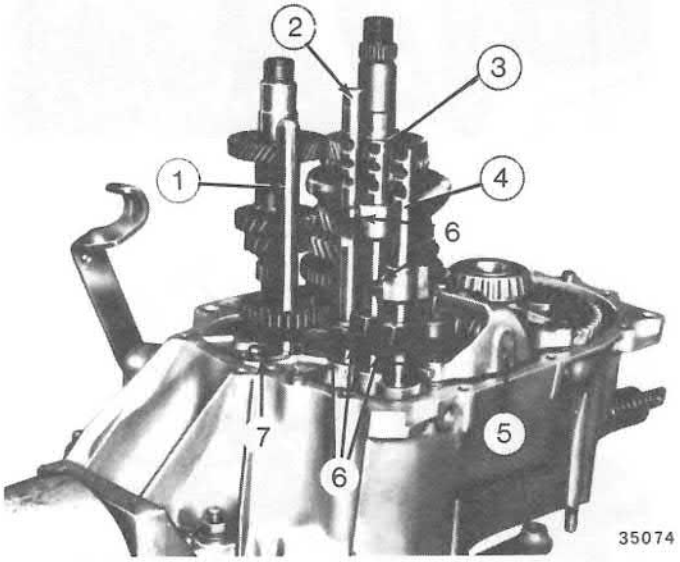
First remove fifth and reverse selector rod (2). Carefully remove center rod (third and fourth) (3) with its lock pin. Remove remaining rod (first and second) (4). After each rod is removed, remove related forks.

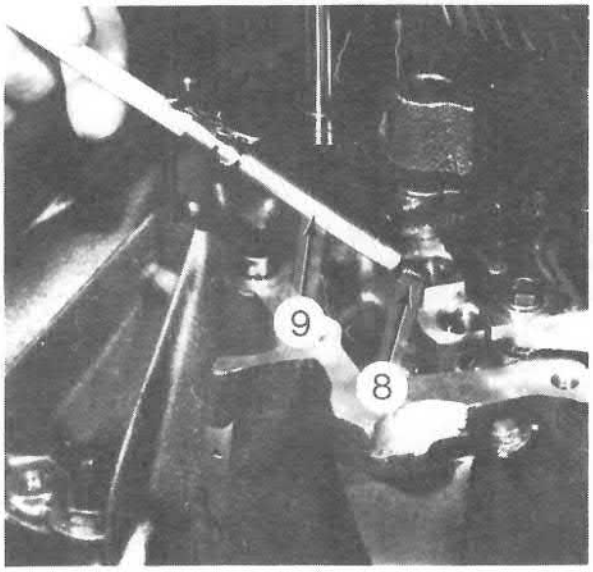
Pull out two lock pins (8) from rod housing with magnetic tool (9).

Remove bolt and clamp (7) holding reverse gear shaft (1). Remove shaft.

Remove three bolts and holding gearchange lever support bracket (5). Remove bracket and reverse lockout assembly.

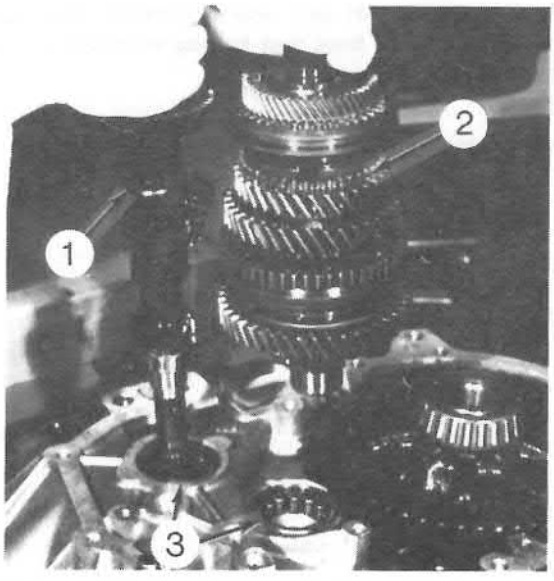
1. Reverse gear shaft 2. Fifth and reverse gear selector rod 3. Third and fourth gear selector rod 4. First and second gear selector rod
5. Gearchange lever support bracket and reverse lockout assembly 6. Fork 7. Bolt and clamp 8. Lock pin 9. Magnetic tool





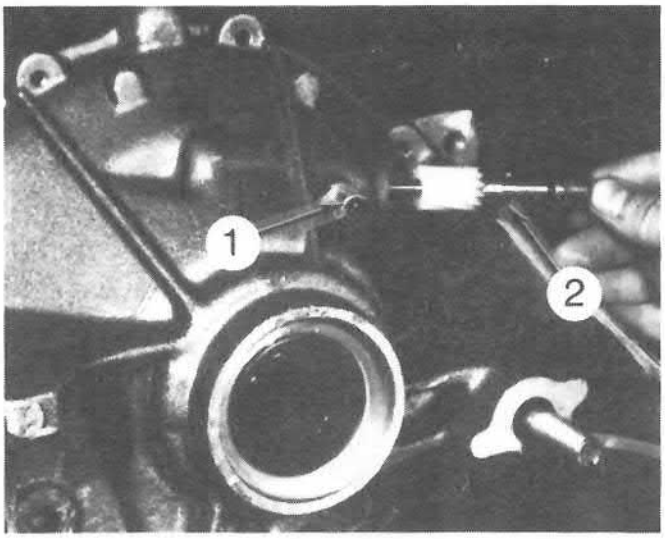
Remove countershaft (2) and mainshaft (1) by lifting out as shown. Remove main and layshaft bearings (3). Remove differential assembly by lifting out.

1. Mainshaft 2. Countershaft 3. Bearings



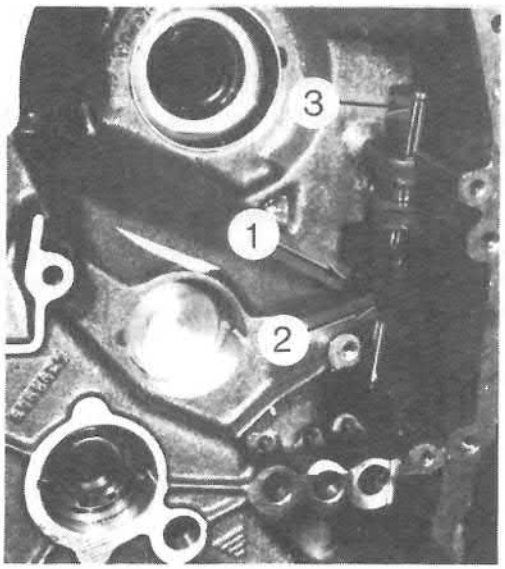
Loosen bolt (1) holding speedometer drive gear assembly (2) and pull assembly out.

1. Bolt 2. Speedometer drive gear assembly



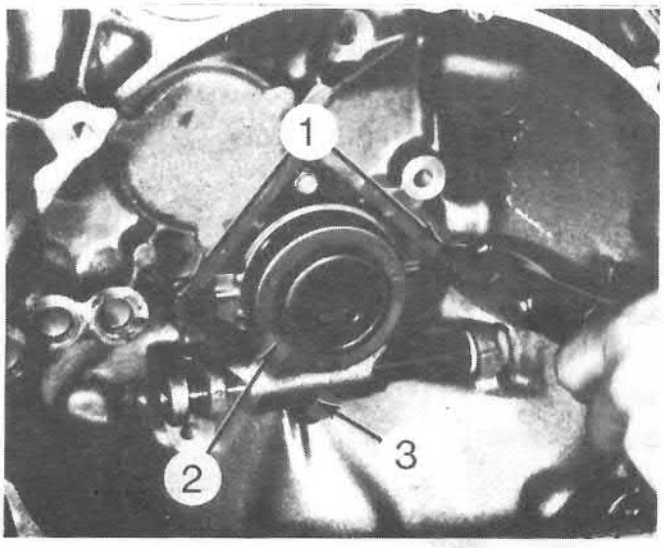
Remove bolt (1) holding shift lever (2) to shift shaft (3). Slide shaft out of housing.

1. Bolt 2. Shift lever 3. Shift shaft



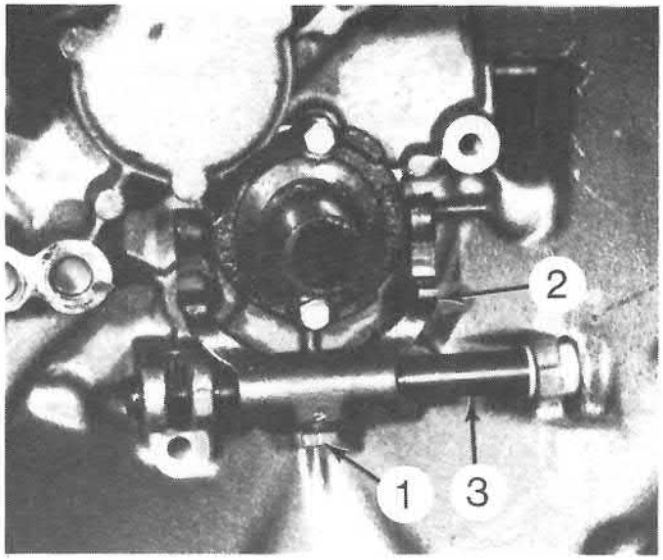
Remove two clips (1) holding throwout bearing (2) to clutch lever (3), as shown. Remove bearing.

1. Clip 2. Throwout bearing 3. Clutch lever



Remove bolt (1) holding throwout bearing lever (2) to shaft (3). Slide shaft out of housing and remove lever.

1. Bolt 2. Throwout bearing lever 3. Throwout lever shaft



Disassemble countershaft as follows, noting order for reassembly.

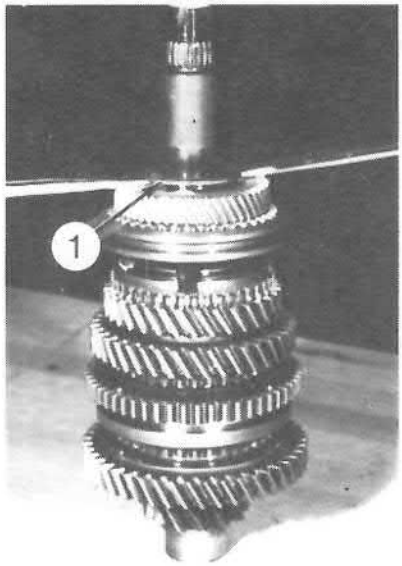
Remove fourth gear bushing (1) as shown.

Slide off fourth gear and syncro, third and fourth gear sleeve, third and fourth gear center hub, third gear and syncro assembly, and third gear bushing.

Remove second gear bushing with puller.

Slide off second gear and syncro, first and second gear sleeve, first and second gear center hub with syncro rings, first and first gear bushing.

1. Fourth gear bushing



INSPECTION

Main Case, Housing and Cover

Check main case for cracks. Check bearing seats for wear or damage that might cause bearing cups to rotate in their seats.

Main case to housing and cover mating surfaces should not show signs of damage, otherwise assembly will be misaligned and oil leakage will result.

Minor imperfections can be removed with a file.

In cases of extensive damage or excessive wear, replace affected parts.

Make sure oil breather opening on cover is not clogged.

NOTE: Upper and lower case sections are line bored matched, and as such are not interchangeable with a half from another transmission.

Seals

Replace all seals.

Shafts

Inspect mainshaft gears for signs of chipping or excessive wear.

Countershaft surfaces must not be damaged or excessively worn.

Splines should be free from nicks and burns, so that hubs may slide freely.

Check countershaft centering by placing it between two centers and rotating it by hand; maximum permissible runout, measured with dial indicator, is .001 in (.025 mm).

The surface of reverse shaft should be smooth and free from nicks and burrs.

Minor imperfections on working surfaces, that do not render parts unfit for service, may be dressed up with extra-fine emery cloth.

Minor distortions of shafts can be corrected with a small press, taking care not to damage surfaces. If shafts are badly distorted, they must be replaced.

Gears

Gears should not show damage or excessive tooth wear. Gear tooth contact pattern must extend to entire working surface. Inspect pattern for roughness or signs of excessive wear.

Gear lash should be .004 in (0.10 mm) for new parts; maximum allowable lash is .008 in (0.20 mm).

Fit clearance between bushings and countershaft gears is .001 to .003 in (0.04 to 0.08 mm). Replace gears worn beyond specified limits.

Hubs — Sleeves — Synchronizer Rings

Check that sliding sleeve hubs for engagement of first-second, third-fourth and fifth gears are not nicked, especially on sleeve sliding surface.

Synchronizer rings must not be excessively worn, either on their inside surface or on teeth that mesh with sliding sleeves. Ring must not be loose in its gear seat.

The outside diameter of seated synchronizer ring when new is 3.004 ± .008 in (76.31 ± 0.2 mm) for first and second gears; 2.607 ± .008 in (66.22 ± 0.2 mm) for third, fourth and fifth gears.

When replacing a synchronizer ring, check that its diameter in its gear seat conforms to specifications.

If splined parts do not slide smoothly, remove imperfection with a fine file.

Parts worn beyond limits should be replaced.

Bearings

Bearings must be in perfect condition. End play must not exceed .020 in (.050 mm). Hold bearing firmly and turn it both ways to check for roughness.

Replace bearings that are not in perfect condition.

Rods — Forks

Shift control forks should not be distorted and control rods should slide freely, but without excessive play, in transmission case and housing guide holes.

Detent balls and rollers should slide freely in their seats.

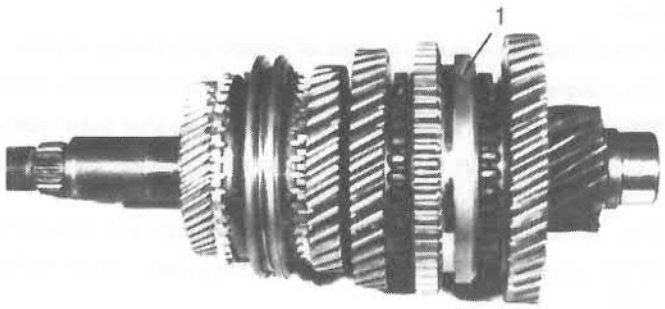
Any sign of seizure could cause engagement or disengagement problems.

Wear patterns should be the same on both sides of forks.

REASSEMBLY

Reassembly is reverse of disassembly with special attention to following Notes, Cautions and Procedures.

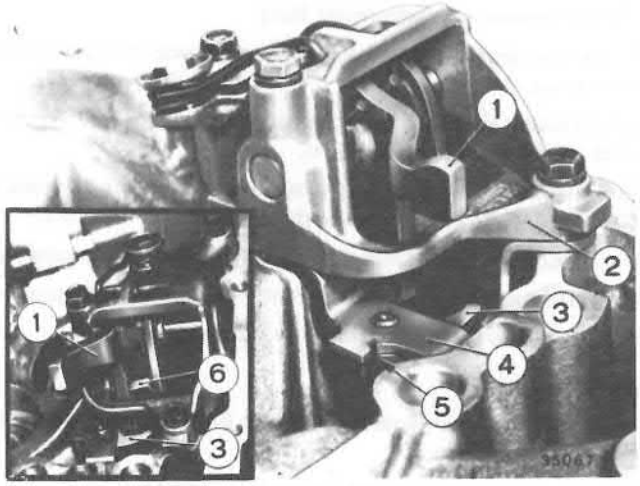
CAUTION: During reassembly of countershaft, be certain that first and second gear sliding sleeve hub reverse gear (1) faces first gear as shown. If this part is to be replaced, make certain that correct sliding sleeve hub is installed since four speed transmission sliding sleeve hub can be installed, but is incorrect, and will result in locked transmission.



1. First and second gear sliding sleeve hub reverse gear

Installation of Shift Rods

Install support bracket (2) so that gear shift lever (6) is positioned as shown.

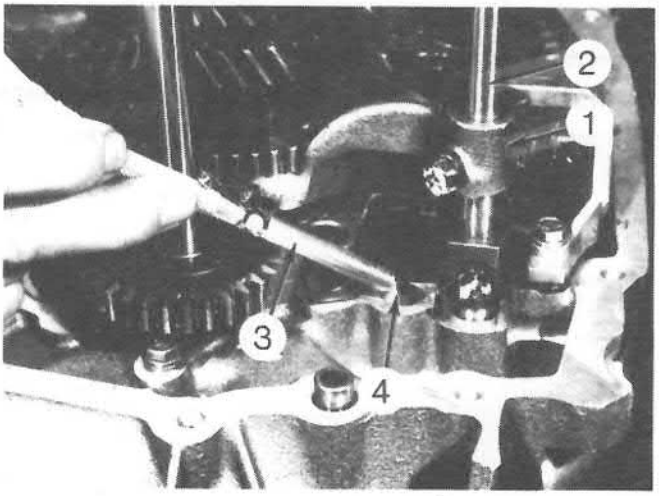


1. Selector lever 2. Support bracket 3. Reverse lockout pawl
4. Pawl support 5. Pawl return spring 6. Gear shift lever

Place forks (1) in position on sliding sleeves/hubs.

Install first and second shift rod (2).

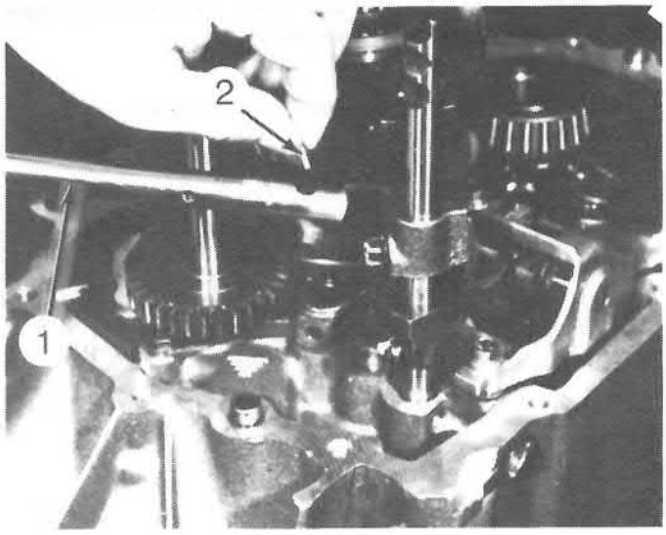
With magnetic tool (3), install lock pin (4) down into its slot in bore as shown. Insure that pin is fully seated.



1. Fork 2. First and second shift rod 3. Magnetic tool 4. Lock pin

Before installing third and fourth shift rod (1), install pin (2) in rod as shown. Insert rod into bore.

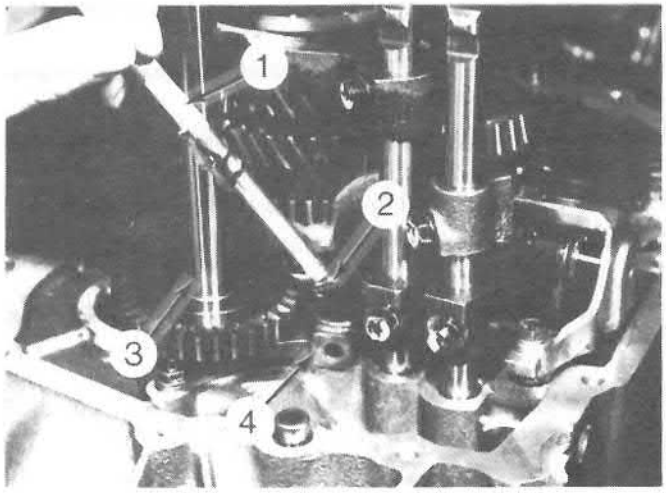
1. Third and fourth shift rod 2. Pin



With magnetic tool (1) insert last lock pin (2) as shown. Insure that pin is fully seated.

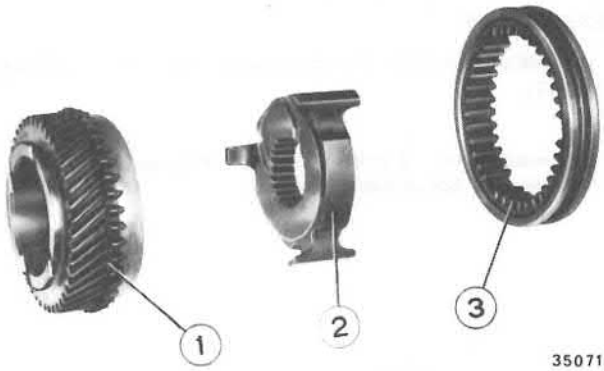
Install reverse idler assembly (3) with fork (4) installed. Install fifth and reverse shift rod.

1. Magentic tool 2. Lock pin 3. Reverse idler assembly 4. Fork



NOTE: On reassembly of fifth gear, synchro hub (2) oil groove should face fifth gear (1) as shown.

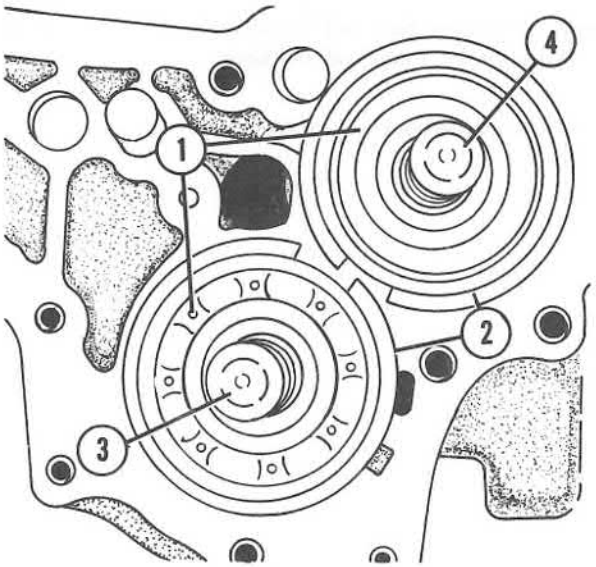
1. Fifth gear 2. Synchro hub 3. Sliding sleeve



35071

CAUTION: Position bearing snap rings (2) as shown or bearings will not seat properly.

1. Bearing 2. Snap ring 3. Mainshaft 4. Countershaft



To torque main and countershaft locknuts, transmission must first be locked-up.

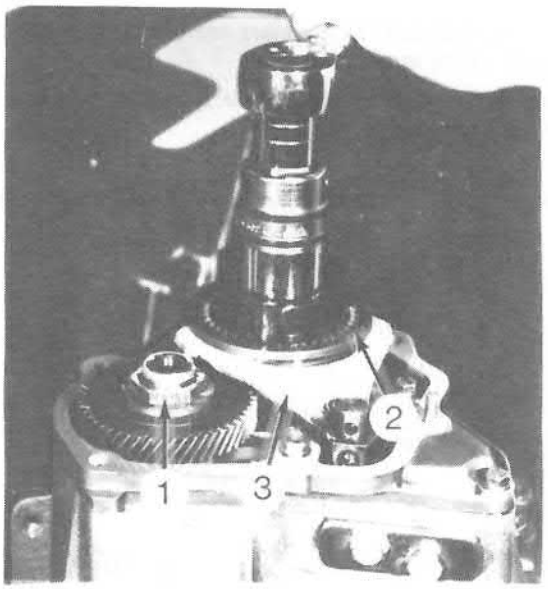
Remove fifth speed fork (3) bolt and engage fifth speed manually by pressing hub (2) down.

Engage transmission in another gear by moving shift lever, this will lock shafts.

Nuts can now be torqued to 86.8 ft lb (12 kgm) as shown.

Disengage hub and reinstall fork bolt.

1. Locknut 2. Hub 3. Fork

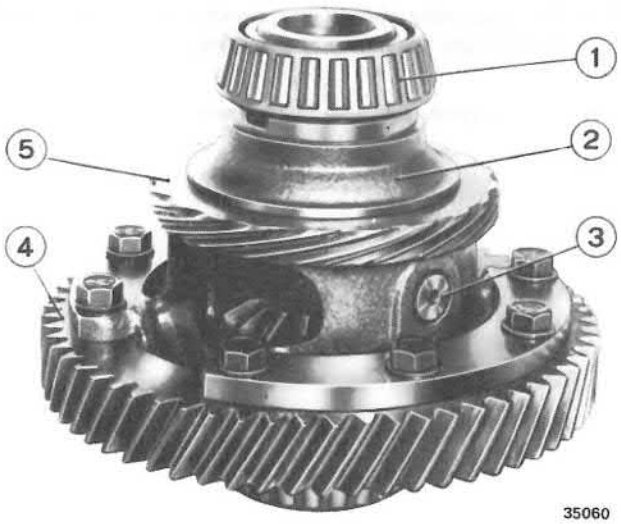


DIFFERENTIAL

DISASSEMBLY

To remove crown gear (4) remove eight bolts (6) attaching it to case (2).

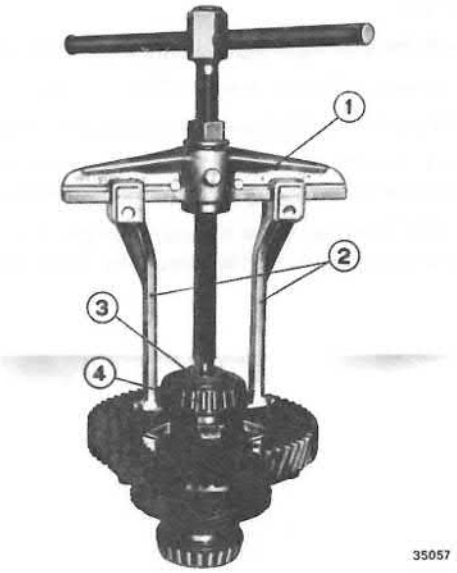
1. Differential bearing 2. Differential case 3. Pinion shaft
4. Crown gear 5. Speedometer drive gear



35060

To remove both differential bearings (4), use puller A.40005/002 (1) together with arms A.40005/302 (2) and spacer A.45028 (3) as shown.

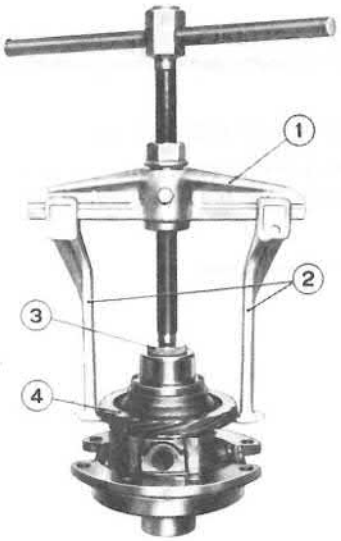
1. Puller A.40005/002 2. Arms A.40005/302 3. Spacer A.45028
4. Bearing



35057

To remove speedometer drive gear (4), use puller A.40005/002 (1) together with arms A.40005/302 (2) and spacer A.45028 (3) as shown.

1. Puller A.40005/002 2. Arms A.40005/302 3. Spacer A.45028
4. Speedometer drive gear

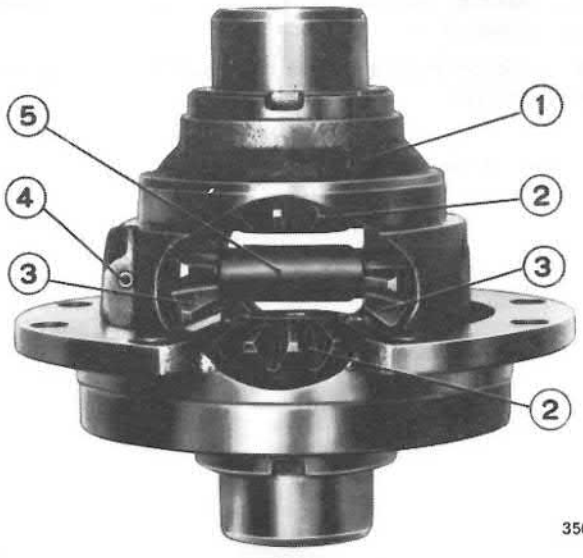


35058

To remove differential pinion shaft (5) and gears (2 and 3), drive out retaining pin (4) and then slide shaft out.

Remove gears through large opening in case (1).

1. Differential case 2. Side gear 3. Pinion gear 4. Retaining pin
5. Pinion shaft



35059

INSPECTION

Check teeth for scoring or signs of abnormal wear and make sure contact pattern extends to entire thrust surface.

If excessive wear is found, replace affected parts.

Gears with chipped teeth should be replaced and mating gears carefully examined for damage.

Inspect pinion shaft and pinion bores for scoring or nicks. Minor damage can be dressed off with extra-fine emery cloth; otherwise replace parts. Follow a similar procedure for inspecting side gears and counterbores in case.

Inspect roller bearings, these should be in perfect condition with no signs of wear and should have perfectly smooth surfaces. If there is any doubt as to their serviceability, replace them, as faulty operation of bearings will result in gear noise and/or seizure.

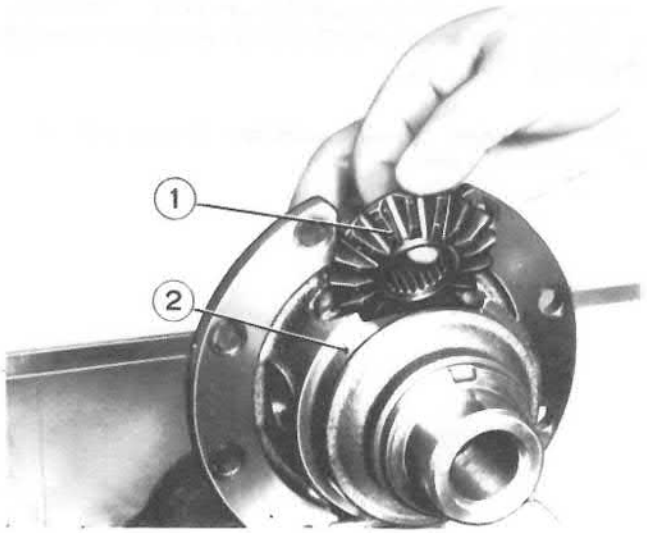
REASSEMBLY

Refit differential gears to case as follows; place side gears (1) in case directly opposite each other, seated in their counterbores.

Place pinion gear in mesh with side gears.

Carefully rotate assembly so that pinion gear is directly opposite large opening in case and place second pinion gear in mesh.

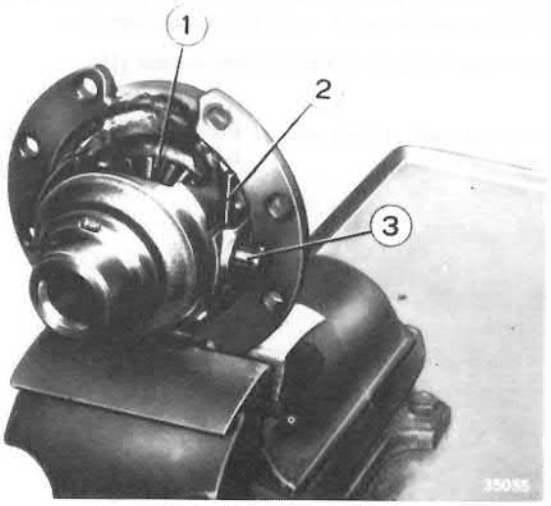
1. Side gear 2. Differential case



Rotate assembly so that pinion shaft (3) can be inserted through pinion gears.

Line up pinion shaft pin hole with hole in case and insert retaining pin (2).

1. Side gear 2. Retaining pin 3. Pinion shaft

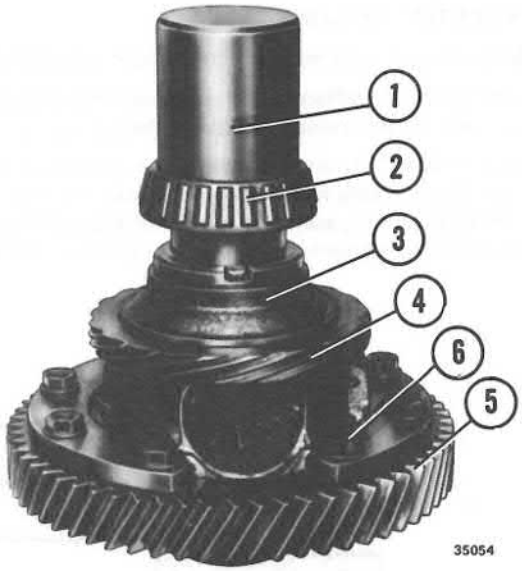


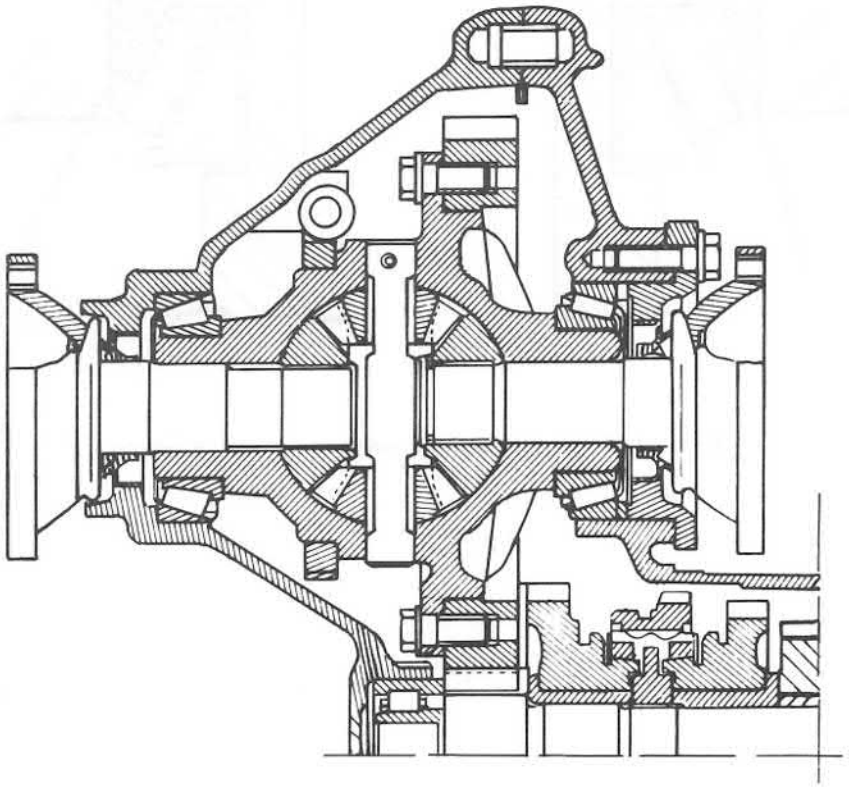
Using a suitable installer, refit speedometer drive gear.

Using installer A.70190 (1) refit bearing (2).

Install crown gear (5) with eight bolts (6).

1. Installer A.70190 2. Bearing 3. Differential case
4. Speedometer drive gear 5. Crown gear 6. Bolt





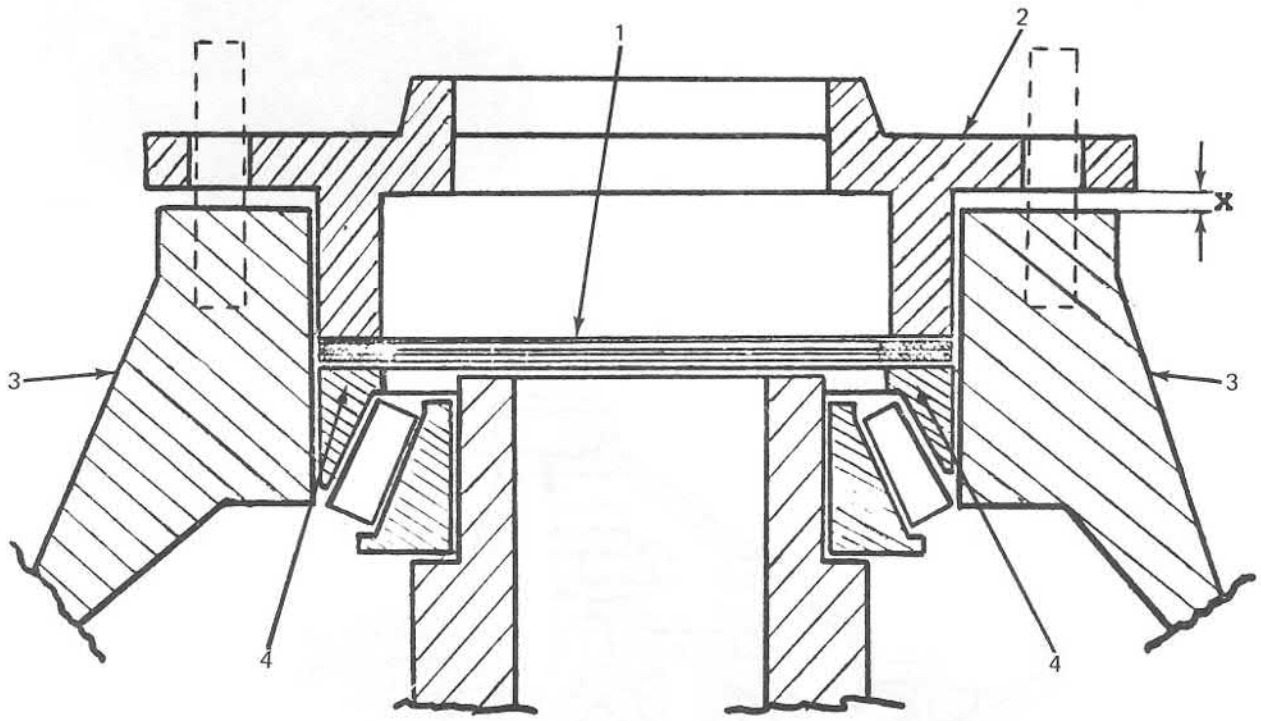
LONGITUDINAL SECTION THROUGH FINAL DRIVE UNIT

DIFFERENTIAL BEARING SETTING

NOTE: Bearing preload must not be changed unless the bearings or transmission housing has been replaced.

The bearing on the differential must be preloaded. Preload is obtained by placing shims between outer ring of the bearing and the sealing cover. To set preload, do one of the following:

If fixture A.95655 is not available, place outer ring of carrier bearing in its seat. Place shims on top of bearing. Place retaining flange on shims. Using feeler gauge measure clearance between flange and transmission housing. If clearance is not 0.003 to 0.005 in. (0.08 to 0.12mm), add or remove shims to obtain this clearance. Install two nuts on studs thru flange and tighten nuts. Turn transmission one full turn to set bearings. Loosen nuts and check clearance. Install nuts on studs. Torque nuts to 18 ft. lbs. (2.5kgm).



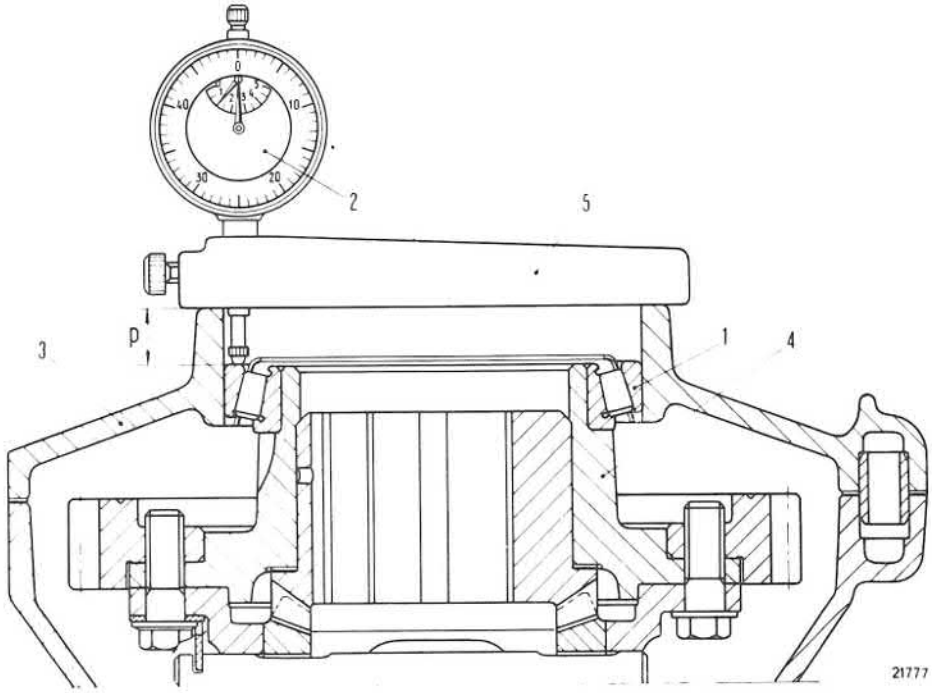
1. Shims 2. Retaining flange 3. Transmission housing 4. Bearing

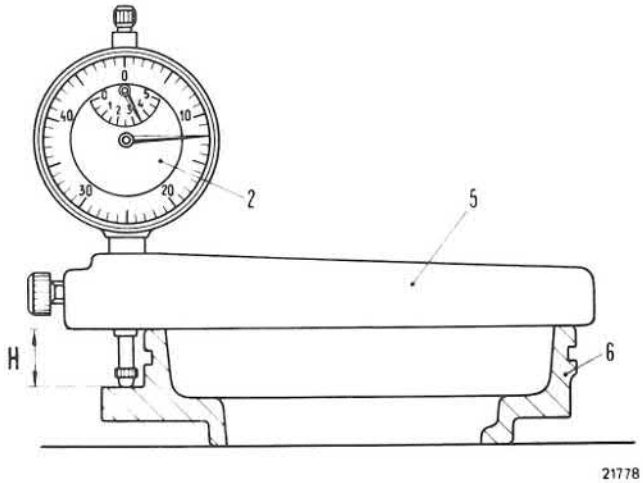
If fixture A.95655 is available, apply a load of 770 lbs. (350kg) to settle bearings. Place fixture A.95655 with dial indicator on surface for sealing cover. Set dial indicator finger against outer ring of bearing. Zero indicator.

Without changing the indicator, place fixture on sealing cover with finger on cover and case surface. Value on indicator is difference between distance "P" and height "H".

Add 0.0031 in. (0.08mm) to value on indicator to determine thickness of shims. Choose a shim with a thickness as close as possible to this value.

NOTE: Shims are supplied in the following thicknesses; 0.0196, 0.0236, 0.0275, 0.0315, 0.0354, 0.0394, 0.0433 in. (0.50, 0.60, 0.70, 0.80, 0.90, 1.00, 1.10mm).





1. Bearing 2. Dial indicator 3. Transmission case 4. Differential case 5. Tool A.95655 6. Sealing cover

P = Distance between mounting surface for cover (6) and outer ring of bearing (1).
H = Height of sealing cover.

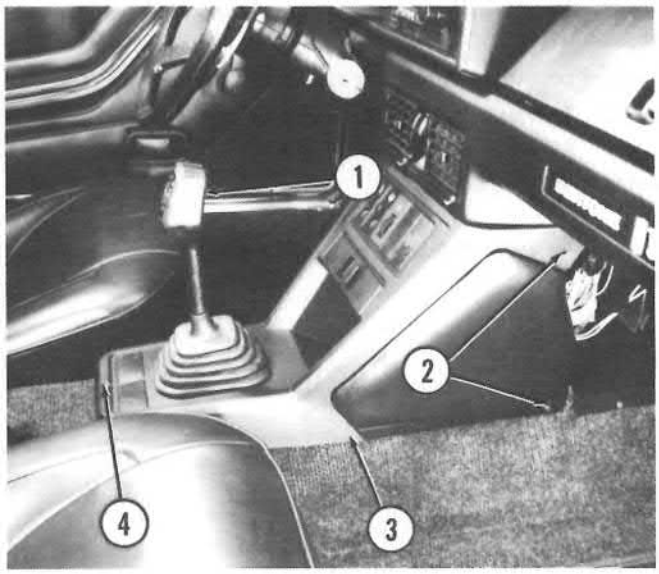
REMOVAL AND INSTALLATION

Unscrew gearshift knob (1).

Remove five screws (2 and 4) holding lower console (3).

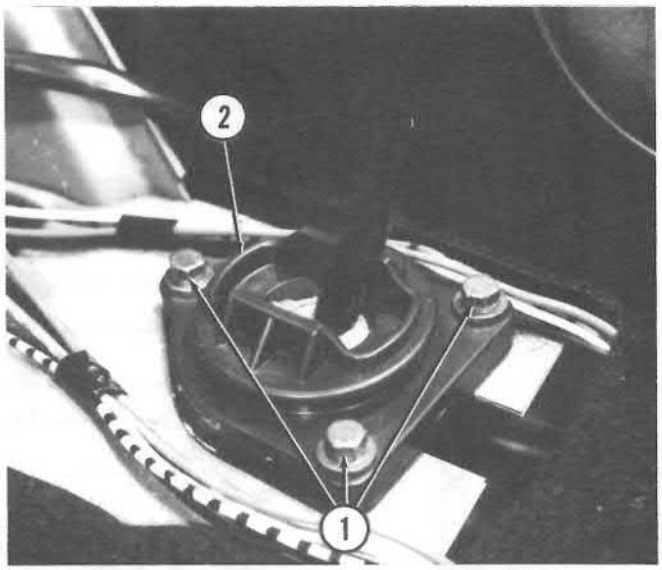
Tilt end of console up until it clears gearshift lever and lay it to one side.

1. Gearshift knob 2. Screws 3. Lower console 4. Screw



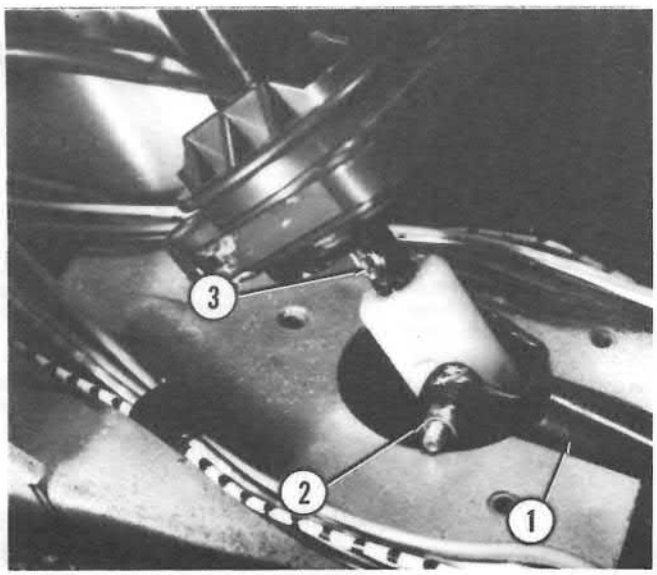
Remove three bolts (1) and washers retaining support (2).

1. Bolts 2. Support



Lift support. Remove nut (2) and bolt holding selector rod (1) to gearshift lever (3). Lift gearshift lever out of vehicle.

1. Selector rod 2. Nut 3. Gearshift lever



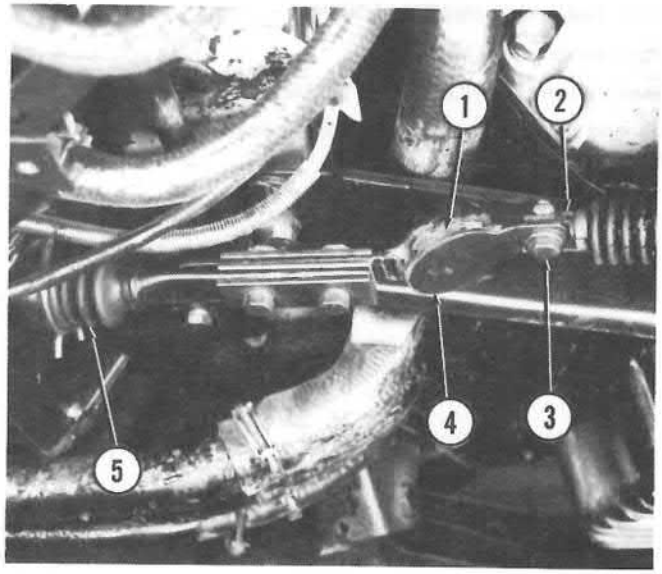
Remove bolt (3) and nut holding transmission link (4) to transmission rod (2).

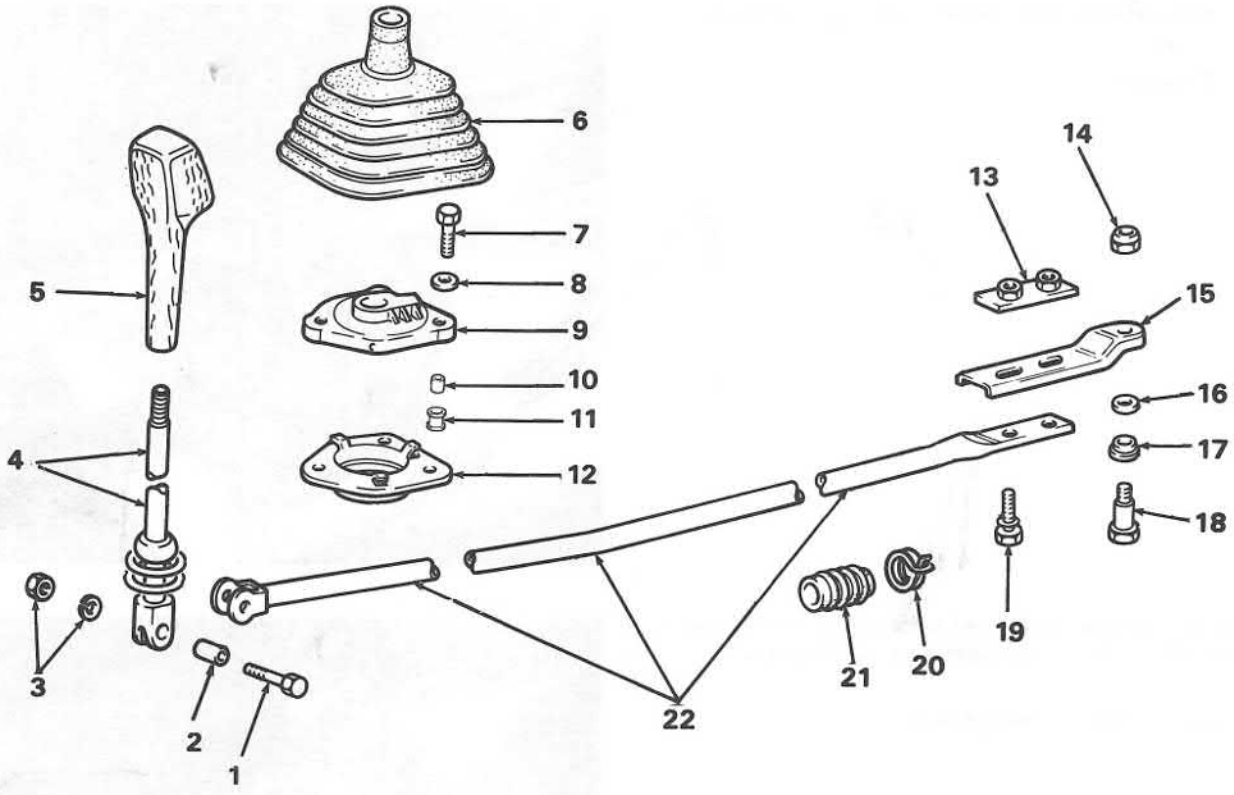
Remove boot (5). Pull selector rod out of vehicle from rear.

NOTE: Transmission link on vehicles with carburetor does not have flexible rubber coupling (1).

Install in reverse order.

1. Flexible coupling 2. Transmission rod 3. Bolt 4. Transmission link 5. Boot





1. Bolt
2. Bushing
3. Locknut and lockwasher
4. Gearshift lever
5. Gearshift knob
6. Gearshift boot
7. Bolt
8. Washer
9. Cover
10. Bushing
11. Grommet
12. Support
13. Plate
14. Nut
15. Transmission link
16. Washer
17. Bushing
18. Bolt
19. Bolt
20. Clamp
21. Boot
22. Selector rod

EXPLODED VIEW OF GEARSHIFT CONTROL ASSEMBLY (VEHICLES WITH CARBURETOR)

ADJUSTING GEARSHIFT LINKAGE

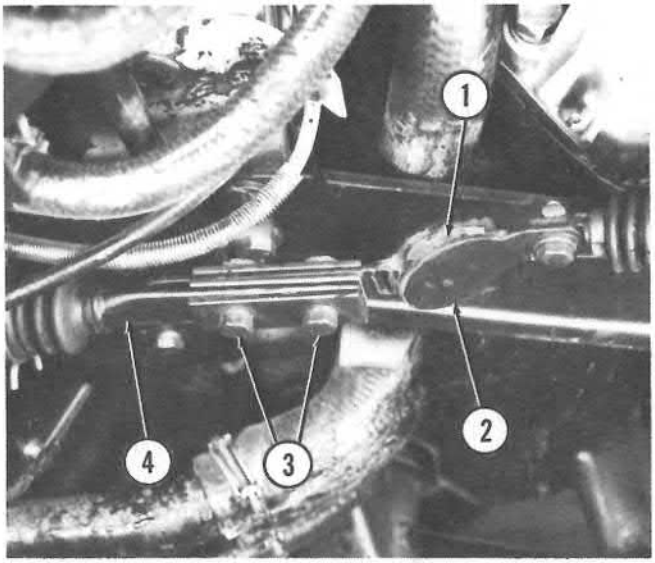
Place transmission in neutral.

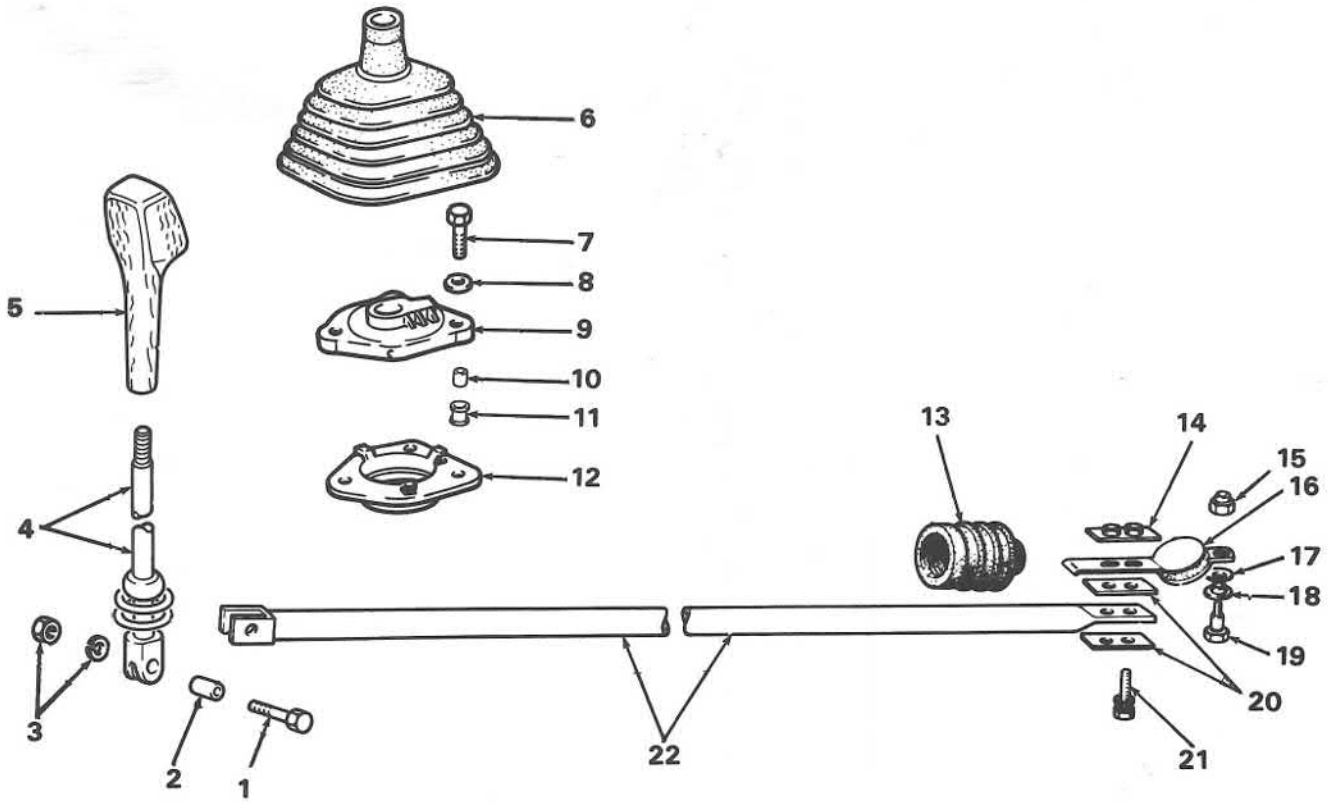
Loosen two bolts (3) holding selector rod (4) to transmission link (2).

Shift transmission link in the elongated holes until gearshift lever is in center of support and is straight up and down. Tighten bolts.

NOTE: Transmission link on vehicles with carburetor does not have flexible rubber coupling (1).

1. Flexible coupling 2. Transmission link 3. Bolts 4. Selector rod





1. Bolt
2. Bushing
3. Locknut and Lockwasher
4. Gearshift lever
5. Gearshift knob
6. Gearshift boot
7. Bolt
8. Washer
9. Cover
10. Bushing
11. Grommet
12. Support
13. Boot
14. Plate
15. Nut
16. Transmission link
17. Washer
18. Bushing
19. Bolt
20. Plates
21. Bolt
22. Selector rod

EXPLODED VIEW OF GEARSHIFT CONTROL ASSEMBLY (VEHICLES WITH FUEL INJECTION)

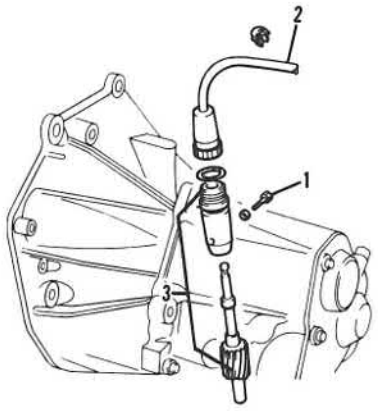
REMOVAL AND INSTALLATION

Unscrew speedometer cable (2) from speedometer drive assembly (3).

Remove locking bolt (1) holding speedometer drive in transmission housing. Withdraw speedometer drive assembly.

Installation is reverse of removal.

1. Locking bolt 2. Speedometer cable 3. Speedometer drive assembly



HALF-SHAFT

REMOVAL AND INSTALLATION

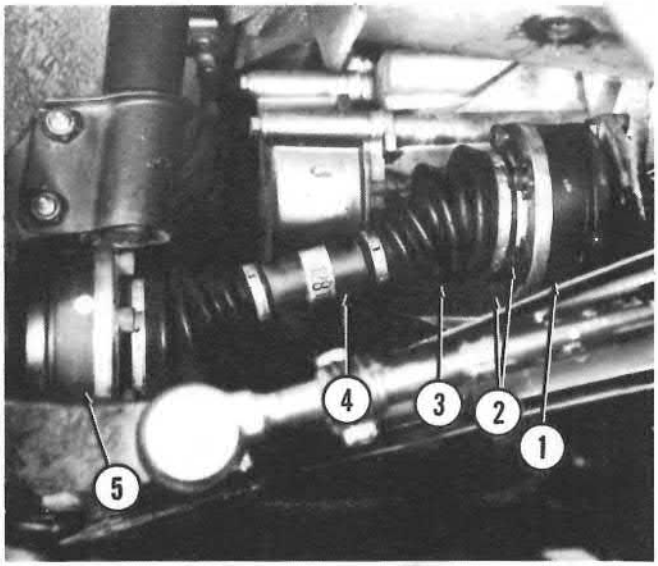
Raise vehicle and remove wheel.

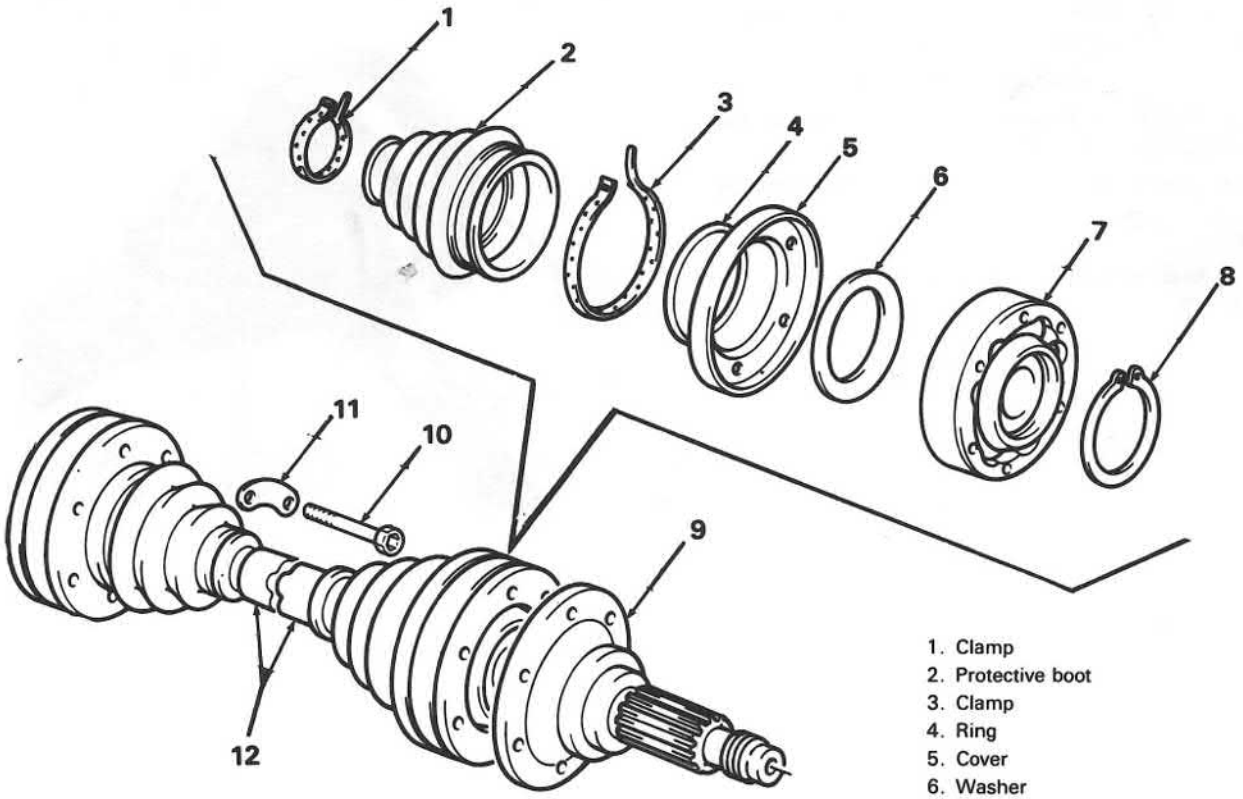
Remove six Allen head bolts (2) at each end of half-shaft. Remove half-shaft (4) complete with CV joints (1 and 5).

NOTE: Discard Allen head bolts and replace with new ones for installation.

Installation is reverse of removal. Torque new Allen head bolts to 31 ft. lbs. (4.3 kgm).

1. Inner CV joint 2. Bolts 3. Protective boot 4. Half-shaft
5. Outer CV joint





1. Clamp
2. Protective boot
3. Clamp
4. Ring
5. Cover
6. Washer
7. Constant velocity joint
8. Circlip
9. Stub shaft
10. Allen bolt
11. Plate
12. Half-shaft

EXPLODED VIEW OF AXLE SHAFT

CONSTANT VELOCITY JOINT

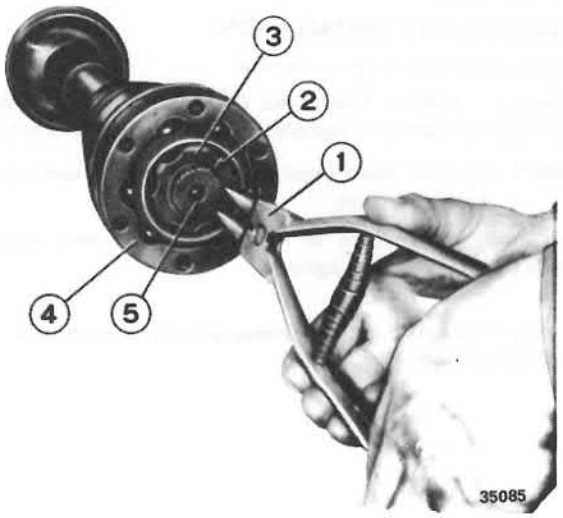
REMOVAL

To remove either CV joint, remove large clamp holding protective boot on CV joint.

Remove circlip (2) with pliers A. 81115 (1).

Slide CV joint off half-shaft (5).

1. Pliers A. 81115 2. Circlip 3. Spherical ball 4. Socket
5. Half-shaft



INSTALLATION

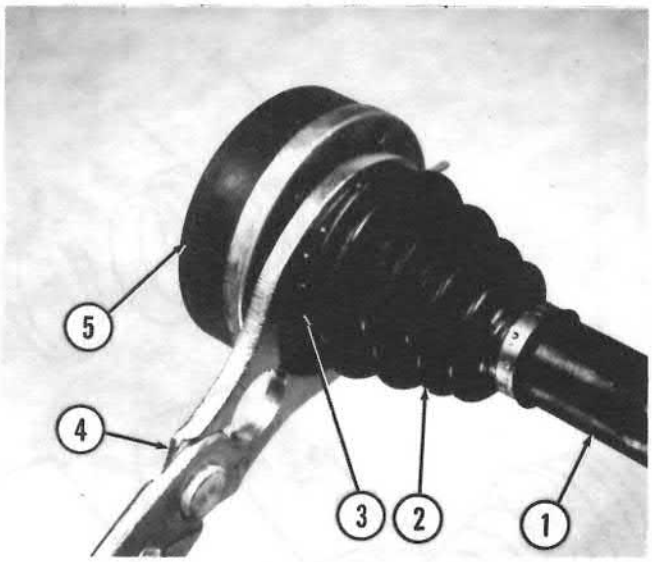
Slide CV joint onto half-shaft (1), ensuring that side with reference groove (5) faces toward end of shaft.

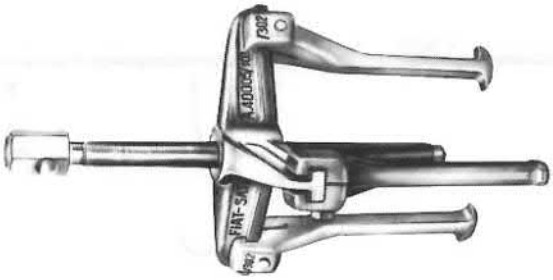
Install circlip on end of shaft with pliers A. 81115.

Grease CV joint socket and inside of protective boot (2). Use no more than 3.2 ozs. (.10 kg) of grease.

Slide boot over joint and secure clamp (3) with pliers A.81118 (4).

1. Half-shaft 2. Boot 3. Clamp 4. Pliers A.81118
5. Reference groove

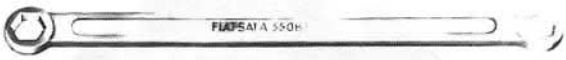




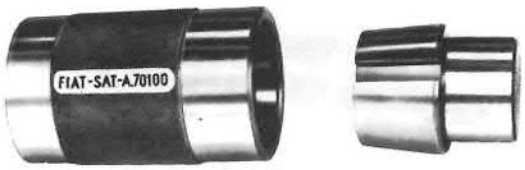
A.40005/003 Special puller and arms for removing differential bearing inner race

A.45028 Knurled spacer for extraction of differential bearing inner race

A.55035 Spin wrench for removing bell housing to engine bolts



A.55087 Ring spanner for oil level and drain plug of final drive unit



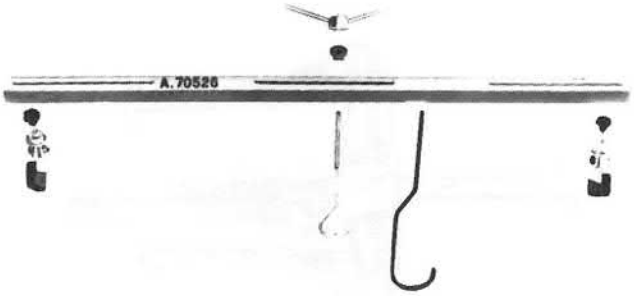
A.70100 Tool for installing circlip in 5th gear synchromesh unit

A.70173 Tool for fitting differential bearing outer race

A.70190 Tool for fitting differential bearing inner race

A.70225/23 Tool for installing circlip on 3rd and 4th gear synchromesh units

A.70296 Tool for fitting gear selector rod oil seal.



A.70526 Engine support cross rail

A.70301 Pilot for fitting gear selector rod oil seal

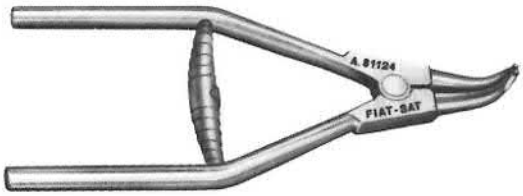
A.70575 Support used in conjunction with hydraulic jack when removing or replacing transmission unit

A.70375 Pilot for fitting seal and bushing on CV joint rubber protectors

A.71001/4 Transmission support for rotating stand Ar.22204

A.70379 Tool for fitting oil seal on transmission front cover

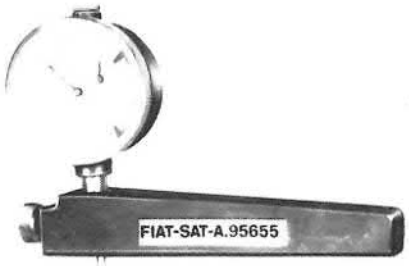
A.81118 Pliers for fitting CV joint protector boot retaining clamps



A.81124 Pliers for CV joint circlips

A.86014 Drift (14 mm) for fitting internal selector rod plugs

A.86016 Drift (16 mm) for fitting internal selector rod plugs



A.95655 Tool for determining thickness of differential bearing adjusting shims

X1/9 1979 - 1982
SERVICE MANUAL

BRAKES - 33

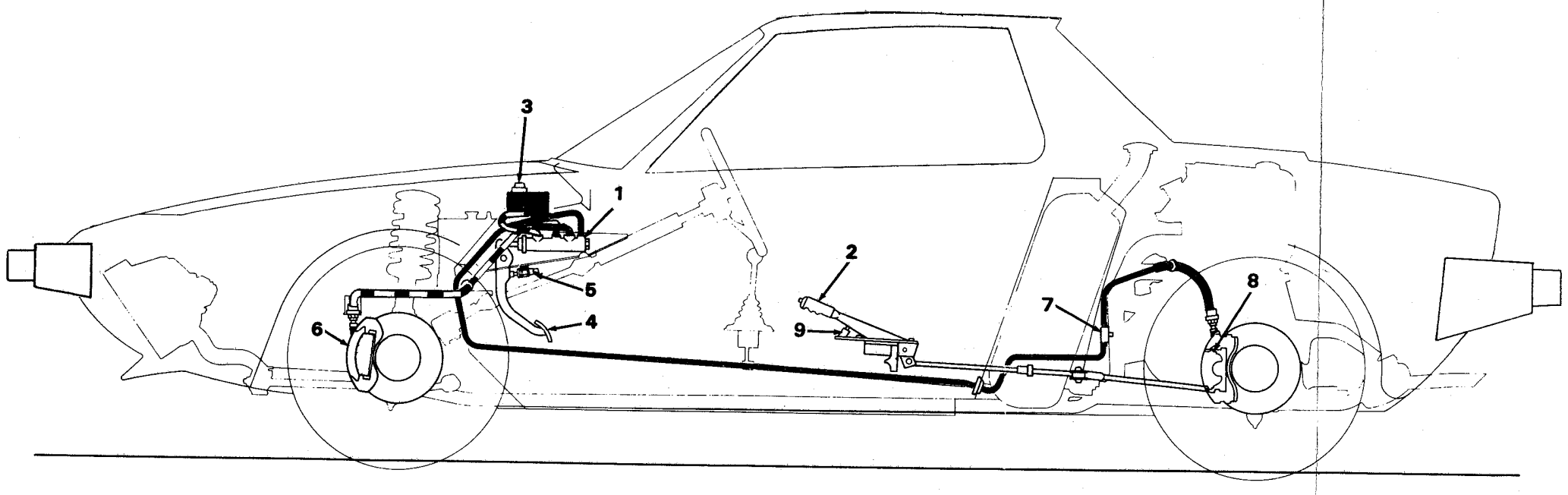
PARTS CATALOG, SERVICE MANUAL & SERVICE TIME SCHEDULE CODE

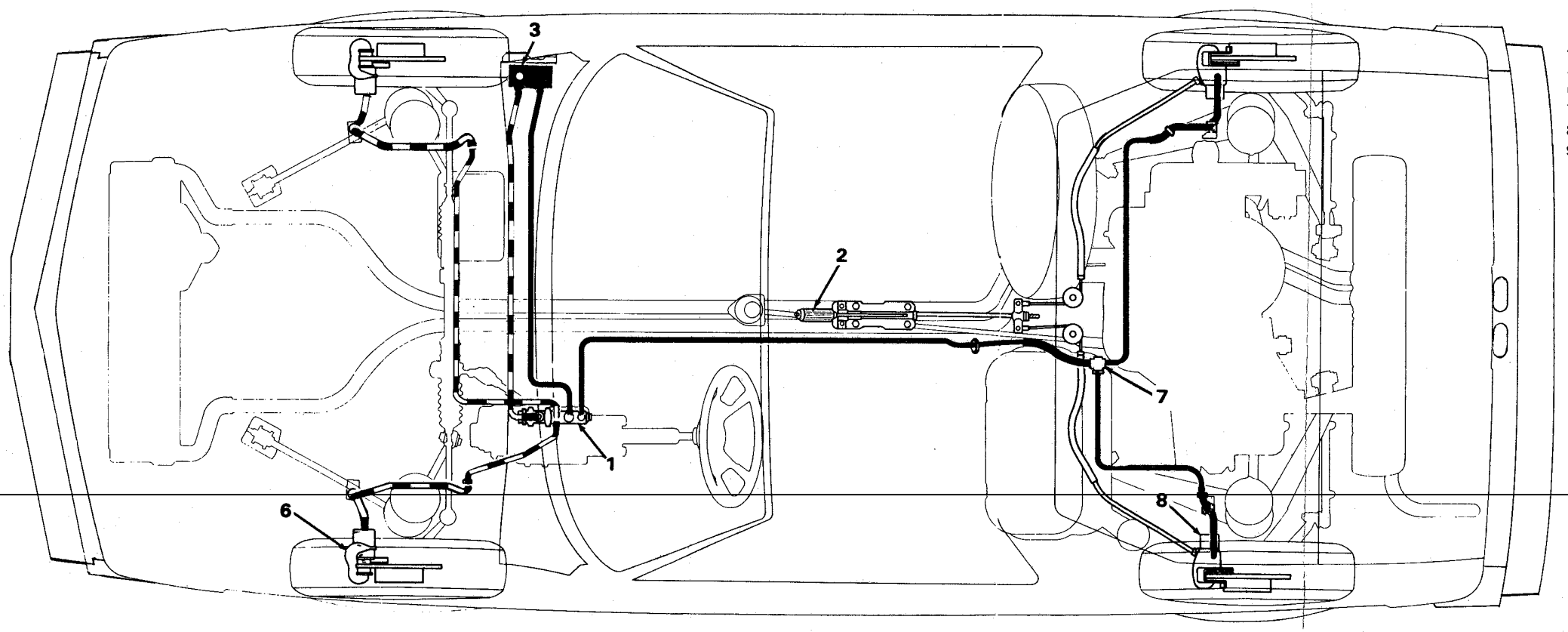
SPECIFICATIONS

DESCRIPTION	IN.	MM
Type	Disc brakes on all four wheels.	
Disc diameter	8.937	227
Disc thickness:		
— When new	0.421 to 0.429	10.7 to 10.9
— Minimum after refacing	0.368	9.35
— Minimum allowed for wear	0.354	9
Maximum runout (at 2 mm from outer edge)	0.010	0.25
Minimum permissible friction material thickness	0.059	1.5
Caliper cylinder bore diameter:		
— Front	1.889	48
— Rear	1.338	34
Master cylinder bore diameter	3/4	19.05
Hand brake for parking	Mechanical, acting on rear wheels.	
Brake fluid	DOT 3 Motor Vehicle Brake Fluid to F.M.V.S.S. No. 116	

TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N•m	Kgm	Ft. Lb.
Nut, master cylinder to pedal support bolt	M 8	24.4	2.5	18
Bolt, brake caliper support bracket	M 10 x 1.25	47	4.7	35
Bolt, hand brake support	M 8	15	1.5	11
Union bolt, front brake hose to caliper	3/8 24 UNF 2A	28	2.8	20





HYDRAULIC BRAKES AND HAND BRAKE SYSTEM

1. Master cylinder
2. Hand brake lever
3. Brake fluid reservoir
4. Brake pedal
5. Stop light switch
6. Front brake calipers
7. Rear brake "T" connection
8. Rear brake calipers
9. Hand brake indicator switch

FRONT WHEEL BRAKES

REAR WHEEL BRAKES

BRAKE PEDAL ASSEMBLY

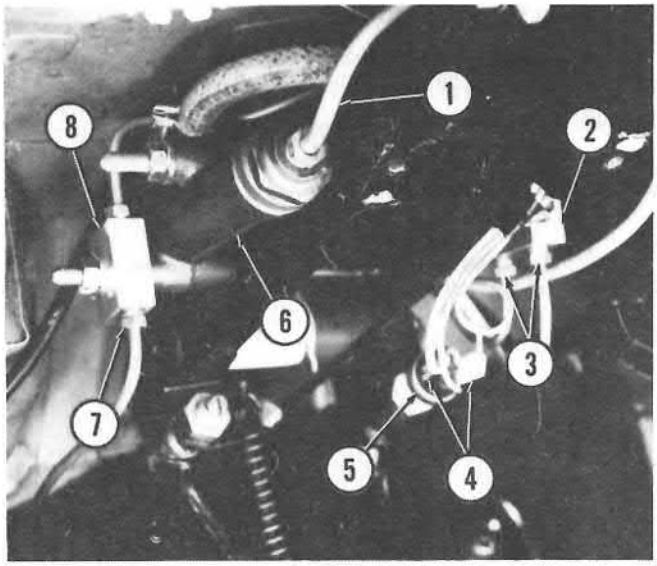
REMOVAL AND INSTALLATION

Siphon fluid from brake and clutch reservoirs. Remove steering column. Refer to 412.01.

Place a container on floor of vehicle to catch fluid. Disconnect brake lines (3 and 7) from junction blocks (2 and 8). Cap lines.

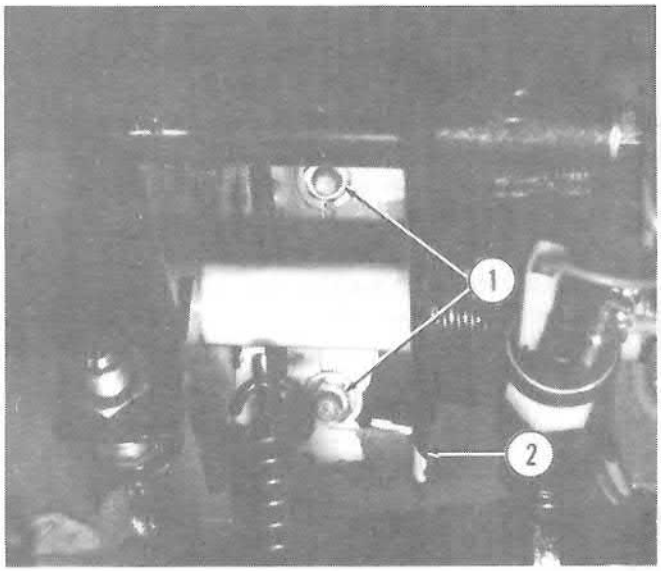
Disconnect clutch line (1) from clutch master cylinder (6). Cap line.

Remove wires (4) from brake light switch (5).



1. Clutch line 2. Junction block 3. Brake lines 4. Wires
5. Brake light switch 6. Clutch master cylinder 7. Brake line
8. Junction block

Remove two nuts (1) and washers holding pedal support bracket (2) to firewall.



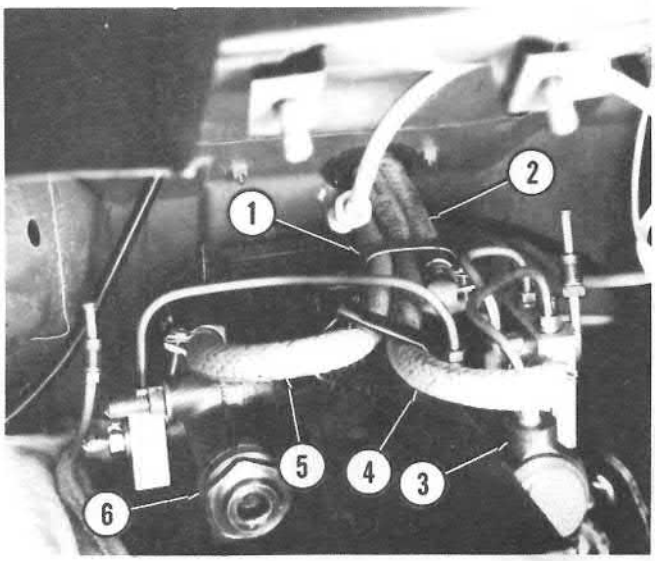
1. Nuts 2. Pedal support bracket

Lower pedal assembly far enough to allow removal of hose (5) from clutch master cylinder (6) and hoses (2 and 4) from brake master cylinder (3).

Remove screw from strap (1) holding hoses to support bracket.

Remove pedal assembly from vehicle.

Install in reverse order. Use new hose clamps. Fill reservoirs, bleed brake and clutch systems, and check for leaks.



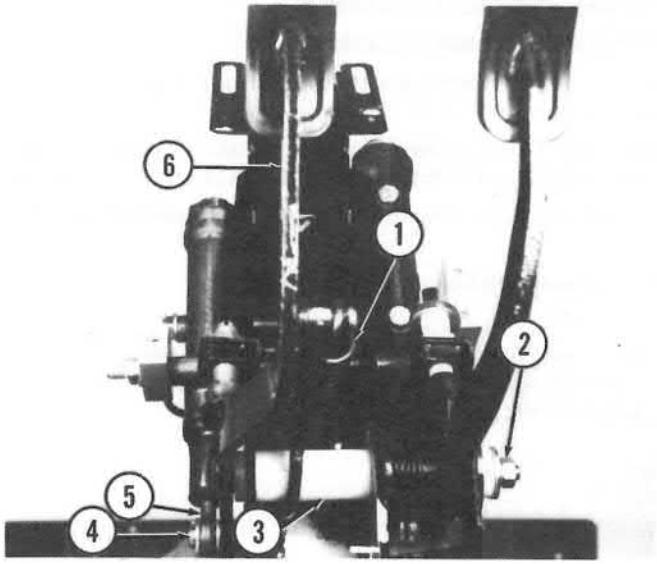
1. Strap 2. Brake hose 3. Brake master cylinder 4. Brake hose
5. Clutch hose 6. Clutch master cylinder

DISASSEMBLY AND REASSEMBLY

Remove cotter pin and washer from clevis pin (4). Pry clutch master cylinder rod (5) off clevis pin.

Remove spring (1) from clutch pedal (6).

Remove nut (2) and two washers from end of clutch pedal shaft. Slide clutch pedal and shaft out of nylon bushing (3).



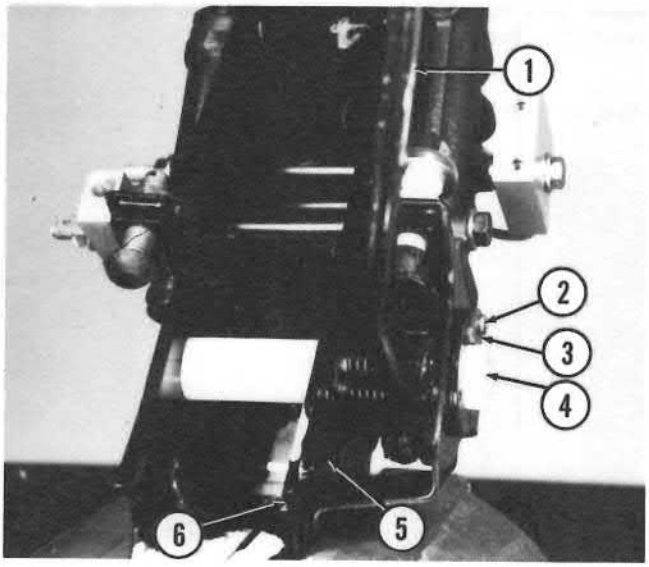
1. Clutch pedal spring 2. Nut 3. Bushing 4. Clevis pin
5. Cylinder rod 6. Clutch pedal

Take end of spring (5) out of pedal support bracket (6).

Remove screw (2) and retaining plate (3) holding nylon bushing (4). Slide bushing out of support bracket.

Remove brake pedal (1) with master cylinder rod attached.

Inspect nylon bushing and replace if worn excessively. Lubricate all bearing surfaces with white grease and reassemble in reverse order of disassembly.



1. Brake pedal 2. Screw 3. Retaining plate 4. Bushing
5. Spring end 6. Pedal support bracket

MASTER CYLINDER

REMOVAL AND INSTALLATION

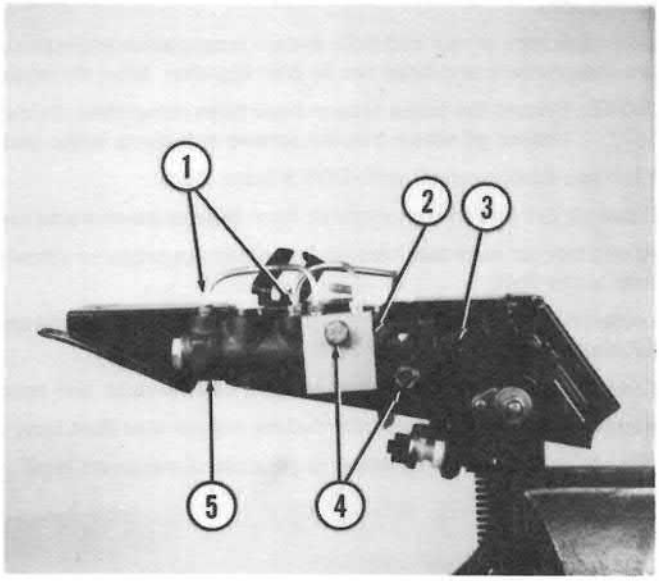
Remove brake pedal assembly. Refer to 331.01.

Disconnect three brake lines (1) from master cylinder (5).

Remove nuts from two bolts (4) holding master cylinder. Remove bolts and junction block (2).

Pull master cylinder out and off of cylinder rod (3).

Install in reverse order, making sure all parts and fittings are clean.



1. Brake lines 2. Junction block 3. Cylinder rod 4. Bolts
5. Master cylinder

OVERHAUL

Remove two connectors (2) and seals (3).

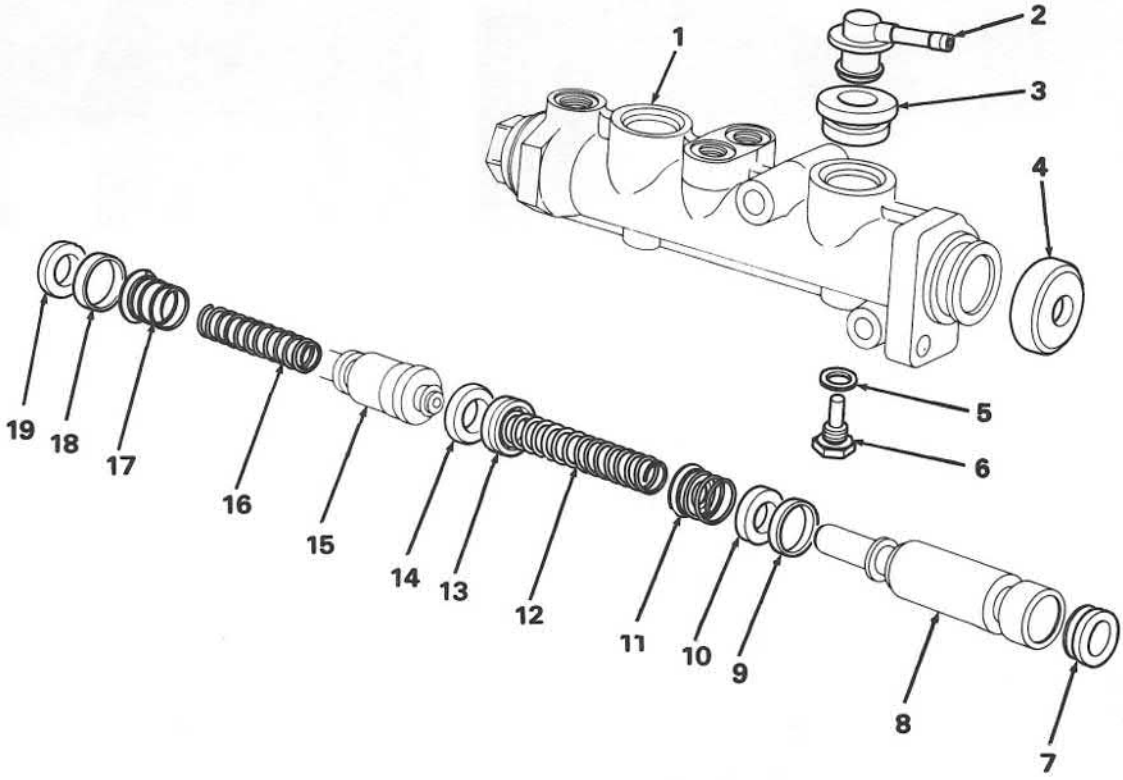
Remove dust boot (4).

Remove two stop bolts (6) and seals (5).

Remove remaining internal parts (items 7 through 19) from cylinder (1).

Carefully inspect cylinder bore and piston surfaces. They should have a mirror-like finish without any kind of roughness. The cylinder bore can be honed to prevent leaks or excessive wear of seals and pistons. Do not increase size of bore. Replace seals and dustcovers. Clean all parts with denatured alcohol and lubricate with brake fluid. Reassemble in reverse order of disassembly.

1. Cylinder body
2. Connector
3. Seal
4. Boot
5. Seal
6. Stop bolt
7. Seal
8. Rear piston
9. Spacer
10. Seal
11. Spring and cup
12. Spring
13. Cup
14. Flat washer
15. Front piston
16. Spring
17. Spring and cup
18. Spacer
19. Seal



EXPLODED VIEW OF MASTER CYLINDER

BLEEDING

When the front or rear hydraulic system is opened for any reason, it must be bled to remove all entrapped air. The front and rear systems are independent and need not be bled together. After all repairs are made, proceed as follows:

NOTE: Should the brake system have been completely drained, it is advisable to carry out the following operation before bleeding: Loosen all wheel bleeder screws and pump brake pedal, as fluid begins to escape tighten bleeder screws.

Fill brake fluid reservoir with DOT 3 brake fluid.

Clean all dirt and foreign material from bleeder screws and remove protective cap.

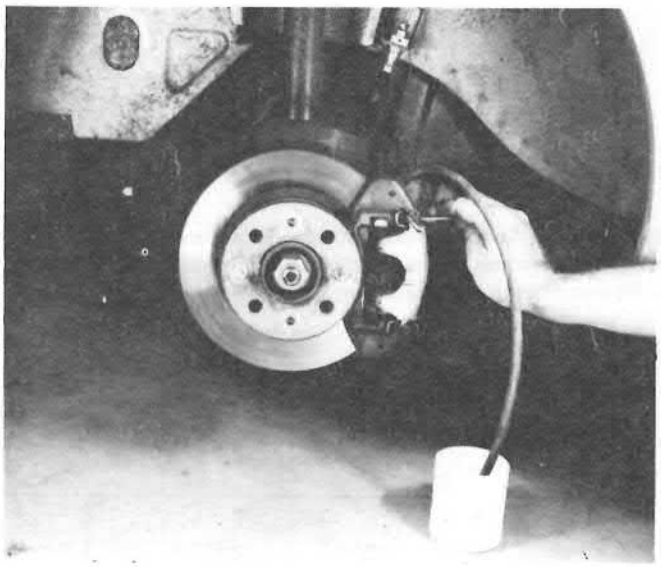
Attach bleeder hose over bleeder fitting in brake caliper or wheel cylinder. Submerge other end of bleeder hose into a clean jar half filled with brake fluid.

Loosen bleeder screw one or two turns and press brake pedal down, allowing it to return slowly; do this several times until no more air bubbles escape from rubber hose.

Keeping brake pedal depressed, remove bleeder hose and tighten bleeder screw. Refit protection cap.

Repeat above on other wheels, making certain that fluid level in reservoir is maintained.

After bleeding, top up reservoir to prescribed maximum level.



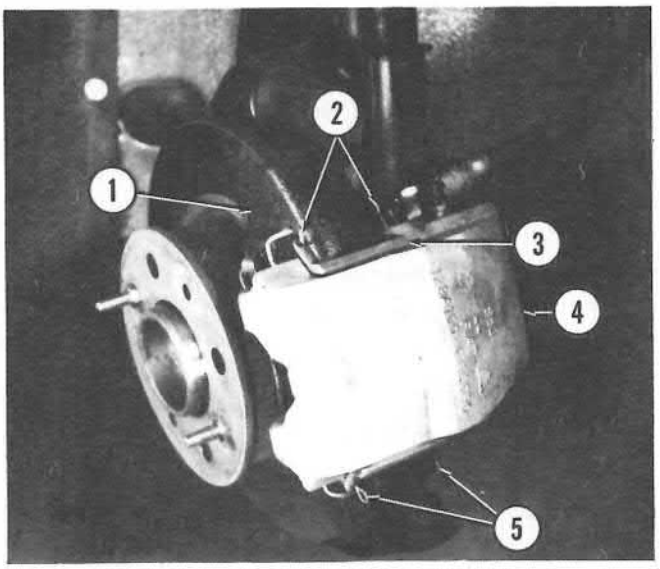
CALIPER AND PADS

REMOVAL AND INSTALLATION

Remove wheel.

Remove four cotter pins (2 and 5) from two caliper locking blocks (3).

Use a drift to drive out locking blocks.

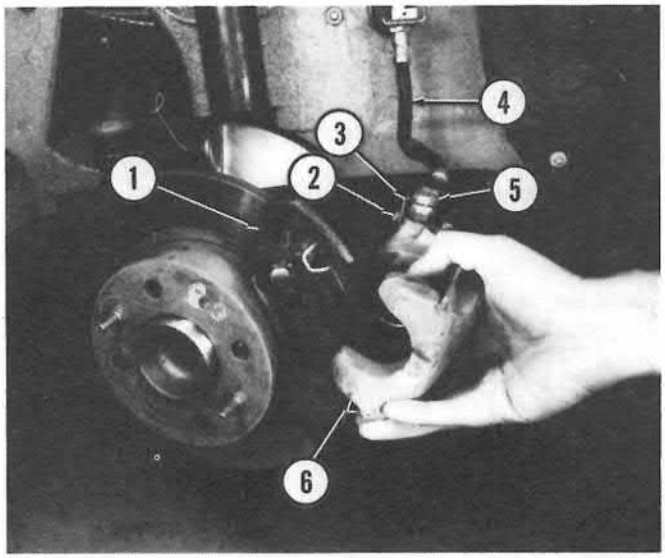


1. Support bracket 2. Cotter pins 3. Locking block 4. Caliper 5. Cotter pins

Separate caliper (6) from support bracket (1).

On front brakes, to remove caliper for replacement or overhaul, remove bolt (2) holding bracket (3) to caliper.

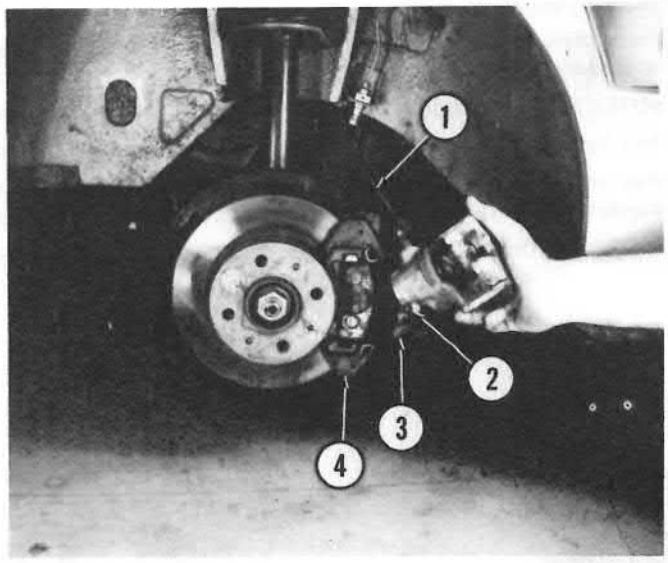
Remove union bolt (5) holding hose (4). Remove gaskets.



1. Support bracket 2. Bolt 3. Bracket 4. Hose 5. Union bolt 6. Caliper

On rear brakes, to remove caliper for replacement or overhaul, disconnect hose (1) from caliper (3). Remove gaskets.

Disconnect hand brake cable (2) from caliper.



1. Hose 2. Cable 3. Caliper 4. Support bracket

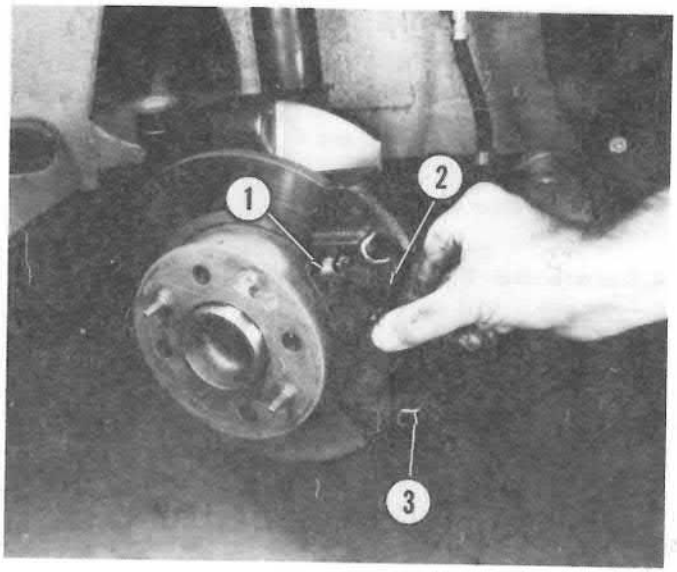
Remove two brake pads (2).

Inspect two retainer springs (1) and two caliper springs (3) for breakage. Replace if necessary.

NOTE: Retainer springs on early type brake systems are a different type than those illustrated. See exploded view in section 331.25.

Install in reverse order.

1. Retainer spring 2. Brake pad 3. Caliper spring



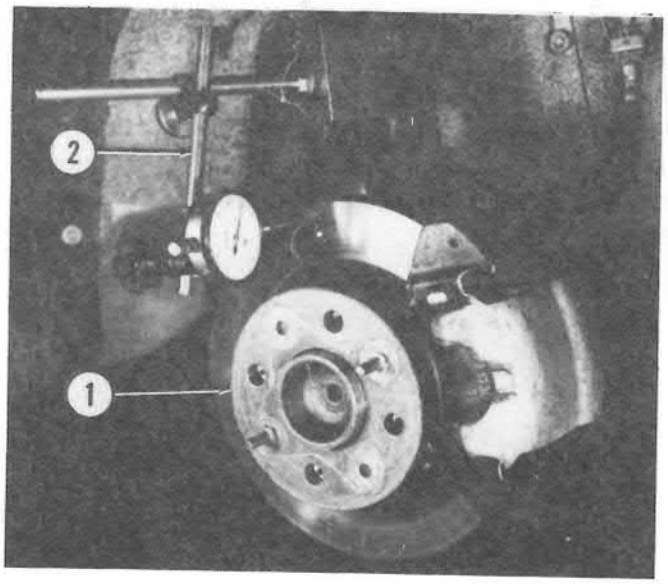
Check disc (1) for runout by placing a dial indicator (2) 0.08 in. (2 mm) from disc outer edge.

Runout must not be greater than 0.010 in. (0.25 mm), otherwise reface disc.

Thickness of disc after refacing must not be less than 0.368 in. (9.35 mm).

Minimum permissible thickness from wear is 0.354 in. (9 mm). Replace disc if less.

1. Brake disc 2. Dial indicator



Install in reverse order of removal.

If new brake pads are being installed, it will be necessary to fully seat caliper pistons in bore in order to have installation clearance for calipers. Push in on center of piston with blunt object (hammer handle, etc.)

NOTE: Brake fluid will back up into master cylinder and may overflow.

Place light coat of grease on locking blocks and contact surfaces of caliper and support bracket.

After installing caliper, install lower locking block first, then with hand pressure against front of caliper, force caliper back far enough to insert top locking block. If caliper hydraulic lines have been disconnected, bleed system (refer to BLEEDING HYDRAULIC SYSTEM).

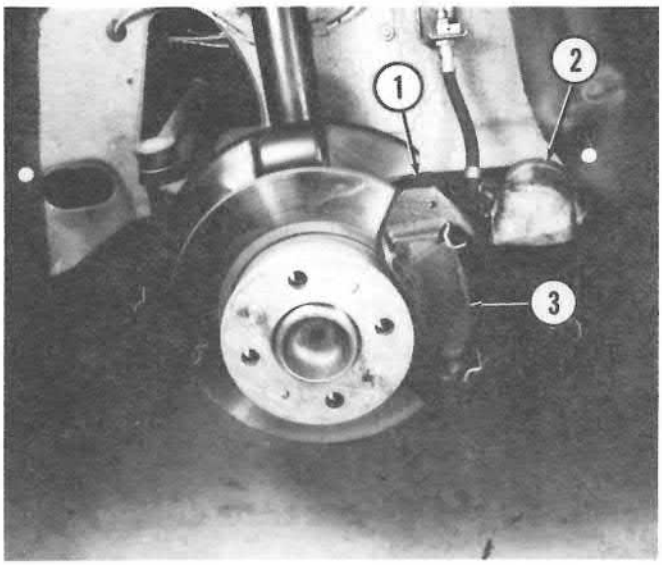
CAUTION: Before driving vehicle, pump brake pedal a few times to make cerain caliper pistons are seated against pads and pedal is firm.

DISC AND BACKING PLATE

REMOVAL AND INSTALLATION

Remove caliper and pads. Refer to Caliper and Pads Removal and Installation.

Remove caliper support bracket (1) by removing two bolts and lockwashers on back face of bracket.



1. Caliper support bracket 2. Caliper 3. Disc

Remove locating pins (1). Remove disc (2).

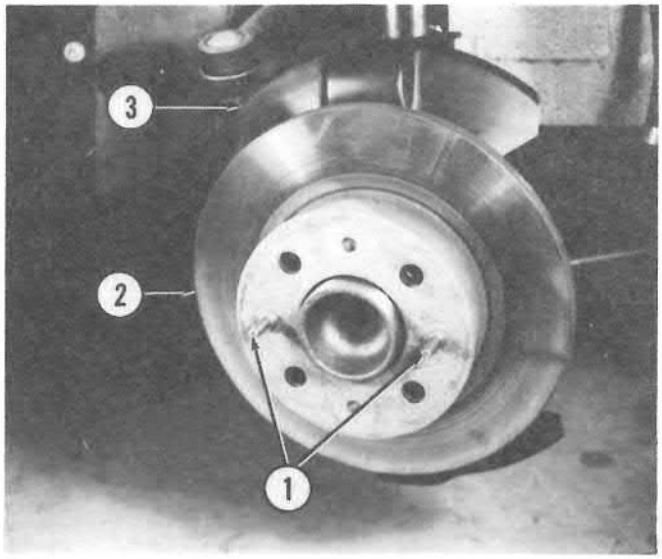
To remove backing plate (3), remove bolt and washers.

Inspect disc for scoring or cracks.

For runout greater than 0.010 in. (0.25 mm) and/or scoring, discs can be refaced to a minimum thickness of 0.368 in. (9.35 mm).

Replace discs if cracked.

Install in reverse order. Torque caliper support bracket bolts to 35 ft. lbs. (4.8 kgm).



1. Locating pins 2. Disc 3. Backing plate

OVERHAUL

Remove caliper. Refer to 331.17/.25

Remove dust boot (4).

Apply compressed air through brake fluid hose connection to force piston (3) out of caliper (1).

WARNING: Apply air pressure gradually or piston will eject at high velocity.

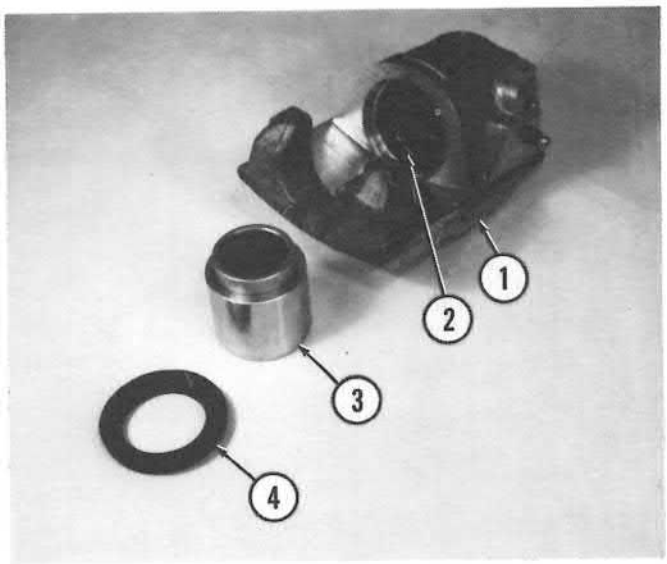
Remove seal (2).

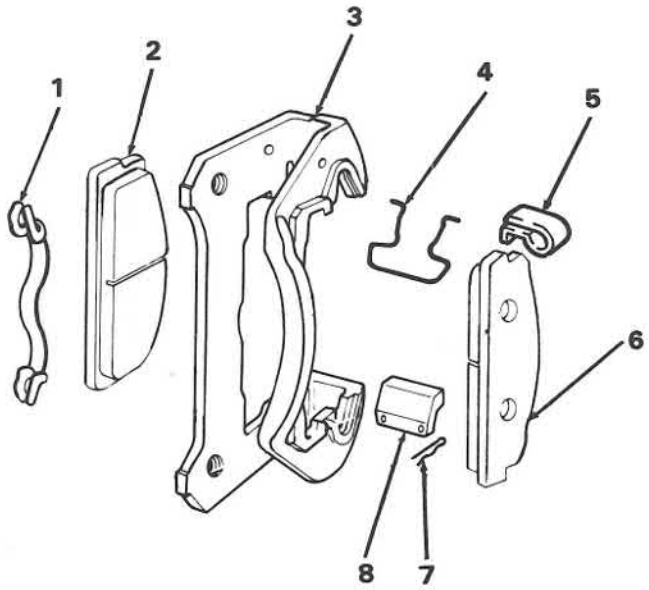
Check piston and caliper cylinder for scoring or binding.

Install seal in caliper. Place piston in caliper. Push piston in until it bottoms.

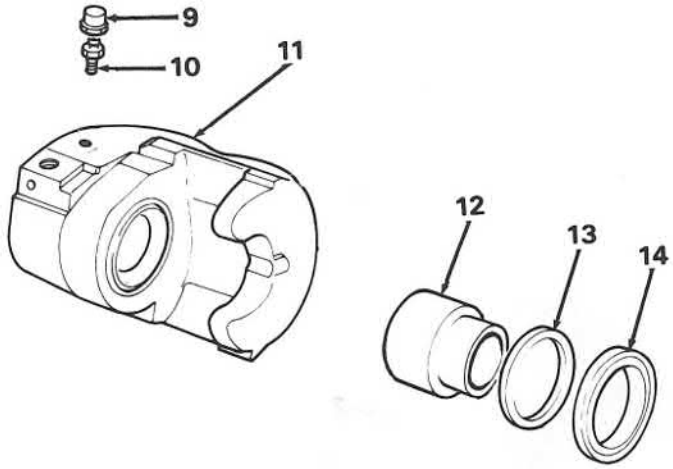
Install dust boot, making sure it is seated in groove in caliper body.

1. Caliper 2. Seal 3. Piston 4. Dust boot





1. Lining retainer spring (early type)
2. Lining pad
3. Caliper support bracket
4. Spring
5. Lining retainer spring (late type)
6. Lining pad
7. Cotter pin
8. Caliper locking block
9. Dust cap
10. Bleeder screw
11. Caliper body
12. Piston
13. Seal
14. Dust boot



EXPLODED VIEW OF FRONT CALIPER AND BRACKET COMPONENTS

OVERHAUL

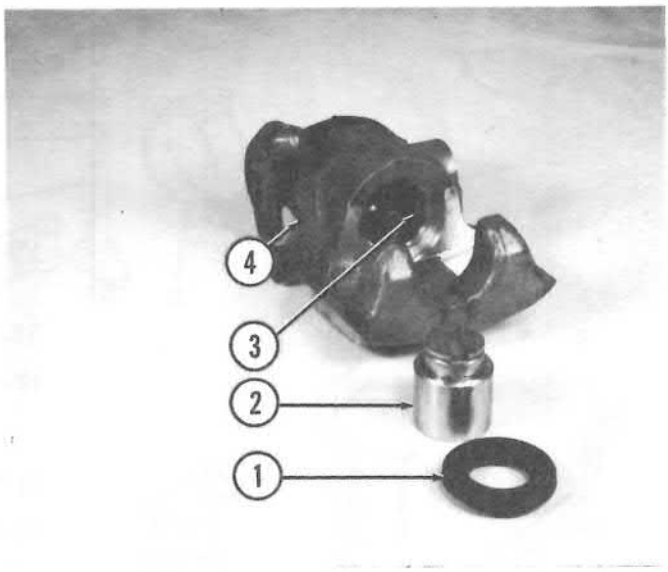
Remove caliper. Refer to 331.17/.25.

Remove dust boot (1).

Unscrew piston (2) from plunger. Use screwdriver in slot.

Remove seal (3) from caliper (4).

1. Dust boot 2. Piston 3. Seal 4. Caliper



To disassemble hand brake mechanism, remove lock ring (7) from shaft (1). Compress plunger (4) to relieve spring tension, then remove shaft.

Remove plunger (4), seal (3) and spring washers (6).

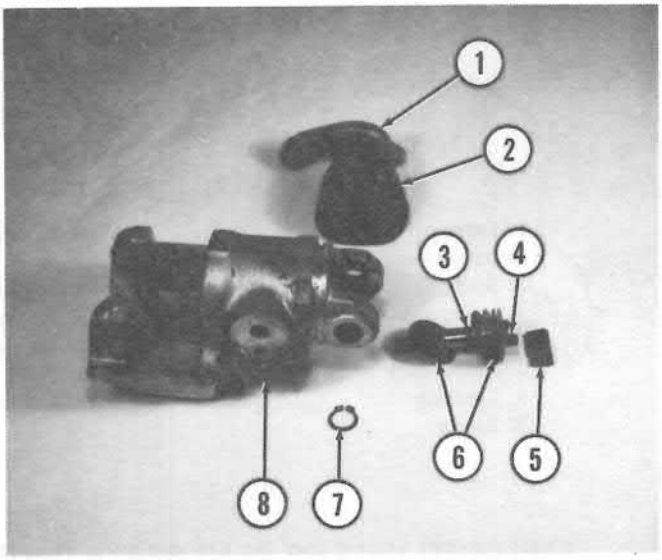
To reassemble, place plunger with seal and spring washers in caliper (8).

Place hand brake shaft in boot (2).

Place shaft and pawl (5) in caliper. Install lock ring.

Coat lever and plunger with grease.

1. Shaft 2. Boot 3. Seal 4. Plunger 5. Pawl 6. Spring washers 7. Lock ring 8. Caliper

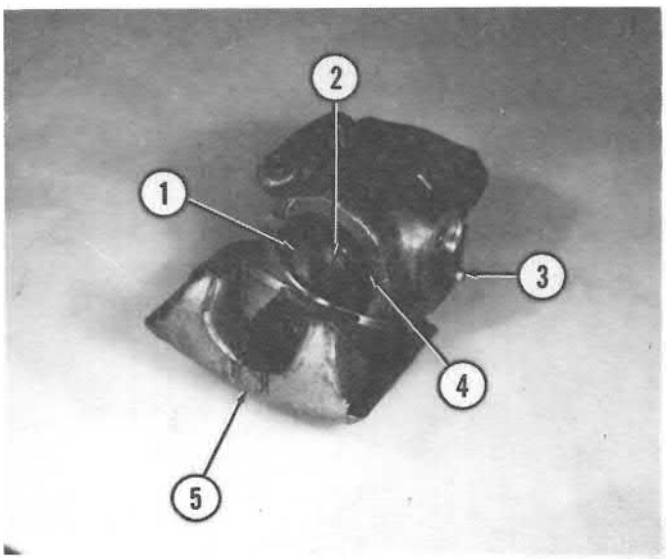


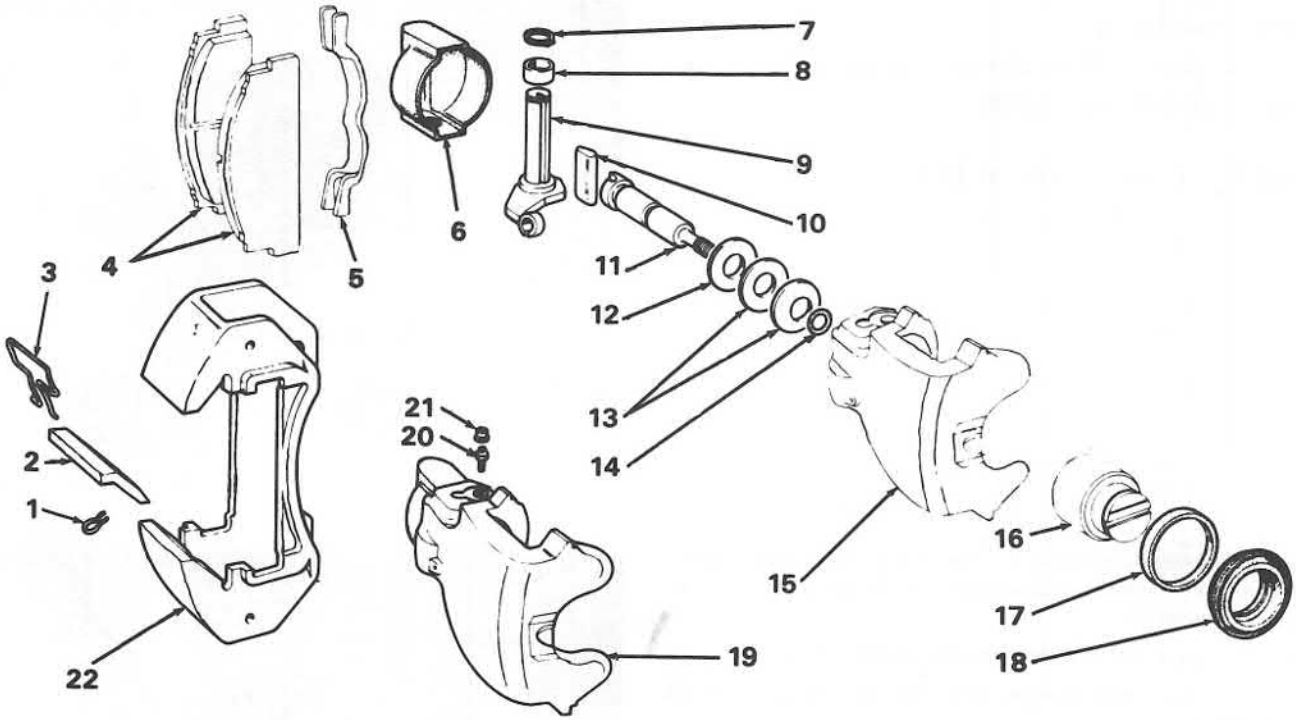
Install seal in caliper cylinder.

Screw piston (1) on plunger until it is seated. Make sure mark (2) on piston is on side of caliper (5) with bleed fitting (3).

Install rubber boot (4). Make sure boot is seated in groove in caliper.

1. Piston 2. Mark 3. Bleed fitting 4. Boot 5. Caliper





1. Cotter pin
2. Caliper locking block
3. Spring
4. Lining pads
5. Lining retainer spring
6. Rubber boot
7. Lock ring
8. Spacer
9. Hand brake shaft
10. Pawl
11. Plunger
12. Spring washer
13. Spring washers
14. Seal
15. Caliper cylinder
16. Piston
17. Seal
18. Dust boot
19. Complete caliper
20. Bleeder screw
21. Bleeder boot
22. Support bracket

EXPLODED VIEW OF REAR BRAKE CALIPER AND BRACKET COMPONENTS

ADJUSTMENT

Press brake pedal a few times.

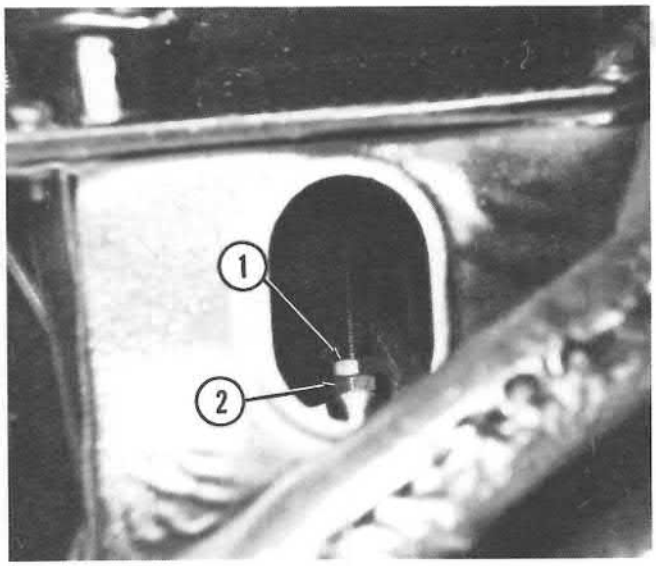
Starting from a released position, pull hand brake lever up three or four clicks.

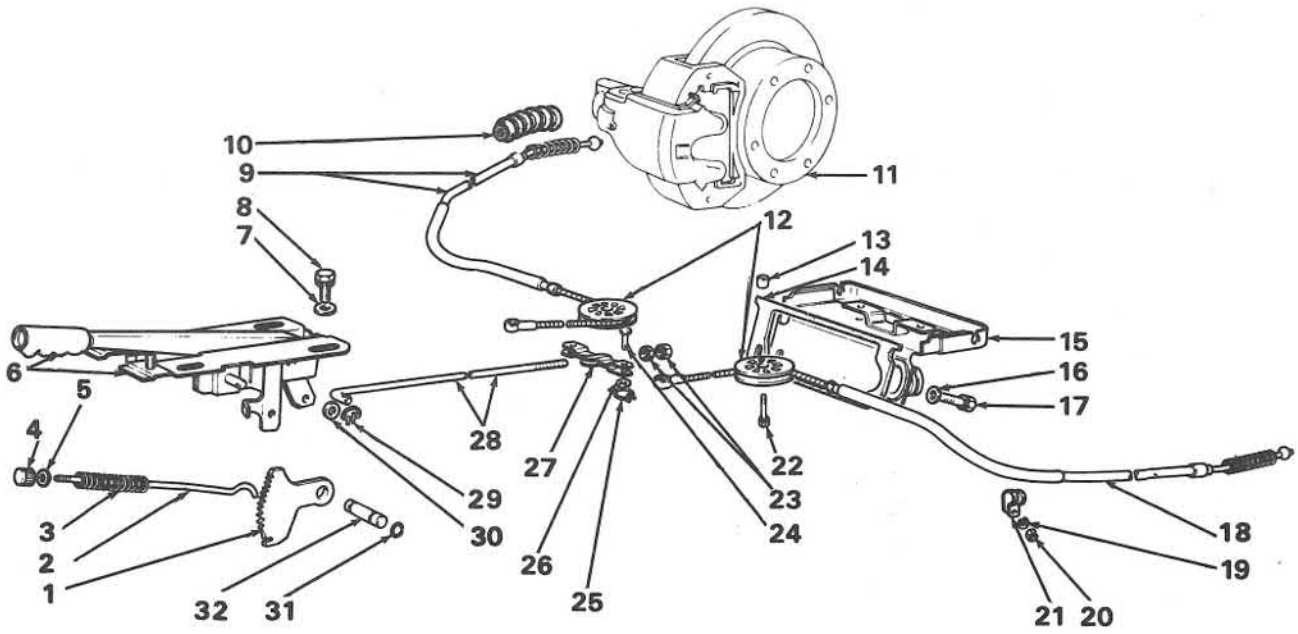
From under car, remove rubber cover. Loosen locknut (1).

Tighten adjusting nut (2) until wheels are locked (try to turn wheels manually). Tighten locknut.

Release hand brake. Check that wheels are free to turn.

1. Locknut 2. Adjusting nut





1. Ratchet
2. Rod
3. Spring
4. Button
5. Rubber ring
6. Lever
7. Washer
8. Bolt
9. Cable
10. Boot
11. Caliper
12. Pulley
13. Spacer
14. Gasket
15. Support
16. Washer
17. Bolt
18. Cable
19. Lockwasher
20. Nut
21. Clamp
22. Bolt
23. Nuts
24. Pin
25. Clip
26. Washer
27. Swinging arm
28. Tie rod
29. Clip
30. Washer
31. Lock ring
32. Pin

EXPLODED VIEW OF HAND BRAKE LINKAGE

A.56126 Wrench for brake line fittings

X1/9 1979 - 1982
SERVICE MANUAL

STEERING - 41

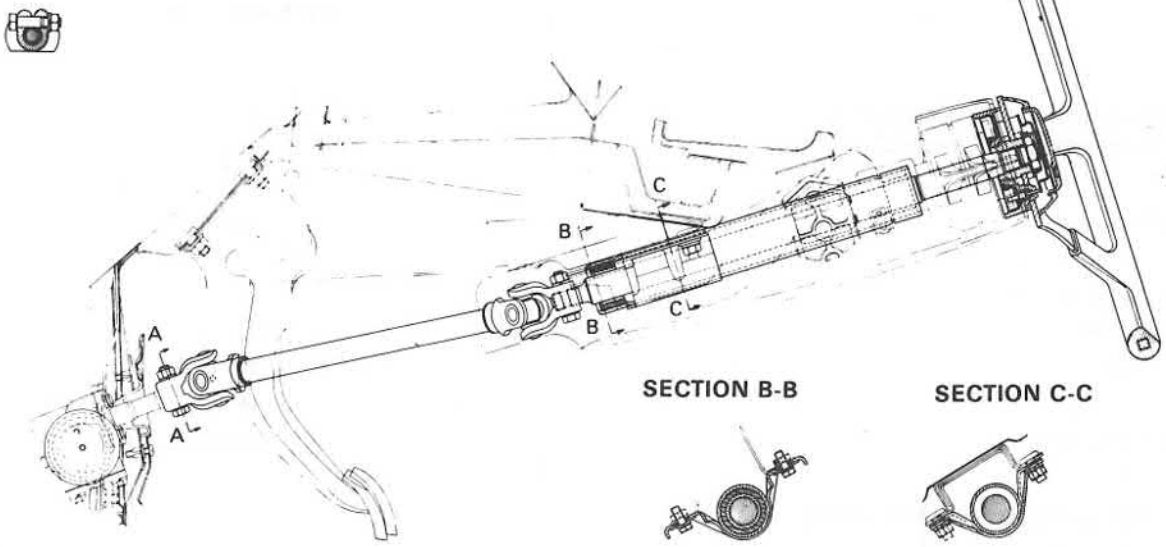
SPECIFICATIONS

Type	Rack and pinion
Ratio:	
— Steering wheel turns, lock to lock	3
— Corresponding rack travel	4.6 in. (117 mm)
Pinion bearings	Two, ball type
Pinion adjustment:	
— Early type	By shims
— Late type	By threaded retainer
Rack adjustment	By shims
Minimum diameter of turning circle	32.5 ft. (9.9 m)
Tie rods	Adjustable, with fixed end ball joints
Steering angles:	
— Outer wheel	28°
— Inner wheel	32° 40′
Front wheel toe-in	+3/32 to +5/64 in. (+2.5 to +6.0 mm)
Steering column	Breakaway type, two universal joints
Steering box capacity	5.3 oz. (.127 kg)
Steering box lubricant	SAE 90 EP oil or lithium-base grease with molybdenum disulphide

TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N•m	Kgm	Ft. Lb.
Nut, steering wheel to column	M 16 x 1.5	49	5	36
Nut, tie rod ball joint to rack	M 14 x 1	49	5	36
Nut, self-locking, ball joint to steering knuckle	M 10 x 1.25	35	3.5	25
Nut, steering box to body bolt	M 8	24.4	2.5	18
Nut, universal joint	M 8	24.4	2.5	18
Nut, upper steering column support	M 8	15	1.5	11

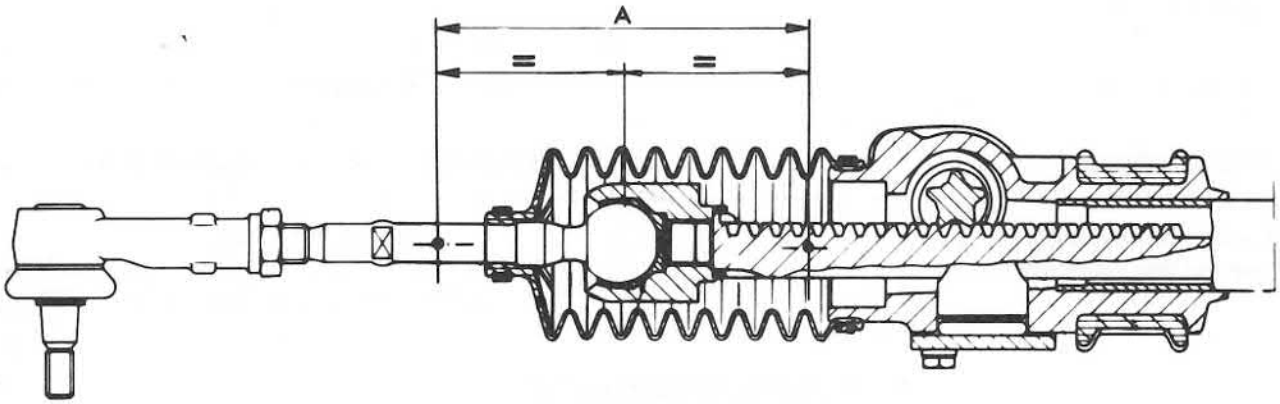
SECTION A-A



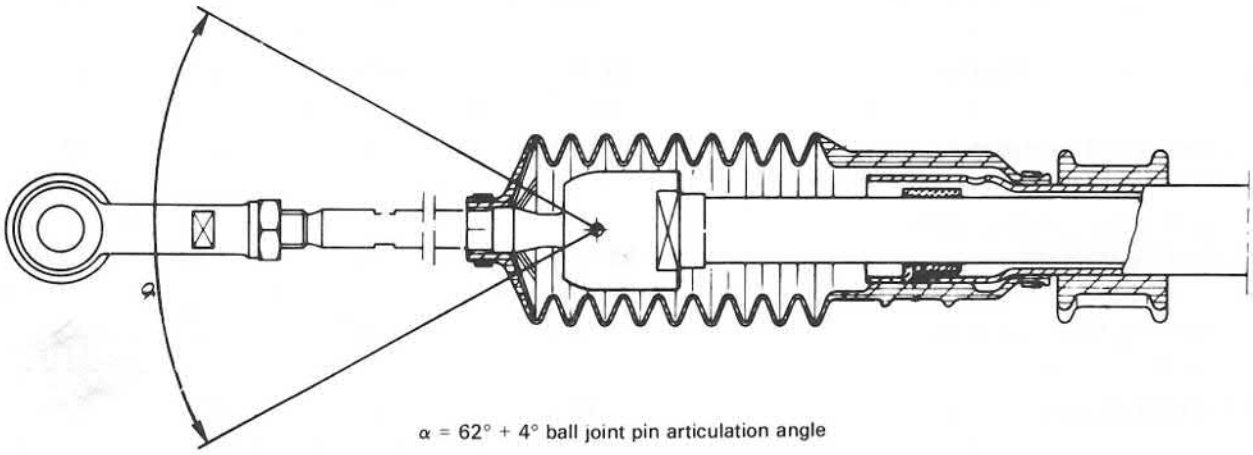
SECTION B-B

SECTION C-C

CROSS SECTION OF STEERING COLUMN



A = rack travel corresponding to 4.6 in. (117 mm)



α = 62° + 4° ball joint pin articulation angle

CROSS SECTION OF STEERING BOX

STEERING WHEEL

REMOVAL AND INSTALLATION

Center steering wheel and front wheels.

Disconnect battery ground cable.

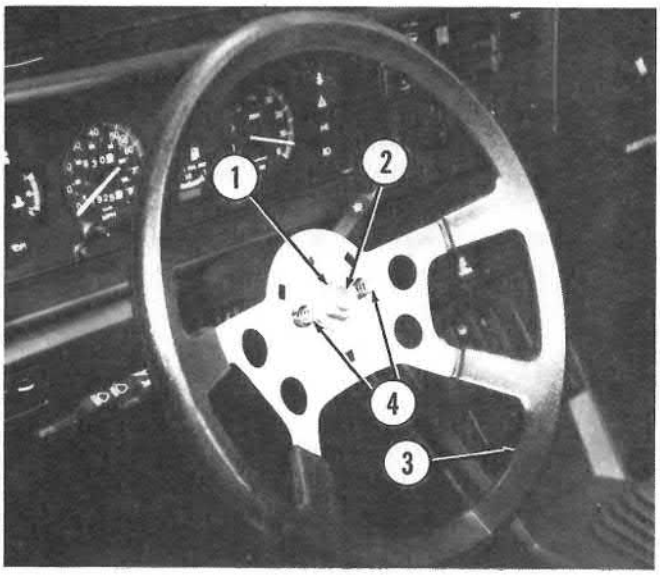
Pry horn button off steering wheel (3).

Remove two horn button springs (4). Remove nut (1) holding wheel (3) to shaft (2).

Mark steering wheel and steering shaft for installation reference. Pull wheel off shaft.

Install steering wheel in reverse order. Torque nut to 36 ft. lbs. (5 kgm).

1. Nut 2. Steering shaft 3. Steering wheel 4. Horn button springs



STEERING COLUMN

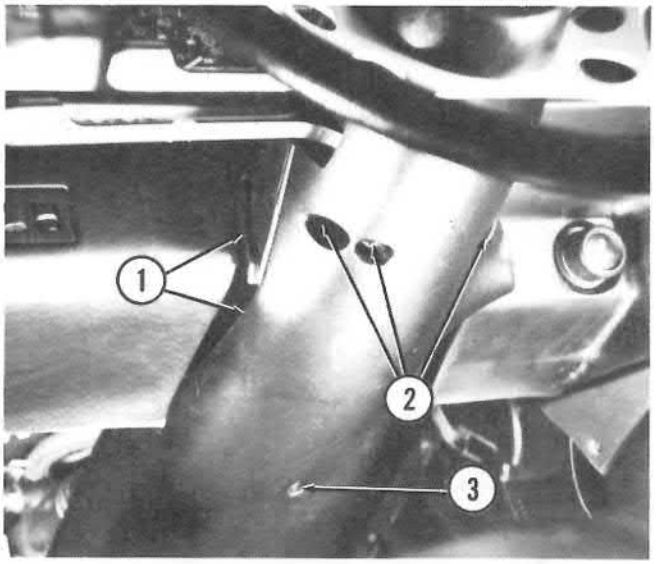
REMOVAL AND INSTALLATION

Center steering wheel and front wheels.

Disconnect battery ground cable.

Remove four screws (2 and 3) to remove upper and lower steering column covers (1).

1. Steering column covers 2. Screws 3. Screw

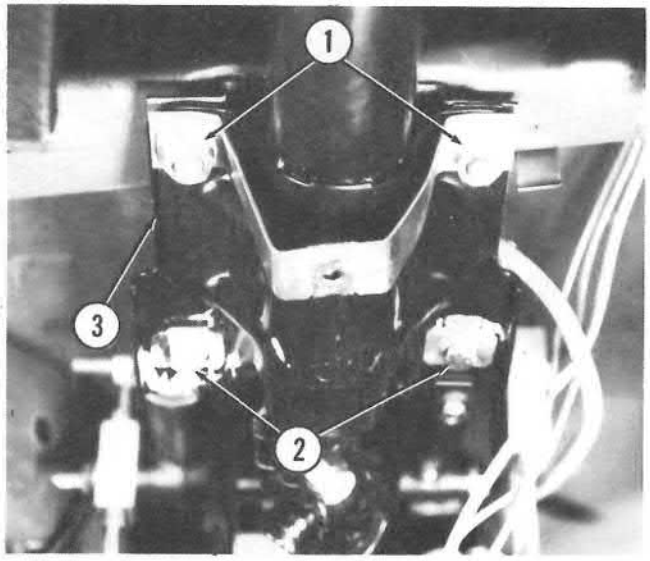


Remove two nuts (1) and washers and two bolts (2) and washers holding steering column support (3) to dash board.

Lower column slightly and disconnect five electrical connectors at dash board.

Rest steering column on floor.

1. Nuts 2. Bolts 3. Steering column support

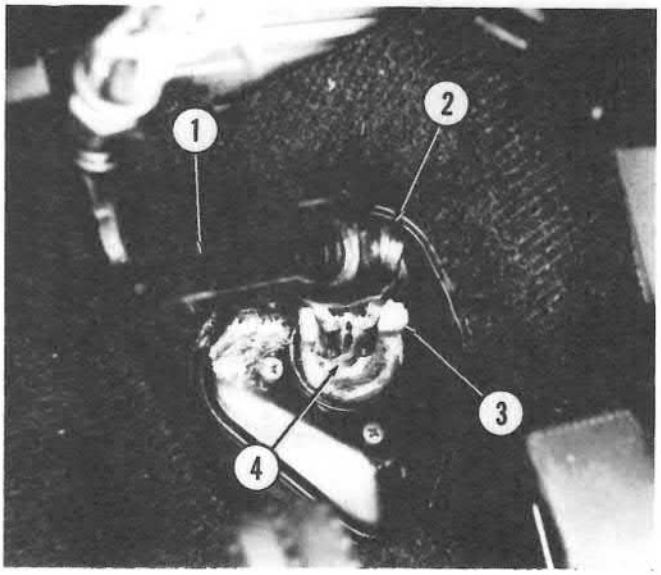


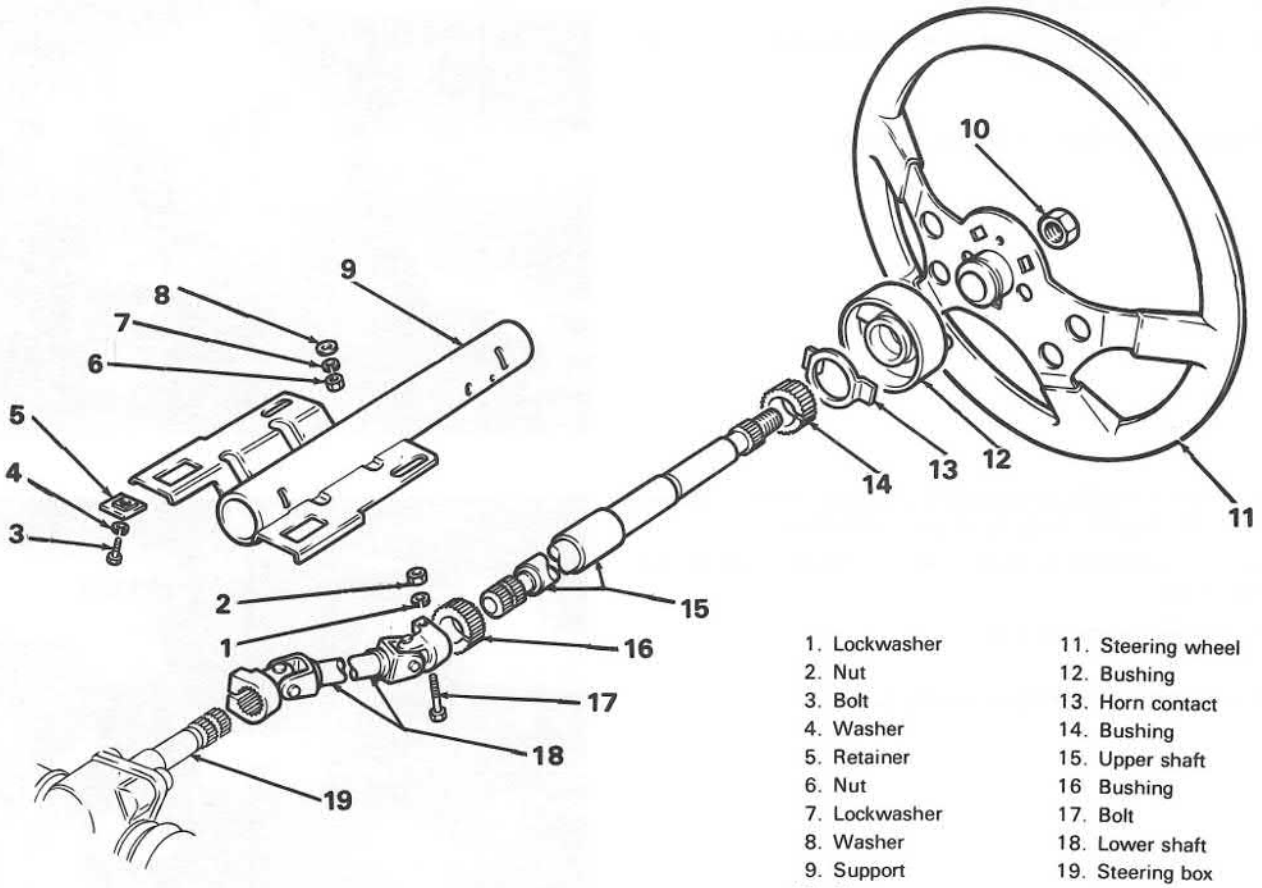
Mark universal joint (2) and steering box shaft (4) for installation reference.

Remove bolt and nut (3) holding universal joint to steering box shaft. Slide universal joint off shaft.

Install in reverse order. Make sure steering wheel is centered with front wheels. Torque nuts and bolts to specifications.

1. Lower shaft 2. Universal joint 3. Nut 4. Steering box shaft





1. Lockwasher
2. Nut
3. Bolt
4. Washer
5. Retainer
6. Nut
7. Lockwasher
8. Washer
9. Support
10. Nut
11. Steering wheel
12. Bushing
13. Horn contact
14. Bushing
15. Upper shaft
16 Bushing
17. Bolt
18. Lower shaft
19. Steering box

EXPLODED VIEW OF STEERING COLUMN

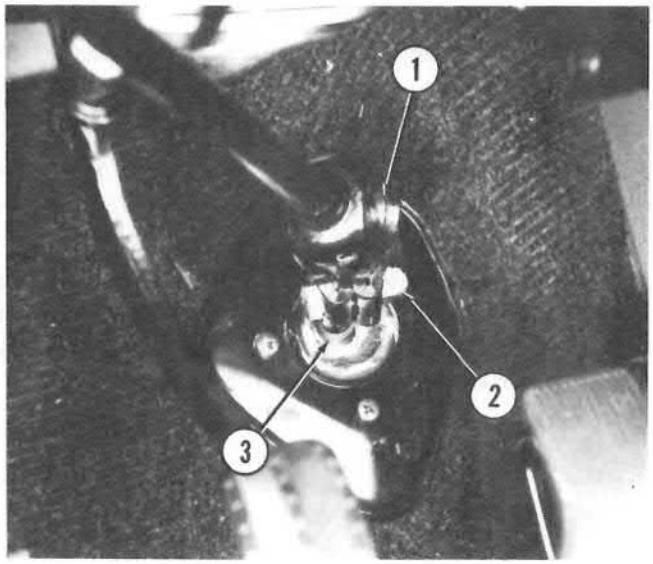
REMOVAL AND INSTALLATION

Center steering wheel and front wheels.

Mark universal joint (1) and steering box shaft (3) for installation reference.

Remove bolt and nut (2) holding universal joint to steering box shaft.

1. Universal joint 2. Nut 3. Steering box shaft

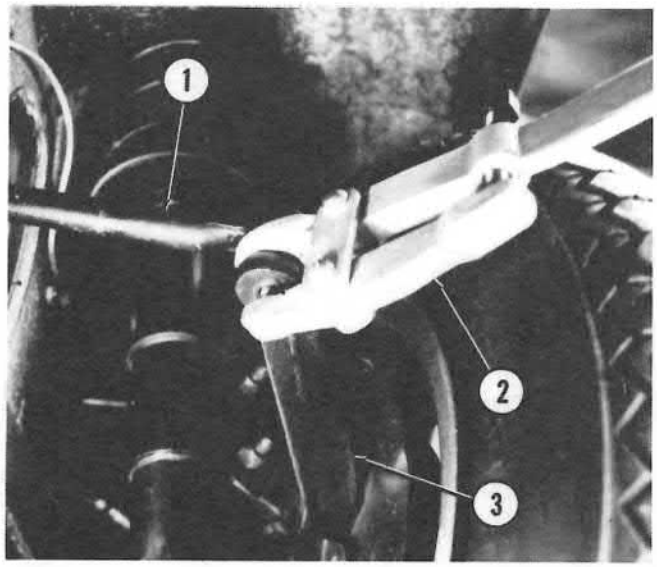


Raise front of vehicle.

Remove nut holding ball joint on tie rod (1) to steering knuckle (3).

Install puller A.47035 (2) on ball joint. Tighten bolt on puller to separate ball joint from steering knuckle. Repeat for other side.

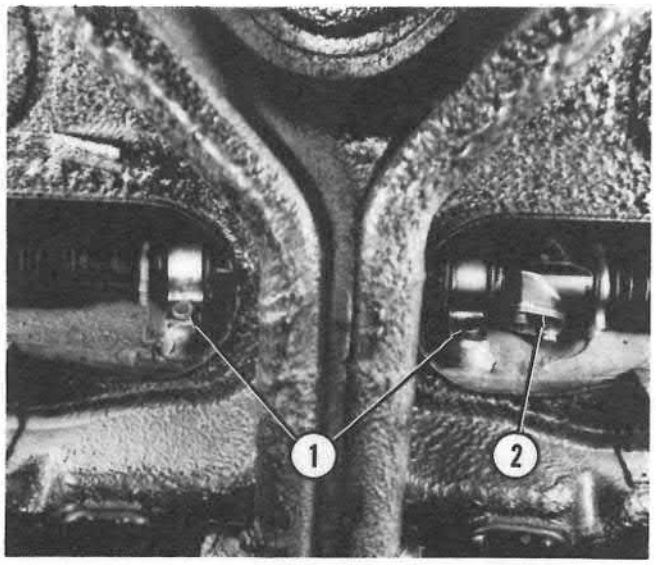
1. Tie rod 2. Puller A.47035 3. Steering knuckle



From inside vehicle, remove nuts from four bolts (1) holding steering box (2) to body. Remove steering box from vehicle.

Install in reverse order. Torque nuts and bolts to specifications. Check front wheel toe. Refer to 443.01.

1. Bolts 2. Steering box



DISASSEMBLY AND REASSEMBLY

Remove four clamps (8, 6 and 16). Remove rubber boots (7 and 17). Unscrew two ball joints (5) from rack (19).

Remove two bolts (9), cover (10), shim (1), spring (12), seal (13) and thrust block (14).

On early type box, remove two bolts (27), seal (26), cover (25), plate (24), shim (23), bearing (22) and pinion (21).

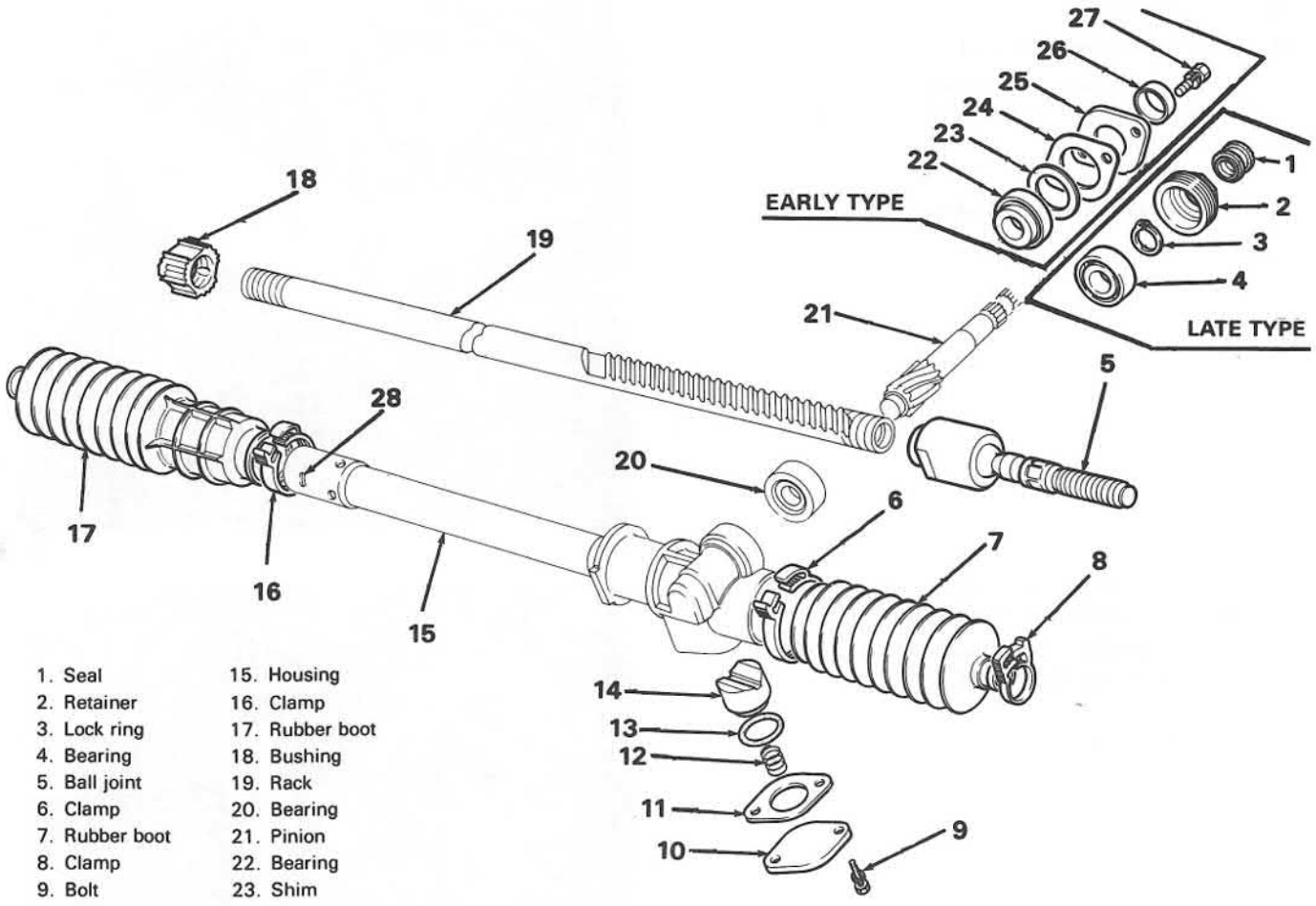
On late type box, remove threaded retainer (2) with seal (1), lock ring (3), bearing (4) and pinion (21).

On all steering boxes, slide rack (19) from housing (15). Remove bushing (18) from rack.

Remove bearing (20) from housing.

Before reassembly, coat all bearing and gear surfaces with 90 W oil or pack rack and pinion housings and boots with a total of 5.3 oz. (.127 kg) of lithium-base grease containing molybdenum disulphide.

Reassemble in reverse order. Use tool A.74247 to install bushing (18). Ensure that tab on bushing aligns with slot (28) in housing. Perform pinion and rack adjustments.



1. Seal
2. Retainer
3. Lock ring
4. Bearing
5. Ball joint
6. Clamp
7. Rubber boot
8. Clamp
9. Bolt
10. Cover
11. Shim
12. Spring
13. Seal
14. Thrust block
15. Housing
16. Clamp
17. Rubber boot
18. Bushing
19. Rack
20. Bearing
21. Pinion
22. Bearing
23. Shim
24. Plate
25. Cover
26. Seal
27. Bolt
28. Slot for tab on bushing 18

EXPLODED VIEW OF STEERING BOX

INSPECTION (Refer to illustration on previous page)

Before inspection, clean all metallic parts in a suitable degreaser. Blow dry.

Inspect rack (19), pinion (21), bearing (20) and housing (15) for wear, scratches, broken teeth or other damage. Replace entire steering box if damaged.

Inspect rubber boots (7 and 17) for tears or breaks that would permit moisture entry. Replace if damaged.

Inspect bushing (18) and thrust block (14) for wear or breaks. Replace if damaged. Replace spring (12) if worn. Inspect bearing (4 or 22) for wear. Replace if damaged. Check that ball joints (5) move freely in all directions. They should not fall under their own weight. Replace if worn.

Replace seal (1 or 26) if worn or damaged.

ADJUSTMENTS

Pinion (Early Type)

Remove two bolts, cover with seal, plate, and shim to gain access to pinion bearings.

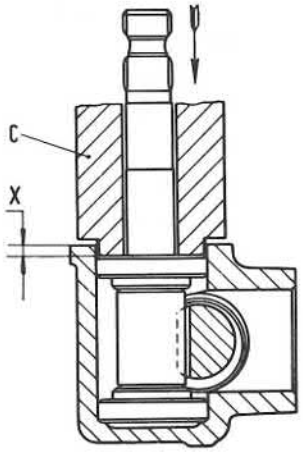
Using a suitable driver, make sure bearing is firmly seated.

Measure distance from top of bearing to pinion cover facing (dimension X).

To dimension X, add 0.003 ± 0.002 in. (0.078 ± 0.053 mm). Combine shims to make up new dimension. Shims available are 0.0047, 0.008, 0.010, and 0.020 in. (0.12, 0.20, 0.25, and 0.50 mm).

Carefully install shims so they are centered on the pinion.

Install plate, cover with seal, and two bolts.



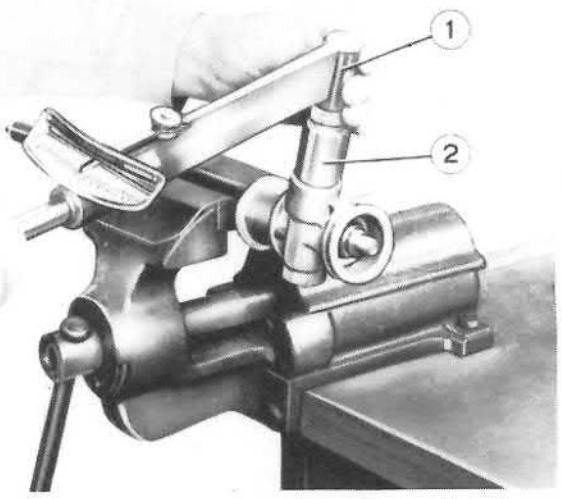
Pinion (Late Type)

With threaded retainer installed over pinion, torque retainer to 22 to 25 ft. lbs. (3.0-3.5 kgm).

Check initial turning torque of pinion. Torque should be 4.3 to 14.0 inch lbs. (0.05 to 0.16 kgm).

Stake retainer.

1. Torque wrench 2. Socket



Rack

Center the rack in its travel.

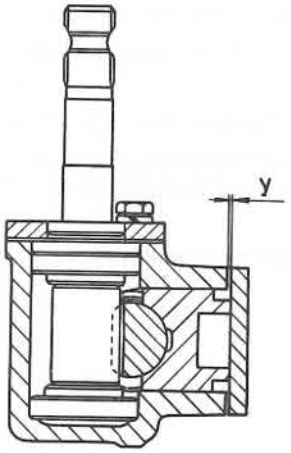
Remove two bolts, cover, shims, and spring to gain access to rack trust block.

While holding rack trust block against rack, turn pinion through 180° in both directions to settle fit.

Measure distance from top of rack thrust block to cover facing (dimension Y).

To dimension Y, add 0.0035 ± 0.0015 in. (0.09 ± 0.04 mm). Combine shims to make up new dimension. Shims available are 0.0039 and 0.0059 in. (0.10 and 0.15 mm).

Install spring, shims, cover, and two bolts.



LUBRICATION

If steering box is being lubricated with grease, lubricate as specified in STEERING BOX DISASSEMBLY AND REASSEMBLY.

If steering box is being lubricated with oil, check that steering box (rubber boots) is empty of oil.

Turn steering fully to the right.

Lift up left side of steering box.

Loosen clamp on left rubber boot.

Using a syringe, add 5.3 oz. (.127 kg) of 90 W oil to left rubber boot.

Tighten clamp.

ALIGNMENT

After the steering box has been installed, set toe-in as specified in SUSPENSION section.

A.47038 Puller for separating tie rod ball joints

A.74247 Tool for fitting rack bush

X1/9 1979 - 1982
SERVICE MANUAL

SUSPENSION - 44

SPECIFICATIONS

FRONT SUSPENSION

Type: Indpendent, control arm, strut bar, knuckle pillar and strut assembly with integral shock absorber and coil spring.

Caster: Unladen	+6°10′ to +7°20′
— Adjustment by shims set between reaction struts and supports	
Camber: Unladen	0° to -1°
— Non-adjustable	
Toe-in: Unladen	+3/32 to +15/64 in. (+2.5 to +6.0 mm)
— Adjustment through threaded tie rods on each end of steering box	

Coil springs:	
— Yellow-marked spring (1): length under a load of 474 lbs.	>6.693 in. (>170 mm)
— Green-marked spring (1): length under a load of 474 lbs.	<6.693 in. (<170 mm)
— Lowest load permissible to compress spring to a length of 6.693 in. (170 mm)	441 lbs. (200 kg)

REAR SUSPENSION

Type: Independent, control arm, knuckle pillar and strut assembly with integral shock absorber and coil spring. Adjustable cross tie rods.

Camber: Unladen	-0°45′ to -1°45′
— Non-adjustable	
Toe-in: Unladen	+13/64 to +11/32 (+5.0 to +8.5 mm)
— Adjustment by threaded sleeves on tie rods	

Coil springs:	
— Yellow-marked spring (1): length under a load of 562 lbs. (255 kg)	>7.874 in. (>200 mm)
— Green-marked spring (1): length under a load of 562 lbs. (255 kg)	<7.874 in. (<200 mm)
— Lowest load permissible to compress spring to a length of 7.874 in. (200 mm)	518 lbs. (235 kg)

WHEELS AND TIRES

Wheel rim type		5J x 13 in.
Tires:		
— Type:		165/70 SR 13 in.
— Inflation pressure:	Front	29 psi (2.0 kg/cm²)
	Rear	32 psi (2.2 kg/cm²)

(1) Springs must always be fitted in matched pairs.

TORQUE SPECIFICATIONS

DESCRIPTION	THREAD	TORQUE FIGURE N·m	Kgm	Ft. Lb.
FRONT SUSPENSION				
Stud bolt, wheel	M 12 x 1.25	87	9	64
Nut, wheel hub (stake)	M 20 x 1.5	216	22	159
Nut, self-locking, steering knuckle ball joint	M 12 x 1.25	79	8	58
Nut, self-locking, strut bar to support	M 12 x 1.25	69	7	51
Nut, strut bar to control arm	M 12 x 1.25	69	7	51
Nut, self-locking control arm to body	M 10 x 1.25	40	4	29
Nut, strut assembly upper mount to body	M 6	9.5	1	7
Nut, self-locking, strut assembly to steering knuckle bolt	M 10 x 1.25	59	6	43
Nut, strut assembly top mounting	M 12 x 1.25	59	6	43
REAR SUSPENSION				
Stud bolt, wheel	M 12 x 1.25	87	9	64
Nut, stub shaft (stake)	M 20 x 1.5	216	22	159
Nut, self-locking, control arm pivot bolt	M 14 x 1.5	98	10	72
Nut, self-locking, ball joint to pillar	M 14 x 1.5	83	8.5	61.5
Nut, self-locking, tie rod to control arm bolt	M 14 x 1.5	69	7	51
Nut, self-locking, strut assembly upper mount to body	M 6	9.5	1	7
Nut, self-locking, strut assembly to pillar bolt	M 10 x 1.25	59	6	43
Nut, strut assembly top mounting	M 12 x 1.25	59	6	43
Ring nut, wheel bearing, (stake)	M 75 x 1.5	59	6	43

REMOVAL

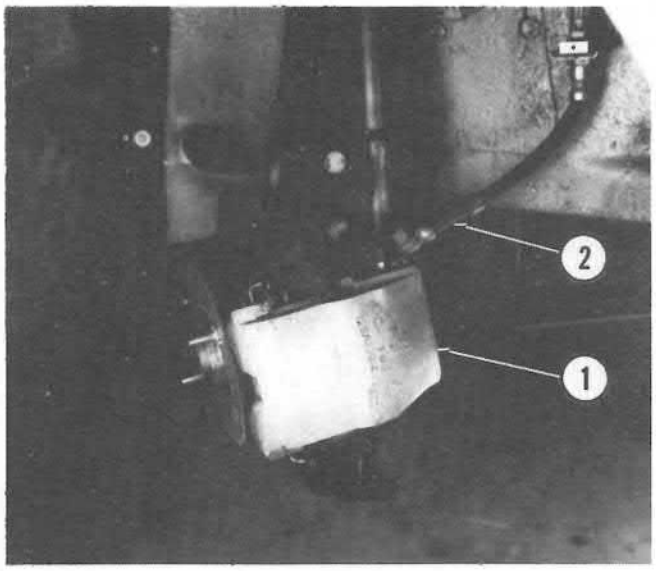
Remove wheel.

If brake caliper (1) needs inspection, leave caliper attached to suspension.

To do this, plug outlet from brake fluid reservoir and disconnect brake fluid hose (2) from caliper.

To remove caliper from suspension, refer to 331.17/.25.

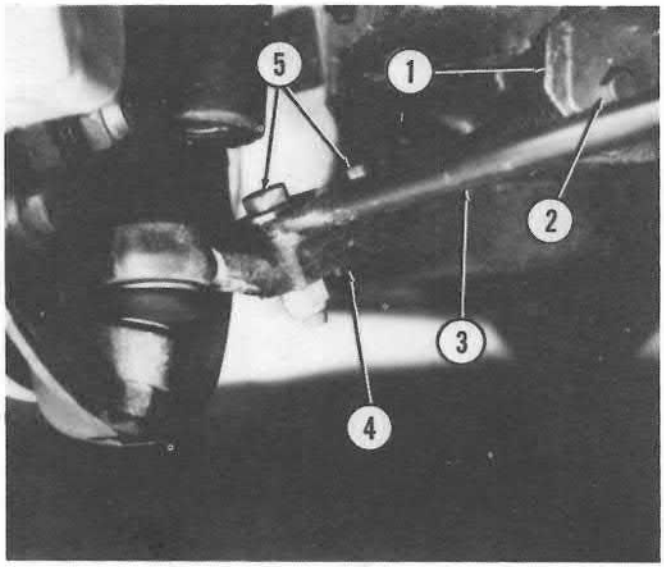
1. Caliper 2. Brake hose



Remove bolts (5) and plate holding strut bar (3) to control arm (4).

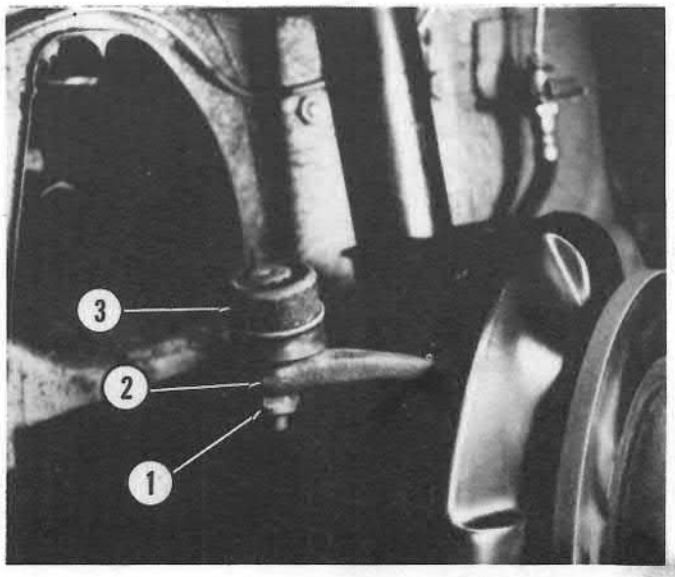
Remove bolt (2) holding control arm to bracket (1).

1. Bracket 2. Bolt 3. Strut bar 4. Control arm 5. Bolts



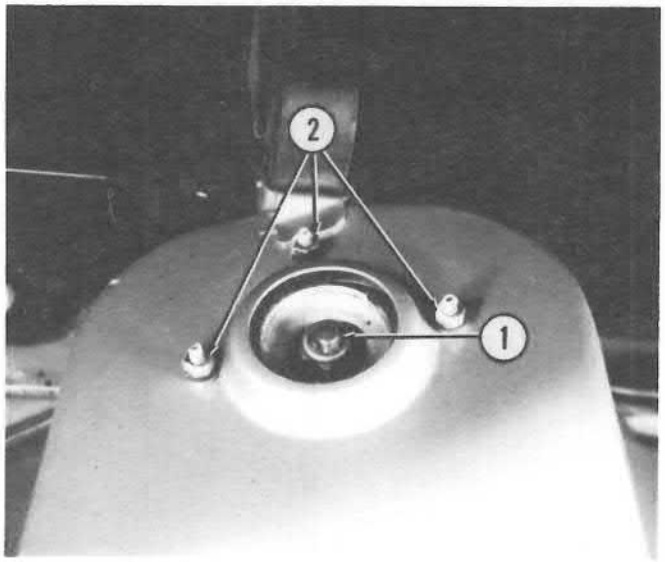
Remove nut (1) holding tie rod ball joint (3) to steering arm (2). Use tool A.47038 to separate ball joint from arm.

1. Nut 2. Steering arm 3. Ball joint



Disconnect strut assembly (1) by removing three nuts (2) and washers.

1. Strut assembly 2. Nuts

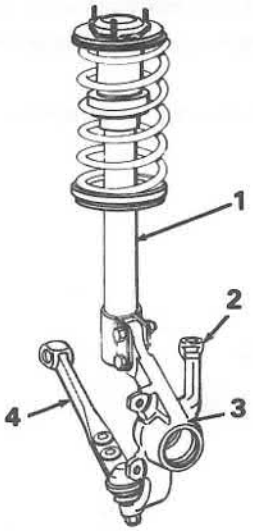


Lower suspension assembly out of vehicle.

To replace coil springs, refer to 443.02/.06.

If hub bearing must be replaced, refer to STEERING KNUCKLE OVERHAUL in this section.

1. Strut assembly 2. Steering arm 3. Steering knuckle
4. Control arm

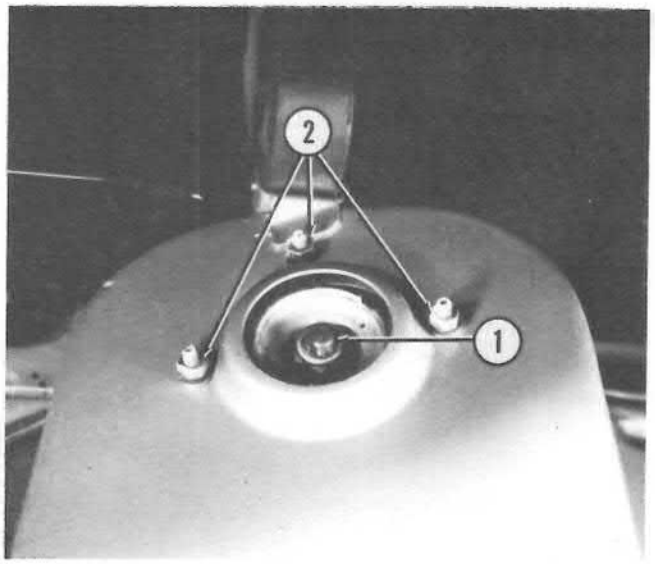


INSTALLATION

Place suspension assembly in vehicle. Install washers and nuts (2) on three bolts on top of strut assembly (1).

Torque nuts to 7 ft. lbs. (1 kgm).

1. Strut assembly 2. Nuts



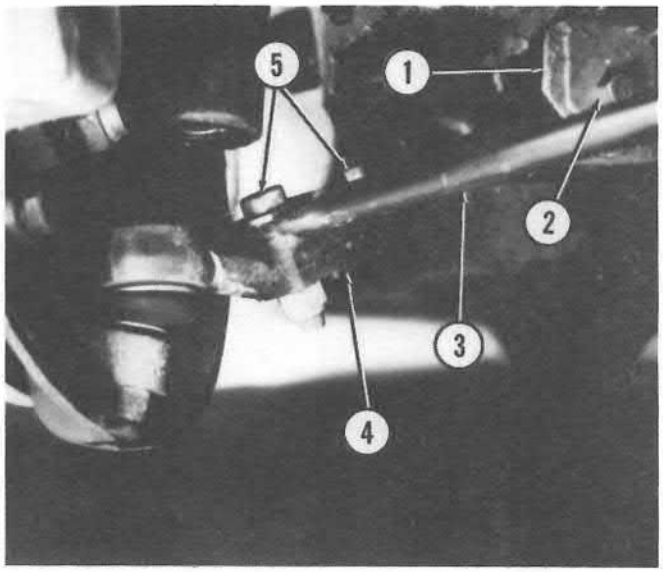
Place control arm (4) in bracket (1).

Install bolt (2), washer and nut.

Place strut bar (3) on control arm. Place plate on strut.

Install bolts (5) through strut bar and control arm and install nut.

1. Bracket 2. Bolt 3. Strut bar 4. Control arm 5. Bolts



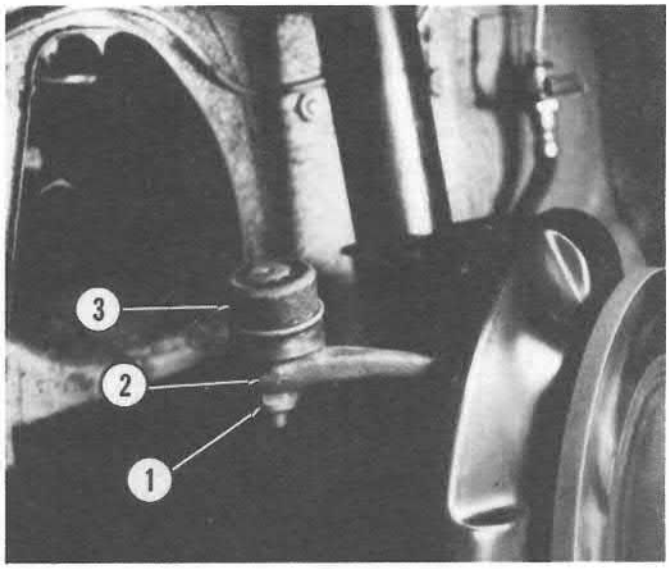
Place tie rod ball joint (3) in steering arm (2).

Install nut (1). Torque nut to 36 ft. lbs. (5 kgm).

Install brake caliper. If caliper was disconnected, attach brake hose and bleed brakes.

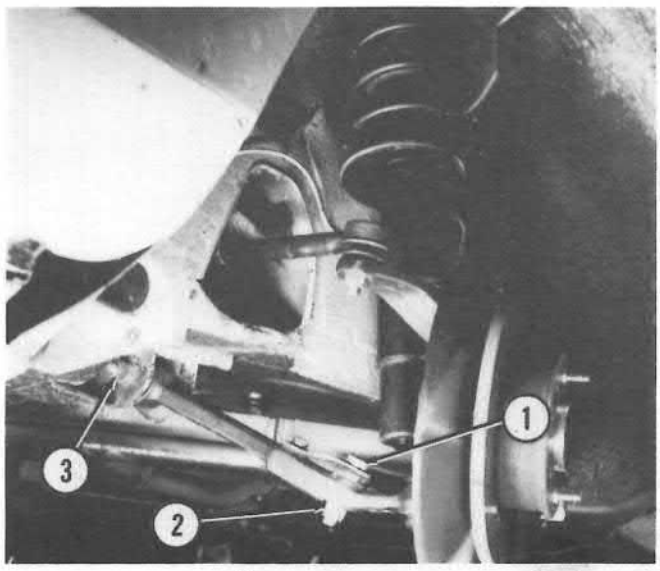
Install wheel.

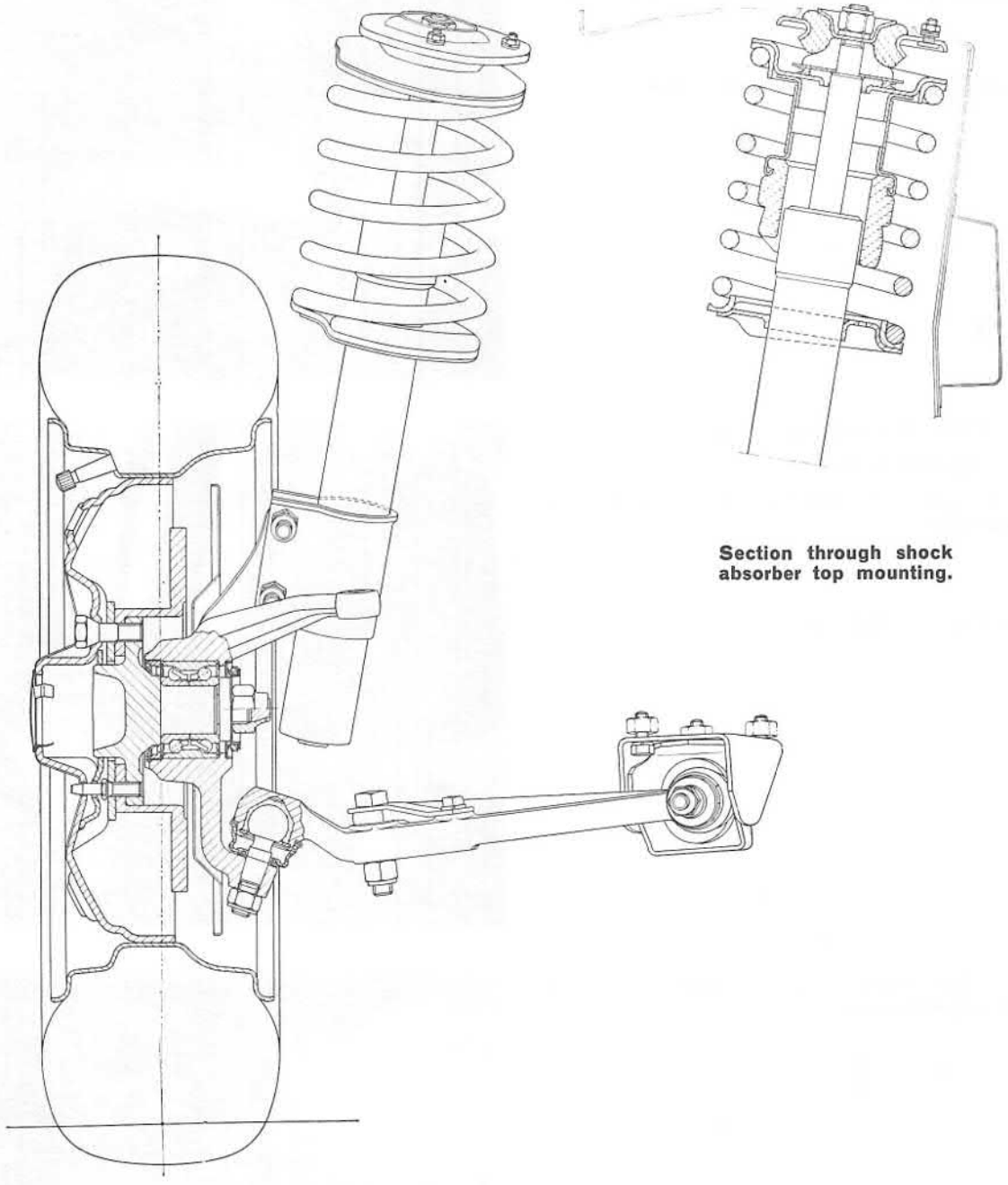
1. Nut 2. Steering arm 3. Ball joint



Lower vehicle. With vehicle on ground, torque bolt (1) and nuts (2 and 3) to specifications.

1. Bolt 2. Nut 3. Nut





Section through shock absorber top mounting.

CROSS SECTION OF FRONT SUSPENSION

STEERING KNUCKLE

REMOVAL AND INSTALLATION

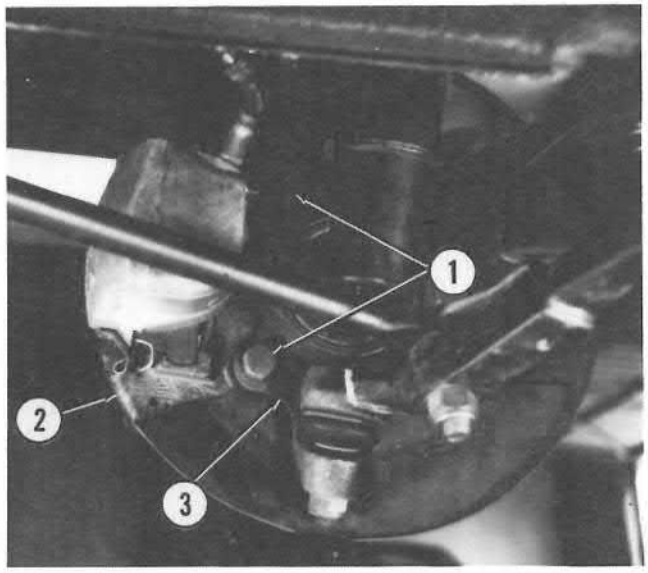
Raise vehicle and remove wheel.

Remove bolts (1) holding caliper support (2) to knuckle (3).

Remove caliper support with caliper attached without disconnecting brake hose. Wire assembly out of way.

Remove disc and backing plate. Refer to 331.17/.25.

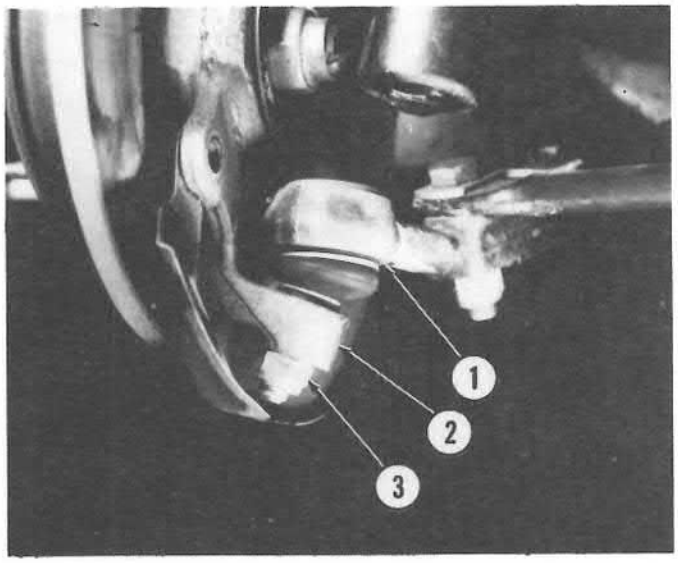
1. Bolts 2. Caliper support 3. Knuckle



Remove nut (3) holding lower ball joint (1) to knuckle (2).

Separate ball joint from knuckle.

1. Ball joint 2. Knuckle 3. Nut



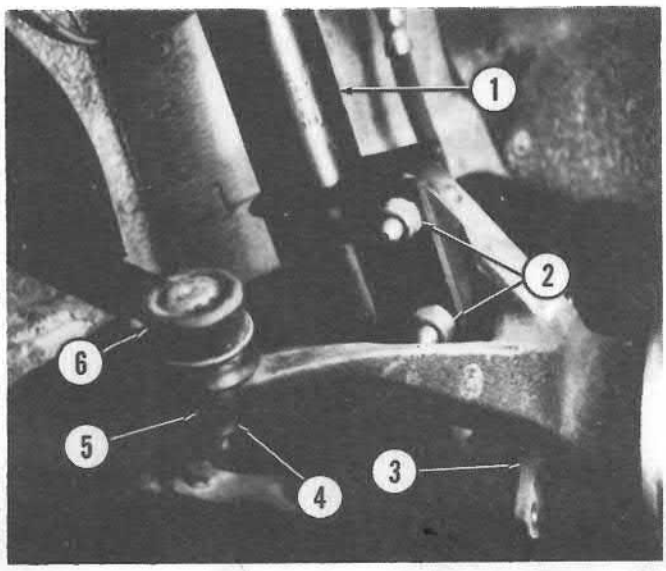
Remove nut (4) holding tie rod ball joint (6) to steering arm (5). Separate ball joint from arm.

Remove two nuts (2) and bolts attaching strut assembly (1) to knuckle (3).

Remove steering knuckle from vehicle.

Installation is reverse of removal. Torque bolts and nuts to specifications.

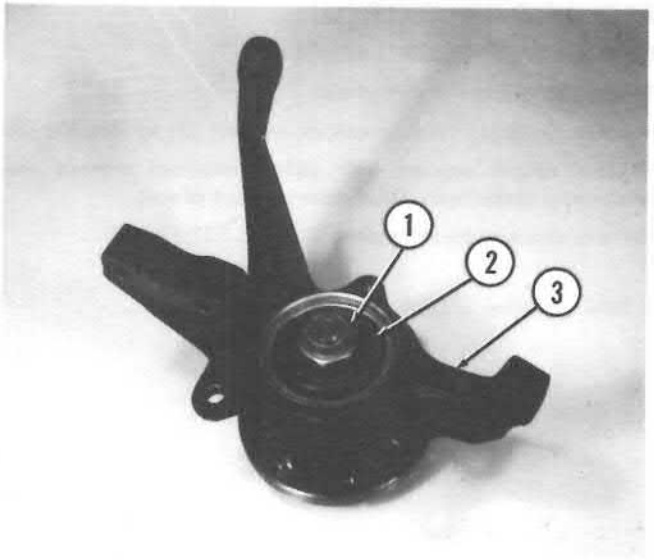
1. Strut assembly 2. Nuts 3. Knuckle 4. Nut 5. Steering arm 6. Ball joint



OVERHAUL

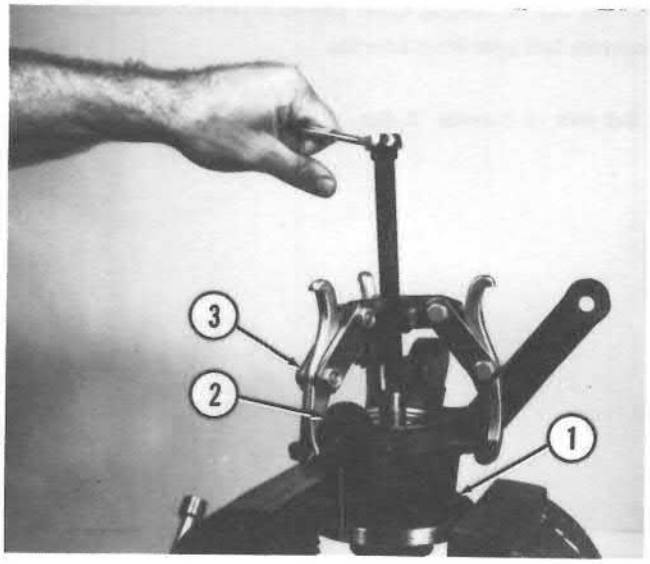
Unstake and remove hub nut (1). Remove washer (2) with gasket attached.

1. Nut 2. Washer 3. Steering knuckle



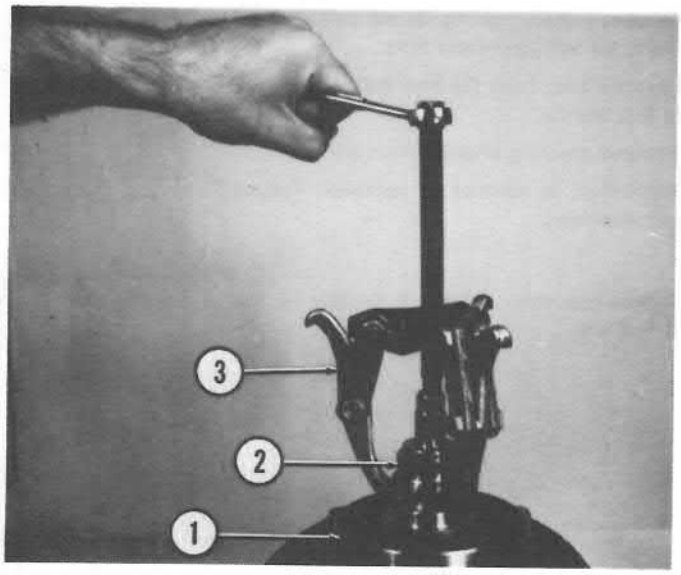
Use a puller (3) or press to remove hub (1) from knuckle (2).

1. Hub 2. Knuckle 3. Puller



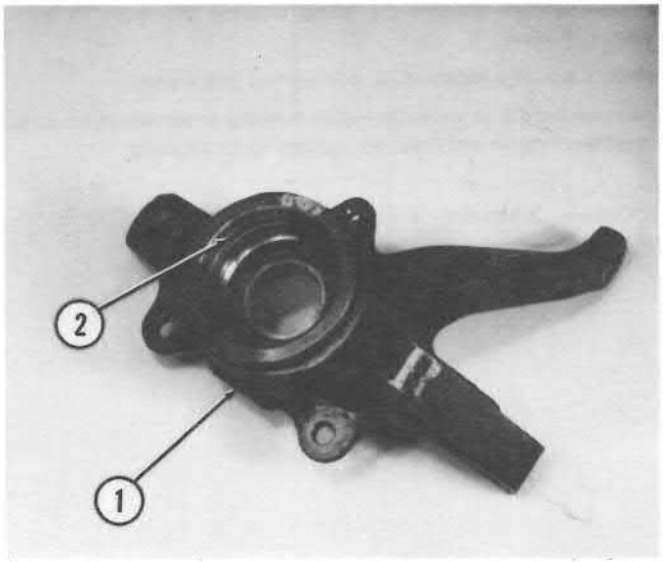
If bearing inner race (2) remains on hub (1), drive race off hub far enough to attach a puller (3), and remove race from hub. A press may also be used.

1. Hub 2. Inner race 3. Puller



Remove internal lock ring (2) from knuckle (1).

1. Knuckle 2. Lock ring

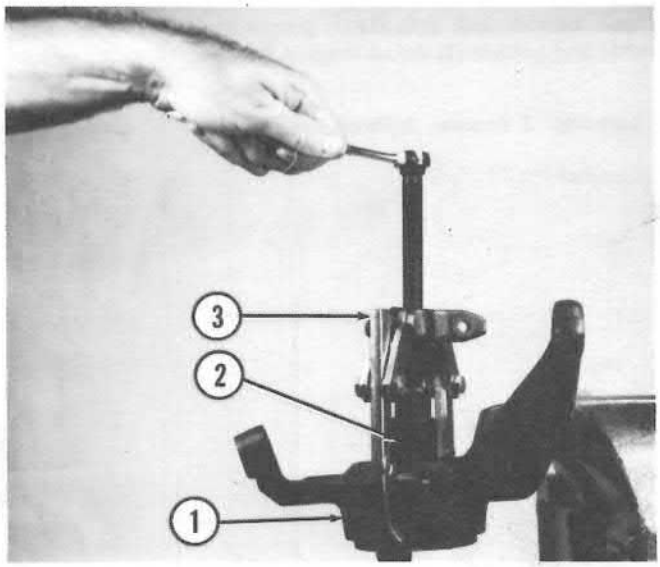


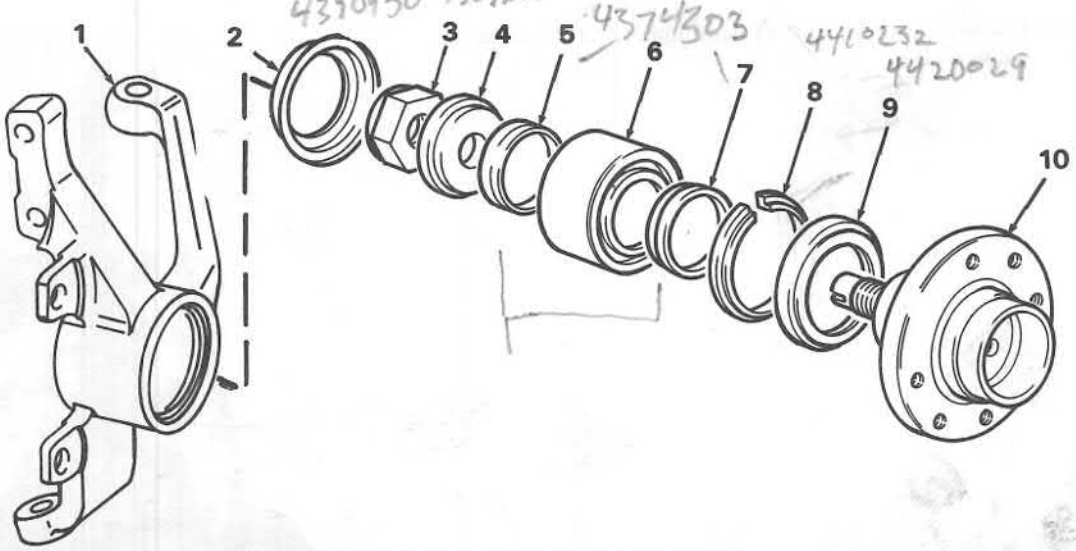
Remove thrust ring from inner side of knuckle.

Place a suitable mandrel (2) on bearing inner race.

Use a puller (3) or press to remove bearing assembly from knuckle (1).

1. Knuckle 2. Mandrel 3. Puller





1. Steering knuckle
2. Thrust ring
3. Nut
4. Washer
5. Gasket
6. Bearing
7. Gasket
8. Lock ring
9. Thrust ring
10. Hub

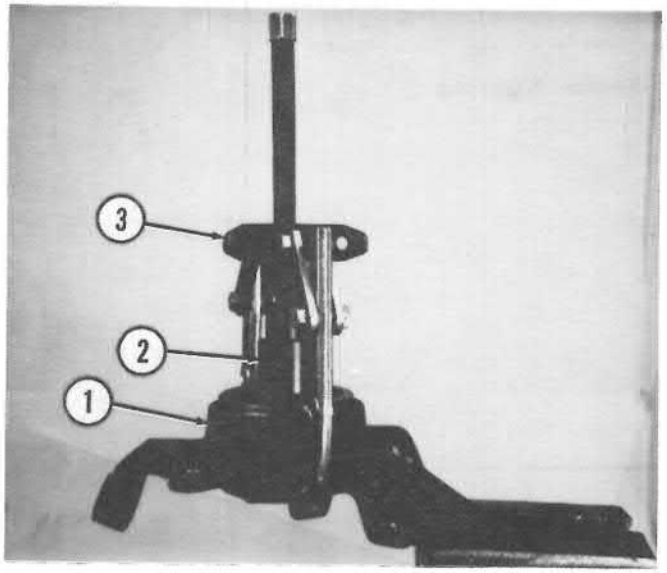
EXPLODED VIEW OF STEERING KNUCKLE

To reassemble knuckle (1), place bearing assembly in outer side of knuckle.

Place a suitable mandrel (2) on bearing inner race.

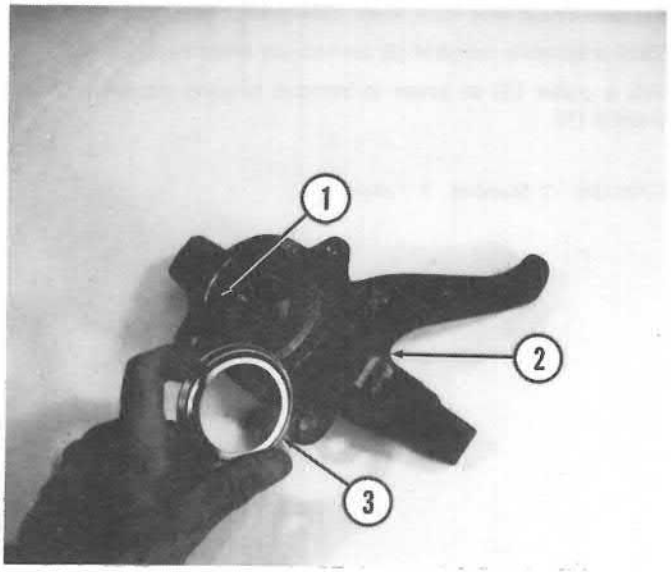
Use a puller (3) or press to install bearing assembly in knuckle. Press bearing in until seated against lip in knuckle.

1. Knuckle 2. Mandrel 3. Puller



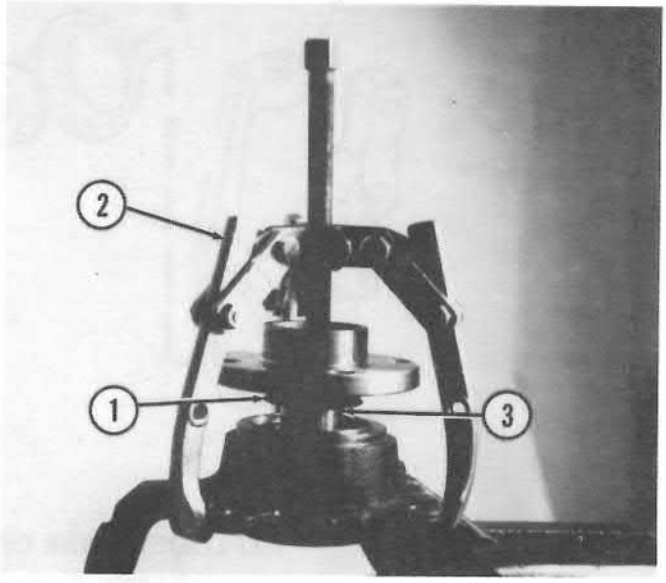
Install internal lock ring (1) in groove in knuckle (2). Install inside and outside (3) thrust rings in knuckle.

1. Lock ring 2. Knuckle 3. Thrust ring



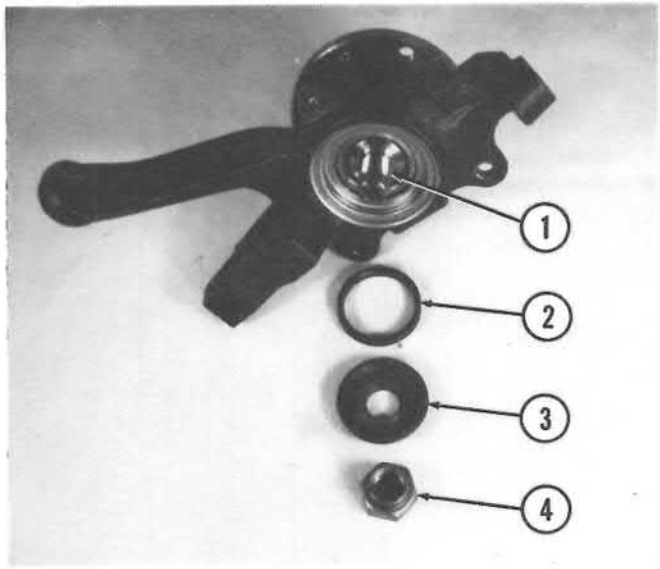
Install gasket (1) on hub shaft (3). Use a puller (2) or press to press hub into place.

1. Gasket 2. Puller 3. Hub shaft



Install gasket (2), washer (3) and nut (4) on hub shaft (1). Torque nut to 159 ft. lbs. (22 kgm). Stake nut.

1. Hub shaft 2. Gasket 3. Washer 4. Nut



CONTROL ARM

INSPECTION

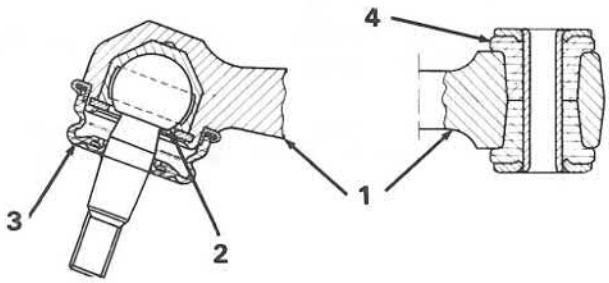
If control arm ball joint is worn, replace entire control arm.

Check control arm (1) for cracks or signs of distortion. Replace if damaged.

Check swivel joint (2) and protective boot (3) for cracks or breaks that might permit mositure or dirt entry. Replace entire control arm if damaged.

Check rubber bushings (4) for wear or deterioration. Overhaul control arm if damaged.

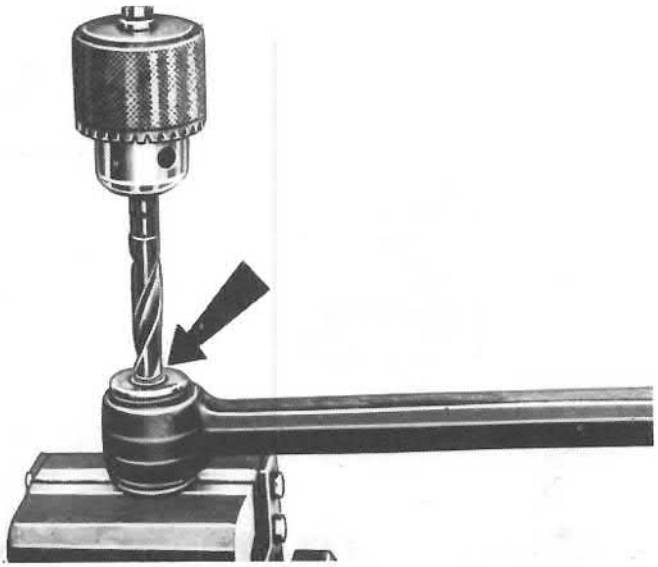
1. Control arm 2. Swivel joint 3. Boot 4. Bushing



OVERHAUL

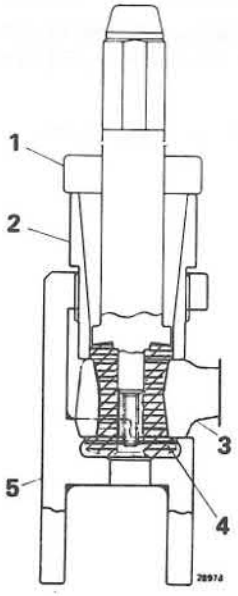
Using a drill press, machine off peened area of spacer (either end) as shown.

Using a press, drive out spacer first, then remove rubber bushing.



Coat new bushing (4) with silicone grease. Using assembly tool A.74225 (items 1, 2 and 5), install new bushing (4) into control arm (3).

1. Installer, tool A.74225 2. Pilot, tool A.74225 3. Control arm
4. Rubber bushing 5. Base, tool, A.74225



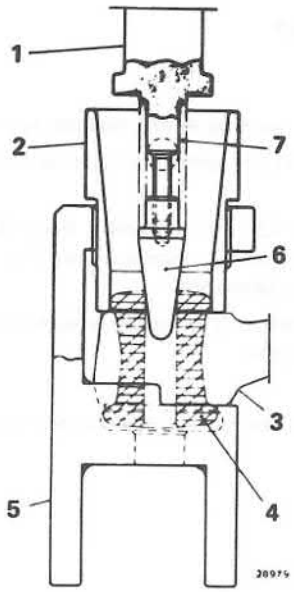
Assemble spacer (7) on installer (1), then screw on tip (6).

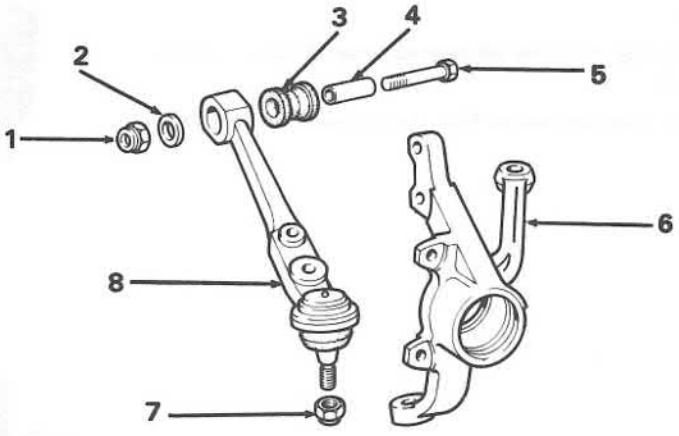
Coat new spacer (7) with silicone grease.

Using assembly tool A.74255 (items 1, 2, 5, 6 and 7), install new spacer (7) into bushing (4).

Position washers on both ends of spacer, then peen over spacer to lock washers in place.

1. Installer, tool A.74255 2. Pilot, tool A.74255 3. Control arm
4. Rubber bushing 5. Base, tool A.74255 6. Tip, tool A.74255
7. Spacer





1. Nut
2. Washer
3. Bushing
4. Spacer
5. Bolt
6. Steering knuckle
7. Nut
8. Control arm

EXPLODED VIEW OF CONTROL ARM COMPONENTS

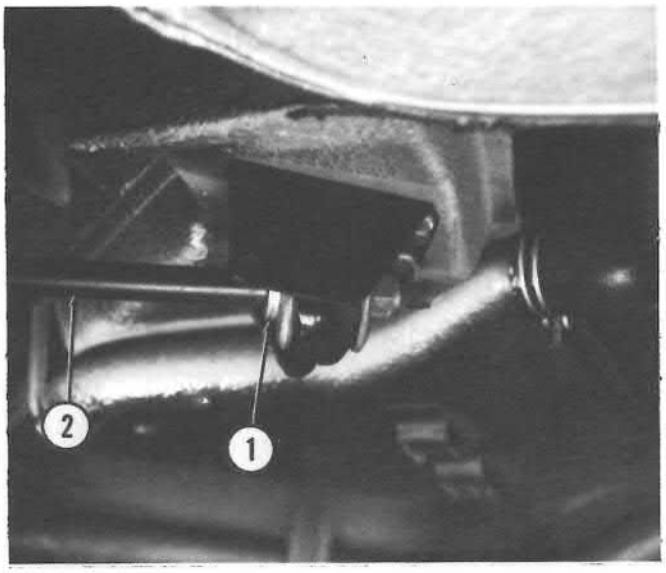
FRONT SUSPENSION ALIGNMENT

Before aligning the front suspension, it must be checked for possible worn or misadjusted components. Check the following:

— Tire pressure (29 psi front, 32 rear).
— Tire radial and lateral runout. Runout should be less than 0.118 in. (3 mm).
— Wheel bolt tightness.
— Wheel bearing end play (if perceptible), bearing may be worn. or bearing may need tightening).
— Lower ball joint (may be worn). Also check ball joint nut tightness. Torque should be 58 ft. lbs. (8 kgm).
— Control arm to chassis mounting nut tightness. Torque should be 29 ft. lbs. (4 kgm).
— Control arm rubber bushings for deterioration (overhaul or replace control arm).
— Strut assembly to knuckle nut tightness. Torque should be 43 ft. lbs. (6 kgm).
— Steering box tie rod ball joints (replace if worn).

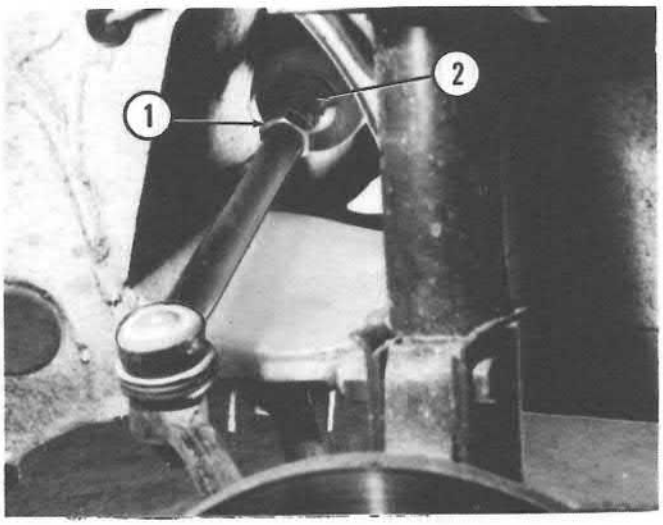
Caster (Unladen)	+6°10′ to +7°20′ (+6°45′ preferred) To adjust, vary thickness of shims (1) at front of strut bar (2).
Camber (Unladen)	0° to -1° (-½° preferred) Non-adjustable

1. Shims 2. Strut bar



Toe-in (Unladen)	+3/32 to +15/64 in. (+2.5 to +6.0 mm) (+5/32 in., +4.0 mm preferred) To adjust, make sure steering box and steering wheel are centered, then loosen nut (1). Turn steering box ball joint (2) in or out to obtain adjustment. Tighten nut. Repeat for other side.

1. Nut. 2. Ball joint

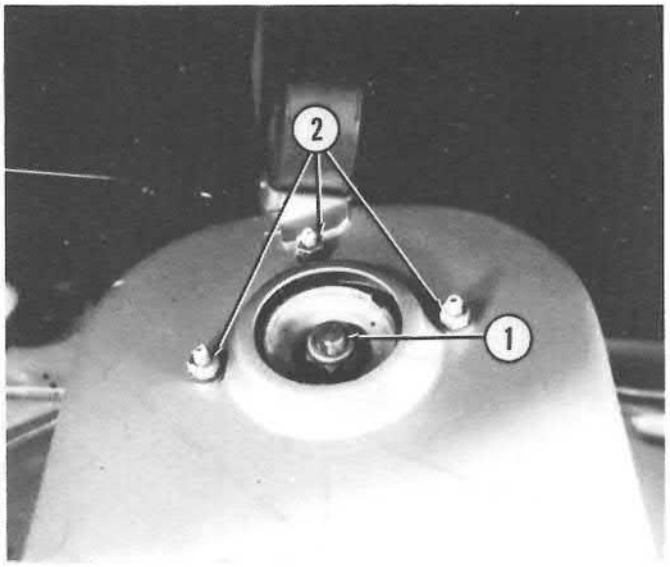


STRUT ASSEMBLY

REMOVAL AND INSTALLATION

Remove three nuts (2) and washers holding strut assembly (1) at top.

1. Strut assembly 2. Nuts.

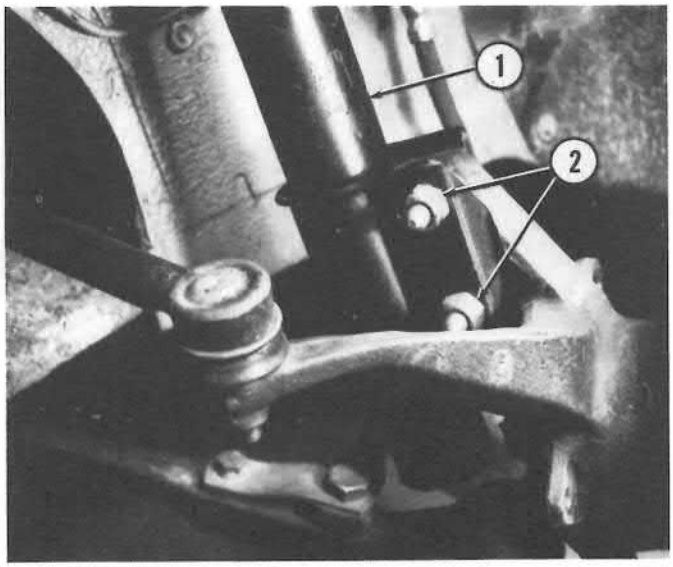


Remove two nuts (2) and bolts attaching strut assembly (1) to suspension.

Remove strut assembly from vehicle.

Install in reverse order. Torque upper mount nuts to 7 ft. lbs. (1 kgm) and lower mount nuts to 43 ft. lbs. (6 kgm).

1. Strut assembly 2. Nuts

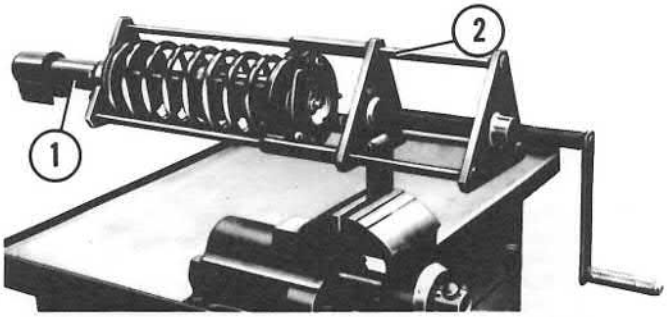


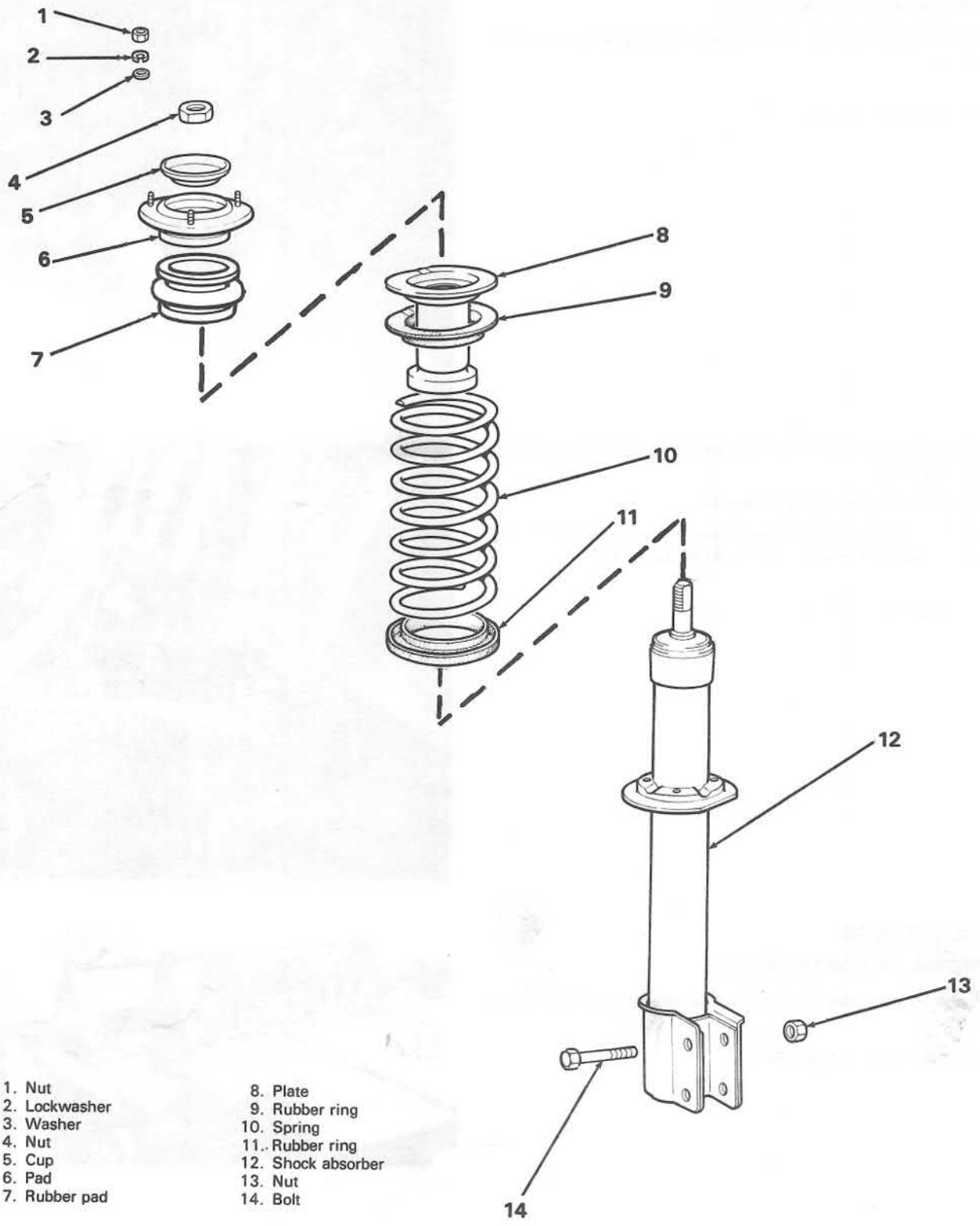
COIL SPRINGS

REMOVAL AND INSTALLATION

Set up strut assembly (1) in coil spring compressor A.74277 (2).

1. Strut assembly 2. Tool A.74277





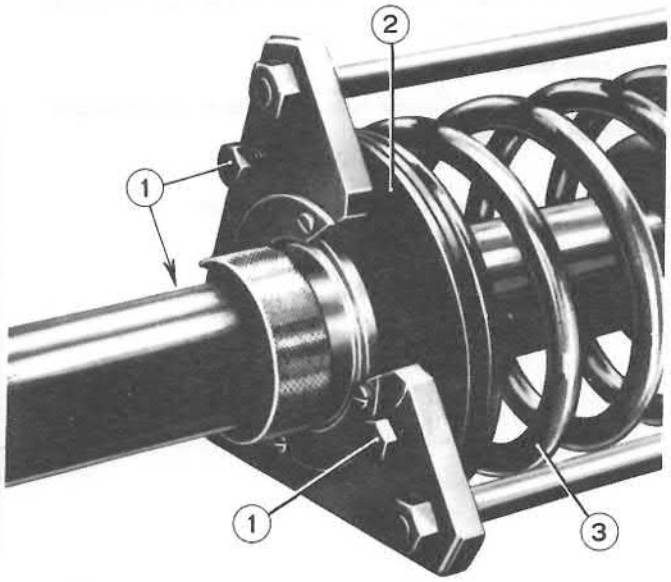
1. Nut
2. Lockwasher
3. Washer
4. Nut
5. Cup
6. Pad
7. Rubber pad
8. Plate
9. Rubber ring
10. Spring
11. Rubber ring
12. Shock absorber
13. Nut
14. Bolt

EXPLODED VIEW OF STRUT ASSEMBLY

Tighten three spring plate bolts (1) until they contact spring plate (2) on strut assembly.

Crank tool A.74277 until spring (3) is compressed about one inch.

1. Spring plate bolts 2. Spring plate 3. Spring



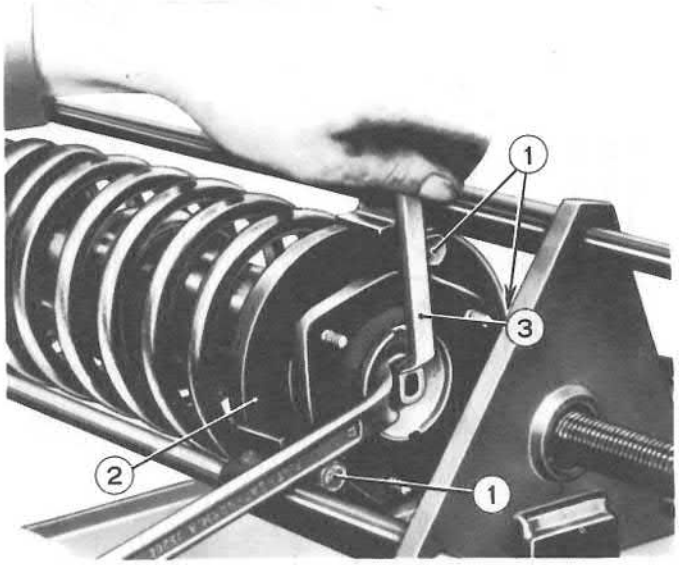
Using a shank wrench (3) to hold shock absorber stud, remove nut holding support to shock absorber.

Carefully uncrank tool A.74277 until spring is fully relaxed.

Remove strut assembly from tool A.74277 and separate parts.

To install coil spring, reverse removal procedure. Torque nut to 43 ft. lbs. (6 kgm).

1. Spring plate bolts 2. Spring plate 3. Shank wrench

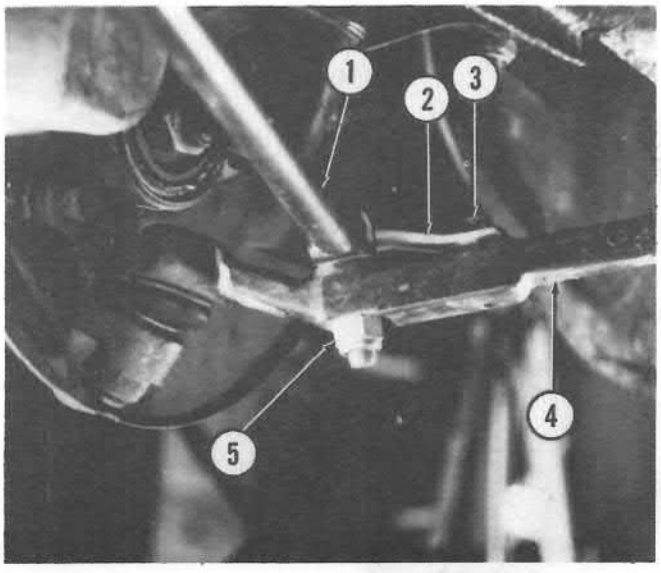


FRONT STRUT BAR

REMOVAL AND INSTALLATION

Remove nut (5), two bolts (3) and plate (2) attaching strut bar (1) to control arm (4).

1. Strut bar 2. Plate 3. Bolt 4. Control arm 5. Nut

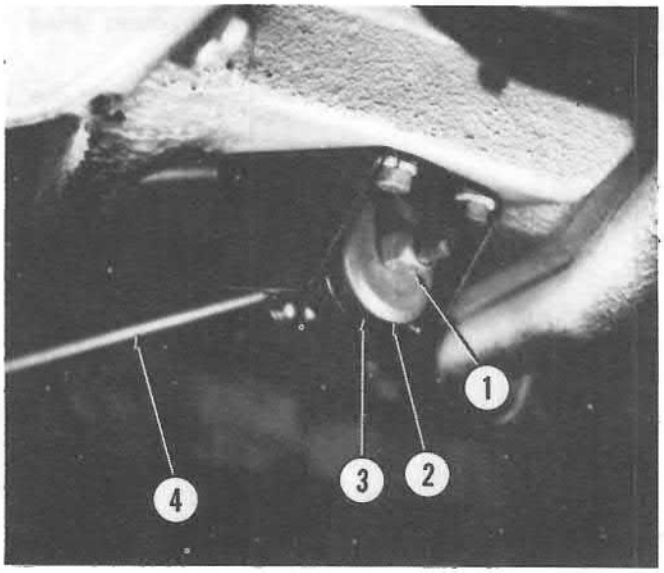


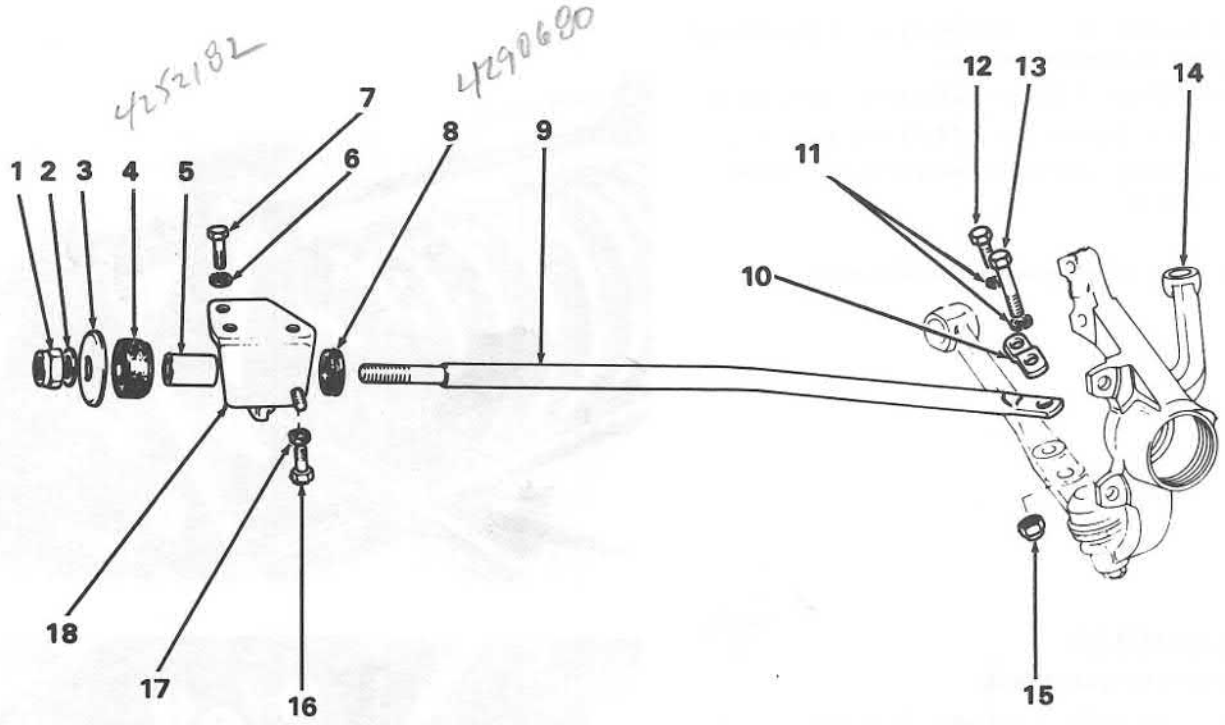
Remove nut (1), outer washer (2) and rubber grommet (3) from end of strut bar (4).

Remove strut from vehicle.

Install in reverse order. Torque nuts and bolts to specifications. Check wheel alignment.

1. Nut 2. Washer 3. Rubber grommet 4. Strut bar





1. Nut
2. Washer
3. Cup
4. Rubber pad
5. Spacer
6. Lockwasher
7. Bolt
8. Rubber ring
9. Strut bar
10. Lock plate
11. Lockwasher
12. Bolt
13. Bolt
14. Pillar
15. Nut
16. Bolt
17. Washer
18. Support

EXPLODED VIEW OF STRUT BAR ATTACHMENTS TO BODY AND CONTROL ARM

REMOVAL

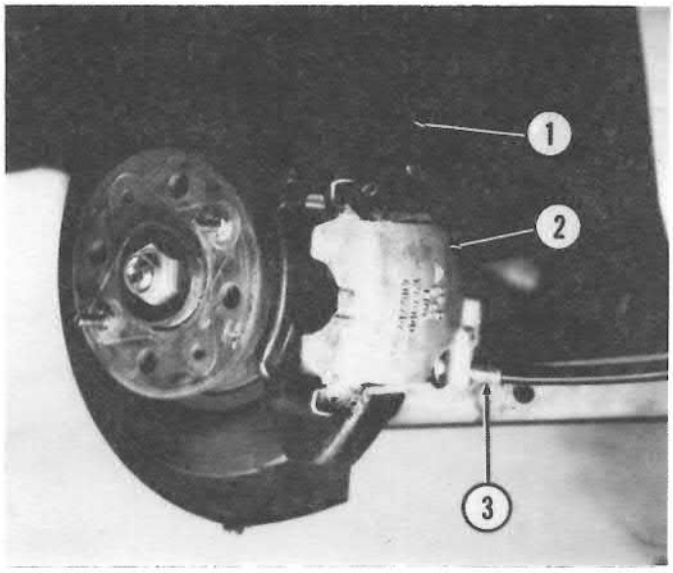
Remove wheel.

If brake caliper (2) needs inspection, leave caliper attached to suspension.

To do this, plug outlet from brake fluid reservoir and disconnect hose (1) from caliper.

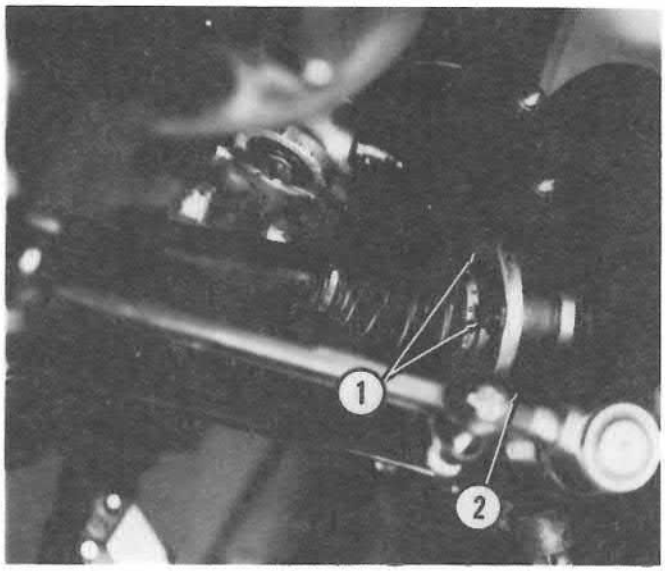
To remove caliper from suspension, refer to 331.17/.25.

1. Hose 2. Caliper 3. Cable



Remove six Allen bolts (1) attaching half-shaft outer CV joint (2) to stub shaft.

1. Allen bolts 2. Outer CV joint



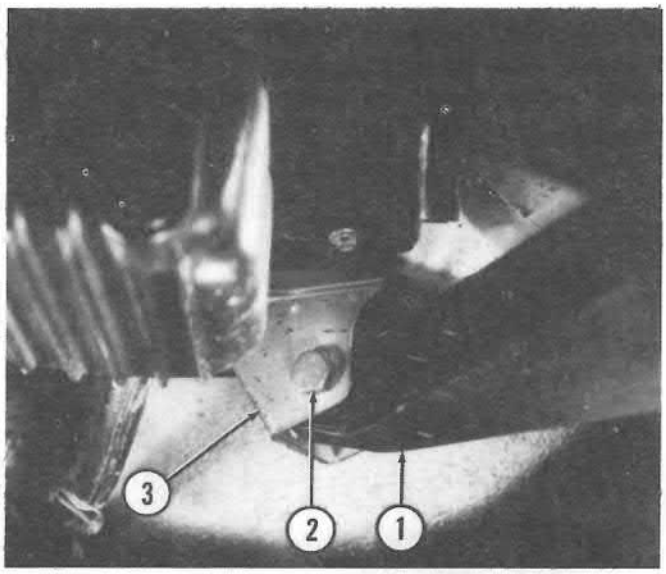
Remove catalytic converter. Refer to 102.58.

Note number and position of shims at front control arm mounting point.

Remove nut, washer and bolt (2) holding control arm (1) to bracket (3) at front of suspension.

Retain shims between arm and bracket.

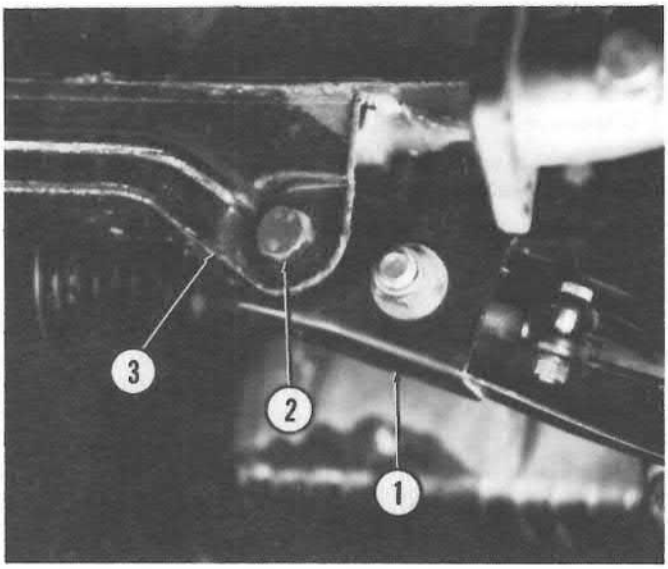
1. Control arm 2. Bolt 3. Bracket



Note number and position of shims at rear control arm mounting point.

Remove nut washer, and bolt (2) holding control arm to bracket (3) at rear of suspension.

1. Control arm 2. Bolt 3. Bracket

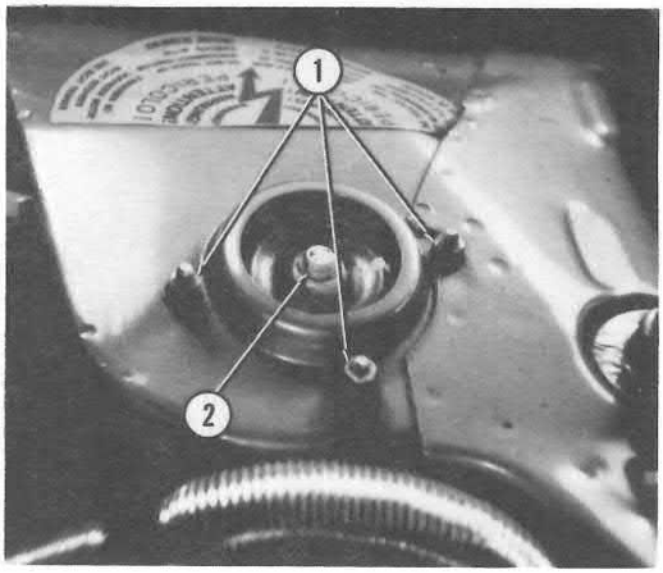


Remove 3 nuts (1) and washers holding strut assembly (2) at top.

Remove suspension assembly from vehicle.

To replace coil spring, refer to 443.02/.06.

1. Nuts 2. Strut assembly

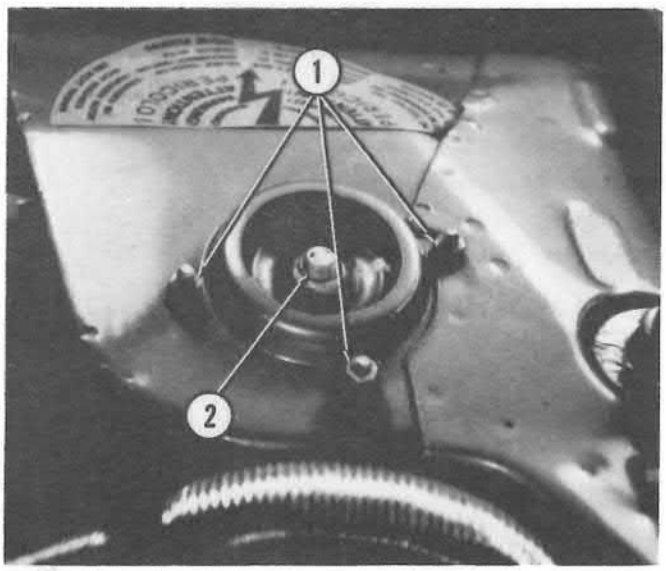


INSTALLATION

Place suspension assembly in vehicle. Install washers and nuts (1) on three bolts on top of strut assembly (2).

Torque nuts to 7 ft. lbs. (1 kgm).

1. Nuts 2. Strut assembly



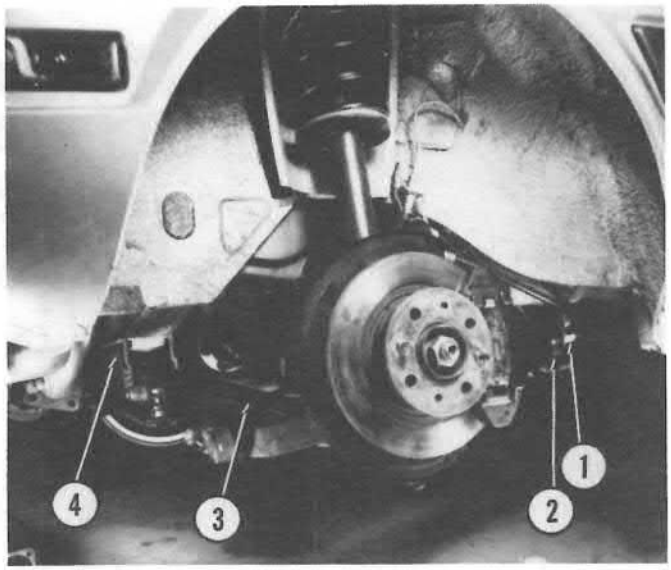
Install shims noted during removal between control arm (3) and front and rear mounting brackets (2 and 4).

Install bolts, nuts (1) and washers holding control arm to brackets.

NOTE: Torque control arm nuts to 72 ft. lbs. (10 kgm) when installation is complete and vehicle is on ground.

Install catalytic convertor.

1. Nut 2. Front bracket 3. Control arm 4. Rear bracket



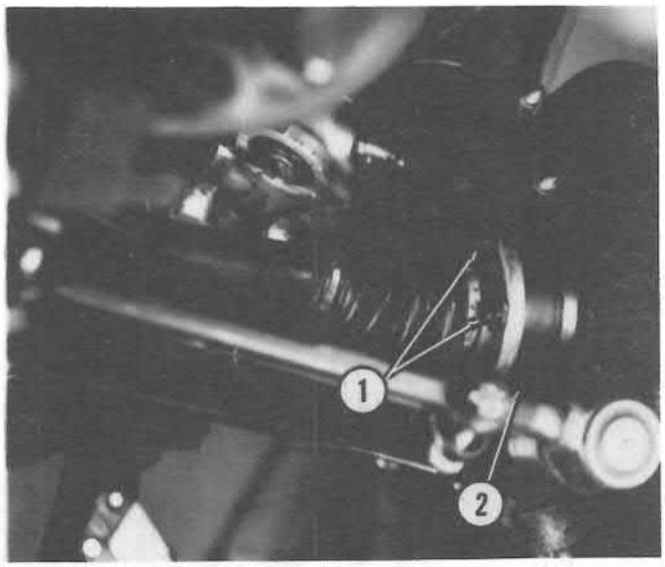
Install six new Allen bolts (1) to attach half-shaft outer CV joint (2) to hub shaft.

Torque bolts to 31 ft. lbs. (4.3 kgm).

Install brake caliper.

If caliper was left on suspension, connect hose and parking brake cable. Bleed caliper. Check wheel alignment.

1. Allen bolts 2. Outer CV joint



REAR WHEEL ALIGNMENT

Install and adjust alignment equipment. Follow instructions provided with equipment.

Set up equipment to check camber.

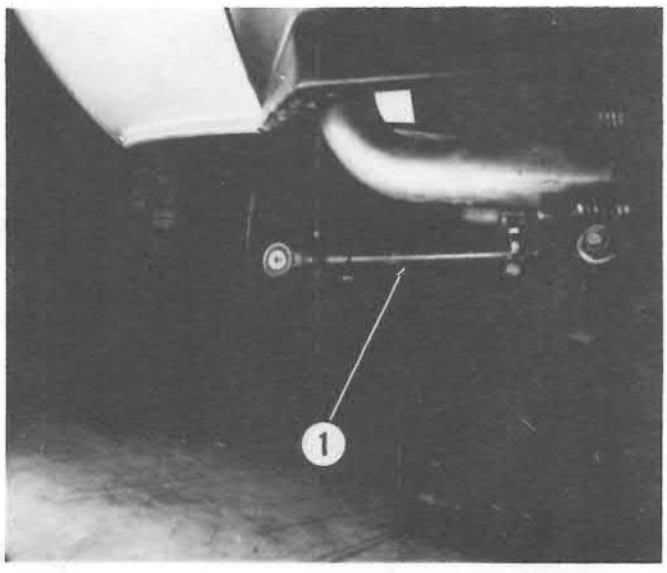
Camber should be -0°45' to -1°45'.

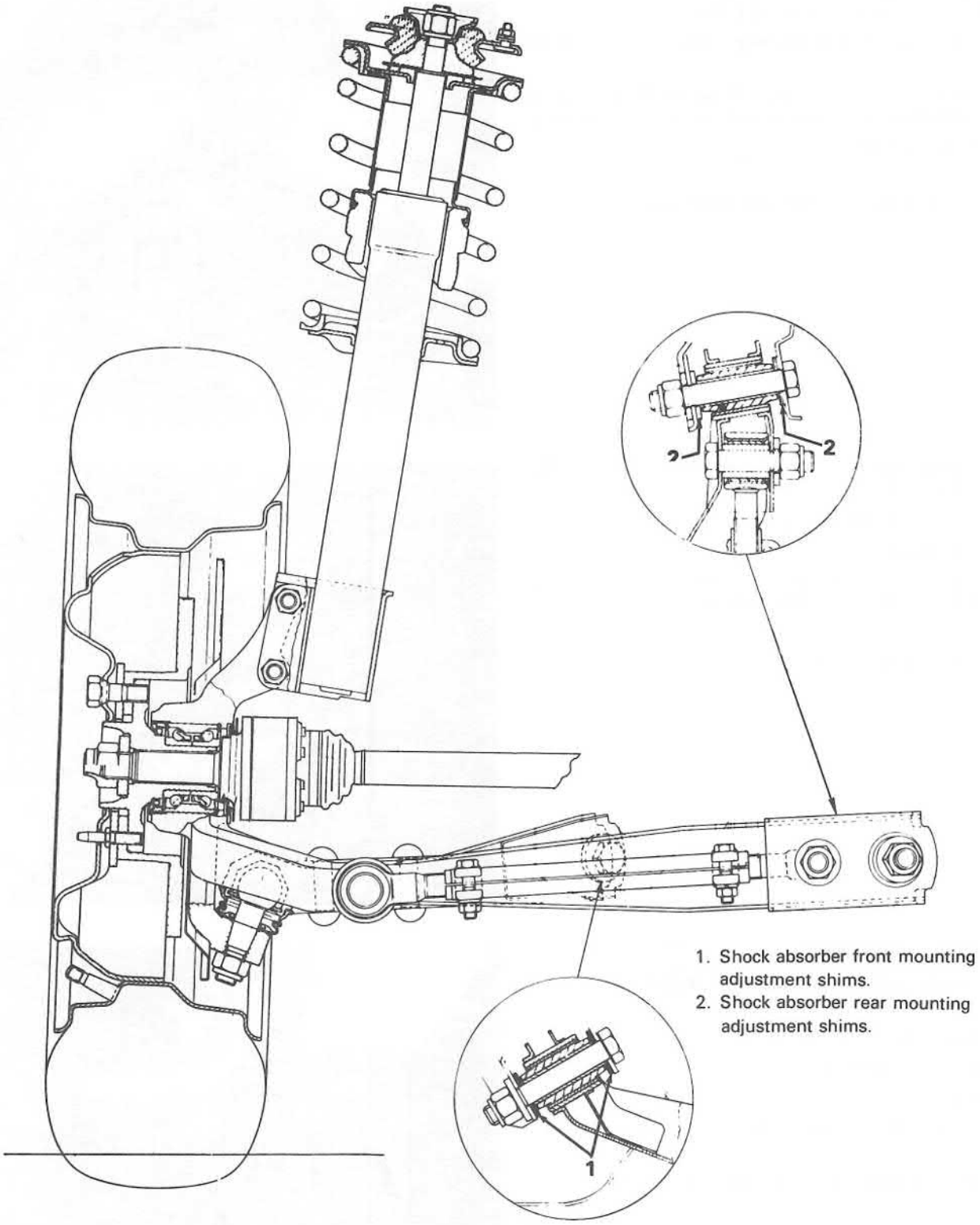
Check toe-in.

Toe-in, unladen vehicle, should be +13/64 to +11/32 in. (5.0 to 8.5 mm).

Adjust toe-in by lengthening or shortening rear tie rod (1).

1. Rear tie rod





1. Shock absorber front mounting adjustment shims.
2. Shock absorber rear mounting adjustment shims.

CROSS SECTION OF REAR SUSPENSION

CONTROL ARM

REMOVAL AND INSTALLATION

Remove rear suspension from vehicle. Refer to REAR SUSPENSION REMOVAL AND INSTALLATION.

Unstake stub shaft nut (1). Remove nut, washer and stub shaft from pillar.

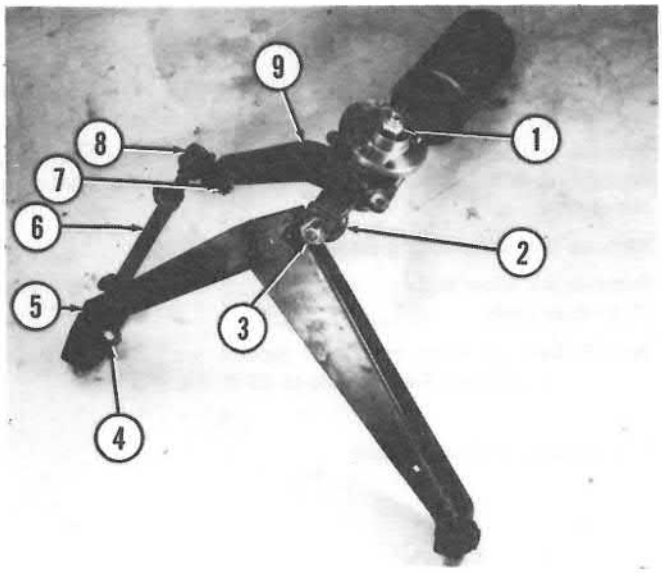
Remove nut (4) washer and bolt attaching rear tie rod (6) to control arm (5).

Remove cotter pin and nut (7) holding tie rod ball joint (8) and remove ball joint from pillar.

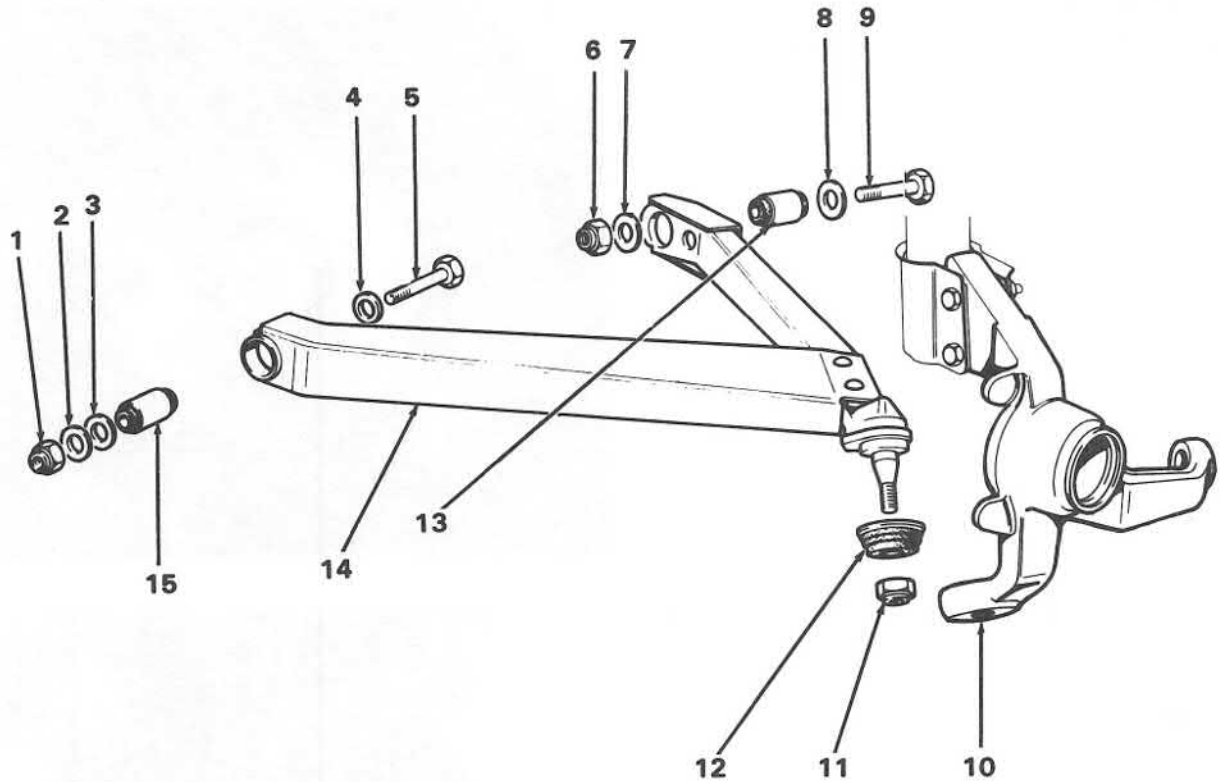
Remove nut (3) holding lower ball joint (2) to pillar (9). Separate ball joint from pillar.

Remove control arm.

Installation is reverse of removal. Torque nuts and bolts to specifications. Stake stub shaft nut.



1. Nut 2. Ball joint 3. Nut 4. Nut 5. Control arm 6. Tie rod
7. Nut 8. Ball joint 9. Pillar



1. Nut
2. Washer
3. Washer
4. Washer
5. Bolt
6. Nut
7. Washer
8. Washer
9. Bolt
10. Pillar
11. Nut
12. Boot
13. Bushing
14. Control arm
15. Bushing

EXPLODED VIEW OF CONTROL ARM

REAR PILLAR

REMOVAL AND INSTALLATION

Remove wheel. Remove bolts holding brake caliper support to pillar.

Remove caliper support with caliper attached without disconnecting brake hose and hand brake cable. Wire assembly out of way.

Remove disc and backing plate. Refer to 331.25.

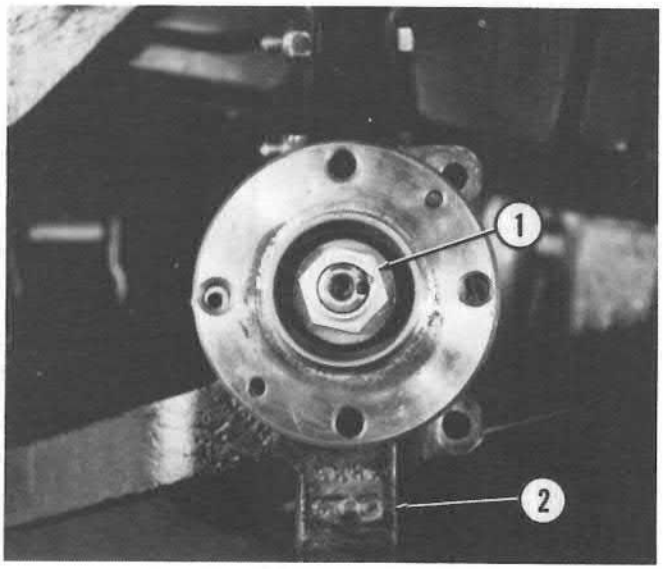
Remove six Allen bolts (1) attaching half-shaft outer CV joint (2) to stub shaft.

NOTE: Discard Allen bolts and replace with new ones for installation. Torque nuts to 31 ft. lbs. (4.3 kgm).

1. Allen bolts 2. Outer CV joint

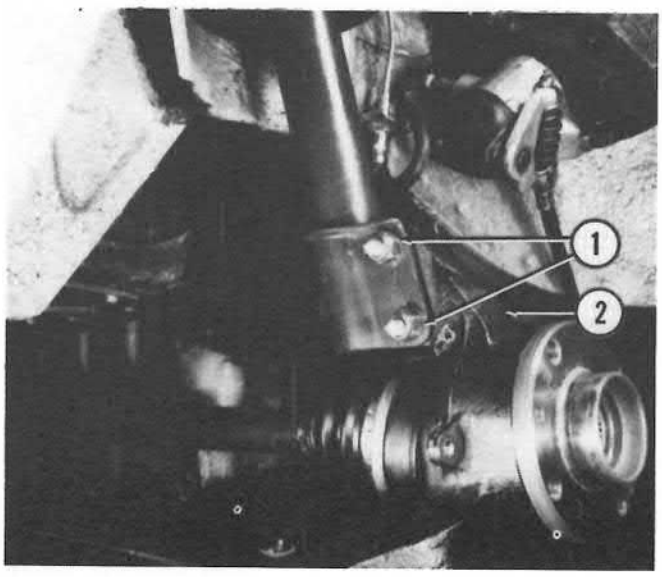
Unstake stub shaft nut (1).

Remove nut, washer and stub shaft from pillar (2).



1. Nut 2. Pillar

Remove two nuts (2) and bolts attaching strut assembly to pillar (1).



1. Pillar 2. Nuts

Remove nut (1) holding lower ball joint (2) to pillar (4).

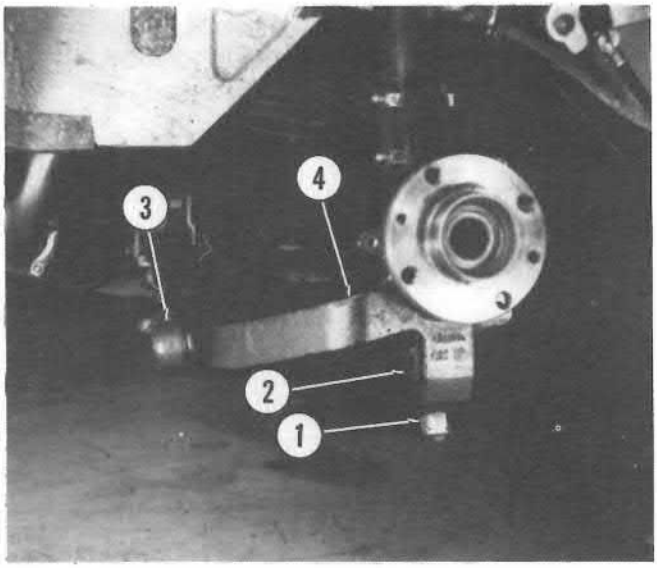
Tilt pillar outward and separate ball joint from pillar.

Remove cotter pin and nut holding rear tie rod ball joint (3) to pillar. Separate ball joint from pillar.

Remove pillar from vehicle.

Installation is reverse of removal. Torque nuts and bolts to specifications. Stake stub shaft nut.

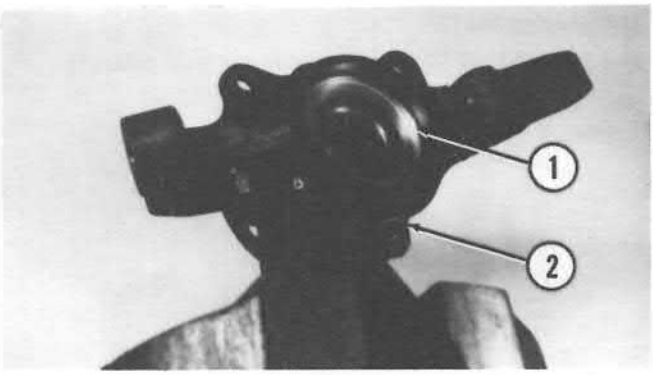
1. Nut 2. Ball joint 3. Ball joint 4. Pillar



OVERHAUL

Remove thrust ring (1) from pillar (2).

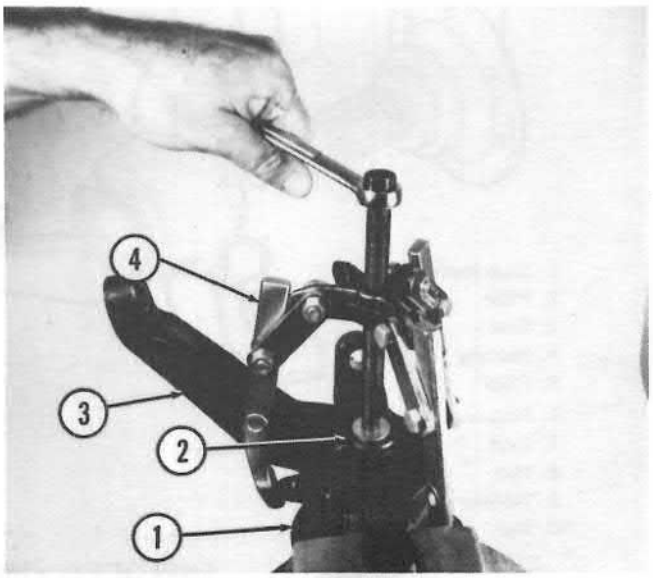
1. Thrust ring 2. Pillar



Place a suitable mandrel (2) on hub (1).

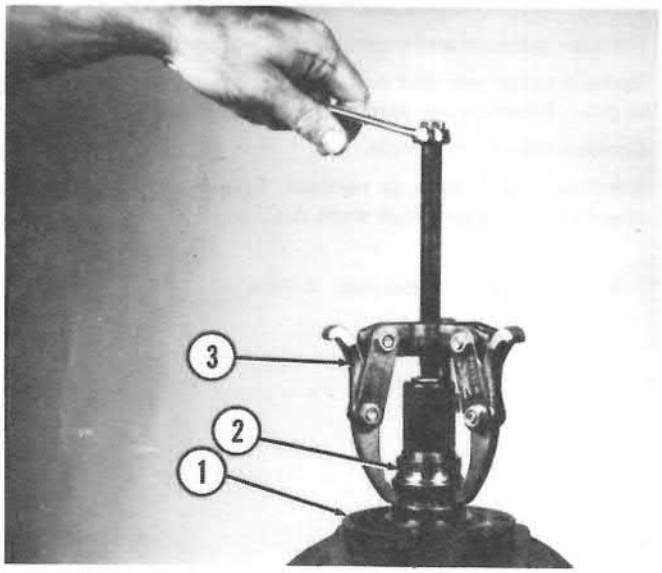
Use a puller (4) or press to press hub out of inner race and out of pillar (3).

1. Hub 2. Mandrel 3. Pillar 4. Puller



If bearing inner race (2) remains on hub (1), drive race off hub far enough to attach to puller (3), and remove race from hub. A press may also be used.

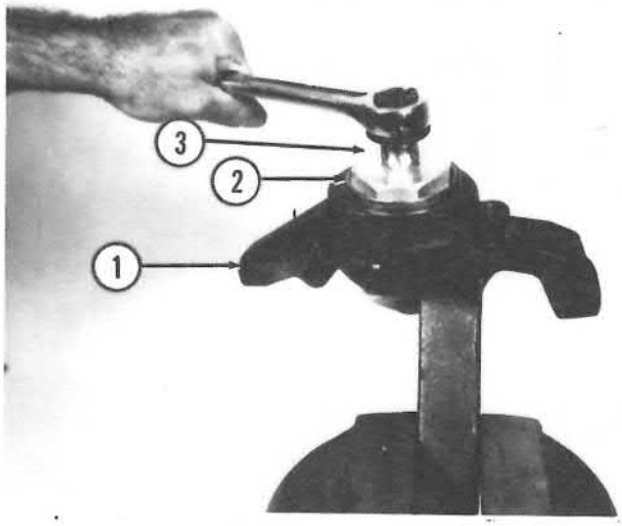
1. Hub 2. Inner race 3. Puller

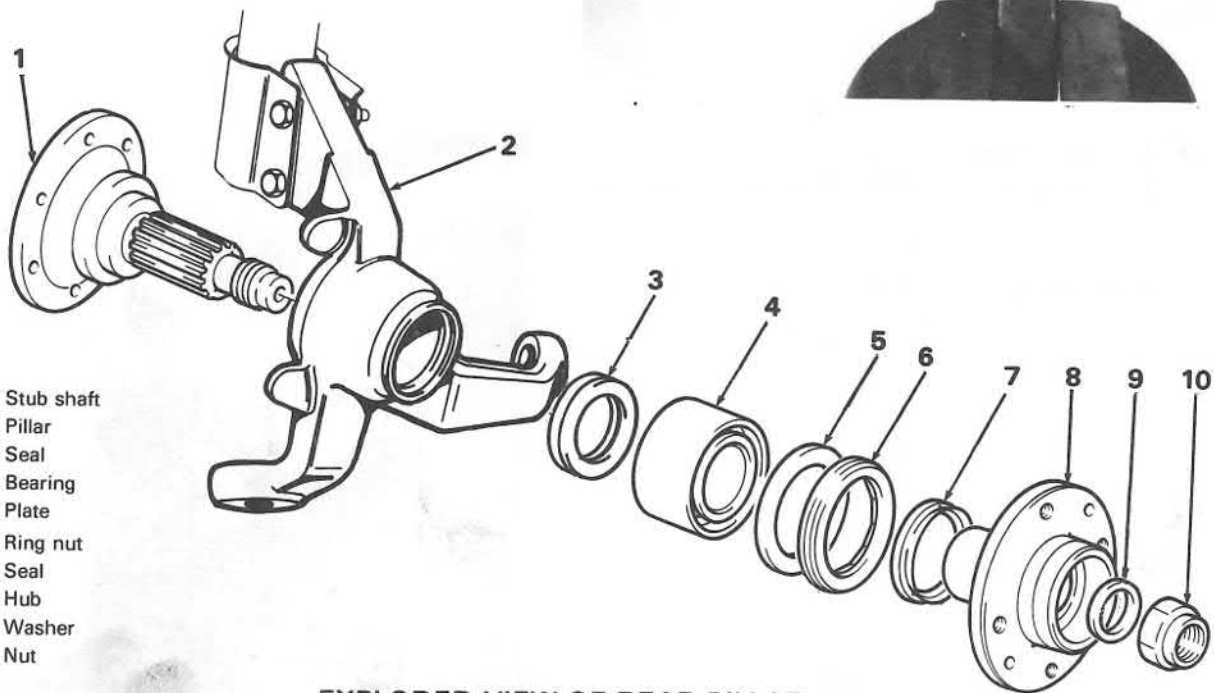


Unstake ring nut (2).

Use tool A.57149 (3) to remove ring nut from pillar (1).

1. Pillar 2. Ring nut 3. Tool A.57149





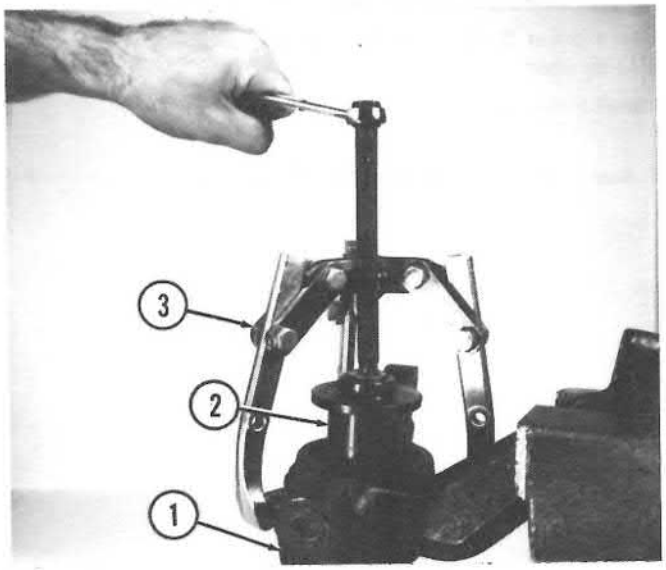
1. Stub shaft
2. Pillar
3. Seal
4. Bearing
5. Plate
6. Ring nut
7. Seal
8. Hub
9. Washer
10. Nut

EXPLODED VIEW OF REAR PILLAR

Place tool A.74377 (2) on bearing inner race.

Use a puller (3) or press to remove bearing assembly from pillar (1).

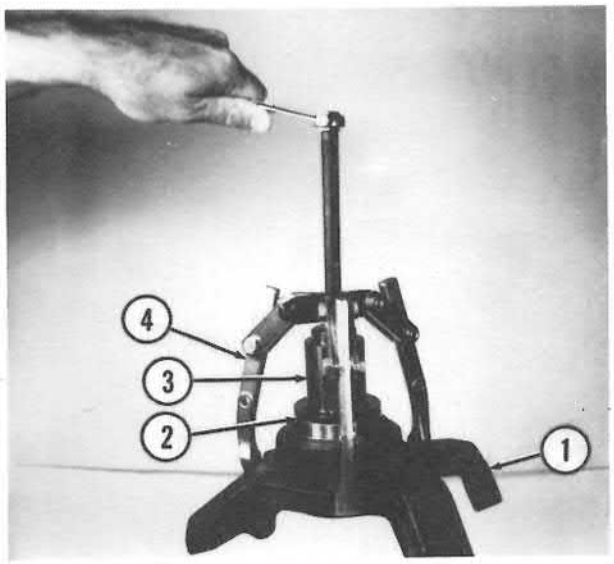
1. Pillar 2. Tool A.74377 3. Puller



To reassemble, place bearing assembly (2) on pillar (1).

Use tool A.74377 (3) and a puller (4) or press to install bearing assembly in pillar.

1. Pillar 2. Bearing assembly 3. Tool A.74377 4. Puller

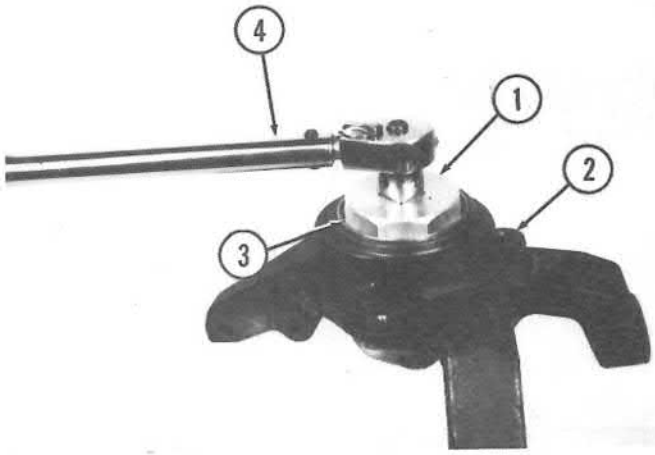


Screw a new ring nut (3) into pillar (2).

Using tool A.57149 (1) and a torque wrench (4), torque nut to 43 ft. lbs. (6 kgm).

Stake nut.

1. Tool A.57149 2. Pillar 3. Ring nut 4. Torque wrench

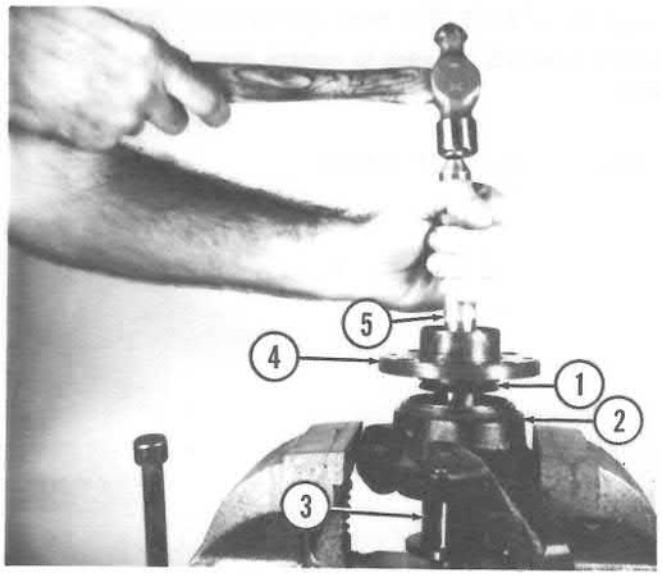


Support bearing inner race with tool A.74377 (3).

Use a driver (5) to install hub (4) into pillar (2). A press may also be used.

Install thrust plate.

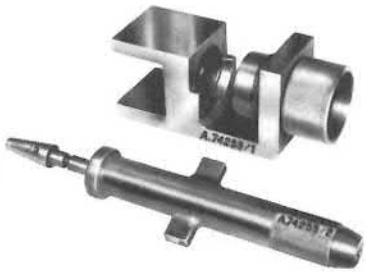
1. Seal 2. Pillar 3. Tool A.74377 4. Hub 5. Driver



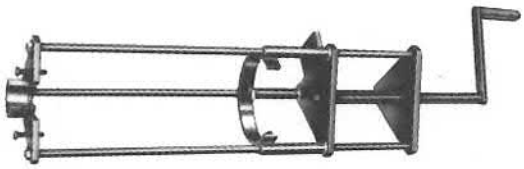
A.47038 Puller for separating tie rod ball joints

A.57149 Rear pillar ring nut wrench

A.74255 Tool for inserting front control arm rubber bushings



A.74277 Coil spring compressor



A.74377 Tool for removing and refitting rear pillar bearing

X1/9 1979 - 1982
SERVICE MANUAL

ACCESSORIES - 50

PARTS CATALOG, SERVICE MANUAL & SERVICE TIME SCHEDULE CODE

TROUBLESHOOTING

Insufficient heat or ventilation may be caused by problems other than a faulty heater. Before disassembly, check for the following:

Leaves or other debris blocking radiator.

Leaves or other debris blocking fresh air inlet.

Faulty coolant thermostat.

Blown fuse or faulty electrical system components.

Low coolant level.

Kinked or otherwise blocked heater hoses.

Cooling system contamination.

CONTROL PANEL

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

Remove radio knobs.

Remove two nuts (3) and washers retaining radio.

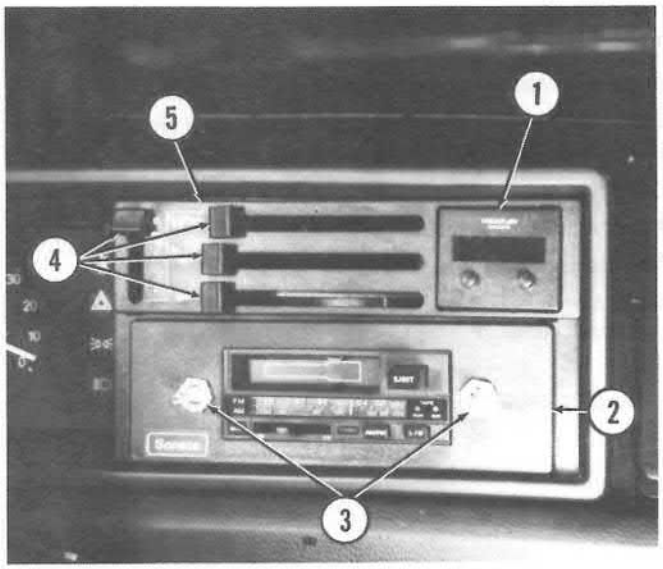
Remove radio fascia panel (2) and remove radio.

Remove four knobs (4) from levers.

Remove control panel fascia panel (5).

Remove and disconnect clock (1), or remove clock opening cover plate.

1. Clock 2. Fascia panel 3. Nuts 4. Knobs 5. Fascia panel

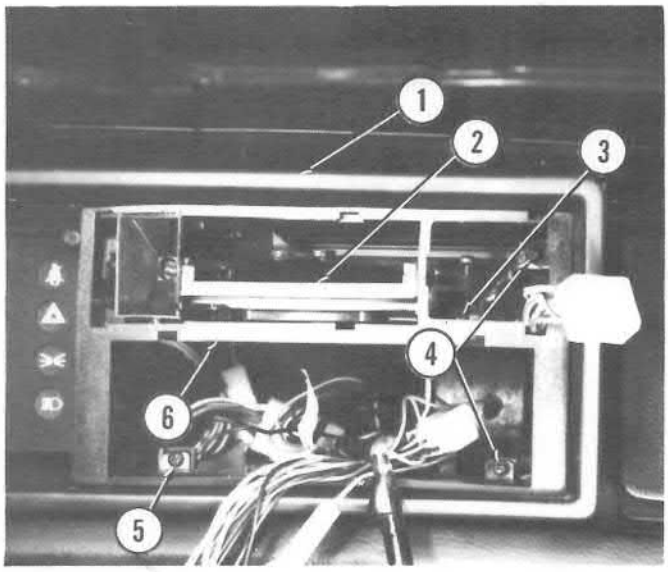


Remove screw (3) holding control panel (2) to support (6).

Remove four screws (4 and 5) holding support to instrument panel (1).

Maneuver support out of instrument panel, leaving control panel in position.

1. Instrument panel 2. Control panel 3. Screw 4. Screws 5. Screw 6. Support



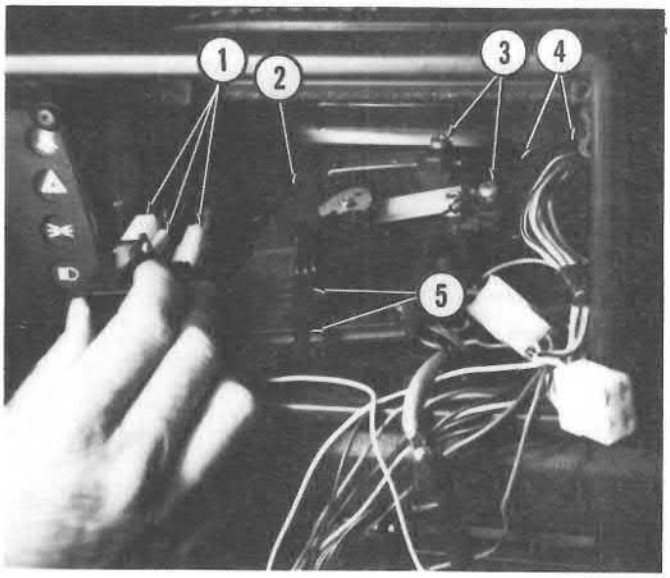
Remove connectors (1) from fan switch and light.

Remove three screws (3) and clamps holding cables (4).

Disconnect cables from levers (5) and remove control panel (2).

Install in reverse order.

1. Electrical connectors 2. Control panel assembly 3. Screws
4. Cables 5. Levers



BLOWER

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

Disconnect end of cable (4) from heater door (5) and remove screw and clamp (1) holding cable to lower housing (3).

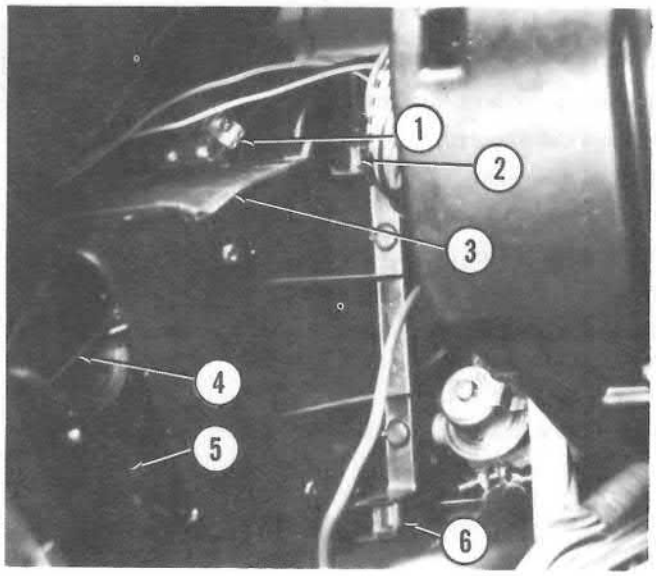
Pull cable out of lower housing.

At left side of housing, disconnect three blower leads.

Remove four clips (2 and 6) holding lower housing.

Maneuver lower housing out of vehicle complete with duct for center vents.

1. Clamp 2. Clip 3. Lower housing 4. Cable 5. Heater door 6. Clip



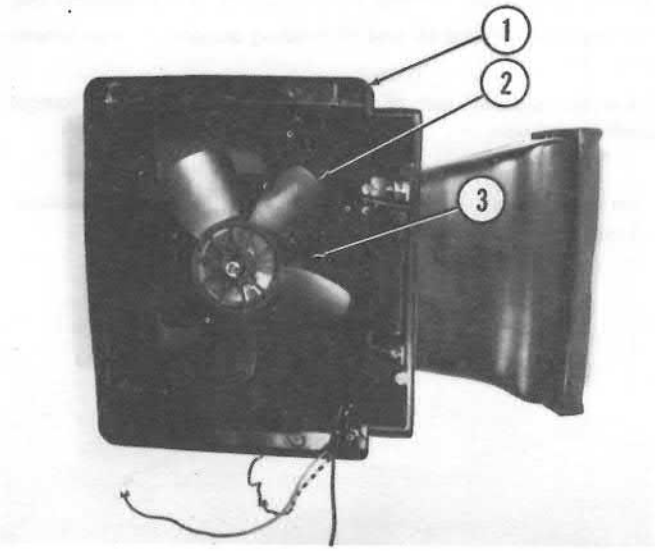
Remove blower fan shroud.

Remove two clips (3) holding blower assembly (2).

Remove blower assembly from lower housing (1).

Install in reverse order.

1. Lower housing 2. Blower assembly 3. Clip



HEATER CORE

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

Drain cooling system.

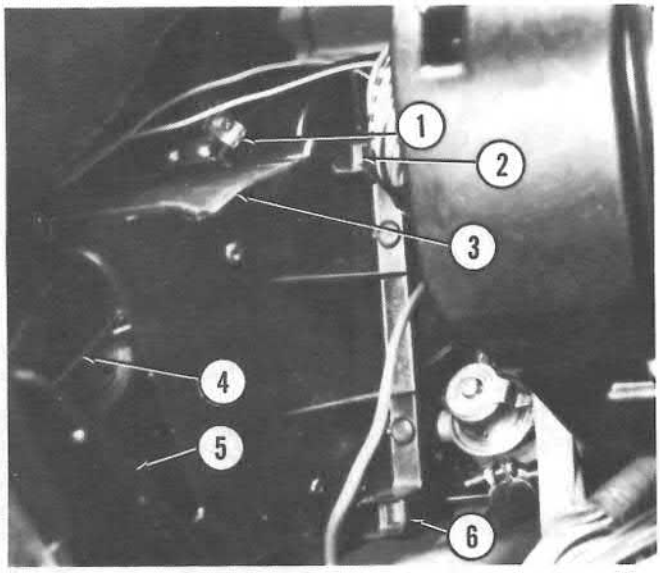
Disconnect end of cable (4) from heater door (5) and remove screw and clamp (1) holding cable to lower housing (3).

Pull cable out of lower housing.

At left side of housing, disconnect three blower leads.

Remove four clips (2 and 6) holding lower housing.

Maneuver lower housing out of vehicle complete with duct for center vents.



1. Clamp 2. Clip 3. Lower housing 4. Cable 5. Heater door 6. Clip

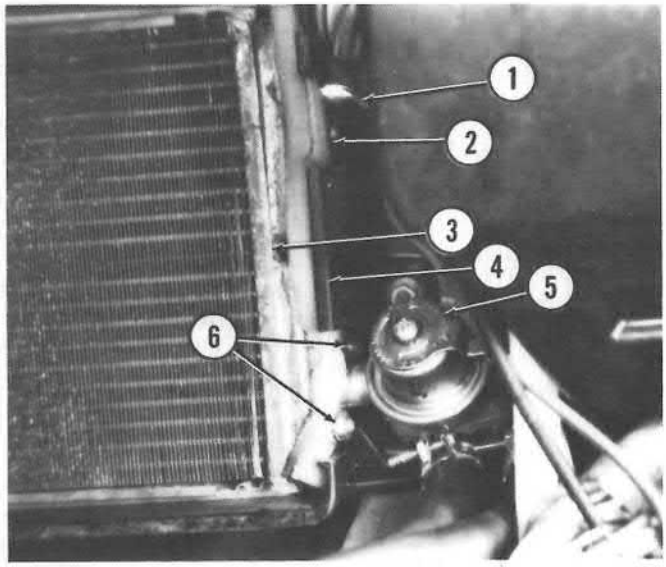
Place container on floor to catch coolant.

Remove two nuts (6) holding water valve (5) to heater core (3) and separate valve from core.

Remove two nuts (2) holding pipe (1) to heater core and separate pipe from core.

Slide heater core out of upper housing (4) and remove from vehicle.

Install in reverse order. Use new gaskets.



1. Water pipe 2. Nut 3. Heater core 4. Upper housing
5. Water valve 6. Nuts

WATER VALVE

REMOVAL AND INSTALLATION

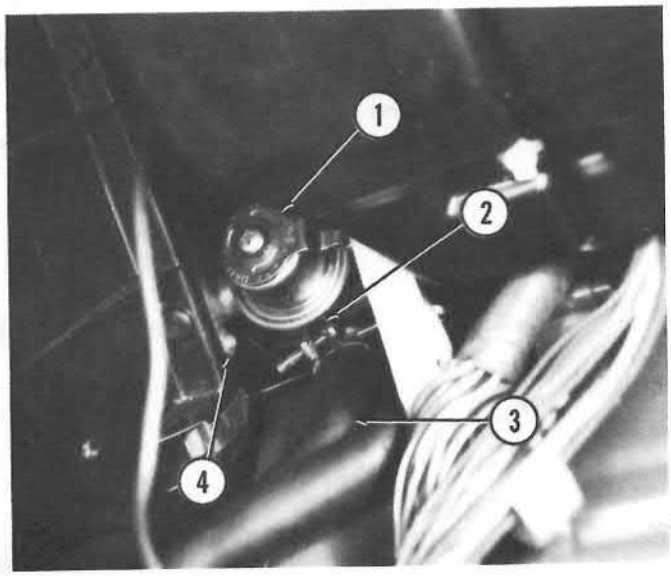
Disconnect battery ground cable. Drain cooling system.

Remove screw and clamp holding control cable to valve (1). Disconnect cable end from valve.

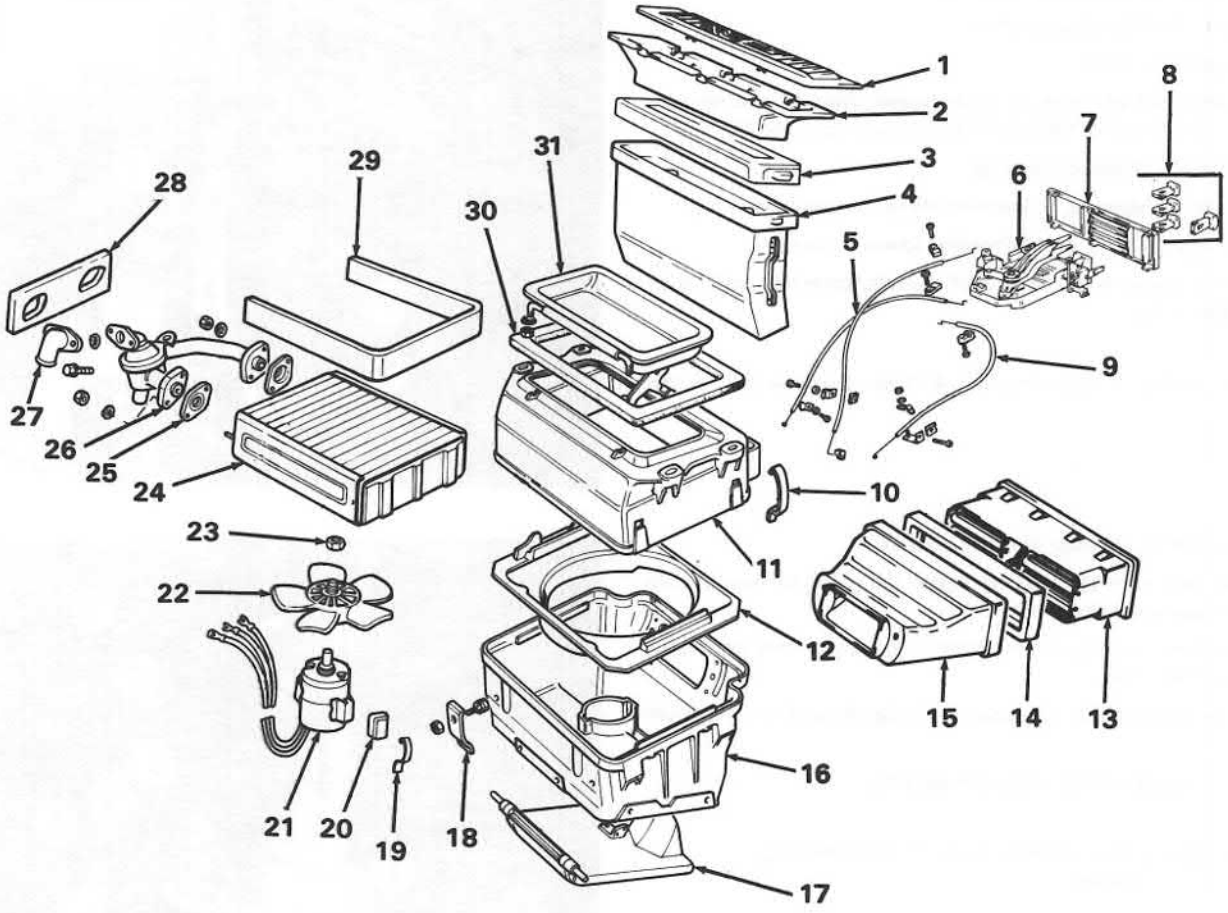
With container on floor to catch coolant, loosen clamp (2) and disconnect hose (3) from valve.

Remove two nuts (4) holding valve to heater core and remove valve.

Install in reverse order. Use new gasket.



1. Water valve 2. Clamp 3. Hose 4. Nut



1. Diffuser
2. Duct
3. Gasket
4. Duct
5. Cables
6. Control panel
7. Fascia panel
8. Knobs
9. Cable
10. Clip
11. Upper housing
12. Fan shroud
13. Vent assembly
14. Gasket
15. Duct
16. Lower housing
17. Heater door
18. Hinge
19. Clip
20. Pad
21. Blower motor
22. Fan
23. Nut
24. Heater core
25. Gasket
26. Water valve
27. Pipe
28. Gasket
29. Pad
30. Gasket
31. Air intake door

EXPLODED VIEW OF HEATER ASSEMBLY

SERVICING

Insufficient air conditioning may be caused by problems other than A/C components.

Before removing any components, check for the following:

Leaves or other debris blocking radiator or condenser.

Leaves or other debris blocking fresh air inlet.

Blown fuse or faulty electrical system components.

Low freon charge.

Kinked or disconnected vacuum lines.

Observe following precautions before any service operations that require opening up freon system.

WARNING: Wear protective eye equipment while purging system. Do not discharge freon near open flame, a toxic gas may result.

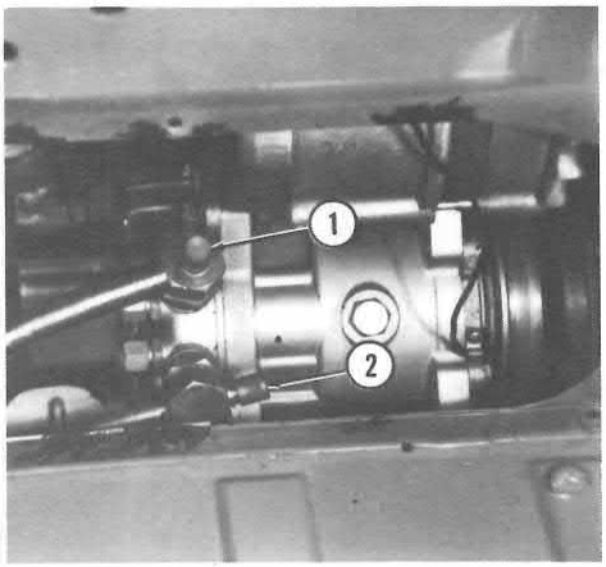
CAUTION: Purge system slowly to prevent excessive loss of system oil.

NOTE: Whenever system is purged, it must be evacuated and recharged.

Purging System

With both valves closed on A/C manifold gauge set, attach red hose (high pressure) to discharge fitting (2) and blue hose (low pressure) to suction fitting (1).

1. Suction fitting 2. Discharge fitting



Place yellow hose in a clean rag.

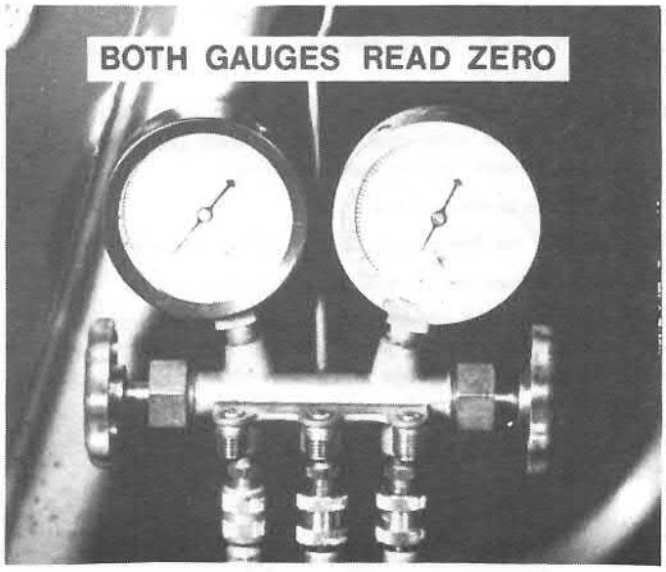
Slowly open low and high pressure valves on gauge set. Allow freon to bleed off through yellow hose.

CAUTION: Open valves only enough to bleed off freon slowly. Rapid bleeding will draw excessive oil from system.

Check rag for signs of oil, a small amount is to be expected. Replace oil if loss is excessive.

When both gauges read zero, system is purged.

Close valves on gauge set, and leave lines connected for evacuating.



Evacuating System

CAUTION: System must not be operating and must be purged before starting evacuation.

Connect yellow hose from A/C gauge set to vacuum pump. Start vacuum pump.

Open low pressure valve. Check that low pressure gauge indicates a slight vacuum. After a few minutes check that low pressure gauge reads about 24" Hg, and high pressure gauge reads slightly below zero. If high pressure gauge does not read below zero, check system for blockage.

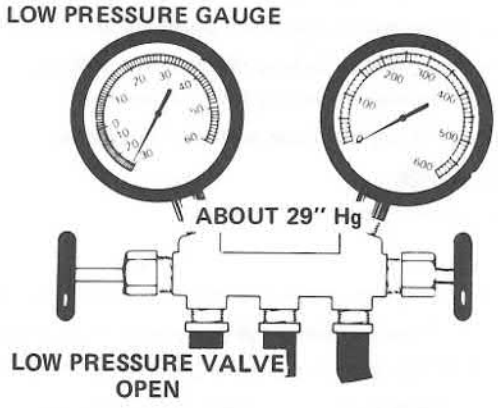
After about 10 minutes of operation, low pressure gauge should read about 29" Hg.

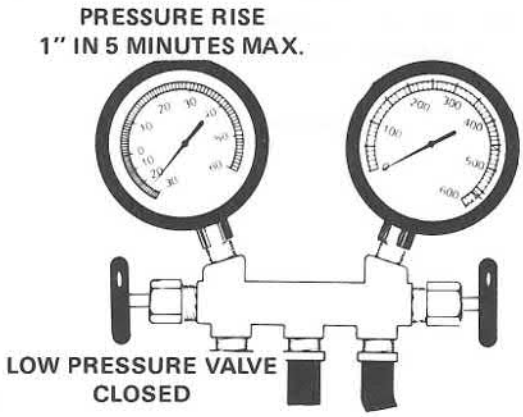
If gauge rises check system for leakage. Any leak must be repaired.

Operate vacuum pump for a minimum of 30 minutes at about 29" Hg (maximum vacuum will be 1" less for each 1000 ft. above sea level).

Close low pressure valve. Check low pressure reading, it should not rise faster than 1" in five minutes. If reading rises faster, check system for leak.

Shut off vacuum pump. Disconnect yellow hose from pump. System is now ready to be charged with freon.





Charging System Using Freon Pound Cans

NOTE: A/C gauge set is connected same as in preceding instructions.

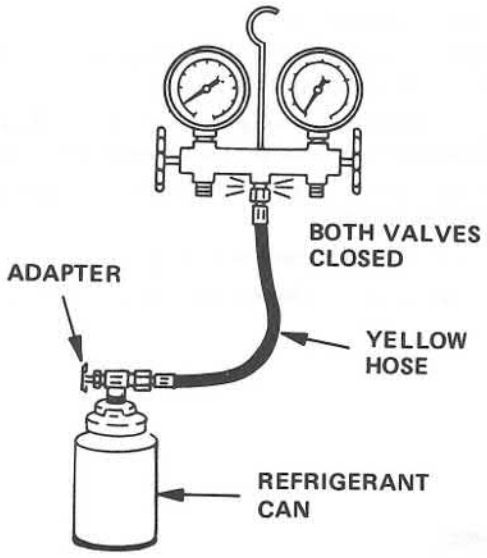
WARNING: Wear protective eye equipment. Do not discharge freon near open flame, a toxic gas may result. Avoid heating freon container.

System charge is about 2 lbs.

Place adapter on freon can. Attach yellow hose to adapter.

Make sure both valves on A/C gauge set are closed.

Pierce freon can and allow freon to enter yellow hose. Loosen yellow hose connector at gauge set and allow gas to escape for a few seconds to purge air in line. Retighten connector.



Make sure both valves on gauge set are closed.

Start engine.

Push "MAX A/C" button and set fan speed at "Hi"

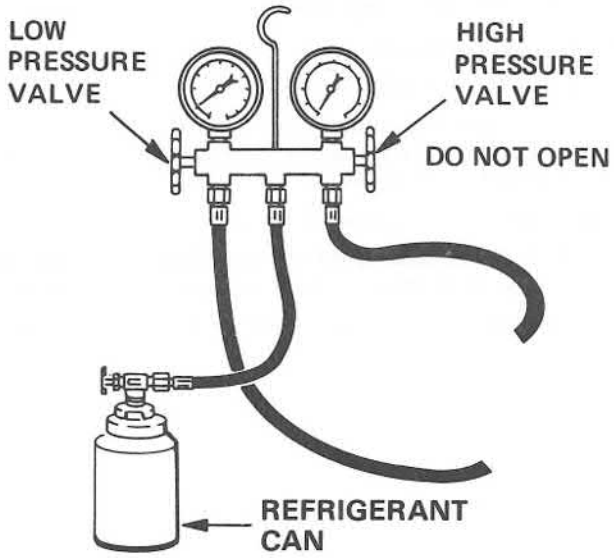
Set engine at fast idle (1500 to 2000 rpm).

With freon can upright, gradually open low pressure valve to allow freon into system.

CAUTION: Do not open high pressure valve.

If pressure on low pressure gauge drops below 40 psi, freon can may be inverted momentarily for faster charging. Do not hold can inverted for more than a few seconds since excessive amounts of liquid will be drawn into compressor and damage it.

To determine when can is empty tap it on bottom. A hollow ring should be heard when empty.



Repeat above with additional cans to charge system with a total of about 2 lbs.

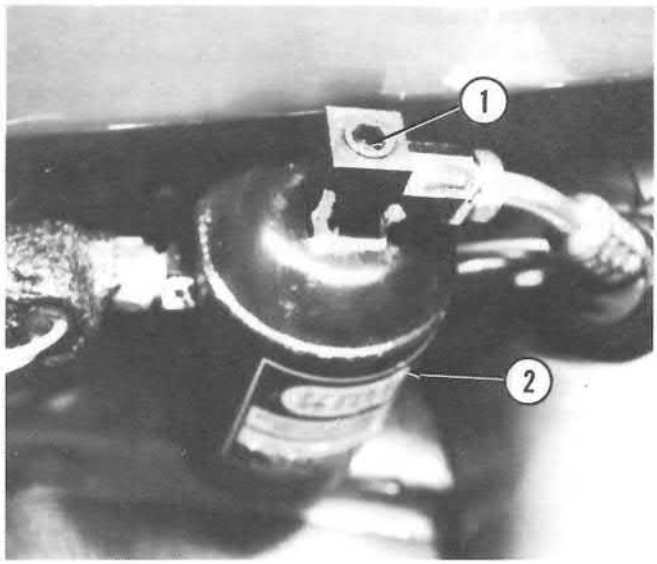
Whether just adding freon to a low system, or fully charging, check sight glass (1) on receiver/dryer (2) to determine when system is completely charged. When freon passing through sight glass is clear and free of bubbles, system is completely charged.

Close low pressure valve.

Disconnect yellow hose from can.

As quickly and carefully as possible, disconnect red and blue hoses from system connectors. Replace caps on connectors.

1. Sight glass 2. Receiver/dryer



Charging System Using Test Stand

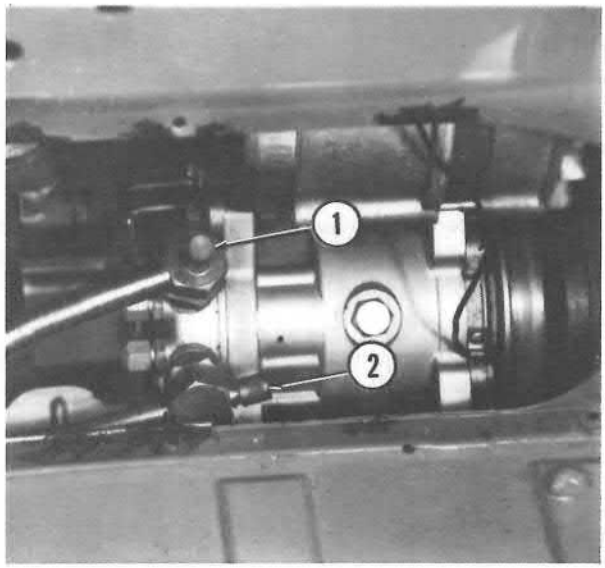
Refer to test stand manufacturer's instructions.

Connect high pressure hose from test stand to discharge fitting (2).

Connect low pressure hose from test stand to suction fitting (1).

Set charge indicator to about 2 lbs.

1. Suction fitting 2. Discharge fitting



OPERATIONAL CHECKS

Connecting Test Equipment

Close both valves on A/C gauge set.

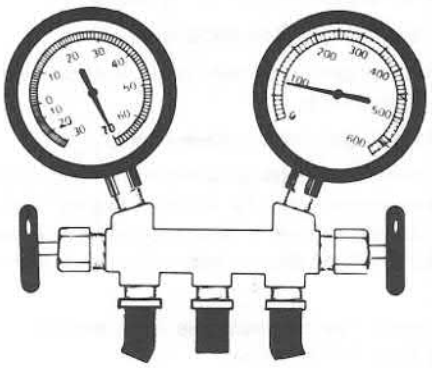
Remove caps from discharge and suction fittings (refer to preceding figure). Connect blue hose (low pressure) to suction fitting and red hose (high pressure) to discharge fitting.

Check that both gages read 70 to 85 psi at 68° to 78°F.

NOTE: Pressure reading will vary according to ambient temperatures, relative humidity, and atmospheric pressure.

Provide a fan to flow air over front of vehicle during following checks.

BOTH GAUGES 70 TO 85 PSI



BOTH VALVES CLOSED

Normal System Operation

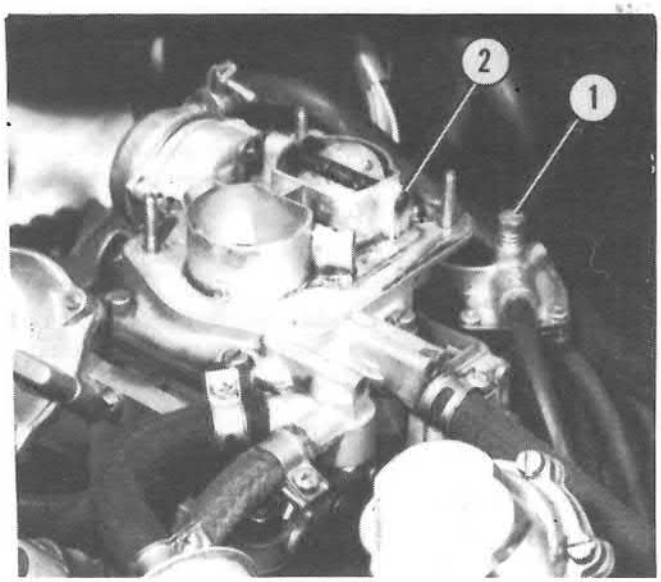
Set A/C controls to "MAX A/C" with fan switch on "Hi"

Accelerate engine and allow it to decrease to idle. On vehicles with carburetor, check that idle is between 950 and 1050 rpm.

On vehicles with fuel injection, check that idle speed does not decrease with A/C on.

Accelerate engine to 1500 rpm. Check that low pressure gauge reads between 7 and 42 psi and high pressure gauge reads between 142 and 248 psi.

Check that freon passing through sight glass is clear and free of bubbles.



1. Idle speed step-up control 2. Carburetor

Compressor Clutch and Minimum Pressure Switch Check

Shut off engine. Turn ignition switch on.

Push "STOP" button and check that compressor clutch disengages.

Push "MAX AC" button and check that clutch engages.

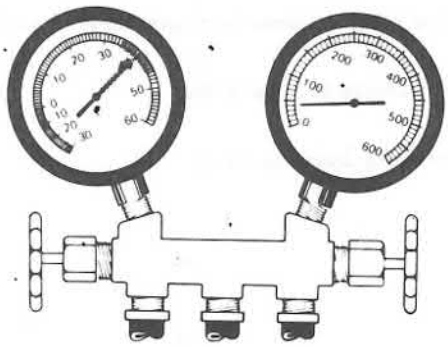
Open low pressure valve on gauge set and slowly bleed freon until clutch disengages. Clutch should disengage at 40 ± 5 psi on low pressure gauge.

Close low pressure valve.

Recharge system. Evacuating system is not required since system was not completely discharged.

35-45 PSI

LOW



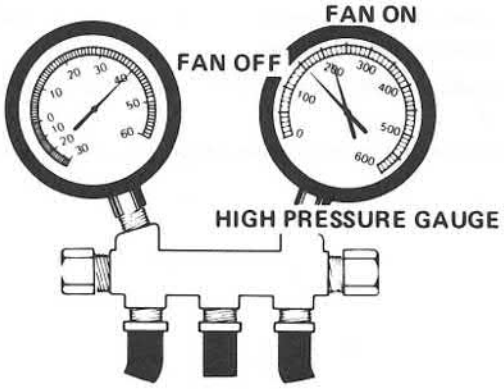
Condenser Fan Switch Check

NOTE: Do not use fan in front of vehicle unless ambient temperature is over 80°F.

Start engine and set A/C controls for maximum cooling. Run engine at about 2000 rpm.

Check that condenser fan comes on between 240 to 280 psi on high pressure gauge. This indicates that switch closed.

Allow engine speed to slow down. Check that fan goes off between 160 and 140 psi. This indicates that switch opened.



High Pressure Switch Check

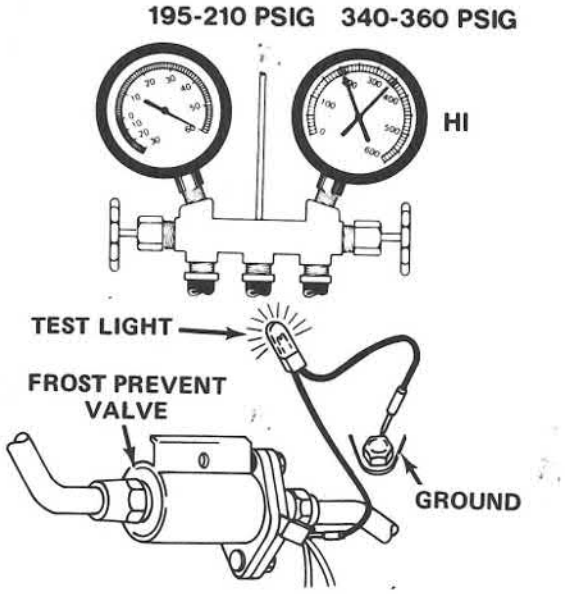
Connect test light to wire on frost prevent valve. Do not disconnect wire from valve.

Disconnect connector for condenser fan.

Increase engine speed to increase pressure. Check that test light comes on between 340 and 360 psi. This indicates that high pressure switch closed.

Check that pressure starts to drop. This indicates that frost prevent valve works.

Reconnect condenser fan connector. Check that test light goes out between 210 and 195 psi. This indicates that high pressure switch opened.



Frost Prevent Switch Check

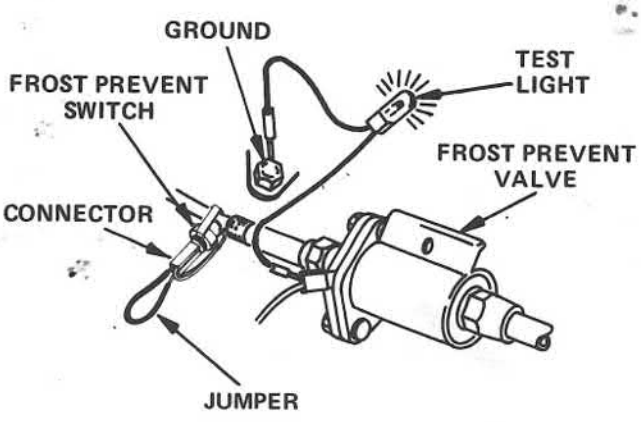
Leave test light connected to frost prevent valve wire.

Run engine at fast idle.

Place jumper wire into frost prevent switch connector.

Check that test light comes on and pressure starts to drop. This indicates that system wiring is good.

Shut engine off. Remove jumper and test light.



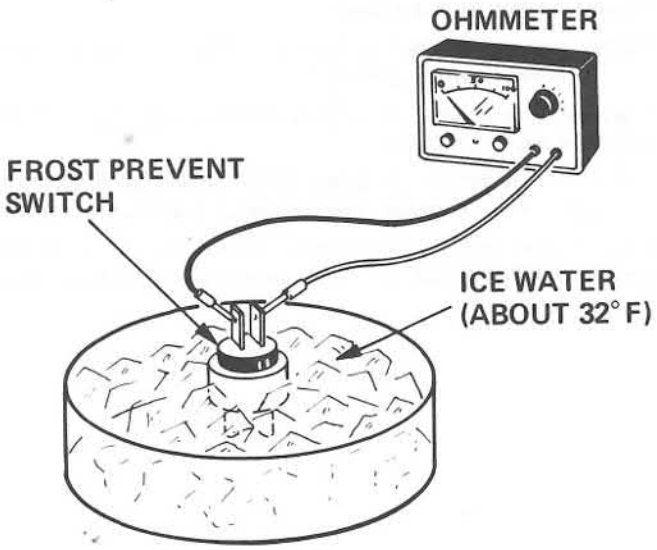
Remove frost prevent switch.

Provide ice cold water about 32°F.

Connect ohmmeter to terminals on switch. Place switch in water. Check that switch closes.

Remove switch from water. Check that switch opens as it warms up.

Install switch making sure surface of switch and pipe are clean.



A/C-HEATER VACUUM SYSTEM

Component Test

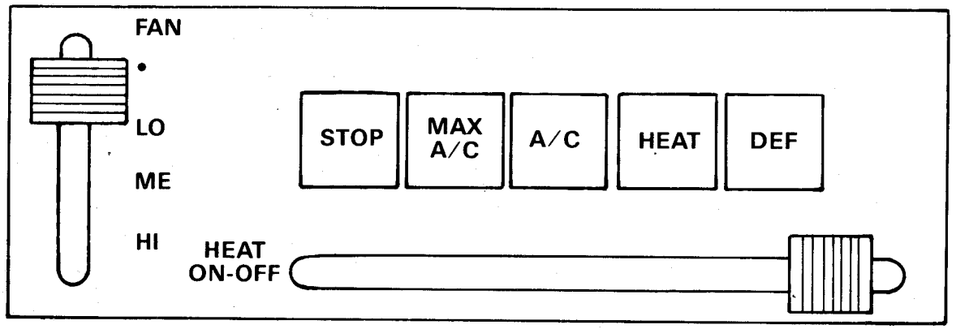
To test each vacuum component, apply vacuum to vacuum motor and check operation. If vacuum motor does not operate, check for binding linkage or broken vacuum motor.

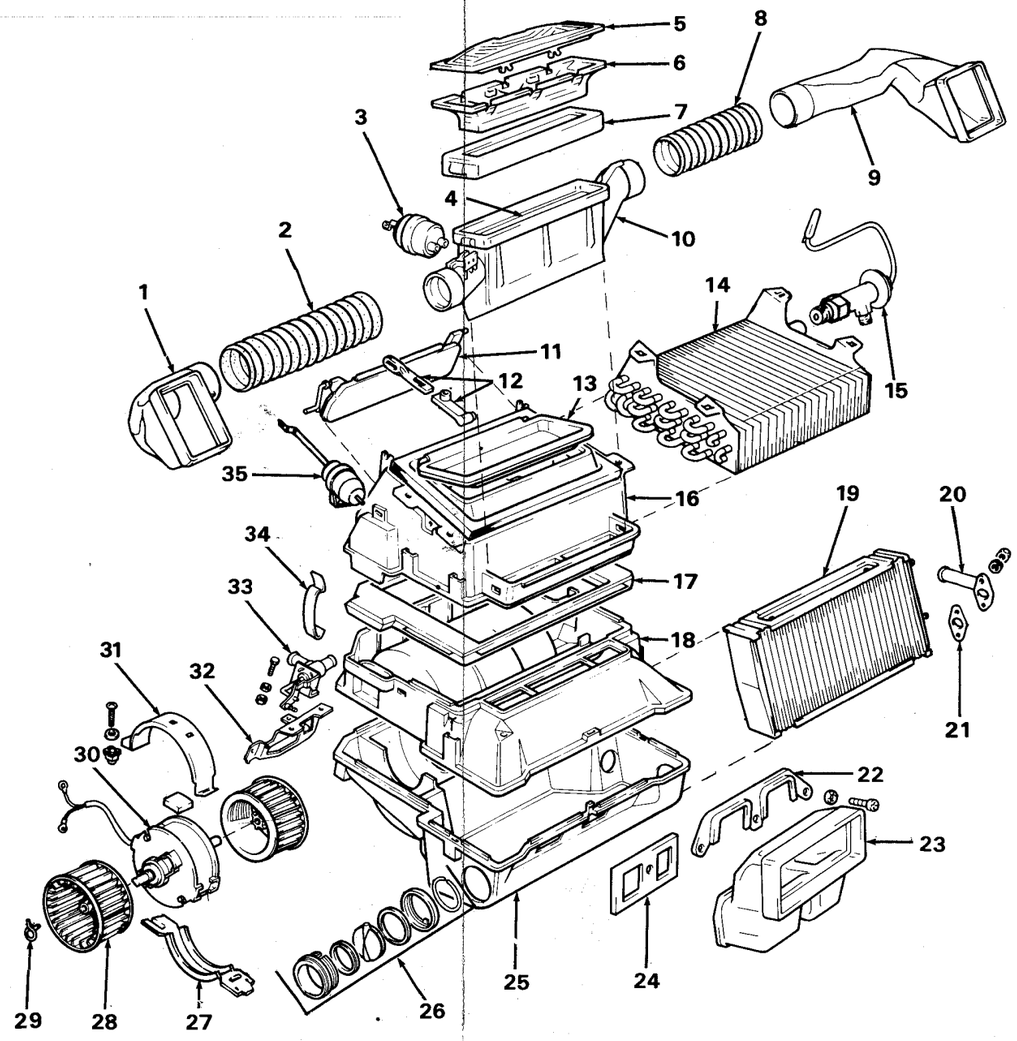
System Test

To test the vacuum system (engine running), press each push button on A/C-Heater Control, then check each component for the condition indicated. Test for vacuum at each component by removing vacuum hose from component, then manually blocking the hose.

COMPONENT	A/C-HEATER CONTROL PUSH BUTTONS				
	STOP	MAX A/C	A/C	HEAT	DEF
COMPRESSOR	Off	On	On	Off	Off
BLOWER (30)	Off	On	On	Off/On*	Off/On*
FRESH AIR DOOR (13)	Closed-NV	Closed-NV	Open-V	Open-V	Open-V
RECIRCULATED AIR DOOR (11)	Open-NV	Open-NV	Closed-V	Closed-V	Closed-V
DEFROSTER DOOR (4)	Closed-V	Closed-V	Closed-V	Closed-V	Open-NV
WATER VALVE (33) (Controlled by HEAT lever)	Closed	Closed	Closed/Open*	Open	Open

* - Optional
V - Vacuum to vacuum motor
NV - No vacuum to vacuum motor





1. Duct
2. Duct tube
3. Vacuum motor for defroster door
4. Defroster door
5. Diffuser
6. Duct
7. Gasket
8. Duct tube
9. Duct
10. Defroster duct
11. Recirculated air door
12. Door linkage
13. Fresh air door
14. Evaporator
15. Expansion valve
16. Upper housing
17. Gasket
18. Center housing
19. Heater Core
20. Pipe
21. Gasket
22. Plate
23. Duct
24. Gasket
25. Lower housing
26. Vent assembly
27. Bracket
28. Fan
29. Clip
30. Blower motor
31. Bracket
32. Bracket
33. Water valve
34. Clip
35. Vacuum motor for doors 11 and 13

EXPLODED VIEW OF A/C-HEATER ASSEMBLY

CONTROL PANEL

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

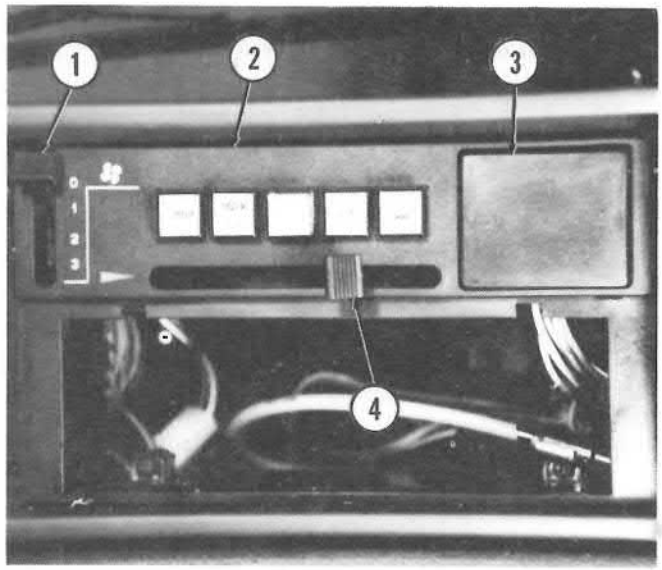
Remove radio.

Remove two knobs (1 and 4) from levers.

Remove fascia panel (2).

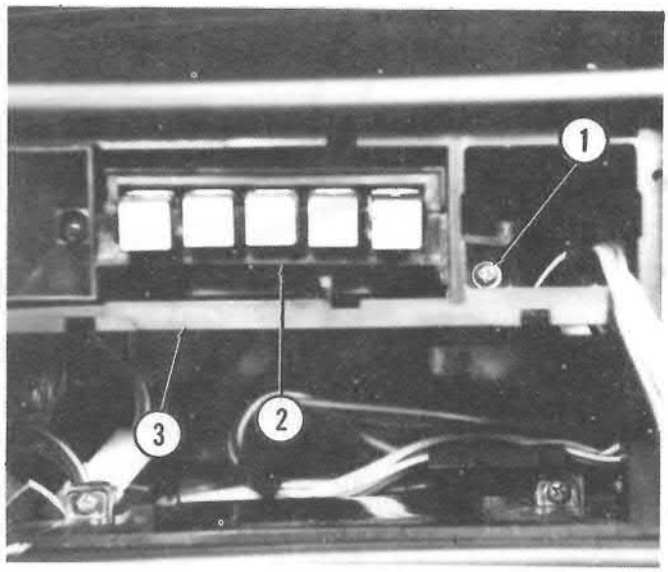
Remove and disconnect clock, or remove clock opening cover plate (3).

1. Knob 2. Fascia panel 3. Clock opening cover plate 4. Knob



Remove screw (1) holding control panel (2) to support (3).

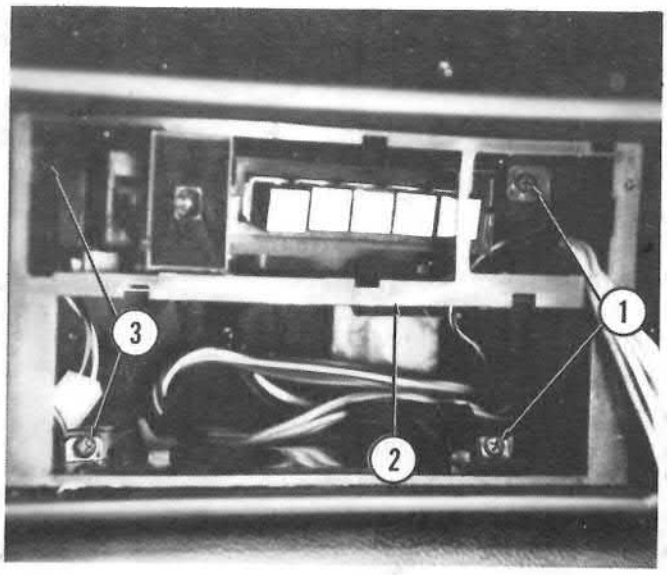
1. Screw 2. Control panel 3. Support



Remove four screws (1 and 3) holding support (2) to instrument panel.

Maneuver support out of instrument panel, leaving control panel in position.

1. Screws 2. Support 3. Screws



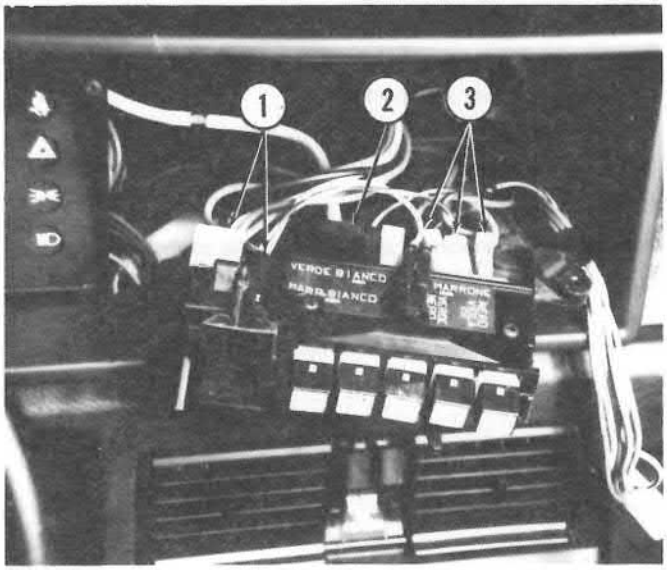
At top side of control panel, disconnect electrical connectors (1 and 3) and vacuum hose connector (2).

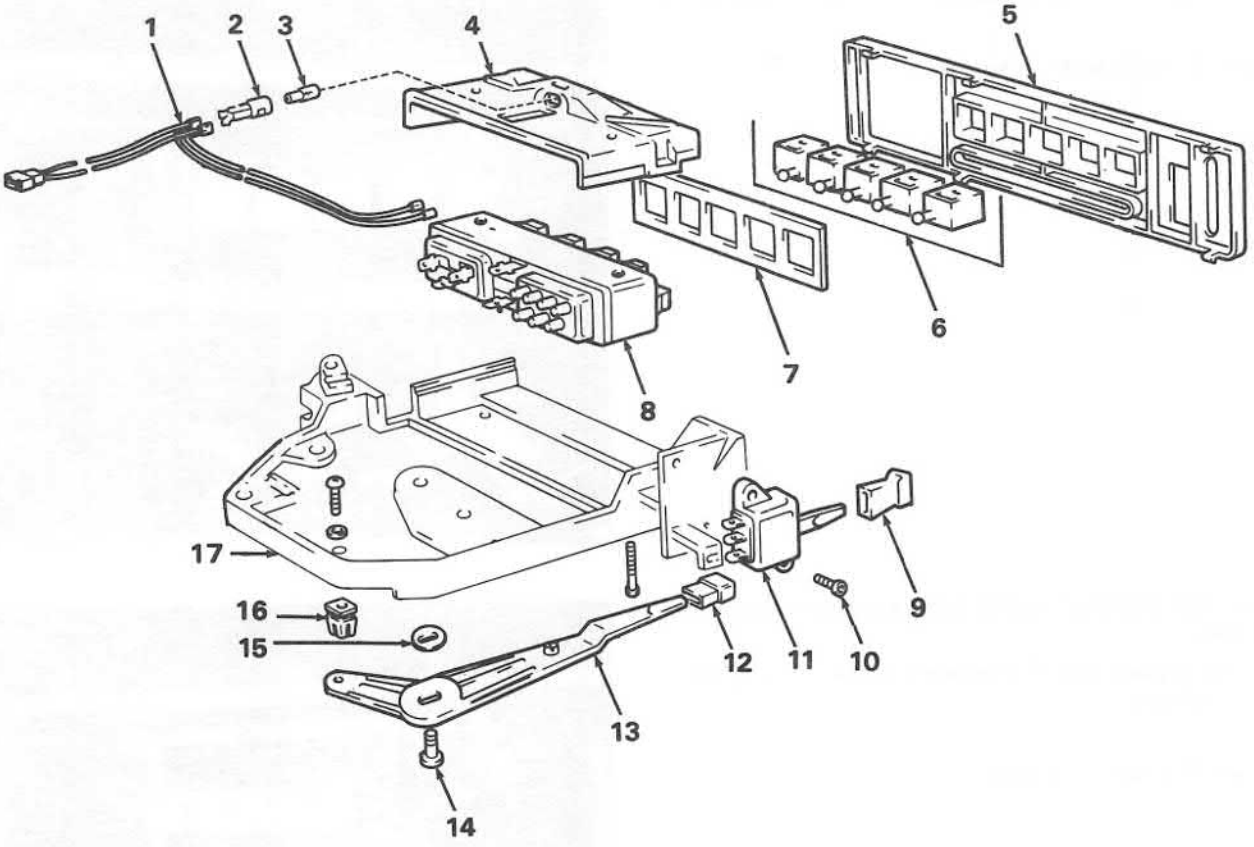
At bottom side of control panel, remove screw and clamp holding cable and disconnect cable from lever.

Remove control panel.

Install in reverse order.

1. Electrical connectors 2. Vacuum hose connector
3. Electrical connectors





1. Wires
2. Socket
3. Bulb
4. Cover
5. Fascia panel
6. Push buttons
7. Gasket
8. Switch panel
9. Knob
10. Screw
11. Switch
12. Knob
13. Lever
14. Pin
15. Clip
16. Pad
17. Support

EXPLODED VIEW OF CONTROL PANEL

HEATER CORE

REMOVAL AND INSTALLATION

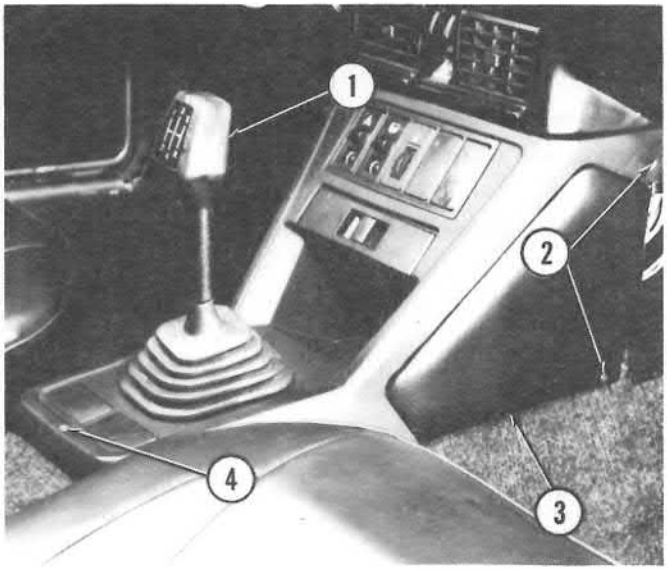
Disconnect battery ground cable. Drain cooling system.

Unscrew gearshift knob (1).

Remove five screws (2 and 4) holding lower console (3).

Tilt end of console up until it clears gearshift lever and lay it to one side.

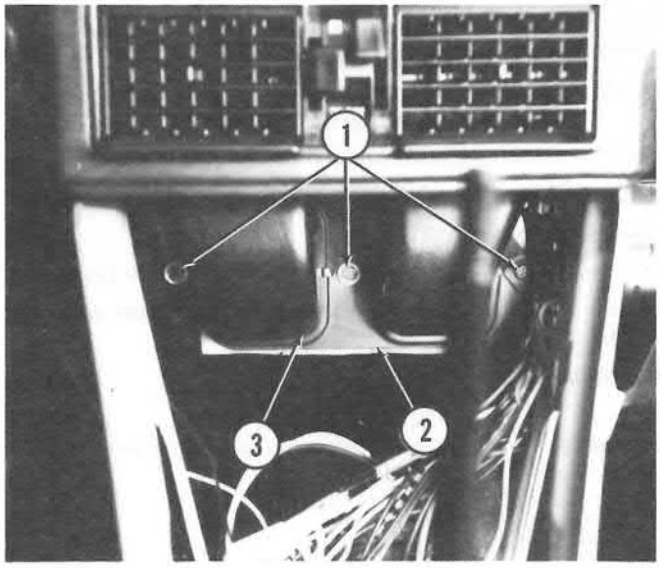
1. Gearshift knob 2. Screws 3. Lower console 4. Screw



Remove three screws (1) and two retaining plates (2) holding center vent duct (3) to housing.

Remove center vent duct.

1. Screws 2. Retaining plate 3. Center vent duct

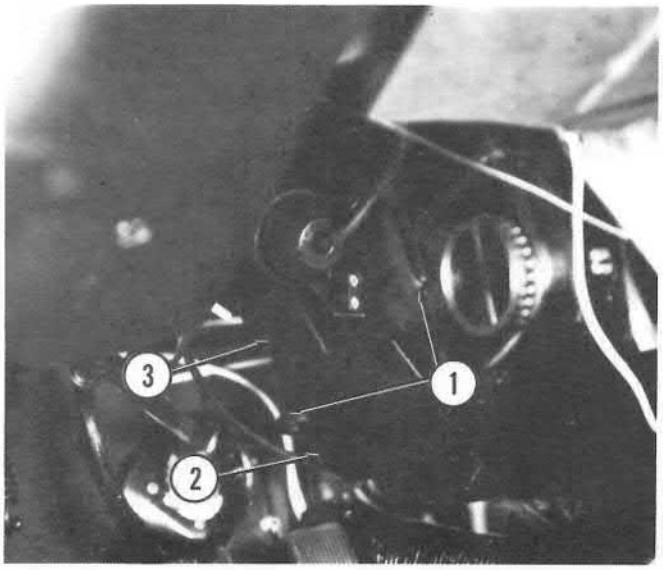


Working in passenger's side footwell, remove access panel covering expansion valve.

Lower fuse/relay panel and set to one side.

Working in both footwells, remove four clips (1) holding lower housing (2) to center housing (3). Lower assembly down to floor.

1. Clips 2. Lower housing 3. Center housing



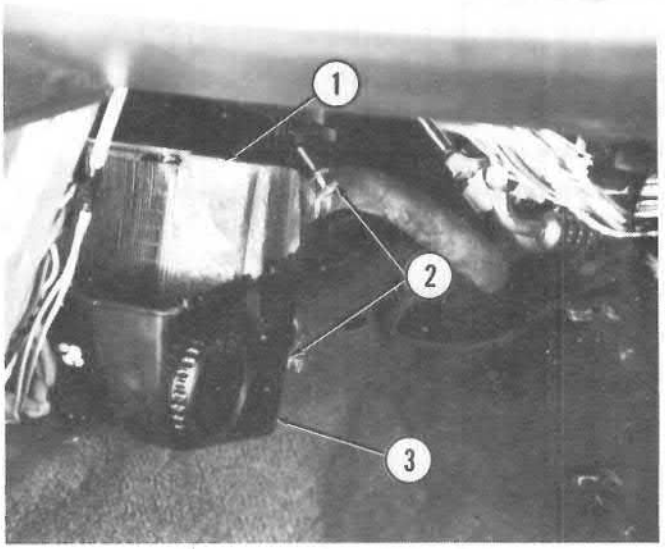
Place container on floor to catch coolant.

Loosen two hose clamps (2) and disconnect hoses from heater core (1).

Remove heater core from lower housing (3).

Install in reverse order.

1. Heater core 2. Hose clamps 3. Lower housing



A/C-HEATER UNIT

REMOVAL AND INSTALLATION

NOTE: A/C-heater unit must be removed to remove evaporator, blower assembly and water valve.

Disconnect battery ground cable. Drain cooling system.

Purge A/C system. Refer to procedures in this section.

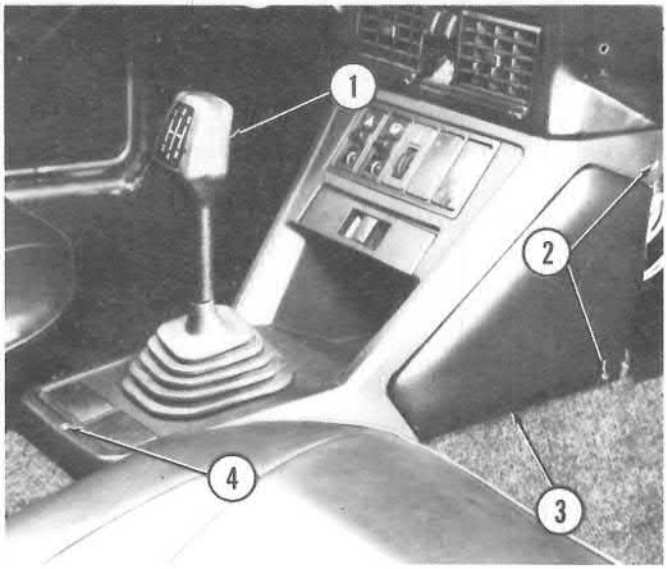
Unscrew gearshift knob (1).

Remove five screws (2 and 4) holding lower console (3).

Tilt end of console up until it clears gearshift lever and disconnect all electrical connectors.

Remove lower console.

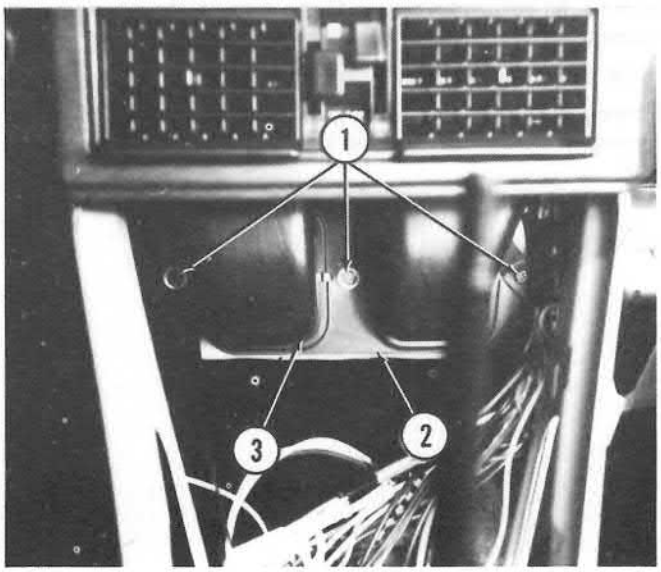
1. Gearshift knob 2. Screws 3. Lower console 4. Screw



Remove three screws (1) and two retaining plates (2) holding center vent duct (3) to housing.

Remove center vent duct.

1. Screws 2. Retaining plate 3. Center vent duct



Working in passenger's side footwell, remove access panel covering expansion valve.

Lower fuse/relay panel and set to one side.

With container on floor to catch coolant, loosen clamp (1) and disconnect heater core outlet hose (2).

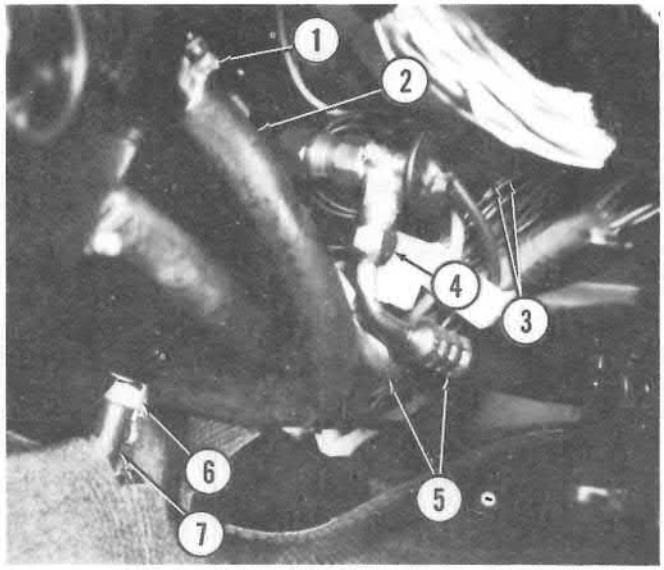
Loosen fittings (4) and disconnect high and low pressure lines (5).

Loosen clamp (6) and disconnect drain hose (7).

Disconnect blower motor electrical connector.

Disconnect electrical leads (3) from frost prevent switch.

1. Clamp 2. Outlet hose 3. Electrical leads 4. Fitting
5. Pressure lines 6. Clamp 7. Drain hose

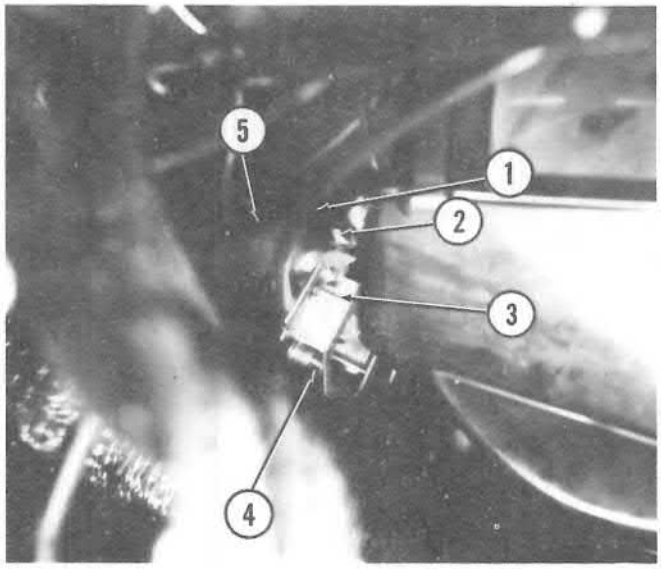


Working at firewall side of unit, remove screw (3) and clamp holding water valve cable (1) to bracket.

Loosen screw (4) holding end of cable to valve and disconnect cable end.

Loosen clamp (2) and disconnect inlet hose (5).

1. Water valve cable 2. Clamp 3. Screw 4. Screw 5. Inlet hose



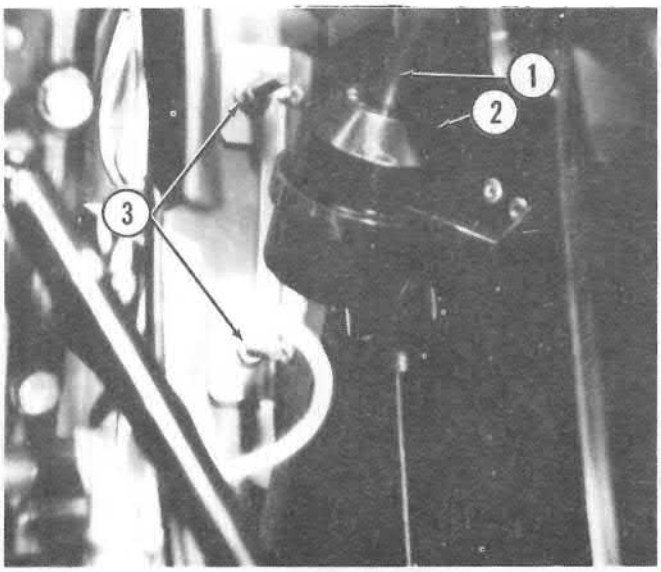
Working in driver's side footwell, disconnect vacuum hose (1) from vacuum motor (2).

From each side of unit, remove two nuts (3) holding unit to body at top.

Fold carpet and padding away from tunnel.

Maneuver A/C-heater unit out through passenger's side footwell.

1. Vacuum hose 2. Vacuum motor 3. Nuts



DISASSEMBLY AND REASSEMBLY

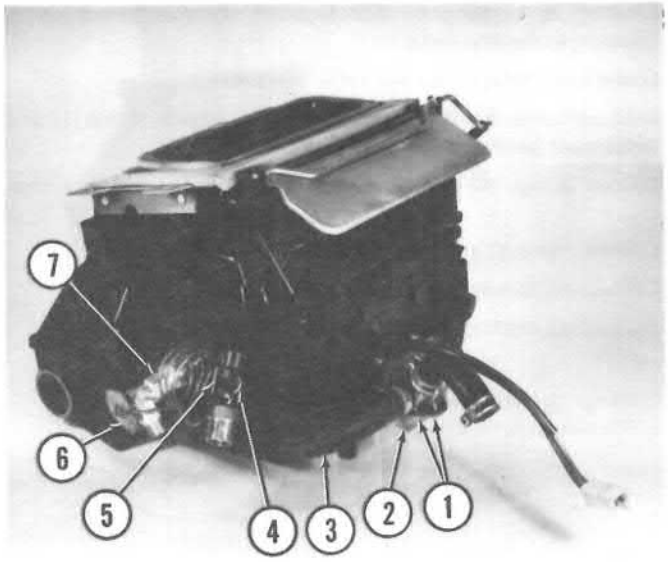
Loosen clamp holding hose (3) to heater core and disconnect hose.

Remove two screws (1) holding water valve to bracket (2) and remove valve.

Remove clip (5) holding temperature sensing tube and frost prevent switch (4) to pipe.

Loosen fitting (7) and remove expansion valve (6).

1. Screws 2. Bracket 3. Hose 4. Frost prevent switch 5. Clip 6. Expansion valve 7. Fitting

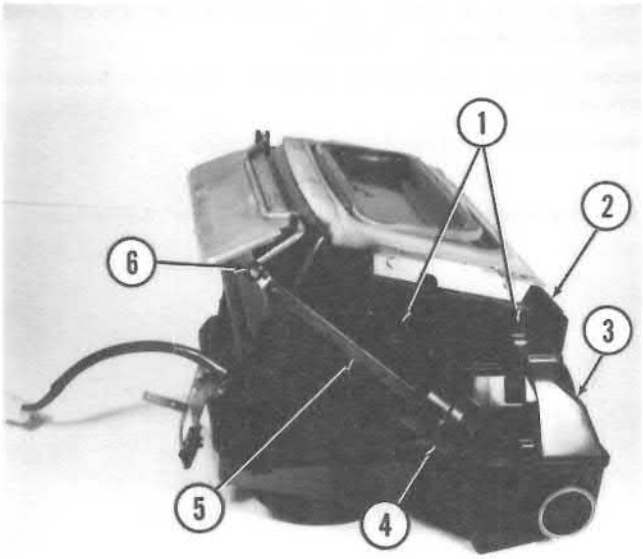


Remove clip (6) holding vacuum motor rod (5) to door linkage and disconnect rod from linkage.

Remove four clips (1) holding upper housing (2) to center housing (3).

Lift upper housing off of center housing.

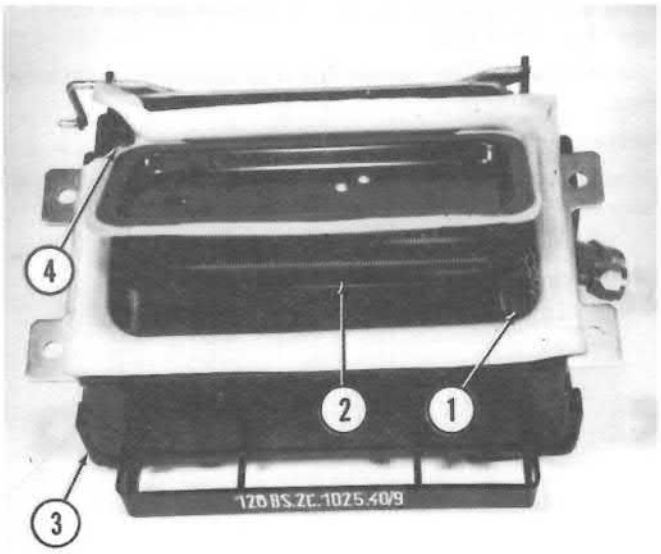
1. Clips 2. Upper housing 3. Center housing 4. Vacuum motor 5. Rod 6. Clip



Remove four screws (1 and 4) retaining evaporator (2) in upper housing (3).

Remove evaporator from housing.

1. Screw 2. Evaporator 3. Upper housing 4. Screw

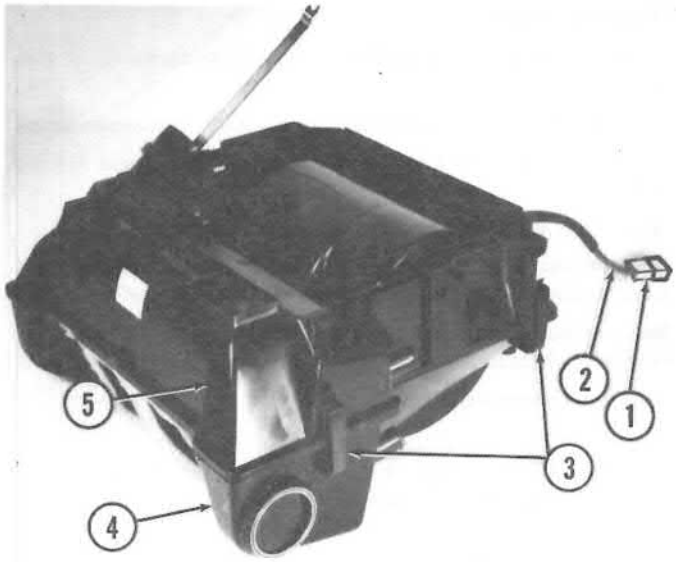


Remove connector casing (1) from blower motor wires (2), noting position of wires for reassembly.

Remove four clips (3) holding center housing (5) to lower housing (4).

Lift center housing off of lower housing.

1. Connector casing 2. Wires 3. Clips 4. Lower housing
5. Center housing

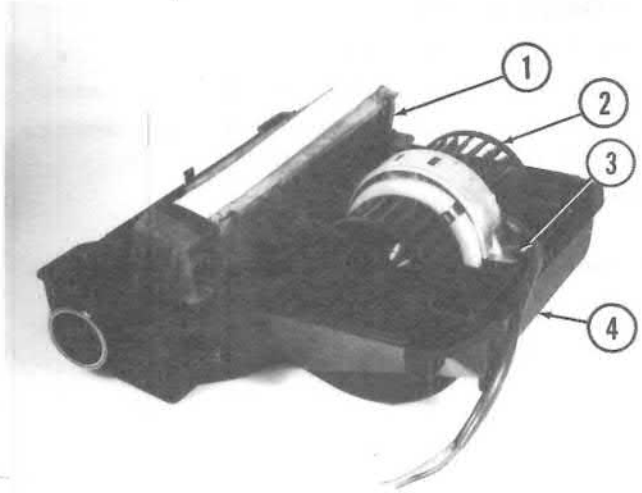


Lift heater core (1) out of lower housing (4).

Remove screw (3) holding blower assembly (2) in housing and remove blower assembly.

Reassemble in reverse order of disassembly. Use new "O" ring on expansion valve.

1. Heater core 2. Blower assembly 3. Screw 4. Lower housing



CONDENSER

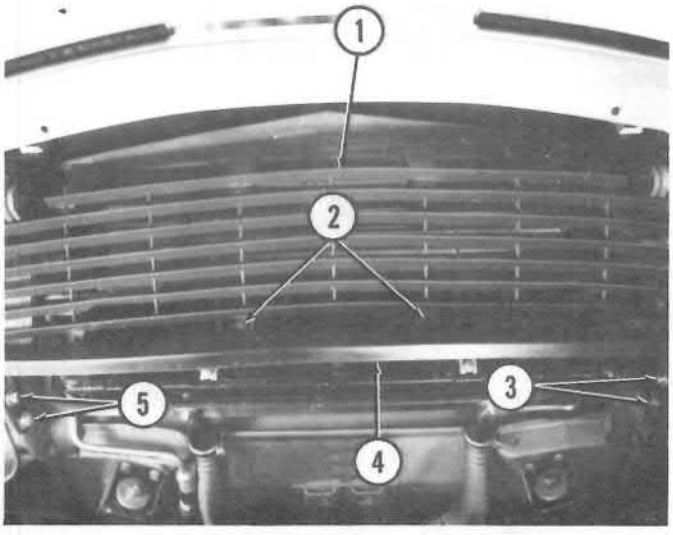
REMOVAL AND INSTALLATION

NOTE: Condenser and radiator are removed as an assembly.

Remove twelve screws (2) holding grille (1) to body and remove grille.

Remove four bolts (3 and 5) and washers holding center section of spoiler (4) to body and remove spoiler.

1. Grille 2. Screws 3. Bolts 4. Spoiler 5. Bolts



Drain cooling system.

Purge air conditioning system. Refer to procedures in this section.

Disconnect fittings (1) connecting lines (10) to condenser pipes.

Loosen clamps (4 and 6) and disconnect hoses (3 and 7) from pipes.

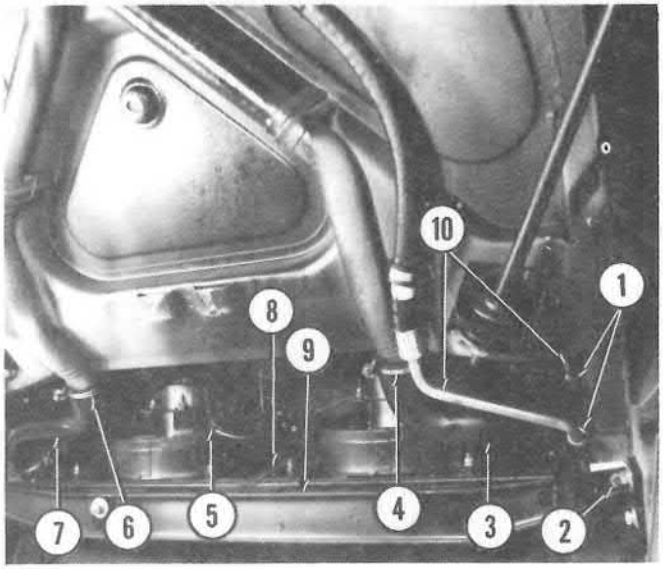
Disconnect electrical connectors (5) to electric fans.

Remove two nuts (2) holding support bracket (9) to body and lower bracket complete with radiator (8) and condenser.

Remove four nuts holding condenser to radiator and separate condenser from radiator.

Install in reverse order.

1. Fittings 2. Nut 3. Hose 4. Clamp 5. Connector 6. Clamp
7. Hose 8. Radiator 9. Support bracket 10. A/C lines



CONDENSER FAN

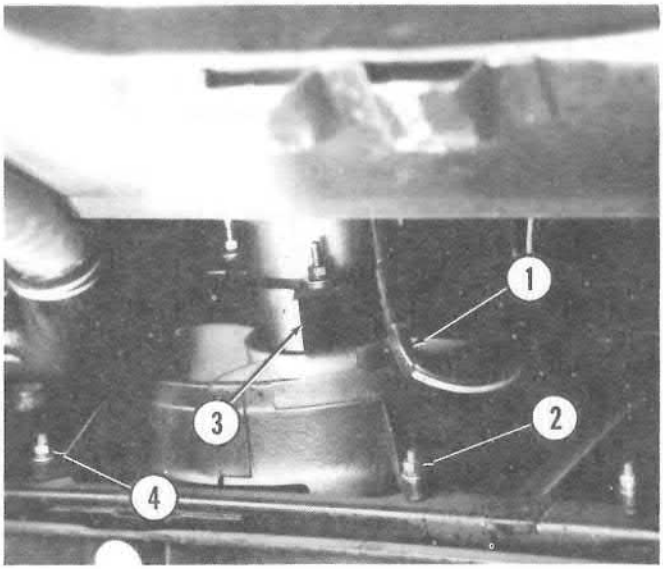
REMOVAL AND INSTALLATION

Working from under vehicle, disconnect electrical connector (1).

Remove four nuts (2 and 4) and washers holding condenser fan assembly (3) to radiator and remove fan assembly.

Install in reverse order.

1. Electrical connector 2. Nut 3. Fan assembly 4. Nut



RECEIVER/DRYER

REMOVAL AND INSTALLATION

Remove protection panel from right-hand side of front luggage compartment.

Purge system. Refer to procedures in this section.

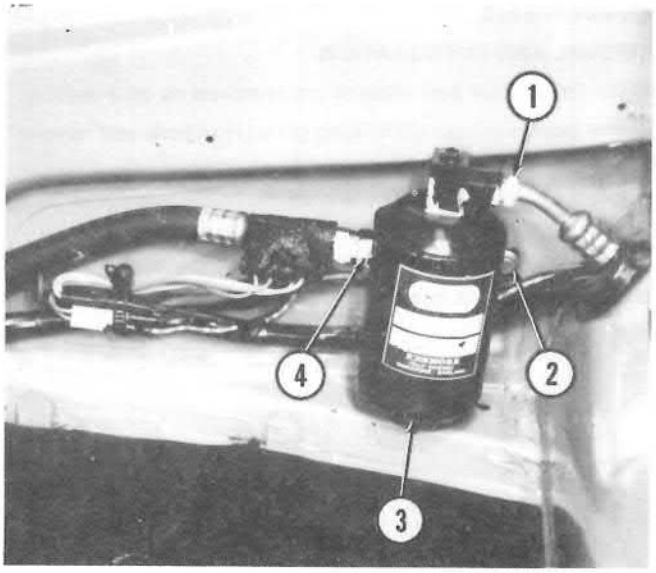
Disconnect fittings (1 and 4) for condenser and expansion valve lines.

Remove two bolts (2) holding receiver/dryer (3) to body and remove receiver/dryer.

Replace receiver/dryer if clogged or moisture saturated.

Install in reverse order.

1. Fitting 2. Bolt 3. Receiver/dryer 4. Fitting



THERMAL SWITCHES

REMOVAL AND INSTALLATION

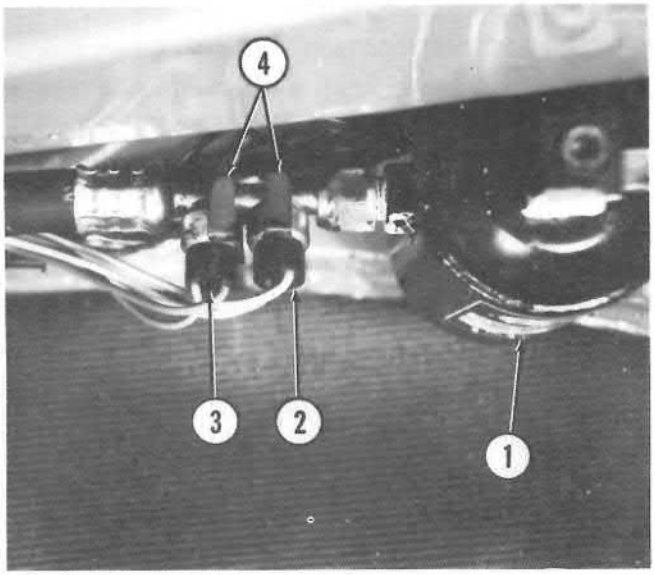
NOTE: There are three thermal switches: condenser fan control switch (2), high pressure control switch (3) and frost prevent switch. The condenser fan and high pressure switches are on the high pressure line next to the receiver/dryer. The frost prevent switch is on the suction line at the evaporator, as shown in the following illustration.

Remove protective panel from right-hand side of front luggage compartment.

Disconnect electrical connectors for switches. Unwrap insulation.

Unclip and remove retaining strap clips (4). Remove switches.

For installation, make sure pipe and switch faces are clean of dirt or corrosion. Place switches on pipe and secure with clips. Wrap switches and pipe with insulation. Connect wires.



1. Receiver/dryer 2. Condenser fan control switch
3. High pressure control switch 4. Clips

EXPANSION VALVE

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

Working in passenger's side footwell, remove access panel covering expansion valve. Lower fuse/relay panel and set to one side.

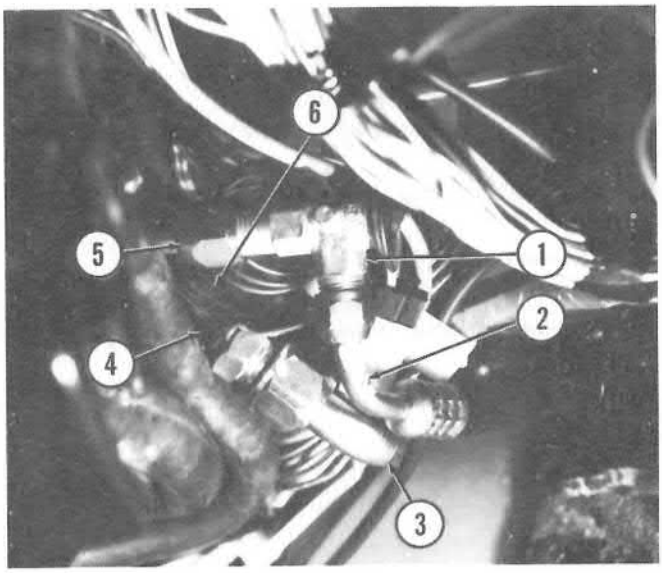
Purge system. Refer to procedures in this section.

Remove temperature sensing tube from clamp (4) on evaporator outlet line (3).

Disconnect high pressure line (2) from expansion valve (1).

Loosen fitting (5) holding expansion valve to evaporator inlet line and remove valve.

Install in reverse order. Use new "O" ring.



1. Expansion valve 2. High pressure line 3. Evaporator outlet line
4. Clamp 5. Fitting 6. Frost prevent switch

FROST PREVENT VALVE

REMOVAL AND INSTALLATION

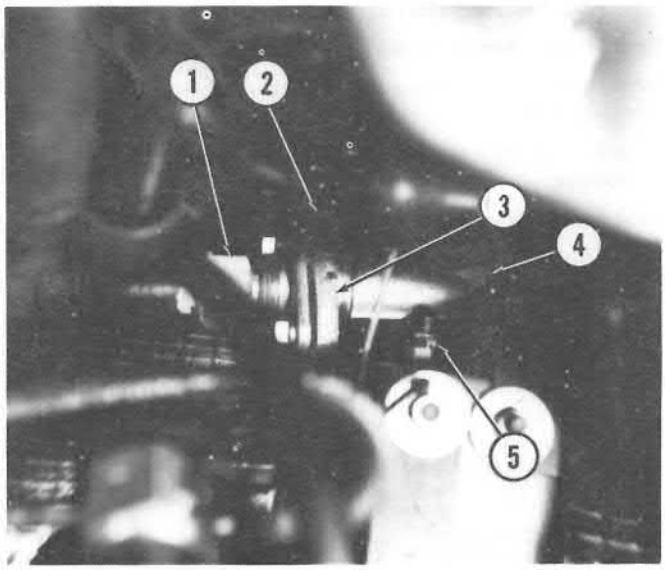
Purge system. Refer to procedures in this section.

Remove electrical lead (2) from frost prevent valve (3).

Disconnect two fittings (1) from ends of valve.

Remove two nuts (5) holding bracket (4) to body and remove valve complete with bracket.

Install in reverse order.



1. Fitting 2. Electrical lead 3. Frost prevent valve 4. Bracket 5. Nut

LOW PRESSURE SWITCH

REMOVAL AND INSTALLATION

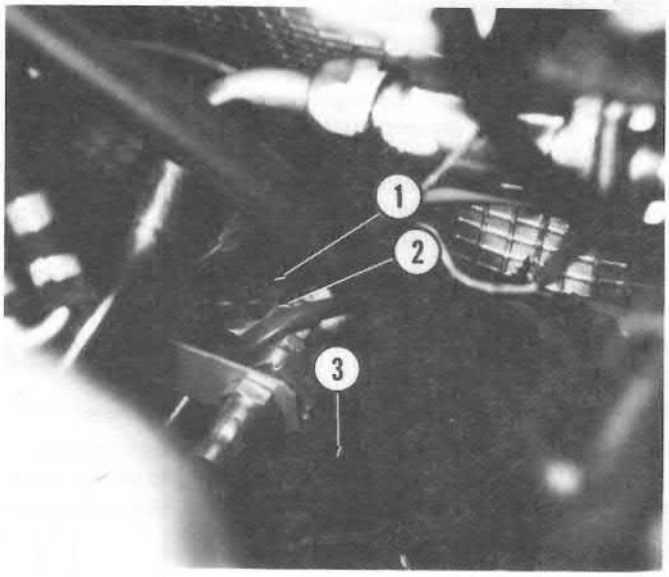
On vehicles with fuel injection, remove air cleaner. Refer to 102.04. Purge system. Refer to procedures in this section.

Disconnect low pressure switch electrical connector (3).

Unscrew low pressure switch (1) from union (2).

Install in reverse order.

1. Low pressure switch 2. Union 3. Electrical connector



FAST IDLE ELECTROVALVE

REMOVAL AND INSTALLATION

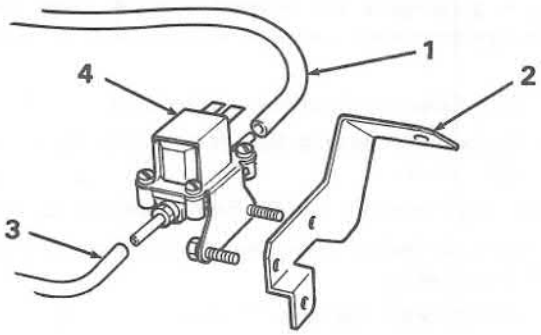
(Vehicles With Carburetor)

Disconnect electrical connectors and vacuum hoses (1 and 3) from electrovalve (4).

Remove two nuts holding electrovalve to bracket (2) and remove electrovalve.

Install in reverse order.

1. Vacuum hose 2. Bracket 3. Vacuum hose 4. Fast idle electrovalve



REMOVAL AND INSTALLATION

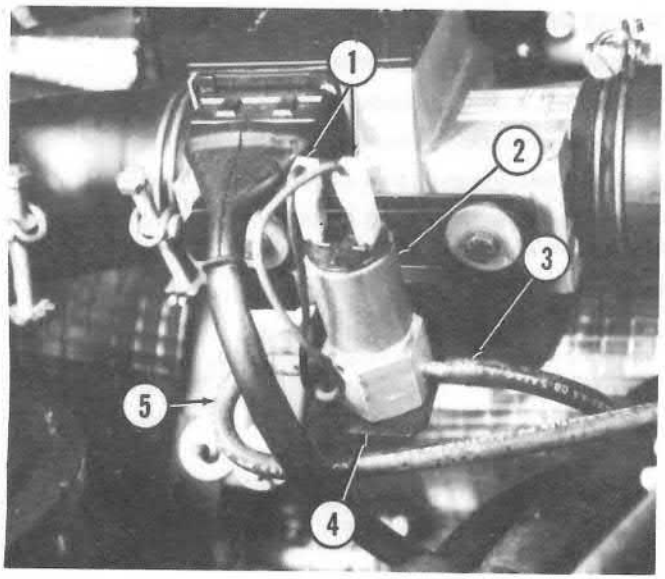
Vehicles With Fuel Injection)

Disconnect electrical connectors (1) and vacuum hoses (3 and 5) from electrovalve (2).

Remove two bolts holding electrovalve to bracket (4) and remove electrovalve.

Install in reverse order.

1. Electrical connectors 2. Fast idle electrovalve 3. Vacuum hose
4. Bracket 5. Vacuum hose



VACUUM RESERVOIR

REMOVAL AND INSTALLATION

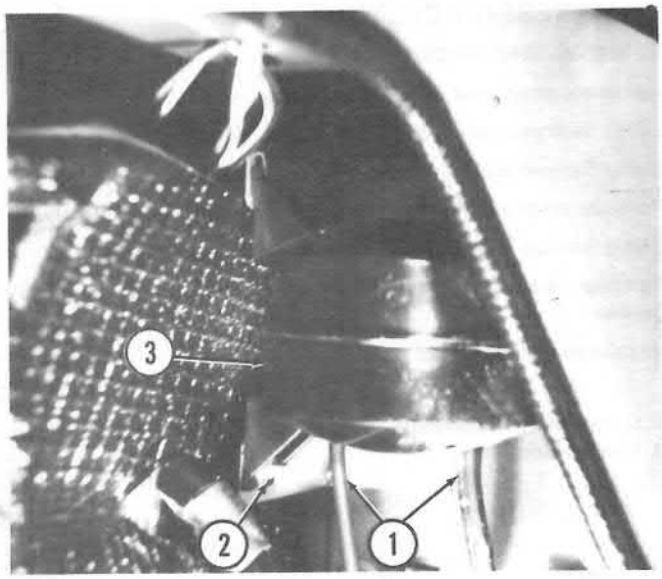
From behind passenger's seat, remove spare tire cover and spare tire.

Disconnect two vacuum hoses (1) from reservoir (3).

Remove nut (2) holding resevoir to bracket and remove reservoir.

Install in reverse order.

1. Vacuum hoses 2. Nut 3. Vacuum reservoir



COMPRESSOR

REMOVAL AND INSTALLATION

Remove access panel from inside rear luggage compartment.

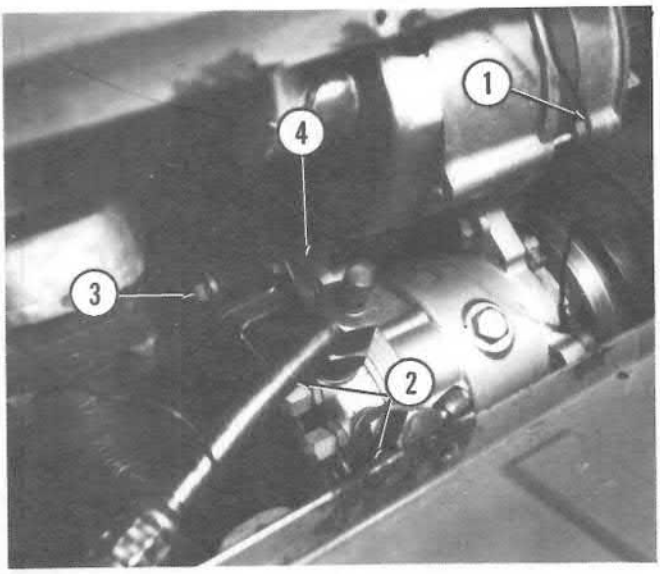
Purge system. Refer to procedures in this section.

Disconnect compressor clutch wire (1) at connector.

Disconnect inlet and outlet lines (2) from compressor.

Remove nut, through bolt (3) and washers holding bracket (4).

1. Wire 2. Compressor lines 3. Bolt 4. Bracket



Raise and support rear of vehicle.

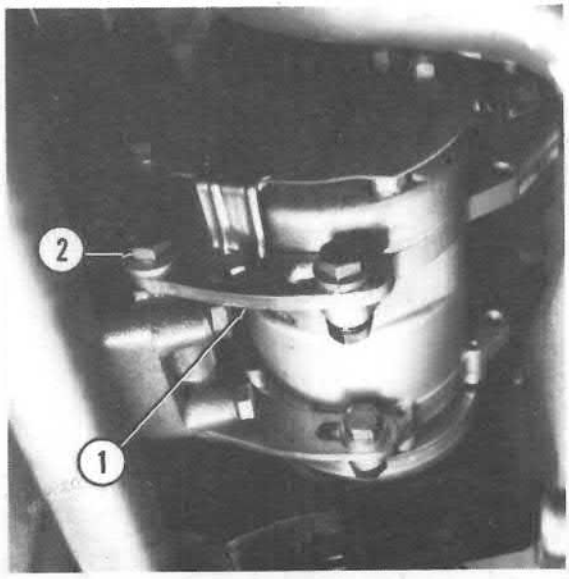
Remove three bolts holding shield under compressor and remove shield.

Remove nut, through bolt (2) and washers holding bracket (1).

Lower compressor out of vehicle with bracket attached.

Install in reverse order. To adjust belt, refer to 101.15.

1. Bracket 2. Bolt



COMPRESSOR CLUTCH

REMOVAL AND INSTALLATION

Remove compressor as outlined above.

Using Sankyo wrench 32409 and 3/4" wrench remove nut (3).

Using Sankyo puller, remove clutch plate (4).

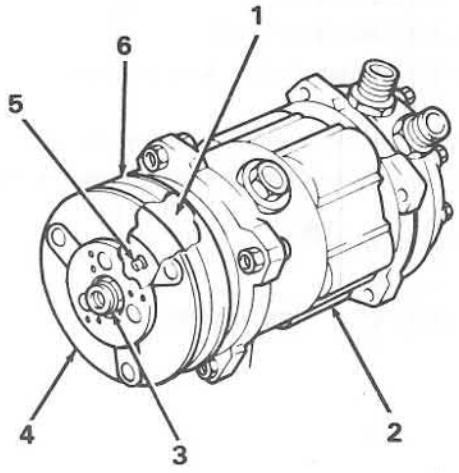
Remove external and internal snap rings with snap ring pliers.

Using Sankyo puller 32418 remove pully assembly (6).

Remove three screws (5) to remove clutch coil (1) from compressor.

Installation is reverse of removal.

1. Clutch coil 2. Compressor 3. 3/4" nut 4. Clutch plate 5. Screw 6. Pully assembly



X1/9 1979 - 1982
SERVICE MANUAL

ELECTRICAL - 55

PARTS CATALOG, SERVICE MANUAL & SERVICE TIME SCHEDULE CODE

SPECIFICATIONS

IGNITION

Firing order	1 - 3 - 4 - 2

Distributor

Type	Bosch — 0-237 . . .
Static advance:	
— Vehicles with carburetor	5°
— Vehicles with fuel injection	10°
Centrifugal advance:	
— Vehicles with carburetor	23° to 27° at 5500 rpm
— Vehicles with fuel injection	16° to 20° at 3500 rpm
Total advance (static and centrifugal):	
— Vehicles with carburetor	28° to 32° at 5500 rpm
— Vehicles with fuel injection	26° to 30° at 3500 rpm
Vacuum advance:	
— Vehicles with carburetor	
with air pump	16° to 18° at 12 in. Hg
without air pump	26° to 30° at 12 in. Hg
— Vehicles with fuel injection	12° to 16° at 11 in. Hg
Air gap	0.011 to 0.019 in. (0.3 to 0.5 mm)
Rotor arm resistance	6000 ohms
Pickup coil resistance	890 to 1285 ohms

Electronic Control Module

Type	Bosch — 0-277-100-029
Current limiter output	4.5 to 6 amps
Input voltage	6 to 18 volts

Coil

Type	Bosch — 0-221-122-012
Primary winding resistance at 68°F (20°C)	1.1 to 1.7 ohms
Secondary winding resistance at 68°F (20°C)	6,000 to 10,000 ohms
Ballast resistor resistance	0.85 to 0.95 ohms

Spark Plugs

Thread diameter and pitch, metric	M 14 x 1.25	
Vehicles With Carburetor	**Normal**	**Resistor**
Type . . . . . AC	42XLS	R42XLS
. . . . . Bosch	W175T30	W175TR30
. . . . . Champion	N9Y	RN9Y
. . . . . Marelli	CW7LP	CW7LPR
Gap	0.023 to 0.027 in. (0.6 to 0.7 mm)	0.027 to 0.031 in. (0.7 to 0.8 mm)
Vehicles With Fuel Injection		
Type	Champion RN9Y	
Gap	0.027 to 0.031 in. (0.7 to 0.8 mm)	

STARTER MOTORS

Type and make	Bosch 0-001-212-210	Marelli E 95-0,9/12
Voltage	12 V	12 V
Rated output	0.8 kW	0.9 kW
Direction of rotation, pinion end	clockwise	clockwise
Poles	4	4
Field winding	series	series
Pinion engagement	with flywheel	with flywheel
Control	solenoid	solenoid
Internal diameter of expanded shoes		60.85 to 61.02 mm
Internal diameter of armature		59.95 to 60.00 mm
Mechanical Data		
Brush spring pressure (new brushes)	1.15 to 1.35 kg	1.15 to 1.30 kg
Armature end float	0.10 to 0.15 mm	0.15 to 0.45 mm
Depth for commutator recutting	0.8 mm	0.5 to 0.7 mm
Data for Bench Testing		
Running test (1):		
– Current		200 A
– Speed		1900 ± 100 rpm
– Voltage		10 V
– Torque developed		0.55 kgm
Lock test (1):		
– Current	320 to 410 A	440 to 460 A
– Voltage	8.5 V	7.5 ± 0.1 V
– Torque developed	1.25 kgm	≥ 1.4 kgm
Light running torque test (1):		
– Current	35 to 55 A	35 ± 5 A
– Voltage	11.5 V	11.4 to 11.7 V
– Speed	6000 to 8000 rpm	6000 ± 500 rpm
Solenoid		
Winding resistance at 20°C:		
Pull-in		0.37 ± 0.01 Ω
Hold-in		1.25 ± 0.05 Ω
Travel of contact plate		3.25 to 3.95 mm
Magnetic plunger travel		12.58 to 15.48 mm
Lubrication		
Pinion splines	Olifiat VS+ Artic (SAE 10 W)	
Contact surface of pinion sleeve	Grassofiat MR 3	

(1) At 20° C

CHARGING SYSTEM

Alternator		
Make and Type	Bosch K1-14 V-65 A 21	Marelli A 125-14 V-55 A
Voltage	12 V	12 V
Maximum output (constant)	65 A	55 A
Cut-in speed, balanced thermally	1100 ± 50 rpm	900 ± 50 rpm
Current flow at 7000 rpm and balanced thermally	≥ 65 A	≥ 55 A
Field winding resistance across slip rings (1)	3.36 ± 0.3 Ω	3.1 ± 0.1 Ω
Direction of rotation (drive side)	Clockwise	Clockwise
Engine/alternator driving ratio	1 to 1.75	1 to 1.75
Rectifier diodes	Built-in diode plate (all)	
Voltage Regulator		
Make and Type	Bosch Electronic, integral with alternator	FIMM "RTT 113 C" Electronic, integral with alternator (2)
Alternator speed for adjustments	6000 rpm	6000 rpm
Current for thermal balance	20 to 22 A	20 to 22 A
Regulating voltage (1)	13.8 to 14.2 V	13.8 to 14.2 V
Battery		
Voltage	12 V	
Capacity (at 20-hour discharge rate)	60 AH	

(1) At 25°C.

(2) Some vehicles are equipped with a non-integral regulator.

LIGHTING

Location	SAE Standard	FIAT Std. Part No.
Headlights (high and low beams)	"Sealed Beam"	headlight unit 6012
Front lamps: — Turn signal and parking	1034 (3/32 cp)	1/141446/90 (12 V - 5/21 W)
Rear lamps: — Turn signal, back-up and stop	1073 (32 cp)	1/41460/90 (12 V - 21 W)
— Tail	1073 (32 cp)	1/41460/90 (12 V - 21 W)
— License plate	67 (4 cp)	1/41459/90 (12 V - 5 W)
Side marker lamps	158 (2 cp)	1/41458/90
Courtesy light	—	1/08630/90 (12 V - 5 W)
Fiber optic cable lamp Instrument cluster lights "EX. GAS SENSOR" indicator	—	1/41439/90 (12 V - 3 W)
Turn signal indicator High beams indicator Battery charge indicator Low oil pressure indicator Fuel reserve indicator Parking and tail lamps indicator Hazard warning signal indicator Low brake fluid level/hand brake ON indicator Fasten belts indicator Rear window defogger Heater control panel light Cigarette lighter light Ideogram illumination light Air conditioner ideogram light	—	1/41437/90 (12 V - 1.2 W)

FUSES

Eight 8-Amp, six 16-Amp and two 3-Amp fuses are located in fuse/relay panel under glove compartment. In addition, one 8-Amp and two 16-Amp fuses are located in separate in-line holders.

Panel Fuses

A (8 Amps)
- Stop lights
- Stop light switch
- A/C blower relay coil
- A/C control relay coil
- Heater fan motor
- Heater fan switch
- Instrument cluster lights
- Dash panel lights
- Turn lights
- Turn indicator
- Hazard indicator
- Rear window defogger switch
- Rear window defogger relay coil

B (8 Amps)
- Windshield wiper/washer switch
- Windshield washer pump
- Wiper motor
- Back-up switch
- Back-up light
- Gulp valve thermoswitch
- Gulp valve electrovalve solenoid
- Seatbelt timer
- Seatbelt relay coil
- Fasten seatbelt indicator
- Brake indicator
- Digital clock (display on)
- Oil pressure warning indicator
- Exhaust gas sensor indicator

C (8 Amps)
- Left headlight high beam
- High beam indicator

D (8 Amps)
- Right headlight high beam

E (8 Amps)
- Left headlight low beam

F (8 Amps)
- Right headlight low beam

G (8 Amps)
- Left front marker light
- Left front park light
- Right tail light
- Left license light
- Right rear marker light
- Lights-on indicator

H (8 Amps)
- Right front marker light
- Right front park light
- Left tail light
- Right license light
- Left rear marker light
- Lights-on indicator
- Digital clock

I (16 Amps)
- Right headlight motor

L (16 Amps)
- Left headlight motor

M (16 Amps)
- Rear window defogger
- Turn/hazard flasher

N (16 Amps)
- Coolant fan
- Horns

O (16 Amps)
- Condenser fan motor

P (16 Amps)
- A/C blower motor

Q (3 Amps)
- Headlight closing relay coils

R (3 Amps)
- Headlight opening relay coils

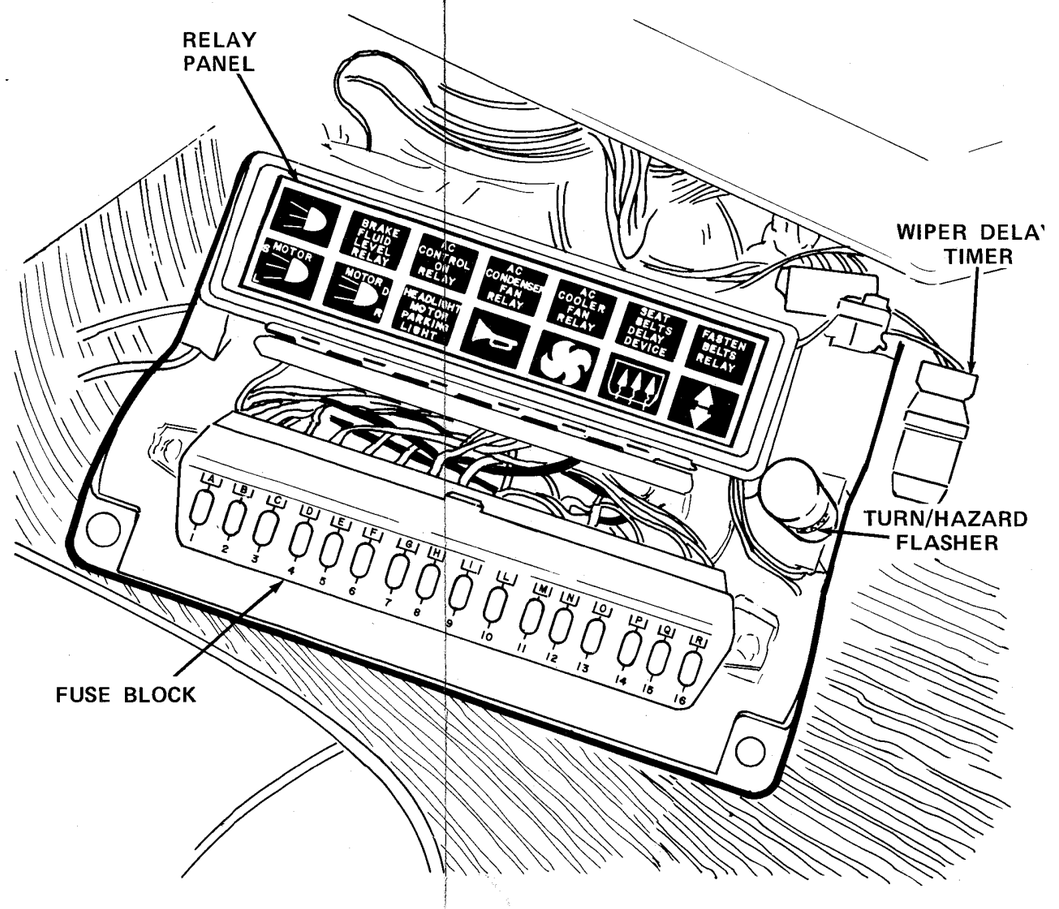
In-Line Fuses

8 Amps
- Fuel injectors fan motor
- Carburetor fan motor
- Seatbelt chime
- Cigar lighter
- Power antenna motor
- Digital clock (power)
- Courtesy light

16 Amps
- Power window motors

16 Amps
- Auxiliary air regulator
- Fuel pump

FUSES AND RELAYS



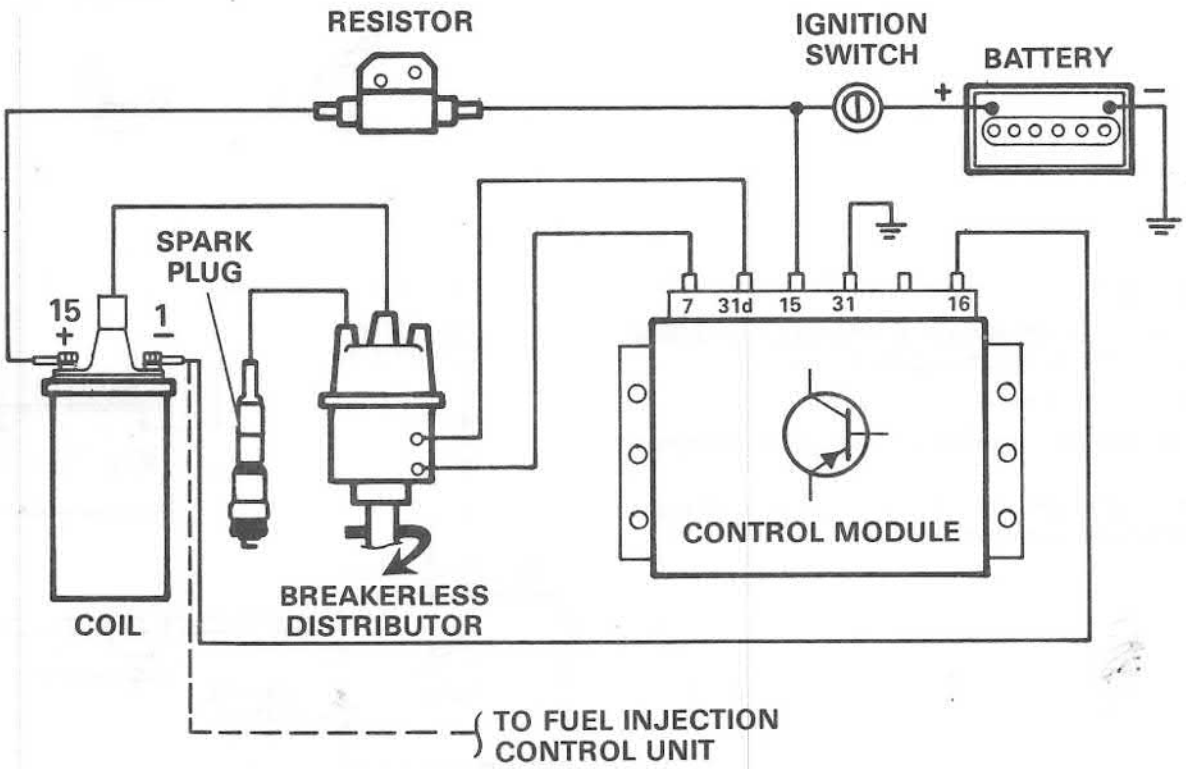
FUSE/RELAY PANEL

UNPROTECTED CIRCUITS

Alternator, starter, ignition, charge indicator, radiator fan relay winding, radio, parking light switch and headlight control relay windings, instrument cluster lights, fuel injection relay winding, power window relay winding.

DESCRIPTION

With ignition switch closed, battery voltage is supplied to electronic control module and through a ballast resistor to primary side of ignition coil. The resistor is used as a current limiter. Voltage is regulated by the control module to supply a regulated current to primary side of ignition coil. When the distributor turns, a trigger generates an impulse on the pickup assembly. This impulse is sensed by the control module, and turns the coil primary on and off. Each time the coil primary is turned off, a high voltage is induced in the coil secondary. The high voltage is distributed through the distributor rotor cap, to spark plugs.



SERVICE

Before performing any service observe the following:

DO NOT

- Energize ignition unless coil support base is properly grounded.
- Crank engine with high voltage wire disconnected from coil.
- Disconnect high voltage wire from coil when engine is running.
- Start or crank engine when instrument panel is disconnected.
- Ground primary circuit or use diagnostic equipment to ground primary circuit.
- Test for current or voltage by flashing terminals with each other or to ground.
- Disconnect battery cables when engine is running. The electronic voltage regulator will be damaged.

DO

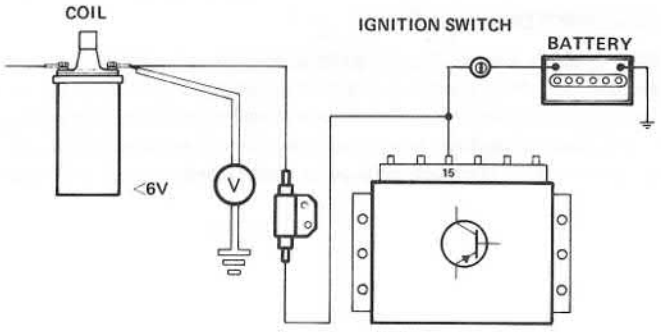
- When required, the distributor pickup assembly may be disconnected when engine is running, or when cranking for compression testing.

PRIMARY INPUT CHECK

Connect voltmeter from coil +B terminal to ground.

With ignition switch on, check for 12 volts (battery).

If not, check for faulty battery, ignition switch, wiring, or connections.



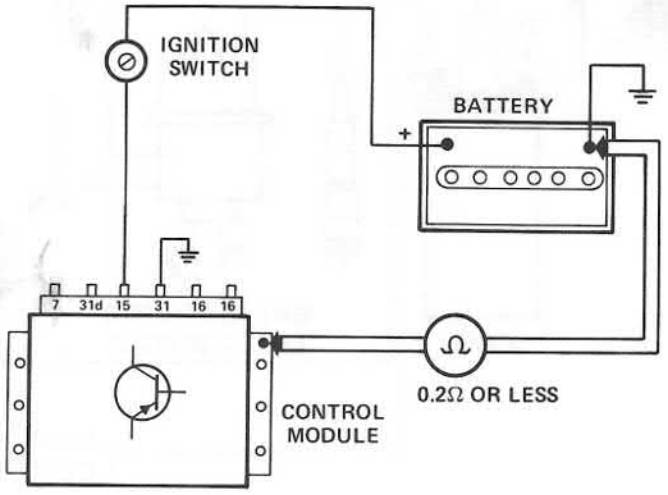
GROUND CHECK

With ignition switch off, connect an ohmmeter from control module support mount to battery ground terminal.

Check for less than 0.2 ohms.

If not, check support, mounting, and battery ground connections.

Also check that control module casing is clean, and that mounting hardware is clean and tight.



COIL RESISTANCE CHECK

Disconnect primary leads from coil, then connect ohmmeter to coil.

Check for 1.1 to 1.7 ohms.

Reconnect one ohmmeter lead to coil high voltage terminal.

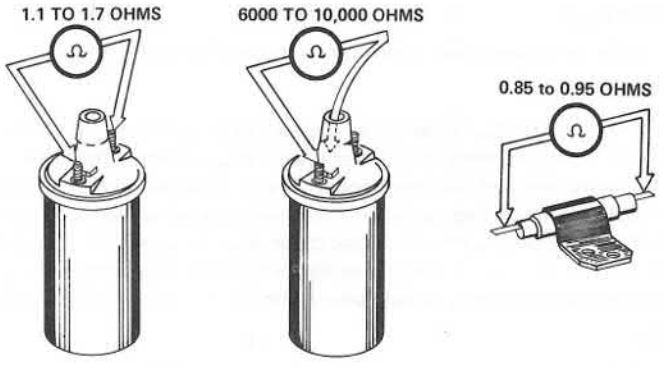
Check for 6K to 10K ohms.

Replace coil if not within specifications.

Disconnect one end of resistor, then connect ohmmeter across resistor.

Check for 0.85 to 0.95 ohms.

Replace resistor if not within specifications.



PICKUP ASSEMBLY CHECK

Disconnect pickup assembly from control module.

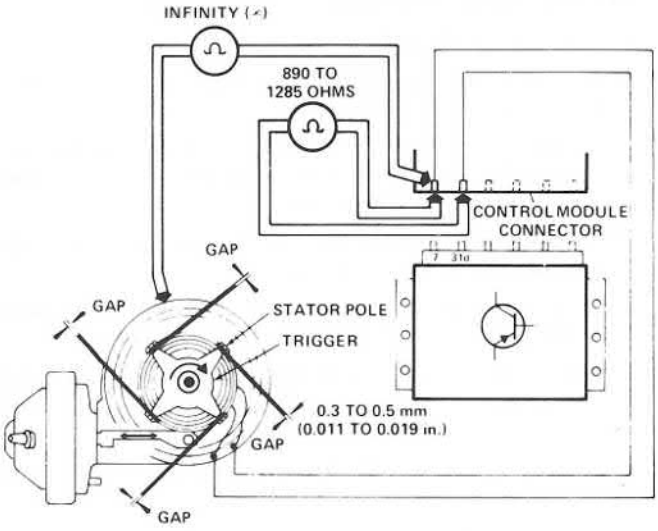
Connect ohmmeter to pickup assembly connector (terminals 7 and 31d).

Check for 890 to 1285 ohms.

Reconnect one ohmmeter lead to distributor body. Check for infinity ohms.

Replace pickup assembly if not within specifications.

Using a nonmagnetic feeler gauge check gap between stator pole and trigger. Adjust as required.



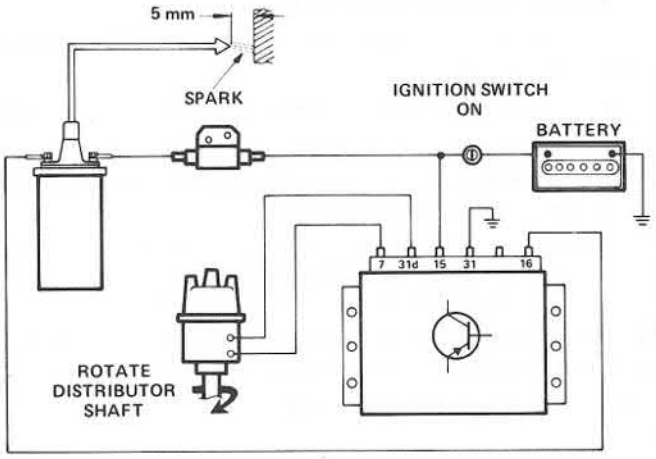
CONTROL MODULE CHECK

Reconnect primary leads to coil, pickup assembly to control module, and resistor lead.

Disconnect high voltage wire from distributor. Do not disconnect from coil.

While holding (use insulated holder) high voltage wire about 5 mm from ground, crank engine and check for spark.

Replace control module if no spark appears.

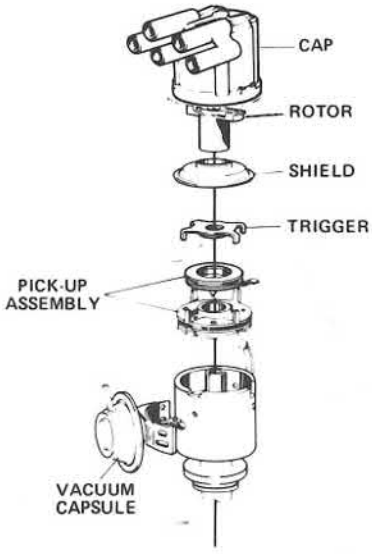


SYSTEM PARTS CHECK

Check all parts for cracks, wear, or breaks that may affect system operation.

Check cap for corroded terminals.

Clean or replace cap as required.



CHECKING AND SETTING IGNITION TIMING

Check ignition timing with a timing light.

Connect timing light power leads to battery or to hot side of coil. Either connection will not affect ignition system.

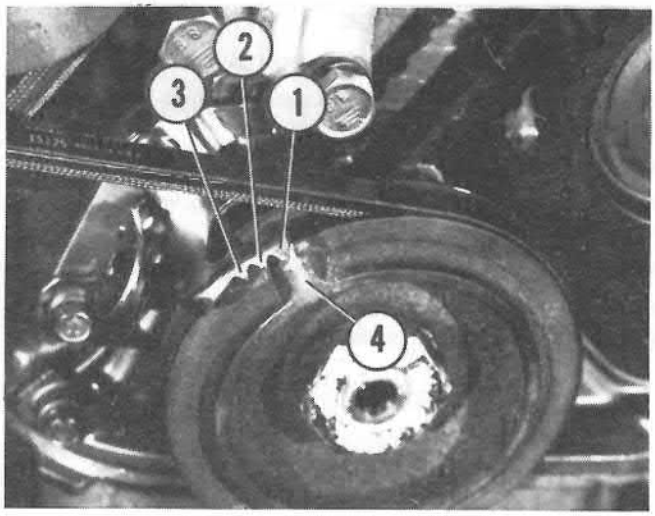
When using an inductive timing light, connect inductive pick-up to number 1 spark plug wire at a point where it can be separated from other spark plug wires.

High voltage wire must not be disconnected from coil while engine is running or being cranked.

Crankshaft timing mark (4) on crankshaft pulley indexes with timing pointer.

With rpm at less than 900, timing should be 5° BTDC for vehicles with carburetor, 10° BTDC for vehicles with fuel injection.

To adjust timing, loosen nut, then turn distributor as required to obtain correct timing. Tighten nut.



1. TDC 2. 5° BTDC 3. 10° BTDC 4. Crankshaft pulley mark

DISTRIBUTOR

REMOVAL AND INSTALLATION

Crank engine until crankshaft pulley timing mark indexes with timing pointer.

Remove distributor cap from distributor and lay to one side.

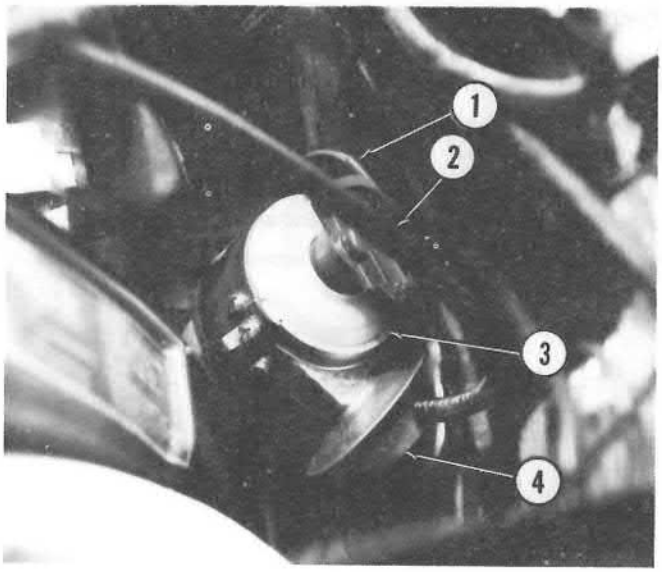
Disconnect vacuum hose (2) from vacuum diaphragm (4).

Disconnect electrical connector for distributor electrical lead (1) at side of distributor (3).

CAUTION: Upon installation, make certain that raised notch on electrical connector is correctly indexed with slot in distributor.

Noting rotor position for installation, remove nut, washer and plate. Remove distributor and gasket.

Install in reverse order. Set timing.



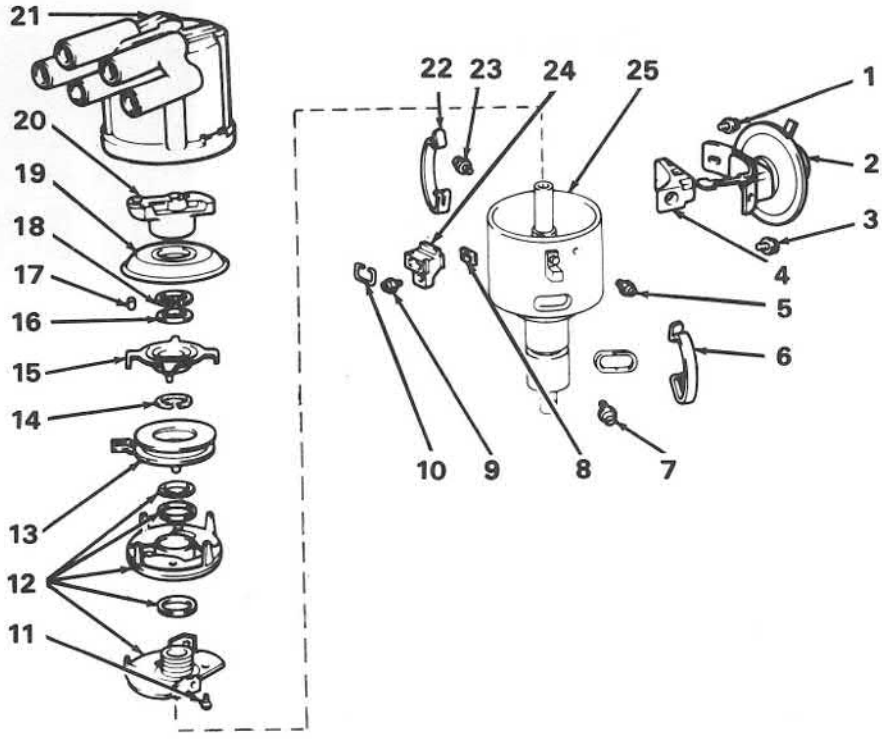
1. Electrical lead 2. Vacuum hose 3. Distributor
4. Vacuum diaphragm

DISASSEMBLY AND REASSEMBLY

Unclip cap (21). Remove rotor (20) and cover (19). Remove screws (1 and 3) to remove vacuum diaphragm (2). Remove lock ring (18), lockwasher (16), rotor (15) and lock ring (14). Remove screw (9) to remove connector (24). Remove screws (5, 7, and 23) to remove coil (13) and pickup assembly (12). Remove screw (11) to separate pickup assembly. Remove clip (6 and 22) only if damaged.

Reassembly is reverse of disassembly.

1. Screw
2. Vacuum diaphragm
3. Screw
4. Support
5. Screw
6. Spring clip
7. Screw
8. Gasket
9. Screw
10. Spring clip
11. Screw
12. Pickup assembly
13. Coil
14. Lock ring
15. Rotor
16. Lockwashers
17. Pin
18. Lock ring
19. Cover
20. Rotor
21. Cap
22. Spring clip
23. Screw
24. Connector
25. Body



INSPECTION

Check distributor cap (21) for cracks, breaks, or corroded terminals. For light corrosion, clean terminals, otherwise replace.

Check rotor (20) for cracks, breaks, or corrosion. Replace if damaged.

Check rotor(15) for bent for broken tabs. Replace if damaged.

Check coil (13) for damaged wires. Check for 890 to 1285 ohms resistance. Replace if damaged.

Check pickup assembly (12) for damaged parts. Replace if damaged.

Check vacuum diaphragm (2) for leakage. Replace if damaged.

Check body (25) for worn or sticky shaft. Replace if damaged.

ELECTRONIC CONTROL MODULE

REMOVAL AND INSTALLATION

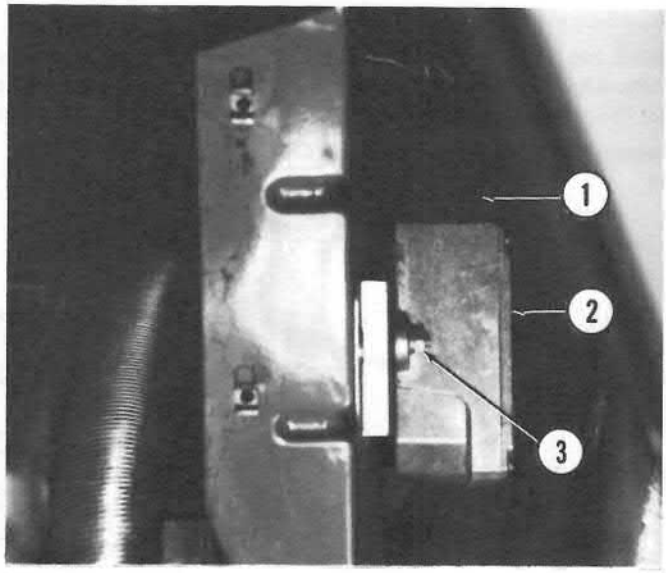
Remove two screws holding cover at right side of engine compartment.

Disconnect electrical connector (1) from control module (2).

Remove two nuts (3) holding control module to body and remove control module.

Install in reverse order.

1. Electrical connector 2. Electronic control module 3. Nut



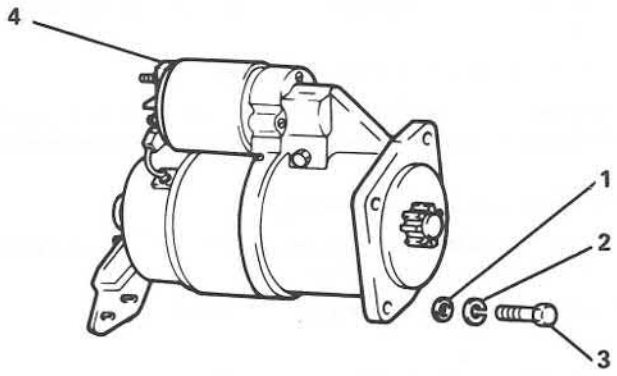
STARTER

REMOVAL AND INSTALLATION

Disconnect battery ground cable. Disconnect electrical leads to starter (4).

Remove three bolts (3), lockwashers (2), and washers (1) to remove starter.

1. Washer 2. Lockwasher 3. Bolt 4. Starter



DISASSEMBLY AND REASSEMBLY (MARELLI)

Remove nut (4), lockwasher (3), and two washers (2).

Disconnect terminal on housing assembly (5) from stud on starter solenoid (1).

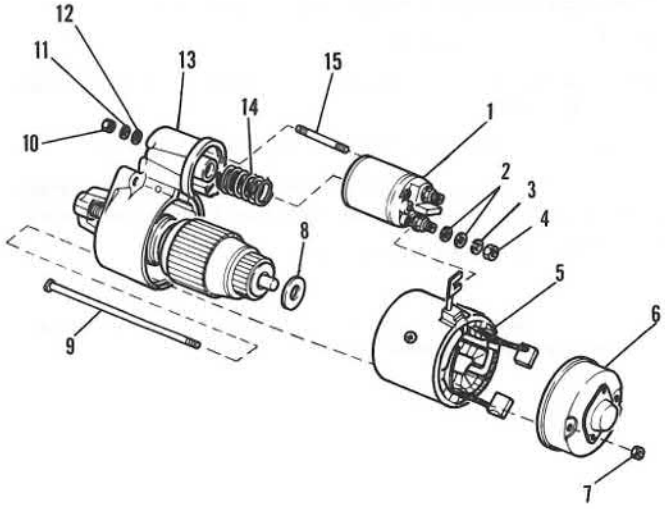
Remove nut (10), lockwasher (11), and washer (12) to remove starter solenoid (1) and spring (14).

Remove stud (15) only if damaged.

Remove two nuts (7) and bolts (9). Carefully separate support (6) from housing assembly (5) until brushes can be removed from brush holder.

Separate housing assembly (5) from support (13). Remove washer (8).

1. Starter solenoid 2. Washers 3. Lockwasher 4. Nut
5. Housing assembly 6. Support 7. Nut 8. Washer 9. Bolt
10. Nut 11. Lockwasher 12. Washer 13. Support 14. Spring
15. Stud



Remove plug (13). Remove cotter pin (11) and pin (2).

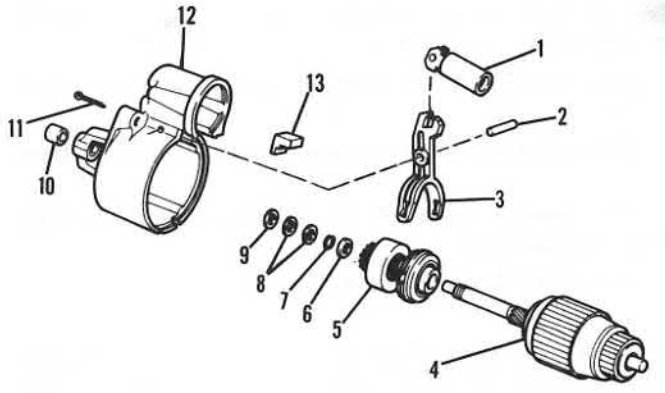
Separate armature (4) with attached parts (5 through 9), fork (3) and cup (1) from support (12). Remove washers (8 and 9).

Press on clutch (5) to remove clip (7).

Remove ring (6) and clutch (5) from armature (4).

Remove bushing (10) from support (12) only if damaged.

1. Cup 2. Pin 3. Fork 4. Armature 5. Clutch 6. Ring 7. Clip
8. Washers 9. Washer 10. Bushing 11. Cotter pin 12. Support
13. Plug



If damaged, remove bushing (7) by removing screw (9) and cover (8).

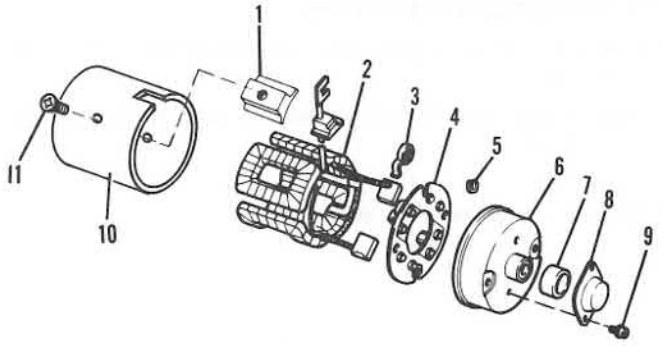
Remove brush holder (4) only if damaged.

To remove coil assembly (2), remove four screws (11) and stator cores (1). Carefully slide coil assembly (2) from housing (10).

Assembly is reverse of disassembly.

If a new coil assembly is installed, preheat to about 120°F (49°C). This will aid fitting in housing.

Lubricate inner spline at clutch with 10 W oil.



1. Stator core 2. Coil assembly 3. Spring 4. Brush holder
5. Insulator 6. Support 7. Bushing 8. Cover 9. Screw
10. Housing 11. Screw

DISASSEMBLY AND REASSEMBLY (BOSCH)

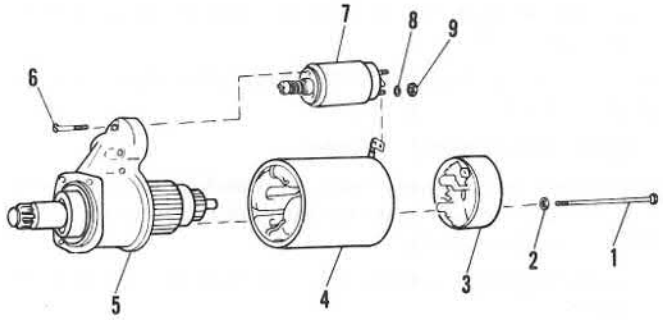
Remove nut (9) and washer (8).

Disconnect terminal on housing assembly (4) from stud on starter solenoid (7).

Remove three screws (6) to remove starter solenoid (7).

Remove two screws (1) and washers (2). Carefully separate cover (3) until brushes can be removed from brush holder.

Separate housing assembly (4) from support (5).



1. Screw 2. Washer 3. Cover 4. Housing 5. Support 6. Screw
7. Starter solenoid 8. Washer 9. Nut

Remove screw (14) and nut (16).

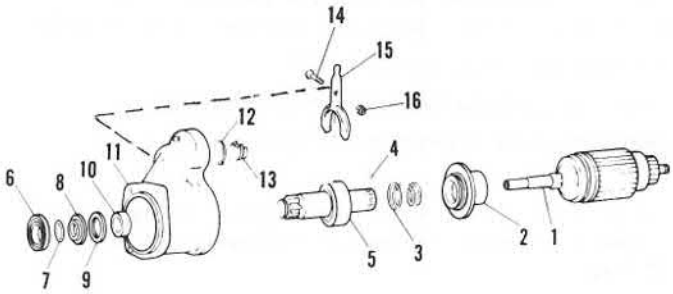
Separate fork (15) and armature (1) with attached parts (2 through 5) from support (11).

Squeeze bushing (2) and pinion (5) together to remove lock ball (4).

Separate pinion (5), spring (3) and bushing (2) from armature (1).

Remove cover (6), spring (7), cup (8), washer (9) and bushing (10) only if damaged.

Remove plug (13) and cover (12).



1. Armature 2. Bushing 3. Spring 4. Lock ball 5. Pinion 6. Cover
7. Spring 8. Cup 9. Washer 10. Bushing 11. Support 12. Cover
13. Plug 14. Screw 15. Fork 16. Nut

If damaged, remove bushing (5) by removing screw (1), cover (2), ring (3) and washers (4).

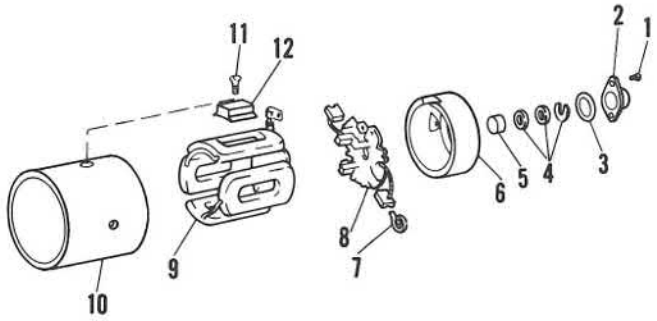
Remove brush holder (8) only if damaged.

To remove coil assembly (9), remove four screws (11) and stator cores (12). Carefully slide coil assembly (9) from housing (10).

Assemble in reverse order of disassembly.

If a new coil is installed, preheat to about 120°F (49°C). This will aid fitting in housing.

Lubricate inner spline of pinion with 10 W oil.



1. Screw 2. Cover 3. Ring 4. Washers 5. Bushing 6. Cover
7. Spring 8. Brush holder 9. Coil assembly 10. Housing
11. Screw 12. Stator core

ALTERNATOR

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

From inside rear luggage compartment, remove engine compartment access panel.

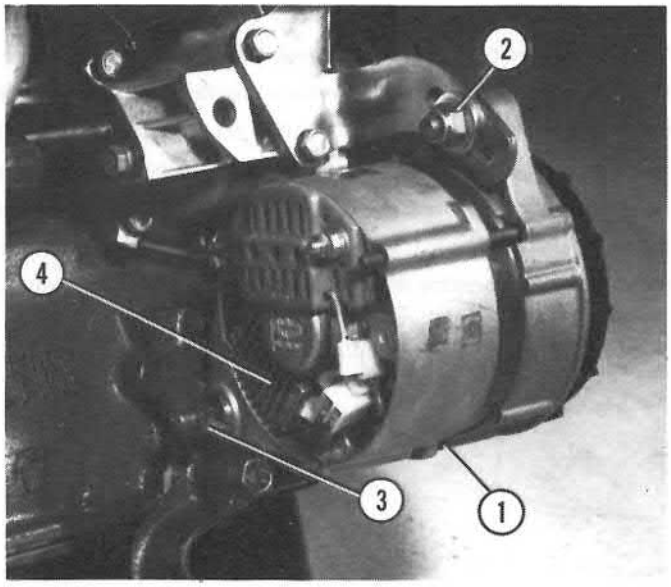
Remove three nuts to remove rear shield. On Bosch alternator, remove cooling duct.

Mark to identify, then disconnect electrical leads.

Remove bolt and nut (2). Remove nut (3), lockwasher, washer and bolt to remove alternator (1).

Install in reverse order. Adjust belt tension. Refer to 101.15.

1. Alternator 2. Nut 3. Nut 4. Integral voltage regulator



DISASSEMBLY AND REASSEMBLY (MARELLI)

Disconnect electrical plug and remove two screws to remove voltage regulator (15) (if equipped with integral voltage regulator).

Remove screw and washer to remove brush holder (13).

Remove nut, lockwasher, pulley (1), fan (2), spacer (3), key (6), and spacer (4).

Remove three long bolts, lockwashers, and washers, then carefully separate front frame (5) from rear frame (11).

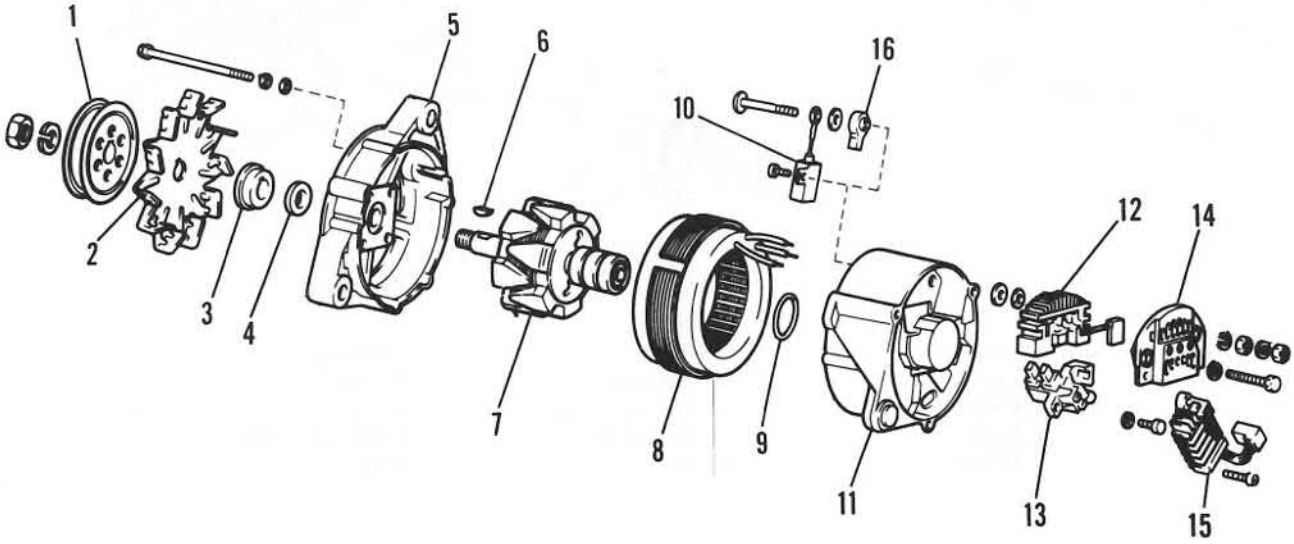
Remove rotor assembly (7) from rear frame by pulling rotor out.

Remove nut, washer, nut, lockwasher, bolt and washer to remove cover (14).

Remove rectifier assembly (12) by first disconnecting three stator wires. Carefully separate stator assembly (8) from rear frame.

Remove screw to remove condenser (10). Remove screw, washer, and insulator (16).

Reassemble in reverse order of disassembly.



1. Pulley
2. Fan
3. Spacer
4. Spacer
5. Frame
6. Key
7. Rotor
8. Stator
9. Seal
10. Condenser
11. Frame
12. Rectifier
13. Brush holder
14. Protective cover
15. Voltage regulator*
16. Insulator

*Some vehicles with Marelli alternator are equipped with a non-integral voltage regulator.

ALTERNATOR MARELLI A125-14V-55A

DISASSEMBLY AND REASSEMBLY (BOSCH)

Disconnect electrical plug and remove screw and lockwasher to remove condenser (7).

Remove two screws to remove voltage regulator/brush assembly (8 and 9).

Remove nut to remove pulley (1), fan (2), spacers, and key (13).

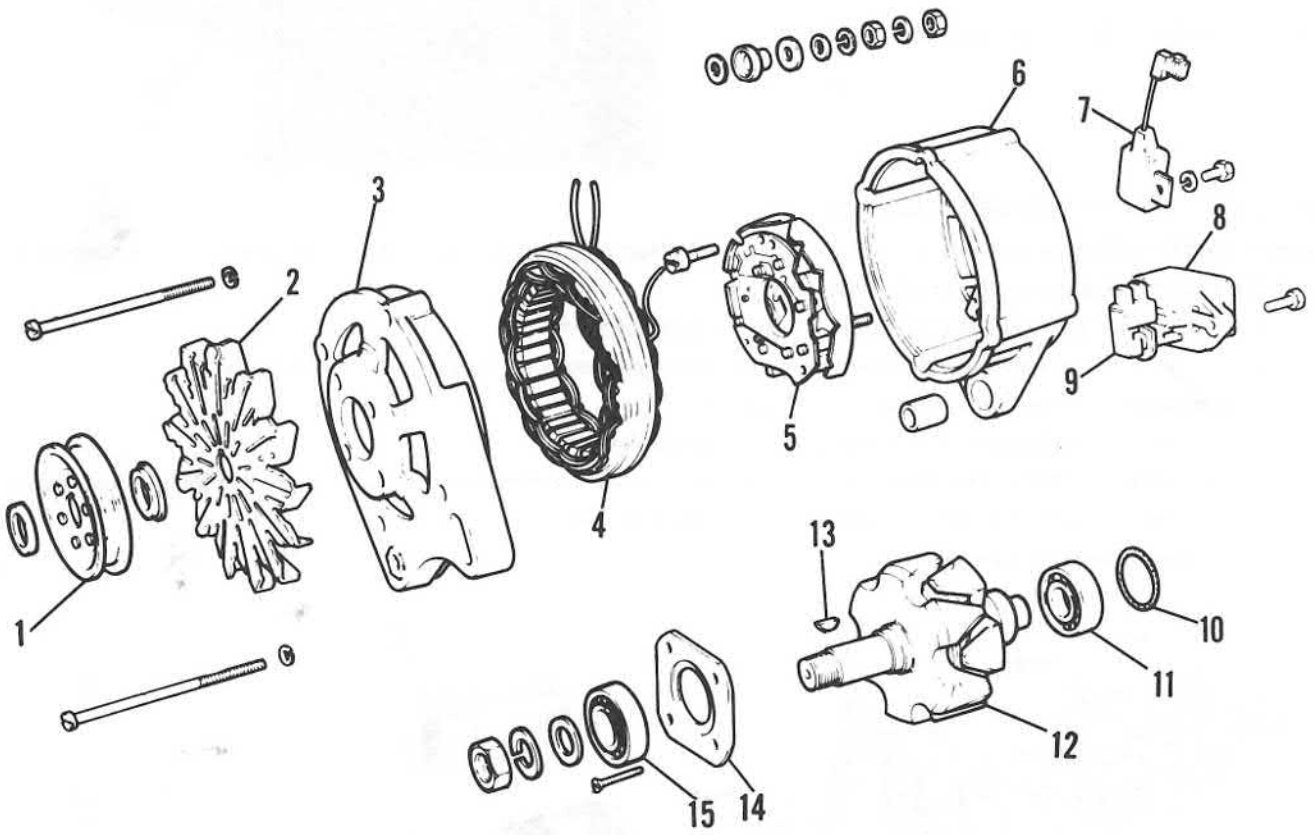
Remove four short screws on front frame (3) to free bearing retainer (14).

Remove four long screws to separate front frame from rear frame (6).

Remove rotor assembly (12) from rear frame by pulling rotor out.

Remove stator assembly (4) and rectifier assembly (5) as a unit by removing three screws. Remove three stator wires from rectifier to separate rectifier.

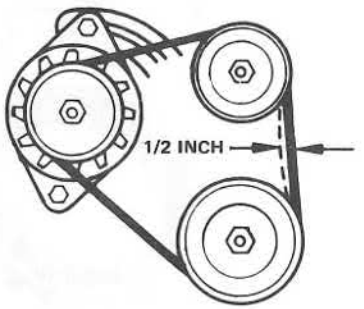
Reassemble in reverse order of disassembly.



1. Pulley
2. Fan
3. Frame
4. Stator
5. Rectifier
6. Frame
7. Condenser
8. Voltage regulator
9. Brush assembly
10. Seal
11. Bearing
12. Rotor
13. Key
14. Bearing retainer
15. Bearing

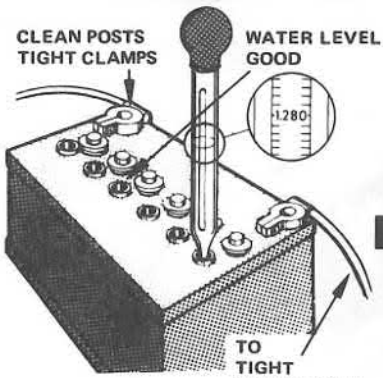
ALTERNATOR BOSCH K1-14V-65A-21

BELT TENSION



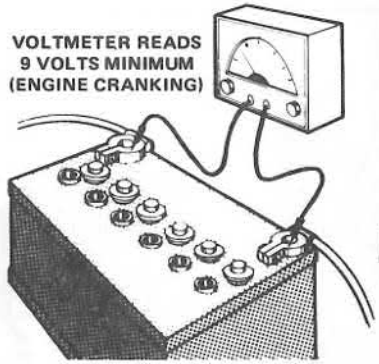
- Check belt tension. Adjust as required. Refer to 101.15.

BATTERY CHECK



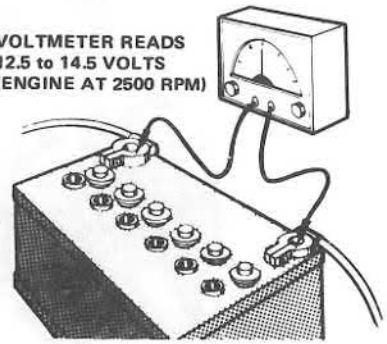
- Check battery condition, water level. Use load tester or hydrometer. Charge if required.
- Check that battery posts are clean.
- Check that cables are in good condition with tight connections on both ends.

ENGINE CRANK TEST



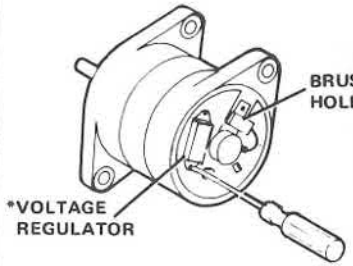
- Disconnect distributor connector. Do not disconnect high voltage cable from coil.
- Connect voltmeter to battery.
- Crank engine 3 to 4 seconds. Note voltmeter reading.
- If voltmeter reads less than 9 volts, check for faulty battery.
- Reconnect distributor connector.

VOLTAGE TEST



- Set engine at 2500 RPM. (Low beam lights on, heater fan on high speed.) Note voltmeter reading.
- If voltmeter reads greater than 15 volts, remove alternator for repair.
- If voltmeter reads less than 12.5 volts, stop engine and proceed to next step.

MOUNTING CHECK

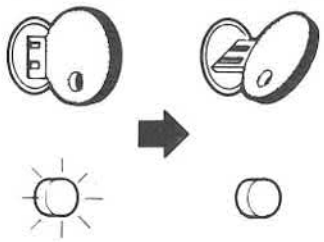


• CHECK FOR CLEAN AND TIGHT MOUNTING SCREWS

- Remove shield at alternator rear (10 mm hardware).
- Check that mounting screws for voltage regulator and brush holder are not corroded, and are tight.

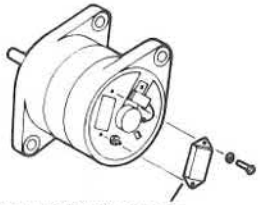
*Some vehicles with Marelli alternator are equipped with a non-integral voltage regulator.

EXCITOR SYSTEM CHECK



- Turn on ignition. If battery charge indicator (on dash) does not light, check for faulty indicator, wiring or alternator brushes. Repair and repeat Voltage Test.
- If indicator lights, start engine. Check that indicator goes out.
- If indicator does not go out, check for possible short in excitor system wiring.
- If indicator goes out, stop engine and go to next step.

REGULATOR/ALTERNATOR CHECK

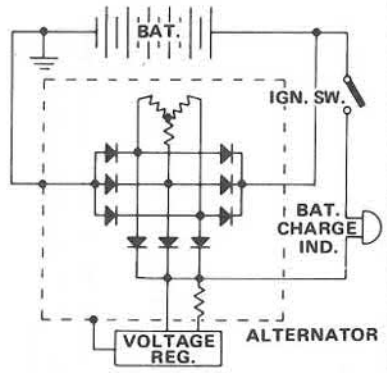


INSTALL KNOWN GOOD *VOLTAGE REGULATOR

- Disconnect battery ground cable.
- Remove voltage regulator from alternator.
- Install a known good voltage regulator.
- Connect battery cable, then repeat voltage test.
- If voltage is within specifications, the original voltage regulator is defective.
- If voltage is below specifications, repair or replace alternator.

*Some vehicles with Marelli alternator are equipped with a non-integral voltage regulator.

RETEST



- After repairs are made, repeat Voltage and Current Tests.
- Remove test equipment.
- Reinstall alternator shield (10 mm hardware).

CHARGING SYSTEM CHECK

ALTERNATOR COMPONENT CHECKS

With alternator disassembled, the following components may be tested.

Rotor Short-to-Ground Test

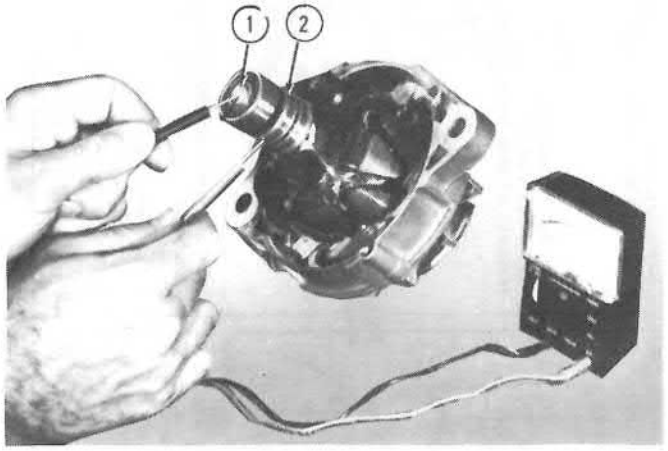
Set ohmmeter to x1000 scale.

Hold one test lead on rotor shaft (1) and other lead on either slip ring (2). Note ohmmeter reading, then put test lead on other slip ring.

In both cases, reading should be infinity (no needle movement). If not, check soldered connections at slip ring and that excess solder is not grounding rotor coil.

Replace rotor if damaged.

1. Rotor shaft 2. Slip ring



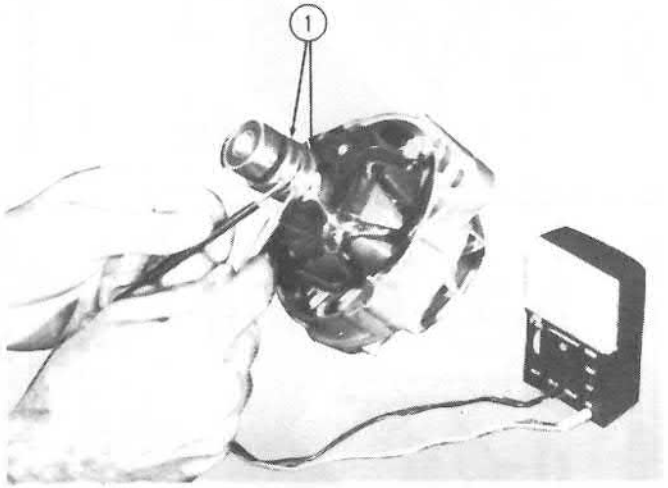
Rotor Open Test

Set ohmmeter to x1 scale.

Hold one test lead on one slip ring and other test lead on other slip ring. Reading should be 3.0 to 3.7 ohms. If not, rotor is open.

Replace rotor.

1. Slip rings



Stator Short to Ground Test

Remove stator leads (1) from rectifier board.

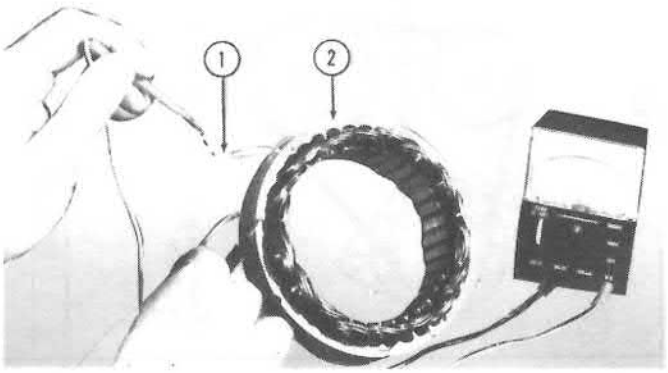
Set ohmmeter to x1000 scale.

Touch one test lead to stator core (2) bare metal and other test lead to any stator lead.

Reading should be infinite (no needle movement). If any needle movement is shown, stator is grounded.

Replace stator.

1. Stator lead 2. Stator core



Stator Continuity Test

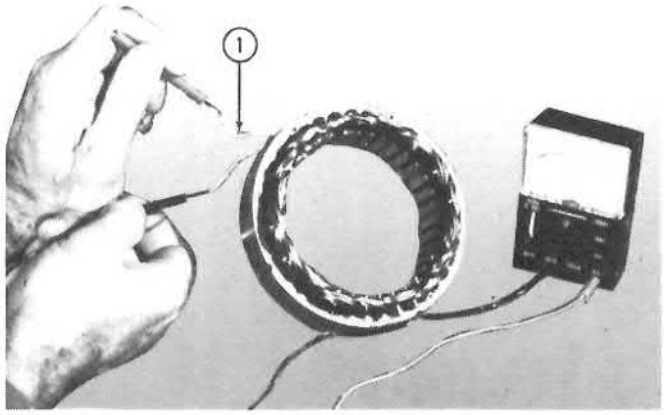
Set ohmmeter to x1 scale.

Touch one test lead to any stator lead (1). Touch other test lead to any other stator lead. Note reading. Repeat at all pairs of test leads.

Equal readings should be obtained at each pair of stator leads. A reading of infinity indicates poor connection at neutral junction.

Repair connection or replace stator.

1. Stator lead



Diode Test

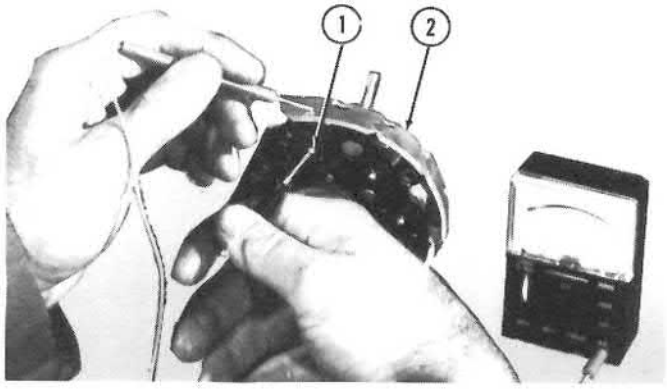
Remove stator leads from rectifier board.

Set ohmmeter to x1 scale.

Touch one test lead to a diode junction (1). Touch other test lead to heat sink (2). Note reading. Reverse test lead positions and note reading. Repeat for remaining diodes.

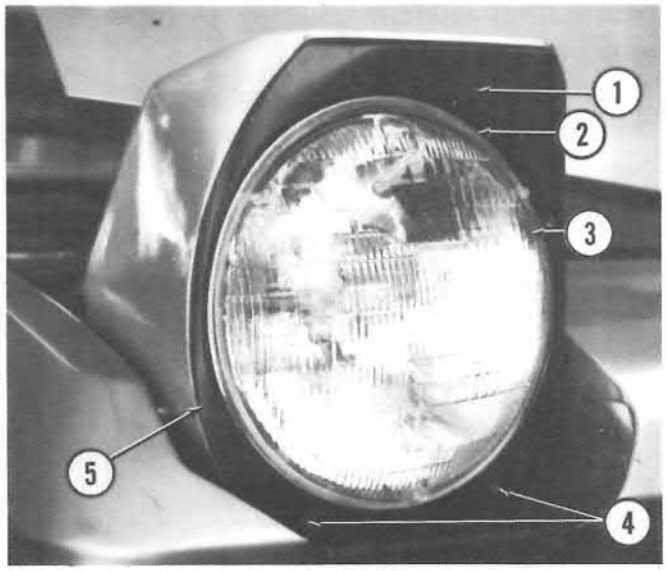
One high and one low reading should be obtained for each diode. If proper readings are not obtained, replace diode plate.

1. Diode junction 2. Heat sink



HEADLIGHTS

REMOVAL AND INSTALLATION



Remove three screws (1 and 4) holding trim molding (5) to body and remove molding.

Loosen three screws holding ring (2). Turn ring counter-clockwise and remove ring.

Disconnect plug from headlight (3). Remove headlight.

Install in reverse order.

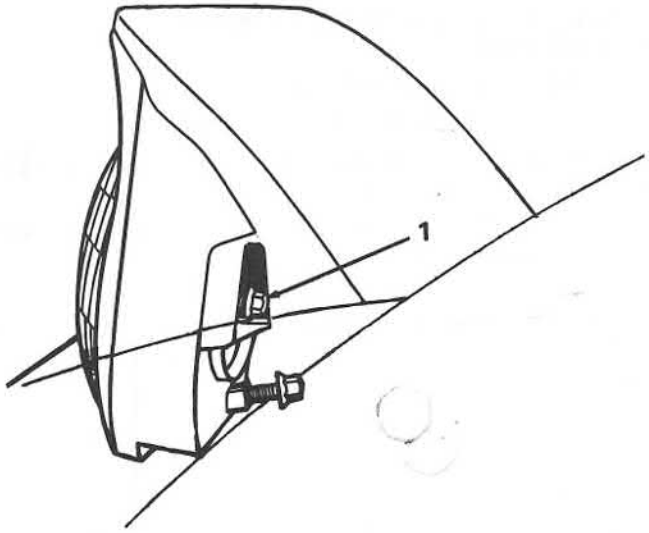
1. Screws 2. Ring 3. Headlight 4. Screws 5. Trim molding

ADJUSTMENT

All headlight adjustments should be made with the car unloaded at 16 ft. (5 m) from the screen. When using headlight alignment equipment, refer to instructions provided.

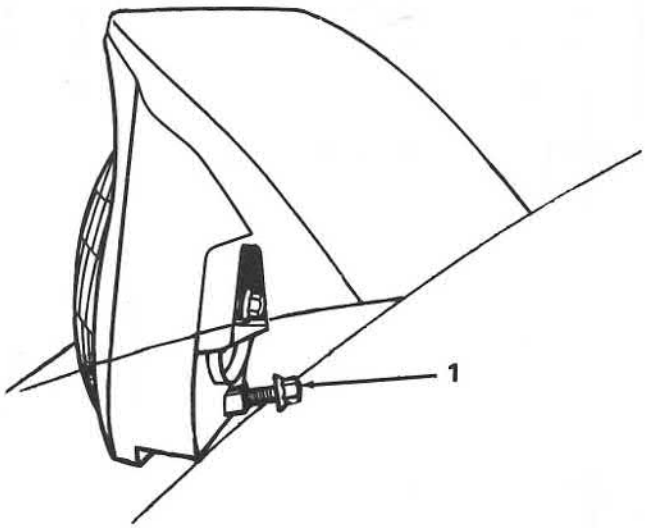
Turn headlights on low beam.

Adjust horizontal alignment by turning screw (1).



1. Horizontal adjustment screw

Adjust vertical alignment by turning screw (1).



1. Vertical adjustment screw

HEADLIGHT MOTOR

REMOVAL AND INSTALLATION

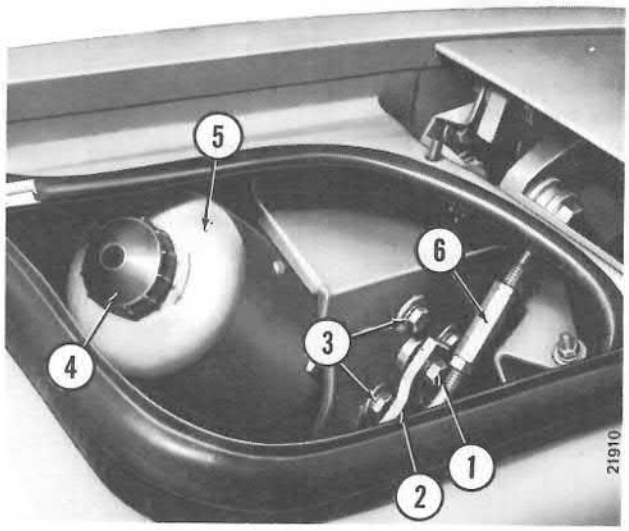
Remove bolt (1) holding arm (2) to motor shaft.

Remove three bolts (3) and washers holding motor (5).

Disconnect electrical connector. Remove motor.

Install in reverse order.

1. Bolt 2. Arm 3. Bolts 4. Knob 5. Motor 6. Turnbuckle



FRONT PARKING/DIRECTIONAL/ HAZARD LIGHT

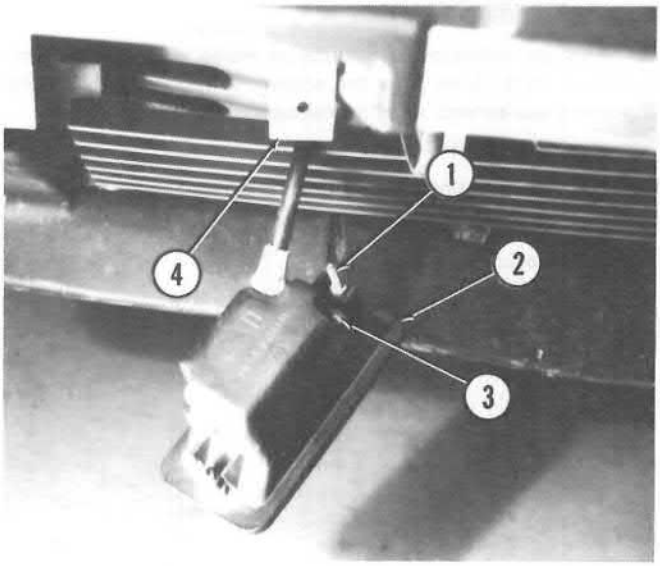
REMOVAL AND INSTALLATION

Remove two screws holding lens and remove lens.

Remove two nuts and washers from studs (1). Remove light assembly (2) from bracket (4).

Remove two screws (3) holding reflector in housing and pull reflector out of housing.

1. Stud 2. Light assembly 3. Screw 4. Bracket

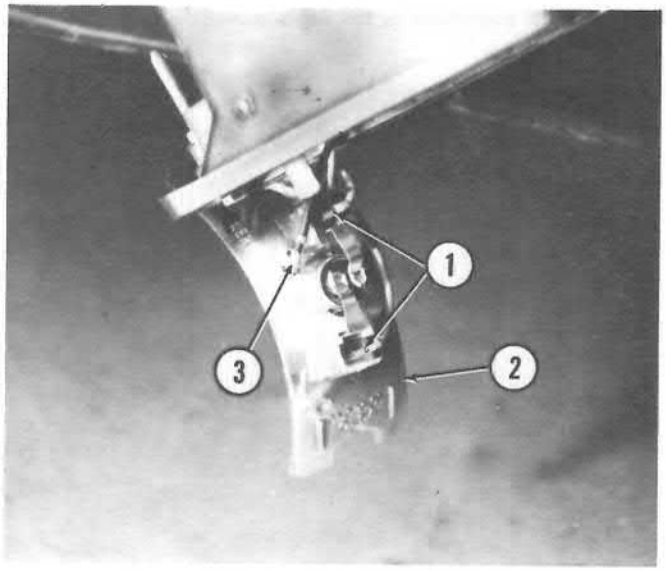


Disconnect electrical leads (1 and 3) from back of reflector (2).

Pull wires out of housing.

Install in reverse order.

1. Electrical leads 2. Reflector 3. Electrical lead



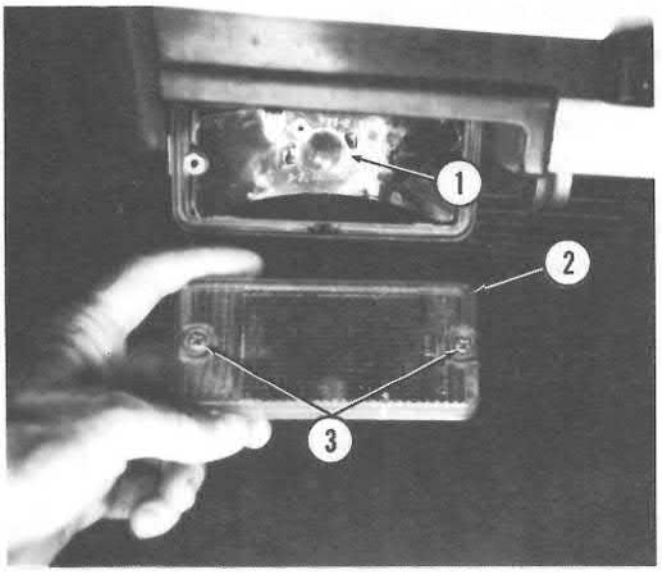
BULB REPLACEMENT

Remove two screws (3) and remove lens (2).

Remove bulb (1) by twisting out.

Install in reverse order.

1. Bulb 2. Lens 3. Screws



TAIL LIGHT ASSEMBLY

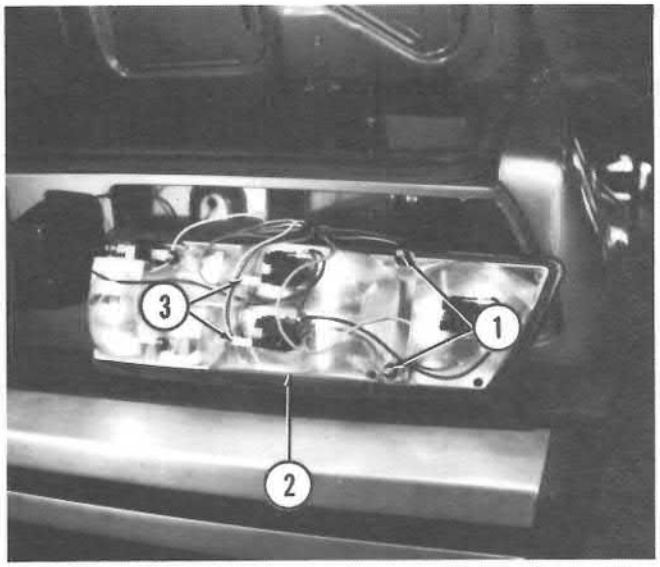
REMOVAL AND INSTALLATION

Working inside trunk, remove four nuts and washers from studs (1).

Pull tail light assembly (2) out of body and disconnect eight electrical leads (3).

Install in reverse order.

1. Studs 2. Tail light assembly 3. Electrical leads



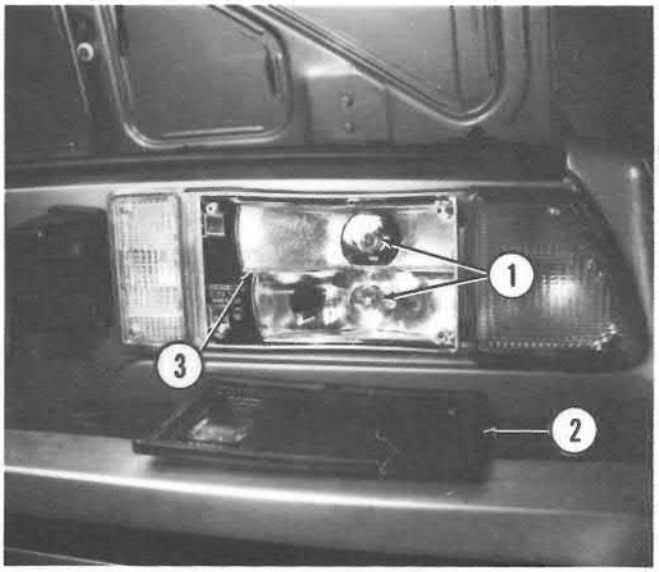
BULB REPLACEMENT

Remove screws and lens (2) covering defective bulb (1).

Remove bulb by twisting out.

Install in reverse order.

1. Bulbs 2. Lens 3. Reflector



LICENSE PLATE LIGHT

REMOVAL AND INSTALLATION

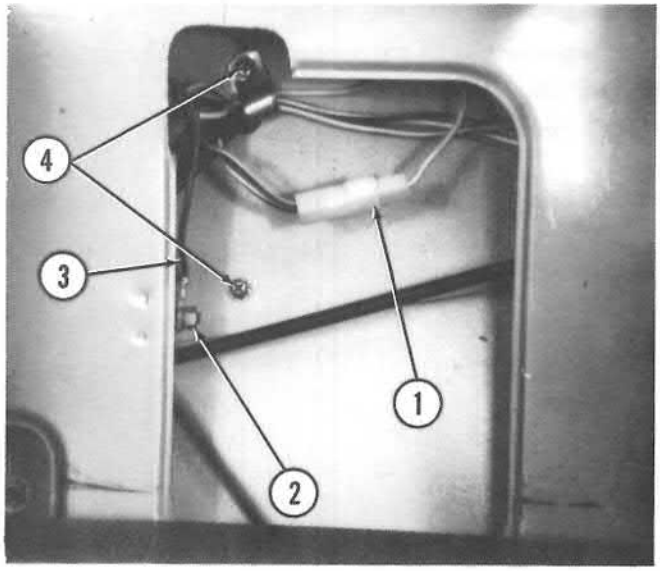
Working inside rear luggage compartment, disconnect electrical connector (1).

Remove nut (2) holding ground wire (3) to body.

Remove two screws (4) holding license plate light to body and remove light.

Install in reverse order.

1. Electrical connector 2. Nut 3. Wire 4. Screws



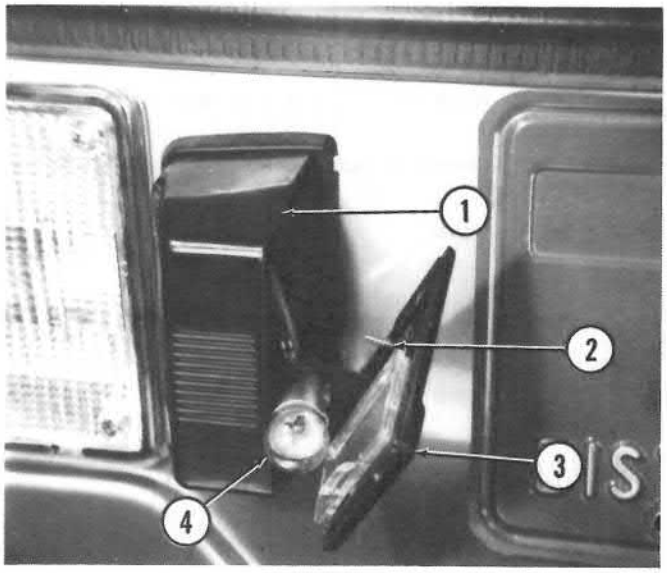
BULB REPLACEMENT

Remove screw (2) holding lens (3) to housing (1).

Remove bulb (4) by twisting out.

Install in reverse order.

1. Housing 2. Screw 3. Lens 4. Bulb



WIPER/DIRECTIONAL/LIGHT SWITCH

REMOVAL AND INSTALLATION

Disconnect battery ground cable.

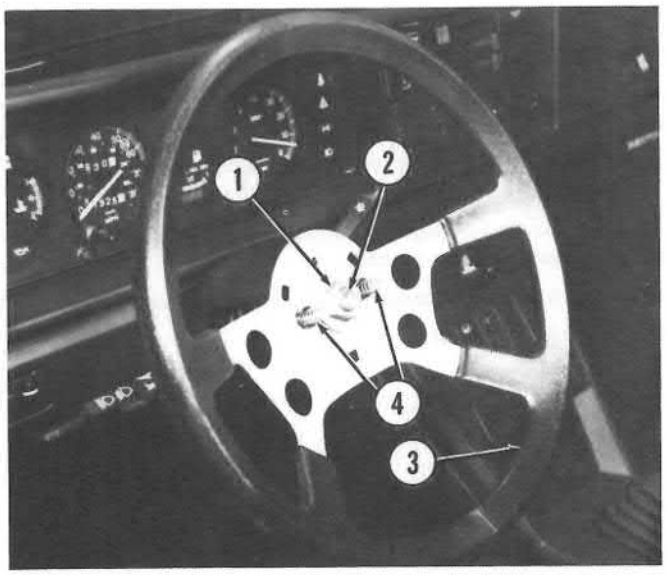
Center steering wheel and front wheels.

Pry horn button off steering wheel (3).

Remove two horn button springs (4). Remove nut (1) holding wheel (3) to shaft (2).

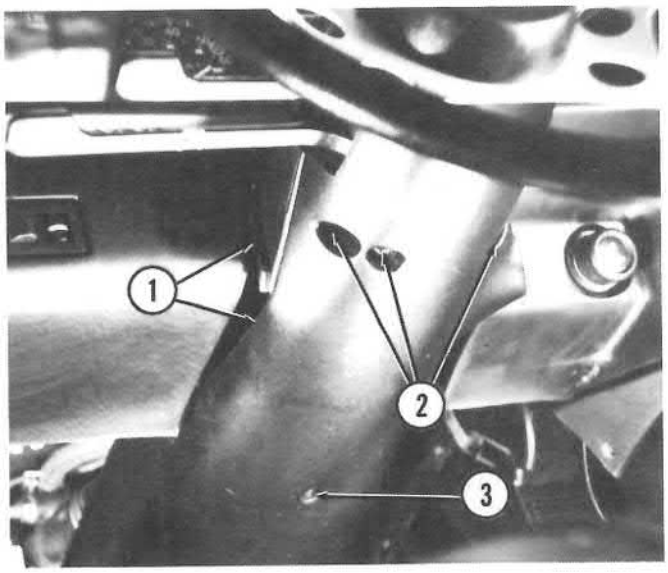
Mark steering wheel and steering shaft for installation reference. Pull wheel off shaft.

1. Nut 2. Steering shaft 3. Steering wheel 4. Horn button springs



Remove four screws (2 and 3) to remove upper and lower steering column covers (1).

1. Steering column covers 2. Screws 3. Screw

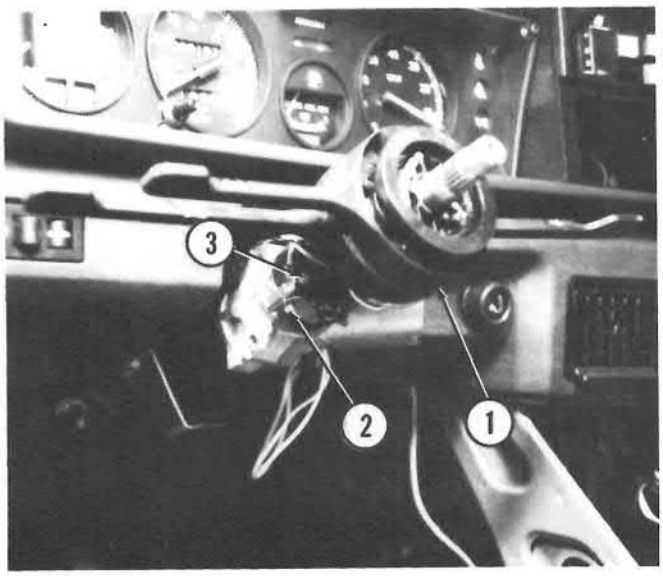


Loosen bolt (2) holding switch assembly (1) to shaft housing (3). Slide switch assembly off steering column.

Disconnect electrical connectors and remove switch assembly.

Install in reverse order.

1. Switch 2. Bolt 3. Shaft housing



HORNS

REMOVAL AND INSTALLATION

From front luggage compartment, remove headlight access panel.

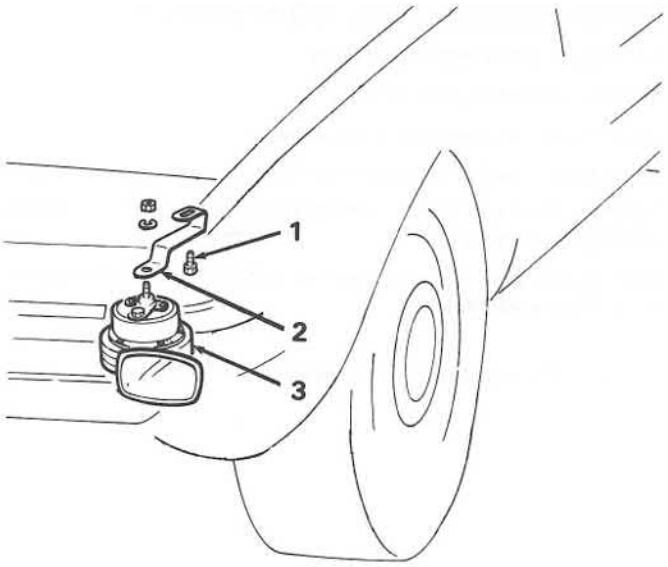
Working inside headlight compartment, disconnect electrical connector from horn (3).

Remove bolt (1) holding horn bracket (2) to body and remove horn (3) complete with bracket.

Repeat procedure on opposite side to remove remaining horn.

Install in reverse order.

1. Bolt 2. Bracket 3. Horn



REMOVAL AND INSTALLATION

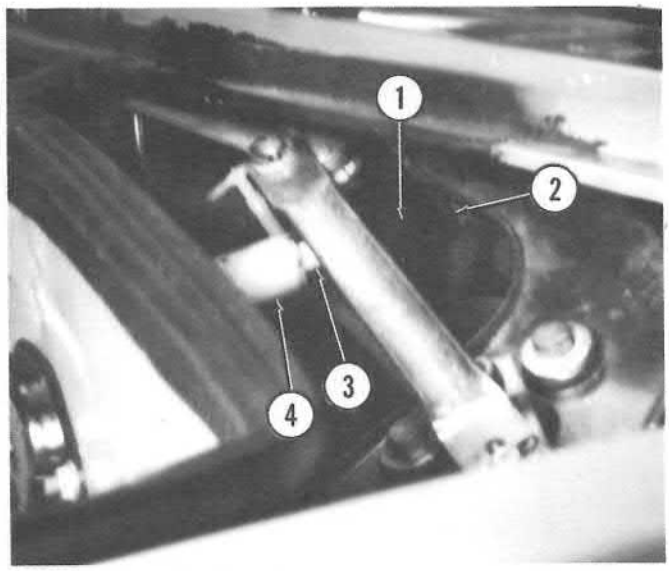
Disconnect battery ground cable.

Working in front luggage compartment, remove four screws and one bolt holding left grille and remove grille.

Uncouple speedometer cable (1) by sliding sleeve (4) on coupler (3) toward front of vehicle.

Remove grommet (2) from firewall.

1. Cable 2. Grommet 3. Coupler 4. Sleeve

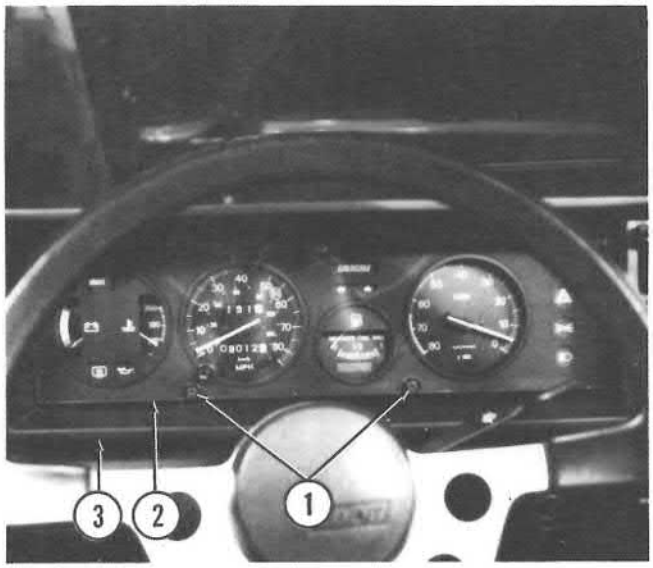


Remove five Allen bolts (1) holding instrument cluster (2) to support (3).

Pull instrument cluster out of panel far enough to gain access to rear of cluster.

NOTE: It may be necessary to guide cable coupler through firewall hole.

1. Allen bolts 2. Instrument cluster 3. Support



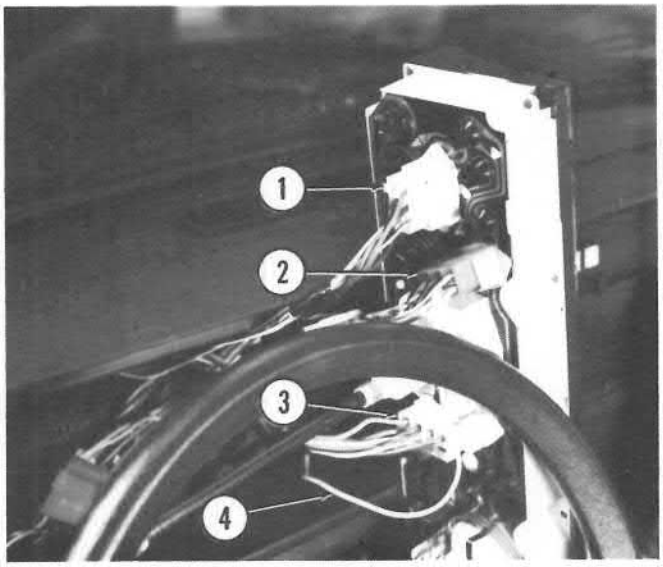
Unplug three electrical connectors (1, 2 and 3) from instrument cluster.

On vehicles with fuel injection, cut wire (4).

Remove instrument cluster.

To install, reverse removal procedure. On vehicles with fuel injection, splice together wire cut during removal.

1. Connector 2. Connector 3. Connector 4. Wire



WINDSHIELD WIPER MOTOR

REMOVAL AND INSTALLATION

NOTE: Wipers should be in "park" position.

Disconnect wiper motor connector (7).

Remove two nuts (8) and both halves of retaining plate (10). Push connector through hole in cowl.

Remove left wiper arm (11). Remove nut (1), spacer and rubber washer from wiper arm shaft.

Remove nut (4) holding motor arm (9) to shaft and remove motor arm.

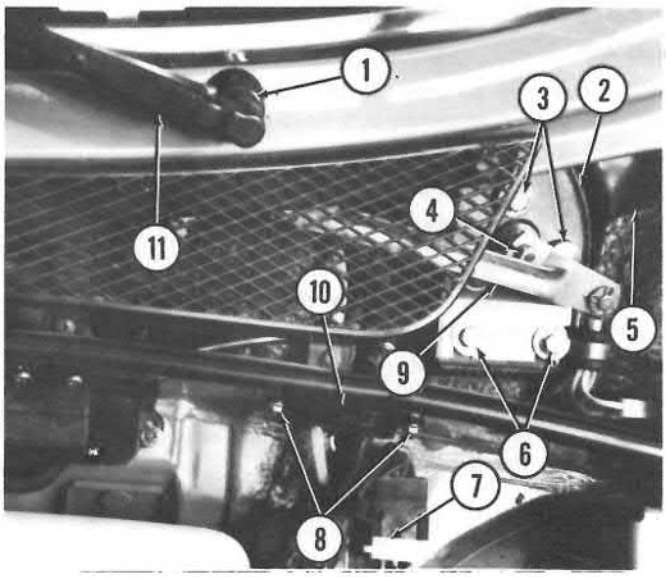
Remove two bolts (6) and washers holding bracket (2).

Remove bolts (3) and washers holding wiper motor (5) to bracket.

Lift bracket until motor can be maneuvered out of vehicle.

Install in reverse order.

1. Nut 2. Bracket 3. Bolts 4. Nut 5. Wiper motor 6. Bolts
7. Electrical connector 8. Nuts 9. Arm 10. Retaining plate
11. Wiper arm

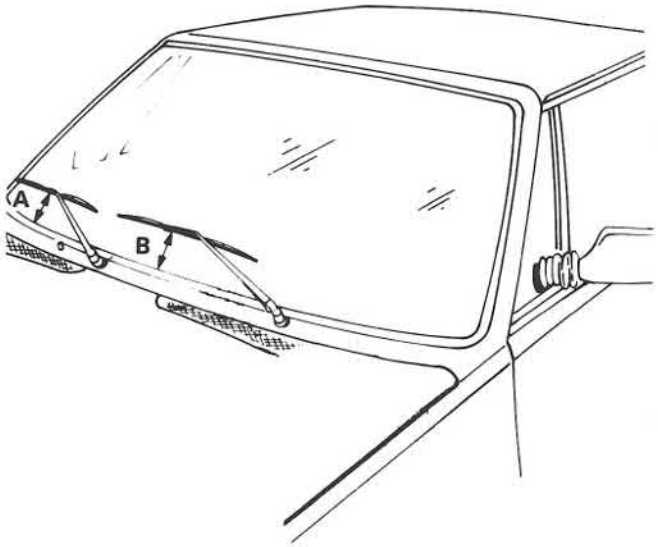


WIPER ARM ADJUSTMENT

With wiper arms in "park" position, check arm height at wiper blade.

Check that dimension "A" is 2.4 to 3.3 in. (60 to 85 mm) and dimension "B" is 2.6 to 3.3 in. (65 to 85 mm).

If necessary, remove wiper arms and reposition them to correct park position.



WINDSHIELD WASHER RESERVOIR

REMOVAL AND INSTALLATION

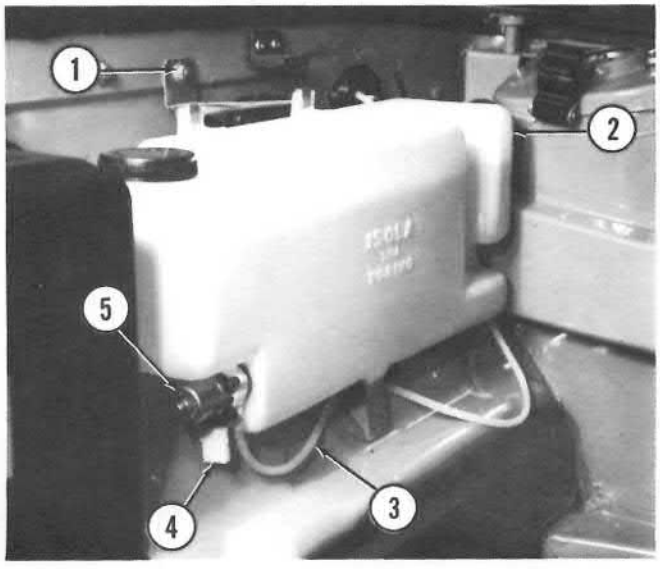
Disconnect hose (3) from motor (5) and plug opening to prevent leakage.

Disconnect electrical connector (4) from motor.

Remove nut (1) holding reservoir (2) and remove reservoir.

Install in reverse order.

1. Nut 2. Reservoir 3. Hose 4. Connector 5. Motor



HEATED REAR WINDOW

REPAIR

When repairing an open metallic conductor attached to rear window, it is not necessary to remove glass.

The repair can be accomplished with a special kit made for this purpose or a silver paint with metallic content.

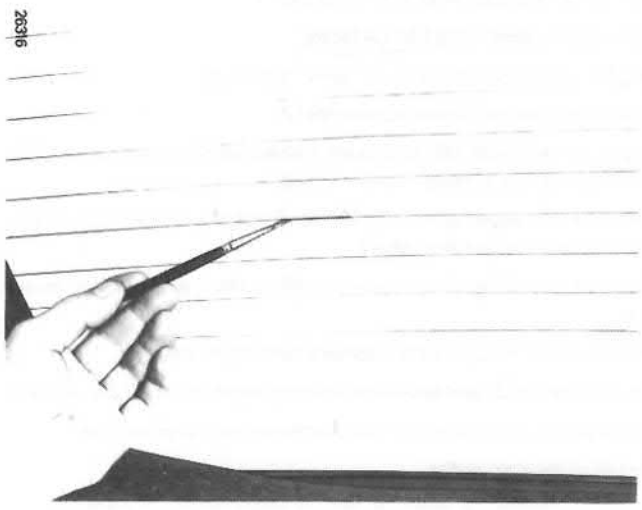
Clean area around break.

Mix paint thoroughly.

Mask off each side of the break. Carefully apply paint to break with a camel hair brush as shown.

Allow to dry for about 4 to 5 hours. A source of low temperature heat (hair dryer, infrared lamp) will shorten drying time.

CAUTION: Do not turn on rear window heater until repair is completely dry.



X1/9 1979 - 1982
SERVICE MANUAL

BODY - 70

PARTS CATALOG,
SERVICE MANUAL &
SERVICE TIME
SCHEDULE CODE

GENERAL INFORMATION

Two-door unitized body.

Front doors hinged at front. Side window with two safety glass panes, i.e. fixed quarter window and drop window controlled by regulator.

Doors have outside key handles and inside locking devices. Outer door handles have spring-loaded release grips.

Rear window is fixed safety glass.

Luggage compartments in front and rear. Front compartment unlatched by latch in driver's footwell. Rear compartment key lock located in left door column. Tool kit and jack located in rear compartment.

Seats are adjustable bucket-type with tiltable back for access to rear of seats.

Spare wheel housed behind passenger's seat.

Instruments and switches on driver's side. Heat and air controls are in center of instrument panel. Four adjustable outlets, one at each end and two in center panel.

Rear view mirrors inside and outside.

Sun visors are padded and adjustable.

Carpeting in passenger compartment. Rubber mats in luggage compartment.

Engine compartment lid has key lock located in driver's door column.

Air louvers in both sides for letting air into engine compartment.

Ignition key lock with anti-theft device.

Removable hard top.

Front and rear energy absorbing bumpers made of aluminum.

ENGINE COMPARTMENT LID

REMOVAL, INSTALLATION AND ADJUSTMENT

Unhook prop (2) from bushing (1).

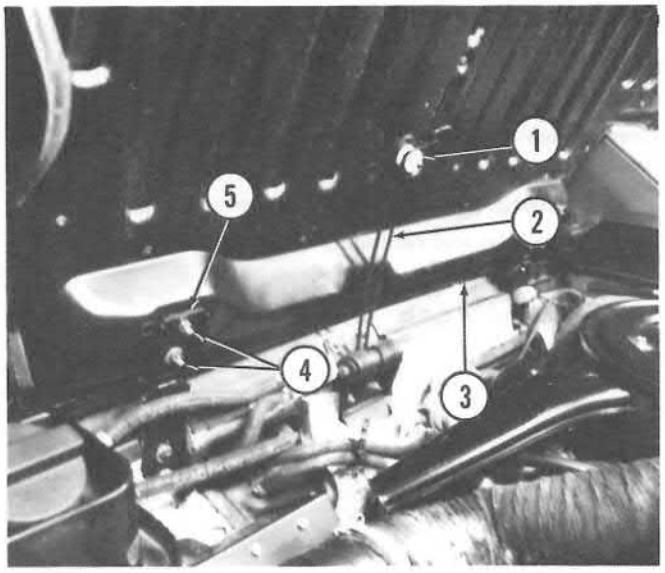
CAUTION: Prop is under high spring tension.

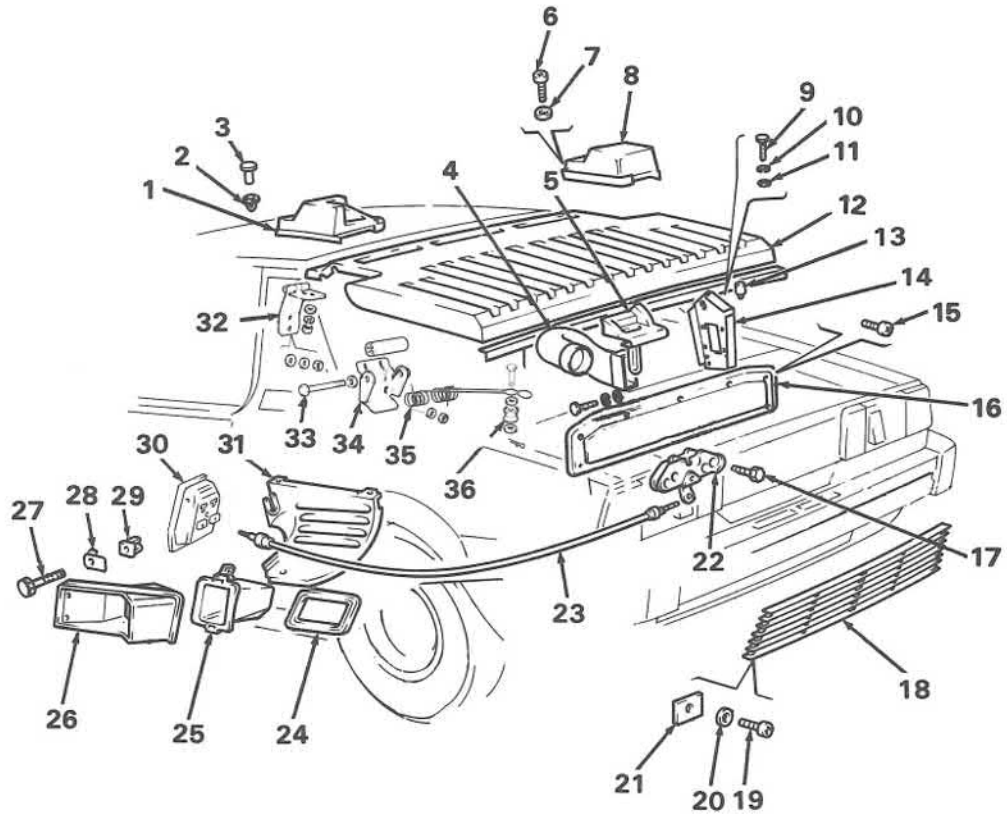
Remove four nuts (4) and washers holding lid (3) to hinges (5). Remove lid.

When installing lid, check position. Shift lid on hinges to obtain proper alignment.

Tighten bolt holding lid to hinges.

1. Bushing 2. Prop 3. Lid 4. Nuts 5. Hinge





1. Cover
2. Plastic clip
3. Pin
4. Air duct (fuel injection only)
5. Striker
6. Screw
7. Washer
8. Cover
9. Bolt
10. Lockwasher
11. Washer
12. Lid
13. Pad
14. Support (fuel injection only)
15. Screw
16. Access panel
17. Bolt
18. Grille
19. Screw
20. Washer
21. Plate
22. Latch
23. Cable
24. Gasket
25. Duct
26. Air intake
27. Bolt
28. Bracket
29. Clip
30. Lock assembly
31. Plate
32. Hinge
33. Bolt
34. Bracket
35. Prop
36. Bushing

EXPLODED VIEW OF ENGINE COMPARTMENT LID COMPONENTS AND AIR DUCTS

ENGINE COMPARTMENT LID LATCH

REMOVAL, INSTALLATION AND ADJUSTMENT

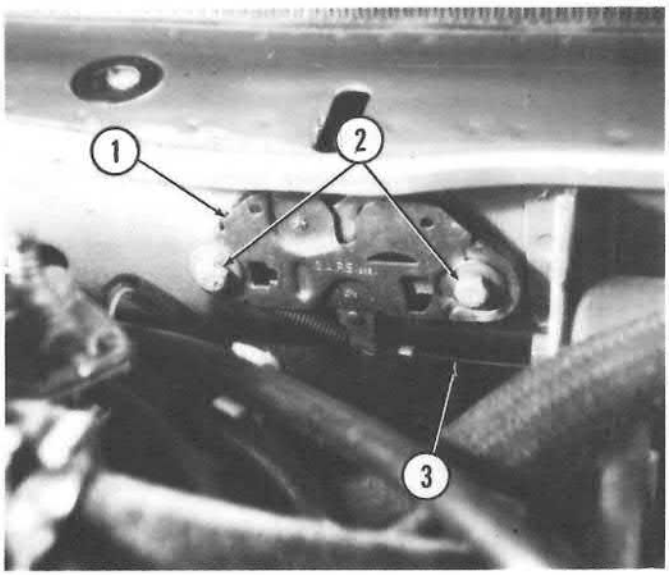
Disconnect cable (3) from latch (1).

Remove two bolts (2) and washers holding latch to body. Remove latch.

When installing, position latch for proper operation.

Tighten two bolts and reconnect cable.

1. Latch 2. Bolts 3. Cable



INSTRUMENT PANEL

REMOVAL AND INSTALLATION

Disconnect battery ground cable. Remove radio.

Remove instrument cluster. Refer to 555.10.

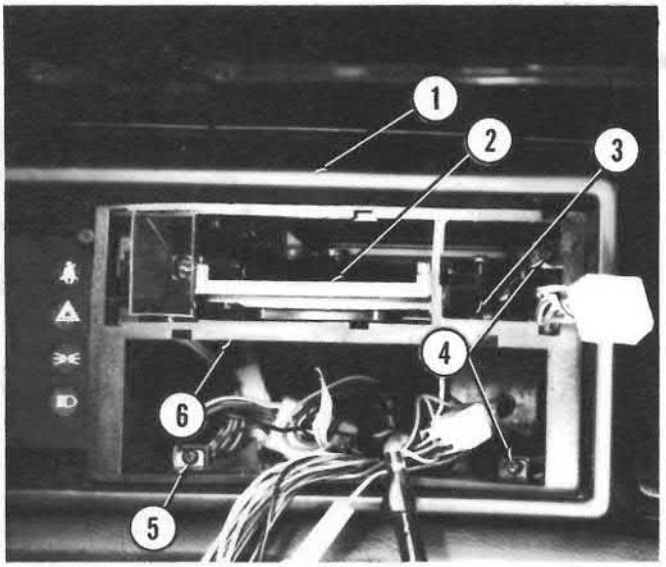
Remove heater or air conditioning control panel fascia panel.

Remove and disconnect clock, or remove clock opening cover plate.

Remove screw (3) holding control panel (2) to support (6).

Remove four screws (4 and 5) holding support to instrument panel (1).

Maneuver support out of instrument panel.



1. Instrument panel 2. Control panel 3. Screw 4. Screws
5. Screw 6. Support

Disconnect electrical connectors from light switch (2) and cigarette lighter.

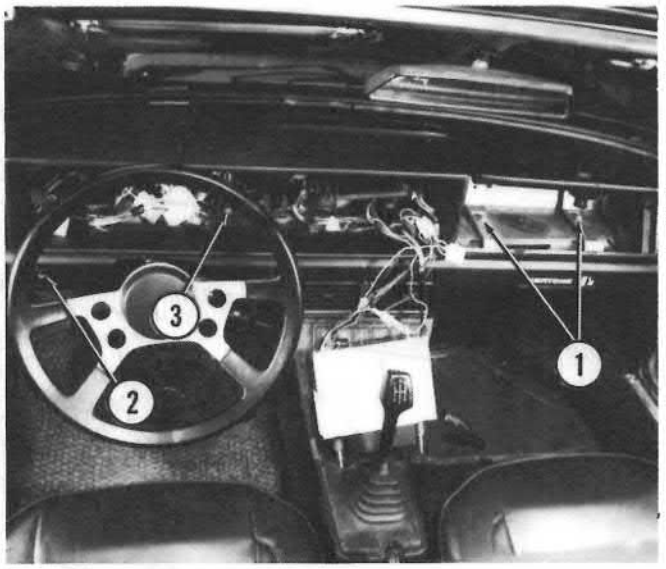
Remove two screws holding glove box liner and remove liner.

Lower fuse/relay panel.

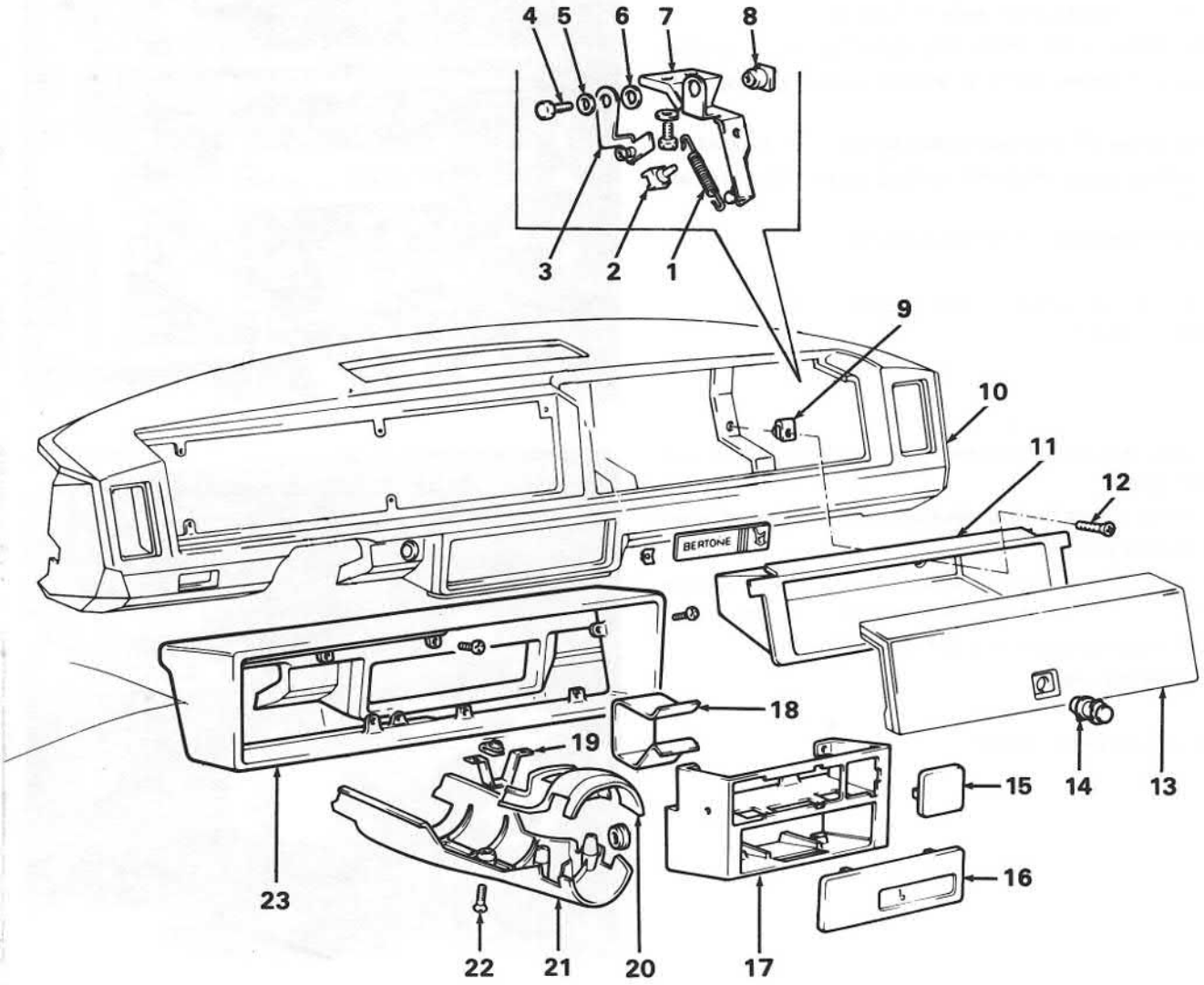
Working through openings and under instrument panel, remove seven bolts (1 and 3) holding instrument panel to cowl.

Carefully remove instrument panel from vehicle.

Install in reverse order.

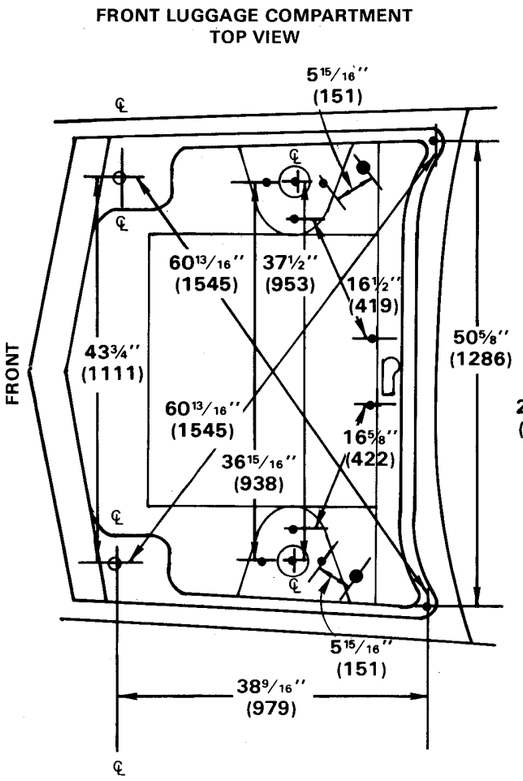


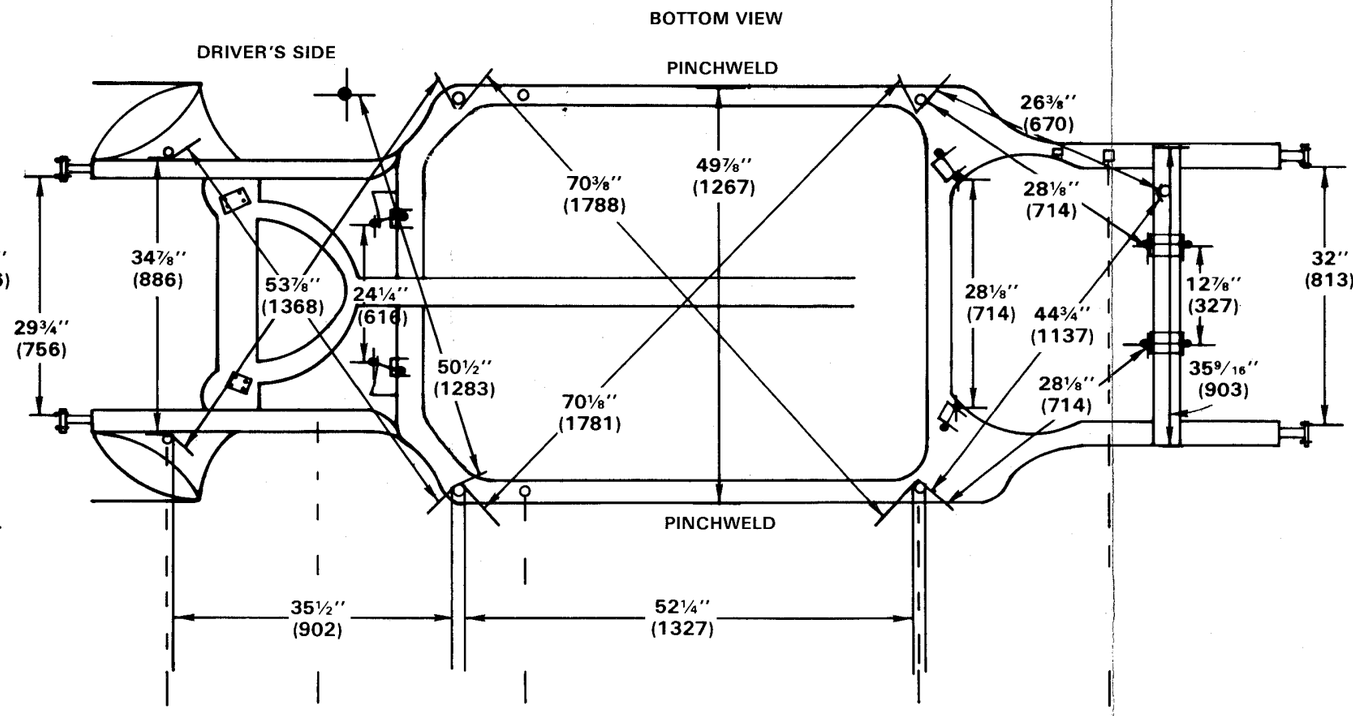
1. Bolts 2. Light switch 3. Bolt

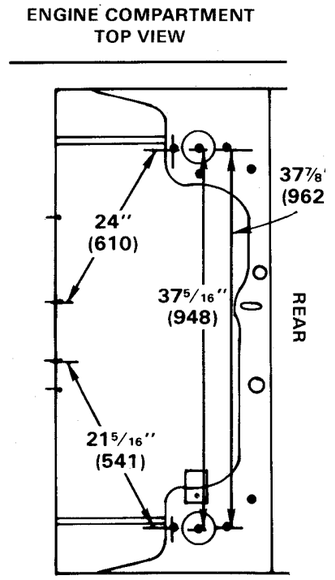


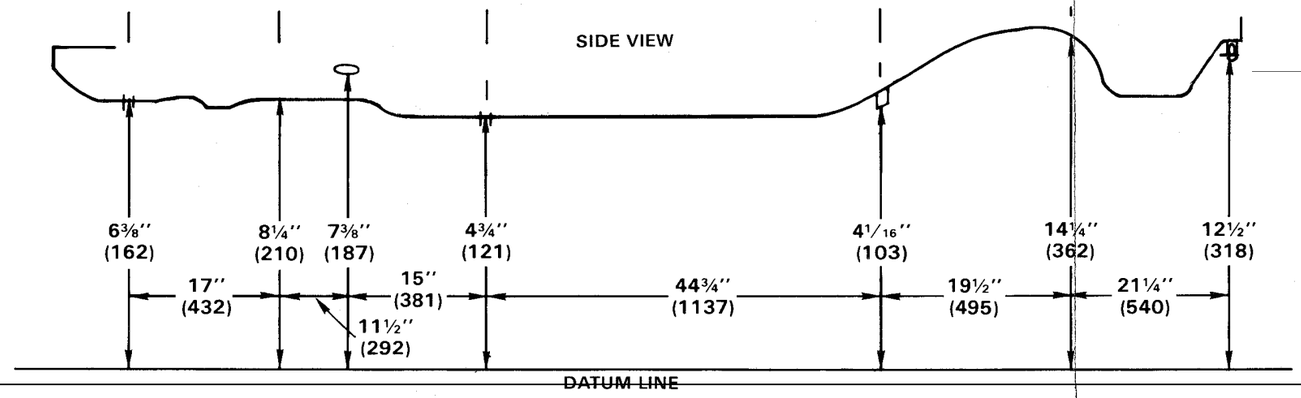
1. Spring
2. Pad
3. Bracket
4. Bolt
5. Lockwasher
6. Washer
7. Bracket
8. Bushing
9. Clip
10. Instrument panel
11. Glove box liner
12. Screw
13. Glove box door
14. Latch
15. Clock opening cover
16. Radio opening cover
17. Support
18. Clip
19. Bracket
20. Upper steering column cover
21. Lower steering column cover
22. Screw
23. Instrument cluster support

EXPLODED VIEW OF INSTRUMENT PANEL









UNDERBODY DIMENSIONS

MEASUREMENTS

All measurements are given in inches and millimeters.

Measurement Points

Bolts, nuts and plugs are measured from the center of the unit and are shown on the illustration as a solid dot.

Holes are measured from the closest edge to the other point of the measurement. Holes are shown as outlines only.

The symbol ℄ next to a hole indicates that the measurement is taken from the center of that hole.

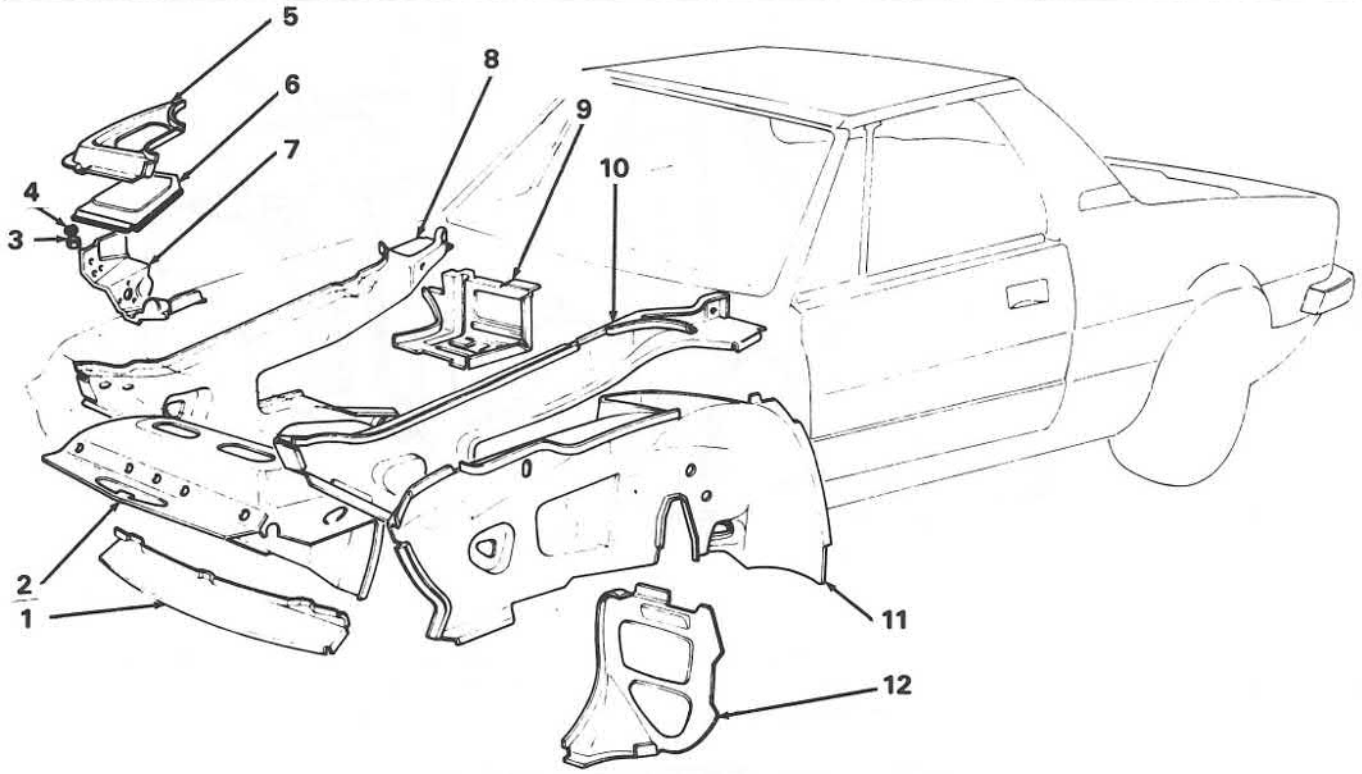
Top and Bottom View Measurements

All dimensions are point-to-point, closest distance between the points of measurement.

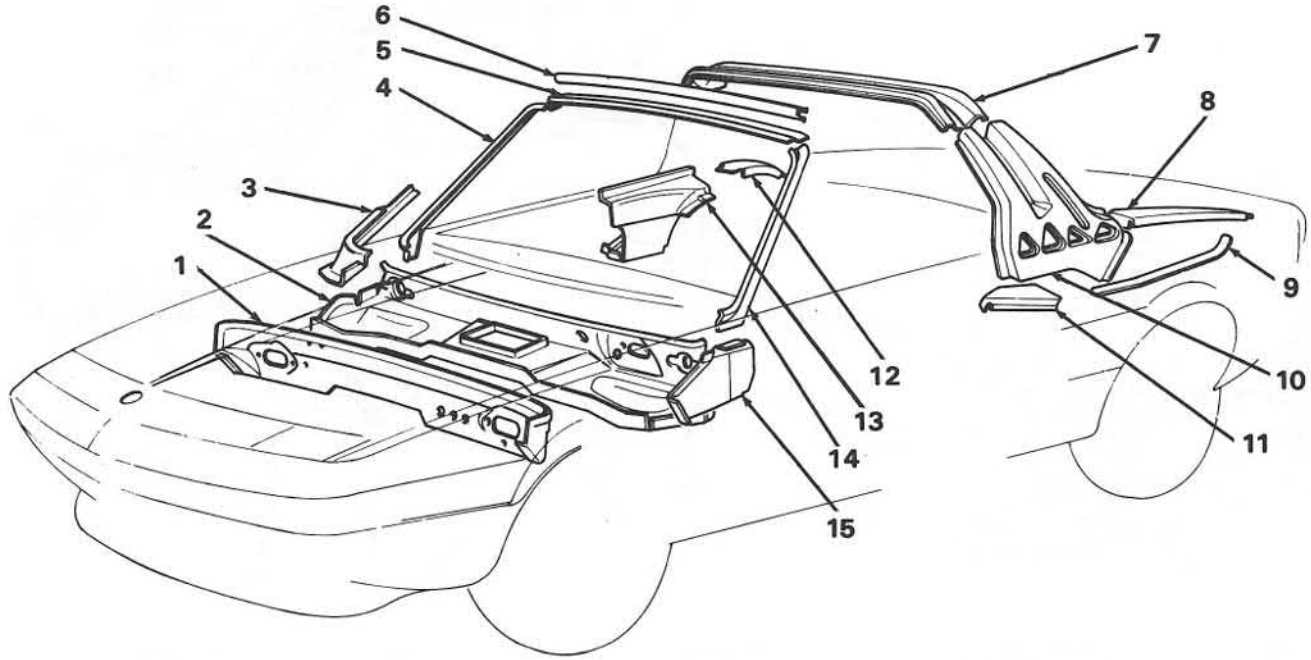
Datum Measurements

Datum measurements provide a fixed reference point for all vertical measurements. Measurements along the datum line are not point-to-point. The measurements must always be made parallel to the datum line.

Dimensions provided courtesy of KLM Inc. for the exclusive use of Fiat Motors of North America.

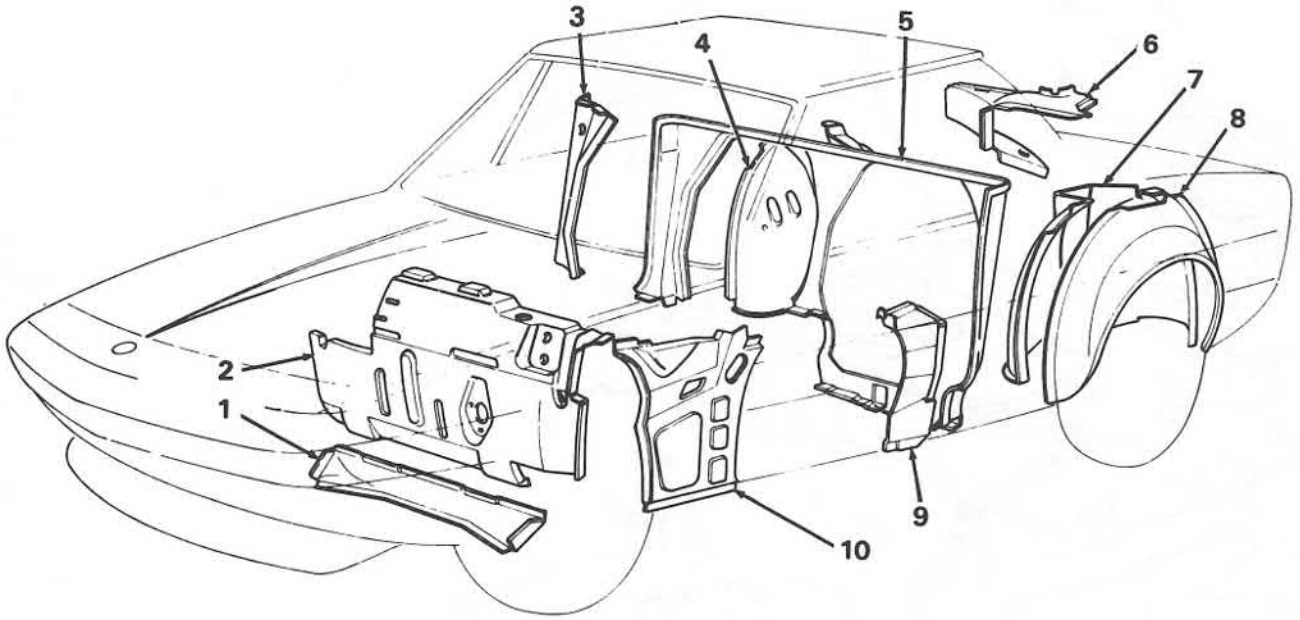


1. Crossrail
2. Wall
3. Nut
4. Lockwasher
5. Joining element
6. Cover
7. Bracket
8. Framing
9. Battery seat
10. Framing
11. Side panel
12. Wall



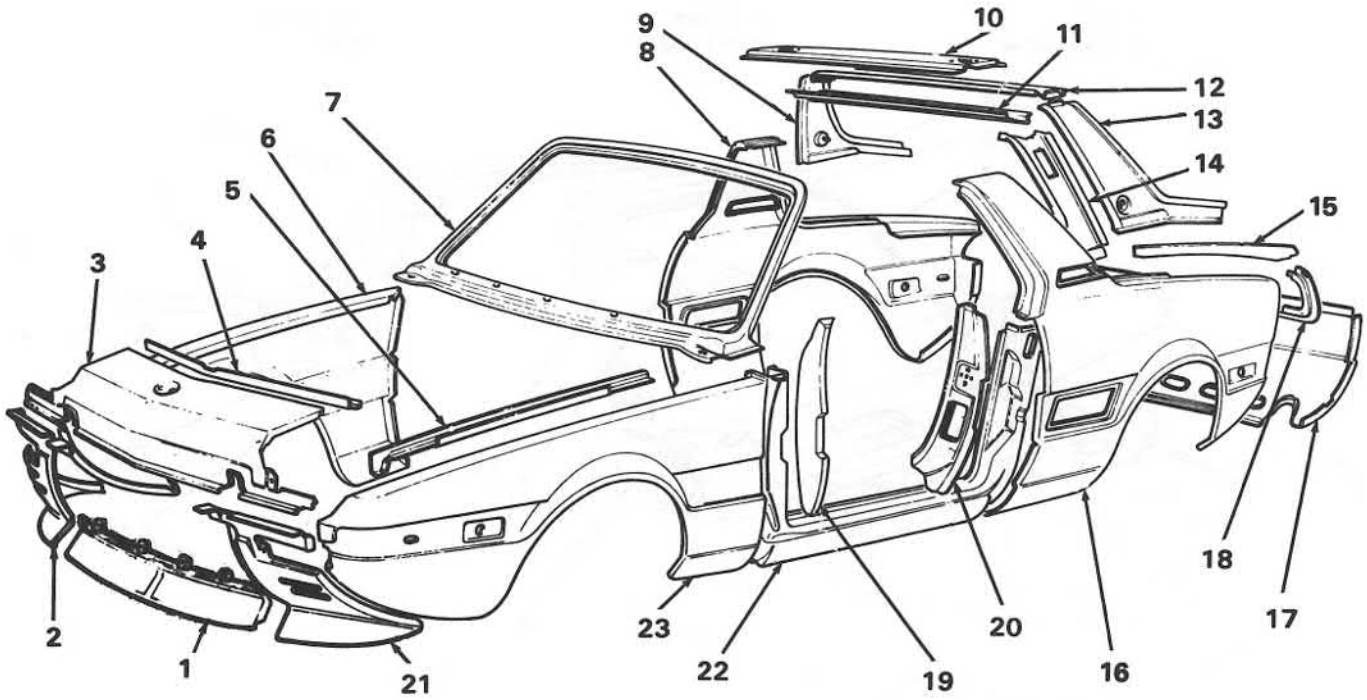
1. Air intake wall
2. Air intake case
3. Reinforcement
4. Framing
5. Windshield framing
6. Joining element
7. Framing
8. Joining element
9. Reinforcement
10. Framing
11. Reinforcement
12. Reinforcement
13. Reinforcement
14. Framing
15. Joining element

BODY SHELL INNER COMPONENTS



1. Boxed panel
2. Wall
3. Joining element
4. Side panel
5. Wall
6. Joining element
7. Side panel
8. Wheel well
9. Reinforcement
10. Side panel

BODY SHELL INNER COMPONENTS



1. Panel
2. Panel
3. Panel
4. Channel
5. Hood channel
6. Panel
7. Windshield panel
8. Panel
9. Panel
10. Panel
11. Panel
12. Panel
13. Panel
14. Panel
15. Hood channel
16. Panel
17. Panel
18. Seat
19. Joining element
20. Joining element
21. Panel
22. Door opening panel
23. Panel

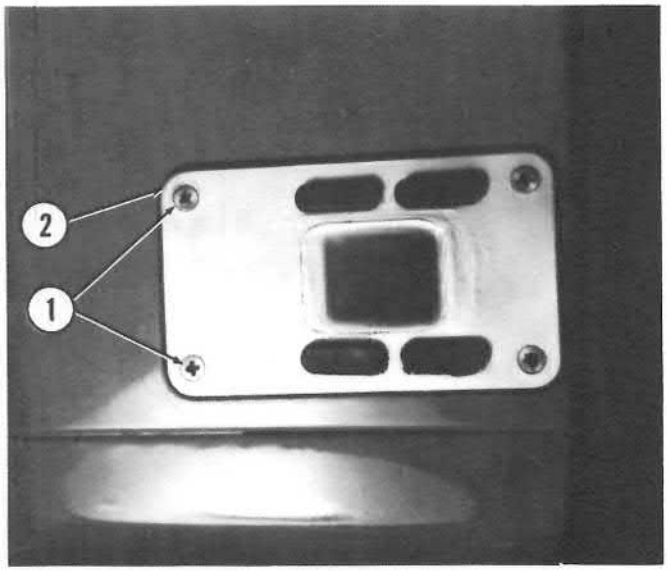
BODY SHELL OUTER COMPONENTS

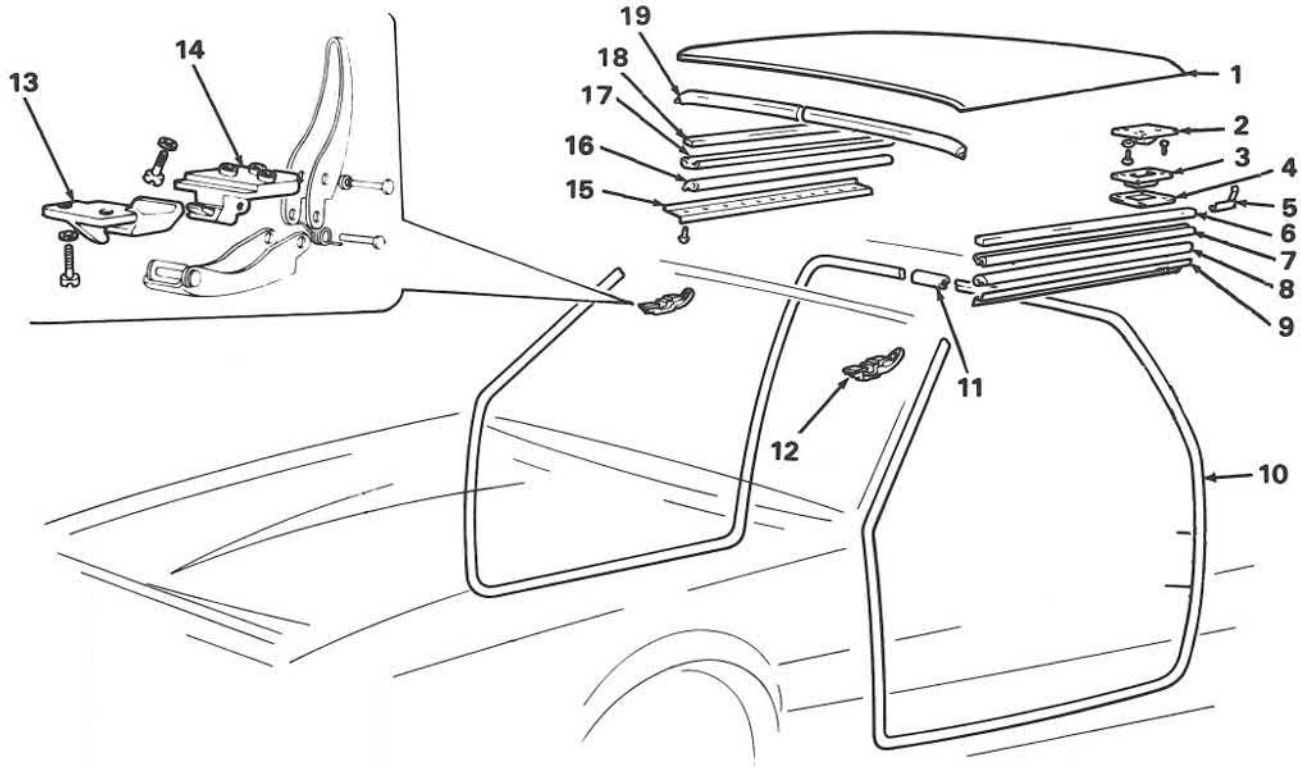
ADJUSTMENT

Adjust hard top for proper alignment by loosening four screws (1) holding striker plate (2).

Shift plate as necessary for proper adjustment.

1. Screws 2. Striker plate





1. Hard top
2. Lug
3. Striker plate
4. Cover
5. End plate
6. Channel
7. Weatherstrip
8. Weatherstrip
9. Molding
10. Weatherstrip
11. Coupling
12. Latch
13. Striker plate
14. Support
15. Molding
16. Weatherstrip
17. Weatherstrip
18. Channel
19. Weatherstrip

EXPLODED VIEW OF HARD TOP COMPONENTS

DOOR PANEL

REMOVAL AND INSTALLATION

Pry out plug (1) in top of arm rest (2).

Remove three screws holding arm rest to door and remove arm rest.

Unscrew lock button (3).

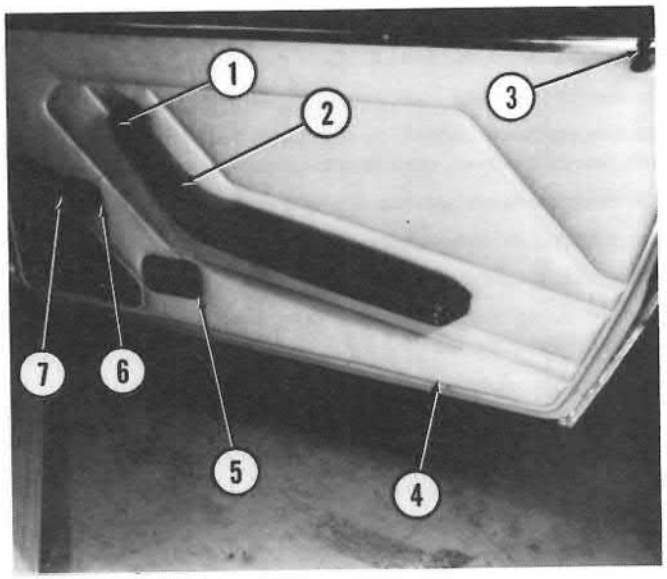
Pry back cover (6) and remove clip on window crank. Remove window crank (7).

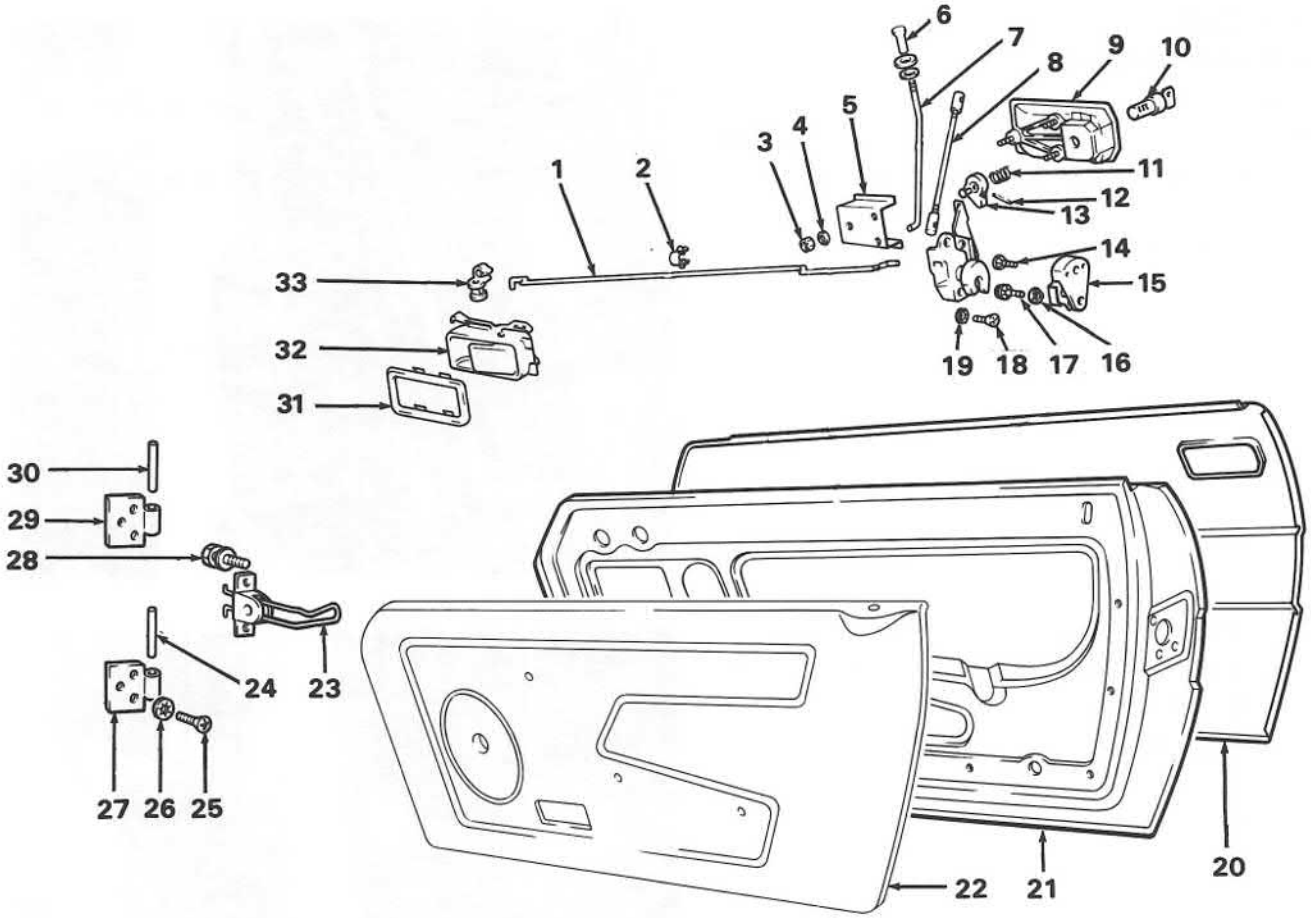
Remove door handle trim ring (5) by pushing toward rear of vehicle and pulling out.

Carefully pry door panel (4) off door.

Install in reverse order.

1. Plug 2. Arm rest 3. Lock button 4. Door panel 5. Trim ring
6. Cover 7. Window crank





1. Latch rod
2. Clip
3. Nut
4. Washer
5. Bracket
6. Lock button
7. Lock rod
8. Tie rod
9. Handle assembly
10. Lock cylinder
11. Spring
12. Pin
13. Pawl
14. Screw
15. Latch
16. Washer
17. Screw
18. Screw
19. Lockwasher
20. Outer skin
21. Door
22. Door panel
23. Door stay
24. Hinge pin
25. Screw
26. Lockwasher
27. Hinge
28. Bolt
29. Hinge
30. Hinge pin
31. Trim ring
32. Door handle
33. Clip

EXPLODED VIEW OF DOOR

DOOR

REMOVAL AND INSTALLATION

Remove door panel.

Remove electrical leads (5) by removing clip (1) and, on vehicles with power windows, disconnecting leads from motor.

Pull electrical leads out through hole in door.

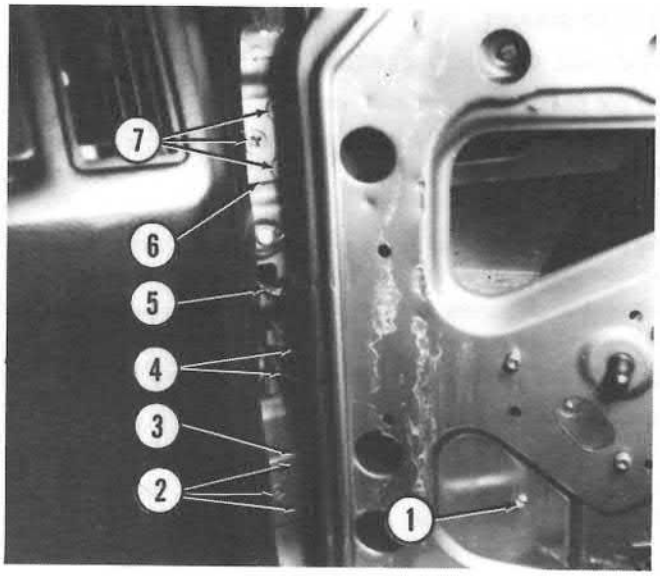
Disconnect door check (4) by squeezing rods together.

Scribe marks for hinge location.

Remove six screws (2 and 7) holding hinges (3 and 6) to door jamb and remove door.

Install in reverse order.

1. Clip 2. Screws 3. Hinge 4. Door check 5. Electrical leads 6. Hinge 7. Screws



DOOR LATCH

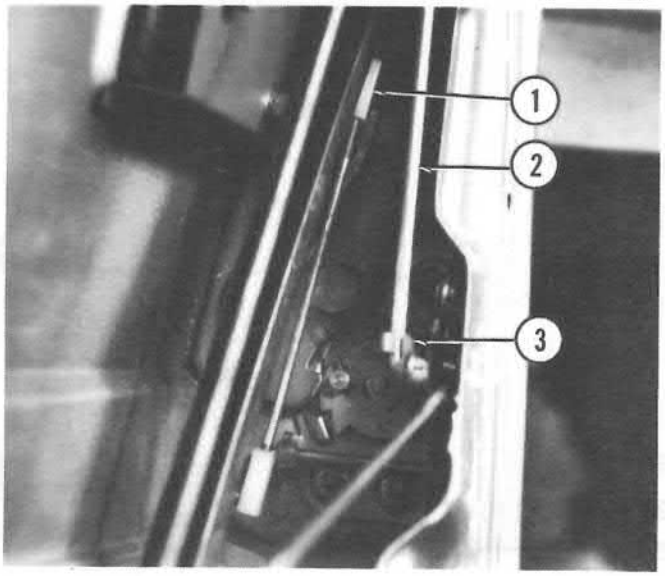
REMOVAL AND INSTALLATION

Remove door panel.

Disconnect lock rod (2) from plastic clip (3) and remove rod.

Disconnect adjustable head (1) from handle assembly.

1. Adjustable head 2. Lock rod 3. Clip



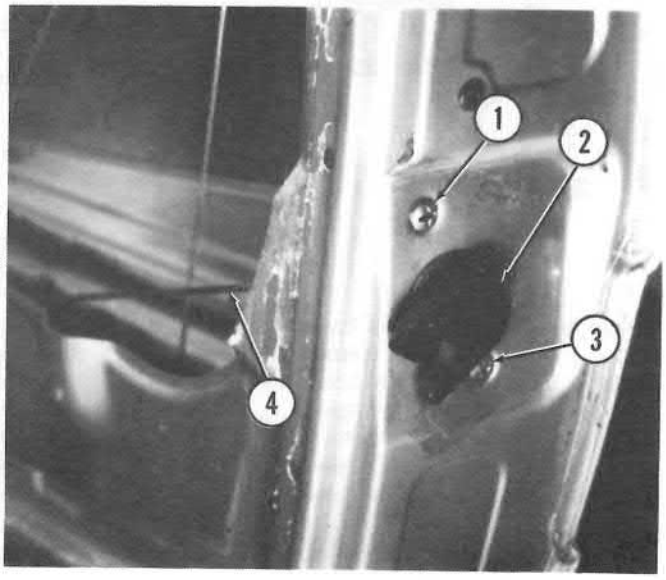
Remove three screws (1 and 3) holding latch (2) to door.

Tilt latch until latch rod (4) can be disconnected from latch.

Maneuver latch out of door.

Install in reverse order. Adjust door handle.

1. Screw 2. Latch 3. Screw 4. Latch rod



HANDLE AND LOCK CYLINDER

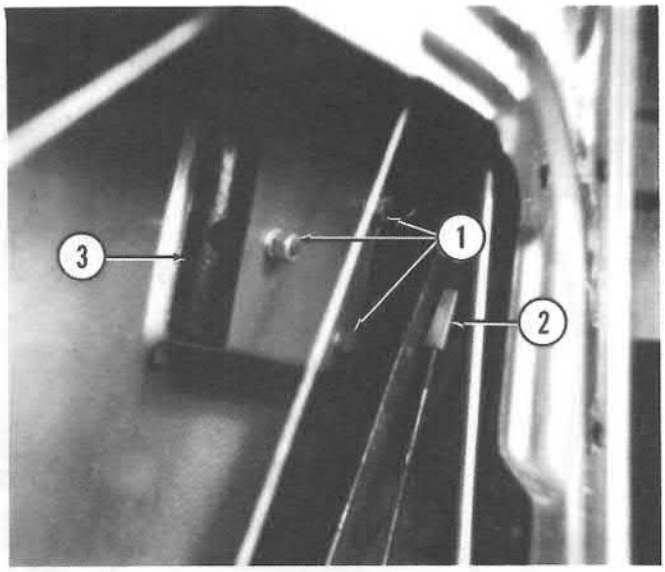
REMOVAL AND INSTALLATION

Disconnect adjustable head (2) from handle assembly (3).

Remove three nuts (1) holding handle assembly to door and remove handle assembly.

Install in reverse order. Adjust handle.

1. Nuts 2. Adjustable head 3. Handle assembly

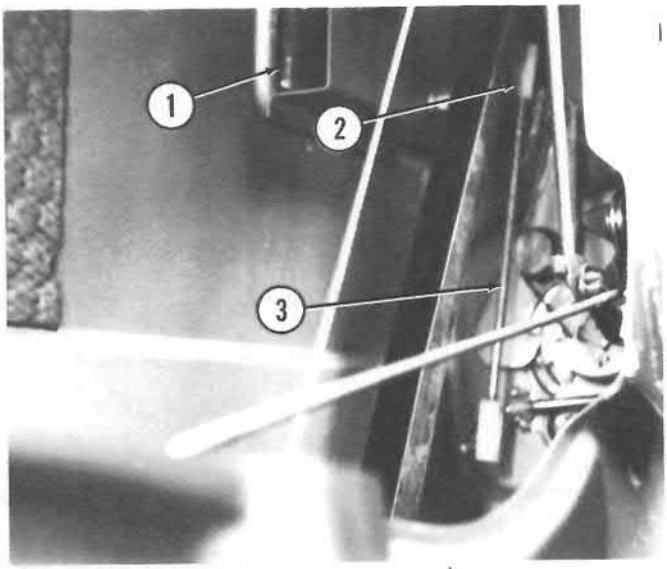


ADJUSTMENT

Disconnect adjustable head (2) from handle assembly (1).

Turn head on tie rod (3) until proper length is obtained.

1. Handle assembly 2. Adjustable head 3. Tie rod

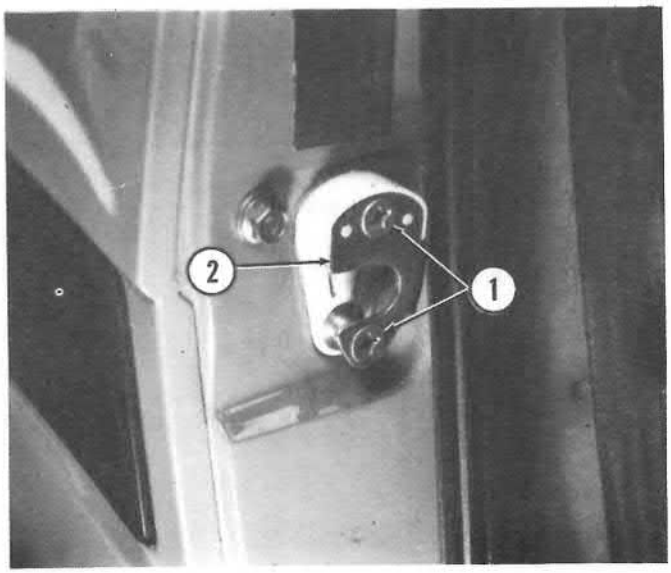


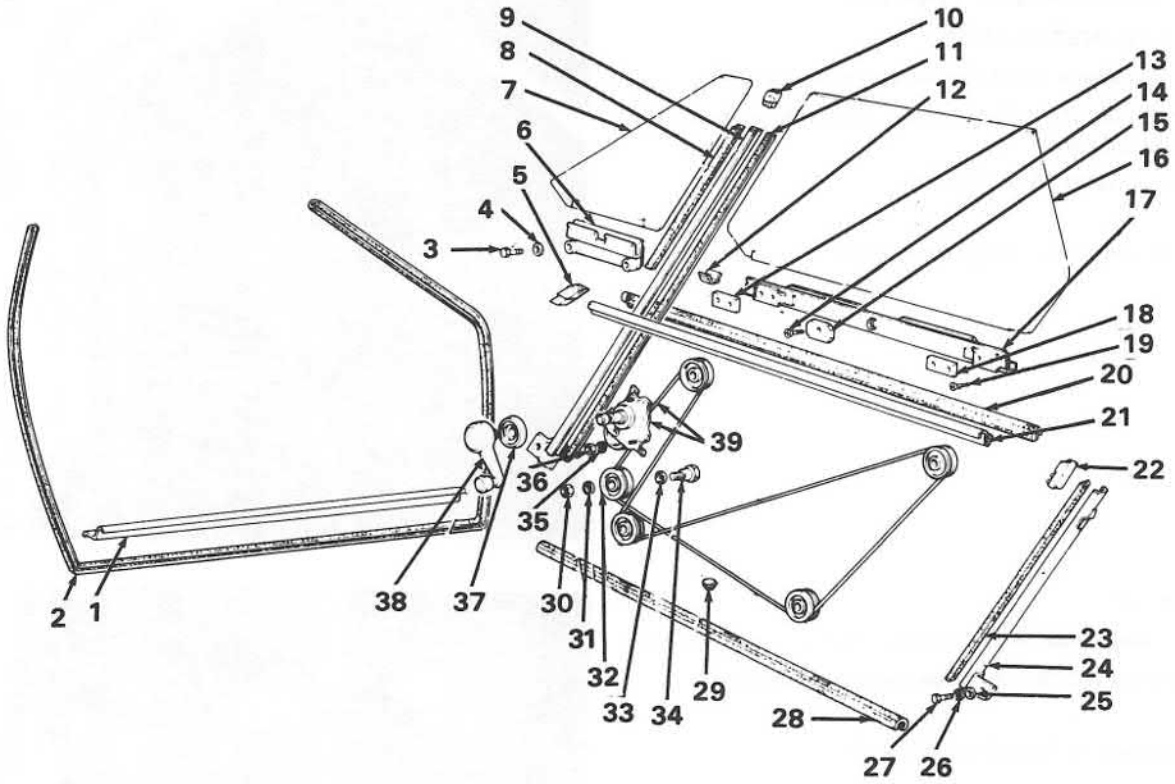
STRIKER PLATE

ADJUSTMENT

Loosen two screws (1) and shift plate (2) as necessary.

1. Screws 2. Striker plate





1. Doorsill molding
2. Weatherstrip
3. Bolt
4. Washer
5. Boot
6. Channel
7. Glass
8. Weatherstrip
9. Pillar
10. Pad
11. Weatherstrip
12. Clip
13. Plate
14. Screw
15. Pad
16. Glass
17. Guide
18. Plate
19. Screw
20. Weatherstrip
21. Cover
22. Boot
23. Weatherstrip
24. Channel
25. Washer
26. Lockwasher
27. Bolt
28. Weatherstrip
29. Pad
30. Nut
31. Washer
32. Pulley
33. Washer
34. Bolt
35. Lockwasher
36. Nut
37. Cover
38. Handle
39. Window regulator

EXPLODED VIEW OF WINDOW ASSEMBLY

WINDOW REGULATOR

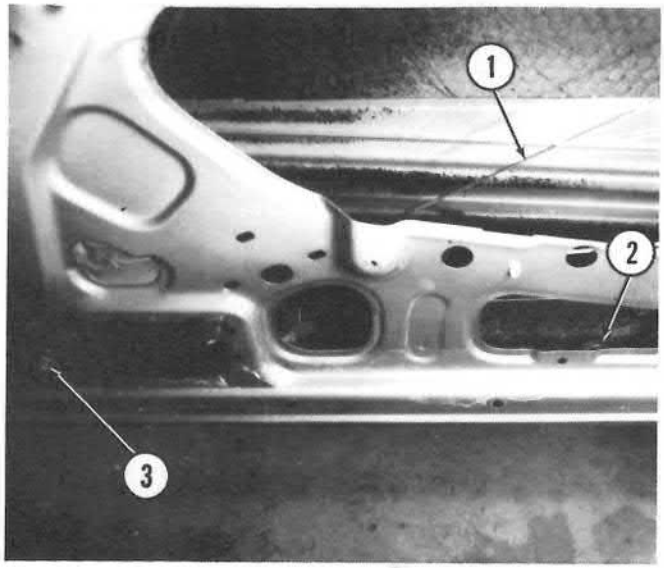
REMOVAL AND INSTALLATION

Remove door panel. Lower window.

Loosen nut (3) on adjustable pulley and relieve tension on control cable (1).

Unhook control cable from five pulleys (2).

1. Control cable 2. Pulley 3. Nut

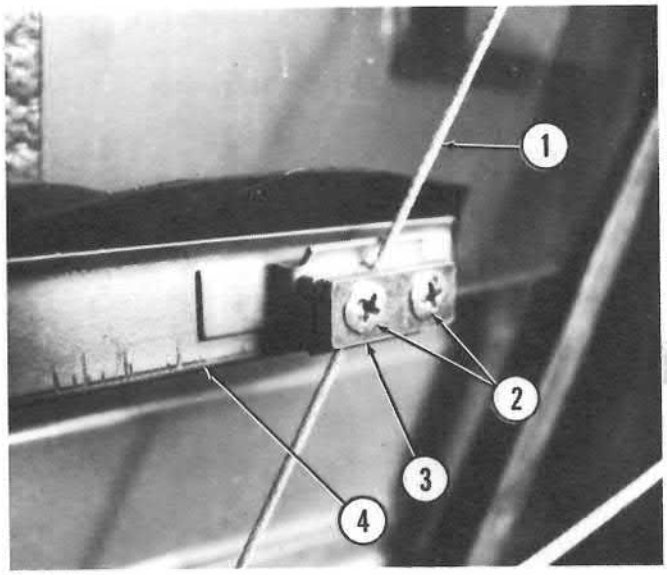


Pull window up part way and remove two screws (2) and plate (3) holding control cable (1) to right side of window (4).

Repeat above procedure to remove cable from left side of window.

Lower window.

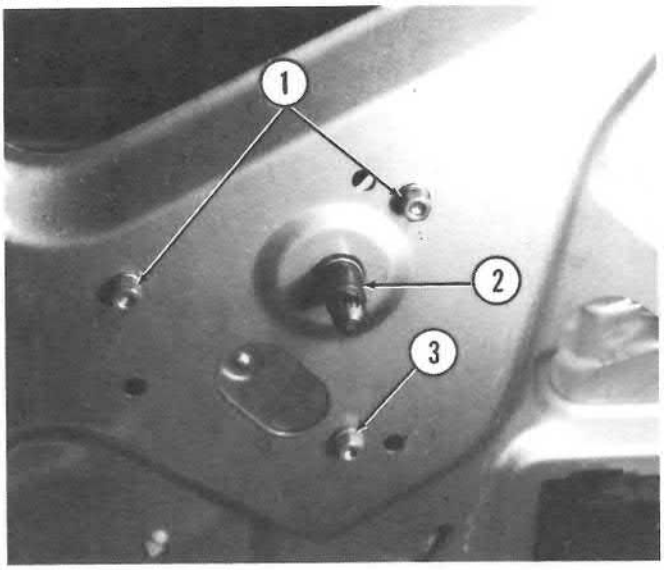
1. Control cable 2. Screws 3. Plate 4. Window



Remove three nuts (1 and 3) and washers holding regulator (2) to door. Remove regulator from door complete with control cable.

Install in reverse order. Adjust regulator.

1. Nuts 2. Regulator 3. Nut



ADJUSTMENT

Loosen four screws (1) through two plates holding control cable (2) at left and right side of window.

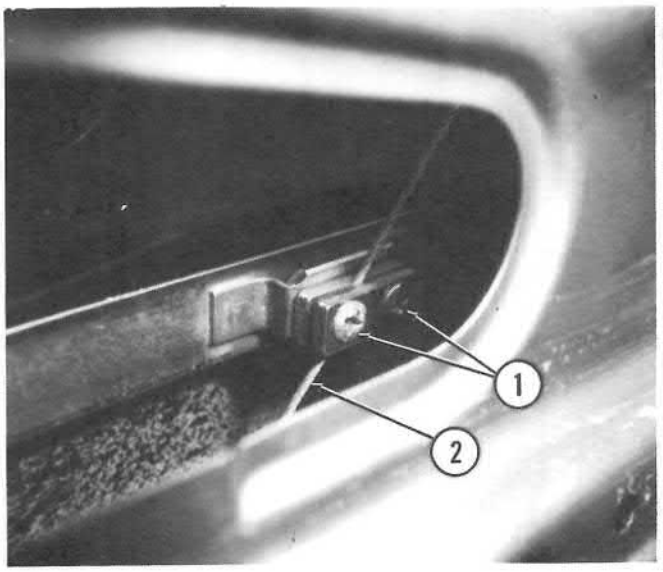
Lower window to full down position.

Set regulator handle in "wide open" position.

Tighten screws securely.

After adjustment, glass must run full length of its travel. Control cable must wind and unwind properly on regulator pulley.

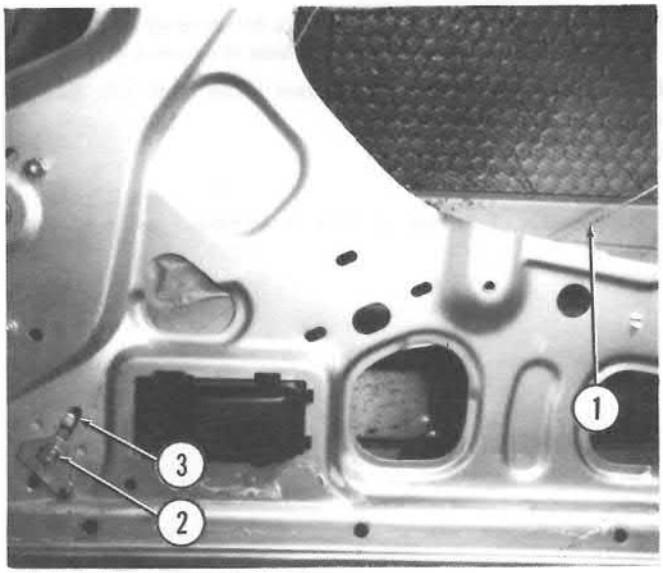
1. Screws 2. Control cable



To adjust tension of control cable (1), loosen nut (2) on adjustable pulley.

Move pulley in slot (3) to set tension. Tighten nut.

1. Control cable 2. Nut 3. Slot



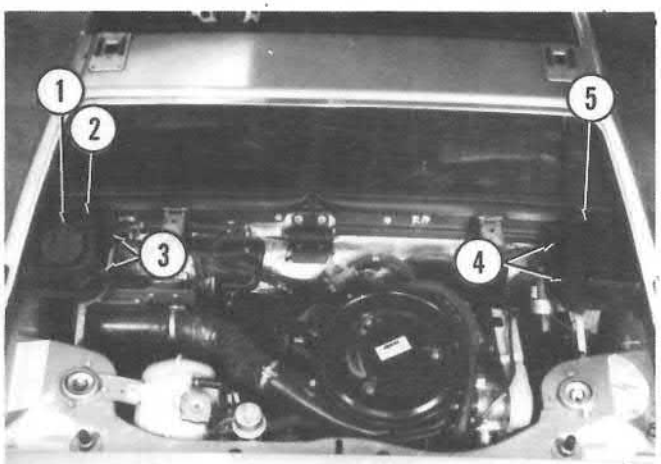
REMOVAL AND INSTALLATION

Remove engine compartment lid. Refer to 701.01.

Remove gas cap (1).

Remove four screws (3 and 4) and washers holding two covers (2 and 5) to body and remove covers.

1. Gas cap 2. Cover 3. Screws 4. Screws 5. Cover



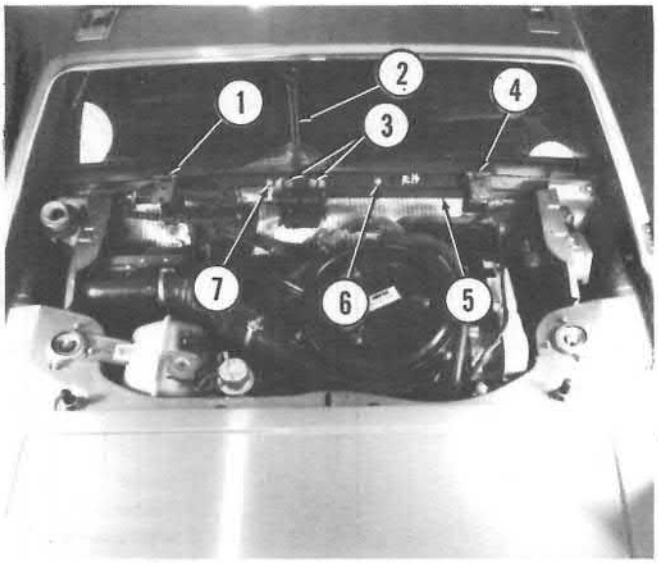
Disconnect one rear window heater wire from each side of window.

Remove four bolts (3) and washers holding prop (2) to body and remove prop.

Remove four nuts and washers holding hinges (1 and 4) to body and remove hinges.

Remove six bolts (6 and 7) and washers holding weatherstrip (5) to body and remove weatherstrip.

1. Hinge 2. Prop 3. Bolts 4. Hinge 5. Weatherstrip
6. Bolt 7. Bolt



Pull rubber seal (2) around window towards center of window (1).

Slide seal out from under window at edge.

Pull window down. Remove top rubber seal. Remove window.

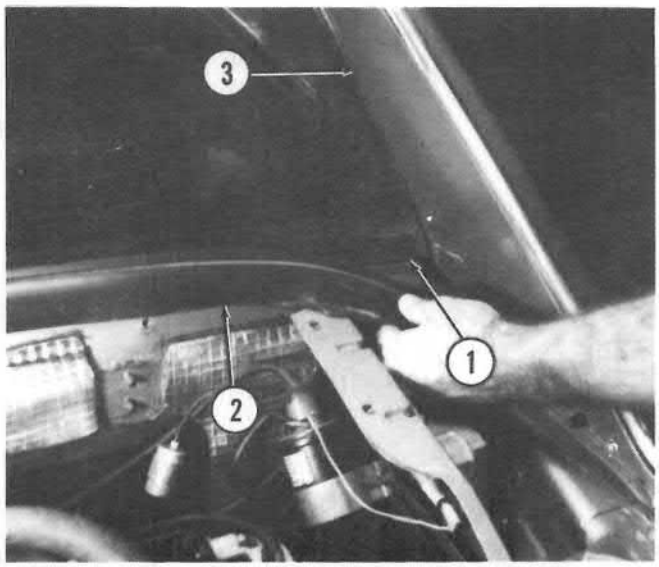
To install, place rubber seal on top of window.

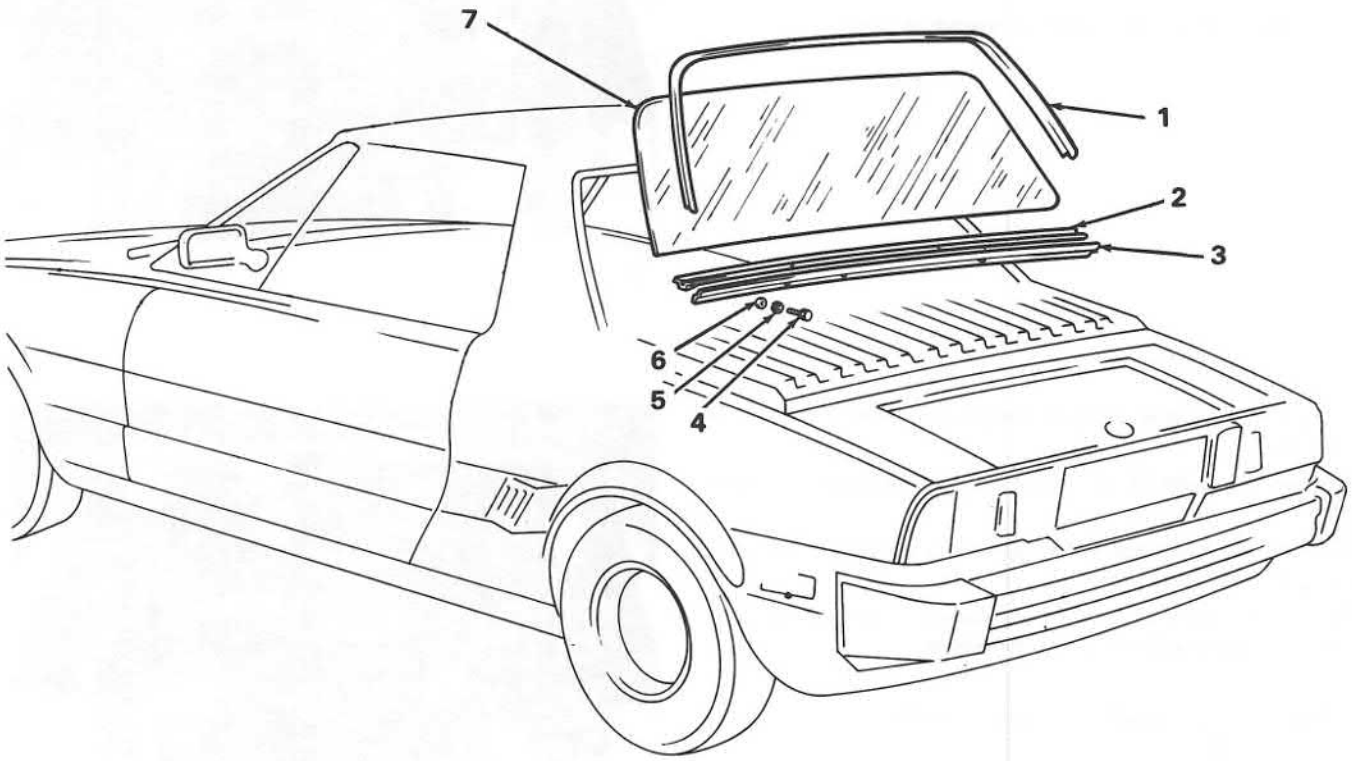
Place window in frame (3) and push it up into place.

Slide rubber seal (2) under window. Make sure window is in center of seal and seal overlaps frame.

Reverse removal procedure to complete installation.

1. Rear window 2. Rubber seal 3. Frame





1. Frame
2. Rubber seal
3. Weatherstrip
4. Bolt
5. Lockwasher
6. Washer
7. Window

EXPLODED VIEW OF REAR WINDOW COMPONENTS

FRONT LUGGAGE LID

REMOVAL, INSTALLATION AND ADJUSTMENT

Remove four bolts (1) and washers holding lid (3) to hinges (2).

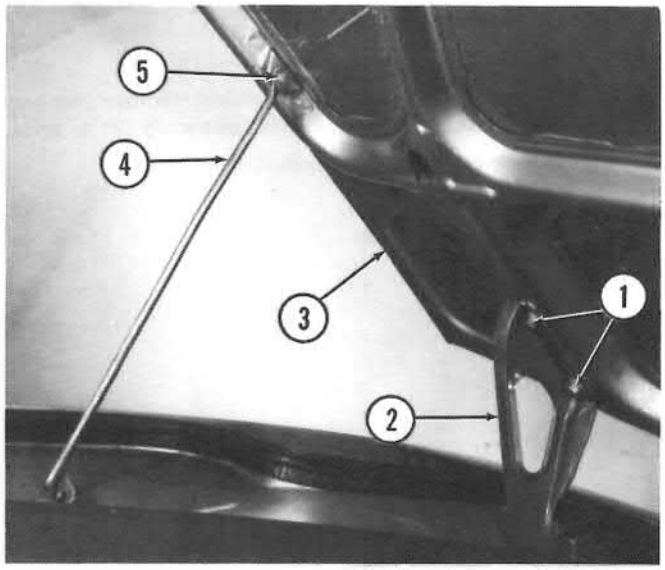
Remove nut (5) and washers holding support rod (4) to lid. Remove lid.

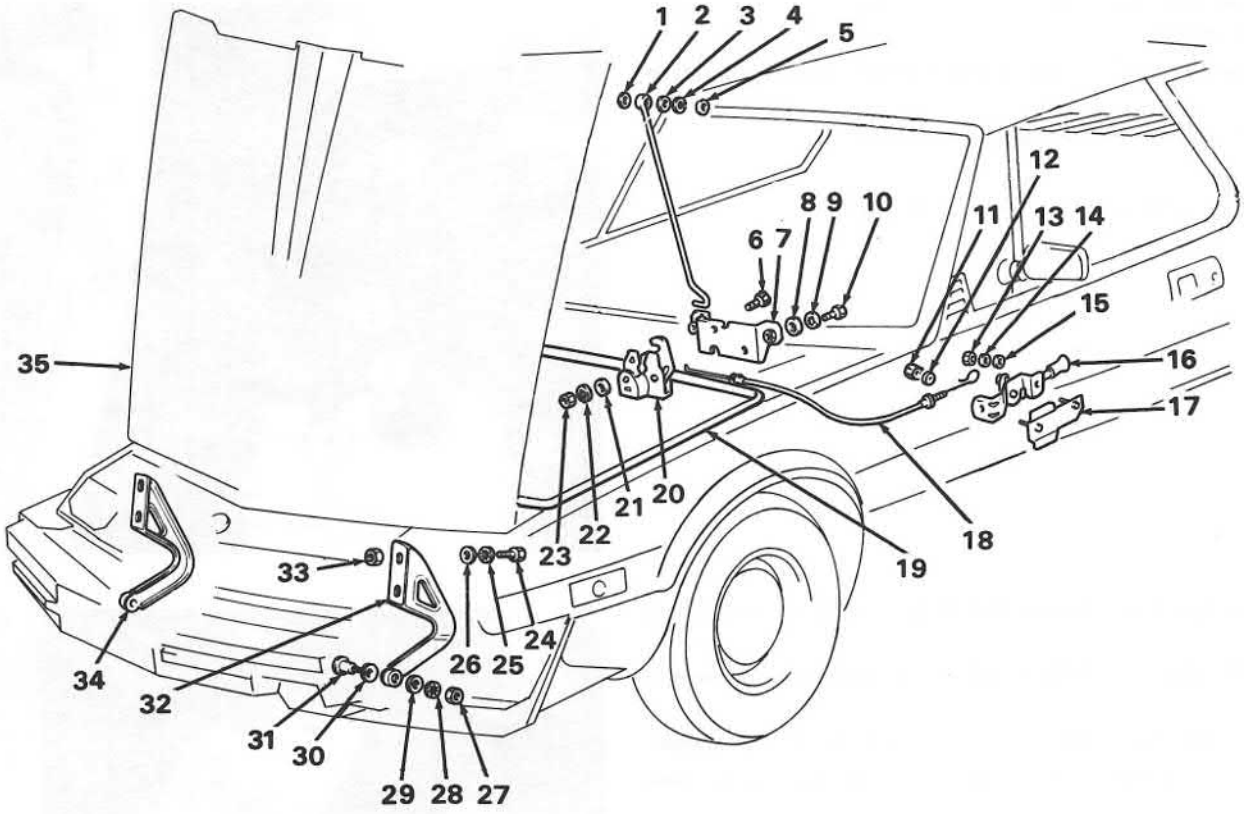
When installing lid, tighten hinge bolts enough to permit lid to be shifted.

Close lid and check for proper alignment. Shift lid as necessary. After lid is positioned properly, tighten bolts.

Install support rod.

1. Bolts 2. Hinge 3. Luggage lid 4. Support rod 5. Nut





1. Spring washer	8. Washer	15. Washer	22. Lockwasher	29. Washer
2. Rod	9. Washer	16. Handle assembly	23. Nut	30. Washer
3. Washer	10. Bolt	17. Bracket	24. Bolt	31. Bolt
4. Lockwasher	11. Nut	18. Cable	25. Lockwasher	32. Hinge
5. Nut	12. Washer	19. Rubber seal	26. Washer	33. Nut
6. Bolt	13. Nut	20. Latch	27. Nut	34. Hinge
7. Bracket	14. Washer	21. Washer	28. Lockwasher	35. Lid

EXPLODED VIEW OF FRONT LUGGAGE LID COMPONENTS

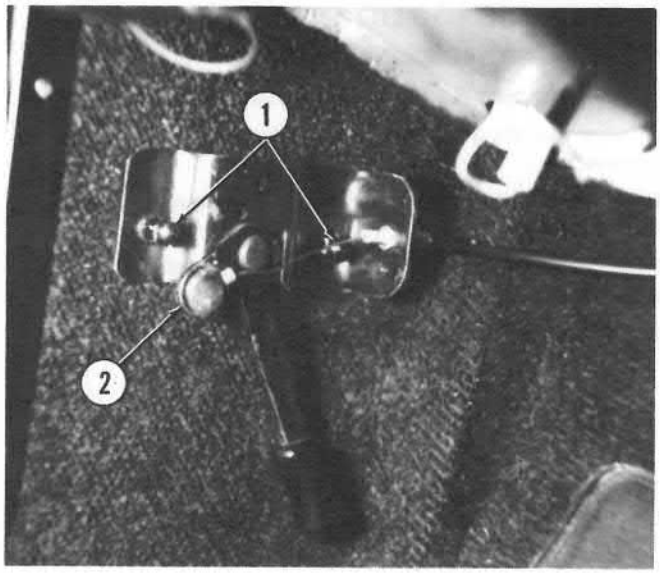
FRONT LUGGAGE LID LATCH

REMOVAL, INSTALLATION AND ADJUSTMENT

To provide slack in cable for latch removal, remove two cap nuts (1) and washers holding handle assembly (2) to body.

Separate handle assembly from body.

1. Cap nuts 2. Handle assembly

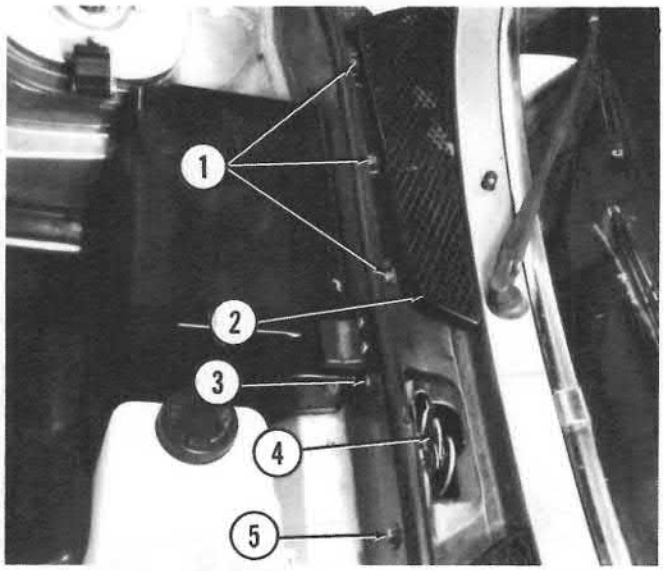


Remove four screws (1) and bolt holding grille (2) on right side of vehicle.

Remove two bolts (3 and 5) and washers holding latch (4) to cowl.

Maneuver latch out through grille opening.

1. Screws 2. Grille 3. Bolt 4. Latch 5. Bolt



Loosen bolt (2) attaching cable (4) to latch (3) and disconnect cable.

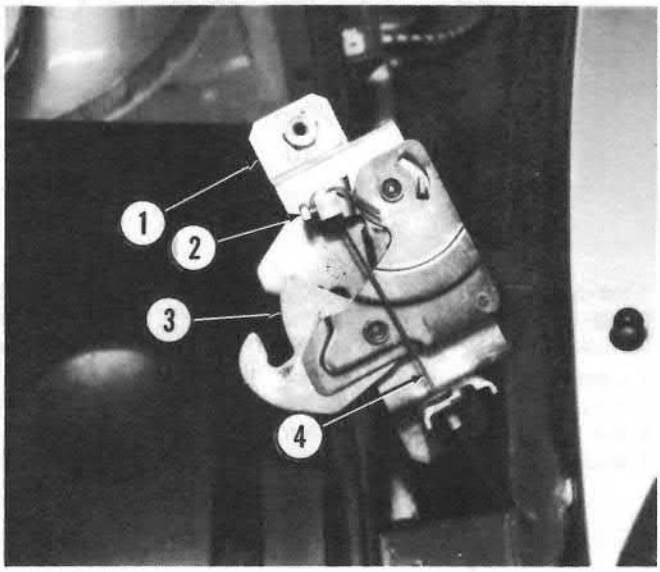
Remove two bolts holding latch to bracket (1) and remove latch.

When installing, tighten bolts enough to allow lock to be shifted.

Check lock operation and shift lock as needed. Tighten two bolts.

Reverse removal procedure to complete installation.

1. Bracket 2. Bolt 3. Latch 4. Cable



REAR LUGGAGE LID

REMOVAL, INSTALLATION AND ADJUSTMENT

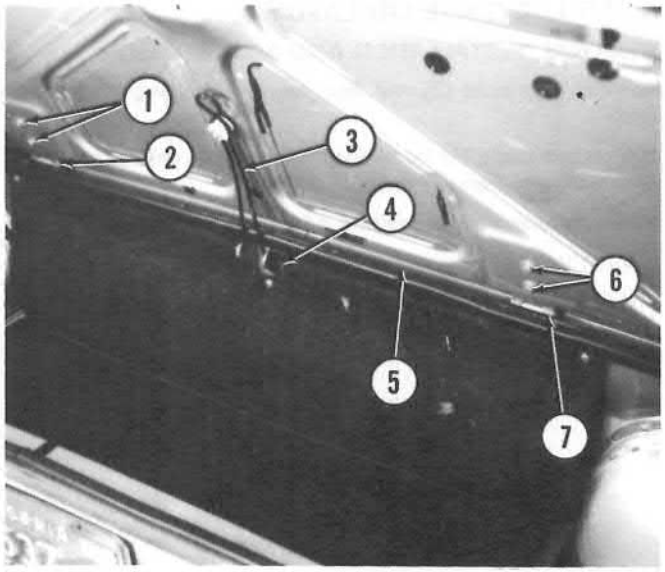
Remove four bolts (1 and 6) holding lid (5) to hinges (2 and 7).

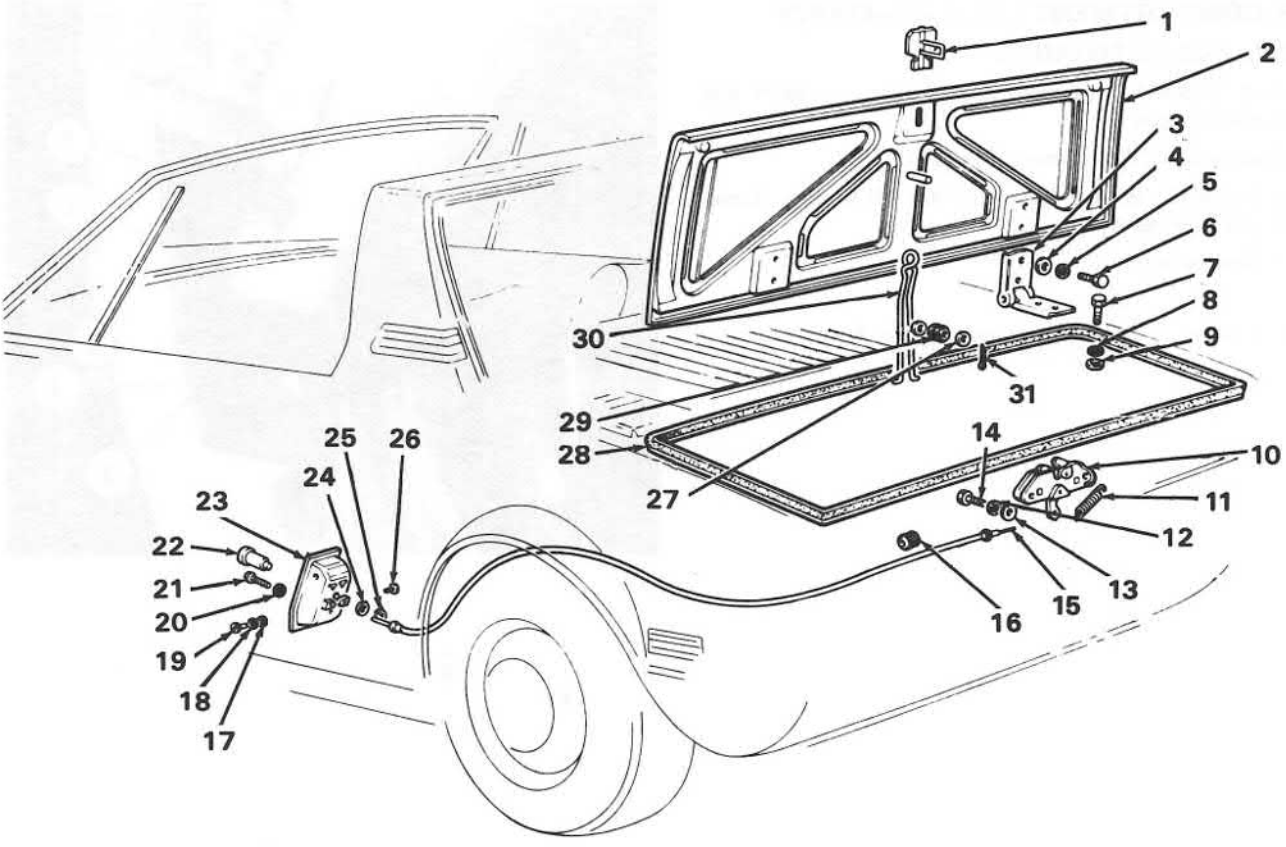
Unhook prop (3) from bracket (4) and remove lid.

Remove prop, cotter pin, washers and bushing.

When installing lid, check position. Shift lid on hinges to obtain proper alignment. Tighten bolts holding lid to hinges.

1. Bolts 2. Hinge 3. Prop 4. Bracket 5. Lid 6. Bolts 7. Hinge





1. Striker plate
2. Lid
3. Hinge
4. Washer
5. Lockwasher
6. Bolt
7. Bolt
8. Lockwasher
9. Washer
10. Latch
11. Spring
12. Lockwasher
13. Washer
14. Bolt
15. Cable
16. Rubber ring
17. Washer
18. Lockwasher
19. Screw
20. Lockwasher
21. Screw
22. Lock cylinder
23. Lock assembly
24. Washer
25. Fork
26. Screw
27. Washer
28. Weatherstrip
29. Bushing
30. Prop
31. Pin

EXPLODED VIEW OF REAR LUGGAGE COMPARTMENT LID COMPONENTS

REAR LUGGAGE LID LATCH

REMOVAL, INSTALLATION AND ADJUSTMENT

Remove two bolts (2) and four washers holding latch (1) to body.

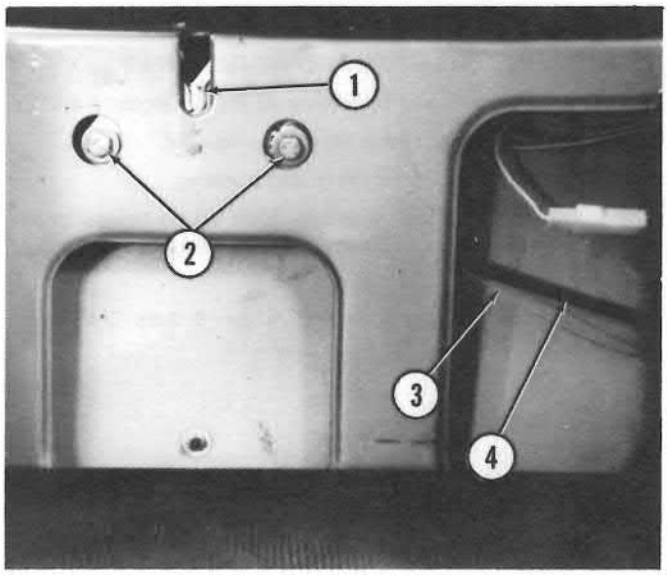
Disconnect cable (4) from latch. Disconnect emergency cable (3) from latch. Remove latch.

When installing latch, position it for proper operation.

Tighten two bolts.

NOTE: Release pull for emergency cable is in engine compartment.

1. Latch 2. Bolts 3. Emergency cable 4. Cable



REAR COMPARTMENT LOCK ASSEMBLY

REMOVAL AND INSTALLATION

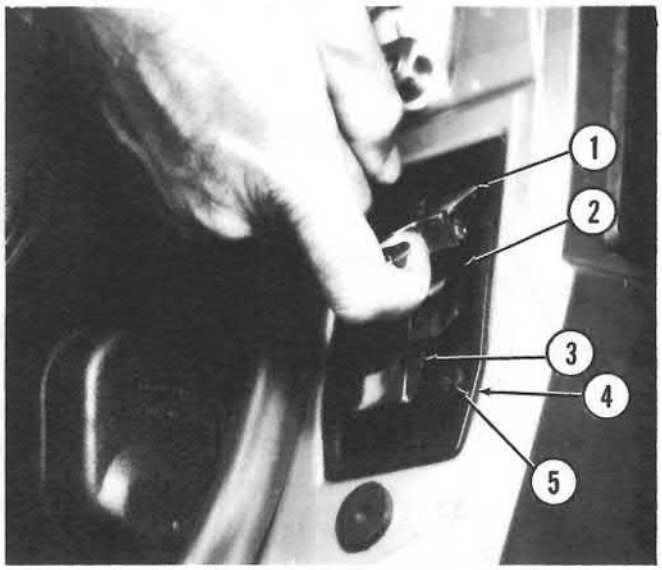
Disconnect cables from engine compartment lid latch and rear luggage lid latch.

Disconnect cables (2) from levers (1 and 3).

Remove screw (5) holding lock assembly (4) in door frame. Remove lock assembly.

Install in reverse order.

1. Lever 2. Cable 3. Lever 4. Lock assembly 5. Screw



FRONT BUMPER

REMOVAL AND INSTALLATION

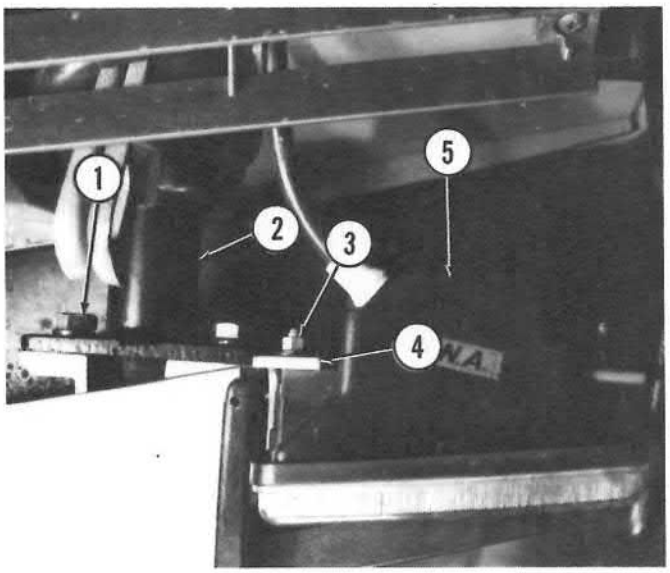
Remove four nuts (3) and washers holding parking/hazard lights (5) to brackets (4).

Separate lights from brackets.

Remove four bolts (1) and washers holding front bumper to shock absorbers (2). Remove bumper.

Install in reverse order.

1. Bolt 2. Shock absorber 3. Nut 4. Bracket 5. Light assembly



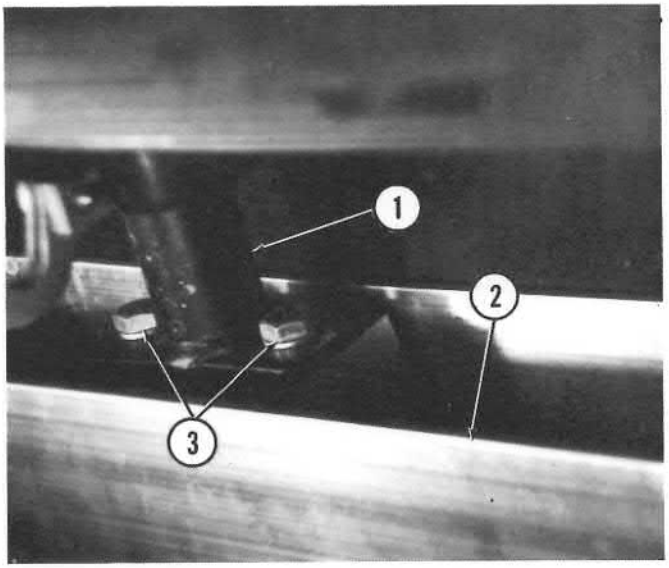
REAR BUMPER

REMOVAL AND INSTALLATION

Remove four bolts (3) and washers holding bumper (2) to shock absorbers (1). Remove bumper.

Install in reverse order.

1. Shock absorber 2. Bumper 3. Bolts



REMOVAL AND INSTALLATION

Disconnect spring (1) from bracket (2) under seat (4).

Raise lever. Slide seat off floor tracks (3).

Install in reverse order.

1. Spring 2. Bracket 3. Track 4. Seat