



# **FIAT SPIDER**

## ***Service Manual***

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IMPORT PARTS AMERICA  
FIAT DIVISION

PRODUCED  
BY  
IMPORT PARTS AMERICA  
FIAT PARTS DIVISION

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**124 Spider**  
**1975 thru 1982**

***Factory Workshop Service Manual Set***

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**Fiat Motors of North America, Inc.**

## FOREWORD

This manual has been written to provide basic information for the proper servicing of the Spider 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.

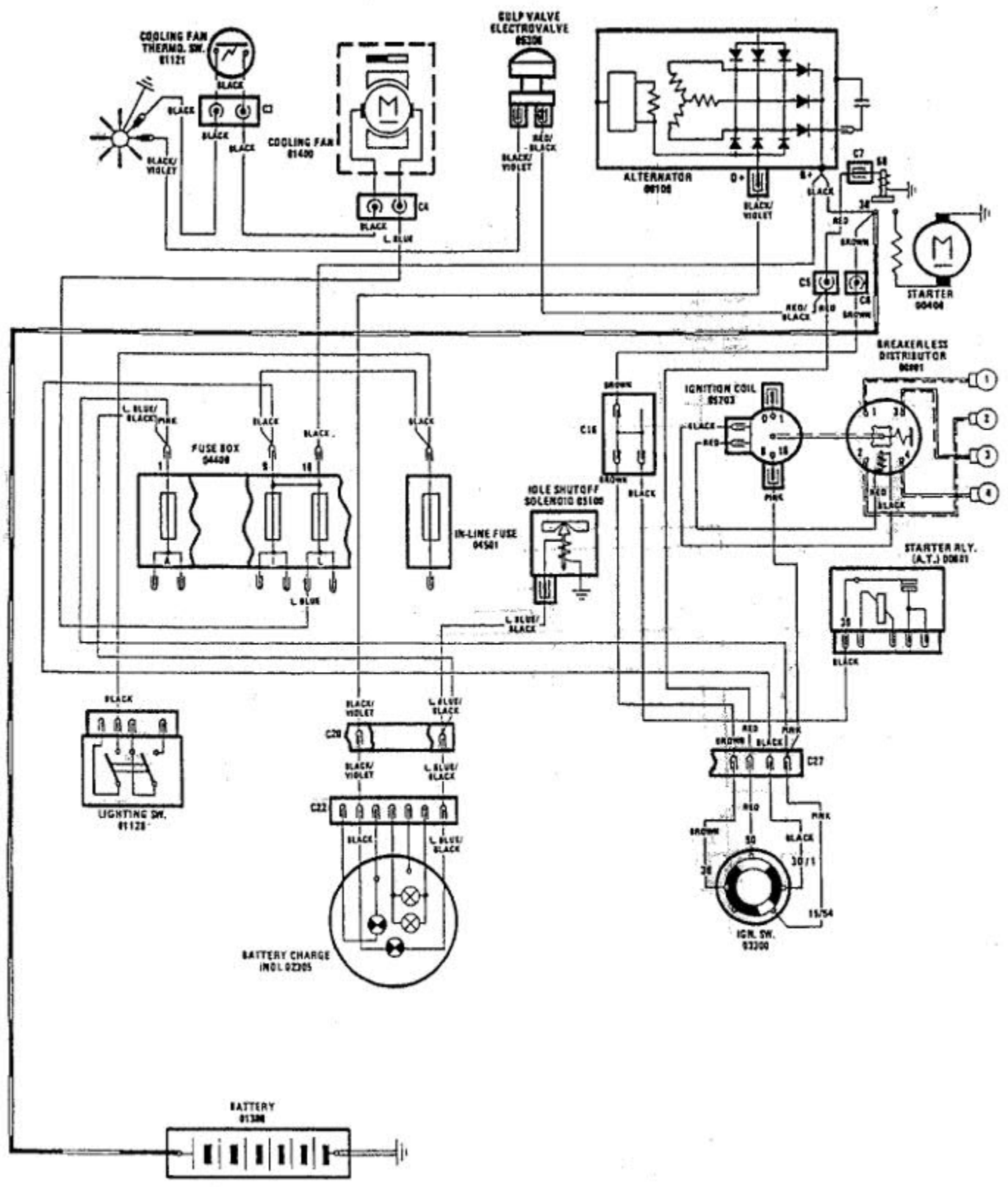
Example: If additional information is needed for information on page 2, the new sheet will be 2A.

**124 SPIDER  
1979  
WIRING DIAGRAMS**

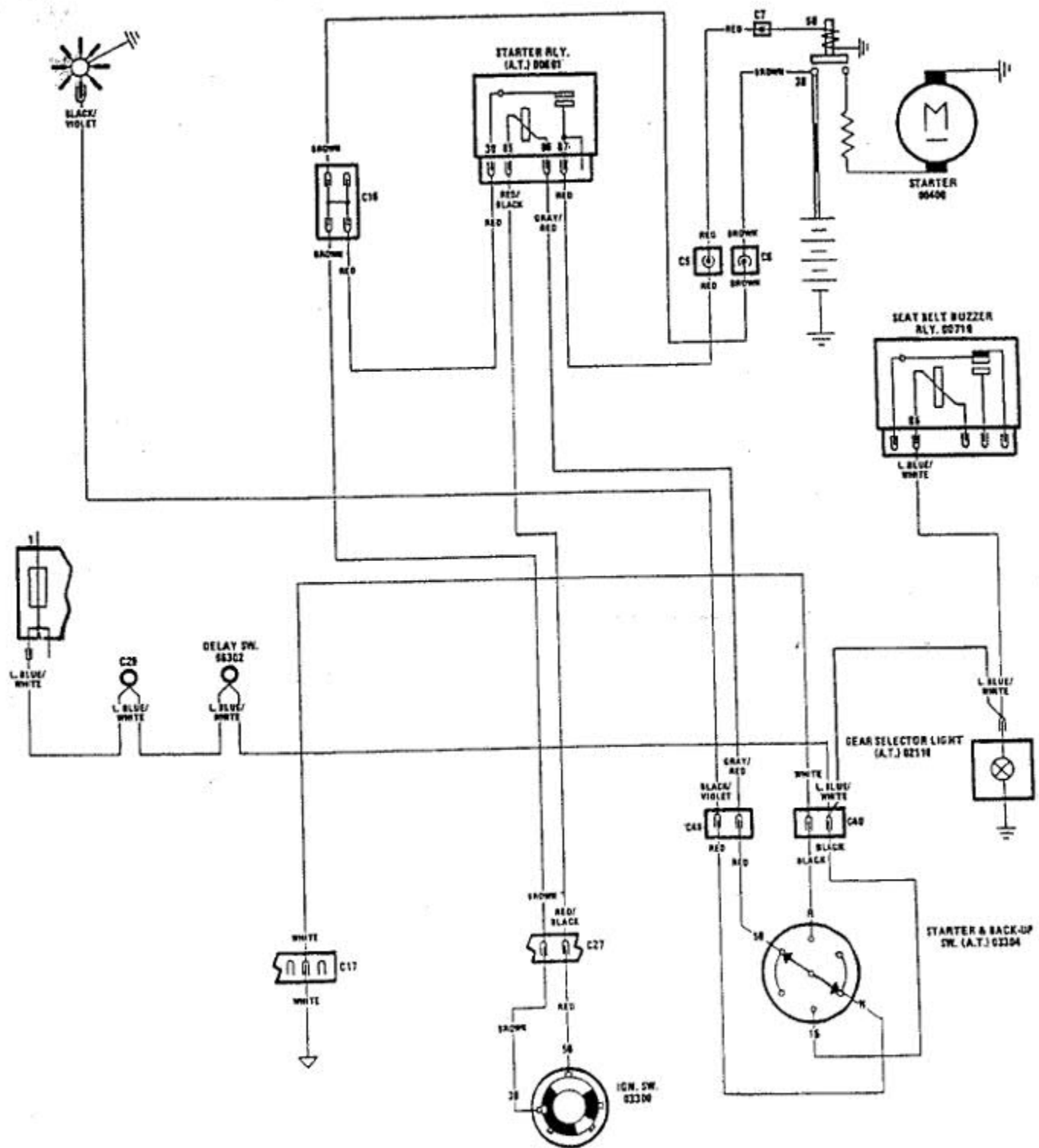
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# Ignition, Starter, Alternator, Engine Cooling Fan, Idle Shutoff Solenoid, Gulp Valve Electrovalve, and Power Distribution Circuits

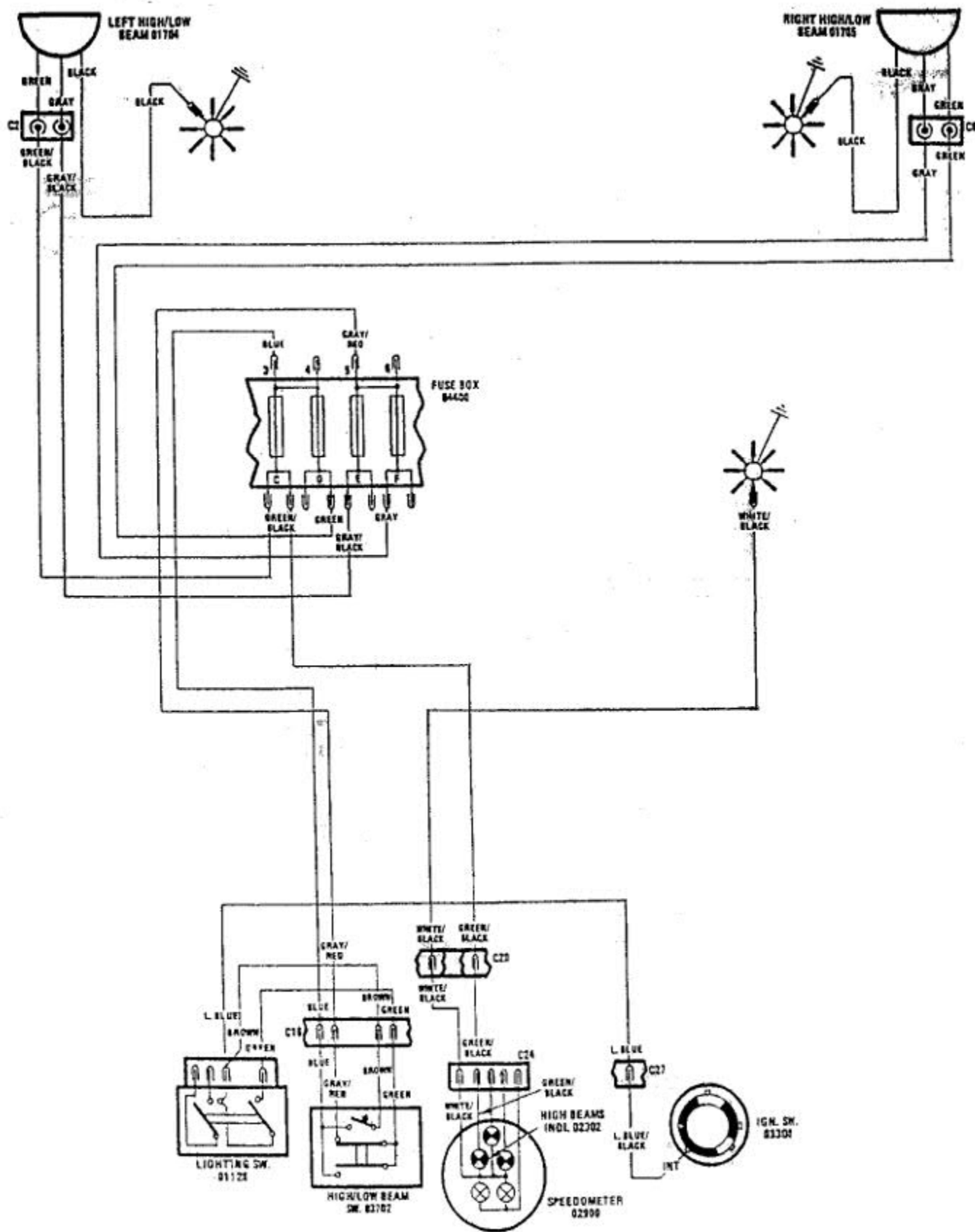


# Starter Circuit – Automatic Transmission

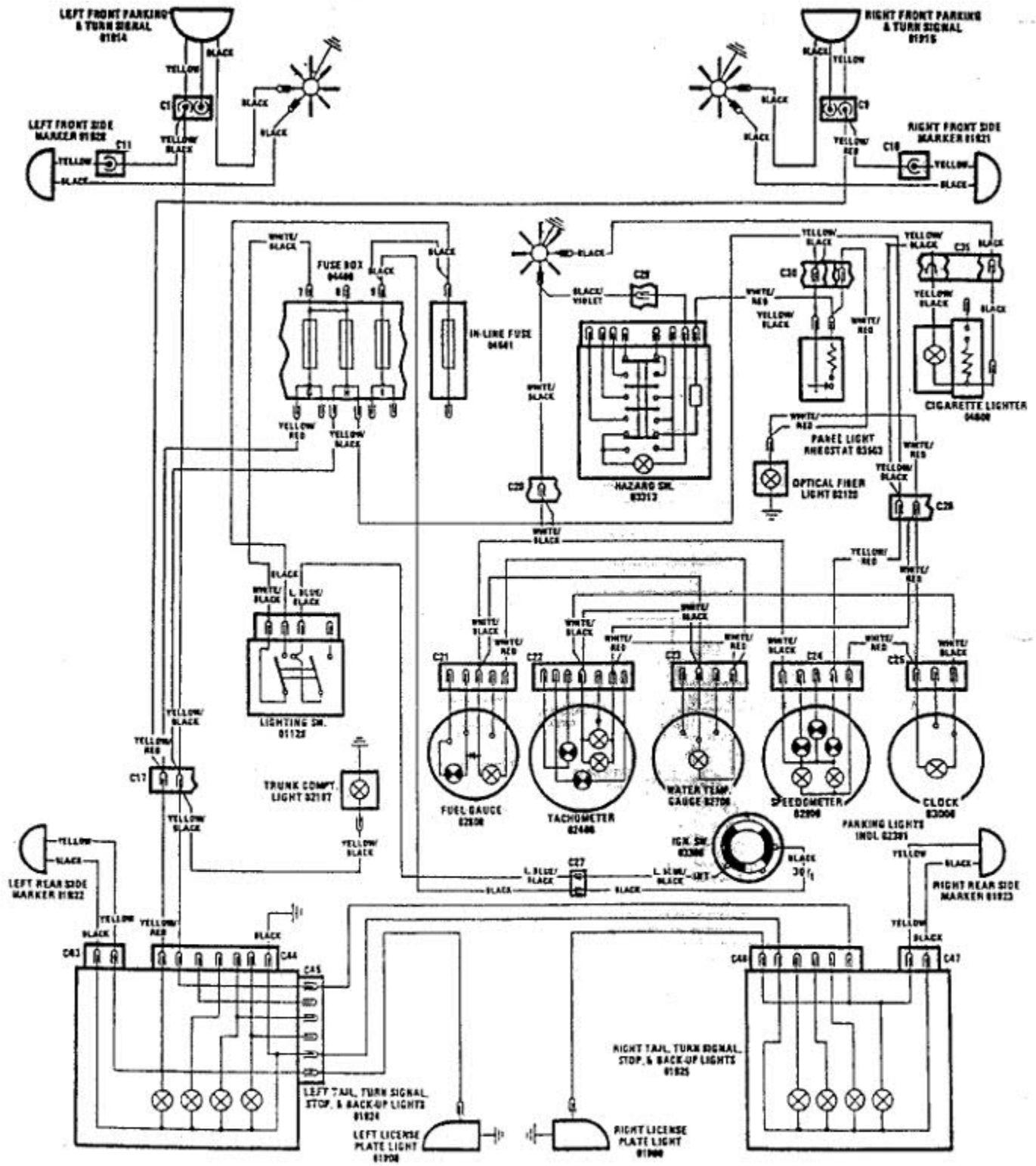




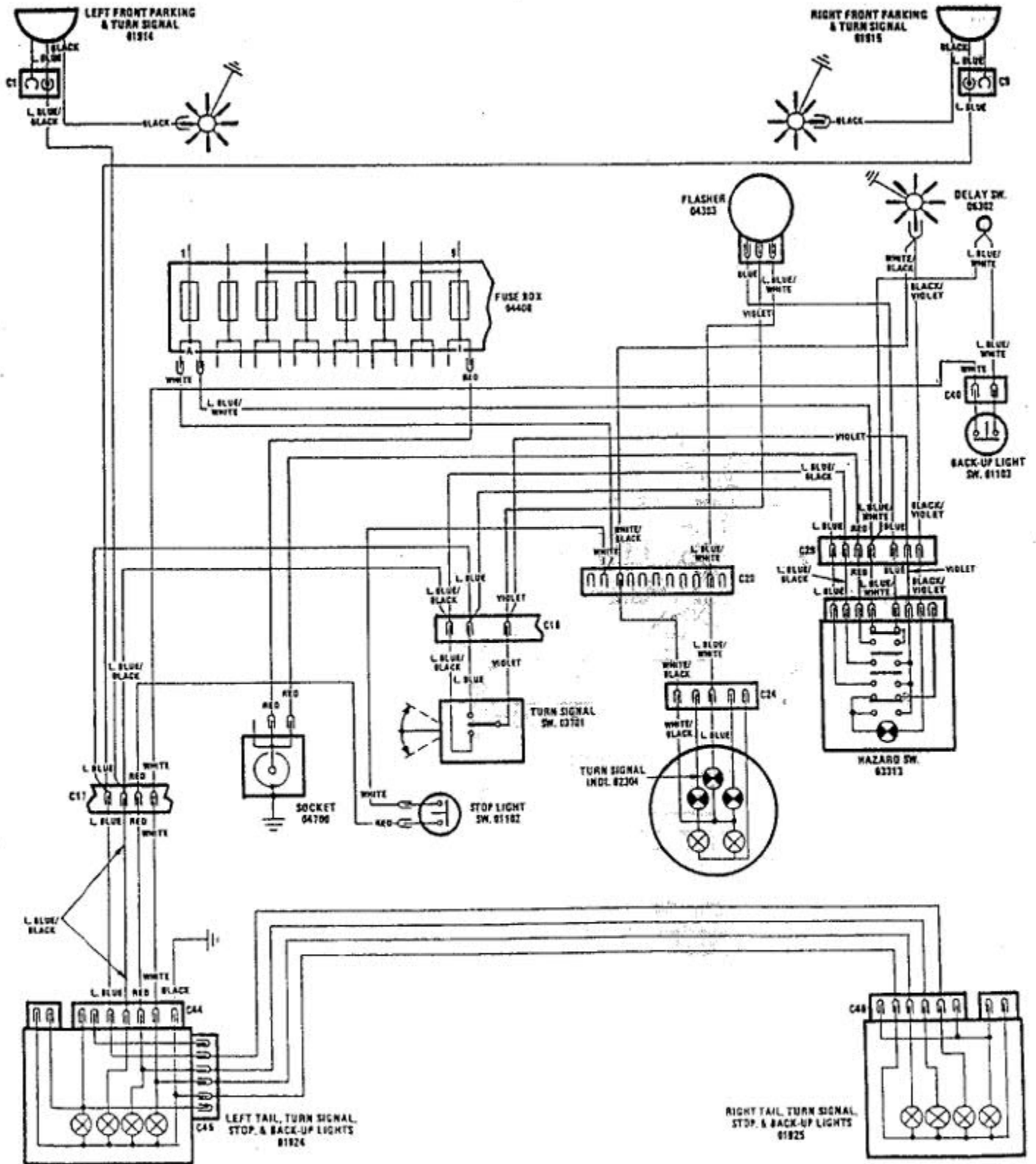
# High and Low Beams Circuits



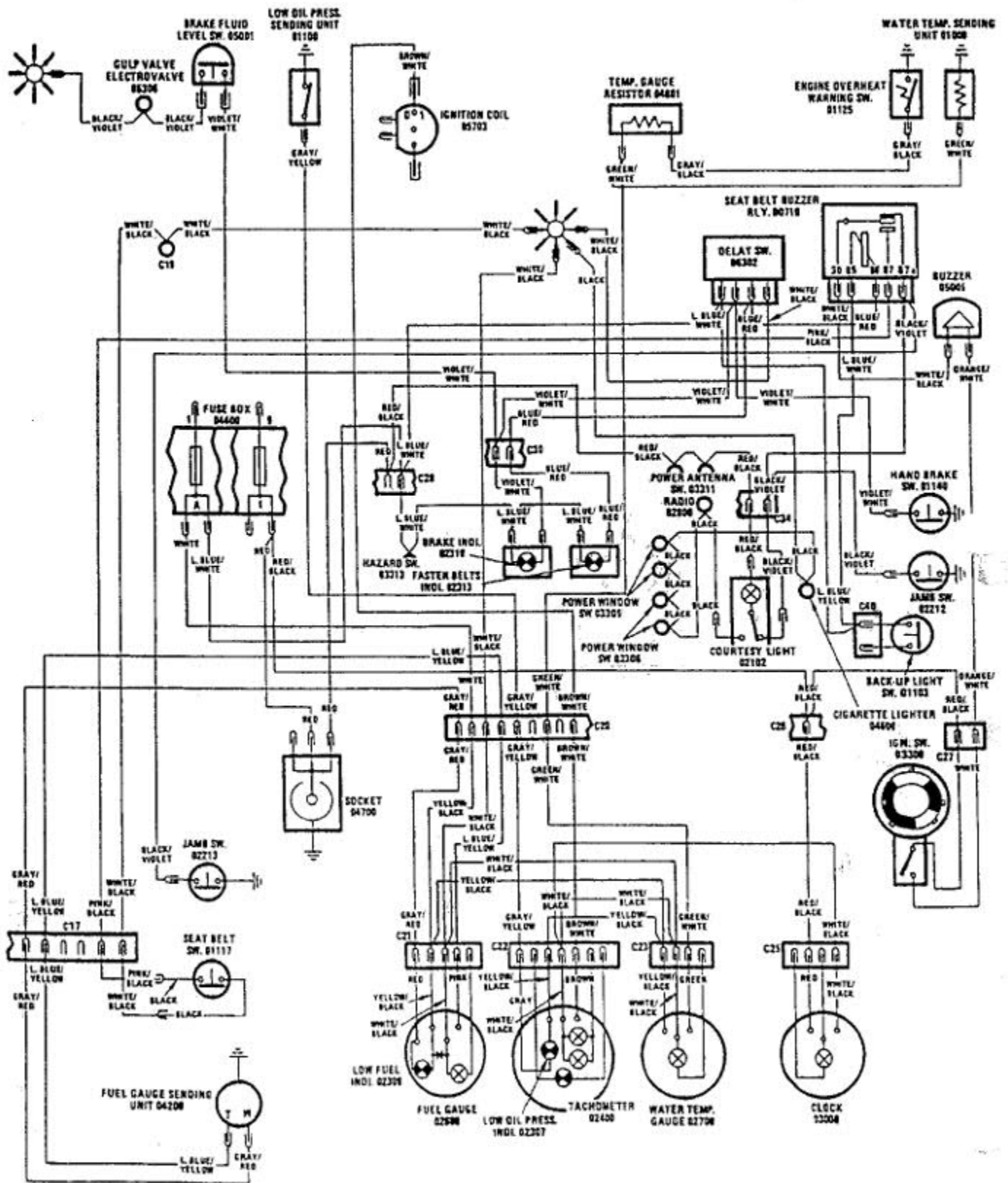
# Parking, License Plate, Side Marker, and Panel Lights



# Hazard and Turn Signal, Back-Up, and Stop Lights Circuits

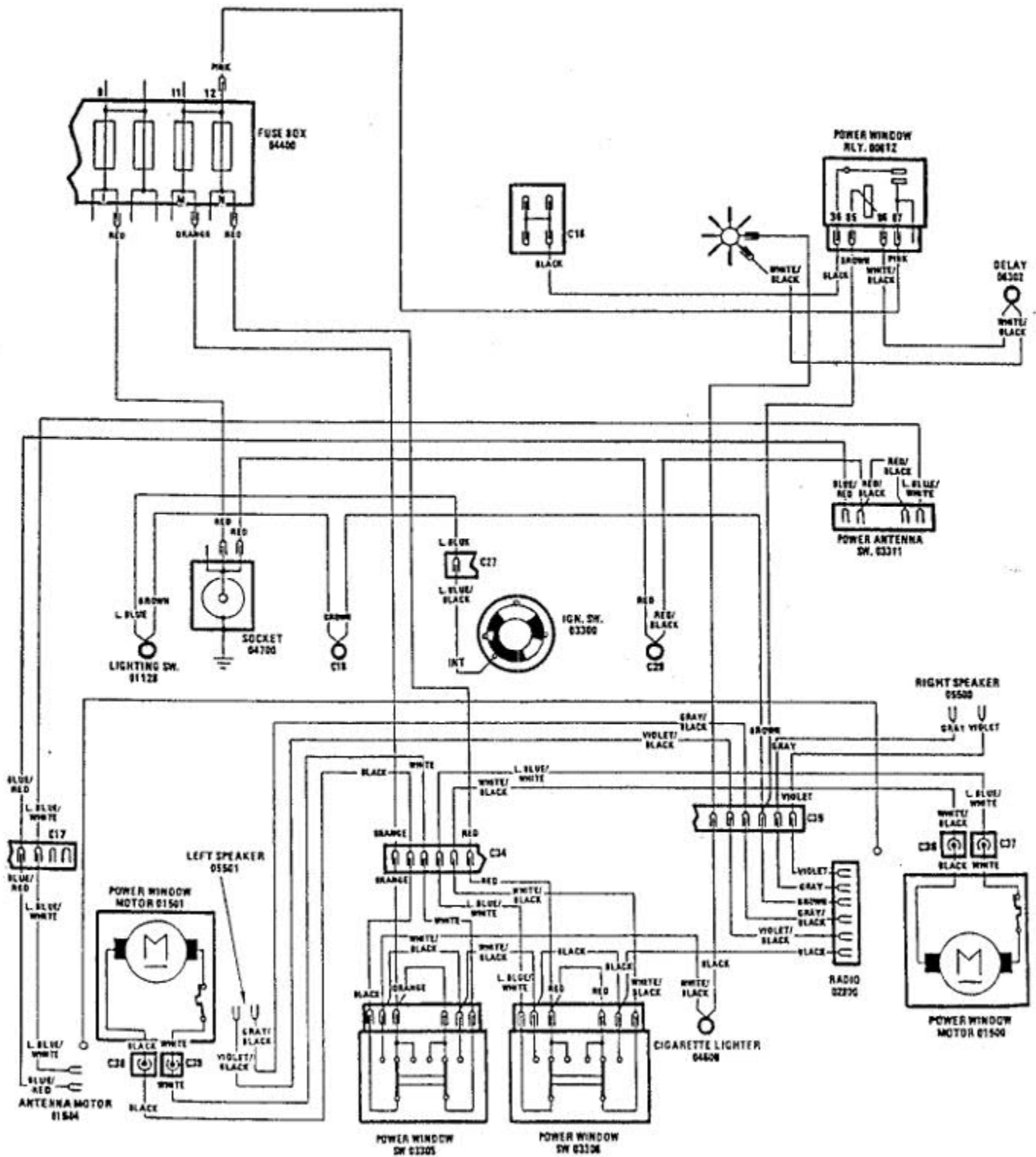


## Instruments, Indicators, Seat Belt and Remove Key Warning, Courtesy Light, Clock, and Socket Circuits





# Power Windows and Radio Circuits



# Component Index

00100	Alternator	02302	High beams indicators
00400	Starter	02304	Turn signal indicator
00601	Starter relay (automatic transmission)	02305	Battery charge indicator
00612	Power windows relay	02307	Low oil pressure indicator
00605	Horn relay	02309	Low fuel indicator
00710	Seat belt buzzer relay	02310	Brake system effectiveness indicator
00801	Brakerless ignition distributor	02313	Fasten seat belts indicator
01000	Engine water temperature gauge sending unit	02400	Tachometer
01100	Low oil pressure indicator sending switch	02600	Fuel gauge
01102	Stop light switch	02700	Engine water temperature gauge
01103	Back-up light switch	02800	Radio
01105	Heater fan switch	02900	Speedometer
01117	Switch on driver's seat belt	03000	Clock
01121	Cooling fan thermostatic switch	03300	Steering lock ignition switch
01125	Engine overheat warning switch	03302	Windshield wipers rheostat
01128	Lighting switch	03304	Starter and back-up light switch (automatic transmission)
01140	Hand brake "ON" switch	03305	Power window switch
01300	Battery	03306	Power window switch
01400	Cooling fan motor	03311	Power antenna switch
01401	Heater fan motor	03313	Hazard warning signal switch
01500	Power window motor	03503	Ideogram light rheostat
01501	Power window motor	03701	Turn signal indicator switch
01504	Antenna motor	03702	High/low beams changeover switch
01505	Windshield wiper motor	03703	Wiper/washer switch
01704	Left low beam	03800	Windshield wiper intermittent switch
01705	Right low beam	03900	Windshield washer pump
01908	Left license plate light	04200	Fuel gauge sending unit
01909	Right license plate light	04303	Turn signal and hazard flasher
01914	Left front parking and turn signal light	04400	Fuse box
01915	Right front parking and turn signal light	04501	In-line fuse for cigarette lighter
01920	Left front side marker light	04600	Cigarette lighter
01921	Right front side marker light	04700	Electrical sockets
01922	Left rear side marker light	04801	Water temperature gauge indicator resistor
01923	Right rear side marker light	05001	Brake fluid level switch
01924	Left tail, turn signal, stop and back-up light	05005	Fasten seat belts and remove key buzzer
01925	Right tail, turn signal, stop and back-up light	05100	Idle shutoff solenoid
02102	Passenger compartment light - with switch on dashboard	05306	Electrovalve for gulp valve
02107	Trunk compartment light	05500	Right radio speaker
02120	Optical fiber illumination light source	05501	Left radio speaker
02212	Courtesy light jamb switch - right door	05703	Ignition coil assembly
02213	Courtesy light jamb switch - left door	05901	Right horn
02215	Horn button	05902	Left horn
02301	Parking lights indicator	06302	Delay switch - seat belt indicator

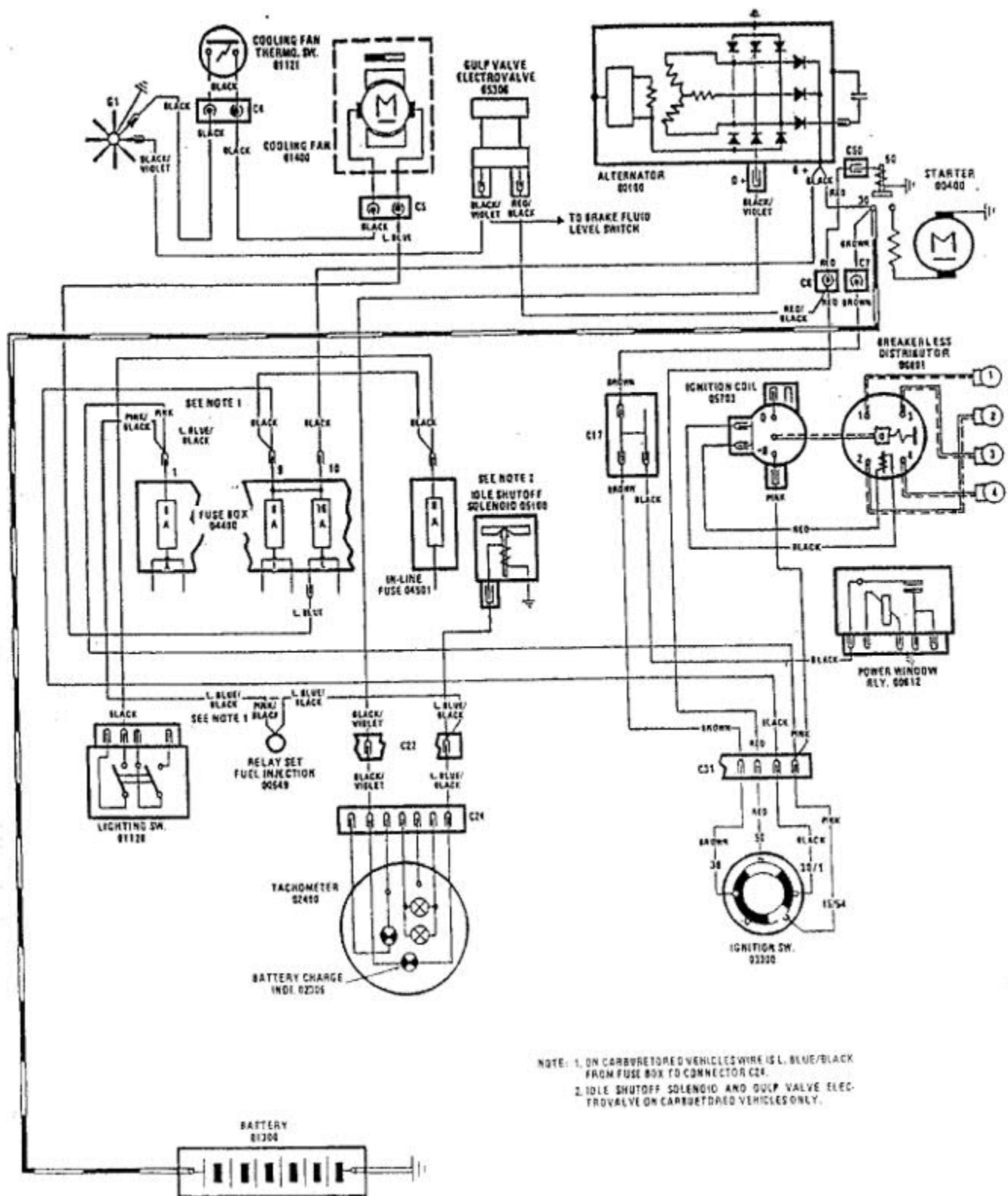
**124 SPIDER  
1980  
WIRING DIAGRAMS**



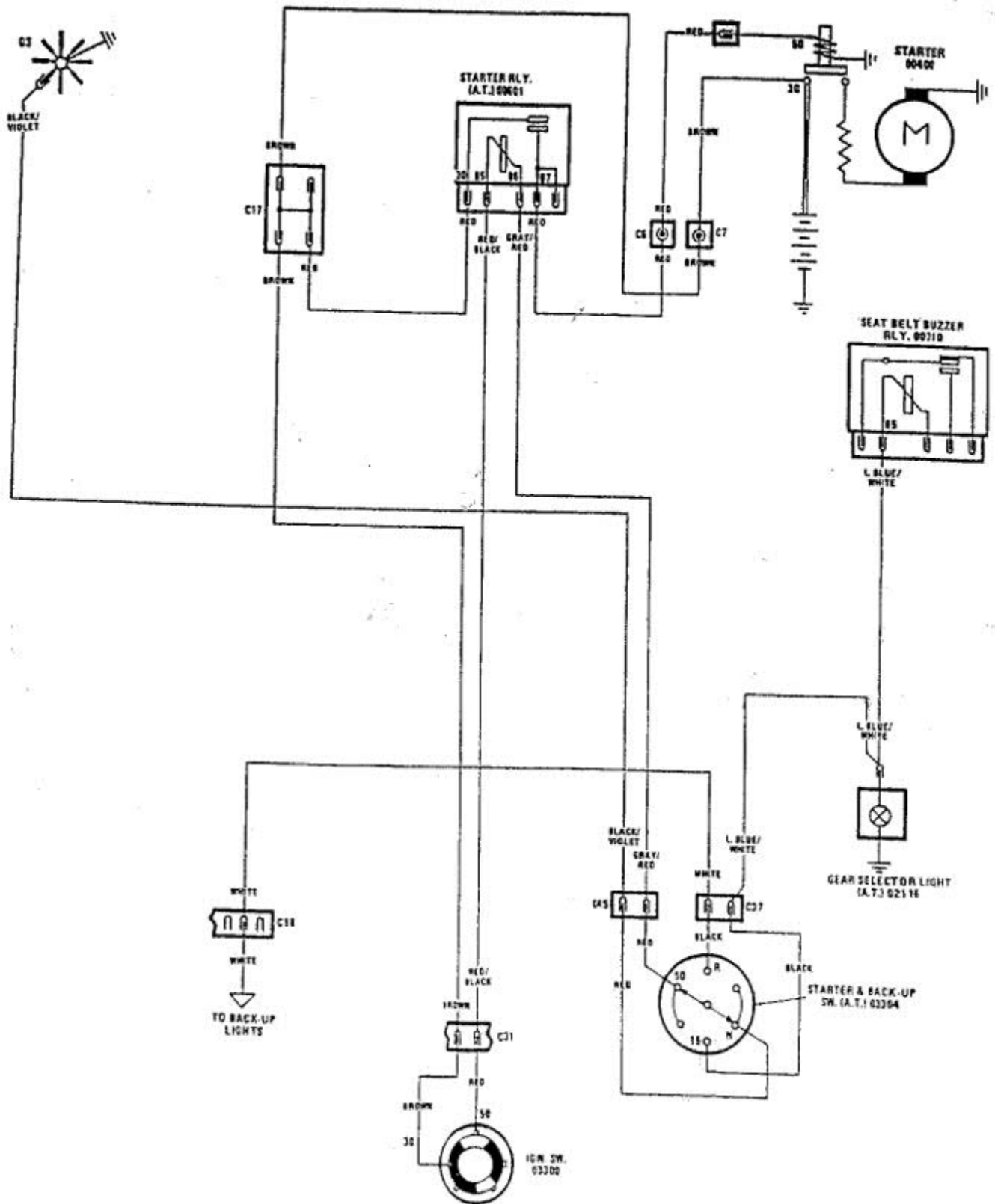
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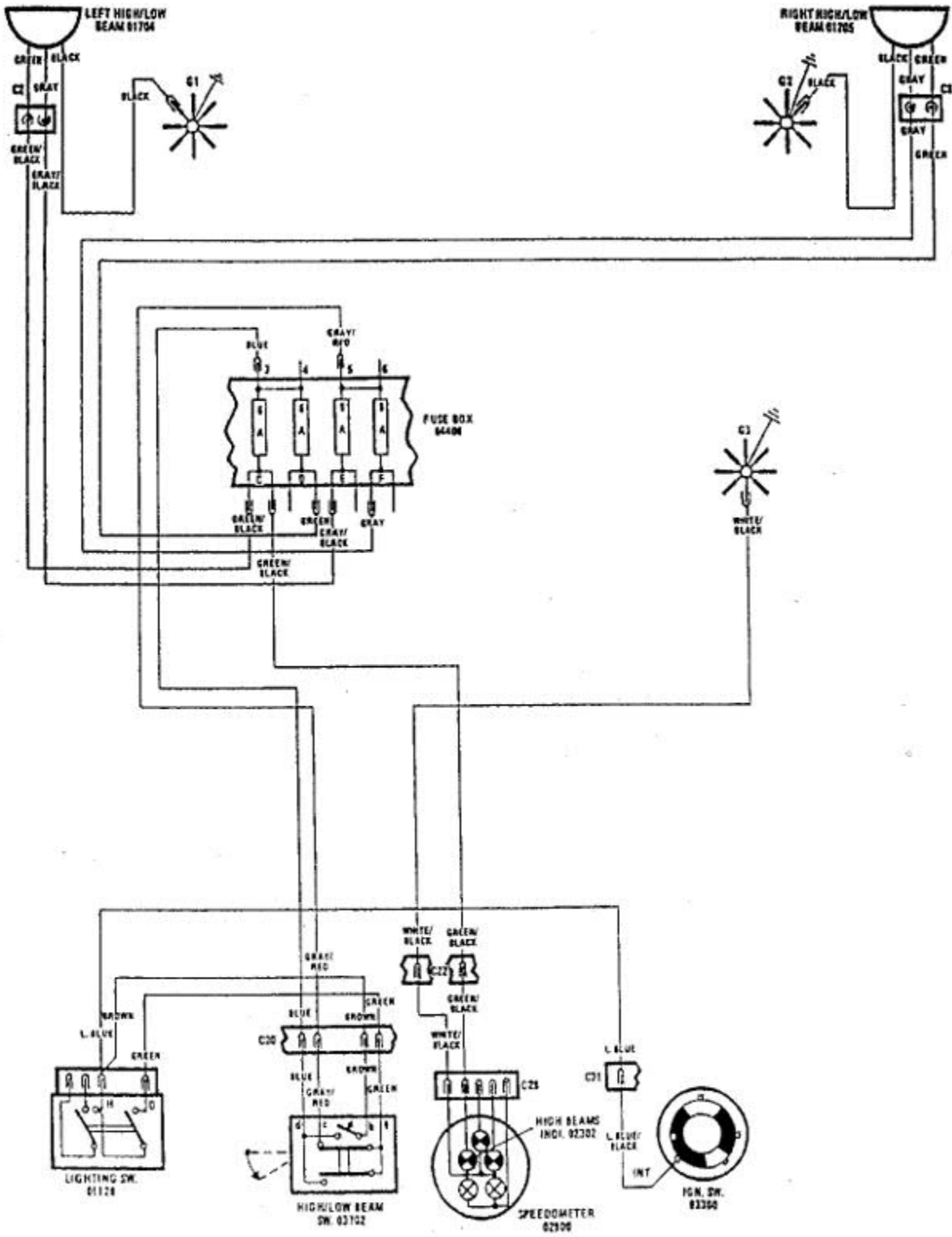
# Ignition, Starter, Alternator, Engine Cooling Fan, Idle Shutoff Solenoid, and Power Distribution Circuits



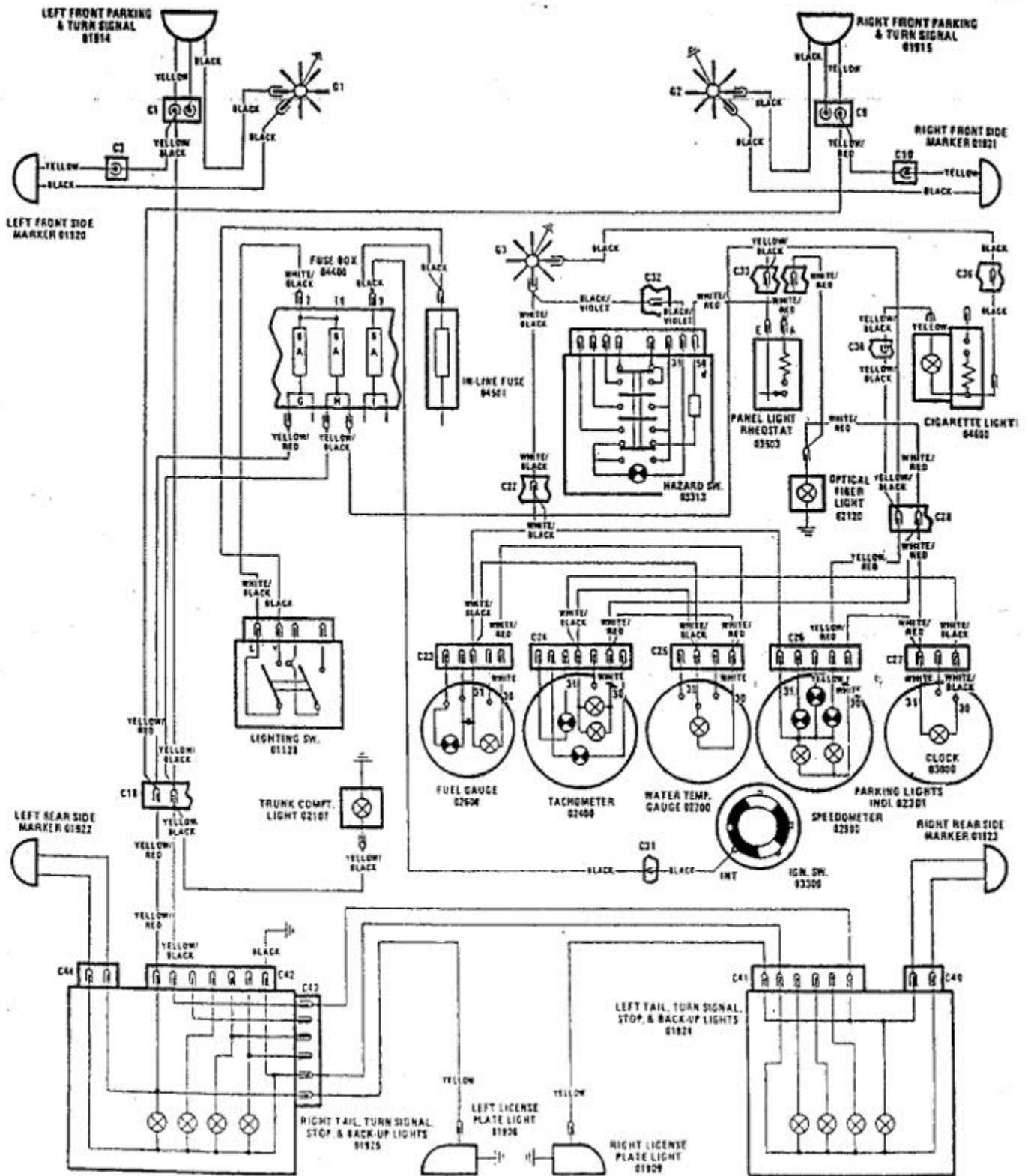
# Starter Circuit – Automatic Transmission



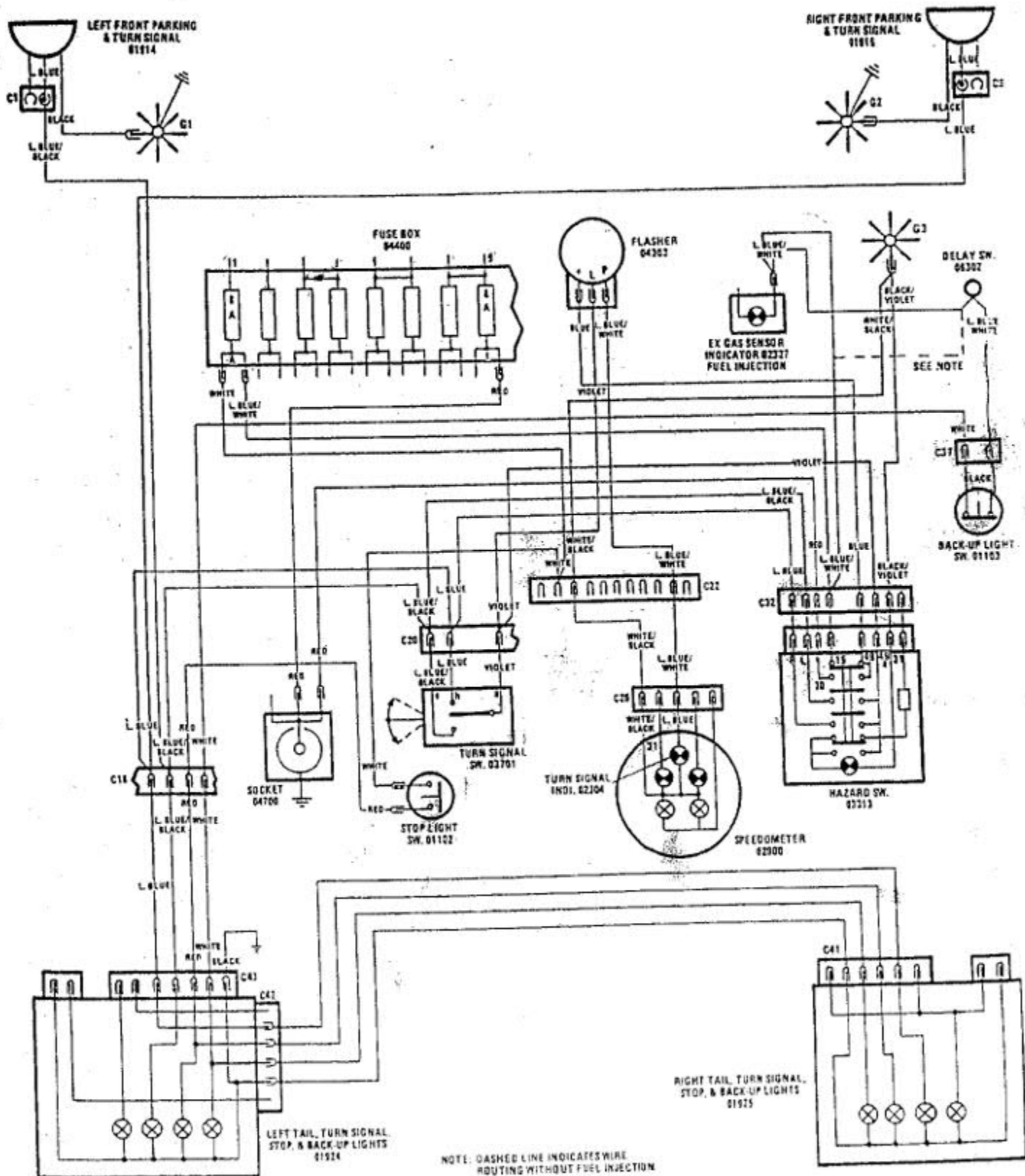
# High and Low Beams Circuits



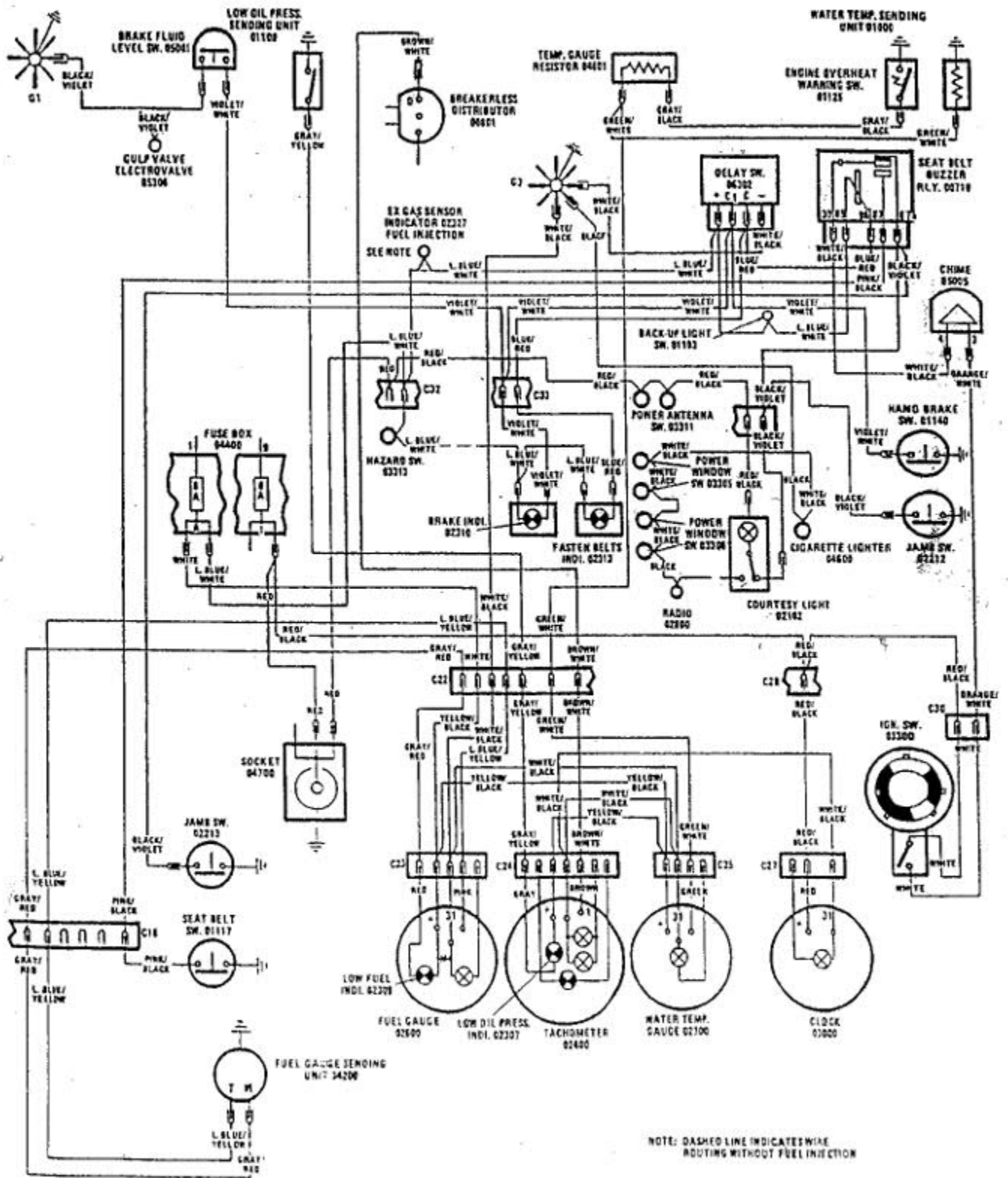
# Parking, License Plate, Side Marker, and Panel Lights



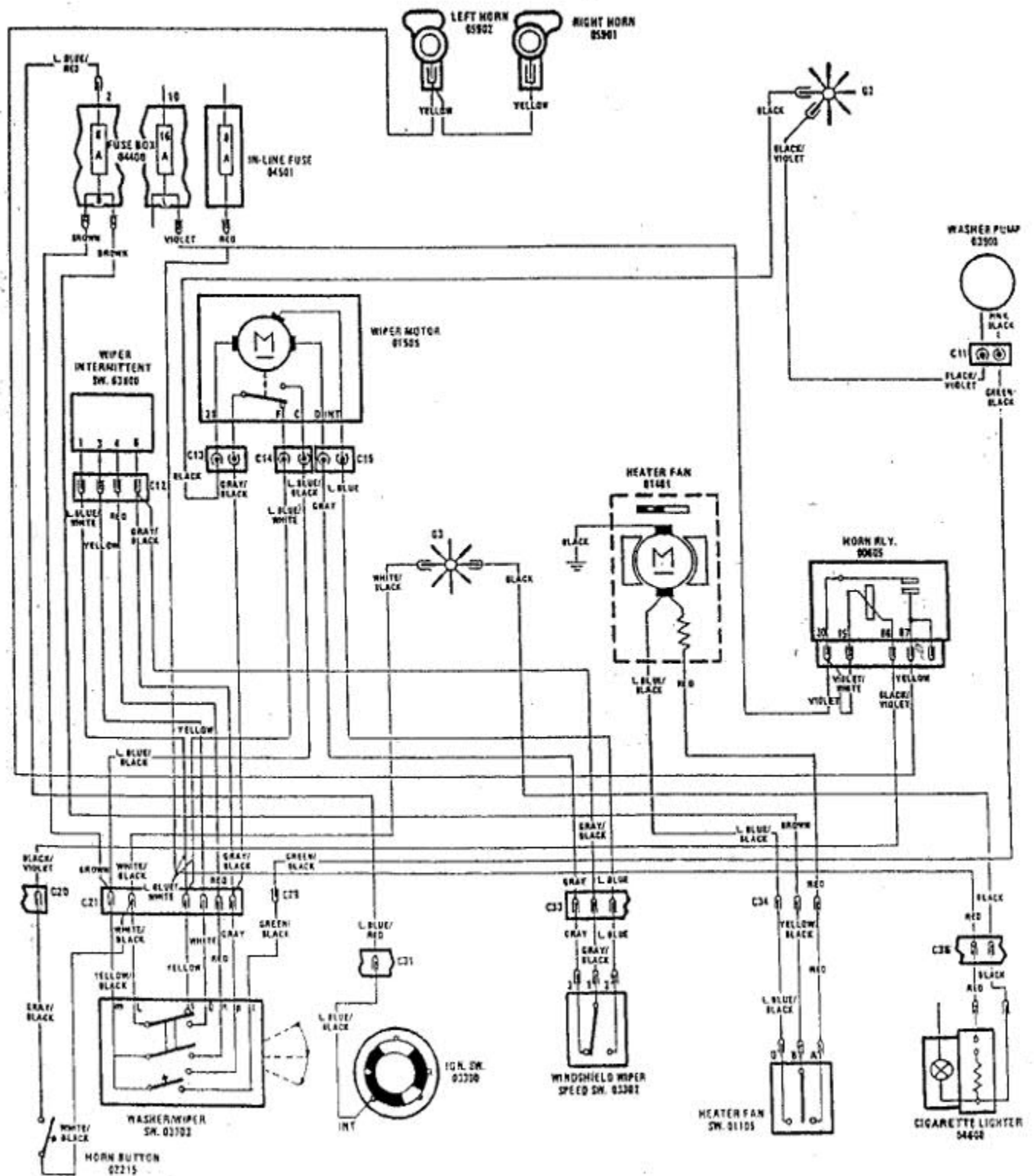
# Hazard and Turn Signal, Back-Up, and Stop Lights Circuits



# Instruments, Indicators, Seat Belt and Remove Key Warning, Courtesy Light, Clock, and Socket Circuits

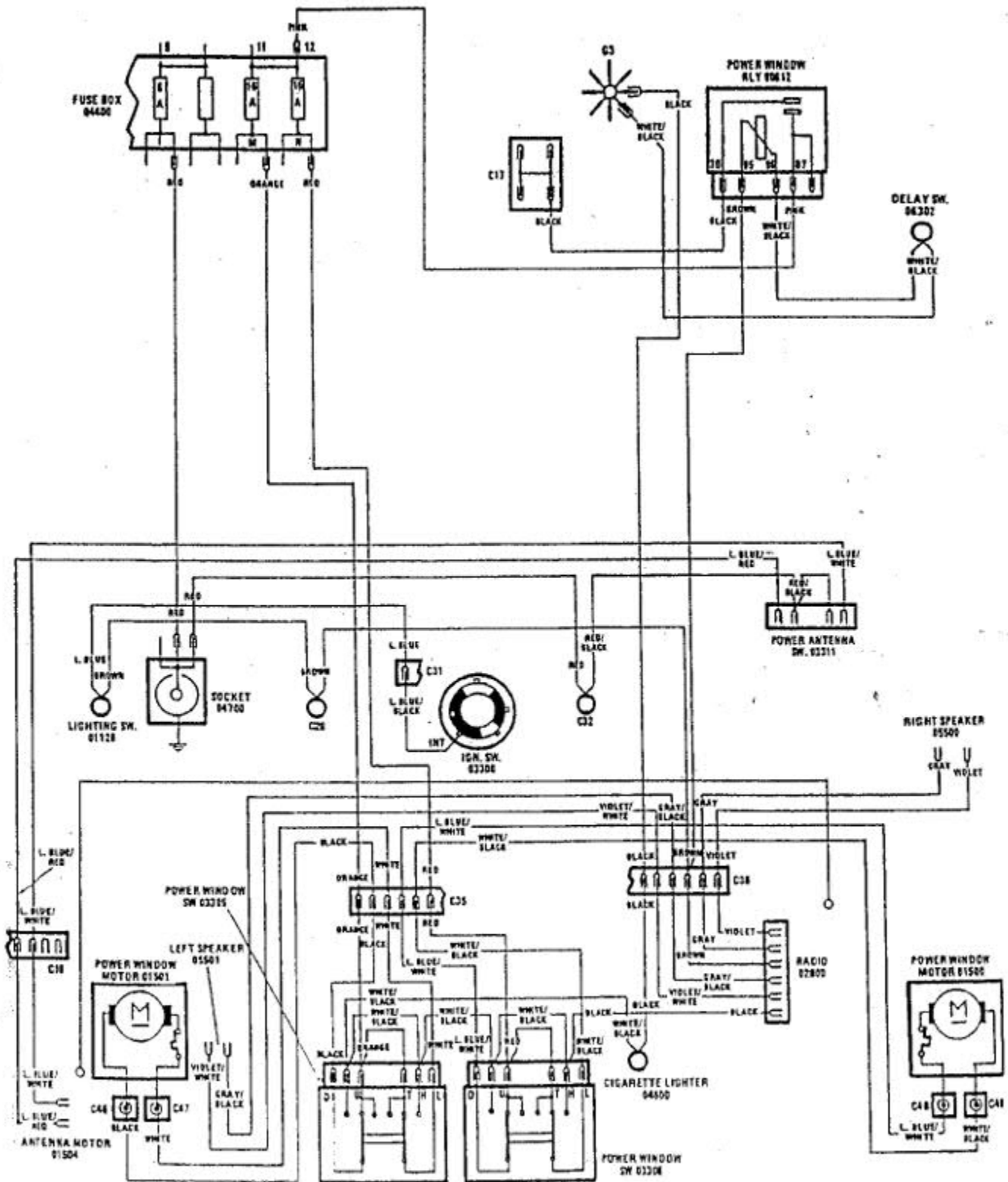


# Windshield Washer/Wiper, Heater, Horn, and Cigarette Lighter Circuits

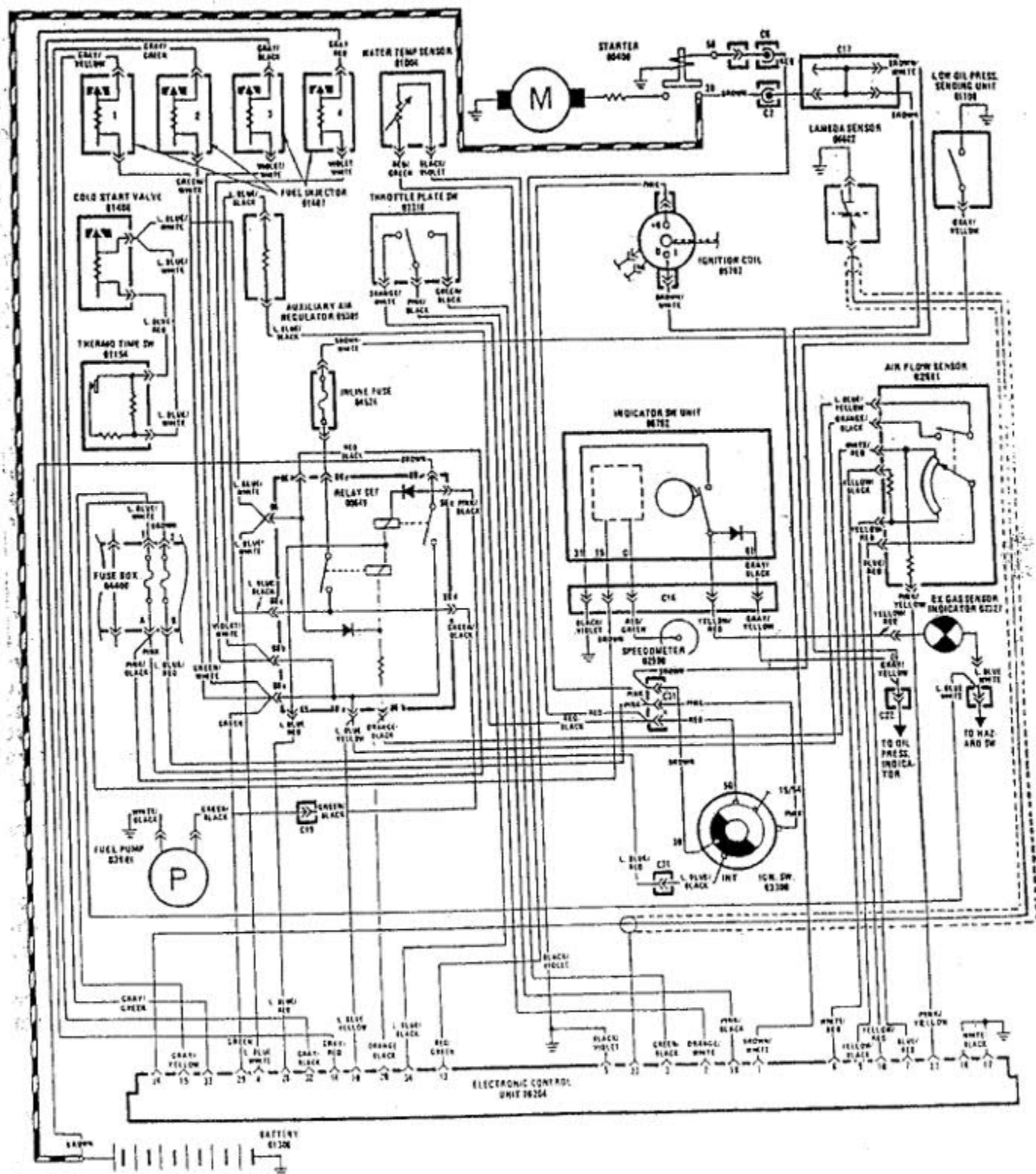




# Power Windows and Radio Circuits



# Fuel injection system circuits



# Component Index

00100	Alternator w/electronic regulator	02302	High beams indicator
00400	Starter	02304	Turn signal indicator
00601	Starter relay (automatic transmission)	02305	Battery charge indicator
00612	Power windows relay	02307	Low oil pressure indicator
00605	Horn relay	02309	Low fuel indicator
00710	Seat belt buzzer relay	02310	Brake system effectiveness indicator
00801	Brakerless ignition distributor	02313	Fasten seat belts indicator
01000	Engine water temperature gauge sending unit	02400	Tachometer
01100	Low oil pressure indicator sending switch	02600	Fuel gauge
01102	Stop light switch	02700	Engine water temperature gauge
01103	Back-up light switch	02800	Radio
01105	Heater fan switch	02900	Speedometer
01117	Switch on driver's seat belt	03000	Clock
01121	Cooling fan thermostatic switch	03300	Steering lock ignition switch
01125	Engine overheat warning switch	03302	Windshield wipers speed switch
01128	Lighting switch	03304	Starter and back-up light switch (automatic transmission)
01140	Hand brake "ON" switch	03305	Power window switch
01300	Battery	03306	Power window switch
01400	Cooling fan motor	03311	Power antenna switch
01401	Heater fan motor	03313	Hazard warning signal switch and indicator
01500	Power window motor	03503	Ideogram light rheostat
01501	Power window motor	03701	Turn signal switch
01504	Antenna motor	03702	High/low beams changeover switch
01505	Windshield wiper motor	03703	Wiper/washer switch
01704	Left low beam	03800	Windshield wiper intermittent switch
01705	Right low beam	03900	Windshield washer pump
01908	Left license plate light	04200	Fuel gauge sending unit
01909	Right license plate light	04303	Turn signal and hazard flasher
01914	Left front parking and turn signal light	04400	Fuse box
01915	Right front parking and turn signal light	04501	In-line fuse for cigarette lighter
01920	Left front side marker light	04600	Cigarette lighter
01921	Right front side marker light	04700	Electrical sockets
01922	Left rear side marker light	04801	Water temperature gauge indicator resistor
01923	Right rear side marker light	05001	Brake fluid level switch
01924	Left tail, turn signal, stop and back-up light	05005	Fasten seat belts and remove key chime
01925	Right tail, turn signal, stop and back-up light	05100	Idle shutoff solenoid
02102	Passenger compartment light — with switch on dashboard	05306	Gulp valve electrovalve
02107	Trunk compartment light	05500	Right radio speaker
02120	Optical fiber illumination light source	05501	Left radio speaker
02212	Courtesy light jamb switch — right door	05703	Ignition coil assembly
02213	Courtesy light jamb switch — left door	05901	Right horn
02215	Horn button	05902	Left horn
02301	Parking lights indicator	06302	Delay switch — seat belt indicator

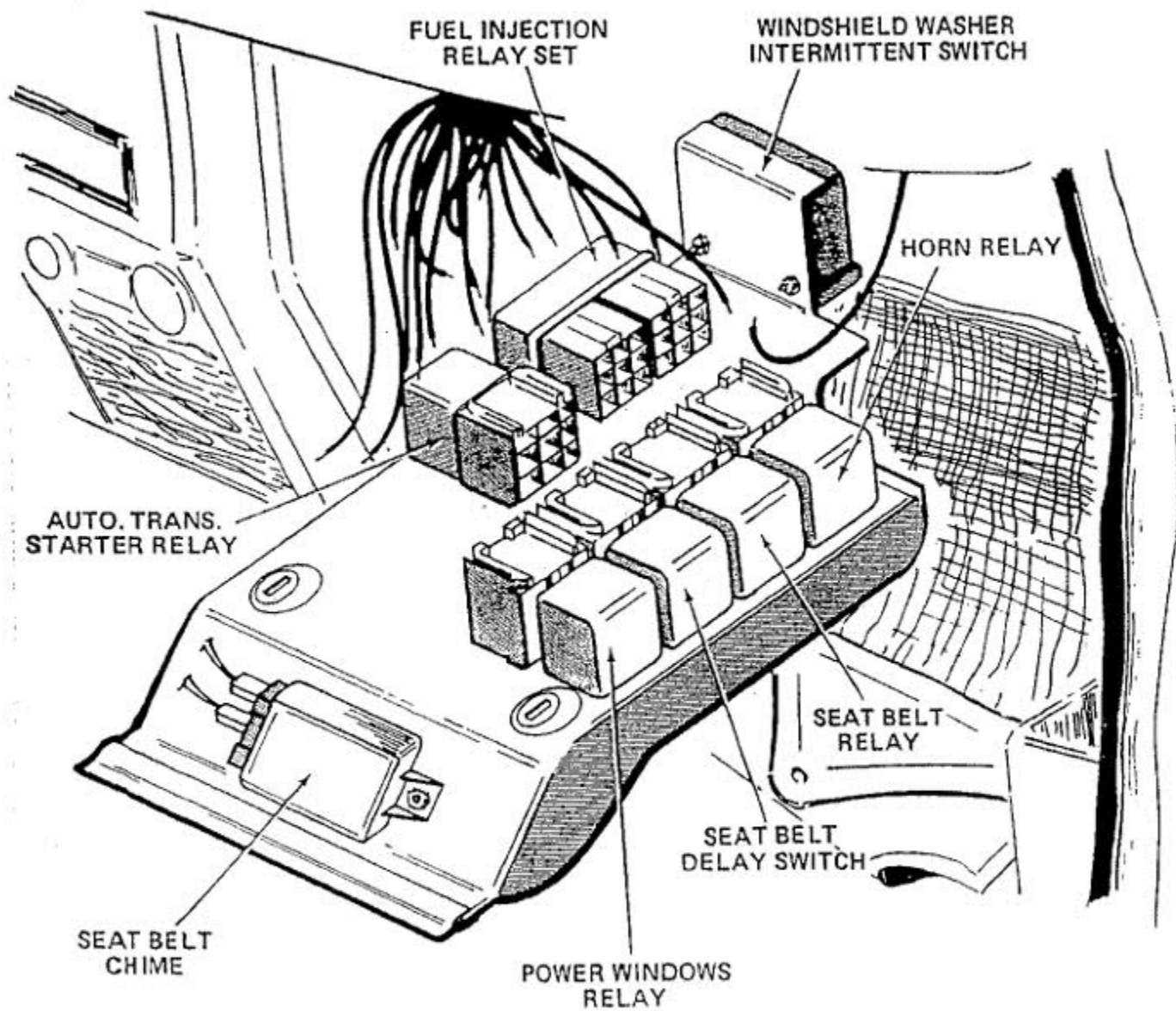
## FUEL INJECTION SYSTEM

00649	Relay set	03316	Throttle plate switch
01004	Coolant temperature sensor	03901	Electrical fuel pump
01154	Thermo time switch	04524	In-line fuse for fuel injection (16A)
01407	Fuel injector	05309	Auxiliary air regulator
01408	Cold start valve	06204	Electronic control unit
02327	Lambda sensor maintenance indicator	06602	Lambda sensor
02601	Air flow sensor	06702	Lambda sensor indicator switch unit

# Connector Codes

CONNECTOR NUMBER	NO. OF PINS	CIRCUITS
C1	2	Parking and turn signal — left front parking lights
C2	2	High/low beams — left front headlights
C3	1	Power for left front side marker light
C4	2	Cooling fan thermostatic switch
C5	2	Cooling fan
C6	1	Power to starter solenoid and gulp valve electrovalve (carburetor version)
C7	1	Power to starter motor
C8	2	High/low beams — right front headlights
C9	2	Parking and turn signal — right front turn signal
C10	1	Power for right front side marker light
C11	2	Windshield washer pump
C12	4	Windshield wiper intermittent switch
C13	2	Windshield wiper motor
C14	2	
C15	2	
C16	5	Lambda sensor indicator switch unit
C17	4	Power distribution connector
C18	11	Rear lights, driver's seat belt switch, power antenna motor, fuel tank sending unit, and trunk compartment light
C19	1	Power to electric fuel pump (fuel injection version)
C20	8	Turn signal switch, high/low beam switch, and horn button
C21	6	Horn button and windshield washer/wiper switch
C22	11	Instrument cluster
C23	5	
C24	7	
C25	4	
C26	5	
C27	3	
C28	3	
C29	1	Windshield washer switch
C30	2	Remove key switch at ignition switch
C31	5	Ignition switch
C32	7	Hazard switch
C33	7	Windshield wiper speed switch, panel light rheostat, brake system effectiveness indicator, and fasten belts indicator
C34	3	Heater motor
C35	8	Power windows and courtesy light
C36	8	Radio, and cigarette lighter
C37	2	Back-up light switch
C38	1	Cigarette lighter
C39	1	
C40	2	Right rear parking and side marker lights
C41	6	
C42	6	Connector for right rear lights at left rear parking light
C43	7	Left rear parking and side marker lights
C44	2	
C45	2	Starter and back-up light switch (Auto. Trans)
C46	1	Left power window motor
C47	1	
C48	1	Right power window motor
C49	1	

# Component Board

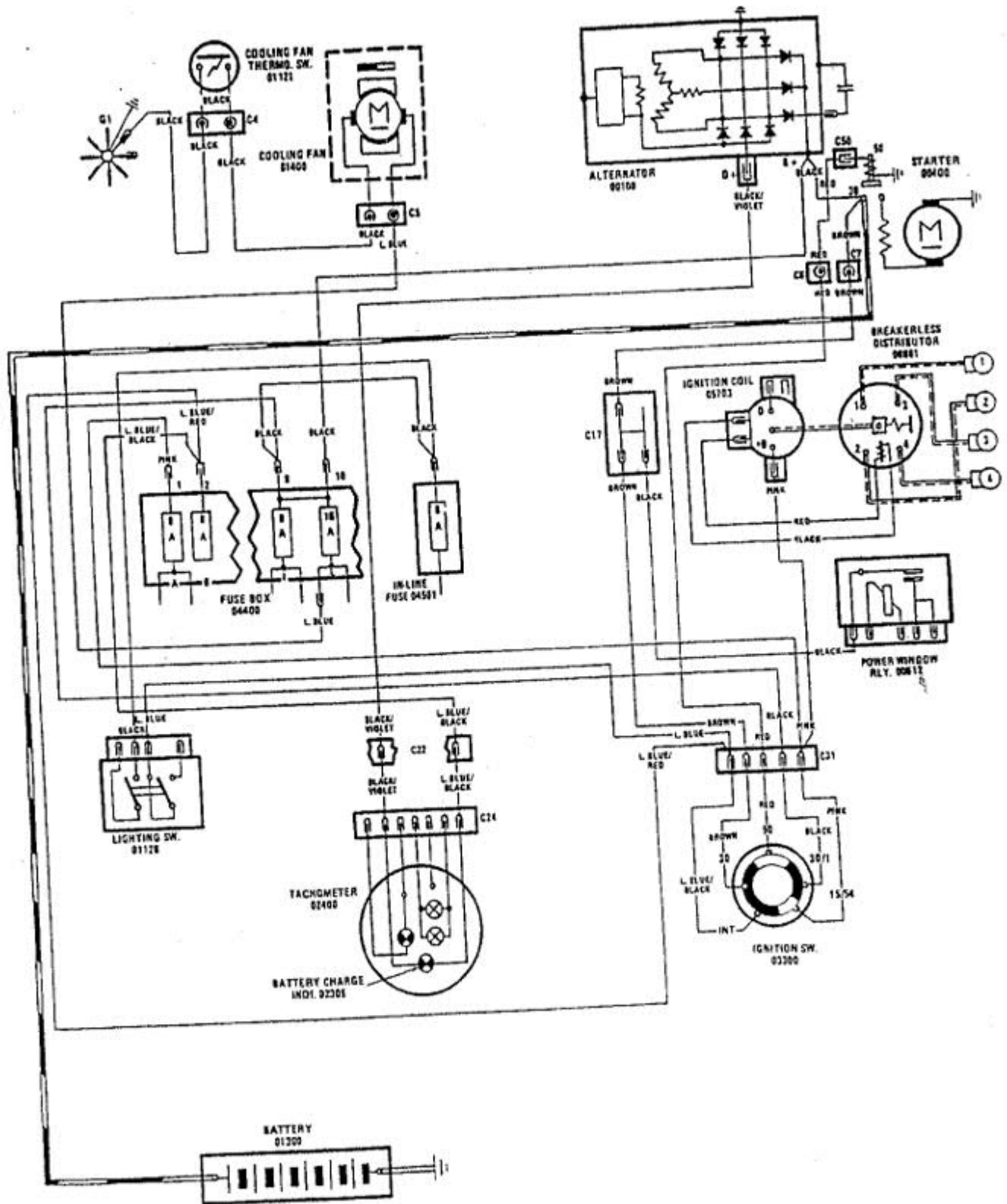


**124 SPIDER  
1981  
WIRING DIAGRAMS**

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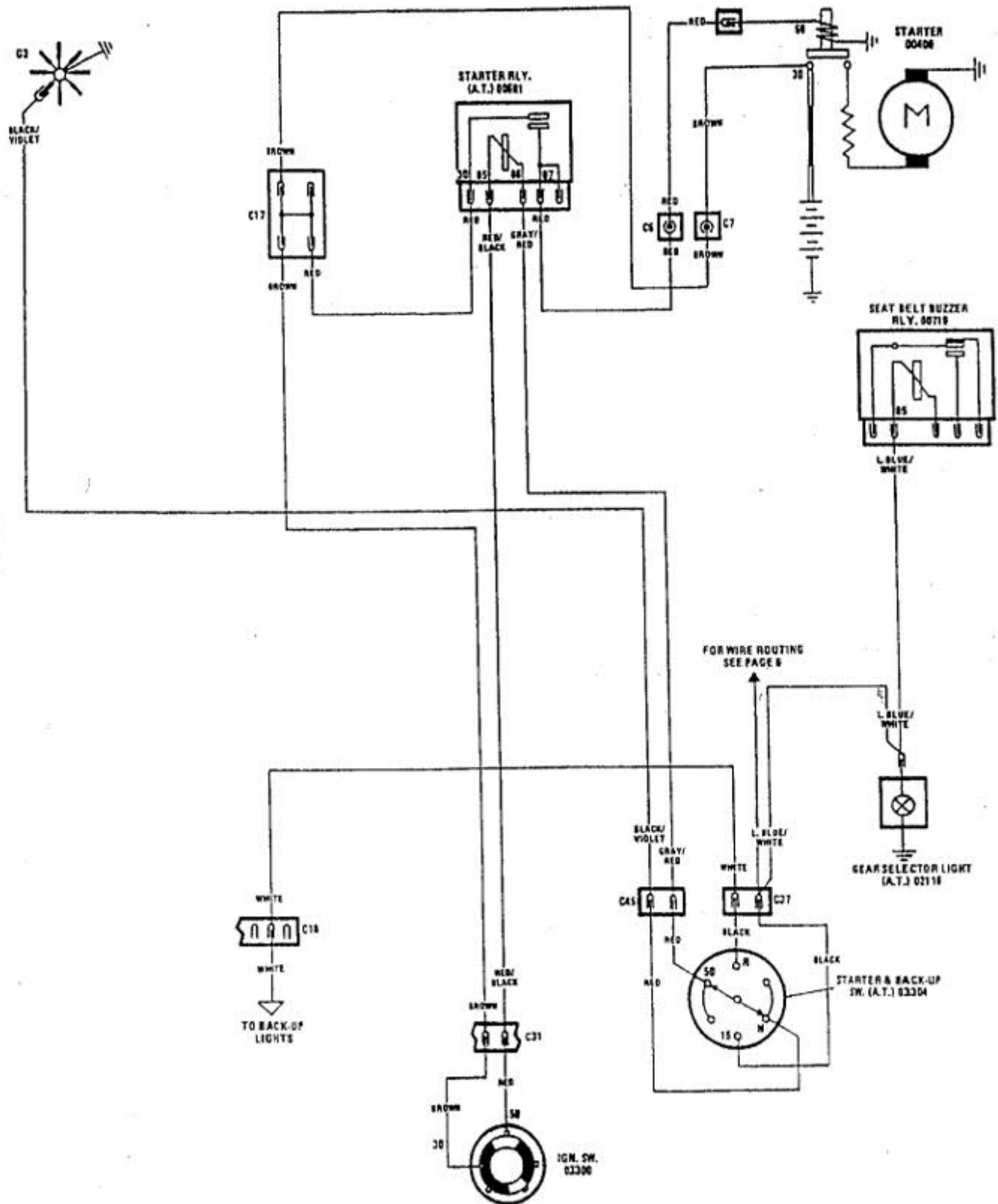
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# Ignition, Starter, Alternator, Engine Cooling Fan, and Power Distribution Circuits

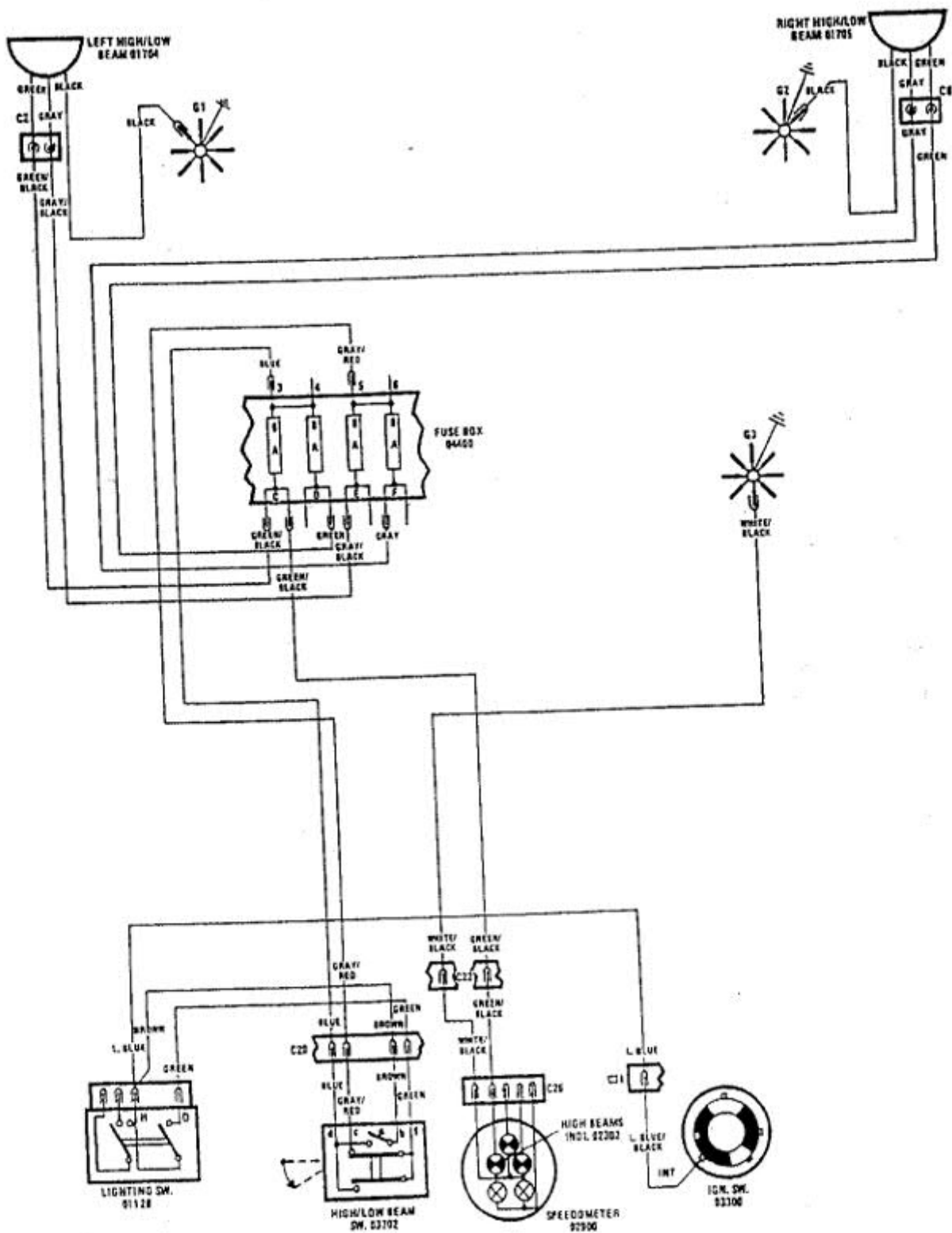




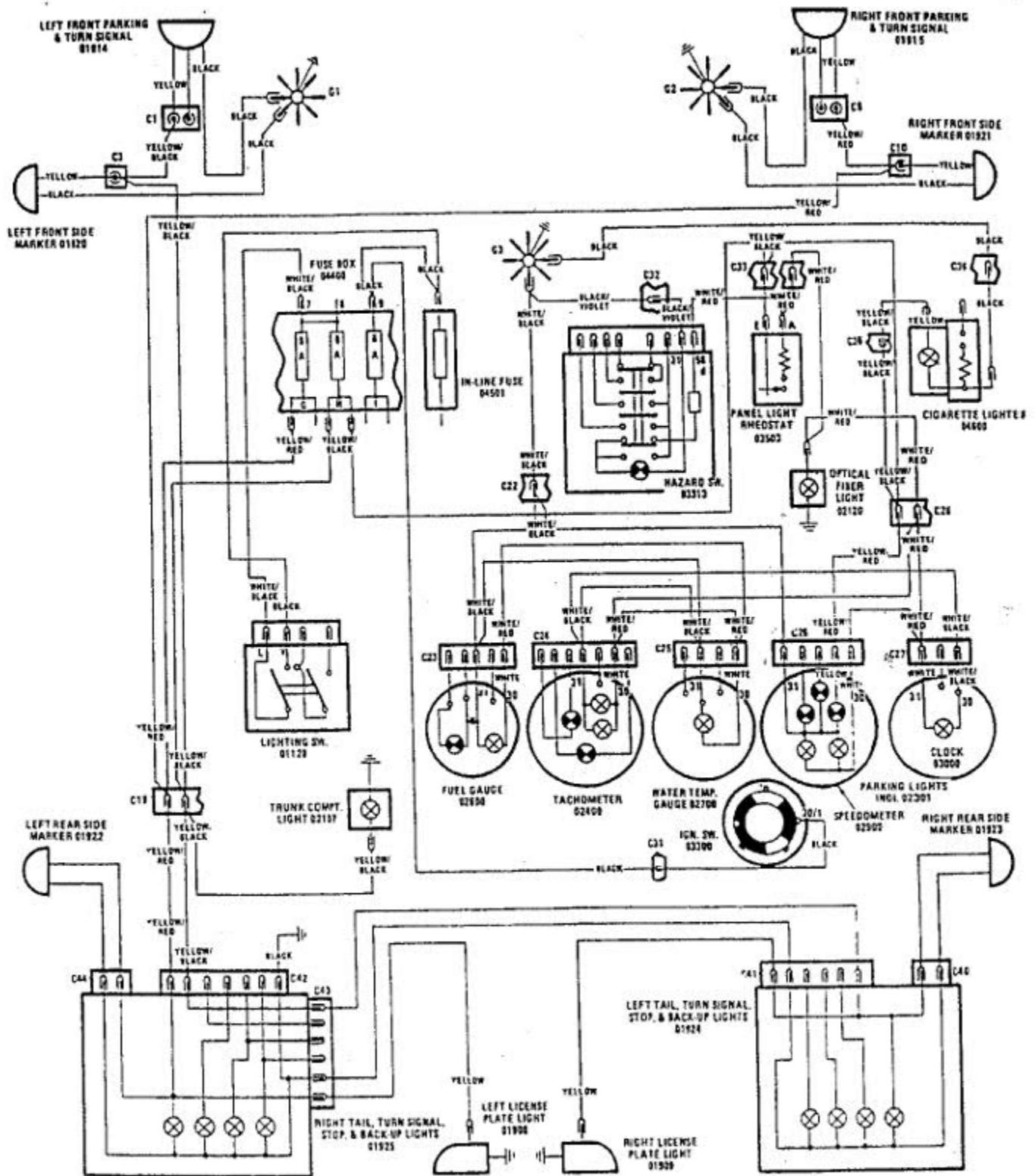
# Starter Circuit – Automatic Transmission



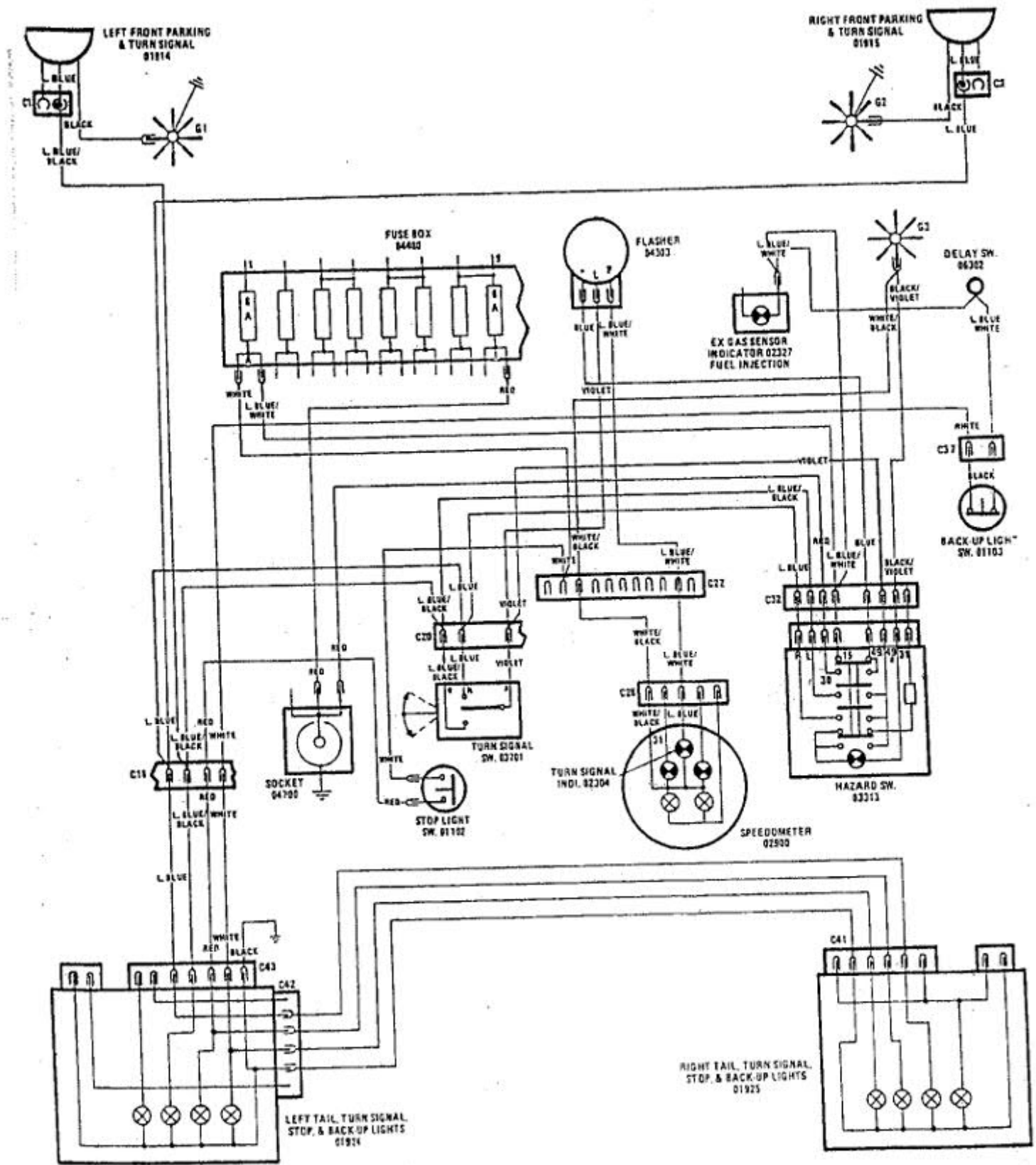
# High and Low Beams Circuits



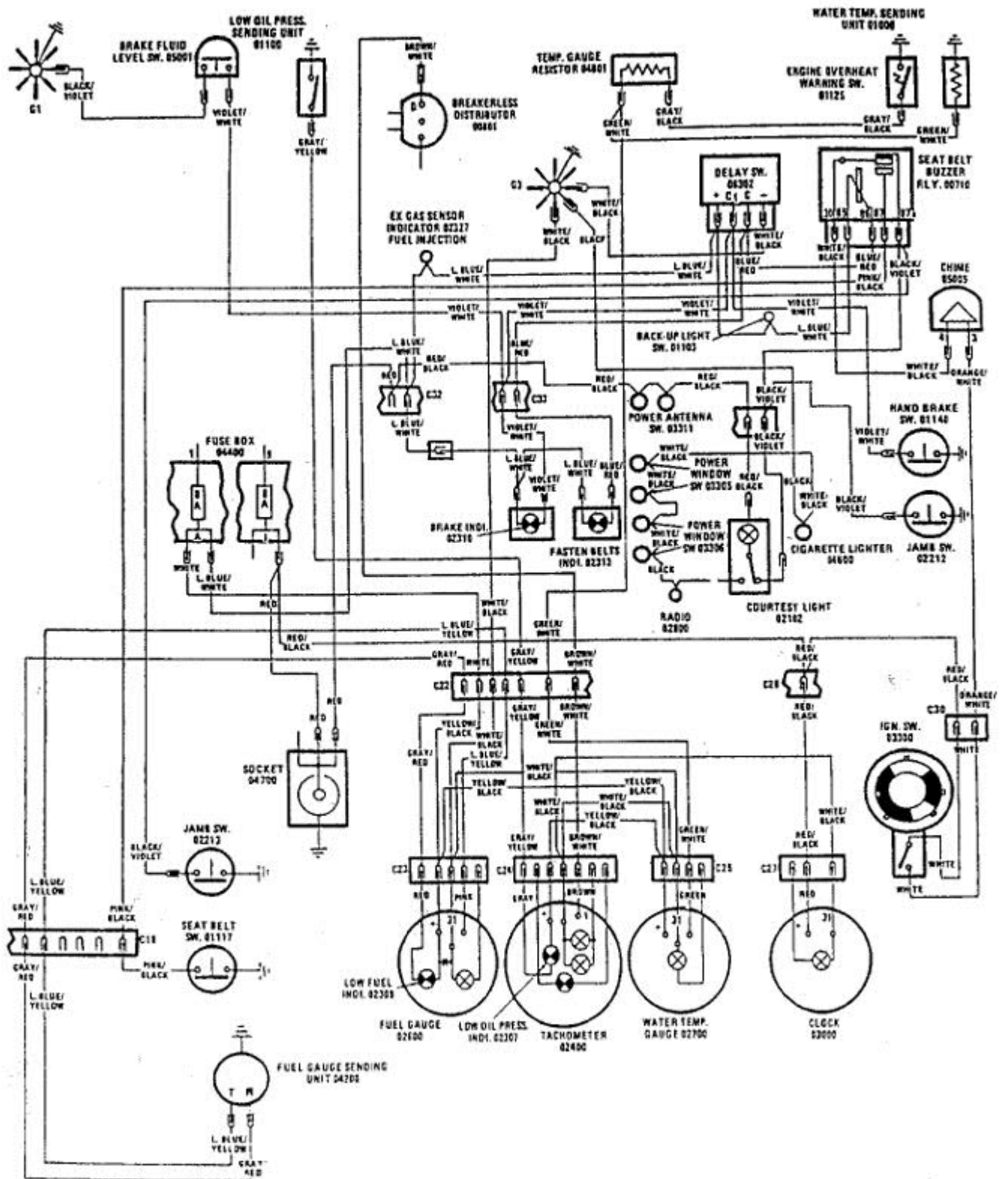
# Parking, License Plate, Side Marker, and Panel Lights



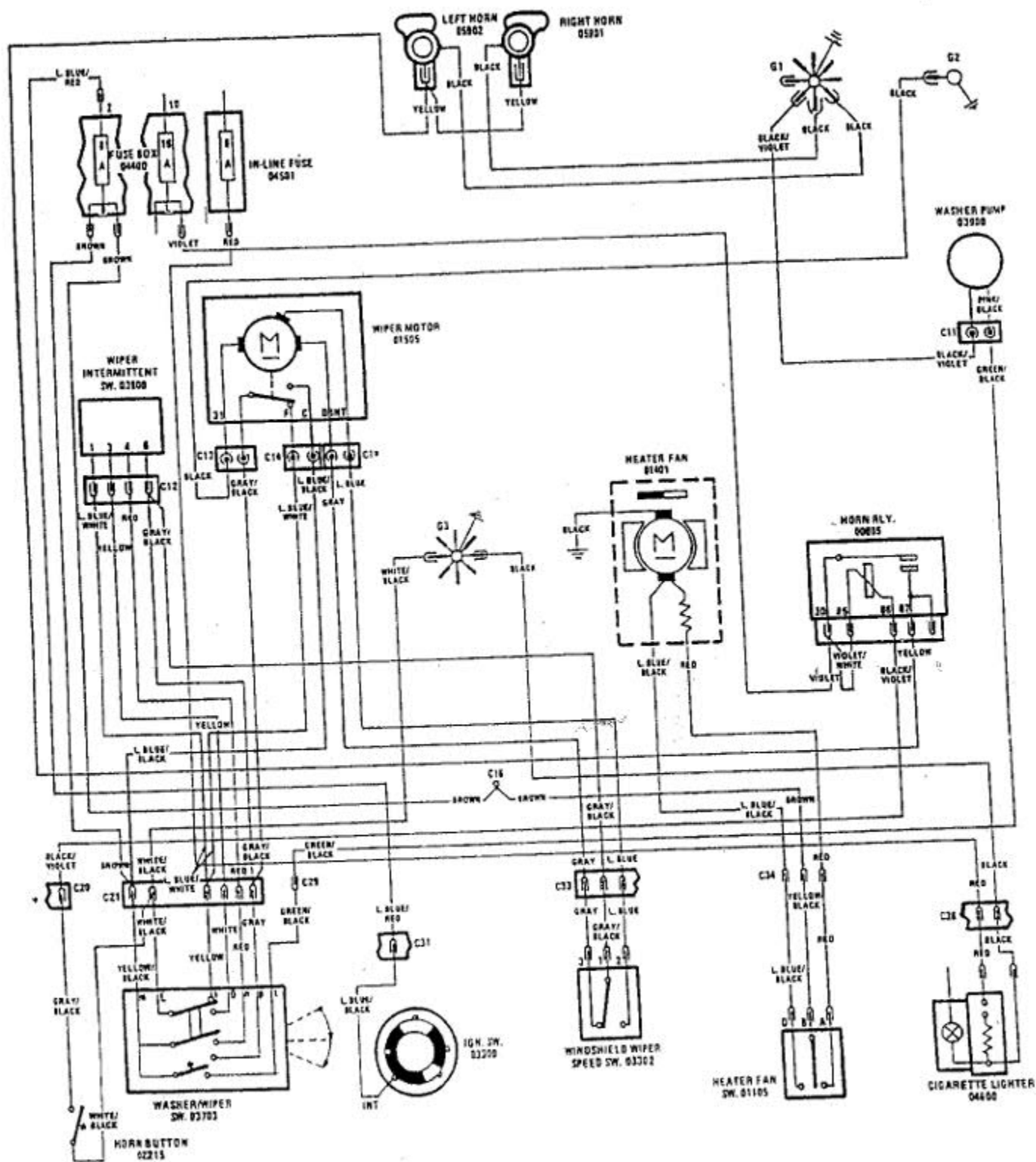
# Hazard and Turn Signal, Back-Up, and Stop Lights Circuits



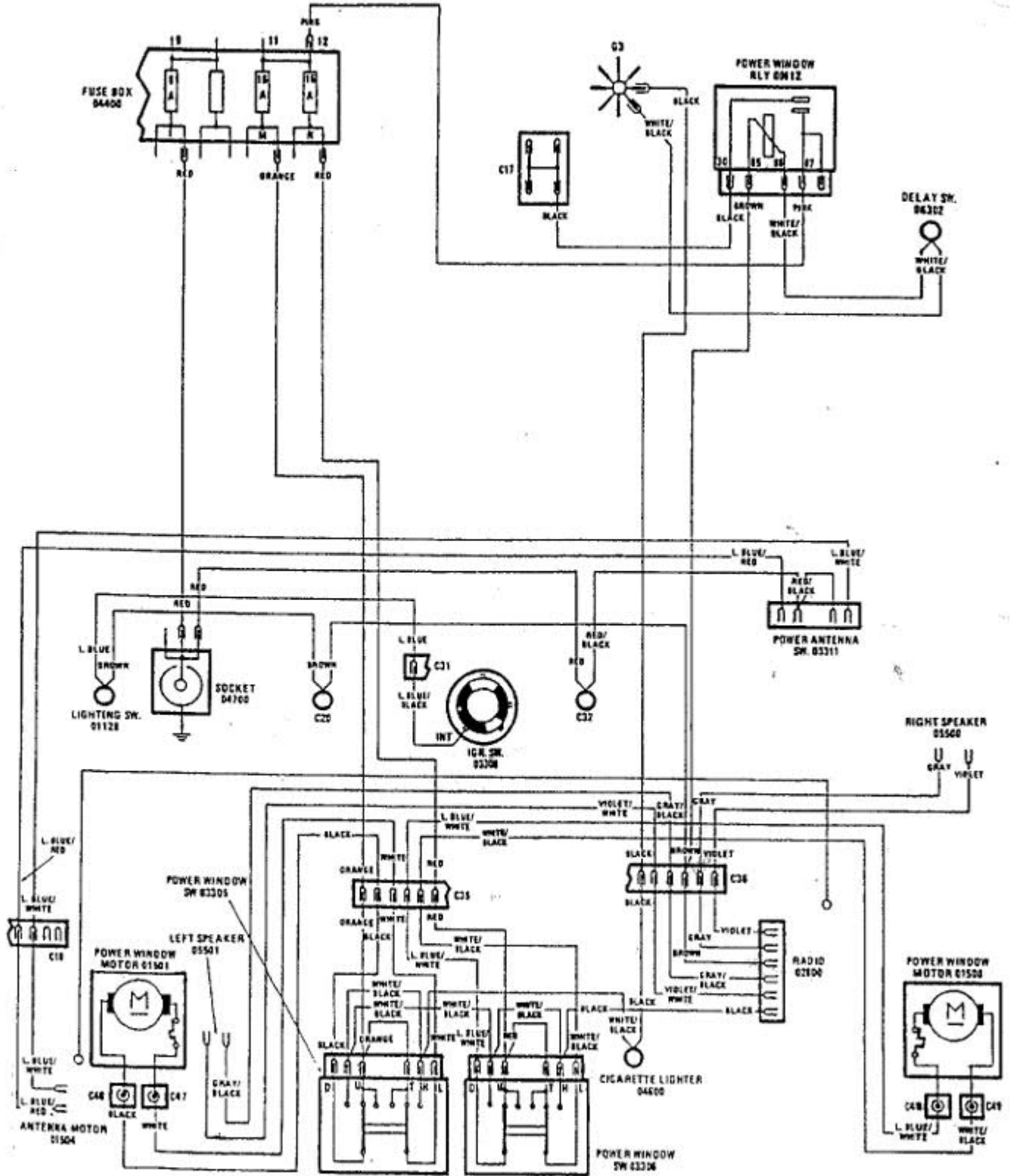
# Instruments, Indicators, Seat Belt and Remove Key Warning, Courtesy Light, Clock, and Socket Circuits



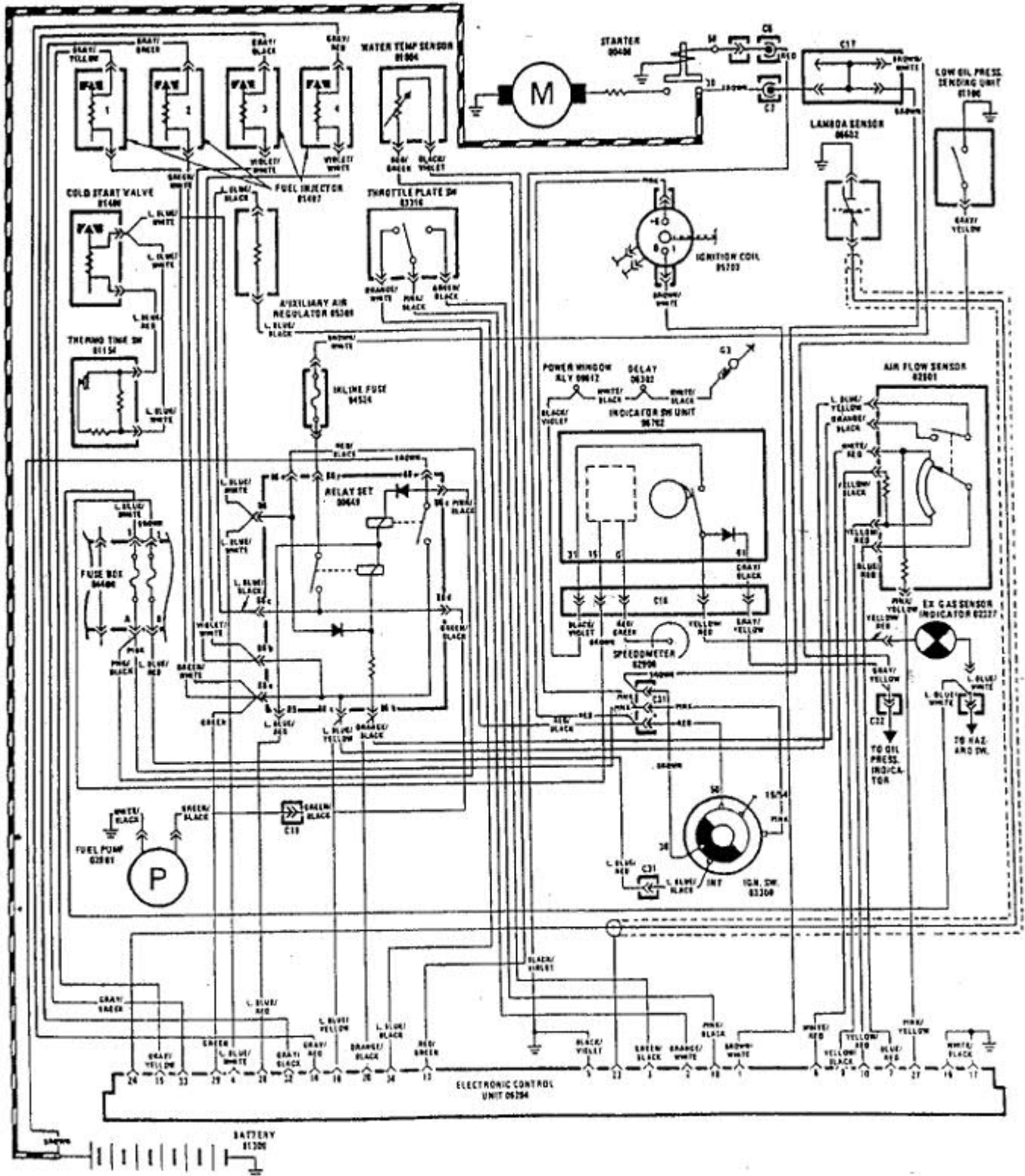
# Windshield Washer/Wiper, Heater, Horn, and Cigarette Lighter Circuits



# Power Windows and Radio Circuits



# Fuel injection system circuits





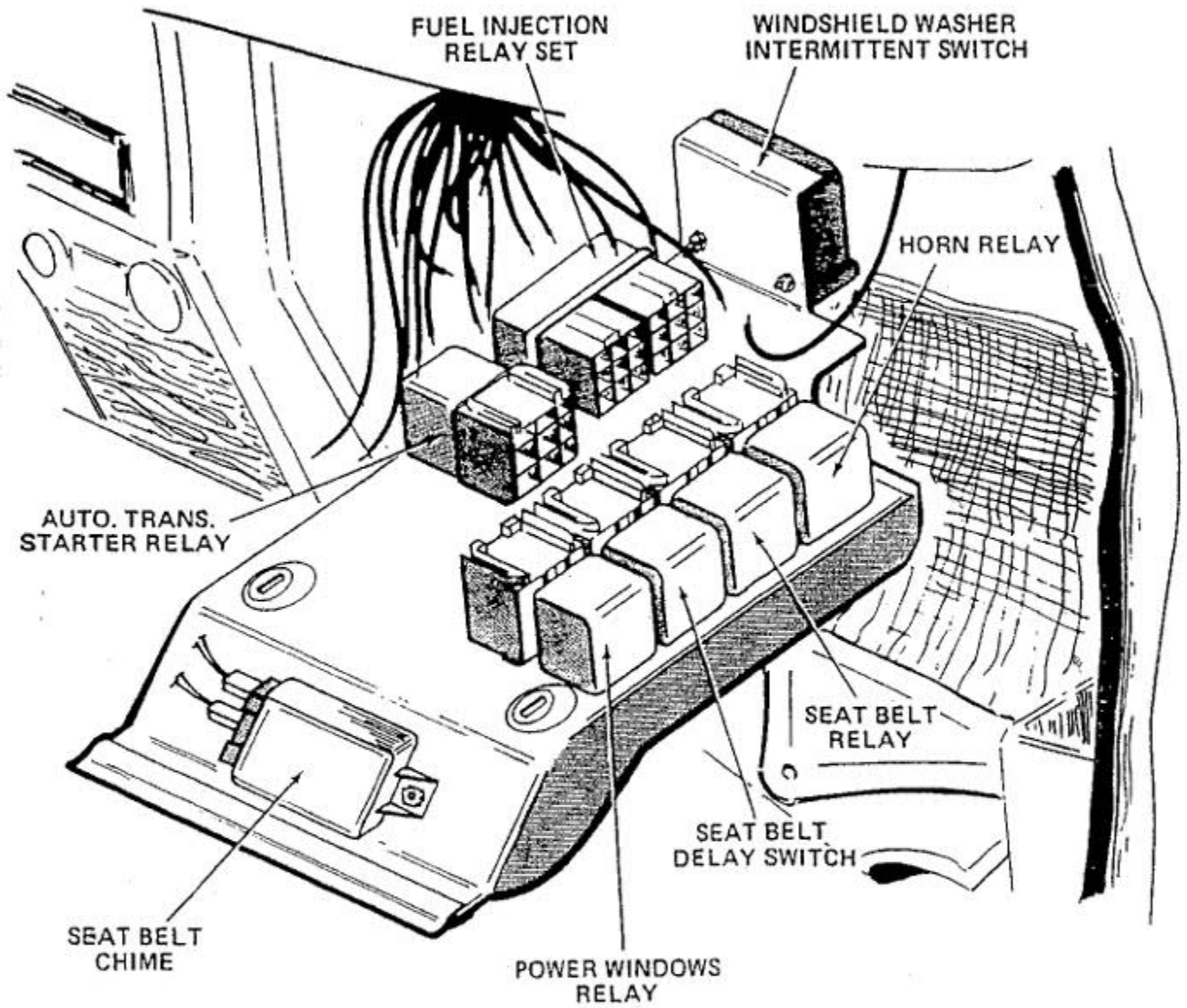
# Component Index

00100	Alternator w/electronic regulator	02304	Turn signal indicator
00400	Starter	02305	Battery charge indicator
00601	Starter relay (automatic transmission)	02307	Low oil pressure indicator
00612	Power windows relay	02309	Low fuel indicator
00605	Horn relay	02310	Brake system effectiveness indicator
00649	Relay set	02313	Fasten seat belts indicator
00710	Seat belt buzzer relay	02327	Lambda sensor maintenance indicator
00801	Brakerless ignition distributor	02400	Tachometer
01000	Engine water temperature gauge sending unit	02600	Fuel gauge
01004	Coolant temperature sensor	02601	Air flow sensor
01100	Low oil pressure indicator sending switch	02700	Engine water temperature gauge
01102	Stop light switch	02800	Radio
01103	Back-up light switch	02900	Speedometer
01105	Heater fan switch	03000	Clock
01117	Switch on driver's seat belt	03300	Steering lock ignition switch
01121	Cooling fan thermostatic switch	03302	Windshield wipers speed switch
01125	Engine overheat warning switch	03304	Starter and back-up light switch (automatic transmission)
01128	Lighting switch	03305	Power window switch
01140	Hand brake "ON" switch	03306	Power window switch
01154	Thermo time switch	03311	Power antenna switch
01300	Battery	03313	Hazard warning signal switch and indicator
01400	Cooling fan motor	03316	Throttle plate switch
01401	Heater fan motor	03503	Ideogram light rheostat
01407	Fuel injector	03701	Turn signal switch
01408	Cold start valve	03702	High/low beams changeover switch
01500	Power window motor	03703	Wiper/washer switch
01501	Power window motor	03800	Windshield wiper intermittent switch
01504	Antenna motor	03900	Windshield washer pump
01505	Windshield wiper motor	03901	Electrical fuel pump
01704	Left low beam	04200	Fuel gauge sending unit
01705	Right low beam	04303	Turn signal and hazard flasher
01908	Left license plate light	04400	Fuse box
01909	Right license plate light	04501	In-line fuse for cigarette lighter
01914	Left front parking and turn signal light	04524	In-line fuse for fuel injection (16A)
01915	Right front parking and turn signal light	04600	Cigarette lighter
01920	Left front side marker light	04700	Electrical sockets
01921	Right front side marker light	04801	Water temperature gauge indicator resistor
01922	Left rear side marker light	05001	Brake fluid level switch
01923	Right rear side marker light	05005	Fasten seat belts and remove key chime
01924	Left tail, turn signal, stop and back-up light	05309	Auxiliary air regulator
01925	Right tail, turn signal, stop and back-up light	05500	Right radio speaker
02102	Passenger compartment light — with switch on dashboard	05501	Left radio speaker
02107	Trunk compartment light	05703	Ignition coil assembly
02120	Optical fiber illumination light source	05901	Right horn
02212	Courtesy light jamb switch — right door	05902	Left horn
02213	Courtesy light jamb switch — left door	06204	Electronic control unit
02215	Horn button	06302	Delay switch — seat belt indicator
02301	Parking lights indicator	06602	Lambda sensor
02302	High beams indicator	06702	Lambda sensor indicator switch unit

# Connector Codes

CONNECTOR NUMBER	NO. OF PINS	CIRCUITS
C1	2	Parking and turn signal — left front parking lights
C2	2	High/low beams — left front headlights
C3	1	Power for left front side marker light
C4	2	Cooling fan thermostatic switch
C5	2	Cooling fan
C6	1	Power to starter solenoid
C7	1	Power to starter motor
C8	2	High/low beams — right front headlights
C9	2	Parking and turn signal — right front turn signal
C10	1	Power for right front side marker light
C11	2	Windshield washer pump
C12	4	Windshield wiper intermittent switch
C13	2	Windshield wiper motor
C14	2	
C15	2	
C16	5	Lambda sensor indicator switch unit
C17	4	Power distribution connector
C18	11	Rear lights, driver's seat belt switch, power antenna motor, fuel tank sending unit, and trunk compartment light
C19	1	Power to electric fuel pump
C20	8	Turn signal switch, high/low beam switch, and horn button
C21	6	Horn button and windshield washer/wiper switch
C22	11	Instrument cluster
C23	5	
C24	7	
C25	4	
C26	5	
C27	3	
C28	3	
C29	1	
C29	1	Windshield washer switch
C30	2	Remove key switch at ignition switch
C31	5	Ignition switch
C32	7	Hazard switch
C33	7	Windshield wiper speed switch, panel light rheostat, brake system effectiveness indicator, and fasten belts indicator
C34	3	Heater motor
C35	8	Power windows and courtesy light
C36	8	Radio, and cigarette lighter
C37	2	Back-up light switch
C38	1	Cigarette lighter
C39	1	
C40	2	Right rear parking and side marker lights
C41	6	
C42	6	Connector for right rear lights at left rear parking light
C43	7	Left rear parking and side marker lights
C44	2	
C45	2	Starter and back-up light switch (Auto. Trans)
C46	1	Left power window motor
C47	1	
C48	1	Right power window motor
C49	1	

# Component Board

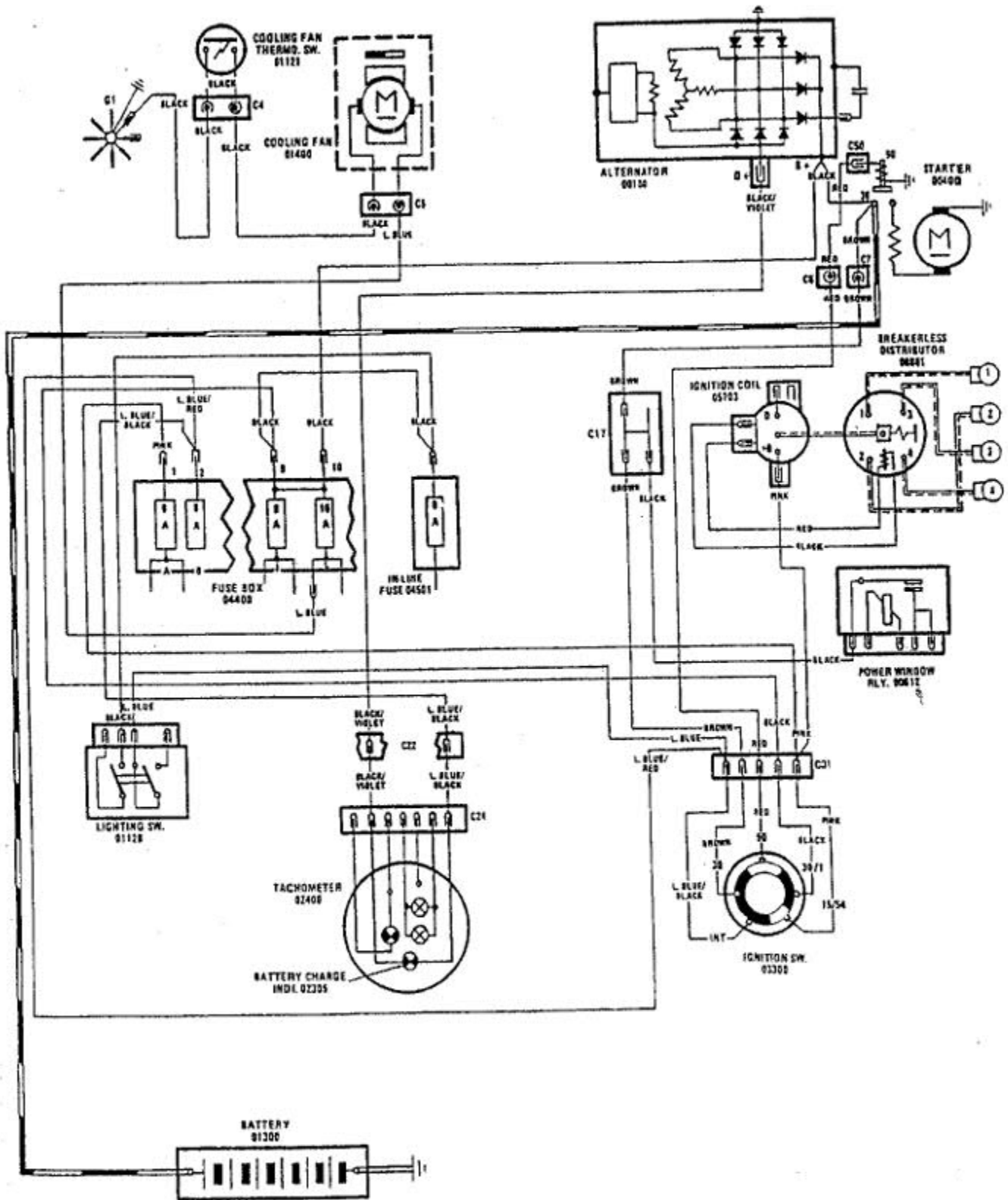


**124 SPIDER  
1982  
WIRING DIAGRAMS**

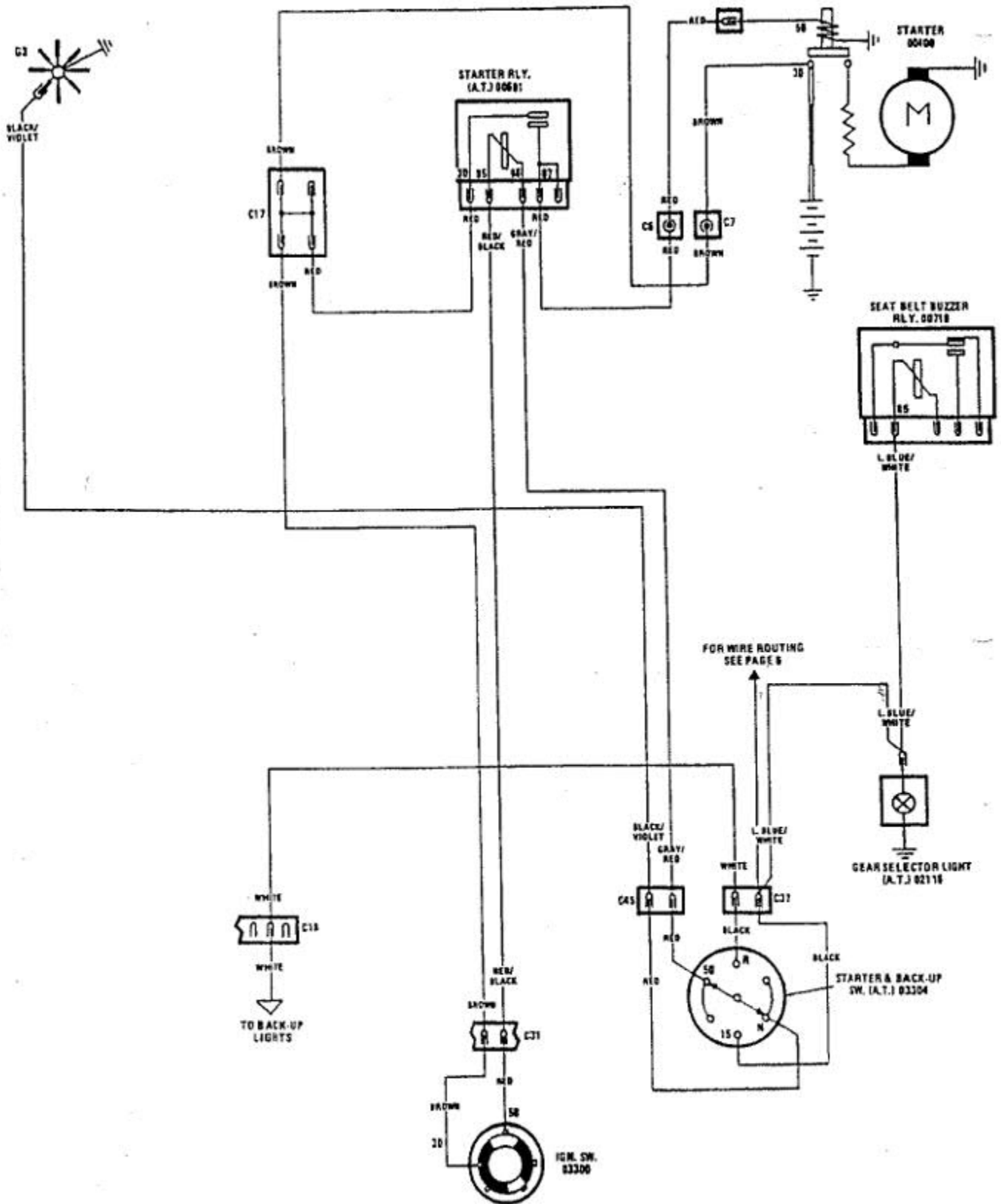
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Hazard and turn signal, back-up, and stop lights circuits .....	5
Instruments, indicators, seat belt and remove key warning, courtesy light, clock, and socket circuits .....	6
Windshield washer/wiper, heater, horn, and cigarette lighter circuits .....	7
Power windows and radio circuits .....	8
Fuel injection system circuits .....	9/10
Component Index .....	11
Connector Code .....	12
Component Board .....	13

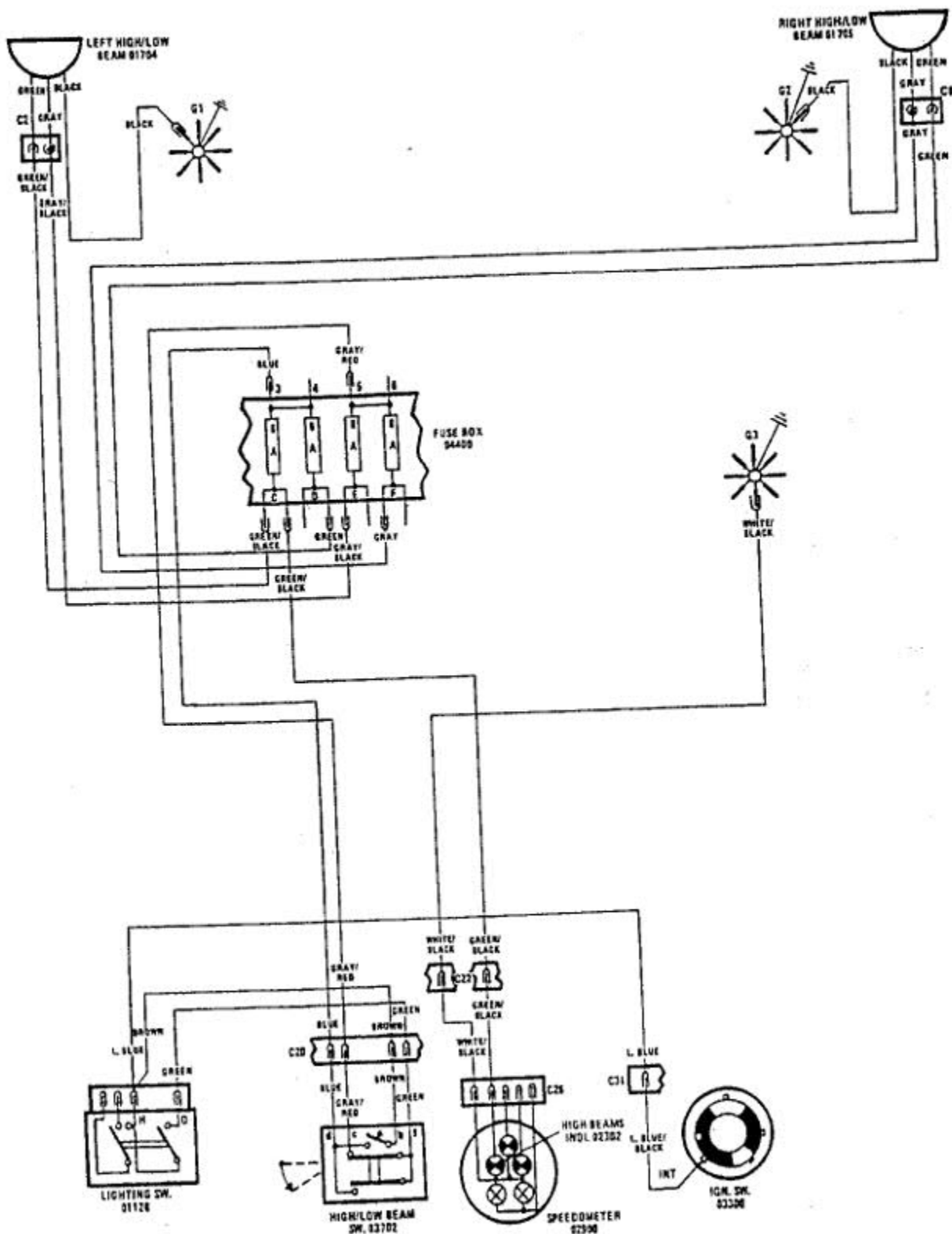
# Ignition, Starter, Alternator, Engine Cooling Fan, and Power Distribution Circuits



# Starter Circuit – Automatic Transmission

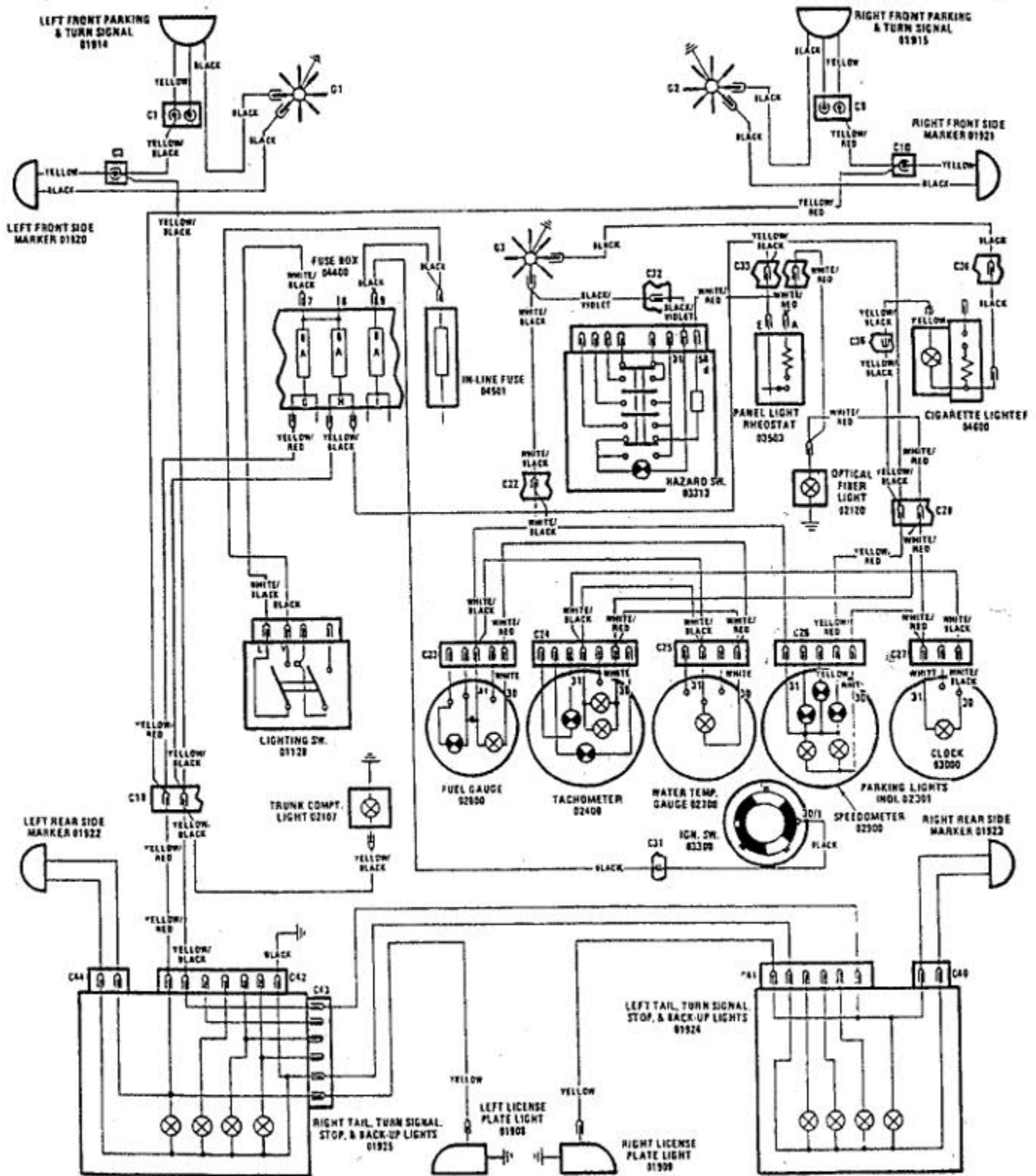


# High and Low Beams Circuits

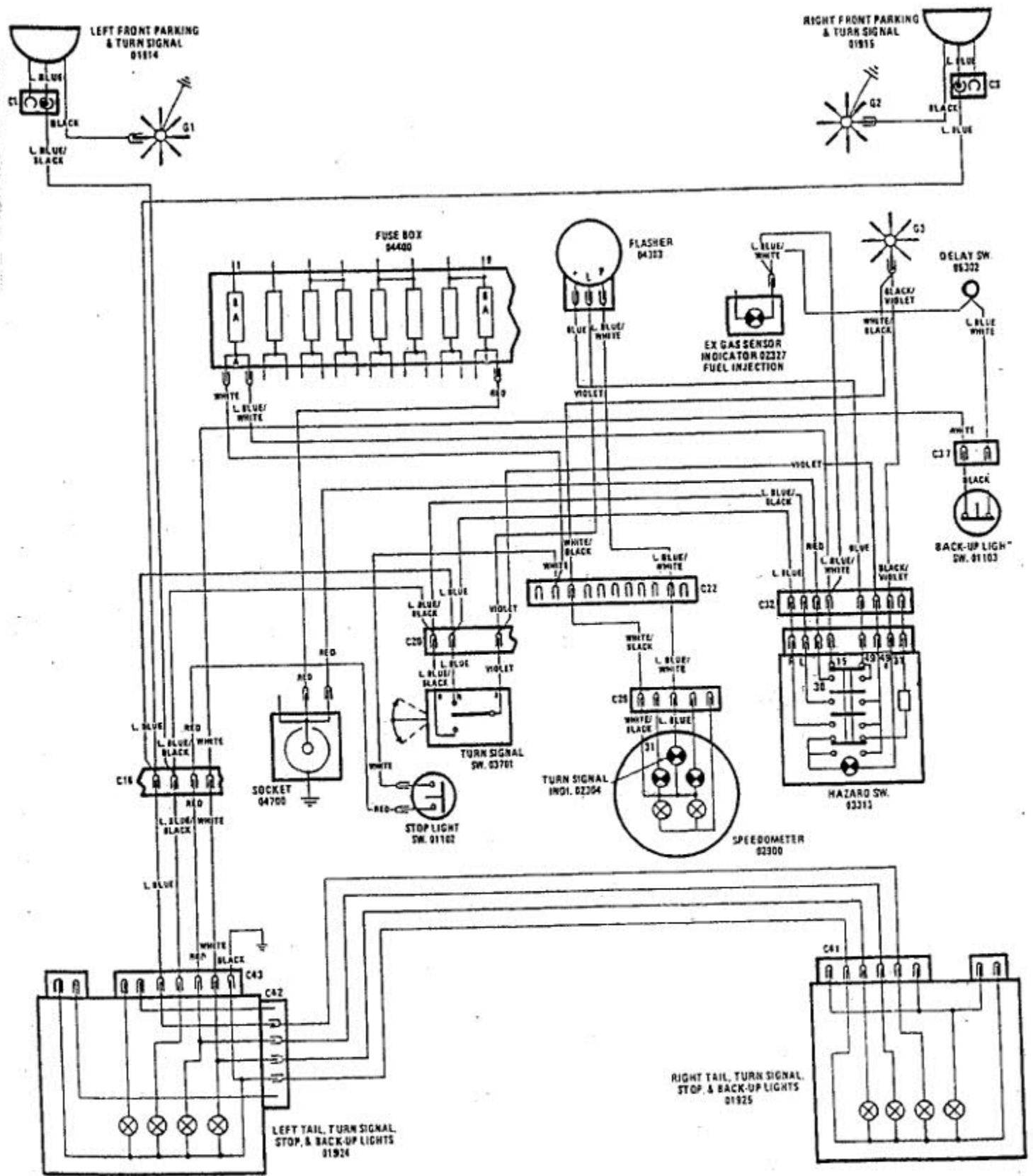




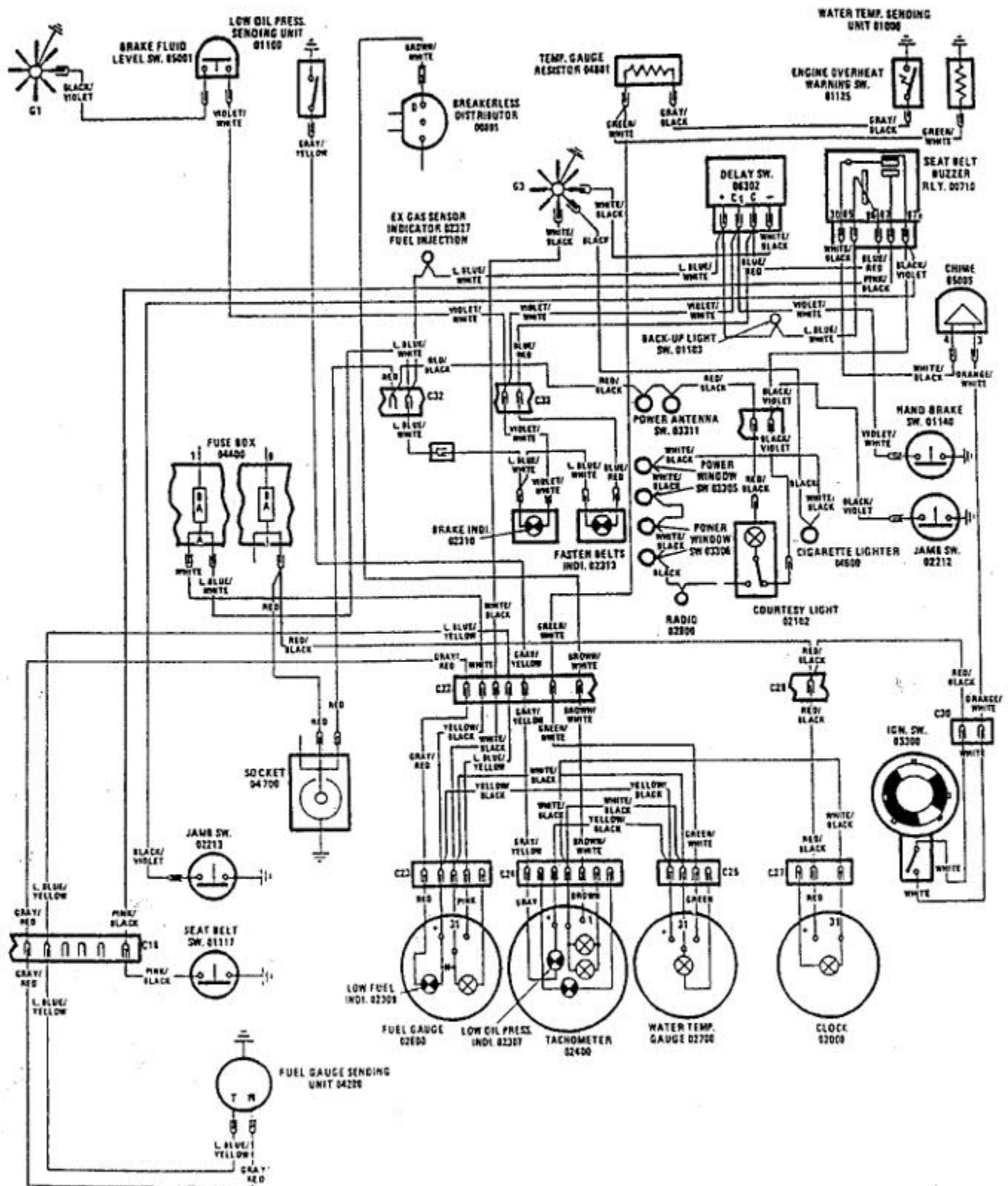
# Parking, License Plate, Side Marker, and Panel Lights



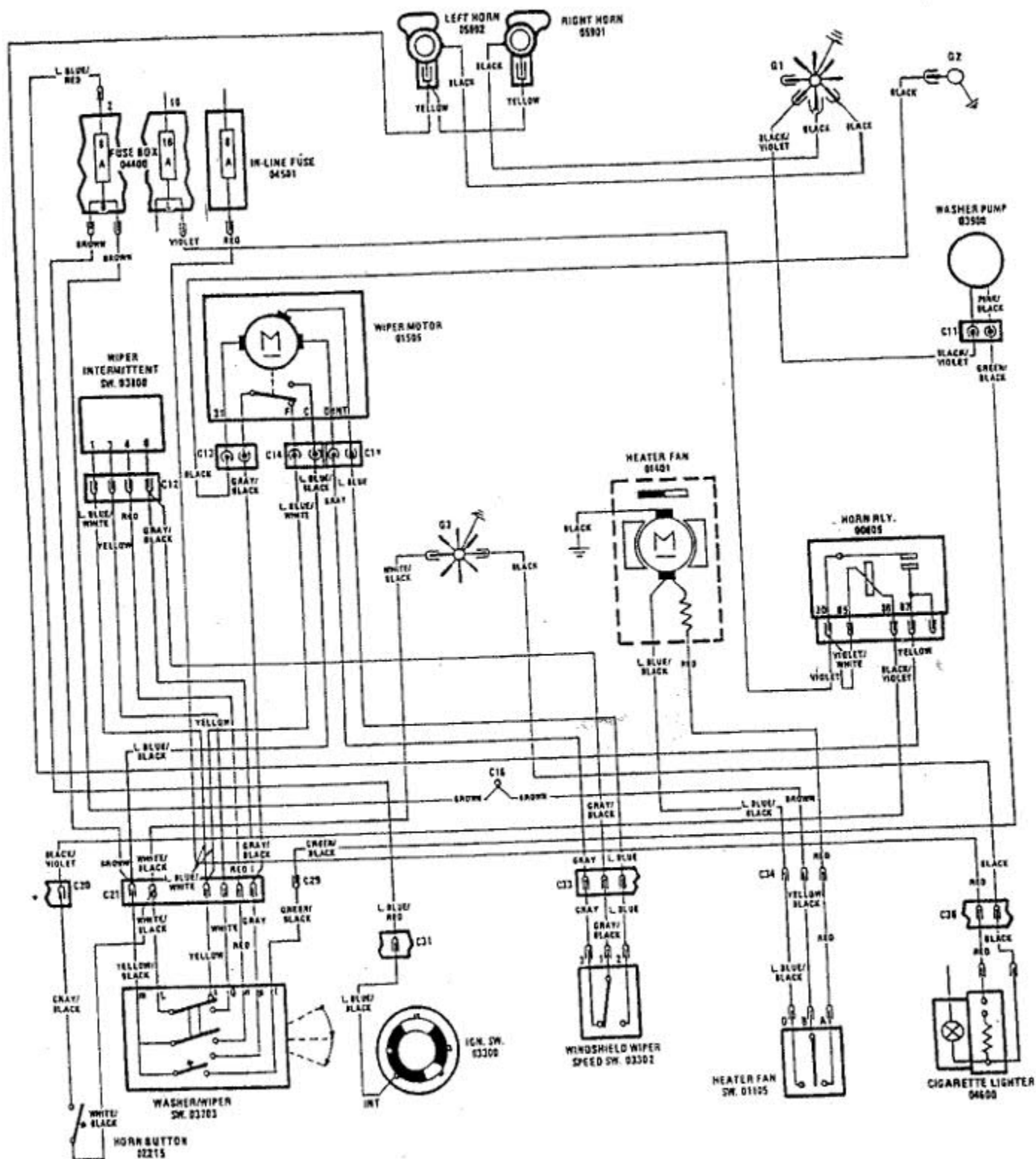
# Hazard and Turn Signal, Back-Up, and Stop Lights Circuits



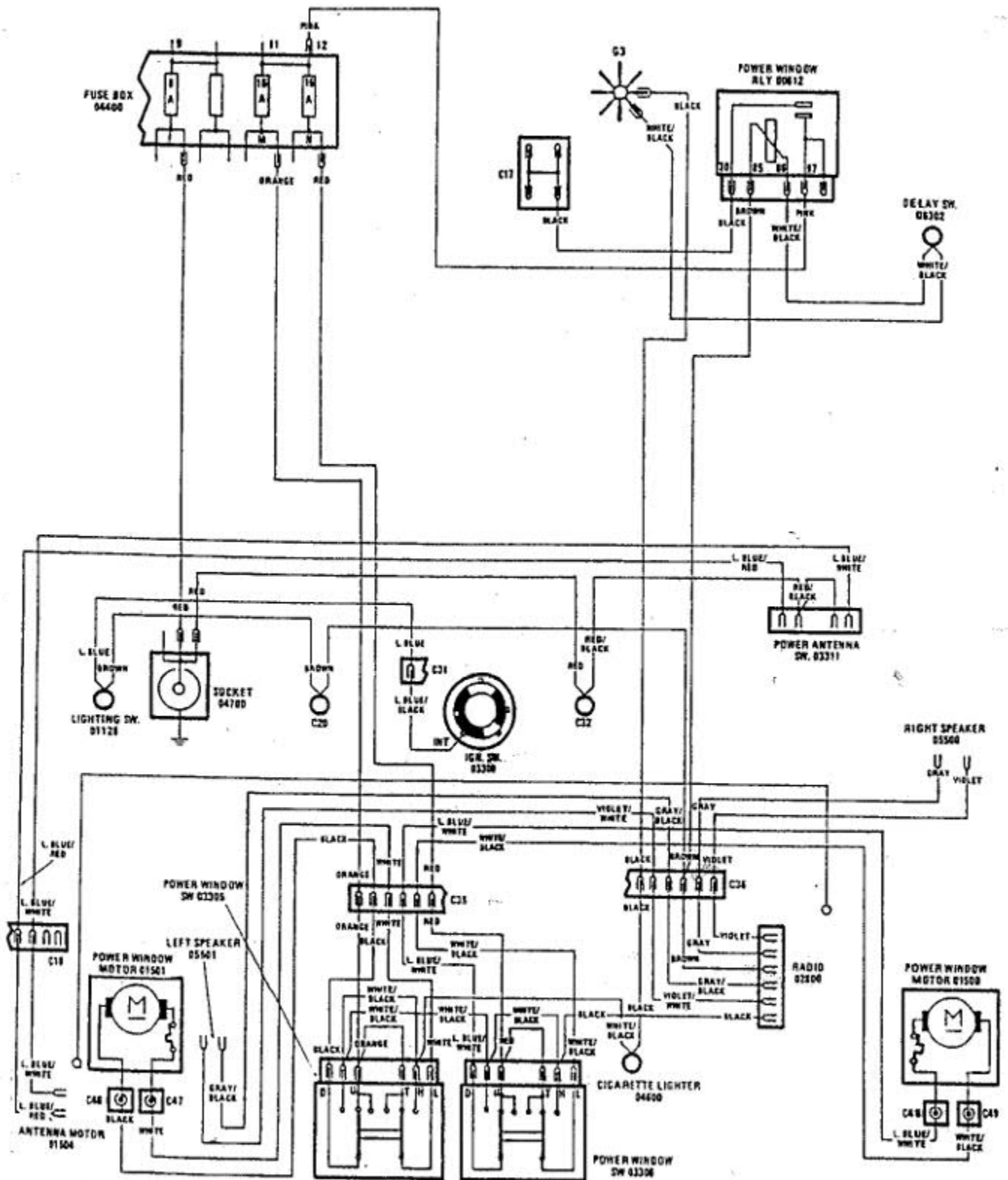
# Instruments, Indicators, Seat Belt and Remove Key Warning, Courtesy Light, Clock, and Socket Circuits



# Windshield Washer/Wiper, Heater, Horn, and Cigarette Lighter Circuits



# Power Windows and Radio Circuits





# Component Index

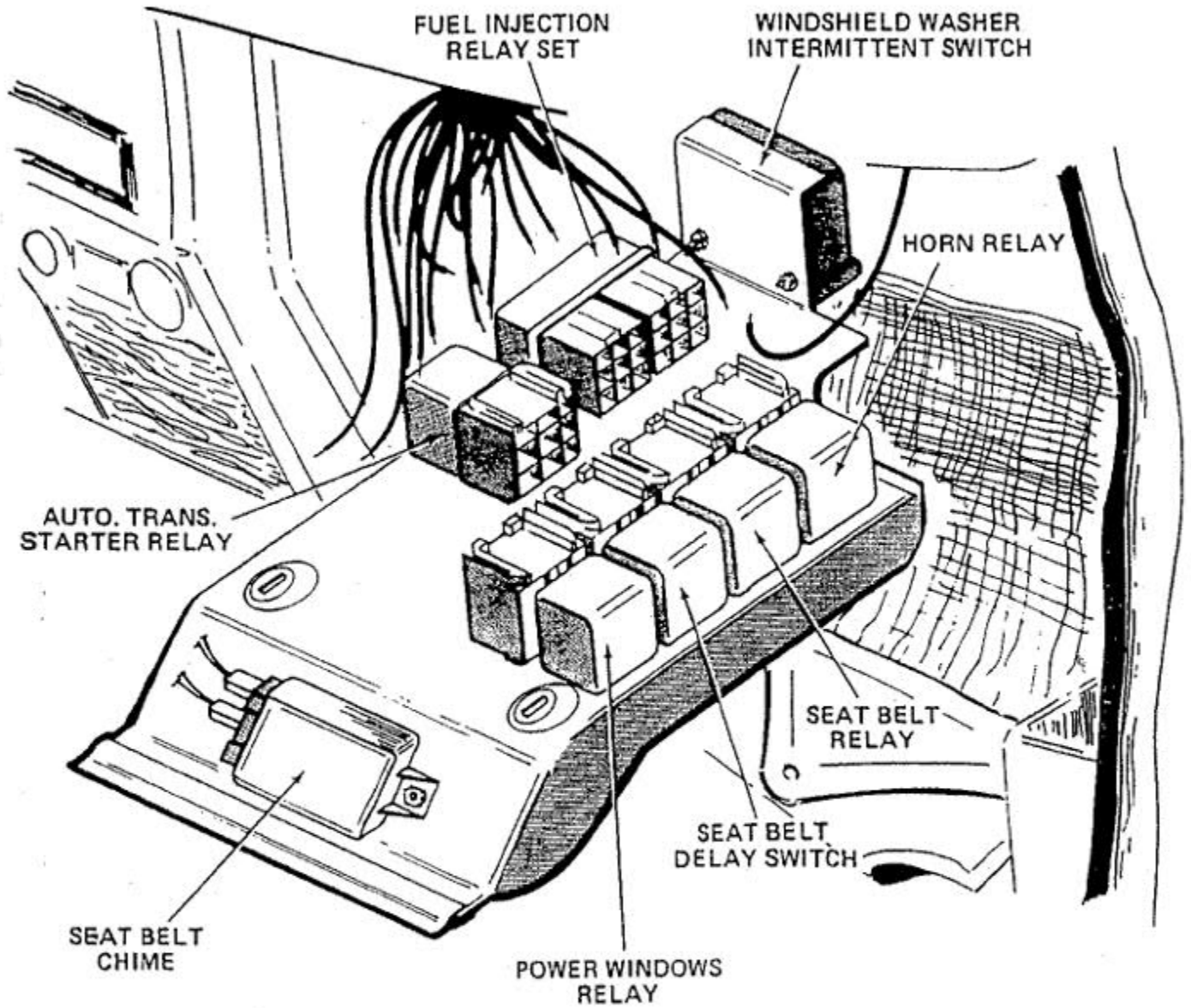
00100	Alternator w/electronic regulator	02304	Turn signal indicator
00400	Starter	02305	Battery charge indicator
00601	Starter relay (automatic transmission)	02307	Low oil pressure indicator
00612	Power windows relay	02309	Low fuel indicator
00605	Horn relay	02310	Brake system effectiveness indicator
00649	Relay set	02313	Fasten seat belts indicator
00710	Seat belt buzzer relay	02327	Lambda sensor maintenance indicator
00801	Brakerless ignition distributor	02400	Tachometer
01000	Engine water temperature gauge sending unit	02600	Fuel gauge
01004	Coolant temperature sensor	02601	Air flow sensor
01100	Low oil pressure indicator sending switch	02700	Engine water temperature gauge
01102	Stop light switch	02800	Radio
01103	Back-up light switch	02900	Speedometer
01105	Heater fan switch	03000	Clock
01117	Switch on driver's seat belt	03300	Steering lock ignition switch
01121	Cooling fan thermostatic switch	03302	Windshield wipers speed switch
01125	Engine overheat warning switch	03304	Starter and back-up light switch (automatic transmission)
01128	Lighting switch	03305	Power window switch
01140	Hand brake "ON" switch	03306	Power window switch
01154	Thermo time switch	03311	Power antenna switch
01300	Battery	03313	Hazard warning signal switch and indicator
01400	Cooling fan motor	03316	Throttle plate switch
01401	Heater fan motor	03503	Ideogram light rheostat
01407	Fuel injector	03701	Turn signal switch
01408	Cold start valve	03702	High/low beams changeover switch
01500	Power window motor	03703	Wiper/washer switch
01501	Power window motor	03800	Windshield wiper intermittent switch
01504	Antenna motor	03900	Windshield washer pump
01505	Windshield wiper motor	03901	Electrical fuel pump
01704	Left low beam	04200	Fuel gauge sending unit
01705	Right low beam	04303	Turn signal and hazard flasher
01908	Left license plate light	04400	Fuse box
01909	Right license plate light	04501	In-line fuse for cigarette lighter
01914	Left front parking and turn signal light	04524	In-line fuse for fuel injection (16A)
01915	Right front parking and turn signal light	04600	Cigarette lighter
01920	Left front side marker light	04700	Electrical sockets
01921	Right front side marker light	04801	Water temperature gauge indicator resistor
01922	Left rear side marker light	05001	Brake fluid level switch
01923	Right rear side marker light	05005	Fasten seat belts and remove key chime
01924	Left tail, turn signal, stop and back-up light	05309	Auxiliary air regulator
01925	Right tail, turn signal, stop and back-up light	05500	Right radio speaker
02102	Passenger compartment light — with switch on dashboard	05501	Left radio speaker
02107	Trunk compartment light	05703	Ignition coil assembly
02120	Optical fiber illumination light source	05901	Right horn
02212	Courtesy light jamb switch — right door	05902	Left horn
02213	Courtesy light jamb switch — left door	06204	Electronic control unit
02215	Horn button	06302	Delay switch — seat belt indicator
02301	Parking lights indicator	06602	Lambda sensor
02302	High beams indicator	06702	Lambda sensor indicator switch unit

# Connector Codes

CONNECTOR NUMBER	NO. OF PINS	CIRCUITS
C1	2	Paring and turn signal – left front parking lights
C2	2	High/low beams – left front headlights
C3	1	Power for left front side marker light
C4	2	Cooling fan thermostatic switch
C5	2	Cooling fan
C6	1	Power to starter solenoid
C7	1	Power to starter motor
C8	2	High/low beams – right front headlights
C9	2	Parking and turn signal – right front turn signal
C10	1	Power for right front side marker light
C11	2	Windshield washer pump
C12	4	Windshield wiper intermittent switch
C13	2	Windshield wiper motor
C14	2	
C15	2	
C16	5	Lambda sensor indicator switch unit
C17	4	Power distribution connector
C18	11	Rear lights, driver's seat belt switch, power antenna motor, fuel tank sending unit, and trunk compartment light
C19	1	Power to electric fuel pump
C20	8	Turn signal switch, high/low beam switch, and horn button
C21	6	Horn button and windshield washer/wiper switch
C22	11	Instrument cluster
C23	5	
C24	7	
C25	4	
C26	5	
C27	3	
C28	3	
C29	1	Windshield washer switch
C30	2	Remove key switch at ignition switch
C31	5	Ignition switch
C32	7	Hazard switch
C33	7	Windshield wiper speed switch, panel light rheostat, brake system effectiveness indicator, and fasten belts indicator
C34	3	Heater motor
C35	8	Power windows and courtesy light
C36	8	Radio, and cigarette lighter
C37	2	Back-up light switch
C38	1	Cigarette lighter
C39	1	
C40	2	Right rear parking and side marker lights
C41	6	
C42	6	Connector for right rear lights at left rear parking light
C43	7	Left rear parking and side marker lights
C44	2	
C45	2	Starter and back-up light switch (Auto. Trans)
C46	1	Left power window motor
C47	1	
C48	1	Right power window motor
C49	1	



# Component Board

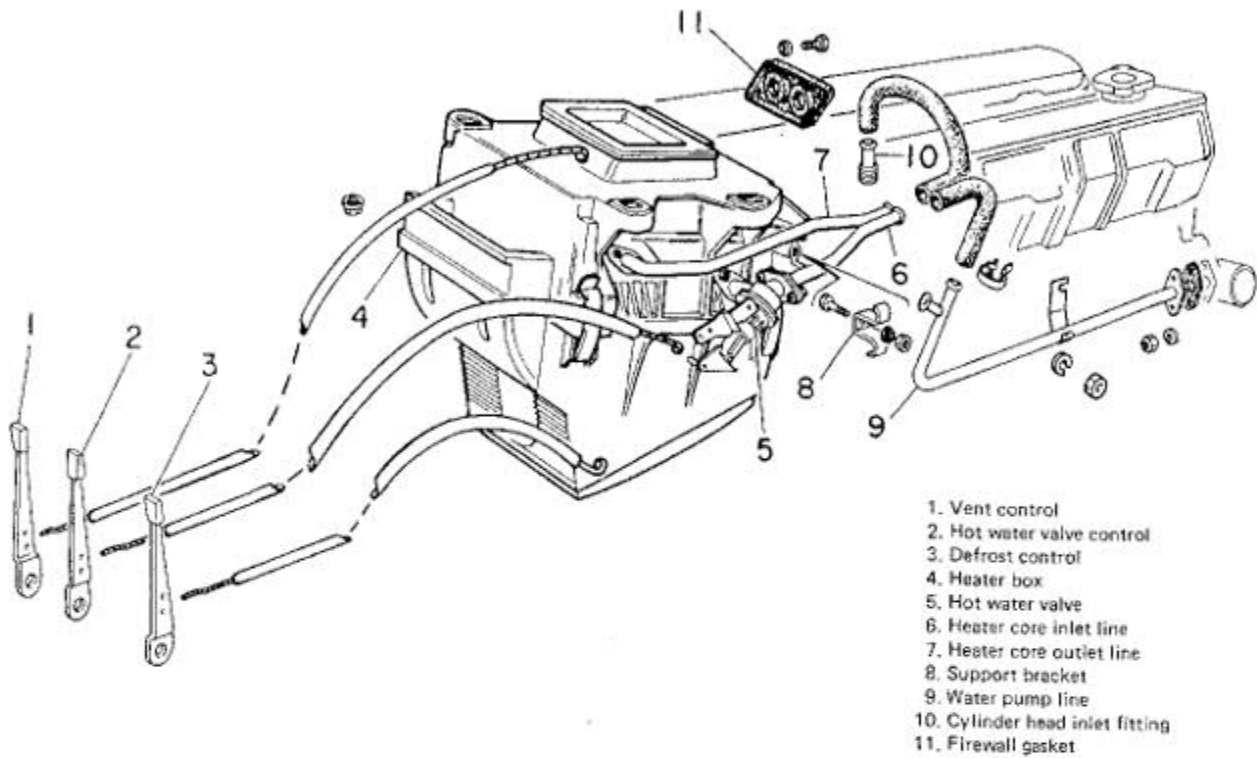


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# ACCESSORIES - 50

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

		PAGE
501.01	Ventilation and Heating .....	50-1
501.17	Windshield Washer .....	50-9



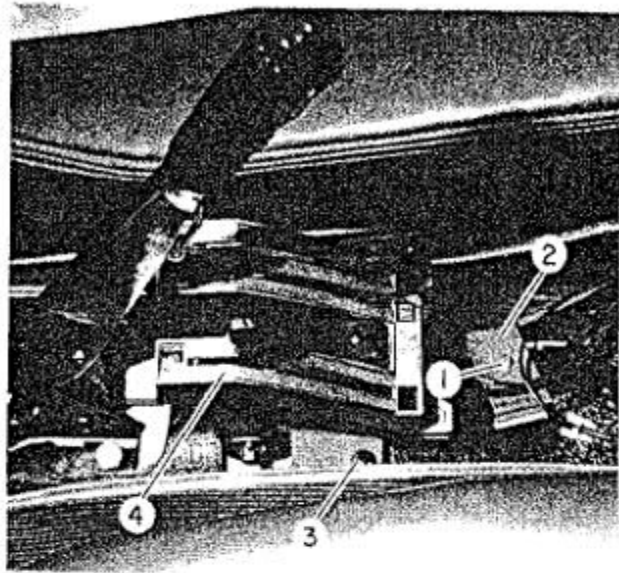
HEAT/VENT/DEFROST ASSEMBLY

Remove screw (1) holding control cables clamp (2).

Pry open clamps on side of transmission hump to release control cables.

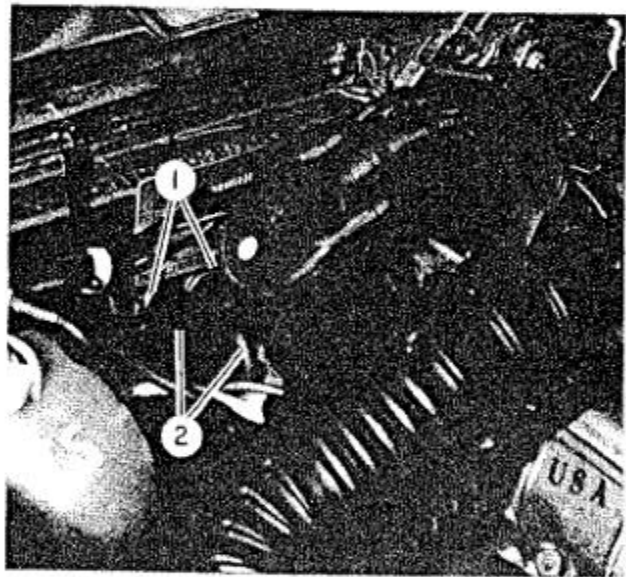
Remove three nuts (3) securing control lever assembly (4) to body.

1. Screw 2. Clamp 3. Nut 4. Control lever assembly



From engine compartment, loosen clamps (1) on two heater hoses (2) at firewall and pull hoses off heater box lines.

1. Clamps 2. Heater hoses



From under instrument panel, remove two screws holding radio rear support bracket to body. Disconnect electrical leads (1).

Remove four nuts holding heater box (2) to body. Lower heater box and carefully withdraw it from under instrument panel.

Installation is reverse of removal.

Refill cooling system and bleed air from system (refer to Engine Section for bleeding procedure).

1. Electrical leads 2. Heater box 3. Mounting lugs



Remove fan shroud by lifting it out.

To remove fan and motor (1), release two clips (2) holding motor to lower half of heater box. While feeding wires thru opening (arrow), lift motor out.

Reassembly is reverse of disassembly.

1. Fan and motor 2. Clip



## HEATER BLOWER

### REMOVAL AND INSTALLATION

Remove center console. Refer to BODY SECTION.

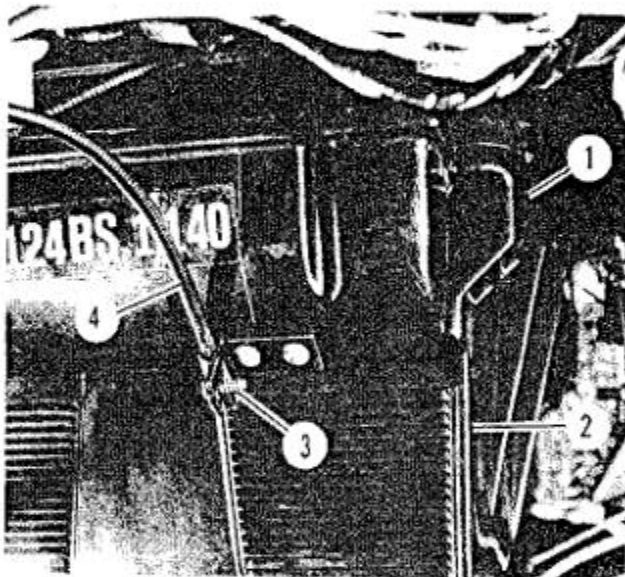
Remove nut securing ground wire for blower to stud above and to left of housing.

Disconnect blower electrical connectors.

Remove screw (3) holding floor door cable (4) to lower half (2) of heater box.

Remove four clips (1) holding lower half (2) to upper half of heater box. Move lower half out to passenger's foot well.

1. Clip 2. Heater box lower half 3. Screw 4. Floor door cable



Push floor door cable housing down to fully open door. Pull white plastic clip back to free cable end. Pull cable end out of door.

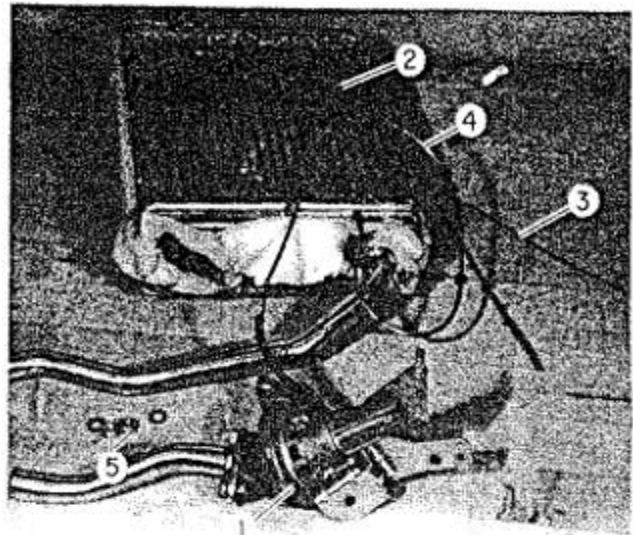
When reconnecting cable, slide cable through door and plastic clip. Push clip up over cable end to secure cable in door.

To remove control valve (1) from core (2), first release sensor line (4) support clip (3). Then remove two nuts (5) holding valve to core.

**CAUTION:** When installing control valve or outlet line to core be careful not to overtighten nuts. This could damage core.

Installation is reverse of removal.

1. Heater control valve 2. Heater core 3. Support clip 4. Sensor line 5. Nut



## HEATER VALVE

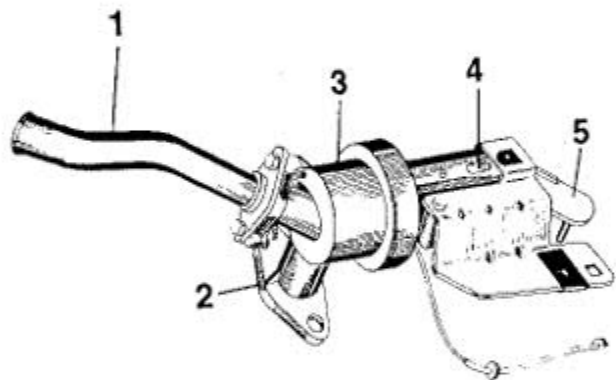
### ADJUSTMENT

**NOTE:** On later versions the heater control valve is adjustable for the full close position. If warm air is coming out of the heater with the heater control off, check heater valve adjustment as follows.

With heater valve removed, make sure lever (5) is in full off position. Blow air through valve (3) and check for air coming out inlet (1). If necessary adjust screw (4) to completely shut off air.

**NOTE:** Screw (4) can be turned either way to obtain full close position.

1. Inlet 2. Outlet 3. Valve 4. Adjustment screw 5. Lever

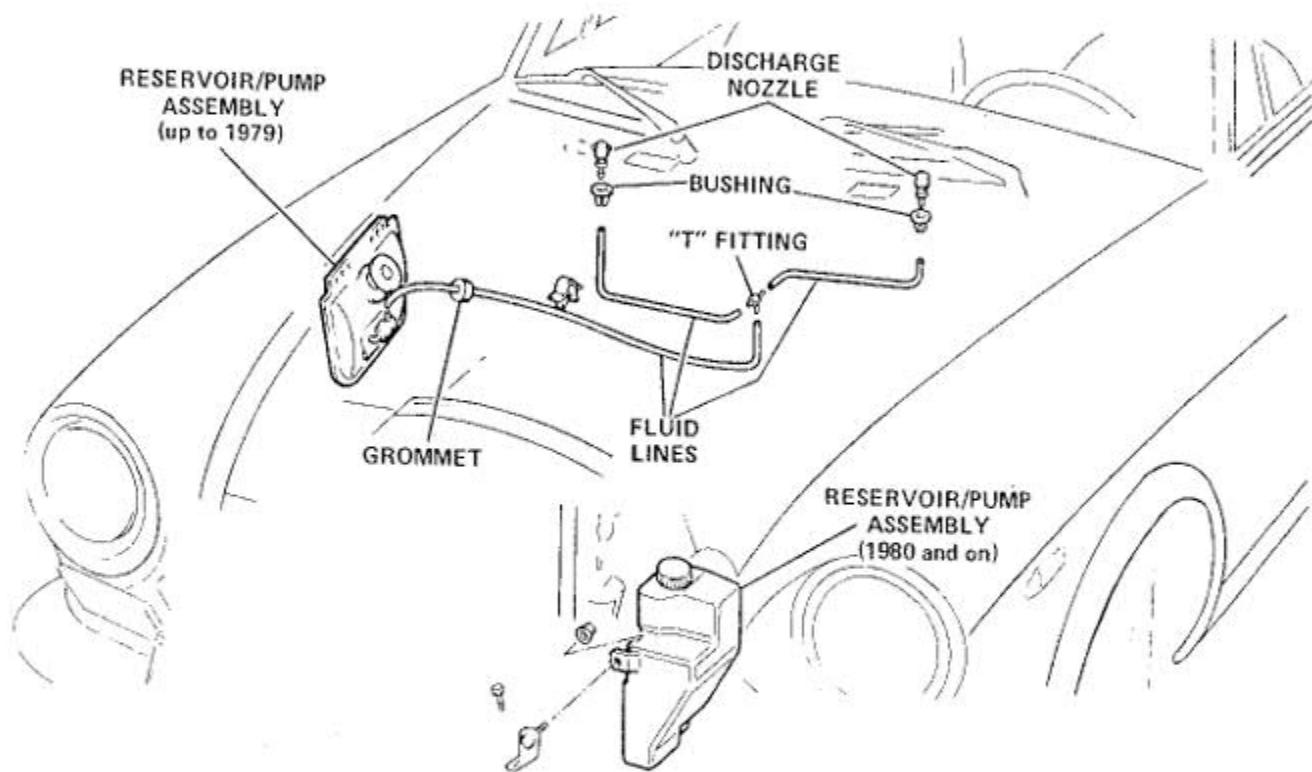


## WINDSHIELD WASHER SYSTEM

Fluid pressure for windshield washer system is provided by an electric pump which is an integral part of the reservoir. System failure is usually caused by one of the following:

- Low fluid level
- Clogged discharge nozzles
- Disconnected, clogged or kinked fluid lines
- Electrical circuit failure
- Faulty pump

Discharge stream from nozzles can be adjusted with screwdriver at nozzle.



WINDSHIELD WASHER SYSTEM

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# BODY - 70

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

		PAGE
701.01	Hood.....	70-1
701.02	Instrument Panel.....	70-3
701.17	External Bodywork.....	70-5
701.23	Folding Top.....	70-7
701.28	Doors – Door Glass – Lock Mechanism.....	70-15
701.55	Windshield.....	70-23
701.60	Trunk Lid.....	70-25
703.02	Radiator Grill.....	70-27
703.06	Front Bumper.....	70-29
703.07	Rear Bumper.....	70-31
706.01	Seats.....	70-33
706.13	Package Shelf.....	70-35
706.23	Interior Trim.....	70-37
70A	Service Tools.....	70-41



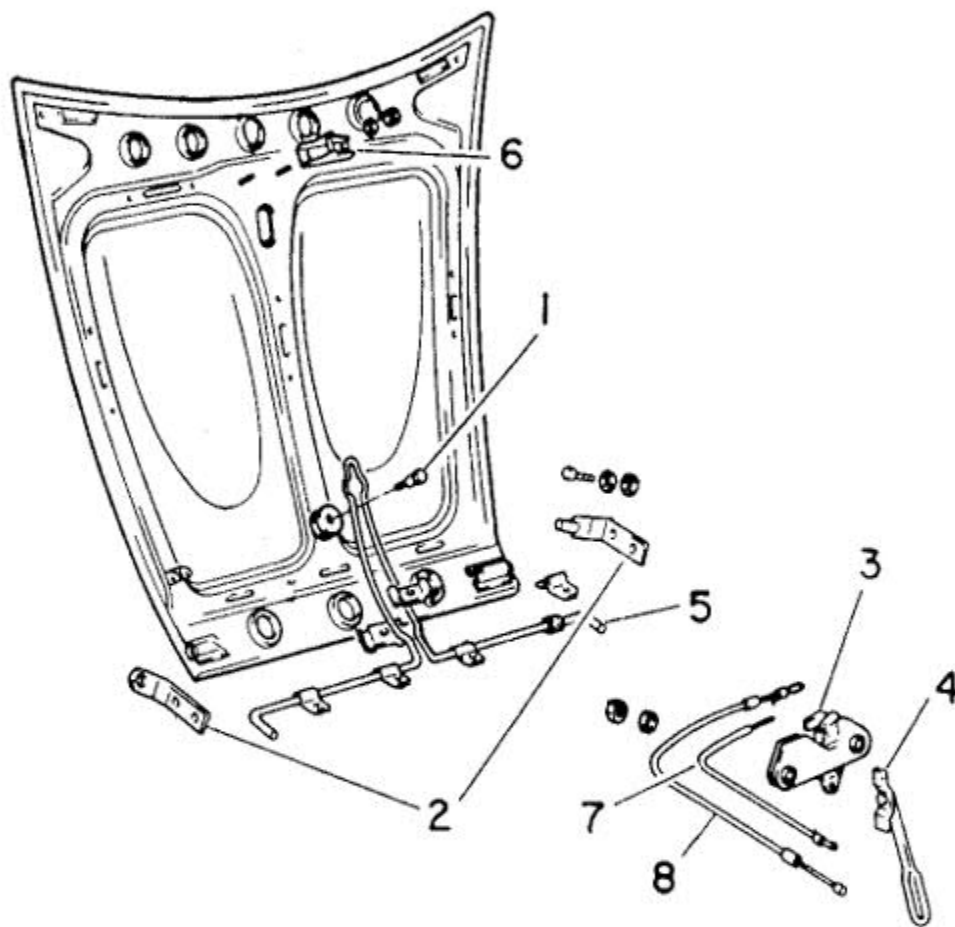
### REMOVAL, ADJUSTMENT AND INSTALLATION

Remove center guide bolt (1). Remove two bolts on each pivot bracket (2).

**NOTE:** Have an assistant help with hood removal to prevent damage to body.

Pivot brackets (2) are elongated for hood adjustment. Latch assembly (3) and striker plate (6) positions can be shifted for adjustment by loosening mounting nuts.

**NOTE:** An emergency hood release cable (8) is provided in the event that normal hood release becomes inoperative. Emergency release cable is located near hood release handle (4).



- 1. Bolt
- 2. Pivot bracket
- 3. Hood latch assembly
- 4. Hood release handle

- 5. Hood support bar
- 6. Striker plate
- 7. Hood release cable
- 8. Emergency release cable

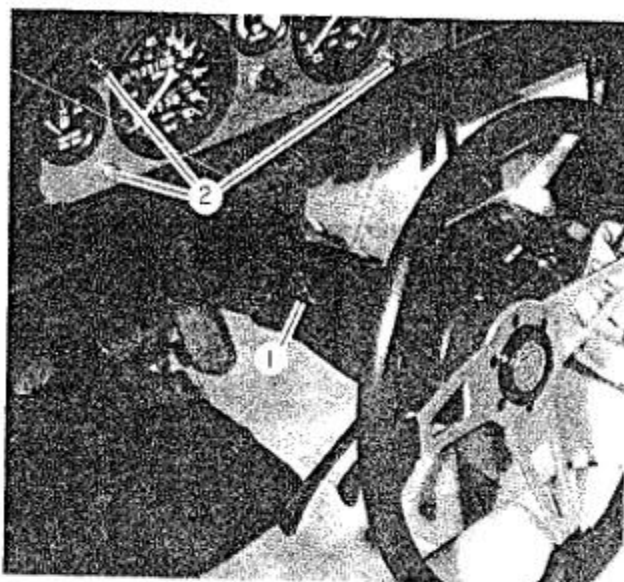
### REMOVAL AND INSTALLATION

Disconnect battery located in trunk.

Remove four bolts holding steering column assembly (1) to dash and lower column as shown.

Unscrew four chrome retainer screws (2) and pull instrument cluster out far enough to gain access to connectors.

1. Steering column assembly 2. Chrome screw

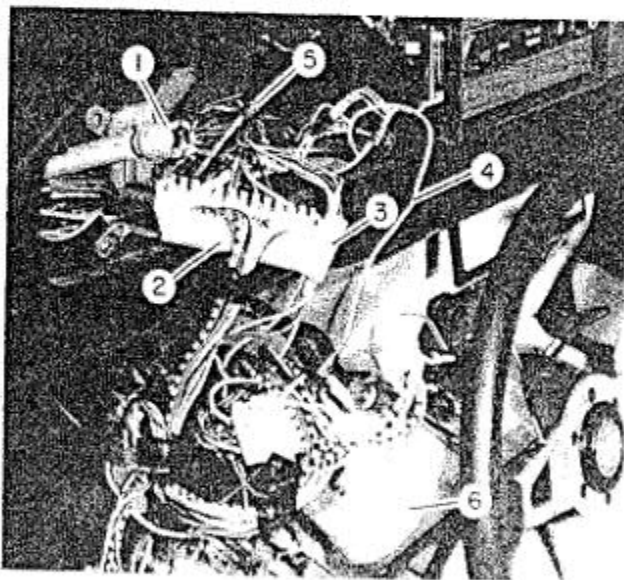


Disconnect speedometer drive (1), large electrical connector (2) and small electrical connector (3).

On fuel injected vehicles only, cut wire (4) in half (upon re-installation, splice this wire together).

If engine is turbo-charged, disconnect pressure line (5) and electrical connector to turbo gage.

1. Speedometer drive 2. Electrical connector 3. Electrical connector  
4. Lambda sensor warning wire 5. Turbo pressure line 6. Instrument cluster

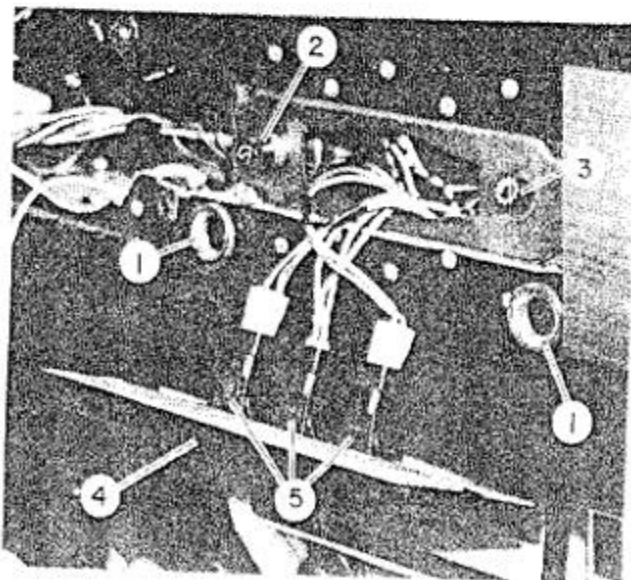


Unscrew chrome nuts (1) holding windshield wiper sweep rate control (2) and dash lights rheostat control (3).

Pull center panel (4) out. Remove light bulbs from sockets (5), first marking their positions.

Remove retaining nut from outer lighting switch on left side of panel and push switch thru panel.

1. Chrome nut 2. Windshield wiper sweep rate control 3. Dash lights rheostat control  
4. Center panel 5. Light socket

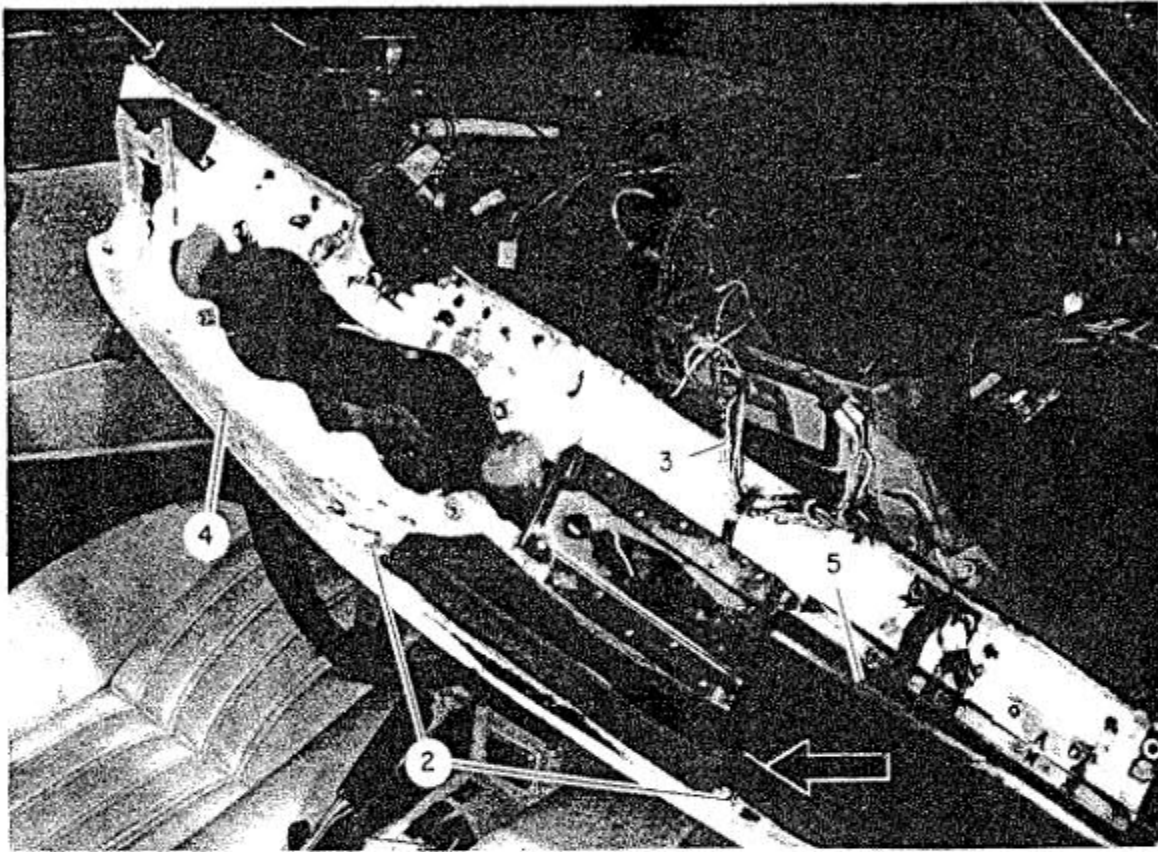


Remove screws under dash holding instrument panel end filets to panel.

Remove two nuts and two bolts under dash to remove instrument panel (4). The two bolts are located at ends (1) of panel, and the two nuts are located centrally (2) next to windshield on either side of defroster duct.

Access to nut on right side is thru glove box (glove box liner (5) has an opening (arrow) in upper left portion for access to this nut).

Carefully pull instrument panel away from body and unclip wire harness (3) from panel.



1 & 2. Fastener points for instrument panel 3. Wire harness 4. Instrument panel 5. Glove box liner

## INSTALLATION

Installation is reverse of removal.

**NOTE:** Make certain that wire on fuel injected vehicles, cut in half during removal, is spliced together with a male and female connector so that it can be easily disconnected during next removal.

**FOLD OUT  
PAGE GOES  
HERE**

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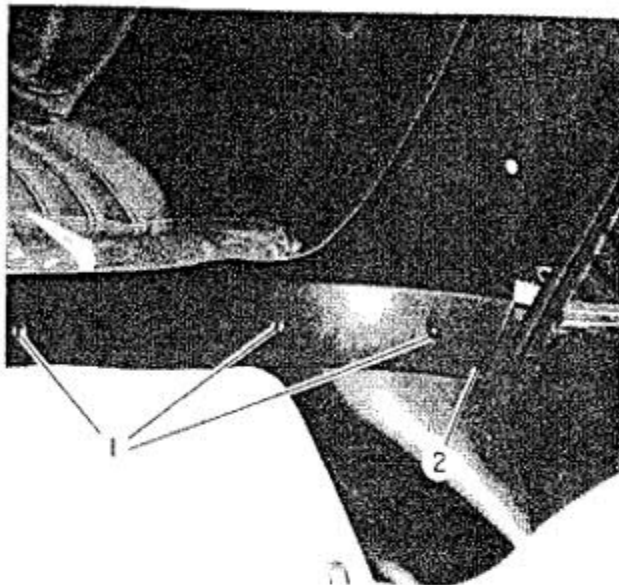
**REFER TO  
FOLDOUT.PDF**

### FOLDING TOP FABRIC REMOVAL

**NOTE:** If frame and fabric are to be removed together, refer to procedure in this section.

Remove screws (1) holding rear molding (2) around inside of rear well. Lift molding out.

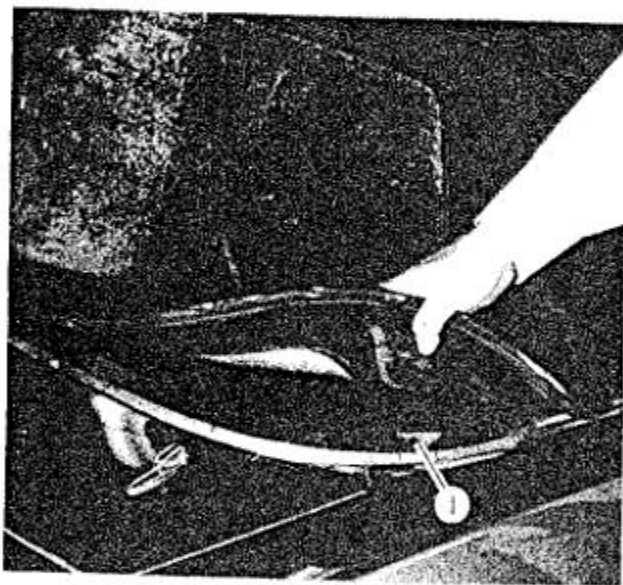
1. Screw 2. Rear molding



Unhook both windshield latches.

Loosen screws holding rear anchor bar (1) down. Lift bar up and pull top out from under bar as shown.

1. Rear anchor bar



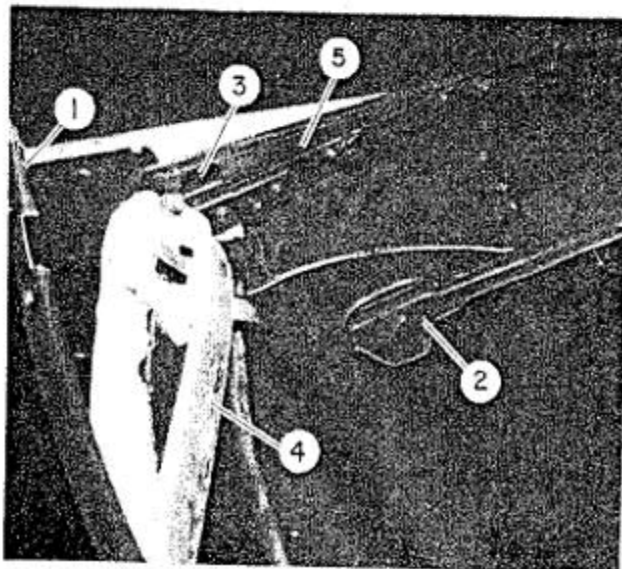
Remove screws holding rubber molding cover (1) in place.

Remove two screws holding each plastic frame guard (2).

Using a 1/8 in. (.125) drill, drill out rivets (3) on front part of window flaps (5) (one on each side).

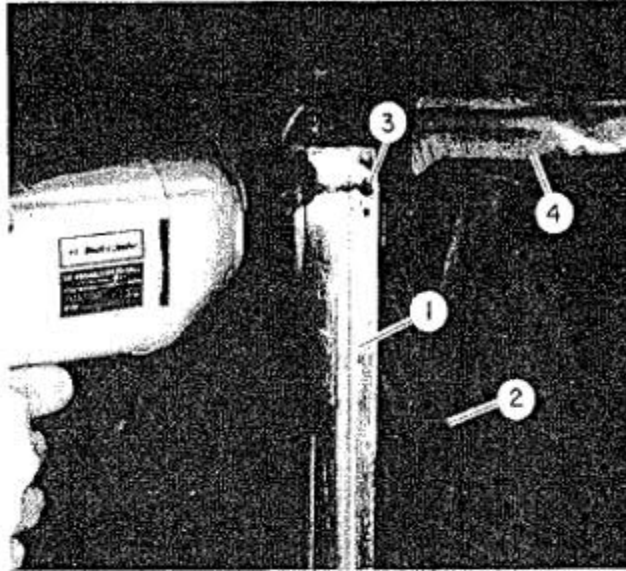
Remove rubber molding (4) and remove glue strip from front bow, being careful not to tear bow covering.

1. Molding cover 2. Plastic guard 3. Rivet 4. Rubber molding  
5. Window flap



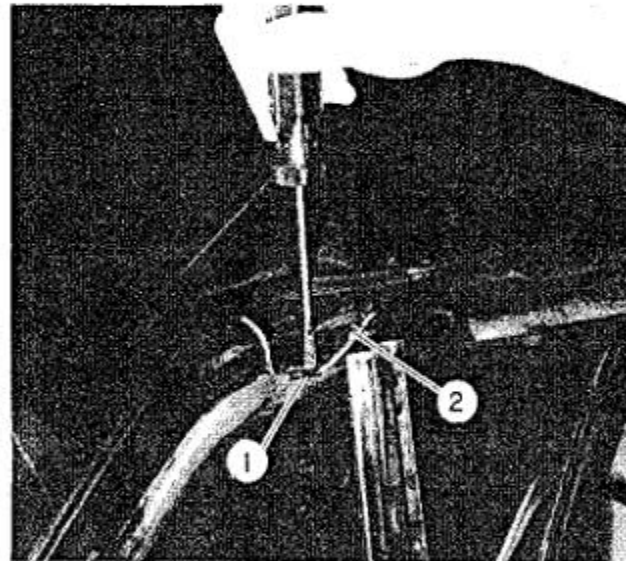
Using a 1/8 in. (.125) drill, drill out two rivets on top of quarter window frame (1) [one holds weatherstrip (2), and underneath weatherstrip is rivet (3) holding window flap (4)].

- 1. Quarter window frame
- 2. Weatherstrip
- 3. Rivet
- 4. Window flap



On each side, pry cable retainer guide (1) away from cable (2).

- 1. Cable retainer guide
- 2. Cable

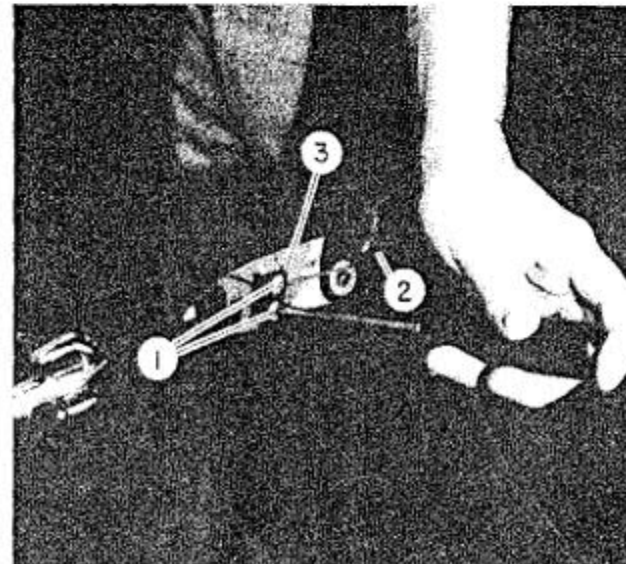


At rear well, loosen screws (1) holding cable (2).

From front bow anchor point, pull cables from old top.

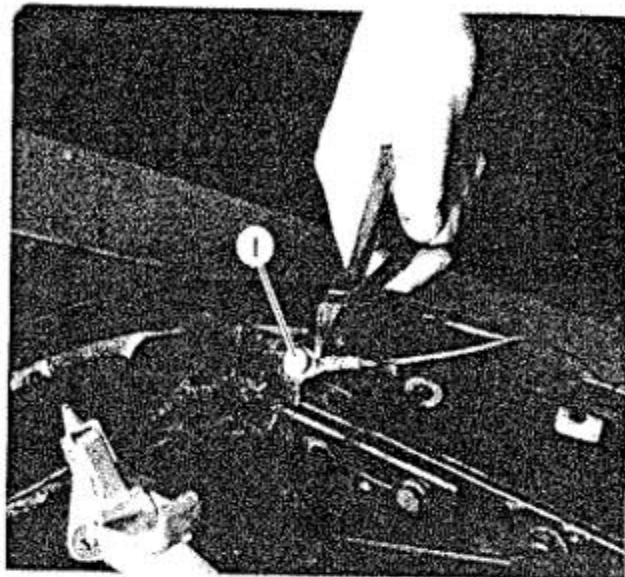
Remove top by pulling material away from bows (material is glued to bows).

- 1. Screw
- 2. Cable
- 3. Cable adjustment and rear anchor point



If cable is not serviceable, replace it by cutting cable at anchor pin (1). Install new cable assembly over anchor pin.

1. Cable anchor pin



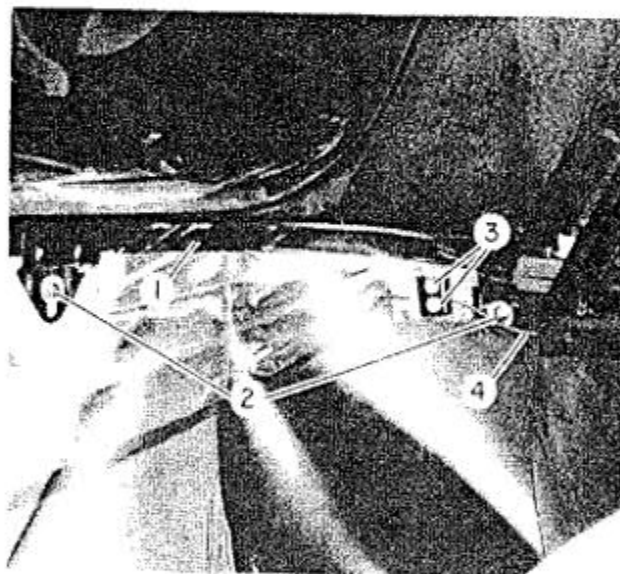
### INSTALLATION

Lay new top over bows and slide top rear stiffeners under rear anchor bar (1), pulling top taut from side to side.

**NOTE:** It may be easier to remove rear anchor bar and install top to bar; then install bar along with top to body.

Push bar down as far as possible and tighten screws (2), starting from center and working out.

1. Rear anchor bar 2. Screw 3. Adjusting screws 4. Cable

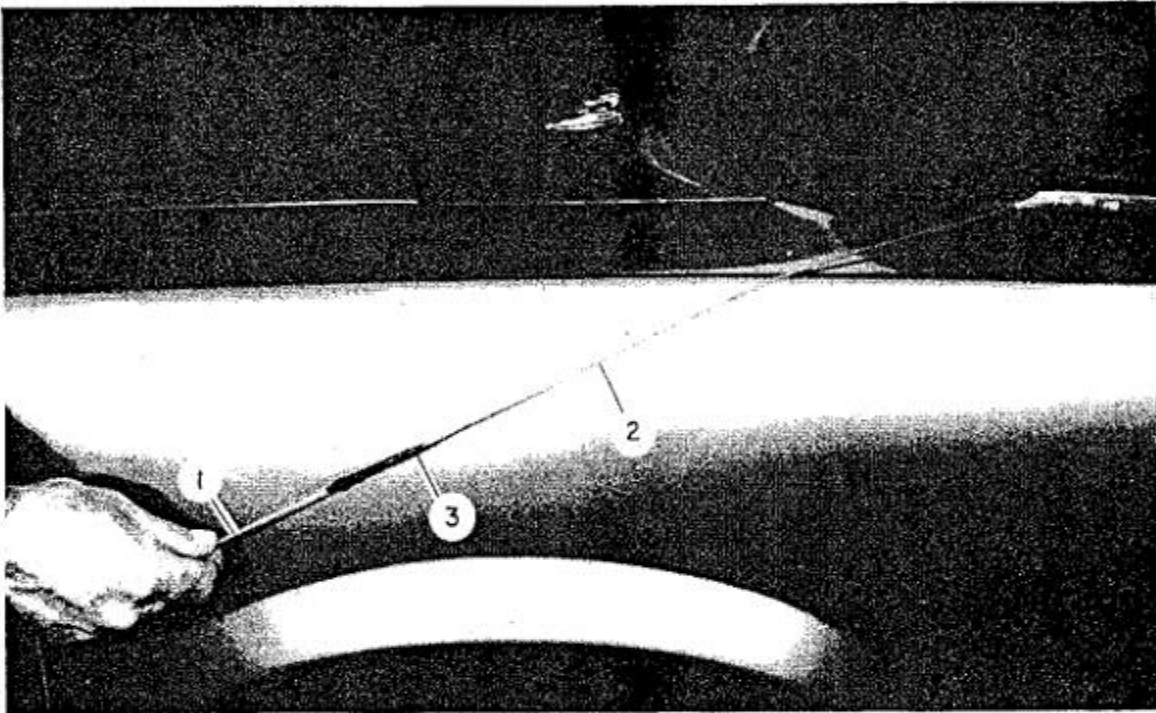


Fold frame full back and place top in position over front bow. Lift top up and forward, but do not latch top to windshield.

To pull cables thru top, first tie string (provided in new top) to cable at forward end of top. Fold cable back double and tightly tape electrical tape (3) around cable/string.

Carefully pull string (1) and cable (2) thru top. Allow cable end to hang loose at this time.

1. String 2. Cable 3. Electrical tape



Fold top assembly full back and remove top from front bow. Thoroughly clean old adhesive from bow with adhesive remover.





# Folding Top

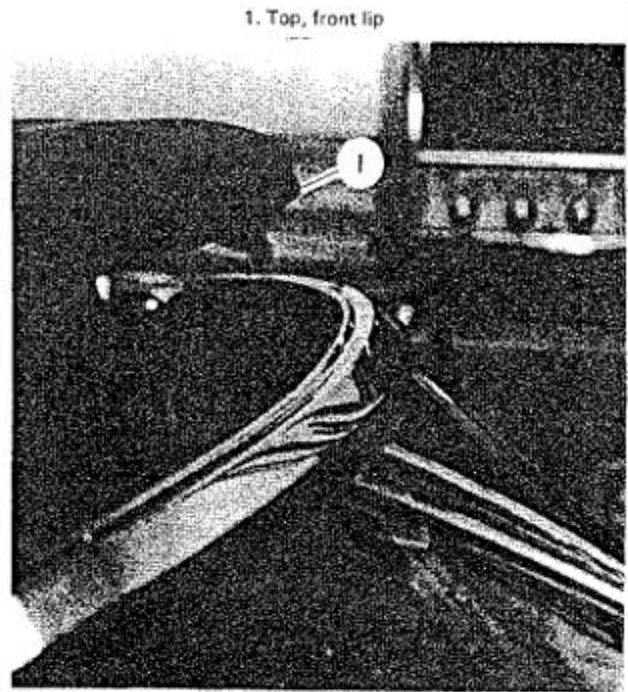
701.23

Page 70-11

Place top into position over front bow. Coat bow and top material with adhesive such as contact cement (Clear Bond, as shown is recommended since drying time is longer and position of top can be adjusted).

Position front lip (1) forward and down to provide a good fit between lip and windshield frame.

Place rubber molding in position on bow. Center molding with awl or scribe inserted thru screw holes. Secure in place with screws and molding cover.



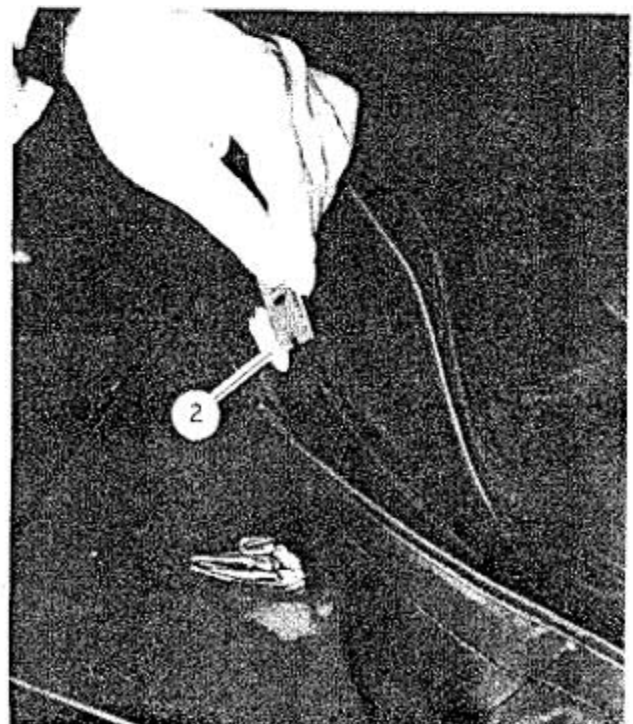
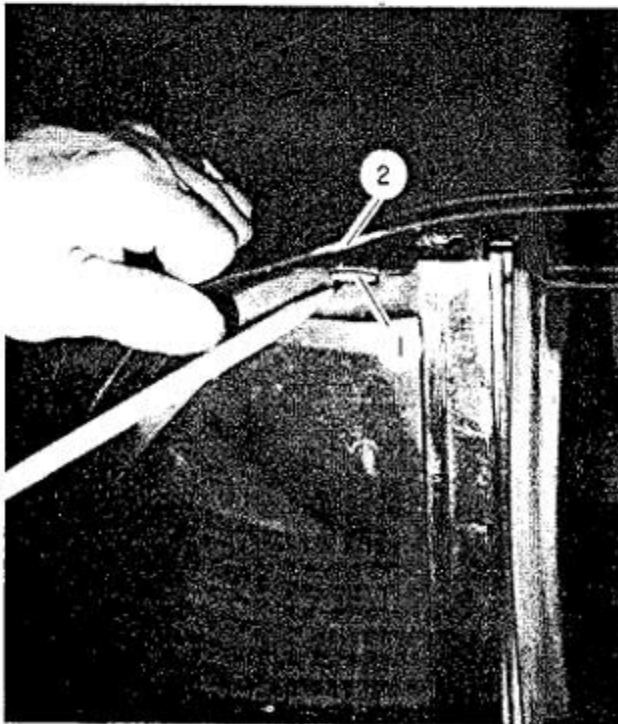
1. Top, front lip

Place top into full up position. Locate cable retainer guide (1) and with chalk, mark position (2) of retainer on top.

Lower top and cut slit in inner liner of top at this position.

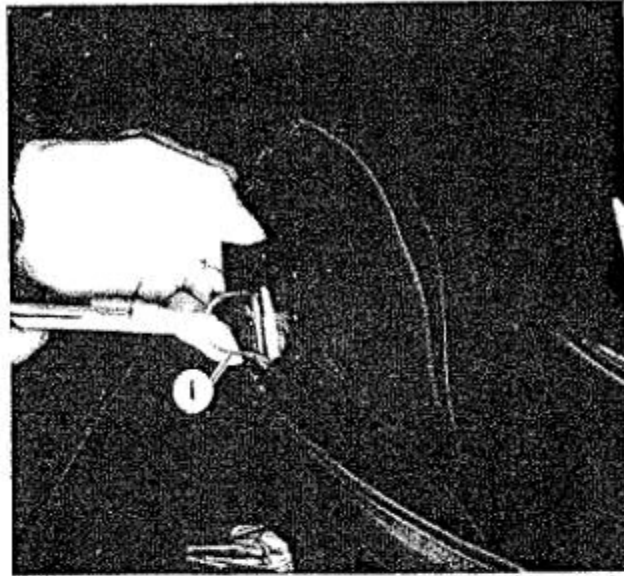
**CAUTION:** Gather inner liner up away from outer material so as not to cut thru to outer material.

1. Cable retainer guide 2. Chalk marked position



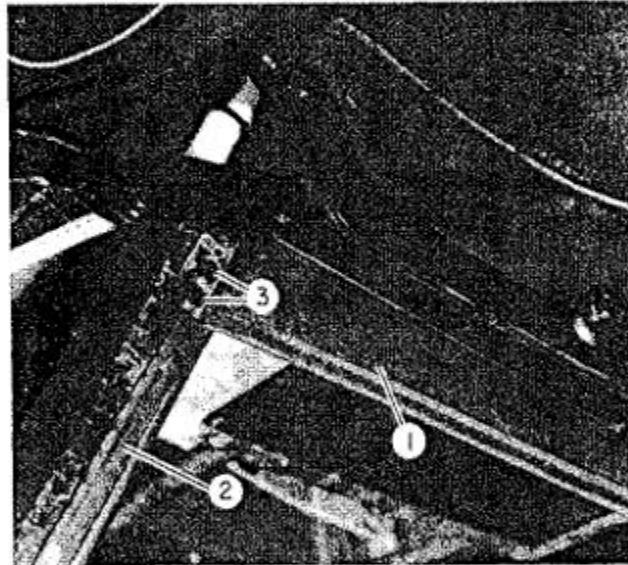
Pull cable (1) thru slit into loop as shown. Place top into full up position. Install cable into retainer/guide and with mallet lightly tap guide around cable. Cable must be able to move back and forth freely in guide.

1. Cable



Place window flaps (1) and weather strips (2) in position and install pop-rivets (3), or screws and nuts (supplied with new top), in holes where rivets were removed. Fasten flap at both front and rear (shown).

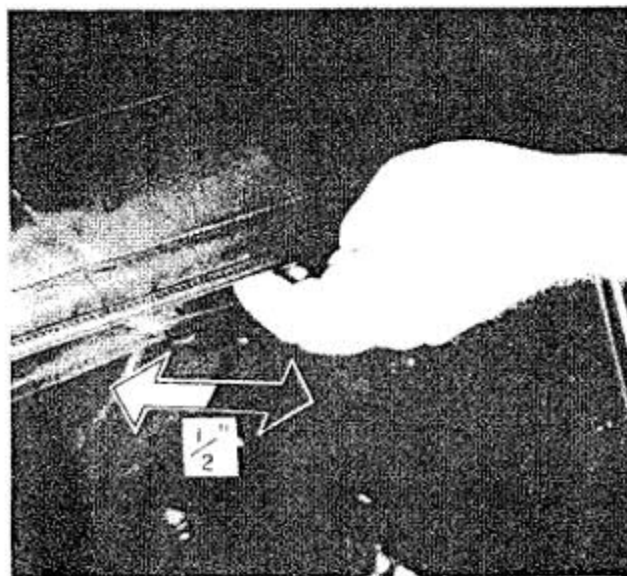
1. Window flap 2. Weather strip 3. Rivets



Latch top into position on windshield.

Run cable thru eyelet just in front of rear anchor/adjustment point. Insert cable under adjustment bracket. Gradually pull back on cable 1/8 to 1/4 in. at a time until tension is such that about 1/2 in. play is obtained on side of top. Tighten adjustment screws once adjustment of cable is correct.

Finally, line up bows correctly in relation to top material, and glue loose material to bows. On vehicles so equipped, install protective plastic covers over bows.



### FOLDING TOP FRAME/FABRIC REMOVAL, INSTALLATION AND ADJUSTMENT

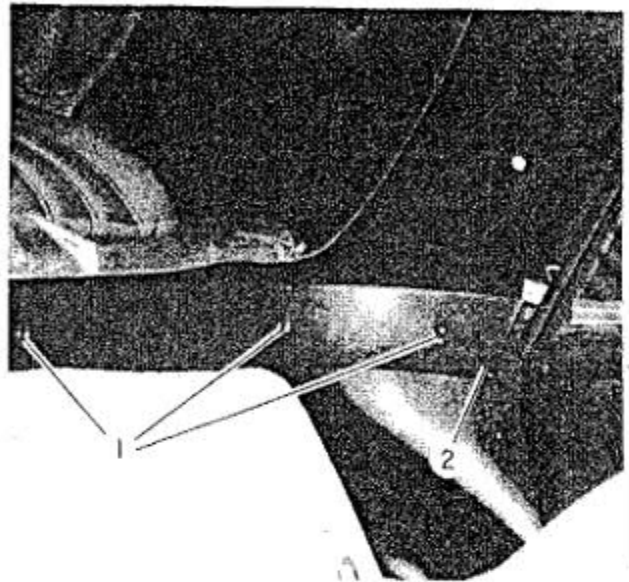
**NOTE:** If fabric only is to be removed, refer to preceding procedure.

Unhook windshield latches.

Remove both rear side panels, each held by two screws.

Remove rear molding (2) held by six screws (1).

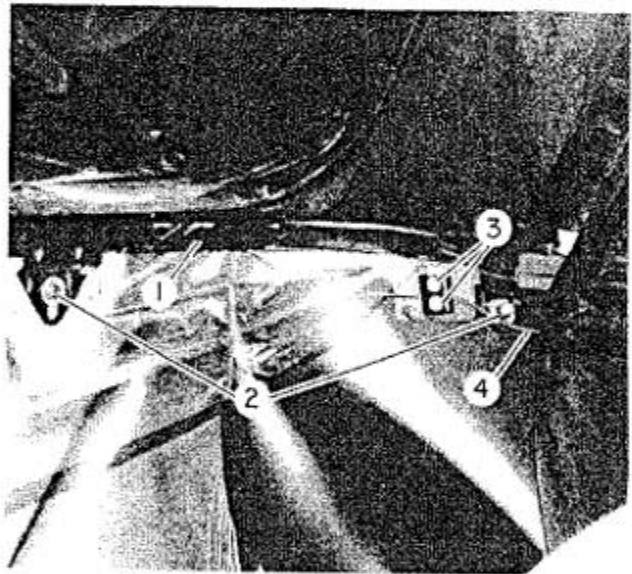
1. Screw 2. Rear molding



Remove three screws (2) holding rear anchor bar (1).

Loosen two screws (3) holding each cable rear adjuster/retainer and pull cable (4) free.

1. Rear anchor bar 2. Screw 3. Screw 4. Cable

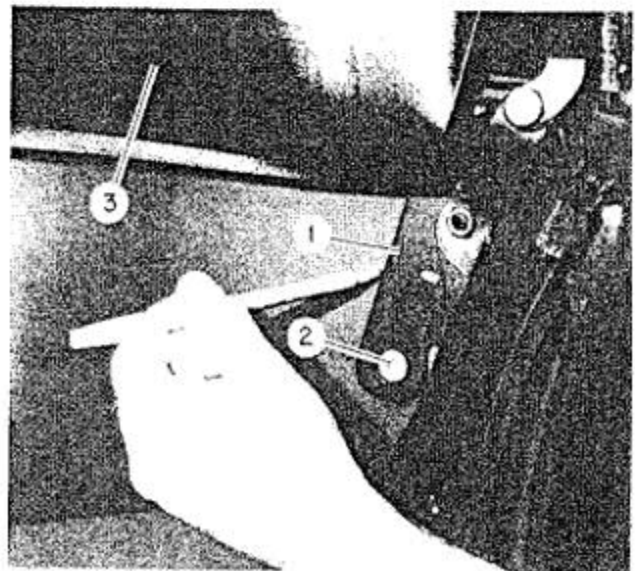


Lift flap (3) out of way.

Mark position of frame mount bracket (1) for reinstallation.  
Remove two allen head bolts (2) on each frame mount.

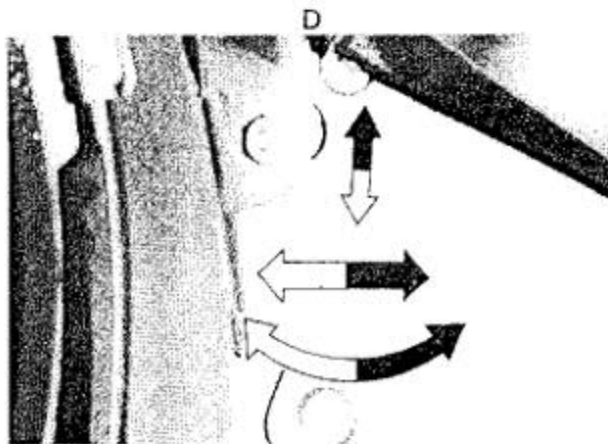
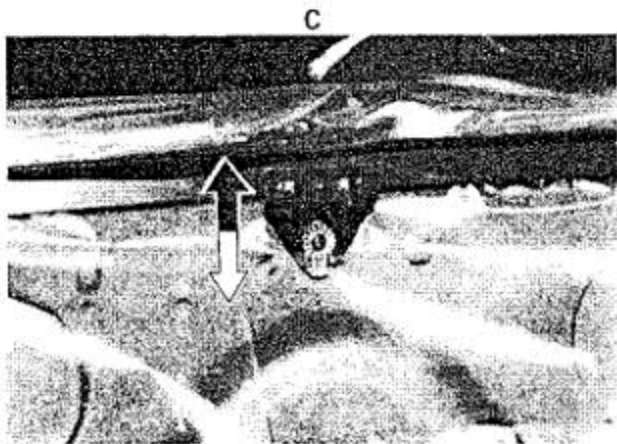
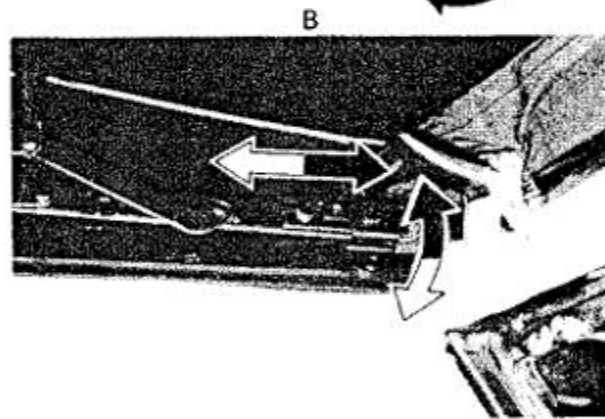
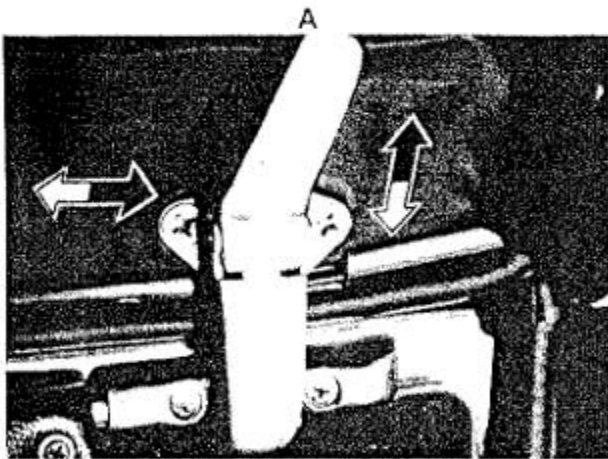
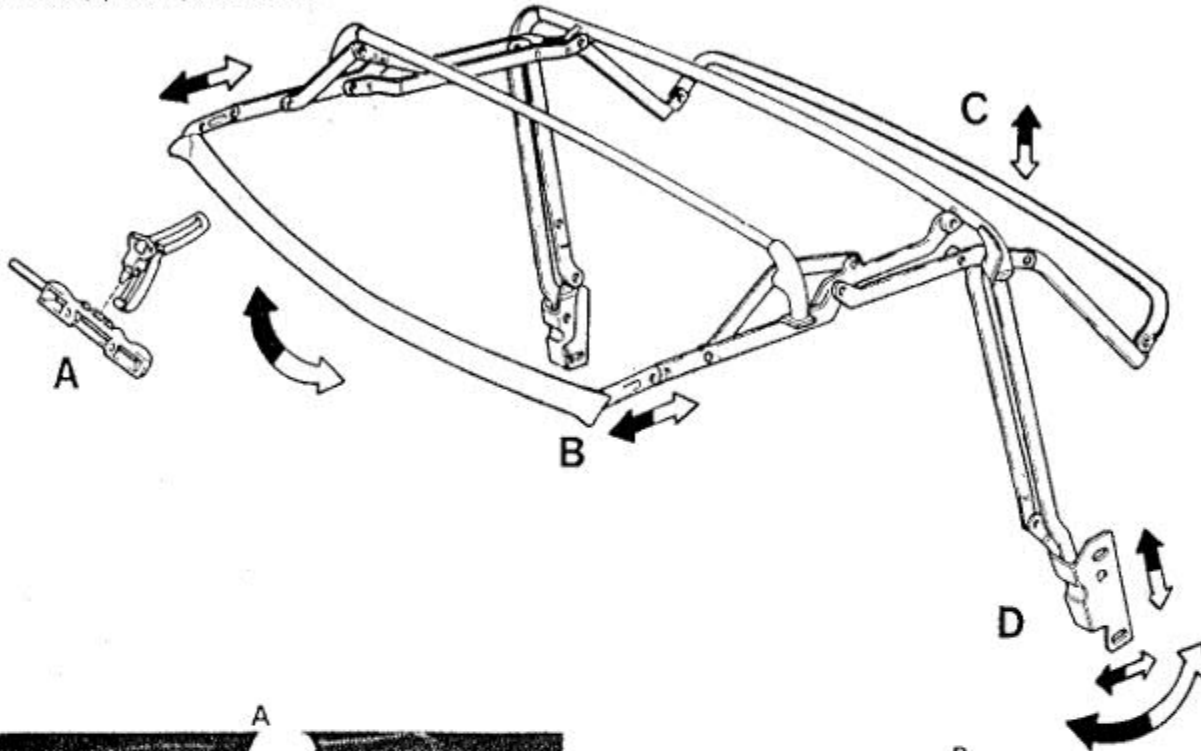
Remove entire top assembly by lifting up at rear bars. Note location and number of spacers behind frame mounts.

1. Frame mount bracket 2. Allen head bolt 3. Protective flap



Installation is reverse of removal. Adjustments are provided at:

- Rear bow (up/down)
- Frame mounts (up/down, fore/aft, and pivot)
- Front latches (up/down, and left/right)
- Front bow (up/down, and fore/aft)



## DOOR

### REMOVAL AND INSTALLATION

If equipped with door radio speakers, remove speaker cover and four screws holding speaker. Disconnect speaker leads.

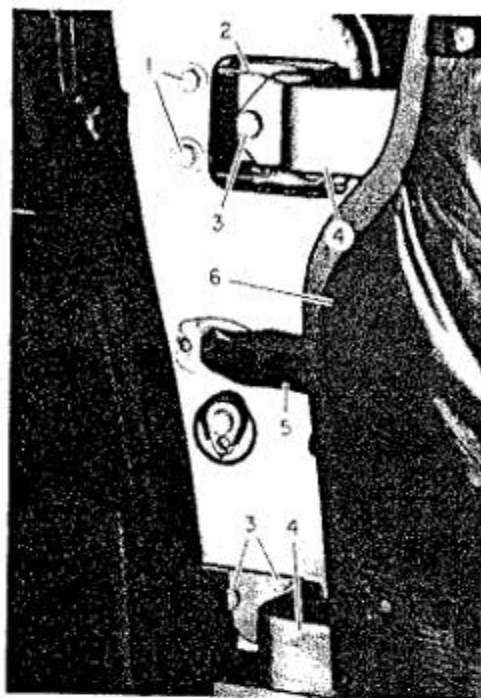
If equipped with power windows remove door trim panel (refer to Door Disassembly) and disconnect electrical leads.

Remove door check spring (2) by removing two bolts (1).

**NOTE:** Scribe position of door hinges for reinstallation.

Remove three bolts (3) on each hinge (4). Remove door, carefully feeding wire harness (5) thru door.

1. Bolt 2. Door check spring 3. Bolt 4. Hinge 5. Wire harness  
6. Door



### ADJUSTMENT

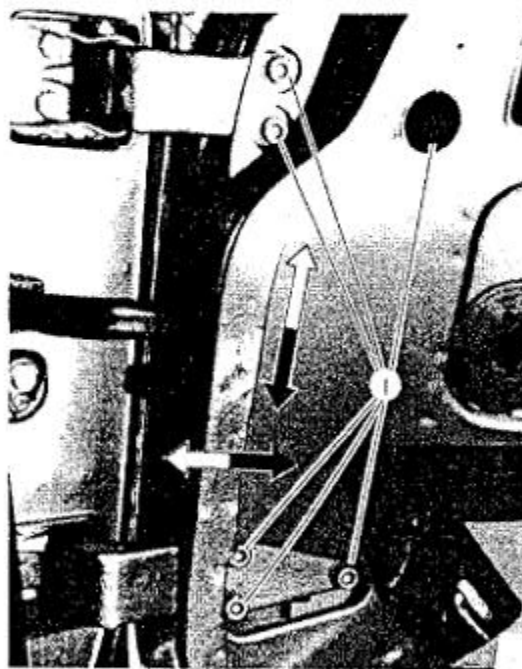
#### Fore/Aft and Up/Down

Remove door trim panel (refer to Door Disassembly).

Loosen three Allen head bolts (1) on each hinge and move door in desired direction.

If necessary, correct striker and door guide positions.

1. Allen head bolt

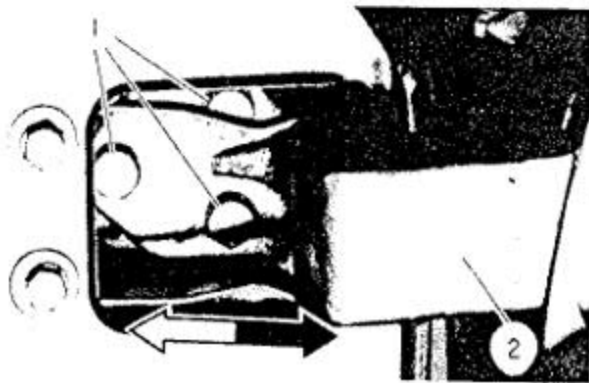


#### In/Out

Loosen three bolts (1) on each hinge (2) and move door in or out in desired direction.

If necessary, correct striker and door guide positions.

1. Bolt 2. Hinge

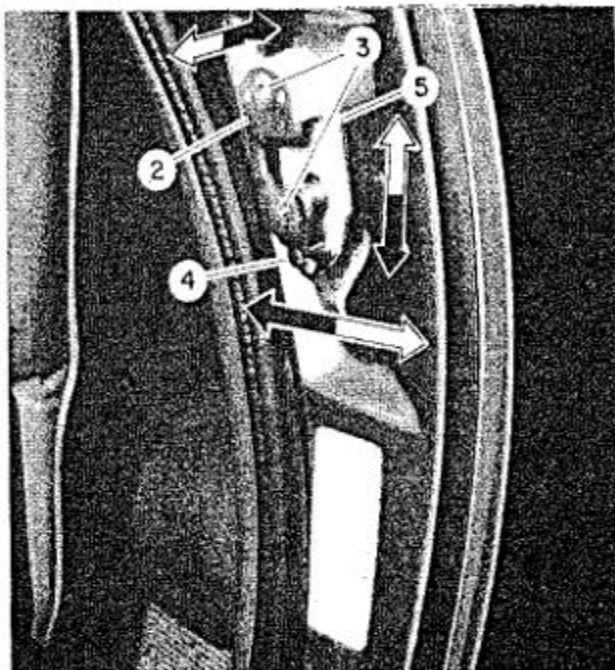
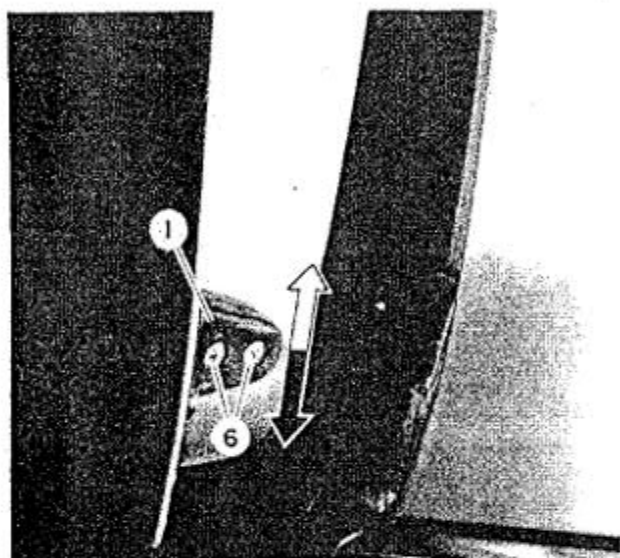


**ADJUSTMENT****Striker Assembly and Door Guide**

To adjust striker assembly (2) loosen two screws (3) and bolt (4) to adjust striker position up/down or in/out. Remove striker assembly and add or remove shims (5) to adjust fore/aft position.

If door rattles or is hard to open or close, with all other adjustments set, adjustment of door guide (1) will correct it. Loosen screws (6) and position guide up or down as needed.

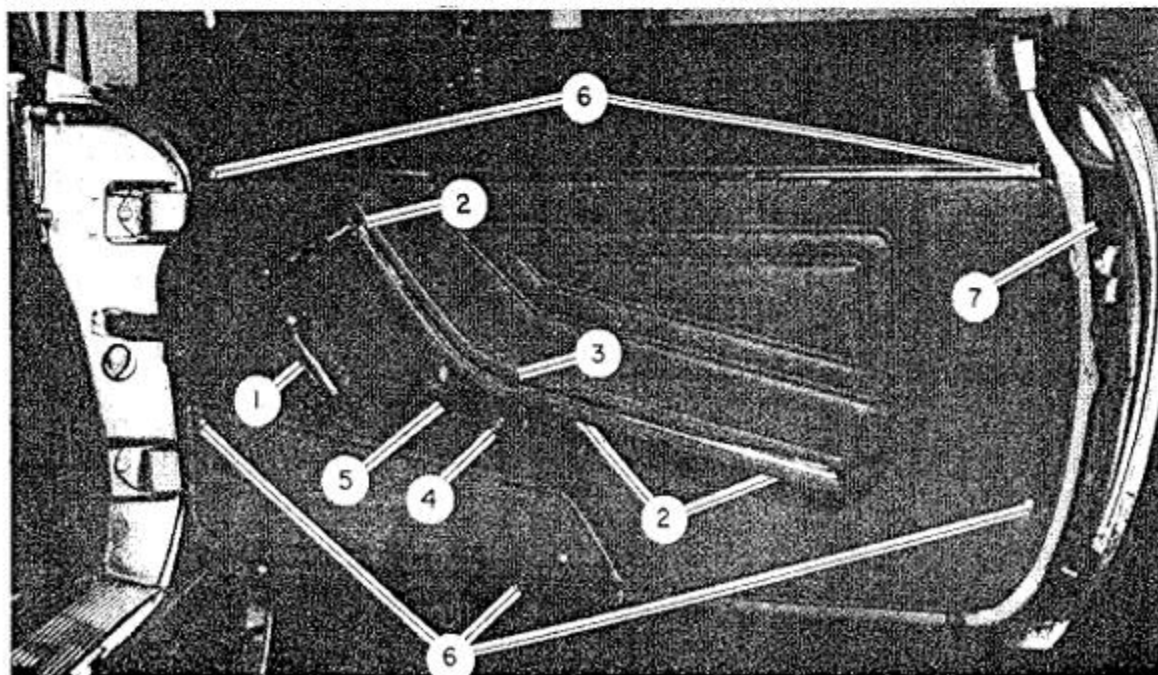
1. Door guide 2. Striker assembly 3. Screw 4. Bolt 5. Shim 6. Screw

**DISASSEMBLY AND REASSEMBLY****Door Trim Panel Removal and Installation**

Remove window regulator handle (1) using tool A.78034. Remove three screws (2) holding arm rests (3). Remove screw (4) holding door latch handle (5). Remove five screws (6) holding door trim panel (7) and lift panel off.

Installation is reverse of removal.

1. Window regulator handle 2. Screw 3. Arm rest 4. Screw 5. Door latch handle 6. Screw 7. Door trim panel

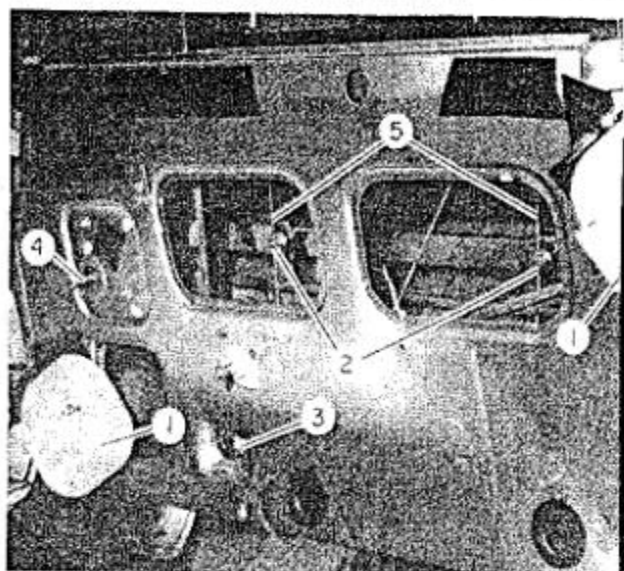


### Window Regulator Removal (Power and Manual)

Untape and place protection shields (1) out of way.

Lower window until window cable retaining screws (2) are accessible. While providing support for window, loosen screws only enough to allow cable (5) to be withdrawn. Lower window in guides.

1. Protection shield 2. Screw 3. Tensioner bolt  
4. Window regulator 5. Regulator cable



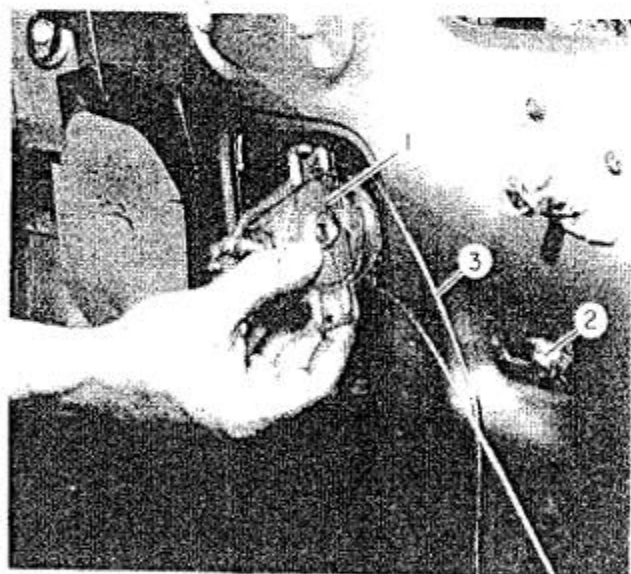
Loosen cable tensioner bolt (2).

Remove three nuts holding window regulator (1) to door.

**CAUTION:** If same regulator/cable assembly is to be reinstalled, first wrap cables together at regulator drum to prevent it from unraveling (refer to Installation below).

Remove cable (3) from pulleys and withdraw regulator assembly from door.

1. Window regulator 2. Tensioner bolt 3. Cable



### Window Regulator Installation (Power and Manual)

**NOTE:** Window regulators are interchangeable for either side.

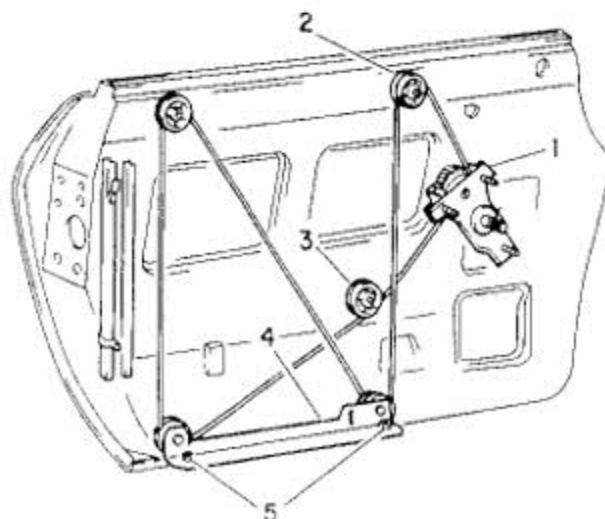
**CAUTION:** Do not remove metal clip securing cable tightly against drum on new regulator until it is installed and has been strung on all pulleys. To do so will cause cable to unravel from drum.

Secure window regulator (1) to door with three nuts.

Start cable on top front pulley (2), then following diagram, over each pulley in turn. String cable on adjustable pulley (3) last.

**NOTE:** In order to provide more slack, it may be necessary to loosen support bar (4) for lower pulleys.

1. Window regulator 2. Top front pulley 3. Adjustable pulley  
4. Lower pulley support bar 5. Support bar bolts



Tighten lower pulley support (if loose). Slightly tension adjustable pulley.

At this point remove metal cable clip from regulator.

With adjustable pulley, tighten cable until all slack is removed.

Lubricate cable and pulleys with light grease.

Attach window to cables, checking to see that it has full travel in both directions and is positioned in guides correctly. Check for free operation of both window and regulator.

#### Outside Door Handle Removal and Installation

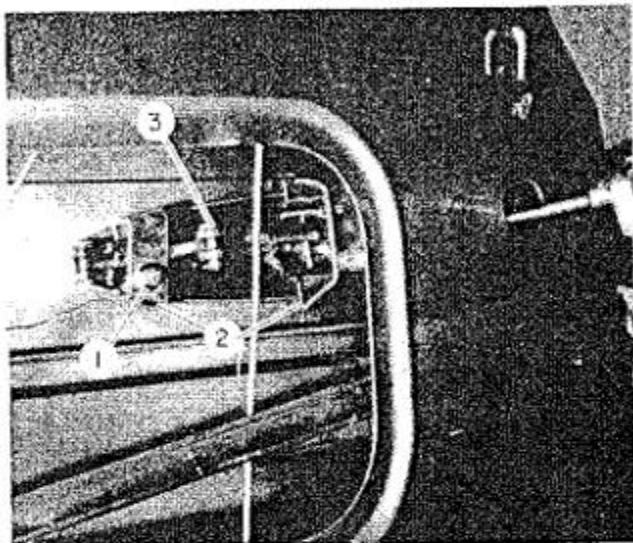
Place window in full up position.

From inside door, pry off plastic ball and socket door lock link.

Remove three nuts (1) and brackets (2) securing handle assembly (3) to door (gain access to two nuts thru hole as shown). Remove handle from outside.

Installation is reverse of removal.

1. Nut 2. Bracket 3. Door handle assembly



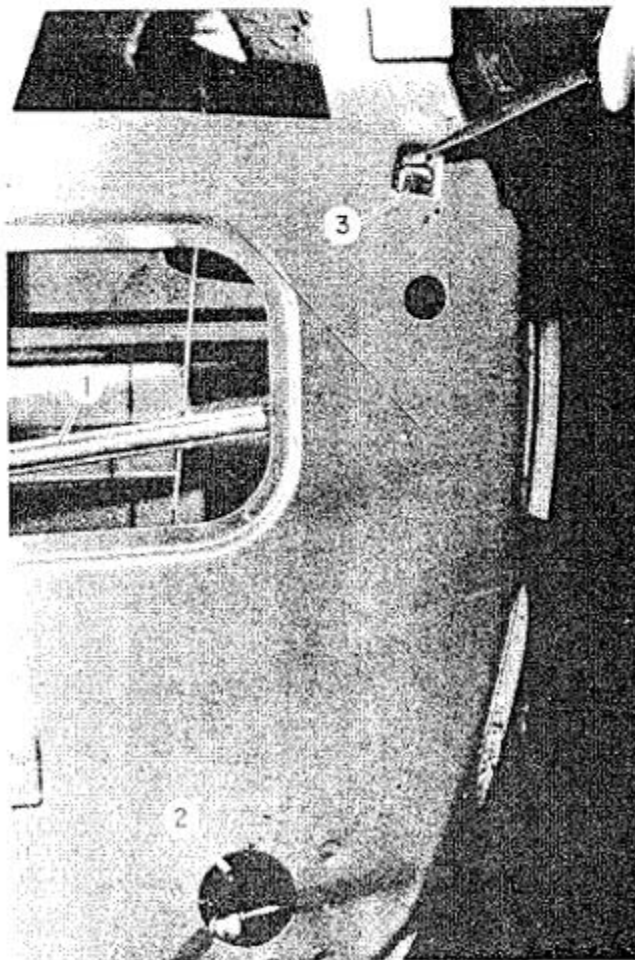
#### Door Lock Mechanism Removal and Installation

Place window in full up position.

Remove plastic band from link arm (1) between door lock and door handle.

Remove nut holding window rear guide, thru lower access (2). With screwdriver at guide (3) upper anchor point, move guide down and out of way.

1. Link arm 2. Lower access to guide 3. Window guide upper anchor point





Remove three screws holding door handle mechanism (1) to door.

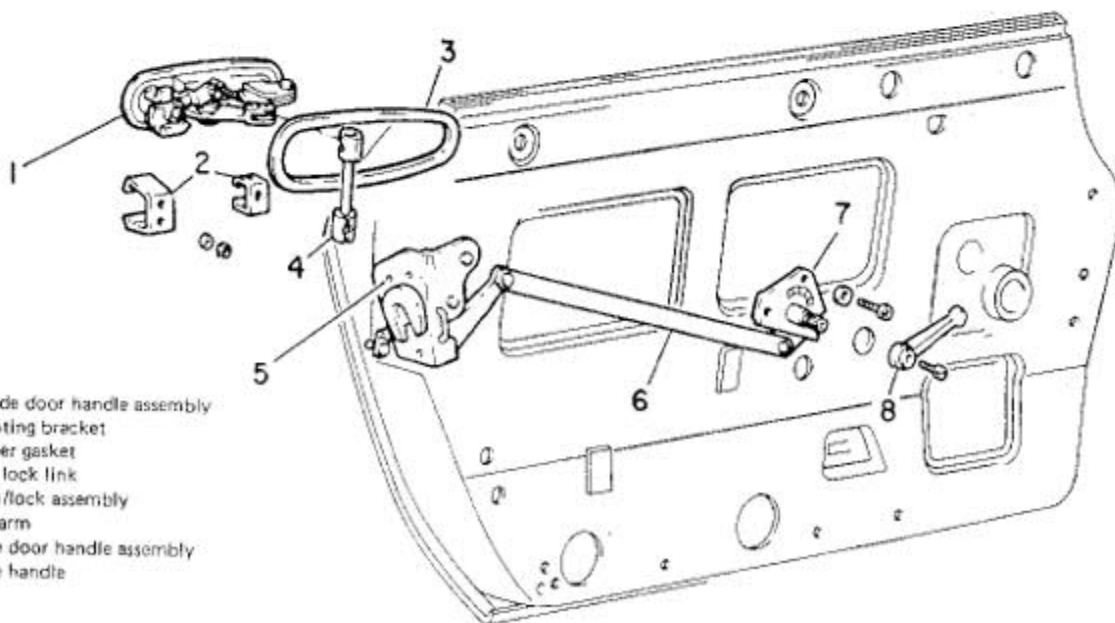
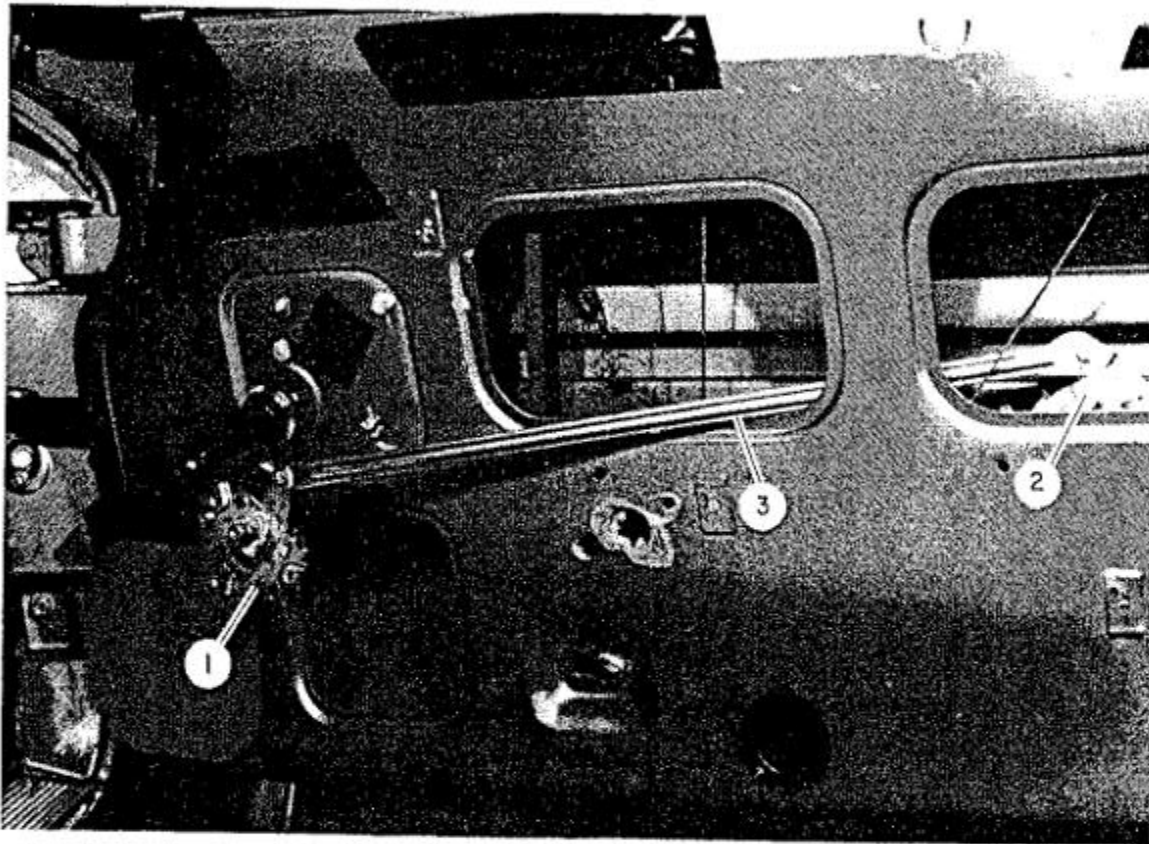
Remove three screws holding lock mechanism (2).

With window guide out of way, remove entire door handle/lock assembly thru door opening as shown.

Installation is reverse of removal.

**NOTE:** Make certain that plastic band is reinstalled on link arm (3).

1. Door handle mechanism 2. Latch/lock mechanism 3. Link arm



1. Outside door handle assembly
2. Mounting bracket
3. Rubber gasket
4. Door lock link
5. Latch/lock assembly
6. Link arm
7. Inside door handle assembly
8. Inside handle

DOOR HANDLE AND LOCK ASSEMBLY

### Sliding Window Removal and Installation

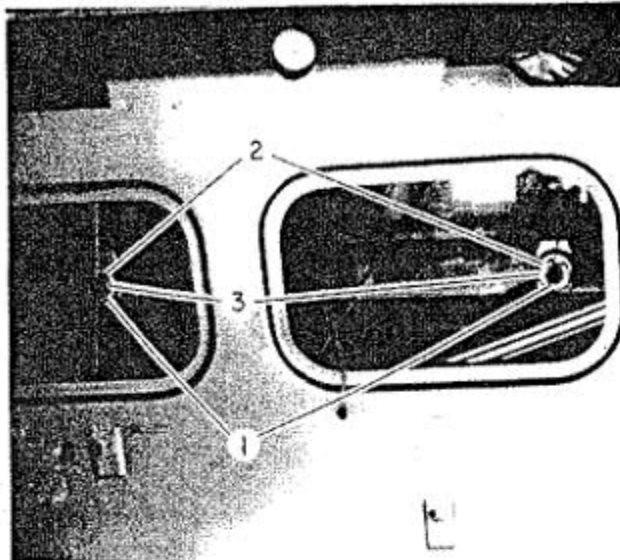
**NOTE:** Window can be removed without removing vent window frame.

Remove outer trim molding by pulling up off door, it is clipped to door.

Raise or lower window until window cable retaining screws (1) are accessible. Mark position of cable (2) in relation to screws for installation.

From this point on provide support for window. Remove screws, bushings, upper stops, grommets and washers.

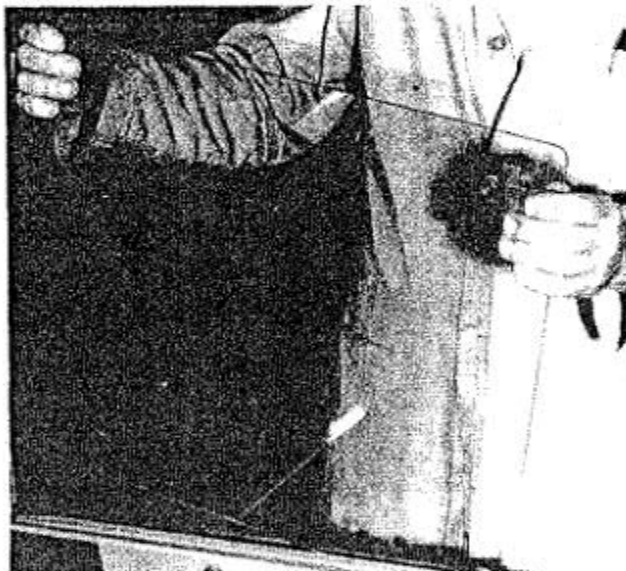
1. Screw 2. Regulator cable 3. Cable bushing

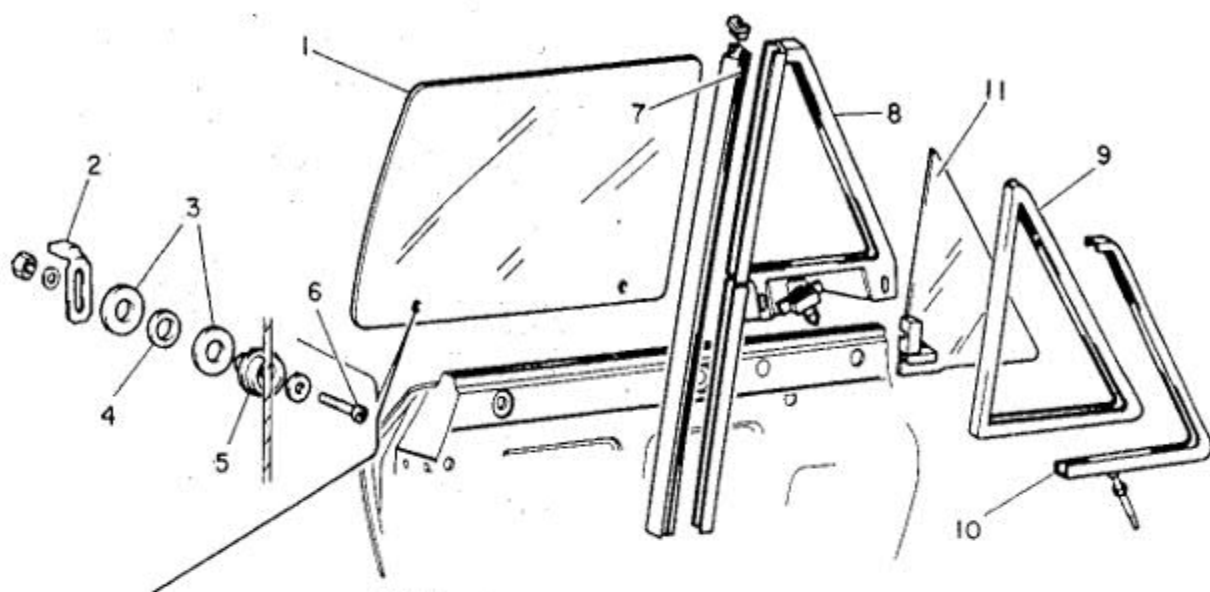


Lift window up and out as shown.

Installation is reverse of removal.

Adjust top and bottom stops if necessary. Upper stops are slotted for adjustment. Bottom rubber stop must be removed and shimmed to raise window, or rubber shaved off to lower it.





- 1. Sliding window
- 2. Upper stop
- 3. Grommet
- 4. Bushing
- 5. Cable bushing
- 6. Screw

- 7. Weatherstrip
- 8. Frame/guide
- 9. Weatherseal
- 10. Frame
- 11. Vent window

## SLIDING WINDOW AND VENT WINDOW ASSEMBLY

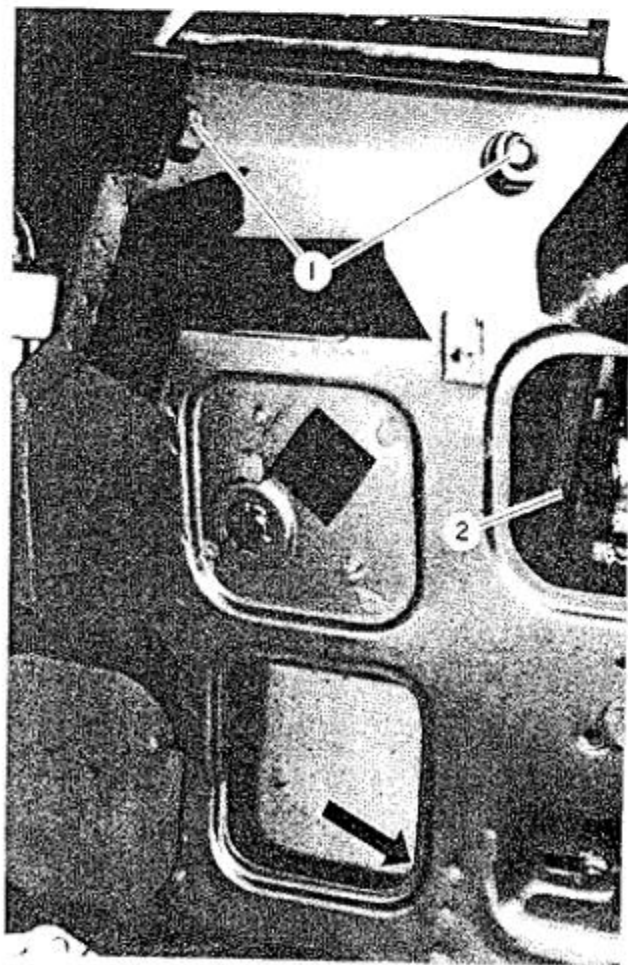
### Vent Window Assembly Removal and Installation

**NOTE:** Vent window can be removed without removing sliding window.

Remove outer molding by pulling up off door, it is clipped to door.

Lower sliding window. Remove two bolts (1) and one nut on lower portion (arrow) of window guide (2).

- 1. Bolt
- 2. Window guide

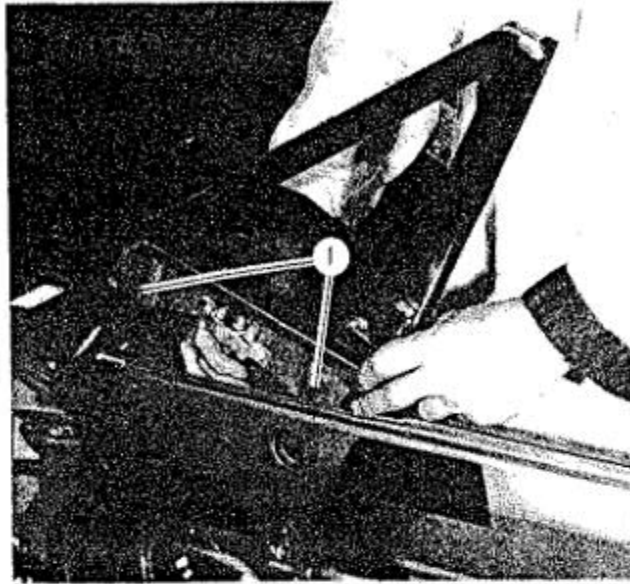


Carefully lift vent assembly out of door as shown.

Installation is reverse of removal.

Adjust to fit windshield frame. Adjustment is provided by two slots (1) for upper mounting bolts.

1. Adjustment slots



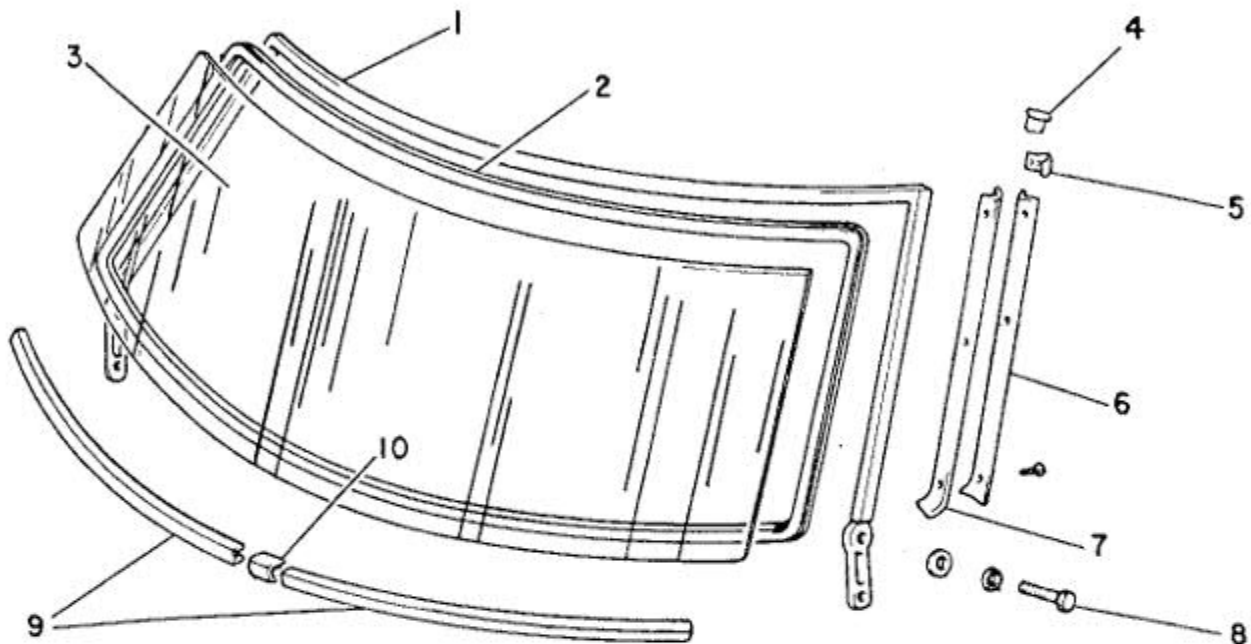
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## WINDSHIELD ASSEMBLY

### REMOVAL AND INSTALLATION

Pull door to windshield weatherstrip away from windshield. Remove one screw holding each filet at instrument panel end. Remove two Allen head bolts on each side of windshield. Carefully lift windshield assembly off.

Installation is reverse of removal. Adjustment is provided by elongated mounting holes on frame.



- |                     |                    |
|---------------------|--------------------|
| 1. Windshield frame | 6. Channel         |
| 2. Weatherstrip     | 7. Weatherstrip    |
| 3. Windshield       | 8. Allen head bolt |
| 4. Boot             | 9. Channel         |
| 5. Retainer         | 10. Plate          |

## WINDSHIELD ASSEMBLY

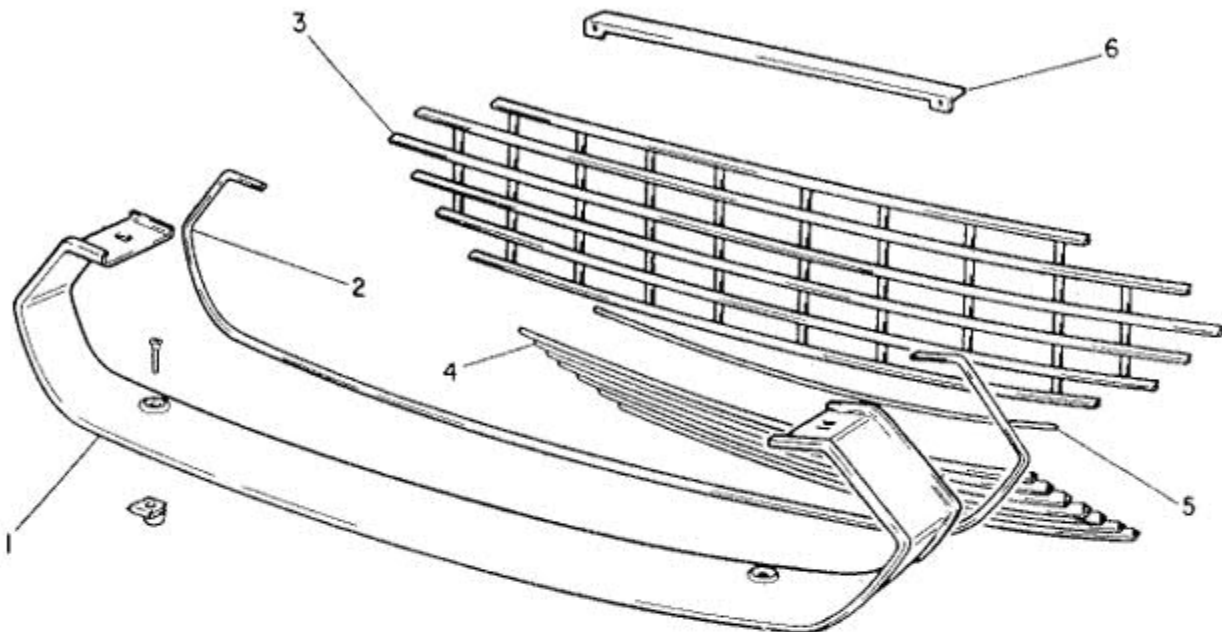
# Radiator Grill

703.02

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## REMOVAL AND INSTALLATION

Remove four screws securing frame and grill to body. Withdraw frame and grill. To remove lower grill, remove two screws. Installation is reverse of removal.



- |                 |                |
|-----------------|----------------|
| 1. Grill frame  | 4. Lower grill |
| 2. Weatherstrip | 5. Gasket      |
| 3. Upper grill  | 6. Bracket     |

## RADIATOR GRILL ASSEMBLY

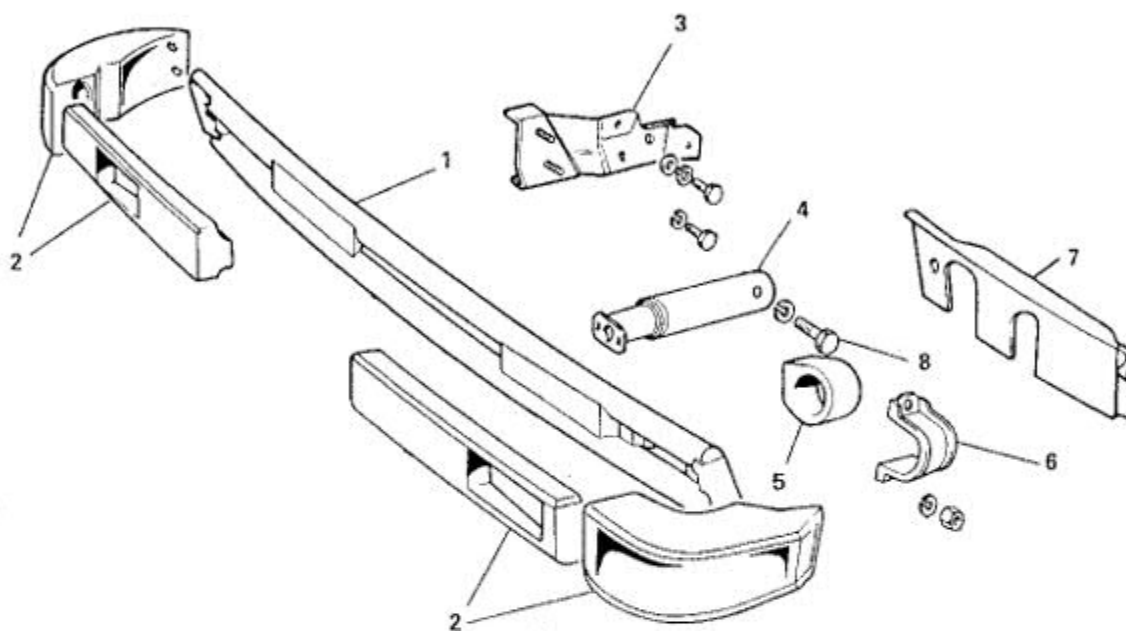
### REMOVAL AND INSTALLATION

Remove screw and nut holding both plastic covers (7) to bumper (1). Remove two nuts holding each signal light assembly. Place light assembly behind bumper.

Remove two nuts holding bumper to each shock absorber (4) and remove bumper.

Remove bumper shock absorbers by removing one bolt (8) on each and withdrawing shock absorber.

Installation is reverse of removal.



- |                     |                  |
|---------------------|------------------|
| 1. Bumper           | 5. Pad           |
| 2. Protective pads  | 6. Bracket       |
| 3. Mounting bracket | 7. Plastic cover |
| 4. Shock absorber   | 8. Mounting bolt |

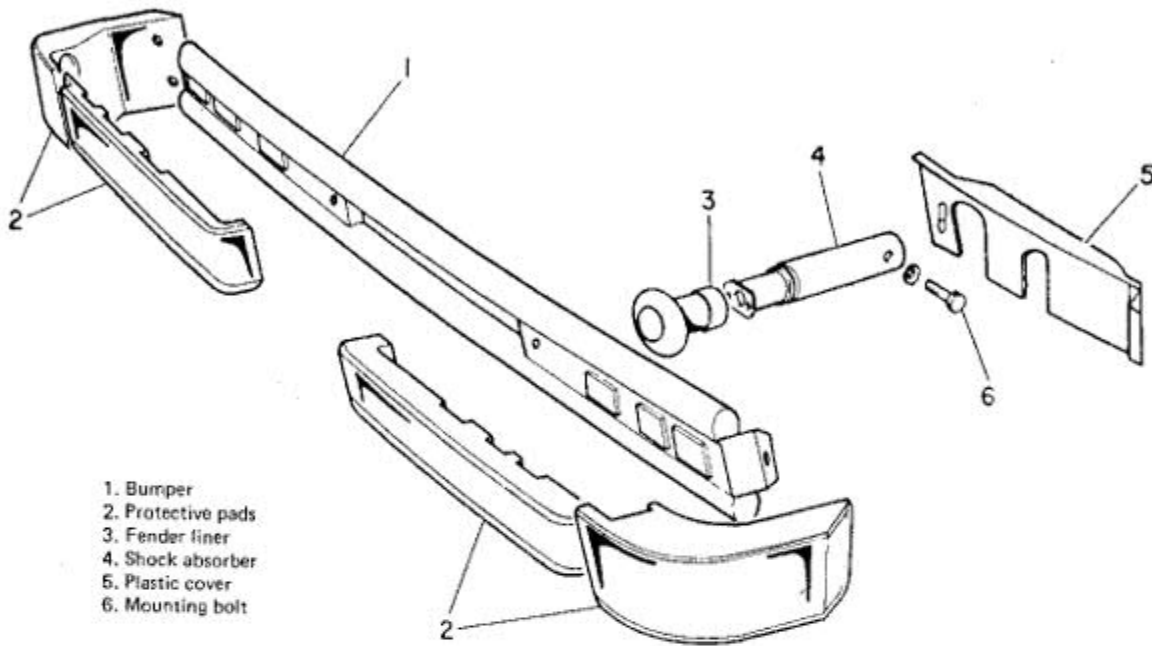
FRONT BUMPER ASSEMBLY

### REMOVAL AND INSTALLATION

Remove two nuts holding bumper to each shock absorber (4) and remove bumper.

To remove bumper shock absorbers, first open trunk and remove covers to spare tire and fuel tank. Remove one bolt (6) on each side holding shock absorber. Withdraw shock absorber.

Installation is reverse of removal.



1. Bumper
2. Protective pads
3. Fender liner
4. Shock absorber
5. Plastic cover
6. Mounting bolt

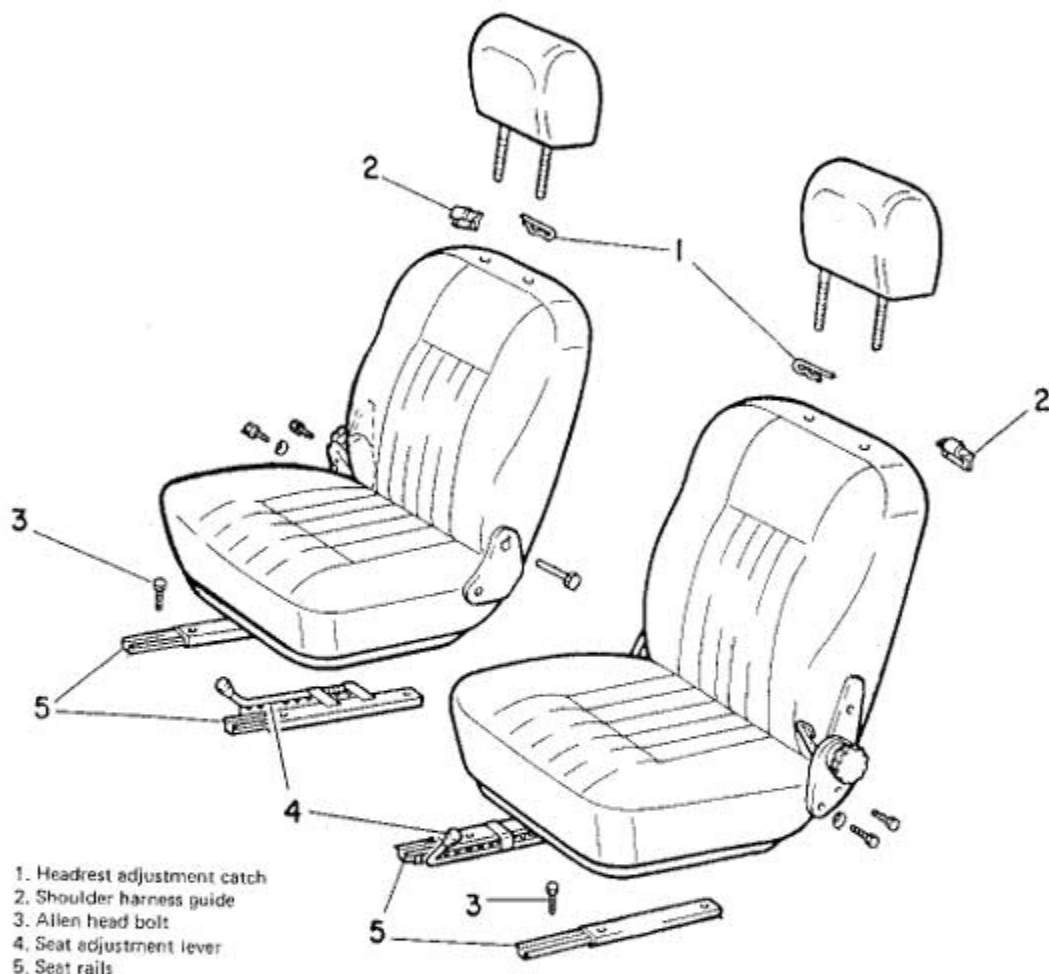
REAR BUMPER ASSEMBLY



### REMOVAL AND INSTALLATION

Place seat in full rear position. Remove two Allen head bolts, one on each rail. Place seat in full forward position. Remove two Allen head bolts, one on each rail. Remove seat.

Installation is reverse of removal.



FRONT SEATS

# Package Shelf

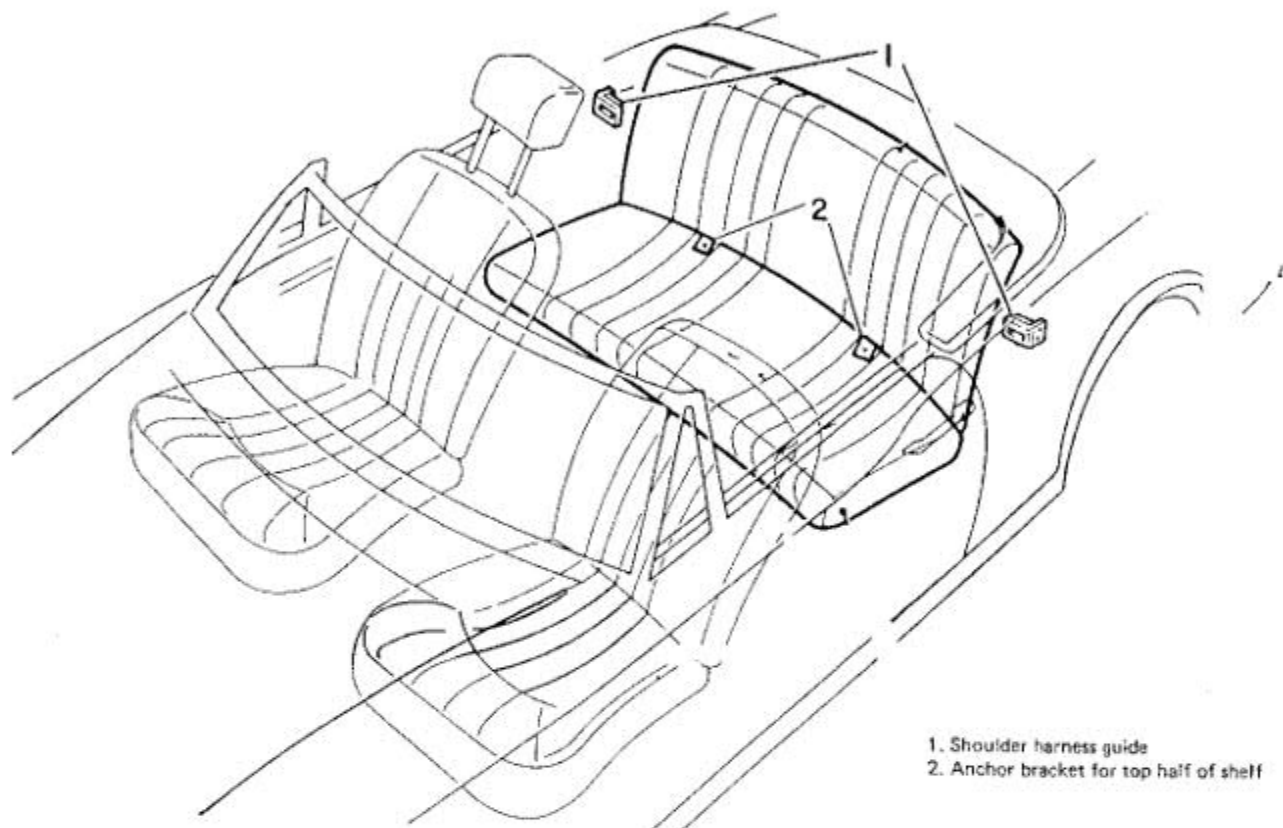
706.13

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## REMOVAL AND INSTALLATION

To remove bottom half of shelf, lift up and out. To remove top half of shelf, remove two screws on bottom brackets and pull shelf down and out.

Installation is reverse of removal.



PACKAGE SHELF

### CENTER CONSOLE

#### REMOVAL AND INSTALLATION

**NOTE:** On vehicles with leather interior the upper and lower halves of the center console must be removed together.

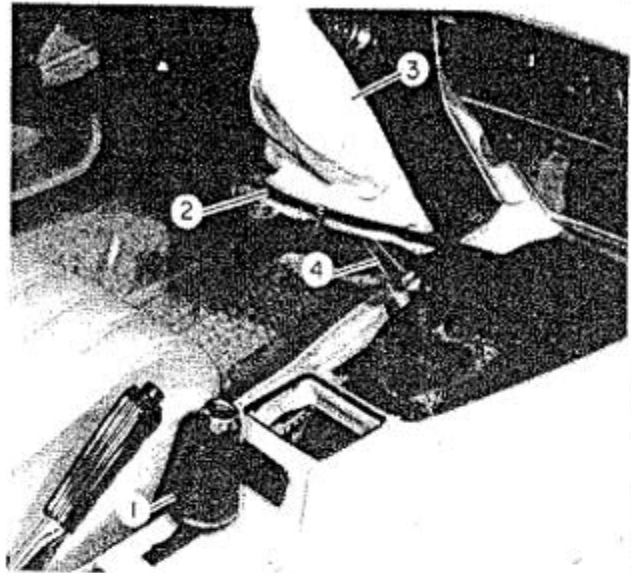
On manual transmission vehicles, unscrew gearshift knob (1).

On vehicles with A.C. swing evaporator down and remove A.C. control panel.

Using your fingers, reach through boot and pry up on rear of console cover (2) to unsnap fasteners. Lift cover up, along with boot (3), over gearshift lever (4).

Remove radio from upper half of center console.

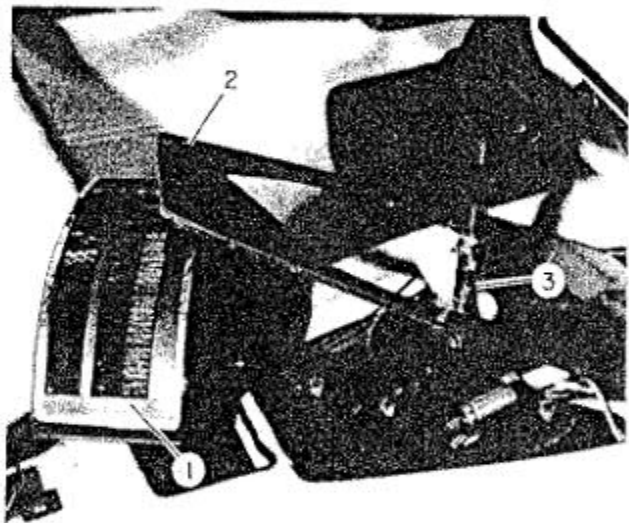
1. Gearshift knob 2. Console cover 3. Gearshift boot 4. Gearshift lever



On automatic transmission vehicles, remove two screws holding selector lever cover (1).

Unsnap rear of console cover (2) and lift out and up to remove.

1. Selector lever cover 2. Console cover 3. Selector lever



Slack off emergency brake cable adjustment from underside of vehicle (refer to Brake Section). Brake handle must be raised high enough for console removal clearance.

On vehicles with vinyl interior, remove lower half of center console as follows:

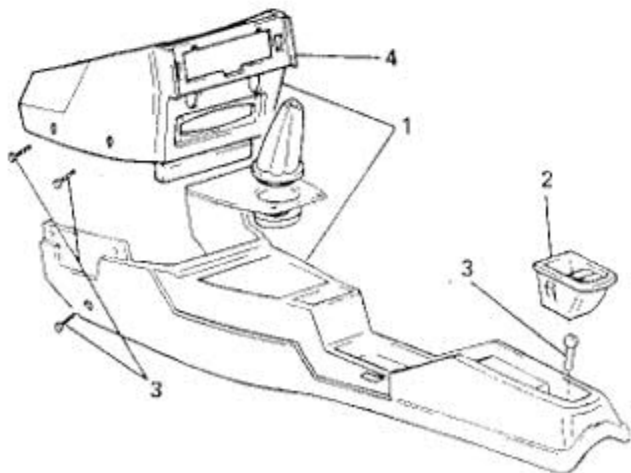
Remove screws (3) at front of console (1).

Remove coin holder (2) at rear of console to remove rear screw.

Lift console up and carefully pull back to remove it.

Installation is reverse of removal.

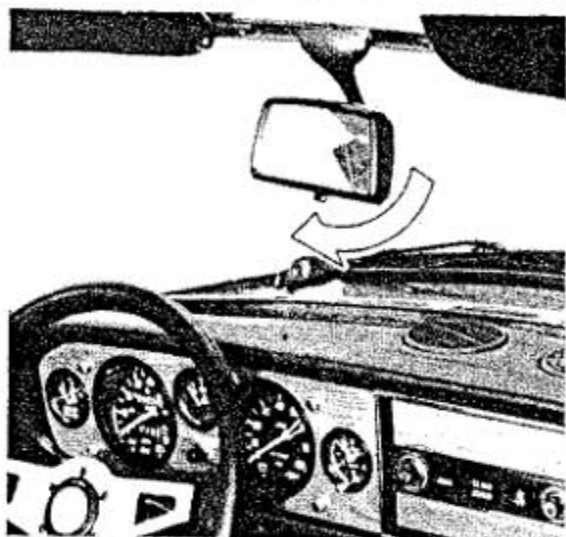
To remove upper half (4) disconnect wires to switches and remove upper half (4).



1. Center console 2. Coin holder 3. Screw 4. Upper half

### INSIDE REAR VIEW MIRROR REMOVAL AND INSTALLATION

Inside rear view mirror is of the safety break-away type and is clipped on to windshield mount. To remove, pull it away from windshield. To install, position mirror in place and push it firmly home.



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### SEAT BELT ASSEMBLY REMOVAL AND INSTALLATION

Remove rear shelf back by removing two screws at bottom of shelf back. Pull shelf back down and out.

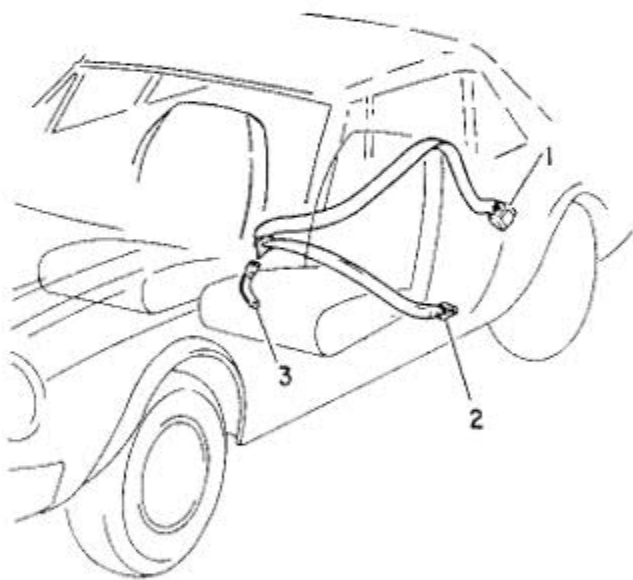
Remove two bolts holding reel assembly (1) to body.

Remove bolt holding belt bracket (2) to body.

Remove bolt holding belt buckle assembly (3) to body.

Installation is reverse of removal.

1. Reel assembly 2. Belt bracket 3. Belt buckle assembly



On vehicles with leather interior, remove both halves of center console (1) together as follows:

Remove radio (if installed) or radio blanking plate. Reaching through radio opening, disconnect wires to items in upper half of center console.

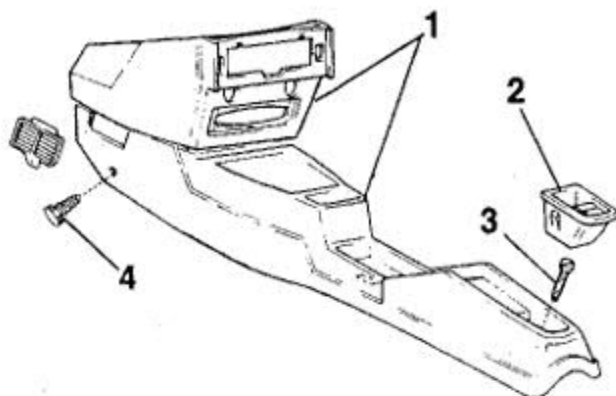
Remove attaching plug (4) at front of center console (1).

Remove coin holder (2) at rear of console.

Remove rear screw (3).

Lift console up and carefully pull back to remove it.

Installation is reverse of removal.



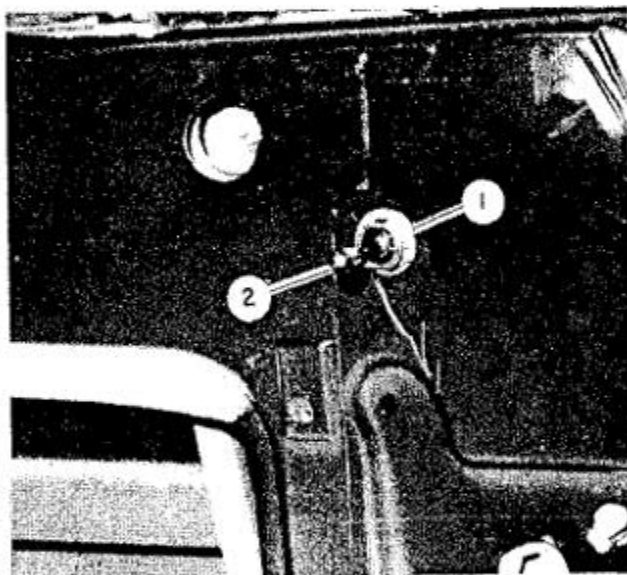
1. Center console 2. Coin holder 3. Screw 4. Attaching plug

### REMOTE CONTROL SIDE-VIEW MIRROR REMOVAL AND INSTALLATION

Remove door trim panel (refer to procedure in this section).

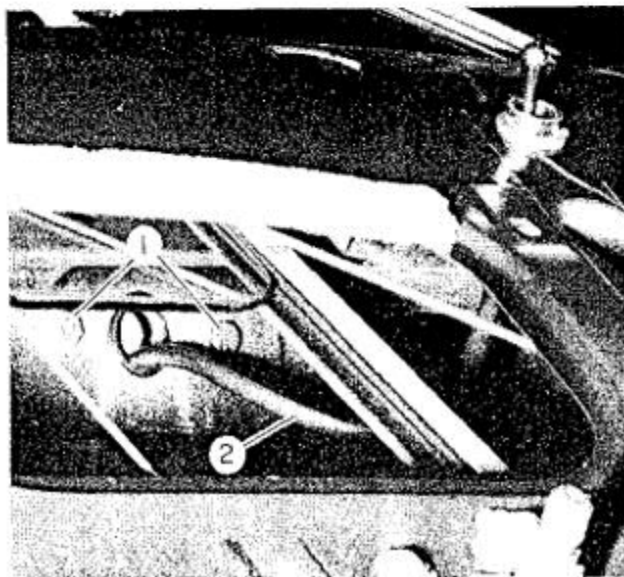
Remove circlip (1) holding mirror actuator (2) to door.

1. Circlip 2. Mirror actuator



Remove two bolts (1) holding mirror assembly to door. Remove mirror and actuating control cable (2) thru door. Installation is reverse of removal.

1. Bolt 2. Control cable



# Service Tools

70A

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A.78034 Door handle retaining clip removal tool



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# BRAKES - 33

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

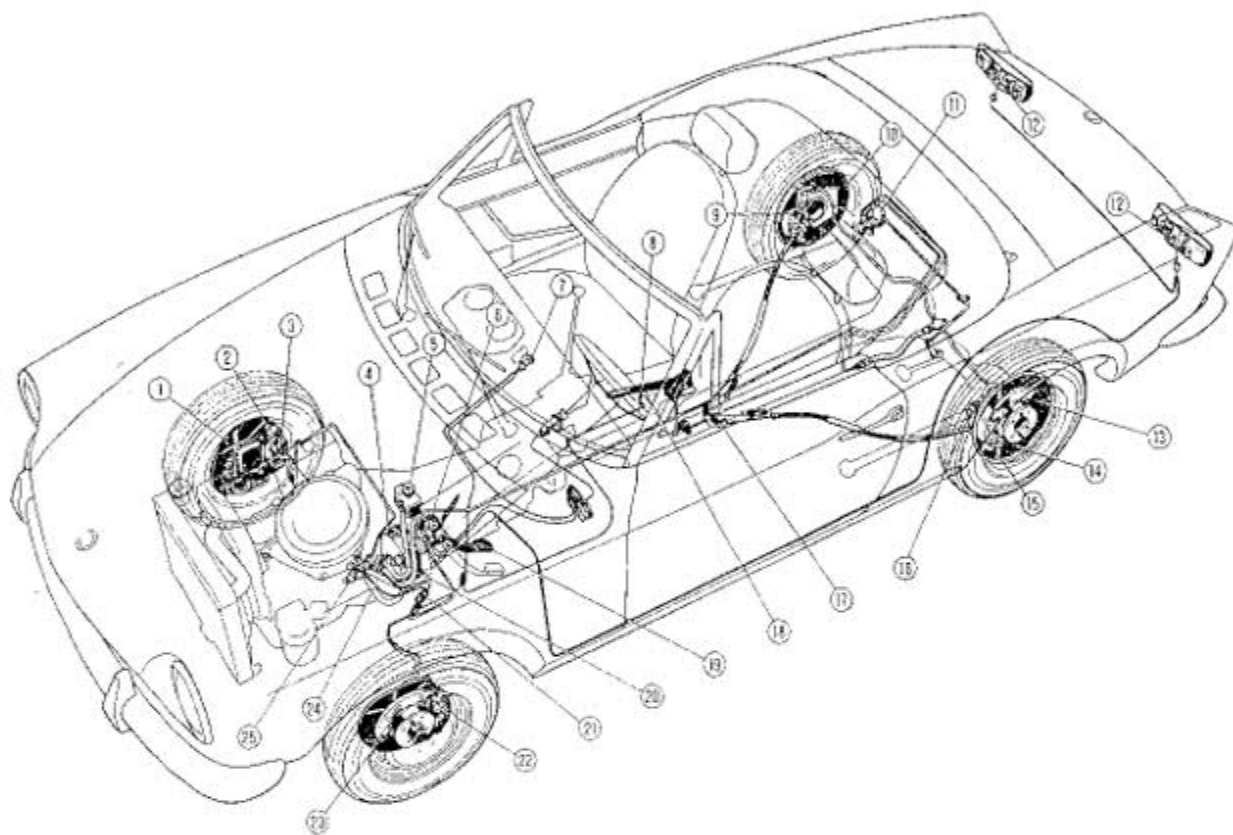
	PAGE
33	Specifications . . . . . 33-1
	Torque Specifications . . . . . 33-2
	Brake System . . . . . 33-3
331.01	Brake Pedal Mechanism . . . . . 33-5
331.02	Hydraulic Brake System . . . . . 33-7
331.08	Power Brake Servo . . . . . 33-15
331.17	Front Wheel Brakes . . . . . 33-19
331.25	Rear Wheel Brakes . . . . . 33-23
331.35	Hand Brakes . . . . . 33-27
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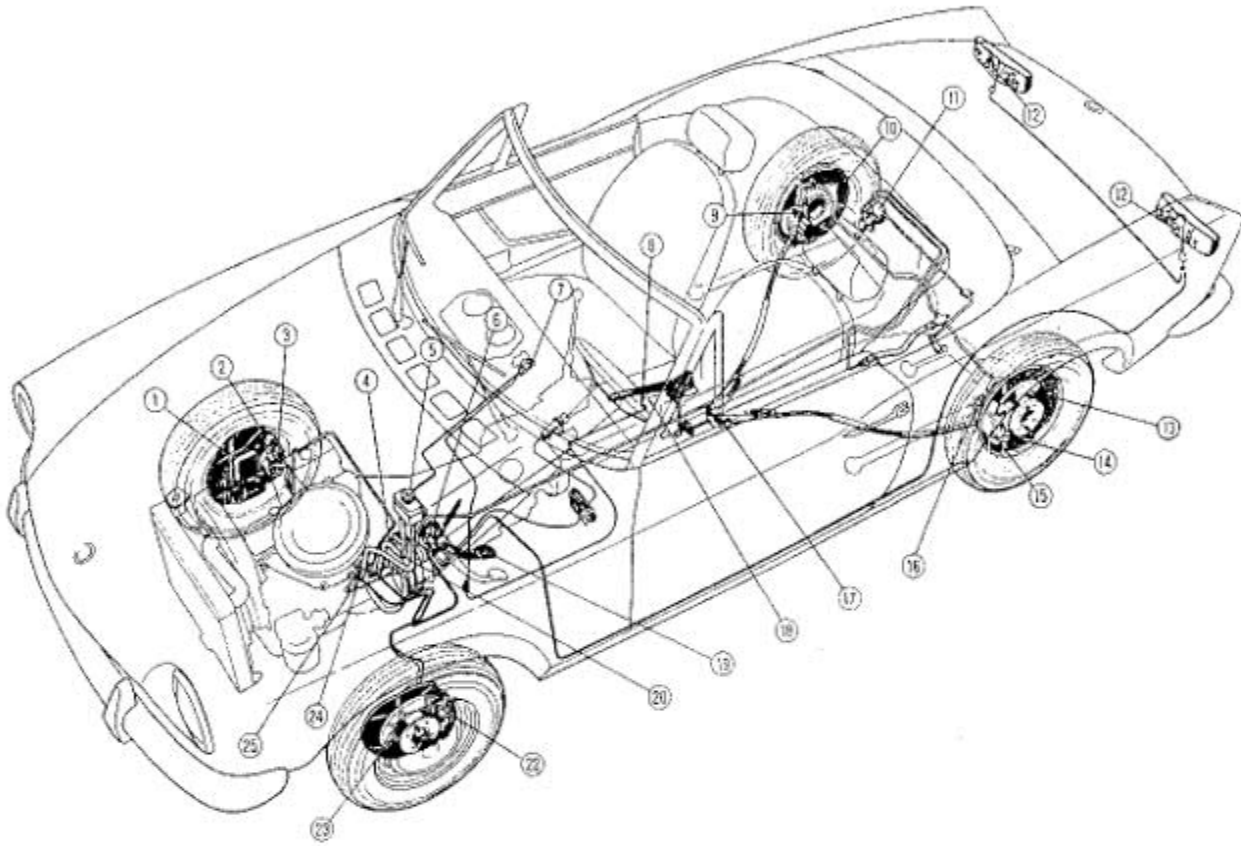


## TORQUE SPECIFICATIONS

DESCRIPTION	THREAD (METRIC)	Kgm	TORQUE	
			N·m	FT. LB.
<b>HYDRAULIC BRAKE SYSTEM</b>				
Master cylinder nut .....	M 8	2.49	25	18
Brake regulator-to-body nut .....	M 8	1.52	15	11
Brake regulator-to-bracket bolt .....	M 8	1.9	20	14
Torsion bar link rod-to-axle case self-locking nut, type S .	M 6	.41	4.9	3
Caliper support bracket bolt .....		5	49	36
<b>PEDALS</b>				
Brake and clutch pedal nut .....	M 12 x 1.25	1.9	20	14
Pedal support-to-dashboard nut .....	M 8	1.52	15	11
Pedal support-to-crossmember nut .....	M 8	2.49	25	18
<b>ELECTRICAL</b>				
Back-up light switch (5 A) .....	M 14 x 1.5	4.42	43	32
<b>POWER BRAKE</b>				
Power brake-to-support nut .....	M 8	2.49	25	18



1. Front brake disc shield
2. Front brake bleeder connection
3. Front brake calipers
4. Vacuum servo
5. Dual brake fluid reservoir with level switch
6. Stop lights switch
7. Brake circuit effectiveness and hand brake ON indicator
8. Jam switch for hand-brake ON signal and efficiency indicator
9. Rear brake bleeder connection
10. Rear brake disc shield
11. Braking action compensator
12. Stop lights
13. Rear brake disc
14. Caliper carrier plate
15. Rear disc brake caliper
16. Mechanical parking hand brake
17. Hand brake cable stretcher
18. Hand brake control lever
19. Service brake pedal
20. Front brake circuit
21. Pressure switch for indicator 7
22. Friction pad carrier plate
23. Front brake disc
24. Rear brake circuit
25. Master cylinder with two co-axial pistons



1. Front brake disc shield
2. Front brake bleeder connection
3. Front brake calipers
4. Vacuum servo
5. Dual brake fluid reservoir with level switch
6. Stop lights switch
7. Brake circuit effectiveness and hand brake ON indicator
8. Jam switch for hand-brake ON signal and efficiency indicator
9. Rear brake bleeder connection
10. Rear brake disc shield
11. Braking action compensator
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14. Caliper carrier plate
15. Rear disc brake caliper
16. Mechanical parking hand brake
17. Hand brake cable stretcher
18. Hand brake control lever
19. Service brake pedal
20. Front brake circuit
22. Friction pad carrier plate
23. Front brake disc
24. Rear brake circuit
25. Master cylinder with two co-axial pistons

### BRAKE PEDAL

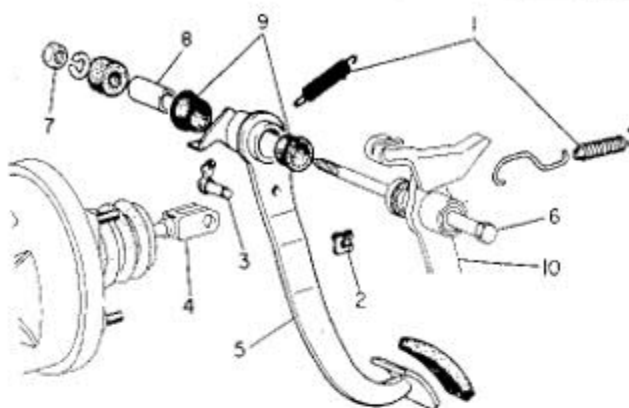
#### REMOVAL AND INSTALLATION (Manual Transmission)

Remove brake and clutch pedal return springs (1).

Remove retainer clip (2) and pin (3) to release servo push rod (4) from brake pedal (5).

Using 5/8 in. wrench, remove pivot bolt (6) and nut (7). Remove brake and clutch pedals along with spacers (8) and bushings (9).

Installation is reverse of removal. Lubricate all bearing surfaces with white grease.



1. Return spring 2. Retainer clip 3. Pin 4. Servo push rod  
5. Brake pedal 6. Pivot bolt 7. Nut 8. Spacer 9. Bushing  
10. Clutch pedal

### BRAKE PEDAL

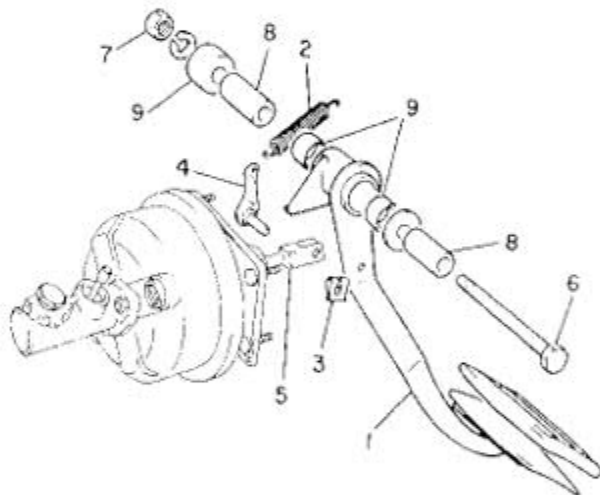
#### REMOVAL AND INSTALLATION (Automatic Transmission)

Remove brake pedal (1) return spring (2).

Remove retainer clip (3) and pin (4) to release servo push rod (5) from brake pedal.

Using 5/8 in. wrench, remove pivot bolt (6) and nut (7). Remove brake pedal along with spacers (8) and bushings (9).

Installation is reverse of removal. Lubricate all bearing surfaces with white grease.



1. Brake pedal 2. Return spring 3. Retainer clip 4. Pin 5. Servo push rod  
6. Pivot bolt 7. Nut 8. Spacer 9. Bushing

### RESERVOIR AND MASTER CYLINDER

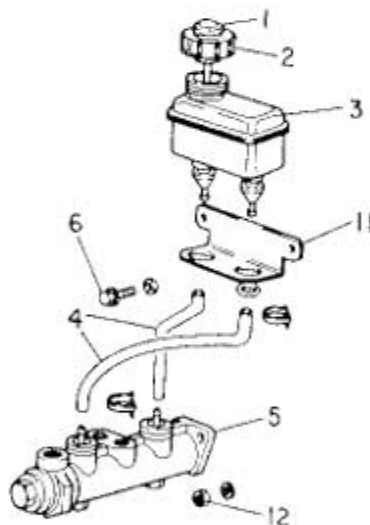
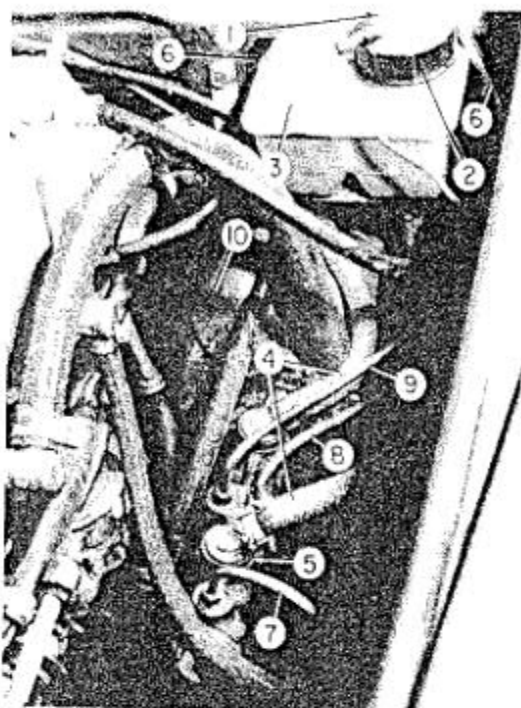
#### REMOVAL AND INSTALLATION

While holding brake fluid level switch (1), unscrew cover (2) from reservoir (3). Drain or siphon reservoir fluid.

**CAUTION:** Provide container to catch brake fluid. Do not allow fluid to contact paint surfaces.

Using gentle side-to-side rocking motion, pull reservoir lines (4) from master cylinder (5). Remove two bolts (6) holding reservoir support bracket (11) to firewall and remove reservoir assembly. Disconnect three brake lines (7, 8 & 9) from master cylinder. Cap lines to prevent dirt entry. Remove two nuts (12) and lockwashers, then pull master cylinder away from power brake servo (10). Install in reverse order of removal making sure all parts and fittings are clean.

1. Fluid level switch 2. Reservoir cover 3. Reservoir 4. Reservoir lines 5. Master cylinder 6. Bolt 7. Brake line, rear 8. Brake line, left front 9. Brake line, right front 10. Power brake servo 11. Bracket 12. Nut



## MASTER CYLINDER OVERHAUL

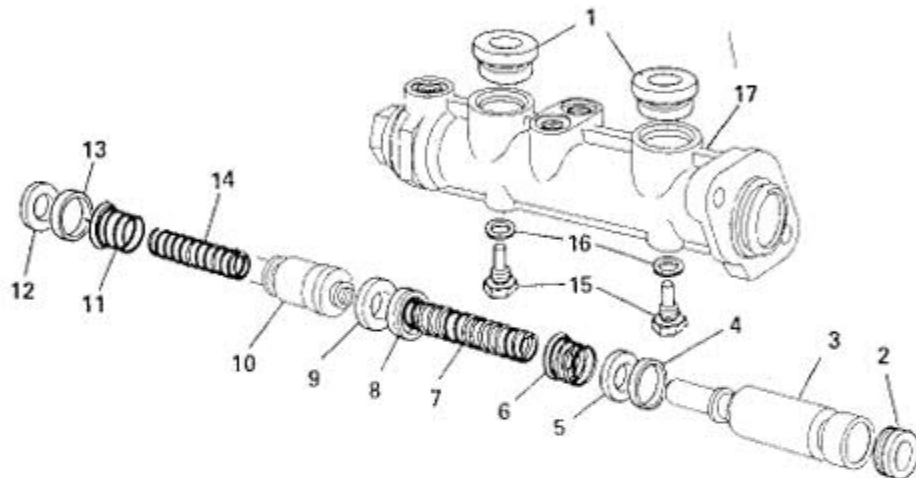
Remove two connectors (1) and dust cover (2).

Remove two stop bolts (15) and seals (16).

Remove remaining internal parts (items 3 through 14) from body (17).

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 dust covers. Clean all parts with denatured alcohol and lubricate with brake fluid. Reassemble in reverse order of disassembly.

1. Connector
2. Seal
3. Rear piston
4. Spacer
5. Seal
6. Spring and cup
7. Spring and cup
8. Flat washer
9. Seal
10. Front piston
11. Spring and cup
12. Seal
13. Spacer
14. Spring and cup
15. Stop bolt
16. Seal
17. Cylinder body



## FRONT CALIPER OVERHAUL

Remove caliper (Refer to FRONT WHEEL BRAKES).

To disassemble caliper, remove dust seal (4). Then apply compressed air to brake fluid hose connection (2) to remove piston (5).

**WARNING:** Apply air pressure gradually or piston will eject with high force.

Remove seal from caliper bore using care not to damage bore surface.

Inspect caliper bore (7) for corrosion, scoring, or pitting. Replace entire caliper if damaged.

Replace piston (8), seal (6) and dust cover (4).

Clean all parts with denatured alcohol, and lubricate with brake fluid. Assemble in reverse order of disassembly using care not to damage surface of caliper bore or piston.



1. Bleed screw
2. Brake fluid hose connection
3. Locking plate bolt hole
4. Dust seal

5. Piston
6. Piston seal
7. Piston bore
8. Caliper body

### REAR CALIPER

#### OVERHAUL

Remove dust seal (15). Remove piston (13) by unscrewing it from brake plunger (6) using a screwdriver in slot formed in piston head. Remove piston seal (14) from caliper bore using care not to damage bore surface. Remove hand brake lever dust cover (1). Withdraw snap ring (3) and bushing (2) from cam lever (5).

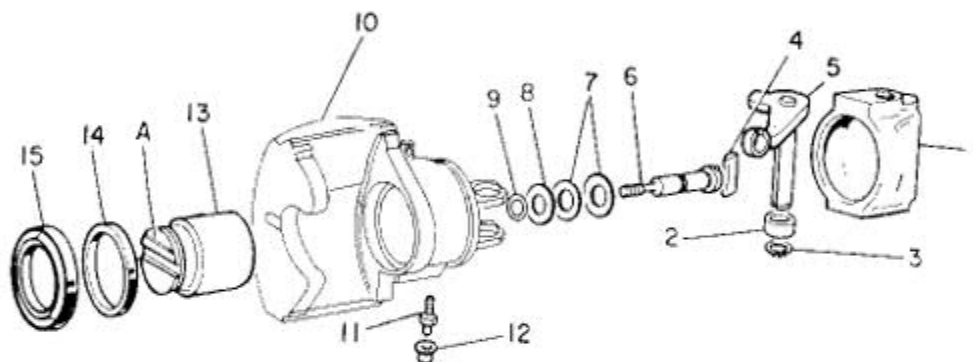
Remove cam lever, hand brake plunger, plunger seal (9), disc springs (7) and spring thrust washer (8).

Inspect caliper bore for corrosion, scoring or pitting. Replace entire caliper if damaged.

Replace piston (13), seal (14), and dust seal (15). Replace any worn or damaged components from hand brake assembly.

Assemble in reverse order of disassembly using care not to damage surface of caliper bore or piston. Screw piston in all the way with mark "A" opposite bleed screw (11).

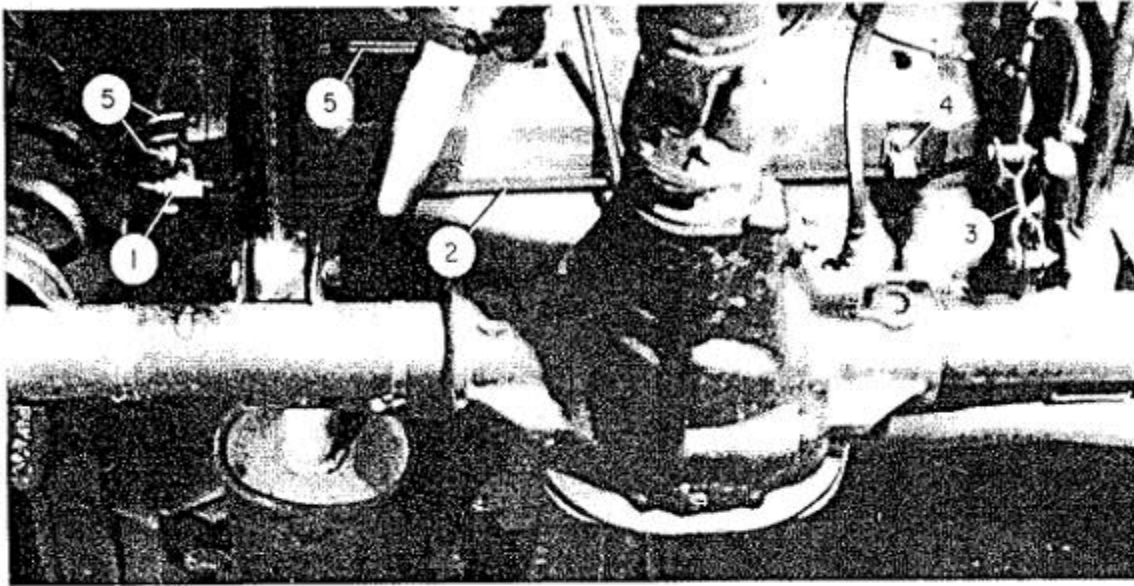
**CAUTION:** Reference mark "A" must be on side of bleed screw or system cannot be bled properly and brake action will be irregular.



1. Dust cover
2. Bushing
3. Snap ring
4. Pawl
5. Hand brake cam lever

6. Plunger
7. Disc springs
8. Thrust washer
9. Plunger seal
10. Caliper body

11. Bleed screw
12. Protective cap
13. Piston
14. Piston seal
15. Dust seal



### COMPENSATOR CONTROL SYSTEM

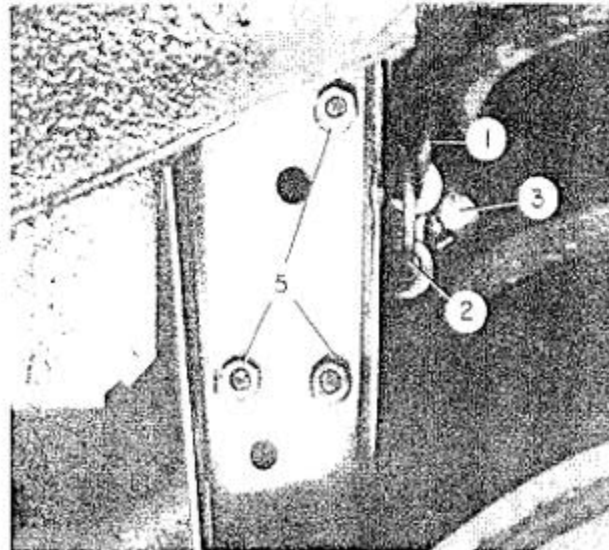
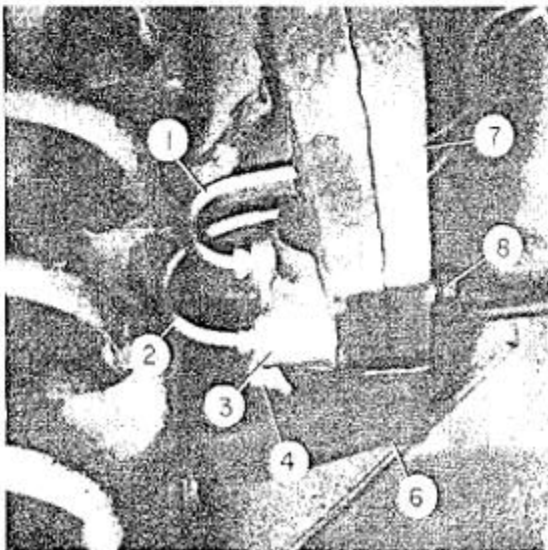
1. Compensator valve 2. Torsion bar 3. Torsion bar link 4. Mounting bracket 5. Fluid lines

The function of rear brake compensator system is to regulate brake fluid pressure to rear calipers. The amount of pressure delivered to rear calipers is directly proportional to the load on rear wheels. As load increases or decreases, the torsion bar transmits load changes to the compensator valve which then regulates amount of fluid pressure to rear calipers. With increased load more pressure is delivered, a decreased load lessens pressure to calipers.

### COMPENSATOR REMOVAL

Disconnect two brake fluid lines (1 & 2) from compensator valve (3). Cap to prevent dirt entry. Remove protection boot from compensator by unclipping plastic clamp (4). Move boot to gain access to torsion bar pivot bolt. Loosen bolt. Remove right rear road wheel. Remove three nuts (5) holding regulator mounting bracket (6) to frame. Remove bracket and regulator assembly from torsion bar. Separate regulator from bracket by removing two bolts (8).

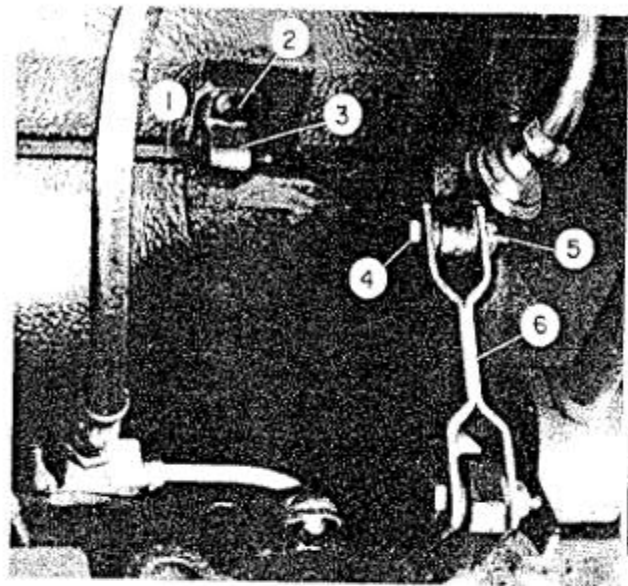
1. Fluid line to rear brakes 2. Fluid line from master cylinder 3. Compensator valve 4. Plastic clamp 5. Nut 6. Mounting bracket  
7. Rubber bumper 8. Bolt





To remove torsion bar (1), remove two bolts (2) and lockwashers holding torsion bar support bracket (3). Then remove bolt (4) and nut (5) from torsion bar link (6).

1. Torsion bar 2. Bolt 3. Support bracket 4. Bolt 5. Nut  
6. Torsion bar link



### INSPECTION

Inspect compensator valve for leaks or jammed piston. Overhaul or replace if damaged (Refer to COMPENSATOR VALVE OVERHAUL).

Check that torsion bar pivot is not worn. Replace if worn.

Check that all bushings are not worn or deteriorated. Replace if damaged.

Check rubber boot for breaks or cracks that would permit moisture entry. Replace if damaged.

### INSTALLATION

Coat bushings with silicone grease, and pivot with chassis grease.

Assemble all parts to the vehicle except do not fully tighten compensator valve bolts and do not attach torsion bar to connecting link.

Bleed system (Refer to BLEEDING HYDRAULIC SYSTEM).

Perform adjustment (Refer to COMPENSATOR CONTROL ADJUSTMENT).

Clean all parts in denatured alcohol. Lubricate with brake fluid. Reassemble in reverse order of disassembly.

### COMPENSATOR VALVE

#### OVERHAUL

Using tool A.56124 or similar type wrench, remove plug (1). Remove remaining parts (items 2 and 9) from body (10).

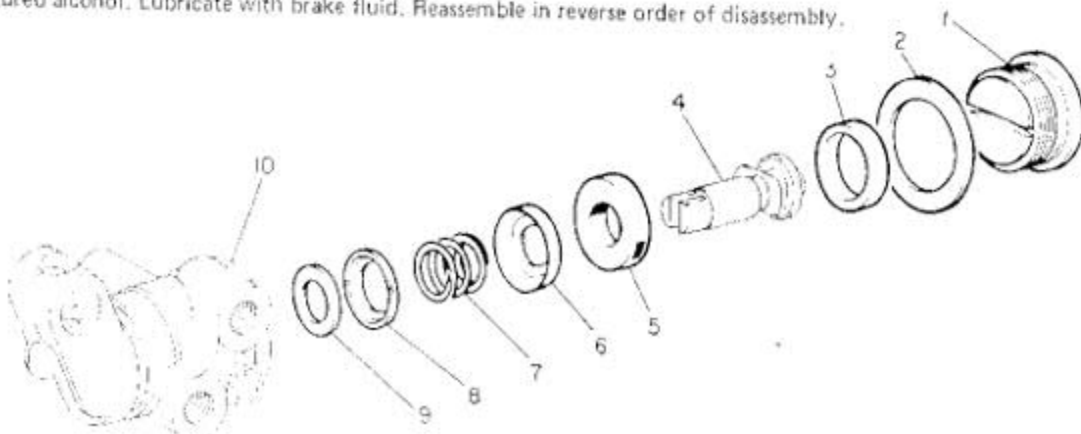
Inspect piston (4) and body (10) for wear, pitting, corrosion, scratches, or cracks.

Replace entire compensator valve if piston or body is damaged.

Replace seals (5 and 9) and cups (6 and 8). Check remaining parts for damage. Replace if damaged.

Clean all parts in denatured alcohol. Lubricate with brake fluid. Reassemble in reverse order of disassembly.

1. Plug  
2. Gasket  
3. Bushing  
4. Piston  
5. Seal  
6. Cup  
7. Spring  
8. Cup  
9. Seal  
10. Body



## COMPENSATOR CONTROL

### ADJUSTMENT

Raise vehicle on lift.

**NOTE:** Adjustment can be accomplished on either drive-on or frame type lifts.

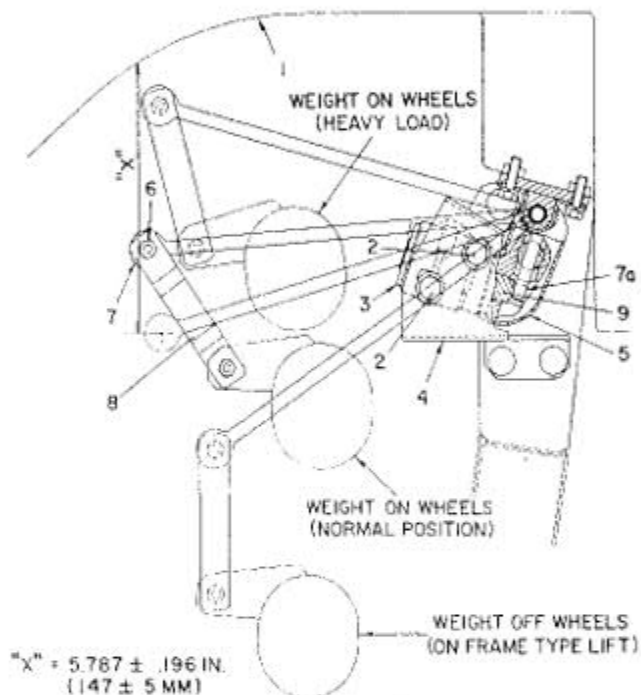
Loosen bolts (2) securing compensator (3) to support bracket (4). Unclip plastic clamp and slide dust boot (5) from compensator. Remove bolt and nut (6) to disconnect torsion bar (7) from connecting link (8). Bring end of torsion bar pivot point to distance "X" of  $5.787 \pm .196$  in. ( $147 \pm 5$  mm) as measured with a ruler held "straight up". Dimension "X" is measured from center of torsion bar pivot point to underside of floor pan (1).

With torsion bar held in this position, rotate compensator until piston (9) is just touching torsion bar (7a). Torque bolts (2) to 18 ft lbs (2.5 kgm) to secure compensator in this position.

Connect torsion bar to connecting link.

Slide dust boot on compensator and install plastic clamp.

1. Floor pan
2. Bolt
3. Compensator valve
4. Mounting bracket
5. Dust boot
6. Nut
7. & 7a. Torsion bar
8. Connecting link
9. Piston

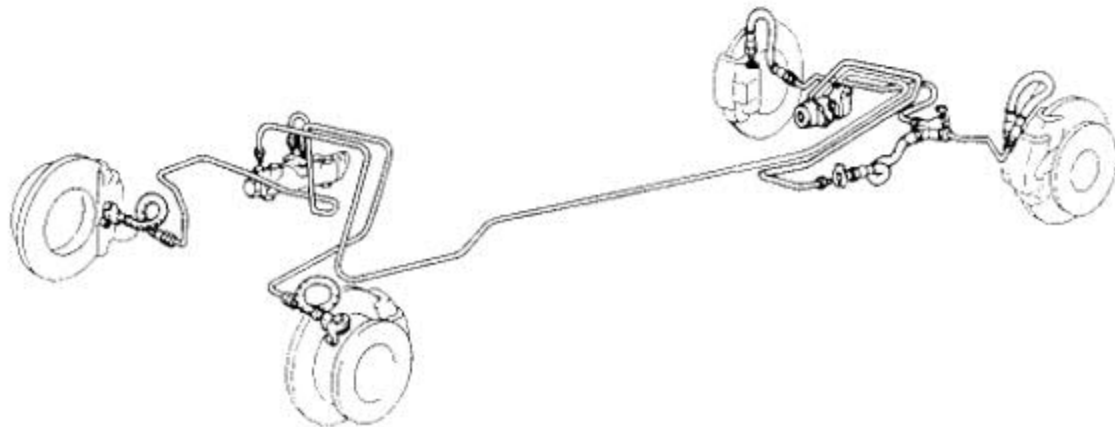


## BRAKE LINES

### REMOVAL AND INSTALLATION

Brake lines normally last the life of the vehicle. However, if damaged, brake lines may be repaired by splicing in a new section of line, or must be replaced. When replaced, make sure lines are secured to prevent chafing from vibration.

After installing, bleed system (Refer to HYDRAULIC SYSTEM BLEEDING).



### BRAKE HOSES

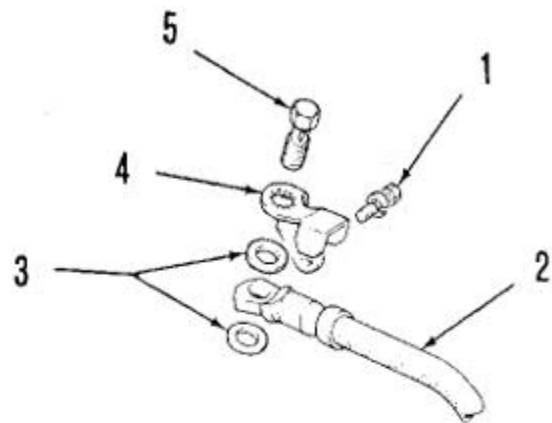
#### REMOVAL AND INSTALLATION

Remove connector (5) and bolt (1) to remove brake hose (2).  
Check that hose is not frayed, worn or brittle. Replace if damaged.

When installing, use new gaskets (3).

Bleed system (Refer to HYDRAULIC SYSTEM BLEEDING).

1. Bolt 2. Hose 3. Gasket 4. Bracket 5. Connector



### HYDRAULIC SYSTEM

#### 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. Keep fluid reservoir filled 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. Submerge other end of bleeder hose into a clean jar half filled with brake fluid.

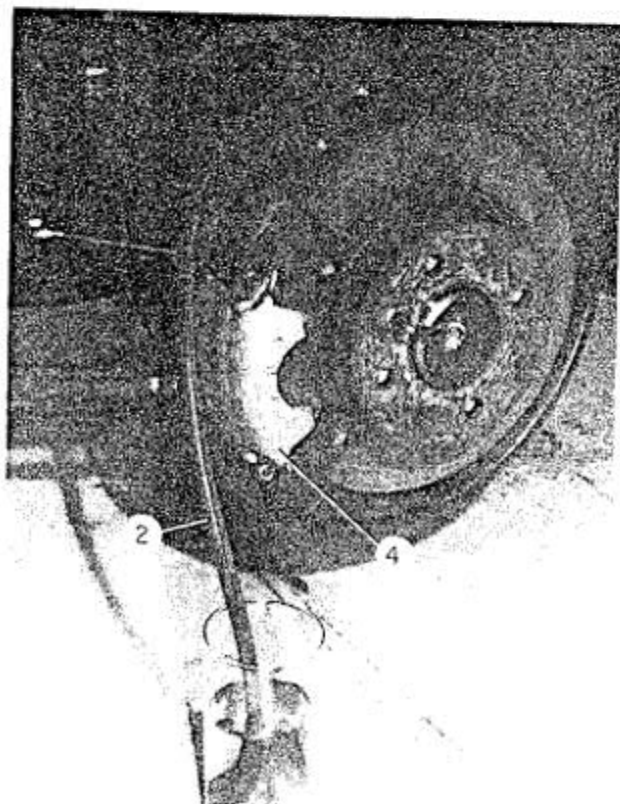
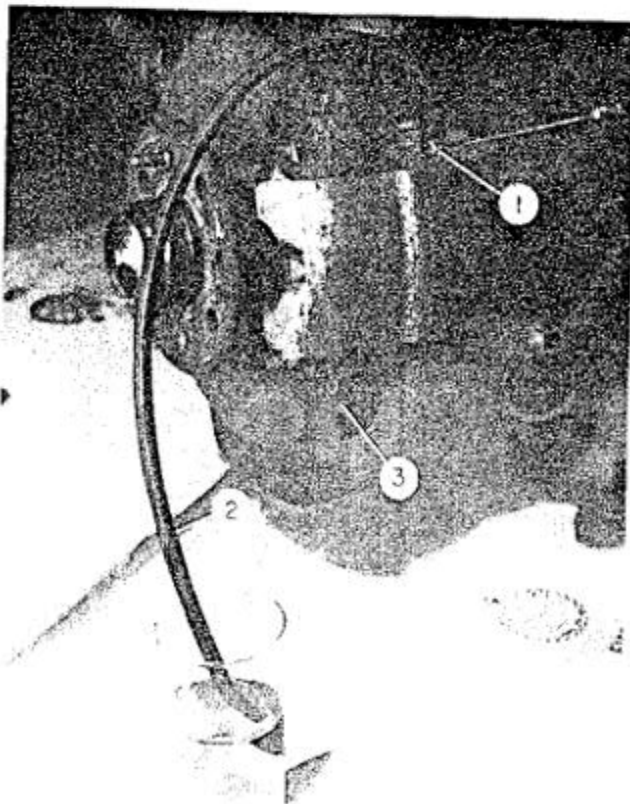
Loosen bleeder screw one or two turns and press brake pedal down, allowing it to return slowly. Do this several times until no more air bubbles escape from rubber hose.

Keep 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.

1. Bleed screw 2. Bleed hose 3. Front brake assembly 4. Rear brake assembly



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### POWER BRAKE SERVO

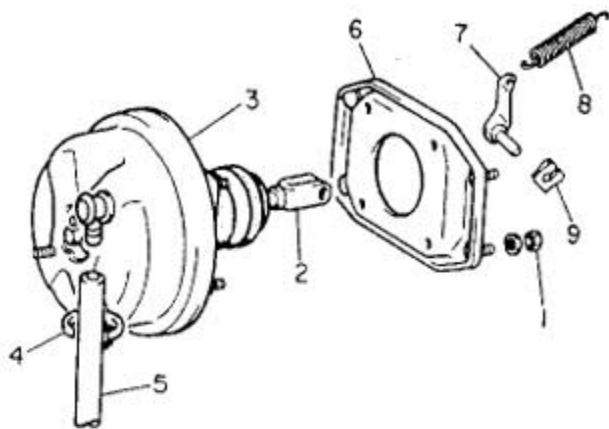
#### REMOVAL AND INSTALLATION

Remove reservoir and master cylinder (Refer to RESERVOIR AND MASTER CYLINDER REMOVAL AND INSTALLATION).

Loosen clamp (4). Disconnect vacuum hose (5) from brake servo (3).

From inside vehicle, remove return spring (8), clip (9) and pin (7) from servo push rod (2). Remove four nuts (1) and lockwashers to remove servo from mounting plate (6).

Install in reverse order of removal.



1. Nut 2. Brake servo push rod 3. Brake servo 4. Clamp  
5. Vacuum hose 6. Mounting plate 7. Pin 8. Spring 9. Clip

#### OVERHAUL

Remove check valve (9) by carefully pulling from bushing (10). Using wood blocks positioned on the six mounting studs, place brake servo in a vise.

Carefully squeeze front cover (6) and rear chamber (18) until rear chamber can be twisted to clear the lock tabs on front cover.

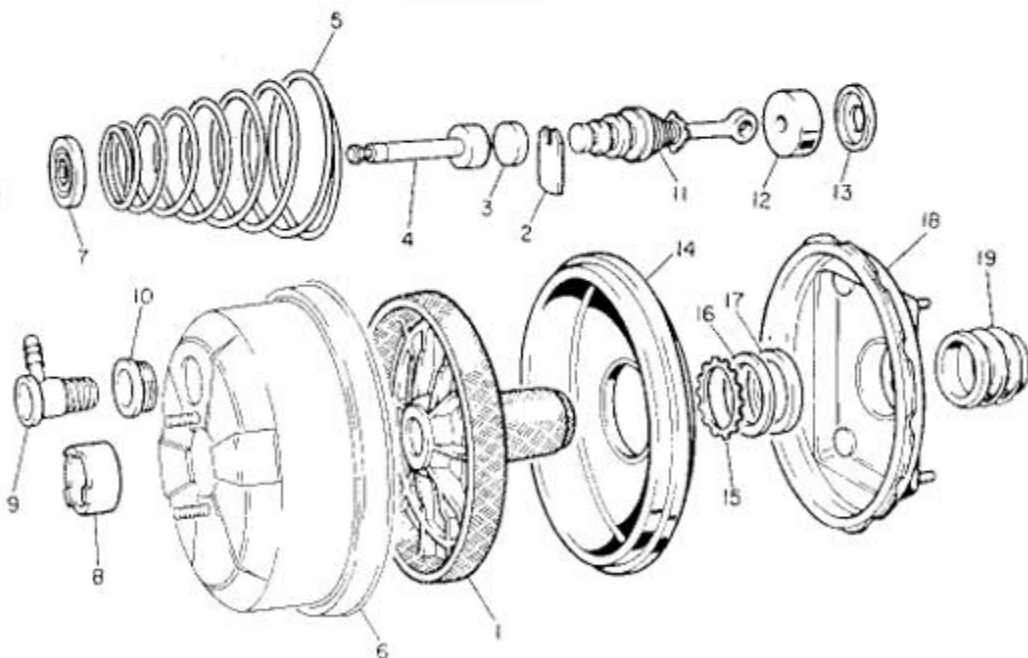
**WARNING:** Use care when releasing vise. Servo is spring loaded.

Carefully open vise until spring (5) pressure is released. Remove from vise and separate parts.

Remove rubber boot (19). Remove metal cup (13) and key (2) to remove plunger and valve (11). Separate remaining parts. Do not upset adjustment on vacuum piston rod (4).

Replace the following kit supplied parts: bushing plate (3), front seal (7), filter (12), cup (13), diaphragm (14), cup (15), seal (16), rear seal (17) and rubber boot (19).

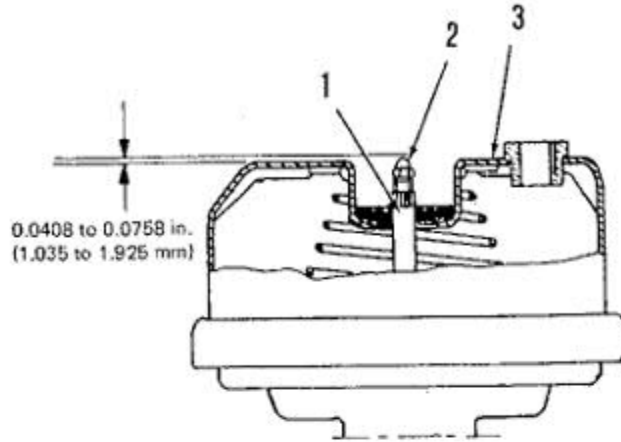
Inspect remaining parts for damage and wear. Replace as required. Lubricate shafts of vacuum piston rod (4), plunger and valve (11) with white grease. Reassemble in reverse order of disassembly.



- |                      |                  |                       |                  |
|----------------------|------------------|-----------------------|------------------|
| 1. Vacuum piston     | 6. Front cover   | 11. Plunger and valve | 16. Seal         |
| 2. Key               | 7. Front seal    | 12. Filter            | 17. Rear seal    |
| 3. Backing plate     | 8. Guide bushing | 13. Cup               | 18. Rear chamber |
| 4. Vacuum piston rod | 9. Check valve   | 14. Diaphragm         | 19. Rubber boot  |
| 5. Spring            | 10. Bushing      | 15. Cup               |                  |

After completing reassembly, adjust tip (2) of vacuum piston rod (1) to extend past front cover (3) by 0.0408 to 0.0758 in. (1.035 to 1.925 mm).

1. Vacuum piston rod 2. Tip 3. Front cover



3  
3

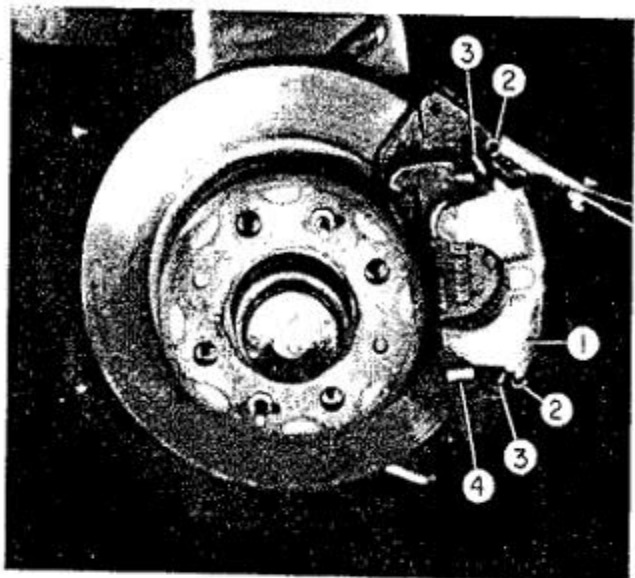
### CALIPER AND PADS

#### REMOVAL AND INSTALLATION

Remove wheels.

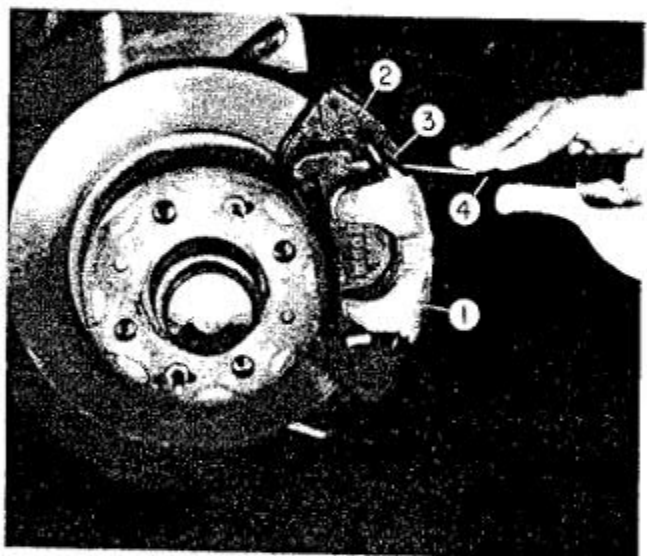
Remove four cotter pins (2).

1. Caliper body 2. Cotter pins 3. Caliper spring 4. Brake pad retainer spring



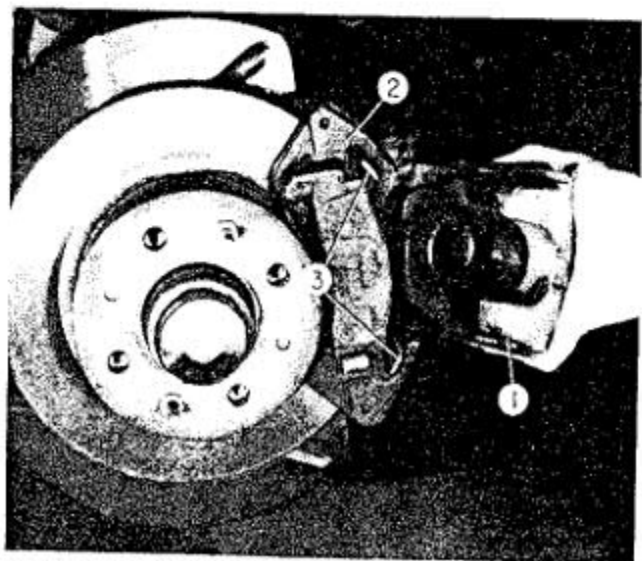
Remove two caliper locking blocks (3) with drift pin (4).

1. Caliper body 2. Support brackets 3. Caliper locking block 4. Drift pin



Separate caliper (1) from caliper support bracket (2).  
To remove caliper for replacement or overhaul, disconnect brake line. Cap line to prevent dirt entry.

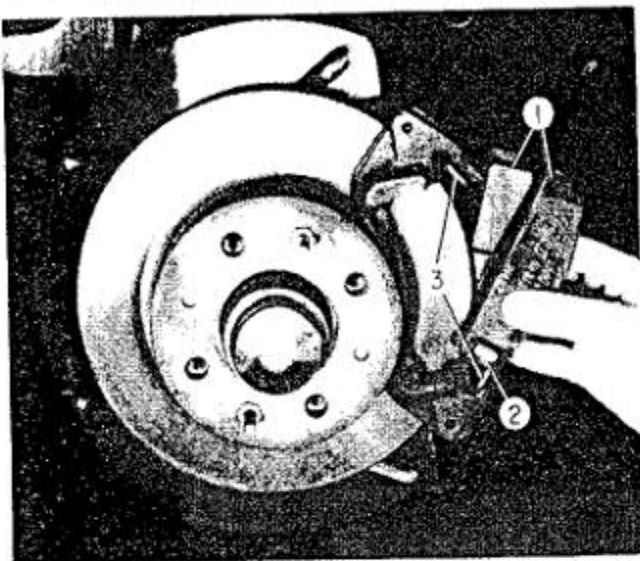
1. Caliper body 2. Caliper support bracket 3. Caliper spring



Remove two brake pads (1).

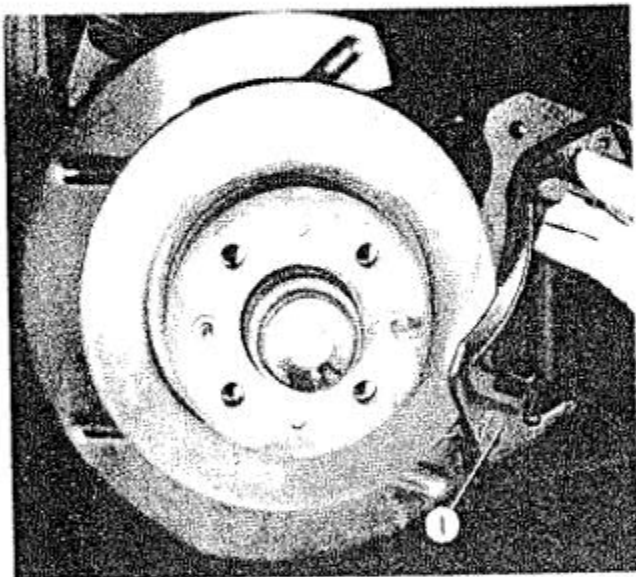
Inspect two retainer springs (2) and two caliper springs (3) for breakage. Replace if necessary.

1. Brake pad 2. Brake pad retainer spring 3. Caliper spring



To remove caliper support bracket (1), remove two bolts at rear of bracket.

1. Caliper support bracket



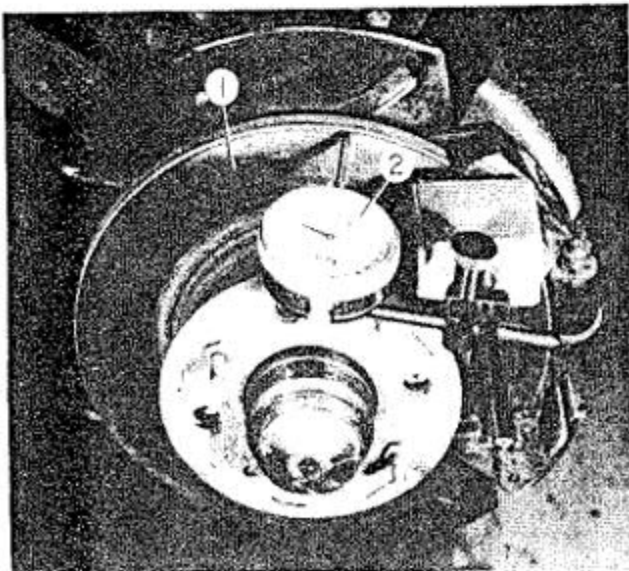
Check disc (1) for runout by placing a dial indicator (2) 0.08 in. (2 mm) from disc outer edge.

Runout must not be greater than 0.006 in. (0.15 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



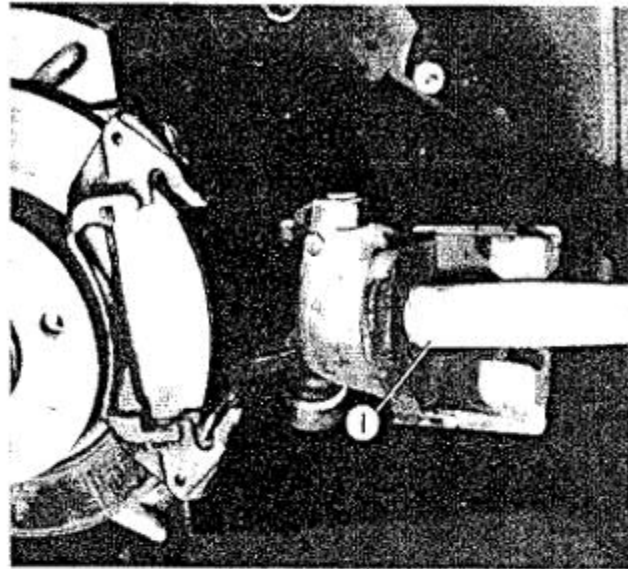


Installation is reverse of removal.

If new brake pads are being installed, it will be necessary to fully seat caliper piston (1) in bore in order to have installation clearance for calipers. Push in on center of piston with blunt object as shown (hammer handle, etc.) until piston bottoms out.

**NOTE:** Brake fluid will back up into master cylinder and may overflow.

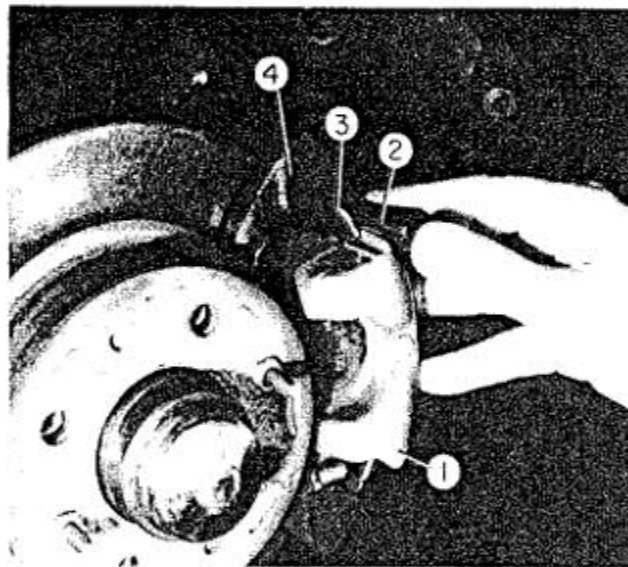
1. Caliper piston



Torque caliper support bracket (4) bolts to 36 ft lb (5 kgm).

After installing caliper, install lower locking block first, then with hand pressure against front of caliper (1) force caliper back far enough to insert top locking block (2).

1. Caliper 2. Caliper locking block 3. Caliper spring 4. Caliper support bracket



If caliper lines have been disconnected, bleed system (Refer to HYDRAULIC SYSTEM BLEEDING).

**CAUTION:** Before driving vehicle, pump brake pedal a few times to make sure caliper pistons are seated against pads and pedal is firm.

**DISC****REMOVAL AND INSTALLATION**

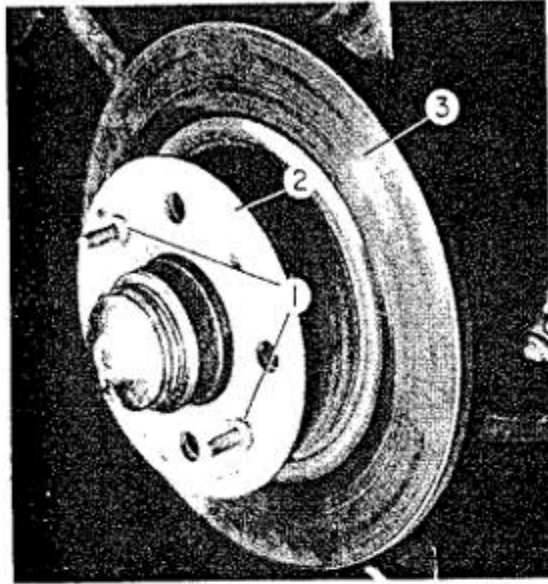
Remove caliper pads (Refer to CALIPER AND PADS REMOVAL AND INSTALLATION).

Remove two locating pin bolts (1). Remove plate (2) and disc (3).

Inspect disc for scoring or cracks. Discs can be refaced for scoring. Minimum thickness after refacing is 0.368 in. (9.35 mm). Replace disc if cracked.

Install in reverse order of removal.

1. Disc 2. Plate 3. Locking pin bolt



### CALIPER AND PADS

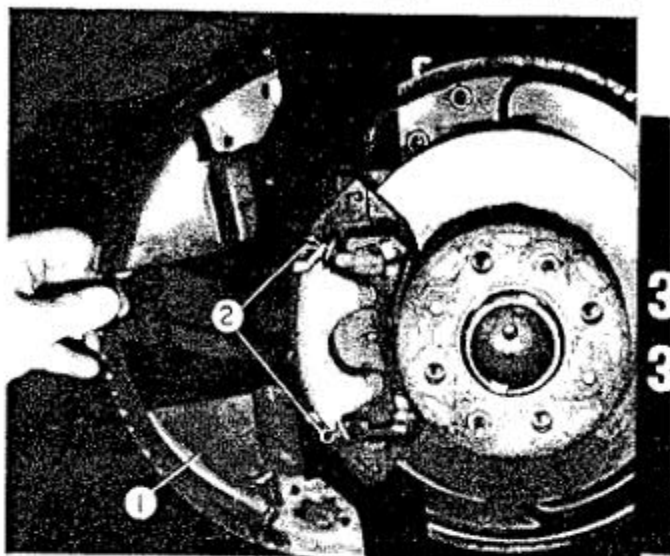
#### REMOVAL AND INSTALLATION

Remove wheels.

Remove four bolts and lockwashers to remove front section of backing plate (1).

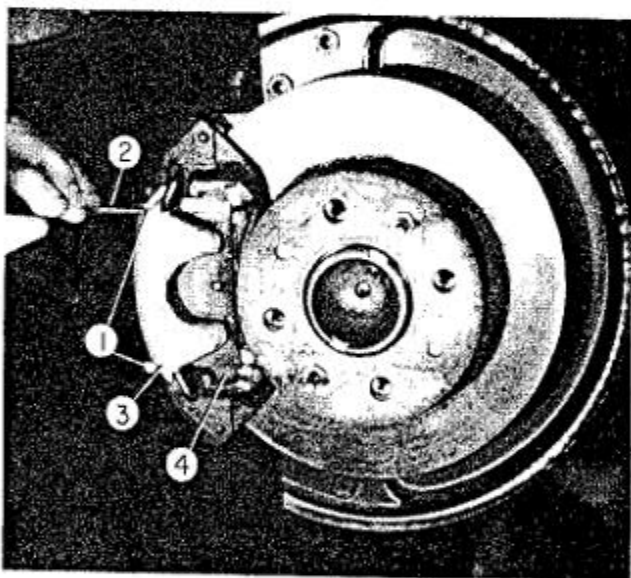
Remove four cotter pins (2).

1. Backing plate 2. Cotter pin



Remove two caliper locking blocks (1) with a drift pin (2).

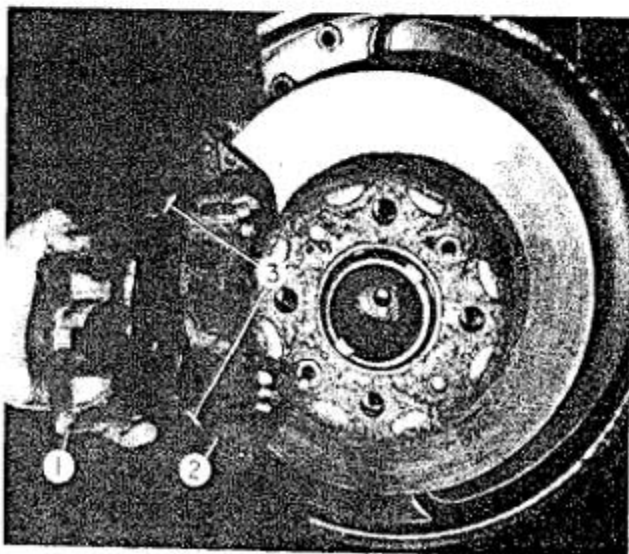
1. Locking block 2. Drift pin 3. Caliper 4. Brake pad



Separate caliper (1) from caliper support bracket (2).

To remove caliper for replacement or overhaul, disconnect brake line and hand brake cable from caliper. Cap brake line to prevent dirt entry.

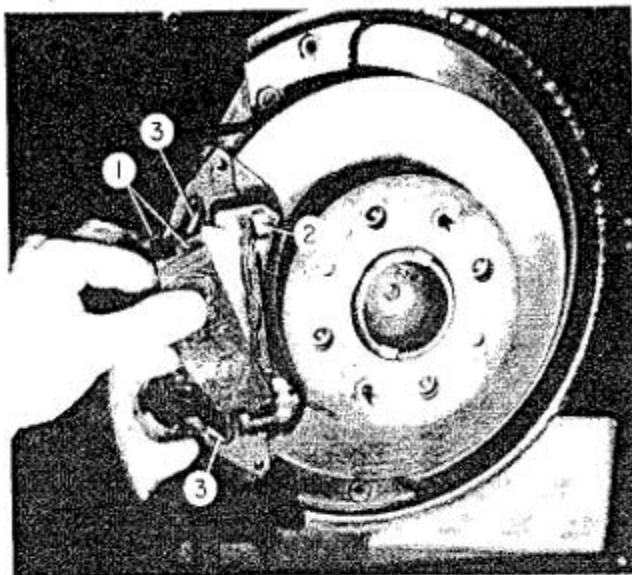
1. Caliper 2. Caliper support bracket 3. Caliper spring



Remove two brake pads (1).

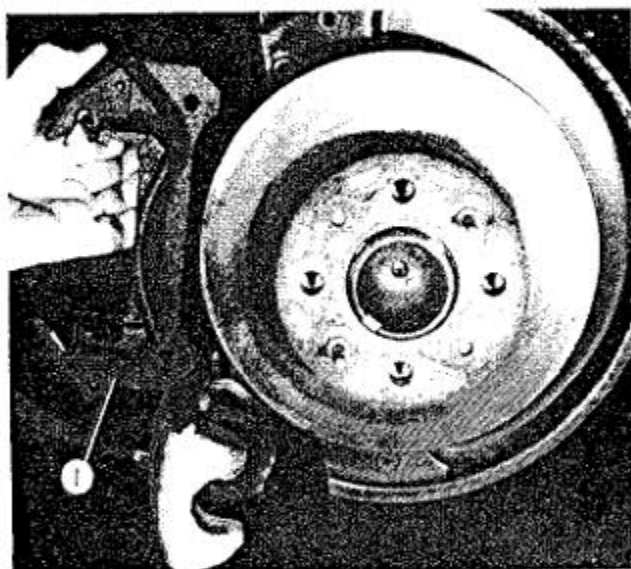
Inspect two retainer springs (2) and two caliper springs (3) for breakage. Replace if necessary.

1. Brake pad 2. Brake pad retainer spring 3. Caliper spring



To remove caliper support bracket (1), remove two bolts at rear of bracket.

1. Caliper support bracket



**CAUTION:** Before reassembling, make sure hand brake is completely off (cable slack). Make sure actuator lever is also completely bottomed to off position. If not done, hand brake operation will be ineffective.

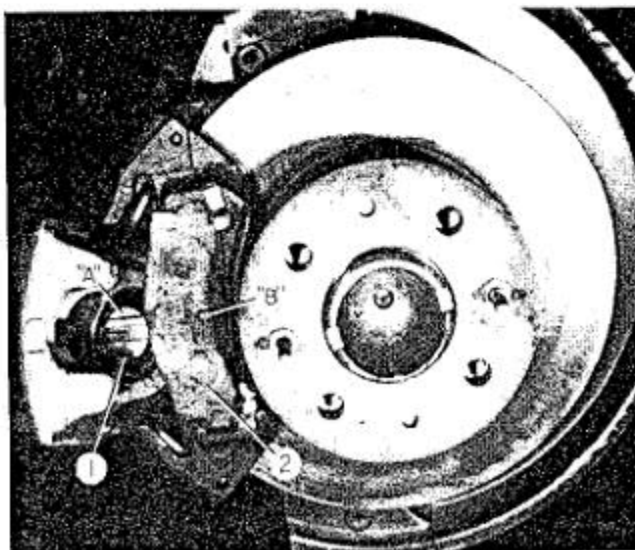
Installation is reverse of removal.

If new brake pads are being installed, it will be necessary to fully seat caliper piston (1) in bore in order to have installation clearance for calipers. Push in on center of piston with blunt object (hammer handle, etc.) until piston bottoms out.

**NOTE:** Brake fluid will back up into master cylinder and may overflow.

**CAUTION:** Piston must be in position shown, with groove "A" on top, and slot parallel so that it aligns with knob "B" on brake pad (2).

1. Caliper piston 2. Brake pad



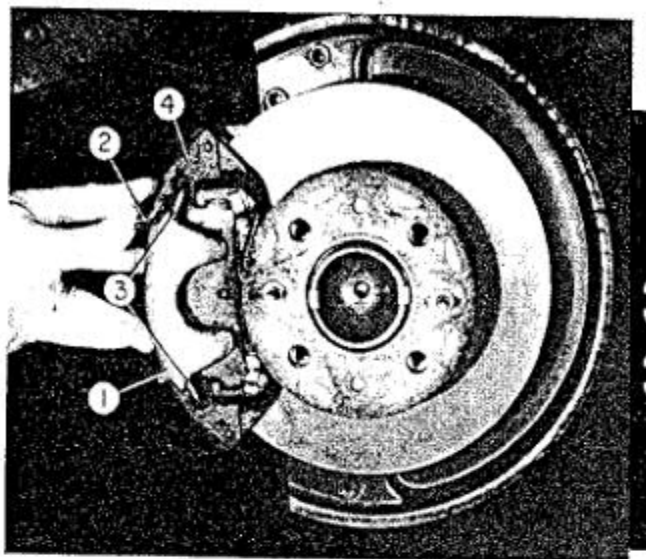
# Rear Wheel Brakes

331.25

Page 33-25

Torque caliper support bracket (4) bolts to 36 ft lb (5 kgm).  
After installing caliper, install lower locking block first, then with hand pressure against front of caliper (1) force caliper back far enough to insert top locking block (2).

1. Caliper 2. Caliper locking block 3. Caliper spring 4. Caliper support bracket



If caliper lines have been disconnected, bleed system (Refer to HYDRAULIC SYSTEM BLEEDING).

**CAUTION:** Before driving vehicle, pump brake pedal a few times to make sure caliper pistons are seated against pads and pedal is firm.

**DISC****REMOVAL AND INSTALLATION**

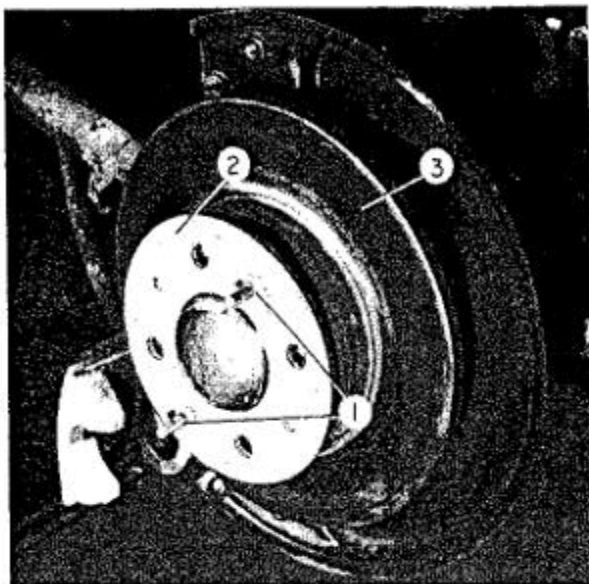
Remove caliper and pads (Refer to CALIPER AND PADS REMOVAL AND INSTALLATION).

Remove two locating pin bolts (1). Remove plate (2) and disc (3).

Inspect discs for scoring or cracks. Discs can be refaced for scoring. Minimum thickness after refacing is 0.368 in. (9.35 mm). Replace disc if cracked.

Install in reverse order of removal.

1. Locking pin bolt 2. Plate 3. Disc

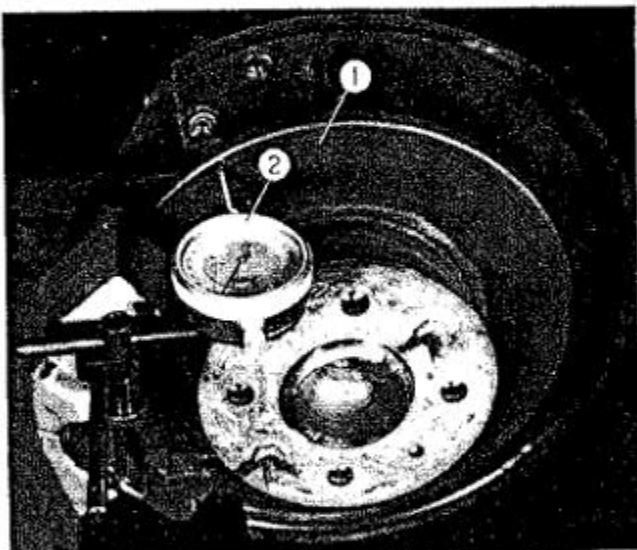


Check disc (1) for runout by placing a dial indicator (2) 0.08 in. (2 mm) from disc outer edge as shown. Runout must not be greater than 0.006 in. (0.15 mm), otherwise reface disc.

Thickness of disc after refacing must not be less than 0.372 in. (9.45 mm).

Minimum permissible thickness from wear is 0.354 in. (9 mm). Replace disc if less.

1. Brake disc 2. Dial indicator



### HAND BRAKE CABLE

#### REMOVAL AND INSTALLATION

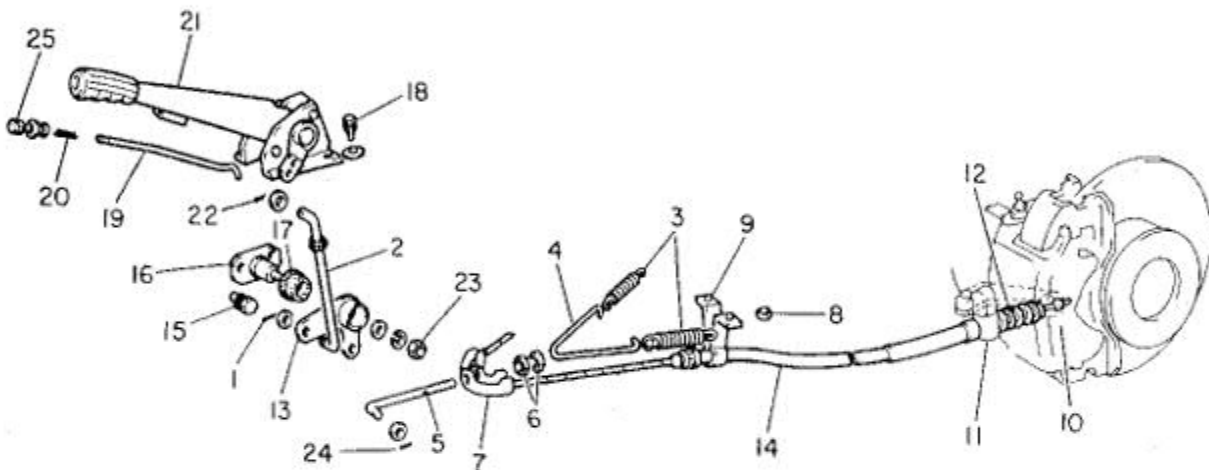
Place hand brake in off position.

From under vehicle remove cotter pin (1) and washer to disconnect hand brake rod (2). Disconnect return springs (3) and remove spring equalizer (7).

Remove nuts (8) holding cable support brackets (9).

Pull ball end (10) of cable out of lever socket. To remove cable assembly from support (11), slide rubber boot (12) out of way and compress spring. Remove cable assembly (14) from support.

Install in reverse order of removal. Lubricate bearing surfaces with white grease.



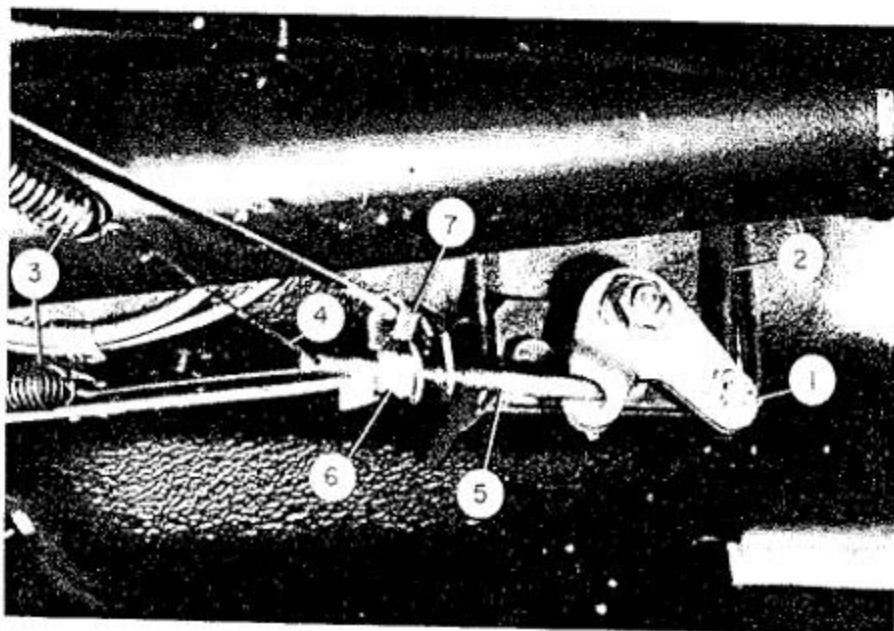
- 1. Cotter pin
- 2. Hand brake rod
- 3. Return spring
- 4. Spring holder
- 5. Cable rod

- 6. Nut
- 7. Cable equalizer
- 8. Nut
- 9. Support
- 10. Cable, ball end

- 11. Support
- 12. Rubber boot
- 13. Control arm
- 14. Cable assembly
- 15. Bolt

- 16. Mounting bracket
- 17. Bushing
- 18. Bolt
- 19. Spring hook
- 20. Spring

- 21. Hand brake lever
- 22. Cotter pin
- 23. Nut
- 24. Cotter pin
- 25. Push button



**ADJUSTMENT**

Whenever free travel is excessive or after replacing rear brakes or hand brake cable, adjust as follows:

**NOTE:** Brakes and hydraulic system must be in good condition for correct adjustment.

From under vehicle, loosen locknut (1). Back off locknut and adjusting nut (2) as far as possible.

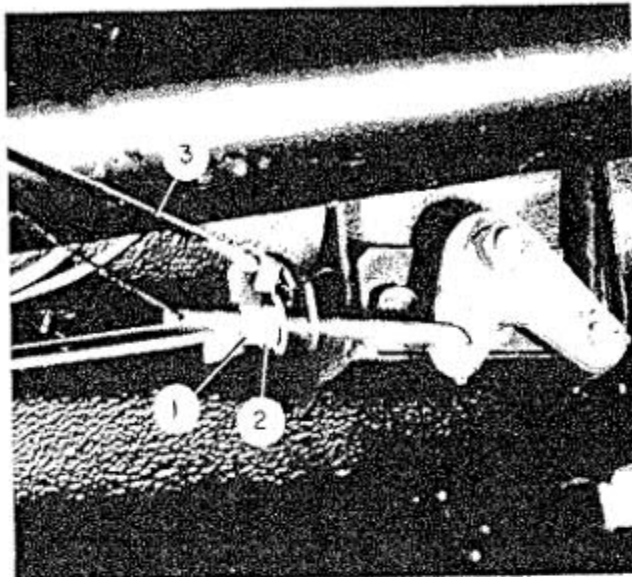
From inside vehicle, pump brake pedal at least 6 times. Move hand brake lever up and down through full travel at least 6 times.

Place hand brake in off position, and then pull it up one or two clicks.

From under the vehicle, turn adjusting nut (2) until cable (3) is taut. Tighten locknut (1) against adjusting nut.

Hand brake is correctly adjusted when three clicks of hand brake will firmly actuate rear brakes.

If one or both rear brakes are locked with hand brake released check linkages and cables for free movement.



1. Locknut 2. Adjusting nut 3. Cable



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# CLUTCH - 18

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

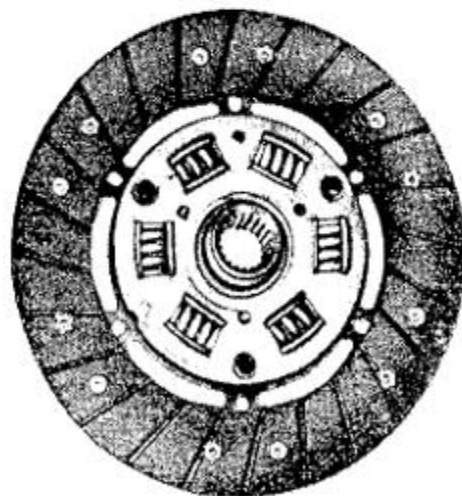
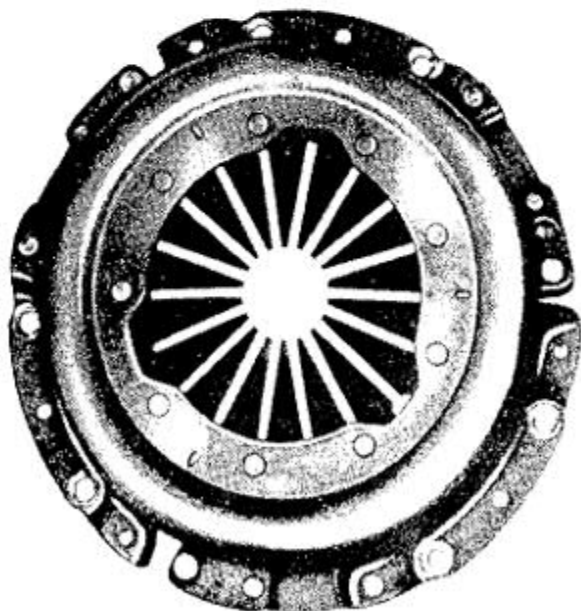
		PAGE
18	Specifications .....	18-1
	Torque Specifications .....	18-1
181.01	Clutch Release Control .....	18-3
181.05	Clutch .....	18-5
18A	Service Tools .....	18-7

## SPECIFICATIONS

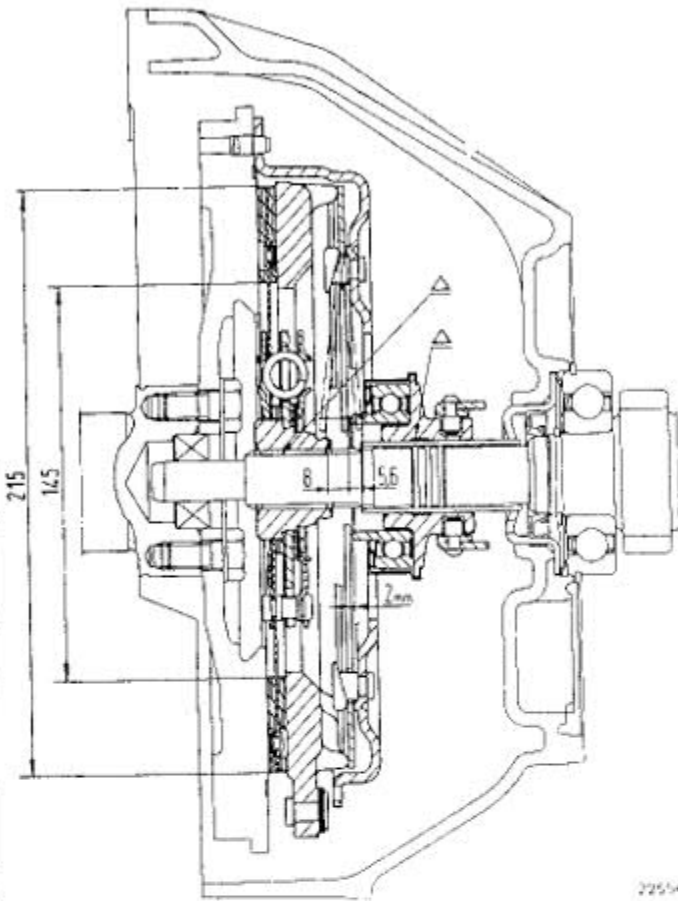
Type .....	single plate, dry	
Release mechanism .....	diaphragm spring	
Control .....	mechanical	
Clutch disc .....	with friction linings	
Lining O. D. ....	8.307	(215 mm)
Lining I. D. ....	5.708	(145 mm)
Max. runout of clutch disc linings .....	.006	(.15 mm)
Clutch pedal free travel, corresponding to a clearance of .079" (2 mm) between diaphragm spring and release sleeve, about. ....	.984	(25 mm)
Travel of diaphragm spring, corresponding to a pressure plate displacement not less than .067" (1.7 mm) .....	.315	(8 mm)

## TORQUE SPECIFICATIONS

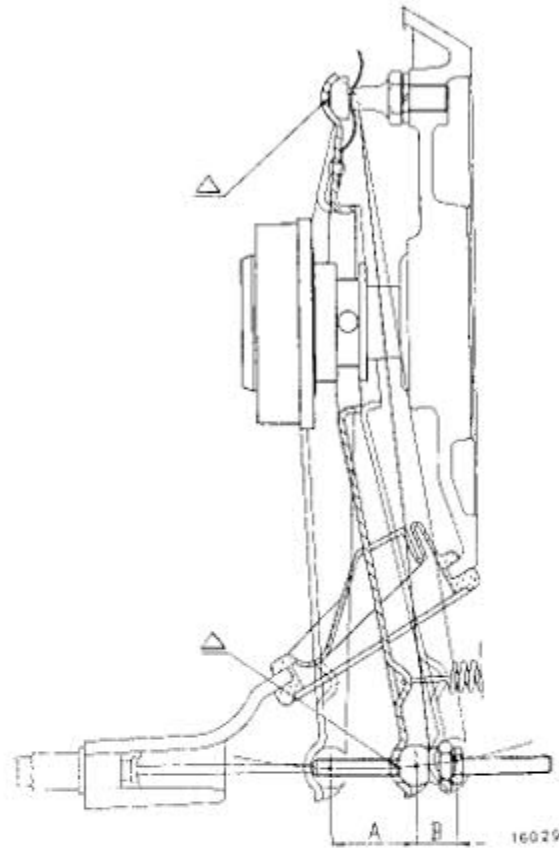
DESCRIPTION	THREAD (METRIC)	N·m	TORQUE	
			FT. LB.	Kgm
Bolt, clutch to flywheel .....	M8	29.4	22	3



CLUTCH COVER AND CLUTCH DISC



- .079" (2 mm) = Gap to be obtained by adjusting release control cable.
- .220" (5.6 mm) = Maximum permissible displacement from wear of driven plate linings.
- .315" (8 mm) = Release travel.



22554

16029

- A = 1.181" (30 mm) approx. Release travel corresponding to a minimum driven plate movement of .067" (1.7 mm).
- B = .689" (17 mm) approx. Displacement of release lever after wear of driven plate linings.
- Δ = Lubrication points: FIAT KG 15 grease.

## SPECIFICATIONS AND FEATURES

## CLUTCH CABLE REMOVAL AND INSTALLATION

Raise vehicle on lift.

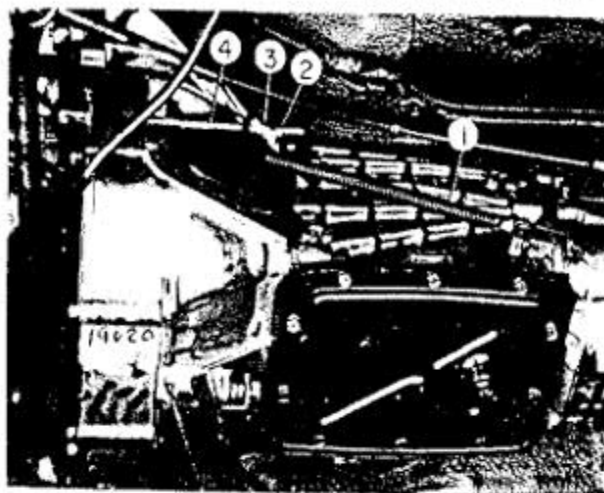
Remove clutch lever return spring (1).

Remove locknut (2) and adjusting nut (3) from clutch cable (4).

Withdraw cable through clutch housing.

Lower vehicle.

1. Return spring 2. Locknut 3. Adjusting nut 4. Clutch cable

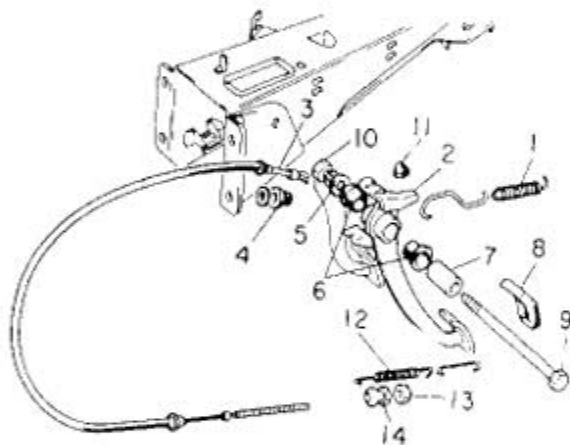


From driver's compartment, remove clutch pedal return spring (1).

Remove clutch cable (3) from clutch pedal (2).

From engine compartment pull clutch cable through firewall and out of vehicle. Installation is reverse of removal.

1. Return spring 2. Clutch pedal 3. Clutch cable 4. Bushing  
5. Spacer 6. Bushing 7. Spacer 8. Rubber pedal cover 9. Bolt  
10. Nut 11. Pedal stop 12. Return spring 13. Locknut  
14. Adjusting nut



## INSPECTION

Check that cable moves freely inside casing, that threaded end is not damaged and that half-moon block end is not worn. Replace if damaged.

Replace return springs if weak.

Replace firewall rubber bushing if damaged.

## CLUTCH ASSEMBLY

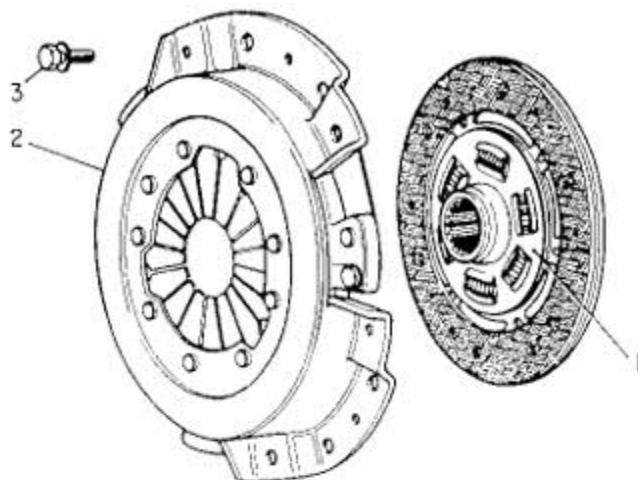
### REMOVAL

Remove transmission (refer to Transmission Section 21).

If same clutch assembly is to be installed, mark position on flywheel so that correct balance will be maintained upon reassembly.

Remove clutch assembly (1 and 2) by gradually (a few turns each bolt) removing six bolts (3).

1. Disc 2. Pressure plate 3. Bolt



### INSPECTION

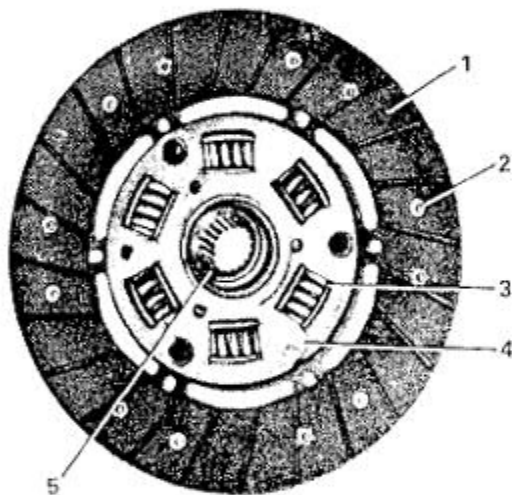
#### Clutch Disc

Check that surface of friction material (1) is not less than 1/16 in. from rivet heads (2), not cracked nor 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



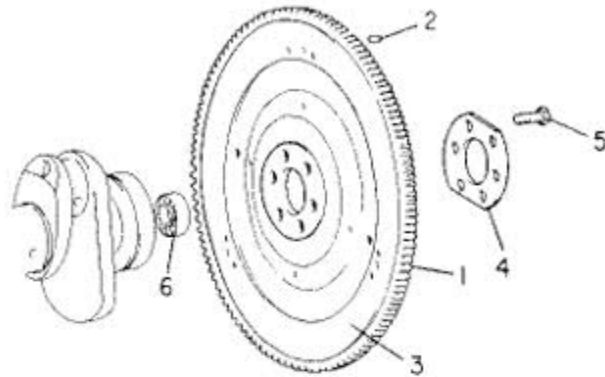
**Flywheel**

Inspect flywheel (3) for grooves, gauling, burns or heat cracks. For minor imperfections, lightly dress with medium 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 damage. Replace if damaged.

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

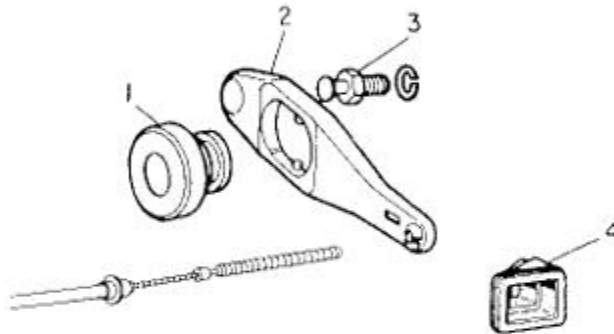
**Throwout Bearing and Clutch Lever**

Check throwout bearing (1) for serviceability. Replace if worn.

Check clutch lever (2) pivot points for excessive wear or damage. Replace if necessary.

Check end of pivot bolt (3) for excessive wear. Replace if worn.

Check dust boot (4) for deterioration. Replace if damaged.



1. Throwout bearing 2. Clutch lever 3. Pivot bolt 4. Dust boot

**INSTALLATION**

If flywheel was removed, torque mounting bolts to 105 ft lb (14.5 kgm).

Make sure clutch and flywheel surfaces are clean. If old clutch assembly is reinstalled, align marks noted in removal.

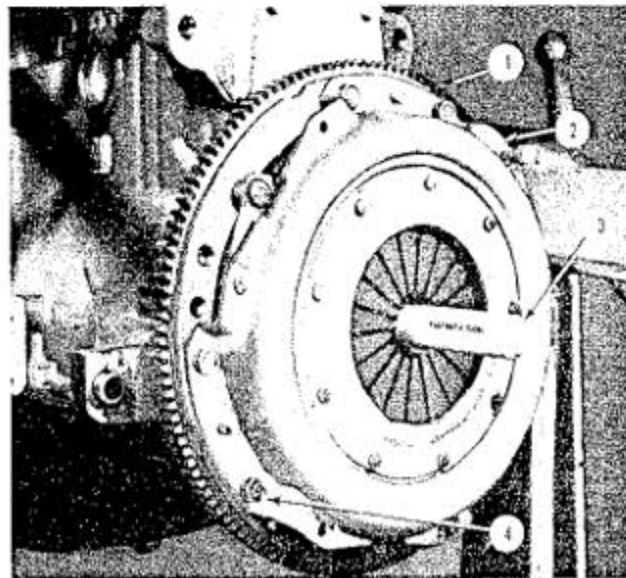
With protruding part of disc hub facing away from flywheel (1), loosely assemble clutch assembly (2) to flywheel.

Using pilot tool A.700B1 (3), center disc in pressure plate.

Gradually torque mounting bolts (4) to 22 ft lb (3 kgm). Remove pilot tool.

Lightly coat transmission pilot shaft with white grease, then reinstall transmission as specified in Transmission Section 21.

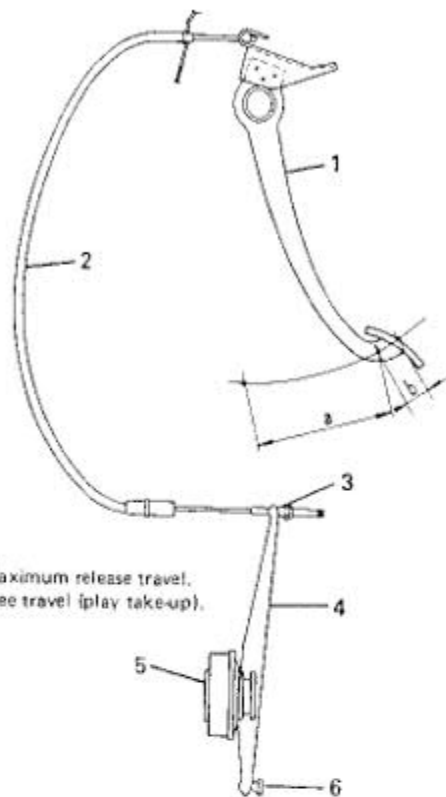
1. Flywheel 2. Clutch assembly 3. Pilot tool A.700B1 4. Bolt



## ADJUSTMENT

Loosen locknut and tighten or loosen adjusting nut (3) to obtain free travel of approximately 1 in (25 mm) as shown (dimension "b").

1. Clutch pedal 2. Clutch cable 3. Adjusting nut 4. Clutch lever  
5. Throwout bearing 6. Pivot bolt



a = 4.72" (120 mm approx. Maximum release travel.  
b = .984" (25 mm) approx. Free travel (play take-up).

## Service Tools

NOTE: Number given in parentheses is Kent Moore catalogue number.

A.70081 (J28091) Clutch centering pilot



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# DRIVE SHAFT - 24

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

		PAGE
24	Specifications . . . . .	24-1
	Torque Specifications . . . . .	24-1
243.01	Drive Shaft . . . . .	24-5
24A	Service Tools . . . . .	24-11



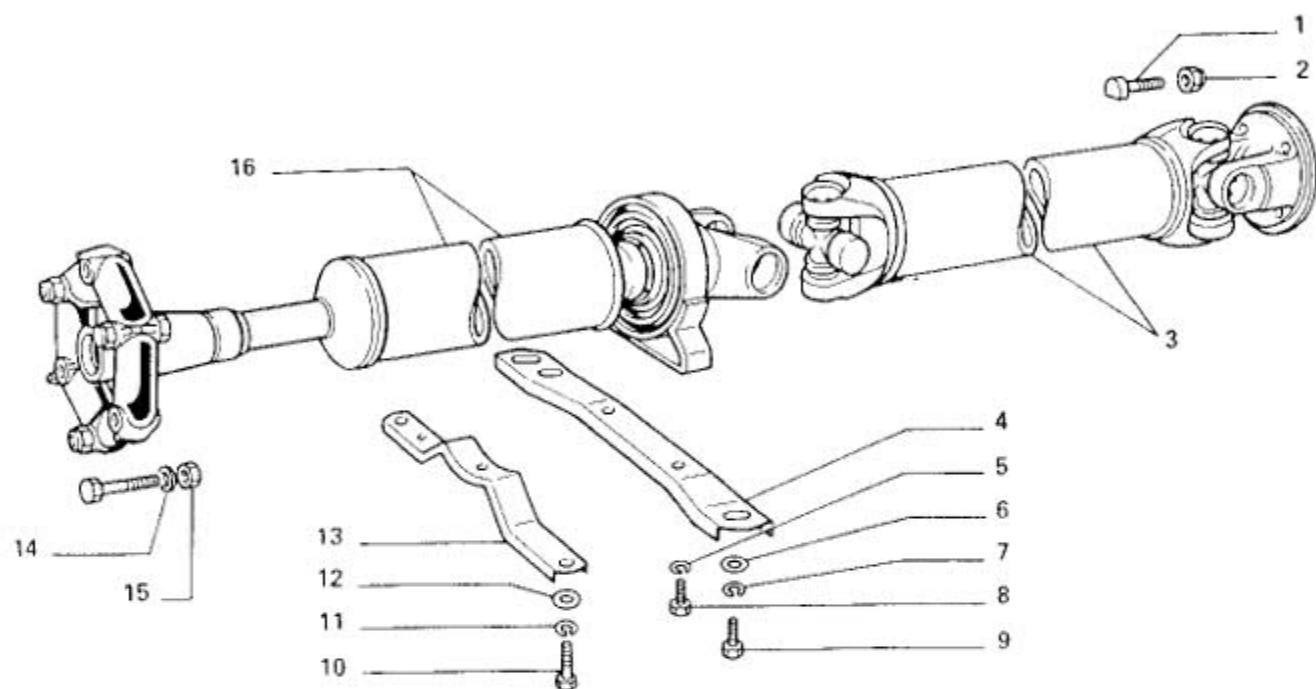
## SPECIFICATIONS

Drive Shaft: dual with center pillow block with rubber-cushioned bearing. Universal joints on rear section. Flexible joint at transmission end.

<b>Front Shaft</b>	
- Type .....	tubular, with splined ends
- Diameter .....	2.756 in. (70 mm)
- Length, manual trans. (measured between stub ends) .....	14.5 in. (368.3 mm)
- Length, auto. trans. (measured between stub ends) .....	10.5 in. (266.7 mm)
<b>Rear Shaft</b>	
- Type .....	tubular, with universal joint yokes
- Diameter .....	2.756 in (70 mm)
- Length, auto. and manual (measured between universal joint centers) ..	30.5 in (774.7 mm)
<b>Center Pillow Block</b> .....	flexible, with sealed ball bearing
<b>Joints</b>	
- Front .....	flexible
- Center .....	universal
- Rear .....	universal
Fit clearance between universal joint spider journals and needle bearings . .	0.004 to 0.016 inch (0.01 to 0.04 mm)
Thickness range of service snap rings for adjusting clearance between universal spider journals and needle bearings .....	0.0591, 0.0602, 0.0614, 0.0626, 0.0638, 0.0649 inch (1.5, 1.53, 1.56, 1.59, 1.62, 1.65 mm)

## TORQUE SPECIFICATION

DESCRIPTION	THREAD (METRIC)	N·m	TORQUE	
			FT. LB.	Kgm
Flange nut, yoke to support .....	M16 x 1.5	29.4	21	3
Self-locking nut, flexible joint to transmission and drive shaft bolt .....	M12 x 1.25	68.6	51	7
Self-locking nut, drive shaft to rear axle bolt . .	M8	34.3	25	3.5
Bolt, drive shaft pillow block to crossmember	M8	25	18	2.5
Bolt, pillow block to body .....	M8	25	18	2.5
Nut, sleeve to shaft .....	-	95	69	9.5

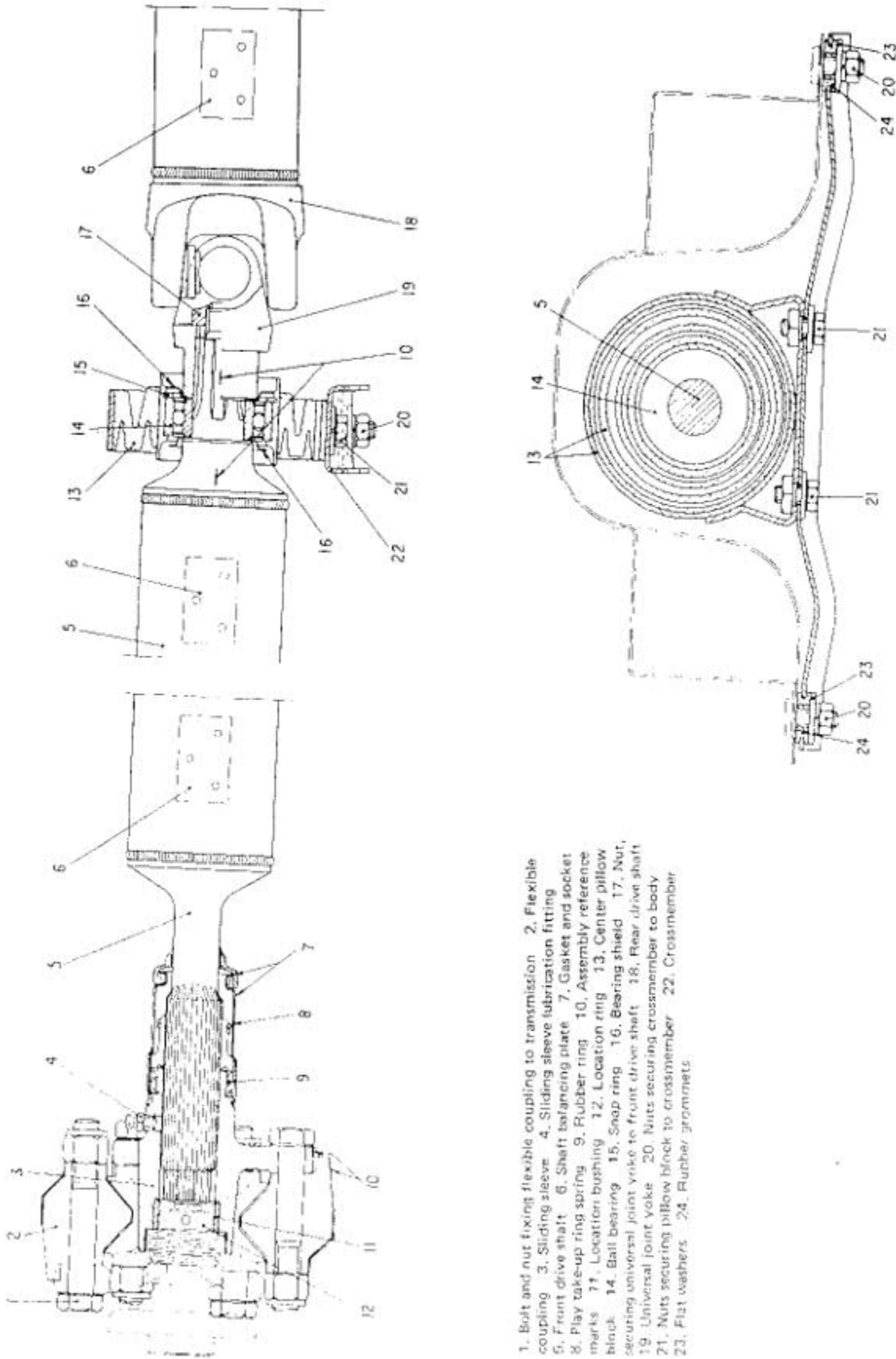


- 1. Bolt
- 2. Nut
- 3. Rear shaft
- 4. Crossmember
- 5. Lock washer
- 6. Flat washer

- 7. Lock washer
- 8. Bolt
- 9. Bolt
- 10. Bolt
- 11. Lock washer
- 12. Flat washer

- 13. Protection bracket
- 14. Bolt
- 15. Nut
- 16. Front shaft

### DRIVE SHAFT ASSEMBLY



1. Bolt and nut fixing flexible coupling to transmission
2. Flexible coupling
3. Sliding sleeve
4. Sliding sleeve lubrication fitting
5. Front drive shaft
6. Shaft balancing plate
7. Gasket and socket
8. Play take-up ring spring
9. Rubber ring
10. Assembly reference marks
11. Location bushing
12. Location ring
13. Center pillow block
14. Ball bearing
15. Snap ring
16. Bearing shield
17. Nut, securing universal joint yoke to rear drive shaft
18. Rear drive shaft
19. Universal joint yoke
20. Nuts securing crossmember to body
21. Nuts securing pillow block to crossmember
22. Crossmember
23. Flat washers
24. Rubber grommets

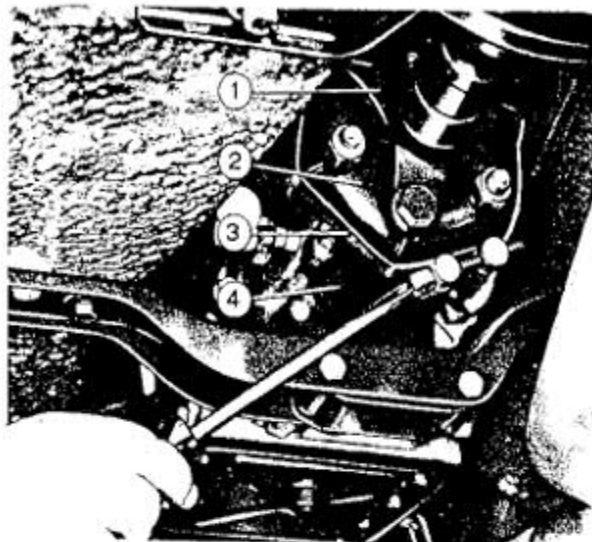
LONGITUDINAL SECTIONS OF DRIVE SHAFT THROUGH FLEXIBLE COUPLING AND CENTER PILLOW BLOCK

### DRIVE SHAFT

#### REMOVAL AND INSTALLATION

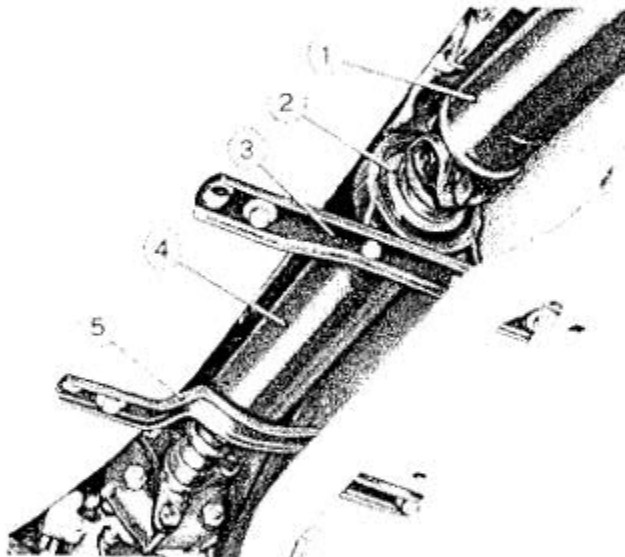
Install compressor (3) on flexible coupling (2). Remove nuts and bolts holding coupling (2) to transmission flange.

1. Drive shaft yoke 2. Flexible coupling 3. Compressor  
4. Transmission mount



Remove bolts holding crossmember (3) for pillow block (2).  
Remove bolts holding protection bracket (5) for front shaft (4).

1. Rear shaft 2. Pillow block 3. Crossmember 4. Front shaft  
5. Protection bracket

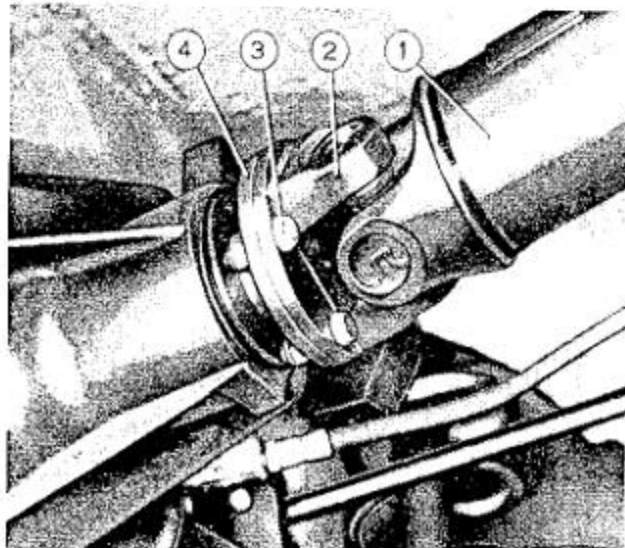


Remove nuts holding rear shaft yoke (2) to differential flange (4). Remove drive shaft.

**NOTE:** If installing new flexible joint do not remove metal band until all 6 bolts are installed.

When connecting flexible joint, make sure all bolts are installed with bolt heads against flanges.

1. Rear shaft 2. Yoke 3. Bolts 4. Differential flange

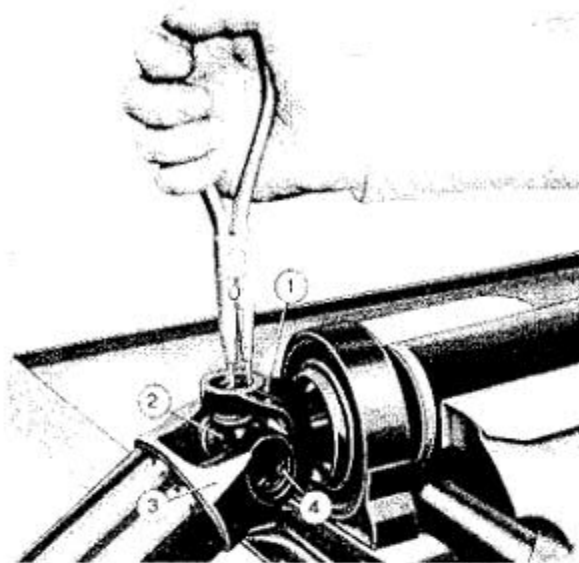


**CENTER PILLOW BLOCK****REMOVING**

Remove drive shaft. Remove 2 bolts holding cross member to block.

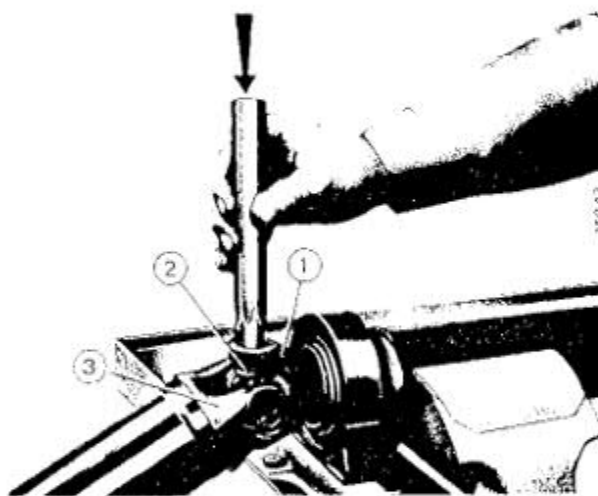
Remove snap rings (4) holding spider (2) in front shaft.

1. Sleeve 2. Spider 3. Rear shaft 4. Snap ring



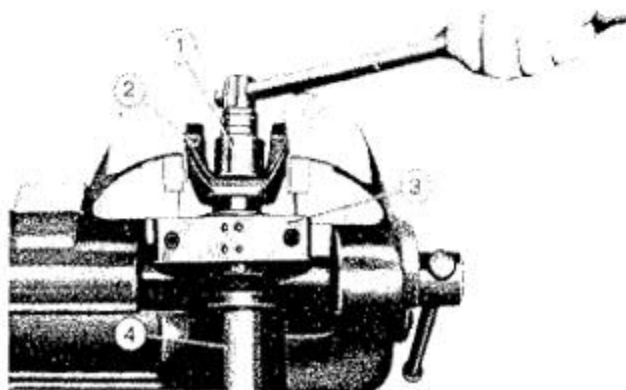
Tap spider out of sleeve. Use a driver.

1. Sleeve 2. Spider 3. Rear shaft



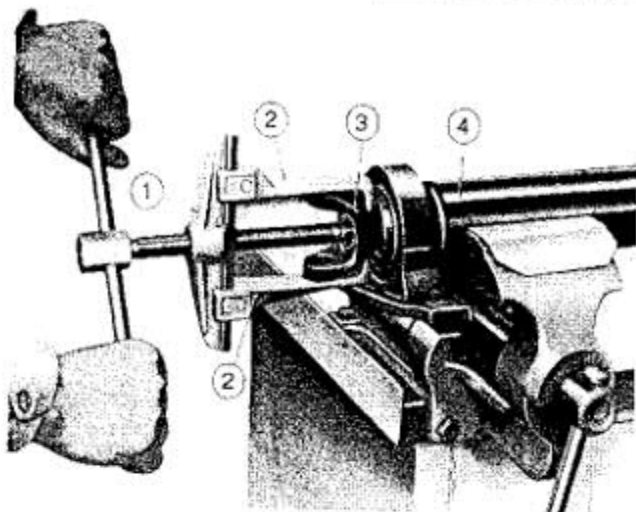
Mark shaft and sleeve for reassembly. Place sleeve in front shaft in vice. Remove nut holding sleeve to shaft.

1. Socket 2. Sleeve 3. Pillow block 4. Front shaft



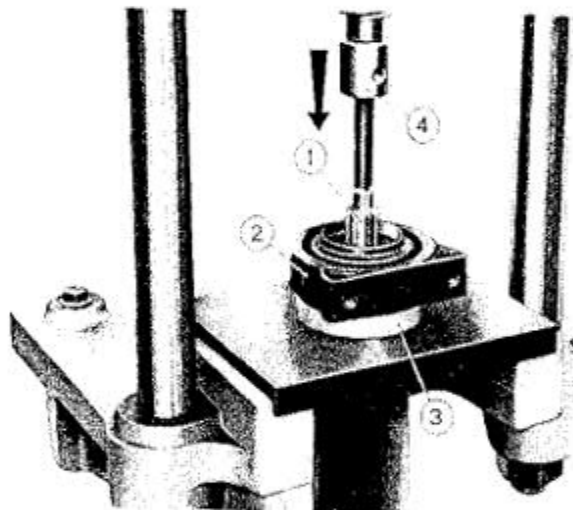
Remove sleeve and dust cover. Use a puller.

1. Puller 2. Puller jaws 3. Sleeve 4. Shaft



Place shaft in press. Press shaft out of pillow block.

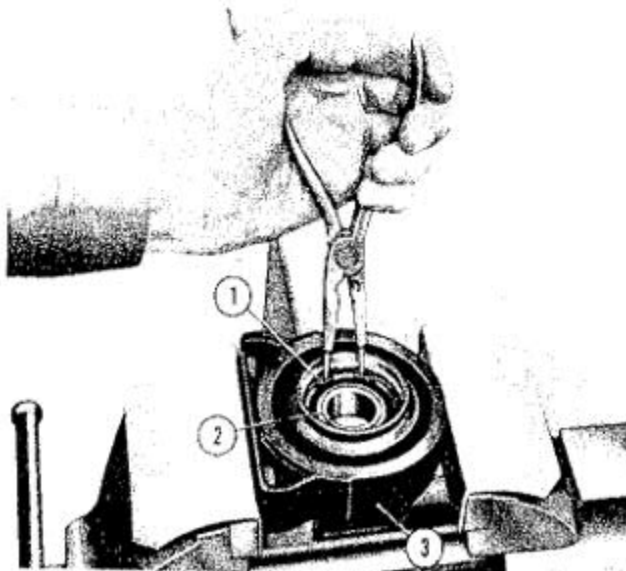
1. Shaft end 2. Pillow block 3. Adapter 4. Press



### DISASSEMBLING

Remove snap ring (1) holding bearing (2) in pillow block (3). Pull bearing out of pillow block. Use a universal puller.

1. Snap ring 2. Bearing 3. Pillow block



**ASSEMBLING**

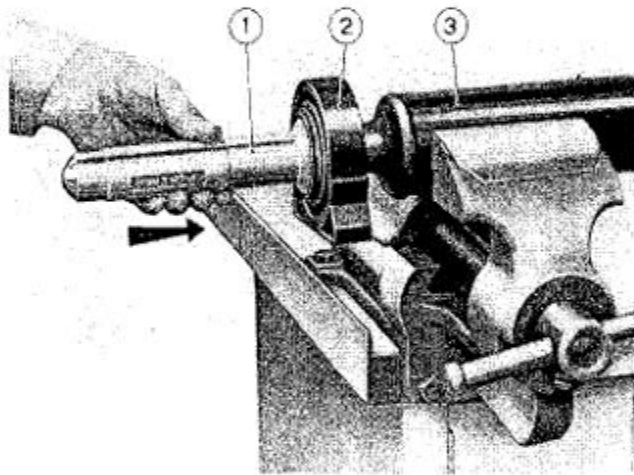
Press bearing (2) into pillow block (3). Use a drift (1). Install bearing retainer snap ring.

1. Drift 2. Bearing 3. Pillow block

**INSTALLING**

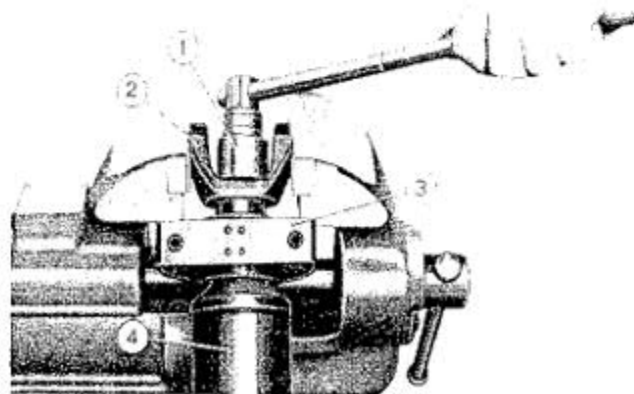
Place dust cover on shaft. Install pillow block (2) on shaft (3). Use a drift (1). Place rear dust cover on shaft.

1. Drift 2. Pillow block 3. Front shaft



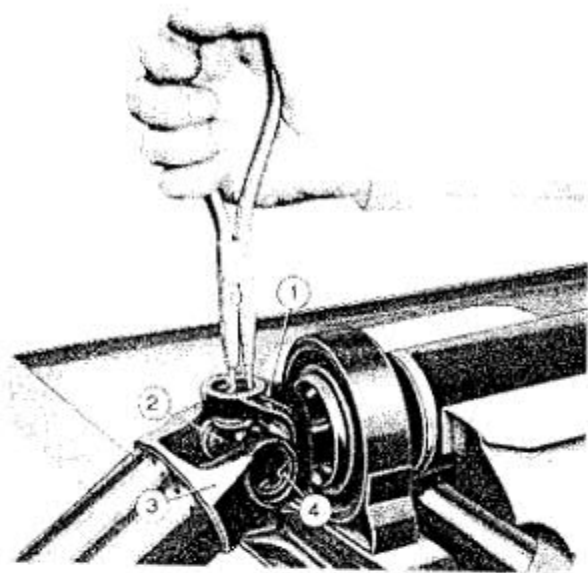
Align mark on sleeve with mark on shaft. Place sleeve on shaft. Install nut on shaft. Torque nut to 69 ft lb. Stake the nut.

1. Socket 2. Sleeve 3. Pillow block 4. Front shaft



Place spider on rear shaft in sleeve on front shaft. Press spider into sleeve. Install two snap rings in sleeve to hold spider.

1. Sleeve 2. Spider 3. Rear shaft 4. Snap ring

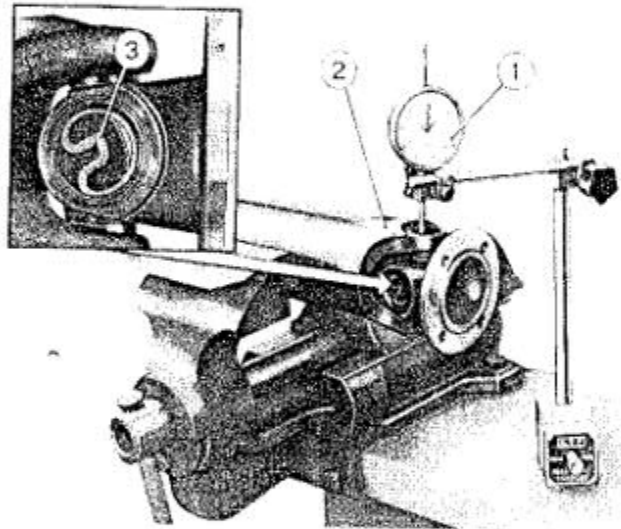


### UNIVERSAL JOINT INSPECTION

Clamp shaft in vice. Using dial indicator, measure play between spider journals and needle bearings.

Play must not exceed 0.0004 to 0.0016 in (0.01 to 0.04 mm). If play exceeds limit, replace snap rings with larger ones. Inspect spider and needle bearings for condition. If interference or looseness between parts is indicated, replace complete spider.

1. Dial indicator 2. Rear drive shaft 3. Snap ring

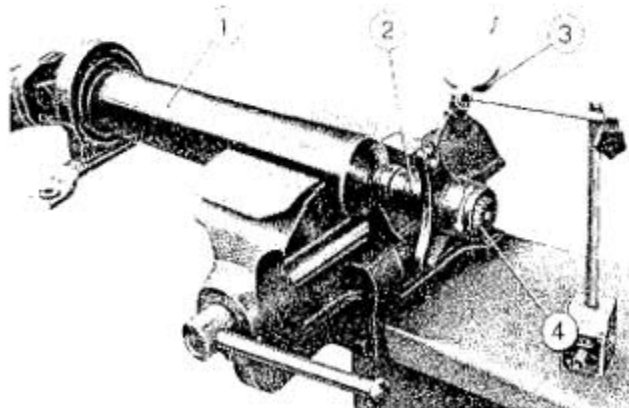


### FLEXIBLE JOINT YOKE INSPECTION

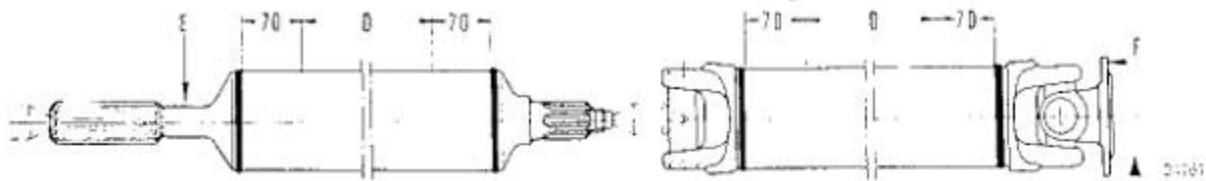
Set dial indicator as shown. Check lash between yoke (2) and front drive shaft splines (4).

Measure lash at yoke outer edge. Lash should be 0.0069 to 0.0137 in (0.175 to 0.350 mm).

1. Front drive shaft 2. Yoke 3. Dial indicator 4. Front shaft splines







## DRIVE SHAFT

### INSPECTION

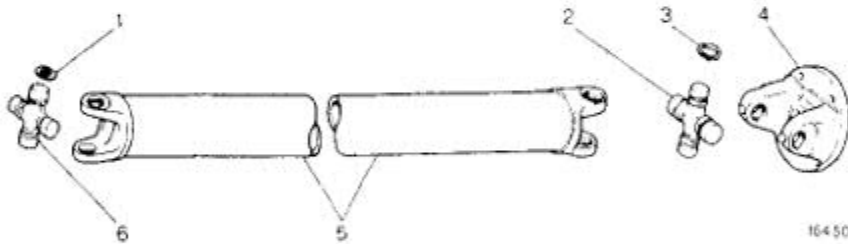
#### Front Shaft

Support shaft between centers. Set dial indicator on section D and E. Turn shaft by hand and check runout. Runout should not exceed 0.014 in (0.35 mm) at D and 0.006 in (0.15 mm) at E.

Shaft straightening, if required should be done under a press.

#### Rear Shaft

Install universal joint on shaft. Mount shaft on suitable fixture. Set dial indicator on section D and point F. Turn shaft by hand check runout. Runout should not exceed 0.014 in (0.35 mm) at D and 0.004 in (0.10 mm) at F.



1. Snap ring
2. Needle bearing
3. Snap ring

4. Yoke
5. Drive shaft
6. Needle bearing

**NOTE:** Number given in parentheses is Kent-Moore catalogue number.

A.70025 (J28087) Compressor, flexible joint removal and installation.



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# ELECTRICAL - 55

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

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55	Specifications .....	55-1
	Fuses .....	55-7
	Relay Location .....	55-9
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552.01	Starting System .....	55-25
553.01	Charging System .....	55-29
554.01	Lighting Equipment .....	55-39
555.01	Signaling .....	55-41
555.16	Accessories .....	55-43

## IGNITION

Firing order . . . . . 1 - 3 - 4 - 2

### IGNITION DISTRIBUTOR (to 1978)

Type . . . . .	MARELLI S144CAY
Static advance . . . . .	0°
Centrifugal advance . . . . .	36° ± 1° 30'
Contact gap . . . . .	0.015 to 0.017 in.
Terminal-to-ground insulation at 500 Vd.c., more than . . . . .	10 megohm
Condenser capacity at 50 to 1000 Hz . . . . .	0.20 to 0.25 microfarad
Breaker contact pressure . . . . .	19.4 ± 1.8 oz. (550 ± 50 gr)
Opening angle . . . . .	35° ± 3°
Closing angle . . . . .	55° ± 3°

### Additional breaker points

— advance of . . . . .	10° ± 1°
— contact gap . . . . .	0.015 to 0.017 in.
— opening angle . . . . .	35° ± 5°
— closing angle . . . . .	55° ± 5°
— breaker contact pressure . . . . .	14.1 ± 1.8 oz. (400 ± 50 gr)

### IGNITION DISTRIBUTOR (1979 and on)

Type . . . . .	MARELLI 877AX
Static advance . . . . .	10°
Centrifugal advance . . . . .	28° ± 2°
Vacuum advance	
California (carburetor) . . . . .	10° ± 2° at 12 in. Hg
49 States (carburetor) . . . . .	14° ± 2° at 12 in. Hg
All (fuel injection) . . . . .	15° ± 2° at 14 in. Hg
Air gap . . . . .	0.012 to 0.016 in. (0.30 to 0.40 mm)
Control module input voltage . . . . .	6 to 18 volts
Current limiter output . . . . .	4.5 to 6.0 amps
Rotor arm resistance . . . . .	5,000 ohms

### IGNITION COIL (to 1978)

Type . . . . .	MARELLI BES200A	MARTINETTI G 37 SU
Primary winding ohmic resistance at 68°F (20°C) . . . . .	2.59 to 2.81 ohms	2.60 to 2.95 ohms
Secondary winding ohmic resistance at 68°F (20°C) . . . . .	6,750 to 8,250 ohms	7,000 to 8,500 ohms

### IGNITION COIL (1979 and on)

Type . . . . .	MARELLI AEI200A
Primary winding ohmic resistance at 68°F (20°C) . . . . .	0.75 to 0.81 ohms
Secondary winding ohmic resistance at 68°F (20°C) . . . . .	10,000 to 11,000 ohms

### SPARK PLUGS

Thread diameter and pitch, metric . . . . .	M14 x 1.25
	(to 1976)                      (1977 and on)
Type: AC . . . . .	41-2XLS                      NORMAL                      RESISTOR
BOSCH . . . . .	42XLS                      R42XLS
CHAMPION . . . . .	W175T30                      W175TR30
MARELLI . . . . .	N7Y                      N9Y                      RN9Y
	CW78LP                      CW7LP                      CW7LPR
Gap (inch) . . . . .	0.019 to 0.027                      0.023 to 0.027                      0.027 to 0.031

\*NOTE: Distributor used on Spider Turbo has a limited centrifugal advance.

**STARTING MOTOR**  
(All Except Automatic Transmission, 1981 and on)

Type .....	MARELLI E 100-1.3/12
Voltage .....	12 V
Rated output .....	1,3 kW
Direction of rotation, pinion side .....	clockwise
Number of poles .....	4
Field winding .....	series-parallel
Engagement .....	free-wheel
Drive .....	solenoid
Diameter inside pole shoes .....	2.675" to 2.677" (67.95 to 68.00 mm)
Diameter of armature .....	2.634" to 2.638" (66.85 to 66.90 mm)

**Bench Testing Data**

## Running test at 77° F (25° C):

Current .....	280 A
Torque developed .....	5.78 ± .24 ft. lb. (0.8 ± 0.02 kgm)
Speed .....	1600 ± 100 rpm
Voltage .....	9.5 V

## Stall torque test at 77° F (25° C):

Current .....	530 A
Voltage .....	7 ± 0.3 V
Torque developed .....	12.58 ± .7 ft. lb. (1.74 ± 0.1 kgm)

## No-load test at 77° F (25° C):

Current .....	28 A or less
Voltage .....	12 V
Speed .....	5200 ± 500 rpm

**Check of Mechanical Characteristics**

Brush pressure (unworn) .....	2.2 ± .2 lb. (1 ± 0.1 kg)
End clearance, armature shaft .....	.003" to .027" (0.07 to 0.70 mm)
Mica undercut depth .....	.019" to .027" (0.5 to 0.7 mm)
Free wheel efficiency: static torque to rotate pinion slowly ...	2 to 2.4 in. lb. (2.3 to 2.8 kgcm)

**Solenoid**

Coil resistance at 68° F (20° C) .....	0.39 ± 0.02 ohm
Contact stroke .....	.113" to .158" (2.87 to 4.03 mm)
Core stroke .....	.538" to .638" (13.68 to 16.20 mm)

**Lubrication**

Drive unit splines .....	FIAT VS <sup>+</sup> 10 W oil (SAE 10 W)
Contact face of pinion sleeve .....	FIAT MR 3 grease

## STARTING MOTOR (Automatic Transmission, 1981 and on)

Type .....	BOSCH 0-001-208-408
Voltage .....	12 V
Rated output .....	0.95 kW
Direction of rotation, pinion side .....	clockwise
Number of poles .....	4
Field winding .....	series
Engagement .....	free-wheel
Drive .....	solenoid

### Bench Testing Data

#### Running test at 77° F (25° C):

Current .....	268 A
Torque developed .....	5.07 ft. lb. (0.7 kgm)
Speed .....	1560 rpm
Voltage .....	9.3 V

#### Stall torque test at 77° F (25° C):

Current .....	496 A
Voltage .....	7.1 V
Torque developed .....	10.8 ft. lb. (1.5 kgm)

#### No-load test at 77° F (25° C):

Current .....	40 ± 5 A
Voltage .....	11.6 V
Speed .....	9600 ± 500 rmp

### Check of Mechanical Characteristics

End clearance, armature shaft .....	.0059" to .017" (0.15 to 0.45 mm)
Mica undercut depth .....	mica undercutting not necessary

### Solenoid

#### Coil resistance at 68° F (20° C):

Pull-in .....	0.375 ± 0.01 ohm
Hold-in .....	1.65 ± 0.05 ohm

### Lubrication

Drive unit splines .....	FIAT VS* 10 W oil (SAE 10 W)
Contact face of pinion sleeve .....	FIAT MR 3 grease

## ALTERNATOR (1975 and 1976)

### Alternator Specifications

Type .....	MARELLI A 12 M 124/12/42 M
Rated voltage .....	12 V
Maximum output .....	770 W
(* Cut-in speed at 12 V (68° F [20° C]) .....	1,000 ± 50 rpm
(* Current output at 14 V to battery at 7,000 rpm at thermal rate, equal to or more than .....	44 A
(* Maximum current output .....	53 A approx.
Speed { continuous .....	13,000 rpm
	peak for 15 min .....
Field winding resistance at 68° C (20° C): across the two slip rings .....	4.3 ± 0.2 ohm
Rotation, drive side .....	clockwise
Drive ratio, engine to alternator .....	1 to 1.8

### Rectifier Diode Specifications

Type .....	{ Positive diodes Negative diodes	{ 4 AF 2 E 11
		{ 4 AF 2 E 12
Permanent direct current at 266° F (130° C), power diodes. . . .		25 A
Reverse voltage, equal to or more than .....		150 V
Maximum operating temperature .....		302° F (150° C)
Voltage drop with 25 A at 77° F (25° C) .....		1.1 V or less
Reverse current, 150 V dc, at 266° F (130° C) .....		2 mA or less

### Checking and Setting Voltage Regulator

Type .....	RC 2/12 B
Alternator speed for test and setting .....	5,000 rpm
Battery capacity .....	40 to 50 A/h
Current for temperature stabilization .....	7 A
Current for checking 2nd stage .....	2 to 12 A
Regulating voltage, 2nd stage .....	14.2 ± 0.3 V
Current for checking 1st stage .....	25 to 35 A
Regulating voltage for the 1st stage, lower than the voltage read for the 2nd stage by .....	0.2 to 0.7 V
Resistance between plug 15 and ground at 77° ± 18° F (25° ± 10° C) .....	27.7 ± 2 ohm
Resistance between plug 15 and plug 67 with contacts open ..	5.65 ± 0.3 ohm
Armature-to-core air gap .....	.059" ± .002" (1.5 ± 0.05 mm)
2nd stage contact gap .....	.018" ± .004" (0.45 ± 0.1 mm)

(\* Readings to be taken with properly bedded-in brushes.

## ALTERNATOR (1977 to 1980)

### Alternator Specifications

Type .....	BOSCH K1 - 14 V - 55A20
Rated voltage .....	12 V
Maximum output .....	945 W
(* Cut-in speed at 12 V (68° F [20° C]) .....	1000 ± 50 rpm
(* Current output at 14 V to battery at 7,000 rpm at thermal rate, equal to or more than .....	55 A
(* Maximum current output .....	70 A approx.
Speed continuous .....	12,000 rpm
Speed peak for 15 min .....	15,000 rpm
Field winding resistance at 68° F (20° C): across the two slip rings .....	3.36 ± 0.3 ohm
Rotation, drive side .....	clockwise
Drive ratio, engine to alternator .....	1 to 1.8

### Rectifier Diode Specifications

Reverse voltage, equal to or more than .....	150 V
Maximum operating temperature .....	302° F (150° C)
Voltage drop with 25 A at 77° F (25° C) .....	1.1 V or less
Reverse current, 150 V dc, at 266° F (130° C) .....	2 mA or less

### Voltage Regulator Specifications (Integral with Alternator)

Regulating voltage, at 68° F (20° C) and at 30 A .....	13.6 to 14.1 V
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## ALTERNATOR (1981 and on)

### Alternator Specifications

Type .....	BOSCH K1 - 14 V - 65 A 21
Rated voltage .....	12 V
Maximum output .....	1170 W
(* Cut-in speed at 12 V (68° F [20° C]) .....	1100 ± 50 rpm
(* Current output at 14 V to battery at 7,000 rpm at thermal rate, equal to or more than .....	65 A
(* Maximum current output .....	80 A approx.
Speed continuous .....	12,000 rpm
Speed peak for 15 min .....	15,000 rpm
Field winding resistance at 68° F (20° C): across the two slip rings .....	3.36 ± 0.3 ohm
Rotation, drive side .....	clockwise
Drive ratio, engine to alternator .....	1 to 1.8

### Rectifier Diode Specifications

Reverse voltage, equal to or more than .....	150 V
Maximum operating temperature .....	302° F (150° C)
Voltage drop with 25 A at 77° F (25° C) .....	1.1 V or less
Reverse current, 150 V dc, at 266° F (130° C) .....	2 mA or less

### Voltage Regulator Specifications (Integral with Alternator)

Regulating voltage, at 68° F (20° C) and at 30 A .....	13.6 to 14.1 V
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(\* Readings to be taken with properly bedded-in brushes.



## LIGHTING EQUIPMENT

	FIAT Std. Part No.	SAE Standard
<b>Bulbs</b>		
Headlamps (high beam and low beams).....	"Sealed Beam" headlamp unit 4002	
Front lamps		
turn signal.....	Norm. 1/41460/90	No. 1034 (32 cp)
Rear lamps		
turn signal.....	Norm. 1/41469/90	No. 1073 (32 cp)
back-up.....		
stop.....		
Front lamps		
parking.....	Norm. 1/41459/90	No. 67 (4 cp)
Rear lamps		
tail.....		
license plate.....		
Courtesy lamp.....	12 V - 5 W Norm. 1/08630/90	-
Gear selector indicator light (automatic transmission) ....	12 V - 3 W Norm. 1/41431/90	-
"EX. GAS SENSOR" indicator.....		
Ideogram illumination optical fiber light source.....	12 V - 5 W Norm. 1/41441/90	-
Turn signal indicator.....	Norm. 1/41439/90 or Norm. 1/41458/90	No. 158 (2cp)
Headlight high beam indicator.....		
Battery charge indicator.....		
Insufficient oil pressure indicator.....		
Fuel reserve indicator.....		
Parking and tail lights indicator.....		
Instrument cluster lights.....		
Fasten belts indicator.....		
Vehicular hazard warning signal indicator.....		
Low brake fluid level and hand brake "ON" indicator.....		
Side marker lights.....		
Vehicular hazard warning signal switch light.....		
EGR indicator (25,000 miles).....		
Trunk lamp.....	12 V - 4 W Norm. 1/41423/90	-
Cigar lighter housing indicator.....		

## FUSES (1975 and 1976)

Nine 8-Amp fuses and one 25 Amp fuse, contained in a box located under instrument panel to the left of steering post. Cover is of the snap-on type. Two 3 Amp fuses, one 8 Amp fuse and one 16 Amp fuse in separate holders.

Before replacing a blown fuse trace the cause and remedy accordingly.

### Unprotected Circuits

Ignition, starting, ignition coil, battery charge indicator and relay (regulation section excluded), starter relay, engine fan relay winding and headlight high beam relay.

### Protected Circuits

- A (24 Amps)
  - Electropneumatic horns
  - Engine fan motor
- B (8 Amps)
  - Windshield wiper
  - Heater fan motor
  - Windshield washer pump
- C (8 Amps)
  - Left headlight high beam
  - High beam indicator
- D (8 Amps)
  - Right headlight high beam
- E (8 Amps)
  - Right headlight low beam
- F (8 Amps)
  - Left headlight low beam
- G (8 Amps)
  - Front left parking lamp
  - Parking and tail lights indicator
  - Rear right tail light
  - Front left/rear right side marker lamps
  - License plate lamp (left)
  - Cigar lighter housing indicator
  - Trunk light
  - Instrument cluster lights
  - Ideogram illumination optical fibers light source
  - Vehicular hazard warning signal switch light
- H (8 Amps)
  - Front right parking lamp
  - Rear left tail light
  - Front right/rear left side marker lamps
  - License plate lamp (right)

- I (8 Amps)
  - Turn signal lights and indicator
  - Stop lights
  - Oil pressure gage and insufficient pressure indicator
  - Engine water temperature gage
  - Fuel gage, with reserve indicator
  - Engine tachometer
  - Brake system effectiveness and hand brake-ON indicator
  - Back-up lights
  - Fast idle electrovalve
  - Fasten belts indicator and relay for buzzer
  - Starter/Belt interlock electronic control unit (1975 only)
  - Idle stop solenoid
  - Electrovalve for diverter valve
  - Relay winding of electrovalve for diverter valve
  - EGR indicator relay winding
  - EGR warning system (25,000 miles)
  - EGR indicator (25,000 miles)
- L (8 Amps)
  - Voltage regulator
  - Alternator field winding
- In separate holder (3 Amps)
  - Remove key and fasten belts buzzer
  - Starter/Belt interlock electronic control unit (1975 only)
- In separate holder (3 Amps)
  - EGR indicator reset device (25,000 miles)
- In separate holder (16 Amps)
  - Cigar lighter
  - Clock
  - Courtesy light
  - Hazard warning and indicator
  - Inspection lamp receptacle
- In separate holder (8 Amps)
  - Fuel pump and relay

## FUSES (1977 and 1978)

Eight 8-Amp, one 16-Amp and one 25-Amp fuse, contained in a box located under instrument panel to the left of steering post. Cover is of the snap-on type.

Before replacing a blown fuse trace the cause and remedy accordingly.

### Unprotected Circuits

Alternator, starting motor, ignition coil, battery charge indicator and relay (regulation section excluded), starter

relay, headlight high beam relay and idle stop solenoid.

### Protected Circuits

- A (8 Amps)
  - Turn signal lamps and indicator
  - Stop lamps
  - Oil pressure gage and insufficient pressure indicator
  - Engine water temperature gage
  - Fuel gage, with reserve indicator
  - Engine tachometer
  - Low brake fluid level and hand brake ON indicator
  - Back-up lamps
  - Fast idle electrovalve
  - Fasten belts indicator and relay for buzzer
  - Delay circuit for fasten seat belts indicator and buzzer
  - EGR cut-out electrovalve
- B (8 Amps)
  - Windshield wiper
  - Heater fan motor
  - Windshield washer pump
- C (8 Amps)
  - Left headlight high beams
  - High beam indicator
- D (8 Amps)
  - Right headlight high beams
- E (8 Amps)
  - Right headlight low beam
- F (8 Amps)
  - Left headlight low beam
- G (8 Amps)
  - Front left parking lamp
  - Parking and tail lamps indicator
  - Rear right tail lamp
  - Front left/rear right side marker lamps
  - License plate lamp (left)
  - Cigar lighter housing indicator
  - Trunk light
  - Instrument cluster lights
  - Ideogram illumination optical fibers light source
  - Vehicular hazard warning signal switch light
- H (8 Amps)
  - Front right parking lamp
  - Rear left tail lamp
  - Front right/rear left side marker lamps
  - License plate lamp (right)
- I (16 Amps)
  - Horns
  - Engine fan motor
- L (25 Amps)
  - Cigar lighter
  - Quartz crystal clock
  - Courtesy light
  - Hazard warning flasher and indicator
  - Inspection lamp receptacle
  - Remove key and fasten belts buzzer
  - Radio aerial motor (where fitted)

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**FUSES (1979 to 1981)**


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Nine 8-Amp and three 16-Amp fuses in a box under dash, driver's side. One 8-Amp and one 16-Amp fuse (fuel injection pump) in separate holder.

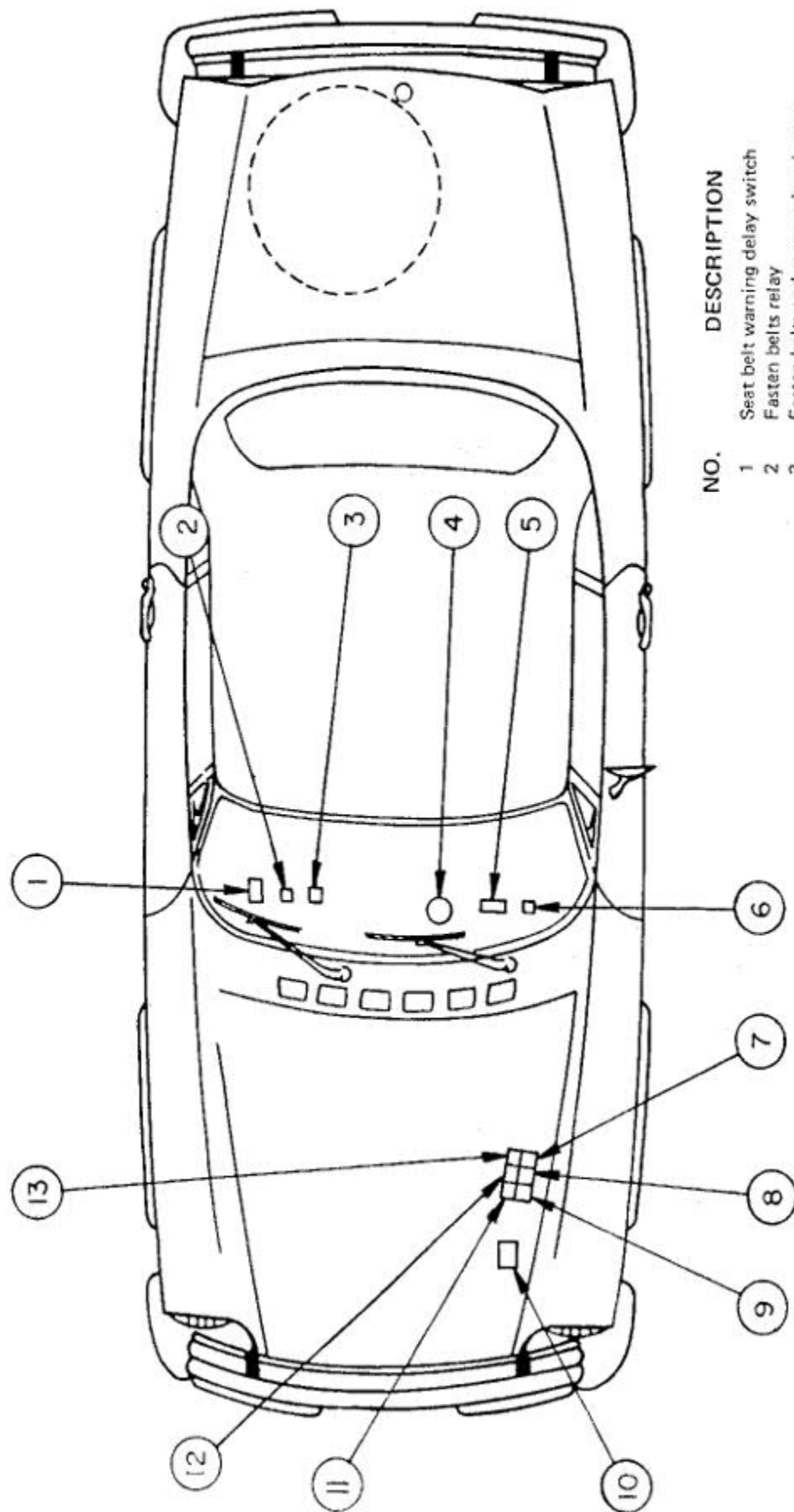
Before replacing a blown fuse trace the cause and remedy accordingly.

**Unprotected Circuits**

Alternator, ignition, starting, battery charge indicator, idle stop solenoid (carburetor), gulp valve electrovalve (carburetor), starting motor relay coil (automatic transmission), power windows relay coil (where fitted), fuel injection system.

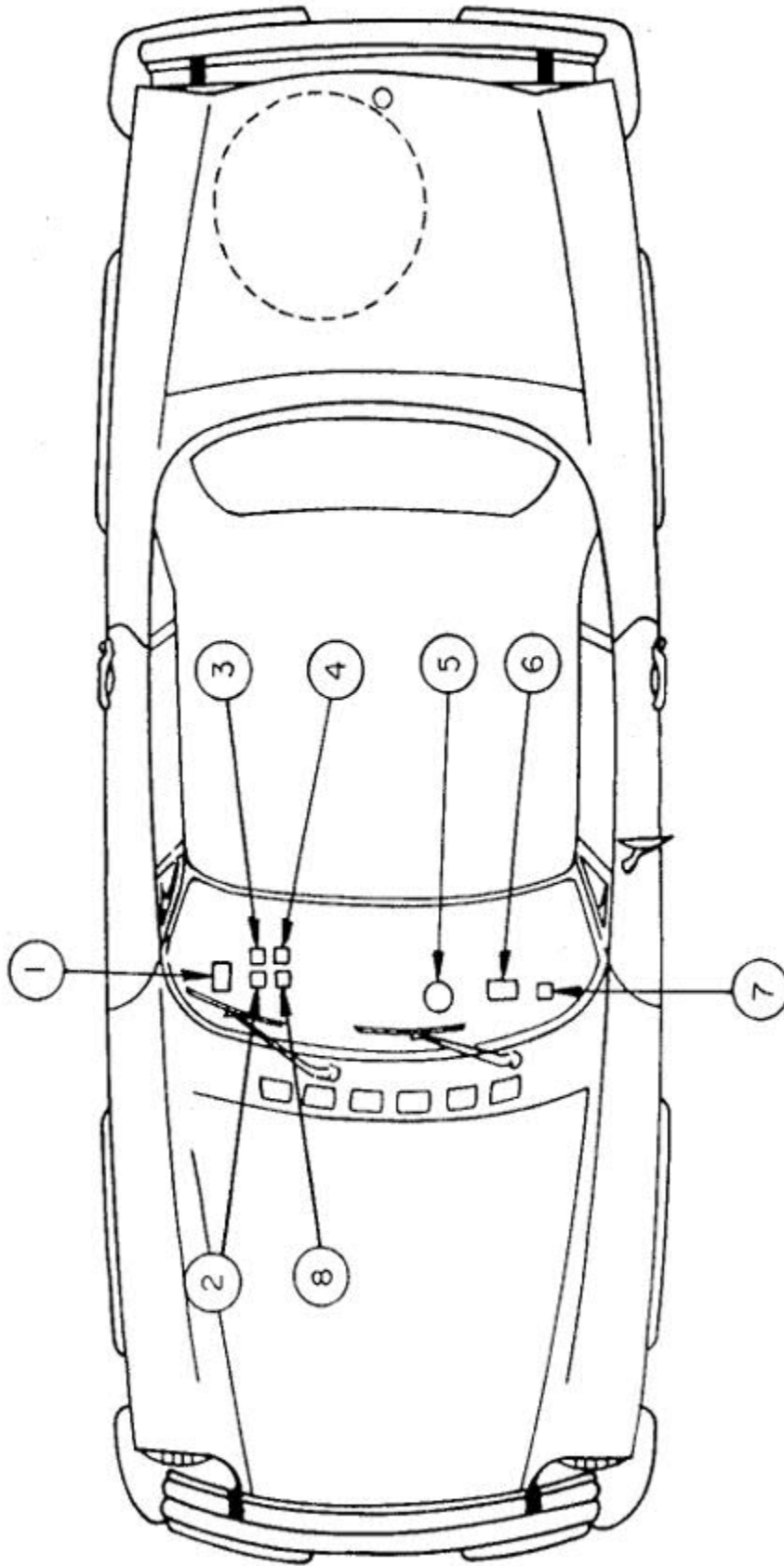
**Protected Circuits**

- A** (8 Amps)  
Turn signal lamps and indicator  
Stop lamps  
Oil pressure gage and insufficient pressure indicator  
Engine coolant temperature gage  
Fuel gage, with reserve indicator  
Engine tachometer  
Low brake fluid level and hand brake ON indicator  
Back-up lamps  
Fast idle electrovalve  
Fasten belts indicator and relay for buzzer  
Delay circuit for fasten seat belts indicator and buzzer  
Selected gear indicator light (automatic transmission)  
30,000 miles pick-up and indicator (fuel injection)
- B** (8 Amps)  
Windshield wiper  
Heater fan motor  
Windshield washer pump  
Windshield wiper sweep rate rheostat
- C** (8 Amps)  
Left headlight high beams  
High beam indicator
- D** (8 Amps)  
Right headlight high beams
- E** (8 Amps)  
Left headlight low beam
- F** (8 Amps)  
Right headlight low beam
- G** (8 Amps)  
Front right parking lamp  
Rear left tail lamp  
Front right/rear left side marker lamps  
License plate lamp (right)
- H** (8 Amp)  
Front left parking lamp  
Parking and tail lamps indicator  
Rear right tail lamp  
Front left/rear right side marker lamps  
License plate lamp (left)  
Cigar lighter housing indicator  
Trunk light  
Instrument cluster lights  
Ideogram illumination optical fibers light source  
Vehicular hazard warning signal switch light
- I** (25 Amps)  
Quartz crystal clock  
Courtesy light  
Hazard warning flasher and indicator  
Inspection lamp receptacle  
Remove key and fasten belts buzzer
- L** (16 Amps)  
Horns  
Engine fan motor
- M** (16 Amps)  
Power window motor (Left - if fitted)
- N** (16 Amps)  
Power window motor (Right - if fitted)
- In separate holder (8 Amps)**  
Cigar lighter
- In separate holder (16 Amps)**  
Fuel pump - supplementary air valve (fuel injection)



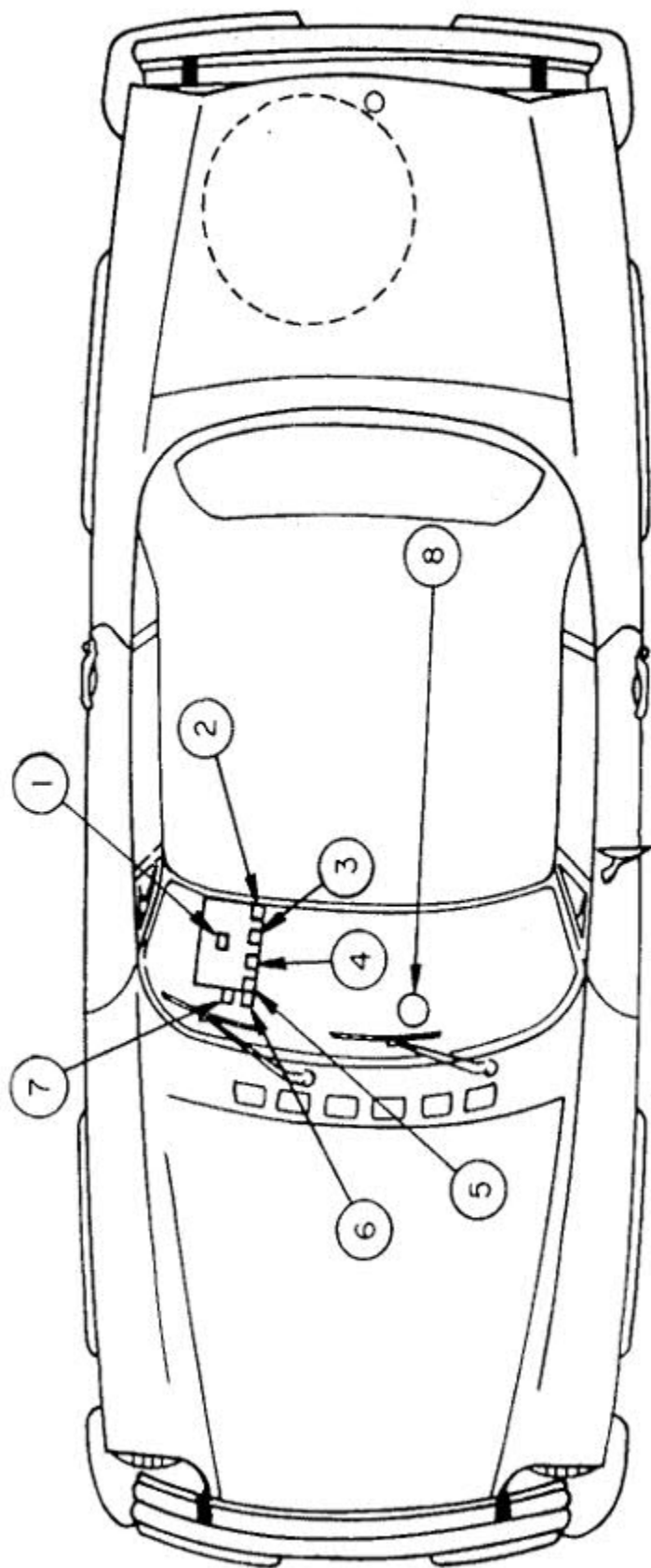
NO.	DESCRIPTION
1	Seat belt warning delay switch
2	Fasten belts relay
3	Fasten belts and remove key buzzer
4	Turn signal flasher
5	Windshield wiper intermittent switch
6	Hazard warning flasher
7	Battery charge relay
8	Fuel/pump relay
9	Ignition mode relay
10	Voltage regulator
11	Diverter valve by-pass relay
12	Engine fan relay
13	Horn relay

RELAY LOCATION 1975 & 1976



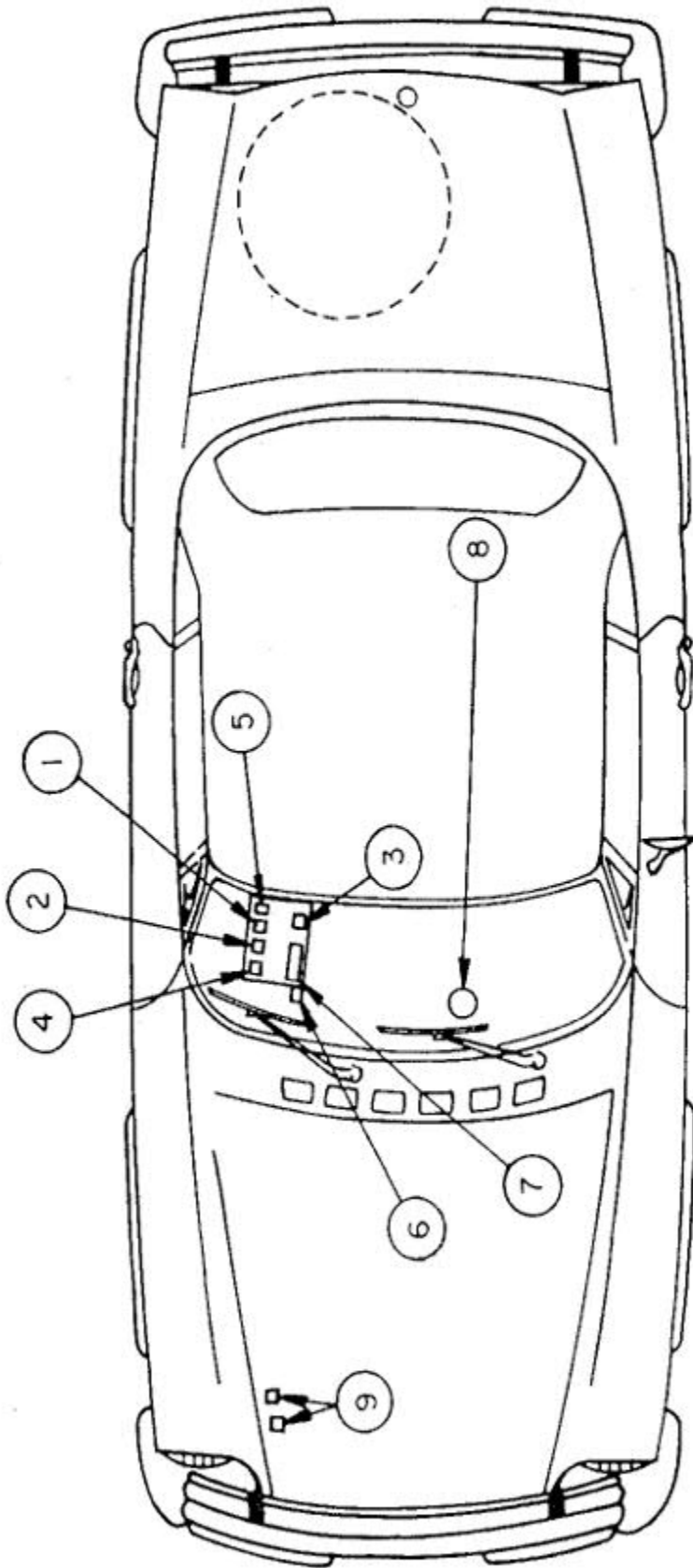
NO.	DESCRIPTION
1	Seat belt warning delay switch
2	Fasten belts relay
3	Ignition mode relay
4	Diverter valve by-pass relay (Calif. only)
5	Turn signal flasher
6	Windshield wiper intermittent switch
7	Hazard warning flasher
8	Horn relay

RELAY LOCATION 1977



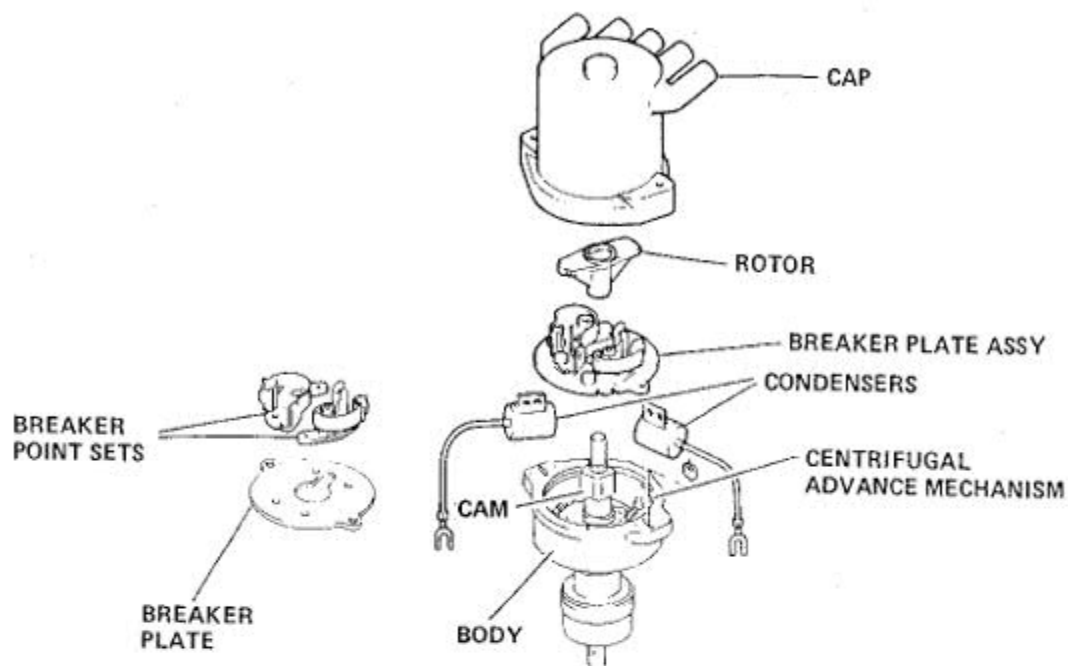
NO.	DESCRIPTION
1	Seat belt warning delay switch
2	Fasten belts relay
3	Ignition mode relay
4	Horn relay
5	Diverter valve by-pass relay (Calif. only)
6	Windshield wiper intermittent switch
7	Hazard warning flasher
8	Turn signal flasher

RELAY LOCATION 1978

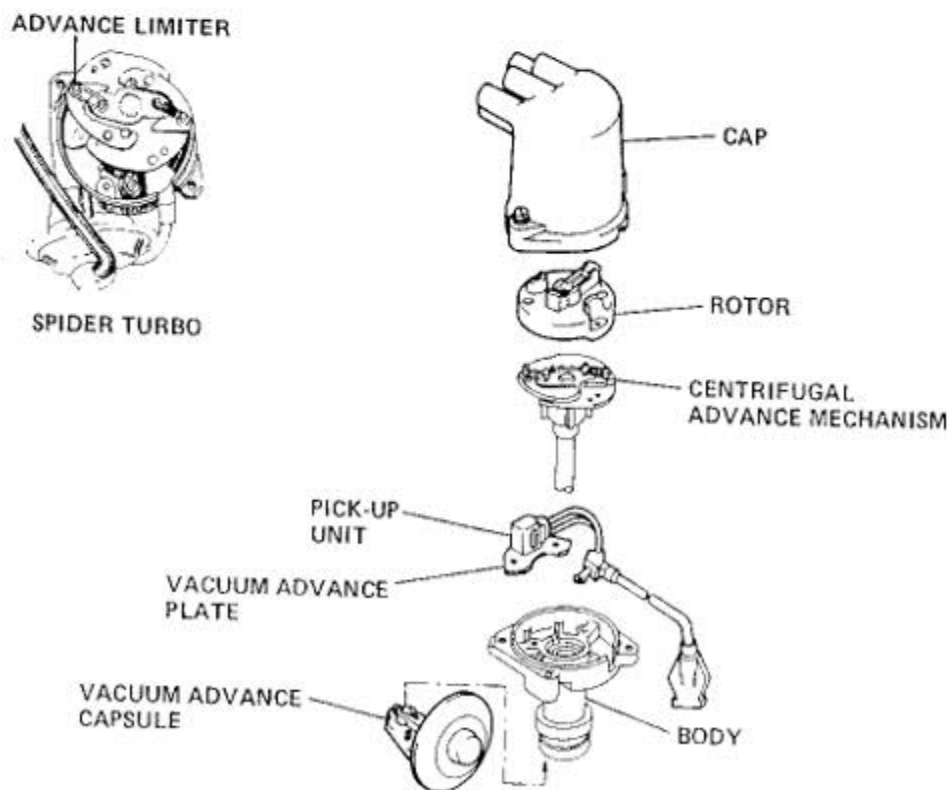


NO.	DESCRIPTION
1	Seat belt warning delay switch
2	Fasten belts relay
3	Automatic transmission starter relay
4	Horn relay
5	Power windows relay
6	Windshield wiper intermittent switch
7	Fuel injection relay set
8	Turn signal and hazard warning flasher
9	Air conditioning relays

RELAY LOCATION 1979, 1980 & 1981



BATTERY IGNITION DISTRIBUTOR (to 1978)



ELECTRONIC IGNITION DISTRIBUTOR (1979 and on)

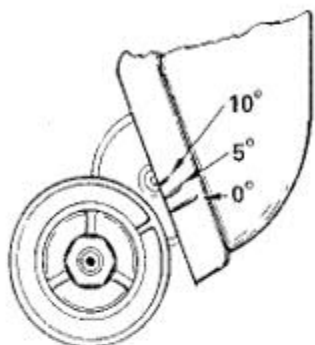




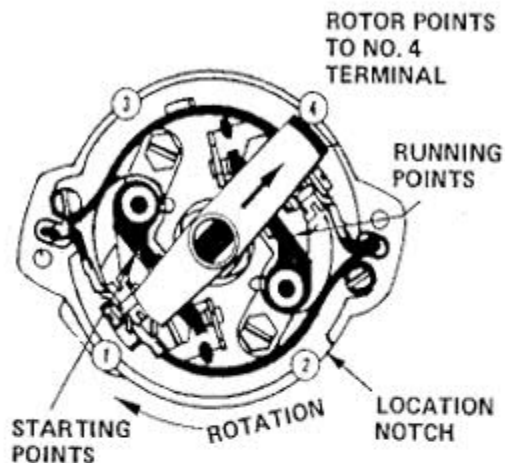
### SETTING IGNITION TIMING (to 1978)

Position crank pulley notch to index with 0° mark on cover. Remove two screws securing distributor cap to body. Rotor will be positioned at No. 1 or No. 4 terminal as shown.

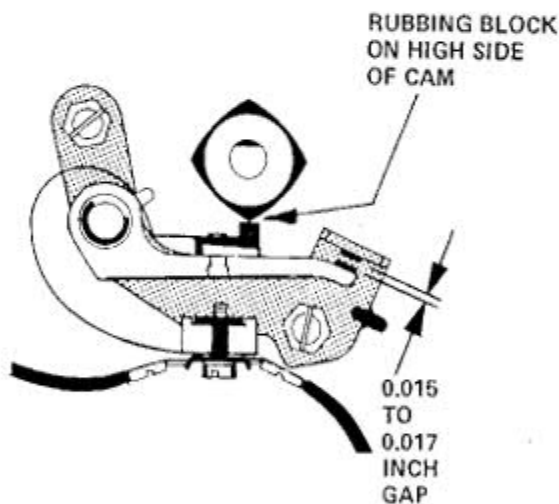
#### ENGINE POSITION



#### DISTRIBUTOR POSITION

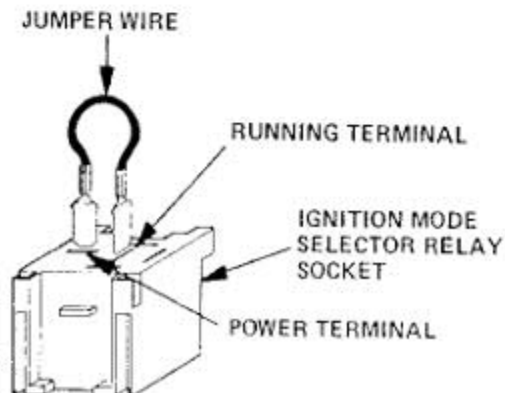


Loosen nut holding distributor body to engine. Turn body until one point set is at maximum opening. Adjust point gap at .015 to .017 in. Repeat with other point set. Then turn distributor body until running points just start to open. Tighten distributor hold-down nut.



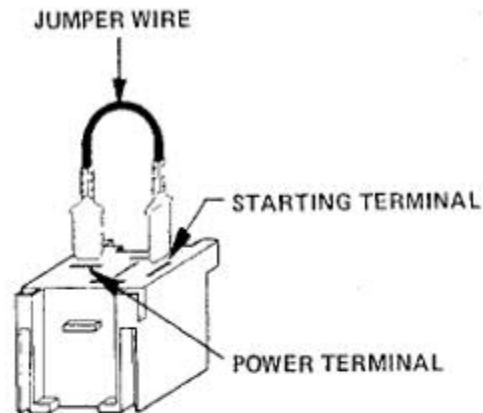
Locate ignition change-over relay (refer to Relay Location Charts). Remove relay.

Connect jumper wire between POWER and RUNNING on plastic base as shown. Connect dwellmeter to running points (green distributor lead). Crank engine. Adjust points to 55° dwell.



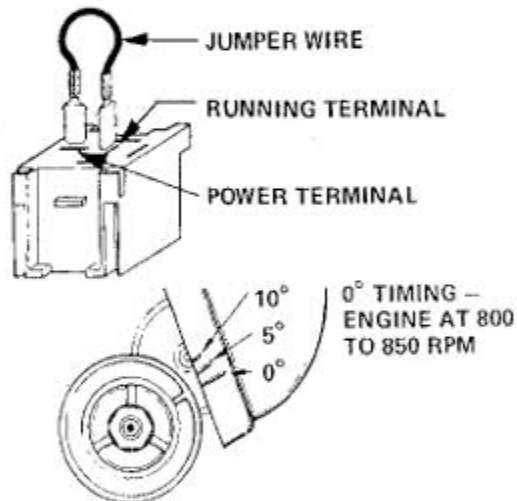
Leave one end of jumper on POWER. Connect other end to STARTING as shown.

Connect dwellmeter to starting points (green/black lead). Crank engine. Adjust points to 55° dwell.



Move jumper wire back to RUNNING as shown. Install rotor and cap. Connect timing light. Start engine and warm it up.

Check ignition timing at idle (850 rpm). Rotate distributor as necessary to obtain 0° (TDC) reading. Tighten distributor hold-down nut.



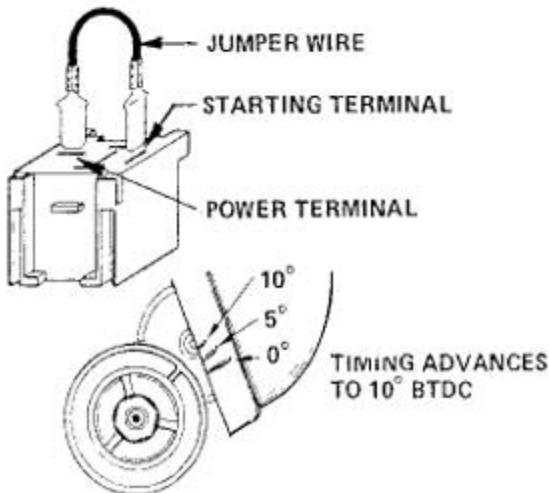
Temporarily reconnect jumper to STARTING as shown. Check that ignition advances to 10°. If not, adjust amount of advance by changing dwell angle of starting points, do not move distributor.

If less than 10°, increase gap to decrease dwell.

If more than 10°, decrease gap to increase dwell.

Remove jumper wire and install relay.

Check maximum centrifugal advance with timing light (36 + 2° at 3600 rpm = about 2 in. on pulley). Disconnect equipment.



### DISTRIBUTOR (to 1978)

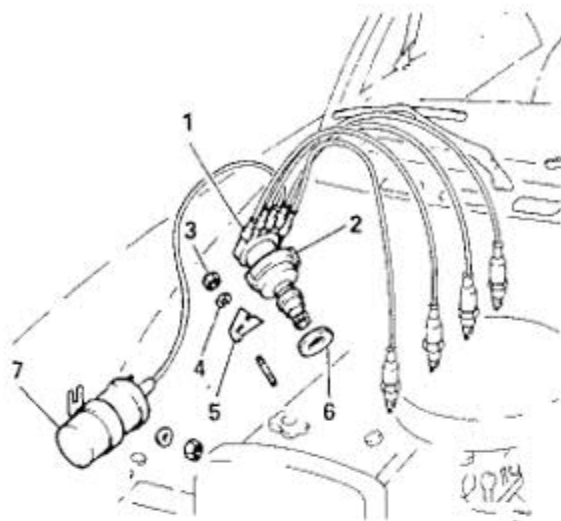
#### REMOVAL AND INSTALLATION

Remove two screws securing distributor cap (1) to body (2). Place cap to one side.

Crank engine until crankshaft pulley timing mark indexes with timing pointer.

Noting rotor position for installation, remove nut (3), washer (4) and clamp (5). Remove distributor and gasket (6).

1. Cap 2. Body 3. Nut 4. Washer 5. Clamp 6. Gasket  
7. Ignition coil



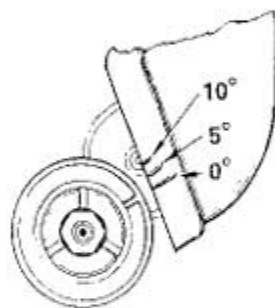
Installation is reverse of removal. Before installing distributor, place rotor in same position as was noted during removal.

Set timing as described in this section.

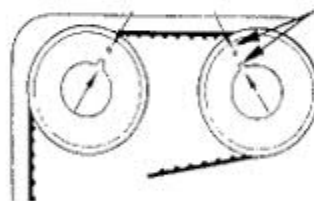
If engine was cranked over during distributor removal, resetting timing of engine and distributor will have to be performed as follows:

Position crank pulley notch to index with 0° mark on cover.

Check that camshaft pulley marks are aligned with indicators on cam housings, if not, rotate crank pulley one full turn to 0° mark (cams turn at 1/2 crank speed).

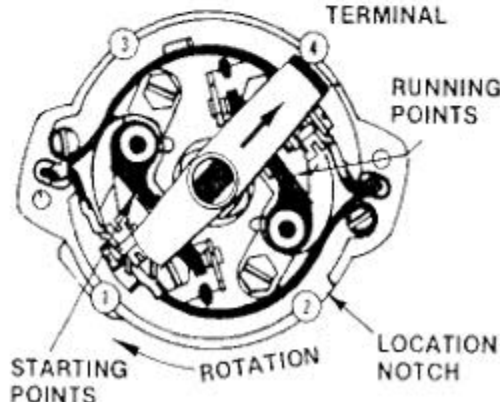


PULLEY TIMING MARK IS AT 0° (TDC)



ALIGN CAMSHAFT TIMING MARKS WITH CAM HOUSING MARKS

Place distributor into engine so that with it fully seated, rotor lines up with No. 4 terminal as shown. Set timing as described in this section.



ROTOR POINTS TO NO. 4 TERMINAL

RUNNING POINTS

STARTING POINTS

ROTATION

LOCATION NOTCH

**DISASSEMBLY AND REASSEMBLY**

Remove two screws securing cap to body.

Remove rotor by pulling it off of shaft.

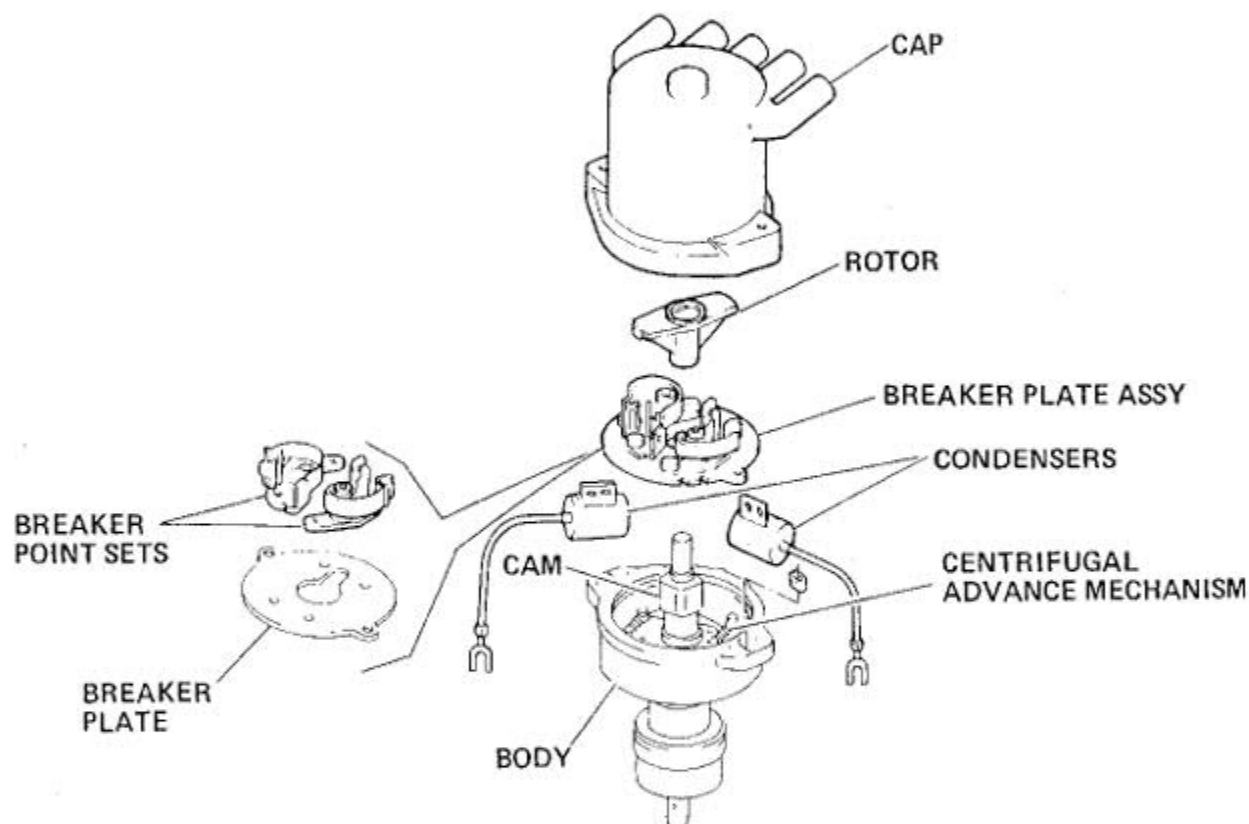
Remove terminal screws at breaker point sets to remove wires. Note where terminal wires are connected.

Remove four screws securing breaker point sets. Remove two screws holding breaker plate to body.

Remove screw holding both condensers to body.

Remove circlip fixing cam and centrifugal advance mechanism to shaft.

Reassembly is reverse of disassembly. Apply a small amount of grease to moving parts of centrifugal advance mechanism. Apply a very light coat of grease to cam surface.

**INSPECTION**

Check distributor cap for cracks, breaks, or corroded terminals. For light corrosion, clean terminals, otherwise replace.

Check rotor for cracks, breaks, or corrosion.

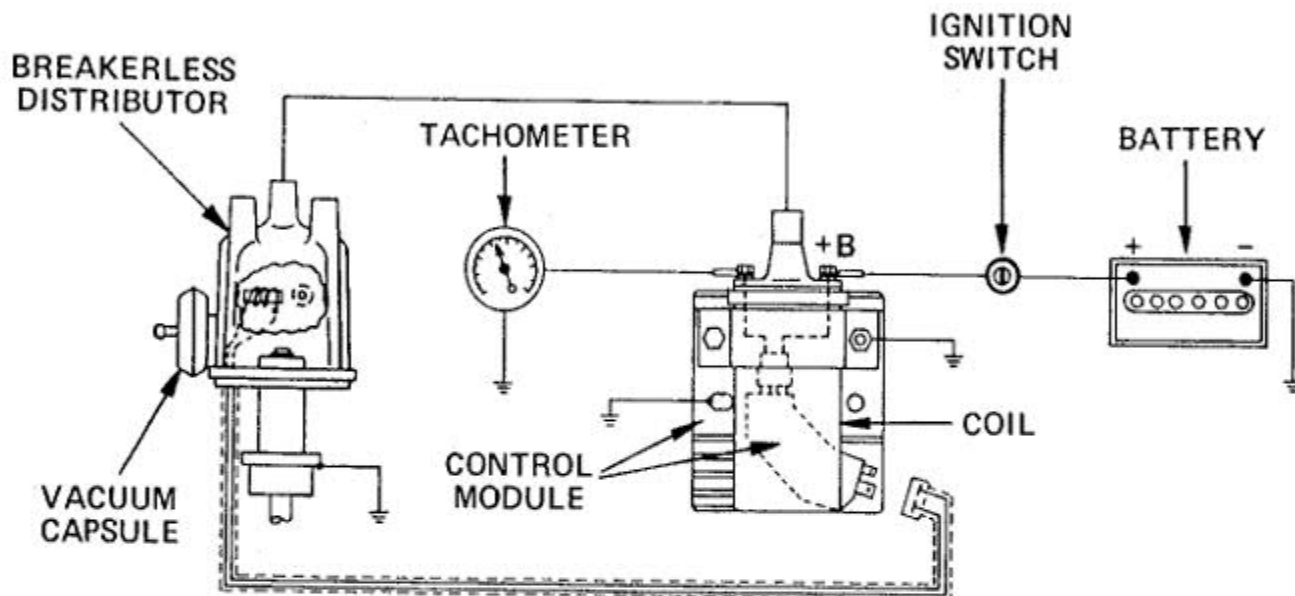
Check body for worn or sticky shaft.

Check breaker points for pitting or corrosion.

### IGNITION SYSTEM (1979 and on)

#### DESCRIPTION

The ignition system used for 1979 and on is an electronic ignition type. The system consists of an ignition coil, an electronic control module on a cast support, and a breakerless distributor. Primary voltage is applied to coil from battery through the ignition switch. This voltage is regulated by the control module to supply a regulated current to primary windings of ignition coil. The control module is triggered by an impulse generated in the distributor. This turns coil primary circuit on and off. Each time primary circuit is broken, a high voltage is induced in coil secondary windings. This is distributed to spark plugs through distributor rotor and cap in conventional manner.



#### 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, distributor pick-up assembly may be disconnected when engine is running, or when cranking for compression testing.

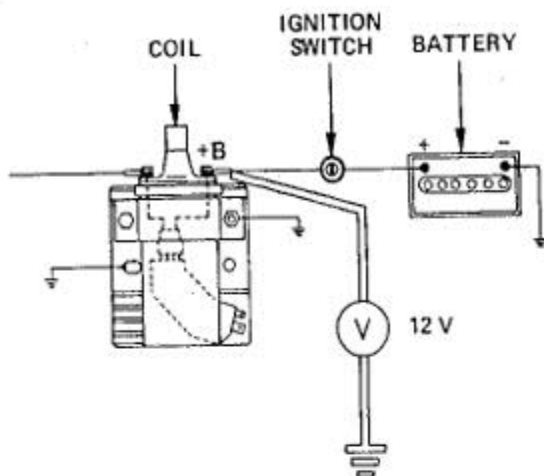
## IGNITION SYSTEM CHECKS

### Primary Input Check

Connect voltmeter from coil +B terminal to ground.

With ignition switch on, check for 12 (battery) volts.

If not, check for faulty battery, ignition switch, wiring, or connections.



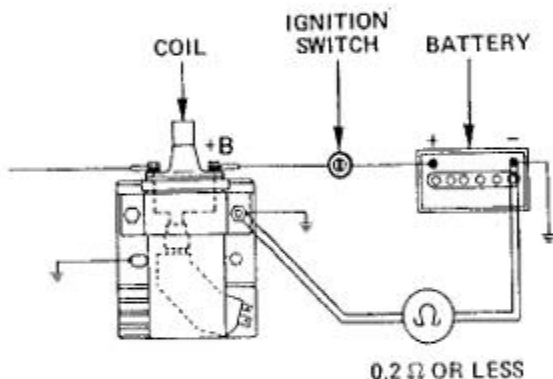
### Ground Check

With ignition switch off, connect ohmmeter from coil ground stud 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

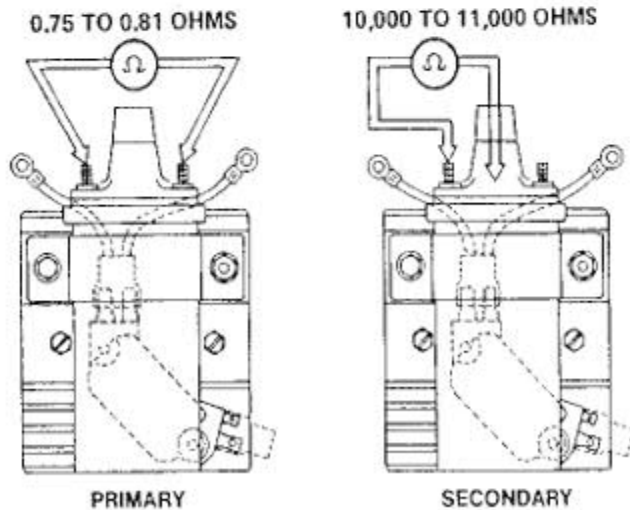
Disconnect primary leads from coil, then connect ohmmeter to coil.

Check for 0.75 to 0.81 ohms.

Reconnect one ohmmeter lead to coil high voltage terminal.

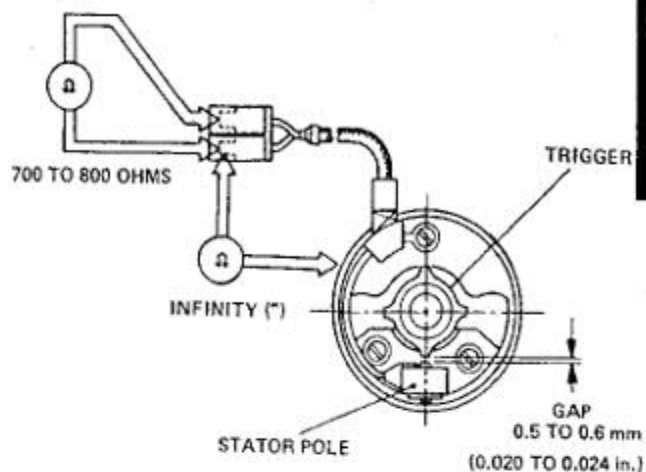
Check for 10K to 11K ohms.

Replace coil if not within specifications.



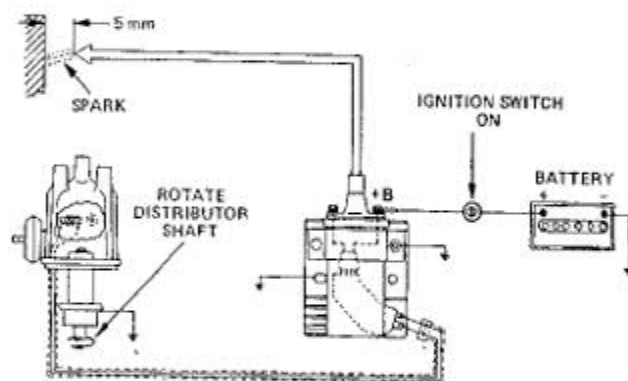
### Pick-Up Assembly Check

- Disconnect pick-up assembly from control module.
- Connect ohmmeter to pick-up assembly connector.
- Check for 700 to 800 ohms.
- Reconnect one ohmmeter lead to distributor body.
- Check for infinity ohms.
- Replace pick-up assembly if not within specification.
- Using a nonmagnetic feeler gauge, check gap between stator pole and trigger. Adjust as required.



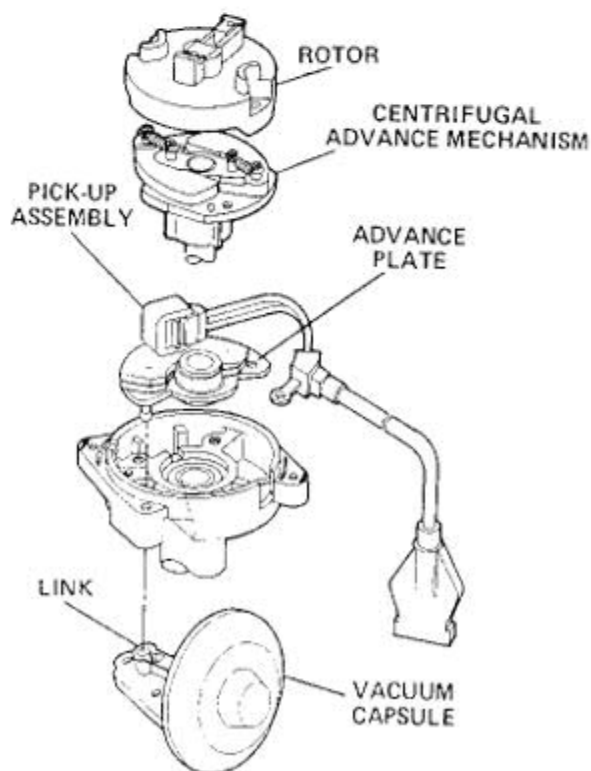
### Control Module Check

- Reconnect primary leads to coil, and pick-up assembly to control module.
- 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.
- Using an ohmmeter, check rotor for 4K to 6K ohms. Replace if not within specifications.





**DISTRIBUTOR (1979 and on)****REMOVAL AND INSTALLATION**

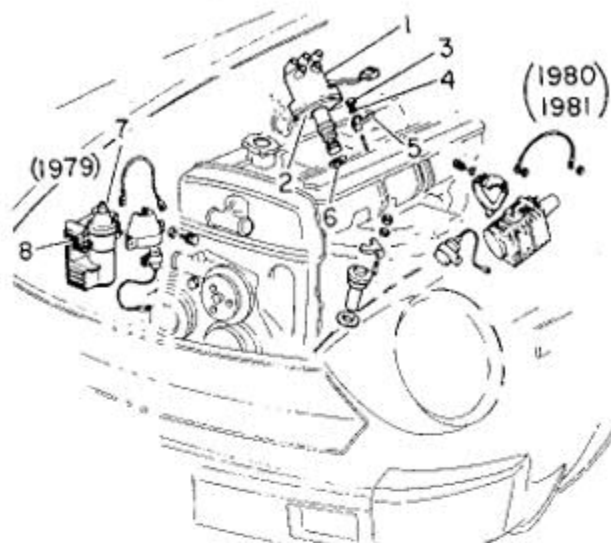
**NOTE:** The ignition distributor used on vehicles with turbo-charger is not interchangeable with non-turbocharger distributor.

Disconnect pick-up assembly ignition connector at control module.

Disconnect vacuum line at vacuum capsule. Remove two screws securing distributor cap (1) to body (2). Place cap to one side.

Crank engine until crankshaft pulley timing mark indexes with timing pointer.

Noting rotor position for installation, remove nut (3), washer (4) and clamp (5). Remove distributor and gasket (6).



1. Cap 2. Body 3. Nut 4. Washer 5. Clamp 6. Gasket  
7. Ignition coil 8. Control module

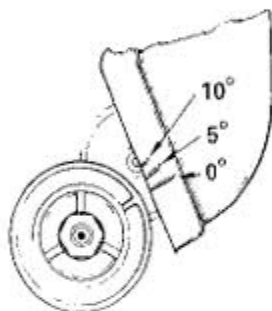
Installation is reverse of removal. Before installing distributor, place rotor in same position as was noted during removal.

Set timing with a timing light.

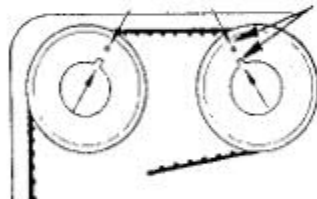
If engine was cranked over during distributor removal, resetting timing of engine and distributor will have to be performed as follows:

Position crank pulley notch to index with 0° mark on cover.

Check that camshaft pulley marks are aligned with indicators on cam housings, if not, rotate crank pulley one full turn to 0° mark (cams turn at ½ crank speed).



**PULLEY TIMING MARK IS AT 0° (TDC)**



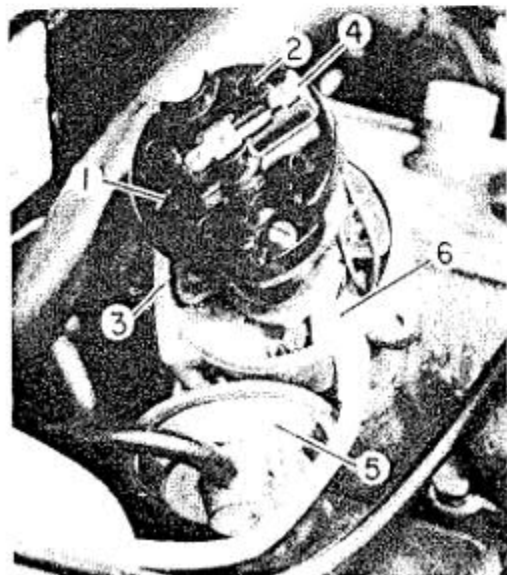
**ALIGN CAMSHAFT TIMING MARKS WITH CAM HOUSING MARKS**

Place distributor into engine so that with it fully seated, pointer (1) which is molded into rotor (2), points to notch (3) on distributor body. Rotor metal contactor (4) will be pointing to No. 4 terminal.

Set timing at 10° BTDC with timing light.

Tighten distributor hold-down nut.

1. Rotor pointer 2. Rotor 3. Notch 4. Metal contactor  
5. Vacuum capsule 6. Pick-up assembly



## DISASSEMBLY AND REASSEMBLY

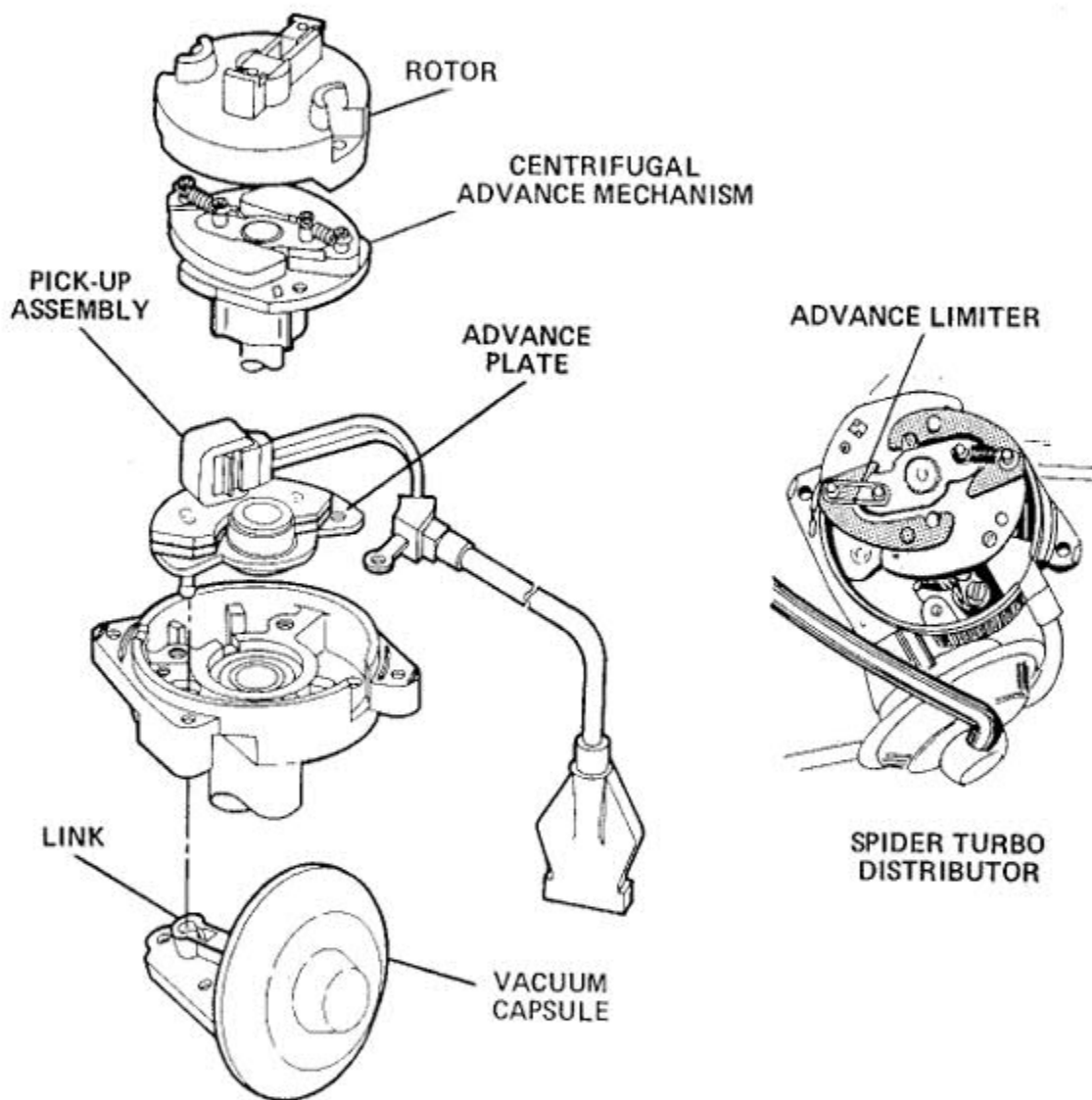
Remove two screws securing cap to body.

Remove two screws holding rotor to advance mechanism.

Remove screw holding pick-up assembly to body.

Remove three screws holding vacuum capsule to body and disconnect link from advance plate.

Reassembly is reverse of disassembly.



## INSPECTION

Check distributor cap for cracks, breaks, or corroded terminals. For light corrosion, clean terminals, otherwise replace.

Check rotor for cracks, breaks, or corrosion.

Check pick-up assembly for damaged parts.

Check vacuum capsule for leakage.

Check body for worn or sticky shaft.

**IGNITION SWITCH****REMOVAL AND INSTALLATION**

Disconnect battery ground lead located in trunk.

Remove five screws securing upper and lower steering shaft covers (1) together.

Disconnect two electrical connectors (4) from ignition switch (3).

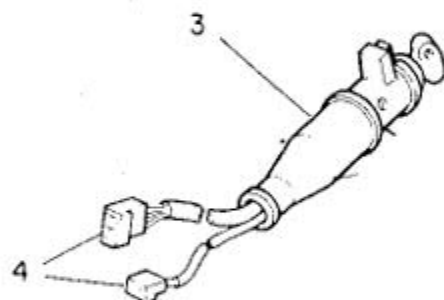
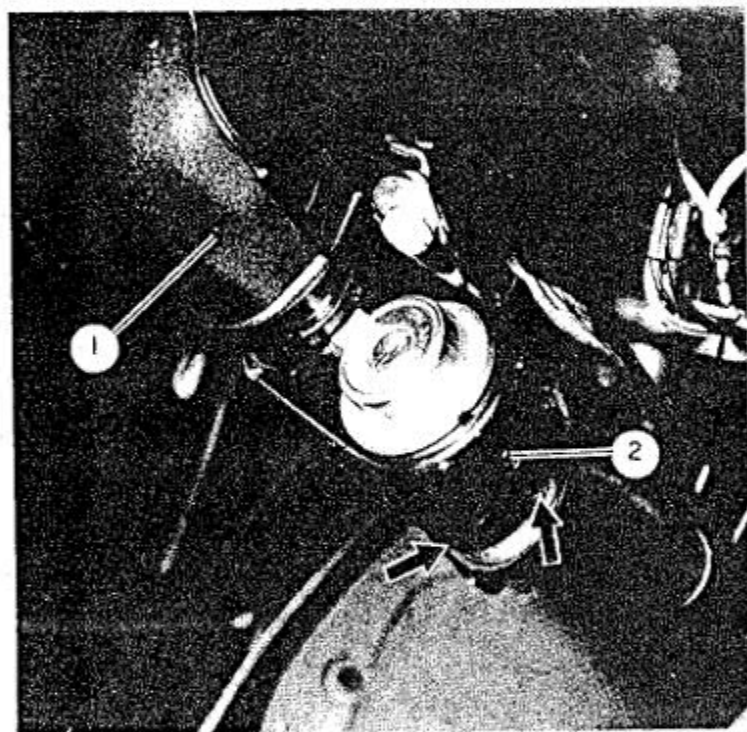
Remove two set screws at base of switch (arrows).

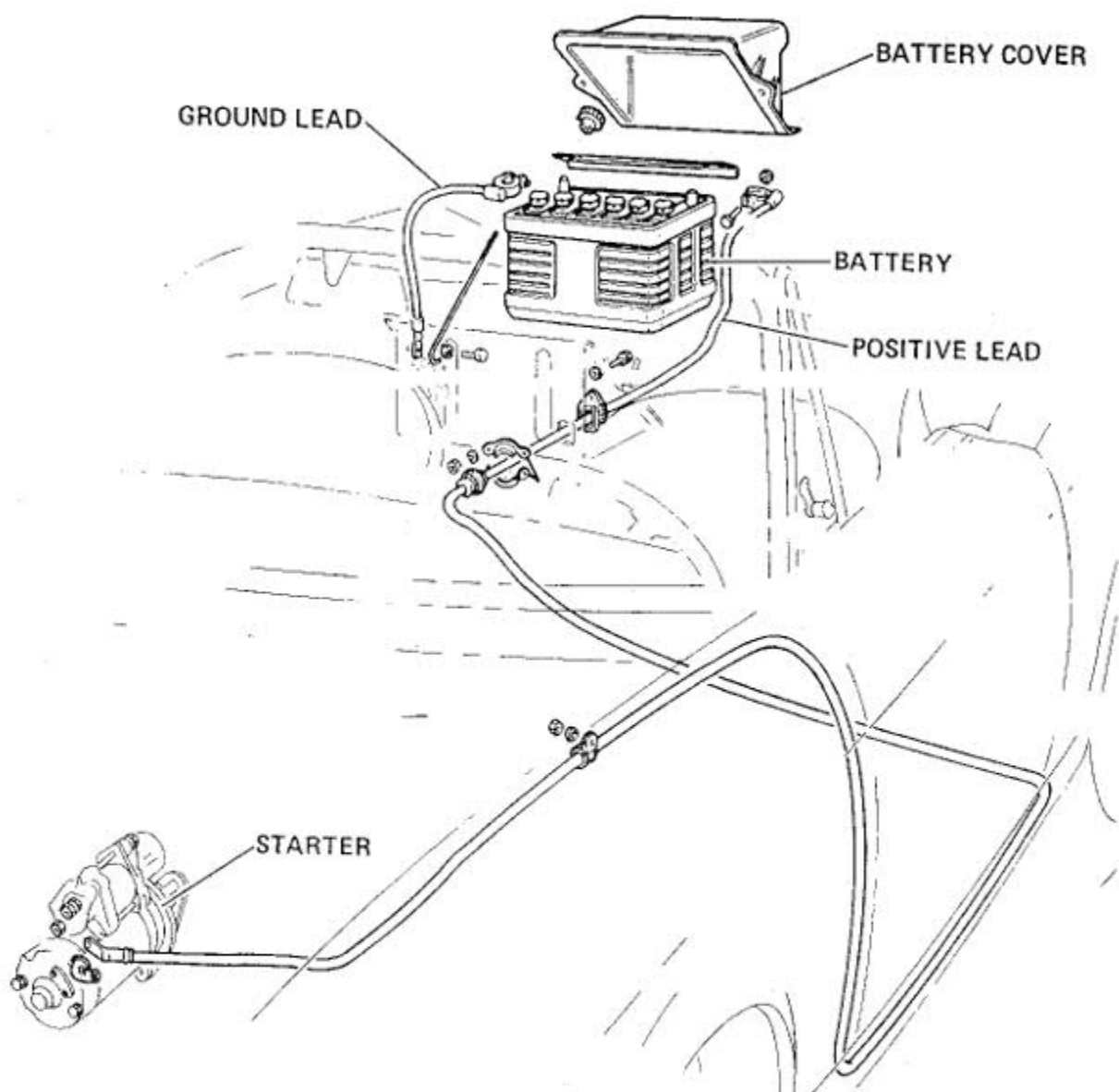
Place ignition key into switch and turn it to arrow mark on switch face.

Insert a thin bladed screwdriver or similar tool into opening (2) on right side of switch and push in to unlock. Pull switch assembly out.

Installation is reverse of removal.

1. Steering shaft cover 2. Unlock opening 3. Ignition switch 4. Electrical connectors





STARTER AND BATTERY PLACEMENT

**STARTER****REMOVAL AND INSTALLATION**

Disconnect battery ground lead in trunk.

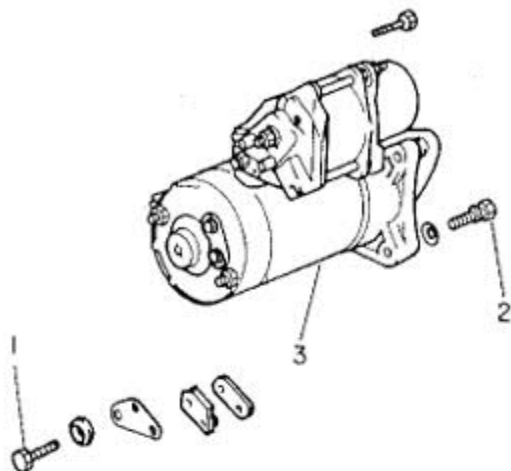
From engine compartment, disconnect electrical leads from starter solenoid. Remove bolt (1) attaching front of starter to engine mount.

Raise vehicle on lift. Disconnect clutch cable and place to one side. Turn road wheels to right to position steering linkage for clearance during removal. Remove three bolts (2) attaching starter (3) to bell housing.

**NOTE:** Access to top bolt is best accomplished with a long socket extension and U-joint.

Remove starter.

Installation is reverse of removal.



1. Bolt 2. Bolt 3. Starter

**DISASSEMBLY AND REASSEMBLY (MARELLI)**

Remove nut (16) and washers holding terminal and disconnect terminal from solenoid (1). Remove three bolts (17) securing solenoid to housing.

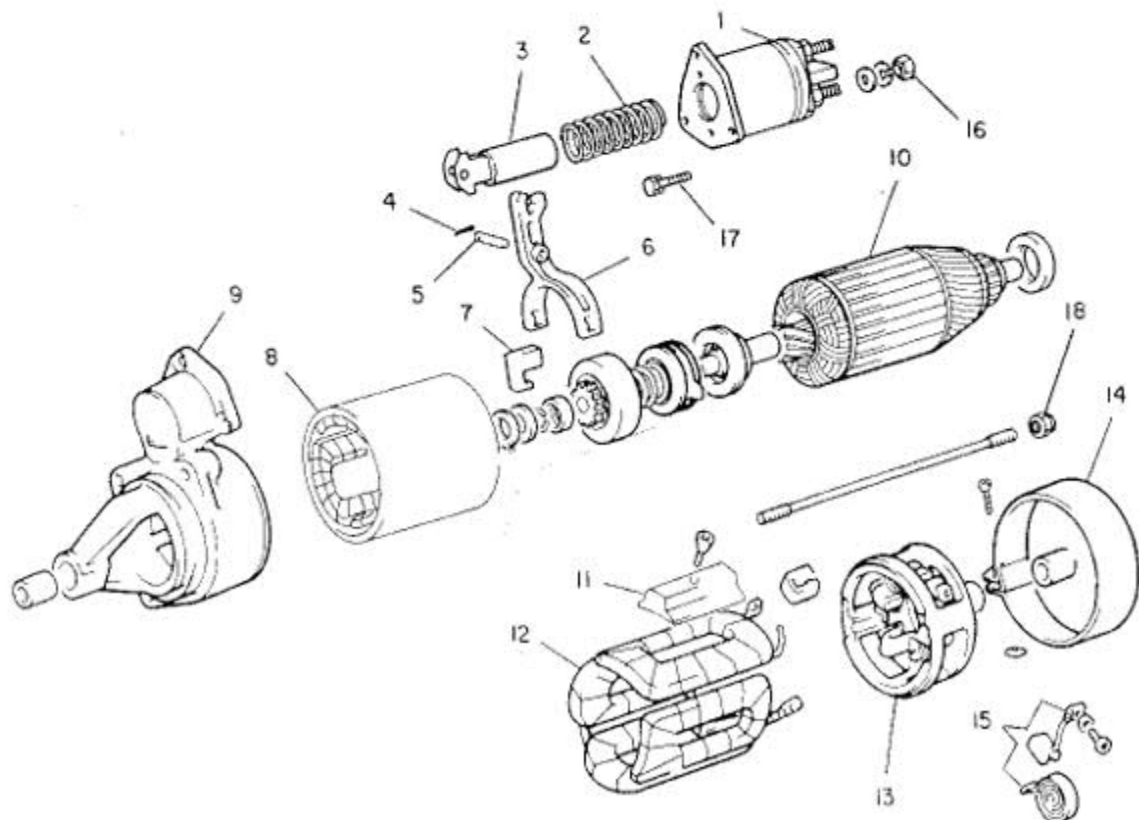
Loosen screw on end frame cover (14) and slide cover off. Remove three screws holding brushes (15) and three field coil leads. Remove two nuts (18) holding commutator end frame (13) and separate frame from field coil housing (8).

Separate field coil housing from drive end frame (9). Remove rubber insert (7) from drive end frame. Remove cotter pin (4) on shift fork pivot pin (5). Drive out pivot pin. Withdraw armature (10) from frame.

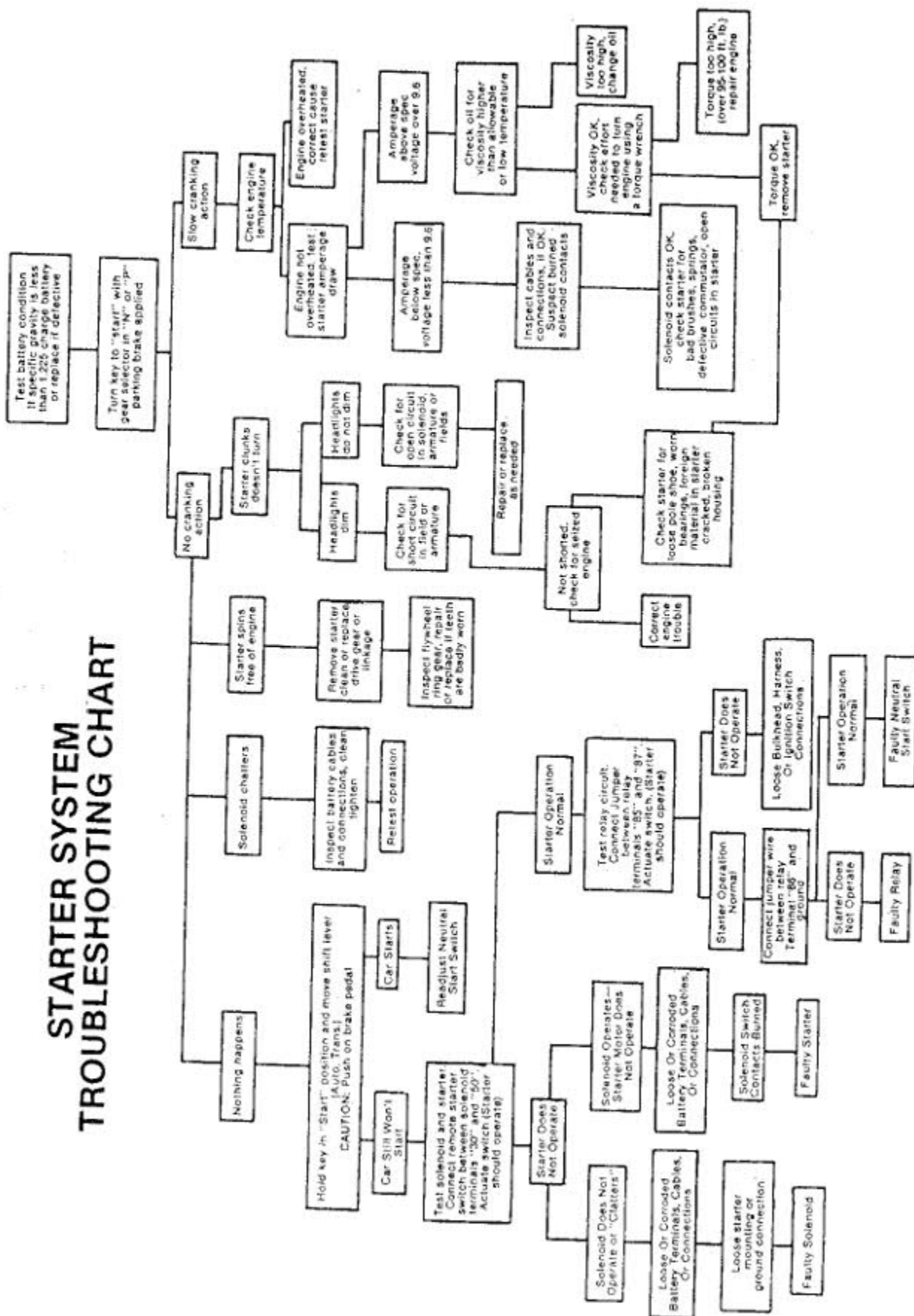
To remove field coil assembly (12), remove four screws and stator cores (11). Carefully slide coil assembly from housing.

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.

1. Solenoid 2. Return spring 3. Plunger 4. Cotter pin 5. Pivot pin 6. Shift fork 7. Rubber insert 8. Field coil housing 9. Drive end frame 10. Armature 11. Stator core 12. Field coil 13. Commutator end frame 14. Frame cover 15. Brush assembly 16. Nut 17. Bolt 18. Nut



### STARTER SYSTEM TROUBLESHOOTING CHART



STARTER SYSTEM TROUBLESHOOTING CHART

ATCS

### ALTERNATOR

#### GENERAL

Marelli (44A) with external regulator – On 1975 and 1976.

Bosch (55A) with integral regulator – On 1977 to 1980.

Bosch (65A) with integral regulator – On 1981 and on.

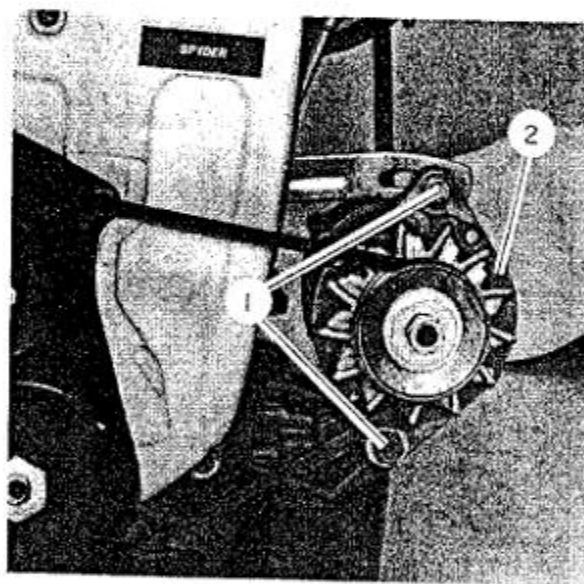
#### REMOVAL AND INSTALLATION (All)

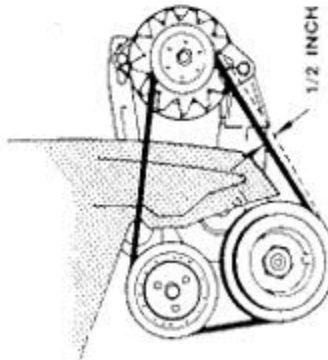
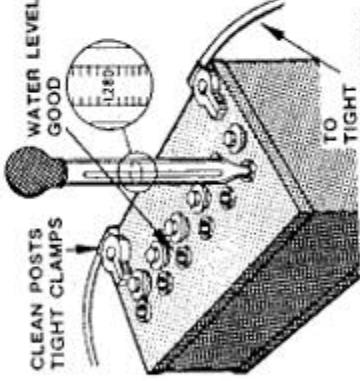
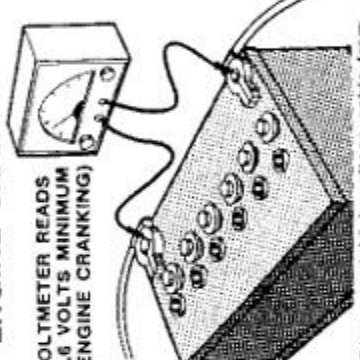
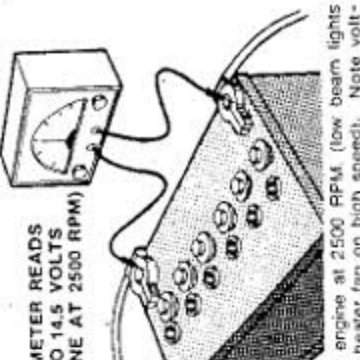
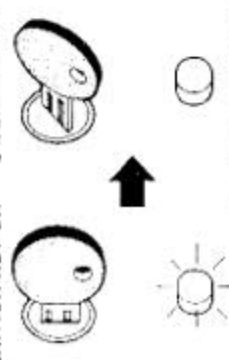
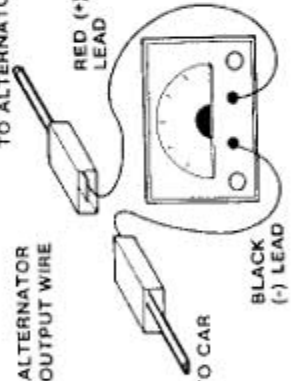
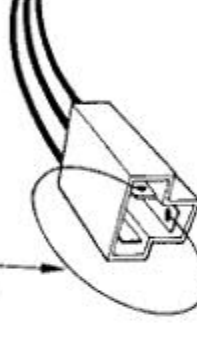
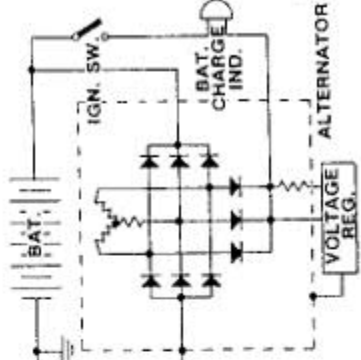
Disconnect battery ground cable. Mark to identify, then disconnect electrical leads. Remove two nuts and bolts (1) and remove alternator (2).

Installation is reverse of removal.

Adjust belt tension.

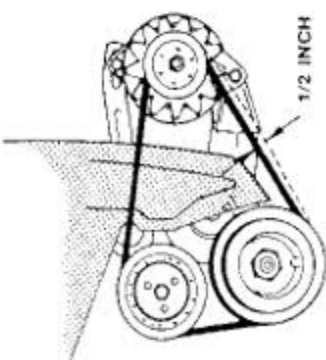
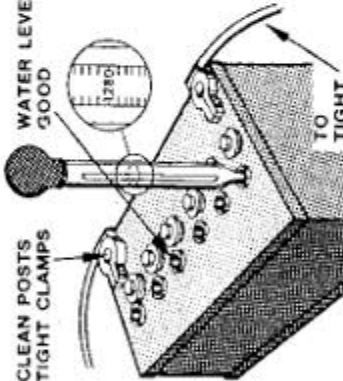
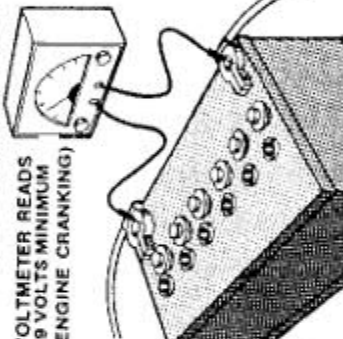
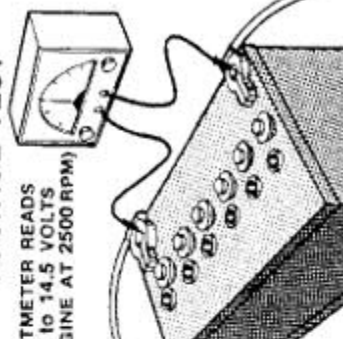


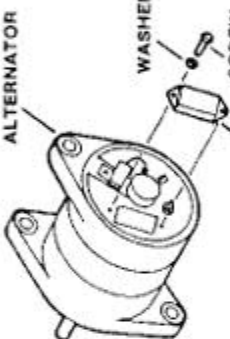
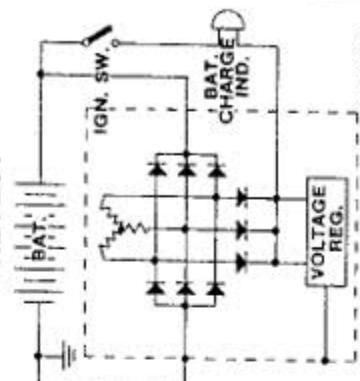
1. Bolt 2. Alternator



<h3>BELT TENSION</h3>  <p>1/2 INCH</p> <ul style="list-style-type: none"> <li>• Check belt tension. Adjust as required.</li> </ul>	<h3>BATTERY CHECK</h3> <p>CLEAN POSTS TIGHT CLAMPS</p>  <p>WATER LEVEL GOOD</p> <p>TO TIGHT CONNECTION</p> <ul style="list-style-type: none"> <li>• Check battery condition, water level. Use load tester or hydrometer. Charge, if required.</li> <li>• Check that battery posts are clean.</li> <li>• Check that cables are in good condition with tight connections on both ends.</li> </ul>	<h3>ENGINE CRANK TEST</h3> <p>VOLTMETER READS 9.6 VOLTS MINIMUM (ENGINE CRANKING)</p>  <ul style="list-style-type: none"> <li>• Disconnect high voltage cable from ignition coil.</li> <li>• Connect voltmeter to battery.</li> <li>• Crank engine 3 to 4 seconds. Note voltmeter reading.</li> <li>• If voltmeter reads less than 9.6 volts, check for faulty battery.</li> <li>• Reconnect high voltage cable to ignition coil.</li> </ul>	<h3>VOLTAGE TEST</h3> <p>VOLTMETER READS 12.5 TO 14.5 VOLTS (ENGINE AT 2500 RPM)</p>  <ul style="list-style-type: none"> <li>• Set engine at 2500 RPM (low beam lights on, heater fan on high speed). Note voltmeter reading.</li> <li>• If voltmeter reads 12.5 to 14.5 volts, alternator and voltage regulator are good.</li> <li>• If voltmeter reads greater than 14.5 volts, replace voltage regulator.</li> <li>• If voltmeter reads less than 12.5 volts, stop engine and proceed to next step.</li> </ul>
<h3>EXCITOR SYSTEM CHECK</h3> <p>IGNITION KEY ON START ENGINE</p>  <p>BATTERY CHARGE INDICATOR GOES OUT</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• If indicator lights, start engine. Check that indicator goes out.</li> <li>• If indicator does not go out, check for possible short in excitor system wiring.</li> <li>• If indicator goes out, stop engine and go to next step.</li> </ul>	<h3>CURRENT TEST SETUP</h3> <p>ALTERNATOR OUTPUT WIRE</p>  <p>RED (+) LEAD</p> <p>BLACK (-) LEAD</p> <p>TO ALTERNATOR</p> <p>TO CAR</p> <ul style="list-style-type: none"> <li>• Disconnect battery ground cable.</li> <li>• At alternator output wire plug (see wiring diagram for location), connect ammeter red (+) lead to alternator side, and black (-) lead to car side.</li> </ul> <p>CAUTION: Do not allow wires to ground or touch.</p> <ul style="list-style-type: none"> <li>• Disconnect connector at voltage regulator.</li> <li>• Check test setup connections, then reconnect battery ground cable.</li> </ul>	<h3>CURRENT TEST</h3> <p>CONNECT JUMPER WIRE</p>  <p>CAUTION: ALTERNATOR MAY BE DAMAGED IF CONNECTION EXCEEDS 5 SECONDS</p> <ul style="list-style-type: none"> <li>• Set engine at 2500 RPM, all lights and accessories off.</li> <li>• Momentarily (5 seconds maximum) connect a jumper wire as shown. Note ammeter reading.</li> <li>• If ammeter reads 50 or more amps, replace voltage regulator.</li> <li>• If ammeter reads less than 50 amps, repair or replace alternator.</li> </ul>	<h3>RETEST</h3>  <ul style="list-style-type: none"> <li>• After repairs are made, repeat Voltage and Current Tests.</li> <li>• Remove test equipment.</li> <li>• Reconnect alternator and voltage regulator wiring. Make sure all connections are tight.</li> </ul>

ALTERNATOR SYSTEM CHECK (Marelli)



<p><b>BELT TENSION</b></p>  <p>1/2 INCH</p> <ul style="list-style-type: none"> <li>• Check belt tension. Adjust as required.</li> </ul>	<p><b>BATTERY CHECK</b></p>  <ul style="list-style-type: none"> <li>• Check battery condition, water level. Use load tester or hydrometer. Charge if required.</li> <li>• Check that battery posts are clean.</li> <li>• Check that cables are in good condition with tight connections on both ends.</li> </ul>	<p><b>ENGINE CRANK TEST</b></p>  <p>VOLTMETER READS 9 VOLTS MINIMUM (ENGINE CRANKING)</p> <ul style="list-style-type: none"> <li>• Disconnect high voltage cable from ignition coil.</li> <li>• Connect voltmeter to battery.</li> <li>• Crank engine 3 to 4 seconds. Note voltmeter reading.</li> <li>• If voltmeter reads less than 9 volts, check for faulty battery.</li> <li>• Reconnect high voltage cable to ignition coil.</li> </ul>	<p><b>VOLTAGE TEST</b></p>  <p>VOLTMETER READS 12.5 TO 14.5 VOLTS (ENGINE AT 2500 RPM)</p> <ul style="list-style-type: none"> <li>• Set engine at 2500 RPM. (low beam lights on, heater fan on high speed). Note voltmeter reading.</li> <li>• If voltmeter reads 12.5 to 14.5 volts, alternator and voltage regulator are good.</li> <li>• If voltmeter reads greater than 14.5 volts, replace voltage regulator.</li> <li>• If voltmeter reads less than 12.5 volts, stop engine and proceed to next step.</li> </ul>
<p><b>MOUNTING CHECK</b></p>  <ul style="list-style-type: none"> <li>• CHECK FOR CLEAN AND TIGHT MOUNTING SCREWS</li> <li>• Remove shield at alternator rear (10mm hardware).</li> <li>• Check that mounting screws for voltage regulator are not corroded, and are tight.</li> </ul>	<p><b>EXCITOR SYSTEM CHECK</b></p>  <p>IGNITION KEY ON START ENGINE</p> <p>BATTERY CHARGE INDICATOR GOES ON</p> <p>INDICATOR ON</p> <p>INDICATOR OUT</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• If indicator lights, start engine. Check that indicator goes out.</li> <li>• If indicator does not go out, check for possible short in excitor system wiring.</li> <li>• If indicator goes out, stop engine and go to next step.</li> </ul>	<p><b>REGULATOR/ALTERNATOR CHECK</b></p>  <p>INSTALL KNOWN GOOD VOLTAGE REGULATOR</p> <ul style="list-style-type: none"> <li>• Disconnect battery ground cable.</li> <li>• Remove voltage regulator from alternator.</li> <li>• Install a known good voltage regulator.</li> <li>• Connect battery cable, then repeat voltage test.</li> <li>• If voltage is within specifications, the original voltage regulator is defective.</li> <li>• If voltage is below specifications, repair or replace alternator.</li> </ul>	<p><b>RETEST</b></p>  <p>ALTERNATOR</p> <p>VOLTAGE REG.</p> <p>BAT. CHARGE IND.</p> <p>IGN. SW.</p> <p>BAT.</p> <ul style="list-style-type: none"> <li>• After repairs are made, repeat Voltage and Current Tests.</li> <li>• Remove test equipment.</li> <li>• Reinstall alternator shield (10-mm hardware).</li> </ul>

**DISASSEMBLY AND REASSEMBLY (MARELLI)**

Remove drive pulley and fan from rotor shaft.

Remove brush holder (29), complete with brushes, by removing screw (28).

Remove Woodruff key (22) from shaft.

Remove four thru-bolt nuts (36) holding end frames together.

Remove drive end frame (23) and rotor assembly (21).

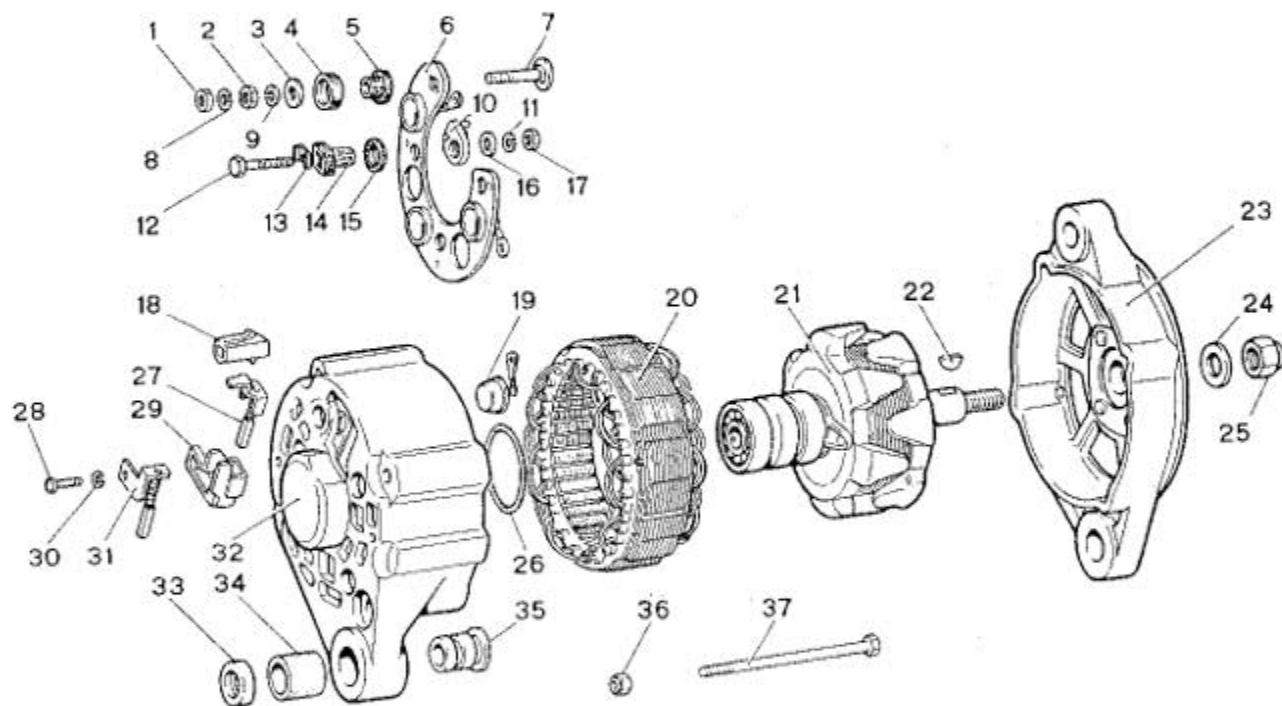
Using a small screwdriver, pry out blade plug from plastic connector (18) on diode end frame (32).

Remove three nuts (17) and bolts (12) attaching stator coil (20) phases to diode ends. Remove stator.

To remove diode plate (6) unscrew nut (2) on terminal "30."

Assemble in reverse order of disassembly.

Apply a small amount of grease to diode end bearing.



- 1 and 2. Nuts
- 3. Flat washer
- 4 and 5. Positive clamp insulators
- 6. Positive diode plate
- 7. Screw, positive clamp
- 8 and 9. Spring washers
- 10. Diode terminal connector insulator
- 11. Spring washer
- 12. Screw, positive diode terminals and stator phases ends attachment
- 13. Plate

- 14 and 15. Insulators
- 16. Flat washer
- 17. Nut
- 18. Plastic connector for charge indicator blade plug
- 19. Negative diode
- 20. Stator
- 21. Rotor
- 22. Key
- 23. Drive end frame
- 24. Spring washer

- 25. Pulley nut
- 26. Rubber seal, bearing outer race
- 27. Positive brush
- 28. Screw
- 29. Brush holder
- 30. Spring washer
- 31. Negative brush
- 32. Diode end frame
- 33, 34, 35. Rubber bushing components
- 36. Nut
- 37. Thru-bolt

**ALTERNATOR, MARELLI A 12 M 124/12/42 M**

### 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 & 9).

Remove nut to remove pulley (1), fan (5), spacers and key (13).

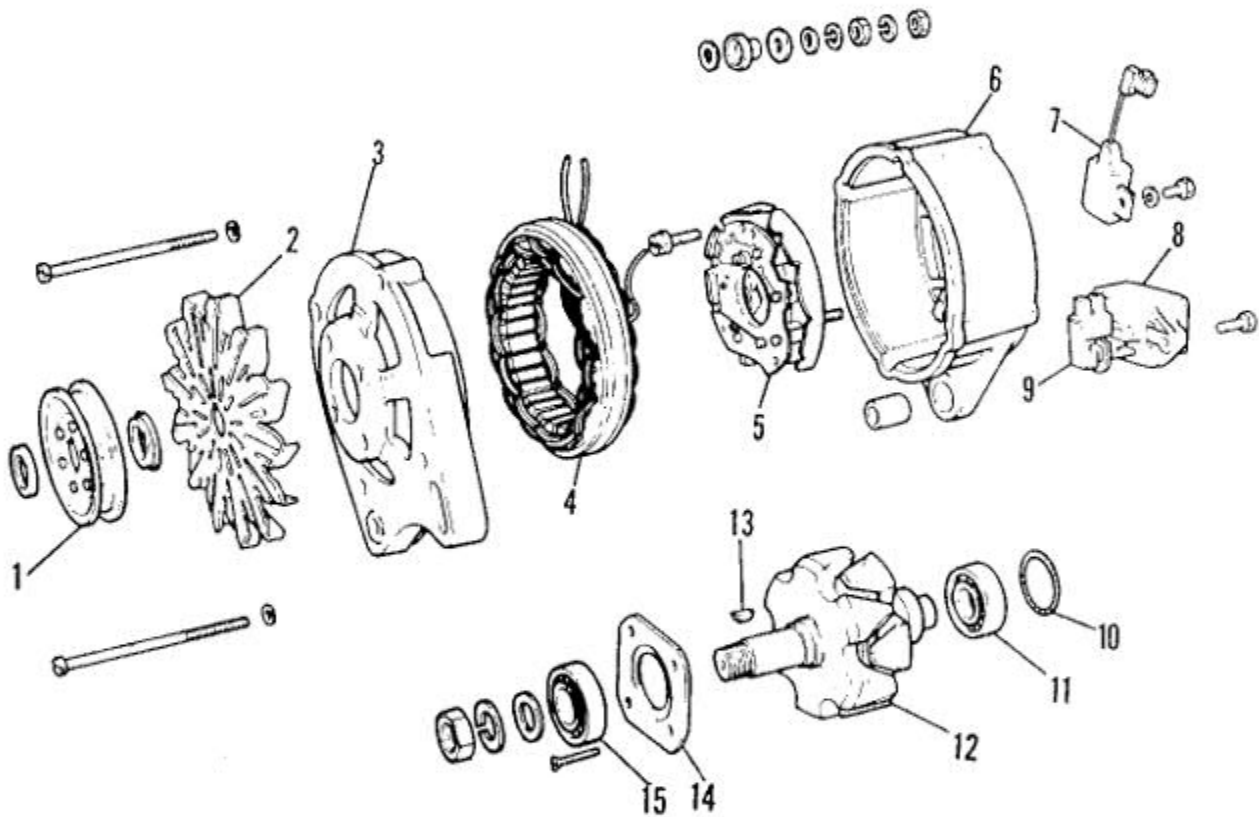
Remove four short screws on front frame (3) to free bearing retainer (14).

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    | 6. Frame             | 11. Bearing          |
| 2. Fan       | 7. Condenser         | 12. Rotor            |
| 3. Frame     | 8. Voltage regulator | 13. Key              |
| 4. Stator    | 9. Brush assembly    | 14. Bearing retainer |
| 5. Rectifier | 10. Seal             | 15. Bearing          |

ALTERNATOR, BOSCH K1 - 14V - 55A - 21 AND K1 - 14V - 65A - 21

**ALTERNATOR COMPONENT CHECKS (All)**

With alternator disassembled, the following components may be tested.

**Rotor Short-to-Ground Test**

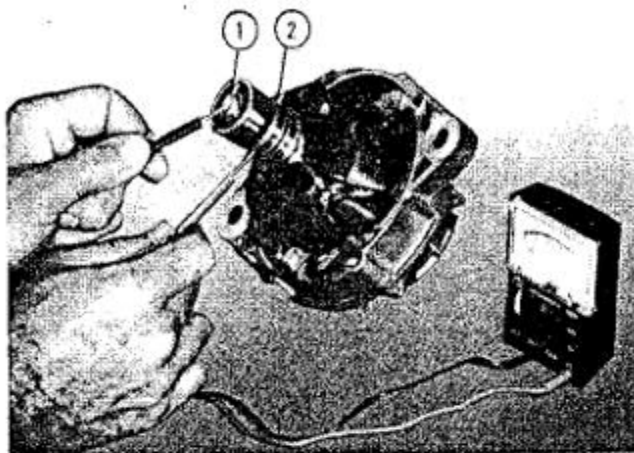
Set ohmmeter to x1000 scale.

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

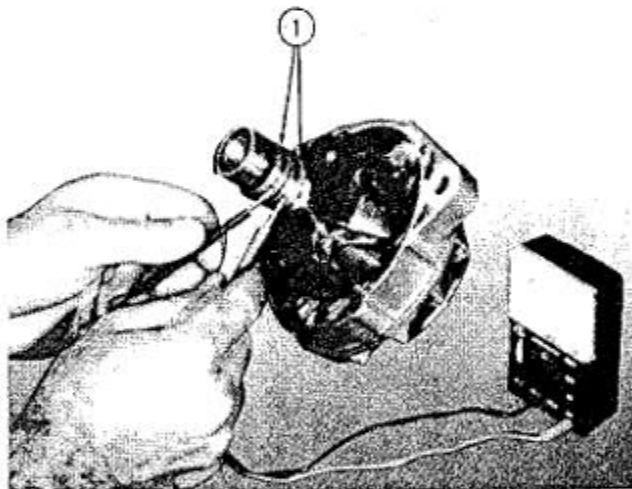
**Rotor Open Test**

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.

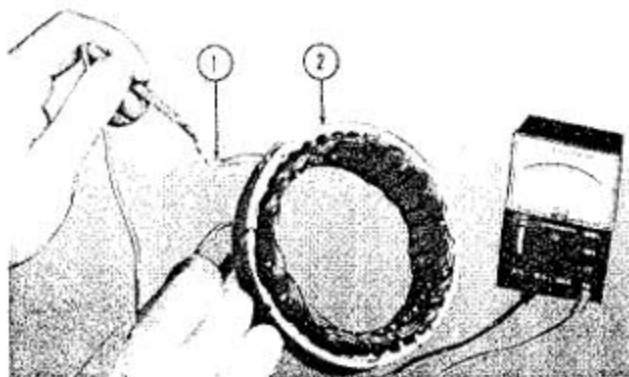
Set ohmmeter to x1000 scale.

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

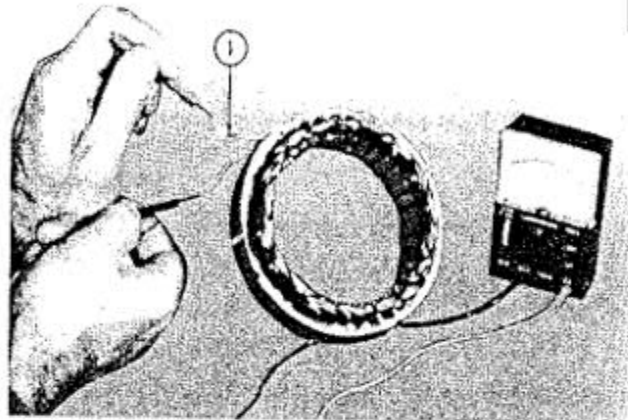
Set ohmmeter to x1 scale.

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

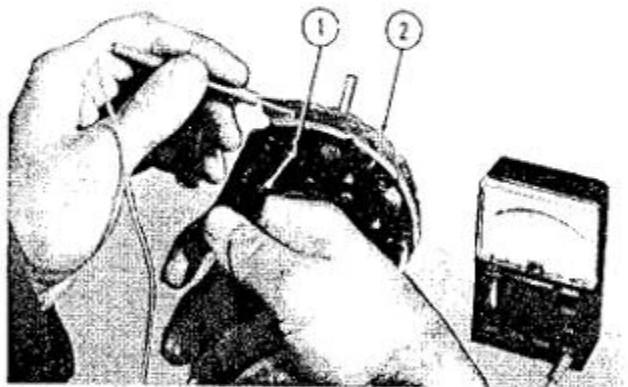
Remove stator leads from rectifier board.

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



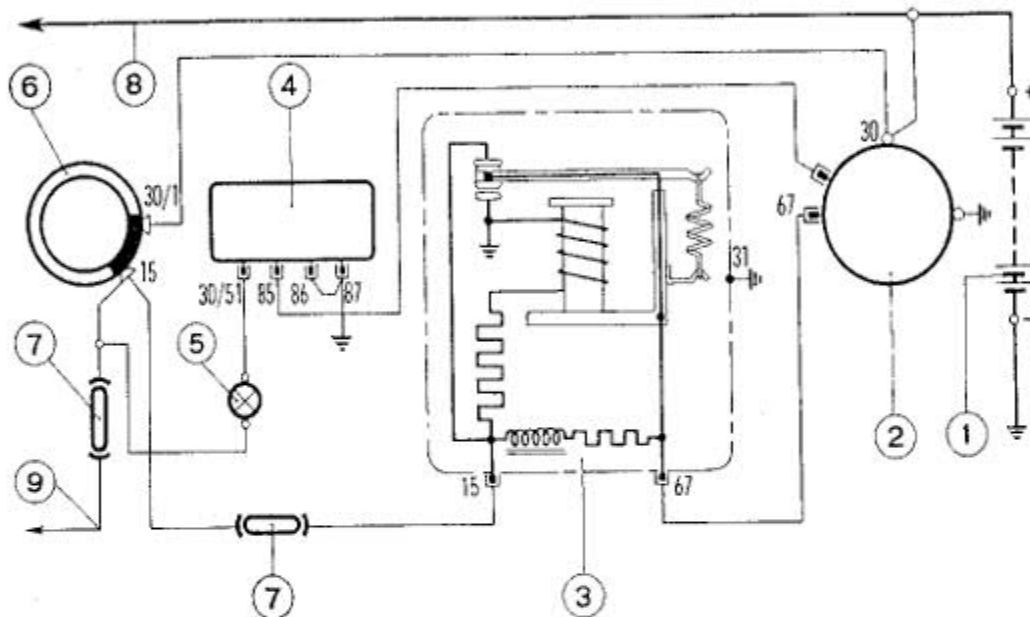
## VOLTAGE REGULATOR (1975 and 1976)

### SERVICE PROCEDURES

Corrective repairs on faulty voltage regulators should only be attempted if a replacement regulator is not available. In general, it is safer to replace a defective regulator rather than attempt repairs or adjustments. Only the following repairs are recommended:

- replacing cover and gasket
- soldering open electrical connections
- cleaning contacts and other regulator components.

**CAUTION:** Open connections should be soldered using smallest possible amount of rosin-core solder and taking care not to over-heat insulating material. After soldering, remove excess rosin.



- |                                 |                           |
|---------------------------------|---------------------------|
| 1. Battery                      | 6. Slip ring              |
| 2. Alternator                   | 7. 8A fuses               |
| 3. Voltage regulator            | 8. Lights and instruments |
| 4. Charge indicator relay       | 9. Signaling equipment    |
| 5. Charge indicator relay light |                           |

### CHARGING SYSTEM WIRING WITH DETAILED VOLTAGE REGULATOR

#### ADJUSTMENTS

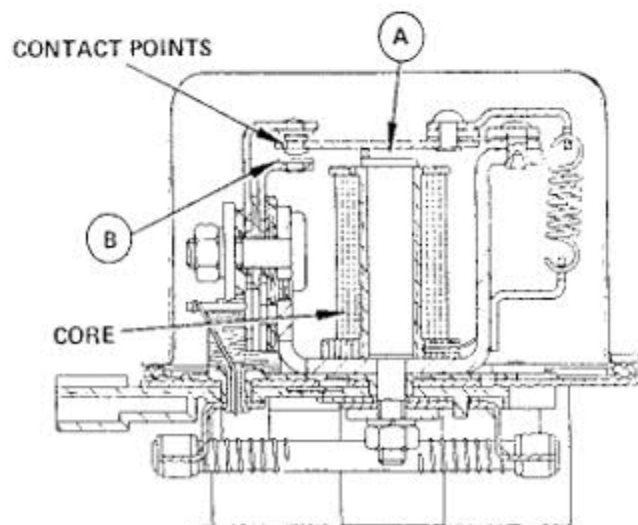
Disconnect positive battery cable. Remove two screws holding dust cover on voltage regulator.

Inspect contact points for pitting and burn marks. Clean minor pitting and burn marks. Extreme damage to points necessitates voltage regulator replacement.

Check core for damage and broken wires. With use of a clean feeler gauge, check following measurements:

(A) 0.055 to 0.063"      (B) 0.014 to 0.022"

If measurements are incorrect, remove voltage regulator from vehicle.



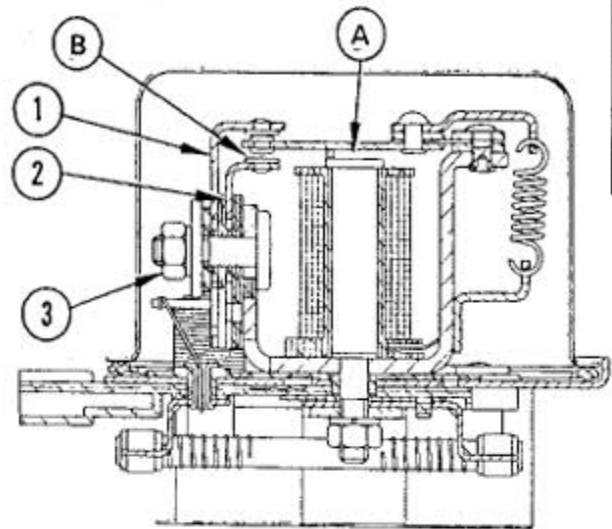
To make necessary adjustments, loosen 8 mm nut (3) to allow proper gapping. Both gaps A & B must be set simultaneously. To adjust gap A, move slotted arm (1) until gap is 0.055 to 0.063". To adjust gap B, move slotted arm (2) until gap is 0.014 to 0.022". After adjustments are completed, retighten 8 mm nut (3). Recheck gaps.

Install regulator in vehicle. Reconnect battery cable.

**NOTE:** Check that battery is fully charged.

Run engine until normal operating temperature is reached. Connect voltmeter positive lead to positive battery pole. Connect negative lead to a ground.

1. Slotted arm 2. Slotted arm 3. Nut



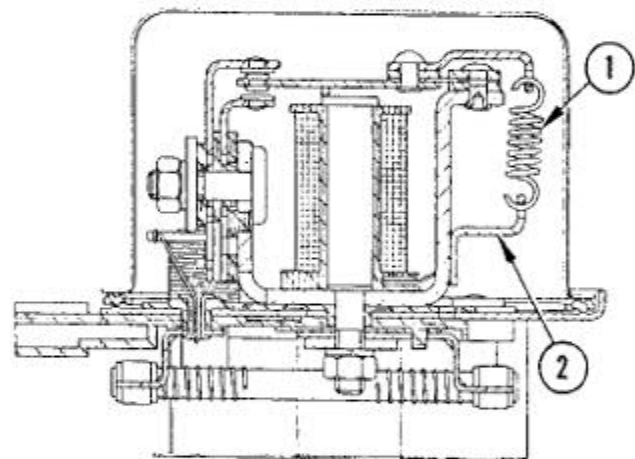
**CAUTION:** In next step, do not ground spring bracket with pliers while making adjustment.

Voltmeter should read 13.9 to 14.5 VDC at 2500 engine RPM with all electrical components off.

If this reading is incorrect, *carefully apply slight pressure* to lower spring bracket (2) in either direction to get desired reading. Bend bracket down to add volts and vice versa. Disconnect voltmeter. Reinstall regulator dust cover. Recheck charging system.

**NOTE:** Bending bracket changes tension on spring (1). A slight change in tension changes voltage. Bend bracket very slightly to increase or decrease voltage.

1. Spring 2. Spring bracket



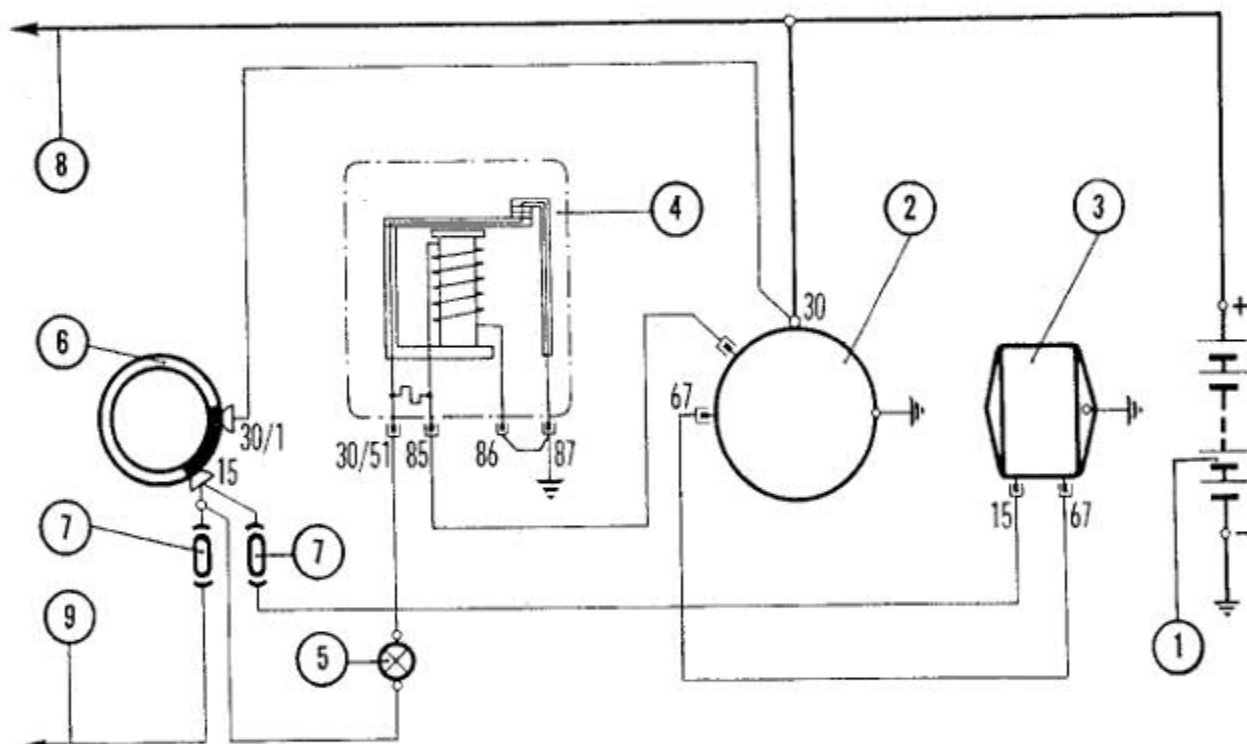
## CHARGE INDICATOR RELAY (1975 and 1976)

### DESCRIPTION

The charge indicator relay serves the purpose of signaling any malfunction in alternator charging system by turning on a red light in the instrument panel.

Data shown in specifications table can be used to check relay. If test readings fail to meet specifications, replace charge indicator relay.

Field winding resistance . . . . .	$29 \pm 2$ ohm
Desensitizing resistor . . . . .	$220 \pm 22$ ohm
Contact opening voltage . . . . .	$5.3 \pm 0.4$ V
Contact closing voltage . . . . .	0.2 to 0.9 V



- |                      |                                 |                           |
|----------------------|---------------------------------|---------------------------|
| 1. Battery           | 4. Charge indicator relay       | 7. BA fuses               |
| 2. Alternator        | 5. Charge indicator relay light | 8. Lights and instruments |
| 3. Voltage regulator | 6. Slip ring                    | 9. Signaling equipment    |

CHARGING SYSTEM WIRING WITH DETAILED CHARGE INDICATOR RELAY

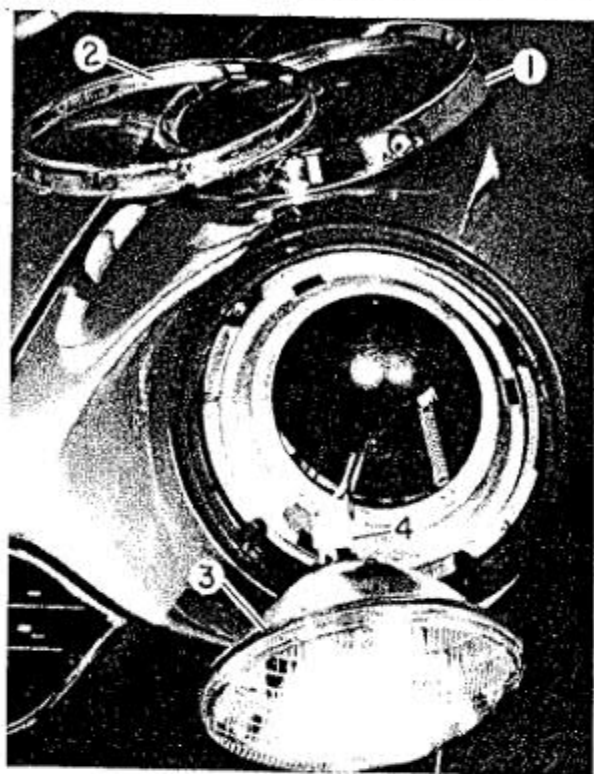


### HEADLIGHT

#### REMOVAL AND INSTALLATION

Remove screw on bottom of trim ring (1) to remove ring. Loosen three screws on inner ring (2) and twist ring off. Withdraw headlight (3) and disconnect electrical connector (4). Installation is reverse of removal.

1. Trim ring 2. Inner ring 3. Headlight 4. Electrical connector

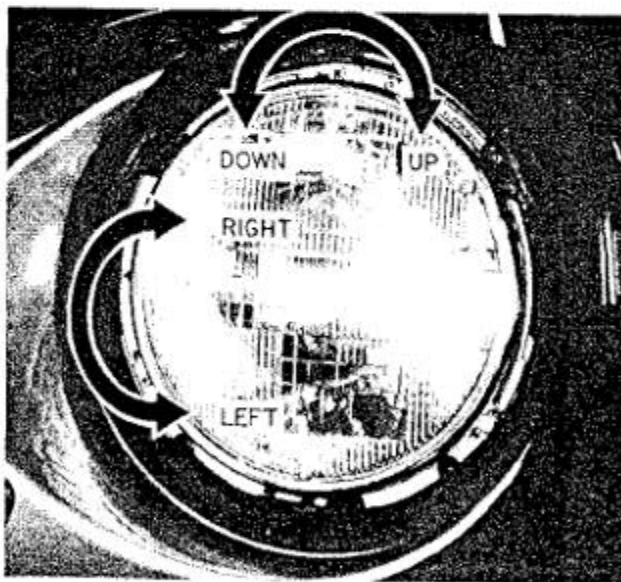


#### ADJUSTMENT

Remove trim ring.

Turn upper adjustment screw clockwise to raise light beam and counterclockwise to lower it.

Turn side adjustment screw clockwise to move beam to right and counterclockwise to move it to left.



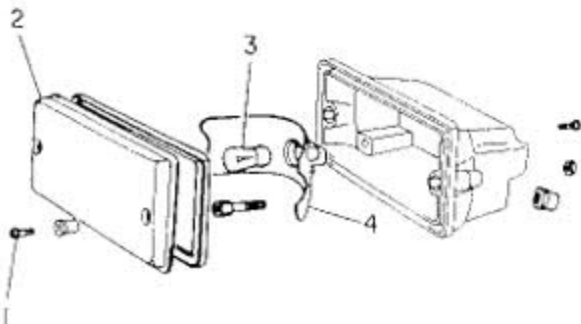
### FRONT PARKING/DIRECTIONAL/HAZARD LIGHT

#### REMOVAL AND INSTALLATION

Remove two screws (1) to remove lens (2). Remove bulb by twisting it out.

Installation is reverse of removal.

1. Screw 2. Lens 3. Bulb 4. Reflector



**TAIL LIGHT ASSEMBLY****REMOVAL AND INSTALLATION**

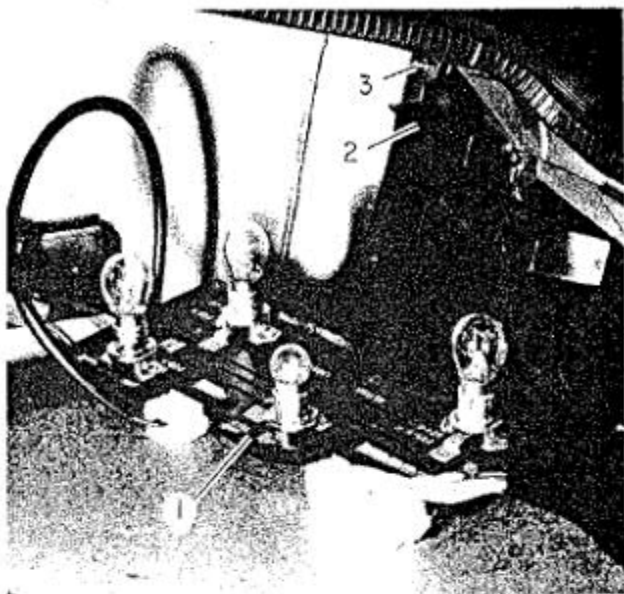
Open trunk. Place floor covering near light assembly out of way.

Unclip four clips holding light assembly (1) to lens assembly (2). Withdraw light assembly. Remove bulbs by twisting out.

To remove lens assembly, remove four nuts (3) securing it to body.

Installation is reverse of removal.

1. Light assembly 2. Lens assembly 3. Nut

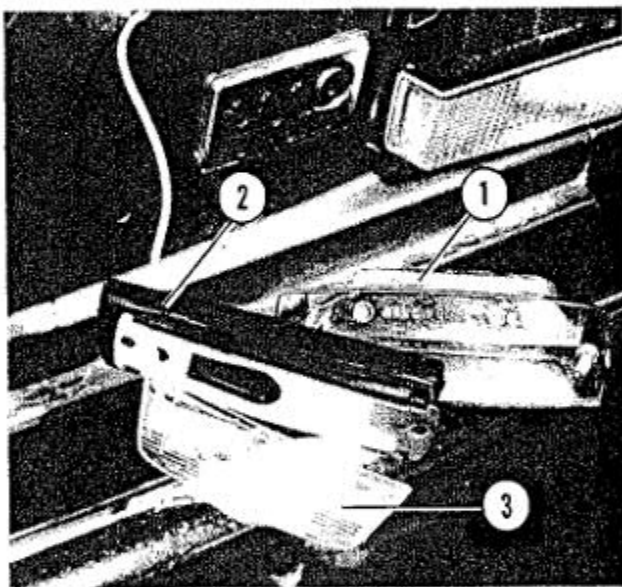
**LICENSE PLATE LIGHT****REMOVAL AND INSTALLATION**

Open trunk. Place floor covering near light assembly out of way.

Remove two nuts securing light assembly to body. Withdraw light assembly and separate cover (1) from light base (2). Remove bulb by twisting out.

Installation is reverse of removal.

1. Light cover 2. Light base 3. Lens

**SIDE MARKER LIGHTS****REMOVAL AND INSTALLATION**

For rear fender light, open trunk and place floor covering out of way.

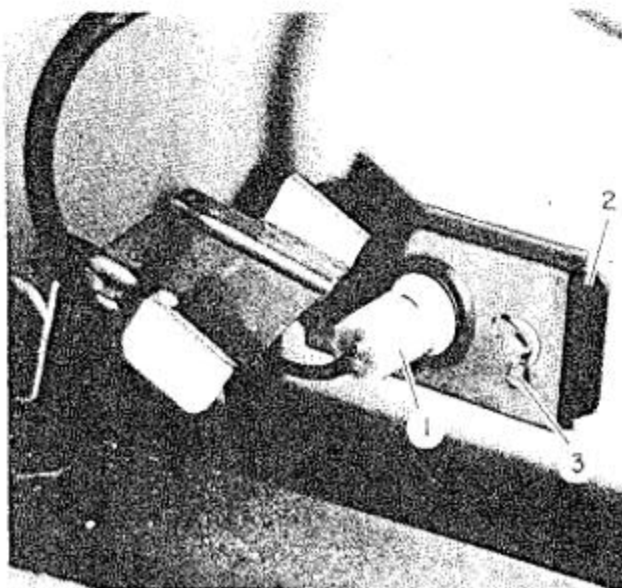
Twist connector (1) to remove light. Remove bulb by pulling it straight out.

To remove lens assembly from fender, remove two wingnuts (3).

For front fender light, first remove wheel well splash shield to gain access to rear of light. Removal is same as for rear light.

Installation is reverse of removal.

1. Electrical connector 2. Lens assembly 3. Wingnut



### HORN/DIRECTIONAL/LIGHT SWITCH ASSEMBLY

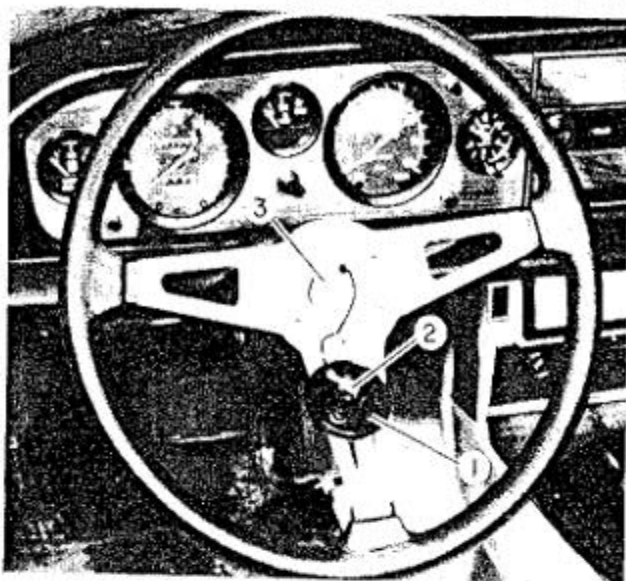
#### REMOVAL AND INSTALLATION

Disconnect battery ground lead located in trunk.

Remove horn button (1) by pulling it straight out. Disconnect horn electrical connector (2).

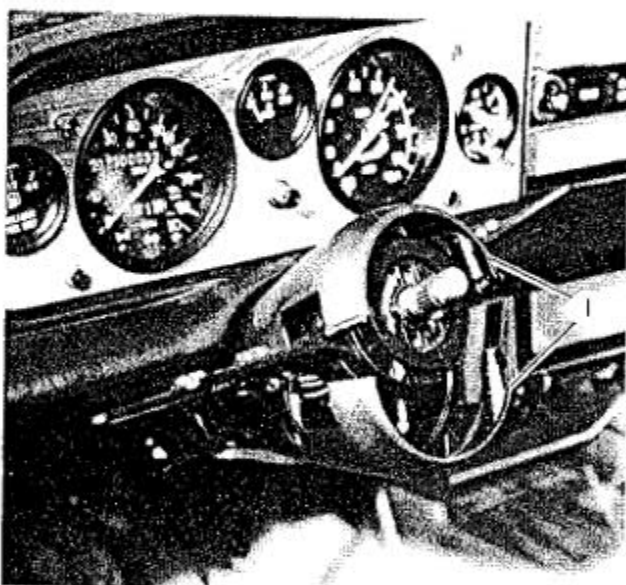
Remove steering shaft nut (3). Mark shaft and steering wheel for reinstallation in same position. Pull steering wheel off.

1. Horn button 2. Electrical connector 3. Steering shaft nut



Remove five screws securing upper and lower cover halves (1) together.

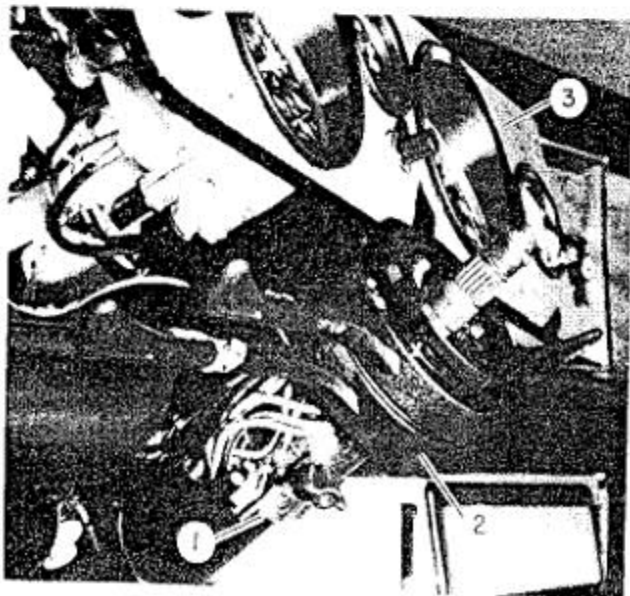
1. Cover halves



Loosen clamp bolt (1) holding switch assembly (2) to steering column.

Remove four knobs holding instrument group (3) to dash panel. Carefully pull instruments out far enough to gain access to signaling wire harnesses.

1. Steering column clamp bolt 2. Switch assembly 3. Instrument group



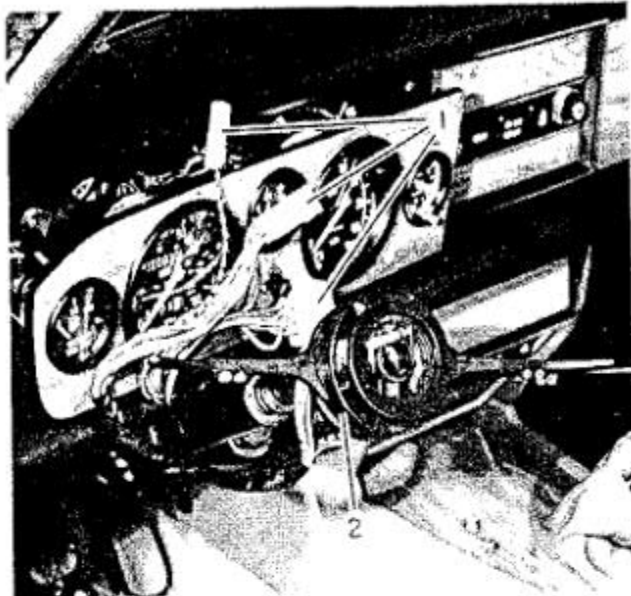
From under dash, disconnect three connectors (1).

Remove switch assembly (2) while carefully pulling wire harnesses and connectors through dash panel.

Installation is reverse of removal.

Torque steering column shaft nut to 36 ft. lb. (5 kgm).

1. Electrical connectors 2. Switch assembly



## HORNS

### REMOVAL AND INSTALLATION

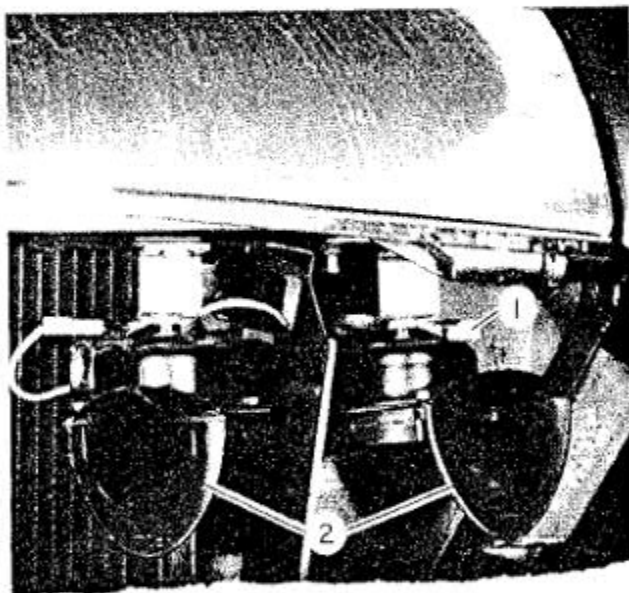
Remove six screws holding radiator trim and grill.

Disconnect electrical connectors (1) on horns (2).

Remove two nuts securing horn assembly to body. Remove horns through front grill opening.

Installation is reverse of removal.

1. Electrical connector 2. Horn assembly



### WINDSHIELD WIPER ASSEMBLY

#### REMOVAL AND INSTALLATION

**NOTE:** Wiper blades should be in Park position.

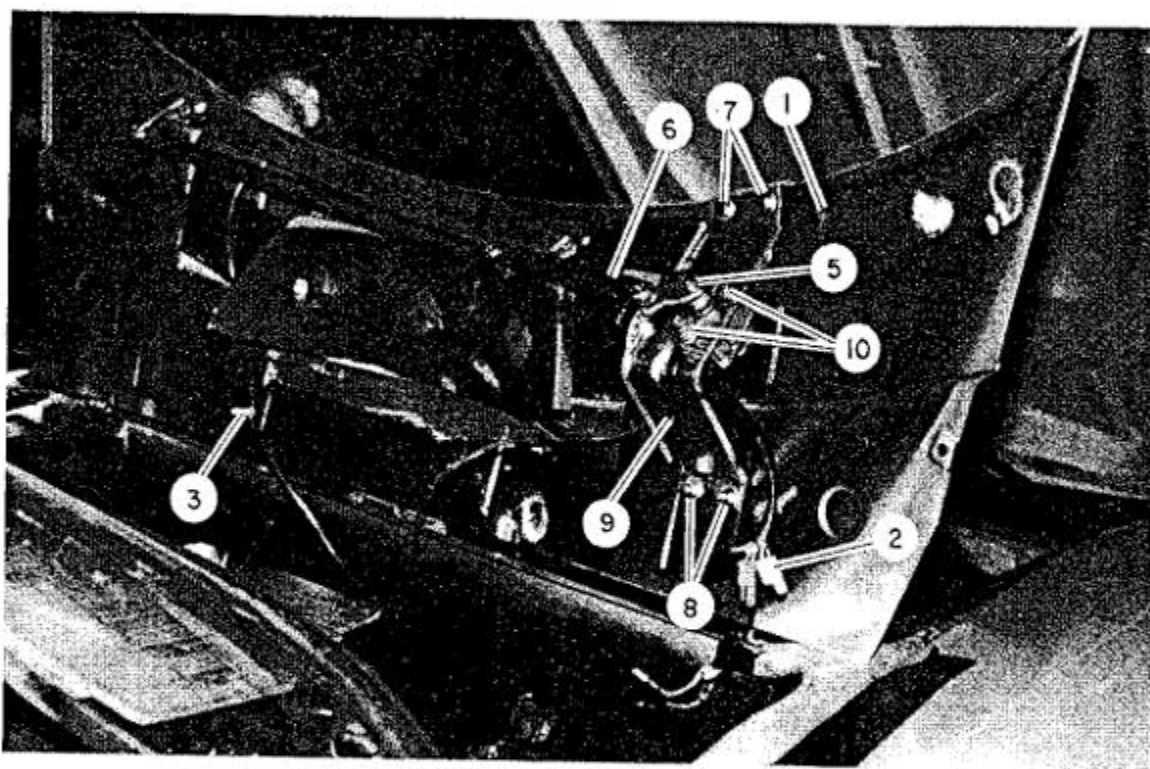
Pivot wiper arms up away from windshield and pull them off drive shafts.

Raise hood. Remove six screws securing cowl (1) to body. Lift cowl up on body as shown, being careful not to damage finish. Disconnect electrical connectors (2), first noting to which connectors they are attached, for reinstallation. Disconnect windshield washer line at "T" fitting (3).

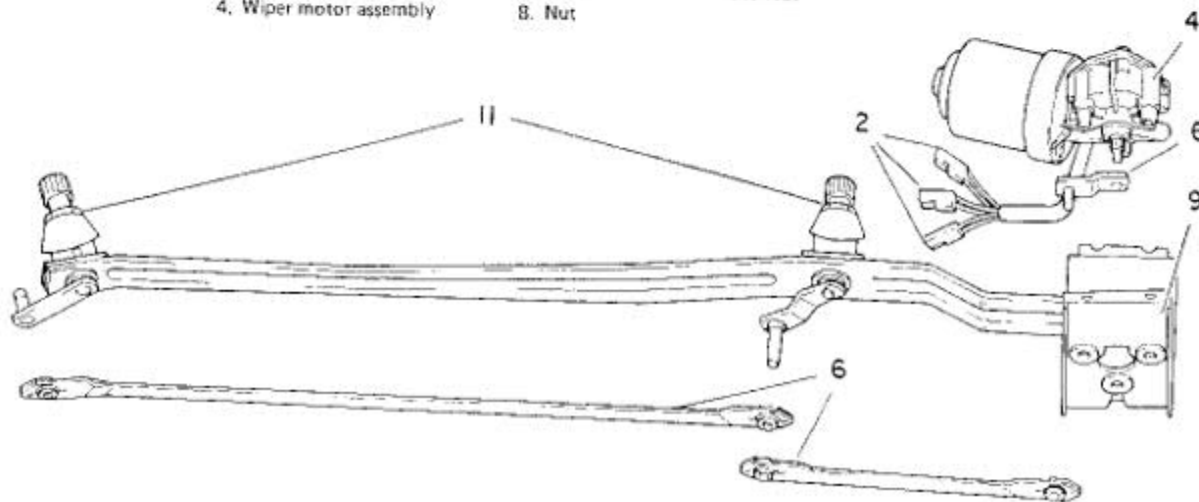
Place cowl on bench. Remove two nuts (11) on drive shafts. Remove two bolts (7) and two nuts (8) holding motor mount bracket (9) to cowl. Remove entire wiper assembly from cowl.

Remove motor drive shaft nut (5) holding linkage (6) to shaft. Pull link end off. Remove three bolts (10) holding motor assembly (4) to bracket.

Installation is reverse of removal.



- |                          |                  |                              |
|--------------------------|------------------|------------------------------|
| 1. Cowl                  | 5. Nut           | 9. Mounting bracket assembly |
| 2. Electrical connectors | 6. Drive linkage | 10. Bolt                     |
| 3. "T" fitting           | 7. Bolt          | 11. Nut                      |
| 4. Wiper motor assembly  | 8. Nut           |                              |



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# ENGINE - 10

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

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	Torque Specifications . . . . .	10-10
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10A	Service Tools . . . . .	10-169

## CYLINDER BLOCK CON-RODS

DESCRIPTION	IN.	MM						
Cylinder bore diameter .....	3.3070 to 3.3090	84.000 to 84.050						
Cylinder bores are graded into classes with 0.0004 in (0.01 mm) progression.								
Auxiliary shaft bushing seats, diameters:								
– belt end .....	2.0126 to 2.0138	51.120 to 51.150						
– flywheel end .....	1.6547 to 1.6559	42.030 to 42.060						
Crankshaft bearing saddle bore diameter .....	2.2329 to 2.2334	56.717 to 56.730						
Length of rear main bearing bore between thrust ring seats .....	0.9095 to 0.9134	23.100 to 23.200						
Big-end bore diameter .....	2.1219 to 2.1225	53.897 to 53.913						
Small-end bore diameter .....	0.9424 to 0.9438	23.939 to 23.972						
Small-end bushing O.D. ....	0.9455 to 0.9465	24.016 to 24.041						
Small-end bushing I.D., fitted and finish reamed .....	<table border="0"> <tr> <td rowspan="2">                     { Class 1                      { Class 2                 </td> <td>0.8662 to 0.8664</td> <td>22.004 to 22.007</td> </tr> <tr> <td>0.8664 to 0.8665</td> <td>22.007 to 22.010</td> </tr> </table>	{ Class 1 { Class 2	0.8662 to 0.8664	22.004 to 22.007	0.8664 to 0.8665	22.007 to 22.010		
{ Class 1 { Class 2	0.8662 to 0.8664		22.004 to 22.007					
	0.8664 to 0.8665	22.007 to 22.010						
Thickness of standard big-end bearings (2000 eng.) .....	0.0603 to 0.0605	1.5338 to 1.537						
Thickness of standard big-end bearings (1800 eng.) .....	<table border="0"> <tr> <td>Class A (*)</td> <td>.0599 to .0600</td> <td>1.521 to 1.525</td> </tr> <tr> <td>Class B (**)</td> <td>.0600 to .0602</td> <td>1.525 to 1.529</td> </tr> </table>	Class A (*)	.0599 to .0600	1.521 to 1.525	Class B (**)	.0600 to .0602	1.525 to 1.529	
Class A (*)	.0599 to .0600	1.521 to 1.525						
Class B (**)	.0600 to .0602	1.525 to 1.529						
Range of undersize big-end bearings for service .....	0.010-0.020-0.030-0.040	0.254-0.508-0.762-1.016						
Small-end bushing fit: interference .....	0.0017 to 0.0040	0.044 to 0.102						
Piston pin-small-end bushing fit:								
– clearance .....	0.0004 to 0.0006	0.010 to 0.016						
Big-end bearings:								
– fit clearance (2000 eng.) .....	0.0008 to 0.0025	0.021 to 0.065						
Big-end bearings:								
– fit clearance (1800 eng.) .....	<table border="0"> <tr> <td>Class A</td> <td>.0018 to .0031</td> <td>.045 to .079</td> </tr> <tr> <td>Class B</td> <td>.0019 to .0032</td> <td>.047 to .081</td> </tr> </table>	Class A	.0018 to .0031	.045 to .079	Class B	.0019 to .0032	.047 to .081	
Class A	.0018 to .0031	.045 to .079						
Class B	.0019 to .0032	.047 to .081						
Maximum misalignment between C/Ls of connecting rod small-end and big-end: – measured at 4.92 in (125 mm) from the shank .....	0.0031	0.08						

(\*) Color-coded with red paint.  
 (\*\*) Color-coded with blue paint.

## PISTON-PINS-RINGS

DESCRIPTION		IN.	MM
Diameter of standard pistons, measured at right angles to C/L of piston ring at 1.181 in (30 mm) from piston skirt edge .....	{ Class A	3.3051 to 3.3055	83.950 to 83.960
	{ Class C	3.3059 to 3.3063	83.970 to 83.980
	{ Class E	3.3066 to 3.3070	83.990 to 84.000
Oversize piston range .....		0.0079-0.0157-0.0236	0.2-0.4-0.6
Piston boss bore diam.	{ Class 1	0.8660 to 0.8661	21.996 to 21.999
	{ Class 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	0.0798 to 0.0806	2.030 to 2.050
	{ Bottom groove	0.1561 to 0.1569	3.967 to 3.987
Standard piston pin diam .....	{ Class 1	0.8658 to 0.8659	21.991 to 21.994
	{ Class 2	0.8659 to 0.8660	21.994 to 21.997
Oversize piston pin .....		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 0.0787	1.980 to 2.000
– third oil ring with oilways and expander .....		0.1544 to 0.1549	3.925 to 3.937
(*) Piston fit in bore (measured at right angles to pin):			
– fit clearance .....		0.0016 to 0.0024	0.040 to 0.060
Piston pin in boss: fit clearance .....		0.0001 to 0.0003	0.002 to 0.008
Piston ring side clearance:			
– first compression ring: fit clearance .....		0.0018 to 0.0030	0.045 to 0.077
– second oil ring: fit clearance .....		0.0011 to 0.0027	0.030 to 0.070
– third oil ring: fit clearance .....		0.0011 to 0.0024	0.030 to 0.062
Piston ring end gap in bore:			
– first compression ring: fit clearance .....		0.0118 to 0.0177	0.30 to 0.45
– second oil ring: fit clearance .....		0.0118 to 0.0177	0.30 to 0.35
– third oil ring: fit clearance .....		0.0098 to 0.0157	0.25 to 0.40
Oversize piston ring range:			
– compression and oil rings .....		0.0079-0.0157-0.0236	0.2-0.4-0.6

(\*) Measured at 1.876 in. (47.65 mm) from piston head.



## CRANKSHAFT AND MAIN BEARINGS

DESCRIPTION	IN.	MM
Main bearing journal standard diam. ....	2.0860 to 2.0868	52.985 to 53.005
Main bearing saddle bore .....	2.2329 to 2.2334	56.717 to 56.730
Standard main bearing insert thickness (2000 eng.) .....	{ Class 1 0.722 to 0.724 { Class 2 0.724 to 0.726	1.834 to 1.840
		1.839 to 1.845
Standard main bearing insert thickness (1800 eng.) .....	.0718 to .0721	1.825 to 1.831
Main bearing inserts for service .....	0.01-0.02-0.03-0.04	0.254-0.508-0.762-1.016
Crankpin standard diameter .....	{ Class A 1.9997 to 2.0001 { Class B 1.9993 to 1.9997	50.792 to 50.802
		50.782 to 50.792
Main bearing-to-journal fit: - fit clearance (2000 eng.) .....	0.0012 to 0.0030	0.032 to 0.077
Main bearing-to-journal fit: - fit clearance (1800 eng.) .....	.0020 to .0037	.050 to .095
Length of rear main bearing journal, shoulder-to-shoulder .....	1.1014 to 1.1034	27.975 to 28.025
Width of rear main bearing seat, between thrust ring seats .....	0.9095 to 0.9134	23.100 to 23.200
Rear main bearing seat thrust ring thickness .....	0.0909 to 0.0929	2.310 to 2.360
Oversize thrust ring thickness .....	0.0959 to 0.0979	2.437 to 2.487
Crankshaft end clearance, thrust rings installed: - fit clearance .....	0.0021 to 0.0120	0.055 to 0.305
Maximum misalignment of main bearing journals (total indicator reading) (2000 eng.) .....	0.0011	0.03
Maximum misalignment of main bearing journals (total indicator reading) (1800 eng.) .....	.0008	0.02
Maximum misalignment of crankpins to main bearing journals .....	0.013	0.35
Maximum out-of-round of crankpins and main bearing journals, after grinding .....	0.0002	0.005
Maximum taper of crankpins and main bearing journals, after grinding .....	0.0002	0.005
Squareness of flywheel resting face to crankshaft centerline: - max. out-of-true with dial indicator set laterally some 1.3 in (33 mm) apart from crankshaft rotation axis .....	0.0010	0.025

## Flywheel:

- parallel relationship of driven plate resting face to crankshaft flange mounting face: max. out-of-true .....	0.0039	0.10
- squareness of above faces to rotation axis: max. out-of-true .....	0.0039	0.10

## CYLINDER HEAD

DESCRIPTION	IN.	MM	
Valve guide seat bore (2000 eng.)	0.5492 to 0.5502	13.950 to 13.977	
Valve guide seat bore (1800 eng.)	.5886 to .5896	14.950 to 14.977	
Valve guide O.D., standard (2000 eng.)	0.5527 to 0.5534	14.040 to 14.058	
Valve guide O.D., standard (1800 eng.)	.5905 to .5912	14.998 to 15.016	
Valve guide oversize on O.D., for service (2000 eng.)	0.0019-0.0039- 0.0098-0.0177	0.05-0.10- 0.25-0.45	
Valve guide oversize on O.D., for service (1800 eng.)	.0079	.2	
Fit between valve guide and bore in head: interference (2000 eng.)	0.0024 to 0.0042	0.063 to 0.108	
Fit between valve guide and bore in head: interference (1800 eng.)	.0008 to .0026	.021 to .066	
Inside diameter of valve guides, fitted in cylinder head	0.3158 to 0.3165	8.022 to 8.040	
Valve stem diameter	0.3139 to 0.3146	7.974 to 7.992	
Fit between valve stem and guide: - fit clearance	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 (2000 eng.)	intake	1.6377 to 1.6535	41.60 to 42.00
	exhaust	1.4114 to 1.4350	35.85 to 36.45
Valve head diameter (1800 eng.)	intake	1.6614 to 1.6772	42.20 to 42.60
	exhaust	1.4115 to 1.4350	35.85 to 36.45
Max. eccentricity of valve head in one complete turn guided by stem, with indicator set on center of contact face	0.0012	0.03	
Width of valve seat in cylinder head (contact face), abt	0.079	2	
Inside diameter of valve seats in cylinder head (2000 eng.)	intake	1.4566 to 1.4645	37.00 to 37.20
	exhaust	1.2755 to 1.2834	32.40 to 32.60
Inside diameter of valve seats in cylinder head (1800 eng.)	intake	1.4134 to 1.4213	35.90 to 36.10
	exhaust	1.2756 to 1.2835	32.40 to 32.60
Lift on valve C/L (without play)	0.3765	9.564	
Diameter of tappet bores in head	1.4567 to 1.4576	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 tappet cap plates: basic dimension	0.1575 ± 0.0004	4 ± 0.01	
Tappet caps are supplied for service in the following thicknesses: .1280, .1299, .1339, .1378, .1417, .1457, .1496, .1535, .1575, .1614, .1654, .1693, .1732, .1772, .1811, .1850 in. (3.25, 3.30, 3.40, 3.50, 3.60, 3.70, 3.80, 3.90, 4.00, 4.10, 4.20, 4.30, 4.40, 4.50, 4.60, 4.70 mm)			

## VALVE SPRINGS

DESCRIPTION	INNER SPRING	OUTER SPRING
Spring height under a load of 85.5 lbs. (38.9 kg) .....	—	1.417 in (36 mm)
Spring height under a load of 32.7 lbs. (14.9 kg) .....	1.220 in (31 mm)	—
Minimum permissible load referred to the above heights .....	32 lbs. (14.5 kg)	79.4 lbs. (36 kg)

## VALVE MECHANISM

DESCRIPTION	IN.	MM									
Diameter of camshaft journal bores in head:											
— front .....	1.1814 to 1.1824	30.009 to 30.034									
— middle .....	1.8031 to 1.8042	45.800 to 45.825									
— rear .....	1.8189 to 1.8198	46.200 to 46.225									
Diameter of camshaft journals:											
— front .....	1.1788 to 1.1795	29.944 to 29.960									
— middle .....	1.8013 to 1.8020	45.755 to 45.771									
— rear .....	1.8171 to 1.8178	46.155 to 46.171									
Camshaft journal to bore fit:											
— fit clearance	<table border="0"> <tr> <td>{ front</td> <td>0.0019 to 0.0035</td> <td>0.049 to 0.090</td> </tr> <tr> <td>{ middle</td> <td>0.0011 to 0.0027</td> <td>0.029 to 0.070</td> </tr> <tr> <td>{ rear</td> <td>0.0011 to 0.0027</td> <td>0.019 to 0.070</td> </tr> </table>	{ front	0.0019 to 0.0035	0.049 to 0.090	{ middle	0.0011 to 0.0027	0.029 to 0.070	{ rear	0.0011 to 0.0027	0.019 to 0.070	
{ front	0.0019 to 0.0035	0.049 to 0.090									
{ middle	0.0011 to 0.0027	0.029 to 0.070									
{ rear	0.0011 to 0.0027	0.019 to 0.070									

## AUXILIARY DRIVE SHAFT

Diameter of bushing bores in crankcase:								
— front .....	2.0126 to 2.0138	51.120 to 51.150						
— rear .....	1.6547 to 1.6559	42.030 to 42.060						
Inside diameter of bushings finished in bores:								
— front .....	1.8930 to 1.8938	48.084 to 48.104						
— rear .....	1.5354 to 1.5362	39.000 to 39.020						
Diameter of shaft journals:								
— front .....	1.8903 to 1.8913	48.013 to 48.038						
— rear .....	1.5326 to 1.5336	38.929 to 38.954						
Fit between bushings and bores in crankcase: interference fit .....								
	0.00314 to 0.0035	0.08 to 0.151						
Fit between bushings and shaft journals:								
— fit clearance	<table border="0"> <tr> <td>{ front</td> <td>0.0018 to 0.0036</td> <td>0.046 to 0.091</td> </tr> <tr> <td>{ rear</td> <td>0.0018 to 0.0036</td> <td>0.046 to 0.091</td> </tr> </table>	{ front	0.0018 to 0.0036	0.046 to 0.091	{ rear	0.0018 to 0.0036	0.046 to 0.091	
{ front	0.0018 to 0.0036	0.046 to 0.091						
{ rear	0.0018 to 0.0036	0.046 to 0.091						

## CARBURETORS

Year	Type, Weber	Venturi Diameter MM	Main Jet MM	Idle Jet MM	Emulsion Tube MM	Air Corrector Jet MM	Pump Jet MM	Needle Valve MM	Float Level MM	Position Primary Throttle on Full Choke MM
75-76	32ADFA 2/100 (49 State)	*23	1.25	0.50	F74	1.85 1.70	0.50	1.75	*** 6.5	1.05/1.15
	32ADFA 5/100 (Calif.)	**25	1.40	0.60	F74	1.80 1.70				
77	32ADFA 12/100 (49 State)	*23	1.25	0.50	F73	1.85 1.70	0.50	1.75	*** 6.5	1.05/1.15
	32ADFA 15/101 (Calif.)	**25	1.40	0.60	F7	1.75 1.70				
78	32ADFA 11/100 (49 State)	*23	1.25	0.50	F73	1.85 1.70	0.50	1.75	*** 6.5	1.05/1.10
	32ADFA 14/101 (Calif.)	**25	1.40	0.60	F7	1.75 1.70				
79	28/32ADHA 3/179 (49 State - S/T)	*22	1.20	0.55	F84	1.75	0.50	1.75	*** 6.5	1.00/1.10
	28/32ADHA 4/179 (49 State - A/T)	**24	1.15	0.60	F7	1.60				1.05/1.15
	28/32ADHA 7/179 (Calif - S/T)	*22	1.20	0.55	F84	1.70 1.70	0.50	1.75	*** 6.5	1.00/1.10
	28/32ADHA 8/179 (Calif - A/T)	**24	1.15	0.60	F7	1.65 1.70				1.05/1.15
80	28/32ADHA 7/180 (Std. Trans.)	*22	1.20	0.55	F84	1.70	0.50	1.75	*** 6.5	1.00/1.10
	28/32ADHA 8/180 (Auto. Trans.)	**24	1.15	0.60	F7	1.70				1.00/1.10

\*Primary Throat  
 \*\*Secondary Throat  
 \*\*\*Tolerance ± 1 MM

80 and on	BOSCH L-JETRONIC FUEL INJECTION
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## LUBRICATION

Oil pump .....	gear type
Oil pump drive .....	by auxiliary shaft
Oil pressure relief valve .....	built in oil pump
Clearance between gears upper end and pump cover mating face .....	0.0010 to 0.0051 in. (0.026 to 0.131 mm)
Clearance between gears and pump housing inside wall .....	0.0043 to 0.0071 in. (0.110 to 0.180 mm)
Fit between drive spindle guide bushing and bore in crankcase .....	interference at all times (0.0010 to 0.0027 in. [0.025 to 0.070 mm])
Clearance between drive spindle and bushing press fitted in crankcase .....	0.0012 to 0.0026 in. (0.032 to 0.067 mm)
Clearance between drive gear spindle and bore in pump body .....	0.0006 to 0.0021 in. (0.016 to 0.055 mm)
Clearance between pin and driven gear .....	0.0007 to 0.0022 in. (0.017 to 0.057 mm)
Lash between matched gears .....	0.006 in. (0.15 mm)
Lash between drive spindle gear and auxiliary shaft gear .....	0.0023 in. (0.06 mm)
Full-flow oil filter with by-pass valve .....	cartridge type
Low oil pressure indicator sending unit .....	electric tell-tale
Lubrication pressure at 212°F (100°C) .....	50 to 71 psi (3.5 to 5.0 Kg/sq. cm)

## OIL PRESSURE RELIEF VALVE SPRING

Length of seated spring under a load of 13.67 ± 0.55 lbs. (6.2 ± .25 kg) .....	0.886 in. (22.5 mm)
Minimum permissible load referred to length of seated spring .....	12.78 lbs. (5.8 kg)

## COOLING SYSTEM

Water circulation cooling system:	
- Water pump .....	centrifugal vane type
- Water pump drive .....	by belt
- Radiator cooling fan .....	four bladed fan driven by electric motor controlled by thermal switch
Radiator fan thermal switch:	
- cuts in at .....	194° to 201°F. (90° to 94°C)
- cuts out at .....	185° to 192°F. (85° to 89°C)

Thermostat:

- begins opening at ..... 172° to 180° F (78° to 82° C)
- opening at 198° F (92° C),  
equal to or more than ..... 0.29 in. (7.5 mm)

Fit clearance between impeller vanes  
and pump body ..... 0.04 in. (1 mm)

Radiator cap valve opening pressure ..... 11.4 p.s.i. (0.8 Kg/sq. cm)  
Water temperature indicator ..... electrical gauge

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## TORQUE SPECIFICATIONS

DESCRIPTION	THREAD (METRIC)	MATERIAL	TORQUE		
			N·m	FT.LB.	Kgm
Bolt, center main bearing cap . . . . .	M12 x 1.25	R100	113	83	11.5
Bolt, front main bearing cap . . . . .	M10 x 1.25	R100	80	59	8.2
Bolt, self-locking, main bearing cap . .	M12 x 1.25	R100	113	83	11.5
Bolt, engine breather mounting . . . . .	M8	R80 Znt	24	17	2.3
Bolt, cylinder head hold-down . . . . .	M10 x 1.25	R100	83	61	8.5
Bolt, cylinder head extensions . . . . .	M8	8.8 Znt/Deidr	22	14	2
Bolt, cylinder head extensions . . . . .	M8	8.8 Znt/Deidr	22	14	2
Nut, intake manifold-to-cylinder head stud . . . . .	M8	R50 Znt (Stud R80 Znt)	25	18	2.5
Bolt, intake manifold . . . . .	M8	8.8 Cdt/Deidr	25	18	2.5
Nut, exhaust manifold-to-cylinder head stud . . . . .	M8	R50 Znt (Stud R80 Znt)	25	18	2.5
Nut, connecting rod bolt . . . . .	M10 x 1	R80 - BON (Bolt 12 R) 30 Cd 4Pb BON (Bolt 12 R)	75	54	7.5
Bolt, flywheel-to-crankshaft . . . . .	M12 x 1.25	38 Cd-4Rct-BON or 40Ni-Cr-Mo- Trf-Rct 120-135 Kg/mm <sup>2</sup>	145	105	14.5
Nut, belt tensioner . . . . .	M10 x 1.25	R50 Znt (Stud R100)	44	33	4.5
Bolt, camshaft sprocket . . . . .	M12 x 1.25	12.9	118	87	12
Bolt, oil pump body and scoop . . . . .	M8	8.8	22	14	2
Bolt, oil filter . . . . .	M10 x 1.25	8.8 Znt/Deidr	51	36	5
Nut, alternator, and water pump . . . .	M20 x 1.5	R50 Znt Waxed or Oiled (Shaft 40 Cr-Mo-4 BON)	245	181	25
Bolt, oil filter support . . . . .	M10 x 1.25	8.8 Znt/Deidr	51	36	5
Bolt, water pump pulley . . . . .	M8 x 1.25	8.8 Znt/Deidr	24	17	2.3
Nut, alternator to crankcase . . . . .	M12 x 1.25	R80 Znt (Bolt 8.8 Znt/Deidr)	69	51	7
Self-locking nut, with nylon, alternator upper bracket . . . . .	M10 x 1.25	R50 Znt (Bolt 8.8 Znt/Deidr)	43	32	4.4
Bolt, alternator upper bracket . . . . .	M10 x 1.25	8.8 Znt/Ec	71	52	7.2
Union, diverter valve vacuum port . .	M10 x 1.5 taper	R50 TRF Znt	13	11	1.5
Nut, air pump bracket . . . . .	M10 x 1.25	R50 Znt (Stud R80 Znt)	25	18	2.5



## TORQUE SPECIFICATIONS

DESCRIPTION	THREAD (METRIC)	MATERIAL	TORQUE		
			N·m	FT.LB.	Kgm
Nut, air pump support stud . . . . .	M10 x 1.25	R50 Znt (Bolt B80 Znt)	51	36	5
Nut, air pump support . . . . .	M8	R50 Znt (Bolt R80 Znt)	28	20	2.8
Bolt, air pump bracket . . . . .	M10 x 1.25	R80 Edt	52	38	5.3
Bolt, air pump pulley . . . . .	20 UNC - 2A	R50 Znt	6	4	0.6
Plug, EGR pipe fitting . . . . .	M16 x 1.5	R50 Znt	54	40	5.5
Switch, oil pressure . . . . .	M14 x 1.5	Steel CDT or Znt	31	24	3.3
Switch, water temperature . . . . .	M16 x 1.5 taper	Brass	49	36	5
Spark plugs . . . . .	M14 x 1.25	—	37	27	3.8

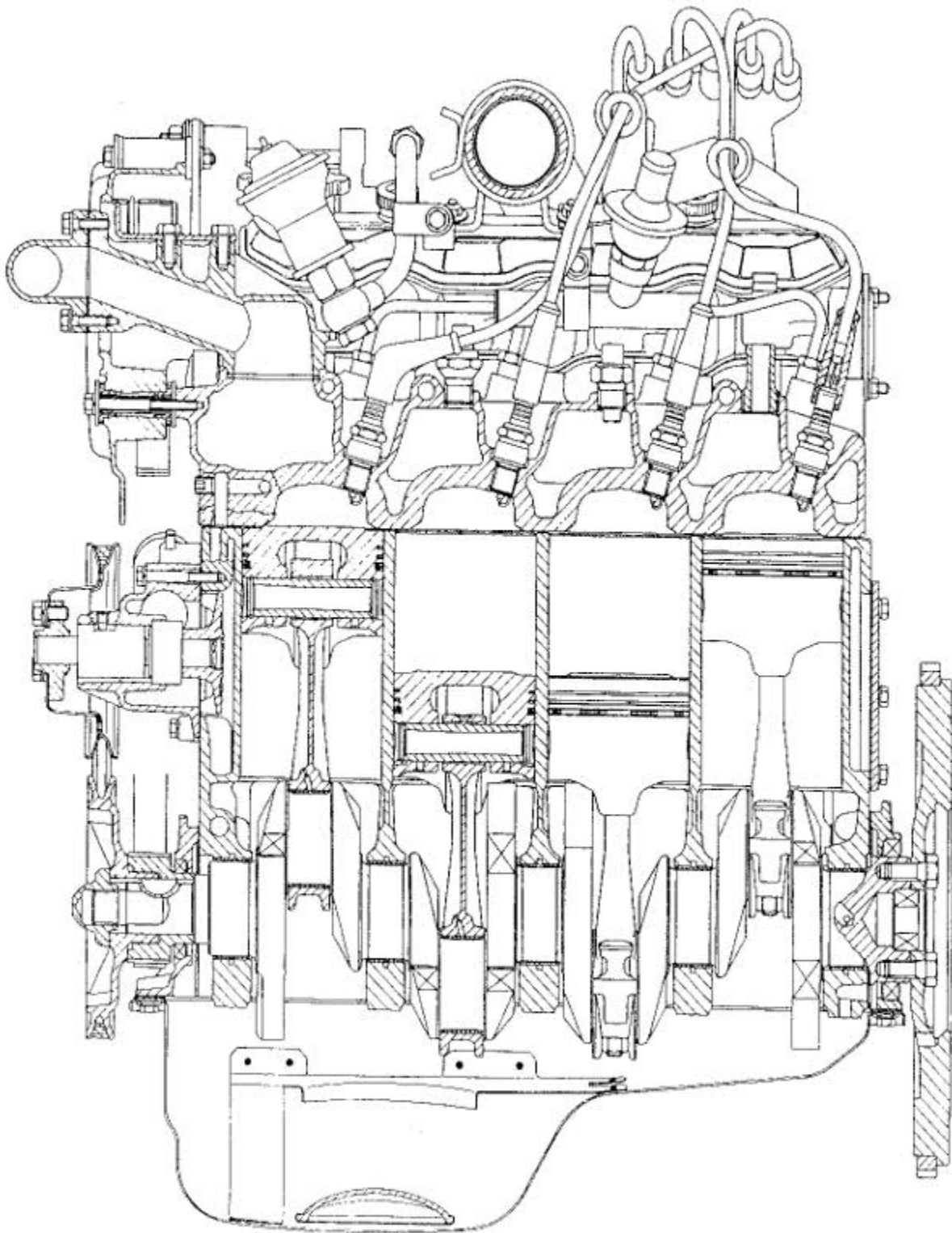
\*\*Components with new coating Znt/EC

Warning! — Znt/EC coating involves a variation in the tightening torque reference. Components coated with Znt/EC are olive green colored, and torque figures are as follows:

Bolt, air pump bracket . . . . .	M10 x 1.25	8.8 Znt/EC	71	52	7.2
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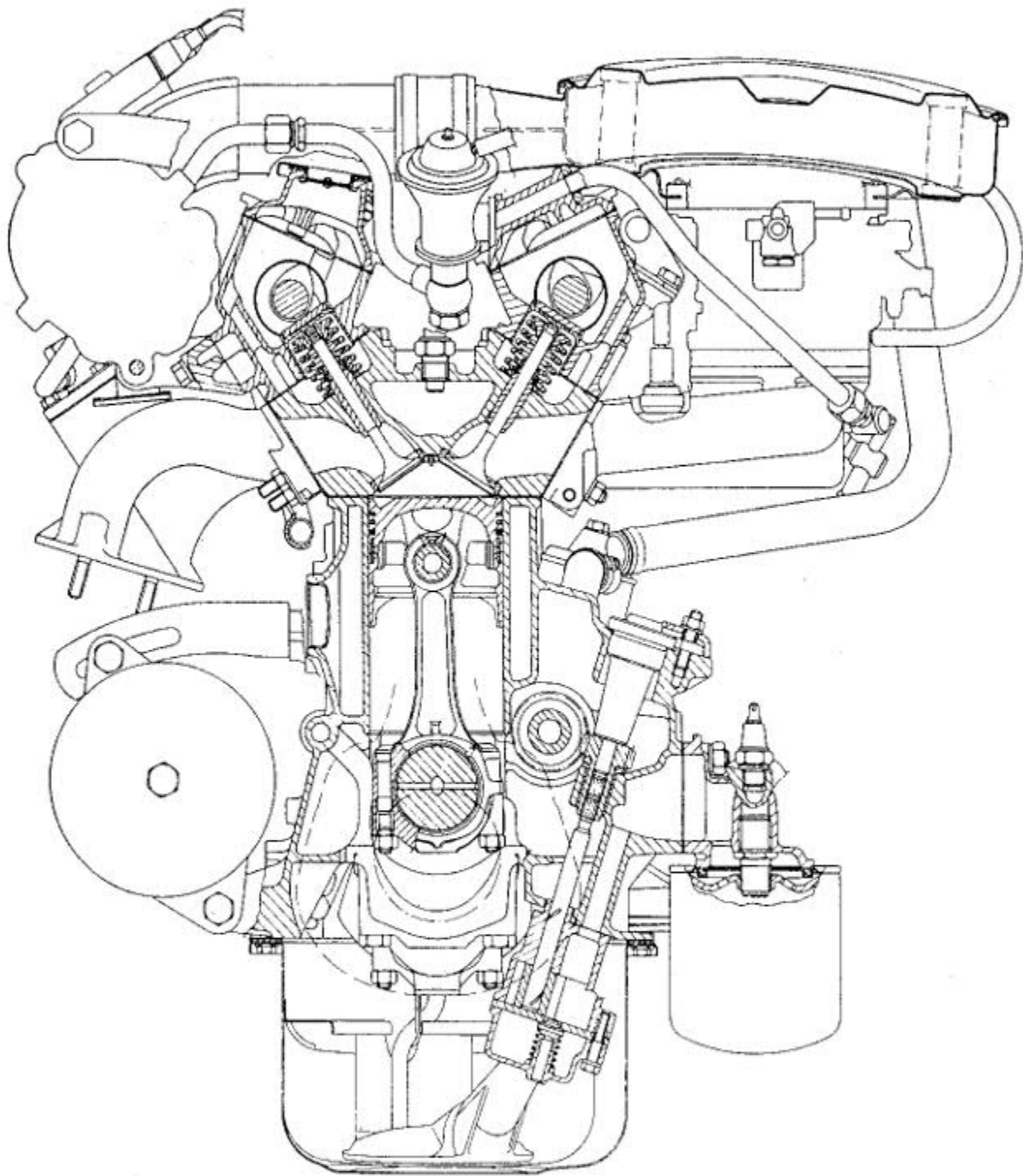
## WITH TURBOCHARGING

DESCRIPTION	TORQUE FT. LB.
Turbocharger to exhaust manifold bolts . . . . .	20
Exhaust manifold nuts . . . . .	22
Outlet elbow to turbocharger bolts . . . . .	22
Outlet elbow to exhaust pipe nuts . . . . .	22
Turbocharger support bracket to cylinder block bolts . . . . .	22
Outlet elbow support bracket to cylinder block nuts . . . . .	30
Plenum support bracket to plenum bolt . . . . .	12
Spark plugs . . . . .	14
Lambda sensor . . . . .	30
Exhaust manifold heat shield . . . . .	22



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ENGINE CROSS SECTION



ENGINE CROSS SECTION

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## ENGINE

### REMOVAL AND INSTALLATION

Disconnect battery ground cable located in trunk. Loosen fuel tank filler cap to release any fuel pressure.

Remove hood (refer to Body Section). Remove four screws to remove hood spring.

Drain radiator thru plug on lower left side of radiator. Drain engine coolant thru plug in lower right side of block.

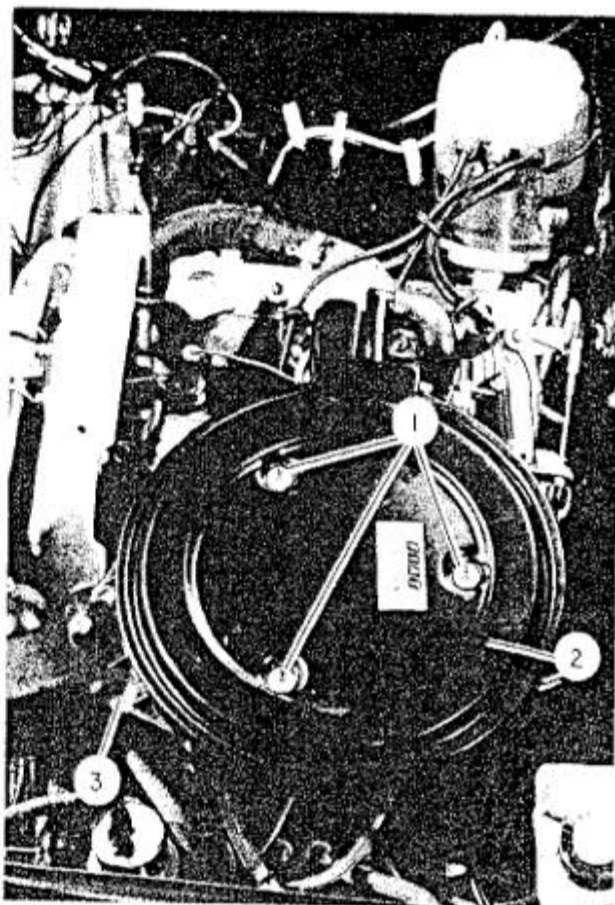
The following procedures refer to carbureted engines:

Remove three nuts (1) holding air cleaner top cover (2).

Remove all air and vacuum lines to air cleaner.

Remove four nuts holding air cleaner to carburetor. Lift air cleaner up high enough to disconnect lines underneath. Remove air cleaner assembly (3) and all attached lines.

1. Nut 2. Air cleaner top cover 3. Air cleaner assembly



On left side of engine, mark to identify, then disconnect fuel inlet line (1), fuel return line (2), fuel vapor line (3), EGR line (4), power brake vacuum line (5), vapor canister vacuum line (6), gulp valve vacuum lines (7) and carburetor electrical connector to solenoid (8).

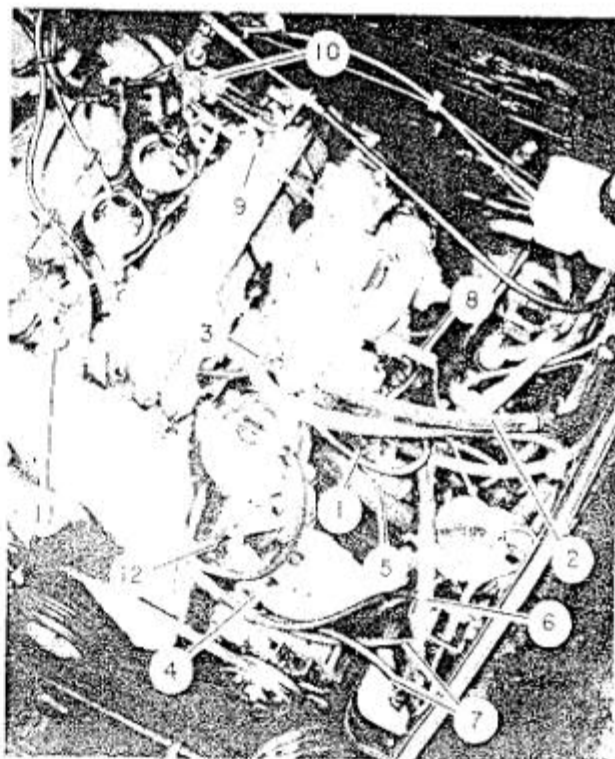
Disconnect throttle rod (9) at linkage (10) on top of engine. Remove two nuts attaching linkage to camshaft cover, and lay linkage to one side.

Mark to identify, then disconnect two water temperature switches electrical connectors from top of cylinder head.

Disconnect vacuum line from intake manifold to automatic transmission, if equipped with automatic transmission.

Disconnect electrical leads at alternator and starter. Disconnect oil pressure switch electrical connector at oil filter.

1. Fuel inlet line 2. Fuel return line 3. Fuel vapor line 4. EGR line  
5. Power brake vacuum line 6. Vapor canister vacuum line 7. Gulp valve vacuum lines 8. Idle stop solenoid 9. Throttle rod  
10. Throttle linkage 11. Water temperature switch



On right side of engine, loosen clamps (1) and disconnect two heater core hoses at firewall.

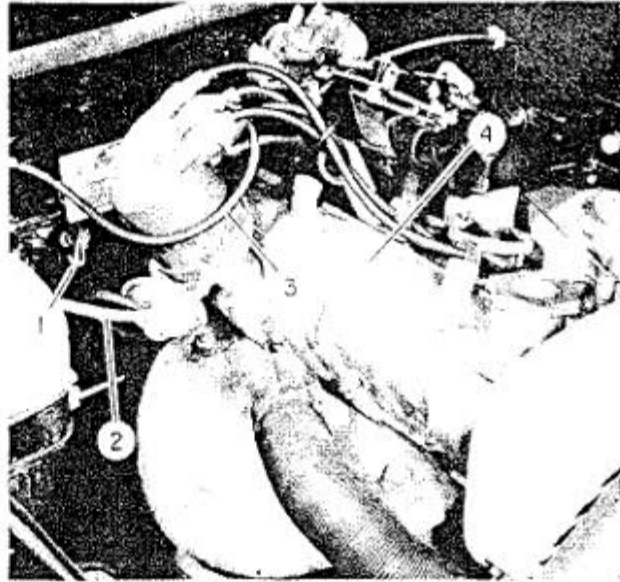
On vehicles with automatic transmission, disconnect dipstick tube from right cam housing.

Disconnect distributor white lead wire (2) connector at electronic control module mounted on right fender shield.

Disconnect coil high tension lead (3) at distributor.

Disconnect module ground wire from rear of right cam housing (4).

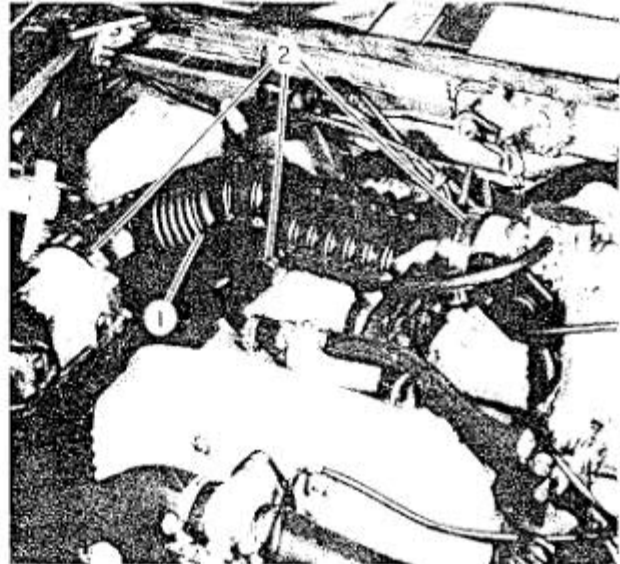
1. Clamp 2. Distributor lead wire 3. High tension lead 4. Right cam housing



The following procedures refer to fuel injected engines:

Remove air intake line (1) by loosening three clamps (2).

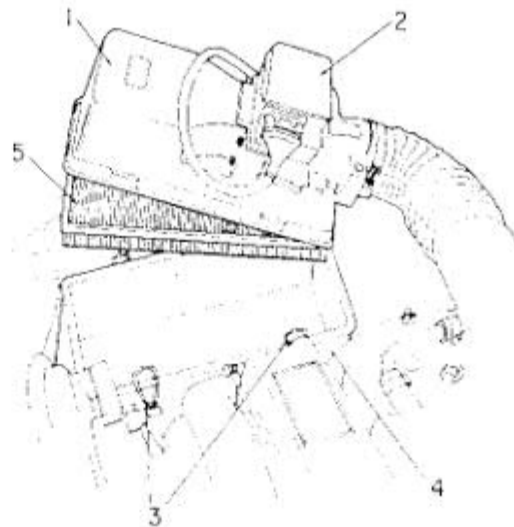
1. Air intake line 2. Clamp



Disconnect electrical connector (1) from air flow sensor (2). Release four catches (3) holding air filter cover to housing (4), and remove filter element (5).

Remove housing by removing three nuts and washers.

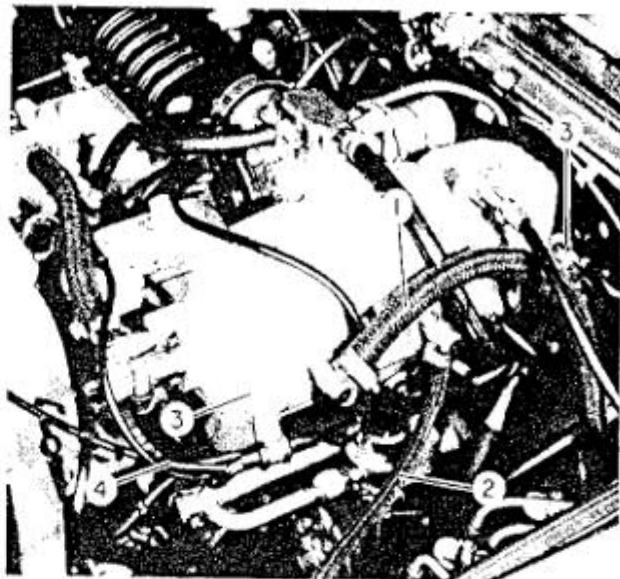
1. Electrical connector 2. Air flow sensor 3. Catch 4. Air filter housing 5. Filter element



Loosen clamps to remove power brake vacuum line (1) and vapor canister vacuum line (2) from intake manifold fittings. Disconnect vacuum line to automatic transmission, if so equipped.

Remove bolts and clamps (3) securing wire harness (4) to intake manifold. Disconnect all electrical connectors coming out of harness (pull connectors straight out).

1. Power brake vacuum line 2. Vapor canister vacuum line 3. Clamp  
4. Electrical harness



Rotate throttle lever (1) and remove throttle cable (2).

**CAUTION:** Note for reassembly that both adjustment nuts (3) are on the left side of mount (4). To assemble otherwise will result in erratic throttle operation.

1. Throttle lever 2. Throttle cable 3. Adjustment nuts 4. Throttle cable mount



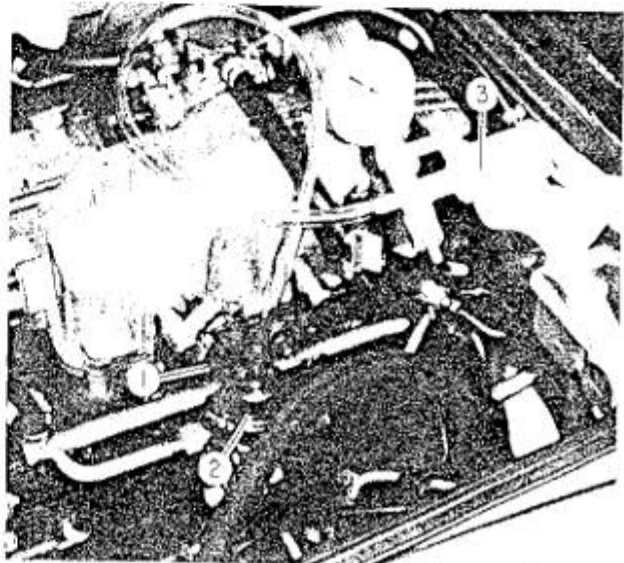
Before disconnecting fuel lines to engine, fuel pressure must first be released.

Remove fuel tank filler cap.

Remove vacuum hose (1) from fuel pressure regulator (2).

Using a hand vacuum pump (3) apply about 25 inches of vacuum to pressure regulator as shown. Fuel system pressure will then be released into fuel tank.

1. Vacuum hose 2. Fuel pressure regulator 3. Hand vacuum pump

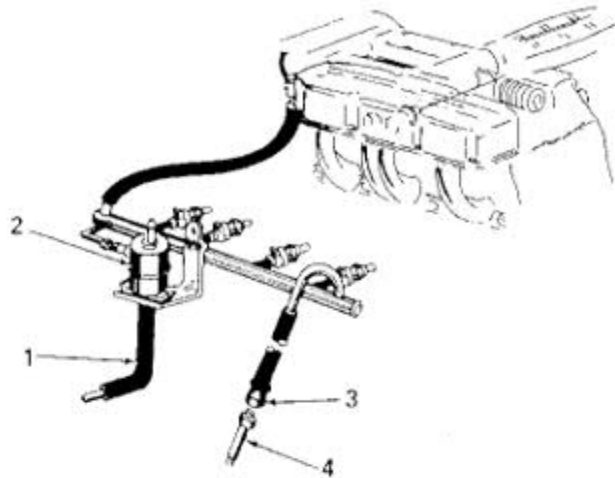


**WARNING:** Take all necessary precautions to prevent a fire when fuel lines are opened.

**CAUTION:** The fuel injection system is highly susceptible to contamination. Make sure area is clean whenever lines are opened, and that dirt does not enter system.

Disconnect fuel return hose (1) from regulator (2). Disconnect fuel supply flex line fitting (3) from metal line (4) near left fender shield.

1. Fuel return hose 2. Fuel pressure regulator 3. Fuel supply line  
4. Metal fuel supply line from pump

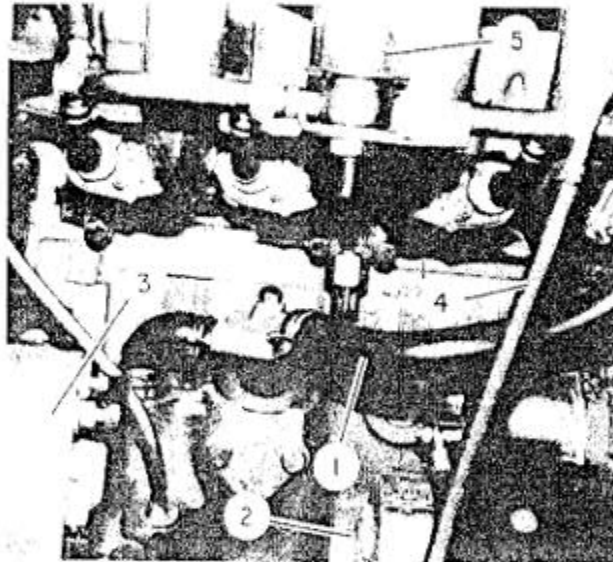


Disconnect crankcase breather hose (1). Disconnect starter (2) and alternator (3) electrical leads.

Disconnect oil pressure electrical connector at oil filter.

Mark to identify, then disconnect two water temperature switches electrical connectors from top of cylinder head.

1. Crankcase breather hose 2. Starter 3. Alternator 4. Fuel supply line 5. Fuel pressure regulator



On right side of engine, loosen clamps and disconnect two heater core hoses at firewall.

On vehicles with automatic transmission, disconnect dipstick tube from cam housing.

Remove plastic nut (1) and clamp holding wire harness.

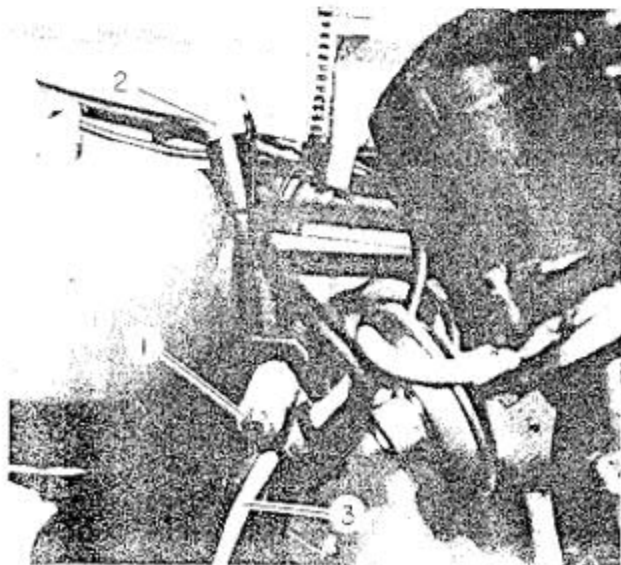
Disconnect Lambda sensor connector (2).

Disconnect distributor white lead wire (3) connector at electronic control module.

Disconnect coil high tension lead at distributor.

Disconnect engine ground wire from rear of right cam housing.

1. Plastic nut 2. Lambda sensor connector 3. Distributor lead wire

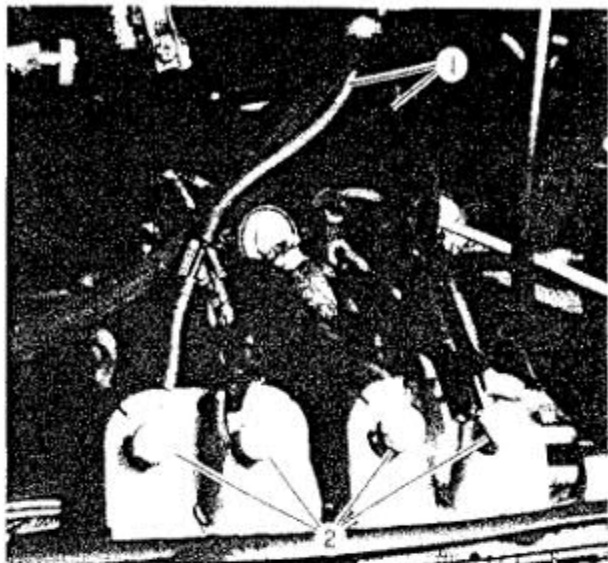




If engine is equipped with a turbocharger, disconnect the following in addition to most items covered under fuel injected engines.

On left side of engine disconnect vacuum lines (1) to turbo pressure switches (2).

1. Vacuum line 2. Turbo pressure switch



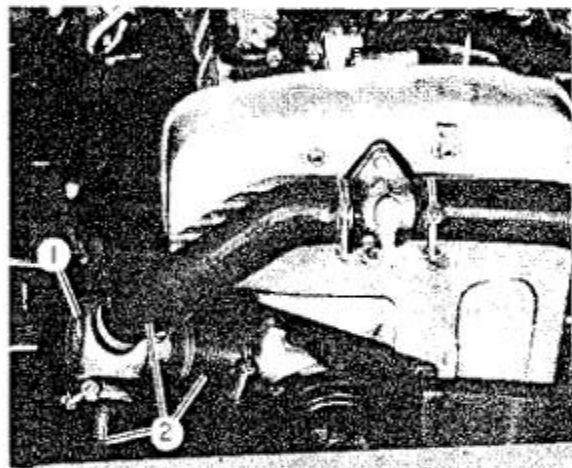
The following procedures refer to all engines:

Remove radiator (refer to Cooling in this section).

Remove controlled bypass thermostat (1) and attached hoses (2) by loosening clamps.

If vehicle is equipped with windshield washer container mounted on left fender well, disconnect electrical connector and fluid line at container, then remove two nuts securing it to body and remove container.

1. Controlled bypass thermostat 2. Coolant hoses



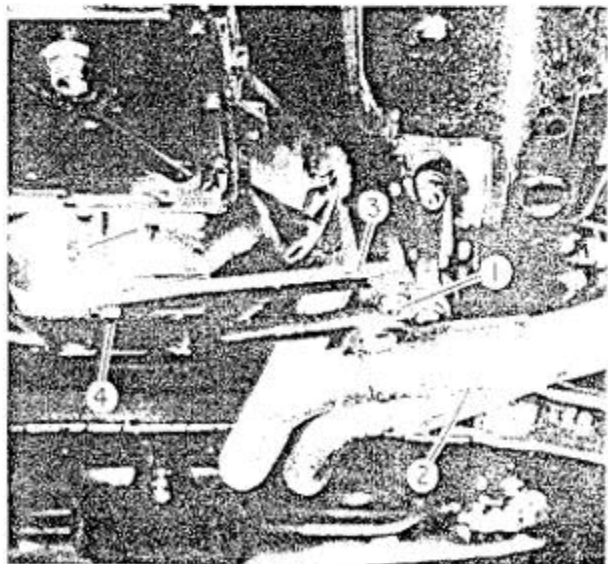
Raise vehicle on lift.

On vehicles without turbocharger, bend locking tabs back and remove nuts securing exhaust pipe to exhaust manifold.

Remove bolt (1) holding exhaust pipe (2) to bracket (3) as shown. Remove bolt (4) and nut (5) holding bracket to transmission.

Pull exhaust pipe away from exhaust manifold.

1. Bolt 2. Exhaust pipe 3. Bracket 4. Bolt 5. Nut

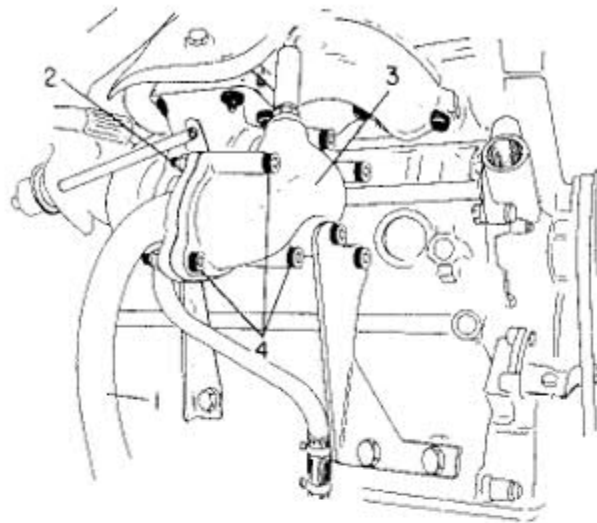


On vehicles with turbocharger, remove 4 nuts (2) and allen bolts (4) holding exhaust pipe (1) to exhaust elbow (3).

Remove bolt holding exhaust pipe to bracket as shown in figure. Remove bolt and nut holding bracket to transmission.

Pull exhaust pipe away from exhaust elbow.

1. Exhaust pipe 2. Nuts 3. Exhaust elbow 4. Bolts



Remove starter (refer to Electrical Section).

Remove four bolts (7) holding flywheel inspection cover (6) to bellhousing (8).

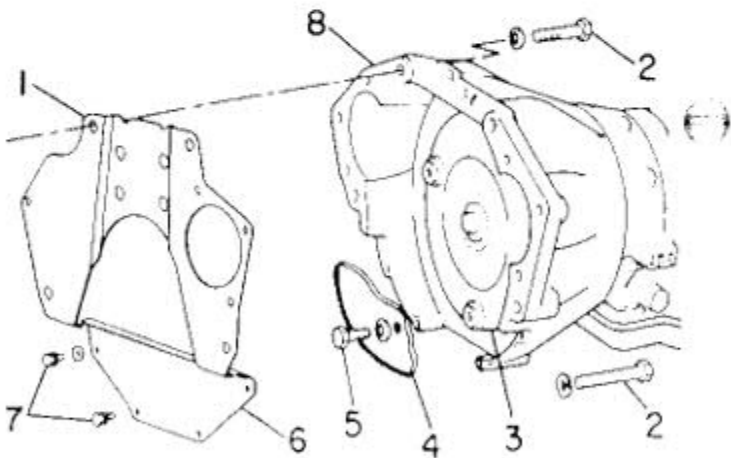
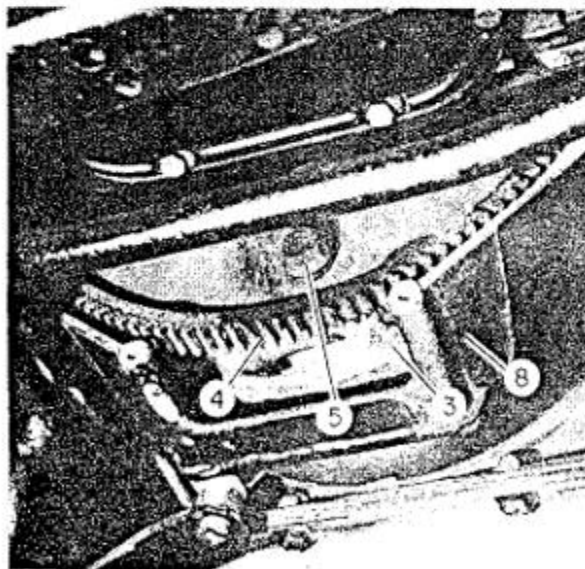
If equipped with automatic transmission, remove three bolts (5) attaching flywheel (4) to torque converter (3). Engine must be rotated to line bolts up with inspection cover opening.

After removing bolts, push converter free from crankshaft as far back as it will go.

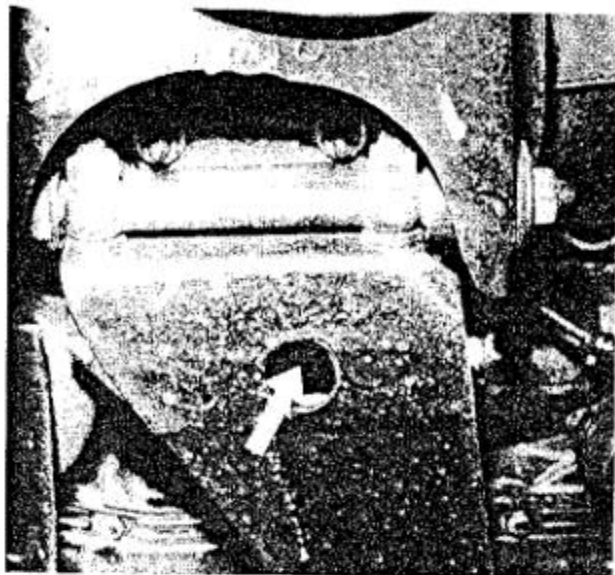
**CAUTION:** During engine removal be sure converter stays on transmission and does not slide forward and fall off.

Using special tool A.55035 or U-joint socket with long extension, remove four bolts (2) attaching bellhousing (8) to engine.

1. Protection plate 2. Bolt 3. Torque converter 4. Flywheel 5. Bolt 6. Inspection cover 7. Bolt 8. Bellhousing



Remove two engine mount nuts thru openings in crossmember (arrow).



10

Lower vehicle and position floor jack under transmission.

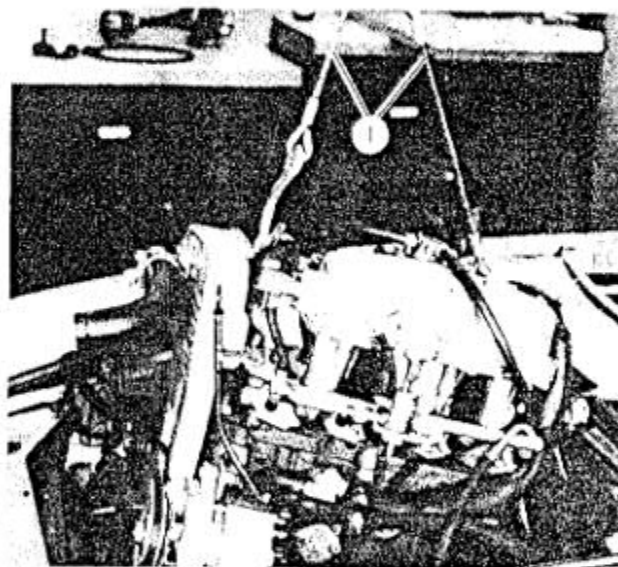
Attach engine lift sling (1). Front lift bracket is attached to engine. For rear attach point, head bolt must be removed and lift bracket secured to it.

**NOTE:** To ease removal, provide slings of two different lengths to give upward tilt to front of engine as shown.

Lift engine until mount bolts clear crossmember. Move engine forward and up.

With manual transmission, clutch has to clear transmission main shaft, and engine must be moved forward more than with the automatic transmission (raising manual transmission slightly with floor jack will aid in engine removal).

Installation is reverse of removal. Bleed cooling system (refer to Cooling in this section).



1. Engine lift sling

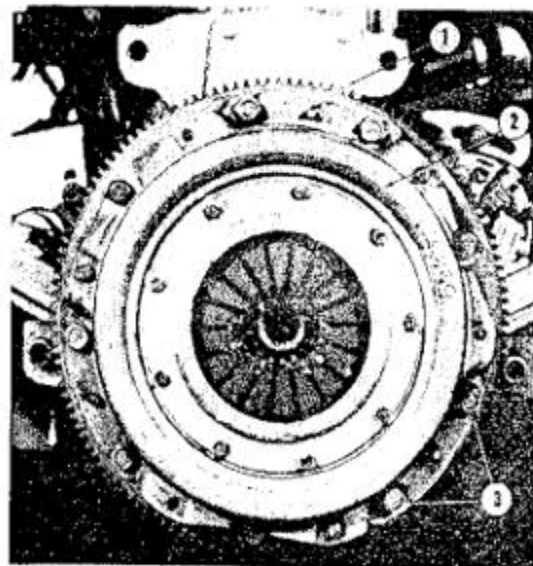
## DISASSEMBLY

Drain oil.

Remove two side mounts with rubber pads from crankcase.

Scribe index marks on clutch (2) and flywheel (1). Remove six bolts (3) and washers holding clutch to flywheel. Remove clutch.

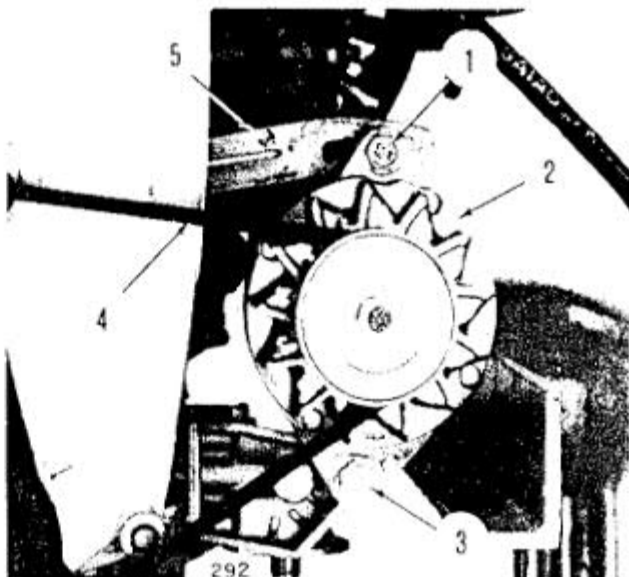
1. Flywheel 2. Clutch 3. Bolts



Remove nut on alternator tensioner bolt (1) and mounting bolt (3), then remove belt (4) and alternator (2).

Remove one bolt to remove tensioner bracket (5).

1. Tensioner bolt 2. Alternator 3. Mounting bolt 4. Belt  
5. Tensioner bracket



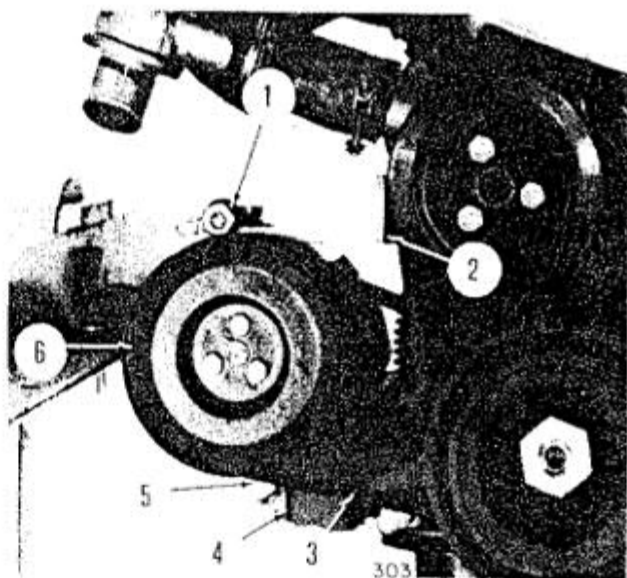
On engines with air pump, remove hose from rear of air pump.

Remove air pump mounting bolt (5) and mounting bolt for tensioner bracket (2).

Remove belt (3) and air pump (6) with attached tensioner bracket (2).

Remove two nuts to remove support bracket (4).

1. Tensioner nut 2. Tensioner bracket 3. Belt 4. Support bracket  
5. Mounting bolt 6. Air pump



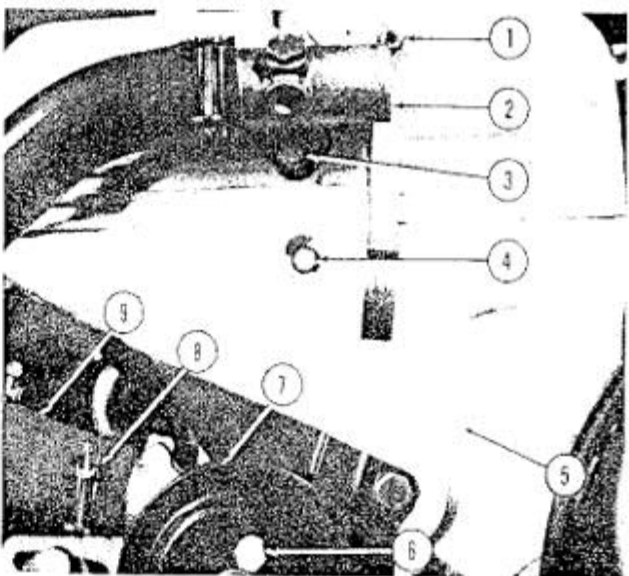
Loosen clamp (8) and disconnect hose.

Remove two bolts (3) and washers, then remove union (2), gasket and attached hoses (9).

Remove two bolts (4) and two nuts (1) to remove timing belt cover (5).

Remove three water pump pulley bolts (6) and remove water pump pulley (7).

1. Nut 2. Union 3. Bolt 4. Bolt 5. Timing belt cover 6. Bolt  
7. Pulley 8. Clamp 9. Hoses



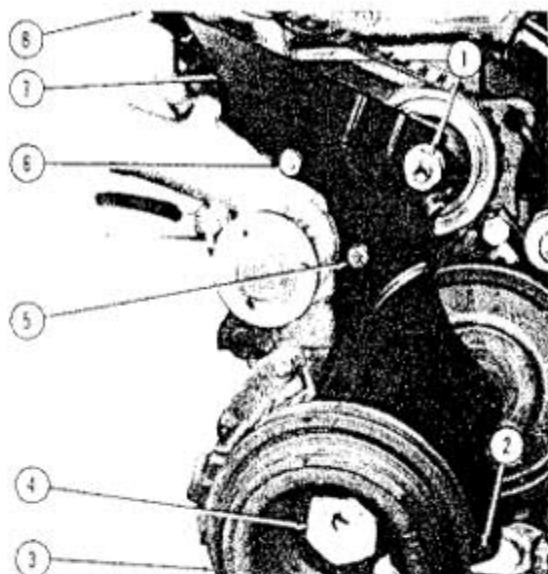
Manually turn engine until holes in camshaft sprockets align with timing pointers.

Block flywheel against turning.

Remove nut (4) holding crankshaft pulley (3). Use 38 mm socket. Remove pulley.

Remove four bolts (2, 5 and 8) and two nuts (1 and 6) holding lower sheet metal timing cover (7). Remove cover.

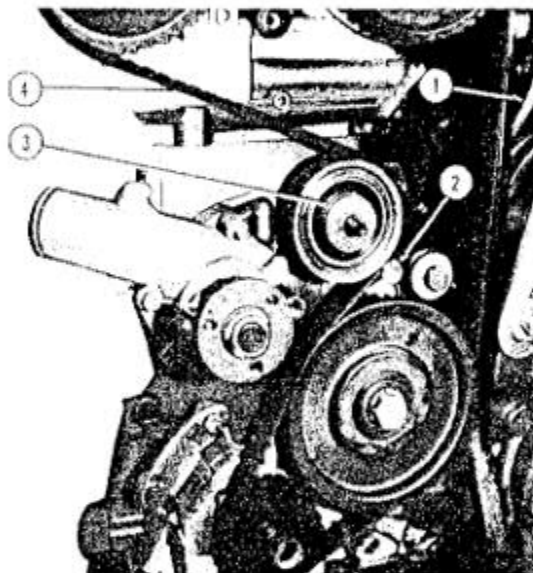
1, Nut 2, Bolt 3, Crankshaft pulley 4, Nut 5, Bolt 6, Nut  
7, Timing belt cover 8, Bolt



Remove bracket bolt for oil dipstick tube (1). Remove tube.

Remove spacer (3) from tensioner pulley stud. Loosen bolt (2) for tensioner bracket. Pry pulley to release belt tension. Retighten bolt (2) to hold pulley in belt-slackened position. Remove timing belt (4). Discard belt.

1, Oil dipstick tube 2, Bolt 3, Spacer 4, Timing belt



Loosen bolt (7) for tensioner bracket (3) to relieve tension from spring (2).

**CAUTION:** Spring is under high tension.

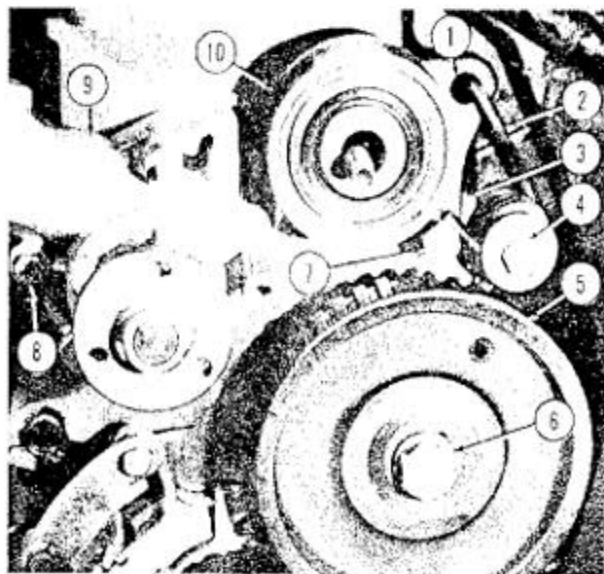
Remove spring from hole (1) in tensioner bracket.

Remove spring retaining bolt (4). Remove spring. Remove tensioner bracket bolt. Slide off tensioner bracket with pulley (10).

Remove bolt (6) and washer holding sprocket (5) on auxiliary shaft. Hold sprocket with used timing belt. Remove sprocket.

Remove four bolts (8) and washers holding water pump (9). Remove pump and gasket.

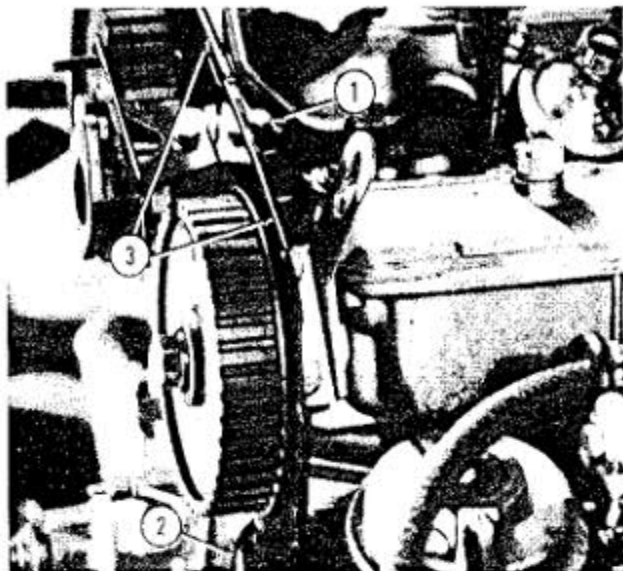
1, Hole 2, Spring 3, Tensioner bracket 4, Spring retaining bolt  
5, Sprocket 6, Bolt 7, Bolt 8, Water pump 9, Pulley



Remove top bolt (1).

Remove intake manifold bolt (2) holding rear timing belt cover (3) to manifold. Remove rear timing belt covers.

1. Bolt 2. Intake manifold bolt (behind cover) 3. Rear timing belt covers



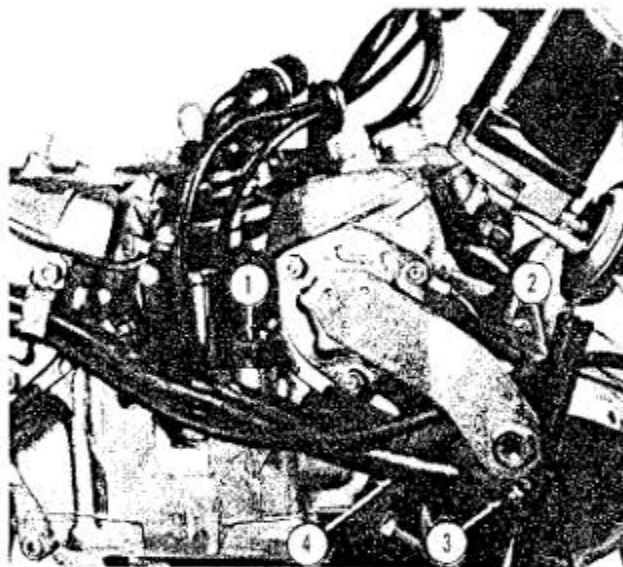
Loosen clamp (3), then disconnect water hose (4) from heater tube (2).

Remove nut holding clamp on heater tube (2) to exhaust manifold.

Remove ten cylinder head bolts (1) and washers. Remove entire cylinder head assembly and gasket.

Disassemble head as specified in section 101.01.

1. Bolt 2. Heater tube 3. Clamp 4. Water hose



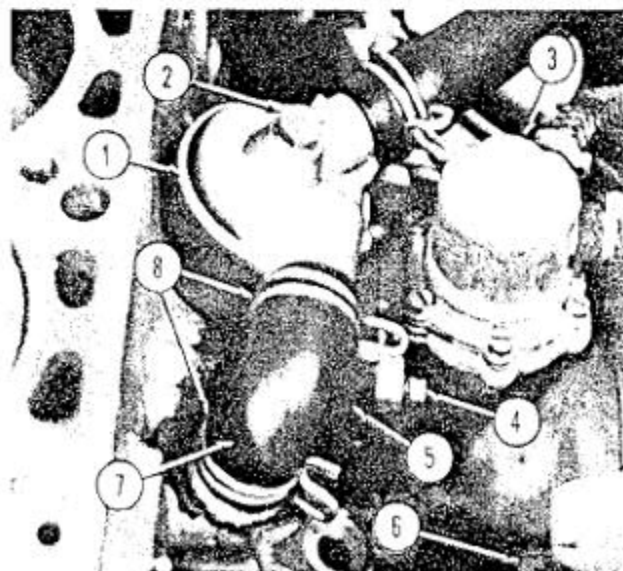
Loosen clamps (8) on oil vapor hose (7), then remove hose.

Remove bolt (2) and washer retaining oil vapor separator (1). Remove separator.

Remove four oil filter support bolts. Remove oil filter support (6) and gasket.

Remove two fuel pump bolts (4). Remove fuel pump (3), spacer (5) and two gaskets (carburettored engines).

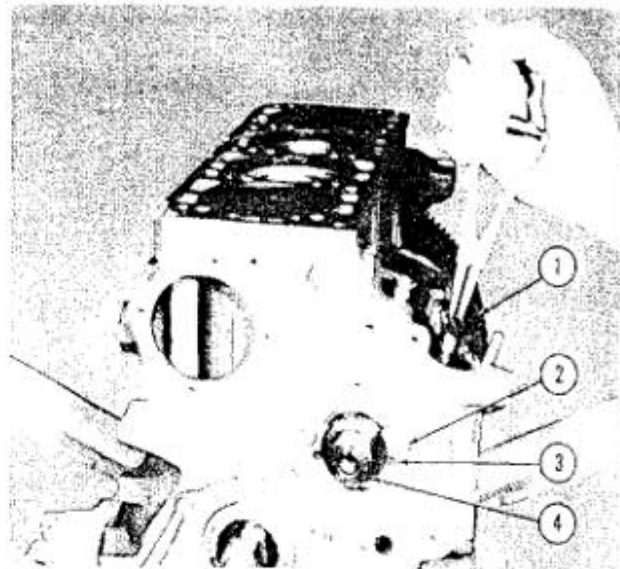
1. Oil vapor separator 2. Bolt 3. Fuel pump 4. Bolt 5. Spacer  
6. Oil filter support 7. Oil vapor hose 8. Clamp



Remove three bolts, nut, and washers holding cover for auxiliary shaft. Remove cover and gasket. Remove nut, washer, and clamp holding spacer for oil pump gear (1) in crankcase.

Remove spacer and gasket. Rotate auxiliary shaft to raise oil pump gear. Using thin pliers, remove gear (1). Remove two bolts (2) and washers holding retainer (3) for auxiliary shaft (4). Remove retainer. Pull auxiliary shaft (4) out of crankcase.

1. Gear 2. Bolts 3. Retainer 4. Auxiliary shaft



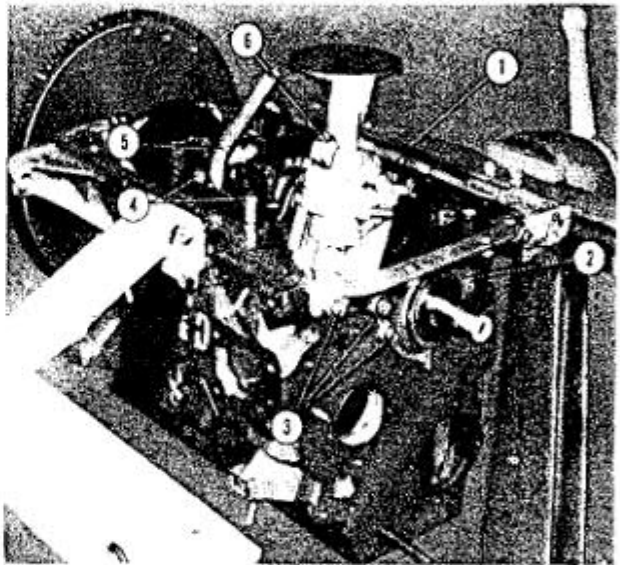
Remove 18 bolts and washers holding oil sump. Remove sump and gasket.

Remove five bolts (3) and washers holding cover (2) for crankcase. Remove cover (2).

Remove two bolts (6) and washers holding oil pump (1). Remove pump (1) and gasket.

Remove two bolts (4) and washers holding oil tube (5). Remove tube.

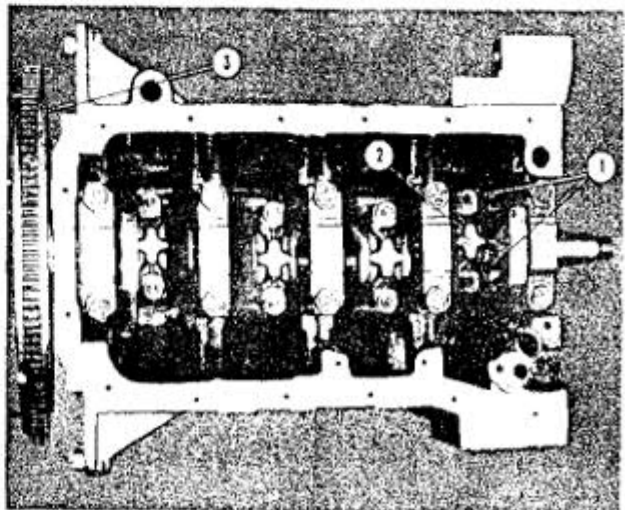
1. Oil pump 2. Cover 3. Bolts 4. Bolts 5. Oil tube 6. Bolt



Remove two nuts (1) and washers holding end cap (2) on connecting rod. Remove cap and bearing insert. Turn crankshaft until piston being removed is at T.D.C. Remove piston and reassemble cap and nuts to connecting rod. Repeat for remaining pistons one at a time.

Remove six bolts and washer plate holding flywheel (3) on crankshaft. Remove flywheel.

1. Nut 2. Cap 3. Flywheel



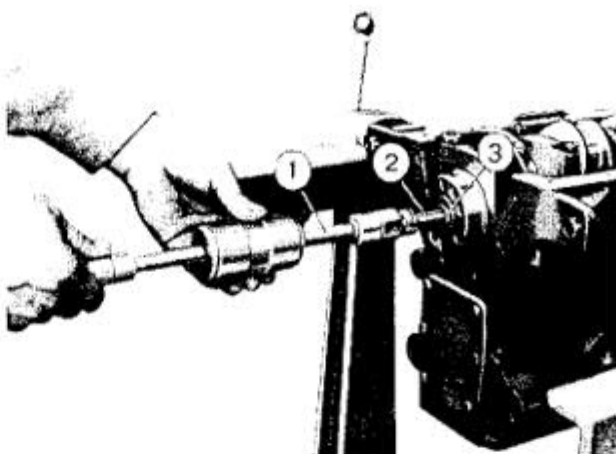
Remove six bolts and washers holding rear cover for crankshaft. Remove cover and gasket.

Remove pilot bearing (3) from crankshaft. Use tool A.40206, A40207, and slide hammer puller.

Remove 10 bolts holding main bearing caps. Remove caps and bearing inserts.

Remove crankshaft, bearing inserts, and thrust rings.

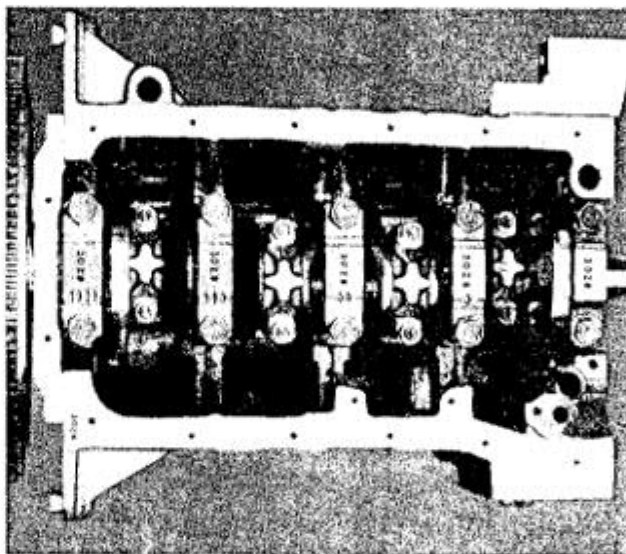
1. Slide hammer puller 2. Tool 3. Pilot bearing



## ASSEMBLY

Install crankshaft. Refer to 101.03. Make sure number on caps is same as number on crankcase. Make sure caps are installed at proper location. Cap without notch is at front of crankcase. Then cap with one notch, etc.

Install pistons. Refer to Section 101.05.

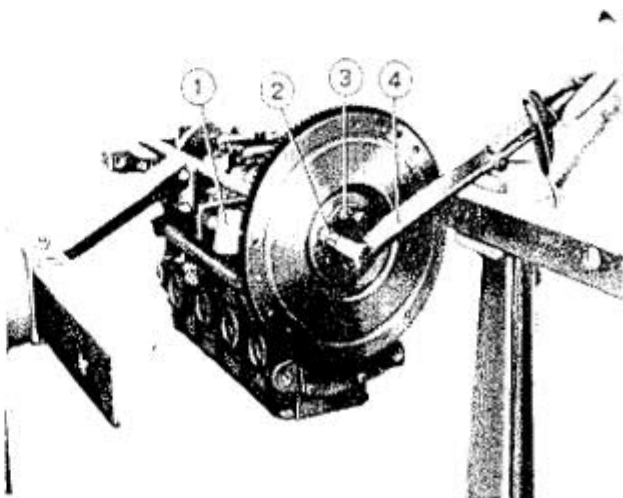


Install bearing for input shaft in seat in crankshaft rear end. Fit oil seal in rear cover for crankshaft. Install cover with six bolts and washers.

Rotate crankshaft until crankpins for No. 1 and No. 4 cylinders are at T.D.C. (crankpins should be at top). Position flywheel on crankshaft with index mark facing 1 and 4 crankpins.

Secure flywheel to crankshaft with washer plate and six bolts. Lock crankshaft against turning. Torque bolts to 105 ft. lbs. (14.5 kgm).

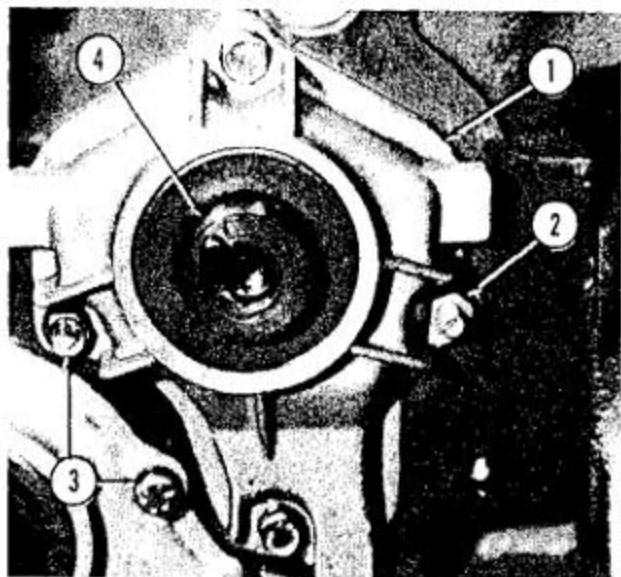
1. Holding tool 2. Socket 3. Bolt 4. Torque wrench





Lubricate bushings for auxiliary shaft with oil. Install auxiliary shaft. Secure shaft with retaining plate, two bolts, and washers. Place gasket, oil seal and cover (1) on auxiliary shaft (4). Secure cover with three bolts (3), nut (2) and washers. Place oil pump drive gear in crankcase. Place spacer on gear.

1. Cover 2. Nut 3. Bolts 4. Auxiliary shaft



Place auxiliary shaft sprocket (1) onto shaft. Rotate auxiliary shaft until gear seats. Secure spacer with clamp, washer and nut.

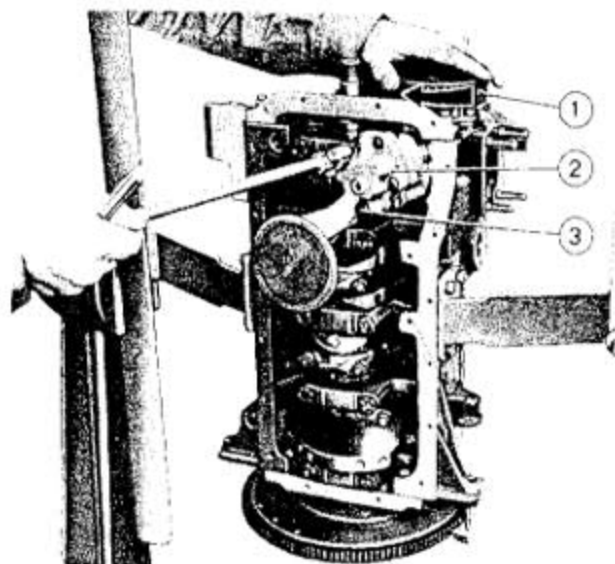
Place oil pump (2) with pickup tube, gasket and drive gear in crankcase. Start bolts (3) thru pump.

Turn auxiliary shaft while tightening bolts securing oil pump.

Install oil line for breather with two bolts and washers in crankcase.

Install oil sump.

1. Auxiliary shaft sprocket 2. Oil pump 3. Bolts

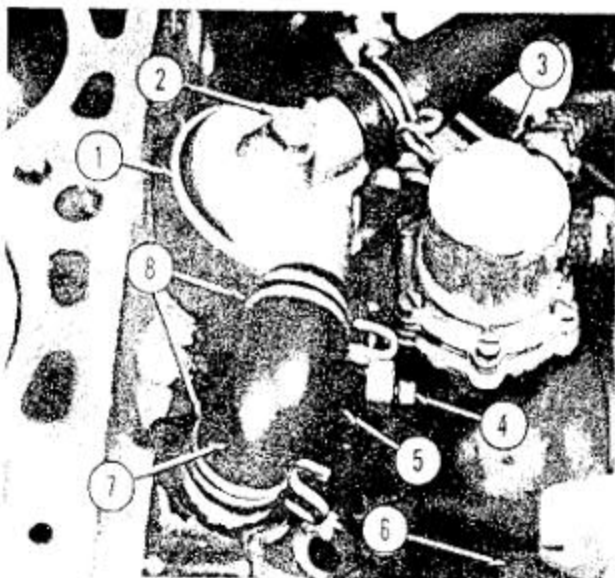


Install two bolts (4), washers, gasket, spacer (5) gasket and fuel pump (3) (carburetor engines).

Install gasket, oil filter support (6) and four bolts.

Install separator (1) and bolt (2). Install oil vapor hose (7) and clamps (8).

1. Oil vapor separator 2. Bolt 3. Fuel pump 4. Bolt 5. Spacer  
6. Oil filter support 7. Oil vapor hose 8. Clamps



Lubricate cylinder bores, then turn crankshaft until No. 4 cylinder is at top center.

Place cylinder head gasket on block. Make sure word "ALTO" is up.

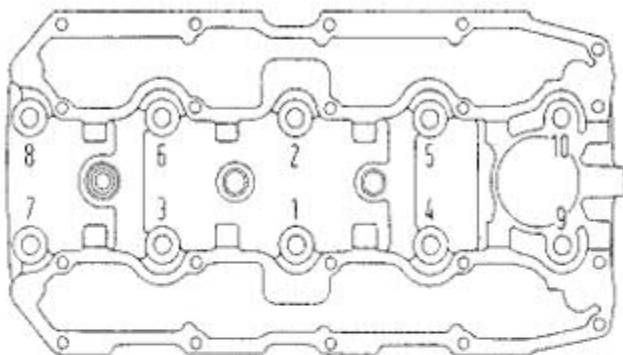
Check that cam sprocket timing marks are aligned with pointers on cam housing, then place cylinder head on block.

Install ten bolts and washers thru cylinder head. Tighten as shown in two steps; 29 ft. lbs. (4 kgm), 61 ft. lbs. (7.5 kgm).

Connect hose from carburetor choke to heater tube. Secure with clamp (carburetor engines).

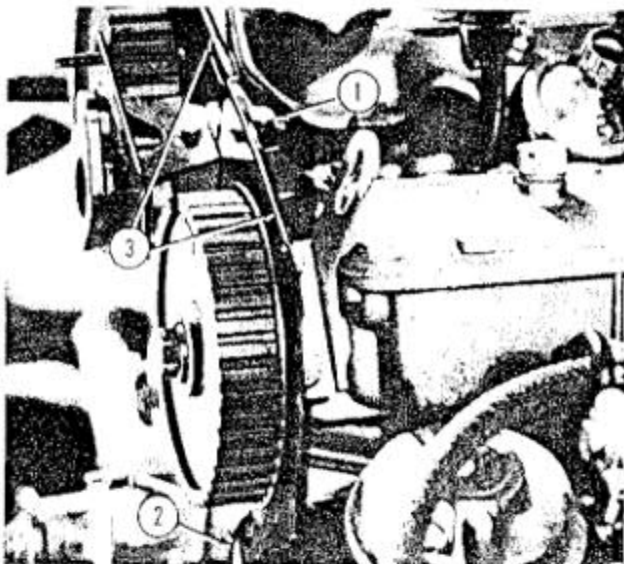
Attach clamp on heater hose to exhaust manifold stud.

Slide crankshaft pulley on crankshaft. Check that crankshaft pulley timing mark aligns with T.D.C. (longest pointer on timing scale).



Install rear timing belt covers (3). Install bolt (2) holding cover to intake manifold. Install top bolt (1).

1. Top bolt 2. Bolt (behind cover) 3. Rear timing belt covers



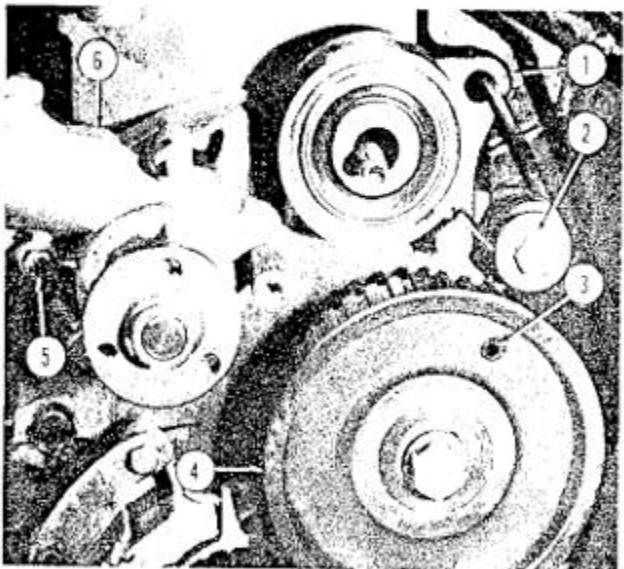
Place water pump (6) and gasket on crankcase. Secure pump with four bolts (5) and washers.

Install sprocket (4) and bolt on auxiliary shaft. Using old timing belt to hold sprocket, torque bolt to 87 ft. lbs. (12 kgm). Install tensioner bracket (1) with pulley and tensioner bracket bolt. Install spring and spring retaining bolt (2). Place spring in hole in tensioner bracket.

**CAUTION:** Spring is under high tension when set.

Turn auxiliary shaft sprocket to align hole (3) in sprocket with spring retaining bolt (2).

1. Tensioner bracket 2. Spring retaining bolt 3. Hole 4. Sprocket  
5. Bolt 6. Water pump



With tensioner bracket bolt (4) slightly loose, pry tensioner pulley (11) to belt-slackened position and tighten tensioner bracket bolt.

Wrap new timing belt (12) over crankshaft sprocket (8), auxiliary shaft sprocket (9), intake camshaft sprocket (2) and exhaust camshaft sprocket (1).

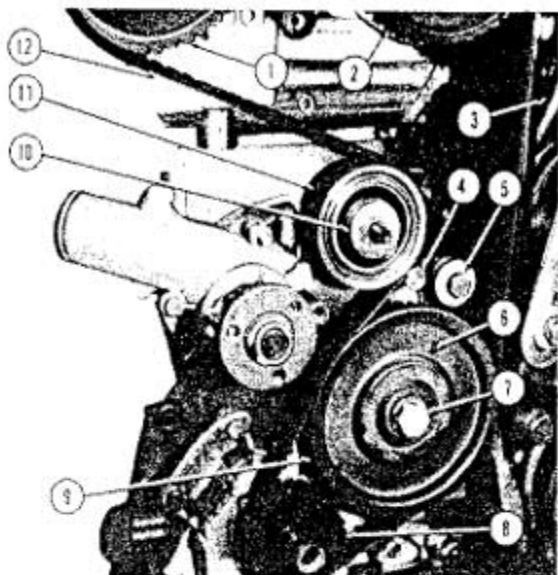
Make sure all play is between exhaust camshaft sprocket (1) and tensioner pulley (11).

Place timing belt over tensioner pulley. Loosen tensioner bracket bolt (4) and allow tensioner pulley to take out play. DO NOT apply additional force to tensioner pulley.

Turn crankshaft two full turns. Check that timing is correct, then tighten tensioner bracket bolt.

Install spacer (10) on tensioner pulley stud. Install oil dipstick tube (3) and bracket bolt.

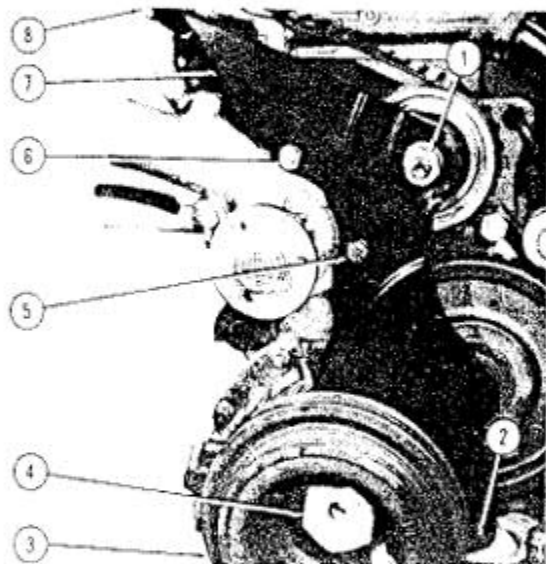
1. Exhaust camshaft sprocket 2. Intake camshaft sprocket 3. Oil dipstick tube 4. Tensioner bracket bolt 5. Spring retaining bolt 6. Hole 7. Bolt 8. Crankshaft sprocket 9. Auxiliary shaft sprocket 10. Spacer 11. Tensioner pulley 12. Belt



Install lower sheet metal timing belt cover with four bolts (2, 5 and 8) and two nuts (1 and 6). Torque nut (1) to 33 ft. lbs. (4.5 kgm).

Coat crankshaft pulley (3) inside diameter with anti-seize compound. Place pulley on crankshaft. Secure pulley with nut (4). With flywheel blocked, torque nut to 181 ft. lbs. (25 kgm).

1. Nut 2. Bolt 3. Crankshaft pulley 4. Nut 5. Bolt 6. Nut 7. Timing belt cover 8. Bolt



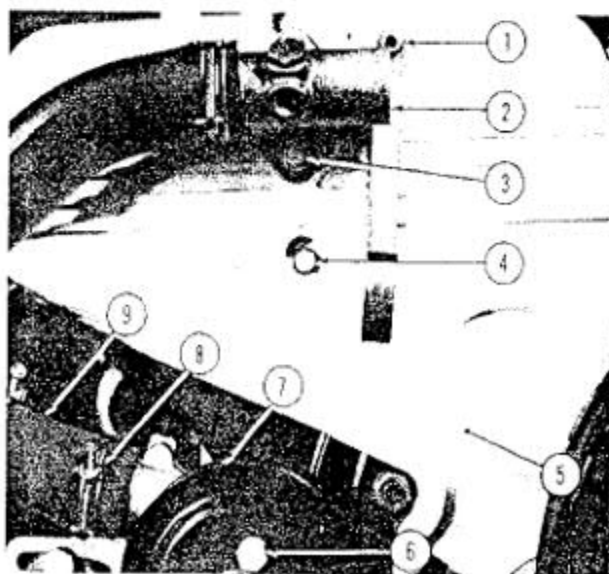
Install water pump pulley (7) and three bolts (6).

Install timing belt cover (5) and retain with two bolts (4) and two nuts (1).

Install union gasket, union (2) and two bolts (3) and washers.

Connect hose and tighten clamp (8).

1. Nut 2. Union 3. Bolt 4. Bolt 5. Timing belt cover 6. Bolt 7. Water pump pulley 8. Clamp 9. Hoses



On engine with air pump, install air pump support bracket (4) using two nuts. Tighten nuts to 20 ft. lbs. (2.8 kgm).

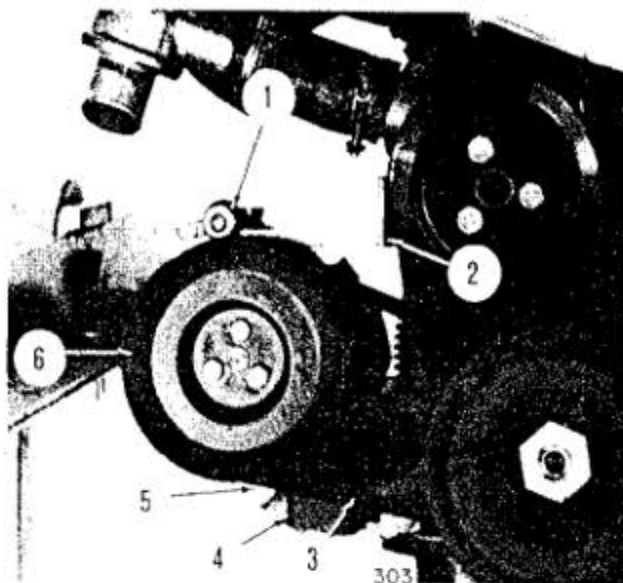
Using mounting bolt (5) and bolt for tensioner bracket (2), install air pump (6). Tighten bolt for tensioner bracket to 38 ft. lbs. (52 ft. lbs. for Znt/EC coating\*).

Install belt (3). Adjust belt tension, then tighten tensioner nut (1) to 18 ft. lbs.

Tighten mounting bolt (5) to 38 ft. lbs.

\*Znt/EC coated components are olive green colored.

1. Tensioner nut 3. Tensioner bracket 3. Belt 4. Support bracket  
5. Mounting bolt 6. Air pump



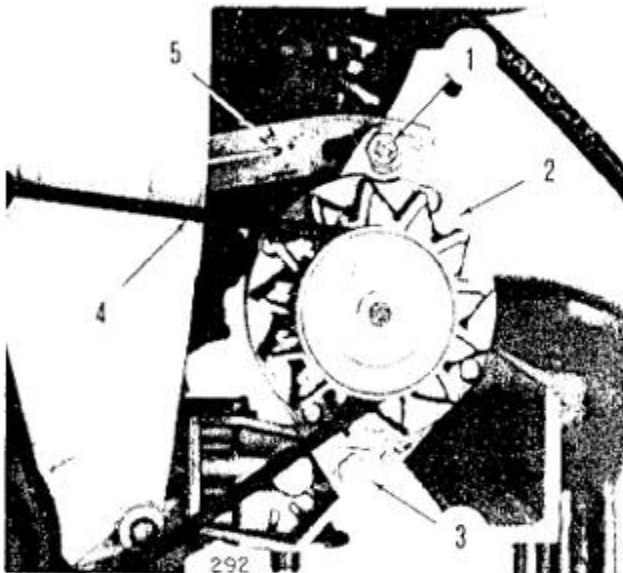
Install tensioner bracket (5). Tighten nut to 51 ft. lbs. (7.05 kgm).

Using alternator mounting bolt (3) and tensioner bolt (1), install alternator (2).

Install belt (4). Adjust belt tension, then tighten nut for tensioner bolt to 32 ft. lbs. (4.4 kgm).

Tighten mounting bolt to 51 ft. lbs. (7.05 kgm).

1. Tensioner bolt 2. Alternator 3. Mounting bolt 4. Belt  
5. Tensioner bracket



Place protruding part of clutch disc away from flywheel (1).

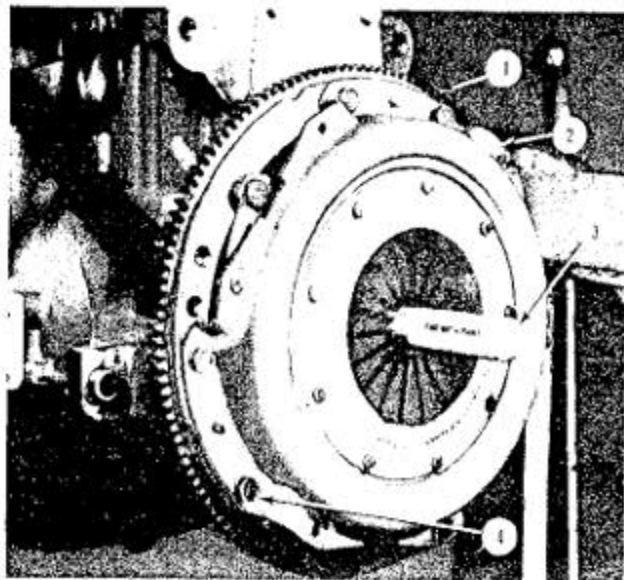
Align scribe marks on clutch pressure plate (2) with scribe mark on flywheel (1).

Install six bolts (4) finger tight.

Install clutch centering tool (3) A.70081, then fully tighten bolts (4).

Attach engine to crane. Remove support arms. Install two side mounts with rubber pads on crankcase.

1. Flywheel 2. Clutch pressure plate 3. Clutch centering tool  
4. Bolt



### CRANKCASE

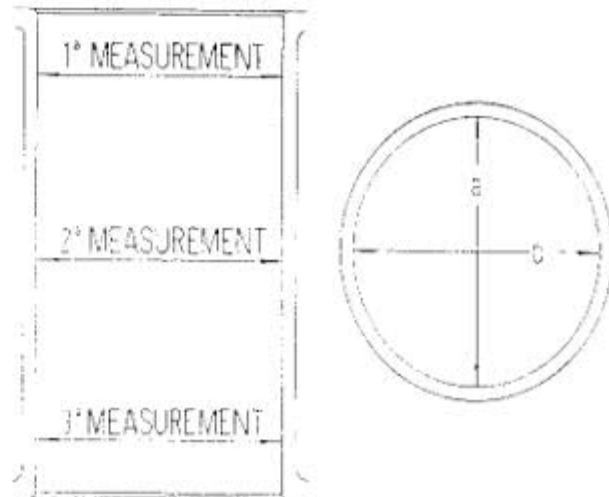
#### CHECKING CYLINDER BORES

Carefully examine cylinder bore surface. If only slight scoring or scratches are found, dress bores. Use extra fine emery cloth wrapped around a hone. Zero dial indicator (1) using ring gauge A.96146 (2).

1. Dial indicator 2. Ring gauge A.96146



Check cylinder bore at three points both lengthwise and cross wise.



The bore class is indicated by letters stamped on the bottom of crankcase (indicated by arrows).

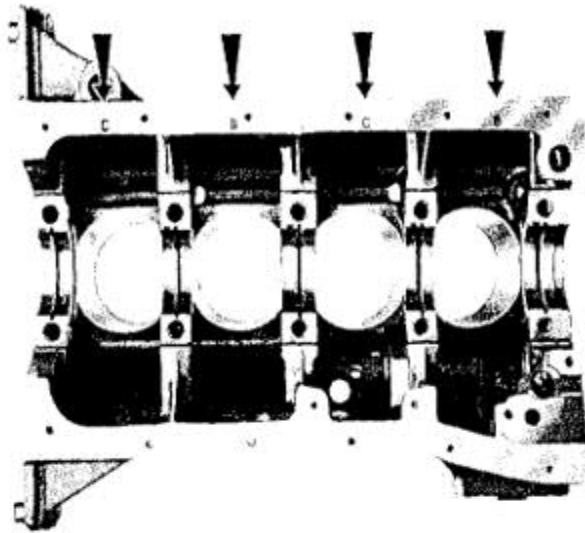
Cylinder bore diameter may vary from 3.3070 to 3.3090 inches (84.000 to 84.050 mm).

Bores are selected in 0.004 inch (0.01 mm) classes.

A = 84.000 - 84.010 mm

C = 84.020 - 84.030 mm

E = 84.040 - 84.050 mm



10

### CYLINDER HEAD (Carburetor)

#### REMOVAL AND INSTALLATION (Engine in Vehicle)

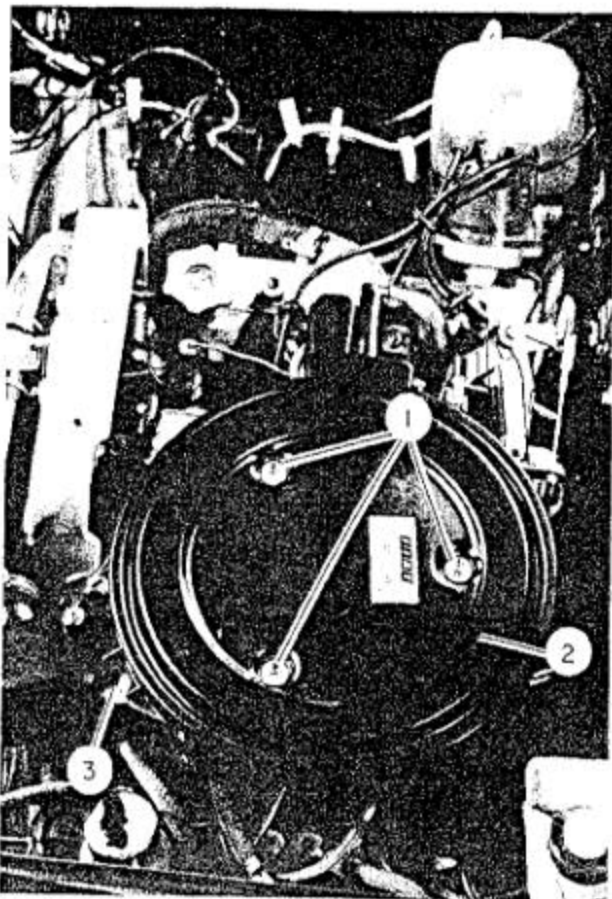
Disconnect battery ground cable located in trunk. Loosen fuel tank filler cap to release any fuel pressure.

Drain radiator thru plug on lower left side of radiator. Drain engine coolant thru plug in lower right side of block.

Remove three nuts (1) holding air cleaner top cover (2). Remove all air and vacuum lines to air cleaner.

Remove four nuts holding air cleaner to carburetor. Lift air cleaner up high enough to remove lines underneath. Remove air cleaner assembly (3) and all attached lines.

1. Nut 2. Air cleaner top cover 3. Air cleaner assembly



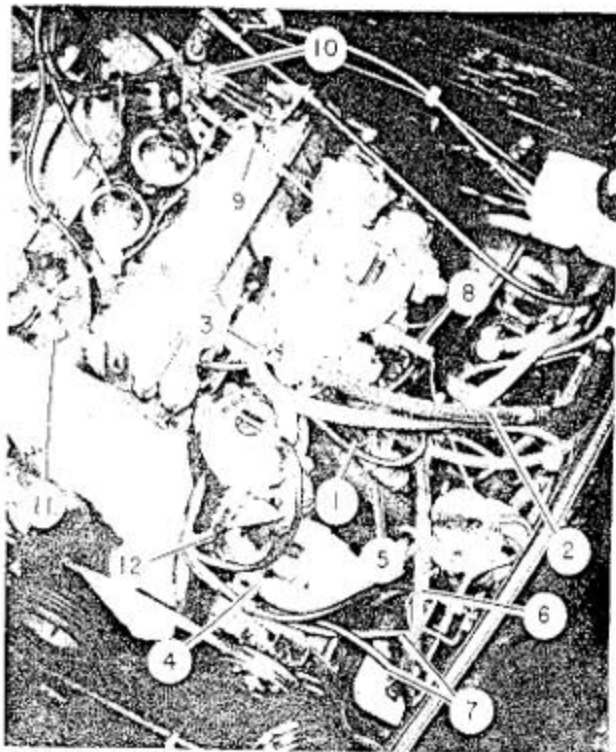
On left side of engine, mark to identify, then remove fuel inlet line (1), fuel return line (2), fuel vapor line (3), EGR line (4), power brake vacuum line (5), purge tank vacuum line (6), gulp valve vacuum lines (7) and carburetor electrical connector (8).

Disconnect throttle rod (9) at carburetor. Remove two nuts attaching linkage (10) to camshaft cover, and lay linkage to one side.

Remove bolt holding oil dipstick assembly (12) to intake manifold.

Disconnect vacuum line from intake manifold to automatic transmission, if equipped with automatic transmission.

1. Fuel inlet line 2. Fuel return line 3. Fuel vapor line 4. EGR line  
5. Power brake vacuum line 6. Purge tank vacuum line 7. Gulp valve vacuum lines 8. Idle stop solenoid 9. Throttle rod 10. Throttle linkage 11. Engine overheat switch 12. Oil dipstick assembly



Mark to identify, then disconnect two water temperature electrical connectors (1) from top of cylinder head.

Loosen clamps and remove air hoses (2) from check valve (two reed valves for engines without air pump). Loosen clamp and remove heater hose (3).

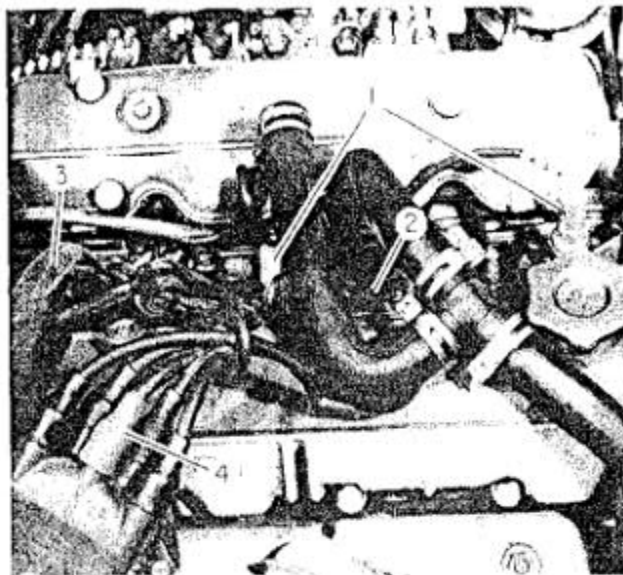
If equipped with automatic transmission, remove bolt holding dipstick assembly to rear of right cam housing.

On vehicles with electronic ignition (1979 and on), disconnect white distributor lead wire from electronic control module mounted on right fender shield. Disconnect black ground wire from module, at rear of cylinder head.

On vehicles with standard breaker-point ignition (up to 1978), disconnect two wire connectors at distributor.

Disconnect coil high voltage lead (4) from distributor.

1. Water temperature electrical connector 2. Air hoses 3. Heater hose 4. Coil high voltage lead



Loosen clamp and remove coolant hose (1) from controlled bypass thermostat (2). Loosen clamp on radiator hose (3) and remove from radiator.

Remove two bolts (4) to remove union (5) and attached hoses.

Remove drive belts from crankshaft pulley.

Remove two nuts (6) and bolts to remove timing belt cover (7).

1. Coolant hose 2. Controlled bypass thermostat 3. Radiator hose 4. Bolt 5. Union 6. Nut 7. Timing belt cover



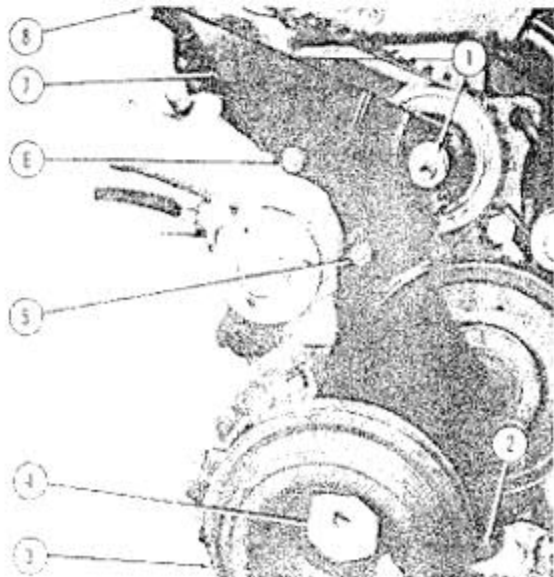
Manually turn engine until holes in camshaft sprockets align with timing pointers.

Block flywheel against turning.

Remove nut (4) holding crankshaft pulley (3). Use 38 mm socket. Remove pulley.

Remove four bolts (2, 5 and 8) and two nuts (1 and 6) holding lower sheet metal timing shield (7). Remove shield.

1. Nut 2. Bolt 3. Crankshaft pulley 4. Nut 5. Bolt 6. Nut 7. Timing belt shield 8. Bolt



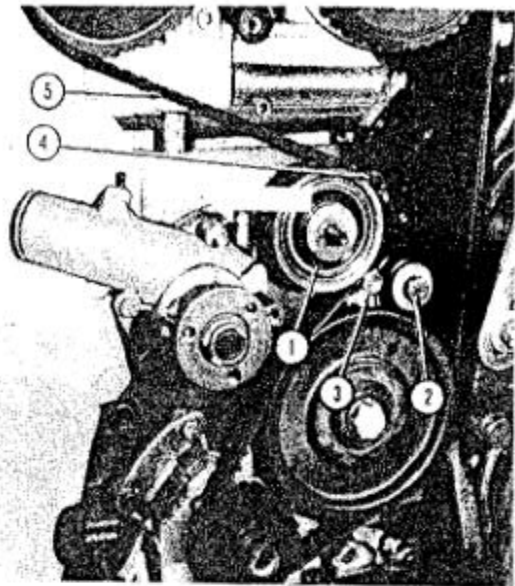


Loosen bolt (3) for tensioner bracket (4). Pry pulley in direction of arrow to release belt tension. Reinstall nut on pulley (1) and tighten it and bolt (3) to hold pulley in belt slackened position.

Remove timing belt (5). Mark belt as "not reusable".

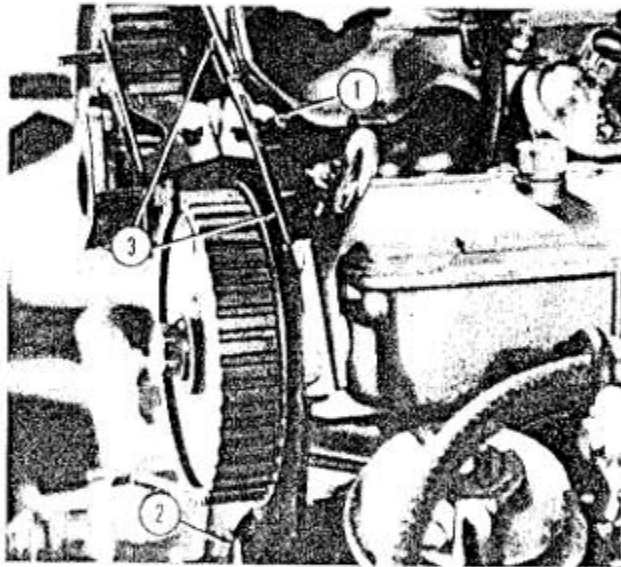
Loosen but do not remove tensioner spring retaining bolt (2).

1. Tensioner pulley 2. Spring retaining bolt 3. Bolt 4. Tensioner bracket 5. Timing belt



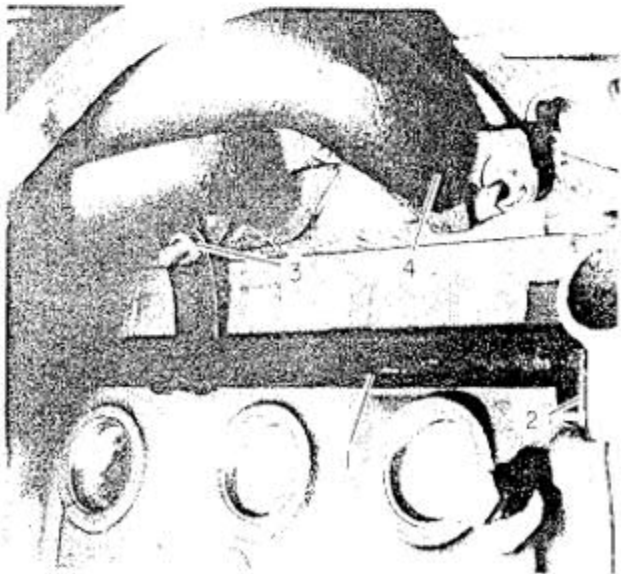
Remove bolts (1 and 2) to remove timing belt shields (3).

1. Bolt 2. Bolt (behind cover) 3. Timing belt shields



Remove nuts securing exhaust pipe to exhaust manifold (4). Disconnect metal heater line (1) by removing two nuts at flange (2) and one nut (3) on exhaust manifold. Remove ten cylinder head bolts and washers. Remove cylinder head and gasket.

1. Metal heater line 2. Flange 3. Nut 4. Exhaust manifold



Install cylinder head in reverse order of removal.

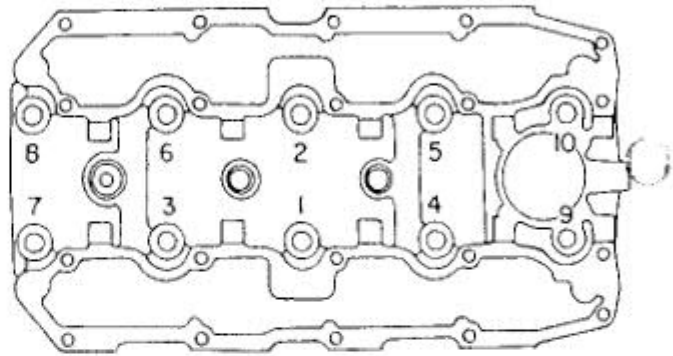
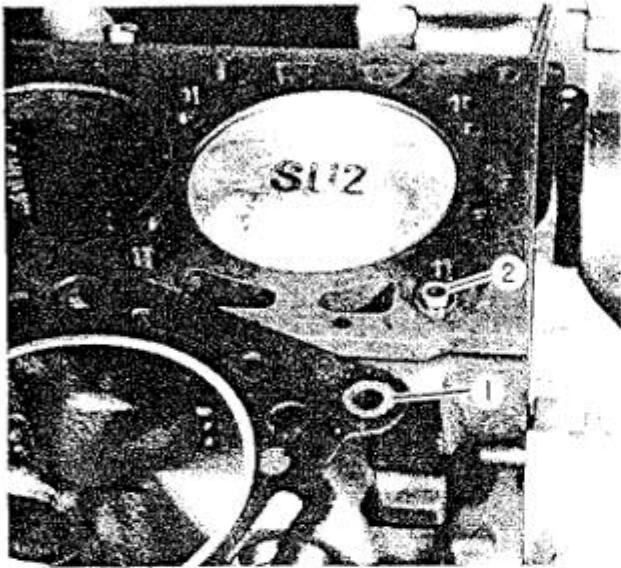
Make sure word "ALTO" (top) on head gasket (1) is facing up, and that two guide dowels (2) are in place in cylinder block.

Install timing belt (refer to Camshaft Drive in this section).

Refill and bleed cooling system (refer to Radiator in this section).

Tighten head bolts in order shown, Torque in at least two stages, final torque will be 61 ft lbs (8.5 kgm).

1. Cylinder head gasket 2. Guide dowel



### CYLINDER HEAD (Fuel Injected and Turbo-Charged)

#### REMOVAL AND INSTALLATION (Engine in Vehicle)

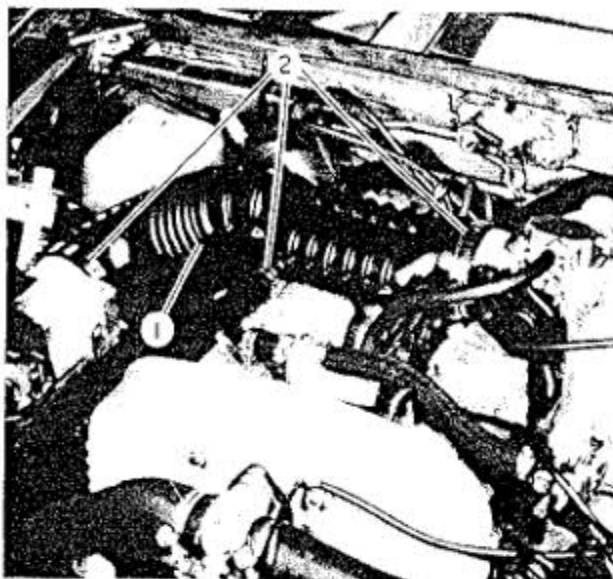
Disconnect battery ground cable located in trunk.

Loosen fuel tank filler cap to release any fuel pressure.

Drain radiator thru plug in lower left side of radiator. Drain engine coolant thru plug in lower right side of block.

Remove air intake line (1) by loosening three clamps (2).

1. Air intake line 2. Clamp

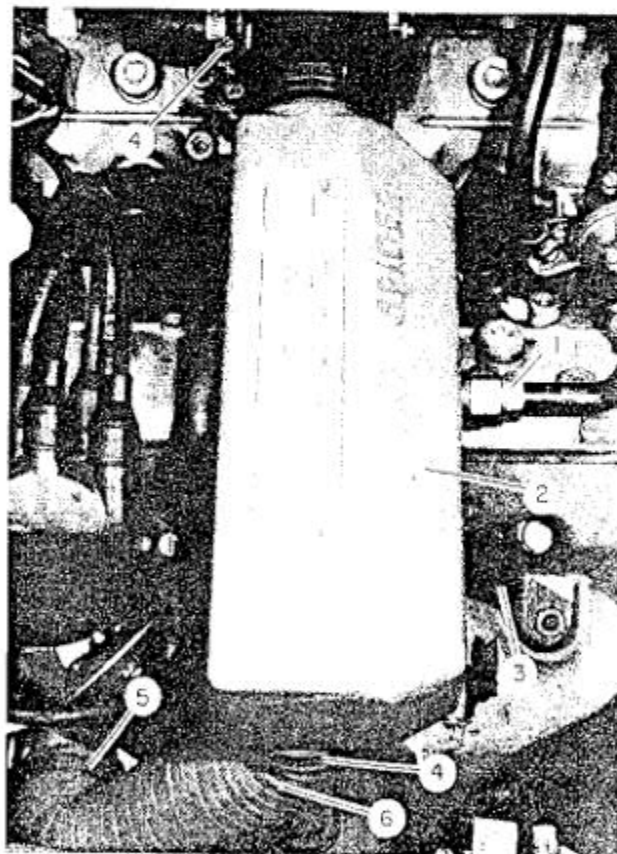


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On turbo-charged engines, first remove auxiliary air regulator fitting (1) to compressor discharge plenum (2). Then remove bracket (3) and clamps (4) to remove plenum.

Loosen clamp (5) on air outlet hose (6) to remove hose.

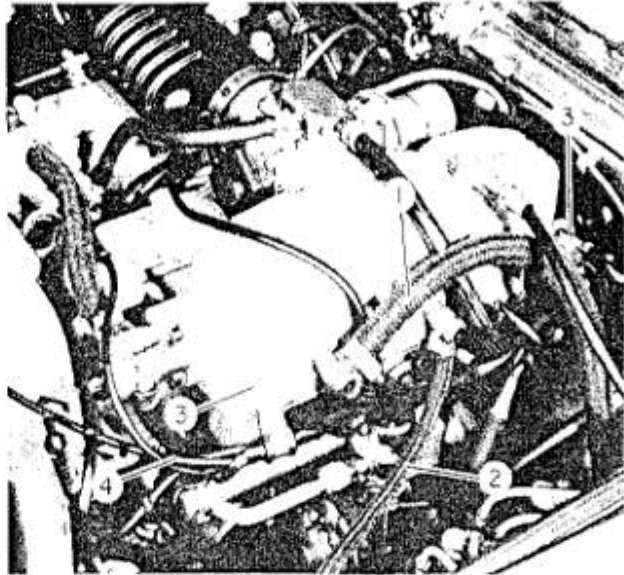
1. Fitting 2. Compressor discharge plenum 3. Bracket 4. Clamp  
5. Clamp 6. Compressor air outlet hose



Loosen clamps to remove power brake vacuum line (1) and vapor canister vacuum line (2) from intake manifold fittings. Also disconnect vacuum line to automatic transmission, if so equipped.

Remove bolts and clamps (3) securing wire harness (4) to intake manifold. Disconnect all electrical connectors coming out of harness (pull connectors straight out).

1. Power brake vacuum line 2. Vapor canister vacuum line 3. Clamp  
4. Wire harness

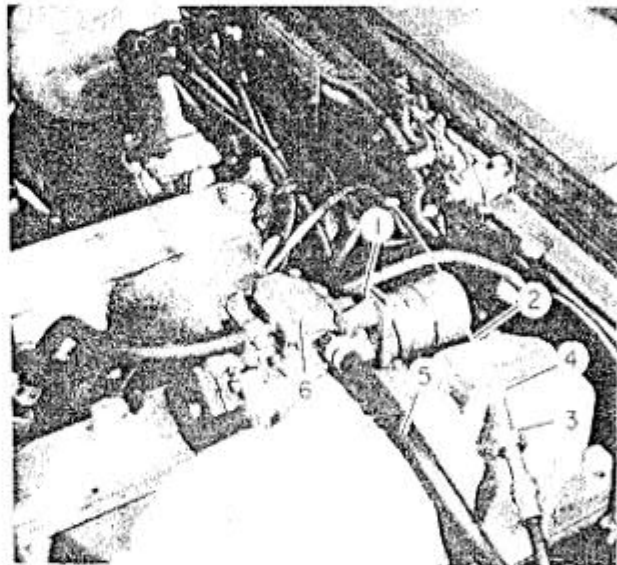


Rotate throttle lever (1) and remove throttle cable (2).

**CAUTION:** Note for reassembly that both adjustment nuts (3) are on the left side of mount (4). To assemble otherwise will result in erratic throttle operation.

Loosen clamp and remove coolant line (5) to throttle body heater (6).

1. Throttle lever 2. Throttle cable 3. Adjustment nuts 4. Mount  
5. Heater hose 6. Throttle body heater



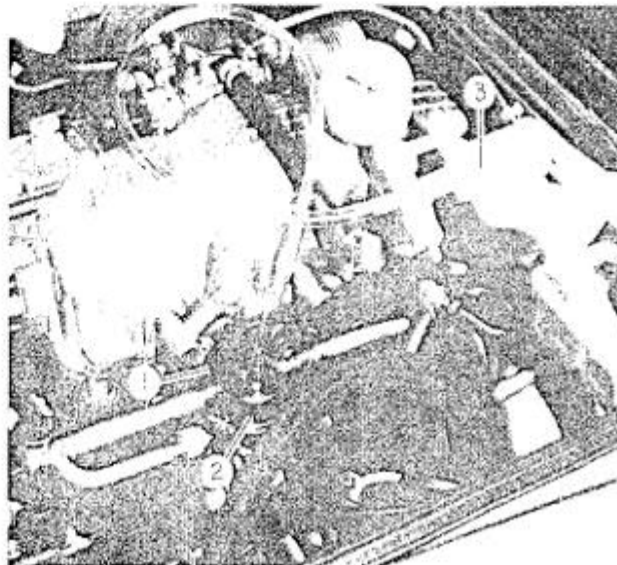
Before disconnecting fuel lines to engine, fuel pressure must first be released.

Remove fuel tank filler cap.

Remove vacuum hose (1) from fuel pressure regulator (2).

Using a hand vacuum pump (3) apply about 25 inches of vacuum to pressure regulator as shown. Fuel system pressure will then be released into fuel tank.

1. Vacuum hose 2. Fuel pressure regulator 3. Hand vacuum pump

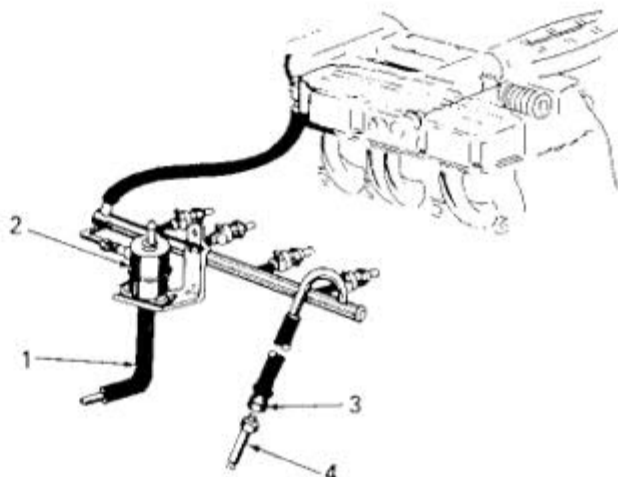


**WARNING:** Take all necessary precautions to prevent a fire when fuel lines are opened.

**CAUTION:** The fuel injection system is highly susceptible to contamination. Make sure area is clean whenever lines are opened up, and that dirt does not enter system.

Disconnect fuel return hose (1) from regulator (2). Disconnect fuel supply flex line fitting (3) from metal line (4) near left fender shield.

1. Fuel return hose
2. Fuel pressure regulator
3. Fuel supply line
4. Metal fuel supply line from pump



Mark to identify, then disconnect two water temperature electrical connectors (1) from top of cylinder head.

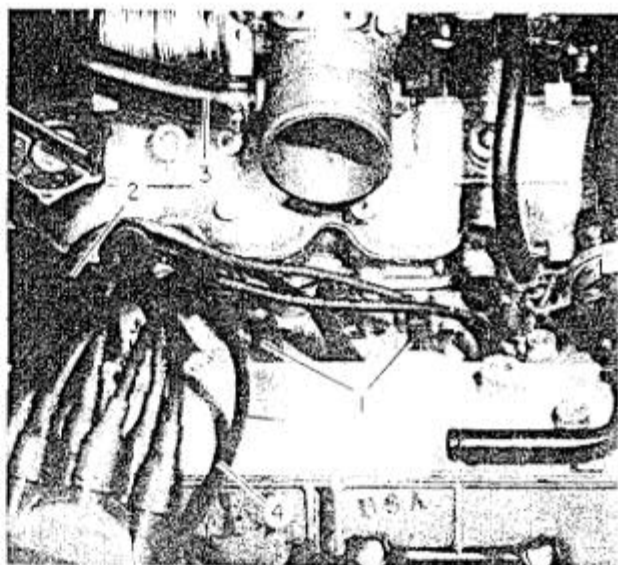
Loosen clamp and remove heater hose (2). Loosen clamp and remove crankcase breather hose (3).

If equipped with automatic transmission, remove bolt holding dipstick assembly to rear of right cam housing.

Disconnect white distributor lead wire from electronic control module on right fender shield. Disconnect black ground wire from module to rear of cylinder head.

Disconnect coil high voltage lead (4) from distributor.

1. Water temperature electrical connectors
2. Heater hose
3. Crankcase breather hose
4. Coil high voltage lead



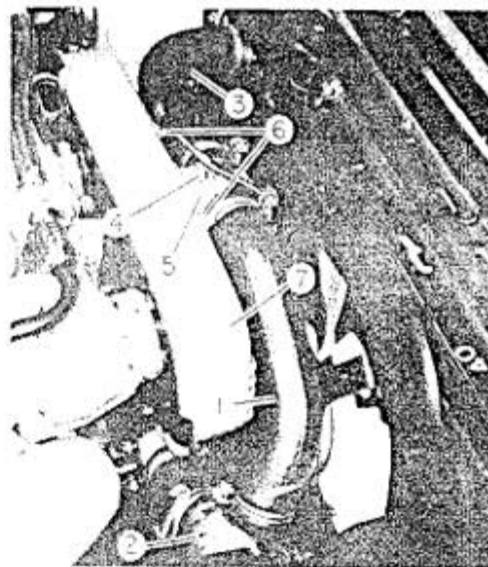
Loosen clamp and remove coolant hose (1) from controlled bypass thermostat (2). Loosen clamp on radiator hose (3) and remove from radiator.

Remove two bolts (4) to remove union (5) and attached hoses.

Remove drive belts from crankshaft pulley.

Remove two nuts (6) and bolts to remove timing belt cover (7).

1. Coolant hose
2. Controlled bypass thermostat
3. Radiator hose
4. Bolt
5. Union
6. Nut
7. Timing belt cover



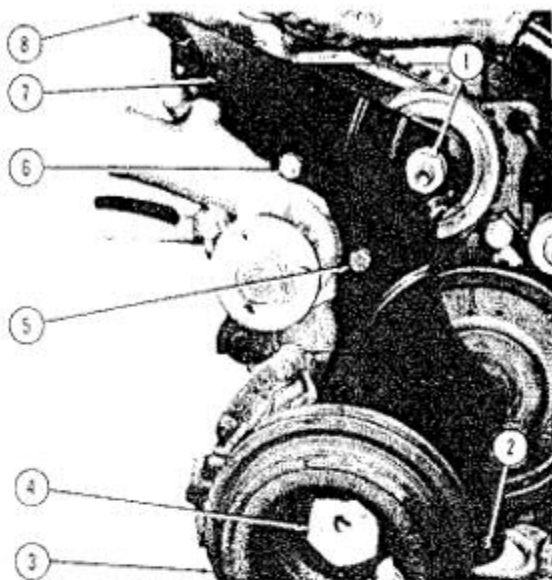
Manually turn engine until holes in camshaft sprockets align with timing pointers.

Block flywheel against turning.

Remove nut (4) holding crankshaft pulley (3). Use 38 mm socket. Remove pulley.

Remove four bolts (2, 5 and 8) and two nuts (1 and 6) holding lower sheet metal timing shield (7). Remove shield.

1. Nut 2. Bolt 3. Crankshaft pulley 4. Nut 5. Bolt 6. Nut  
7. Timing belt shield 8. Bolt

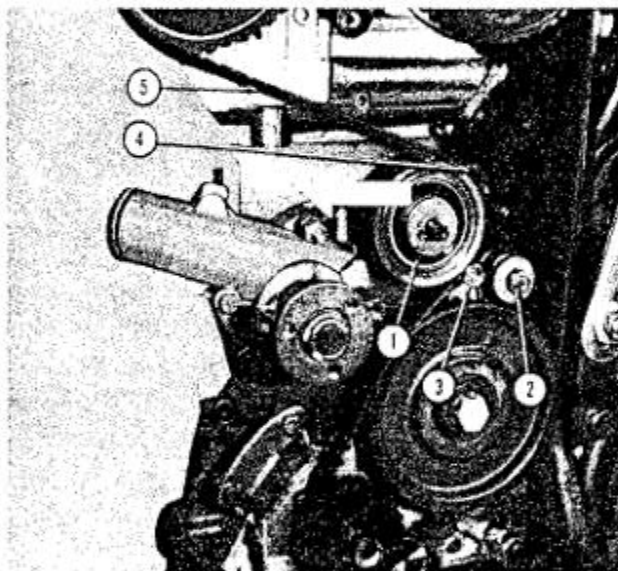


Loosen bolt (3) for tensioner bracket (4). Pry pulley in direction of arrow to release belt tension. Reinstall nut on pulley (1) and tighten it and bolt (3) to hold pulley in belt slackened position.

Remove timing belt (5). Mark belt as "not reusable".

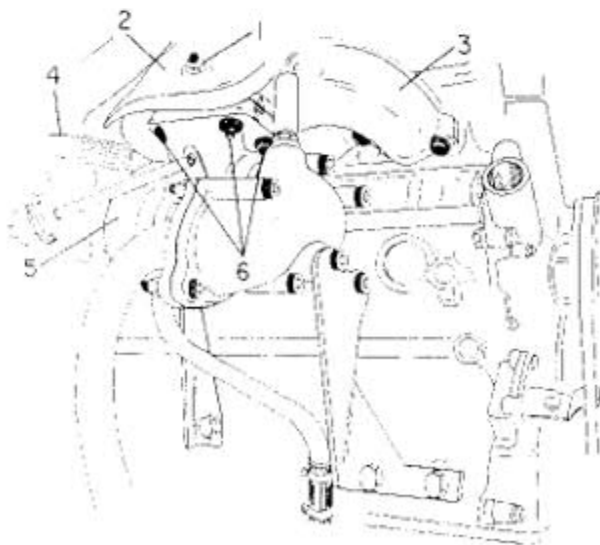
Loosen but do not remove tensioner spring retaining bolt (2). Remove bolts to remove timing belt shields.

1. Tensioner pulley 2. Spring retaining bolt 3. Bolt 4. Tensioner bracket 5. Timing belt



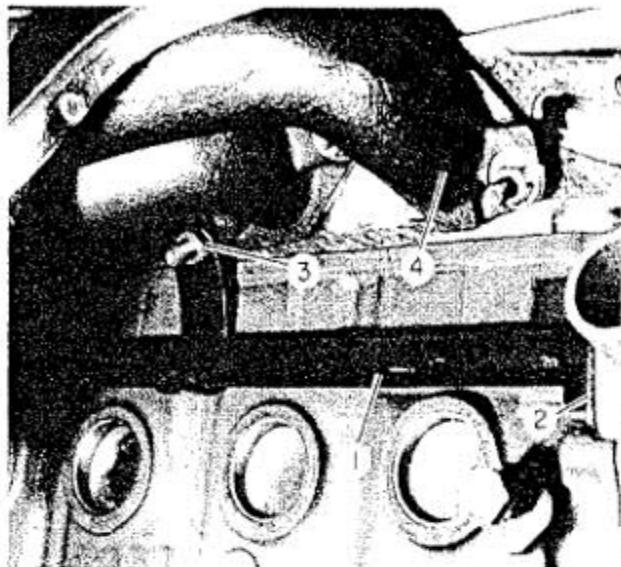
Remove nuts securing exhaust pipe to exhaust manifold. On turbo-charged engines remove nuts (1) holding shield (2) to exhaust manifold (3). Remove oil pressure line (4) to turbo unit (5). Remove three Allen head bolts (6) attaching turbo exhaust elbow to exhaust manifold.

1. Nut 2. Shield 3. Exhaust manifold 4. Oil pressure line  
5. Turbo unit 6. Bolt



Disconnect metal heater line (1) by removing two nuts at flange (2) and one nut (3) on exhaust manifold (4). Remove ten cylinder head bolts and washers. Remove cylinder head and gasket.

1, Metal heater line 2, Flange 3, Nut 4, Exhaust manifold



Install cylinder head in reverse order of removal.

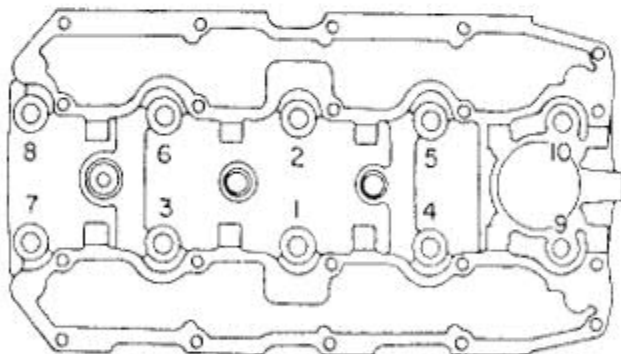
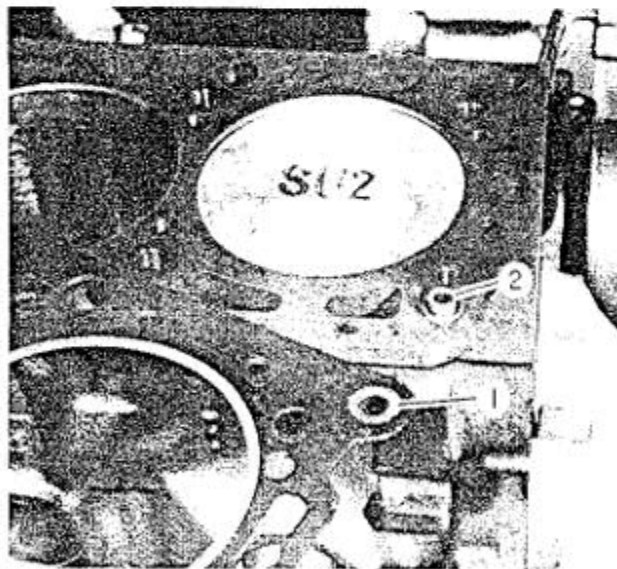
Make sure word "ALTO" (top) on head gasket (1) is facing up, and that two guide dowels (2) are in place in cylinder block.

Install timing belt (refer to Camshaft Drive in this section).

Refill and bleed cooling system (refer to Radiator in this section).

Tighten head bolts in order shown. Torque in at least two stages, final torque will be 61 ft lbs (8.5 kgm).

1, Cylinder head gasket 2, Guide dowel



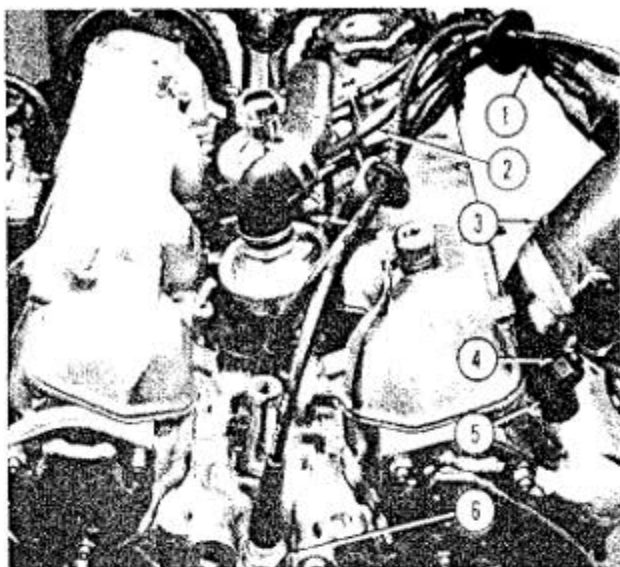
**DISASSEMBLY AND ASSEMBLY (Carbureted)**

Disconnect high voltage cables (1) from spark plugs (5).

Remove dirt from spark plug wells, then remove spark plugs.

Remove nut (4), washer and bracket (5), then remove distributor (3).

1. High voltage cables 2. Wire 3. Distributor 4. Nut 5. Bracket  
6. Spark plug



Remove water temperature sending unit (2).

On cars with air induction, remove reed valves (1).

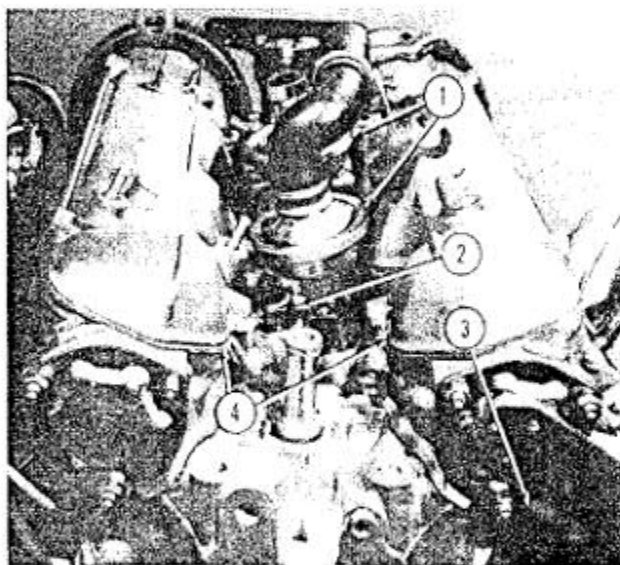
On cars with air pump, remove air injection check valve.

Remove three nuts holding shield to exhaust manifold.

Remove five nuts and remove exhaust manifold (3).

Remove four bolts holding camshaft covers (4). Remove covers and gaskets.

1. Reed valves 2. Temperature sending unit 3. Exhaust manifold  
4. Camshaft covers



Disconnect hose (8) from EGR valve (7). Remove two bolts (6), then remove EGR valve.

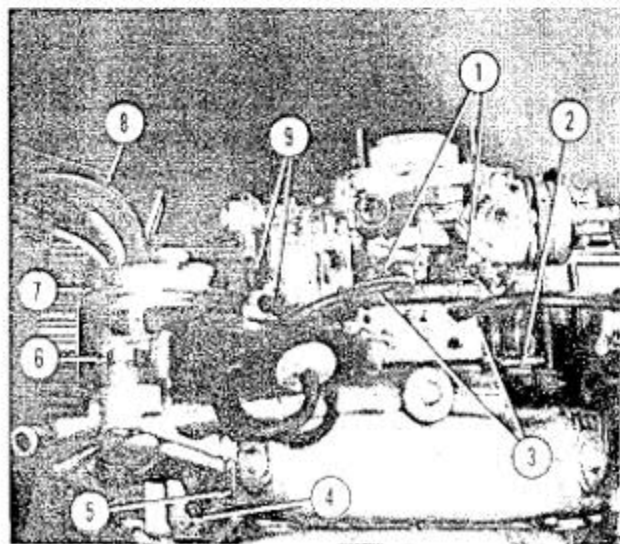
Remove two vacuum hoses (9) from front of carburetor and two vacuum hoses (3) from side of carburetor.

Remove four nuts (1) and washers, remove the carburetor and spacer.

Remove two camhousing bolts holding vacuum tube brackets (2) to camhousing.

Remove four bolts (4), two nuts and washers. Remove intake manifold and gasket.

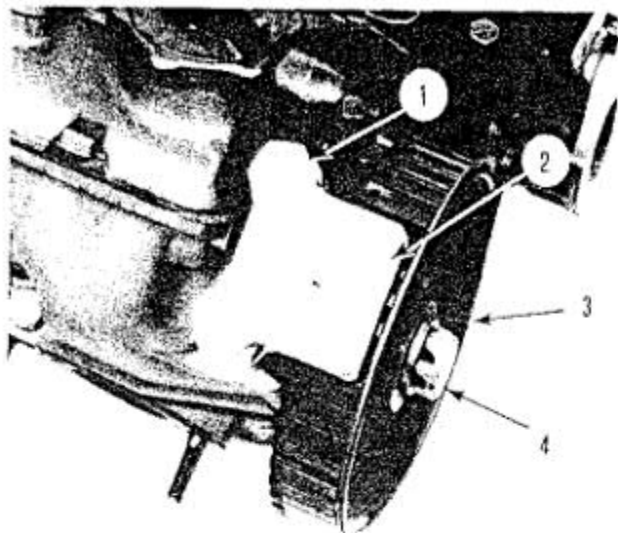
1. Nuts 2. Bracket 3. Vacuum hoses 4. Bolt 5. Intake manifold  
6. Bolt 7. EGR valve 8. Hose 9. Vacuum hoses





Remove two front camhousing bolts (1). Install tool A.60446 using bolts (1). Remove bolt (4) and washer. Remove camshaft pulley (3). Repeat for other side.

1. Bolt 2. Tool A.60446 3. Exhaust camshaft pulley 4. Bolt



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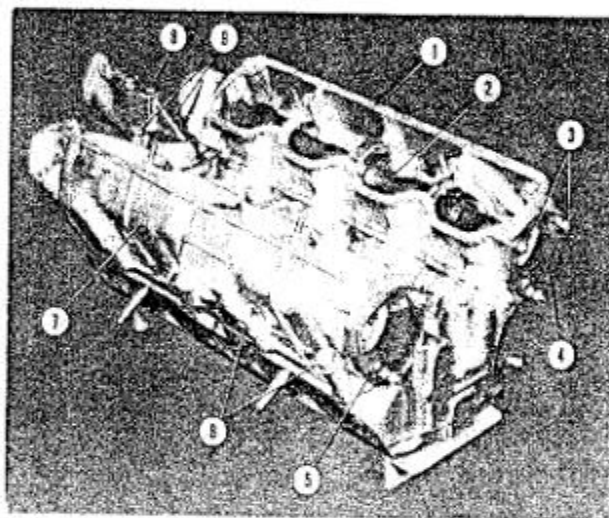
Remove three nuts (3) holding camshaft covers (4 and 5). Remove camshafts (2).

Remove bolts (6) holding cam housings (1 and 7). Remove housings and gaskets.

Remove two bolts (9) and washer holding water extension (8). Remove extension and gasket.

Assemble in reverse order.

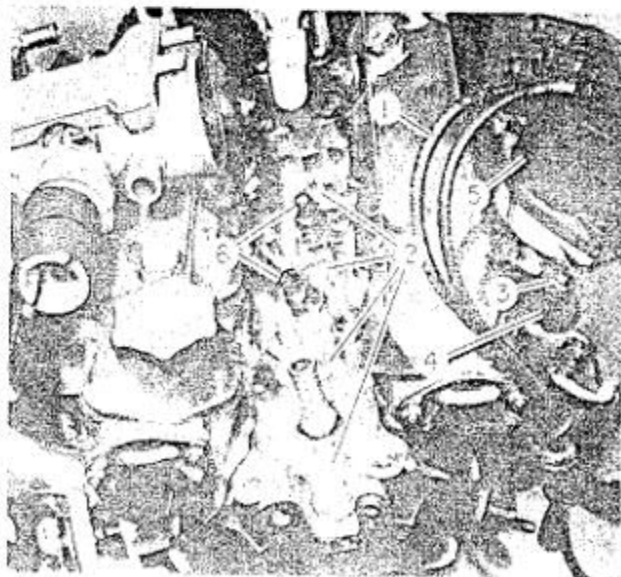
1. Exhaust camhousing 2. Camshaft 3. Nuts 4. Cover 5. Cover  
6. Camhousing bolts 7. Intake camhousing 8. Water extension  
9. Bolts



### DISASSEMBLY AND ASSEMBLY (Fuel Injected and Turbo-Charged)

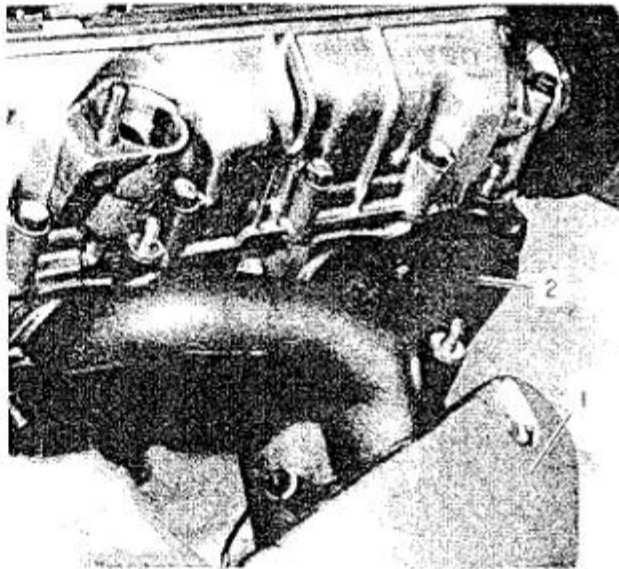
Disconnect high voltage cables (1) from spark plugs (2). Remove dirt from spark plug wells, then remove spark plugs. Remove nut (3), washer and bracket (4), then remove distributor (5). Remove water temperature sending units (6).

1. High voltage cables 2. Spark plug 3. Nut 4. Bracket  
5. Distributor 6. Water temperature sending unit



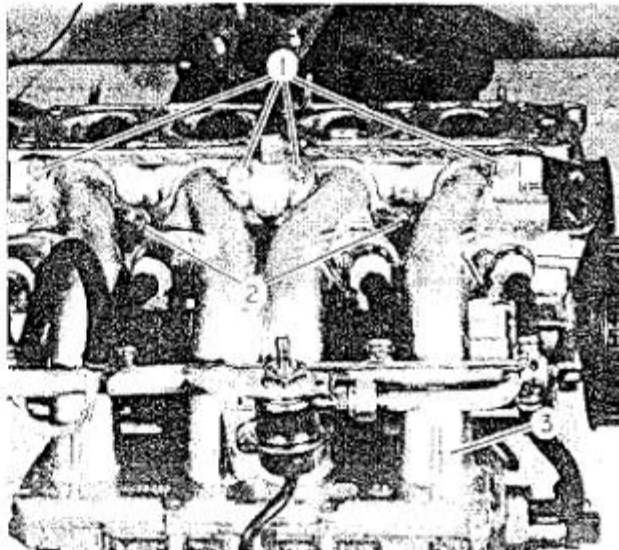
Remove three nuts holding heat shield (1) to exhaust manifold (2). Remove five nuts and remove exhaust manifold.

1. Heat shield 2. Exhaust manifold



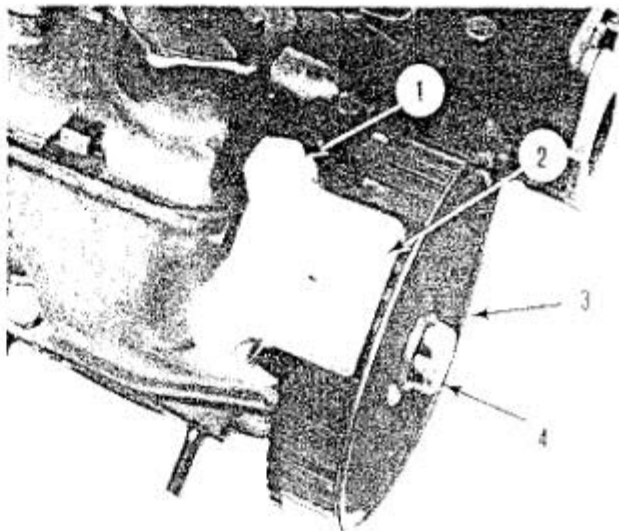
Remove four bolts (1) and two nuts (2) to remove intake manifold (3).

1. Bolt 2. Nut 3. Intake manifold



Remove two front camhousing bolts (1). Install tool A.60446 using bolts (1). Remove bolt (4) and washer. Remove camshaft pulley (3). Repeat for other side.

1. Bolt 2. Tool A.60446 3. Exhaust camshaft pulley 4. Bolt



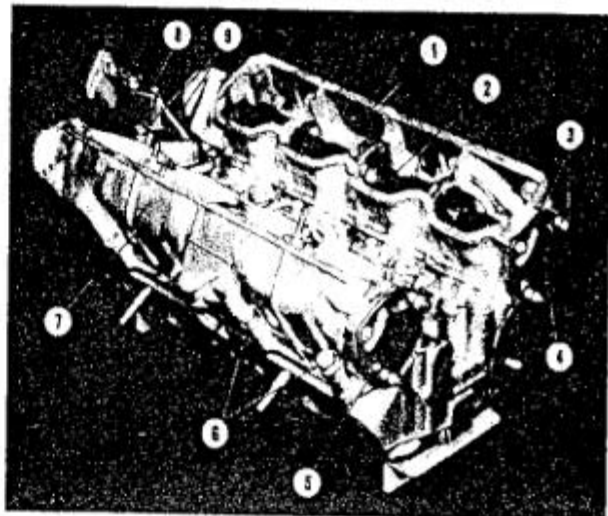
Remove three nuts (3) holding camshaft covers (4 and 5).  
Remove camshafts (2).

Remove bolts (6) holding cam housings (1 and 7). Remove housings and gaskets.

Remove two bolts (9) and washer holding water extension (8).  
Remove extension and gasket.

Assemble in reverse order.

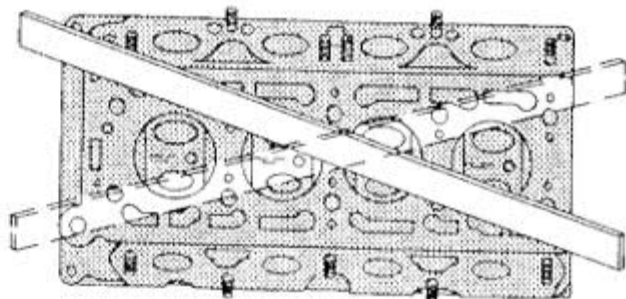
1. Exhaust camhousing 2. Camshaft 3. Nuts 4. Cover 5. Cover  
6. Camhousing bolts 7. Intake camhousing 8. Water extension  
9. Bolts



### CHECKING CYLINDER HEAD GASKET SURFACE

Using a straight edge, check head for distortion. Lay straight edge across diagonals of gasket surface and lengthwise in the middle. The gap between head and straight edge must not exceed 0.002 inch. If gap exceeds this, reface cylinder head gasket surface.

Do not remove more material than necessary. Check depth of combustion chambers to make sure it has not been reduced below allowable limits.

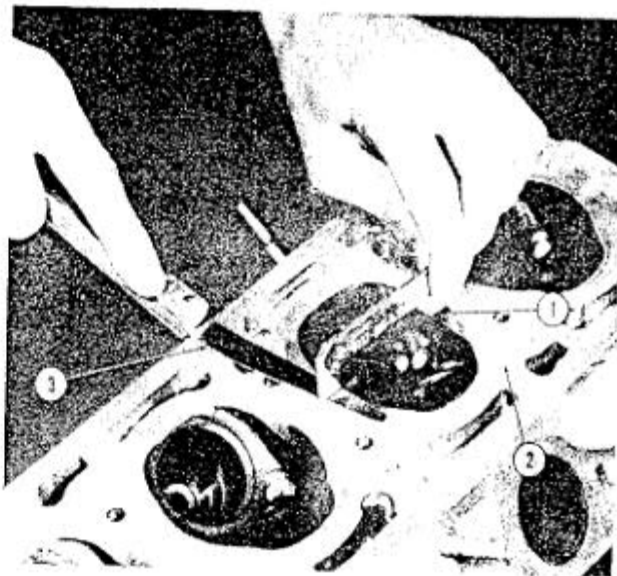


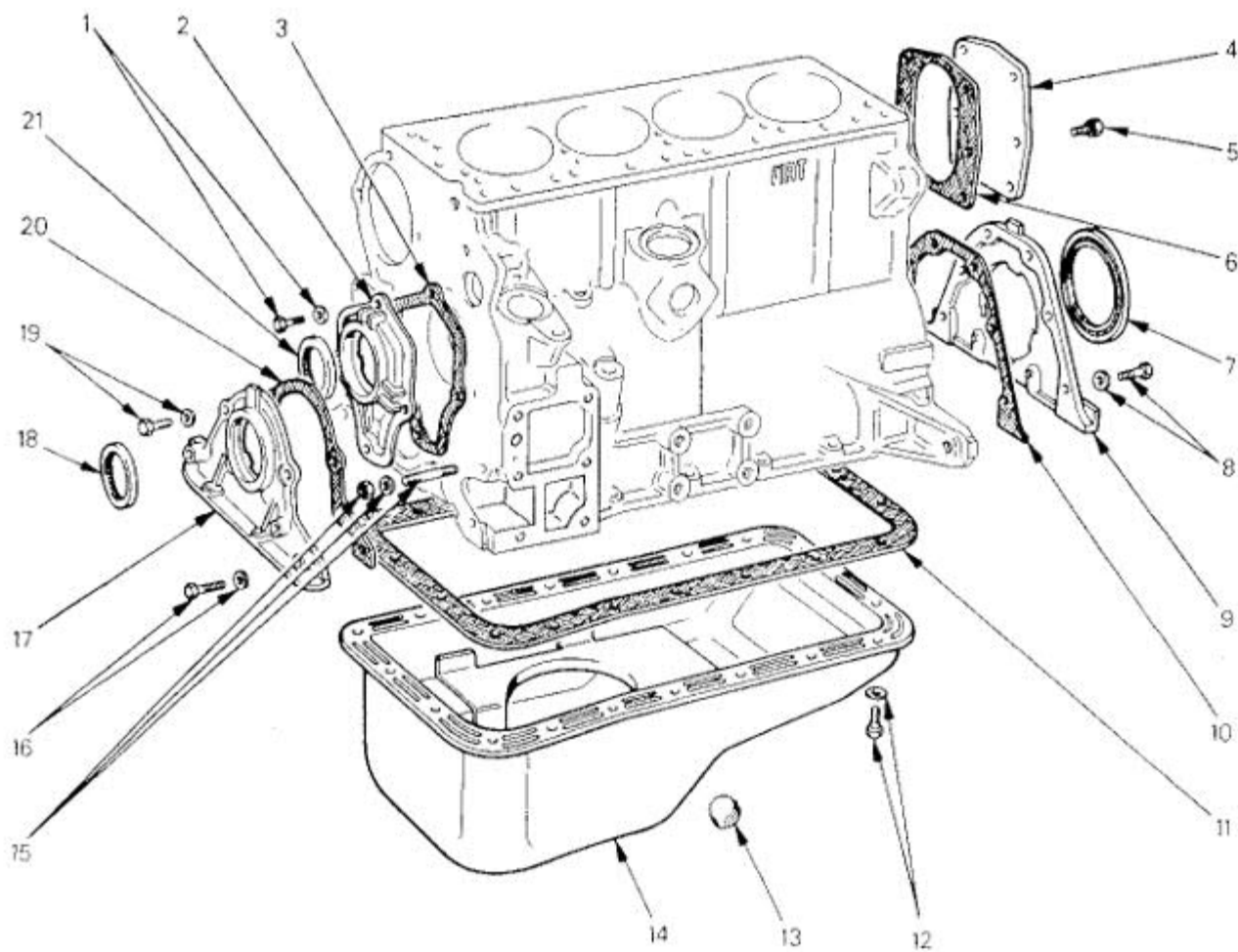
### CHECKING DEPTH OF COMBUSTION CHAMBERS

Place gauge A.96229 (1) in center of combustion chamber. Check gap between gauge and surface of gasket. Use a feeler gauge (3).

Gap should not exceed 0.01 in. (0.25 mm).

1. Tool A.96229 2. Cylinder head 3. Feeler gauge





- 1. Bolt and lockwasher
- 2. Auxiliary shaft cover
- 3. Gasket
- 4. Cover
- 5. Bolt
- 6. Gasket
- 7. Oil seal
- 8. Bolt and lockwasher
- 9. Rear cover
- 10. Gasket
- 11. Gasket

- 12. Bolt and lockwasher
- 13. Drain plug
- 14. Oil sump
- 15. Stud, lockwasher, and nut
- 16. Bolt and lockwasher
- 17. Front cover
- 18. Oil seal
- 19. Bolt and lockwasher
- 20. Gasket
- 21. Oil seal

### SEALS AND GASKETS

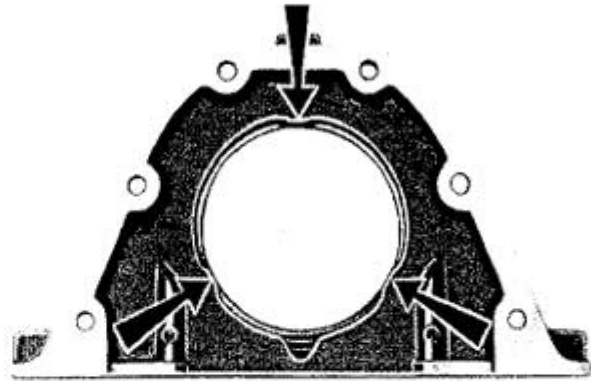
## OIL SUMP AND CRANKCASE COVERS

### REPLACEMENT

When overhauling engine, replace oil seals at crankshaft and auxiliary shaft.

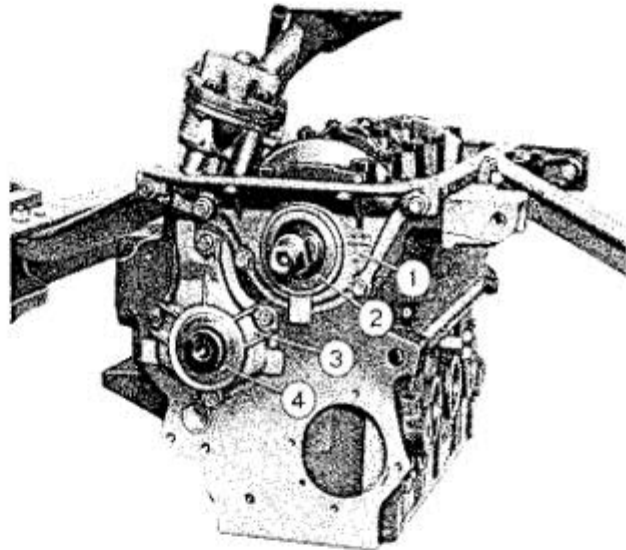
#### Crankcase cover with oil seal

Arrows show indexes for positioning rear cover on crankshaft flange.



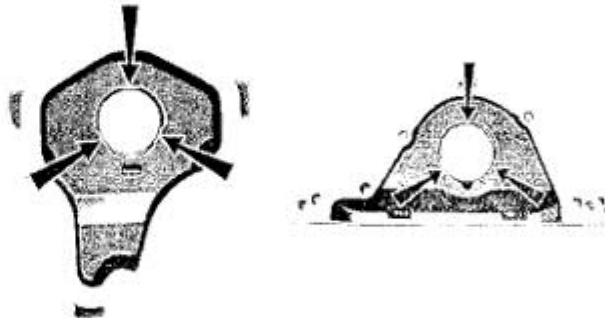
#### Engine front view

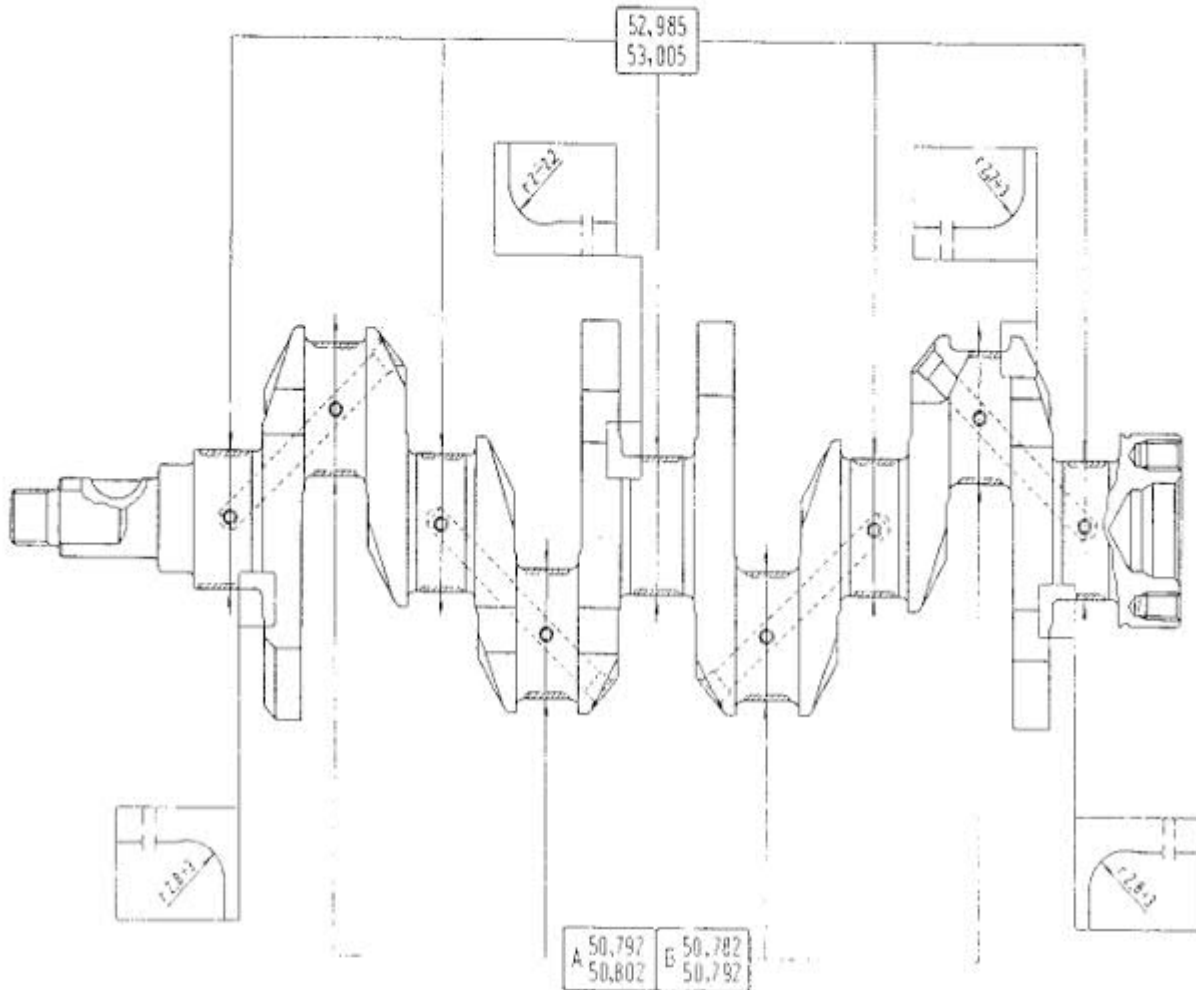
1. Crankshaft front cover
2. Crankshaft front oil seal
3. Auxiliary shaft cover
4. Auxiliary shaft oil seal



#### Auxiliary shaft and crankshaft covers with oil seals

Arrows show indexes for positioning covers on shafts.





01

### INSPECTING

#### Journals and Crankpins

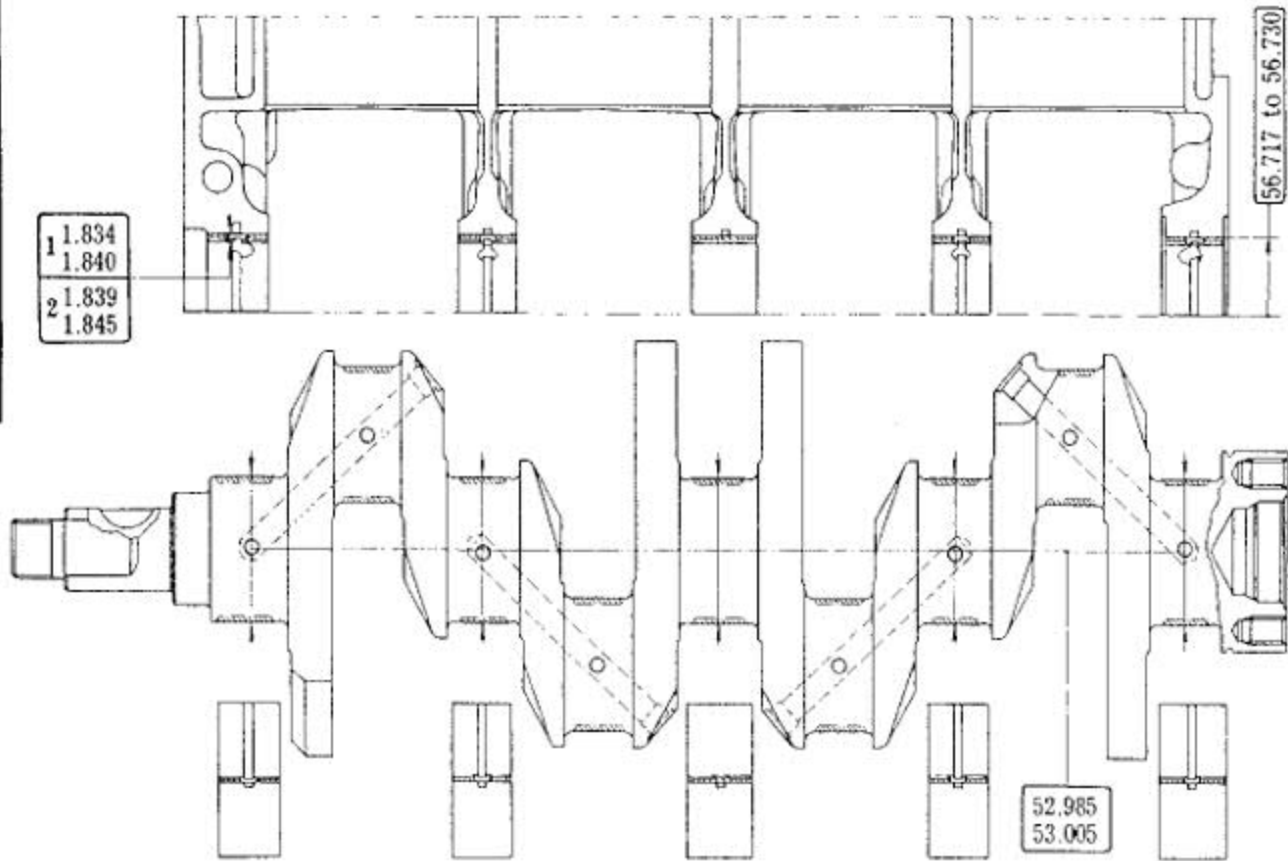
Inspect crankshaft for cracks.

Inspect crankshaft for scoring on journals. Slight scoring can be refinished using extra-fine carborundum stone.

Deep scoring, or if journals show an out-of-round condition in excess of .0002 in. (0.005 mm), must be corrected by grinding journals to next undersize.

Main bearing journals and crankpins should be reground to the undersize diameters called for in the Specifications if they are damaged or worn.

After grinding and polishing, clean crankshaft to remove every trace of abrasive material. Flush the oilways several times.

1  
0

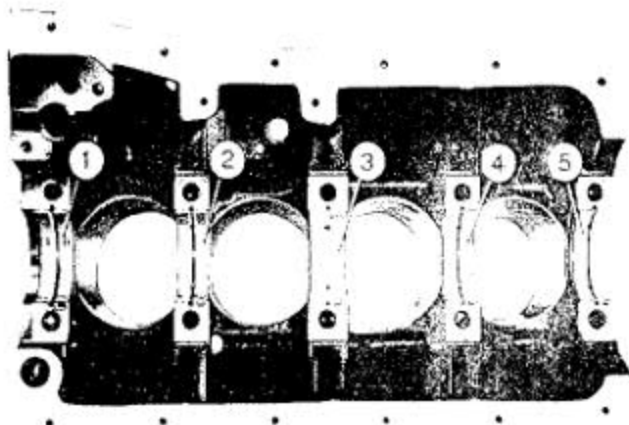
### MAIN DATA OF CRANKSHAFT MAIN BEARINGS AND SADDLE BORES IN CRANKCASE

#### Bearings

If bearings show signs of scoring, seizing or excessive wear, replace them.

If bearings are good, check clearance between bearings and crankshaft.

1. Front bearing    2. Intermediate front bearing    3. Center bearing, without oil groove    4. Intermediate rear bearing    5. Rear bearing

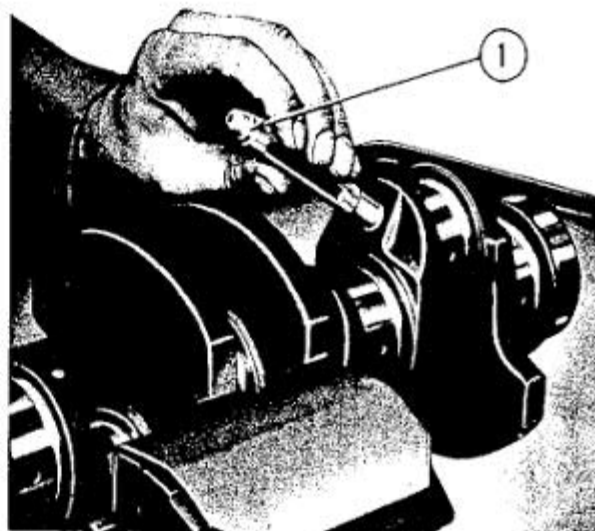


After journals have been ground to size and polished, crankshaft must be thoroughly cleaned to remove all metal and abrasive particles.

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



### Crankshaft Balance

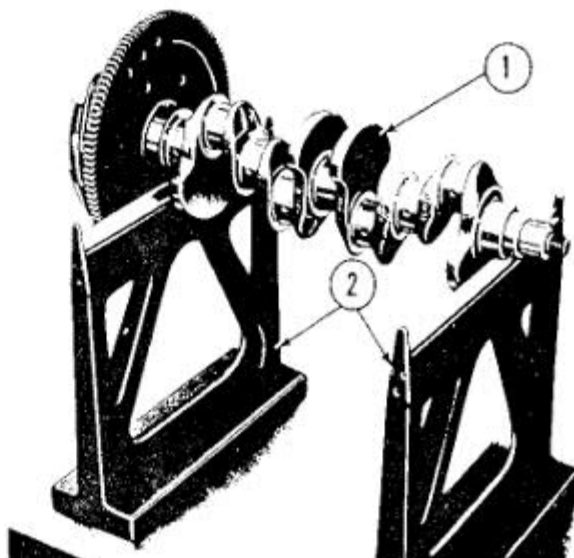
Place two parallel blocks (2) on a surface plate.

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

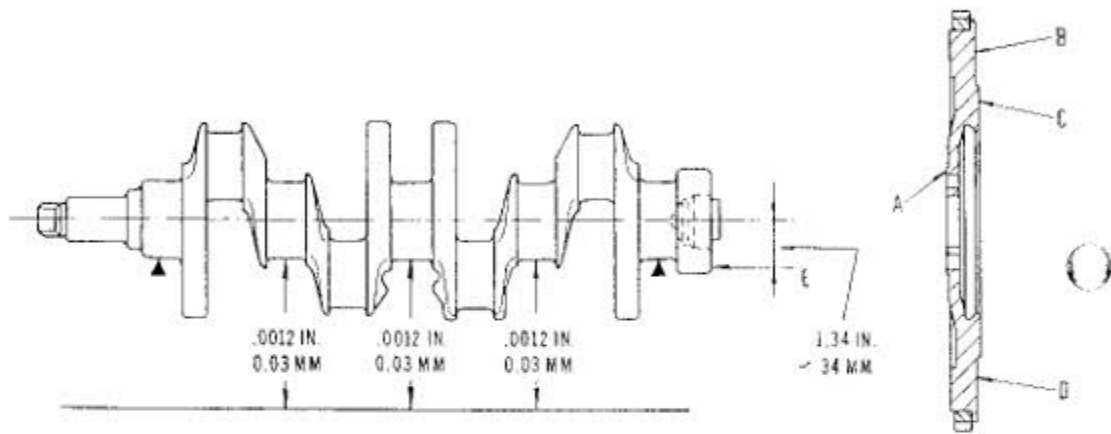
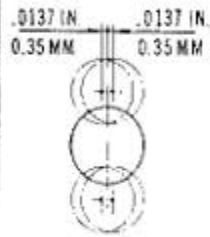
Inspect condition of ring gear teeth. If there is any obvious damage, replace ring gear.

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).

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A-B-C-E = points for checking alignment and squareness with respect to rotation axis.  
D = drilling points for 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,  $\pm 0.0137$  in. ( $\pm 0.35$  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).

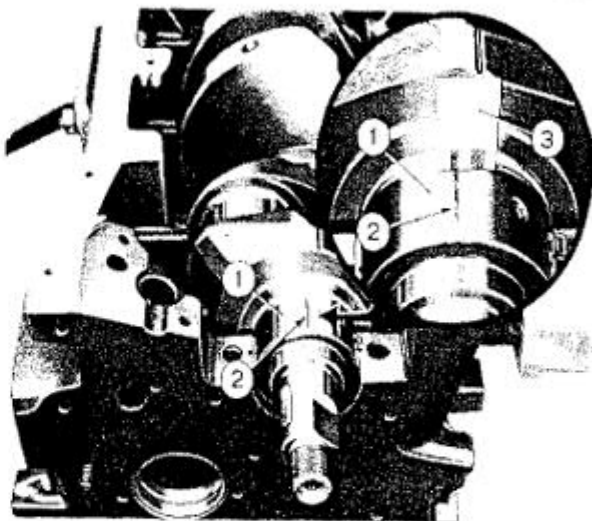
If inspection of main bearing journals and crankpins alignment reveals distortions, the shaft should be straightened using a hydraulic press, taking care not to subject shaft to excessive stress which could damage its internal structure.

Place a length of calibrated plastic wire (2) on journal (1).  
Install bearing caps and shells. Torque cap bolts to 83 ft. lbs. (11.5 kgm).

Torque smaller bolt for front cap to 59 ft. lbs. (8.2 kgm). Remove caps.

Compare width of wire to scale (3) to determine clearance. If clearance is not between 0.0012 to 0.0030 in. (0.032 to 0.077 mm), replace bearings with undersize ones.

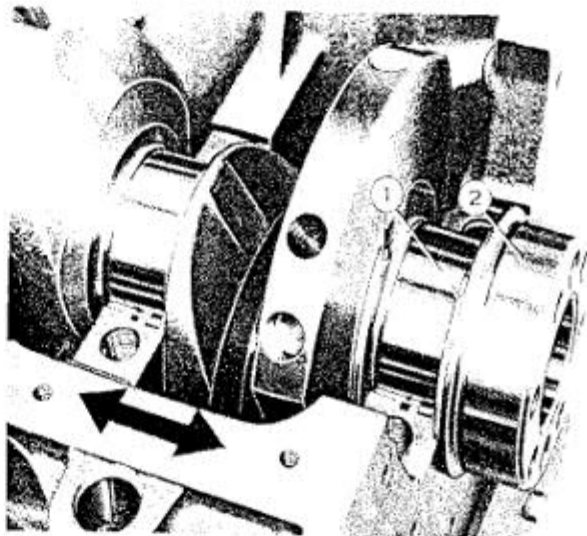
1. Journal 2. Calibrated wire 3. Scale



Check crankshaft end play using a dial indicator. Move the crankshaft (2) axially (arrows) using two screwdrivers. If end play is not between 0.0021 to 0.0120 inch (0.055 to 0.305 mm), replace thrust rings (1).

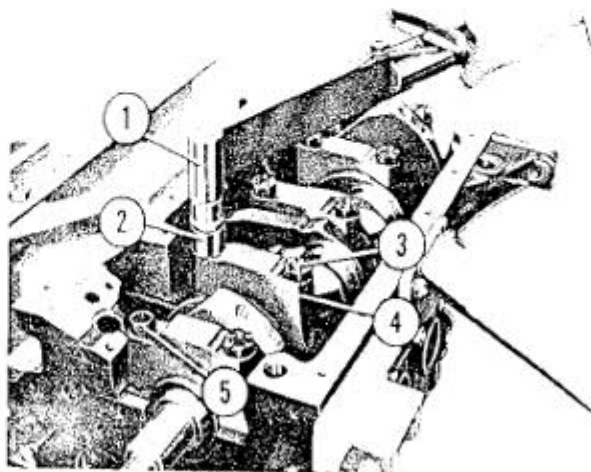
Make sure side of thrust ring with groove faces shoulder of crankshaft.

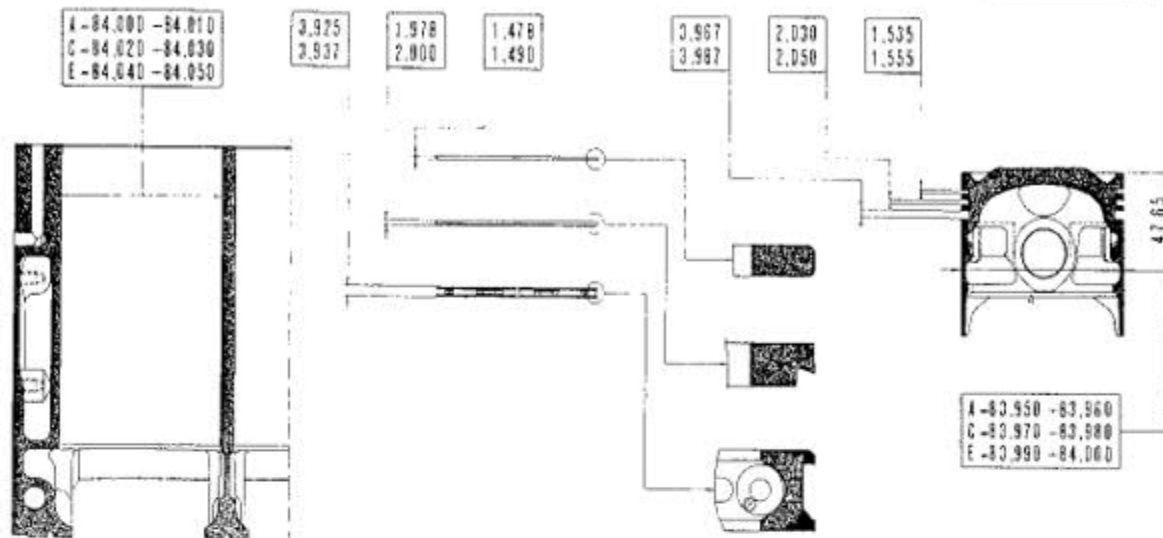
1. Thrust rings 2. Crankshaft



Install bearing cap (4). Torque cap bolts to 83 ft. lbs. (11.5 kgm). Torque smaller cap bolt (5) to 59 ft. lbs. (8.2 kgm).

1. Torque wrench 2. Socket 3. Cap bolt 4. Main bearing cap 5. Small cap bolt





MAIN DATA OF CYLINDER BORE, PISTON, AND RINGS

### PISTONS

Piston class and piston bore class are identified by letter and number stamped on underside of piston bosses. Piston pin class is stamped on pin surface.

1. Piston pin class 2. Piston class 3. Connecting rod matching number

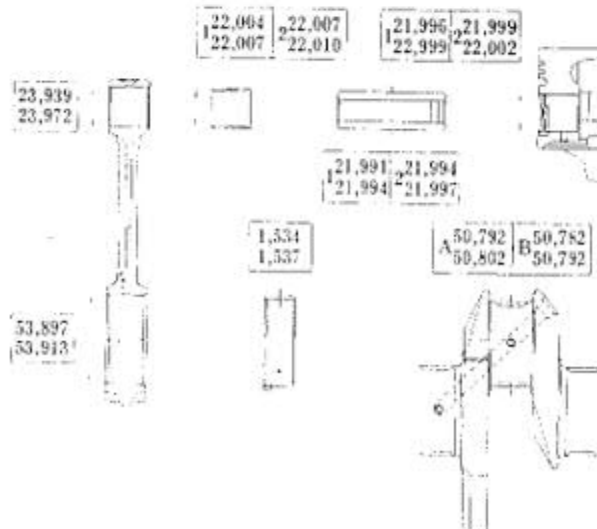


### INSPECTING

Before assembling, check that the four pistons are the same weight within  $\pm 0.18$  oz. ( $\pm 5$  g).

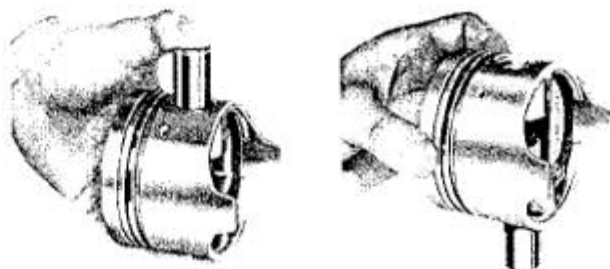
The fit clearance of the piston pin in the small end bushing is 0.0004 to 0.0006 inch (0.010 to 0.016 mm).

The fit clearance of the piston pin in the piston boss is 0.0001 to 0.0003 inch (0.002 to 0.008 mm).



To check pin fit in piston bore, coat piston bore.

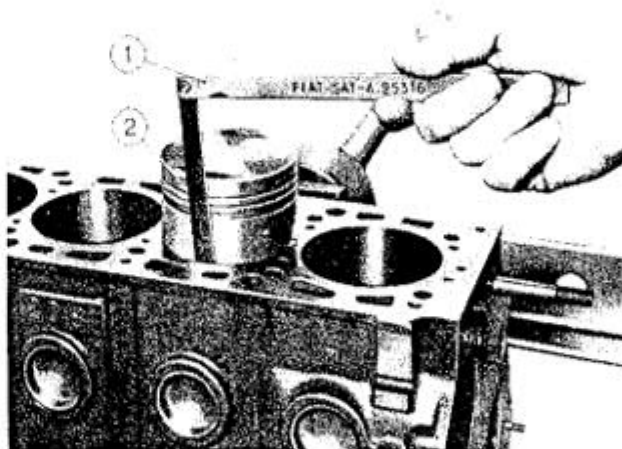
Pin should slide in by thumb pressure and should not fall out when piston is held in vertical position.



Check piston clearance in cylinder bore. Use a feeler gauge.

Clearance should be 0.0016 to 0.0024 inch (0.040 to 0.060 mm) measured at right angles to the pin at 1.876 inches (47.65 mm) from the piston head.

1. Feeler gauge 2. Piston



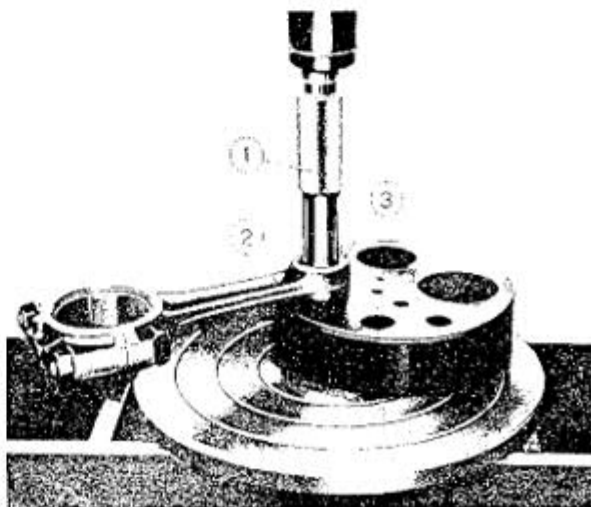
## CONNECTING ROD

### REPLACING BUSHING

To replace small end bushing, use a press. After installing, grind bushing to obtain the specified clearance for the piston pin.

Grind bushing to eliminate any out-of-round condition or scoring.

1. Bushing installer 2. Connecting rod 3. Small end bushing

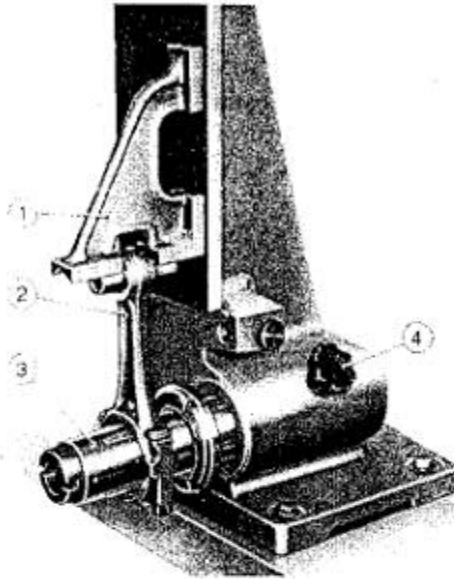


### INSPECTING

Check alignment of big-end and small-end axes measured at 4.92 in. (125 mm) from shank.

Maximum allowable misalignment is 0.0031 inch (0.08 mm).

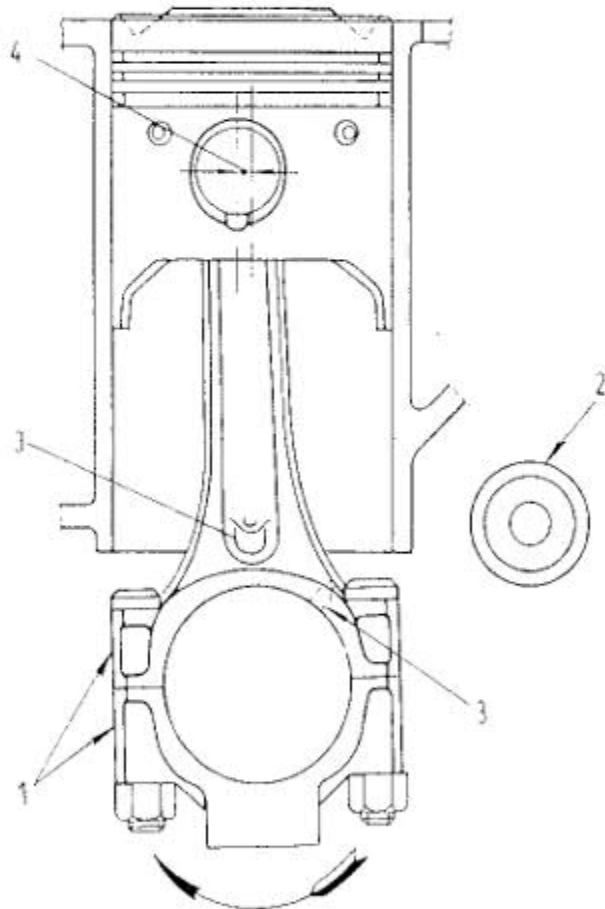
- 1, Square 2, Connecting rod and pin 3, Expansible blade arbor  
4, Arbor lock



Piston boss bore is 0.08 inch (2 mm) offset.

When assembling piston to connecting rod, make sure number on connecting rod faces the piston bore offset.

When installing the assembly, make sure numbers on connecting rod face away from side with auxiliary shaft.



Install piston pin. Secure pin with circlips. Make sure gap in circlip is not in line with slot in piston.

- 1, Location of connecting rod to cylinder matching number  
2, Auxiliary shaft 3, Oil holes 4, Piston pin offset

**RINGS****INSTALLING**

Before installing rings on pistons, push rings down in groove. Check clearance with feeler gauge. See Specifications.

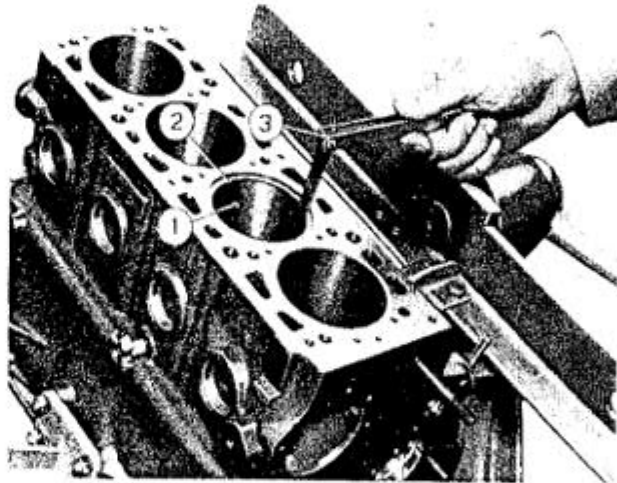
1. Ring 2. Piston 3. Feeler gauge



Push rings squarely into cylinder bore. Using feeler gauge, check ring end gap. See Specifications.

When installing rings, stagger end gaps 120° apart.

1. Cylinder bore 2. Ring 3. Feeler gauge

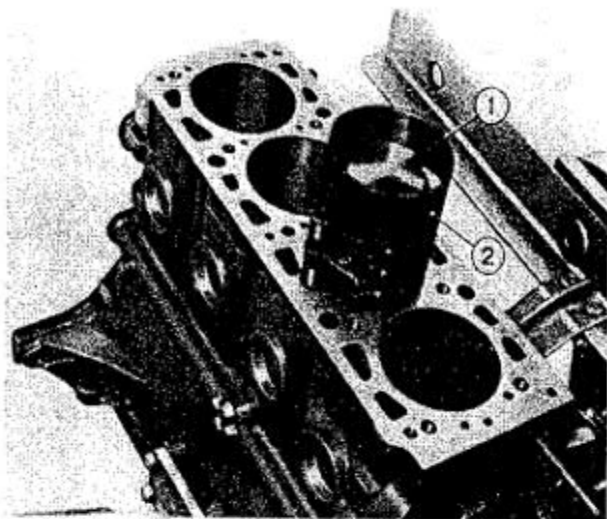


### INSTALLATION

Make sure cylinder bores are lubricated with light engine oil before installing connecting rod-piston assemblies.

Install assemblies with numbers on connecting rods facing away from auxiliary shaft.

1. Piston 2. Ring compressor



Place a length of calibrated wire on crankpin. Install connecting rod cap. Torque cap nuts to 38 ft. lbs. (5,1 kgm).

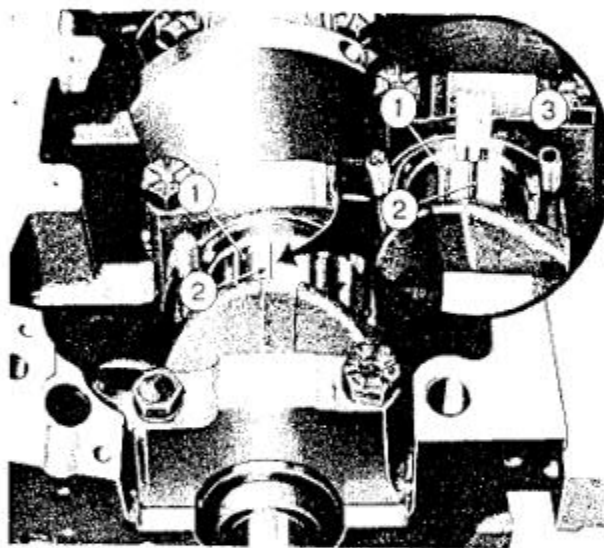
Remove caps.

Compare width of wire with scale to determine clearance.

Clearance should be:

0.0008 to 0.0025 in. (0.021 to 0.065 mm)

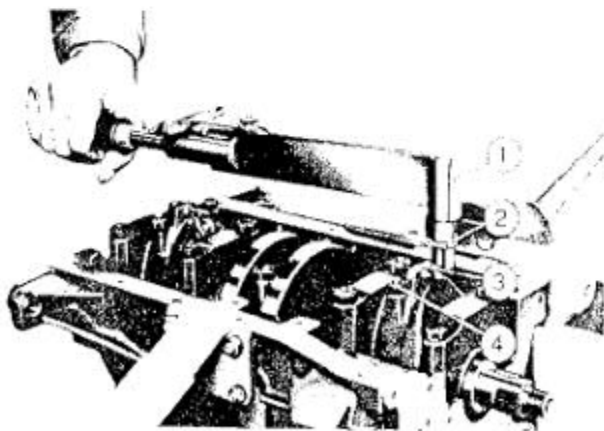
1. Crankpin 2. Calibrated wire 3. Scale



Install caps and nuts.

Torque nuts to value specified in Engine Specifications.

1. Torque wrench 2. Socket 3. Cap 4. Cap nut



## TIMING BELT

### REPLACING (Engine in car)

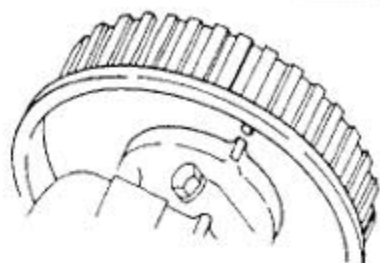
**CAUTION:** Timing belts cannot be reused. Once tension is relieved, replace timing belt. When a timing belt is removed, do not turn camshaft independent of engine. Valves may be damaged.

Disconnect battery ground cable.

Remove spark plugs.

Turn engine to set timing mark as shown.

Engine is set to fire on No. 4 cylinder.



CAMSHAFT  
TIMING



CRANKSHAFT  
TIMING

Remove heated air hose from exhaust shroud and air cleaner (carburetor engines only).

Remove all drive belts from crankshaft pulley.

Partially drain cooling system.

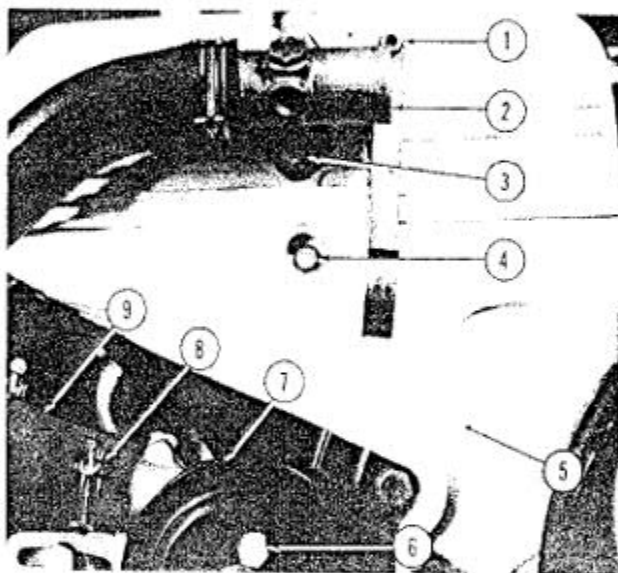
Remove upper radiator hose from union (2).

Remove two bolts (3) and washers, then pull union (2) away from cylinder head.

Remove two bolts (4) and two nuts (1) to remove timing belt cover (5).

Remove three water pump pulley bolts (6) and remove water pump pulley.

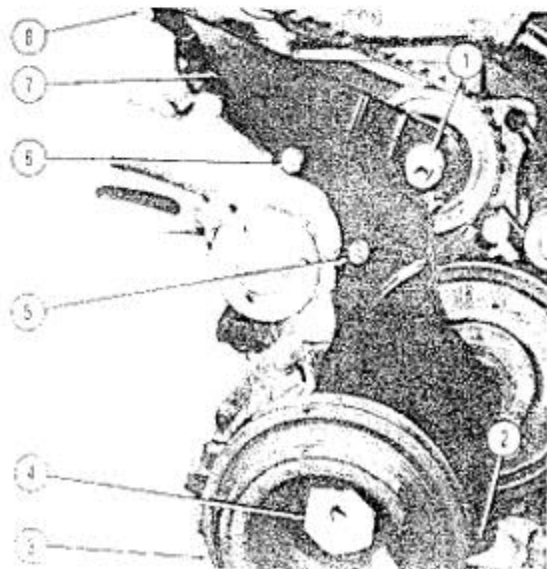
1, Nut 2, Union 3, Bolt 4, Bolt 5, Timing belt cover 6, Bolt 7, Pulley 8, Clamp 9, Hose



Remove nut (4) holding crankshaft pulley (3). Use 38 mm socket. Remove pulley.

Remove four bolts (2, 5 and 8) and two nuts (1 and 6) holding lower sheet metal timing cover (7). Remove cover.

1, Nut 2, Bolt 3, Crankshaft pulley 4, Nut 5, Bolt 6, Nut 7, Timing belt cover 8, Bolt

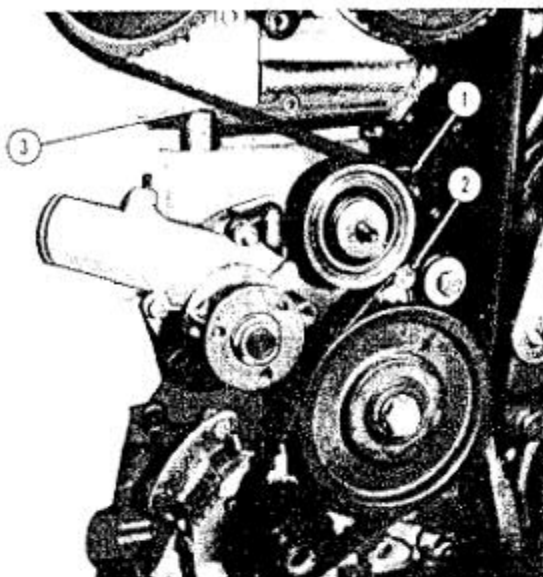




Loosen bolt (2) for tensioner bracket (1). Pry pulley to release belt tension. Retighten bolt (2) to hold pulley in belt-slackened position.

Remove timing belt (3). Mark belt as not reusable.

1. Tensioner bracket 2. Bolt 3. Timing belt



Turn auxiliary shaft sprocket to align hole (6) in sprocket with sprocket bolt (7) and spring retaining bolt (5).

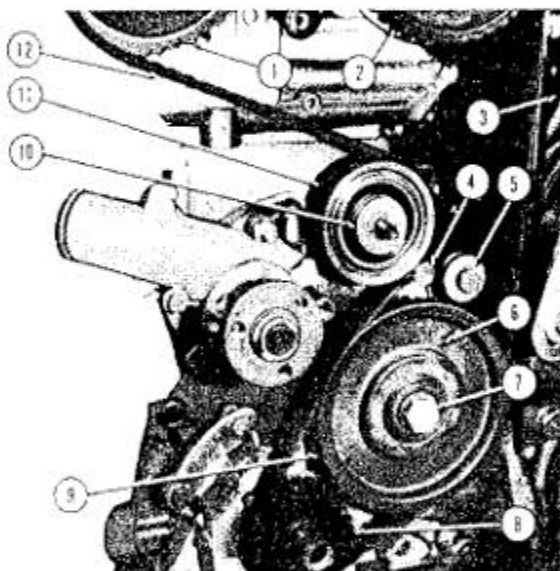
Wrap new timing belt (12) over crankshaft sprocket (8), auxiliary shaft sprocket (9), intake camshaft sprocket (2) and exhaust camshaft sprocket (1).

Make sure all play is between exhaust camshaft sprocket (1) and tensioner pulley (11).

Place timing belt over tensioner pulley. Loosen tensioner bracket bolt (4) and allow tensioner pulley to take out play. DO NOT apply additional force to tensioner pulley.

Turn crankshaft two full turns. Check that timing is correct, then tighten tensioner bracket bolt.

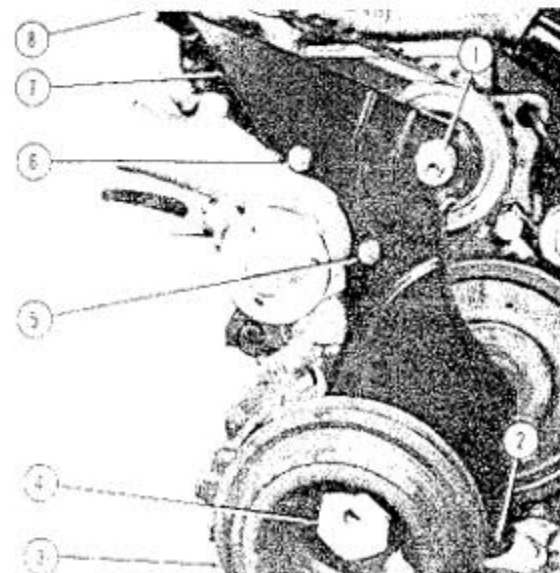
1. Exhaust camshaft sprocket 2. Intake camshaft sprocket 3. Oil dipstick tube 4. Tensioner bracket bolt 5. Spring retaining bolt 6. Hole 7. Bolt 8. Crankshaft sprocket 9. Auxiliary shaft sprocket 10. Spacer 11. Tensioner pulley 12. Belt



Install lower sheet metal timing belt cover with four bolts (2, 5 and 8) and two nuts (1 and 6). Torque nut (1) to 33 ft. lbs. (4.5 kgm).

Coat crankshaft pulley (3) inside diameter with anti-seize compound. Place pulley on crankshaft. Secure pulley with nut (4). With flywheel blocked, torque nut to 181 ft. lbs. (25 kgm).

1. Nut 2. Bolt 3. Crankshaft pulley 4. Nut 5. Bolt 6. Nut 7. Timing belt cover 8. Bolt



# Camshaft Drive

101.06

Page 10-65/66

Install water pump pulley (7) using three bolts (6).

Install timing belt cover (5) and retain with two bolts (4) and two nuts (1).

Install drive belts on crankshaft pulley and tension to specifications.

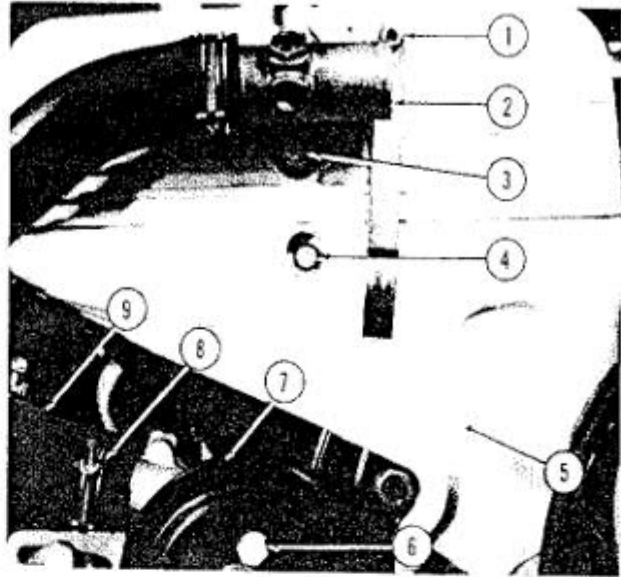
Install union gasket, union (2) and two bolts (3) and washers. Attach upper radiator hose to union.

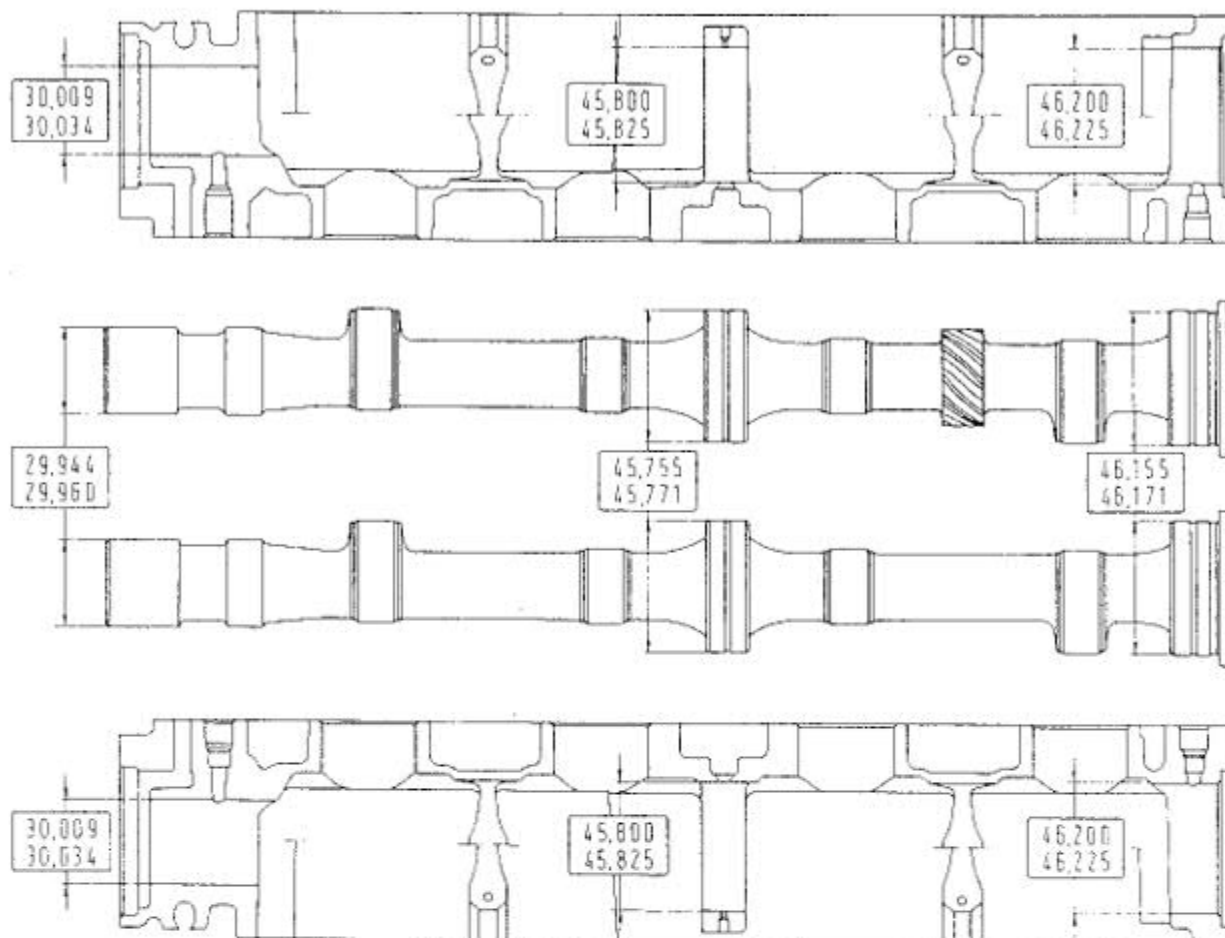
Install heated air hose on exhaust shroud and air cleaner (carbureted engines only).

Install spark plugs.

Fill cooling system.

1. Nut 2. Union 3. Bolt 4. Bolt 5. Timing belt cover 6. Bolt  
7. Pulley 8. Clamp 9. Hose



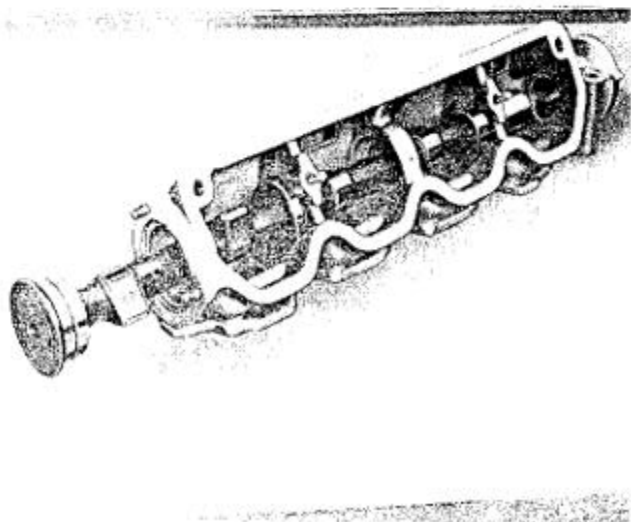


101

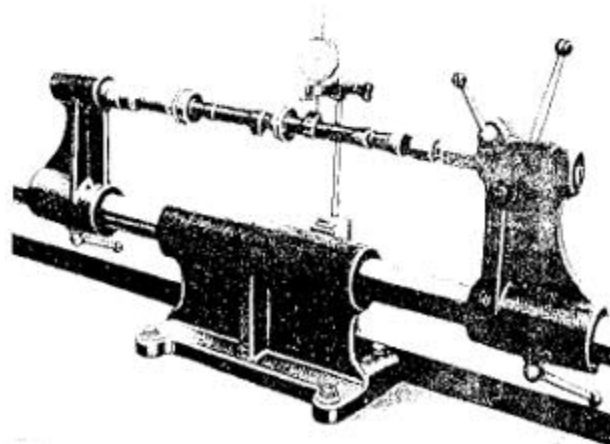
## MAIN DATA OF CAMSHAFTS AND SEATS IN CAMHOUSING

### INSPECTION

Place camshaft between points. Set dial indicator to check both intake and exhaust camshaft lobe lift. Lobe lift (without play) should be 0.3765 in. (9.564 mm) for both. Check runout. Runout must not exceed 0.0008 in. (0.02 mm).

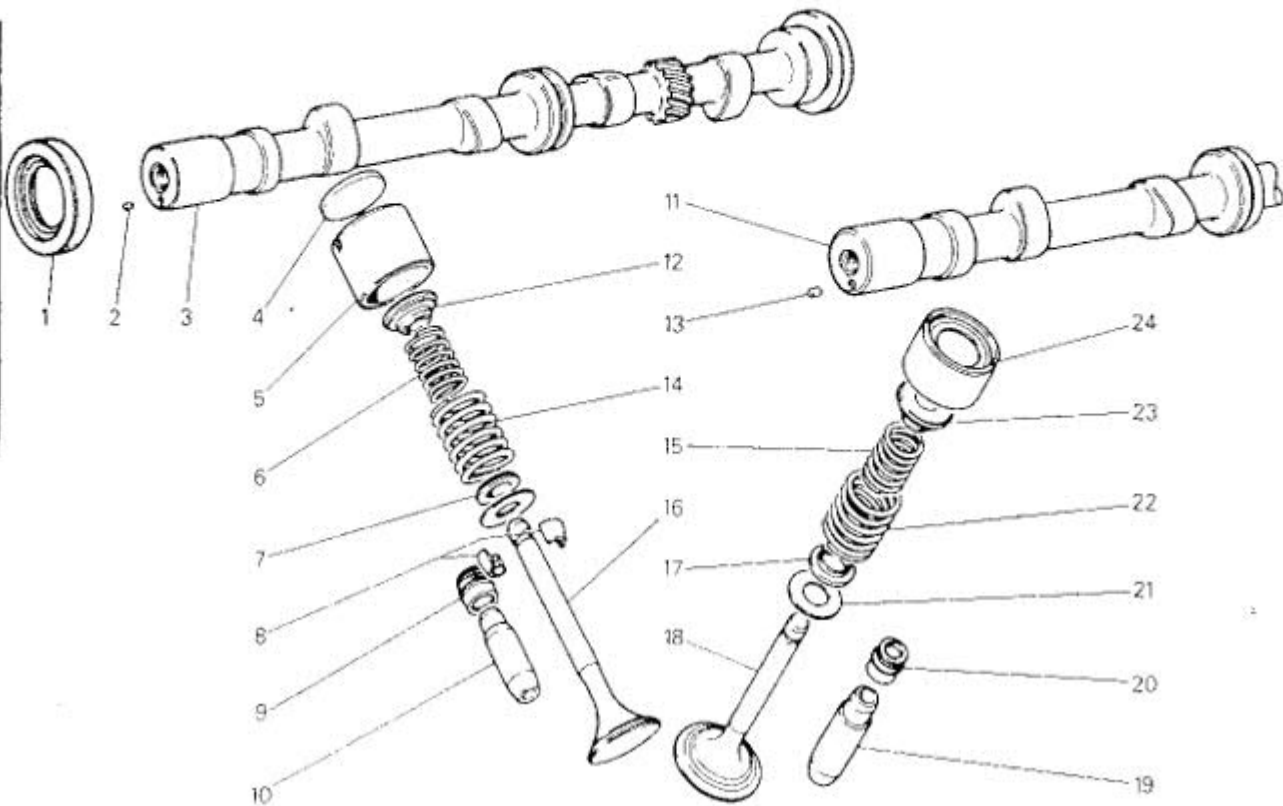


Sliding camshaft out of housing



Checking camshaft lobe lift

10



- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Camshaft seal              | 13. Dowel                      |
| 2. Exhaust camshaft dowel     | 14. Exhaust valve outer spring |
| 3. Exhaust camshaft           | 15. Intake valve inner spring  |
| 4. Tappet plate               | 16. Exhaust valve              |
| 5. Exhaust valve tappet       | 17. Lower cup                  |
| 6. Exhaust valve inner spring | 18. Intake valve               |
| 7. Lower cup                  | 19. Intake valve guide         |
| 8. Locks                      | 20. Oil seal                   |
| 9. Exhaust valve oil seal     | 21. Washer                     |
| 10. Exhaust valve guide       | 22. Intake valve outer spring  |
| 11. Intake camshaft           | 23. Upper cup                  |
| 12. Upper cup                 | 24. Intake valve tappet        |

## VALVE MECHANISM COMPONENTS

## TAPPET CLEARANCE (Engine Cold)

On carbureted engines, remove air cleaner.

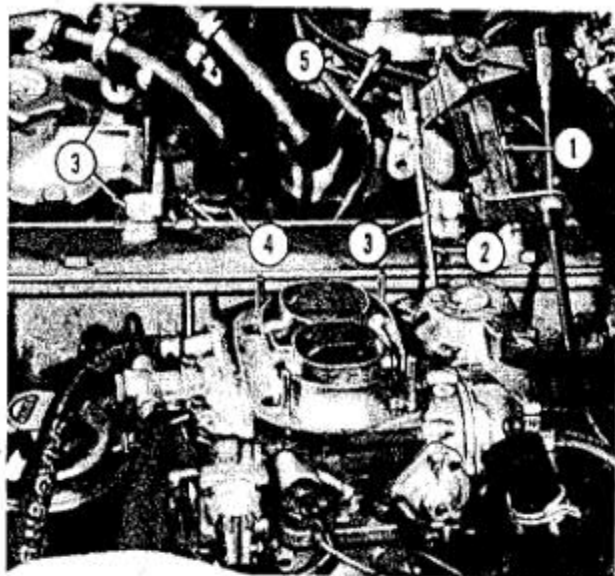
Remove two nuts to disconnect accelerator linkage (1) from cam cover. Lay linkage to one side.

On engines with air pump, remove hose from air pump check valve (4).

Remove spark plug wires from support (5).

Remove four bolts (3) holding cam covers. Remove covers and gaskets.

1. Accelerator linkage 2. Accelerator rod 3. Bolt 4. Check valve  
5. Support bracket



10

On fuel injected engines, loosen clamps (1) to remove air inlet hose (2).

**NOTE:** On turbo-charged engines, remove auxiliary air regulator fitting from compressor discharge plenum, loosen clamps and mounting bracket to remove plenum.

Loosen auxiliary air regulator (3) line clamp (4) and pull line off regulator.

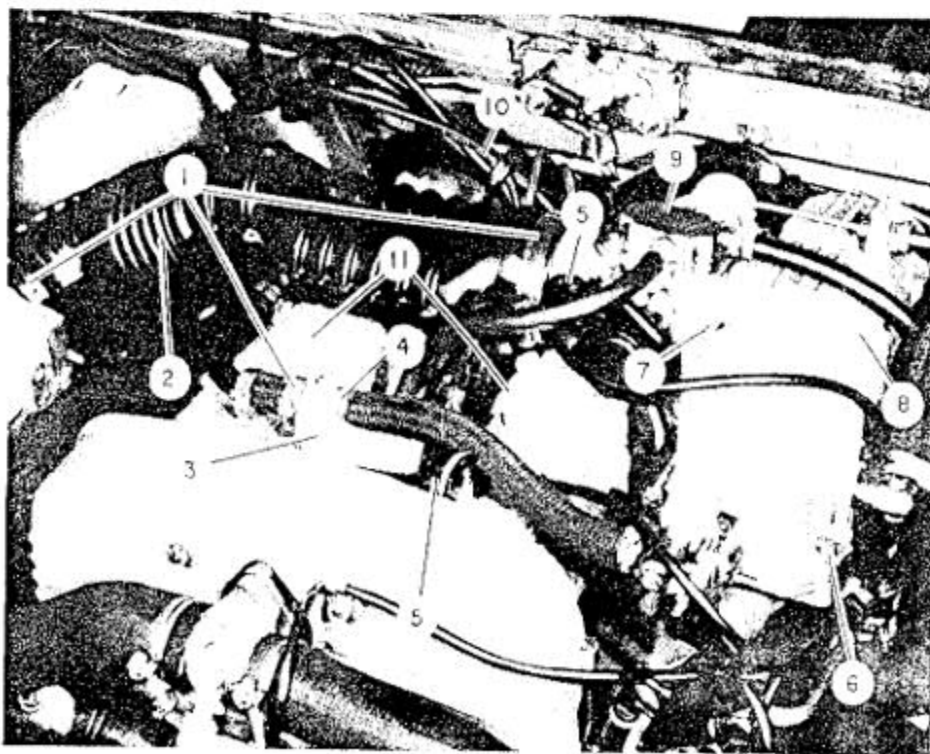
Disconnect electrical connectors (5) on throttle body and auxiliary air regulator.

Remove six bolts (6) and two nuts (7) to separate intake manifold halves (8). Without disconnecting throttle body heater (9) hoses, place intake manifold half away from cam cover.

Remove spark plug wires (10) from support.

Remove four bolts (11) holding cam covers. Remove covers and gaskets.

1. Clamp 2. Air inlet hose 3. Auxiliary air regulator 4. Clamp 5. Electrical connector 6. Bolt 7. Nut 8. Intake manifold 9. Throttle body heater 10. Spark plug wires 11. Bolt

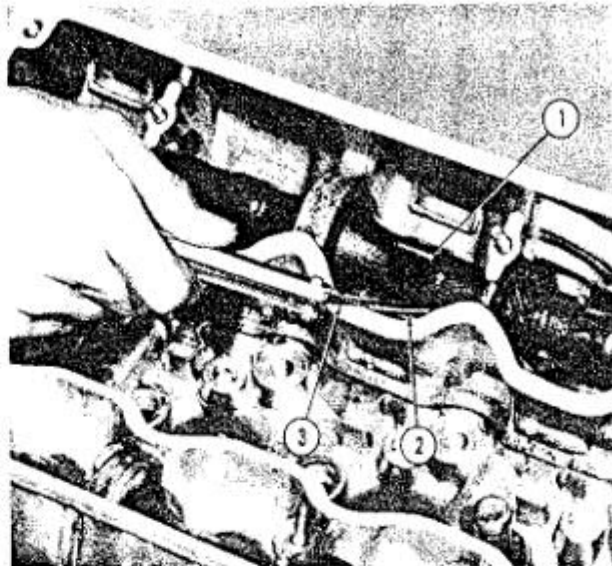


Position camshaft so that lobe (1) for valve being checked is pointing up and at right angle to valve.

Measure clearance between camshaft (1) and tappet plate (2).

Clearance: Intake - 0.015 to 0.019 in.  
(0.41 to 0.48 mm)  
Exhaust - 0.018 to 0.021 in.  
(0.46 to 0.53 mm)

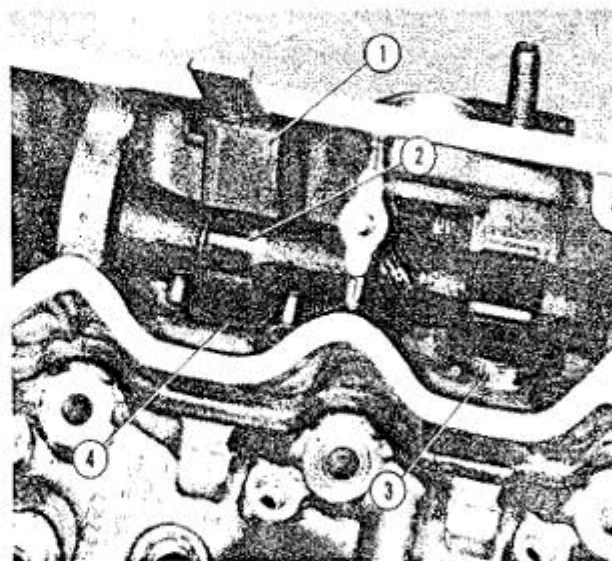
1. Camshaft lobe 2. Tappet 3. Feeler gauge



Rotate tappet (4) so that notch (3) is facing out as shown.

If adjusting is necessary, pry tappet down using tool A.60443. If tool is not available, rotate camshaft (2) down to depress tappet. Install clamping tool A.60594 (1).

1. Clamping tool A.60594 2. Camshaft lobe 3. Notch on tappet  
4. Tappet

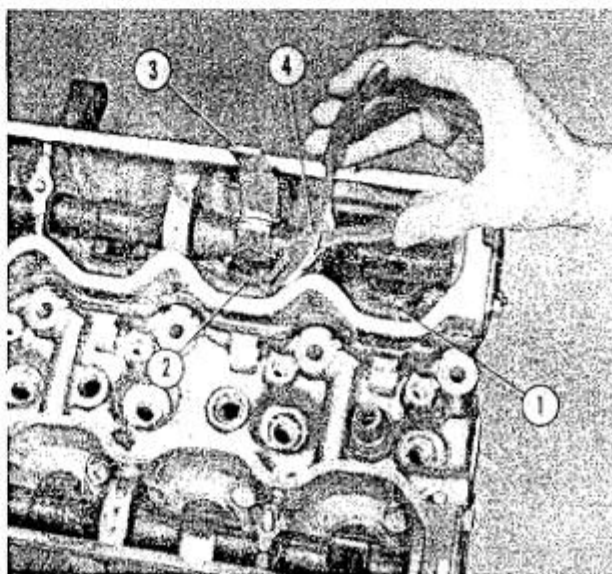


Rotate camshaft up to gain clearance between lobe and tappet plate (2).

Lift plate thru notch (1) with scribe. Remove plate with tool A.87001 (4). Install new tappet.

**NOTE:** Tappet plate thickness is stamped on face of plate. Install this face toward tappets. If number on plate(s) is not visible, determine needed thickness with a micrometer.

1. Notch on tappet 2. Tappet plate 3. Clamping tool A.60594  
4. Tool A.87001



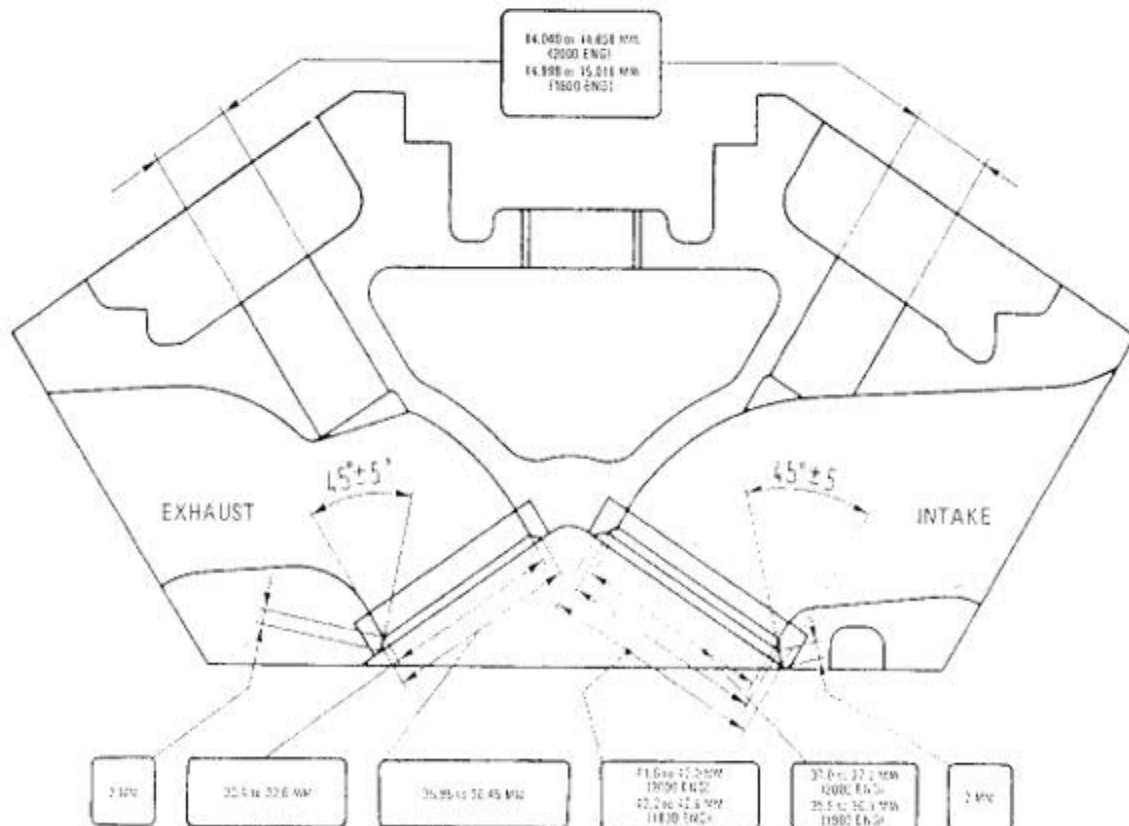
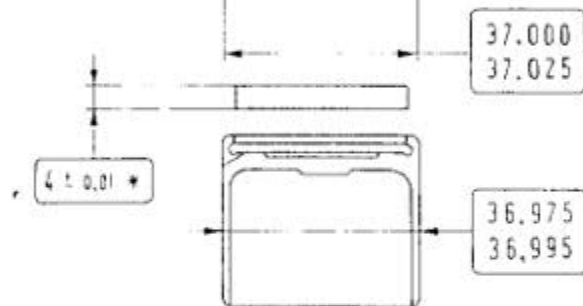
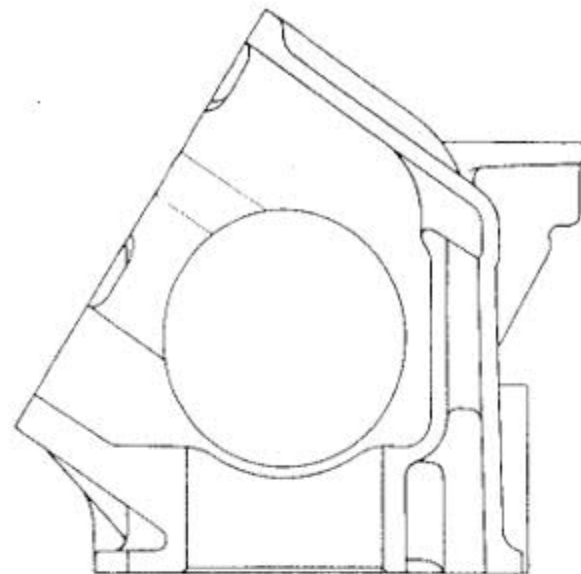
## TAPPET

### INSPECTING

Make sure tappet plate surface in contact with camshaft lobe is glass-like and shows no signs of dishing or pitting.

Fit clearance between tappets and bores in upper cylinder head is 0.0002 to 0.0019 inch (0.005 to 0.050 mm).

\*Basic tappet plate thickness.



MAIN DATA OF VALVE SEATS AND VALVE GUIDE SEATS IN CYLINDER HEAD

101

**REFACING**

Valve seats in cylinder head must not show evidence of pitting in contact face. If pitted, they must be refaced.

Make sure grinding stones have a taper of  $45^\circ \pm 5'$ .

Perform the refacing operation by hand.

Reface valve seat using  $45^\circ$ .

1. Valve seat 2. Grinding stone 3. Pilot

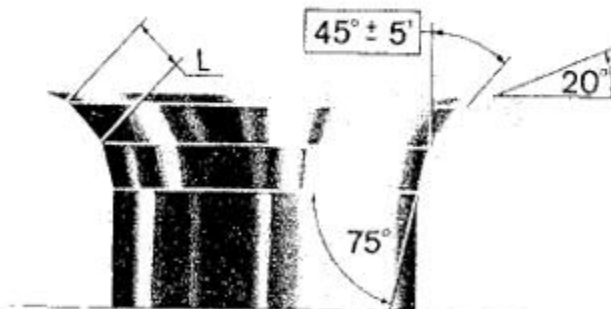


Narrow seat width. Use a  $20^\circ$  valve seat reamer and a  $75^\circ$  reamer alternately.

1. Valve seat 2. Cutter 3. Pilot



The width of intake and exhaust valve seats, after narrowing should be  $L = 0.08$  inch (2 mm) approximately.

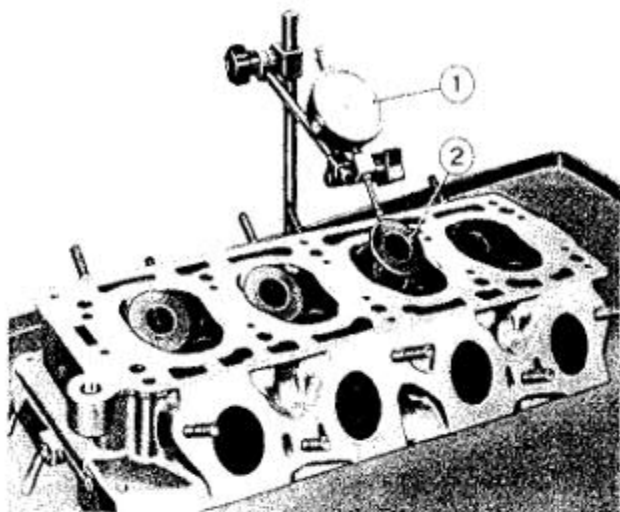




Valve stem must not be distorted or cracked. If necessary, replace valve.

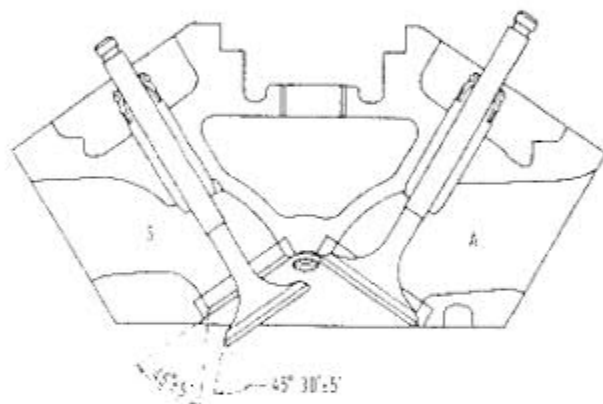
Maximum runout in a full turn, guided by stem with dial indicator resting at center of contact face, should not exceed 0.0012 inch (0.03 mm).

1. Dial indicator 2. Intake valve



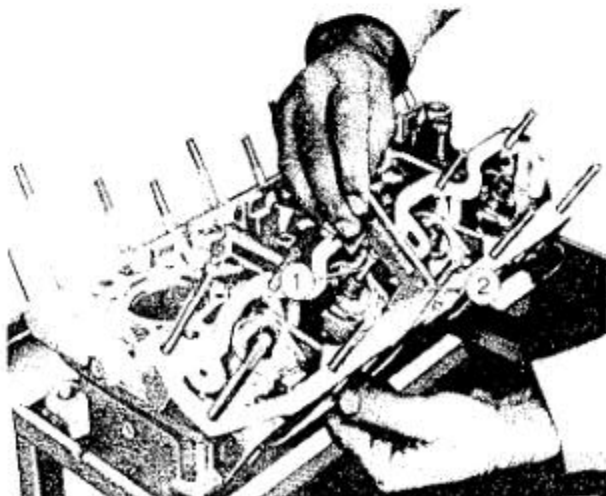
Check valve face for wear or damage. If necessary, reface valve.

After refacing, check that the thickness of the valve at edge of head is not less than 0.02 inch (0.5 mm).



After refacing, valve will seat lower in its seat and result in excessive valve stem (2) height. Check height of valve stem above cylinder head with gage A.96218 (1) as shown. If height exceeds gage check, valve stem must be ground off to reduce height within limits.

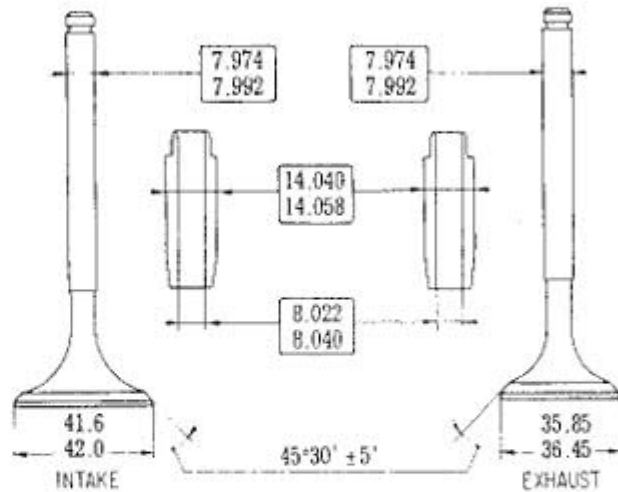
1. Gage A.96218 2. Valve stem



## VALVE GUIDES AND SPRINGS

## REPLACING

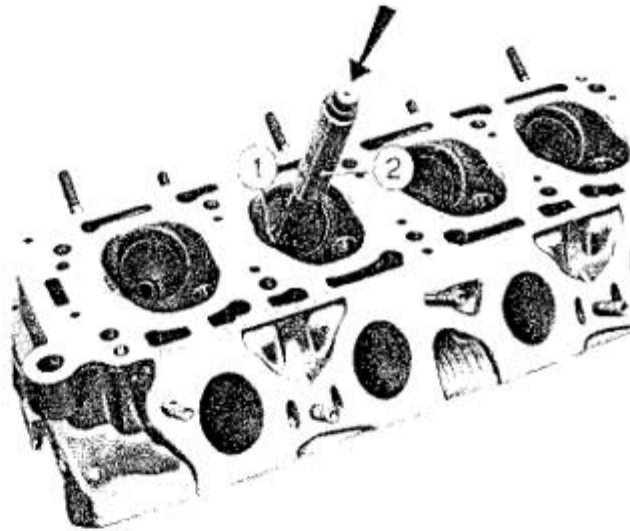
Valve stem to valve guide clearance is 0.0012 to 0.0026 inch (0.030 to 0.066 mm).



Valve guides (1) should be replaced whenever an excessive clearance between valve stem and guide cannot be corrected by replacing the valve or if guides become loose in their bores in the head.

Use tool A.60395 (2) to remove guides.

1. Valve guides 2. Tool A.60395

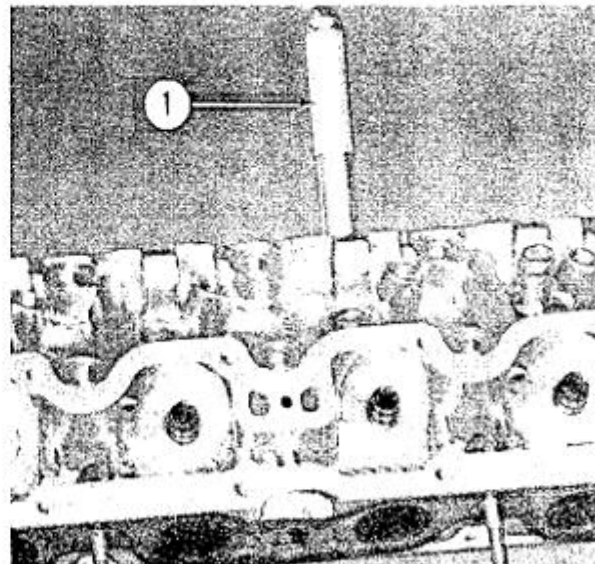


Press guides into lower cylinder head.

Use tool A.60462.

The interference between guide and bore is 0.0024 to 0.0042 in. (0.063 to 0.108 mm).

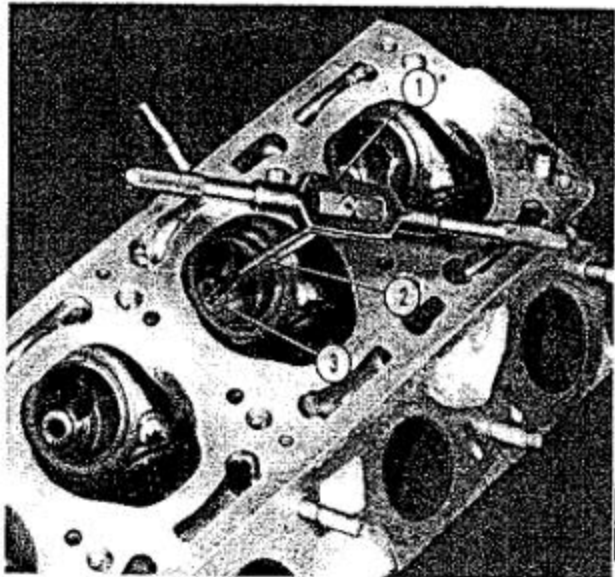
1. Tool A.60462



Replacement guides (3) are prefinished to size on the inside diameter.

If press fitting causes minor faults, refinish guide. Use reamer A.90310 (2).

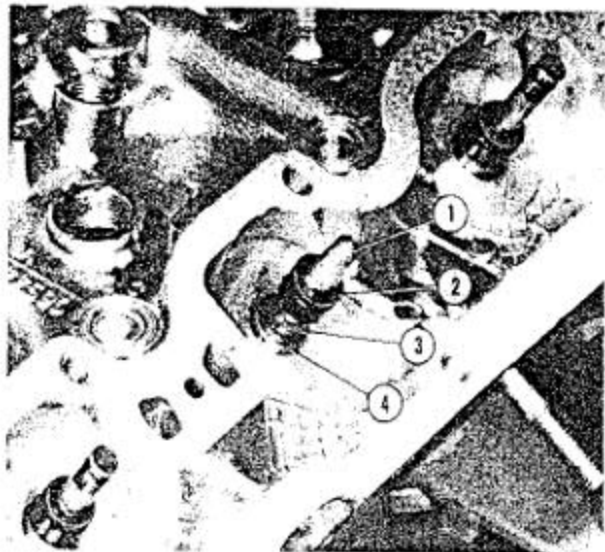
1. Mandrel 2. Reamer A.90310 3. Valve guide



Install oil seal (2) on valve guides (4) as follows:

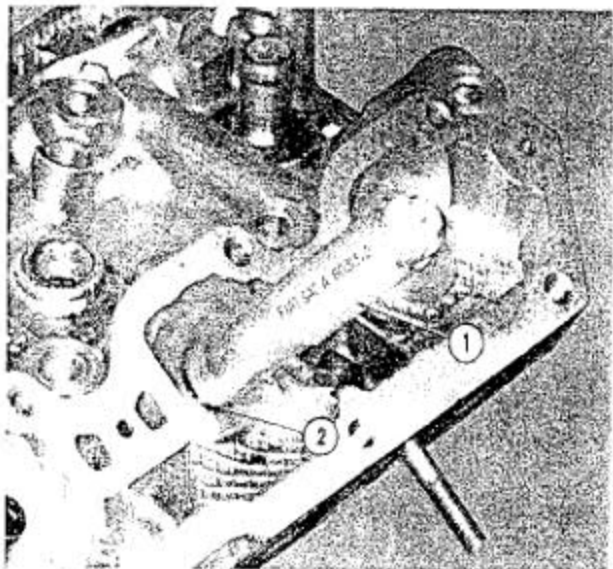
Place oil seal on pilot A.60313 (1). Mount pilot on valve stem (3). Slide seal over stem.

1. Pilot 2. Oil seal 3. Valve stem 4. Valve guide



Press oil seal onto milled upper end of valve guide (2). Use installer A.60313/2 (1).

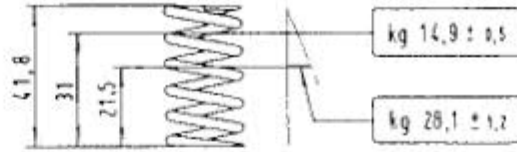
1. Installer A.60313/2 2. Valve guide



Test spring tension using fixture AP.5049.

Main data for testing valve inner springs.

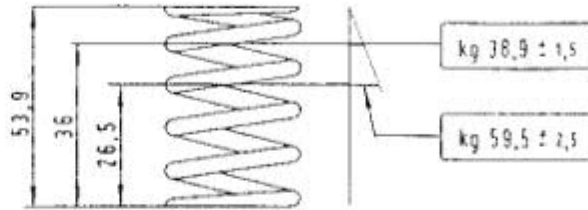
41.8 mm = 1.646 in	14.9 ± 0.5 kg = 33 ± 1.1 lbs
31 mm = 1.220 in	28.1 ± 1.2 kg = 64 ± 2.6 lbs
21.5 mm = .846 in	



Then compare the tension and deflection data read on the test fixture with the spring specifications shown on opposite figures.

Main data for testing valve outer springs.

53.9 mm = 2.122 in	38.9 ± 1.5 kg = 85 ± 3.3 lbs
36 mm = 1.417 in	59.5 ± 2.5 kg = 141 ± 5.5 lbs
26.5 mm = 1.043 in	



### MAIN DATA FOR TESTING VALVE SPRINGS

## REPLACING AND ADJUSTING DRIVE BELTS

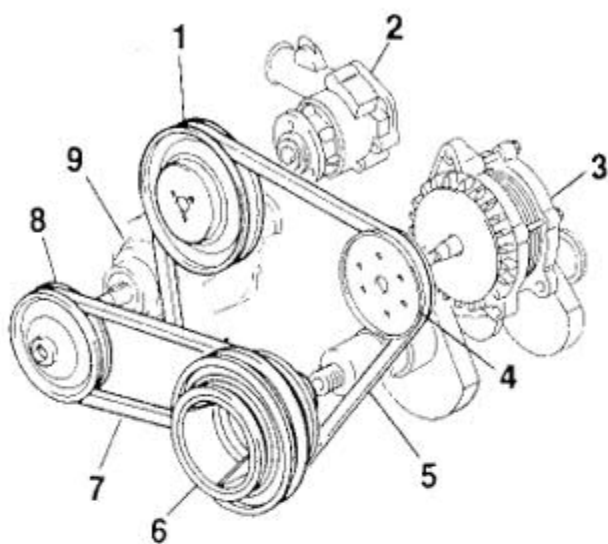
To replace drive belts, loosen alternator (3) mount bolts. Remove belt (5).

On vehicles with air pump, loosen air pump (9) mount bolts. Remove belt (7).

### Air Pump Belt

Install new belt (7) on air pump pulley (8) and crankshaft pulley (6). Install belt on rear groove of pulley (6). Fully tighten air pump belt (7) and air pump mount bolts. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

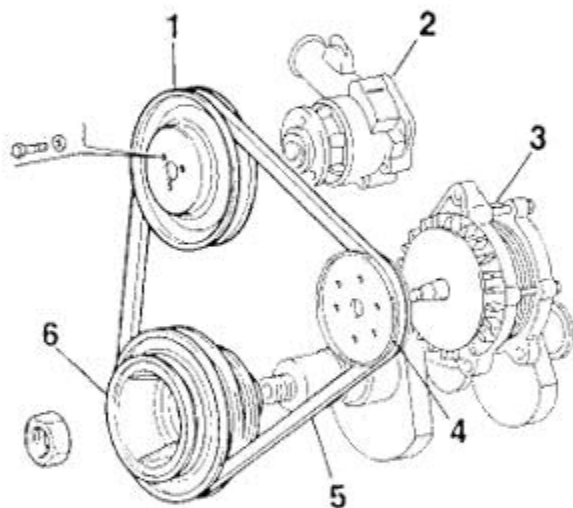
- 1, Water pump pulley 2, Water pump 3, Alternator  
4, Alternator pulley 5, Water pump/alternator belt  
6, Crankshaft pulley 7, Air pump belt 8, Air pump pulley  
9, Air pump



### Alternator/Water Pump Belt

Install new belt (5) on water pump pulley (1), alternator pulley (4) and center groove on crankshaft pulley (6). Fully tighten belt (5) and alternator mount bolts. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

- 1, Water pump pulley 2, Water pump 3, Alternator  
4, Alternator pulley 5, Water pump/alternator belt  
6, Crankshaft pulley

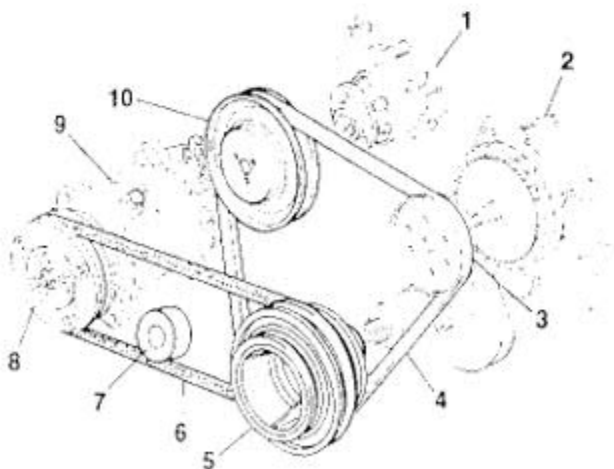


### A.C. Belt Without Turbo

Install new belt (6) over rear groove on crankshaft pulley (5) and front groove on compressor clutch (8). Make sure belt is under eccentric idler pulley (7). Make sure compressor (9) mounting bolts are tight.

Rotate idler pulley (7) down to set belt tension. Tighten bolt holding eccentric to bracket. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

- 1, Water pump 2, Alternator 3, Alternator pulley  
4, Water pump/alternator belt 5, Crankshaft pulley 6, A.C. belt  
7, Eccentric idler pulley 8, Compressor clutch 9, Compressor  
10, Water pump pulley



**A.C. Belt With Turbo**

Place new belt (6) over front groove of compressor clutch (8) and front groove of crankshaft pulley (5).

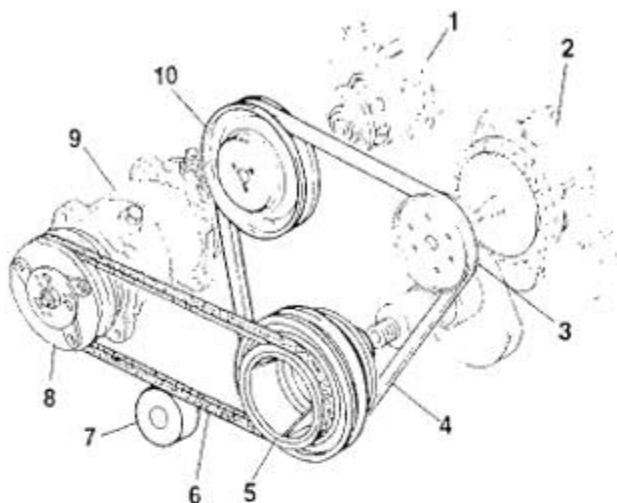
**NOTE:** Belt is exact fit and must be gently jumped over crankshaft pulley by turning engine with wrench (tool No. 50121).

Gently pull top of compressor (9) out and tighten upper front mounting bolt. Tighten lower front mounting bolt and then remaining two rear mounting bolts.

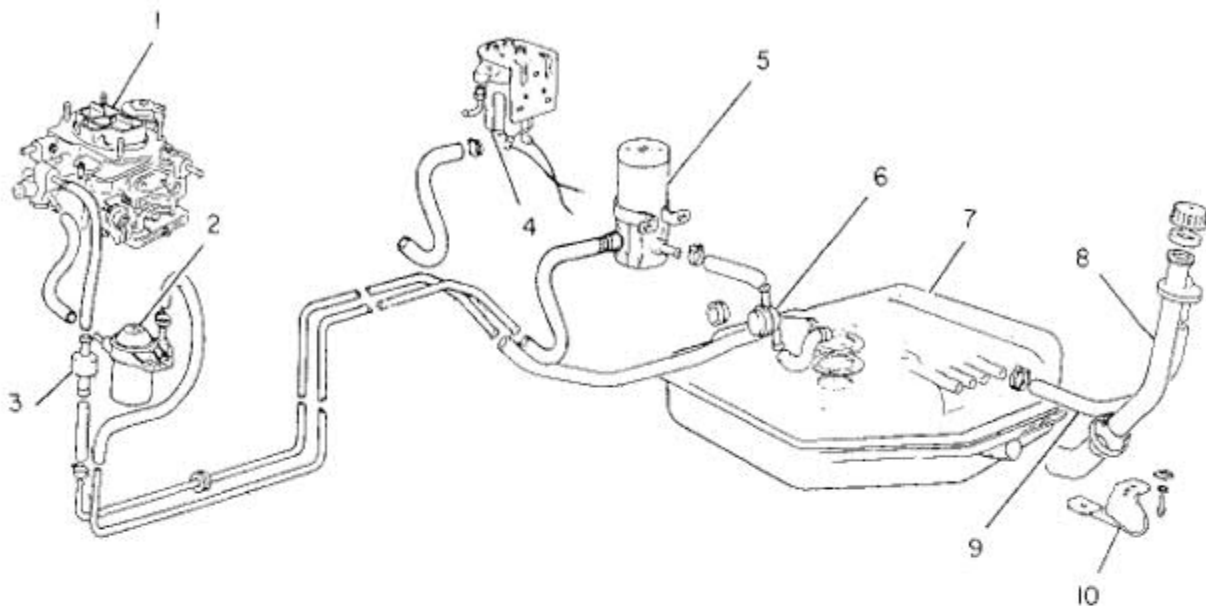
**NOTE:** This sets the drive belt tension.

Rotate eccentric idler pulley (7) up slightly against the belt (6). Tighten the bolt holding eccentric to compressor bracket.

**NOTE:** The drive belt (6) is at its proper tension when compressor (9) was adjusted. The idler pulley (7) is used for future belt adjustment if and when necessary.

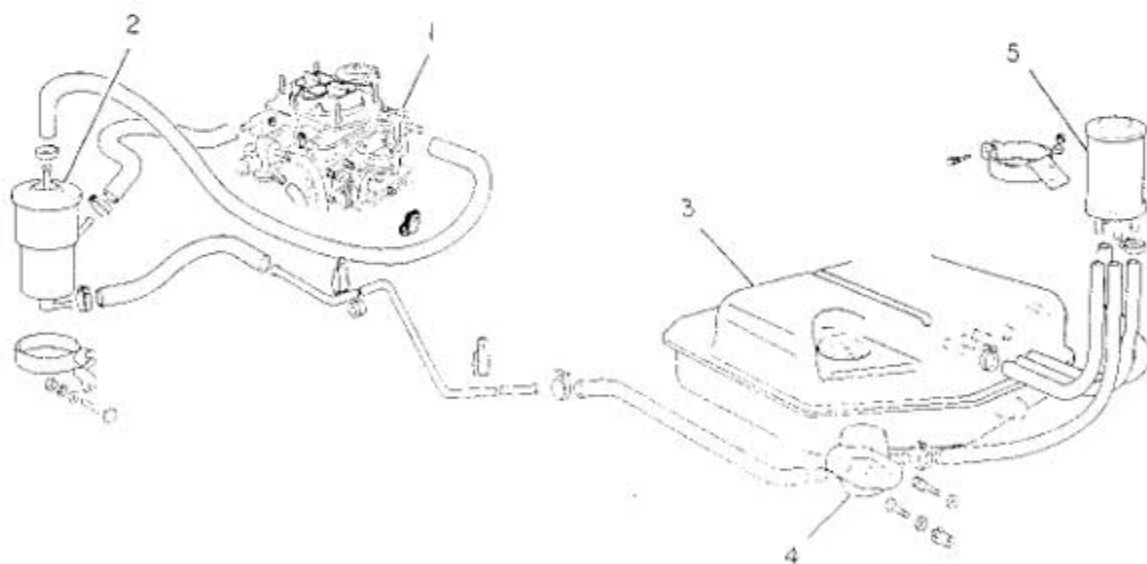


- 1, Water pump 2, Alternator 3, Alternator pulley  
 4, Water pump/alternator belt 5, Crankshaft pulley 6, A.C. belt  
 7, Eccentric idler pulley 8, Compressor clutch 9, Compressor  
 10, Water pump pulley



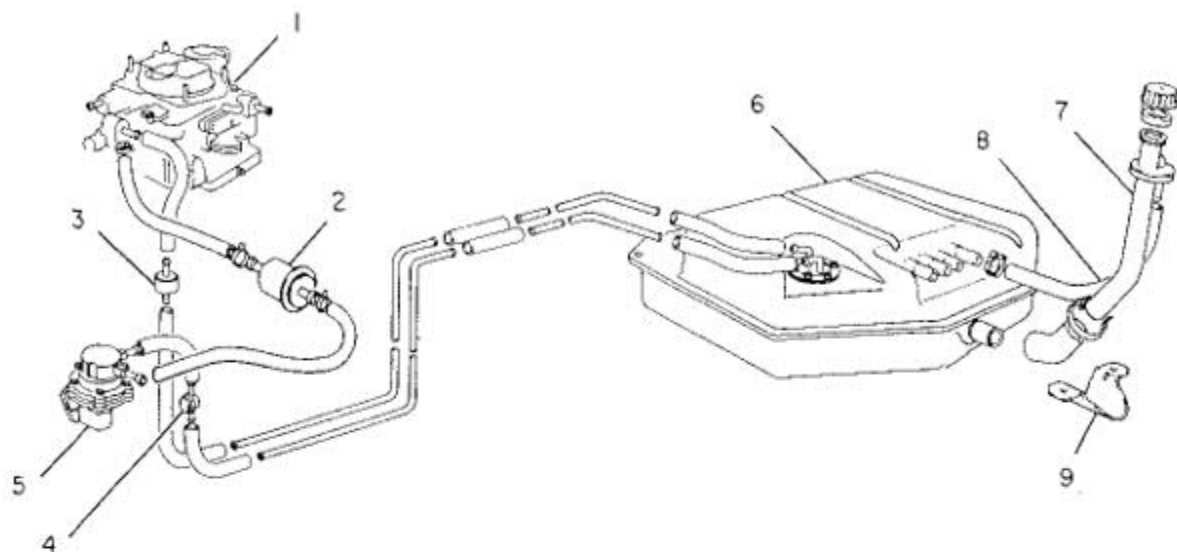
- |   |                        |
|---|------------------------|
| 1. Carburetor                                 | 6. Check valve         |
| 2. Fuel filter                                | 7. Fuel tank           |
| 3. Check valve                                | 8. Filler line         |
| 4. Fuel pump, Carter (replacement for Corona) | 9. Overflow line       |
| 5. Fuel pump, Corona                          | 10. Filler line shield |

FUEL TANK AND LINES (1975 to early 1977)



- |  |
|--|
| 1. Carburetor                            |
| 2. Charcoal trap                         |
| 3. Fuel tank                             |
| 4. Check valve and pressure relief valve |
| 5. Vapor/liquid separator                |

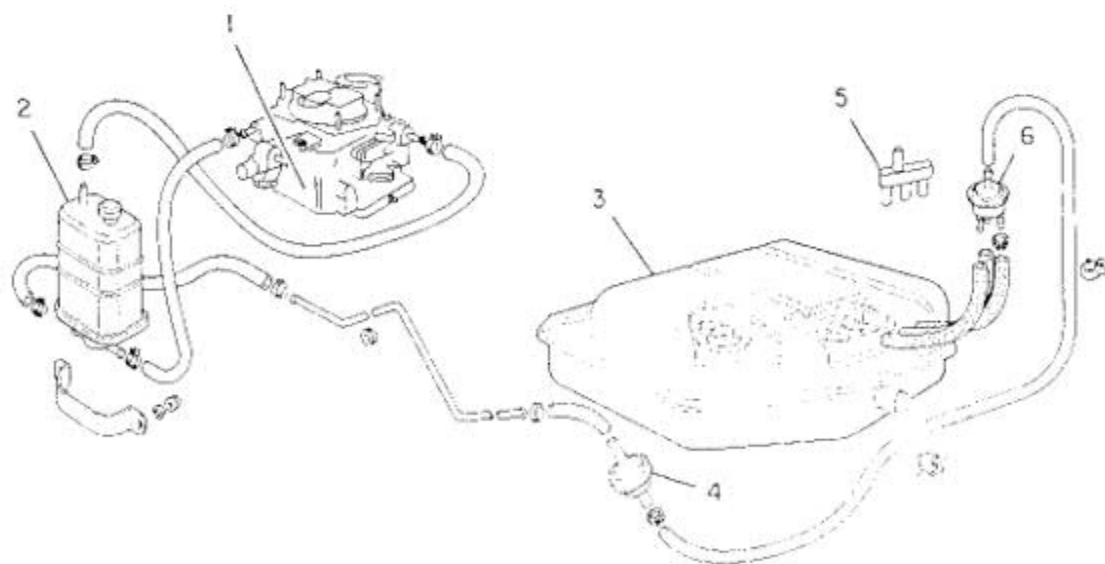
FUEL VAPOR LINES (1975 to early 1977)



1. Carburetor
2. Fuel filter
3. Check valve
4. Check valve
5. Fuel pump

6. Fuel tank
7. Filler line
8. Overflow line
9. Filler line shield

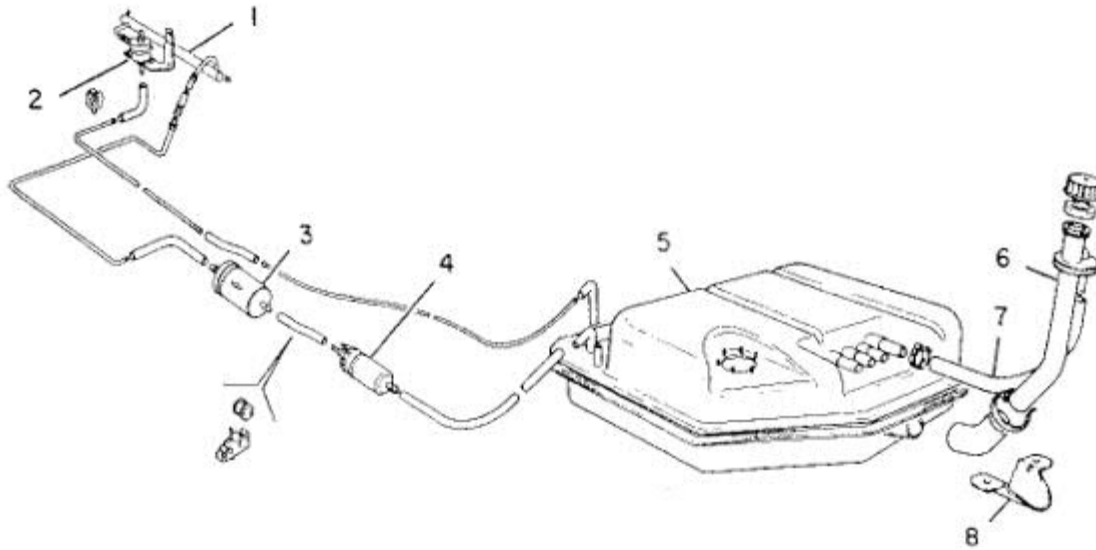
FUEL TANK AND LINES (1977 to early 1980)



1. Carburetor
2. Charcoal trap
3. Fuel tank
4. Two-way valve
5. Vapor/liquid separator

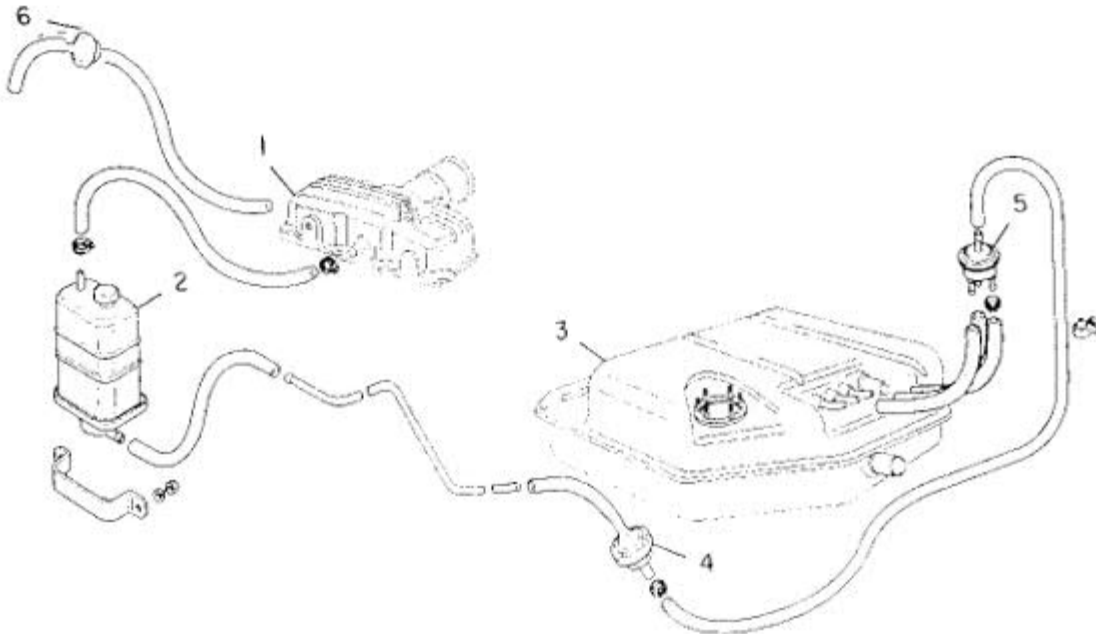
FUEL VAPOR LINES (1977 to early 1980)





- |                            |                       |
|----------------------------|-----------------------|
| 1. Fuel manifold           | 5. Fuel tank          |
| 2. Fuel pressure regulator | 6. Filler line        |
| 3. Fuel filter             | 7. Overflow line      |
| 4. Fuel pump               | 8. Filler line shield |

FUEL TANK AND LINES (1980 and on, fuel injected)



- |                                    |
|------------------------------------|
| 1. Intake manifold                 |
| 2. Charcoal trap                   |
| 3. Fuel tank                       |
| 4. Two-way valve                   |
| 5. Vapor/liquid separator          |
| 6. Check valve (Spider Turbo only) |

FUEL VAPOR LINES (1980 and on, fuel injected)

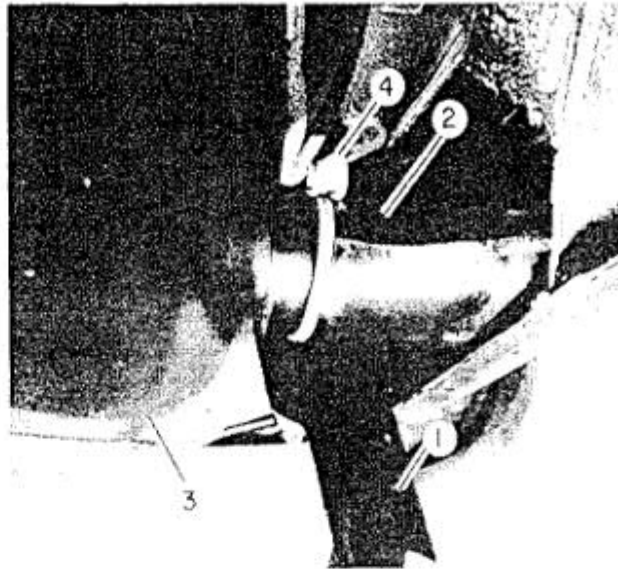
10

**FUEL TANK****REMOVAL AND INSTALLATION**

Drain or siphon fuel tank.

From under vehicle, remove two screws holding filler line shield (1). Loosen clamp (4) holding filler line (2) to tank (3) and pull line from tank.

1. Filler line shield 2. Filler line 3. Fuel tank 4. Clamp



Open trunk and remove carpeting, spare tire cover, fuel tank cover and spare tire.

Disconnect two electrical connectors (1) from fuel sending unit (2).

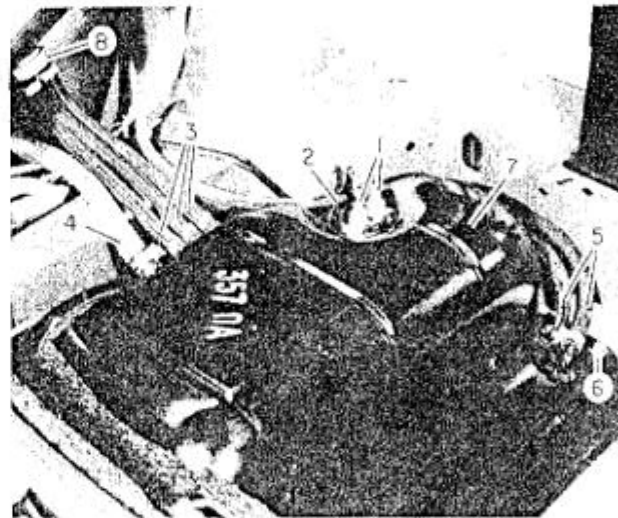
Loosen clamps on fuel vapor lines (3) and overflow line (4). Pull lines off.

Loosen clamps on fuel lines (5) and pull lines off (on carburetor vehicles, fuel lines are attached to sending unit).

Remove four nuts (6) holding tank (7) to body. Lift tank out of trunk area.

Installation is reverse of removal.

1. Electrical connector 2. Fuel sending unit 3. Fuel vapor lines  
4. Overflow line 5. Fuel lines 6. Nut 7. Fuel tank  
8. Vapor/liquid separator

**SENDING UNIT****REMOVAL AND INSTALLATION**

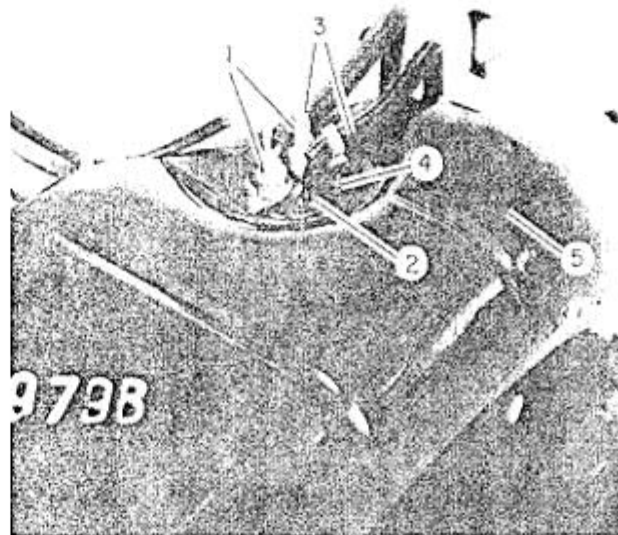
Open trunk and remove carpeting and fuel tank cover.

Disconnect two electrical connectors (1) from fuel sending unit (2). On carburetor vehicles (shown) loosen clamps on two fuel lines (3) and remove lines.

Remove six nuts (4) holding sending unit to tank (5) and carefully remove sending unit and gasket.

Installation is reverse of removal. Replace gasket during installation.

1. Electrical connector 2. Fuel sending unit 3. Fuel lines 4. Nut  
5. Fuel tank



### FUEL PUMP (1975 to early 1977)

#### REMOVAL AND INSTALLATION

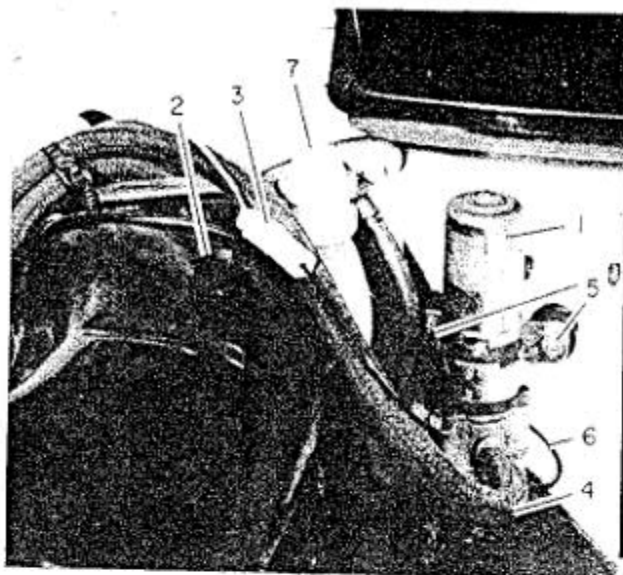
The electric fuel pump (1), either a Carter or a Corona (shown), is located in trunk area next to fuel tank (2).

From trunk compartment, remove carpeting, fuel tank cover, spare tire cover and spare tire.

Disconnect electrical connector (3) to pump. Loosen clamps on fuel inlet and outlet lines (4) and pull lines from pump. Remove two nuts (5) holding pump to body, remove pump.

Installation is reverse of removal.

1. Fuel pump 2. Fuel tank 3. Electrical connector 4. Fuel lines  
5. Nut 6. Ground wire 7. Vapor system pressure relief valve



### FUEL FILTER/PRESSURE REGULATOR (1975 to early 1977)

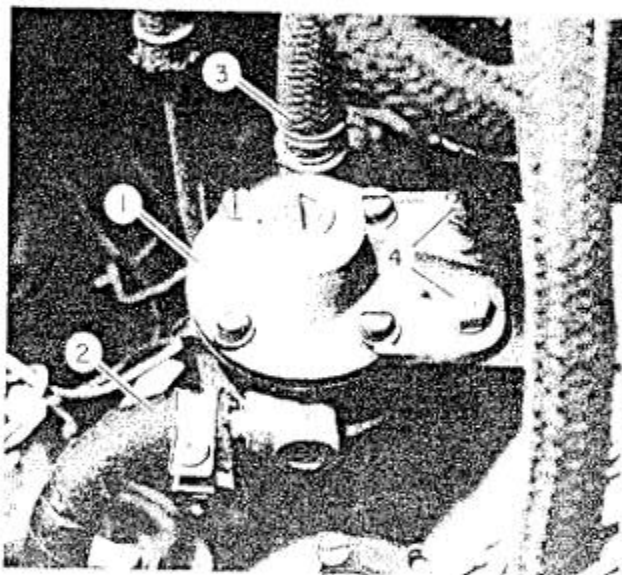
#### REMOVAL AND INSTALLATION

The fuel filter/pressure regulator (1) is located in engine compartment, mounted on left side just forward of and below carburetor.

Loosen clamps on inlet (2) and outlet (3) lines and pull lines from filter/pressure regulator. Remove two bolts (4) holding unit to body and remove filter/pressure regulator.

Installation is reverse of removal.

1. Fuel filter/pressure regulator 2. Fuel inlet line 3. Fuel outlet line  
4. Bolt



### FUEL PUMP (1977 to early 1980)

#### REMOVAL AND INSTALLATION

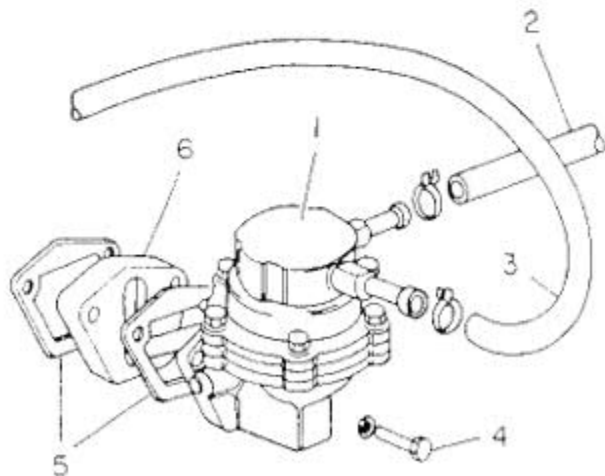
The mechanical fuel pump (1) is bolted to left side of engine.

From underneath vehicle, remove front splash pan.

Loosen clamps on inlet (2) and outlet (3) lines and pull lines from pump. Remove two bolts (4) holding pump to engine and remove pump.

Installation is reverse of removal. Install new gaskets (5).

1. Fuel pump 2. Fuel inlet line 3. Fuel outlet line 4. Bolt  
5. Gasket 6. Spacer



**FUEL FILTER (1977 to early 1980)****REMOVAL AND INSTALLATION**

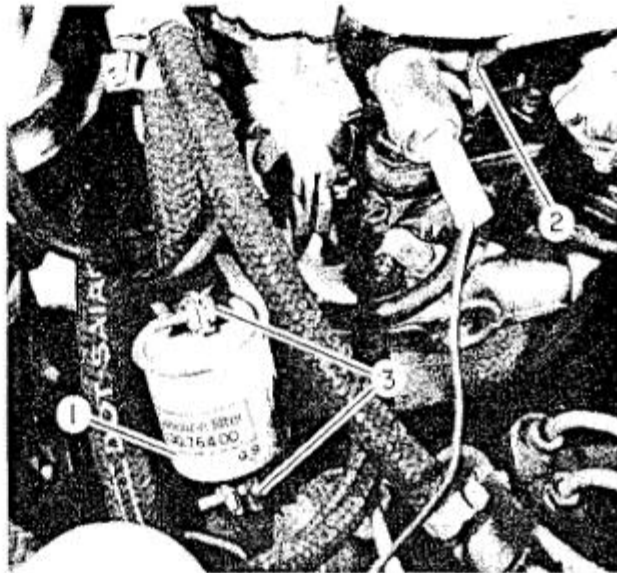
The fuel filter (1) is located in engine compartment near carburetor (2).

Loosen clamps (3) on inlet and outlet lines and pull lines from filter.

Installation is reverse of removal.

**NOTE:** Be certain that arrow on filter points towards carburetor.

1. Fuel filter 2. Carburetor 3. Clamp

**FUEL PUMP (1980 and on, Fuel Injected)****REMOVAL AND INSTALLATION**

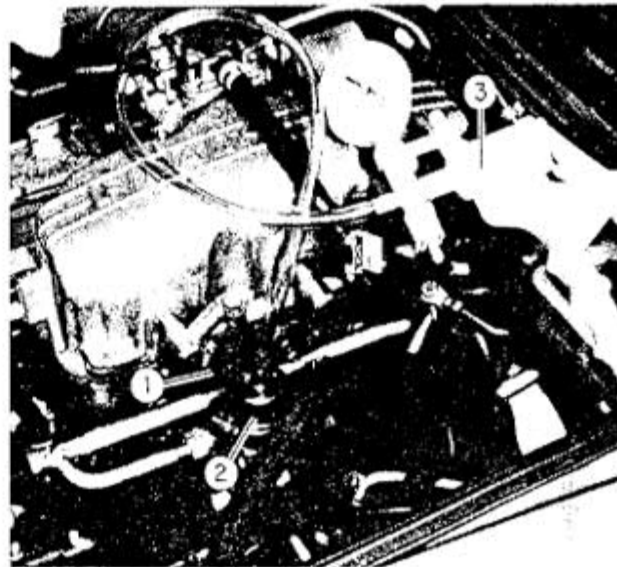
Before disconnecting fuel lines, fuel pressure must first be released.

Remove fuel tank filler cap.

Remove vacuum hose (1) from fuel pressure regulator (2).

Using a hand vacuum pump (3) apply about 25 inches of vacuum to pressure regulator as shown. Fuel system pressure will then be released into fuel tank.

1. Vacuum hose 2. Fuel pressure regulator 3. Hand vacuum pump



The electric fuel pump (1) is located underneath vehicle on left side, just forward of rear axle.

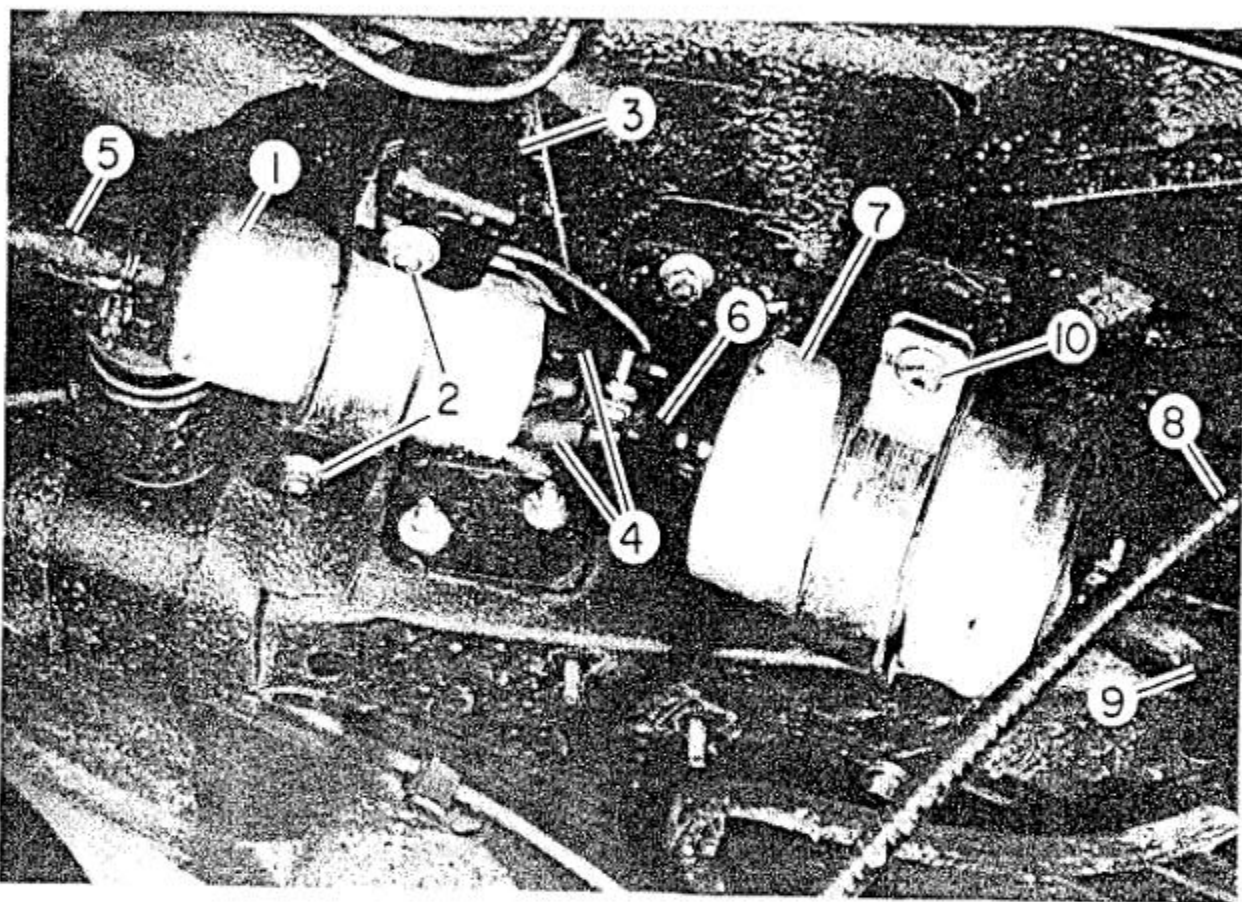
Loosen two nuts (2) holding shield and pump to body mount (3), remove shield.

Disconnect two electrical connectors (4) from pump.

Loosen clamps on fuel inlet (5) and outlet (6) lines and pull lines from pump. Remove pump from outlet.

Installation is reverse of removal.

1. Fuel pump 2. Nut 3. Mount 4. Electrical connector 5. Fuel pump inlet line 6. Fuel line, pump to filter 7. Fuel filter 8. Emergency brake cable 9. Filter outlet line 10. Nut



### FUEL FILTER (1980 and on, Fuel Injected)

#### REMOVAL AND INSTALLATION

The fuel filter (7) is located underneath vehicle on left side, just forward of rear axle.

Before disconnecting fuel lines, system pressure must first be released (see procedure under FUEL PUMP).

Remove two bracket nuts holding emergency brake cable (8) to body. Lower cable out of way, as shown.

Loosen clamps on inlet (6) and outlet (9) lines and pull lines from filter.

Remove two nuts (10) holding shield and filter to body mount. Remove shield and filter.

Installation is reverse of removal.

**NOTE:** Be certain that arrow on filter points toward front of vehicle.

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### AIR CLEANER

#### REMOVAL AND INSTALLATION (Without Fuel Injection)

Remove three nuts (2) holding cover (1) on air cleaner assembly (3). Remove filter element.

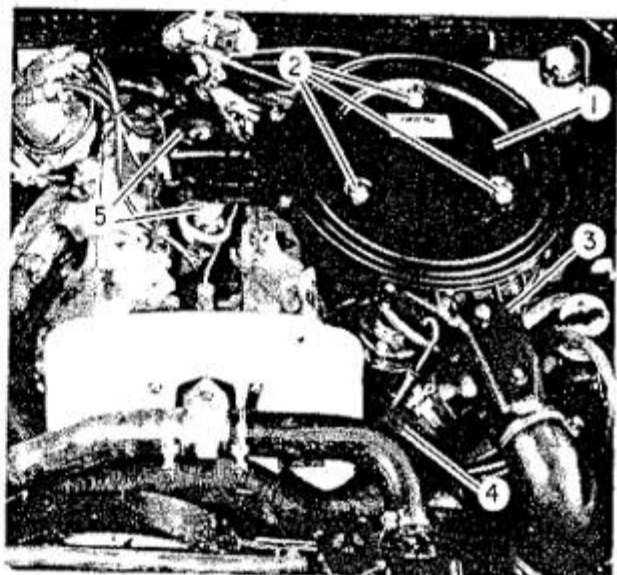
On engines with air induction (shown), remove reed valve hoses (5) from air cleaner. On engines with air pump, remove air injection hose from air cleaner.

If equipped with hot air hose (4), loosen clamp and remove hose from snorkel.

Remove four nuts holding air cleaner to carburetor. Lift air cleaner, then disconnect two hoses from bottom. Remove air cleaner.

Install in reverse order. Make sure metal bushings are installed in rubber spacer.

1. Cover 2. Nut 3. Air cleaner assembly 4. Hot air hose  
5. Reed valve hose



### AIR CLEANER

#### REMOVAL AND INSTALLATION (With Fuel Injection)

**NOTE:** The air filter element should be changed every 30,000 miles. If vehicle is frequently driven in heavy traffic or sandy or dusty areas, it is recommended to replace filter every 15,000 miles.

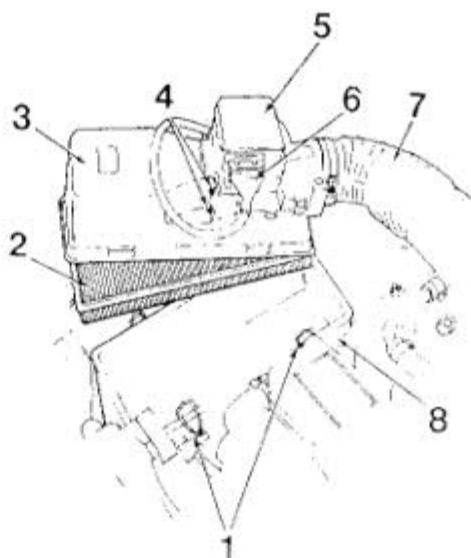
Using a screwdriver, release the four catches (1).

Lift the cover (3) off and remove the filter (2).

Install new filter and replace cover.

Secure catches by pressing on curved section.

1. Catch 2. Filter 3. Cover 4. Bolts 5. Air flow sensor  
6. Connector 7. Air hose 8. Housing



### CARBURETOR

#### REMOVAL AND INSTALLATION

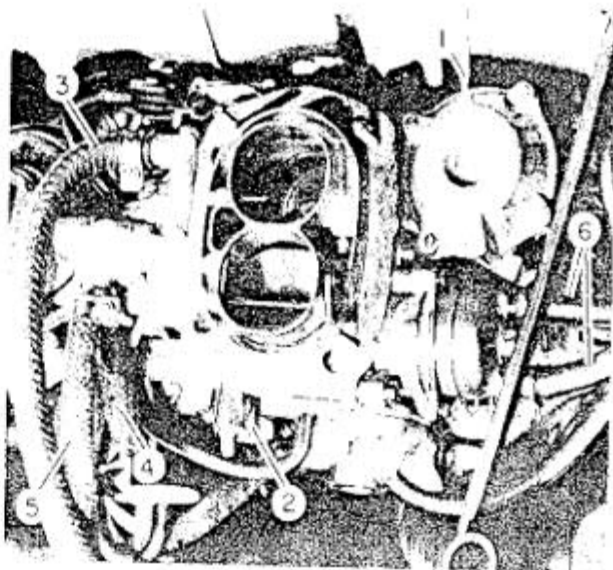
Remove air cleaner.

Remove spring clip and disconnect accelerator rod (1). Disconnect wire from idle stop solenoid (2). Disconnect vacuum lines from carburetor. Disconnect float bowl vapor line (3). Disconnect fuel inlet (4) and return (5) lines. Disconnect hot water lines (6) to automatic choke.

Remove four nuts at base of carburetor and remove carburetor.

**NOTE:** As an aid to connecting vacuum lines, there are color coded plastic clips at the base of five vacuum connectors on carburetor. These colors match colors on lines that are attached to connectors.

1. Accelerator rod 2. Idle stop solenoid 3. Vapor line 4. Fuel inlet line  
5. Fuel return line 6. Hot water lines



## AIR CLEANER

### REMOVAL AND INSTALLATION (Without Fuel Injection)

Remove three nuts (2) holding cover (1) on air cleaner assembly (3). Remove filter element.

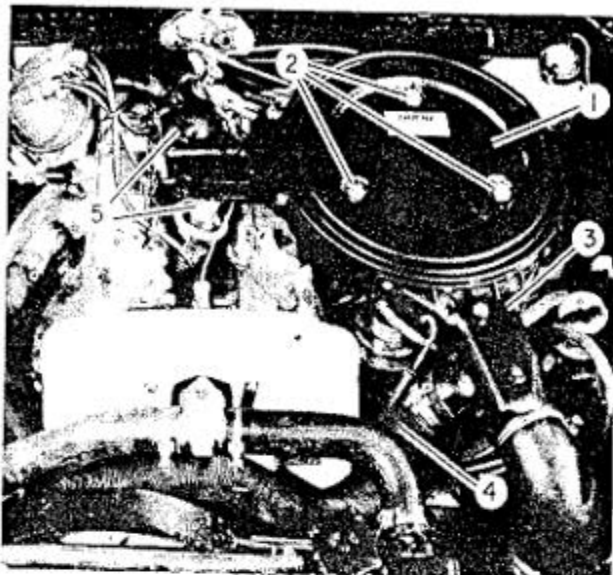
On engines with air induction (shown), remove reed valve hoses (5) from air cleaner. On engines with air pump, remove air injection hose from air cleaner.

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Remove four nuts holding air cleaner to carburetor. Lift air cleaner, then disconnect two hoses from bottom. Remove air cleaner.

Install in reverse order. Make sure metal bushings are installed in rubber spacer.

1. Cover 2. Nut 3. Air cleaner assembly 4. Hot air hose  
5. Reed valve hose



## AIR CLEANER

### REMOVAL AND INSTALLATION (With Fuel Injection)

**NOTE:** The air filter element should be changed every 30,000 miles. If vehicle is frequently driven in heavy traffic or sandy or dusty areas, it is recommended to replace filter every 15,000 miles.

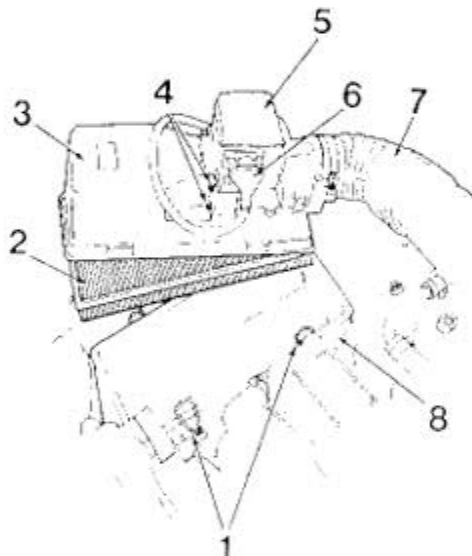
Using a screwdriver, release the four catches (1).

Lift the cover (3) off and remove the filter (2).

Install new filter and replace cover.

Secure catches by pressing on curved section.

1. Catch 2. Filter 3. Cover 4. Bolts 5. Air flow sensor  
6. Connector 7. Air hose 8. Housing



## CARBURETOR

### REMOVAL AND INSTALLATION

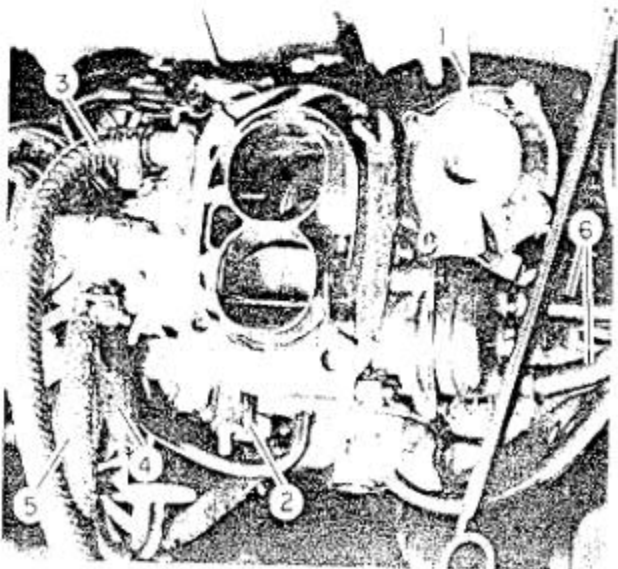
Remove air cleaner.

Remove spring clip and disconnect accelerator rod (1). Disconnect wire from idle stop solenoid (2). Disconnect vacuum lines from carburetor. Disconnect float bowl vapor line (3). Disconnect fuel inlet (4) and return (5) lines. Disconnect hot water lines (6) to automatic choke.

Remove four nuts at base of carburetor and remove carburetor.

**NOTE:** As an aid to connecting vacuum lines, there are color coded plastic clips at the base of five vacuum connectors on carburetor. These colors match colors on lines that are attached to connectors.

1. Accelerator rod 2. Idle stop solenoid 3. Vapor line 4. Fuel inlet line 5. Fuel return line 6. Hot water lines





**ADJUSTMENT****Float Level Adjustment**

Remove six screws holding float bowl cover to carburetor. Remove cover, being careful not to damage gasket.

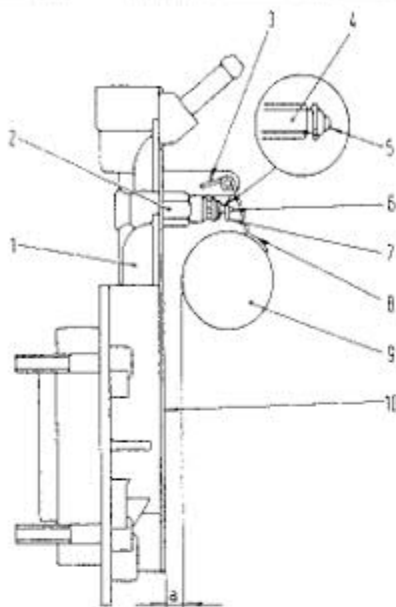
Check that needle valve (2) is screwed down in housing. Check that float (9) is free of dents or punctures.

Check that float can move freely on hinges.

Check distance (a) between float and cover face gasket with float in vertical position.

a = 0.236 to 0.275 in. (6 to 7 mm)

1. Carburetor cover 2. Needle valve 3. Lug 4. Valve needle  
5. Movable ball 6. Return hook 7. Tang 8. Float arm 9. Float  
10. Gasket

**Idle and CO Adjustment**

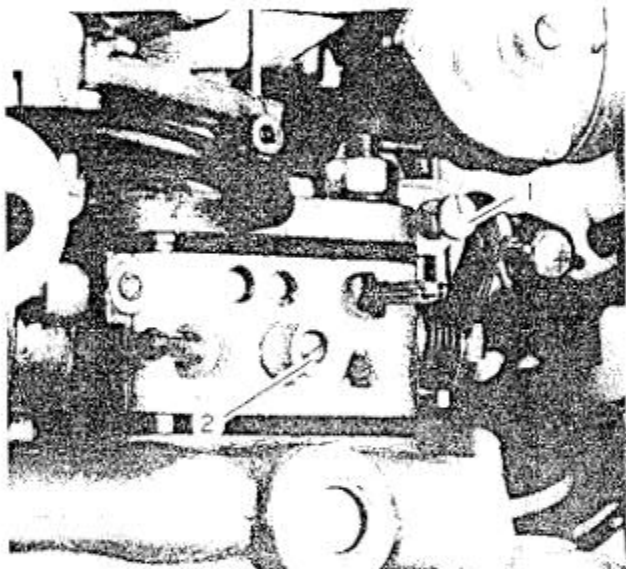
On engines with air induction, remove air cleaner cover and block inlet to reed valves. Reinstall cover.

On engines with air pump, pinch off air injection hose between check valve and tee fitting.

In all engines, connect tachometer. Apply handbrake. Start engine and allow it to warm up. Insert CO tester probe in tailpipe.

Check normal idle and CO. On cars with manual transmission, normal idle speed should be 800 to 900 rpm. On cars with automatic transmission, normal idle speed should be 700 to 800 rpm in drive. Check information tag in engine compartment for correct CO setting.

1. Idle speed screw 2. Idle mixture screw

**High Idle Speed (1975 to 1978 only)**

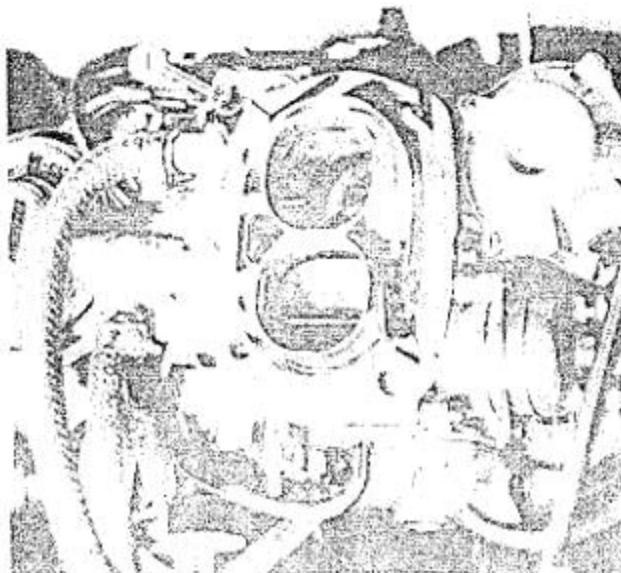
Let engine idle. Place transmission in NEUTRAL.

Move throttle linkage to obtain 2500 rpm. Hold linkage and push high idle button, located on left fender well, down. Hold button down and release carburetor linkage. Allow engine to decelerate to high idle. Check that high idle is 1550 to 1650 rpm (manual trans.) or 1250 to 1350 rpm (auto. trans.).

If high idle is not correct, adjust screw (1). Turn screw in to decrease or out to increase rpm.

While button is kept depressed, accelerate engine several times to check whether fast idle rpm is correct. If not, readjust.

1. High idle speed screw



## AUTOMATIC CHOKE

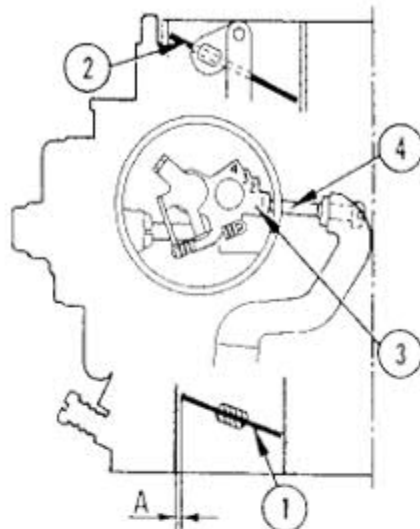
### CHECKS AND ADJUSTMENTS

Remove carburetor from car. Remove 3 screws holding automatic choke cover. Remove cover and gasket.

#### Choke Fast Idle

Set fast idle screw (4) on first (highest) step of cam (3). Check that primary throttle opening (dimension A) is 1.05 to 1.15 mm (0.042 to 0.046 in.). If dimension A is not correct, adjust screw (4).

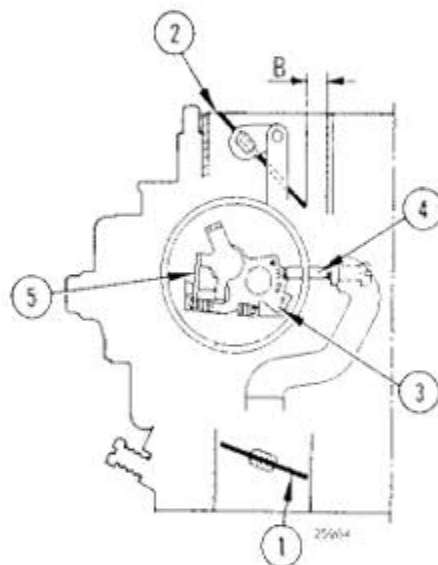
1. Primary throttle plate 2. Choke plate 3. Fast idle cam  
4. Fast idle adjustment screw



#### Fast Idle Cam

Set fast idle screw (4) on third step of cam (3). Check that choke plate opening (dimension B) is 6.25 to 6.74 mm (0.246 to 0.266 in.). Use 1/4 inch and 17/64 inch drill bits to check dimension. If dimension B is not correct carefully bend arm (5).

1. Primary throttle plate 2. Choke plate 3. Fast idle cam  
4. Fast idle screw 5. Choke lever arm



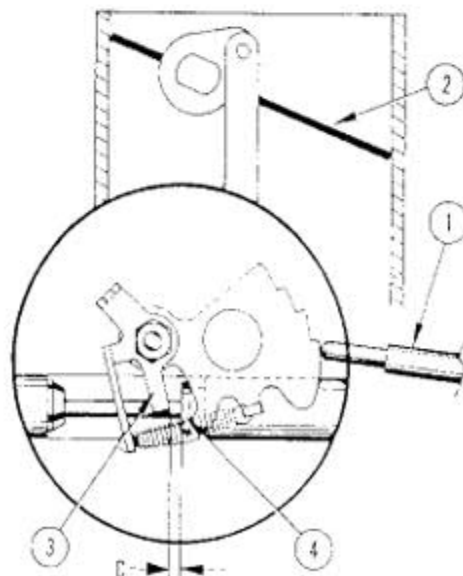
#### Choke Unloader

Pull fast idle linkage (1) back. Close choke plate (2). Release linkage (1).

Measure gap (c) between lever (3) and shoulder of bushing (4). A spark plug gap gauge of the bent wire type can be used.

Gap should be 0.3 to 1.0 mm (0.012 to 0.039 in.). If gap is not correct, carefully bend tang (3).

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



**Choke Plate Minimum Opening**

Set fast idle screw (2) on second step of cam (3). Separate tool 4900 into its 3 parts by unscrewing. Thread tool (1) into end of vacuum piston bore as far as it will go without forcing.

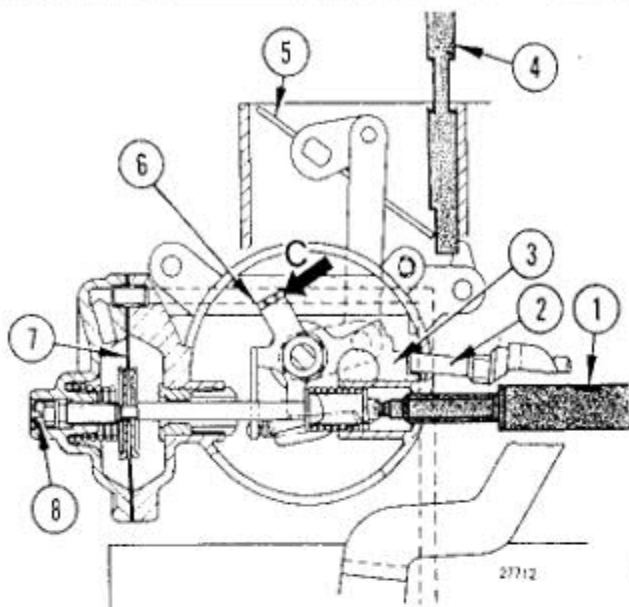
Push lever (6) in direction of arrow (C) and hold it. Measure choke plate opening using tool gauge (4). Opening should be 4.7 mm (0.177 in.).

**NOTE:** Notch on tool (4) is 4.5 mm. If opening is too small, back off stop screw (8) and turn tool half (1) further in until 4.5 mm is obtained. Turn stop screw in until it contacts piston.

If opening is too large, back off tool (1) until 4.5 mm is obtained. Turn stop screw (8) in until it contacts piston.

Leave tool (1) in place for next check.

1. Tool (threaded end) 2. Fast idle screw 3. Fast idle cam  
4. Tool gauge 4.5 mm (notched end) 5. Choke plate  
6. Choke plate opening lever 7. Diaphragm 8. Stop screw

**Choke Plate Maximum Opening**

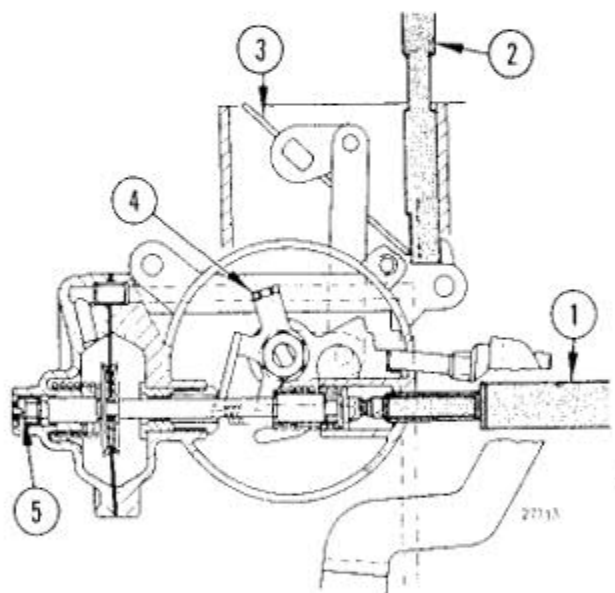
After having checked minimum opening setting and with tool (1) in place, release lever (4). Check that opening is 6.7 mm (0.264 in.).

Use tool gauge (2) to check opening.

**NOTE:** Notch on tool is 6.7 mm.

If opening is not within specifications, replace vacuum diaphragm assembly.

1. Tool (threaded end) 2. Tool gauge 6.7 mm 3. Choke plate  
4. Choke plate opening lever 5. Diaphragm travel stop screw

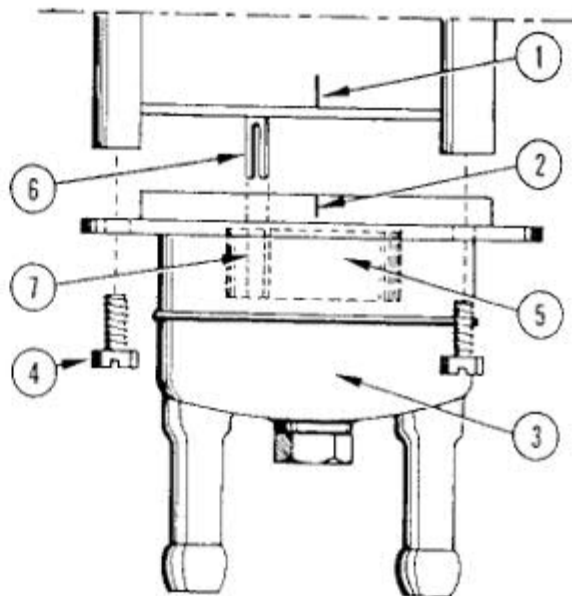


### Choke Cover Indexing

Place choke cover (3) on housing so that lug (7) on spring (5) inside cover is in fork (6) of choke opening lever. Rotate cover to align index marks (2) on cover with marks (1) on housing. Secure cover (3) with 3 screws (4).

With index marks aligned and carburetor at room temperature of 77°F, check that choke plate closes fully and remains closed when primary throttle is opened.

1. Housing mark 2. Cover mark 3. Choke cover 4. Screw  
5. Thermostatic spring 6. Choke opening lever fork 7. Spring lug



### SECONDARY THROTTLE PLATE GAP

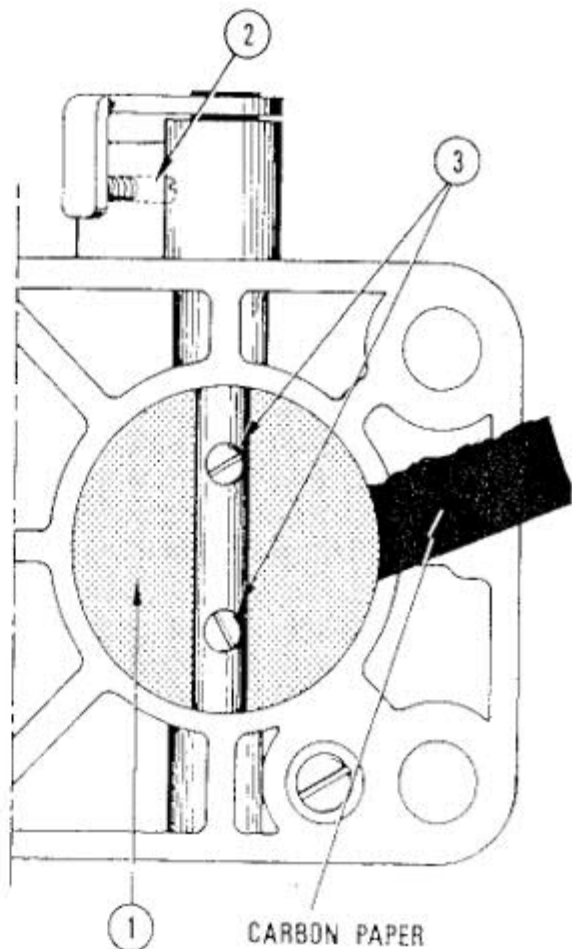
#### CHECK AND ADJUSTMENT

With throttle linkage released, secondary throttle plate (1) should have an opening of 0.04 to 0.05 mm (0.0015 to 0.0019 in.). This dimension is about the thickness of a piece of type-writer carbon paper.

To check opening, open secondary throttle plate (1). Place a strip of carbon paper inside barrel. Release secondary throttle plate. Turn screw (2) as necessary until a resistance is felt when pulling strip out of barrel without tearing it.

Using a light from behind throttle plate (1), check that gap is even around plate. If not, loosen 2 screws (3) holding plate to shaft. Center plate and tighten screws. Check gap again.

1. Throttle plate 2. Secondary throttle plate screw  
3. Throttle plate mounting screws

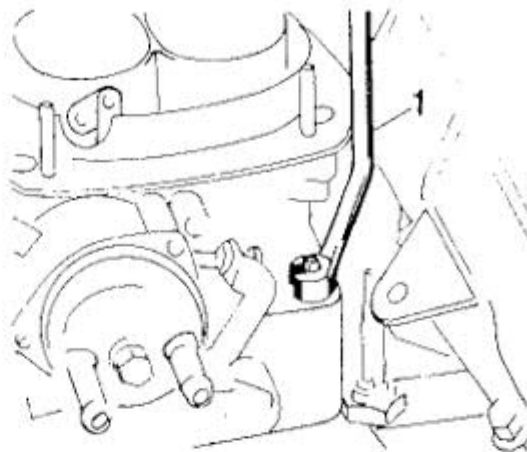


**CARBURETOR****ENGINE COLD CHECKS**

If carburetor was removed, install it. Do not install air cleaner cover. If carburetor was not removed, remove air cleaner cover.

Make sure the four 13 mm nuts holding carburetor are tight. Use wrench A.50146 (1) to tighten two inboard nuts.

1. Wrench A.50146

**Idle Cut-Off Solenoid Check**

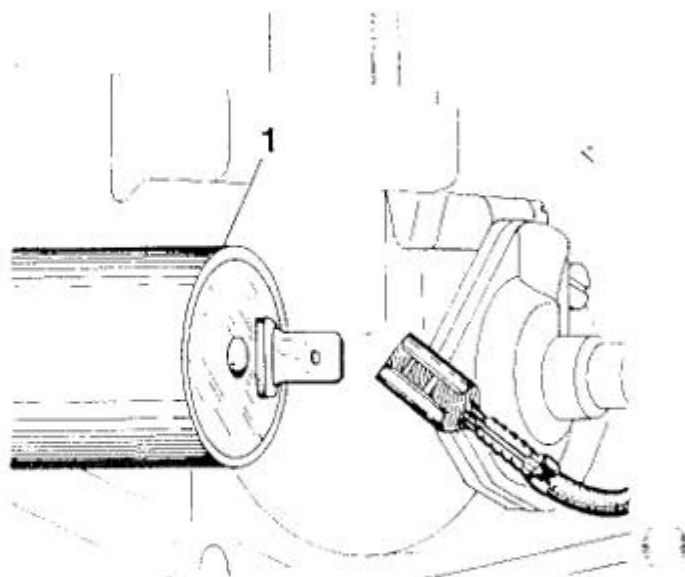
Disconnect wire from solenoid (1). Turn ignition switch to ON without cranking engine.

Listen closely while reconnecting wire to solenoid. A click from solenoid should be heard while connecting wire.

Repeat as necessary to confirm.

If click is not heard, check for voltage at solenoid connection. If no voltage, troubleshoot electrical system. If voltage is present, remove solenoid. Clean or replace solenoid as necessary.

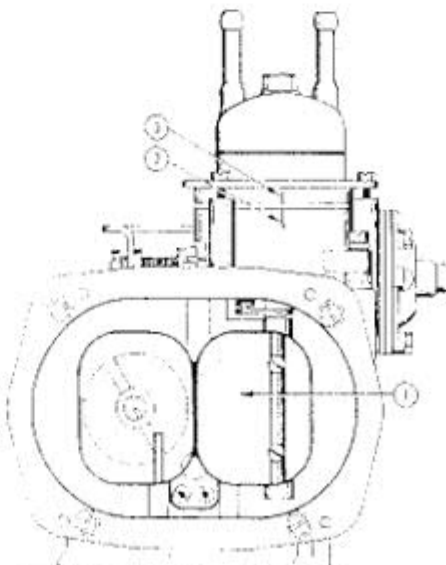
1. Idle cut-off solenoid

**Closed Position of Choke Plate**

Pull carburetor linkage to open throttles. Release linkage. With engine cold and temperature of 77°F or less, check that choke plate (1) is fully closed.

If plate is not fully closed, check choke plate for binding. Check that plate is centered. If plate is not centered and not binding, check alignment of marks (2 and 3) on choke housing. If marks are aligned, replace thermostatic spring in choke housing.

1. Choke plate 2. Housing alignment mark 3. Cover alignment mark



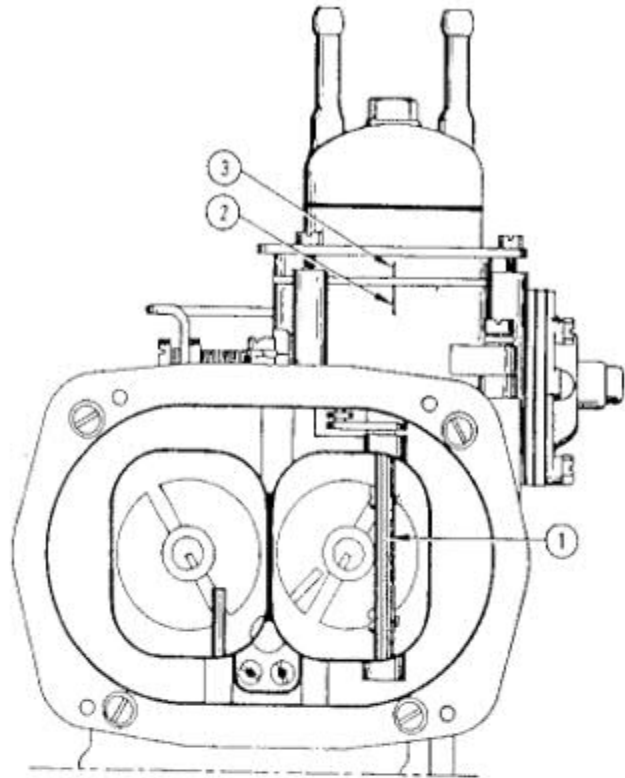
### Open Position of Choke Plate

Run engine until it reaches normal operating temperature (radiator fan starts running).

Check that choke plate (1) is fully open.

If plate is not fully open check linkage for binding. Check that plate is centered in barrel. If plate is centered and not binding, check alignment of marks (2 and 3) on choke housing. If marks are aligned, replace the thermostatic spring in choke housing.

1. Choke plate 2. Housing alignment mark 3. Cover alignment mark



### Air Cleaner Cover Indexing (1975 to 1978)

If air cleaner is not installed, install it. Before installing cover, align letter on cover with arrow on air cleaner duct as follows:

I = outside temperatures 60° F (15° C) or less

E = outside temperatures above 60° F (15° C)

## CATALYTIC CONVERTER TACHIMETRIC SWITCH (1975 and 1976)

### CHECKS

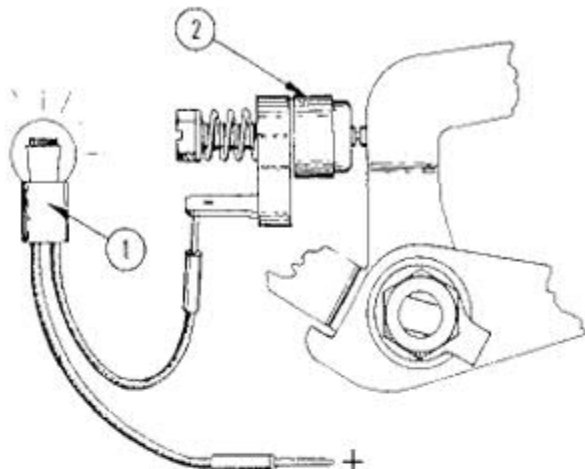
#### Inhibitor Switch Check

Run engine until normal operating temperature is reached. Shut engine off. Turn ignition ON.

Disconnect wire from inhibitor switch (2) and ground wire for later checks. Connect lead of test lamp (1) to terminal of inhibitor switch. Connect other lead of test lamp to power. Lamp should be on.

Open carburetor throttle linkage slowly. Lamp should remain on for a while and then go out. If test lamp did not indicate proper operation, troubleshoot electrical system. (Refer to schematic in exhaust emissions portion of this section.)

1. Test lamp 2. Inhibitor switch



#### Tachimetric Switch Calibration Check

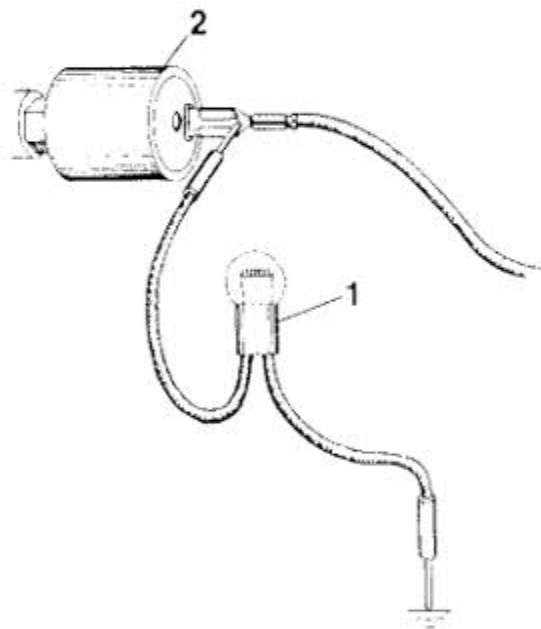
Connect tachometer. Connect test lamp between idle cutoff solenoid and ground. Run engine and let it idle.

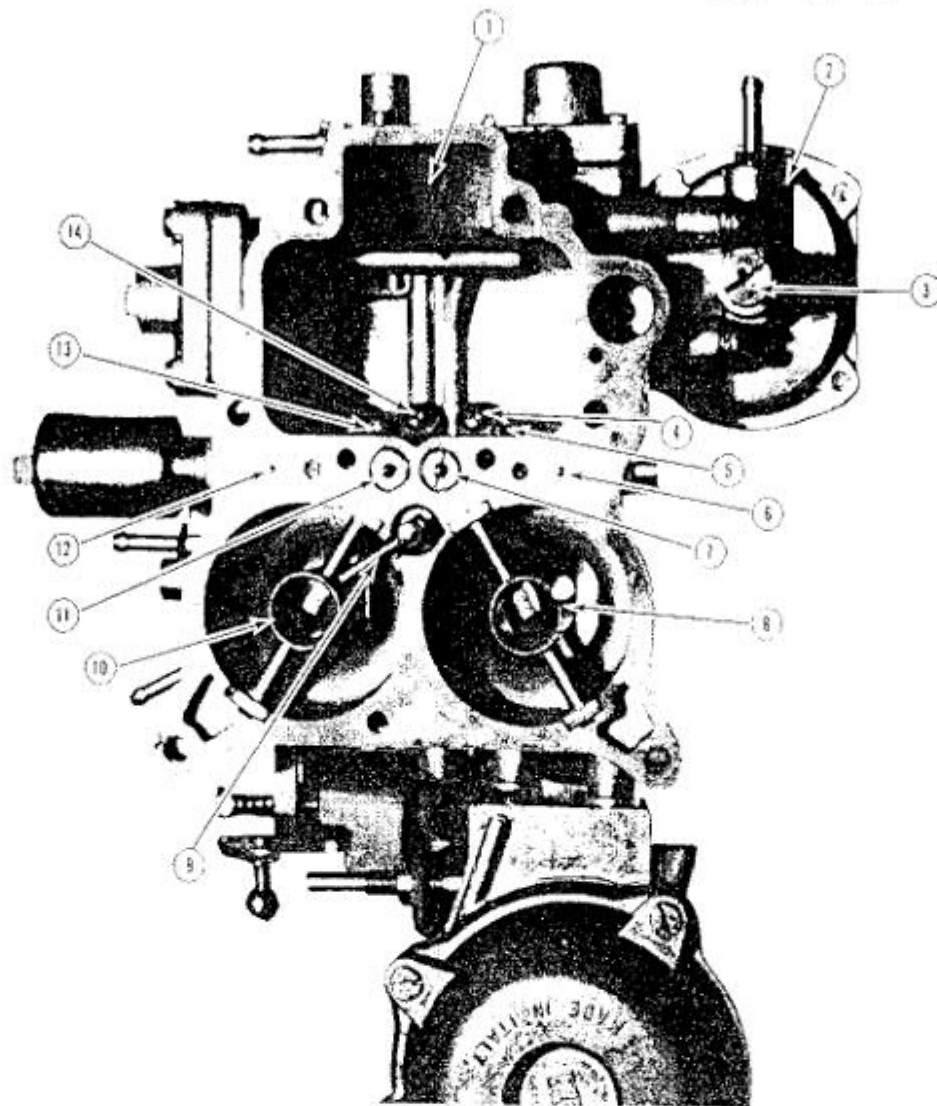
Check that test lamp is lit. Slowly increase engine speed to 2800 rpm. Check that test lamp goes out between 2600 and 2700 rpm. Slowly allow engine speed to decrease to idle. Check that test lamp comes on at 2600 rpm or above.

If test lamp did not indicate proper operation, troubleshoot tachimetric system. (Refer to schematic in exhaust emissions portion of this section.)

Shut off engine. Disconnect test equipment. Connect wire to inhibitor switch.

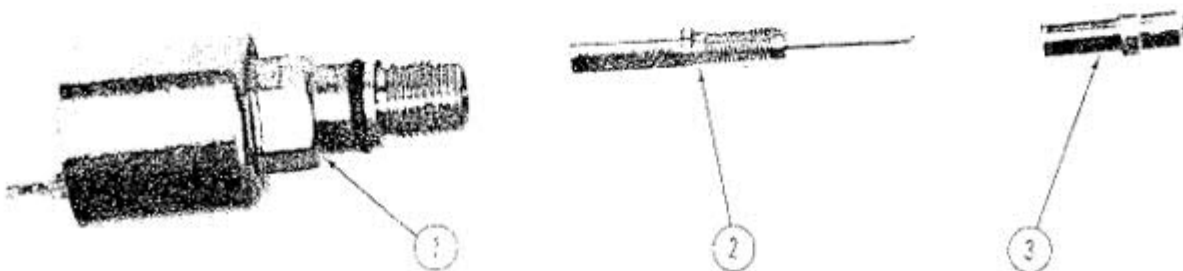
1. Test lamp 2. Idle cutoff solenoid





- |  |  |
|--|--|
| 1. Float bowl  | 9. Acceleration pump nozzle                      |
| 2. Fast idle diaphragm (not functional on 28/32 ADHA)        | 10. Primary venturi                              |
| 3. Fast idle adjustment screw (not functional on 28/32 ADHA) | 11. Air correction jet-primary                   |
| 4. Main jet-secondary  | 12. High speed air passage                       |
| 5. High speed gas inlet                                      | 13. High speed gas inlet                         |
| 6. High speed air passage                                    | 14. Main jet-primary                             |
| 7. Air correction jet-secondary                              | 15. Idle shutoff control                         |
| 8. Secondary venturi   | 16. Secondary throttle control (28/32 ADHA only) |

### CARBURETOR WITH TOP COVER REMOVED



1. Idle shutoff solenoid    2. Shutoff plunger    3. Idle jet

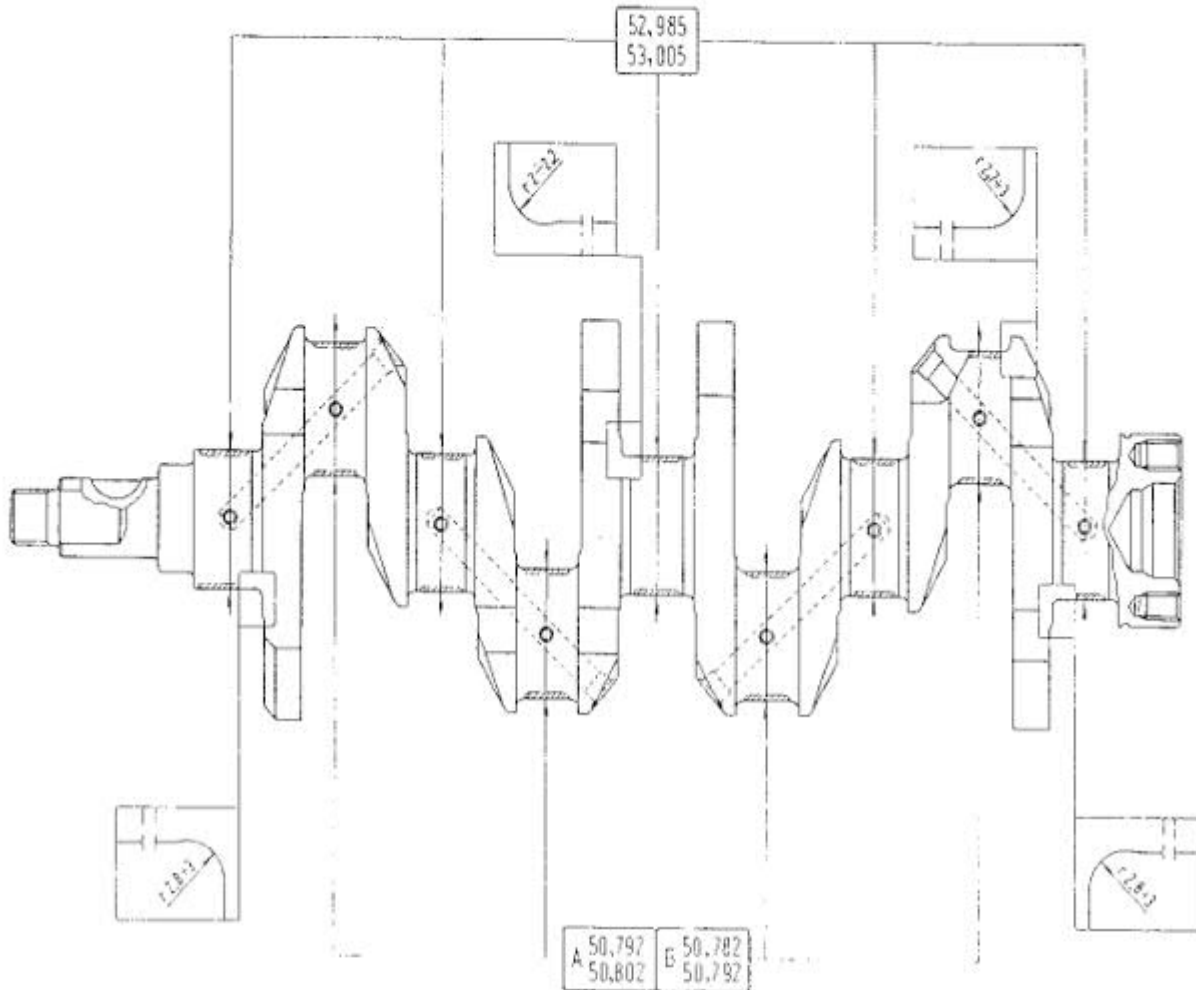
### IDLE SHUTOFF CONTROL



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01

### INSPECTING

#### Journals and Crankpins

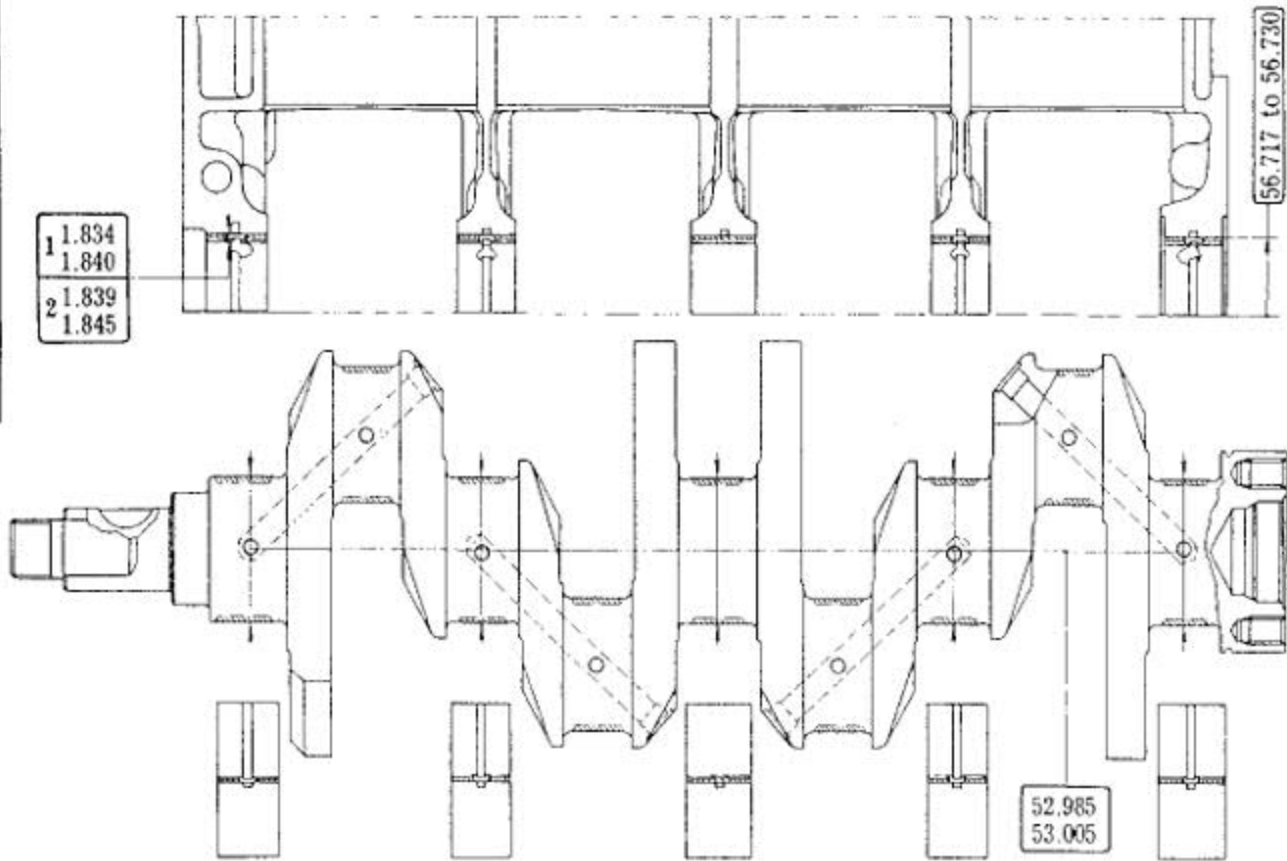
Inspect crankshaft for cracks.

Inspect crankshaft for scoring on journals. Slight scoring can be refinished using extra-fine carborundum stone.

Deep scoring, or if journals show an out-of-round condition in excess of .0002 in. (0.005 mm), must be corrected by grinding journals to next undersize.

Main bearing journals and crankpins should be reground to the undersize diameters called for in the Specifications if they are damaged or worn.

After grinding and polishing, clean crankshaft to remove every trace of abrasive material. Flush the oilways several times.

1  
0

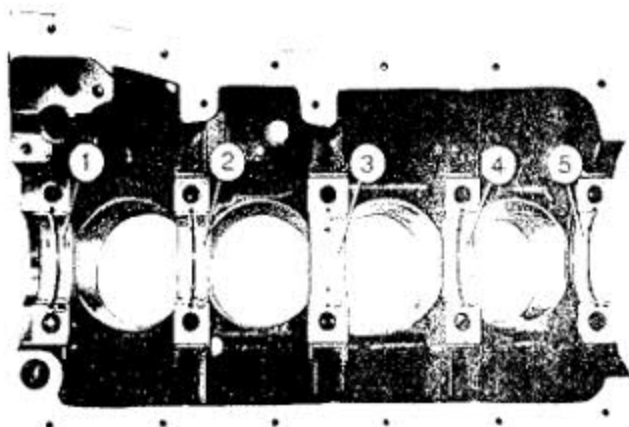
### MAIN DATA OF CRANKSHAFT MAIN BEARINGS AND SADDLE BORES IN CRANKCASE

#### Bearings

If bearings show signs of scoring, seizing or excessive wear, replace them.

If bearings are good, check clearance between bearings and crankshaft.

1. Front bearing    2. Intermediate front bearing    3. Center bearing, without oil groove  
4. Intermediate rear bearing    5. Rear bearing

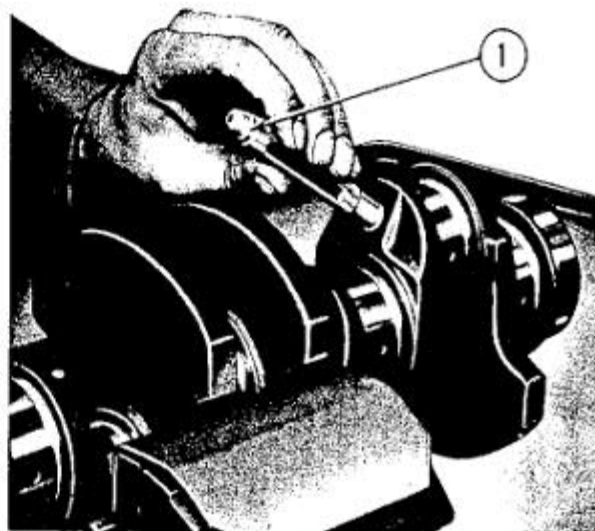


After journals have been ground to size and polished, crankshaft must be thoroughly cleaned to remove all metal and abrasive particles.

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



### Crankshaft Balance

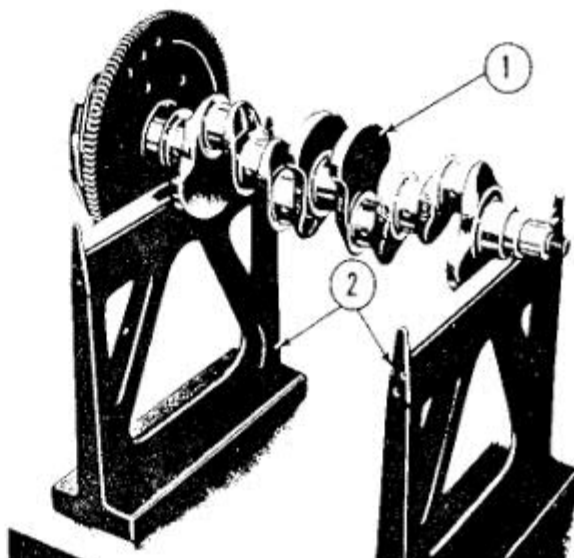
Place two parallel blocks (2) on a surface plate.

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

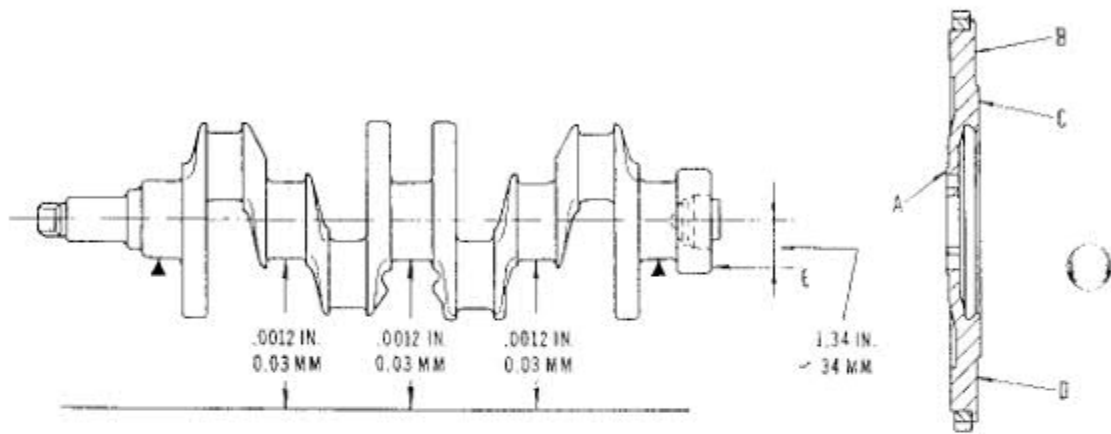
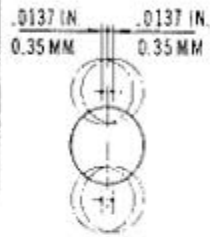
Inspect condition of ring gear teeth. If there is any obvious damage, replace ring gear.

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).

10



A-B-C-E = points for checking alignment and squareness with respect to rotation axis.  
D = drilling points for 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,  $\pm 0.0137$  in. ( $\pm 0.35$  mm).

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

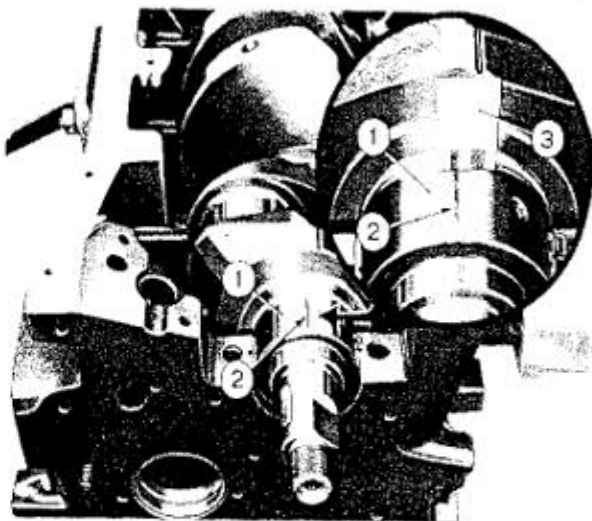
Main bearing journals and crankpins taper: maximum allowable tolerance after regrinding, .0002 in. (0.005 mm).

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.

Place a length of calibrated plastic wire (2) on journal (1).  
Install bearing caps and shells. Torque cap bolts to 83 ft. lbs. (11.5 kgm).  
Torque smaller bolt for front cap to 59 ft. lbs. (8.2 kgm). Remove caps.  
Compare width of wire to scale (3) to determine clearance. If clearance is not between 0.0012 to 0.0030 in. (0.032 to 0.077 mm), replace bearings with undersize ones.

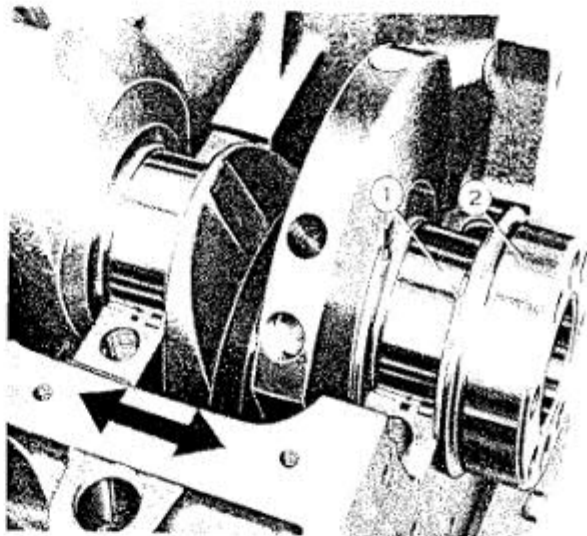
1. Journal 2. Calibrated wire 3. Scale



Check crankshaft end play using a dial indicator. Move the crankshaft (2) axially (arrows) using two screwdrivers. If end play is not between 0.0021 to 0.0120 inch (0.055 to 0.305 mm), replace thrust rings (1).

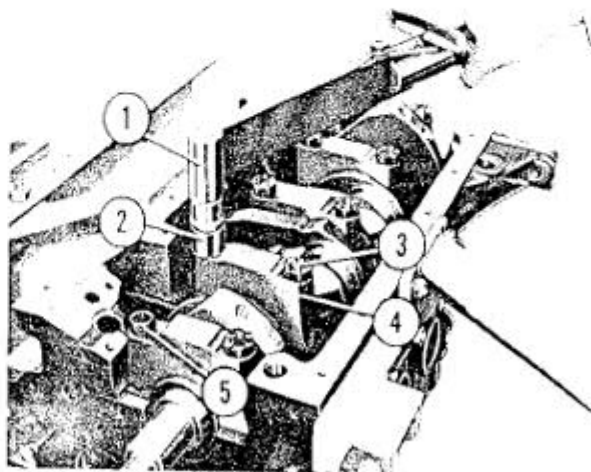
Make sure side of thrust ring with groove faces shoulder of crankshaft.

1. Thrust rings 2. Crankshaft



Install bearing cap (4). Torque cap bolts to 83 ft. lbs. (11.5 kgm). Torque smaller cap bolt (5) to 59 ft. lbs. (8.2 kgm).

1. Torque wrench 2. Socket 3. Cap bolt 4. Main bearing cap 5. Small cap bolt



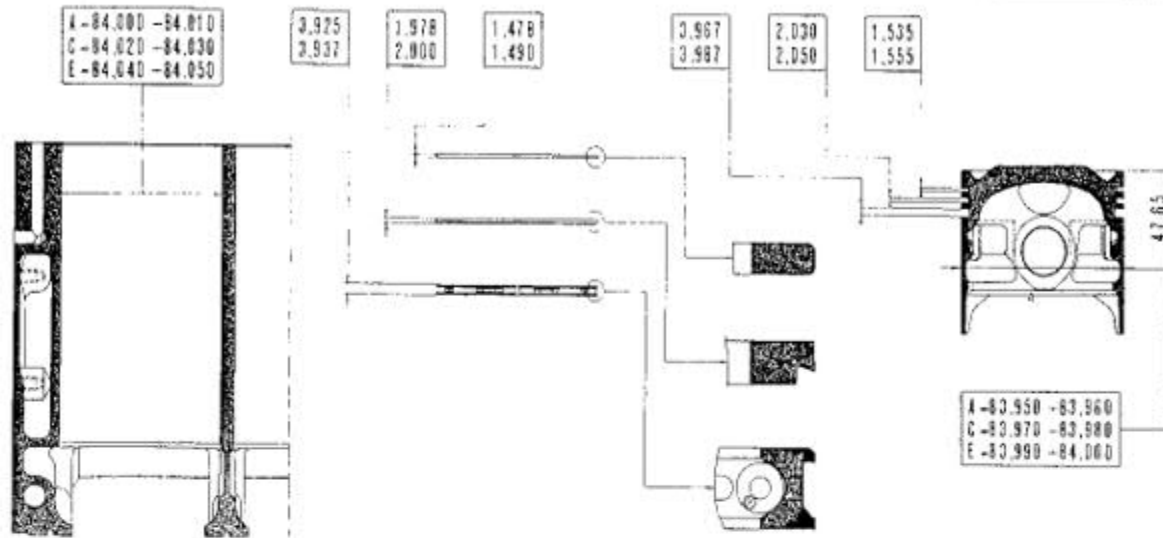
C

C

C

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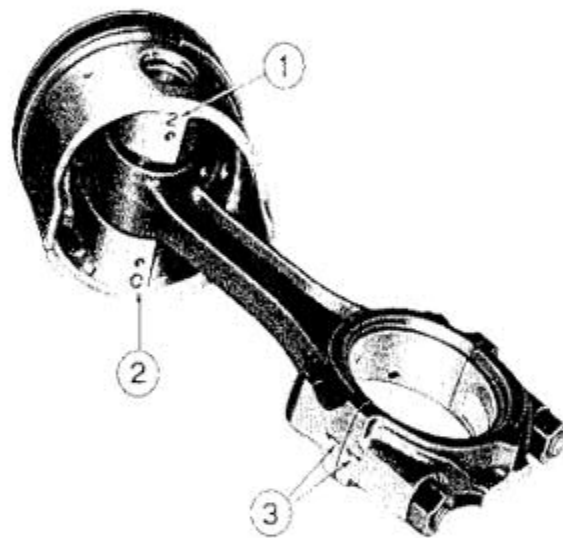


MAIN DATA OF CYLINDER BORE, PISTON, AND RINGS

### PISTONS

Piston class and piston bore class are identified by letter and number stamped on underside of piston bosses. Piston pin class is stamped on pin surface.

1. Piston pin class 2. Piston class 3. Connecting rod matching number

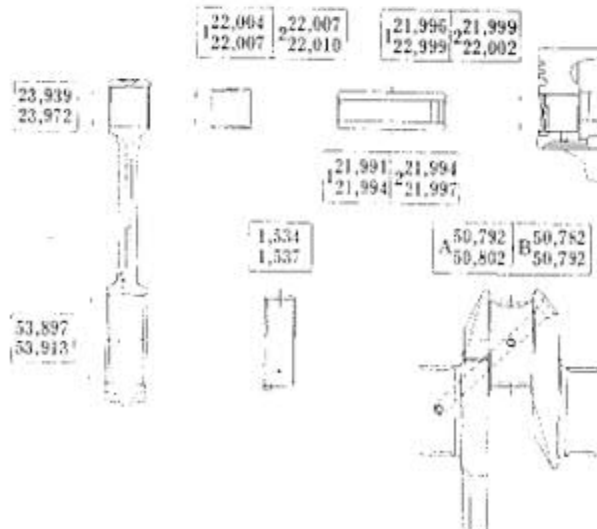


### INSPECTING

Before assembling, check that the four pistons are the same weight within  $\pm 0.18$  oz. ( $\pm 5$  g).

The fit clearance of the piston pin in the small end bushing is 0.0004 to 0.0006 inch (0.010 to 0.016 mm).

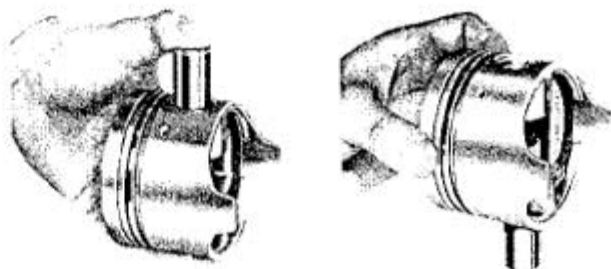
The fit clearance of the piston pin in the piston boss is 0.0001 to 0.0003 inch (0.002 to 0.008 mm).





To check pin fit in piston bore, coat piston bore.

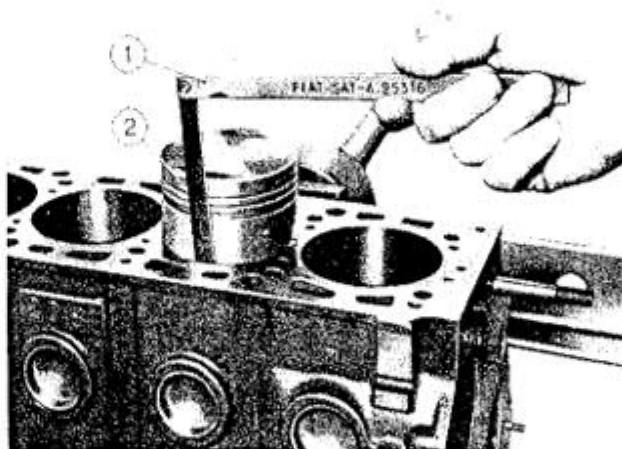
Pin should slide in by thumb pressure and should not fall out when piston is held in vertical position.



Check piston clearance in cylinder bore. Use a feeler gauge.

Clearance should be 0.0016 to 0.0024 inch (0.040 to 0.060 mm) measured at right angles to the pin at 1.876 inches (47.65 mm) from the piston head.

1. Feeler gauge 2. Piston



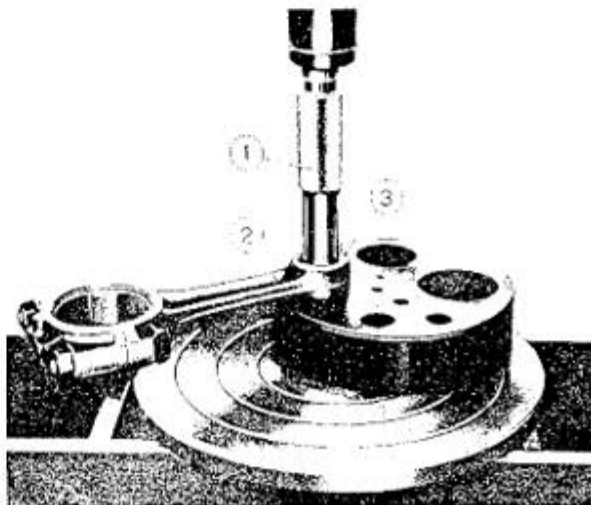
## CONNECTING ROD

### REPLACING BUSHING

To replace small end bushing, use a press. After installing, grind bushing to obtain the specified clearance for the piston pin.

Grind bushing to eliminate any out-of-round condition or scoring.

1. Bushing installer 2. Connecting rod 3. Small end bushing

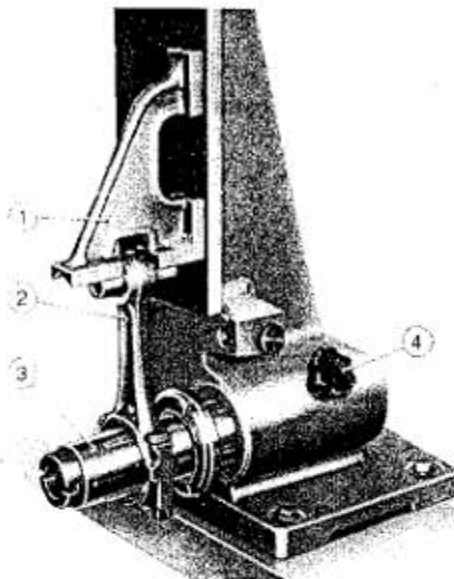


### INSPECTING

Check alignment of big-end and small-end axes measured at 4.92 in. (125 mm) from shank.

Maximum allowable misalignment is 0.0031 inch (0.08 mm).

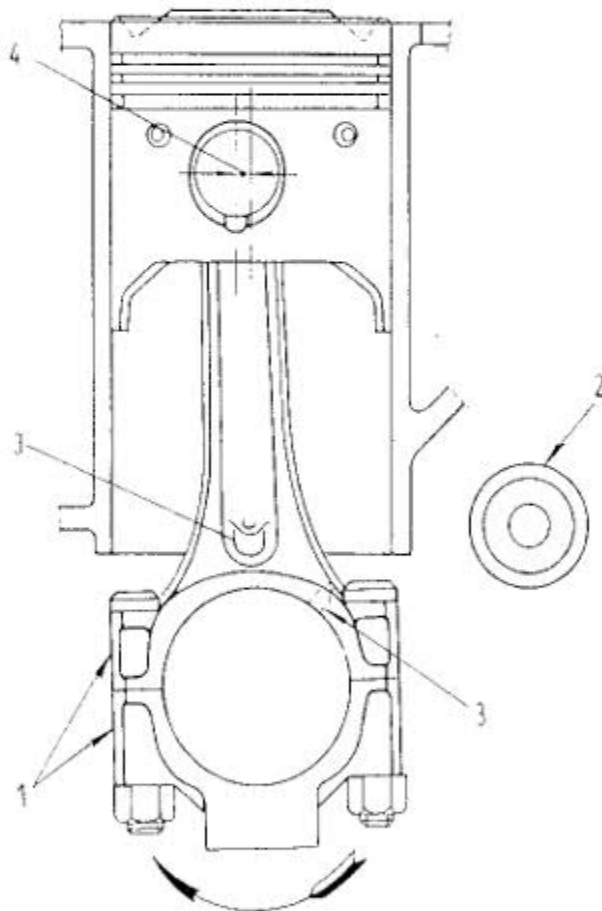
- 1, Square 2, Connecting rod and pin 3, Expansible blade arbor  
4, Arbor lock



Piston boss bore is 0.08 inch (2 mm) offset.

When assembling piston to connecting rod, make sure number on connecting rod faces the piston bore offset.

When installing the assembly, make sure numbers on connecting rod face away from side with auxiliary shaft.



Install piston pin. Secure pin with circlips. Make sure gap in circlip is not in line with slot in piston.

- 1, Location of connecting rod to cylinder matching number  
2, Auxiliary shaft 3, Oil holes 4, Piston pin offset

**RINGS****INSTALLING**

Before installing rings on pistons, push rings down in groove. Check clearance with feeler gauge. See Specifications.

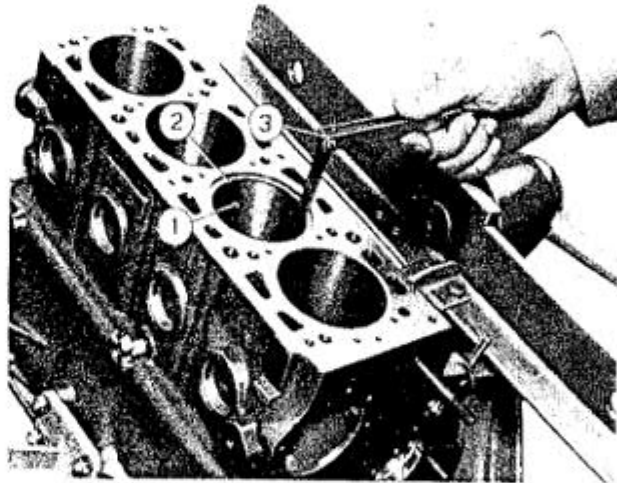
1. Ring 2. Piston 3. Feeler gauge



Push rings squarely into cylinder bore. Using feeler gauge, check ring end gap. See Specifications.

When installing rings, stagger end gaps 120° apart.

1. Cylinder bore 2. Ring 3. Feeler gauge

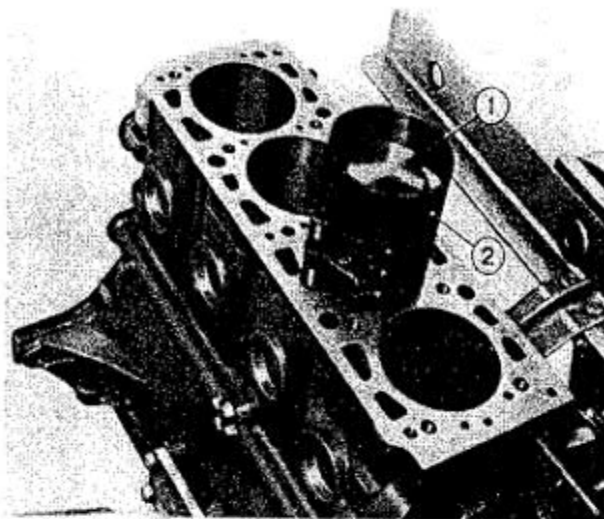


### INSTALLATION

Make sure cylinder bores are lubricated with light engine oil before installing connecting rod-piston assemblies.

Install assemblies with numbers on connecting rods facing away from auxiliary shaft.

1. Piston 2. Ring compressor



Place a length of calibrated wire on crankpin. Install connecting rod cap. Torque cap nuts to 38 ft. lbs. (5,1 kgm).

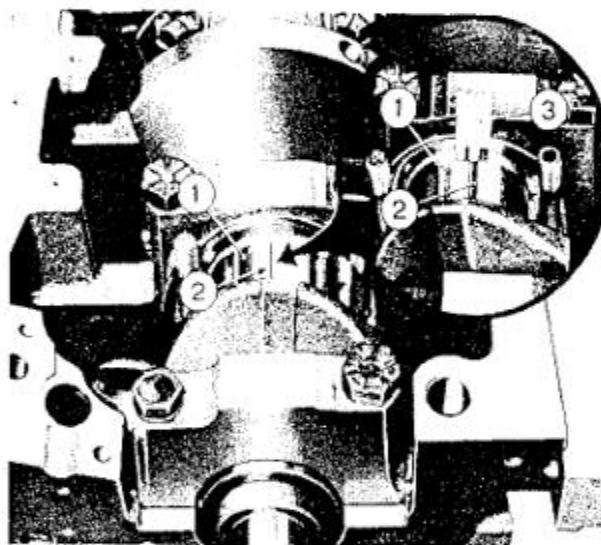
Remove caps.

Compare width of wire with scale to determine clearance.

Clearance should be:

0.0008 to 0.0025 in. (0.021 to 0.065 mm)

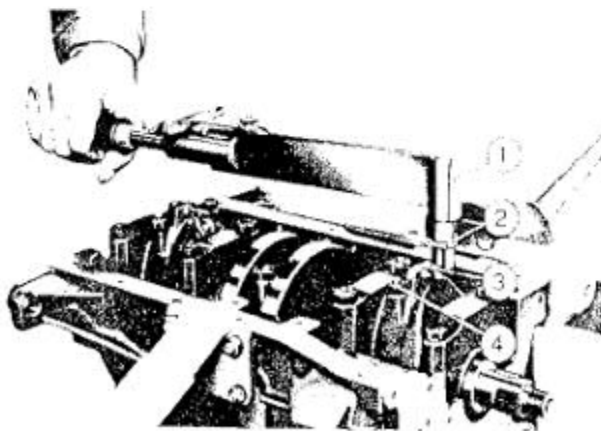
1. Crankpin 2. Calibrated wire 3. Scale



Install caps and nuts.

Torque nuts to value specified in Engine Specifications.

1. Torque wrench 2. Socket 3. Cap 4. Cap nut





### TIMING BELT

#### REPLACING (Engine in car)

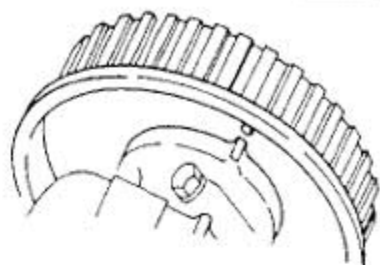
**CAUTION:** Timing belts cannot be reused. Once tension is relieved, replace timing belt. When a timing belt is removed, do not turn camshaft independent of engine. Valves may be damaged.

Disconnect battery ground cable.

Remove spark plugs.

Turn engine to set timing mark as shown.

Engine is set to fire on No. 4 cylinder.



CAMSHAFT  
TIMING



CRANKSHAFT  
TIMING

Remove heated air hose from exhaust shroud and air cleaner (carburetor engines only).

Remove all drive belts from crankshaft pulley.

Partially drain cooling system.

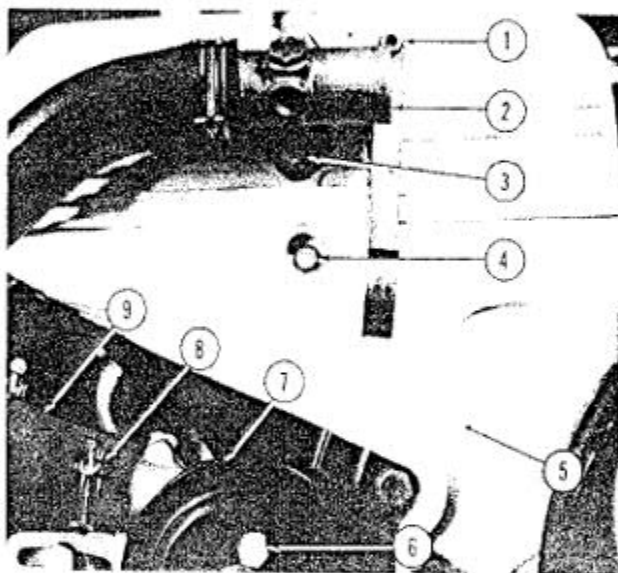
Remove upper radiator hose from union (2).

Remove two bolts (3) and washers, then pull union (2) away from cylinder head.

Remove two bolts (4) and two nuts (1) to remove timing belt cover (5).

Remove three water pump pulley bolts (6) and remove water pump pulley.

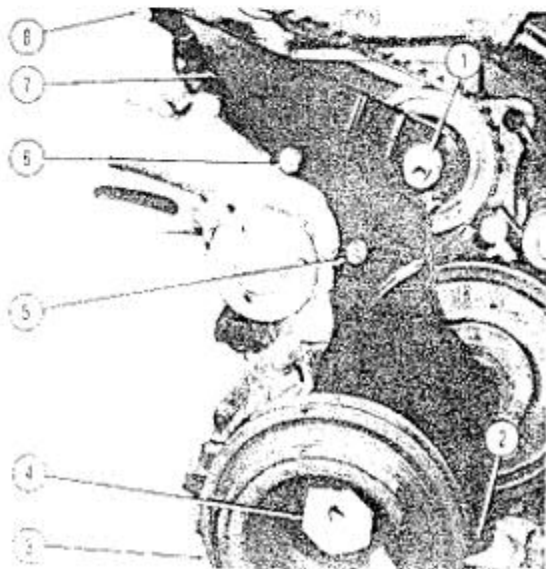
1, Nut 2, Union 3, Bolt 4, Bolt 5, Timing belt cover 6, Bolt 7, Pulley 8, Clamp 9, Hose



Remove nut (4) holding crankshaft pulley (3). Use 38 mm socket. Remove pulley.

Remove four bolts (2, 5 and 8) and two nuts (1 and 6) holding lower sheet metal timing cover (7). Remove cover.

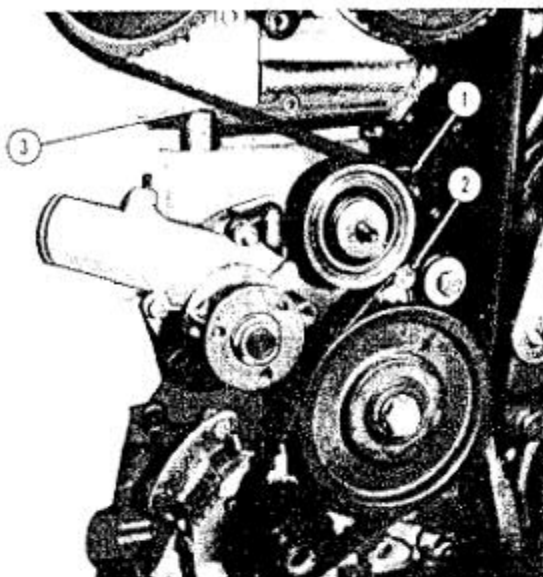
1, Nut 2, Bolt 3, Crankshaft pulley 4, Nut 5, Bolt 6, Nut 7, Timing belt cover 8, Bolt



Loosen bolt (2) for tensioner bracket (1). Pry pulley to release belt tension. Retighten bolt (2) to hold pulley in belt-slackened position.

Remove timing belt (3). Mark belt as not reusable.

1. Tensioner bracket 2. Bolt 3. Timing belt



Turn auxiliary shaft sprocket to align hole (6) in sprocket with sprocket bolt (7) and spring retaining bolt (5).

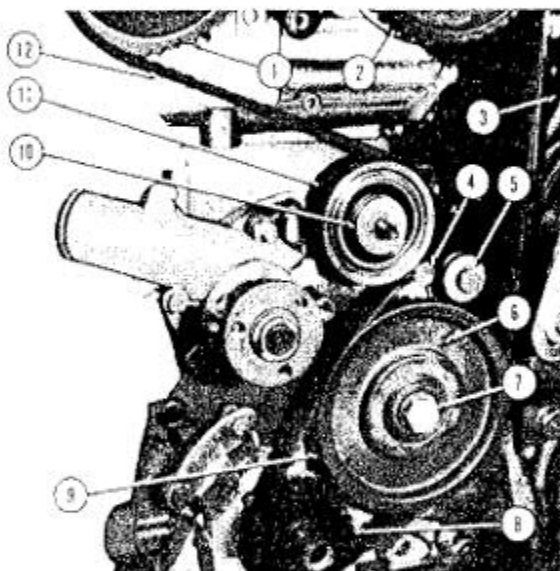
Wrap new timing belt (12) over crankshaft sprocket (8), auxiliary shaft sprocket (9), intake camshaft sprocket (2) and exhaust camshaft sprocket (1).

Make sure all play is between exhaust camshaft sprocket (1) and tensioner pulley (11).

Place timing belt over tensioner pulley. Loosen tensioner bracket bolt (4) and allow tensioner pulley to take out play. DO NOT apply additional force to tensioner pulley.

Turn crankshaft two full turns. Check that timing is correct, then tighten tensioner bracket bolt.

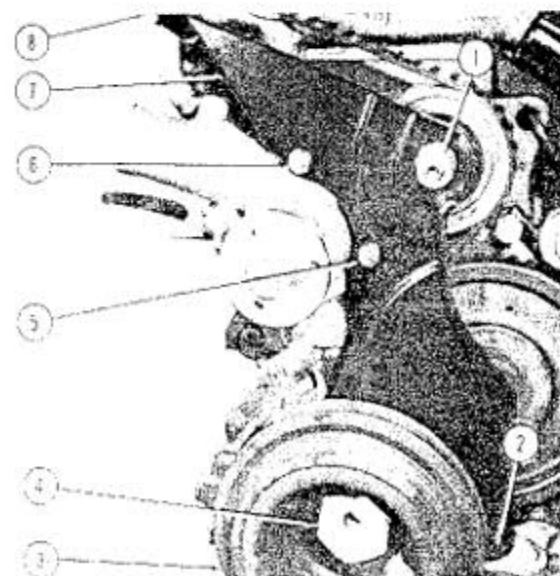
1. Exhaust camshaft sprocket 2. Intake camshaft sprocket 3. Oil dipstick tube 4. Tensioner bracket bolt 5. Spring retaining bolt 6. Hole 7. Bolt 8. Crankshaft sprocket 9. Auxiliary shaft sprocket 10. Spacer 11. Tensioner pulley 12. Belt



Install lower sheet metal timing belt cover with four bolts (2, 5 and 8) and two nuts (1 and 6). Torque nut (1) to 33 ft. lbs. (4.5 kgm).

Coat crankshaft pulley (3) inside diameter with anti-seize compound. Place pulley on crankshaft. Secure pulley with nut (4). With flywheel blocked, torque nut to 181 ft. lbs. (25 kgm).

1. Nut 2. Bolt 3. Crankshaft pulley 4. Nut 5. Bolt 6. Nut 7. Timing belt cover 8. Bolt



# Camshaft Drive

101.06

Page 10-65/66

Install water pump pulley (7) using three bolts (6).

Install timing belt cover (5) and retain with two bolts (4) and two nuts (1).

Install drive belts on crankshaft pulley and tension to specifications.

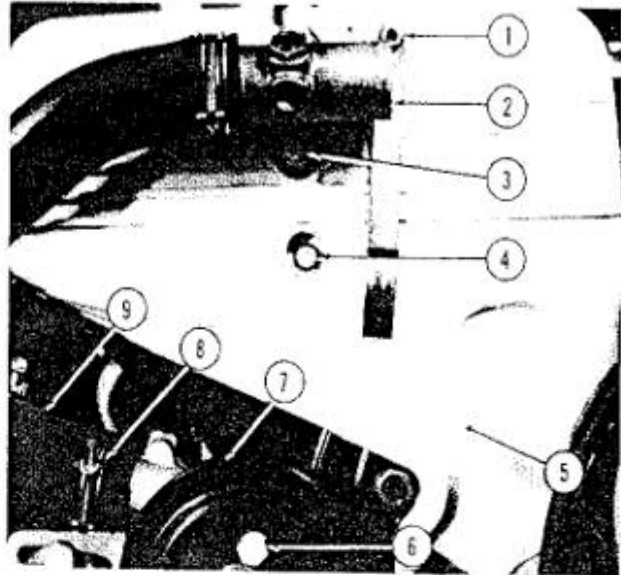
Install union gasket, union (2) and two bolts (3) and washers. Attach upper radiator hose to union.

Install heated air hose on exhaust shroud and air cleaner (carbureted engines only).

Install spark plugs.

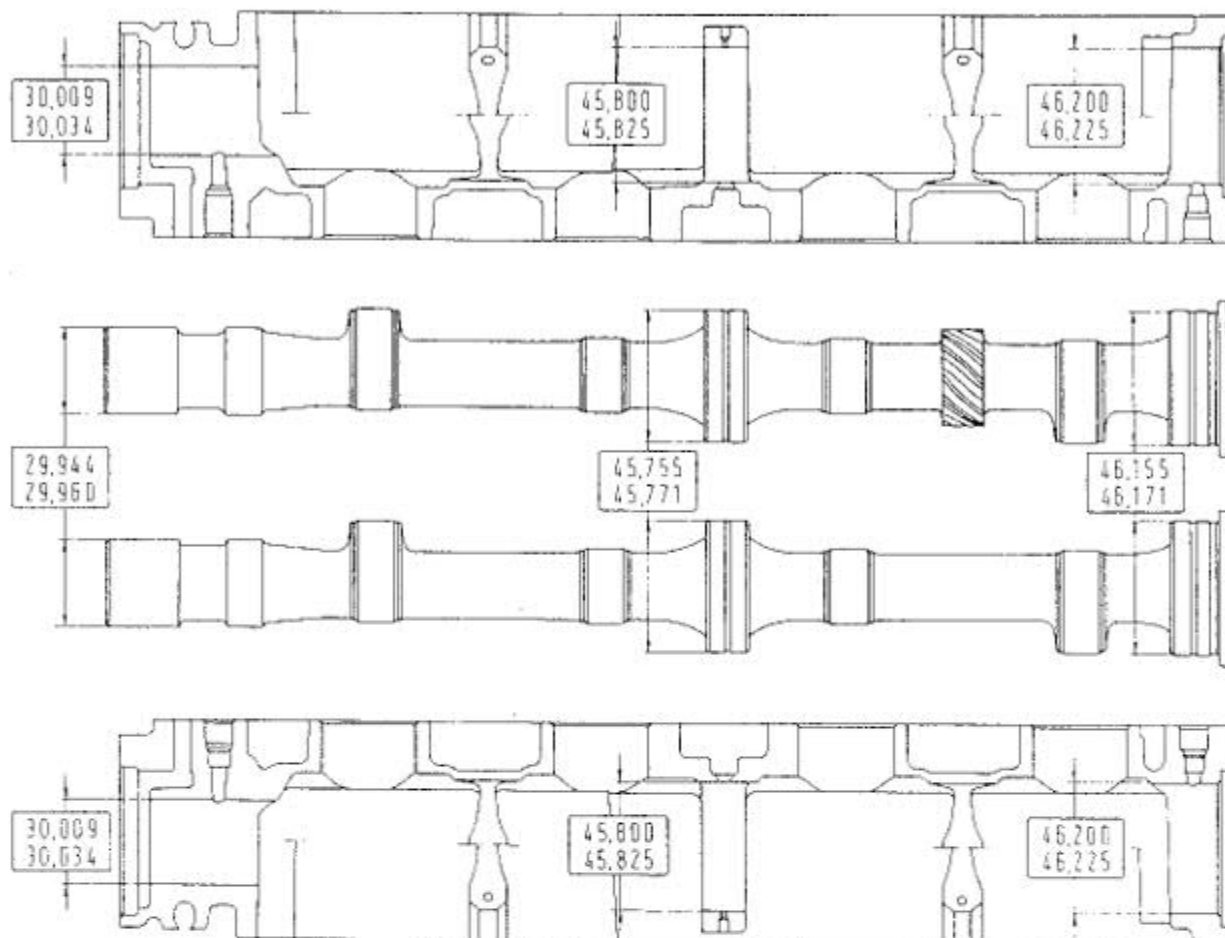
Fill cooling system.

1. Nut 2. Union 3. Bolt 4. Bolt 5. Timing belt cover 6. Bolt  
7. Pulley 8. Clamp 9. Hose





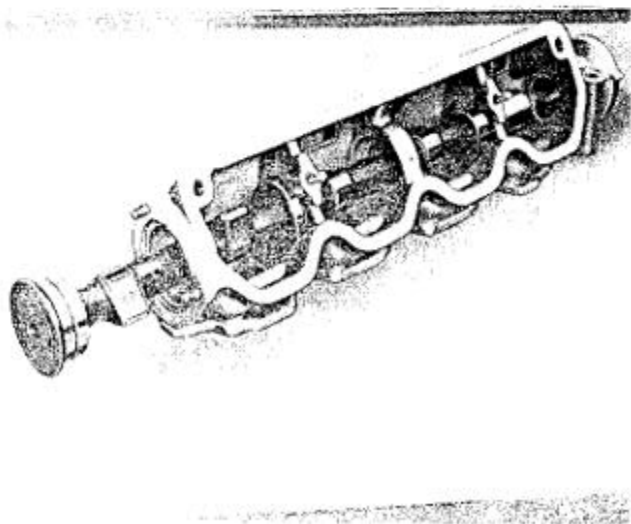




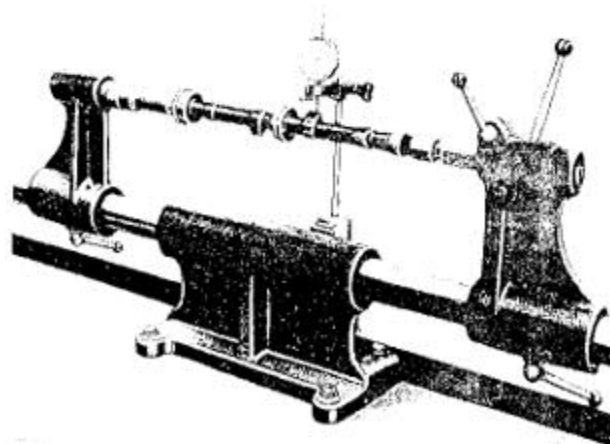
## MAIN DATA OF CAMSHAFTS AND SEATS IN CAMHOUSING

### INSPECTION

Place camshaft between points. Set dial indicator to check both intake and exhaust camshaft lobe lift. Lobe lift (without play) should be 0.3765 in. (9.564 mm) for both. Check runout. Runout must not exceed 0.0008 in. (0.02 mm).

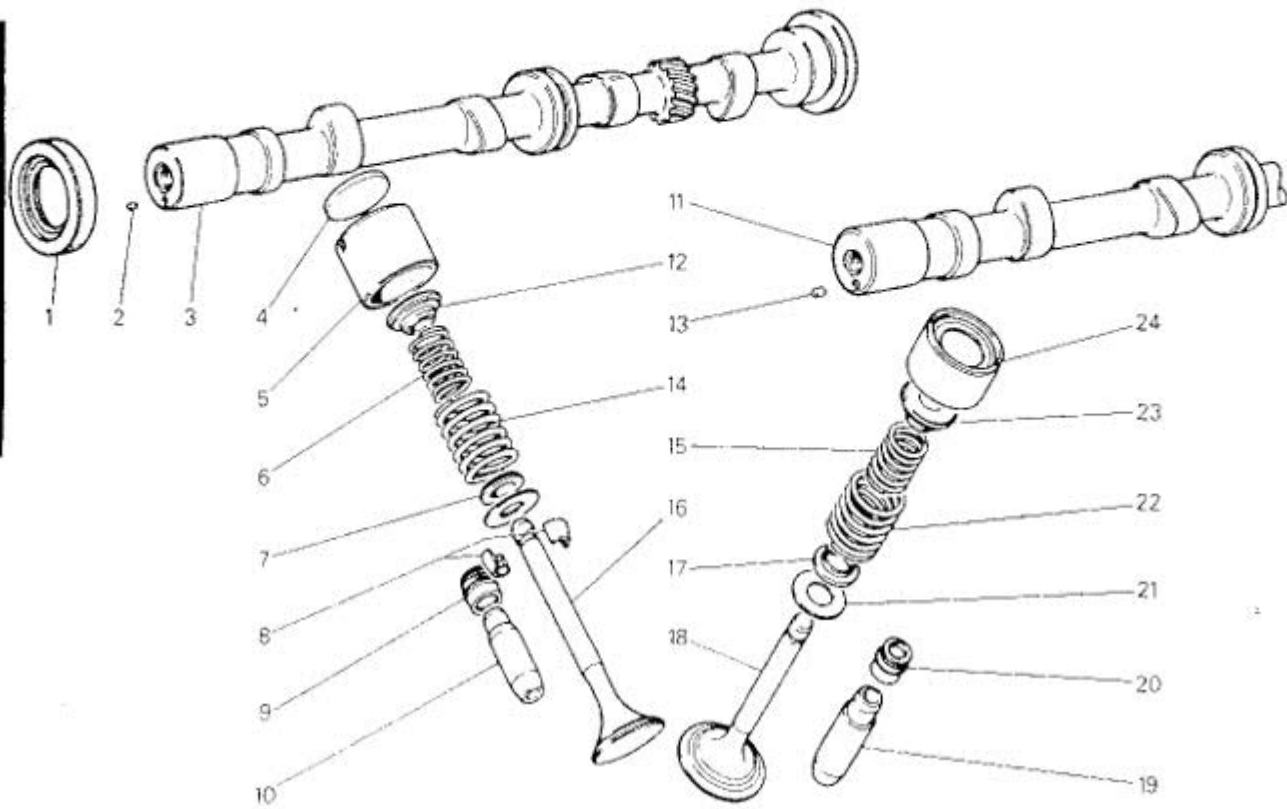


Sliding camshaft out of housing



Checking camshaft lobe lift

10



- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Camshaft seal              | 13. Dowel                      |
| 2. Exhaust camshaft dowel     | 14. Exhaust valve outer spring |
| 3. Exhaust camshaft           | 15. Intake valve inner spring  |
| 4. Tappet plate               | 16. Exhaust valve              |
| 5. Exhaust valve tappet       | 17. Lower cup                  |
| 6. Exhaust valve inner spring | 18. Intake valve               |
| 7. Lower cup                  | 19. Intake valve guide         |
| 8. Locks                      | 20. Oil seal                   |
| 9. Exhaust valve oil seal     | 21. Washer                     |
| 10. Exhaust valve guide       | 22. Intake valve outer spring  |
| 11. Intake camshaft           | 23. Upper cup                  |
| 12. Upper cup                 | 24. Intake valve tappet        |

## VALVE MECHANISM COMPONENTS

## TAPPET CLEARANCE (Engine Cold)

On carbureted engines, remove air cleaner.

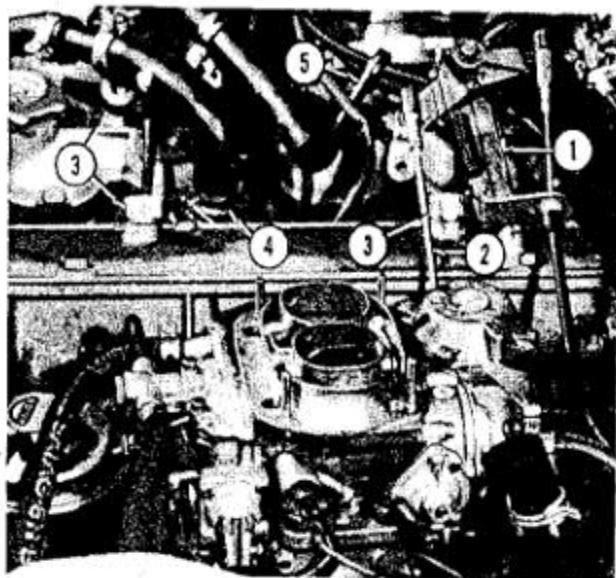
Remove two nuts to disconnect accelerator linkage (1) from cam cover. Lay linkage to one side.

On engines with air pump, remove hose from air pump check valve (4).

Remove spark plug wires from support (5).

Remove four bolts (3) holding cam covers. Remove covers and gaskets.

1. Accelerator linkage 2. Accelerator rod 3. Bolt 4. Check valve  
5. Support bracket



On fuel injected engines, loosen clamps (1) to remove air inlet hose (2).

**NOTE:** On turbo-charged engines, remove auxiliary air regulator fitting from compressor discharge plenum, loosen clamps and mounting bracket to remove plenum.

Loosen auxiliary air regulator (3) line clamp (4) and pull line off regulator.

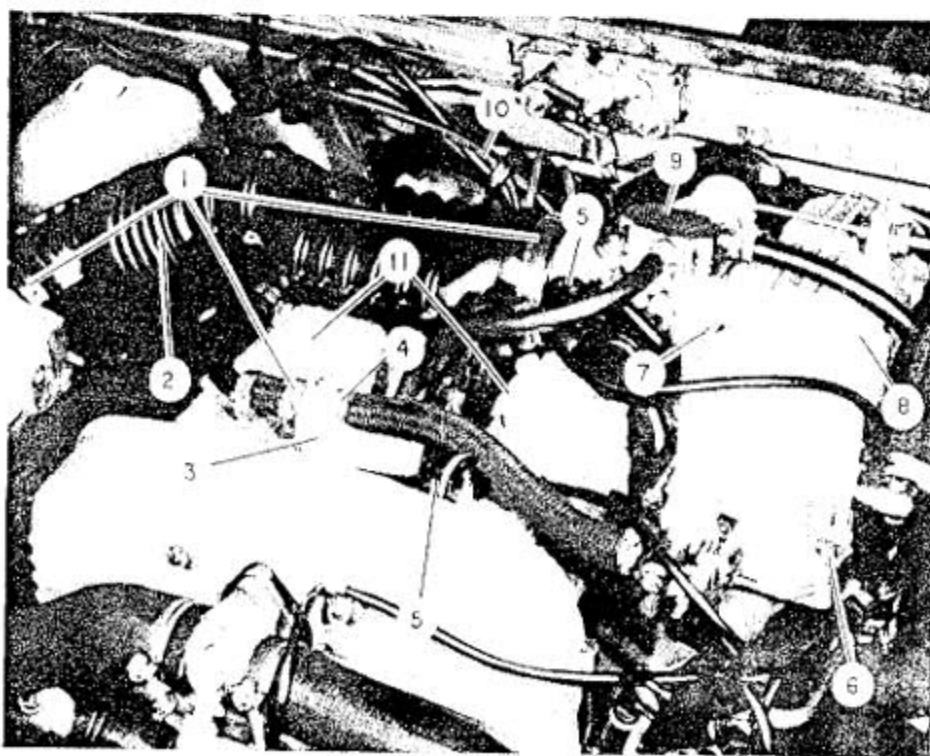
Disconnect electrical connectors (5) on throttle body and auxiliary air regulator.

Remove six bolts (6) and two nuts (7) to separate intake manifold halves (8). Without disconnecting throttle body heater (9) hoses, place intake manifold half away from cam cover.

Remove spark plug wires (10) from support.

Remove four bolts (11) holding cam covers. Remove covers and gaskets.

1. Clamp 2. Air inlet hose 3. Auxiliary air regulator 4. Clamp 5. Electrical connector 6. Bolt 7. Nut 8. Intake manifold 9. Throttle body heater 10. Spark plug wires 11. Bolt

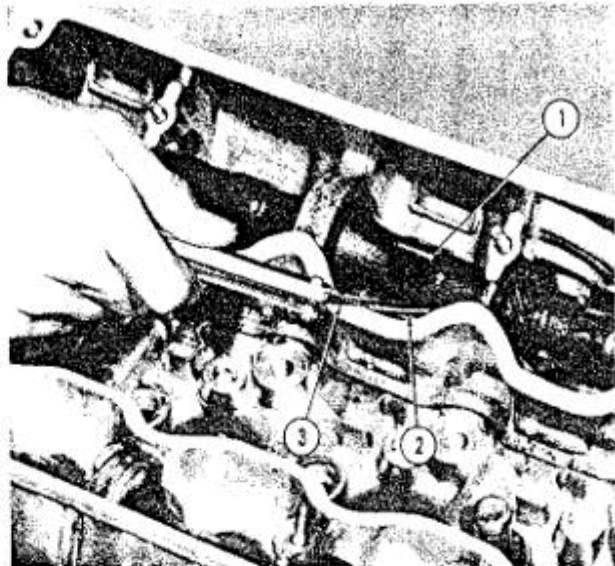


Position camshaft so that lobe (1) for valve being checked is pointing up and at right angle to valve.

Measure clearance between camshaft (1) and tappet plate (2).

Clearance: Intake - 0.015 to 0.019 in.  
(0.41 to 0.48 mm)  
Exhaust - 0.018 to 0.021 in.  
(0.46 to 0.53 mm)

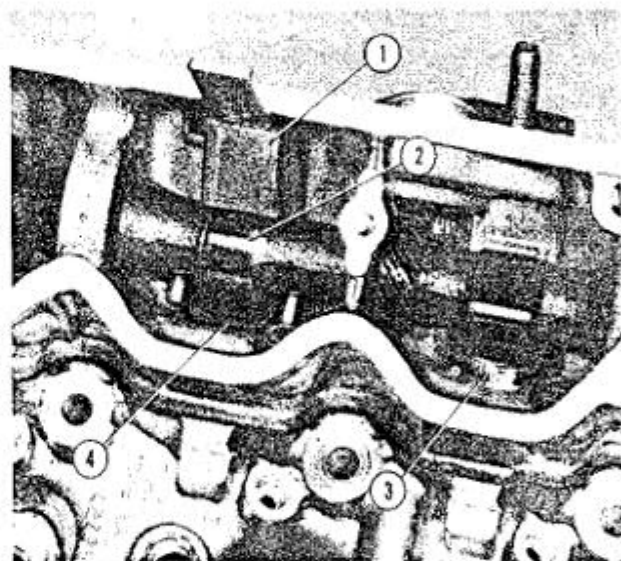
1. Camshaft lobe 2. Tappet 3. Feeler gauge



Rotate tappet (4) so that notch (3) is facing out as shown.

If adjusting is necessary, pry tappet down using tool A.60443. If tool is not available, rotate camshaft (2) down to depress tappet. Install clamping tool A.60594 (1).

1. Clamping tool A.60594 2. Camshaft lobe 3. Notch on tappet  
4. Tappet

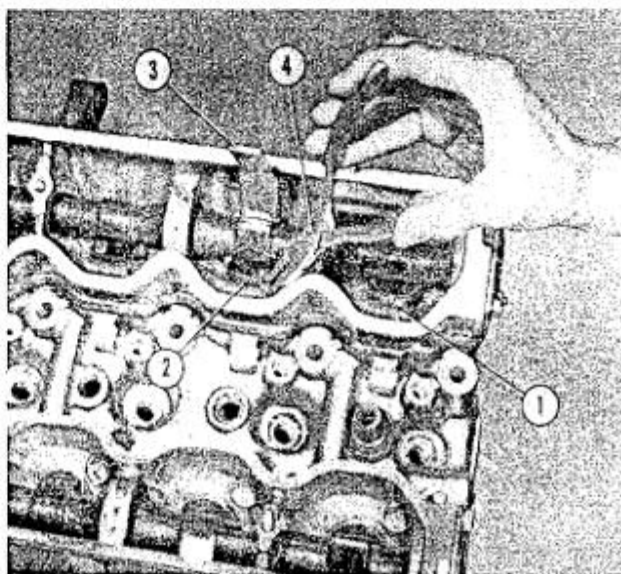


Rotate camshaft up to gain clearance between lobe and tappet plate (2).

Lift plate thru notch (1) with scribe. Remove plate with tool A.87001 (4). Install new tappet.

**NOTE:** Tappet plate thickness is stamped on face of plate. Install this face toward tappets. If number on plate(s) is not visible, determine needed thickness with a micrometer.

1. Notch on tappet 2. Tappet plate 3. Clamping tool A.60594  
4. Tool A.87001



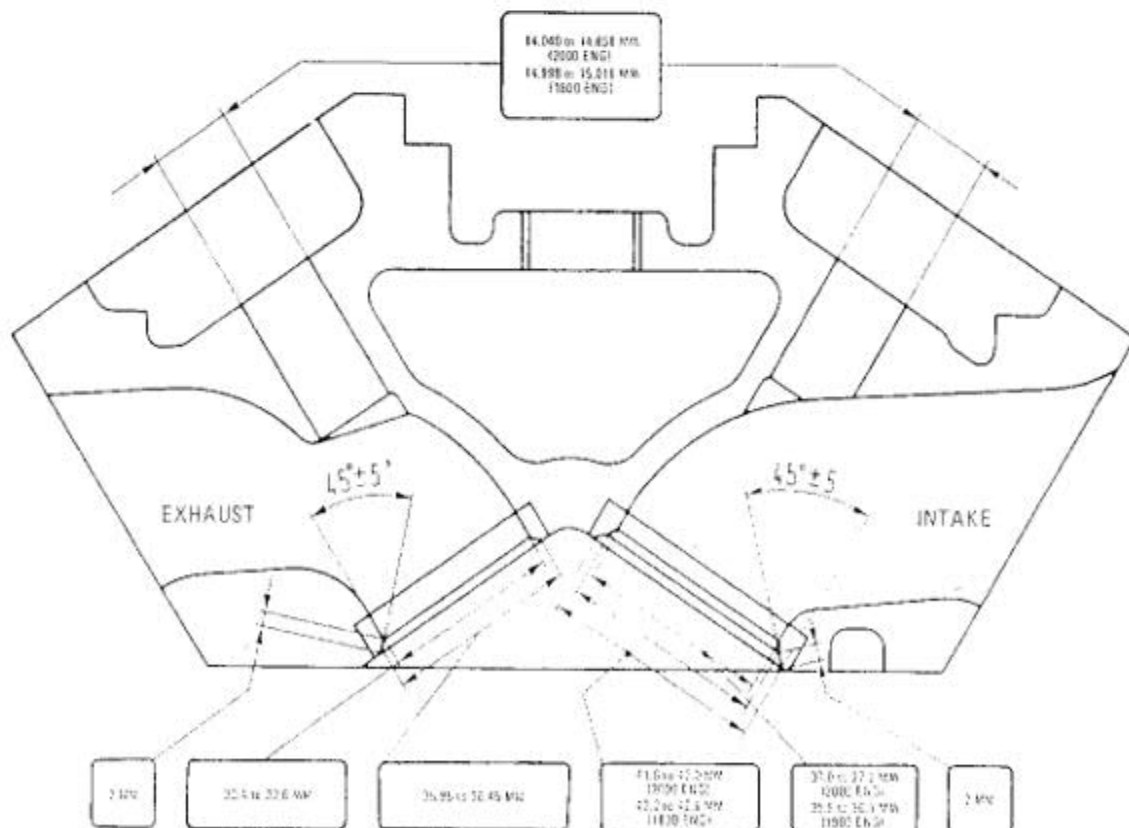
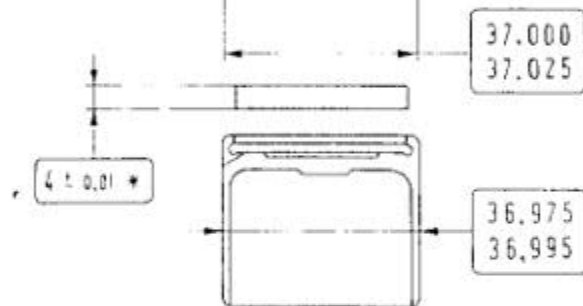
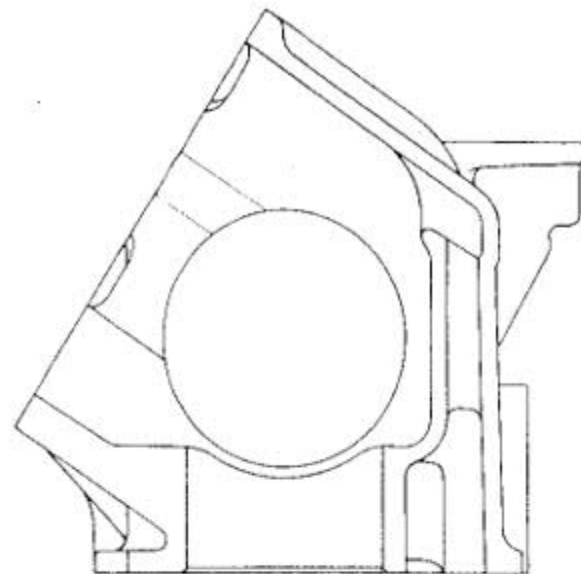
## TAPPET

### INSPECTING

Make sure tappet plate surface in contact with camshaft lobe is glass-like and shows no signs of dishing or pitting.

Fit clearance between tappets and bores in upper cylinder head is 0.0002 to 0.0019 inch (0.005 to 0.050 mm).

\*Basic tappet plate thickness.



MAIN DATA OF VALVE SEATS AND VALVE GUIDE SEATS IN CYLINDER HEAD

101

**REFACING**

Valve seats in cylinder head must not show evidence of pitting in contact face. If pitted, they must be refaced.

Make sure grinding stones have a taper of  $45^\circ \pm 5'$ .

Perform the refacing operation by hand.

Reface valve seat using  $45^\circ$ .

1. Valve seat 2. Grinding stone 3. Pilot

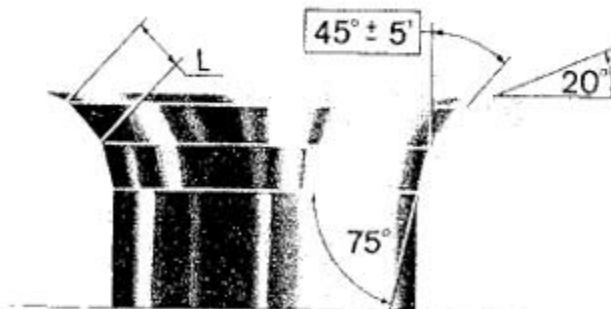


Narrow seat width. Use a  $20^\circ$  valve seat reamer and a  $75^\circ$  reamer alternately.

1. Valve seat 2. Cutter 3. Pilot



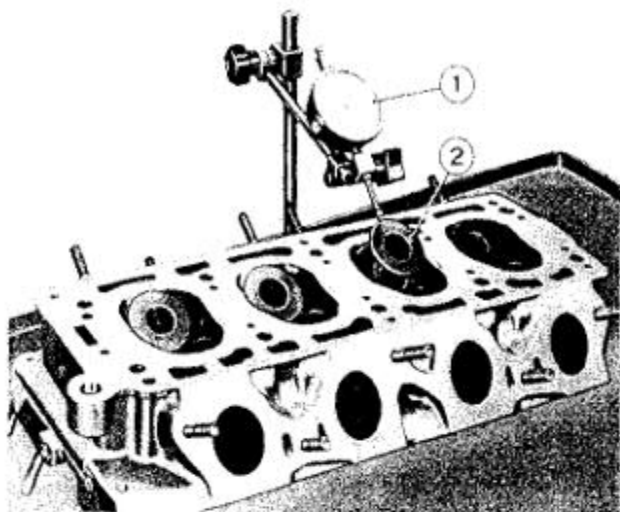
The width of intake and exhaust valve seats, after narrowing should be  $L = 0.08$  inch (2 mm) approximately.



Valve stem must not be distorted or cracked. If necessary, replace valve.

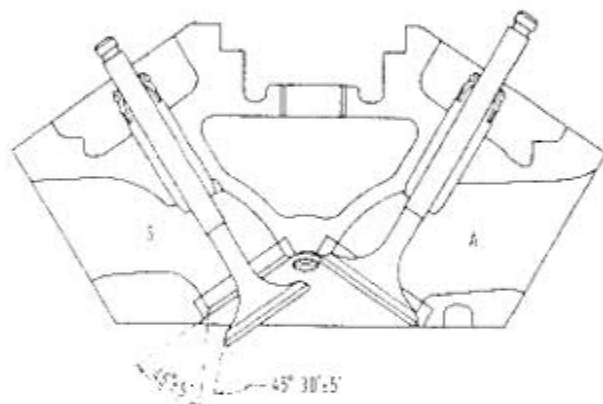
Maximum runout in a full turn, guided by stem with dial indicator resting at center of contact face, should not exceed 0.0012 inch (0.03 mm).

1. Dial indicator 2. Intake valve



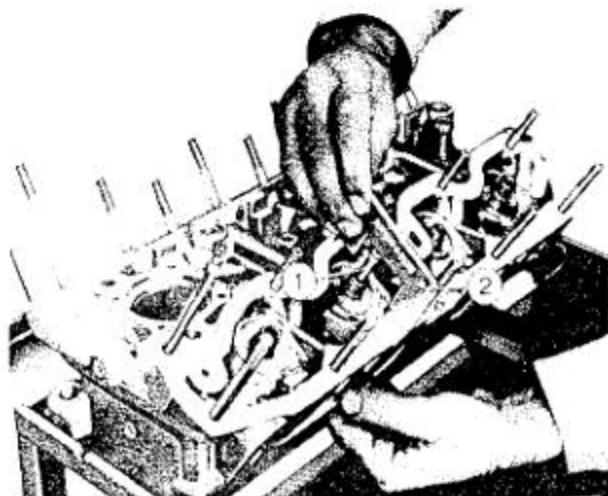
Check valve face for wear or damage. If necessary, reface valve.

After refacing, check that the thickness of the valve at edge of head is not less than 0.02 inch (0.5 mm).



After refacing, valve will seat lower in its seat and result in excessive valve stem (2) height. Check height of valve stem above cylinder head with gage A.96218 (1) as shown. If height exceeds gage check, valve stem must be ground off to reduce height within limits.

1. Gage A.96218 2. Valve stem

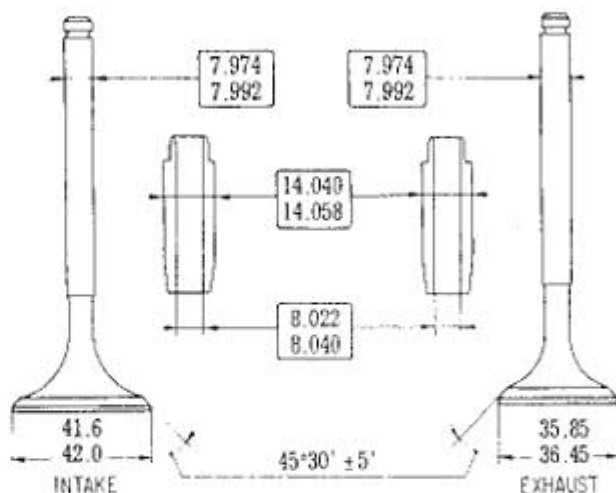




## VALVE GUIDES AND SPRINGS

## REPLACING

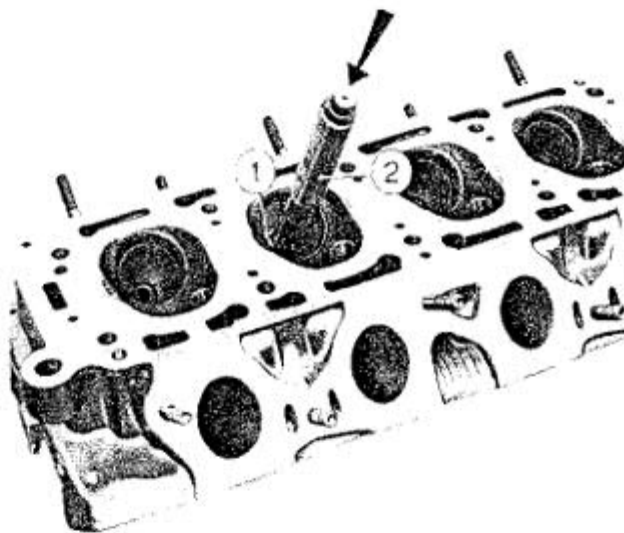
Valve stem to valve guide clearance is 0.0012 to 0.0026 inch (0.030 to 0.066 mm).



Valve guides (1) should be replaced whenever an excessive clearance between valve stem and guide cannot be corrected by replacing the valve or if guides become loose in their bores in the head.

Use tool A.60395 (2) to remove guides.

1. Valve guides 2. Tool A.60395

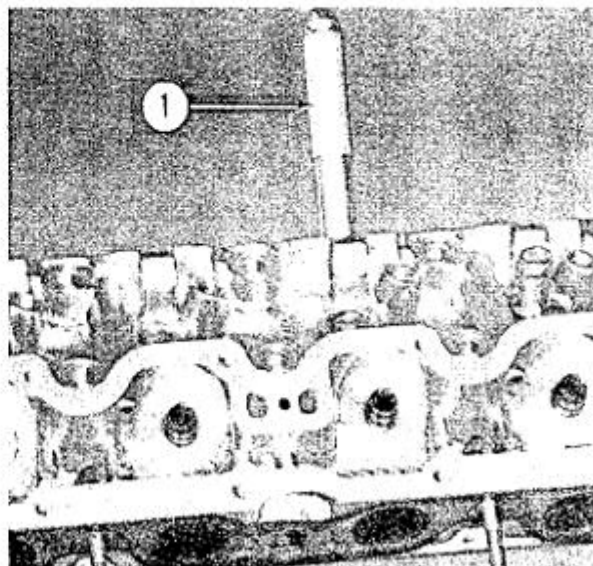


Press guides into lower cylinder head.

Use tool A.60462.

The interference between guide and bore is 0.0024 to 0.0042 in. (0.063 to 0.108 mm).

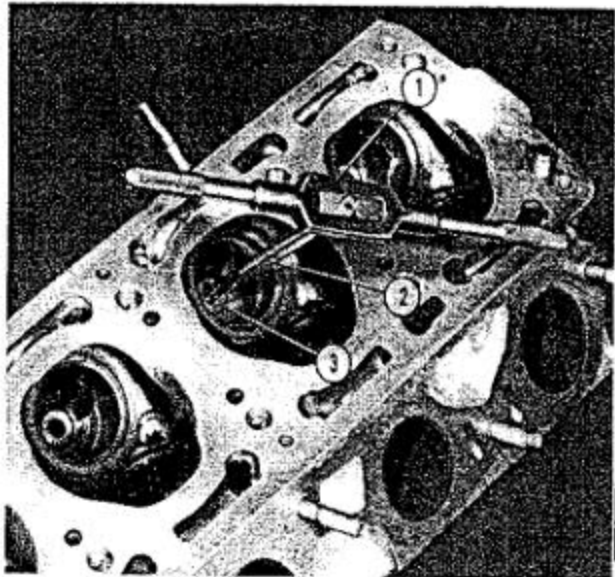
1. Tool A.60462



Replacement guides (3) are prefinished to size on the inside diameter.

If press fitting causes minor faults, refinish guide. Use reamer A.90310 (2).

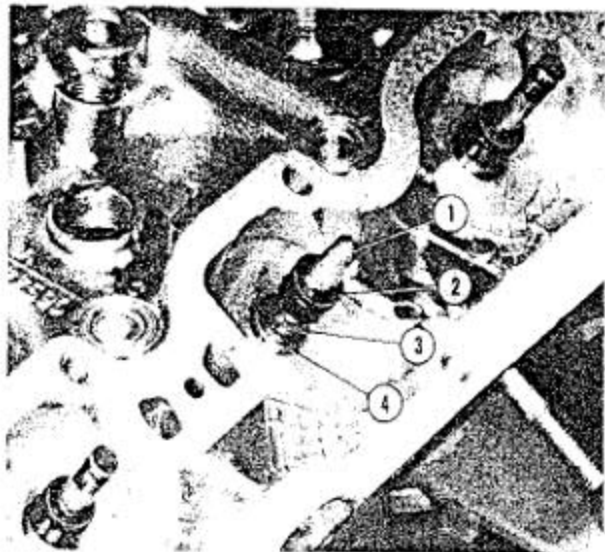
1. Mandrel 2. Reamer A.90310 3. Valve guide



Install oil seal (2) on valve guides (4) as follows:

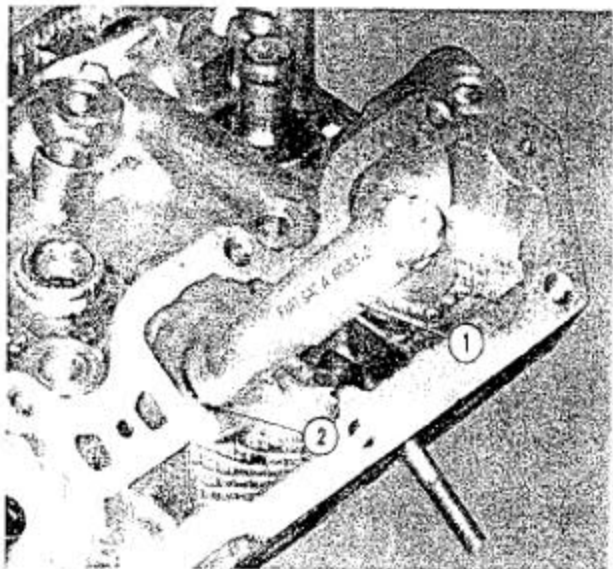
Place oil seal on pilot A.60313 (1). Mount pilot on valve stem (3). Slide seal over stem.

1. Pilot 2. Oil seal 3. Valve stem 4. Valve guide



Press oil seal onto milled upper end of valve guide (2). Use installer A.60313/2 (1).

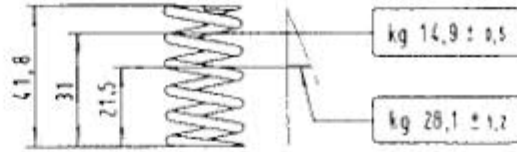
1. Installer A.60313/2 2. Valve guide



Test spring tension using fixture AP.5049.

Main data for testing valve inner springs.

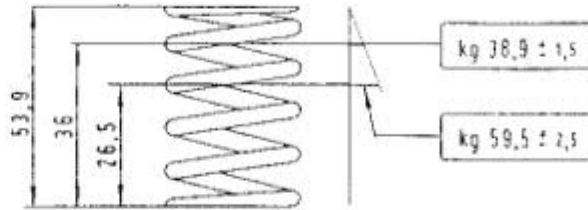
41.8 mm = 1.646 in	14.9 ± 0.5 kg = 33 ± 1.1 lbs
31 mm = 1.220 in	28.1 ± 1.2 kg = 64 ± 2.6 lbs
21.5 mm = .846 in	



Then compare the tension and deflection data read on the test fixture with the spring specifications shown on opposite figures.

Main data for testing valve outer springs.

53.9 mm = 2.122 in	38.9 ± 1.5 kg = 85 ± 3.3 lbs
36 mm = 1.417 in	59.5 ± 2.5 kg = 141 ± 5.5 lbs
26.5 mm = 1.043 in	



### MAIN DATA FOR TESTING VALVE SPRINGS

## REPLACING AND ADJUSTING DRIVE BELTS

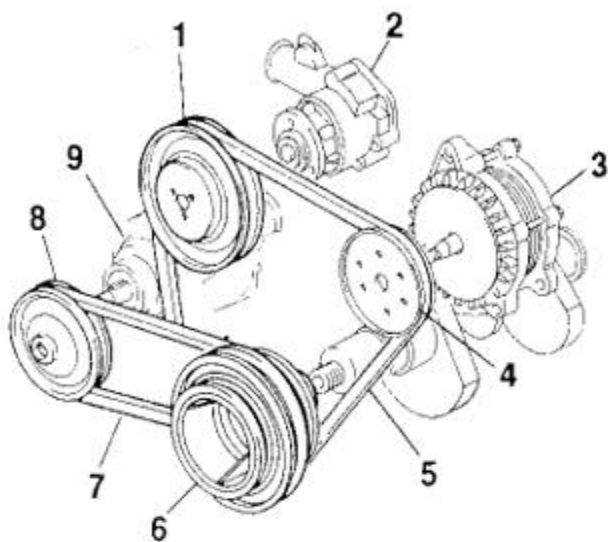
To replace drive belts, loosen alternator (3) mount bolts. Remove belt (5).

On vehicles with air pump, loosen air pump (9) mount bolts. Remove belt (7).

### Air Pump Belt

Install new belt (7) on air pump pulley (8) and crankshaft pulley (6). Install belt on rear groove of pulley (6). Fully tighten air pump belt (7) and air pump mount bolts. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

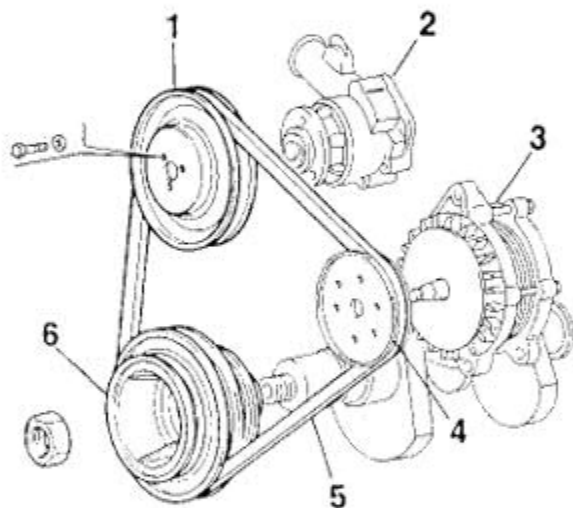
- 1, Water pump pulley 2, Water pump 3, Alternator  
4, Alternator pulley 5, Water pump/alternator belt  
6, Crankshaft pulley 7, Air pump belt 8, Air pump pulley  
9, Air pump



### Alternator/Water Pump Belt

Install new belt (5) on water pump pulley (1), alternator pulley (4) and center groove on crankshaft pulley (6). Fully tighten belt (5) and alternator mount bolts. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

- 1, Water pump pulley 2, Water pump 3, Alternator  
4, Alternator pulley 5, Water pump/alternator belt  
6, Crankshaft pulley

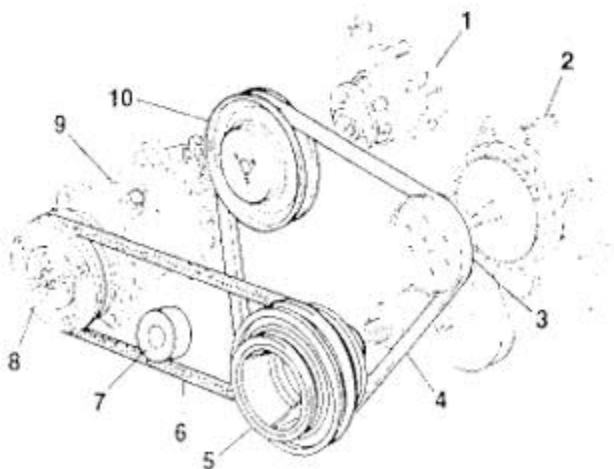


### A.C. Belt Without Turbo

Install new belt (6) over rear groove on crankshaft pulley (5) and front groove on compressor clutch (8). Make sure belt is under eccentric idler pulley (7). Make sure compressor (9) mounting bolts are tight.

Rotate idler pulley (7) down to set belt tension. Tighten bolt holding eccentric to bracket. Check for about  $\frac{1}{8}$  inch belt deflection with moderate finger pressure.

- 1, Water pump 2, Alternator 3, Alternator pulley  
4, Water pump/alternator belt 5, Crankshaft pulley 6, A.C. belt  
7, Eccentric idler pulley 8, Compressor clutch 9, Compressor  
10, Water pump pulley



**A.C. Belt With Turbo**

Place new belt (6) over front groove of compressor clutch (8) and front groove of crankshaft pulley (5).

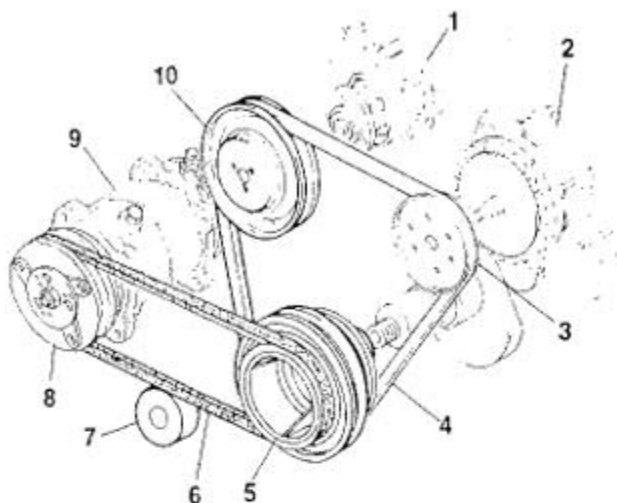
**NOTE:** Belt is exact fit and must be gently jumped over crankshaft pulley by turning engine with wrench (tool No. 50121).

Gently pull top of compressor (9) out and tighten upper front mounting bolt. Tighten lower front mounting bolt and then remaining two rear mounting bolts.

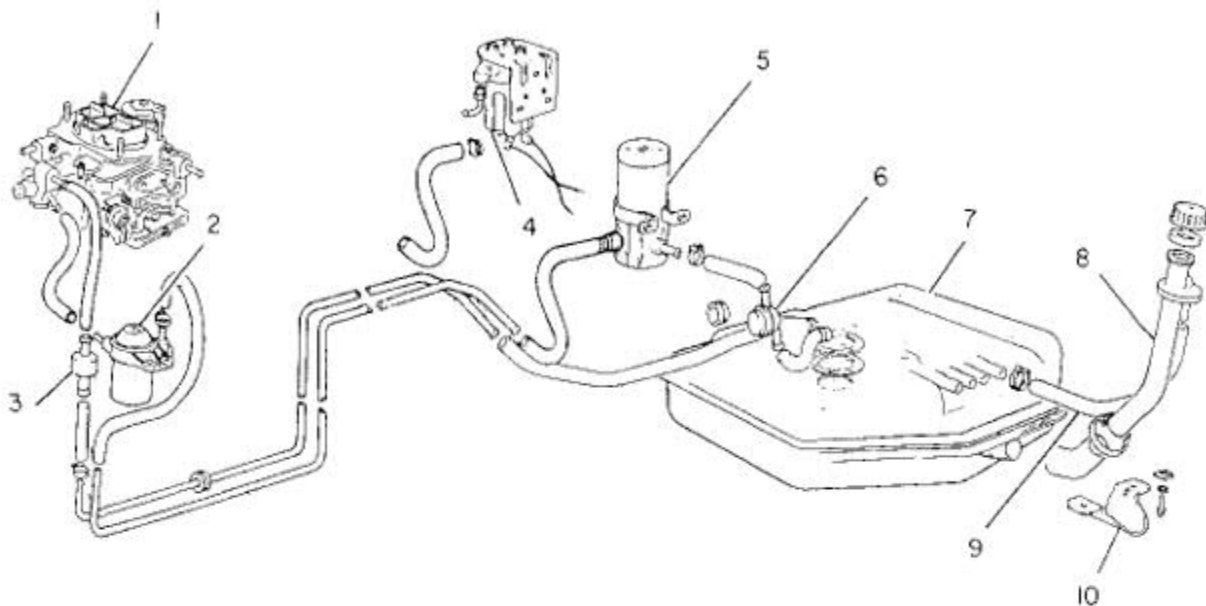
**NOTE:** This sets the drive belt tension.

Rotate eccentric idler pulley (7) up slightly against the belt (6). Tighten the bolt holding eccentric to compressor bracket.

**NOTE:** The drive belt (6) is at its proper tension when compressor (9) was adjusted. The idler pulley (7) is used for future belt adjustment if and when necessary.

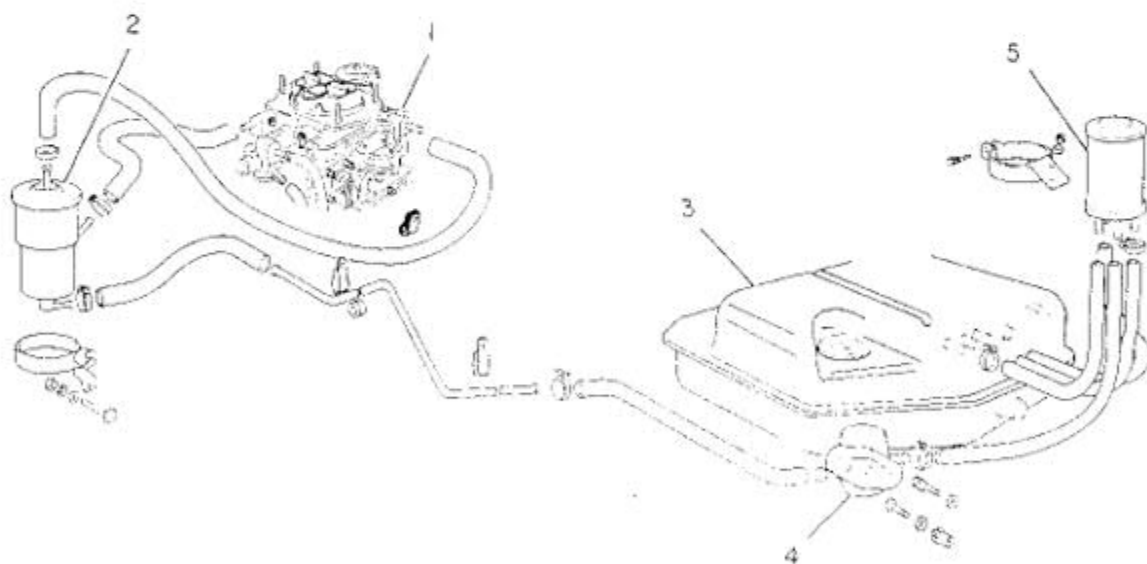


- 1, Water pump 2, Alternator 3, Alternator pulley  
 4, Water pump/alternator belt 5, Crankshaft pulley 6, A.C. belt  
 7, Eccentric idler pulley 8, Compressor clutch 9, Compressor  
 10, Water pump pulley



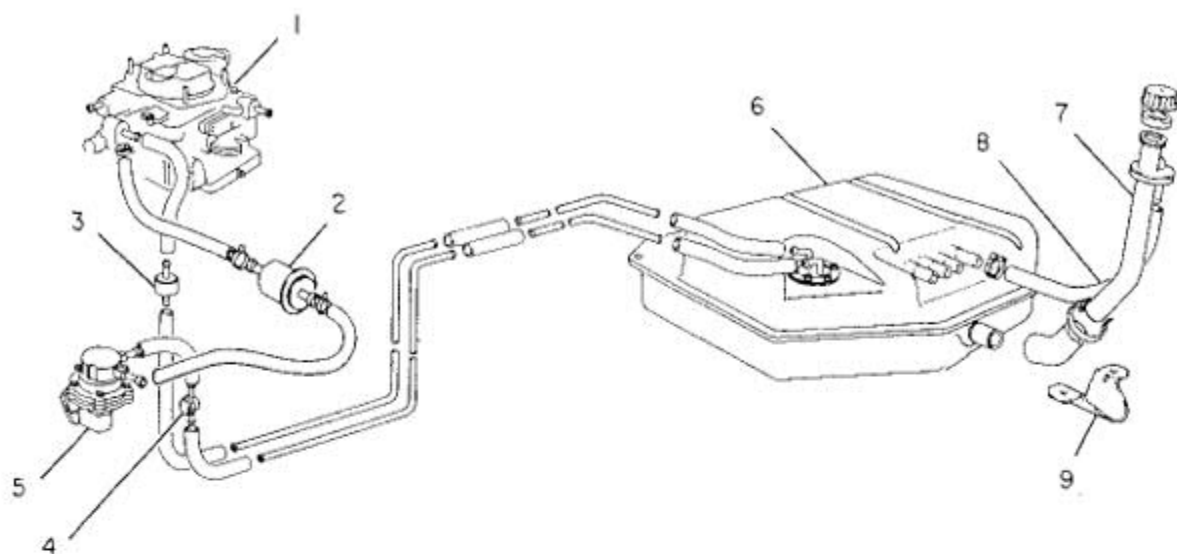
- |   |                        |
|---|------------------------|
| 1. Carburetor                                 | 6. Check valve         |
| 2. Fuel filter                                | 7. Fuel tank           |
| 3. Check valve                                | 8. Filler line         |
| 4. Fuel pump, Carter (replacement for Corona) | 9. Overflow line       |
| 5. Fuel pump, Corona                          | 10. Filler line shield |

FUEL TANK AND LINES (1975 to early 1977)



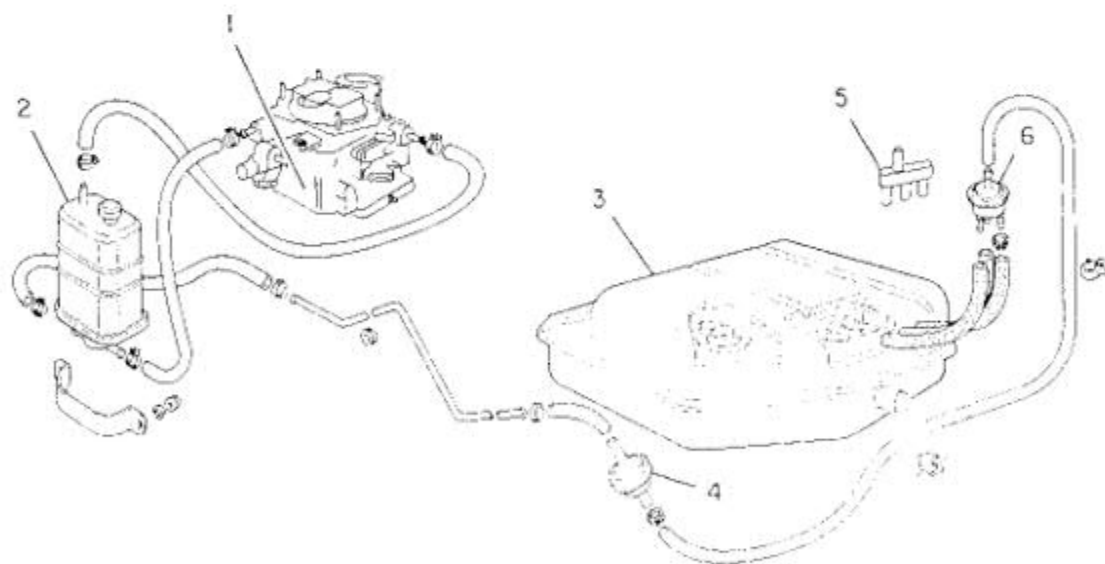
- |  |
|--|
| 1. Carburetor                            |
| 2. Charcoal trap                         |
| 3. Fuel tank                             |
| 4. Check valve and pressure relief valve |
| 5. Vapor/liquid separator                |

FUEL VAPOR LINES (1975 to early 1977)



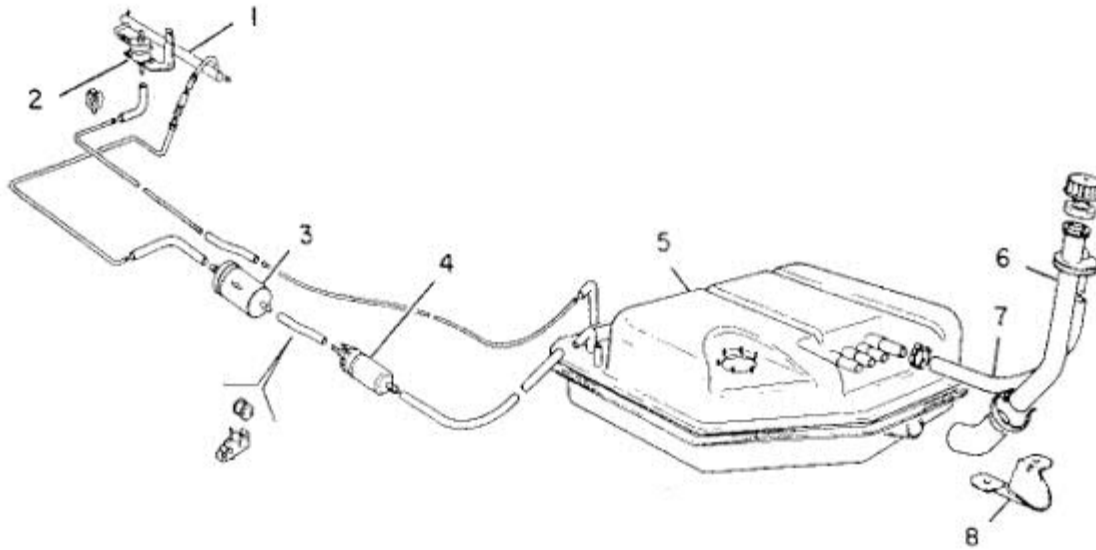
- |                |                       |
|----------------|-----------------------|
| 1. Carburetor  | 6. Fuel tank          |
| 2. Fuel filter | 7. Filler line        |
| 3. Check valve | 8. Overflow line      |
| 4. Check valve | 9. Filler line shield |
| 5. Fuel pump   |                       |

FUEL TANK AND LINES (1977 to early 1980)



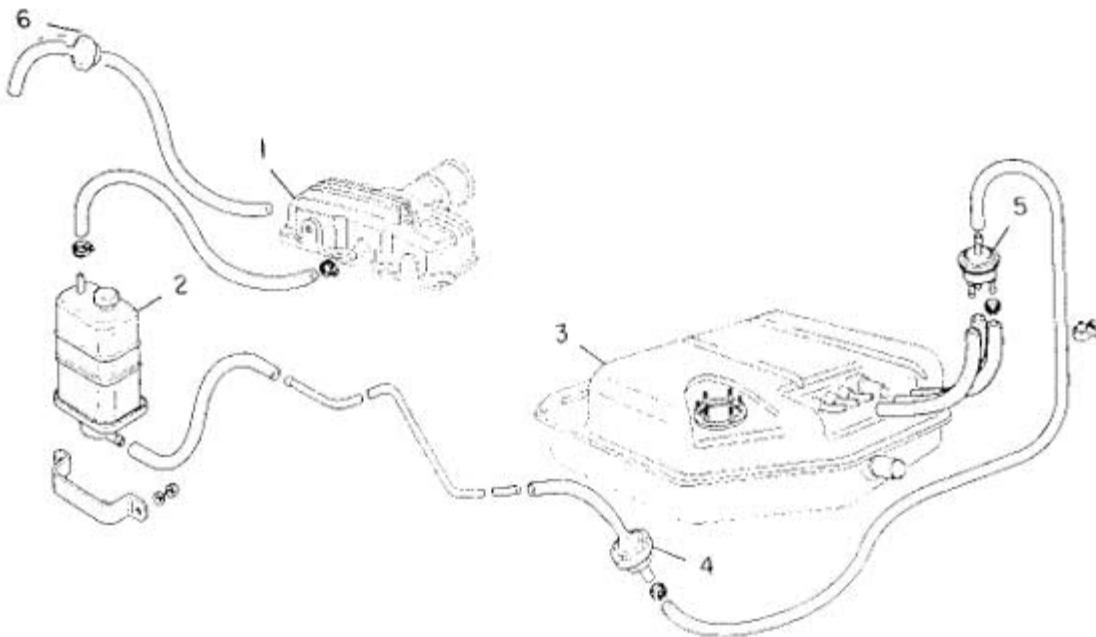
- |                           |
|---------------------------|
| 1. Carburetor             |
| 2. Charcoal trap          |
| 3. Fuel tank              |
| 4. Two-way valve          |
| 5. Vapor/liquid separator |

FUEL VAPOR LINES (1977 to early 1980)



- |                            |                       |
|----------------------------|-----------------------|
| 1. Fuel manifold           | 5. Fuel tank          |
| 2. Fuel pressure regulator | 6. Filler line        |
| 3. Fuel filter             | 7. Overflow line      |
| 4. Fuel pump               | 8. Filler line shield |

FUEL TANK AND LINES (1980 and on, fuel injected)



FUEL VAPOR LINES (1980 and on, fuel injected)

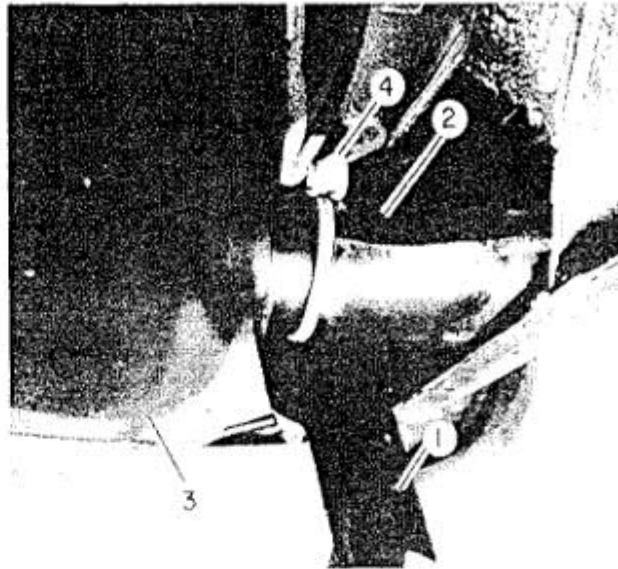


**FUEL TANK****REMOVAL AND INSTALLATION**

Drain or siphon fuel tank.

From under vehicle, remove two screws holding filler line shield (1). Loosen clamp (4) holding filler line (2) to tank (3) and pull line from tank.

1. Filler line shield 2. Filler line 3. Fuel tank 4. Clamp



Open trunk and remove carpeting, spare tire cover, fuel tank cover and spare tire.

Disconnect two electrical connectors (1) from fuel sending unit (2).

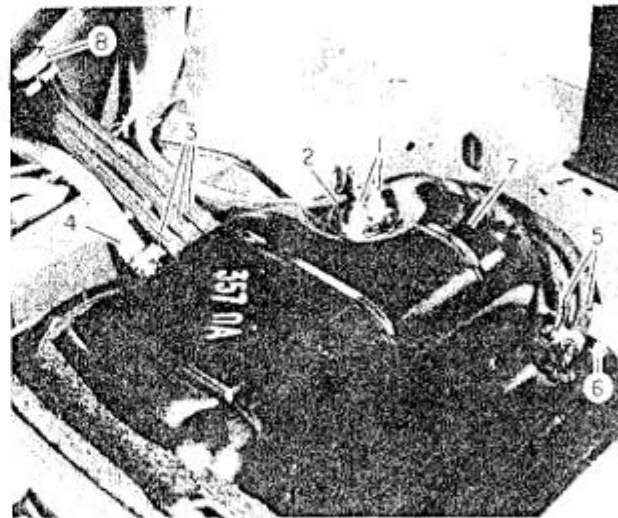
Loosen clamps on fuel vapor lines (3) and overflow line (4). Pull lines off.

Loosen clamps on fuel lines (5) and pull lines off (on carburetor vehicles, fuel lines are attached to sending unit).

Remove four nuts (6) holding tank (7) to body. Lift tank out of trunk area.

Installation is reverse of removal.

1. Electrical connector 2. Fuel sending unit 3. Fuel vapor lines  
4. Overflow line 5. Fuel lines 6. Nut 7. Fuel tank  
8. Vapor/liquid separator

**SENDING UNIT****REMOVAL AND INSTALLATION**

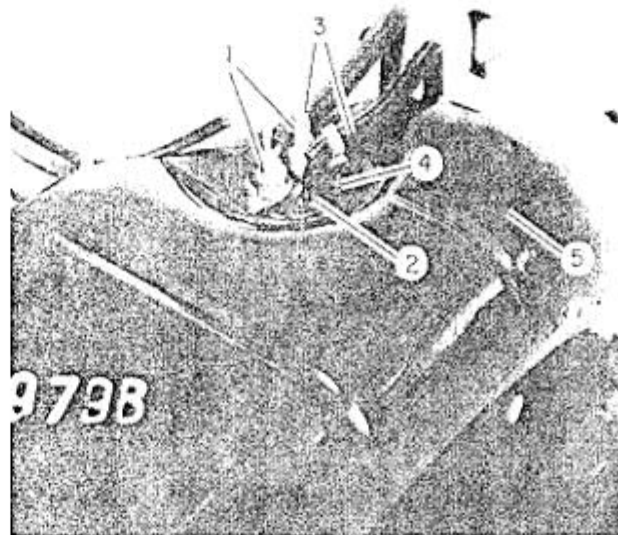
Open trunk and remove carpeting and fuel tank cover.

Disconnect two electrical connectors (1) from fuel sending unit (2). On carburetor vehicles (shown) loosen clamps on two fuel lines (3) and remove lines.

Remove six nuts (4) holding sending unit to tank (5) and carefully remove sending unit and gasket.

Installation is reverse of removal. Replace gasket during installation.

1. Electrical connector 2. Fuel sending unit 3. Fuel lines 4. Nut  
5. Fuel tank



### FUEL PUMP (1975 to early 1977)

#### REMOVAL AND INSTALLATION

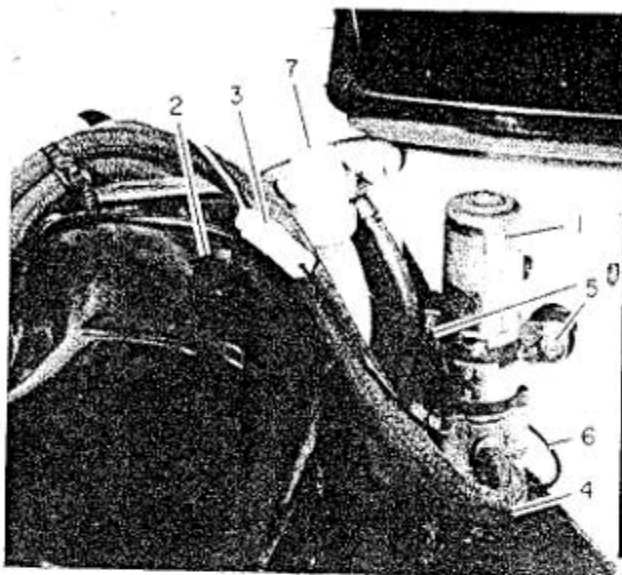
The electric fuel pump (1), either a Carter or a Corona (shown), is located in trunk area next to fuel tank (2).

From trunk compartment, remove carpeting, fuel tank cover, spare tire cover and spare tire.

Disconnect electrical connector (3) to pump. Loosen clamps on fuel inlet and outlet lines (4) and pull lines from pump. Remove two nuts (5) holding pump to body, remove pump.

Installation is reverse of removal.

1. Fuel pump 2. Fuel tank 3. Electrical connector 4. Fuel lines  
5. Nut 6. Ground wire 7. Vapor system pressure relief valve



### FUEL FILTER/PRESSURE REGULATOR (1975 to early 1977)

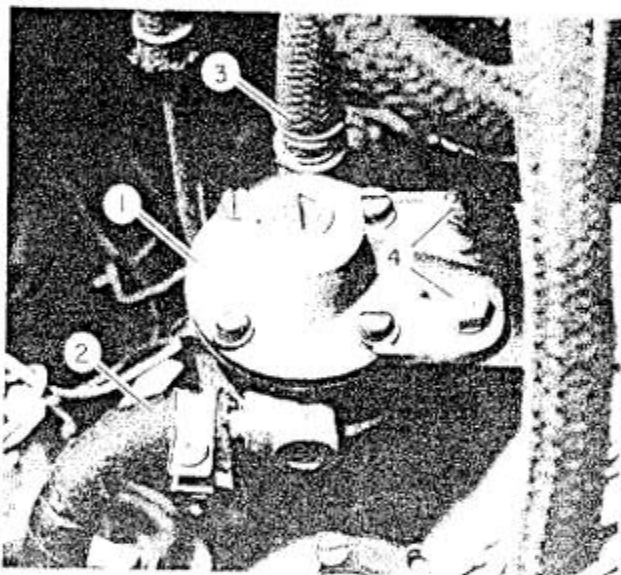
#### REMOVAL AND INSTALLATION

The fuel filter/pressure regulator (1) is located in engine compartment, mounted on left side just forward of and below carburetor.

Loosen clamps on inlet (2) and outlet (3) lines and pull lines from filter/pressure regulator. Remove two bolts (4) holding unit to body and remove filter/pressure regulator.

Installation is reverse of removal.

1. Fuel filter/pressure regulator 2. Fuel inlet line 3. Fuel outlet line  
4. Bolt



### FUEL PUMP (1977 to early 1980)

#### REMOVAL AND INSTALLATION

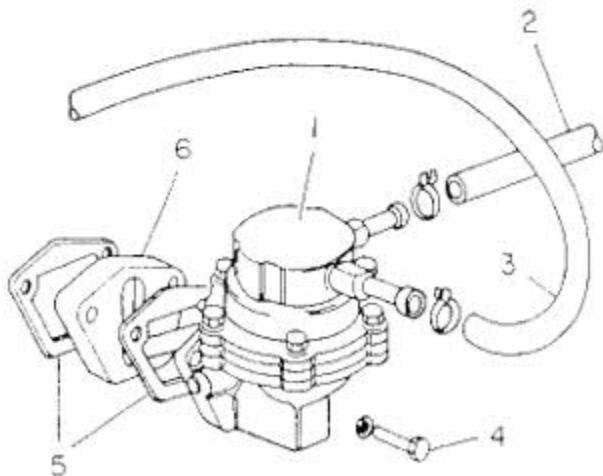
The mechanical fuel pump (1) is bolted to left side of engine.

From underneath vehicle, remove front splash pan.

Loosen clamps on inlet (2) and outlet (3) lines and pull lines from pump. Remove two bolts (4) holding pump to engine and remove pump.

Installation is reverse of removal. Install new gaskets (5).

1. Fuel pump 2. Fuel inlet line 3. Fuel outlet line 4. Bolt  
5. Gasket 6. Spacer



**FUEL FILTER (1977 to early 1980)****REMOVAL AND INSTALLATION**

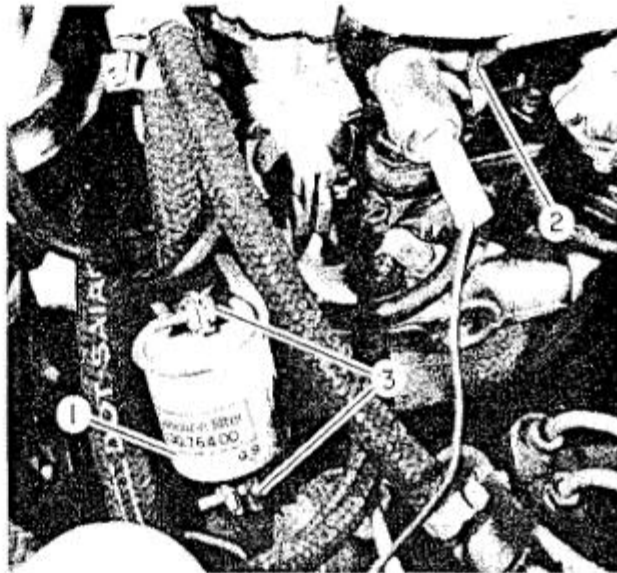
The fuel filter (1) is located in engine compartment near carburetor (2).

Loosen clamps (3) on inlet and outlet lines and pull lines from filter.

Installation is reverse of removal.

**NOTE:** Be certain that arrow on filter points towards carburetor.

1. Fuel filter 2. Carburetor 3. Clamp

**FUEL PUMP (1980 and on, Fuel Injected)****REMOVAL AND INSTALLATION**

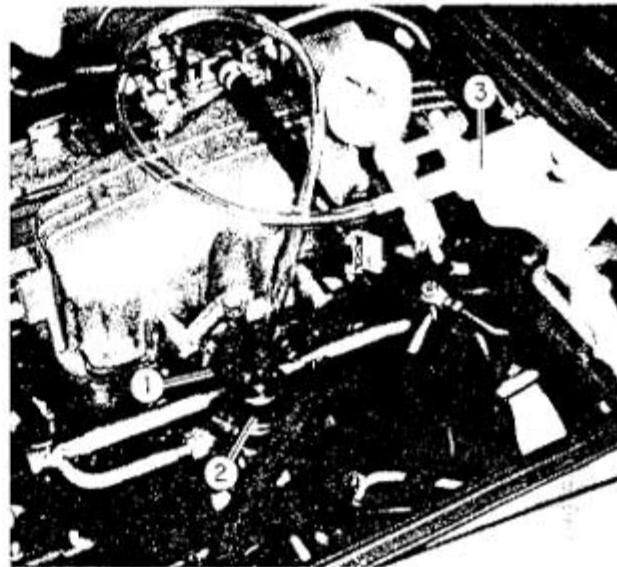
Before disconnecting fuel lines, fuel pressure must first be released.

Remove fuel tank filler cap.

Remove vacuum hose (1) from fuel pressure regulator (2).

Using a hand vacuum pump (3) apply about 25 inches of vacuum to pressure regulator as shown. Fuel system pressure will then be released into fuel tank.

1. Vacuum hose 2. Fuel pressure regulator 3. Hand vacuum pump



The electric fuel pump (1) is located underneath vehicle on left side, just forward of rear axle.

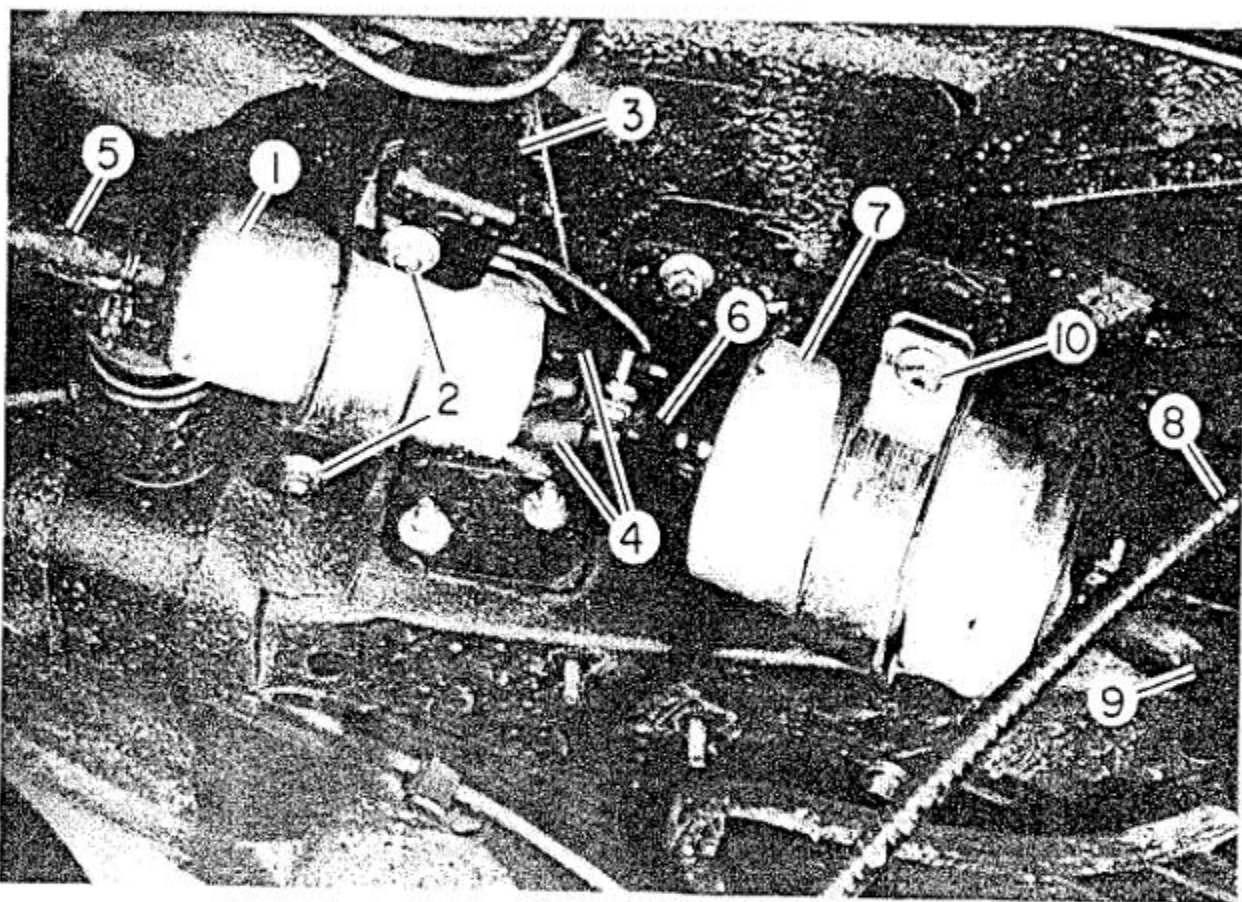
Loosen two nuts (2) holding shield and pump to body mount (3), remove shield.

Disconnect two electrical connectors (4) from pump.

Loosen clamps on fuel inlet (5) and outlet (6) lines and pull lines from pump. Remove pump from outlet.

Installation is reverse of removal.

1. Fuel pump 2. Nut 3. Mount 4. Electrical connector 5. Fuel pump inlet line 6. Fuel line, pump to filter 7. Fuel filter 8. Emergency brake cable 9. Filter outlet line 10. Nut



### FUEL FILTER (1980 and on, Fuel Injected)

#### REMOVAL AND INSTALLATION

The fuel filter (7) is located underneath vehicle on left side, just forward of rear axle.

Before disconnecting fuel lines, system pressure must first be released (see procedure under FUEL PUMP).

Remove two bracket nuts holding emergency brake cable (8) to body. Lower cable out of way, as shown.

Loosen clamps on inlet (6) and outlet (9) lines and pull lines from filter.

Remove two nuts (10) holding shield and filter to body mount. Remove shield and filter.

Installation is reverse of removal.

**NOTE:** Be certain that arrow on filter points toward front of vehicle.

1950

1951

1952

1953

1

2

3

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### AIR CLEANER

#### REMOVAL AND INSTALLATION (Without Fuel Injection)

Remove three nuts (2) holding cover (1) on air cleaner assembly (3). Remove filter element.

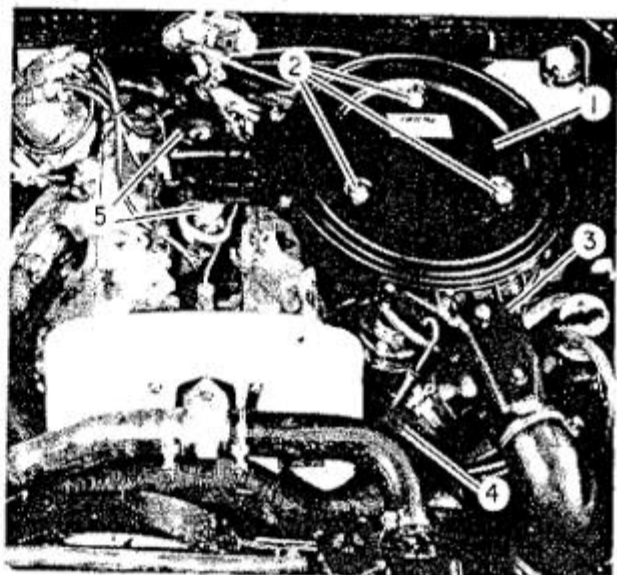
On engines with air induction (shown), remove reed valve hoses (5) from air cleaner. On engines with air pump, remove air injection hose from air cleaner.

If equipped with hot air hose (4), loosen clamp and remove hose from snorkel.

Remove four nuts holding air cleaner to carburetor. Lift air cleaner, then disconnect two hoses from bottom. Remove air cleaner.

Install in reverse order. Make sure metal bushings are installed in rubber spacer.

1. Cover 2. Nut 3. Air cleaner assembly 4. Hot air hose  
5. Reed valve hose



### AIR CLEANER

#### REMOVAL AND INSTALLATION (With Fuel Injection)

**NOTE:** The air filter element should be changed every 30,000 miles. If vehicle is frequently driven in heavy traffic or sandy or dusty areas, it is recommended to replace filter every 15,000 miles.

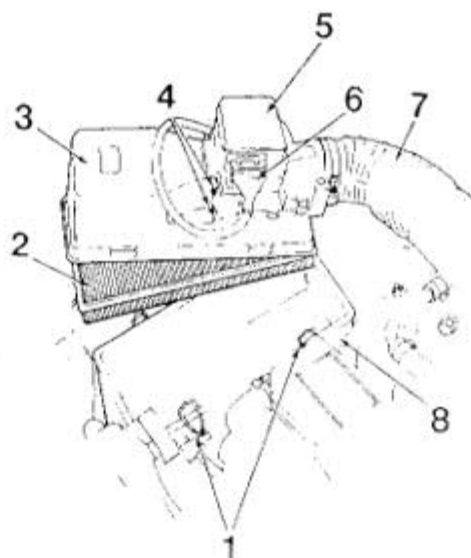
Using a screwdriver, release the four catches (1).

Lift the cover (3) off and remove the filter (2).

Install new filter and replace cover.

Secure catches by pressing on curved section.

1. Catch 2. Filter 3. Cover 4. Bolts 5. Air flow sensor  
6. Connector 7. Air hose 8. Housing



### CARBURETOR

#### REMOVAL AND INSTALLATION

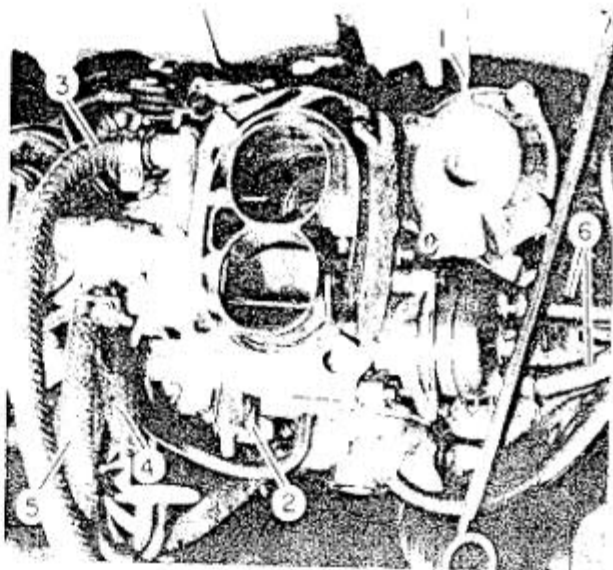
Remove air cleaner.

Remove spring clip and disconnect accelerator rod (1). Disconnect wire from idle stop solenoid (2). Disconnect vacuum lines from carburetor. Disconnect float bowl vapor line (3). Disconnect fuel inlet (4) and return (5) lines. Disconnect hot water lines (6) to automatic choke.

Remove four nuts at base of carburetor and remove carburetor.

**NOTE:** As an aid to connecting vacuum lines, there are color coded plastic clips at the base of five vacuum connectors on carburetor. These colors match colors on lines that are attached to connectors.

1. Accelerator rod 2. Idle stop solenoid 3. Vapor line 4. Fuel inlet line  
5. Fuel return line 6. Hot water lines







## AIR CLEANER

### REMOVAL AND INSTALLATION (Without Fuel Injection)

Remove three nuts (2) holding cover (1) on air cleaner assembly (3). Remove filter element.

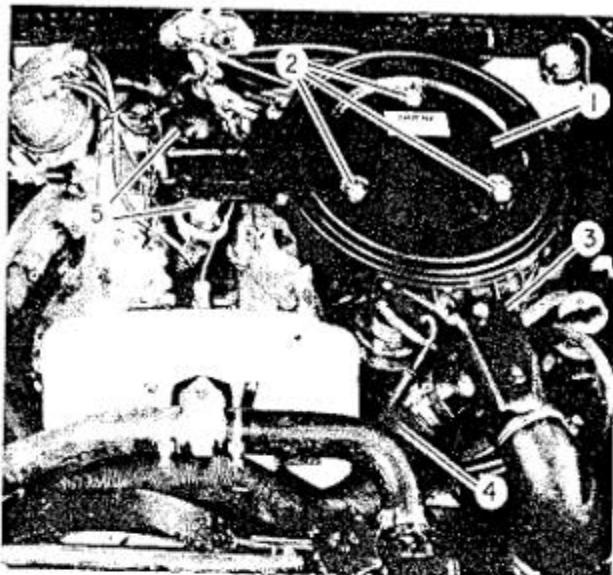
On engines with air induction (shown), remove reed valve hoses (5) from air cleaner. On engines with air pump, remove air injection hose from air cleaner.

If equipped with hot air hose (4), loosen clamp and remove hose from snorkel.

Remove four nuts holding air cleaner to carburetor. Lift air cleaner, then disconnect two hoses from bottom. Remove air cleaner.

Install in reverse order. Make sure metal bushings are installed in rubber spacer.

1. Cover 2. Nut 3. Air cleaner assembly 4. Hot air hose  
5. Reed valve hose



## AIR CLEANER

### REMOVAL AND INSTALLATION (With Fuel Injection)

**NOTE:** The air filter element should be changed every 30,000 miles. If vehicle is frequently driven in heavy traffic or sandy or dusty areas, it is recommended to replace filter every 15,000 miles.

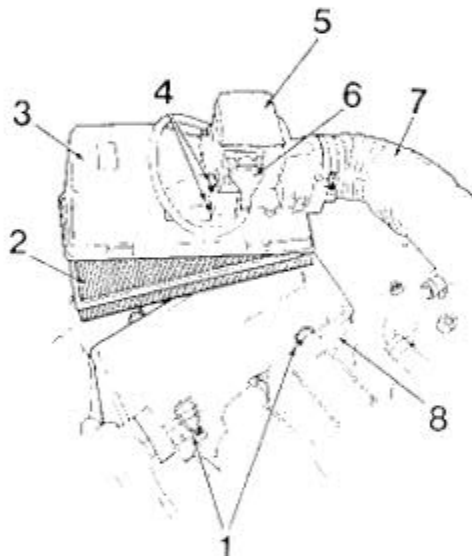
Using a screwdriver, release the four catches (1).

Lift the cover (3) off and remove the filter (2).

Install new filter and replace cover.

Secure catches by pressing on curved section.

1. Catch 2. Filter 3. Cover 4. Bolts 5. Air flow sensor  
6. Connector 7. Air hose 8. Housing



## CARBURETOR

### REMOVAL AND INSTALLATION

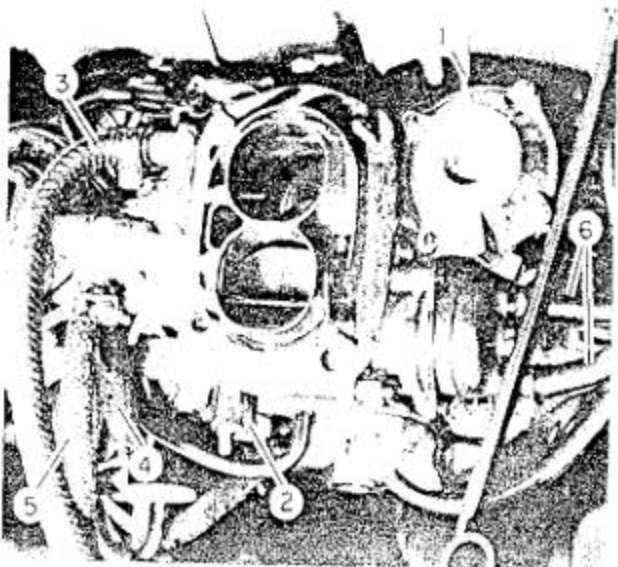
Remove air cleaner.

Remove spring clip and disconnect accelerator rod (1). Disconnect wire from idle stop solenoid (2). Disconnect vacuum lines from carburetor. Disconnect float bowl vapor line (3). Disconnect fuel inlet (4) and return (5) lines. Disconnect hot water lines (6) to automatic choke.

Remove four nuts at base of carburetor and remove carburetor.

**NOTE:** As an aid to connecting vacuum lines, there are color coded plastic clips at the base of five vacuum connectors on carburetor. These colors match colors on lines that are attached to connectors.

1. Accelerator rod 2. Idle stop solenoid 3. Vapor line 4. Fuel inlet line 5. Fuel return line 6. Hot water lines



**ADJUSTMENT****Float Level Adjustment**

Remove six screws holding float bowl cover to carburetor. Remove cover, being careful not to damage gasket.

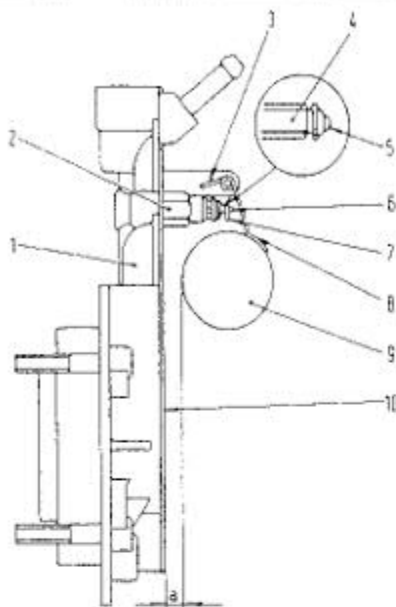
Check that needle valve (2) is screwed down in housing. Check that float (9) is free of dents or punctures.

Check that float can move freely on hinges.

Check distance (a) between float and cover face gasket with float in vertical position.

a = 0.236 to 0.275 in. (6 to 7 mm)

1. Carburetor cover 2. Needle valve 3. Lug 4. Valve needle  
5. Movable ball 6. Return hook 7. Tang 8. Float arm 9. Float  
10. Gasket

**Idle and CO Adjustment**

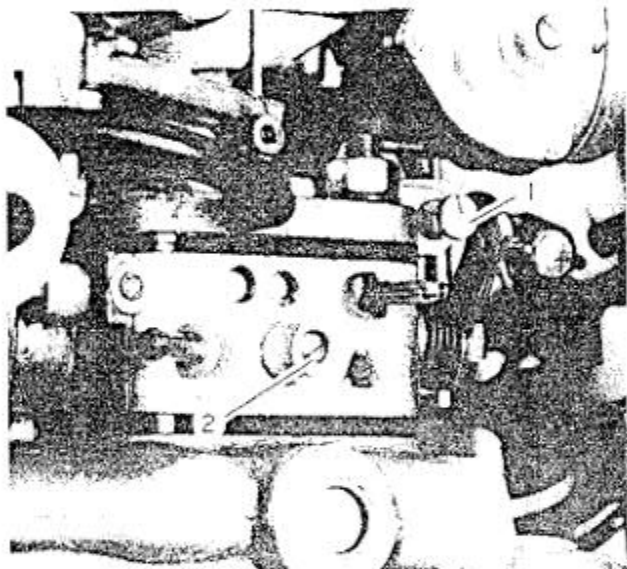
On engines with air induction, remove air cleaner cover and block inlet to reed valves. Reinstall cover.

On engines with air pump, pinch off air injection hose between check valve and tee fitting.

In all engines, connect tachometer. Apply handbrake. Start engine and allow it to warm up. Insert CO tester probe in tailpipe.

Check normal idle and CO. On cars with manual transmission, normal idle speed should be 800 to 900 rpm. On cars with automatic transmission, normal idle speed should be 700 to 800 rpm in drive. Check information tag in engine compartment for correct CO setting.

1. Idle speed screw 2. Idle mixture screw

**High Idle Speed (1975 to 1978 only)**

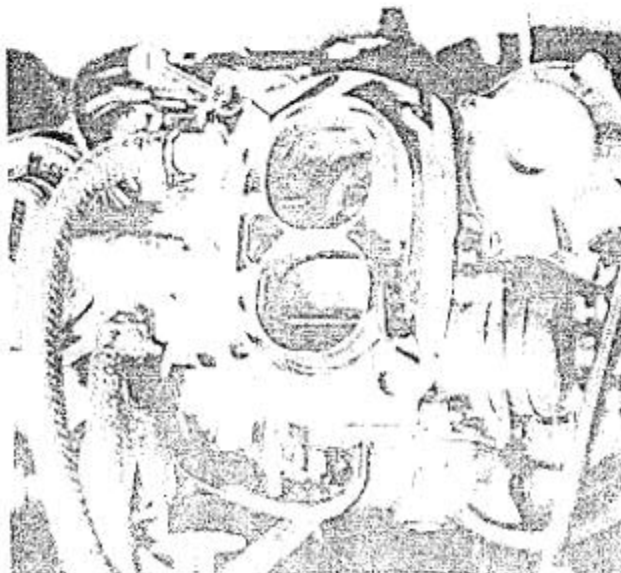
Let engine idle. Place transmission in NEUTRAL.

Move throttle linkage to obtain 2500 rpm. Hold linkage and push high idle button, located on left fender well, down. Hold button down and release carburetor linkage. Allow engine to decelerate to high idle. Check that high idle is 1550 to 1650 rpm (manual trans.) or 1250 to 1350 rpm (auto. trans.).

If high idle is not correct, adjust screw (1). Turn screw in to decrease or out to increase rpm.

While button is kept depressed, accelerate engine several times to check whether fast idle rpm is correct. If not, readjust.

1. High idle speed screw



## AUTOMATIC CHOKE

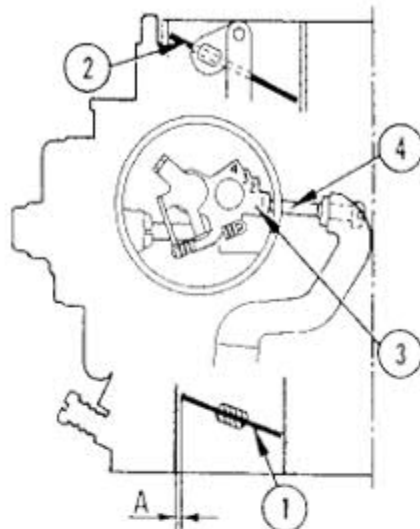
### CHECKS AND ADJUSTMENTS

Remove carburetor from car. Remove 3 screws holding automatic choke cover. Remove cover and gasket.

#### Choke Fast Idle

Set fast idle screw (4) on first (highest) step of cam (3). Check that primary throttle opening (dimension A) is 1.05 to 1.15 mm (0.042 to 0.046 in.). If dimension A is not correct, adjust screw (4).

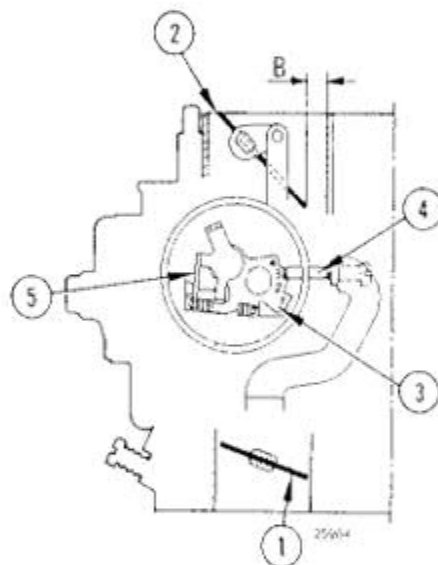
1. Primary throttle plate 2. Choke plate 3. Fast idle cam  
4. Fast idle adjustment screw



#### Fast Idle Cam

Set fast idle screw (4) on third step of cam (3). Check that choke plate opening (dimension B) is 6.25 to 6.74 mm (0.246 to 0.266 in.). Use 1/4 inch and 17/64 inch drill bits to check dimension. If dimension B is not correct carefully bend arm (5).

1. Primary throttle plate 2. Choke plate 3. Fast idle cam  
4. Fast idle screw 5. Choke lever arm



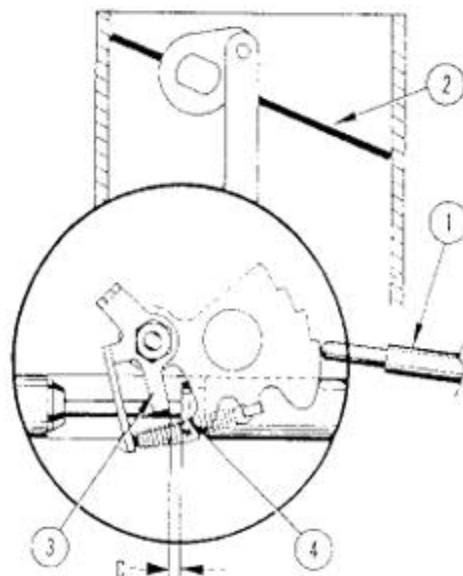
#### Choke Unloader

Pull fast idle linkage (1) back. Close choke plate (2). Release linkage (1).

Measure gap (c) between lever (3) and shoulder of bushing (4). A spark plug gap gauge of the bent wire type can be used.

Gap should be 0.3 to 1.0 mm (0.012 to 0.039 in.). If gap is not correct, carefully bend tang (3).

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



**Choke Plate Minimum Opening**

Set fast idle screw (2) on second step of cam (3). Separate tool 4900 into its 3 parts by unscrewing. Thread tool (1) into end of vacuum piston bore as far as it will go without forcing.

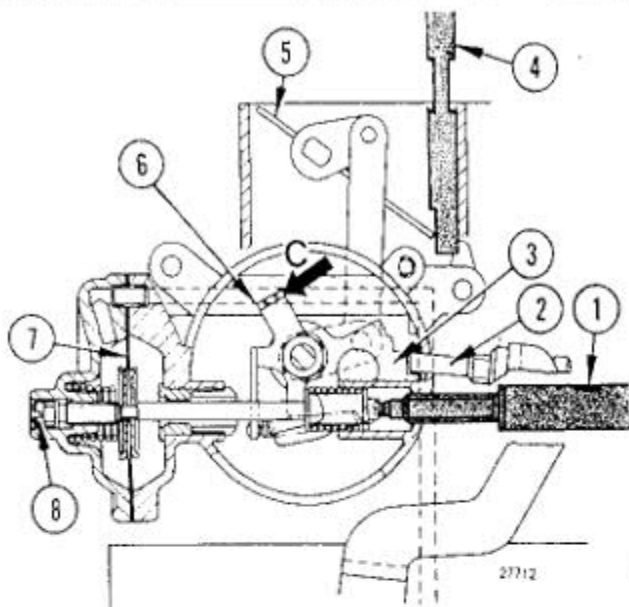
Push lever (6) in direction of arrow (C) and hold it. Measure choke plate opening using tool gauge (4). Opening should be 4.7 mm (0.177 in.).

**NOTE:** Notch on tool (4) is 4.5 mm. If opening is too small, back off stop screw (8) and turn tool half (1) further in until 4.5 mm is obtained. Turn stop screw in until it contacts piston.

If opening is too large, back off tool (1) until 4.5 mm is obtained. Turn stop screw (8) in until it contacts piston.

Leave tool (1) in place for next check.

1. Tool (threaded end) 2. Fast idle screw 3. Fast idle cam  
4. Tool gauge 4.5 mm (notched end) 5. Choke plate  
6. Choke plate opening lever 7. Diaphragm 8. Stop screw

**Choke Plate Maximum Opening**

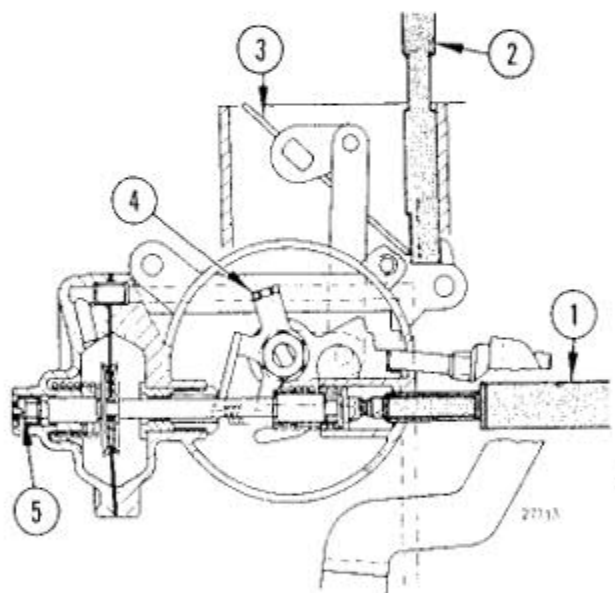
After having checked minimum opening setting and with tool (1) in place, release lever (4). Check that opening is 6.7 mm (0.264 in.).

Use tool gauge (2) to check opening.

**NOTE:** Notch on tool is 6.7 mm.

If opening is not within specifications, replace vacuum diaphragm assembly.

1. Tool (threaded end) 2. Tool gauge 6.7 mm 3. Choke plate  
4. Choke plate opening lever 5. Diaphragm travel stop screw

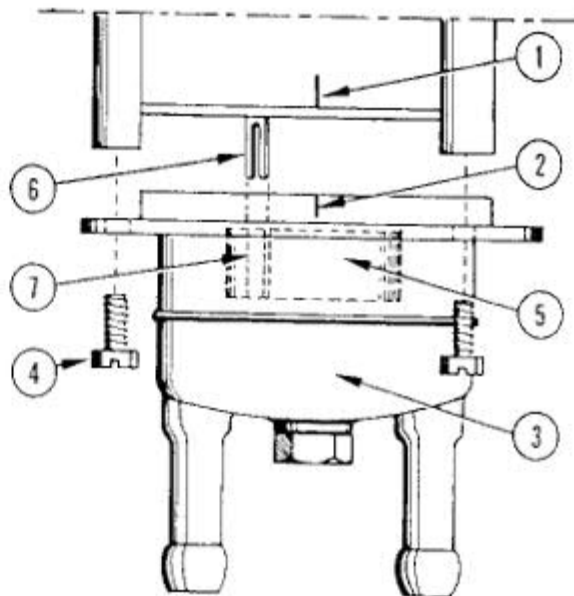


### Choke Cover Indexing

Place choke cover (3) on housing so that lug (7) on spring (5) inside cover is in fork (6) of choke opening lever. Rotate cover to align index marks (2) on cover with marks (1) on housing. Secure cover (3) with 3 screws (4).

With index marks aligned and carburetor at room temperature of 77°F, check that choke plate closes fully and remains closed when primary throttle is opened.

1. Housing mark 2. Cover mark 3. Choke cover 4. Screw  
5. Thermostatic spring 6. Choke opening lever fork 7. Spring lug



### SECONDARY THROTTLE PLATE GAP

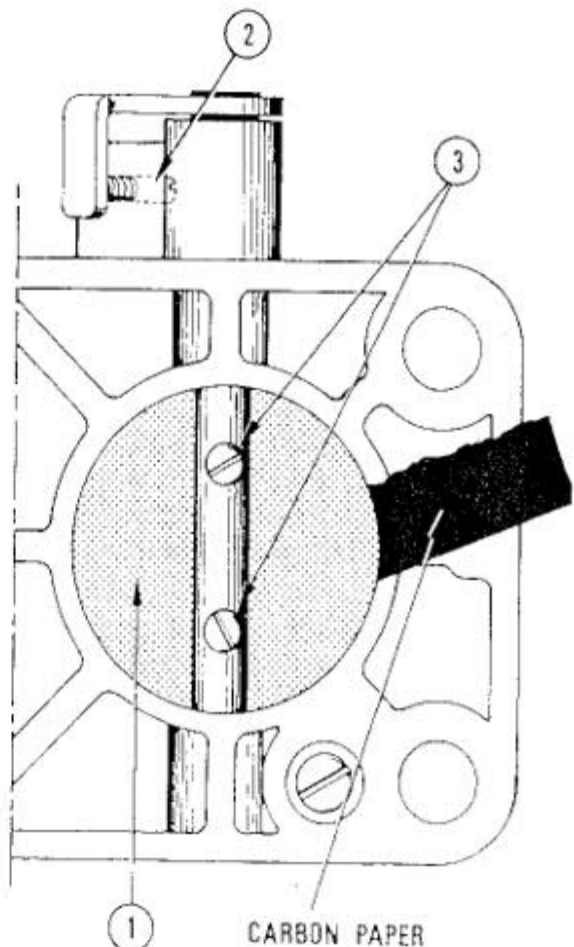
#### CHECK AND ADJUSTMENT

With throttle linkage released, secondary throttle plate (1) should have an opening of 0.04 to 0.05 mm (0.0015 to 0.0019 in.). This dimension is about the thickness of a piece of type-writer carbon paper.

To check opening, open secondary throttle plate (1). Place a strip of carbon paper inside barrel. Release secondary throttle plate. Turn screw (2) as necessary until a resistance is felt when pulling strip out of barrel without tearing it.

Using a light from behind throttle plate (1), check that gap is even around plate. If not, loosen 2 screws (3) holding plate to shaft. Center plate and tighten screws. Check gap again.

1. Throttle plate 2. Secondary throttle plate screw  
3. Throttle plate mounting screws

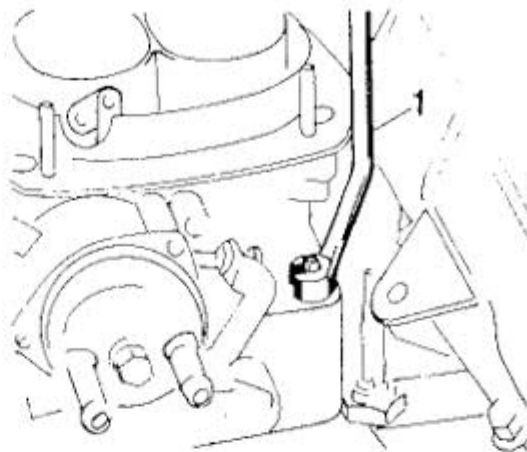


**CARBURETOR****ENGINE COLD CHECKS**

If carburetor was removed, install it. Do not install air cleaner cover. If carburetor was not removed, remove air cleaner cover.

Make sure the four 13 mm nuts holding carburetor are tight. Use wrench A.50146 (1) to tighten two inboard nuts.

1. Wrench A.50146

**Idle Cut-Off Solenoid Check**

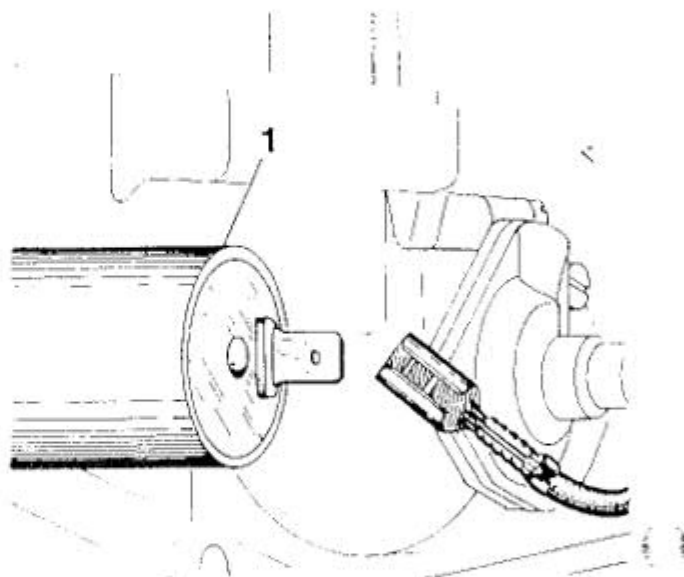
Disconnect wire from solenoid (1). Turn ignition switch to ON without cranking engine.

Listen closely while reconnecting wire to solenoid. A click from solenoid should be heard while connecting wire.

Repeat as necessary to confirm.

If click is not heard, check for voltage at solenoid connection. If no voltage, troubleshoot electrical system. If voltage is present, remove solenoid. Clean or replace solenoid as necessary.

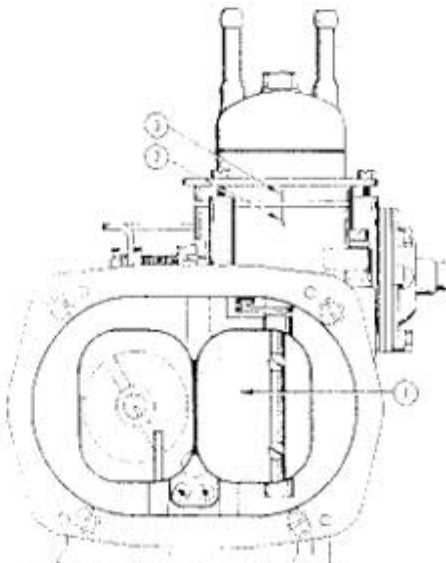
1. Idle cut-off solenoid

**Closed Position of Choke Plate**

Pull carburetor linkage to open throttles. Release linkage. With engine cold and temperature of 77°F or less, check that choke plate (1) is fully closed.

If plate is not fully closed, check choke plate for binding. Check that plate is centered. If plate is not centered and not binding, check alignment of marks (2 and 3) on choke housing. If marks are aligned, replace thermostatic spring in choke housing.

1. Choke plate 2. Housing alignment mark 3. Cover alignment mark



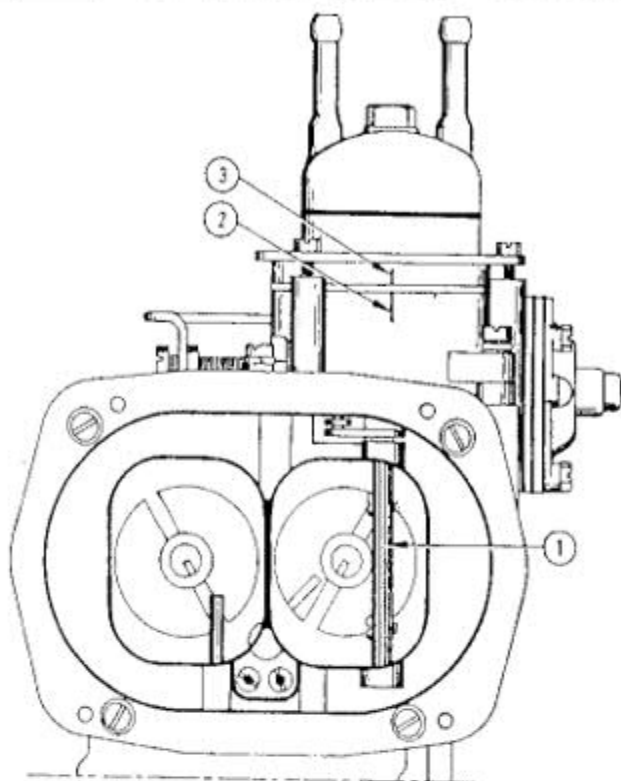
### Open Position of Choke Plate

Run engine until it reaches normal operating temperature (radiator fan starts running).

Check that choke plate (1) is fully open.

If plate is not fully open check linkage for binding. Check that plate is centered in barrel. If plate is centered and not binding, check alignment of marks (2 and 3) on choke housing. If marks are aligned, replace the thermostatic spring in choke housing.

1. Choke plate 2. Housing alignment mark 3. Cover alignment mark



### Air Cleaner Cover Indexing (1975 to 1978)

If air cleaner is not installed, install it. Before installing cover, align letter on cover with arrow on air cleaner duct as follows:

I = outside temperatures 60° F (15° C) or less

E = outside temperatures above 60° F (15° C)



## CATALYTIC CONVERTER TACHIMETRIC SWITCH (1975 and 1976)

### CHECKS

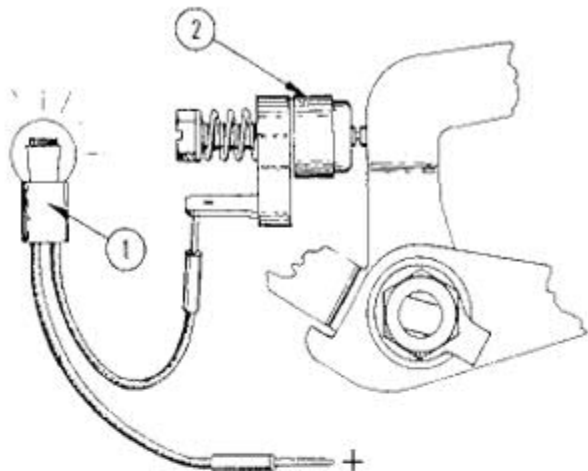
#### Inhibitor Switch Check

Run engine until normal operating temperature is reached. Shut engine off. Turn ignition ON.

Disconnect wire from inhibitor switch (2) and ground wire for later checks. Connect lead of test lamp (1) to terminal of inhibitor switch. Connect other lead of test lamp to power. Lamp should be on.

Open carburetor throttle linkage slowly. Lamp should remain on for a while and then go out. If test lamp did not indicate proper operation, troubleshoot electrical system. (Refer to schematic in exhaust emissions portion of this section.)

1. Test lamp 2. Inhibitor switch



#### Tachimetric Switch Calibration Check

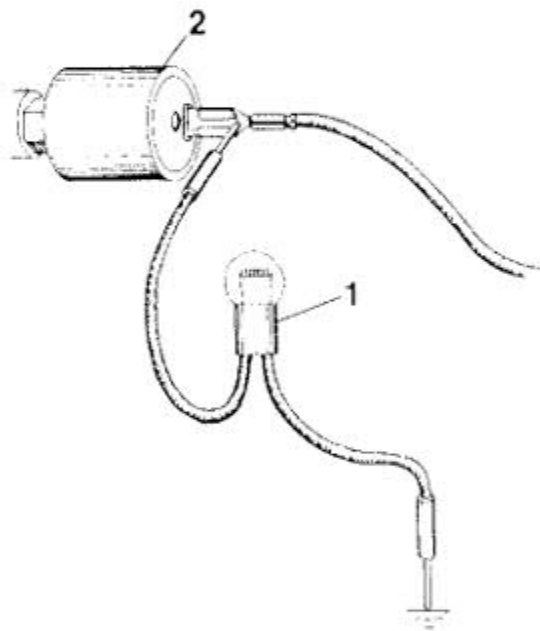
Connect tachometer. Connect test lamp between idle cutoff solenoid and ground. Run engine and let it idle.

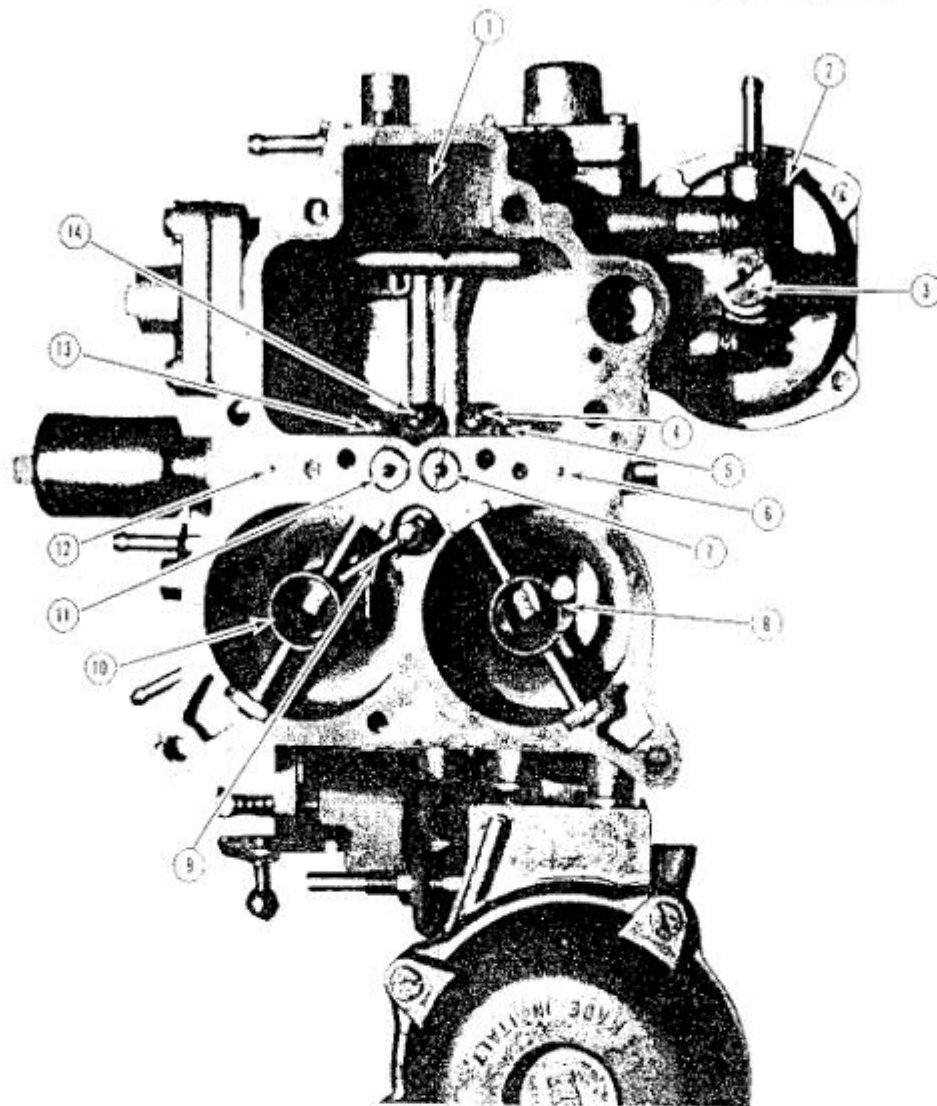
Check that test lamp is lit. Slowly increase engine speed to 2800 rpm. Check that test lamp goes out between 2600 and 2700 rpm. Slowly allow engine speed to decrease to idle. Check that test lamp comes on at 2600 rpm or above.

If test lamp did not indicate proper operation, troubleshoot tachimetric system. (Refer to schematic in exhaust emissions portion of this section.)

Shut off engine. Disconnect test equipment. Connect wire to inhibitor switch.

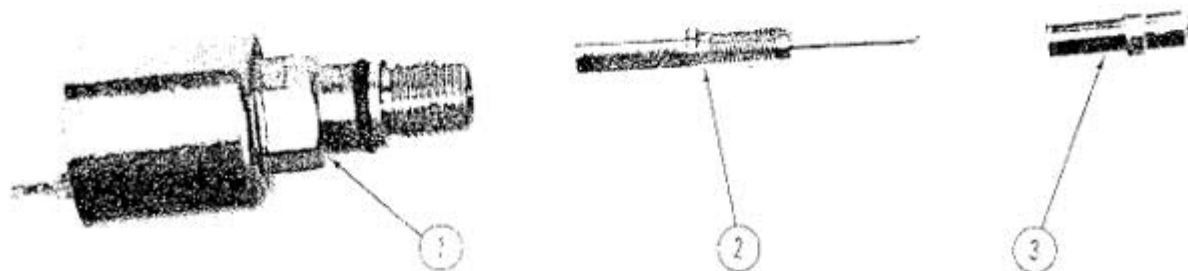
1. Test lamp 2. Idle cutoff solenoid





- |  |  |
|--|--|
| 1. Float bowl  | 9. Acceleration pump nozzle                      |
| 2. Fast idle diaphragm (not functional on 28/32 ADHA)        | 10. Primary venturi                              |
| 3. Fast idle adjustment screw (not functional on 28/32 ADHA) | 11. Air correction jet-primary                   |
| 4. Main jet-secondary  | 12. High speed air passage                       |
| 5. High speed gas inlet                                      | 13. High speed gas inlet                         |
| 6. High speed air passage                                    | 14. Main jet-primary                             |
| 7. Air correction jet-secondary                              | 15. Idle shutoff control                         |
| 8. Secondary venturi   | 16. Secondary throttle control (28/32 ADHA only) |

### CARBURETOR WITH TOP COVER REMOVED



1. Idle shutoff solenoid    2. Shutoff plunger    3. Idle jet

### IDLE SHUTOFF CONTROL



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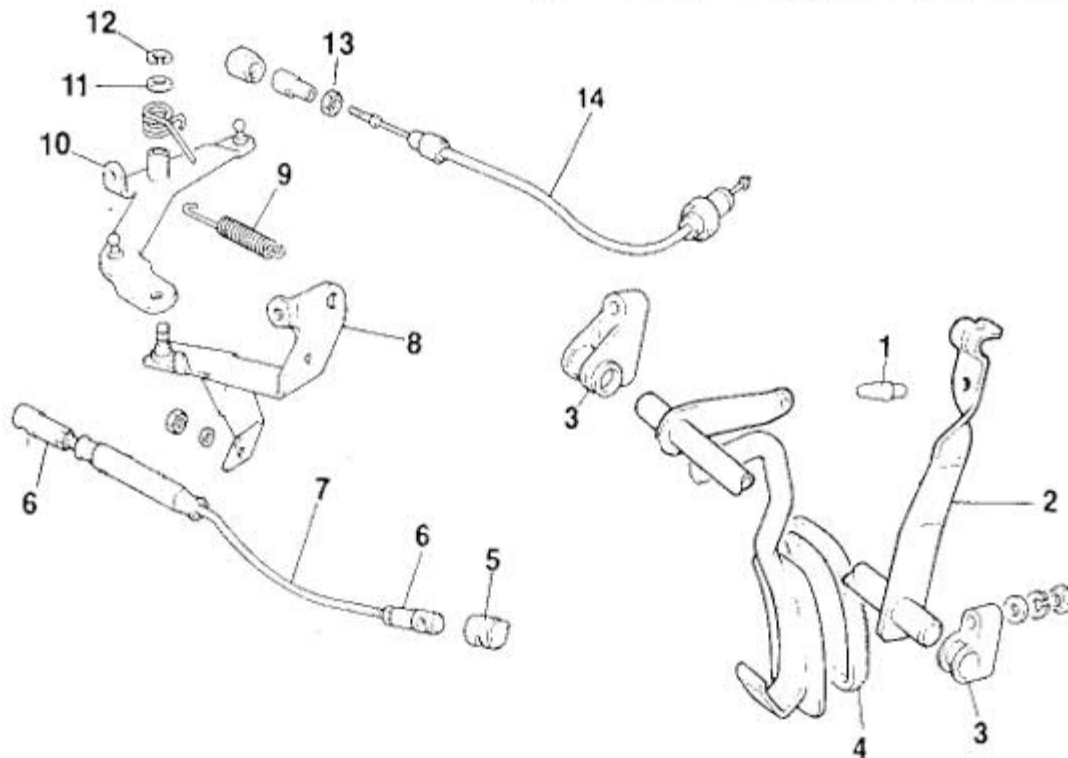
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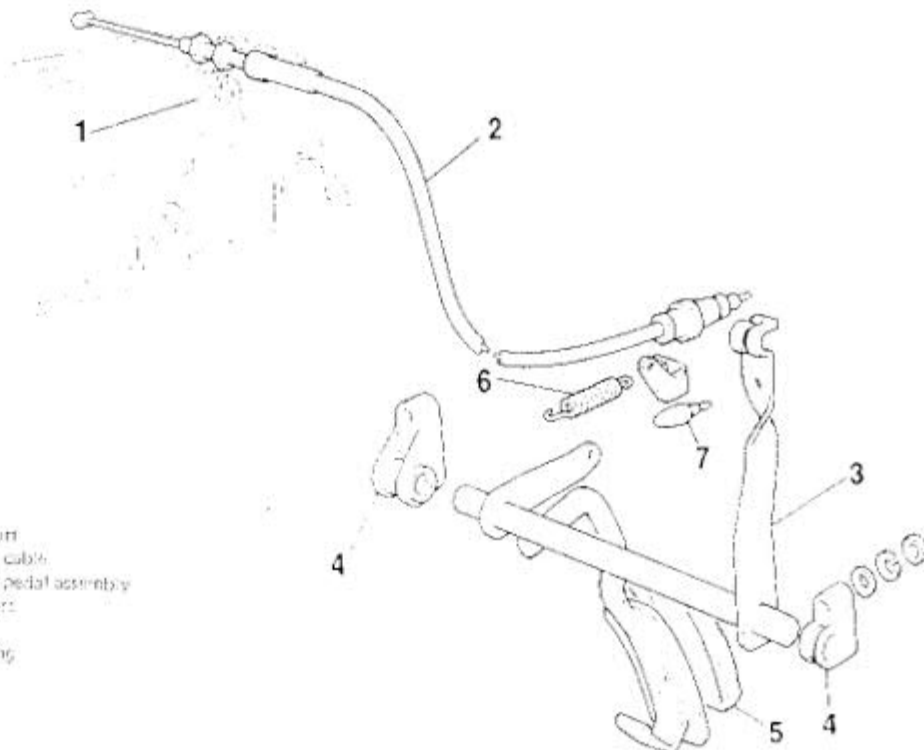
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|-------------------------------|----------------------|-----------------------|
| 1. Stop                       | 6. Cable end         | 11. Spring            |
| 2. Accelerator pedal assembly | 7. Throttle rod      | 12. Snap ring         |
| 3. Pedal support              | 8. Ballcrank support | 13. Adjustment nut    |
| 4. Pedal pad                  | 9. Return spring     | 14. Accelerator cable |
| 5. Clip                       | 10. Ballcrank        |                       |

## CARBURETOR ACCELERATOR LINKAGE



- |                               |
|-------------------------------|
| 1. Cable support              |
| 2. Accelerator cable          |
| 3. Accelerator pedal assembly |
| 4. Pedal support              |
| 5. Pedal pad                  |
| 6. Return spring              |
| 7. Stop                       |

## FUEL INJECTION ACCELERATOR LINKAGE

10

**ACCELERATOR AND KICK-DOWN CABLE ADJUSTMENT**

Make sure engine idle speed is set correctly.

**Accelerator Cable**

Pull back slightly on cable housing (5) until just prior to moving throttle lever (3).

Check for approximately 1 mm of clearance between adjustment nuts (6) and support (4).

If necessary, adjust nuts (6) to obtain clearance.

**Kick-Down Cable**

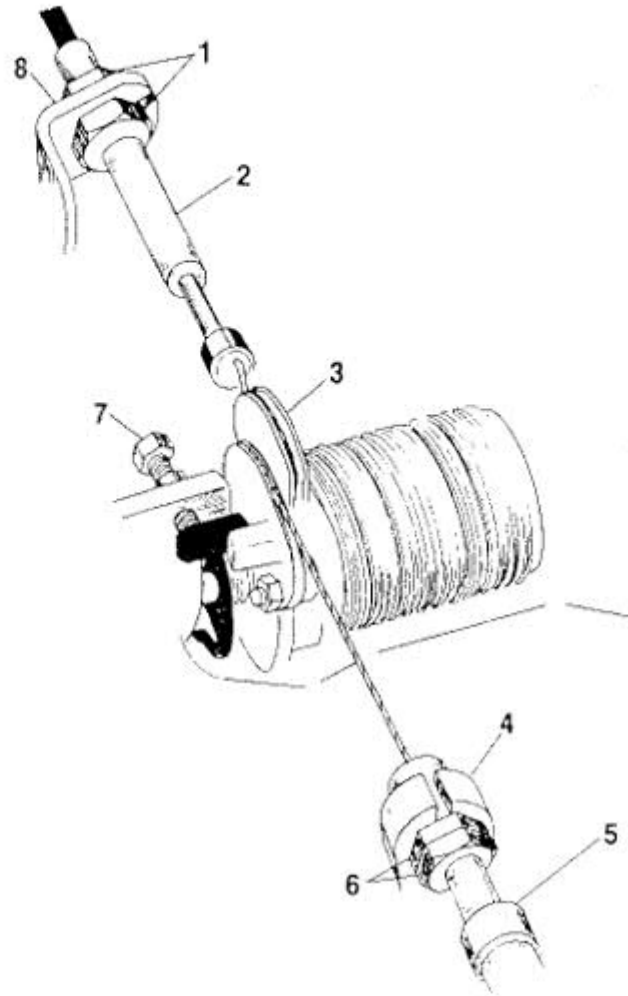
Depress accelerator until throttle lever (3) contacts maximum opening stop (7).

Check that kick-down cable (2) starts to pull at this point.

Fully depress accelerator. Check that kick-down cable (2) extends 0.35 to 0.43 in. (9 to 11 mm).

If necessary, adjust nuts (1) on housing (8) to obtain correct extension of cable.

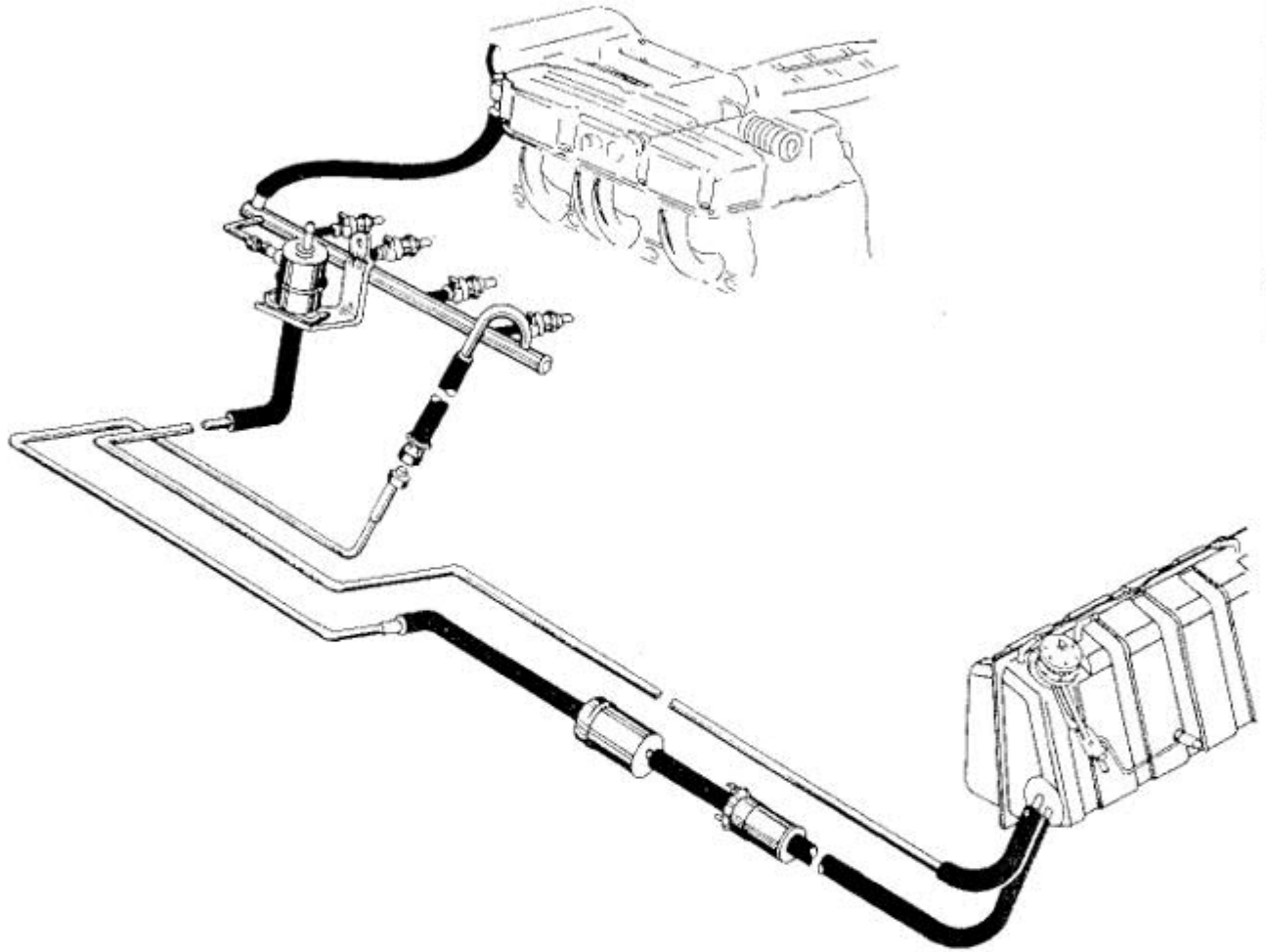
1. Adjustment nuts 2. Kick-down cable 3. Throttle lever  
4. Support 5. Accelerator cable 6. Adjustment nuts 7. Maximum opening stop 8. Housing



## FUEL SYSTEM

The fuel system consists of:

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

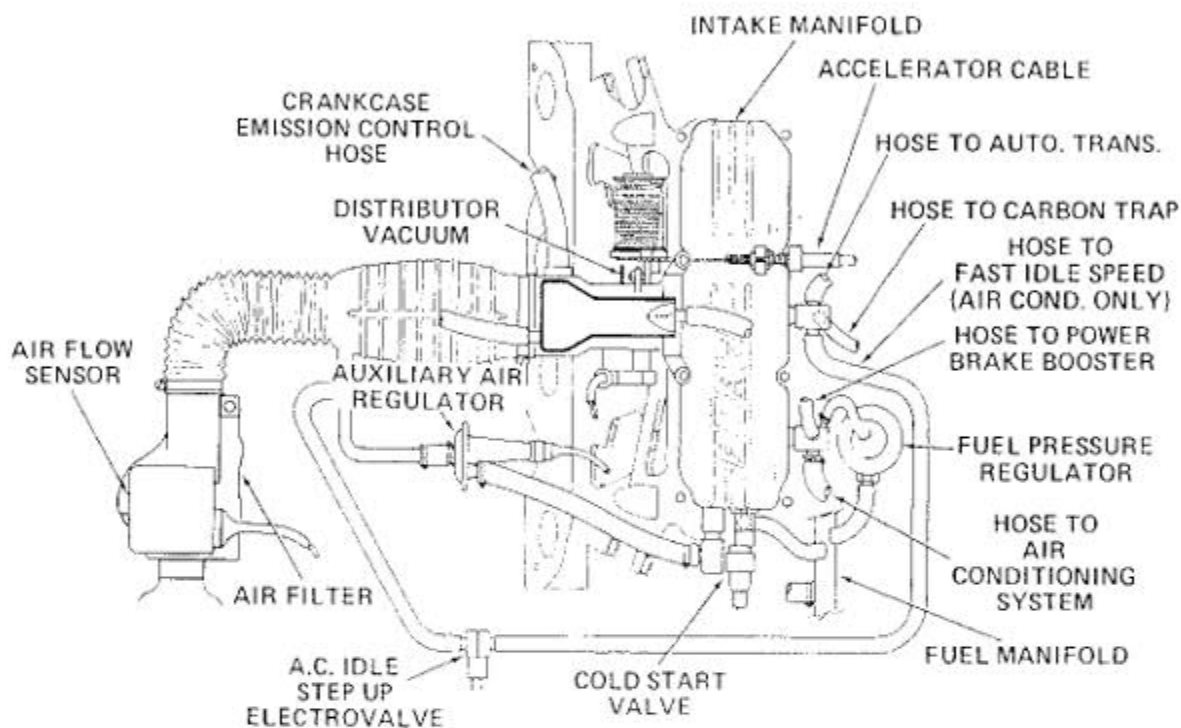




## AIR INTAKE SYSTEM

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.

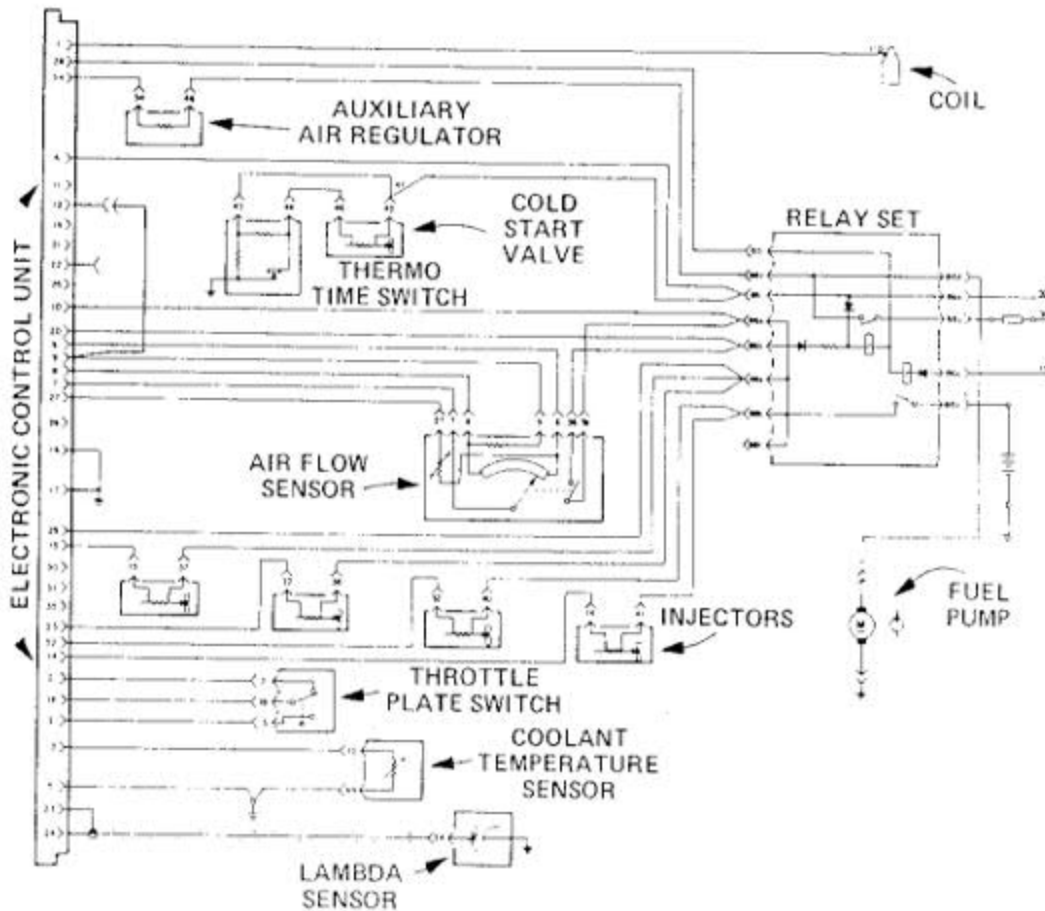
## ELECTRICAL SYSTEM

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



101

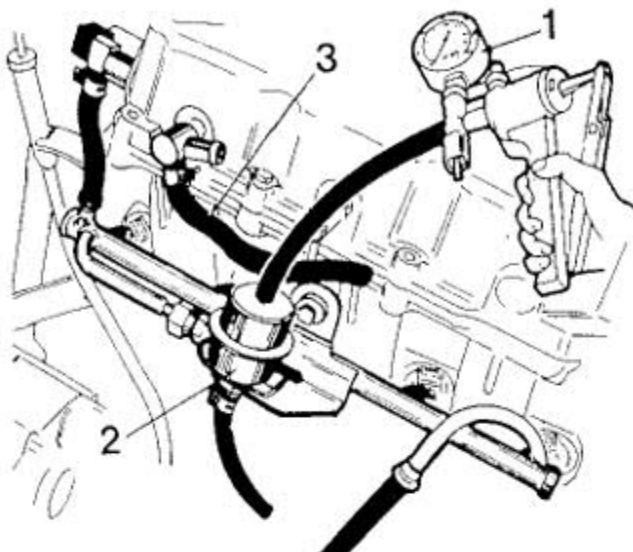
**RELIEVING FUEL PRESSURE**

**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 to cold start valve. Pull hose off valve.

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

Connect "Y" fitting on gauge assembly to fuel hose. Secure hose with clamp.

Connect hose on gauge tool A.958754 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).

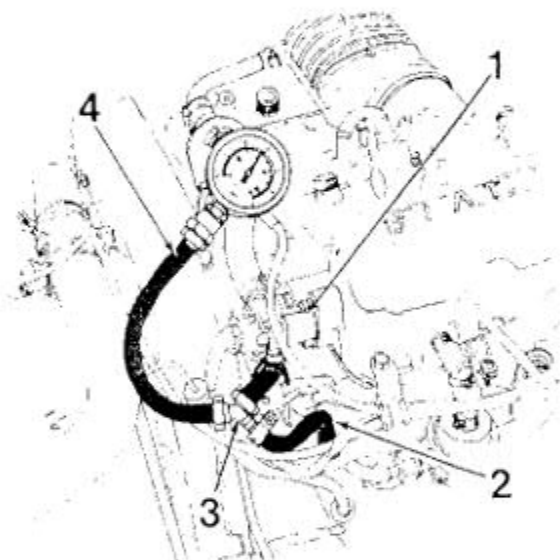
Start engine and operate at idle.

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, Fuel hose 3, "Y" fitting 4, Gauge assembly



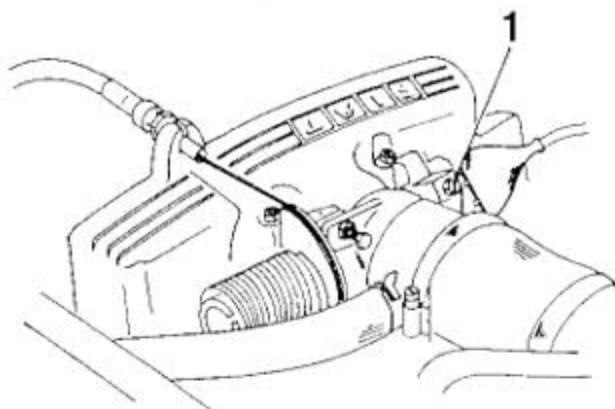
### IDLE SPEED ADJUSTMENT

**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

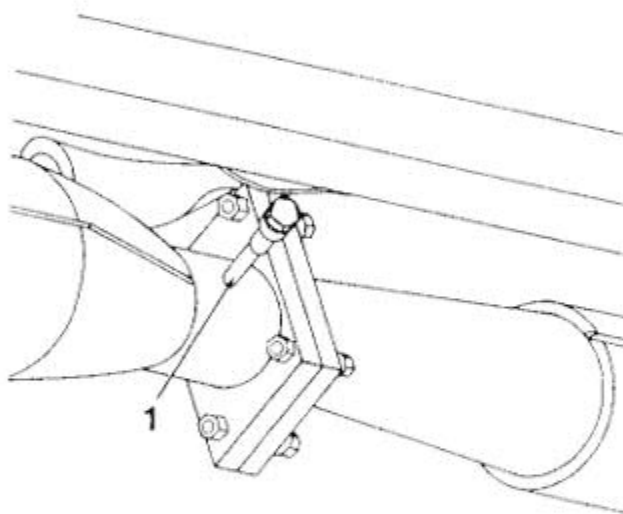
To check mixture, first connect test equipment as follows.

Remove plug (1) from CO pickup fitting. Install adapter probe (tool 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

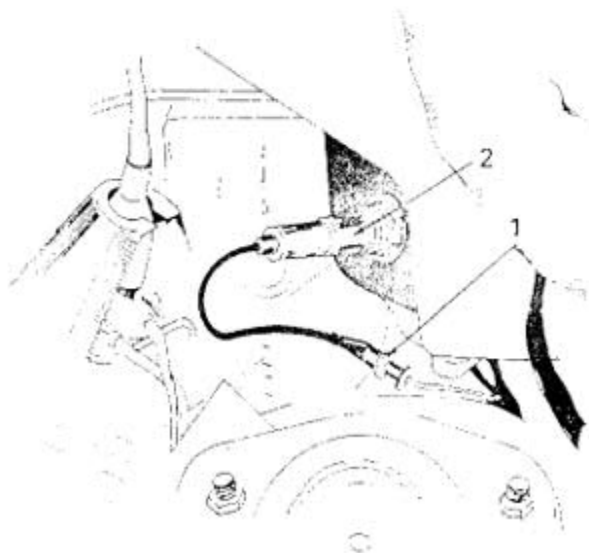


Zero analyzer according to manufacturer's instructions.

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

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

1. Lambda sensor connector 2. Lambda sensor



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.

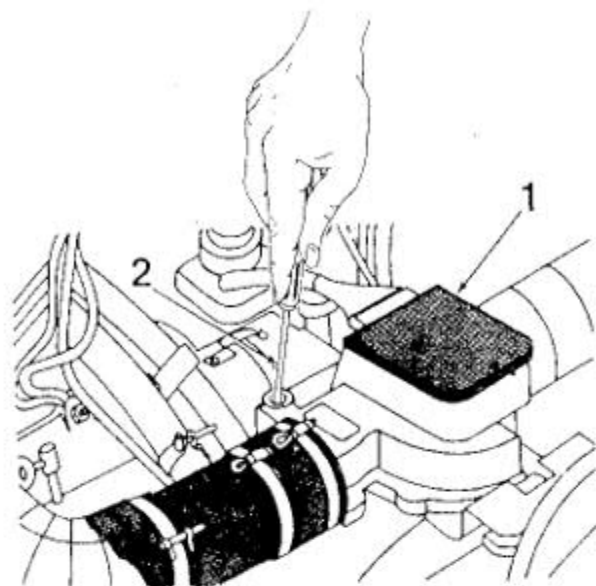
If mixture screw is concealed by an aluminum plug, refer to MIXTURE ADJUSTMENT SCREW PLUG REMOVAL AND INSTALLATION before performing this procedure.

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 and probe. Install plug in exhaust pickup.



1. Air flow sensor 2. Screwdriver

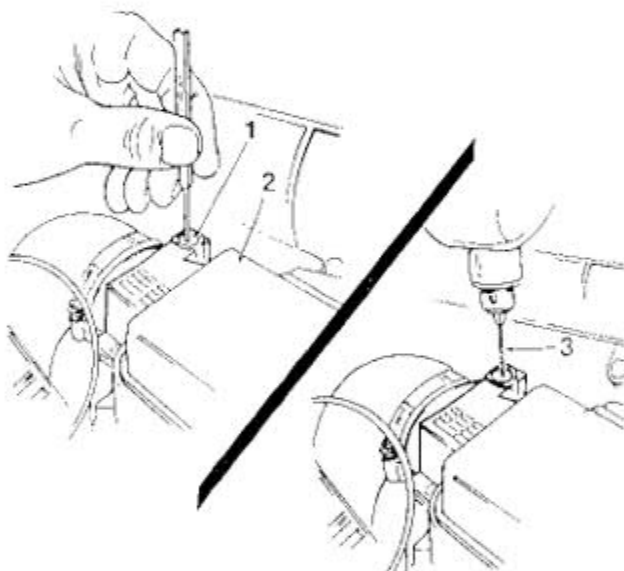
### MIXTURE ADJUSTMENT SCREW PLUG REMOVAL

**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.

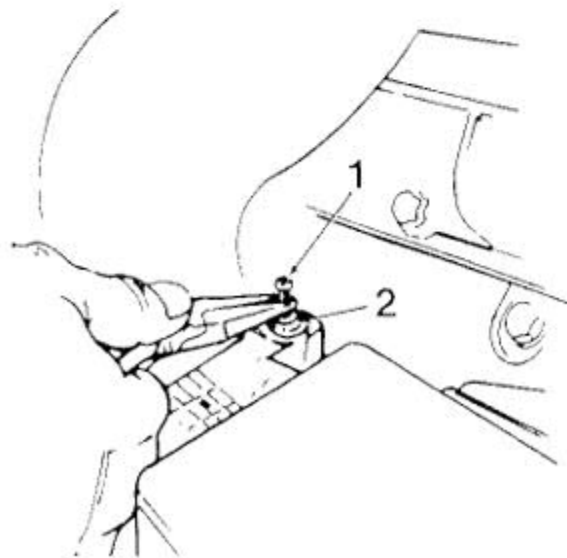


1. Aluminum plug 2. Air flow sensor 3. 3/32 in. (2.5 mm) drill

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. 1/8 in. (3 mm) screw 2. Aluminum plug

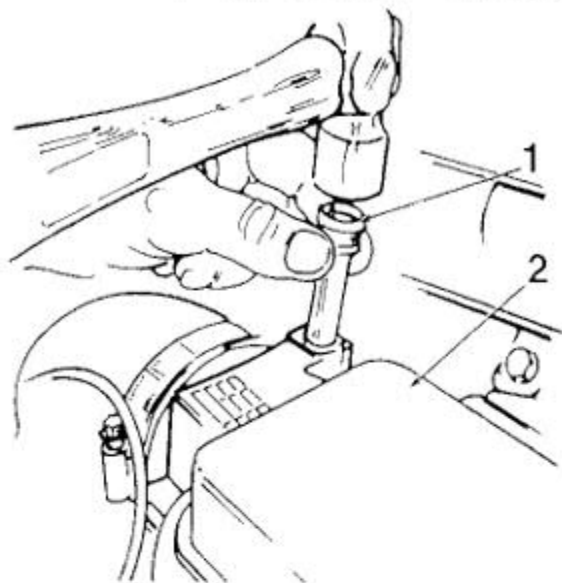


### INSTALLATION

**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

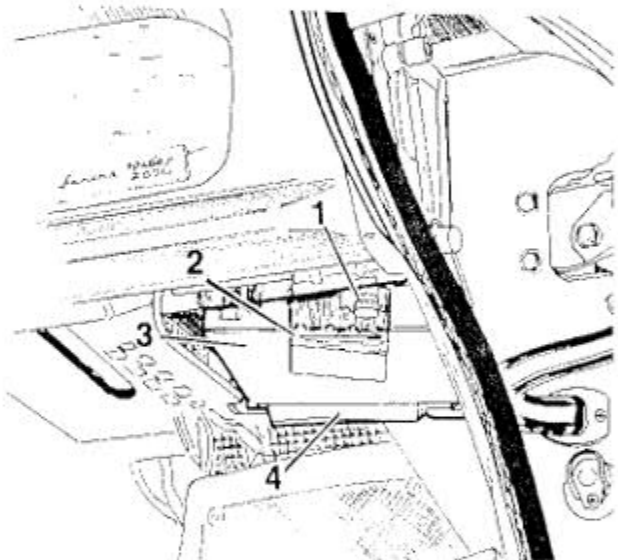
On vehicles with A.C., remove front nut holding evaporator under dashboard. Swing evaporator forward and down to gain access to control unit.

Loosen and remove plastic nut (1) holding bracket (1) in car. Lower control unit (3) and pull it back free of front bracket (4).

Release spring slip holding connector to control unit. Remove control unit.

Install in reverse order.

1. Plastic nut 2. Mounting bracket 3. Electronic control unit  
4. Front bracket



### LAMBDA SENSOR

#### REMOVAL AND INSTALLATION

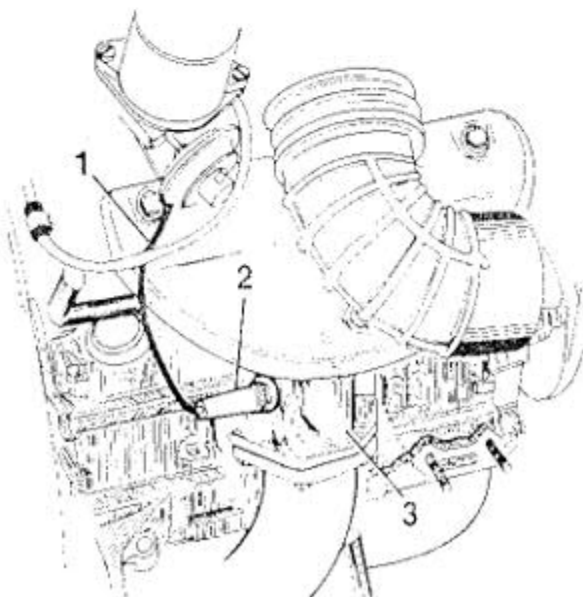
**NOTE:** The Lambda sensor must be replaced every 30,000 miles.

Allow exhaust system to cool.

On vehicles without turbo, disconnect cable (1) for sensor (2) from connector.

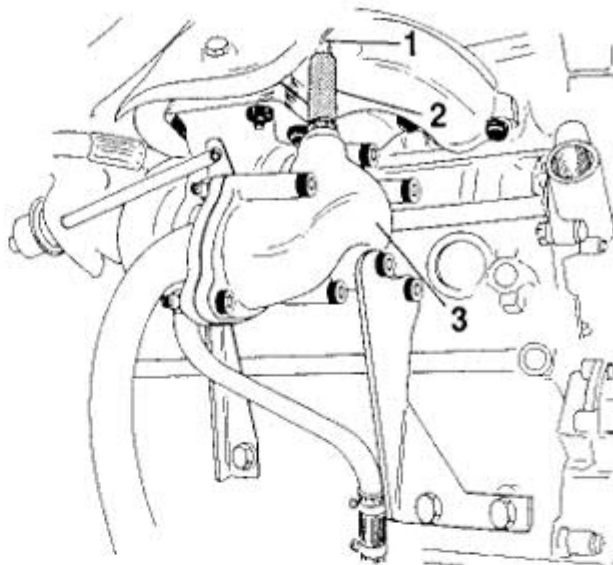
Remove sensor from exhaust manifold (3).

1. Cable 2. Lambda sensor 3. Exhaust manifold



On vehicles with turbo, disconnect cable (1) from sensor (2).  
Remove sensor from exhaust outlet elbow (3).

1. Cable 2. Lambda sensor 3. Exhaust outlet elbow

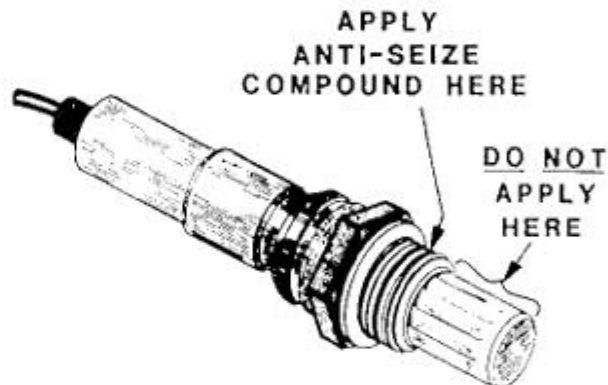


Coat threads of new Lambda sensor with anti-seize, anti-rust grease.

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

Thread sensor into exhaust pipe (non-turbo) or exhaust outlet elbow (turbo). Torque sensor to 30 to 36 ft lbs (4.2 to 5.0 mkg).

Connect cable to sensor.



#### INDICATOR RESET

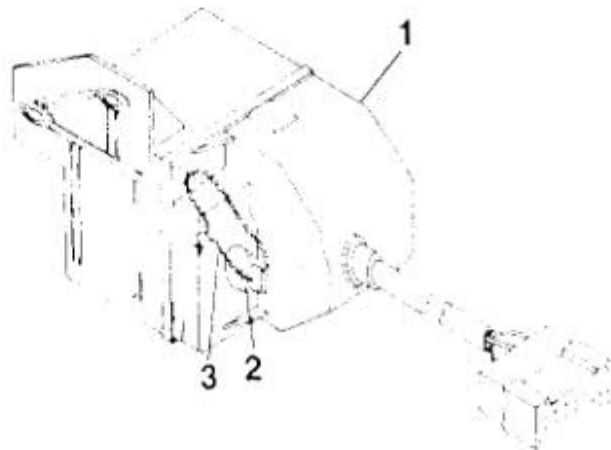
**NOTE:** Lambda sensor indicator comes on at 30,000 miles to indicate replacement of sensor. To turn indicator off, the switch unit must be reset.

Switch unit is located under dashboard to the right of steering column.

Remove wire (3) securing cap screw (2). Remove cap screw.

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

Install cap screw (2). Secure screw with new wire (3).



1. Switch unit 2. Cap screw 3. Wire

### THROTTLE PLATE SWITCH REMOVAL AND INSTALLATION

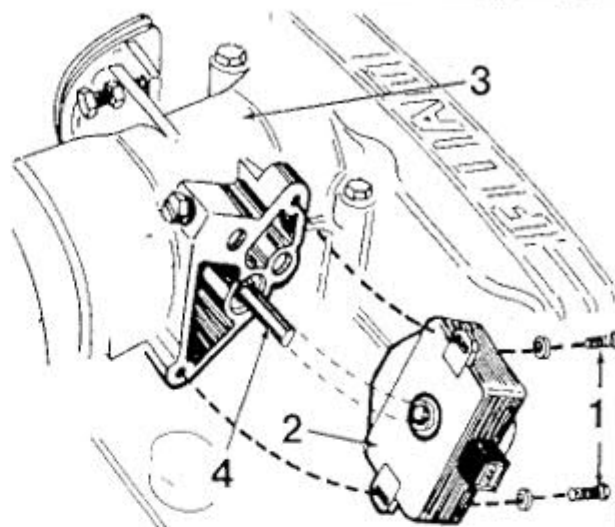
Disconnect throttle plate switch.

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. Make sure switch is properly aligned with throttle shaft (4).

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

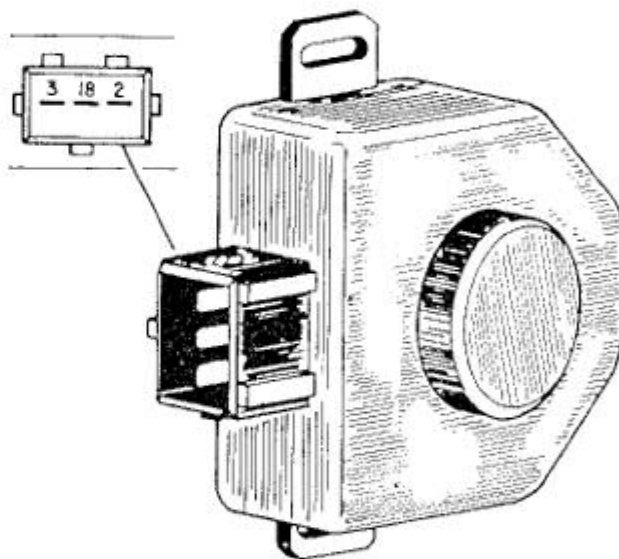


### ADJUSTMENT

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.



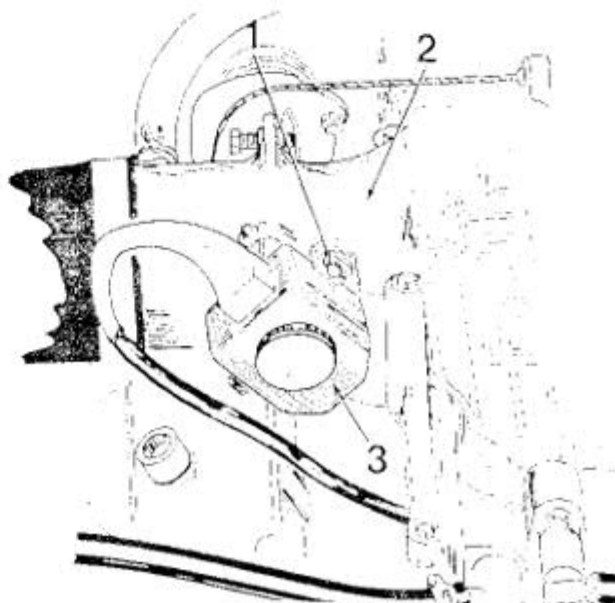
Loosen two screws (1) holding throttle plate switch (3) to throttle housing (2).

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.

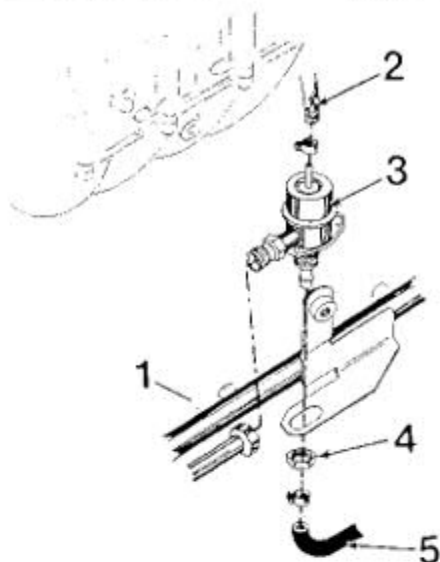
Disconnect vacuum hose (2) and fuel return hose (5) from pressure regulator (3).

Disconnect fuel manifold (1) connection from pressure regulator (3).

Remove nut (4) 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. Nut  
5. 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 (7) from cold start valve (2).

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

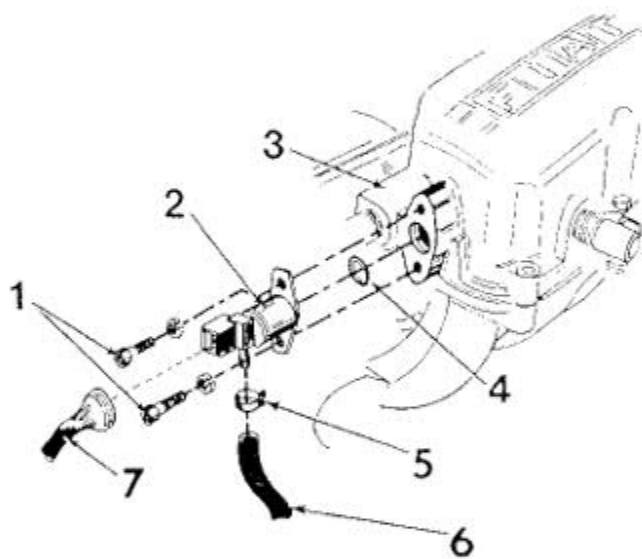
**CAUTION:** Use care in pulling fuel hose off valve. Valve body is plastic.

Using 5 mm Allen wrench, remove two screws (1) and washers holding valve in intake manifold (3). Remove valve and "O" ring (4).

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

Check fuel connections for leaks.

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

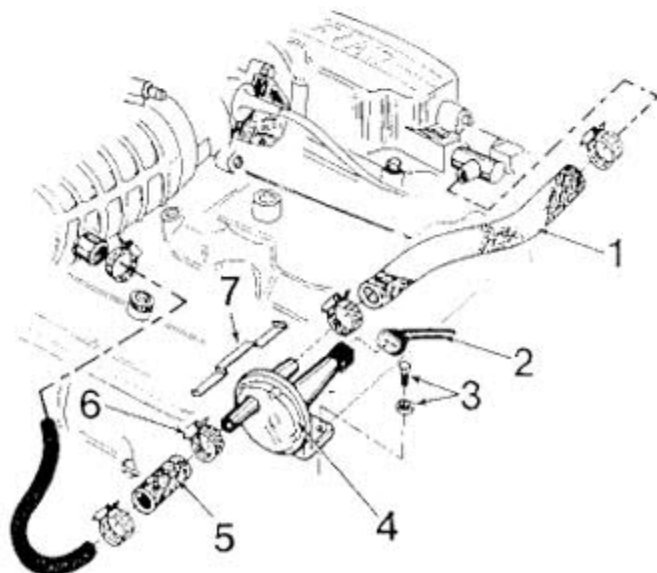
**AUXILIARY AIR REGULATOR****REMOVAL AND INSTALLATION**

Disconnect air hoses (1 and 5) from regulator (4). Disconnect electrical connector (2).

Remove two 10 mm bolts (3) and washers holding regulator to cylinder head.

Install in reverse order. Make sure air hose connections are tight. Make sure clip (7) is installed under clamps (6) on regulator.

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



### AIR FLOW SENSOR

#### REMOVAL AND INSTALLATION

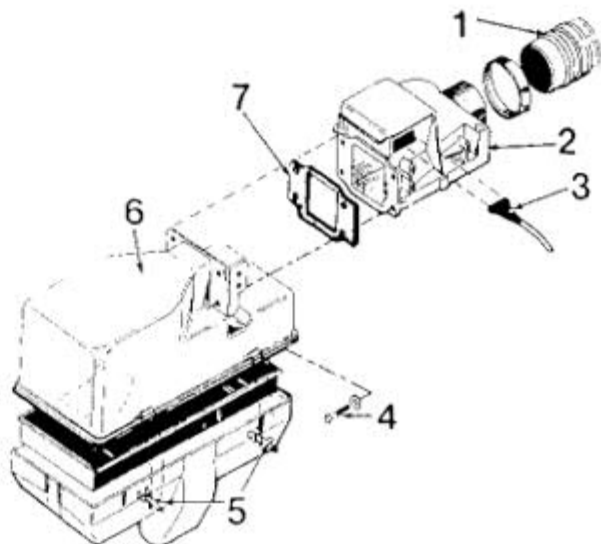
Disconnect air hose (1) from air flow sensor (2). Disconnect electrical connector (3).

Remove air cleaner cover (6) by releasing four clips (5).

Remove four bolts (4) and washers holding air flow sensor (2) to air cleaner cover (6). Remove air flow sensor (2) and gasket (7).

Install in reverse order, making sure air hose connection is tight.

1. Air hose 2. Air flow sensor 3. Electrical connector 4. Bolt  
5. Clip 6. Air cleaner cover 7. Gasket



### 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.

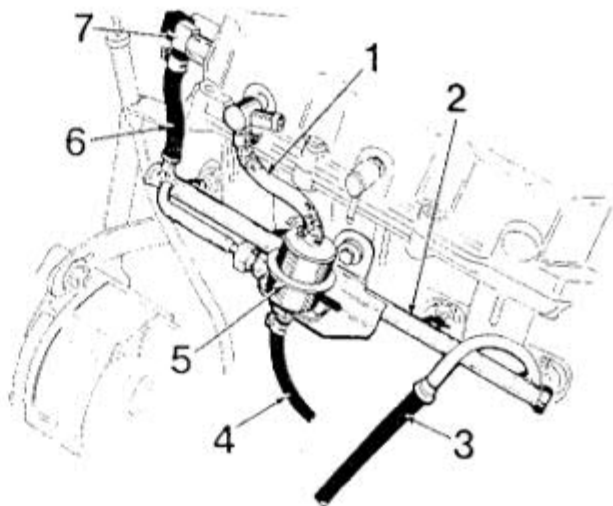
**NOTE:** Before disconnecting any fuel hoses, place a rag beneath them to catch any spilled fuel.

Disconnect the following:

- electrical connectors from injectors,
- fuel supply hose (3) from pipe. Use a 12 mm wrench to hold fuel line and a 17 mm wrench to turn fuel hose connection.
- fuel return hose (4) from pressure regulator (5),
- vacuum hose (1) from regulator (5),
- fuel hose (6) from cold start valve (7).

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

1. Vacuum hose 2. Fuel manifold 3. Fuel supply hose 4. Fuel return hose 5. Pressure regulator 6. Fuel hose 7. Cold start valve



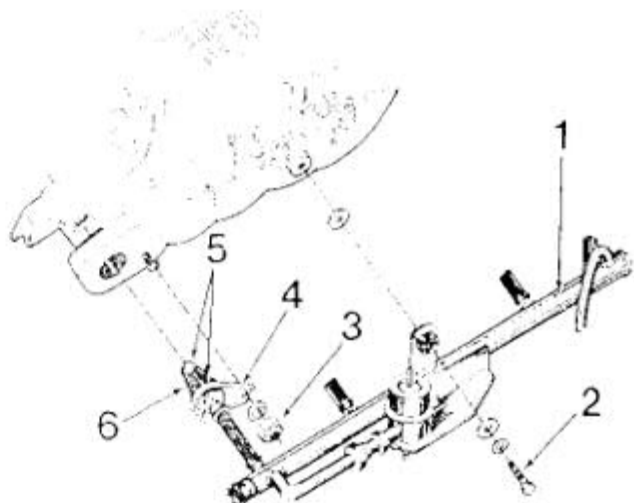
Remove 10 mm bolt (2) holding fuel manifold (1) to intake manifold.

Remove four 10 mm nuts (3) and washers holding injector retainers (4) to intake manifold.

Remove fuel manifold (1) complete with injectors (6) and regulator. Be careful of rubber bushings (5) in intake manifold. They may fall out.

Remove four small and four large rubber bushings (5) and retainers (4) from injectors. Inspect bushings for cracks and damage.

1. Fuel manifold 2. Bolt 3. Nut 4. Retainer 5. Bushing  
6. Fuel injector



**NOTE:** When replacing a defective injector, replace injector and hose.

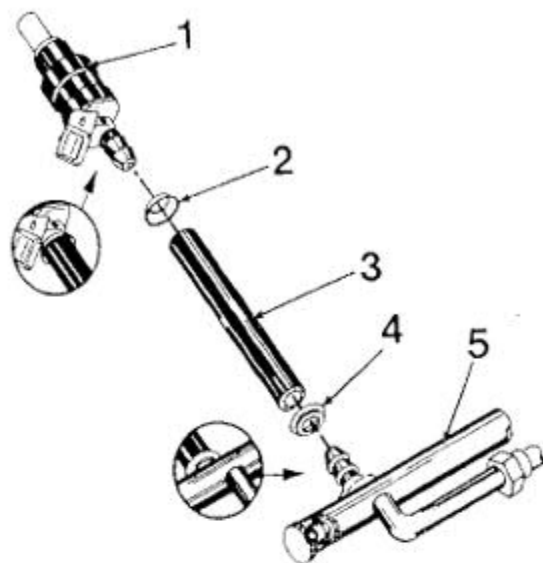
To replace injector, pull hose (3) off fuel manifold (5). Use a twisting, rocking motion while pulling on hose.

To replace a damaged hose from a good injector, cut hose at both ends and remove it.

When installing the new hose or injector, place collars (2 and 4) over shoulder of injector (1) and manifold (5).

Push hose (3) on injector (1) and manifold (5) until hose end is inside collars (2 and 4) and collars are tight against shoulder.

1. Fuel injector 2. Collar 3. Hose 4. Collar 5. Fuel manifold



## INSTALLATION

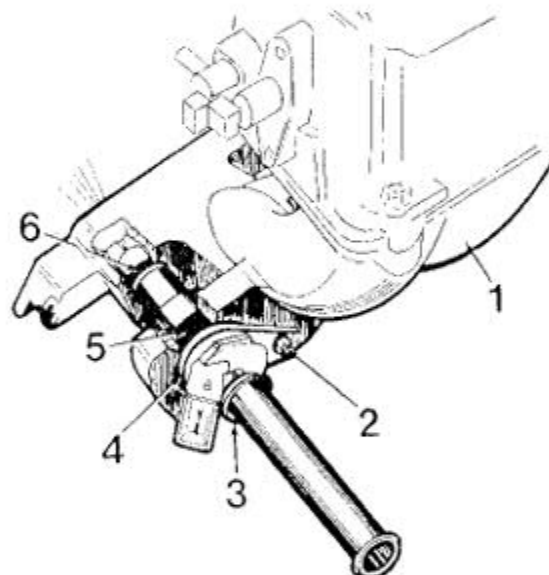
Place retainers (4) on injectors (3). Slide large bushing (5) on injector until seated in groove in injectors. Place small bushings (6) on tip of injectors.

Reinstall injectors and fuel manifold in reverse order, making sure:

- all components are clean
- rubber bushings are not damaged
- rubber bushings are installed in intake manifold properly
- injectors are installed in small bushings airtight
- retainers holding nuts are tight

Check all fuel connections for leaks.

1. Intake manifold 2. Nut 3. Fuel injector 4. Retainer 5. Large bushing 6. Small bushing



## THROTTLE PLATE

### REMOVAL AND INSTALLATION

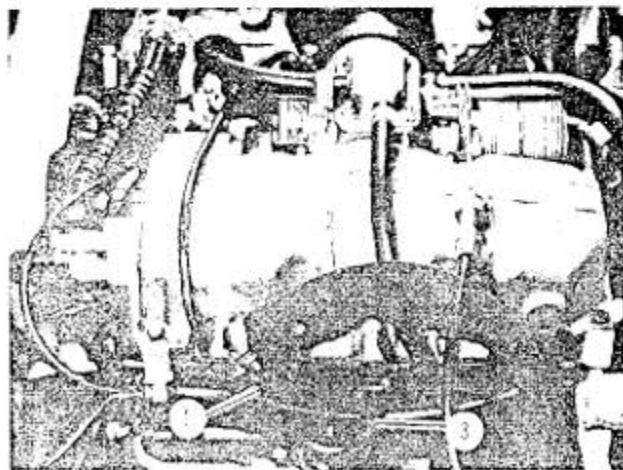
**NOTE:** The upper air intake should be removed for ease of access to throttle plate.

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

Relieve fuel pressure as directed under **RELIEVING FUEL PRESSURE**.

Disconnect from intake manifold ( ) vacuum hoses for:

- automatic transmission
- fuel pressure regulator (1)
- brake booster (2)
- charcoal trap (3)
- boost switches (turbocharger only)



1. Fuel pressure regulator hose 2. Brake booster hose  
3. Charcoal trap hose

Disconnect electrical connectors from cold start valve (4) and throttle plate switch (3).

Disconnect auxiliary air regulator air hose (5) from intake manifold (1). Loosen clamp and disconnect air hose (6) from throttle housing.

On vehicles without turbocharger, disconnect crankcase emission hose (7) from throttle housing.

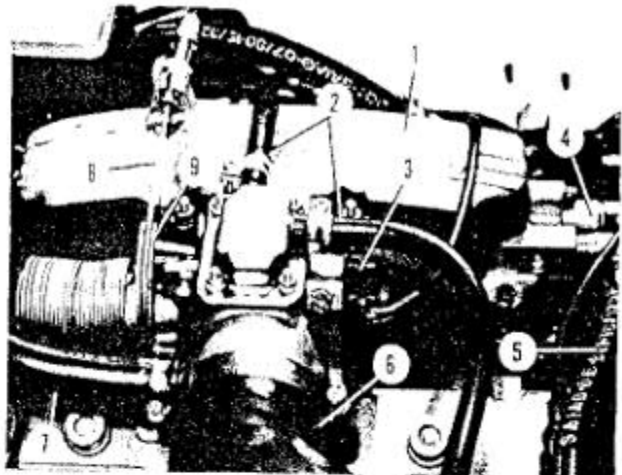
Disconnect distributor vacuum hose from throttle housing.

Disconnect accelerator cable (8) from throttle lever (9). Remove cable from support on intake manifold.

Disconnect fuel hose from cold start valve (4).

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

Disconnect two water hoses (2) from throttle plate heater.

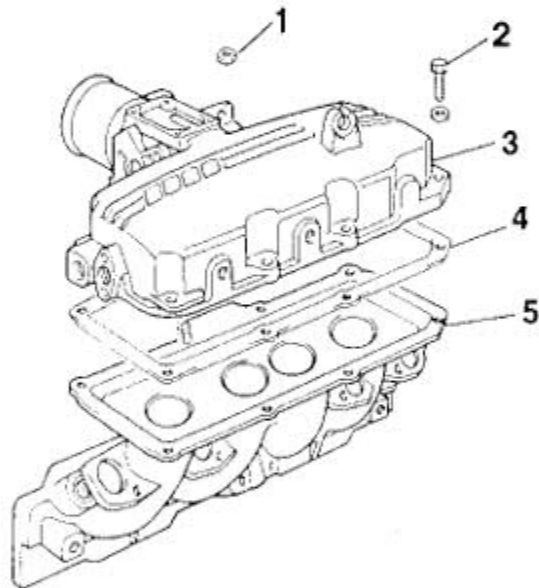


1. Intake manifold 2. Water hose 3. Throttle plate switch  
4. Cold start valve 5. Auxiliary air regulator hose 6. Main air hose  
7. Crankcase emission hose 8. Accelerator cable 9. Throttle lever

Remove the six bolts (2) and two nuts (1) holding upper section (3) to lower section (5) of intake manifold.

Carefully lift upper section off.

1. Nut 2. Bolt 3. Upper section 4. Gasket 5. Lower section



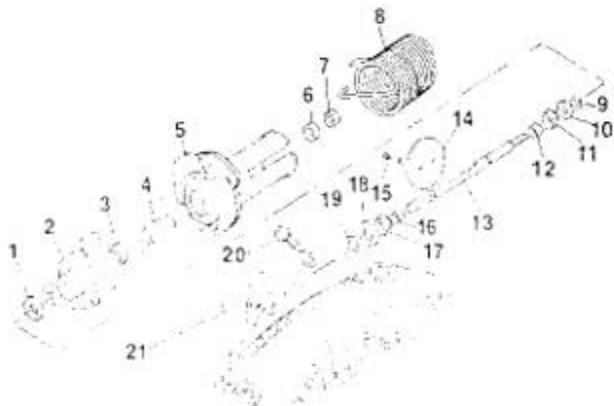
Remove two screws and washers and remove throttle plate switch.

Working through throttle housing, remove two screws (15) and washers holding throttle plate (14) to throttle shaft (13). Remove throttle plate.

If necessary to remove throttle shaft, remove snap ring (19). Pull shaft out of housing.

Assemble and install in reverse order.

Check all air and fuel connections for leaks.



1. Washer 2. Plate 3. Spring 4. Spacer 5. Throttle lever  
6. Washer 7. Nut 8. Spring 9. Snap ring 10. Washer 11. Seal  
12. Bushing 13. Throttle shaft 14. Throttle plate 15. Screw  
16. Bushing 17. Seal 18. Washer 19. Snap ring 20. Idle speed adjustment screw 21. Intake manifold

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.

On cars with automatic transmission, apply hand brake and place gearshift lever in "D".

Turn idle speed adjustment screw (2) in all the way.

Adjust stop screw (1) to obtain:

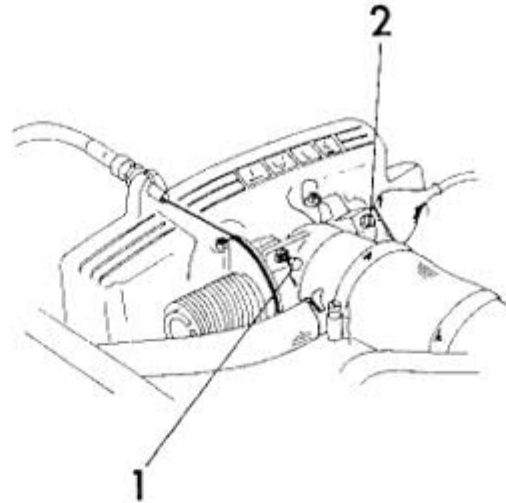
- Manual Transmission – 700 to 800 rpm
- Automatic Transmission – 600 to 700 rpm

Hold stop screw (1) and tighten locknut.

Adjust idle speed adjustment screw (2) to obtain:

- Manual Transmission – 800 to 900 rpm
- Automatic Transmission – 700 to 800 rpm

Check that throttle plate switch is adjusted properly as directed under THROTTLE PLATE SWITCH ADJUSTMENT.



1. Throttle stop screw 2. Idle speed adjustment screw

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## CATALYTIC CONVERTER REMOVAL AND INSTALLATION

**WARNING:** Make sure catalytic converter (4) has cooled down before working on it.

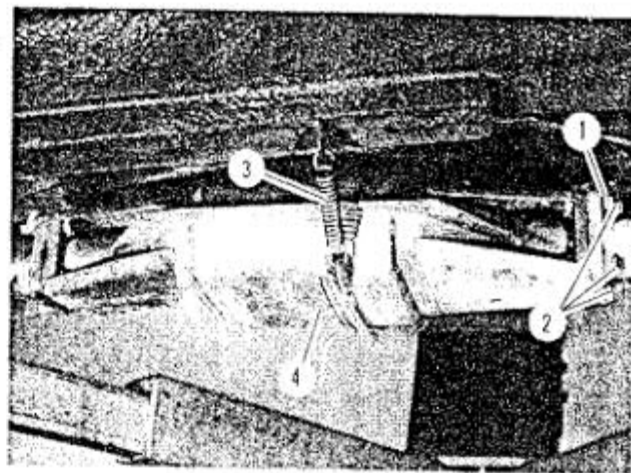
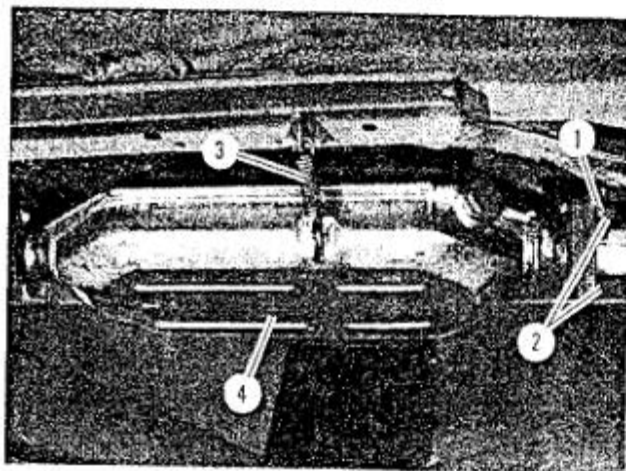
On 1975 to 1978 vehicles, remove thermocouple from catalytic converter.

Bend locking rings (1) clear of nuts (2) securing converter to exhaust pipes.

Disconnect spring hangers (3) from converter. Remove converter.

Installation is reverse of removal.

1. Locking ring 2. Nut 3. Spring hanger 4. Catalytic converter



## AIR PUMP (1975 to 1978)

### REMOVAL AND INSTALLATION

Remove timing belt cover (1). Remove pump drive belt.

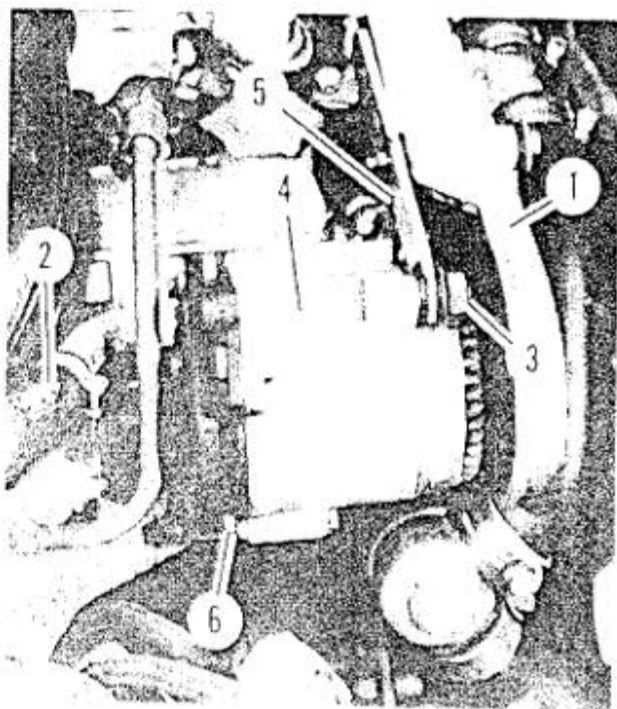
Loosen clamp and disconnect hose (2) from air pump (4).

Remove tensioner nut (3) and washers holding pump to bracket (5). Remove bolt (6), nut, washer and shield holding pump to cylinder head. Remove pump.

When installing pump, make sure to install shield on back side of mounting lugs.

Adjust belt tension.

1. Timing belt cover 2. Air outlet hose 3. Tensioner nut  
4. Air pump 5. Bracket 6. Mounting bolt



**AIR PUMP (1979 and 1980 carbureted)****REMOVAL AND INSTALLATION**

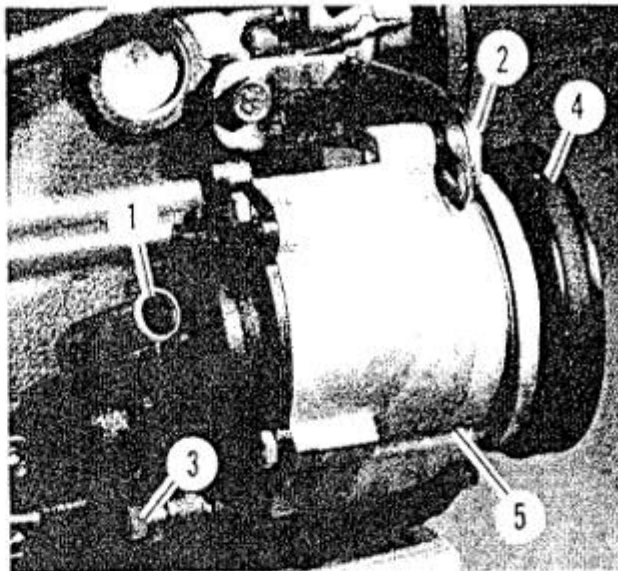
Loosen clamp and remove air hose from pump outlet (1).

Loosen tensioner bolt (2) and mounting bolt (3) to remove belt (4). Then remove bolts to remove pump (5).

Install in reverse order.

Adjust belt tension.

1. Air pump outlet 2. Tensioner bolt 3. Mounting bolt  
4. Drive belt 5. Air pump

**AIR MANIFOLD (1975 to 1978)****REMOVAL AND INSTALLATION**

Remove air cleaner.

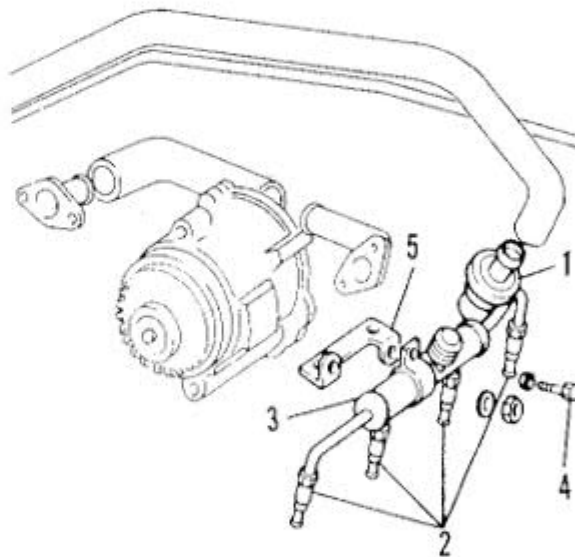
Disconnect hose to check valve (1).

Remove bolt (4), washer, and nut holding air manifold (3) to bracket (5).

Using tool A.5016, disconnect tubes (2) from cylinder head. Remove air manifold.

Install in reverse order.

1. Check valve 2. Tube 3. Air manifold 4. Bolt 5. Bracket

**AIR PUMP CHECK VALVE****(1979 and 1980 carbureted)****REMOVAL AND INSTALLATION**

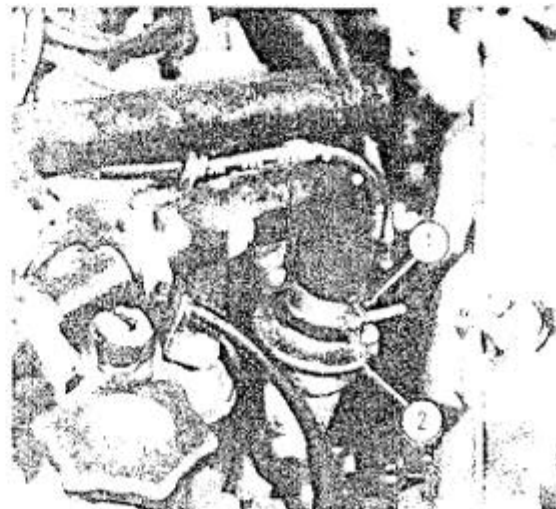
Remove air cleaner.

Loosen clamp (1) and remove hose from check valve.

Using wrench, remove check valve from cylinder head.

Install in reverse order.

1. Clamp 2. Check valve





## EGR VALVE (1975 to 1978)

### REMOVAL AND INSTALLATION

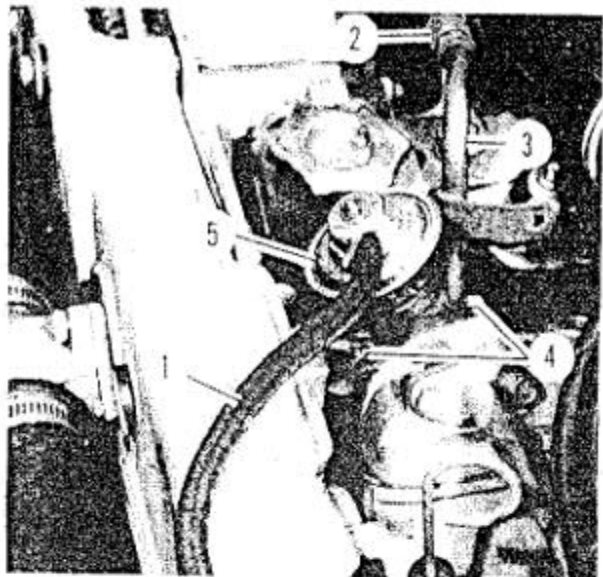
Loosen clamp and disconnect vacuum line (1).

Disconnect line fitting (2) from line attached to valve. Remove bolt, nut and washer holding line (3) to bracket on cam cover.

Remove two bolts (4) and washers holding EGR valve (5) to cam cover. Remove valve.

Install in reverse order.

1. Vacuum line 2. Line fitting 3. Valve line 4. Bolt 5. EGR valve



## EGR VALVE (1979 and 1980 carbureted)

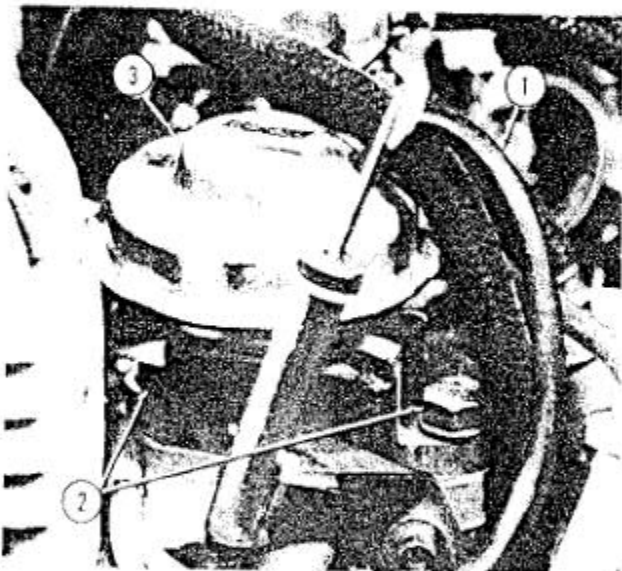
### REMOVAL AND INSTALLATION

Disconnect vacuum hose (1) from EGR valve (3).

Remove two bolts (2) and washers, then remove EGR valve and gasket from intake manifold.

Install in reverse order. Use a new gasket.

1. Vacuum hose 2. Bolts 3. EGR valve



## REED VALVES (1979)

### REMOVAL AND INSTALLATION

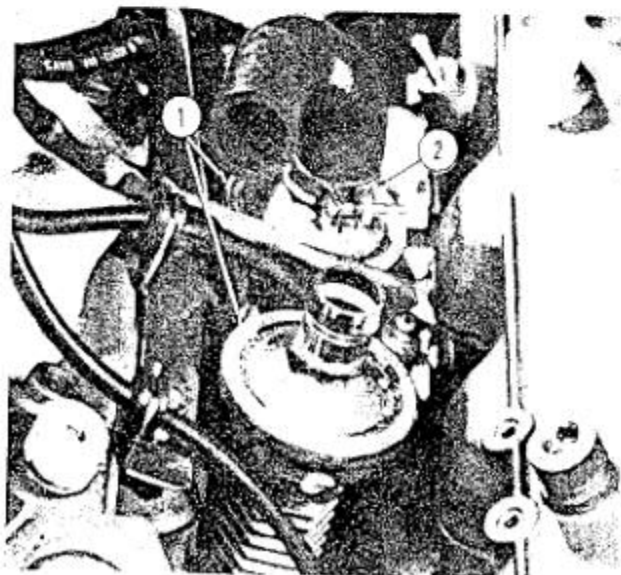
Remove air cleaner.

Loosen clamp (2) and remove hose from reed valve (1).

Using wrench, remove reed valves from cylinder head.

Install in reverse order.

1. Reed valves 2. Clamp



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**REED VALVE FILTER (1979)****REMOVAL AND INSTALLATION**

Loosen clamp (1) and remove hose from air induction filter housing (2).

Remove two bolts (3) and washers and remove air induction filter housing from air cleaner. Remove filter.

Install in reverse order.

1. Clamp 2. Air induction filter housing 3. Bolts

**PCV CONTROL VALVE (Carburetoed engines)****REMOVAL AND INSTALLATION**

Remove carburetor (refer to Carburetor section).

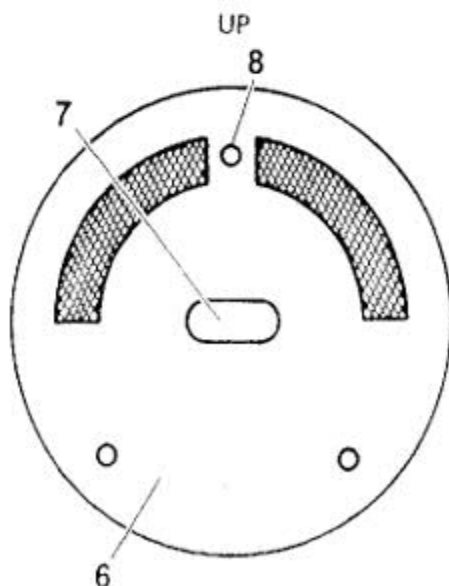
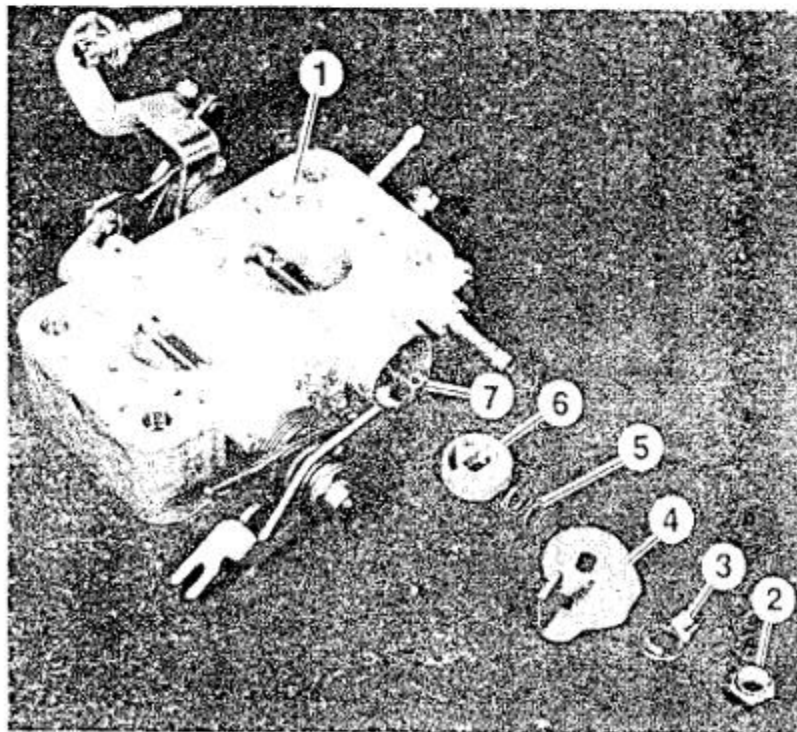
Separate throttle base (1) from carburetor body.

Remove nut (2), washer (3), cam (4), retainer spring (5) and valve (6) from slotted shaft (7).

Install in reverse order.

**CAUTION:** Valve is slotted to fit easily on shaft if installed correctly, but it can be forced on incorrectly, resulting in crankcase pressurization and high oil consumption. There are three raised knobs on the valve. When installed correctly, they face out and a single knob (8) will be up, as shown.

1. Throttle base 2. Nut 3. Washer 4. Cam 5. Retainer spring 6. PCV valve 7. Throttle shaft 8. Raised knob



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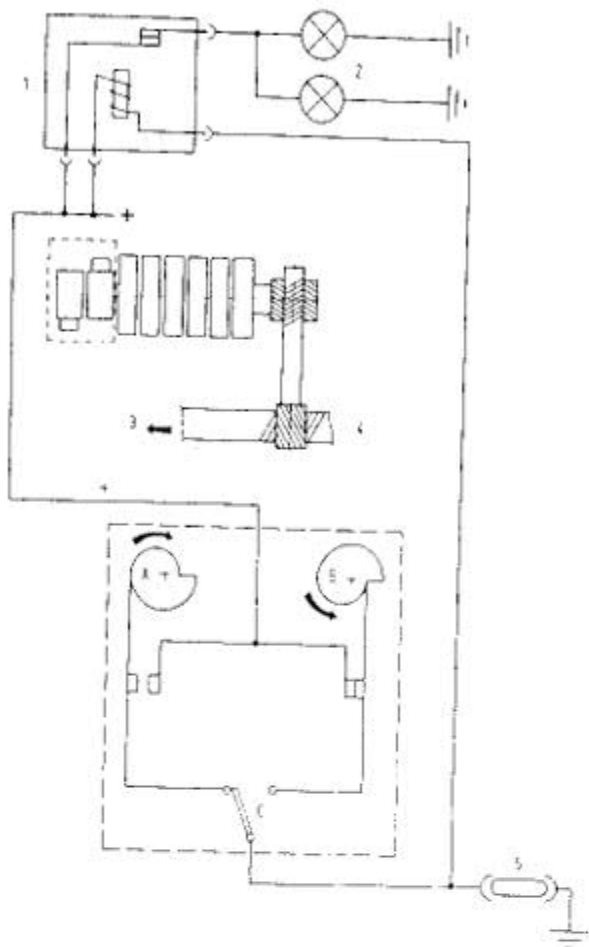
## "EGR" AND "CATALYST" MAINTENANCE REMINDER SYSTEM (1975 and 1976)

The maintenance reminder system is controlled by relay (1). With proper power and ground the relay is energized.

This opens the circuit to the lights. Cam drums A and B in odometer switch are driven by the speedometer cable and are set to close their contacts at  $25,000 \pm 1$  miles. Closing the contact applies power to fuse (5) causing fuse to blow. This removes ground from relay (1) causing lights to come on.

The maintenance reminder system is no longer necessary. If servicing is required, the system should be eliminated.

1. Normally closed relay 2. "EGR" and "Catalyst" indicator lights  
3. To speedometer 4. To transmission 5. Fuse A and B cam drums  
C. Resetting switch



### ODOMETER SWITCH (1975 and 1976)

Odometer switch operation (part of the maintenance reminder system) is no longer necessary. If servicing is required, the switch should be deactivated. The odometer switch (1) is located on the front right side of drivers footwell.

### CATALYTIC TEMPERATURE WARNING CONTROL UNIT (1975 and 1976)

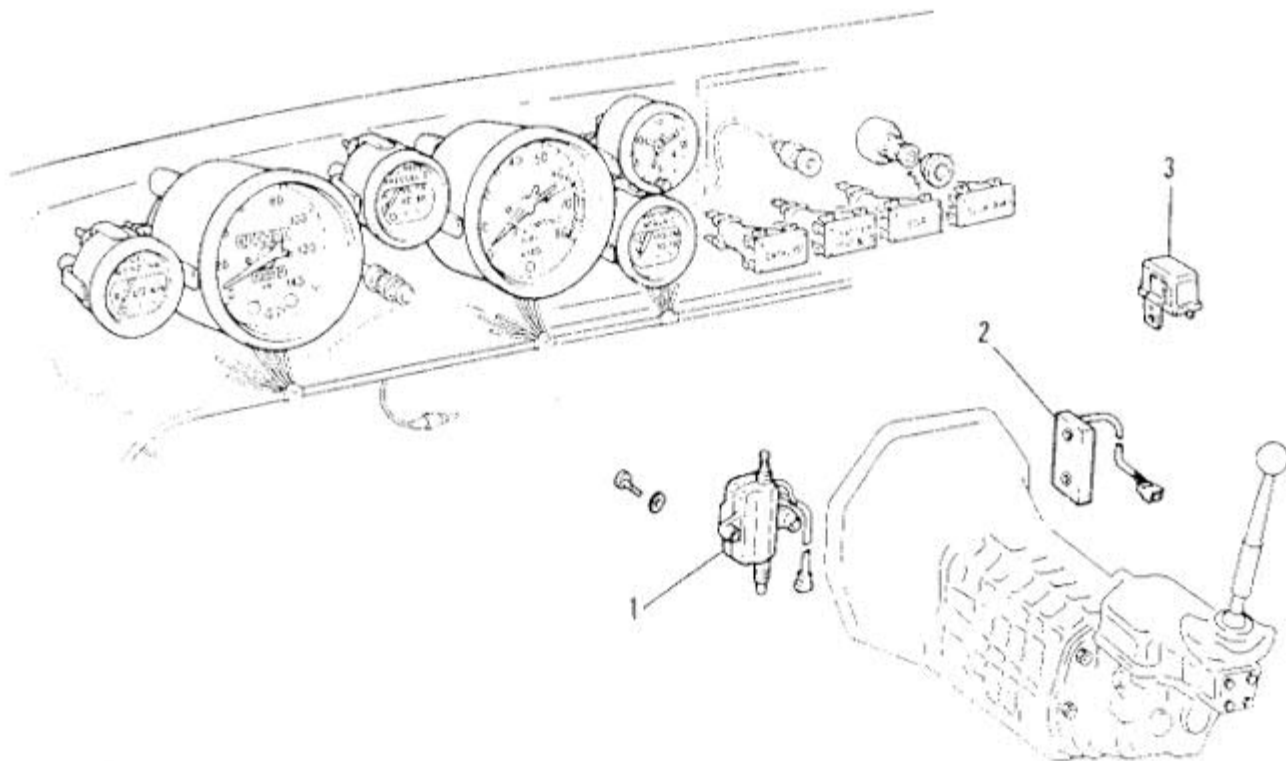
The control unit senses the temperature of the converter by means of a thermocouple. When converter temperature reaches  $982 \pm 50^\circ \text{C}$  ( $1800 \pm 50^\circ \text{F}$ ), the control unit causes the "SLOW DOWN" warning light to flash. If the temperature continues to increase, the frequency of the light increases.

The control unit (2) is located under the glove box.

### CATALYTIC TEMPERATURE PROTECTION TACHYMERIC SWITCH (1975 and 1976)

To prevent excessive temperatures in the converter, the fuel is shut off from the carburetor during decelerations. The tachymetric switch senses engine speed from the coil. With the throttle closed during decelerations above  $2650 \pm 50 \text{ rpm}$ , the switch energizes the idle shutoff solenoid. This shuts off idle fuel flow inside the carburetor. The tachymetric switch (3) is located under the glove box.

1. 25,000 mile control switch 2. Catalytic temperature control unit 3. Tachymetric switch



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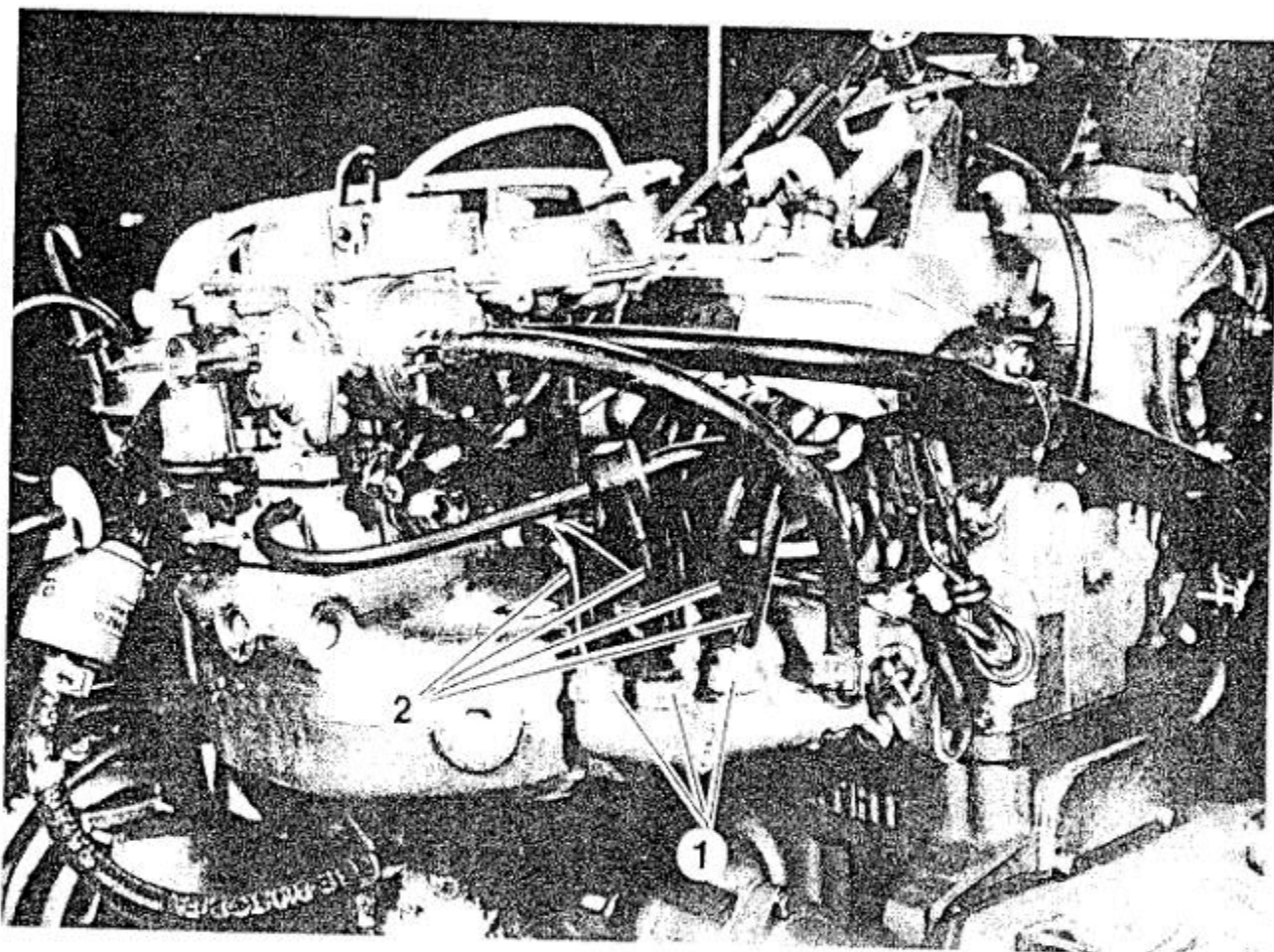
## THERMOVALVES (1979 and 1980 carbureted)

### REMOVAL AND INSTALLATION

Drain cooling system to a level below thermostats (1).

Remove vacuum lines (2) from thermostat to be removed, noting that lines and valve are color coded. Remove thermostat. Install in reverse order. Refill and bleed cooling system (refer to Radiator section).

1. Thermostats 2. Vacuum lines



## GULP VALVE AND ELECTRO VALVE (1979 and 1980 carbureted)

### REMOVAL AND INSTALLATION

Gulp valve (1) and electro valve (2) are located together in the engine compartment mounted on the left fender shield.

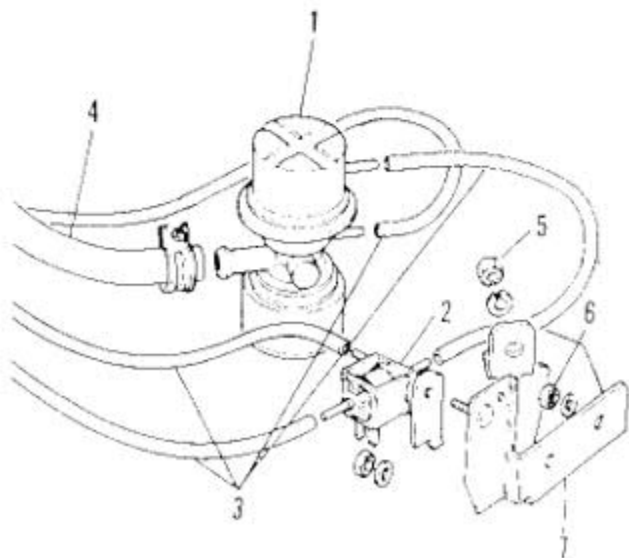
Disconnect vacuum lines (3), air line (4) and electrical connector on valves.

Remove one nut (5) and washer to remove gulp valve.

Remove one nut (6) and washer to remove electro valve.

Install in reverse order.

1. Gulp valve 2. Electro valve 3. Vacuum lines 4. Air line 5. Nut  
6. Nut 7. Mounting bracket

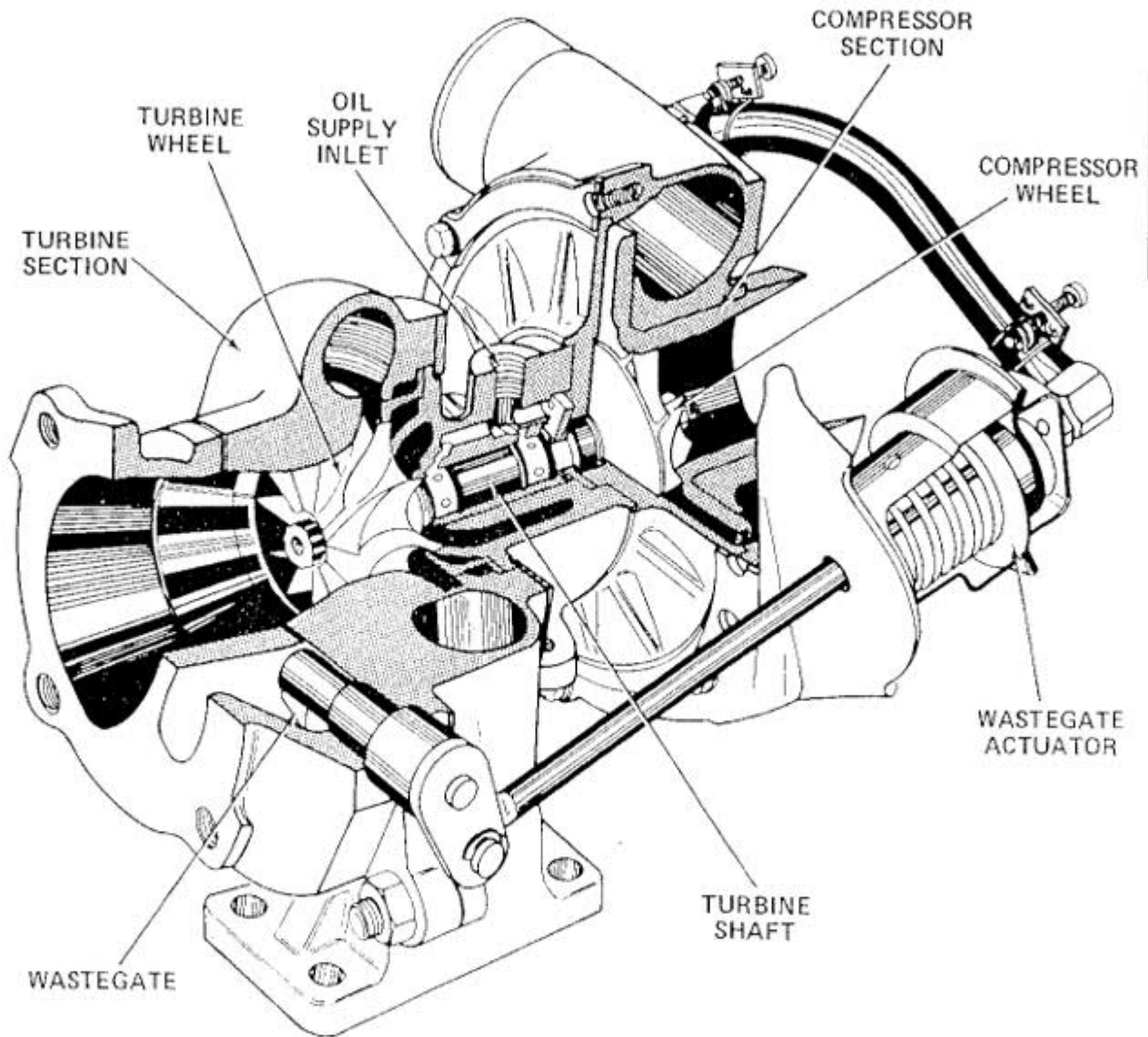


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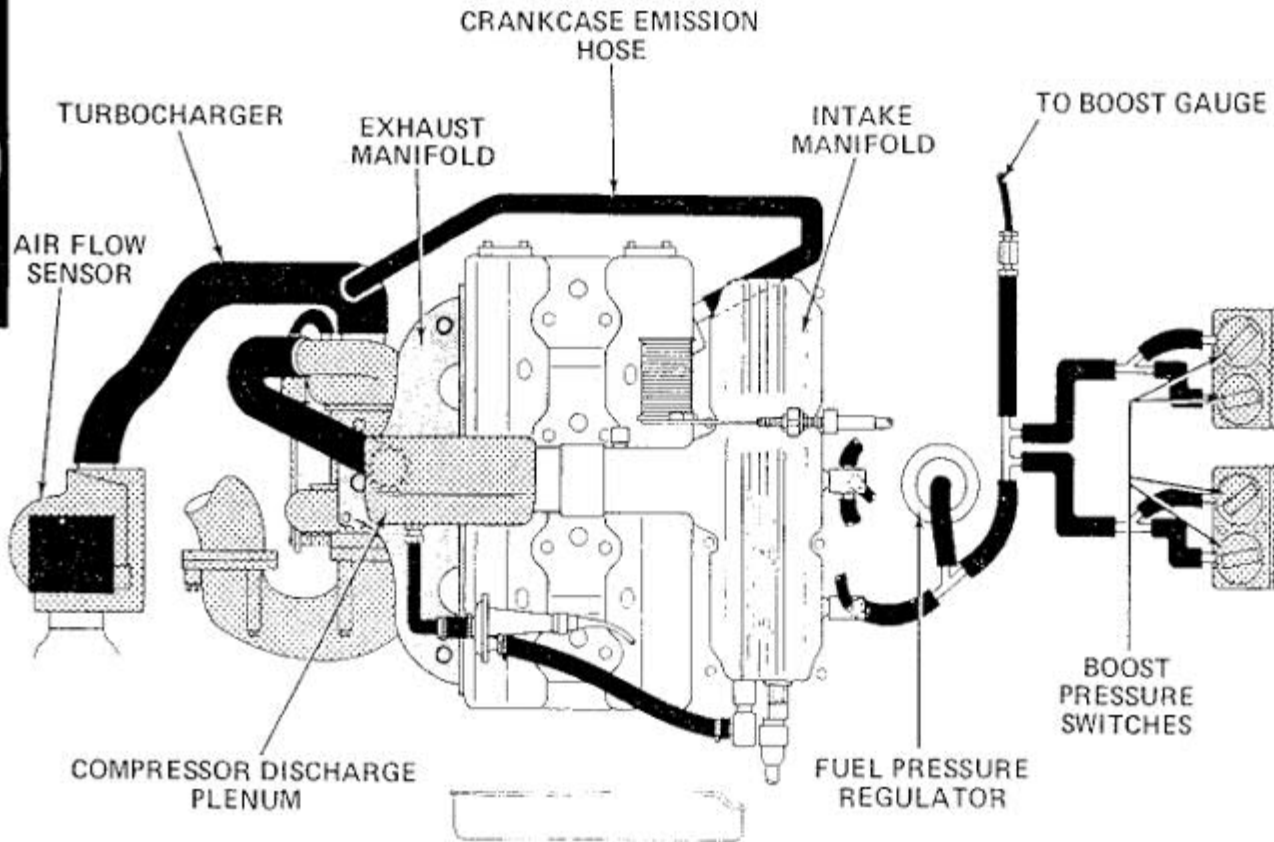




TURBOCHARGER WARNER-ISHI (RHB6)

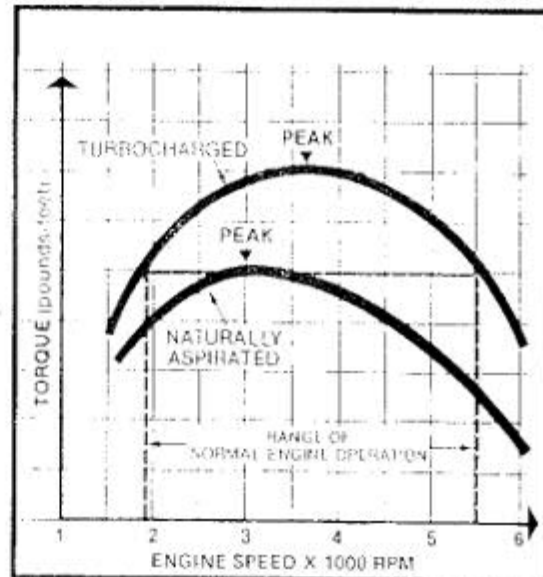
## GENERAL

The turbocharger installed as an option on 1981 and up Spiders is a light weight unit with a low inertia turbine wheel. This provides quick response and minimal turbo lag. It is bolted to the exhaust manifold so that all exhaust gases flow thru the unit. Inlet air is routed from the air flow sensor to the turbocharger where it is compressed. The compressed air is then routed to the discharge plenum and intake manifold. The compressed air increases the charge of air/fuel mixture which results in a significant increase in power output and engine torque.



TOP VIEW OF TURBOCHARGER

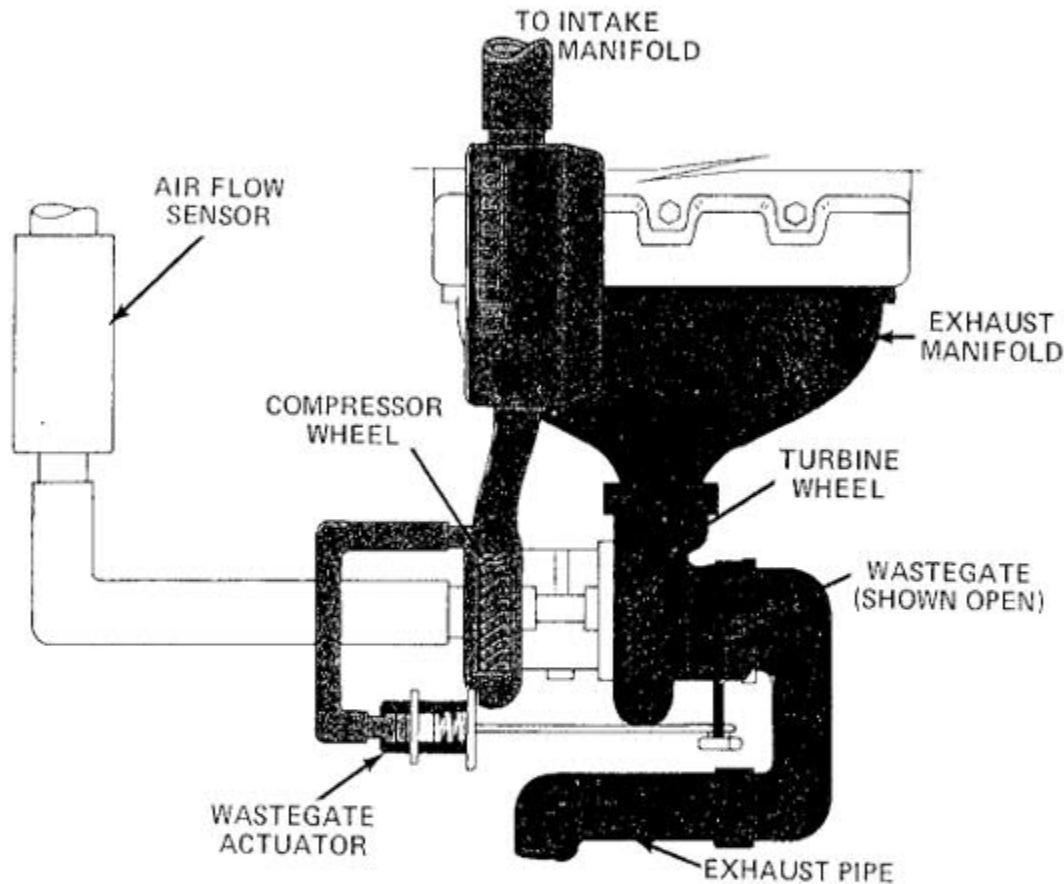
The low inertia turbine wheel is designed to provide boost at relatively low engine speed which produces a broad torque curve. This results in more torque in the normal driving range of the engine without undue sacrifice of fuel economy, emissions, or durability.



## OPERATION

### TURBOCHARGER

Since the turbine wheel is driven by exhaust gases, the speed of the turbine wheel as well as the boost pressure will increase in proportion to the speed and load of the engine. Depending on the amount of exhaust gas flow, the turbine wheel will spin at up to 100,000 rpm. In order to prevent overboost which would damage the engine, a wastegate (charge boost pressure regulator) is incorporated in the turbocharger. The wastegate actuator contains a diaphragm and return spring. The upper chamber of the actuator is connected to the compressor outlet. The boost pressure in the compressor outlet is applied to the diaphragm. At 6 p.s.i., the boost pressure starts to overcome the spring pressure. This opens the wastegate which allows some exhaust gas to bypass the turbine wheel. Any increase in exhaust gas flow will result in an increase in the bypass flow which will maintain the maximum boost pressure at 6 p.s.i.



### CONTROL SWITCHES

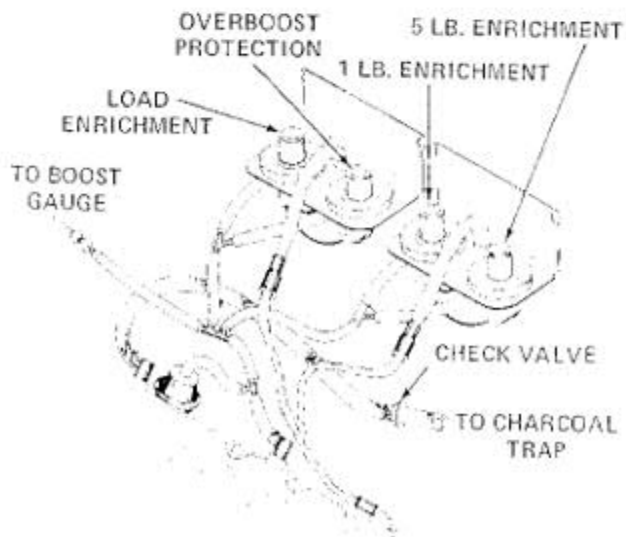
The turbocharger system is equipped with four boost pressure switches. The switches are mounted on the left fender well and are connected to the intake manifold. The switches are color coded as follows:

- Load Enrichment - Blue
- Overboost Protection - Black
- 1 lb. Enrichment - Yellow
- 5 lb. Enrichment - Green

A boost gauge in the instrument cluster is also connected to the intake manifold. This gauge indicates:

- White Zone - Manifold vacuum, no boost
- Green Zone - Normal turbo boost
- Red Zone - Dangerous overboost and system malfunction

A check valve is installed in the hose to the charcoal trap. This prevents boost pressure from pressurizing the charcoal trap.

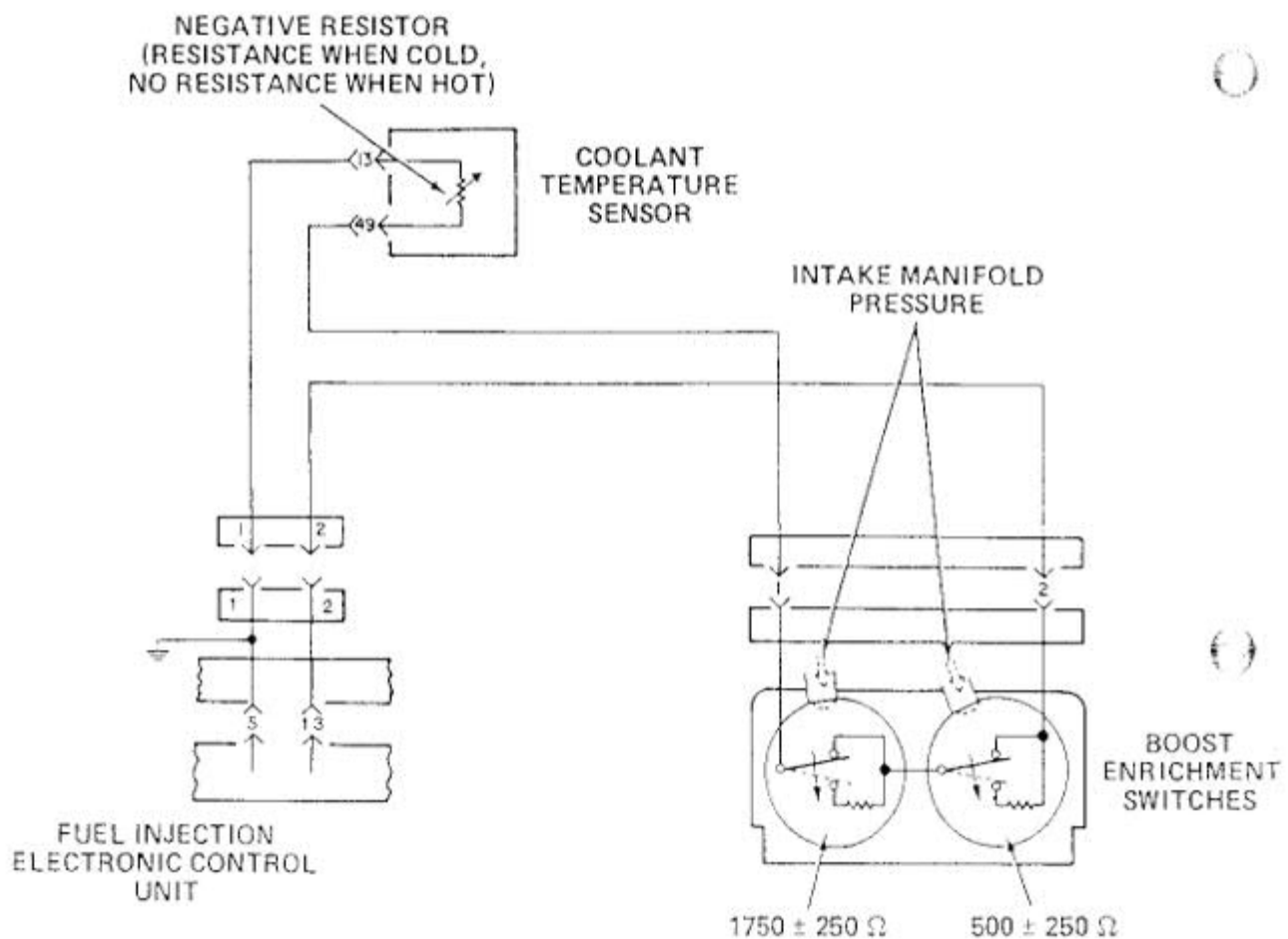


### Boost Enrichment Switches

The boost enrichment switches are wired in series with the coolant temperature sensor of the fuel injection system. This circuit ensures that the proper fuel/air mixture is supplied by the fuel injection system whenever the turbocharger is providing boost (positive intake manifold pressure).

Each switch is a single pole, two position switch. The circuit through the normally closed contacts contain no resistance. The circuit through the normally open contacts contain resistors. When the switch is deactivated, the signal through it is unchanged. When the switch is activated the signal passes through the resistors.

When operating without boost the coolant temperature sensor provides a signal to the electronic control unit (ECU) for extra fuel during the warmup. When boost pressure increases to  $1 \pm 0.5$  psi the first switch is activated. This opens the switch contact and causes the signal to pass through a resistor of  $1750 \pm 250$  ohms. This increase in resistance signals the ECU for additional fuel. When boost pressure increases to  $5 \pm 0.5$  psi the second switch is activated and an additional  $500 \pm 250$  ohms is added. This signals for an additional increase in fuel flow.



## Load Enrichment/Overboost Protection Switches

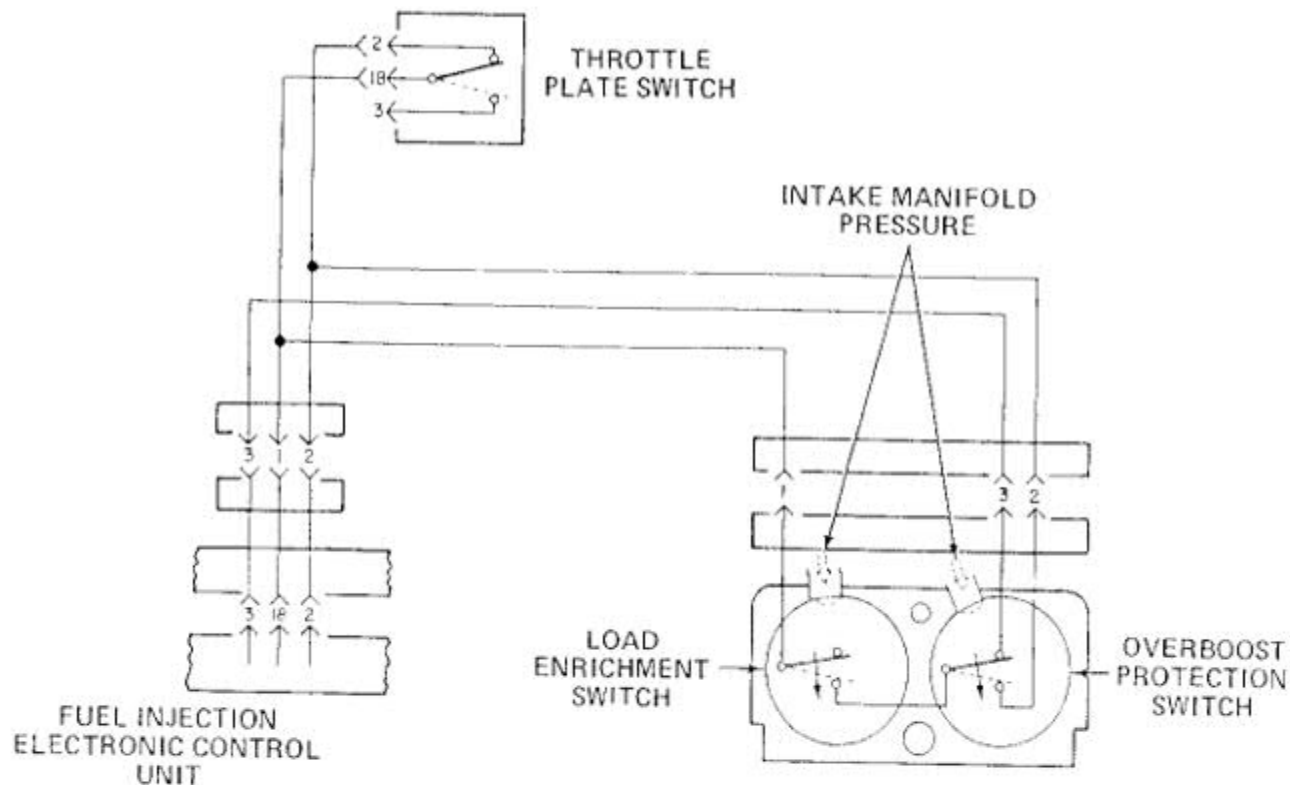
The load enrichment and overboost protection pressure switches are wired into the throttle plate switch circuit of the fuel injection electrical system. The load enrichment switch is a single pole, single position switch. The overboost protection switch is a single pole, two position switch.

### Load Enrichment

When the throttle plate is in idle position, the throttle plate switch provides the normal signal to the ECU. When boost pressure increases to about 1 psi, the throttle plate switch is open and not providing any signal to the ECU. The load enrichment switch is closed. This connects the "full throttle" signal circuit from terminal 3 of the ECU through the normally closed contacts of the overboost switch, the closed contacts of the load enrichment switch to terminal 18 of the ECU. This signal provides additional fuel for operation with boost.

### Overboost Protection

If boost pressure should exceed 9 psi (wastegate failure), the overboost protection switch would be activated. This switches the signal for the ECU from "full throttle" to "idle" signal. When the ECU receives an "idle" signal and a high rpm signal, it closes the fuel injectors. This causes the engine to slow down thereby reducing boost pressure.



## TURBOCHARGER

### REMOVAL AND INSTALLATION

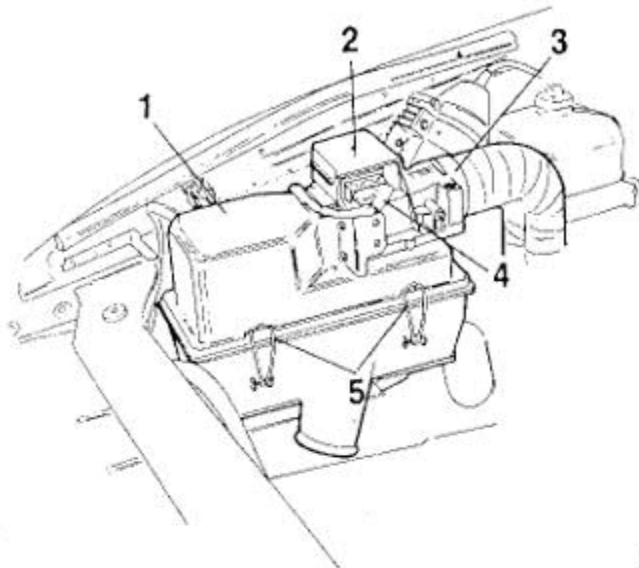
**CAUTION:** The exhaust manifold and turbocharger must be removed as a unit. Do not attempt to remove turbocharger from exhaust manifold on vehicle. The turbocharger bolts must be properly torqued and this can only be accomplished off the vehicle.

Remove front splash pan and drain cooling system by opening engine drain.

Loosen hose clamp (3). Disconnect electrical connector (4) from air flow sensor (2).

Release four clips (5) holding air cleaner cover (1). Remove cover with air flow sensor and remove air filter. Remove 3 nuts in air cleaner and lift air cleaner out.

1. Air cleaner cover 2. Air flow sensor 3. Clamp 4. Electrical connector 5. Clip



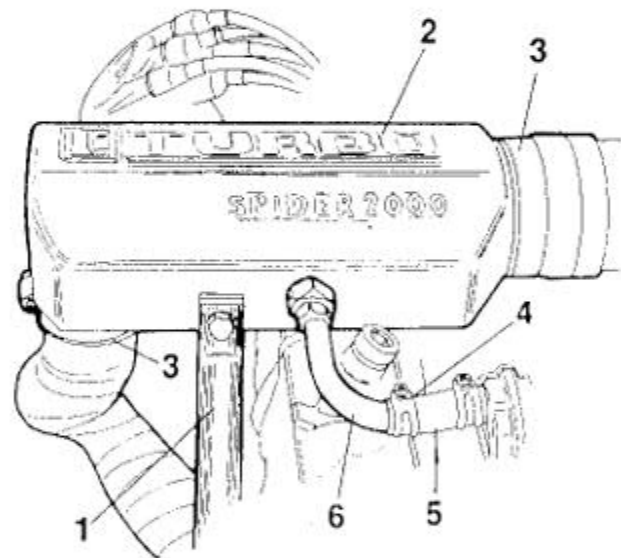
Remove bolt and nut securing support bracket (1) for air plenum (2) to exhaust manifold heat shield.

Loosen clamp (4) and disconnect auxiliary regulator air hose (5) from tube (6).

Loosen air hose clamps (3) and lift plenum off air hoses.

**CAUTION:** Cap off all turbocharger ports and oil supply and return orifices which may be exposed during removal.

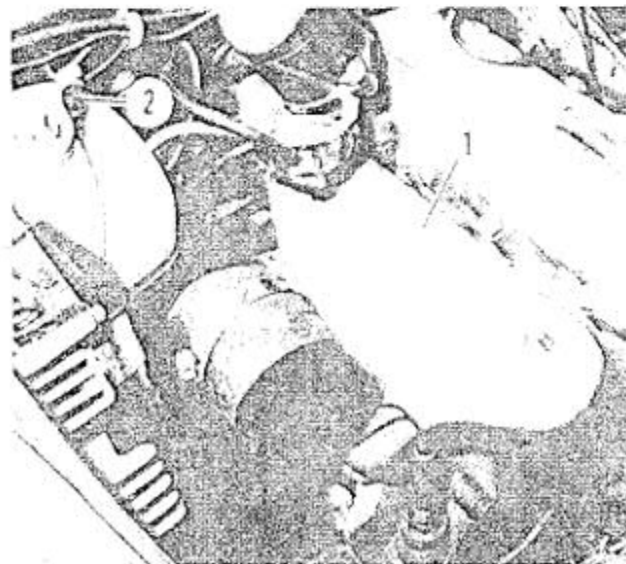
1. Support bracket 2. Air plenum 3. Clamp 4. Clamp 5. Auxiliary air regulator hose 6. Tube



Remove two remaining nuts and washers holding heat shield (1) to exhaust manifold. Remove shield.

Disconnect Lambda sensor electrical connector (2).

1. Heat shield 2. Lambda sensor electrical connector



Remove three Allen head bolts (1) holding turbine outlet elbow (2) to exhaust pipe (3). Remove gasket and discard.

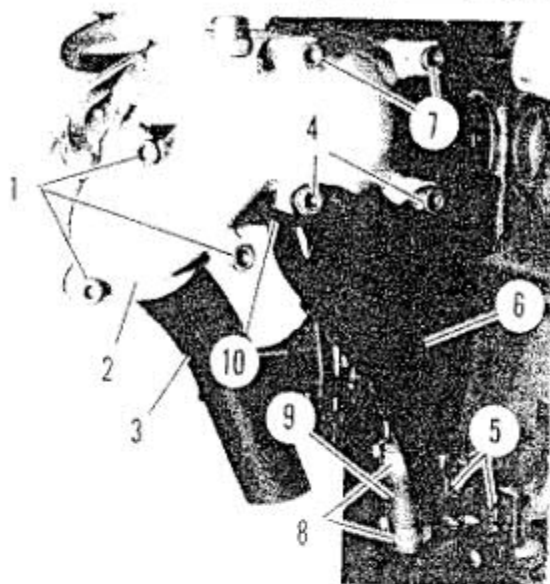
Remove two Allen head bolts (4) and two self-locking nuts (5) or two bolts (A.C. vehicles) to remove exhaust elbow bracket (6).

Remove two remaining Allen head bolts (7) on exhaust elbow and remove elbow. Remove gasket and discard.

Loosen two clamps (8) on turbo oil drain line hose (9) at oil sump connection. Push hose down to clear drain line.

From under vehicle remove turbo support bracket nut at oil drain line flange (10).

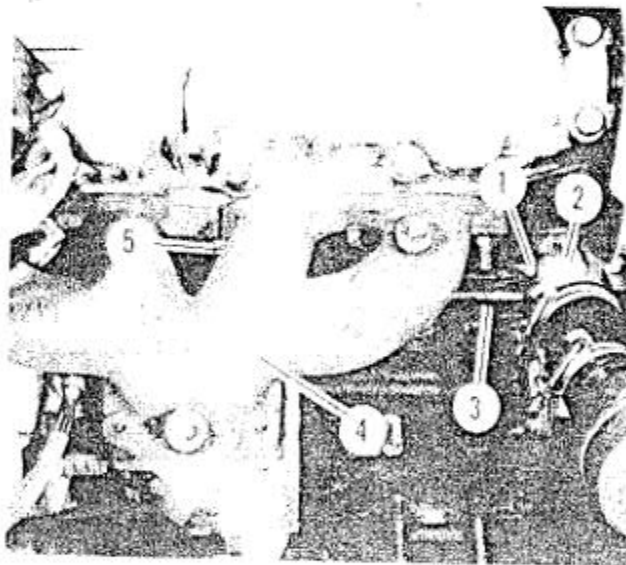
1. Allen head bolt 2. Turbine outlet elbow 3. Exhaust pipe  
4. Allen head bolt 5. Self-locking nut 6. Exhaust elbow bracket  
7. Allen head bolt 8. Clamp 9. Oil drain hose 10. Oil drain line flange



Remove two nuts (1) holding heater return line (3) to water pump (2).

Remove nut (5) holding bracket on heater return line to exhaust manifold (4). Move return line away from manifold.

1. Nut 2. Water pump 3. Heater return line 4. Exhaust manifold  
5. Nut



Loosen clamp (2) holding crankcase hose (1) to inlet hose (8). Disconnect hose (1). Leave inlet hose in place.

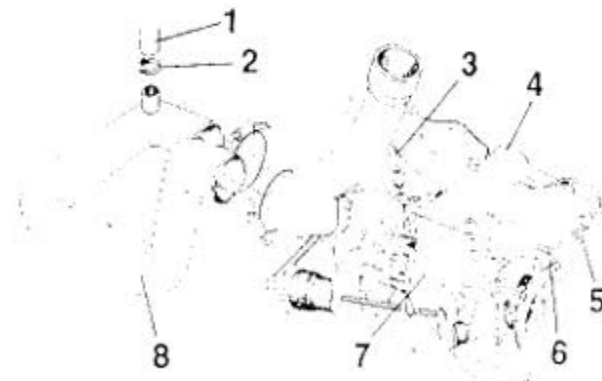
Disconnect oil hose (3) from turbocharger (7). Move hose to one side.

Remove five nuts (5) and washers securing exhaust manifold (4) to engine. Carefully remove exhaust manifold/turbocharger assembly.

Remove four bolts (6) holding turbocharger to exhaust manifold.

**NOTE:** Early production turbochargers had a gasket between manifold and turbocharger. If installed, remove and discard gasket. Do not install a gasket.

1. Crankcase hose 2. Clamp 3. Oil hose 4. Exhaust manifold  
5. Nut 6. Bolt 7. Turbocharger 8. Air hose



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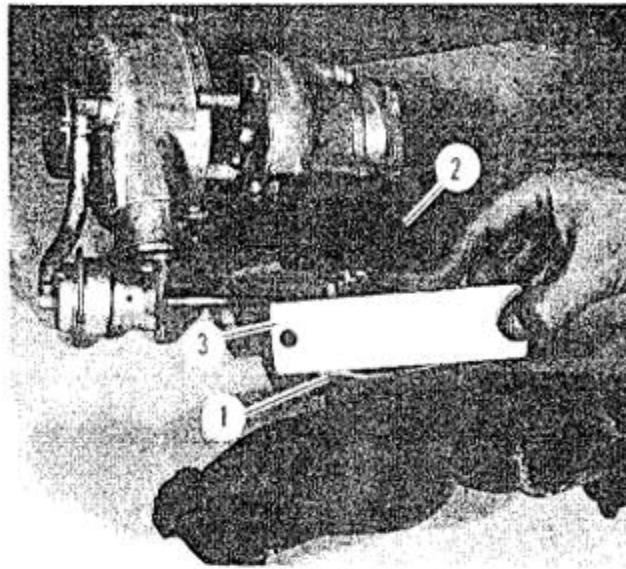
## INSTALLATION

Installation is reverse of removal with particular attention to the following steps and precautions.

**NOTE:** High quality hardware is used throughout the turbo system. Whenever replacement is required, be sure to use hardware of same quality. Torque all hardware, refer to torque chart on following page. Apply a light application of anti-seize compound to all threads and both sides of each stainless steel gasket.

Using straightedge (3), check flatness of exhaust manifold flange (1) and turbocharger flange (2) as shown. Surfaces must be perfectly flat. If not, they must be machined. Remove only enough metal to return level finish to surface.

1. Exhaust manifold flange 2. Turbocharger flange 3. Straightedge



Using new bolts (2), (must be same type of high strength bolts as was removed), torque turbocharger and exhaust manifold flanges together (20 ft. lbs.).

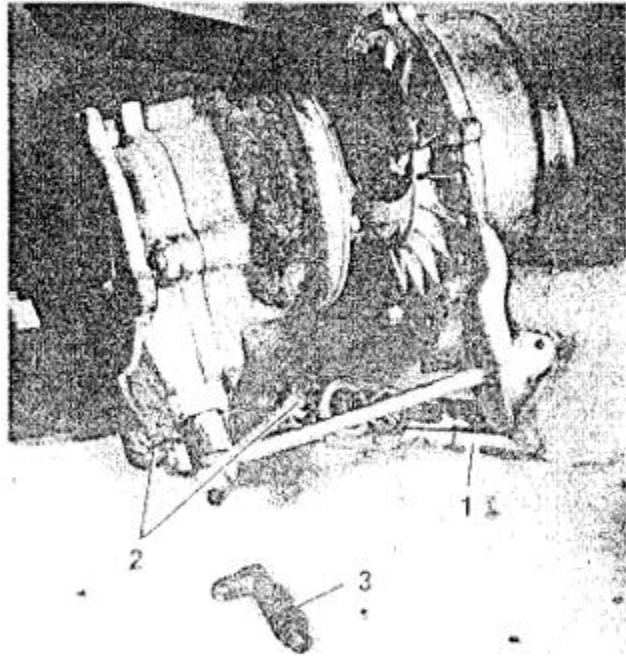
Due to limited clearance, this can be accomplished with "crows foot" wrench extension on torque wrench (1) as shown.

**NOTE:** Crows foot extension will not add a significant amount of torque above 20 ft. lbs.

Reinstall oil supply line fitting (3).

1. Torque wrench 2. Bolt 3. Oil supply line fitting

**CAUTION:** All intake hoses, wires, etc, must be kept clear of turbocharger, exhaust manifold and heat shield. Be certain to secure all hose clamps to prevent them from coming off during positive boost pressure.

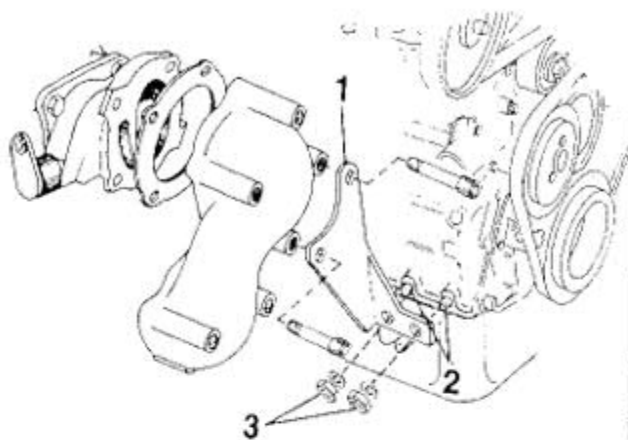




When installing elbow support bracket (1), insure that holes in leg of bracket line up with studs (2) and/or tapped holes (A.C. vehicles) in engine block before securing bracket to elbow.

The leg of elbow support bracket should be parallel and flush to engine block. If it is not, take up slack with washer shims rather than drawing leg flush with mounting nuts (4).

1. Elbow support bracket 2. Mounting studs 3. Self-locking nuts

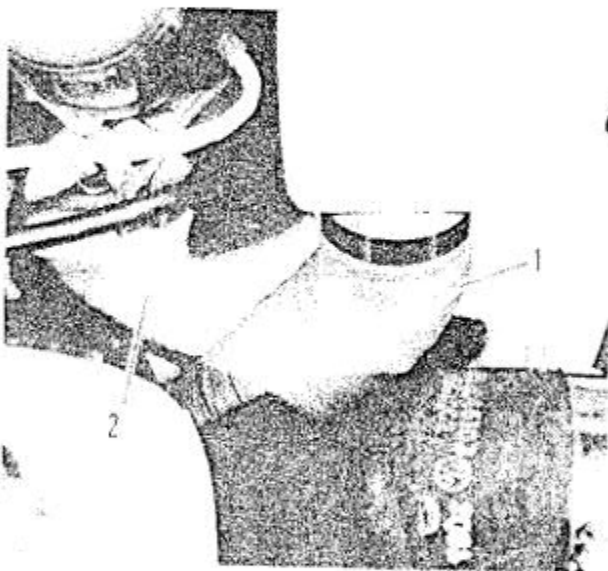


The orange compressor outlet hose (1) must be adjusted for a clearance of at least 5 mm from exhaust manifold heat shield (2). This can be accomplished by sliding hose up or down on compressor outlet port of turbocharger.

1. Compressor outlet hose 2. Heat shield

**CAUTION:** The stainless steel braided oil supply line can be extremely abrasive to anything it comes into contact with. Make sure the protective sheathing around this line is in good condition and positioned correctly to avoid contact with any components.

Refill and bleed cooling system. Refer to bleeding procedures in Radiator section.



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**TESTING****Preparation**

Disconnect vacuum hoses from "Y" fittings. Connect pressure tester J33076 to "Y" fitting.

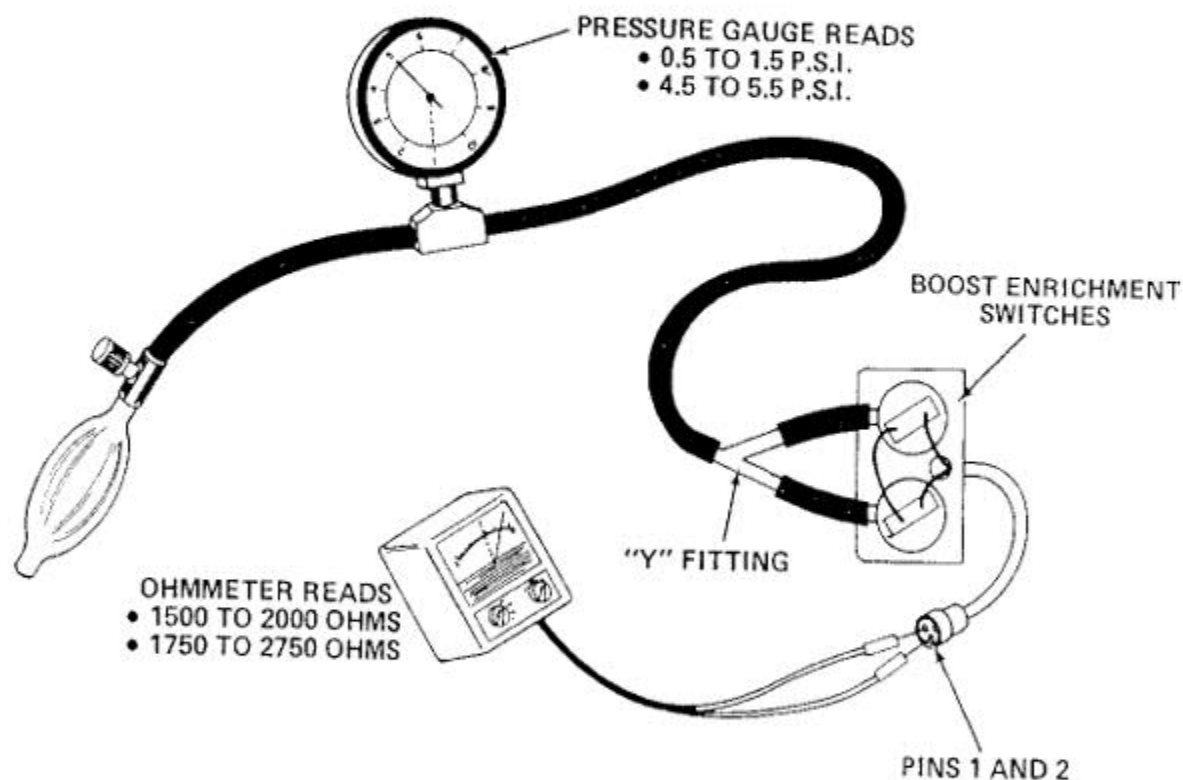
**CAUTION:** When operating tester with line pressure connected, make sure air pressure to switches does not exceed 12 psi. Disconnect connectors for switches from fuel injection wire harness.

**Boost Enrichment Switches**

Connect an ohmmeter to pins 1 and 2 of connector for boost enrichment switches.

Slowly apply pressure to switches. Check that switch operates (a slightly audible click may be heard) at 0.5 to 1.5 psi. Check that ohmmeter reads between 1500 and 2000 ohms.

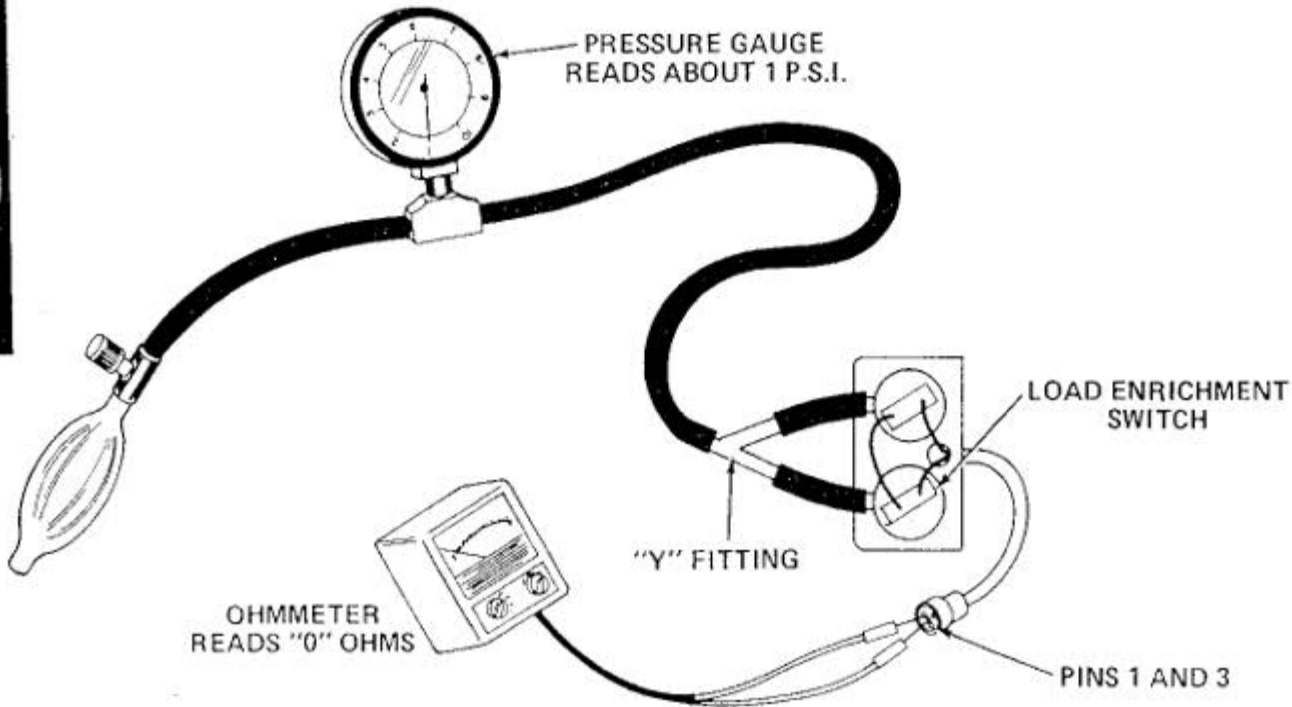
Slowly increase pressure. Check that other switch operates at 4.5 to .5.5 psi. Check that ohmmeter reads between 1750 and 2750.



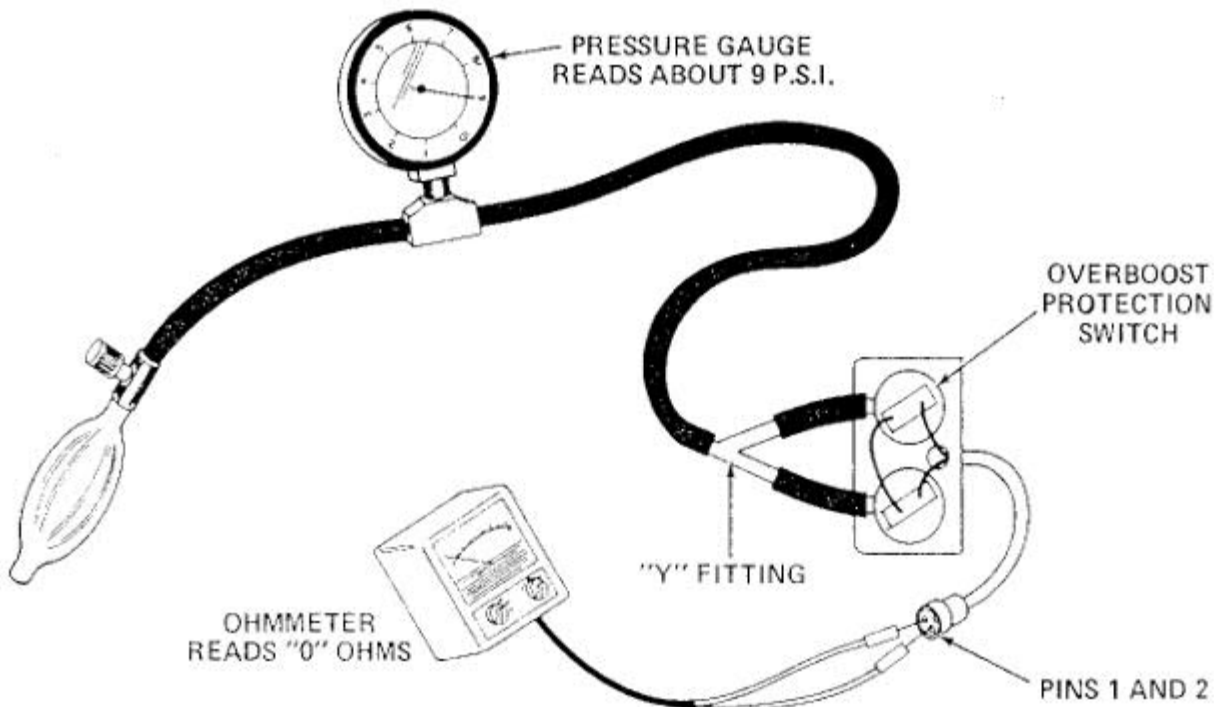
**Load Enrichment Switch**

Connect pressure tester to "Y" fitting for load enrichment switch. Connect ohmmeter to pins 1 and 3 of connector for load enrichment/overboost switches. Zero ohmmeter.

Check that ohmmeter reads infinity. Slowly apply pressure to switch. Check that load switch operates (a slightly audible click may be heard) at about 1 psi. Check that ohmmeter reads 0 ohms.

**Overboost Protection Switch**

Connect ohmmeter to pins 1 and 2 of connector. Check that ohmmeter reads infinity. Slowly increase pressure. Check that overboost switch operates at about 9 psi. Check that ohmmeter reads 0 ohms.



## TROUBLESHOOTING

### SYMPTOM OR COMPLAINT

No Boost

Lack of power

Detonation  
w/no boost

w/normal boost

w/excessive boost

Excessive fuel consumption  
(black exhaust smoke)

Excessive oil consumption  
(blue, gray, or white exhaust smoke)

Noise or vibration at turbo unit

### POSSIBLE CAUSES

Boost gauge inoperative  
Wastegate stuck open  
Turbo unit inoperative, seized  
Turbine impeller coked up

Engine  
low compression  
incorrect valve timing and clearance  
incorrect ignition timing  
Clogged air cleaner element  
Insufficient fuel supply  
restriction  
low fuel pressure  
fuel enrichment system not working

Low grade fuel  
Ignition timing advanced too far  
Rough edge or foreign object in cylinder

Low grade fuel  
Ignition timing advanced too far  
Insufficient fuel supply  
restriction  
low fuel pressure  
fuel enrichment system not working

Wastegate actuator signal line leaking  
Actuator tampered with  
Wastegate or actuator damaged

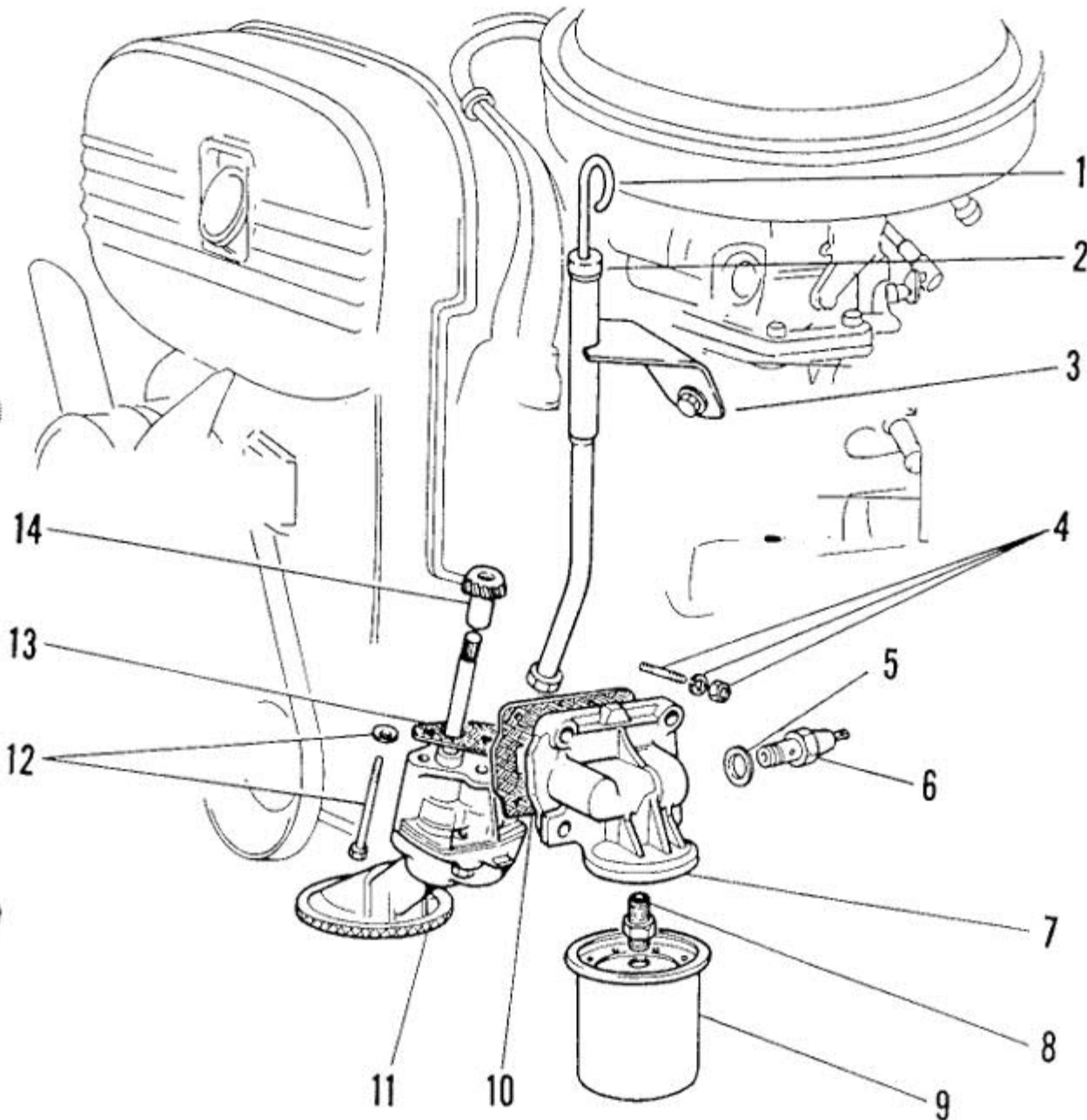
Engine out of tune  
Intake air flow restricted  
filter clogged  
air delivery hoses kinked or collapsed  
Cold start valve or injectors leaking  
Fuel enrichment system working all the time

Incorrect type or grade of oil  
Extended oil change intervals  
Clogged air cleaner element  
Engine wear (piston rings, valve guides)  
Crankcase emission check valve stuck open  
or installed backwards

Internal leakage at seals in turbo unit

Loose mount or brackets  
Internal wear — excessive shaft play  
Internal damage — out of balance

101



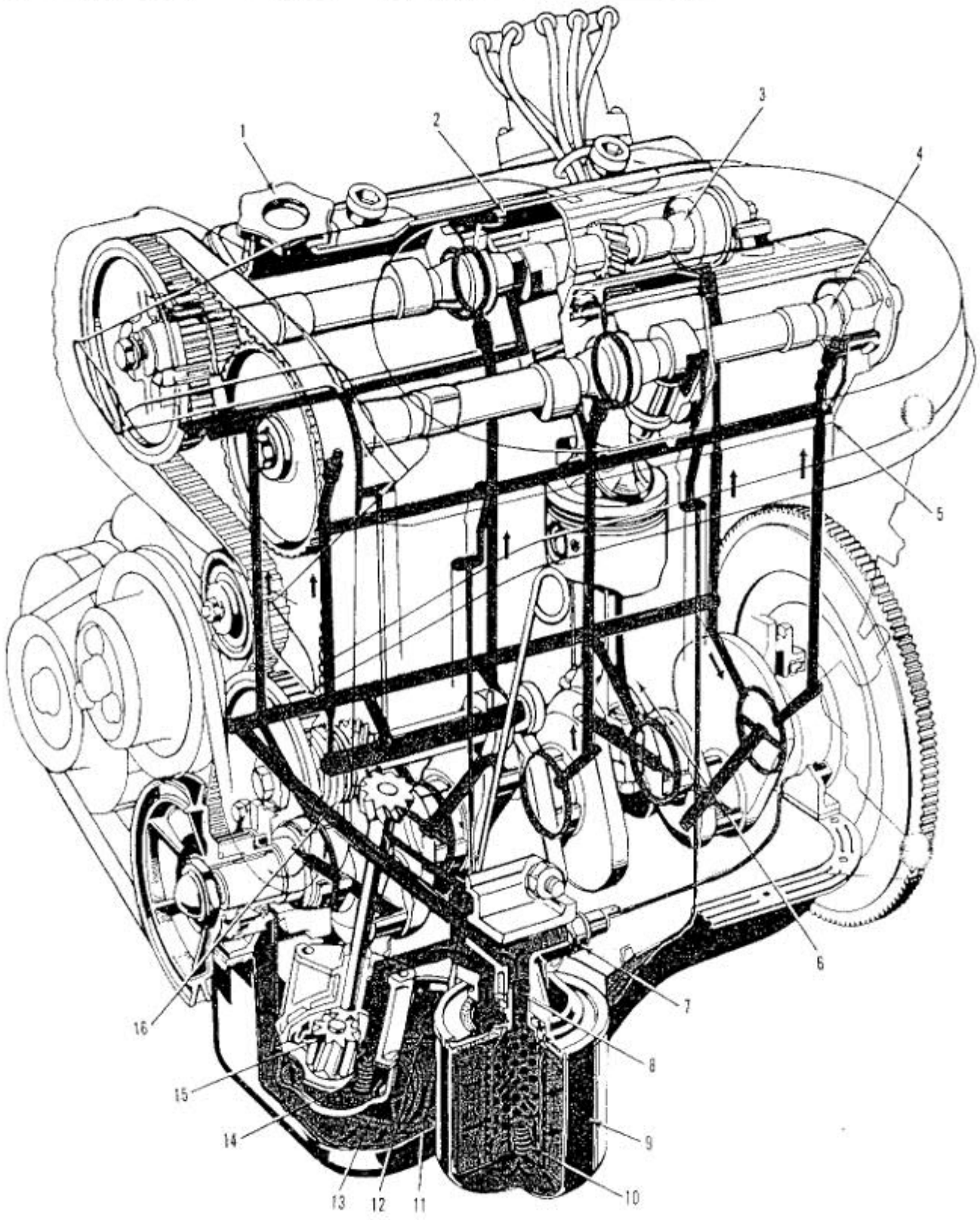
1. Dipstick
2. Dipstick seal
3. Support
4. Stud, lockwasher and nut
5. Gasket
6. Oil pressure indicator switch
7. Oil filter support

8. Connector, oil filter to support
9. Full-flow, cartridge type oil filter
10. Oil filter support gasket
11. Oil pump
12. Bolt and spring washer
13. Oil pump gasket
14. Oil pump drive gear

ENGINE LUBRICATION SYSTEM COMPONENTS

10

01



- |                                      |   |                                   |
|--------------------------------------|---|-----------------------------------|
| 1. Oil filter cap                    | 7. Low oil sending unit                     | 13. Oil pump suction intake       |
| 2. Oil spurt for camshaft and tappet | 8. Oil delivery-filter to engine components | 14. Relief valve                  |
| 3. Exhaust camshaft                  | 9. Oil filter                               | 15. Oil pump                      |
| 4. Intake camshaft                   | 10. Filter by-pass valve                    | 16. Duct for oil pump drive gears |
| 5. Oil return from tappets           | 11. Dipstick                                |                                   |
| 6. Oil spurt for cylinder walls      | 12. Oil sump drain plug                     |                                   |

ENGINE LUBRICATION DIAGRAM

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### OIL PUMP

#### REMOVAL AND INSTALLATION (Engine in Vehicle)

Drain engine oil.

Remove front protection shield.

Remove flywheel protection cover.

On turbocharged engines, loosen clamps on return hose (1) and push hose up to clear drain fitting.

1, Turbocharger oil return hose 2, Oil sump



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**NOTE:** Engine must be raised and crossmember under engine must be lowered for clearance when removing oil sump.

Remove engine mount nut (1) thru hole in crossmember (3).

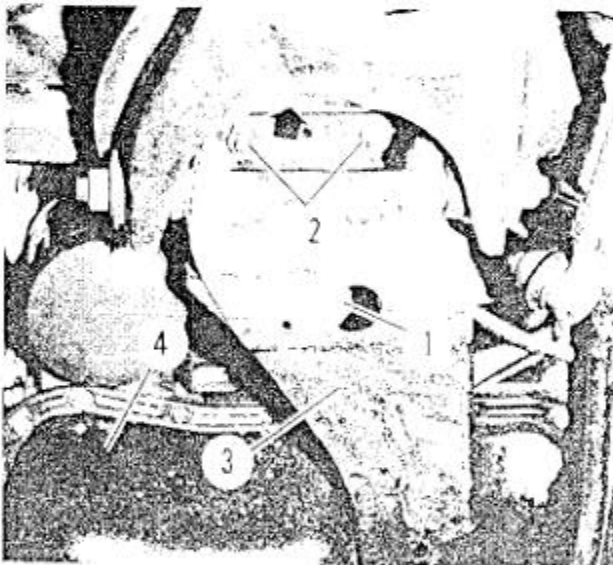
Remove upper crossmember bolt (arrow). Back-off on two crossmember nuts (2) until about two threads are left showing at bottom of stud. Repeat for other side.

Move crossmember down.

Place jack under transmission and raise engine until clearance is obtained for sump removal.

Remove bolts securing sump to engine. Remove sump (4) and gasket.

1, Bolt 2, Nut 3, Crossmember 4, Oil sump

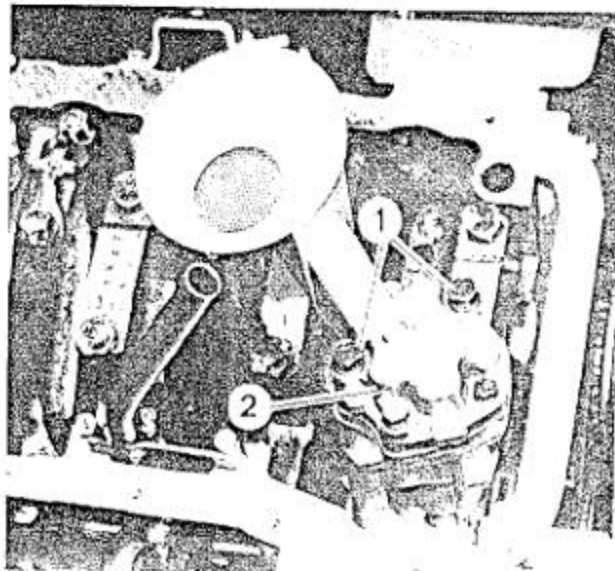


Remove two bolts (1) and washers holding oil pump (2). Remove pump and gasket.

Installation is reverse of removal.

Make sure pump is seated before tightening bolts. Torque bolts to 14 ft. lbs. (2 kgm).

1, Bolt 2, Oil pump



**INSPECTION**

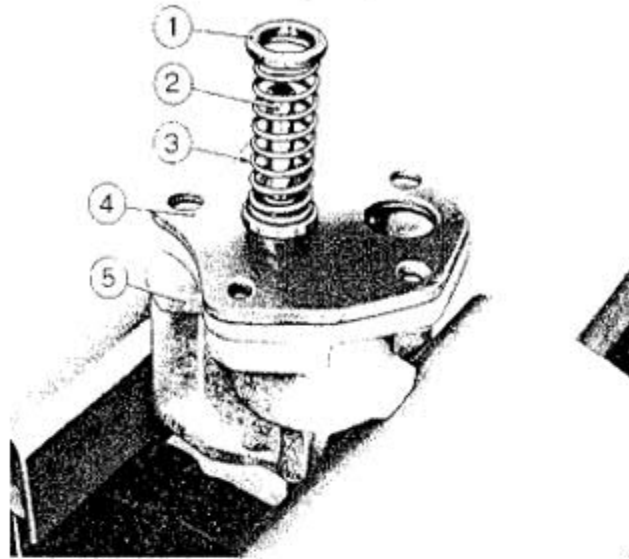
Clean all parts. Blow parts dry with compressed air.

Check housing (5) and cover (4) for cracks. Check suction pipe and oil duct for clogging. Blow clear with compressed air. Make sure dirt and residues are removed between relief valve (2) and housing (3).

Check relief valve spring for cracks and loss of elasticity. Check spring load.

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1. Washer 2. Relief valve 3. Spring 4. Cover 5. Housing

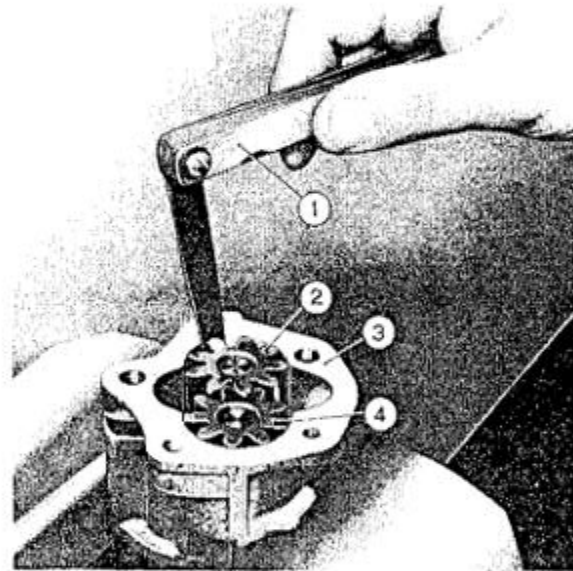


Check gears for wear.

Check gears for tooth to housing clearance. Clearance should be 0.0043 to 0.0070 inch (0.110 to 0.180 mm).

If clearance fails to meet specifications, replace gears and housing, if necessary.

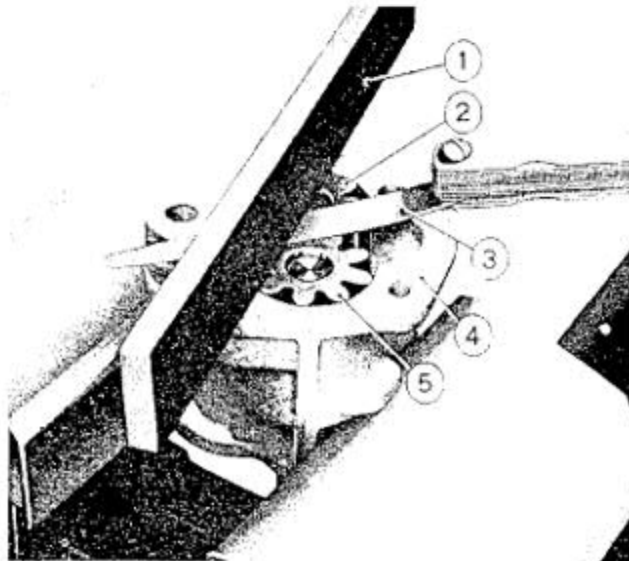
1. Feeler gauge 2. Drive gear 3. Housing 4. Driven gear

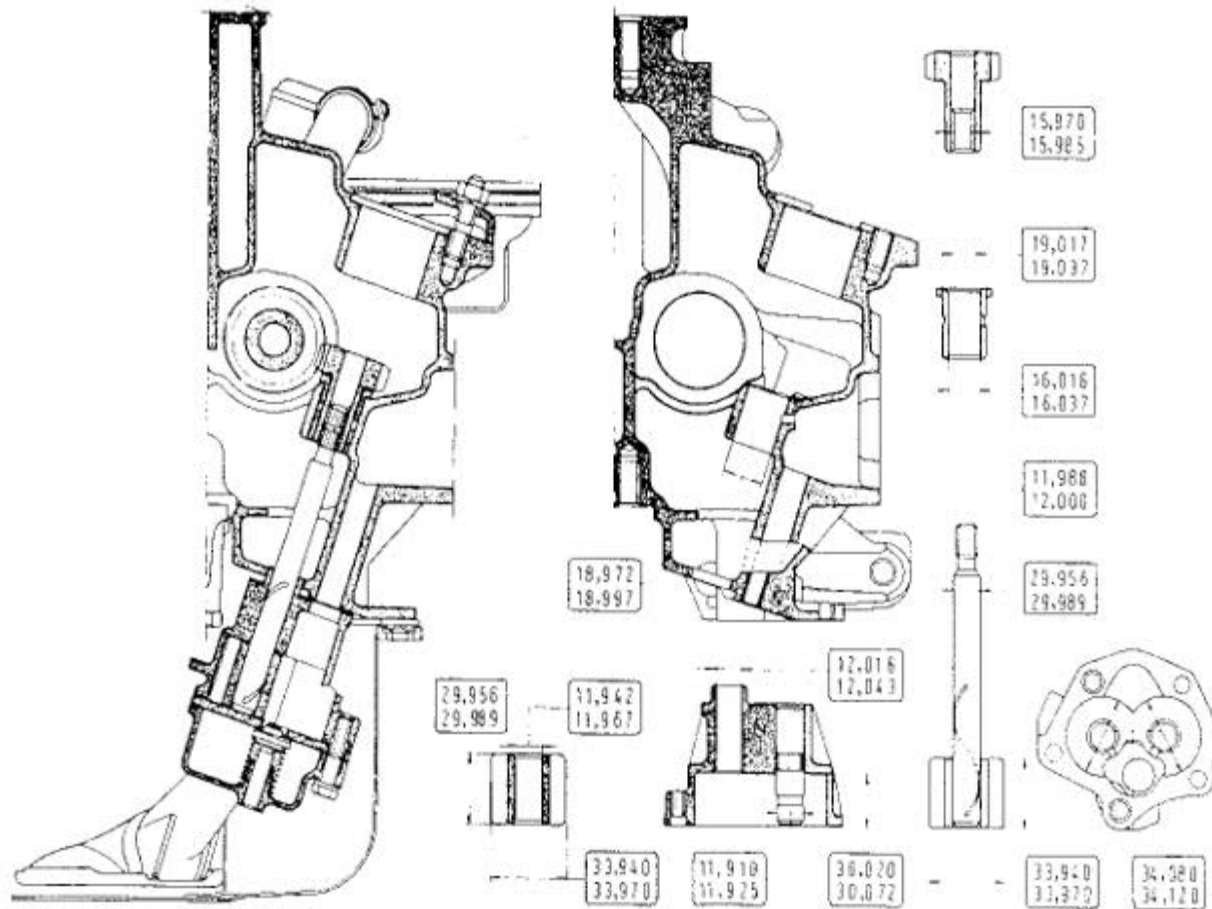


Check clearance between gears and cover mating face. Clearance should be 0.0010 to 0.0051 in. (0.026 to 0.131 mm). Use a straight edge and a feeler gauge.

If clearance fails to meet specifications, replace gears or housing.

1. Straight edge 2. Drive gear 3. Feeler gauge 4. Housing 5. Driven gear





29.956 mm = 1.1793 in  
 29.969 mm = 1.1806 in  
 18.972 mm = .7469 in  
 18.997 mm = .7479 in  
 11.942 mm = .4701 in  
 11.967 mm = .4711 in

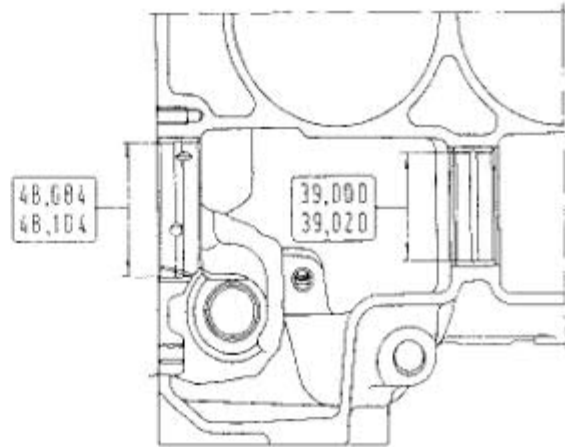
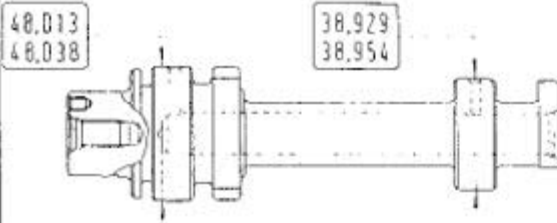
33.940 mm = 1.3362 in  
 33.970 mm = 1.3374 in  
 11.918 mm = .4692 in  
 11.925 mm = .4695 in  
 12.016 mm = .4730 in  
 12.043 mm = .4741 in

30.020 mm = 1.1819 in  
 30.072 mm = 1.1839 in  
 15.970 mm = .6287 in  
 15.985 mm = .6293 in  
 19.017 mm = .7487 in  
 19.037 mm = .7495 in

16.016 mm = .6305 in  
 16.037 mm = .6314 in  
 11.988 mm = .4719 in  
 12.000 mm = .4724 in  
 34.080 mm = 1.3418 in  
 34.120 mm = 1.3433 in

CROSS SECTION THRU OIL PUMP AND MAIN DATA OF OIL PUMP AND DRIVE COMPONENTS

## AUXILIARY SHAFT



## MAIN DATA OF AUXILIARY SHAFT AND BUSHINGS

## REMOVAL AND INSTALLATION

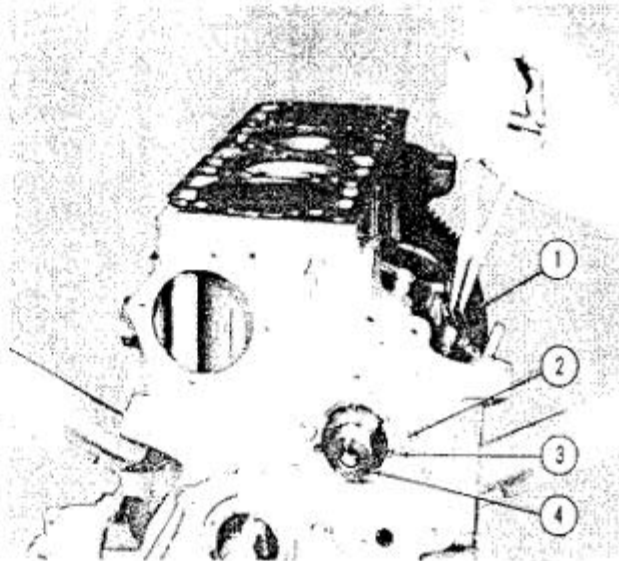
Remove nut, washer, and clamp holding spacer for oil pump in crankcase. Turn auxiliary shaft to raise oil pump gear. Using thin pliers, remove gear. Remove two bolts and washers holding retainer for auxiliary shaft.

Pull shaft out of crankcase.

Inspect shaft journals for scuffing or scoring. If shaft cannot be dressed, replace it.

Fit clearance between journals and bushings should be 0.0018 to 0.0036 in. (0.046 to 0.091 mm).

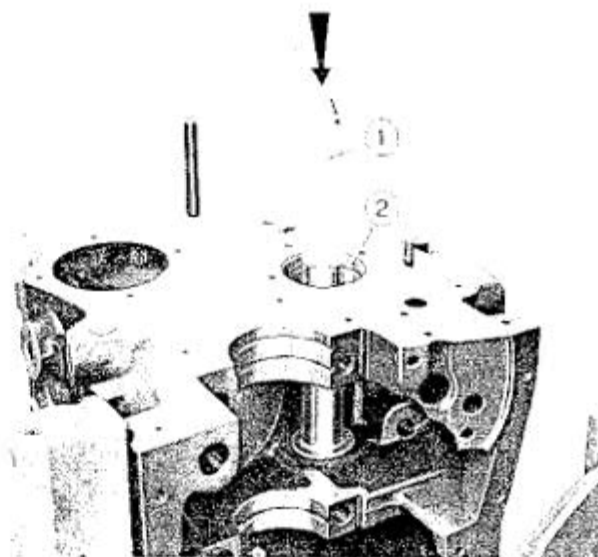
1. Gear 2. Bolts 3. Retainer 4. Auxiliary shaft



## REPLACING AND REAMING AUXILIARY SHAFT BUSHINGS

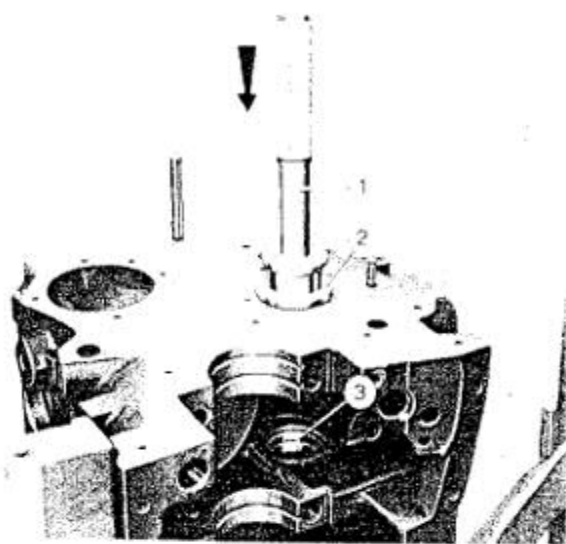
Press out front and rear bushings. Use tool A.60321/1 for rear bushing and tool A.60321/2 for front bushing.

1. Remover and installer 2. Front bushing



When installing new bushings, make sure oil holes in bushing are in line with oil holes in crankcase.

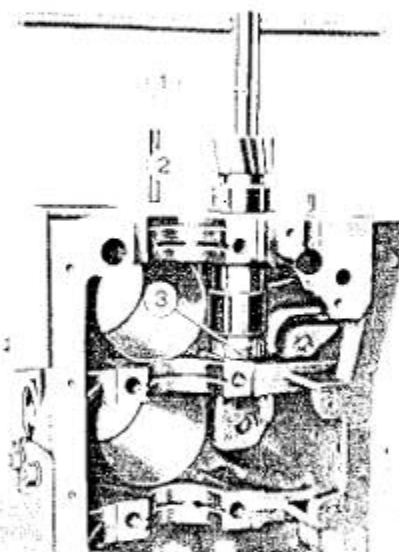
1. Remover and installer 2. Adapter 3. Rear bushing



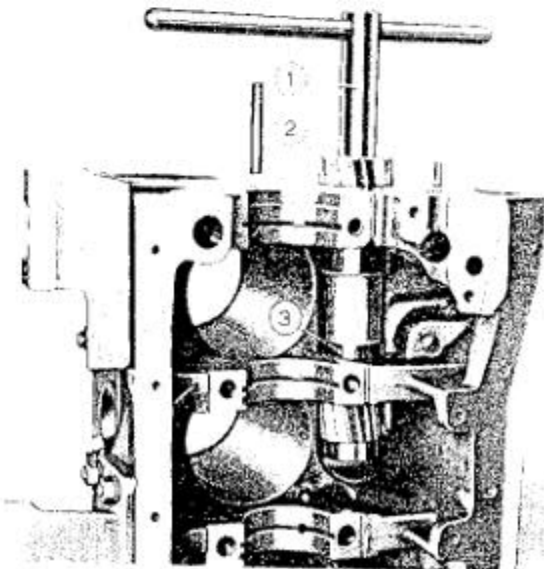
After press fitting bushings, ream bushings to finish size. Refer to Specifications.

Use care to make sure bushings are reamed with correct alignment and squareness of shaft axes.

1. Tool 2. Pilot on front bushing 3. Reamer on rear bushing



1. Tool 2. Reamer on front bushing 3. Pilot on rear bushing



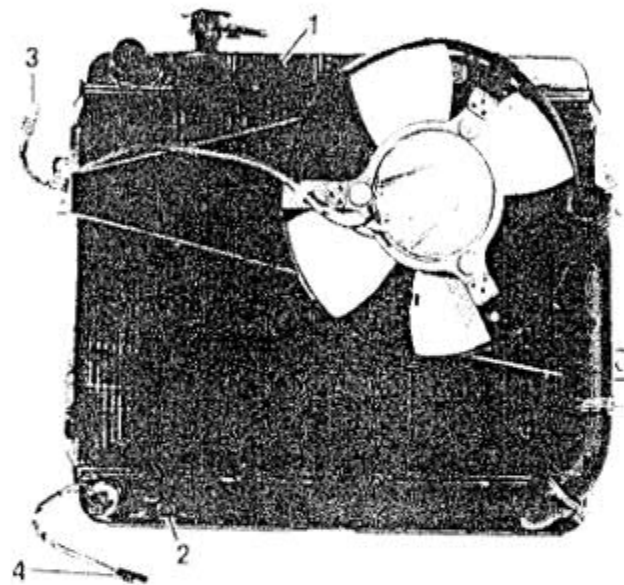
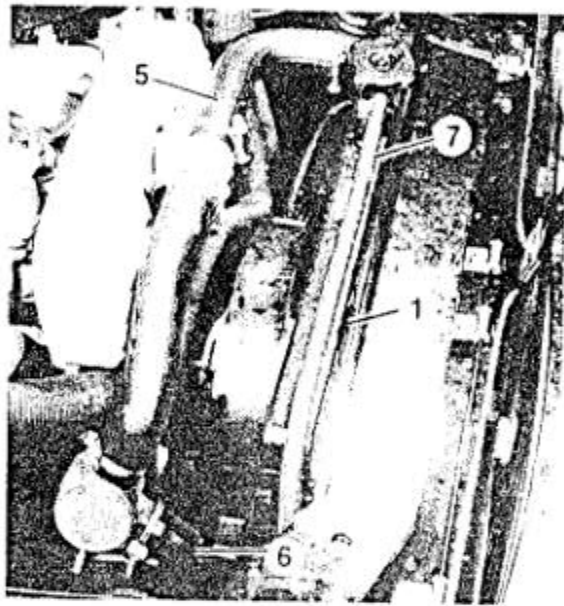
### RADIATOR

#### REMOVAL AND INSTALLATION

From underneath vehicle, remove splash shield. Drain radiator (1) thru plug (2) on lower left side. Disconnect radiator fan connector (3). Disconnect fan thermo switch connector (4). Loosen clamps and disconnect upper (5) and lower (6) radiator hoses. Loosen clamp and disconnect radiator overflow hose (7). On vehicles with automatic transmission disconnect two oil cooling lines at radiator. Remove two nuts, one on each side (arrows), securing radiator to body. Carefully lift radiator/fan assembly out.

**NOTE:** On vehicles with turbocharger and A.C. the fan assembly has been repositioned on the radiator by using spacers. Also the fan shroud has been trimmed to clear radiator. When installing a new radiator be sure to use the spacers to position the fan properly.

1. Radiator 2. Drain plug 3. Connector 4. Connector 5. Upper hose 6. Lower hose 7. Overflow hose



#### TESTING

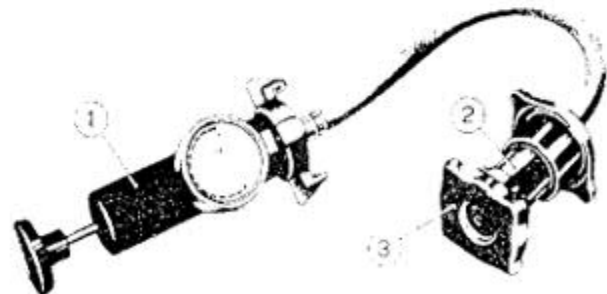
Fill radiator with water.

Attach tester to radiator filler.

Pump in air until pressure of 14 psi is built up. If pressure decreases check for leaks.

Test radiator cap (3) by applying pressure with tester (1) as shown. Check that vent valve opens at 11 psi.

1. Tester 2. Union 3. Radiator cap



## BLEEDING COOLING SYSTEM

**NOTE:** Whenever cooling system has been drained and refilled, the system must be bled. Since the radiator height is lower than the engine, an air pocket will form in the engine cooling jacket.

Open heater valve. Fill radiator and install radiator cap.

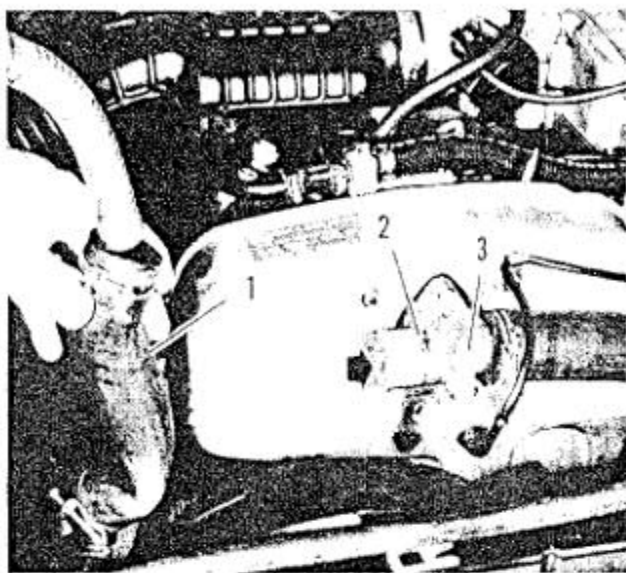
Disconnect water hose (1) from engine "T" housing (2).

Slowly pour coolant into hose (1) until it starts to flow out of housing (arrow). Reconnect hose to housing.

Remove bleed plug (3). Pour coolant into housing (2) until it overflows. Install bleed plug.

Fill expansion tank to "MAX" level and install cap.

1. Water hose 2. Engine "T" housing 3. Bleed plug

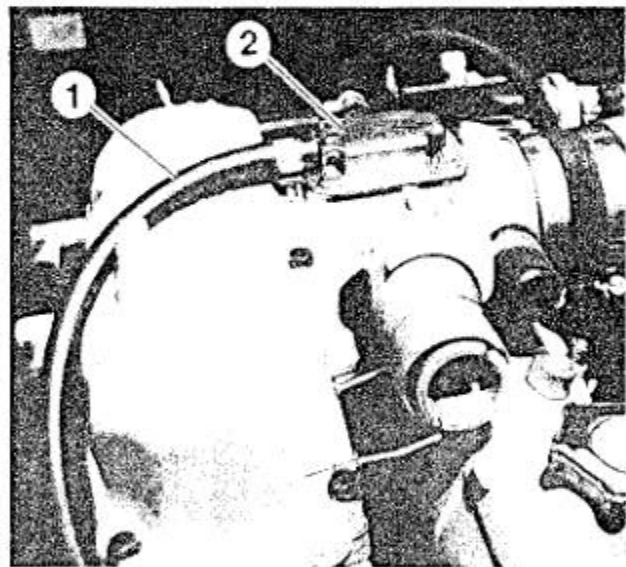


Disconnect hose (1) from throttle plate heater (2). Pour coolant into hose until heater overflows. Reconnect hose.

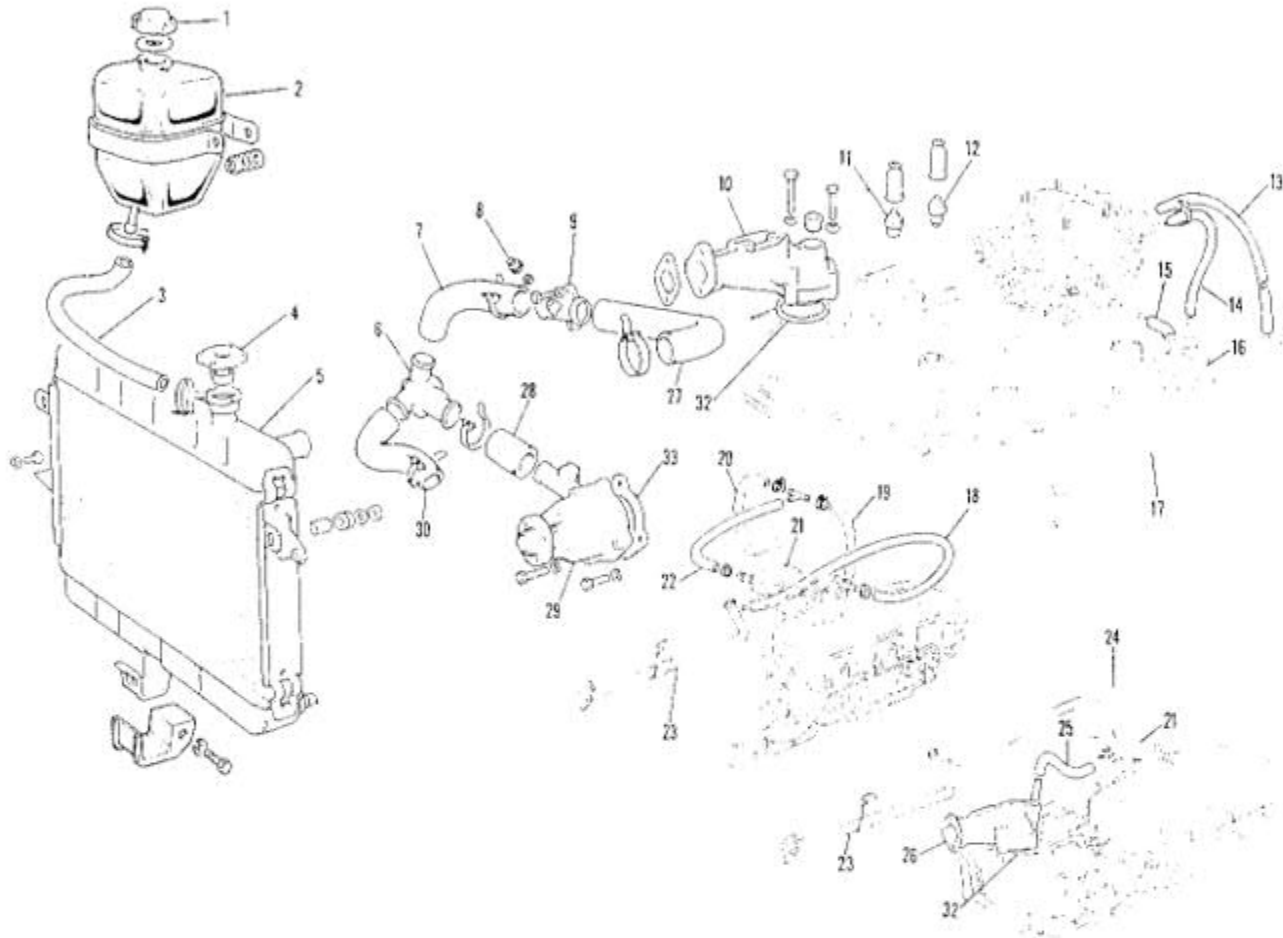
Start and run engine in neutral. If system is completely bled, temperature gauge will rise slowly to operating temperature and radiator will heat up. After passing operating temperature fan will operate. Allow this to occur for at least two fan operating cycles.

**NOTE:** If system is not completely bled, gauge will rise rapidly, radiator will be cool, and fan will not operate even though temperature is above normal. If this occurs, shut engine off and bleed system again.

1. Hose 2. Throttle plate heater



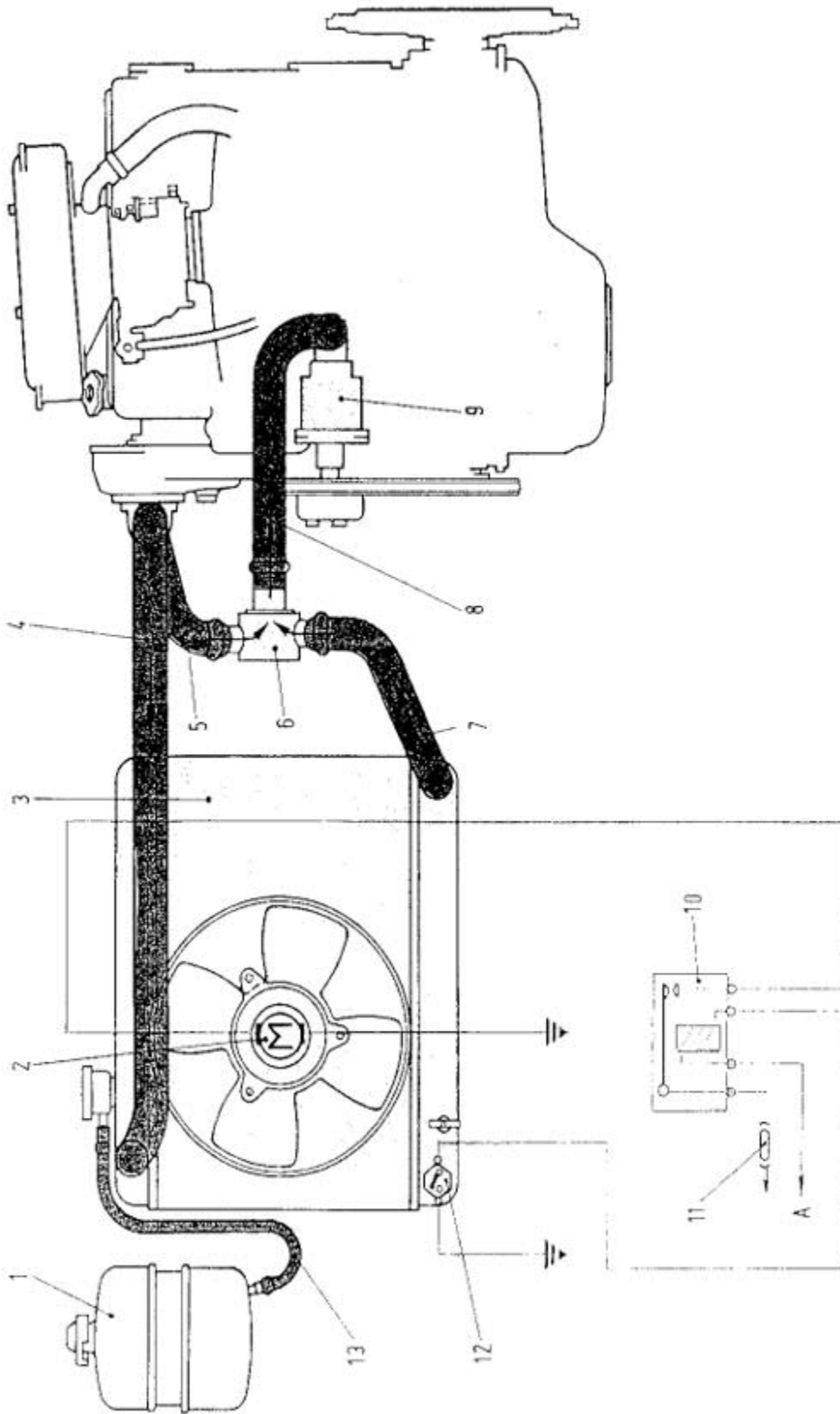
## WATER PUMP AND DUCTS



1. Expansion tank cap
2. Expansion tank
3. Overflow hose
4. Radiator cap
5. Radiator
6. Controlled by-pass thermostat
7. Water hose, cylinder head outlet to thermostat
8. Bleed plug
9. Union
10. Water outlet from cylinder head (carburetor version)
11. Temperature sending unit
12. Temperature sending unit
13. Water hose, automatic choke to heater return line
14. Water hose, automatic choke to thermostatic housing
15. Water hose, engine to thermostat housing
16. Thermostatic housing
17. Heater return line

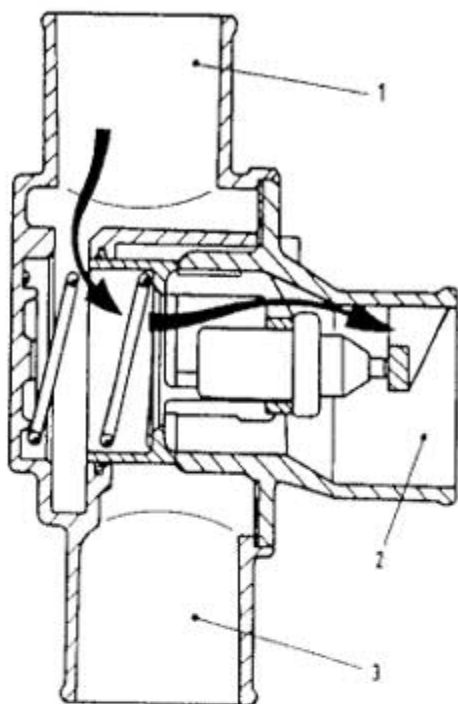
18. Water hose, throttle plate heater to heater return line
19. Water hose, heater supply line
20. Water hose, heater supply line
21. Throttle plate heater
22. Water hose, throttle plate heater to heater supply line
23. Heater return line
24. Water hose, throttle plate heater to heater return line
25. Water hose, engine to throttle plate heater
26. Water outlet from cylinder head (fuel injection version)
27. Water hose, union to radiator
28. Water hose, water pump to thermostat
29. Water pump
30. Water hose, thermostat to radiator
31. Cooling fan thermostat switch
32. Gasket
33. Gasket



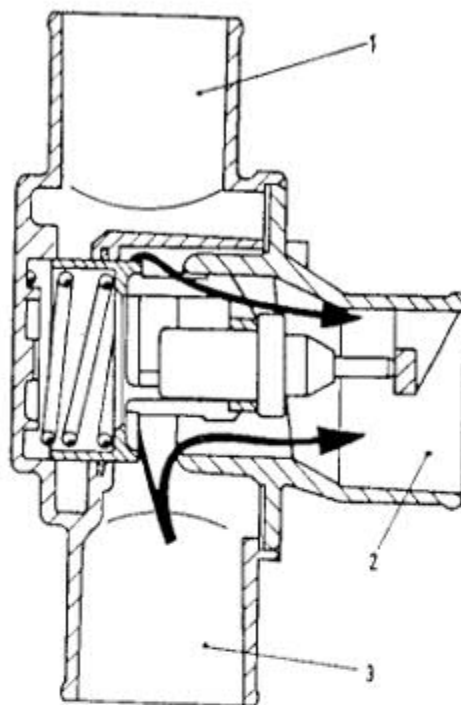


- |                                       |   |                                     |
|---------------------------------------|---|-------------------------------------|
| 1. Expanding tank                     | 5. Water hose from engine to thermostat     | 9. Water pump                       |
| 2. Electrofan motor                   | 6. Controlled bypass thermostat             | 10. Electrofan motor relay          |
| 3. Radiator                           | 7. Water hose from radiator to thermostat   | 11. Fuse                            |
| 4. Water hose from engine to radiator | 8. Water hose from thermostat to water pump | 12. Electrofan motor thermal switch |
|                                       |   | 13. Radiator to expansion tank hose |

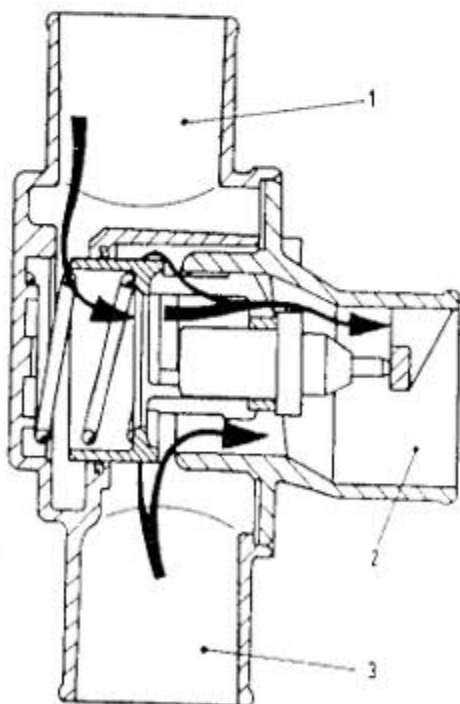
COOLING SYSTEM OPERATIONAL DIAGRAM



CLOSED



FULLY OPEN



PART OPEN

Operational diagrams of controlled-by-pass thermostat for mixing coolant.

1. Thermostat water inlet from engine.
2. Thermostat water outlet to pump.
3. Thermostat water inlet from radiator.

The thermostat must be working properly for good engine performance.

Thermostat should begin opening at 172° to 180° F (78° to 82° C).

Thermostat should be fully open at 198° F (92° C).

Thermostat valve stroke at 198° F (92° C) is 0.29 in. (7.5 mm).

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**WATER PUMP****REMOVAL AND INSTALLATION**

Drain cooling system thru radiator and engine block plug. Plug is located on right side of engine.

Loosen two bolts securing alternator (1). Remove drive belt (2).

Remove three water pump pulley bolts (3) to remove pulley.

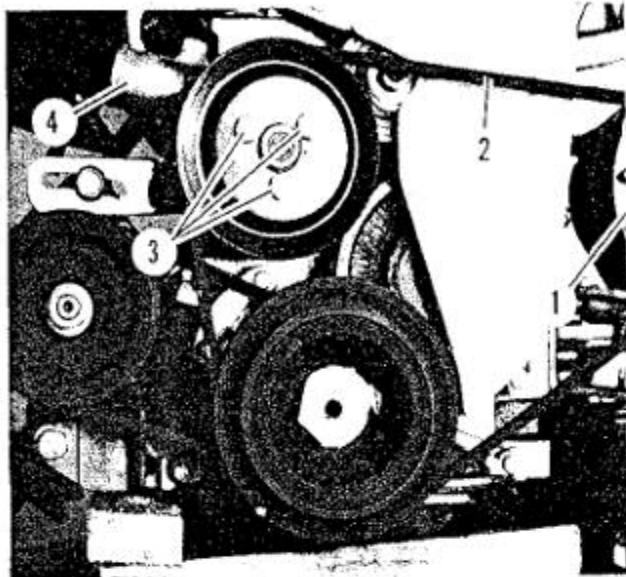
Loosen clamp and remove hose from water pump inlet (4). Remove four bolts to remove pump and gasket.

Remove two nuts and washers securing heater return tube to rear of water pump.

Install in reverse order. Torque water pump bolts to 14 ft. lbs. (2 kgm).

Adjust belt tension.

Refill and bleed cooling system (refer to Radiator section for bleeding procedure).

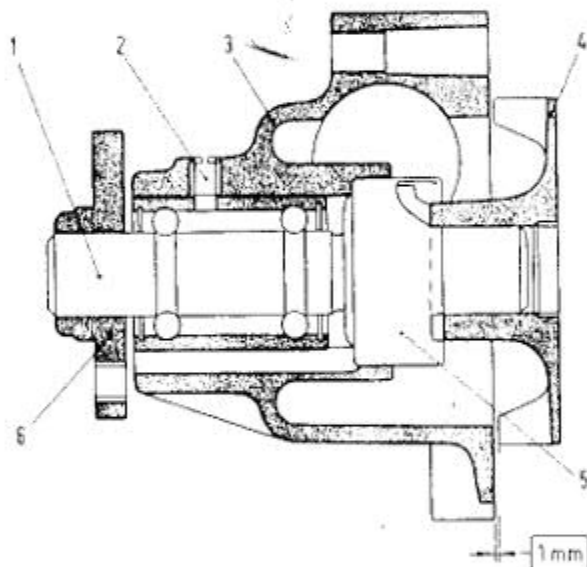


1. Alternator 2. Drive belt 3. Pulley 4. Pump inlet

**Longitudinal Section of Water Pump**

1. Drive shaft and bearing
2. Bearing lock screw on pump housing
3. Pump housing
4. Impeller
5. Packing
6. Pump drive shaft hub

1 mm = 0.04 in. — fit clearance between impeller and pump housing.

**CYLINDER HEAD WATER OUTLET HOUSING****REMOVAL AND INSTALLATION**

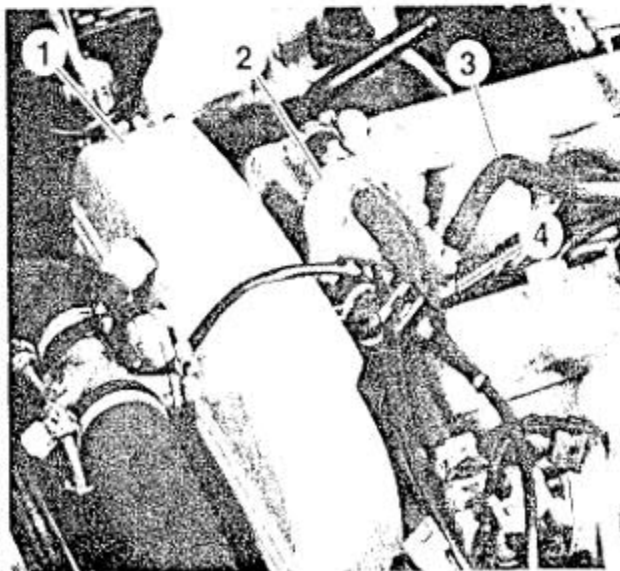
Drain cooling system through engine block plug until level is below top of radiator.

On fuel injected vehicles, remove auxiliary air regulator (2) from housing (4).

Remove clamp holding throttle plate heater hose (3) (if installed), and disconnect hose from housing.

Remove timing belt cover (1). Refer to REPLACING TIMING BELT.

1. Timing belt cover
2. Auxiliary air regulator
3. Heater hose
4. Water outlet housing



# Cooling System

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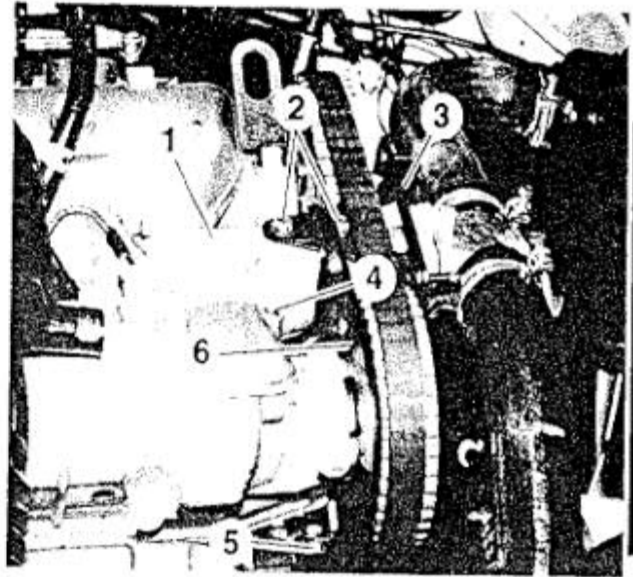
Remove bolt ( ) and washer holding timing belt rear shield ( ) on right side of engine.

Remove two bolts ( ) and washers holding cam timing bracket ( ) and rear shield ( ) to housing ( ).

Remove four bolts ( ) and washers holding housing ( ) to cylinder head. Remove housing and gasket.

Install in reverse order. Use new gaskets.

Refill and bleed cooling system. Refer to RADIATOR section.

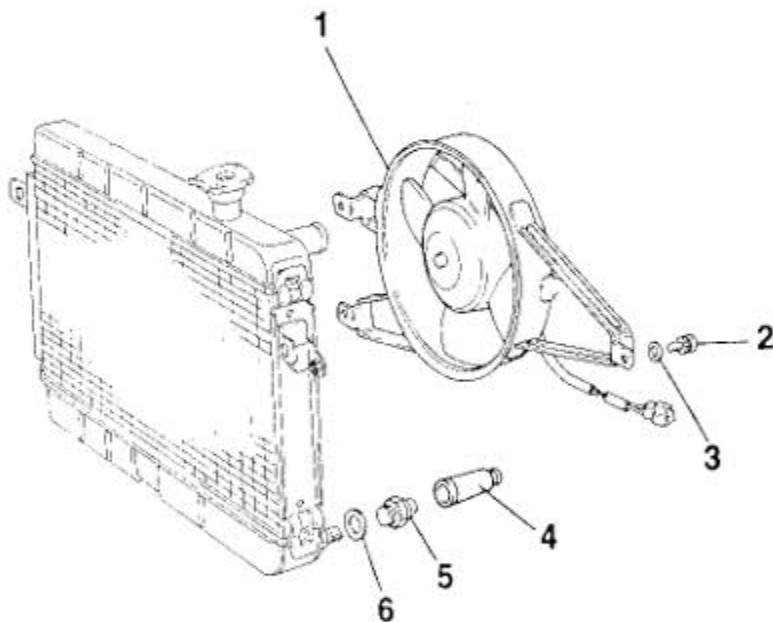
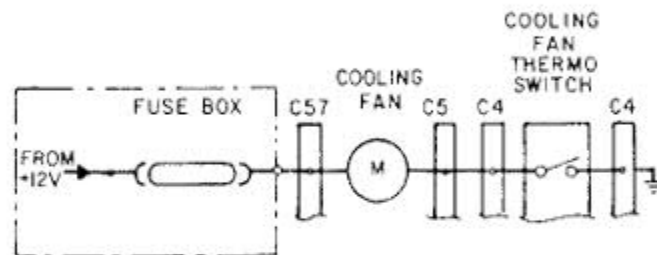


## ELECTRIC FAN OPERATION

When water temperature is 194°F (90°C) or above, the thermostatic switch closes and electric fan operates. The fan continues to run until the temperature drops below 185°F (85°C).

**CAUTION:** Cooling fan can operate with ignition switch in "OFF".

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1. Fan motor and support
2. Bolt and lockwasher
3. Washer
4. Boot
5. Thermostatic switch
6. Gasket

EXPLODED VIEW OF FAN

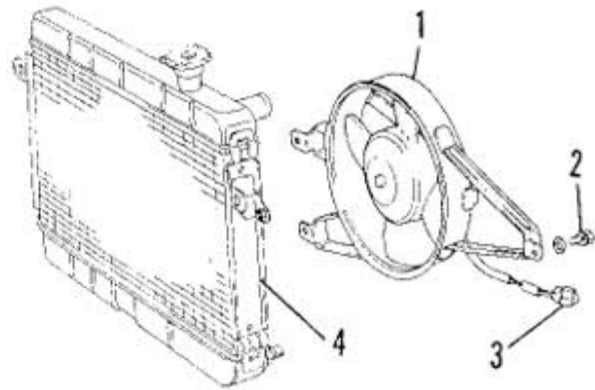
### FAN ASSEMBLY

#### REMOVAL AND INSTALLATION

Disconnect electrical connector (3) located near lower left side of radiator (4).

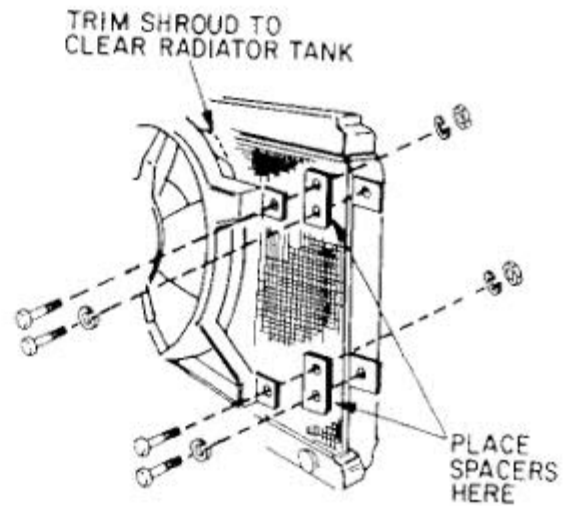
Remove three bolts (2) and washers securing fan assembly (1) to radiator (4).

1. Fan assembly 2. Bolt and lockwasher 3. Electrical connector  
4. Radiator



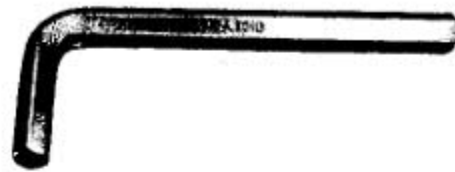
**NOTE:** On vehicles with turbocharger and A.C., fan assembly is attached to two spacers on right side of radiator.

When installing a new fan assembly on a vehicle with turbocharger and A.C., trim shroud to clear top of radiator as shown.



**NOTE:** Number given in parentheses is Kent-Moore catalogue number.

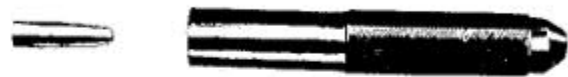
A.50113 (J28152) Wrench, oil sump drain plug



A.60395 (J28078) Remover and installer, valve guide



A.60313/1/2 (J28069) Installer, valve guide oil seal



A.60594 (J28229) Tool, holding tappets while removing plates and timing levers



A.60443 (J28080) Lever, pressing down tappets while timing valves



A.60446 (J28081) Tool, holding camshaft sprocket while tightening bolt



A.87001 (J28151) Remove tappet plates



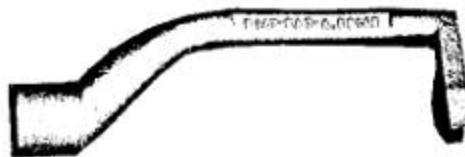
A.96218 (J28203) Gauge, valve stem height check after seat reconditioning



A.96229 (J28256) Depth gauge, combustion chamber

10-1

A.50149 (J28036) Wrench, cylinder head bolt (17mm)



A.95874 (J29821) Fuel pressure gauge (fuel injected engines)



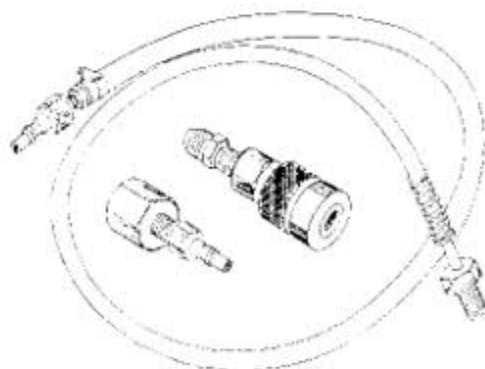
A.33076 (J33076) Turbocharger pressure switches test pump



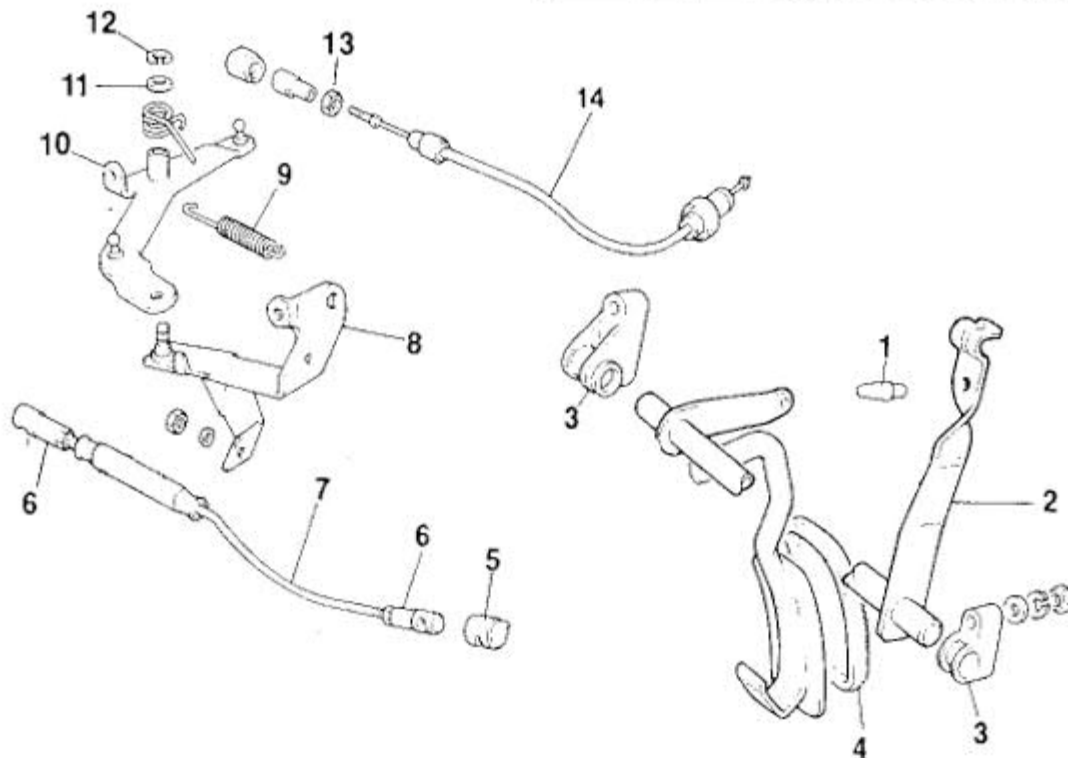
A.60645 (J28291) Intake cam sprocket holder (1978 and 1980 carbureted engines)



A.4467 (J29820) Exhaust gas analyzer adapter (fuel injected engines)

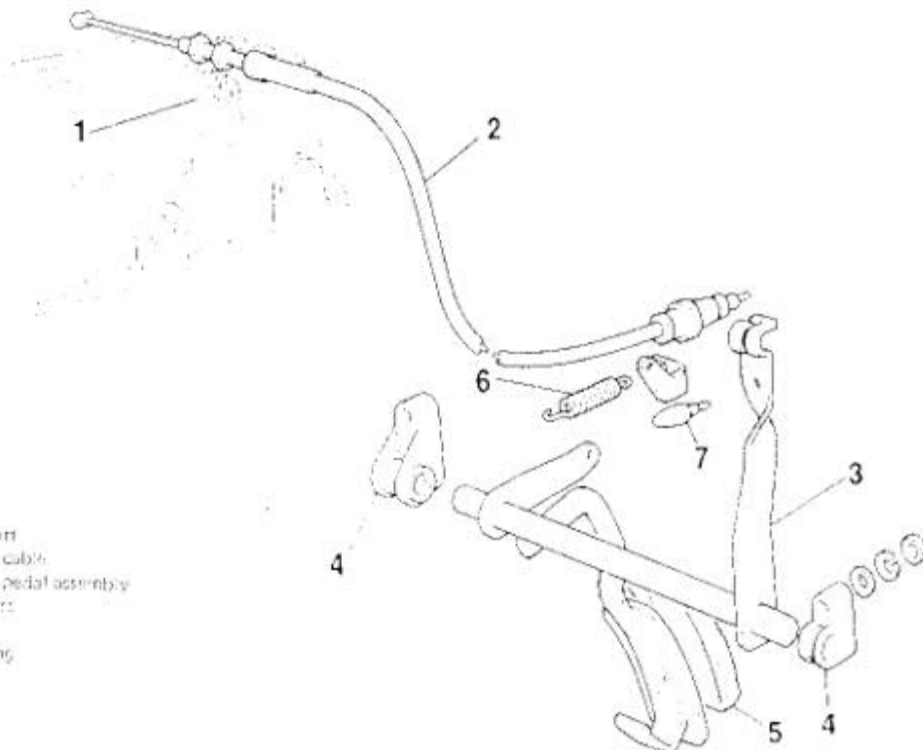






- |                               |                      |                       |
|-------------------------------|----------------------|-----------------------|
| 1. Stop                       | 6. Cable end         | 11. Spring            |
| 2. Accelerator pedal assembly | 7. Throttle rod      | 12. Snap ring         |
| 3. Pedal support              | 8. Ballcrank support | 13. Adjustment nut    |
| 4. Pedal pad                  | 9. Return spring     | 14. Accelerator cable |
| 5. Clip                       | 10. Ballcrank        |                       |

## CARBURETOR ACCELERATOR LINKAGE



- |                               |
|-------------------------------|
| 1. Cable support              |
| 2. Accelerator cable          |
| 3. Accelerator pedal assembly |
| 4. Pedal support              |
| 5. Pedal pad                  |
| 6. Return spring              |
| 7. Stop                       |

## FUEL INJECTION ACCELERATOR LINKAGE

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**ACCELERATOR AND KICK-DOWN CABLE ADJUSTMENT**

Make sure engine idle speed is set correctly.

**Accelerator Cable**

Pull back slightly on cable housing (5) until just prior to moving throttle lever (3).

Check for approximately 1 mm of clearance between adjustment nuts (6) and support (4).

If necessary, adjust nuts (6) to obtain clearance.

**Kick-Down Cable**

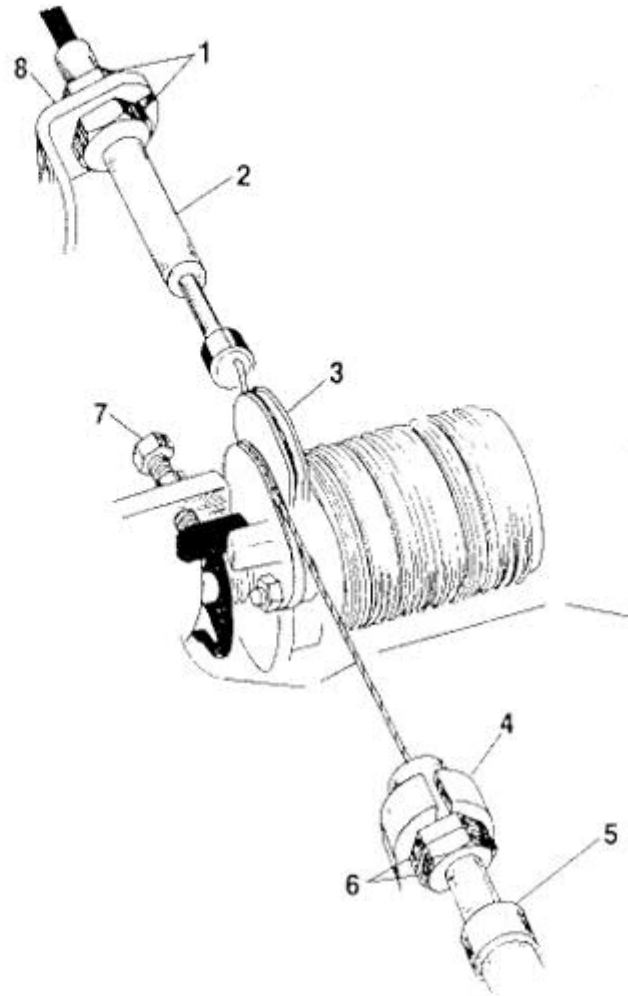
Depress accelerator until throttle lever (3) contacts maximum opening stop (7).

Check that kick-down cable (2) starts to pull at this point.

Fully depress accelerator. Check that kick-down cable (2) extends 0.35 to 0.43 in. (9 to 11 mm).

If necessary, adjust nuts (1) on housing (8) to obtain correct extension of cable.

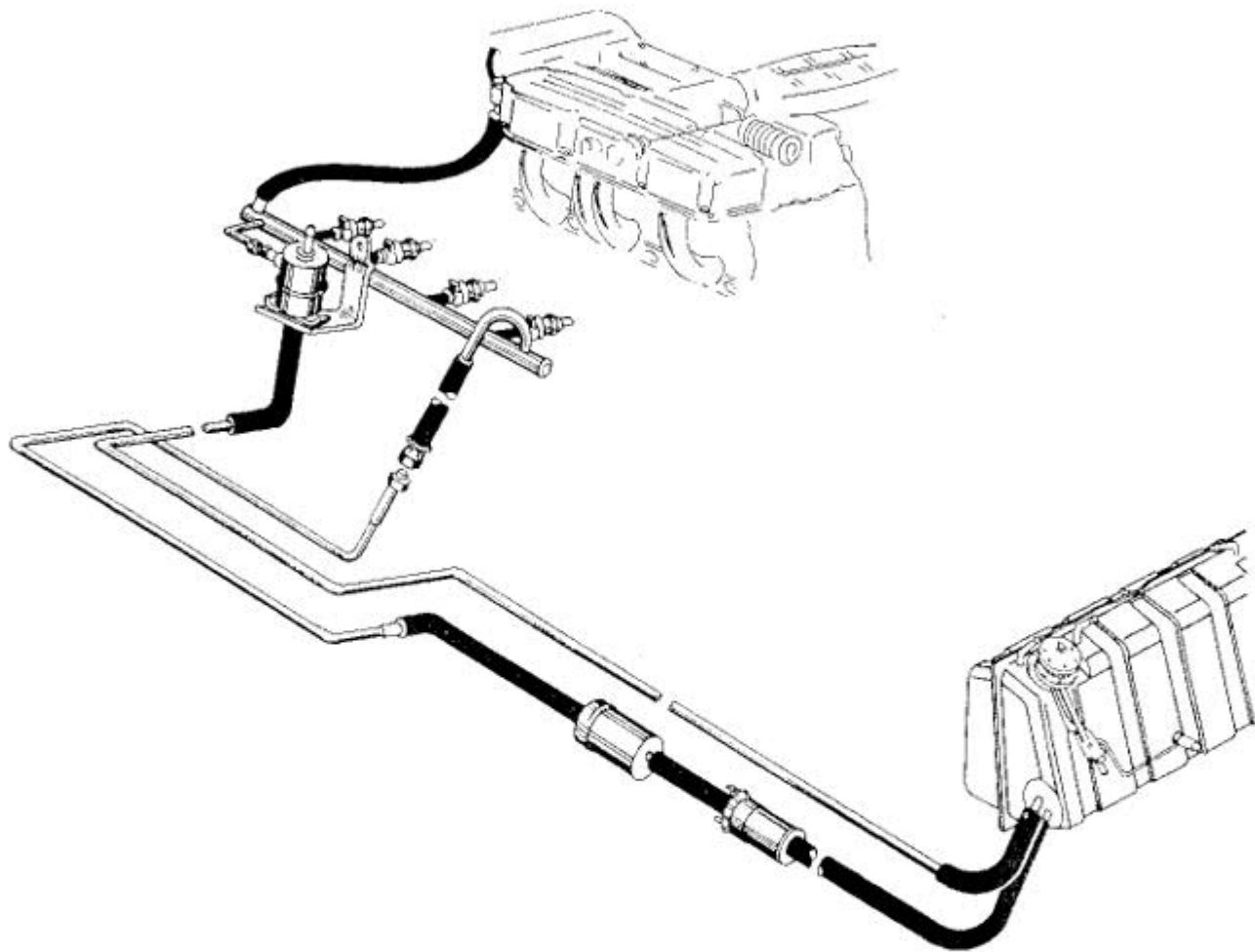
1. Adjustment nuts 2. Kick-down cable 3. Throttle lever  
4. Support 5. Accelerator cable 6. Adjustment nuts 7. Maximum opening stop 8. Housing



## FUEL SYSTEM

The fuel system consists of:

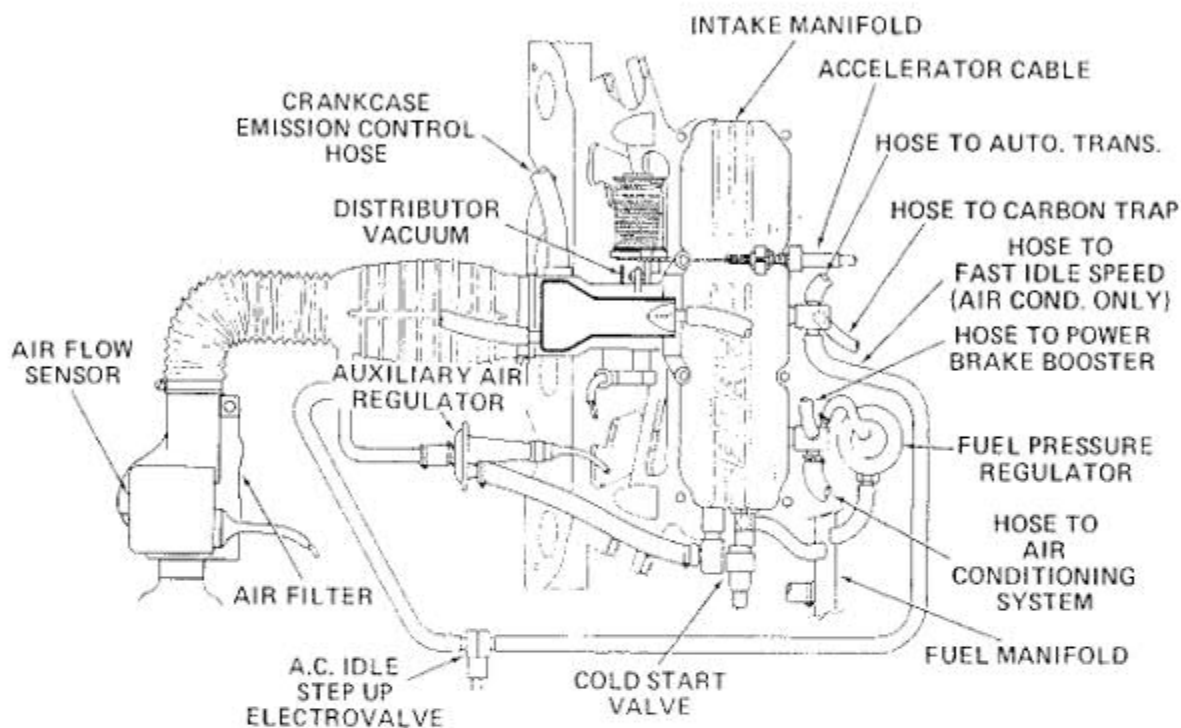
- Fuel tank
- Fuel pump
- Fuel filter
- Fuel manifold
- Pressure regulator
- Injectors
- Cold start valve



## 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.

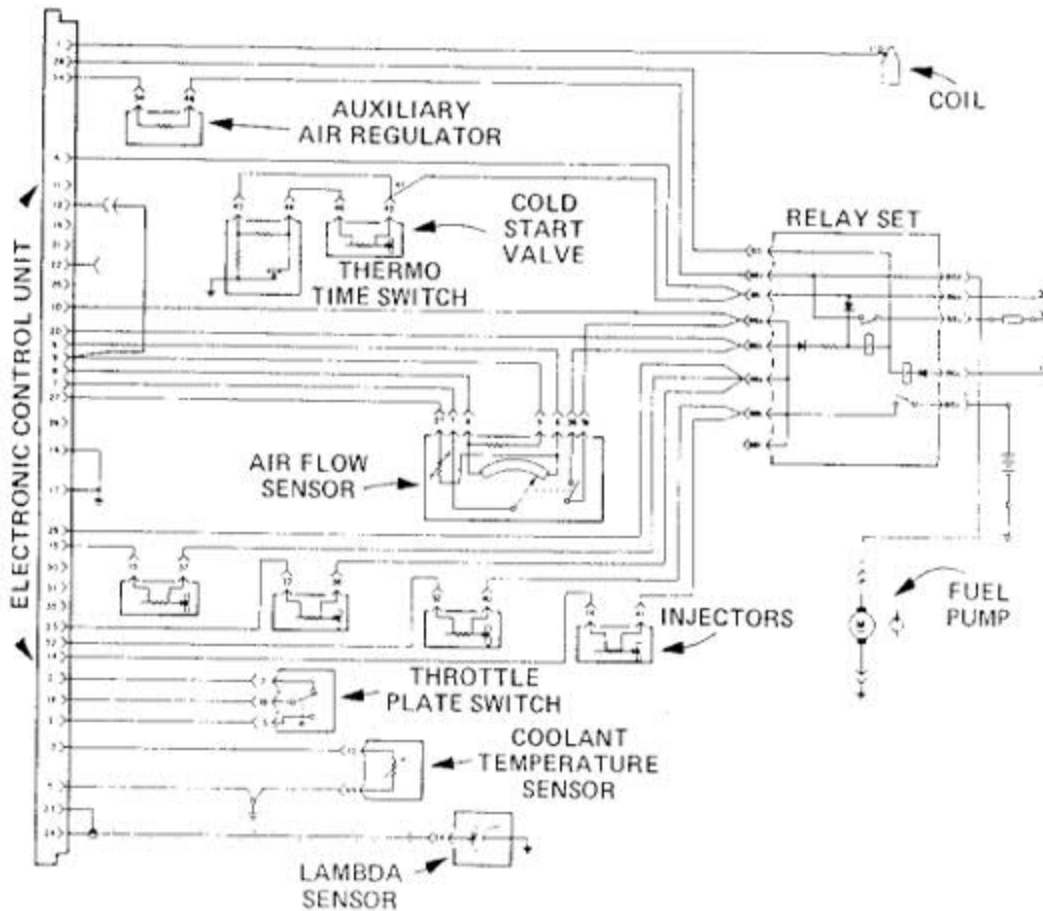
### ELECTRICAL SYSTEM

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



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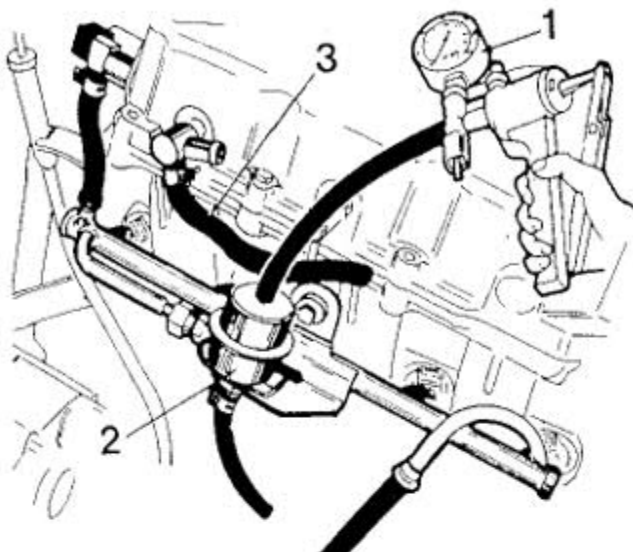
**RELIEVING FUEL PRESSURE**

**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 to cold start valve. Pull hose off valve.

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

Connect "Y" fitting on gauge assembly to fuel hose. Secure hose with clamp.

Connect hose on gauge tool A.958754 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).

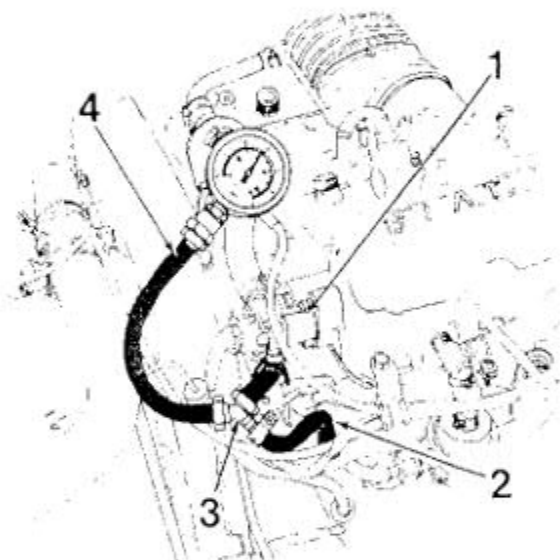
Start engine and operate at idle.

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, Fuel hose 3, "Y" fitting 4, Gauge assembly



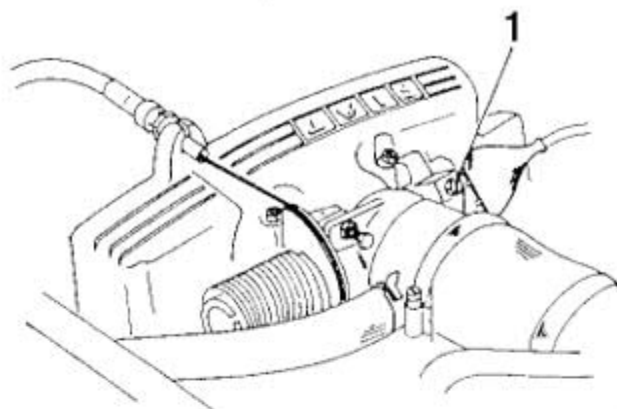
### IDLE SPEED ADJUSTMENT

**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

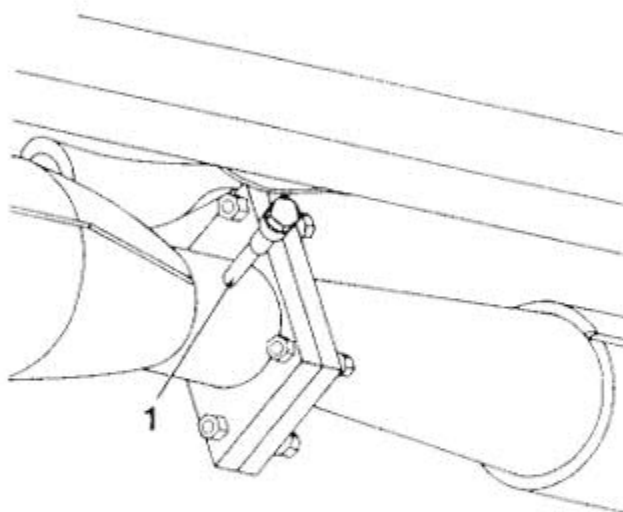
To check mixture, first connect test equipment as follows.

Remove plug (1) from CO pickup fitting. Install adapter probe (tool 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

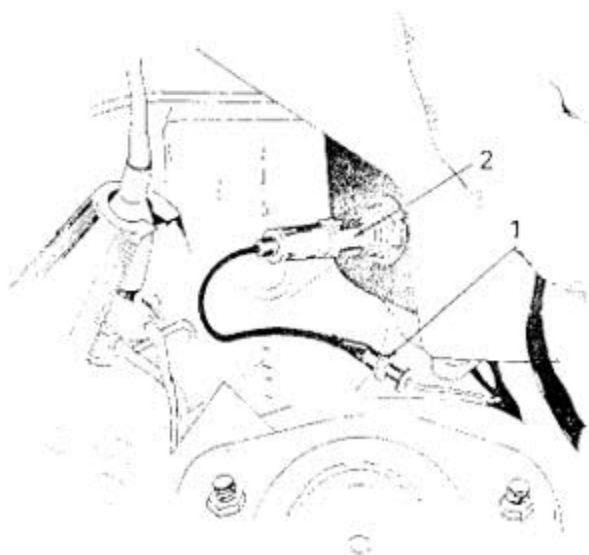


Zero analyzer according to manufacturer's instructions.

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

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

1. Lambda sensor connector 2. Lambda sensor



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.

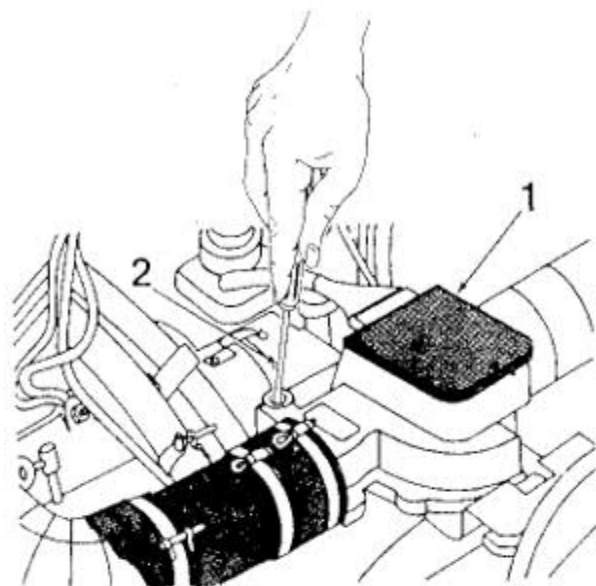
If mixture screw is concealed by an aluminum plug, refer to MIXTURE ADJUSTMENT SCREW PLUG REMOVAL AND INSTALLATION before performing this procedure.

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 and probe. Install plug in exhaust pickup.



1. Air flow sensor 2. Screwdriver

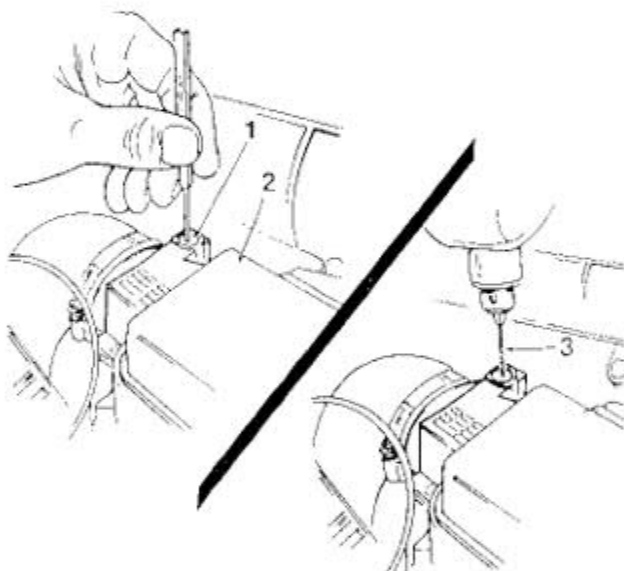
### MIXTURE ADJUSTMENT SCREW PLUG REMOVAL

**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.

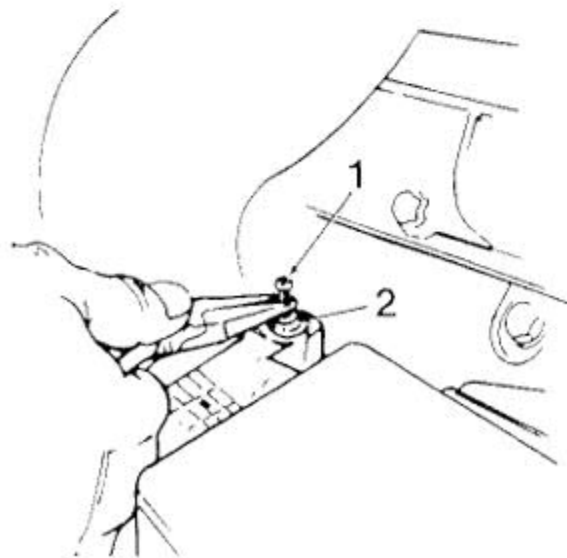


1. Aluminum plug 2. Air flow sensor 3. 3/32 in. (2.5 mm) drill

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. 1/8 in. (3 mm) screw 2. Aluminum plug



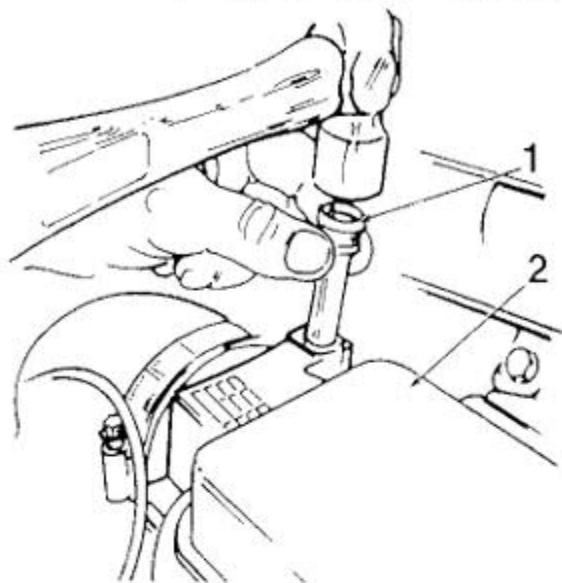


## INSTALLATION

**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

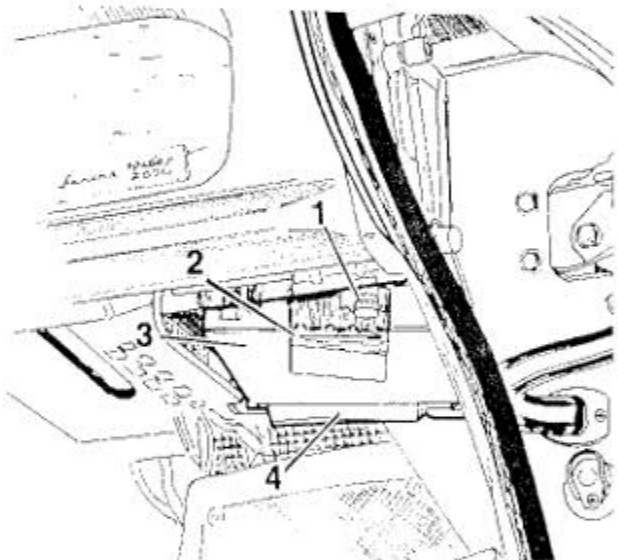
On vehicles with A.C., remove front nut holding evaporator under dashboard. Swing evaporator forward and down to gain access to control unit.

Loosen and remove plastic nut (1) holding bracket (1) in car. Lower control unit (3) and pull it back free of front bracket (4).

Release spring slip holding connector to control unit. Remove control unit.

Install in reverse order.

1. Plastic nut 2. Mounting bracket 3. Electronic control unit  
4. Front bracket



## LAMBDA SENSOR

### REMOVAL AND INSTALLATION

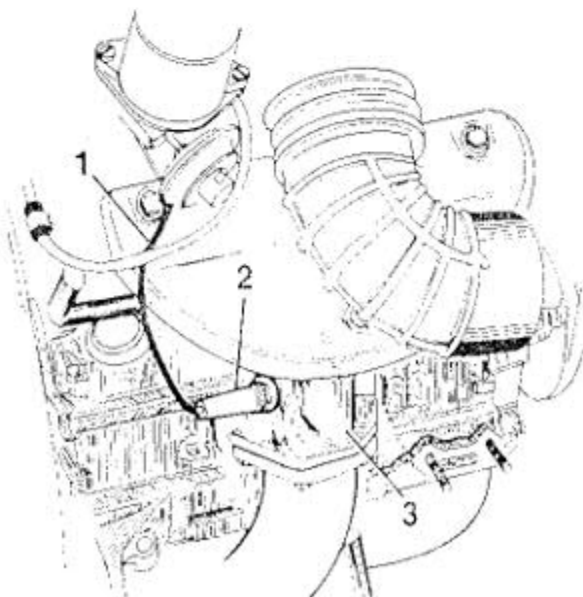
**NOTE:** The Lambda sensor must be replaced every 30,000 miles.

Allow exhaust system to cool.

On vehicles without turbo, disconnect cable (1) for sensor (2) from connector.

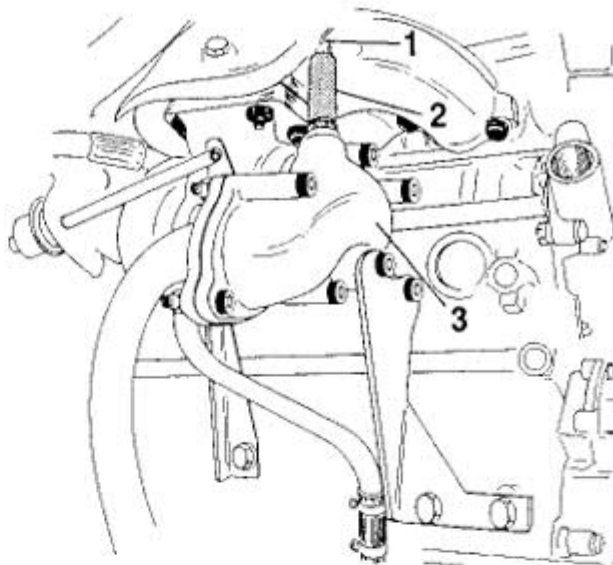
Remove sensor from exhaust manifold (3).

1. Cable 2. Lambda sensor 3. Exhaust manifold



On vehicles with turbo, disconnect cable (1) from sensor (2).  
Remove sensor from exhaust outlet elbow (3).

1. Cable 2. Lambda sensor 3. Exhaust outlet elbow

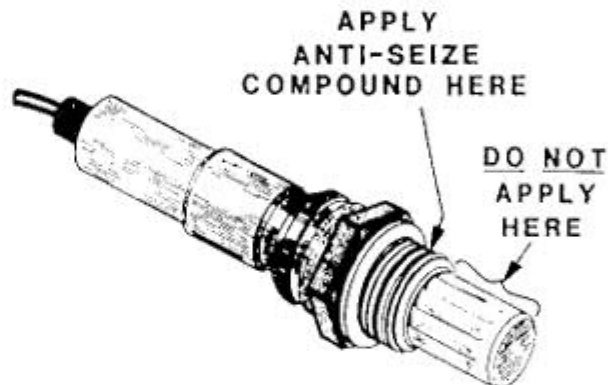


Coat threads of new Lambda sensor with anti-seize, anti-rust grease.

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

Thread sensor into exhaust pipe (non-turbo) or exhaust outlet elbow (turbo). Torque sensor to 30 to 36 ft lbs (4.2 to 5.0 mkg).

Connect cable to sensor.



#### INDICATOR RESET

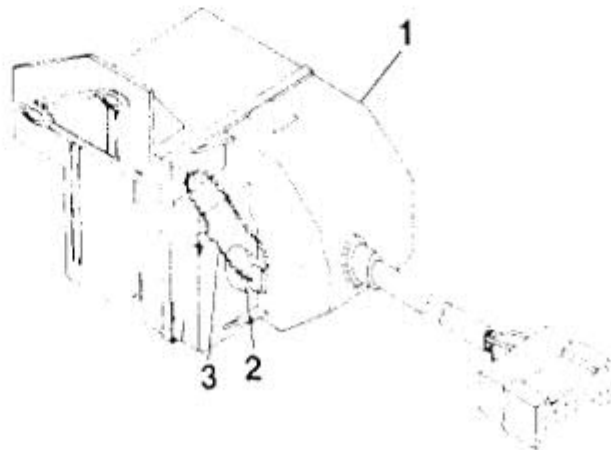
**NOTE:** Lambda sensor indicator comes on at 30,000 miles to indicate replacement of sensor. To turn indicator off, the switch unit must be reset.

Switch unit is located under dashboard to the right of steering column.

Remove wire (3) securing cap screw (2). Remove cap screw.

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

Install cap screw (2). Secure screw with new wire (3).



1. Switch unit 2. Cap screw 3. Wire

### THROTTLE PLATE SWITCH REMOVAL AND INSTALLATION

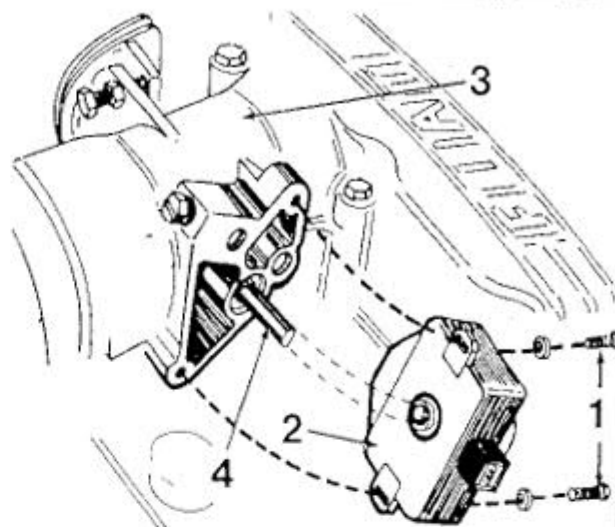
Disconnect throttle plate switch.

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. Make sure switch is properly aligned with throttle shaft (4).

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

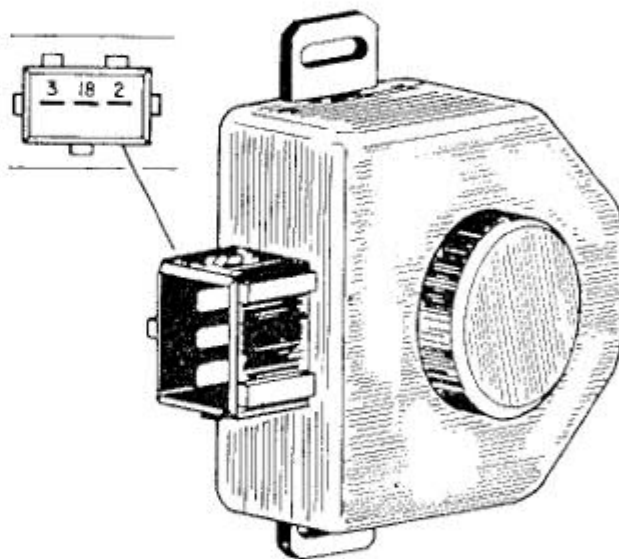


### ADJUSTMENT

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.



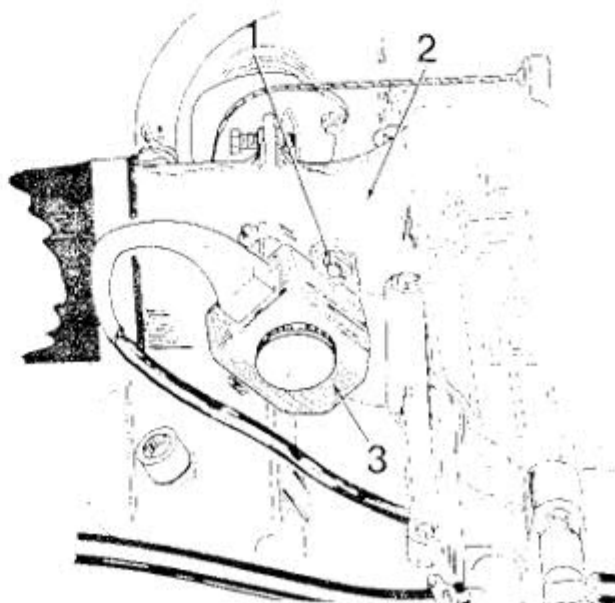
Loosen two screws (1) holding throttle plate switch (3) to throttle housing (2).

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.

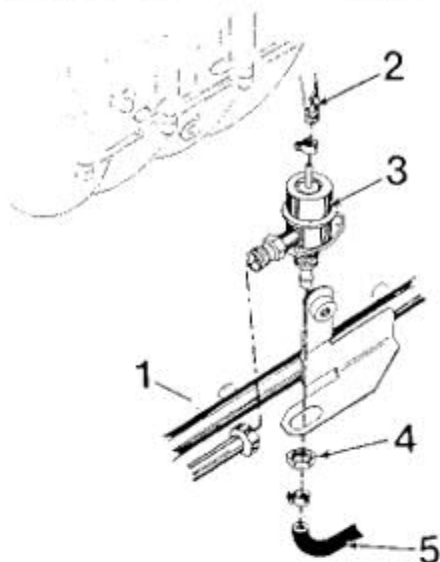
Disconnect vacuum hose (2) and fuel return hose (5) from pressure regulator (3).

Disconnect fuel manifold (1) connection from pressure regulator (3).

Remove nut (4) 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. Nut  
5. 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 (7) from cold start valve (2).

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

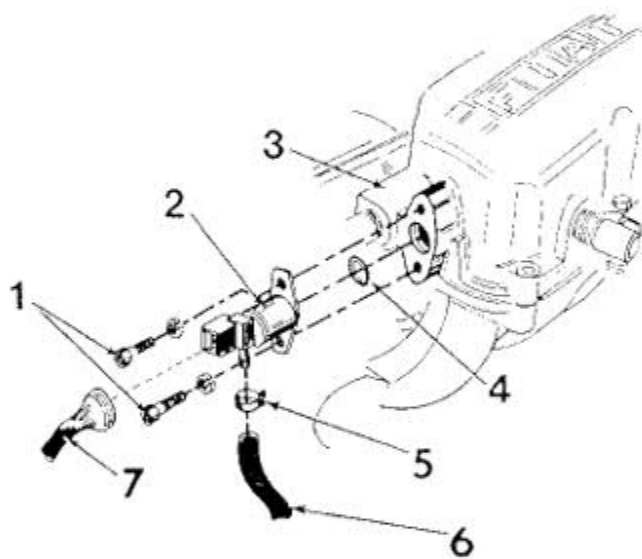
**CAUTION:** Use care in pulling fuel hose off valve. Valve body is plastic.

Using 5 mm Allen wrench, remove two screws (1) and washers holding valve in intake manifold (3). Remove valve and "O" ring (4).

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

Check fuel connections for leaks.

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

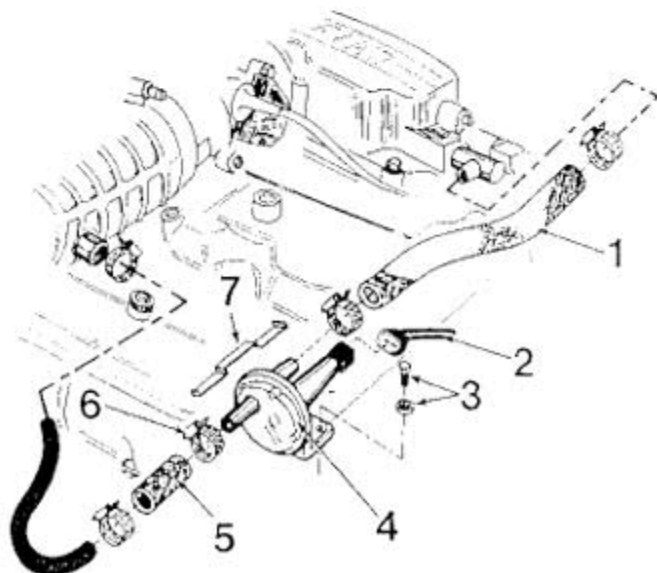
**AUXILIARY AIR REGULATOR****REMOVAL AND INSTALLATION**

Disconnect air hoses (1 and 5) from regulator (4). Disconnect electrical connector (2).

Remove two 10 mm bolts (3) and washers holding regulator to cylinder head.

Install in reverse order. Make sure air hose connections are tight. Make sure clip (7) is installed under clamps (6) on regulator.

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



### AIR FLOW SENSOR

#### REMOVAL AND INSTALLATION

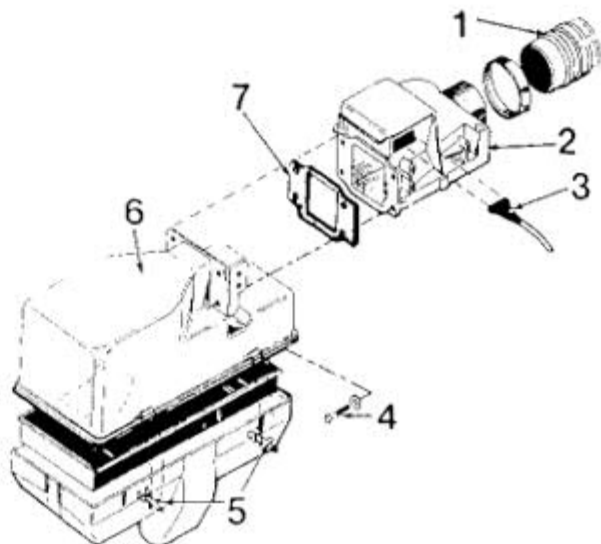
Disconnect air hose (1) from air flow sensor (2). Disconnect electrical connector (3).

Remove air cleaner cover (6) by releasing four clips (5).

Remove four bolts (4) and washers holding air flow sensor (2) to air cleaner cover (6). Remove air flow sensor (2) and gasket (7).

Install in reverse order, making sure air hose connection is tight.

1. Air hose 2. Air flow sensor 3. Electrical connector 4. Bolt  
5. Clip 6. Air cleaner cover 7. Gasket



### 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:

- electrical connectors from injectors,
- fuel supply hose (3) from pipe. Use a 12 mm wrench to hold fuel line and a 17 mm wrench to turn fuel hose connection.
- fuel return hose (4) from pressure regulator (5),
- vacuum hose (1) from regulator (5),
- fuel hose (6) from cold start valve (7).

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

1. Vacuum hose 2. Fuel manifold 3. Fuel supply hose 4. Fuel return hose 5. Pressure regulator 6. Fuel hose 7. Cold start valve

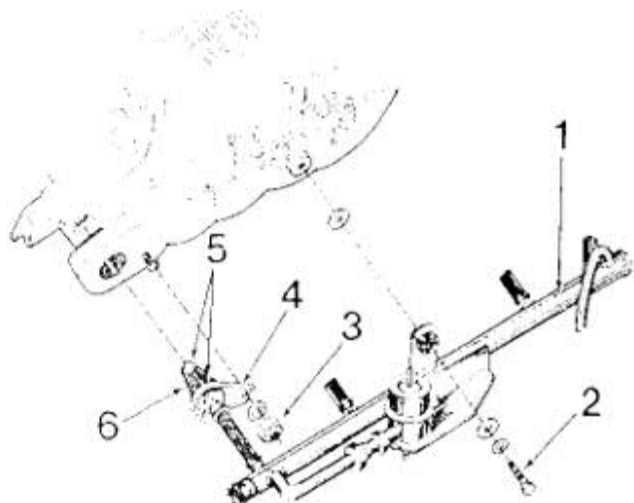
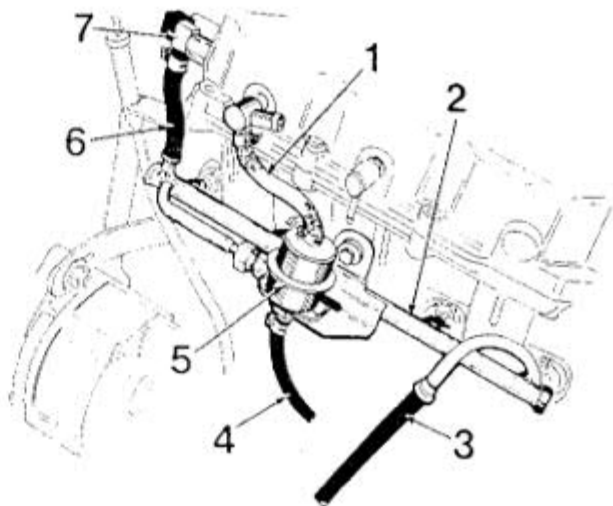
Remove 10 mm bolt (2) holding fuel manifold (1) to intake manifold.

Remove four 10 mm nuts (3) and washers holding injector retainers (4) to intake manifold.

Remove fuel manifold (1) complete with injectors (6) and regulator. Be careful of rubber bushings (5) in intake manifold. They may fall out.

Remove four small and four large rubber bushings (5) and retainers (4) from injectors. Inspect bushings for cracks and damage.

1. Fuel manifold 2. Bolt 3. Nut 4. Retainer 5. Bushing  
6. Fuel injector



**NOTE:** When replacing a defective injector, replace injector and hose.

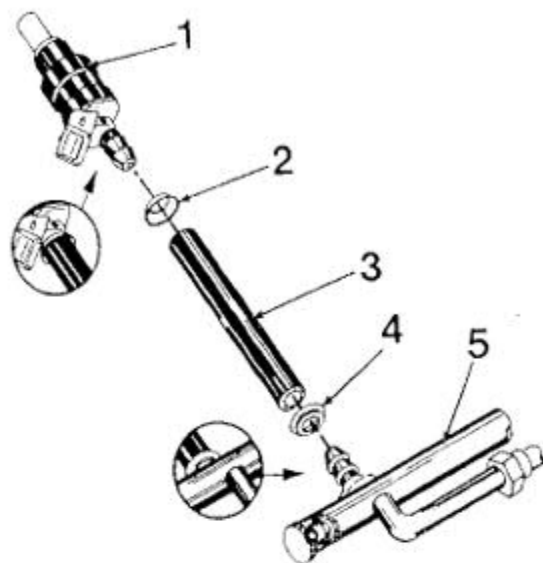
To replace injector, pull hose (3) off fuel manifold (5). Use a twisting, rocking motion while pulling on hose.

To replace a damaged hose from a good injector, cut hose at both ends and remove it.

When installing the new hose or injector, place collars (2 and 4) over shoulder of injector (1) and manifold (5).

Push hose (3) on injector (1) and manifold (5) until hose end is inside collars (2 and 4) and collars are tight against shoulder.

1. Fuel injector 2. Collar 3. Hose 4. Collar 5. Fuel manifold



## INSTALLATION

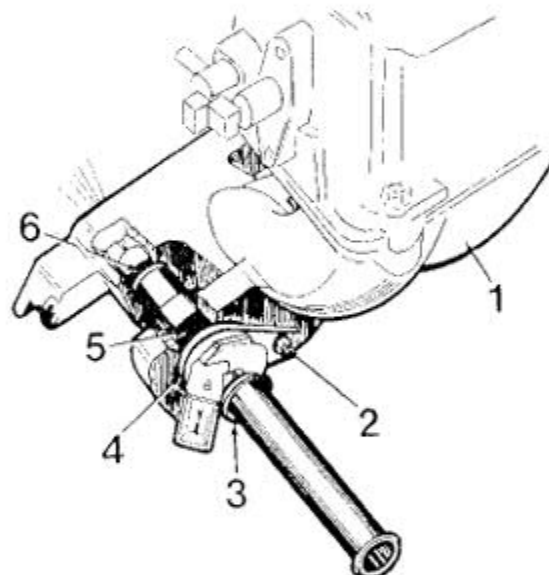
Place retainers (4) on injectors (3). Slide large bushing (5) on injector until seated in groove in injectors. Place small bushings (6) on tip of injectors.

Reinstall injectors and fuel manifold in reverse order, making sure:

- all components are clean
- rubber bushings are not damaged
- rubber bushings are installed in intake manifold properly
- injectors are installed in small bushings airtight
- retainers holding nuts are tight

Check all fuel connections for leaks.

1. Intake manifold 2. Nut 3. Fuel injector 4. Retainer 5. Large bushing 6. Small bushing



## THROTTLE PLATE

### REMOVAL AND INSTALLATION

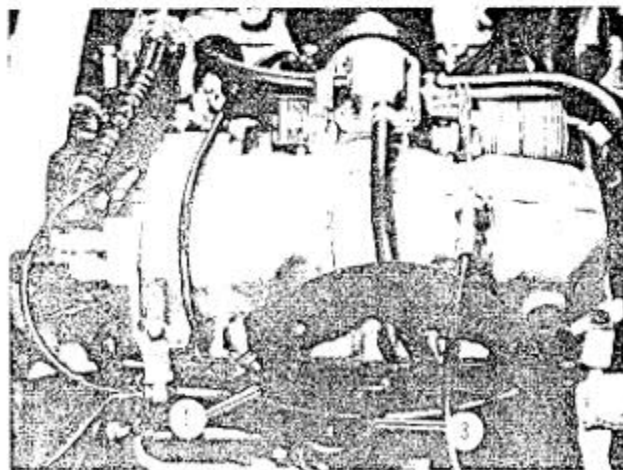
**NOTE:** The upper air intake should be removed for ease of access to throttle plate.

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

Relieve fuel pressure as directed under **RELIEVING FUEL PRESSURE**.

Disconnect from intake manifold ( ) vacuum hoses for:

- automatic transmission
- fuel pressure regulator (1)
- brake booster (2)
- charcoal trap (3)
- boost switches (turbocharger only)



1. Fuel pressure regulator hose 2. Brake booster hose  
3. Charcoal trap hose

Disconnect electrical connectors from cold start valve (4) and throttle plate switch (3).

Disconnect auxiliary air regulator air hose (5) from intake manifold (1). Loosen clamp and disconnect air hose (6) from throttle housing.

On vehicles without turbocharger, disconnect crankcase emission hose (7) from throttle housing.

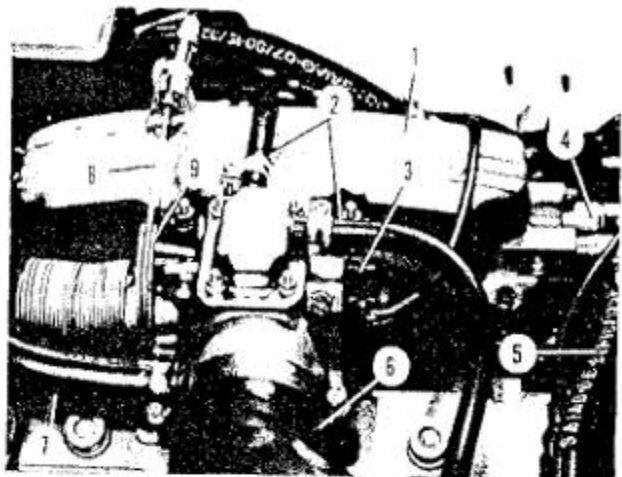
Disconnect distributor vacuum hose from throttle housing.

Disconnect accelerator cable (8) from throttle lever (9). Remove cable from support on intake manifold.

Disconnect fuel hose from cold start valve (4).

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

Disconnect two water hoses (2) from throttle plate heater.

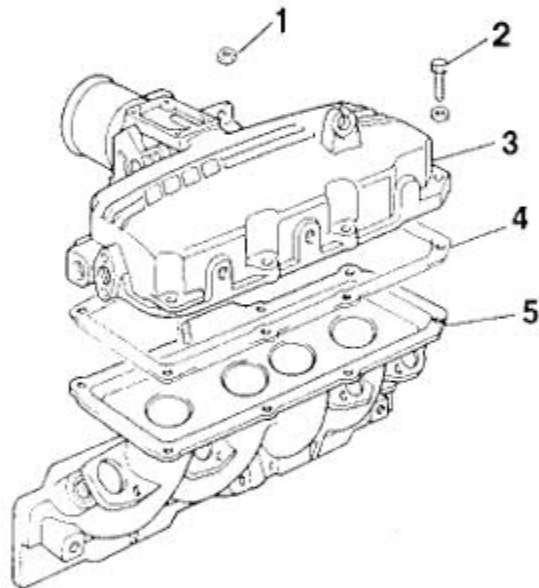


1. Intake manifold 2. Water hose 3. Throttle plate switch  
4. Cold start valve 5. Auxiliary air regulator hose 6. Main air hose  
7. Crankcase emission hose 8. Accelerator cable 9. Throttle lever

Remove the six bolts (2) and two nuts (1) holding upper section (3) to lower section (5) of intake manifold.

Carefully lift upper section off.

1. Nut 2. Bolt 3. Upper section 4. Gasket 5. Lower section



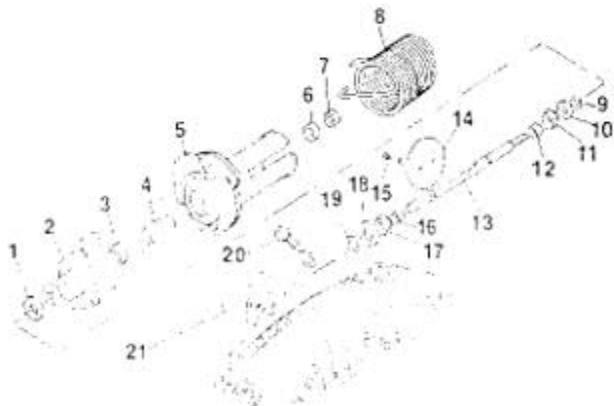
Remove two screws and washers and remove throttle plate switch.

Working through throttle housing, remove two screws (15) and washers holding throttle plate (14) to throttle shaft (13). Remove throttle plate.

If necessary to remove throttle shaft, remove snap ring (19). Pull shaft out of housing.

Assemble and install in reverse order.

Check all air and fuel connections for leaks.



1. Washer 2. Plate 3. Spring 4. Spacer 5. Throttle lever  
6. Washer 7. Nut 8. Spring 9. Snap ring 10. Washer 11. Seal  
12. Bushing 13. Throttle shaft 14. Throttle plate 15. Screw  
16. Bushing 17. Seal 18. Washer 19. Snap ring 20. Idle speed adjustment screw 21. Intake manifold

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.

On cars with automatic transmission, apply hand brake and place gearshift lever in "D".

Turn idle speed adjustment screw (2) in all the way.

Adjust stop screw (1) to obtain:

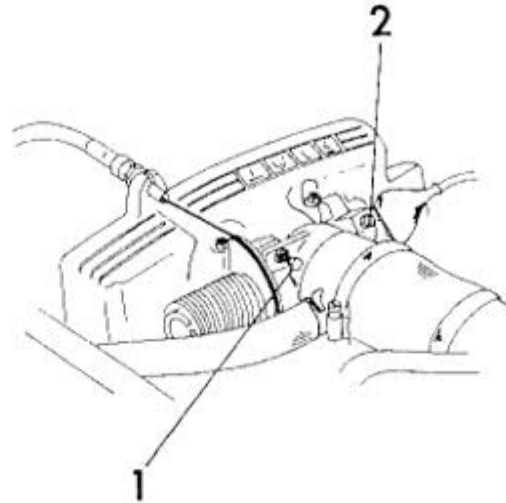
- Manual Transmission – 700 to 800 rpm
- Automatic Transmission – 600 to 700 rpm

Hold stop screw (1) and tighten locknut.

Adjust idle speed adjustment screw (2) to obtain:

- Manual Transmission – 800 to 900 rpm
- Automatic Transmission – 700 to 800 rpm

Check that throttle plate switch is adjusted properly as directed under THROTTLE PLATE SWITCH ADJUSTMENT.



1. Throttle stop screw 2. Idle speed adjustment screw



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## CATALYTIC CONVERTER REMOVAL AND INSTALLATION

**WARNING:** Make sure catalytic converter (4) has cooled down before working on it.

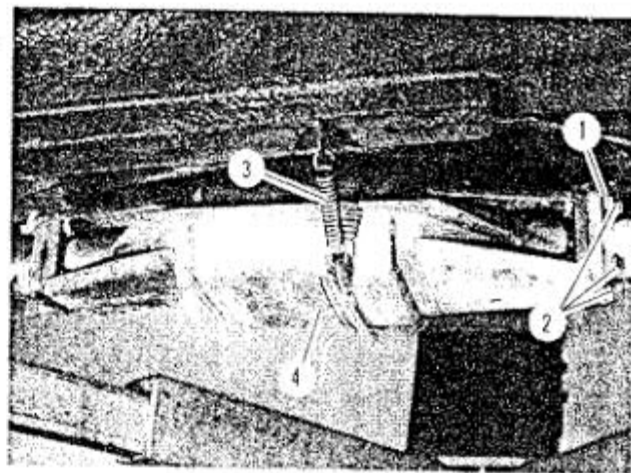
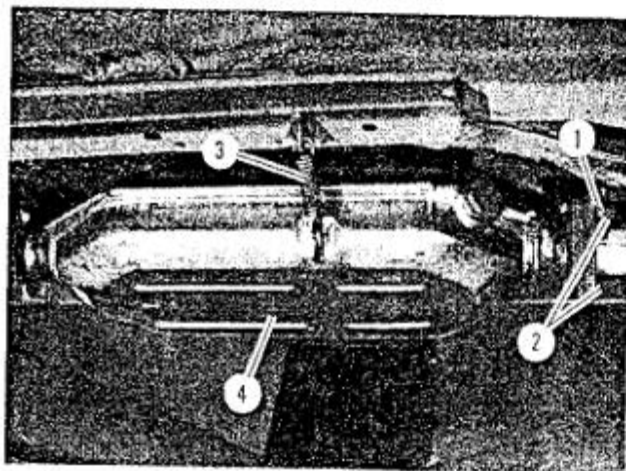
On 1975 to 1978 vehicles, remove thermocouple from catalytic converter.

Bend locking rings (1) clear of nuts (2) securing converter to exhaust pipes.

Disconnect spring hangers (3) from converter. Remove converter.

Installation is reverse of removal.

1. Locking ring 2. Nut 3. Spring hanger 4. Catalytic converter



## AIR PUMP (1975 to 1978)

### REMOVAL AND INSTALLATION

Remove timing belt cover (1). Remove pump drive belt.

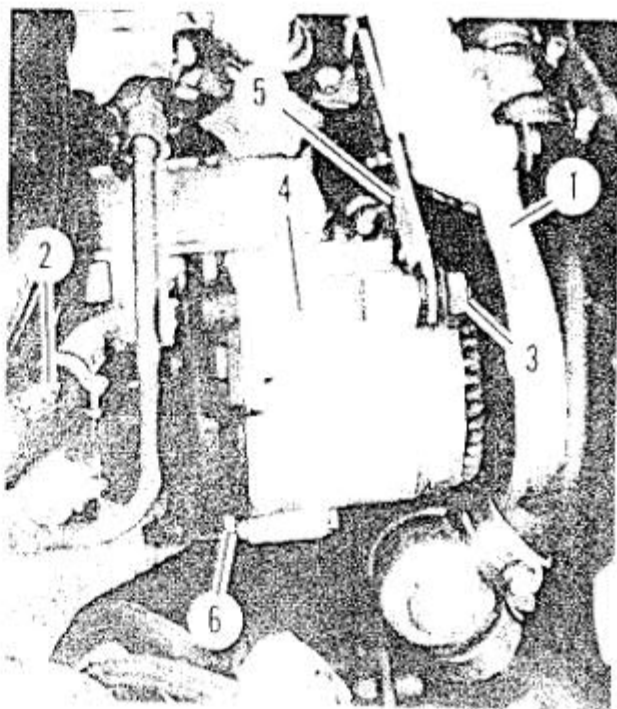
Loosen clamp and disconnect hose (2) from air pump (4).

Remove tensioner nut (3) and washers holding pump to bracket (5). Remove bolt (6), nut, washer and shield holding pump to cylinder head. Remove pump.

When installing pump, make sure to install shield on back side of mounting lugs.

Adjust belt tension.

1. Timing belt cover 2. Air outlet hose 3. Tensioner nut  
4. Air pump 5. Bracket 6. Mounting bolt



**AIR PUMP (1979 and 1980 carbureted)****REMOVAL AND INSTALLATION**

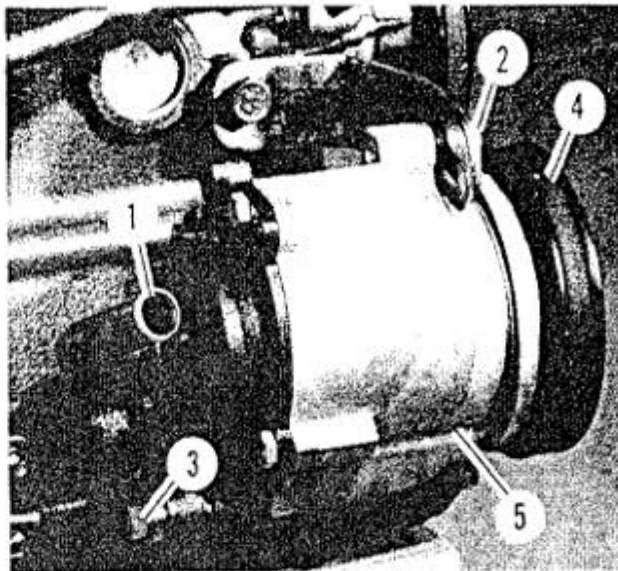
Loosen clamp and remove air hose from pump outlet (1).

Loosen tensioner bolt (2) and mounting bolt (3) to remove belt (4). Then remove bolts to remove pump (5).

Install in reverse order.

Adjust belt tension.

1. Air pump outlet 2. Tensioner bolt 3. Mounting bolt  
4. Drive belt 5. Air pump

**AIR MANIFOLD (1975 to 1978)****REMOVAL AND INSTALLATION**

Remove air cleaner.

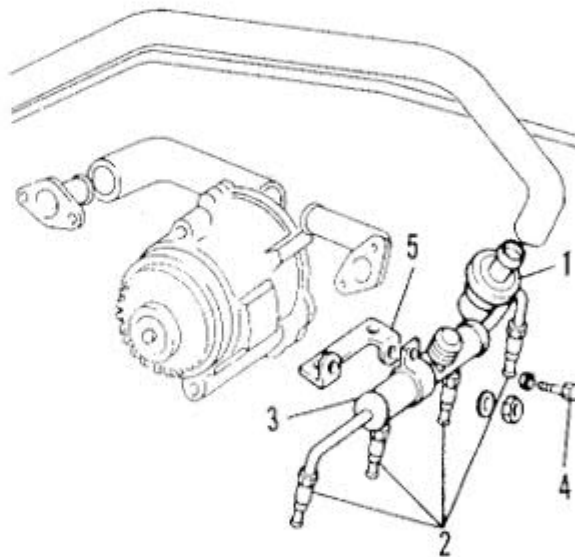
Disconnect hose to check valve (1).

Remove bolt (4), washer, and nut holding air manifold (3) to bracket (5).

Using tool A.5016, disconnect tubes (2) from cylinder head. Remove air manifold.

Install in reverse order.

1. Check valve 2. Tube 3. Air manifold 4. Bolt 5. Bracket

**AIR PUMP CHECK VALVE****(1979 and 1980 carbureted)****REMOVAL AND INSTALLATION**

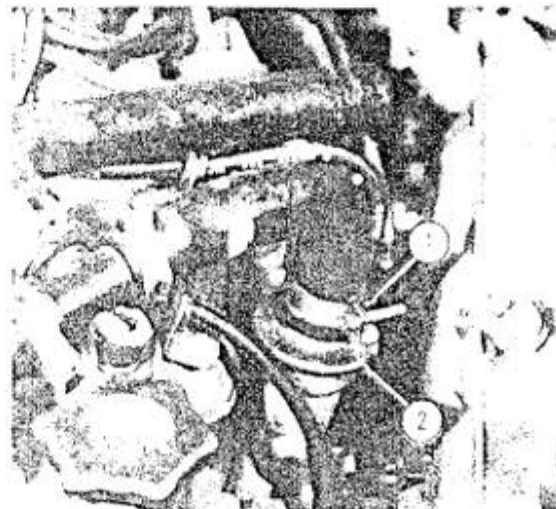
Remove air cleaner.

Loosen clamp (1) and remove hose from check valve.

Using wrench, remove check valve from cylinder head.

Install in reverse order.

1. Clamp 2. Check valve



## EGR VALVE (1975 to 1978)

### REMOVAL AND INSTALLATION

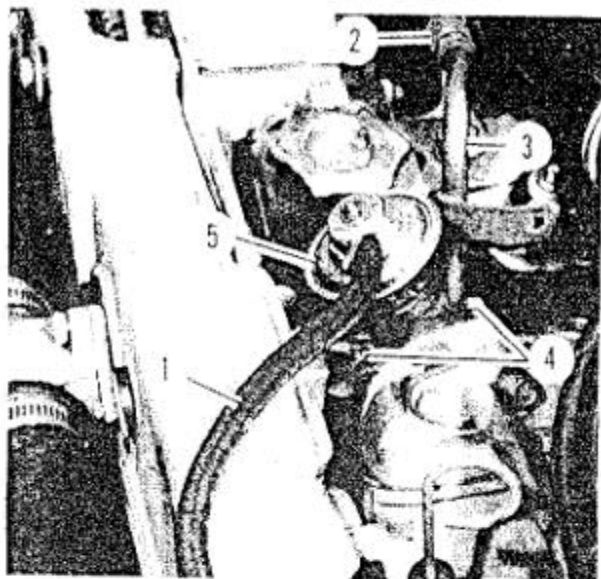
Loosen clamp and disconnect vacuum line (1).

Disconnect line fitting (2) from line attached to valve. Remove bolt, nut and washer holding line (3) to bracket on cam cover.

Remove two bolts (4) and washers holding EGR valve (5) to cam cover. Remove valve.

Install in reverse order.

1. Vacuum line 2. Line fitting 3. Valve line 4. Bolt 5. EGR valve



## EGR VALVE (1979 and 1980 carbureted)

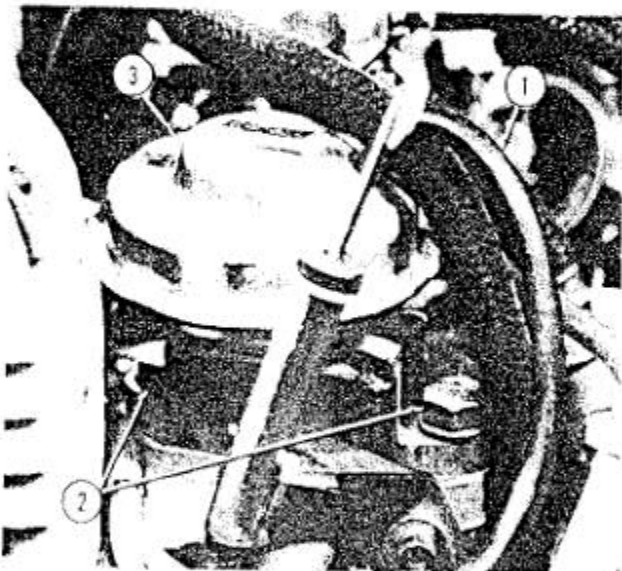
### REMOVAL AND INSTALLATION

Disconnect vacuum hose (1) from EGR valve (3).

Remove two bolts (2) and washers, then remove EGR valve and gasket from intake manifold.

Install in reverse order. Use a new gasket.

1. Vacuum hose 2. Bolts 3. EGR valve



## REED VALVES (1979)

### REMOVAL AND INSTALLATION

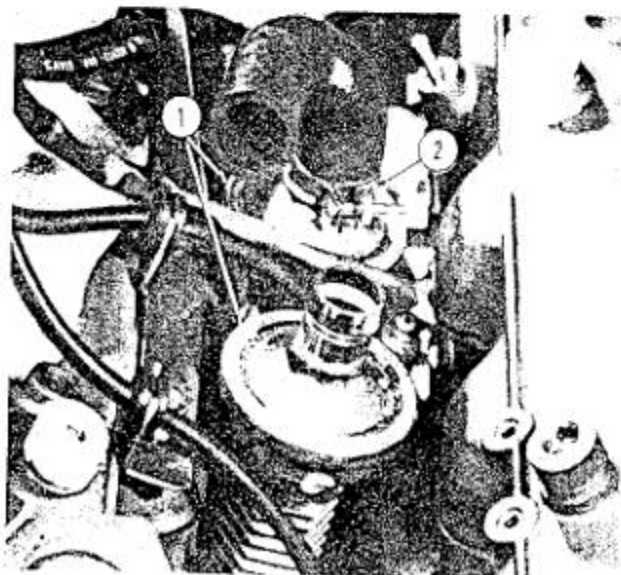
Remove air cleaner.

Loosen clamp (2) and remove hose from reed valve (1).

Using wrench, remove reed valves from cylinder head.

Install in reverse order.

1. Reed valves 2. Clamp



**REED VALVE FILTER (1979)****REMOVAL AND INSTALLATION**

Loosen clamp (1) and remove hose from air induction filter housing (2).

Remove two bolts (3) and washers and remove air induction filter housing from air cleaner. Remove filter.

Install in reverse order.



1. Clamp 2. Air induction filter housing 3. Bolts

**PCV CONTROL VALVE (Carbureted engines)****REMOVAL AND INSTALLATION**

Remove carburetor (refer to Carburetor section).

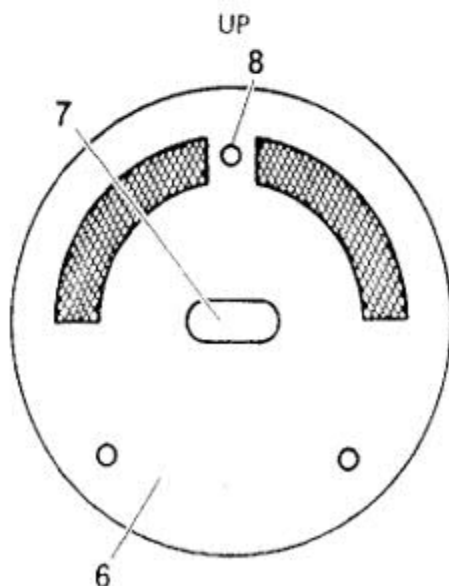
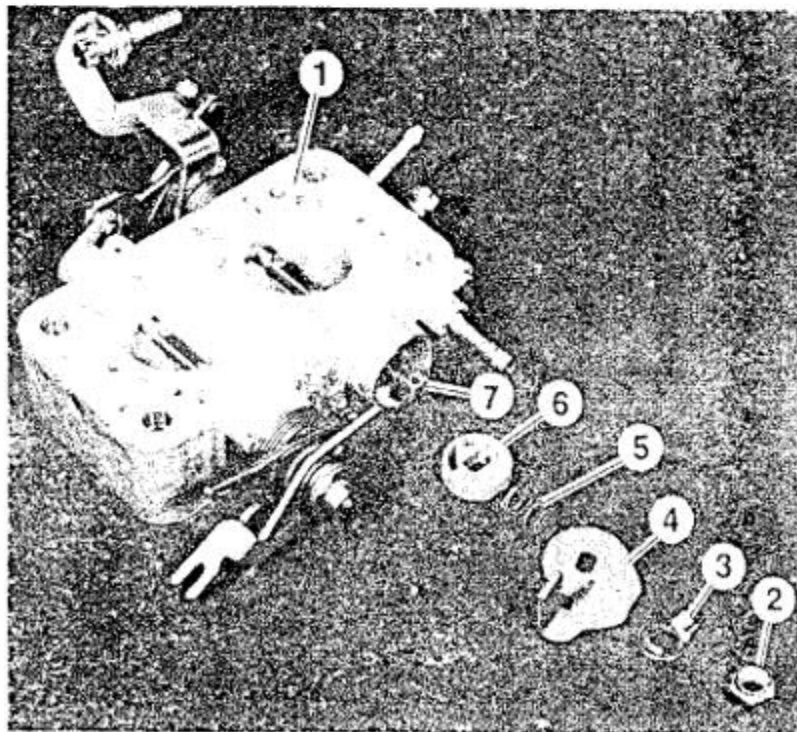
Separate throttle base (1) from carburetor body.

Remove nut (2), washer (3), cam (4), retainer spring (5) and valve (6) from slotted shaft (7).

Install in reverse order.

**CAUTION:** Valve is slotted to fit easily on shaft if installed correctly, but it can be forced on incorrectly, resulting in crankcase pressurization and high oil consumption. There are three raised knobs on the valve. When installed correctly, they face out and a single knob (8) will be up, as shown.

1. Throttle base 2. Nut 3. Washer 4. Cam 5. Retainer spring 6. PCV valve 7. Throttle shaft 8. Raised knob



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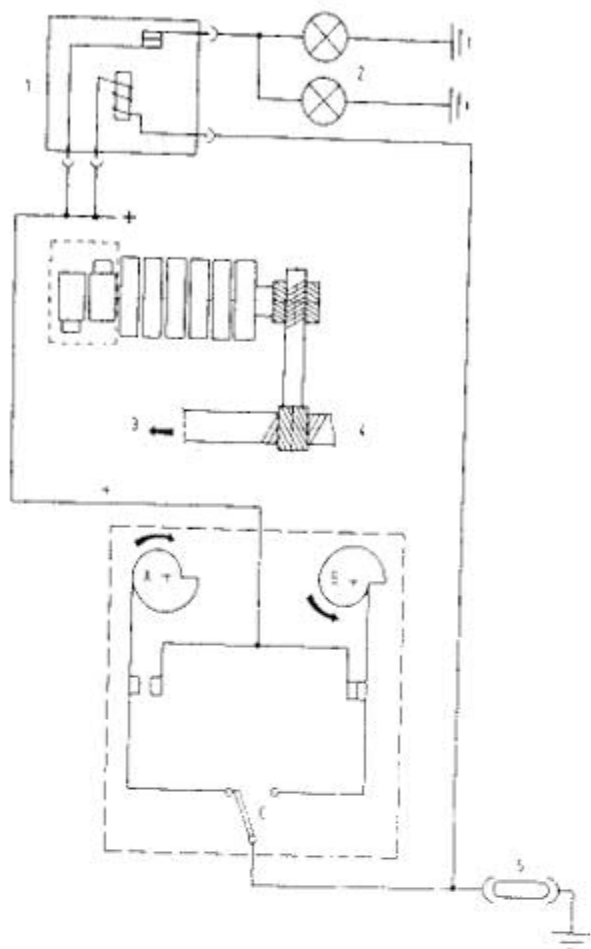
## "EGR" AND "CATALYST" MAINTENANCE REMINDER SYSTEM (1975 and 1976)

The maintenance reminder system is controlled by relay (1). With proper power and ground the relay is energized.

This opens the circuit to the lights. Cam drums A and B in odometer switch are driven by the speedometer cable and are set to close their contacts at  $25,000 \pm 1$  miles. Closing the contact applies power to fuse (5) causing fuse to blow. This removes ground from relay (1) causing lights to come on.

The maintenance reminder system is no longer necessary. If servicing is required, the system should be eliminated.

1. Normally closed relay 2. "EGR" and "Catalyst" indicator lights  
3. To speedometer 4. To transmission 5. Fuse A and B cam drums  
C. Resetting switch



**ODOMETER SWITCH (1975 and 1976)**

Odometer switch operation (part of the maintenance reminder system) is no longer necessary. If servicing is required, the switch should be deactivated. The odometer switch (1) is located on the front right side of drivers footwell.

**CATALYTIC TEMPERATURE WARNING CONTROL UNIT (1975 and 1976)**

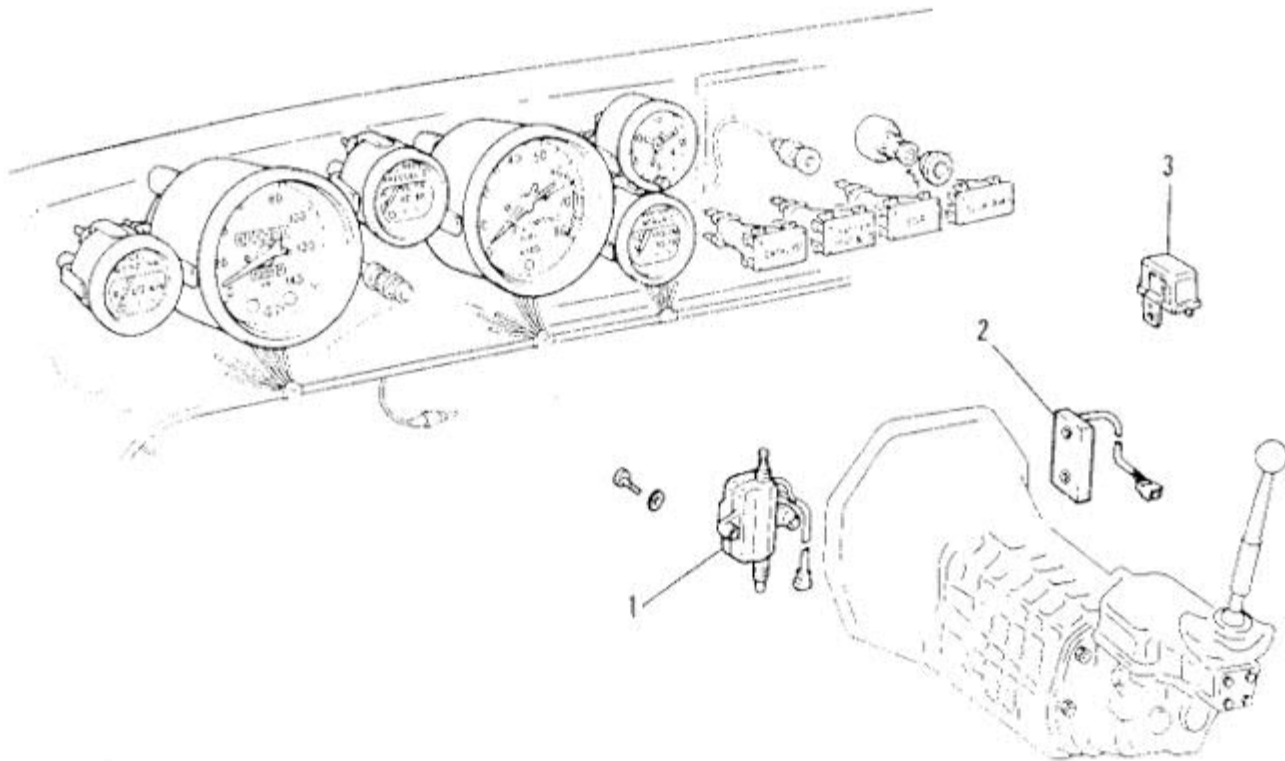
The control unit senses the temperature of the converter by means of a thermocouple. When converter temperature reaches  $982 \pm 50^\circ \text{C}$  ( $1800 \pm 50^\circ \text{F}$ ), the control unit causes the "SLOW DOWN" warning light to flash. If the temperature continues to increase, the frequency of the light increases.

The control unit (2) is located under the glove box.

**CATALYTIC TEMPERATURE PROTECTION TACHYMERIC SWITCH (1975 and 1976)**

To prevent excessive temperatures in the converter, the fuel is shut off from the carburetor during decelerations. The tachymetric switch senses engine speed from the coil. With the throttle closed during decelerations above  $2650 \pm 50 \text{ rpm}$ , the switch energizes the idle shutoff solenoid. This shuts off idle fuel flow inside the carburetor. The tachymetric switch (3) is located under the glove box.

1. 25,000 mile control switch 2. Catalytic temperature control unit 3. Tachymetric switch



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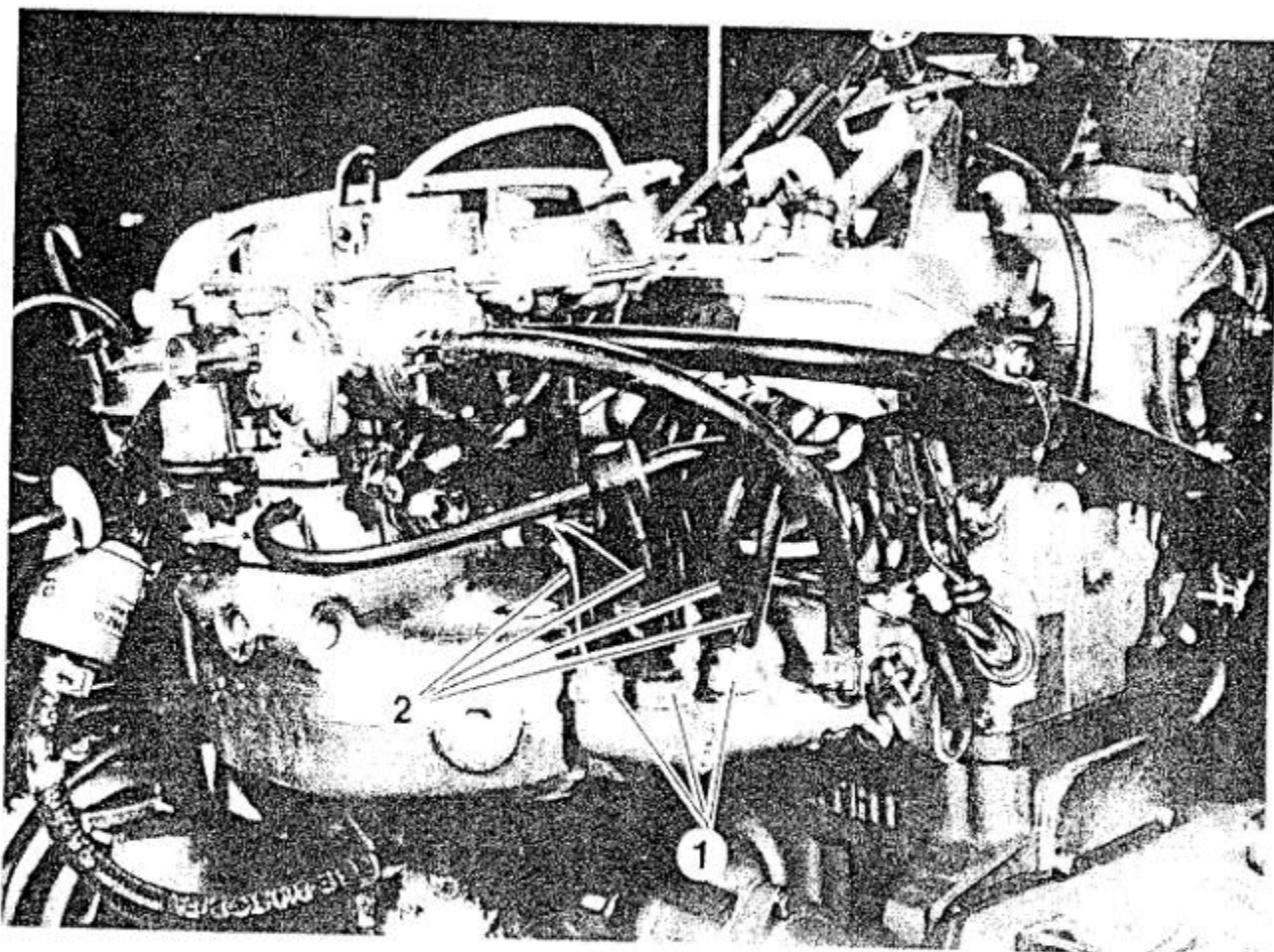
## THERMOVALVES (1979 and 1980 carbureted)

### REMOVAL AND INSTALLATION

Drain cooling system to a level below thermostats (1).

Remove vacuum lines (2) from thermostat to be removed, noting that lines and valve are color coded. Remove thermostat. Install in reverse order. Refill and bleed cooling system (refer to Radiator section).

1. Thermostats 2. Vacuum lines



## GULP VALVE AND ELECTRO VALVE (1979 and 1980 carbureted)

### REMOVAL AND INSTALLATION

Gulp valve (1) and electro valve (2) are located together in the engine compartment mounted on the left fender shield.

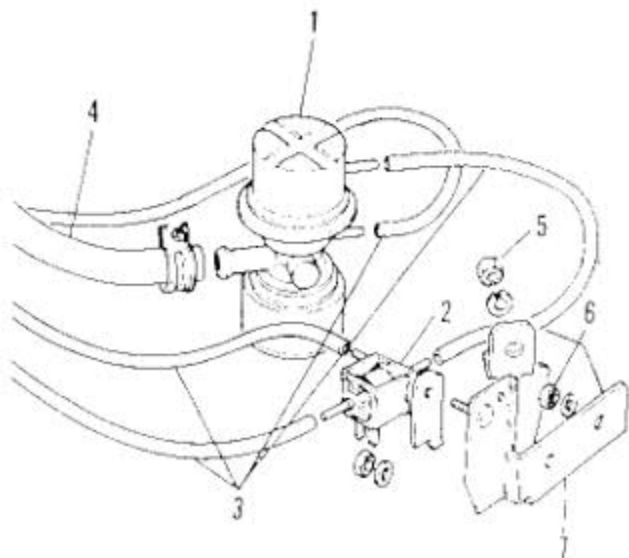
Disconnect vacuum lines (3), air line (4) and electrical connector on valves.

Remove one nut (5) and washer to remove gulp valve.

Remove one nut (6) and washer to remove electro valve.

Install in reverse order.

1. Gulp valve 2. Electro valve 3. Vacuum lines 4. Air line 5. Nut  
6. Nut 7. Mounting bracket





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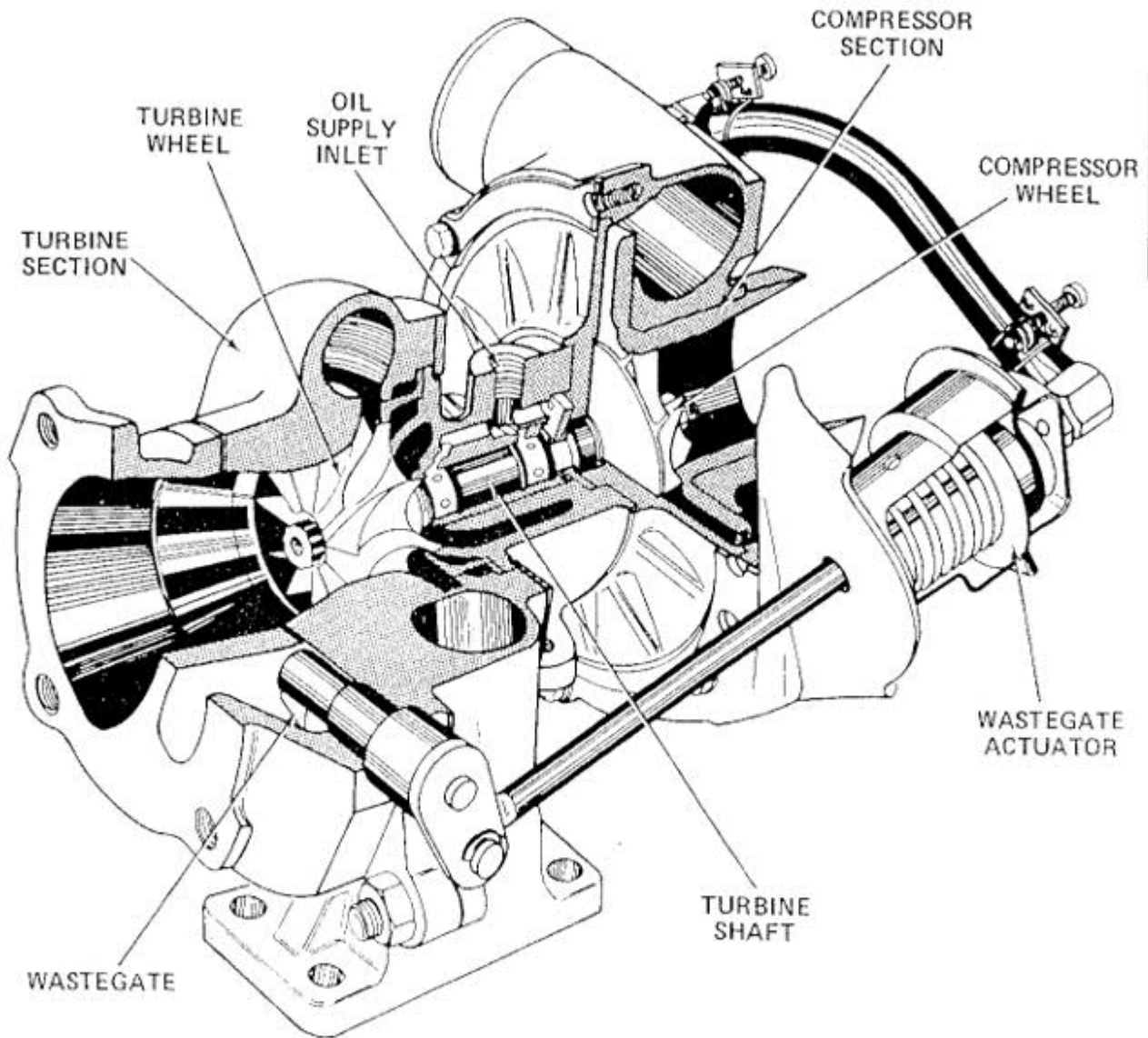
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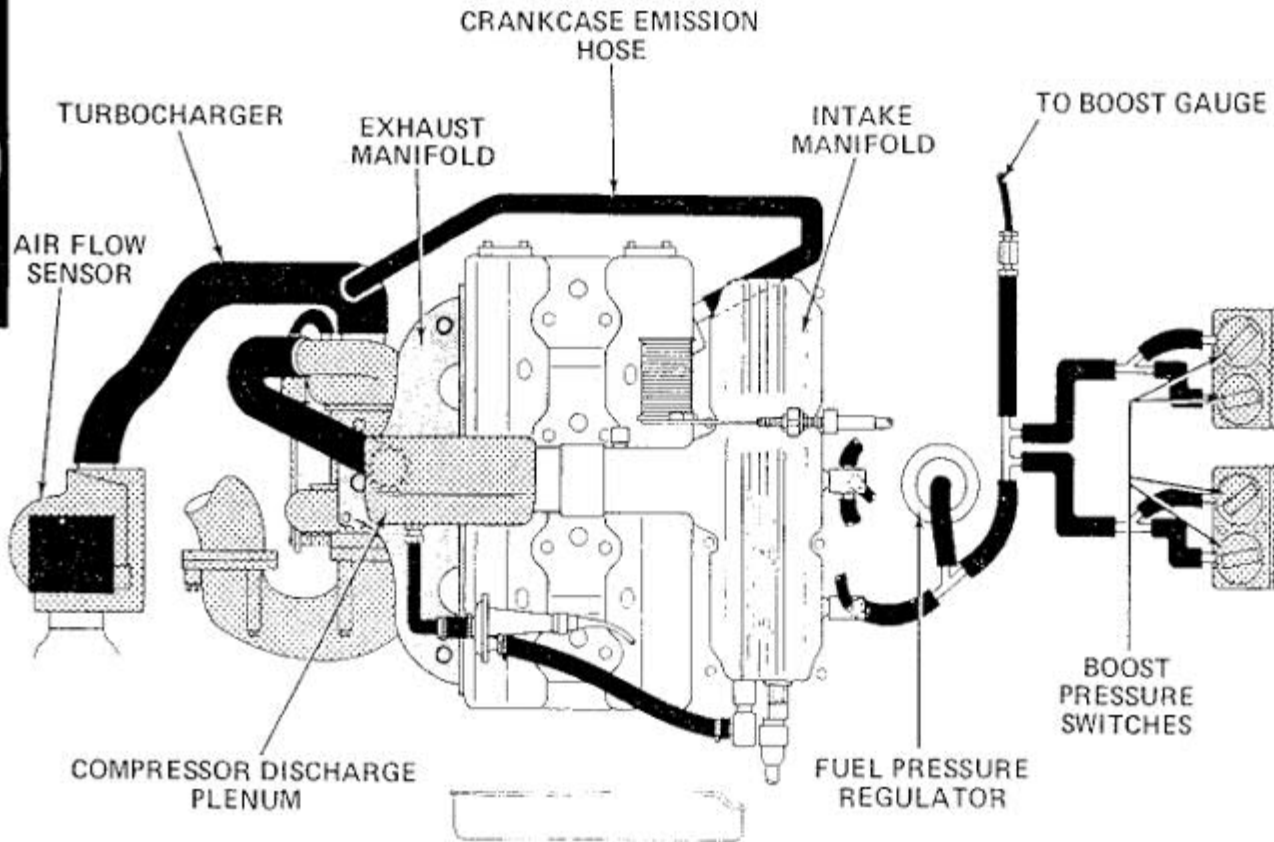




TURBOCHARGER WARNER-ISHI (RHB6)

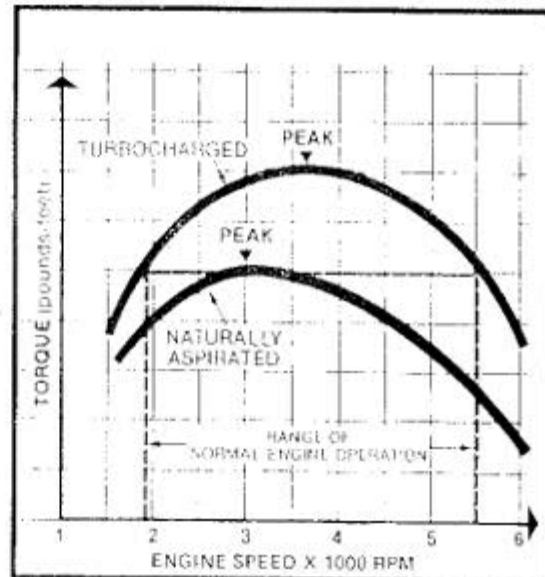
## GENERAL

The turbocharger installed as an option on 1981 and up Spiders is a light weight unit with a low inertia turbine wheel. This provides quick response and minimal turbo lag. It is bolted to the exhaust manifold so that all exhaust gases flow thru the unit. Inlet air is routed from the air flow sensor to the turbocharger where it is compressed. The compressed air is then routed to the discharge plenum and intake manifold. The compressed air increases the charge of air/fuel mixture which results in a significant increase in power output and engine torque.



TOP VIEW OF TURBOCHARGER

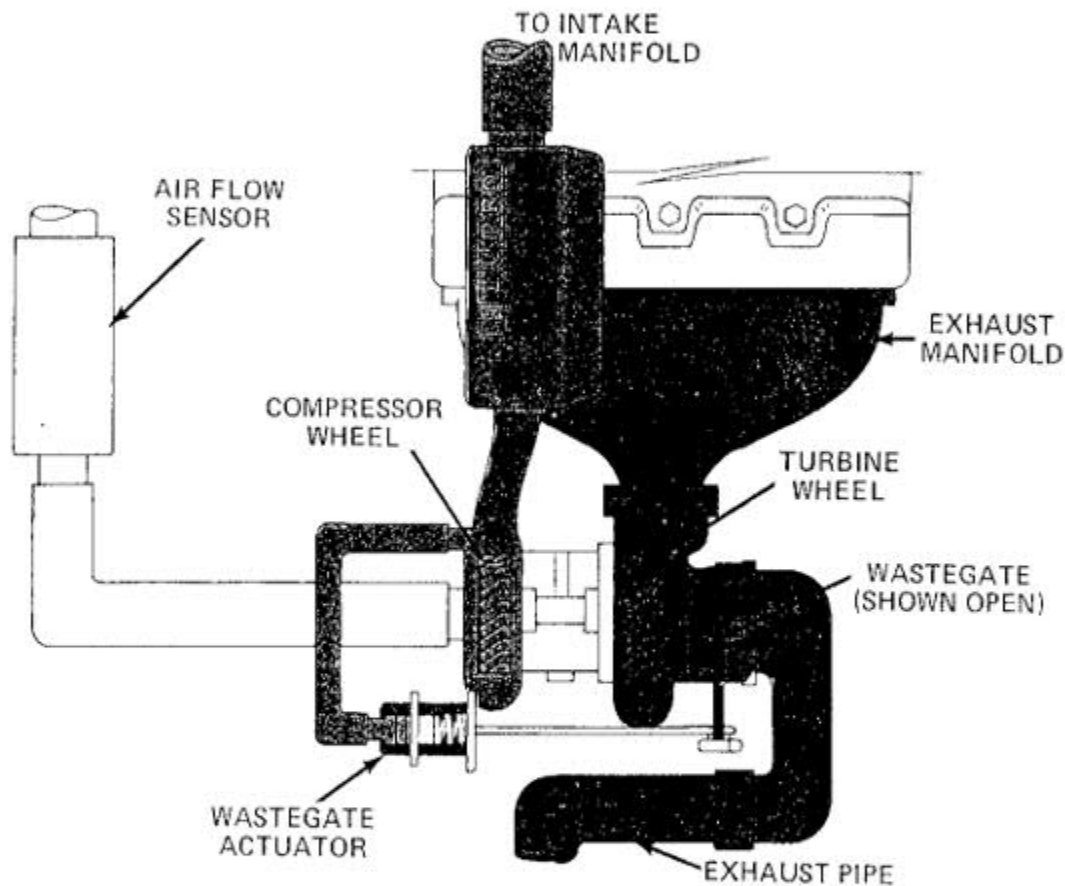
The low inertia turbine wheel is designed to provide boost at relatively low engine speed which produces a broad torque curve. This results in more torque in the normal driving range of the engine without undue sacrifice of fuel economy, emissions, or durability.



## OPERATION

### TURBOCHARGER

Since the turbine wheel is driven by exhaust gases, the speed of the turbine wheel as well as the boost pressure will increase in proportion to the speed and load of the engine. Depending on the amount of exhaust gas flow, the turbine wheel will spin at up to 100,000 rpm. In order to prevent overboost which would damage the engine, a wastegate (charge boost pressure regulator) is incorporated in the turbocharger. The wastegate actuator contains a diaphragm and return spring. The upper chamber of the actuator is connected to the compressor outlet. The boost pressure in the compressor outlet is applied to the diaphragm. At 6 p.s.i., the boost pressure starts to overcome the spring pressure. This opens the wastegate which allows some exhaust gas to bypass the turbine wheel. Any increase in exhaust gas flow will result in an increase in the bypass flow which will maintain the maximum boost pressure at 6 p.s.i.



### CONTROL SWITCHES

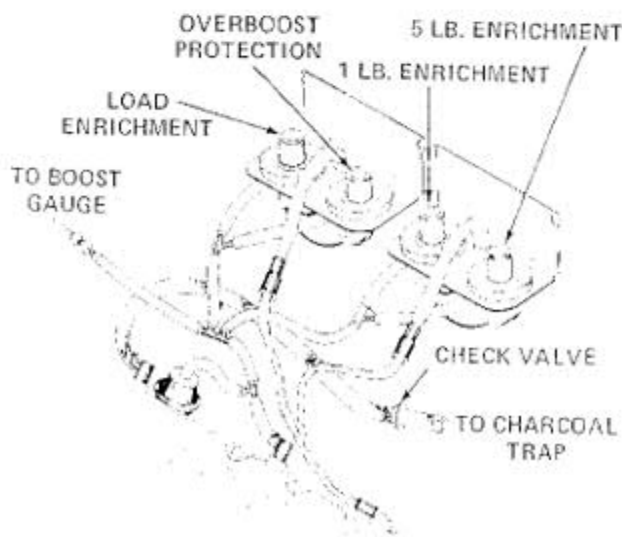
The turbocharger system is equipped with four boost pressure switches. The switches are mounted on the left fender well and are connected to the intake manifold. The switches are color coded as follows:

- Load Enrichment - Blue
- Overboost Protection - Black
- 1 lb. Enrichment - Yellow
- 5 lb. Enrichment - Green

A boost gauge in the instrument cluster is also connected to the intake manifold. This gauge indicates:

- White Zone - Manifold vacuum, no boost
- Green Zone - Normal turbo boost
- Red Zone - Dangerous overboost and system malfunction

A check valve is installed in the hose to the charcoal trap. This prevents boost pressure from pressurizing the charcoal trap.

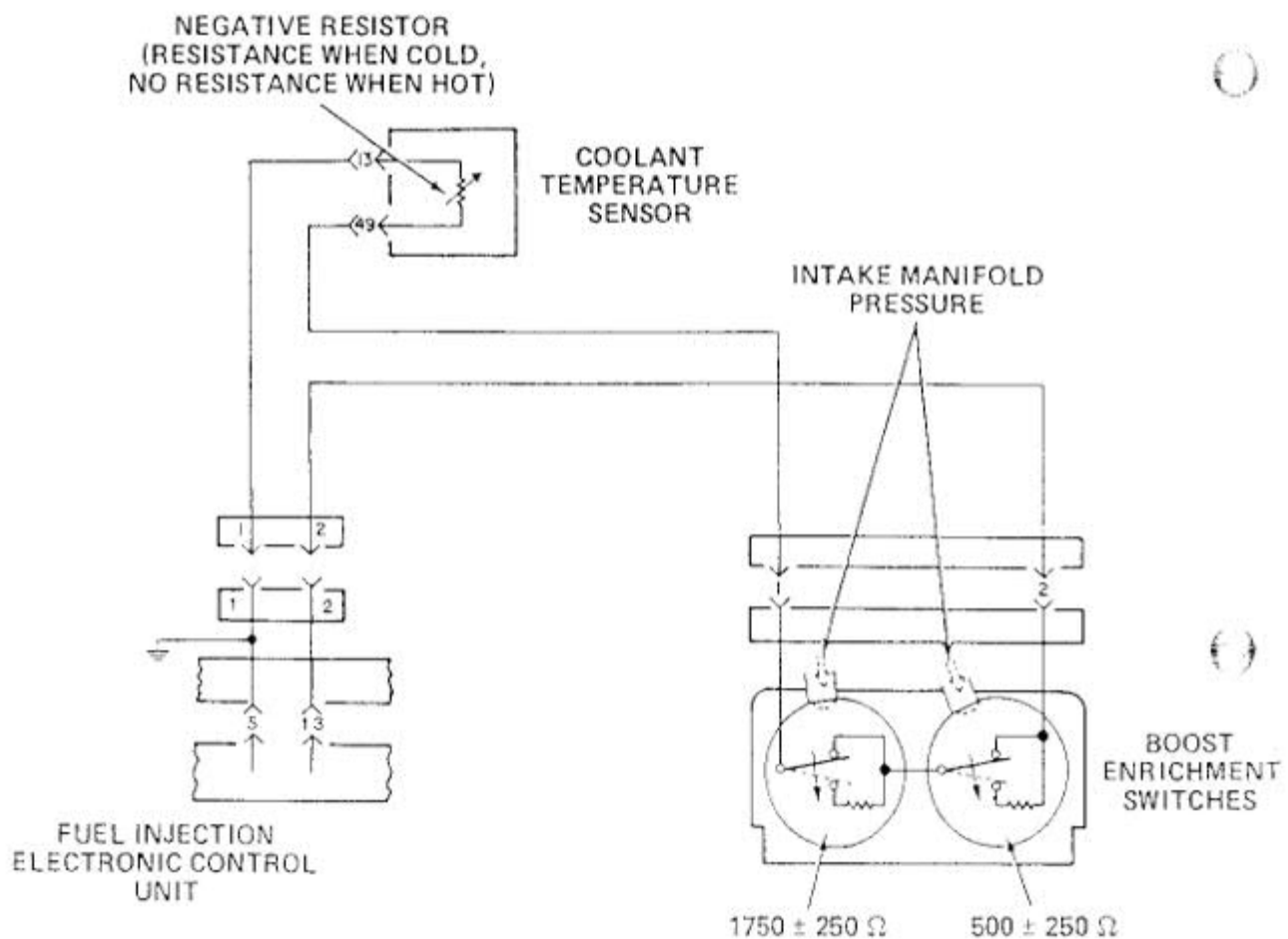


### Boost Enrichment Switches

The boost enrichment switches are wired in series with the coolant temperature sensor of the fuel injection system. This circuit ensures that the proper fuel/air mixture is supplied by the fuel injection system whenever the turbocharger is providing boost (positive intake manifold pressure).

Each switch is a single pole, two position switch. The circuit through the normally closed contacts contain no resistance. The circuit through the normally open contacts contain resistors. When the switch is deactivated, the signal through it is unchanged. When the switch is activated the signal passes through the resistors.

When operating without boost the coolant temperature sensor provides a signal to the electronic control unit (ECU) for extra fuel during the warmup. When boost pressure increases to  $1 \pm 0.5$  psi the first switch is activated. This opens the switch contact and causes the signal to pass through a resistor of  $1750 \pm 250$  ohms. This increase in resistance signals the ECU for additional fuel. When boost pressure increases to  $5 \pm 0.5$  psi the second switch is activated and an additional  $500 \pm 250$  ohms is added. This signals for an additional increase in fuel flow.



## Load Enrichment/Overboost Protection Switches

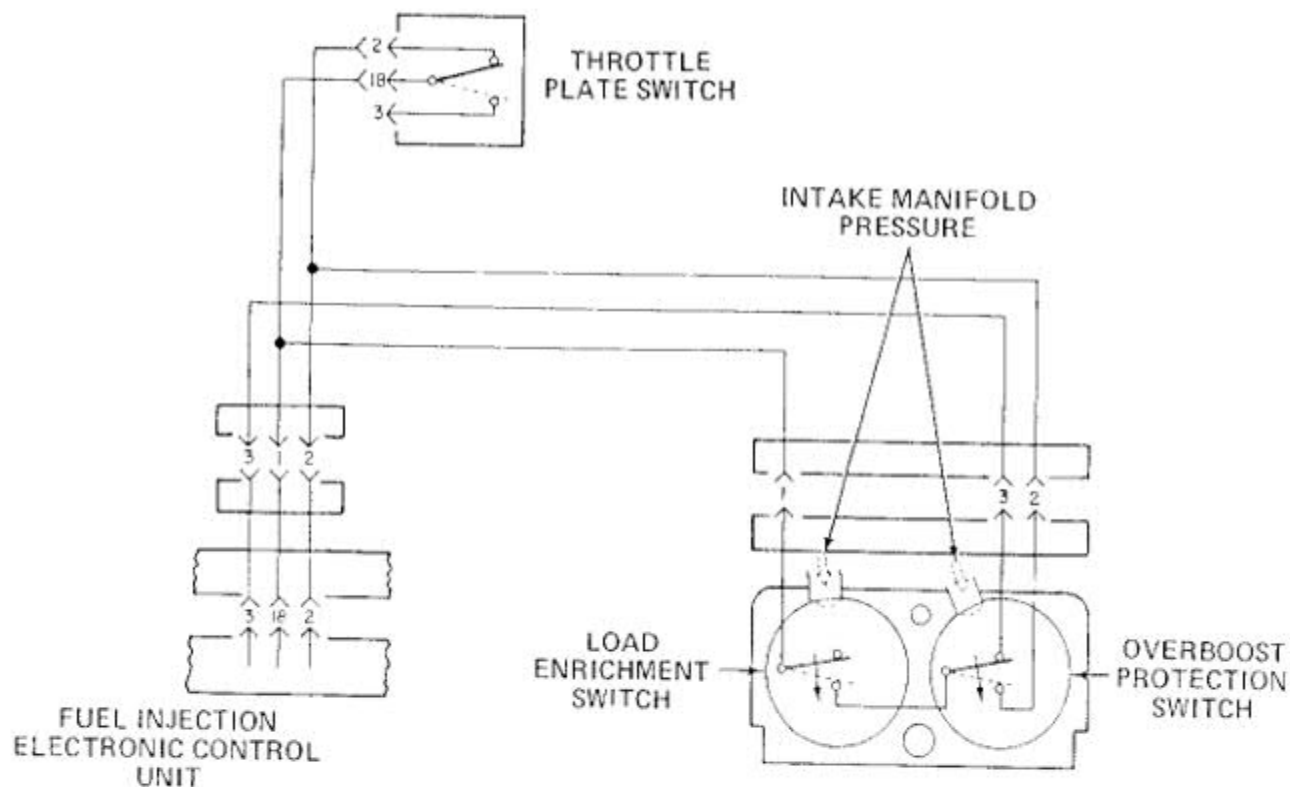
The load enrichment and overboost protection pressure switches are wired into the throttle plate switch circuit of the fuel injection electrical system. The load enrichment switch is a single pole, single position switch. The overboost protection switch is a single pole, two position switch.

### Load Enrichment

When the throttle plate is in idle position, the throttle plate switch provides the normal signal to the ECU. When boost pressure increases to about 1 psi, the throttle plate switch is open and not providing any signal to the ECU. The load enrichment switch is closed. This connects the "full throttle" signal circuit from terminal 3 of the ECU through the normally closed contacts of the overboost switch, the closed contacts of the load enrichment switch to terminal 18 of the ECU. This signal provides additional fuel for operation with boost.

### Overboost Protection

If boost pressure should exceed 9 psi (wastegate failure), the overboost protection switch would be activated. This switches the signal for the ECU from "full throttle" to "idle" signal. When the ECU receives an "idle" signal and a high rpm signal, it closes the fuel injectors. This causes the engine to slow down thereby reducing boost pressure.



## TURBOCHARGER

### REMOVAL AND INSTALLATION

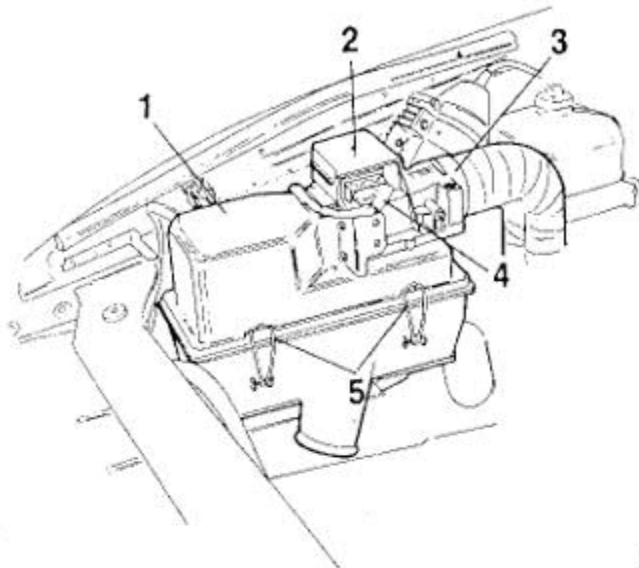
**CAUTION:** The exhaust manifold and turbocharger must be removed as a unit. Do not attempt to remove turbocharger from exhaust manifold on vehicle. The turbocharger bolts must be properly torqued and this can only be accomplished off the vehicle.

Remove front splash pan and drain cooling system by opening engine drain.

Loosen hose clamp (3). Disconnect electrical connector (4) from air flow sensor (2).

Release four clips (5) holding air cleaner cover (1). Remove cover with air flow sensor and remove air filter. Remove 3 nuts in air cleaner and lift air cleaner out.

1. Air cleaner cover 2. Air flow sensor 3. Clamp 4. Electrical connector 5. Clip



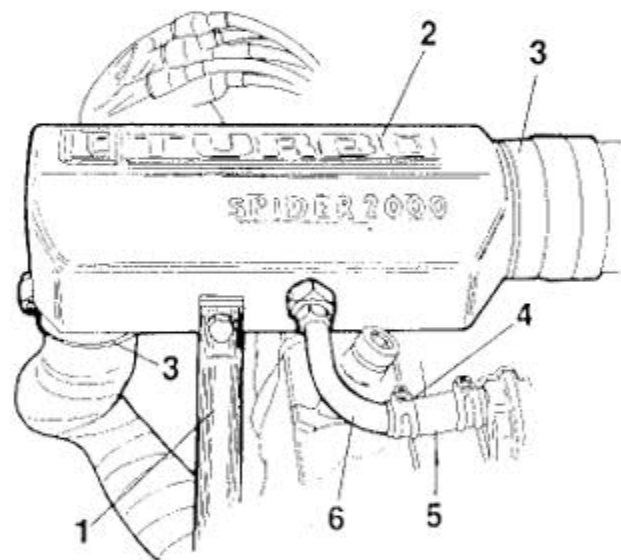
Remove bolt and nut securing support bracket (1) for air plenum (2) to exhaust manifold heat shield.

Loosen clamp (4) and disconnect auxiliary regulator air hose (5) from tube (6).

Loosen air hose clamps (3) and lift plenum off air hoses.

**CAUTION:** Cap off all turbocharger ports and oil supply and return orifices which may be exposed during removal.

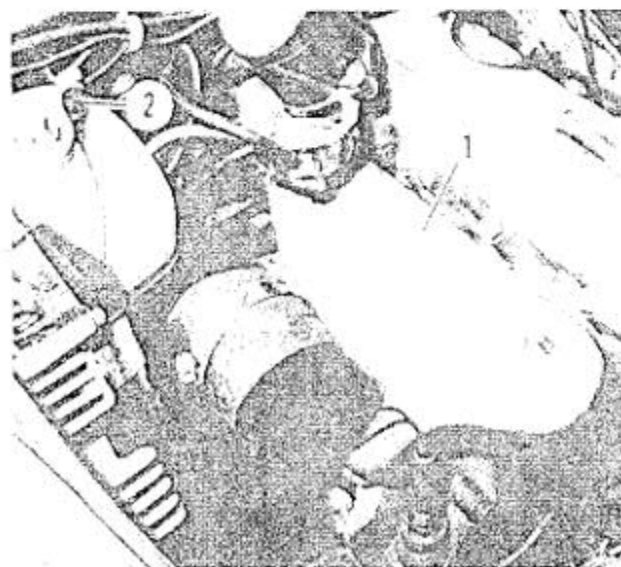
1. Support bracket 2. Air plenum 3. Clamp 4. Clamp 5. Auxiliary air regulator hose 6. Tube



Remove two remaining nuts and washers holding heat shield (1) to exhaust manifold. Remove shield.

Disconnect Lambda sensor electrical connector (2).

1. Heat shield 2. Lambda sensor electrical connector



Remove three Allen head bolts (1) holding turbine outlet elbow (2) to exhaust pipe (3). Remove gasket and discard.

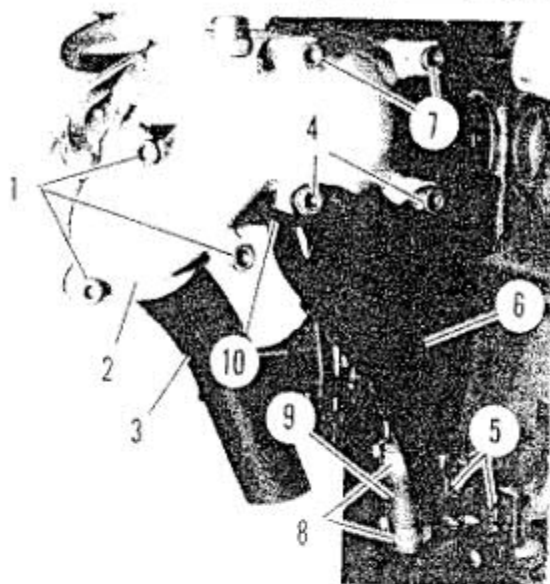
Remove two Allen head bolts (4) and two self-locking nuts (5) or two bolts (A.C. vehicles) to remove exhaust elbow bracket (6).

Remove two remaining Allen head bolts (7) on exhaust elbow and remove elbow. Remove gasket and discard.

Loosen two clamps (8) on turbo oil drain line hose (9) at oil sump connection. Push hose down to clear drain line.

From under vehicle remove turbo support bracket nut at oil drain line flange (10).

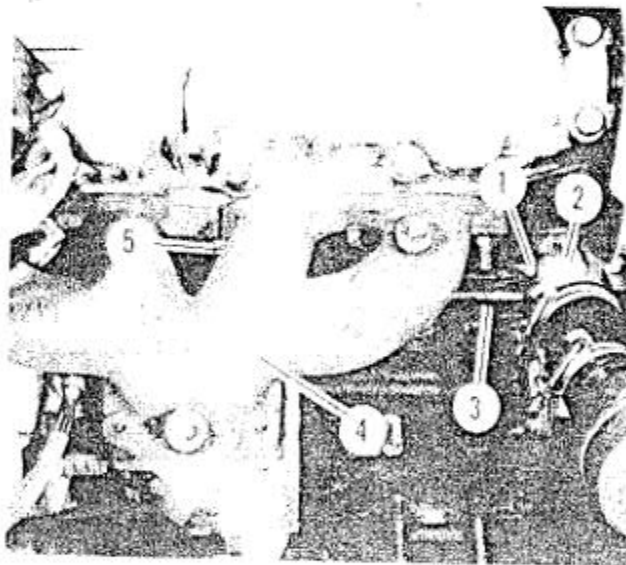
1. Allen head bolt 2. Turbine outlet elbow 3. Exhaust pipe  
4. Allen head bolt 5. Self-locking nut 6. Exhaust elbow bracket  
7. Allen head bolt 8. Clamp 9. Oil drain hose 10. Oil drain line flange



Remove two nuts (1) holding heater return line (3) to water pump (2).

Remove nut (5) holding bracket on heater return line to exhaust manifold (4). Move return line away from manifold.

1. Nut 2. Water pump 3. Heater return line 4. Exhaust manifold  
5. Nut



Loosen clamp (2) holding crankcase hose (1) to inlet hose (8). Disconnect hose (1). Leave inlet hose in place.

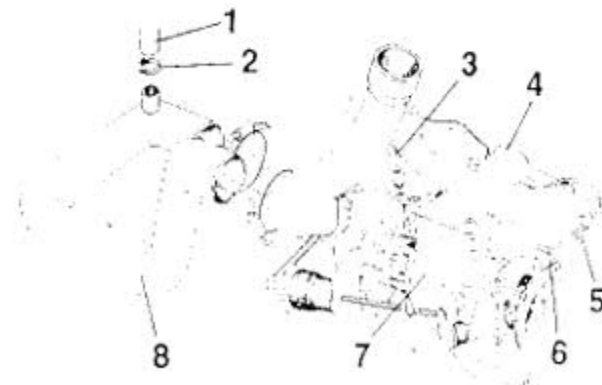
Disconnect oil hose (3) from turbocharger (7). Move hose to one side.

Remove five nuts (5) and washers securing exhaust manifold (4) to engine. Carefully remove exhaust manifold/turbocharger assembly.

Remove four bolts (6) holding turbocharger to exhaust manifold.

**NOTE:** Early production turbochargers had a gasket between manifold and turbocharger. If installed, remove and discard gasket. Do not install a gasket.

1. Crankcase hose 2. Clamp 3. Oil hose 4. Exhaust manifold  
5. Nut 6. Bolt 7. Turbocharger 8. Air hose



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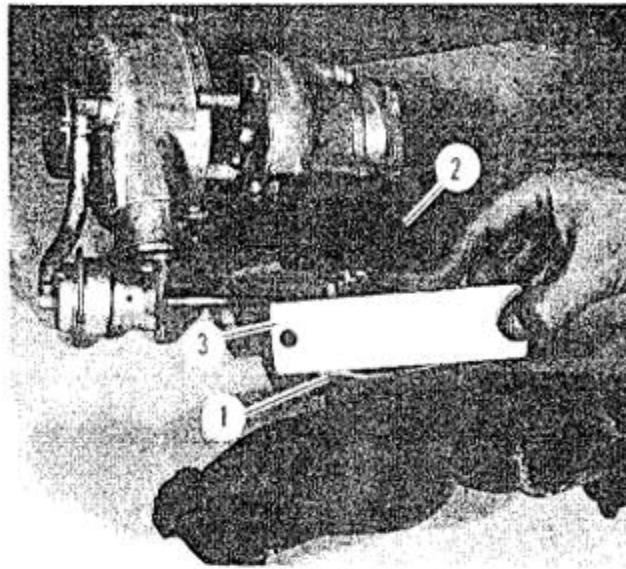
## INSTALLATION

Installation is reverse of removal with particular attention to the following steps and precautions.

**NOTE:** High quality hardware is used throughout the turbo system. Whenever replacement is required, be sure to use hardware of same quality. Torque all hardware, refer to torque chart on following page. Apply a light application of anti-seize compound to all threads and both sides of each stainless steel gasket.

Using straightedge (3), check flatness of exhaust manifold flange (1) and turbocharger flange (2) as shown. Surfaces must be perfectly flat. If not, they must be machined. Remove only enough metal to return level finish to surface.

1. Exhaust manifold flange 2. Turbocharger flange 3. Straightedge



Using new bolts (2), (must be same type of high strength bolts as was removed), torque turbocharger and exhaust manifold flanges together (20 ft. lbs.).

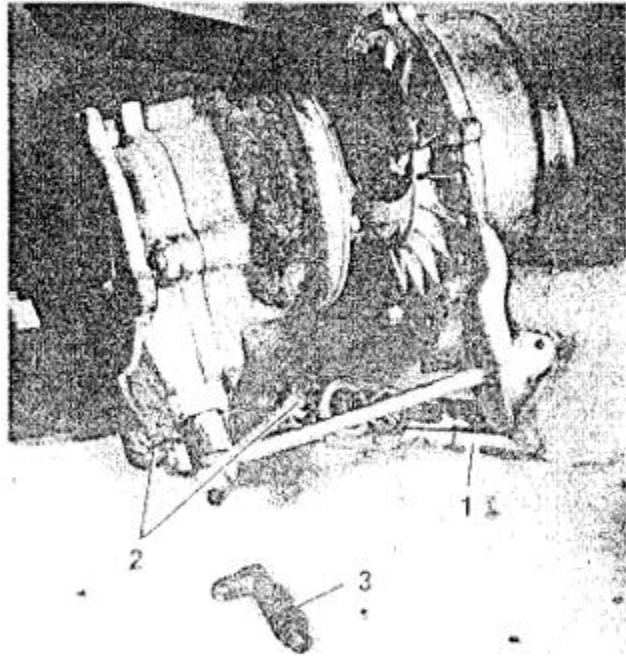
Due to limited clearance, this can be accomplished with "crows foot" wrench extension on torque wrench (1) as shown.

**NOTE:** Crows foot extension will not add a significant amount of torque above 20 ft. lbs.

Reinstall oil supply line fitting (3).

1. Torque wrench 2. Bolt 3. Oil supply line fitting

**CAUTION:** All intake hoses, wires, etc, must be kept clear of turbocharger, exhaust manifold and heat shield. Be certain to secure all hose clamps to prevent them from coming off during positive boost pressure.

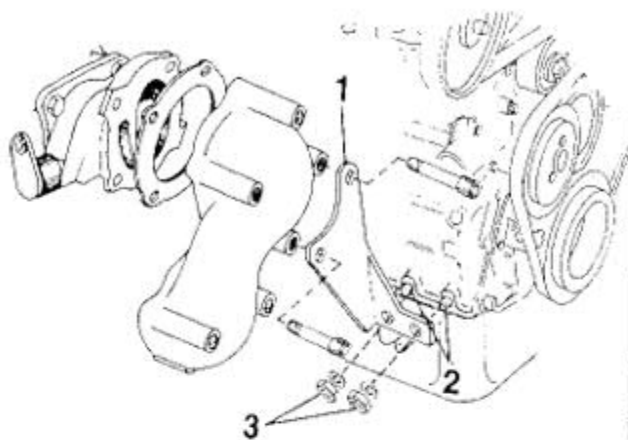




When installing elbow support bracket (1), insure that holes in leg of bracket line up with studs (2) and/or tapped holes (A.C. vehicles) in engine block before securing bracket to elbow.

The leg of elbow support bracket should be parallel and flush to engine block. If it is not, take up slack with washer shims rather than drawing leg flush with mounting nuts (4).

1. Elbow support bracket 2. Mounting studs 3. Self-locking nuts

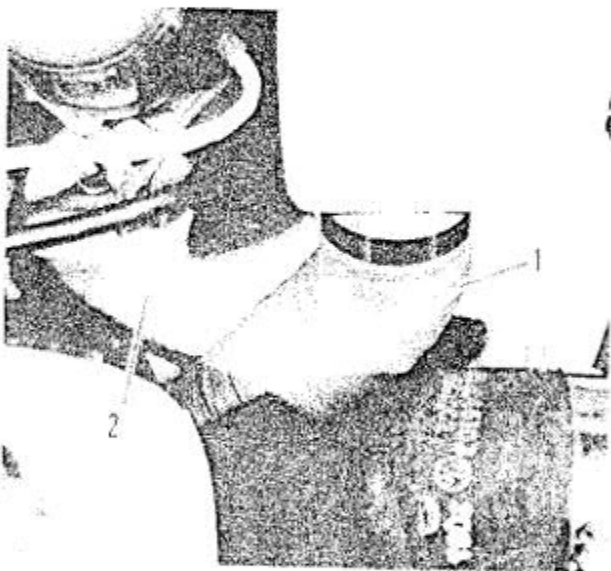


The orange compressor outlet hose (1) must be adjusted for a clearance of at least 5 mm from exhaust manifold heat shield (2). This can be accomplished by sliding hose up or down on compressor outlet port of turbocharger.

1. Compressor outlet hose 2. Heat shield

**CAUTION:** The stainless steel braided oil supply line can be extremely abrasive to anything it comes into contact with. Make sure the protective sheathing around this line is in good condition and positioned correctly to avoid contact with any components.

Refill and bleed cooling system. Refer to bleeding procedures in Radiator section.





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## TESTING

## Preparation

Disconnect vacuum hoses from "Y" fittings. Connect pressure tester J33076 to "Y" fitting.

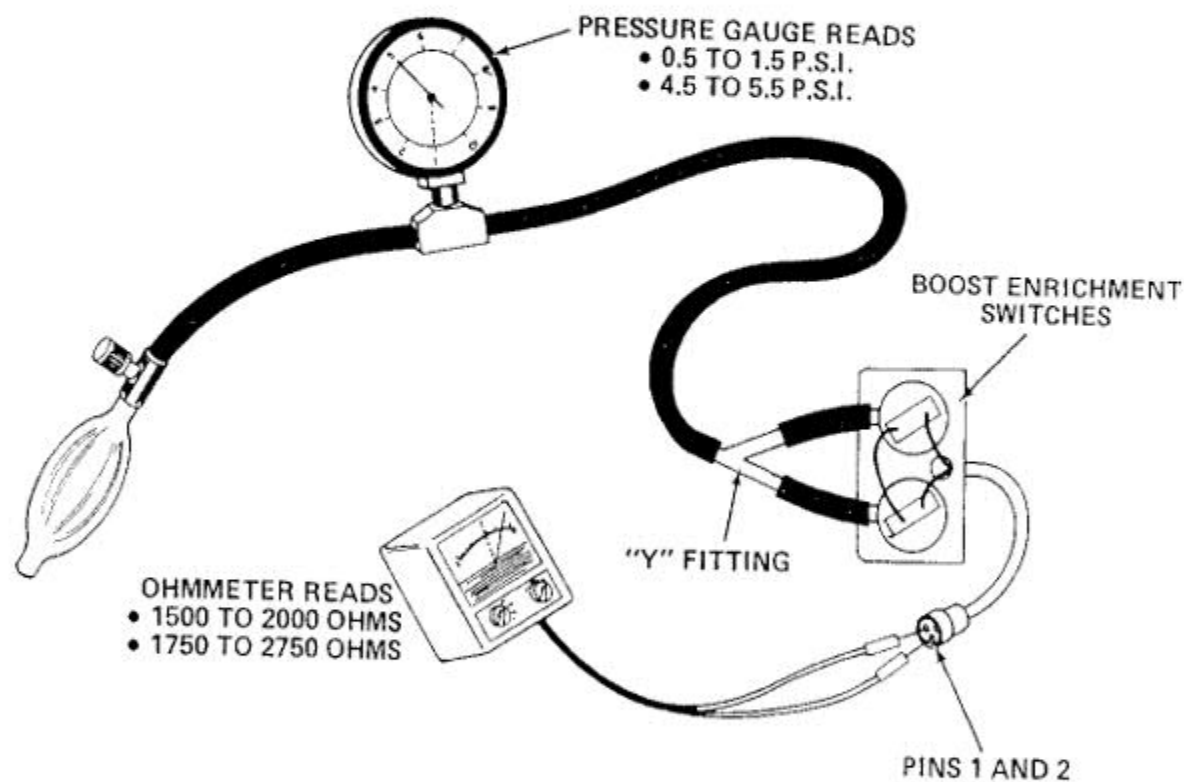
**CAUTION:** When operating tester with line pressure connected, make sure air pressure to switches does not exceed 12 psi. Disconnect connectors for switches from fuel injection wire harness.

## Boost Enrichment Switches

Connect an ohmmeter to pins 1 and 2 of connector for boost enrichment switches.

Slowly apply pressure to switches. Check that switch operates (a slightly audible click may be heard) at 0.5 to 1.5 psi. Check that ohmmeter reads between 1500 and 2000 ohms.

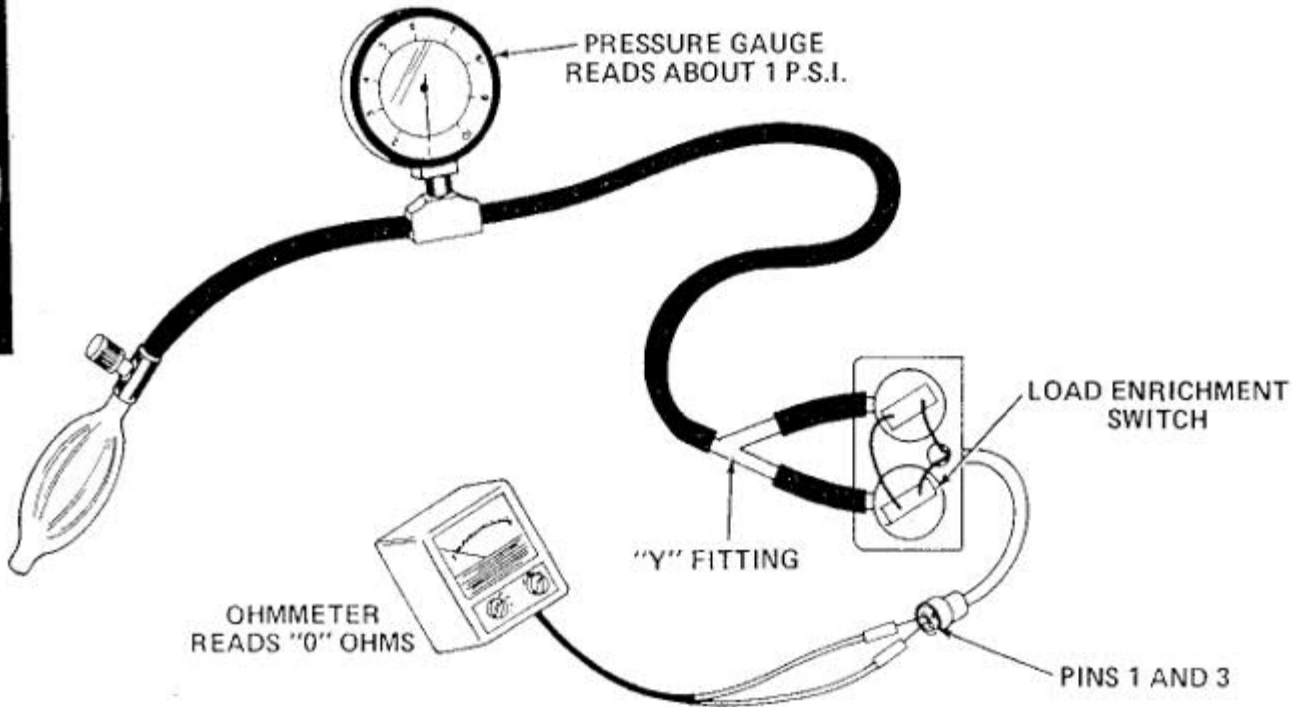
Slowly increase pressure. Check that other switch operates at 4.5 to 5.5 psi. Check that ohmmeter reads between 1750 and 2750.



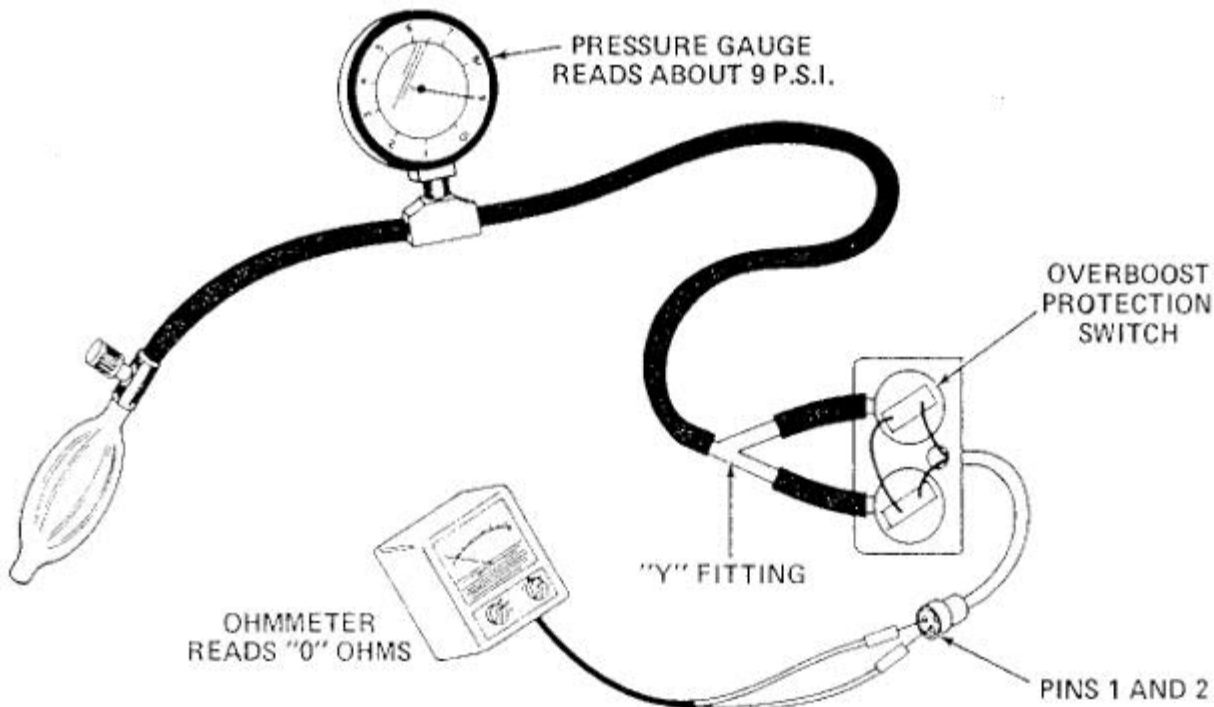
**Load Enrichment Switch**

Connect pressure tester to "Y" fitting for load enrichment switch. Connect ohmmeter to pins 1 and 3 of connector for load enrichment/overboost switches. Zero ohmmeter.

Check that ohmmeter reads infinity. Slowly apply pressure to switch. Check that load switch operates (a slightly audible click may be heard) at about 1 psi. Check that ohmmeter reads 0 ohms.

**Overboost Protection Switch**

Connect ohmmeter to pins 1 and 2 of connector. Check that ohmmeter reads infinity. Slowly increase pressure. Check that overboost switch operates at about 9 psi. Check that ohmmeter reads 0 ohms.



## TROUBLESHOOTING

### SYMPTOM OR COMPLAINT

No Boost

Lack of power

Detonation  
w/no boost

w/normal boost

w/excessive boost

Excessive fuel consumption  
(black exhaust smoke)

Excessive oil consumption  
(blue, gray, or white exhaust smoke)

Noise or vibration at turbo unit

### POSSIBLE CAUSES

Boost gauge inoperative  
Wastegate stuck open  
Turbo unit inoperative, seized  
Turbine impeller coked up

Engine  
low compression  
incorrect valve timing and clearance  
incorrect ignition timing  
Clogged air cleaner element  
Insufficient fuel supply  
restriction  
low fuel pressure  
fuel enrichment system not working

Low grade fuel  
Ignition timing advanced too far  
Rough edge or foreign object in cylinder

Low grade fuel  
Ignition timing advanced too far  
Insufficient fuel supply  
restriction  
low fuel pressure  
fuel enrichment system not working

Wastegate actuator signal line leaking  
Actuator tampered with  
Wastegate or actuator damaged

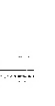
Engine out of tune  
Intake air flow restricted  
filter clogged  
air delivery hoses kinked or collapsed  
Cold start valve or injectors leaking  
Fuel enrichment system working all the time

Incorrect type or grade of oil  
Extended oil change intervals  
Clogged air cleaner element  
Engine wear (piston rings, valve guides)  
Crankcase emission check valve stuck open  
or installed backwards

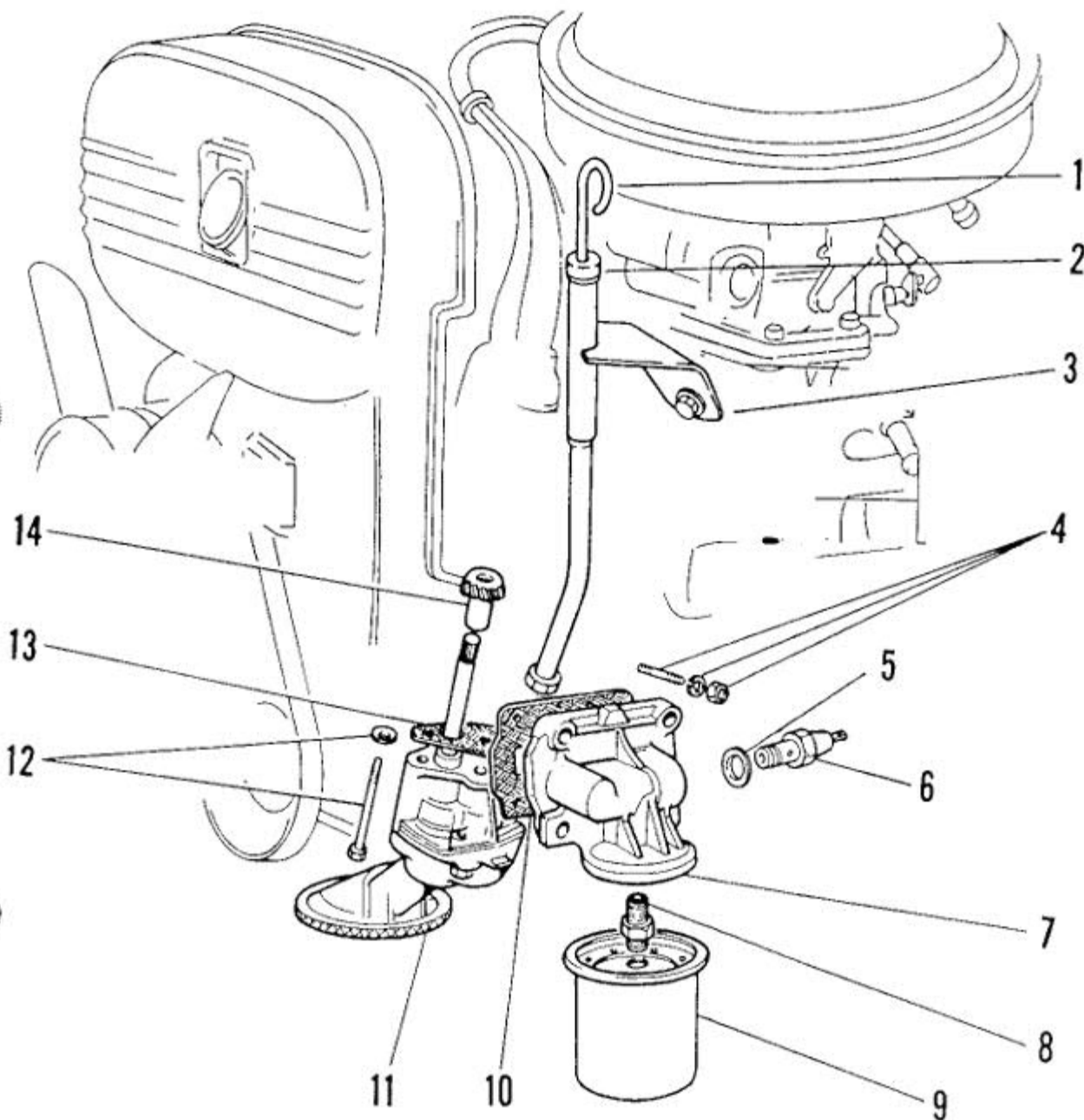
Internal leakage at seals in turbo unit

Loose mount or brackets  
Internal wear — excessive shaft play  
Internal damage — out of balance

101





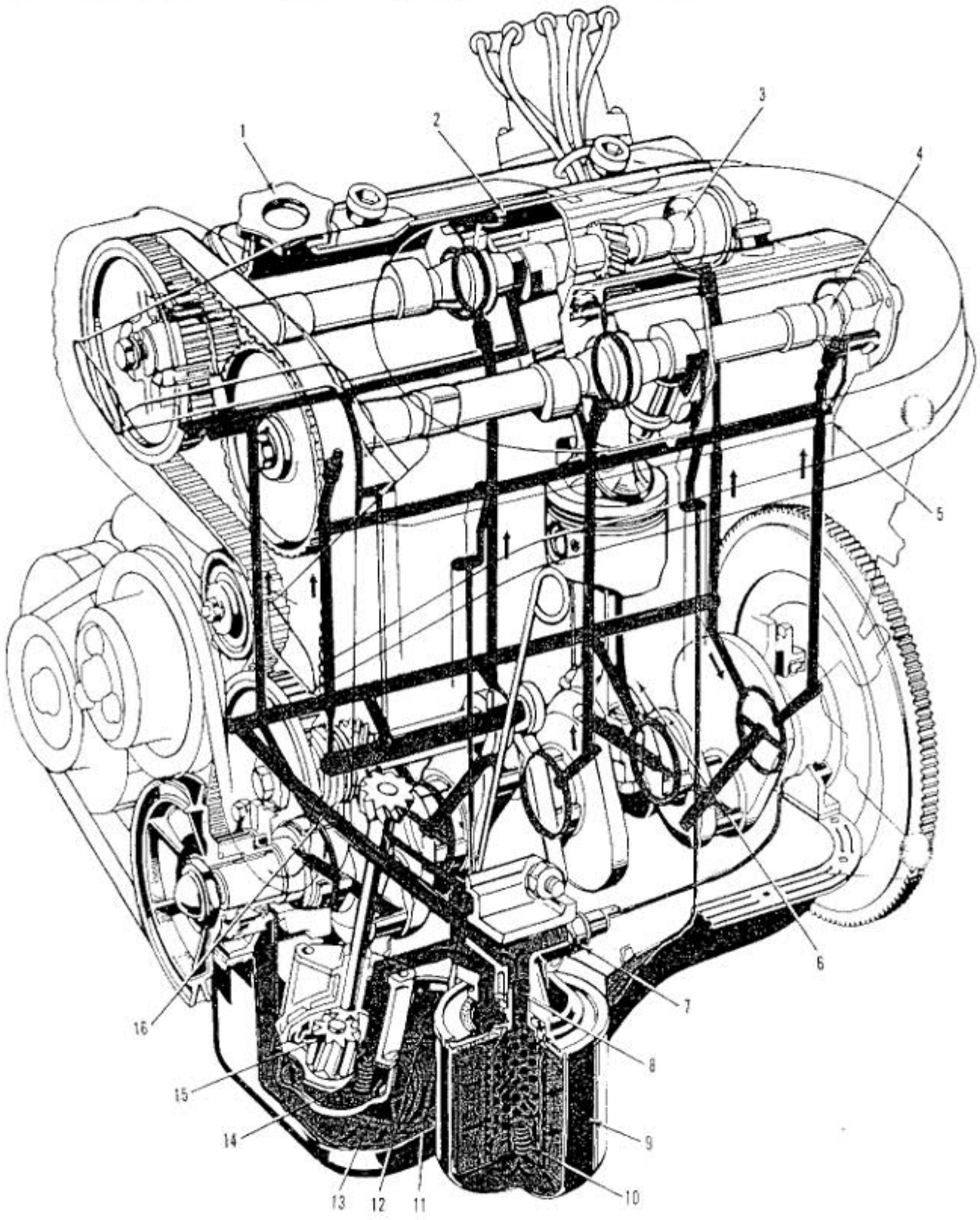


- |                                  |   |
|----------------------------------|---|
| 1. Dipstick                      | 8. Connector, oil filter to support     |
| 2. Dipstick seal                 | 9. Full-flow, cartridge type oil filter |
| 3. Support                       | 10. Oil filter support gasket           |
| 4. Stud, lockwasher and nut      | 11. Oil pump                            |
| 5. Gasket                        | 12. Bolt and spring washer              |
| 6. Oil pressure indicator switch | 13. Oil pump gasket                     |
| 7. Oil filter support            | 14. Oil pump drive gear                 |

ENGINE LUBRICATION SYSTEM COMPONENTS

10

01



- |                                      |   |                                   |
|--------------------------------------|---|-----------------------------------|
| 1. Oil filter cap                    | 7. Low oil sending unit                     | 13. Oil pump suction intake       |
| 2. Oil spurt for camshaft and tappet | 8. Oil delivery-filter to engine components | 14. Relief valve                  |
| 3. Exhaust camshaft                  | 9. Oil filter                               | 15. Oil pump                      |
| 4. Intake camshaft                   | 10. Filter by-pass valve                    | 16. Duct for oil pump drive gears |
| 5. Oil return from tappets           | 11. Dipstick                                |                                   |
| 6. Oil spurt for cylinder walls      | 12. Oil sump drain plug                     |                                   |

ENGINE LUBRICATION DIAGRAM

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### OIL PUMP

#### REMOVAL AND INSTALLATION (Engine in Vehicle)

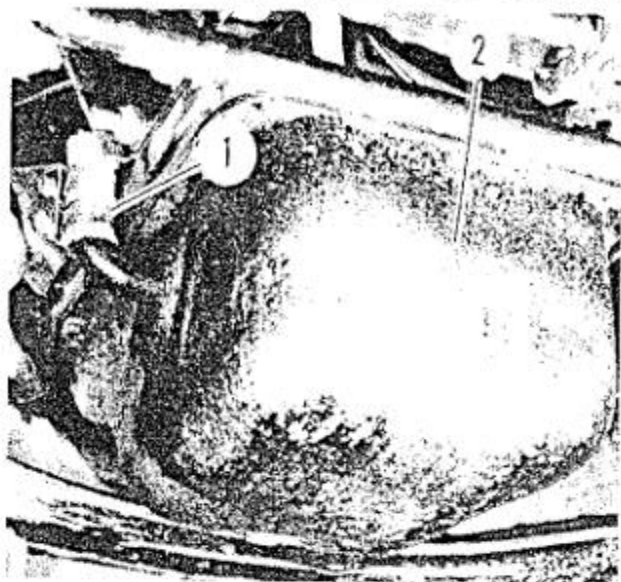
Drain engine oil.

Remove front protection shield.

Remove flywheel protection cover.

On turbocharged engines, loosen clamps on return hose (1) and push hose up to clear drain fitting.

1. Turbocharger oil return hose 2. Oil sump



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**NOTE:** Engine must be raised and crossmember under engine must be lowered for clearance when removing oil sump.

Remove engine mount nut (1) thru hole in crossmember (3).

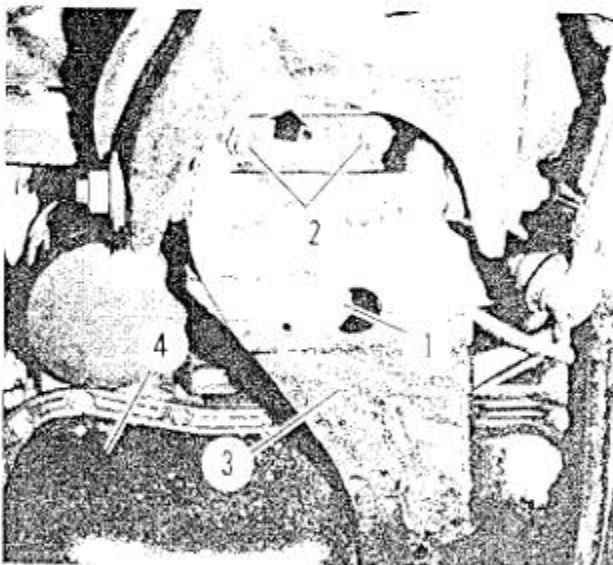
Remove upper crossmember bolt (arrow). Back-off on two crossmember nuts (2) until about two threads are left showing at bottom of stud. Repeat for other side.

Move crossmember down.

Place jack under transmission and raise engine until clearance is obtained for sump removal.

Remove bolts securing sump to engine. Remove sump (4) and gasket.

1. Bolt 2. Nut 3. Crossmember 4. Oil sump

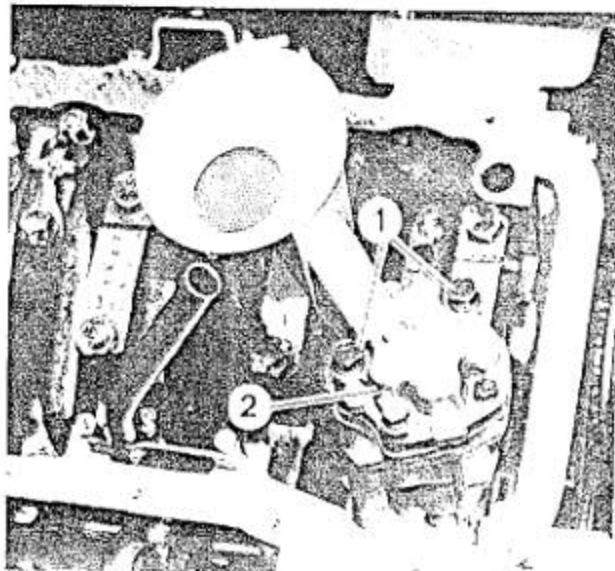


Remove two bolts (1) and washers holding oil pump (2). Remove pump and gasket.

Installation is reverse of removal.

Make sure pump is seated before tightening bolts. Torque bolts to 14 ft. lbs. (2 kgm).

1. Bolt 2. Oil pump



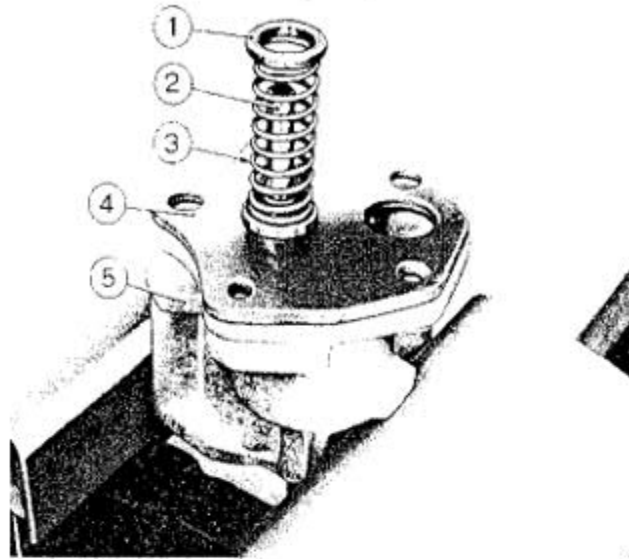
**INSPECTION**

Clean all parts. Blow parts dry with compressed air.

Check housing (5) and cover (4) for cracks. Check suction pipe and oil duct for clogging. Blow clear with compressed air. Make sure dirt and residues are removed between relief valve (2) and housing (3).

Check relief valve spring for cracks and loss of elasticity. Check spring load.

1. Washer 2. Relief valve 3. Spring 4. Cover 5. Housing

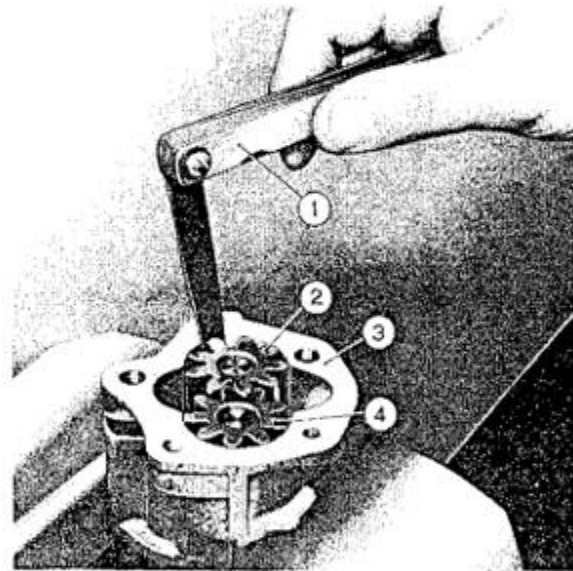


Check gears for wear.

Check gears for tooth to housing clearance. Clearance should be 0.0043 to 0.0070 inch (0.110 to 0.180 mm).

If clearance fails to meet specifications, replace gears and housing, if necessary.

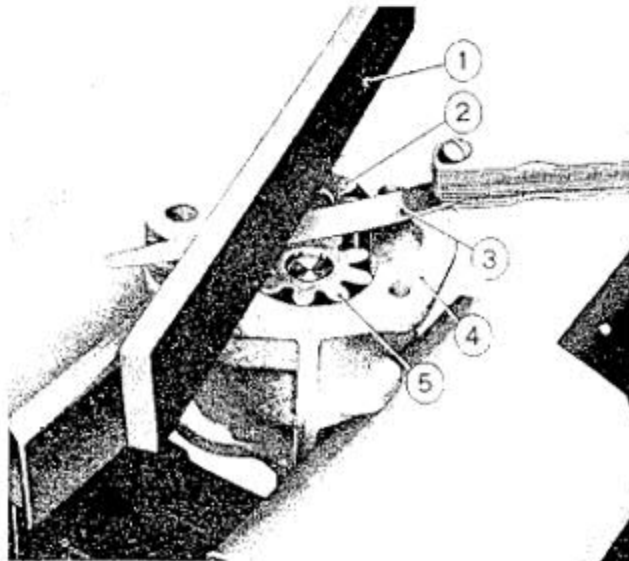
1. Feeler gauge 2. Drive gear 3. Housing 4. Driven gear

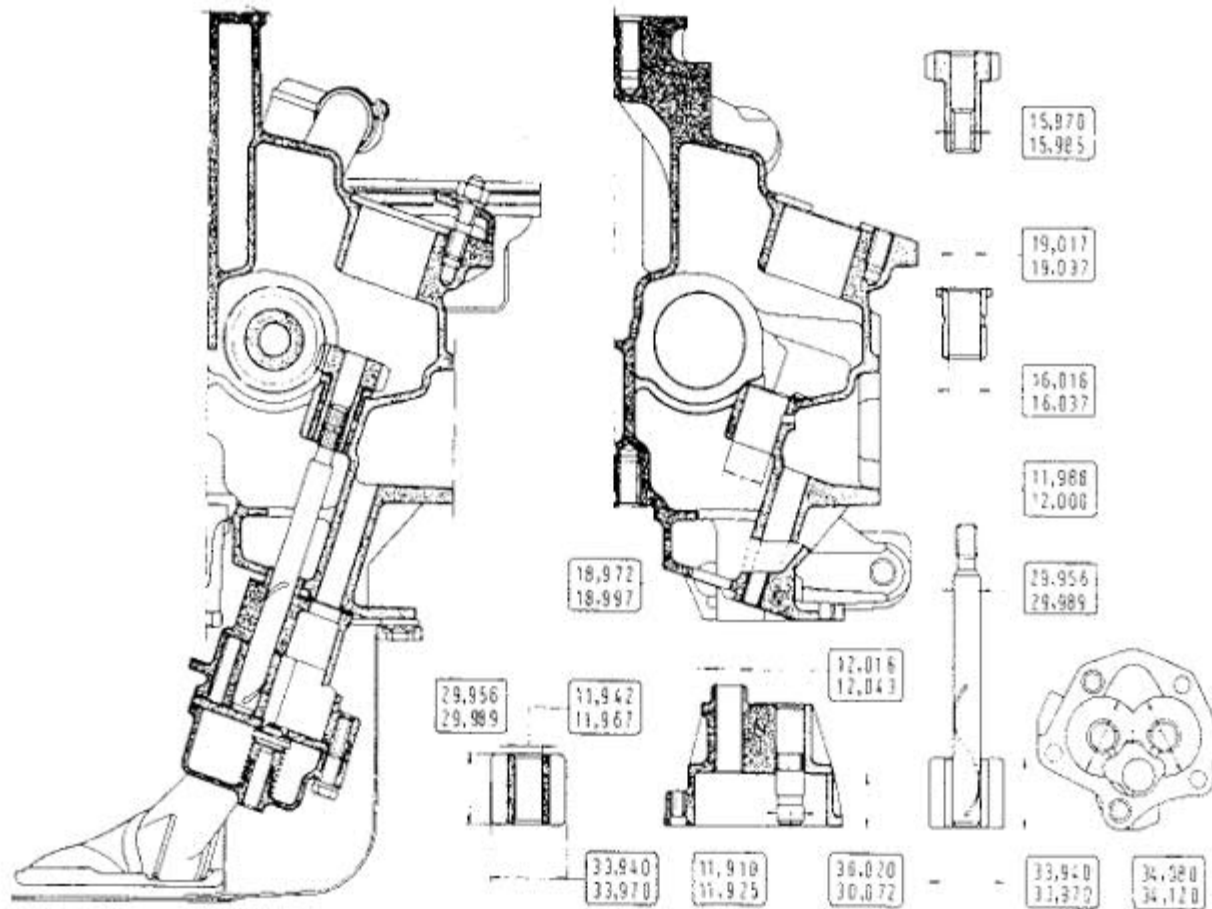


Check clearance between gears and cover mating face. Clearance should be 0.0010 to 0.0051 in. (0.026 to 0.131 mm). Use a straight edge and a feeler gauge.

If clearance fails to meet specifications, replace gears or housing.

1. Straight edge 2. Drive gear 3. Feeler gauge 4. Housing 5. Driven gear





29.956 mm = 1.1793 in  
 29.969 mm = 1.1806 in  
 18.972 mm = .7469 in  
 18.997 mm = .7479 in  
 11.942 mm = .4701 in  
 11.967 mm = .4711 in

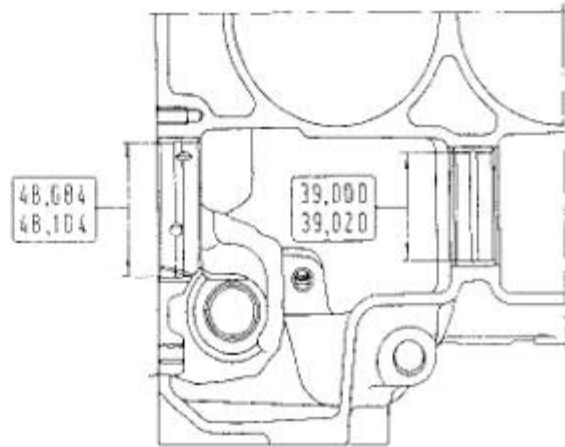
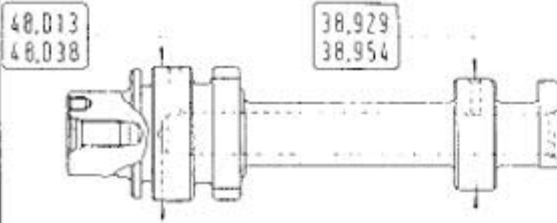
33.940 mm = 1.3362 in  
 33.970 mm = 1.3374 in  
 11.918 mm = .4692 in  
 11.925 mm = .4695 in  
 12.016 mm = .4730 in  
 12.043 mm = .4741 in

30.020 mm = 1.1819 in  
 30.072 mm = 1.1839 in  
 15.970 mm = .6287 in  
 15.985 mm = .6293 in  
 19.017 mm = .7487 in  
 19.037 mm = .7495 in

16.016 mm = .6305 in  
 16.037 mm = .6314 in  
 11.988 mm = .4719 in  
 12.000 mm = .4724 in  
 34.080 mm = 1.3418 in  
 34.120 mm = 1.3433 in

CROSS SECTION THRU OIL PUMP AND MAIN DATA OF OIL PUMP AND DRIVE COMPONENTS

## AUXILIARY SHAFT



## MAIN DATA OF AUXILIARY SHAFT AND BUSHINGS

## REMOVAL AND INSTALLATION

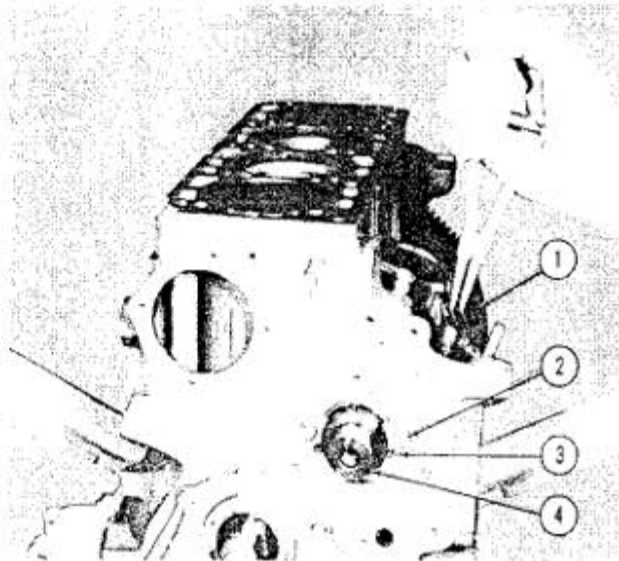
Remove nut, washer, and clamp holding spacer for oil pump in crankcase. Turn auxiliary shaft to raise oil pump gear. Using thin pliers, remove gear. Remove two bolts and washers holding retainer for auxiliary shaft.

Pull shaft out of crankcase.

Inspect shaft journals for scuffing or scoring. If shaft cannot be dressed, replace it.

Fit clearance between journals and bushings should be 0.0018 to 0.0036 in. (0.046 to 0.091 mm).

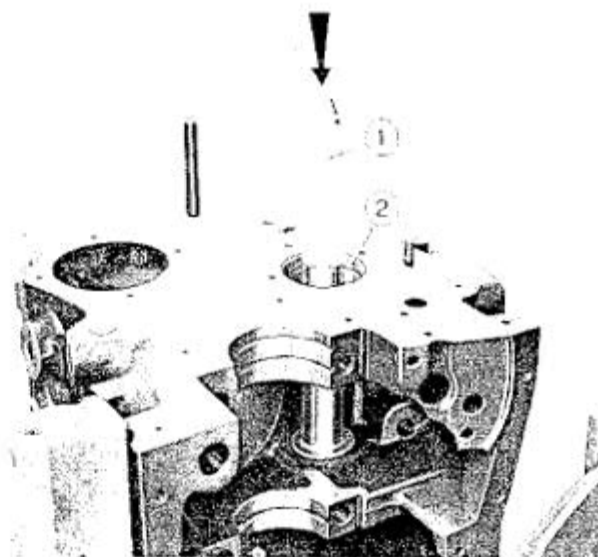
1. Gear 2. Bolts 3. Retainer 4. Auxiliary shaft



## REPLACING AND REAMING AUXILIARY SHAFT BUSHINGS

Press out front and rear bushings. Use tool A.60321/1 for rear bushing and tool A.60321/2 for front bushing.

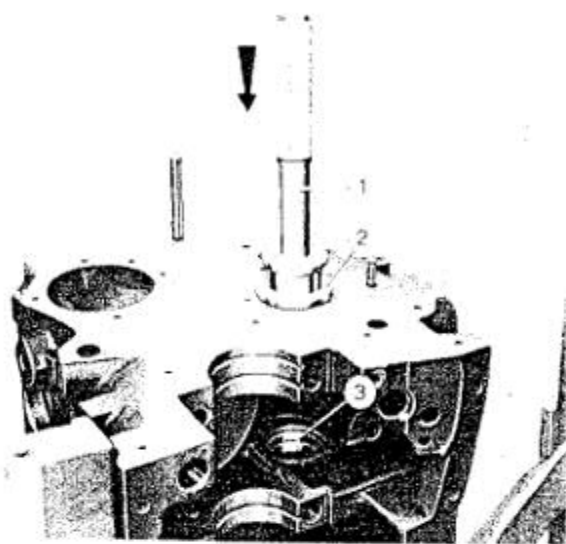
1. Remover and installer 2. Front bushing





When installing new bushings, make sure oil holes in bushing are in line with oil holes in crankcase.

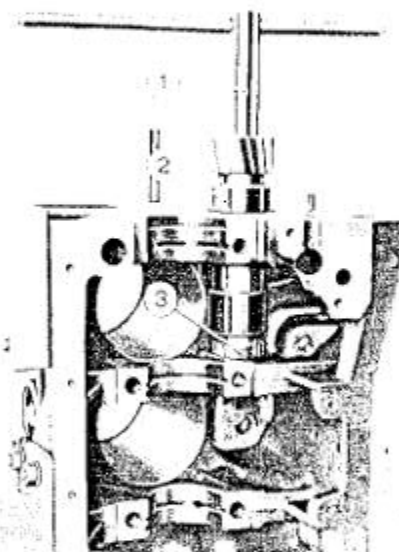
1. Remover and installer 2. Adapter 3. Rear bushing



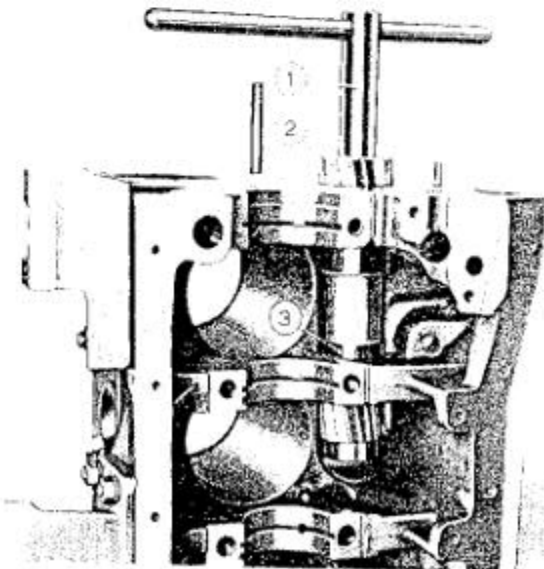
After press fitting bushings, ream bushings to finish size. Refer to Specifications.

Use care to make sure bushings are reamed with correct alignment and squareness of shaft axes.

1. Tool 2. Pilot on front bushing 3. Reamer on rear bushing



1. Tool 2. Reamer on front bushing 3. Pilot on rear bushing



C

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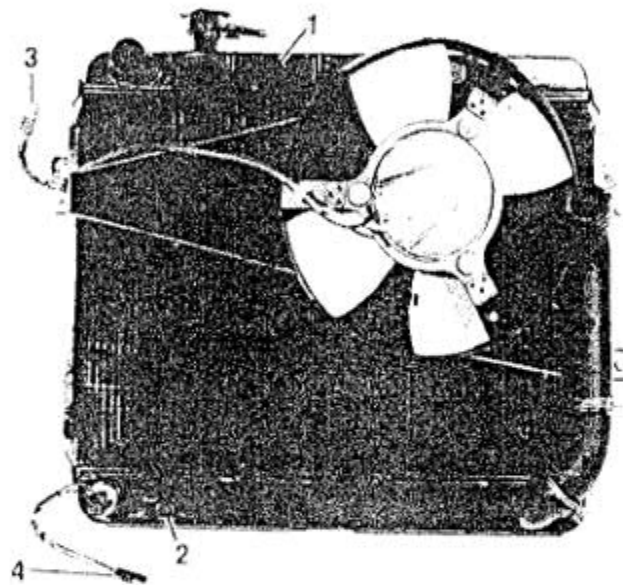
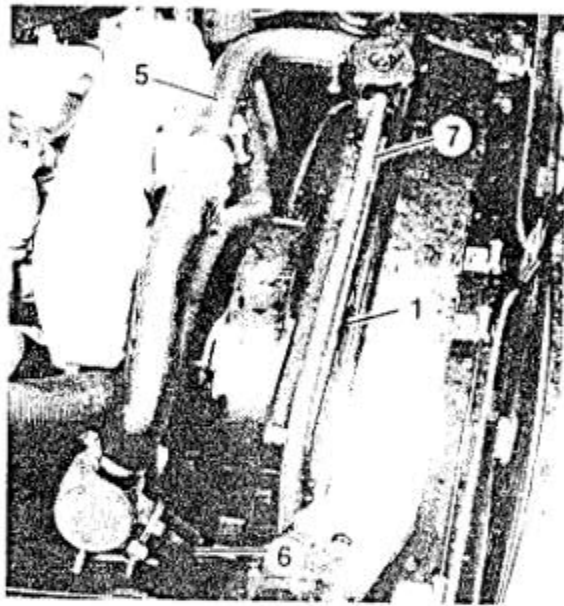
### RADIATOR

#### REMOVAL AND INSTALLATION

From underneath vehicle, remove splash shield. Drain radiator (1) thru plug (2) on lower left side. Disconnect radiator fan connector (3). Disconnect fan thermo switch connector (4). Loosen clamps and disconnect upper (5) and lower (6) radiator hoses. Loosen clamp and disconnect radiator overflow hose (7). On vehicles with automatic transmission disconnect two oil cooling lines at radiator. Remove two nuts, one on each side (arrows), securing radiator to body. Carefully lift radiator/fan assembly out.

**NOTE:** On vehicles with turbocharger and A.C. the fan assembly has been repositioned on the radiator by using spacers. Also the fan shroud has been trimmed to clear radiator. When installing a new radiator be sure to use the spacers to position the fan properly.

1. Radiator 2. Drain plug 3. Connector 4. Connector 5. Upper hose 6. Lower hose 7. Overflow hose



#### TESTING

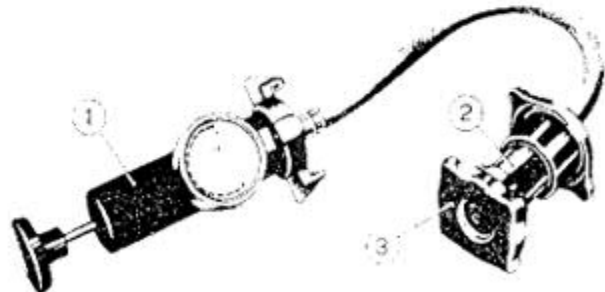
Fill radiator with water.

Attach tester to radiator filler.

Pump in air until pressure of 14 psi is built up. If pressure decreases check for leaks.

Test radiator cap (3) by applying pressure with tester (1) as shown. Check that vent valve opens at 11 psi.

1. Tester 2. Union 3. Radiator cap



**BLEEDING COOLING SYSTEM**

**NOTE:** Whenever cooling system has been drained and refilled, the system must be bled. Since the radiator height is lower than the engine, an air pocket will form in the engine cooling jacket.

Open heater valve. Fill radiator and install radiator cap.

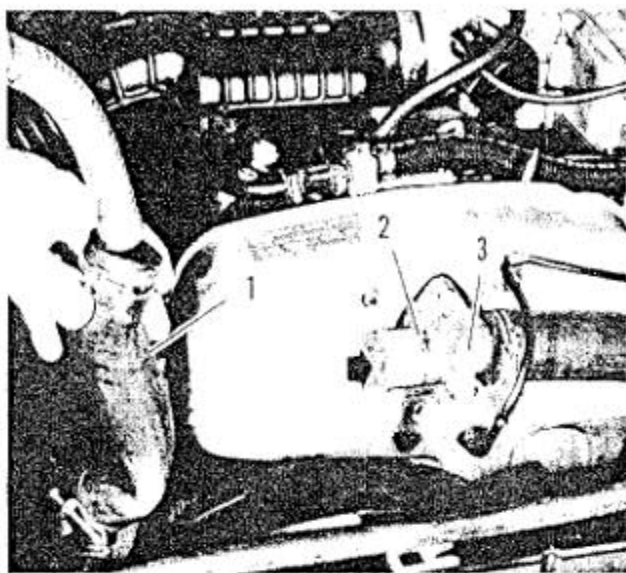
Disconnect water hose (1) from engine "T" housing (2).

Slowly pour coolant into hose (1) until it starts to flow out of housing (arrow). Reconnect hose to housing.

Remove bleed plug (3). Pour coolant into housing (2) until it overflows. Install bleed plug.

Fill expansion tank to "MAX" level and install cap.

1. Water hose 2. Engine "T" housing 3. Bleed plug

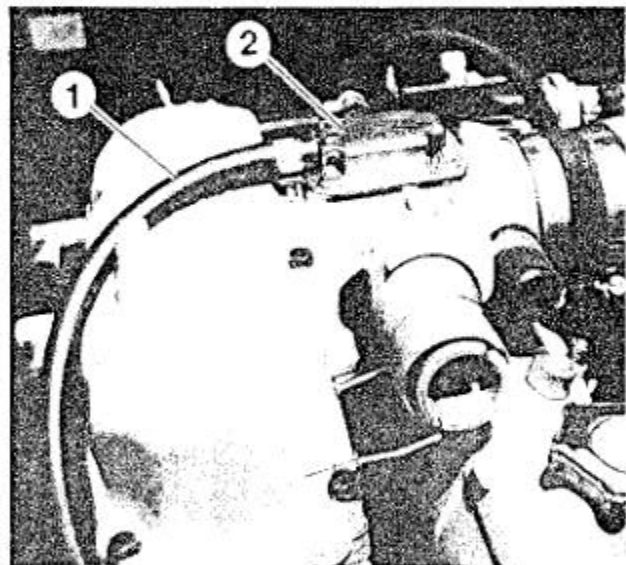


Disconnect hose (1) from throttle plate heater (2). Pour coolant into hose until heater overflows. Reconnect hose.

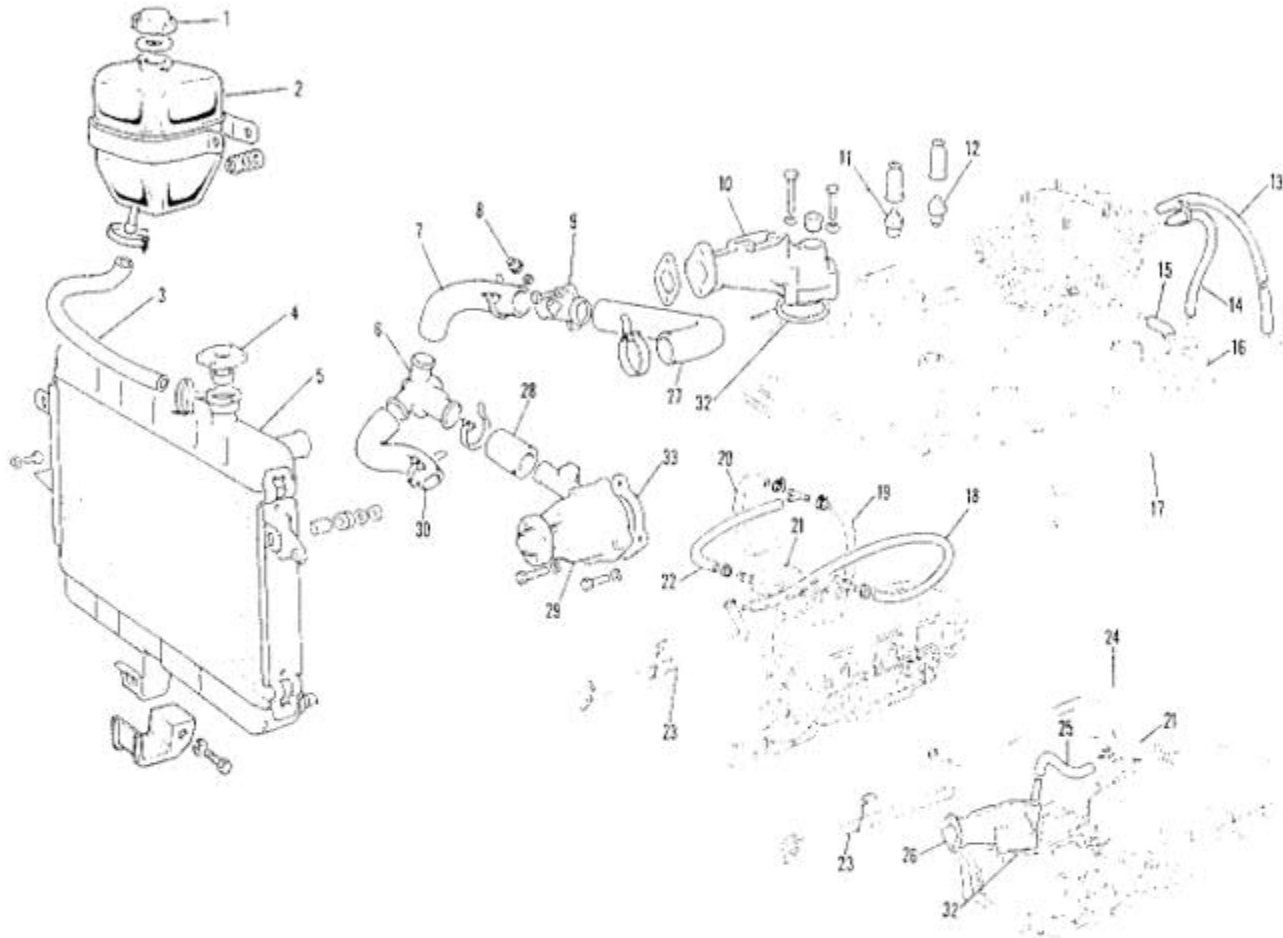
Start and run engine in neutral. If system is completely bled, temperature gauge will rise slowly to operating temperature and radiator will heat up. After passing operating temperature fan will operate. Allow this to occur for at least two fan operating cycles.

**NOTE:** If system is not completely bled, gauge will rise rapidly, radiator will be cool, and fan will not operate even though temperature is above normal. If this occurs, shut engine off and bleed system again.

1. Hose 2. Throttle plate heater

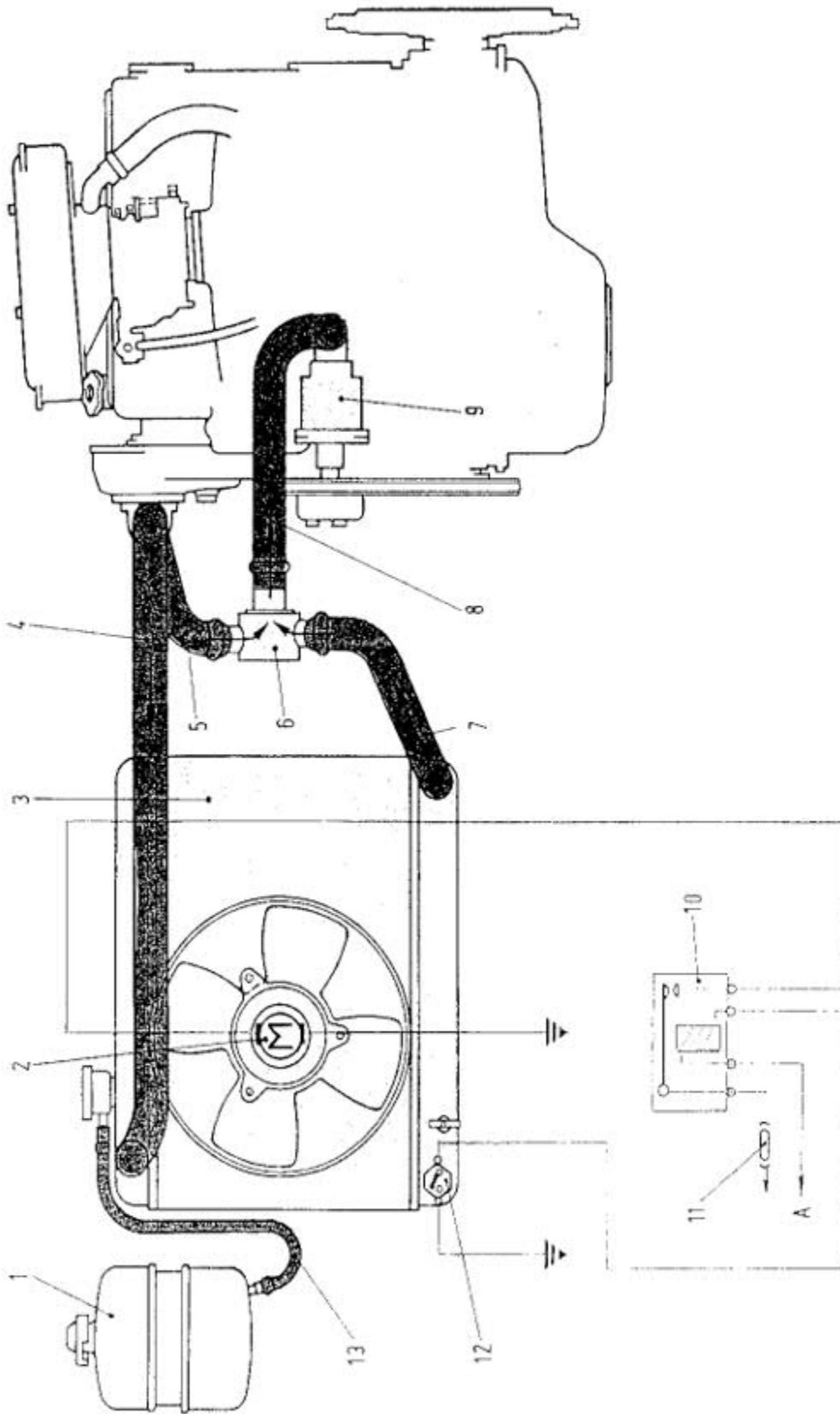


## WATER PUMP AND DUCTS



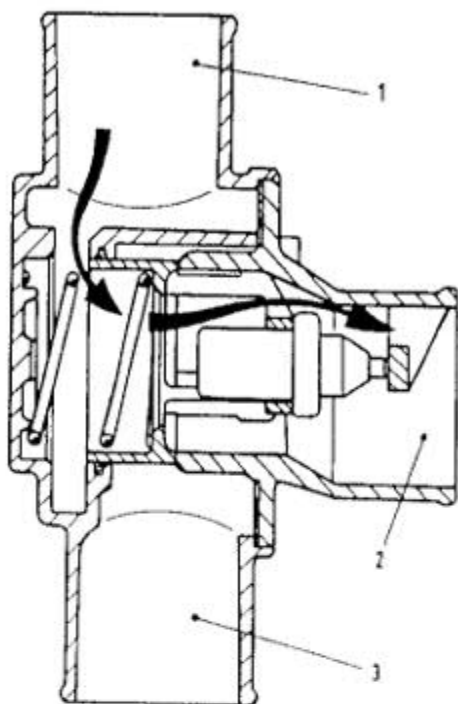
1. Expansion tank cap
2. Expansion tank
3. Overflow hose
4. Radiator cap
5. Radiator
6. Controlled by-pass thermostat
7. Water hose, cylinder head outlet to thermostat
8. Bleed plug
9. Union
10. Water outlet from cylinder head (carburetor version)
11. Temperature sending unit
12. Temperature sending unit
13. Water hose, automatic choke to heater return line
14. Water hose, automatic choke to thermostatic housing
15. Water hose, engine to thermostatic housing
16. Thermostatic housing
17. Heater return line

18. Water hose, throttle plate heater to heater return line
19. Water hose, heater supply line
20. Water hose, heater supply line
21. Throttle plate heater
22. Water hose, throttle plate heater to heater supply line
23. Heater return line
24. Water hose, throttle plate heater to heater return line
25. Water hose, engine to throttle plate heater
26. Water outlet from cylinder head (fuel injection version)
27. Water hose, union to radiator
28. Water hose, water pump to thermostat
29. Water pump
30. Water hose, thermostat to radiator
31. Cooling fan thermostatic switch
32. Gasket
33. Gasket

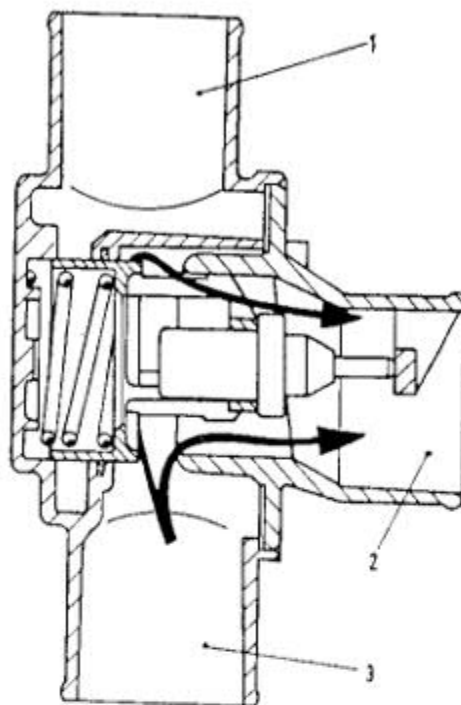


- |                                       |   |                                     |
|---------------------------------------|---|-------------------------------------|
| 1. Expanding tank                     | 5. Water hose from engine to thermostat     | 9. Water pump                       |
| 2. Electrofan motor                   | 6. Controlled-by-pass thermostat            | 10. Electrofan motor relay          |
| 3. Radiator                           | 7. Water hose from radiator to thermostat   | 11. Fuse                            |
| 4. Water hose from engine to radiator | 8. Water hose from thermostat to water pump | 12. Electrofan motor thermal switch |
|                                       |   | 13. Radiator to expansion tank hose |

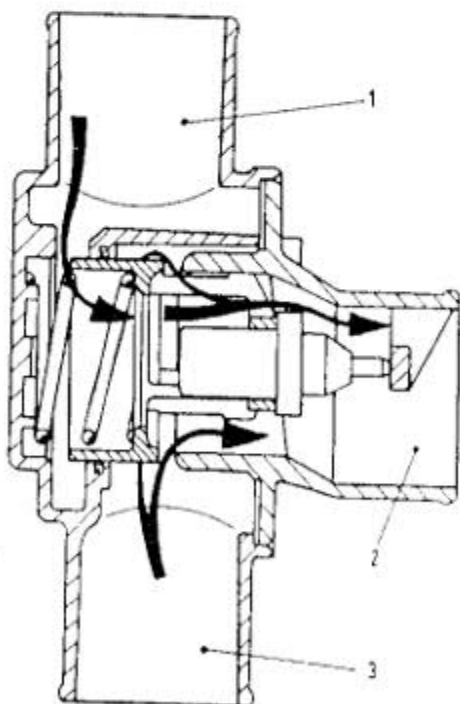
COOLING SYSTEM OPERATIONAL DIAGRAM



CLOSED



FULLY OPEN



PART OPEN

Operational diagrams of controlled-by-pass thermostat for mixing coolant.

1. Thermostat water inlet from engine.
2. Thermostat water outlet to pump.
3. Thermostat water inlet from radiator.

The thermostat must be working properly for good engine performance.

Thermostat should begin opening at 172° to 180° F (78° to 82° C).

Thermostat should be fully open at 198° F (92° C).

Thermostat valve stroke at 198° F (92° C) is 0.29 in. (7.5 mm).

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**WATER PUMP****REMOVAL AND INSTALLATION**

Drain cooling system thru radiator and engine block plug. Plug is located on right side of engine.

Loosen two bolts securing alternator (1). Remove drive belt (2).

Remove three water pump pulley bolts (3) to remove pulley.

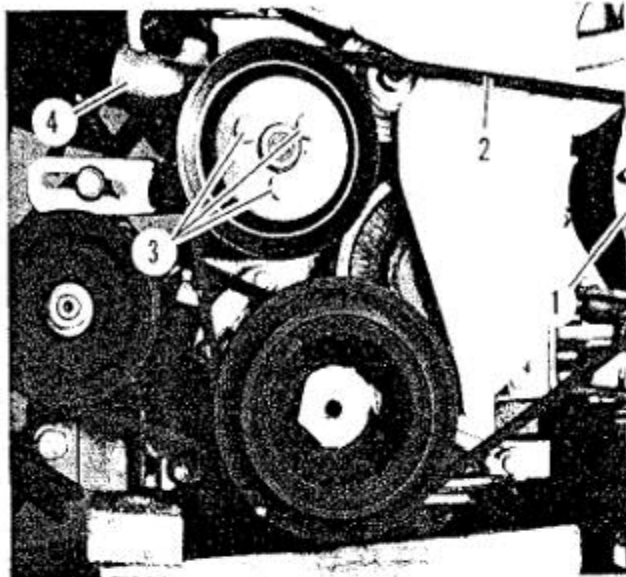
Loosen clamp and remove hose from water pump inlet (4). Remove four bolts to remove pump and gasket.

Remove two nuts and washers securing heater return tube to rear of water pump.

Install in reverse order. Torque water pump bolts to 14 ft. lbs. (2 kgm).

Adjust belt tension.

Refill and bleed cooling system (refer to Radiator section for bleeding procedure).

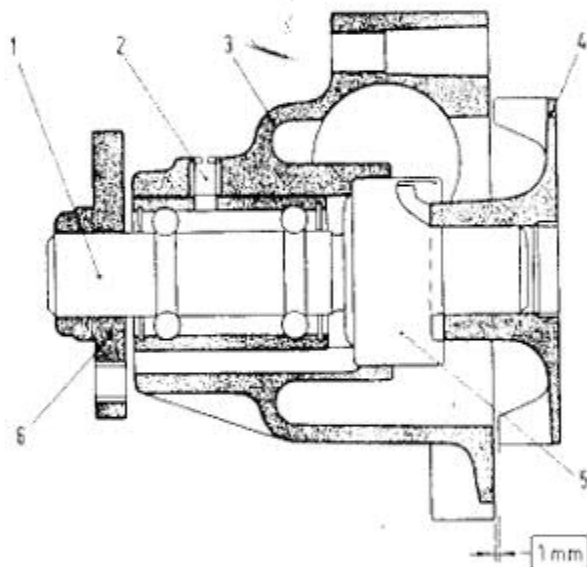


1. Alternator 2. Drive belt 3. Pulley 4. Pump inlet

**Longitudinal Section of Water Pump**

1. Drive shaft and bearing
2. Bearing lock screw on pump housing
3. Pump housing
4. Impeller
5. Packing
6. Pump drive shaft hub

1 mm = 0.04 in. — fit clearance between impeller and pump housing.

**CYLINDER HEAD WATER OUTLET HOUSING****REMOVAL AND INSTALLATION**

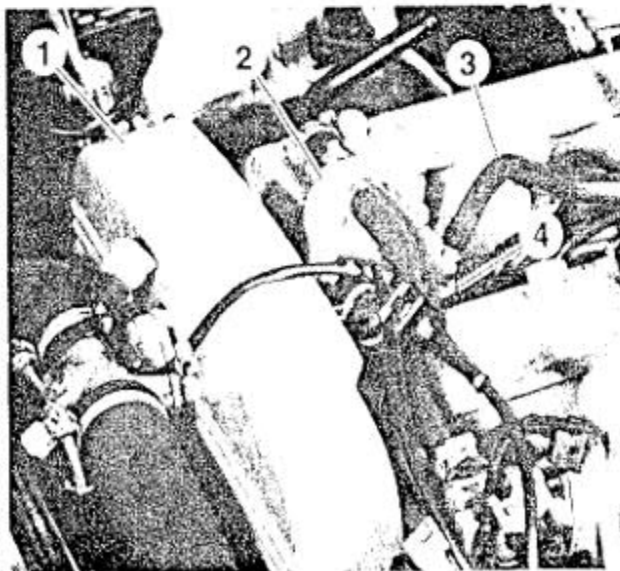
Drain cooling system through engine block plug until level is below top of radiator.

On fuel injected vehicles, remove auxiliary air regulator (2) from housing (4).

Remove clamp holding throttle plate heater hose (3) (if installed), and disconnect hose from housing.

Remove timing belt cover (1). Refer to REPLACING TIMING BELT.

1. Timing belt cover
2. Auxiliary air regulator
3. Heater hose
4. Water outlet housing





# Cooling System

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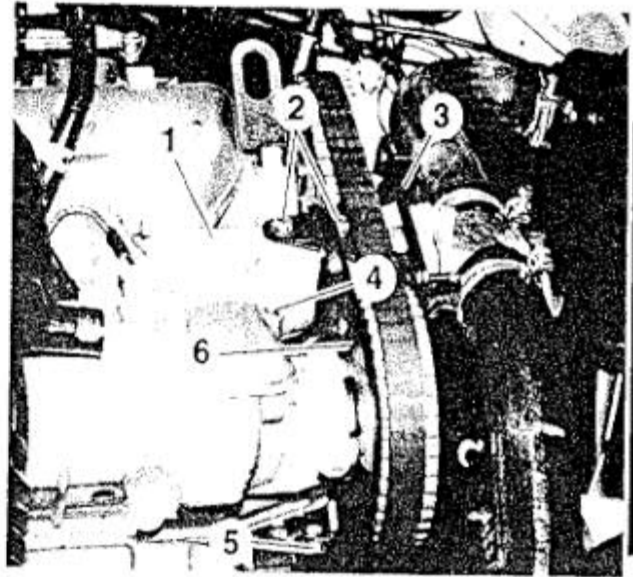
Remove bolt ( ) and washer holding timing belt rear shield ( ) on right side of engine.

Remove two bolts ( ) and washers holding cam timing bracket ( ) and rear shield ( ) to housing ( ).

Remove four bolts ( ) and washers holding housing ( ) to cylinder head. Remove housing and gasket.

Install in reverse order. Use new gaskets.

Refill and bleed cooling system. Refer to RADIATOR section.

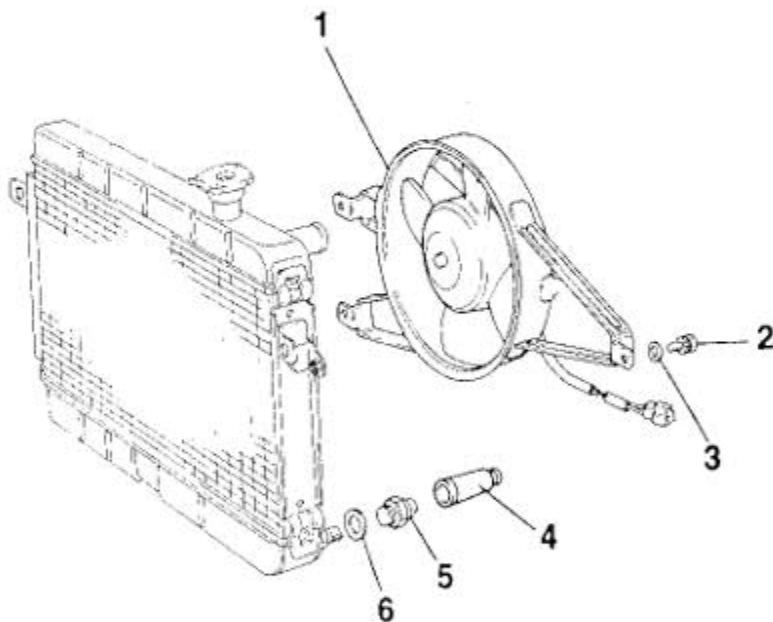
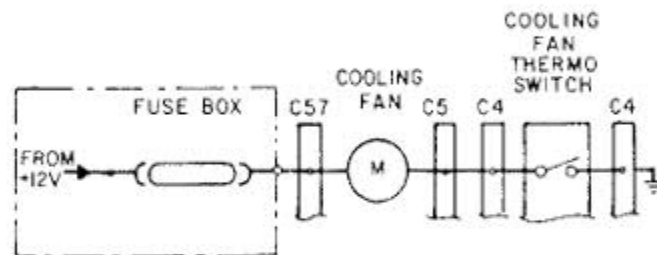


## ELECTRIC FAN OPERATION

When water temperature is 194°F (90°C) or above, the thermostatic switch closes and electric fan operates. The fan continues to run until the temperature drops below 185°F (85°C).

**CAUTION:** Cooling fan can operate with ignition switch in "OFF".

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1. Fan motor and support
2. Bolt and lockwasher
3. Washer
4. Boot
5. Thermostatic switch
6. Gasket

EXPLODED VIEW OF FAN

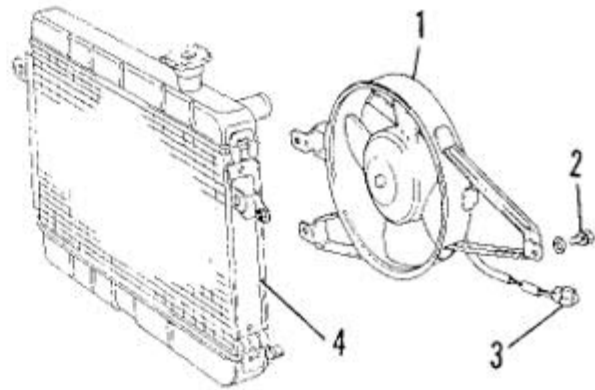
### FAN ASSEMBLY

#### REMOVAL AND INSTALLATION

Disconnect electrical connector (3) located near lower left side of radiator (4).

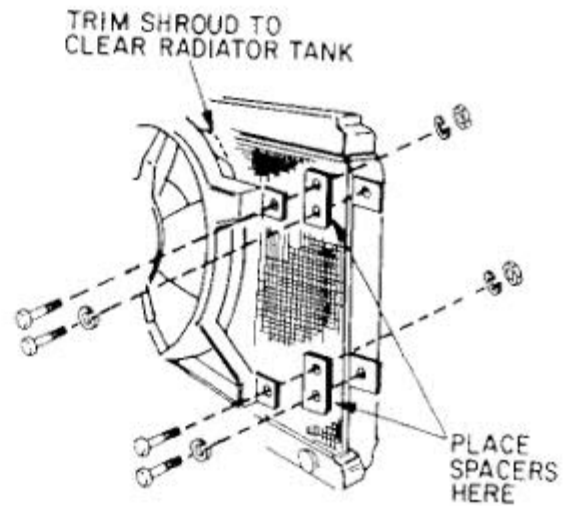
Remove three bolts (2) and washers securing fan assembly (1) to radiator (4).

1. Fan assembly 2. Bolt and lockwasher 3. Electrical connector  
4. Radiator



**NOTE:** On vehicles with turbocharger and A.C., fan assembly is attached to two spacers on right side of radiator.

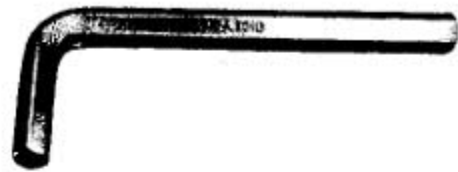
When installing a new fan assembly on a vehicle with turbocharger and A.C., trim shroud to clear top of radiator as shown.





**NOTE:** Number given in parentheses is Kent-Moore catalogue number.

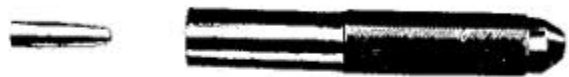
A.50113 (J28152) Wrench, oil sump drain plug



A.60395 (J28078) Remover and installer, valve guide



A.60313/1/2 (J28069) Installer, valve guide oil seal



A.60594 (J28229) Tool, holding tappets while removing plates and timing levers



A.60443 (J28080) Lever, pressing down tappets while timing valves



A.60446 (J28081) Tool, holding camshaft sprocket while tightening bolt



A.87001 (J28151) Remove tappet plates



A.96218 (J28203) Gauge, valve stem height check after seat reconditioning



A.96229 (J28256) Depth gauge, combustion chamber

10-1

A.50149 (J28036) Wrench, cylinder head bolt (17mm)



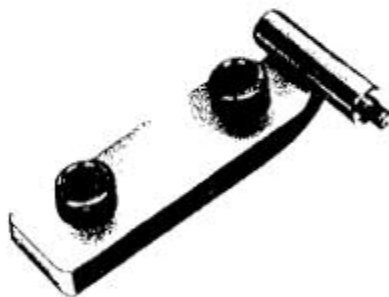
A.95874 (J29821) Fuel pressure gauge (fuel injected engines)



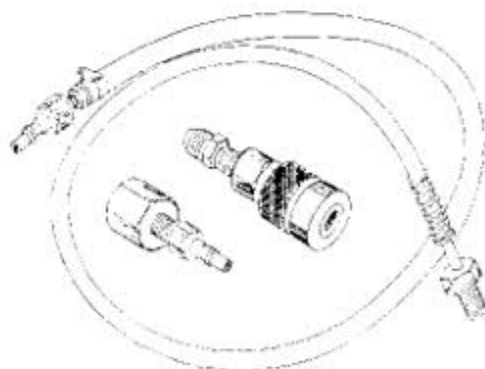
A.33076 (J33076) Turbocharger pressure switches test pump



A.60645 (J28291) Intake cam sprocket holder (1978 and 1980 carbureted engines)



A.4467 (J29820) Exhaust gas analyzer adapter (fuel injected engines)



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# GENERAL INFORMATION - MAINTENANCE - 00

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Chassis Specifications .....	00-6
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Tune-Up Specifications .....	00-15



**SPIDER**





## ENGINE (1975 to 1978)

Type .....	1975/1976 132A1.040.5	1977/1978 132A1.040.6
(with catalytic converter) .....	132A1.031.5	132A1.031.6
Cycle .....	Four-stroke, gasoline	
No. of cylinders .....	Four	
Bore .....	3.31 in. (84 mm)	
Stroke .....	3.12 in. (79.2 mm)	
Displacement .....	107.13 cu. in. (1756 cc)	
Compression ratio .....	8 to 1	
Horsepower rating, S.A.E. net .....	86 HP	
at .....	6200 rpm	
Horsepower rating, S.A.E. net (catalytic converter version) .....	83 HP	
at .....	5800 rpm	
Torque rating, S.A.E. net .....	90 ft. lbs.	
at .....	2800 rpm	
Torque rating, S.A.E. net (catalytic converter version) .....	86 ft. lbs.	
at .....	2800 rpm	
Arrangement .....	Front in line	
Valve arrangement .....	Overhead valves. Twin overhead camshafts driven by toothed timing belt with tensioner.	
Valve Timing:		
Intake		
Opens .....	5° B.T.D.C.	
Closes .....	53° A.B.D.C.	
Exhaust		
Opens .....	53° B.B.D.C.	
Closes .....	5° A.T.D.C.	
Valve clearance:		
- for checking valve timing .....	0.031 in. (0.80 mm)	
- operation clearance, engine cold:		
Intake .....	0.018 in. (0.45 mm)	
Exhaust .....	0.020 in. (0.50 mm)	

# General Information

00

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## ENGINE (1979)

Type	
49 State version .....	132C2.040
California version .....	132C2.031
Cycle .....	Four-stroke, gasoline
No. of cylinders .....	Four
Bore .....	3.31 in. (84 mm)
Stroke .....	3.54 in. (90 mm)
Displacement .....	121.74 cu. in. (1995 cc)
Compression ratio .....	8.1 to 1
Horsepower rating, S.A.E. net at rpm	
49 State version .....	86 HP at 5100 rpm
California version .....	80 HP at 5000 rpm
Torque rating, S.A.E. net at rpm	
49 State version .....	104.3 ft. lbs. at 3000 rpm
California version .....	100.0 ft. lbs. at 3000 rpm
Arrangement .....	Front in line
Valve arrangement .....	Overhead valves. Twin overhead camshafts driven by toothed timing belt with tensioner.
Valve timing:	
Intake	
Opens .....	5° B.T.D.C.
Closes .....	53° A.B.D.C.
Exhaust	
Opens .....	53° B.B.D.C.
Closes .....	5° A.T.D.C.
Valve clearance:	
For checking valve timing .....	0.031 in. (0.80 mm)
Operating clearance, engine cold	
Intake .....	0.018 in. (0.45 mm)
Exhaust .....	0.020 in. (0.50 mm)

## ENGINE (1980)

Type	
Carburetor version .....	132C3.040
Fuel injected version .....	132C3.031
Cycle .....	Four-stroke, gasoline
No. of cylinders .....	Four
Bore .....	3.31 in. (84 mm)
Stroke .....	3.54 in. (90 mm)
Displacement .....	121.74 cu. in. (1995 cc)
Compression ratio .....	8.1 to 1
Horsepower rating, S.A.E. net at rpm	
Carburetor version .....	80 HP at 5000 rpm
Fuel injected version .....	102 HP at 5500 rpm
Torque rating, S.A.E. net at rpm	
Carburetor version .....	100 ft. lbs. at 3000 rpm
Fuel injected versions .....	110 ft. lbs. at 3000 rpm
Arrangement .....	Front in line
Valve arrangement .....	Overhead valves. Twin overhead cam- shafts driven by toothed timing belt with tensioner.
Valve timing:	
Intake	
Opens .....	5° B.T.D.C.
Closes .....	53° A.B.D.C.
Exhaust	
Opens .....	53° B.B.D.C.
Closes .....	5° A.T.D.C.
Valve clearance:	
For checking valve timing .....	0.031 in. (0.80 mm)
Operating clearance, engine cold	
Intake .....	0.018 in. (0.45 mm)
Exhaust .....	0.020 in. (0.50 mm)

# General Information

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## ENGINE (1981 and 1982)

Type	
Fuel injected version and turbocharged version . . . . .	132C3.031
Cycle . . . . .	Four-stroke, gasoline
No. of cylinders . . . . .	Four
Bore . . . . .	3.31 in. (84 mm)
Stroke . . . . .	3.54 in. (90 mm)
Displacement . . . . .	121.74 cu. in. (1995 cc)
Compression ratio . . . . .	8.1 to 1
Horsepower rating, S.A.E. net at rpm	
Turbocharged version . . . . .	120 HP at 6000 rpm
Fuel injected version . . . . .	102 HP at 5500 rpm
Torque rating, S.A.E. net at rpm	
Turbocharged version . . . . .	130 ft. lbs. at 3600 rpm
Fuel injected version . . . . .	110 ft. lbs. at 3000 rpm
Arrangement . . . . .	Front in line
Valve arrangement . . . . .	Overhead valves. Twin overhead cam- shafts driven by toothed timing belt with tensioner.
Valve timing:	
Intake	
Opens . . . . .	5° B.T.D.C.
Closes . . . . .	53° A.B.D.C.
Exhaust	
Opens . . . . .	53° B.B.D.C.
Closes . . . . .	5° A.T.D.C.
Valve clearance:	
For checking valve timing . . . . .	0.031 in. (0.80 mm)
Operating clearance, engine cold	
Intake . . . . .	0.018 in. (0.45 mm)
Exhaust . . . . .	0.020 in. (0.50 mm)

## FUEL SYSTEM

### Carburetor Version

Vertical, dual-barrel downdraft WEBER carburetor with differential opening of the secondary throttle, automatic butterfly valve choke and idle stop solenoid.

Enrichment system consists of mechanical and vacuum assisted accelerator pumps and a power valve.

Carburetor fed by mechanical pump. Fuel filter installed in fuel line between fuel pump and carburetor.

Carburetor equipped with thermostatic air cleaner containing paper cartridge element.

### Fuel Injection Version

Electronically controlled fuel injection with engine and exhaust sensors supplying information to the electronic control unit to optimize the fuel/air mixture in all engine operating conditions.

Four injectors, one per cylinder and a cold start valve, all supplied at constant fuel pressure.

Fuel flow controlled by variation in opening time of injectors.

An air flow sensor to measure air flow variation.

Air cleaner with paper cartridge installed before air flow sensor.

## LUBRICATION SYSTEM

Forced circulation by gear pump.

Pressure limiter valve on delivery circuit. Normal lubrication pressure at rated engine rpm and oil temperature 50 to 71 psi (3.5 to 5 kg/cm<sup>2</sup>).

Full-flow cartridge oil filter.

## COOLING SYSTEM

Radiator and translucent expansion tank. Water circulated by centrifugal pump.

Thermostat with controlled by-pass on cylinder head water outlet duct.

Four-blade fan driven by electric motor controlled by thermostatic switch on radiator: cut-in temperature about 194°F (90°C).

## EMISSION CONTROL SYSTEMS

Engine fuel system provided with fuel recirculation (closed circuit) and evaporative emission control system.

Crankcase emission control (CEC) system (closed circuit) by recirculation of blow-by gases and oil vapors.

Exhaust emission control system separate from CEC system. System reduces air pollution from exhaust by gas recirculation, post-combustion processes and catalytic converter.

## CHASSIS

### CLUTCH

Single-plate, dry, with disc spring mechanically controlled.

### TRANSMISSION

Manual transmission: five forward speeds (all synchronized) and reverse.

Automatic transmission: three forward speeds and reverse, fully automatic.

Gear Ratios	Manual			Automatic
	1975-1978	1979-1980	1981-1982	
First	3.667	3.612	3.667	2.4 to 1
Second	2.1	2.045	2.1	1.48 to 1
Third	1.361	1.357	1.361	1 to 1
Fourth	1	1	1	—
Fifth	0.881	0.830	0.881	—
Reverse	3.526	3.244	3.244	1.92 to 1

### PROPELLER SHAFT

Dual, center pillow with ball bearing mounted on rubber cushion. Universal joints at rear section. Flexible joint at transmission end.

### REAR AXLE

Semi-floating.

Hypoid final drive.

Gear ratio: 4.30 to 1 (10/43) — 1975 to 1978

3.58 to 1 (12/43) — Automatic Trans.

3.90 to 1 (10/39) — Manual Trans. 1979 and up

### STEERING

Worm screw and roller type.

Ratio: 1/16.4

Turning circle diameter: 34 ft. 2 in. (10.4 m)

Steering column of the break-away mount type with two universal joints. Independent and symmetric track rods to each wheel. Sealed-for-life joints. Hydraulic, double-acting damper on relay support.

## BRAKES

Hydraulically operated by pedal through vacuum servo and tandem master cylinder.

Disk type, with floating caliper and one cylinder to each wheel.

Independent front and rear circuits.

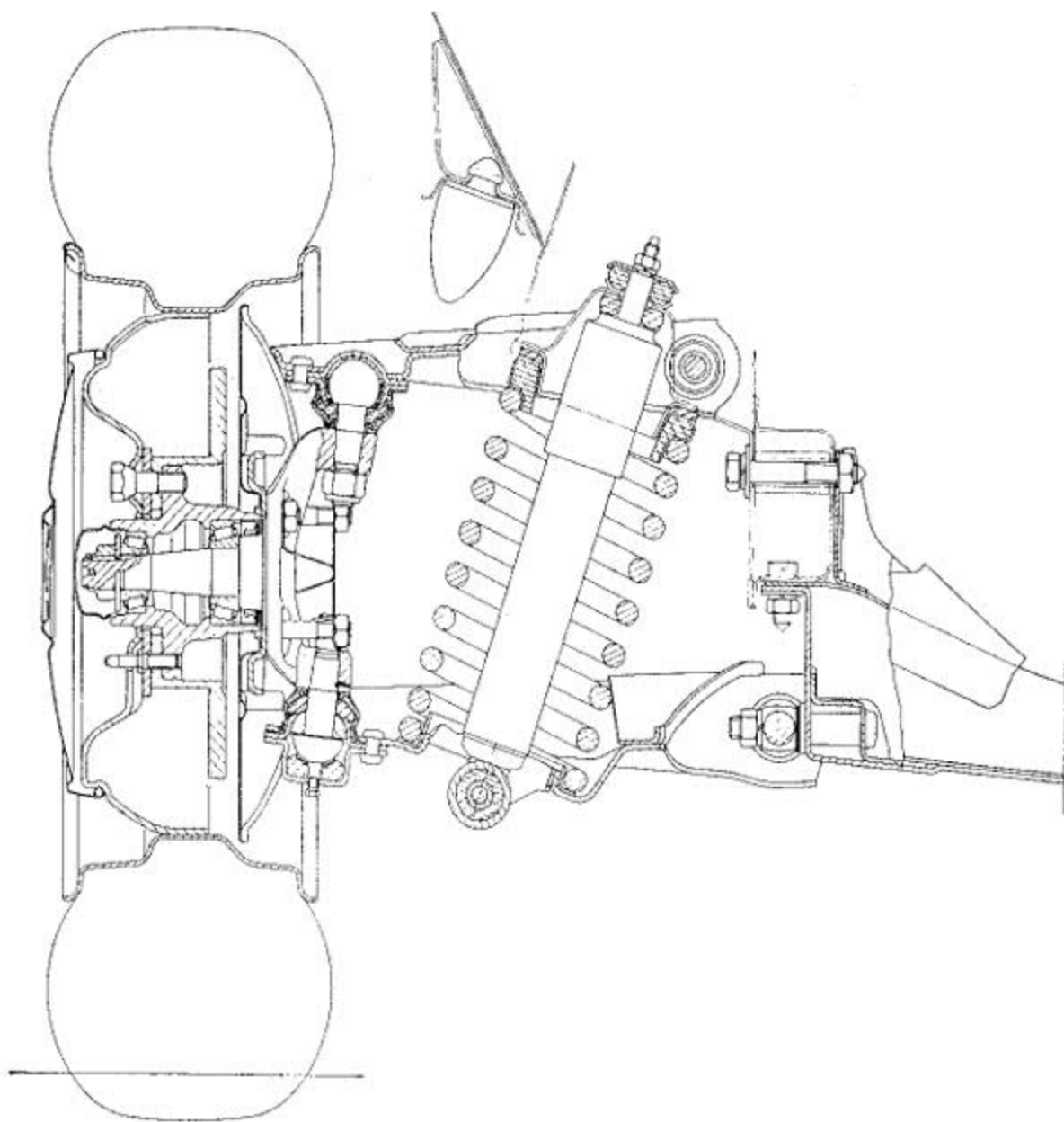
Proportioning valve in rear circuit for car load and deceleration rate variation compensations.

Device for automatic wear take-up.

Parking hand brake acting on rear brakes.

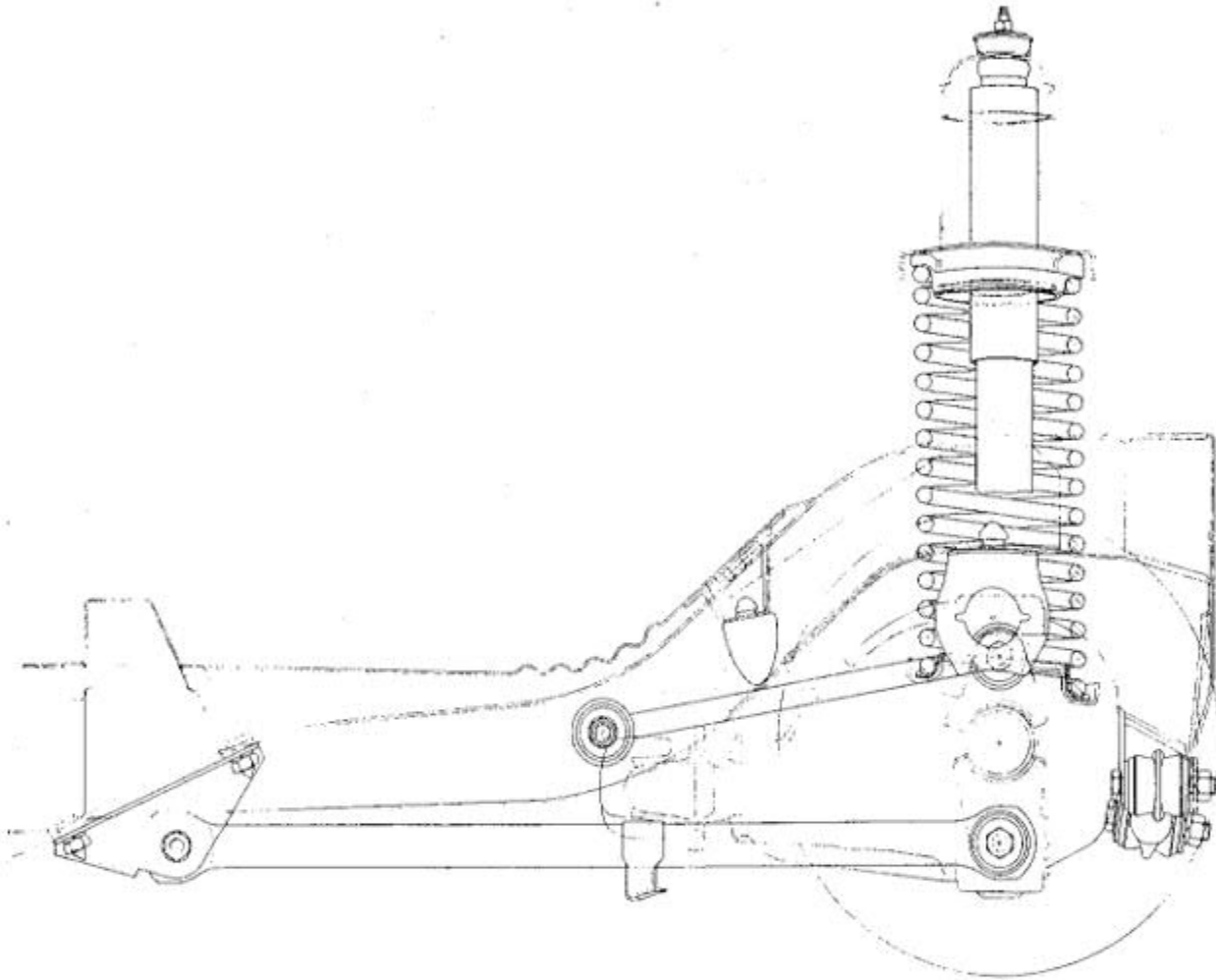
## FRONT SUSPENSION

Independent wheels, by swinging arms, with coil springs and hydraulic, double-acting telescopic shock absorbers. Stabilizer bar. Sealed-for-life articulations.



## REAR SUSPENSION

By rigid axle anchored to body through 5 reaction rods – 4 longitudinal and 1 transversal. Coil springs, hydraulic double-acting telescopic shock absorbers. Asymmetric wheel motions stabilized by elastic mounts of reaction rods.



## WHEELS AND TIRES

Disk wheels, ventilated, with rim size . . . . . 5 J x 13"  
 Radial-ply tires, size . . . . . 165 SR-13"

or

Alloy wheels, ventilated, with rim size . . . . . 5.5 J x 14"  
 Radial-ply tires, size . . . . . R 185/60-14"

## ELECTRICAL SYSTEM

### 1975 to 1977

Voltage . . . . . 12 Volts

#### Alternator

Continuous current rating . . . 44 Amps  
Incorporated current rectifiers.  
Automatic voltage regulator.  
Cut-in speed at starting of engine (with users off).

#### Battery

With grounded negative; capacity at 20-hr discharge rate . . . . 60 Amp. hr.  
Cold (-18°C) high-discharge test current . . . . . 255 Amp.

#### Starter

Power rating . . . . . 1.3 kW  
Direct engagement by solenoid and free-wheeling pinion.

#### Heater Fan Motor

Power rating . . . . . 20 W

#### Engine Radiator Fan Motor

Power rating . . . . . 110 W

#### Windshield Wiper Motor

Power rating . . . . . 28 W

#### Ignition System (1975 & 1976)

Firing order . . . . . 1-3-4-2  
Basic ignition timing at

850 rpm . . . . . 0° (TDC)

Automatic advance . . . . . 36°

Dwell angle, for distributor contacts gap check

(at 850 ± 50 rpm) . . . . . 55°

Breaker additional points gap .31 - .49 mm (.012 - .019 in.)

Spark Plugs: CHAMPION N 7 Y or AC DELCO 41-42 XLS or MARELLI CW 78 LP

Thread size . . . . . 14 x 1.25 mm

Gap . . . . . .5-.7 mm (.020-.027 in.)

### 1978 to 1980

Voltage . . . . . 12 Volts

#### Alternator

Continuous current rating . . . 55 Amps  
Incorporated current rectifiers.  
Automatic voltage regulator.  
Cut-in speed at starting of engine (with users off).

#### Battery

With grounded negative; capacity at 20-hr discharge rate . . . . 60 Amp. hr.  
Cold (-18°C) high-discharge test current . . . . . 255 Amp.

#### Starter

Power rating . . . . . 1.3 kW  
Direct engagement by solenoid and free-wheeling pinion.

#### Heater Fan Motor

Power rating . . . . . 20 W

#### Engine Radiator Fan Motor

Power rating . . . . . 110 W

#### Windshield Wiper Motor

Power rating . . . . . 28 W

#### Ignition System (1977 & 1978)

Firing order . . . . . 1-3-4-2  
Basic ignition timing at

850 rpm . . . . . 0° (TDC)

Automatic advance . . . . . 36°

Dwell angle, for distributor contacts gap check

(at 850 ± 50 rpm) . . . . . 55°

Breaker additional points gap .31 - .49 mm (.012 - .019 in.)

Spark Plugs: Standard Type: CHAMPION N9 Y AC DELCO 42-XLS MARELLI CW 7LP BOSCH W175 T30

Resistor Type: CHAMPION RN9 Y AC DELCO R42-XLS MARELLI CW 7LPR BOSCH W175 TR30

Thread size . . . . . 14 x 1.25 mm

Gap:

Standard type - .6 to .7 mm (.023-.027 in.)

Resistor type - .7 to .8 mm (.027-.031 in.)

### 1981 and ON

Voltage . . . . . 12 Volts

#### Alternator

Continuous current rating . . . 65 Amps  
Incorporated current rectifiers.  
Automatic voltage regulator.  
Cut-in speed at starting of engine (with users off).

#### Battery

With grounded negative; capacity at 20-hr discharge rate . . . . 60 Amp.hr.  
Cold (-18°C) high-discharge test current . . . . . 255 Amp.

#### Starter

Power rating . . . . . 1.3 kW  
Direct engagement by solenoid and free-wheeling pinion.

#### Heater Fan Motor

Power rating . . . . . 20 W

#### Engine Radiator Fan Motor

Power rating . . . . . 110 W

#### Windshield Wiper Motor

Power rating . . . . . 28 W

#### Ignition System (1979 and on)

Firing order . . . . . 1-3-4-2  
Electronic, with inductive discharge ignition distributor.

Basic ignition timing at 800 to 850 rpm (manual transmission), at 700 to 750 rpm (automatic transmission)

Automatic advance . . . . . 10° ± 1.5 BTDC

Spark Plugs:

Standard Type: CHAMPION N9 Y AC DELCO 42-XLS MARELLI CW 7LP FIAT 1L4J BOSCH W 7D

Resistor Type: CHAMPION RN9 Y or RN1 OY AC DELCO R42-XLS or R43 - XLS MARELLI CW 7LPR or CW 67 LPR FIAT 1L4JR BOSCH WR7D or WR7D2

Thread size . . . . . 14 x 1.25 mm

Gap:

Standard type - .6 to .7 mm (.023-.027 in.)

Resistor type - .7 to .8 mm (.027-.031 in.)



PERFORMANCE

(1975 to 1978)

(1979 and On)

Speeds

Maximum speeds after break-in, fully laden:

	m.p.h.
1st gear . . . . .	28
2nd gear . . . . .	50
3rd gear . . . . .	75
4th gear . . . . .	102
5th gear, over . . . . .	105

Gradeability

Maximum grades climbable, fully laden:

1st gear . . . . .	50%
2nd gear . . . . .	25%
3rd gear . . . . .	15%
4th gear . . . . .	10%
5th gear . . . . .	8%

WEIGHTS

- Curb weight . . . . . 2,250 lbs.
- Vehicle load capacity (total 430 lbs.):  
2 adults (300 lbs.) + 130 lbs. of luggage
- Gross weight (fully laden) . . . . . 2,680 lbs.
- Designated seating capacity . . . . . 2 persons
- Occupant distribution . . . . . 2 in front

Speeds

Maximum speeds after break-in, fully laden:

	Manual Trans.	Auto. Trans.
1st gear . . . . .	28	47
2nd gear . . . . .	50	76
3rd gear . . . . .	76	103
4th gear . . . . .	104	
5th gear, over . . . . .	105	

Gradeability

Maximum grades climbable, fully laden:

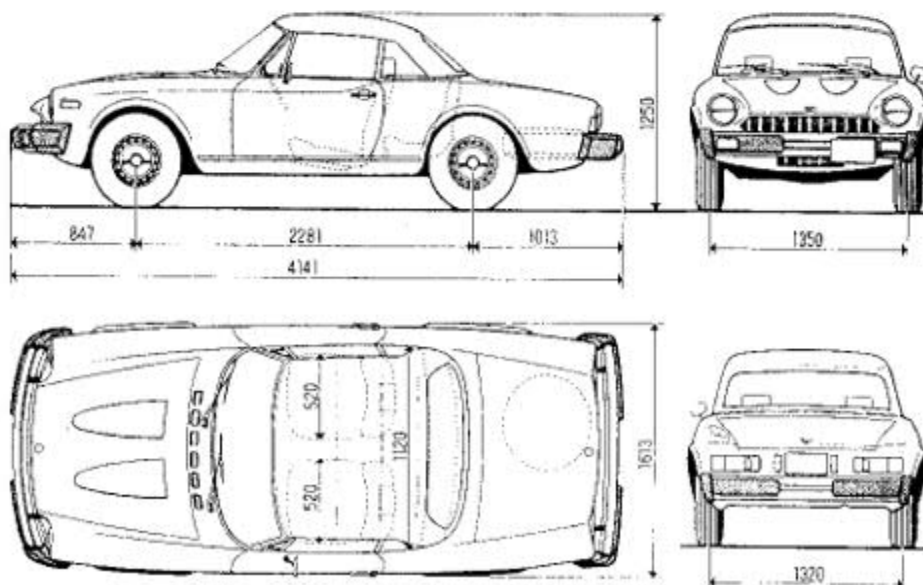
	%	%
1st gear . . . . .	48	48
2nd gear . . . . .	29	30
3rd gear . . . . .	17	20
4th gear . . . . .	12	
5th gear . . . . .	9	

WEIGHTS

- Curb weight: Manual . . . . . 2,360 lbs.
- Automatic . . . . . 2,400 lbs.
- Vehicle load capacity (total 430 lbs.):  
2 adults (300 lbs.) + 130 lbs. of luggage
- Gross weight: Manual . . . . . 2,790 lbs.
- (fully laden) Automatic . . . . . 2,830 lbs.
- Designated seating capacity . . . . . 2 persons
- Occupant distribution . . . . . 2 in front

MAIN DIMENSIONS (ALL)

mm	520	847	1,013	1,120	1,250	1,320	1,350	1,613	2,281	4,141
in.	20.5	33.4	39.9	44	49.2	52	53.2	63.5	89.7	163



Overall height is measured with unladen car. Trunk volume: 180 cu. cm. (6.4 cu. ft.).

# General Information

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## CAPACITIES

UNIT	QUANTITY			REFILL
	lt	kg	U.S. Units	
Fuel tank	43	—	11.4 gals.	Leaded (no catalytic converter) or unleaded gasoline with octane rating of at least 91 (Research Method)
Radiator, cylinder jackets and heating system	8		8.5 qts.	Use 50-50 antifreeze and water mixture
Engine sump and filter (*)	4.125	3.75	4.25 qts.	See table below
Transmission				
Manual	1.65	1.50	1.75 qts.	SAE 80W/90 oil (not EP) containing special anti-wear additives.
Automatic	2.8	2.5	3.0 qts.	DEXRON automatic transmission fluid (**)
Rear axle	1.30	1.20	1.40 qts.	SAE 80W/90 EP oil
Steering box	0.215	0.195	0.40 pts.	SAE 80W/90 EP oil ATF type A (suffix A)
Hydraulic brake circuits	0.38	0.38	0.40 pts.	DOT 3 motor vehicle brake fluid to F.M.V.S. No. 116
Windshield washer bottle	Temperature		Solvent in bottle	
	above 32°F (0°C)		3%	Pure water plus high quality windshield washer solvent
	down to 14°F (-10°C)		50%	
	below 14°F (-10°C)		100%	
Engine oil usage, temperature		Unigrade oil	Multigrade oil	
Below 5°F (-15°C)		VS10W (SAE 10W)	—	
5°F (-15°C) to 32°F (0°C)		VS20W (SAE 20W)	VS15W-40 (SAE 15W-40)	
32°F (0°C) to 95°F (35°C)		VS30 (SAE 30)	VS15W-40 (SAE 15W-40)	
Above 95°F (35°C)		VS40 (SAE 40)	VS15W-40 (SAE 15W-40)	

(\*) Total capacity including sump, filter and lines is 5½ qts. Amount indicated in table is the requirement for periodic oil changes.

(\*\*) Fluid refill quantity for new or overhauled transmission is 6 qts.

## LUBRICATION SPECIFICATIONS

FIAT TYPE	INTERNATIONAL DESIGNATION	APPLICATION
VS	Low ash content detergent oil API service SE, CC to MIL-L-46152 and the European sequence.	Engine
ZC 90	SAE 80W/90 oil (not EP) with anti-wear additives.	Manual transmission
GI/A	ATF - DEXRON type	Automatic transmission
W 90/M	SAE 80W/90 EP oil to MIL-L-2105B	Rear axle Manual steering box
Jota 1	Lithium-base grease N.L.G.I. No. 1	Seat rails
MR 3	Lithium-base grease N.L.G.I. No. 3	Starter, ball joints, front wheel bearings

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## TUNE-UP

This section contains information needed to perform a tune-up of the engine. Perform the tasks in this section according to the MAINTENANCE chart.

Example: If doing tune-up at 7,500 miles, check spark plugs. If doing tune-up at 15,000 miles, change spark plugs.

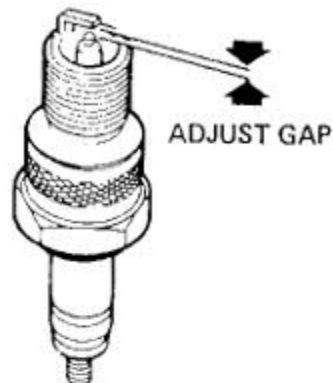
### SPARK PLUGS

Remove plugs. Inspect plugs for condition. Clean or replace plugs.

Adjust plug gap.

Gap	Normal	Resistor
	0.023 to 0.027 in. (0.6 to 0.7 mm)	0.027 to 0.031 in. (0.7 to 0.8 mm)

**NOTE:** If checking tappet clearance, leave plugs out until clearance is adjusted.



### TAPPET CLEARANCE (Engine Cold)

#### Fuel Injected and Turbocharged Engines

Loosen clamps (1) on molded air intake line (2) and remove line (on turbocharged engines, remove air plenum).

Disconnect line (3) to auxiliary air regulator (4). Remove two bolts holding auxiliary air regulator to cylinder head.

Disconnect coolant line (5) at throttle plate heater (6).

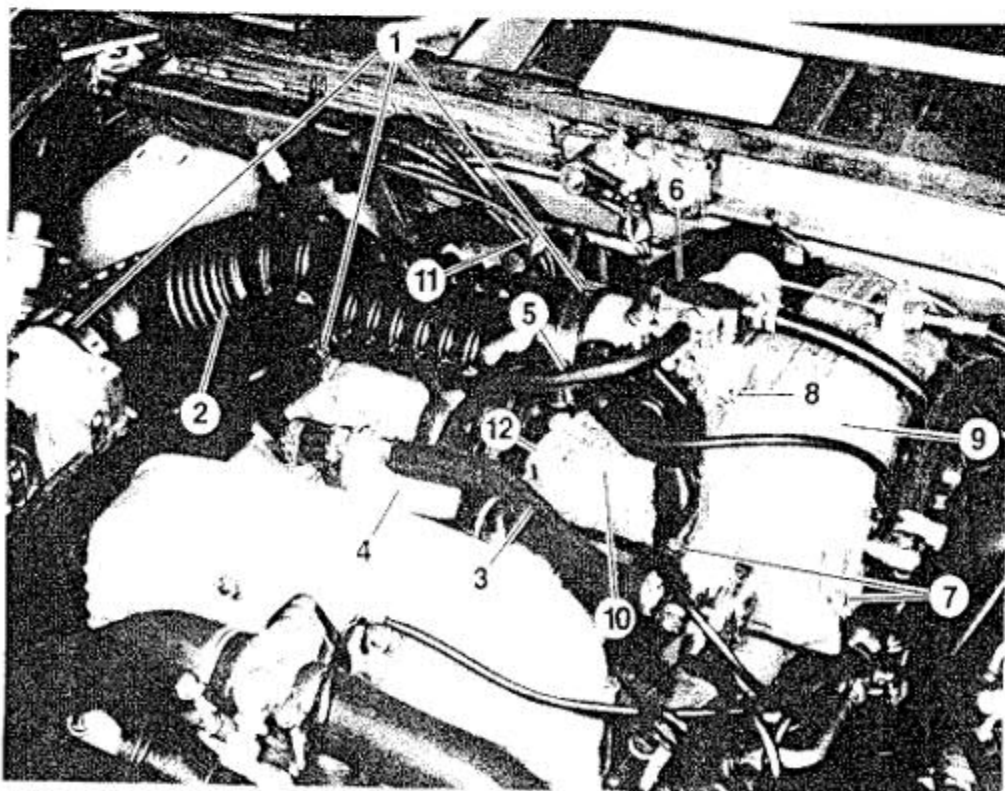
Remove six bolts (7) and two nuts (8) on intake manifold half (9). Carefully lift and move manifold back so that it is positioned clear of cam cover (10).

**NOTE:** If intake manifold gasket is damaged it must be replaced.

Remove spark plug wires (11) from support.

Remove four bolts (12) holding cam covers. Remove covers and gaskets.

1. Clamp
2. Air intake line
3. Auxiliary air regulator line
4. Auxiliary air regulator
5. Coolant line
6. Throttle plate heater
7. Bolt
8. Nut
9. Intake manifold
10. Cam cover
11. Spark plug wires
12. Bolt



**Carbureted Engines**

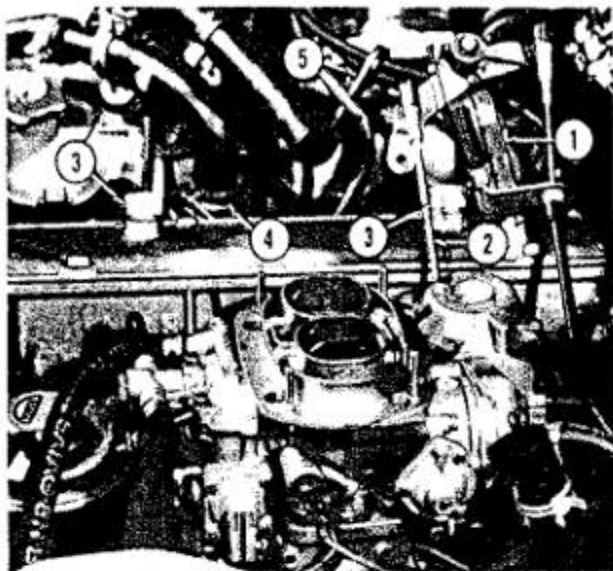
Remove air cleaner. Disconnect accelerator rod (2) from carburetor.

On engines with air pump, remove hose from air pump check valve (4).

Remove spark plug wires from support (5).

Remove four bolts (3) holding camshaft covers. Remove covers and gaskets.

1. Support 2. Accelerator rod 3. Bolts 4. Check valve 5. Support

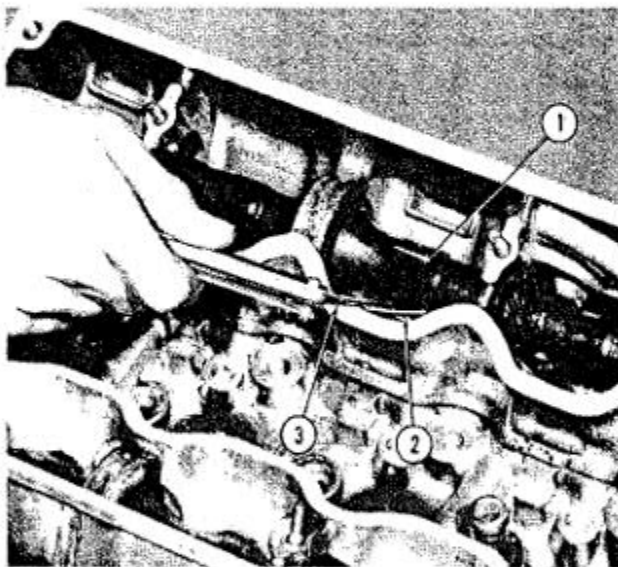
**All Engines**

Position camshaft so that lobe for valve being checked is pointing up and at right angle to valve.

Clearance: Intake — 0.017 to 0.019 in.  
(0.43 to 0.48 mm)

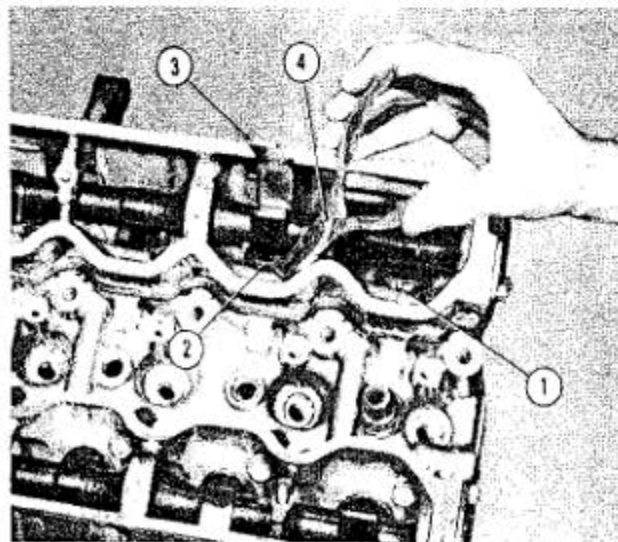
Exhaust — 0.019 to 0.021 in.  
(0.48 to 0.53 mm)

1. Camshaft lobe 2. Tappet 3. Feeler gauge



Adjust clearance as necessary by replacing tappet plates (2). After adjusting, install cam covers, and all removed parts.

1. Notch on tappet 2. Tappet plate 3. Clamping tool 4. Tool

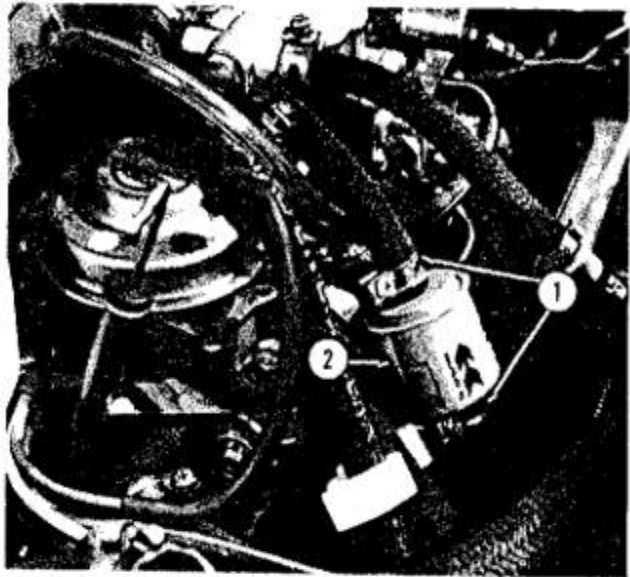


## FUEL FILTER

### Carburetor

Replace fuel filter (2) by loosening two fuel line clamps (1), then pulling fuel lines from filter. Install in reverse order. Do not use plastic type filters.

1. Clamps 2. Fuel filter



### Fuel Injection

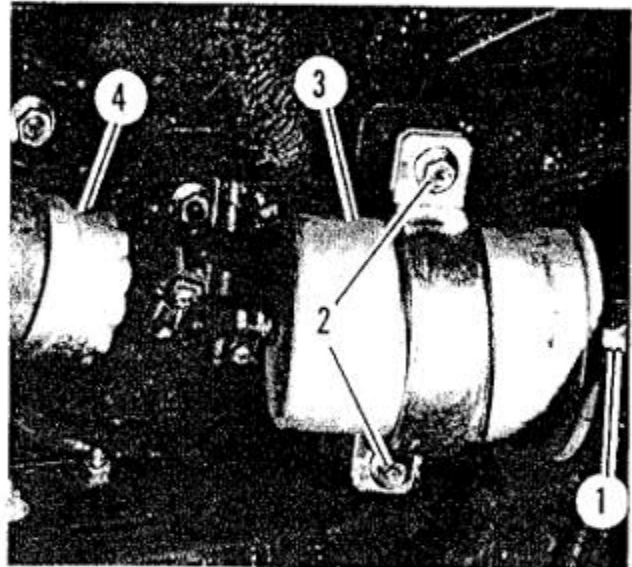
**CAUTION:** Before disconnecting fuel lines, system must first be depressurized (refer to Fuel Injection section).

Fuel filter (3) is located underneath vehicle on left side, just forward of rear axle.

Loosen line clamps (1) and disconnect lines. Remove two nuts (2) and clamp to remove filter.

**CAUTION:** Replace filter with same type as was removed. Fuel injection system pressure is higher than carburetor system and requires special filter.

1. Clamp 2. Nut 3. Fuel filter 4. Fuel pump

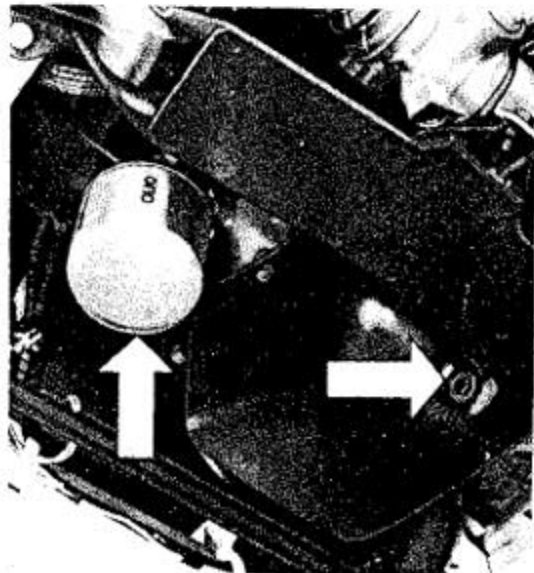


## ENGINE OIL

With engine warm, drain oil. Remove oil filter.

Coat seal on new filter with oil.

Thread filter on by hand until seal touches plate. Turn filter down  $\frac{3}{4}$  turn more. Fill oil sump to full mark. Run engine and check for oil pressure. Check around filter for leaks. Stop engine and add oil if necessary to bring level to full mark.



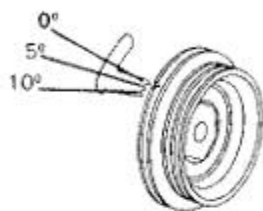
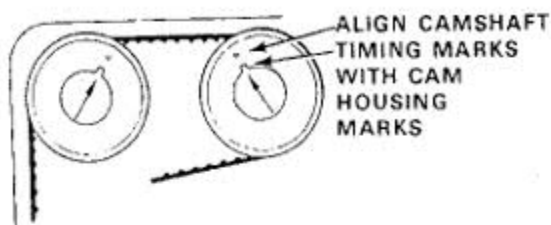
**IGNITION TIMING**

**CAUTION:** On Engines with electronic ignition, DO NOT disconnect high tension coil wire while engine is running or being cranked for starting or other testing.

Remove rubber plugs from timing belt rear cover.

Turn engine to align camshaft timing marks with pointers on cam housing.

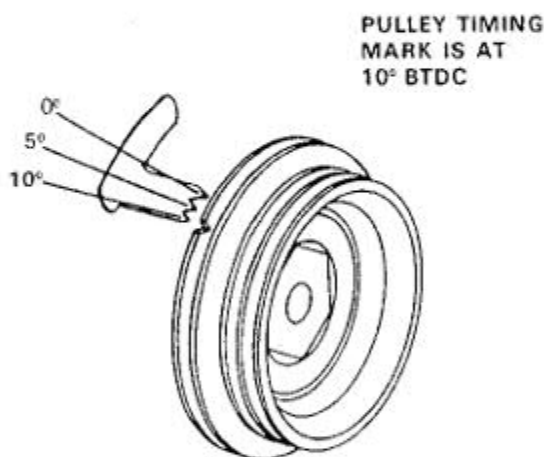
Check that crank pulley notch aligns with zero degree timing pointer. If not, adjust cam timing. Engine is now set to fire on No. 4 cylinder.

**CHECK CAM TIMING**

Connect timing light. Start engine and run at normal idle.

Check initial timing. (Refer to timing specifications in this section.)

To adjust, loosen distributor and hold down nut and rotate distributor. Fully tighten distributor hold down nut. Adjust carburetor settings.

**CHECK IGNITION TIMING****IDLE AND CO ADJUSTMENT**

**NOTE:** Refer to fuel injection section for adjustments to this system.

**Carburetor**

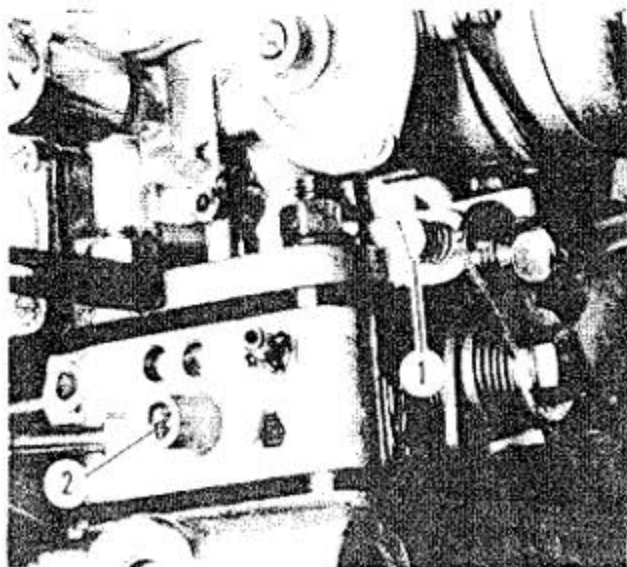
On cars with air induction, remove air cleaner cover and block inlet to reed valves. Reinstall cover.

On cars with air pump, pinch off air injection hose between check valve and tee fitting.

On all cars, connect tachometer. Apply handbrake. Start engine and allow it to warm up. Insert CO tester probe in tailpipe.

On cars with automatic transmission, place lever in DRIVE.

Check normal idle and CO. On cars with automatic transmission, normal idle speed should be 800 to 900 rpm. On cars with manual transmission, normal idle speed should be 700 to 800 rpm. CO level should be as stated on underhood tag.





## AIR CLEANER (Carburetor)

### Installation

Install air cleaner (3) on carburetor with four nuts and plate. Connect hoses to bottom of air cleaner.

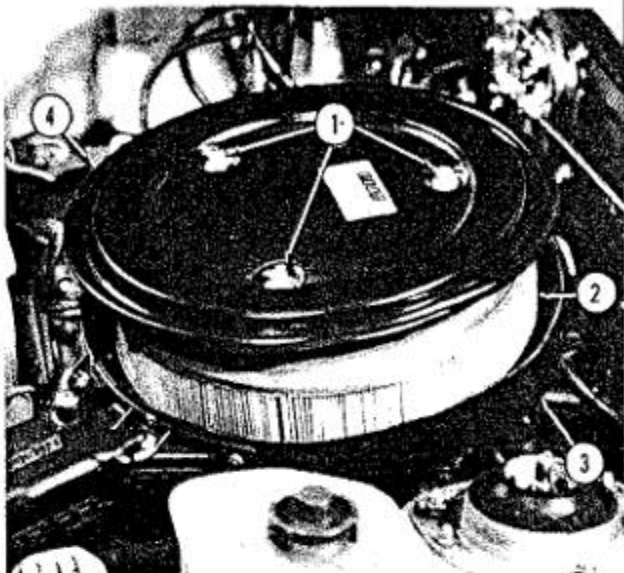
Place element (2) in air cleaner. Place cover (4) on air cleaner. Secure cover with three nuts (1) and washers.

Install heated air hose on snorkel.

On cars with air induction, install reed valve hoses on air cleaner.

On cars with air pump, install air injection hose on air cleaner.

1. Nut 2. Filter element 3. Air cleaner 4. Cover



## REED VALVE FILTER (Carbureted Engines With Air Induction)

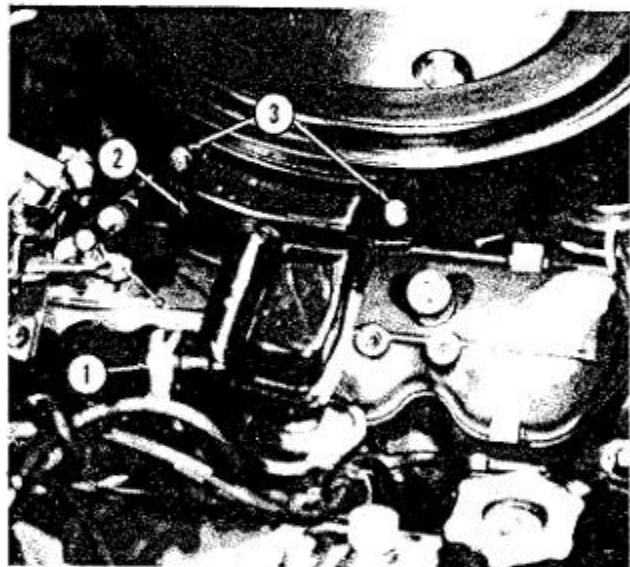
### Removal and Installation

Loosen clamp (1) and remove hose from air induction filter housing (2).

Remove two bolts (3) and washers and remove air induction filter housing from air filter. Remove filter.

Install in reverse order.

1. Clamp 2. Air induction filter housing 3. Bolts



## AIR CLEANER (Fuel Injection)

### Removal and Installation

**NOTE:** The air filter element should be changed every 30,000 miles. If vehicle is frequently driven in heavy traffic or sandy or dusty areas, it is recommended to replace filter every 15,000 miles.

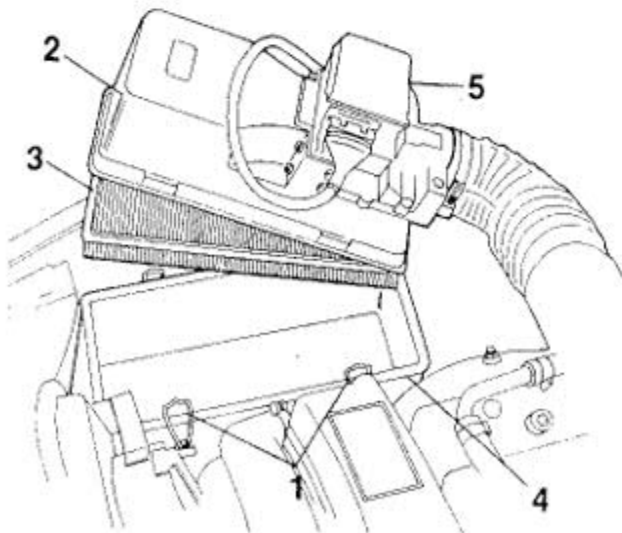
Using a screwdriver, release the four catches (1).

Lift the cover (2) off and remove the filter (3).

Install new filter and replace cover.

Secure catches by pressing on curved section.

1. Catches 2. Cover 3. Filter 4. Housing 5. Air Flow Sensor



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# REAR AXLE - 27

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

		PAGE
27	Specifications .....	27-1
	Torque Specifications .....	27-3
274.01	Rear Axle and Axle Shafts .....	27-5
274.05	Axle Final Drive and Differential Gears .....	27-13
27A	Service Tools .....	27-37

# Rear Axle

27

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## SPECIFICATIONS – Up to Early 1978

Type .....	semi-floating
Pinion and ring gear set .....	hypoid
Ratio .....	4.3 to 1 (10/43)
Pinion bearings .....	two
Bearing type .....	taper roller
Bearing preload adjustment .....	by collapsible spacer and pinion nut tightening
Thickness range of pinion adjustment shims .....	.100-.102-.104-.106-.108-.110-.112-.114-.116-.118-.120-.122-.124-.126-.128-.130-.132 in. (2.55-2.60-2.65-2.70-2.75-2.80-2.85-2.90-2.95-3.00-3.05-3.10-3.15-3.20-3.25-3.30-3.35 mm)
Pinion rolling torque .....	14 to 17.40 in. lb. (16 to 20 kgcm)
Differential bearings .....	two
Bearing type .....	taper roller
Adjustment .....	by threaded adjusters
Bearing preload: differential carrier caps spread .....	.005 to .007 in. (0.14 to 0.18 mm)
Side gear adjustment (not for self-locking differential) .....	by thrust washers
Thickness range of side gear thrust washers .....	.071-.073-.075-.077-.079-.081-.083 in. (1.80-1.85-1.90-1.95-2.00-2.05-2.10 mm)
Pinion and ring gear backlash .....	.003 to .005 in. (.08 to 0.13 mm)
Axle shaft type .....	semi-floating
Axle shaft bearings .....	ball
Track, rear .....	51.81 in. (1316 mm)
Lubricant – SAE 80 W/90 EP .....	1.3 LT      1.2 KG      1.4 QT

## SPECIFICATIONS – 1978 and On

Type .....	semi-floating
Pinion and ring gear set .....	hypoid
Ratio .....	Manual Trans. 3.90 to 1 (10/39) Auto. Trans. 3.58 to 1 (12/43)
Pinion bearings .....	two
Bearing type .....	taper roller
Bearing preload adjustment .....	by tightening pinion nut
Thickness range of pinion nut adjustment shims .....	0.105, 0.108, 0.110, 0.112, 0.114, 0.116, 0.118, 0.120, 0.122, 0.124, 0.126, 0.128, 0.130, 0.132 in. (2.55, 2.60, 2.65, 2.70, 2.75, 2.80, 2.90, 2.95, 3.00, 3.05, 3.10, 3.15, 3.20, 3.25, 3.30, 3.35 mm)
Pinion rolling torque .....	14 to 17 in. lbs. (16 to 30 kg cm)
Differential bearings .....	two
Bearing type .....	taper roller
Adjustment .....	by shims
Thickness range of differential adjustment shims .....	From 6.52 to 7.48 mm in 0.02 mm steps
Differential bearing preload .....	0.004 in. (0.10 mm)
Differential side gear adjustment .....	by shims
Thickness range of side gear adjustment shims .....	.033, .035, .037, .039, .041, .043, .045, .047, .049, .051, .071, .073, .075, .077, .079, .081, .083 in. (.85, .90, .95, 1.00, 1.05, 1.10, 1.15, 1.20, 1.25, 1.30, 1.80, 1.85, 1.90, 1.95, 2.00, 2.05, 2.10 mm)
Rolling torque of one side gear with differential case free and other side gear blocked .....	22 to 36 ft. lbs. (3 to 5 kgm)
Pinion and ring gear .....	matched set
Pinion and ring gear backlash .....	0.00315 to 0.00511 in. (0.08 to 0.13 mm)
Axle shaft type .....	semi-floating
Axle shaft bearings .....	ball
Track, rear .....	51.934 inches (1320 mm)
Lubricant – SAE 80 W/90 EP .....	1.3 LT      1.2 KG      1.4 QT

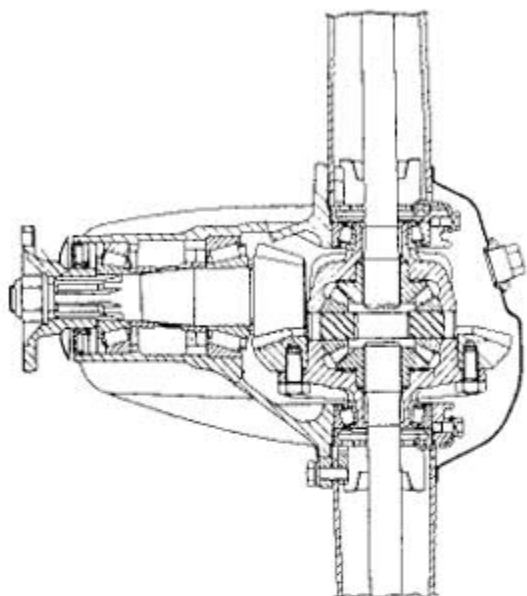
# Rear Axle

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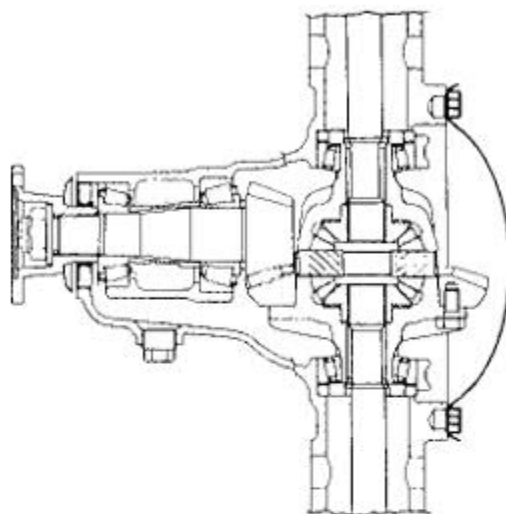
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## TORQUE SPECIFICATIONS

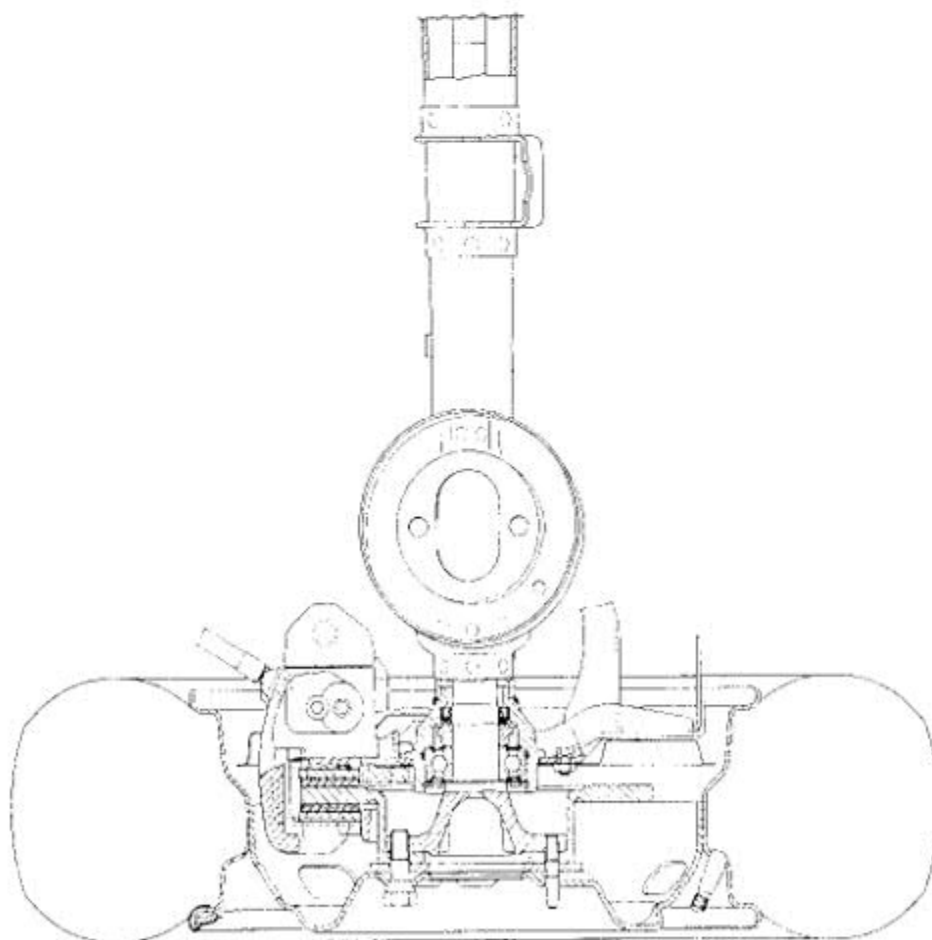
DESCRIPTION (Up to Early 1978)	THREAD (METRIC)	MATERIAL	TORQUE		
			FT. LB.	Kgm	N·m
Bolt, differential carrier-to-axle housing	M 8	R 120 Fosf	33	4.5	44
Bolt, cap-to-differential carrier . . . . .	M 10 x 1.25	R 80	36	5	51
Bolt, ring gear . . . . .	M 10 x 1.25	40 Ni Cr Mo 2 R 120 to 135	72	10	98
Wheel stud . . . . .	M 12 x 1.25	C 35 R Bon Znt	65	9	86
DESCRIPTION (1978 and On)					
Bolt, axle shaft retaining plate to housing	M 10 x 1.25	R 80 Znt	36	5	51
Bolt, differential cover to housing . . . .	M 8	R 80 Znt	18	2.5	25
Bolt, caps to differential carrier . . . . .	M 10 x 1.25	R 80	36	5	51
Bolt, ring gear to carrier . . . . .	M 10 x 1.25	40 Ni Cr Mo 2 R 120 to 135	72	10	98
Wheel stud . . . . .	M 12 x 1.25	C 34 R Bon Znt	65	9	86



ALL VEHICLES UP TO EARLY 1978



1978 AND ON



CROSS SECTION OF REAR AXLE

### REAR AXLE

#### REMOVAL AND INSTALLATION

**NOTE:** Rear axle need not be removed to overhaul differential. Overhaul can be accomplished with axle in place on vehicle. Refer to Suspension Section for removal and installation of rear axle.

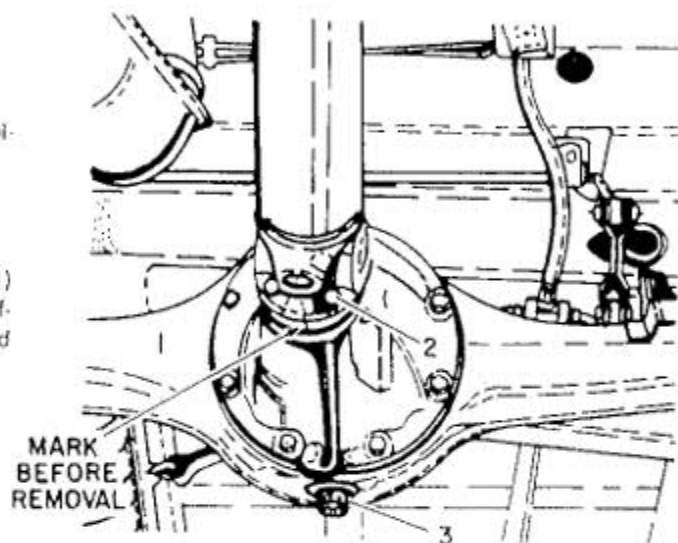
### REAR AXLE AND AXLE SHAFTS (VEHICLES UP TO EARLY 1978 ONLY)

#### DISASSEMBLY

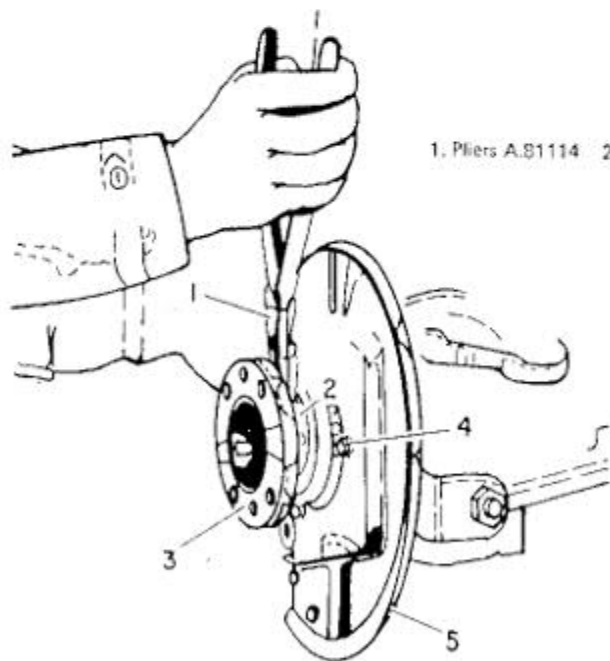
If differential is to be overhauled on vehicle, perform the following:

- Drain oil.
- Remove wheels.
- Remove four bolts (2) and nuts holding drive shaft flange (1) to differential flange. Mark shaft flange in relation to differential flange so that upon installation it will be assembled in same position. Secure drive shaft up, out of way.
- Remove brake calipers and discs (refer to Brakes Section).

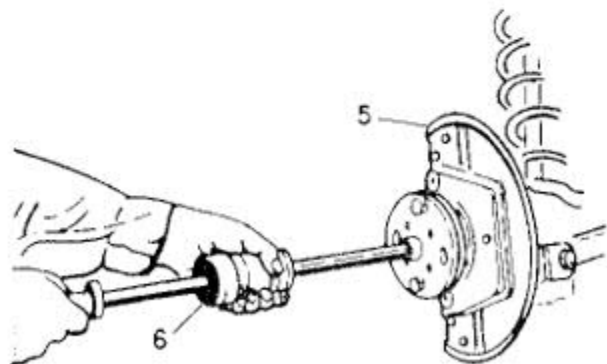
1. Drive shaft flange 2. Bolt 3. Oil drain



Remove four bolts (4) securing brake shield (5). Remove axle shaft snap ring with pliers A.81114 as shown. Attach axle puller A.47017 (6) to axle shaft flange and pull shaft out.

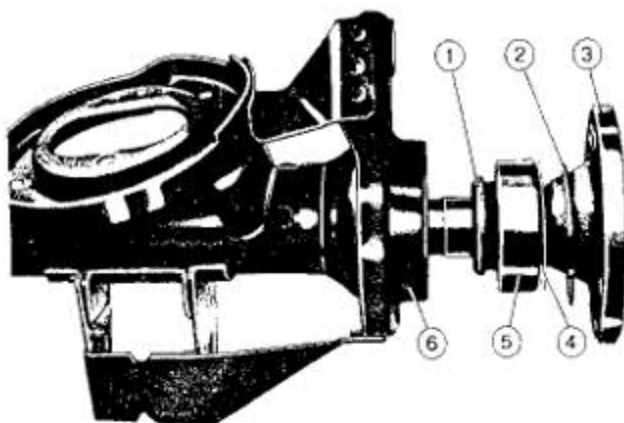


1. Pliers A.81114 2. Snap ring 3. Axle shaft flange 4. Bolt 5. Brake shield 6. Puller A.47017



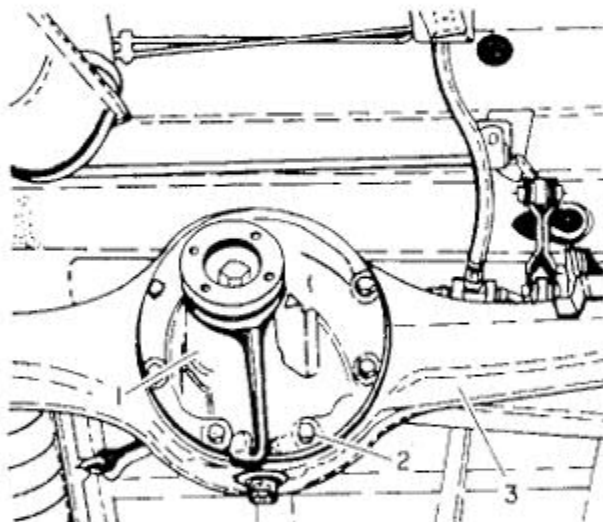
Unless axle shaft service is required, it is only necessary to disengage shafts from differential side gears and not completely remove them.

1. Bearing retaining collar 2. Snap ring 3. Axle shaft 4. Dust shield  
5. Ball bearing 6. Axle housing



Support differential assembly (1) and remove eight bolts (2) securing it to axle housing (3). Carefully withdraw differential from housing.

1. Differential assembly 2. Bolt 3. Axle housing

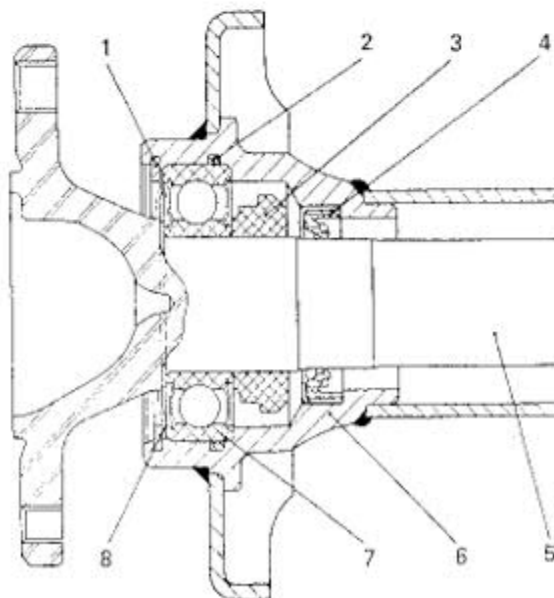


## AXLE SHAFT

### INSPECTION AND OVERHAUL

After removing axle shaft (5) as described earlier, remove axle shaft oil seal (4) and "O" ring (2) from their seats in housing.

1. Snap ring 2. "O" ring 3. Bearing retainer collar 4. Oil seal  
5. Axle shaft 6. Axle housing 7. Ball bearing 8. Dust shield





Check condition of axle shaft and components to make sure that:

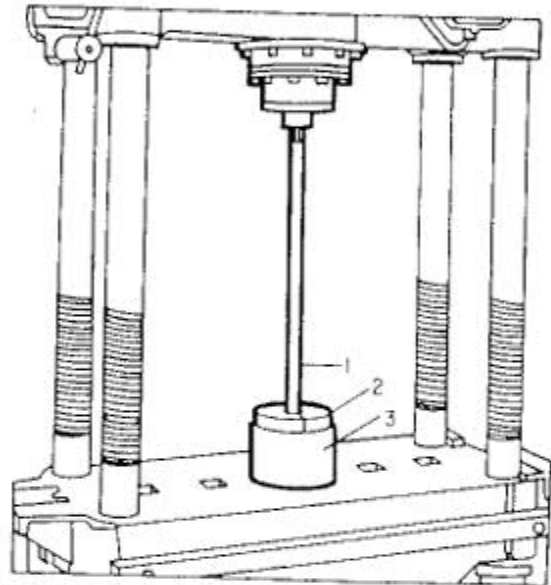
- Shaft is not bent or damaged.
- Ball bearing is not worn or damaged.
- Retaining collar and bearing have not moved from their position on shaft.
- Snap ring, oil seal and "O" ring on bearing seat is not damaged or worn.

Damaged or worn parts must be replaced.

Place shaft [1], with half-rings [2] around retaining collar, in press as shown and press collar off. Check that seating face of collar on shaft is not scored or damaged. Replace shaft if damaged.

Remove bearing, dust shield and snap ring.

1. Axle shaft 2. Half-rings 3. Mounting base

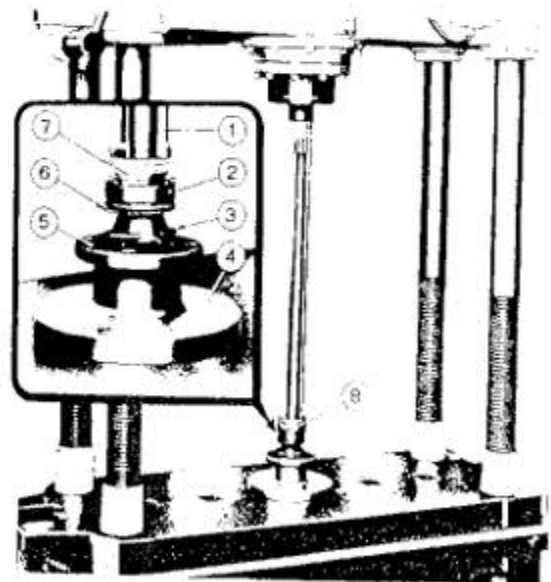


To replace axle shaft components, place shaft in press as shown. Install snap ring (3), dust shield (6) and bearing (2).

Place collar and holder on shaft. Place sleeve (1) in position over shaft onto collar and press down so that inner race of bearing is locked between collar and shaft shoulder.

Check that collar and bearing are tight on shaft (no movement).

1. Sleeve 2. Ball bearing 3. Snap ring 4. Base plate 5. Axle shaft  
6. Dust shield 7. Retaining collar 8. Collar holder



Installation of axle shaft is reverse of removal with special attention to the following:

- Fit oil seal with driver A.70157.
- Install "O" ring in its seat in axle housing.
- After inserting axle shaft in axle housing, fit snap ring with pliers A.81114.

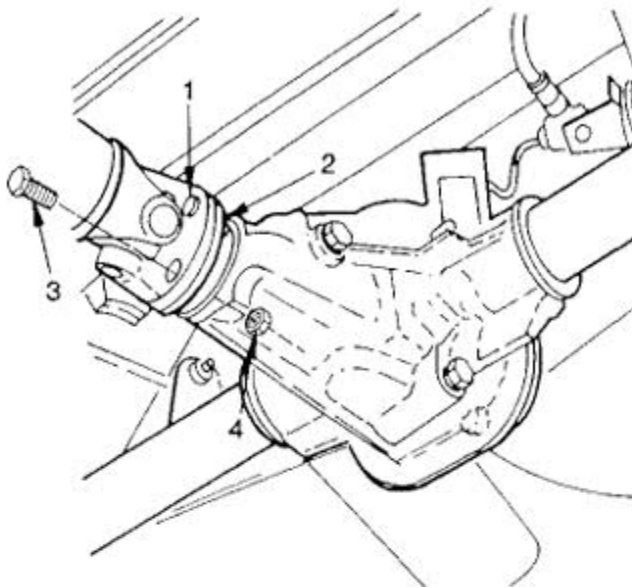
## REAR AXLE AND AXLE SHAFTS (1978 AND ON)

### DISASSEMBLY

If differential is to be overhauled on vehicle, perform the following:

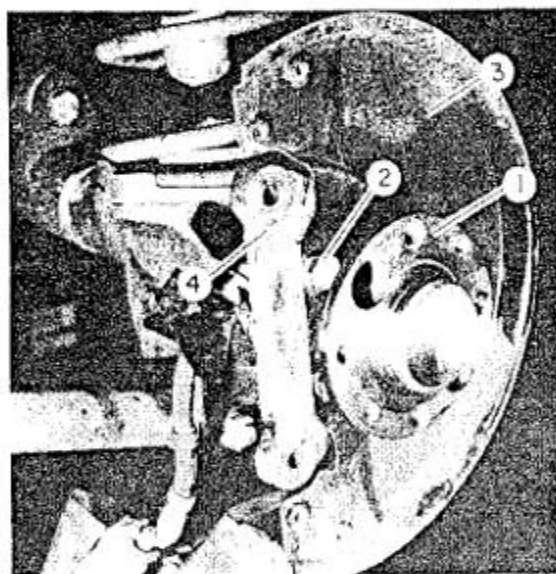
- Drain oil.
- Remove wheels.
- Remove four bolts (3) and nuts (4) holding drive shaft flange (1) to differential flange (2). Mark shaft flange in relation to differential flange so that upon installation it will be assembled in same position. Secure drive shaft up, out of way.
- Remove brake calipers and discs (refer to Brakes Section).

1. Drive shaft flange 2. Differential flange 3. Bolt 4. Nut



Working thru large holes in axle shaft flange (1), remove four bolts (2) and lockwashers holding brake shield (3) and caliper mounting bracket (4) to axle flange.

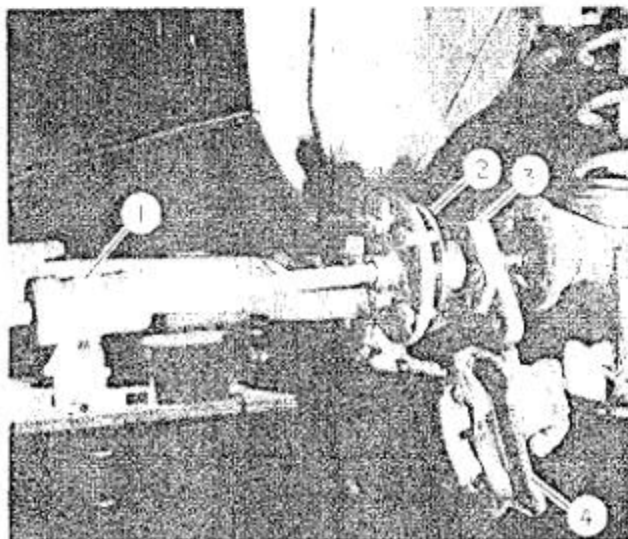
1. Axle shaft flange 2. Bolt 3. Brake shield 4. Caliper mounting bracket



Attach axle puller A.47017 (1) to axle shaft flange (2) and pull shaft out.

**NOTE:** Unless axle shaft service is required, it is only necessary to disengage shafts from differential side gears and not completely remove them.

1. Axle puller A.47017 2. Axle shaft flange 3. Caliper mounting bracket 4. Brake caliper



### AXLE SHAFT

#### INSPECTION AND OVERHAUL

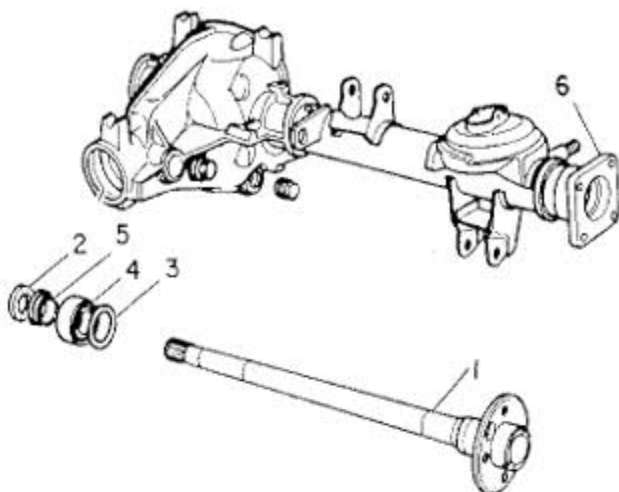
After removing axle shaft (1), remove shaft oil seal (2) and axle housing "O"-ring (3) from their seats in housing.

Check condition of axle shaft and components to make sure that:

- Shaft is not bent or damaged.
- Ball bearing is not worn or damaged.
- Retainer collar and bearing have not moved from their position on shaft.
- Oil seal and "O"-ring is not damaged.

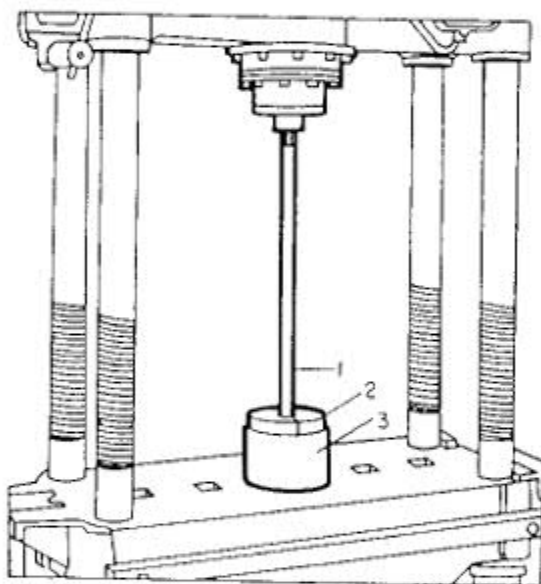
Damaged or worn parts must be replaced.

1. Axle shaft 2. Oil seal 3. "O"-ring 4. Ball bearing 5. Bearing retainer collar 6. Axle housing



Place shaft (1), with half-rings (2) around retainer collar, in press as shown and press collar off. Check that seating face of collar on shaft is not scored or damaged. Replace shaft if damaged. Remove bearing and caliper mounting bracket.

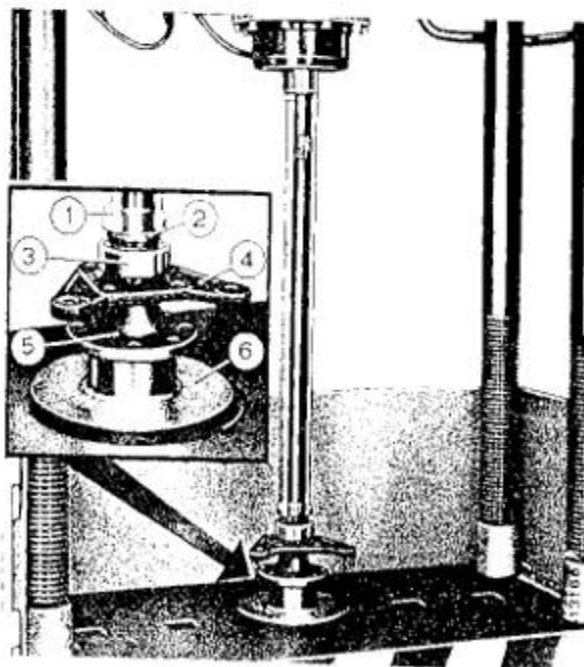
1. Axle shaft 2. Half-rings 3. Mounting base



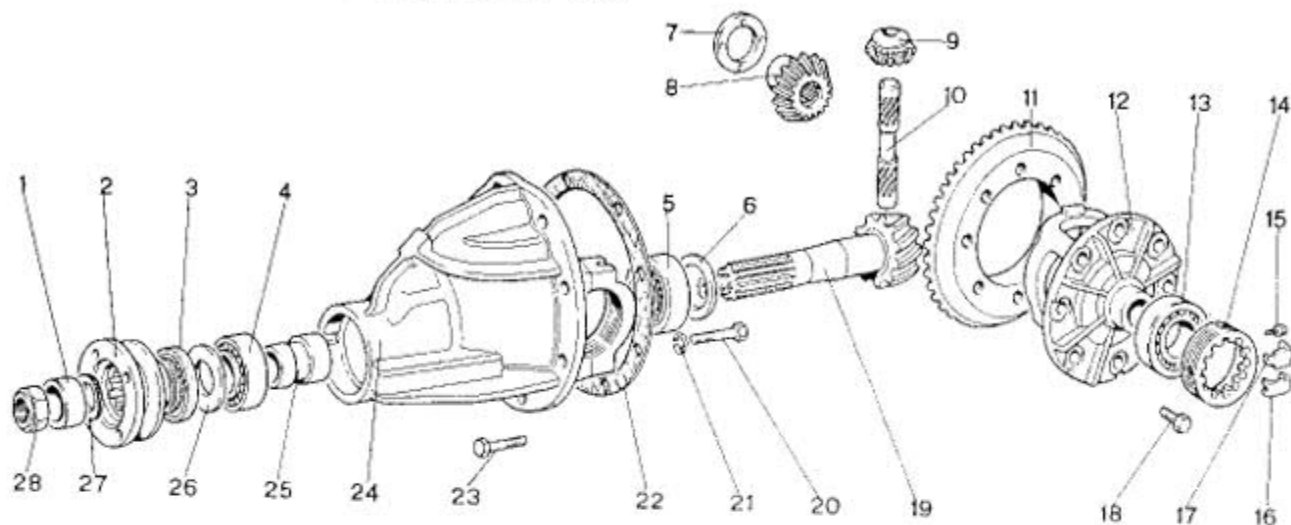
To replace axle shaft components, place shaft in press as shown. Install caliper mounting bracket (4), roller bearings (3) and retaining collar (2). Place sleeve (1) in position over shaft onto collar and press down so that inner race of bearing is locked between collar and shaft shoulder. Check that collar and bearing are tight on shaft (no movement).

Installation of shaft is reverse of removal.

1. Sleeve 2. Retaining collar 3. Roller bearing 4. Caliper mounting bracket 5. Axle flange 6. Mounting base



## DIFFERENTIAL (VEHICLES UP TO EARLY 1978)



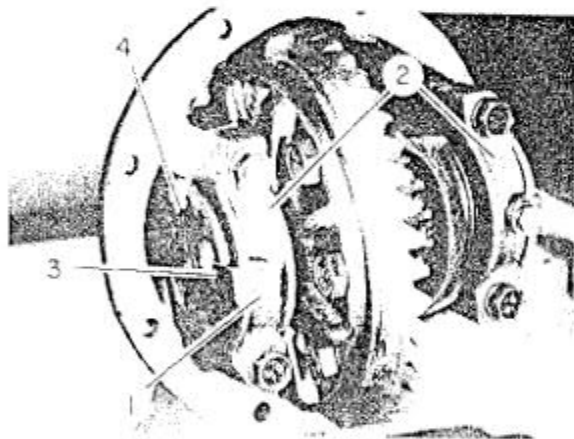
1. Spacer 2. "U" joint sleeve 3. Oil seal 4. Front roller bearing 5. Rear roller bearing 6. Pinion shaft rear roller bearing thrust washer 7. Side gear thrust washer 8. Side gear 9. Pinion gear 10. Pinion gear shaft 11. Ring gear 12. Differential case 13. Differential case roller bearing 14. Bearing adjuster ring 15. Locking plate bolt 16 and 17. Locking plates 18. Bolt fixing ring gear to differential case 19. Bevel spacer 20. Carrier cap bolt 21. Lockwasher 22. Gasket 23. Differential carrier to axle housing bolt 24. Differential carrier 25. Collapsible spacer 26. Oil slinger 27. Plain washer 28. Bevel pinion nut

## DIFFERENTIAL CARRIER ASSEMBLY (VEHICLES UP TO EARLY 1978 ONLY)

### DISASSEMBLY

Place differential assembly in a vise or stand as shown. Remove two bolts (1) and lockwashers from each bearing cap (2). These secure lock plates (3) which hold adjuster rings (4) in position. Remove lock plates.

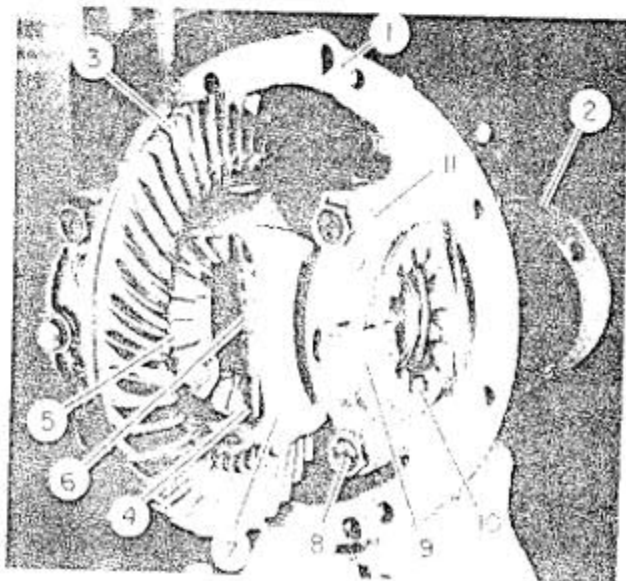
1. Bolt 2. Bearing cap 3. Lock plate 4. Adjuster ring



Remove two bolts and lockwashers from both differential case bearing caps. Remove caps, adjuster rings (10) and roller bearing cups.

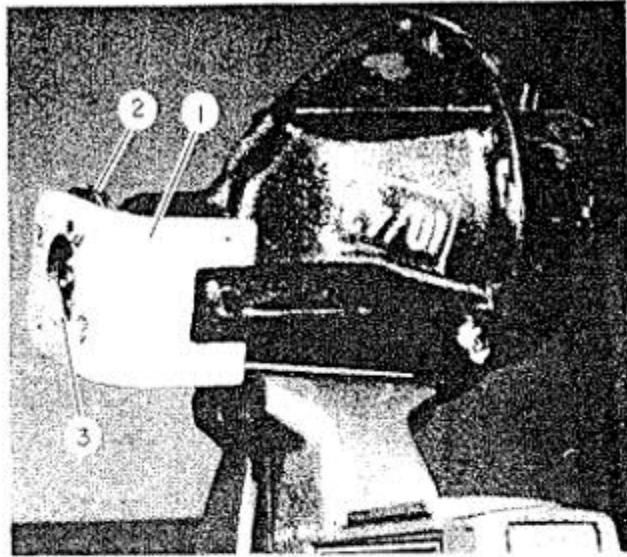
Withdraw differential case (7) from carrier housing (1), complete with gears and bearings.

1. Differential carrier housing 2. Drive pinion flange 3. Ring gear 4. Pinion gear 5. Side gear 6. Pinion gear shaft 7. Differential case 8. Bearing cap bolt 9. Adjuster lock plate 10. Bearing adjuster 11. Differential case bearing cap



Lock bevel pinion with tool A.70341 (1) or A.70345 as shown. Remove self-locking nut (3) securing "U"-joint sleeve (2) to bevel pinion. Remove sleeve.

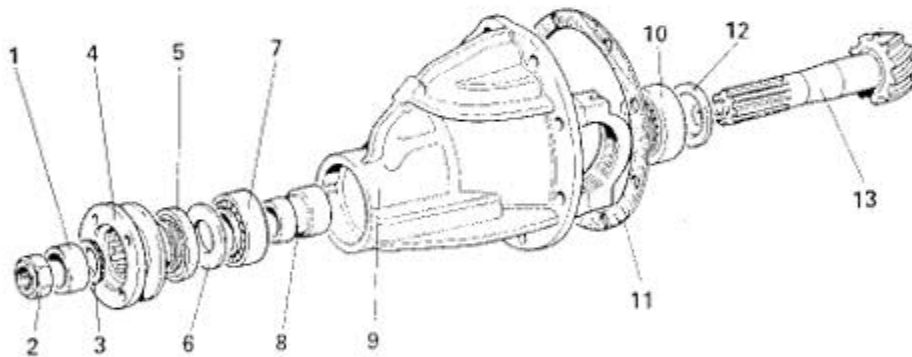
1. Bevel pinion 2. "U"-joint sleeve 3. Self-locking nut



Withdraw bevel pinion (13) complete with thrust washer (12), rear roller bearing (10) and collapsible spacer (8). Remove oil seal (5), oil slinger (6) and front roller bearing (7) from differential carrier.

To remove cup of rear roller bearing, use a drift pin. To remove cup of front roller bearing, use driver A.70198.

1. Spacer 2. Bevel pinion nut 3. Plain washer 4. "U"-joint sleeve 5. Oil seal 6. Oil slinger 7. Front roller bearing 8. Collapsible spacer 9. Differential carrier 10. Rear roller bearing 11. Gasket 12. Thrust washer 13. Bevel pinion



Slide collapsible spacer off bevel pinion (2).

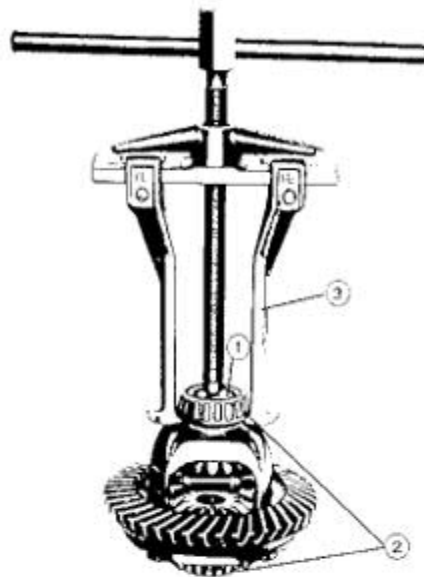
With a universal puller (1) and tool A.45008 (4), remove rear roller bearing (3). Thrust washer can then be removed.

1. Universal puller 2. Bevel pinion 3. Roller bearing 4. Tool A.45008



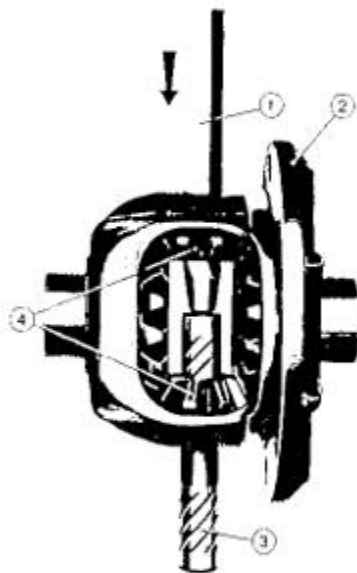
With a universal puller (3) and tool A.45028 (1), remove both differential roller bearings (2).

1. Tool A.45028 2. Roller bearing 3. Universal puller



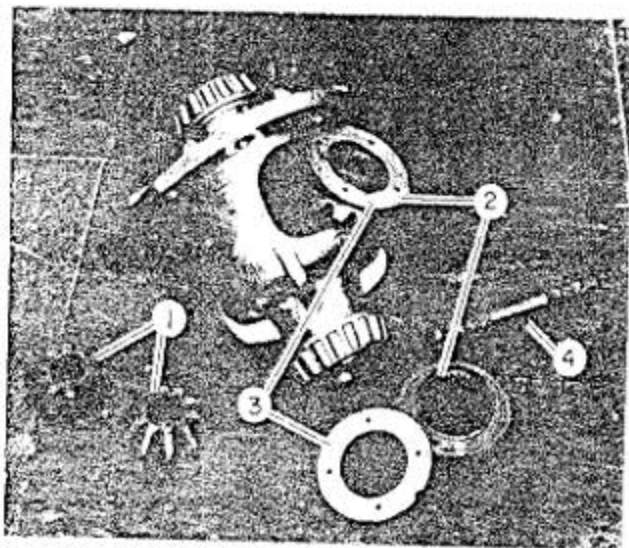
Mark position of ring gear in relation to case and remove eight bolts holding ring gear to differential case (2). With a drift pin (1), drive pinion gear shaft (3) from case.

1. Drift pin 2. Differential case 3. Pinion gear shaft 4. Pinion gears



Turn gears to bring pinion gears (1) opposite openings in case, and withdraw gears. Then remove side gears (2) with their thrust rings (3).

1. Pinion gears 2. Side gears 3. Thrust rings 4. Pinion gear shaft



**INSPECTION**

Before inspecting components, clean them thoroughly, as this will enable faults and wear to be more easily detected.

Check that teeth are not worn or damaged and that they make contact over their entire faces. If excessive wear is found, change parts affected. If teeth are not making correct contact, check for cause. Should any gears have chipped teeth, they must be changed.

**NOTE:** Bevel pinion and ring gear are supplied in matched pairs; if one is damaged, both must be changed.

Check that surface of pinion gear shaft and bores of pinion gears are not damaged. If damage is slight, polish surfaces with very fine abrasive paper, otherwise replace them. This also applies to side gears.

Inspect roller bearings of pinion and case; they should be in perfect condition. If there is any doubt about condition, replace them since incorrect bearing operation will cause noise and damage to teeth.

Inspect surfaces of side gear thrust washers; if they are only slightly defective, polish them. If necessary, replace them using standard or oversize parts. Washers are supplied in the following thicknesses: .070, 0.72, 0.74, 0.76, 0.78, 0.80 and 0.82 in. (1.80, 1.85, 1.90, 1.95, 2.00, 2.05 and 2.10 mm).

Check that differential carrier and case are not deformed or cracked. If so, replace them.

**ASSEMBLY**

Assemble side gears (2) with their thrust washers, in case. Insert pinion gears (3) thru openings in case and engage them with side gears. Turn the four gears so as to bring holes in pinion gears in line with corresponding holes in case. Insert pinion gear shaft.

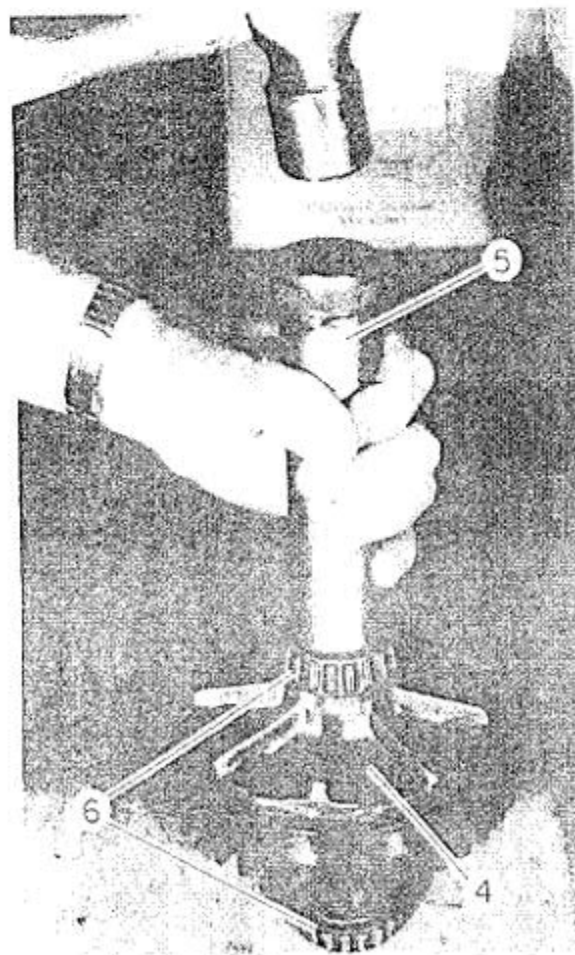
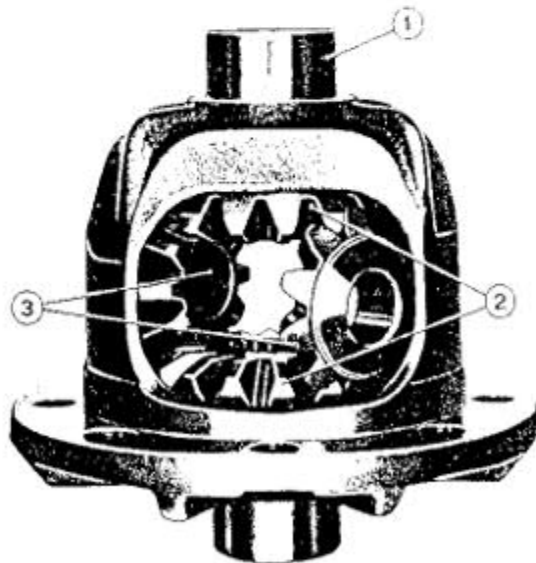
Check axial play in each side gear; it should not exceed .004 in. (0.10 mm). If it is more than this, there is excessive wear between gear pairs, and side gear thrust washers must be replaced with thicker ones.

After changing thrust washers, measure clearance again. If correct clearance is not obtained, gear teeth are excessively worn and must be replaced.

Install ring gear to case (with alignment marks aligned) with eight bolts (4) and torque to 72 ft. lb. (10 kgm).

Using driver A.70152 (5) install both roller bearings (6) on case.

1. Differential case 2. Side gears 3. Pinion gears  
4. Bolt 5. Driver A.70152 6. Roller bearing



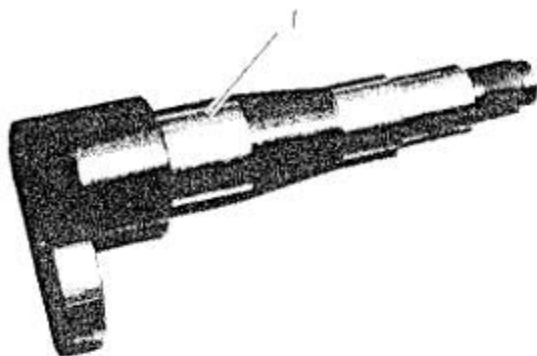
## Bevel Pinion Assembly and Adjustment

To ensure correct meshing between ring gear and pinion, a thrust washer of suitable thickness must be placed between pinion and rear roller bearing, to compensate for any difference in machining between pinion and differential carrier.

Dummy pinion A.70184 (1) and a dial indicator are needed to determine thickness of washer.

**NOTE:** Pinion roller bearing thrust washers are supplied for service in the following thicknesses: .100, .102, .104, .106, .108, .110, .112, .114, .116, .118, .120, .122, .124, .126, .128, .130, and .132 in. (2.55, 2.60, 2.65, 2.70, 2.75, 2.80, 2.85, 2.90, 2.95, 3.00, 3.05, 3.10, 3.15, 3.20, 3.25, 3.30, and 3.35 mm).

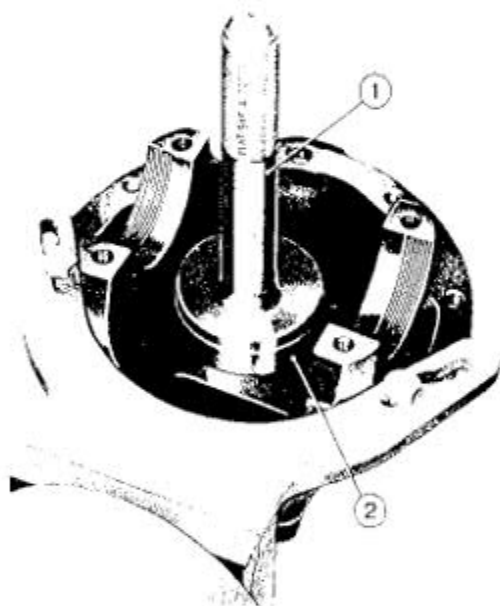
1. Dummy pinion A.70184



Mount differential carrier on suitable stand.

Place front and rear roller bearing cups of bevel pinion in their seats. Using driver A.70185 for front and driver A.70171 for rear, install cups in seats as shown.

1. Driver A.70171 2. Roller bearing cup



Using tool A.70152, fit rear roller bearing (2) to dummy pinion A.70184 (3). Insert dummy pinion into its seat in differential carrier.

1. Tool A.70152 2. Rear roller bearing 3. Dummy pinion A.70184



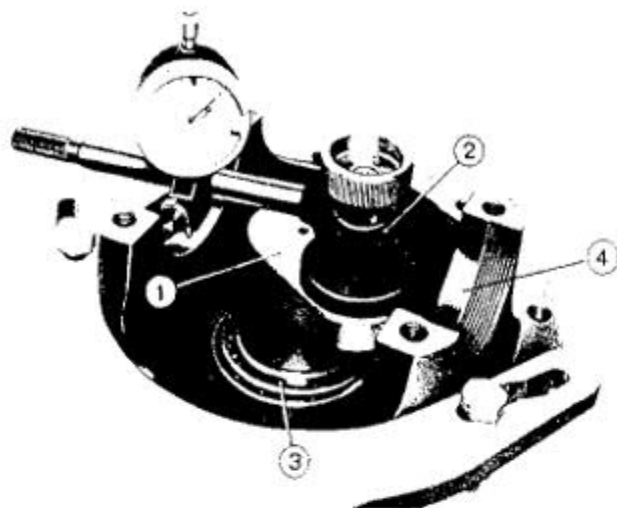


Install front roller bearing on dummy pinion. Install "U"-joint sleeve, pinion nut and washer, turn nut a few times to seat bearings. Then tighten nut firmly.

Zero dial indicator on a surface plate. Mount it to dummy pinion (1) with plunger in contact with one of roller bearing seats (4) as shown. Move dial indicator right and left horizontally and when minimum reading is obtained, make note of it. Repeat operation for other seat.

Average out the two readings and this will be (a) (refer to next page).

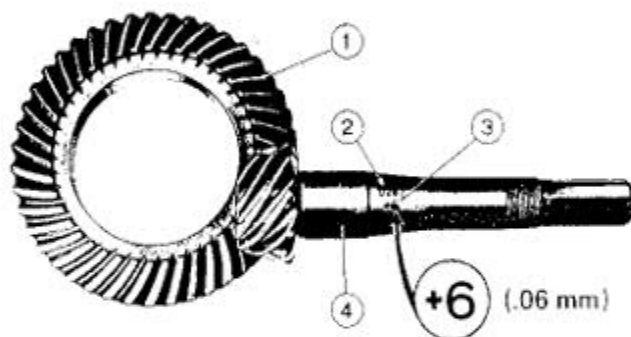
1. Dummy pinion A.70184 2. Dial indicator base 3. Rear roller bearing 4. Differential case bearing seat



Thickness(s) of thrust washer to be inserted between pinion head and shoulder of rear roller bearing is obtained by adding or subtracting value stamped at factory on bevel pinion (4), from value (a). If number is preceded by a plus (+), subtract it from (a). If number is preceded by a minus (-) add it to (a) (refer to next page).

Remove dummy pinion and parts mounted on it.

1. Ring gear 2. Serial production and matching number, stamped on pinion shank and ring gear 3. Value of difference between actual and nominal distance 4. Bevel pinion

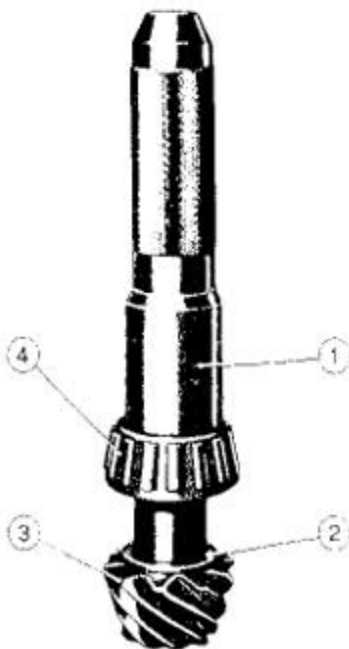


Install thrust washer (2) to correct thickness on pinion (3). Using tool A.70152 (1), install rear roller bearing (4) as shown. Install collapsible spacer and then insert pinion assembly into carrier.

**NOTE:** If bevel pinion, pinion bearings and differential carrier are not changed, the collapsible spacer can be used again. If any of these parts are changed, a new spacer must be used.

From forward end of carrier, install front roller bearing, oil slinger, oil seal and "U"-joint sleeve.

1. Tool A.70152 2. Thrust washer 3. Bevel pinion 4. Rear roller bearing



## HOW TO DETERMINE THICKNESS OF BEVEL PINION REAR BEARING THRUST WASHER

If  $\ll a \gg$  is mean reading obtained by dial gauge measurements on two bearing seats and  $\ll b \gg$  the value stamped on pinion at factory, thickness  $\ll S \gg$  of required new thrust washer is given by the following formula:

$$S = a - (+b) = a - b$$

$$\text{or } S = a - (-b) = a + b$$

In other words:

- if number stamped on pinion is preceded by a **plus** sign, thickness of washer is to be obtained by **subtracting** this number from dial gauge reading;
- if number stamped on pinion is preceded by a **minus** sign, thickness of washer is obtained by **adding** this to dial gauge reading.

Example:

let  $\ll a \gg$  be 2.90 (dial gauge reading)  
 and let  $\ll b \gg$  be -5 (number stamped on pinion)  
 then  $\ll S \gg = a - (-b)$

$$S = 2.90 - (-0.05) \quad .114'' - (-.002'')$$

$$S = 2.90 + 0.05 \quad .114'' + .002''$$

$$S = 2.95 \quad .116''$$

In this case a thrust washer .116" (2.95 mm) thick will be needed.

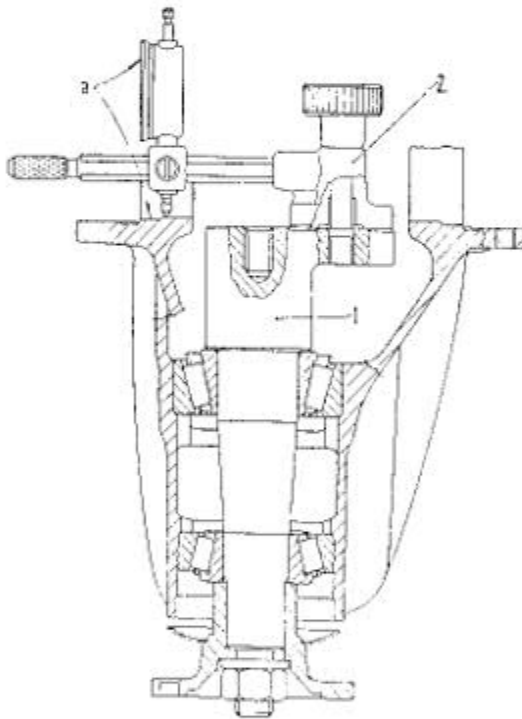


Diagram showing how to fit dummy pinion and support with dial gauge to determine thickness of thrust washer required for rear bearing of bevel pinion.

1. Dummy pinion A, 70184 2. Dial gauge a. Mean value of both measurements taken with dial gauge on bearing seats.

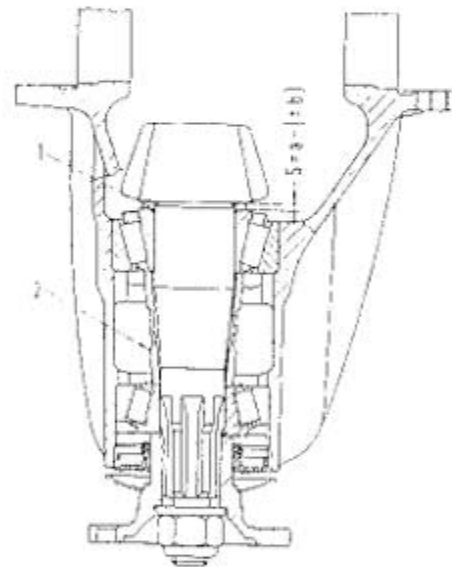


Diagram showing how to fit bevel pinion.

S = Thickness of rear bearing thrust washer.  
 a = Dial gauge reading.  
 b = Value stamped on bevel pinion.

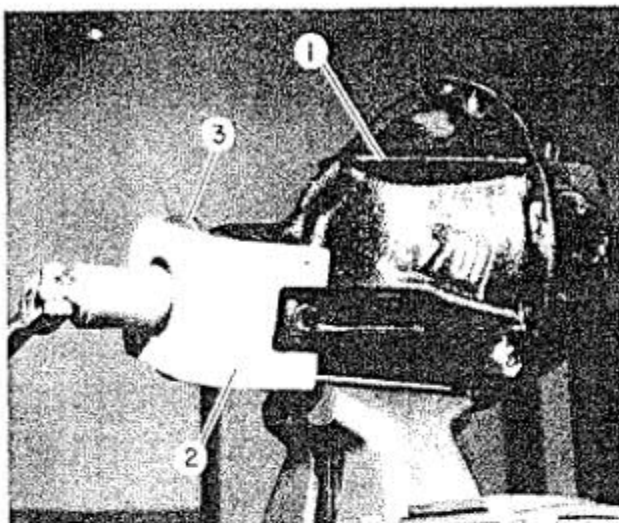
1. Rear bearing thrust washer 2. Collapsible spacer between roller bearings

Install washer and self-locking nut on pinion shaft.

With carrier (1) mounted in suitable stand, install holding tool A.70341 (2) or A.70345 on "U"-joint sleeve (3).

With a torque wrench, gradually in stages, tighten nut to a torque of between 87 and 166 ft. lb. (12 to 23 kgm), checking turning torque of pinion itself as this is done (next step). Once the turning torque of bevel pinion is between 14 and 17 in. lb. (16 to 20 kgcm), do not torque any further.

1. Differential carrier 2. Holding tool A.70341 3. "U"-joint sleeve



To check turning torque proceed as follows:

Remove holding tool from "U"-joint sleeve.

Attach dynamometer A.95697 (1) and socket (2) to pinion nut. Move pointer to 17 in. lb. (20 kgcm) graduation on scale.

With lever, rotate dynamometer thru a few turns. As pinion turns, check that moving pointer does not pass pointer set at 17 in. lb. (20 kgcm), and is not below 14 in. lb. (16 kgcm) mark.

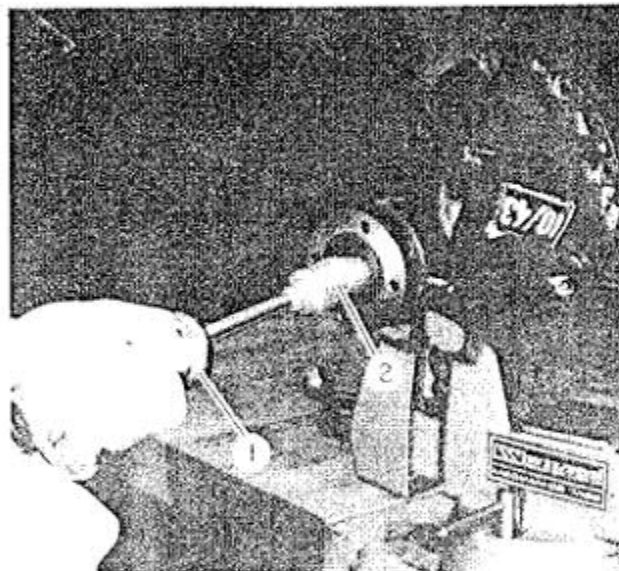
If turning torque is more than 17 in. lb. (20 kgcm), bearing preload is too high.

**NOTE:** Do not loosen nut to obtain preload. Pinion must be removed and new collapsible spacer installed, then repeat operation.

If turning torque is less than 14 in. lb. (16 kgcm), pinion nut must be tightened further without exceeding maximum torque of 166 ft. lb. (23 kgm), and turning torque checked again.

If prescribed turning torque cannot be obtained, change spacer, as it will have been compressed to a point of being unserviceable.

1. Dynamometer A.95697 2. Socket



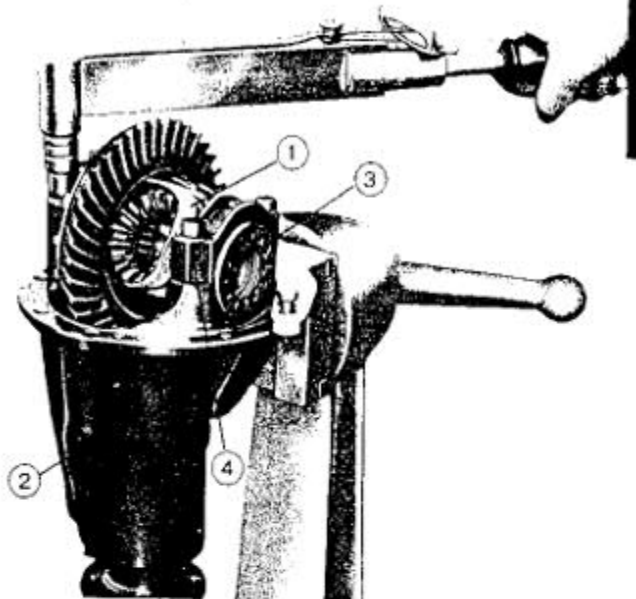
## Differential Case Installation Into Carrier

Place differential case (1), complete with bearings, in carrier (2).

Install two bearing retaining and adjusting rings (3). Screw them into contact with bearings.

Fit bearing caps (4) and torque cap bolts to 36 ft. lb. (5 kgm).

1. Differential case 2. Carrier 3. Adjusting rings 4. Bearing caps



## Preloading Differential Case Bearings and Adjusting Bevel Gears Backlash

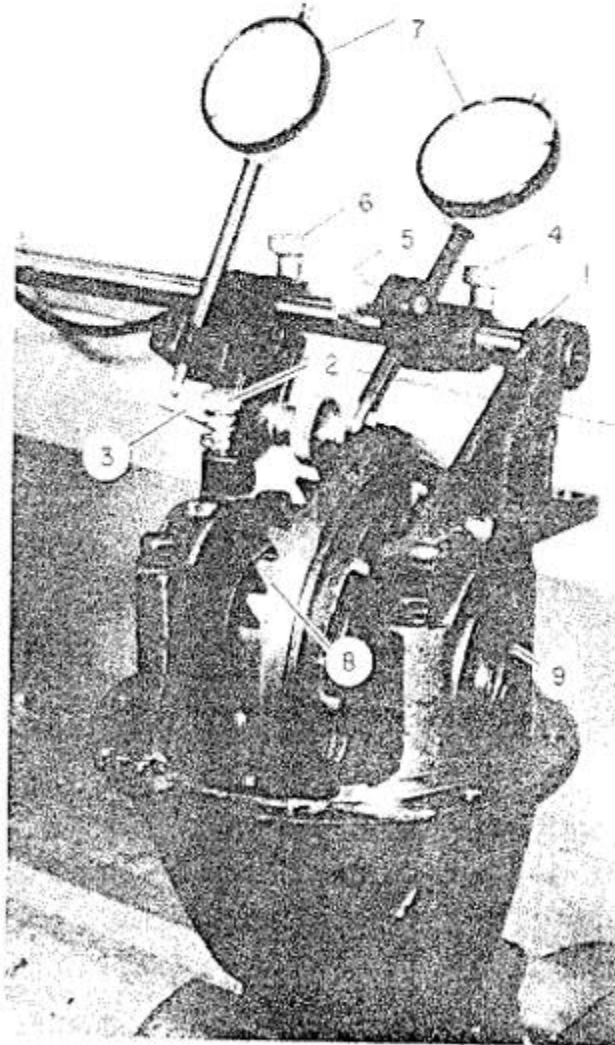
These two operations must be carried out at the same time, using tool A.95688 and wrench A.55025. Install Tool A.95688 (1) into differential carrier locking plate bolt holes with bolt and clamping knob (2).

Move support to bring lever (3) into contact with outer side face of cap, then tighten knob (6).

Unscrew knobs (4) and (5) and adjust support so that plunger of dial indicator (7) bears on side face of one tooth of ring gear (8). Tighten knobs.

Adjust backlash between ring gear and pinion temporarily to .0031 to .0051 in. (.08 to .13 mm) by means of adjusting rings (9). This must be done so that bearings are not preloaded to any extent, the rings must just be in contact with bearings, otherwise the subsequent preloading measurements will be incorrect.

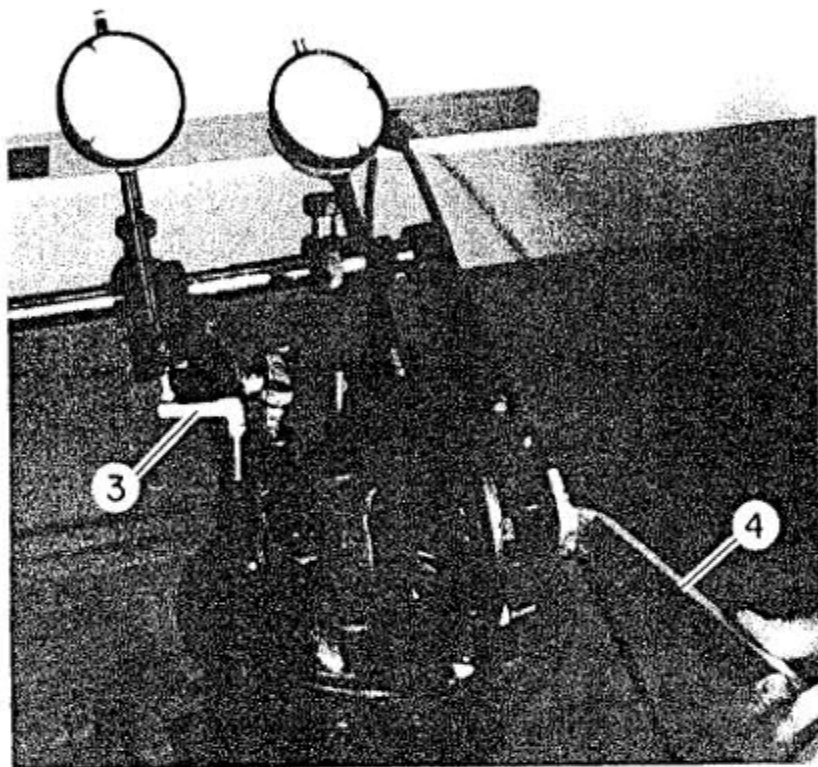
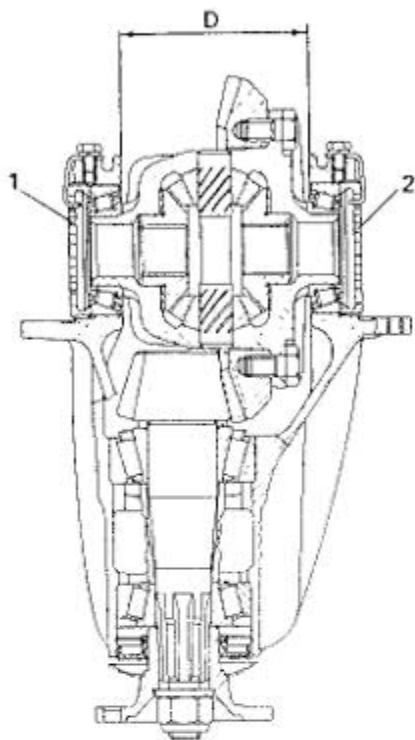
1. Tool A.95688 2. Clamping knob 3. Lever 4, 5, & 6. Adjusting knobs 7. Dial indicator 8. Ring gear 9. Adjusting rings



With wrench A.55025 (4), tighten two bearing adjustment rings (1 and 2) alternately the same number of turns; in this way, differential case caps will be moved slightly apart and distance "D" increased. This increased spacing will be shown by dial indicator thru lever (3).

**NOTE:** Differential case bearing adjusting rings must be tightened until an increase of .0055 to .0071 in. (0.14 to 0.18 mm) in distance "D" is obtained.

1 & 2, Adjusting rings 3, Lever 4, Wrench A.55085



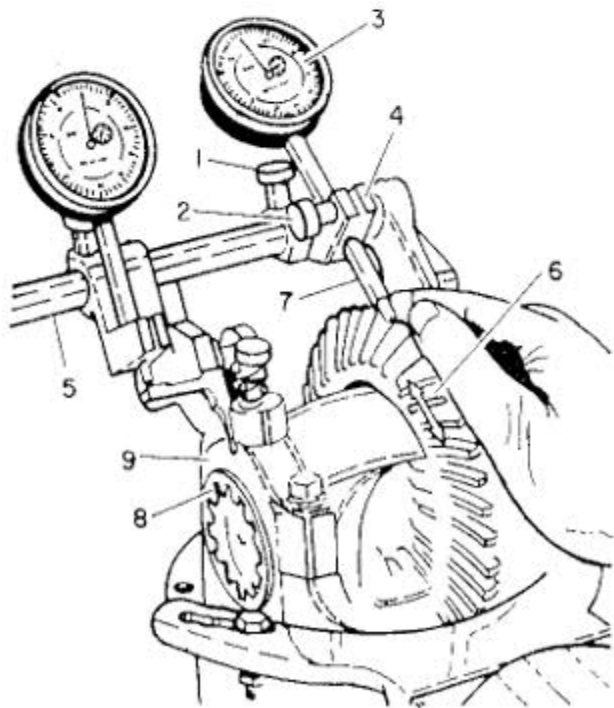
When exact preloading of differential case bearings has been accomplished, make a final check of backlash, .0031 to .0051 in. (.08 to .13 mm) as follows: clamp pinion so that it will not move. Bring teeth into contact, and place dial indicator plunger (7) against flank of one of ring gear (6) teeth. Zero dial indicator (3). Turn ring gear in opposite direction and read amount of movement on dial gauge. It should be between .0031 and .0051 in. (.08 and .13 mm). If it is more or less than this, ring gear must be moved nearer to or farther from pinion by tightening one adjustment ring (8) and slackening the other.

**NOTE:** It is very important that when one of the rings is turned, the other should be turned the same amount so as not to alter preloading already obtained.

Set dial indicator to zero. After one ring has been tightened, bearing cap (9) spacing will increase and indicator will reflect it. Now slacken other ring until indicator reading returns to zero. Check again on dial indicator that correct backlash has been obtained; if not, repeat operation.

Remove gauges and tool A.75688 (5). Install adjusting ring locking plates and bolts.

**NOTE:** Adjusting ring locking plates are supplied in two different patterns, with one tooth or two teeth, and are fitted according to final position of rings.



1, Bearing cap  
2, Adjusting knobs 3, Dial indicator 4, Dial indicator support  
5, Tool A.75688 6, Ring gear 7, Plunger 8, Adjustment ring

## Gear Teeth Pattern Check

Coat ring gear teeth with red lead or prussian blue. Rotate ring gear about 15 turns in each direction while applying a load to drive pinion flange. If pattern is uniformly distributed over both tooth faces, adjustment is correct.

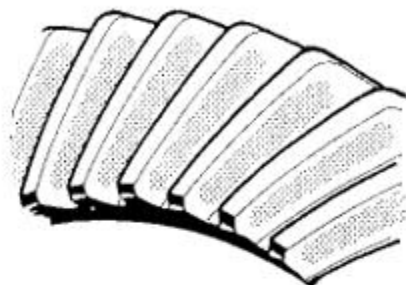
Drive Side

Coast Side



**Correct mesh.**

The contact pattern is uniformly distributed over both tooth faces, drive and coast.

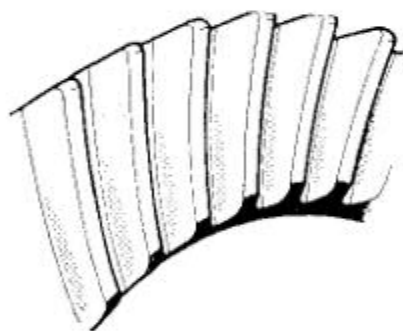
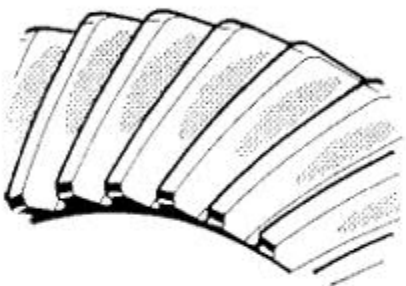


**Incorrect mesh.**

Drive side: contact on toe of tooth and towards center.

Coast side: contact on heel of tooth and towards center.

Move pinion away from ring gear, using thinner thrust washer.

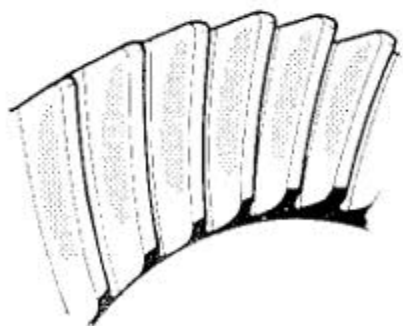
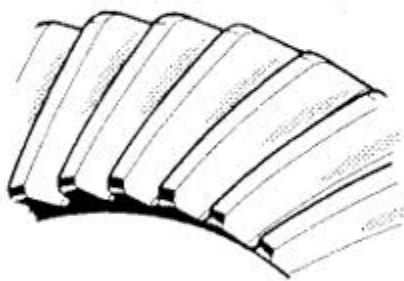


**Incorrect mesh.**

Drive side: Toe contact, localized at root.

Coast side: Heel contact, localized at root.

Move pinion away from ring gear, using thinner thrust washer.

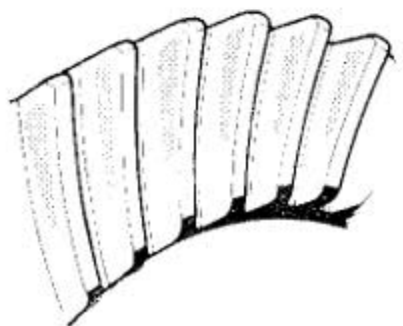
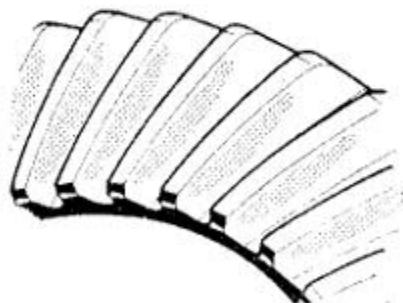


**Incorrect mesh.**

Drive side: Heel contact, toward center of tooth.

Coast side: Toe contact, towards center of tooth.

Move pinion closer to ring gear, using thicker thrust washer.

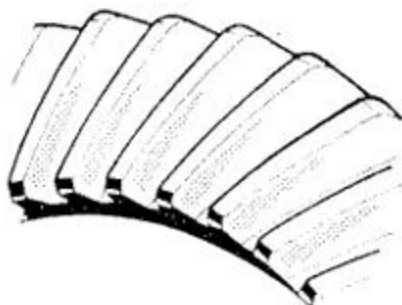


**Incorrect mesh.**

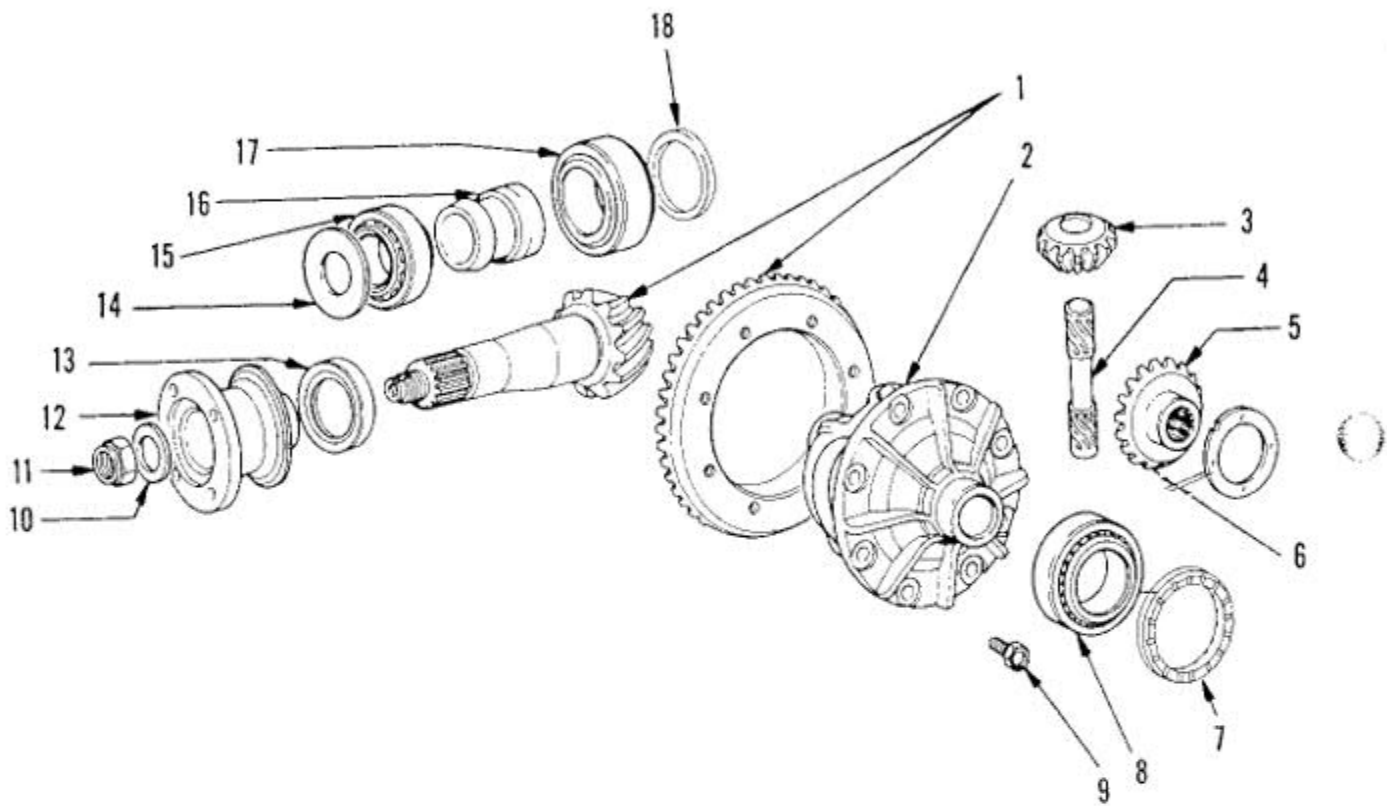
Drive side: Heel contact, localized on crest of tooth.

Coast side: Toe contact, localized on crest of tooth.

Move pinion closer to ring gear, using thicker thrust washer.



## DIFFERENTIAL (1978 AND ON)



- |                    |            |                        |
|--------------------|------------|------------------------|
| 1. Ring and pinion | 7. Shim    | 13. Oil seal           |
| 2. Carrier         | 8. Bearing | 14. Washer             |
| 3. Pinion gear     | 9. Bolt    | 15. Bearing            |
| 4. Pinion shaft    | 10. Washer | 16. Collapsible spacer |
| 5. Side gear       | 11. Nut    | 17. Bearing            |
| 6. Shim            | 12. Flange | 18. Shims              |

## DIFFERENTIAL ASSEMBLY

## DISASSEMBLY

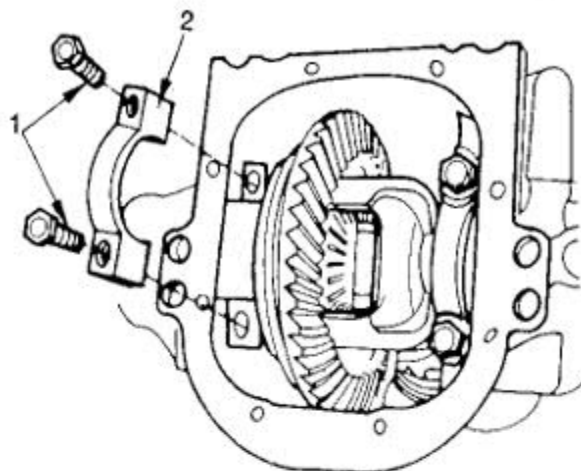
Remove eight bolts and washers holding cover on axle housing.

Before disassembling, the following checks should be made:

- ring gear runout and backlash
- tooth contact pattern.

Remove two bolts (1) and washers holding side bearing caps (2). Note markings on caps and housing. Do not mix caps.

1. Bolts 2. Side bearing cap



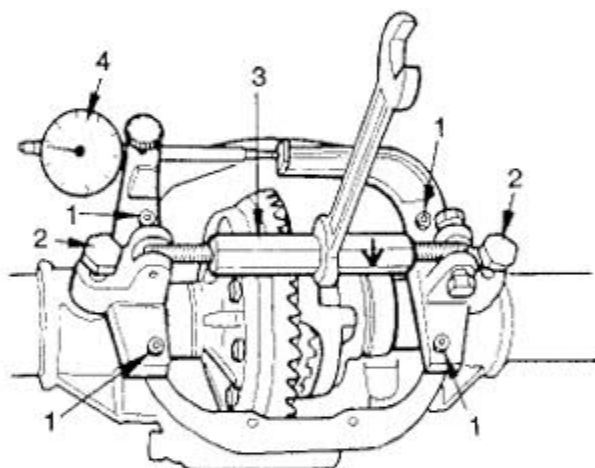
Install differential housing spreader (Kent Moore No. 28294) as follows:

- secure spreader to housing with four bolts (1)
- torque side bolts (2) of tool to 1 kgm (7.23 ft. lbs.)
- calibrate dial indicator (4) by preloading indicator until needle travels half full travel. Set indicator dial to zero at needle.
- rotate turnbuckle (3) in direction of arrow until indicator reads 0.6 to 0.8 mm (0.024 to 0.031 inch).

**CAUTION:** Spreading case more than 0.8 mm (0.031 inch) could cause permanent distortion.

- return turnbuckle to starting position
- check tightness of anchor bolts and side bolts.

1. Anchor bolts 2. Side bolts 3. Turnbuckle 4. Dial indicator



Reset dial indicator (1) to zero. Rotate turnbuckle (2) until indicator reads 0.6 to 0.8 mm (0.024 to 0.031 inch).

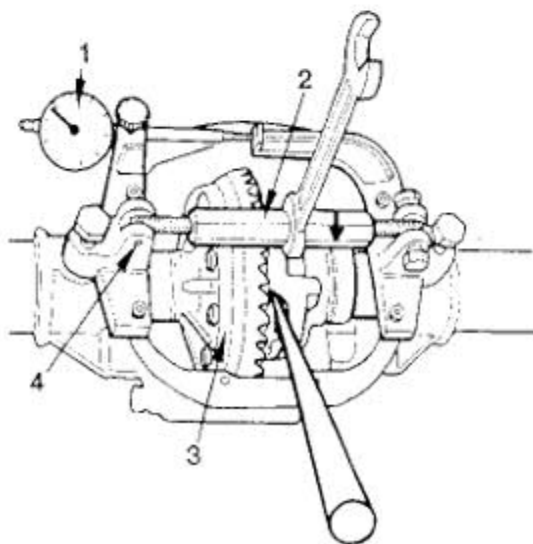
Using a suitable lever, remove differential case (3) from housing.

Loosen turnbuckle to relieve force from housing. Remove turnbuckle bolt (4).

**NOTE:** Make sure dial indicator returns to zero.

Remove differential case, shims and bearings. Do not mix up adjusting shims and bearings. Keep caps, bearings, and shims of same side together.

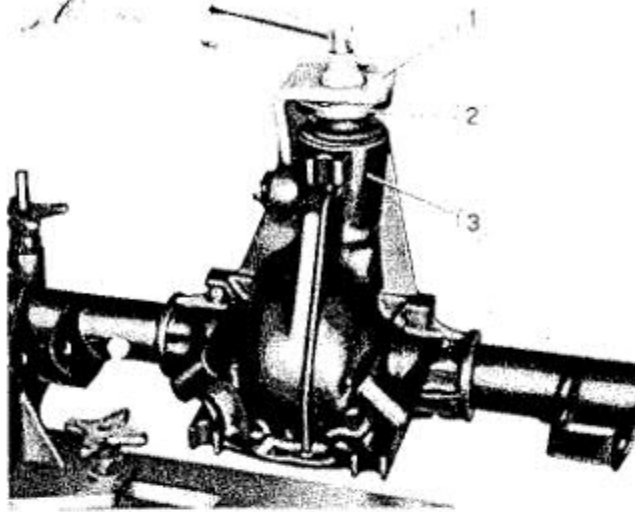
1. Dial indicator 2. Turnbuckle 3. Differential case 4. Turnbuckle bolt





Install holding tool (1) (Kent Moore No. 28115) on pinion flange (2). Remove nut, washer, and flange from pinion shaft. Push drive pinion gear out rear of housing (3). Remove collapsible spacer from pinion.

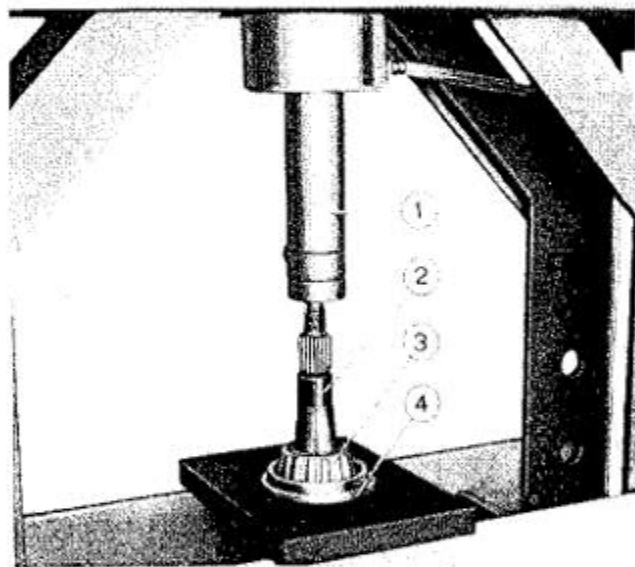
1. Holding tool 2. Pinion flange 3. Axle housing



Place drive pinion shaft in press.

Press rear bearing (3) off shaft (2). Remove and retain shim from under pinion bearing.

1. Press 2. Pinion shaft 3. Rear bearing 4. Plate

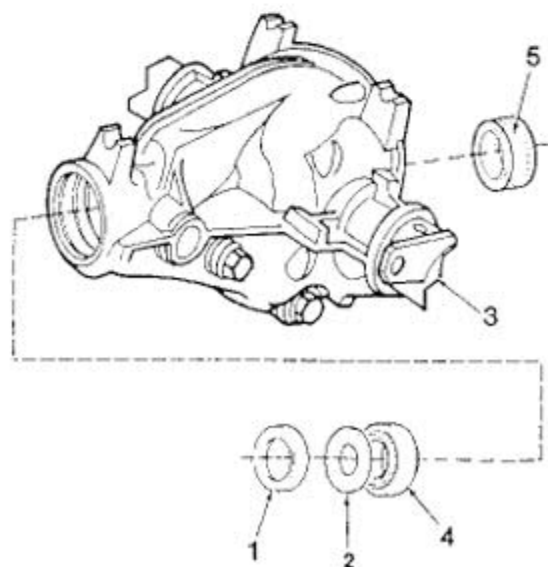


Remove oil seal (1) and dust shield (2) from housing (3).

Remove front pinion bearing (4) from housing.

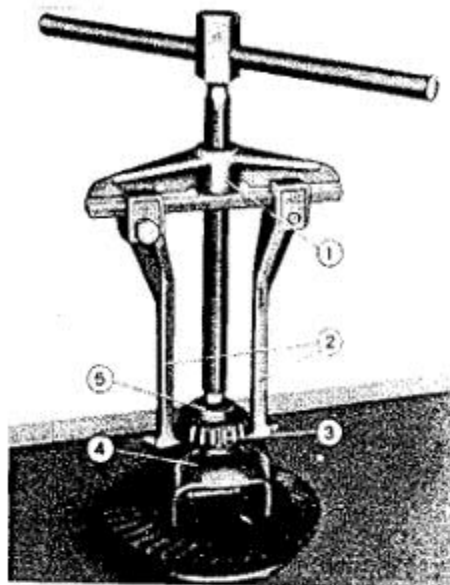
Remove rear pinion bearing outer race (5) from housing.

1. Oil seal 2. Dust shield 3. Axle housing 4. Front pinion bearing  
5. Rear pinion bearing outer race



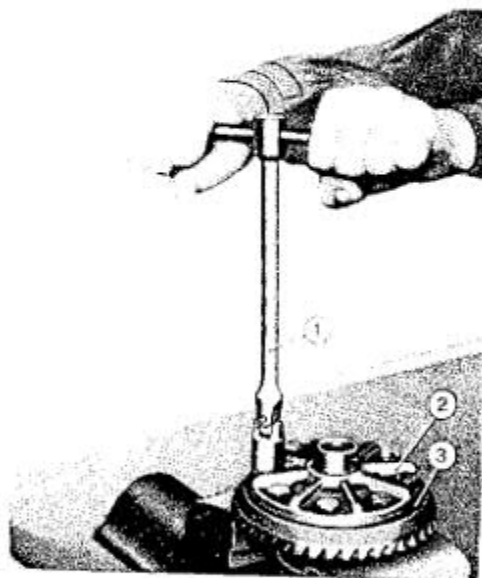
Using a puller, remove side bearings (3) from carrier (4).  
Keep bearings with outer race, cap, and shims from same side.  
Do not mix bearings and outer races.

1. Puller 2. Puller arms 3. Bearing 4. Carrier 5. Adapter



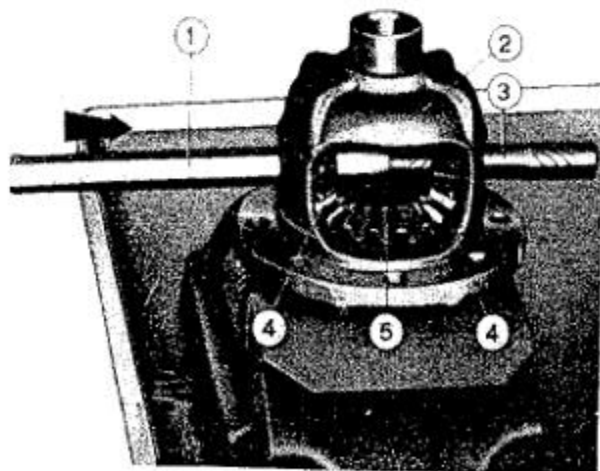
Put locating reference marks on ring gear and carrier.  
Remove eight bolts holding ring gear (3) to carrier (2).  
**NOTE:** Drive ring gear from carrier using a soft mallet.

1. Wrench 2. Carrier 3. Ring gear



Using a soft drift, drive pinion gear shaft (3) out of carrier (2).  
Remove pinion gears (4), side gears (5) and side gear thrust washers.

1. Soft drift 2. Carrier 3. Pinion gear shaft 4. Pinion gears  
5. Side gears



**INSPECTION**

Wash all parts in a suitable cleaning solvent.

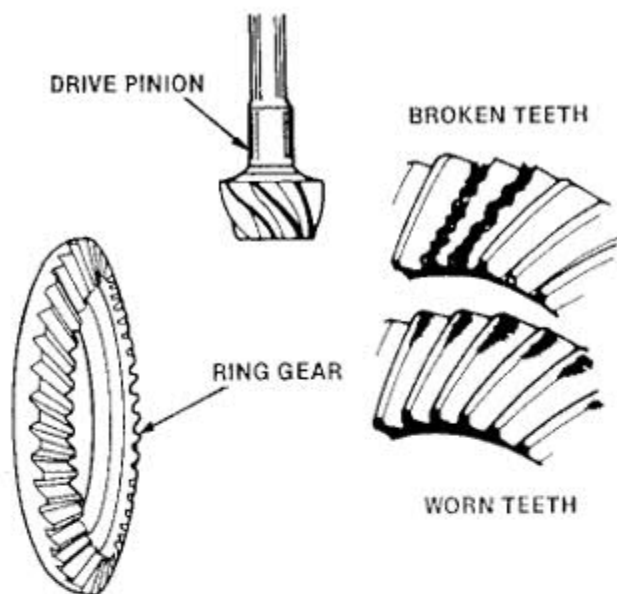
With the exception of the bearings, dry with compressed air.

**Gears**

Make sure teeth on gears are not excessively worn. Replace as necessary.

Check gears for irregular wear pattern and investigate causes.

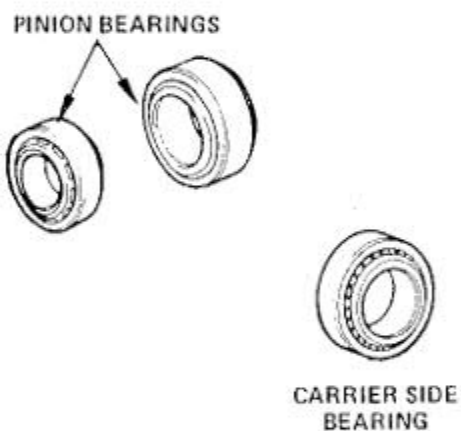
Make sure there are not chipped teeth.



Check bearings for wear or damage.

Determine the cause.

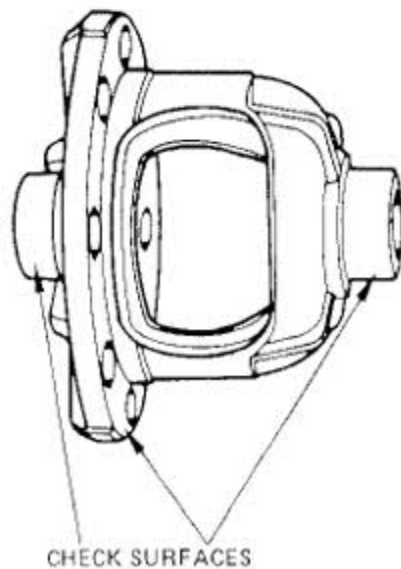
Make all repairs, following recommended procedures.



Check that all machined contact surfaces are smooth and free of any raised edges.

Check for cracks and distortions.

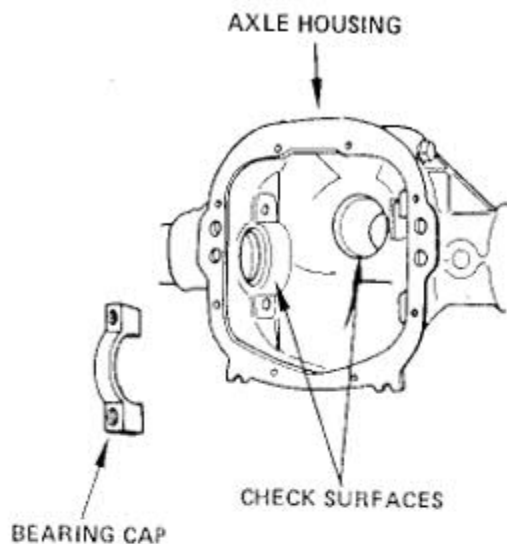
Check thrust washers for damage or excessive wear.



Check that all machined contact surfaces in housing and bearing caps are smooth and free of any raised edges.

Check condition of oil seal contact surfaces on pinion flange.

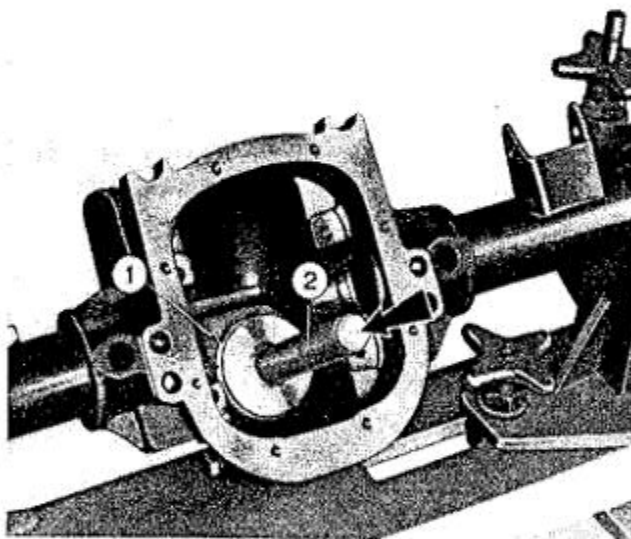
Check for distortions or cracks.



## ASSEMBLY

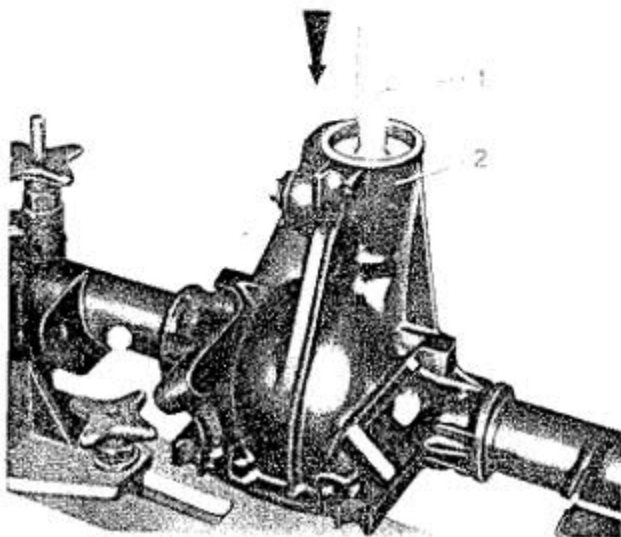
Install outer race (1) for pinion shaft rear bearing in housing. Use installer (Kent Moore No. 28105).

1. Outer race 2. Installer



Install outer race for pinion shaft rear bearing in housing (2). Use installer (Kent Moore No. 28248).

1. Installer 2. Housing

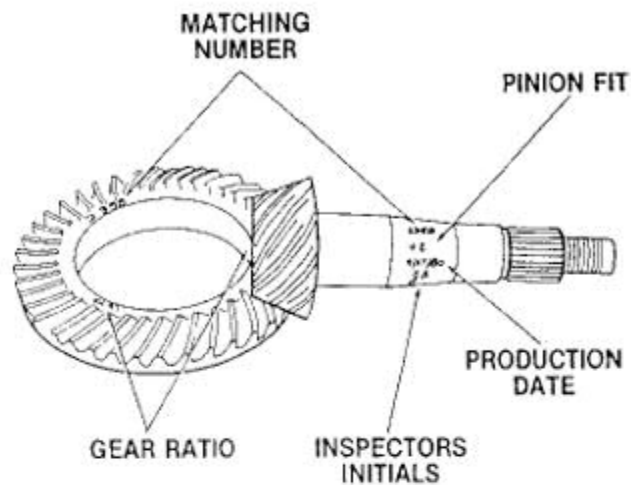


**NOTE:** Drive pinion and ring gear are supplied in matched pairs; if one is damaged, both must be replaced.

The drive pinion is marked on the shaft with the following:

- production date
- Inspector's initials
- gear ratio — also on ring gear
- production number — same number on ring gear, mating ring gear to pinion
- pinion fit — value in hundreds of mm showing difference between actual and ideal pinion fit.

**NOTE:** Subtract positive values and add negative values to shim size.



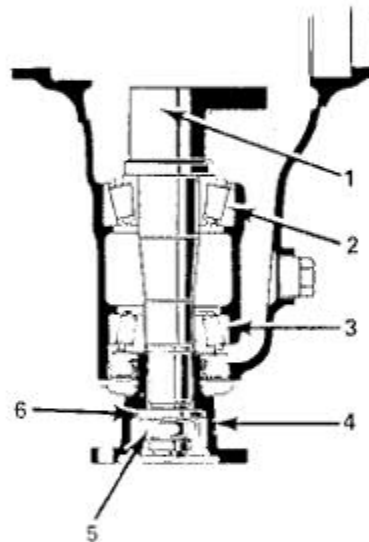
#### Calculating Pinion Depth

Install dummy pinion (1) (Kent Moore No. 28249) with bearings (2 and 3).

Install flange (4), fiatwasher (6), and nut (5).

Tighten nut. Rotate dummy pinion a few times to seat bearings and retighten nut.

1. Dummy pinion 2. Bearing 3. Bearing 4. Drive flange 5. Nut  
6. Flat washer



Zero dial indicator on a flat surface.

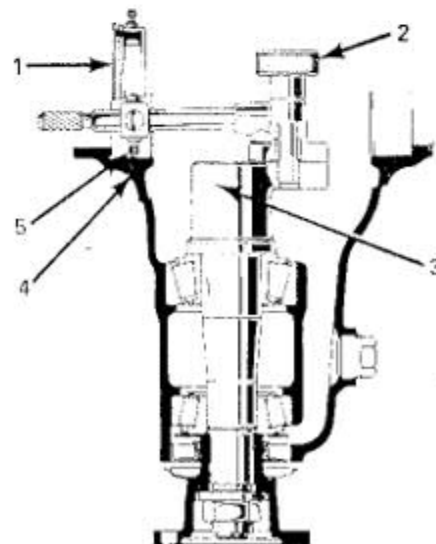
Install dial indicator (1) (Kent Moore No. 28193) on dummy pinion (3) with plunger (5) on carrier bearing seat (4). Tighten knurled bolt (2).

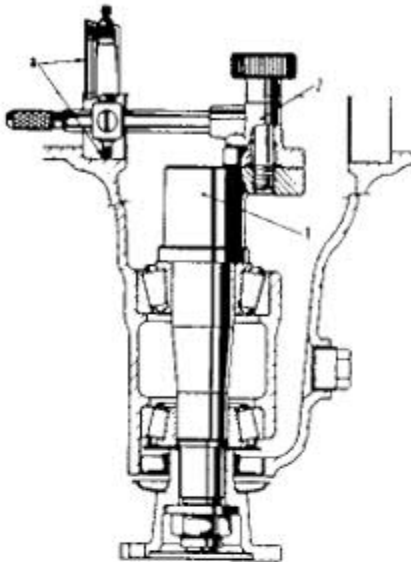
Note reading on dial indicator.

Note markings on new drive pinion.

Determine size of shim necessary to obtain proper pinion depth as shown on next page.

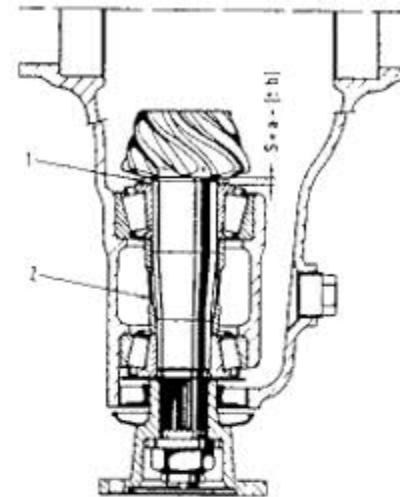
1. Dial indicator 2. Knurled bolt 3. Dummy pinion 4. Carrier bearing seat 5. Plunger





1. Dummy pinion 2. Dial indicator

a = Dial indicator reading from which factory marking on pinion must be subtracted.



1. Rear pinion bearing shim 2. Collapsible spacer

s = Thickness of rear pinion bearing mounting shim.  
a = Dial indicator reading.  
b = Factory marking on pinion.

## HOW TO DETERMINE THICKNESS OF REAR PINION BEARING SHIM

If (a) is dial indicator reading and (b) factory marking (in hundredths of a millimeter), thickness (S) of shim is determined as follows:

$$S = a - (+b) = a - b$$

$$\text{or } S = a - (-b) = a + b$$

in other words

- If factory marking on pinion is preceded by PLUS (+), subtract this number from dial indicator reading to obtain shim thickness.
- If factory marking on pinion is preceded by MINUS (-), add this number to dial indicator reading to obtain shim thickness.

Example:

If a = 2.90 (indicator reading)  
and b = -5 (marking on pinion)  
then  $S = a - (-b)$   
 $S = 2.90 - \{-0.05\}$   
 $S = 2.90 + 0.05$   
 $S = 2.95$

In this case a shim 2.95 mm thick must be used.

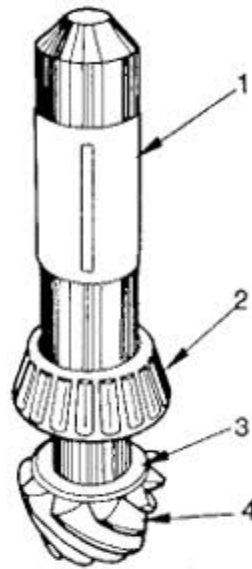
**NOTE:** Shims are available from 2.55 mm to 3.35 mm in graduations of 0.5 mm.

Place shim (3) previously calculated on pinion (4).

**NOTE:** If original ring and pinion gears will be used for reassembly, and ring to drive pinion gear tooth contact pattern is satisfactory, use original shims.

Install inner race (2) of pinion bearing on pinion. Use drift (Kent Moore No. 28101).

1. Drift 2. Pinion bearing inner race 3. Shim 4. Drive pinion

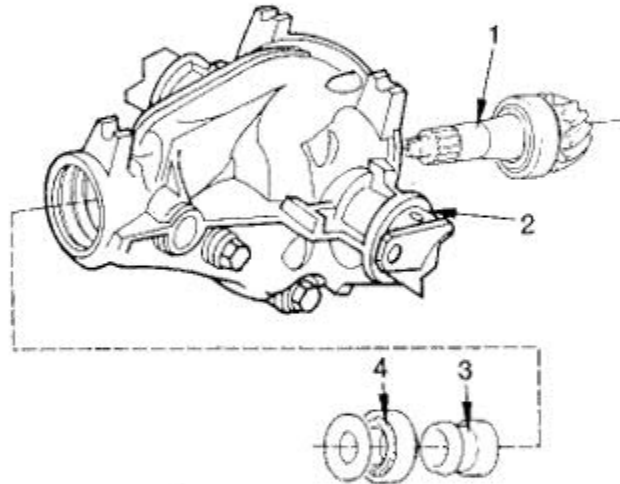


#### Pinion Installation

Lubricate the bearings with oil.

Place pinion (1) in housing (2). Install collapsible spacer (3), bearing (4), and plate on drive pinion.

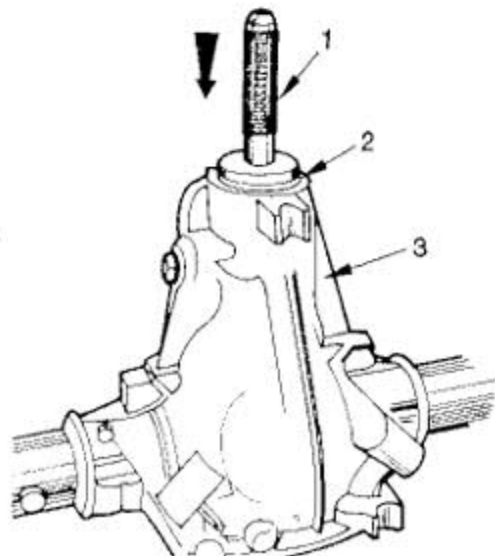
1. Pinion 2. Housing 3. Collapsible spacer 4. Bearing



Hold drive pinion in housing.

Place oil seal on housing and install with tool (1) (Kent Moore No. J28252).

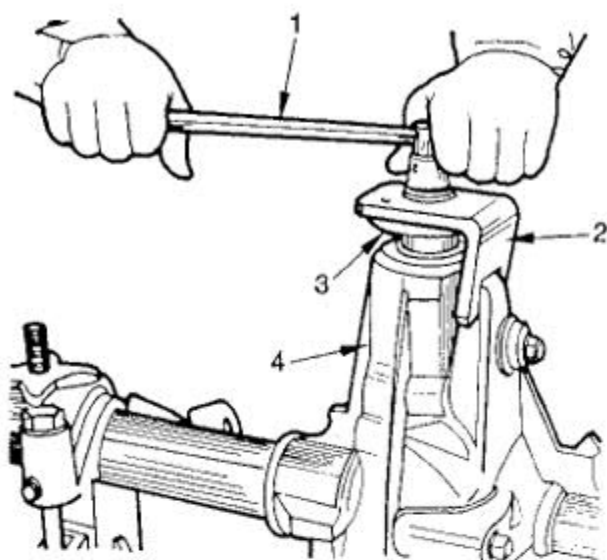
1. Tool 2. Oil seal 3. Housing



Install flange (3), washer, and nut on pinion shaft.

Install holding tool (2) on pinion flange (3). Tighten nut down gradually and check rolling torque of pinion.

1. Wrench 2. Holding tool 3. Pinion flange 4. Housing

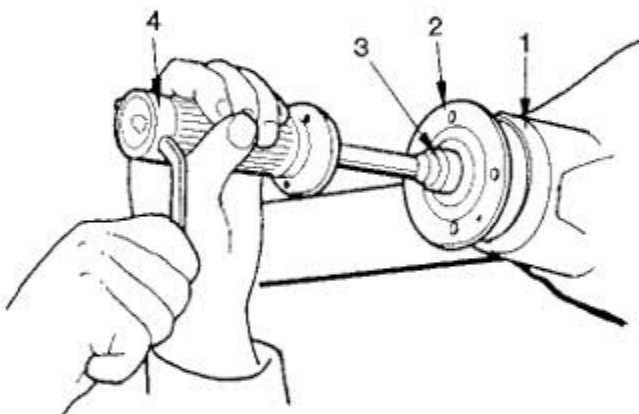


The nut is tightened sufficiently when the rolling torque of the pinion is 14 to 17 in. lbs. (16 to 20 kgcm).

**NOTE:** If rolling torque is exceeded, start procedure over using a new collapsible spacer. Do not loosen nut to obtain preload.

Using a punch, burr collar of nut securing flange of drive pinion.

1. Housing 2. Pinion flange 3. Socket 4. Rolling torque wrench (Kent Moore No. 28194)



### Differential Carrier Assembly

Place thrust washers under side gears (2). Install side gears (2) in carrier (1).

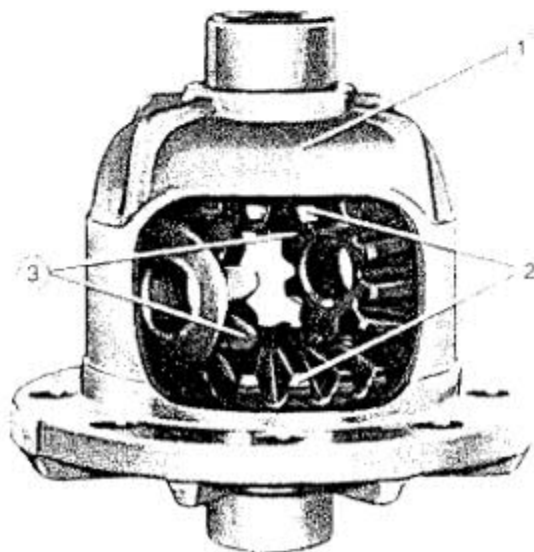
Mesh pinion gears (3) with side gears. Rotate pinion gears on side gears until aligned with hole in carrier. Install pinion shaft.

Block one side gear and check rolling torque on other side gear. Use rolling torque wrench (Kent Moore No. 28194).

Rolling torque = 22 to 36 ft. lbs. (3 to 5 kgm).

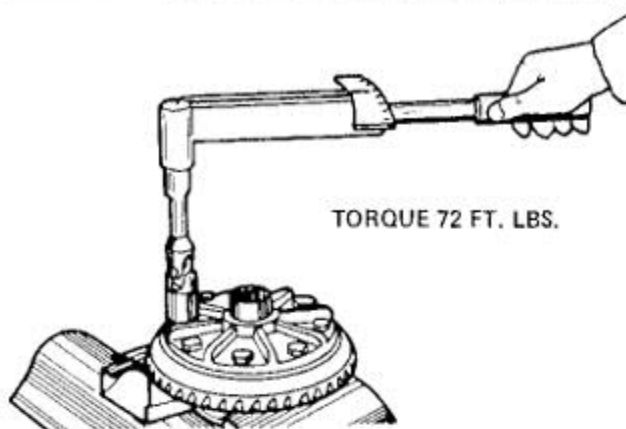
If torque is not within specifications, install new thrust washers.

1. Carrier 2. Side gears 3. Pinion gears





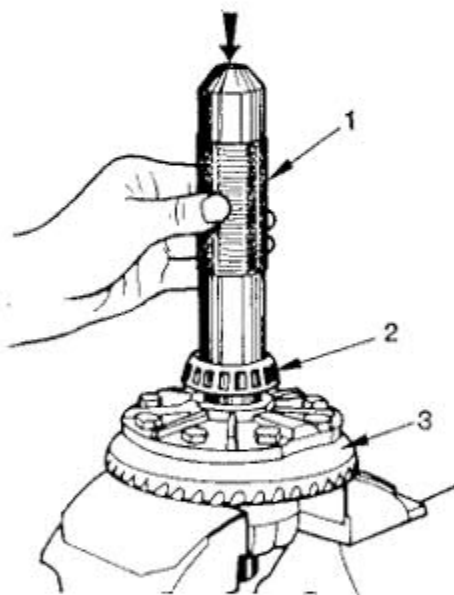
Align reference mark on ring gear with mark on carrier. Install eight bolts through carrier into ring gear. Torque bolts to 72 ft. lbs. (10 kgm).



Press side bearings (2) onto carrier (3) using installer (Kent Moore No. 26101).

If using old bearings, make sure they are installed on same side from which they were removed.

1. Installer 2. Bearing 3. Carrier



Reinstall carrier into housing. Make sure side bearing outer races are seated.

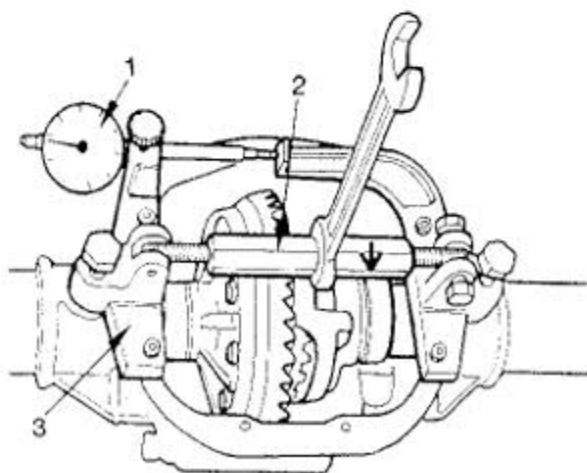
Reinstall turnbuckle (2) in spreader (3).

Calibrate dial indicator (1) by

- preloading indicator until needle travels  $\frac{1}{2}$  full travel
- set indicator dial to zero at needle.

Rotate turnbuckle (2) to spread housing 0.6 to 0.8 mm (0.024 to 0.031 inch) to facilitate side shim adjustment.

1. Dial indicator 2. Turnbuckle 3. Differential spreader



### Shim Selection

Use original shims if:

- Incorrect backlash or gear wear pattern was not a problem
- Old side bearings and races are reused.
- Shims, side bearings and races were kept separate during removal and can be installed on same side from which they were removed.

Select new shims if:

- Wear pattern indicates incorrect backlash.
- New side bearings were used.
- Shims were mixed up during disassembly.

Make sure side bearing outer races are seated properly.

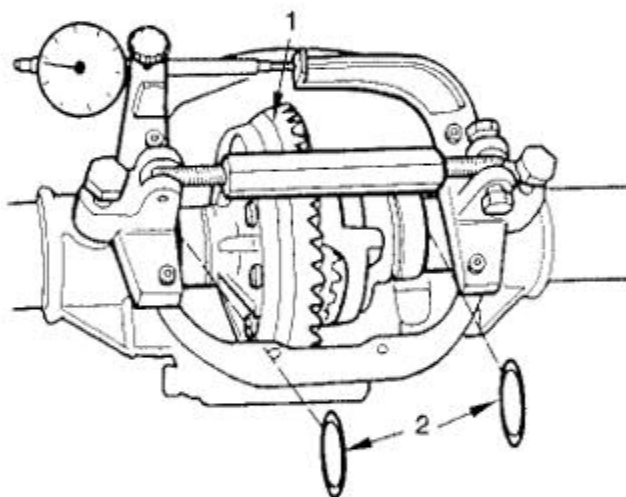
Move ring gear (1) against drive pinion to obtain zero backlash.

Fit largest shim (2) on ring gear side that will just take up clearance.

Install shim (2) on opposite side to take up clearance plus desired preload.

**NOTE:** This is only a starting point. Shim sizes may have to be changed to obtain desired preload and backlash.

1. Ring gear 2. Shim

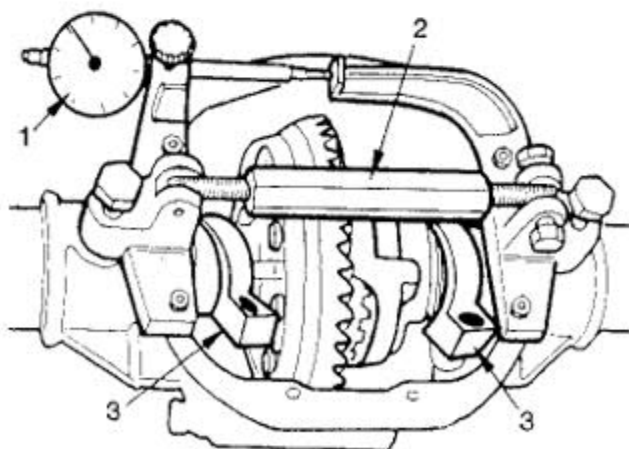


Loosen turnbuckle to the rest position. Check that dial indicator reading is 0.10 mm (0.004 inch). This is the bearing preload.

If necessary, adjust shims to obtain correct preload.

Install side bearing caps on same side from which they were removed. Torque bolts to 36 ft. lbs. (5 kgm).

1. Dial indicator 2. Turnbuckle 3. Side bearing caps



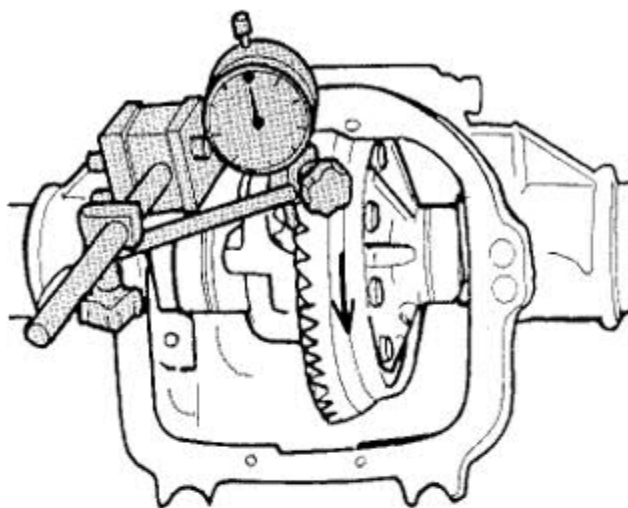
**NOTE:** Correct backlash is required for normal gear life and quiet operation.

Make sure bearing preload is adjusted correctly and caps are installed.

Install holding tool on pinion flange to block it from turning.

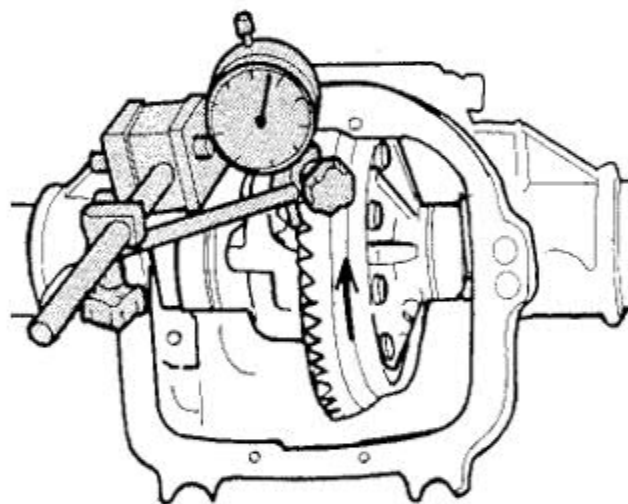
Mount dial indicator on housing with plunger contacting ring gear at right angle to teeth.

Rotate ring gear in one direction as far as it will go. Preload indicator until needle travels half full travel. Set indicator dial to zero at needle.



Rotate ring gear in other direction as far as it will go and read indicator. Backlash reading = 0.08 to 0.13 mm (0.003 to 0.005 inch).

Repeat check at two more different points on the ring gear circumference.

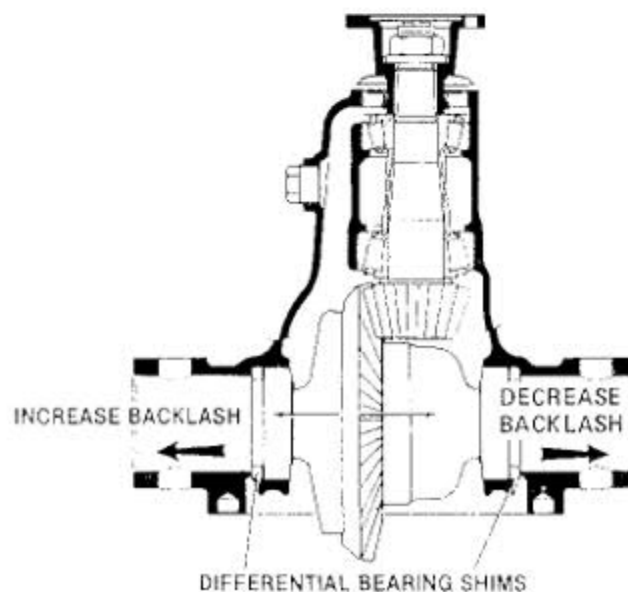


Adjust backlash by changing the size of the shims.

– To increase backlash, increase the size of the shim on pinion side of carrier and decrease size of shim on ring gear side.

– To decrease backlash, increase size of shim on ring gear side and decrease size of shim on pinion side.

**CAUTION:** Make sure you increase one side and decrease other side the same amount to maintain preload.



## TOOTH CONTACT PATTERN CHECK

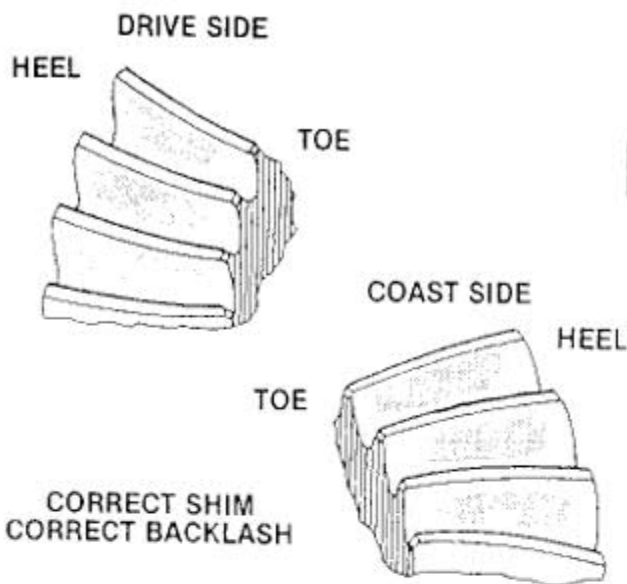
Coat ring gear teeth with red lead or Prussian blue.

Rotate ring gear about 15 turns in each direction while applying a load to the drive pinion flange.

If pattern is uniformly distributed over both tooth faces, the adjustment is correct.

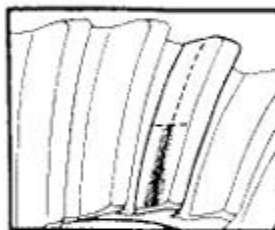
If readjustment is necessary, move ring gear or pinion in small amounts. Before rechecking the pattern, be sure

- bearings are properly preloaded
- cap bolts are torqued
- backlash is correct.



### Toe Contact

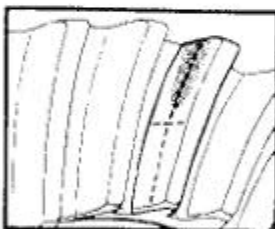
Too little backlash. Move ring gear away from pinion to increase backlash.



TOE CONTACT  
INCREASE BACKLASH

### Heel Contact

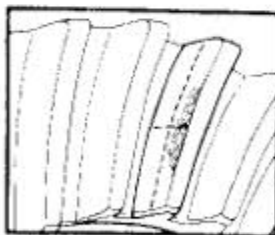
Too much backlash. Move ring gear toward pinion to decrease backlash.



HEEL CONTACT  
DECREASE BACKLASH

### High Face Contact

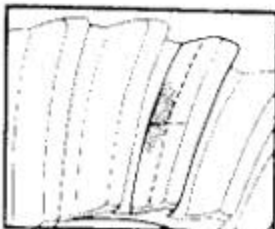
Pinion too far from ring gear. Increase pinion shim to move pinion toward ring gear.



HIGH FACE CONTACT  
INCREASE PINION SHIM

### Low Flank Contact

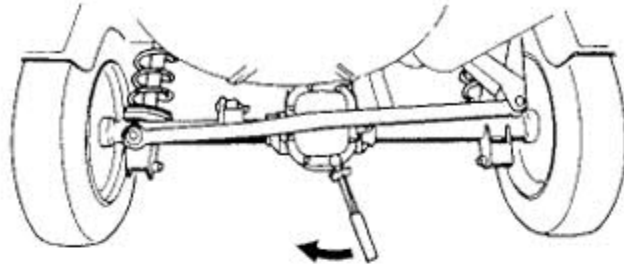
Pinion too close to ring gear. Decrease pinion shim to move pinion away from ring gear.



LOW FLANK CONTACT  
DECREASE PINION SHIM

Install new gasket and cover. Torque cover bolts to 18 ft. lbs. (2.5 kgm).

Fill differential with hypoid gear oil, SAE 80 W/90 EP to MIL-L-2105B (1.4 quarts).



TORQUE 18 FT. LBS.

**NOTE:** Number given in parentheses is Kent Moore catalogue number.

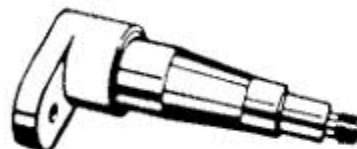
A.47017 (J28010) Axle puller



A.70341 (J28115) Pinion flange holding tool



A.70184 (J28106) Dummy pinion



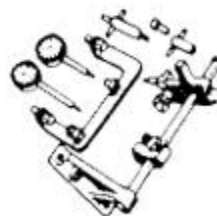
A.70152 (J28101) Side bearing and rear pinion bearing installer



A.70171 (J28105) Rear pinion bearing outer race installer



A.95688 (J28192) Pinion height and side bearing preload gage set



A.95697 (J28194) Dynamometer (rolling torque wrench)



A.45008 (J28005) Rear pinion bearing remover



A.45028 (J28007) Side bearing puller pilot



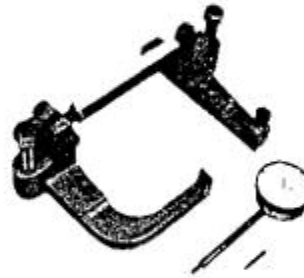
A.55015 (J28041) Side bearing lockring adjusting wrench



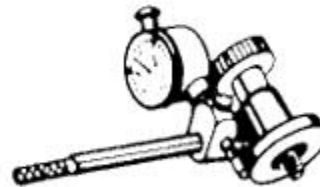
A.70198 (J28107) Pinion bearing outer race remover



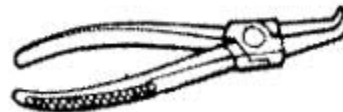
A.95753 (J28294) Differential housing spreader



A.95690 (J28193) Dial indicator



A.81114 (J28148) Snap ring pliers



A.70157 (J28252) Axle housing seal installer



A.70185 (J28248) Pinion bearing outer race installer



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# STEERING - 41

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

		PAGE
41	Specifications . . . . .	41-1
	Torque Specifications . . . . .	41-2
412.01	Steering Column . . . . .	41-3
412.02	Steering Box . . . . .	41-5
412.10	Steering Linkage . . . . .	41-7



## DATA AND SPECIFICATIONS

Type .....	worm and roller
Gear ratio .....	16.4 to 1
Worm shaft bearings .....	two, ball bearings
Cross shaft bearings .....	three, needle bearings
Steering column .....	in three sections, with two universal joints
Turning circle diameter .....	34.11 ft. (10.40 m)
Steering wheel turns, right to left, abt. ....	2 $\frac{1}{4}$
Steering linkage .....	symmetrical and independent tie rods with center link and idler arm
Steering box lubrication .....	7 $\frac{1}{4}$ ozs. SAE 90 EP oil
Tie rods .....	with adjustable ball joints
Center link .....	with non-adjustable ball joints
Ball joint type .....	lubricated "for-life"
Idler arm support .....	with double acting hydraulic damper
Lock angle: - outer wheel .....	35° 50' ± 1° 30'
- inner wheel .....	28° 30'
Front wheel toe-in, car laden (*) .....	.12" ± .039" (3 ± 2 mm) (on rim edge)

(\*) Car laden: 2 persons + 130 lb. (59 kg) of luggage.

## TORQUE SPECIFICATIONS

DESCRIPTION	THREAD (METRIC)	MATERIAL	TORQUE		
			N·m	FT. LB.	Kgm
<b>STEERING</b>					
Anti-theft device and steering column support rear mounting bolt .....	M 8	r 80 Fosf	25	18	2.5
Universal joint clamp self-locking nut (nylon-lined) .....	M 8	R 80 Znt (Bolt R 100 Cdt)	26	18	2.6
Steering wheel to column nut .....	M 16 x 1.5	R 50 Znt (Shaft C 30 Norm)	49	36	5
Steering box-to-body self-locking nut, type S .....	M 10 x 1.25	R 50 Cdt (Bolt R 80 Znt)	29	22	3
Pitman arm nut .....	M 20 1.5	R 80 Cdt (Shaft 30 Cd 4)	235	173	23.5
Hydraulic damper-to-body self-locking nut, type S .....	M 10 x 1.25	R 50 Cdt (Bolt R 80 Znt)	29	22	3
Track rod clamp nut .....	M 8	R 50 Znt (Bolt R 80 Znt)	17	11	1.7
Ball joint-to-steering rod self-locking nut (nylon-lined) .....	M 10 x 1.25	R 50 Znt (Pin 12 Nc 3 Carbn)	34	25	3.5

### STEERING WHEEL

#### REMOVAL AND INSTALLATION

Center steering wheel and front wheels.

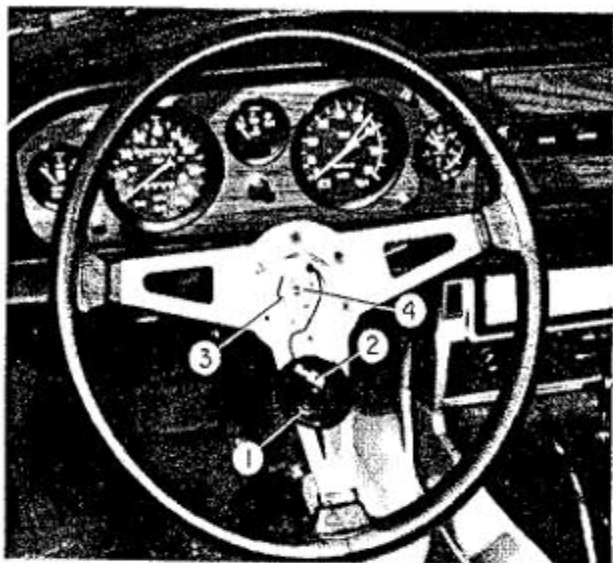
Disconnect battery ground cable.

Pull horn button (1) from steering wheel and disconnect electrical connector (2).

Remove nut (3) holding wheel to shaft (4). Mark steering wheel and steering shaft for reinstallation in same position. Pull wheel off shaft.

Install in reverse order of removal. Torque nut to 36 ft lb (5 kgm).

1. Horn button 2. Electrical connector 3. Nut 4. Steering shaft



### STEERING COLUMN

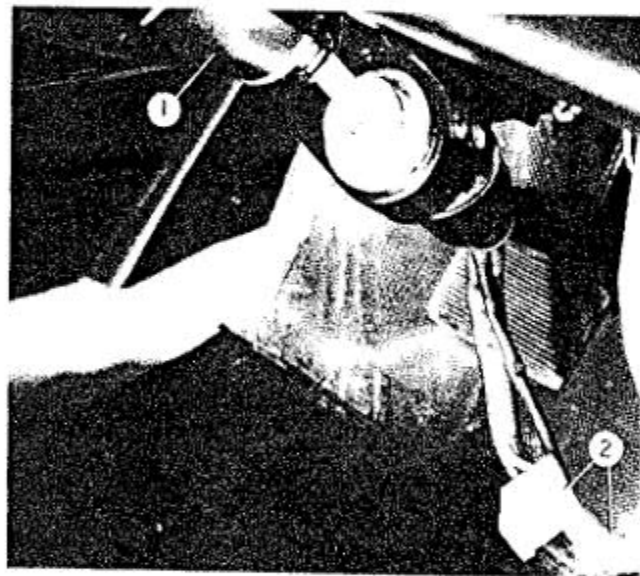
#### REMOVAL AND INSTALLATION

Remove steering wheel as described above.

Remove four screws to remove upper and lower cover halves (1).

Disconnect two ignition switch electrical connectors (2).

1. Steering column cover half 2. Electrical connector

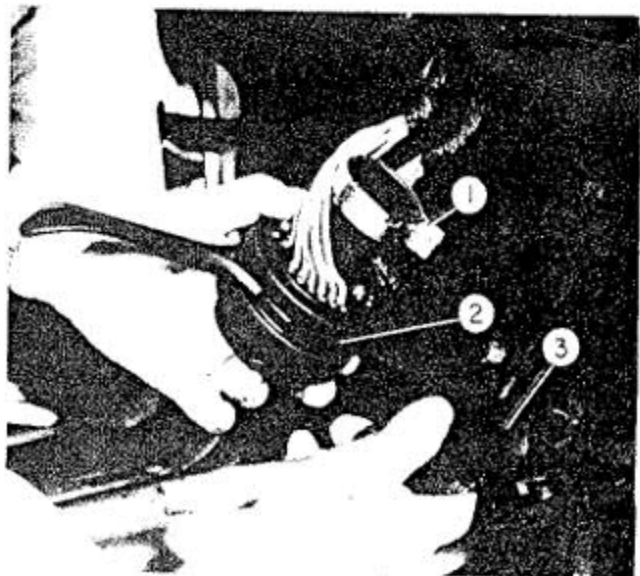


4  
1

Loosen clamp (1) holding lights/wiper/directional switch assembly (2) to column.

Remove two bolts and two nuts securing steering column (3) to underdash frame. Lower column and simultaneously slide lights/wiper/directional switch assembly off column.

1. Clamp 2. Lights/wiper/directional switch assembly  
3. Steering column

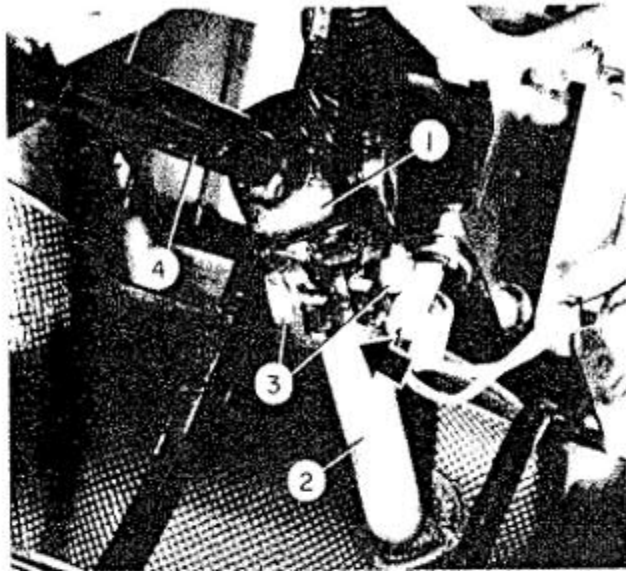


Mark position (arrow) of column shaft U-joint (1) in relation to steering box shaft (2).

Remove bolt and nut (3). Slide entire column (4) off steering box shaft.

Install in reverse order of removal. Torque U-joint clamp nut to 18 ft lb (2.6 kgm).

1. U-joint 2. Steering box shaft 3. Bolt and nut 4. Steering column



#### INSPECTION

Inspect U-joints (1) for wear. Replace if worn.

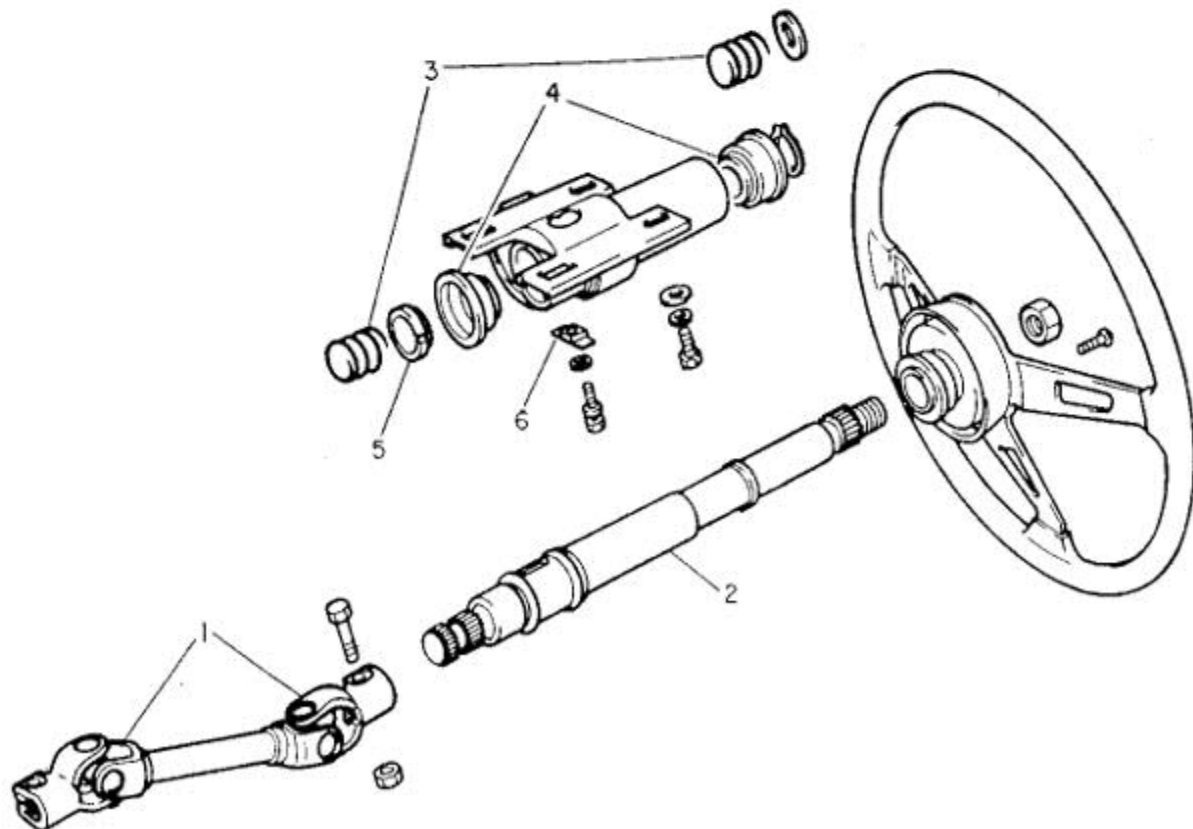
Inspect splines and shaft (2) for wear or damage. Replace if necessary.

Inspect springs (3) for breakage. Replace if broken.

Inspect bearings (4) and bushing (5) for wear. Replace if worn.

Replace retainers (6) if broken.

1. U-joint 2. Steering shaft 3. Spring 4. Bearing 5. Bushing 6. Retainer



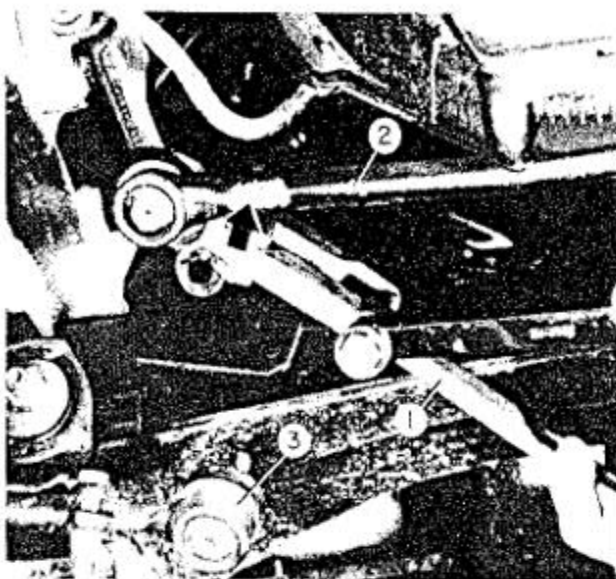
### STEERING BOX

#### REMOVAL AND INSTALLATION

Remove tie rods from pitman arm with tool A.47038 (1) as shown.

**NOTE:** Mark one side (arrow) of intermediate tie rod (2) so that it will be assembled in same position.

1. Tool A.47038 2. Intermediate tie rod 3. L. side tie rod assembly



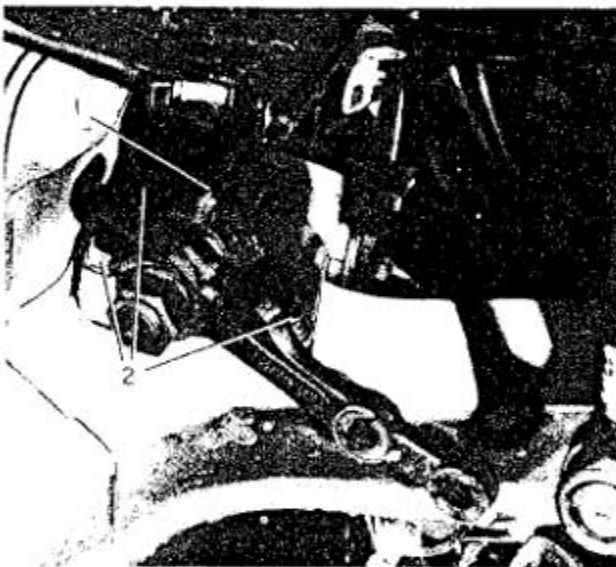
Disconnect starter (refer to Electrical Section) and move it out of way.

Remove lower bolt on left wheel well shield to gain access to steering box (1) mounting nuts. Remove three bolts (2) and nuts.

Remove steering box by withdrawing steering box shaft thru firewall.

Install in reverse order of removal. Torque steering box mounting nuts to 22 ft lb (3 kgm). Torque pitman arm tie rod nuts to 25 ft lb (3.5 kgm).

1. Steering box 2. Bolt



4  
1

### IDLER ARM SUPPORT/STEERING DAMPNER

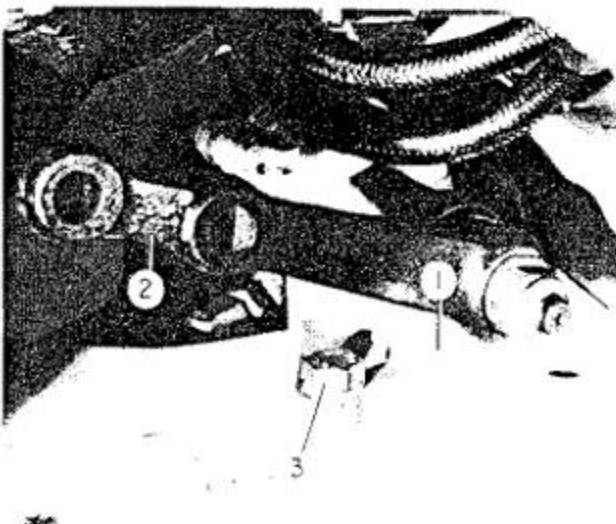
#### REMOVAL AND INSTALLATION

Remove tie rods from idler arm (2) with tool A.47038.

Remove lower bolt on right wheel well shield in order to gain access to dampner mounting nut. Remove two bolts (3) and nuts to remove dampner (1).

Install in reverse order of removal. Torque dampner mounting nuts to 22 ft lb (3 kgm). Torque idler arm tie rod nuts to 25 ft lb (3.5 kgm).

1. Idler arm support/steering dampner 2. Idler arm 3. Bolt



**ADJUSTMENT**

Before adjusting steering, first check that steering linkage joints are not worn, since this will cause excessive free play in steering wheel.

If, with front wheels in straight ahead position, steering wheel free travel at rim is more than one inch, steering box may need adjustment.

**NOTE:** Adjustment between worm and roller must be made with pitman arm in mid position (front wheels straight ahead).

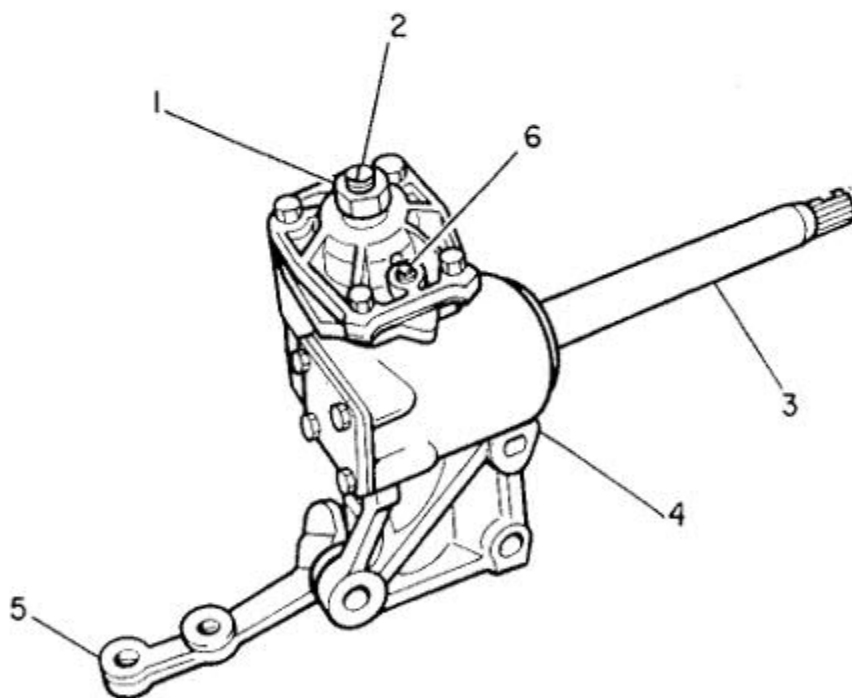
Loosen locknut (1). Turn adjusting screw (2) clockwise until steering wheel free play is less than one inch.

To check that adjustment is not too tight, move steering wheel from left turn to full right turn (this is best accomplished with front end jacked up or wheels on slip plates). There should be no binding or tightness at end of wheel travel. If tightness is felt, back off on adjustment until it is eliminated.

With screwdriver holding adjusting screw in position, tighten locknut to secure adjustment.

**LUBRICATION**

Steering box is filled with 7¼ ozs. of SAE 90 EP oil. Top up thru filler plug (6).



- 1. Locknut
- 2. Adjusting screw
- 3. Steering shaft
- 4. Steering box
- 5. Pitman arm
- 6. Oil filler plug

### STEERING LINKAGE

#### REMOVAL AND INSTALLATION

Remove self-locking nuts which secure side rod ball joints (2) to steering arms (1). With tool A.47038 remove ball joint pins from taper seats in arms.

Repeat operation for remaining side rod ball joints on pitman (3) and idler (4) arms.

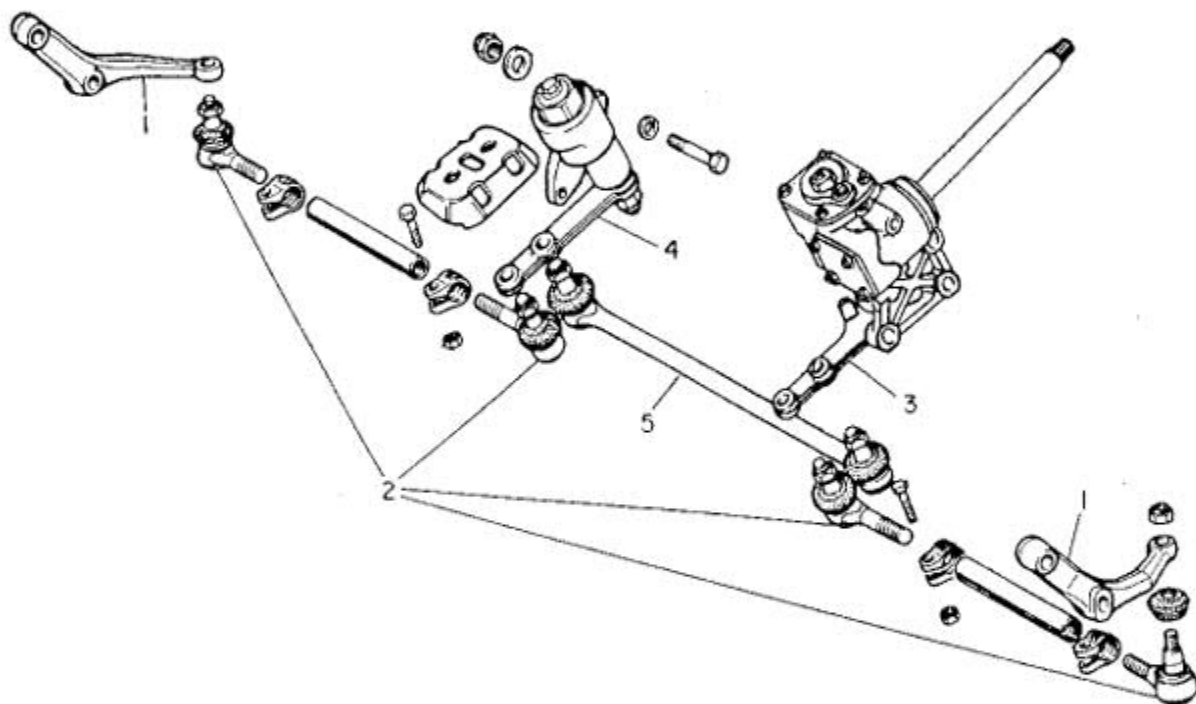
**NOTE:** Before removing intermediate arm (5), mark one side of arm so that it will be reassembled in same position.

Remove intermediate arm with tool A.47038.

Installation is reverse of removal. Torque all ball joint self-locking nuts to 25 ft lb (3.5 kgm).

Adjust toe-in (refer to Suspension section).

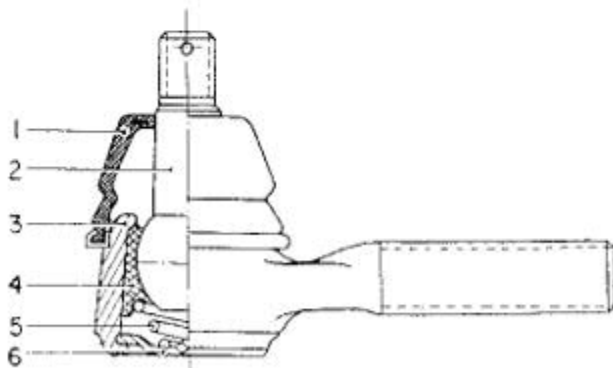
1, Steering arm 2, Rod ball joints 3, Pitman arm 4, Idler arm 5, Intermediate arm



#### INSPECTION

Check that ball joints are not too loose in their sockets (3) and that pins (2) and rubber boots (1) are in good condition. If not, replace entire rod for the intermediate rod, and replace ball joints for the side rods.

1, Rubber boot 2, Ball pin 3, Socket 4, Spherical bushing  
5, Spring 6, Cover plate

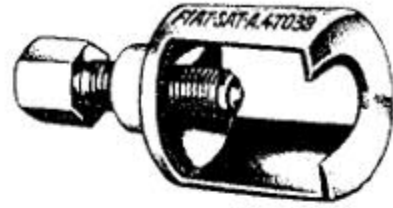


# Service Tools

41A

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A.47038 Puller for separating ball joints



41



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# SUSPENSION - 44

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

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443.06	Rear Shock Absorbers . . . . .	44-23
443.14	Steering Knuckle . . . . .	44-25
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## SPECIFICATIONS, FRONT SUSPENSION

**Type:** Independent wheel with control arms, coil springs, sway bar and hydraulic, telescopic, double-acting shock absorbers on lower control arm. Joints lubricated << for life >>.

### Steering Knuckles.

Inclination angle .....	6°
Caster angle (car laden*) .....	3°30' ± 30'
Caster adjustment: by shims inserted between body and upper control arm.	

### Wheels.

Camber (car laden*) .....	0°30' ± 30'
Camber adjustment: by shims inserted between body and upper control arm.	
Toe-in (car laden*) .....	.12 ± .039" (3 ± 2 mm)
Toe-in adjustment: by threaded sleeves on steering tie rods.	
Locking suspension: with car laden* .....	

### Coil Springs.

Length under a load of 970.03 ± 33 lb. (440 ± 15 kg) .....	8.8189" (224 mm)
Minimum permissible load referred to above length .....	892 lb. (405 kg)
Coil springs are divided into two classes color coded as follows:	
– yellow: springs which under a load of 970.03 lb. (440 kg) have a length of more than .....	8.8189" (224 mm)
– green: springs which under a load of 970.03 lb. (440 kg) have a length equal to or less than .....	8.8189" (224 mm)
Spring pairs belonging to the same class should be fitted.	

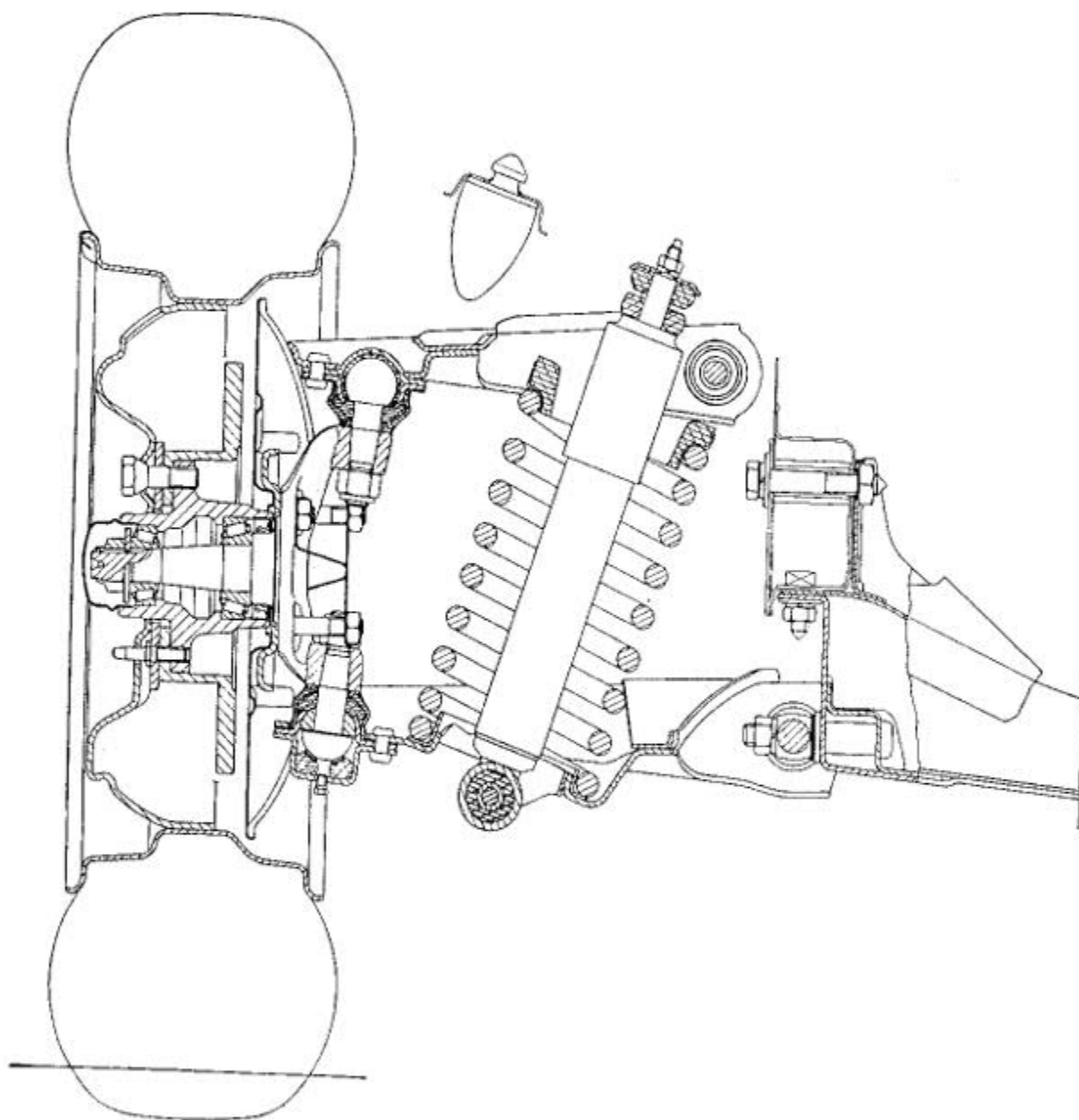
### Shock Absorbers.

Pressure cylinder bore .....	1.063 (27 mm)
Length: – extended (abutting begins) .....	12.046" $\begin{smallmatrix} +.118" \\ -.039" \end{smallmatrix}$ (306 $\frac{3}{4}$ mm)
– retracted .....	8.464 ± 0.787" (215.5 ± 2 mm)
Stroke (abutting begins) .....	3.563" (90.5 mm)

(\*) Car laden: 2 persons + 130 lb. (59 kg).

## TORQUE SPECIFICATIONS

DESCRIPTION	THREAD (METRIC)	MATERIAL	TORQUE		
			N·m	FT. LB.	Kgm
<b>FRONT SUSPENSION</b>					
Front wheel stud .....	M 12 x 1.25	C 35 R Bon Znt	86	65	9
Crossmember-to-side member bolt .....	M 12 x 1.25	R 80 Znt	93	69	9.5
Crossmember-to-side member lower nut .....	M 10 x 1.25	R 50 Znt (Bolt R 80 Znt)	56	40	5.5
Lower control arm-to-crossmember nut .....	M 12 x 1.25	R 50 Znt (Bolt R 50 Sd Stab)	59	43	6
Lower control arm-to-pivot bar nut .....	M 14 x 1.5	R 50 Znt	98	72	10
Self-locking nut, type S, securing ball joint to lower control arm .....	M 14 x 1.5	R 50 Cdt (Pin 25 Mc 6 Rct Glob Estr Dist Fosf R 65 ± 5)	52	40	5.5
Upper control arm self-locking nut (nylon-lined)	M 14 x 1.5	R 80 Znt (Pin R 80 Cdt)	88	65	9
Shock absorber upper mounting nut .....	M 8	R 50 Znt (Stem R 50)	15	11	1.5
Shock absorber lower mounting nut .....	M 10 x 1.25	R 80 Znt (Bolt R 100)	59	43	6
Sway bar bracket-to-lower control arm nut .....	M 8	R 50 Znt (Bolt R 50 Sd Stab)	18	14	2
Sway bar center mounting nut .....	M 8	R 50 Znt (Bolt R 50 Sd Stab)	18	14	2
Ball joint-to-knuckle self-locking nut (nylon-lined) .....	M 14 x 1.5	R 50 Znt (Pins 35 Nc 5 R 40 Ni Cr Mo 2R)	98	72	10
Caliper plate and steering arm-to-knuckle nut ..	M 10 x 1.25	R 80 Znt (Bolt R 100 Cdt)	59	43	6
Brake caliper carrier plate bolt .....	M 10 x 1.25	R 80 Fosf Black	49	36	5
Front brake bleeding screw .....	M 8	R 50 Ind Cdt	6,4	3	.4
Front wheel brake hose connector .....	3/8-24Unf-2A	C 4 Mf Trf Bon Cdt Bright	27	22	3
<b>REAR SUSPENSION</b>					
Shock absorber upper mount nut .....	M 8	R 50 Znt (Shank R 50)	15	11	1.5
Shock absorber lower mount nut .....	M 10 x 1.25	R 50 Znt (Bolt R 80 Znt)	49	36	5
Shock absorber lower mount support self-locking nut (nylon-lined) .....	M 8	R 50 Znt (Bolt R 50 SD Stab)	18	14	2
Reaction and cross rods nut .....	M 12 x 1.25	R 50 Znt (Bolt R 80 Znt)	78	58	8
Upper reaction rod-to-body self-locking nut (nylon-lined) .....	M 12 x 1.25	R 80 Znt (Bolt R 80 Znt)	78	58	8
Lower reaction rod front support-to-body nut ..	M 10 x 1.25	R 50 Znt (Bolt R 50 SD Stab)	32	25	3.5



CROSS SECTION OF L.H. ROAD WHEEL AND FRONT SUSPENSION

# Front Suspension

443.01

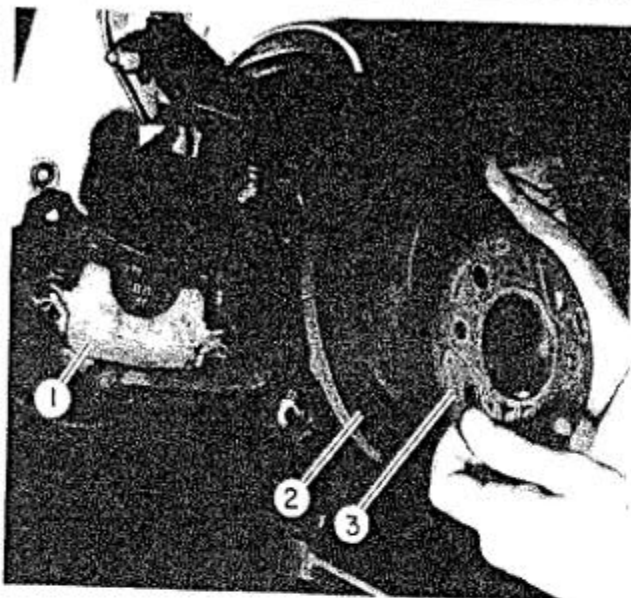
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Remove two bolts holding caliper assembly (1) to backing plate and lay to one side.

Remove two locating bolts to remove brake disc (2) and plate (3).

Remove bearing cap. Remove nut and washer and withdraw wheel hub.

1. Caliper assembly 2. Brake disc 3. Plate

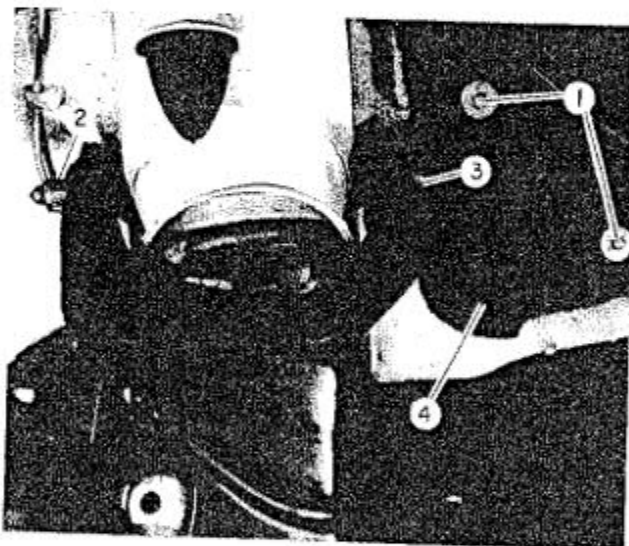


Remove five bolts (1) holding fender splash shield (4) to body and withdraw shield.

Remove nut (2) from pivot bolt (3). Drive pivot bolt out with brass drift pin.

**NOTE:** If coil spring compressor does not completely release spring tension, lower vehicle until lower control arm just contacts jack, this will take tension off upper control arm pivot bolt.

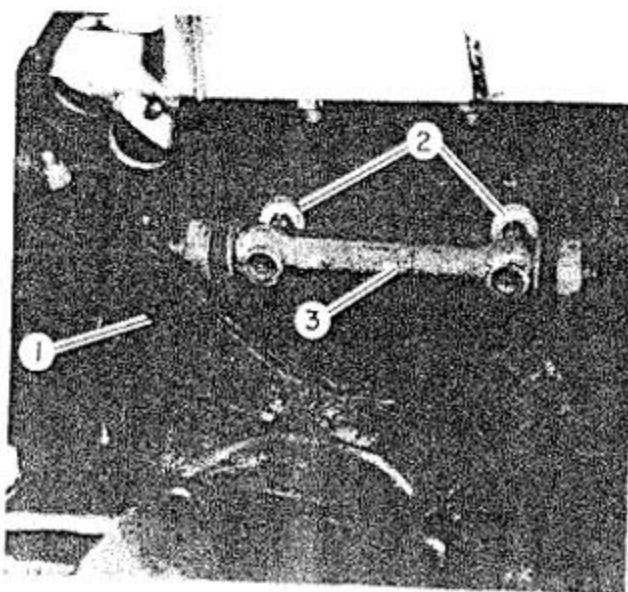
1. Bolt 2. Nut 3. Pivot bolt 4. Splash shield



Remove two nuts which secure lower control arm (1) to cross-member. Entire assembly can now be removed.

**NOTE:** If shims (2) are removed when removing lower control arm, note number and location of shims between pivot bar (3) and body. Shims control caster and camber adjustments.

1. Lower control arm 2. Shims 3. Pivot bar



# Front Suspension

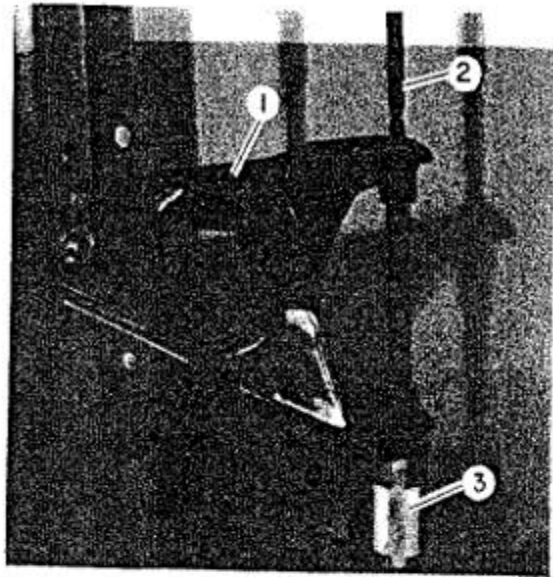
443.01

Page 44-9

Place lower control arm (1) in press with pin (2) and collar (3) as shown. Press bushing out of its seat.

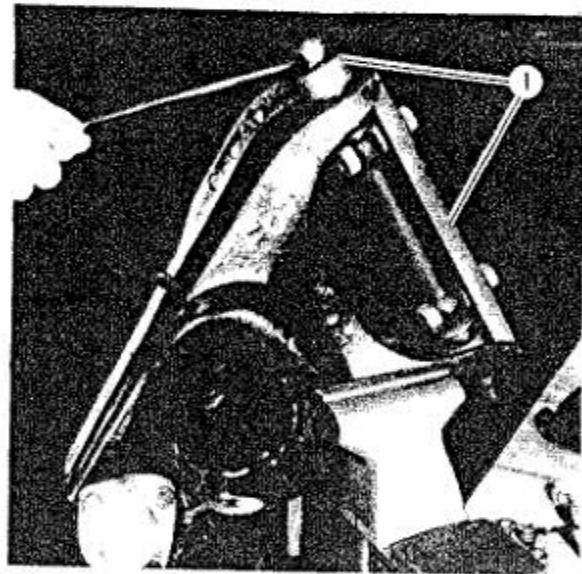
Turn control arm around and repeat operation to extract other bushing.

1. Lower control arm 2. Pin 3. Collar



Install new bushings with special collars (1) as shown. Tighten nut until bushing bottoms out.

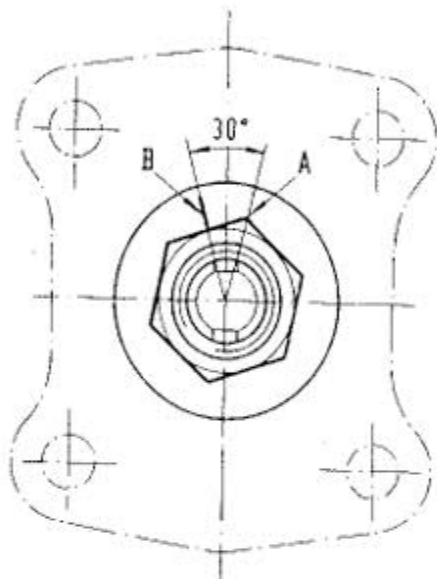
1. Bushing installation collars



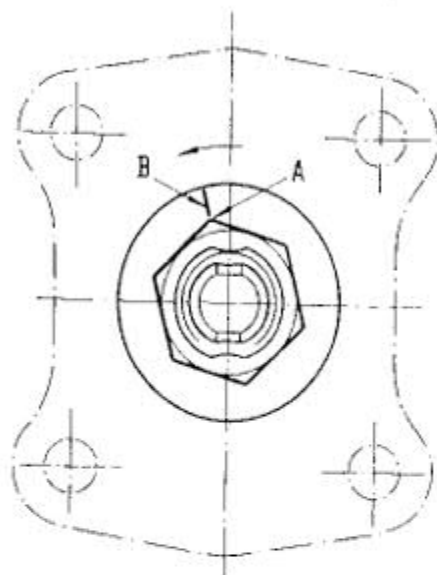
Fit hub complete with bearings and seal to steering knuckle. Be certain bearings are lubricated with bearing grease.

Install outer bearing thrust washer, inserting tab in groove on knuckle spindle. Install new hub nut and tighten it with a torque of 14.5 ft. lb. (2 kgm) at the same time turning hub in both directions four or five times to ensure that bearings are properly seated. Unscrew nut and then torque it to 5 ft. lb. (0.7 kgm).

Unscrew nut  $30^\circ$ . To do this first make a chisel mark "B" on washer opposite the middle of one face of hex nut as shown. Then unscrew nut until next angle "A" of nut is opposite mark "B".



Nut tightened with a torque of 5 ft.lbs (0.7 kgm).



Nut unscrewed by  $30^\circ$ .

A. Angle of nut. - B. Reference mark on washer.

Figure shows adjustment of left front wheel hub. Reverse procedure for right hand hub as nut has a left-hand thread.

When nut has been unscrewed  $30^\circ$ , lock it in this position by crimping its lock collar with tool A.74140 (1) as shown.

Fill wheel hub cover with bearing grease and install on hub (2) by gently tapping until it seats.

Install brake disc and plate to wheel hub with two locating bolts.

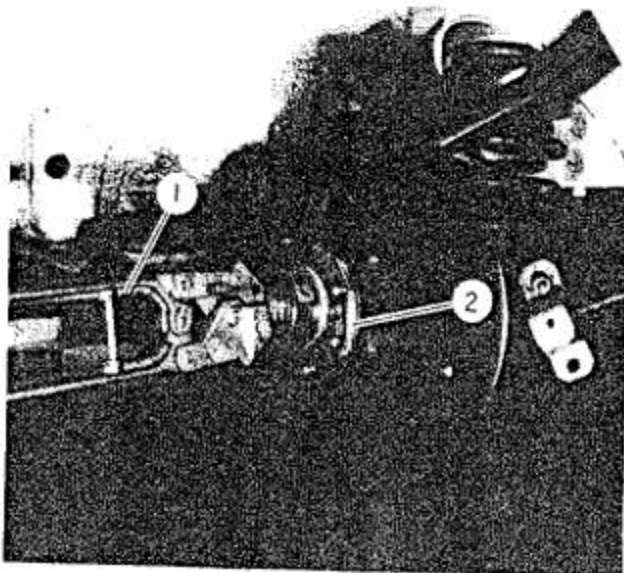
Install complete caliper assembly to mounting bracket with two bolts. Torque to 36 ft. lb. (5 kgm).

Install road wheels. Torque wheel bolts to 65 ft. lb. (9 kgm). Check tire pressures for conformance to specifications.

Lower vehicle and set front wheels straight ahead.

**NOTE:** Rubber bushing nuts and bolts must be tightened with vehicle laden with two persons + 130 lb. (59 kg) of luggage to avoid abnormal stresses on bushings. Refer to figure on next page.

**CAUTION:** Pump brake pedal a few times to ensure brake pads are fully seated before driving vehicle.



### SWAY BAR

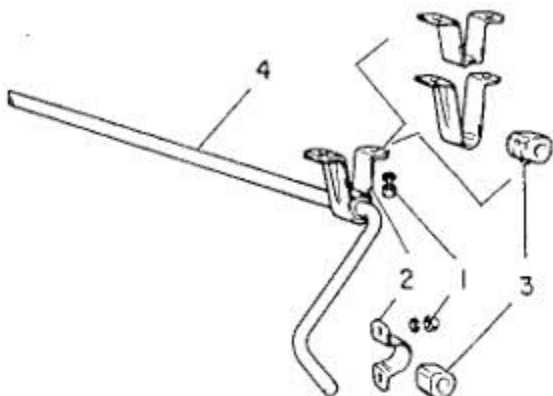
#### REMOVAL AND INSTALLATION

Remove eight bolts to remove front splash shield.

Remove eight nuts (1) and lockwashers holding sway bar supports (2) and bushings (3). Remove sway bar.

Install in reverse order of removal. Torque nuts to 14 ft. lb. (2 kgm).

1. Nut 2. Support bracket 3. Bushing



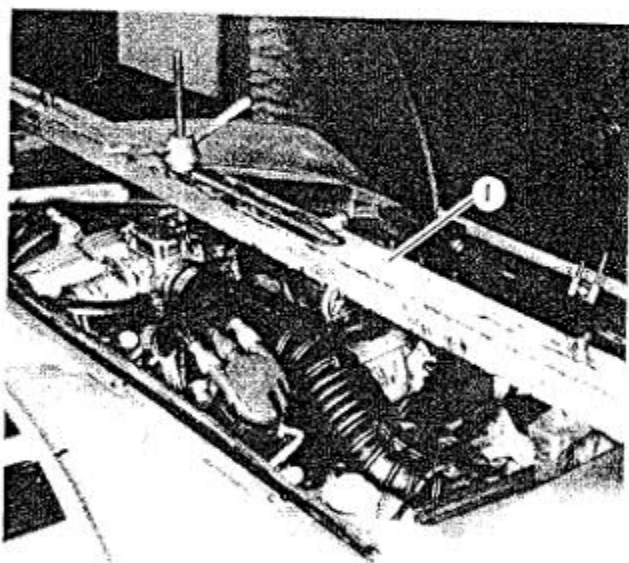
### CROSSMEMBER

#### REMOVAL AND INSTALLATION

Support engine with bar A.70526 (1) as shown.

Remove both front suspension assemblies as described in this section.

1. Engine Support A.70526

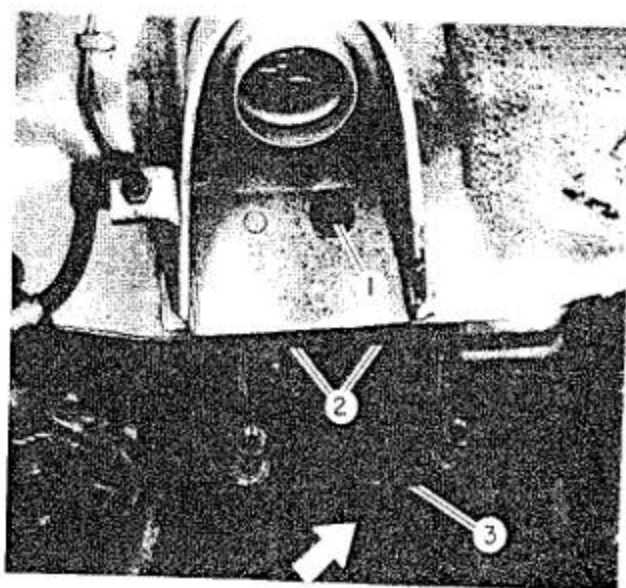


Remove two bolts (1), four nuts (2) and washers holding crossmember (3) to frame. Remove two nuts and washers, thru crossmember opening (arrow), holding engine mounts to crossmember. Remove crossmember.

Note location of any shims between body and crossmember.

Install in reverse order of removal. Torque bolts to 69 ft. lb. (9.5 kgm) and nuts to 40 ft. lb. (5.5 kgm). Torque engine mount nuts to 25 ft. lb. (3.5 kgm).

1. Bolt 2. Nut 3. Crossmember





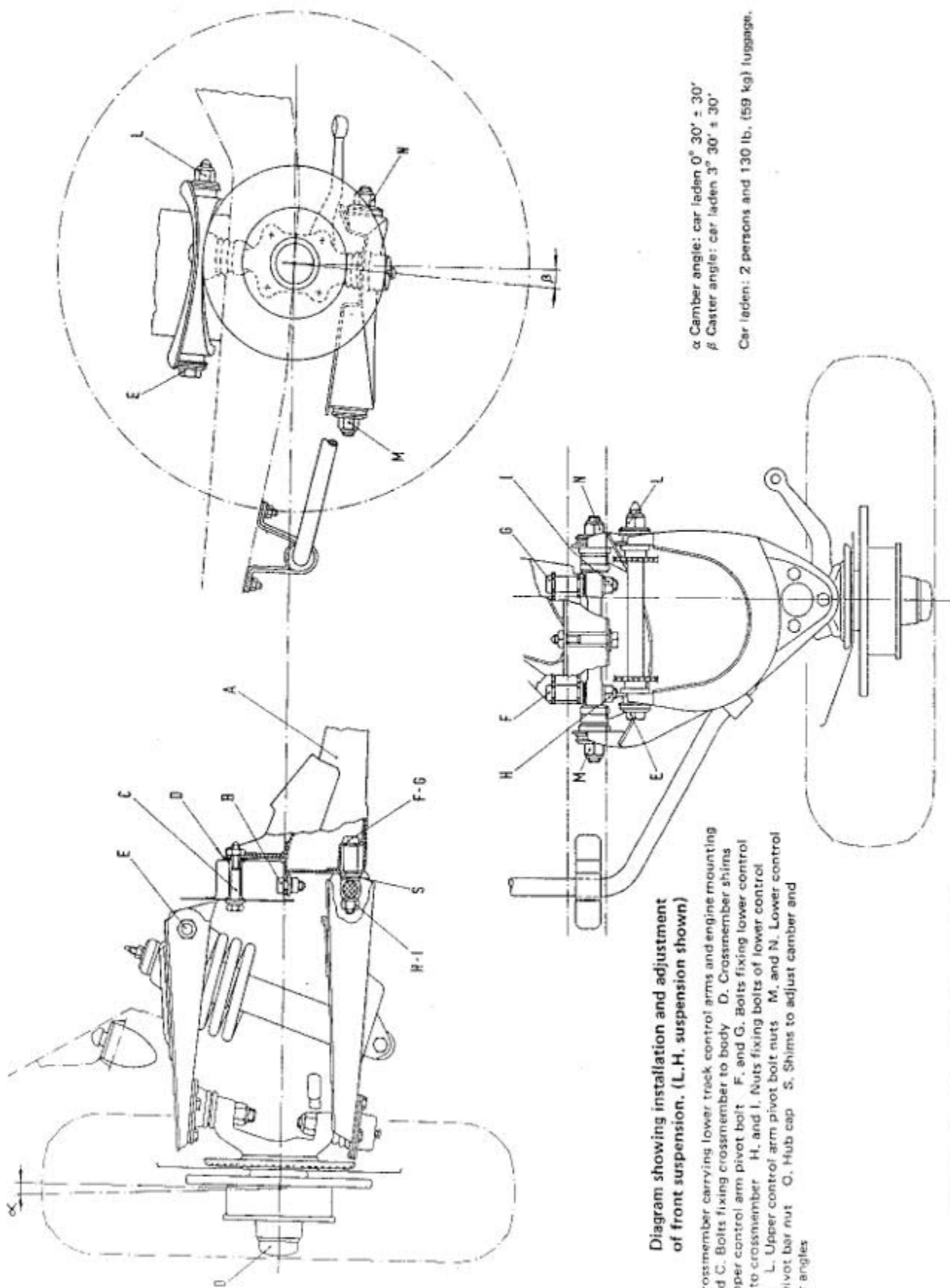


Diagram showing installation and adjustment of front suspension. (L.H. suspension shown)

- A. Crossmember carrying lower track control arms and engine mounting
- B. and C. Bolts fixing crossmember to body O. Crossmember shims
- E. Upper control arm pivot bolt F. and G. Bolts fixing lower control arms to crossmember H. and I. Nuts fixing bolts of lower control arms L. Upper control arm pivot bolt nuts M. and N. Lower control arm pivot bar nut O. Hub cap S. Shims to adjust camber and caster angles

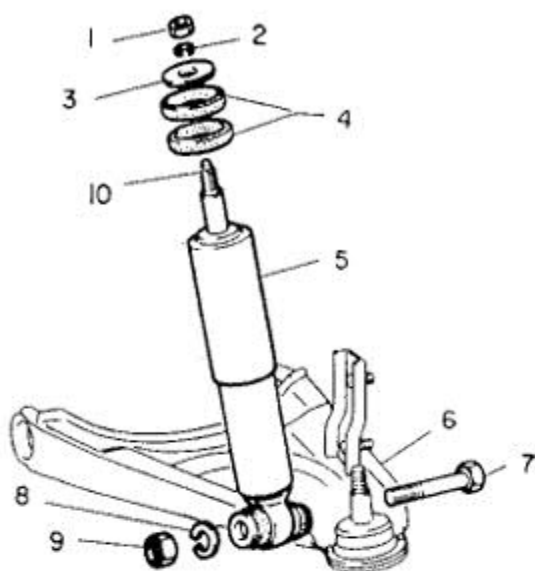
$\alpha$  Camber angle: car laden  $0^{\circ} 30' \pm 30'$   
 $\beta$  Caster angle: car laden  $3^{\circ} 30' \pm 30'$   
 Car laden: 2 persons and 130 lb. (59 kg) luggage.

### REMOVAL AND INSTALLATION

From inside engine compartment, disconnect nut (1) on upper end of shock absorber (5), holding shank (10) from turning with wrench A.57070.

From under vehicle, remove bolt (7) and nut (9) holding shock absorber to lower control arm (6). Withdraw shock absorber thru lower control arm.

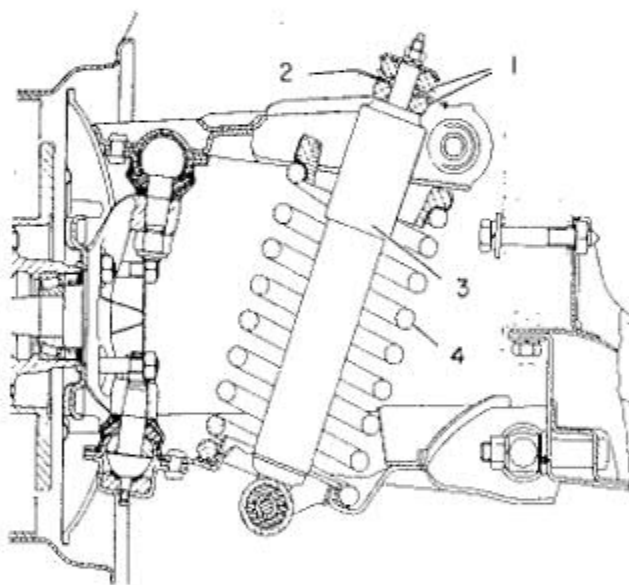
1. Nut 2. Lockwasher 3. Flat washer 4. Rubber bushing  
5. Shock absorber 6. Lower control arm 7. Bolt 8. Lockwasher  
9. Nut



Installation is reverse of removal.

Be certain that rubber bushings (1) are installed between body section (2) and shock absorber (3) as shown. Torque lower nut to 43 ft. lb. (6 kgm) and upper nut to 11 ft. lb. (1.5 kgm).

1. Rubber bushing 2. Body section 3. Shock absorber 4. Coil spring



### REAR SUSPENSION

#### REMOVAL

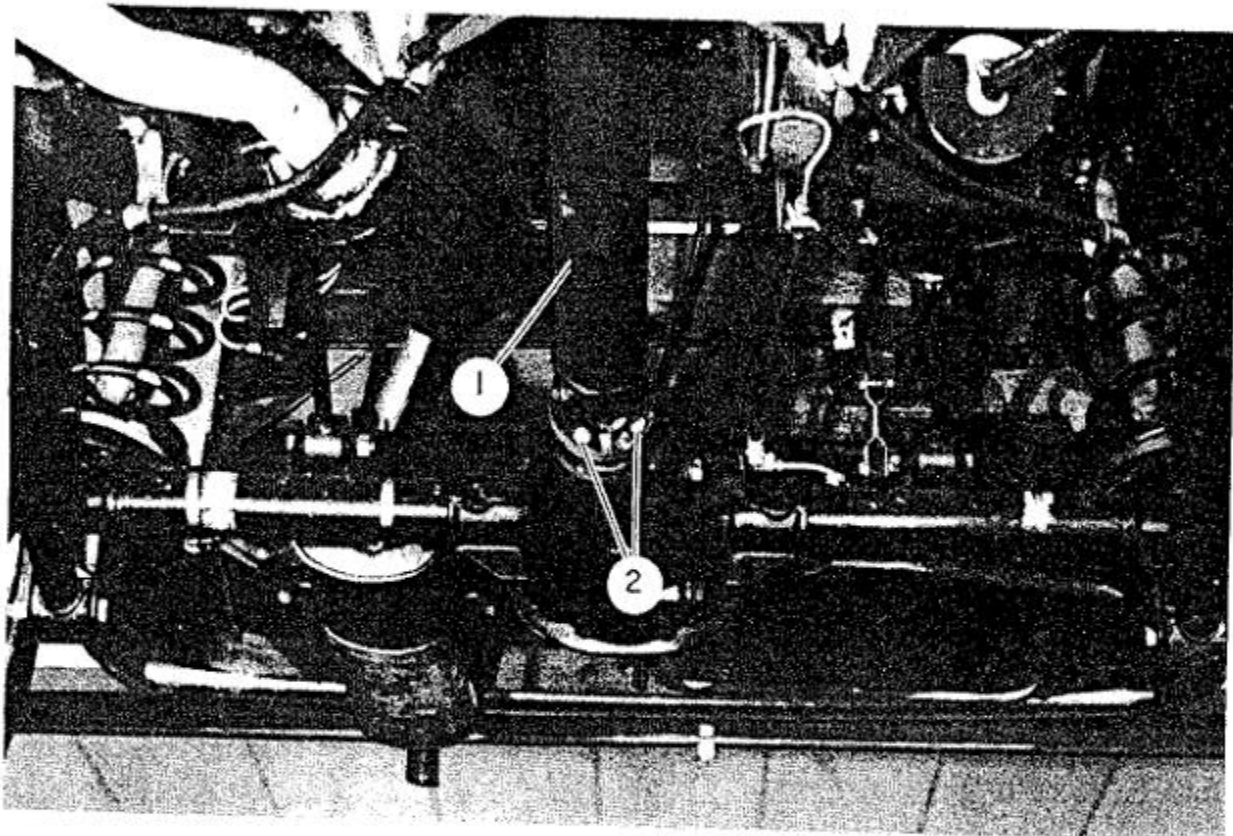
Raise vehicle on lift. Remove both rear road wheels.

Disconnect drive shaft (1) at differential by removing four bolts (2) and nuts.

**NOTE:** Mark shaft flange in relation to differential flange so that upon installation it will be assembled in same position.

Secure shaft out of way.

1. Drive shaft 2. Bolt

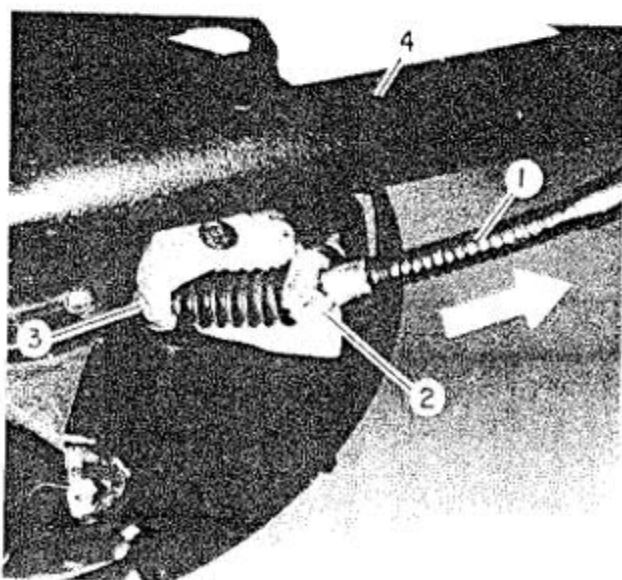


Disconnect ends of hand brake cable by first loosening cable adjustment with adjusting nuts.

Pull cable (1) out of support housing (2) in direction shown (arrow) and remove ball end (3) from socket.

Free cables from clips on lower reaction rods (4).

1. Hand brake cable 2. Support housing 3. Cable ball end  
4. Lower reaction rod



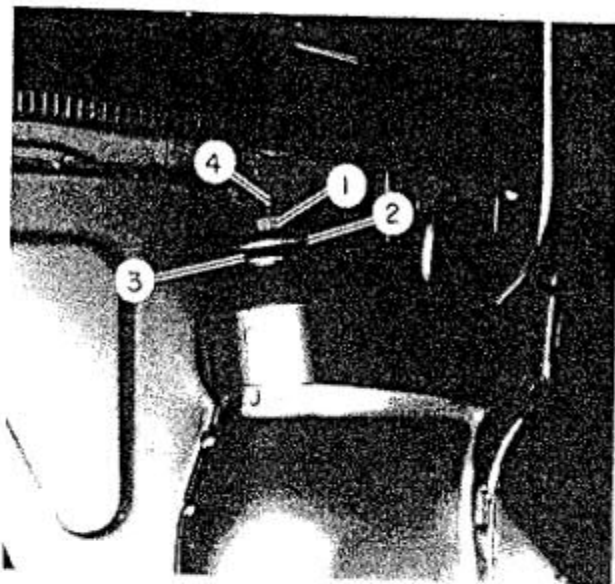
# Rear Suspension

443.05

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From inside trunk, remove nuts (1), washers (2) and rubber bushings (3) holding upper end of shock absorbers. Use wrench A.57070 to hold shank (4) while removing nut. Carefully lower jack and withdraw suspension assembly.

1. Nut 2. Washer 3. Rubber bushing 4. Shank



## INSTALLATION

Installation is reverse of removal with attention to the following steps:

- Coil springs are divided into two classes, color coded yellow or green. Spring pairs must be the same color code. Also, both front and rear must be the same color code.
- Do not fully tighten reaction rod mounting hardware until suspension is completely installed and vehicle is on ground or drive-on lift, and is laden to equivalent of two persons plus 130 lb. (59 kg) of luggage. This is to prevent rubber bushings from being over stressed. Refer to torque specifications at beginning of this section.
- After connecting hydraulic brake hose, bleed system. Refer to Brakes Section.

# Rear Shock Absorbers

443.06

Page 44-23

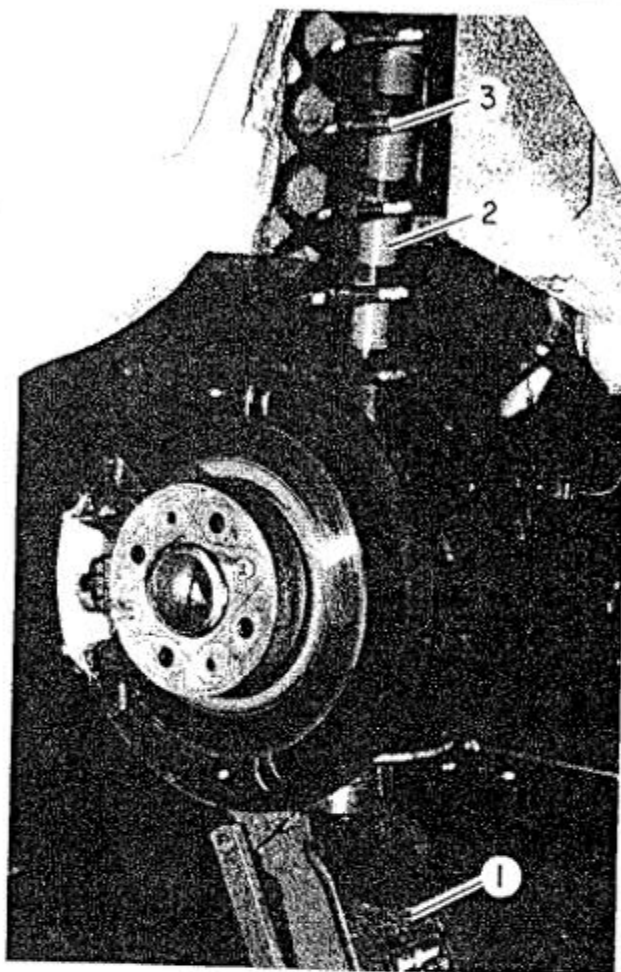
## REMOVAL AND INSTALLATION

Raise vehicle on lift.

Remove road wheel.

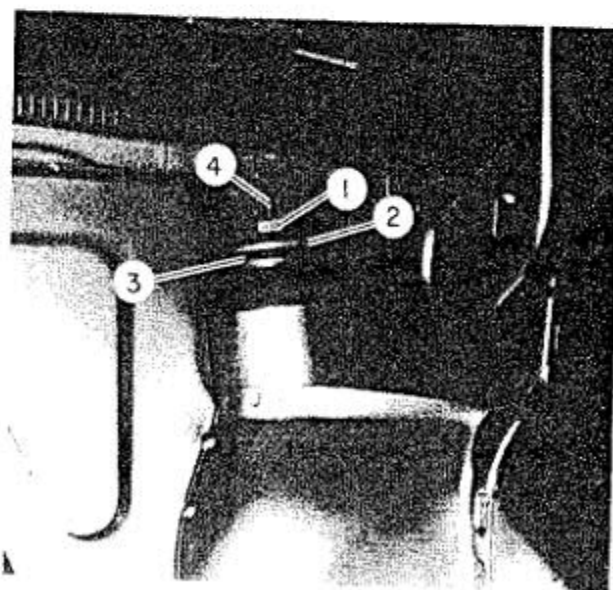
Lower axle onto jack (1) as shown, compressing spring slightly to take tension off upper nut on shock absorber (2).

1. Jack 2. Shock absorber 3. Coil spring



Remove nut (1), washer (2) and rubber bushing (3). To keep shank (4) from turning while removing nut, use wrench A.57070.

1. Nut 2. Washer 3. Rubber bushing 4. Shank

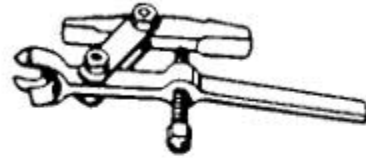


4  
4

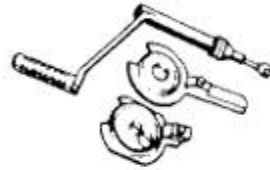
A.57070 (J28051) Shock absorber shank wrench



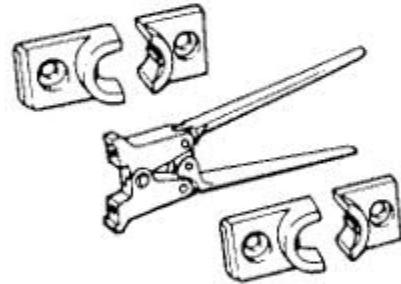
A.47038 (J28013) Tie rod remover



A.74174 (J28131) Front suspension coil spring compressor



A.74140 (J28213) Hub nut staking tool



A.47042 (J28015) Ball joint remover





*Spider*

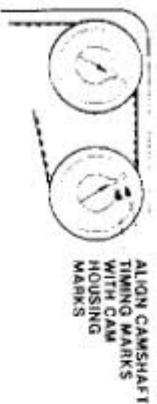
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**SERVICE  
MANUAL**

# FI/IA/T TIMING BELT REPLACEMENT HELPER 2000cc Engine

## CHECK CAM TIMING

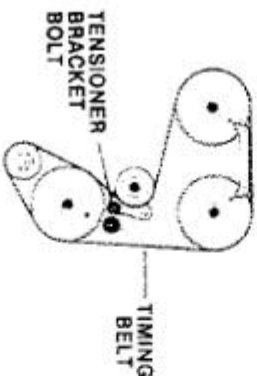


PULLEY TIMING MARK IS AT 0° BTDC



- Check every 30,000 mi. Change if worn or loose.
- Turn engine to align camshaft timing marks with pointer on cam housing.
- Check that crank pulley notch aligns with 0° mark on cover. If not, install a new timing belt. Engine is now set to fire on no. 4 cylinder.

## REMOVE BELT



- Loosen tensioner bracket bolt.
  - Move pulley to release belt tension.
  - Re-tighten bolt to hold pulley in belt slackened position.
  - Remove timing belt.
  - Mark belt as "NOT REUSEABLE".
  - Inspect and clean sprocket teeth.
  - Check belt tensioner bearing for proper play and rotation.
- Caution:** When timing belts removed do not turn camshaft independent of engine. Valves may be damaged.

## PREPARE ENGINE

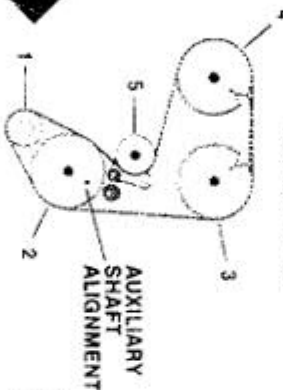


CRANKSHAFT TIMING



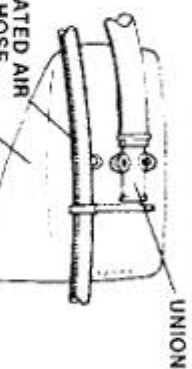
- Disconnect battery ground cable.
  - Remove spark plugs.
  - Set up crankshaft and camshaft timing marks to prepare for timing belt removal.
  - Put car in gear and apply hand brake.
- Caution:** Timing belts can not be re-used once tension is relieved. Replace timing belt. Do not attempt to take up slackness by means of the tensioner.

## INSTALL BELT

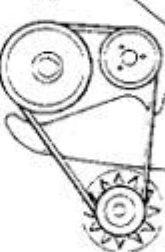


- Double-check sprocket alignment then:
  - Install belt on drive sprocket (1)
  - Fix belt to slots of accessory drive sprocket both sides (2)
  - Keeping slack out of belt, fix to intake camshaft sprocket (3)
  - Continue with belt to exhaust camshaft sprocket (4)
- Slide belt over tensioner pulley (5) last.
- Caution:** Belt should fit easily. Do not pry or kink belt.

## REMOVE COVER

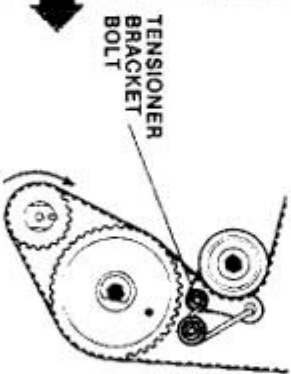


TIMING BELT COVER



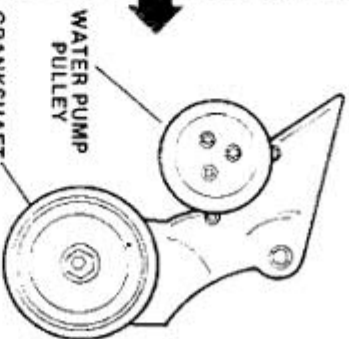
- Remove heated air hose.
- Remove all drive belts from crankshaft pulley.
- Partially drain cooling system.
- Remove upper radiator hose from union.
- Remove union from cylinder head.
- Remove timing belt cover.

## ADJUST TENSIONER



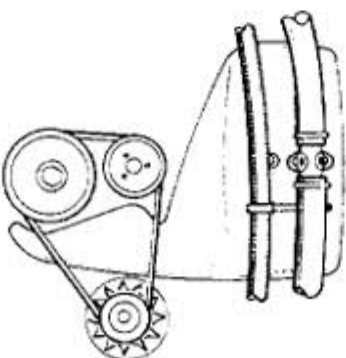
- Release tensioner bracket bolt and allow tensioner pulley to take out play.
  - Turn crankshaft clockwise two full turns.
  - Check that timing is correct then tighten tensioner bracket bolt to 33 ft-lb (45 kgm).
- Caution:** Never push car backward in gear or allow the engine to turn backward. Slack will develop in the belt, allowing the belt to jump timing.

## REMOVE PULLEYS



- Remove water pump pulley.
- Remove crankshaft pulley.
- Remove metal timing cover.

## INSTALL COVER



- Install all parts in reverse order of removal.
- Coat crankshaft pulley ID with anti-seize compound before installing.
- Tighten 38mm crankshaft pulley nut to 87 ft-lb (124kgm).
- Fill and bleed cooling system.



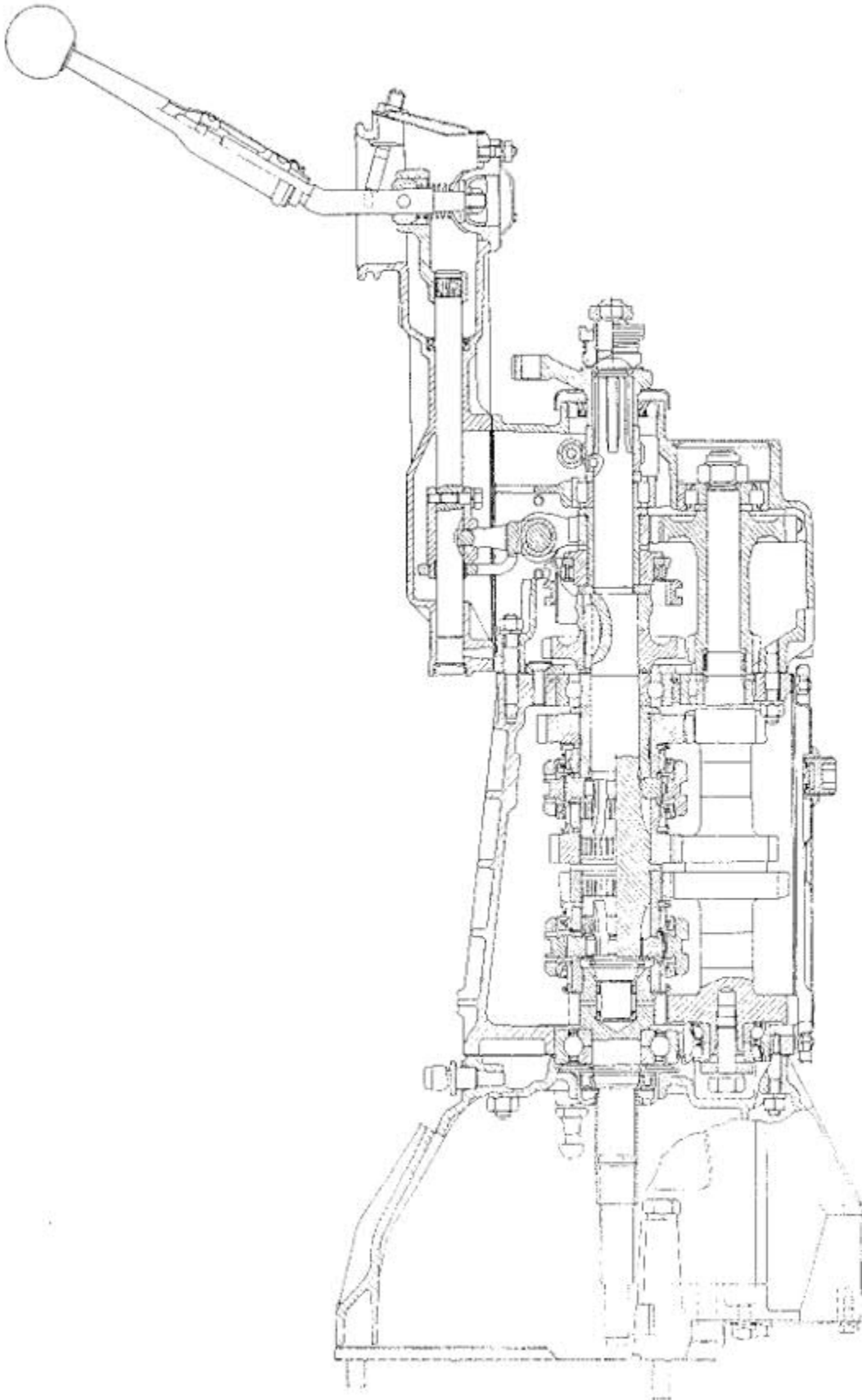
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# TRANSMISSION - 21

PARTS CATALOG,  
SERVICE MANUAL &  
SERVICE TIME  
SCHEDULE CODE

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21

LONGITUDINAL SECTION OF MANUAL TRANSMISSION

# Transmission

212.00

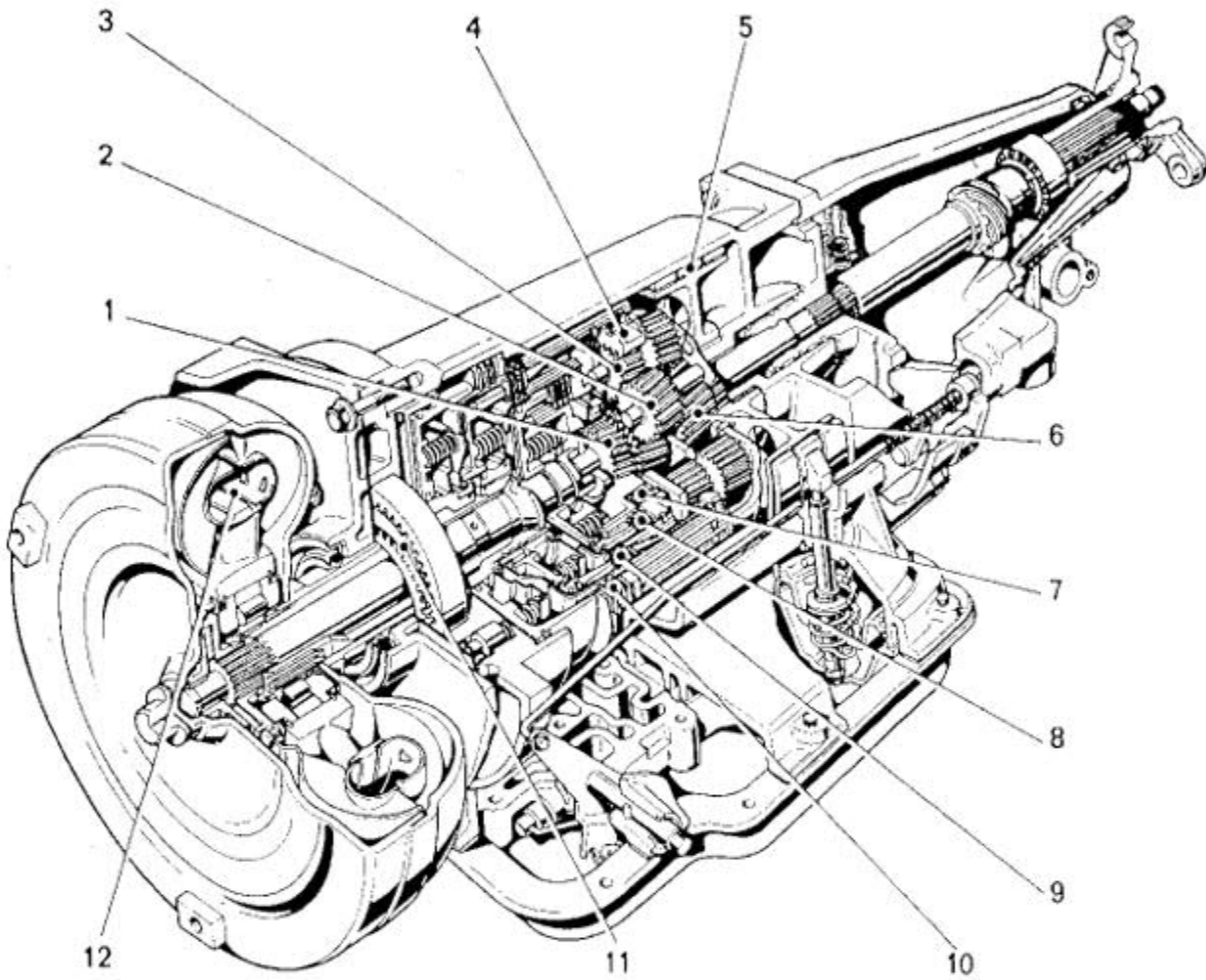
Page 21-3

Gear changing .....	Automatic, actuated by the vacuum of the engine (valve and butterfly) and the speed of the vehicle (governor body)		
KICK DOWN operation .....	mechanical by means of a cable		
Sprag clutch .....	Installed on hub of 3rd clutch – raised lip faces input sun gear		
Clutch composition .....	<u>Reverse</u>	<u>2nd gear</u>	<u>3rd gear</u>
Discs with linings .....	3	3	3
Steel discs .....	4	4	4
Cushion plate (wave washer) .....	1	1	1
Reaction plate .....	1	–	–
Torque converter			
Diameter .....	9.01 in (229 mm)		
Variable torque multiplication ratio .....	between 2.4 to 1 and 1 to 1		
Oil type .....	Oliofiat G I/A (dexron type)		
Oil change quantities:			
Total with transmission and converter empty .....	11.8 pints (5.6 litres)		
Change only .....	5.28 pints (2.8 litres)		

## Vehicle towing

The vehicle may be towed a maximum distance of 31 miles at a maximum speed of 31 mph with the transmission in running order and the drive shaft connected.

For distances greater than 31 miles, speeds higher than 31 mph or if transmission is damaged, disconnect drive shaft or lift rear wheels.



1. Input sun gear
2. Planet short pinion
3. Planet long pinion
4. Annulus
5. Brake band
6. Output sun gear
7. Sprag wheel
8. 3rd gear clutch
9. 2nd gear clutch
10. Reverse clutch
11. Oil pump
12. Torque converter

## AUTOMATIC TRANSMISSION

## TIGHTENING REFERENCE

DESCRIPTION	THREAD (METRIC)	TORQUE		
		N·m	FT. LB.	Kgm
<b>Manual Transmission</b>				
Selector rod detent spring cover bolt .....	M8	25	2.5	18
Bell housing-to-engine upper mounting bolt .....	M12 x 1.25	80.5	8.3	61
Bell housing-to-engine lower mounting bolt .....	M12 x 1.25	80.5	8.3	61
Transmission case-to-bell housing bolt .....	M10 x 1.25	49	4.9	36
Transmission case-to-bell housing nut .....	M8	25	2.5	18
Rear cover nut .....	M8	25	2.5	18
Rear cover lower bolt .....	M8	19.6	2.0	14
Starter motor bolt .....	M8	19.6	2.0	14
Countershaft rear bearing nut .....	M18 x 1.5	116	11.8	87
Propeller shaft yoke-to-mainshaft nut .....	M20 x 1	145	14.7	108
Countershaft front bearing bolt .....	M12 x 1.25	92	9.3	69
Forked lever bolt .....	M6	18	1.8	14
Gear shifter and selector shaft retainer cover nut .....	M6	6.4	.64	3
Prong-to-selector shaft bolt .....	M6	18	1.8	14
Gear lever support bolt .....	M8	19.6	2.0	14
Inner cup-to-gear lever lower self-locking nut, type S .....	M8	15	1.5	11
Rear mounting pad-to-transmission extension cover nut .....	M8	25	2.5	18
<b>Automatic Transmission</b>				
Bolt, bell housing attachment to engine .....	M12 x 1.25	85	61.5	8.5
Bolt, converter to flywheel .....	3/8-16 UNC	63	47	6.5
Self-locking nut, type S, gear selection rod lever .....	3/8-16 UNC-2 B	20	14.5	2
Bolt, gearshift support lever .....	M8	15	11	1.5
Bolt, starter motor attachment .....	M8	20	14.5	2
Bolt, support plate to rear housing .....	M10	51	36	5

### MANUAL TRANSMISSION REMOVAL AND INSTALLATION

Disconnect battery ground cable.

Unscrew gearshift knob (1).

Unsnap rear of console cover (2) and lift up, along with boot (3), over gearshift lever (4) as shown.

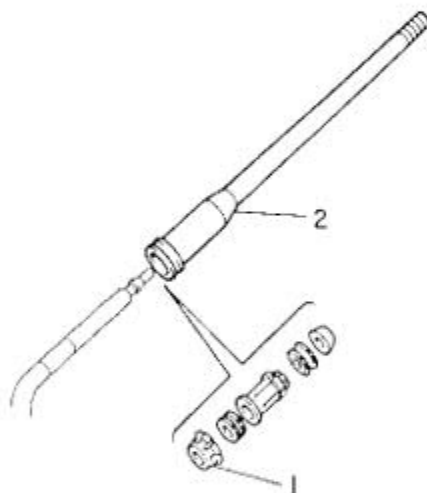
1. Gearshift knob 2. Console cover 3. Gearshift boot 4. Gearshift lever



Unclip plastic retainer (1) at bottom of gearshift lever assembly and separate top half (2) of lever from bottom half as shown.

**NOTE:** To reassemble, install all retainers and bushings, including bottom retainer (1), into top half of lever in order shown. Place top half onto bottom half and tap into position with plastic mallet.

1. Plastic retainer 2. Shift lever top half



Disconnect electrical connector (4) to reverse switch.

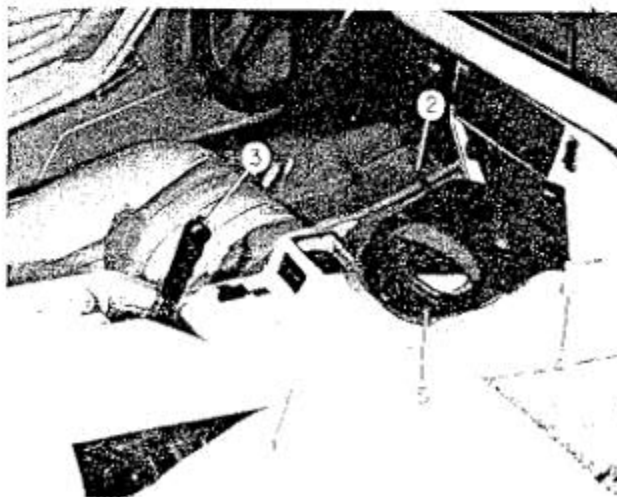
Lift insulation to gain access to screws holding top cover (5) and remove cover.

Remove screws at front of console (1). Remove coin holder at rear of console to remove rear screw.

Lift console up slightly, and carefully pull back about 3 inches in order to obtain clearance for gearshift lever (2) when transmission is lowered.

**NOTE:** It may be necessary to slacken off emergency brake cable adjustment in order to raise brake handle (3) high enough for console to be moved to rear.

1. Console 2. Gearshift lever (lower half) 3. Emergency brake handle  
4. Electrical connector 5. Transmission top cover



Raise vehicle on lift. Drain transmission by removing bottom plug (5).

Remove clutch lever return spring (3). Disconnect clutch cable (1) from clutch lever (2). Withdraw cable through clutch housing.

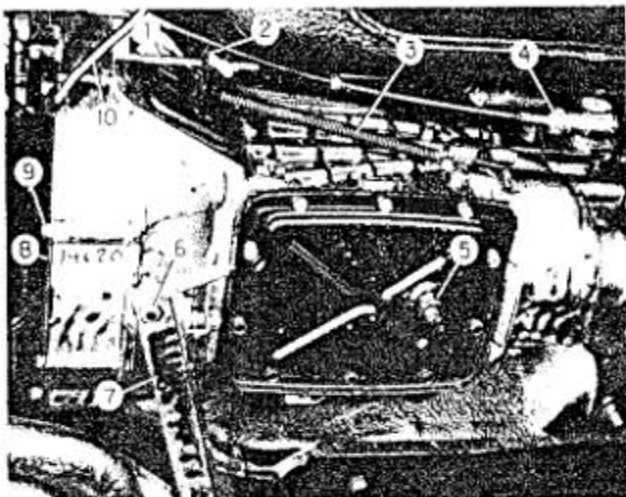
Unscrew speedometer connector (4) from transmission.

Remove three bolts holding starter to clutch housing. Secure starter out of way.

Remove four bolts (8) to remove flywheel cover (9).

**NOTE:** Left bolt of flywheel cover also secures engine ground lead (10).

1. Clutch cable 2. Clutch lever 3. Clutch return spring  
4. Speedometer connector 5. Drain plug 6. Bolt 7. Bracket  
8. Bolt 9. Flywheel cover 10. Engine ground lead

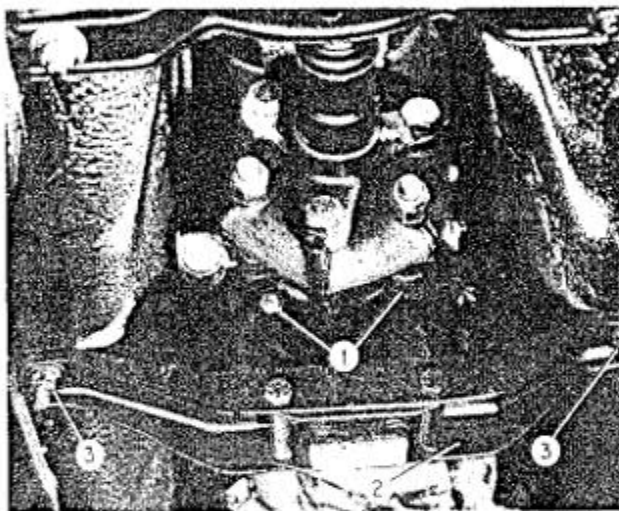


Remove drive shaft assembly (refer to Drive Shaft section).

Place transmission jack under transmission.

Remove two nuts (3) holding transmission mount (2) to body.  
Remove two nuts (1) holding mount to transmission.

1. Nut 2. Transmission mount 3. Nut



Remove four bolts (1) securing transmission to engine.

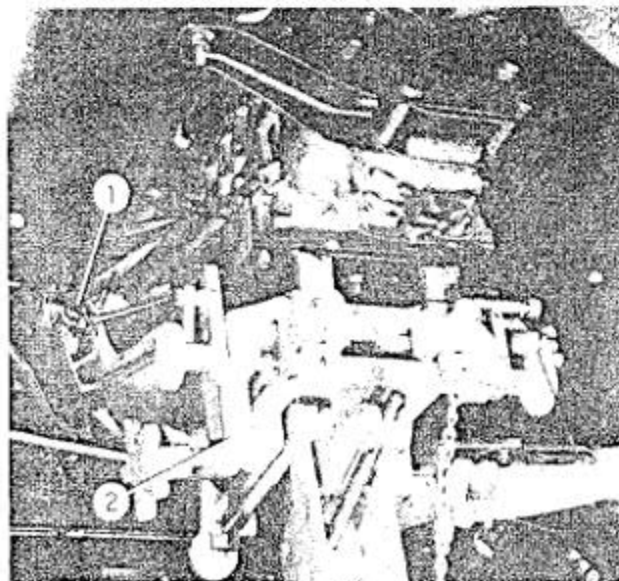
Separate transmission from engine and move it rearward. Tilt transmission to slip input shaft out of clutch. Lower transmission.

**CAUTION:** Be careful that transmission input shaft does not damage clutch diaphragm spring laminae.

Install in reverse order of removal.

Torque all bolts (refer to Torque Specification chart).

1. Bolt 2. Transmission jack





## DISASSEMBLY

Mount transmission on support (2) A.71001/19, part of rotating stand (1).

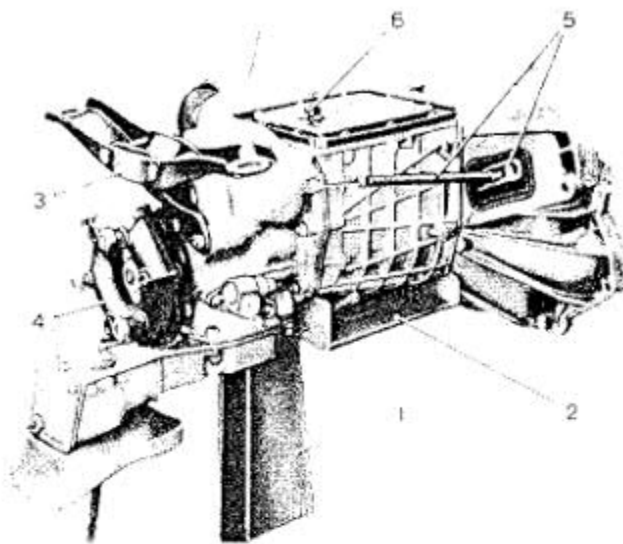
Using tools A.50113, A.55087, and A.57051, remove oil drain plug (6), oil level plug, and rear housing oil drain plug.

Remove three self-locking nuts and bolts attaching flexible joint (4).

Remove two nuts and washers attaching rear supporting cross strut (3) to rear housing.

Remove return spring and rubber boot (5).

1. Rotating stand 2. Support 3. Rear supporting cross strut  
4. Flexible joint 5. Spring and rubber boot 6. Oil drain plug

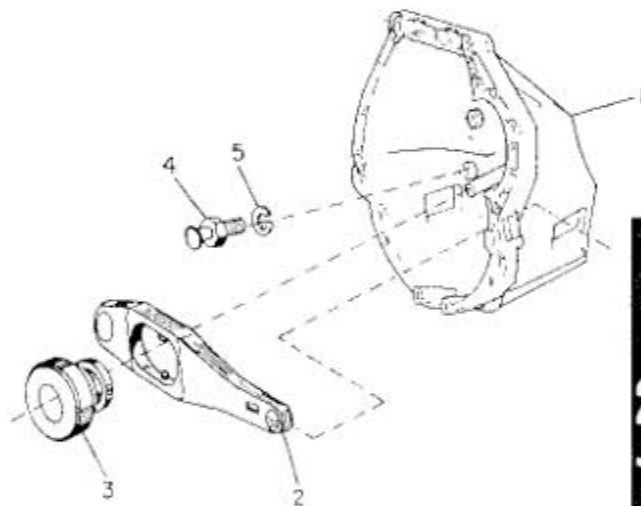


Unhook yoke (2) from pivot (4) by sliding yoke toward return spring end.

When unhooked, guide yoke and throwout bearing (3) off input shaft.

Remove pivot (4) and lockwasher (5) from bellhousing (1) only if damaged.

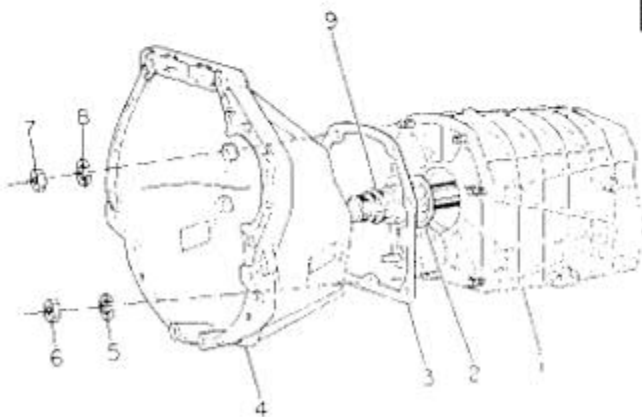
1. Bellhousing 2. Yoke 3. Throwout bearing 4. Pivot  
5. Lockwasher



Remove six nuts (7), lockwashers (8), and one nut (6) and lockwasher (5) attaching bellhousing (4) to case (1).

Remove gasket (3) and spring washer (2). Remove seal (9) from the bellhousing (4) only if seal will be replaced.

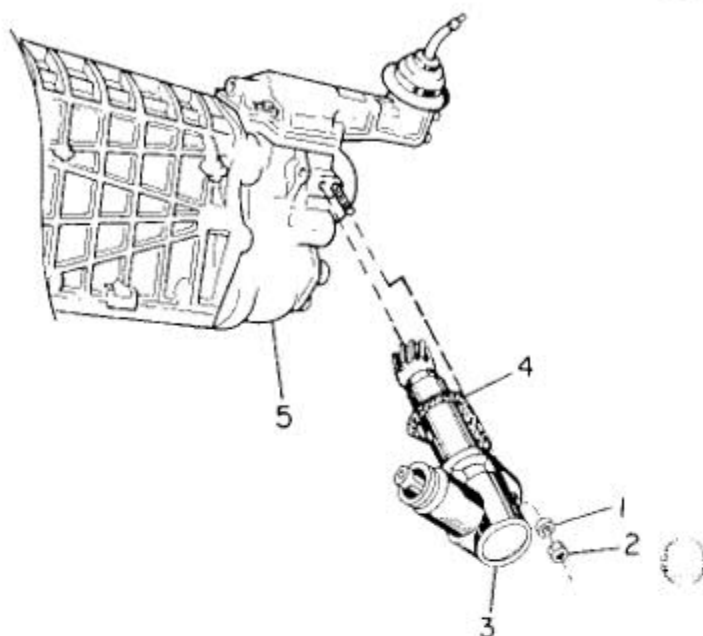
1. Case 2. Spring washer 3. Gasket 4. Bellhousing 5. Lockwasher  
6. Nut 7. Nut 8. Lockwasher 9. Seal



Remove nut (2) and lockwasher (1) attaching speedometer drive (3) to rear housing (5).

Remove speedometer drive (3) and gasket (4).

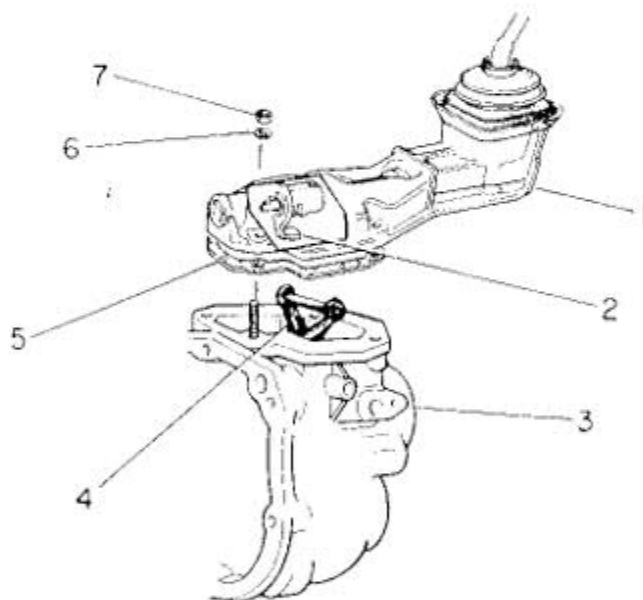
1. Lockwasher 2. Nut 3. Speedometer drive 4. Gasket  
5. Rear housing



Remove four nuts (7) and lockwashers (6).

Remove entire shift tower assembly (1) by lifting, then pushing shift lever forward until tab on dog (2) clears engaging lever (4) in rear housing (3). Remove gasket (5).

1. Shift tower assembly 2. Dog 3. Rear housing 4. Engaging lever  
5. Gasket 6. Lockwasher 7. Nut



**NOTE:** Disassemble shift tower assembly only to the extent to replace defective components.

Remove boot (15).

Remove four nuts and lockwashers (14), cover (17), and gasket (16). Do not remove reverse lockout screw (18) and locknut (19) unless damaged.

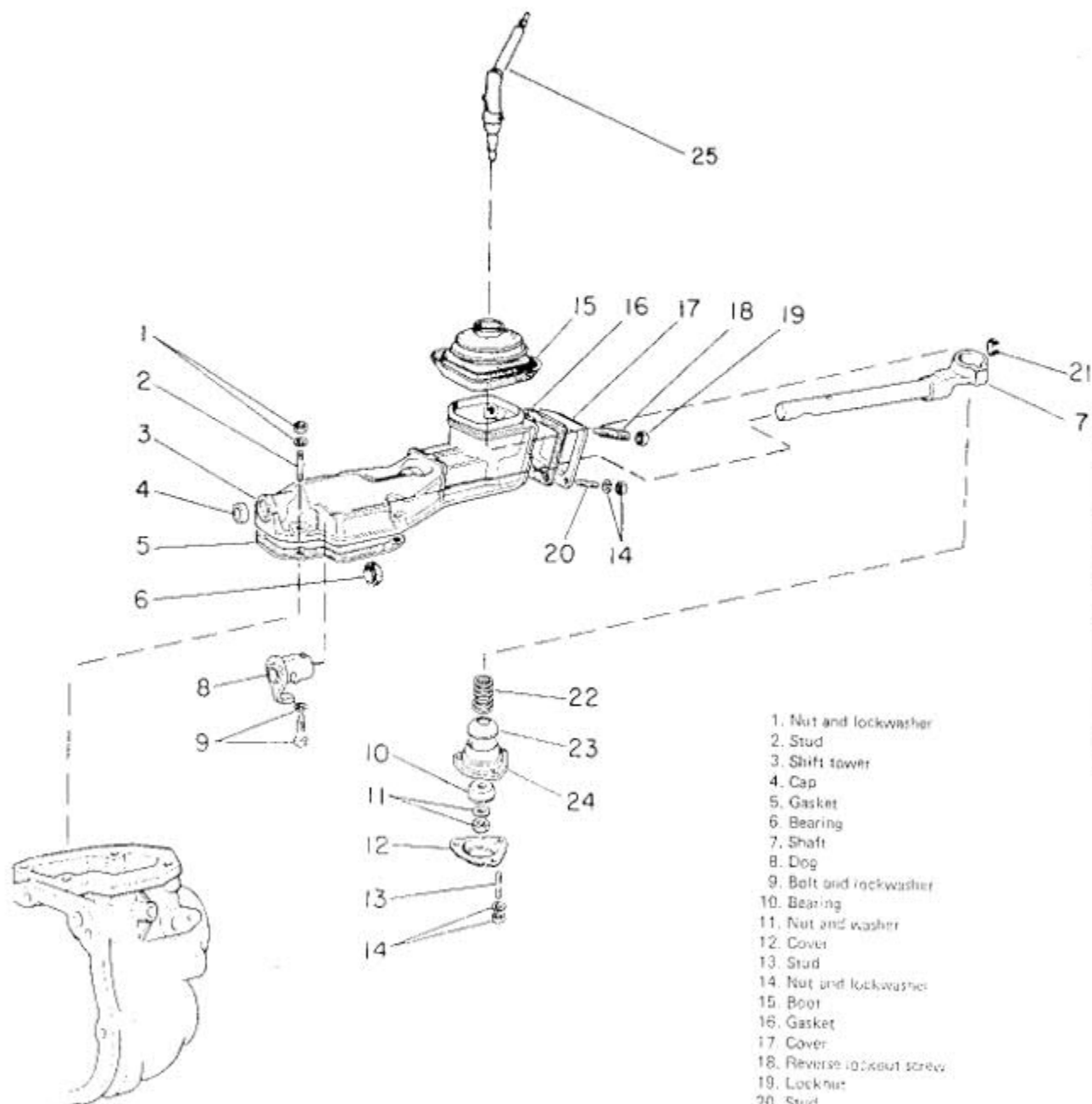
Remove three nuts and lockwashers (14), and cover (12).

Remove nut and washer (11), bearings (10), socket (24), cover (23), and spring (22).

Lift shift lever (25) from shift tower. Remove spring clip (21).

Remove bolt and lockwasher (9). Slide shaft out shift tower rear, then remove dog (8).

Remove cap (4), bearing (6), and studs (2, 13, and 20) only if damaged



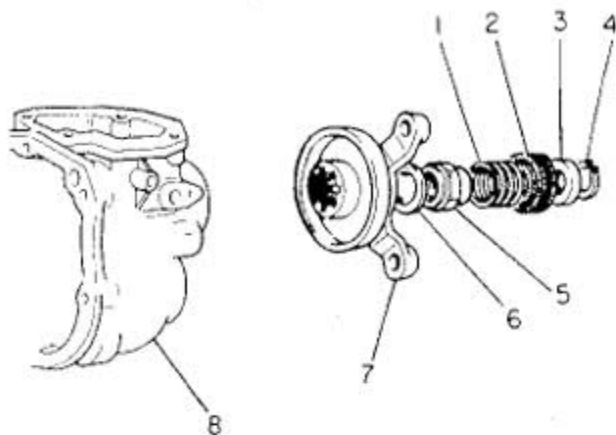
1. Nut and lockwasher
2. Stud
3. Shift tower
4. Cap
5. Gasket
6. Bearing
7. Shaft
8. Dog
9. Bolt and lockwasher
10. Bearing
11. Nut and washer
12. Cover
13. Stud
14. Nut and lockwasher
15. Boot
16. Gasket
17. Cover
18. Reverse lockout screw
19. Locknut
20. Stud
21. Spring
22. Spring
23. Cover
24. Socket
25. Shift lever

Remove snap ring (4), spacer (3), seal (2), and spring (1) from output shaft.

Using adapter A.55130 on yoke (7), remove nut (5) and washer (6).

Using a puller, remove yoke (7).

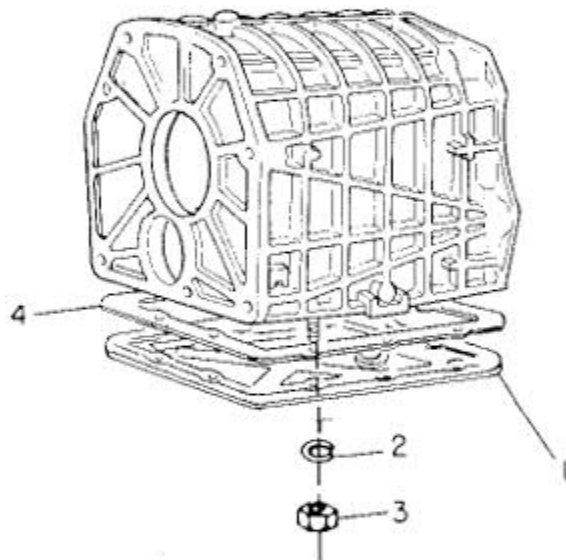
1. Spring 2. Seal 3. Spacer 4. Snap ring 5. Nut 6. Washer  
7. Yoke 8. Rear housing



Remove ten nuts (3) and lockwashers (2).

Remove cover (1) and gasket (4).

1. Cover 2. Lockwasher 3. Nut 4. Gasket



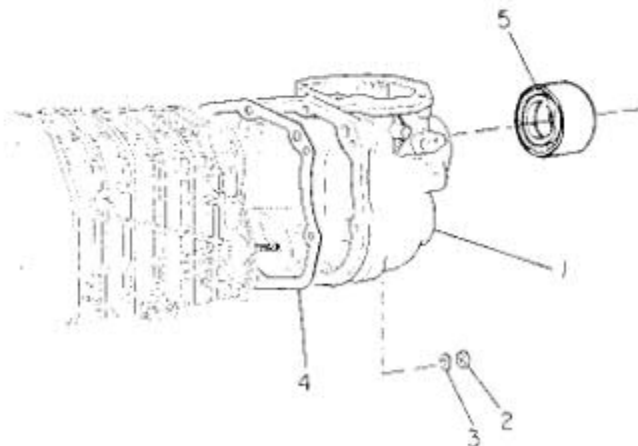
Remove six nuts (2) and lockwashers (3) attaching rear housing (1) to case. (One nut is located inside the case.)

Carefully remove rear housing (1) from case. As housing is removed, guide gear selection and engaging lever out of fork shafts.

Remove gasket (4).

Remove seal (5) from rear housing (1) only if the seal will be replaced.

1. Rear housing 2. Nut 3. Lockwasher 4. Gasket 5. Seal



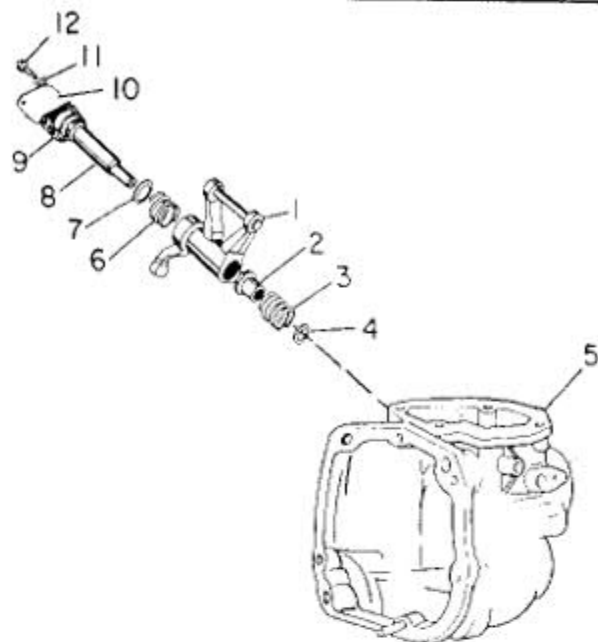
**NOTE:** Disassemble gear selection and engaging lever only if damaged.

Remove two bolts (12) and two lockwashers (11) attaching cover (10) to rear housing (5).

Remove cover (10) and gasket (9).

Slowly slide gear selection and engaging lever rod (8) out side of rear housing (5). As rod is withdrawn, remove spring (3), spring retainer (2), gear selection and engaging lever (1), spring (6), and thrust washer (7).

Remove thrust washer (4) from rear housing (5).



1. Engaging lever 2. Spring retainer 3. Spring 4. Thrust washer  
5. Rear housing 6. Spring 7. Thrust washer 8. Engaging lever rod  
9. Gasket 10. Cover 11. Lockwasher 12. Bolt

Remove bolt (3) and lockwasher (2) attaching fifth and reverse shift fork to fifth and reverse fork shaft (1).

Slowly remove fork shaft. As fork shaft is removed, detent ball (8) will release.

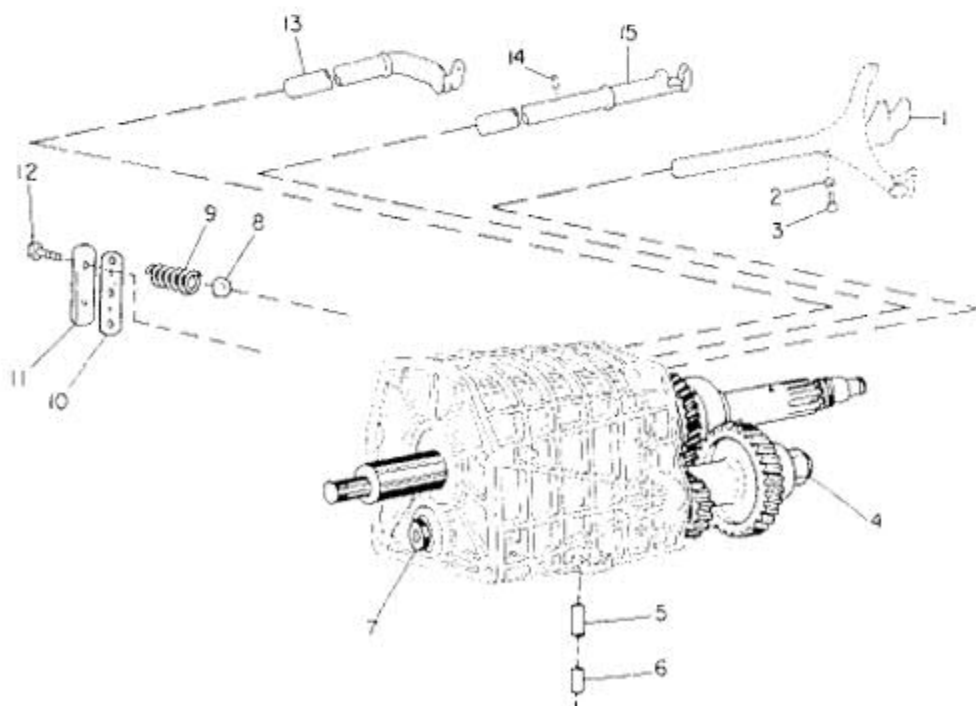
Engage two gears to lock the transmission. Loosen, but do not remove, 27-mm nut (4) and 19-mm bolt (7) on ends of countershaft. Disengage the two gears.

Remove two bolts (12) attaching cover (11) to case. Remove gasket (10), three springs (9), three detent balls (8), and short detent dowel (6).

Remove second bolt (3) and lockwasher (2) attaching third and fourth shift fork to third and fourth fork shaft (15).

Slowly remove third and fourth fork shaft. While removing fork shaft, remove detent pin (14) from fork shaft. Using a magnet, remove long detent dowel (5).

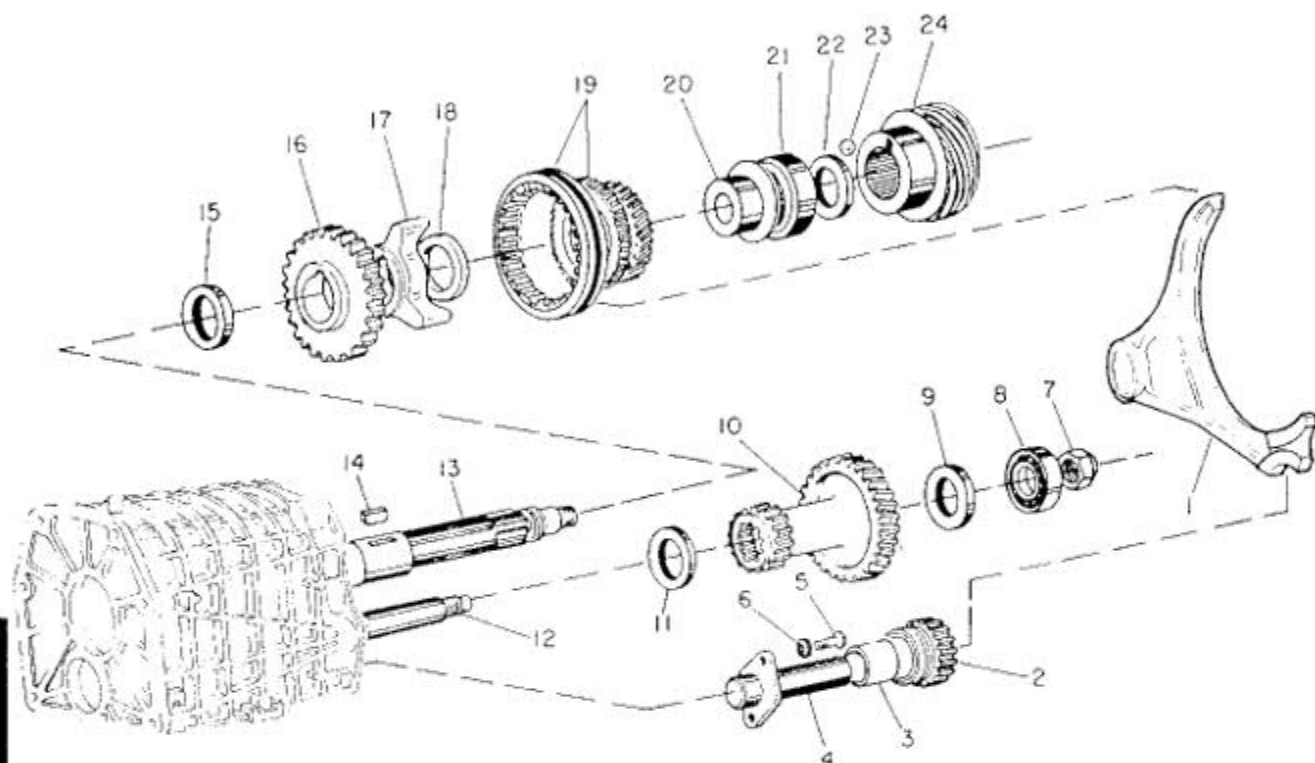
Remove third bolt (3) and lockwasher (2) attaching first and second shift fork to first and second fork shaft (13). Remove fork shaft.



1. Fifth and reverse fork shaft  
2. Lockwasher  
3. Bolt  
4. 27-mm nut  
5. Long detent dowel  
6. Short detent dowel  
7. 19-mm bolt  
8. Detent ball  
9. Spring  
10. Gasket  
11. Cover  
12. Bolt  
13. First and second fork shaft  
14. Detent pin  
15. Third and fourth fork shaft

Remove speedometer drive gear (24), ball (23), spacer (22), and bearing (21). Remove 27-mm nut (7), bearing (8), and spacer (9). Carefully tap fifth and reverse gear (10) off until its internal splines are disengaged. As fifth and reverse gear is removed from countershaft (12), remove reverse sliding gear (2), fifth and reverse gear (10), spacer (11), bushing (20), fifth and reverse gear shift fork (1), and fifth gear assembly (19). Disassemble fifth gear assembly as specified in Fifth Gear Assembly.

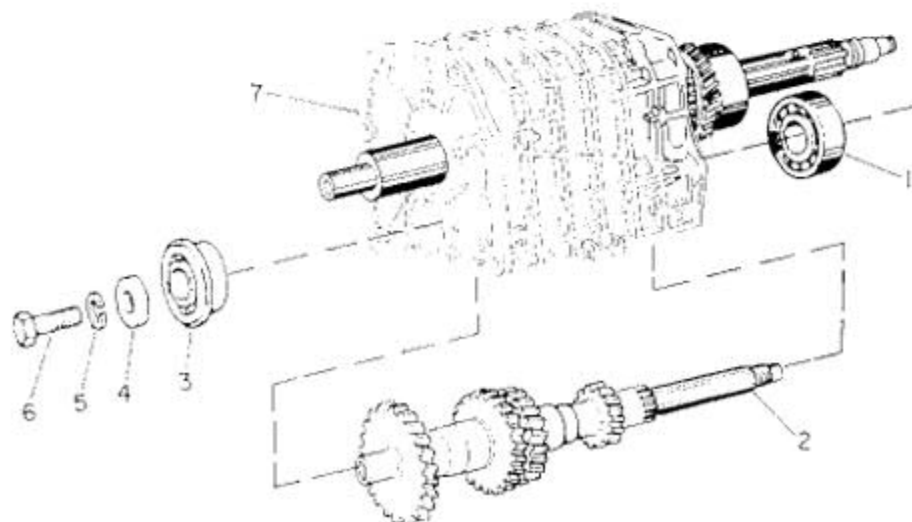
Remove spacer (18), hub (17), and reverse gear (16). Remove bushing (3) and shaft (4) attached with screws (5) and lockwasher (6) only if damaged.

2  
1

- |                                 |                            |                  |                            |
|---------------------------------|----------------------------|------------------|----------------------------|
| 1. Fifth and reverse shift fork | 7. 17-mm nut               | 13. Main shaft   | 19. Fifth gear assembly    |
| 2. Reverse sliding gear         | 8. Bearing                 | 14. Key          | 20. Bushing                |
| 3. Bushing                      | 9. Spacer                  | 15. Spacer       | 21. Bearing                |
| 4. Shaft                        | 10. Fifth and reverse gear | 16. Reverse gear | 22. Spacer                 |
| 5. Screw                        | 11. Spacer                 | 17. Hub          | 23. Ball                   |
| 6. Lockwasher                   | 12. Countershaft           | 18. Spacer       | 24. Speedometer drive gear |

Remove bolt (6), lockwasher (5), and washer (4). Using a soft mallet, tap on output end of countershaft (2) until bearing (3) can be removed from case (7).

Carefully tap on bearing (1) outer race to remove from case (7). Remove countershaft (2) from case.



- |                 |
|-----------------|
| 1. Bearing      |
| 2. Countershaft |
| 3. Bearing      |
| 4. Washer       |
| 5. Lockwasher   |
| 6. Bolt         |
| 7. Case         |

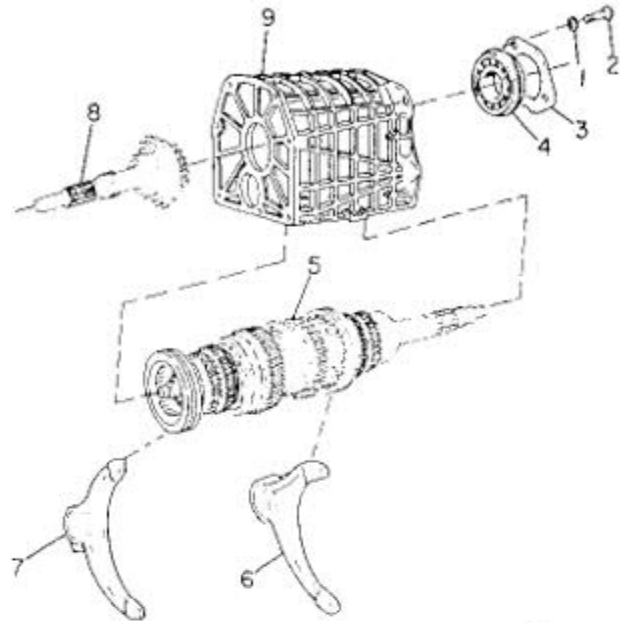
Remove third and fourth shift fork (7), first and second shift fork (6). Although both forks are the same, do not mix to maintain wear.

Using an impact driver, remove three screws (2) and lockwashers (1). Remove bearing retainer (3) and bearing (4).

Carefully work to slip input shaft assembly (8) out of case (9). Disassemble as specified in Input Shaft Disassembly.

Carefully move main shaft assembly (5) rearward, then remove from case (9). Disassemble as specified in Main Shaft Assembly.

1. Lockwasher 2. Screw 3. Bearing retainer 4. Bearing 5. Main shaft assembly 6. First and second shift fork 7. Third and fourth shift fork 8. Input shaft assembly 9. Case



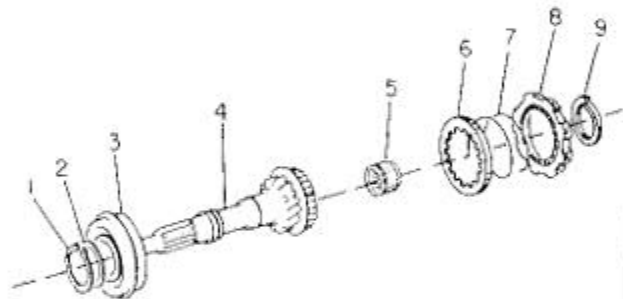
### Input Shaft Disassembly

Use a press and tool A.70350 to compress spring washer (2). Unsnap snap ring (1) from its groove, then remove from press.

Remove snap ring (1), spring washer (2), and bearing (3) from input shaft (4). Remove bearing (5) from inside input shaft.

Remove snap ring (9) holding synchro (8) to input shaft. Remove synchro (8), spring (7), and spring retainer (6).

1. Snap ring 2. Spring washer 3. Bearing 4. Input shaft 5. Bearing 6. Spring retainer 7. Spring 8. Synchro 9. Snap ring

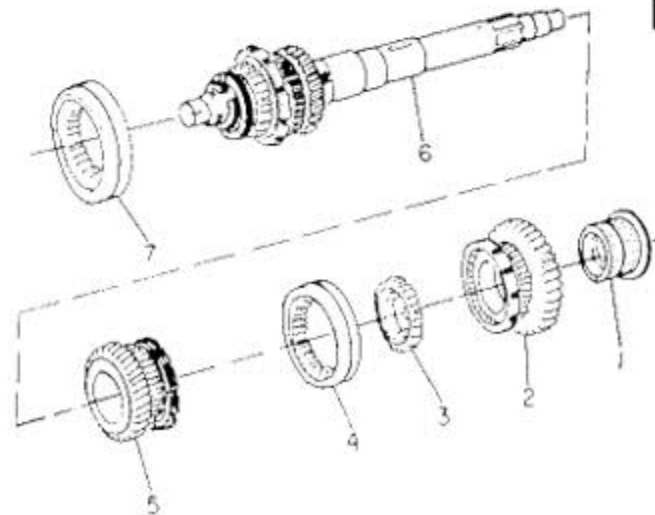


### Main Shaft Disassembly

Remove sleeve (7). Remove bushing (1), first gear assembly (2), hub (3), sleeve (4) and second gear assembly (5) from main shaft and third gear subassembly (6).

Disassemble main shaft and third gear subassembly (6) as specified in Main Shaft and Third Gear Subassembly. Disassemble first and second gear assemblies (2 and 5) as specified in First, Second, and Third Gear Assemblies.

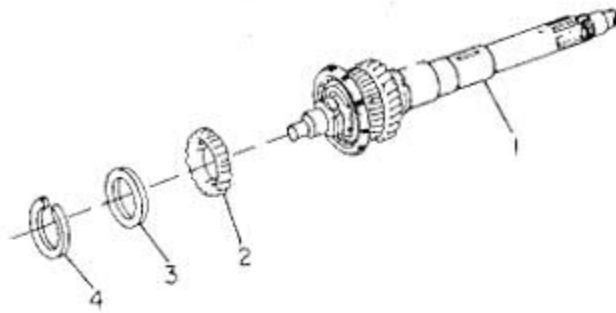
1. Bushing 2. First gear assembly 3. Hub 4. Sleeve 5. Second gear assembly 6. Main shaft and third gear subassembly 7. Sleeve



### Main Shaft and Third Gear Subassembly Disassembly

Place subassembly in press. Do not support subassembly on gear, but on shoulder of main shaft. Use press and tool A.70159 to compress spring washer (3). Unsnap snap ring (4) from its groove, then remove from press.

Remove snap ring (4), spring washer (3) and hub (2) from main shaft and third gear (1). Disassemble main shaft and third gear (1) as specified in First, Second, and Third Gear Assemblies.



1. Main shaft and third gear 2. Hub 3. Spring washer 4. Snap ring

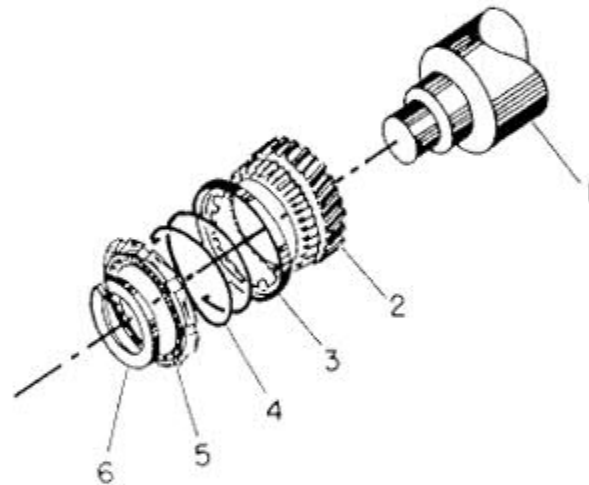
### First, Second, and Third Gear Disassembly

**NOTE:** Although different in size, first, second, and third gear assemblies are similar in assembly. Also, third gear assembly is assembled on the main shaft.

Using tool A.70159, remove snap ring (6).

Remove synchro (5), spring (4) and spring retainer (3) from gear (2).

Remove third gear assembly from main shaft (1).



1. Main shaft (third gear only) 2. First, second, or third gear  
3. Spring retainer 4. Spring 5. Synchro 6. Snap ring

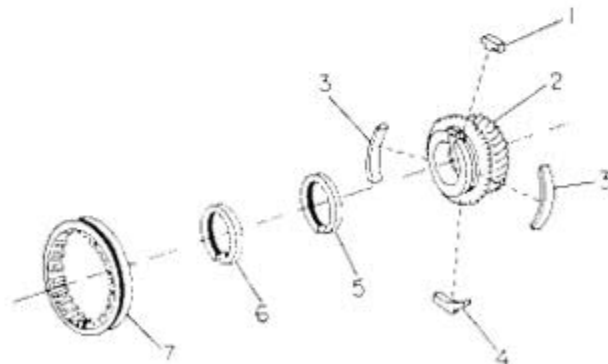
### Fifth Gear Disassembly

Remove sleeve (7).

Remove synchromesh parts snap ring (6). Discard snap ring.

Using tool A.70166, remove synchromesh ring (5).

Remove spring (3), lock (1), and stop (4) from fifth gear (2).



1. Lock 2. Gear 3. Spring 4. Stop 5. Synchromesh ring  
6. Synchromesh parts snap ring 7. Sleeve



## INSPECTION AND REPAIR

### Cleaning

Clean all parts with a suitable cleaning solvent to remove oil traces.

Carefully scrape or brush away deposits from holes and grooves.

Carefully remove gaskets from mating surfaces.

Dry with compressed air.

**CAUTION:** Do not spin dry bearings as damage may result.

Inspect and repair each part as described. If there is doubt as to a part's serviceability, replace the part.

### Bearings

#### a. Roller or ball

1. Check that bearing rollers and balls are free to turn in their cages, or that there is no galling, scratches, or cracks. Replace bearing if damaged.

2. Check that surfaces of inner and outer races are free from galling, scratches, or cracks. Replace bearing if damaged.

3. Check that radial play is not greater than 0.002 inch and end play is not greater than 0.020 inch. Replace worn bearings.

b. Throwout bearing. Check throwout bearing for wear. Replace if worn.

c. Nonroller bearings. Check for wear. For minor scratches, clean with fine emery or stone. Replace if worn, cracked, or broken.

Roller or  
Ball Bearing



Throwout  
Bearing



Nonroller  
Bearings



### Hubs and Sleeves

Check that bearing surfaces are free from burrs, nicks, or galling. For nicks or burrs, use a fine stone or emery. Replace if galled.

Check that there is no excessive play between a hub or sleeve and its mating surface.

Check that teeth are not chipped, broken, galled, or worn. Replace if damaged.



Sleeves

Hubs



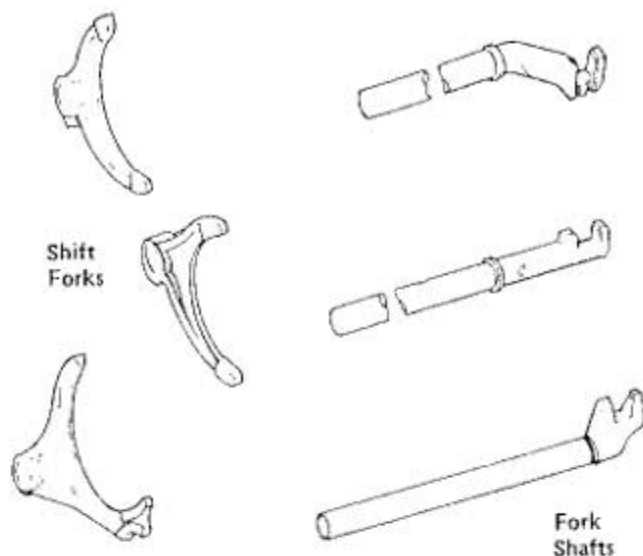
### Shift Forks and Fork Shafts

**NOTE:** Although the first and second shift fork is the same as the third and fourth shift fork, do not interchange.

Check that threads in bolt holes are clean and free from damaged threads. Use a tap to clean holes. Replace shaft if threads are stripped.

Check sliding surfaces for excessive wear. Replace if worn.

Check that fork shafts are not bent, and that grooves for detent balls are not scored. Replace if bent or worn.

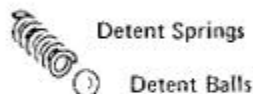


### Detent Balls, Dowels, and Pin

Check for free travel of detent pin in third and fourth fork shaft. Replace pin if worn. Use fine emery for minor scratches.

Check detent ball and dowels for galling. Replace if damaged.

Check detent springs for tension. Replace if weak.



Detent Springs

Detent Balls



Detent Dowels and Pin

### Input Shaft, Main Shaft, Countershaft, Reverse Sliding Gear Shaft, and Engaging Lever Rod

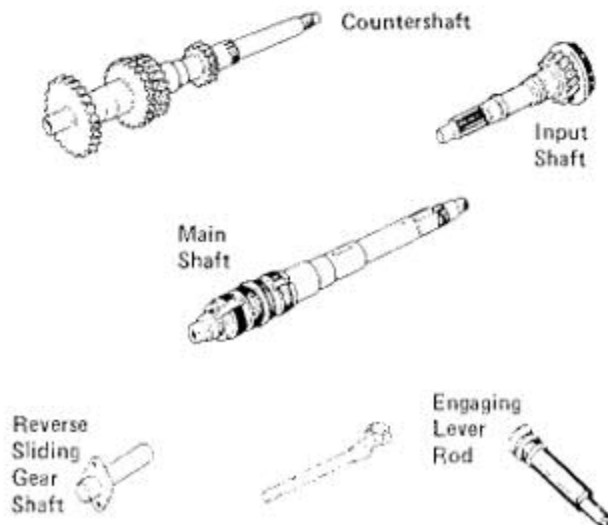
Check all shafts for straightness by placing between points. Maximum runout shall be not greater than 0.002 inch. Some shafts can be straightened with a press. If not, replace.

Check splines for damage. Use a fine file, emery, or stone to remove burrs or nicks.

Check that threads on main shaft and countershaft are not damaged. Replace shaft if threads are stripped.

Check that bearing surfaces are free from burrs, nicks or galling. Use a fine stone or emery to clean.

Check engaging lever rod for straightness and wear. Replace if worn or bent.



### Gears

Check that teeth on all gears are not chipped, broken, or galled. Replace if damaged.

Check that synchro crown teeth are flat and not rounded. Rounded teeth indicates worn gear. Replace. Also replace mating gear.

Check that wear pattern is even. Replace if worn.

Check that bearing surfaces are free from burrs, nicks or galling. Use fine emery to clean.

Check that clearance between reverse sliding gear bushing and reverse shaft is 0.002 to 0.004 inch. Replace bushing if worn.

Check that clearance between first gear and its bushing is 0.002 to 0.004 inch. Replace if worn.

Check that clearance between second and third gears and seats on main shaft is 0.002 to 0.004 inch. Replace if worn.



First, Second, and Third Gears

Fifth and Reverse Gear



Countershaft



Input Shaft

### Synchros

Check that synchro is not cracked. Replace if cracked.

Check that teeth are not broken. Replace if broken.

Check bearing surfaces for excessive wear. Replace if worn.



Synchros

### Springs

Check all springs for tension. Replace weak springs.

Check detent springs for wear on axial surface. Replace if worn.

### Snap Rings

Check that snap rings are not deformed and maintain a good grip in their grooves. Replace if worn. Discard the synchromesh parts snap ring used on fifth gear assembly.

### Spacers, Thrust and Spring Washers

Check all thrust washers for wear. Replace if worn.

Check that spacer and spring washers are not deformed. Replace if deformed.



Springs



Snap Ring



Spring Washers

**Pivot and Yoke**

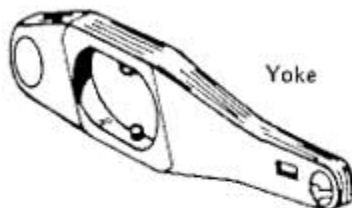
Check that pivot and yoke for throwout bearing are not worn. Replace if worn.

Check that hole for return spring on yoke is not worn. A steel washer can be welded to restore hole.

Check that yoke is not bent. Replace if bent.



Pivot



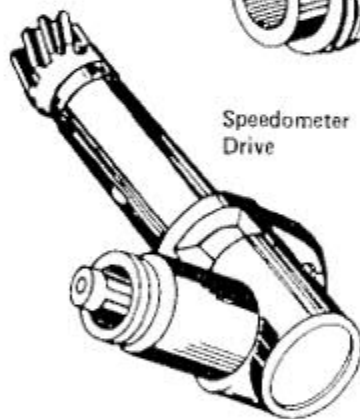
Yoke

**Speedometer Drive**

Check that teeth on speedometer drive are not chipped, broken or galled. Replace if damaged. Also replace speedometer drive gear.

Check that shafts turn easily without excessive play. Replace if worn.

Speedometer Drive Gear



Speedometer Drive

2  
1**Shift Tower and Gear Selection and Engaging Lever**

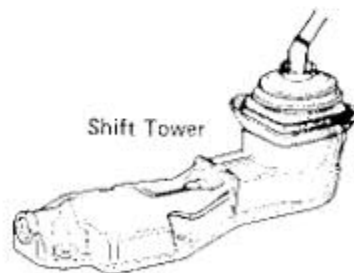
If not disassembled, check for free movement without binding or excessive play. Disassemble for binding.

If disassembled, check that all bearing surfaces are free from excessive wear. Replace worn parts.

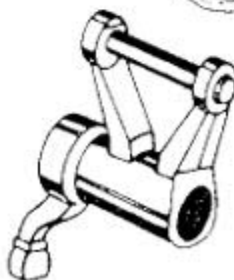
Check that shafts are not bent. Replace bent parts.

Check that dog is not damaged. Replace if damaged.

Shift Tower



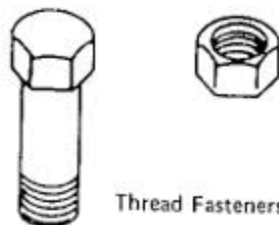
Gear Selection and Engaging Lever



### Thread Fasteners

Check that threads on all threaded fasteners are not stripped or cross-threaded. Replace if damaged.

Replace all self-locking nuts.



### Case, Rearhousing, Bell Housing, Covers

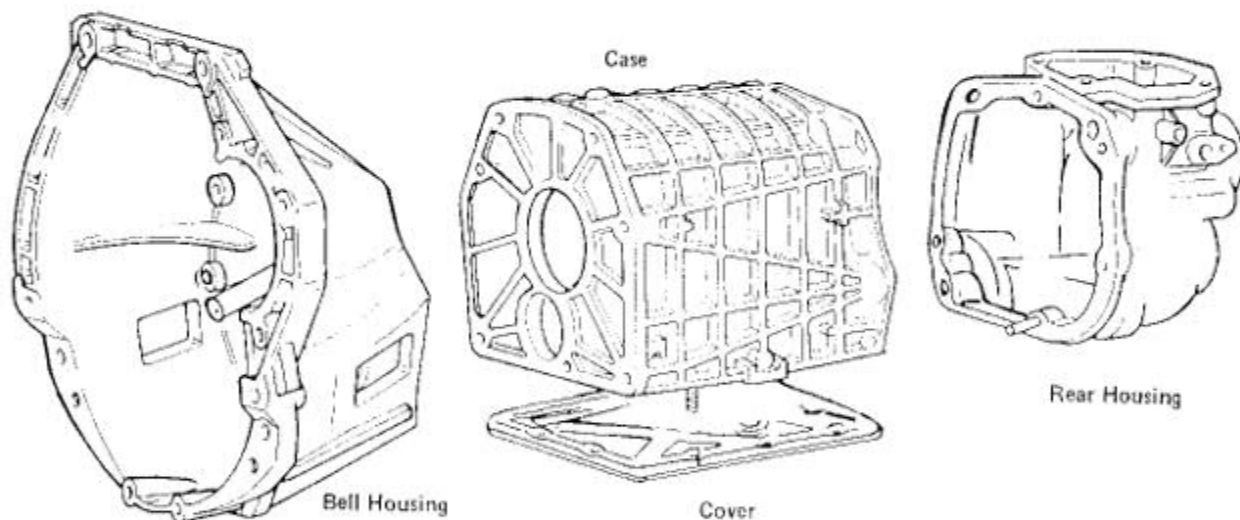
Check that all structured parts are not cracked, broken, or damaged. Replace if damage is in a bearing or structural area. Cracks or holes in any nondimensional or structural area may be repaired by welding.

Check that all threaded holes are not stripped or cross-threaded. Repair by retreading oversize or using helical inserts.

Check that covers are not bent or cracked. Repair by straightening or welding.

Check that bores for detent balls and dowels are not worn. Replace steel sleeve if worn.

Check gasket surfaces for nicks, scratches, or breaks that may cause leaks. Clean with fine emery. Gasket surface can be repaired by welding and machining. Otherwise replace part.



### Oil Seals

Check that oil seals are not worn, chipped, torn, brittle, or cracked. Replace if damaged.

Check that seal springs are not deformed and in place. Restore spring to its position if seal is not otherwise damaged.



Oil Seal

**REASSEMBLY**

Reassembly is reverse of disassembly and observing the following instructions.

**Fifth Gear Reassembly**

Lightly coat parts with oil.

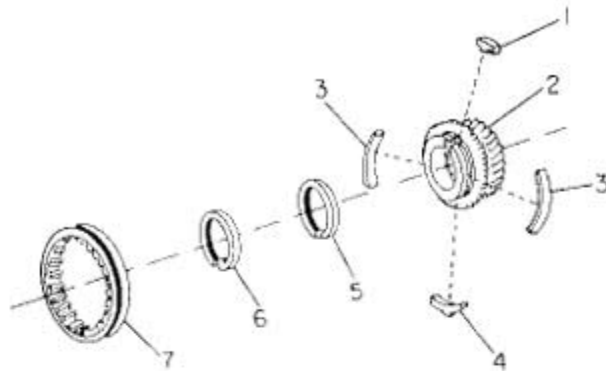
With gear (2) laying flat (gear side down), assemble lock (1) into slot of gear (2).

Assemble stop (4) and two springs (3).

Carefully spread synchro ring (5) and place around assembled parts (1, 3, and 4).

Using tool A.70166, assemble new synchromesh parts snap ring (6) with dog end in slot on gear (2).

Assemble sleeve (7).



1. Lock 2. Gear 3. Spring 4. Stop 5. Synchromesh ring  
6. Synchromesh parts snap ring 7. Sleeve

**First, Second, and Third Gear Reassembly**

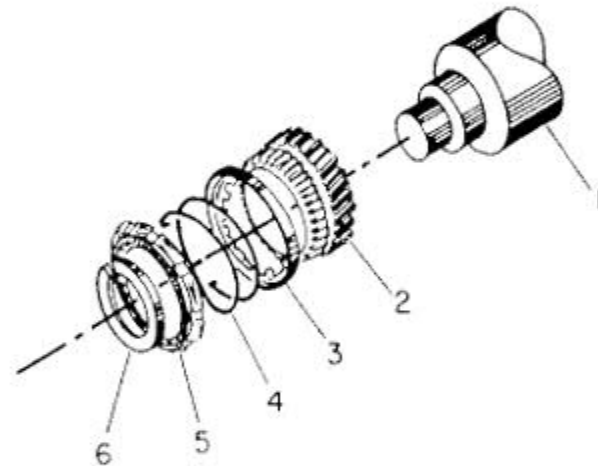
Lightly coat parts with oil.

For third gear only, assemble third gear (2) on main shaft (1).

With cup side away from gear (2), assemble spring retainer (3) on gear (2). Assemble spring (4).

With small end of synchro (5) away from gear (2), assemble synchro (5) and snap ring (6) on gear (2). Use tool A.70159 to assemble snap ring (6).

When assembled, check that synchro (5) can be moved along gear (2), and springs back when released.



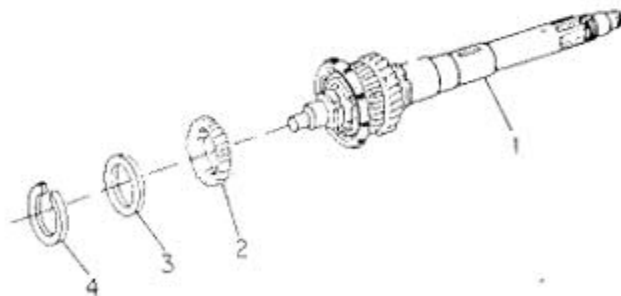
1. Main shaft (third gear only) 2. First, second, or third gear  
3. Spring retainer 4. Spring 5. Synchro 6. Snap ring

**Main Shaft and Third Gear Reassembly**

Lightly coat parts with oil, then place main shaft and third gear (1) in a press. Do not support on third gear, but on shoulder of main shaft.

Onto main shaft and third gear (1) input end, assemble hub (2), spring washer (3), snap ring (4), and tool A.70159.

Use press to compress spring washer (3), then seat snap ring (4) in its groove. Remove subassembly from press.



1. Main shaft and third gear 2. Hub 3. Spring washer 4. Snap ring

## Main Shaft Reassembly

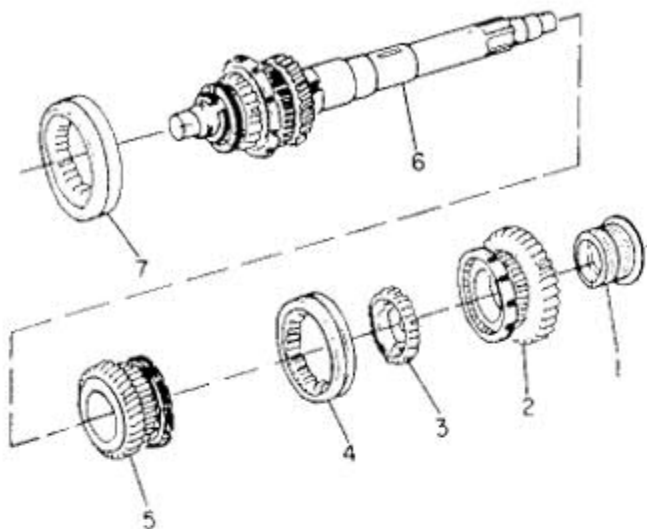
Lightly coat parts with oil.

Onto output end of main shaft and third gear assembly (6), assemble second gear assembly (5), sleeve (4), hub (3), first gear assembly (2), and bushing (1).

Carefully mate all parts. When assembled, sleeve (4) should straddle the synchros on second and first gear assemblies, and the gears should go from small to large, input end to output end.

Assemble sleeve (7) on input end.

1. Bushing 2. First gear assembly 3. Hub 4. Sleeve 5. Second gear assembly 6. Main shaft and third gear subassembly 7. Sleeve



## Input Shaft Reassembly

Lightly coat parts with oil. Place input shaft (4) in press. Support on gear end.

Onto input shaft (4) input end, assemble bearing (3) with retaining ring away from gear, spring washer (2), snap ring (1), and tool A.70350.

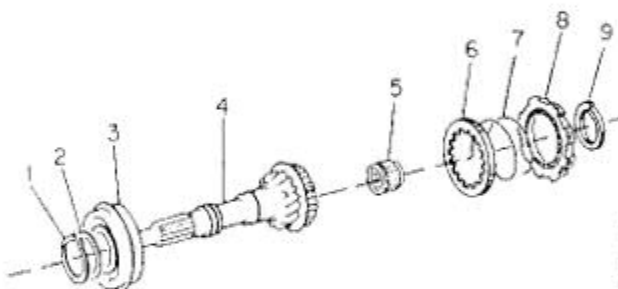
Use press to compress spring washer (2), then seat snap ring (1) in its groove. Remove from press.

Coat bearing (7) with heavy grease. Install bearing (5) inside input shaft.

Assemble spring retainer (6), spring (7), and synchro (8) on input shaft. Assemble snap ring (9) in its groove on input shaft.

Lay input shaft on its side so bearing (5) does not come out.

1. Snap ring 2. Spring washer 3. Bearing 4. Input shaft  
5. Bearing 6. Spring retainer 7. Spring 8. Synchro 9. Snap ring



## Input and Main Shaft Assemblies Installation

Lightly coat all bearing bores, bores for fork shafts, and bores for detent balls and dowels. Also coat each part as it is installed.

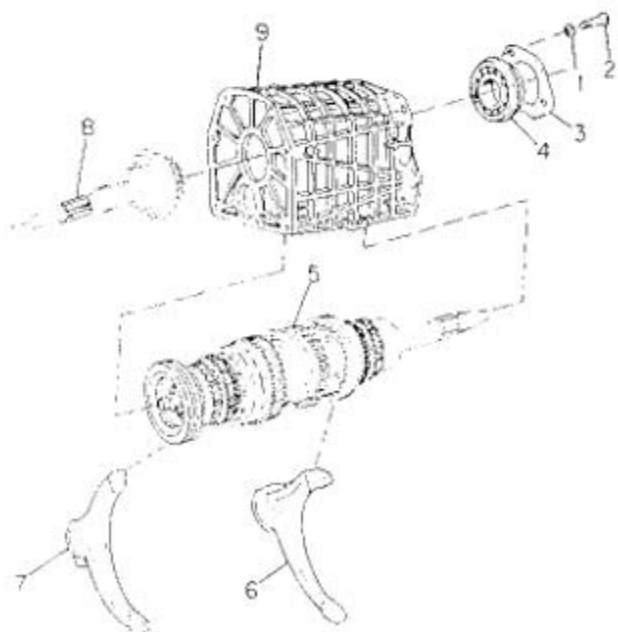
While keeping main shaft assembly (5) fully compressed, carefully insert output end into its bore in case (9), then insert input end. Check for bearing in input shaft assembly (8), then carefully work input shaft assembly into its bore in case (9).

Assemble bearing (4), bearing retainer (3), washers (1) and screws (2). Tighten screws with an impact driver.

Check that input and main shaft assemblies (8 and 5) are easily turned. Check that sleeves on main shaft assembly can be moved axially.

Install first and second shift fork (6) and third and fourth shift fork (7) in their respective sleeves on main shaft assembly (5). Make sure thread holes face cover end of case (9).

1. Lockwasher 2. Screw 3. Bearing retainer 4. Bearing 5. Main shaft assembly 6. First and second shift fork 7. Third and fourth shift fork 8. Input shaft assembly 9. Case



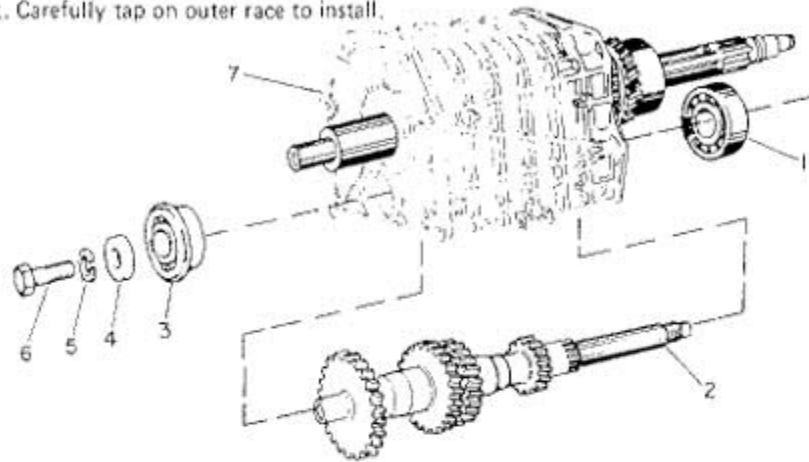
### Countershaft Installation

Insert output end of countershaft (2) into its bore in case (7), then insert input end.

Assemble bearing (3) with retaining ring away from case (7), washer (4), lockwasher (5), and bolt (6). Finger tighten bolt.

Install bearing (1) with inner race going on first. Carefully tap on outer race to install.

1. Bearing
2. Countershaft
3. Bearing
4. Washer
5. Lockwasher
6. Bolt
7. Case



### Fifth and Reverse Gears Installation

If removed, install bushing (3) in reverse sliding gear (2). Attach shaft (4), lockwasher (6), and screws (5). Tighten screws with impact driver.

Assemble spacer (15) and key (14) on main shaft (13). Assemble reverse gear (16), hub (17), and spacer (18). Assemble spacer (11) on countershaft (12).

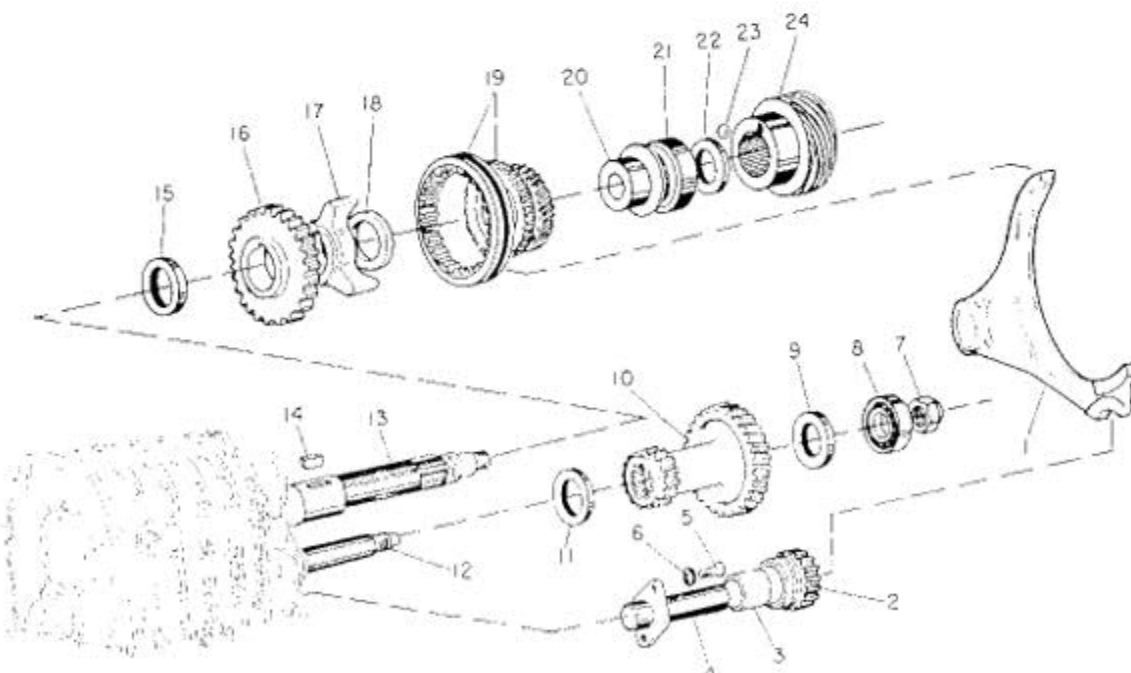
Partially assemble fifth and reverse gear (10) on countershaft (12), and fifth gear assembly (19) on main shaft (13).

Assemble fifth and reverse shift fork (1) on reverse sliding gear (2) and fifth gear assembly (19). Carefully slide partially assembled parts on their respective shafts until they can be released.

Carefully tap on fifth and reverse gear (10) until it is fully seated on countershaft (12).

Assemble spacer (9), bearing (8), and nut (7). Finger tighten nut.

Assemble bushing (20), bearing (21), spacer (22), ball (23), and speedometer drive gear (24).



- |                                 |                            |                  |                         |                            |
|---------------------------------|----------------------------|------------------|-------------------------|----------------------------|
| 1. Fifth and reverse shift fork | 6. Lockwasher              | 11. Spacer       | 16. Reverse gear        | 21. Bearing                |
| 2. Reverse sliding gear         | 7. 27-mm nut               | 12. Countershaft | 17. Hub                 | 22. Spacer                 |
| 3. Bushing                      | 8. Bearing                 | 13. Main shaft   | 18. Spacer              | 23. Ball                   |
| 4. Shaft                        | 9. Spacer                  | 14. Key          | 19. Fifth gear assembly | 24. Speedometer drive gear |
| 5. Screw                        | 10. Fifth and reverse gear | 15. Spacer       | 20. Bushing             |                            |



### Fork Shafts Installation

Install first and second fork shaft (13) in fork shaft hole furthest away from case cover. As fork shaft is installed, insert into first and second shift fork.

Assemble washer (2) and bolt (3). Tighten to 14 ft lb torque.

Install long detent dowel (5).

Install third and fourth fork shaft (15) in center fork shaft holes. As fork shaft is installed, insert into third and fourth shift fork. Also install detent pin (14) into fork shaft (15).

Assemble washer (2) and bolt (3). Tighten to 14 ft lb torque.

Temporarily install two detent balls (8) and two springs (9) for installed fork shafts. Assemble cover (11) and two bolts (12).

Engage two gears to lock the transmission.

Tighten 27-mm nut (4) to 87 ft lb and 19-mm bolt to 69 ft lb torque. Disengage two gears.

Check that both countershaft and main shaft can be easily turned. If countershaft cannot be turned, its rear bearing may be installed backwards. Also engage each gear and check for free turning.

Using staking pliers A.74140/1 and staking heads A.74140/4, stake nut (4).

Install short detent dowel (6).

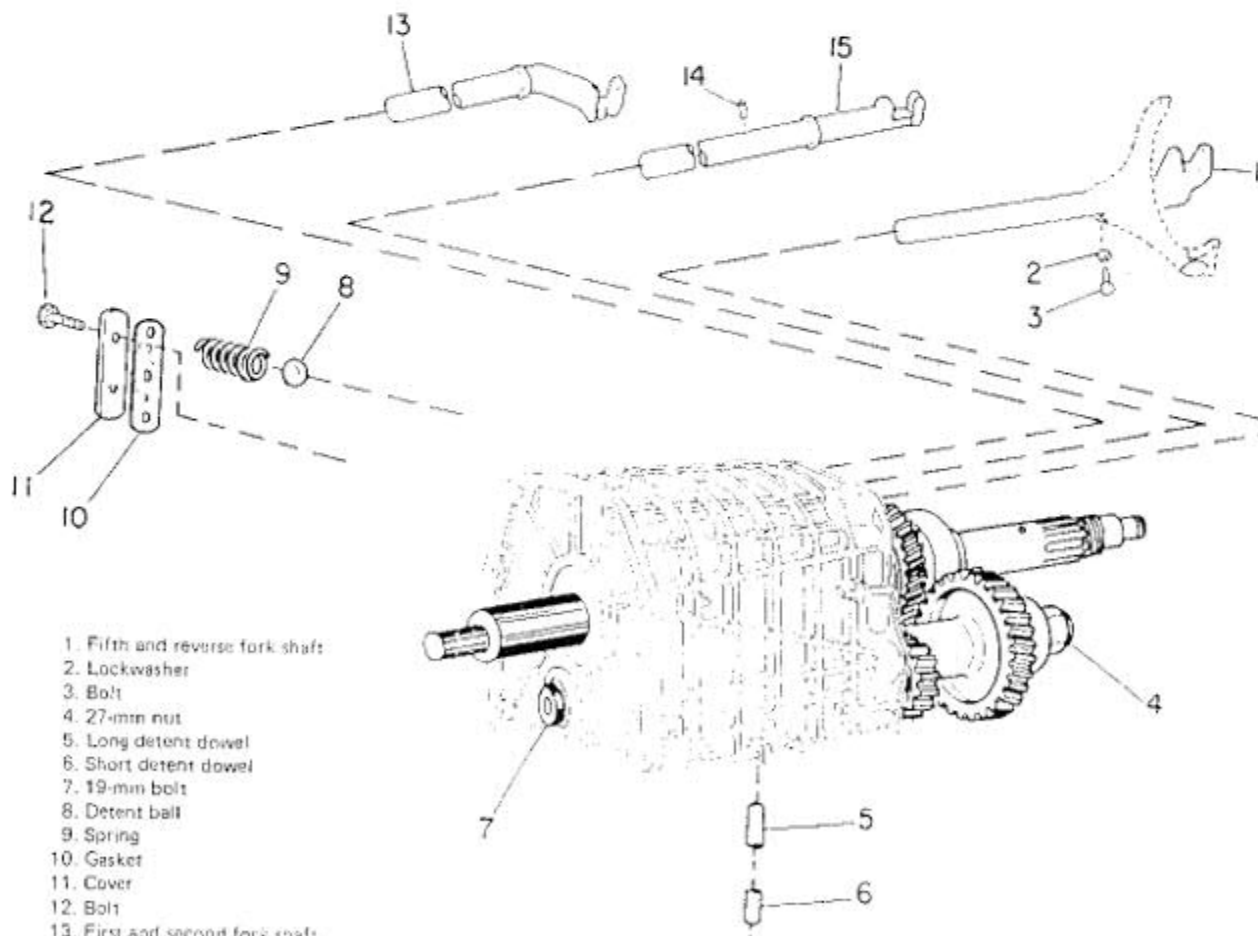
Install fifth and reverse fork shaft (1) into fifth and reverse shift fork, and into remaining fork shaft hole.

Assemble washer (2) and bolt (3). Tighten to 14 ft lb torque.

Remove bolt (12) and cover (11). Install third detent ball (8) and spring (9).

Install new gasket (10) (sealant is not recommended), cover (11), and two bolts (12). Tighten bolts to 18 ft lb torque.

Engage a gear. Check that a second gear cannot be engaged at the same time.



1. Fifth and reverse fork shaft
2. Lockwasher
3. Bolt
4. 27-mm nut
5. Long detent dowel
6. Short detent dowel
7. 19-mm bolt
8. Detent ball
9. Spring
10. Gasket
11. Cover
12. Bolt
13. First and second fork shaft
14. Detent pin
15. Third and fourth fork shaft

**Engaging Lever Installation**

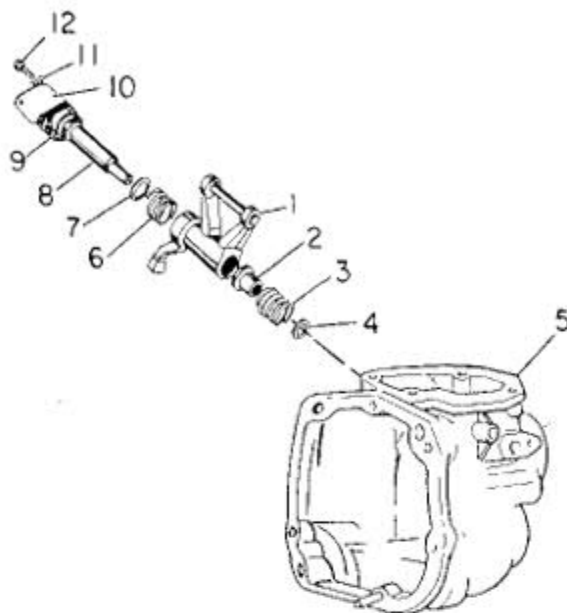
If disassembled, install thrust washer (4) in rear housing (5).

Slowly install engaging lever rod (8) into rear housing (5). As rod is installed, assemble thrust washer (7), spring (6), gear selection and engaging lever (1), spring retainer (2), and spring (3).

Install new gasket (9) (sealant is not recommended), cover (10), lockwasher (11), and bolt (12). Tighten bolt to 14 ft lb torque.

Check for free side-to-side travel of gear selection and engaging lever (1), and that it returns to center position when released.

1. Engaging lever 2. Spring retainer 3. Spring 4. Thrust washer  
5. Rear housing 6. Spring 7. Thrust washer 8. Engaging lever rod  
9. Gasket 10. Cover 11. Lockwasher 12. Bolt

**Rear Housing Installation**

If removed, install new seal (5).

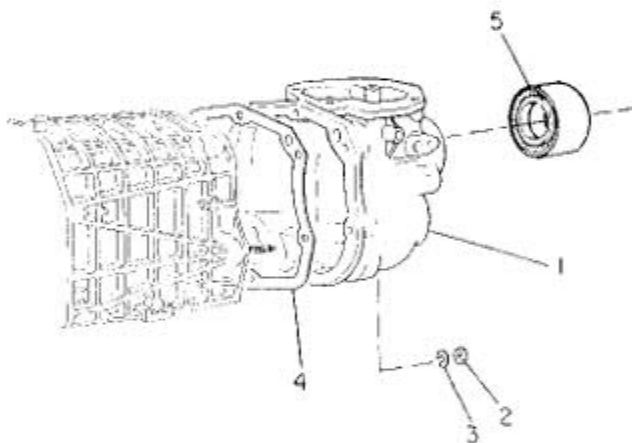
Assemble new gasket (4) on case (sealant is not recommended).

Move gear selection and engaging lever rearward. Slowly assemble rear housing (1) onto case. As rear housing is assembled, guide gear selection and engaging lever into fork shafts.

Assemble six nuts (2) and lockwashers (3). Tighten to 18 ft lb torque.

Check that gear selection and engaging lever can be operated through all gears.

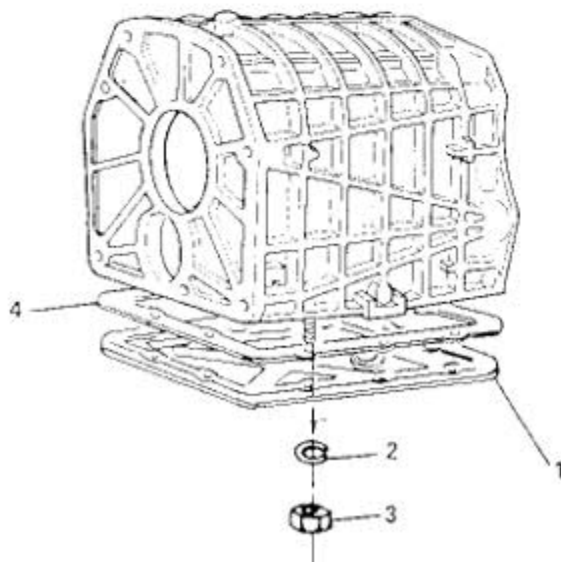
1. Rear housing 2. Nut 3. Lockwasher 4. Gasket 5. Seal

**Case Cover Installation**

Assemble new gasket (4) to case.

Assemble cover (1), ten lockwashers (2), and nuts (3).

1. Cover 2. Lockwasher 3. Nut 4. Gasket



### Yoke Installation

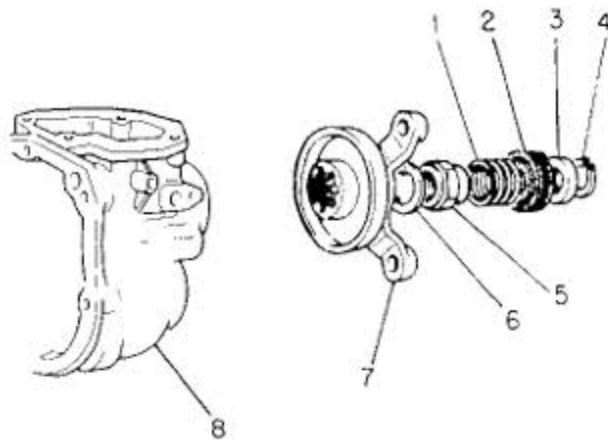
Coat splines of yoke (7) with antiseize compound, then assemble to main shaft.

Assemble washer (6) and nut (5). Using adapter A.55130 on yoke (7), tighten nut to 108 ft lb torque.

Assemble spring (1), seal (2), spacer (3), and snap ring (4).

Coat seal (2) with heavy grease.

1. Spring 2. Seal 3. Spacer 4. Snap ring 5. Nut 6. Washer  
7. Yoke 8. Rear housing



### Shift Tower Reassembly

If disassembled, install shaft (7) in shift tower (3) and into dog (8). Assemble bolt and washer (9). Tighten screw to 14 ft lb torque.

Assemble new gasket (16), cover (17), and washer and nut (14).

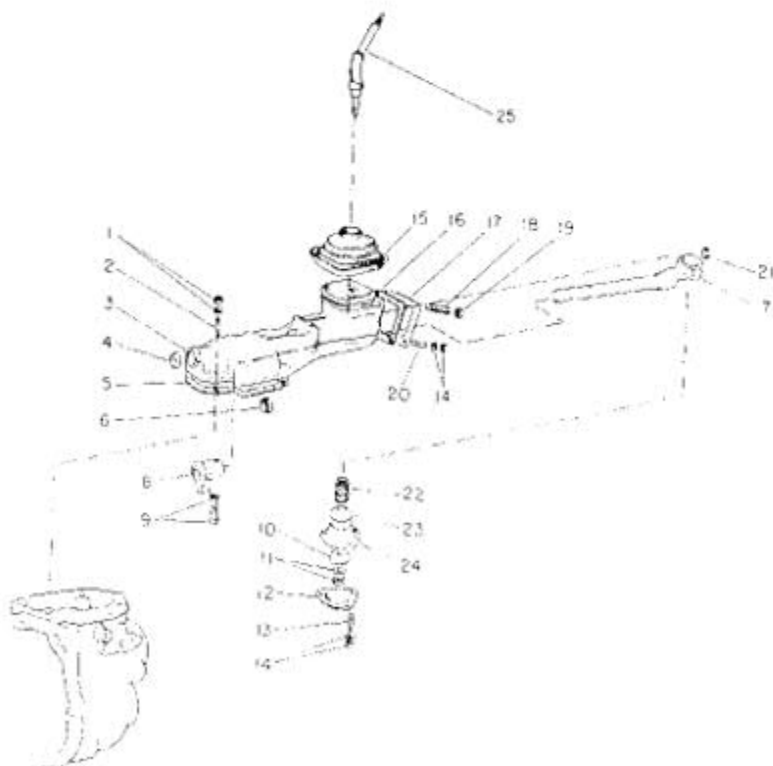
Place spring (21) in groove in shaft (7). Install shift lever (25).

To bottom of shift lever, assemble spring (22), cover (23), socket (24), bearing (10), and washer and nut (11). Tighten nut to 11 ft lb torque.

Assemble cover (12) and three washers and nuts (14).

To adjust reverse lockout screw (18), place shift lever (25) in fifth/reverse gate. Screw reverse lockout screw (18) in until it contacts shift lever, then back out three turns. Tighten locknut (19).

1. Nut and lockwasher  
2. Stud  
3. Shift tower  
4. Cap  
5. Gasket  
6. Bearing  
7. Shaft  
8. Dog  
9. Bolt and lockwasher  
10. Bearing  
11. Nut and washer  
12. Cover  
13. Stud  
14. Nut and lockwasher  
15. Bolt  
16. Gasket  
17. Cover  
18. Reverse lockout screw  
19. Locknut  
20. Stud  
21. Spring  
22. Spring  
23. Cover  
24. Socket  
25. Shift lever



**Shift Tower Installation**

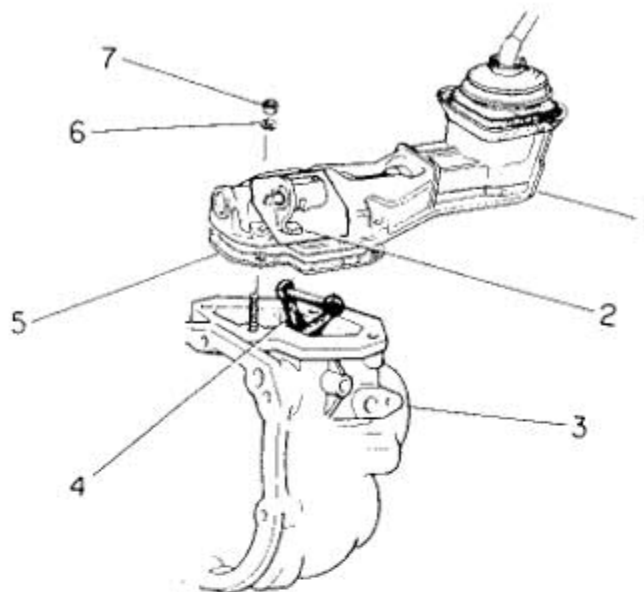
Assemble new gasket (5) on rear housing (3).

Move shift lever forward, then place shift tower (1) on rear housing (3).

Carefully slide shift tower down, then move shift lever rearward to engage dog (2) on engaging lever (4).

Assemble four washers (6) and nuts (7).

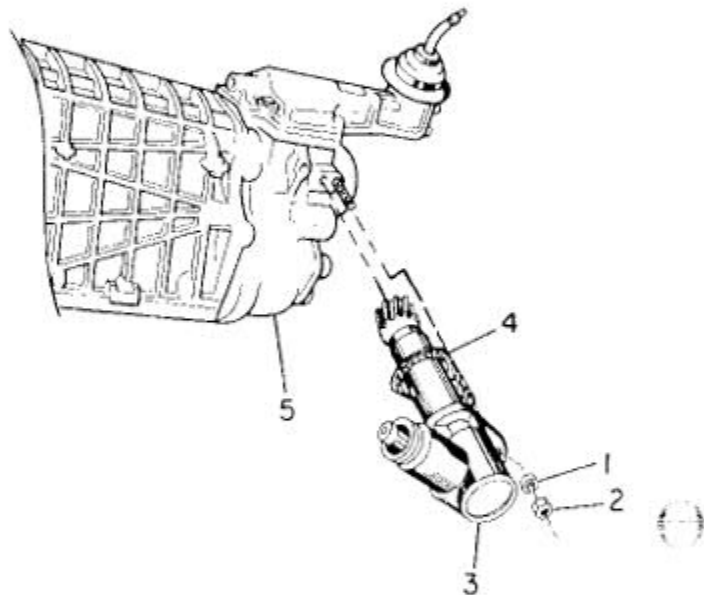
1. Shift tower assembly 2. Dog 3. Rear housing 4. Engaging lever  
5. Gasket 6. Lockwasher 7. Nut

**Speedometer Drive Installation**

Assemble new gasket (4) and speedometer drive (3) on rear housing (5).

Assemble washer (1) and nut (2).

1. Lockwasher 2. Nut 3. Speedometer drive 4. Gasket 5. Rear housing

**Bellhousing Installation**

If removed, install new seal (9) in bell housing (4).

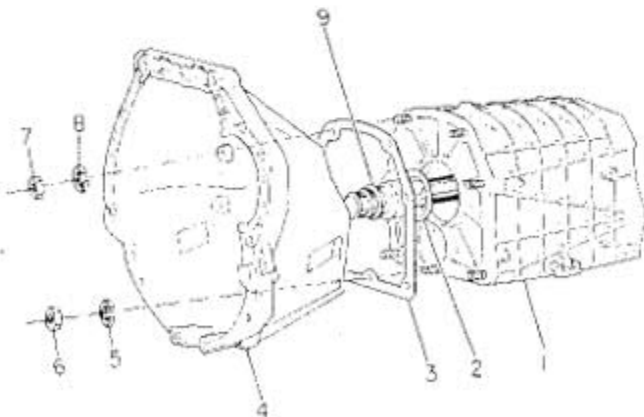
Assemble new gasket (3) on case (1).

Coat spring washer (2) with heavy grease. With cup end forward, place on seal in bellhousing.

Assemble bellhousing (4), six lockwashers (8), nuts (7), and one lockwasher (5) and nut (6).

Tighten nuts (7) to 36 ft lb torque and nut (6) to 18 ft lb torque.

1. Case 2. Spring washer 3. Gasket 4. Bellhousing 5. Lockwasher  
6. Nut 7. Nut 8. Lockwasher 9. Seal



### Yoke and Throwout Bearing Installation

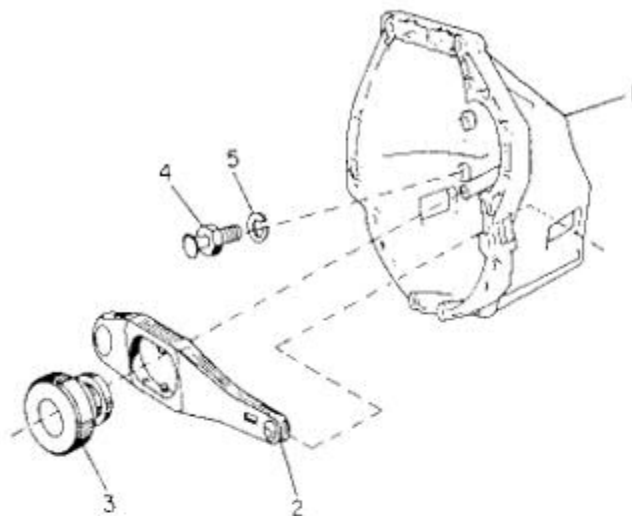
If removed, assemble lockwasher (5) and pivot (4) to bellhousing (1).

Insert throwout bearing (3) into yoke (2).

Insert return spring end of yoke (2) into opening in bellhousing (1) and throwout bearing (3) over input shaft.

Slide yoke (2) over pivot (4) until locked in place.

1. Bellhousing 2. Yoke 3. Throwout bearing 4. Pivot  
5. Lockwasher



### Oil Plugs Installation

Assemble return spring and rubber boot (5).

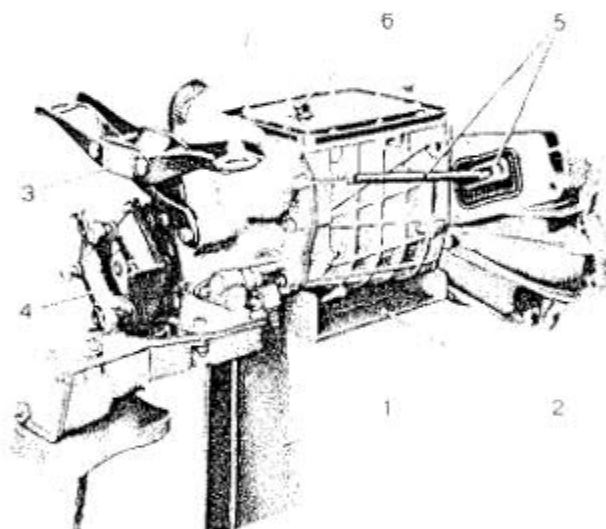
Using two nuts and washers, attach rear supporting cross strut (3) to rear housing.

Using three self-locking nuts and bolts, attach flexible joint (4) to yoke.

Using tools A.50113 and A.55087, install oil drain plug (6) and rear housing oil drain plug. Loosely install oil level plugs until transmission is filled with oil.

After transmission is installed in car, add 1 1/4 quarts of SAE 90 oil containing antiwear additives. Do not use EP oil.

1. Rotating stand 2. Support 3. Rear supporting cross strut  
4. Flexible joint 5. Spring and rubber boot 6. Oil drain plug



### AUTOMATIC TRANSMISSION

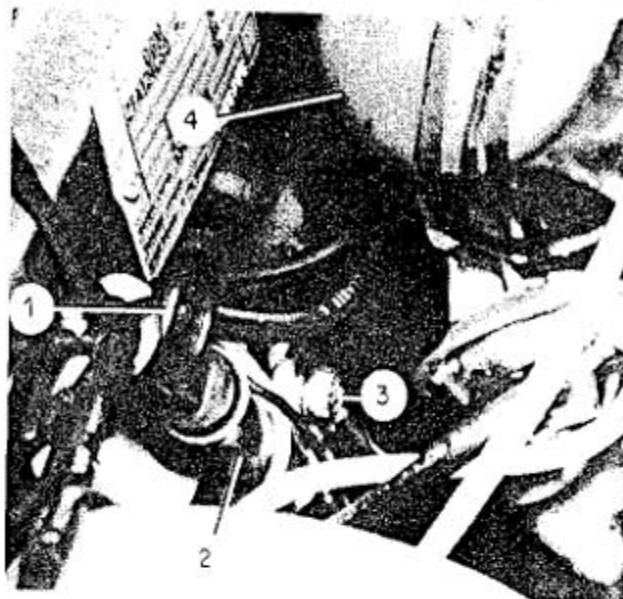
#### REMOVAL AND INSTALLATION

Disconnect battery ground cable.

In engine compartment remove dipstick (1) from filler tube (2). Remove bolt (3) and washers securing filler tube to engine bracket.

**NOTE:** Do not remove filler tube until transmission has been drained.

1. Dipstick 2. Filler tube 3. Bolt 4. Ignition distributor



Raise vehicle on lift.

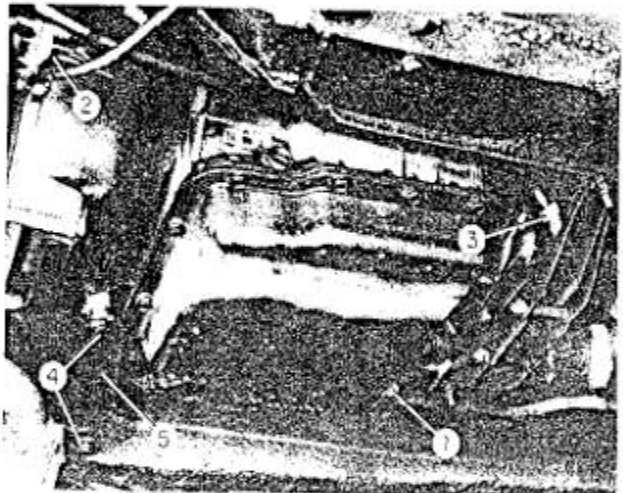
Remove drain plug (1) to drain transmission.

Remove three bolts (2) holding starter to transmission housing. Secure starter out of way.

Unscrew speedometer connector (3) from transmission.

Remove two bolts (4) to remove exhaust pipe bracket (5).

1. Drain plug 2. Starter bolt 3. Speedometer cable connector  
4. Bolt 5. Bracket

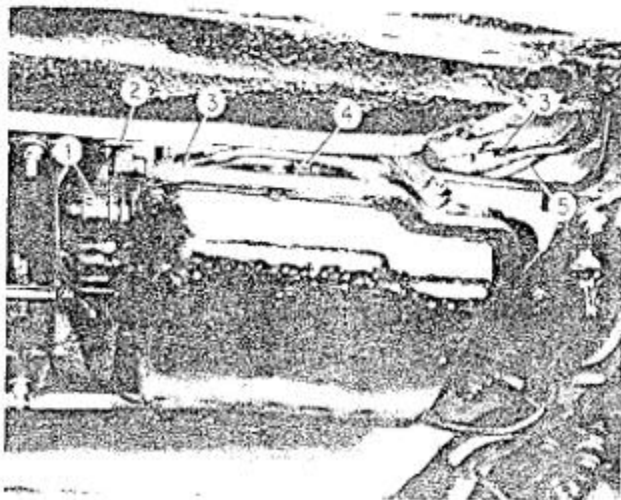


Disconnect vacuum hose from modulator (1). Disconnect vacuum line from clip (2) on transmission.

Disconnect and cap cooling lines (3) from transmission. Remove bolt and clamp holding cooling line.

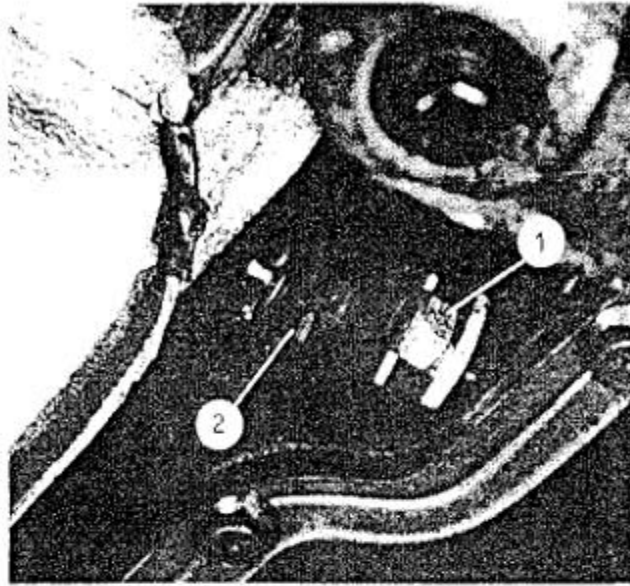
Disconnect kick-down cable (5) by removing bolt and clamp (4).

1. Modulator 2. Clip 3. Transmission cooling lines 4. Bolt and clamp 5. Kick-down cable



Remove nut (1) holding shift lever (2) to transmission control rod. Disconnect lever.

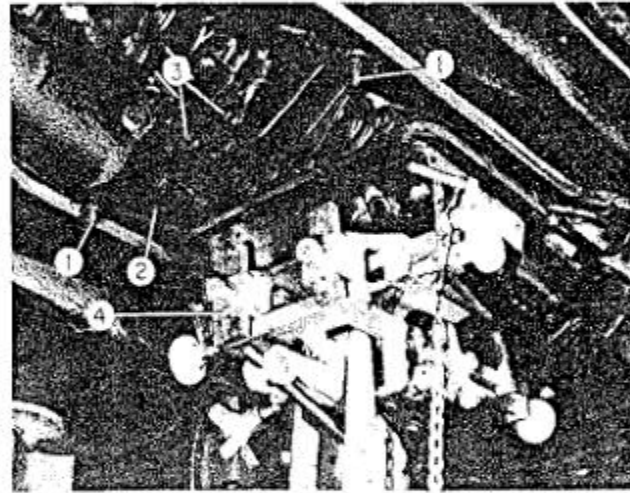
1. Nut 2. Shift lever



Remove drive shaft assembly (refer to Drive Shaft section).  
Place transmission jack (4) under transmission.

Remove two nuts (1) holding transmission mount (2) to body.  
Remove two bolts (3) holding mount to transmission.

1. Nut 2. Transmission mount 3. Bolt 4. Transmission jack

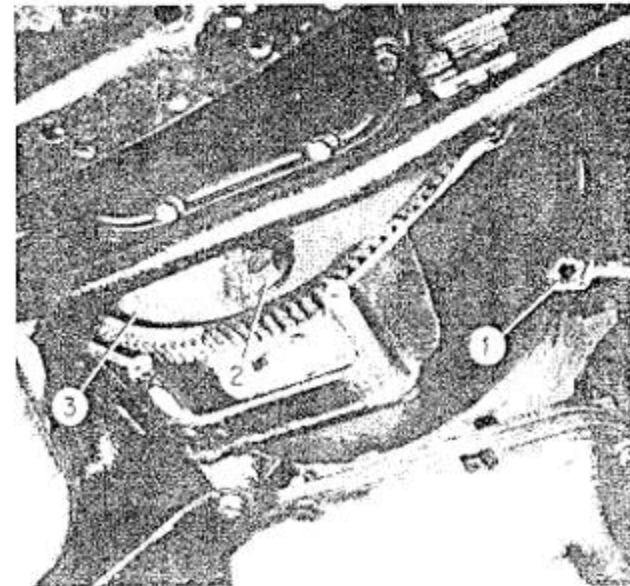


Remove four bolts to remove flywheel cover.

**NOTE:** Left bolt of flywheel cover also secures engine ground lead (1).

Remove three bolts (2) holding flywheel (3) to torque converter.  
Turn flywheel to gain access to bolts.

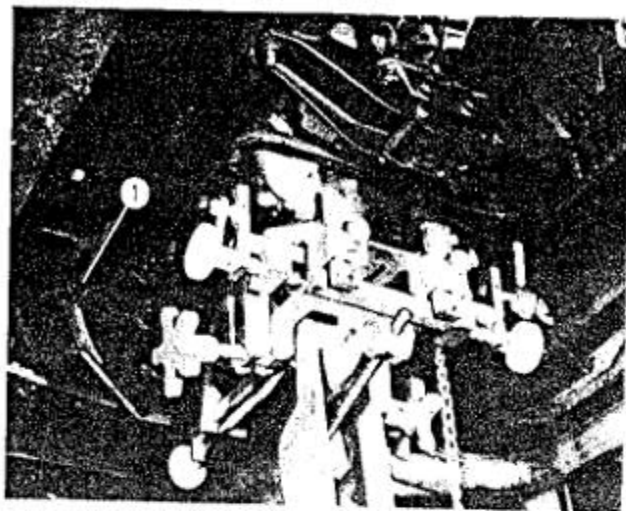
1. Ground lead 2. Bolt 3. Flywheel



Remove four bolts (1) holding transmission to engine.  
Tilt rear of transmission down and slide it back. Lower transmission to ground.

**CAUTION:** Support torque converter while removing and installing transmission.

1. Bolt



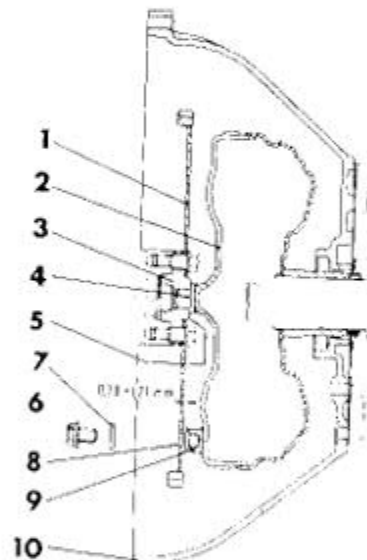
Installation is reverse of removal.

Torque all bolts (refer to Torque Specifications chart).

After attaching transmission to engine, push torque converter (2) against flywheel flange (3). Check that gap between boss (9) and attachment point (8) is .008 to .048 in (.02 to 1.21 mm). Check at each point with a feeler gage. If clearance is not correct, replace flywheel.

Attach flywheel to converter with three bolts (6) and washers. Torque bolts to 47 ft lb (6.5 kgm).

1. Flywheel 2. Torque converter 3. Flywheel flange 4. Converter contact point 5. Flywheel contact point 6. Bolts 7. Washers  
8. Attach point 9. Attachment boss 10. Converter housing



### CHECKING AND FILLING TRANSMISSION

**CAUTION:** Use Dexron type transmission fluid only.

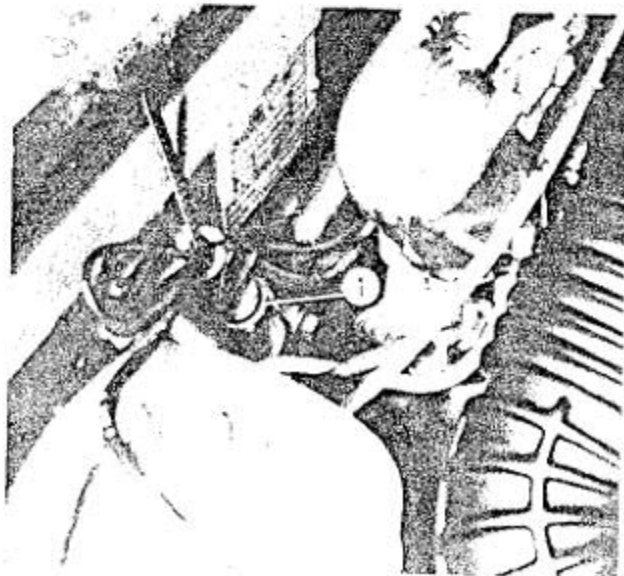
Complete transmission installation in vehicle and install drain plug in fluid sump pan.

Add about 5.28 pints (2.8 liters) of transmission fluid, through filler tube (1).

Apply brakes and block wheels. Start engine and run at normal idle. Place gearshift in "D" (Drive).

Move selector lever slowly through each range and allow transmission to warm up.

1. Dipstick and filler tube





**NOTE:** Make sure vehicle is on level ground, engine idling, and gearshift in "P" (Park) or "N" (Neutral).

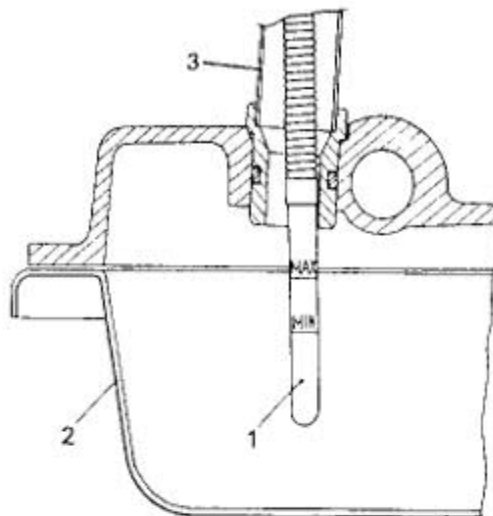
When transmission reaches operating temperature of about 156°F (80°C), move lever to "N" (Neutral) or "P" (Park). Check fluid level. Fill to MAX mark on dipstick (1). Use lint-free cloth when wiping dipstick.

**CAUTION:** Do not overfill as foaming and fluid loss will occur when fluid heats up.

**FILLING CAPACITIES:**

Fluid change . . . . .	3 quarts (2.8 liter)
New Torque Converter . . . . .	2 quarts (1.9 liter)
Dry Transmission . . . . .	6 quarts (5.6 liter)

1, Dipstick 2, Oil pan 3, Filler tube



### DISASSEMBLY

Remove torque converter from within housing by sliding it off splined shaft by hand.

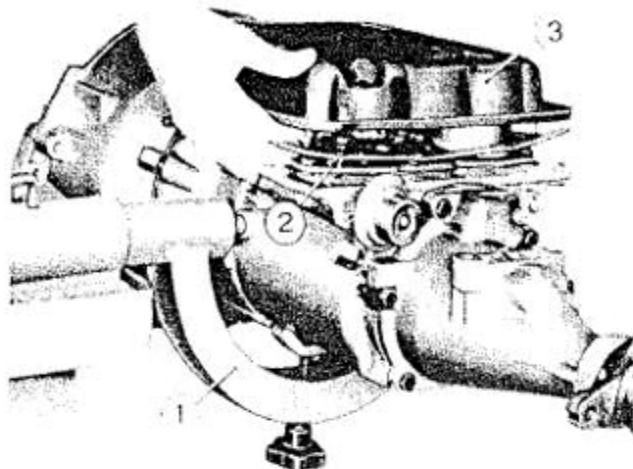
Place transmission in holding fixture 3289-20 and 8763-02.

Remove bolt and lockwasher holding speedometer driven gear. Remove driven gear and gasket.

Turn transmission over.

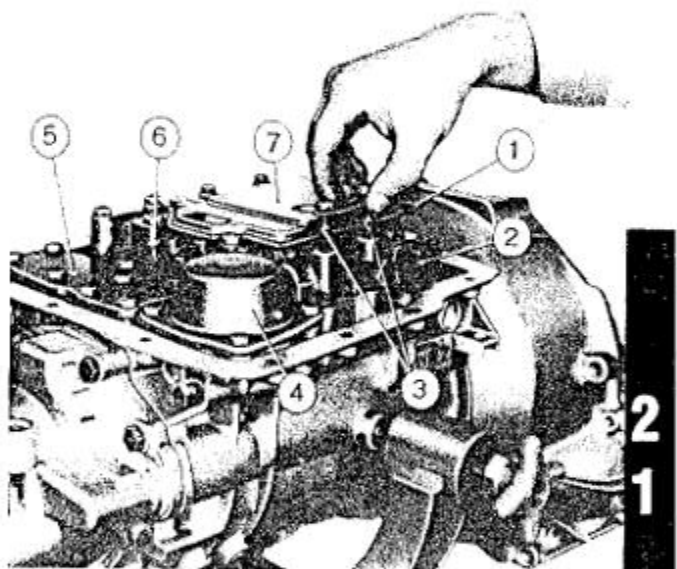
Remove 12 bolts holding oil pan (3). Use a 1/2 inch socket. Remove pan and gasket (2). Discard gasket.

1. Transmission stand 2. Gasket 3. Oil pan



Remove 2 bolts (3) holding manual detent spring (1). Remove spring. Remove 3 bolts holding oil filter (7). Remove oil filter (7) and gasket. Discard gasket and filter.

1. Manual detent spring 2. Selector lever 3. Bolts 4. Servo piston  
5. Transfer plate reinforcement 6. Valve body 7. Oil filter

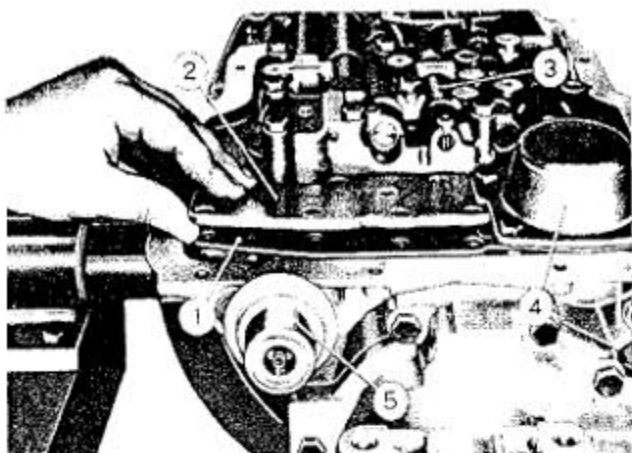


2  
1

Loosen 20 bolts holding valve body (3), reinforcement plate (2) and servo cover (4). Use a 1/8 inch socket.

Remove the 12 bolts holding the reinforcement plate and servo cover. Remove gasket for servo cover. Discard gasket.

1. Transfer plate 2. Reinforcement plate 3. Valve body 4. Servo cover 5. Vacuum modulator

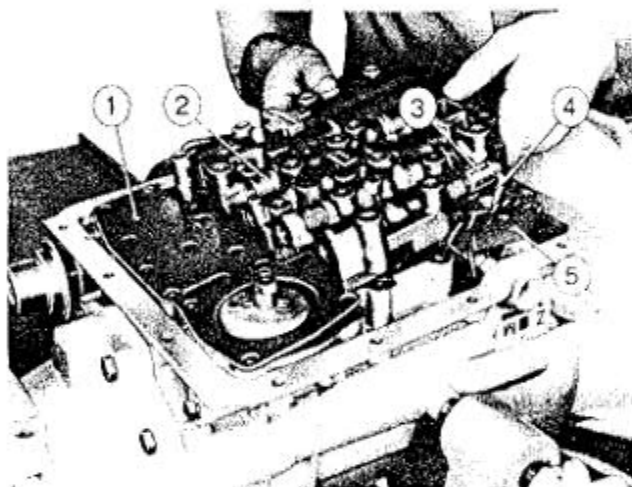


Remove 8 bolts holding valve body (2). Lift valve body and transfer plate (1). Hold manual valve link (4) and disconnect it from selector lever (5).

Make sure manual valve (3) and link (4) are not dropped or damaged. Remove valve body (2) and transfer plate (1). Remove gasket. Discard gasket.

Remove check ball from oil passages in transmission case.

1. Reinforcement 2. Valve body 3. Manual valve 4. Link 5. Selector lever

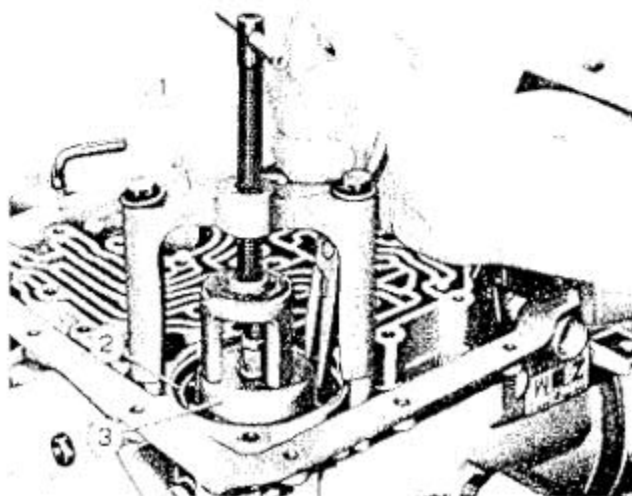


Install tool 23075 on case. Make sure legs of tool are seated. Make sure middle of tool is centered over servo. Carefully thread 2 bolts of tool into case.

Turn tool down just enough to allow removal of snap ring (2). Using pliers, remove snap ring.

Loosen tool slowly to relieve spring pressure on servo piston (3). Remove tool and servo piston. Remove return spring and piston apply rod.

1. Compressor tool 2. Snap ring 3. Servo piston



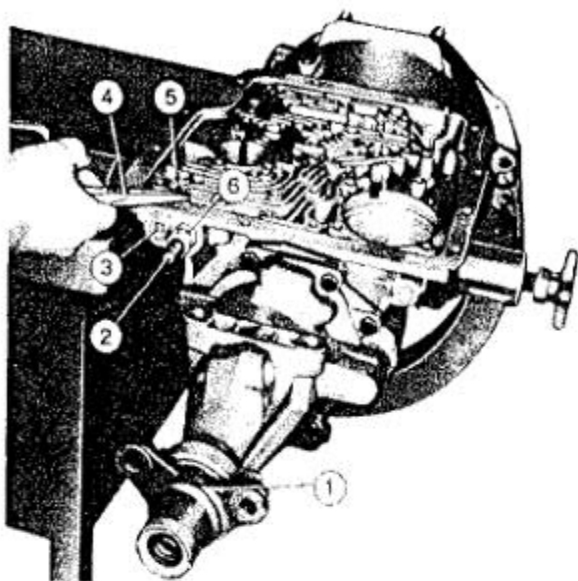
Using wrench 23100, remove vacuum modulator and gasket. Discard gasket. Remove modulator plunger.

Remove valve (2) and sleeve (6) for modulator assembly from case.

Very carefully remove retaining roll pin (5) holding kick-down valve assembly (3).

Remove kick-down sleeve, valve, spring seat, and spring from case.

1. Output shaft flange 2. Modulator valve 3. Kick-down valve assembly 4. Pliers 5. Retaining roll pin 6. Modulator sleeve



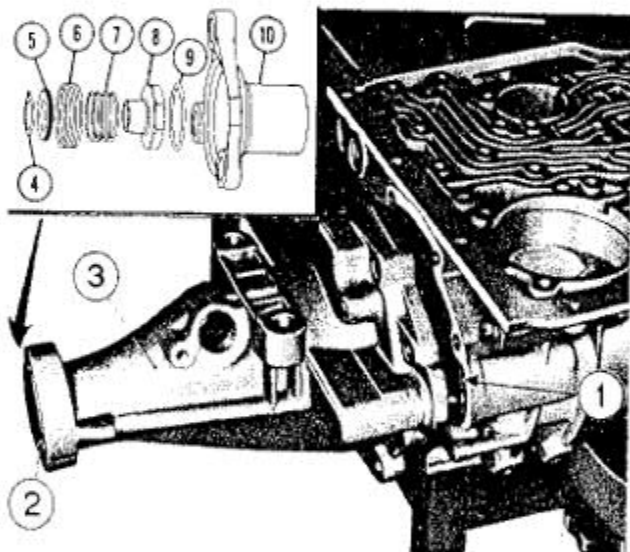
Remove snap ring (4), ring (5), seal (6), spring (7), nut (8) and washer (9) from end of output shaft.

Remove output yoke (10) by pulling it off of output shaft.

Remove seven bolts holding rear housing (3) to case. Use a 9/16 inch socket.

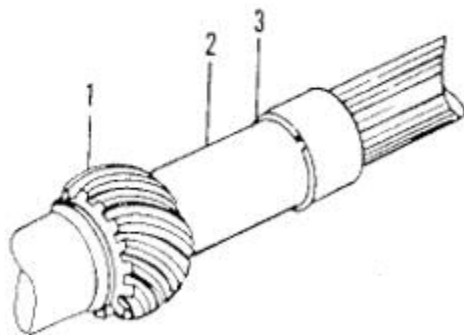
Slide rear housing (3) off output shaft. Remove gasket (1). Discard gasket.

1. Gasket 2. Output shaft seal 3. Rear housing 4. Snap ring 5. Ring 6. Seal 7. Spring 8. Nut 9. Washer 10. Output yoke



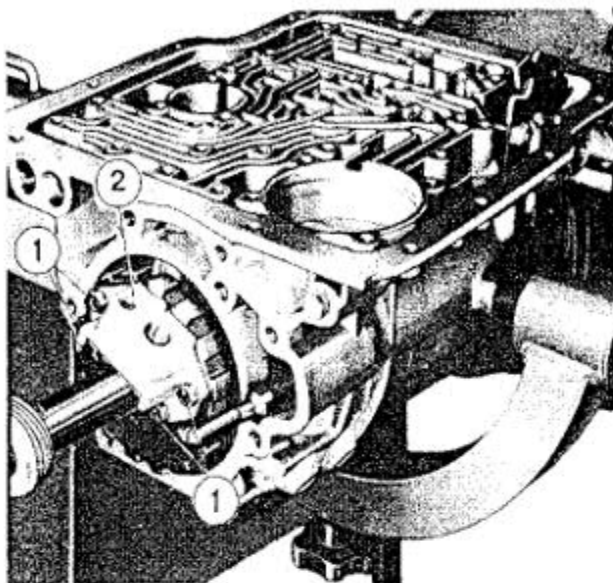
Remove snap ring (3). Slide collar (2) from output shaft and pull off speedometer gear (1).

1. Speedometer gear 2. Collar 3. Snap ring



Remove four bolts (1) holding governor (2) to hub. Use a 7/16 inch socket. Remove governor. Remove and discard gasket.

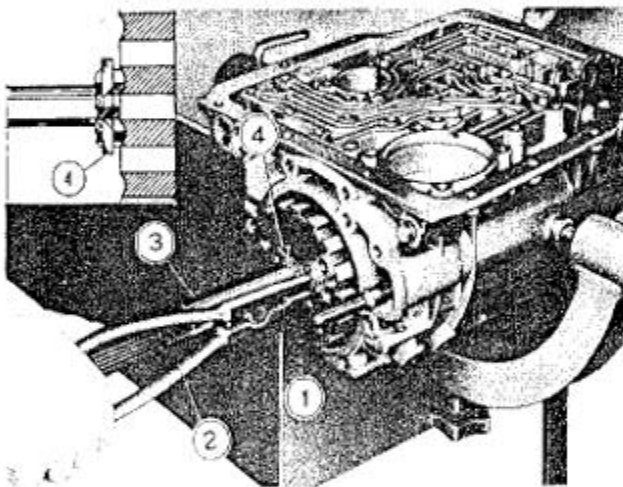
1. Bolts 2. Governor



Remove snap ring (4) holding governor hub (1) to output shaft (3). Use snap ring pliers (2).

Slide hub off shaft.

1. Governor hub 2. Pliers 3. Output shaft 4. Snap ring



2  
1

Position transmission with converter housing up.

Just "crack" 5 inner bolts holding converter to pump.

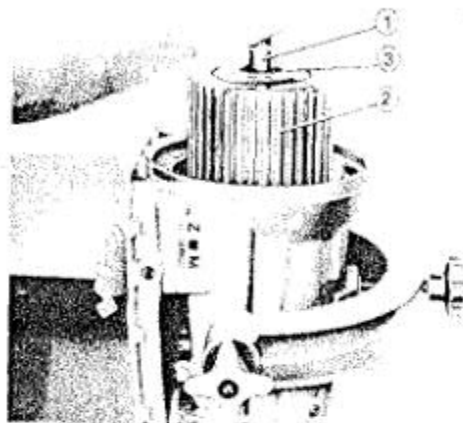
Remove 7 outer bolts and sealing washers holding housing to case. Discard sealing washers. Use a 1/2 inch socket. Lift housing and oil pump out of case. If necessary, slap sharply on side of housing with rubber mallet to loosen pump assembly.



Lift third clutch assembly (1) and second clutch drum (2) out of case by the input shaft.

Remove selective thrust washer from input shaft.

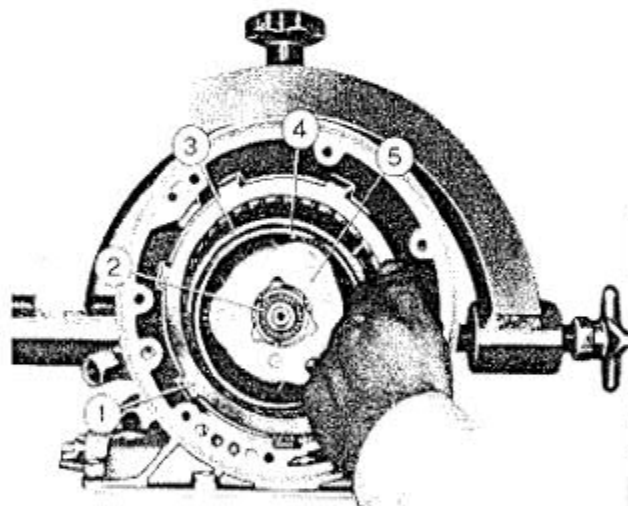
1. Third clutch assembly 2. Second clutch drum 3. Selective thrust washer



Remove reverse clutch plates (1) and reaction plate from case.

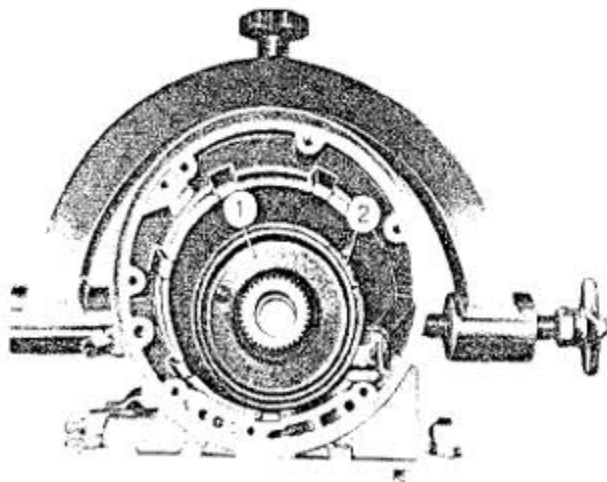
Lift planetary carrier (5) with output shaft out of case. Be careful of needle bearings (2) and races so as not to drop or lose them.

1. Reverse clutch plates 2. Needle bearing 3. Band 4. Drum 5. Planetary carrier



Remove reaction sun gear and drum (1) from case by pulling straight out.

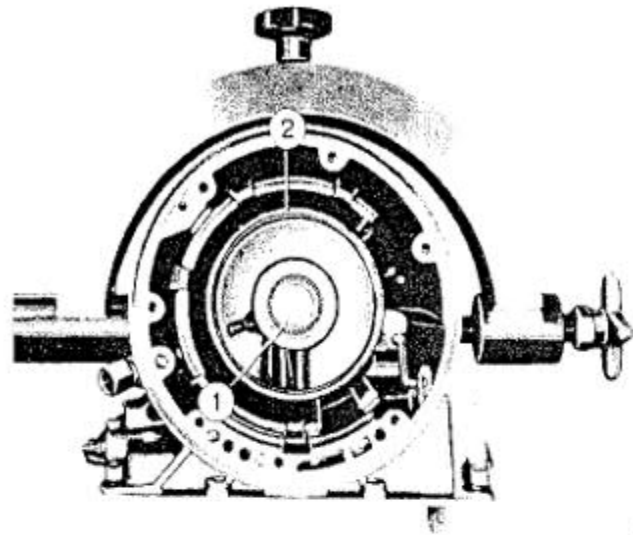
1. Reaction sun gear and drum 2. Band



Remove needle bearing (1) and race from rear of case. Bearing and race may come out with reaction sun gear and drum. Be careful not to lose them.

Slightly compress band (2). Remove band by pulling it straight out.

1. Needle bearing 2. Band

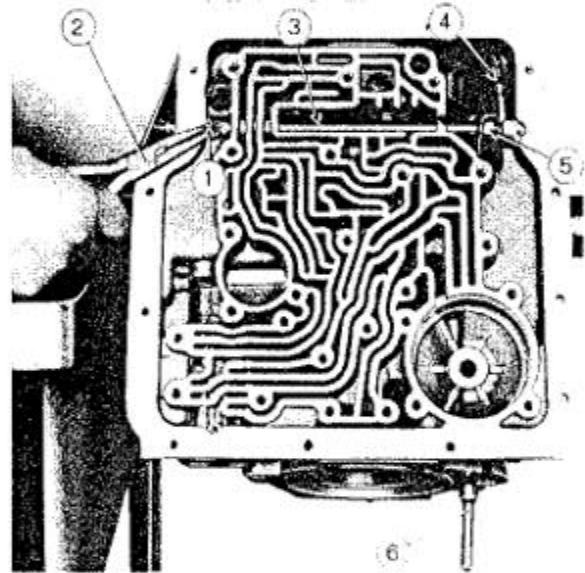


Turn case so that oil passages are up.

Remove nut (5) holding lever (4) to shaft (3). Remove retaining pin (1) holding selector lever shaft (3). Slide lever out of case.

Remove parking lock actuator (6) with selector lever (4). Remove lever from actuator by aligning slot in lever with tab on actuator.

1. Retaining pin 2. Pliers 3. Shaft 4. Selector lever 5. Nut  
6. Parking lock actuator



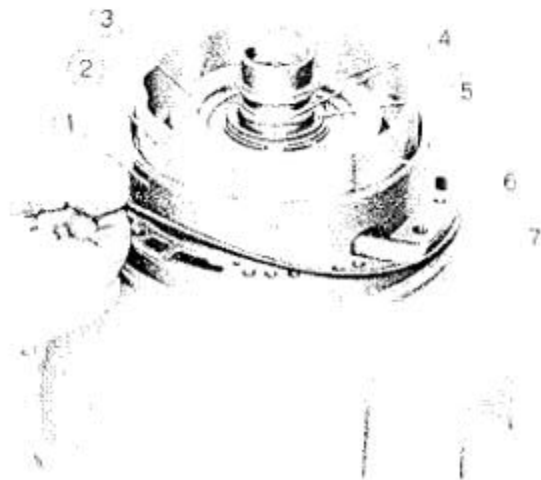
2  
1

#### Disassembly, Inspection and Reassembly of Converter Housing

Remove 5 bolts and sealing washers holding oil pump (1) to housing. Discard sealing washers. Remove outer oil seal (7) from housing. Discard oil seal.

Lift housing off of oil pump.

1. Oil pump 2. Reverse clutch piston 3. Spring retainer 4. Seal rings 5. Adjustment washer 6. Snap ring 7. Outer oil seal.

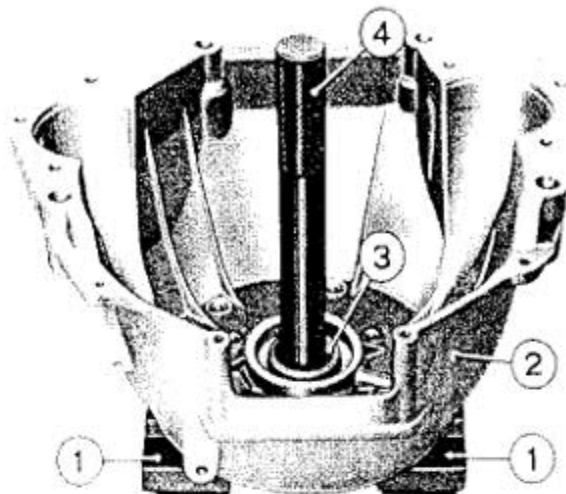


Remove oil seal.

Thoroughly clean converter housing.

Inspect bushing in housing. If worn, remove bushing from converter side of housing as shown. Use bushing remover 21465-17 and drive handle 8093.

1. Converter housing 2. Front oil seal 3. Slide hammer 7004-1  
4. Hook 23129



Turn housing over and install bushing in converter housing from oil pump side. Use bushing installer 21465-17 and handle 8093.

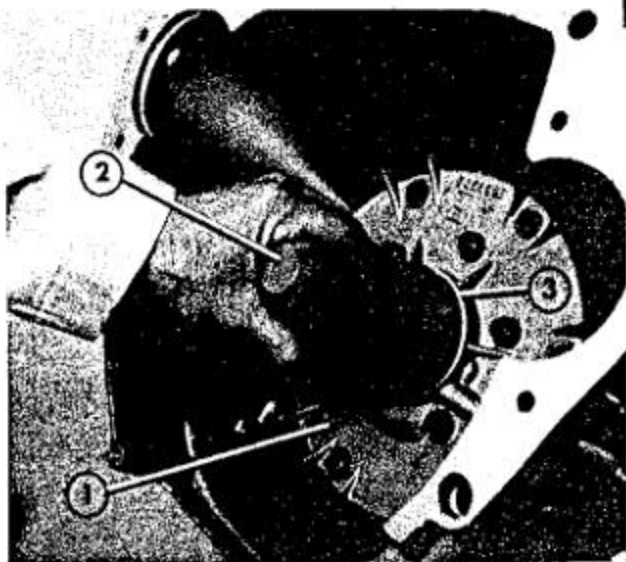
Make sure bushing is flush with front face of housing (seal side).

1. Handle 8093 2. Bushing installer 21465-17 3. Converter housing



Install new oil seal in housing. Use seal installer 21359.

1. Converter housing 2. Seal installer 21359 3. Oil seal





### Disassembly, Inspection and Reassembly of Oil Pump and Reverse Clutch

Remove wearplate from oil pump. Mark topside of oil pump gears (2 and 5) as shown.

Inspect wear plate for signs of scoring and wear.

**CAUTION:** Do not use center punch.

**NOTE:** Priming valve (4) not installed in later models.

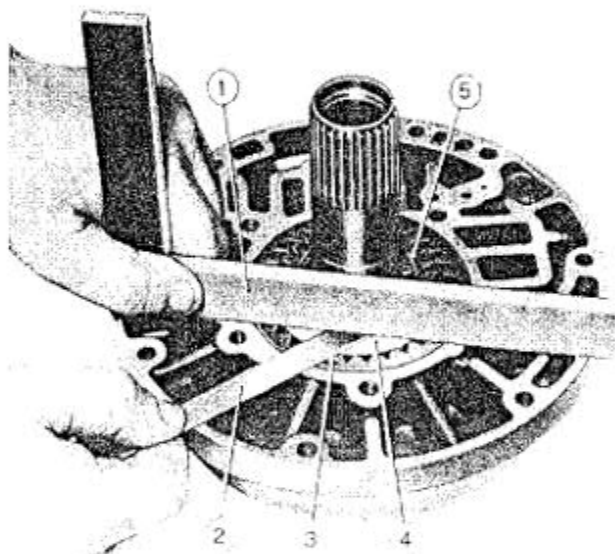
1. Converter stator support 2. Pump gear 3. Sump segment  
4. Priming valve 5. Pump gear



Check end clearances of both gears to pump face. Use a straight edge and feeler gauge. Clearance should be 0.013 to 0.038 mm (0.0005 to 0.0015 inch).

If clearance is not within limits, replace pump.

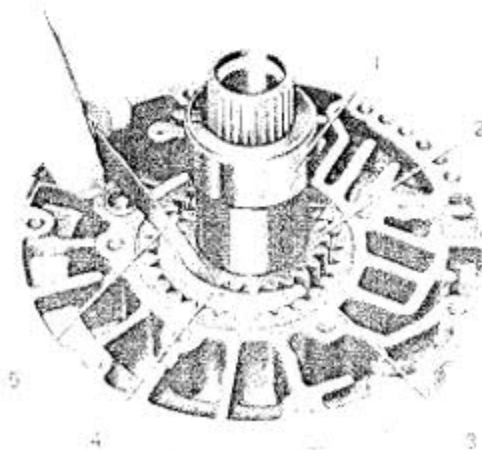
1. Straight edge 2. Feeler gauge 3. Driven pump gear 4. Pump segment  
5. Driving pump gear



Install aligning tool 23082 (1) on oil pump drive gear (2) to center gear. Measure clearance between drive gear (2) and pump segment (4) while rotating gears thru 360°. Use feeler gauge (5).

If clearance is not between 0.135 and 0.235 mm (0.0053 to 0.0093 inch) replace pump assembly.

1. Aligning tool 70266 2. Drive gear 3. Driven gear 4. Pump segment  
5. Feeler gauge

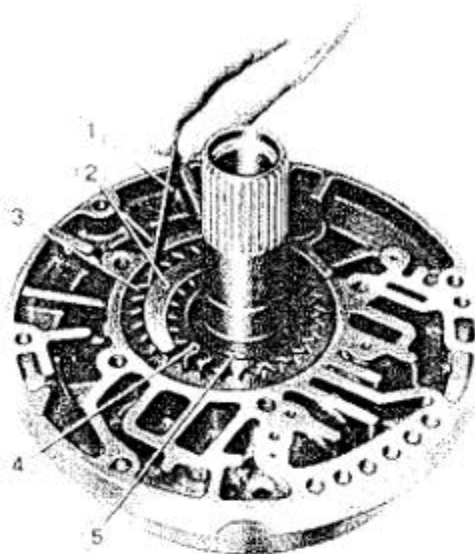


Measure clearance between outside of driven gear (3) and pump housing. Rotate gear thru  $360^{\circ}$  while measuring clearance. If clearance is not within 0.069 to 0.165 mm (0.0027 to 0.0065 inch), replace pump assembly.

Measure clearance between inside of driven gear (3) and pump segment (2). Rotate gear thru  $360^{\circ}$ . If clearance is less than 0.125 mm (0.005 inch), replace pump assembly.

If clearances are good, remove gears (3 and 4).

1. Feeler gauge 2. Pump segment 3. Driven gear 4. Drive gear  
5. Gear tab



Place compressor tool (1) 23078 on spring retainer for reverse clutch (3). Place adapter on tool shaft and turn nut to compress clutch. Remove snap ring (2).

**CAUTION:** Release compressor tool slowly. Make sure spring retainer does not catch in snap ring groove.

When springs are released, remove compressor tool and retaining ring.

Remove 24 springs for reverse clutch.

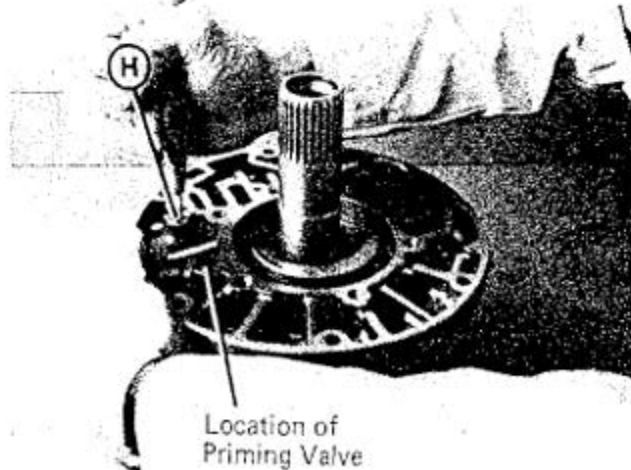
1. Compressor tool 2. Snap ring 3. Reverse clutch piston 4. Pliers  
5. Oil pump



**WARNING:** When using compressed air, always wear eye protection.

Cover priming valve (if installed) by hand.

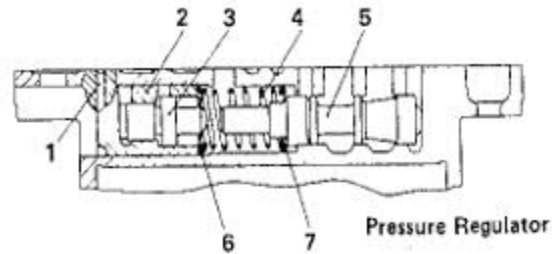
Remove reverse clutch piston (3) by blowing compressed air through hole (H) on front face of oil pump assembly.



Location of Priming Valve

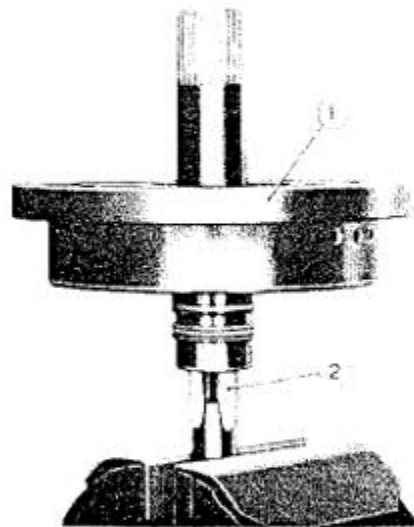
Depress boost valve sleeve (2). Remove retaining pin (1). Use small wire cutters. If necessary, remove burr caused by pin from bore. Remove boost valve sleeve (2), valve (3), spring (4) and seats (6 and 7), and pressure regulator valve (5).

1. Retaining pin 2. Sleeve 3. Boost valve 4. Spring 5. Pressure regulator 6. Spring seat 7. Spring seat

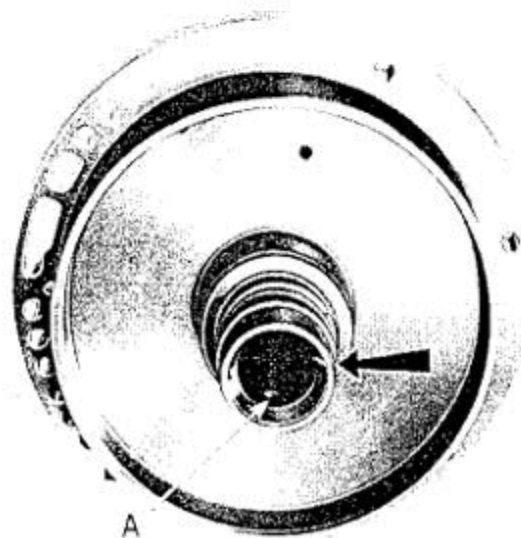


Inspect bushing in oil pump hub for damage. If necessary, remove bushing by threading tool 23130-5 into bushing. Using a press and a drift, press bushing out. Use a rag or cloth to protect oil pump face.

1. Oil pump 2. Tool 23130-5



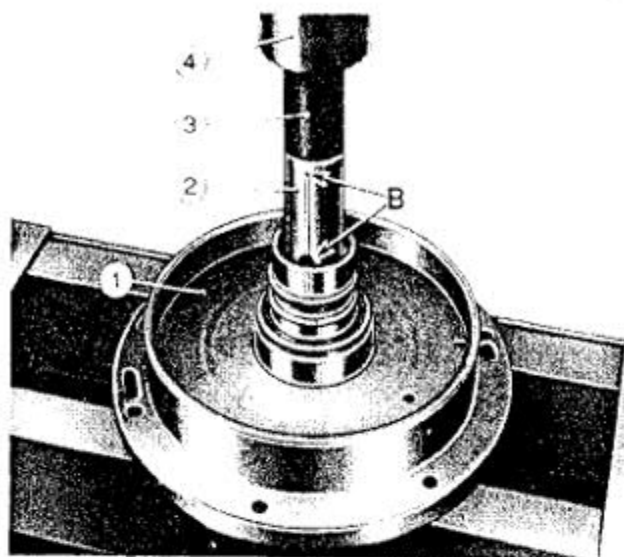
Thoroughly clean pump body. Make sure all passages are clean. Position oil pump with hole "A" facing downwards. Locate oil groove to right of hole "A" (see arrow). Scribe an aligning mark on inner diameter of shaft at center of oil groove.



Scribe a mark on outer edge of new bushing (2) thru centers of small and large holes "B". Place bushing into pump shaft with small hole up. Align scribe marks.

Press bushing into shaft until bushing is seated in bore. Use an arbor press. Make sure bushing is pressed in straight. Make sure marks are aligned.

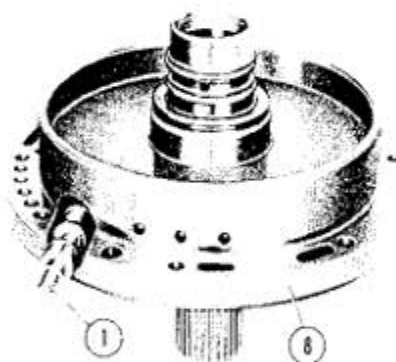
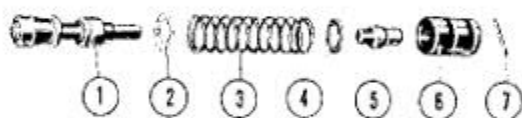
1. Oil pump 2. Bushing 3. Tool 23130-1 4. Press



Inspect and thoroughly clean pressure regulator assembly. Immerse valve in transmission fluid before installing.

Install pressure regulator valve (1), spring seat (2), spring (3), seat (4), boost valve (5), and sleeve (6) in pump. Depress sleeve until back end aligns with pin hole. Install retaining pin (7).

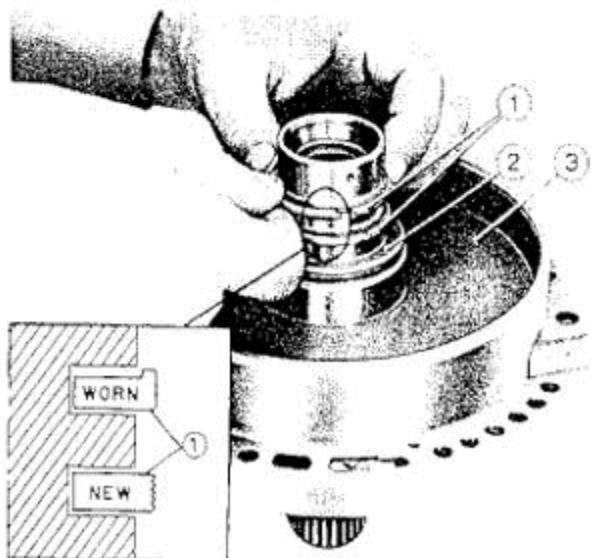
1. Pressure regulator valve 2. Seat 3. Spring 4. Seat 5. Boost valve 6. Sleeve 7. Retaining pin 8. Oil pump



Inspect oil seal rings (1) on oil pump hub (2). Replace rings if damaged or show side wear.

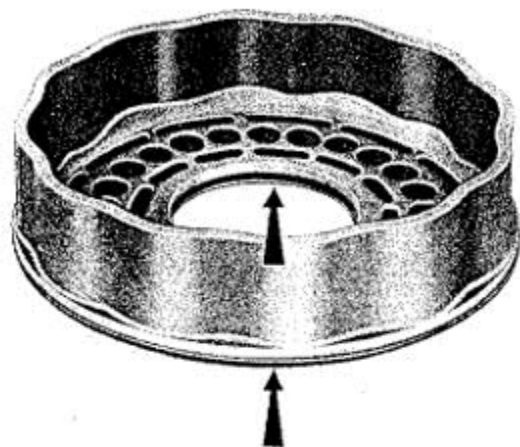
**NOTE:** Rings should have flat sides and no bright spots. Install rings on hub (2). Make sure split in rings are 90° apart.

1. Oil seal rings 2. Hub 3. Oil pump



Coat each seal, piston, and oil pump with transmission fluid.

Install new inner and outer oil seals on reverse clutch piston as shown by arrows.



Install seal protector 28241 on pump hub.

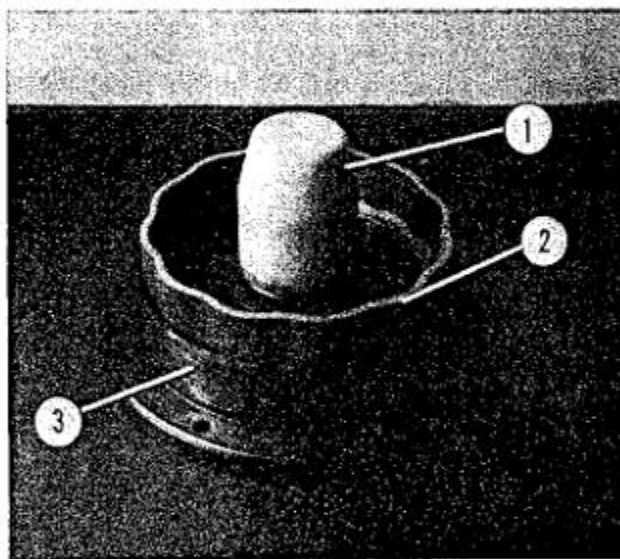
**CAUTION:** Do not damage seal when installing piston.

Install piston on pump. Remove seal protector 28241.

Inspect return springs for reverse clutch. Look for bent or broken springs or heat discoloration. Replace entire set if any are damaged.

Install 24 return springs on piston.

1. Seal protector 28241 2. Reverse clutch piston 3. Oil pump



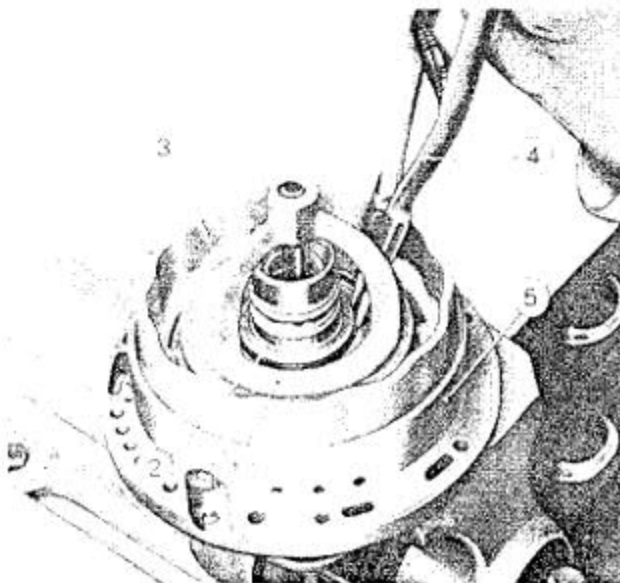
Place spring retainer on springs. Install compressor tool 23078. Compress springs.

**CAUTION:** Retainer may catch in snap ring groove. Be careful not to damage spring retainer. In next step make sure snap ring is seated in its groove.

Install snap ring. Use pliers. Loosen and remove compressor tool slowly.

**CAUTION:** Do not air check reverse clutch. Clutch assembly is not complete. Air checking may damage spring retainer and seat.

1. Compressor tool 2. Snap ring 3. Reverse clutch 4. Pliers  
5. Oil pump

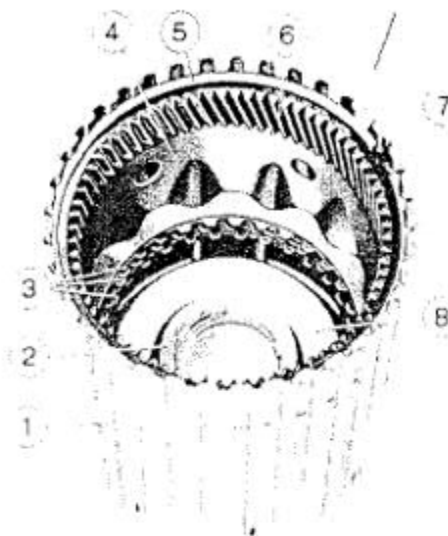


### Disassembly, Inspection and Assembly of Second Clutch

Remove retaining ring (5) for ring gear (6).

Remove ring gear.

1. Second clutch drum 2. Thrust washer 3. Clutch plates 4. Spacer  
5. Retaining ring 6. Ring gear 7. Screwdriver 8. Spring retaining plate

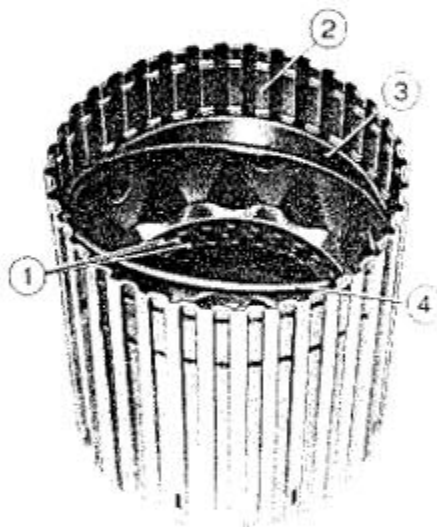


Remove retaining ring (4) for spacer plate (3). Remove spacer plate (3).

**NOTE:** After removing clutch plates (1), keep them in same sequence.

Remove clutch plates (1).

1. Clutch plates 2. Clutch drum 3. Spacer 4. Retaining ring



Remove thrust washer from center of drum.

Install compressor tool assembly 23078 or J2590-02, 03, 04, 05 and adapter on spring retainer (4).

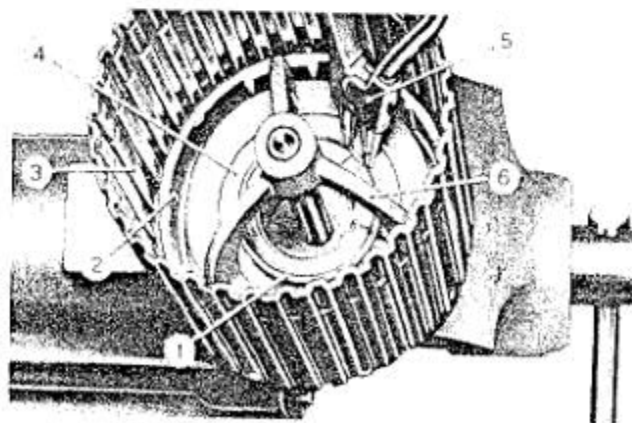
Compress springs and remove snap ring (1). Use snap ring pliers (5).

Loosen compressor tool slowly. Remove tool. Remove retainer (4).

**CAUTION:** Retainer may catch in snap ring groove.

Remove 22 return springs from piston (2). Remove piston from drum.

1. Snap ring 2. Piston 3. Drum 4. Spring retainer 5. Pliers  
6. Compressor tool.



21

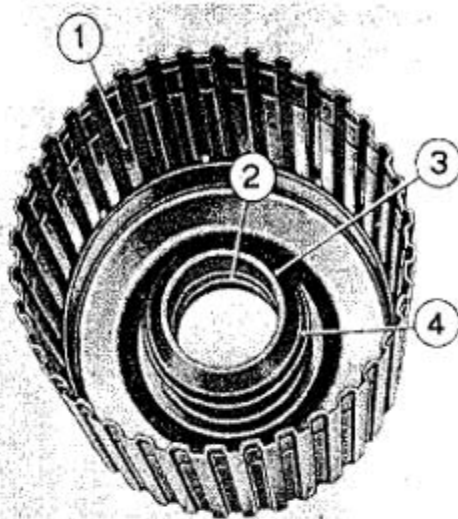
Remove oil seal (4) from hub (3). Discard oil seal.

Inspect bushing (2) in clutch hub (3) for scoring or wear. If necessary, remove bushing. Use tool 23130-6 and handle 8092.

Thoroughly clean hub in solvent. If removed, install new bushing. Use tools 23130-6 and handle 8092. Drive bushing in until tool bottoms on bench.

Install new oil seal (4) on hub (3).

1. Clutch drum 2. Bushing 3. Clutch hub 4. Oil seal

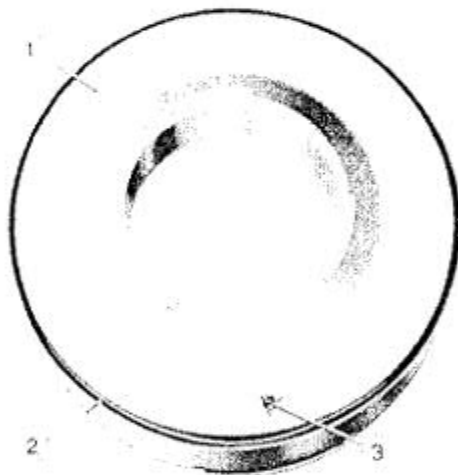


Remove oil seal (2) from piston (1). Discard oil seal.

Inspect piston for damage. Shake the piston and make sure check ball moves freely. If piston is damaged or check ball is stuck, replace piston.

Inspect piston return springs. If any spring is damaged, replace complete set.

1. Piston 2. Oil seal 3. Check ball



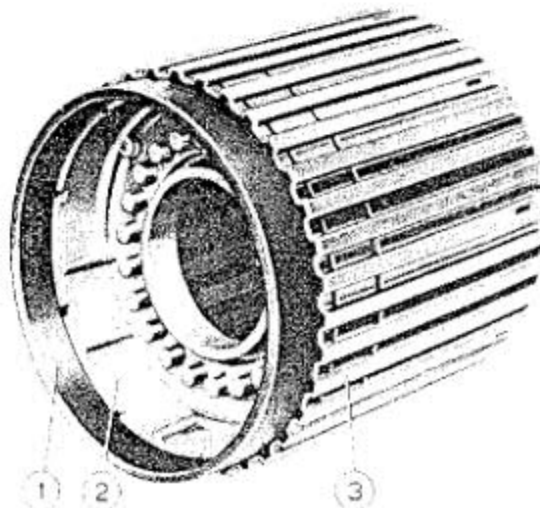
Install new oil seal on piston (2).

Coat oil seal, piston, and drum with transmission fluid. Place tool 23080 on piston to protect oil seal.

Install piston and tool in drum.

Push piston and tool down until tool seats. Then push piston down further until it bottoms. Remove tool.

1. Tool 23080 2. Piston 3. Drum

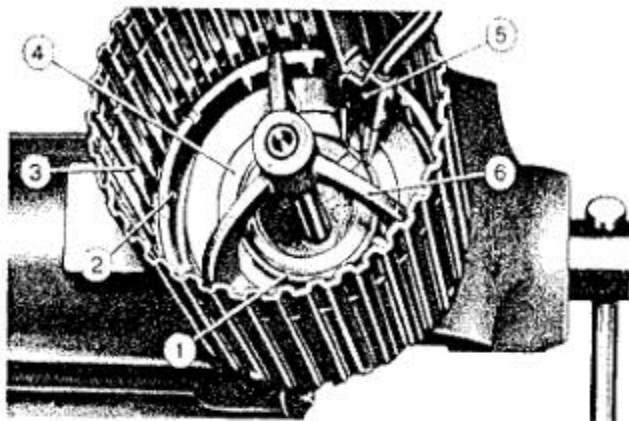


Place 22 springs on piston. Place spring retainer (4) on springs. Install tool (6) on piston (2). Compress spring retainer.

**CAUTION:** Retainer may catch in snap ring groove. Be careful not to damage spring retainer. In next step make sure snap ring is seated in its groove.

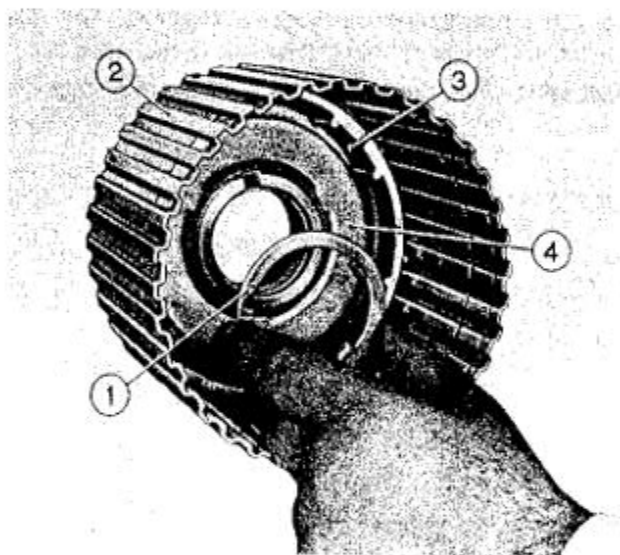
Install snap ring (1). Use pliers (5). Loosen compressor and remove it.

1. Snap ring 2. Piston 3. Drum 4. Spring retainer 5. Pliers  
6. Compressor tool



Inspect thrust washer (1) for damage. Install thrust washer on hub. Make sure tang on washer seats in slot of hub. Secure washer with petroleum jelly.

1. Thrust washer 2. Drum 3. Clutch piston 4. Spring retainer

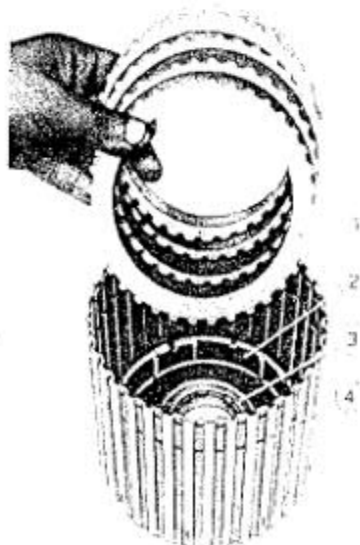


Inspect clutch plates (1) for wear, scores, or excessive heat marks. Replace clutch pack if damaged.

Coat plates with clean transmission fluid.

Install wave washer in drum (4) first. Install clutch plates in drum, first steel plate, composition plate, steel plate, etc.

1. Clutch plates 2. Piston 3. Thrust washer 4. Drum



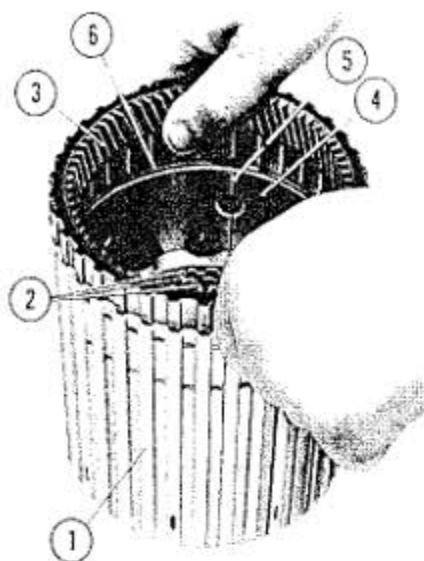


Install spacer plate (4) in drum (1). If plate slides in without pressure, expand plate. Use a screwdriver in slot (5) to expand plate. Make sure spacer seats tightly in drum (1), wave part down.

Install spacer plate retaining ring (6).

Install ring gear (3) in drum. Secure gear with second retaining ring.

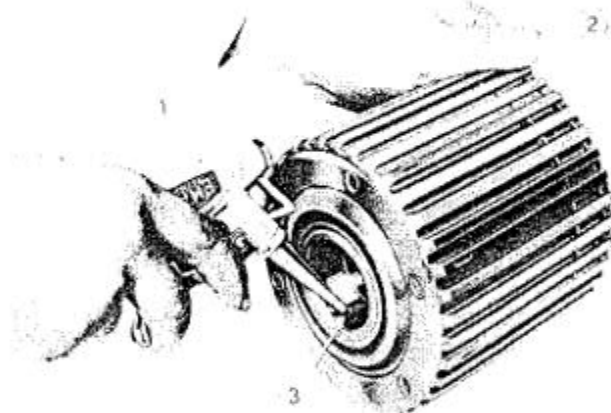
1. Drum 2. Clutch plates 3. Ring gear 4. Spacer plate 5. Slot  
6. Retaining ring



Apply air to hole (3) in drum. Check that clutch piston moves. If piston does not move, disassemble clutch. Check seal rings.

**WARNING:** When using compressed air, always use eye protection.

1. Air gun 2. Drum 3. Hole



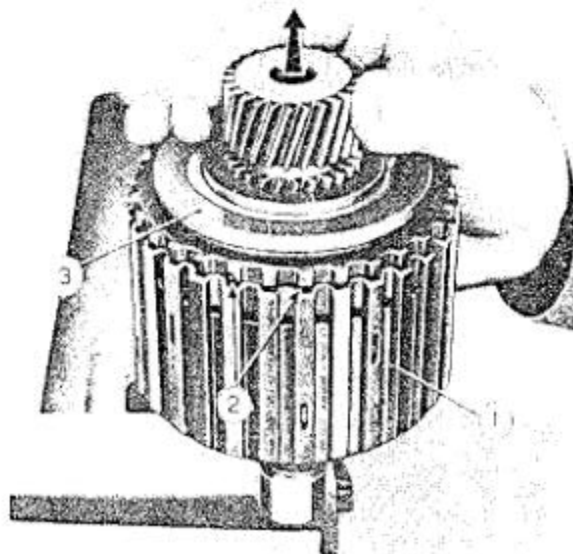
### Disassembly, Inspection, and Assembly of Third Clutch

Compress retaining ring (2) at several places around drum (1) while lifting input sun gear (3) in direction of arrow.

Remove input sun gear with clutch hub in direction of arrow.

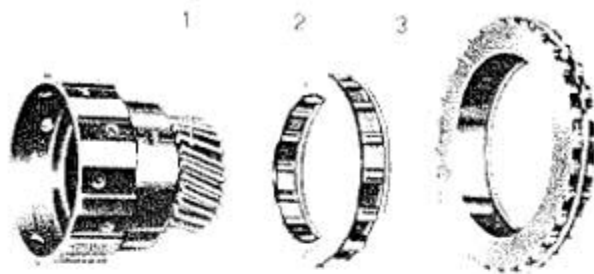
Remove gear, sprag, and outer race from drum.

1. Drum 2. Retaining ring 3. Sprag



Remove sprag (2) and outer race (3) from clutch hub (1).  
Push sprag (2) out of outer race (3).

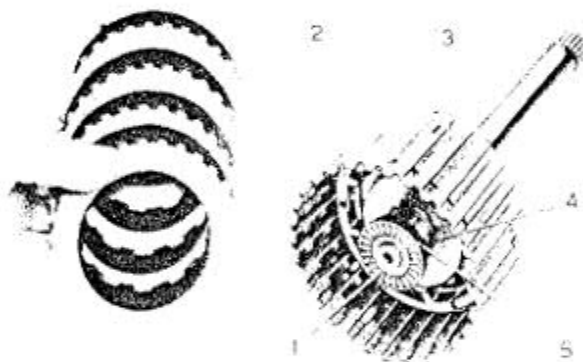
1. Third clutch hub 2. Sprag race 3. Outer race



Remove third clutch plates from drum (3). Keep plates in same order that they were removed.

Remove thrust bearing (1) and washer (5) from input shaft.

1. Thrust bearing 2. Piston 3. Drum 4. Spring retainer  
5. Thrust washer

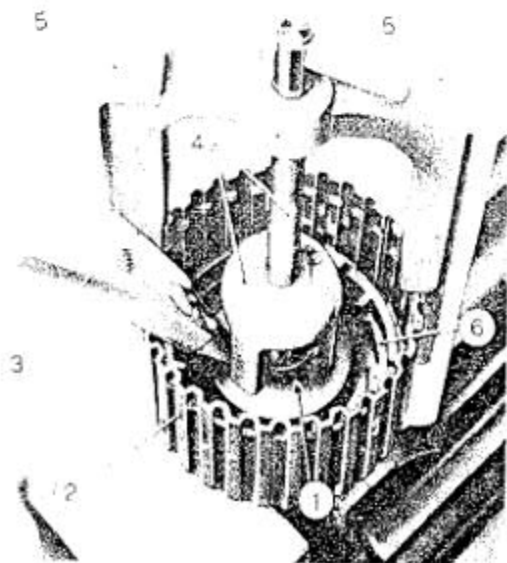


Install spring compressor 23075 (4) on spring retainer. Use puller jaws (5) 23075-10 to hold tool on drum or use a press. Compress springs. Remove snap ring (1).

Loosen and remove tools (4 and 5). Remove spring retainer and 12 springs from piston (6).

**CAUTION:** Release compressor tool slowly. Make sure spring retainer does not catch in snap ring groove.

1. Snap ring 2. Drum 3. Pliers 4. Compressor tool 5. Puller jaws  
6. Piston



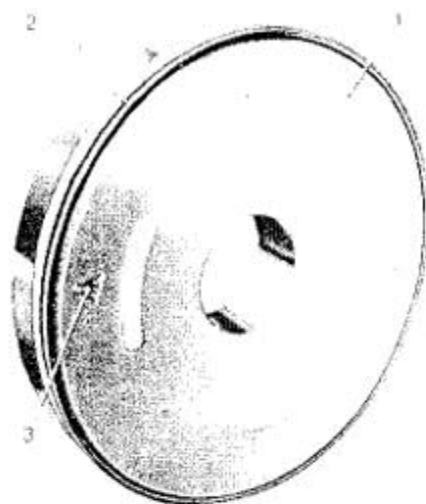
Remove third clutch piston (1) from drum.

Inspect piston for damage. Inspect check ball (3). If ball is stuck, missing, or falls out, replace piston. If piston is damaged, replace it.

Remove oil seal (2). Install new oil seal.

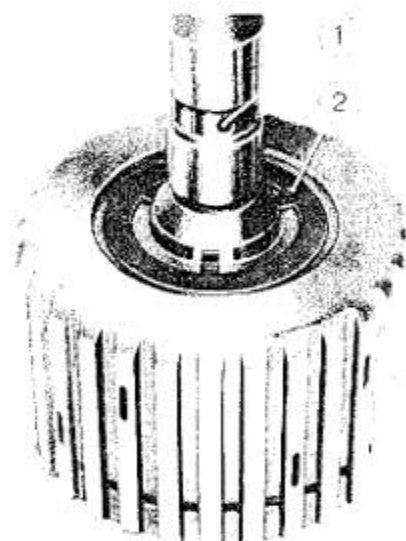
Inspect return springs. If any spring is damaged, replace entire set.

1. Piston 2. Oil seal 3. Check ball



Thoroughly clean third clutch drum. Inspect drum and input shaft for damage. Inspect thrust washer (2) for scoring or damage. Replace if necessary.

1. Oil pressure hole 2. Thrust washer

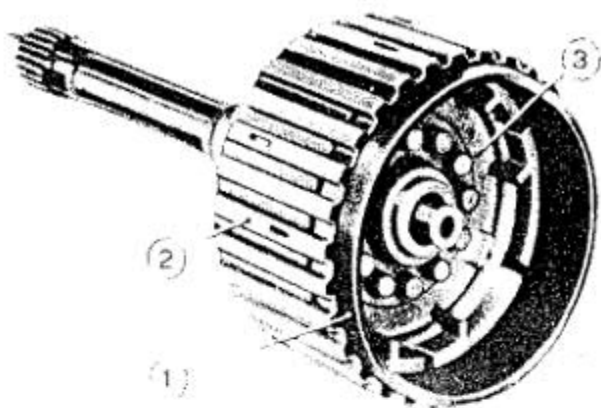


Remove oil seal from input shaft inside drum. Install new oil seal. Be careful not to damage seal on edge of shaft.



Coat oil seal on piston (3) and inside of drum with transmission fluid. Install tool 23084 on piston. Install piston in drum (2). Remove tool.

1. Tool 23084 2. Drum 3. Piston

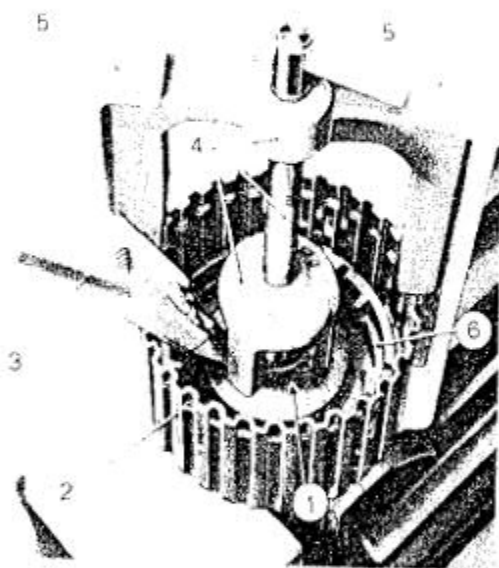


Install 12 return springs on piston. Place spring retainer on piston.

Install compressor 23075 (4) on spring retainer. Install puller jaws 23075-10. Compress spring retainer and install snap ring (1).

**CAUTION:** Make sure retainer does not catch on snap ring groove. Release compressor tool slowly.

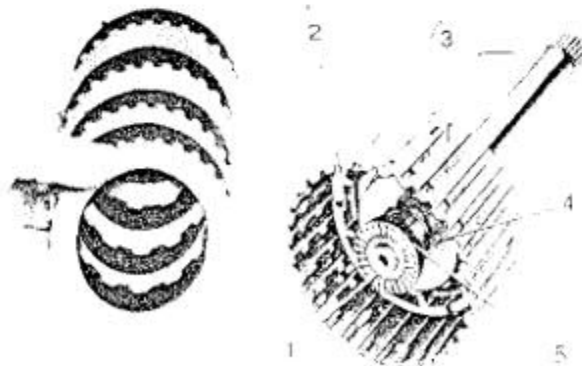
1. Snap ring 2. Drum 3. Pliers 4. Compressor tool 5. Puller jaws 6. Piston



Inspect third clutch plates. If plates are worn, scored, or show excessive heat, replace entire clutch pack.

Inspect thrust washer (5) and bearing (1) for damage. Replace if necessary. Install washer and bearing on input shaft. Secure them with petroleum jelly.

1. Thrust bearing 2. Piston 3. Drum 4. Spring retainer 5. Thrust washer

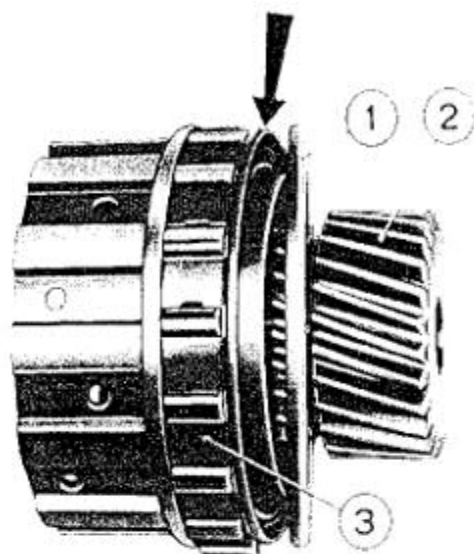


Inspect sprag assembly (3) for wear, damage, or sprags that fall out of cage. Inspect sun gear (2) for chipped or nicked teeth and wear. Replace part if necessary.

Install sprag on third clutch hub with groove (arrow) toward sun gear.

Install sprag race and retainer over sprag assembly.

1. Sprag retainer 2. Sun gear 3. Sprag

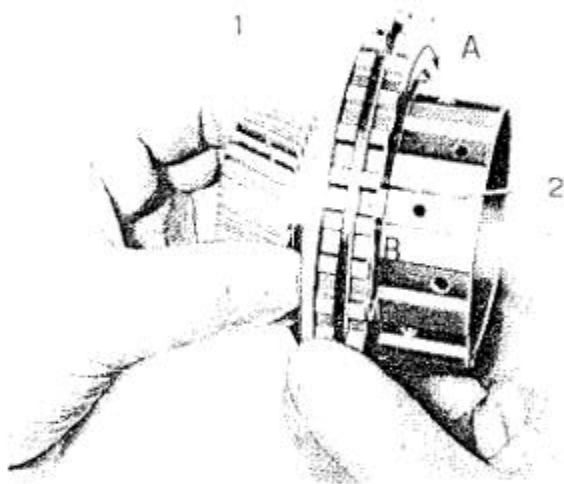


Check sprag for operation as follows:

Hold sun gear (1) with left hand. Turn sprag race (2) in direction of arrow "A". Check that sprag locks up.

Turn sprag race (2) in direction of arrow "B". Check that sprag rotates freely.

1. Sun gear 2. Sprag race

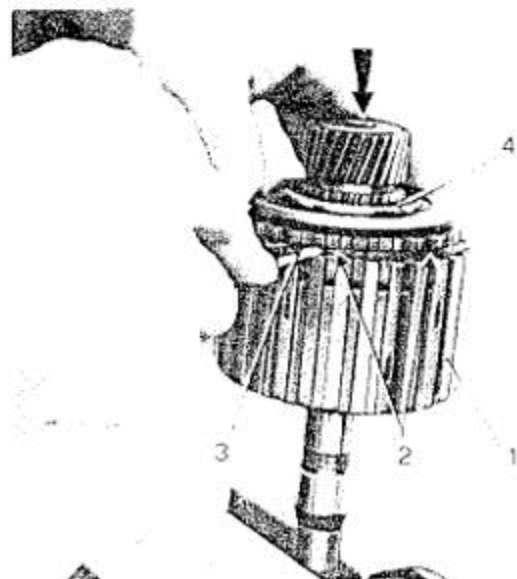


2  
1

Place retaining ring (2) on outer race. Install clutch plates in third clutch drum (1). Install wave washer first, then steel plate, composition plate, steel plate, etc.

Align inner teeth of composition plates. Align grooves of clutch hub with these teeth and slide hub into clutch plates. Align outer race with grooves in hub. Using screwdriver (3), compress retaining ring (2). Push outer race in until retaining ring snaps into groove in drum (1).

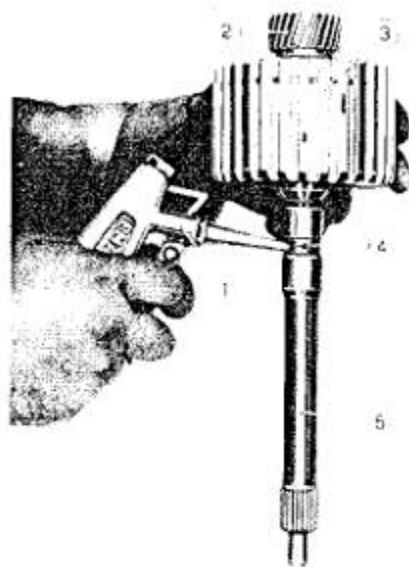
1. Drum 2. Retaining ring 3. Screwdriver 4. Sprag



Apply air from air gun (1) to hole (4) in input shaft (5). Check that clutch moves in drum (3).

**WARNING:** When using compressed air, always wear eye protection.

1. Air gun 2. Sun gear 3. Drum 4. Oil pressure hole 5. Input shaft



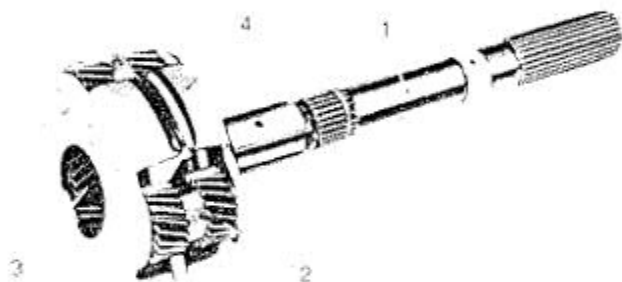
### Planetary Carrier Inspection

Inspect planetary carrier and output shaft for distortion or damage.

Inspect planetary pinions for excessive wear or damage. Inspect for chipped teeth.

**NOTE:** Do not lose needle bearings on either side of carrier.

1. Output shaft 2. Planetary pinions 3. Planetary pinions 4. Carrier

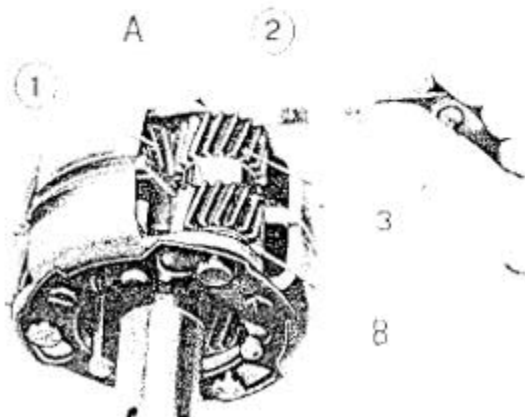


Check end clearance of all planetary pinions (1 and 3) at points A and B. Use a feeler gauge (2).

Clearance should be between 0.13 and 0.89 mm (0.005 and 0.035 inch).

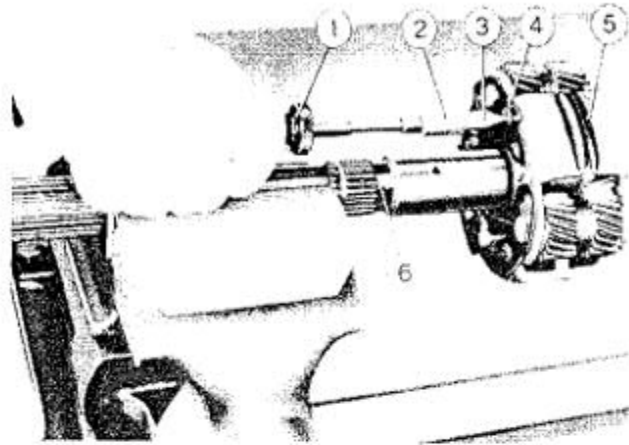
Replace entire assembly if damage or excessive wear is noted.

1. Planetary pinion 2. Feeler gauge 3. Planetary pinion



Check retaining screws (4) for lock plate on planetary carrier (5). Torque to 40 to 52 kgcm (29 to 38 in. lbs).

1. Torque wrench 2. Adapter 3. Screwdriver 4. Retaining screw  
5. Planetary carrier 6. Output shaft

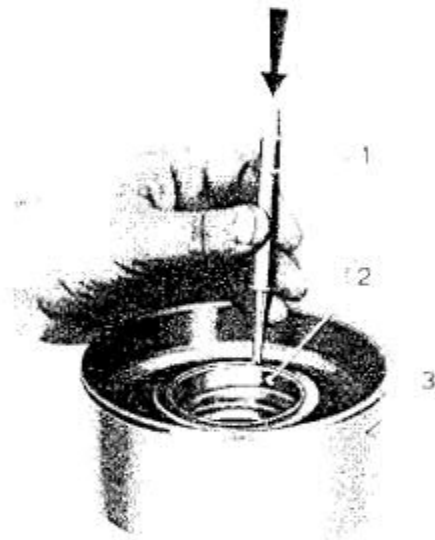


#### Reaction Sun Gear and Drum Disassembly, Inspection and Assembly

Inspect reaction sun gear for chipped or nicked teeth. Inspect sun gear for scoring. If necessary, replace entire assembly.

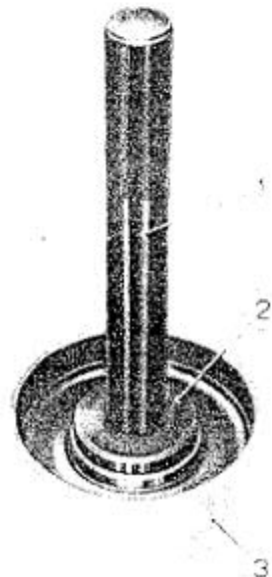
Inspect sun gear drum (3) and bushing (2). If necessary to replace bushing (2), use a chisel (1). Remove bushing from drum at bushing joint.

1. Chisel 2. Bushing 3. Drum



Thoroughly clean drum (3). Install new bushing. Use installer tool 23130-2 and handle 8093. Install bushing flush with rear face of drum hub.

1. Handle 8093 2. Installer 23130-2 3. Drum



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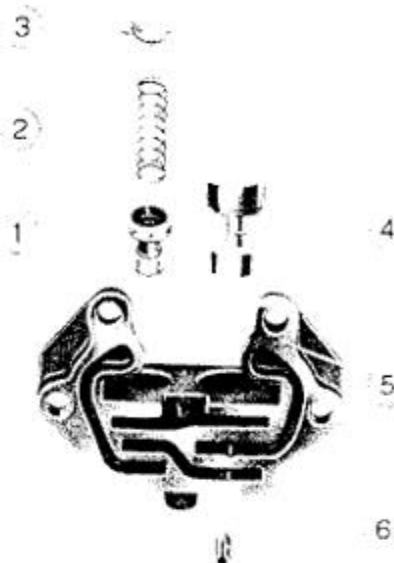
### Governor Body Disassembly, Inspection and Assembly

Depress secondary valve (1). Remove spring retainer (3). Remove valve spring (2). Remove valve (1). Remove spring pin (6) from body (5). Remove primary valve (4).

Inspect primary and secondary valves for nicks, burrs, etc. Use crocus cloth to remove small burrs. Inspect valve spring for distortion.

Clean all parts in solvent. Blow parts dry. Inspect all oil passages and valve bores for dirt, nicks, burrs and varnish in body. Replace if necessary.

1. Secondary valve 2. Spring 3. Spring retainer 4. Primary valve  
5. Body 6. Spring pin

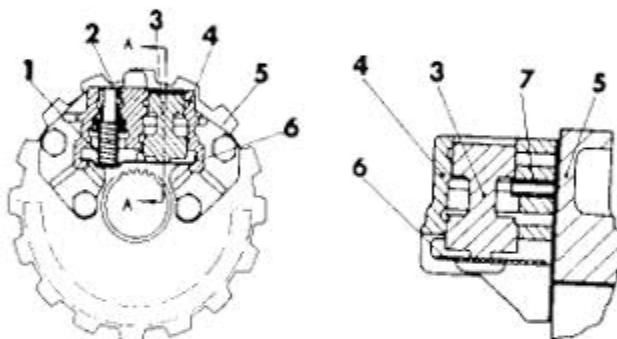


Coat valves with transmission fluid.

Install primary valve (3) in body (4) with smaller section first. Install spring pin (7) in front face of body. Pin should be flush to 0.01 inch below face.

Install secondary valve (2) (small end first) and spring (1) in body. Depress spring and install retainer (6) in body.

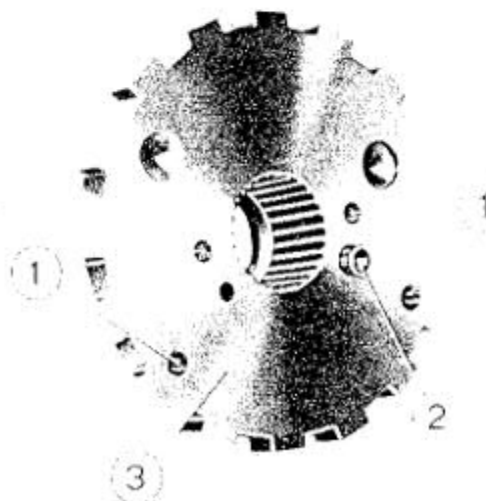
1. Spring 2. Secondary valve 3. Primary valve 4. Body  
6. Governor hub 7. Spring pin



### Governor Hub Disassembly, Inspection and Assembly

Remove oil screen (2) from hub (3). Clean and inspect screen. Replace if necessary. Install oil screen flush to governor hub.

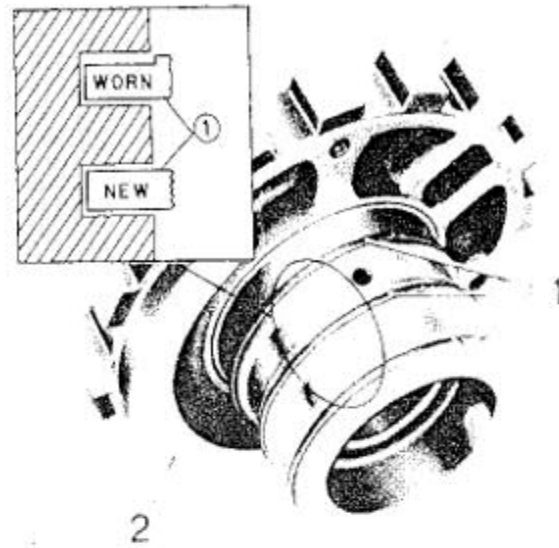
1. Bolt holes 2. Oil screen 3. Hub



Inspect 3 oil rings (1). If broken or side wear is noted, replace rings.

Inspect splines of hub (2) for cracks or chipped teeth. Replace governor hub if damaged.

1, Oil rings 2, Governor hub



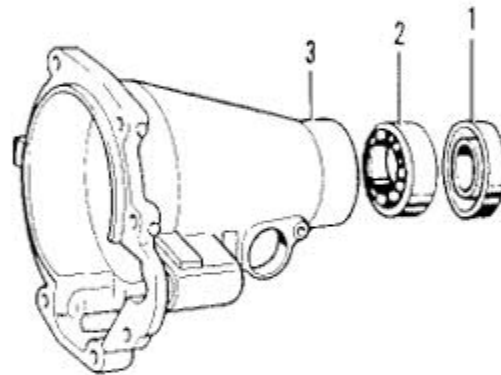
#### Rear Housing Disassembly, Inspection and Assembly

Thoroughly clean extension housing (3). Inspect housing for damage. Replace housing if necessary.

Remove oil seal (1).

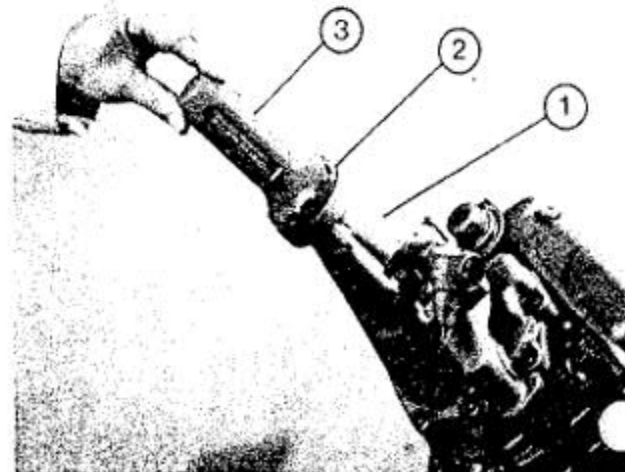
Inspect housing bearing (2). If bearing is worn, scored or damaged, replace it.

1, Rear oil seal 2, Bearing 3, Rear housing

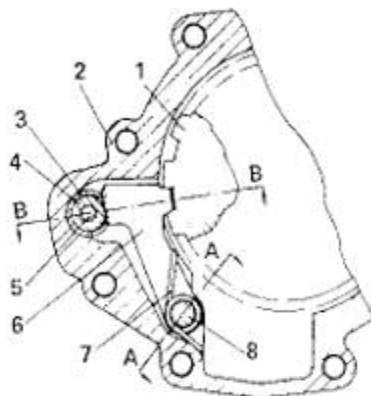


Install new oil seal in extension housing. Use seal installer 21426.

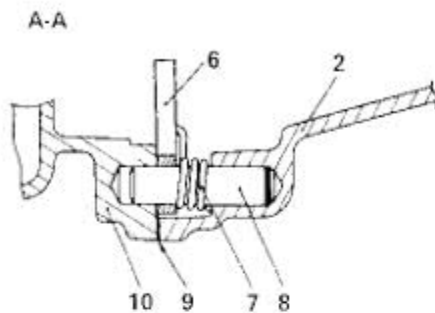
1, Extension housing 2, Rear oil seal 3, Seal installer 21426



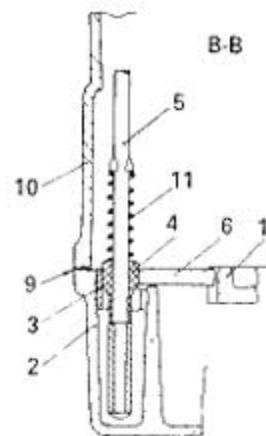
Inspect parking pawl (6) and spring (7) for damage. If damaged, replace.



1. Governor hub
2. Extension housing
3. Guide bushing
4. Actuating rod bushing



5. Actuating rod
6. Parking pawl
7. Spring
8. Pin

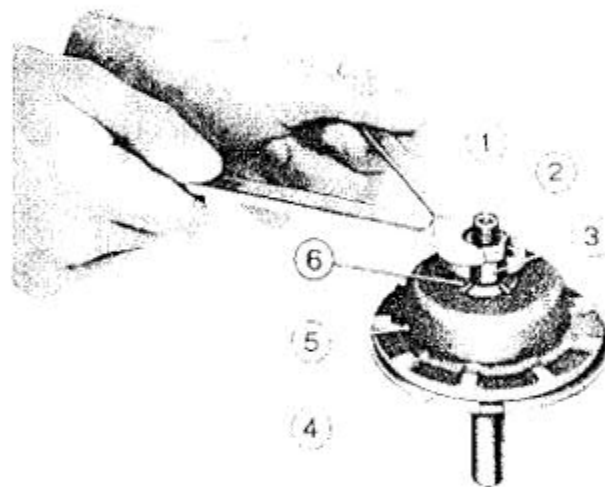


9. Gasket
10. Transmission case
11. Actuating rod spring

### Servo Piston Inspection and Assembly

Remove rod from servo piston (4). Hold sleeve (3) with a wrench on flats on sleeve. Remove locknut (2). Depress piston sleeve and remove retaining clip (6). Remove piston ring (4).

1. Adjusting bolt
2. Locknut
3. Sleeve
4. Piston ring
5. Servo piston
6. Clip



Push sleeve (3) thru piston (7). Remove spring (5) and retainer (4).

Inspect spring, adjusting bolt (9), and sleeve for damage. Inspect piston for damage. Inspect piston ring for side wear. Replace parts as necessary.

Place retainer (4) and spring (5) on sleeve (3). Thread adjusting bolt (9) into sleeve. Push sleeve thru piston (7). Secure sleeve with clip (11). Thread locknut (10) on bolt (9). Install piston ring (6) on piston.

1. Spring
2. Piston apply rod
3. Sleeve
4. Spring retainer
5. Spring
6. Piston ring
7. Piston
8. Retaining ring
9. Adjusting bolt
10. Locknut
11. Clip

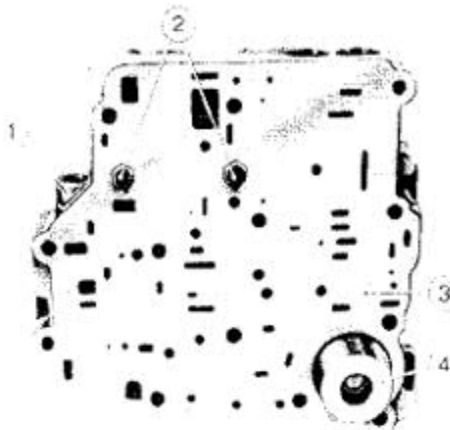


### Valve Body Disassembly, Inspection and Assembly

Remove manual valve and link from valve body.

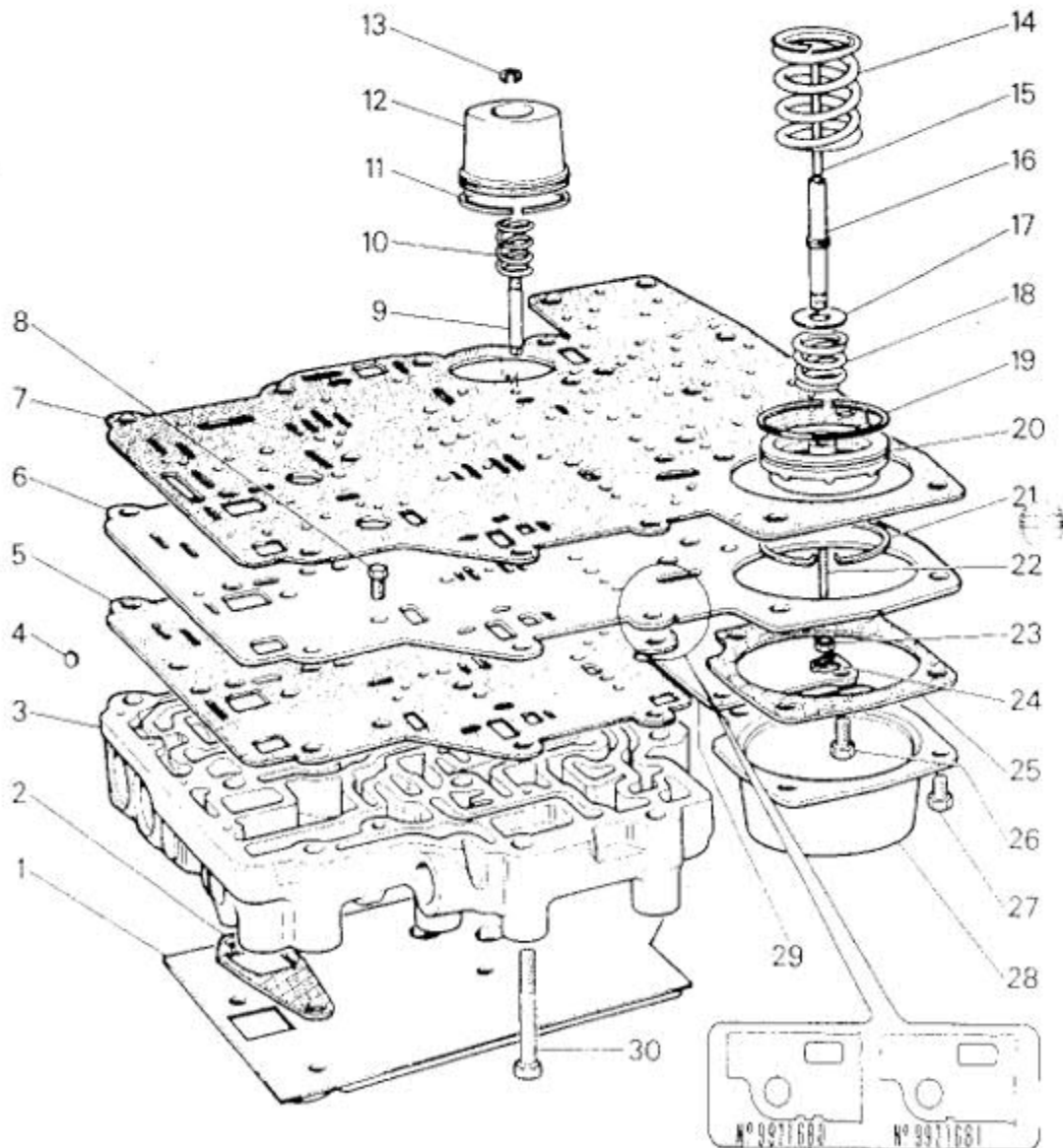
Position valve body with transfer plate (3) up. Remove 2 bolts (2). Remove plate and gasket. Discard gasket.

1. Valve body 2. Bolts 3. Transfer plate 4. Accumulator piston



### Valve Body Assembly

1. Oil strainer
2. Gasket
3. Valve body
4. Check ball
5. Gasket
6. Transfer plate
7. Gasket
8. Bolt
9. Accumulator piston
10. Spring
11. Oil ring
12. Accumulator
13. Retaining ring
14. Spring
15. Servo apply rod
16. Servo adjusting sleeve
17. Spring retainer
18. Spring
19. Oil ring
20. Servo piston
21. Retaining ring
22. Adjusting bolt
23. Locknut
24. Retaining ring
25. Gasket
26. Bolt
27. Bolt
28. Servo cover
29. Reinforcement plate
30. Bolt

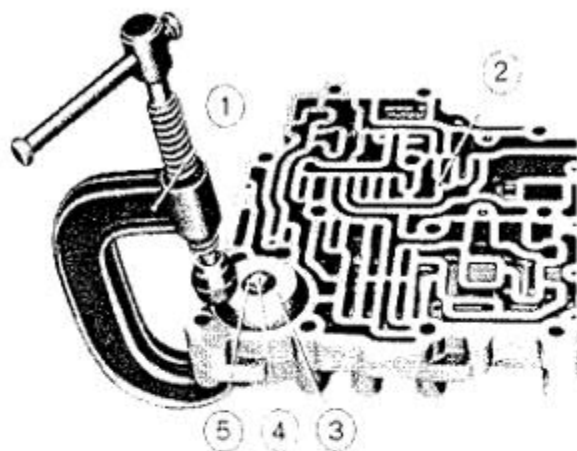


Compress accumulator piston (3). Use a small C clamp (1). Remove retaining ring (5). Carefully loosen clamp. Accumulator piston is under spring tension.

Remove piston (3) and spring from valve body (2). Remove oil ring from piston.

Inspect piston and spring for damage. Inspect oil ring for damage or side wear. Replace parts as necessary.

1. C clamp 2. Valve body 3. Piston 4. Shaft 5. Retaining ring



## Disassembly, Inspection, and Assembly of Control Valves

**NOTE:** Be careful when removing retaining pins. Do not damage valve body. Drive all pins from outside of valve body. If necessary, remove burrs in bore of valve body. Use a fine crocus cloth.

All numbers in parenthesis refer to drawing on the facing page.

### 1-2 Shift Control Valve

Remove retaining pin (1). Remove sleeve (2). Remove control valve (3), spring (4) and shift valve (5).

### 2-3 Shift Control Valve

Remove retaining pin (9). Remove sleeve (10). Remove control valve (11), spring (12), seat (13) and shift valve (14).

### 3-2 Shift Control Valve

Remove retaining pin (15) and plug (16). Remove spring (17) and control valve (18).

### Detent Pressure Regulator Valve

Remove retaining pin (20) and spring (21). Remove regulator valve (22).

### High Speed Downshift Timing Valve

Remove retaining pin (33) and spring (32). Remove timing valve (31).

### Low Speed Downshift Timing Valve

Remove retaining pin (34). Remove plug (30), timing valve (29), and spring (28).

### Manual Low and Reverse Control Valves

Remove retaining pin (26) and spring (25). Remove manual low control valve (24) and reverse control valve (23).

### 1-2 Accumulator Valve

Remove retaining pin (19) and plug (18). Remove accumulator valves (6 and 7).

### Cleaning and Inspection

Make sure work area is free of dirt or dust. Make sure hands and tools are clean. Clean valve body and valves in cleaning solvent. Use compressed air to blow out passages.

**CAUTION:** Do not use paraffin base cleaning solvent to clean parts. This could block passages. Do not use cloth to clean or dry valves. Material removed from cloth could block passages.

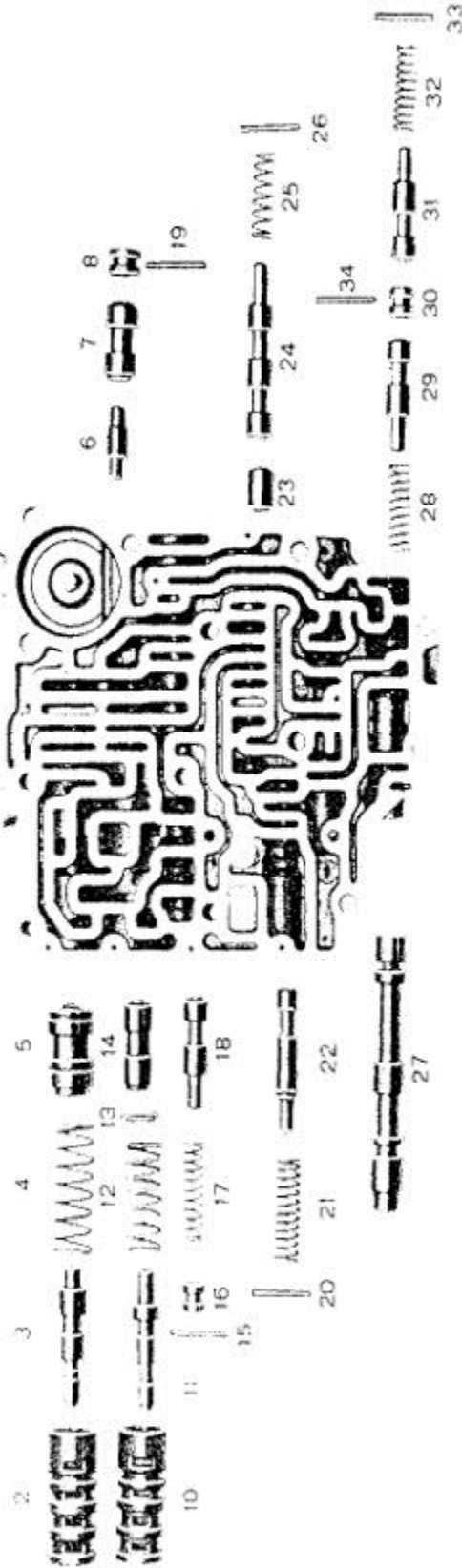
Inspect each valve for free movement in the bore. If necessary, remove small burrs on a valve. Use crocus cloth.

Do not remove sharp edges of the valves. These edges perform a cleaning action within the bore.

Inspect valve springs for distortion or collapsed coils. If necessary, replace springs.

If any damage is found to the valves or valve body, replace valve body assembly.

Reassemble valves, springs, plugs, and retaining pins in their proper location and order. Use a liberal amount of transmission fluid.



- 1. Retaining pin
- 2. 1-2 shift control valve sleeve
- 3. 1-2 shift control valve
- 4. Control valve spring
- 5. 1-2 shift valve
- 6. Accumulator control valve
- 7. Accumulator valve
- 8. Valve plug
- 9. Retaining pin
- 10. 2-3 shift control valve
- 11. 2-3 shift control valve
- 12. Control valve spring

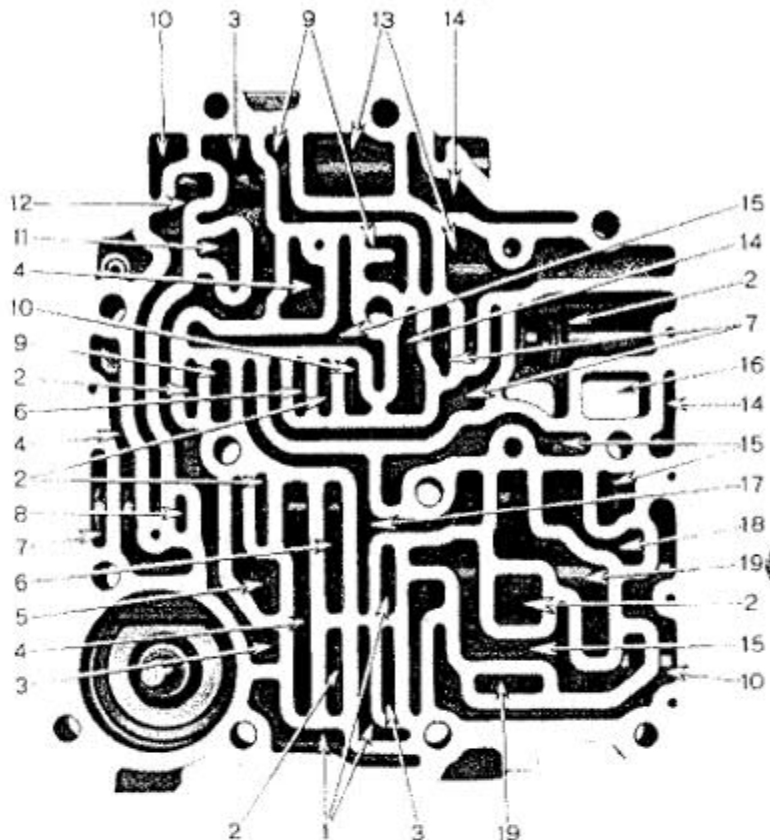
- 13. Spring seat
- 14. 2-3 shift valve
- 15. Retaining pin
- 16. Valve plug
- 17. 3-2 control valve spring
- 18. 3-2 control valve
- 19. Retaining pin
- 20. Retaining pin
- 21. Regulator valve spring
- 22. Direct pressure regulator valve
- 23. Reverse control valve
- 24. Manual low control valve

- 25. Control valve spring
- 26. Retaining pin
- 27. Manual valve
- 28. Timing valve spring
- 29. Low speed downshift timing valve
- 30. Valve plug
- 31. High speed downshift timing valve
- 32. Timing valve spring
- 33. Retaining pin
- 34. Retaining pin

## VALVE BODY COMPONENTS

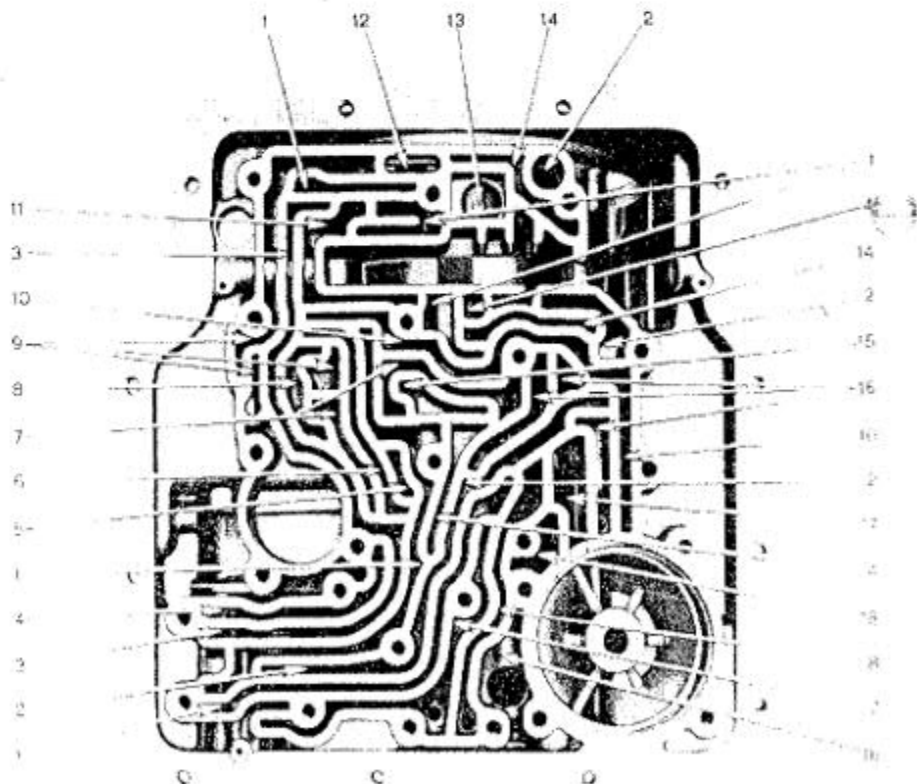
### VALVE BODY PASSAGES (Top Side)

1. Second clutch
2. Exhaust
3. Drive
4. Governor
5. 1-2 accumulator
6. 2-3 exhaust
7. Regulator
8. 1-2 shift
9. Servo release
10. Low
11. Servo apply
12. Intermediate
13. Drive
14. Reverse
15. Modulator
16. Suction
17. Third clutch
18. Modulator or detent
19. Detent



### TRANSMISSION CASE PASSAGES (Bottom Side)

1. Modulator
2. Line
3. Detent
4. Regulator
5. 1-2 accumulator
6. Intermediate
7. Governor
8. Drive
9. Second clutch
10. Low
11. Third clutch
12. Boost
13. Suction
14. Reverse
15. 2-3 exhaust
16. Servo release
17. Regulator
18. Exhaust





Install oil ring (2) on accumulator piston (3). Install spring (1) and piston in valve body (4).

Compress piston and install retaining ring. Use a small C clamp to compress piston.

1. Spring 2. Oil ring 3. Accumulator piston 4. Valve body



Inspect transfer plate (3) for dents or distortion. Check particularly area that check balls in case contact transfer plate. Replace plate if necessary.

Install a new valve body gasket on body (1). Use six bolts to center up transfer plate with valve body. Bolt transfer plate (3) to body (1) with 2 bolts (2). Torque bolts (2) to 0.8 to 1.1 kgm (6 to 8 ft lbs).

1. Valve body 2. Bolts 3. Transfer plate 4. Accumulator piston



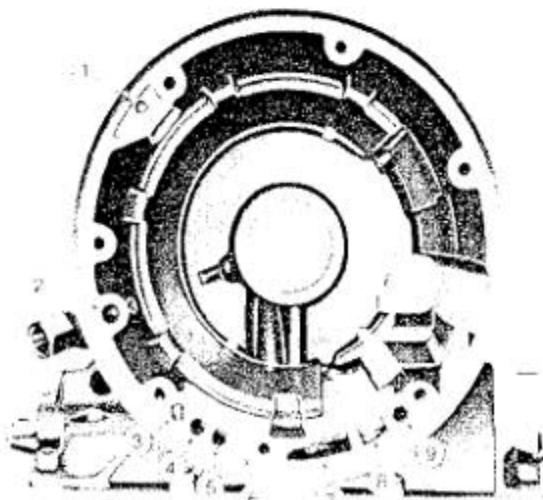
### Case Disassembly, Inspection and Assembly

Inspect case for damage. Check that band anchor pins are retained properly and of equal height.

Inspect and clean oil passages in case. Use cleaning solvent and air.

Inspect bores for detent valve and modulator valves for scratches or scoring.

1. Case vent 2. Converter out 3. 2nd clutch 4. 3rd clutch  
5. Modulator 6. Boost 7. Suction 8. Line 9. Reverse

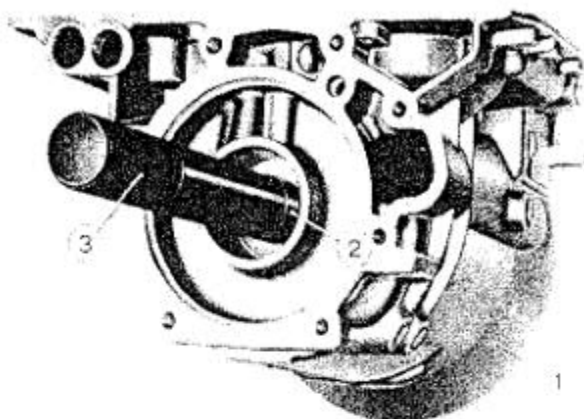


Inspect bushing inside rear of case. If damaged, remove bushing. Use tool 23130-3 and handle.

Inspect bushing sleeve for sun gear drum inside case for scoring. If damaged, remove sleeve by grinding. Be very careful when grinding to prevent damage to aluminum case.

Install new sleeve. Use installer 32130-7 and handle. Install new bushing. Use installer 23130-3 and handle. Make sure bushing is flush with case at rear.

1. Case 2. Tool 23130-3 3. Handle



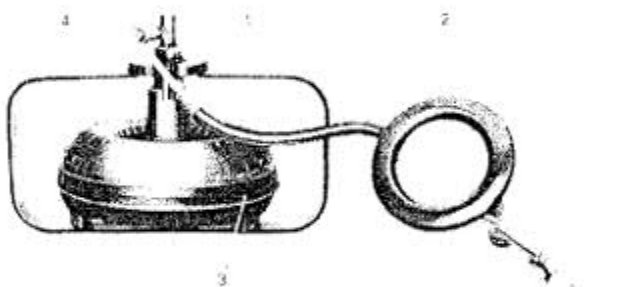
#### Torque Converter Inspection

Drain converter. Check fluid for clutch material or foreign matter. If foreign matter or clutch material is found, replace converter. Converter cannot be cleaned properly.

Check hub surfaces of converter for scoring or wear.

If available, use tool to check converter for leaks. Apply 71 to 85 psi air pressure to tool. Submerge converter in water. Check for leaks.

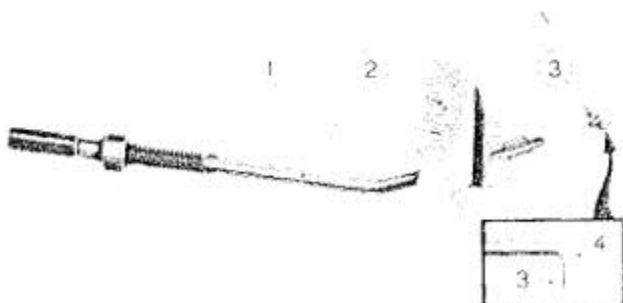
1. Tool for checking converter 2. Air gauge 3. Converter 4. Gauge fitting



#### Selector Lever and Shaft Installation

Install selector lever (2) on parking lock actuator (1) by aligning tab (3) on actuator with slot lever. Place actuator with lever in case.

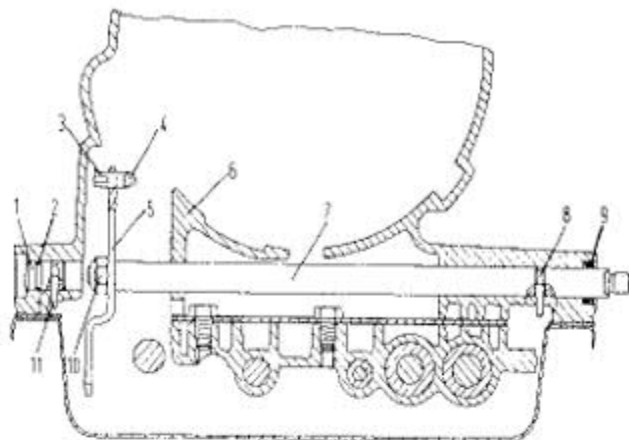
1. Parking lock actuator 2. Selector lever 3 & 4. Tab



Install new oil seal (9) in case (6). Insert selector lever shaft (7) thru case from outside. Be careful not to damage oil seal (9). Install retaining pin (8) thru case and shaft.

Position selector lever (5) over shaft (7). Secure lever to shaft with nut (10). Torque nut (10) to 1.1 to 1.5 kgm (8 to 11 ft lbs).

1. Plug 2. Gasket 3. Tab 4. Parking lock actuator 5. Selector lever 6. Case 7. Shaft 8. Retaining pin 9. Oil seal 10. Nut 11. Retaining pin



### REASSEMBLY

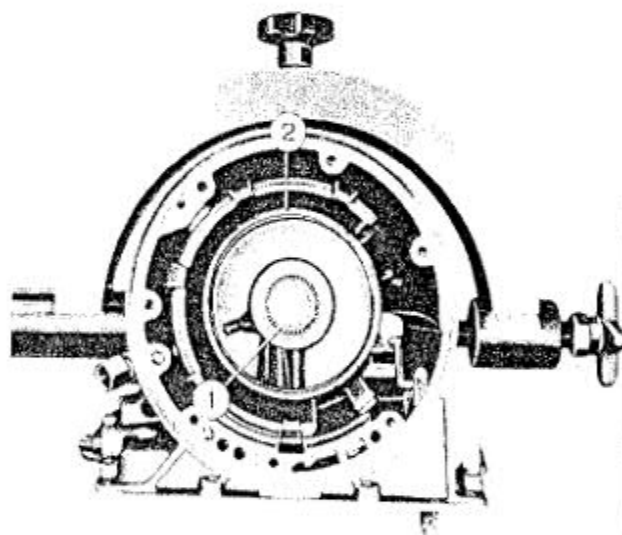
Turn transmission so that front of case is up.

Inspect band for cracks, flaking, burring or looseness. Replace, if necessary.

Place band in case. Locate band so that tabs on outer edges of band seat against anchor pins in case.

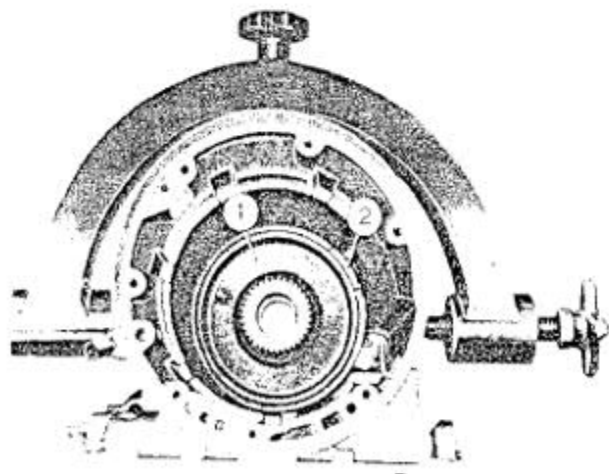
Place race for thrust bearing on rear of case. Secure with petroleum jelly. Place thrust bearing on race. Secure with petroleum jelly.

1. Needle bearing 2. Low band



Install reaction sun gear and drum (1) into band (2) with sun gear up. Place thrust bearing on sun gear. Place race on thrust bearing. Secure with petroleum jelly.

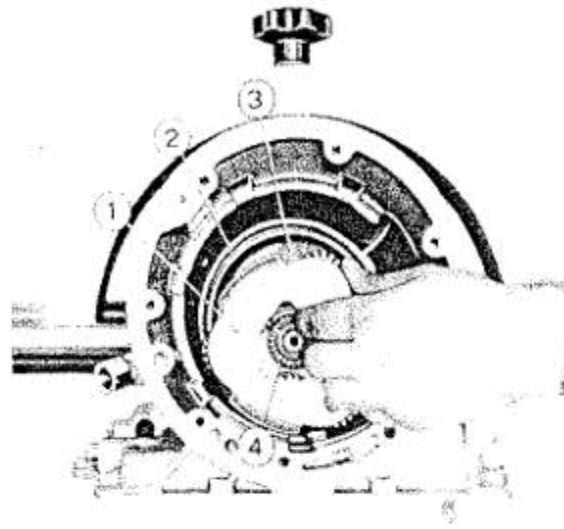
1. Reaction sun gear and drum 2. Low band



Place thrust washer in carrier (1). Place thrust bearing (4) on washer.

Install output shaft and planetary carrier (1) into case to spline with reaction sun gear.

1. Planetary carrier 2. Low band 3. Reaction sun gear and drum  
4. Thrust bearing

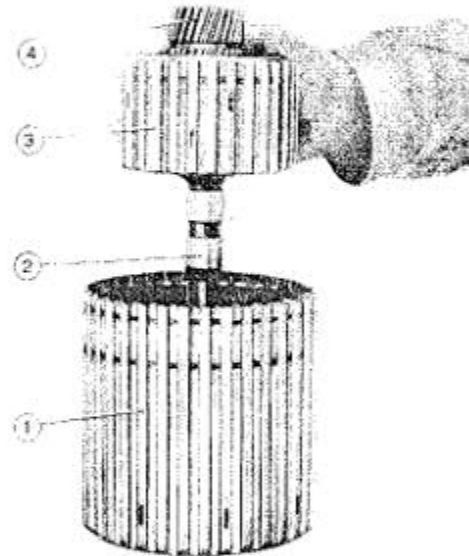


On the bench, align clutch plates in second clutch drum (1).

**NOTE:** Check that thrust washer is seated correctly on second clutch hub.

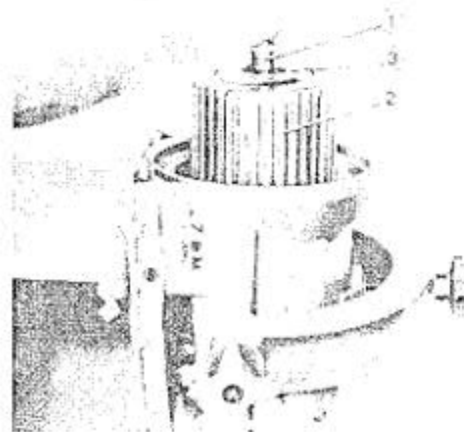
Insert third clutch drum (3) and input shaft (2) thru top of drum (1). Seat splines of drum (3) into splines of clutch plates inside drum (1).

1. Second clutch drum 2. Input shaft 3. Third clutch drum  
4. Input sun gear



Hold clutch assemblies (2) by input shaft (1). Lower assembly into case. Turn drum and shaft to align ring gear and input sun gear with planetary pinions.

1. Input shaft 2. Clutch assemblies 3. Selective thrust washer

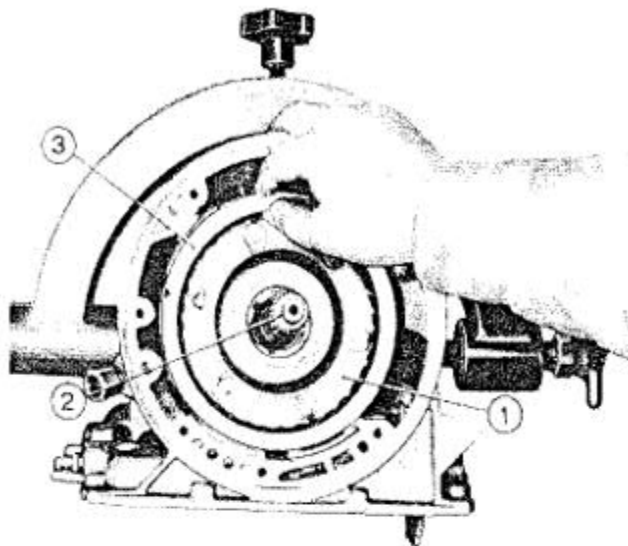


Inspect clutch plates for third clutch. If plates are worn, scored, or burned, replace the pack.

Place steel reaction plate (3) in case. Place reverse clutch steel plate, composition plate, steel plate, composition plate, etc. into case. Use a liberal amount of transmission fluid.

Place reverse clutch cushion plate (wave washer) in case.

1. Third clutch drum 2. Input shaft 3. Reaction plate

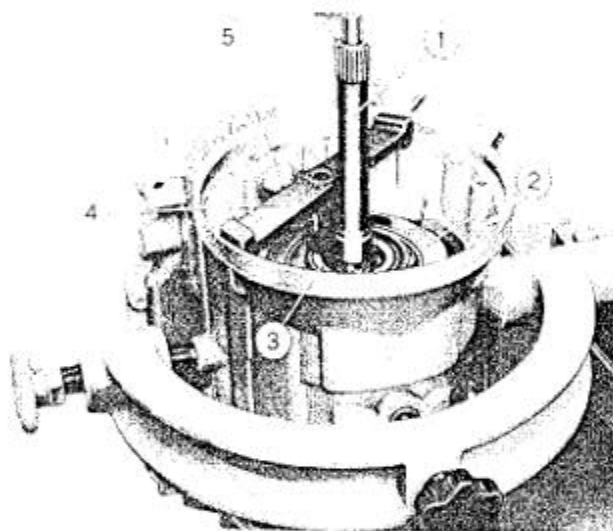


Place gauging tool 23085 (4) on case flange against input shaft (1).

Loosen thumb screw (5) on tool. Allow inner shaft to drop on second clutch drum (3). Tighten thumb screw and remove tool.

Place selective washer against inner shaft of tool. Washer should be flush with top face of shaft. If not, select next larger or smaller washer until correct size is obtained.

1. Input shaft 2. Reverse clutch plate 3. Second clutch drum  
4. Gauging tool 23085 5. Thumb screw



The washer selected should be exactly flush or slightly below inner shaft for correct end play in transmission.

**NOTE:** Selective washer removed from transmission may be oil soaked and discolored.

Selective Washer Chart

No.	Identification Code		Thickness Inch
	Color		
2	Yellow		0.070 to 0.074
3	Blue		0.076 to 0.080
4	Red		0.081 to 0.085
5	Brown		0.086 to 0.090
6	Green		0.091 to 0.095
7	Black		0.097 to 0.101

Install two gears into oil pump (3) noting topside marks made at disassembly.

Place wear plate (2) on oil pump (3).

Insert guide pins (1) in oil pump for alignment of converter housing.

1. Guide pins 2. Wear plate 3. Oil pump



Lower converter housing (5) onto oil pump (6).

Install new sealing washers on 5 bolts for converter housing. Remove guide pins (3). Loosely install bolts thru housing (5) into oil pump.

Install aligning tool 23082 (2) on the shaft (1) to align housing to pump. Tool should bottom on oil pump gear.

Tighten bolts "finger tight" only.

1. Converter stator support shaft 2. Tool 23082 3. Guide pins  
4. Oil seal 5. Converter housing 6. Oil pump



2  
1

Install new rubber oil seal on converter housing (4). Install new gasket on pump flange.

Place selective washer, previously selected, on oil pump shaft. Use petroleum jelly to secure it.

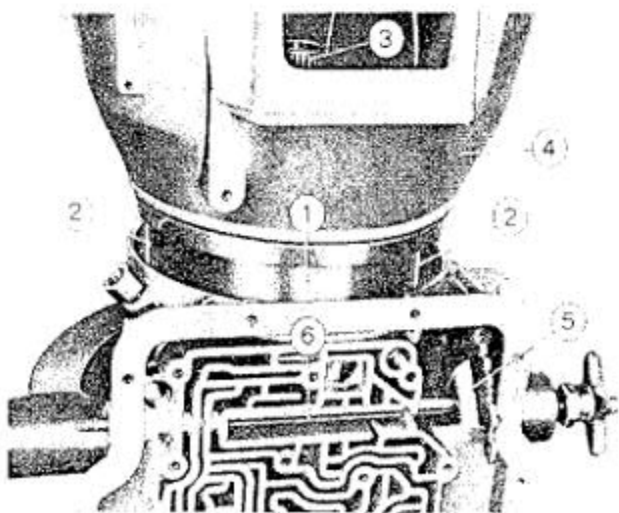
Install 2 glide pins (2) in case. Lower converter housing (4) and oil pump onto case. Place new sealing washers on 7 bolts. Remove glide pins. Loosely install 7 case bolts.

Torque outer 7 bolts to 3 to 3.6 kgm (22 to 26 ft lbs) and torque 5 bolts to 1.8 to 2.3 kgm (13 to 17 ft lbs). Remove tool 23082.

**NOTE:** Torque in "star" pattern.

Check for correct assembly by turning input shaft by hand.

1. Oil pump 2. Guide pins 3. Input shaft 4. Converter housing  
5. Selector lever 6. Shaft

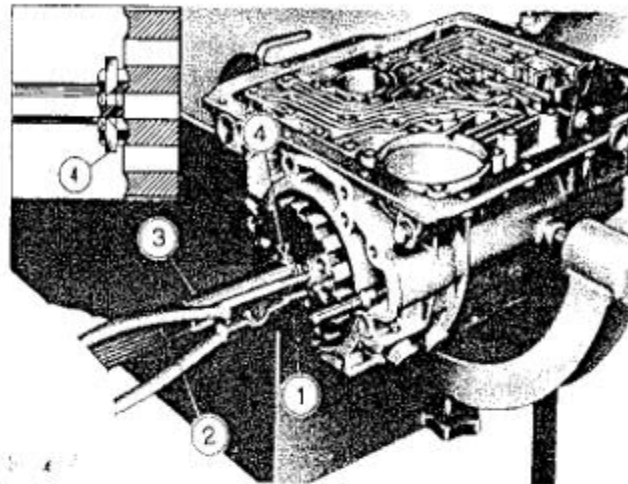


Turn case so that bottom of case is facing up.

Stagger seal ring gaps on hub.

Slide governor hub (1) along output shaft (3). Seat hub in case. Secure hub with snap ring (4), narrow side towards rear or outwards.

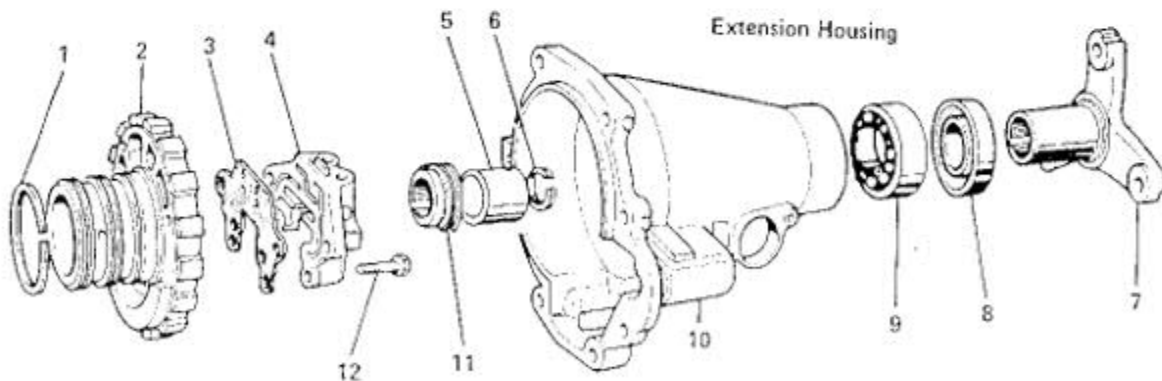
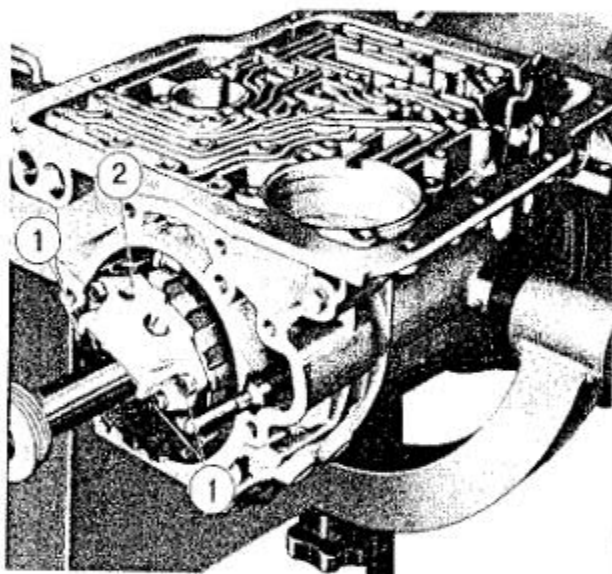
1. Governor hub 2. Pliers 3. Output shaft 4. Snap ring



Place new gasket on governor body (2). Secure governor (2) to hub with four bolts (1). Torque bolts to 6 to 8 ft lbs (0.8 to 1 kgm). Check that valves in governor body move freely after bolts are torqued.

Slide speedometer drive gear and collar into position on shaft. Install snap ring.

1. Bolts 2. Governor



1. Seal ring  
2. Governor hub  
3. Gasket  
4. Governor body

5. Collar  
6. Snap ring  
7. Output flange  
8. Oil seal

9. Bearing  
10. Rear extension housing  
11. Speedometer drive gear  
12. Bolt

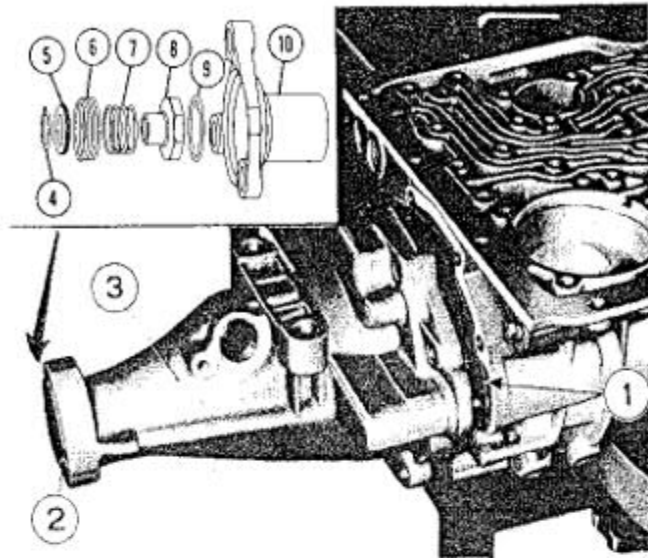
Install new gasket (1) on case. Slide extension housing (3) over output shaft. Align parking lock actuator with extension housing. Align bolt holes. Install 7 bolts. Torque bolts to 2.8 to 3.5 kgm. (20 to 25 ft lbs).

Slide output yoke (10) onto output shaft.

Install washer (9) and nut (8) on end of output shaft. Torque nut to 108 ft lbs (15 kgm).

Install spring (7), seal (6), ring (5) and snap ring (4) on end of output shaft.

1. Gasket 2. Output shaft seal 3. Rear housing 4. Snap ring  
5. Ring 6. Seal 7. Spring 8. Nut 9. Washer 10. Output yoke



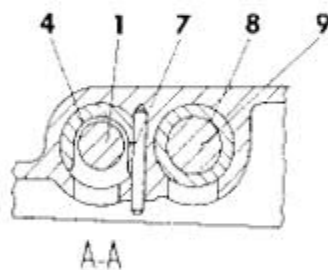
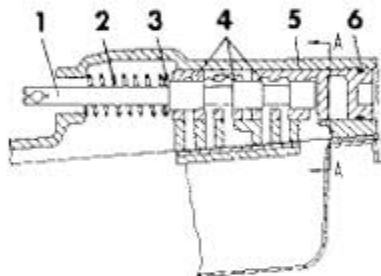
Replace "O" ring on detent valve sleeve (4). Coat parts with transmission fluid.

Place spring seat (3) and spring (2) on detent valve (1). Install valve in sleeve (4). Install sleeve (4) in case with slots in sleeve facing oil pan.

Align groove in sleeve (4) with retaining pin bore. Use a 3/8 inch drive tool inserted in end of sleeve.

Depress valve spring and sleeve (4). Install retaining pin (7) thru case and sleeve. Make sure pin is inserted into groove in sleeve and not into one of the oil passage slots.

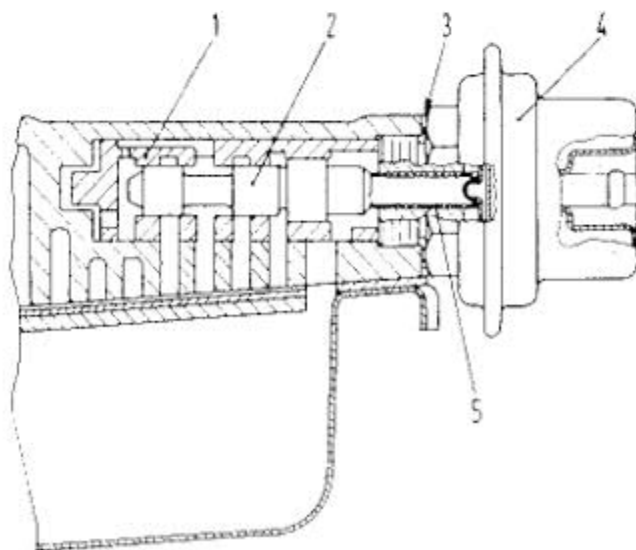
1. Detent valve 2. Spring 3. Spring seat 4. Sleeve 5. Case  
6. O ring 7. Retaining pin 8. Modulator valve sleeve 9. Modulator valve



Install modulator valve (2), small end first into sleeve (1). Install sleeve in case.

Place new gasket (3) on modulator (4). Install plunger (5) in modulator. Thread modulator (4) into case. Tighten with wrench J23100.

1. Modulator valve sleeve 2. Modulator valve 3. Gasket  
4. Modulator 5. Plunger



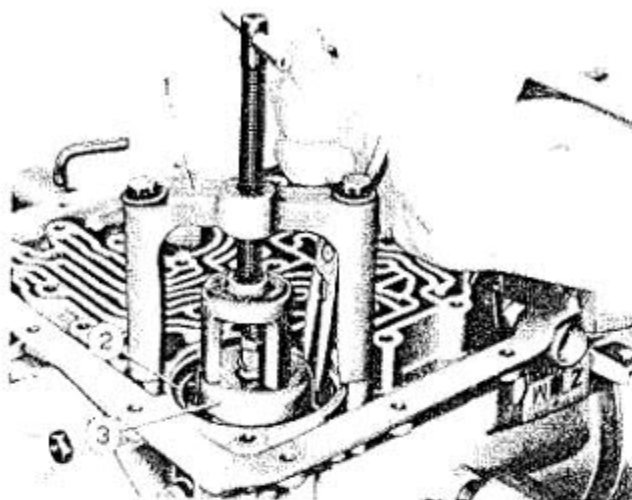


Coat servo parts with transmission fluid.

Install servo apply rod, spring, and piston into case.

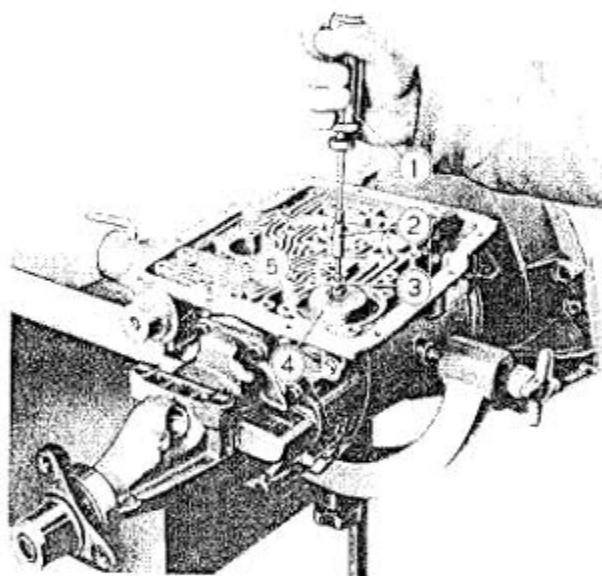
Install compressor tool 23075 (1) on case. Make sure legs of tool are straight. Turn tool down to compress piston (3). Lightly tap on piston while compressing until piston is seated to prevent damage to oil ring. Install retaining ring (2). Remove tool 23075 carefully, insuring retaining ring has seated.

1. Compressor tool 2. Retaining ring 3. Servo piston



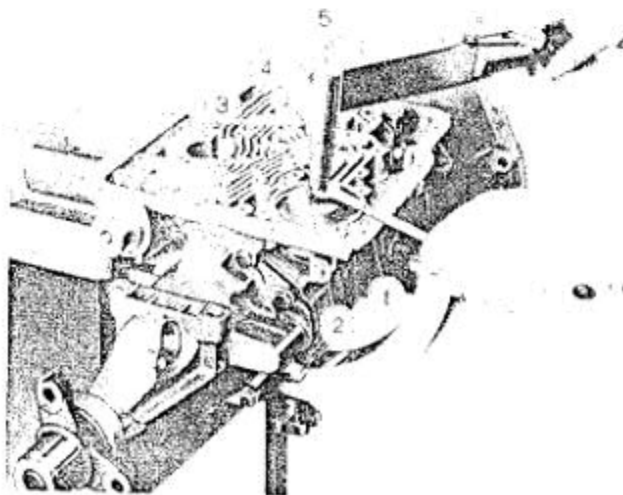
Using a 3/16" hex head wrench on servo adjusting bolt, adjust servo apply rod. Torque adjusting bolt to 46 kgcm (40 in lbs). Back off bolt exactly 4 turns.

1. Torque wrench 2. Adapter 3. Lock nut 4. Servo piston 5. Adjusting bolt



Hold sleeve of servo piston with a wrench on flats. Using 9/16 inch socket and torque wrench, torque lock nut to 1.7 to 2.1 kgm (12 to 15 ft lbs).

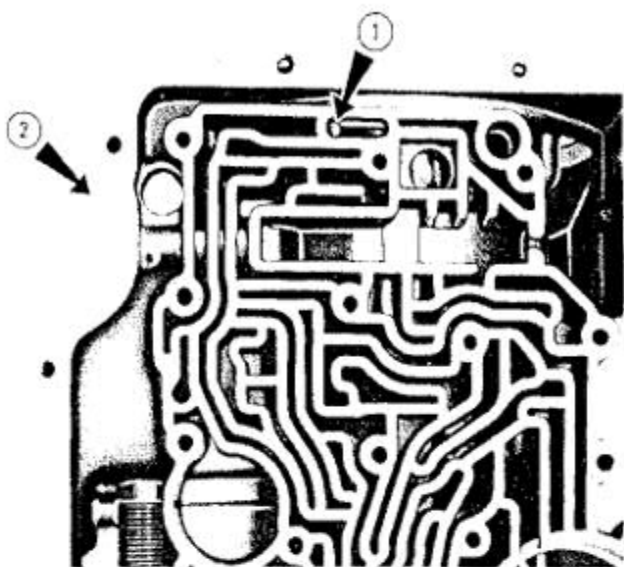
1. Wrench 2. Servo piston 3. Socket 4. Extension 5. Torque wrench



Clean check ball with lint-free rag.

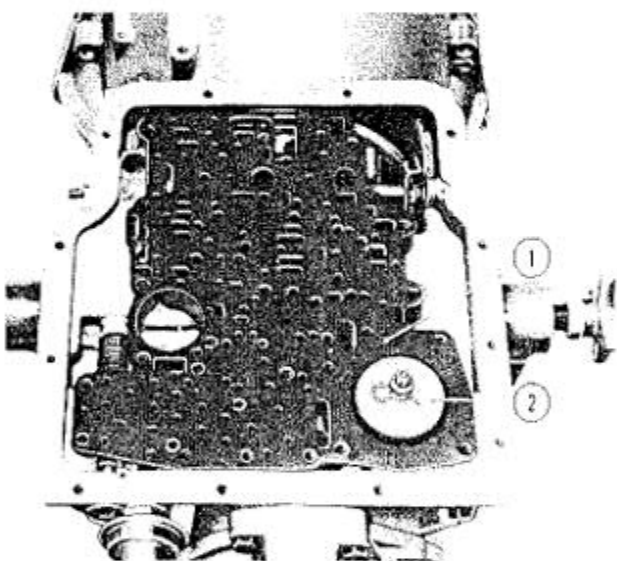
Insert ball in oil passage of transmission case as shown by arrows.

1. Check ball 2. Transmission case



Install new gasket (1) on case.

1. Gasket 2. Servo piston

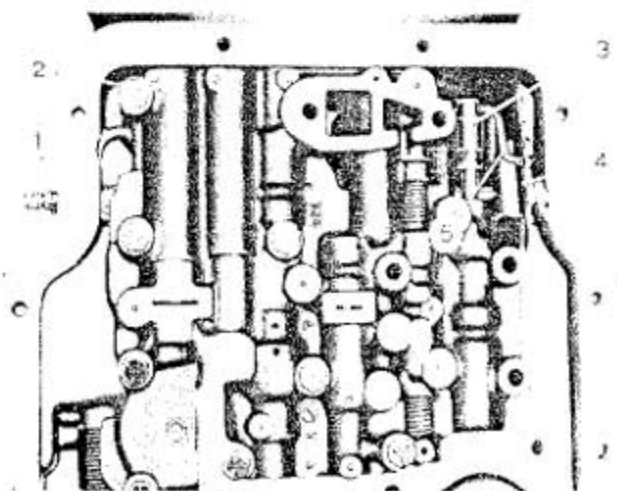


Coat manual valve with transmission fluid. Install manual valve (3) in valve body. Install long side of link (5) in manual valve.

Install small end of link (5) into selector lever (4) and position valve body and transfer plate onto large gasket and casing.

Loosely install 8 bolts (2) holding valve body to transmission case.

1. Selector lever shaft 2. Bolt 3. Manual valve 4. Selector lever  
5. Link



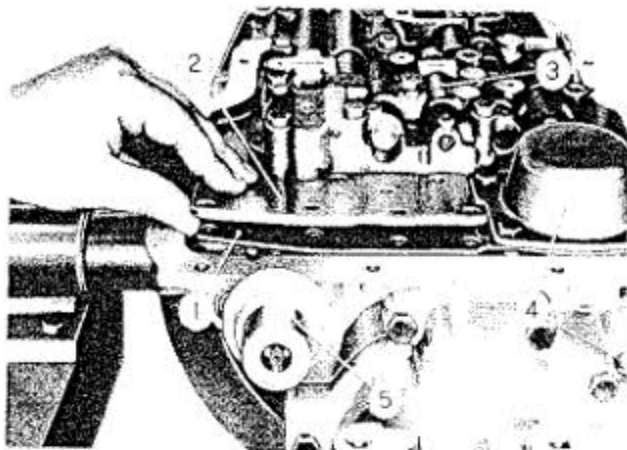
Install gasket for servo cover (4) on transfer plate (1). Install cover (4) with 4 bolts.

Install reinforcement plate (2) on transfer plate (1). Secure plate with 8 bolts. Torque bolts for valve body (3) to 1.8 to 2.1 kgm (13 to 15 ft lbs). Torque bolts from center working outward.

Torque bolts for reinforcement plate (2) to 1.8 to 2.1 kgm (13 to 15 ft lbs).

Torque bolts for servo cover (4) to 2.3 to 2.6 kgm (17 to 19 ft lbs).

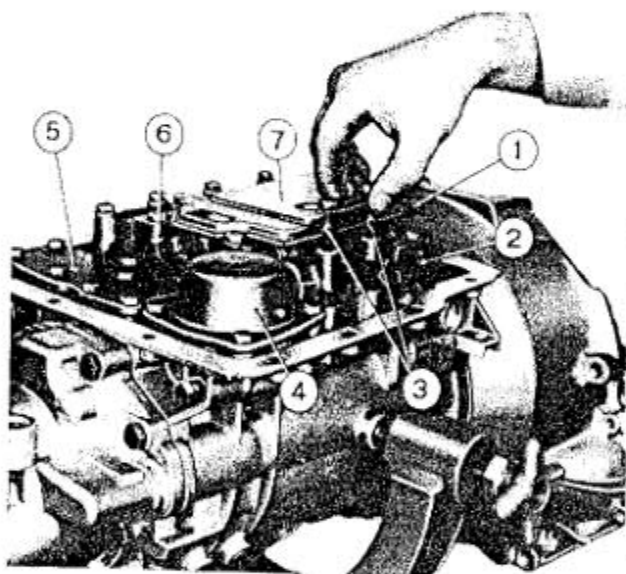
1. Transfer plate 2. Reinforcement plate 3. Valve body  
4. Servo cover 5. Modulator



Place oil filter gasket on valve body. Install filter on valve body (6) with 3 bolts. Torque bolts to 1.8 to 2.1 kgm (13 to 15 ft lbs).

Install manual detent spring (1) with 2 bolts (3). Torque bolts to 1.8 to 2.1 kgm (13 to 15 ft lbs).

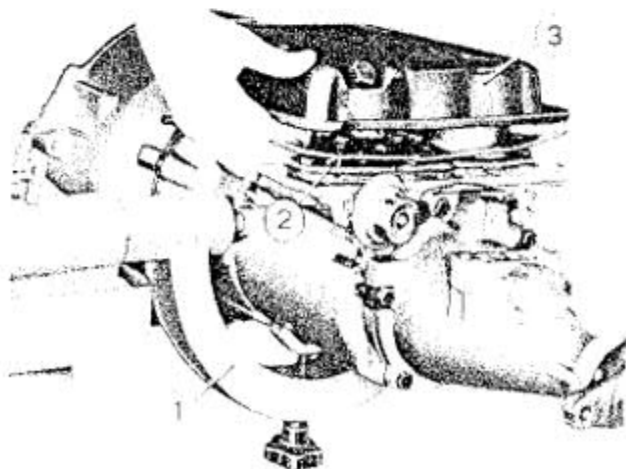
1. Detent spring 2. Selector lever 3. Bolts 4. Servo cover  
5. Reinforcement plate 6. Valve body 7. Oil filter



Install new gasket (2) for oil pan (3). Secure pan to case with 12 bolts. Torque bolts to 1 to 1.3 kgm (7 to 10 ft lbs).

Install output shaft flange, sliding it on by hand.

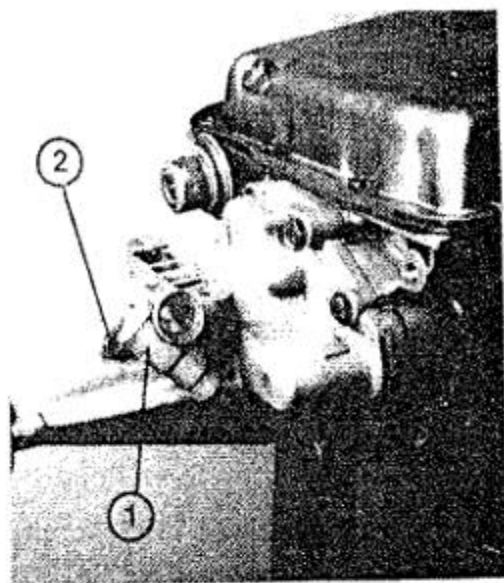
1. Tool 2. Gasket 3. Oil pan



Slide torque converter over stator shaft and input shaft. Make sure keyway on converter hub is seated into drive lugs on oil pump. Rotate converter to check that it is fully seated.

Install gasket, speedometer driven gear (1), bolt (2), and lock-washer.

1. Speedometer driven gear 2. Bolt



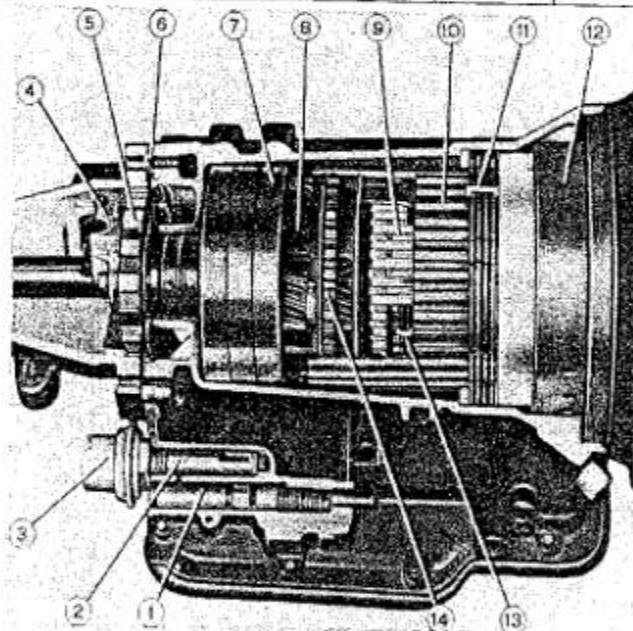
## TRANSMISSION BOLT TORQUE CHART

DESCRIPTION	TORQUE	
	Kgm	Ft lb
Bolt, oil pan to case	1.0 to 1.3	7 to 9
Bolt, filter to case	1.8 to 2.1	13 to 15
Bolt, reinforcement plate to case	1.8 to 2.1	13 to 15
Bolt, valve body to case	1.8 to 2.1	13 to 15
Bolt, transfer plate to valve body	0.8 to 1.1	6 to 8
Bolt, servo cover to body	2.3 to 2.6	17 to 19
Bolt, converter housing to case	3.0 to 3.6	22 to 26
Bolt, converter housing to oil pump	1.8 to 2.3	13 to 17
Nut, selector lever to shaft	1.1 to 1.5	8 to 11
Bolt, governor body to governor	0.8 to 1.0	6 to 7
Bolt, extension housing to case	2.8 to 3.5	20 to 25
Bolt, servo adjusting	0.46	3.3 (40 in lb)
Nut, lock, servo adjusting bolt	1.7 to 2.1	12 to 15
Screw, lock plate to planetary carrier	0.4 to 0.5	2.5 to 3.2 (29 to 38 in lb)
Nut, output flange	7	51

### COMPONENT OPERATION CHART

Selector Lever Position	Gear Engaged	Reverse Clutch	Second Clutch	Third Clutch	Band	Sprag Clutch Locked	Parking Pawl
P	Park						X
R	Reverse	X		X			
N	Neutral						
D	1st Gear				X	X	
	2nd Gear		X		X		
	3rd Gear		X	X			
2	1st Gear				X	X	
	2nd Gear		X		X		
1	1st Gear			X	X		

1. Kick Down valve
2. Modulator sleeve
3. Modulator
4. Governor
5. Governor hub
6. Gasket
7. Band
8. Planetary carrier
9. Third clutch drum
10. Second clutch drum
11. Reverse clutch discs
12. Pump body
13. Third clutch discs
14. Ring gear



### OIL PRESSURE CHECKS

To check oil pressures of transmission, connect pressure gauge 5907 to transmission. Connect vacuum gauge in vacuum line to modulator. Position gauge inside car so it can be read during driving. Start engine and operate car until engine and transmission reach normal operating temperature. Check that engine is running properly.

#### Normal Oil Pressure Check:

With selector in D, and engine at idle (750 to 850 rpm), check that the oil pressure is 61 to 70 psi (4.3 to 4.9 Kg/cm<sup>2</sup>).

#### Modulator Oil Pressure Check:

Drive car with selector in D and accelerator pedal down past KICK-DOWN position. Check that transmission shifts up when oil pressure reads 108 to 119 psi (7.5 to 8.4 Kg/cm<sup>2</sup>). Vacuum gauge should read 0.86 in/Hg (25 mm/Hg).

#### Regulator Boost Oil Pressure Check:

Place selector in 1 with car stopped. Check that oil pressure is 98 to 109 psi (6.9 to 7.7 Kg/cm<sup>2</sup>) with approximately 12 in/Hg (305 mm/Hg) of vacuum.

**CAUTION:** In the next step do not keep engine at stall speed longer than a few seconds. Maintaining stall speed could overheat transmission.

#### Stall Speed Oil Pressure Check:

Place selector in 1 or R. Apply brakes and run engine to stall speed. Check that oil pressure is 156 to 160 psi (10.9 to 11.7 Kg/cm<sup>2</sup>).

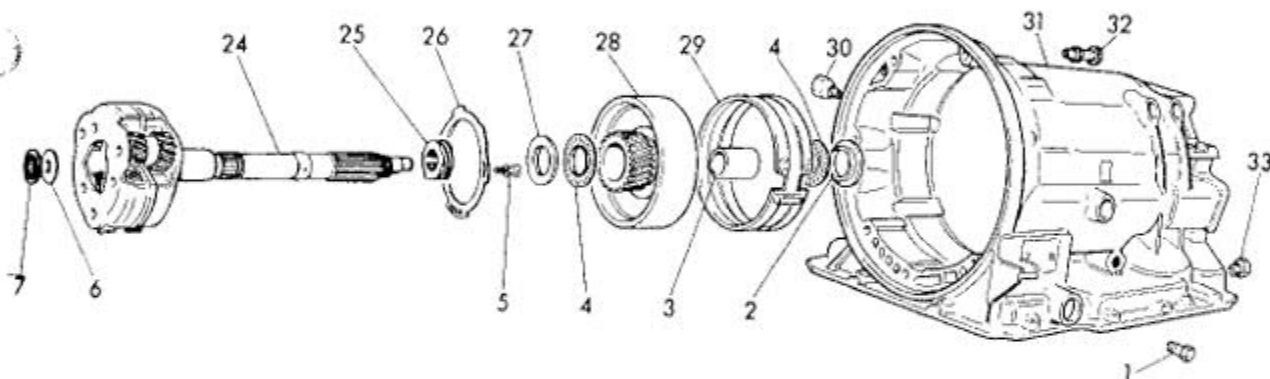
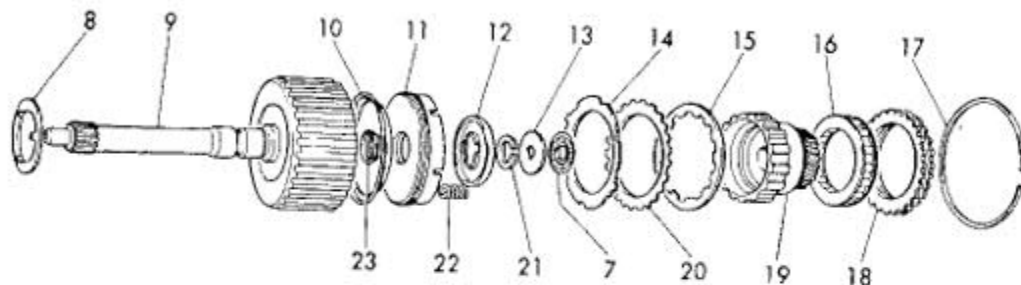
**NOTE:** Stall speed is maximum speed engine can obtain with brakes applied and accelerator pressed all the way. Read engine rpm on tachometer. Stall speed should be 2200-2300 rpm.

## TROUBLE DIAGNOSIS

CONDITION	POSSIBLE CAUSE
Low oil level	<ol style="list-style-type: none"> <li>1. Oil coming out of filler tube</li> <li>2. External oil leak</li> <li>3. Failed vacuum modulator diaphragm</li> </ol>
Oil coming out of filler tube	<ol style="list-style-type: none"> <li>1. Oil level too high</li> <li>2. Water in oil</li> <li>3. External vent clogged</li> <li>4. Leak in pump suction circuit</li> </ol>
External oil leaks	<ol style="list-style-type: none"> <li>1. Converter housing area               <ol style="list-style-type: none"> <li>a. Leaking converter</li> <li>b. Converter housing seal (front seal)</li> <li>c. Sealing washers under converter housing to case bolts</li> <li>d. Sealing washers under converter housing to pump bolts</li> <li>e. Converter housing to case seal</li> </ol> </li> <li>2. Case and extension area               <ol style="list-style-type: none"> <li>a. Shifter shaft seal</li> <li>b. Extension seal</li> <li>c. Oil pan gasket</li> <li>d. Filler tube O-ring (bottom of tube)</li> <li>e. Extension to case gasket</li> <li>f. Vacuum modulator gasket</li> <li>g. Drain plug gasket</li> <li>h. Cooler line fittings</li> <li>i. Speedo drive housing gasket</li> </ol> </li> </ol>
Excessive smoke coming from exhaust	<ol style="list-style-type: none"> <li>1. Failed modulator diaphragm</li> </ol>
No drive in any selector position	<ol style="list-style-type: none"> <li>1. Low oil level</li> <li>2. Clogged suction screen</li> <li>3. Inner manual valve linkage disconnected</li> <li>4. External linkage disconnected</li> <li>5. Input shaft broken</li> <li>6. Pressure regulator stuck in open position</li> <li>7. Failed pump</li> </ol>
No forward drive	<ol style="list-style-type: none"> <li>1. Band worn or adjustment loose</li> <li>2. Band servo piston stuck</li> <li>3. Band servo seal ring cracked</li> </ol>
No drive in D or 2 but drive in 1 and R	<ol style="list-style-type: none"> <li>1. Input sprag installed backwards</li> <li>2. Input sprag failure</li> </ol>
No drive in R, Drive in all other ranges	<ol style="list-style-type: none"> <li>1. Reverse clutch failure</li> </ol>
Drive in neutral	<ol style="list-style-type: none"> <li>1. Selector lever linkage improperly adjusted</li> <li>2. Planetary carrier broken (lock-up)</li> <li>3. Band improperly adjusted (too tight)</li> </ol>
Low oil pressure	<ol style="list-style-type: none"> <li>1. Low oil level</li> <li>2. Clogged suction screen</li> <li>3. Leak in pump suction circuit</li> <li>4. Internal leak in pressure circuit</li> <li>5. Priming valve stuck</li> <li>6. Pressure regulator malfunction</li> </ol>
High oil pressure	<ol style="list-style-type: none"> <li>1. Broken or disconnected vacuum line to transmission</li> <li>2. Failed modulator or stuck modulator valve</li> <li>3. Leak in any part of engine or accessory vacuum system</li> <li>4. Pressure regulator malfunction</li> </ol>

### TROUBLE DIAGNOSIS (cont'd)

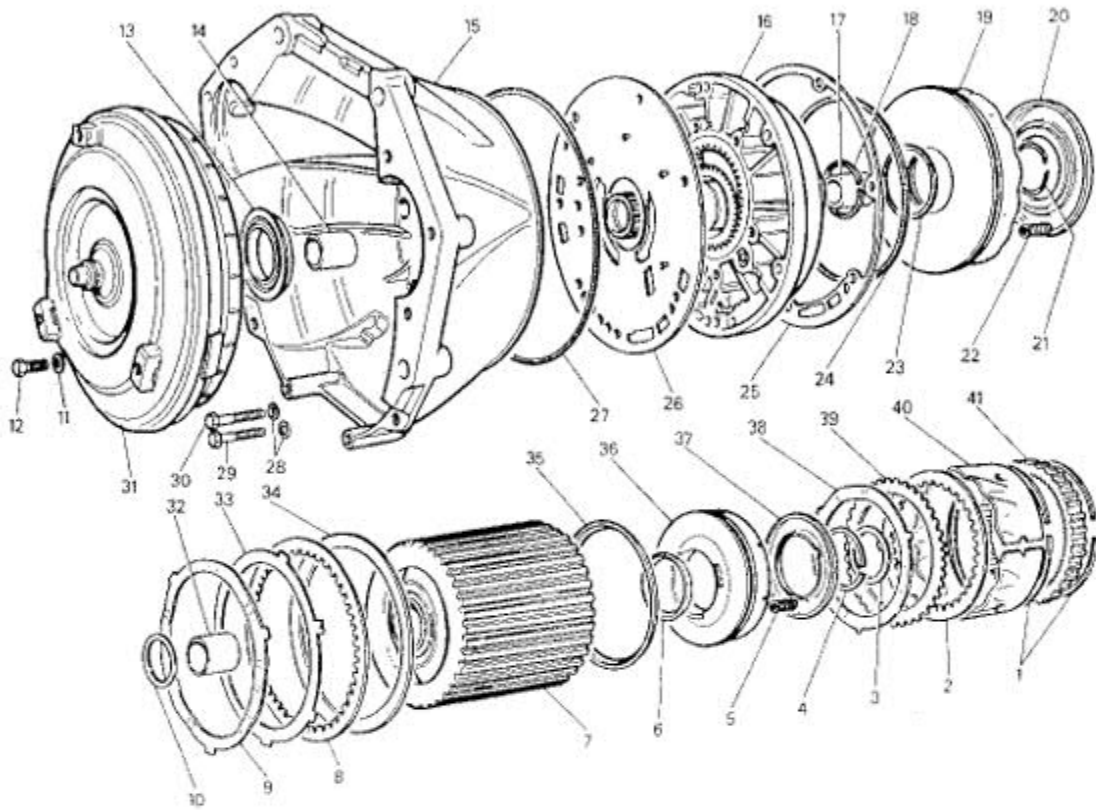
CONDITION	POSSIBLE CAUSE
Will not shift at any speed	<ol style="list-style-type: none"> <li>1. Governor valves stuck</li> <li>2. 1-2 shift valve stuck in downshifted position</li> <li>3. Large leak in governor pressure passage</li> </ol>
Upshifts only at part throttle	<ol style="list-style-type: none"> <li>1. Detent pressure regulator valve stuck</li> <li>2. Detent cable broken or misadjusted</li> </ol>
Upshifts only at full throttle	<ol style="list-style-type: none"> <li>1. Modulator valve stuck</li> <li>2. Failed modulator diaphragm</li> <li>3. Broken or disconnected vacuum line to modulator</li> <li>4. Engine vacuum leak</li> </ol>
Will not make part throttle 3-2 downshift at lower car speeds	<ol style="list-style-type: none"> <li>1. 3-2 downshift control valve stuck</li> </ol>
Only upshifts from 1 to 2	<ol style="list-style-type: none"> <li>1. 2-3 shift valve stuck</li> </ol>
Sudden engagement after an increase in rpm	<ol style="list-style-type: none"> <li>1. Band servo piston binding</li> </ol>
Slipping 1-2 upshifts	<ol style="list-style-type: none"> <li>1. Low oil pressure</li> <li>2. 1-2 accumulator valve stuck</li> <li>3. Second clutch piston seals leaking</li> <li>4. Second clutch piston centrifugal ball stuck open</li> <li>5. Second clutch piston cracked or broken</li> </ol>
Slipping 2-3 upshifts	<ol style="list-style-type: none"> <li>1. Low oil pressure</li> <li>2. Third clutch piston seals leaking</li> <li>3. Third clutch piston centrifugal ball stuck open</li> <li>4. Third clutch piston cracked or broken</li> <li>5. Input shaft bushing worn</li> </ol>
Abrupt 1-2 upshift	<ol style="list-style-type: none"> <li>1. High oil pressure</li> <li>2. 1-2 accumulator valve stuck</li> <li>3. Governor valves stuck</li> </ol>
Abrupt 2-3 upshift	<ol style="list-style-type: none"> <li>1. High oil pressure</li> <li>2. Governor valves stuck</li> </ol>
Abrupt 3-2 forced downshift at high speed	<ol style="list-style-type: none"> <li>1. High speed downshift timing valve stuck open</li> </ol>
Abrupt 3-2 coast downshift	<ol style="list-style-type: none"> <li>1. Low speed downshift timing valve stuck open</li> </ol>



- |                         |                     |                                |
|-------------------------|---------------------|--------------------------------|
| 1. Bolt                 | 12. Spring retainer | 23. Oil seal                   |
| 2. Thrust bearing race  | 13. Thrust washer   | 24. Output shaft               |
| 3. Bushing              | 14. Wave washer     | 25. Speedometer drive gear     |
| 4. Thrust bearing       | 15. Clutch plate    | 26. Lock plate                 |
| 5. Thrust washer        | 16. Sprag assembly  | 27. Thrust bearing race        |
| 6. Thrust washer        | 17. Retaining ring  | 28. Reaction sun gear and drum |
| 7. Thrust bearing       | 18. Outer race      | 29. Low band                   |
| 8. Thrust washer        | 19. Input sun gear  | 30. Connection                 |
| 9. Input shaft          | 20. Clutch plate    | 31. Main case                  |
| 10. Oil seal            | 21. Snap ring       | 32. Vent                       |
| 11. Third clutch piston | 22. Clutch spring   | 33. Connection                 |

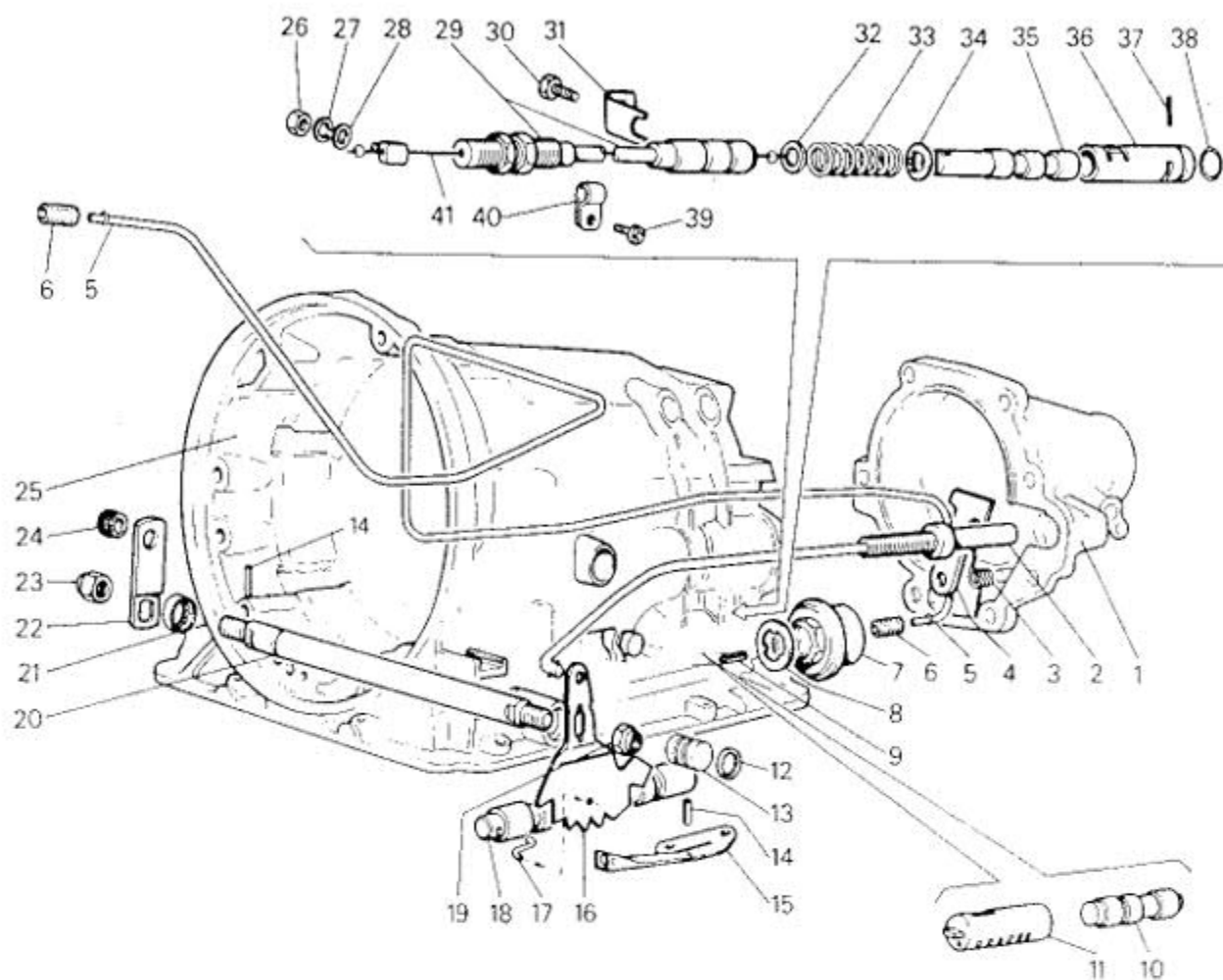
THIRD CLUTCH, PLANETARY CARRIER, REACTION SUN GEAR, LOW BAND, AND MAIN CASE





- |                       |                           |                          |
|-----------------------|---------------------------|--------------------------|
| 1. Retaining ring     | 15. Converter housing     | 29. Bolt                 |
| 2. Clutch plate       | 16. Oil pump              | 30. Bolt                 |
| 3. Thrust washer      | 17. Bushing               | 31. Torque converter     |
| 4. Snap ring          | 18. Oil seal rings        | 32. Bushing              |
| 5. Clutch spring      | 19. Reverse clutch piston | 33. Clutch plate         |
| 6. Oil seal           | 20. Spring retainer       | 34. Reaction plate       |
| 7. Second clutch drum | 21. Snap ring             | 35. Oil seal             |
| 8. Clutch plate       | 22. Clutch spring         | 36. Second clutch piston |
| 9. Wave washer        | 23. Inner seal            | 37. Spring retainer      |
| 10. Selective washer  | 24. Outer seal            | 38. Wave washer          |
| 11. Washer            | 25. Gasket                | 39. Clutch plate         |
| 12. Bolt              | 26. Wear plate            | 40. Spacer               |
| 13. Oil seal          | 27. Outer seal            | 41. Ring gear            |
| 14. Bushing           | 28. Seal washers          |                          |

### TORQUE CONVERTER, OIL PUMP, REVERSE CLUTCH, AND SECOND CLUTCH



- |                          |                    |
|--------------------------|--------------------|
| 1. Extension housing     | 22. Control lever  |
| 2. Parking lock actuator | 23. Nut            |
| 3. Spring                | 24. Washers        |
| 4. Parking pawl          | 25. Main case      |
| 5. Vacuum tube           | 26. Nut            |
| 6. Hose                  | 27. Lockwasher     |
| 7. Modulator             | 28. Washer         |
| 8. Gasket                | 29. Kickdown cable |
| 9. Plunger               | 30. Bolt           |
| 10. Modulator valve      | 31. Support        |
| 11. Sleeve               | 32. Washer         |
| 12. Gasket               | 33. Spring         |
| 13. Plug                 | 34. Spring seat    |
| 14. Retaining pin        | 35. Detent valve   |
| 15. Detent spring        | 36. Sleeve         |
| 16. Selector lever       | 37. Retaining pin  |
| 17. Link                 | 38. Oil seal       |
| 18. Manual valve         | 39. Screw          |
| 19. Nut                  | 40. Clamp          |
| 20. Shift                | 41. Cable          |
| 21. Seal                 |                    |

TRANSMISSION INNER CONTROLS

**BRAKE BAND ADJUSTMENT**

Adjust brake band in car as follows:

Drain transmission oil.

Remove sump and gasket.

Remove servobrake cover (15).

Loosen locknut (14) of adjusting screw (13).

Using torque wrench and socket tighten screw (13) to 40 in lb (46 kgm).

Then back off screw five turns.

Tighten locknut (14) to 12 to 15 ft lbs (1.7 to 2.1 kgm). Hold sleeve (5) and screw (13) to prevent rotation.

Install servobrake cover (15).

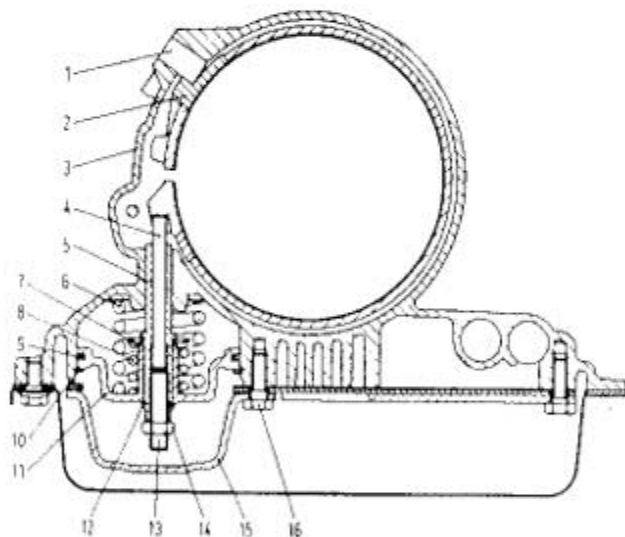
Use a new gasket. Tighten bolts (16) to 17 to 19 ft lbs (2.3 to 2.5 kgm).

Install oil sump with new gasket. Tighten attaching bolts to 7 to 9 ft lbs (1 to 3 kgm).

Fill transmission with oil.

**NOTE:** The correct adjustment of the brake band is not confined to clearance between band and drum but includes the correct preload setting of the servobrake release spring. The servobrake acts as an accumulator for oil directed to the reverse clutch when shifting from intermediate to high gear. Therefore the band adjustment directly affects the operation of the rear clutch.

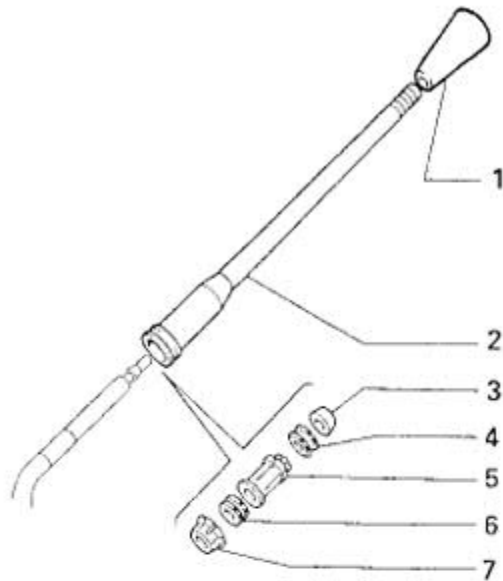
1. Brake band anchoring pin
2. Brake band
3. Transmission main case
4. Brake actuating rod
5. Sleeve
6. Release spring
7. Damping spring seat
8. Damping spring
9. Piston ring
10. Retainer
11. Piston
12. Circlip
13. Adjusting screw
14. Nut
15. Servobrake cover
16. Cover bolt



### MANUAL TRANSMISSION LINKAGE REMOVAL AND INSTALLATION

Refer to Manual Transmission portion in this section for removal and installation.

1. Knob 2. Upper half of gearshift lever 3. Shoulder block  
4. Rubber bushing 5. Spacer 6. Rubber bushing 7. Plastic retainer



## AUTOMATIC TRANSMISSION LINKAGE ADJUSTMENT (Carburetor Vehicles Only)

Refer to illustration on facing page.

The travel of accelerator pedal between positions I and III is divided into two parts (Travel "A" and "B"). Travel "A" is from pedal released (position I) up to wide open throttle (position II). Travel "B" is from wide open throttle (position II) up to travel stop (position III). This additional travel is accomplished by overcoming the action of the spring in the telescoping link (3). Travels "A" and "B" must be adjusted together since they make up the total travel "D" and are interdependent. Pedal travel is limited by stops (15 and 16).

The correct setting for KICK-DOWN is when the telescoping link (3) has extended 0.276 to 0.354 in (7 to 9 mm) with the carburetor butterfly full open and the accelerator pedal against stop (15).

### Checking and Adjusting Travel

Disconnect telescoping link (3) from control lever (1).

Push accelerator pedal (13) down until ball end (6) on cable (7) is just touching cable pin (5). Push pedal to stop (15). Check that cable (7) has extended 0.276 to 0.354 in (7 to 9 mm).

If cable travel is not correct, adjust nuts (10).

Push pedal (13) to stop (15).

Hold control lever (1) in full throttle (position II). Extend telescoping link (3) 0.315 to 0.393 in (8 to 10 mm). Check that link can be connected to control lever (1) when extended.

If link cannot be connected, loosen nuts (2 and 4) and adjust link (3).

Release accelerator pedal until ball end (6) is just touching cable pin (5). Move control lever (1) to full throttle (position II). Check that telescoping link (3) can be connected to control lever (1) without extending.

If link cannot be connected, loosen nuts (2 and 4) and adjust link (3).

When adjusting link (3) make equal adjustments at each end. Adjusting only one end could cause that end to run out of threads.

**NOTE:** For correct adjustment it is necessary for the kick-down valve to move its specified travel when accelerator pedal is fully depressed (position III).

## THROTTLE AND KICK-DOWN CABLE

### ADJUSTMENT (Fuel Injection Only)

Make sure engine idle speed is set correctly (Refer to Engine Section).

#### Throttle Cable

Check for cable slack at the cable housing support on the intake manifold.

Pull back lightly on the cable housing until just prior to moving throttle lever. Check for approximate clearance of 1 mm between adjustment nuts and support.

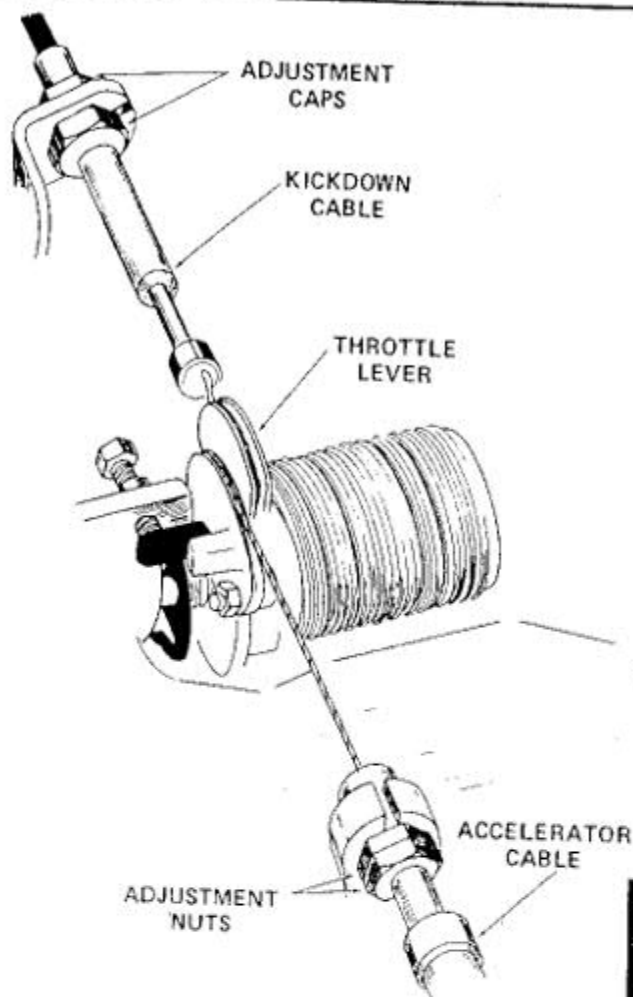
If necessary, adjust nuts to obtain clearance.

#### Kick-Down Cable

Depress throttle cable until lever contacts the maximum opening stop. Check that kick-down cable starts to pull at this point.

Fully depress throttle. Check that kick-down cable extends 9 to 11 mm.

If necessary, adjust nuts on housing to obtain correct extension of cable.



## SELECTOR VALVE LINKAGE ADJUSTMENT

Refer to illustration on facing page.

This adjustment may be required to correct a loose condition in linkage or as a result of power plant taking some set on rubber mounts.

A misadjustment of linkage will eventually affect selector lever (3), so that movement of lever will fail to affect a corresponding movement of selector valve.

To adjust linkage, proceed as follows:

- Disconnect tie rod (13) from relay lever (10) and set this in position [P].
- Set lever (14) in position [P] (all the way back): to check that this position is correct, make sure vehicle is blocked.
- Adjust length of rod (13), if necessary, by turning nut (12) as required, and reconnect rod to relay lever (10), after locking nut (12).

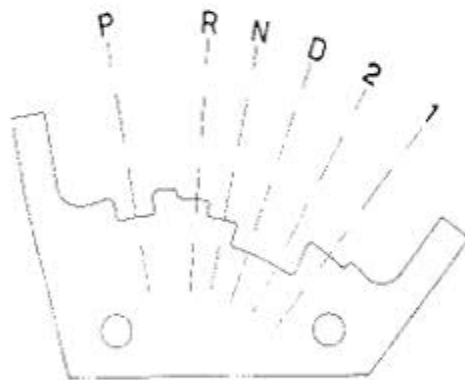
With lower handle (2) up, check all six positions: a definite click should be felt in each position.

Then check selector lever (3) for correct positioning in gear selector (5) gate, as follows:

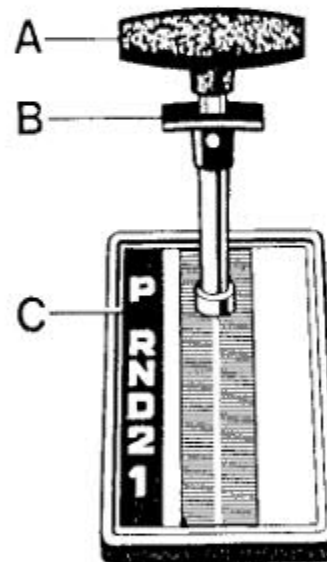
- With lower handle (2) fully up, select position [1] and release handle: stop tooth should engage selector gate without causing selector lever (3) to be shifted from its position.
- Repeat above check in all other positions and correct adjustment of rod (13), if required.

Make sure selector positions are in line with numbers and letters on selector plate; if not, adjust plate as required.

**CAUTION:** Misadjustment of linkage may cause manual valve to direct part of oil under pressure to discharge, when positions [D], [2], [1], and [R] are selected, without driver being able to notice trouble. This will result in a sudden drop of hydraulic pressure, with possible clutch slippage and attendant clutch lining burning.



- P. Parking
- R. Reverse
- N. Neutral
- D. Drive range
- 1. Drive range (high gear excluded)
- 2. Low gear (holding in low)



- A. Selector lever upper handle
- B. Lower handle to be raised for shifting [P-R], [R-P], [N-R], [D-N], [2-1]
- C. Gear indicator.

# Gearshift Linkage

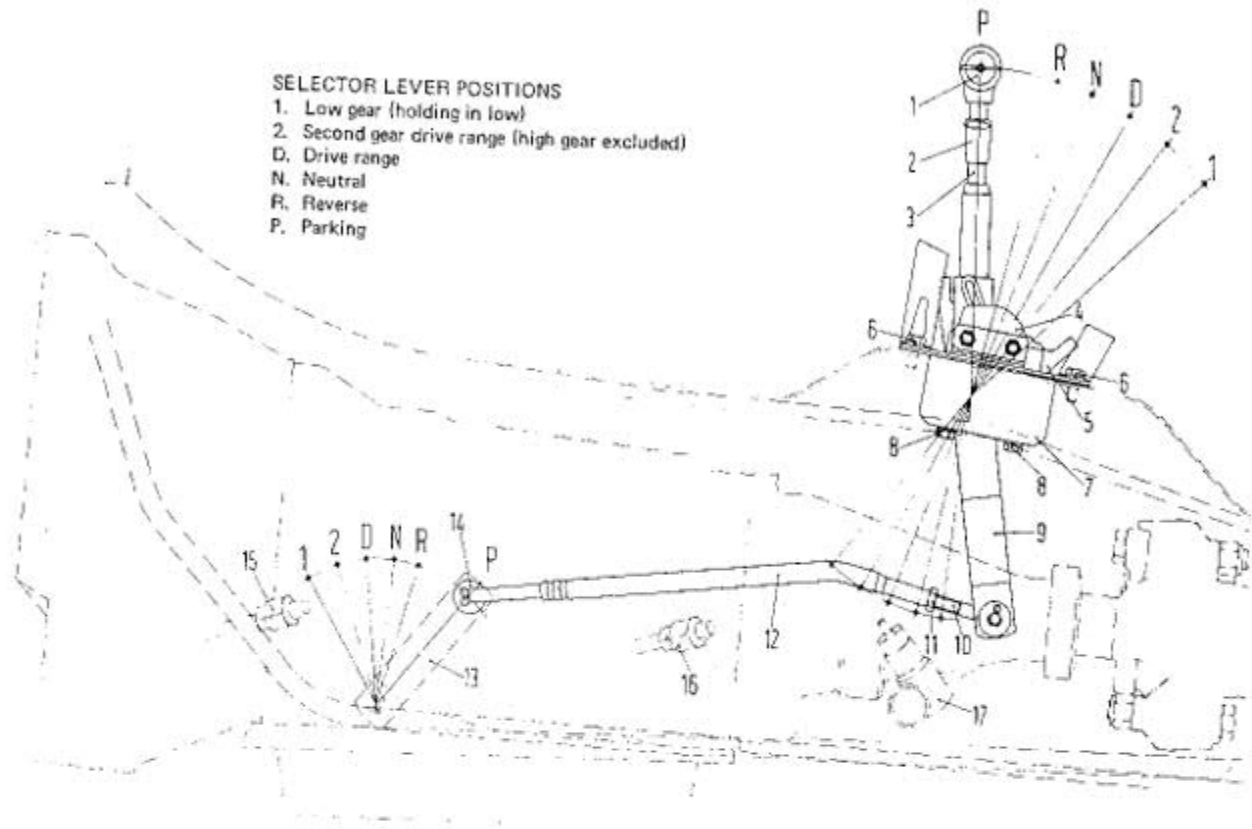
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## AUTOMATIC TRANSMISSION LINKAGE

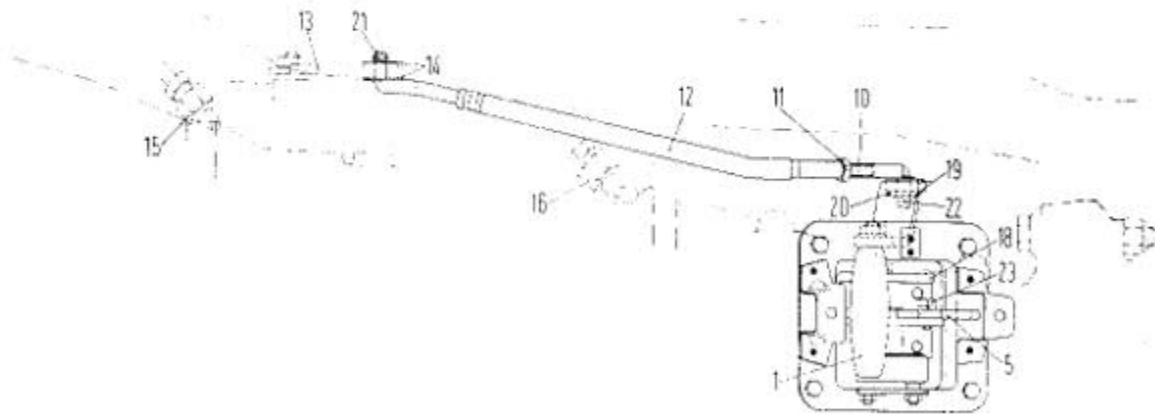
### SELECTOR LEVER POSITIONS

- 1. Low gear (holding in low)
- 2. Second gear drive range (high gear excluded)
- D. Drive range
- N. Neutral
- R. Reverse
- P. Parking



## SELECTOR VALVE CONTROL AND PARKING LOCK LINKAGE

- |                 |                 |                            |                               |                  |                                 |             |
|-----------------|-----------------|----------------------------|-------------------------------|------------------|---------------------------------|-------------|
| 1. Upper handle | 2. Lower handle | 3. Selector lever          | 4. Starter inhibitor switch   | 5. Gear selector | 6. Bolt                         | 7. Support  |
| 8. Bracket bolt | 9. Relay lever  | 10. Tie rod adjustable end | 11. Adjusting nut             | 12. Tie rod      | 13. Cross shaft actuating lever |             |
| 14. Flat washer | 15. Oil union   | 16. Oil union              | 17. Speedometer drive support | 18. Bracket      | 19. Flat washer                 | 20. Bushing |
| 21. Cotter pin  | 22. Cotter pin  | 23. Gear selector bolt     |                               |                  |                                 |             |





**NOTE:** Number given in parentheses is Kent-Moore catalogue number.

A.70159 (J28103) Remover and installer, snap ring and spring washer



A.70256 (J23084) Ring for installing third clutch piston



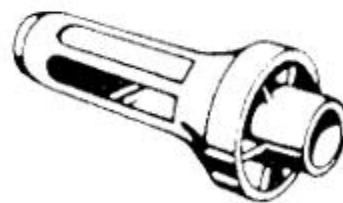
A.70263/2 (J23075-10) Holding brackets for tool 23075



A.70350 (J28117) Remover and installer, snap ring and spring washer



A.21359 (J23159) Converter housing seal installer



A.21424-9 (J21424-9) Extension housing bushing installer



A.21426 (J21426) Extension housing oil seal installer



21465-17 (J21465-17) Remover and installer, converter housing bushing



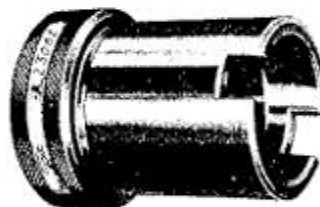
23075 (J23075) Spring compressor



A.70255 (J23080-A) Second clutch piston seal installer



23082 (J23082-01) Converter housing to oil pump aligning tool



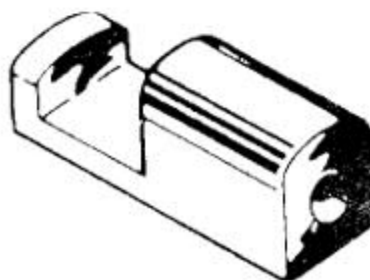
23085 (J23085) Oil pump hub to second clutch gauging tool



23100 (J23100) Vacuum modulator wrench



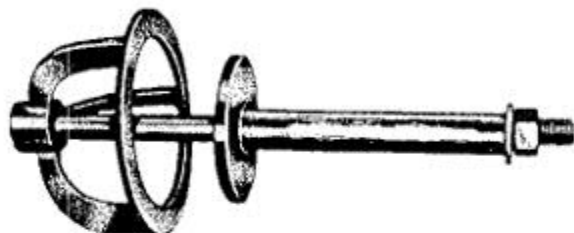
23129 (J23129) Converter housing seal remover



23130 (J23130) Bushing service tool set



70250 (J23078) Clutch spring compressor  
(J2590-02, 03, 04, 05 can be used)



328920 (J3289-20) Holding fixture base  
A 876302 (J8763-02) Transmission holding fixture



33872 (J3387-2) Aligning pins



5907 (J5907) Pressure gauge set

