DE LOREAN WORKSHOP MANUAL

Part No. 113096

Issued by:

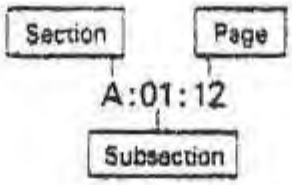
Technical Publications Department
De Lorean Motor Cars (1982) Ltd.
Dunmurry Industrial Estate
DUNMURRY, Co. Antrim
N. Ireland, BT17 9JJ

FOREWORD

Every possible care is taken during the manufacture of De Lorean cars to ensure they leave the factory capable of giving many miles of trouble free motoring. Proper servicing is absolutely essential if satisfactory performance is to be maintained.

Indexing System

The various units and systems of the vehicles are dealt with in sections designated by a letter. This is further divided into subsections which are identified by a number and a page number within the subsections.



Each section opens with a contents and index page so that any particular operation may be easily referred to.

General Data

Comprehensive information regarding dimensions tolerances and weights are given at the beginning of the manual and at the start of each section. Dimensions are given in both metric and imperial units.

SERVICE ORGANISATION

In order to provide the best possible service for owners, the dealer organisation throughout the world form a link between the owner and factory. All problems related to the servicing and repair of cars are dealt with through that organisation.

Dealers have the backing of the National Distributor and the factory Service Department.

Any communication relating to a De Lorean car should state the Vehicle Identification Number (VIN) which can be found by looking through the driver's side of the windshield, or on the driver's side door shut.

DE LOREAN GENUINE PARTS

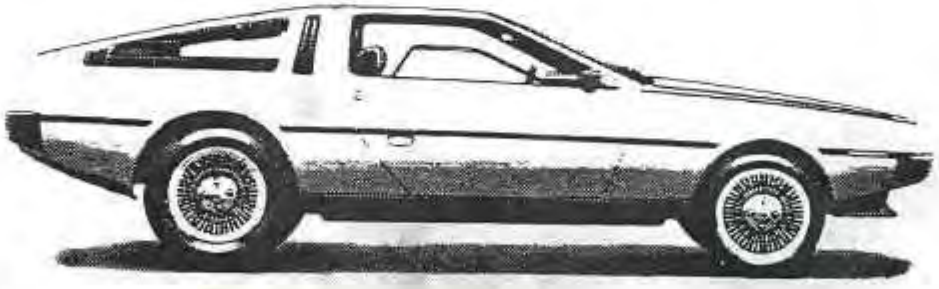
De Lorean genuine parts are identical to the high quality factory parts installed in new De Lorean cars.

DE LOREAN SPECIAL TOOLS

Certain service operations are made easier by the use of specially designed tools manufactured by Kent Moore Ltd.

These tools are essential to achieve the Flat Rate (Man Hour Schedule) Times approved by the factory.

The use of the tools is described under the appropriate sections and the relevant tools are listed at the beginning of each section.



GENERAL SAFETY HINTS

1. Use the correct spanner or driver for all fastening. When fitting new fastenings ensure the thread size is correct. Metric fastenings are predominantly, but not exclusively used.
2. Never walk under a car unless it is properly supported by stands.
3. Make sure jacks or stands are positioned safely and where they will not cause damage to the car.
4. Always disconnect the battery before working on electrical components or wiring.
5. When working in the engine compartment or under the car make sure the engine cannot be started accidentally.
6. Keep hands and clothing clear of electrically operated fans even when the ignition is OFF
7. Take care not to inhale dust from brake pads — it contains asbestos which is a health hazard.
8. Treat gasoline (petrol) with great respect — avoid any sort of spark or flame. Do not start syphoning by mouth; drain fuel into a closed container.

LEGISLATION REQUIREMENTS

Most countries have stringent regulations governing the design and manufacture of cars, aimed mainly at maintaining standards of safety, noise and pollution. De Lorean cars conform to the homologation specifications required in the countries to which they are distributed.

Alterations to the car after purchase — by changing settings or adjustments, by addition of unapproved parts, or the fitting of unsuitable replacement parts — can result in deviation from the agreed specification. Such deviations can have legal consequences and you are therefore advised not to make alterations and to ensure that replacement parts are to the original specification.

SPECIFICATION CHANGES

The Company reserves the right to change the specification of the car from time to time without notice.

This is required in order to achieve the Company's objective for constant improvement. Before carrying out any repair refer to latest issue of the Service Bulletins, which are designed to advise any changes in specification or repair technique.

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General Data

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VEHICLE SPECIFICATION DATA

ENGINE

Number of cylinders	V6
Bore of cylinders	91 mm (3.58 in.)
Stroke of crankshaft	73 mm (2.87 in.)
Engine capacity	2849 cc (173.86 cu. in.)
Compression ratio	8.8 :1
Maximum power output	130 B.H.P. I.S.O. at 5,550 R.P.M. on 91 Octane Fuel (unleaded)
Maximum torque	208 Nm (153 ft. lbs.) at 2750 R.P.M.

COOLING SYSTEM

Type	Positive pressure closed system
Starts to open at	85° – 89°C (185° – 192°F)
Fully open at	100°C (212°F)
Circulation	Impellor type pump, thermostatically controlled
Fans	Electrically operated twin, thermostatically controlled

FUEL SYSTEM — FUEL INJECTION

Make Type	Bosch K Jetronic continuous injection
Pump	Electric — immersed in fuel tank
Fuel Filter	Paper with nylon gauze
Line Pressure	4.8 to 5.0 bar (70 to 72 lb./sq. in.)
Injectors open at	3.5 to 4.1 bar (51 to 59 lb./sq. in.)
Rest pressure	2.95 bar (42.77 lb./sq. in.)
Control pressure	4.9 bar (71.05 lb./sq. in.)
Minimum output	120 litres/hour, 32 U.S. gallons/hour

IGNITION SYSTEM

Type	Bosch (Electronic contactless)
Rotation of Distributor	Clockwise — viewed from top of rotor arm
Firing order	1–6–3–5–2–4
Ignition Timing	13° ± 2° B.T.D.C. at 750 ± 50 R.P.M.
Spark Advance — Vacuum	5 in. hg. = 3°
	10 in. hg. = 12°
	15 in. hg. = 20°

IGNITION SYSTEM (Contd.)

Spark Advance — Mechanical	1000 R.P.M. = 0°
	2000 R.P.M. = 10°
	3000 R.P.M. = 14°
	4000 R.P.M. = 20°

ELECTRICAL DATA

System	12 v A C Delco Freedom II
Battery	12 v 75 AH Maintenance free
Alternator	Ducellier 80 Amp output or Motorola 90 Amp output

AUTOMATIC TRANSMISSION — TYPE 4141

Ratios: 1st	2.40
2nd	1.48
3rd	1.00
Reverse	1.92

MANUAL TRANSMISSION — TYPE 369

Ratios: 1st	3.36
2nd	2.06
3rd	1.38
4th	1.06
5th	0.82
Reverse	3.18

WHEELS AND TYRES

Wheels type	Cast light alloy
Size: Front	14" × 6" (357 mm × 152 mm)
Rear	15" × 8" (381 mm × 203 mm)
Spare	15" × 4" (381 mm × 102 mm)
Tyres type	Goodyear NCT steel belted radial
Size: Front	195/60 HR 14
Rear	235/60 HT 15
Spare	T125/70 D 15

General Data

A:01:03

STEERING

Type	Rack and Pinion with adjustable collapsible column
Turning circle	13.20 meters (43 ft.)
Wheel turns (lock to lock)	2.4

STEERING GEOMETRY

Tow-In	3 mm (0.12) per wheel
Caster Angle	3½° to 4° Positive
Camber Angle	0° to ½° Negative (Non Adjustable)
King Pin Inclination	6° + ½° – 0° (Non Adjustable)

BRAKES

Type		Power assisted — Discs front and rear
Disc Diameter:	Front	254 mm (10 in.)
	Rear	275 mm (10½ in.)

SUSPENSION

Front	Unequal length upper and lower control arms, coil springs, telescopic shock absorbers and stabilizer bar.
Rear	Diagonal trailing radius arms with upper and lower links, coil springs with telescopic shock absorbers.

HEATING AND A/C

Orifice tube type electrically operated clutch recycling.

CHASSIS/BODY

Epoxy coated steel backbone chassis, reinforced glass fibre underbody, grade 304 stainless steel body panels.

ENGINE TUNING DATA

Idle Speed	775 R.P.M. ± 50 R.P.M.		
C.O. reading at 950 R.P.M.	1% ± 0.3%		
Valve clearance (cold):			
Inlet	0.10 – 0.15 mm (0.004" – 0.006")		
Exhaust	0.25 – 0.30 mm (0.010" – 0.012")		
Valve Timing		LH	RH
Inlet opens	B.T.D.C.	9°	7°
closes	A.B.D.C.	45°	43°
Exhaust opens	B.B.D.C.	45°	43°
closes	A.T.D.C.	9°	7°

SPARK PLUGS

Type	Bosch HR 6 DS
Gap	0.6 – 0.7 mm (0.024" – 0.028")
Torque	17 – 20 Nm (13 – 15 ft./lbs.)

DESCRIPTION	TORQUE	REMARKS
CHASSIS: Fuel Tank Cover Plate	16 lb. ft. – 22 Nm	
Fuel Tank Front	8 lb. ft. – 11 Nm	
Horn Bracket Attachment	8 lb. ft. – 11 Nm	
Radiator Mounting Bracket to Frame	16 lb. ft. – 22 Nm	
Horn to Bracket	8 lb. ft – 11 Nm	
Radiator Stay Bracket to Frame	3 lb. ft. – 5 Nm	
REAR SUSPENSION: Trailing Arm Bush Attachment	16 lb. ft. – 22 Nm	
Lower Link Both Ends	INNER – OUTER 60 lb. ft. – 42 lb. ft INNER – OUTER 80 Nm – 64 Nm	
Upper Link Both Ends	60 lb. ft. – 42 lb. ft 80 Nm – 64 Nm	
Trailing Arm Hub to Carrier	75 lb. ft. – 55 Nm	
Outer Drive Shaft to Hub	270 lb. ft. – 370 Nm	
Travelling Arm to Pivot Bush	42 lb. ft. – 64 Nm	
Shaft to Inner and Outer Drive Shafts	30 lb. ft. – 40 Nm	
Parking Brake Cable Bracket to Hub Carrier	5½ lb. ft. – 7 Nm	
Caliper – Hub Carrier	40 lb. ft. – 55 Nm	
Flex Brake Pipe Attachment	12 lb. ft. – 16 Nm	
Wheels	60 lb. ft. – 80 Nm	

DESCRIPTION	TORQUE	REMARKS
TRANSMISSION AND FINAL DRIVE: Drain and Fill Plugs	15 lb. ft. – 20 Nm	
Mounts 8 mm 10 mm	18 lb. ft. – 25 Nm 26 36	
TRANSMISSION SHIFT LINKAGE: Auto and Manual Relay Pivot Bolts	16 lb. ft. – 22 Nm	
FRONT SUSPENSION: Caliper to Mounting Bracket	55 lb. ft. – 75 Nm	
Dust Shield	20 lb. ft. – 28 Nm	
Front Disc to Hub	20 lb. ft. – 28 Nm	Assemble with Loctite 601
Stub Axle to Steering Knuckle	165 lb. ft. – 220 Nm	
Hub Bearing to Stub Shaft	145 lb. ft. – 190 Nm	
Upper Control Arm Pivot Bolt	60 lb. ft. – 80 Nm	
Lower Control Arm Pivot Bolt	60 lb. ft. – 80 Nm	
Shock Absorber (Upper)	20 lb. ft. – 28 Nm	
Shock Absorber (Lower)	60 lb. ft. – 80 Nm	
Stabilizer Bar – Lower Control Arm	INNER – OUTER INNER – OUTER 44 lb. ft. – 68 lb. ft. 60 Nm – 90 Nm	
Stabilizer Bar Pivot (on Chassis)	26 lb. ft. – 36 Nm	
Flex Brake Pipe Attachment	12 lb. ft. – 16 Nm	
Upper Ball Joint to Steering Knuckle	35 lb. ft. – 50 Nm	
Lower Ball Joint to Steering Knuckle	35 lb. ft. – 50 Nm	
Body to Chassis	23 lb. ft. – 35 Nm	
Fixing Bolts	23 lb. ft. – 35 Nm	

General Data

A:03:03

DESCRIPTION	TORQUE	REMARKS
ENGINE: Engine Mounts	18 lb. ft. – 25 Nm	
A/C Compressor Bracket to Engine	12 lb. ft. – 16 Nm	
Heat Shields to Exhaust Crossover	8 lb. ft. – 11 Nm	
Exhaust Crossover Pipe to Manifold	30 lb. ft. – 40 Nm	
'U' Bolt Catalyst to Muffler	11 lb. ft. – 15 Nm	
Muffler Support Bracket on Engine	16 lb. ft. – 22 Nm 22 lb. ft. – 30 Nm	
Muffler Rubber Mounts	8 lb. ft. – 11 Nm	
BRAKE LINES: "T" Connections to Frame	8 lb. ft. – 11 Nm 16 lb. ft. – 22 Nm	
Flex Pipe to Frame	12 lb. ft. – 16 Nm	
Line Union through Frame	12 lb. ft. – 16 Nm	
RADIATOR: Fan Cowl to Radiator	5 lb. ft. – 7 Nm 8 lb. ft. – 11 Nm	
STEERING UNITS: Lower Column to Universal Joint to Rack Pinion and Upper Column	16 lb. ft. – 22 Nm	
Tie Rod to Steering Knuckle	26 lb. ft. – 36 Nm	
Tie Rod to Lock Nut	48 lb. ft. – 65 Nm	
Steering Rack Assembly to Frame	18 lb. ft. – 24 Nm	

TORQUE FIGURES

ENGINE		
Cylinder Head Tightening New Cylinder Head Gasket. Torque tighten to 45 lb. ft. – 61 Nm. Slacken off, pre-tighten to 15 lb. ft. – 20 Nm and then Angular tighten 115°. Re-tighten Cylinder Head. Slacken off, pre-tighten to 15 lb. ft. – 20 Nm and then Angular tighten 115°. Tightening main bearing Cap Nuts: Pre-tighten to 20 lb. ft. – 27 Nm and then Angular tighten 75°.		
DESCRIPTION	**TORQUE**	**REMARKS**
Big End Cap Nuts	34 lb. ft. – 46 Nm	
Flywheel Fixing Bolts	42 lb. ft. – 58 Nm	With Loctite 601
Converter Driving Plate Bolts	49 lb. ft. – 66 Nm	With Loctite 601
Sump Fixing Bolts	11½ lb. ft. – 16 Nm	
Crankshaft Pulley Fixing	135 lb. ft. – 183 Nm	With Loctite 601
Oil Pump Sprocket Bolts	4 lb. ft. – 6 Nm	
Chain Tensioner Blade Bolts	11 lb. ft. – 15 Nm	
Timing Cover Fixing Bolts	11 lb. ft. – 15 Nm	Bottom bolts with Loctite 601
Camshaft Sprocket Fixing Bolts	55 lb. ft. – 75 Nm	
Camshaft Pulley Fixing Bolts	74 lb. ft. – 100 Nm	
Camshaft Sprocket Access Plug	22 lb. ft. – 30 Nm	
Inlet Manifold Fixing Bolts	9 lb. ft. – 14 Nm	
Taper Seat Spark Plug (No Washer)	14 lb. ft. – 18 Nm	

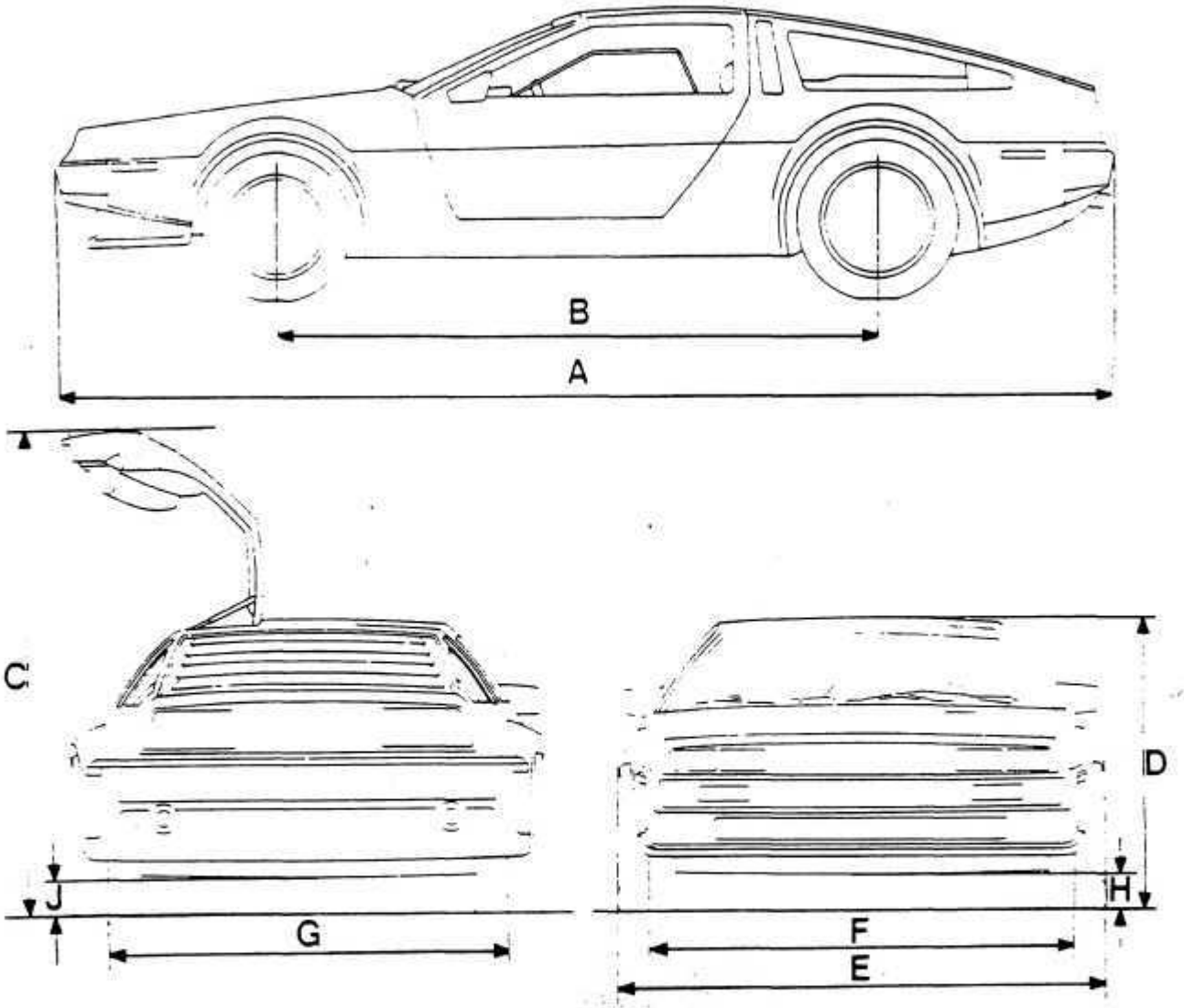
MANUAL TRANSMISSION

DESCRIPTION	TORQUE	REMARKS
Half Casing Bolts 8 mm	22½ lb. ft. – 31 Nm	
Diameter 10 mm	37 lb. ft. – 50 Nm	
Rear Cover Fixing Bolts 8 mm	18 lb. ft. – 25 Nm	
Diameter 10 mm	37 lb. ft. – 50 Nm	
Clutch Housing Fixing Bolts	37 lb. ft. – 50 Nm	
Reverse Gear Selector Bolts	26 lb. ft. – 35 Nm	
Crown Wheel Fixing Bolts	100 lb. ft. – 130 Nm	
Secondary Shaft Speedo Worm	105 lb. ft. – 135 Nm	
Bearing Plate Bolts	37 lb. ft. – 50 Nm	
Primary Shaft Nut	105 lb. ft. – 135 Nm	

AUTOMATIC TRANSMISSION

DESCRIPTION	TORQUE	REMARKS
Output Shaft (Planet Wheel Carrier) Nut	145 lb. ft. – 195 Nm	
Half Casing Assy. Bolts 8 mm Dia.	22½ lb. ft. – 31 Nm	
Half Casing Assy. Bolts 10mm Dia.	32 lb. ft. – 44 Nm	
Final Drive Pinion Nut	170 lb. ft. – 230 Nm	
F2 Brake Bolts	11 lb. ft. – 15 Nm	
Stator Support Fixing Bolts	24 lb. ft. – 33 Nm	
Converter Casing to Final Drive Casing Fixing Bolts	32 lb. ft. – 44 Nm	
Hydraulic Distributor Fixing Bolts	7½ lb. ft. – 10 Nm	
Crown Wheel Fixing Bolts	100 lb. ft. – 130 Nm	

DIMENSIONS — GENERAL



	Inches	Millimetres
A — Overall Length	166.00	4213
B — Wheel Base	95.00	2410
C — Height (Door Open)	77.20	1962
D — Height (Door Closed)	44.90	1140
E — Width	73.10	1856
F — Track — Front	62.60	1590
G — Track — Rear	62.80	1594
H — Ground Clearance — Front	5.60	142
J — Ground Clearance — Rear	6.10	155

RECOMMENDED LUBRICANTS, FLUIDS AND CAPACITIES

UNIT	CAPACITY			GRADE
	U.S. GALLONS	U.K. PINTS	LITRES	
ENGINE AND FILTER	1.72 1.78	11.4 11.8	6.5 6.75	15 W 40 20 W 40 ABOVE – 10°C (14°F) 20 W 50
				15 W 40 *10 W 30 BELOW – 10°C (14°F) 5 W 20
*THE USE OF 10 W 30 MULTI GRADE OIL IS NOT ADVISABLE UNLESS THE TEMPERATURE WARRANTS IT HOWEVER IF A 10 W 30 MULTI GRADE OIL IS USED TO ASSIST STARTING IN COLD WEATHER IT MAY REMAIN IN THE SUMP AS LONG AS THE TEMPERATURE DOES NOT RISE ABOVE – 10°C				
MANUAL GEARBOX (INCLUDES FINAL DRIVE)	0.97	6.5	3.7	TO MEET SPEC MIL – L 2105C OR API – GL5 *SAE 75W BELOW – 10°C (14°F) SAE 80W ABOVE – 10°C (14°F)
*WHERE SAE 75W OIL IS NOT AVAILABLE SAE 80W OIL MAY BE USED				
FINAL DRIVE AUTOMATIC	0.42	2.6	1.5	SAE 80W { MIL – L 2105C / API GL5
AUTOMATIC TRANSMISSION (CONVERTER)	1.57	10.5	6.0	ATF TYPE DEXTRON II ELF RENAULT MATIC D2 OR MOBIL ATE 220
BRAKE CIRCUIT		1.3	0.764	DOT 4
COOLING SYSTEM	2.9	19.37	11.0	ETHYLEN GLYCOL BASED (CONTAINING NO BORAX) MINIMUM 50 50 MIXTURE WITH WATER TO BE USED ALL YEAR ROUND AND REPLACED ANNUALLY
CLUTCH CIRCUIT		66	0.378	DOT 4
WINDSHIELD WASHER RESERVOIR		9	5.5	
AIR CONDITIONING REFRIGERANT OIL	2.50 POUNDS		1.40 GRAMMES	SUNISO 5GS OR TEXACO CARPELLA 'E' OR EQUIVALENT R-12 – FREON OR ARCTON
FUEL TANK	13.5	11.5 IMP GALLONS	51.6	91 OCTANE (UNLEADED)
WHEEL BEARINGS				SEALED FOR LIFE
STEERING RACK	0.3 U.S. PINT	.26	0.15	API SERVICE GL-5 (SAE – EP 90)

PRE-DELIVERY INSPECTION

After each operation has been completed tick corresponding box | ✓ |

VEHICLE INTERIOR

1 Check operation of instruments, controls, interior/exterior lights, horns, seat adjustment, window operation, electric door locks
2 Check wipers and washers, adjust as required
3 Check seat belts for condition and correct operation of mechanism and buckles
4 Check soft and hard trim for damage and attachment

VEHICLE EXTERIOR

5 Check and adjust tyre pressures including spare
6 Check wheel nut torque
7 Check alignment and adjust, if required, doors, hook and engine compartment lid and louvre
8 Check operation of hood and engine compartment lock
9 Check and adjust headlamps

UNDER HOOD

10 Check brake fluid
11 Check clutch fluid
12 Check windshield washer fluid
13 Check tool kit for completeness
14 Check luggage compartment light
15 Check carpet for fit and fastening

ENGINE COMPARTMENT

16 Check/Top up Engine oil
Cooling mixture and protection
Auto. transmission fluid
17 Check cooling system for leaks
18 Check fuel system for leaks
19 Check engine compartment light

ON HOIST

20 Check tyres for damage/specification
21 Check brake hoses/pipes for leaks, damage and chafing
22 Check gaiters of driveshafts for damage/leaks
23 Check steering/suspension linkages, ball joints and gaiters/boots for damage, and security
24 Check and top manual transmission oil and final drive oil (automatic)
25 Check exhaust for leaks/damage
26 Check coolant and fuel pipes for leaks/damage and chafing

ROAD OR ROLLER TEST

27 Check operation and function of engine drive performance
28 Operation of handbrake, foot brake, clutch, auto. transmission, kick down and shifting, steering, speedometer, heater and air conditioning
29 General check for squeaks and rattles

ON HOIST AFTER ROAD OR ROLLER TEST

Check and correct

30 Cooling system for leaks
31 Engine oil leaks
32 Transmission for leaks
33 Fuel system for leak
34 Brake system for leaks
35 Front Toe In
36 Rear Toe In
37 Clean exterior and interior

Work carried out by

Vehicle approved for delivery

Service Manager

DEALER CERTIFICATE

VIN No Stock No

PDI DATE MILES RO No

We hereby certify that this motor vehicle conforms to all applicable emission standards of the U S Environmental Protection Agency This certificate is being made upon the basis of

(1) our knowledge that the vehicle is covered by an EPA certificate of conformity based on written notification furnished by the manufacturer

(2) a visible inspection of emission control devices of portions thereof which are visible without removal or adjustment of any component or system of the vehicle Based on such inspection, there are no apparent deficiencies in the installation of such devices by the manufacturer ("emission control devices" is limited to all devices installed on a vehicle for the sole or primary purpose of controlling vehicle emissions and which were not in general use prior to 1968), and

performancy of all emission related preparation required by the manufacturer prior to the sale of the vehicle, as set forth in the applicable pre delivery service instructions provided by the manufacturer

vehicle fails an EPA approved emission test prior to the expiration of 6 months or 4,000 miles (whichever occurs first) from the date of sale at the time of delivery of the vehicle to the ultimate purchaser (company cars and demonstrators), and the vehicle has been maintained and used in accordance with the written instructions for proper maintenance and use then the vehicle manufacturer shall remedy the non conformity under the DMC emission performance warranty given to you

The dealer certification shall not be construed as either a representative or a warranty, express or complied, by the dealer that the emission control system or any part thereof is without defect or that the system will properly perform The emission performance warranty referred to above is solely that of the manufacturer

OWNER'S ACCEPTANCE CERTIFICATE

I have inspected the above vehicle and accept it without any visible damage and complete with owner's manual

owner's manual		vehicle/emission/battery	
maintenance schedule/record		tyres	
warranty statement/information		sound system	

SIGNATURE/DATE

DMC

DMC

DMC MAINTENANCE

DMC

[ ] FIRST SERVICE 1,200 MILES (1,920 KM)

[ ] ONCE A YEAR OR AT 7,500 MILES (12,000 KM)

TICK APPROPRIATE BOX [✓]

NAME ..... TEL NO .....

ADDRESS ..... REG NO .....

..... DEL DATE .....

MILEAGE ..... VIN NO .....

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
PREPARATION FOR WORK				
Fit seat, wing, steering and floor covers				
UNDERSIDE				
*Engine Drain and re-fill oil (without flushing)				
Oil Filter Replace				
Automatic Transmission Fluid Drain at 1,200 then every 15,000 miles				
Final Drive Drain at 1,200 then every 7,500 miles				
Manual Transmission Drain oil and refill				
Engine/Transmission Check leaks				
Steering Suspension Check play/leaks				
Drive Shafts Check play/leaks				
Gearbox/Sump/Timing Cover Check leaks				
Sump Tighten bolts				
Shock Absorbers Check mountings/leaks				
Brake Circuit Check leaks				
Check condition of flexible hoses				
Brake Pads/Disc Check wear/condition				
The following must be replaced or checked for condition every 45,000 miles (72,000 km)				
Brake Servo Filter				
Flexible Brake Hoses				
Brake Calipers				
and				
Master Cylinder Seals, Pistons, and complete units				
Replace brake fluid every 15,000 miles (24,000 km)				
Grease Ball Joints				
Fuel Lines Check condition/leaks				
Clutch Check hydraulic circuit for leaks				
ENGINE COMPARTMENT				
*Check and adjust driving belts				
Rocker Cover Check leaks				
Cooling System Check leaks/Top up if necessary Drain and refill system every 2 years or 15,000 miles				
Hoses Tighten clips				
Automatic Transmission Governor cable Check/Adjust if necessary				
*Exhaust System Check leaks and security				

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
ENGINE				
*Rocker Arm Clearance Adjust if necessary				
Inlet/Exhaust Manifolds Check bolt tightness (inc. clamps)				
Fuel System Check leaks/Chafing				
Oxygen Sensor Renew every 30,000 miles U.S. only				
Air Conditioning Check compressor mounting bolts				
Check pipe condition/leaks				
Check refrigerant level				
Accelerator Cable Check for full throttle opening Lubricate linkages				
*Air Filter Replace if necessary				
PERFORM THE FOLLOWING IGNITION CHECKS				
*Engine stopped, ignition on, check				
battery voltage				
cranking speed				
coil output				
coil input				
At idling speed, check				
initial timing				
centrifugal timing				
vacuum advance				
At 1,500 R.P.M., check				
coil polarity (primary side)				
spark plug firing voltage				
spark plug firing voltage (snap acc.)				
*Replace plugs if necessary				
maximum coil output (plug lead removed)				
secondary resistance				
condenser				
alternator diodes				
At 1,200 R.P.M., check				
power balance				
charging voltage				
At engine idle, check (if necessary set CO and HC levels)				
Refer to workshop manual emission setting				

TICK APPROPRIATE SERVICE REQUIRED	A	B	C	D
WHEELS AND TYRES				
Tyres Check pressures including spare				
Check cuts/damage on inside/outside walls				
Check tyres comply to manufacturer's specification				
Check and adjust wheel alignment if necessary				
Torque tighten wheel nuts				
Check/top up brake and clutch reservoirs				
ELECTRICAL				
Headlamps Check and adjust beam (dipped beam)				
Check light intensity				
Headlamp Flasher Check operation				
Reverse Lamps Check operation				
Parking/Side Lights Check operation				
Rear Number Plate Lights Check operation				
Stop Lights Check operation				
Indicators/Hazard Warning Lights Check operation				
Internal, Luggage and Engine Compartment Lights Check operation				
Fascia Illumination and Warning Lights Check operation				
Horns Check operation				
Windscreen Wiper Adjust sweep				
Windscreen Washer Adjust jet if necessary				
Electric Windows Check operation/Adjust if necessary				
Seat Belts Check condition/fixing security				

NOTE

*Only these emission control maintenance items are considered to be required Maintenance as defined by the California Air Resources Board (A.R.B.) regulations, the maximum maintenance an owner in California must perform to fulfill the minimum requirements of the emission warranty. All other emission maintenance items are recommended maintenance as defined by such regulation. DMC urges that all emission control items be performed.

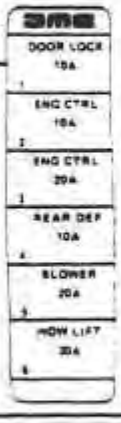
DURING THE COURSE OF SERVICING YOUR DE LOREAN CAR THE FOLLOWING REPAIRS HAVE BEEN NOTED AND REQUIRE ATTENTION

RECOMMENDED REPAIRS	URGENT	IMPORTANT

Service carried out by .....

LABEL IDENTIFICATION

1



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CAUTION
DO NOT INTERCHANGE MODULES
SEE HAND BOOK

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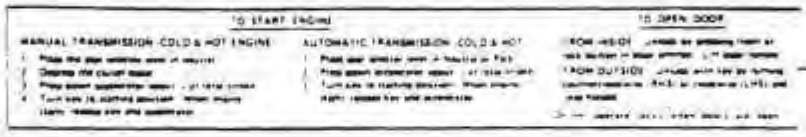

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DMC
DE LOREAN MOTOR CARS LTD
VEHICLE No
BELFAST - N IRELAND

3

IMPORTANT
THIS VEHICLE IS
NEGATIVE GROUND

11

ESSENCE SANS PLOMB SEULEMENT
UNLEADED GASOLINE ONLY

4

WARNING
BATTERIES PRODUCE EXPLOSIVE GASSES
KEEP SPARKS, FLAME, CIGARETTES
AWAY

12

WARNING. Clean filler cap before removing. Use only 'DOT 4' fluid from a sealed container.

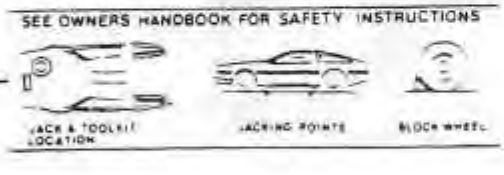
5

6

BATTERY ACCESS

13

7



14

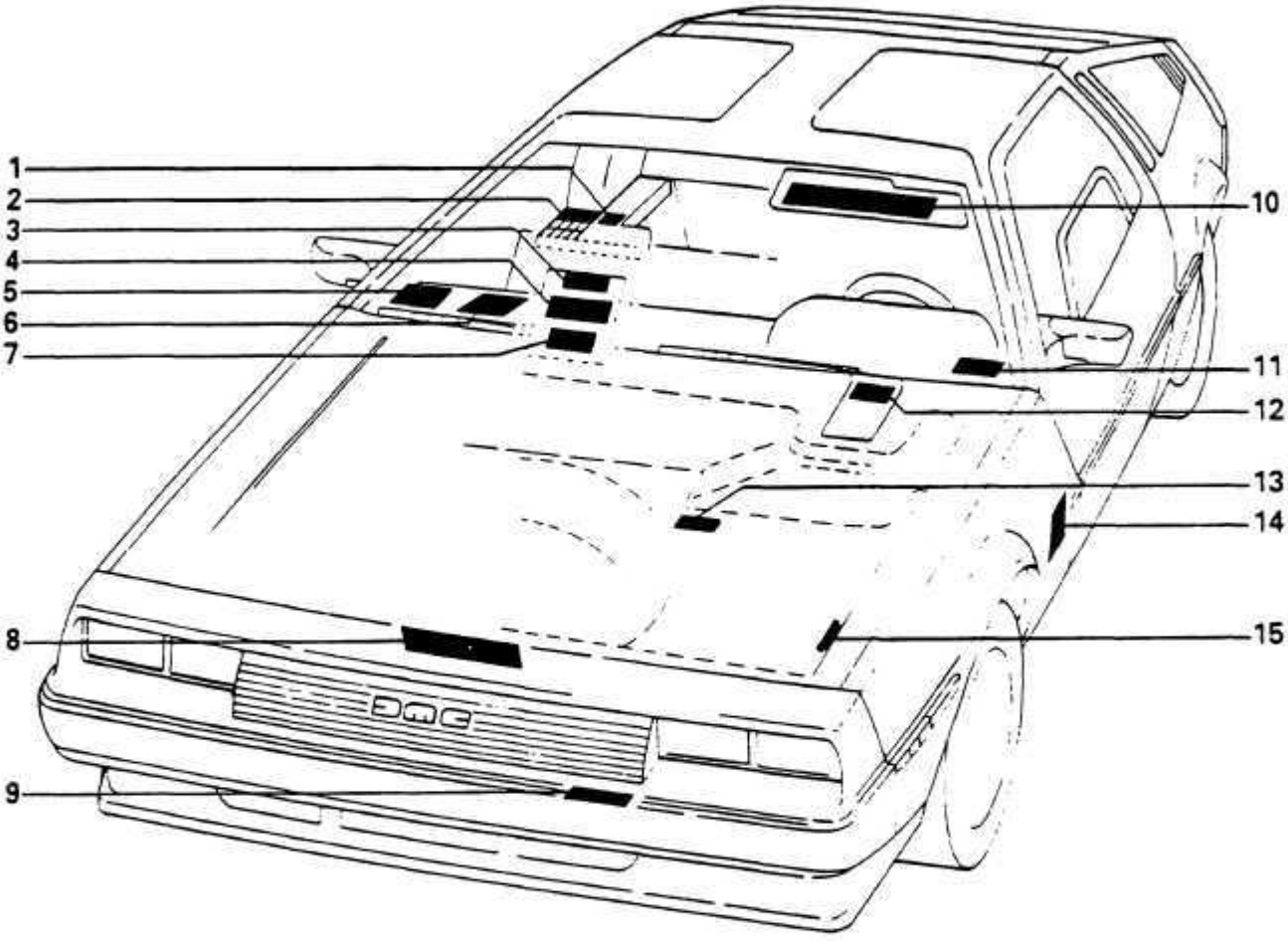
WINDSHIELD WASHER RESERVOIR
USE WATER OR DILUTED METHANOL
DO NOT FILL WITH OIL, GASOLINE, OR ANY OTHER OIL BASE MATERIAL

8

WARNING
RADIATOR FANS MAY START AT ANY TIME

General Data

A:08:03



LABEL IDENTIFICATION

DESCRIPTION	COUNTRY
1. – Not Yet Applicable	
2. – Electronic Module Warning Label	
3. – Negative Ground Label (Battery Compartment)	
4. – Battery Gas Warning Label	
5. – California Assembly Line Decal	USA
6. – Glove Box Placard	
7. – Battery Access Label	
8. – Jacking Instruction Label	
9. – Radiator Fan Warning Label	
10. – Engine Start and Operation Label	
11. – Vehicle Identification Number	
12. – Unleaded Gasoline Label	Canada/USA
13. – Brake Fluid Warning Label	
14. – Not Yet Applicable	
15. – Windshield Washer Reservoir Label	

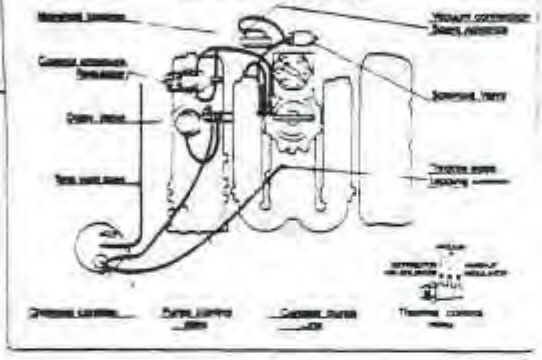
15

VEHICLE EMISSION CONTROL INFORMATION
THIS VEHICLE CONFORMS TO U.S.E.P.A. REGULATIONS APPLICABLE TO 1981 MODEL YEAR NEW MOTOR VEHICLES
CATALYST

16

DMC VACUUM HOSE ROUTING

ENGINE FAMILY BOLITA V6 · PB 3



21

VEHICLE CAPACITY WEIGHT	400 LBS
DESIGNATED SEATING CAPACITY	2
RECOMMENDED COLD TIRE INFLATION PRESSURE	FRONT 32 P.S.I. REAR 30 P.S.I. SPARE 60 P.S.I.
PRESSURES APPLY TO ALL VEHICLES LOADING CONDITIONS UP TO VEHICLE CAPACITY WEIGHT SHOWN ABOVE	
RECOMMENDED TIRE SIZES	
FRONT 195/60HR – 14	
REAR 225/60HR – 15	
SPARE T125/70D – 15	

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VEHICLE EMISSION CONTROL INFORMATION

DMC

23

VEHICLE EMISSION CONTROL INFORMATION UPDATE

DMC

DELOREAN MOTOR CO . LTD

17

MANUFACTURED BY
DE LOREAN MOTOR CARS LTD
MONTH AND YEAR OF MANUFACTURE
GROSS VEHICLE WEIGHT RATING 1471 KG
GROSS AXLE WEIGHT RATING FRONT 583 KG
REAR 888 KG
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE
V I N
PASSENGER CAR

MANUFACTURED BY
DE LOREAN MOTOR CARS LTD
MONTH AND YEAR OF MANUFACTURE
GROSS VEHICLE WEIGHT RATING 3244 LBS
GROSS AXLE WEIGHT RATING FRONT 1286 LBS
REAR 1958 LBS
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY AND BUMPER STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE
V I N
PASSENGER CAR

18

COMPLIANCE WITH RADIO INTERFERENCE REGULATIONS

IMPORTANT
THIS VEHICLE IS
NEGATIVE GROUND

24

JUMP LEAD STARTING

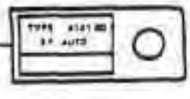
25

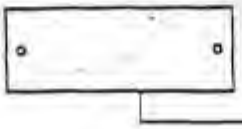
19

IMPORTANT. Use only FREON 12 or ARCTON 12 mixed with SUNISO 5GS or TEXACO CAPELLA as a refrigerant.
Recommended operating charge 2.50lbs of FREON 12 or ARCTON 12 mixed with 1.8 cu ins of SUNISO 5GS or TEXACO CAPELLA
Compressor manufactured by Sankyo, Isesaki, Japan.

26

20





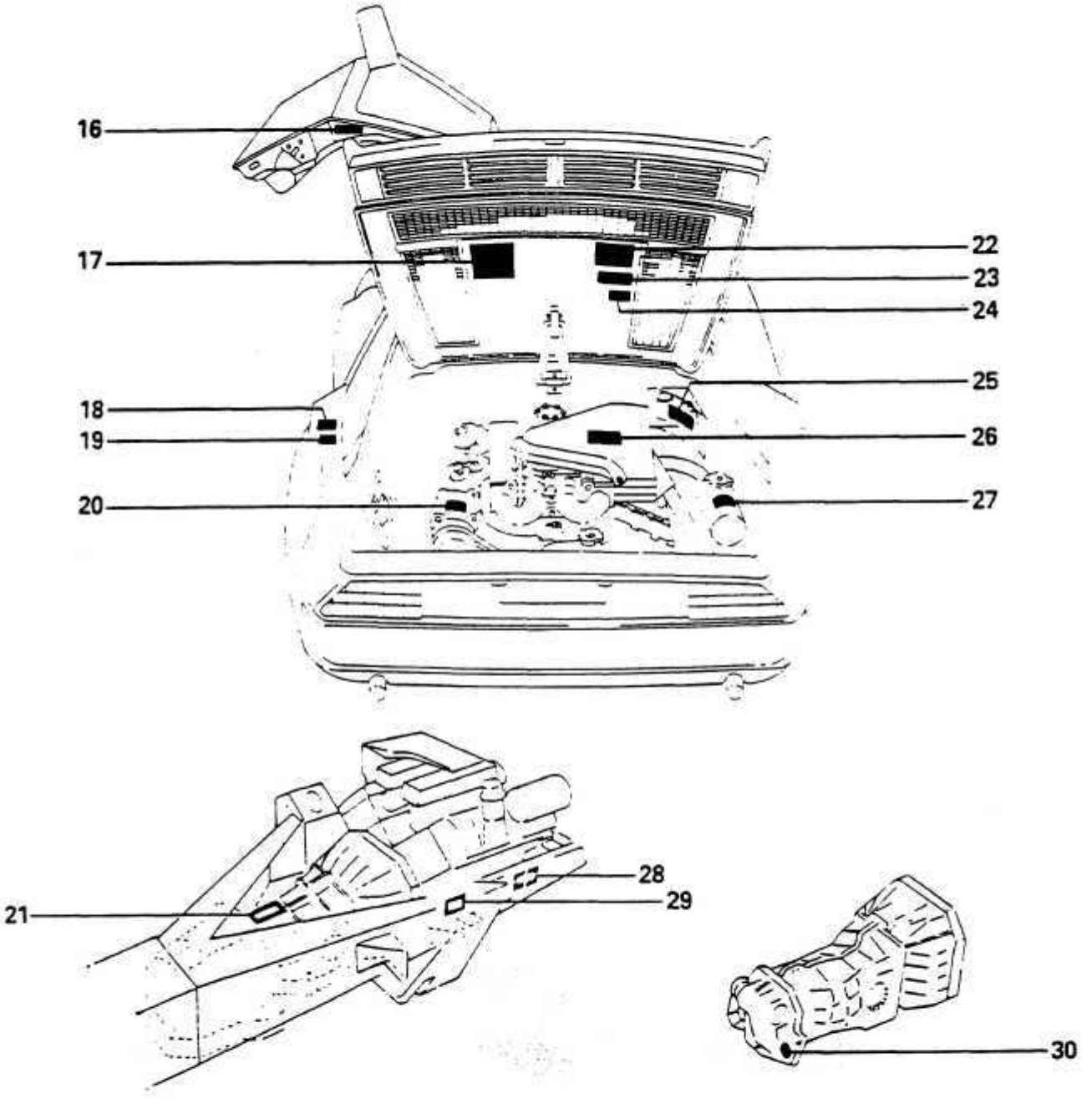
27

28

DANGER HOT WATER - REMOVE CAP SLOWLY
COOLANT FILLER TANK
Fill with 50% water 50% antifreeze containing corrosion inhibitor

29

30



DESCRIPTION	COUNTRY
16. – Catalyst Label	
17. – Vacuum Hose Routing	
18. – Federal Compliance Plate	Canada/USA
19. – Radio Interference Compliance Plate	Canada
20. – ACU Warning Label	
21. – Automatic Transmission Type/Number Plate	
22. – Vehicle Exhaust Emission Label	

DESCRIPTION	COUNTRY
23. – Emission Control Update Label	
24. – Negative Ground Label	
25. – Jump Start Label	
26. – Air Filter Element Label	
27. – Header Bottle Warning Label	
28. – Chassis Number	
29. – Engine Type/Number Plate	
30. – Manual Transmission Type/Number Plate	

Fuel Tank

Contents

Fuel Tank

B:01:01

REMOVING – REFITTING

IMPORTANT

Be acutely aware of the fire and explosion hazard, when working on fuel system. Take every precaution to ensure that sparks, cigarettes, open flames etc. are kept well away from the work area.

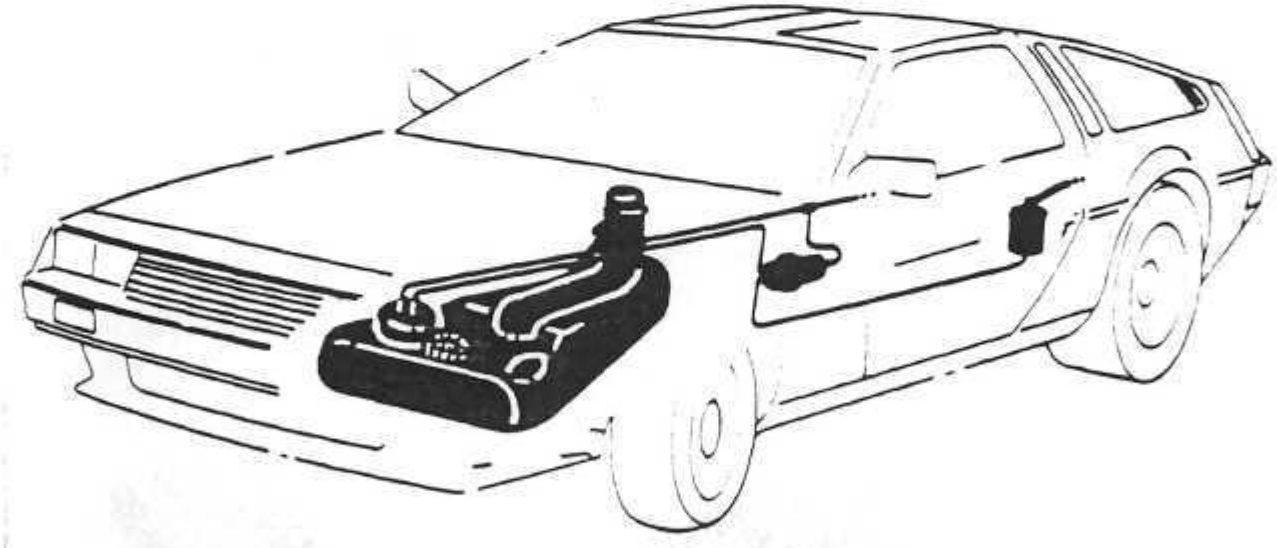


Fig. 1

B:01:02 Fuel Tank

REMOVING

This operation should only be attempted with the fuel tank empty. Use a syphon pump if necessary to transfer fuel into an appropriate container.

DISCONNECT BATTERY POSITIVE TERMINAL.

Remove access cover below spare wheel to gain access to fuel tank top.

Disconnect fuel supply and return pipes.

Disconnect electrical connections to fuel pump and fuel lever sensor unit. *Fig. 2*

Remove filler neck hose and breather hose from tank, and seal tank aperture.

Raise the car on a hoist.

Remove the bolts securing the protection plate (1) whilst providing alternative support for the tank. *Fig. 3*

Carefully withdraw tank downwards easing the tank between water pipes.

REFITTING

Before refitting a fuel tank examine the tank for any signs of damage or chaffing. Replace the tank if there is any doubt about its serviceability. Ensure the foam rubber protection strips are in place and in good condition (2). *Fig. 3*

Insert the tank from under the rear of the car, guiding it between the water pipes. Whilst supporting the tank, slide in the support protection plate and fit the bolts.

Refit the filler neck hose and breather hose

Re-connect electrical connections to fuel pump and fuel sender unit.

Re-connect fuel supply and return pipes.

Re-connect battery positive cable.

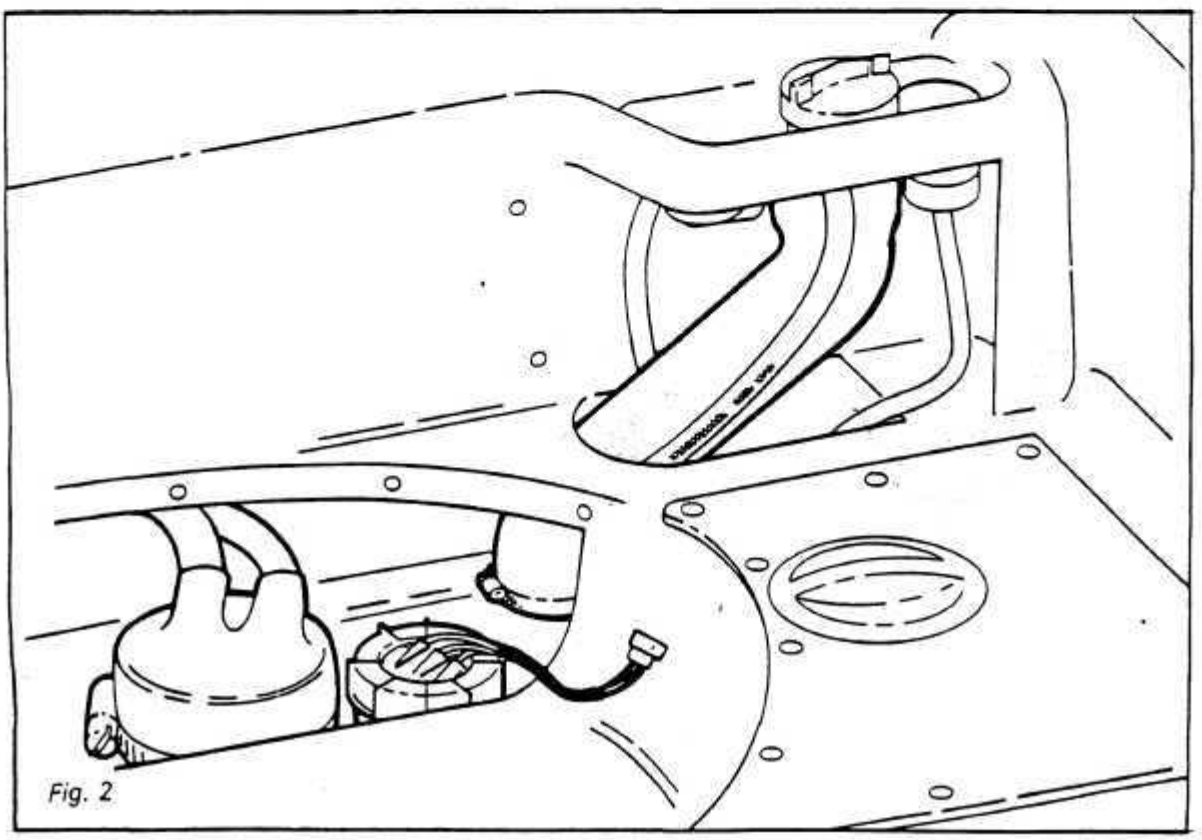


Fig. 2

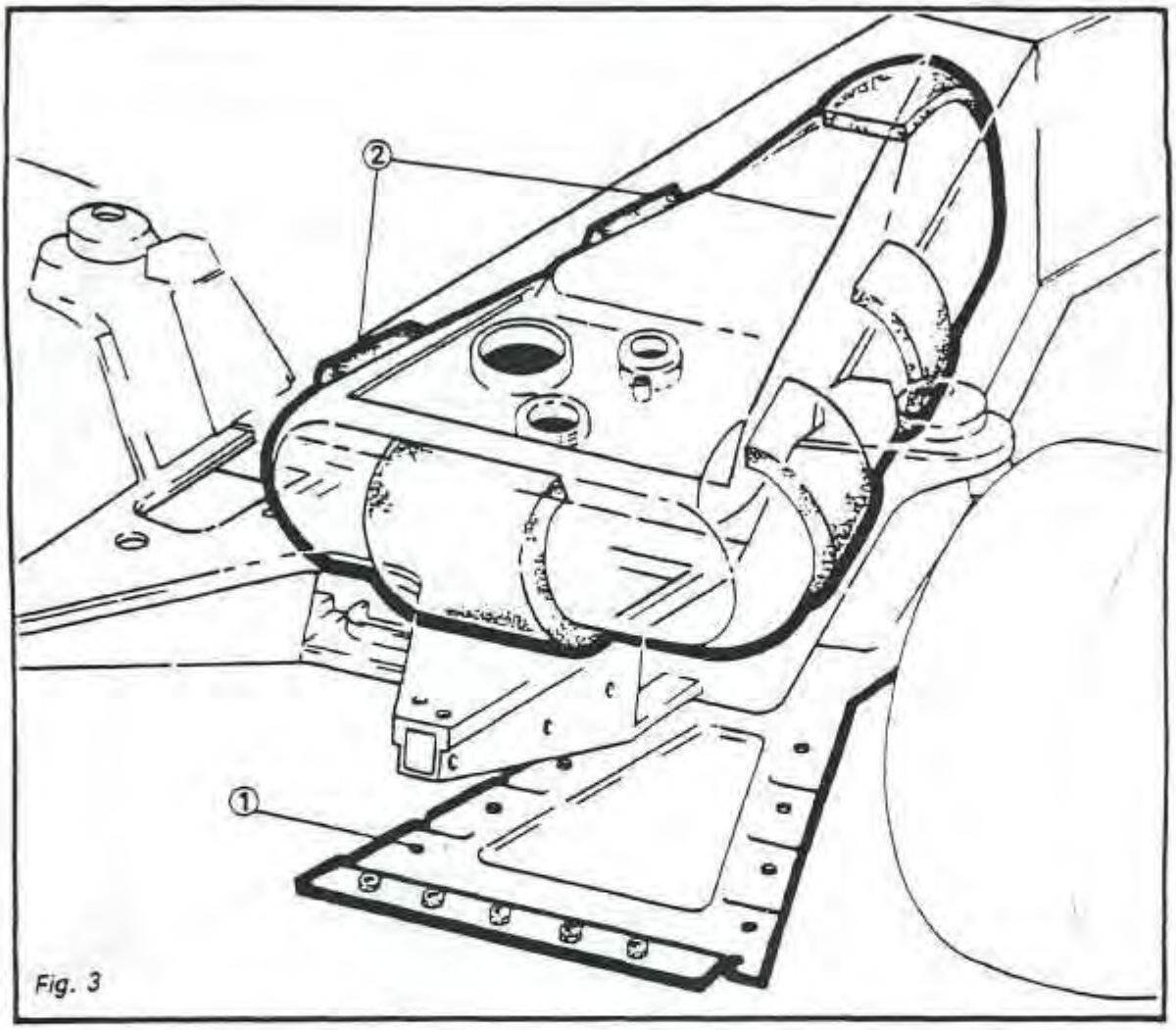
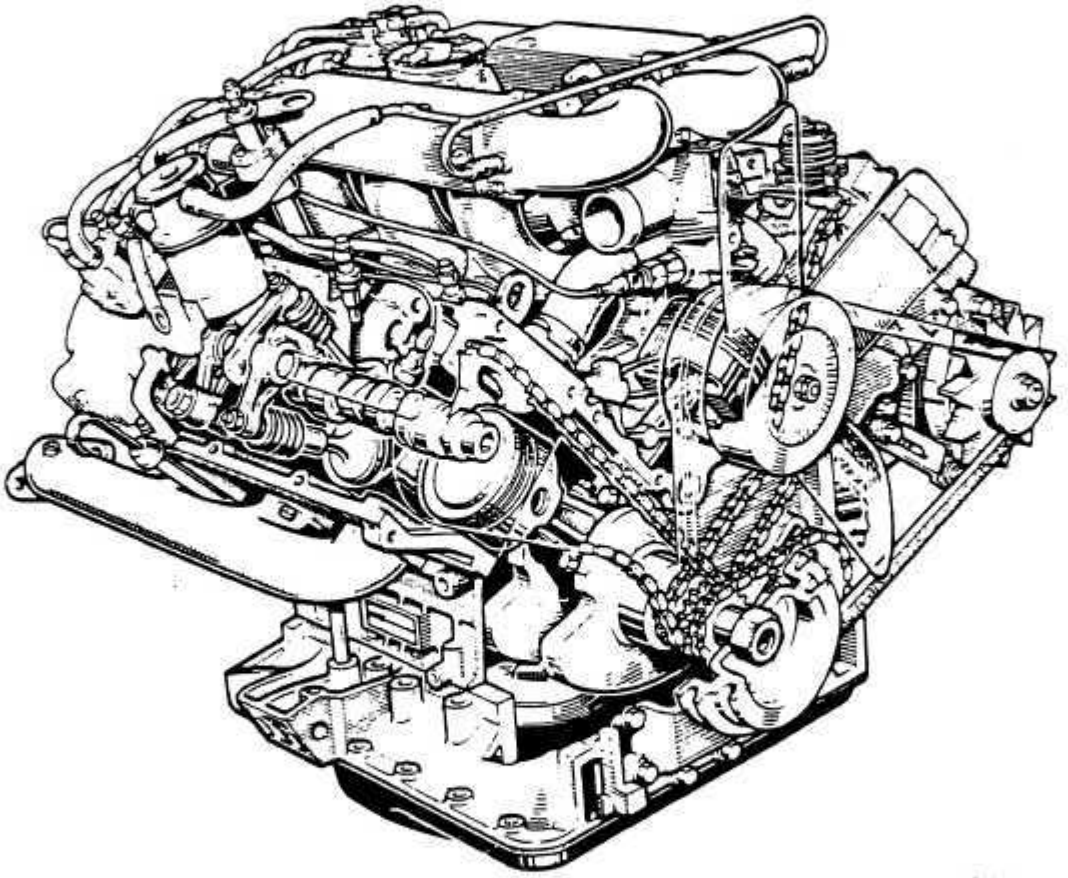


Fig. 3

Engine

CONTENTS

Specifications



Number of Cylinders	V6
Bore	91 mm (3.58 in)
Stroke	73 mm (2.87 in)
Engine Capacity	2849 cc (173.86 cu in)
Compression Ratio	8.8:1

Fig. 1

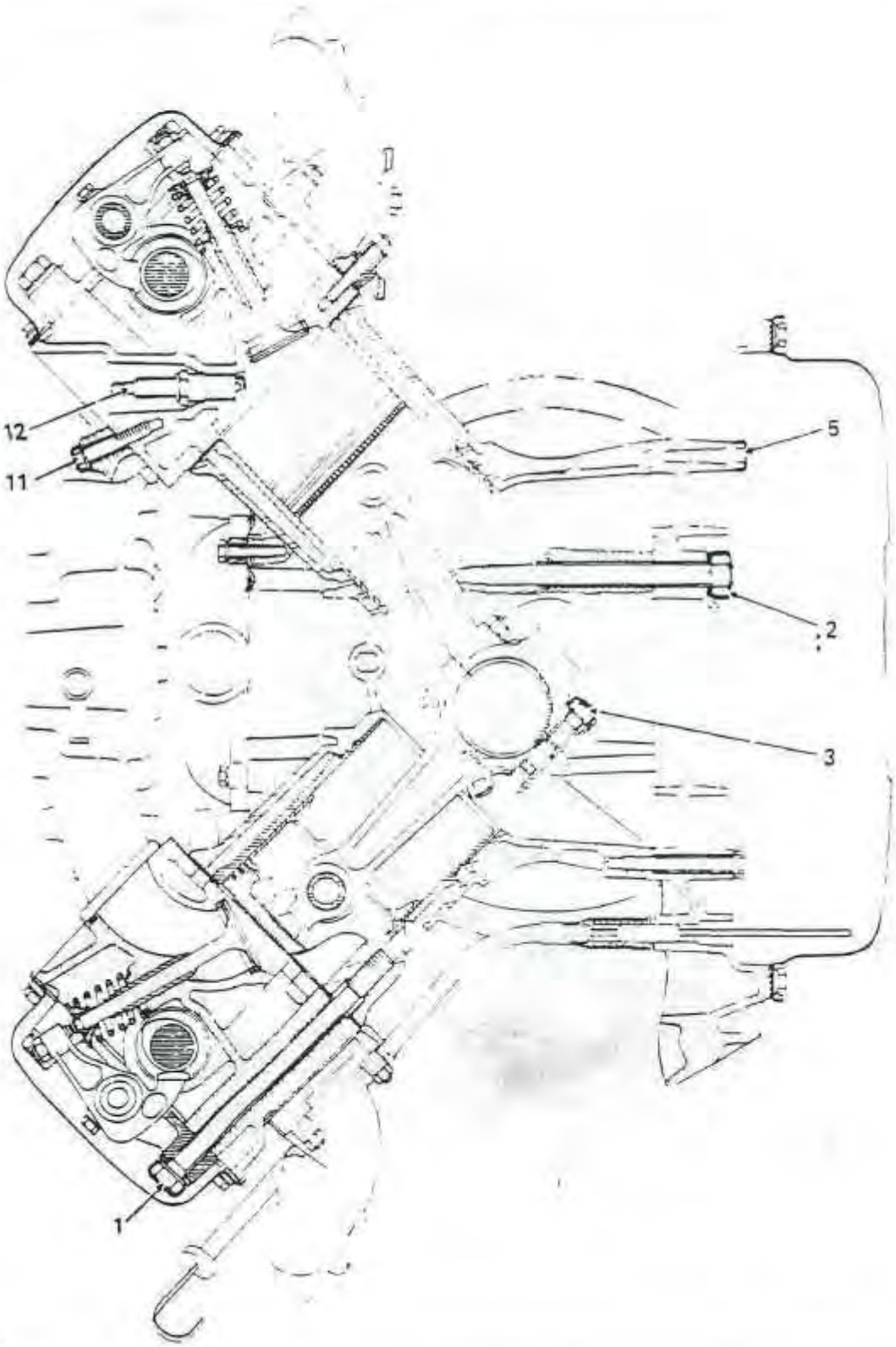


Fig. 2

TIGHTENING TORQUES—Figs. 3 and 4

NEW CYLINDER HEAD GASKET
Torque tighten to 45 lb ft (60 Nm) slacken off, pre-tighten to 15 lb ft (20 Nm) and then angular tighten 115° – (No. 1).

RETIGHTENING CYLINDER HEAD
Slacken off, pre-tighten to 15 lb ft (20 Nm) then angular tighten 115° – (No. 1).

TIGHTENING MAIN BEARING CAP NUTS
Pre-tighten to 20 lb ft (28 Nm) then angular tighten 75° – (No. 2).

No. 3	Big End Cap Nuts	35 lb ft (48 Nm)	
No. 4	Flywheel Fixing Bolts	45 lb ft (60 Nm)	With Loctite
No. 4	Converter Driving Plate Fixing Bolts	50 lb ft (68 Nm)	With Loctite
No. 5	Sump Fixing Bolts	11 lb ft (16 Nm)	
No. 6	Crankshaft Pulley Fixing Nut	135 lb ft (183 Nm)	With Loctite
	Oil Pump Sprocket Bolts	4 lb ft (6 Nm)	
No. 7	Chain Tensioner Blade Bolts	11 lb ft (15 Nm)	
No. 8	Timing Cover Fixing Bolts	11 lb ft (15 Nm)	Bottom Bolts with Loctite
No. 9	Camshaft Sprocket Fixing Bolts	60 lb ft (81 Nm)	
	Camshaft Stop Fixing Bolt	11 lb ft (15 Nm)	
No. 10	Camshaft Sprocket Access Plug	22 lb ft (30 Nm)	
No. 11	Inlet Manifold Fixing Bolts	11 lb ft (15 Nm)	
No. 12	Spark Plug	15 lb ft (20 Nm)	

CYLINDER HEADS
Rocker arm clearance adjustment
When cold (mm)
inlet 0.10 (.004")
exhaust 0.25 (.010")
Maximum bow of gasket face (mm) 0.05 (.002")
No resurfacing permitted.
Cylinder head height (mm) –
111.07 ± 0.15 (4.373" ± .006)

VALVE SEATS
Seat angle
inlet 30° ± 0.25
exhaust 30° ± 0.25

SEAT WIDTH (mm)
inlet 1.7 – 2.1 mm (0.067 – 0.0827 in)
exhaust 2.0 – 2.4 mm (0.0788 – 0.0945 in)

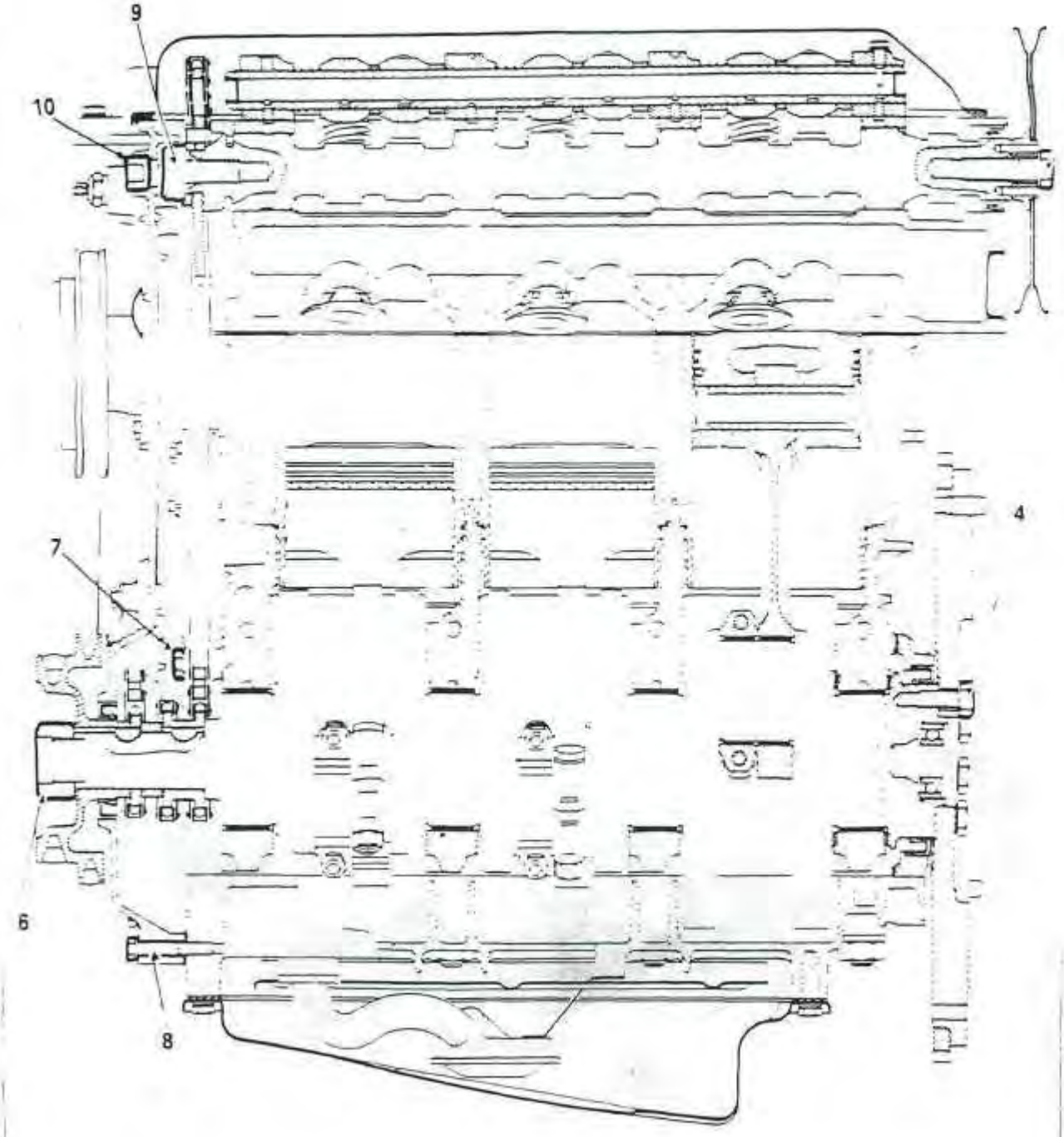


Fig. 3

VALVE GUIDES

Bore (mm) 8—8,022 (0.3150—0.3158 in)
External dia (mm)
nominal 13 mm (.512 in)
repair size
1st oversize 13.1 (.516 in)
2nd oversize 13.25 (.522 in)

Valve guide positions

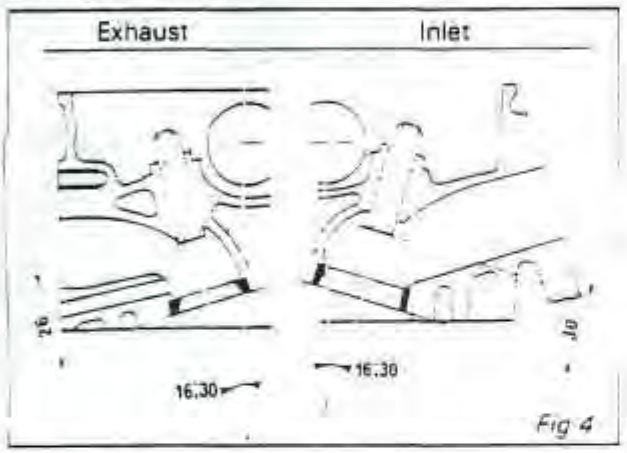


Fig 4

VALVES

Stem dia (mm)
Angle (included)
inlet 8 mm (0.315")
exhaust 8 mm (0.315")

VALVE SPRINGS

Inlet and Exhaust Valve Springs are identical.

Approx. free length (mm)	47.2 (1.858")
Length (mm) under load of	
56.3 lbs	40 (1.268")
124 lbs	32.2 (1.268")
Length Coil Touching Coil (mm)	30 (1.181")
Wire Diameter (mm)	4,2 (1,153")
Coil Internal Dia (mm)	21.4 (.842")

CAMSHAFT

Number of Bearings	4
End Play (mm)	0,07 to 0,14 (.003" to .0055")

VALVE TIMING

With tappets adjusted to a clearance of 0,7 mm (.028")

		LH	RH
Inlet Valve Opens	BTDC	9°	7°
Inlet Valve Closes	ABDC	45°	43°
Exhaust Valve Opens	BBDC	45°	43°
Exhaust Valve Closes	ATDC	9°	7°

CONNECTING RODS

Bearing Shell Material: Aluminium-Tin	
Side Clearance (mm)	0,20 to 0,38 (.008 to .015")

CRANKSHAFT

Number of Bearings	4
Main Bearing Shell Material: Aluminium-Tin	
End Play (mm)	0,07 to 0,27 (.003 to .010")
Thrust Washer Thickness (mm)	—2,30 —2,40 —2,45 —2,50 (—.0905 — .0944 — 0964 — 0984")
Roll-Hardened Main Bearing Journals:	
nominal diameter (mm)	70,062 (2.7583")
regrind diameter (mm)	69,762 (2.7465")
regrinding tolerance (mm)	0—0,019 (—.0007")

LINERS

Bore (mm)	91 mm (3.58 in)
Base Locating Diameter	93,48 (3.6803 in)
Liner Protrusion (mm)	0,16 to 0,23 (.006 to .009")
Liner Base Seal Thickness (mm)	
Blue Tag	0,087
White Tag	0,102
Red Tag	0,122
Yellow Tag	0,147

PISTONS

Gudgeon Pin Fitting: Press—fit in small end and free turning in piston.

FITTING DIRECTION:

Arrow Facing Timing Gear End.	
Gudgeon Pin Length (mm)	72 (2.8346")
Gudgeon Pin Dia (mm)	
External	23,5 (.9252")
Bore	15 (.5906")
3 Piston Rings, Thickness (mm)	
1 Top Ring	1,5 (.059")
1 Taper Compression Ring	2 (.079")
1 Oil Scraper	4 (.158")
Gap Measurement:	Supplied Pre-adjusted.

After regrinding, the roll-hardened zone should remain intact over the 140° sector.

The zones concerned are those marked "A" and "B".

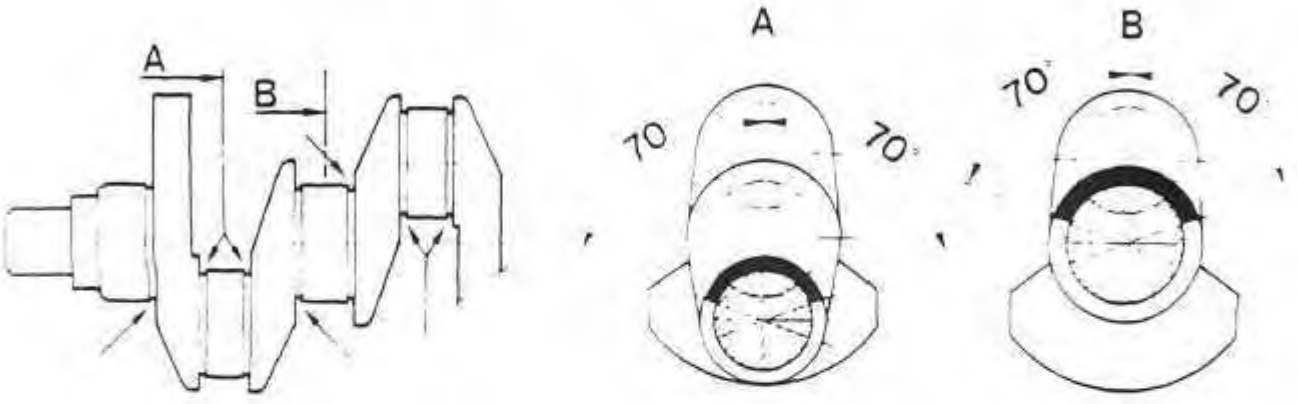


Fig. 5

OIL PUMP

Minimum oil pressure at 80°C

at 900 rpm (bar) 2,2 (32 psi)

at 4000 rpm (bar) 4,4 (64 psi)

CAMSHAFT

The camshafts differ: The R.H. camshaft has the distributor drive. *(Fig. 6)*

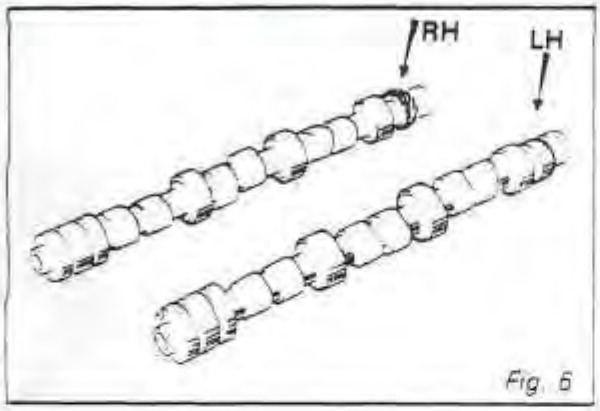


Fig. 6

CYLINDER HEAD GASKETS

The cylinder head gaskets differ: the L.H. head gasket has a large cut-out at one end. *(Fig. 7)*

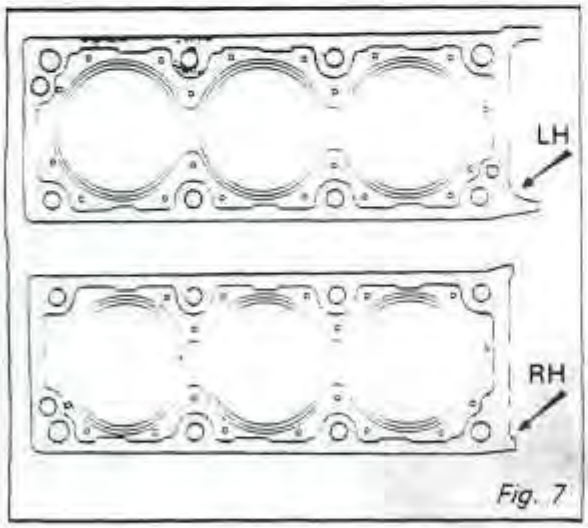


Fig. 7

CRANKSHAFT

The service crankshaft is not fitted with the clutch shaft spigot bearing. The spigot bearing must be inserted if the engine is mated to a manual gearbox. It is bonded in: smear the outside of the bearing with loctite. *(Fig. 8)*

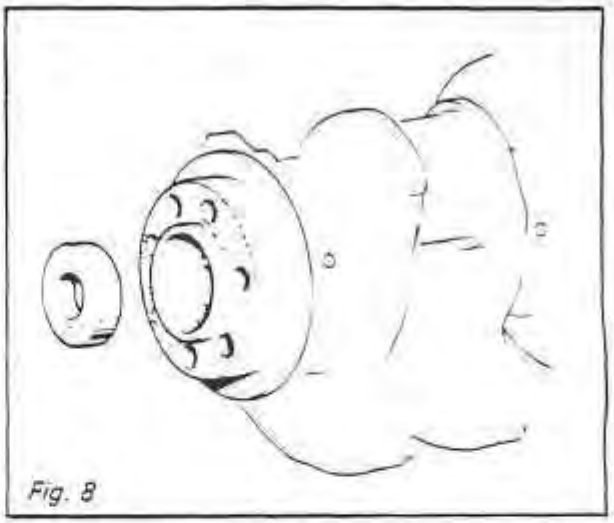


Fig. 8

Components which must be changed at each dismantling.

Flywheel fixing bolts.
Convertor driving plate fixing bolts.
Big-end cap nuts.

CYLINDER NUMBERING IN EACH BANK

The bank comprising cylinders 1, 2, and 3 is designated the L.H. bank or group and that for cylinders 4, 5, and 6 the R.H. bank or group. *Fig. 9*

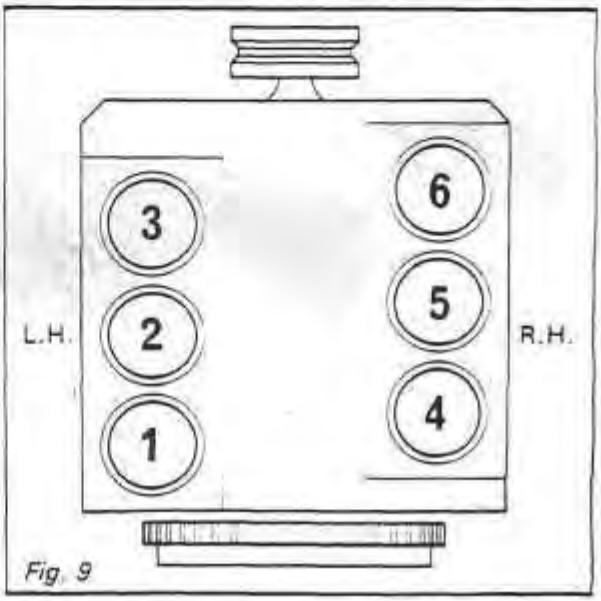


Fig. 9

Special Tools

Part No.	Description	Fig. No.
J.23907	PILOT BEARING PULLER	Not Illustrated
J.28847	DRAIN PLUG WRENCH	Not Illustrated
J.28851	ENGINE SUPPORT	Not Illustrated
J.28852	CYLINDER LINER CLAMPS (4)	Fig. 88
J.28853	MAIN BEARING RETAINING BLOCKS	Fig. 91
J.28854	PISTON PIN SERVICE SET	Fig. 71
J.28855	CYLINDER LEAD BREAKER BAR	Fig. 40
J.28856	CYLINDER LINER DEPTH GAUGE	Fig. 66
J.28857	ANGULAR TORQUE GAUGE	Fig. 38
J.28858	TIMING SPROCKET SUPPORT TOOL	Fig. 45
J.28859	FLYWHEEL LOCK	Not Illustrated
J.28860	REAR CRANKSHAFT PULLEY SEAL INSTALLER	Fig. 115
J.28861	FRONT CRANKSHAFT SEAL INSTALLER	Fig. 120
J.28872	OIL GAUGE	Fig. 129
J.28873	PIPE AND ADAPTOR FOR OIL GAUGE	Fig. 128

Engine/Gearbox

REMOVING

Disconnect battery.

Remove
rear louvre
engine compartment cover
air conditioning compressor drive belt
air conditioning compressor and set aside
air filter
ignition coil cover

Disconnect
rear light harness
coil lead
engine harnesses from their multi sockets

Remove
rear side markers and disconnect wiring harnesses

Remove
engine compartment lock and disconnect release cable

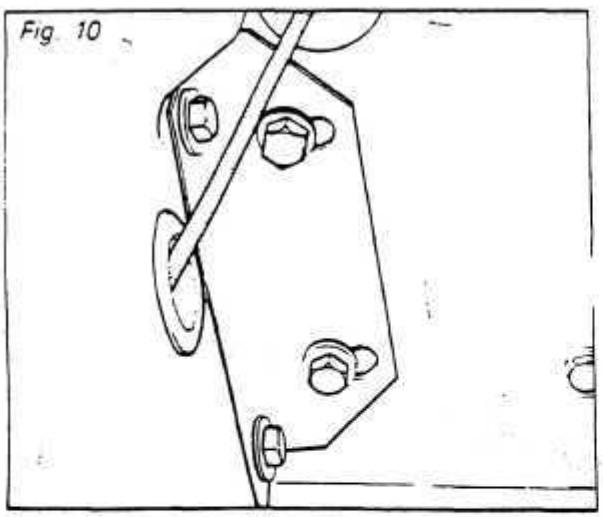


Fig. 10

Remove
rear fascia attachment bolts and remove fascia *(Figs. 10/11)*

Remove
exhaust muffler and heat shields
(See Section "D")

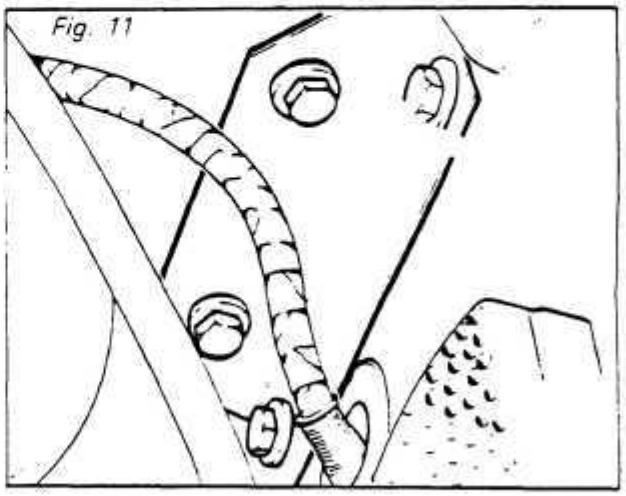


Fig. 11

Remove
chassis cross brace *(Fig. 12)*

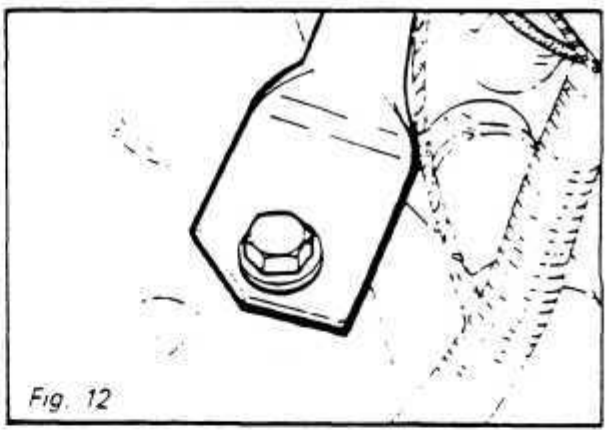


Fig. 12

Drain
coolant from cylinder block *(Fig 13)*
engine oil and transmission oil/ fluid if applicable

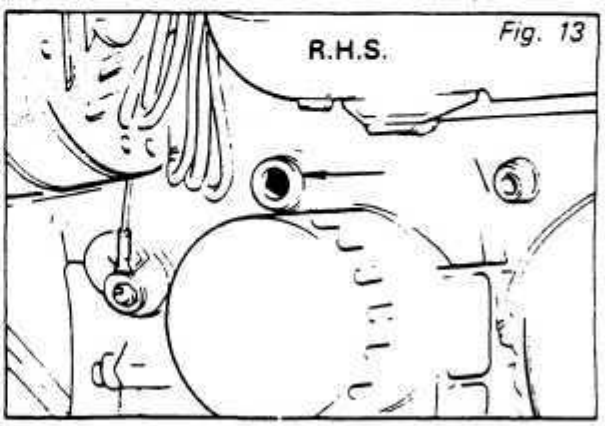
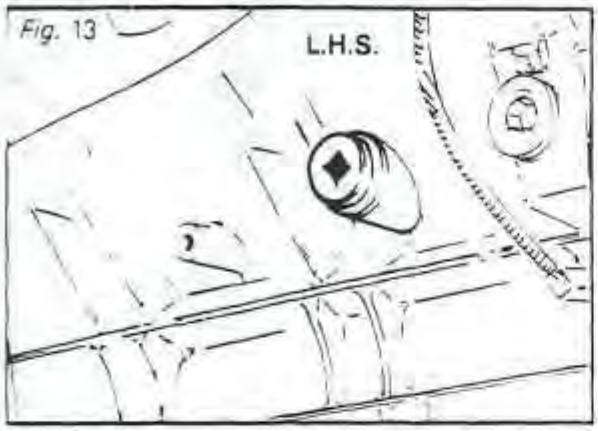
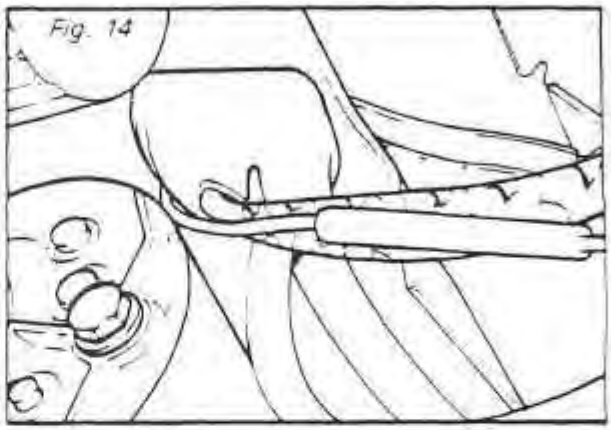
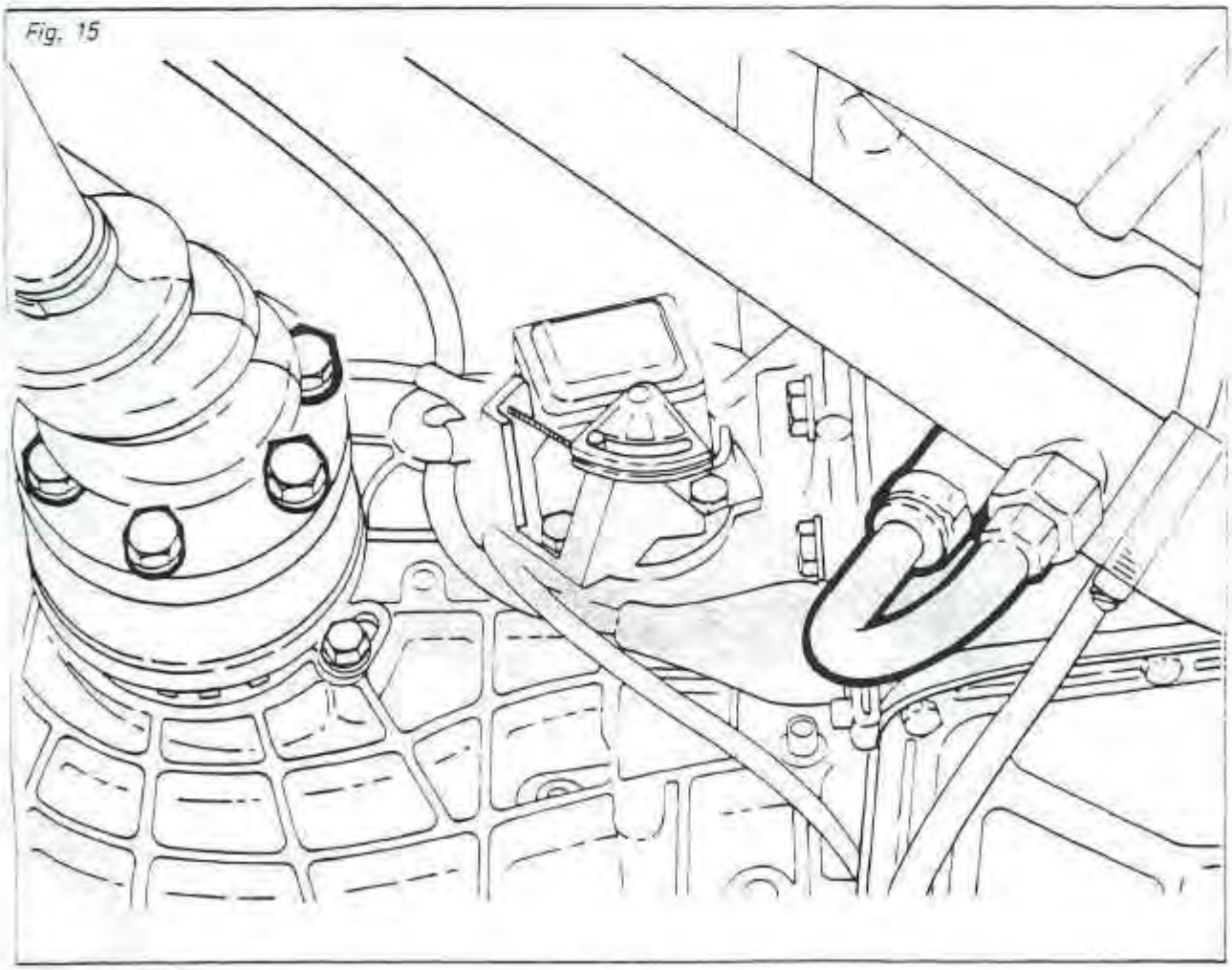


Fig. 13



Disconnect
heater hoses from control valve and cylinder head
heater bleed pipe from header tank
brake servo vacuum pipe
fuel feed to metering head
fuel return at bundy metal pipe connection
accelerator cable
starter positive cables (*Fig. 14*)
wiring harness at bulkhead (auto transmission only)





Remove
coolant hoses at engine

Remove
driveshaft retaining bolts
exhaust cross-over pipe *(Fig. 15)*

For automatic transmission disconnect oil cooler hoses at cooler end.

Disconnect gear change control (manual transmission).

For automatic transmission disconnect cable at relay lever.

Remove
gear box side mounting bolts *(Fig. 16)*
(R.H. illustrated)
Fit lifting sling to rings provided
(Figs. 17 & 18) (L.H.S.) *(Figs. 19 & 20)* (R.H.S.)
Take weight off engine and remove both mounting bolts. Pull engine forward and lift out. *(Fig. 21)* (L.H.S. illustrated)

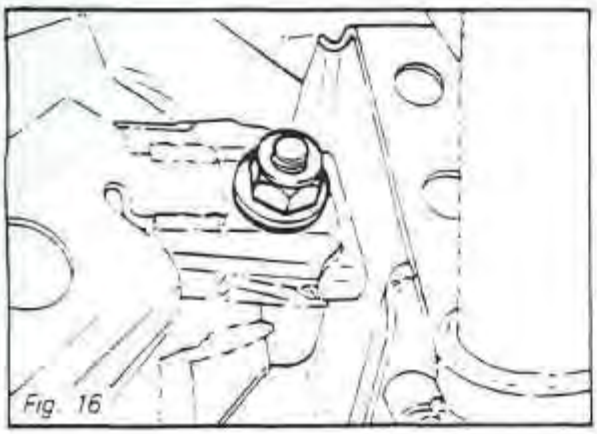


Fig. 16

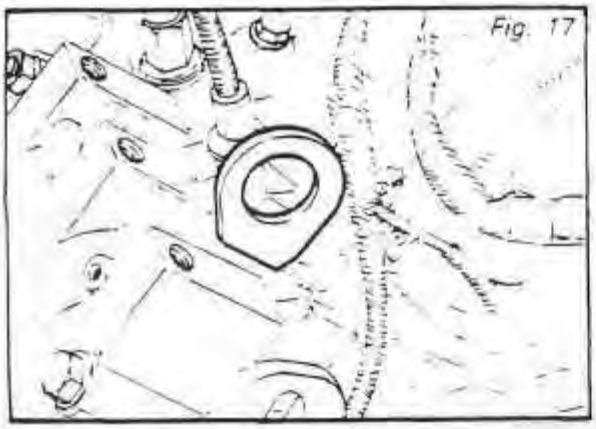


Fig. 17

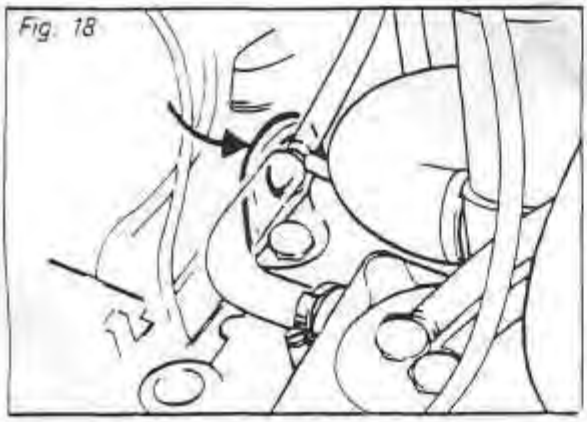


Fig. 18

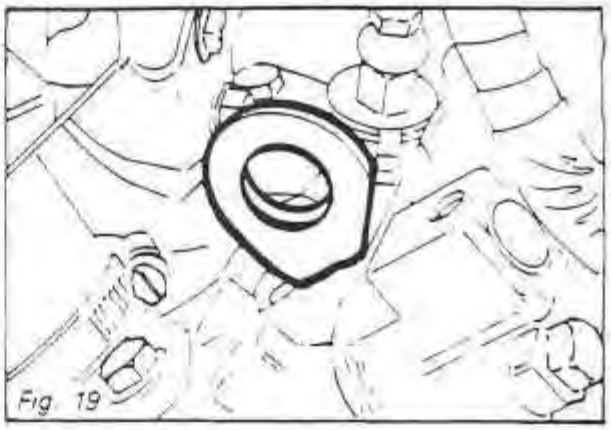


Fig. 19

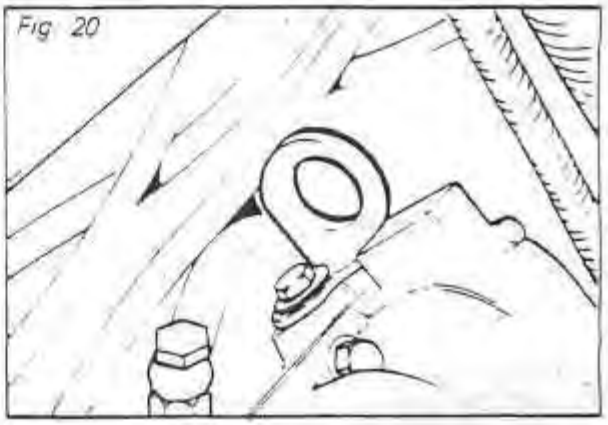


Fig. 20

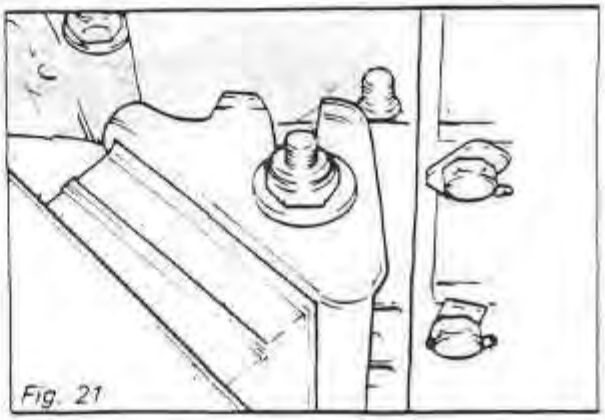


Fig. 21

Refitting is reverse of removal operation

SPECIAL POINTS CONCERNING REFITTING

Adjust the travel of the accelerator cable and gear change linkages.

For automatic transmission: adjust the governor cable travel and the selector cable travel.

CHECK:

Engine, gearbox or automatic oils and fill as necessary.
Fill and bleed cooling system.
Adjust all controls.

Cylinder Heads

RETIGHTENING—TIGHTENING
Before commencing the above operation, loosen the inlet manifold fixing bolts. Also the bolts securing the timing cover to the cylinder heads.

RETIGHTENING CYLINDER HEAD
This operation is to be carried out when the engine is cold (at least 2 hours after engine has stopped).

Cylinder heads should be retightened:

1. After a cylinder head has been replaced. Run engine until engine reaches normal operating temperature, i.e. when cooling fans have switched themselves on.
   After two hours, when engine is cold, repeat tightening procedure.

2. After a service exchange engine has been fitted. While engine is in its transit cradle (and easily accessible).

The vehicle need not return to workshop for cylinder head retightening when the above procedure is observed.

PRETIGHTENING—Fig. 22
Loosen bolt No. 1 and retorque tighten to 15 lb ft (20 Nm). Repeat the above on each bolt in the tightening sequence shown.

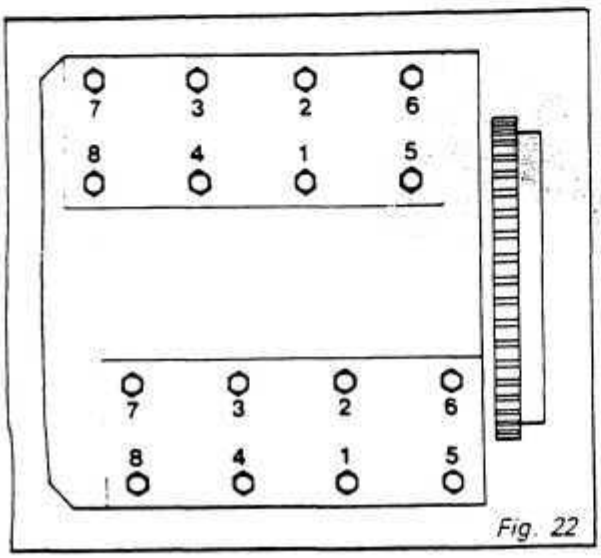
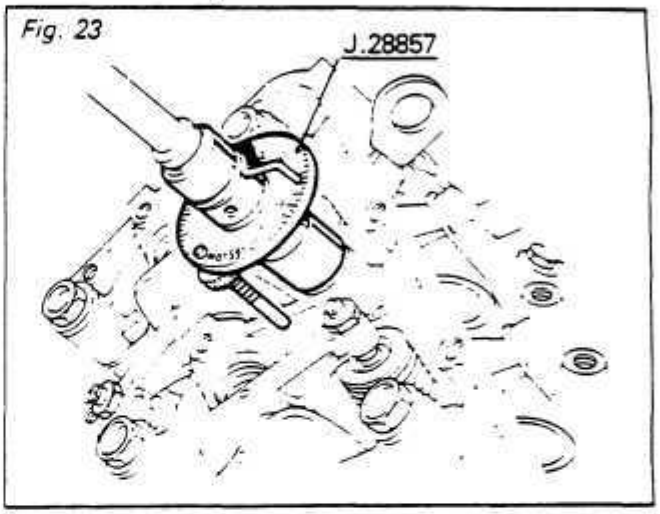


Fig. 22

ANGULAR TIGHTENING—Fig. 23
Slip graduated disc J.28857 over the socket before fitting the torque wrench J.28855. Turn the graduated disc clockwise until the locking stem rests against a solid object which will prevent the disc from turning.

Fig. 23



Adjust the moving pointer to angular tightening value 115°. Tighten bolt No. 1 until the moving pointer reaches "O". Repeat the above operation on each bolt in sequence shown. *(Fig 24)*

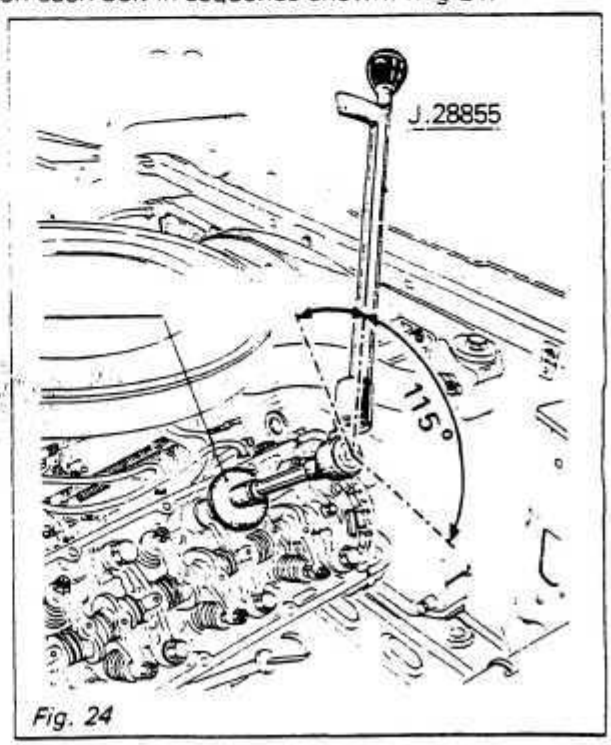


Fig. 24

TIGHTENING

This operation is carried out when the cylinder heads are fitted with new gaskets.

Pre-torque tighten all bolts to 15 lb/ft (20 Nm) then to 45 lb/ft (60 Nm) in the correct sequence to compress the head gaskets.

Loosen bolt No. 1 and retorque. Tighten it to 15 lb/ft (20 Nm).

Repeat the above on each bolt in the tightening sequence shown opposite.

Slip the graduated disc over the socket before fitting the torque wrench and lock it as previously.

Adjust the mobile pointer to angular tightening value 115°.

Tighten bolt No. 1 until the moving pointer reaches "0".

Repeat the above operation on each bolt in the sequence shown.

Then commence "retightening" operations after running the engine.

ADJUSTING ROCKER ARM CLEARANCES

Clearances with engine cold.
inlet: 0.10 (.004")
exhaust: 0.25 (.010")

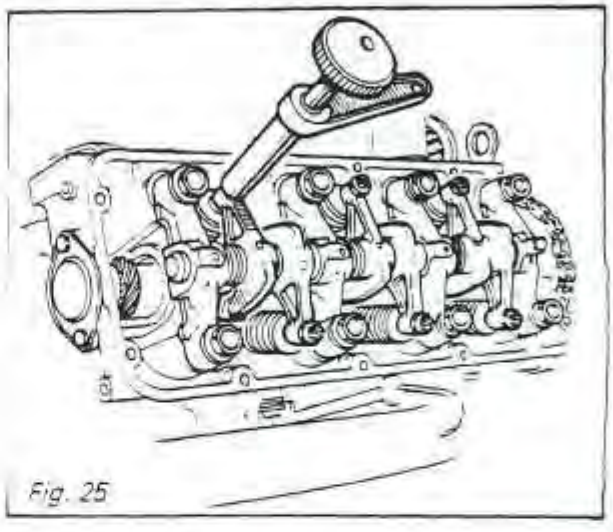
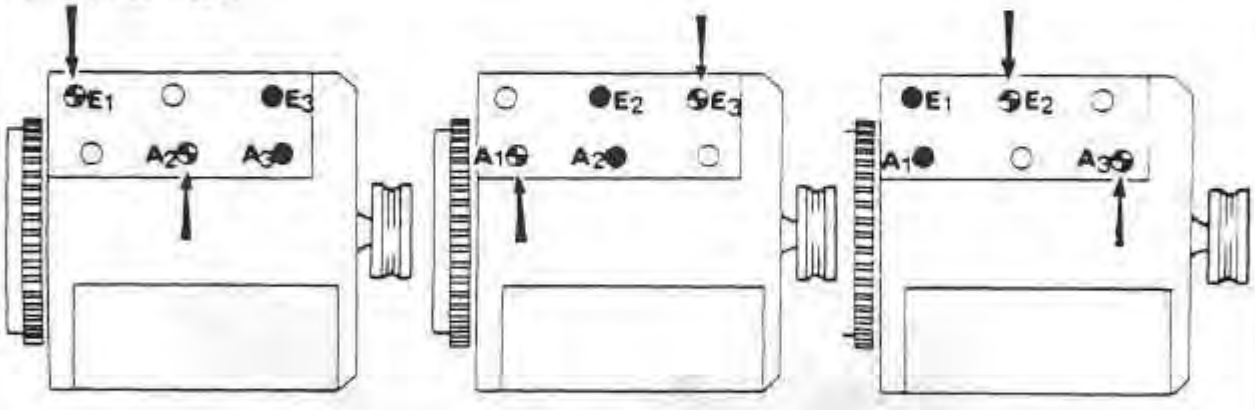


Fig. 25

FIRST METHOD

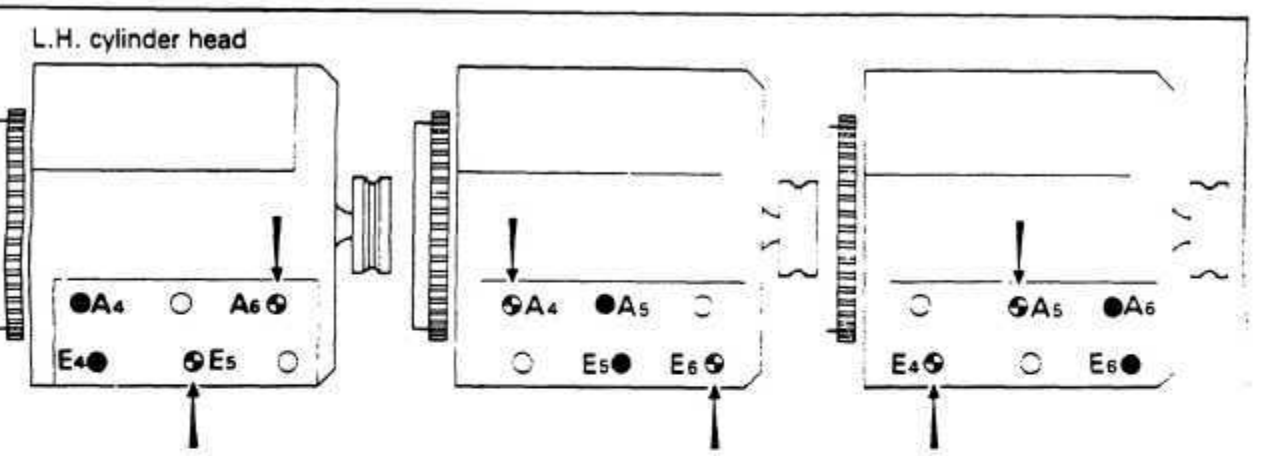
Adjust the rocker arms on each cylinder head in turn.

R.H. cylinder head.



● Rocker arms "on the rock"	◔ Rocker arms in position for adjustment	
	Inlet	Exhaust
I1 – E1	I3	E2
I2 – E2	I1	E3
I3 – E3	I2	E1

Fig. 26



● Rocker arms "on the rock"	◔ Rocker arms in position for adjustment	
	Inlet	Exhaust
I4 – E4	I6	E5
I5 – E5	I4	E6
I6 – E6	I5	E4

Fig. 27

SECOND METHOD

1. Set the piston in No. 1 cylinder to T.D.C. firing stroke, which corresponds to

   No. 5 cylinder rocker arms "on the rock"

   Timing mark on crankshaft pulley opposite pointer (O) on timing cover. *(Fig. 28)*

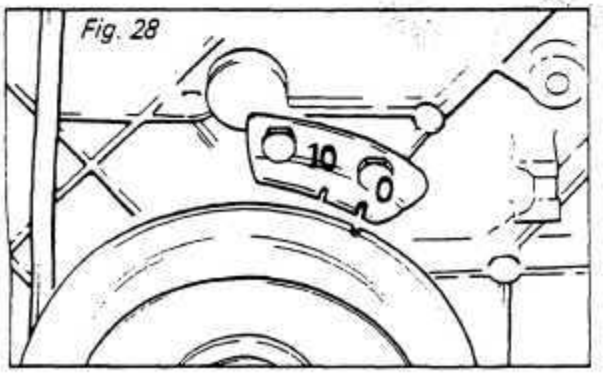


Fig. 28

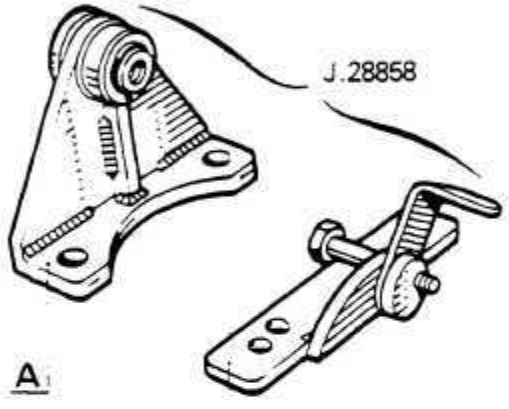
Cylinder No. 1 on T.D.C. Firing Stroke	Adjust	
	Inlet	Exhaust
	I1	E1
	I2	E3
	I4	E6

2. Starting from pos. 1 turn the crankshaft one complete turn (360°) which corresponds to T.D.C. "End of Exhaust – commencement of inlet on cylinder No. 1".
   Cylinder No. 1 rocker arms "on the rock".
   Timing mark (O) on the crankshaft pulley opposite pointer (A) on timing cover.

Cylinder No. 1 on T.D.C. "End of Exhaust -commencement of inlet"	Adjust	
	Inlet	Exhaust
	I3	E2
	I5	E4
	I6	E5

CHANGING CYLINDER HEAD GASKETS

NOTE:
If only one cylinder head is to be removed, the operation may be performed without removing the timing cover using camshaft sprocket support tool (B) No. J.28858 to support the timing sprocket and maintain tension on timing chain. *(Fig. 29)*



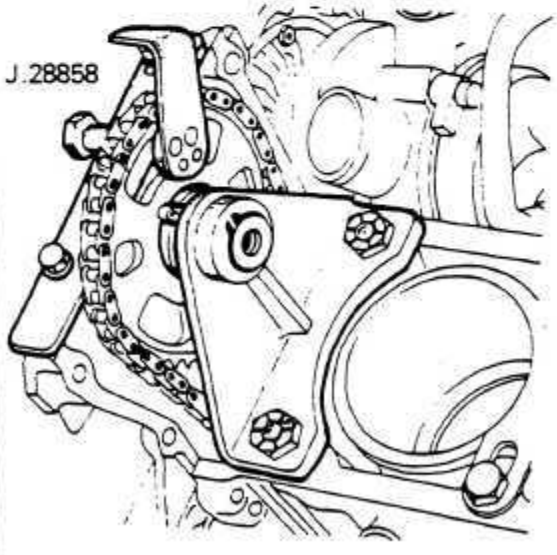


Fig. 29

The timing chain must not be allowed to become slack during this operation. The timing cover will have to be removed to release the tensioner if the chain is slackened accidentally.

The dummy bearing (A) will only be used if the crankshaft has to be turned, for example, when "piston and liner" assemblies are changed to prevent any alteration in the valve timing.

LH Cylinder
Disconnect battery
Drain cooling system
Remove intake manifold
Remove water pump hose leading to head
Disconnect any heater hoses leading to cylinder heads
Remove rocker cover and access plug for the camshaft sprocket bolt.

Turn the camshaft sprocket so that the drive pin (1) is at the top.
Unlock the camshaft sprocket fixing bolt (10 mm male hexagon key) *(Fig. 30)*
Fit the camshaft sprocket support on the timing cover.

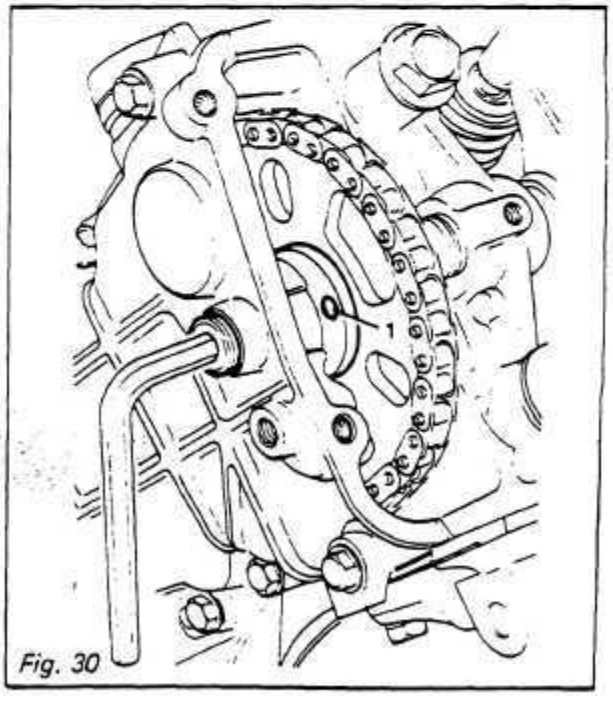
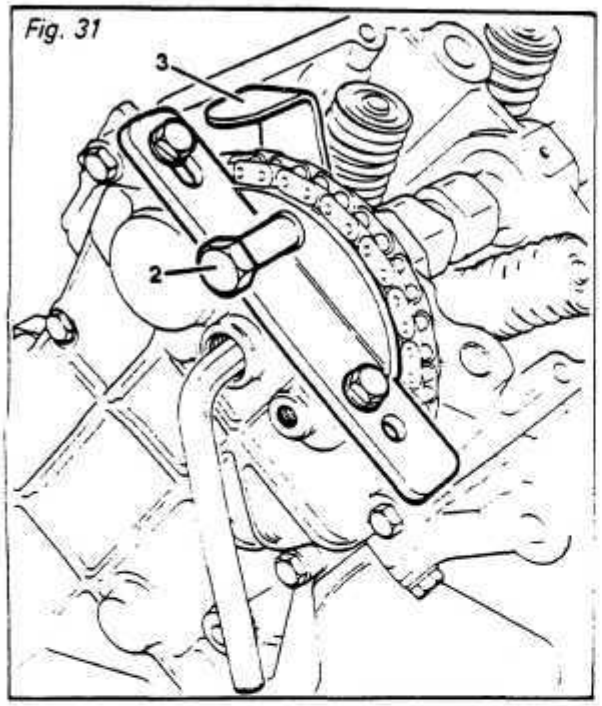


Fig. 30

Moderately tighten both bolts. Attach the camshafts sprocket to it with bolt (2) and nut (3), using a hole in the sprocket. *(Fig. 31)*

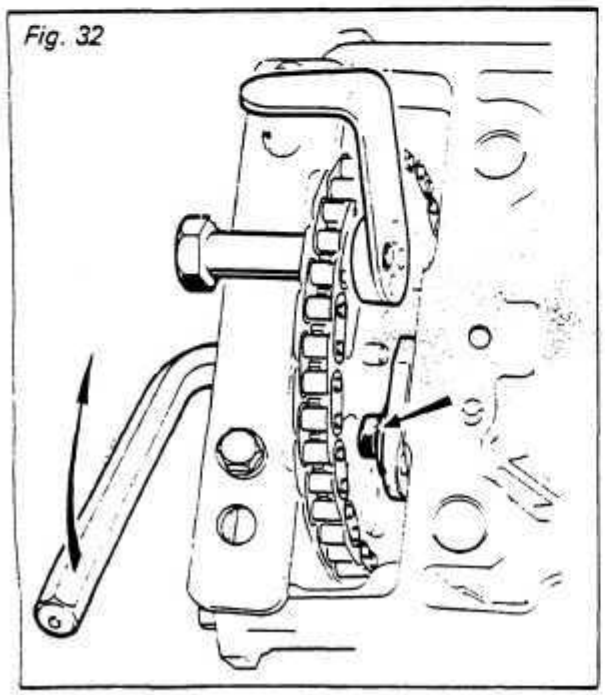
Fig. 31



Remove the cylinder head fixing bolts and rocker assembly.

Unscrew the camshaft flange and free the flange from its recess, unscrew the camshaft sprocket bolt carefully until the camshaft disengages the sprocket. *(Fig. 32)*

Fig. 32



Press the locating roll pins down at (A) and (B) using an old pushrod. *(Fig. 33)*

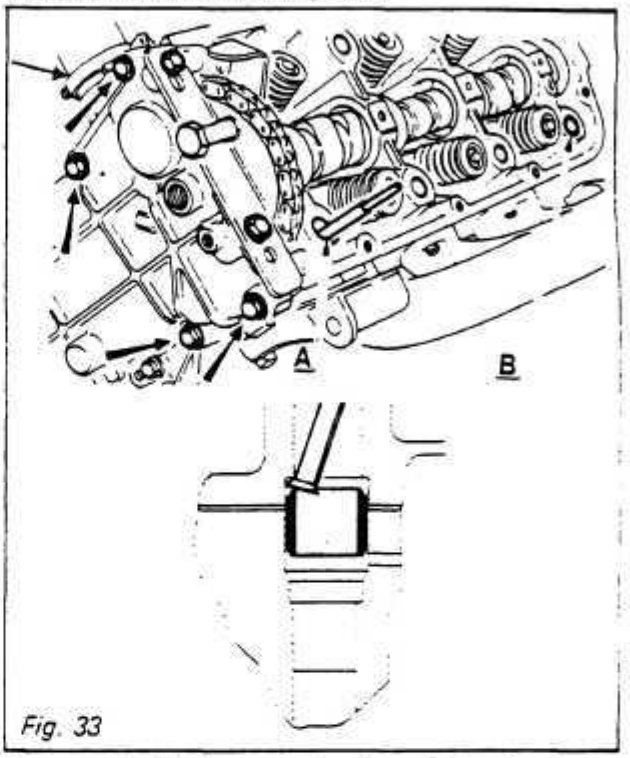


Fig. 33

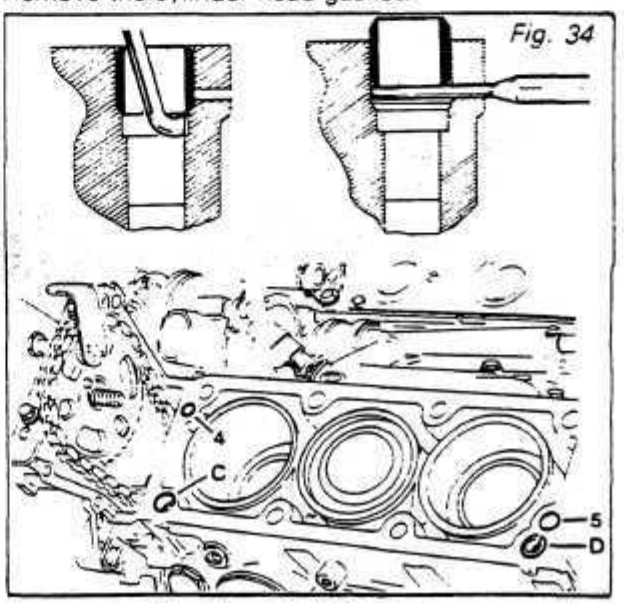
Remove the 4 bolts securing the cylinder head to the timing cover.

Remove cylinder head bolts and remove rocker arm assembly.

Unstick the cylinder head gasket and remove the cylinder head, taking care not to unseat the liners.

Remove the cylinder head gasket.

Fig. 34



Remove the cylinder head locating sleeves (C) and (D).
Use paint stripper to clean the gasket faces on the cylinder block and head.

Take care not to introduce any foreign matter into the oilways (4) and (5) which might block the rocker arm oil jet holes and lead to excessive wear of cam lobes and rocker fingers.

REFITTING

Check that the camshaft sprocket driving pin is uppermost. *(Fig. 35)*
Avoid any slackening of the timing chain. If it becomes slack accidentally then it is imperative that the timing cover be removed in order to release the tensioner.

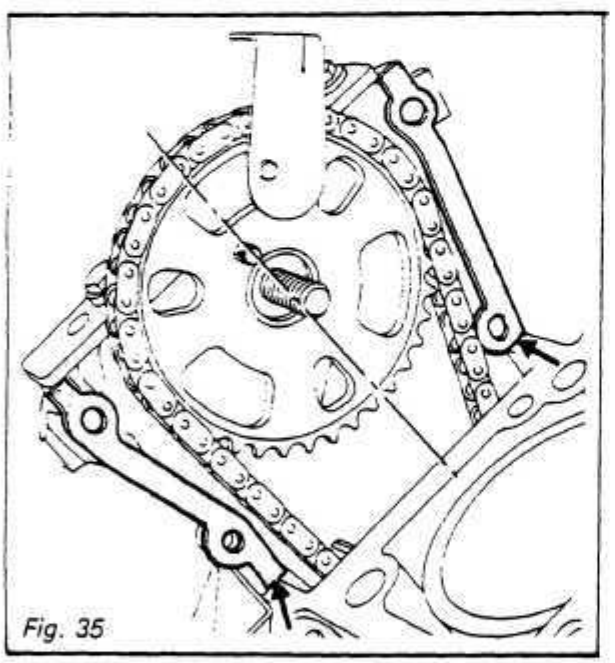


Fig. 35

In this case, use the dummy bearing to prevent the valve timing becoming out of phase.
Oil tightness between cylinder head and timing cover.
Cut the timing cover gasket off level with the cylinder head gasket face.
Cut sections from new gaskets to replace the above.
Use gasket cement to hold new gaskets in place and seal joint at cut area.
Insert a 3 mm (1/8") dia. pin punch into each locating roll pin hole and press the dowels against them. *(Fig. 36)*

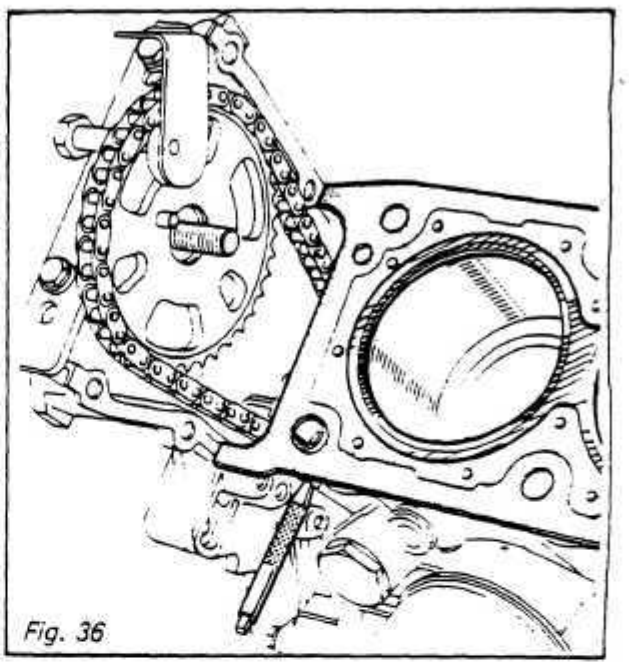


Fig. 36

Fit a new cylinder head gasket dry. Fit the cylinder head, taking care not to move the timing cover gaskets. Insert the timing cover fixing bolts and hand tighten them.
Line up the driving peg and hole and enter the camshaft into the sprocket carefully. Make sure

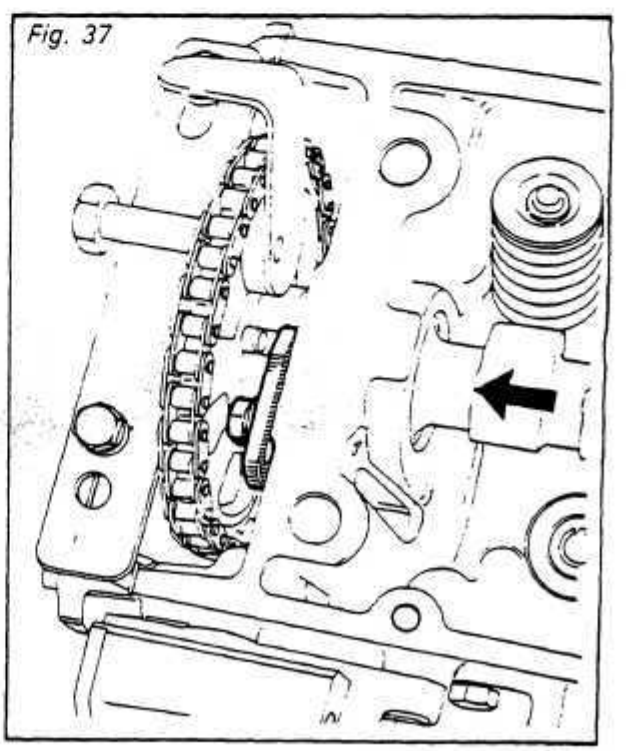


Fig. 37

that the camshaft top is fully withdrawn to allow the camshaft flange to pass through. Partially tighten the sprocket fixing bolt. *(Fig. 37)*

Remove sprocket support.

Push the camshaft stop fully home in its groove and torque. Tighten the bolt. Remove both pin punches.

Fit the rocker arm assembly and the cylinder head bolts.

Carry out the angular tightening operation.

Pre-tighten the bolts in the order shown to 15 lb/ft (20 mm) then tighten them to 45 lb/ft (60 mm) to compress gasket. Loosen bolt No. 1 Retighten it to 15 lb/ft (20 mm) then angular tighten it to 115°. Repeat for all the remaining bolts in the order shown.

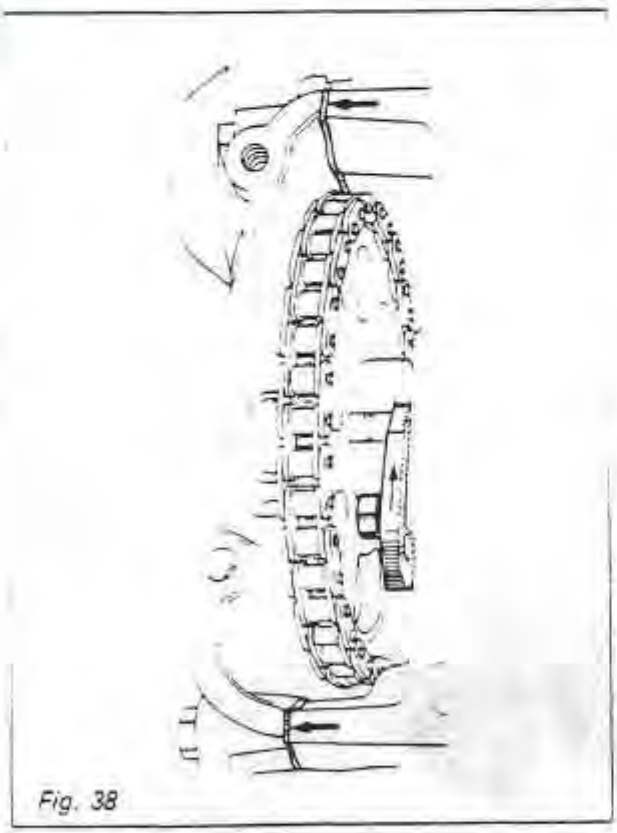


Fig. 38

Torque tighten
the timing cover bolts and cut the gaskets off flush. *(Fig. 38)*
the timing sprocket fixing bolt.
the access plug for the timing sprocket fixing bolt.

Fit the manifold using new gaskets.

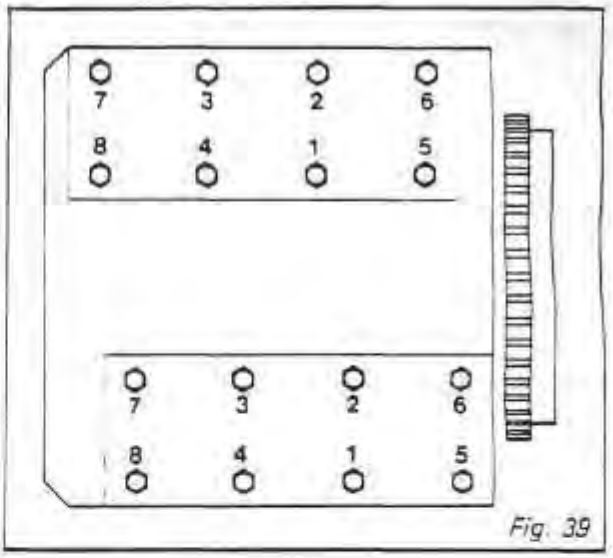


Fig. 39

Refit hoses and pipes.
Refit exhaust clamp.
Adjust the rocker arm clearances.
Fit the rocker cover.
Fill and bleed cooling system.
Run engine for 30 minutes.
Let the engine cool down for at least 2 hours then retighten the cylinder head. *(Fig. 39)*

RH CYLINDER HEAD

The removing and refitting operations for the RH cylinder head are identical to those of LH cylinder head with the exception of
the dipstick tube clip
diagnostic socket and bracket
and distributor

ADJUSTING VALVES—Fig. 22

Set the piston in No. 1 cylinder to TDC firing stroke, which corresponds to
No. 5 cylinder rocker arms "on the rock"
TDC mark on pulley is aligned with "O" mark on timing plate.

Check and adjust the following rocker arms in this position.

INLET	EXHAUST
Cyl No. 1	Cyl No. 1
Cyl No. 2	Cyl No. 3
Cyl No. 4	Cyl No. 6

Turn the crankshaft clockwise one complete turn and align TDC mark on pulley with "O" mark on timing plate.

Check and adjust following rocker arms in this position.

INLET	EXHAUST
Cyl No. 3	Cyl No. 2
Cyl No. 5	Cyl No. 4
Cyl No. 6	Cyl No. 5

CHANGING CYLINDER HEADS

DISMANTLING

Once a cylinder head has been removed lift out the camshaft and remove the spark plugs.

Remove
camshaft stop
exhaust manifold
coolant outlet pipe
engine lifting rings and diagnostic socket bracket (RH cylinder head)

Compress the valve springs using a valve spring compressor.

Remove the split cotters, topcups, springs and thrust washers; lay them out in their correct order. *(Fig. 40)*

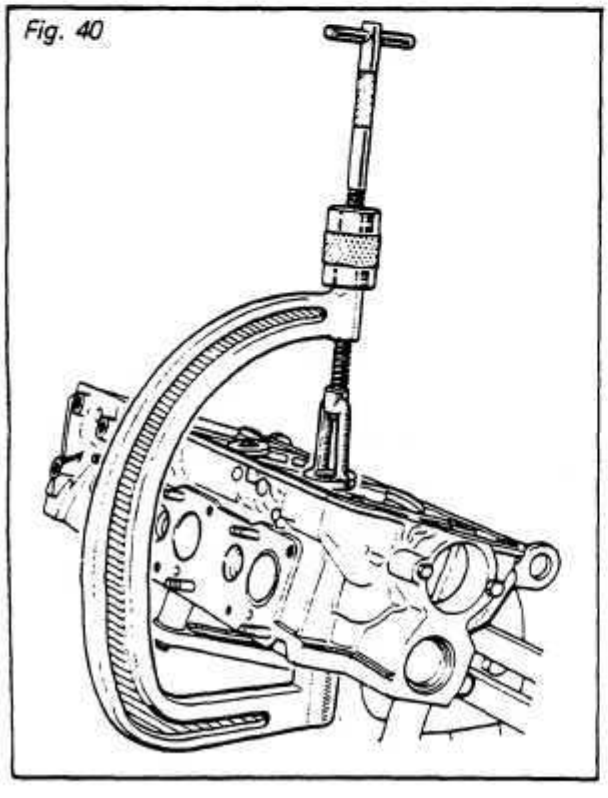


Fig. 40

RE-ASSEMBLING

Grind in the valves and check them for gas tightness

Clean the cylinder head carefully. Re-assemble the valves, fitting components in the following order: —

1 Thrust washer
2 Oil seal
3 Valve spring (closest coil facing cylinder head)
4 Cup washer
5 Split cotters *(Fig. 41)*

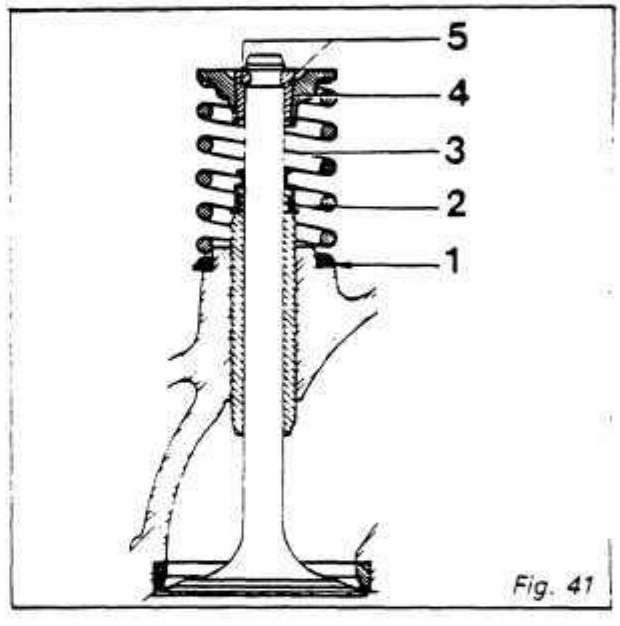


Fig. 41

Re-attach the components to the cylinder head.
Position of exhaust manifold gaskets:
Pip (A) on each gasket to face downwards.
(Fig. 42)

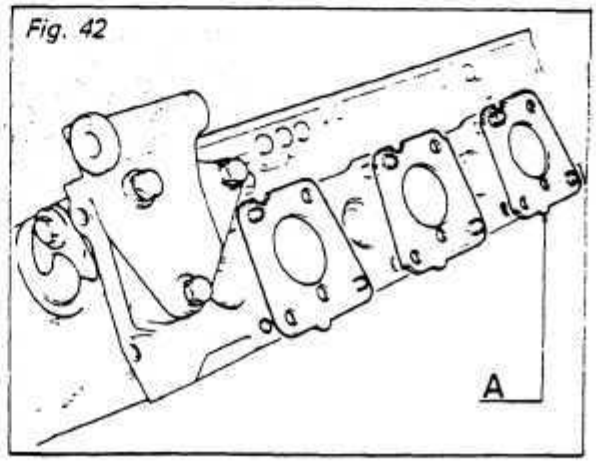


Fig. 42

ROCKER SHAFTS

DISMANTLING

The oilway plugs on the ends of the rocker shafts are press-fitted and cannot be removed.

Remove the set bolt, withdraw the parts and lay them out in order.

RE-ASSEMBLING

The RH and LH side rocker shaft assemblies are identical. They match their respective cylinder heads by turning the complete assembly round. The position of the rocker shaft must not be reversed because the oil feed holes (A) will be blocked; the rocker shafts must be fitted with their oil holes facing downwards. *(Fig. 43)*

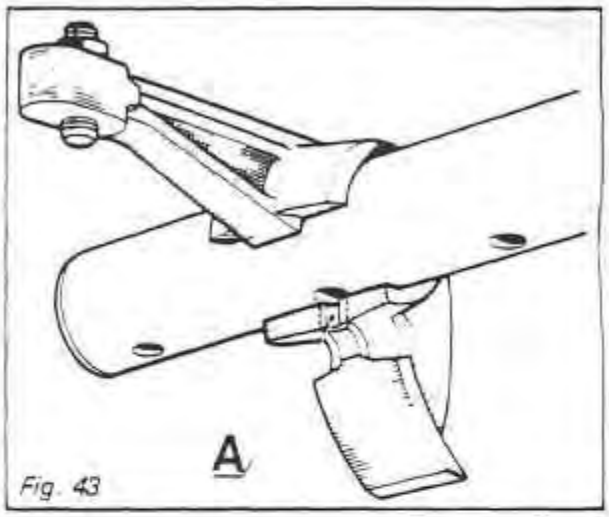


Fig. 43

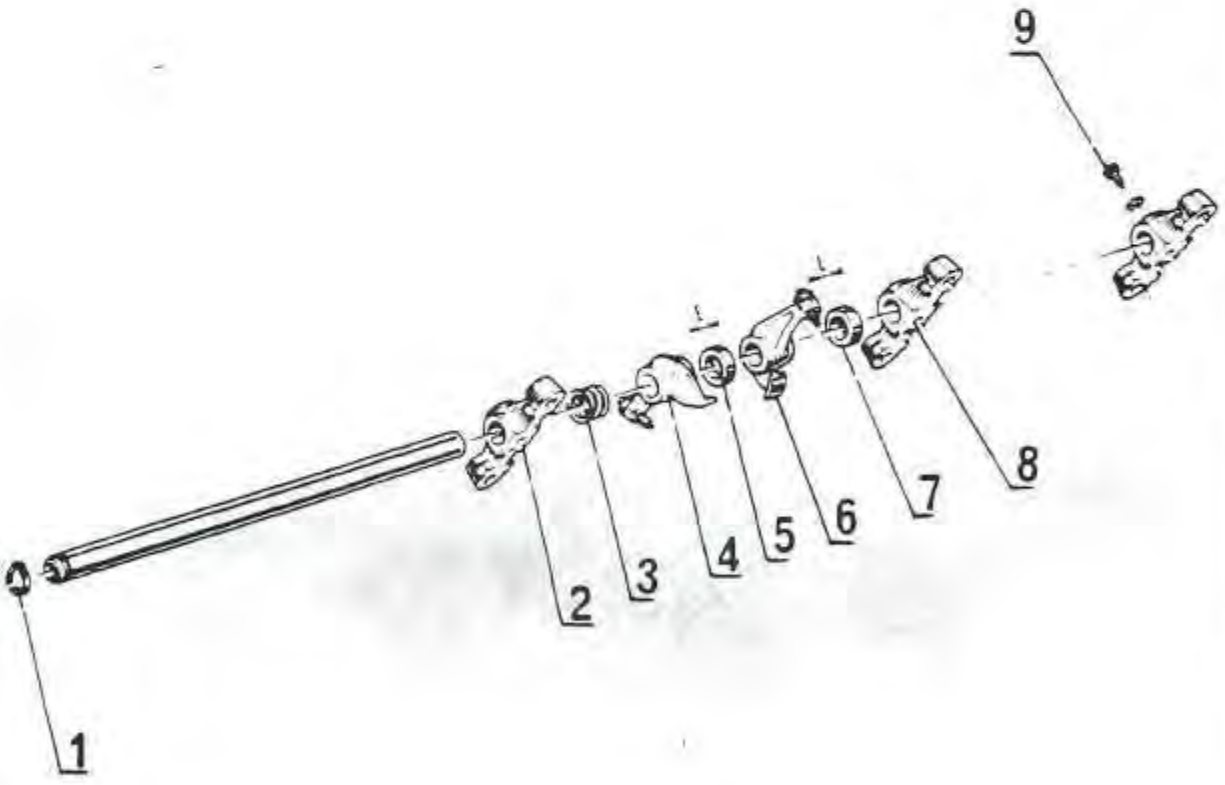


Fig. 44

Assemble in the following order *(Fig. 44)*

1 Snap ring
2 Bearing with flat on boss facing snap ring *(Fig. 45)*
3 Spacer spring
4 Rocker arm with tappet adjusting screw on left
5 Spacer "E" equals 5,35 mm thick
6 Rocker arm with tappet adjusting screw on right
7 Spacer "E" equals 8,2 mm thick
8 Bearing with flat on boss facing snap ring

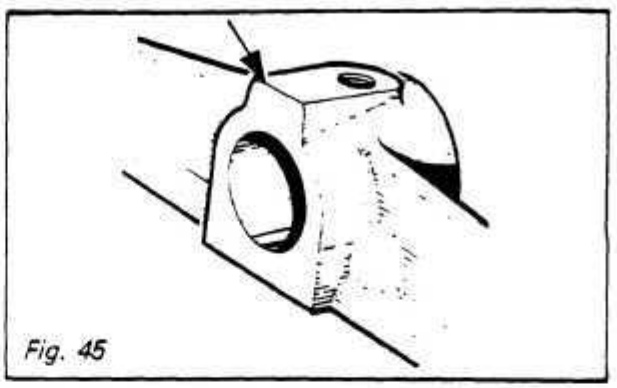


Fig. 45

Liners—Pistons

CHANGING

The engine need not be removed for this operation, furthermore, it is possible to change one individual "liner-piston" assembly.

It is not necessary to remove the timing cover and timing gear when one or more "liner" and "piston" assemblies belonging to one bank of cylinders (LH or RH) have to be changed.

Use the J28858 Tool. *(Fig. 46)*

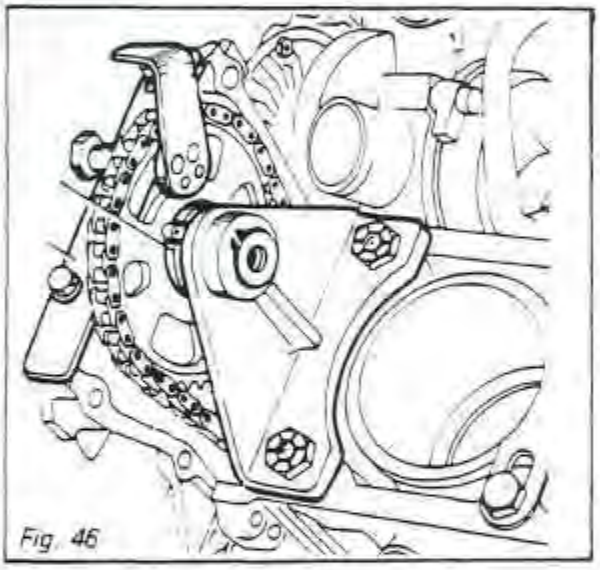


Fig. 46

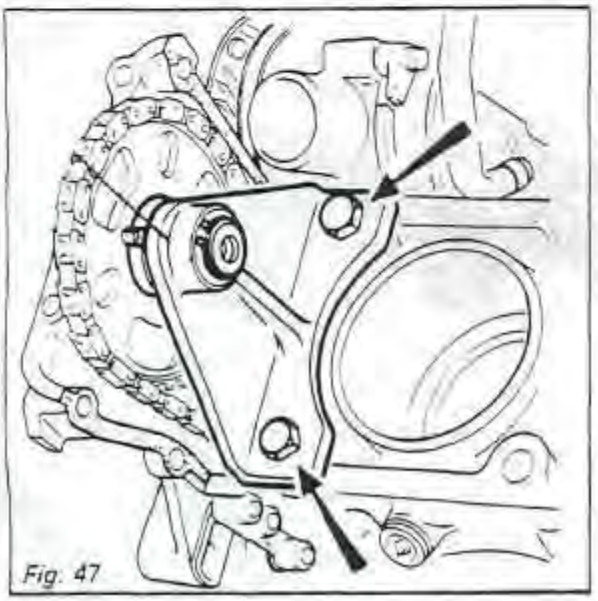


Fig. 47

Support (S) will be used as outlined in the chapter "Cylinder Heads—Changing the Gaskets".
Dummy bearing (F) will be fitted and this will allow the crankshaft to be turned in order to reach each big-end cap in turn without upsetting the timing phase.

FITTING THE DUMMY BEARING—Fig. 47

With support (S) already in position, fit dummy bearing (F) and tighten the camshaft sprocket fixing bolt moderately.
If a clearance exists between the underside of the dummy bearing bottom flange and the gasket face on the cylinder head, pack up with shims to prevent any slackening of the timing chain which may jam the tensioner in the forward position.
Moderately tighten both bolts. Remove support (S).

Removal of all six assemblies is dealt with in this chapter. As both cylinder heads have to be removed it is more practical to remove the timing gear

Disconnect battery.
Drain the cooling system and sump (oil pan)

Remove
the air filter
inlet manifold
exhaust
timing cover (to loosen pulley nut, lock the flywheel)
oil pump driving sprocket and its chain
camshaft sprockets and their chains
oil pan (sump)
the suction pipe and gauge
anti-emulsion plate
and cylinder heads.

Refer to chapters "Cylinder Block" and "Cylinder Heads" for peculiar points dealing with the various dismantling operations.
Fit liner clamps J28852.
Mark the connecting rods, starting with No. 1 at the flywheel end, so that they match the cylinder numbers.
The nuts holding the six big-end caps cannot be unscrewed with the crankshaft in one position only. Work round in order of accessibility and withdraw the "liner-piston" assemblies one by one.

OVERHAULING—Fig. 38

Clean gasket faces on cylinder heads and cylinder block using paint stripper (protect oil holes) 4 and 5.

Take care not to let any foreign matter enter the oilways which could block the rocker arm jet holes and lead to excessive wear of cam lobes and rocker arm fingers.

Clean inside the cylinder block, particularly the locating flanges for the liner base seals and crankshaft.

Extract the cylinder head locating roll pins (C) and (D).

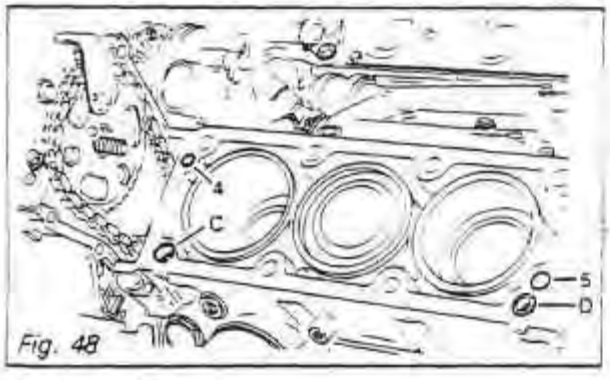


Fig. 48

Check condition of:

oil pump

and cylinder heads; check their gasket faces for truth (resurfacing not permitted)

Grind in the valves and re-cut the valve seats.

Change the "liner-piston" assemblies. *(Fig. 49)*


Fig. 49

LINER PROTRUSION

Excelnyl liner base seals are used in the engine.

They are available in the following thicknesses:

blue tag	0,087 mm (.0034")
white tag	0,102 mm (.004")
red tag	0,122 mm (.0048")
yellow tag	0,147 mm (.0058")

With liner base seals in position, the amount of liner protrusion above the cylinder block face should be

between 0,16 and 0,23 mm (.0063 to .0091")

work as close to 0,23 mm as possible.

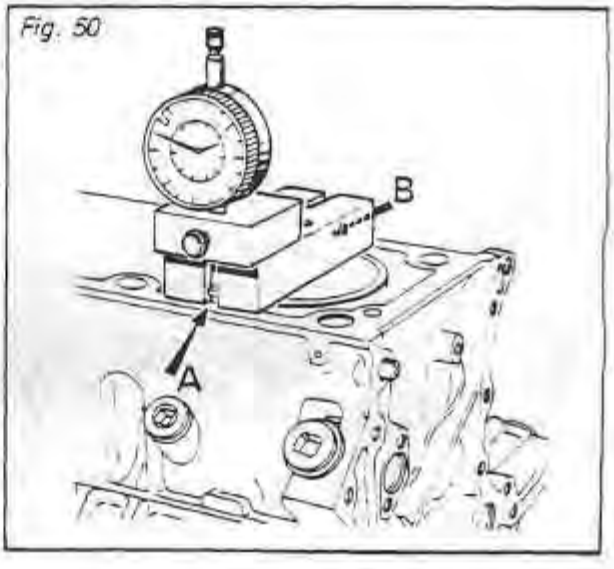
The new liners need not be inserted with an angular reference.

Difference in level liner to liner may be made by selective insertion.

To select the correct liner base seals, the amount of protrusion of each "liner-piston-connecting rod" assembly, without its seal, must be determined for each block of cylinders.

Check liner protrusions at (A) and (B) using thrust plate, bracket fitted with a clock gauge, J 28856 *(Fig. 50)*

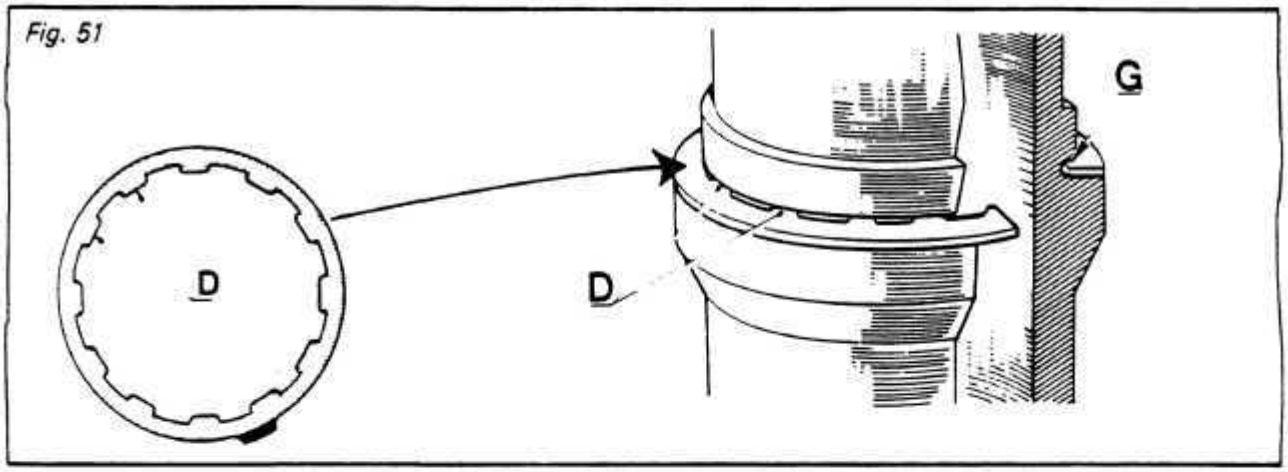
Fig. 50



Subract the larger measurement from 0,23 mm to determine the thickness of the seal required.

Select a seal whose thickness is equal to, or just less than, the thickness calculated.

Fig. 51



EXAMPLE–Fig. 51
First measurement at A: 0,10 mm (.004")
Second measurement at B: 0,08 mm (.003")
Subtract 0,10 mm from 0,23 mm which leaves 0,13 mm (.005"). Select a seal with red tag, 0,122 mm (.0048") thick (average value)
Fit one seal of the same thickness to each liner and bend castellation (D) into recess (G).

Insert the liners so that the base seal colour tags are visible (spaced as shown in the sketch). *(Fig. 52)*

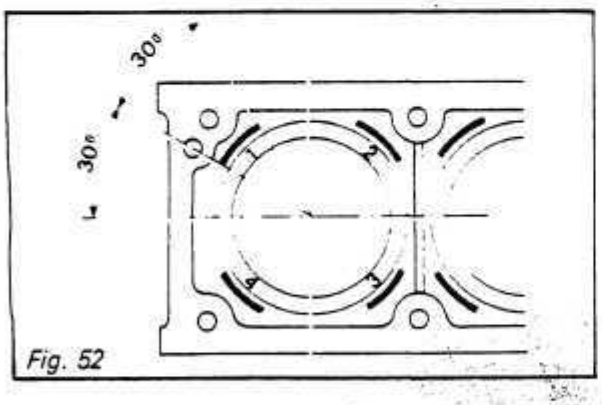


Fig. 52

Positions 1, 2, 3, or 4.
Check the protrusion of each liner in relation to the cylinder block.
If necessary, change the thickness of the seals in order to position the liners so that:

–the difference in protrusion between any two adjacent liners do not exceed 0,04 mm (.0016") within the permitted tolerance. *(Fig. 53)*
–and any differences are stepped from cylinder No. 1 to No. 3 (or 4 to 6) and vice versa.

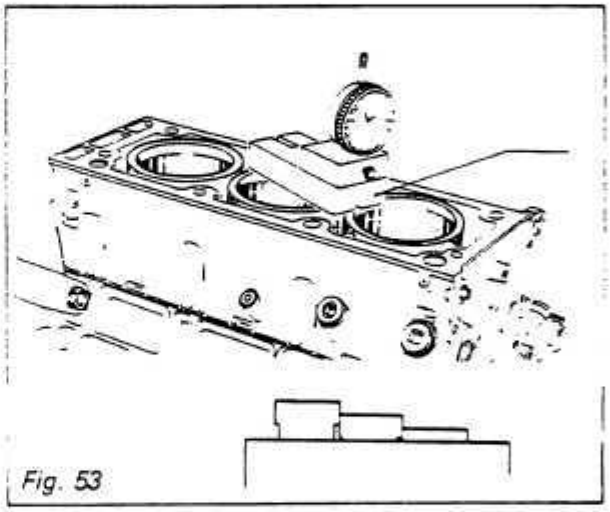


Fig. 53

Once the correct protrusions have been obtained, refit assemblies A, B, C, D, E, and F together, then number the liners, pistons and gudgeon pins 1 to 6 (No. 1 at flywheel end) so that they match the corresponding connecting rods. *(Fig. 54)*

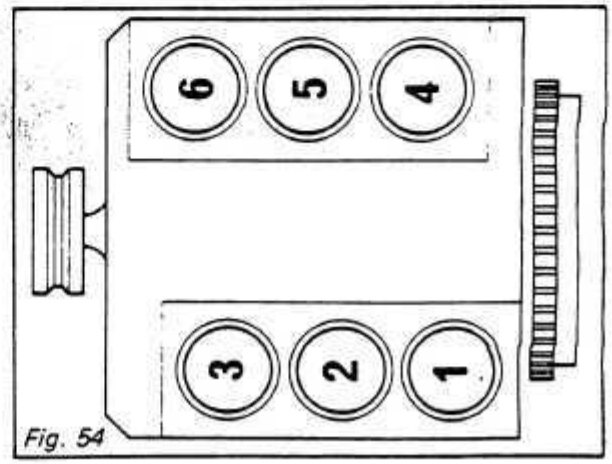


Fig. 54

GUDGEON PINS—TOOLING

The gudgeon pins are a press fit in the small ends and free turning in the pistons.
Use tooling J 28854 which is supplied in a box containing
piston supporting block
an extraction mandrel
piston thrust collar
inserting mandrels and guides.
We approved the use of an electric hot plate to make gudgeon pin insertion easy. The required temperature of 250°C is restricted to small end zone only. *(Fig. 55)*

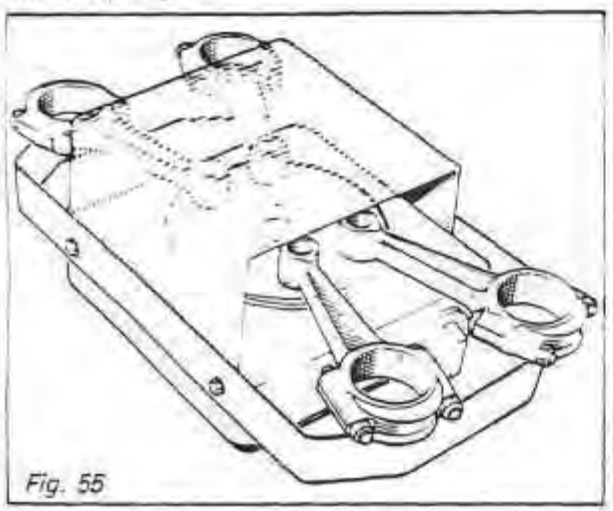


Fig. 55

EXTRACTING GUDGEON PINS

Rest the piston in the vee on the support base, with the gudgeon pin over the extraction hole. Press out the piston with the extracting mandrel (B). *(Fig. 56)*

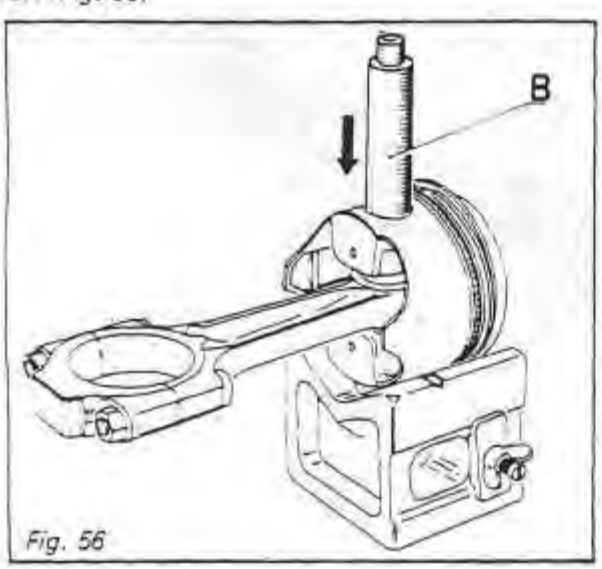


Fig. 56

INSERTING GUDGEON PINS

Preparing the connecting rods. Check the rods for truth (twist—out of square).
Selecting the bottom end components by cylinder bank.
The connecting rod big-ends are offset and have an extended flange (E) on one side (counter balanced side) in order that a pair of connecting rods can share a common crank pin. *(Fig. 57)*

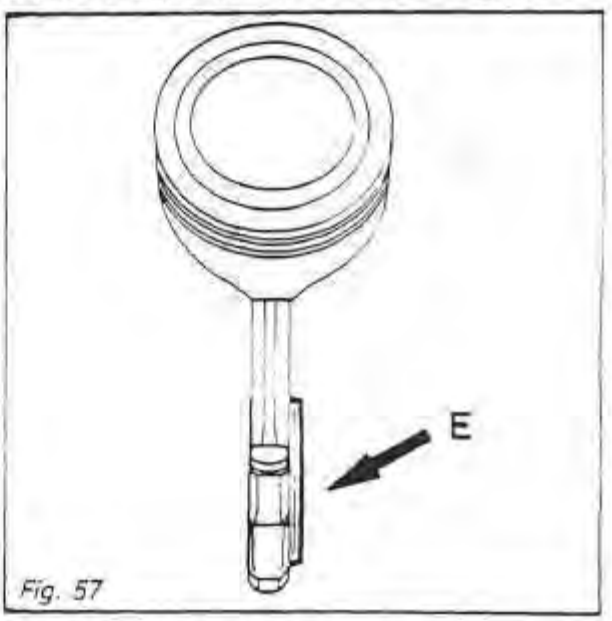


Fig. 57

ALIGNING THE PISTONS

All six pistons will be laid in turn on support base (A) with the arrow pointing upwards and with spot facing on the piston resting on thrust pad (C). Connecting rod—piston assemblies LH cylinder bank.
Spread the small ends on connecting rods 1-2-3 evenly round the hot plate, with extended flange (E) face downwards.

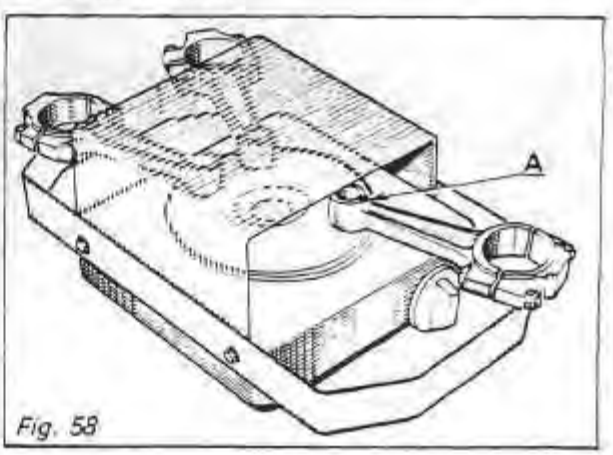


Fig. 58

Check that each small end is lying square on the hot plate. As the temperature guide, place a small piece of cored tinmans, solder with a melting pointing of about 250°C on each small end (A). Let them heat up until the solder melts. *(Fig. 58)*

PREPARING GUDGEON PINS

Check that each gudgeon pin rotates freely in its piston. Fit the gudgeon pins in turn to assembly mandrel (D). (Do not tighten; the gudgeon pin must be free to float between mandrel and guide.) *(Fig. 59)*

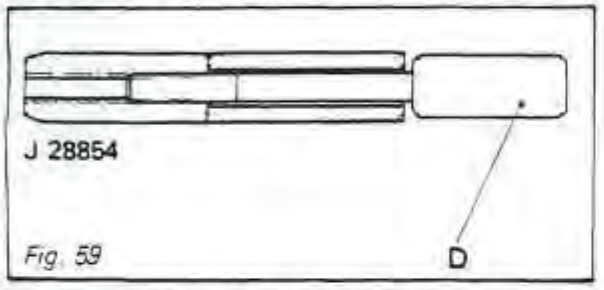


Fig. 59

Fit a thrust pad (C) *(Fig. 60)* which corresponds to the gudgeon pin on the support base (A) and clamp the piston to the support base with the clip; the spotfacing on the piston must rest on the thrust pad.

The following operations must be carried out rapidly so that heat loss is reduced to a minimum.

As soon as the piece of solder melts:

Wipe off the solder droplet

Insert locating guide (D) in the piston

Fit the connecting rod to the piston with one hand (extended flange (E) facing downwards)

Press in the piston pin quickly with other hand until the guide bottoms against the support base.

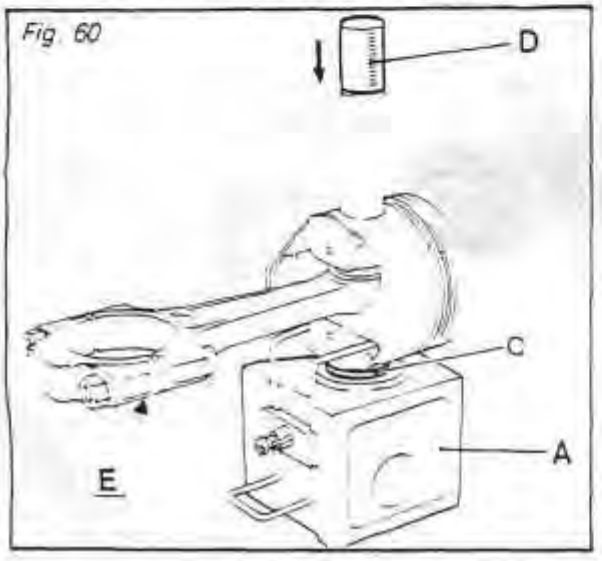


Fig. 60

After a few seconds, remove the connecting rod-piston assembly from the support base; unscrew the guide and remove the mandrel assembly.

Assemble the other two connecting rods in the same way.

Mark the three assemblies made up in this way so that they are immediately identifiable with the LH bank of cylinders. *(Fig. 61)*

Connecting rod-piston assemblies: RH cylinder bank.

Spread the small ends on connecting rods 4-5-6 evenly round the hot plate, with extended flange face downwards. Then carry out the assembly operations as indicated earlier, taking care to insert the gudgeons pins with extended flange (E) facing upwards.

Mark the three assemblies made up in this way so that they are immediately identifiable with RH bank cylinders. *(Fig. 61)*

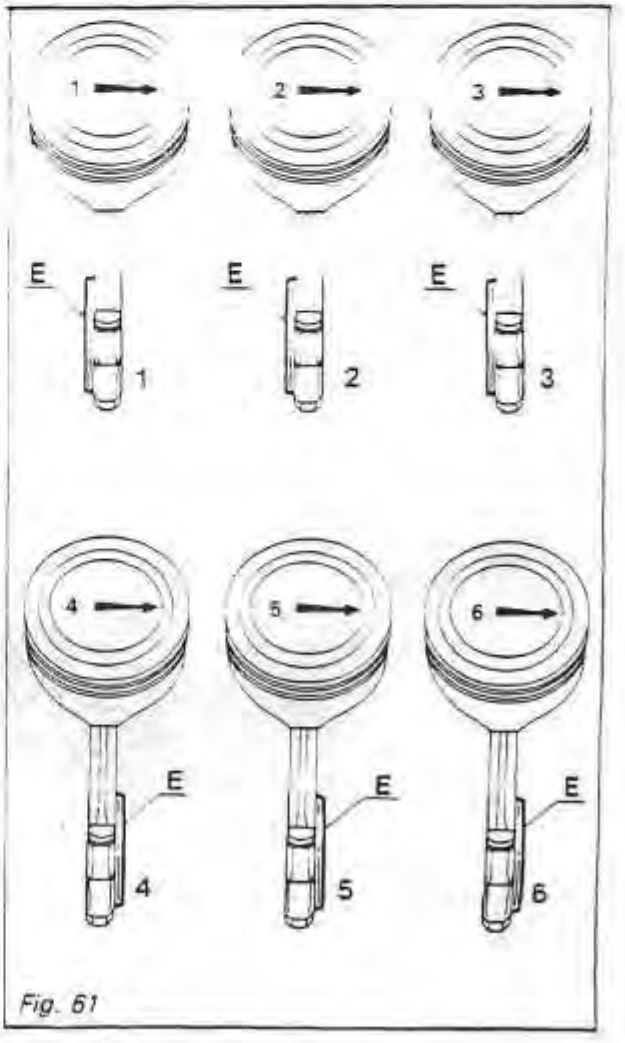


Fig. 61

ASSEMBLING THE PISTONS AND LINERS

Fitting piston rings. *(Fig. 62)*

The piston rings, which have their gaps pre-set, should be free in their grooves.

Faces with markings must face upwards towards the combustion chamber.

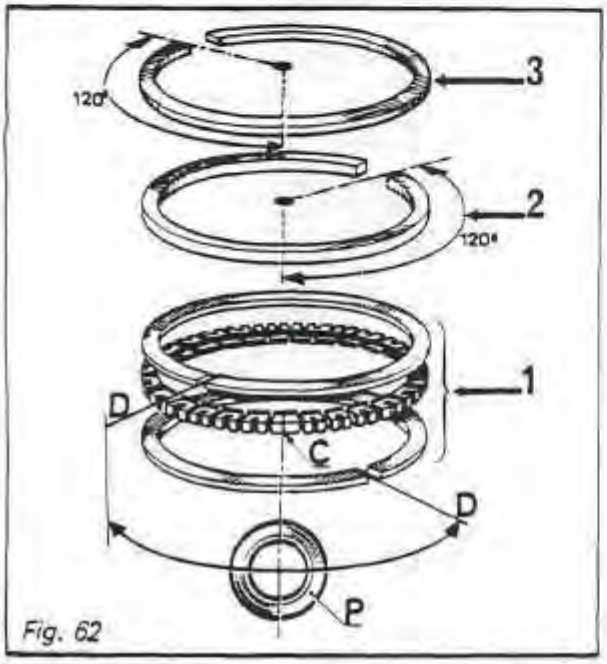


Fig. 62

1 Scraper Ring

Gap (C) in the expander in line with centre of gudgeon pin (P).

Gaps (D) on the rings offset about 20 to 50 mm (¾" to 1").

2 Taper Compression Ring
3 Top Ring

Spaced evenly at 120° from the expander gap.

Lubricate the pistons.

Fit the connecting "rod-piston" assemblies into their respective liners using a piston ring clamp.

Fit the shell bearings to the big-ends. Insert No. 1 assembly in the cylinder block (arrow on the piston crown facing towards the timing gear end). *(Fig. 63)*

Fit No.1 big-end cap together with its shell bearing. Make sure that the assembly marks on the cap and rod match. *(Fig. 64)*

Screw up the cap nuts by hand. Clamp No. 1 liner with a liner clamp.

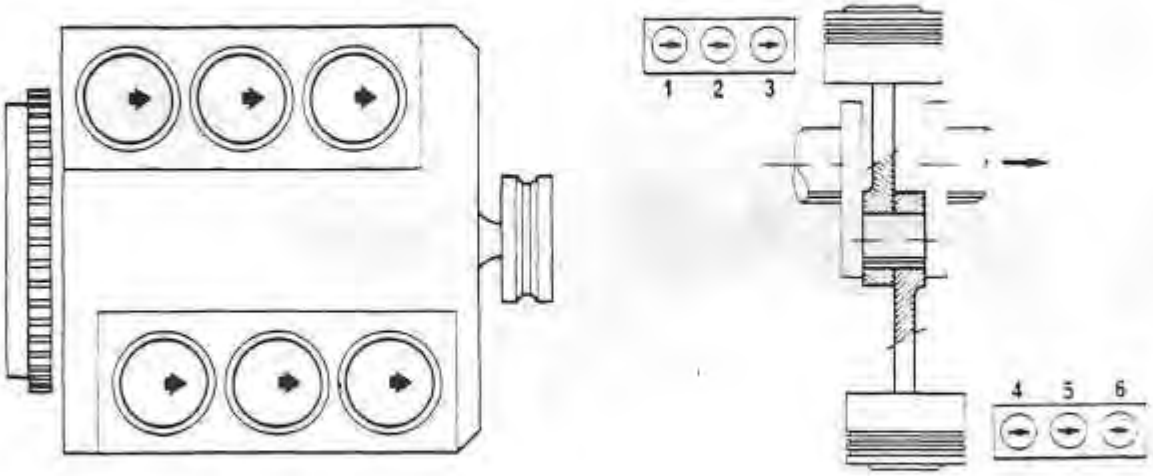
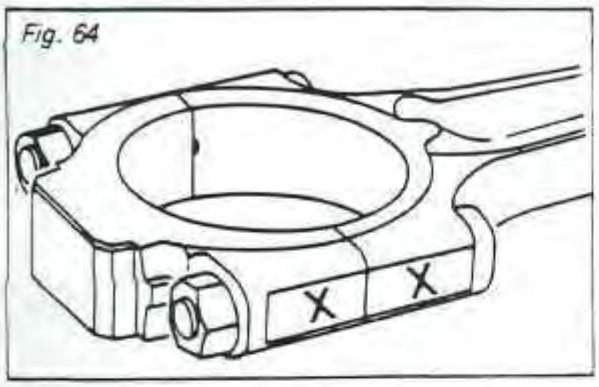


Fig. 63

Fig. 64



Proceed in the same way for assemblies No. 2-3-4-5- and 6 clamping the liners as assembly proceeds.

The cylinder heads,
Timing chains,
Timing cover,
Anti-emulsion plate, suction pipe and sump.

Refer to chapters "Cylinder Block-Changing" and "Cylinder Heads Changing".

Cylinder Block—Changing

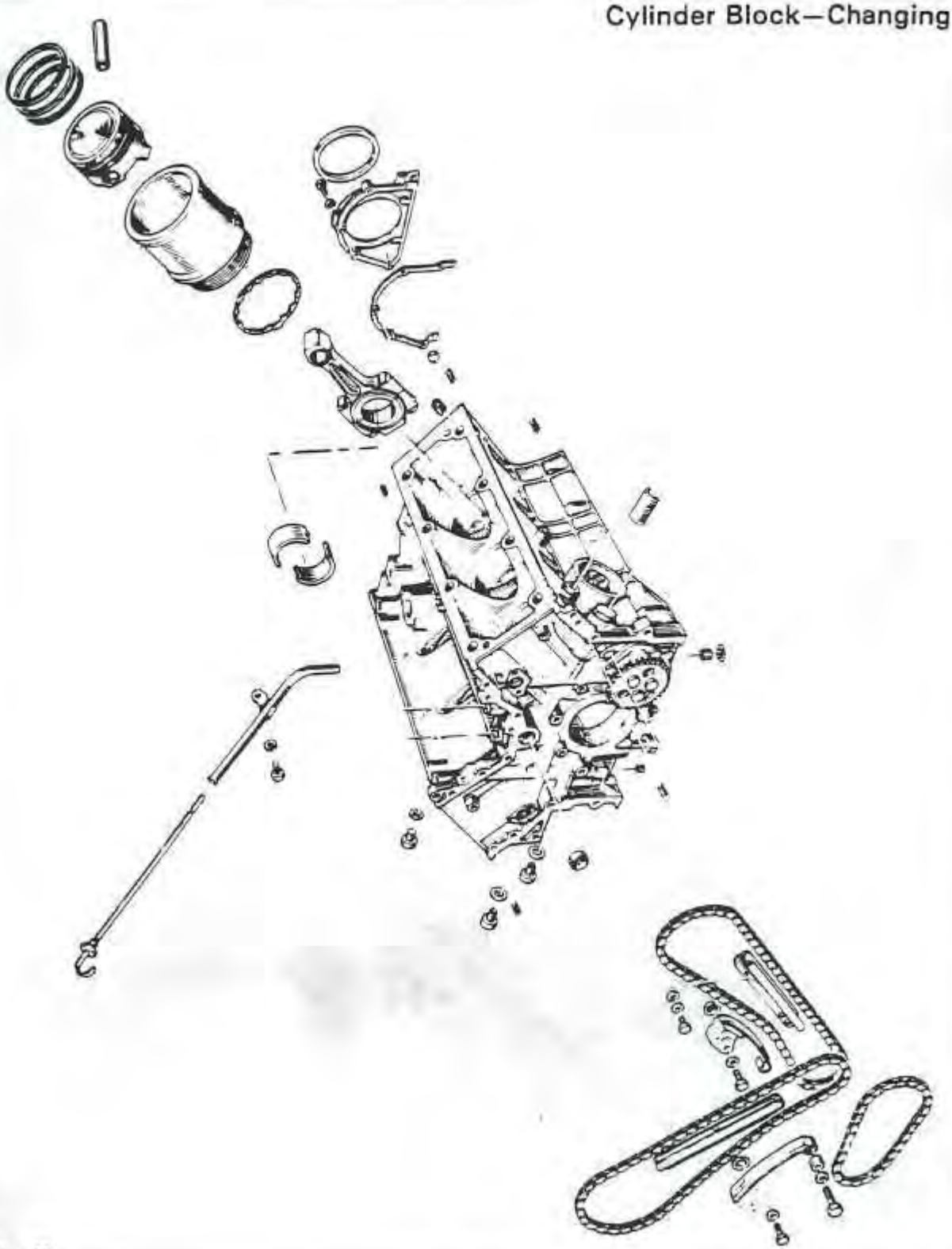


Fig. 65

Cylinder Block—Changing

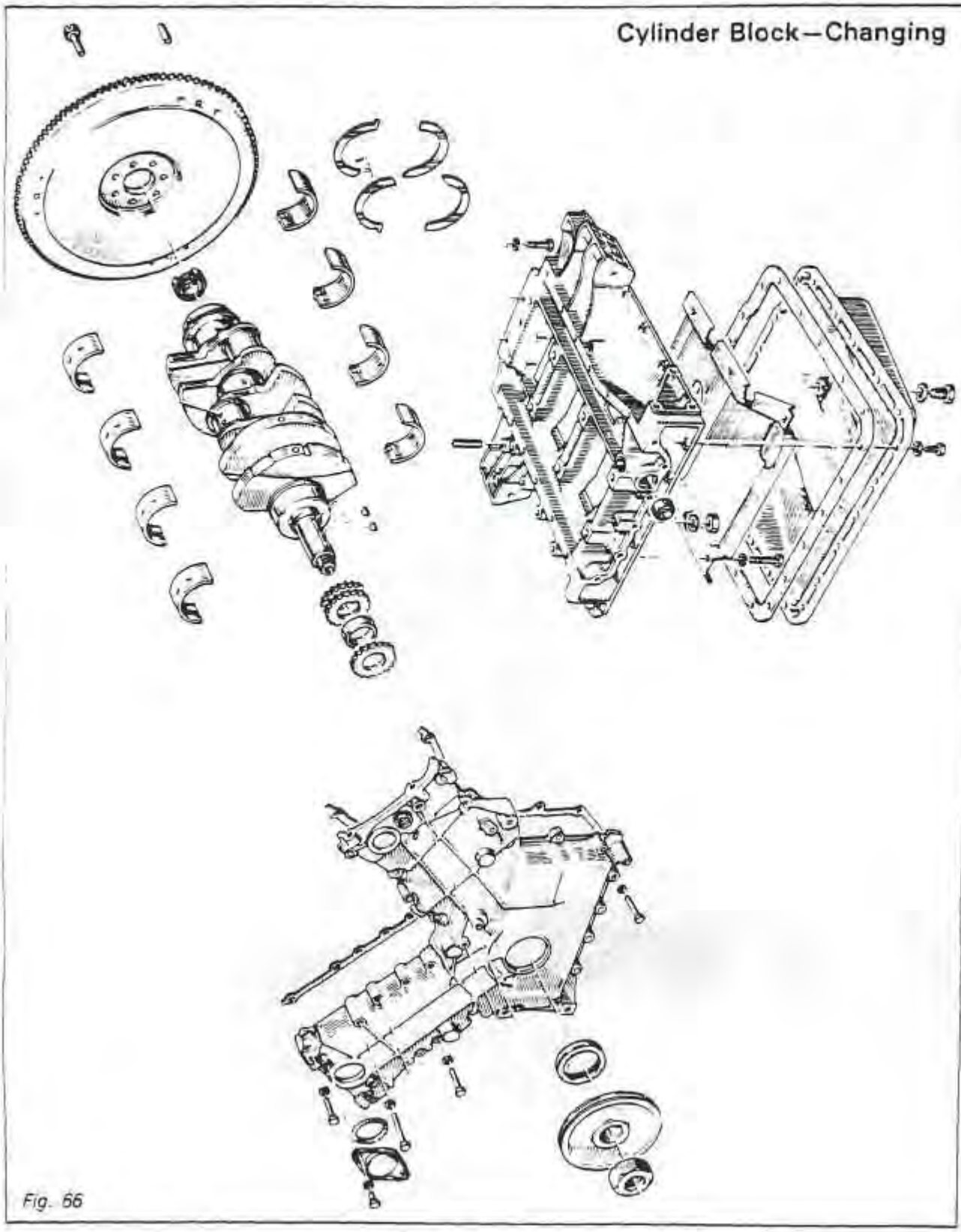


Fig. 66

Cylinder Block

CHANGING

Remove the engine.
Dismantling
Remove
clutch mechanism
flywheel or convertor driving plate
rear cover plate
oil filter
dipstick and tube
alternator and drive belt
distributor and leads
inlet manifold
the six rubber seal
and insulating blocks
water pump and hoses *(Fig. 67)*
fuel injection equipment
and crankshaft pulley fixing nut

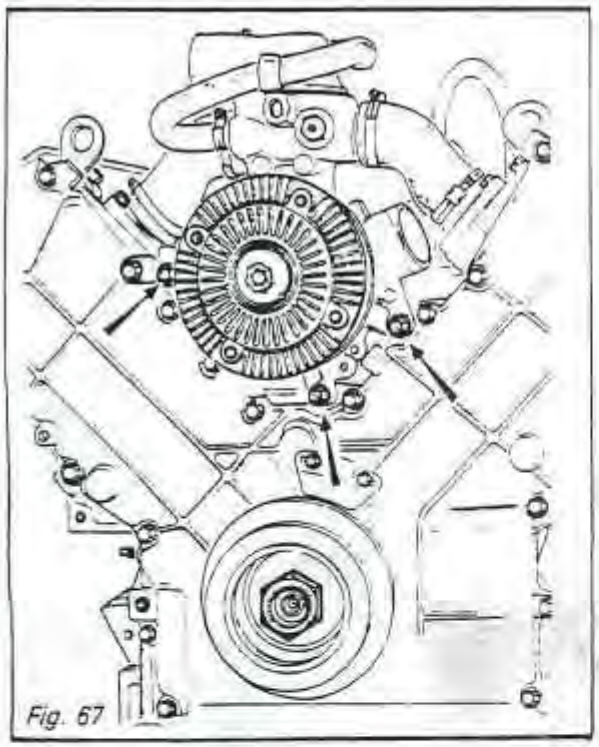


Fig. 67

Turn the crankshaft so that the keyway is vertical. *(Fig. 68)*

Remove the
pulley
the rocker covers
timing cover
and sprockets with oil pump driving chain (retain the key and spacer).

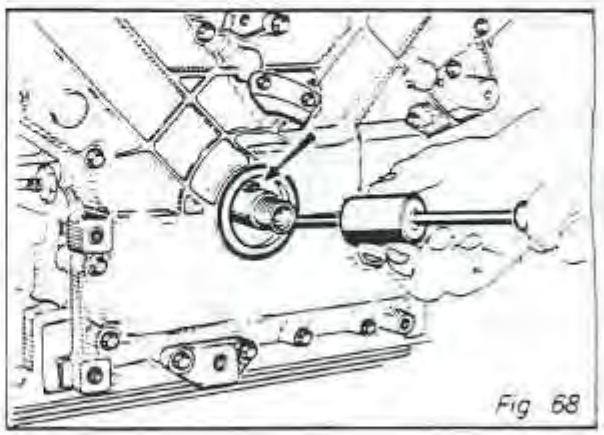


Fig. 68

Loosen the two camshaft fixing bolts.

Mark all the timing gear components according to side if they are to be re-used. *(Fig. 69)*

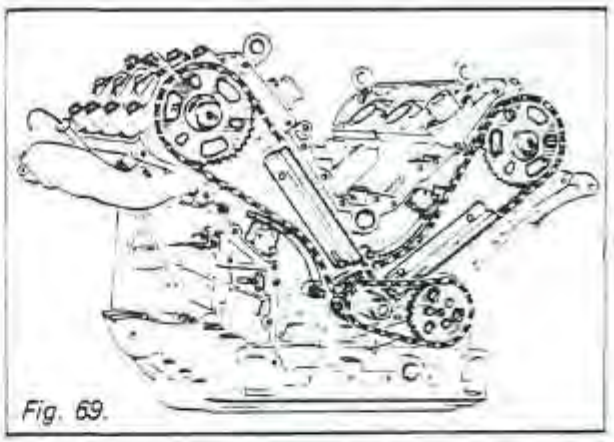


Fig. 69.

Release both chain tensioners by turning the ratchet mechanism anti-clockwise with a screwdriver. *(Fig. 70)*

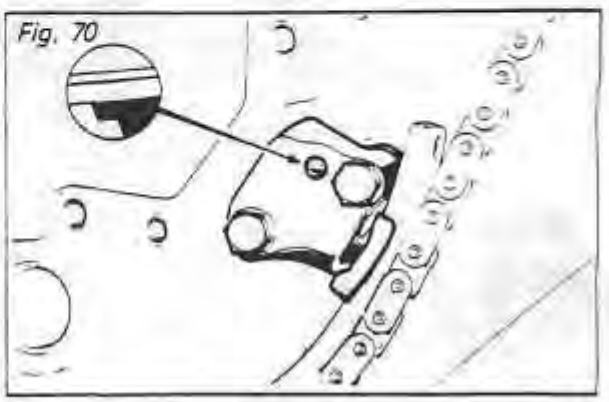


Fig. 70

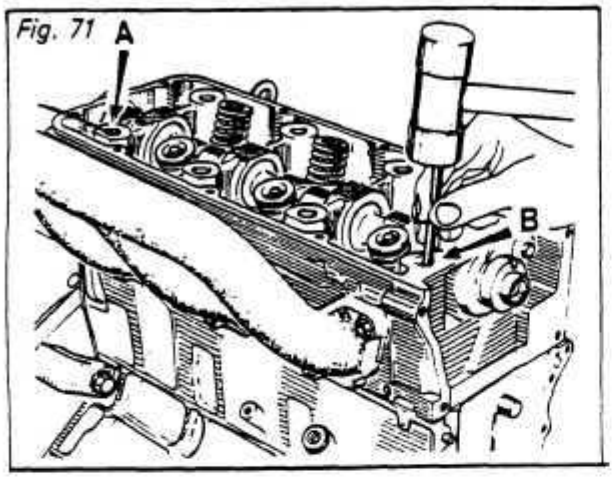


Fig. 71

Remove
the timing chains RH first
the tensioners and their shoes (retain the filters)
and oil pressure switch

Turn the cylinder block so that the RH bank of cylinders is uppermost.

Remove the rocker assembly. *(Fig. 71)*

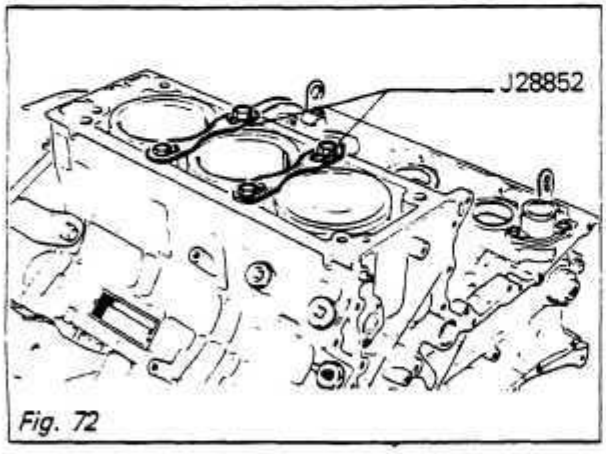


Fig. 72

Tap the locating dowels (A) and (B) down into the cylinder block with an old push rod.

Unstick the cylinder head using a mallet.

Remove the cylinder head gasket.

Clamp the liners with the clamps. J 28852 *(Fig. 72)*

Turn the cylinder block so that the LH bank of cylinders is uppermost and carry out the same operations to remove the LH cylinder head. *(Fig. 73)*

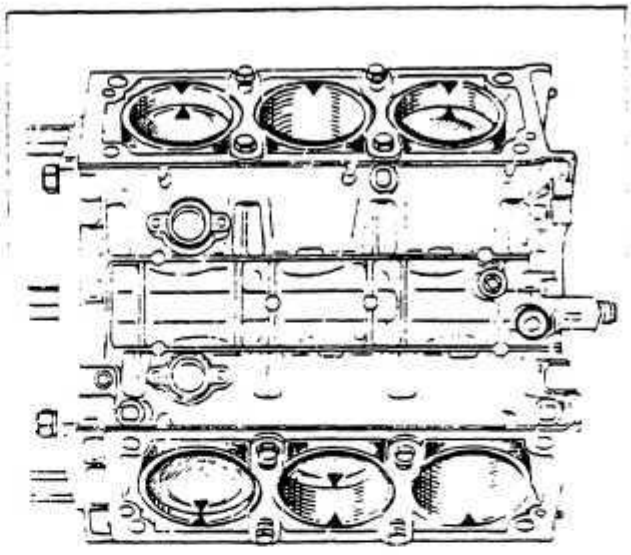


Fig. 73

Turn the engine over. *(Fig. 74)*

Remove
the sump
suction pipe and gauge
anti-emulsion plate
bottom casing
and intermediate main bearing caps after marking their positions.

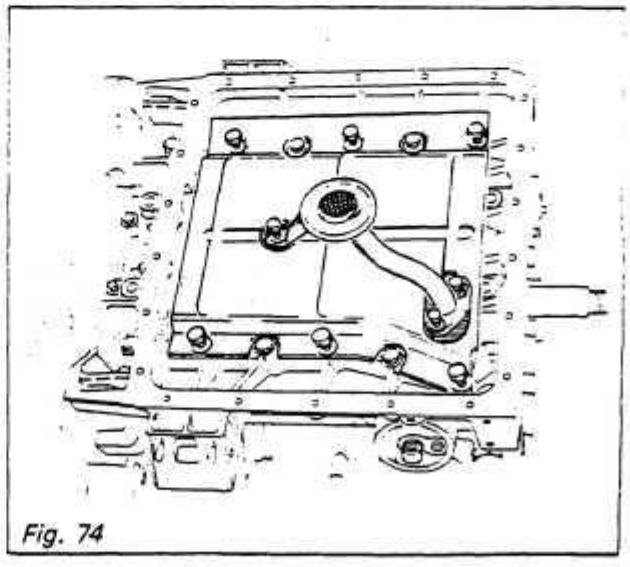


Fig. 74

Hold the front and rear main bearing caps with the two retaining blocks J 28853
which will keep the crankshaft in position. *(Fig. 75)*

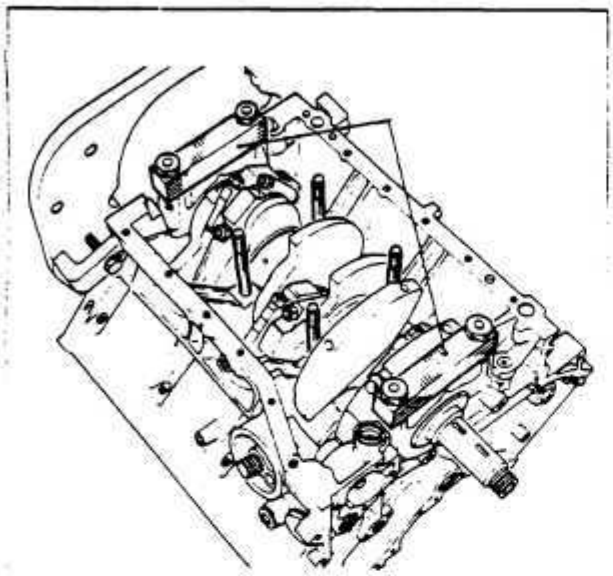


Fig. 75

Mark the connecting rods to match the cylinder numbering, starting at the flywheel end. *(Fig. 76)*

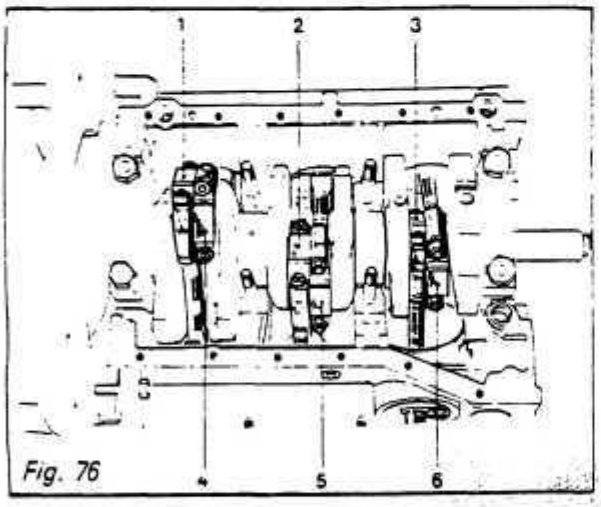


Fig. 76

Remove
the connecting rod big-end caps
liner retaining clamps
marked "liner-piston-connecting rod" assemblies
front and rear main bearing retaining caps and caps themselves
thrust half-washers
and crankshaft

Clean all parts and inspect them for condition.

Use extractor to remove the clutch shaft spigot bearing. *(Fig. 77)*

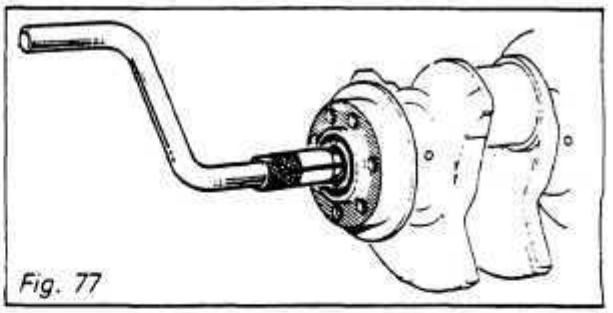


Fig. 77

RE-ASSEMBLING

Lubricate the parts as they are being assembled.
Always change gaskets, oil seals and lockwashers.
Make sure that the oilways are clean and that the oilway plugs are tight.
Check that the cylinder head fixing bolts run down the thread easily.
The new cylinder block is supplied with the oil pump already assembled.
Refit "liner-piston-conrod" assembly.
Refer to chapter changing pistons and liner replacement. *(Fig. 78)*

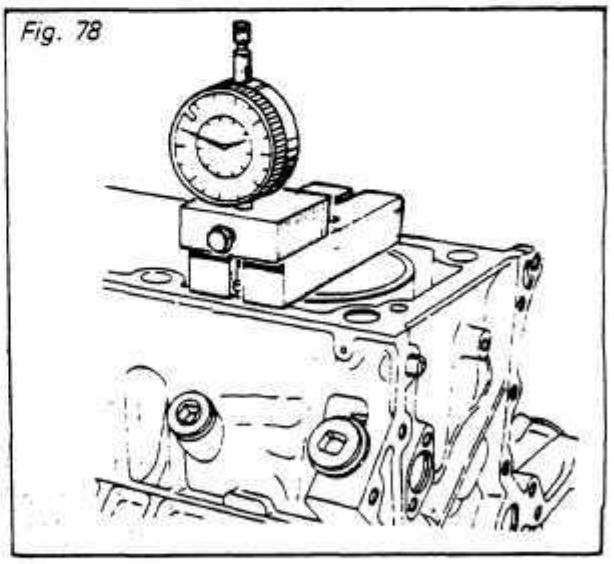


Fig. 78

Remove the assemblies. Turn the engine over. *(Fig. 79)*

Fit the upper halves of the main bearings (locating tags fully home)

Shells fitted with oil grooves are fitted to the block.
Shells without oil grooves are fitted to the main bearing caps.

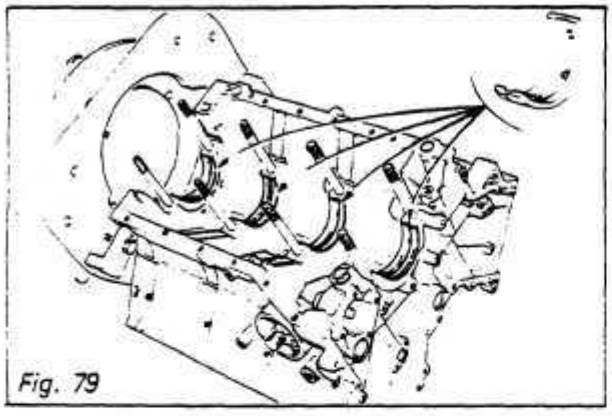


Fig. 79

Refit the crankshaft. *(Fig. 80)*

The nominal size top thrust half washers 2,30 mm (.0805") with the oil grooves facing the crankshaft flange.
The front and rear main bearing caps boss (A) facing the timing gear end.

Fit retaining block J 28853 astride the main bearing caps. Torque tighten the nuts to 20lb/ft.

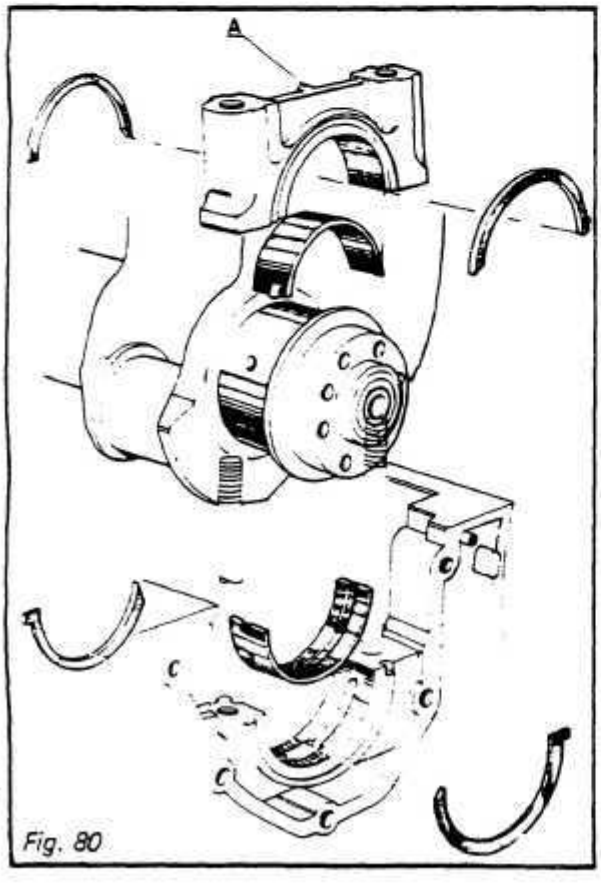


Fig. 80

Place a clock gauge on the end of the crankshaft and set it to zero. *(Fig. 97)*

Push the crankshaft towards the timing gear end. Read off the value of the end play. It should lie between 0,07 and 0,027 mm (.003 to .010").
If it is incorrect, change the thrust washers.
Fit the half shells to the connecting rods. *(Fig. 81)*

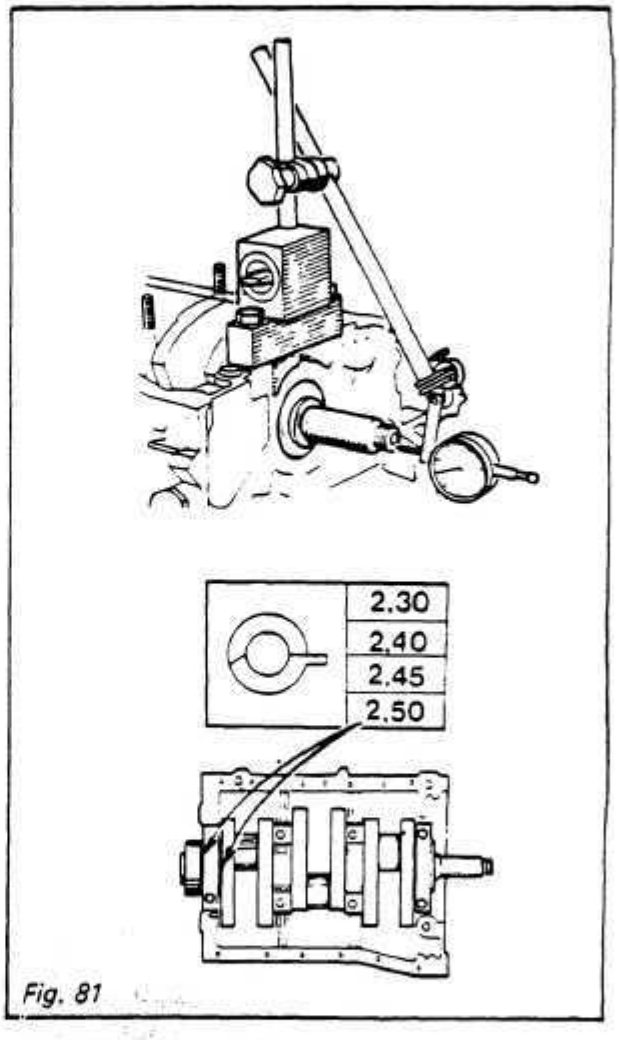


Fig. 81

ASSEMBLING THE "LINER-PISTON-CONNECTING ROD" ASSEMBLIES

Keep strictly to the markings made on dismantling to denote the correct way round and position of the various components.
Insert the assemblies in the order that they were marked during the liner protrusion check (numbered 1 to 6). *(Fig. 82)*
Clamp the first liner with a clamp.
Proceed in the same way for the other assemblies clamping the liners as assembly proceeds.

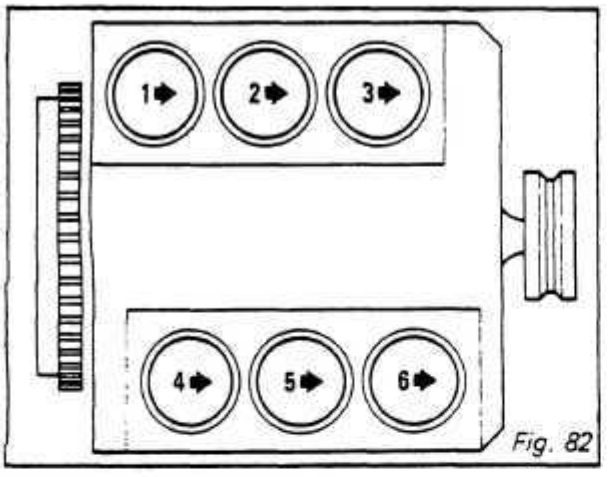


Fig. 82

Check that all the arrows on the piston crowns point towards the timing gear end.

Fit the big-end caps and torque tighten the new nuts.

Remove the main bearing retaining blocks.

Refit:
The intermediate main bearing caps bosses (A) facing towards the timing cover. *(Fig. 83)*

The rear plate fitted with its oil seal and if necessary, make the joint between plate and cylinder block flush. (Hand tighten the bolts).

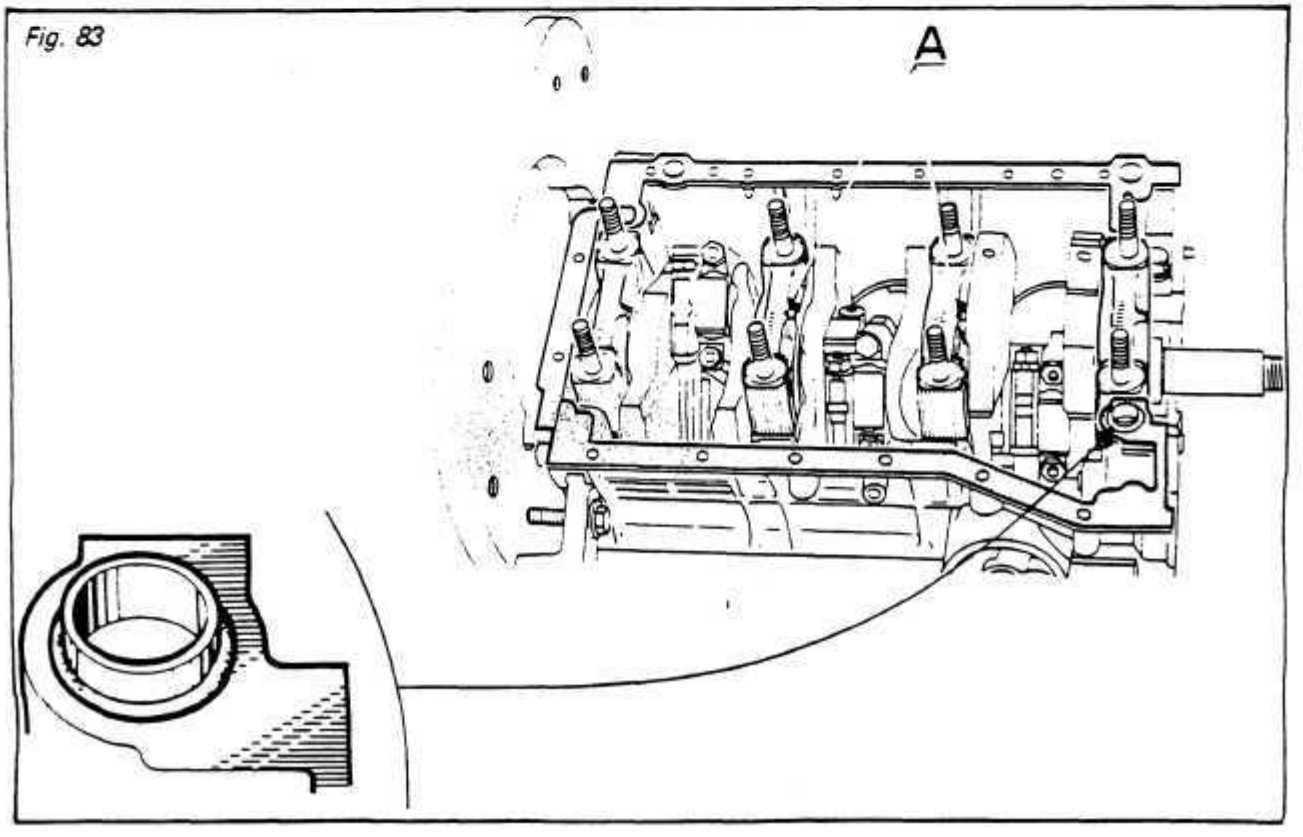
Fit a new "O" ring seal on the oil entry pipe and smear the assembly face with sealing compound.

FITTING THE BOTTOM CASING

It is essential that the bottom casing and cylinder block are absolutely flush at the clutch end in order to avoid distortion of the clutch housing when the gear box is fitted.

Refit
The bottom casing
The flat washers (boss under nut) and main bearing cap nuts without tightening
Another peripheral bolts also without tightening.
Align the bottom casing flush with the cylinder block using either
A clutch housing, tightening the four fixing bolts moderately *(Fig. 84)*
Or using two straight edges laid on the cylinder block in the latter case, check the alignment after tightening the fixing bolts.

Fig. 83



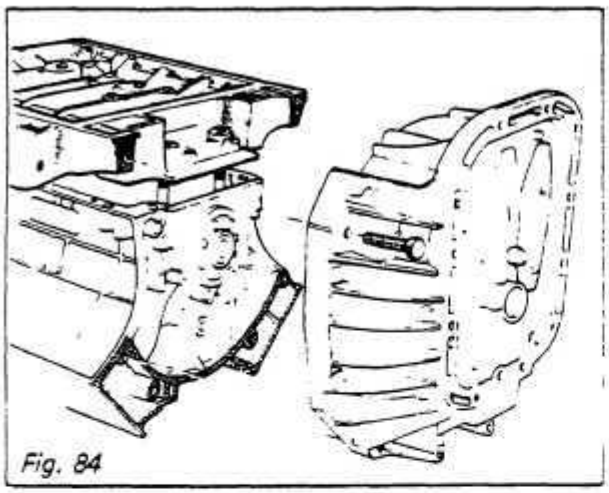


Fig. 84

ANGULAR TIGHTENING OF MAIN BEARING CAPS

Torque tighten the 8 nuts in sequence starting from centre main bearing cap and working outwards. *(Fig. 85)*
Slip the graduated disc over the socket before fitting the torque wrench.
Turn the graduated disc clockwise until the locking stem rests against a solid object which will prevent the disc from turning.
Adjust the moving pointer to the angular tightening value 75° for main bearing cap nuts.
Tighten the nuts until the moving pointer reaches "0".
Repeat the above operation on each nut.

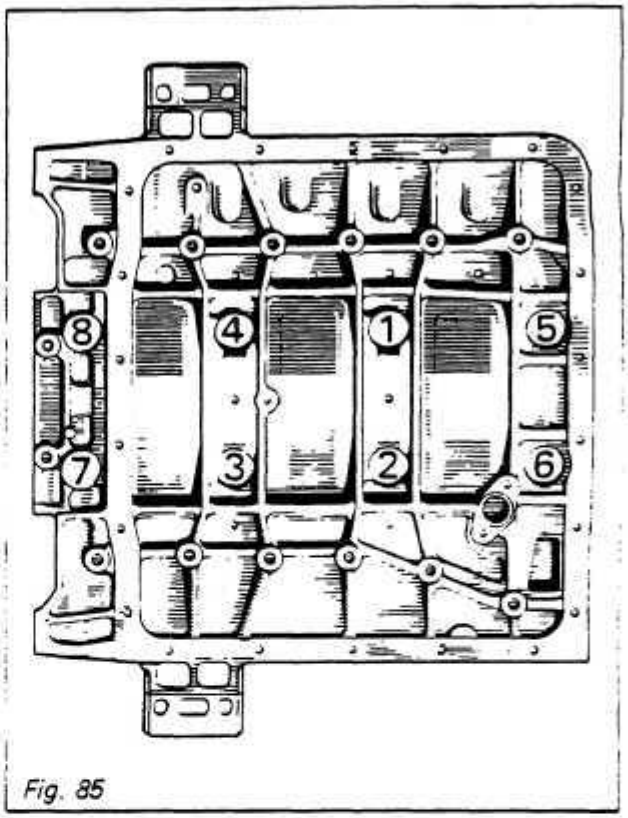
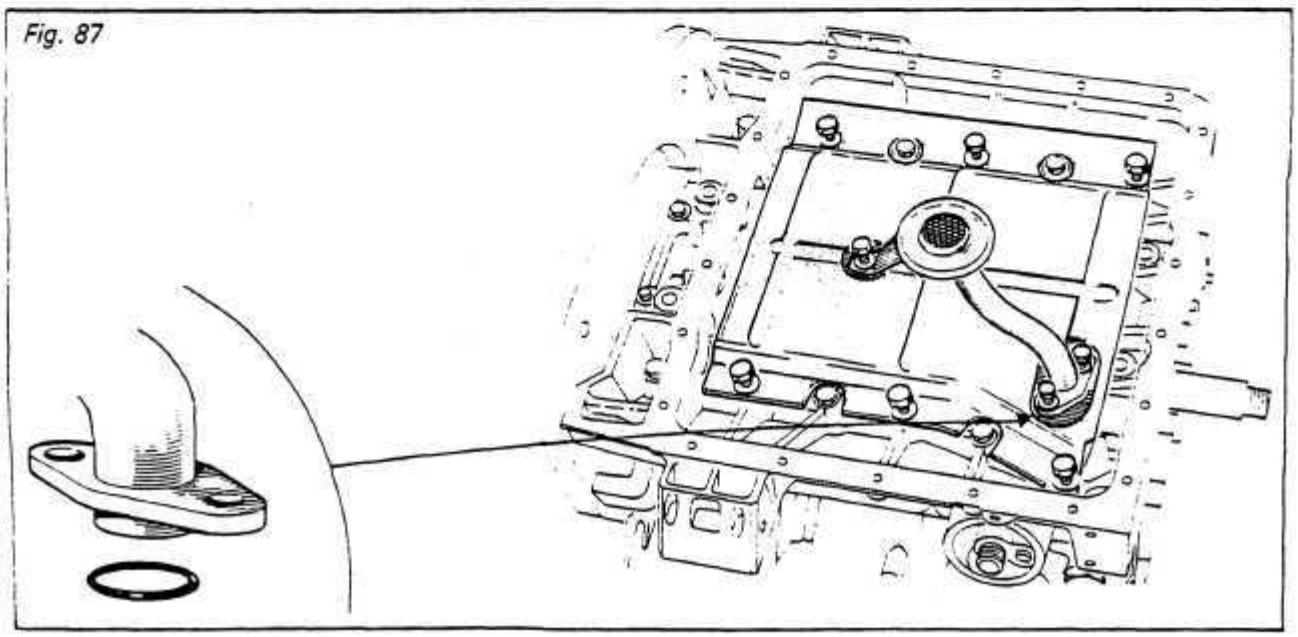


Fig. 85

REAR PLATE

Offer up the rear plate with its paper gasket. It is located laterally by dowel (A). Tighten bottom bolts (1) first followed by the 6 female capscrews. *(Fig. 86)*

Fig. 87



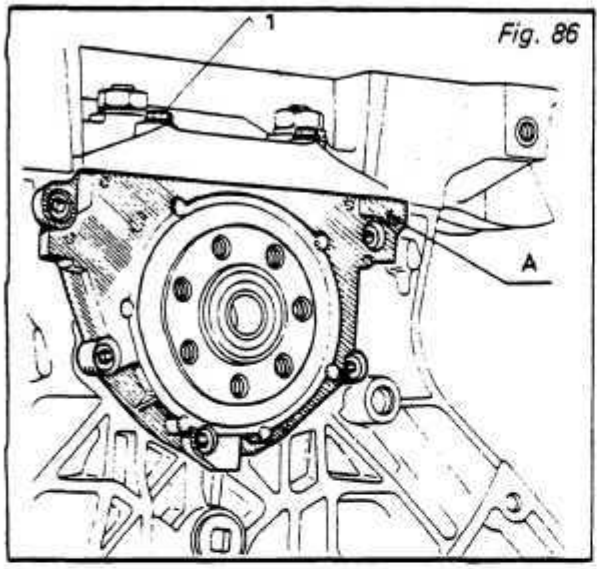


Fig. 86

Refit:
The anti-emulsion plate
The suction pipe fitted with a new "O" ring seal
A new cork gasket and the sump. *(Fig. 87)*

Turn engine over.

The crankshaft must be positioned as follows in order to set the valve timing.
Keyway vertical
No. 1 piston 15 mm (19/32") down its bore on the compression stroke (BTDC) to avoid the risk of contact with the valves. *(Fig. 88)*

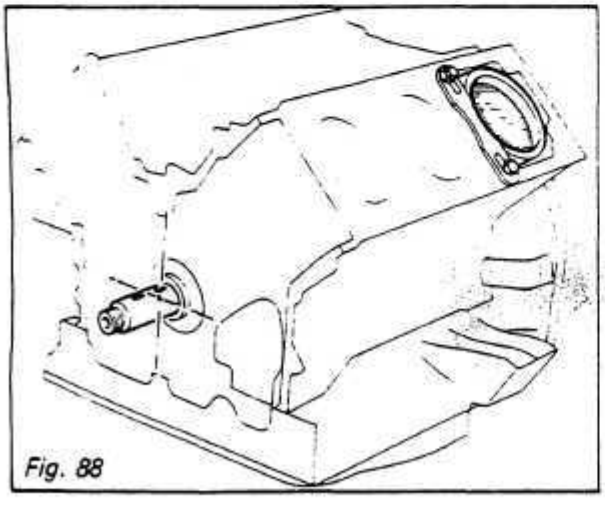


Fig. 88

FITTING CYLINDER HEADS
A—LH cylinder head: insert a pin punch into the side of each cylinder locating roll pin hole to prevent the latter being pushed down when the cylinder head is refitted. *(Fig. 89)*

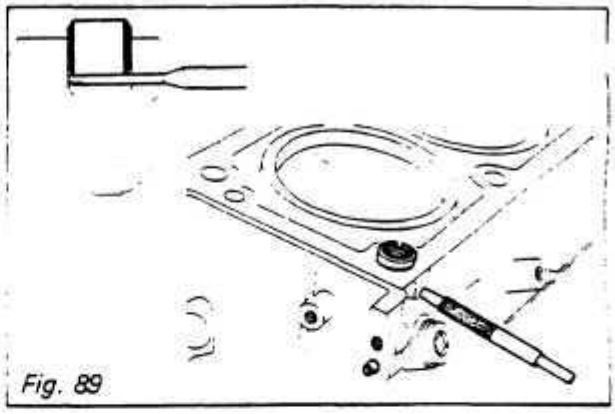


Fig. 89

Insert the roll pins and push them in until they rest on the pin punches.
Remove the liner clamps.
Fit the cylinder head gaskets dry.
Fit the cylinder head.
Line up the LH camshaft so that its slot (E) is positioned as shown. *(Fig. 90)*

This corresponds to the "on the rock" position of the rocker arms for No. 1 cylinder.
Remove the pin punches. Fit the rocker shaft assembly, taking care to place it the correct way.

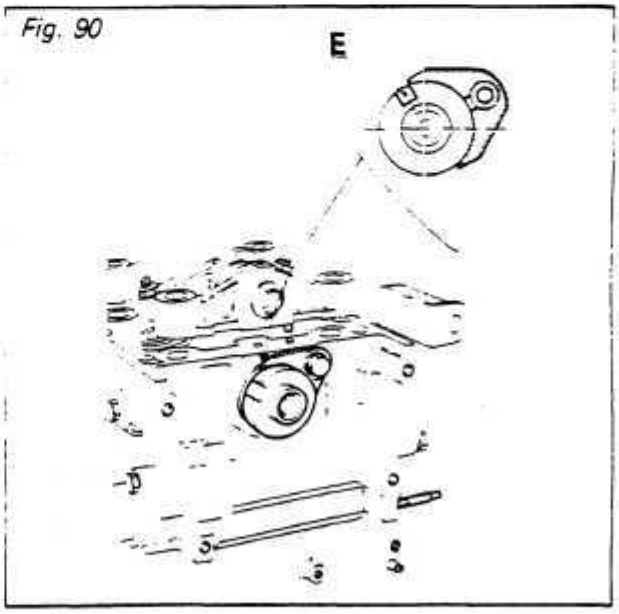


Fig. 90

A—RH cylinder head: carry out the same operation for the RH cylinder head. Line up the RH camshaft so that its slot (F) is positioned as shown. This corresponds to the "on the rock" position of the rocker arms for No. 6 cylinder. Fit the rocker arm assembly, taking care to place it the correct way round. *(Fig. 91)*

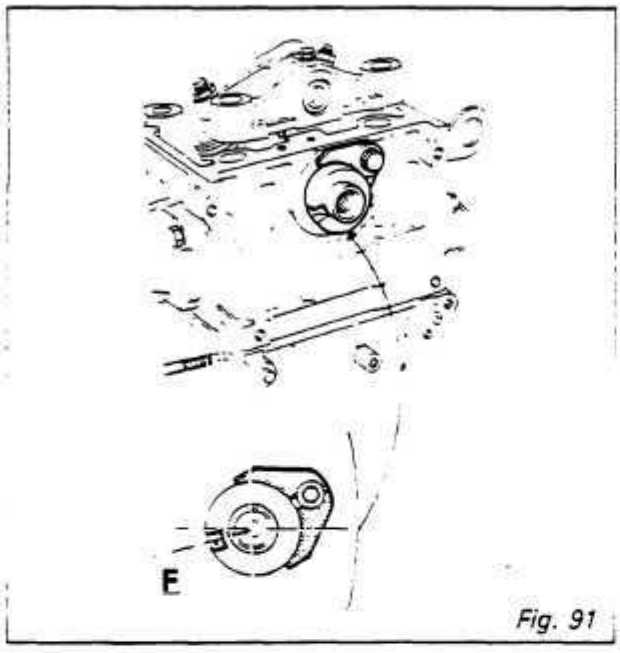


Fig. 91

Lubricate the cylinder head bolts and hand tighten them.

Torque tighten the cylinder heads on both banks.

Refit:
oil pressure switch
tensioner oil filter gauzes
both chain tensioners
the fixed shoes
tensioner blades
timing sprocket key and timing sprocket with timing mark facing outwards. *(Fig. 92)*

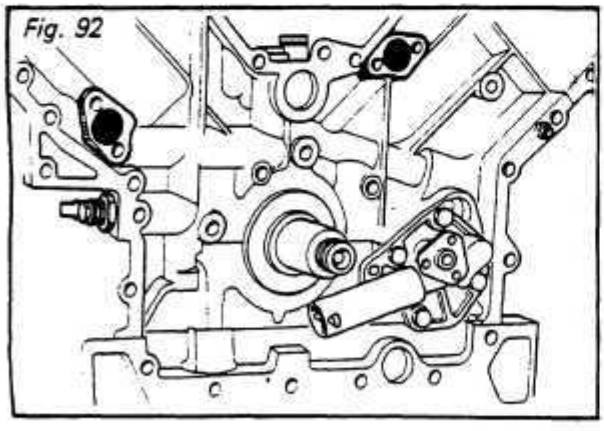


Fig. 92

VALVE TIMING LH SIDE

Turn the crankshaft clockwise so that the keyway centre lies on the centre line of the LH bank of cylinders. *(Fig. 93)*

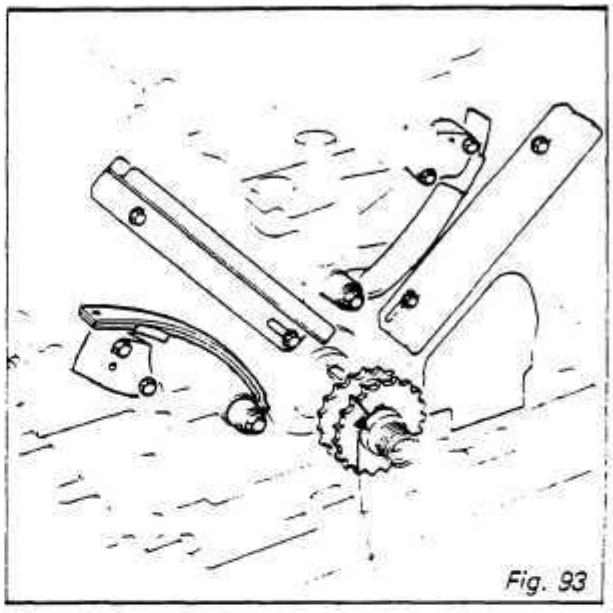


Fig. 93

Fit the timing chain to the LH sprocket, with the dual marking on the chain astride the timing mark on the sprocket.

Now fit the timing chain over the rear set of teeth on the timing double sprocket, with the single marking on the chain in line with the timing mark on the front of the double sprocket. *(Fig. 94)*

Fit the camshaft sprocket to the camshaft, taking care to ensure that the driving pin enters its slot.

Torque tighten the camshaft sprocket bolt while preventing the crankshaft from turning.

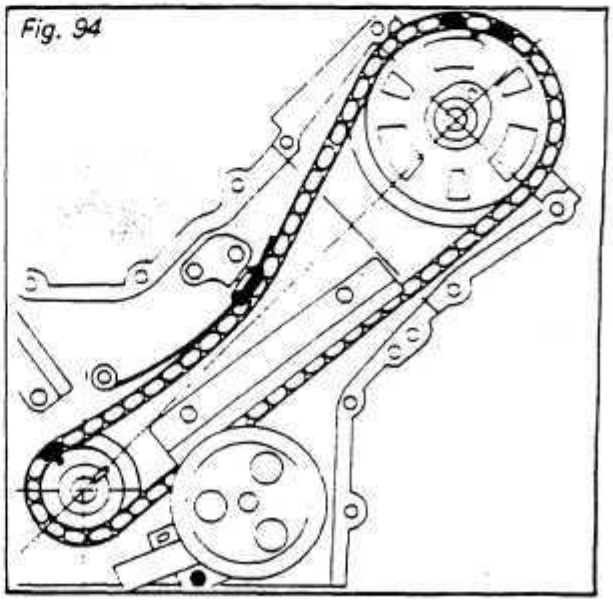


Fig. 94

VALVE TIMING RH

Turn the crankshaft through 150° (the timing mark on the crankshaft sprocket becomes in line with the oil pump cover bottom fixing bolt). *(Fig. 95)*

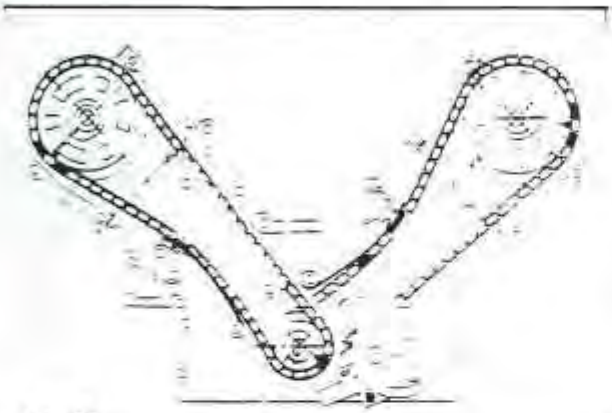


Fig. 95

Fit the timing chain to the RH sprocket, with the dual marking on the chain astride the timing mark on the sprocket.

Now fit the timing chain over the front set of teeth on the timing double sprocket, with the single marking on the chain in line with the timing mark on the front of the double sprocket.
Torque tighten the camshaft sprocket bolt while preventing the crankshaft from turning.

Set both timing chain tensioners by turning the ratchet mechanism clockwise with a screw driver. Do not assist the tensioner to find their operational setting. *(Fig. 96)*

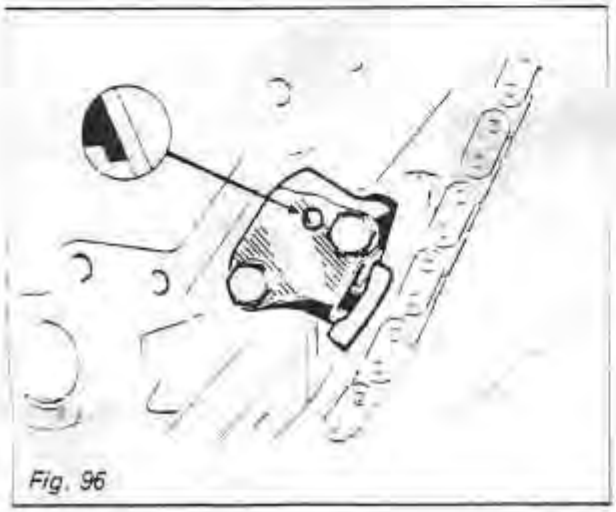


Fig. 96

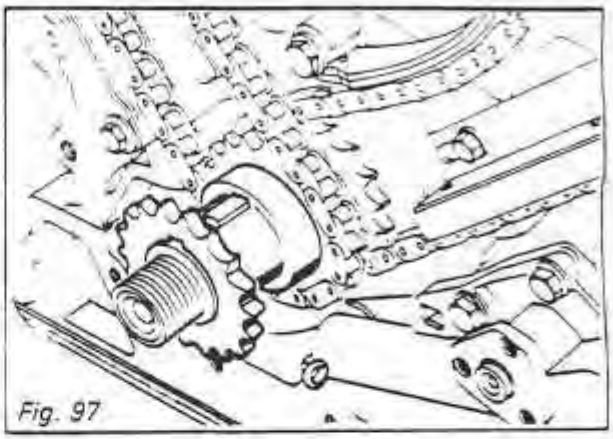


Fig. 97

Position the crankshaft with the keyway uppermost. *(Fig. 97)*

Refit:
The distance piece for the oil pump drive pinion,
The key,
And oil pump drive pinion,
The oil pump drive chain and sprocket, (assemble the bolts with loctite and torque tighten them. *(Fig. 98)*
The timing cover gaskets dry
The timing cover (located by two dowels)
The fixing bolts (smear the bottom bolts with loctite)

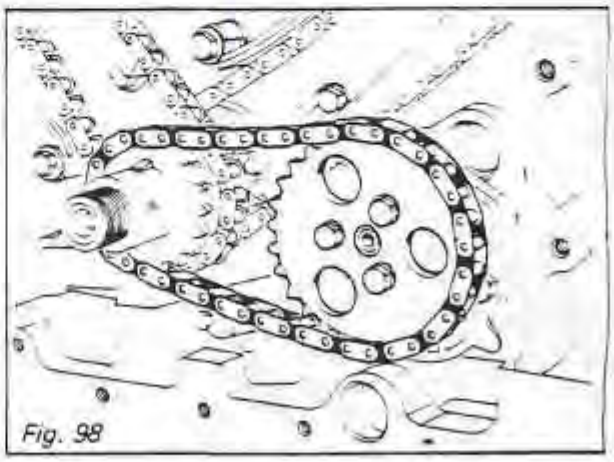


Fig. 98

Trim off the gaskets flush with the tops of the cylinder heads.

Refit:
The crankshaft pulley oil seal.
The pulley (oil seal bearing face lubricated). *(Fig. 99)*

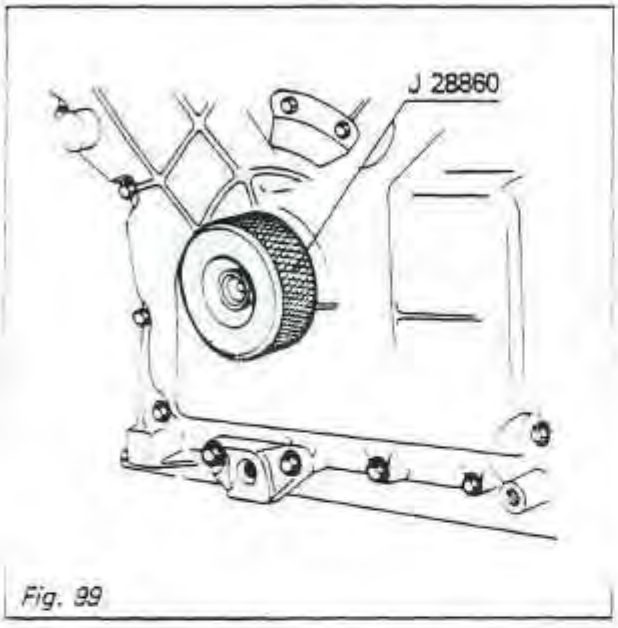


Fig. 99

Smear the crankshaft threads with loctite.
Prevent the crankshaft from turning.
Fit and torque tighten nut.

Refit:
The water pump complete with its hoses (inserting new "O" rings) *(Fig. 100)*

Insulating plates

Rubber seals round inlet tracts

Inlet manifold assembly

Alternator and its drive belt and distributor and leads

Adjust rocker arm clearances. Fit the rocker covers and spark plugs.
Remove the engine from the support.
Fit and tighten
the cylinder block drain plugs
and new oil filter (after injecting some oil through hole (A) to prime oil pump) *(Fig. 101)*

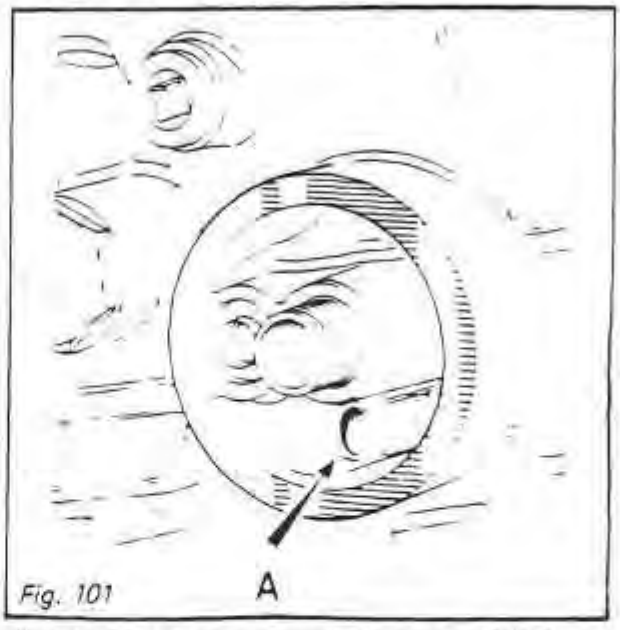


Fig. 101

Fit the main bearing oil seal using tool J28861
Fit the flywheel or convertor driving plate.
The final bolts are of the self locking type and they must be renewed after each dismantling, smear the threads with loctite.
Refit the dipstick tube smeared with loctite.

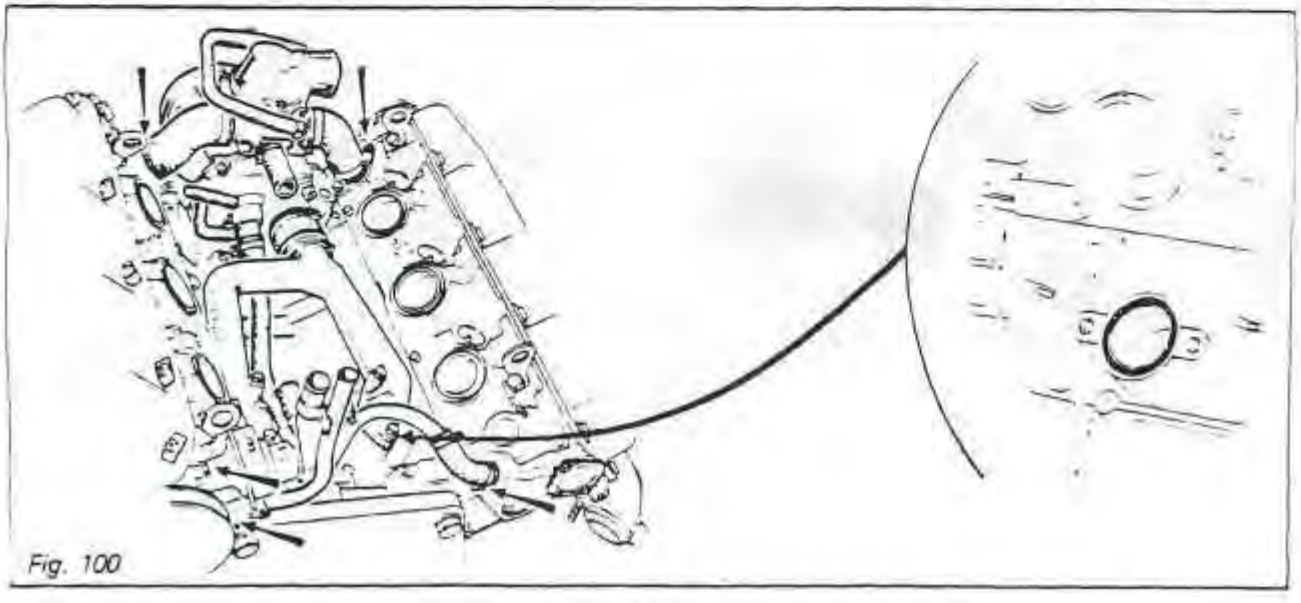


Fig. 100

Refit the engine to the vehicle.

Fill
The engine with oil
The cooling system
Adjust the controls, ignition and fuel injection.

Then run the engine for 30 minutes. Allow it to cool down for at least two hours, then re-tighten the cylinder heads.

Loosen bolt No. 1 and re-tighten it to 15 lb/ft (20mm). Repeat the above on each bolt in the order shown. *(Fig. 102)*

Slip graduated disc over the socket before fitting the torque wrench and angular tighten to 115°.

Repeat for each bolt in the order shown.

Adjust valve clearances.

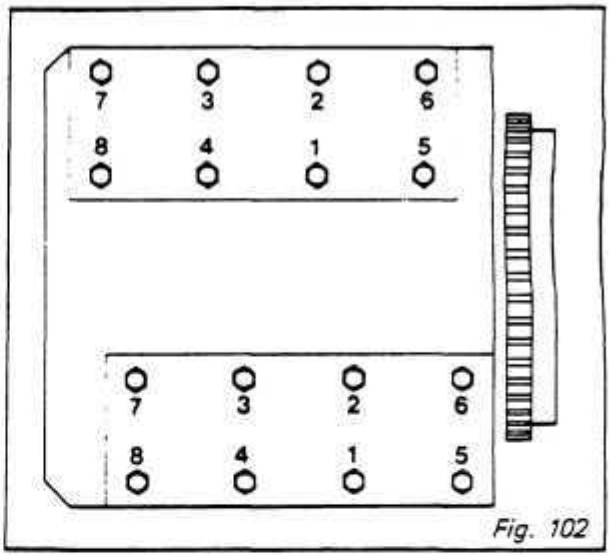


Fig. 102

Main Bearing Oil Seal—Flywheel End—Changing

REMOVING

Remove
the gearbox or automatic transmission
the clutch mechanism and disc if applicable
flywheel or convertor driving plate *(Fig. 103)*
Ease the oil seal out with a screw driver.
Special points concerning refitting.
Lubricate the new oil seal and insert it in the tool. J28861

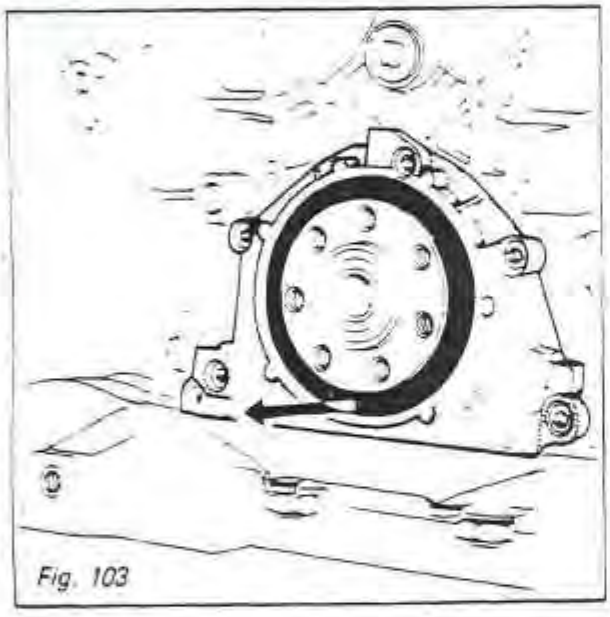


Fig. 103

Take extreme care when fitting as the oil seal lip is delicate.
Locate the seal by tapping on the end of the tool. (Fig. 104)

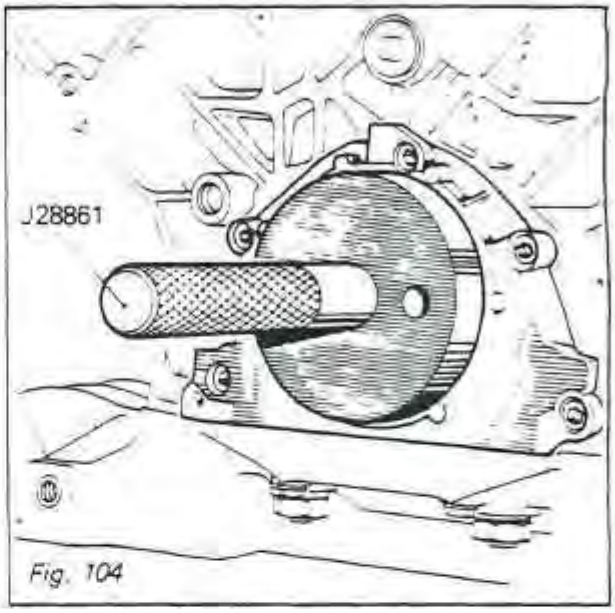


Fig. 104

Remove the tool by pulling and turning at the same time.
Smear the new bolts for the flywheel or convertor driving plate with loctite.
Note: Place one plate (A) on each side of the convertor driving plate. *(Fig. 105)*

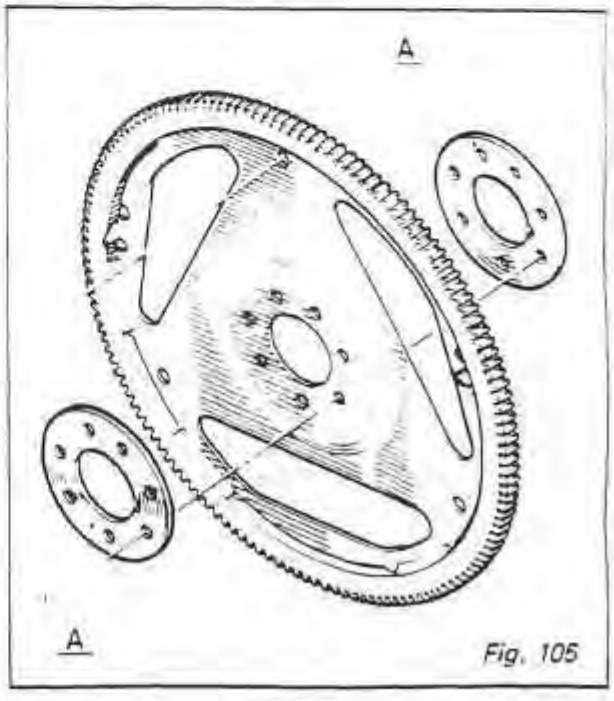


Fig. 105

Torque tighten bolts.
Convertor driving plate fixing bolts 50 lb/ft (68 mm)
Flywheel fixing bolts 45 lb/ft (60 mm).

Main Bearing Oil Seal—Timing Gear End—Changing

REMOVING

Remove
alternator drive belt
air conditioning drive belt
exhaust muffler
Rotate crankshaft until TDC timing mark on pulley is straight up. *(Fig. 106)*

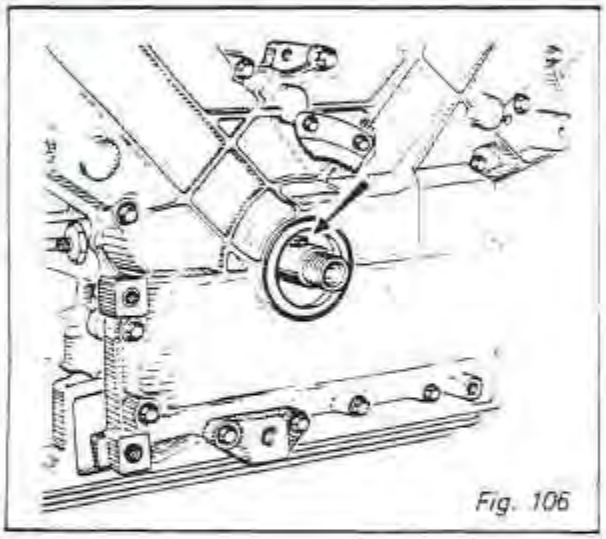


Fig. 106

Remove crankshaft pulley nut. Remove pulley. Extract the old oil seal with a screw driver: do not mark the oil seal location.

REFITTING

Lubricate the new seal, fit it to inserting tool J28860—offer up tool and seal, push the tool in until it contacts the timing cover which locates the oil seal correctly. *(Fig. 107)*

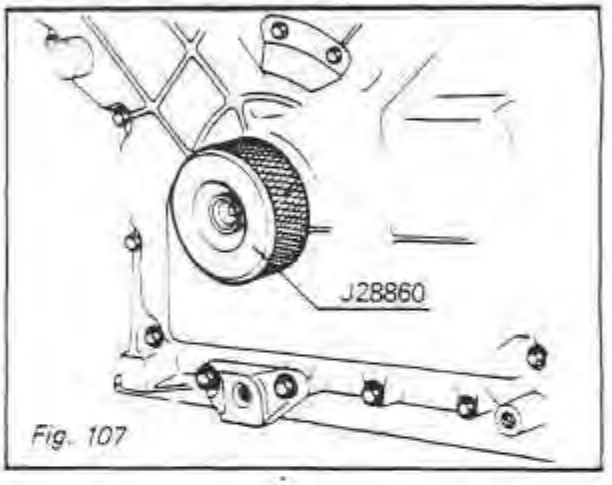


Fig. 107

Check the oil seal locating on the old pulley. Fit a new pulley if the old pulley is marked or worn; make sure it enters the key.
Smear the bolt with 1 or 2 drops of loctite and torque tighten the nut to 135 lb ft (183 nm).
Refit
exhaust muffler
alternator drive belt
air conditioning drive belt and tension

Oil Pump—Overhauling

REMOVING

Drain engine oil
Remove
alternator drive belt tensioner
air conditioning drive belt
air conditioning compressor
air filter
and rocker covers

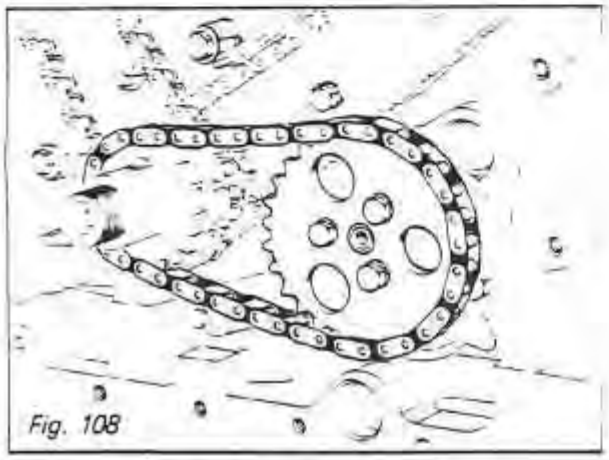


Fig. 108

Remove
exhaust muffler
crankshaft pulley nut
crankshaft pulley
and timing cover
Remove
the sprocket and chain *(Fig. 108)*
oil pump cover (never unstick the cover by tapping the release valve boss) (A) *(Fig. 109)*
and driven gear

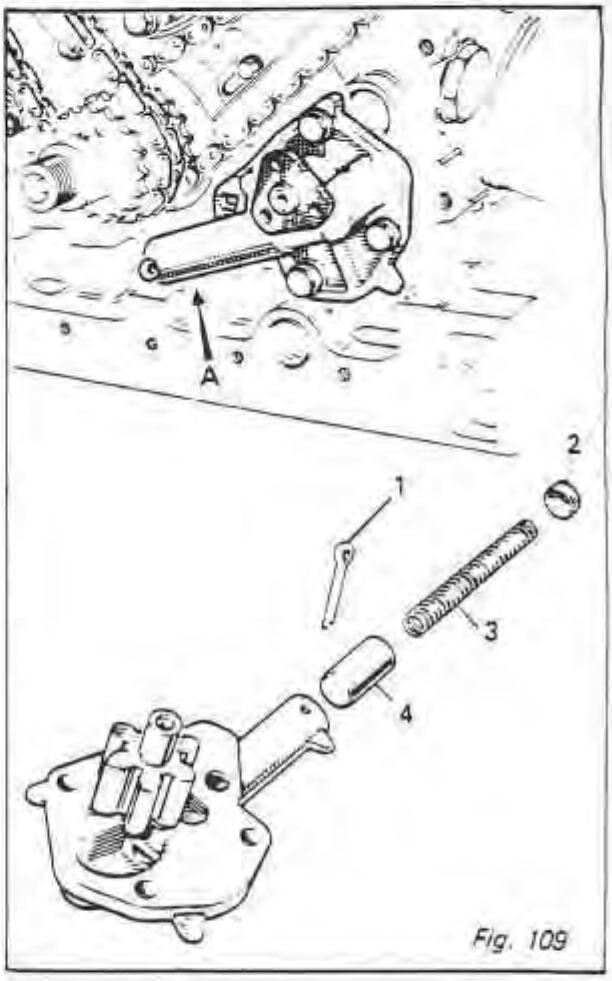


Fig. 109

DISMANTLING

Remove the split pin (1) and take out
the concave spring seat (2)
spring (3)
and release valve plunger (4)

OVERHAULING

Check
condition of components;
and location in cylinder block. *(Fig. 110)*

The complete oil pump assembly must be changed if any particular part is worn.

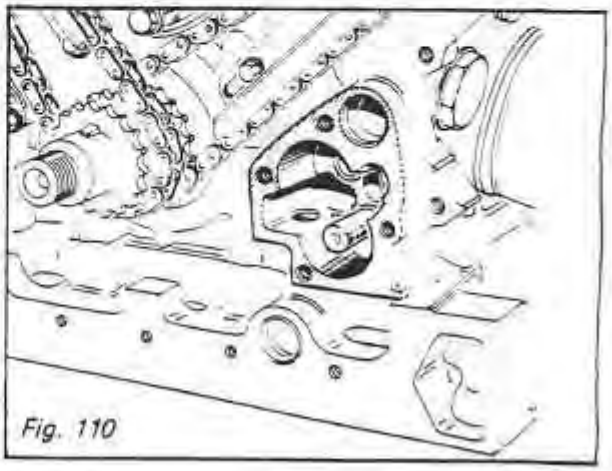


Fig. 110

REFITTING

Check oil pump rotation.
Make sure that the release valve plunger and spring seat are inserted the correct way round.

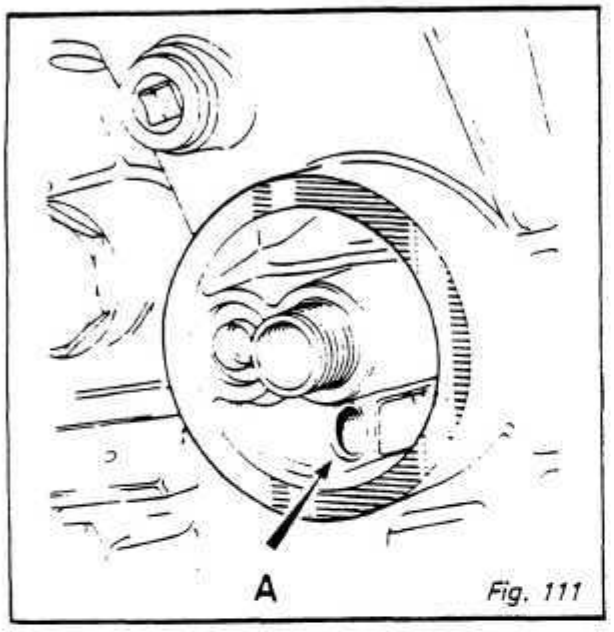


Fig. 111

SPECIAL POINTS CONCERNING REFITTING

Fit in position
the drive gear
and oil pump cover; tighten the driving plate bolts progressively to make sure that pump gears revolve freely.

Remove the oil filter and inject some engine oil through hole (A) with an oil can to prime the oil pumps. *(Fig. 111)*
Fit the oil pump sprocket bolts and the timing cover bottom bolts with loctite.
Torque tighten the pulley nut after smearing the crankshaft threads with loctite.

Refit
alternator drive belt and tension
rocker covers
air conditioning compressor
air conditioning drive belt and tension
exhaust muffler
Fill engine with correct quantity of recommended oil.
Make all necessary adjustments.

Oil Pressure Checking — Fig. 112

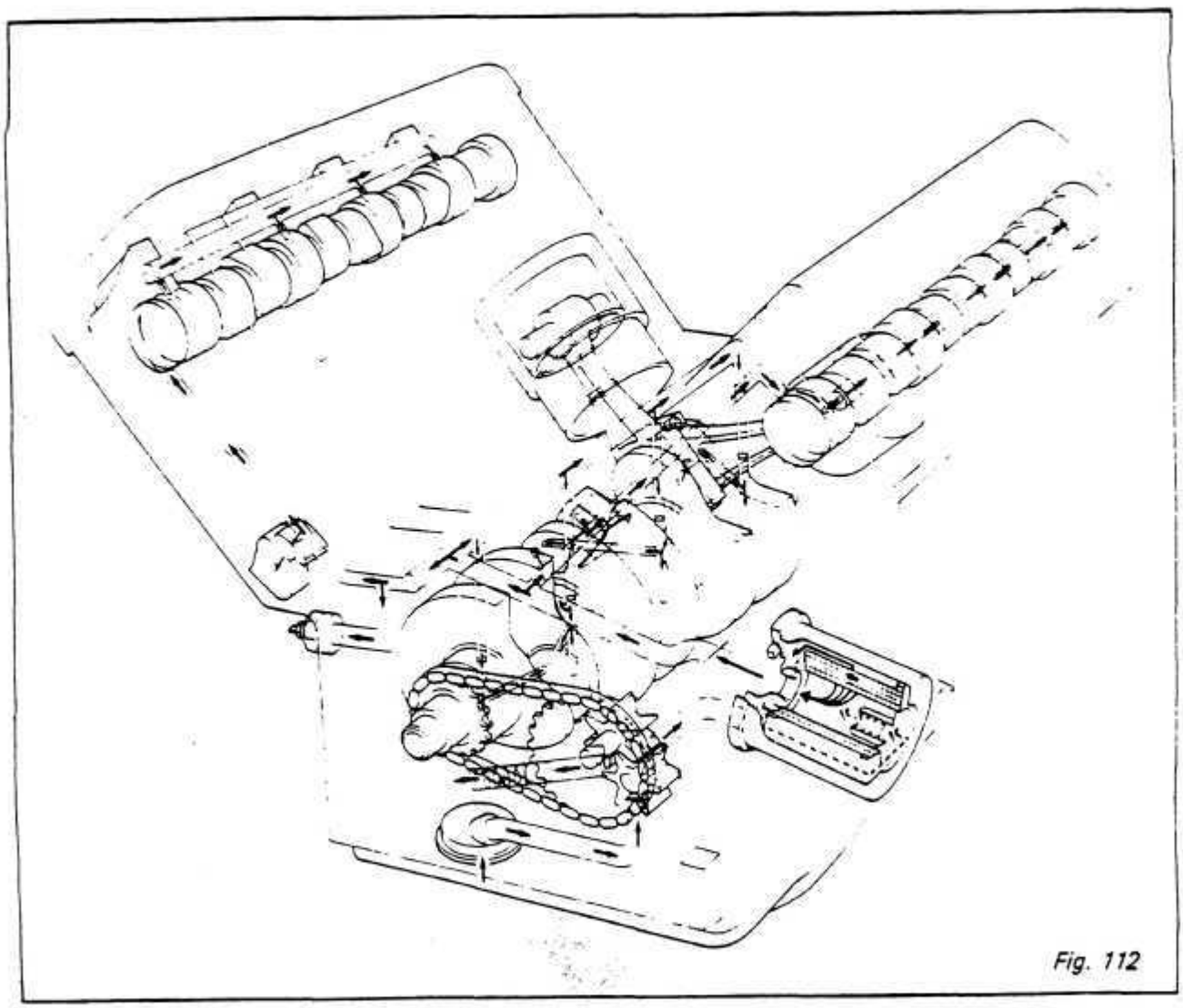


Fig. 112

The engine oil pressure must be checked when the engine is hot (80°C).
The oil pressure is to be checked using tools J28872 and J28873. *(Fig. 113 and 114)*

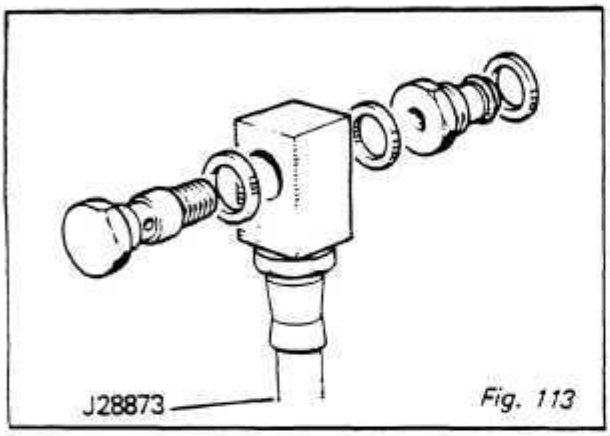


Fig. 113

Remove oil pressure sender then connect oil pressure checking gauge.
The oil pressure should be
32 psi (2,0 bars) min at 900 rpm
65 psi (4,4 bars) min at 4000 rpm

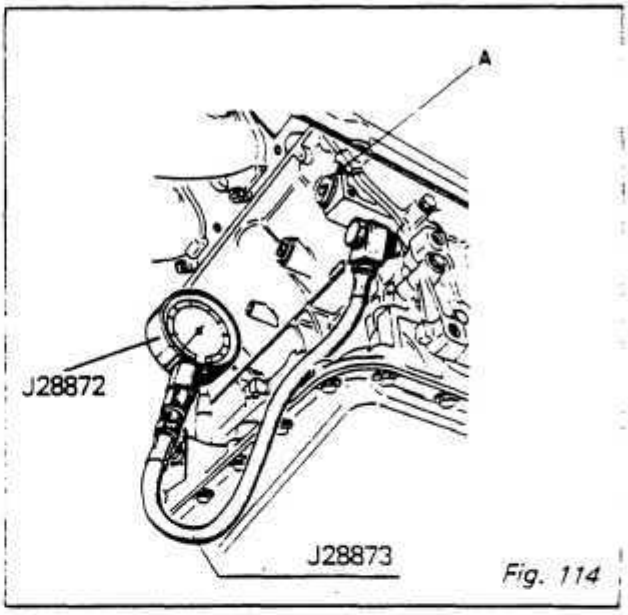


Fig. 114

Refit
the oil pressure sender using a new copper washer and top up engine oil if required.

Water Pump

REMOVING

Remove
intake manifold
alternator and A/C
drive belts
Loosen hose clamps securing water pump and heater hoses. *(Fig. 115)*

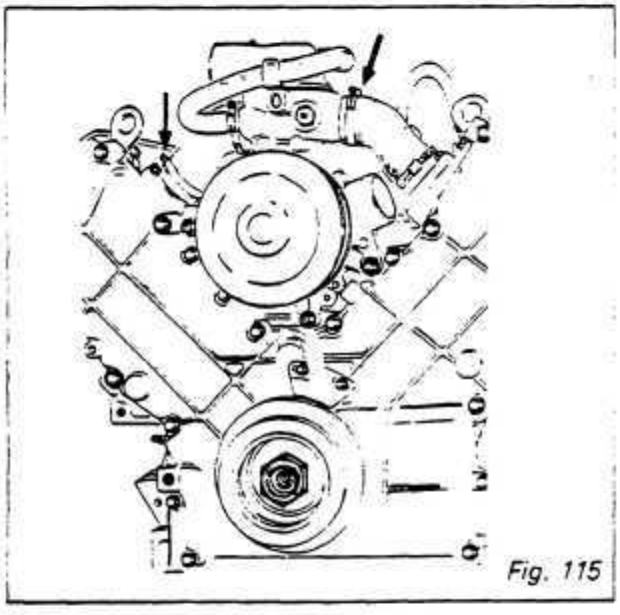


Fig. 115

Remove
coolant temperature switch wire.
water pump mounting bolts.
Remove water pump.

Remove
water pump body *(Fig. 116)*
coolant temperature switch
thermostat cover
and thermostat

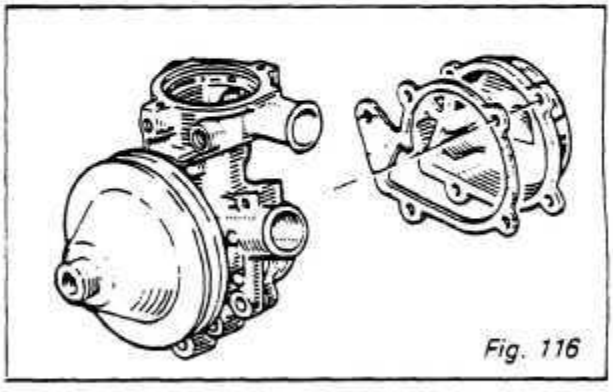


Fig. 116

FITTING

Clean the joint faces before fitting new gaskets.
Fit the thermostat to its cover the right way round. *(Fig. 117)*

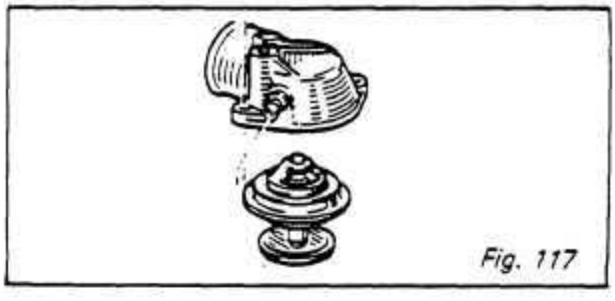


Fig. 117

Check that "O" rings are in position in the inlet manifold.

Tighten all hose clamps.

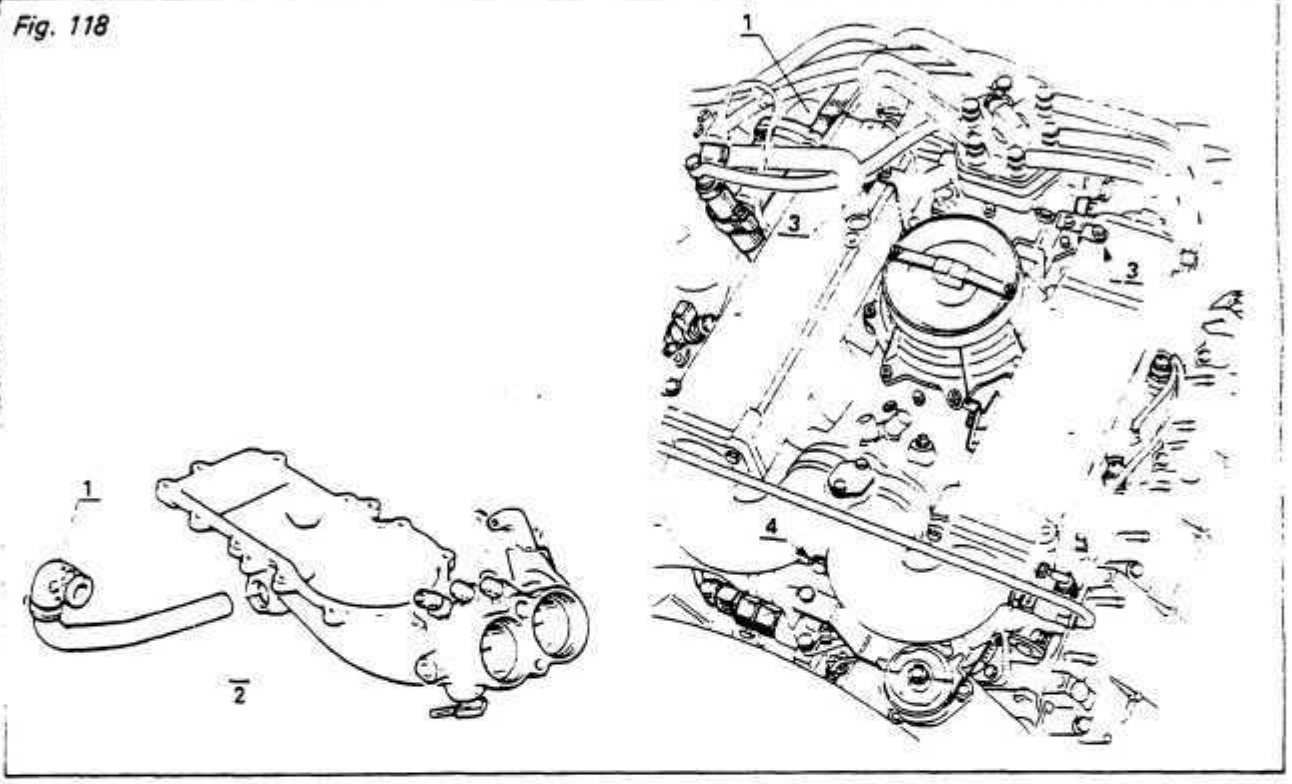
Refit alternator and A/C drive belts and tension.

Refit intake manifold.

Fill the cooling system.

Inlet Air Manifold

Fig. 118



LOWER AIR CASING

REMOVING

Remove air filter assembly. Unscrew the fuel unions on the fuel metering head.

Loosen the hose clip connecting air inlet pipe (1) to the idle speed control. *(Fig. 118)*

Turn the pipe to free the idle speed control hose and pull to release it from the lower air casing.

The pipe is assembled with an "O" ring (2) in the lower air casing for sealing purposes.

Remove idle speed control. Unscrew the 2 capscrews (3) and bolt (4) holding the lower air casing to the inlet manifold.

Disconnect arm (5) *(Fig. 119)* from the throttle linkage ball as follows: —

— rotate clip half a turn to free it then slide it along ⅜" to unlock the ball.

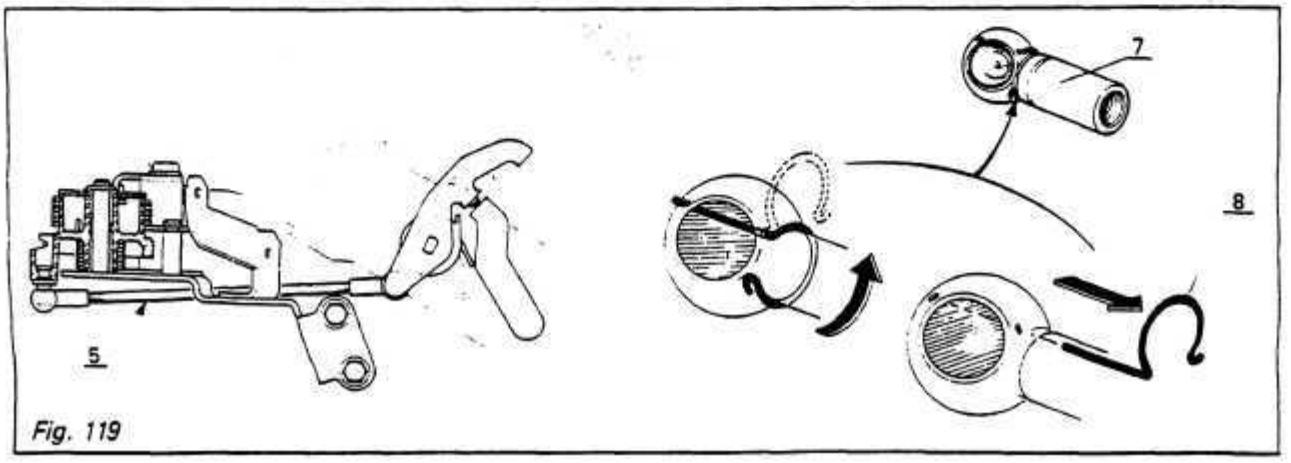


Fig. 119

NOTE: The arm has LH and RH threaded ends to assist adjustment.

The LH threaded end is identified by a groove (7) on the ball joint. Disconnect the HT wires from the distributor.

Free the lower casing rearwards to clear the air intake elbow rings and lift it at the back to pass over the distributor cap. Remove the lower casing and disconnect the vacuum pipes on the distributor.

REFITTING

Change all seals. There is a plastic seal at the elbow end of the air channel and an "O" ring at the lower casing end in the connecting rings.

Connect up the vacuum pipes.

Offer up the casing.

Screw in bolt (4) first to enable capscrews (3) to line up with their holes.

Tighten bolt (4) then capscrews (3). *(Fig. 118)*

Re-connect

The HT wires to the distributor cap
All fuel unions
The idle speed air pipe, after greasing the "O" ring in the lower casing
The idle speed control
The throttle arm ball joint, locking it correctly with the clip (8) *(Fig. 119)*

INLET AIR MANIFOLD

REMOVING

Remove lower air casing (see preceding page).
Unscrew the 4 manifold bolts (1). *(Fig. 120)*

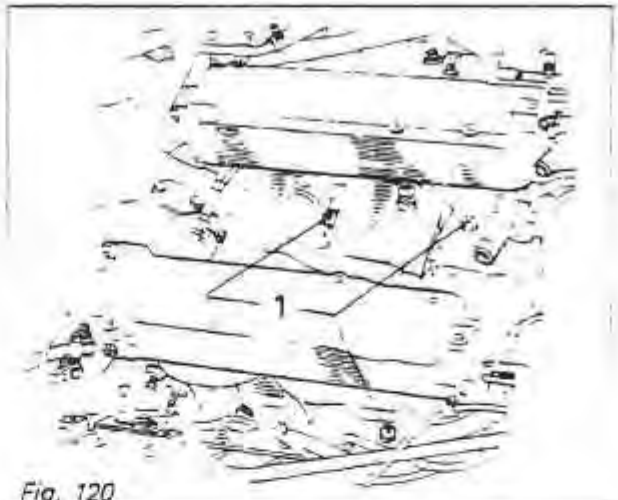


Fig. 120

REFITTING

Note the following

Change all gaskets and seals
Fit inlet sleeves
Reconnect the distributor vacuum pipe
Fit the fuel metering head, air flow meter in place
Remember to pass the control arm under the bracket
Screw the inlet sleeve bolt in a few threads so as to be able to lift up the back of the air flow meter to avoid the distributor cap
Screw in bolt (42) first partly to line up capscrews (41) then tighten first

REFIT

The auxiliary air pipe
The throttle arm
Fuel pipes
Injectors
HT wires
Oil fume rebreathing and vacuum pipes
Connections
Idle speed control

Radiator

ENGINE COOLING

The vehicle has two (2) electric fans for radiator cooling mounted at the front of the vehicle. These fans are activated when the engine coolant temperature exceeds 97°C (206°F) and deactivated at 91°C (195°F). Operation of these fans is controlled by a temperature switch located on the coolant return pipe in the engine compartment.

The water pump, located at the rear of the engine, is belt driven by the crankshaft pulley. The thermostat is housed in the top of the water pump under the thermostat housing cover. The thermostat ... sing cover is equipped with an air bleed screw used to purge the air from the coolant system when refil

Coolant leaving the engine is directed through a series of pipes and hose couplings along the left side of the vehicle centre tunnel to the radiator. Coolant leaving the radiator is directed through a series of pipes and hose couplings along the right side of the vehicle centre tunnel to the engine.

The coolant expansion tank (fill point) located on the right side of the engine compartment, is connected to the coolant return pipe by a hose.

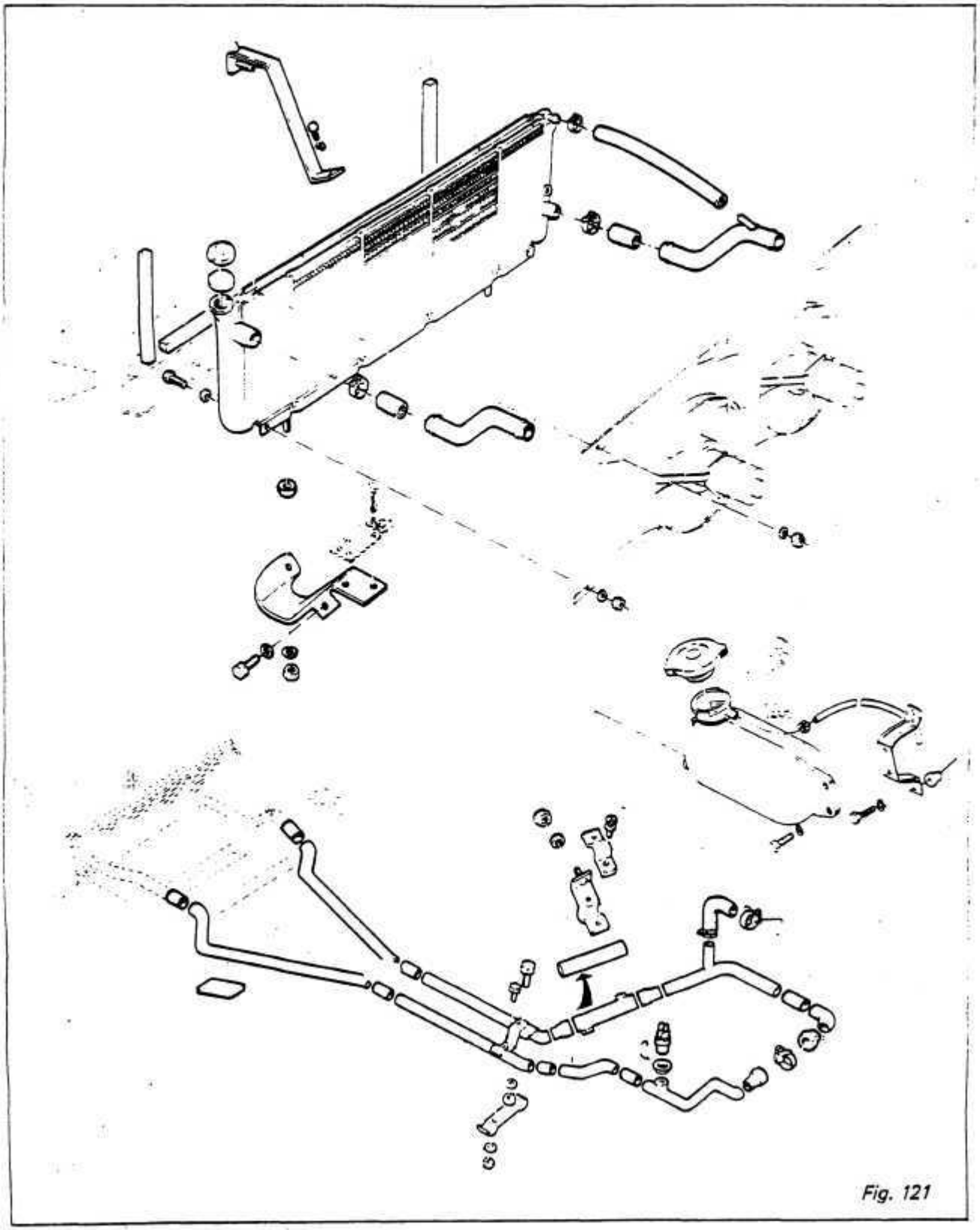


Fig. 121

Radiator

REMOVING

Release the radiator bottom hose connection and drain coolant, also release the outlet breather pipe connection from the RH top of the radiator.

Release the radiator top hose connection.

Release all screws securing the radiator air duct to the body and spoiler and withdraw duct downwards.

Remove the nuts, washers and rubber mountings securing the radiator to the lower support brackets.

Disconnect both horn leads. Remove three bolts securing each lower support bracket and horn bracket to frame and whilst providing alternative support for the radiator assembly, remove support brackets and horns with brackets.

With radiator assembly supported, remove each bolt securing radiator top support to frame.

Manoeuvre the radiator assembly sufficiently to gain access to and release nut securing each top support strut to radiator assembly. Remove brackets.

From top of radiator remove central nut and bolt securing fan housing to radiator and two nuts securing condenser.

From lower edge of radiator remove three nuts and bolts securing fan housing and two nuts securing condenser.

Ease condenser forwards and disengage mounting studs from radiator downwards between condenser and fan housing and remove.

Provide temporary support for condenser and fan housing.

REFITTING

With the fan housing assembly and condenser supported in position, insert the radiator between and engage the condenser mounting studs in the radiator top and bottom flanges. Fit nuts to all four studs.

Secure fan housing assembly to radiator with a central nut and bolt in the top flange, and three nuts and bolts along the bottom flange.

Secure the radiator top support struts to radiator assembly with nuts.

Ensure foam strip is fitted to underside of body, to about top of radiator assembly.

Raise the radiator assembly into position and secure top struts to frame with two bolts.

Check rubber bushes are fitted to radiator bottom studs before fitting lower support brackets onto studs and securing, with horn brackets, to frame using three bolts each side.

Fit second rubber bush, washer and nut onto each radiator bottom stud. Do not over-tighten nuts.

Connect horn leads. Slide radiator duct into position and secure with screws to body and spoiler.

Refit top hose, bottom hose and outlet breather pipe to radiator.

Refill cooling system with correct coolant mixture.

Fuel, Emission and Exhaust System

CONTENTS

FUEL INJECTION—GENERAL DESCRIPTION

SYSTEM DESCRIPTION

The De Lorean is equipped with the Bosch K-Jetronic fuel injection system. This form of fuel induction by means of manifold injection permits the optimum adaptation of the air-fuel mixture to every operating phase of the engine. The K-Jetronic system ensures a lower pollutant level in the exhaust gas, high performance and increased fuel economy.

The K-Jetronic is a mechanical continuous fuel injection system which does not require any form of drive mechanism. An electric fuel pump mounted inside the tank provides fuel at a constant pressure to the mixture control unit. The control unit consists of an air flow sensor which measures the flow of air entering the engine, and a fuel distributor which is mechanically operated by the air flow sensor. The fuel distributor provides the injection valves with the correct amount of fuel. The fuel is injected into the inlet manifold immediately upstream of the intake valve. Injection takes place continuously, that is, without regard to the position of the intake valve. During the intake valve closed phase, the fuel is stored in the intake tubes of the manifold.

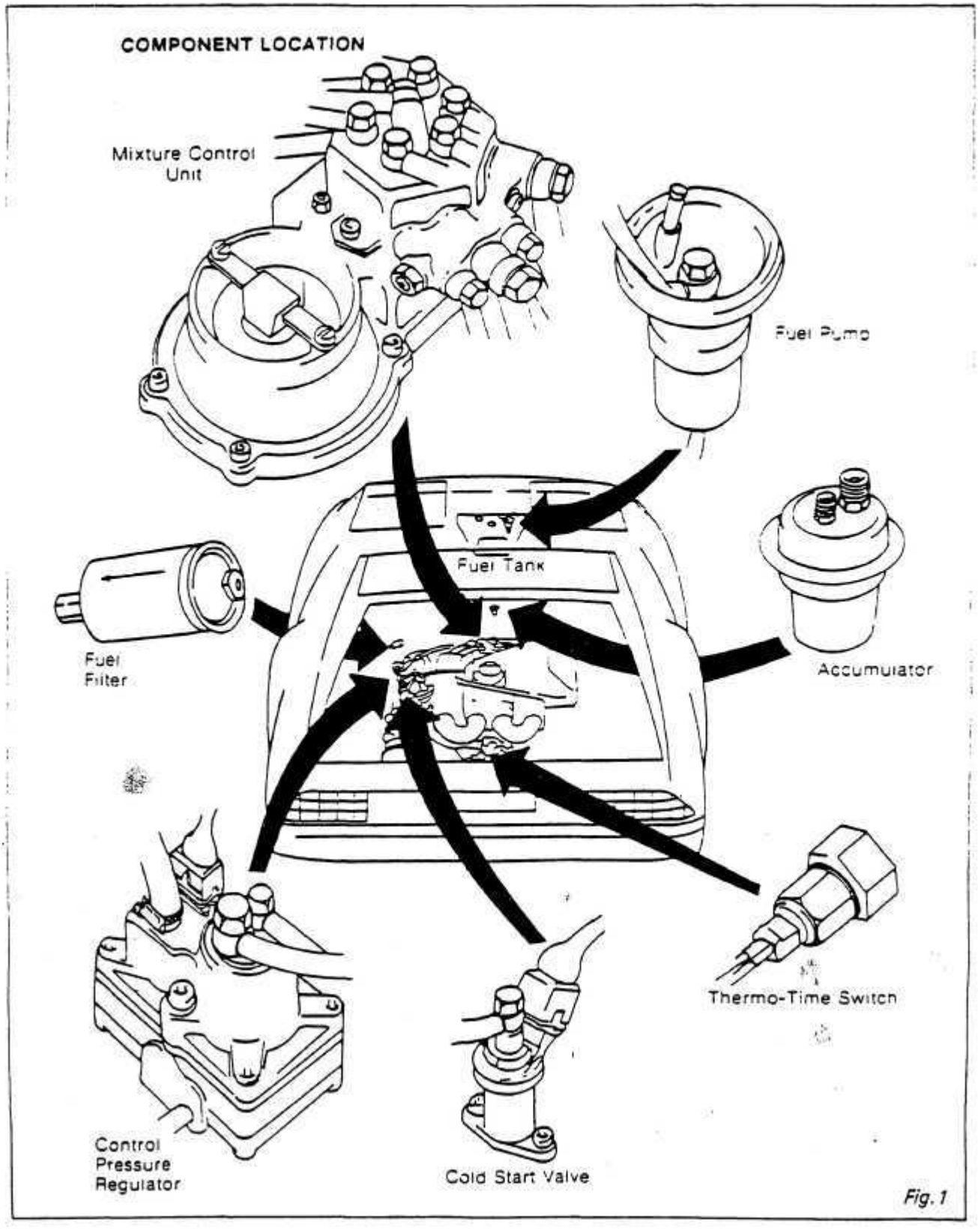
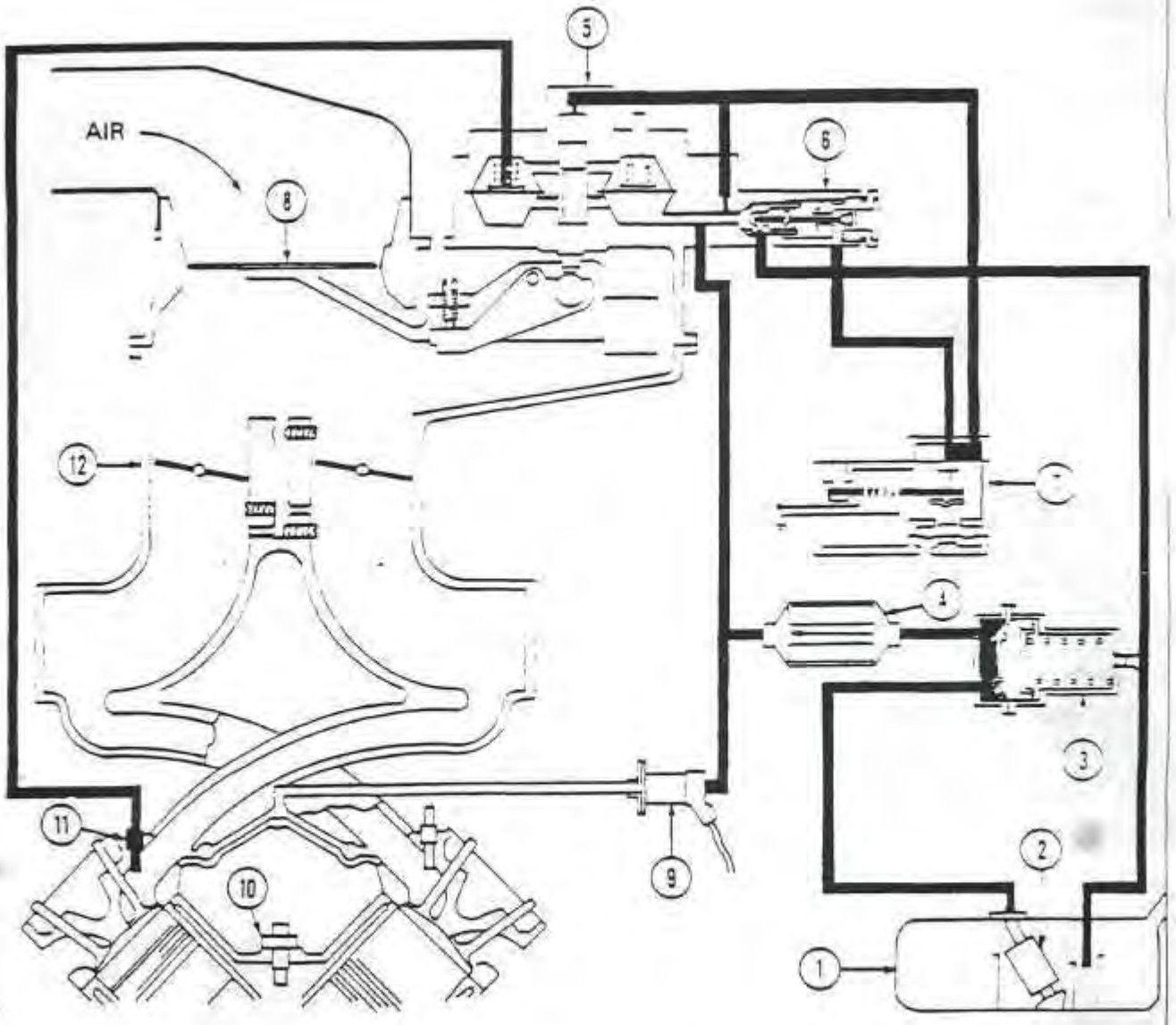

COMPONENT LOCATION
Mixture Control Unit
Fuel Pump
Fuel Tank
Fuel Filter
Accumulator
Thermo-Time Switch
Control Pressure Regulator
Cold Start Valve

Fig. 1

Fig. 2



1 FUEL TANK
2 FUEL PUMP
3 FUEL ACCUMULATOR
4 FUEL FILTER
5 FUEL DISTRIBUTOR
6 PRIMARY PRESSURE REGULATOR
7 CONTROL PRESSURE REGULATOR
8 AIR FLOW SENSOR
9 COLD START VALVE
10 THERMO-TIME SWITCH
11 INJECTORS
12 THROTTLE VALVES

D:01:04 Fuel, Emission and Exhaust System

COMPONENTS AND DESCRIPTION

1. Fuel Tank
   A moulded plastic fuel tank is located in the front wishbone of the frame. Access to the tank components is gained by removing the inspection panel inside the trunk.

2. Fuel Pump
   An electric rotary pump is used to provide fuel for the system. The pump is mounted inside the fuel tank.

3. Fuel Accumulator
   The accumulator keeps the system under pressure when the pump is not running. The accumulator is mounted inside the rear section of the frame backbone.

4. Fuel Filter
   A special filter is used to remove foreign particles from the fuel. The filter is mounted on the left rear frame rail.

5. Fuel Distributor
   The fuel distributor determines the necessary volume of fuel to be delivered to each injector.

6. Primary Pressure Regulator
   The primary pressure regulator controls the primary or main line fuel pressure in the system. The regulator is located inside the fuel distributor.

7. Control Pressure Regulator
   The control pressure regulator provides fuel enrichment during warm up and cold acceleration. The regulator is mounted on the left valve cover.

8. Air Flow Sensor
   The air flow sensor measures the amount of air entering the engine.

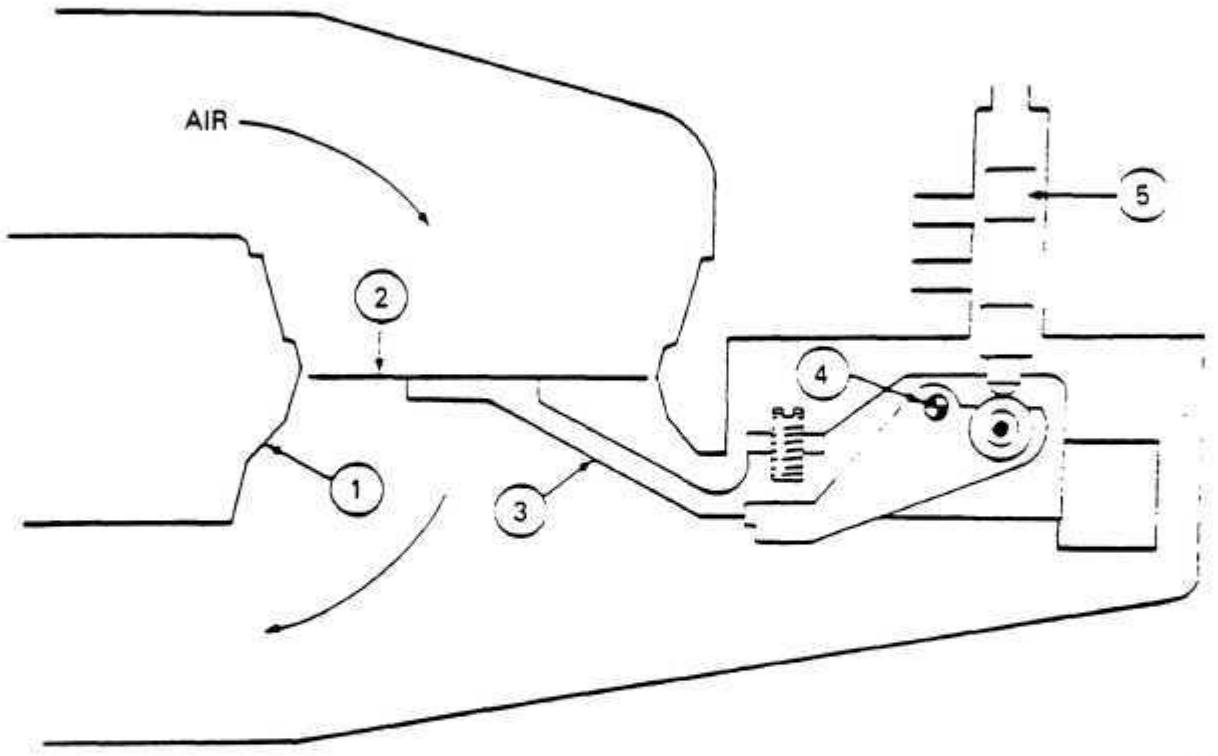
9. Cold Start Valve
   An electrically operated cold start valve is used to supply extra fuel to the engine during cold start conditions. The valve is mounted on the left side of the engine.

10. Thermo-Time Switch
    The thermo-time switch regulates injection time of the cold start valve. The switch is mounted in the thermostat housing.

11. Injectors
    The injectors are always open when the engine is running. Their main function is to atomize the fuel as it enters the intake chambers. The injectors are mounted in the cylinder heads.

12. Throttle Valves
    The throttle valves control the amount of air entering the engine. The throttle valves are located between the mixture control unit and the intake manifold.

SYSTEM OPERATION

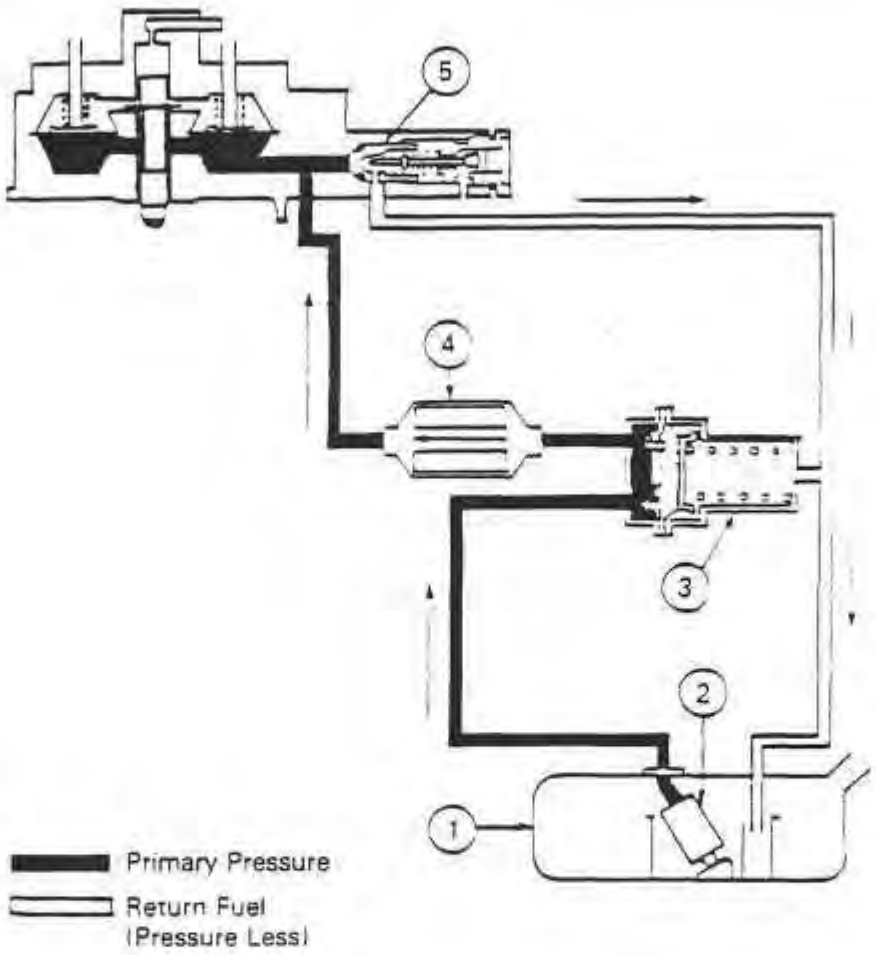


1 Air Funnel
2 Air Flow Sensor Plate
3 Balanced Lever Assembly
4 Pivot
5 Control Plunger

Fig. 3

AIR MEASUREMENT

The amount of air entering the engine is controlled by the throttle valves, engine speed, and engine load. Air flowing through the air funnel (1) moves the sensor plate (2) downward in direct proportion to the air volume. This movement is transferred by the balanced lever assembly (3) to the control plunger (5) located in the fuel distributor. *Fig. 3.*



1 Fuel Tank
2 Fuel Pump
3 Accumulator
4 Filter
5 Primary Pressure Regulator

Fig. 4

PRIMARY PRESSURE CIRCUIT

An electric fuel pump (2) runs constantly during cranking and when the engine is running. It supplies fuel to the lower chambers of the fuel distributor. Any fuel that is not used, returns to the fuel tank by passing through the primary pressure regulator (5).

The primary pressure regulator controls main line fuel pressure. If the main line pressure increases above a pre-set value, the pressure forces the regulator open. This allows fuel to return to the tank, maintaining a constant main line pressure. *Fig. 4.*

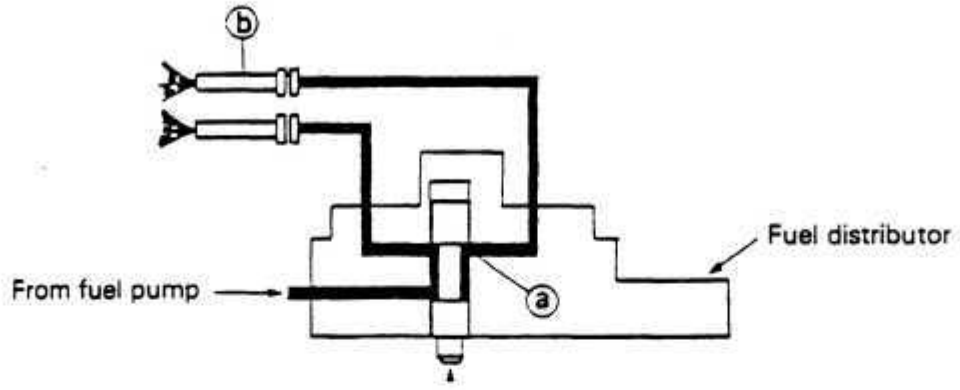


Fig. 5

FUEL DISTRIBUTION

Sensor plate movement causes the control plunger to move within a barrel containing one metering slot (a) per cylinder. As the control plunger rises, it allows an increased amount of fuel to be delivered to each injector (b) through the metering slots. The amount of fuel to the injectors is constantly controlled by the control plunger moving in relation to the amount of air entering the engine. *Fig. 5.*

In the actual fuel distributor, there are six chambers that are separated by a diaphragm (c). The lower chambers (a) are connected together and the upper chambers (b) are separated with each one containing a pressure differential valve. The pressure differential valves (d) ensure that each cylinder will receive the same volume of fuel as the control plunger rises or lowers. *Fig. 6.*

If the primary pressure decreases, the pressure regulator will close by opposing spring tension and restrict the amount of fuel returning to the tank. The movement of this regulator valve will maintain constant main line pressure and distributor lower chamber pressure regardless of engine fuel requirements or voltage fluctuations at the fuel pump. Main line pressure is regulated at approximately 5.2 Bar (75.4 PSI). The pump continuously circulates approximately 29 gallons of fuel per hour through the system.

The fuel accumulator (3) will charge during the first seconds of operation. this charging process will dampen initial fuel pump surge. when the engine is shut down, several check valves close throughout the system and prevent fuel from returning to the tank. The accumulator maintains pressure in the fuel system to prevent fuel vaporisation while the vehicle is not in use.

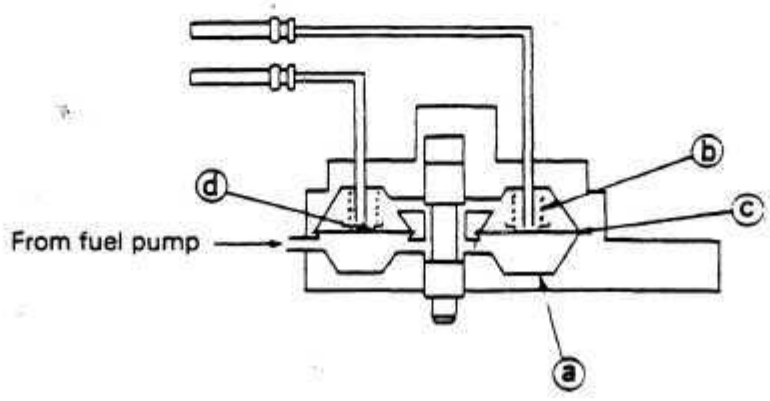


Fig. 6

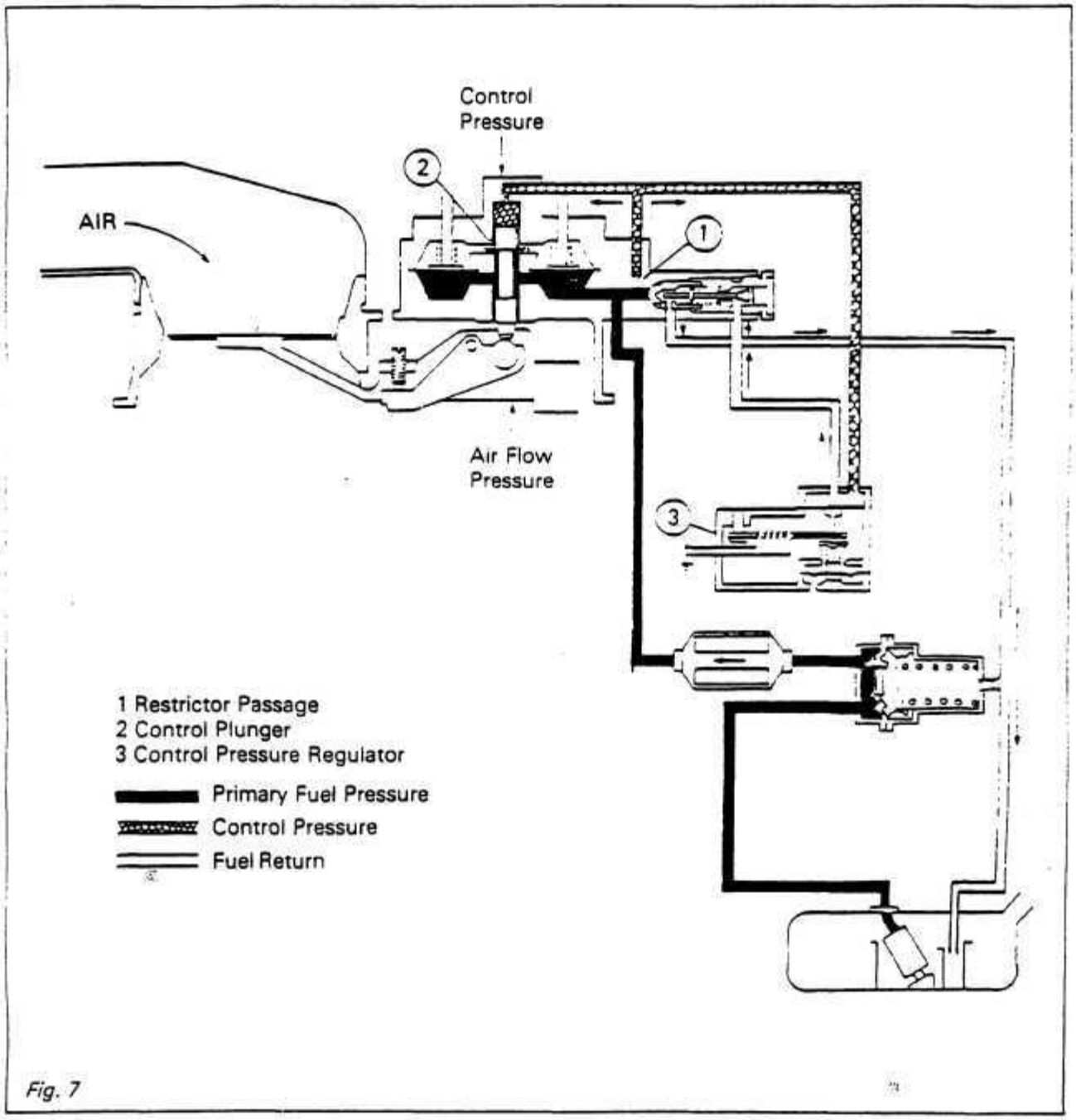


Fig. 7

CONTROL PRESSURE CIRCUIT

A *portion of main* line fuel is directed through a restrictor passage (1) to the top of the control plunger (2). This pressure circuit is referred to as the control pressure. The control pressure generates an opposing force to that originating from the air flow sensor plate. When the control pressure gulator (3) decreases the control pressure, the sensor plate will travel *further* downward per given air volume, thus increasing the amount of fuel injected to the engine (rich mixture). Increasing the control pressure will reduce the sensor plate travel with the same air volume reducing the amount of fuel injected to the engine (lean mixture). *Fig. 7*

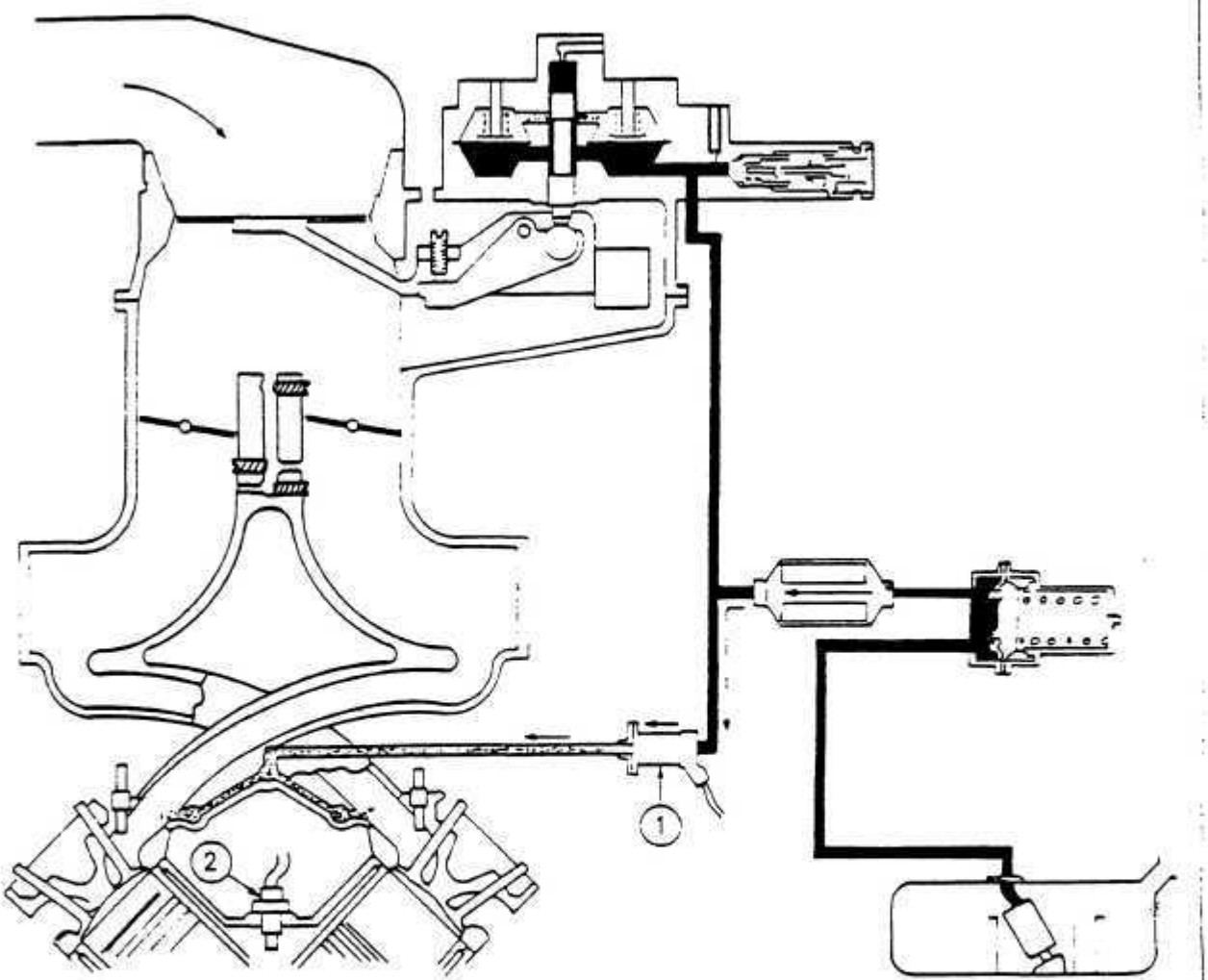


Fig. 8

COLD START CIRCUIT

The cold start circuit provides a richer fuel mixture to facilitate starting a cold engine. The circuit operates only when the engine temperature is below +35°C (95°F) and during the cranking process.

The cold start valve (1) is of the solenoid-operated type. The winding of an electro-magnet is fitted inside the valve. In the "off" position, the moveable armature of the electromagnet is forced against a seal by means of a spring. When the magnet is energised, the armature is pulled away from the seat and fuel is allowed to flow through the valve. A special nozzle atomizes the fuel as it leaves the valve and enters directly into the intake manifold. *Fig. 8.*

The thermo-time switch regulates the cold start valve injection time in relation to coolant temperature. when the coolant temperature is below approximately + 35°C (95°F) the bimetal arm will bend enough to close the contact points. The closed contact points will provide a ground for the cold start valve, energising the electro-magnet and injecting additional fuel to the engine while it is being cranked. During cranking, voltage is also applied to the heating element in the thermo-time switch. The heating element will warm the bimetal arm and open the contact points to prevent excessive cold start injection (flooding). The length of time that it takes the heating element to open the contact points is dependent on the engine coolant temperature. *Fig. 9.*

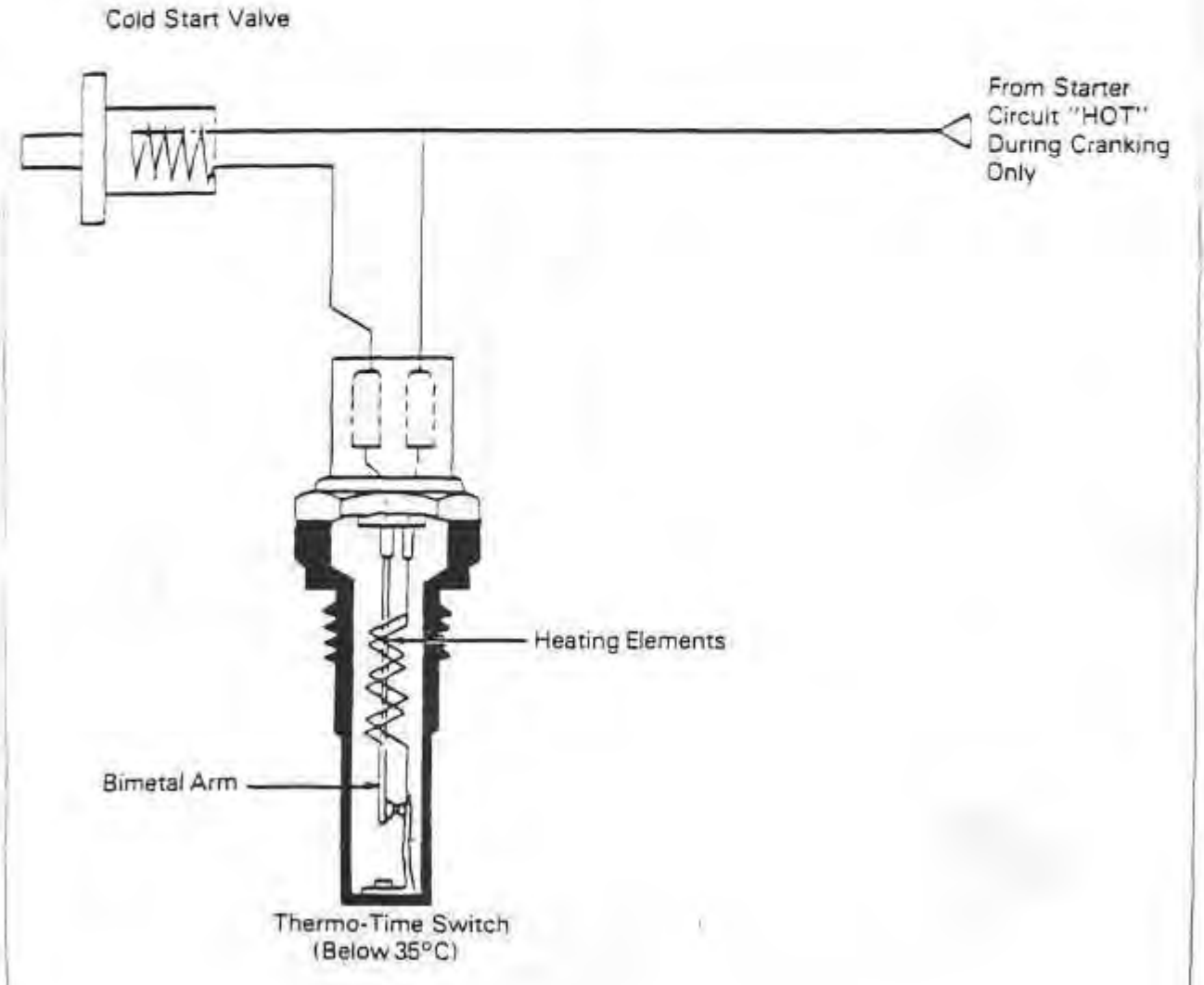


Fig. 9

WARM-UP CIRCUIT

During the engine warm-up period, it is necessary to provide a richer fuel mixture to improve driveability and eliminate hesitation during acceleration. The warm-up circuit performs this function by lowering the control pressure which allows the air sensor plate to move further downward for a given volume of air. *Fig. 10*

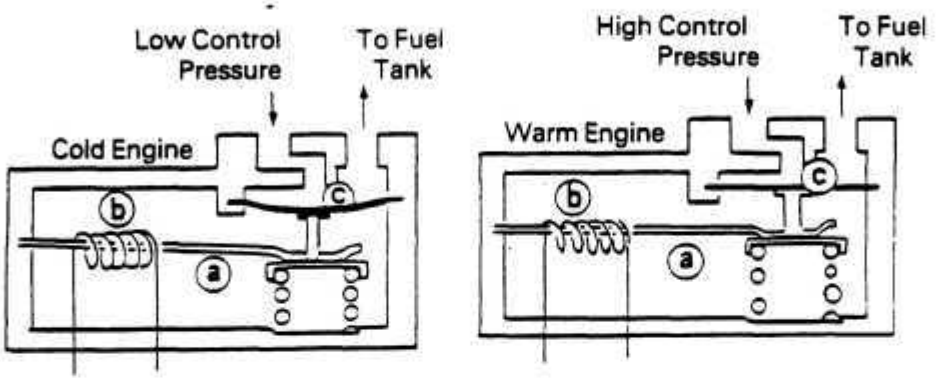


Fig. 10

CONTROL PRESSURE REGULATOR

Control pressure is determined by the control pressure regulator and varies between approximately 1.5 Bar (22 PSI) and 3.8 Bar (55 PSI). The control pressure regulator is mounted on the left valve cover and is affected by engine radiant temperature. At engine start-up the control pressure is determined by engine radiant temperature rather than ambient air temperature. The regulator contains both a bimetal arm (a) which reacts to the engine temperature, and an electrical heating element (b). As the bimetal arm bends, the circuit pressure changes by opening or closing a passage (c) which allows fuel to return to the tank. On a cold engine, the bimetal arm will open the passage allowing more fuel to return to the tank, lowering the control pressure. This enriches the fuel mixture. As the heating element warms the bimetal arm, the passage will gradually close and allow the control pressure to build to its maximum valve.

In the actual control pressure regulator, a dual heating element is used with the bimetal arm, plus an additional bimetal switch (d) is used. When the regulator temperature is below 15°C (59°F), the bimetal switch will open allowing only one heater to operate thus increasing the engine warm-up time. Closing of the bimetal switch above 15°C will permit both heaters to operate which in turn will reduce the engine warm-up time. *Fig. 11*

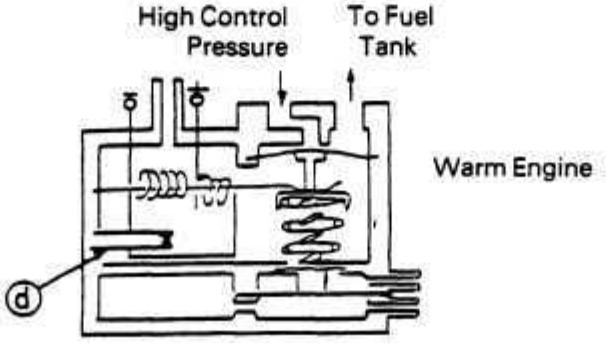


Fig. 11

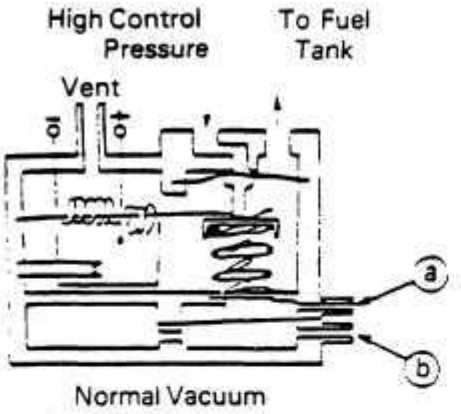


Fig. 12

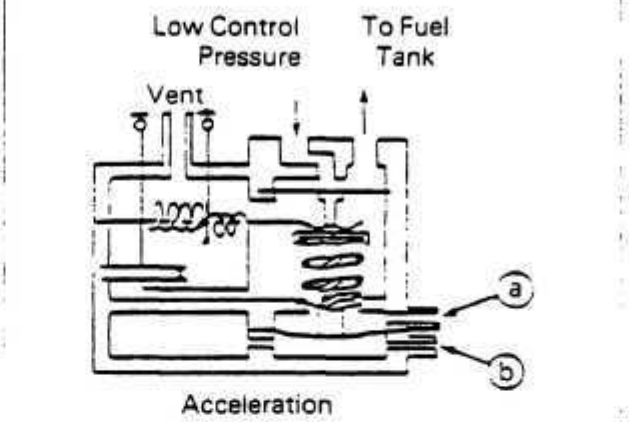


Fig 13

ACCELERATION ENRICHMENT CIRCUIT

The control pressure regulator is affected by engine manifold vacuum when the coolant temperature is below 40°C (104°F). Outlets (a) and (b) are both connected to the engine intake manifold. The hose to outlet (b) contains a delay valve. At coolant temperatures below 40°C the pressure increase (loss of vacuum) in the intake manifold during acceleration reaches the lower vacuum chamber later than it reaches the upper chamber due to the delay valve. The diaphragm separating these two chambers then deflects downwards opening the pressure regulator momentarily. This results in a very short "enrichment spike" in the air-fuel mixture. *Fig. 12–13.*

The vacuum delay valve (1) located in the hose connected to outlet (b) provides a 10 second delay during acceleration. After 10 seconds, the pressures above and below the diaphragm will equalise and the control pressure will return to normal.

The thermal vacuum control valve (2) opens at coolant temperatures below 40°C (104°F) to allow manifold vacuum to reach the control pressure regulator. Above 40°C, the acceleration enrichment circuit is inoperative. *Fig. 14.*

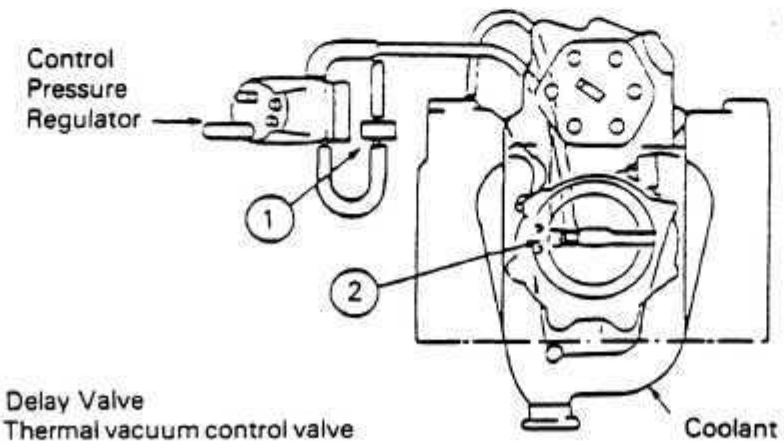
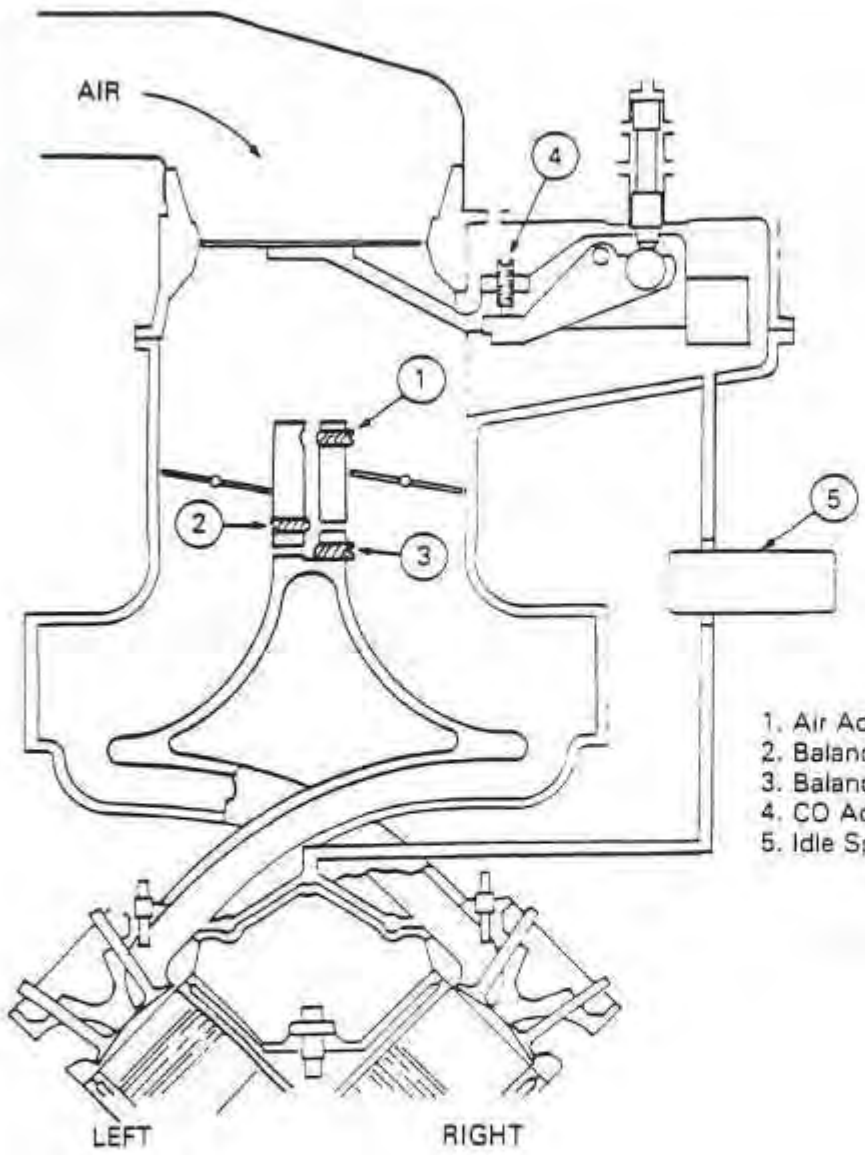


Fig. 14



1. Air Adjusting Screw
2. Balancing Screw-Left Bank
3. Balancing Screw-Right Bank
4. CO Adjustment Screw
5. Idle Speed Regulator

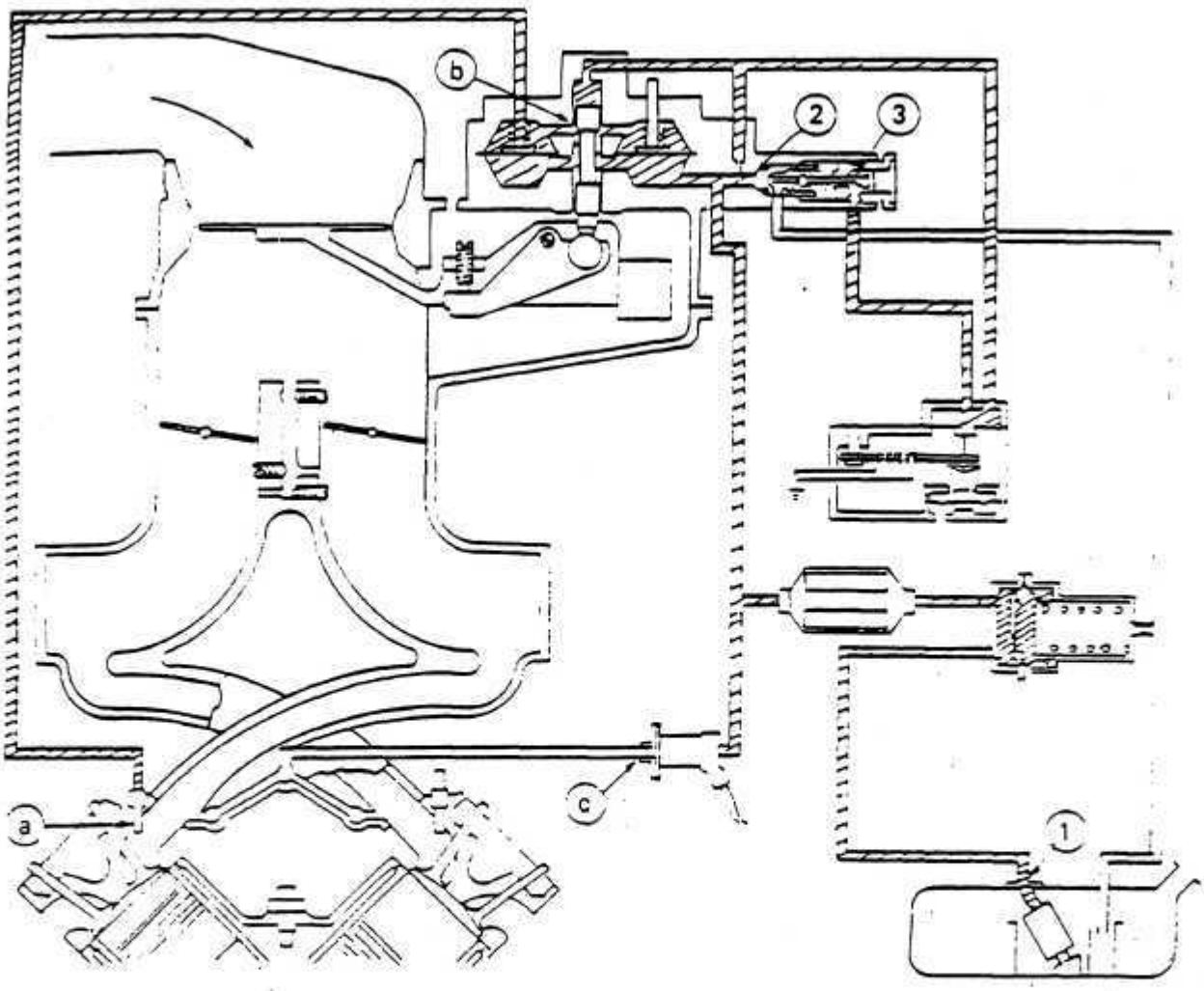
Fig. 15

IDLE CIRCUIT

The throttle body on the PRV V-6 engine contains an air adjusting screw (1) and two air balancing screws (2 and 3). These adjustment screws are not used on the De Lorean since an electronic idle speed control system is used. The air adjusting screw (1) should be fully seated to eliminate any air bypass at the throttle plates.

The idle speed regulator (5) allows the proper amount of air to bypass the closed throttle plates during an idle condition.

The CO adjusting screw (4) is used to control the amount of injected fuel in relation to the position of the air sensor plate. Turning this screw will increase or decrease the air-fuel ratio. This adjustment is performed at the factory and the access hole is plugged. *Fig. 15*



REST PRESSURE

1 Fuel Pump Check Valve
2 Primary Circuit Seal
3 Control Pressure Circuit Seal

Fig. 16

REST PRESSURE

When the fuel pump is not operating, it is necessary to retain fuel under pressure in all lines. This "rest" pressure will prevent vapour from forming in the lines and ensure instant re-starting. When the fuel pump stops, a check valve (1) and two seals (2 & 3) close, sealing off the fuel return lines to the tank. The accumulator will then maintain pressure in the system to prevent vaporisation.

In addition to the check valves and seals, it is important that the control plunger (b) returns to the closed position, all injectors (a) close tightly, cold start valve (c) closes tightly and all fuel connections are tight and leak free. *Fig. 16.*

ELECTRICAL CIRCUIT FUNCTION

If the engine coolant temperature is below 35°C (95°F) the thermo-time switch is closed providing a ground for the cold start valve. During cranking conditions, power is supplied to the cold start valve from the starter solenoid, activating the valve to inject additional fuel to the engine. If the cranking process takes longer than 8 to 15 seconds, the thermo-time switch heating element opens the switch, deactivating the cold start valve to prevent the engine from flooding. In this case, the thermo-time switch functions as a time switch.

If the temperature of the engine coolant is above 35°C (95°F) when the starting process is commenced, the thermo-time switch is open eliminating the cold start valve ground. In this case the thermo-time switch functions as an engine coolant temperature switch.

This circuit is equipped with an RPM relay which receives power from the main relay through fuse No. 1. The rotational speed of the engine produces ignition pulses at terminal No. 1 of the ignition coil. These pulses are processed by an electronic circuit in the RPM relay which closes the relay contacts. Current from No. 7 fuse is then supplied to the fuel pump and control pressure regulator.

The RPM relay remains closed as long as the ignition switch is "on" and the engine is running. If the pulses from terminal No. 1 of the ignition coil stop because the engine has stopped turning, the RPM relay opens about one second after the last pulse is received. This safety circuit prevents the fuel pump from pumping when the ignition switch is "on" but the engine is not running.

Another safety feature in the fuel pump circuit is the inertia switch. This switch provides the ground circuit for the electric fuel pump. In the case of an accident where high impact is involved, the inertia switch will open the circuit between the fuel pump and ground. This will prevent the fuel pump from pumping fuel out of a possible ruptured hose. The inertia switch also activates the door lock circuit to unlock the doors upon high impact.

The control pressure regulator receives power from the RPM relay when the engine is rotating. Thus current will heat the bimetal arm in the pressure regulator for proper engine warm-up operation.

The car is wired for a hot start relay. This relay can be installed if a hot starting problem is experienced in excessively hot regions of the country. When this relay is used, the cold start valve will inject intermittently during cranking when engine is hot.

SYSTEM REPAIR NOTES

1. The majority of the fuel injection components are sealed units and cannot be adjusted or repaired. Tampering with a sealed component will automatically void the component warranty. The following guide indicates component serviceability and authorised repairs:

   Fuel Pump:
   The fuel pump is not serviceable. The return check valve located in the fuel inlet cannot be replaced.

   Accumulator:
   Not serviceable.

   Fuel Filter:
   Not serviceable, replace when contaminated.

   Mixture Control Unit:
   - Fuel Distributor:
     The fuel distributor can be removed from the mixture control unit for replacement. Fuel distributor is not serviceable.
   - Primary Pressure Regulator:
     The regulator O-ring seals are replaceable and the primary pressure may be adjusted by adding or subtracting spring shims.
   - Air Flow Sensor Assembly:
     Sensor plate and arm assembly can be centred if a binding condition exists. Rest position of sensor plate can also be adjusted.

   Control Pressure Regulator:
   Not serviceable.

   Cold Start Valve:
   Not serviceable.

   Thermo-time Switch:
   Not serviceable.

   Fuel Injectors:
   Not serviceable.

   Throttle Valves:
   Throttle idle stop position is preset and should not be tampered with.

2. The largest problem affecting the operation of fuel injection components is dirt and moisture contamination. Therefore, precautions should be taken when working on the system to avoid contamination.

3. When replacing fuel lines or components, use only approved replacement parts that were designed for this system. Due to the high fuel pressures used in this system, do not attempt to splice fuel hoses.

4. After replacing any major fuel injection component, the engine idle speed and CO level should be checked and adjusted if necessary.

5. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments" Section M).

6. The inertia switch is located under the left side of the dash panel and is mounted to the footwell wall, adjacent to the luggage compartment cover release. When the button on the inertia switch is in the "up" position the switch is in the "open" position. In this position the fuel pump will not operate and the door locks will move to the unlock position. To reset the inertia switch, depress the button or move to the "down" position.

7. Excessively high fuel pressures can be caused by a plugged fuel return line.

8. Positive pressure buildup in the fuel tank is normal for this system.

9. If it is necessary to adjust the CO level, the adjusting hole plug can be removed by drilling down to the hardened steel insert and threading a pulling tool into the plug.

SPECIFICATIONS

1. Electric fuel pump
   Fuel Delivery: Minimum 850 cm^3/30 sec. (1.8 pints/30 sec.)

2. Control pressure "COLD" (Regulator temp. below 40°C) *Fig. 17*

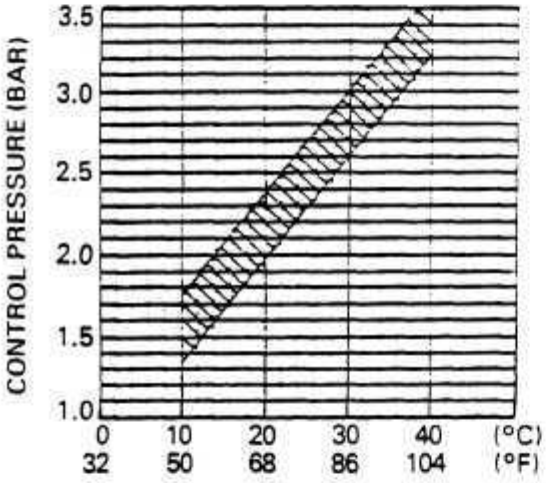


Fig. 17

3. Control Pressure "WARM" (Regulator temp. above 40°C)

   a. Test with intake manifold vacuum hoses disconnected from control pressure regulator — 3.4—3.8 Bar

   b. Connect vacuum pump to vacuum port on control pressure regulator which contains the delay valve — 1.4—1.8 Bar

   Vacuum Setting Value: 450-550 mbar (13.3-16.2 in Hg)

4. Primary Pressure

   Checking value — 4.9—5.5 Bar
   Setting value — 5.1—5.3 Bar

5. Rest pressure leakage test

   Rest Pressure — 3.3 Bar
   Minimum pressure after 10 min. — 1.7 Bar

6. Injection valves

   Opening pressure — 3.5—4.1 Bar

7. Control pressure regulator delay valve

   Time required to bleed-down from 16 in. Hg vacuum to 8 in. Hg — 10 ± 2 seconds

8. Acceleration enrichment thermal vacuum control valve.

   a. Fully closed at temperatures above 53°C (127°F).

   b. Must start to open at 48°C (118°F) when temperature is decreasing.

9. Thermo-time Switch.

Coolant Temperature	Contact Opening Time
−20°C (−5°F)	7.5 ± 2 seconds
35 ± 4°C (95°F)	0

10. Fuel line tightening torques:

M8 Bolt	10-12 Nm	(7-9 FT LB)
M10 Bolt	13-15 Nm	(9-11 FT LB)
M12 Bolt	20-24 Nm	(14-17 FT LB)
M14 Bolt	15-20 Nm	(11-14 FT LB)
M12 Cap Nut	15-20 Nm	(11-14 FT LB)
M14 Cap Nut	25-30 Nm	(18-22 FT LB)

11. Throttle idle stop adjustment: See "Engine" Section.

TEST GAUGE CONNECTION

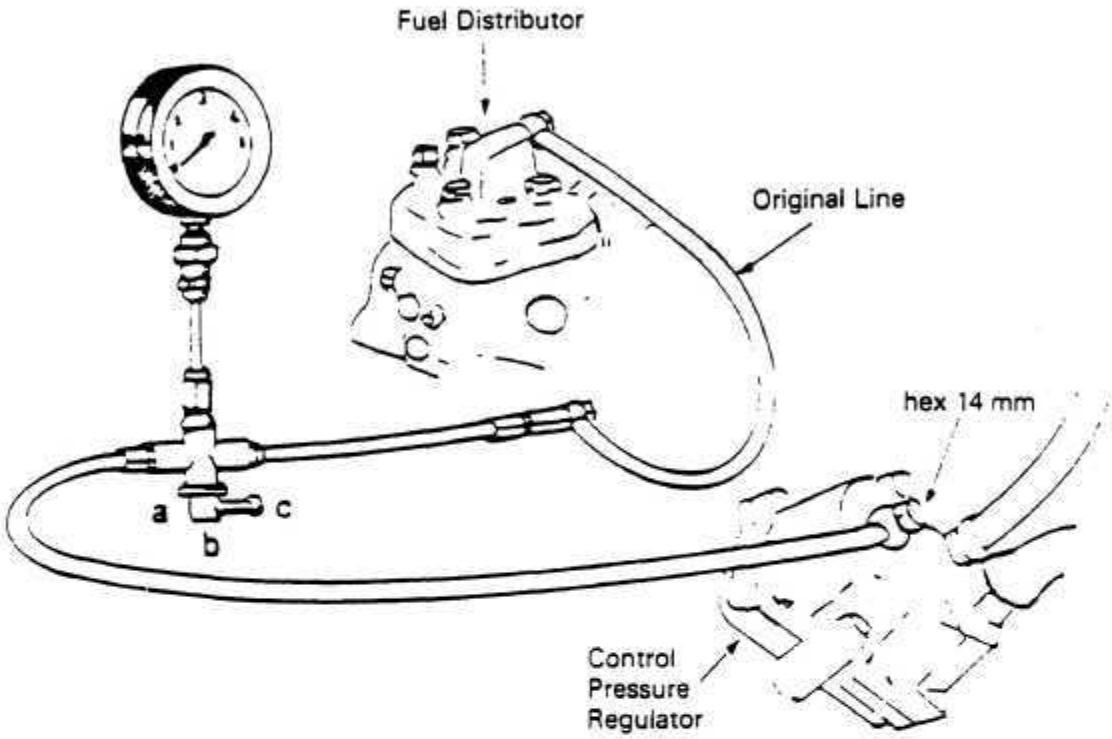


Fig. 18

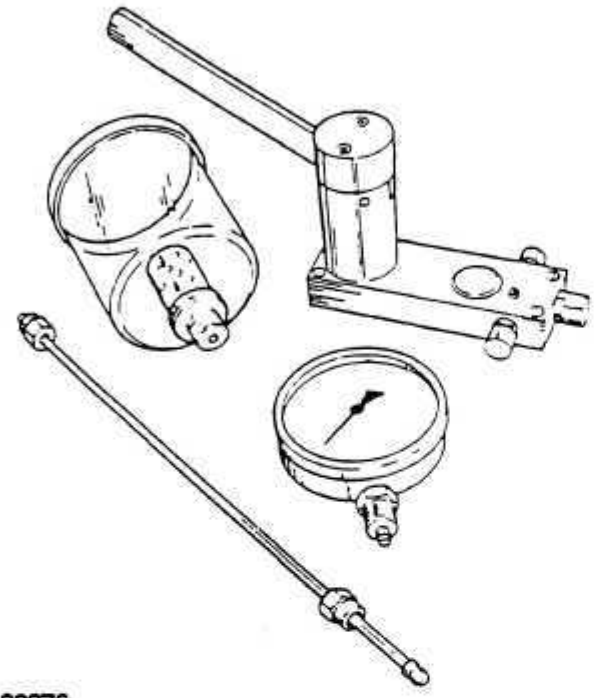
VALVE POSITION

"A"	Off
"B"	Check control pressure
"C"	Check primary pressure

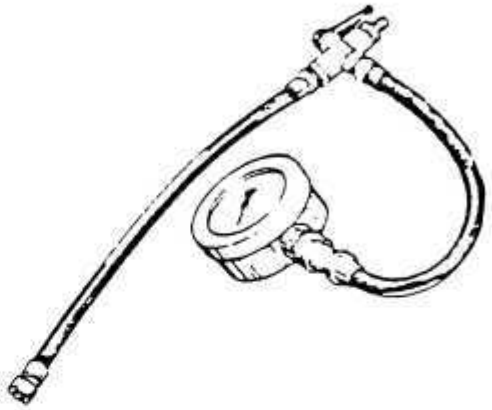
Note:
When checking fuel pressures, it is necessary to operate the fuel pump without the engine running. To by-pass the RPM relay, remove relay and connect a jumper wire between terminals No. 87 and No. 30 in the connector. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments", Section M)

Caution: When connecting or disconnecting the test gauge, rest pressure will be present in the fuel system. Fuel fittings should be loosened slowly to avoid fuel spray in the engine compartment and a container should be available to drain fuel into.

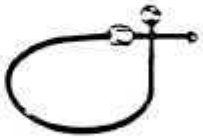
SPECIAL TOOLS



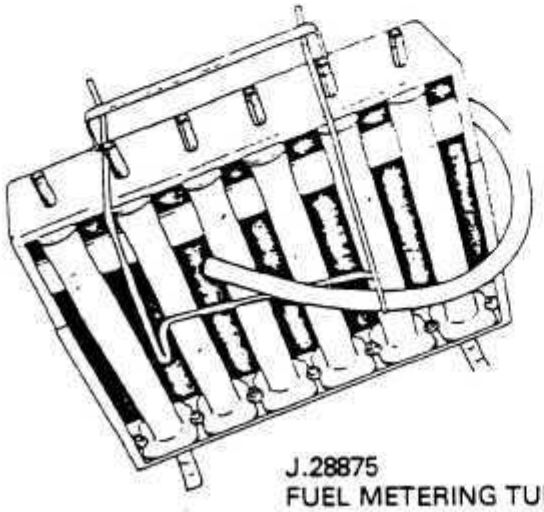
J.28876
INJECTOR VALVE TESTER



J.28872
PRESSURE GAUGE



J.28873
HOSE CONNECTOR



J.28875
FUEL METERING TUBES

J.28874
ADAPTOR NIPPLE

EMISSION CONTROL SYSTEM

CO EMMISSION ADJUSTMENT

IDLING* SPEED R.P.M.	CO % ON EACH BANK	MAX IMBALANCE PERMITTED
950*	1%	±0.3%

*(Setting idle only. Normal Engine R.P.M. 775 ± 50 R.P.M.)

The idle mixture adjustment must be sealed to comply with Federal Regulations. The idle mixture is set at the factory and is unlikely to require further adjustment throughout the life of the vehicle. If any malfunction in vehicle performance is noted it is essential to ensure that all other engine settings are checked prior to attempting the adjusting of the idle mixture.

The engine must be run in with air filter in position. The ignition system must be serviceable and correctly set. No air leaks must be present (Brake Vacuum Hose, Ignition Advance Capsule Pipe, Fuel Lines, Oil Vapour Rebreathing Pipes etc).

An infra red exhaust gas analyser must be used for this adjustment. Each exhaust down-pipe has a boss fitted with a plug which may be removed for fitting the exhaust analyser pipe in its place. Exhaust gas analyser comprises of two metal pipes which screw into each plug hold A3-way union joined together on one hand by the hoses to the metal pipes and on the other hand to the analyser.

The connection to the analyser must be air tight.

1. Plug in diagnostic plug and connect up rev counter to check engine R.P.M.
2. Switch Dwell operation for 6 cylinder engine.
3. Disconnect the electrical connection to the oxygen (lambda) sensor.
4. Ensure that the idle speed screw (1) common to both banks is fully closed.

Note:
DO NOT adjust the two individual bank by-pass screws as they are set at the engine manufacture plant.

5. Ensure that the air conditioning system is switched off.
6. Fit a link wire to the cooling fan switch to ensure the cooling fans are on continuously.
7. Start the engine and run it until it has reached normal working temperature (ie. cooling system thermostat open – water pipes hot).
8. Check that the engine speed is 775 ± 50 RPM and running smoothly.
9. Check ignition timing is 13° ± 2° at 775 RPM and adjust if necessary. Rev the engine to 2000 RPM and check that the timing is about 40° B.T.D.C.
10. Using idle speed screw common to both banks, adjust the idle speed to 950 RPM (temporary setting).
11. Check Dwell operation for duty cycle is 50% ± 3.0%.
12. To ensure that plugs are not "sooted" due to long idling, rev engine at 2000 RPM for 15 secs and start the next operation **immediately** afterwards.
13. With both taps on the T-piece of the sample hose open, and the plastic cap or fingertip blocking the hole for fuel adjustment, check that the idle CO level is 1% ± 0.3%.
    If not reset the fuel by removing the plastic cap or finger tip and turning the mixture screw (2) in the flap valve clockwise to increase the CO (richer) and anti-clockwise to reduce CO (leaner). Replace the plastic bung, reset the engine speed to 950 RPM rev the engine for a few seconds to 2000 RPM and check CO level when idle speed returns to 950 RPM. If outside the limits repeat the procedure until specification is met. *Fig. 19.*

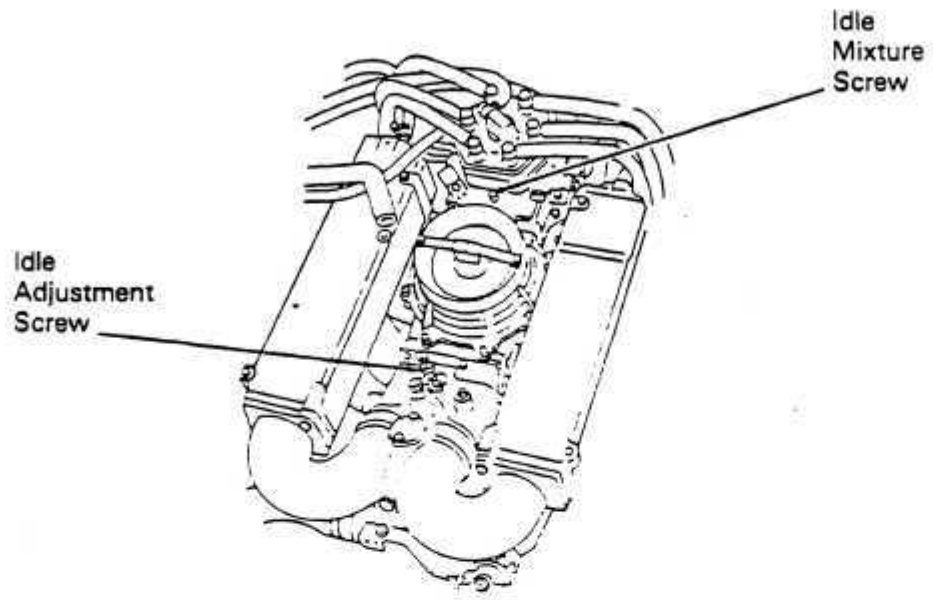


Fig. 19.

14. Note the Hydrocarbon reading at this point is no greater than 300 PPM.

15. By closing one tap on the sample hose T-piece, and then the other check that the CO level in each bank of cylinders is 1% ± 0.3%.

16. Re-connect the electrical connection to the oxygen sensor.

17. Check that the duty cycle is operating at an average setting between 45-55%. Total swing on the needle must be less than ± 10%

18. Re-connect the electrical connection to the oxygen sensor.

19. Using the idle speed screw common to both banks adjust the idle speed to 775 ± 50 RPM. This will normally require the screw to be fully closed.

20. Switch off the engine.

21. Insert the tamper proof plug in the mixture hole in the metering unit and drive home.

22. Remove exhaust sampling probes from the down pipe and insert the blanking plugs.

Note:
Section 203 of the Clean Air Act prohibits any person to remove or render inoperative any device specifically installed on the vehicle to ensure that the vehicle emission complies with control standards. It is essential therefore that components to the correct specification are fitted and specified engine settings are strictly adhered to.

TAMPER PROOF PLUG REMOVAL/REPLACEMENT

1. Remove the air/fuel metering unit and clamp in an inverted position in a vice.

2. Depress the air sensor plate in order to expose the underside of the hole in which the tamper proof plug is located.

EXTRACTION TOOL

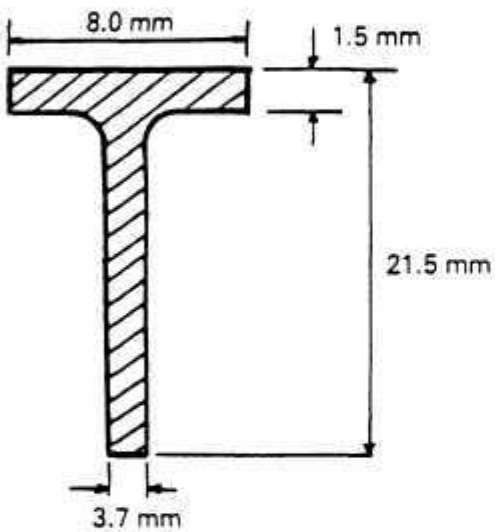


Fig. 20

3. With a pair of "pointed-nosed" pliers insert the extraction tool *(Fig. 20)* in the hole. The tool must be held vertically.

   NB. An appropriately sized nail cut to the requisite length is aptly suitable.

4. Close the sensor plate until it firmly constrains the extraction tool in position.

5. Apply sufficient pressure on the frame supporting the sensor plate to cause the extraction tool to force out the tamper proof plug. This pressure need not be excessive, the sensor plate arm acting as a lever, and can be applied manually or by tapping the frame with a plastic mallet. DO NOT apply force to the senor plate itself as serious damage could result.

6. Remove the extraction tool.

7. Re-install the air/fuel metering unit on the engine using a new gasket.

8. Adjust the idle CO as required.

9. Insert a new tamper proof plug (discard the old one) and gently tap home.

   NB. Repeated removal of the tamper proof plug will damage the hold in which it is inserted, to the extent that new plugs will no longer provide a press fit.

EMISSION SETTINGS AT HIGH ALTITUDE

To ensure compliance with the Emission Regulations at high altitude and maintain optimum fuel economy and driveability requires adjustment to engine settings. Full technical details on emission settings and tamperproofing are contained in Service Bulletins 30 and 40.

It is the responsibility of the DMC dealer to ensure that each new vehicle delivered for operation in a high altitude area has the emission settings adjusted prior to delivery. Additionally, the full throttle enrichment switch must be disconnected and isolated at the connector block located by the engine air cleaner. Care must be taken to ensure that on automatic transmission cars the full throttle enrichment switch lead (light green) is not confused with the kickdown switch lead (on earlier cars light green lead with dark green sleeve—on late cars light green lead with dark green tracer).

For absolute safety the car should be road tested afterwards to ensure that kickdown operates. A label confirming the adjustment (see sample label part number 110741) must be attached to the engine setting label in the engine compartment.

Any vehicle relocating permanently from a high to a low altitude area, or vice versa, will require the emission adjustment to be undertaken to achieve the standards applicable to vehicles originally sold at that altitude. The full throttle enrichment switch will have to be disconnected and isolated or reconnected as the case may be. Vehicles relocating

permanently into a high altitude area will require label part number 110741 attaching after adjustment, whereas vehicles relocating permanently to a low altitude area will require the original label removing.

Note:
It is not necessary to perform these adjustments for only a temporary visit to a high or low altitude area. Vehicle performance will remain adequate for any such temporary period.

LAMBDA CONTROL SYSTEM

The De Lorean uses a Lambda control system developed by Bosch. The Lambda system is used in conjunction with the K-Jetronic fuel injection and a three-way catalytic converter to control exhaust emissions.

Lambda control, used with a three-way catalytic converter, is capable of reducing the noxious emissions of carbon monoxide (CO), hydrocarbons (CH) and nitrogen oxides (NOx). A requirement for this action, however, is that the air-fuel ratio must be controlled to a high degree of accuracy so that the engine will operate within an "ideal" air-fuel mixture range.

LAMBDA CONTROL PRINCIPLE

The control principle employed is based on the fact that the Lambda sensor is continuously monitoring the exhaust gas and informing the fuel injection system to modify the mixture for minimum emissions.

Acting as a monitoring device, the oxygen sensor in the exhaust pipe provides data on whether the mixture is richer or leaner than the "ideal".

The Lambda electronic control unit (ECU) processes this data and sends a signal to the fuel injection system to change the amount of fuel injected into the engine. *(Fig. 21)*

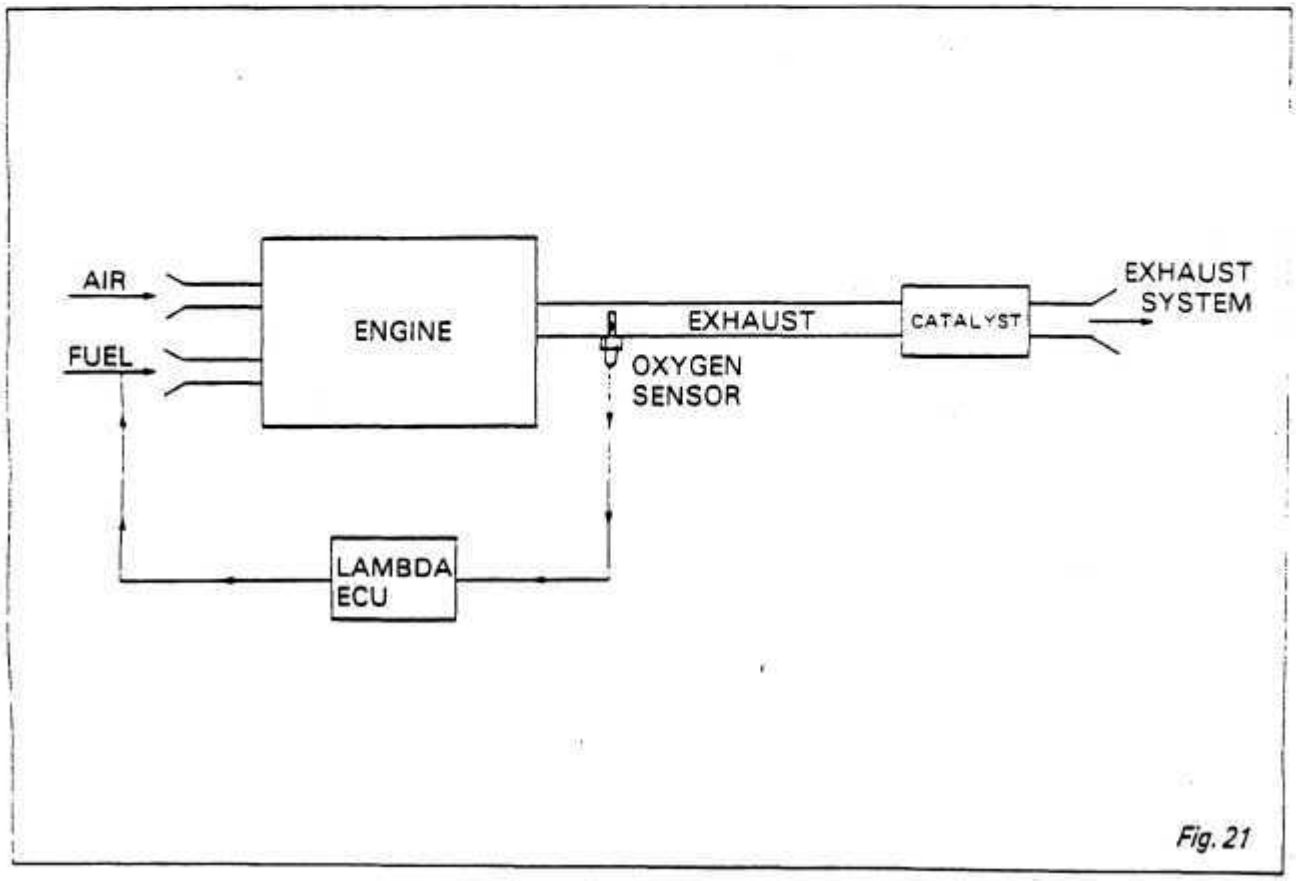


Fig. 21

SYSTEM OPERATION—OXYGEN SENSOR

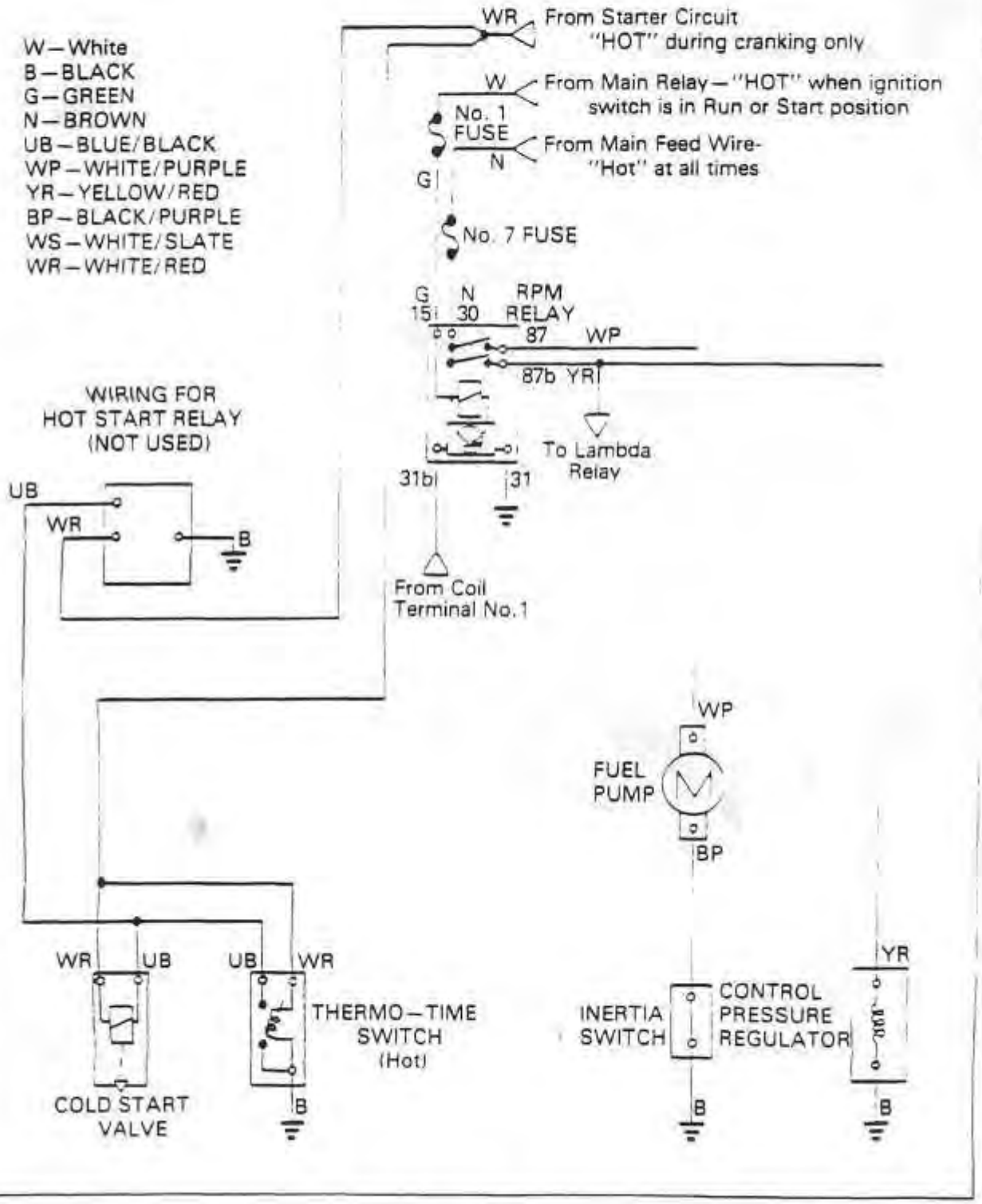
The oxygen sensor measures the amount of oxygen in the exhaust gases. As the sensor measures the exhaust gas, it produces an electrical signal which informs the Lambda ECU module if the engine is running richer or leaner than the "ideal" air-fuel mixture ratio.

The sensor is mounted in the exhaust pipe in a position where it will monitor the exhaust gas from both cylinder banks before it enters the catalytic converter *Fig. 22.*

Fig. 22

Fig. 23

FUEL INJECTION WIRING



ELECTRONIC CONTROL UNIT (ECU)

The Lambda ECU module receives the voltage signal from the oxygen sensor and determines if the amount of fuel injected to the engine should be increased or decreased. The module will then signal the frequency valve to adjust the fuel Mixture. *(Fig. 24)*

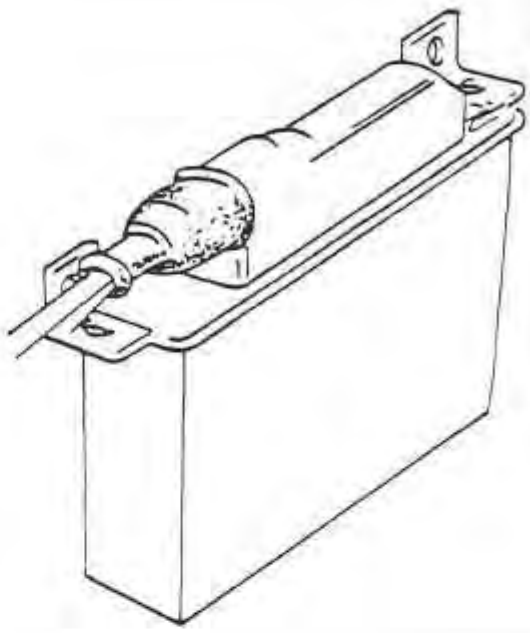


Fig. 24

FREQUENCY VALVE

The frequency valve regulates the pressure in the lower chambers of the fuel distributor. This regulation will affect the normal operation of the fuel distributor.

The frequency valve is an electrically operated valve. *(Fig. 25)*. It is mounted on the right valve cover and is connected to the lower chambers (primary pressure) of the fuel distributor and the return line to the fuel tank.

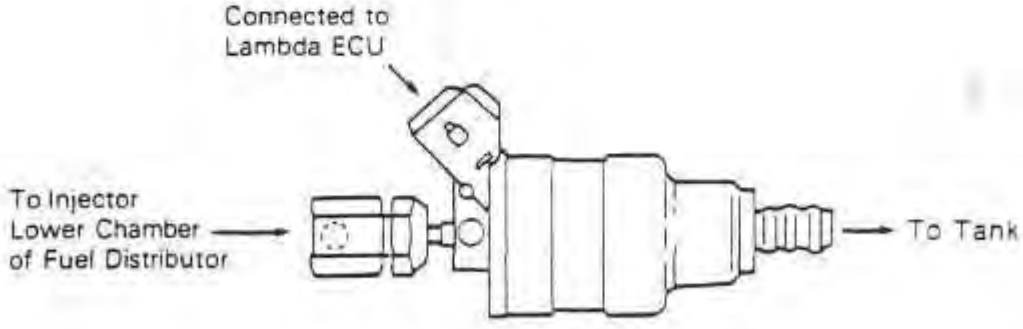


Fig. 25

When the frequency valve is open, the fuel pressure in all of the lower chambers will be reduced by allowing some of the fuel to return to the tank. When the lower chamber pressure is reduced, the diaphragm downward movement will increase the passage opening to the injectors. This will increase the volume of fuel being injected to the engine, enrichening the mixture. When the frequency valve closes, the pressure in the lower chambers will return to normal and the diaphragm will return to its original position. *(Fig. 26—27)*

The frequency valve operates at 70 cycles per second. The length of time the valve is held open during each cycle depends on the pulse ratio supplied by the Lambda ECU module.

The pulse ratio is the frequency valve open time versus closed time during one cycle of operation. A pulse ratio of 80/20 means that the frequency valve

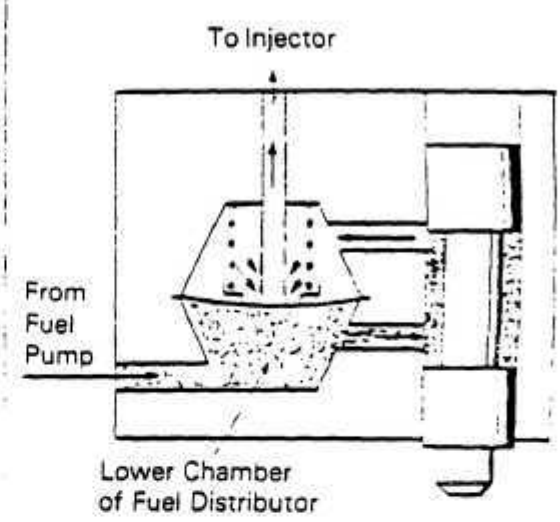


Fig 26

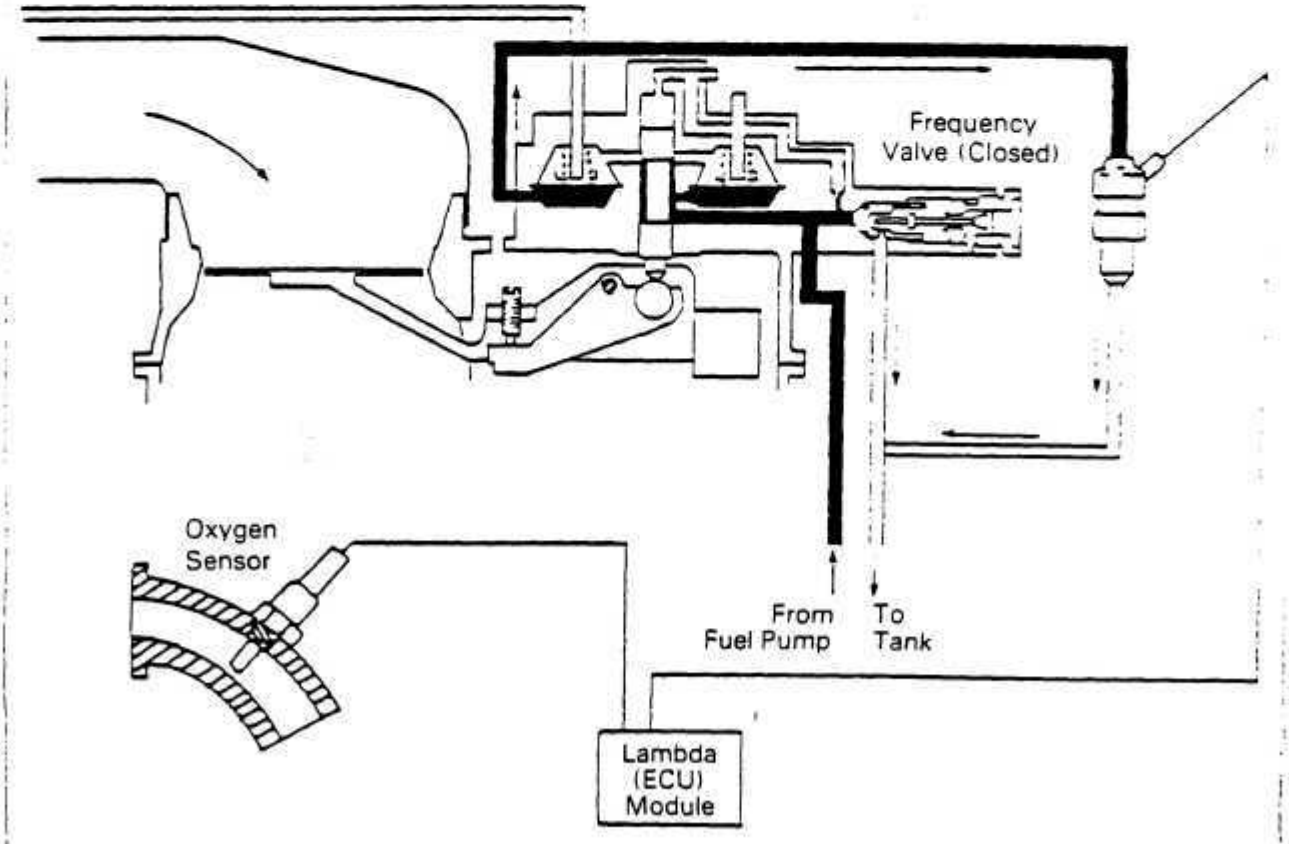


Fig. 27 **LAMBDA CONTROL SYSTEM**

is open 80 percent of the time and closed 20 percent of the time during one cycle of operation. *(Fig. 28)*

To operate the frequency valve at a pulse ratio of 80/20, the ECU module will allow current to flow through the frequency valve for 80 percent of one cycle and stop the current flow for the remaining 20 percent of the cycle. When current is flowing in the frequency valve, the electromagnet will energise and open the valve. *(Fig. 29)*

When the frequency valve is open, fuel from the lower chambers of the fuel distributor is released and routed back to the fuel tank. For example, if the exhaust gases reflect a lean condition, the oxygen sensor will signal the ECU module to change to a pulse ratio that will allow the frequency valve to remain open for a longer period. Therefore, an increased amount of fuel is fed from the lower chambers. This reduction of pressure in the lower chambers causes the diaphragm in the fuel distributor to deflect, injecting more fuel into the engine; the fuel mixture is now enriched. The oxygen sensor will then sense the enriched mixture and signal the ECU module to switch the frequency valve back to a shorter pulse ratio that will reduce the amount of fuel injected. This process repeats constantly to maintain the "ideal" air-fuel mixture ratio. *(Fig. 30)*

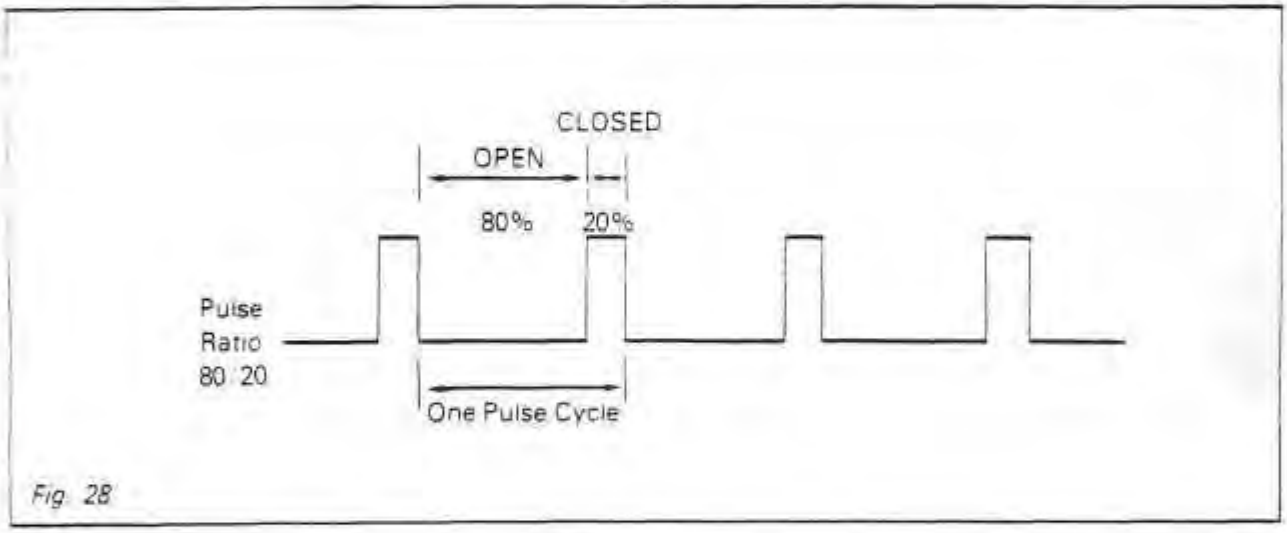


Fig. 28

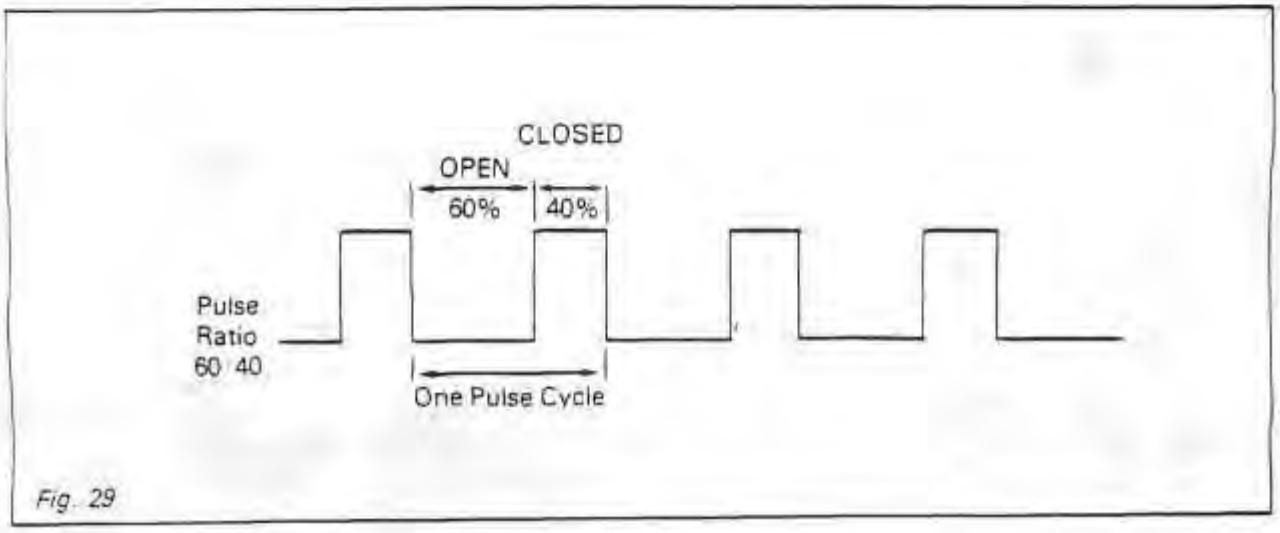


Fig. 29

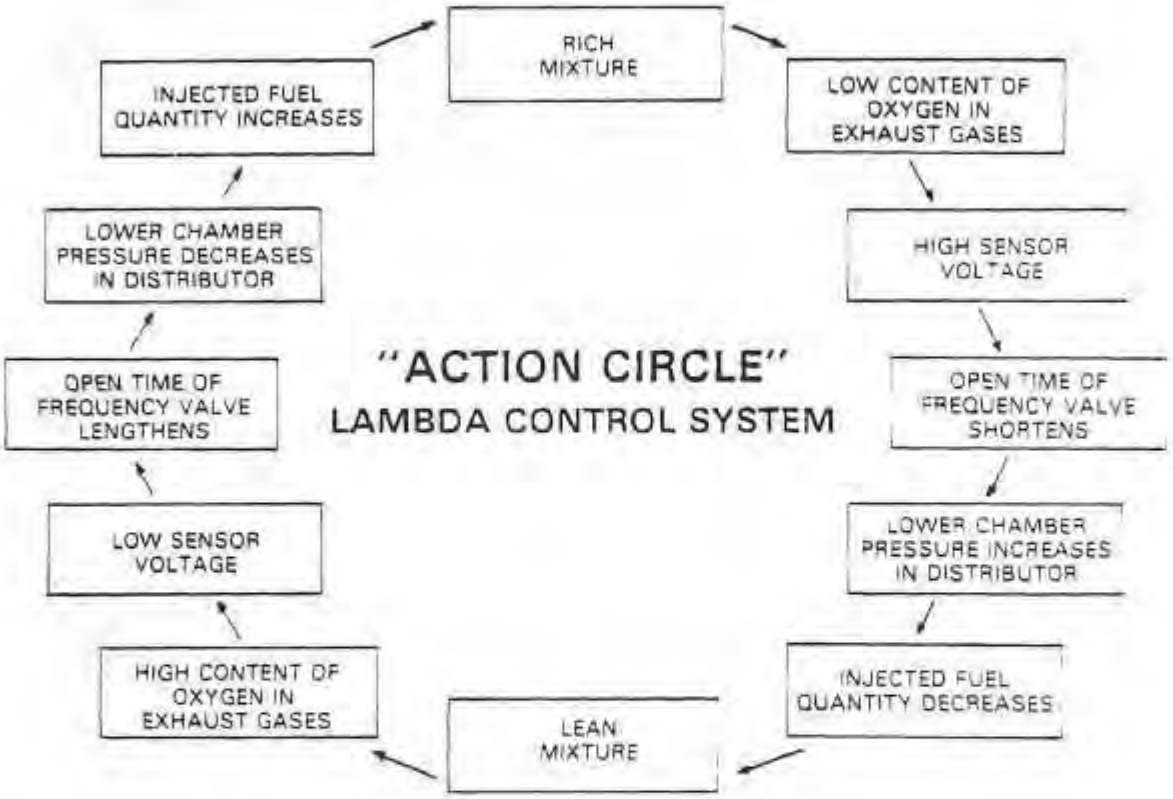
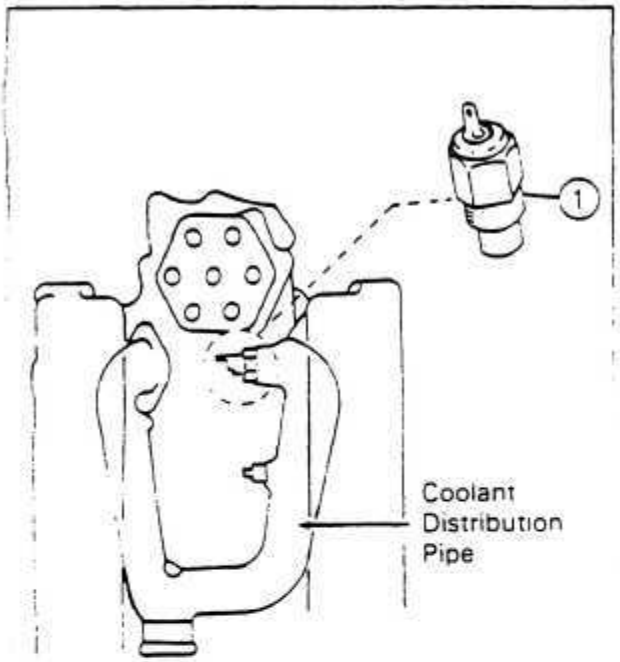


Fig. 30

SYSTEM CONTROL MONITORS

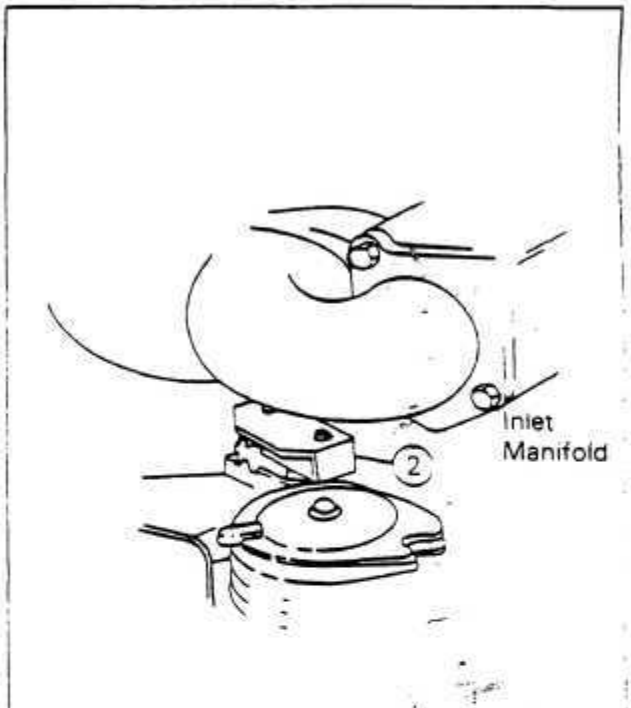
The oxygen sensor needs a minimum operating temperature to deliver a signal (approximately 300°C). In order to achieve driveability from start, the ECU module sets the frequency valve on a fixed pulse ratio until the sensor warms up. This is also the case if the sensor fails at any time during operation. The fixed ratio will provide a richer fuel mixture than normal.

The pulse ratio is controlled at another fixed value when the engine coolant temperature is below 15°C (59°F) or when the engine is at wide open throttle. These conditions are determined by a thermal switch *(Fig. 31)* (1) and a full throttle micro switch (2) *(Fig. 32)*. The fixed pulse ratio provides a rich fuel mixture to improve engine performance when cold or in the full throttle position.



LAMBDA THERMAL SWITCH

Fig. 31



FULL THROTTLE MICRO-SWITCH

Fig. 32

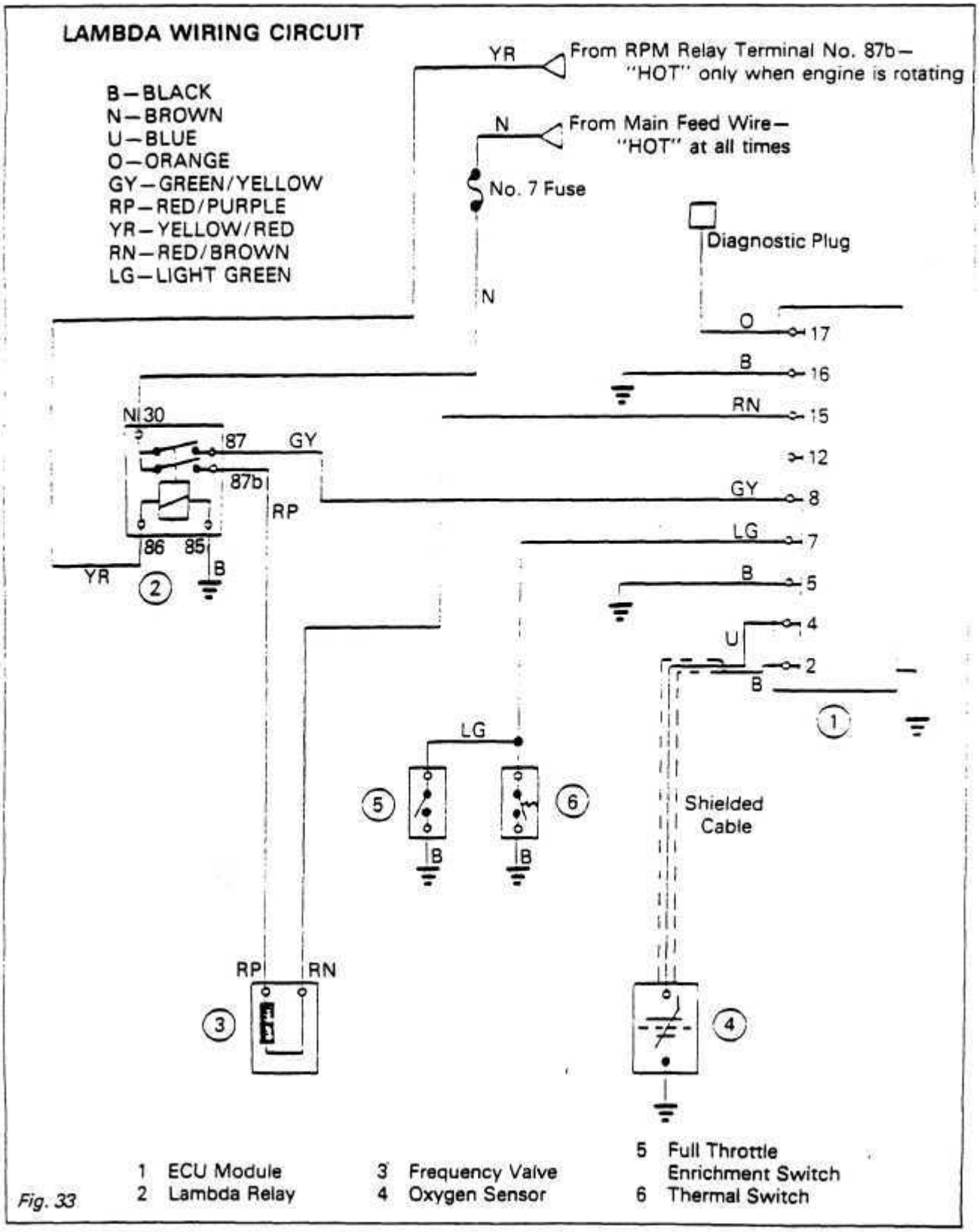
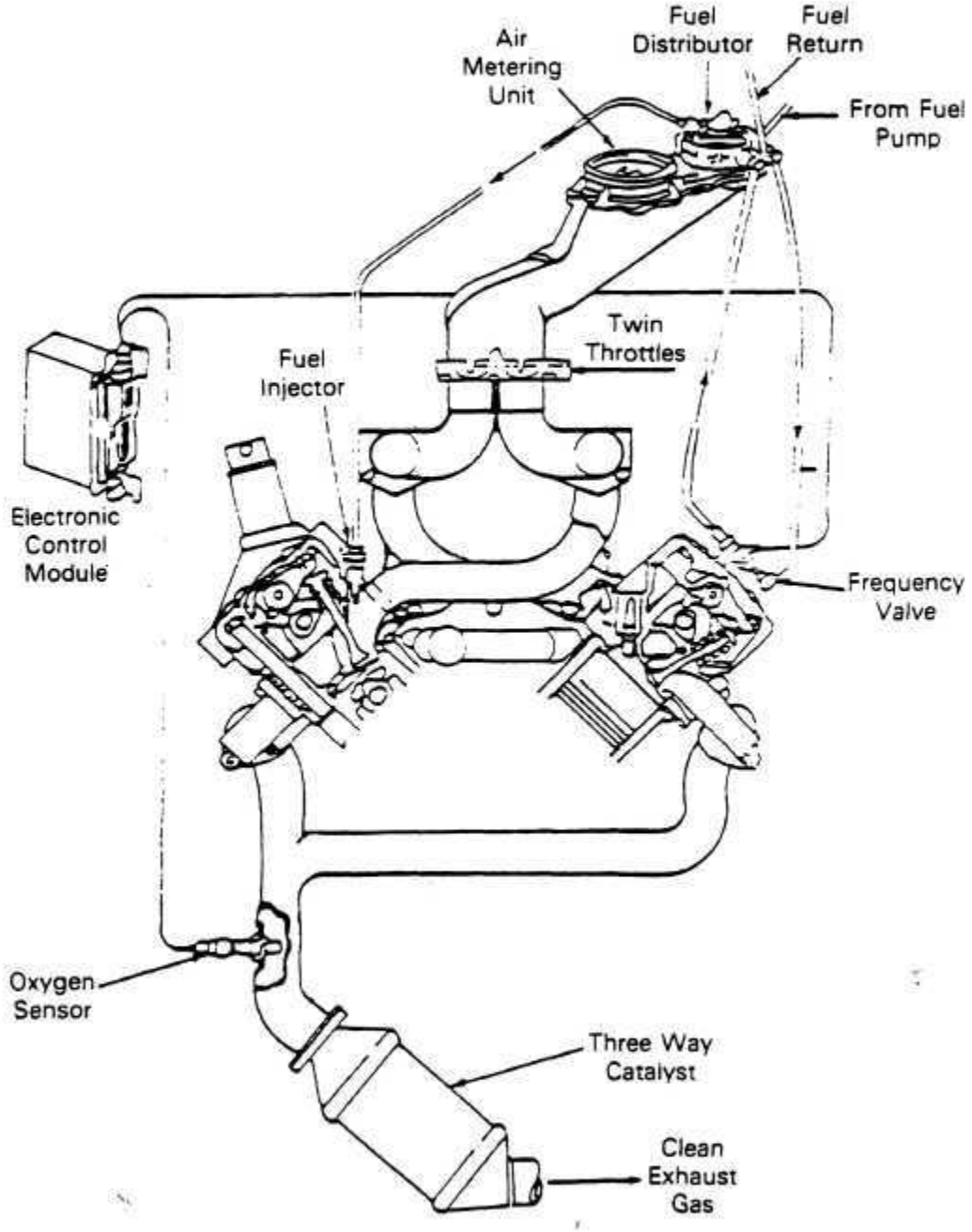

LAMBDA WIRING CIRCUIT
B—BLACK
N—BROWN
U—BLUE
O—ORANGE
GY—GREEN/YELLOW
RP—RED/PURPLE
YR—YELLOW/RED
RN—RED/BROWN
LG—LIGHT GREEN
YR
From RPM Relay Terminal No. 87b—"HOT" only when engine is rotating
N
From Main Feed Wire—"HOT" at all times
No. 7 Fuse
Diagnostic Plug
O
17
B
16
RN
15
12
GY
8
LG
7
B
5
U
4
2
B
1
N
30
87
GY
87b
RP
86
85
B
YR
2
LG
5
6
B
B
Shielded Cable
RP
RN
3
4
1 ECU Module
2 Lambda Relay
3 Frequency Valve
4 Oxygen Sensor
5 Full Throttle Enrichment Switch
6 Thermal Switch

Fig. 33



LAMBDA CONTROL SYSTEM

Fig. 34

ELECTRICAL CIRCUIT FUNCTION

The Lambda relay (2) receives power from the RPM relay and is energised only when the engine is rotating. When the relay is energised, the contacts close and voltage from fuse No. 7 is applied to the frequency valve (3) and the ECU module (1).

The oxygen sensor (4) generates a signal voltage (approximately 500 mv) which is carried by a screened cable to the module. The signal voltage will vary depending on the oxygen content in the exhaust gas. The less oxygen content in the exhaust (rich condition), the greater the signal voltage produced by the sensor.

During operation, the ECU module will analyse the oxygen sensor signal and send a pulse cycle signal to the frequency valve. This signal will allow a pulsating current flow to the valve which will turn it on and off as required. The pulse cycle can be measured by connecting a dwell meter to the diagnostic plug which is connected to terminal No. 17 of the ECU module.

The full-throttle enrichment switch (5) sends a ground signal to the ECU module when the throttle is in the wide-open position. The thermal switch (6) also sends a ground signal to the ECU module when the coolant temperature is below 15°C (59°F). These two switches override the oxygen sensor input to the ECU module, allowing a fixed pulse cycle to be sent to the frequency valve. *(Fig. 33)*

SYSTEM REPAIR NOTES

All of the Lambda system parts, with the exception of the throttle microswitch, are sealed units and cannot be adjusted or repaired. Tampering with a sealed unit will automatically void the warranty.

1. The Lambda ECU module is located in the module compartment behind the driver's seat. It is in the forward section of the compartment and is silver in colour.

2. When replacing the oxygen sensor, it is necessary to use an antiseize compound on the sensor threads. Do not allow any of the compound to get on the tube projecting from the sensor. Do not attempt to disconnect the wire lead directly at the sensor.

3. If it is necessary to supply power to the Lambda system when the engine is not running, by-pass the RPM relay by removing the relay and connecting a jumper wire between terminals No. 87b and No. 30 in the connector. The RPM relay is located in the relay compartment behind the passenger seat. (See "Electrical System and Instruments" Section M).

4. When checking the pulse ratio, a fluctuating dwell reading when the sensor is connected indicates that the system is operating. Readings above or below specifications could be caused by a rich or lean CO adjustment.

SPECIFICATIONS

1. Lambda Sensor:
   Torque specifications – 40 Nm (29 FT LB)

2. Thermal Switch
   Contact shall open at 15 ± 3°C (59°F)
   Close at max. of 5°C below its opening temperature

3. Throttle Micro-Switch
   Shall operate during the final 1.5 mm (0.060 IN) of throttle movement.

4. Fuel Line Tightening Torques:

M8 Bolt	10-12 Nm (7-9 FT LB)
M10 Bolt	13-15 Nm (9-11 FT LB)
M12 Bolt	20-24 Nm (14-17 FT LB)
M14 Bolt	15-20 Nm (11-14 FT LB)
M12 Cap Nut	15-20 Nm (11-14 FT LB)
M14 Cap Nut	25-30 Nm (18-22 FT LB)

5. Pulse Ratios:

   A. Normal Operation (Sensor connected and CO properly adjusted) –
   35-45° (reading pulsates)

   B. Oxygen sensor disconnected –
   40-50° (steady reading)

   C. Oxygen sensor lead disconnected.
   Ground lead –
   87° minimum (steady reading)

   D. Oxygen sensor lead disconnected.
   1.5 volts applied to lead –
   20° maximum (steady reading)

   E. Full throttle or engine cold (below 15°C or 59°F) –
   50-60° (steady reading)

IDLE SPEED CONTROL SYSTEM

SYSTEM DESCRIPTION

The De Lorean Sports Car is equipped with a Bosch electronic idle speed control system. This system is used to maintain an extremely accurate engine idle speed under all operating conditions.

IDLE SPEED CONTROL PRINCIPLE

The control principle used is based on the fact that an electronic control unit (ECU) module is constantly monitoring the engine speed during an idle condition and correcting this speed when necessary.

The idle speed regulator contains a rotary valve which controls the air flow through a duct that by-passes the throttle plates. During engine warm-up, for example, the engine speed is reduced due to friction. The idle speed regulator will open allowing additional air flow to the engine, increasing the RPM to specification. *(Fig. 35)*

SYSTEM OPERATION

The idle speed regulator is constructed in a similar fashion to that of an electric motor, its purpose is to control the position of a rotary valve mounted on its shaft. This valve controls the air flow through a duct that by-passes the throttle plates.

The regulator is mounted on the left side of the intake manifold. *(Fig. 36)*

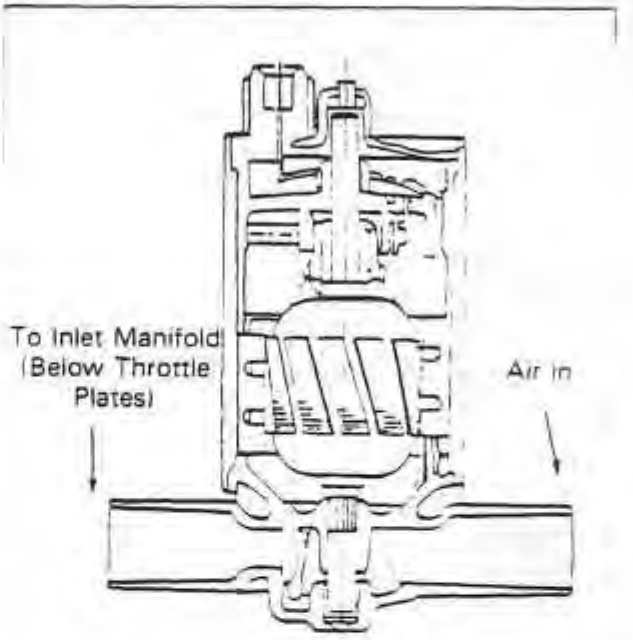


Fig. 36

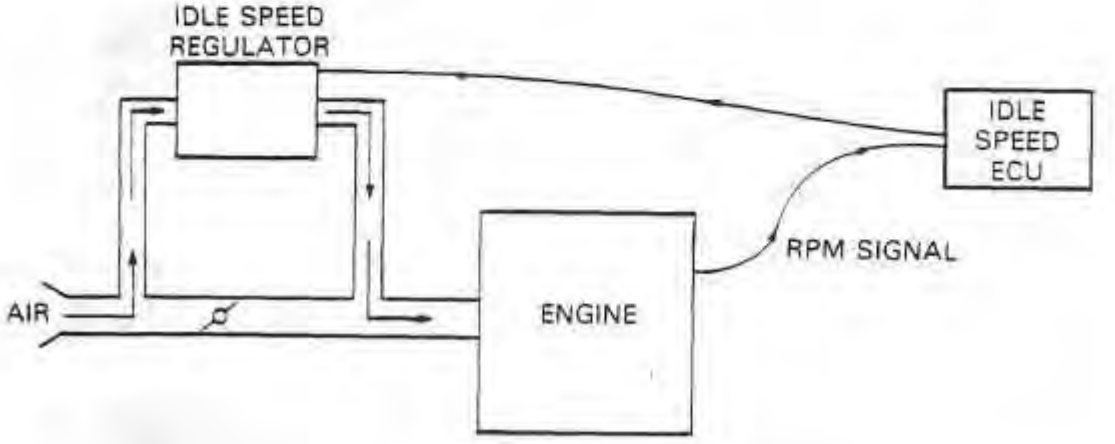


Fig. 35

The idle speed control system is only in operation when a microswitch *(Fig. 37)* (1) is closed by the throttle plates being in a fully closed position. This switch is located on the engine throttle linkage and allows the ECU module to operate. The ECU module senses engine speed from the tachometer and activates the idle speed regulator. The regulator changes the position of the rotary air valve in order to maintain a specified idle speed.

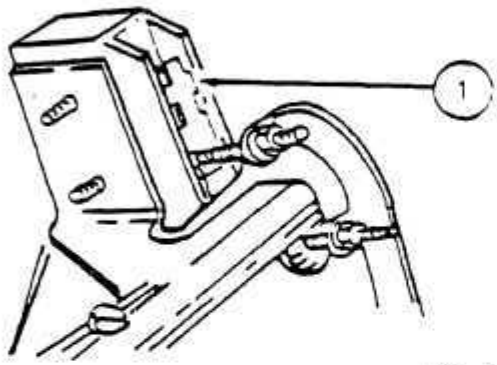
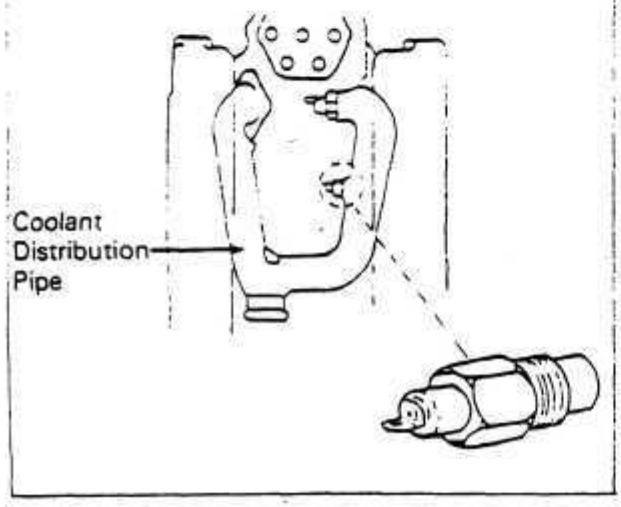


Fig. 37

At engine coolant temperatures below 15°C (59°F), a thermistor, located on the coolant distribution pipe, signals the ECU module to switch the regulator to a "wider" open position. This will increase the idle speed (fast idle) during the engine warm-up period. *(Fig. 38)*

Fig. 38



ELECTRICAL CIRCUIT FUNCTION

The ECU module (1) receives power through fuse No. 1 from the main relay when the ignition switch is in the "run" or "start" position.

When the throttle plates are fully closed, the microswitch (5) provides ground for the ECU module to begin operation. An idle speed diode (4) is used to prevent "feed back" to the ECU module from another circuit which also uses the idle speed microswitch to provide its ground.

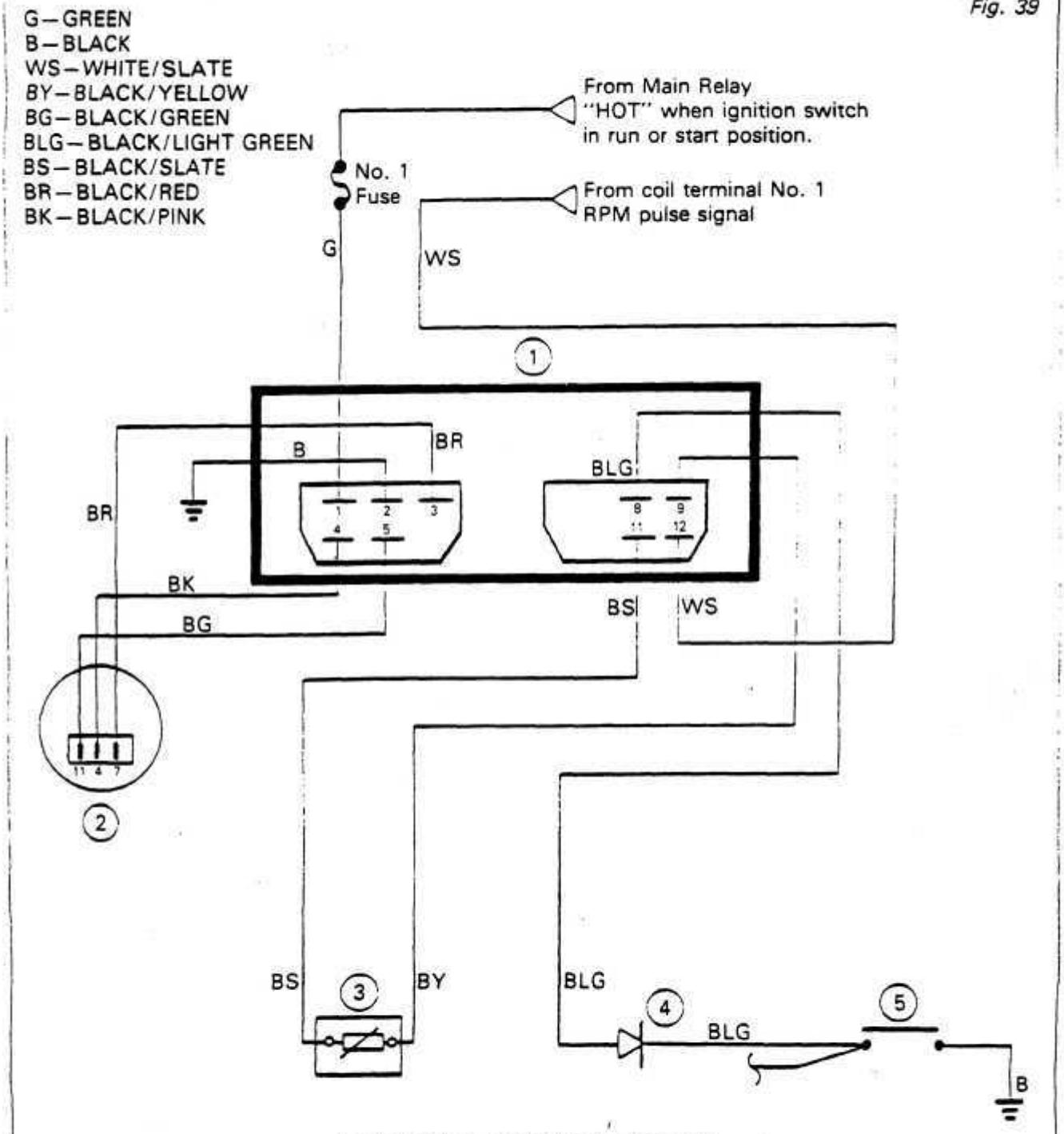
A thermistor (3), located in the coolant system distribution pipe, will activate another circuit within the ECU module when the coolant temperature is below 15°C (59°F). This circuit will provide a fast idle condition.

The ECU module receives an RPM signal from coil terminal No. 1. When the engine idle speed is above or below specifications, the ECU module activates the electric motor in the idle speed regulator (2). The signal from the module will run the motor in a forward or reverse direction which will open or close the rotary valve as necessary to achieve proper engine idle speed. *(Fig. 39)*

SYSTEM REPAIR NOTES

1. All of the idle speed control system parts are sealed units and cannot be adjusted or repaired. Tampering with a sealed unit will automatically void the warranty.
2. The idle speed ECU module is located in the module compartment behind the driver's seat. The module is black in colour and is mounted in the upper portion of the compartment.
3. The idle speed diode is located in the module compartment behind the driver's seat. The diode is black in colour.
4. The idle speed microswitch is not adjustable and is preset to activate the control system when the throttle plates are in the closed position.
5. Engine idle speed is not adjustable. Speed is elecronically controlled to 775 RPM ± 50 RPM.
6. Do not disconnect the idle speed regulator when adjusting the CO level. (See "Engine adjustments, tests and diagnosis" section)

Fig. 39



IDLE SPEED CONTROL CIRCUIT

1 ECU module
2 Idle Speed Regulator
3 Thermistor
4 Idle Speed Diode
5 Idle Speed Micro-Switch

COMPONENT LOCATION

IDLE SPEED CONTROL SYSTEM

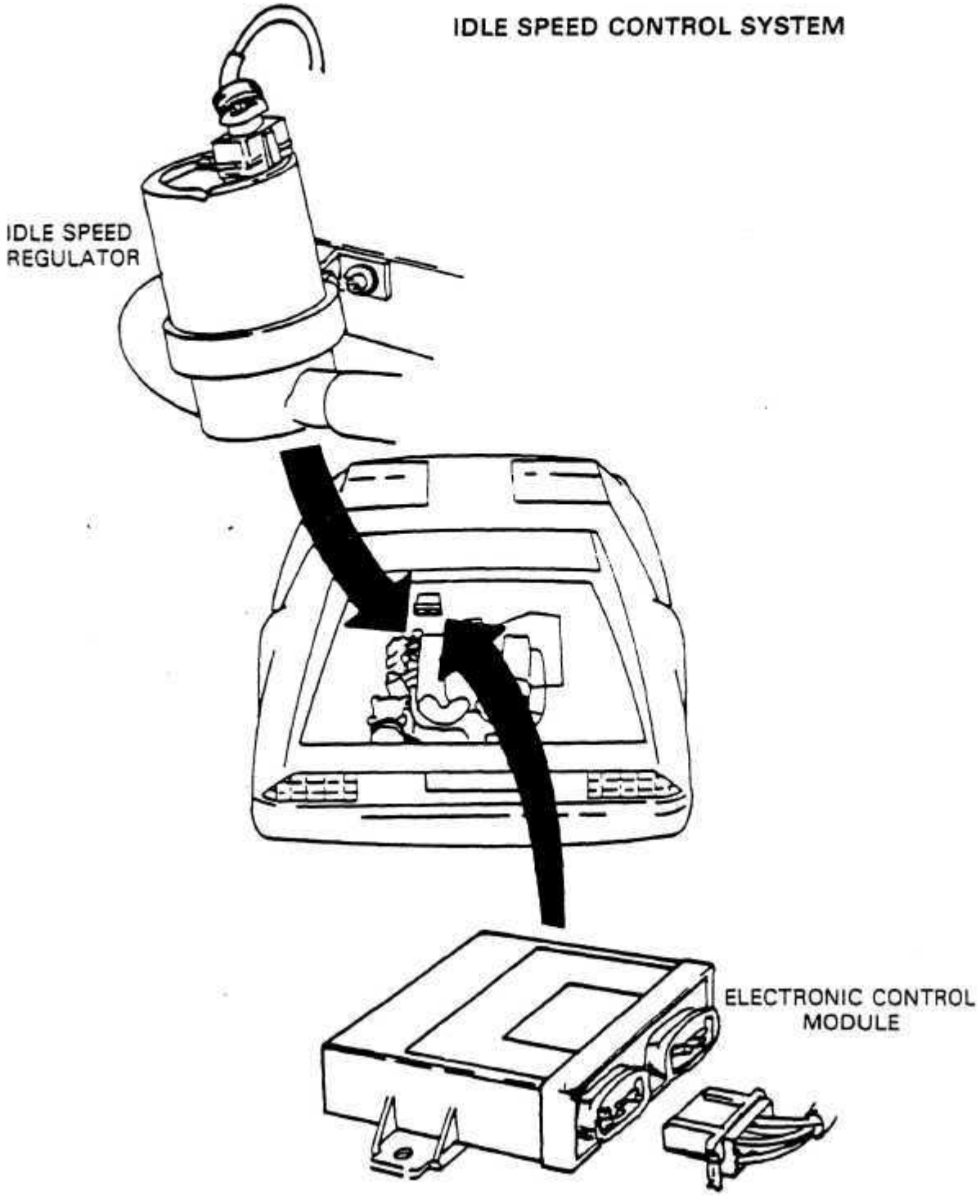


Fig. 40

EVAPORATIVE EMISSION CONTROL SYSTEM

SYSTEM DESCRIPTION

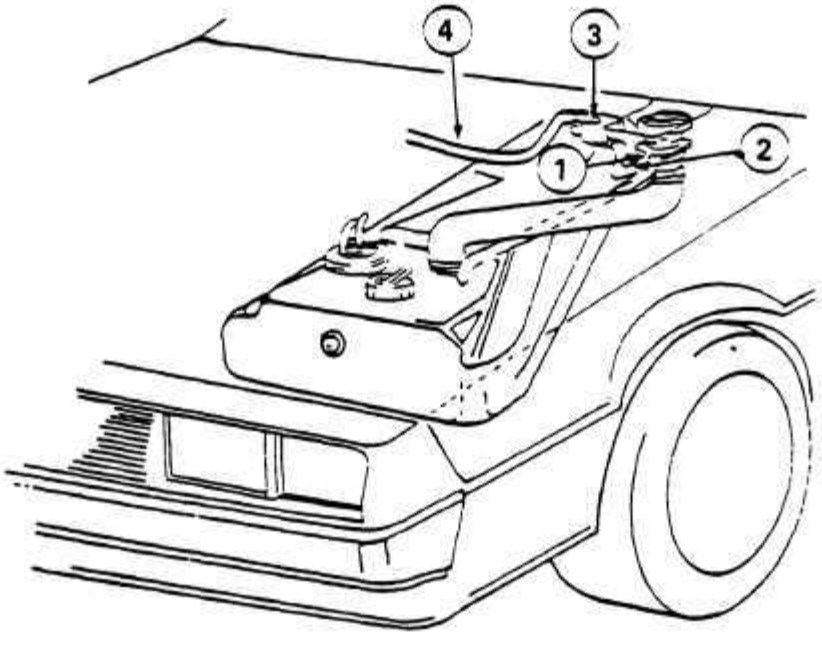
An evaporative emission control system consisting of the fuel tank, vapour lines, vapour storage cannister and a closed engine crankcase is used on the De Lorean.

The purpose of the system is to prevent fuel and oil vapours from entering the atmosphere. All vapours are stored within the system when the vehicle is not running. During operation, the vapours are purged from the system and burned in the engine. *(Fig. 41)*

SYSTEM OPERATION

The entire fuel system is sealed to prevent fuel vapour from escaping. Gasoline vapour in the fuel tank is routed through the vapour separating hose (2) and the roll-over valve (3) to a storage cannister in the rear of the car. When the engine is not running, fuel vapours will remain in the storage cannister.

In the event of a roll-over accident, the roll-over valve prevents liquid fuel from leaking out of the fuel tank and travelling through the vapour hose to the cannister (4).



1 Vapour Outlet
2 Vapour Separating Hose
3 Roll-Over Valve
4 Vapour Hose to Cannister

Fig. 41

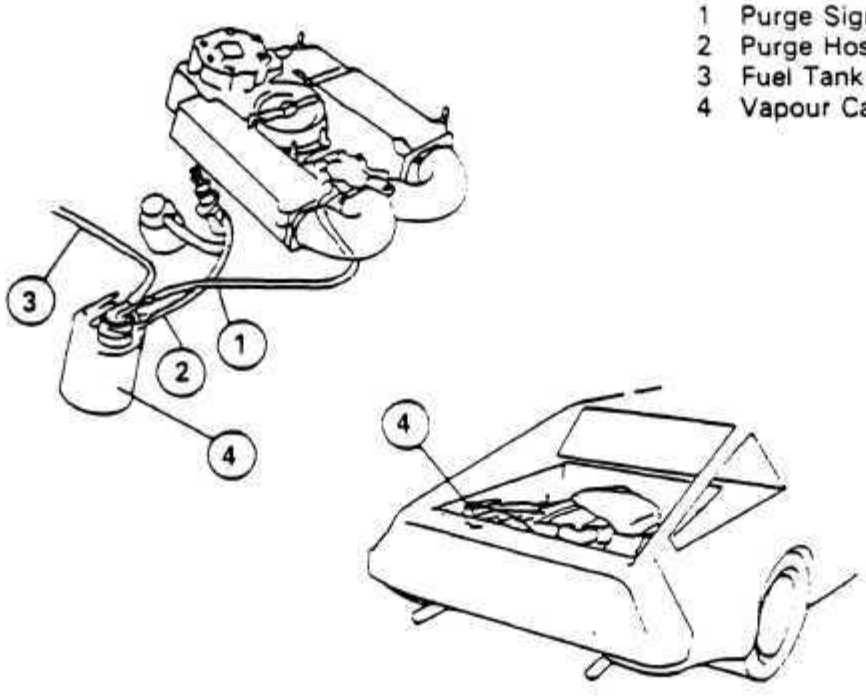


Fig. 42

A purge valve located inside the vapour cannister (4) controls the operation of the vapour storage system. When the engine throttle plates are opened, the purge signal hose (1) applies engine vacuum to the purge valve and opens a passage inside the vapour cannister. The purge hose (2) then connects the cold start air tube to the vapour cannister.

Opening of the purge valve allows the cannister to be purged of fuel vapours. These vapours are drawn into the cold start valve air tube which is connected to the air inlet system. The vapours are mixed with incoming air and burned in the combustion chambers.

The engine oil filter cap is also connected to the cold start valve air tube. This allows any engine vapours to be drawn from the crankcase through the left valve cover to the cold start valve air tube. An orifice in the air tube meters the amount of vacuum applied to the closed crankcase of the engine.

SYSTEM REPAIR NOTES

1. All connections must be tight and leak-free for the evaporative control system to operate properly.

2. Due to the design of the fuel injection system, it will be normal to have a slight amount of pressure in the fuel tank. This pressure will be noticed when removing the fuel filler cap.

3. A restricted vapour hose between the fuel tank and the vapour cannister will cause a vacuum to be created in the fuel tank and possible collapse of tank.

4. The closed crankcase system does not have an air inlet for air circulation within the crankcase. This system applies manifold vacuum to the crankcase which is completely sealed to outside air.

a. A plugged orifice in the cold start valve air tube or a plugged hose that connects the oil filler cap to the air tube would cause excessive pressure build up within the crankcase resulting in possible oil seal and/or gasket damage

b. An air leak in the engine crankcase will cause a lean running condition since the crankcase is connected to the intake manifold. Possible air leaks could be the oil dip stick not installed completely, oil filler cap not sealing properly, or leaking engine gaskets.

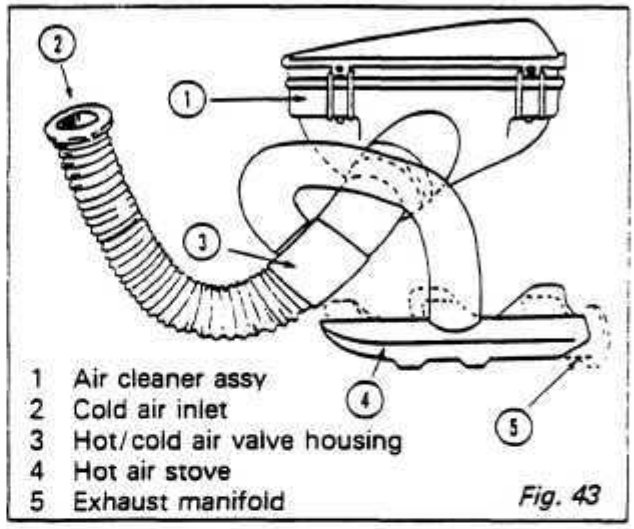
5. The vapour cannister is not serviceable and must be replaced as a complete assembly. The cannister is located inside the left rear body section and is attached to the cover plate which is fastened to the body with (4) bolts. *(Fig. 42)*

AIR INLET SYSTEM

DESCRIPTION AND OPERATION

The temperature of the incoming air to the engine is controlled to improve driveability and reduce exhaust emissions. The temperature of the air is controlled by the air valve housing (3) which is connected to the cold air inlet (2) and the hot air stove (4).

A wax thermostat inside the air valve housing determines the position of a flap controlling the incoming air. The flap is fully open to exhaust manifold heated air at temperatures below 15°C (59°F). As ambient temperature increases, the flap allows a mixture of hot and cold air to enter the engine until 25°C (77°F) is reached. At this time, the flap is fully closed to hot air and fully open to the outside cold air inlet. *Fig. 43*



1 Air cleaner assy
2 Cold air inlet
3 Hot/cold air valve housing
4 Hot air stove
5 Exhaust manifold

Fig. 43

IGNITION VACUUM ADVANCE CONTROL

***DESCRIPTION AND OPERATION*—Fig. 44**

The vacuum signal to the distributor advance is not present during idle and at low engine temperatures. Distributor advance is cut out at low temperatures to improve catalytic converter warm-up. A thermal vacuum control valve (A), located in a coolant passage, closes when the coolant temperature is below 40°C (104°F) to prevent manifold vacuum from reaching the distributor advance. Above 40°C, the control valve is open allowing vacuum to pass to the solenoid valve (B).

The electrically operated solenoid valve (B) is energised whenever the throttle plates are closed. Energising the solenoid closes the vacuum passage to the distributor advance, thus eliminating an over-advanced condition during idle or deceleration. Solenoid operation is controlled by a throttle micro-switch (C) which provides an electrical ground for the solenoid valve when the throttle plates are closed.

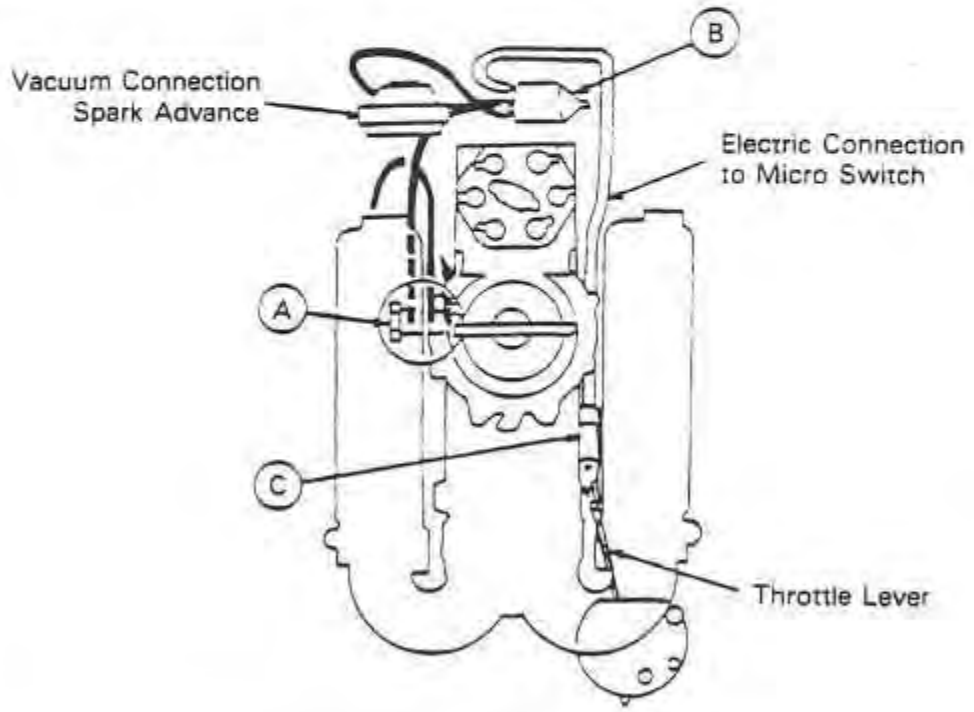


Fig. 44

DECELERATION CONTROL

DESCRIPTION AND OPERATION

During deceleration, a high manifold vacuum is created behind the closed throttle plates and lean condition occurs due to the loss of air flow through the air flow sensor. To eliminate this lean condition which causes high hydrocarbon emissions, a by-pass valve is located in each throttle plate.

The by-pass valves open when the manifold vacuum is above the normal idling vacuum. This allows enough air flow to by-pass the throttle plates and permit continued fuel injection. *Fig. 45.*

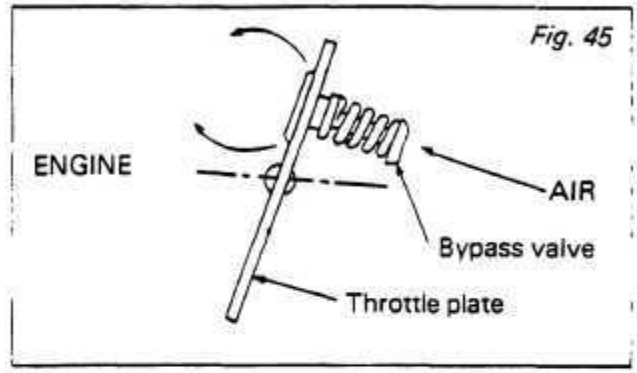


Fig. 45

REMOVING—REFITTING EXHAUST MUFFLER

REMOVING

Note:
Alternator must be loosened and pivoted to gain access to bracket bolts.

Release two bolts securing LH support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Remove two nuts and bolts securing rubber mounting to RH muffler support bracket.

Remove three bolts securing RH muffler support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Slide muffler pipe off catalyst pipe and remove muffler.

Remove bolts securing top muffler mounting bracket to engine.

Withdraw rubber mounting off mounting pin, and remove bracket.

Raise rear of car and release four nuts and bolts securing heatshield to muffler brackets and remove shield.

Loosen off catalyst/muffler joint U-clamp.

Before removing the two lower muffler mountings, provide alternative support for the muffler to avoid injury from sudden release and excessive strain on the pipe joint.

REFITTING

Reverse the removal procedure using exhaust sealant paste on the pipe joint, and tightening mounting brackets in their optimum position before tightening this clamp will distort the pipes and make removal very difficult.

REMOVING—REFITTING EXHAUST MUFFLER

REMOVING

Note:
Alternator must be loosened and pivoted to gain access to bracket bolts.

Release two bolts securing LH support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Remove two nuts and bolts securing rubber mounting to RH muffler support bracket.

Remove three bolts securing RH muffler support bracket to engine.

Withdraw rubber mounting off muffler pin, and remove bracket.

Slide muffler pipe off catalyst pipe and remove muffler.

Remove bolts securing top muffler mounting bracket to engine.

Withdraw rubber mounting off mounting pin, and remove bracket.

Raise rear of car and release four nuts and bolts securing heatshield to muffler brackets and remove shield.

Loosen off catalyst/muffler joint U-clamp.

Before removing the two lower muffler mountings, provide alternative support for the muffler to avoid injury from sudden release and excessive strain on the pipe joint.

REFITTING

Reverse the removal procedure using exhaust sealant paste on the pipe joint, and tightening mounting brackets in their optimum position before tightening this clamp will distort the pipes and make removal very difficult.

Clutch

Contents

GENERAL DESCRIPTION

The vehicle, when equipped with the five speed manual transmission, uses a single dry disc type clutch. The clutch is hydraulically operated. The pressure plate is a diaphram spring type and the disc has a spring cushioned hub. A self-aligning, sealed ball-type throw-out bearing is used to depress the diaphram spring. The clutch has its own fluid reservoir and master cylinder which provides hydraulic pressure when the clutch pedal is depressed.

The clutch pedal is connected to the master cylinder with a pushrod. When the pedal is depressed, the pushrod exerts pressure against the master cylinder piston. Slave cylinder piston pressure causes the clutch fork to move the throw-out bearing against the pressure plate. As a diaphram spring is depressed, pressure on the disc is released and the clutch disengages. When the clutch pedal is released, the procedure is reversed and the clutch engages.

The clutch controls consist of a mechanical pedal assembly and a hydraulic control system. A clutch master cylinder, connected to the pedal assembly, converts mechanical movement into hydraulic movement. This pressure and movement is transmitted through a hydraulic pipe to the clutch slave cylinder where it is converted back to mechanical movement. The slave cylinder, connected to the clutch assembly, moves the clutch fork and release bearing, thus engaging or disengaging the clutch mechanism.

The hydraulic clutch system is self-adjusting, therefore no provisions are made for adjustment.

SPECIFICATIONS

Clutch Disc Diameter	235 mm (9.25")
Total Pedal Travel	150 mm (5.90")
Maximum Pedal Load	15 kg (33 lb.)
Pedal Free-Play	Non-Adjustable
Clutch Fluid	Dot 4 Hydraulic Fluid to SAE J 1703

Torque Specifications

Pressure Plate to Flywheel Bolts	20 NM (15 ft.(lb.)
Flywheel to Crankshaft Bolts	55 – 60 NM (41 – 45 ft./lb.)

Note:

Flywheel Bolts must be renewed after each dismantling. Apply Loctite 601 or equivalent on bolt threads.

Special Tools

J28863	Clutch Alignment Arbor
J23907	Pilot Bearing Puller

Clutch

E:03:01

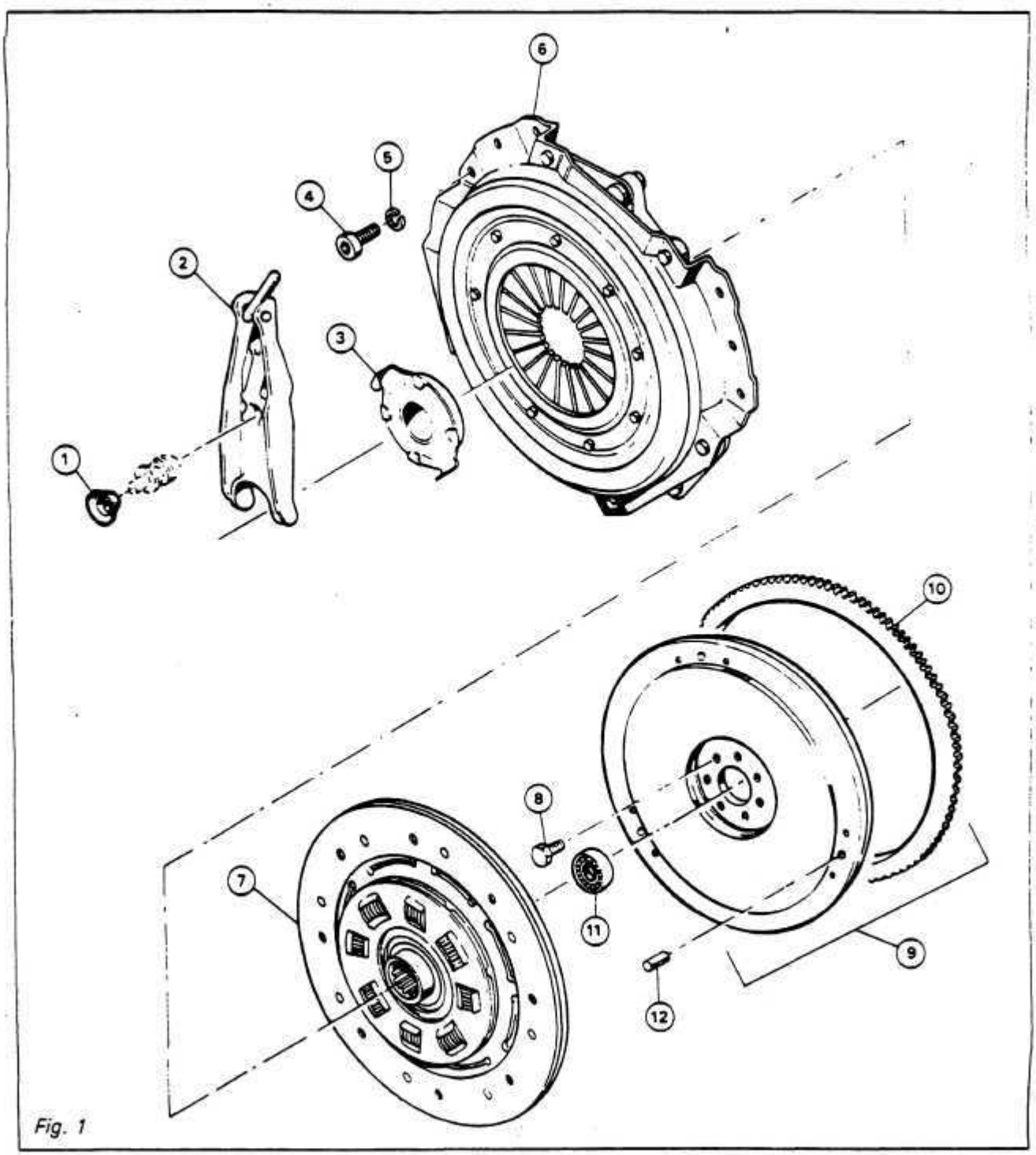


Fig. 1

1. — Dust Seal
2. — Fork, Clutch Release
3. — Bearing, Release
4. — Bolt, Pressure Plate
5. — Lock Washer
6. — Pressure Plate
7. — Clutch Disc
8. — Screw M9 × 100
9. — Flywheel Wiring Gear
10. — Ring Gear, Flywheel
11. — Pilot Bearing, Crankshaft
12. — Pin, Dowel

CLUTCH ASSEMBLY — Fig. 1

REMOVAL

1. Disconnect negative battery — blue cable — and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Install clutch alignment arbor, Tool J28863, to support the clutch assembly during removal. Mark the pressure plate and flywheel for indexing purposes during installation.
4. Loosen the pressure plate to flywheel attaching bolts evenly until spring pressure is released. Remove bolts, clutch and pressure plate.
5. Inspect flywheel for cracks, heat checking, runout or other defects. Replace or repair as required.

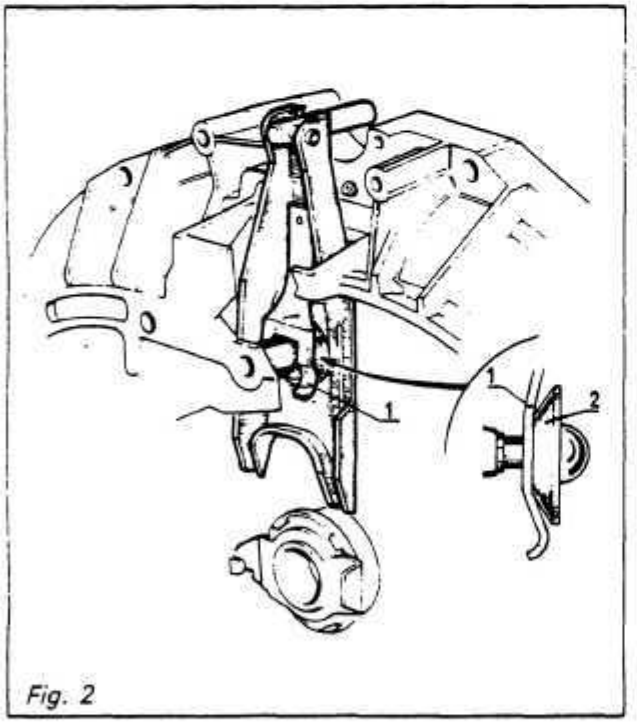


Fig. 2

6. Slide clutch release fork from ball stud. Remove fork and release bearing. *Fig. 2 and Fig. 3*
7. Inspect condition of clutch shaft pilot bearing. See pilot bearing section for replacement.

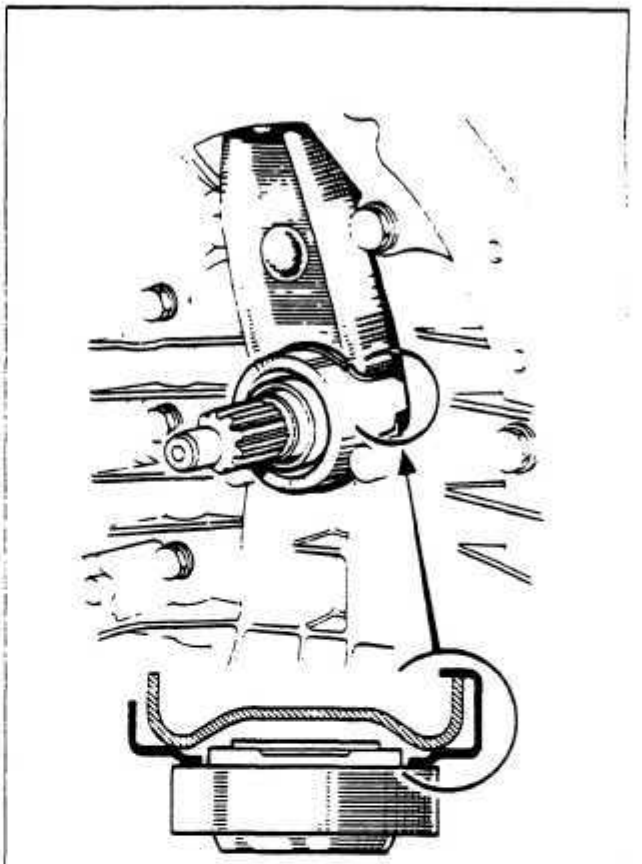


Fig. 34

INSTALLATION

1. Clean pressure plate and flywheel. They should be free of oil, grease, metal deposits or burned spots.
2. Position clutch disc and pressure plate in relative installed position and support them with alignment Tool J 28863.

   Note:
   Driven disc is installed with damper springs to transmission.
3. Align pressure plate and flywheel index marks.
4. Install bolts and tighten down evenly. Torque to proper specifications and remove clutch pilot tool.

5. Lubricate the release bearing contact surface on the pressure plate with Molykote BR2 grease. Lubricate clutch fork pivot and clutch shaft splines with graphite grease.

6. Install clutch fork and release bearing in the clutch housing.

7. Install transmission as outlined in transmission section.

8. Adjust shift linkage as outlined in transmission controls section.

FLYWHEEL/PILOT BEARING

FLYWHEEL

Removal

1. Disconnect negative battery cable and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Remove clutch as outlined in clutch section.
4. Mark flywheel and crankshaft for indexing purposes.
5. Remove flywheel attaching bolts and flywheel.

Installation

1. Reverse removal procedure.

Note:
Flywheel bolts must be replaced after each dismantling. Apply Loctite 601 or equivalent on bolt threads.

PILOT BEARING

Removal

1. Disconnect negative battery cable and raise vehicle on hoist.
2. Remove transmission as outlined in transmission section.
3. Remove clutch as outlined in clutch section.
4. Remove pilot bearing using tool J 23907.
5. Apply Loctite 601 or equivalent to outside of pilot bearing and install using suitable drift.

Installation

1. Reverse removal procedure.

CLUTCH PEDAL — Fig. 4

REMOVAL

1. Remove pedal box assembly as outlined in chassis frame and body section.
2. Remove spring clip and pivot pin connecting clutch pedal to clutch release shaft.
3. Remove spring clip retaining pedal shaft on right hand side of pedal box.
4. Draw out pedal shaft towards left hand side (at same time inserting short bar or screwdriver to retain accelerator and brake pedals) until clutch pedal is released.
5. Pedal pivot bushes may be replaced by knocking out old bushes and pressing in new.

INSTALLATION

1. Lubricate clutch pedal pivot bushes with grease.
2. Smear clutch release shaft pivot pin with molybdenum based grease and lightly oil shaft retaining clips and felt washer.
3. Position clutch pedal in pedal box, with spacer washer (if fitted) between left hand side of clutch pedal and pedal box.
4. Push pedal shaft through spacer washer (if fitted), clutch pedal, brake pedal, accelerator pedal, felt washer, plain washer, and into 'D' shaped hole in pedal box. Retain with spring clip.
5. Connect clutch release shaft to clutch pedal lever with pivot pin and retain with spring clip.
6. Wipe any excess lubricant from assembly and ensure all pedal pads are totally grease free.
7. Install pedal box assembly.

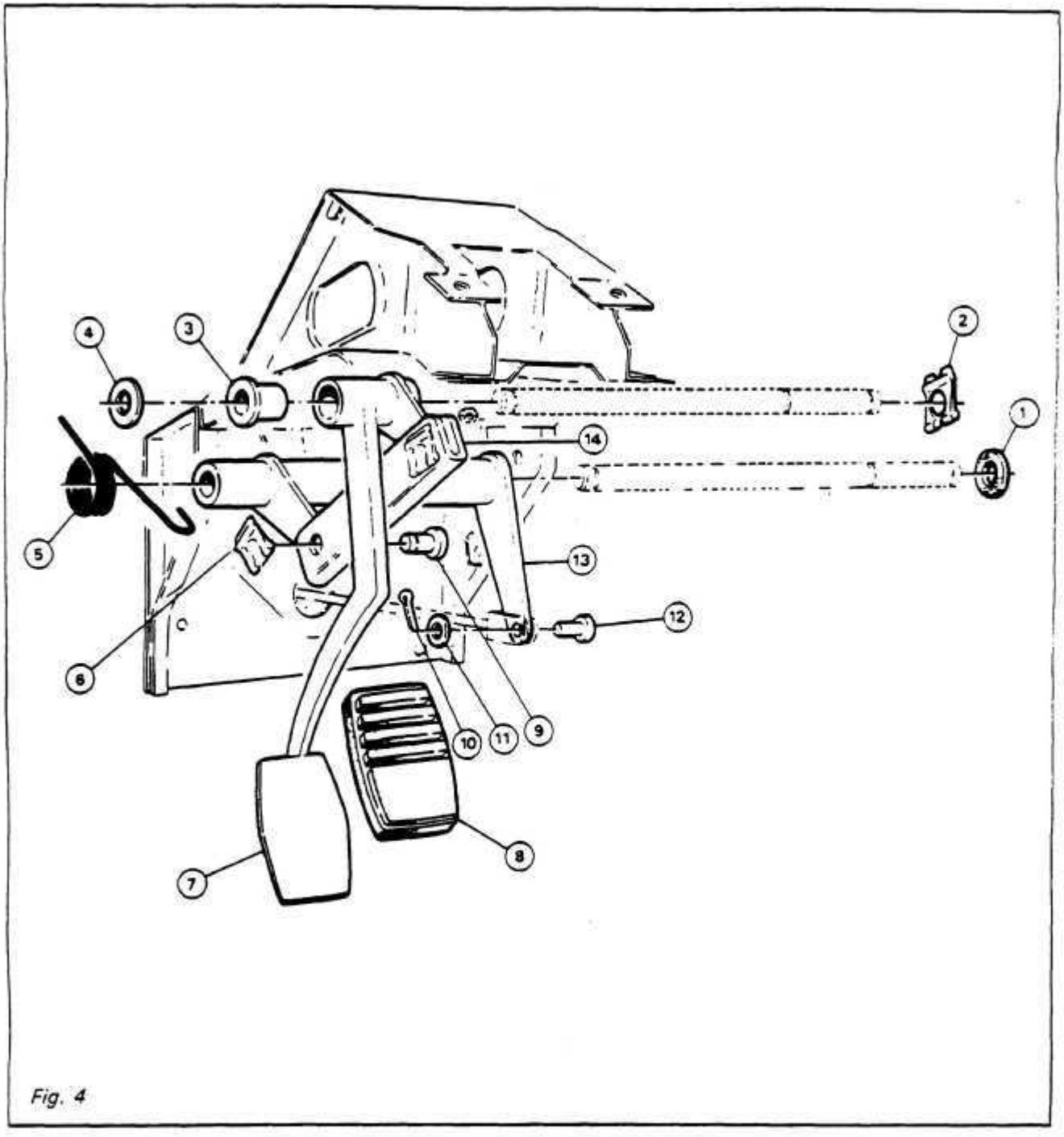


Fig. 4

1. — Felt Washer
2. — Retaining Clip
3. — Bush, Shift Brkt.
4. — Washer
5. — Spring, Clu. Ped. Ret.
6. — Screw M6 × 20
7. — Pedal, Clutch
8. — Pad. Brkt./Clu. Pedal
9. — Pivot Pin
10. — Pin
11. — Washer M8
12. — Clevis Pin, Clu. M./Cyl.
13. — Clutch Rel. Shaft
14. — Link, Mech. Clu. and Brkt.

BLEEDING AND FLUSHING

BLEEDING SYSTEM

1. Top up clutch fluid reservoir with specified fluid.

   Note:
   Ensure that reservoir fluid level is maintained throughout the bleeding procedure.

2. Connect one end of a hose to the bleedscrew and place the other end in a container.

3. Raise vehicle and open bleedscrew on clutch slave cylinder enough to allow the fluid to be pumped out.

4. Depress the clutch pedal through the full stroke, followed by three short, rapid strokes.

5. Close the bleedscrew before releasing the pedal on the last stroke. Release the pedal and allow it to return rapidly.

6. Open bleedscrew and repeat operation 4 and 5 until all the air is evacuated.

7. Remove bleed hose and top up reservoir to bring the level to within 10 mm (0.394 in.) of the bottom of the filler neck.

FLUSHING SYSTEM

It is recommended that the entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in the hydraulic system.

Flushing is also recommended if there is any doubt as to the grade of fluid or if there is any trace of contamination.

1. Remove fluid from clutch reservoir.

2. Top up reservoir with new fluid and perform bleeding operation. See "Bleeding Hydraulic System" procedures.

3. Continue to bleed until all of old fluid has been flushed from system.

CLUTCH MASTER CYLINDER

REMOVAL

1. Remove luggage compartment carpet and both access covers on left side of compartment.
2. Disconnect reservoir hose and clutch pipe from master cylinder and cap ends to prevent entrance of dirt.
3. Working from inside vehicle, remove clip and clevis pin securing master cylinder push rod to clutch release shaft.
4. Remove nuts securing master cylinder to pedal box.
5. Remove master cylinder from vehicle by pulling it out through forward access hole.

DISASSEMBLY

1. Clean outside of master cylinder thoroughly. Turn cylinder over and pump push rod by hand to drain all fluid. Always discard used fluid.
2. Carefully release crimps on metal retaining band securing dust cover. Do not damage metal band as it must be reused.
3. Pull back dust cover and remove circlip.
4. Remove plunger assembly by shaking cylinder or by compressed air pressure.
5. Lift leaf on spring retainer and separate spring assembly from plunger. *Fig. 5*
6. Compress spring to free valve stem from keyhole in spring retainer. Remove spring and valve assembly from spring retainer.

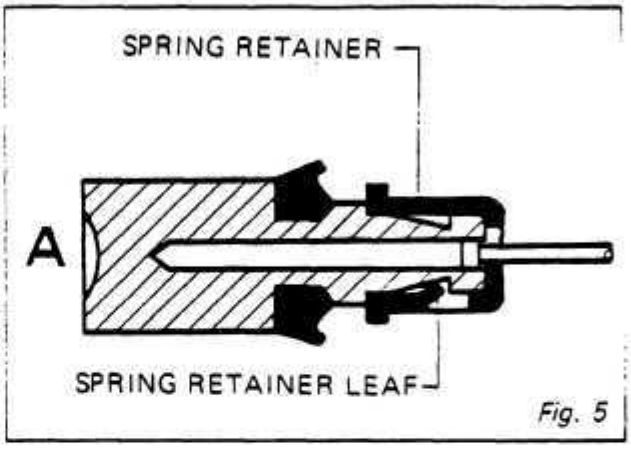


Fig. 5

7. Remove valve stem and spring washer from valve spacer.
8. Remove valve seal from valve stem and remove plunger seal from plunger.
9. Use clean brake fluid to clean all metal parts thoroughly. Air dry and place cleaned parts on clean paper or lint-free cloth.

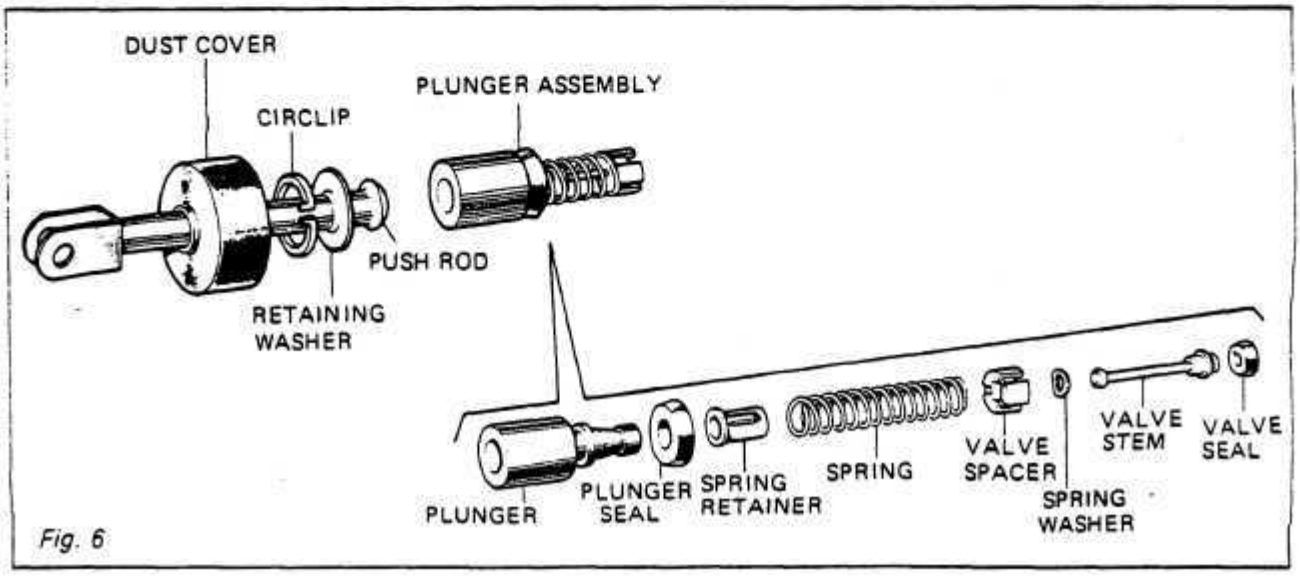


Fig. 6

Note:
Do not use any cleaning fluids that contain mineral oil.

10. *Examine* plunger and cylinder bore for visible score marks, ridges and corrosion. If bore or plunger are not smooth, cylinder must be replaced. *Fig. 6*

Note:
Polishing or honing the bore of the cylinder is **prohibited.**

REASSEMBLY

1. Use new parts from service kit when reassembling.
2. Lubricate new plunger seal with clean brake fluid and install seal on the plunger with lip facing valve assembly. *Fig. 6*
3. Lubricate new valve seal and fit seal, smallest diameter leading, on to valve head.

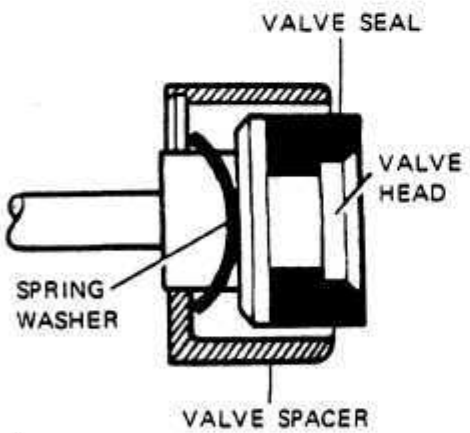


Fig. 7

4. Position new spring washer on valve stem so it "flares" away from valve stem shoulder. *Fig. 7*
5. Fit valve stem and spring washer into valve spacer.
6. Fit spring and spring retainer to valve assembly. Compress spring until valve stem passes through keyhole in spring retainer and engages in center.
7. Fit spring sub-assembly onto plunger and depress leaf of spring retainer to secure assembly.
8. Lubricate plunger assembly and cylinder bore with clean brake fluid. Insert plunger assembly into cylinder bore.
9. Fit new dust cover on push rod. Place push rod and retaining washer in master cylinder and install new circlip.
10. Smear dust cover and plunger bore entrance with rubber grease supplied in service kit.
11. Position dust cover over bore and install metal retaining band. Firmly press metal band against cover and crimp metal band in three (3) equally spaced places to secure.

INSTALLATION

1. Fit master cylinder on vehicle. Install and tighten two (2) mounting bolts. See torque specifications.
2. In car, connect master cylinder push rod to clutch release shaft using clevis pin, washer and retaining pin.
3. Connect reservoir hose to master cylinder.
4. Fit clutch pipe to master cylinder but do not tighten completely.
5. Top up reservoir with clean brake fluid and bleed air from master cylinder by depressing clutch pedal slowly. Repeat until all air has been evacuated. Tighten clutch pipe.
6. Install access covers and luggage compartment carpet.
7. Top up reservoir and perform clutch bleeding.

CLUTCH SLAVE CYLINDER

The clutch slave cylinder should not be disassembled. Replace the cylinder as an assembly if there are any signs of leakage or if a malfunction occurs.

REMOVAL

1. Raise vehicle on hoist.
2. After engine exhaust has cooled, disconnect clutch line from slave cylinder.
3. Remove two (2) bolts securing slave cylinder to clutch housing.
4. Remove slave cylinder.

Note:

Slave cylinder push rod does not have to be disconnected from clutch fork.

INSTALLATION

1. Reverse removal procedure.
2. Bleed clutch. See clutch bleeding section for procedure.

CLUTCH PIPING/RESERVOIR

CLUTCH PIPING

The clutch pipe leading from the clutch master cylinder to the slave cylinder clutch line is routed between the body and chassis. To replace the clutch pipe, it is necessary to remove the vehicle body from the chassis. See the "Body" section for removal and installation procedures.

CLUTCH RESERVOIR

Removal

1. Remove left hand vertical access cover inside luggage compartment.
2. Clamp reservoir hose and remove hose from master cylinder.
3. From inside vehicle, remove two (2) nuts securing reservoir.
4. Remove reservoir from vehicle.

Installation

1. Reverse removal procedures.

Manual Transmission

CONTENTS

GENERAL DESCRIPTION

The manual transmission is a constant mesh five speed. All forward gears are fully synchronised for ease of shifting. The aluminium case consists of two halves which, when repair is necessary, can be separated to provide easy access to internal parts. The final drive components are also contained within the transmission case. Both the final drive and transmission use the same lubricant eliminating the need for a separate final drive lube. *(Fig. 1)*

The power train consists of:

A. Primary (input) shaft
B. Secondary (output) shaft
C. Six driving gears
D. Six driven gears
E. One reverse slider gear

The selector control consists of:

A. Four shift rods and shift forks
B. One pivoting interlock
C. One selector lever and shaft
D. One selector shaft arm

All forward gear power flow is transferred via:

A. Primary shaft (input)
B. The selected driving gear (primary shaft)
C. The selected driven gear (secondary shaft)
D. Pinion shaft/final drive unit

Reverse gear power flow is transferred by means of:

A. Primary shaft
B. Reverse driving gear
C. Reverse slider gear
D. Reverse driven gear
E. Pinion shaft/final drive unit.

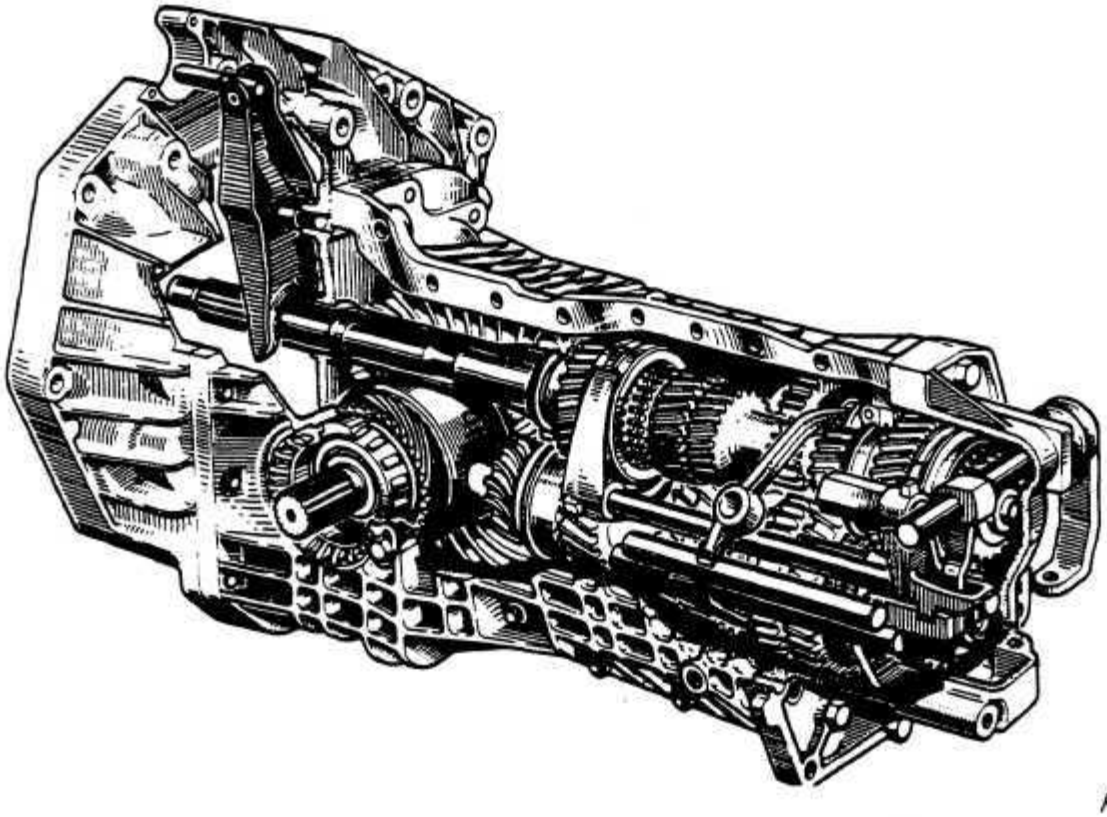


Fig. 1

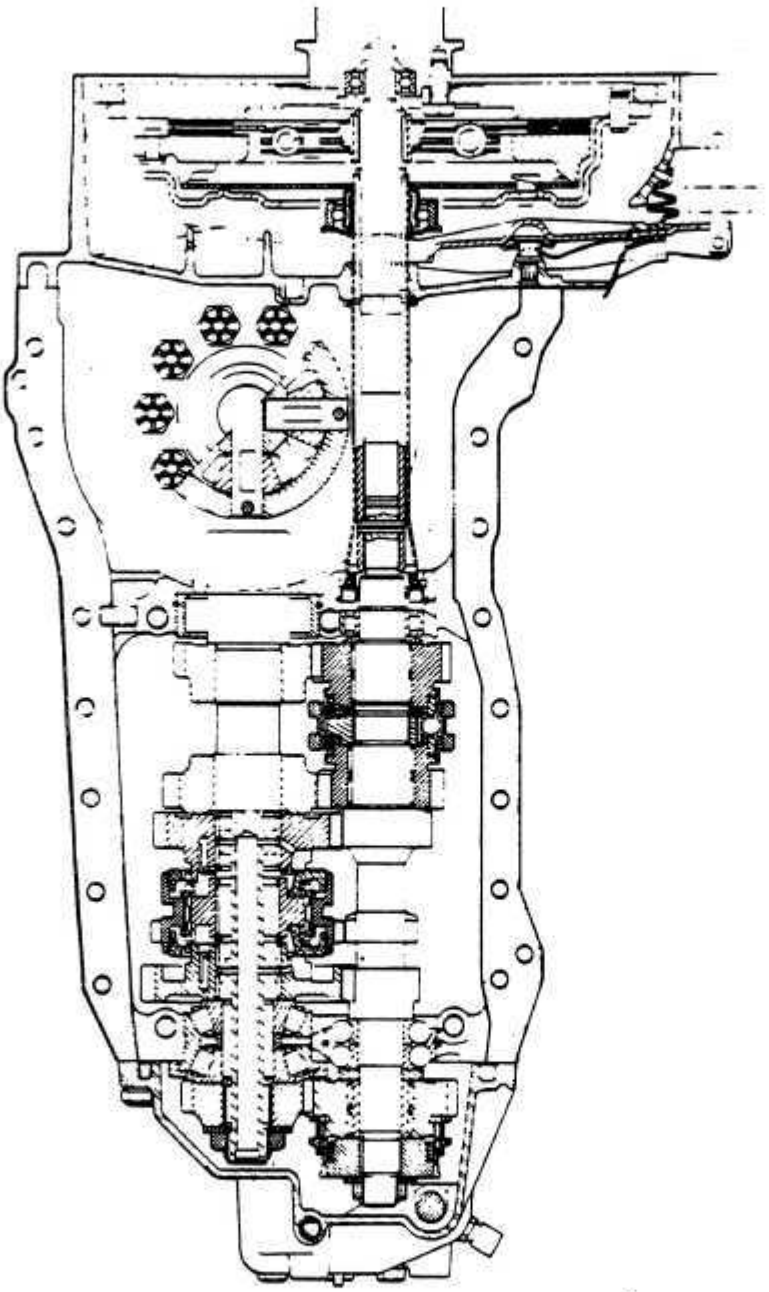


Fig. 2

All gears are selected manually by the driver using the gearshift lever attached to the selector lever mounted on the side of the transmission rear housing. Inside the rear housing, a selector shaft arm, attached to the selector shaft, fits through a slot in the pivoting interlock. When a gear is selected, the selector shaft arm moves the interlock to the desired position and moves the appropriate shift rod in or out depending on the gear selected. The shift fork attached to the shift rod moves the desired gear into the proper position while the synchroniser ring matches the speed of the two gears being coupled. This shift sequence is repeated for all forward gears. Reverse operation is the same with the exception of the synchroniser ring, which is not required, since the vehicle should be stationary when shifting to reverse. *(Fig. 2)*

Manual Transmission

F:02:01

SPECIFICATIONS

GEAR RATIOS

1st.	3.364	4th.	1.057
2nd.	2.059	5th.	0.8205
3rd.	1.381	Rev.	3.1818

FINAL DRIVE RATIO

3:44:1

LUBRICANT

Capacity: 3.7 litres (7.82 pints)
Viscosity: Below −10°C (−3°F) SAE 75
Above −10°C (−3°F) SAE 80
Classification: Must meet spec. MIL−L−2105C or API−GLS

DIFFERENTIAL

Backlash: Nonadjustable
Carrier Bearing Preload:
New Bearing 10−30 Nm (2.7 LB)
Used Bearings Must turn free without any play.

TORQUE SPECIFICATIONS

Transmission mount brackets to rear cover−
25 Newton Metres (18 FT/LB)
Clutch housing to engine shield−
20 Newton Metres (14 FT/LB)
Starter motor to clutch housing−
27 Newton Metres (19 FT/LB)
Flywheel protection shields to clutch housing−
20 Newton Metres (14 FT/LB)
Inner driveshaft to flange
Shift cable mount brackets to rear cover−
25 Newton Metres (18 FT/LB)
Transmission drain and fill plugs−
19 Newton Metres (13 FT/LB)
Rear cover to case−
20 Newton Metres (14.6 FT/LB)
Half-casing attaching bolts:
8 mm diameter 30 NM (22.5 FT/LB)
10 mm diameter 45−55 NM (34−41 FT/LB)
Clutch housing to case−
45−55 NM (34−41 FT/LB)
Differential ring gear to carrier−
120−140 NM (90−105 FT/LB)
Primary shaft nut−
120−150 NM (90−112.5 FT/LB)
Secondary shaft nut−
120−150 NM (90−112.5 FT/LB)
Bearing retaining plate to case−
45−55 NM (34−41 FT/LB)
Reverse shift fork to case−
12−14 NM (22−30 FT/LB)

SPECIAL TOOLS

J28869	Spring Compressor
J28866	Slide Bearing Cap Wrench
J33400	Seal Installer
J23907	Pilot Bearing Installer

ON CAR SERVICE

DRAIN AND REFILL

1. Raise the vehicle on a hoist.
2. With the transmission at operating temperature, remove the drain plug and allow oil to drain completely. *(Fig. 3)*
3. Install drain plug and tighten.
4. Remove the fill plug located on the side of the transmission case. *(Fig. 3)*
5. Fill the transmission with lubricant until the level of the oil is at the bottom edge of the fill plug hole. See specifications for proper specified lubricant.
6. Install the fill plug and tighten. *(Fig. 4)*

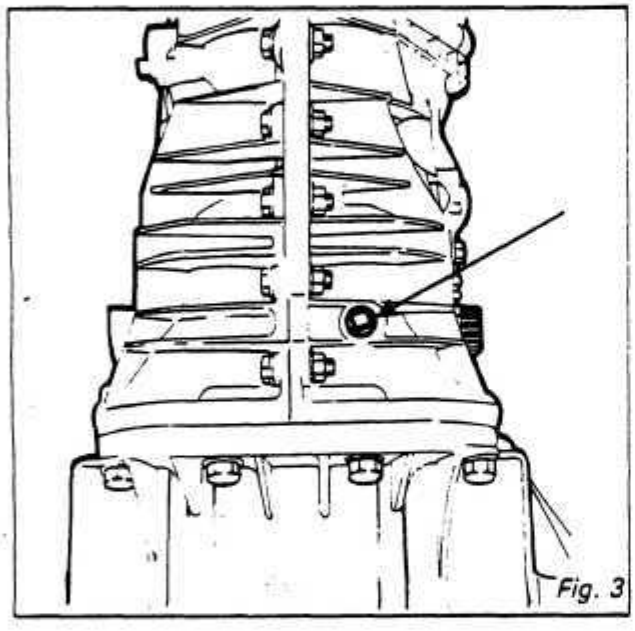


Fig. 3

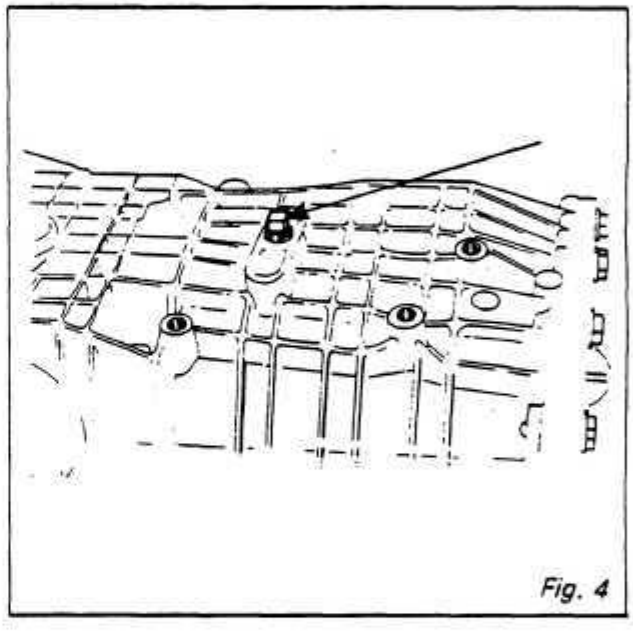


Fig. 4

DIFFERENTIAL OIL SEAL

REMOVAL

1. Raise the vehicle on a hoist.
2. Drain the transmission oil as previously described.
3. Disconnect the inner end of the inner driveshaft from the flange on the side that is going to be replaced.
4. Remove the retaining pin with pin punch securing the flange to the differential shaft. *(Fig. 5)*

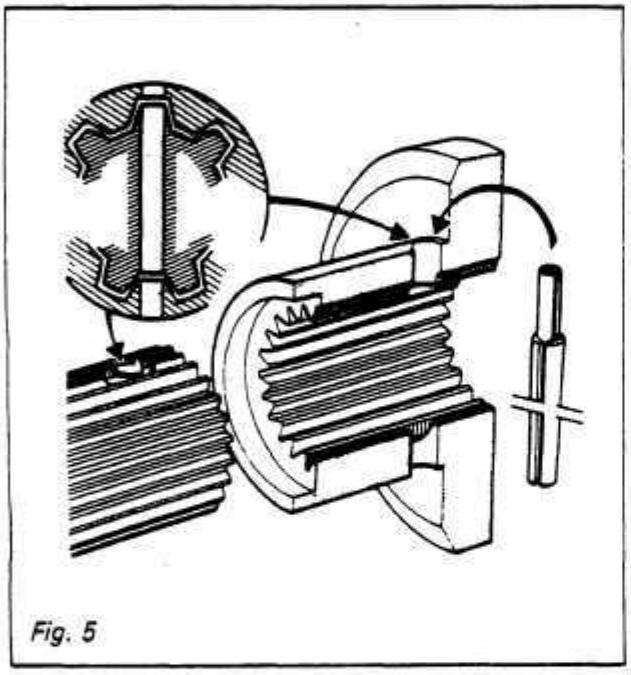


Fig. 5

5. Remove the driveshaft flange.
6. (a) Right Seal: Pry seal out of the transmission case using a suitable tool taking care not to damage case.

   (b) Left Seal:

   (1) Index mark the adjusting nut and transmission case for reinstallation. Remove the differential adjusting nut lock plate. *(Fig. 6)*

   (2) Unscrew the adjusting nut using Tool J28866 **counting the number of turns required to disengage the threads.** *(Fig. 7)*

   (3) Remove O-ring seal and pry out the lip seal using suitable tool taking care not to damage adjusting nut.

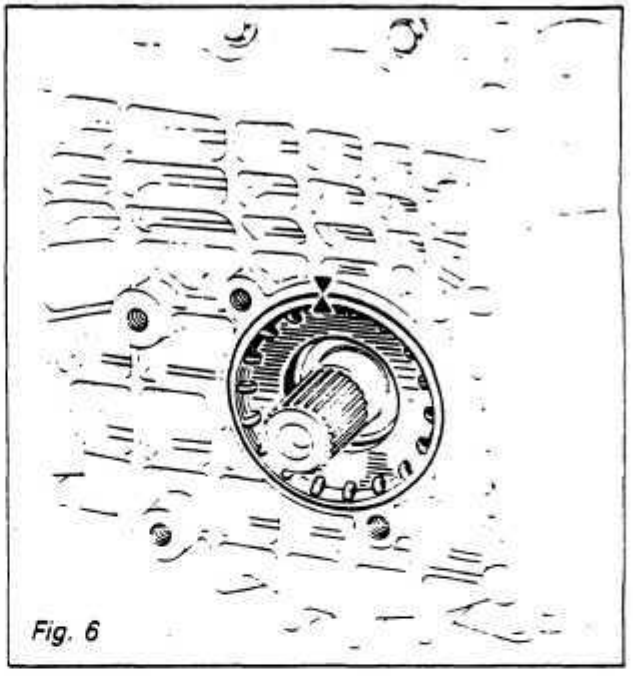


Fig. 6

INSTALLATION

1. (a) Right Side: Apply specified sealer CAF 33 to the outer edge of the new lip seal and install the seal in the transmission using a suitable drift.

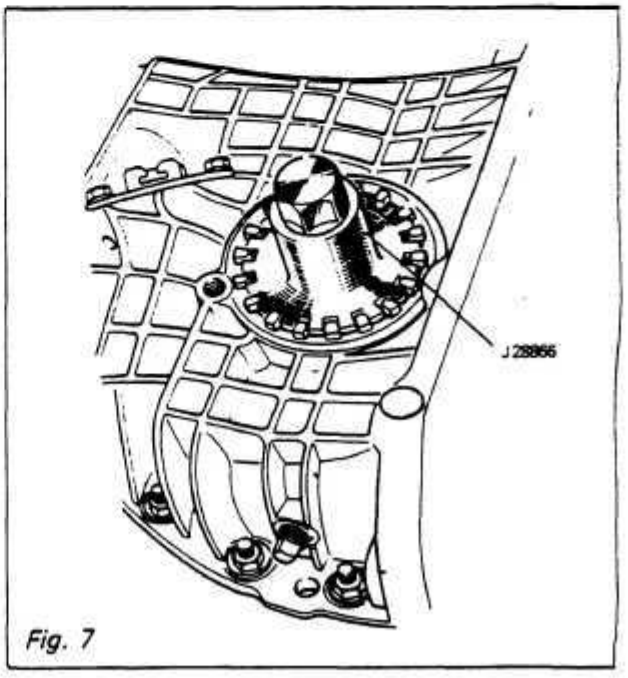


Fig. 7

(b) Left Side:

(1) Apply specified sealer to the outer edge of the new lip seal and install the seal in the adjusting nut using Tool J33400.

(2) Fit the new O-ring seal on the adjusting nut.

(3) Apply specified sealer to the adjusting nut threads and install nut into the transmission case.

(4) Thread the adjusting nut into the case the exact number of turns noted on removal. Align the index marks and install the adjusting nut lock plate and bolt.

(5) Align the retaining pin hole in the driveshaft flange with the retaining pin hole in the differential side gear shaft and position the flange accordingly.

(6) Insert the retaining pin.

(7) Connect the inner driveshaft to the driveshaft flange and torque bolts to specification.

(8) Fill the transmission with the recommended lubricant and lower the vehicle.

TRANSMISSION — REMOVAL/INSTALLATION — Fig. 8

REMOVAL

1. Disconnect the negative battery cable and raise the vehicle on a hoist.
2. Remove the right rear wheel. Mark the adjustment position of the parking brake cable and disconnect the cable from the brake lever and the mounting bracket. Move the cable clear of the transmission.
3. Disconnect the gear change tube from the bellcrank and the transmission. Remove the gear change tube.
4. Support the transmission and remove the bolts securing the left and right transmission mount brackets to the mounts.
5. Remove the mount brackets from the transmission end cover.
6. Lower transmission and remove the retaining clip, washer and clevis pin securing the shift cable.
7. Disconnect the shift cable mounting bracket from the end cover.
8. Disconnect the wires from the back-up light switch.
9. Disconnect the clutch hydraulic line (plastic) from the union leaving the steel line connected to the union and the clutch slave cylinder.
10. Remove the flywheel protection shield from the clutch housing.
11. Disconnect the plate securing the magnetic timing pick-up on left side of the clutch housing.
12. Remove the bolts securing the starter motor to the clutch housing and position starter out of the way.
13. Remove the bolts securing the transmission to the engine.
14. Using a suitable transmission jack, remove the transmission.
    NOTE: It is necessary to support the transmission and keep proper alignment between the engine and the transmission while separating the units.

INSTALLATION

NOTE: Engine/transmission pilot bearing should be replaced each time the transmission assembly is removed using Tool J23907.

1. To complete installation, reverse the removal procedures. Torque fasteners to specifications.

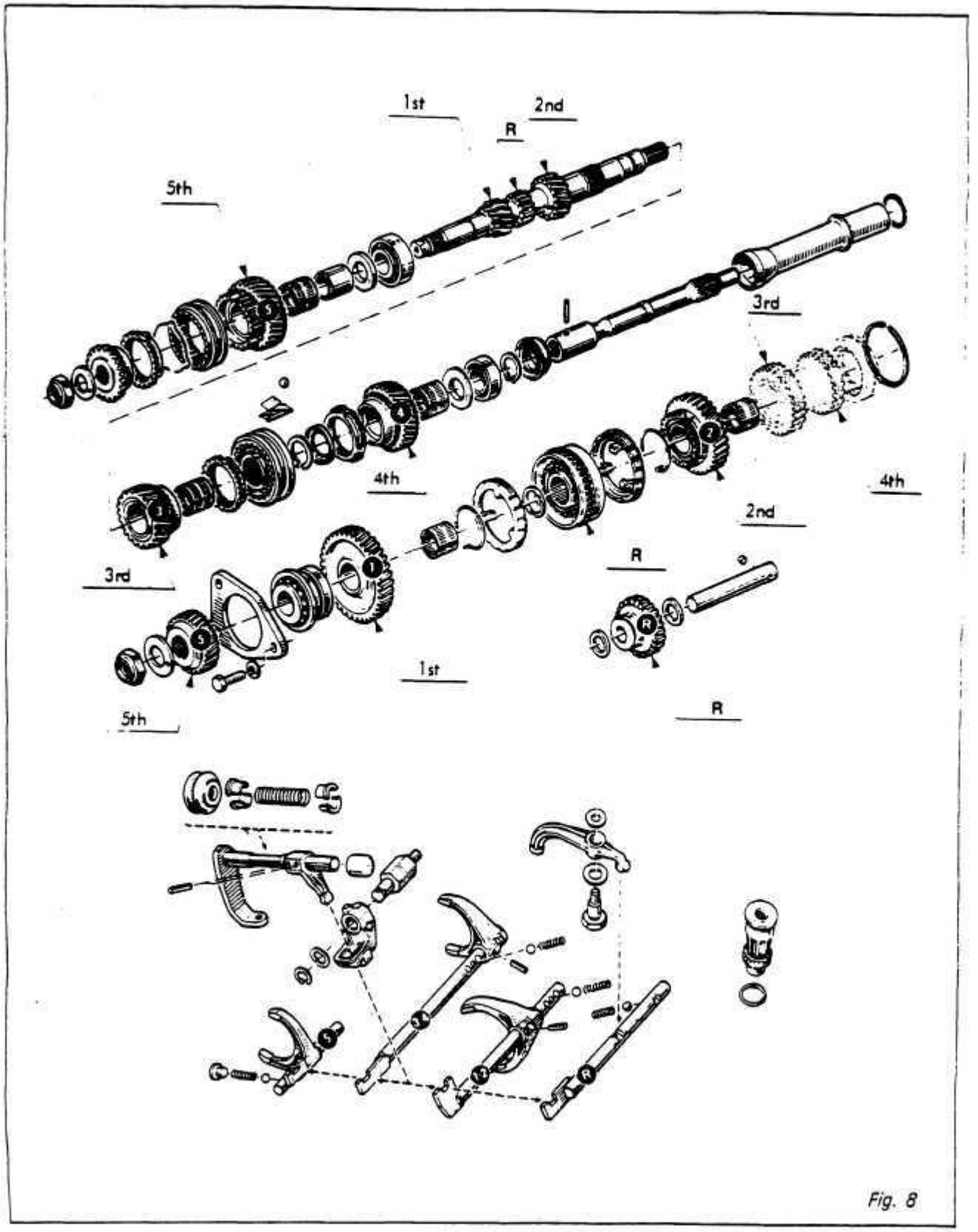


Fig. 8

OVERHAULING TRANSMISSION ASSEMBLY

UNIT DISASSEMBLY

1. Remove the clutch release bearing and clutch fork from the clutch housing. *(Fig. 9)*
2. Remove the clutch housing attaching bolts and remove housing from the transmission case.
3. Remove the 5th speed detent from end cover by removing the screw, spring and detent ball.
4. Remove the end cover attaching bolts (11) and remove end cover. *(Fig. 10)*.
5. Select two (2) gears at the same time by moving any two (2) shift rods, to lock transmission. *(Fig. 11)*
   Remove both shaft nuts and discard. Remove both conical washers.

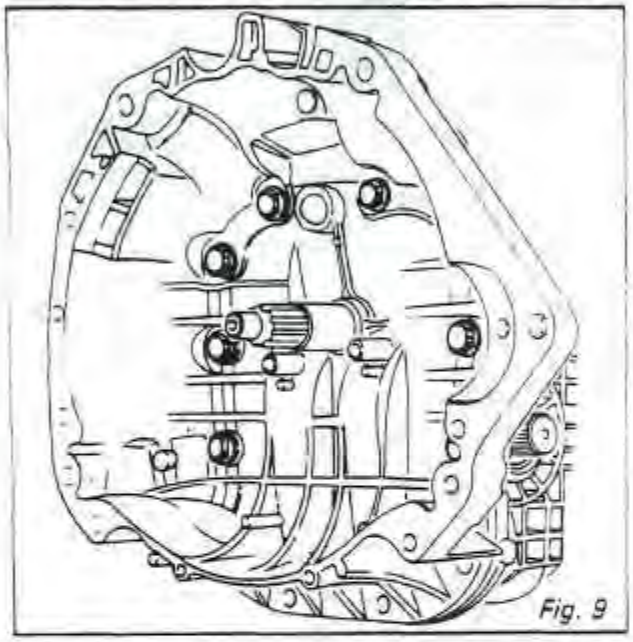


Fig. 9

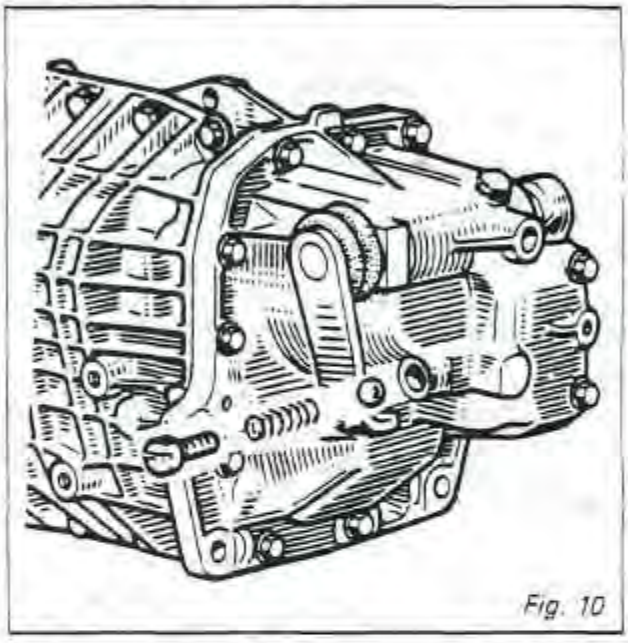


Fig. 10

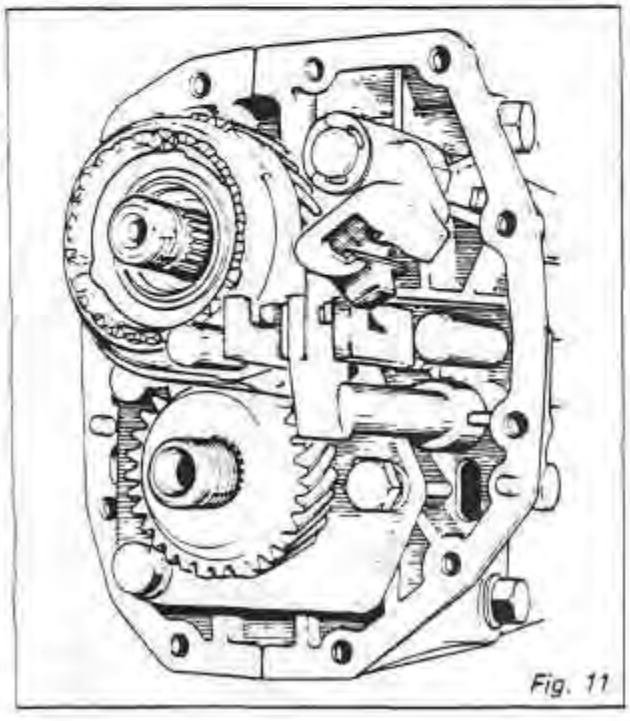


Fig. 11

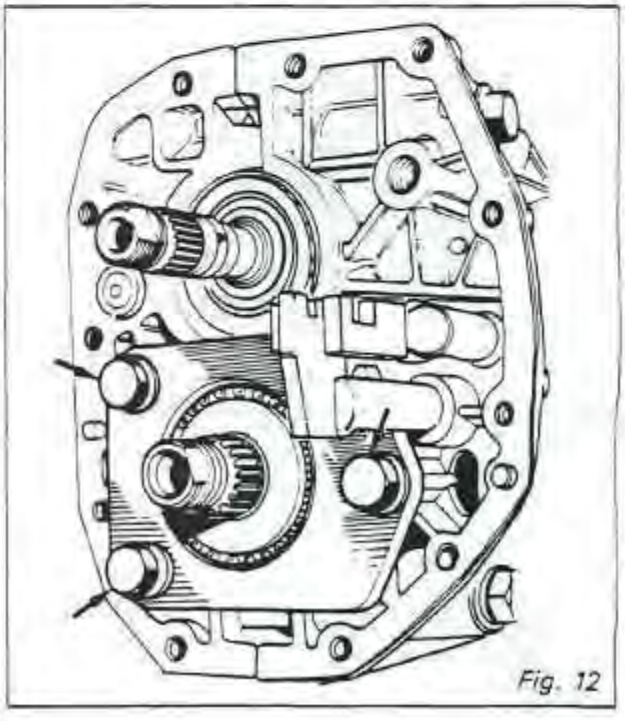


Fig. 12

NOTE: When removing the sliding gear assembly, be careful not to drop the needle roller half-bearings.

6. Remove the 5th speed sliding gear, shaft and fork as an assembly from the primary shaft. *(Fig. 12)*
7. Remove the needle bearing race and washer from the shaft.
8. Mark the 5th speed hub and sliding gear with marking paint for reassembly. Remove the sliding hub from the 5th speed gear.
9. Remove the 5th speed drive gear from the secondary shaft.
10. Remove the pivoting interlock assembly.
11. Remove three (3) bolts securing the roller bearing retaining plate and remove plate. *(Fig. 12)*
12. Remove the twenty (20) bolts, securing the half-casings and separate the cases by lifting up on the case half containing differential adjusting nut (left-hand case). *(Fig. 13)*

    NOTE: Do not use sharp metal tools to pry apart case halves.

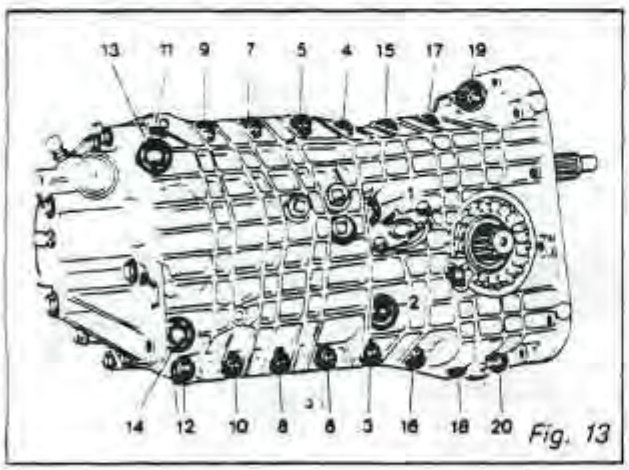


Fig. 13

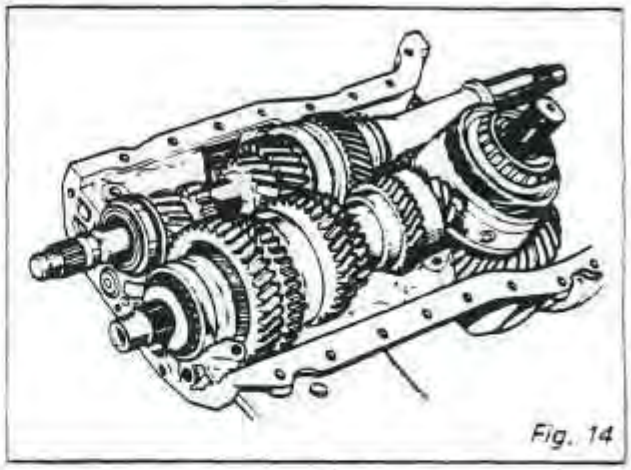


Fig. 14

13. Remove the differential assembly and lift out the primary and secondary shaft assemblies. *(Fig. 14)*
14. Remove the reverse gear shaft, gear, and friction washers from the case. *(Fig. 15)*

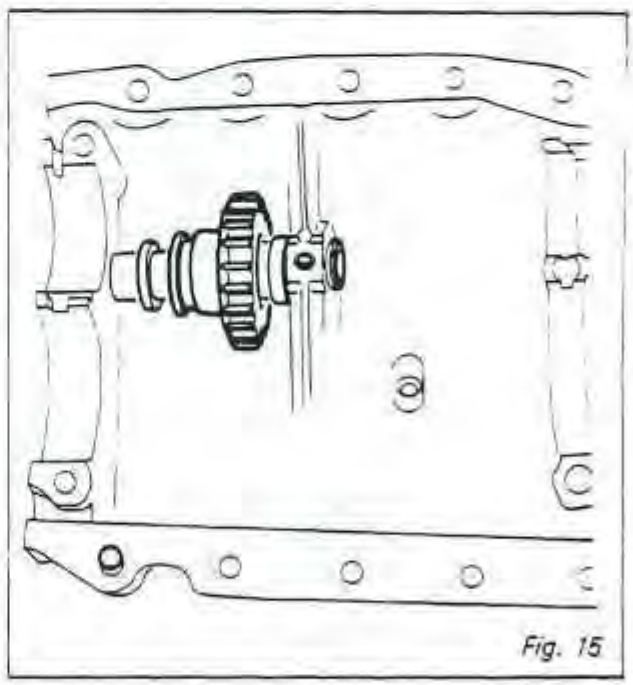


Fig. 15

UNIT REASSEMBLY

Before reassembly is performed, the differential carrier bearing preload must be adjusted.

1. Clean the half-case mating surfaces.
2. Insert the differential assembly in the right-hand half-casing.
3. Install left-hand case and torque tighten the bolts in the correct sequence. *(Fig. 13)*
4. Lubricate the threads on the ring nut and install in the case until it contacts the bearing race using Tool J28866.
5. Tighten the ring nut until all play is removed from the bearings.
6. Attach a piece of string to the differential housing and wrap around the housing several times.
7. Pull the string using a spring scale to measure the bearing preload. *(Fig. 16)* The reading is taken when there is a constant rotating movement of the differential.
8. Tighten differential nut until the proper reading is obtained.
   New Bearings: 10—30 NM (3—7 ft. lb.)
   Used Bearings: Differential should turn free without any play in the bearings.
9. Install adjusting nut lock plate and tighten bolt.
10. Remove left-hand case and differential assembly.
11. Insert the 3mm thick washer, the reverse gear and the 5mm thick washer into the half-case. Fit the reverse shaft in the case, washer, gear and washer. *(Fig. 17)*
    NOTE: Reverse gear must be installed with the shift fork flange facing the rear cover end of the transmission and the 3mm washer placed between the flange and the case.
12. Insert the secondary shaft assembly into the right-hand half-case.
    NOTE: When installing the secondary shaft, align the notch in the double roller bearing with the pin in the case.
13. Insert the primary shaft assembly into right-hand half-case, taking care that the flange of the clutch shaft tube seal is in the **inner groove** of the case. *(Fig. 18)*
14. Install the differential assembly into the right-hand half-case.
15. Coat the half-casing joint faces with specified sealer in accordance with its labelled precautions. Assemble the case-halves.
    NOTE: Use specified sealer, in accordance with its labelled precautions, on No. 1 bolt.
16. Torque tighten the half-case bolts in the proper sequence as shown. *(Fig. 19)*
17. Install the double taper roller bearing retaining plate and torque bolts. *(Fig. 20)*
18. Install the 5th speed gear, conical washer and nut onto the secondary shaft.
    NOTE: Install the conical washer with the cone side towards the nut.
19. Fit the bearing washer and needle bearing race onto the primary shaft.
20. Fit the synchro spring into the lower groove of the 5th speed sliding gear to the hub.
21. Install the 5th speed gear assembly, needle roller half-bearings and shift fork onto the primary shaft.
22. Install the 5th speed synchro ring and dog onto the primary shaft.
23. Install the conical washer and nut on the primary shaft.
    NOTE: Install the conical washer with the cone side towards the nut.

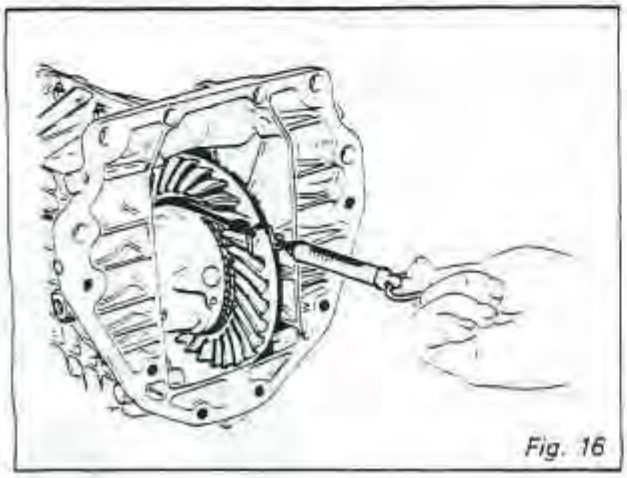


Fig. 16

Fig. 17

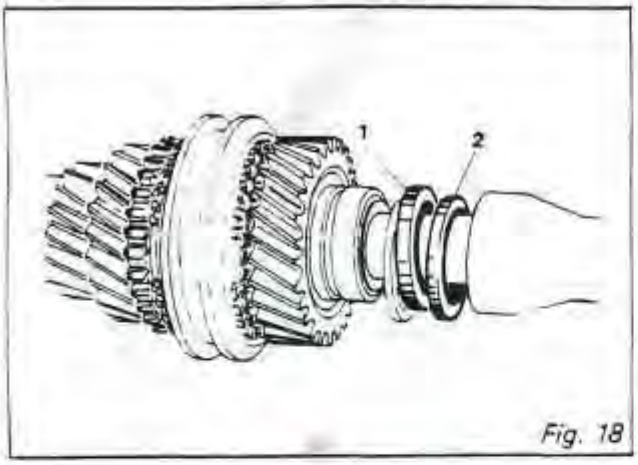


Fig. 18

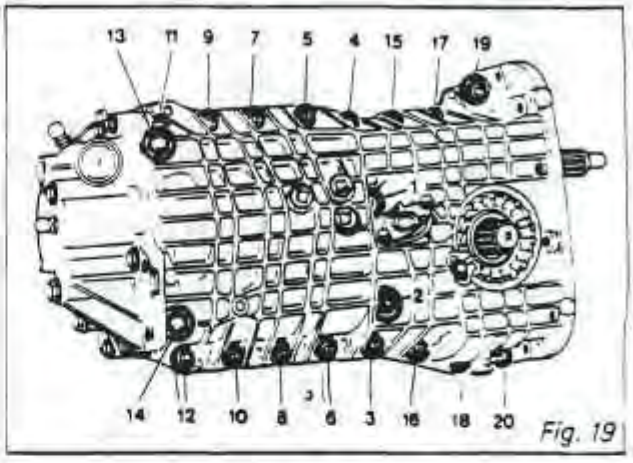


Fig. 19

24. Select two (2) speeds to lock the transmission from turning and torque the new primary and secondary shaft nuts.
    Stake the nuts to the shafts using a suitable soft nosed punch.
25. Place the shift rods in the neutral position (all rod notches aligned) and install the pivoting interlock. *(Fig. 21)*
26. Clean the joint faces on the rear cover and transmission case. Install the new gasket.
    Fit the rear cover making sure that the selector finger enters the pivoting interlock.
    Torque the rear cover bolts to specification.
27. Insert the 5th speed detent ball and spring into the rear cover.
    Coat the plug with specified sealer "Perfect-Seal" in accordance with its labelled precautions and install in the rear cover and tighten. Check operation of the shift linkage.

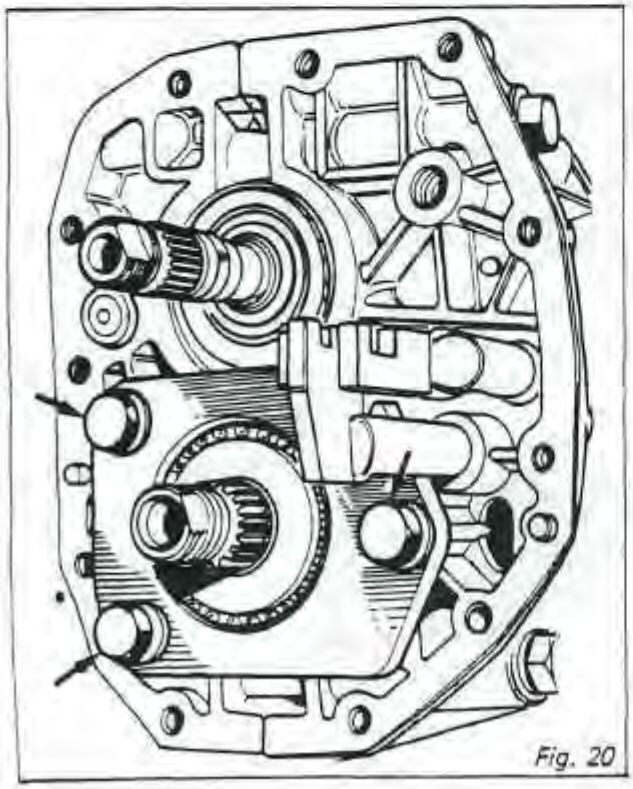


Fig. 20

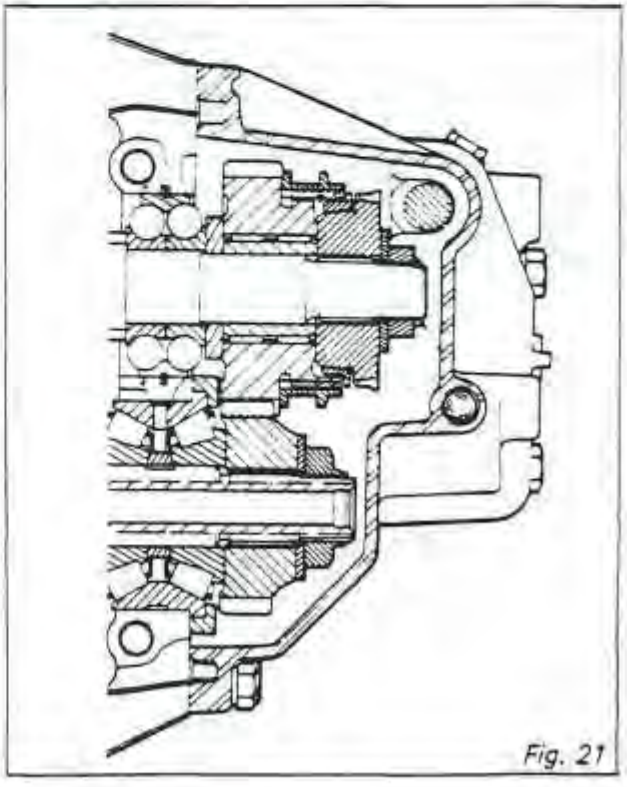


Fig. 21

28. Clean the joint faces of the clutch housing and transmission. Install the new gasket on the transmission case.
Install new O-ring seal on the clutch shaft tube.

29. Install the clutch housing and torque bolts.

30. Install the clutch fork onto the pivot in the clutch housing. The spring clips on the fork should be positioned to hold the dust boot against the clutch fork.

31. Install the throw-out bearing on the clutch fork.

UNIT REPAIR—PRIMARY SHAFT DISASSEMBLY

1. Remove the clutch shaft tube.

2. Separate the clutch shaft from primary shaft by removing the rollpin.

3. Remove the snap ring holding the bearing on the clutch end of the primary shaft.
Remove the bearing from the primary shaft.
NOTE: Do not drop the needle roller half-bearings when performing the next operation.

4. Remove the thrust washer and 4th speed driven gear. Remove the 4th speed synchro ring. *(Fig. 22)*
NOTE: Do not drop the three (3) balls and spring clips when performing the next operation.

5. Mark the position of the 3rd-4th speed sliding gear with marking paint. *(Fig. 23)*
Remove the sliding gear from the synchro hub. Retain the three (3) spring clips and balls.
NOTE: Do not drop the needle roller half-bearings when performing the following operation.

6. Remove the splined washer and synchro hub retaining lock ring.
Remove the 3rd speed driven gear, synchro ring and hub. *(Fig. 24)*

7. Remove the bearing from the differential end of the primary shaft with a suitable splitter extractor and press. *(Fig. 25)*

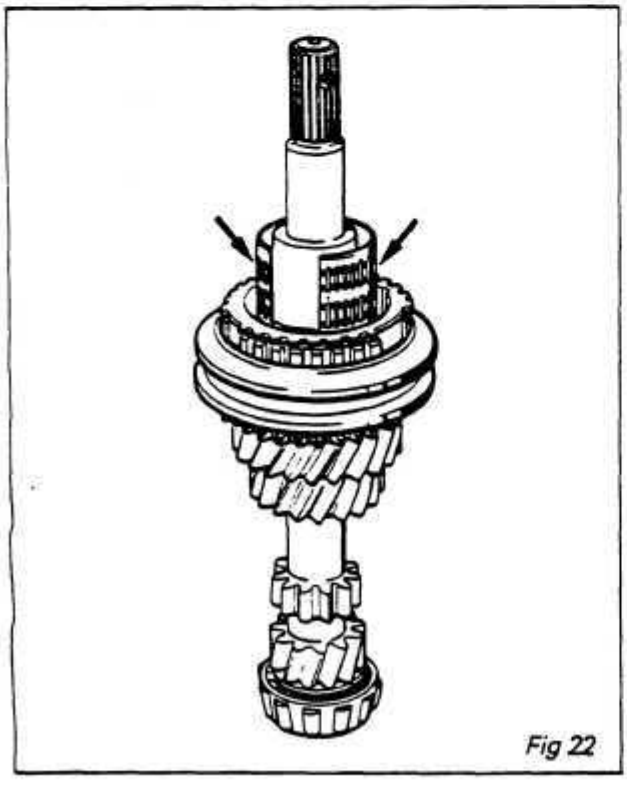


Fig 22

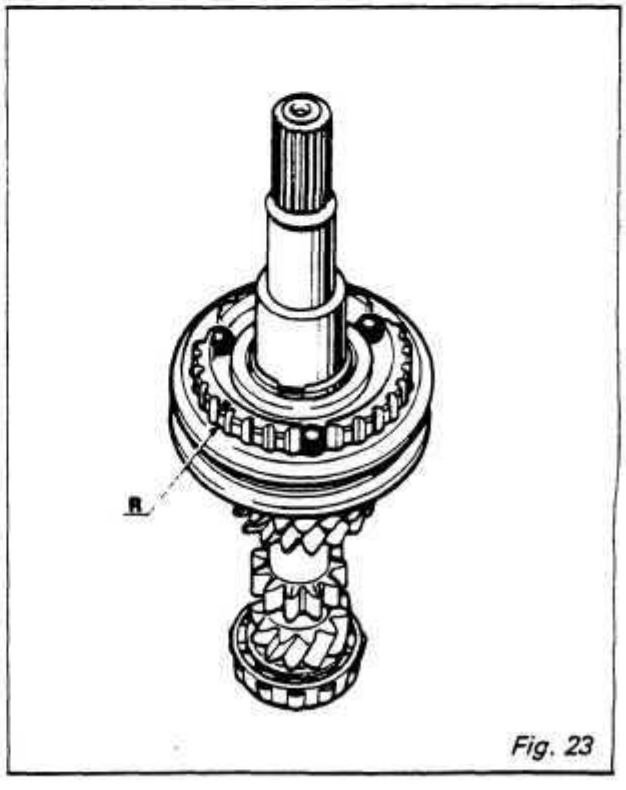


Fig. 23

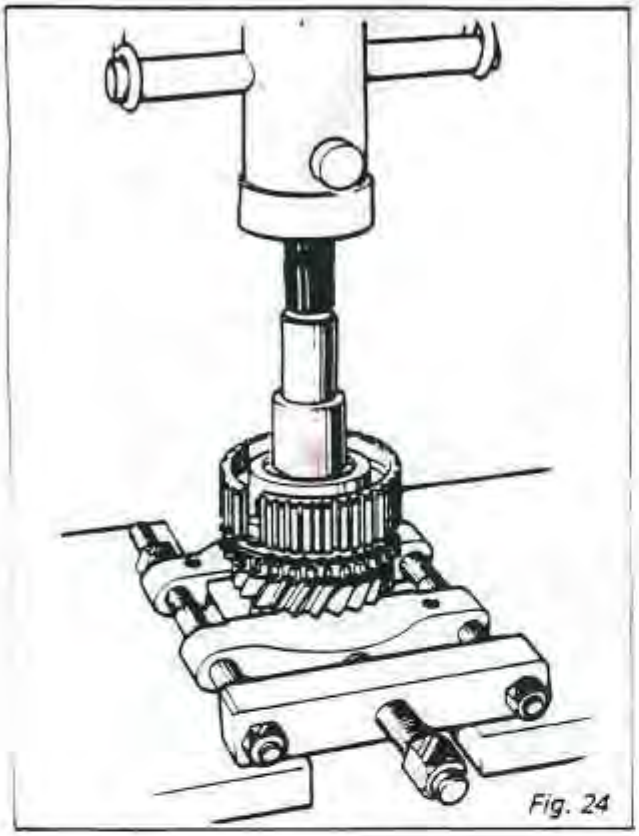


Fig. 24

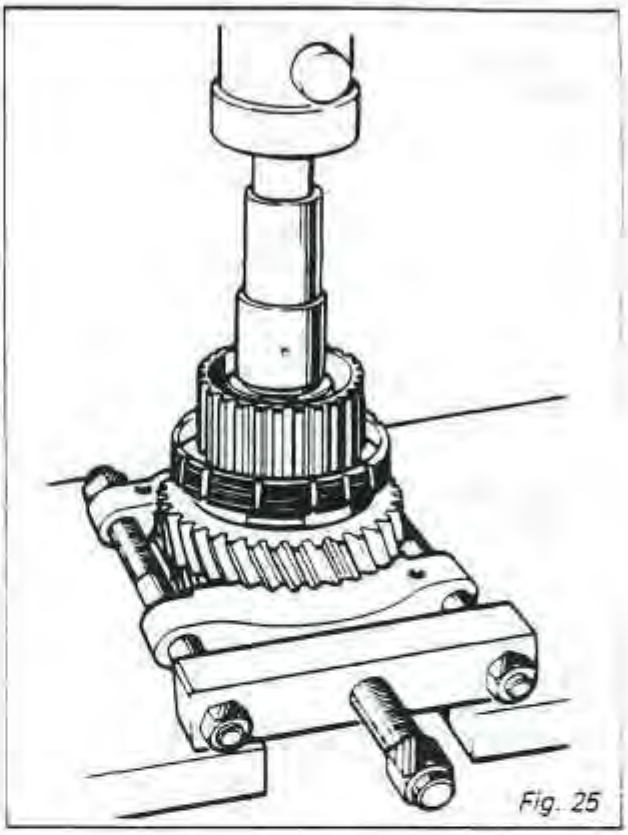


Fig. 25

REASSEMBLY

1. Install the 3rd speed gear, needle roller half-bearings and the 3rd speed synchro ring on the primary shaft.
2. Install the 3rd-4th speed synchro hub on the shaft with the larger offset facing the 4th speed gear.
   Install the hub lock ring.
3. Install the three (3) spring clips in the 3rd-4th speed sliding gear and three (3) detent rollers.
4. Install the washer over the hub lock ring. *(Fig. 26)*
5. Install the 4th speed synchro ring, 4th speed gear and the needle roller half-bearings.
6. Install the washer and bearing on the clutch end of the primary shaft.
   Install the bearing lock ring.
7. Install the bearing on the differential end of the primary shaft. *(Fig. 27)*
8. Install the oil seal on the clutch shaft end of the primary shaft.
9. Fit the clutch shaft on the primary shaft and install the rollpin.
10. Fit the clutch shaft tube onto the clutch shaft. seat the tube on the shaft seal by tapping gently.

SECONDARY SHAFT

DISASSEMBLY

1. Remove the double taper roller bearing from the secondary shaft.
   NOTE: Do not drop the needle half-bearings when performing the following operation.
2. Remove the 1st speed gear and the synchro ring.
3. Mark the position of the 1st-2nd sliding gear with marking paint.
   Remove the sliding gear. *(Fig. 28)*
4. Remove the synchro hub, synchro ring and 2nd speed gear.
   NOTE: The pinion bearing, 3rd gear and 4th gear cannot be removed.

Fig 26

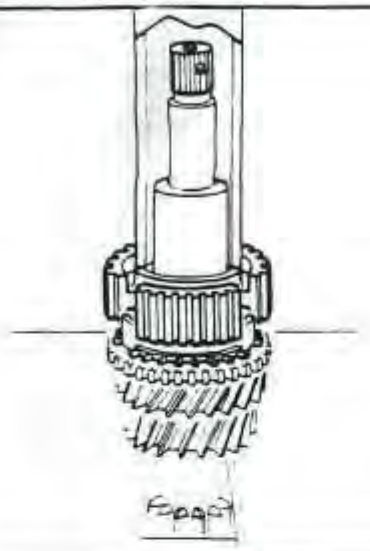


Fig. 28

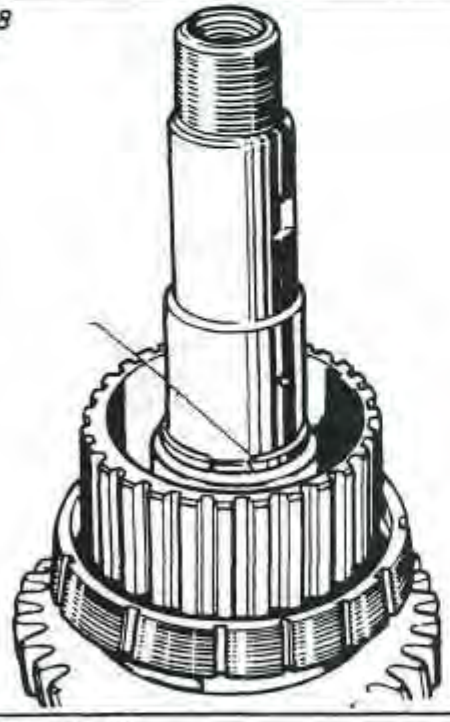
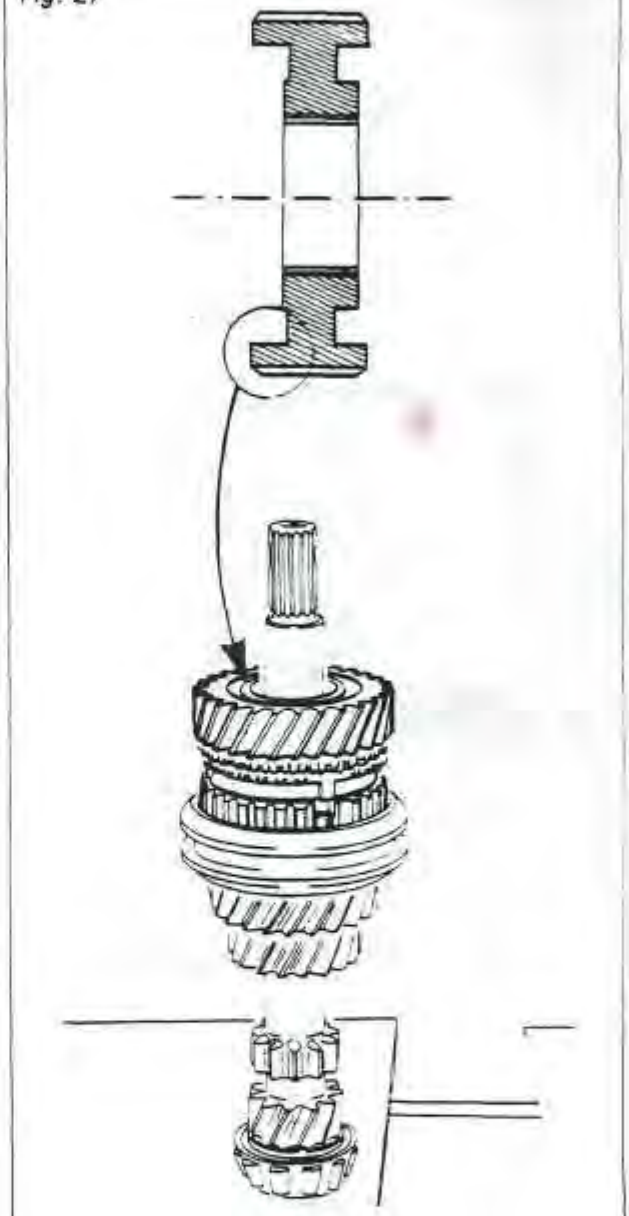


Fig. 27



REASSEMBLY

NOTE: The secondary shaft pinion and the ring gear are lapped together during manufacture. They must be replaced as a set.

1. Install the synchro spring on the 2nd speed gear so that it covers the three (3) notches. *(Fig. 29)*
2. Install the 2nd speed gear, synchro ring and needle roller half-bearings on secondary shaft. NOTE: The 2nd speed synchro ring is smaller than the 1st speed synchro ring.
3. Heat the 1st-2nd speed synchro hub to 250°C (428°F) on a hot plate.
4. Install the synchro hub on the secondary shaft with the offset towards 2nd gear. Press the synchro hub on until it touches the shoulder, keeping the synchro ring aligned and the lugs below the level of the shoulder to prevent damage. Continue pressure until the hub cools. Install the hub lock ring. *(Fig. 30 & Fig. 31)*

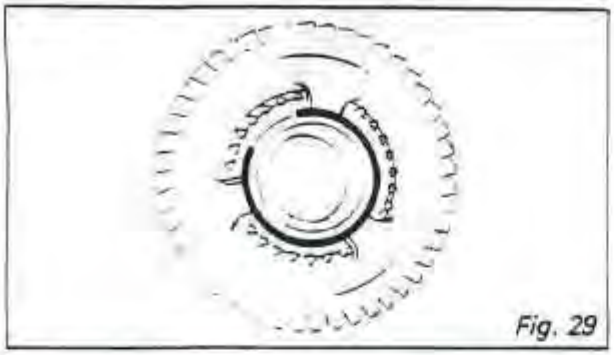


Fig. 29

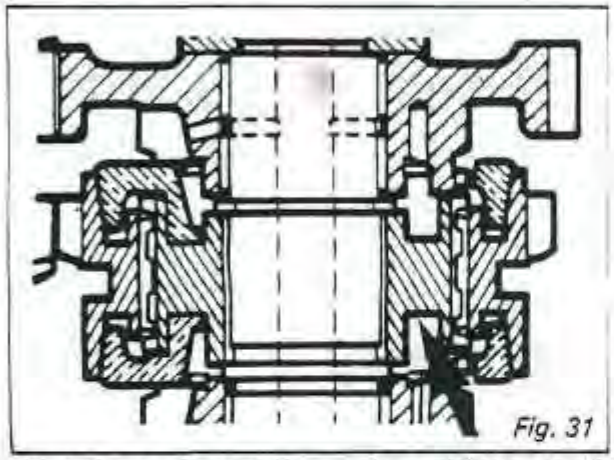


Fig. 31

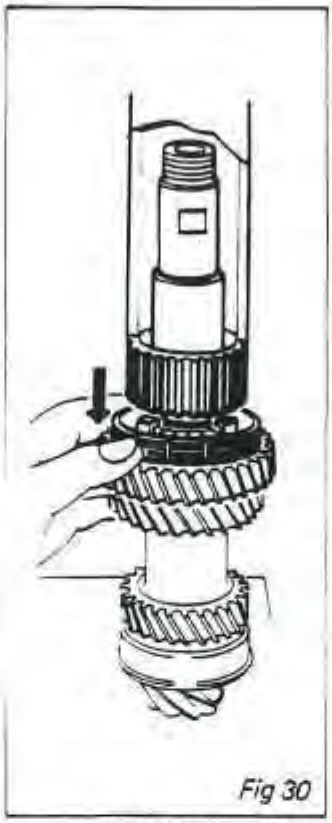


Fig 30


Fig. 32

5. Align the dismantling marks and fit the 1st-2nd sliding gear to the synchro hub.
6. Install the synchro spring on the 1st speed gear so that it covers the three (3) notches.
7. Install the 1st speed gear, synchro ring and needle roller half-bearings on the secondary shaft.

NOTE: The 1st speed synchro ring is larger than the 2nd speed synchro.

8. Install the double taper roller bearing on the secondary shaft with the shoulder on the bearing race facing the threaded end of the shaft. *(Fig. 32)*

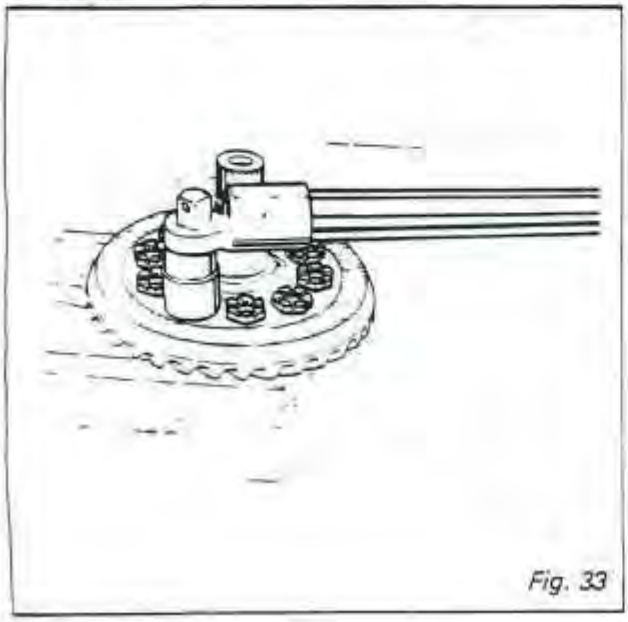


Fig. 33

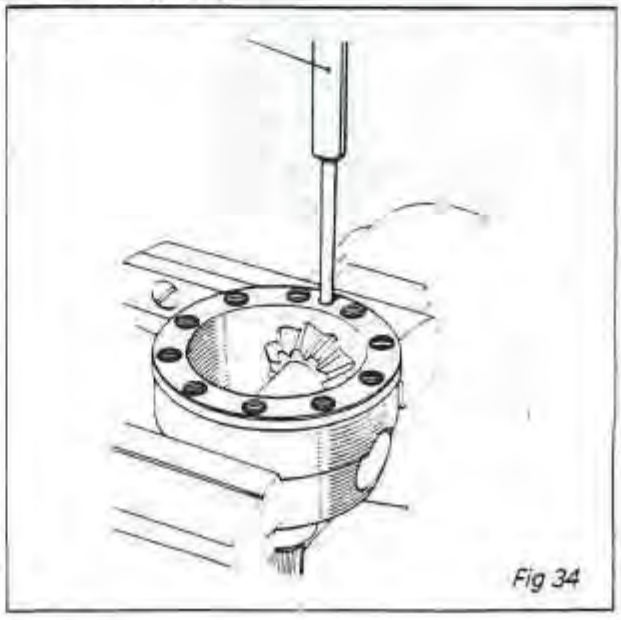


Fig 34

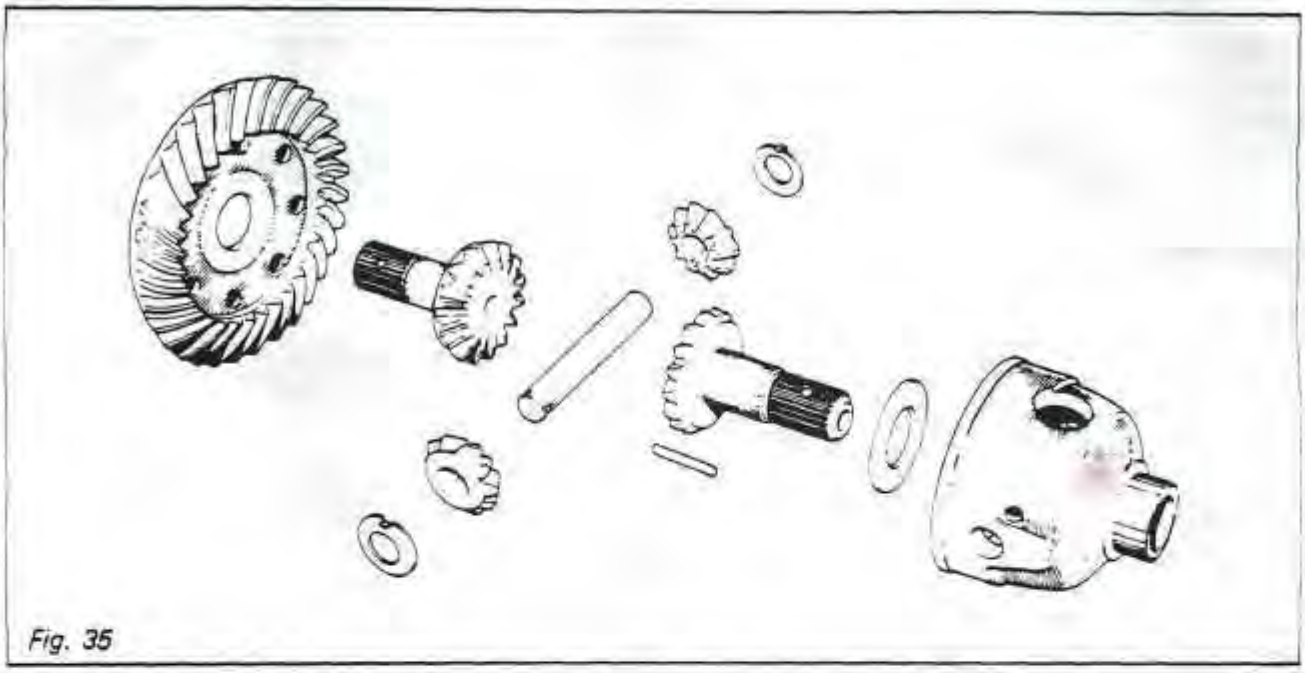


Fig. 35

DIFFERENTIAL ASSEMBLY

DISASSEMBLY

1. Remove the O-rings from the axle shafts.
2. Remove the carrier bearing from ring gear side of the differential using a suitable puller. If it is necessary, remove some of the ring gear bolts to aid in the installation of the puller. *(Fig. 33)*
3. Remove the ring gear bolts and ring gear.
4. Remove the side gear.
5. Remove the shaft retaining pin and remove the spider gear shaft. *(Fig. 34)*
6. Remove the spider gears and concave washers.
7. Remove the side gear and thrust washer.
8. Remove the remaining carrier bearing. Retain any shims that may be located between the bearing and the carrier. *(Fig. 35)*
9. Remove the bearing outer race from the right-hand half-case using Tool J23907. *(Fig. 36)*
10. Remove the driveshaft flange seal from the right-hand half-casing.
11. Remove the lockplate for the differential ring nut in the left-hand half-casing.
12. Remove the ring nut using Tool J28866. *(Fig. 37)*
13. Remove the seals from ring nut.
14. Remove the bearing outer race from the left-hand half-casing using a brass drift.

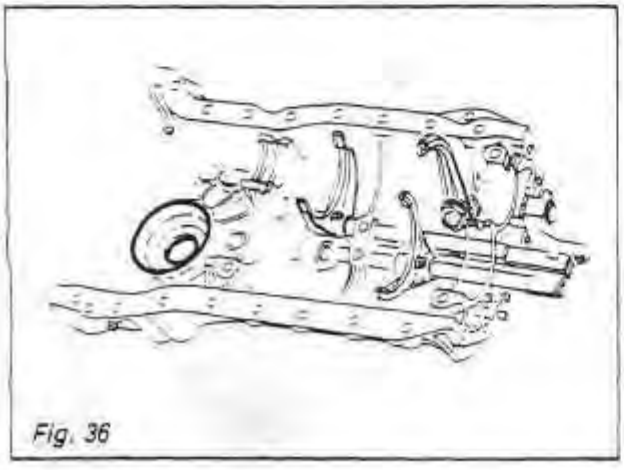


Fig. 36

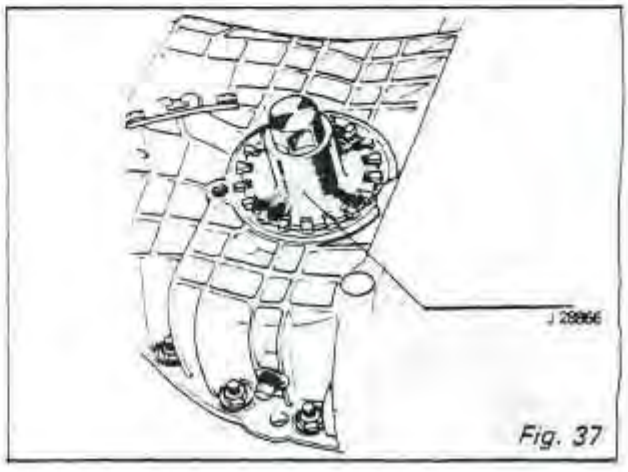


Fig. 37

REASSEMBLY

1. Install the outer bearing race in the left-hand half-casing using a brass drift.
   The race should be slightly recessed from the inside face of the case.
2. Install the new O-ring and lip seal on the differential adjusting nut.
3. Thread the nut into the case until it touches the bearing race.
4. Install the outer bearing race in the right-hand half-case using a brass drift.
   Make sure that the race is firmly seated.
5. Install the differential oil seal in the right-hand half-case.
6. Fit the shim(s) and press the carrier bearing onto the differential case.
   NOTE: Use the same shim(s) that were removed during disassembly.
7. Lubricate the thrust washer and side gear. Fit the gear and washer into case with the oil groove on the washer facing side gear.
8. Fit the spider gears and the concave washers into the case. Install the spider gear shaft and retaining pin.
9. Press the carrier bearing onto the ring gear. *(Fig. 38)*
10. Lubricate the side gear and fit the gear into the ring gear.
11. Install the ring gear on the case and torque tighten the bolts.
    NOTE: Use new self-locking bolts on the ring gear.
12. Install new O-ring seals on the side gear shafts.

GEARSHIFT CONTROLS DISASSEMBLY

NOTE: Place the gearshift controls in the neutral position (all rod notches aligned) before proceeding to the next step.

1. Remove the rollpins securing the 1st-2nd and shift fork and damping spring to its shift rod. Remove the rollpin securing the 3rd-4th shift fork to the shift rod.
   NOTE: The detent balls are spring loaded and will fly out when the shafts are removed. *(Fig. 39)*
2. Remove the 1st-2nd shift rod and withdraw the shaft from the fork spring and case. Extract the detent ball and spring.
3. Rotate the 3rd-4th shift rod and remove the rod from fork and case.
   Extract the detent ball and spring.
4. Remove the reverse gear locking bolt, securing the reverse shift fork.

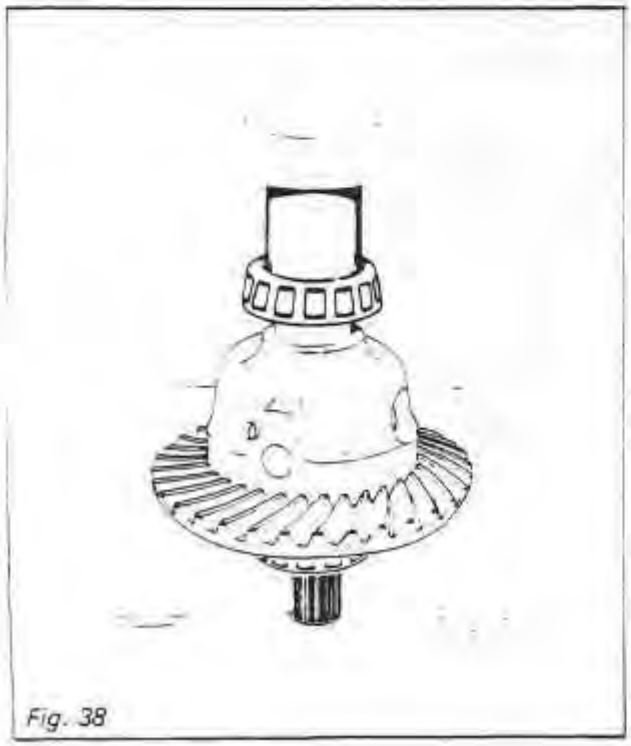


Fig. 38

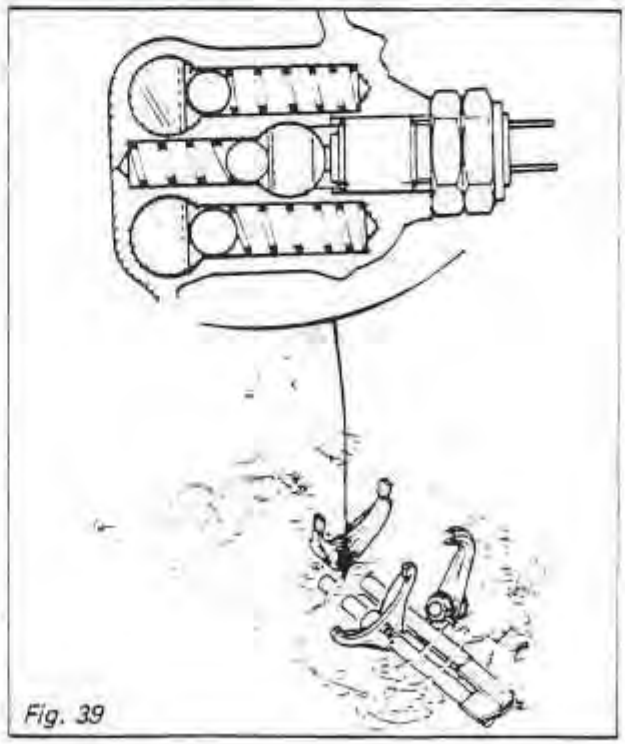


Fig. 39

5. Remove the reverse shift fork.
   NOTE: The detent ball is spring loaded and will fly out when the shaft is removed.
6. Remove the reverse shift rod from the case.
7. Remove the reverse light switch from the case.
8. Extract the detent ball and spring.

REASSEMBLY

NOTE: The reverse shaft detent spring is shorter than the other detent springs.

1. Insert the reverse shaft detent spring and ball into the half-casing through the reverse lights switch.
2. Depress the ball with a drift and insert the reverse shaft.
3. Install the reverse shift fork with the end of the arm fitted in slot on shaft.
4. Install the wave washer on the locking bolt and fasten fork to the case. Torque tighten the bolt.
   NOTE: The 3rd-4th and the 1st-2nd detent springs are the same length.
5. Insert the 3rd-4th detent spring and ball into the half-casing.
6. Depress the detent ball with a drift and insert the 3rd-4th shift rod into the case.
   NOTE: When installing the rollpins, the gap in the pin must face towards the rear cover.
7. Fit the 3rd-4th shift fork on the shift rod and insert the rollpin.
8. Insert the 1st-2nd detent spring and ball into the half-case.
   NOTE: When installing the rollpins, the gap in the pin must face towards the rear cover.
9. Fit the 1st-2nd shift fork and damping spring on the rod and insert the rollpins (3).
   NOTE: When installing the damping spring's outer rollpin, the top of this rollpin must be flush with the spring coil to avoid contact with the 1st speed gear.

REAR COVER

DISASSEMBLY

1. Compress the selector shaft spring with Tool J28869 and remove the two (2) half-bushes from each end of the spring. *(Fig. 40)*
2. Remove the rear cover plug and remove the selector fork rollpins, securing the fork to the shaft.
3. Remove the selector shaft and fork from the rear cover.
4. Remove the shaft seal from the rear cover.
5. Remove the selector shaft spring from the rear cover.

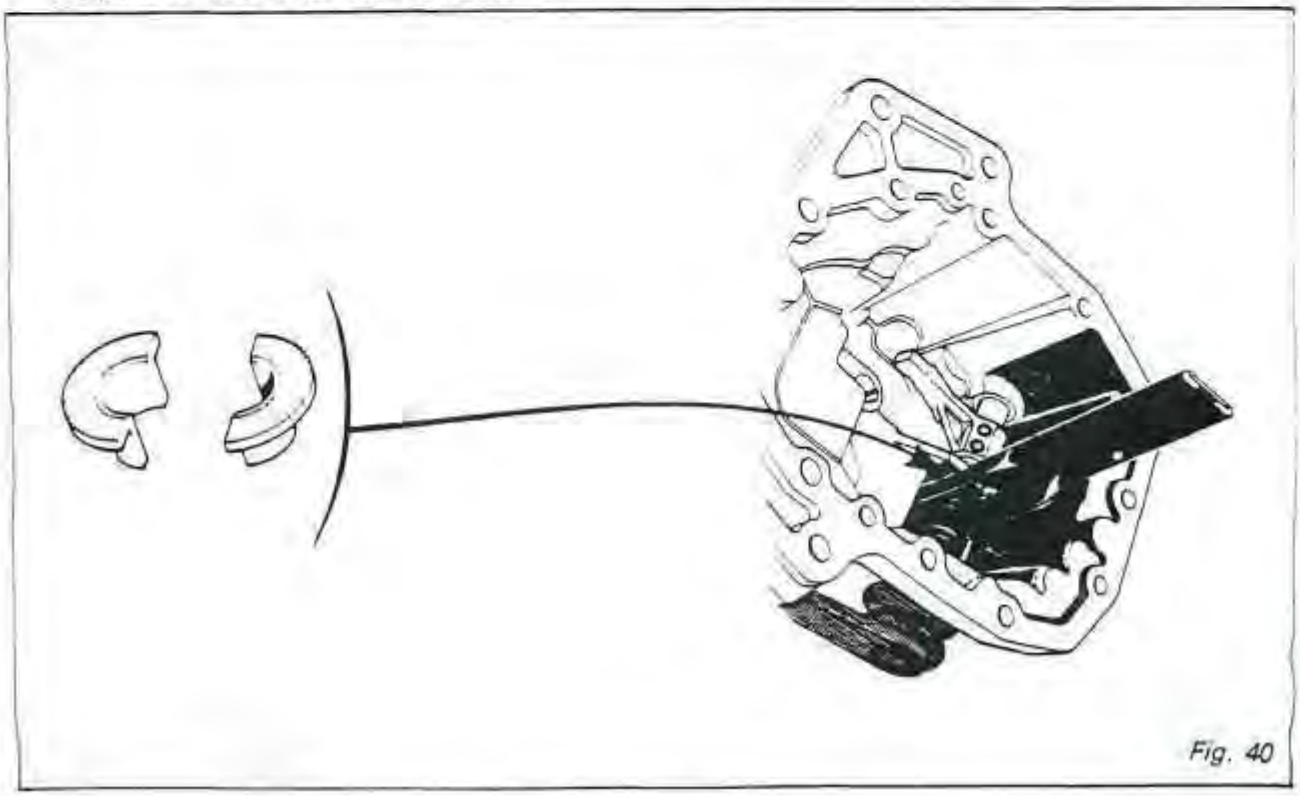


Fig. 40

REASSEMBLY

1. Install the selector shaft oil seal into the rear cover.
2. Insert the selector shaft spring and selector finger into the rear cover.
3. Place the bellows on the selector shaft and insert the shaft into the rear cover, spring and selector finger.
4. Install the rollpins securing the selector finger to the shaft.
5. Compress the spring using Tool J28869 and insert the two (2) half-bushes in each end of the spring.
6. Install the rear cover plug using specified sealer in accordance with its labelled precautions on the threads.

CONTROLS DESCRIPTION AND OPERATION

The transmission controls consist of a shift lever assembly, cross gate cable and two gear change tubes connected to a pivoting bellcrank.

The shift cable transmits left and right shift lever movement to the transmission selector shaft. Movement of this shaft controls the shift gate selection. A detent plate in the shift lever assembly limits cable travel to provide proper alignment of the selector shaft and shift rods within the transmission. The plate also provides reverse lock-out by requiring that shift lever be lifted up before it is moved into the reverse gate position.

The gear change tubes transmit fore and aft motion to the transmission selector shaft. this movement selects the gear change within the selected shift gate.

CHECKING ADJUSTMENT

1. Remove screws securing gear shift trim plate to the console. Lift rear of plate and pull out of vertical trim plate to gain access to shift lever assembly. Do not remove completely.
2. With transmission in neutral and shift lever in 3rd-4th gate, shift lever stop pin should be centred in cross gate guide plate notch.

NOTE: Shift mechanism in transmission is spring loaded to return to 3rd-4th gate when shift lever is released. *(Fig. 41)*

ADJUSTING CABLE

1. Raise vehicle on hoist.
2. Adjust shift cable to centre shift lever stop pin lengthening or shortening cable at transmission. This can be performed by changing position of cable housing lock nuts at cable mount bracket or by removing clevis pin at cable end and turning cable end.
   Shortening cable will move shift lever stop pin to right.
3. Install cable clevis pin and retaining clip or tighten cable housing lock nuts.
4. Lower vehicle and install gear shift trim plate on console. *(Fig. 42)*

GEAR CHANGE TUBE

Perform following adjustment if necessary to move the position of shift pattern closer to or further away from driver. The adjustment must also be performed if either of gear change tubes are replaced.

1. Raise vehicle on hoist.
2. Loosen lock nut on rear of rear gear change tube at transmission.

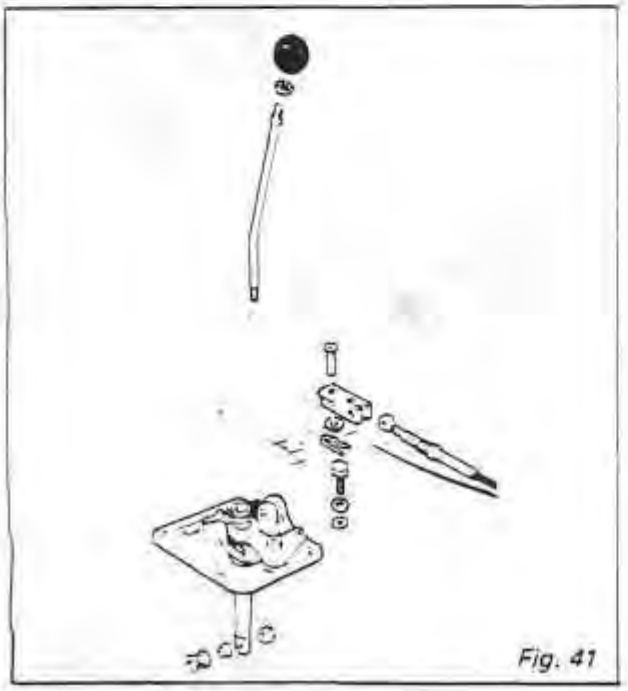


Fig. 41

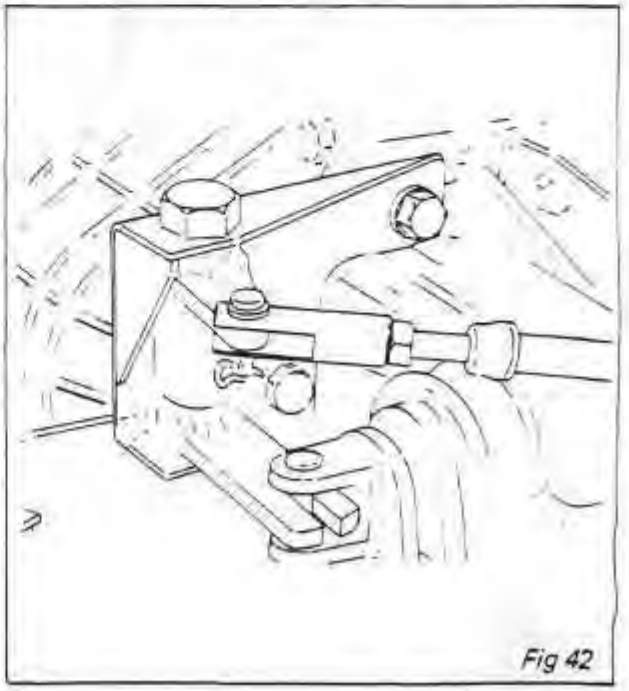


Fig 42

3. Disconnect tube from transmission arm and adjust tube until bellcrank is aligned at approximately 90 degrees to centreline of chassis when tube is connected and transmission is in neutral.
4. Working through access hole in chassis centre backbone, disconnect front gear change tube from bellcrank.
5. Loosen locknut on gear change tube and turn end of tube to adjust.
   Lengthening rod moves shift pattern closer to driver.
6. Tighten lock nut and install tube on bellcrank.

SHIFT LEVER ASSEMBLY
REMOVAL AND INSTALLATION

1. Remove gear shift knob.
2. Remove two screws securing gear shift trim plate to console. Disconnect wires and remove plate.
3. Remove retaining clip and pin securing shift cable to shift lever clevis.
4. Remove bolts securing shift lever assembly to chassis.
5. Disconnect front gear change tube by lifting assembly out of chassis to gain access to securing pivot bolt.
6. Remove shift lever assembly.
7. Reverse above procedure for installation.

SHIFT CABLE
REMOVAL AND INSTALLATION

1. Remove the gear shift knob.
2. Remove two screws securing gear shift trim plate to console. Disconnect wires and remove the plate.
3. Remove retaining clip and pin securing the shift cable to shift lever clevis.
4. Remove nut securing cable to chassis.
5. Raise vehicle on hoist and disconnect cable at transmission arm.
6. Remove rear cable adjusting nut and pull cable assembly out of mounting bracket.
7. Remove shift cable by pulling out of chassis.
   NOTE: Cable may be secured inside chassis backbone with tie strap.
8. Adjust cable. See cross gate cable adjustment procedure *(Fig. 43)*

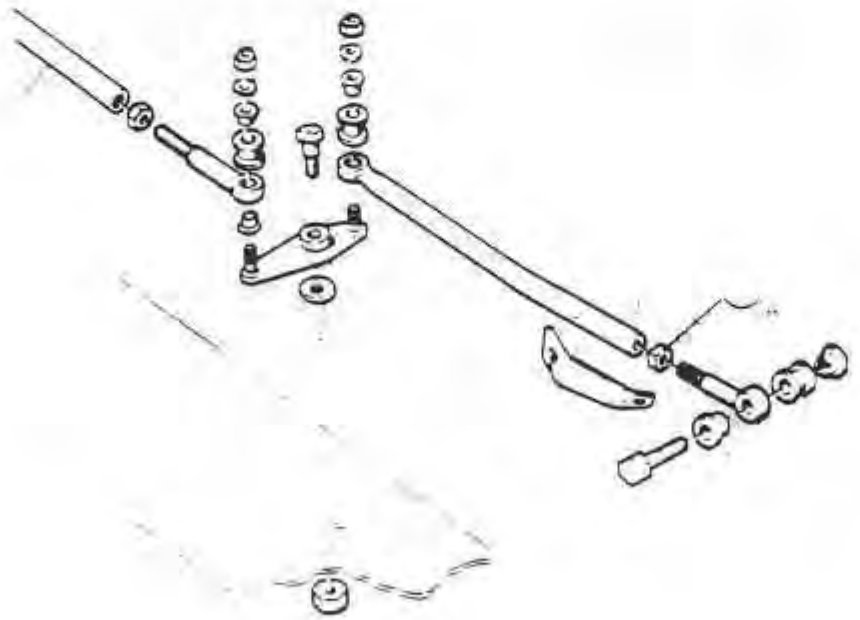


Fig. 43

Automatic Transmission

CONTENTS

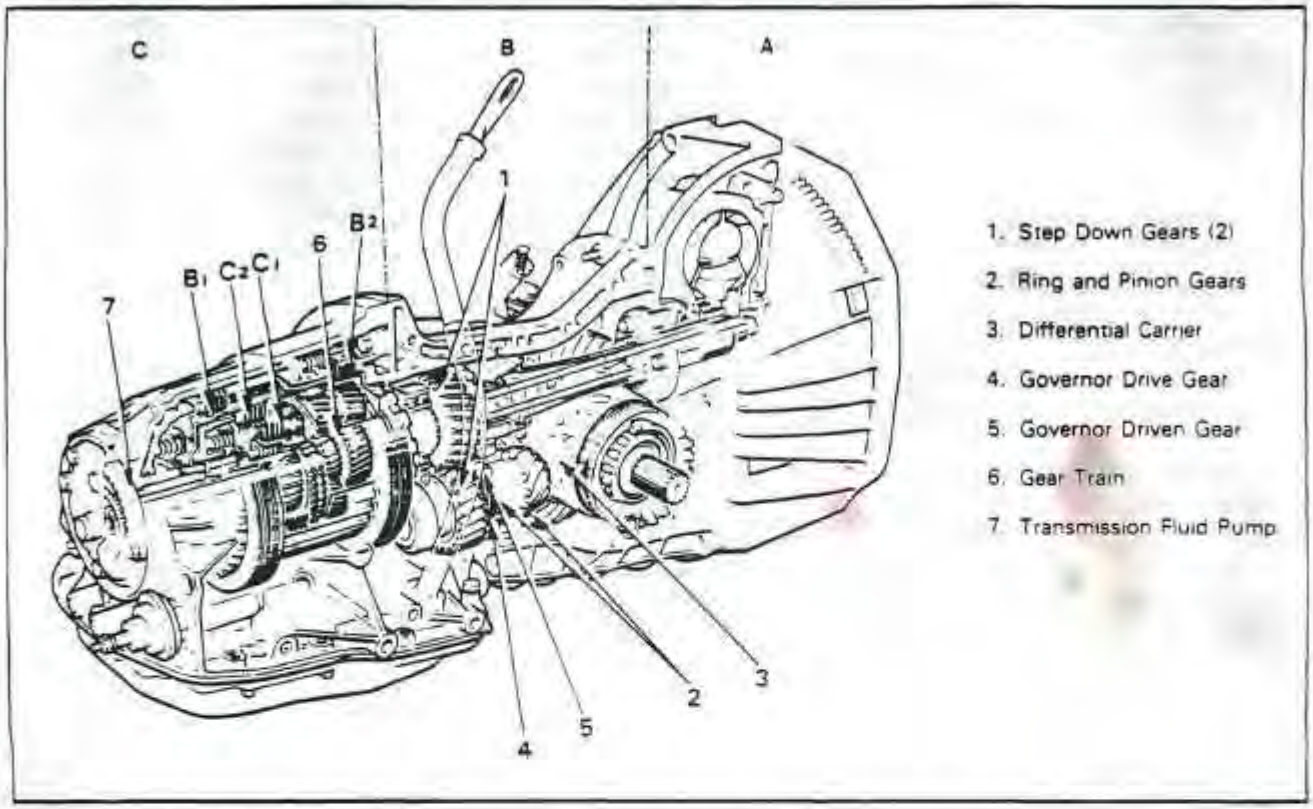


Fig. 1 AUTOMATIC TRANSMISSION – SECTIONAL VIEW

GENERAL DESCRIPTION

The three speed transmission is a fully automatic unit consisting primarily of a 3-element torque converter and a single planetary gear set. Two multiple disc clutches, two multiple disc brakes, and a one-way roller clutch provide the friction elements required to obtain the desired functions of the planetary gear set.

The transmission assembly consists of a torque converter unit final drive unit and a hydraulic transmission unit.

TORQUE CONVERTER UNIT (A):

The torque converter provides automatic clutch action, additional engine torque multiplication, and smooth coupling for transmitting engine torque to the mechanical assembly. The converter is of welded construction and is serviced as an assembly. The unit is made up of two vaned sections (turbine and pump) and a single stator mounted on a one-way roller clutch. Automatic clutch action and smooth coupling takes place when circulating fluid within the converter couples the two vaned sections together. Increased torque is brought about by the stator redirecting the fluid flow and providing an additional driving force against the turbine.

FINAL DRIVE UNIT (B):

The final drive transmits power from the hydraulic transmission to the driving wheels. The unit consists of a step-down gear, which lowers the drive centerline and a differential assembly. The differential is made up of a ring and pinion gear assembly and carrier housing containing two axle side gears and two spider gears, including a governor drive gear.

HYDRAULIC TRANSMISSION UNIT (C):

The hydraulic transmission receives power from the torque converter turbine and converts this power into three reduction ratios for forward movement and one reduction ratio for reverse movement. Forward and reverse gears are

achieved by locking certain members of the planetary gear set. Locking of gear members is performed by applying fluid pressure to one or more of the brakes and clutches (B1, B2, C1 and C2).

The hydraulic system is pressurized by an involute gear fluid pump which is shaft driven directly by the engine. A vacuum modulator is used to sense engine torque input to the transmission and adjust the fluid pressure accordingly. Line fluid pressure is increased during high torque requirements to ensure positive application of clutches and brakes.

Fluid pressure distribtion is performed by the valve body. A manually operated selector valve directs fluid pressure to the proper passages which lead to the appropriate brakes or clutches. The shift valves in the valve body are controlled by two electric solenoid ball valves. Opening or closing of the solenoids will activate the appropriate shift valve which will in turn create a gear change.

The electrical solenoids *Fig. 2* receive their information from the governor computer assembly. The gear driven governor is a low output alternator that produces current which varies with output shaft speed and throttle position. Current from the governor supplies information to the computer. Depending on governor current and gear selector position, the computer will activate or de-activate one or both of the solenoid valves, thus providing a gear ratio change at the proper speed. The governor computer also ensures that 1st gear cannot be selected above 22 MPH (35 km/h) on light throttle.

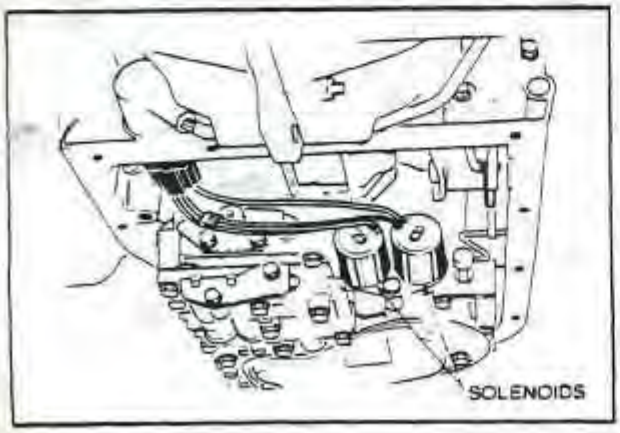


Fig. 2 VALVE BODY AND ELECTRIC SHIFT SOLENOIDS

The governor computer *Fig. 3* receives gear selector information from the multiple switch. Movement of the manual linkage opens or closes various electrical circuits within the multiple switch. These circuits identify the gear selector position and provide current for the reverse light (Position R) and the starter motor (Position P and N).

An electric microswitch is fitted *Fig. 4* at the end of the accelerator control bellcrank. In the full throttle position, the switch provides a ground for one of the governor computer circuits and causes an immediate down shift if the vehicle speed is slow enough.

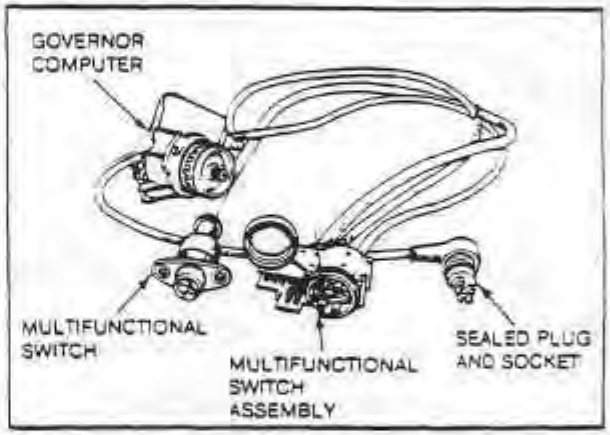


Fig. 3 GOVERNOR-COMPUTER ASSEMBLY

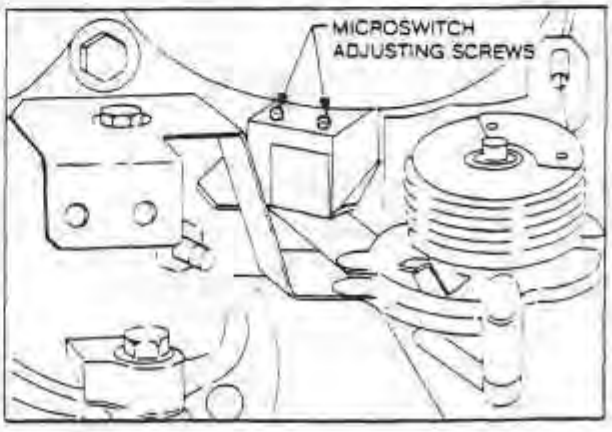


Fig. 4 MICROSWITCH

GENERAL SPECIFICATIONS

TYPE: 4141-80

RATIOS:

First	2.40:1
Second	1.48:1
Third	1:1
Reverse	1.92:1

TRANSMISSION LUBRICANT:

ATF Type Dextron II

BRAKE B-1:

Steel Discs	3
Lined Discs	3
Clutch Pack Clearance	1.05 – 2.85 mm (non-adjustable)
Thrust Plate Thickness	8.5 mm

BRAKE B-2:

Steel Discs	4
Lined Discs	3
Clutch Pack Clearance	1.0 – 1.5 mm (adjustable)

CLUTCH C-1:

Steel Discs	5
Lined Discs	4
Clutch Pack Clearance	1.05 – 3.75 mm (non-adjustable)

CLUTCH C-2:

Steel Discs	5
Lined Discs	4
Clutch Pack Clearance	1.0 – 2.0 mm (adjustable)
Spacer Sleeve Dimension	43.3 mm

FINAL DRIVE UNIT:

Ratio	3:44:1
Lubrication Capacity	3.6 pts. 1.6 L.
Lubrication Requirements	
(below – 10°C (– 3°F)	SAE 75
(above – 10°C (– 3°F)	SAE 80

TORQUE SPECIFICATIONS

	LOCATION	NM	LBS./FT.
1	Fluid Pan Attaching Bolts	3 – 4	2 – 3
2	Valve Body Attaching Bolts	9	7
3	Flex Plate to Crankshaft Attaching Bolts	67 – 70	50 – 52
4	Converter to Flex Plate Attaching Bolts	30 – 35	22 – 26
5	Fluid Pump Cover Bolts	10	8
6	Brake B-2 Housing Bolts	15	11
7	Output Shaft Nut (Planetary Carrier Shaft)	183 – 203	135 – 150
8	Ring Gear Bolts	122 – 142	90 – 105
9	Half-Case Assembly Bolts (8 mm dia.)	30	22
10	Half-Casing Assembly Bolts(10 mm dia.) (Transmission Case)	40 – 46	30 – 34
14	Final Drive Pinion Nut	223 – 244	165 – 180
13	Converter Housing to Final Drive Case Bolts	40 – 46	30 – 34
15	Stator Shaft Support Bolts	30 – 35	22 – 26
16	Transmission Mount to Case Attaching Bolts	24	18
17	Transmission Mount Through Bolts	35	26
18	Transmission Mount to Chassis Bolts	24	18
19	Dipstick Tube Attaching Bolts	24	18
12	Final Drive Case to Transmission Case Bolts	30	22
11	Half-Casing to Half-Casing Bolts	43	32

Notice:
The De Lorean contains many parts dimensioned in the metric system. During any service procedure, replacement fasteners must have the same measurements and strength as those fasteners removed, either metric or customary. The numbers on the heads of metric bolts and on the surface of metric nuts indicate their strength. Customary bolts use radial lines on their heads for strength indicators while most customary nuts do not have strength indicators. Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possibly personal injury. Fasteners removed from the vehicle should be reused in the same locations whenever possible except when indicated otherwise. When fasteners are not satisfactory for reuse, care should be taken to select a replacement fastener that is equivalent to the original quality.

Notice:
Torque specifications should not be exceeded. Fastener chemical treatments such as Loctite, etc. should be used as specified within the text.

SPECIAL TOOLS

TOOL NUMBER	TOOL DESCRIPTION
J 28866	Side Bearing Adjuster Nut Wrench
J 28847	Drain Plug Wrench
J 28859	Flex Plate Locking Tool
J 28864	Convertor Seal Installer
J 28868	Final Drive Pinion Lock
J 29351	C.1. Clutch Compressor
J 28867	Automatic Transmission Tool Set includes: —
J 28867/1	Dismantling Tool for C.2. — B.1. Assemblies
J 28867/2	C.1. and B.2. Piston Spring Compressing Tool
J 28867/3	Transmission Operating Clearance Adjusting Tool
J 28867/4	Output Shaft Planetary Carrier Oil Seal Inserting Tool
J 28867/5	Bearing Pre-load Checking Pulley

TRANSMISSION DIAGNOSIS

DIAGNOSIS PROCEDURE

1. Road test the vehicle and determine all irregularities.

Notice:
It is important to gain as much information as possible on the precise nature of any fault. Whenever possible, perform a complete diagnosis procedure an identify all symptoms.

2. Check and adjust transmission fluid level (see MAINTENANCE AND ADJUSTMENT section for proper level).

3. Check the condition of the transmission electrical system.
   a. Transmission fuse.
   b. Wiring connections on the governor computer wiring harness.
   c. Cut, broken or heat damaged wiring harnesses on the governor computer.
   d. Improper charging system voltage (vehicle alternator).

4. Check and adjust the gear shift selector linkage (see MAINTENANCE AND ADJUSTMENT section).

5. Check and adjust the governor control cable (see MAINTENANCE AND ADJUSTMENT section).

6. Check vacuum modulator connections and perform fluid pressure check and adjustment (see MAINTENANCE AND ADJUSTMENT section).

7. Inspect the transmission fluid for evidence of gear fluid contamination, burning or metallic particles.

8. Check the microswitch for proper operation; including inspection of the wiring for grounds and electrical continuity with a test light.

9. Evaluate the results of the previous checks and adjustments. Refer to the DIAGNOSIS CHART No. 1 and No. 2 *Figs. 6 and 7* and the COMPONENT APPLICATION CHART *Fig. 5* for final diagnosis of problem.

SELECTOR POSITION	GEAR	C1 CLUTCH	C2 CLUTCH	B2 BRAKE	B1 BRAKE	ROLLER CLUTCH	SOLENOID BALL VALVES	
							EL1	EL2
PARK		OFF	OFF	OFF	OFF	INEFFECTIVE	ON	ON
REVERSE		ON	OFF	OFF	ON	INEFFECTIVE	ON	ON
NEUTRAL		OFF	OFF	OFF	OFF	INEFFECTIVE	ON	ON
DRIVE	FIRST	OFF	OFF	ON	OFF	EFFECTIVE	ON	ON
	SECOND	OFF	ON	ON	OFF	INEFFECTIVE	OFF	ON
	THIRD	ON	ON	OFF	OFF	INEFFECTIVE	OFF	OFF
2	FIRST	OFF	OFF	ON	OFF	EFFECTIVE	ON	ON
	SECOND	OFF	ON	ON	OFF	INEFFECTIVE	OFF	ON
1	FIRST	ON	OFF	ON	OFF	INEFFECTIVE	*ON	ON
*BELOW 22 MPH (35 Km/h) ON LIGHT THROTTLE								

Fig. 5 COMPONENT APPLICATION CHART

MAINTENANCE AND ADJUSTMENT

Checking and Adding Transmission Fluid

1. Place vehicle on level ground and apply parking brake.
2. With the selector lever in the PARK position, start the engine and run long enough to achieve operating temperature (coolant fans begin to cycle — A/C off).
3. Check the fluid level with the transmission selector in the PARK position and the engine running at idle. The fluid level on the dipstick should be at the HOT.
4. If additional fluid is required, add sufficient fluid through the filler tube to bring the level to the proper mark on the dipstick. Do not overfill the transmission.

DIAGNOSIS CHART No. 1

FAULTS	CAUSES DUE TO TRANSMISSION AUXILIARIES	CAUSES OF ELECTRICAL ORIGIN	CAUSES OF HYDRAULIC ORIGIN	CAUSES OF MECHANICAL ORIGIN
ENGINE STALLS UNEVEN IDLING	② ③ ④ ⑬			
CREEP IN "N"	⑩		⑲	㉛
EXCESSIVE CREEP IN "D"	② ④		㉗	
SLIP WHEN MOVING OFF IN "D" OR "R"			① ⑫ ⑲ ㉟ ㉗	
SLIP WHEN MOVING OFF IN "D"				㉜
SLIP DURING GEAR CHANGING			⑫ ㉟ ⑲	
GRABS ON MOVING OFF	② ④		㉗	
GRABS DURING GEAR CHANGING	⑤	⑱	⑫ ⑬ ⑲ ㉟ ㊱	
INCORRECT GEAR CHANGING SPEEDS	④ ⑤ ⑥ ⑰	⑧ ⑯ ⑰ ㉞ ⑱		
NO DRIVE IN ANY RATIO	① ⑩		⑲	㉒ ㉓ ㉔ ㉕ ㉖ ㉗
NO DRIVE IN 1ST AND 2ND "AUTOMATIC"				㉑
NO DRIVE IN 2ND OR 3RD				㉙
NO DRIVE IN 3RD, NO ENG. BRAKING IN "R"				㉘
NO DRIVE IN REVERSE				㉚
NO DRIVE IN 1ST AUTO, BUT DRIVE IN 1ST GEAR "HOLD"				㉜
NO 1ST AUTOMATIC		⑧ ⑯ ⑱	⑲	㉜
NO 2ND AUTOMATIC		⑧ ⑯ ⑱	⑲	
NO 3RD AUTOMATIC		⑧ ⑯ ⑱	⑲	
NO 1ST GEAR "HOLD" NO 2ND GEAR "HOLD"	⑩	⑧ ⑯ ⑰ ⑱	⑲	
REMAINS IN 1ST AUTO.		⑧ ⑯ ⑰ ⑱	⑲	
REMAINS IN 3RD		⑦ ⑧ ⑯ ⑱	⑲	
SOME RATIOS UNOBTAINABLE AND SELECTOR LEVEL ABNORMAL	⑩			㉝
"PARK" FACILITY NOT WORKING	⑩			㉝
STARTER NOT WORKING	⑩	⑧ ⑰		
SMOKE FROM EXHAUST	⑬			

Fig. 6 DIAGNOSIS CHART 1

DIAGNOSIS CHART No. 2

		CHECK LIST
①	●	FLUID LEVEL
②	●	IDLE SPEED
③	●	ENGINE IGNITION SYSTEM
④	●	ACCELERATOR CONTROL
⑤	●	GOVERNOR CABLE
⑥	●	MICROSWITCH ADJUSTMENT
⑦	●	FUSES
⑧	●	HARNESSES, WIRING, PLUGS, SOCKETS, GROUNDS
⑨	●	COMPUTER SETTING
⑩	●	SELECTOR LEVER ADJUSTMENT
⑫	●	FLUID PRESSURE SETTING
⑬	■	VACUUM LEAKS
⑯	■	GOVERNOR/COMPUTER
⑰	■	MICROSWITCH
⑱	■	SOLENOID SHIFT VALVES
⑲	■	VALVE BODY
⑳	■	PRESSURE REGULATOR
㉑	■	STARTER SWITCH
㉒	▲	FLUID PUMP
㉓	▲	FLUID PUMP SHAFT
㉔	▲	TURBINE SHAFT
㉕	▲	FINAL DRIVE
㉖	▲	CONVERTER DRIVING PLATE
㉗	▲	CONVERTER
㉘	▲	CLUTCH C1
㉙	▲	CLUTCH C2
㉚	▲	BRAKE B1
㉛	▲	BRAKE B2
㉜	▲	ROLLER CLUTCH
㉝	▲	MANUAL CONTROL VALVE
㉞	■	CHARGING SYSTEM VOLTAGE
㉟	■	VACUUM MODULATOR
㊱	■	PICK-UP SCREEN
㊲	■	MULTIFUNCTION SWITCH

● Adjustment on installed transmission
■ Overhaul on installed transmission
▲ Overhaul on removed or dismantled transmission

Fig. 7 DIAGNOSIS CHART 2

MAINTENANCE/ADJUSTMENT

CHECKING AND ADDING FINAL DRIVE OIL

1. Raise the vehicle on a hoist.
2. Remove the final drive fill plug. *Fig. 8*
3. The oil level should be at the bottom of the fill plug hole. If necessary, add oil to bring level to proper height.

CHANGING FINAL DRIVE OIL

Notice:

The oil should be drained while hot.

1. Raise the vehicle on a hoist.
2. Remove the drain plug from the final drive case and all the oil thoroughly. *Fig. 8*
3. Install the drain plug and tighten with special tool wrench (J28847).
4. Remove the oil fill plug from the side of the final drive case and add gear oil until the oil level is at the bottom edge of the fill plug hole. *Fig. 8*
5. Install fill plug.
6. Lower vehicle on hoist.

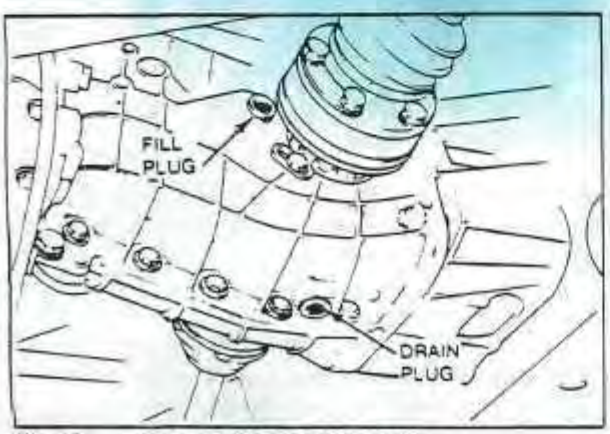


Fig. 8 FINAL DRIVE DRAIN PLUG

CHANGING THE TRANSMISSION FLUID

CAUTION: The fluid should be drained while hot.

SPECIAL CARE should be exercised to prevent physical contact with transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

1. Raise the vehicle on a hoist.
2. Remove the drain plug from the transmission fluid pan and allow the fluid to drain thoroughly. *Fig. 9*
3. Install the drain plug and tighten to ensure proper seating.

Notice:
A new copper washer should be installed each time drain plug is removed.

4. Lower the vehicle and add two quarts (1.89 liters) of transmission fluid through the filler tube.

Notice:
Use a funnel with a built-in 15/100 mesh filter.

5. With the selector level in the PARK position apply the parking brake, start the engine and let idle.
6. Add additional fluid to bring the fluid level to the proper mark on the dipstick.

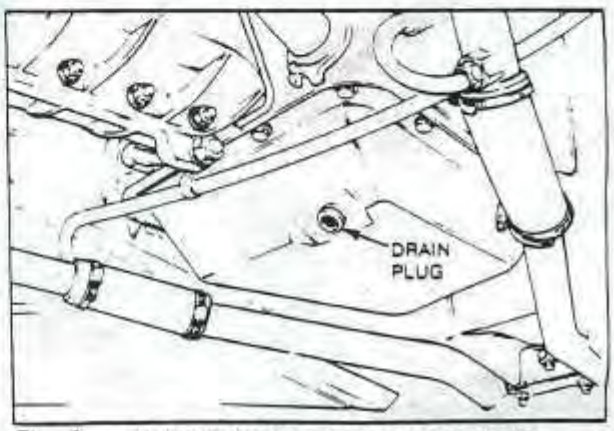


Fig. 9 TRANSMISSION FLUID DRAIN PLUG

SELECTOR LINKAGE ADJUSTMENT

1. Place car on chassis contact hoist and place the gear selector lever in the PARK position with park brake off. Ensure that the lever locking mechanism is fully seated and the lever is locked in position.

2. Raise the vehicle on a hoist and disconnect the shift tube from the bellcrank lever. *Fig. 10*

3. Place the transmission in PARK by rotating the bellcrank lever by hand. Ensure that the transmission is in the PARK position by holding one rear wheel and attempt to rotate the other rear wheel. The parking pawl should drop into position and lock the wheel.

4. Unlock the shift tube adjustment nut and lengthen or shorten the tube until it will slip over the bellcrank mounting stud.

5. Tighten the shift tube adjustment nut lock and connect the tube to the bellcrank.

6. Lower the vehicle on hoist.

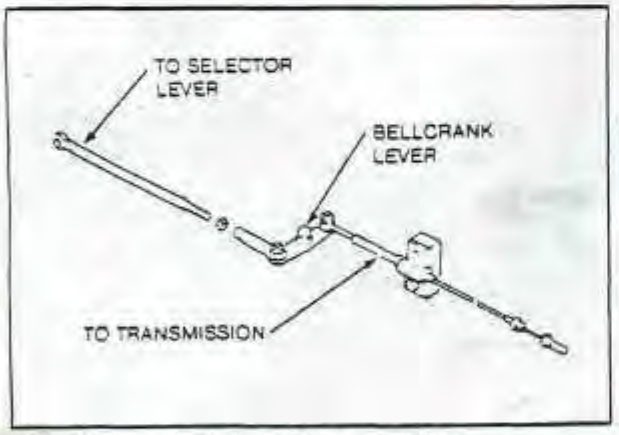


Fig. 10 **SHIFT TUBE ADJUSTMENT**

GOVERNOR CONTROL CABLE ADJUSTMENT

1. *Raise the vehicle* on a hoist.

2. With the engine turned off, use a suitable weight to depress the accelerator pedal to the floor (full throttle position). Check to ensure full throttle at engine is achieved.

3. Perform throttle cable adjustments if the throttle is not opening to the maximum before proceeding.

4. Loosen the cable lock nut and adjust the cable sleeve stop (G) at the governor end to obtain clearance (J) between the quadrant arms and the 0.3 – 0.5 mm (.012 – .020 in.). *Fig. 11*

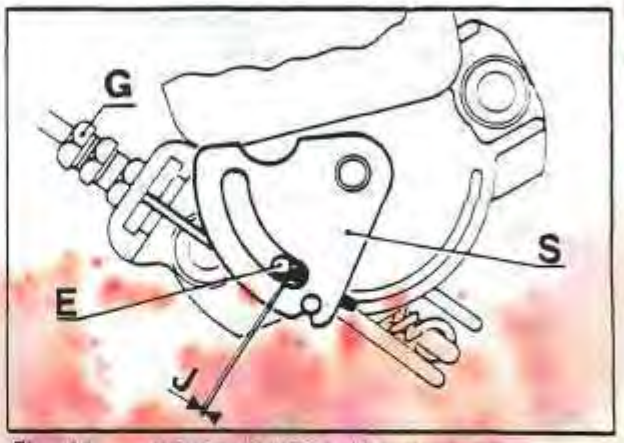


Fig. 11 **GOVERNOR CONTROL CABLE ADJUSTMENT**

Notice:
If the cable cannot be adjusted properly at the governor end, the cable housing can be lengthened or shortened at the throttle linkage end. Repeat the cable adjustment procedure after changing the housing position.

5. Tighten the locknut.

6. Lower the vehicle on hoist.

MICROSWITCH ADJUSTMENT

1. Working in the engine compartment with the engine turned off, open the throttle plates to the full throttle position.

2. Loosen the microswitch attaching screws and position the switch so that it is activated in the full throttle position. *Fig. 12*

3. Tighten the switch attaching screws.

4. Use a suitable weight or prop to depress the throttle pedal to the floor and check to ensure that the microswitch is activating by using a test light.

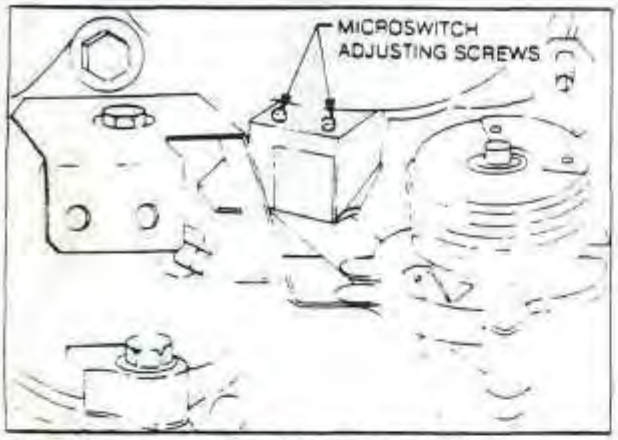


Fig. 12 **MICROSWITCH ADJUSTMENT**

TRANSMISSION FLUID PRESSURE ADJUSTMENT

1. Connect the transmission pressure gauge J21867 to the main line pressure fitting located at the front of the transmission below the transmission pump. *Fig. 13*

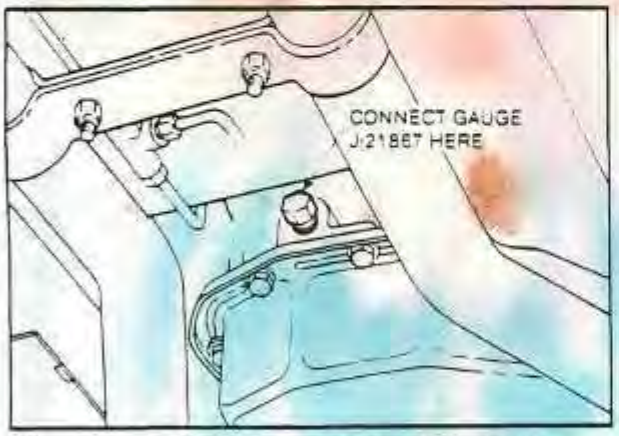


Fig. 13 **CHECKING TRANSMISSION FLUID PRESSURE**

2. Run the engine until transmission reaches normal operating temperature (coolant fans begin to cycle – A/C off).
3. Raise the vehicle on a hoist which will allow the rear wheels to turn freely.
4. Disconnect the vacuum hose from the vacuum modulator.
5. Start the engine, place the transmission sector lever in DRIVE, and run the rear wheels until 2,500 RPM is reached with the transmission shifted into third gear.
6. Read transmission fluid pressure; the pressure should be 8 Bar ± .2 (113 PSI ± 3) when the transmission fluid temperature is 80°C. (176°F.).
7. Adjust the fluid pressure by unlocking the retaining clip and rotating the vacuum modulator in its housing. *Fig. 14*

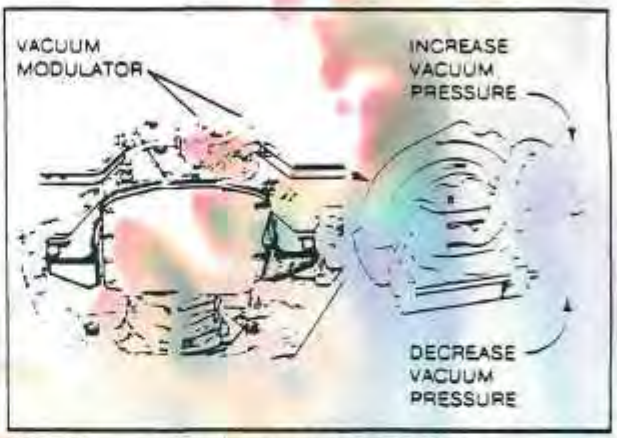


Fig. 14 **ADJUSTING TRANSMISSION FLUID PRESSURE**

Notice:

Turning the modulator clockwise will increase the fluid pressure. One notch of movement will change the pressure approximately 0.1 Bar (1.5 PSI).

8. Install the modulator retaining clip, refit the modulator vacuum hose, and remove the fluid pressure gauge and install plug.
9. Lower the vehicle, check and adjust transmission fluid level.

ON CAR SERVICE

FLUID PUMP AND/OR SEAL

Removal

1. Raise car on hoist.
2. Remove five (5) of six (6) fluid pump attaching bolts. Back out but do not remove remaining bolt as this will help prevent dropping gears upon pump housing separation from transmission assembly. *Fig. 15*

CAUTION: Special care should be exercised to prevent contact with transmission fluid as transmission fluid is scalding hot (80°C/176°F).

3. After separating pump assembly from transmission assembly, remove last bolt. Then remove pump assembly. Do not drop fluid pump gears when performing this operation. Paint mark the position of the gears for reassembly.

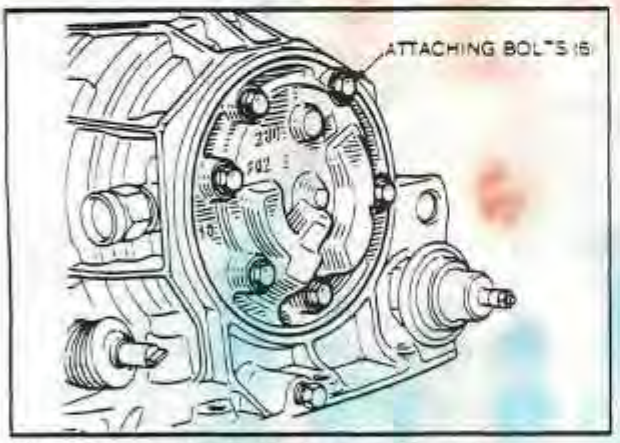


Fig. 15 **TRANSMISSION FLUID PUMP**

Installation

1. Lubricate the new "O" ring seal with transmission fluid and fit it on the fluid pump body.
2. Lubricate the fluid gears with transmission fluid and insert gears in the pump housing aligning the disassembly marks.

Notice:

The larger pump gear must be fitted with the chamfered edge facing the pump housing.

3. Fit the fluid pump drive in the center gear.
4. Position and secure the fluid pump to the transmission case and torque the belts (see torque specifications).

FLUID PAN AND/OR GASKET

Removal

1. Raise car on hoist.
2. Remove the transmission fluid pan drain plug and drain the fluid.

CAUTION: Special care should be exercised to prevent physical contact with the transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

3. Remove fluid pan attaching bolts and remove pan and gasket.

Installation

1. Clean the fluid pan and transmission mounting surfaces. Install the fluid pan using a new gasket and torque attaching bolts (see torque specifications).
2. Lower the vehicle and fill the transmission with fluid to the proper level (see MAINTENANCE AND ADJUSTMENT section).

ELECTRICAL SHIFT SOLENOIDS

Removal

1. Raise car on a hoist.
2. Remove the transmission fluid pan as previously described.
3. Disconnect the external wiring harness from the solenoid socket.
4. Depress the retaining lugs and remove the sealed socket from the transmission case.

5. Remove the solenoid mounting bolt and plate. *Fig. 16*

6. *Extract* both solenoids with wiring harness from *valve body*.

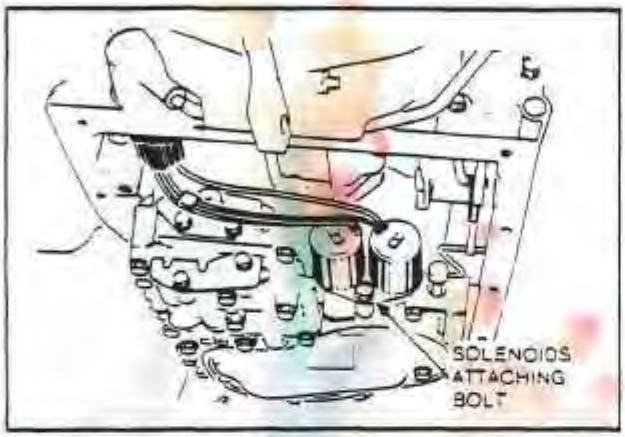


Fig. 16 **SHIFT SOLENOID REMOVAL**

Installation

1. Fit new "O" ring seals on the solenoids and install the solenoids in the valve body until they are fully sealed and seated.

Notice:

On the solenoid with the clear insulation wires must be fitted on the side next to the manual control valves.

2. Install the mounting plate and bolt.

3. Fit a new "O" ring seal on the seal socket and install the socket in the transmission case.

4. Connect the transmission wiring harness to the sealed socket.

5. Clean the fluid pan and transmission mounting surfaces. Install the fluid pan using a new gasket and torque tighten the attaching bolts (see torque specifications).

6. Lower the vehicle and fill the transmission with fluid to the proper level (see MAINTENANCE AND ADJUSTMENT section).

VALVE BODY

Removal

1. Raise the vehicle on a hoist and remove the electric shift solenoids as previously described.

2. Remove the manual control valve linkage by pushing the link into the quadrant arm and compressing the spring. This will disengage the other end of the link from the control valve. Remove the linkage. *Fig. 17*

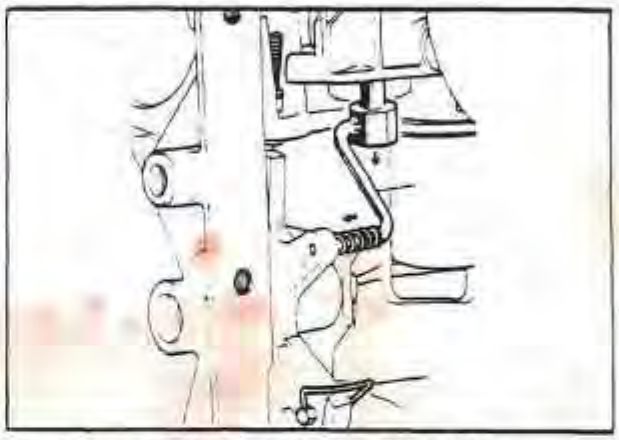


Fig. 17 **MANUAL CONTROL VALVE AND PARKING PAWL LINKAGE**

3. Remove the three (3) bolts securing the fluid pick-up screen and gasket and remove.

4. Remove the valve body attaching bolts only. *Fig. 18*

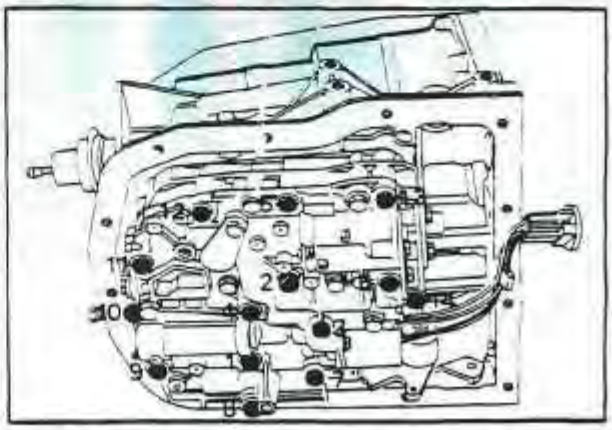


Fig. 18 **VALVE BODY ATTACHING BOLTS-SEQUENCE**

Notice:
DO NOT remove valve body assembly bolts. This assembly is not serviceable.

5. Remove the valve body plate and gaskets (2).

Installation

1. Clean the surfaces of the valve body, plate and transmission case. Place a new gasket, the plate and another new gasket on the valve body. Insert two (2) mounting bolts in the valve body to align the gaskets and plate. *Fig. 19*

2. Fit the valve body assembly to the transmission and install the remaining bolts. Torque tighten the bolts in the sequence shown. *Fig. 18*

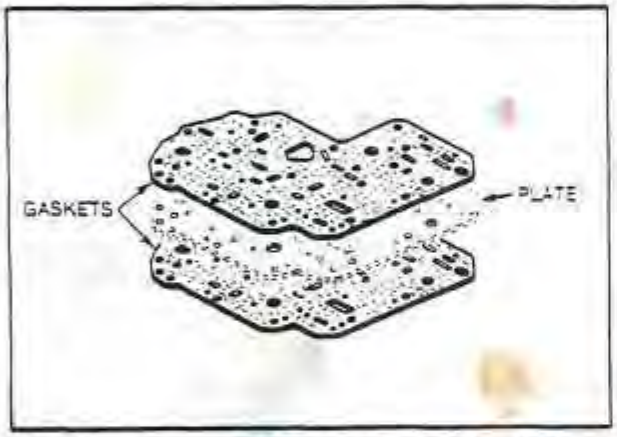


Fig. 19 VALVE BODY GASKETS AND PLATE

3. Fit a new gasket to the fluid pick-up screen install the screen on the valve body.

4. Re-fit the control valve linkage by inserting the spring end of the link into the quadrant arm first. Push the link in to compress the spring and fit the other end of the link in the control valve hole.

5. Install the electric shift solenoids and new pan gasket as previously described.

VACUUM MODULATOR

Replacement

1. Raise the vehicle on a hoist.

2. Disconnect the vacuum hose at the vacuum modulator.

3. Remove the vacuum modulator hold down clamp and remove the modulator assembly.

4. Remove the modulator retaining clip and unscrew the modulator from the adaptor housing.

5. Reverse the above procedure for installation.

6. Adjust the transmission fluid pressure (see MAINTENANCE AND ADJUSTMENT section for procedures).

GOVERNOR COMPUTER ASSEMBLY

Replacement

1. Working in the engine compartment, disconnect the chassis wiring harness from the governor computer wiring socket.

2. Remove the wiring socket from the mounting bracket.

3. Raise the vehicle on a hoist.

4. Remove the transmission fluid pan drain plug and drain the transmission fluid.

CAUTION: Special care should be exercised to prevent physical contact with the transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

5. Remove the fluid pan and gasket.

6. Disconnect the electric solenoid harness from the sealed socket in the case.

7. Remove the sealed socket from the transmission case. *Fig. 20*

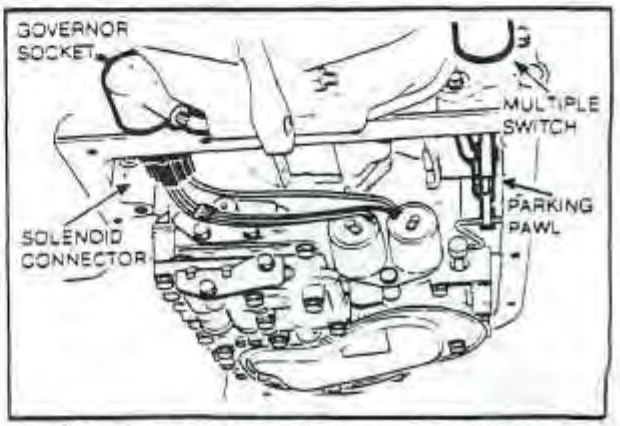


Fig. 20 GOVERNOR COMPUTER REMOVAL

8. Remove the bolts securing the multiple switch and remove the switch.

9. Disconnect the governor control cable from the governor computer.

10. Remove the bolts securing the governor computer to the case and extract the governor drive gear and assembly. *Fig. 21*

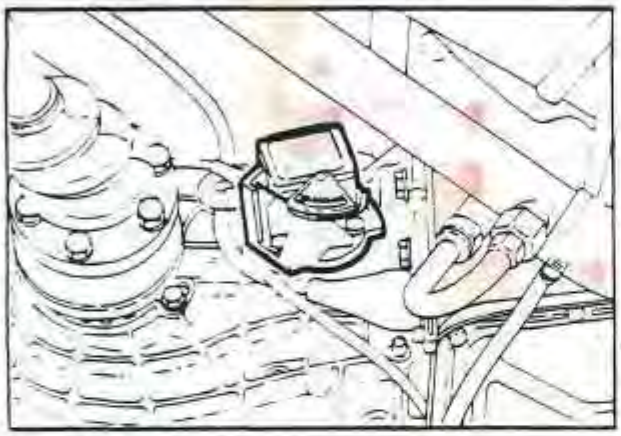


Fig. 21. **GOVERNOR COMPUTER ASSEMBLY REMOVAL**

11. Disconnect the wiring tie straps and remove the governor computer assembly and wiring harness. *Fig. 22*

Notice:
Steps 4, 5, and 6 may be omitted if the solenoid wiring harness is not defective. Mark the three (3) solenoid wires (M, J, and B) and remove the wires from the wiring socket. This will allow the removal of the governor computer without removing the transmission fluid pan.

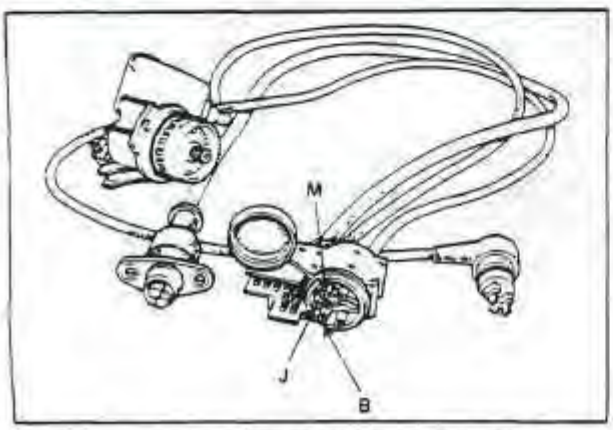


Fig. 22 **GOVERNOR COMPUTER ASSEMBLY**

12. Reverse the above procedures for installion. Use new "O" ring seals and gaskets. Torque tighten fastening bolts to the proper specifications (see torque specifications).

13. Fasten the wiring harness clear of the exhaust system using tie straps.

14. Adjust the governor control cable (see MAINTENANCE AND ADJUSTMENT section for procedure).

PARKING PAWL

Replace

1. Raise vehicle on a hoist.

2. Remove fluid pan and gasket as previously described.

3. Remove the clip retaining the parking pawl from the quadrant and remove parking pawl. *Fig. 20*

4. To complete installation, reverse removal procedures and torque fasteners to specifications.

DRIVESHAFT FLANGE/OIL SEAL

Removal

1. Raise vehicle on a hoist.

2. Drain the final drive gear oil.

3. Disconnect the inner end of the inner driveshaft from the driveshaft flange.

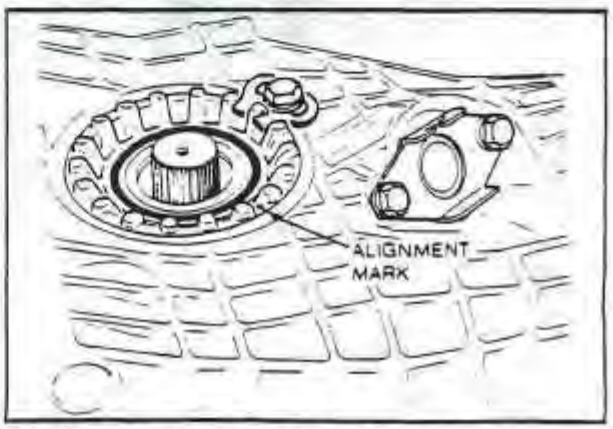


Fig. 23 **DIFFERENTIAL ADJUSTING NUT**

4. Remove the roll pin securing the inner driveshaft flange from the differential shaft.
5. Remove the driveshaft flange.
6. Remove the differential adjusting nut lock plate. Index mark the adjusting nut on the transmission case for installation. *Fig. 23*
7. Unscrew the adjusting nut using tool J28866. COUNT THE NUMBER OF TURNS REQUIRED TO DISENGAGE THE THREADS. *Fig. 24*

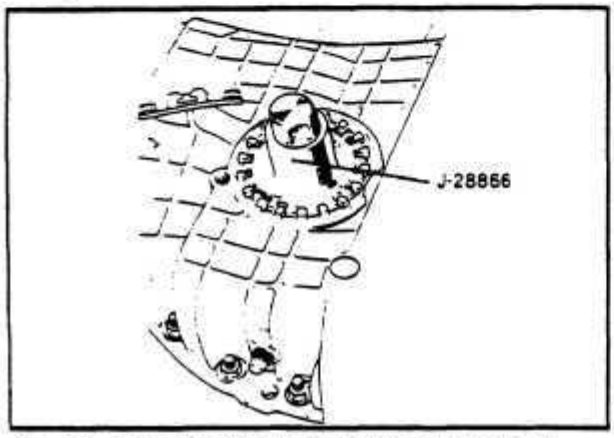


Fig. 24 **DIFFERENTIAL ADJUSTING NUT TOOL**

8. Remove the "O" ring seal and pry out the lip seal using a suitable tool taking care not to damage the machined surface.
9. Replace the side gear "O" ring seal.

Installation

1. Install the new lip seal in the adjusting nut using a suitable drift. Seat the seal with the lip facing the final drive area.
2. Fit the new "O" ring seal on the adjusting nut.
3. Thread the adjusting nut into the case. THE EXACT NUMBER OF TURNS NOTED ON REMOVAL. Align the index marks and install the adjusting nut lock plate. *Fig. 23*
4. Align the role pin hole in the driveshaft flange with the pin hole in differential side gear shaft and install the flange.
5. Align the roll pin hole and insert the roll pin.
6. Connect the inner driveshaft to the driveshaft flange and torque bolts (see torque specifications).
7. Fill the final drive with the recommended lubricant and lower the vehicle on the hoist.

TRANSMISSION MOUNTS

Replacement

1. Raise vehicle on a hoist.
2. Support the transmission to remove the weight from the mounts.
3. Remove the nyloc nut and the bolt securing the rubber mount to the transmission metal mount on each side of auto-case (L.H.S. Illustrated). *Fig. 25*

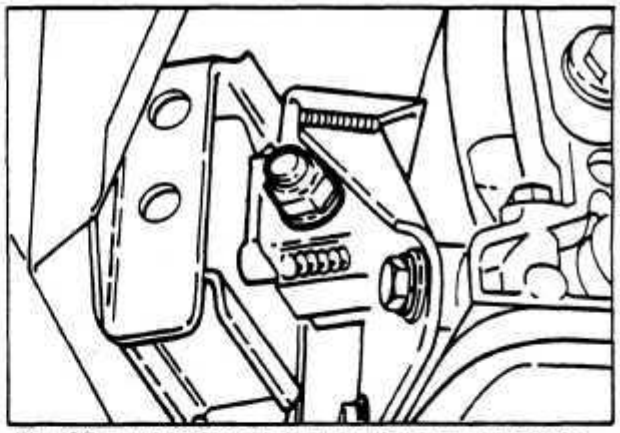


Fig. 25 **TRANSMISSION MOUNT REPLACEMENT**

4. Remove the bolts securing the rubber mount and bracket to the chassis frame. Remove the mount.
5. Reverse the above procedures to install the mount and torque fasteners to specifications.

REMOVAL AND REFITTING

1. Disconnect the negative battery cable.

2. Working in the engine compartment, disconnect the chassis wiring harness from the governor computer wiring socket. *Fig. 26*

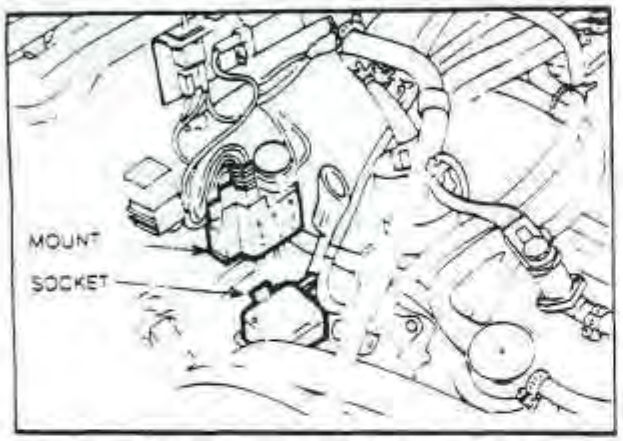


Fig. 26 **GOVERNOR COMPUTER WIRING SOCKET AND MOUNT**

3. Remove the wiring socket from the mounting bracket.

4. Raise the vehicle on a hoist and drain transmission fluid.

CAUTION: Special care should be exercised to prevent physical contact with transmission fluid when changing or checking as transmission fluid is scalding hot (80°C/176°F).

5. Disconnect the selector cable from the bellcrank.

6. Remove the clamp securing the selector cable to the chassis.

Notice:
It may be necessary to remove the trailing arm shield to gain access to the cable clamp securing nuts.

7. Disconnect the governor control cable from the governor.

8. Remove any tie-straps securing the governor computer wiring harness to the chassis.

Notice:
The governor and wiring will remain with the transmission upon removal.

9. Disconnect the engine vacuum hose from the modulator vacuum pipe.

10. Remove the right rear wheel and disconnect the parking brake cable from the caliper. Mover the brake cable clear of the transmission.

11. Remove the dipstick tube.

12. Disconnect the magnetic timing pick-up and plate on the side of the converter housing.

13. Disconnect the inner driveshaft from the driveshaft flanges.

14. Remove the bolts securing the starter motor to the converter housing.

15. Disconnect the transmission fluid cooler lines from the transmission.

16. Loosen the engine mount bolts and jack the front of the engine up to gain access to the converter inspection plate.

Notice:
Do not damage the rear fascia with the exhaust tail pipes while lifting the engine.

17. Remove the converter inspection plate.

18. Remove the bolts securing the torque converter to the flex plate.

19. Lower the engine.

20. Place a transmission jack under the transmission. Disconnect the transmission mounts and remove the mount brackets from the transmission.

21. Remove all of the bolts securing the transmission to the engine.

22. Jack the front of the engine up and lower the transmission as far as possible.

Notice:
Do not damage the rear fascia with the exhaust pipes. If the enlarged tail pipe extensions are used, it may be necessary to remove the muffler.

23. Install suitable converter retaining device to prevent converter from slipping off and carefully lower the transmission from the vehicle.

Installation

1. Reverse the removal procedures for installation. Torque tighten all fasteners (see torque specifications).

2. Adjust the governor control cable and selector linkage (see MAINTENANCE AND ADJUSTMENT section for procedures).

3. Fill the transmission and final drive with fluid/lubricant.

4. Adjust the transmission fluid pressure (see MAINTENANCE AND ADJUSTMENT section for procedures).

TORQUE CONVERTER SEAL

Replacement

1. Remove transmission as described in this section.

2. Remove the torque converter from the transmission.

3. Remove the converter seal from the housing.

4. Fit the new seal in the housing with the lip on the seal facing the transmission. Install the seal using Tool J28864 and a mallet. *Fig. 27*

5. Lubricate the seal with transmission fluid and install the torque converter. Rotate the converter until it engages with the pump drive, the turbine shaft and the stator support.

Notice:
Ensure that the converter is fully seated.

6. Install the transmission as outlined in the TRANSMISSION REPLACEMENT section.

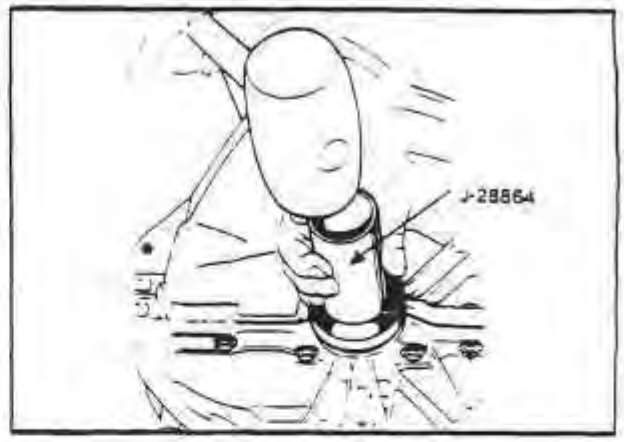


Fig. 27 **CONVERTER SEAL INSTALLATION**

FLEX PLATE

Replacement

1. Remove the transmission as described in this section.

2. Install the flex plate lock Tool J28859 and remove seven (7) flex plate bolts and discard. *Fig. 28*

3. Remove the lock tool, the flex plate and the reinforcement plates.

4. Install the flex plate by fitting a reinforcement plate, the flex plate, and then the other reinforcement plate on the flywheel.

5. Fasten the flex plate to the crankshaft using new bolts and Loctite 601 or equivalent. Torque tighten to specifications (see torque specifications).

Notice:
Use Tool J28859 to lock the flex plate while torquing bolts.

6. Install the transmission as described in this section.

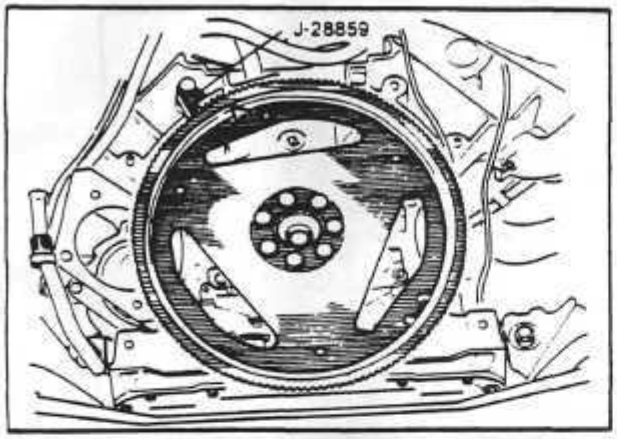


Fig. 28 **FLY WHEEL LOCKING TOOL**

UNIT SEPARATION

1. Drain the transmission fluid and final drive lubricant from the transmission assembly.
2. Remove the two (2) bolts securing the dipstick tube.
3. Remove the torque converter and fluid pump shaft. *Fig. 29*

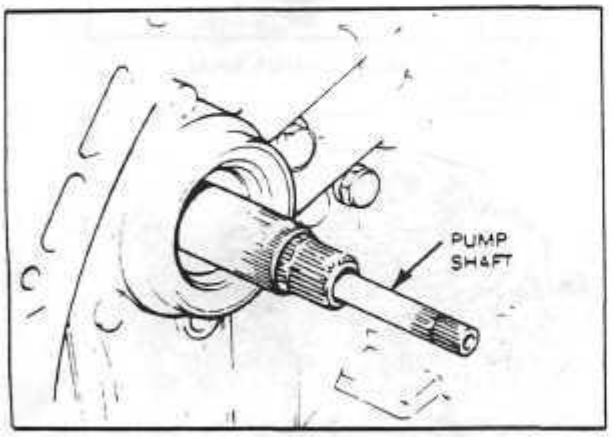


Fig. 29 **FLUID PUMP SHAFT**

4. Place the transmission in a vertical position, resting on the converter housing.
5. Remove the transmission fluid pan and gasket.
6. Remove the bolts securing the multiple switch and remove the switch. *Fig. 30*

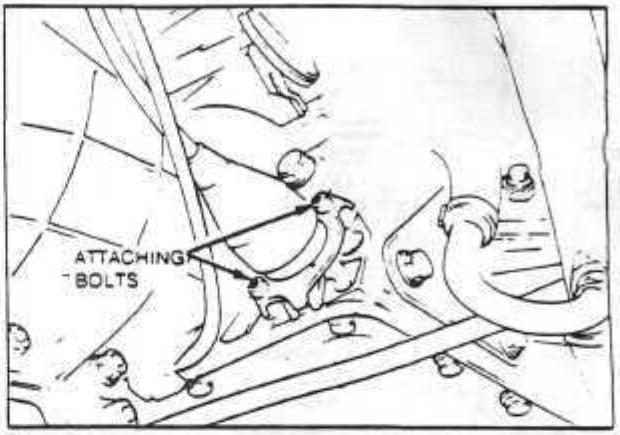


Fig. 30 **MULTIPLE SWITCH REMOVAL**

7. Release the retaining lugs on the wire connector and disconnect the solenoid wiring harness from the socket. *Fig. 31*

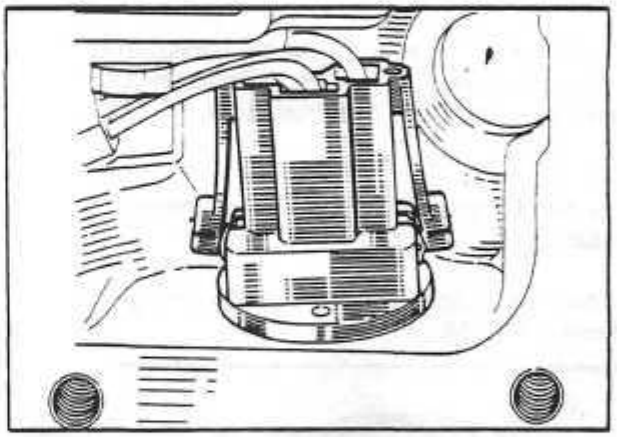


Fig. 31 **SHIFT SOLENOIDS CONNECTOR**

8. Remove the sealed socket from the case by pressing the two (2) plug retaining lugs together and pushing on the socket. *Fig. 32*

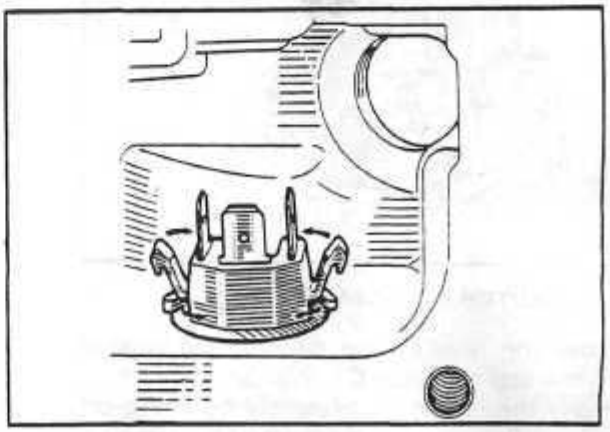


Fig. 32 **SEALED SOCKET PLUG**

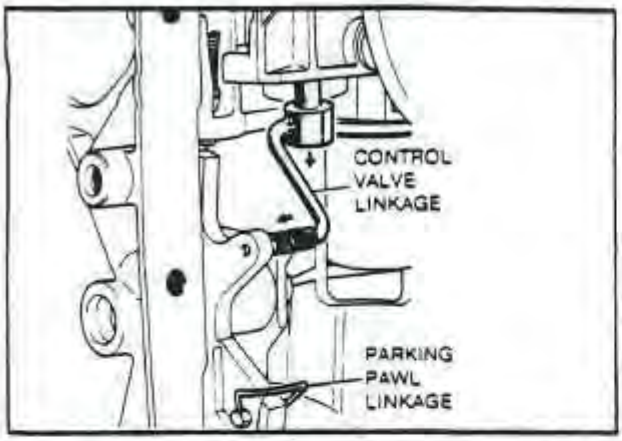


Fig. 33 **MANUAL CONTROL VALVE AND PARKING PAWL LINKAGE**

9. Remove the parking pawl link retaining clip and remove the link. *Fig. 33*

10. Remove the bolts securing the transmission to the final drive assembly. Lift the transmission up and separate from the final drive.

Notice:
There are two (2) securing bolts located inside the transmission.

11. Remove the clutch C2 assembly by lifting off vertically. *Fig. 34*

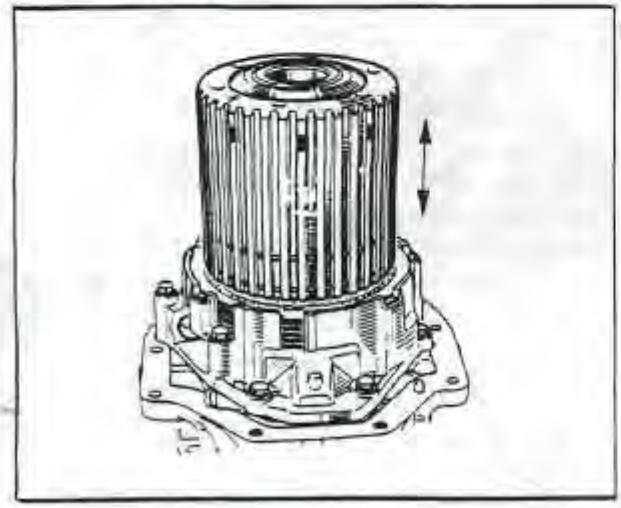


Fig. 34 **CLUTCH C-2 ASSEMBLY**

12. Remove the needle roller bearing and washer from the top of clutch C1. *Fig. 35*
Remove the clutch C1 assembly by lifting off vertically. Remove turbine shaft from clutch C1 using a soft metal drift. *Fig. 36*

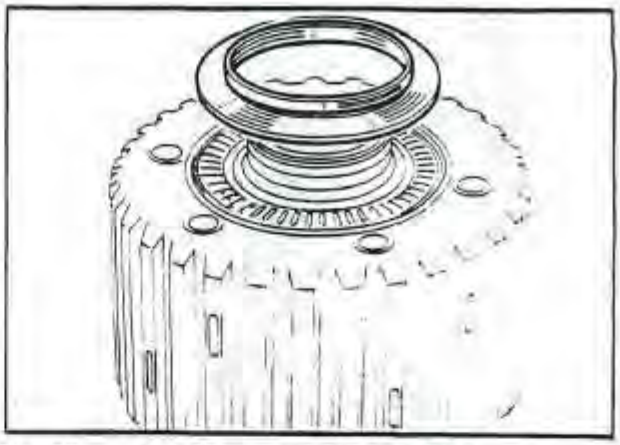


Fig. 35 **CLUTCH C-1 NEEDLE BEARING**

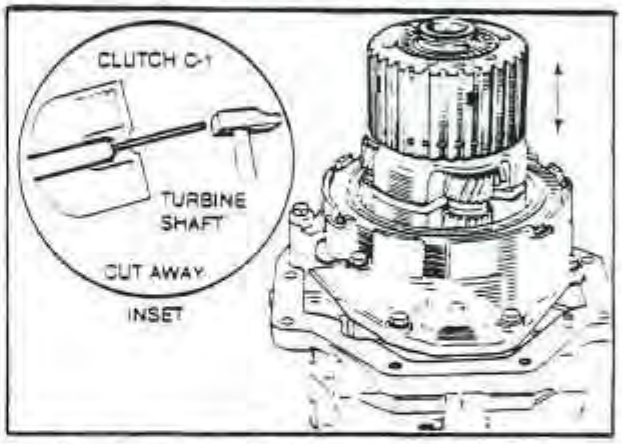


Fig. 36 **CLUTCH C-1 AND TURBINE SHAFT REMOVAL**

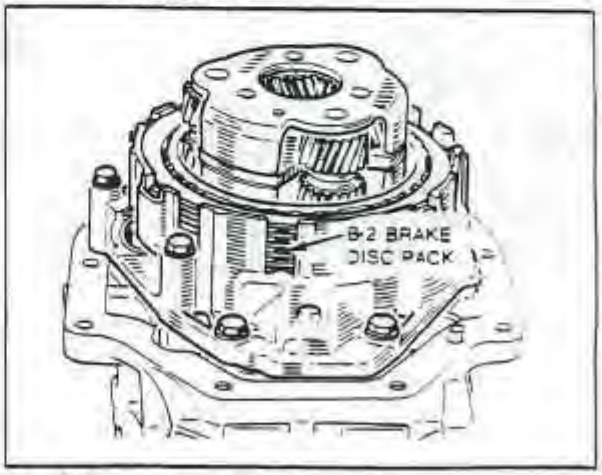


Fig. 37 **BRAKE B-2 DISC PACK**

13. Remove the thrust washer from the inside of the planetary gear carrier.

14. Remove the steel discs, lined discs and adjusting shim(s) from brake B2 housing. *Fig. 37*

Notice:
All of the transmission components except the planetary gear carrier, have been separated from the final drive unit.

Notice:
If it is necessary to repair or replace the planetary gear carrier, refer to the final drive COMPONENT REPAIR section for further instructions.

Notice:
If transmission repairs are required, refer to the TRANSMISSION DISASSEMBLY and COMPONENT REPAIR sections for further dismantling instructions.

Notice:
If final drive repairs are required, refer to the FINAL DRIVE DISASSEMBLY and COMPONENT REPAIR sections for further dismantling instructions.

UNIT REASSEMBLY

1. Check and adjust the operating clearance on brake B2.

When the transmission and final drive units are assembled together, there must be a proper amount of clearance between the B2 apply piston and the last brake disc to allow the brake B2 to function correctly.

The B2 apply piston is located in the transmission case and the brake discs are located in the final drive case; therefore, it is necessary to perform the following measurements on each unit to determine the amount of clearance that will exist when the two units are bolted together.

a. Install the B2 disc pack on the planet wheel carrier as follows:

   Fit the shim(s) that were removed, a steel disc, a lined disc, a steel disc and so on. Substitute the wave disc with a flat disc and fit on the pack last to obtain exact measurement.

b. Fit a new gasket on the final drive case and place the special tool J 28867/3 (part of A/T tool kit) in position.

   Use a depth gauge to measure the distance between the top face of the special tool and the last B2 disc. *Fig. 38* — "Y"

c. Subtract the measurement from 120 mm (4.724 in.) to obtain the final dimension. *Fig. 38* — "A"

Example:

120.00 mm	Set Value
− 62.97 mm	Distance Measurement "Y"
57.03 mm	Final Dimension "A"

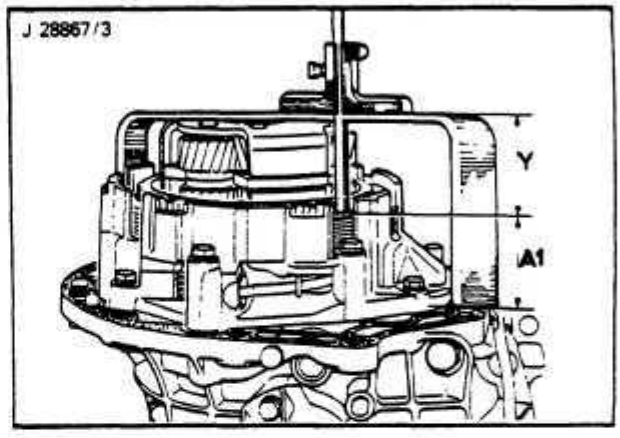


Fig. 38 **BRAKE B-2 OPERATING CLEARANCE**

d. Clean the mating surface of the transmission case and place a straight edge across the joint face.

   Use a depth gauge to measure the distance between the top face of the straight edge and the B2 apply piston. *Fig. 39*

   Notice:
   This distance is not adjustable.

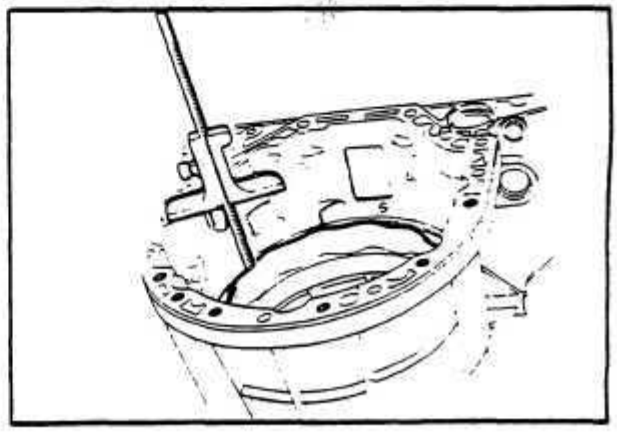


Fig. 39 **B-2 PISTON CHECKING LOCATION**

e. Use a micrometer to measure the thickness of the straight edge used in the above measurement.

Subtract this measurement from the distance measure obtained in Step "d" to determine the final dimension "B". *Fig. 40*

Example:

65.10 mm	Distance Measurement
– 6.38 mm	Thickness of Straight Edge
58.72 mm	Final Dimension "B"

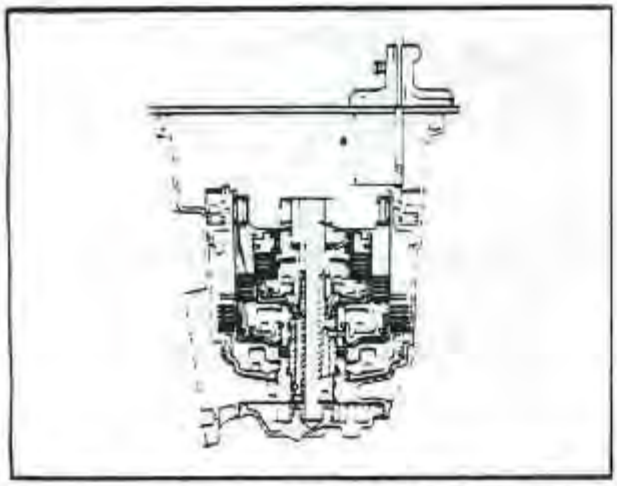


Fig. 40 **B-2 APPLY PISTON MEASUREMENT**

f. Calculate the operating clearance by subtracting the final dimension "A" (Step "c") from the final dimension "B" (Step "e").

Example:

58.72 mm	Dimension "B" *Fig. 40*
– 57.03 mm	Dimension "A" *Fig. 38*
1.69 mm	Clearance

This clearance must be 1.1 – 1.5 mm (.043 – .059 in.). If the clearance is not within specifications, shims may be added or subtracted or a different thickness shim may be used between the B2 disc pack and the planetary carrier. Do not use more than two (2) shims to obtain the proper clearance.

g. Remove the disc pack and fit the proper adjustment shim(s).

h. Remove the substitution steel disc and fit the wave disc on the pack. Re-fit the disc pack on the planetary gear carrier.

2. Check and adjust the transmission end play.

When the transmission and final drive units are assembled together, there must be a proper amount of end play clearance between the mechanical components within the transmission. Incorrect clearance will result in premature failure.

It is necessary to perform the following measurements to determine the amount of clearance that will exist when the two units are bolted together.

a. Clean the contact face of the final drive case and remove the thrust washer from the planetary gear carrier.

b. Position the special measuring tool J 28867-4 (part of the A/T tool kit) on the final drive case without the gasket. *Fig. 41*

Use a depth gauge to measure the distance "X" *Fig. 41* from the top face of the special tool to the top of the planetary carrier shaft. THRUST WASHER REMOVED.

c. Subtract "X" *Fig. 41* from 120 mm (4.724 in.) to obtain the dimension "A". *Fig. 41*

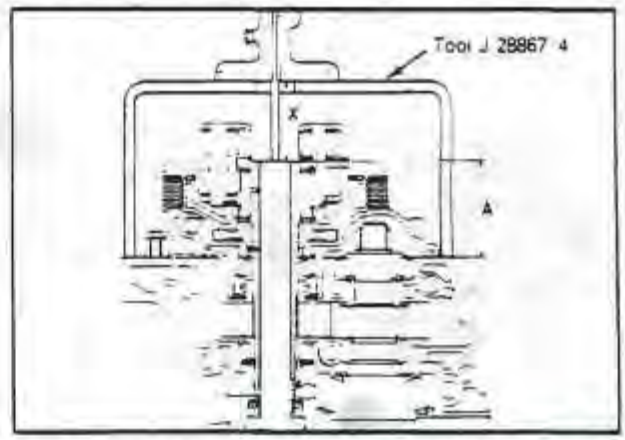


Fig. 41 **PLANETARY CARRIER TO FINAL DRIVE CASE MEASUREMENT**

Example:

120.00 mm	Set Value
– 46.46 mm	Distance Measurement "X"
73.54 mm	Final Dimension "A"

d. Install clutch C2 in the transmission case. Rotate the clutch until it engages all of the brake B1 discs and is fully seated. *Fig. 42*

e. Fit the washer on clutch C2 with the flange on the washer facing towards clutch C2. *Fig. 42*

f. Place the needle roller bearing on top of the washer with the needles facing the washer. *Fig. 42*

g. Install clutch C1 in the transmission case. Rotate the clutch until it engages all of the discs of the clutch C2 and is fully seated.

h. Place the thrust washer on the hub of clutch C1. *Fig. 42*

i. Clean the contact surface of the transmission case and place a straight edge across the face of the transmission. *Fig. 42*

Notice:
A new gasket must be positioned on the transmission housing prior to performing this measurement.

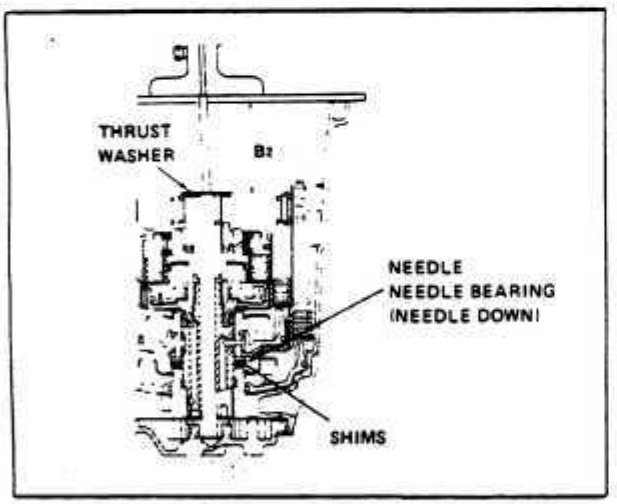


Fig. 42 **TRANSMISSION END PLAY ADJUSTMENT**

Use a depth gauge to measure the distance "B" from the top of the straight edge to the top of the thrust washer on the hub. *Fig. 42*

j. Use a micrometer to measure the thickness of the straight edge.

Subtract the thickness of the straight edge from the distance measurement to obtain dimension "B".

Example:

74.33 mm	Distance Measurement
−74.10 mm	Thickness of Straight Edge
.23 mm	Dimension "B"

k. Calculate the end play clearance by *subtracting* dimension "A" *Fig. 41* from dimension "B". *Fig. 42*

Example:

74.10 mm	Dimension "B"
−73.54 mm	Dimension "A"
0.56 mm	End Play Clearance

End play clearance should be between 0.37 – 0.74 mm (90.015 – 0.029 in.). If the clearance is not within specifications, it will be necessary to increase or decrease the thickness of the shim(s) located between the transmission case and clutch C2. *Fig. 42*

Shims are available in the following thicknesses.

0.25 mm (.010 in.)
0.5 mm (.020 in.)
0.7 mm (.028 in.)
0.8 mm (.031 in.)

Notice:
If the end play clearance cannot be adjusted properly, it will be necessary to perform the planetary gear carrier height adjustment and then repeat the end play clearance adjustment. (See Final Drive COMPONENT REPAIR section for height adjustment procedures.)

l. Remove the thrust washer, clutch C1, needle bearing, washer, and clutch C2 from the case.

m. Remove the washer and needle roller bearing from the hub in the bottom of the transmission case. Fit the proper adjustment shims on the hub to give the specified end play clearance.

n. Re-fit the needle roller bearing with the needles facing upwards and place the washer on top of the bearing.

o. Install two (2) new sealing rings on the hub. Ensure that the ring ends are *properly* connected. Lubricate the seal rings with transmission fluid.

3. Fit the thrust washer in the planetary gear carrier with the grooves in the washer facing up (towards sun gear).

4. Install clutch C1 and turbine shaft into the planetary gear carrier.

5. Lubricate the needle roller bearing with automatic transmission fluid and install on clutch C1 with the needles facing upwards.

6. Install the thrust washer on top of the needle roller bearing with the flange on the washer facing upwards.

7. Install the clutch C2. Rotate the clutch until it is fully seated and engaged with clutch C1.

Notice:
Ensure that the clutch is fully seated and in contact with the needle roller bearing and thrust washer.

8. Clean the mating surfaces on the transmission and final drive cases. Fit a new gasket on the final drive case.

9. Align the splines on the discs in brake B1 before fitting the transmission case onto the final drive. This will allow the clutch C2 drum to enter the disc pack without difficulty.

10. Carefully place the transmission case on the final drive while maintaining alignment between the clutch C2 drum and brake B1 discs. After the transmission case is fully seated, install the case attaching bolts and torque tighten. (See specifications.)

11. Install the parking pawl link and fit the retaining clip.

12. Fit a new "O" ring seal on the solenoid wiring socket and install the socket in the case until it is fully seated. Connect the solenoid wiring harness to the socket.

13. Fit a new "O" ring seal on the multiple switch and install the switch in the transmission case.

14. Clean the mating surfaces on the fluid pan and transmission case. Fit a new gasket and install the fluid pan. Torque the attaching bolts. (See torque specifications.)

15. Lubricate the turbine shaft with transmission fluid and install grooved end at the shaft into the transmission. Ensure that the shaft is fully seated and retained by the spring clip. Lubricate the fluid pump shaft with transmission fluid and install. Rotate the shaft to ensure that it is fully engaged and the pump is free turning.

16. Install the torque converter. Rotate the converter while installing until the converter engages the turbine shaft and the fluid pump shaft.

17. Fit a new "O" ring seal on the dipstick tube and install the tube.

TRANSMISSION UNIT

TRANSMISSION UNIT DISASSEMBLY AND REASSEMBLY

Notice:
The transmission/final drive unit separation procedure must be performed before starting with transmission disassembly.

SEE – ON CAR SERVICE – FOR DISASSEMBLY, INSPECTION AND ASSEMBLY PROCEDURES FOR:

- Manual control valve
- Pick up screen and gasket
- Valve body and gaskets
- Vacuum modulator
- Electric shift solenoids
- Fluid pump

TRANSMISSION COMPONENT REPAIR

BRAKE B2 – Fig. 43

1 – **Piston Support Outer Seal**
2 – **Piston Support**
3 – **Piston Seal (Square Section/Inner)**
4 – **Piston Seal (Square Section/Outer)**
5 – **Piston**
6 – **Return Springs**
7 – **Spring Retaining Plate**
8 – **Lock Ring**
9 – **Wave Disc**
10 – **Steel Discs (4)**
11 – **Lined Discs (3)**
12 – **B2 Operating Clearance Adjusting Shims**

Disassembly

1. Remove the tension on the B-2 piston return springs using the special tool (part of the A T Tool Kit). Tighten the tool until the ring on the tool bottoms against the piston *Fig. 44*. Remove the lock ring securing the spring plate.

Notice:
Do not over-tighten the tool. When the ring on the tool contacts the face of the piston, the coil springs are fully compressed.

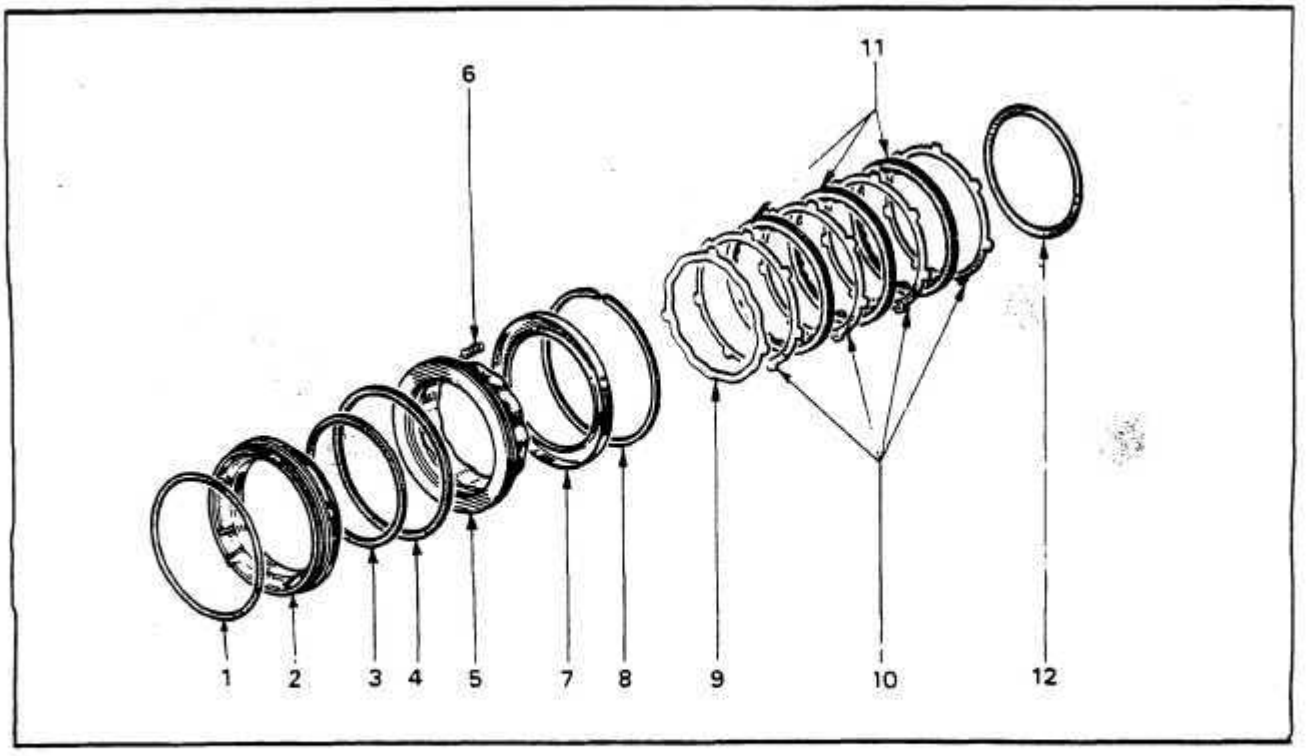


Fig. 43 BRAKE B-2 DISASSEMBLED

2. Remove the special tool and remove the retaining plate and the coil springs.

3. Remove the piston from the transmission case.

4. Separate the piston from the support and remove the seals 1, 3 and 4. *Fig. 43*

5. Remove the brake B2 discs and adjusting shim(s) from the planetary gear carrier housing (on the final drive unit).

Reassembly

Clean and inspect all parts for damage and scoring.

1. Lubricate the two (2) square section seals and fit the outer seal on the piston. Fit the inner seal in the groove on the inside of the piston. *Fig. 43*

2. Lubricate the new support seal with transmission fluid and fit on the piston support. *Fig. 43*

3. Lubricate the support and insert it in the piston. Ensure that it is fully seated.

4. Lubricate the piston assembly with transmission fluid and install in the transmission case.

Notice:
Ensure that the three (3) lugs on the piston support mate with the large groove in the transmission case.

5. Fit the piston return springs and spring retaining plate on the piston. Tighten the spring compressor J 28867/2 until the tool contacts the face of the piston and install the lock ring. *Fig. 44*

7. Remove the tool and insure that the piston is properly seated by placing a straight edge across the face of the case and measuring the distance to the piston in three (3) different locations. The readings should be the same.

8. Fit the adjustment shim(s) on the planetary gear carrier.

9. Alternately fit a steel disc, a lined disc, a steel disc and so on.

10. Fit the wave disc on top of the last steel disc in the B2 disc pack.

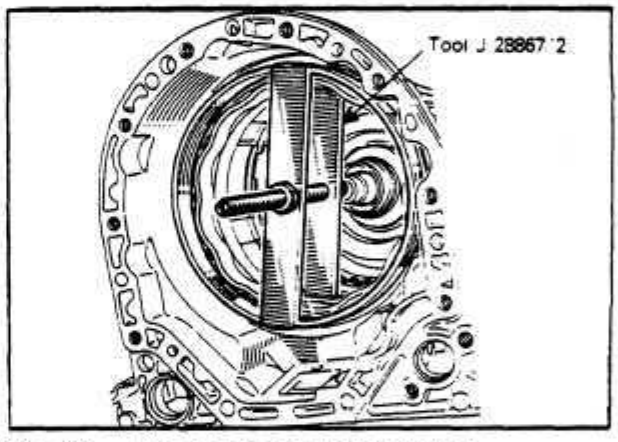


Fig. 44 **BRAKE B-2 PISTON REMOVAL**

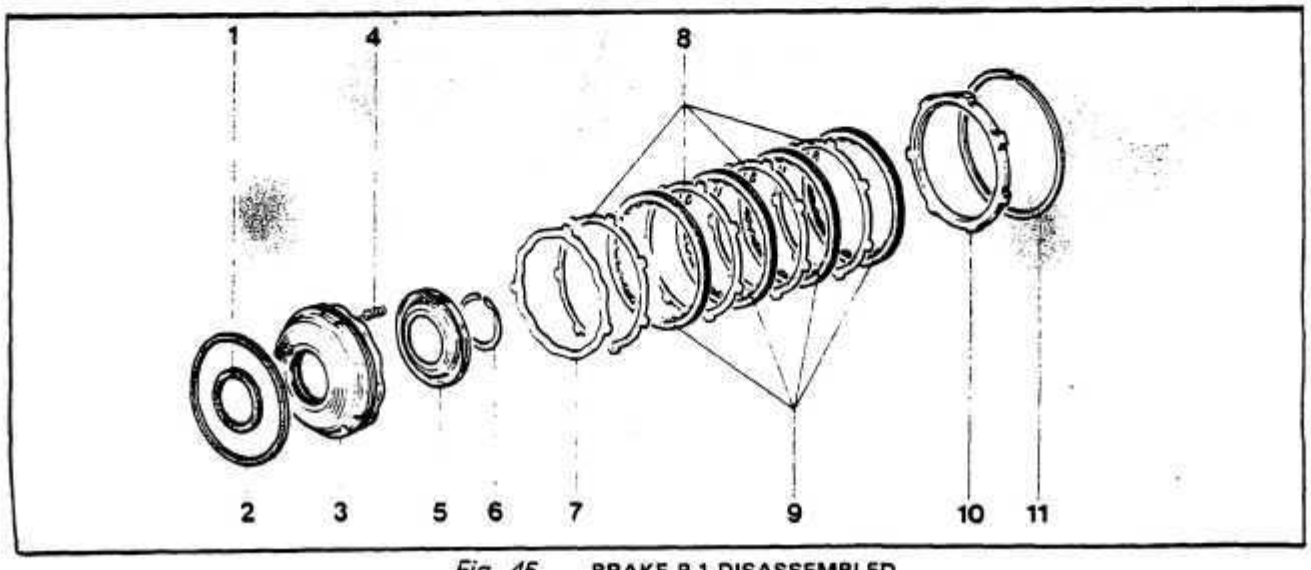


Fig. 45 **BRAKE B-1 DISASSEMBLED**

BRAKE B-1 — Fig. 45

1 – Piston Seal (Square Section/Inner)
2 – Piston Seal (Square Section/Outer)
3 – Piston
4 – Return Springs
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (3)
9 – Lined Discs (3)
10 – Pressure Plate
11 – Lock Ring

Disassembly

1. Remove Brake B-2 piston as outlined in the previous section.

2. Remove the lock ring, pressure plate, and discs from the transmission case. *Fig. 46*

3. Remove the two (2) sealing rings from the hub in the bottom of the case.

Notice:
The rings have locking ends that are released by pushing on the ring on the opposite side of the lock and depressing one side of the lock at the same time. After the lock is released, expand the ring with snap ring pliers and remove. *Fig. 47*

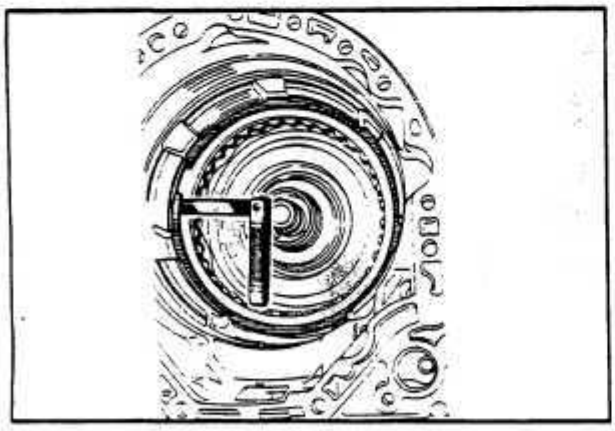


Fig. 46 BRAKE B-1 DISC PACK

4. Remove the washer, roller thrust bearing and adjustment shims from the hub in the bottom of the case.

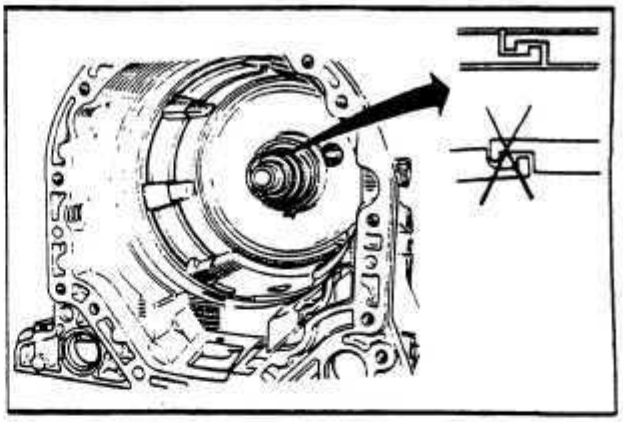


Fig. 47 TRANSMISSION CASE HUB SEAL

5. Compress the B1 piston return springs with the special tool J 28867/1 (part of the A T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 48*

6. Remove the special tool and remove the spring retaining plate and coil springs.

7. Remove the piston from the case and remove the piston seals.

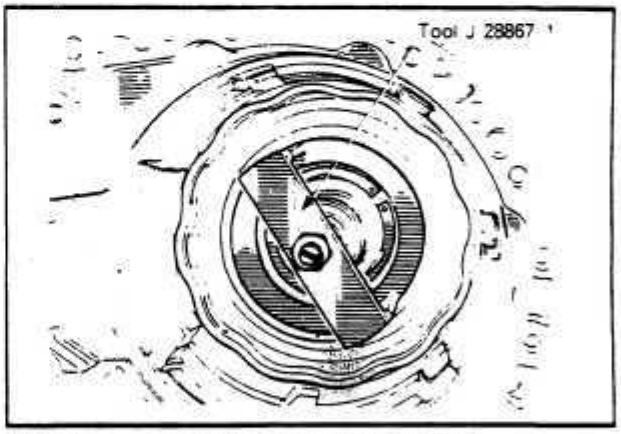


Fig. 48 BRAKE B-1 PISTON REMOVAL

Reassembly

Clean all parts and inspect for damage or scoring.

1. Lubricate the two (2) square section seals with transmission fluid and fit them to the piston. *Fig. 49*

2. Lubricate the inside of the case with transmission fluid. Position a strip of thin plastic sheet in the transmission case to prevent damage to the outer piston seal *when* installing the piston.

3. Lubricate the piston with transmission fluid and insert the piston into the case aligning the locating boss on the piston with the hole in the transmission case. *Fig. 49*

4. Remove the plastic sheet and ensure that the piston is properly seated.

5. Fit the return springs and spring retaining plate on the piston.

6. Position the lock ring on top of the hub and install the special spring compressing tool. Compress the springs and install the lock ring. *Fig. 48*

7. Remove the spring compressor tool and fit the end play adjustment shims on the hub.

Notice:
DO NOT install the two (2) sealing rings on the hub until the transmission end play has been adjusted. (Part of the transmission reassembly procedure.)

8. Lubricate the needle thrust bearing with transmission fluid and fit the bearing on the hub with the needles facing upwards.

9. Fit the washer on top of the needle bearing.

10. Fit the wave disc on the B-1 piston. *Fig. 45*

11. Lubricate the new discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc, and so on. *Fig. 45*

Notice:
There should be three (3) steel and three (3) lined discs.

12. Fit the pressure plate on top of the last lined disc and install the lock ring. *Fig. 46*

13. Check the disc pack clearance using a feeler gauge. The clearance should be 1.05 – 2.85 mm (.014 – .112 in.). *Fig. 50*

Notice:
If the clearance is incorrect, recheck the assembly procedure as this clearance cannot be adjusted.

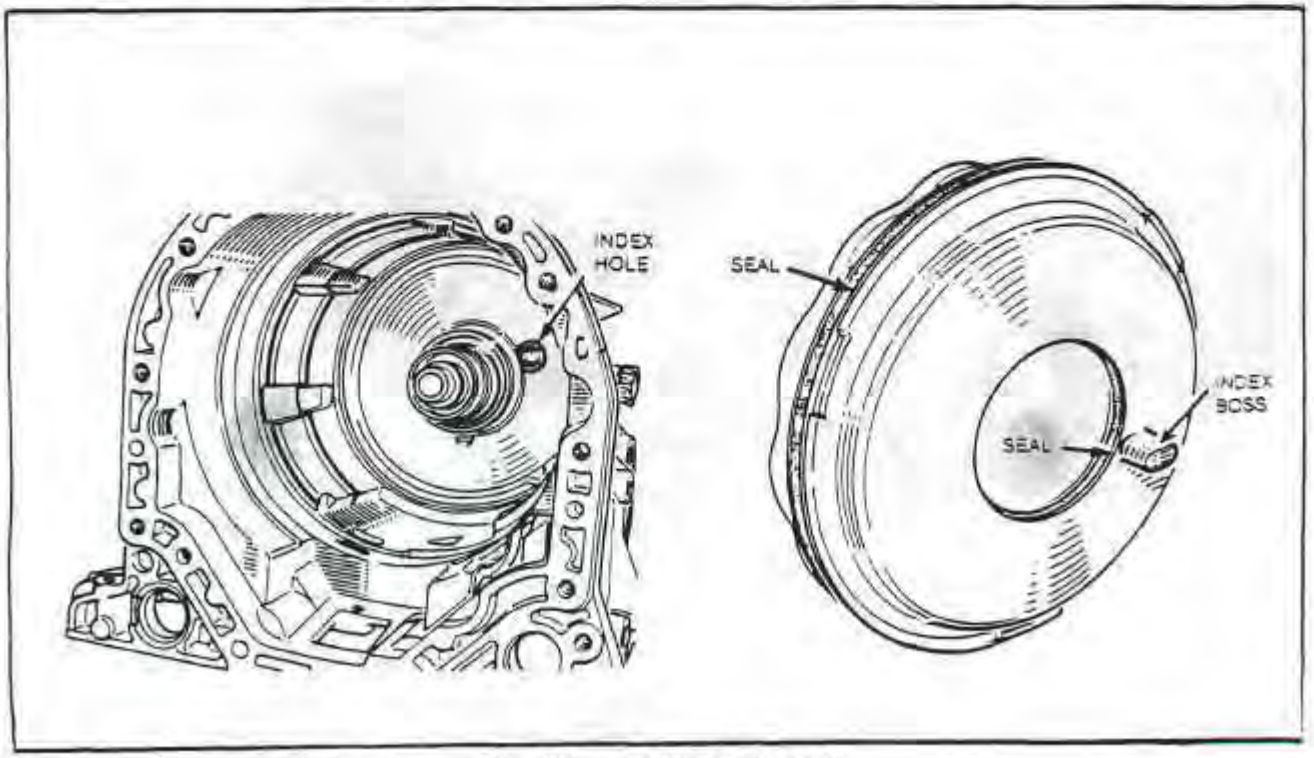


Fig. 49 BRAKE B-1 PISTON

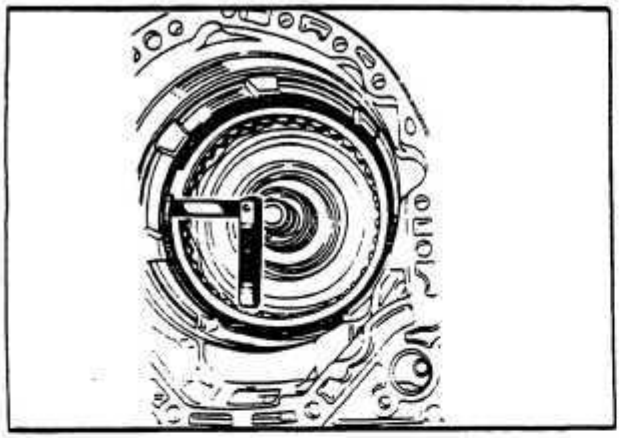


Fig. 50 BRAKE B-1 DISC PACK

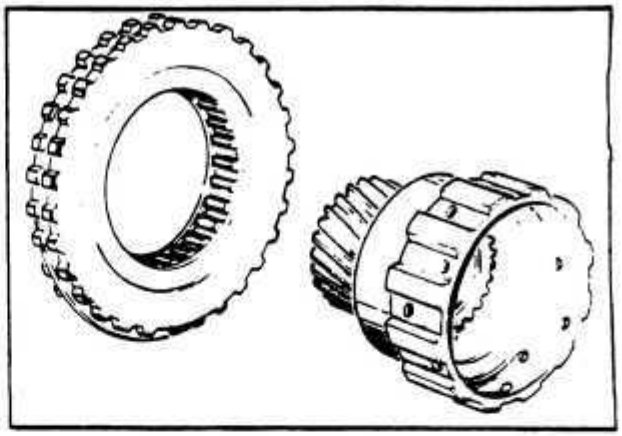


Fig. 52 INPUT GEAR ROLLER CLUTCH ASSEMBLY

ROLLER CLUTCH

The roller clutch is part of the clutch C1 assembly and must be removed from the assembly for repair.

Disassembly

1. Remove the turbine shaft from the clutch C1 by using a brass drift and hammer to free the shaft from the retaining clip.

2. Remove the roller clutch assembly from the clutch C1 housing as follows:

   Install the special tool J 29351 (part of the A/T Tool Kit) on the clutch housing aligning the depressing screws with the holes in the clutch housing. Tighten the screws evenly until the lock ring is released and pull the assembly free from the housing. *Fig. 51*

3. Separate the input gear hub from the roller clutch and outer hub assembly. *Fig. 52*

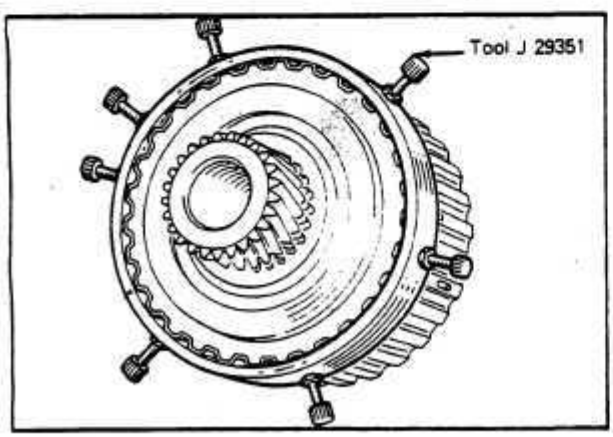


Fig. 51 CLUTCH C-1

4. Remove the upper thrust sleeve, roller clutch, and lower thrust sleeve from the outer hub. *Fig. 53*

Reassembly

Clean and inspect roller clutch parts for any damage or scoring.

1. Fit the lower thrust sleeve in the outer hub. *Fig. 53*

2. Lubricate the roller clutch with transmission fluid and install in the hub with the shoulder on the clutch to the outside of the outer hub. *Fig. 53*

3. Fit the upper thrust sleeve on the clutch and install the input gear hub.

4. Check the operation of the roller clutch. When holding the outer hub, the sun gear on the input gear hub must be free to rotate clockwise and lock itself when an attempt is made to turn it counter-clockwise. *Fig. 54*

5. Fit the roller clutch assembly in the clutch C1 housing. Depress the lock ring and insert the assembly until it is fully seated and the lock ring is in position.

Notice:
Do not fit the turbine shaft to the clutch C1 as it will have to be removed for transmission reassembly adjustments.

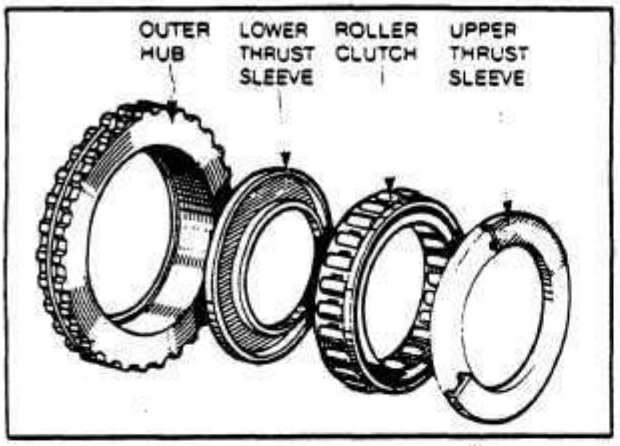


Fig. 53 ROLLER CLUTCH DISASSEMBLED

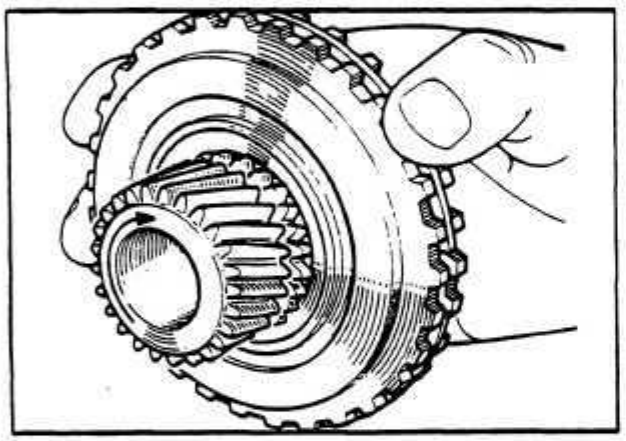


Fig. 54 ROLLER CLUTCH OPERATION

CLUTCH C-1 — Fig. 55

1 – Piston Seal (Lip-Type/Outer)
2 – Piston Seal (Square Section/Inner)
3 – Piston
4 – Return Springs
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (5)
9 – Lined Discs
10 – Input Gear Hub
11 – Outer Hub
12 – Inner Thrust Sleeve
13 – Roller Clutch
14 – Outer Thrust Sleeve
15 – Needle Thrust Bearing
16 – Clutch Housing

Disassembly

1. Remove the roller clutch assembly. (See ROLLER CLUTCH in component repair section for procedures.)

2. Remove the steel and lined clutch discs (5 steel, 4 lined).

3. Remove the needle thrust bearing.

4. Compress the piston return springs using the special tool J 28867/2 (part of the A/T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 56*

5. After removing the special tool, remove the spring retaining plate and coil springs.

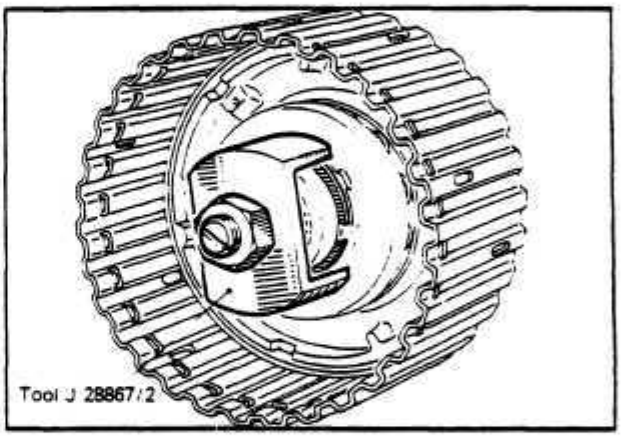


Fig. 56 C-1 PISTON REMOVAL

6. Remove the piston from the clutch housing. Remove the inner and outer seals from the piston. *Fig. 57*

7. Remove the external sealing ring from the clutch housing by compressing one side of the locking tab to release the lock. *Fig. 59*

Reassembly

Clean and inspect all parts for damage or scoring.

1. Lubricate the new piston seals with clean transmission fluid.

   Fit the square section seal inside the piston and lip-type seal on the outside of the piston with the lip facing the bottom. *Fig. 57*

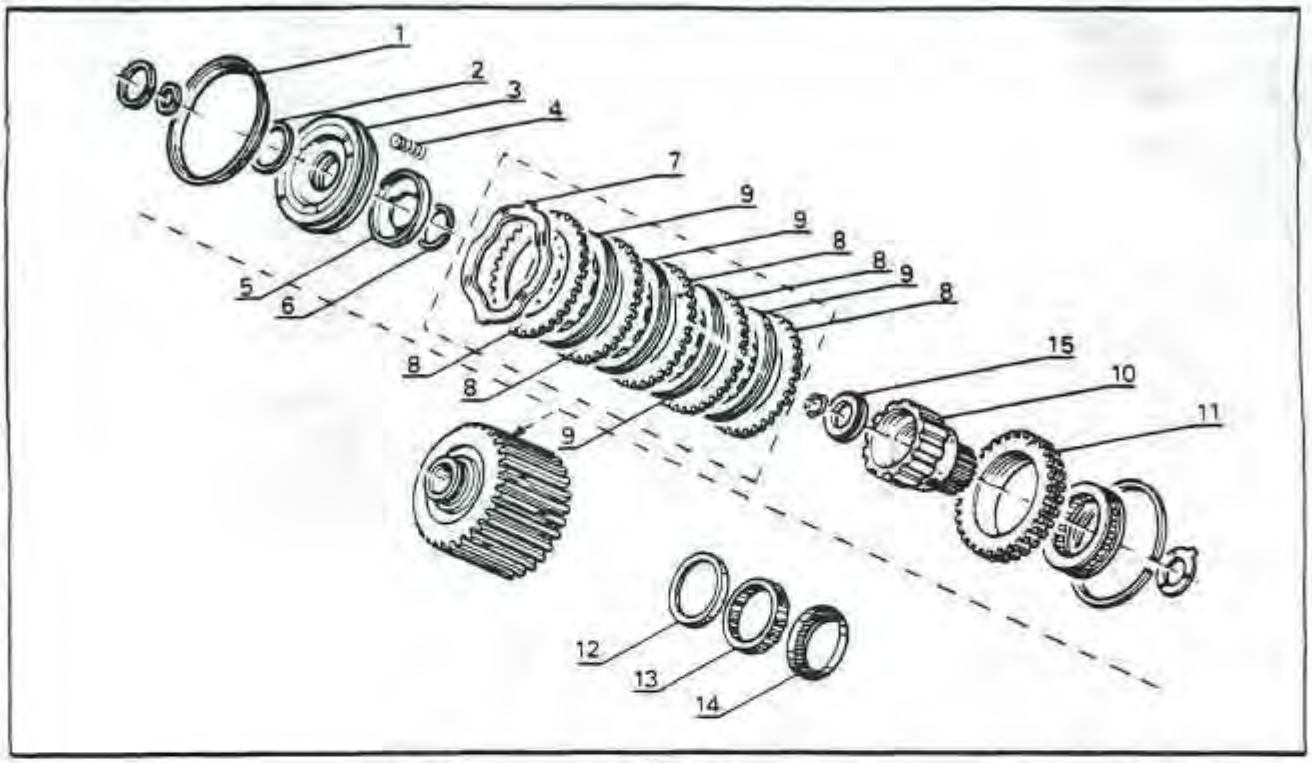


Fig. 55 CLUTCH C-1 DISASSEMBLED

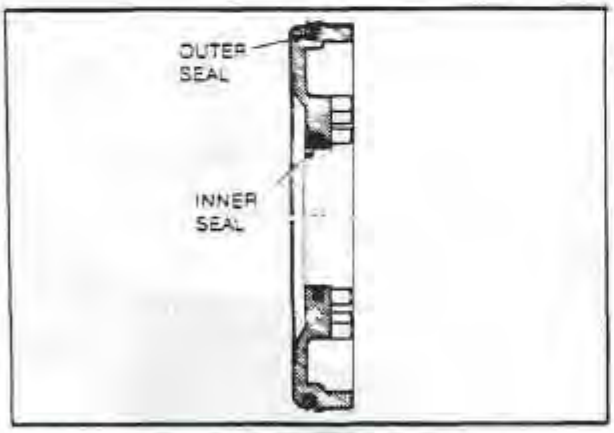


Fig. 57 C-1 PISTON SEALS

2. Check and ensure that the clutch depressurizing ball in the piston is clean and free to move in its seat.

3. Lubricate the inside of the clutch housing with transmission fluid and position a strip of thin plastic sheet in the clutch housing. Insert the piston into the housing and press into position by hand. *Fig. 58*

Remove the plastic sheet and rotate the piston to ensure that it is free and fully seated.

4. Fit the piston return springs, retaining plate, and lock ring on the piston.

5. Compress the retaining plate using the special tool and install the lock ring. Make sure that the three (3) lugs on the retaining plate are holding the lock ring in position when the tool is removed. *Fig. 56*

6. Fit the wave disc on the piston.

7. Lubricate the clutch discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc and so on (5 steel, 4 lined).

8. Lubricate the needle thrust bearing with transmission fluid and place the bearing on the hub with the needle facing up.

9. Insert the roller clutch assembly into the clutch housing until the lock ring is locked in its groove.

10. Fit the new external sealing ring to the clutch housing hub. Ensure that the ring locks are properly fastened. *Fig. 59*

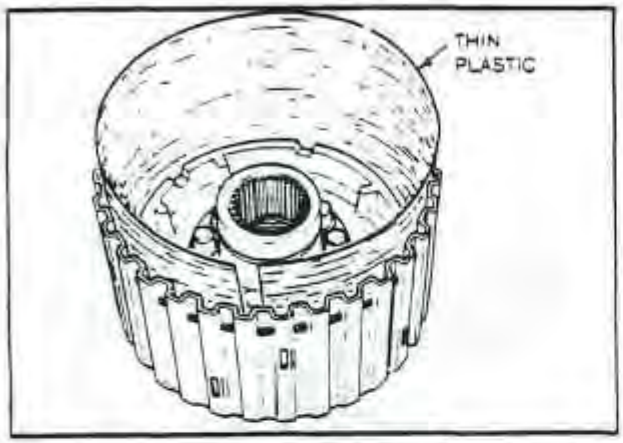


Fig. 58 C-1 PISTON INSTALLATION

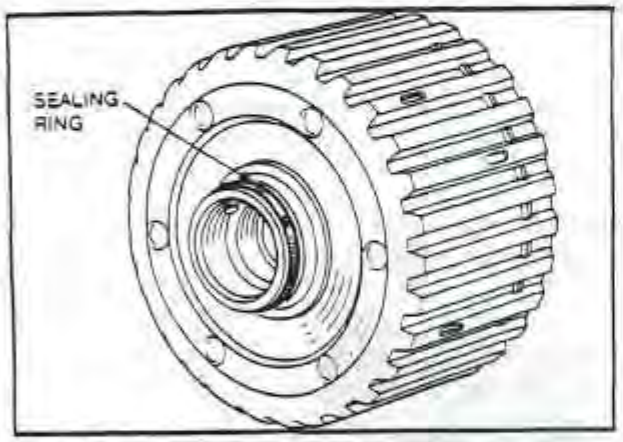


Fig. 59 CLUTCH C-1 HUB SEAL

Notice:
Do not fit the turbine shaft to the clutch C1 as it will have to be removed for transmission re-assembly adjustments.

CLUTCH C-2 — Fig. 60

1 – Piston Seal (Lip-Type/Outer)
2 – Piston
3 – Clutch Housing Hub Seal
4 – Return Springs
5 – Spring Retaining Plate
6 – Lock Ring
7 – Wave Disc
8 – Steel Discs (5)
9 – Lined Discs (4)
10 – Distance Sleeve
11 – Lock Ring
12 – Ring Gear
13 – Lock Ring

Disassembly

1. Remove the lock ring and the ring gear from the clutch housing. *Fig. 61*

2. Remove the lock ring and distance sleeve. *Fig. 62*

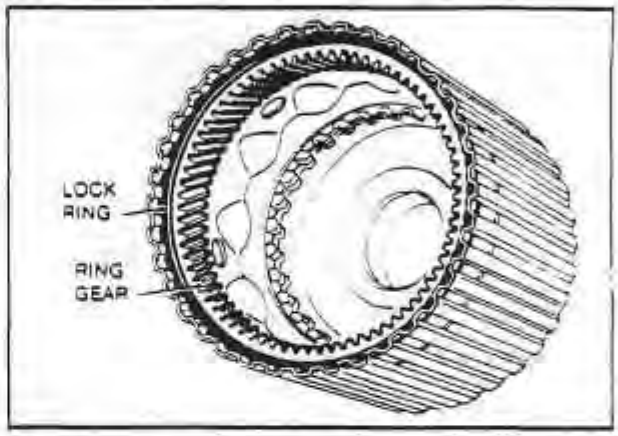


Fig. 61 C-2 RING GEAR

3. Remove the steel and lined clutch discs from the housing.

4. Compress the piston return springs using the special tool J 28867/1 (part of the A/T Tool Kit) and remove the lock ring securing the spring retaining plate. *Fig. 63*

5. After removing the special tool, remove the spring retaining plate and the coil springs.

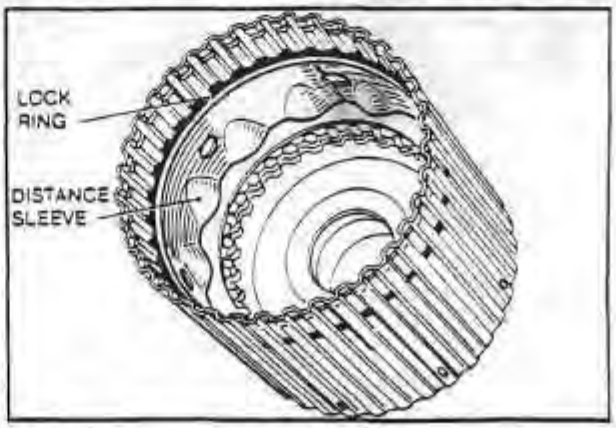


Fig. 62 C-2 DISTANCE SLEEVE

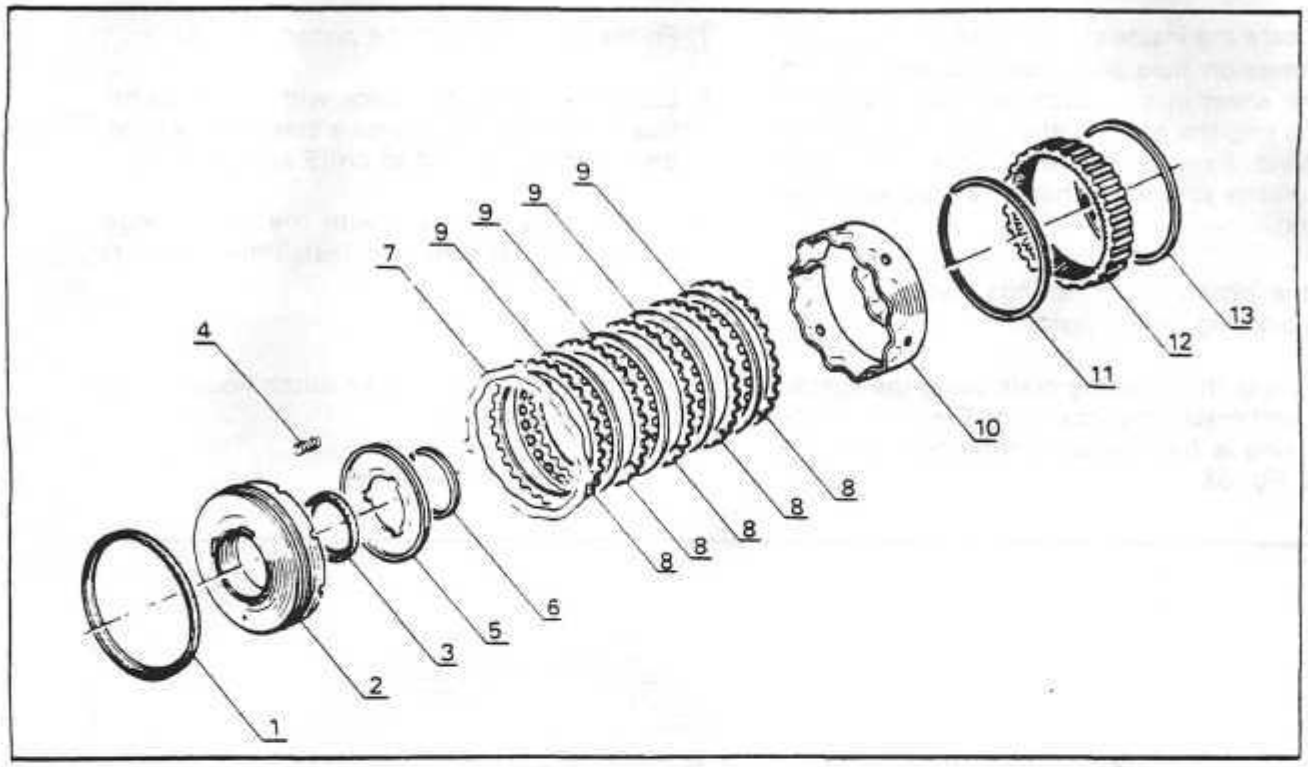


Fig. 60 CLUTCH C-2 DISASSEMBLED

6. Remove the piston from the clutch housing.
7. Remove the seal from the piston. *Fig. 64*
8. Remove the seal from the clutch housing using a hooked tool. *Fig. 65*

Reassembly

Clean and inspect all parts for damage or scoring.

1. Lubricate the new piston with transmission fluid and fit on the piston with the lip on the seal facing the bottom of the piston. *Fig. 64*
2. Check and ensure that the clutch depressurizing ball in the piston is clean and free to move in its seat.
3. Lubricate the new clutch housing hub seal with transmission fluid and install on the hub with the lip facing the bottom of the housing.

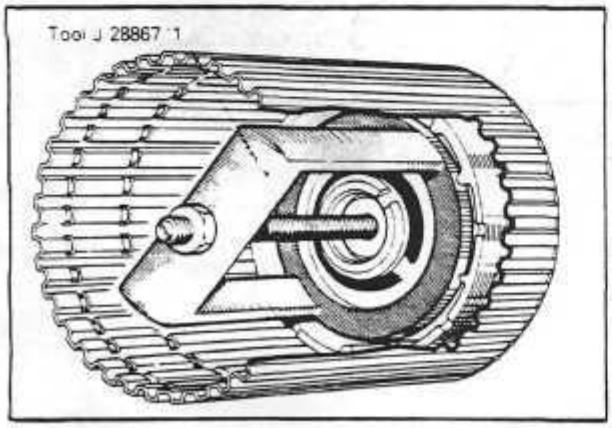


Fig. 63 C-2 PISTON REMOVAL

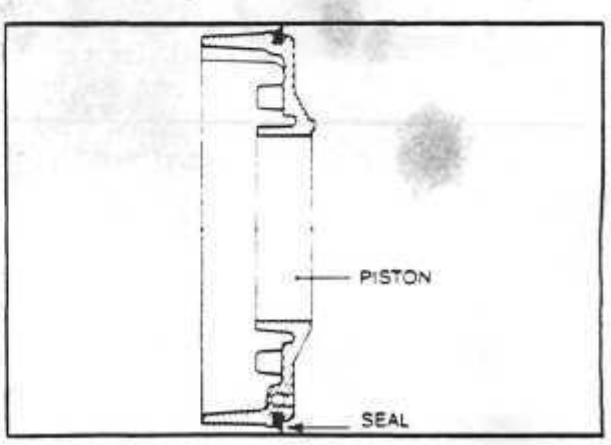


Fig. 64 C-2 PISTON SEAL

4. Lubricate the inside of the clutch housing with transmission fluid and position a strip of thin plastic sheet in the clutch housing. Insert the piston into the housing and press into position by hand. Remove the plastic sheet and rotate the piston to ensure that it is free and fully seated.

5. Fit the piston return springs, retaining plate and lock ring on the piston.

6. Compress the retaining plate using the special tool and install the lock ring. Ensure that the lock ring is fully seated before removing the tool. *Fig. 63*

7. Fit the wave plate on the piston. *Fig. 60*

8. Lubricate the clutch discs with transmission fluid and alternately install a steel disc, a lined disc, a steel disc and so on (5 steel, 4 lined).

9. Fit the distance sleeve with the waved edge against the last steel disc. Install the lock ring.

Notice:

10. Insert the ring gear into the clutch housing and install the lock ring.

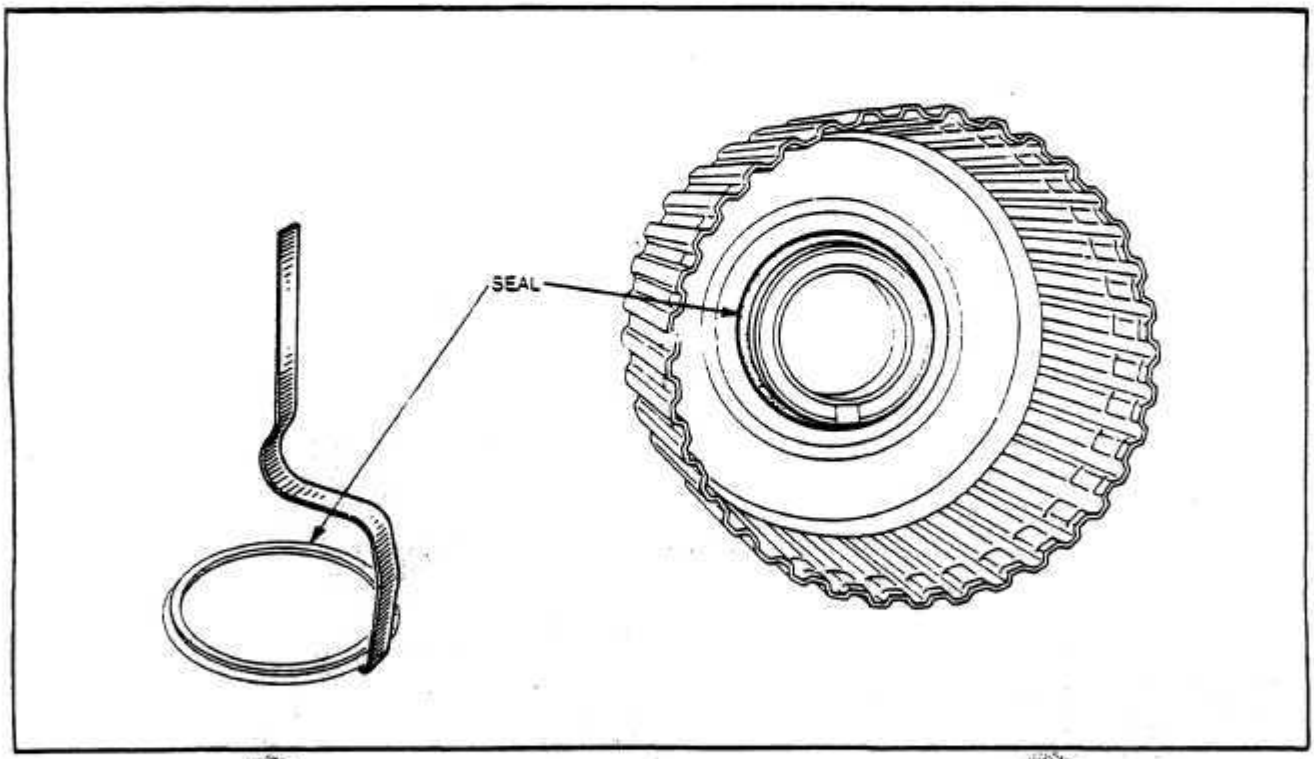


Fig. 65 CLUTCH C-2 HOUSING SEAL

FINAL DRIVE UNIT

FINAL DRIVE DISASSEMBLY

Notice:
Perform the transmission/final drive unit separation procedure before starting with final drive assembly.

1. Remove the governor computer and drive gear from the case.
2. Remove the torque converter housing. *Fig. 66*
3. Remove the bolts securing the planetary gear carrier housing to the case and remove the carrier assembly and gasket. *Fig. 67*
4. Fasten special Tool J28868 to the final drive case to lock the pinion gear in place. Loosen the pinion gear nut. *Fig. 68*

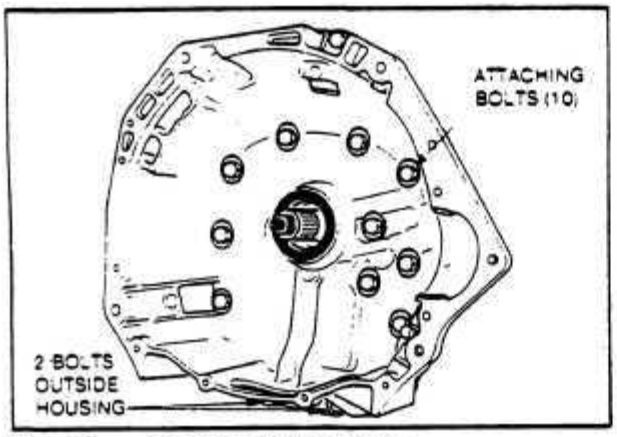


Fig. 66 **CONVERTER HOUSING**

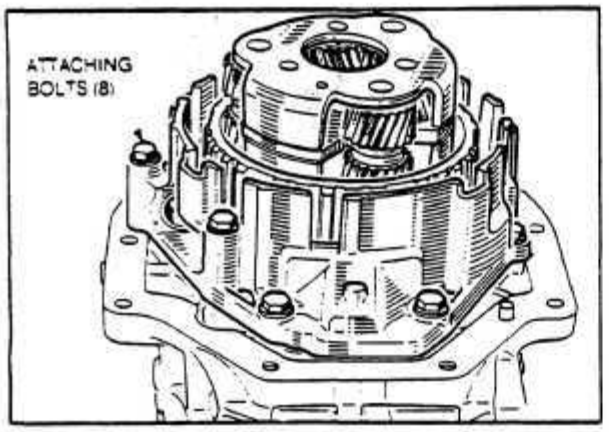


Fig. 67 **PLANETARY GEAR HOUSING**

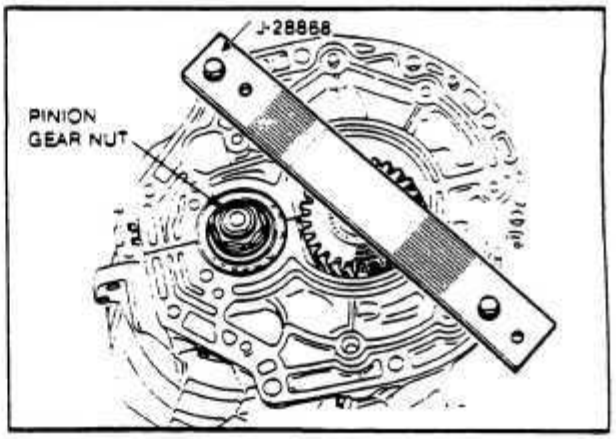


Fig. 68 **PINION GEAR NUT REMOVAL**

5. Remove the half-casing assembly bolts. With the final drive positioned as shown, remove the upper half-case. *Fig. 69*

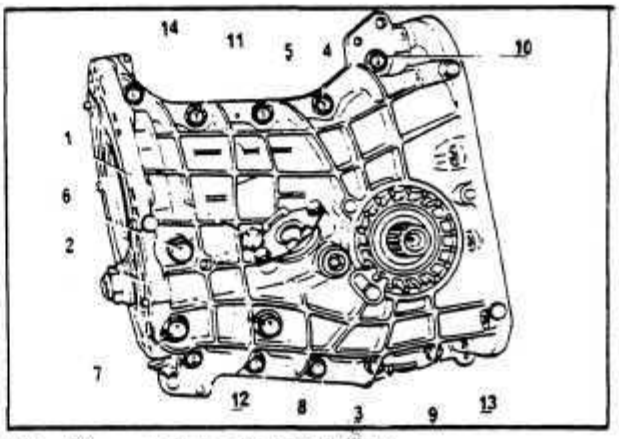


Fig. 69 **HALF CASING BOLTS**

Notice:
Do not use metal tools to pry apart the case.

6. Remove the pinion gear assembly, converter shaft tube and seal, planetary shaft bearing and preload adjustment shims, and the differential carrier assembly. *Fig. 70*

Notice:
If repair of the individual components is required, refer to the Final Drive COMPONENT REPAIR section for further dismantling procedures.

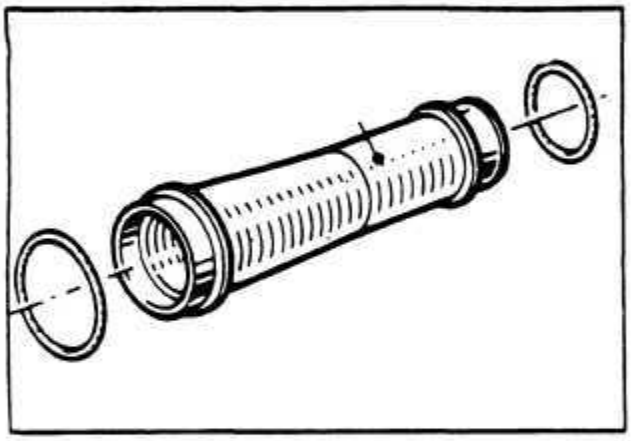


Fig. 70 CONVERTER SHAFT TUBE

FINAL DRIVE COMPONENT REPAIR

Planetary Gear Carrier — Fig. 71

1 – Nut
2 – Shim Set (Planetary Carrier Height)
3 – Roller Bearing
4 – Output Gear
5 – Lip Seal
6 – Spacer Sleeve
7 – Roller Bearing
8 – Shim Set (Bearing Pre-Load)
9 – Housing
10 – Spacer
11 – Needle Bearing
11 – Park Socket
12 – Needle Bearing
13 – Washer
14 – Brake Hub
15 – Planetary Gear Set
16 – Thrust Washer

Disassembly

1. Remove the carrier shaft locknut.
2. Remove the roller bearing and output gear using a suitable puller. *Fig. 71*
3. Remove the spacer sleeve No. 6 from the carrier shaft and separate the planetary carrier from the housing. *Fig. 71*
4. Remove the spacer No. 10 and park sprocket No. 11 from the carrier shaft. *Fig. 71*
5. Remove the needle bearing No. 12 and washer No. 13 from the carrier shaft. *Fig. 71*
6. Remove the brake hub No. 14 and thrust washer No. 16 from the carrier shaft. *Fig. 71*
7. Remove the seal No. 5 and roller bearing No. 7 from the housing. *Fig. 71*

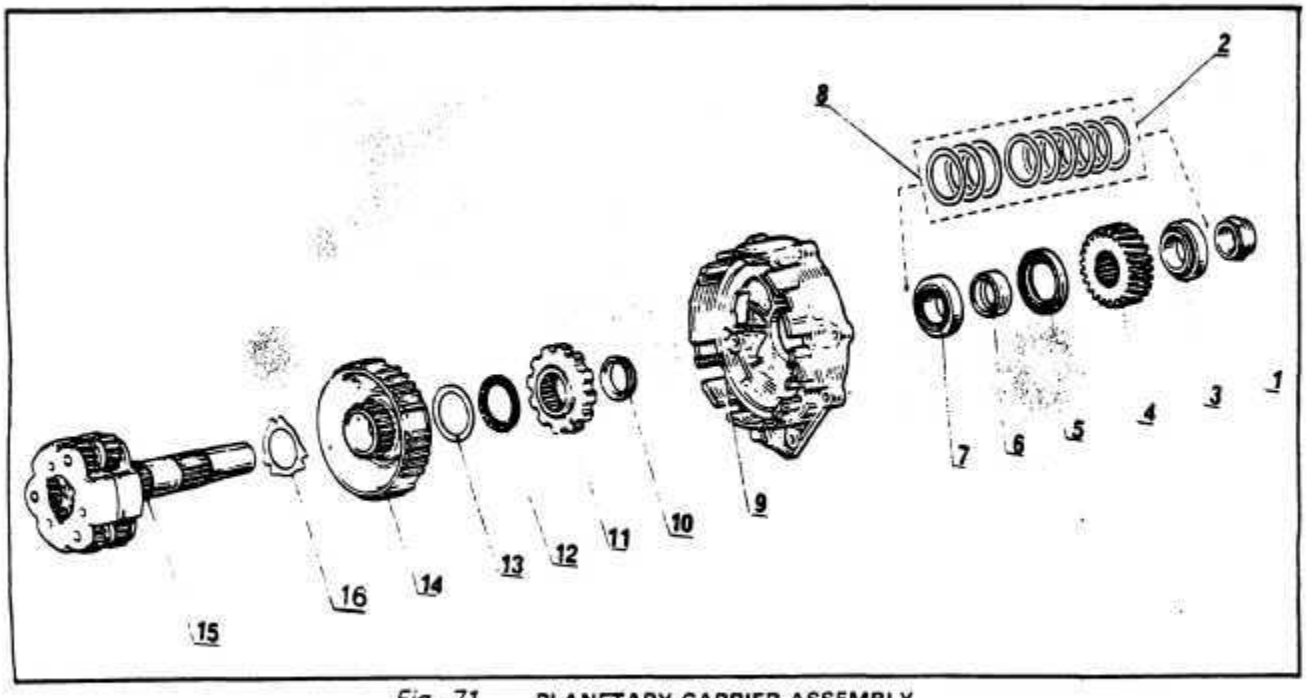


Fig. 71 PLANETARY CARRIER ASSEMBLY

8. Remove the outer bearing race and planetary carrier shims from the housing using a brass drift. Retain the shims for reassembly. *Fig. 72*

9. Remove the parking pawl by releasing the retracting spring and remove the pivot pin.

Reassembly

1. Lubricate the thrust washer No. 16 with automatic transmission fluid and install on the carrier shaft. *Fig. 71*

2. Install the brake Hub No. 14 on the carrier shaft. *Fig. 71*

3. Lubricate the needle bearing with automatic transmission fluid and install the washer and needle bearing on the carrier shaft.

Notice:
Place the needle bearing on top of the washer with the needles facing the washer.

4. Install the park sprocket on the carrier shaft with its diameter flange facing the bearing.

5. Install the spacer No. 10 on the carrier shaft with its larger diameter facing the park sprocket. *Fig. 71*

6. Fit the parking pawl in the housing and install the pivot pin. Attach the retracting spring to the pawl.

7. Fit the bearing race planetary carrier clearance shims (removed during disassembly) and the bearing outer race in the housing. Ensure that the race is fully seated. *Fig. 72*

8. Install the planetary gear carrier in the housing.

Notice:

Do not install the lip seal in the housing at this time.

9. Install the roller bearing and spacer sleeve on the carrier shaft.

10. Install the output gear on the carrier shaft WITH THE GROOVE IN THE GEAR FACING UPWARD.

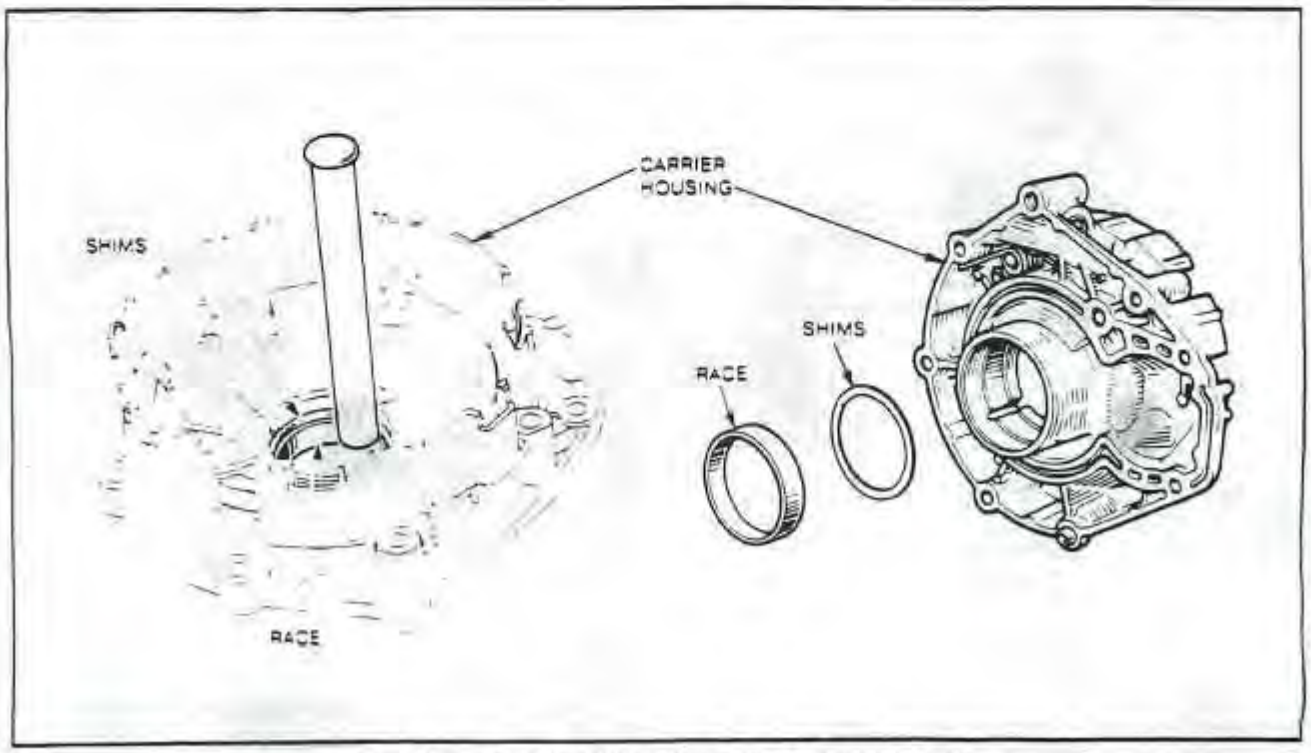


Fig. 72 PLANETARY CARRIER CLEARANCE SHIMS

11. Install the roller bearing and new lock nut on the carrier shaft. Torque tighten the nut but do not lock (peen) the nut to the shaft (see torque specifications).

12. Perform the planetary gear carrier height adjustment as follows:

    a. Reassemble the final drive half-cases leaving the differential ring and pinion assembly out of the case. Torque tighten case bolts (see torque specifications).

    b. Fit the pre-load shims in the case and install the carrier bearing race using a brass drift.

    c. Lubricate both planetary carrier bearings with gear oil and install the carrier assembly in the final drive case using a new gasket. Torque tighten the bolts (see torque specifications).

    d. Clean the contact face of the final drive case and ensure that the thrust washer has been removed from the top of the planetary carrier shaft.

    e. Position the special measuring tool J 28867/3 (part of the A/T Tool Kit) on the final drive case.

Use a depth gauge to measure the distance from the top face of the special tool to the top of the planetary carrier shaft (with thrust washer removed). *Fig. 73*

    f. Subtract the measurement from 120 mm (4.724 in.) to obtain dimension "A". *Fig. 73*

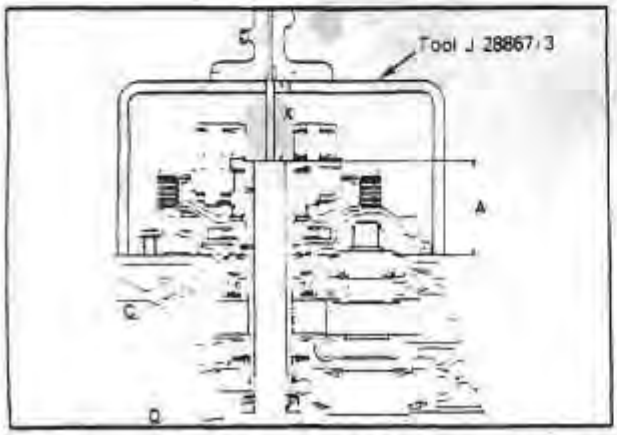


Fig. 73 PLANETARY CARRIER TO FINAL DRIVE CASE MEASUREMENT

13. Perform the planetary gear carrier bearing pre-load adjustment as follows:

    a. Install the planetary carrier and gasket in the final drive case. Torque tighten the bolts (see torque specifications).

    b. Wrap a piece of string around the planetary gear carrier and pull with a spring scale to measure the bearing pre-load. *Fig. 74*

Take the measurement while the carrier is rotating. The bearing pre-load should be:

New Bearings: 5 – 12 Nm (1 – 3 lb. ft.)
Used Bearings: Turn free without play

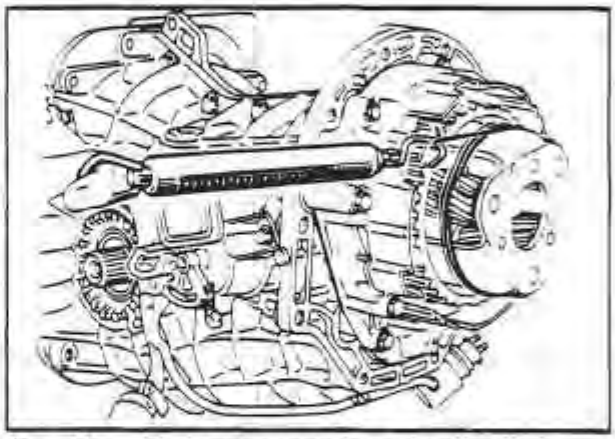


Fig. 74 BEARING PRE-LOAD ADJUSTMENT

Notice:

Perform steps "c" and "d" if the bearing pre-load is NOT WITHIN specification:

    c. Remove the planetary gear carrier from the case.

    d. Remove the planetary gear carrier bearing outer race from the final drive case and adjust the thickness of the shim pack to obtain the proper bearing pre-load. Re-install planetary gear carrier and check adjustment.

    e. After pre-load is checked and adjusted, remove the planetary gear carrier, separate the final drive case, and reassemble the final drive (see FINAL DRIVE RE-ASSEMBLY section for procedures).

Notice:
If the differential adjusting nuts were not moved and the pinion gear assembly was not disassembled, the differential adjustments will not have to be performed during final drive reassembly.

Example:

120.00 mm	Set Value
– 46.48 mm	Distance Measurement X
73.52 mm	Dimension A

f. The final dimension should be as near as possible to 73.6 mm (2.898 in.). If it is not close to 73.6 mm, the thickness of the shim pack under the bearing race C *Fig. 73* in the planetary housing will have to be increased or decreased.

g. Remove and disassemble the planetary gear carrier assembly.

h. Remove the bearing race from the planetary gear carrier housing and adjust the shim pack to obtain the proper final dimension measurement.

i. Install the bearing race using a brass drift. Fit the roller bearing in the race and install the new lip-seal.

j. Reassemble the planetary gear carrier and torque tighten the lock nut. Lock (peen) the nut to the shaft (see torque specifications).

DIFFERENTIAL PINION GEAR — Fig. 75

1 – Roller Bearing (Inner)
2 – Governor Drive Gear
3 – Secondary Gear
4 – Spacer
5 – Roller Bearing (Outer)
6 – Nut

Disassembly

1. Remove the nut, roller bearing, and spacer from the pinion gear.
2. Remove the secondary gear and governor drive gear.
3. Remove the inner pinion bearing from the shaft using a hydraulic press.

Reassembly

Notice:
The ring and pinion gears are not serviced separately. If one part is damaged, they must be replaced as a set.

1. Press the inner pinion bearing onto the pinion gear shaft.
2. Install the governor drive gear.
3. Install the secondary gear with the flat face of the gear towards the head of the pinion gear.
4. Install the spacer with the larger diameter end facing the secondary gear.
5. Install the outer pinion bearing and nut.

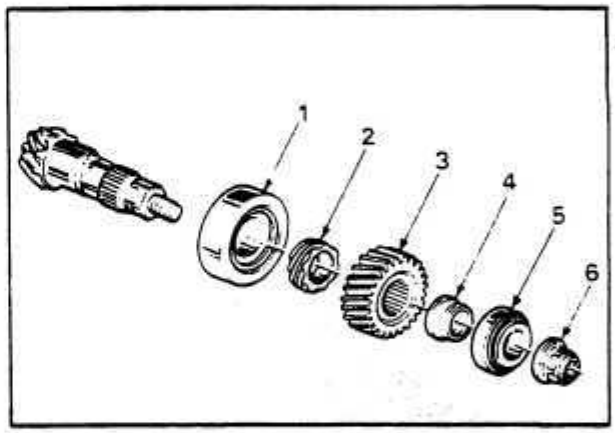


Fig. 75 FINAL DRIVE PINION ASSEMBLY

Notice:
Do not tighten the nut at this time.

Notice:
Pinion gear adjustments will be performed in the Final Drive REASSEMBLY section.

DIFFERENTIAL CARRIER — Fig. 76

1 – Carrier
2 – Carrier Bearing
3 – "O" Ring Seal
4 – Concave Washer
5 – Spider Gear
6 – Shaft
7 – Pin

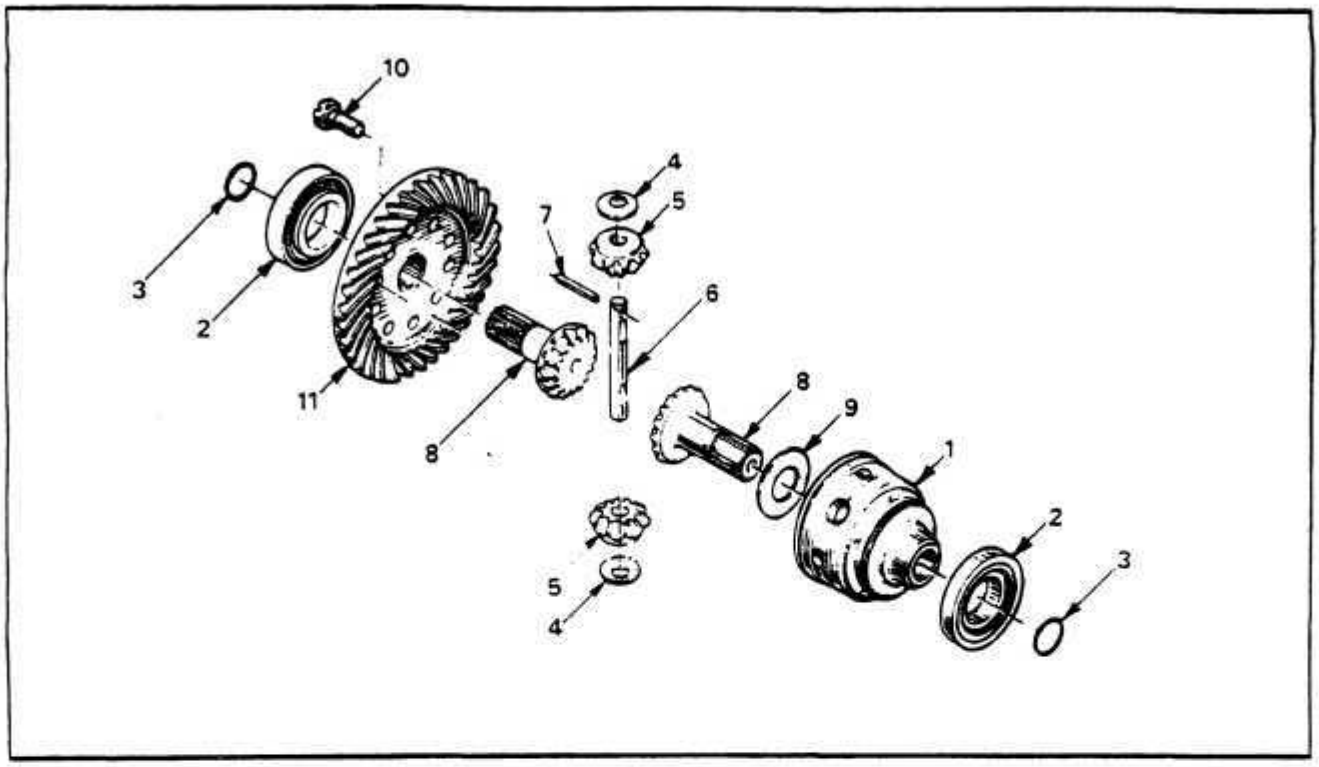


Fig. 76 FINAL DRIVE ASSEMBLY EXPLODED

8 – Side Gear
9 – Thrust Washer
10 – Bolt
11 – Ring Gear

Disassembly

1. Remove both "O" ring seals from the side gear shifts.
2. Remove the carrier bearing on the ring gear side using a suitable puller. *Fig. 77*

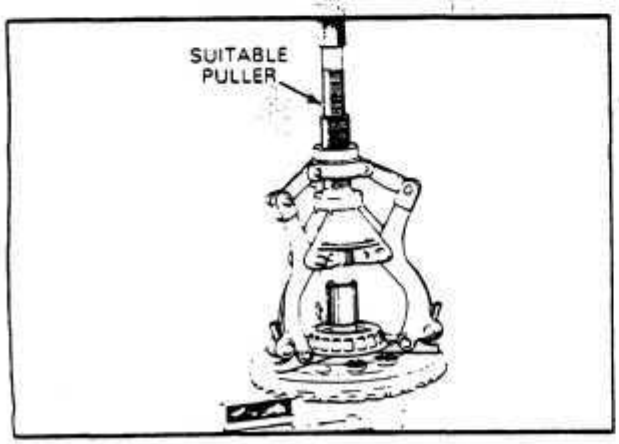


Fig. 77 CARRIER BEARING

Notice:
Remove some of the ring gear bolts if necessary to install the puller.

3. Remove the ring gear and side gear from the carrier.
4. Remove the lock pin from the spider gear shaft.
5. Remove the spider gear shaft, both spider gears, and both concave washers.
6. Remove the side gear and thrust washer from the carrier.
7. Remove the carrier bearing using a press.
8. Remove the lock plates securing the differential adjusting nuts to the final drive half-cases. Remove the adjusting nuts using Tool J28866. *Fig. 78*
9. Remove the "O" ring seals and lip seals from the adjusting nuts.
10. Remove the outer bearing races from both half-cases using a brass drift.

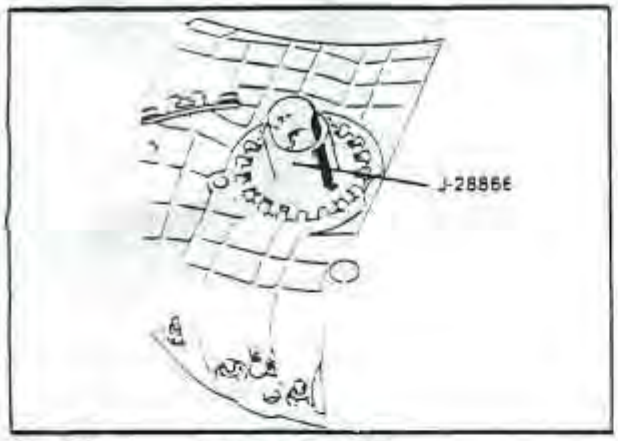


Fig. 78 SIDE GEAR TOOL

Reassembly

Clean and inspect all parts for damage or scoring.

1. Lubricate the thrust washer with gear oil and place on the side gear with the lubricating groove in the washer facing the gear.
2. Install the side gear with the thrust washer in the carrier.
3. Lubricate the concave washers and place the washers and spider gears in the carrier.
4. Lubricate the spider gear shaft and insert in the carrier aligning the pin hole in the shaft with the hole in the carrier.
5. Insert the spider gear shaft lock pin in the carrier hole to secure the shaft.
6. Lubricate the side gear and position the gear in the carrier.
7. Install the ring gear using new bolts and torque tighten the bolts (see torque specifications).
8. Install both carrier bearings using a press.
9. Fit the "O" ring seals on both side gear shafts.
10. Install the carrier bearing races in the half-cases. Drive the race into the case until it is slightly recessed.
11. Install new "O" ring seals and lip seals on the differential adjusting nuts.
12. Lubricate the seals and screw the adjusting nuts into the half-cases until they contact the bearing races.

Notice:
Carrier adjustments will be performed in the FINAL DRIVE REASSEMBLY section.

FINAL DRIVE REASSEMBLY

Notice:
If the planetary gear carrier was disassembled for repair, ensure that the bearing pre-load and carrier height adjustments are performed before re-assembly of the final drive. See FINAL DRIVE COMPONENT REPAIR section for adjustment procedures.

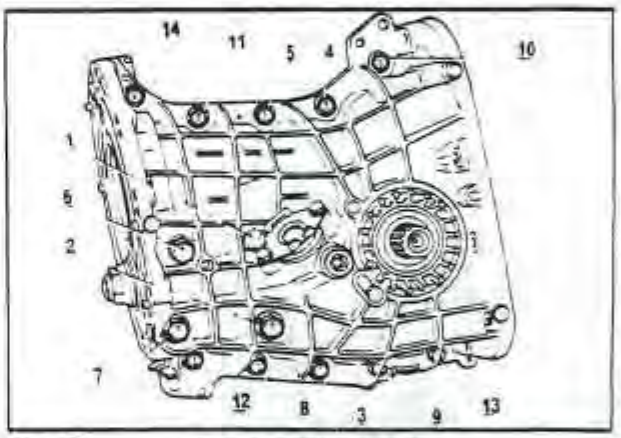


Fig. 79 HALF-CASING BOLTS

1. Adjust the pinion bearing pre-load as follows:
   a. Clean the final drive half-cases and their mating surfaces. Lubricate the pinion bearings with gear oil and fit the pinion gear assembly in the half-case.
   b. Assemble the half-cases and torque tighten the case bolts in the sequence shown. *Fig. 79*
   c. Lock the pinion gear with Tool J28868 and torque the pinion nut (see torque specifications). DO NOT lock (peen) the nut at this stage.
   d. Remove the pinion lock tool and attach the measuring tool (part of the A. T Tool Kit) to the pinion nut. *Fig. 80*

Wrap a piece of string around the tool J 28867/5 and measure the pre-load by pulling the string with a spring scale. Take the reading while the pinion gear is rotating.

New Bearings: 20 – 35 Nm (4.5 – 7 lb./ft.)
Used Bearings: Turn freely without play.

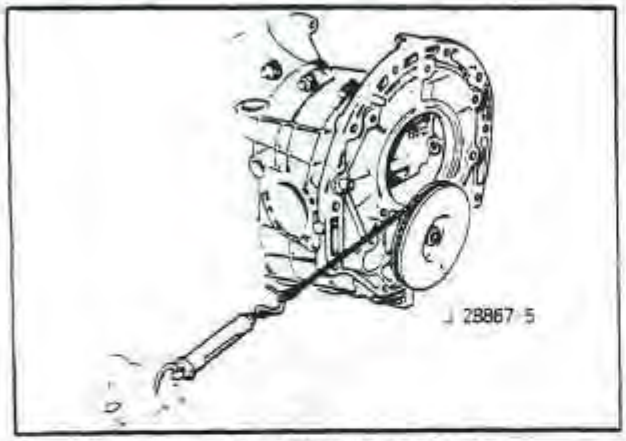


Fig. 80 **PINION BEARING PRE-LOAD**

e. If the reading is not within specifications, adjust the pre-load by loosening the pinion nut, remove the pinion gear assembly from the case, and change the thickness of the adjusting sleeve. *Fig. 75*

Notice:
Decreasing the thickness of the sleeve between the secondary gear and the bearing will increase the pre-load.

f. Repeat the adjustment operation until the proper reading is obtained.

g. Loosen the pinion nut and remove the pinion gear assembly from the half-cases.

2. Adjust the differential carrier bearing pre-load as follows:

a. Remove the lock plates securing the differential adjusting nuts on both of the half-casings.

b. Unscrew both of the differential carrier adjusting nuts one complete turn.

c. Lubricate the differential carrier bearings with gear oil and fit the differential carrier assembly in the half-cases.

d. Assemble the half-casings and torque tighten the case bolts in the proper sequence *Fig. 79* (see torque specifications)

e. Tighten the differential carrier adjusting nut on the opposite side of the ring gear until all play is removed from the carrier bearings. Use Tool J28866 to turn the adjusting nut. *Fig. 78*

Notice:
This procedure is necessary to offset the differential carrier in the half-cases. If the differential carrier is not offset properly, a binding condition will occur between the ring gear and the pinion gear when the final drive is completely reassembled.

f. Wrap a piece of string around the differential carrier housing and measure the pre-load by pulling on the string with a spring scale. Take the reading while the carrier is rotating. *Fig. 81*

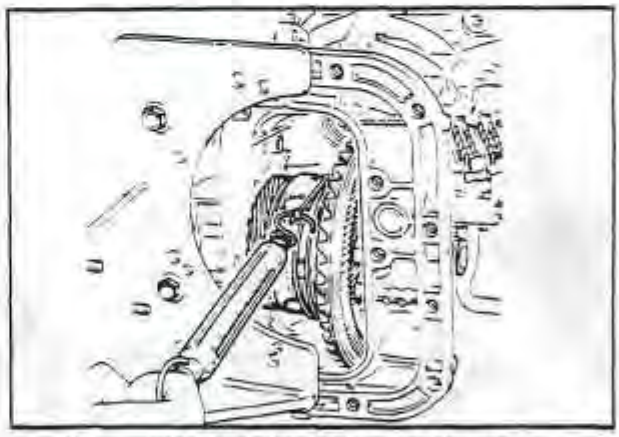


Fig. 81 **DIFFERENTIAL CARRIER PRE-LOAD**

New Bearings: 10 – 30 Nm (2.5 – 6.5 lb./ft.)
Used Bearings: Free turning without play.

g. Tighten either of the differential carrier adjusting nuts until the proper reading is obtained.

h. Mark the position of both adjusting nuts in relation to the half-casings after the final setting has been obtained.

i. Remove the case bolts and separate the half-cases.

3. Fit the pinion gear assembly in the half-case along with the differential carrier assembly.

Notice:
The carrier must be installed first and then the pinion gear is placed in the case.

4. Apply specified sealing compound to the half-case mating surfaces and assemble the cases. Torque tighten the case bolts in the proper sequence. *Fig. 79*

Notice:
Apply specified sealing compound on the 10 mm diameter case bolts.

5. Install Tool J28868 and torque tighten the pinion shaft nut (see torque specifications).

Lock the nut to the shaft by peening the end of the nut. Remove the pinion gear locking tool.

6. Fit the planetary gear carrier adjustment shims in the final drive case.

Notice:
Use the same shims that were removed if the planetary gear carrier was not disassembled for repair. If the carrier was repaired, use the shims that were specified in the adjustment procedure in the COMPONENT REPAIR section.

Install the bearing race using a brass drift. Ensure that the race is fully seated in the case.

7. Fit a new gasket and install the planetary gear carrier assembly in the case. Torque tighten the mounting bolts (see torque specifications).

8. Perform the ring/pinion gear backlash adjustment as follows:

Notice:
When performing the following adjustment, the differential adjusting nuts must be adjusted equally to maintain the proper carrier bearing pre-load.

a. Remove excessive backlash between the ring and pinion gears by loosening the adjusting nut on the carrier bearing opposite the ring gear, and tighten the other adjusting nut an equal amount. Use Tool J28866 to turn the adjusting nuts.

b. Attach a dial indicator to the final drive case and set the indicator tip on the outer edge of a ring gear tooth. *Fig. 82*

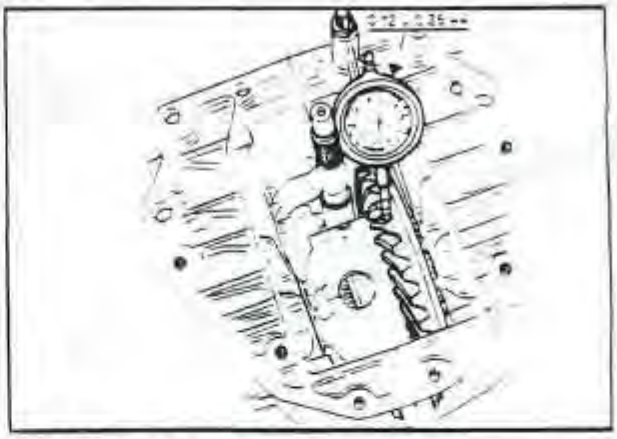


Fig. 82 **RING GEAR BACKLASH**

c. Zero dial indicator and check backlash. Clearance between the ring and pinion gear should be 0.12 – 0.25 mm (.005 – .010 in.).

d. Turn the differential adjusting nuts an equal amount until the backlash is within specifications. Install the adjusting nut locktabs.

9. Install the new planetary shaft lip seal in the final drive case using the special tool J 28867 4 (part of the A. T Tool Kit). *Fig. 83*

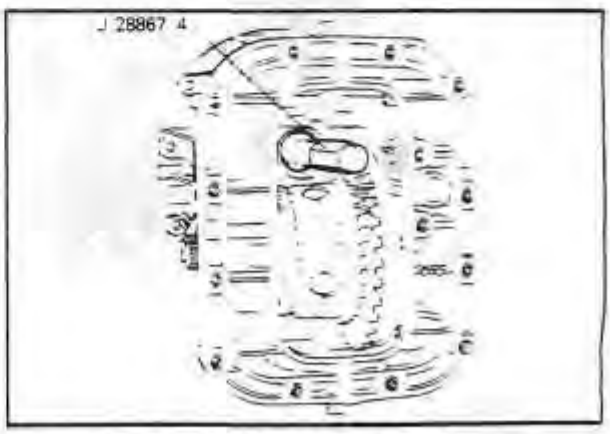


Fig. 83 **PLANETARY SHAFT SEAL**

Notice:
Fit the seal in the case with the lip facing the differential area.

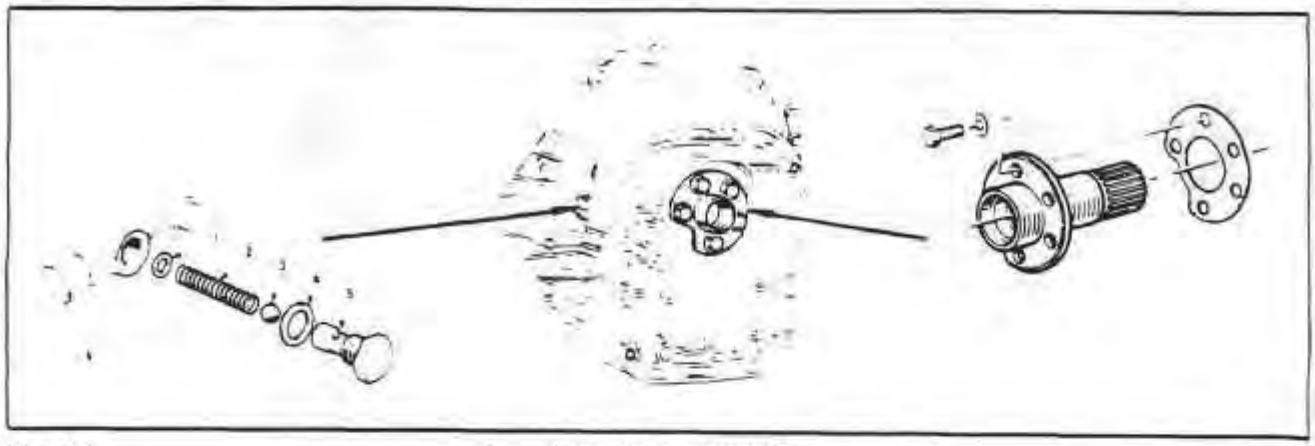


Fig. 84 CONVERTER HOUSING

10. Fit new "O" ring seals on each end of the converter shaft tube and install the tube in the final drive case.

11. Install the converter housing on the final drive case using a new gasket. Torque tighten the housing bolts (see torque specifications).

12. Fit a new "O" ring seal on the governor-computer and install the governor and drive gear in the case.

CONVERTER HOUSING

Disassembly

1. Remove the torque converter seal from the converter housing.

2. Remove the stator shaft and gasket. *Fig. 84*

3. Remove the converter return safety valve, ball, spring, and washer. *Fig. 84*

Notice:

If the check ball rolls into the fluid passage, it can be recovered by removing the fluid cooler line fitting.

Reassembly

1. Fit a new seal on the return safety valve.

2. Fit the washer and spring into the converter housing.

3. Position the check ball on the spring and install the valve in the housing.

4. Install the new torque converter seal in the housing using Tool J28864. *Fig. 85*

5. Install the stator shaft and gasket on the converter housing. Torque tighten the bolts (see torque specifications).

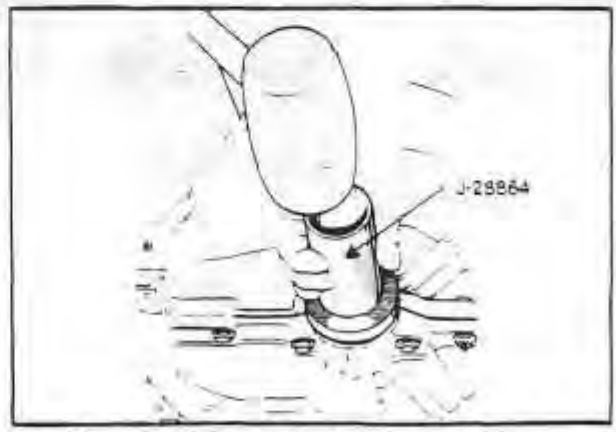


Fig. 85 CONVERTER SEAL INSTALLATION

Steering

CONTENTS

GENERAL DESCRIPTION

The steering system consists of a collapsible steering column assembly, an intermediate shaft assembly and a rack and pinion type steering unit.

The steering column assembly is supported in the driving compartment with an adjustable (up and down) bracket. Each end of the steering column shaft is splined. The upper splined end is designed to accept the steering wheel. The lower splined end of the steering column shaft fits through an opening in the driver's foot well and is sealed with a gasket and plate.

The lower end of the steering column shaft is secured to the upper universal joint of the intermediate shaft. The lower universal joint of the intermediate shaft is secured to the splined stub shaft of the steering gear.

The steering gear unit consists of a rack and pinion assembly, tie rod assemblies and the rod ends. Each end of the rack and pinion assembly is protected from the elements with a flexible rubber boot which is secured with two (2) clamps. The adjustable tie rod ends, for adjusting toe-in specifications, are fastened to the steering knuckles. *Fig. 1*

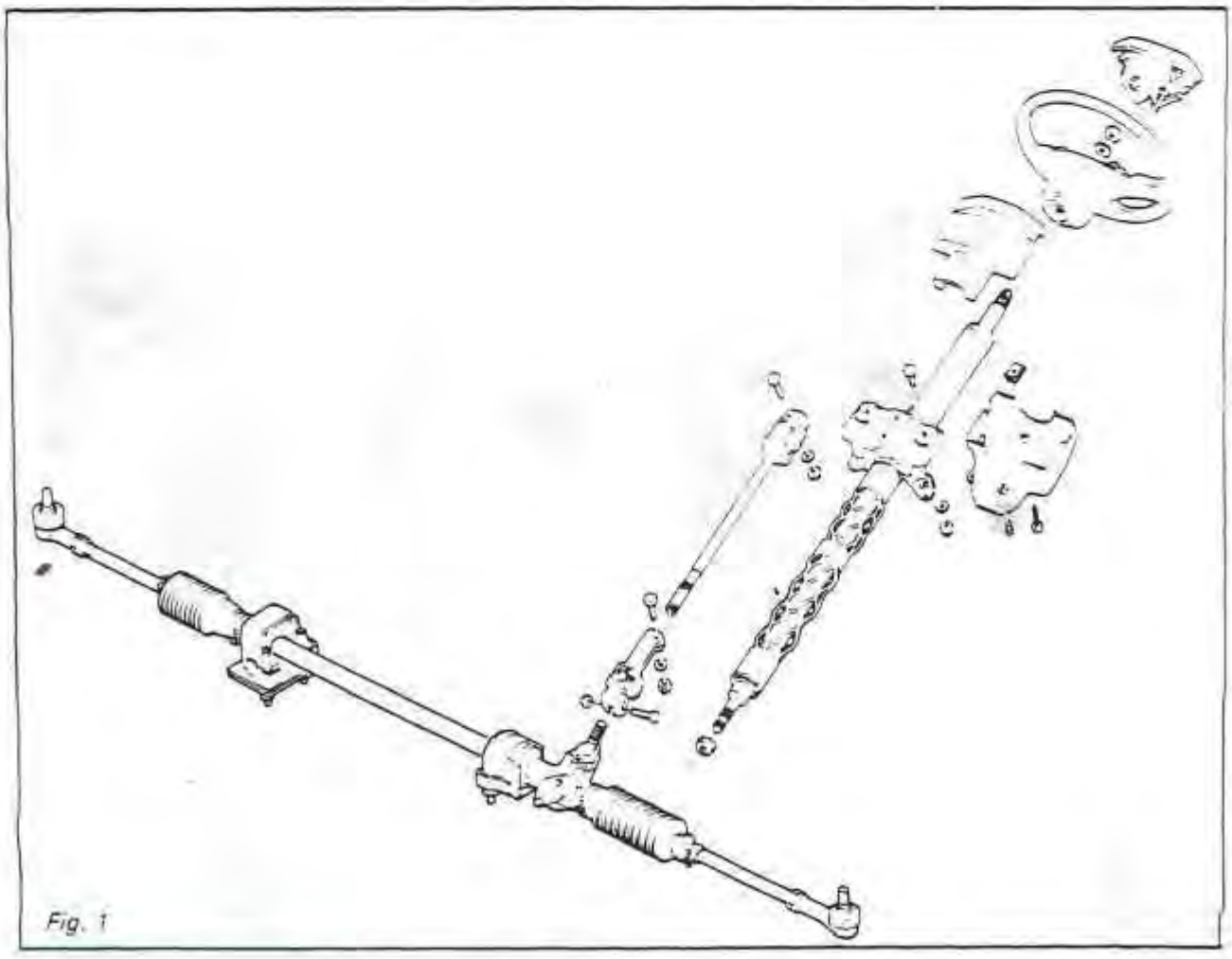


Fig. 1

TORQUE SPECIFICATIONS

Location	Wrench Size	Thread Size	NM Torque	Ft/lb Torque
Lower column to universal joint to rack pinion and intermediate column.	11 & 13 mm		20	14.60
Steering rack assembly to chassis from impact extension.	13 mm	8	25	18.25
Tie rod end lock nut.	14 mm	$\frac{7}{16}$	36	26.28
Tie rod end to steering knuckle.				

STEERING WHEELPAD

REMOVAL

1. Pull out steering wheel centre trim pad. Pad is retained by four (4) mounting pins moulded on backside of pad.
2. Remove centre steering wheel mounting nut.
3. Using steering wheel puller tool, remove steering wheel from column.

INSTALLATION

1. Position the front wheels in the straight ahead position.
2. Position steering wheel in a centre position onto the steering column making sure that the steering wheel tabs on the hub of steering wheel mounting face engage the turn signal switch rotor. Install steering wheel retaining nut and torque to specification.
3. Reinstall steering wheel trim cover.

COLUMN TRIM CANOPY

REMOVAL

1. Lower steering column to its lowest adjustable position.
2. Working under the column, remove three (3) screws securing lower trim canopy to upper trim canopy—
3. Separate upper and lower trim canopy and remove from car.

INSTALLATION

To complete installation, reverse the removal procedure.

STEERING COLUMN

REMOVAL

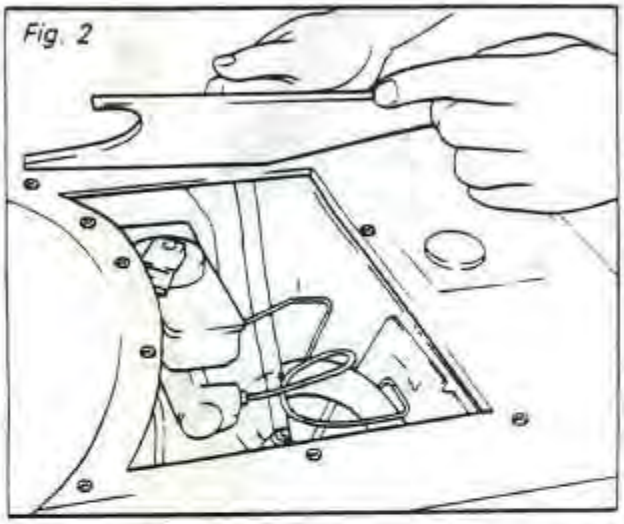


Fig. 2

1. Open luggage compartment cover. Remove carpeting, and remove brake master cylinder access cover from luggage compartment floor. Remove access cover at fuel filler neck inside luggage compartment. *Fig. 2*

2. Remove pinch bolt securing upper universal joint to steering column assembly. *Fig. 3*

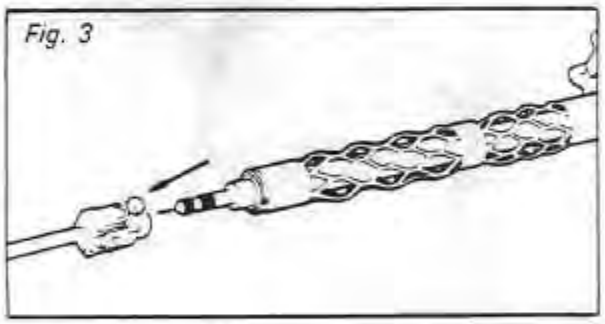


Fig. 3

3. Loosen pinch bolt clamping lower universal joint to steering column intermediate shaft. Slide steering column intermediate shaft into lower universal joint and off the steering column assembly.

4. Disconnect wiring harnesses from steering column switches and position out of the way.

5. Remove driver's knee pads from both sides of the steering column by removing the four (4) nuts securing each knee pad.

6. Remove instrument cluster support bracket from cluster.

7. Remove two (2) bolts securing steering column assembly to pedal box.

8. Remove steering column assembly.

9. Working on bench, remove steering wheel trim pad and steering wheel assembly.

10. Loosen multifunction switch assembly retaining band screw located on the underside of column and slide switch assembly off column.

11. Remove both shear bolts securing ignition lock assembly to column (by drilling and then using pin punch to turn bolts). Transfer lock assembly to replacement column. *Fig. 4*

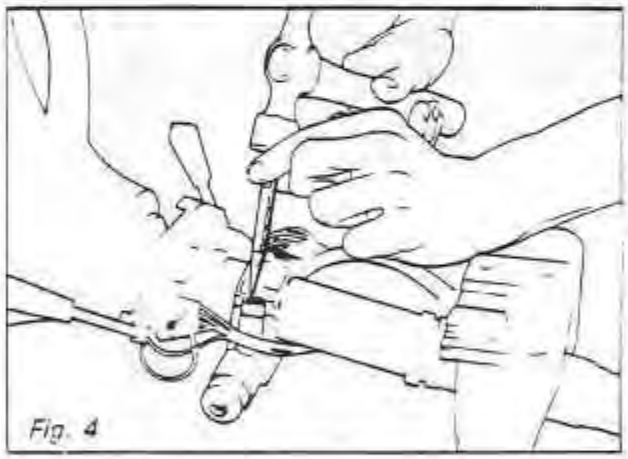


Fig. 4

INSTALLATION

1. Inspect the condition of the rubber bush in the pedal box. Replace if necessary.

2. Guide steering column assembly through passenger compartment opening.

3. Position and secure steering column support to pedal box and secure to instrument cluster support bracket. Torque fasteners to specifications.

4. Reinstall screws securing instrument cluster support bracket to cluster.

5. Position and secure ignition lock assembly to column with shear bolts.

   Note:
   Shear bolts are designed to allow bolt heads to break off when torque has been achieved.

6. Position and secure multifunction switch to steering column.

   Note:
   The "nub" on the turn signal cancelling cam must be pointing towards the turn signal lever in order to operate properly.

7. Connect steering column electrical harnesses.

8. Position and secure both driver's instrument column knee pads.

9. Position and secure steering wheel to steering column and torque to specification. Install steering wheel trim pad.

10. With the steering column in the straight ahead position, and front wheels pointing straight a: :d, slide the upper universal joint onto the steering column assembly and secure the pinch bolt. Torque to specification. *Fig. 5*

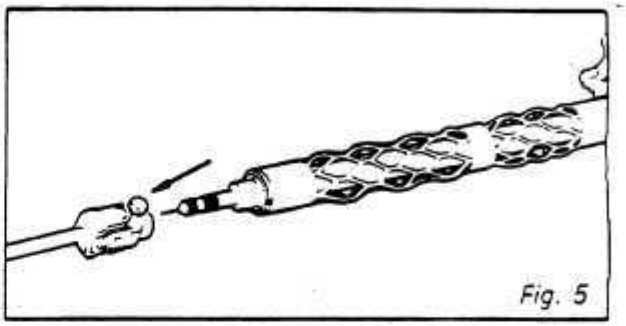


Fig. 5

11. Tighten pinch bolt securing intermediate shaft to lower universal joint. Torque to specification.

12. Position and secure both access covers in the luggage compartment. Reposition carpeting. Close luggage compartment hood.

13. Check operation of all column mounted switches.

STEERING COLUMN IGNITION LOCK ASSEMBLY

REMOVAL

1. Remove driver's knee pads from both sides of the steering column by removing four (4) nuts securing each knee pad.

2. Remove instrument cluster support bracket from cluster.

3. Remove two (2) bolts securing steering column support to pedal box assembly. Lower steering column assembly onto seat. *Fig. 6*

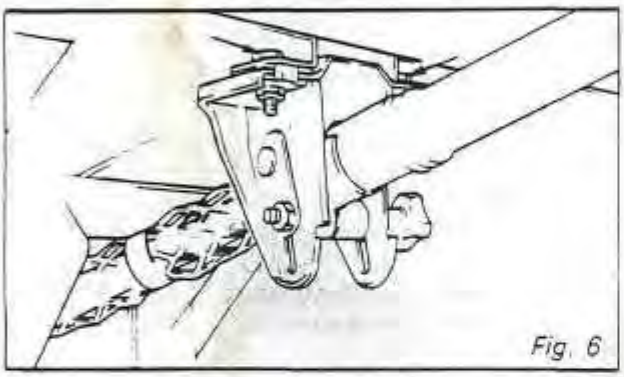


Fig. 6

4. Remove three (3) screws securing column's trim collar to upper trim collar. Separate upper and lower trim collars and remove from car.

5. Remove set screw securing ignition switch to ignition lock assembly and remove ignition switch from lock assembly.

6. Using a pin punch remove both shear bolts securing ignition lock assembly and remove ignition lock assembly.

INSTALLATION

To complete installation, reverse removal procedures and torque fasteners to specification.

Note:

The shear bolts supplied with the service replacement ignition lock assembly are designed to allow bolt heads to break off when torque has been achieved.

STEERING COLUMN UNIVERSAL JOINT

REMOVAL – Fig. 7

1. Raise luggage compartment cover.
2. Remove luggage compartment carpeting. Remove brake master cylinder reservoir access cover from luggage compartment floor.

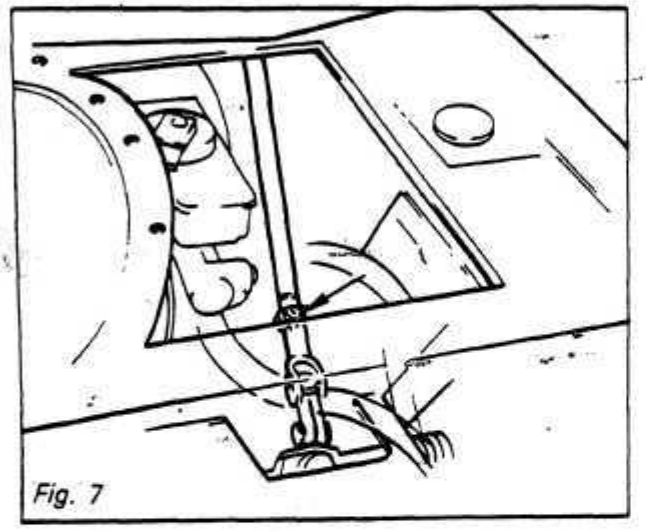


Fig. 7

3. Remove pinch bolts securing universal joint to steering column intermediate shaft and steering rack pinion shaft.
4. Slide universal joint up intermediate shaft sufficient to disengage universal joint from pinion shaft. Slide universal joint off intermediate shaft and remove from car.

INSTALLATION

1. Slide replacement universal joint onto intermediate shaft sufficient to allow joint to be engaged to pinion shaft.
2. With front wheels in straight ahead position and the steering wheel centred, slide the universal joint onto steering rack pinion shaft and secure both universal joint pinch bolts. Torque to specification.
3. Position and secure access cover and luggage compartment carpeting.
4. Close luggage compartment hood.

COLUMN INTERMEDIATE SHAFT

Removal

1. Raise luggage compartment hood.
2. Remove luggage compartment carpeting. Remove brake master cylinder reservoir access cover from luggage compartment floor and remove fuel filter neck access cover.
3. Remove pinch bolts securing upper universal joint to steering column assembly.
4. Loosen pinch bolt securing intermediate shaft in universal joint and remove intermediate shaft.

Installation

1. Slide intermediate shaft into lower universal joint and loosely tighten pinch bolt.
2. With front wheels in straight ahead position and the steering wheel centered, slide the upper universal joint with the lower steering column attached onto the upper steering column. Torque pinch bolts to specification.
3. Position and secure access covers in luggage compartment and close luggage compartment cover.

RACK AND PINION ASSEMBLY – REPLACE

REMOVAL

1. Raise car on hoist.
2. Remove both front tyre and wheel assemblies.
3. Remove both tie rod ends to steering knuckle nuts and separate tie rod ends from steering knuckles with the appropriate tool.
4. Remove the pinch bolt securing the steering column universal joint to the steering rack pinion shaft.
5. Loosen pinch bolt securing the universal joint to the intermediate shaft and slide the universal joint up the intermediate shaft sufficient to disengage universal joint from pinion shaft.
6. Remove both pairs of steering rack clamp nuts and remove the clamps.
7. Remove the lateral restraint bracket from underneath the RH rubber steering mount rack.
8. Remove rubber mounts by rotating mounts and prying them off rack and pinion assembly.
9. Slide rack and pinion assembly out from the LH side of chassis frame. *Fig. 8*
10. Transfer both the rod ends to replacement unit.

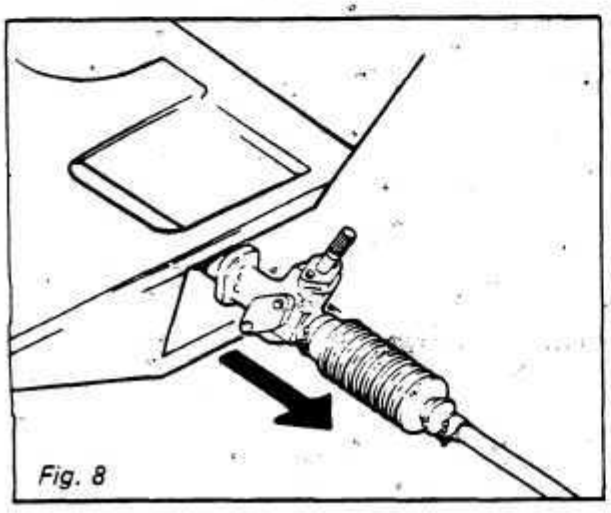


Fig. 8

INSTALLATION

1. Guide replacement rack assembly into chassis from left side.
2. Position LH rubber mount onto rack assembly and rotate the rubber mount onto its proper position.
3. Position the RH rubber mount onto the rack assembly and rotate the rubber mount into the proper position.
4. Position lateral restraint bracket underneath the RH mounting making sure that the rack assembly collar is engaged between the two (2) tabs of the restraint bracket.
5. Make sure both rubber mounts are positioned so that the rack assembly collar fits securely in each mount.
6. Position a steering rack clamp over each rubber mount and locate in chassis frame. Secure each clamp with two nuts and washers inserted through the chassis frame openings.
7. Evenly tighten the four (4) clamp nuts while checking the proper location of the rubber mount and torque to specification.
8. Position and secure the tie rod ends to steering knuckle and torque to specification.
9. With the front hub in the straight ahead position and the steering wheel centred, slide the steering column universal joint onto the rack assembly pinion shaft and secure the pinch bolt. Position the lower universal joint so as to provide maximum clearance from the chassis frame. Torque both pinch bolts to specification.
10. Reinstall tyre and wheel assemblies. Torque to specification.
11. Lower car, and with car at normal ride height, check toe-in and adjust if necessary.

RACK AND PINION TIE ROD BOOTS – ONE OR BOTH

REMOVAL

1. Remove rack and pinion assembly as previously described.
2. Loosen inner and outer boot(s) clamp screws and remove boot(s) clamps and discard.
3. Slide damaged boot(s) off tie rod(s).

INSTALLATION

1. (a) If replacing one (1) boot, add ⅓ pint of specified lubricant to steering rack assembly via the left end before proceeding.

   (b) If replacing both boots, position and secure with new clamps one (1) boot invert the steering rack assembly and add **⅓ pint of specified lubricant** via the left end.

   Notice:
   In order to properly add lubricant to rack and pinion assembly, the rack and pinion assembly MUST BE removed and filled from LEFT side (pinion end) only.

2. Position and secure with new clamps replacement boot (or second boot).
3. Install rack and pinion assembly as previously described.

TIE ROD END – ONE OR BOTH

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly (or assemblies).
2. Remove tie rod end to steering knuckle nut(s) and separate tie rod end(s) from steering knuckle(s) with appropriate tool.
3. Remove tie rod end(s) from tie rod(s).

INSTALLATION

1. Install replacement tie rod end(s) on tie rod(s)
2. Position and secure tie rod end(s) to steering knuckle(s) and grease tie rod end(s) via its fitting. Torque nut(s) to specification.
3. Position and secure tyre and wheel assembly (or assemblies) and torque to specification.
4. Lower car, and with car at setting height:
   (a) Front cross member to ground 140 mm (5.5 inches).
   (b) This should be checked by means of a wooden block depth to be 140 mm (5.5 inches) which should be placed beneath the front cross member (it may be necessary to lift the front of the vehicle or load the luggage compartment to ensure that the chassis cross member rests on the block.
   (c) Check toe-in and adjust track.
   (d) Ensure the steering wheel is in the dead ahead position. Ensure all road dirt is removed from the threads of the track rod arms. With the aid of suitable tracking equipment check wheel alignment. ANGULAR WHEEL ALIGNMENT TOE IN ½ DEGREE (PER WHEEL) +0 −10 minutes.

ADJUSTING

Hold ball joint firm with wrench (A) and undo locknut (B) using grips rotate steering rod (C) in for toe-in and vice versa. *Fig. 9*

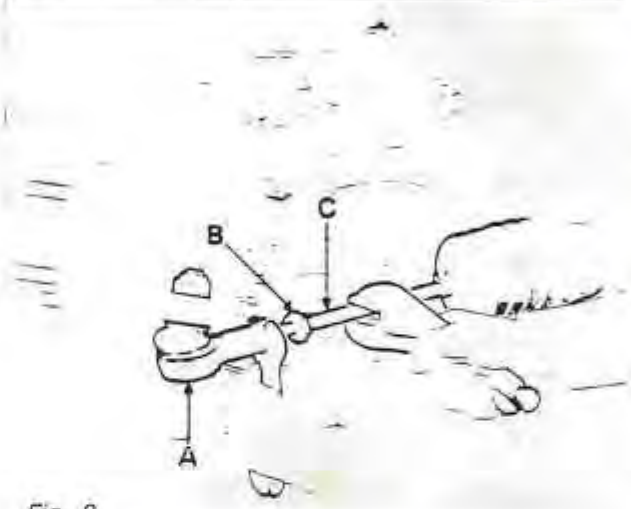


Fig. 9

Note:

IT IS IMPORTANT TO ADJUST LEFT AND RIGHT HAND TRACK ROD EVENLY ENSURING THAT THE SAME NUMBER OF THREADS ARE EXPOSED BOTH SIDES.

Remove wood block from underside of cross member and roll vehicle backwards and forwards to eliminate wind up. Refit wood block to chassis cross member and re-check. Continue this procedure until specifications are met.

On completion of adjustment tighten locknuts (B) to 65 NM (48 ft/lbs)

GENERAL DESCRIPTION

The front suspension is fully independent with upper and lower control arms, stabilizer bar *and steering knuckle assembly*. Telescopic shock absorbers, *secured* to the chassis frame tower at the absorber's upper end and to the lower control arm at the absorber's lower end, are positioned through the coil springs.

The single front spindle bearing supports the hub assembly on the spindle which is fastened to the steering knuckle. The steering knuckle is secured to the upper and lower control arms with upper and lower ball joints and to the steering system with an adjustable tie rod. *Fig. 1 and Fig. 2*

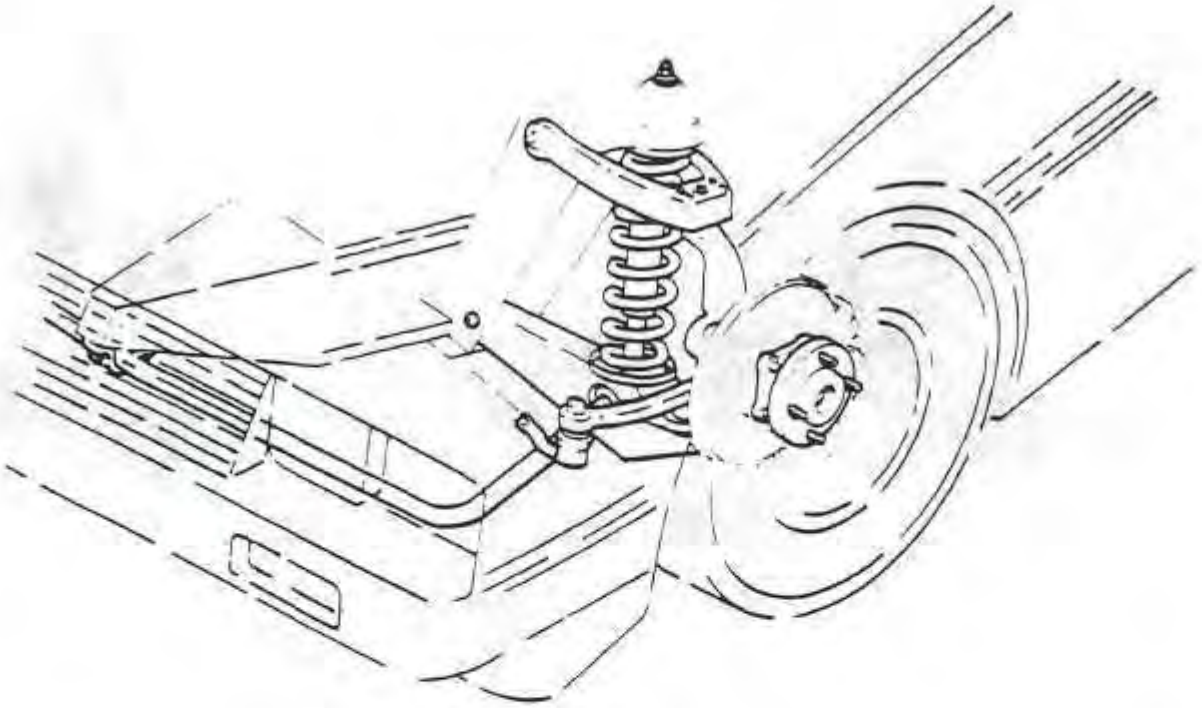


Fig. 1

Front Suspension

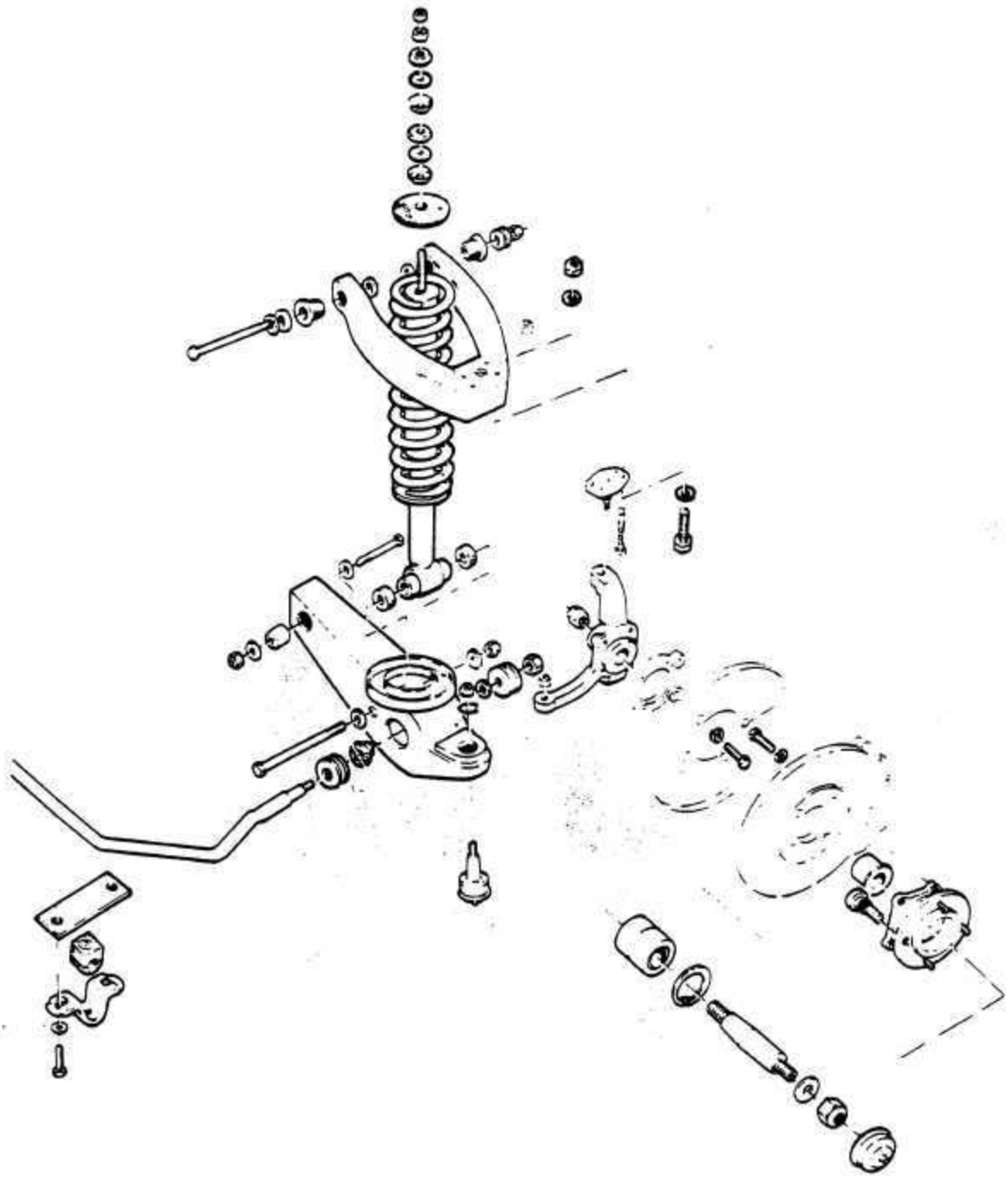


Fig. 2

HUB ASSEMBLY – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable at wheel spindle.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose. *Fig. 3*

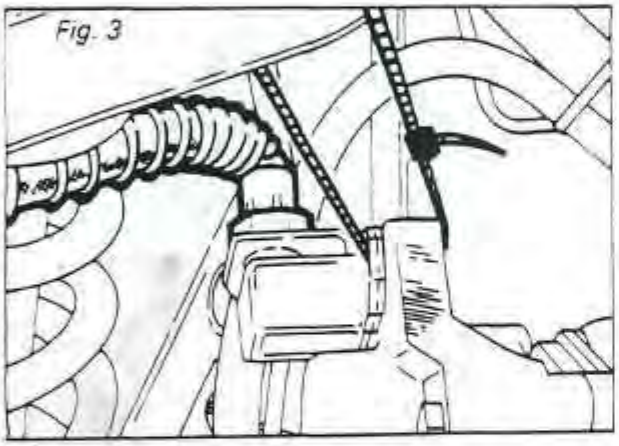


Fig. 3

5. When working on left side, remove speedometer drive cap from centre of hub. *Fig. 4*

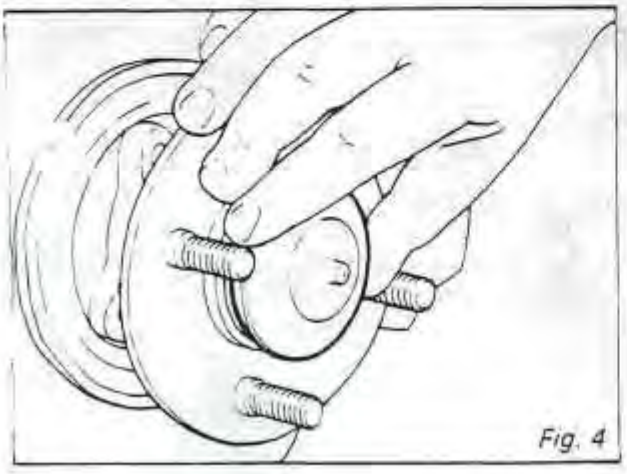


Fig. 4

6. Remove hub nut and "D" washer. *Fig. 5*

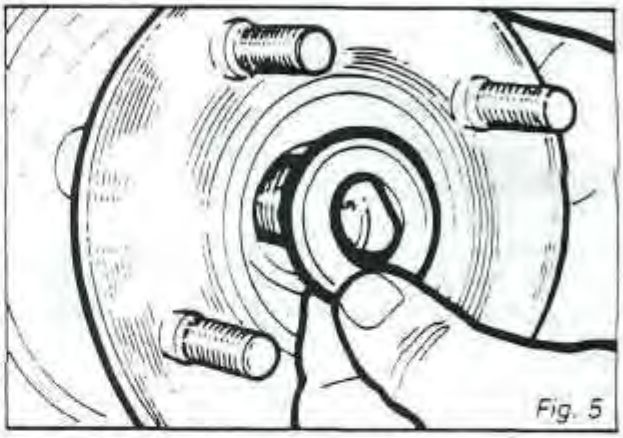


Fig. 5

7. Remove hub and brake disc assembly.
8. Working on bench, remove four (4) bolts securing brake disc to hub. *Fig. 6*

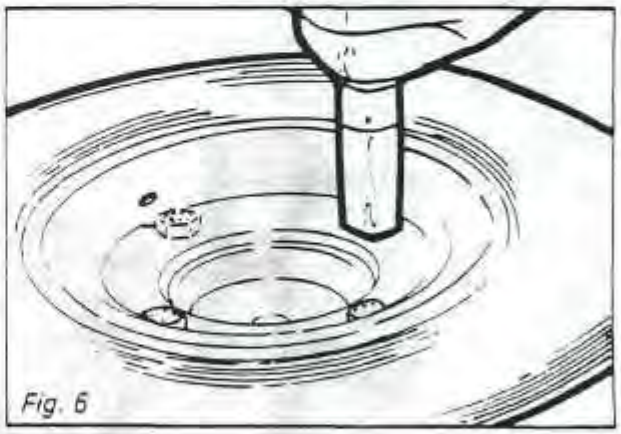


Fig. 6

9. Remove snap ring, retaining hub bearing to hub assembly.

INSTALLATION

Reverse removal procedures starting with Step 8 and torque fasteners to specification.

HUB BEARING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose. *Fig. 7*

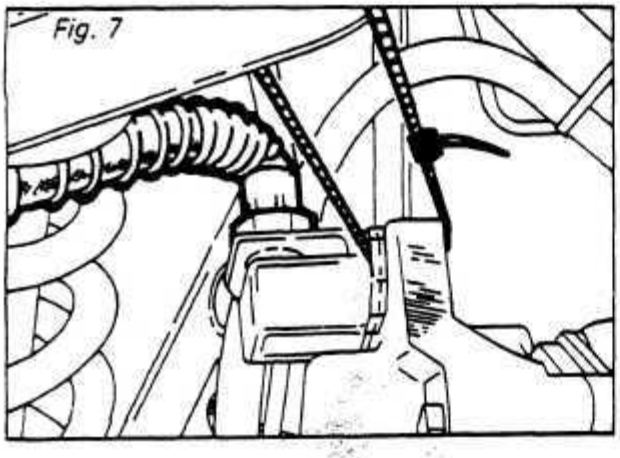


Fig. 7

5. When working on left side, remove speedometer drive cap from centre of hub. *Fig. 8*

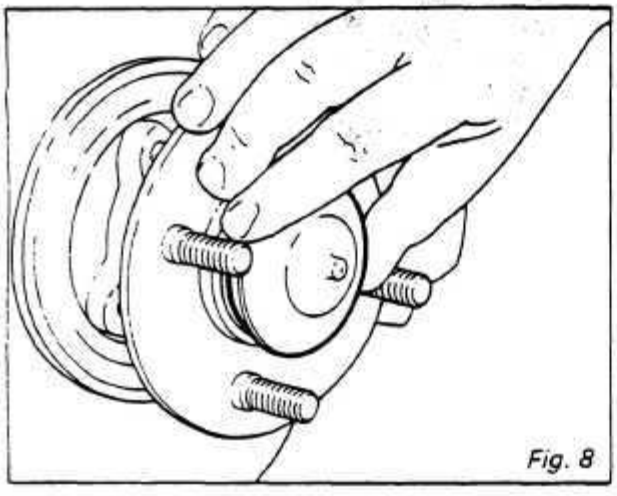


Fig. 8

6. Remove hub nut and "D" washer.
7. Remove hub and brake disc assembly.
8. Remove snap ring, retaining hub bearing to hub assembly. Remove hub bearing by pressing.
9. Press new hub bearing into hub assembly. *Fig. 9*

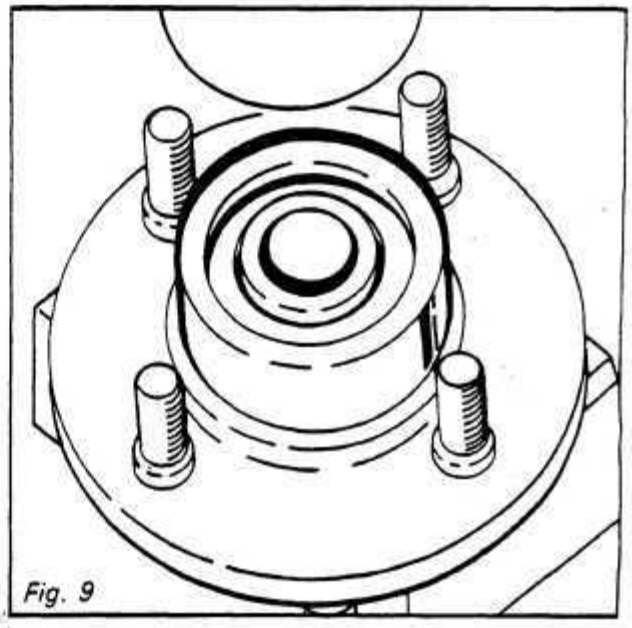


Fig. 9

10. Position and secure hub bearing snap ring.

INSTALLATION

Reverse removal procedure starting with Step 7 and torque fasteners to specification.

WHEEL SPINDLE

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect the speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by brake hose.
5. When working on left side, remove speedometer drive cap from centre of hub.
6. Remove hub nut and "D" washer.
7. Remove hub and brake disc assembly.
8. Using a tie rod end remover, disconnect tie rod end from steering knuckle.
9. Remove brake disc spacer.
10. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
11. Remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. Remove steering knuckle assembly.
12. Remove spindle retaining nut. (On left side, nut is removed with speedometer 90° angle drive.)
13. Press spindle from steering knuckle as shown in *Fig. 10*

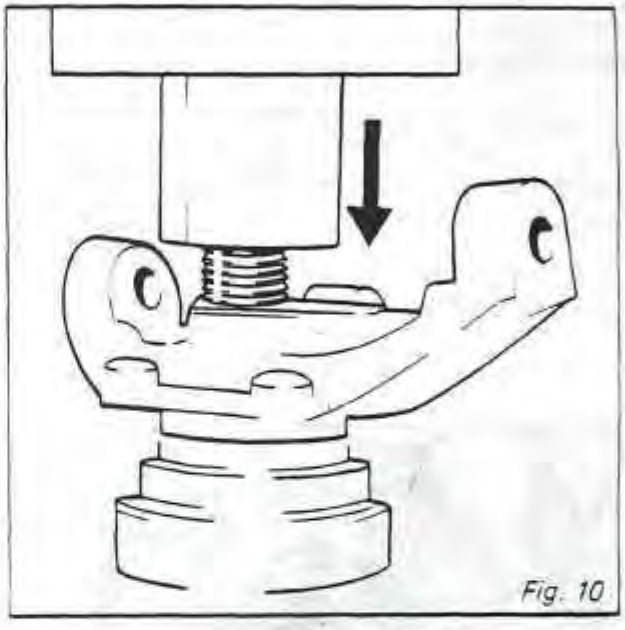


Fig. 10

INSTALLATION

1. Position spindle into steering knuckle. Install spindle retaining nut and torque to specification.
2. To complete installation, reverse removal procedures starting with Step 11 and torque fasteners to specification.

STEERING KNUCKLE – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. When working on left side, disconnect speedometer cable.
4. Remove both brake caliper mounting bolts and position caliper assembly out of the way. Caliper must not be suspended by its brake hose.
5. When working on left side, remove speedometer drive cap from centre of hub.
6. Remove hub nut and "D" washer. *Fig. 11*

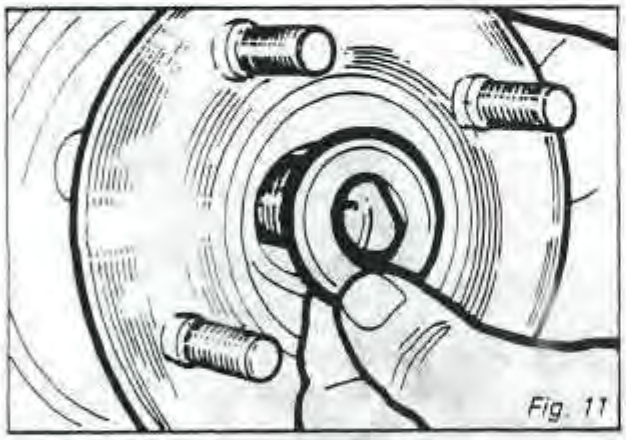


Fig. 11

7. Remove hub and brake disc assembly.
8. Using a tie rod-end remover, disconnect tie rod end from steering knuckle.
9. Remove brake disc spacer.
10. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
11. Remove nut securing *upper* ball joint to steering knuckle and separate ball joint from steering knuckle. Remove steering knuckle assembly.
12. Remove spindle retaining nut. (On left side, nut is removed with speedometer 90° angle drive.)
13. Press spindle from steering knuckle.
14. Remove four (4) bolts securing brake disc dustshield and caliper mounting bracket to steering knuckle assembly.

INSTALLATION

1. Position and secure brake disc dustshield and caliper mounting bracket to steering knuckle.
2. Position spindle into steering and install spindle retaining nut and torque to specification.
3. To complete installation, reverse removal procedures starting with Step 11 and torque fasteners to specification.

UPPER BALL JOINT – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. With front suspension at full travel, remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. Steering knuckle should be supported by wire, and care should be exercised not to allow the steering knuckle assembly to pivot outward.
4. Using nut cracker or splitter remove four (4) fasteners securing the upper ball joint to the upper control arm and remove ball joint.

Note:
Previously serviced ball joints will be secured with nuts and bolts.

INSTALLATION

1. Position and secure ball joint. Install ball joint boot, grease ball joint via its fitting, and torque fasteners supplied with ball joint to specification.
2. To complete installation, reverse the removal procedure and torque fasteners to specification.

LOWER BALL JOINT – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.

2. Remove tyre and wheel assembly.

3. With front suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle. Suspend upper control arm and steering knuckle assembly inside the wheel opening and position out of the way.

4. Disconnect and remove stabilizer bar.

5. Remove shock absorber lower mounting through bolt and nut. Remove shock absorber upper mounting nut and remove shock absorber.

6. Place jack stands under lower control arm and lower car sufficient enough to compress coil spring, using a suitable spring compressing tool. Raise car and remove spring.

7. Remove lower control arm pivot bolt and remove control arm from car.

8. Working on bench, remove the lower ball joint protective boot and remove lower ball joint retaining snap ring.

9. Press ball joint from control arm. *Fig. 12*

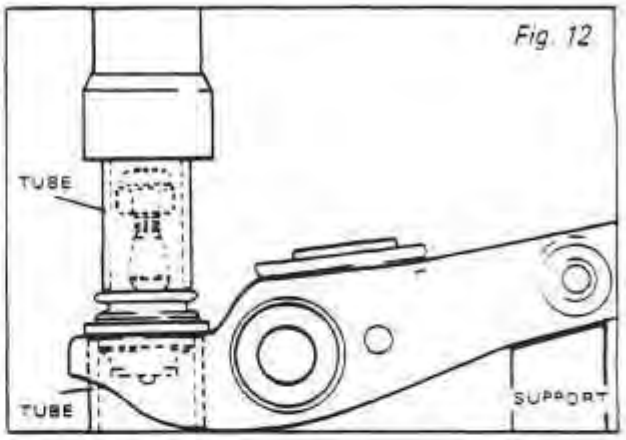


Fig. 12

INSTALLATION

1. Press new ball joint into lower control arm. *Fig. 13*

2. Install ball joint retaining snap ring and install new boot.

3. To complete installation, reverse the removal procedures. Torque fasteners to specification and fill lower ball joint with grease via the fitting.

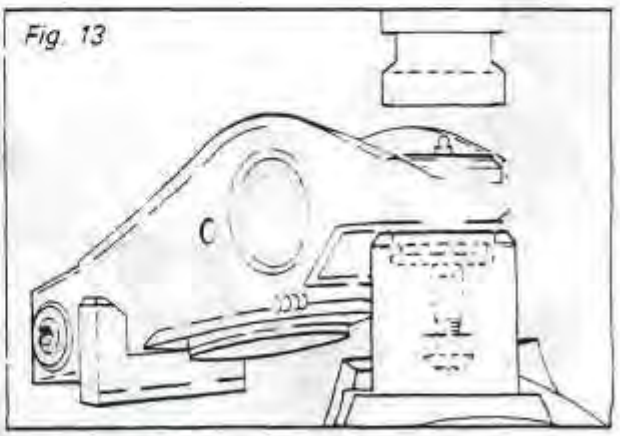


Fig. 13

UPPER CONTROL ARM/BUSHINGS – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.
2. With suspension at full travel, remove nut securing upper ball joint to steering knuckle and separate ball joint from steering knuckle. The steering knuckle should be supported by wire and care should be exercised not to allow the steering knuckle assembly to pivot outward.
3. Remove the upper control arm pivot bolt nut and remove pivot bolt. Remove control arm assembly from car.
4. With upper control arm assembly removed from car and using an arbor press, press the control arm bushings from control arm. *Fig. 14*
5. Press new control arm bushings into control arm.
6. If control arm is being replaced, a new upper service ball joint must be installed into the upper control arm. By positioning and securing service replacement ball joint, install ball joint boot. Grease ball joint via its fittings and torque fasteners supplied to specification.

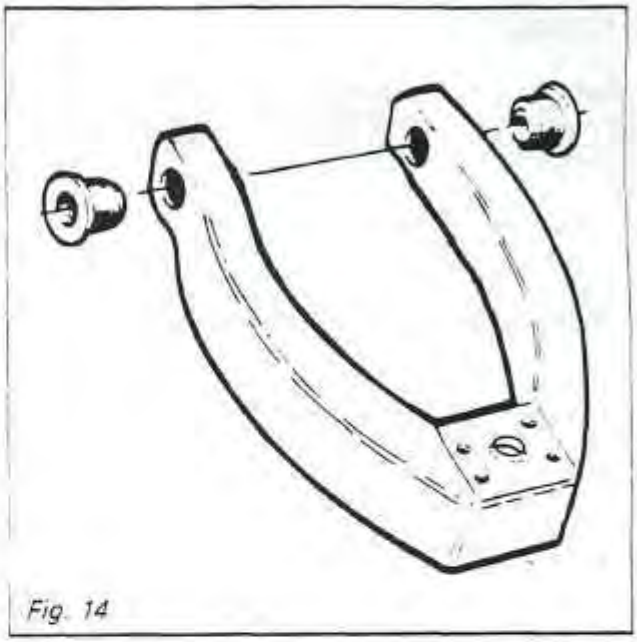


Fig. 14

Note:
Service replacement upper control arms are supplied with new bushings installed.

INSTALLATION

To complete installation, reverse the removal procedures and torque fasteners to specification.

STABILIZER BAR/BUSHINGS

REMOVAL

1. Remove two (2) screws, each side securing stabilizer bar bushings at front chassis, front impact extension. *Fig. 15*
2. Raise car on hoist.

Note:
Step 3 is required if bar is being replaced.

3. Remove nut securing stabilizer bar to lower control arm assembly. Repeat on other side and remove stabilizer bar.
4. Using a brass drift, drive out stabilizer bushings in the lower control arm.

INSTALLATION

To complete installation, reverse removal procedure and torque fasteners to specifications.

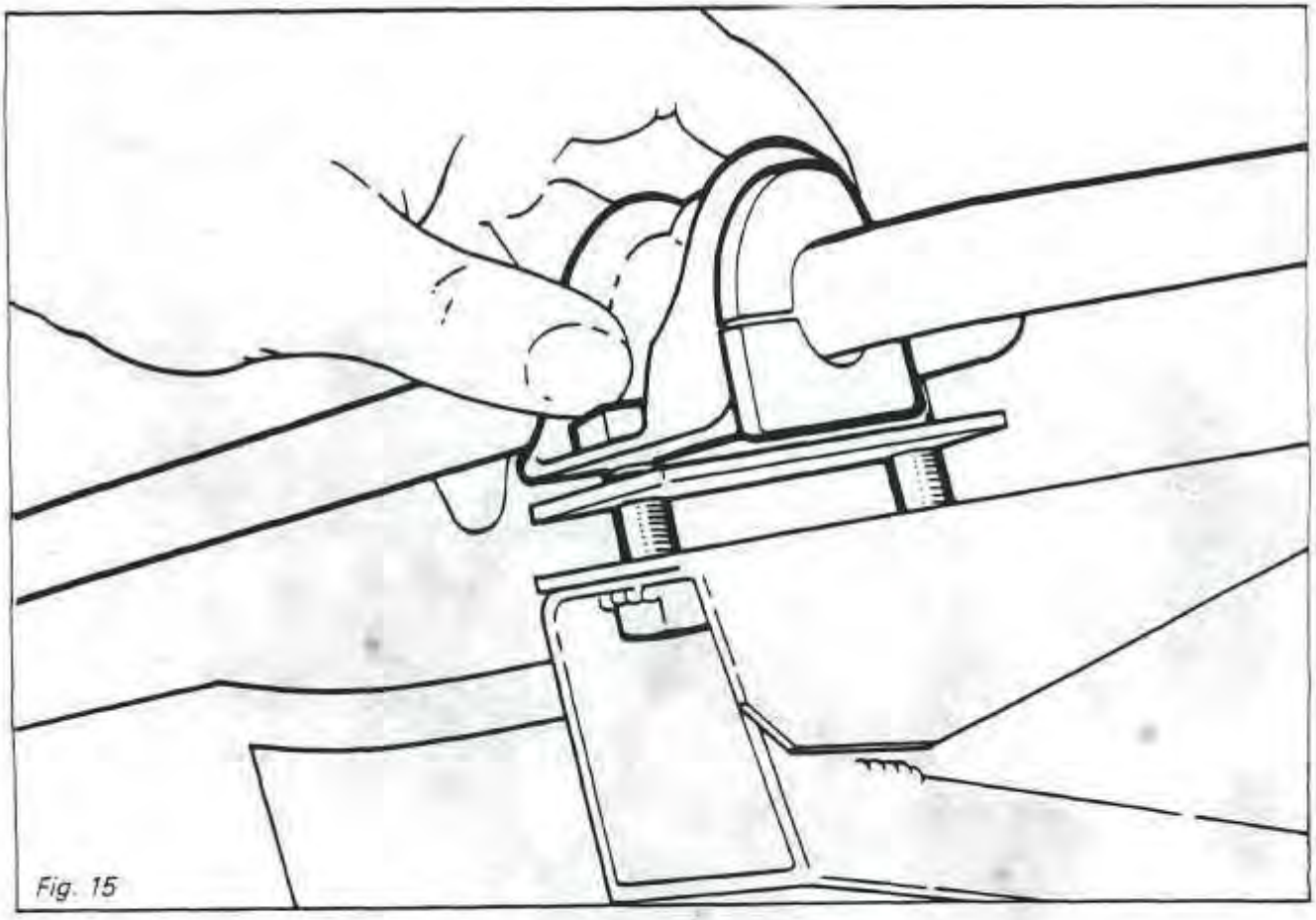


Fig. 15

LOWER CONTROL ARM/BUSHINGS – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. With suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.
4. Suspend upper control arm/steering knuckle assembly inside wheel opening and position out of way.
5. Remove four (4) screws securing both stabilizer bar bushing brackets to front chassis frame impact extension.
6. Remove nut securing stabilizer bar to lower control arm and position stabilizer bar out of the way.
7. Remove shock absorber lower mounting through bolt and nut. Remove shock absorber upper mounting nut and remove shock absorber from car.
8. Place jack stand under lower control arm and lower car sufficient enough to compress coil spring. Compress spring using the service tool, raise car and remove spring from car.

CAUTION: Compressed coil springs are considered very dangerous. Extreme care should be exercised to prevent personal injury.

9. Remove lower control arm pivot bolt nut and remove bolt. Remove lower control arm from car.
10. Using an arbor press, press out control arm bushing.

Note:
Service replacement lower control arms have new bushings and ball joints installed.

11. Press new bushing into lower control arm.
12. Press new ball joint into lower control arm and secure with new snap ring. Install and secure ball joint boot and grease ball joint via its fittings.

INSTALLATION

To complete installation, reverse procedure. Torque fasteners to specification.

SHOCK ABSORBER – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.

2. Remove shock absorber lower mounting through bolt nut and remove through bolt. *Fig. 16*

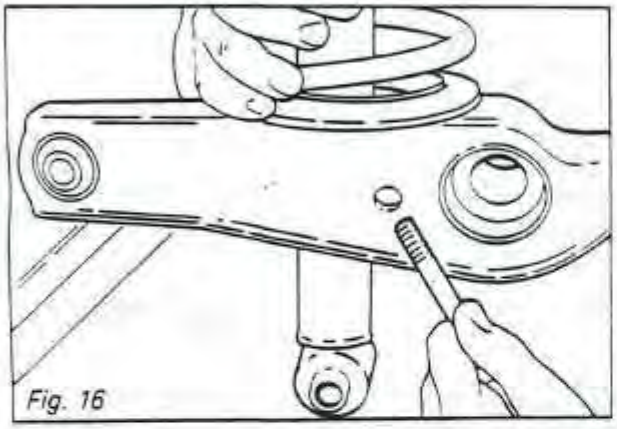


Fig. 16

Note:
It may be necessary to place a jack stand under the lower control arm and lower the car sufficient to relieve any side load which may be on the through bolt.

3. Remove shock absorber upper mounting nut and remove shock absorber through the bottom of lower control arm. *Fig. 17*

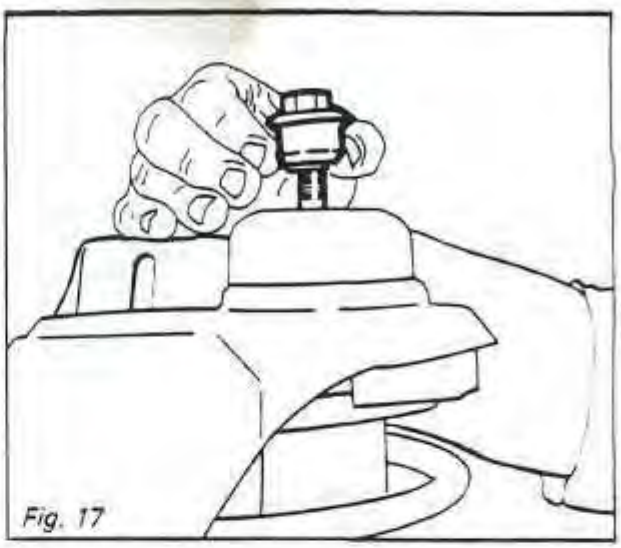


Fig. 17

Note:
The location and placement of the upper shock absorber mounting bushes and caps should be noted prior to removal to ensure proper placement upon reassembly.

INSTALLATION

To complete installation, reverse removal procedure. Torque fasteners to specification.

Note:
Compressing the coil spring by lightly lowering the car on the hoist may assist the installation.

COIL SPRING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist, and remove tyre and wheel assembly.

2. With suspension at full travel, remove nut securing lower ball joint to steering knuckle and separate ball joint from steering knuckle.

3. Suspend upper control arm/steering knuckle assembly inside the wheel opening and position out of the way.

4. Remove four (4) screws securing both stabilizer bar bushing brackets to front chassis frame impact extension.

5. Remove nut securing stabilizer bar to lower control arm and position stabilizer bar out of the way.

6. Remove shock absorber lower mounting through bolt nut and remove through bolt.

   Note:
   It may be necessary to place a jack stand under the lower control arm and lower the car sufficient to relieve any side load which may be on the through bolt.

7. Remove shock absorber upper mounting nut and remove shock absorber through the bottom of the control arm.

   Note:
   The location and the placement of the upper shock absorber mounting bushes and cups should be noted prior to removal to assure proper placement upon reassembly.

   Note:
   Compressing the coil spring by lowering the car on the hoist may assist in removing the shock absorber by gaining additional coil spring clearance, or use service tool to compress spring.

8. Place jack stand under lower control arm and lower the car sufficient enough to compress the coil spring, or use a suitable spring compressing tool: raise car and remove the spring and insulator pad from the car.

   CAUTION: Compressed coil springs are considered very dangerous. Extreme care should be exercised to prevent personal injury.

INSTALLATION

1. Apply S.M.P. grease on any spring to chassis frame contact area. Position spring insulator into cavity.

2. To complete installation, reverse removal procedures and torque fasteners to specification.

TORQUE SPECIFICATIONS

MOUNTING AREA	Nm Torque	Ft./lb. Torque
Brake caliper to mounting bracket	75	55
Brake disc dustshield	28	20
Front disc to hub (W/LOCTITE 601)	28	20
Spindle to steering knuckle nut	220	165
Spindle bearing to spindle nut	190	145
Upper control arm pivot bolt/nut	80	60
Lower control arm pivot bolt/nut	80	60
Shock absorber, upper	28	20
Shock absorber, lower	80	60
Stabilizer bar at lower control arm	75	55
Stabilizer bar pivot (on chassis)	36	26
Brake hose attaching screw	16	12
Upper ball joint to steering knuckle	60	45
Lower ball joint to steering knuckle	60	45

Rear Suspension

Contents

GENERAL DESCRIPTION – Fig. 1 and 2

The rear suspension is a fully independent type with a radius arm (trailing), upper and lower links and a rear hub carrier. Telescopic shock absorbers, secured to the chassis frame at the absorbers upper end and to the rear hub carrier and the absorbers lower end, are positioned through the coil springs.

The rear hub carrier is attached to the chassis frame with upper and lower links as well as the radius arm.

Rear suspension toe-in is achieved by shimming the radius arm at its frame attaching location.

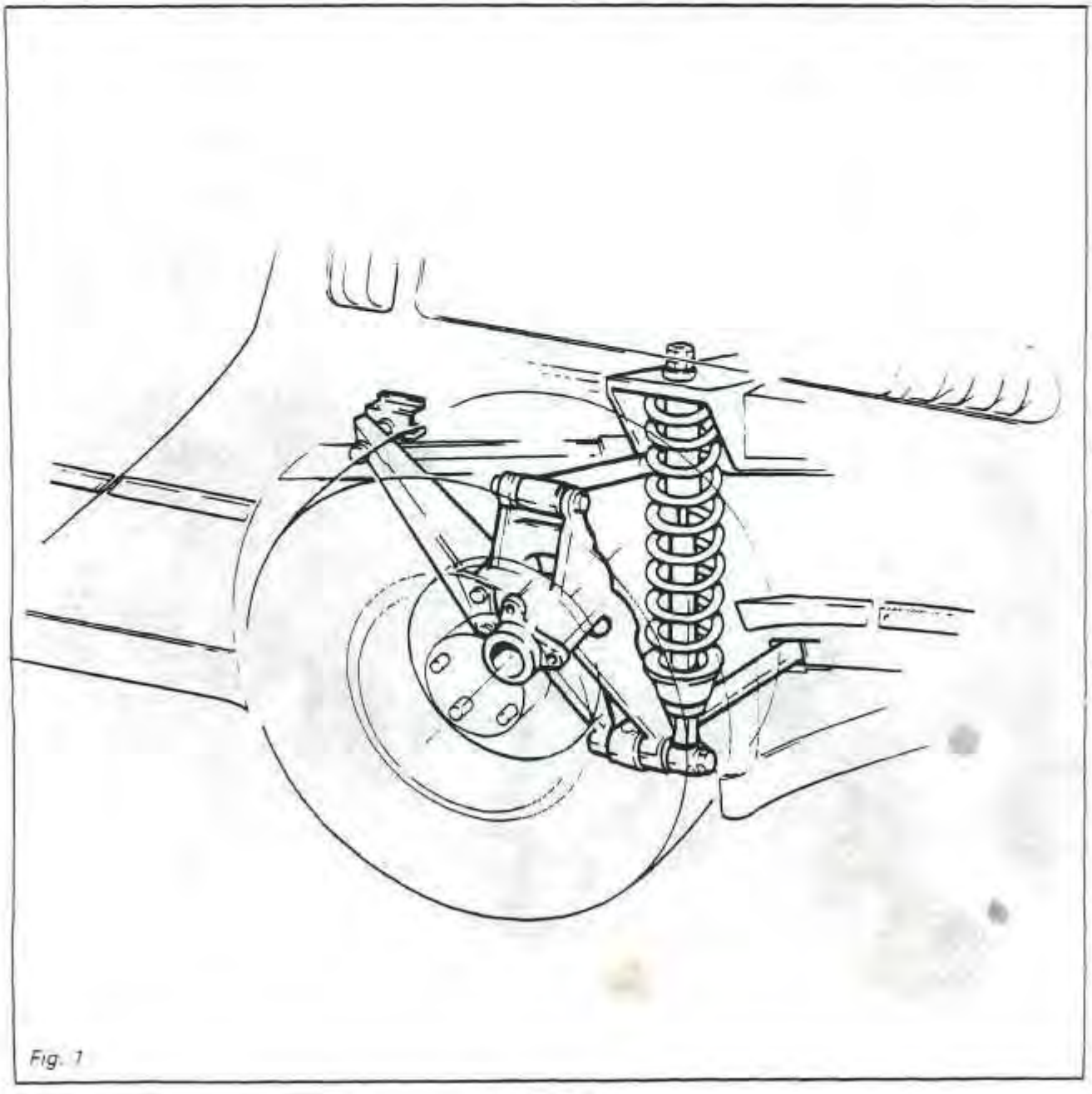


Fig. 1

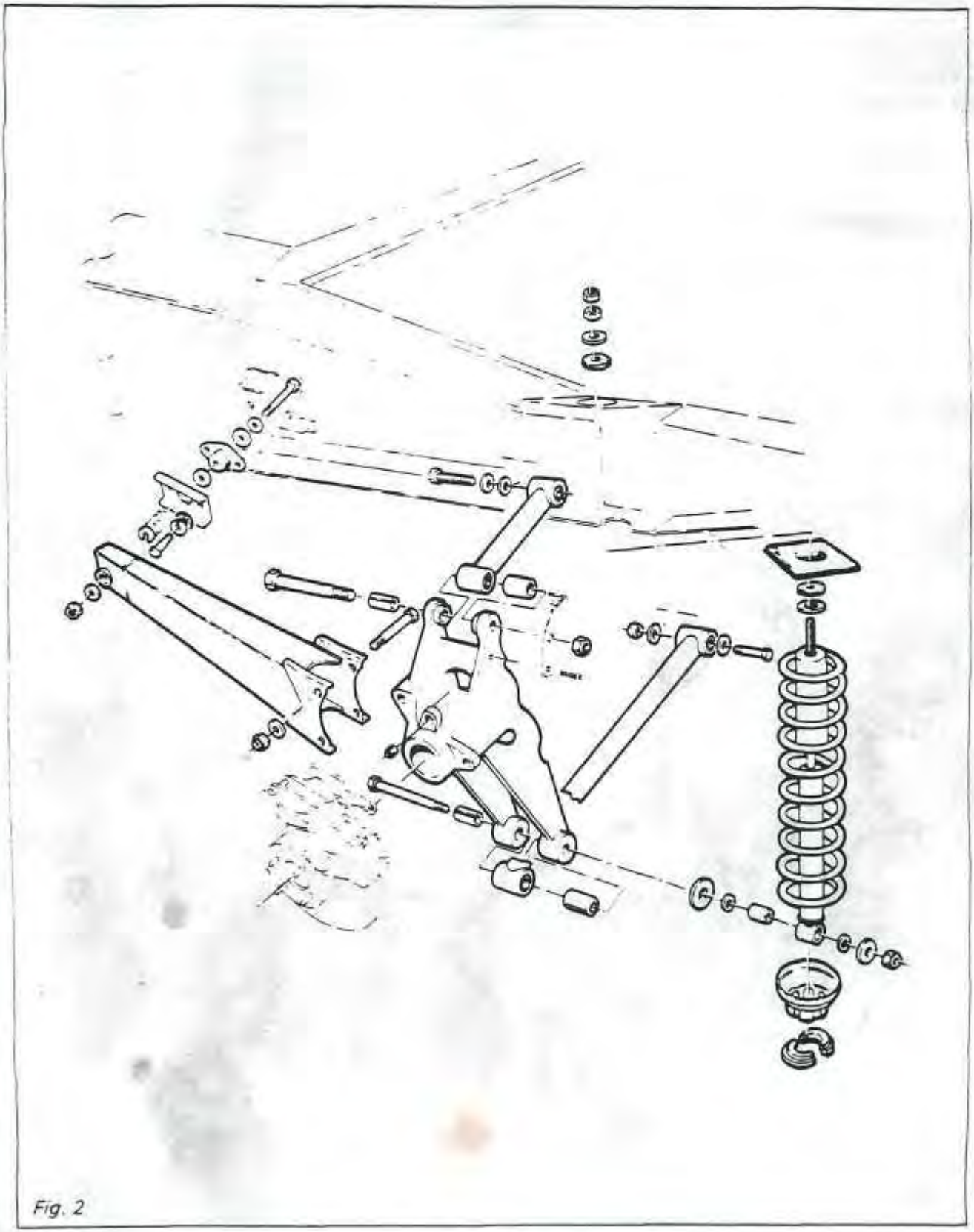


Fig. 2

UPPER LINK/BUSHINGS

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
3. Using jack relieve the tension on the rear suspension assembly, and remove the nut and washer from hub carrier to upper link bolt. Remove upper link to hub carrier pivot bolt.
4. Remove upper link inner pivot bolt at chassis frame. *Fig. 3*
5. Check the condition of the rubber bushings and replace if necessary by pressing them out.

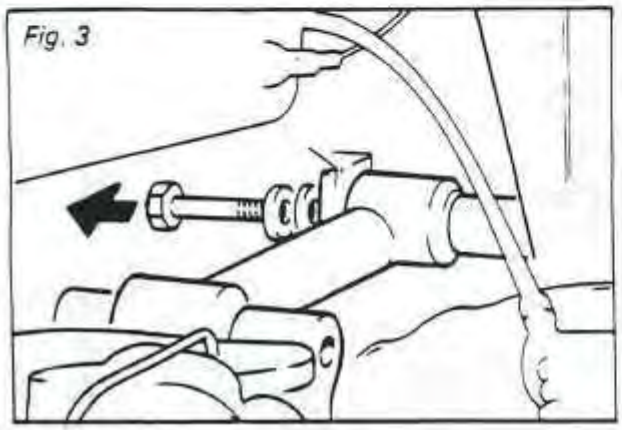


Fig. 3

Note:
Service replacement upper links are supplied with new bushings installed.

INSTALLATION

1. To install, reverse the removal procedures and torque fasteners to specifications.

Notice:
Fasteners must be torqued with car resting on its suspension.

LOWER LINK/BUSHINGS

REMOVAL

1. Raise car on hoist.
2. Remove tyre and wheel assembly.

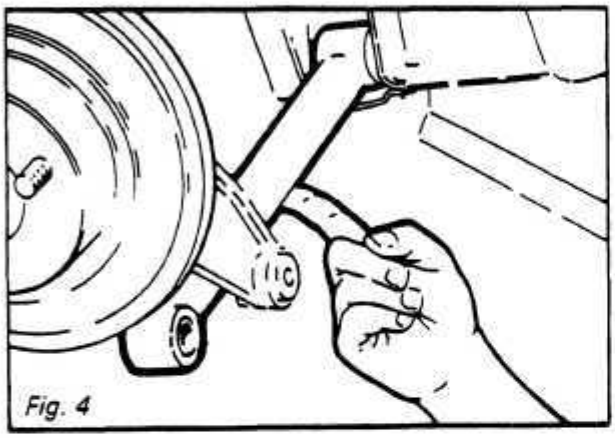


Fig. 4

3. Supporting the rear suspension with a jack stand to relieve tension remove the nut and washer from the hub carrier to lower link pivot bolt.
4. Remove the lower link to chassis frame, pivot bolt and nut and remove lower link. *Fig. 4*
5. Check the condition of the rubber bushings and replace if necessary by pressing them out.

Note:
Service replacement lower links are supplied with new bushings installed.

INSTALLATION

1. To install, reverse the removal procedures and torque fasteners to proper specifications.

Notice:
Fasteners must be torqued with car resting on its suspension.

HUB CARRIER

REMOVAL

1. Raise car on hoist.
2. Remove rear tyre and wheel assembly.
3. Remove screws securing the trailing arm shield to chassis frame and remove shields.
4. Remove six (6) bolts securing the inner driveshaft to out driveshaft.
5. Loosen hub nut (righthand thread, both sides).
6. Disconnect brake hose to rear brake line. Clamp hose and line ends.
7. Unclip metal brake line from trailing arm.
8. Disconnect park brake cable from park brake caliper lever arm by removing the split pin and clevis.
9. Remove two (2) bolts securing brake caliper assembly to hub carrier. Remove caliper assembly. *Fig. 5*

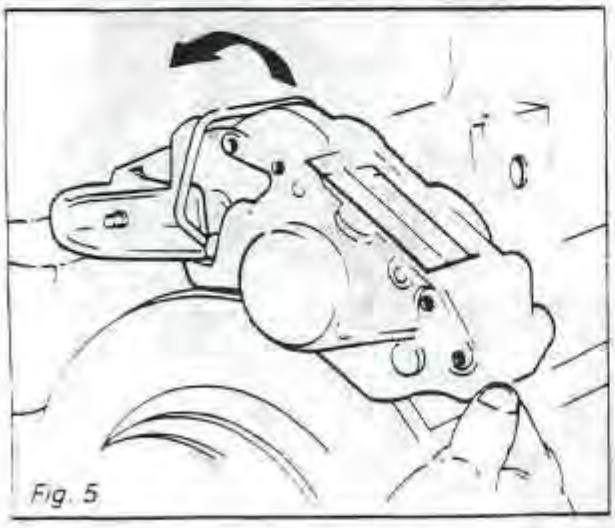


Fig. 5

10. Remove hub nut and pull off brake disc and hub assembly.
11. Remove two (2) nuts and bolts, securing trailing arm to hub carrier and disconnect trailing arm from hub carrier. *Fig. 6*

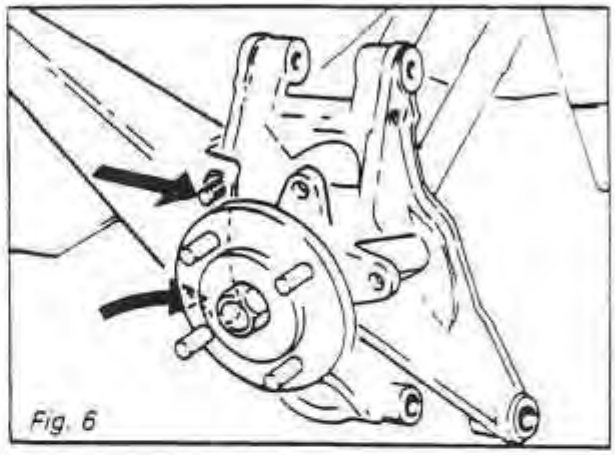


Fig. 6

12. Support the trailing arm to avoid straining the brake hose or pivot bushing.
13. Remove nuts from both upper and lower hub carrier pivot bolts. Remove bolt securing park brake cable to hub carrier.
14. Support the hub carrier with a jack stand while removing the upper and lower pivot bolt.
15. Remove hub carrier from car.

INSTALLATION

1. To install hub carrier, reverse the removal procedures and torque fasteners to specifications.

   Notice:
   Fastener must be torqued with car resting on its suspension.

2. Bleed brake system.
3. Check rear suspension for specified toe-in alignment and adjust if necessary.
4. Adjust park brake cables.

TRAILING ARM – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist and remove tyre and wheel assembly.
2. Remove screws securing the trailing arm shield to chassis frame and remove shield.
3. Disconnect brake hose to rear brake line. Cap hose and line.
4. Unclip brake line from trailing arm.
5. Disconnect hand brake cable from hand brake caliper lever arm by removing the split pin and clevis.
6. Remove two (2) bolts securing brake caliper assembly to hub carrier. Remove caliper assembly. *Fig. 7*
7. Remove brake disc.
8. Remove two (2) nuts and bolts, securing trailing arm to hub carrier and disconnect trailing arm from hub carrier.
9. Remove trailing arm pivot bolt and nut. Remove trailing arm from car. Inspect trailing arm bushing for damage and replace if necessary. *Fig. 8*

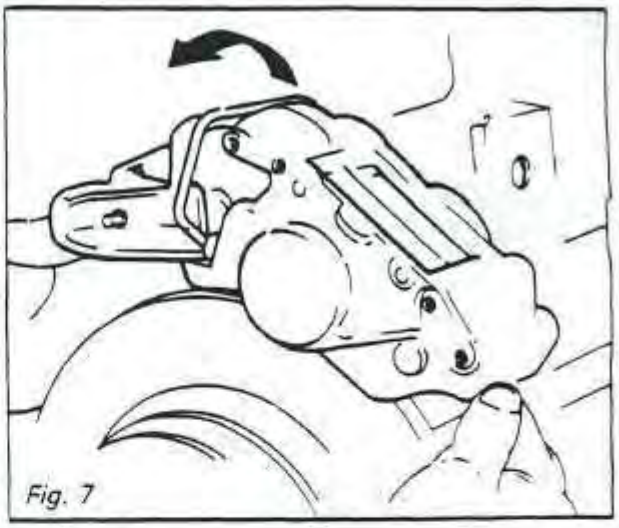


Fig. 7

INSTALLATION

1. To complete installation reverse the removal procedure, torque fasteners to specification.

   Notice:
   Fasteners must be torqued with car resting on its suspension.

2. Bleed brake system.
3. Check car suspension for specified toe-in alignment and adjust if necessary.
4. Adjust hand brake cable(s) if necessary.

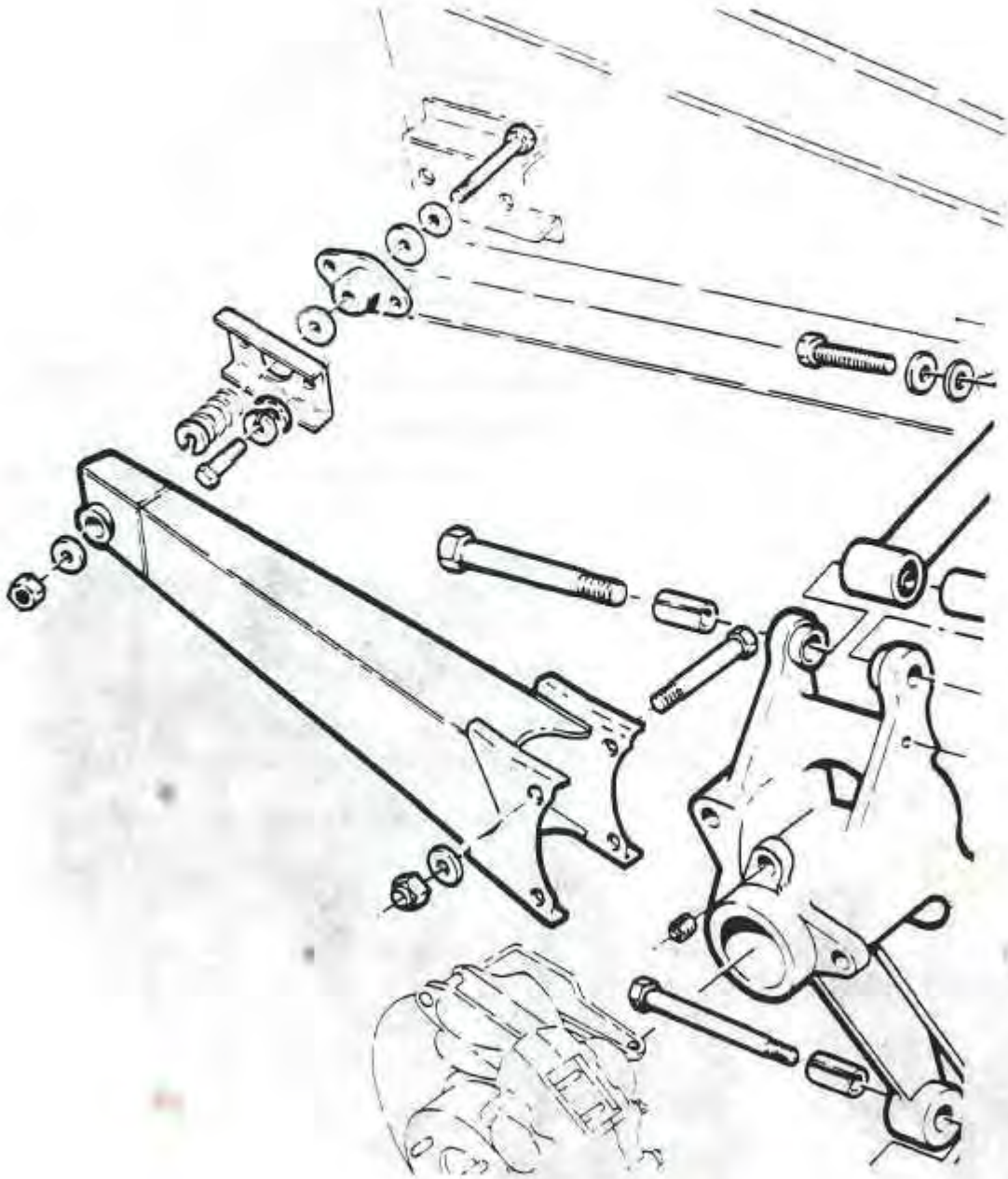


Fig. 8

TRAILING ARM BUSHING – RIGHT OR LEFT

REMOVAL

1. Raise car on hoist.
2. Remove trailing arm pivot bolt and nut. Position trailing arm out of the way to gain access to bushing retaining plate.

   Note:

   Quantity of removed shim washers should be noted and replaced upon installation.

3. Remove both bushing mounting plate nuts and bolts. Remove plate and bushing.
4. Fit new bushing. Reverse removal procedures and torque fasteners.
5. Check rear suspension for specified tow-in alignment and adjust if necessary.

SHOCK ABSORBER/COIL SPRING

REMOVAL AND INSTALLATION OF REAR SPRING AND SHOCK ABSORBER

Removal

1. Raise rear of car on jack and place on axle stands.
2. Remove rear wheels and tyre assemblies.
3. Place jack under rear hub carrier to remove pressure from rear spring.
4. Compress rear spring using a suitable compression tool.
5. Remove lower mounting nylon nut and washers.
6. Remove upper mounting nut and washers.
7. Pull lower part of shock absorber clear of lower pivot bolt and carefully remove spring and shock absorber assembly from the car.
8. Remove shock absorber from rear spring.
9. Carefully remove spring compression tool from rear spring.

Note:
Coil spring can be dangerous. A spring compression tool must be used at all times to fit and remove coil springs.

Installation

1. To reassemble, reverse removal procedure and torque components to specification.

TOE-IN ALIGNMENT ADJUSTMENT

1. Check rear wheels for rim run out. Maximum tolerance is .406 mm (.16 inch).

2. Check tyre pressures. 30 p.s.i. 2.06 bar.

3. Check and ensure no abnormal wear in suspension, joints, wheel bearings.

4. Place vehicle on flat surface.

5. Check and, if necessary, adjust setting height 140 mm (5.5 inches). *Fig. 9* This measurement must be taken from the centre of the rear crossmember.

   It is important to note that the vehicle setting height must be attained prior to checking or adjusting the suspension.

   It may be necessary to lift the rear of the vehicle or load the vehicle to obtain the specified setting height.

6. Proceed with wheel alignment per the directions of the manufacturer of the alignment equipment used.

Note:
Where equipment directions indicate to jounce the suspension, substitute with, check and ensure specified setting height is maintained.

ALIGNMENT SPECIFICATIONS – REAR

Toe-In 3 mm (0.12 inch) per wheel
CAMBER ¼° to ¾° negative and non-adjustable

Note:
If camber specifications do not fall within the specified tolerance, check for damaged suspension components.

7. Remove trailing arm shields.

8. Loosen trailing arm pivot bolt 'A' *Fig. 10*

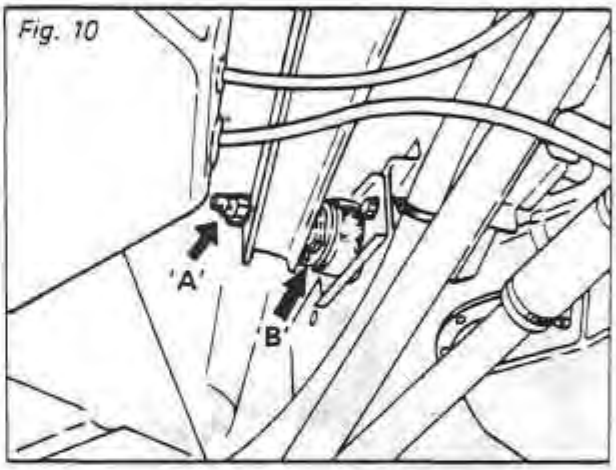


Fig. 10

9. Remove or add the required amount of shims (Part No. 106680) to obtain the specified tolerance. 'B' *Fig. 10*

   Note:
   1 Shim = 1.1° ($\frac{1}{16}$ inch)

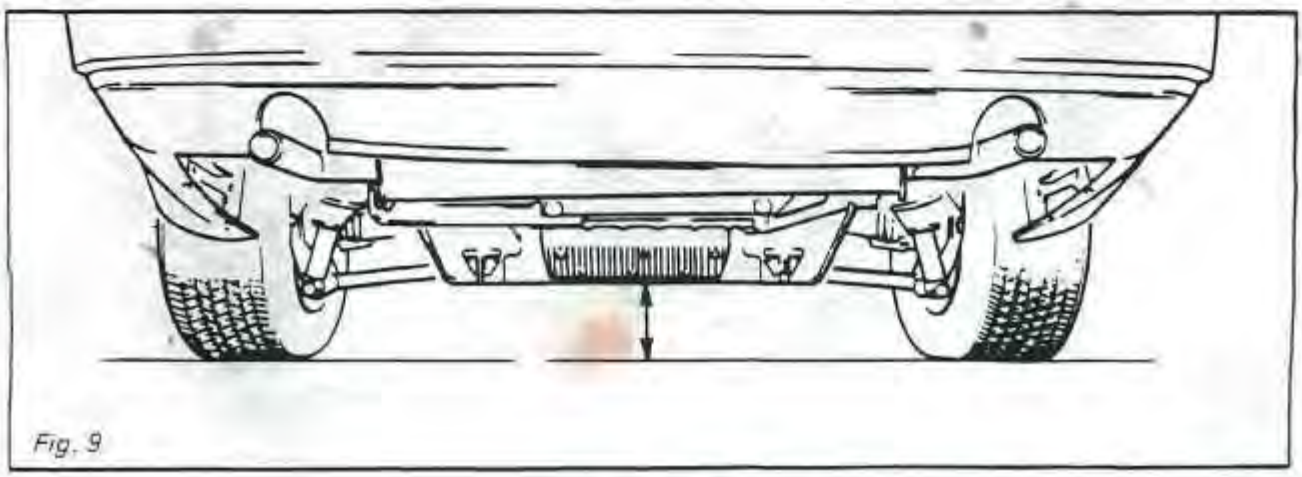


Fig. 9

10. Proceed with wheel alignment per directions of manufacturers of alignment equipment used.

11. Torque trailing arm pivot bolt 'A' *Fig. 10* to 75 Nm (55 ft./lbs.)

12. Check adjustment.

FIGURE CONVERSION TABLE

FRACTIONAL INCHES/DECIMAL DEGREES

1/32 = .06°	17/32 = .58°
1/16 = .13°	9/16 = .64°
3/32 = .19°	11/32 = .70°
1/8 = .26°	3/4 = .77°
5/32 = .32°	13/32 = .83°
3/16 = .38°	7/8 = .90°
7/32 = .45°	15/32 = .96°
1/4 = .51°	1/2 = 1.02°

TORQUE SPECIFICATIONS

REAR SUSPENSION

Important Note:
TORQUE SPECIFICATIONS SHOULD NOT BE EXCEEDED.

Trailing arm bush attachment	M8 × 13	22	16
Lower link both ends	½" × 19	80	60
Upper link both ends	½" × 19	80	60
Trailing arm hub to carrier	M12 × 19	75	55
Outer drive shaft to hub	M22 × 32	370	270
Trailing arm to pivot bush	M12 × 19	75	55
Shaft to inner and outer drive shafts	M10 × 17	40	30
Parking brake cable bracket to hub carrier	M6 × 10	7	5.5
Caliper — hub carrier	$\frac{7}{16}$" × 16	55	40
Flex brake pipe attachment	$\frac{3}{8}$" × 15	16	12
Wheels	M12 × 19	80	60

Brakes, Wheels and Tyres

CONTENTS

GENERAL DESCRIPTION

The vehicle is equipped with a four wheel, vacuum assisted, hydraulic disc brake system. The disc brakes are applied with separate front and rear hydraulic circuits. The hydraulic pressure for these circuits originates at a tandem master cylinder which is operated with push rods. Brake application is assisted with the aid of a mechanical/vacuum power servo unit which is activated by brake pedal application. The park brake mechanically operates the rear brakes only.

Each wheel assembly is equipped with a fixed caliper containing two opposing pistons (attached to knuckle or carrier), a brake disc (positioned over the hub and wheel studs) and a set of brake pads.

In addition to the service brake calipers and pads, the rear brakes are equipped with independent and separate park brake caliper and pad assemblies. The park brake calipers and pads are operated with the park brake lever inside the driver's compartment by means of two (2) separate cables to provide park and emergency braking of the rear discs. The park brake caliper and pad assemblies are secured to the rear service brake calipers. The park brake caliper and pad assemblies are self-adjusting by means of a spring loaded racheting pawl incorporated within the caliper apply lever.

The tandem master cylinder consists of two (2) independent cylinders in a single casting. Should one cylinder or system fail, the other system will remain operational. Each hydraulic system (front and rear) has a separate brake fluid supply well in the brake fluid reservoir which is mounted to the top of the master cylinder. The brake fluid reservoir is equipped with a float actuated, low fluid warning indicator. However, this system is not equipped with a low pressure indicator, a metering valve, proportioning valve or a combination of these valves.

The power assist from the brake servo unit is developed by engine vacuum. Engine vacuum, obtained from an intake manifold fitting, is applied to both sides of a diaphragm inside the servo unit. Depressing the brake pedal will allow atmospheric pressure to enter one side of the diaphragm. This difference in pressure develops the power assist used in applying the brake systems. The servo unit is located between the brake pedal and master cylinder. The apply pressure is transferred through two (2) in-line push rods. Should a vacuum failure occur, the two (2) push rods will act as a single rod and the brakes will continue to operate in the unassisted, conventional manner; however, additional brake pedal effort will be required. A vacuum check valve is used in the supply line where it connects to the servo unit. This check valve prevents vacuum loss from the servo unit after the engine stops running and provides enough vacuum reserve for emergency brake application. *(Fig. 1)*

Brakes, Wheels and Tyres

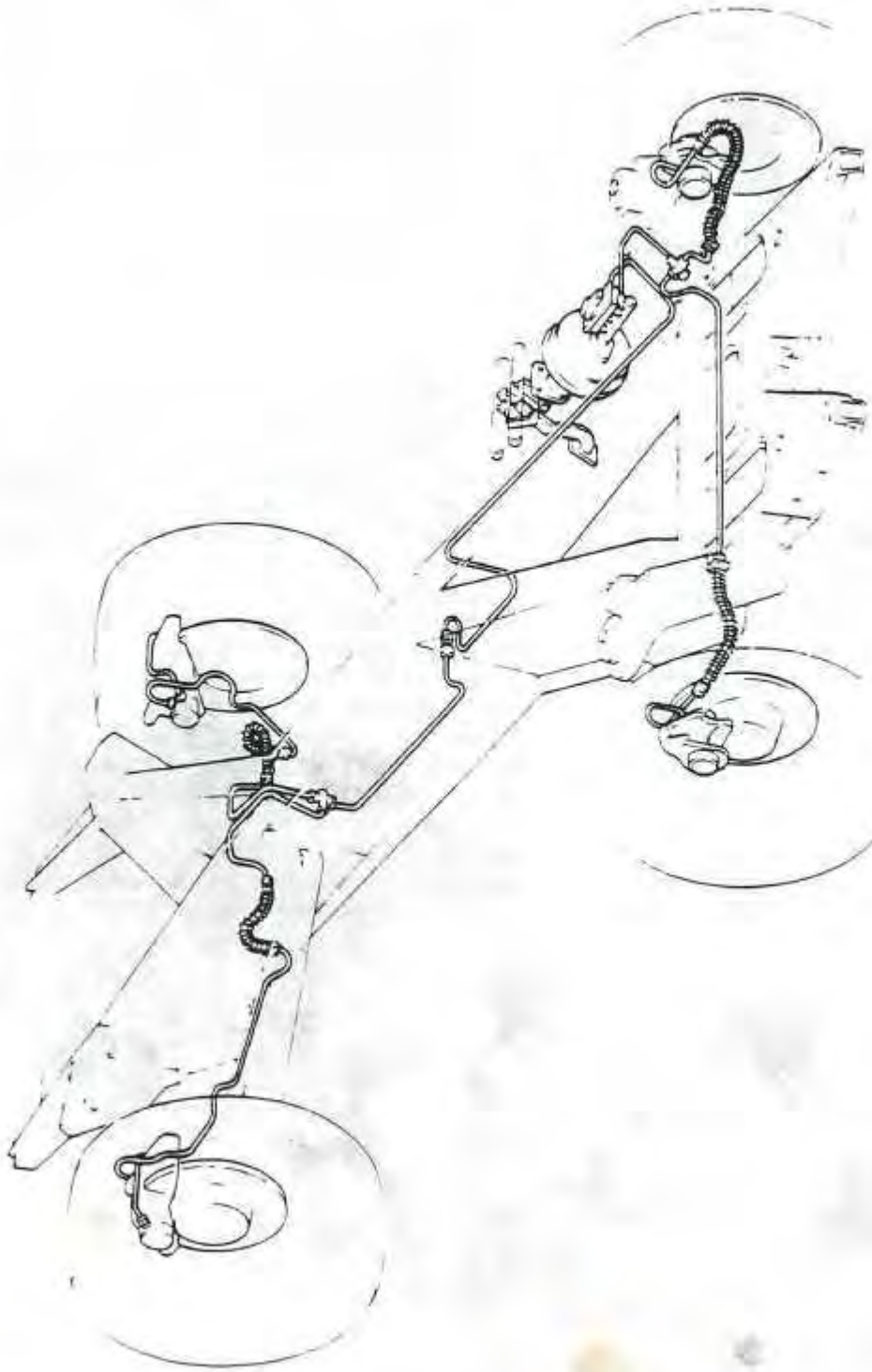


Fig. 1

SPECIFICATIONS

Brake Type	Power Assistance Discs Front and Rear
Boost Ratio	2.2 to 1
Diameter of Vacuum Servo	190 mm (7½")
Effective Braking Area Front	1800 Sq Cms (279 Sq Ins)
Effective Braking Area Rear	1690 Sq Cms (262 Sq Ins)
Disc Diameter Front	254 mm (10")
Disc Diameter Rear	276 mm (10½")
Hand Brake	Mechanical Self Adjusting Acting on Both Rear Discs
Brake Fluid Specification	D.O.T. 4/SAE J1703 (Hydraulic Fluid)

FRONT BRAKE PADS

INSPECTION

1. Raise car on hoist and remove front tyre and wheel assemblies.
2. Measure the thickness of the brake lining material on all pads. If the thickness of brake lining material on one or both pads is less than '$_8$" thick (3 mm) replace all pads.
   NOTE: Always replace pads in complete sets, on both sides.
3. Install tyre and wheel asemblies and torque to specification.
4. Lower car.

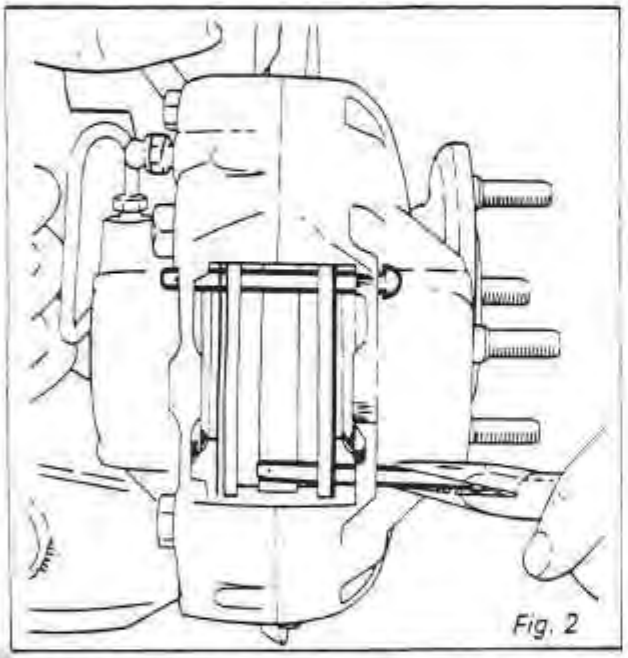


Fig. 2

FRONT BRAKE DISC PADS—REPLACE

1. Raise car on hoist.
2. Remove tyre and wheel assembly.
   NOTE: When disc pads are being replaced, all pads on both front wheels should be replaced at the same time.
3. Clean the exterior of the caliper assemblies with a wire brush and note the location and position of damping shims.
4. Remove pad retaining pin clips from retaining pins and remove pad retaining pins. *(Fig. 2)*
   NOTE: Inspect the condition of the clips. If worn or corroded, install new clips on re-assembly. *(Fig. 3)*
5. Remove the disc pads from the caliper assembly.
6. Inspect piston dust covers for damage, deterioration or leakage. Replace as required.

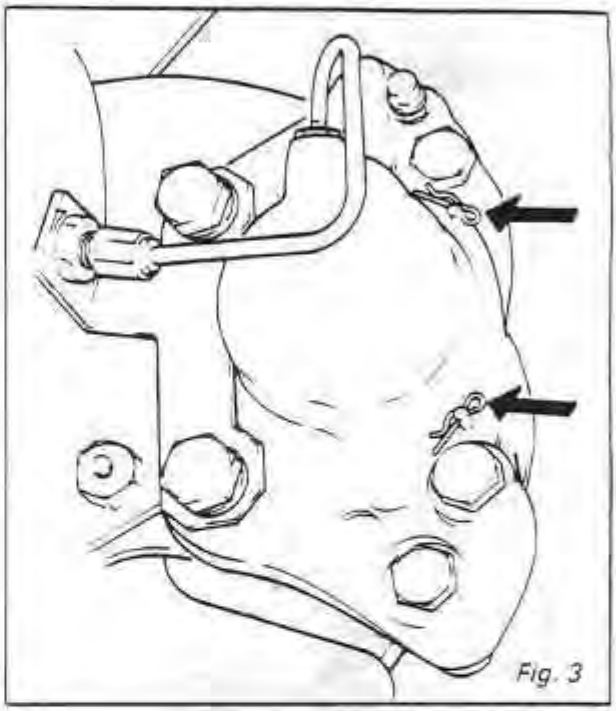


Fig. 3

INSTALLATION

1. Remove protective cap on brake fluid reservoir and place a clean shop towel over the opening to catch any displaced brake fluid.
2. Evenly press each piston back into its bore.
3. Clean pad gap area of caliper before installing new pads.
4. Using new anti-squeal shims, smear the special grease provided on both sides of the anti-squeal shims and on the back plates of the new pads.
   NOTE: Make certain no grease gets on the brake pad lining material.
5. Insert new brake pads and anti-squeal shims. The anti-squeal shims are to be placed between each brake pad and piston with the arrow shaped perforation pointing in the direction of disc rotation. *(Fig. 4)*
6. Install the pad retaining pins and secure with pin retaining clips.
7. Repeat this procedure on the other side.
8. Slowly pump the brake pedal to move the pistons and pads up to the disc.

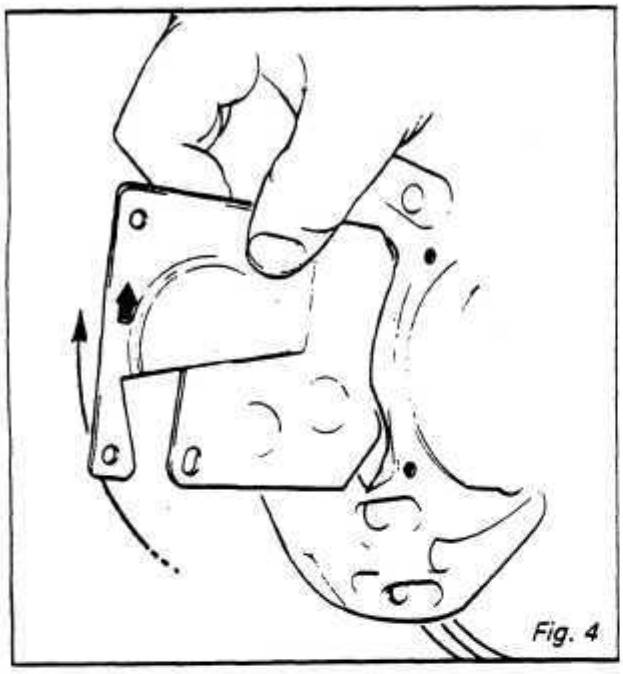


Fig. 4

9. Brake bleeding is generally unnecessary, but check the brake fluid reservoir for the proper fluid level ("MAX" mark on reservoir) and top up with fresh brake fluid as required.
10. Install tyre and wheel assemblies and torque to specification.
11. Lower car on hoist.

FRONT BRAKE CALIPER

REMOVAL

1. Remove brake disc pads as previously described.
2. Disconnect brake line at caliper and cap.
3. Remove two bolts securing the disc caliper assembly to the hub carrier and remove caliper. *(Fig. 5)*
   NOTE: Any shims removed between the mounting faces should be noted so they can be replaced in the same position upon installation.

INSTALLATION

1. To complete installation, reverse the removal procedure.
2. Torque fasteners to specification and bleed brake system.

UNIT DISASSEMBLY

1. Remove the caliper assembly as previously described.
2. Remove caliper piston dust cover retaining ring and remove piston dust covers. *(Fig. 6)*
3. Pack a clean piece of shop towel between the pistons and then drive them from the cylinder bores by applying clean compressed shop air to the inlet connection.
   CAUTION: Care should be exercised that fingers are kept well clear from the gap area and eye protection should also be worn as there may be fluid spray.
4. Remove piston sealing ring from bore.
   NOTICE: Care should be exercised not to damage the bore or locating groove.
5. Remove dust cap and unscrew bleed screw.

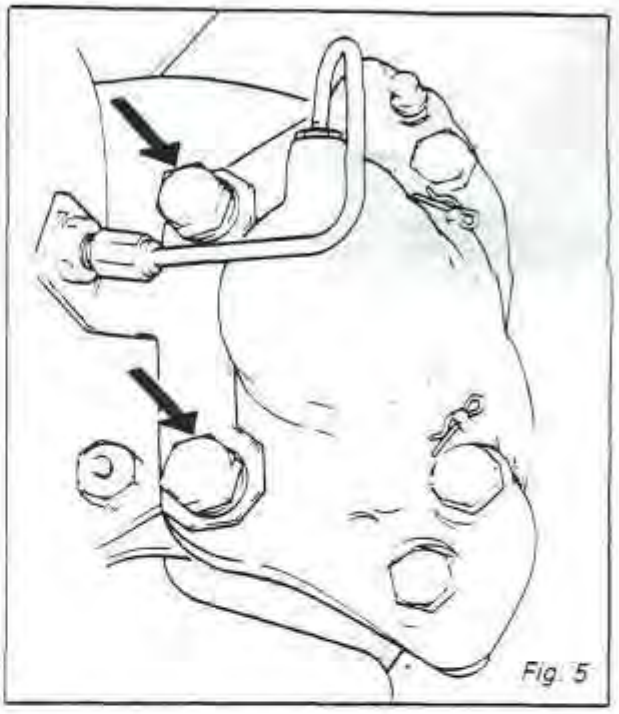


Fig. 5

NOTICE: No attempt should be made to remove the bolts and separate the two halves of the caliper body.

INSPECTION

1. Clean all parts thoroughly with Girling cleaning fluid or fresh, clean specified brake fluid. (DOT 4 only).
2. Examine the cylinder bores and pistons carefully for signs of damage, abrasion, scuffing or corrosion. New pistons may be

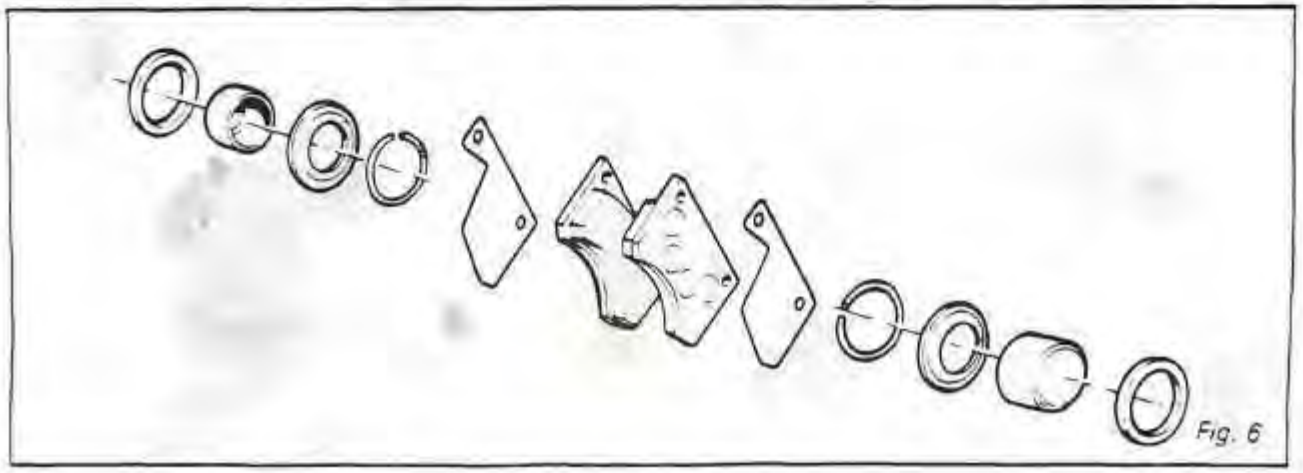


Fig. 6

installed. If the cylinder bore is damaged, the caliper must be replaced.

REASSEMBLY

1. Lubricate cylinder bores and new sealing rings with clean brake fluid and install sealing rings into groove in the bore.
2. For ease of assembly, keep the dust covers dry and do not lubricate.
3. Insert the piston into cylinder bore and install the dust covers and retaining rings. Make certain dust covers are correctly installed.

INSTALLATION

1. Position the caliper to the hub assembly ensuring shims originally removed between the mounting faces are correctly positioned. Torque to specification.
2. Replace pads retaining pins and retaining pin clips.
3. Reconnect brake pipe and bleed system.
4. Install tyre and wheel assembly. Torque to specification.
5. Lower car on hoist.

REAR BRAKE PADS

REAR BRAKE PADS—INSPECTION

1. Raise car on hoist and remove rear tyre and wheel assemblies.
2. Measure thickness of brake lining material on all parts. If the thickness of brake lining material on one or both parts is less than $\frac{1}{8}$" thick (3 mm) replace pads.
   NOTE: always replace pads in complete sets on both sides.
3. Install tyre and wheel assemblies and torque to specification.
4. Lower car.

REAR BRAKE DISC PADS—REPLACE

1. Raise car on hoist and remove both rear tyre and wheels assemblies.
   NOTE: When brake disc pads are being replaced, all service pads on both rear wheels should be replaced at the same time.
2. Clean exterior of caliper assemblies with wire brush.
3. Remove pad retaining pin clips from retaining pins and remove pad retaining pins.
   NOTE: Inspect condition of clips. If worn or corroded install new clips on reassembly.
4. Remove disc pads and damping shims from caliper assemblies.
5. Inspect piston dust covers for damage, or deterioration. Replace as required.

INSTALLATION

1. Remove brake fluid reservoir cap and place a clean shop towel in opening to catch any displaced fluid.
   Remove protective cap on bleed screw and open bleed screw one full turn to prevent fluid pressure from building up when caliper pistons are pushed back.
2. Evenly press each piston back into its bore.
3. Torque tighten the bleed screw to specification.
4. Clean pad gap area of caliper before installing new pads.
5. Insert new brake pads.
6. Install brake pad retaining pins and secure with pin retaining clips.
7. Repeat this procedure on other rear caliper.
8. Slowly pump brake pedal to move pistons and pads up to disc.
9. Brake bleeding is generally unnecessary, but check brake fluid reservoir for proper fluid level (MAX mark on reservoir) and top up with fresh brake fluid as required.
10. Install tyre and wheel assemblies and torque to specification.
11. Lower car.

REAR BRAKE CALIPER

REMOVAL

1. Remove brake disc pads as previously described.
2. Disconnect hydraulic brake line at rear caliper and cap.
3. Disconnect park brake cable from park brake caliper lever arm by removing backing off locknut. *(Fig. 7)*
4. Remove two (2) bolts securing brake caliper assembly to hub carrier and remove caliper assembly. *(Fig. 8)*

INSTALLATION

1. To complete installation, reverse the removal procedure.
2. Torque fasteners to specification and bleed brake system.

UNIT DISASSEMBLY

1. Remove brake caliper assembly as previously described.
2. Remove caliper piston dust covers retaining ring and remove piston dust covers.
3. Pack a clean piece of shop towel between the pistons and then drive them from cylinder bores by applying clean compressed shop air to brake line inlet connection.
   CAUTION: Care should be exercised that fingers are kept well clear from the caliper gap area and eye protection should also be worn as there may be some fluid spray.
4. Remove piston sealing ring from caliper bore.
   NOTE: Care should be exercised not to damage the bore or locating groove.
5. Remove dust cap and uncrew bleed screw.

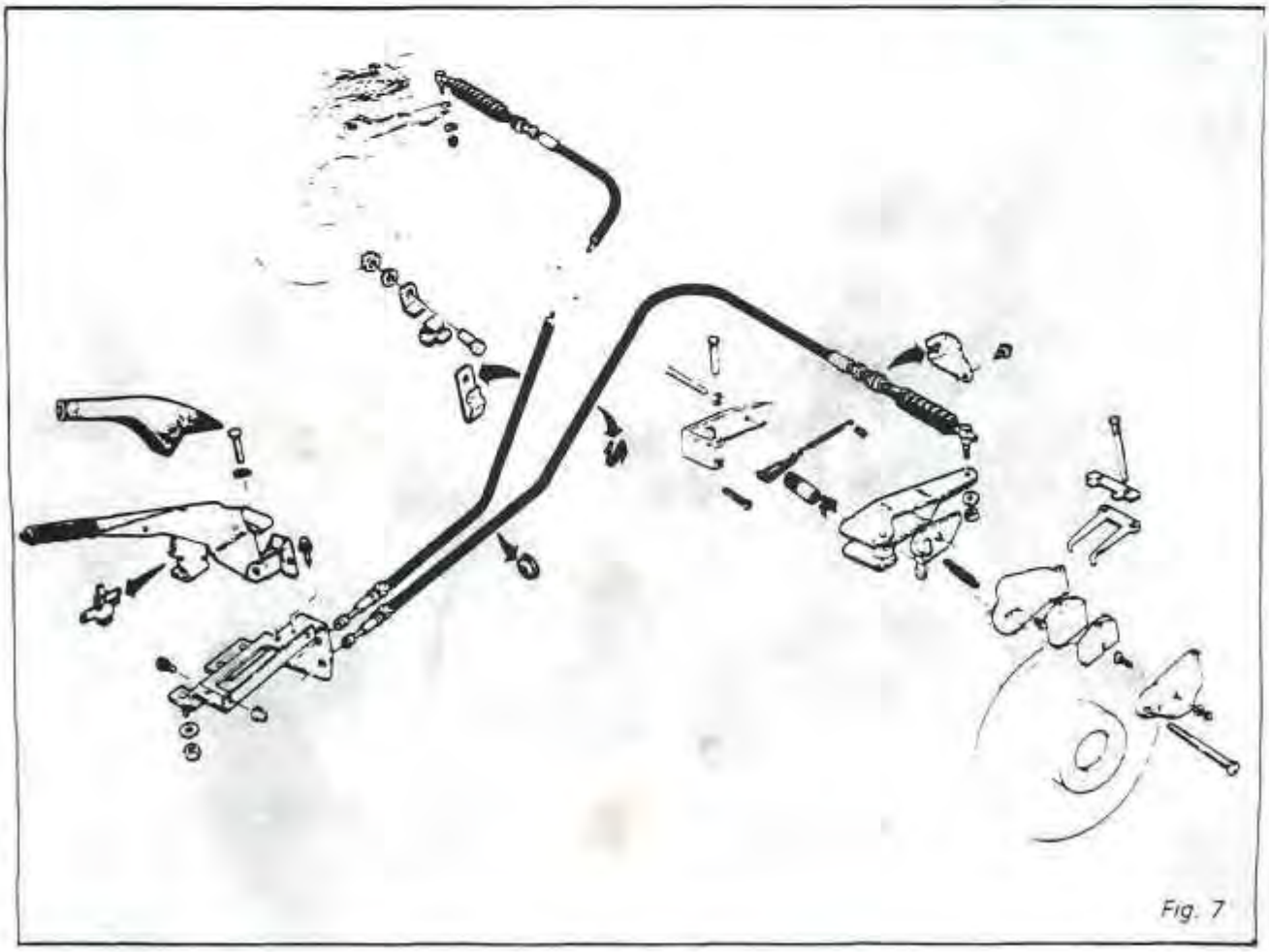


Fig. 7

NOTICE: No attempt should be made to remove the bolts and separate the two halves of the caliper body.

UNIT INSPECTION

1. Clean all parts thoroughly with Girling cleaning fluid or fresh, clean specified brake fluid (DOT 4 only).
2. Examine cylinder bores and pistons carefully for signs of damage, abrasion, scuffing or corrosion.
3. New pistons may be installed. However, if cylinder bore is damaged, replace caliper.

UNIT REASSEMBLY

1. Lubricate cylinder bore and new sealing ring with fresh clean brake fluid and install sealing ring into groove in bore.
   NOTE: For ease of assembly, keep dust cover dry and do not lubricate.
2. Insert piston into cylinder bore and position and secure dust cover retaining ring. Make certain the cover is correctly installed.

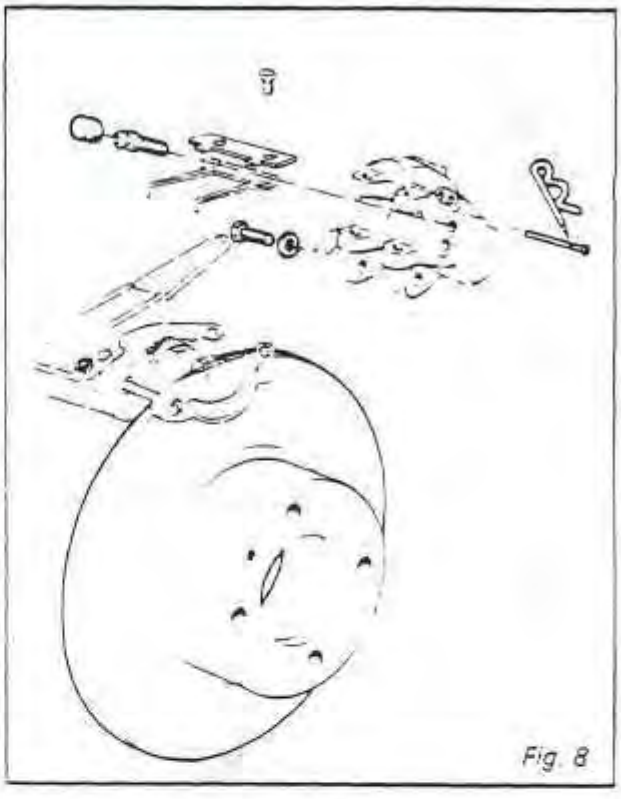


Fig. 8

BRAKE SERVO

REMOVAL—Fig. 9

1. Working inside car, remove spring clip and clevis pin from push rod fork.
2. Remove filler neck and master cylinder access covers from inside luggage compartment.
3. Remove two (2) nuts and washers 1 securing master cylinder to power brake servo and remove.
4. Disconnect vacuum pipe 2 from check valve 3 on brake servo.
5. Remove four (4) bolts securing brake servo mounting bracket to pedal box assembly.
6. Remove brake servo assembly from car.
7. Remove mounting bracket from servo unit by removing four (4) nuts.

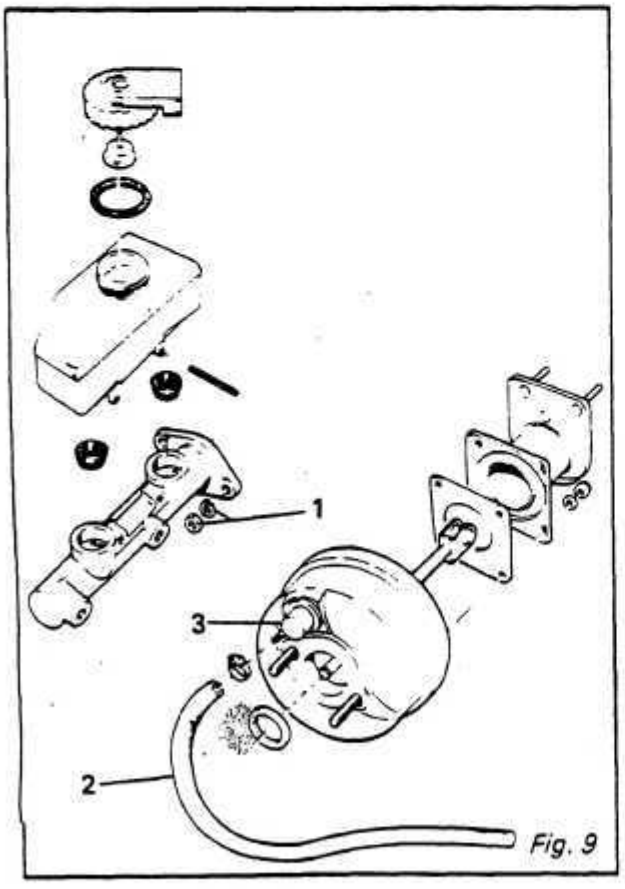


Fig. 9

INSTALLATION

1. Fit mounting bracket to brake servo, and torque to specification.
2. Position and secure brake servo assembly complete with mounting bracket, to the pedal box and torque the four (4) bolts to specification.
3. Install new seal between master cylinder and brake servo and ensure breather groove in servo-flange is clear.
4. Position the master cylinder to brake servo and secure with two (2) nuts and washers. Torque to specification.
5. Check vacuum pipe to valve on brake servo. Secure with clamp.
6. Position and secure the fuel filler neck and master cylinder access covers.
7. Working inside car, connect fork on input rod, to pedal relay lever by inserting the grease smeared clevis pin and spring clip.

CHECK VALVE—REMOVAL

1. Remove the fuel filler neck and master cylinder access covers from inside the luggage compartment.
2. Remove the check valve 3 by pulling on nozzle while exerting side thrust. Use a screwdriver between the rubber grommet and the valve flange taking care not to damage the unit. *(Fig. 9)*

NOTE: When removing the grommet ensure that it does not drop into the vacuum chamber.

INSTALLATION

1. Lubricate the ribs of the new check valve and install a new grommet into the brake servo.
2. Push in the check valve, so that it is located squarely on its seating, and the stem is in the original direction.

AIR/NOISE FILTERS

REMOVAL

1. Remove the power brake unit as previously described.
2. Pull back the dust cover and filter retainer, hook out the filters, and cut to remove from input rod.

INSTALLATION

1. Cut new filters to same length as old. Install over input rod and press into the neck of the valve body.
2. Reinstall the filter retainer and dust cover. NOTE: If the dust cover is damaged replace as necessary.

SEAL AND PLATE ASSEMBLY — REMOVAL

1. Remove the power brake unit as previously described.
2. Remove the seal and plate assembly from the front shell recess by gripping the centre rib and pulling off.

INSTALLATION

1. Wipe clean the output rod and recess wall. Lubricate the new seal and plate assembly.
2. Wipe clean the front mating face of the unit and with plate side leading, install the new seal and plate assembly over the rod and into the recess.

BRAKE MASTER CYLINDER/FLUID RESERVOIR

REMOVAL—Fig. 10

1. Remove access cover from inside luggage compartment.
2. Disconnect electrical connection to master cylinder cap.
3. Disconnect brake lines from master cylinder, and cap to reduce spillage of brake fluid.
4. Remove two (2) nuts securing master cylinder to power brake unit, and remove master cylinder.
   A small screwdriver with the end rounded and polished is required to remove the seals.
5. Remove the filler cap and drain off surplus brake fluid; remove rubber washer.
6. Remove the fluid reservoir from the master cylinder, by removing the two (2) roll pins.
7. Remove the fluid reservoir and lever out the seals 2. *(Fig. 10)*

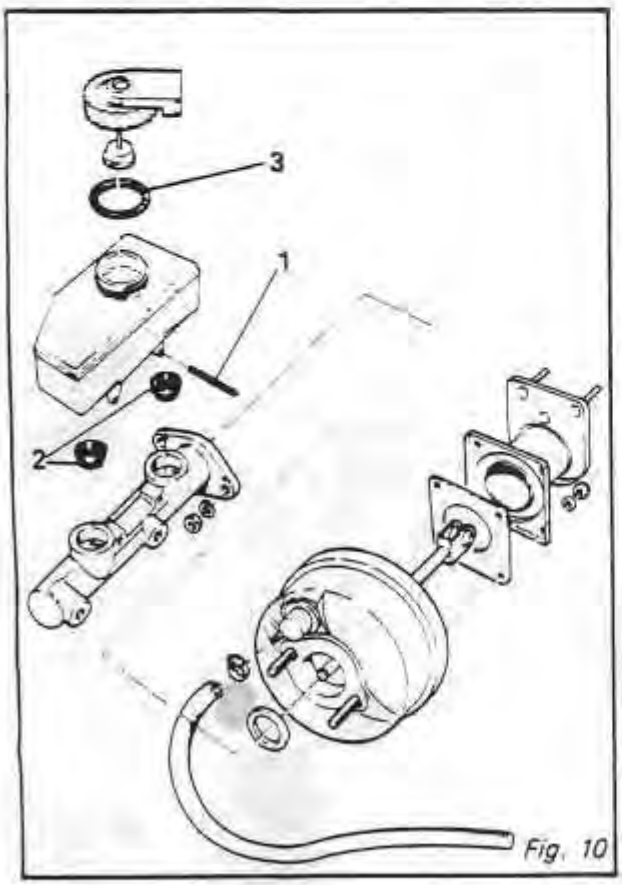


Fig. 10

INSTALLATION

1. To install the fluid reservoir lubricate the seals and press the fluid reservoir into position on the cylinder. Install the fluid reservoir retaining pins and pin retaining clips.
2. Install a new rubber washer 3 in the filler cap and screw the cap onto the reservoir.
3. Locate the master cylinder on the studs of the brake servo unit.
4. Install the two (2) locking washers and nuts and torque to specification.
5. Remove covers/plugs and connect brake lines to master cylinder.
6. Torque the brake line nuts to specification.
7. Connect electrical connection to the cap on the master cylinder.
8. Position and secure the access cover from inside the luggage compartment.
9. Refill and bleed the brake system.

TESTING THE OPERATION OF THE LOW FLUID WARNING DEVICE.

1. Press the small rubber diaphragm located on the reservoir cap, if the brake warning light (on the instrument cluster) illuminates, the operation of the low fluid warning is correct.
   NOTE: This warning light will not indicate fault conditions in the braking system, other than the two functions explained.

TESTING THE OPERATION OF THE PARKING BRAKE REMINDER

1. Apply the parking brake, if the brake warning light illuminates, then it indicates that the operation of the parking brake reminder is correct.
2. If the light does not illuminate check for bulb failure or continuity of electrical circuit.

BRAKE PEDAL

REMOVAL

NOTE: Manual Transmission – *(Fig. 11)* – this procedure may be performed wth the pedal box installed; Automatic Transmission – *(Fig. 12)* – the pedal must first be removed from the car.

1. Remove the spring clip and clevis pin connecting the brake pedal.
2. Remove the spring clip retaining the pedal shaft from the right side of the pedal box.
3. Move the pedal shaft towards the left hand side (at the same time inserting a short bar or screwdriver to retain the accelerator pedal) sufficiently to release the brake pedal.
4. The pedal pivot bushes may be replaced by knocking out the old bushes and pressing in the new.

INSTALLATION

1. Lubricate the brake pedal pivot bushes with SMP white lithium based grease.
2. Smear the relay link clevis pin with a molybdenum based grease and lightly oil the shaft retaining clip and felt washer.
3. Position the brake pedal in the pedal box and push the pedal shaft through brake pedal, accelerator pedal, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with screw.
4. Connect the relay link to the brake pedal lever with the clevis pin and retain with its spring clip.
5. Wipe any excess lubricant from the assembly and ensure that all pedal pads are totally grease free.

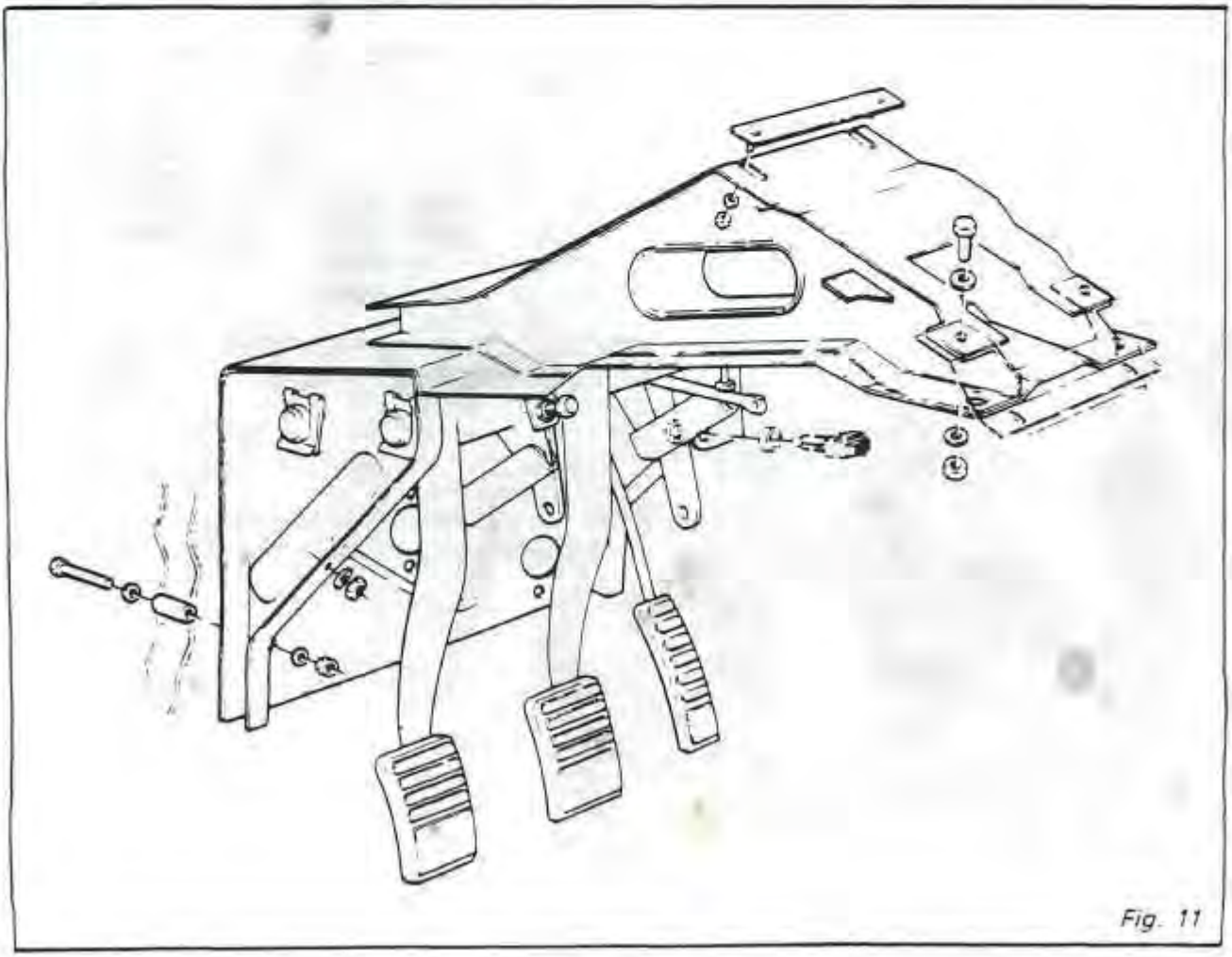


Fig. 11

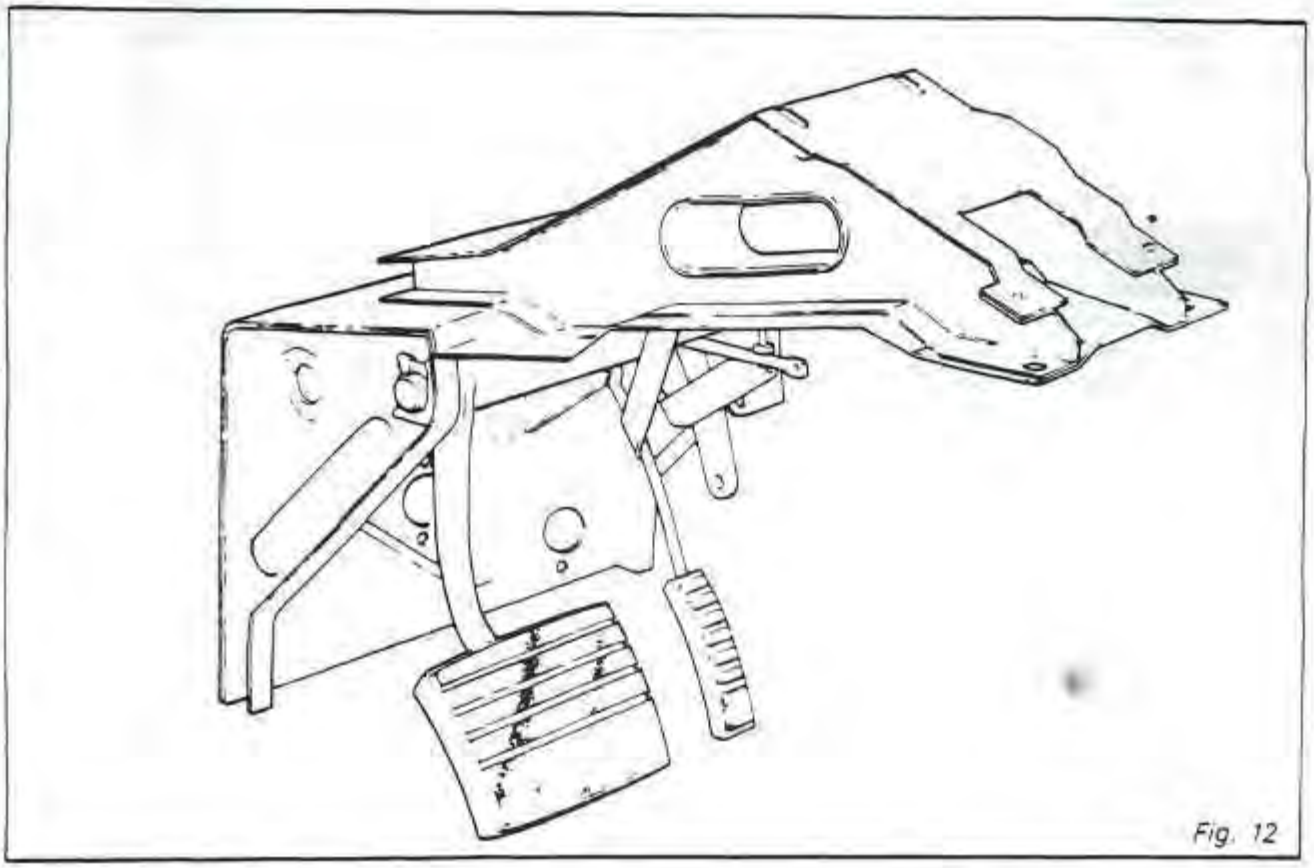


Fig. 12

6. Automatic transmission only. Install the pedal box assembly. *(Fig. 12)*

PEDAL RELAY LEVER (MANUAL ONLY) - REMOVAL

1. Remove the pedal box assembly from car.
2. Remove the spring clips and clevis pins connecting the relay links to the relay levers.
3. Remove the spring clip retaining the pedal shaft from the right side of the pedal box.
4. Draw out the relay shaft towards the left side to release the relay levers, with their springs.
5. The relay lever pivot bushes may be replaced by knocking out the old bushes and pressing in the new. *(Fig. 11)*

INSTALLATION

1. Lubricate the relay pedal pivot with SMP grease.
2. Smear the relay link clevis pin with molybdenum based grease and lightly oil the shaft retaining clips and felt washer.
3. Position the relay levers in the pedal box with the spacer washer (if fitted) between the left side of the clutch relay lever and the pedal box, and the springs in their locations.
4. Push the relay shaft through the spacer washer, clutch relay lever, brake relay lever, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with spring clip.
5. Connect the relay links to the relay levers with the clevis pins and retain with their spring clips.
6. Wipe any excess lubricant from the assembly and ensure that all pedal pads are totally grease free.
7. Install the pedal box assembly. *(Fig. 11)*

PEDAL RELAY LEVER (AUTOMATIC) — REMOVAL

1. Remove the spring clip and clevis pin connecting the relay link to relay lever.
2. Remove the spring clip retaining the pedal shaft from the right side of the pedal box. *(Fig. 12)*
3. Draw out the relay shaft towards the left hand side to release the relay lever with its spring.

4. The relay lever pivot bushes may be replaced by knocking out the old bushes and pressing in the new.

INSTALLATION

1. Lubricate the relay lever pivot bushes with SMP, a low viscosity lithium based grease.
2. Smear the relay link clevis pin with a molybdenum based grease and lightly oil the spring clips and felt washer.
3. Position the relay lever in the pedal box with its return spring in position and the felt and plain washer between the relay lever and right side of the pedal box.
4. Push the relay shaft through the relay lever, felt washer, plain washer and into the 'D' shaped hole in the pedal box. Retain with spring clip.
5. Connect the relay link to the relay lever with the clevis pin and retain with its spring clip.
6. Wipe excess lubricant from the assembly and ensure that all pedal pads are totally grease free.

BRAKE BLEEDING PROCEDURE

BRAKE SYSTEM BLEEDING – MANUALLY

Whenever any part of the brake system has been disconnected or when the level of brake fluid in the reservoir becomes so low as to allow air to be drawn into the master cylinder, bleeding the air from the brake system is required.

If brake component seals are worn or deteriorated it is possible for air to enter the caliper piston bores without any indication of leaking brake fluid and thus creating a 'spongy' pedal feel. This spongy pedal feel is the usual indication of air in the system.

NOTICE: It is important that cleanliness be strictly practiced during the entire brake bleeding procedure. Care should be exercised to ensure that dirt or water are not allowed to enter the brake system, especially at the reservoir.

BLEEDING PROCEDURE

1. Inspect brake fluid reservoir for proper fluid level (at MAX mark) and top up if necessary with fresh, unused brake fluid of the specified grade (DOT 4) (SAE 1703).
   NOTICE: Never use brake fluid which has been bled from any system to top up the fluid in the reservoir as it may be contaminated or aerated.
   NOTICE: Periodically inspect the level of brake fluid in the brake reservoir during the bleeding procedure. Care should be exercised not to allow the level of fluid to drop to a point where air could enter the hydraulic system via the reservoir.

   A clean glass container holding approximately ½" of clean, unused brake fluid (DOT 4) should be used to receive the brake fluid being bled from the system. In addition, the end of the transparent drain tube should always be immersed in this fluid during the bleeding procedure.

   When bleeding the brake system it is important to start with the **longest length** of hydraulic line first.
2. With the engine off, remove the vacuum reserve in the brake servo booster by applying the brakes several times.
3. Raise car on hoist.
   When bleeding all four wheels, the following sequence **MUST** be followed:
   A. RIGHT REAR
   B. LEFT REAR
   C. RIGHT FRONT
   D. LEFT FRONT
4. Install a box end wrench over the caliper bleeder screw and install a transparent drain hose over the bleeder screw. The drain hose should then be placed into the receiving container with the other end immersed in brake fluid.
5. Repeat the following steps for each wheel in the sequence previously listed:
   A) Fully depress the brake pedal **slowly one time and hold.**
   B) Loosen the bleed screw to purge the air from the line.
   C) Re-tighten the bleed screw.
   D) Slowly release the brake pedal and wait 5 seconds to allow the master cylinder piston to fully retract.
   E) Repeat A through D until brake fluid containing no bubbles emerges from the drain tube.

   NOTICE: There may be a small amount of red fluid discharged from the drain tube on the initial bleeding of the brake system. This fluid is test fluid used by the manufacturer during production and is not harmful to the system.

   NOTICE: Top-up the brake fluid reservoir as required during the bleeding procedure making certain air is not drawn into the system.
6. Lower car and top up brake fluid reservoir as required.

BRAKE SYSTEM BLEEDING—PRESSURE TECHNIQUE

Bleeding the brake system with available pressure bleeder tools considerably assists in performing this procedure. These tools are equipped with brake fluid holding tanks pressurised.

The variety of equipment consists of a holding tank partially filled with brake fluid and a rubber hose which is intended to be connected to master cylinder adapter suitably designed to be installed on specific master cylinder reservoirs. Compressed air is then placed in the holding tank which forces the brake fluid into the brake hydraulic system via the master cylinder reservoir.

Pressure bleeding equipment must be of the diaphragm type, that having a rubber diaphragm between the brake fluid and the air supply to prevent moisture, air or other contaminants from entering the brake hydraulic system.

Brakes, Wheels and Tyres

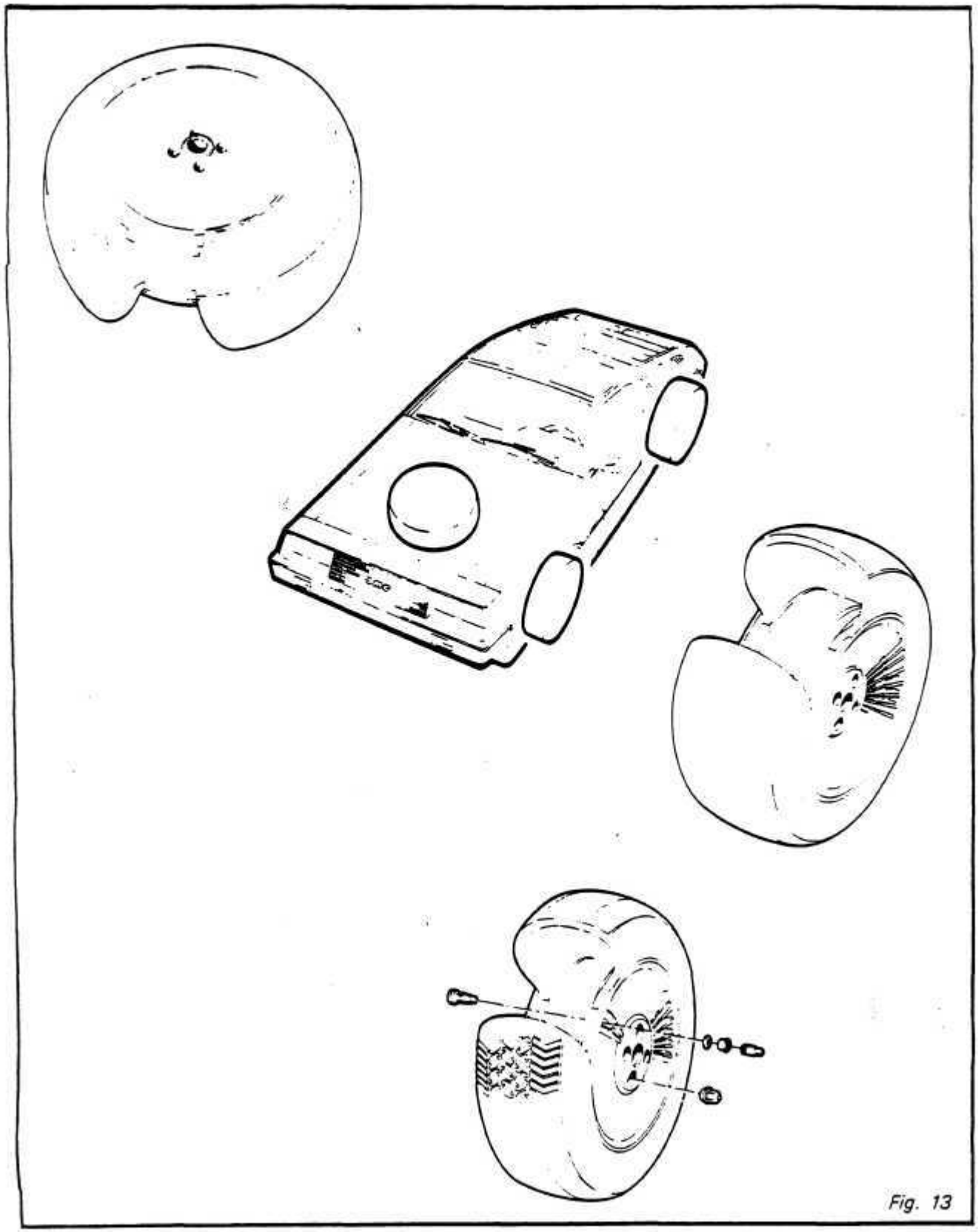


Fig. 13

WHEELS AND TYRES

WHEELS—Fig. 13

The wheels are a four bolt locating aluminium alloy LM25KD with 45 ribs equally spaced at 8°, with windows between.

The maximum run out of the wheel is 0.5 (.080") measured at any location on either tyre seat.

SPARE WHEEL

The spare wheel and tyre assembly is for emergency use only. The maximum speed advised is 50 mph, and the tyre pressure should be kept at 60 PSI.

To conserve tyre tread the spare wheel should be returned to the storage area as soon as the standard tyre can be repaired or replaced.

WHEEL SIZES

Front Wheel	14" × 6" (375mm × 152mm)
Rear Wheel	15" × 8" (381mm × 203mm)
Spare Tyre	15" × 4" (381mm × 102mm)

CLEANING

Using a brush with nylon or natural bristles only, the wheel should be washed with warm water and detergent.

TYRES:

The tyres are steel belted tubeless radials.

TYRE SIZES:

Front	195/60 HR 14
Rear	235/60 HR 15
Spare	T125/70 D15

TYRE PRESSURES: for normal and high speed driving.

	Normal	High Speed
Front	23LB F/IN²	29LB F/IN²
Rear	30LB F/IN²	34LB F/IN²
Spare	60LB F/IN²	

GENERAL INFORMATION

1. Wheel nuts should be torqued to 100Nm (70 LB FT). The wheel nuts should be tightened alternately to the correct torque.
2. Never use oil or grease on the studs or nuts. Improperly tightened nuts could eventually allow the wheel to come off, while the car is moving, causing loss of control.
3. Tyres should be checked at regular intervals, for tread depth and external cuts in the fabric, exposure of ply or cord structure, lumps or bulges.
4. It is essential that the wheel and tyre assembly are balanced regularly and that the geometry (tracking) is checked as recommended in the Steering Section (H).

Electrical System and Instruments

CONTENTS

IGNITION SYSTEM

The ignition system is comprised of Battery, Ignition Switch, Coil with certain special features, Electronic Unit, Distributor with inductive pick-up, two Resistances and Sparking Plugs.

DISTRIBUTOR

The Distributor is driven by a spiral gear on the camshaft and rotates in a clockwise direction. The breaker points in the distributor have been replaced by a pulse generator consisting of a Stator, Detecting Coil and Permanent Magnet.

The pulse generator is connected to an Electronic Control Unit (E.C.U.) in which the signal from the Distributor is converted and amplified. The E.C.U. is connected to the coil.

Ignition spark advance is achieved by mechanical advance and a vacuum diaphram unit. The advance is mechanically controlled, according to engine speed, by governor weights inside the Distributor body and according to engine load by vacuum control acting directly on the base plate. As vacuum advance does not operate at idling speed due to the butterfly plates being closed, a correctly retarded spark is obtained for starting.

Note:
The dwell angle cannot be read, neither can it be adjusted.

REMOVING – REFITTING (DISTRIBUTOR) – Fig. 1

Note:
The mixture regulator must be removed to reach the distributor. Mark the following before removing the distributor:

1. Position of distributor body in relation to cylinder head.
2. Position of rotor arm in relation to cylinder head.

This will aid reassembly and avoid having to retime the ignition:

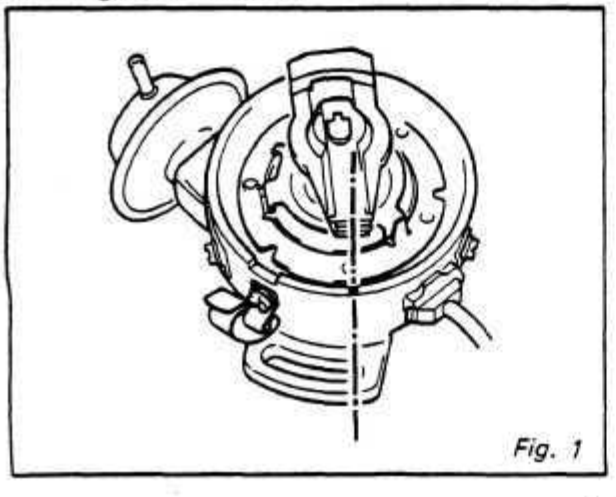


Fig. 1

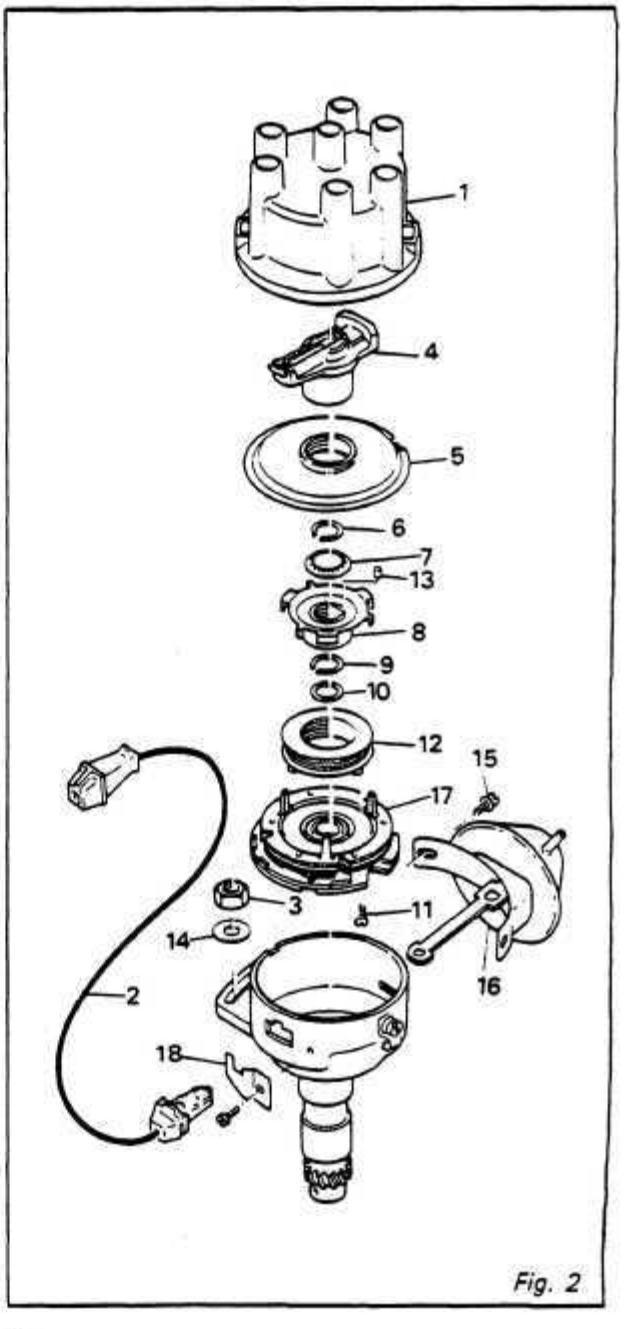


Fig. 2

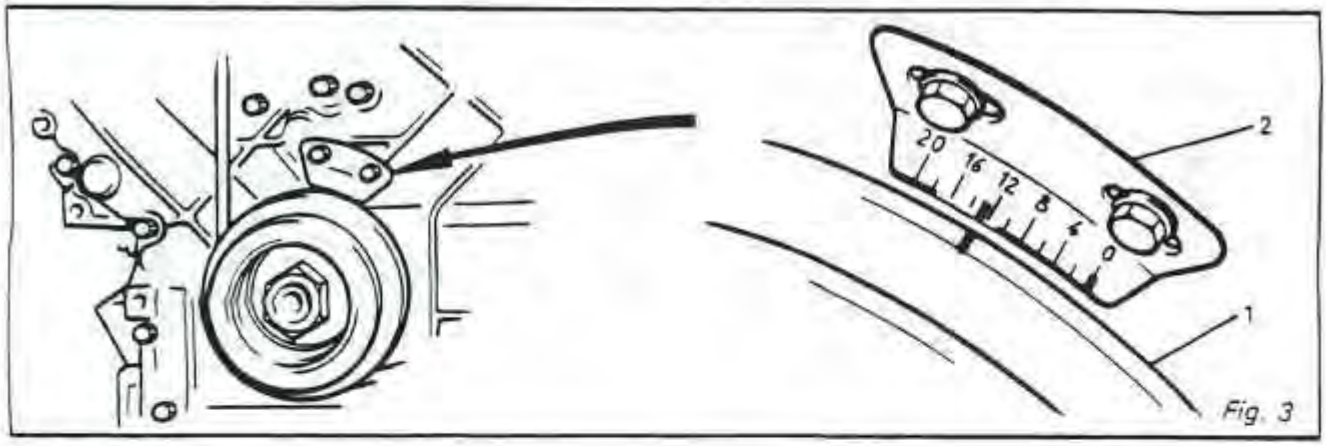


Fig. 3

1. Disconnect Battery.
2. Remove Distributor Cap (1). *Fig. 2*
3. Disconnect wire (2) between E.C.U. and Distributor.
4. Unscrew distributor retaining nut (3) and washer (14).
5. Remove Distributor.

REFITTING — Figs. 2 and 3

Follow the marks made on dismantling, check the Timing and adjust if required.

If in doubt as to the position of the Distributor proceed as follows for a first approximate setting: —

1. Set cylinder No. 1 to T.D.C. — firing stroke (line up marks on Crankshaft Pulley (1) and Calibrated Bracket (2) attached to the Timing Chain cover).
2. Line up the Rotor Arm (3) to the No. 1 Cylinder mark on Distributor Body (4). Note that the Distributor Spindle is driven by spiral gears and allow for this when lowering, also make sure Timing Adjustment Slot passes over the Fixing Stud. Then refit the Mixture Regulator (Gaskets must be renewed).

SETTING THE IGNITION TIMING — Fig. 4

There are two slots cut into the Crankshaft Pulley indicating No. 1 and No. 6 Cylinder T.D.C. A Timing Plate (2) is provided on the Timing Cover indicating 0° to 20° advance. The engine must be running at 775 ± 50 R.P.M. for this adjustment.

1. Connect up Strobe Light (3) to Cylinder No. 1 or No. 6.
2. Set the Crankshaft Pulley (1) Timing Slot opposite the Fixed Timing Line 13° by means of moving the Distributor.

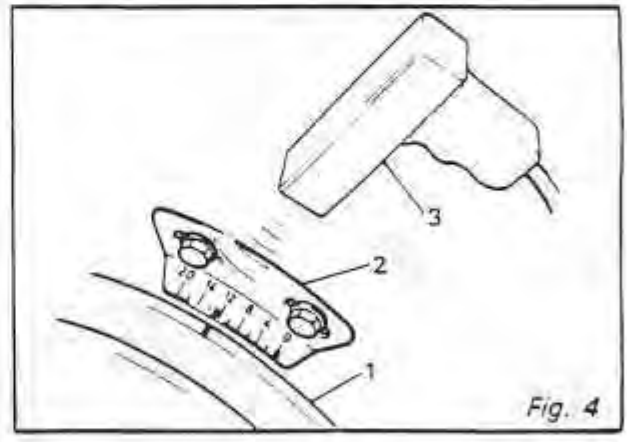


Fig. 4

DISMANTLING DISTRIBUTOR — Fig. 2

1. Remove Distributor Cap (1), Rotor Arm (4) and Dust Cover (5).
2. Unscrew Bracket (18) to remove low Tension Wire (2).
3. Remove Circlip (6) and Starwasher (7), holding Rotor (8), lever Rotor (8) off, with two screw drivers.
4. Remove Circlip (9) and Compensating Washer(s) (10).

5. Remove Screws (15) and withdraw Vacuum Valve (16), withdraw Coil Magnet (12) and Base Plate (17) as an assembly.

6. Remove three Screws (11) and remove Coil Magnet (12). Take care not to lose the Rotor Key (13).

ELECTRONIC CONTROL UNIT (E.C.U.) — Fig. 5

The E.C.U. module controls the operation of the ignition coil and determines the proper dwell angle. The module is a sealed component and must be replaced as a unit when confirmed as the cause of ignition breakdown. The module monitors engine operation by the varying voltage pulses it receives from the pulse generator in the Distributor. This then converts the signal received which breaks this current suddenly to obtain induced H.T. current at the coil output terminal.

This H.T. current is sent to each spark via a rotor arm in the same way as in the conventional distributor.

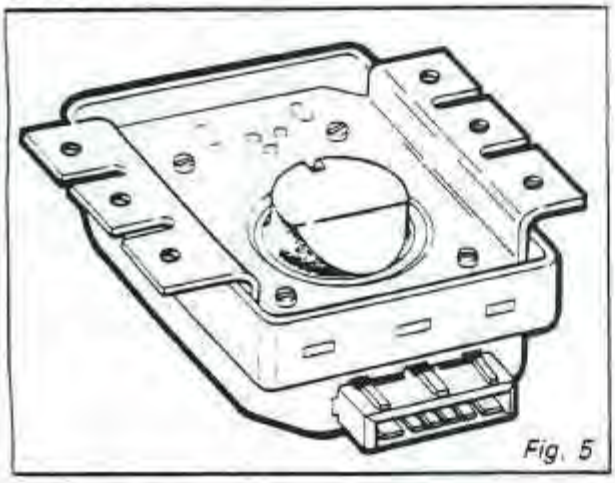


Fig. 5

COMPENSATING RESISTOR — Fig. 6

A dual resistance ballast resistor is used to control primary circuit voltage and current flow.

When the ignition is switched "on" the current flow is reduced by both resistors to prevent overheating of the coil. In operation to provide increased coil voltage for starting the engine, one half of the ballast resistor is by-passed during the engine cranking process to reduce the circuit resistance. The coil primary voltage and current will increase thus increasing secondary output voltage.

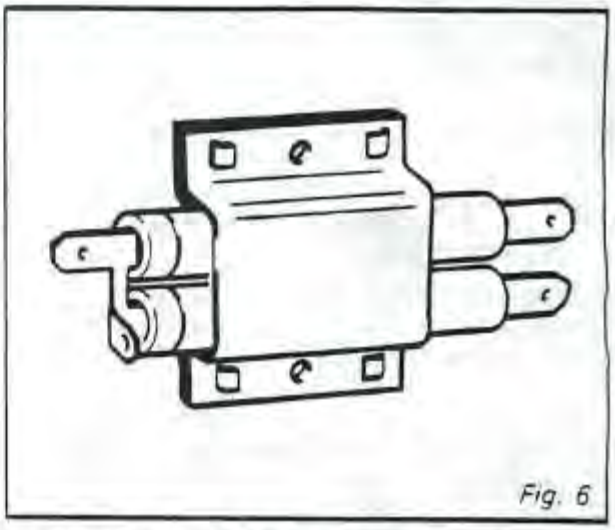


Fig. 6

CHECKING THE TRANSISTORIZED IGNITION SYSTEM

Preliminary Checks

1. Disconnect plug lead from plug, fit replacement spark plug in the lead.

2. Earth plug to cylinder head and get a colleague to crank engine, a spark should jump the gap in the plug.

Each plug should be checked, if no spark occurs, check components.

CHECKING THE COMPONENTS

Checking the resistances:
Connect an ohm meter across the terminals on both resistances. Meter should indicate approximately 0.5 ohm/Resistance.

Checking the Ignition Coil:
L.T. circuit connect an ohm meter between Battery + terminal and distributor terminals on the ignition coil, meter should indicate approximately 1 ohm.

H.T. circuit connect the ohm meter between the Battery + terminal and H.T. output socket on the ignition coil, meter should indicate approximately 7000 ohm.

WARNING: THESE RESISTANCES ARE HIGH.

Checking the Distributor:
Connect the ohm meter between the two terminals in the L.T. connector, meter should indicate approximately 1000 ohm.

Connect the ohm meter between one of the terminals in the connector and distributor body.

Meter should show open circuit. Resistance shows there is a fault.

PROVING THE EXISTENCE OF A FAULT IN THE DISTRIBUTOR

Disconnect the distributor connector and insert two wires from a T.D.C. pick up into the sockets in the connector on the electronic unit side.

Take a magnet and move it smartly towards and away from the T.D.C. pick up. Should a spark jump the gap between the ignition coil and H.T. lead the distributor must be changed or replaced.

If the ignition is faulty when the engine is running:

It is adviseable to change the electronic unit when misfiring or jerky operation occurs, only after first checking the following:

- Spark Plugs
- H.T. Leads
- Position Plug Leads
- Distributor
- Ignition Coil

Checking the Curves on the Oscilloscope:
The control voltage curve cannot be checked on the oscilloscope and this voltage cannot be altered. Only the H.T. curve can be checked in the same way as for a conventional distributor.

The dwell angle cannot be read neither can it be adjusted.

SPECIFICATIONS

Distributor

Rotation	: Clockwise
Firing Order	: 1-6-3-5-2-4
Resistor Value	0.5 ohm each (1.0 ohm total)
Ignition Timing	: 13° ± 2° B.T.D.C. at 775 ± 50 rpm
Centrifugal Advance	: 1000 rpm = 0° 2000 rpm = 10° 3000 rpm = 14° 4000 rpm = 20°
Vacuum Advance	: 5 in HG = 3° 10 in HG = 12° 15 in HG = 20°
Induction Coil Resistance	: 895 — 1,275 ohm
Trigger/Stator air gap	: 0.25 mm (use non magnetic feeler gauge)

Coil

Primary Winding Resistance	: 0.95 — 1.4 ohm at 20°C
Secondary Winding Resistance	: 5.5 — 8.5 kohms
Average Current Value Through Primary Winding at Idle	: 3.2 amps
Spark Plugs	: Bosch HR6 DS
Spark Plug Gap	: 0.6 mm to 0.7 mm (.024 to .028)
Spark Plug Tightening Torque	: 17 — 20 Nm (13 to 15 ft./lb.)

Precautions

- Never disconnect an H.T. wire with engine running.
- Any H.T. wire disconnected for checking purposes must be earthed before the engine is started.
- When the engine is running dangerously high voltages which may prove fatal are present in this circuit.

STARTER

REMOVING — Fig. 7

DISCONNECT BATTERY
REMOVE OIL FILTER (1)
RAISE R.H. REAR OF VEHICLE
REMOVE THE THREE BOLTS (2)
TILT THE STARTER (3)
DISCONNECT THE WIRES
REMOVE STARTER (3)
REMOVE COVER (4)

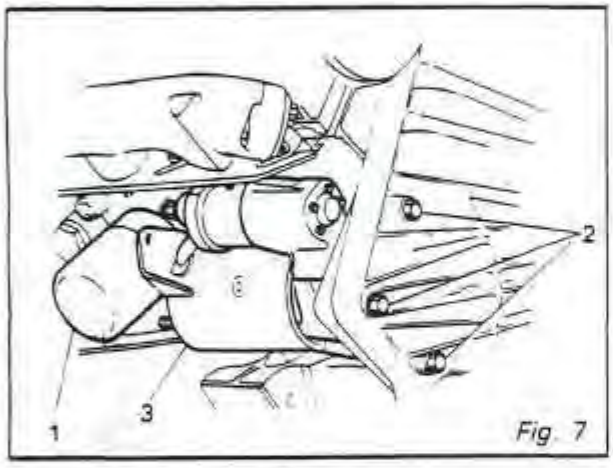


Fig. 7

REFITTING — Figs. 7 and 8

SPECIAL POINTS

LOCATE THE COVER ON THE CLUTCH DOWEL (5)

REVERSE THE REMOVAL PROCEDURE FOR REFITTING

Lubricate the bearings sparingly with oil and the spiral splines of the armature shaft with Mobil 22 Anderol 761 grease.

DISMANTLING THE STARTER — Fig. 9

Having removed the starter from vehicle:—

1. Remove the nut (1) and washer (2) which secures the Solenoid Terminal.
2. Remove the nuts (3) and washers (4) which secures the Solenoid to the starter.

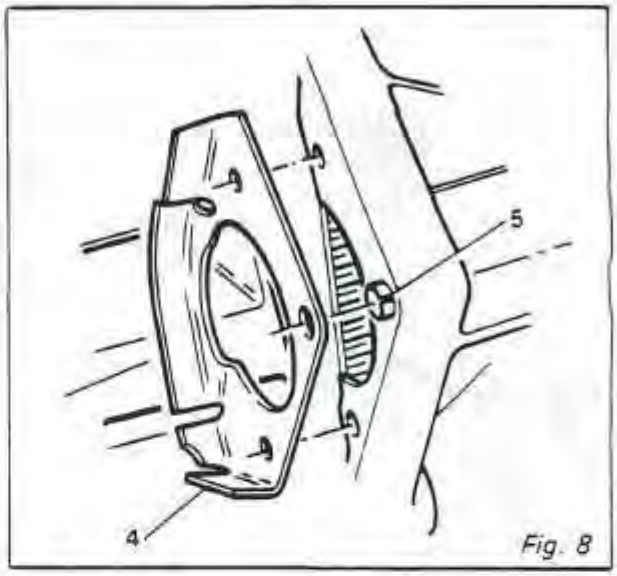


Fig. 8

3. Withdraw Solenoid (5) from Fixing Bracket (15).
4. Remove the Bearing Bosch Cap (6) off the End Plate (9).
5. Undo Screw (7) at the end of the Shaft with an impact driver in direction of rotation of the Armature.
6. Remove the Long Bolts (8).
7. Pull back End Plate (9).
8. Raise the Brushes (10) with a Hooked Tool.
9. Remove End Plate (9).
10. Remove the Cylindrical Pin (11) and Plastic Sleeve (12) which are between the Pivot Arm (16) and the Fixing Bracket (15).
11. Remove Rubber Grommet (13) and Washer (14) from Fixing Bracket (15).
12. Withdraw the Pivot Arm (16), Fixing Bracket (15) and Field Coil Assembly (17) from Armature (28).

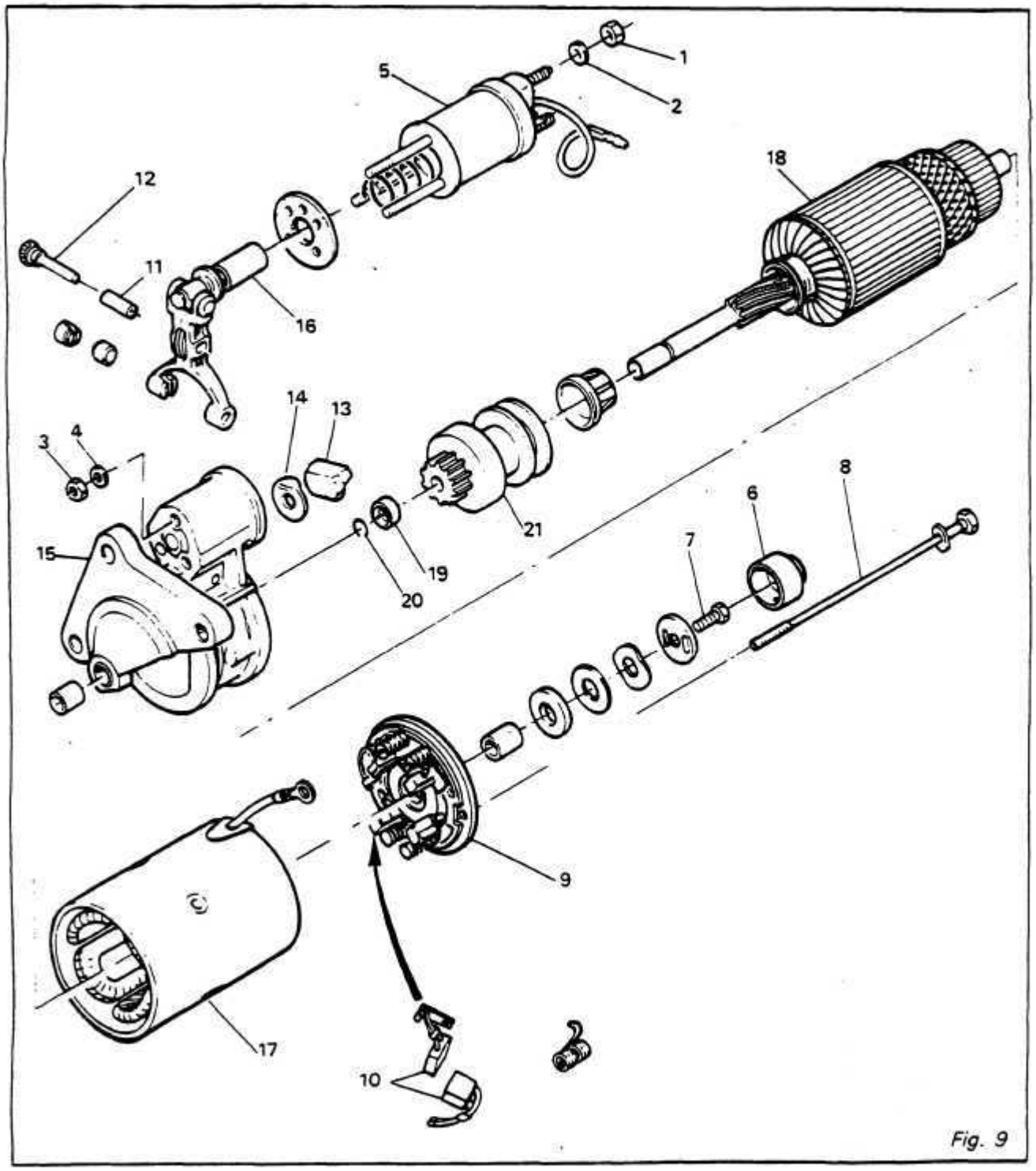


Fig. 9

REMOVING THE ROLLER CLUTCH ASSEMBLY – Fig. 9

Removal of the Roller Clutch Assembly necessitates the withdrawal of the Collar (19). A tube of appropriate diameter may be used to drive this down the shaft.

1. Remove the Spring Ring (20).
2. Remove Collar (19) and Roller Clutch Assembly (21).

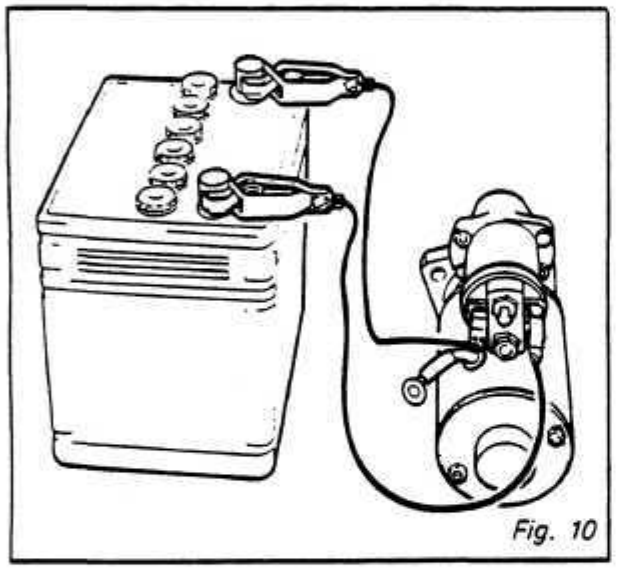


Fig. 10

ADJUSTING THE SOLENOID – STARTER DRIVE FORK – Fig. 10 and 11

Activate the solenoid as shown.

Check in this position that clearance (A) between the pinion and stop is 1.5 mm (.059"). *Fig. 11*

Turn the fork eccentric pivot pin to adjust if necessary.

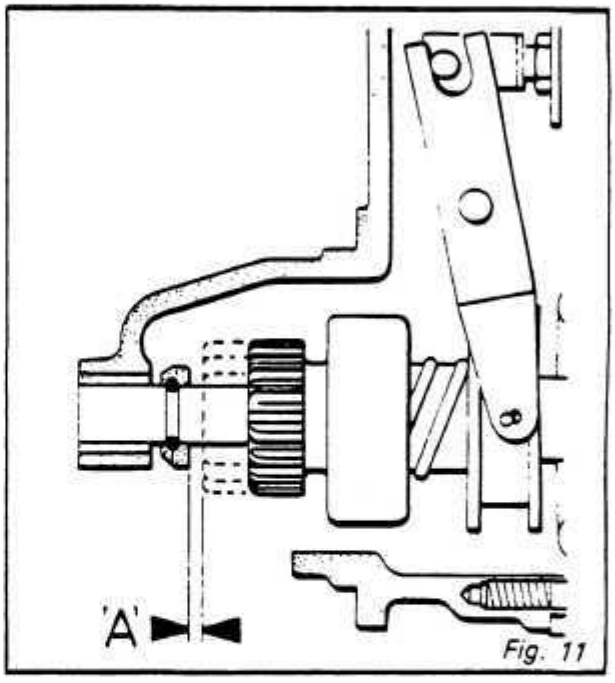
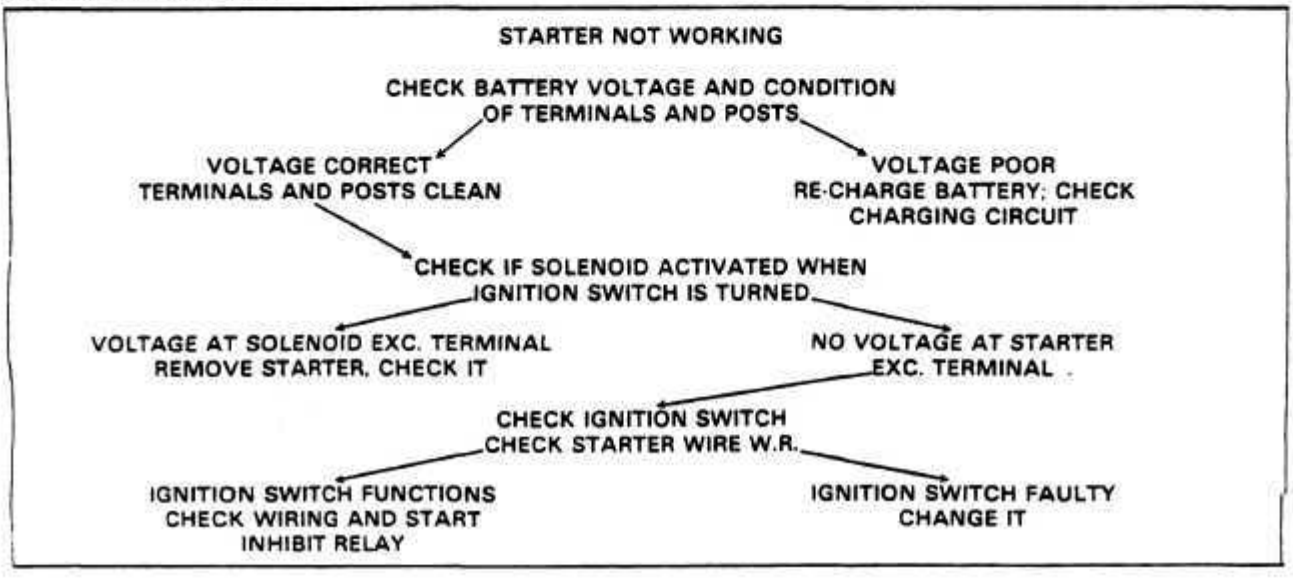


Fig. 11

FAULT DIAGNOSIS



STARTER SOLENOID

Inrush current	: 50 – 60 amps
Holding current	: 8 – 10 amps
Pull in voltage	: 8
Voltage supply	: 12

STARTER

Type	: Paris-Rhone D10E59
Battery rates voltage	: 12 volts
Locked torque	: 28 Nm (20.6 ft./lb.)
Current draw	: 540 amps
Voltage	: 7 volts
Maximum output	: 130 KW
Voltage	: 9.4 volts
Current draw	: 260 amps
Torque	: 10 Nm (7.40 ft./lb.) 1300 rpm
Minimum no load	: 4000 rpm
Voltage	: 11.5 volts
Maximum current draw	: 60 amps
Mounting on motor	: By flange (3 holes)
Clockwise running	: (pinion side)
Number of teeth	: 9
Diametral pitch	: 2.116/1.814
Spring tension on new brushes	: About 15.5 Newtons (3.3 lbs.) ± 10%

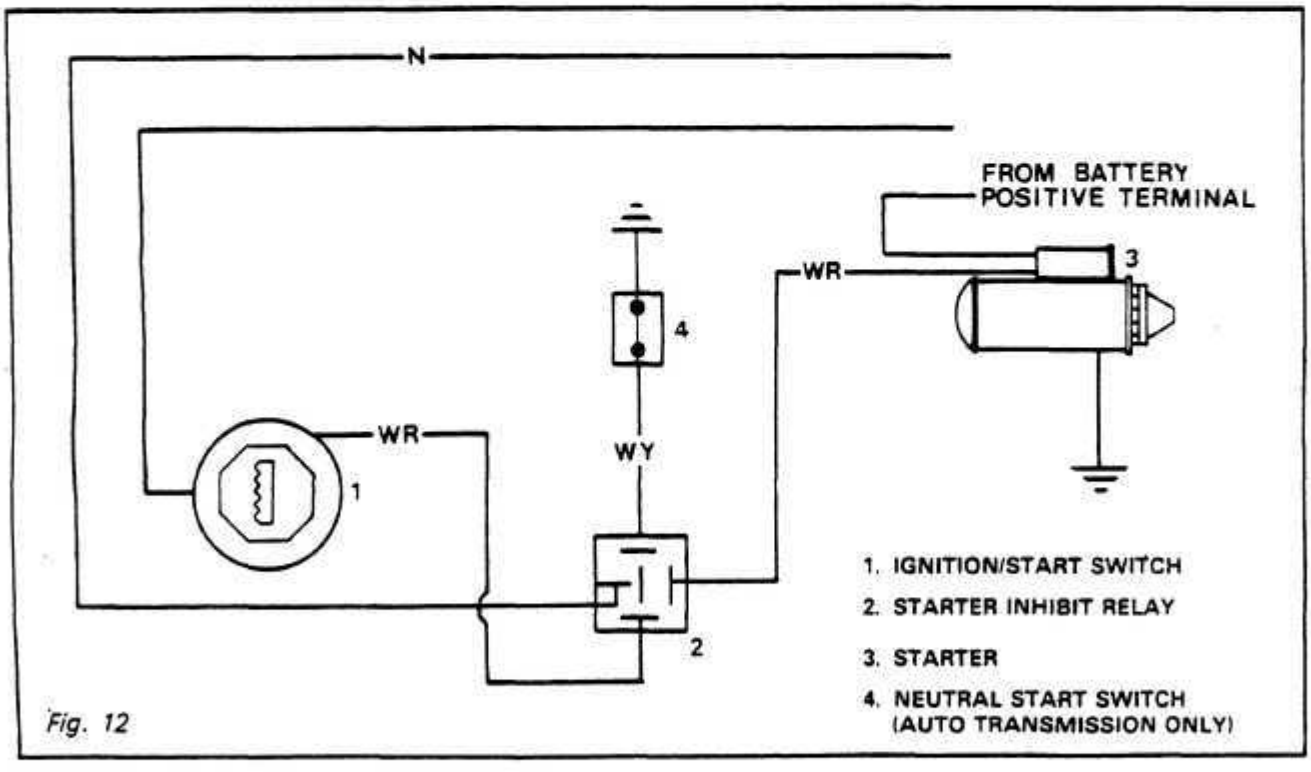


Fig. 12

CIRCUIT OPERATION

On turning the ignition key (1) to the starting position, current flows through the start inhibit relay (2) and on to ground via the transmission wiring harness completing the circuit to the Solenoid (3). When the vehicle is equipped with an automatic transmission, the neutral start switch (4) must be in the "neutral" or "park" position to complete the circuit.

The Solenoid has a two-fold function, that of a relay and drive. When the Solenoid is activated, it establishes contact between positive cable from the battery and starter.

DIAGNOSTIC SOCKET

DIAGNOSIS SOCKET — Fig. 13

The Diagnostic Socket on the engine enables the following to be carried out direct with approved instruments: —

- Checking H.T. circuit
- Duty cyle frequency valve
- Initial advance setting
- Checking the development of centrifugal and vacuum curves
- Measuring engine R.P.M.

Wire Connections

A Lambda Electronic Control Unit Orange. Frequency Valve Monitor

B Feed Wire Purple. Battery Feed

C T.D.C. Pick-Up on Cylinder Block

D Earth. Yellow wire

Terminal Allocation	Wire Colour
1. T.D.C. Signal Pick-Up	RED
2. Diagnostic Socket Earth (ground)	YELLOW
3. Lambda Electrical Control Unit	BLACK
4. T.D.C. Signal Pick-Up	WHITE
5. T.D.C. Pick-Up Screening	
6. Feed	GREY

Fig. 14

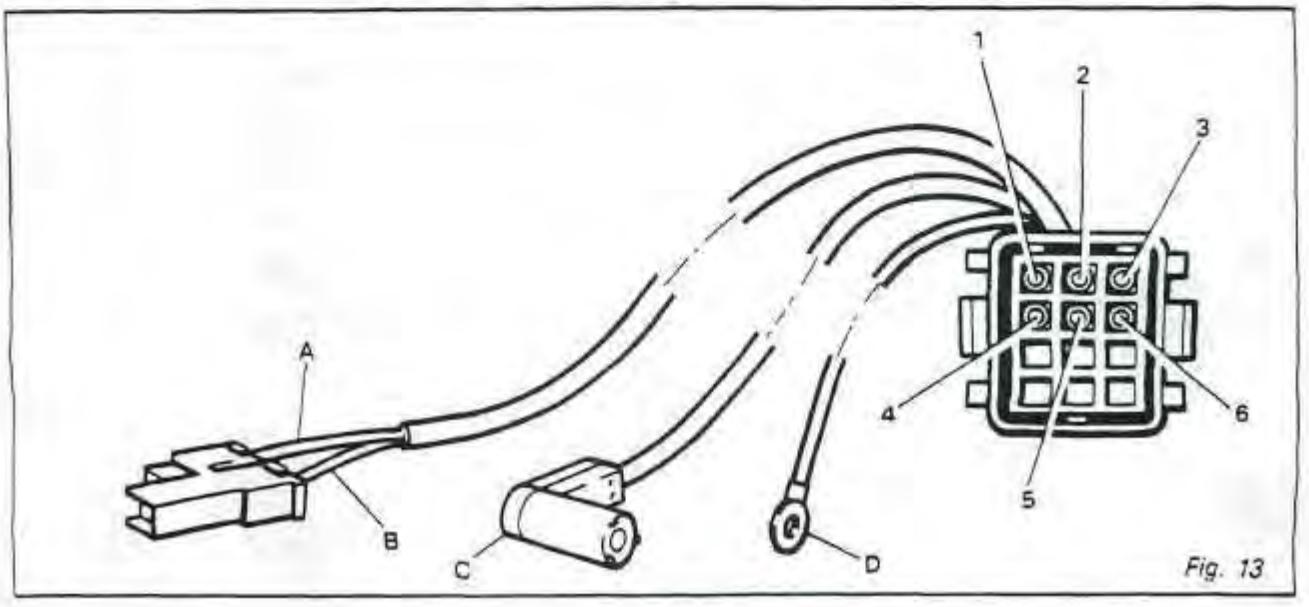


Fig. 13

REMOVING — Figs. 13, 14 and 15

1. Disconnect Battery.
2. Remove Diagnostic Socket (1) by pressing on Lugs (2) and pull down Socket out of Bracket (3). *Fig. 14*
3. Disconnect Earth Wire, Lambda Control Wire and Feed Wire.
4. Remove Screw (4), holding Pick-Up (5) and remove. *Fig. 15*

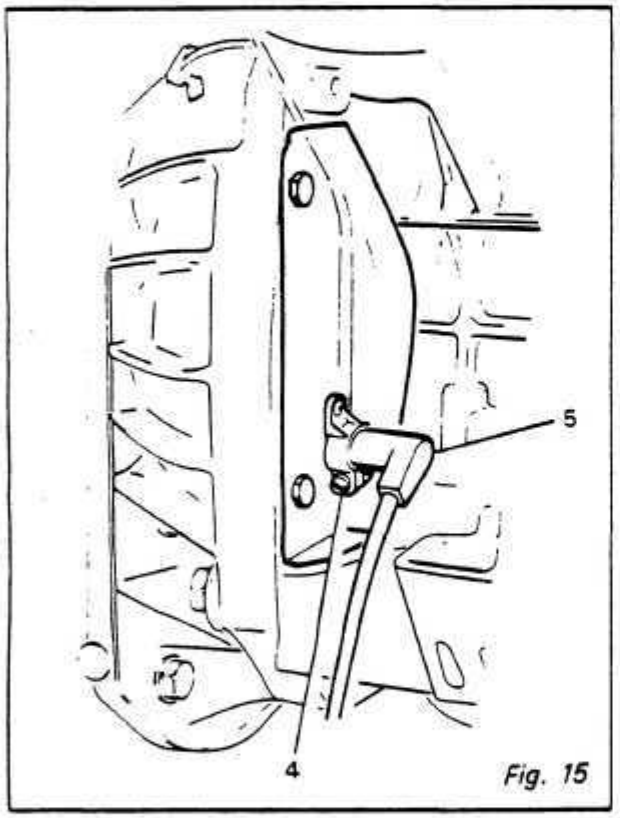


Fig. 15

REFITTING

1. Reconnect Earth Wire, Lambda Control Wire and Feed Wire.
2. Re-clip Diagnostic Socket into Bracket.

NEW PICK-UP — Fig. 16

The pick-up (5) has three Lugs which set its position. Bring the three Lugs into contact with the Flywheel (6) and tighten Screw (4).

RE-USING AN OLD PICK-UP

If the Lugs are worn, push the pick-up (5) in until it touches the Flywheel (6). Mark its position and withdraw it 1 mm A (.040" A). Tighten Screw (4).

RE-FIT ADJUSTING PICK-UP

The pick-up (5) should be set 0, to 1 mm A (.020" to .040" A) from Flywheel (6).

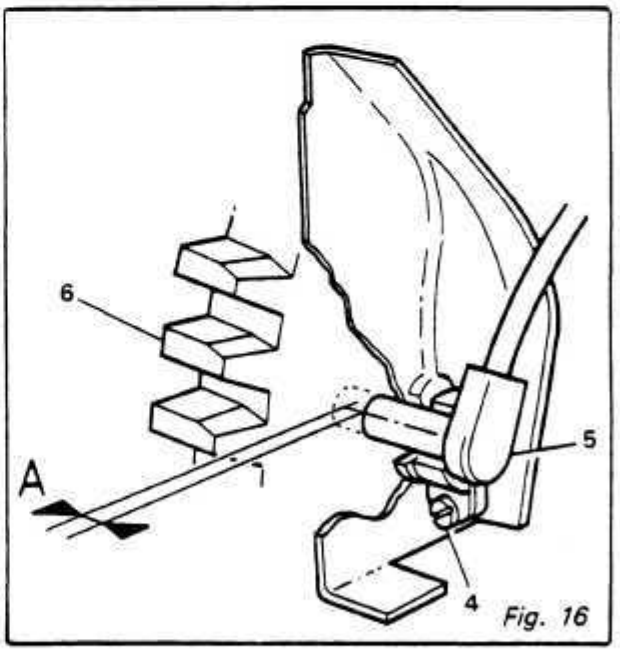


Fig. 16

DUCELLIER ALTERNATOR

REMOVING — Fig. 17

1. Disconnect Battery.
2. Disconnect Wires to Alternator.
3. Remove the Tension Bolt (1).
   Note position of Tensioning Bracket (2).
4. Remove Drive Belt (3).
5. Remove Fixing Bolts (4).
6. Lift out of car.

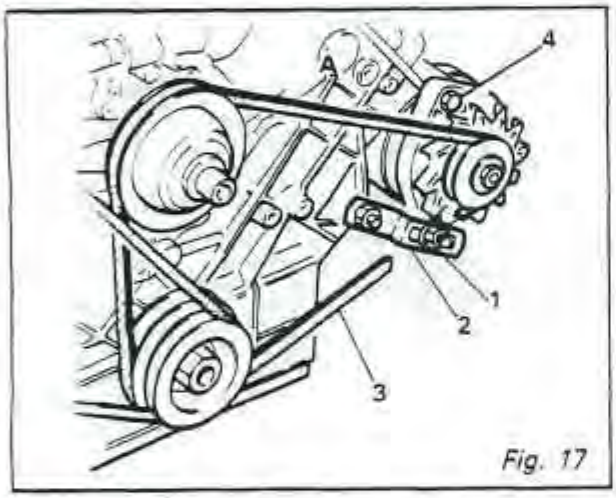


Fig. 17

REFITTING

Carry out the removal operations in reverse order. Retension the drive belt. The belt must be depressed 6 — 10 mm (¼" — ⅜") with moderate thumb pressure midway between pulleys, as shown by "A".

PRECAUTIONS TO BE TAKEN TO PREVENT DAMAGE TO THE CHARGING CIRCUIT

1. Never earth the alternator or regulator "E X C" terminal or its wire.
2. Never cross the regulator wires.
3. Never disconnect the regulators or battery when the alternator is turning.
4. Always disconnect the battery before removing the alternator.

Note:
When an alternator is turning, its positive terminal (+), must always be connected to the battery and its negative terminal (−) together with the battery negative (−) terminal connected to earth.

DUCELLIER

BUILT IN REGULATOR

CHECKING OUTPUT

Connect a voltmeter across the battery posts.

1. Read off battery voltage.
2. Start engine and accelerate until the voltmeter needle remains steady on the regulated voltage.
3. The voltage should read between 13.5 volts and 15.0 volts.

Check out and correct the following faults before replacing an alternator: —

If the customer complains of a charging fault, although the warning light functions correctly

If the regulated voltage is less than 13.5 v, check the alternator as the fault may be due to: —

1. A defective diode.
2. Phase out.
3. Carboned tracks.
4. Defective regulator.

REMOVING REGULATOR — Fig. 18

1. Disconnect battery.
2. Remove hex bolts holding voltage regulator (1) and regulator guard (2).
3. Remove screw, nuts and washers holding plastic terminal guard and disconnect wires from voltage regulator (1).
4. Remove screws, holding cover on voltage regulator (1) and disconnect wires to regulator (3).

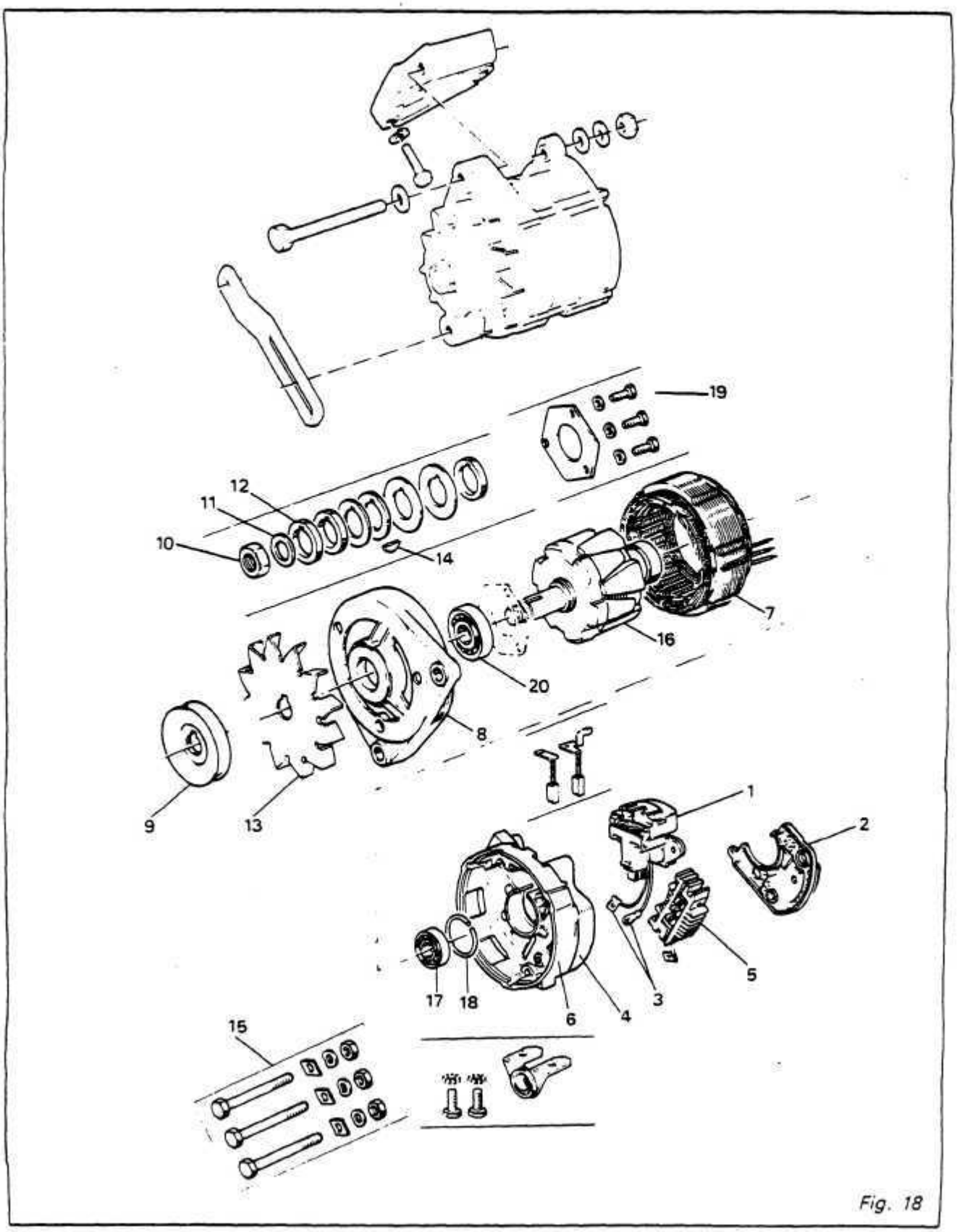


Fig. 18

REMOVING THE DIODE CARRIER — Fig. 18

Remove alternator from vehicle.

1. Remove screw, nuts and washers holding plastic terminal guard (4).
2. Unsolder the three diode carrier wires.
3. Remove wires from voltage regulator (1).
4. Remove diode carrier (5). **Never** dismantle the diode bridge.

The instrument panel has a red warning light which works as follows: —

- On switching on ignition it is illuminated.
- As soon as engine starts it goes out.
- If it is illuminated when the engine is running there is a charging fault.
- If the warning light fails to be illuminated on switching on ignition, check the following.

CHECK

1. That no connectors are loose or disconnected.
2. That the bulb has not blown.

If the warning light is illuminated while engine is running there is a charging fault which may be due to: —

1. Broken alternator belt.
2. Broken charging wire.
3. Alternator internal fault (rotor, stator, diodes or brushes).
4. Regulator fault.

REMOVING THE BRUSH CARRIER — Fig. 18

Note:
The alternator need not be removed for the operation. The brush carrier (1) being fixed to the regulator is removed in the same way as the voltage regulator.

REMOVING THE STATOR

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws, with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.
7. Remove the nuts, washers, and through bolts (15).
8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).

REMOVING THE ROTOR

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.

7. Remove the nuts, washers and through bolts (15).

8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).

9. With suitable levers remove rotor (16) from slip ring end bracket (6). *Fig. 19*

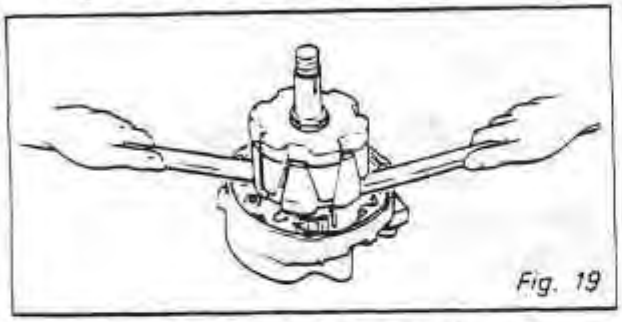


Fig. 19

REMOVING — REAR BEARING — Fig. 18

1. Remove the voltage regulator (1).

2. Remove the diode carrier (5).

3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).

4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).

5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).

6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.

7. If the bearing remains on the spigot of the rotor assembly (16) use suitable puller for removal of bearing. *Fig. 20*

8. If the bearing is in the slip ring end bracket (6), fill the bearing aperture with thick grease and drive a well fitting drift through the inner race of the bearing (17) which will be forced out by the hydraulic lock created by the grease. *Fig. 21*

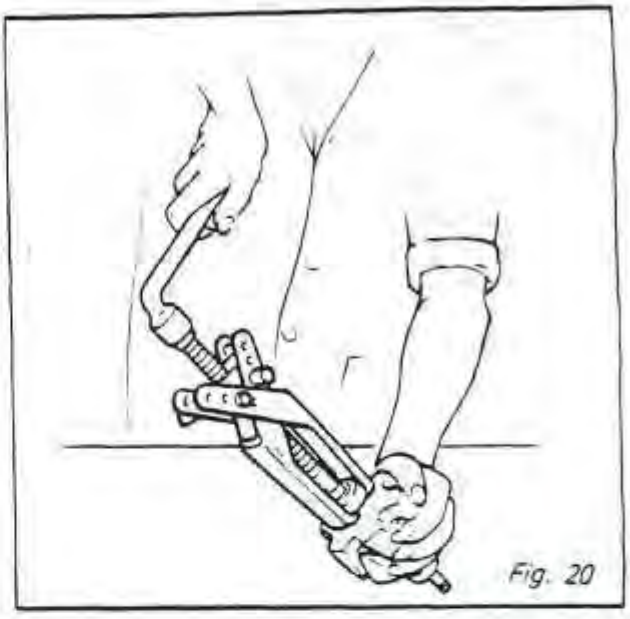


Fig. 20

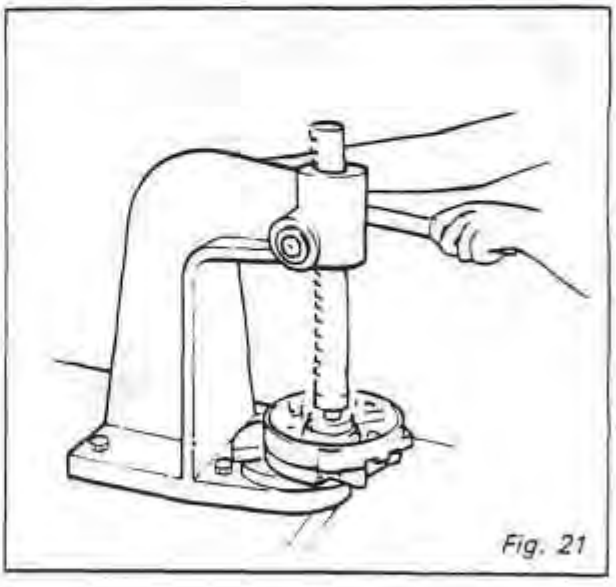


Fig. 21

REFITTING

1. Clean the grease from the aperture taking care not to damage the "O" ring (18).

2. Position the new bearing (17) on the shaft with the shielded side towards the rotor (16).

3. Press it firmly onto its locating shoulder in rear housing (6).

4. Pack the bearing with grease.

REMOVING DRIVE END BEARING — Fig. 18

1. Remove the voltage regulator (1).
2. Remove the diode carrier (5).
3. Mark the relative positions of the slip ring end bracket (6), laminations of stator (7) and drive end bracket (8).
4. Place an old fan belt around the pulley (9) and clamp the belt in vice jaws with the pulley as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (10).
5. Remove the assembly from the vice, remove the nut, spring washer (11), spacer (12) and pulley (9).
6. Remove the spacer, washer, fan (13), washer, key (14) and spacer.
7. Remove the nuts, washers and through bolts (15).
8. Separate the drive end bracket (8) from the stator (7), slip ring end bracket (6) and rotor assembly (16). Withdraw the stator (7) from the slip ring end bracket (6).
9. With suitable levers remove rotor (16) from slip ring end bracket (6). *Fig 19.*
10. Remove the three bolts (19) and washers securing the bearing retainer to the drive end bracket (8) and press out the bearing (20).

REPLACING

1. Pack the new bearing with grease.
2. Place the bearing (20) in the drive end bracket (8) with shielded side towards the rotor (16).
3. Re-fit the bearing retainer (19) and three bolts and washers.

TO REASSEMBLE ALTERNATOR

Refitting is a reversal of the dismantling procedures with attention to the following points:

1. Align the marks made on dismantling when assembling the end brackets (6 and 8) and stator (7).
2. Tighten the through bolts (15) evenly and check that the rotor (16) turns freely in its bearings (20 and 17) before fitting the voltage regulator (1).
3. Ensure the insulating washer is fitted over the main output terminal before fitting diode carrier (5).

MOTOROLA ALTERNATOR

BUILT-IN REGULATOR

CHECKING OUTPUT

1. Connect a voltmeter across the battery posts.
2. Read off battery voltage.
3. Start engine and accelerate until the voltmeter needle remains steady on the regulated voltage.
4. The voltage should read between 13.5 v and 15.0 v.

THE INSTRUMENT PANEL HAS A RED WARNING LIGHT WHICH WORKS AS FOLLOWS:

1. On switching on the ignition it is illuminated.
2. As soon as engine starts it goes out.
3. If it is illuminated when the engine is running there is a charging fault.

If the warning light fails to be illuminated on switching on ignition, check the following:

1. That no connectors are loose or disconnected.
2. That the bulb has not blown (touch earth wire with the regulator connector to check).

If the warning light is illuminated while engine is running there is a charging fault which may be due to:

1. Broken alternator belt.
2. Broken charging wire.
3. Alternator internal fault (rotor, stator, diodes or brushes).
4. Regulator fault.

MOTOROLA ALTERNATOR REMOVING

1. Disconnect battery.
2. Disconnect wires to alternator.
3. Remove the tension bolt (1).
   Note position of tensioning bracket (2).
4. Remove drive belt (3).
5. Remove fixing bolts (4).
6. Lift out of car.

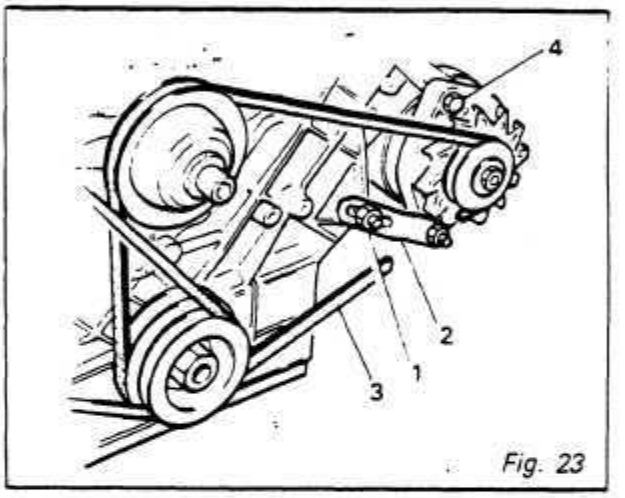


Fig. 23

Check out and correct the first four faults before changing a regulator:

1. If the customer complains of a charging fault although the warning light functions correctly.
2. If the regulated voltage is less than 13.5 v, check the alternator, the fault may be due to:
   1. A defective diode.
   2. Phase cut.
   3. Carboned tracks.
   4. Faulty regulator.

Precautions to be taken to prevent damage to the charging circuit:

1. Never earth the alternator or regulator "E X C" terminal or its wire.
2. Never cross the regulator wires.

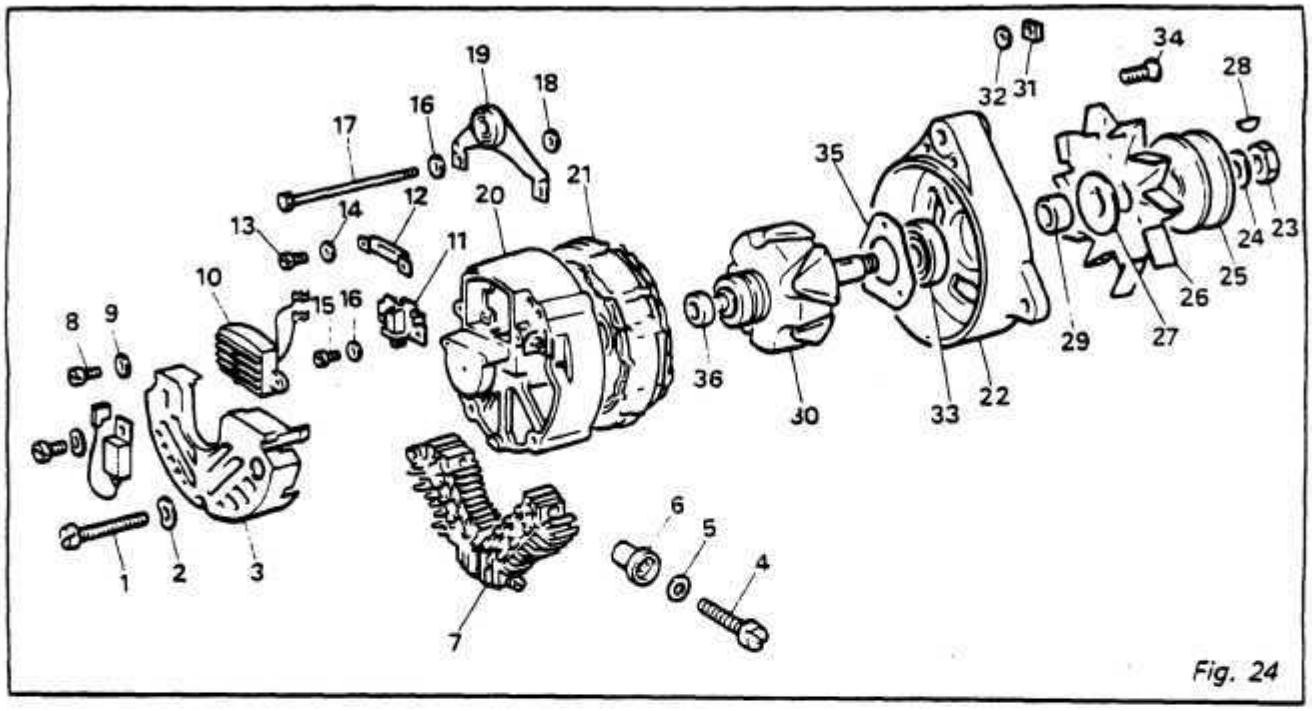


Fig. 24

3. Never disconnect the regulator or battery when the alternator is turning.

4. Always disconnect the battery before removing the alternator.

When an alternator is turning its positive terminal (+) must always be connected to the battery and its negative terminal (−) together with the battery negative (−) terminal connected to earth.

REMOVING REGULATOR — Fig. 24

1. Remove screws (8) and washers (9) from regulator (10).

2. Disconnect wires from brush carrier (11) and regulator feed plate (12) and remove regulator (10).

REVERSE THE ABOVE PROCEDURE FOR RE-FITTING.

REMOVING THE DIODE CARRIER — Fig. 24

1. Remove screw (1), washer (2) and holding plastic cover (3).

2. Unsolder six winding wires.

3. Unsolder regulator feed wire.

4. Remove two screws (4), washer (5), spacer (6) and holding bridge (7) to rear housing.

5. Remove diode bridge (7).

Note:
Never dismantle the diode bridge.

REMOVING THE BRUSH CARRIER — Fig. 24

1. Remove screws (8) and washers (9) from regulator (10).

2. Disconnect wires from brush carrier (11) and regulator feed plate (12) and remove regulator (10).

3. Remove screws (13) and washers (14) holding regulator feed plate (12) and leave loose.

4. Remove screws (15) and washers (16) holding brush carrier (11) and lift carrier out.

REVERSE THE ABOVE PROCEDURE FOR RE-FITTING.

REMOVING THE STATOR — Fig. 24

1. Remove regulator (10), brush carrier (11) and regulator feed plate (12).

2. Mark the relative position of rear housing (20), stator (21) and front housing (22).

3. Place an old fan belt around the pulley (25) and clamp the belt in vice jaws with the pulley (25) as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (23).

4. Remove the assembly from the vice. Remove the nut (23), washer (24), pulley (25), fan (26), washer (27), key (28) and spacer bush (29).

5. Remove four through bolts (17), washers (18), attachment bracket (19), nut (31), washer (32), recessed in front housing (22).

6. Withdraw front housing (22).

7. Remove stator (21).

REMOVING THE ROTOR — Fig. 24

1. Remove regulator (10), brush carrier (11) and regulator feed plate (12).

2. Mark the relative position of rear housing (20), stator (21) and front housing (22).

3. Place an old fan belt around the pulley (25) and clamp the belt in vice jaws with the pulley (25) as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (23).

4. Remove the assembly from the vice. Remove the nut (23), washer (24), pulley (25), fan (26), washer (27), key (28) and spacer bush (29).

5. Remove four through bolts (17), washers (18), attachment bracket (19), nut (31), washer (32), recessed in front housing (22).

6. Withdraw front housing (22).

7. Remove stator (21).

8. With suitable levers, remove rotor (30) from rear housing (20). *Fig. 24*

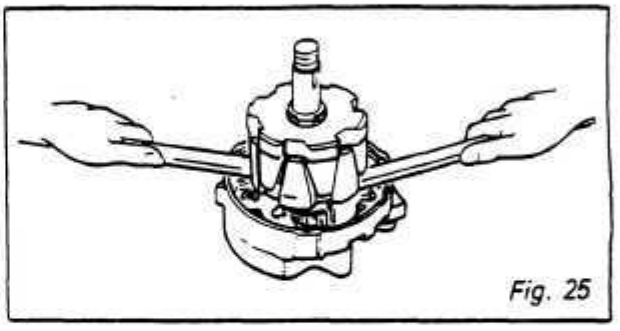


Fig. 25

REMOVING REAR BEARING — Fig. 24

1. Remove regulator (10), brush carrier (11) and regulator feed plate (12).

2. Mark the relative position of rear housing (20), stator (21) and front housing (22).

3. Place an old fan belt around the pulley (25) and clamp the belt in vice jaws with the pulley (25) as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (25).

4. Remove the assembly from the vice. Remove the nut (23), washer (24), pulley (25), fan (26), washer (27), key (28) and spacer bush (29).

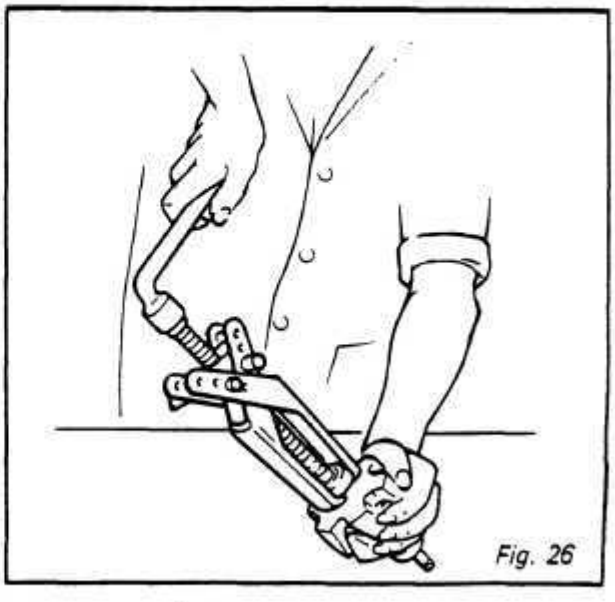


Fig. 26

5. Remove four through bolts (17), washers (18), attachment bracket (19), nut (31), washer (32), recessed in front housing (22).

6. Withdraw front housing (22).

7. Remove stator (21).

8. With suitable levers, remove rotor (30) from rear housing (20).

9. Remove bearing (36) from spigot on rotor (30) with suitable puller. *Fig. 25*

REFITTING

Place rotor (30) under suitable press and with suitable hollow mandral press bearing (36) into position. *Fig. 27*

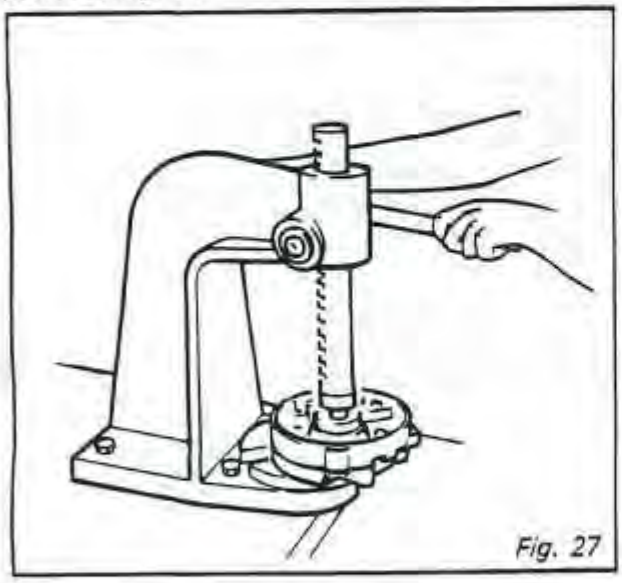


Fig. 27

REMOVING FRONT BEARING

1. Remove regulator (10), brush carrier (11) and regulator feed plate (12).

2. Mark the relative position of rear housing (20), stator (21) and front housing (22).

3. Place an old fan belt around the pulley (25) and clamp the belt in vice jaws with the pulley (25) as close to the vice as possible. The friction and self wrapping action of the belt will provide adequate reaction to loosening the pulley nut (25).

4. Remove the assembly from the vice. Remove the nut (23), washer (24), pulley (25), fan (26), washer (27), key (28) and spacer bush (29).

   Remove four through bolts (17), washers (18), attachment bracket (19), nut (31), washer (32) recessed in front housing (22).

   Remove screws (34) and bearing retaining plate (35) from front housing (22).

   Place front housing (22) under suitable press and press out bearing (33).

REFITTING

REFITTING IS A REVERSAL OF THE DISMANTLING PROCEDURES.

BATTERY

REMOVING — Fig. 28

1. Slide passenger's seat fully forward and tilt to full extent.
2. Unclip carpet behind passenger's seat to reveal battery access cover (1).
3. Remove two nuts (2) retaining access cover (1) on rear bulkhead assembly (3).
4. Remove access cover (1).
5. Remove plastic protective cover (4) over battery positive terminal and remove bolt (5) and washer (6). Disconnect cable (7).
6. Release battery retaining strap (8).
7. Move battery (9) forward to gain access to battery negative terminal and remove plastic protective cover (10), bolt (11) and washer (12). Disconnect cable (13).
8. Remove battery (9).

REFITTING

1. Place battery (9) at front of battery compartment and connect negative cable (black to battery negative terminal).
2. Re-fit plastic protective cover (10).
3. Move battery (9) into position on the battery compartment ensuring that the retaining strap (8) is not trapped by the battery (9).

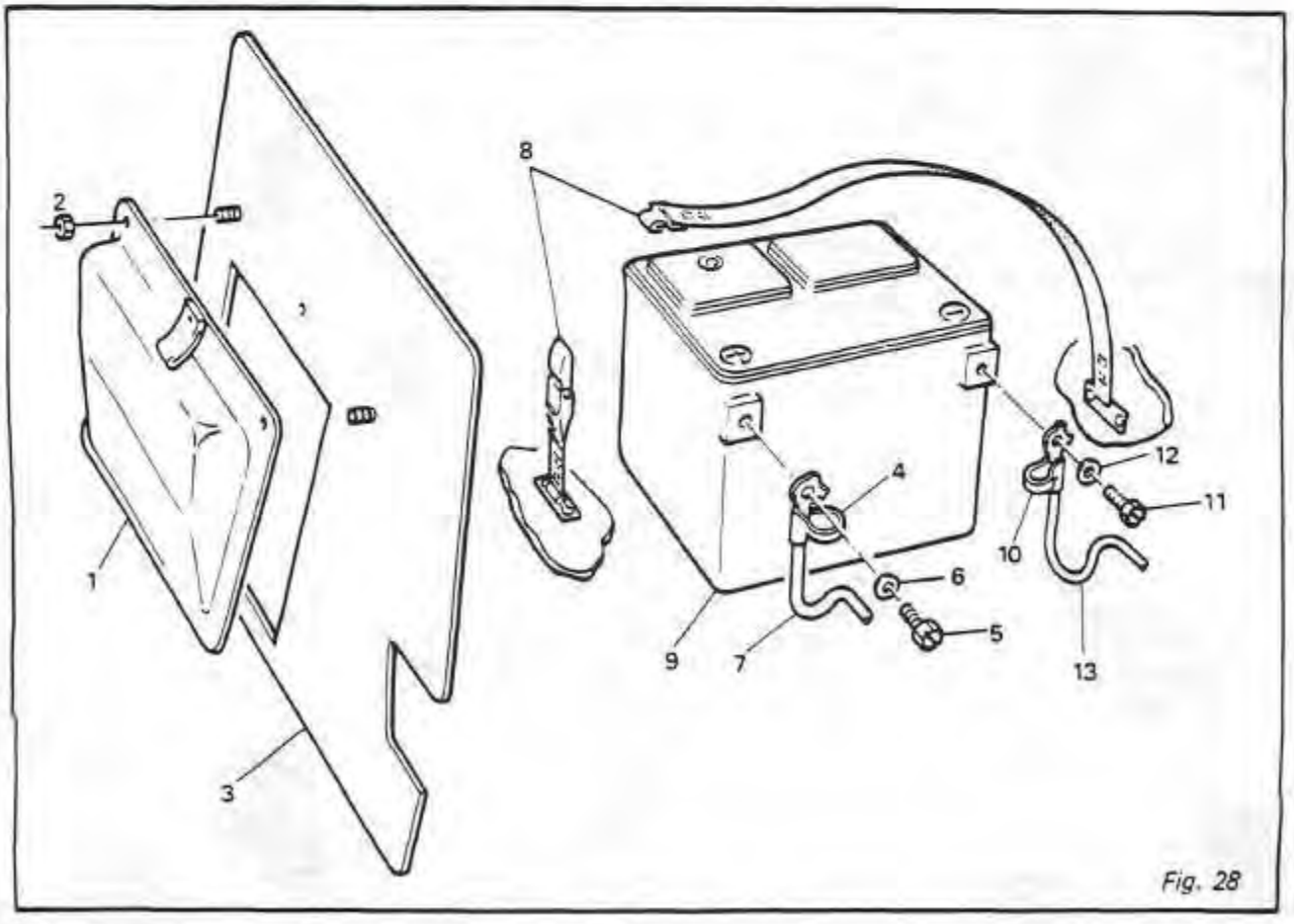


Fig. 28

4. Connect positive (Red) cable to terminal and tighten.
5. Re-fit plastic protective cover (4).
6. Fit strap (8) to battery (9) and adjust as necessary to ensure security of battery (9).
7. Re-fit cover (1) and secure.
8. Re-clip carpet.
9. Re-adjust passenger's seat as required.

GENERAL INFORMATION

Water never needs to be added to the Freedom Battery. There are no filler caps in the cover. The battery is sealed, except for small vent holes in the cover. The vents allow what small amount of gasses that are produced in the battery to escape. The special chemical composition inside the battery reduces gassing to a very small amount at normal charging voltages. Besides reducing gassing, the special chemistry greatly reduces the possibility of overcharge damage.

The vents require keeping the battery in an upright position to prevent electrolyte leakage. Tipping the battery beyond a 45° angle in any direction can allow a small amount of electrolyte to leak out the vent hole.

DO NOT exceed this 45° angle when carrying or installing the battery.

Evidence of electrolyte leakage does not necessarily mean the battery is defective.

With special cables properly attached the metal surfaces that carry the current are completely sealed from the atmosphere. This prevents terminal oxidation and corrosion that would cause starting and charging problems. If new cables are needed, sealed terminal cable replacements should be used to retain the reliability of the original maintenance-free connection. Torque studs to 5 – 10 lb./ft. (7 – 13 Nm). With the correct cables properly attached, and with the battery properly mounted, the Freedom Battery never needs any periodic maintenance attention.

WARNING: All lead-acid batteries generate hydrogen gas which is highly flammable. If ignited by a spark or flame, the gas may explode violently, causing spraying of acid, fragmentation of the battery, and possible severe personal injuries. Wear safety glasses when working near batteries. In case of contact with acid, flush immediately with water.

BUILT-IN HYDROMETER – Fig. 28

A special temperature compensated hydrometer is built into the cover of Freedom Batteries to show at a glance the battery's state-of-charge. The hydrometer is attached to a clear plastic rod. The green ball will float at a pre-determined specific gravity of the electrolyte that represents about a 65% state-of-charge. When the green ball floats, it rises within the cage and positions itself under the rod. Visually a green dot then shows in the centre of the hydrometer. The built-in hydrometer provides a guide for testing and charging. In testing, the green dot means the battery is charged enough for testing. If the green dot is not visible, it means the battery must be charged before the test procedure is performed.

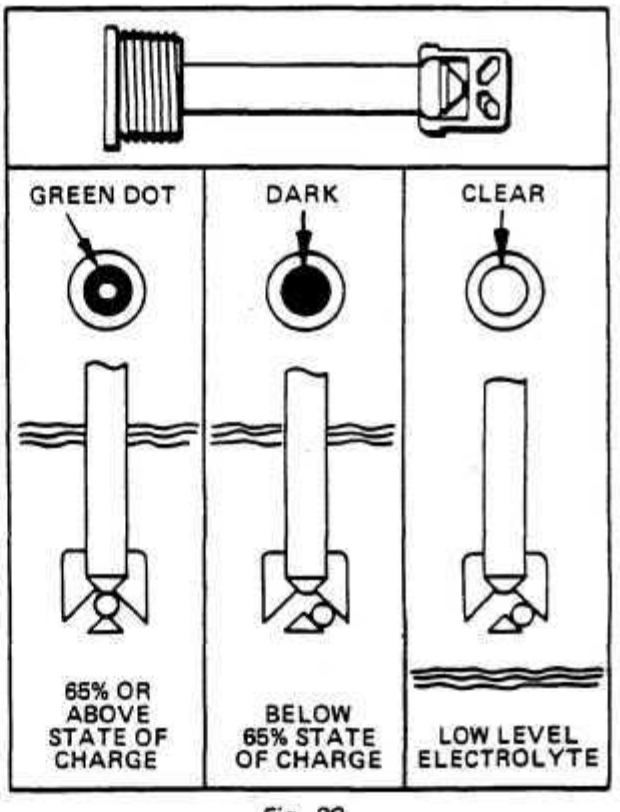


Fig. 29

In charging, the appearance of the green dot means that the battery is sufficiently charged. Charging can be stopped to prevent overcharging.

The hydrometer on some few batteries may be clear or light yellow. This means the fluid level is below the bottom of the rod and attached cage. This may have been caused by excessive or prolonged charging, a broken case, excessive tipping or normal battery wearout. If a cranking complaint exists and is caused by the battery, replace it — do not charge, test or jump start the battery!

It is important when observing the hydrometer that the battery has a clean top to see the correct indication. A light may be required in some poorly-lit areas.

BATTERY CHARGING

The adaptor kit (1) shown in *Fig. 30* is available from AC-DELCO, Part No. ST-1201. It is recommended that this adaptor kit, or equivalent be used in charging sealed-terminal batteries when they are out of the vehicle.

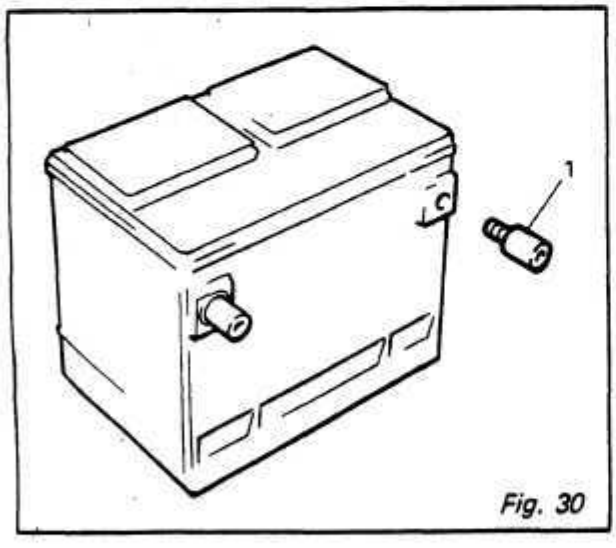


Fig. 30

When the sealed-terminal battery is in the vehicle, connect the charger's leads to the studs or nuts at the battery's terminals. Post-type batteries need to adaptors.

The following basic rules apply to any Freedom Battery charging situation:

1. Do not charge a battery if the hydrometer is clear or light yellow — replace the battery.

2. Charge rates between 3 and 50 amperes are generally satisfactory for any Freedom Battery as long as spewing of electrolyte does not occur or the battery does not feel excessively hot (over 125°F, 52°C). If spewing occurs or temperature exceeds 125°F, the charging rate must be reduced or temporarily halted to permit cooling.

   Battery temperature can be estimated by touching or feeling the battery case.

3. The battery is sufficiently charged when the green dot in the built-in hydrometer is visible. No further charging is required. Shake or tilt the battery at hourly intervals during charging to mix the electrolyte and see if green dot appears.

4. Battery charging consists of a charge current in amperes for a period of time in hours. Thus, a 25 ampere charging rate for two hours would be 50 ampere-hour charge to the battery. In most cases, batteries whose load test values are less than 200 amperes (see Battery Testing Procedure) will have a green dot visible after at least a 50 ampere-hour charge. Most batteries whose load test values are greater than 200 amperes (see Battery Testing Procedure) will have the green dot visible after at least a 75 ampere-hour charge. In the event that the green dot does not appear, after this amount of charging, continue charging for another 50 or 75 ampere-hours. If the green dot still does not appear replace the battery.

   The time required for a charge will vary because:

   Size of Battery (Example)
   A completely discharged large heavy-duty battery requires more than twice the re-charging as a completely discharged small passenger car battery.

   Temperature (Example)
   A longer time will be needed to charge any battery at 0°F than at 80°F. When a fast charger is connected to a cold battery, the current accepted by the battery will be very low at first, then in time the battery will accept a higher rate as the battery warms.

State-of-Charge (Example)
A completely discharged battery requires more than twice as much as a one-half charged battery. Because the electrolyte is nearly pure water and a poor conductor in a completely discharged battery, the current accepted is very low at first. Later, as the charging current causes the electrolyte acid content to increase, the charging current will likewise increase.

Charger Capacity (Example)
A charger which can supply only 5 amperes will require a much longer period of charging than a charger that can supply 30 amperes or more.

TESTING THE FREEDOM BATTERY

1. **Visual Inspection**

Check for obvious damage such as cracked or broken case or cover that could permit loss electrolyte. If obvious physical damage is noted, replace battery. Determine cause of damage and correct as needed.

2. **Built-In Hydrometer (State of Charge) Check:**

Observe the built-in hydrometer and proceed as follows:

A. Greet Dot Visible — means a sufficient state-of-charge for testing is indicated. Proceed to 3.

B. Dark, Green Dot NOT VISIBLE — indicates insufficient state-of-charge for testing. Charge battery (as discussed in "Battery Charging" section) until the green dot appears, then proceed to 3.

DO NOT TEST OR CHARGE a battery having a clear or light yellow indication; replace the battery.

3. **Load Test**

A. Connect voltmeter and battery load tester across terminals of battery as follows:

1. If Freedom Battery is in the vehicle, connect battery tester cable clamps to terminal studs, being careful to NOT TOUCH BARE METAL, of the clamp attached to positive battery terminal to the metal of the vehicle — sparking will occur.

2. If the Freedom Battery is OUT of the vehicle, assemble adaptors *Fig. 30* and connect tester clamps to the adaptors.

B. Remove surface charge from all batteries that have just been on charge IF THE GREEN DOT IS VISIBLE. This includes batteries in the vehicle having been charged by the vehicle generator. Do not remove surface charge from batteries that have been in storage. To remove surface charge, apply a 300 ampere load across the terminals for 15 seconds. Then turn off load and wait for 15 seconds to allow the battery to recover.

C. Battery temperature should be estimated by touch and also by the surrounding temperature it was exposed to during the preceding few hours before testing. Select the nearest estimated temperature in **Table A** and determine the minimum voltage which must be maintained while the battery supplies a specified electrical load (see "D" following).

D. Apply specified load selected from **Table B** (on some batteries the specified load is printed on the label of the battery).

1. Observe voltage after 15 seconds with load connected. Then turn off load.

2. If voltage is below determined in "C" above, replace battery.

3. If voltage is at or above value determined in "C" above, battery is good and may be returned to service.

Note:
The accuracy of this test procedure is dependent upon close adherence to the proper load, time and temperature specifications.

TABLE A

Battery	85 – 4	55 – 4	85 – 5	49 – 4	55 – 5	87 – 5	71 – 4	1200	1071	49 – 5	89A – 5	1150	1110
Model	85 – 50		85 – 60	59 – 4		87 – 60	81 – 4			59 – 5	89A – 60		
Number				87 – 4						71 – 5			
				89 – 4						81 – 5			
				1059						89 – 5			
										89 – 60			
Amperes													
For	130	150	170	180	200	210	220	230	240	250	270	290	310
								210				260	270

TABLE B

	(21°C) 70°F & Above	(10°C) 50°F	(0°C) 30°F	(– 10°C) 15°F	(– 18°C) 0°F
Temperature					
Minimum Voltage	9.6	9.4	9.1	8.8	8.5

TROUBLESHOOTING

If a battery has tested good and then has not performed satisfactorily in service for no apparent reason, the following are some of the more important factors that may point to the cause of trouble:

1. Vehicle accessories inadvertently left on overnight.
2. Defects in the charging system, such as slipping fan belt, high wiring resistance, faulty generator or regulator.
3. A vehicle electrical load exceeding the generator capacity, with the addition of electrical devices, such as radio equipment, air-condition, window defoggers or light systems.
4. Defects in the electrical system, such as shorted or pinched wires.
5. Extended slow speed driving with many accessories turned on.
6. Loose or poor battery cable-to-post connections, previous improper charging of a rundown battery, or loose hold-downs.
7. High resistance connections or defects in the cranking system.

JUMP STARTING IN CASE OF EMERGENCY WITH AUXILIARY (BOOSTER) BATTERY

WARNING: ON FREEDOM BATTERIES, DO NOT JUMP START IF INDICATOR IS YELLOW.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow exactly the procedure outlined below, being careful not to cause sparks:

1. Set parking brake and place automatic transmission in "PARK" (neutral for manual transmission). Turn off lights, heater and other electrical loads. Observe charge indicator. If indicator is light, replace battery. DO NOT attempt jump starting when indicator is light. If charge indicator is dark and has a green dot in the centre, failure to start is not due to a discharged battery and the cranking system should be checked. If charge indicator is dark but the green dot does not appear in centre, proceed as follows:

NEGATIVE GROUND ONLY

2. Attach one end of one jumper cable to the positive terminal of the booster battery and the other end of same cable to jump start post on vehicle.

   DO NOT PERMIT vehicles to touch each other as this could establish a ground connection and counteract the benefits of this procedure.

3. DO NOT CONNECT DIRECTLY TO THE NEGATIVE POST OF THE DEAD BATTERY.

   Connect one end of negative cable to negative of booster battery then connect other end to engine block.

4. Take care that the clamps from one cable do not inadvertently touch the clamps on the other cable. Do not lean over the battery when making connections. The ground connection must provide good electrical conductivity and current carrying capacity. Avoid moving, hot or electrical hazards such as fans, manifolds and spark plug terminals.

5. Reverse this sequence exactly when removing the jumper cables.

WARNING: Any procedure other than the above could result in:

1. Personal injury caused by electrolyte squirting out the battery vent.
2. Personal injury to property damaged due to battery explosion.
3. Damage to the charging system of the booster vehicle or of the immobilized vehicle.

FUSES AND FUSE BOX — Fig. 31

All of the fused circuits are routed through the fuse box located in the relay compartment behind the passenger seat. There are eighteen fuses in use, each fuse has a number on the top which corresponds to its amperage rating. The fuses are of two terminal autofuse type. The radio has two in-line fuses which are located at the unit.

To change a fuse, tilt the passenger seat forward, unclip carpet around rear deck board, lift up the rear deck board and remove fuse box cover. A blown fuse is indicated by the failure of all units protected by it and is confirmed by examination of the fuse. **Use only the correct value fuse.**

The circuit function of each fuse is indicated on the fuse box cover.

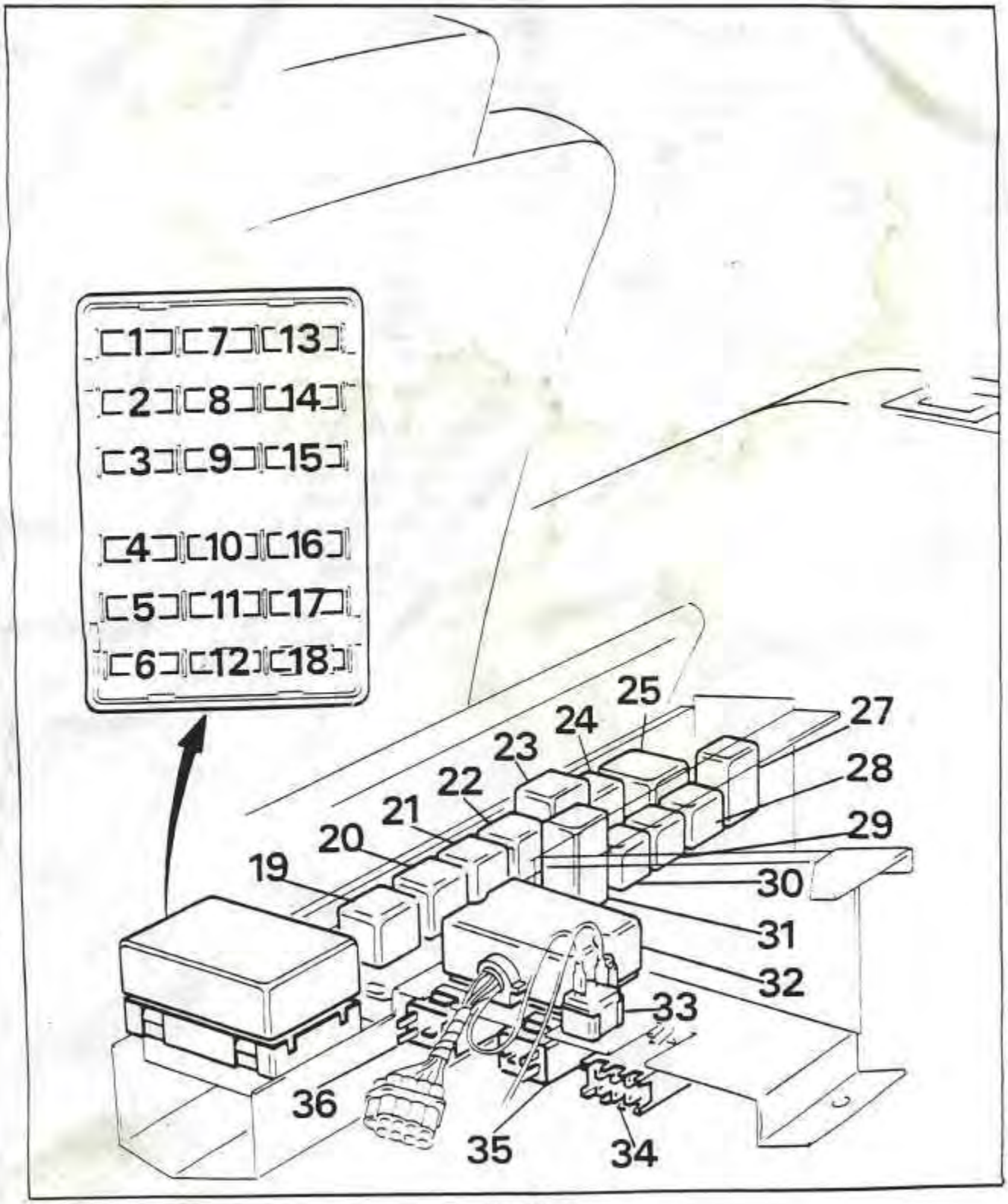
RELAY COMPARTMENT — Fig. 31

The relay compartment is situated inside the vehicle behind the passenger seat under the rear deck board. To change a relay, tilt the passenger seat forward, unclip carpet around rear deck board and remove and replace relay affected. A defective relay is indicated by the failure of the unit it operates.

The correct location of the relays are as follows:

Relay Locations

19 – Dipped Beam
20 – Main Beam
21 – Fan 3rd Speed
22 – Fan 4th Speed
23 – Courtesy Delay Lamp (White)
24 – Cooling Fan
25 – Fan Fail Module (Blue)
26 – Spare
27 – Resistor (Red)
28 – Start Inhibit
29 – A/C Illumination
30 – Main Fuel — (Bosch)
31 – H.R.W. Timer (Green)
32 – Impulse Unit
33 – Door Lock Thermal Trip (25A)
34 – R.P.M. Relay
35 – Aux Relay — Accessories Position — 1
36 – Aux Relay — Ignition Position — 2


1 7 13
2 8 14
3 9 15
4 10 16
5 11 17
6 12 18
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35
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Fig. 31

FUSED CIRCUITS

Fuse No.	Rating	Circuits
1	10A	– R.P.M. Relay, distributor, vacuum solenoid, ignition E.C.U. and idle speed E.C.U.
2	10A	– L.H. Tail Lamp, side lamps, front parking lamp and license plate lamp.
3	10A	– Windshield wiper and washer motors.
4	20A	– Directional indicator switch and stop light switch.
5	10A	– All dash instruments and indicators, service interval counter.
6	20A	– Hazard warning switch, horns and buzzer, logic box.
7	20A	– Lambda relay, lambda E.C.U., frequency valve, fuel pump and control pressure regulator.
8	10A	– R.H. tail lamp, side lamps, front parking lamp, license plate lamp, cigar lighter lamp, instrument panel illumination lamps, main light switch lamp and digital clock lamp.
9	10A	– Heated rear window and electrical mirrors.
10	20A	– A/C mode switch and door lock warning lamp.
11	30A	– Radio clock, gear selector lamp A/C panel lamps and power windows.
12	10A	– Diagnostic plug, engine compartment lamp, luggage compartment lamp, glove box lamp, door lamps, interior lamps and interior lamp delay unit.
13	10A	– Automatic transmission.
14	20A	– Low beam headlamps.
15	20A	– High beam headlamps.
16	10A	– Reverse lamps.
17	20A	– Cigar lighter and clocks.
18	20A	– Stop lamps.

HORNS — Fig. 32

Twin high and low tone horns (1) and (2) are mounted on right and left hand side of the radiator support brackets the high tone horn on the left and low tone on the right.

If the horns (1) and (2) fail to operate first check the security of the horn terminal (3) and earth fixings (4). The horns are not adjustable and must be renewed if faulty.

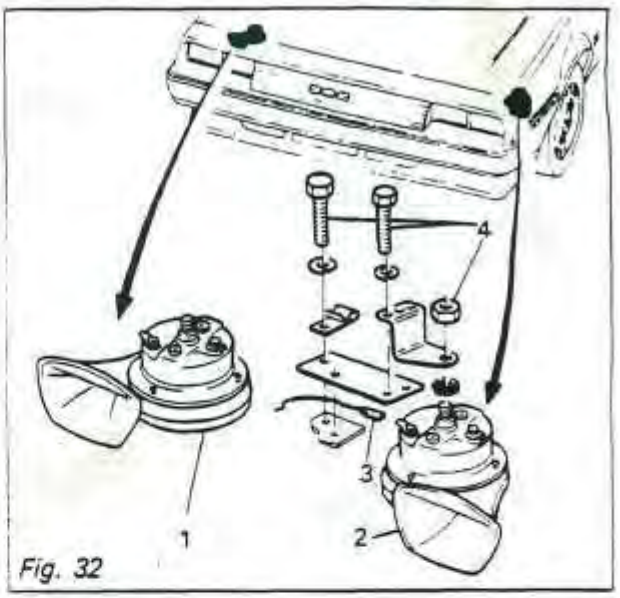


Fig. 32

WINDSHIELD WASHERS

LOCATION

The windshield washer Reservoir/Motor Assembly is located within the body double skin behind the L.H. headlamp and secured by a container screwed to the underside of the body. The filler neck protrudes a rubber grommet into the L.H. front of the luggage compartment.

REMOVING – REFITTING – Fig. 33

Removing

- Remove the filler cap (1). Release the retaining screws (2), washers (3), securing the support container (4), to the underside of the body, lower container (4), from reservoir (8) and remove.
- Release the washer tubing (5) from the line connector or motor and disconnect the electrical leads (7) from the motor (6). Pull the reservoir (8) downwards feeding the filler neck through its grommet (9) and remove reservoir (8), unscrew motor assembly (6).

Refitting

- Screw motor assembly (6) into reservoir, replace reservoir upwards guiding the filler neck through the grommet (4) into luggage compartment.
- Connect the electrical leads to the motor and fit the plastic tubing to connector/motor.
- Ensure that the reservoir (8) is correctly fitted into its container (4) re-fit container (4) to car body with screws (2) and washers (3).
- Refill with fluid and re-fit filler cap (1).

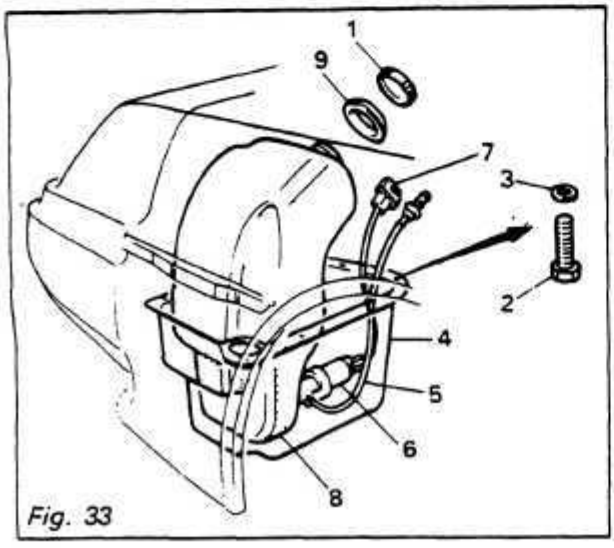


Fig. 33

REMOVING WINDSHIELD WASHER MOTOR – Fig. 33

Removing

With windshield washer reservoir (8) removed as previously described.

- Unscrew motor (6) from grommet in the reservoir (8).

Refitting

- Screw motor (6) from grommet in reservoir (8).
- Install the washer/reservoir/motor assembly as previously described.

WINDSCREEN WIPER AND MOTOR

The windscreen wiper motor and linkage are situated under the dash panel next to the pedal box. The motor is a two speed type incorporating a self switching power unit which drives two spindles by means of a series of linkages. The wiper switch, mounted on the right hand side of the steering column, has four control positions and a sliding sleeve which is used to operate the windshield washer. An electronic intermittent wipe control module is placed between the wiper switch and the motor to provide an intermittent wipe at slow speed.

REMOVING MOTOR

Before commencing removal of wiper motor (1), ensure wiper arms (12) are in the parked position.

- Disconnect battery.
- Disconnect L.H.S. flexi ducting between fascia vent and L.H.S. rigid ducting.
- Remove retaining clamp and L.H.S. A.C.U. rigid ducting to pedal box.
- Disconnect upper link (2) from wiper motor (1) drive arm spindle with suitable lever.
- Remove lower link (3) from wiper motor (1), drive arm by inserting blade of flat screwdriver between drive arm and link (3) and levering link (3) away from drive arm on motor (1).

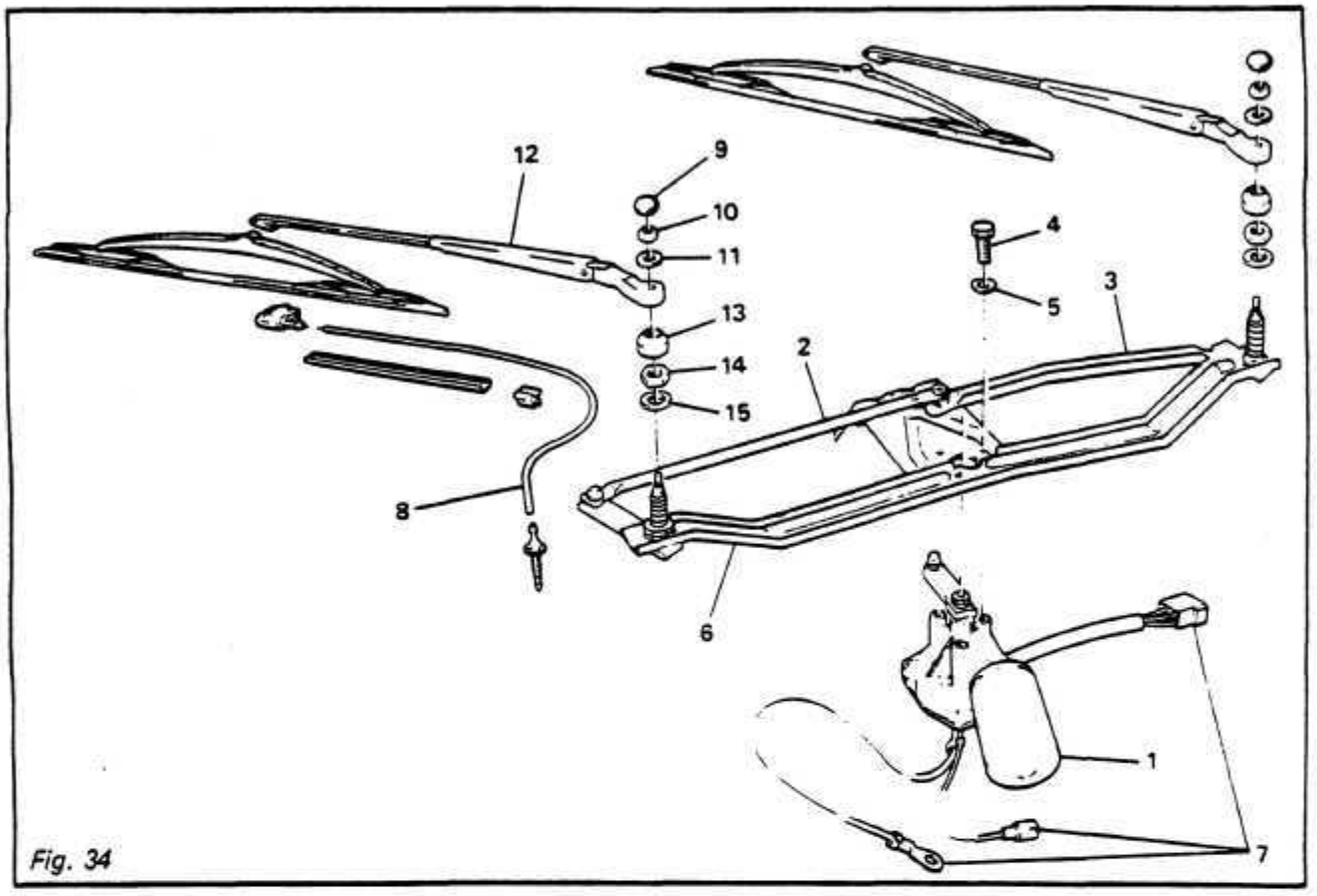


Fig. 34

DO NOT DISCONNECT LINK AT SPINDLE ARM.

- Remove three screws (4) and washers (5) retaining the wiper motor (1) to the support bracket (6), disconnect electrical connection (7) and remove motor (1).

REFITTING

- Fit wiper motor (1) to support bracket (6) and secure in position with three screws (4), washers (5) and tighten.
- Reconnect electrical leads (7).
- Reconnect battery.
- Replace lower link (3) and upper link (2) on motor (1) drive arm.
- Re-fit A.C.U. rigid duct (L.H.S.) and retaining clamp.
- Re-fit L.H.S. flexi ducting to A.C.U. rigid duct and L.H. fascia vent.

REMOVING MECHANISM

- Remove wiper motor (1) from support bracket (6) mechanism (refer to procedure removing motor).
- Disconnect windshield washer tubing.
- Remove cap (9), nut (10), washer (11), retaining wiper arm (12).
- Remove arms from spindles.
- Remove seal (13), nut (14) from spindle on support bracket (6) mechanism.
- Withdraw mechanism from under the dash panel next to pedal box.
- Lift out assembly.

REFITTING MECHANISM

REPLACE IN REVERSE ORDER.

Special point concerning re-fitting:

- Make sure that the washers are positioned correctly.

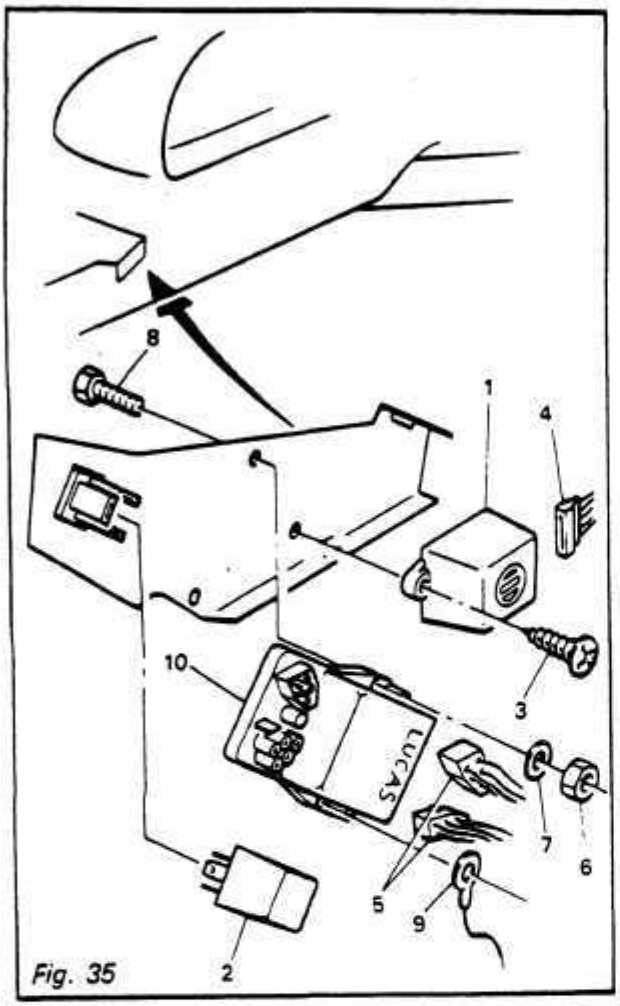


Fig. 35

WIPER MOTOR SPECIFICATION

Type Bosch 12 Volt.

Nominal wiping speed (screen wet) 45 and 60 cycles per minute.

WIPER DELAY CONTROL BOX REMOVING – REFITTING – Fig. 35

Wiper control box is located under L.H.S. of dash panel next to the door logic buzzer box.

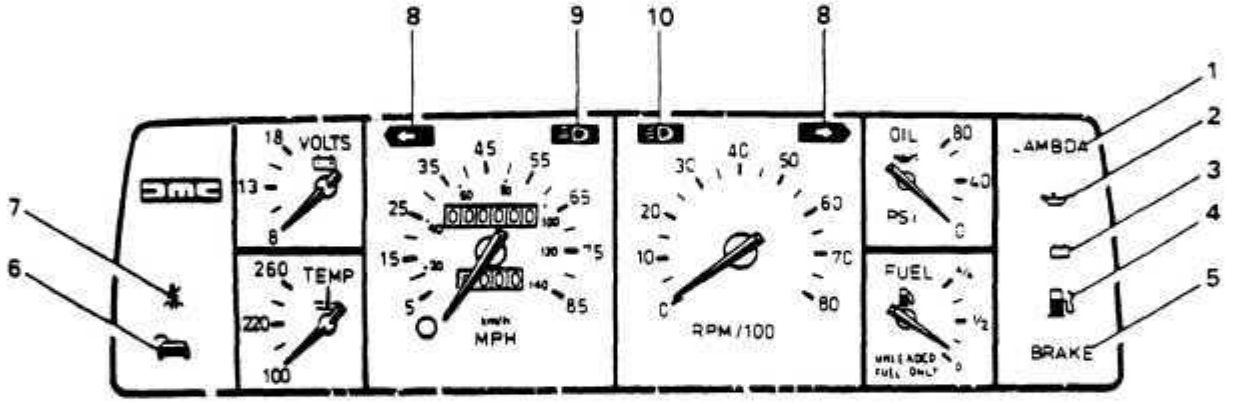
Removing

1. Remove screws (8) and earth wire (9).
2. Disconnect two harness plugs (5).
3. Withdraw wiper delay control box (10).

Refitting

REVERSE REMOVAL PROCEDURE.

INSTRUMENT CLUSTER WARNING LIGHT IDENTIFICATION



1 LAMBDA WARNING LIGHT
2 OIL PRESSURE WARNING LIGHT
3 IGNITION LIGHT
4 LOW FUEL WARNING LIGHT
5 HAND BRAKE WARNING LIGHT
6 DOOR OPEN WARNING LIGHT
7 SAFETY BELT
8 DIRECTION INDICATORS
9 MAIN BEAM
10 DIP BEAM

Fig. 36

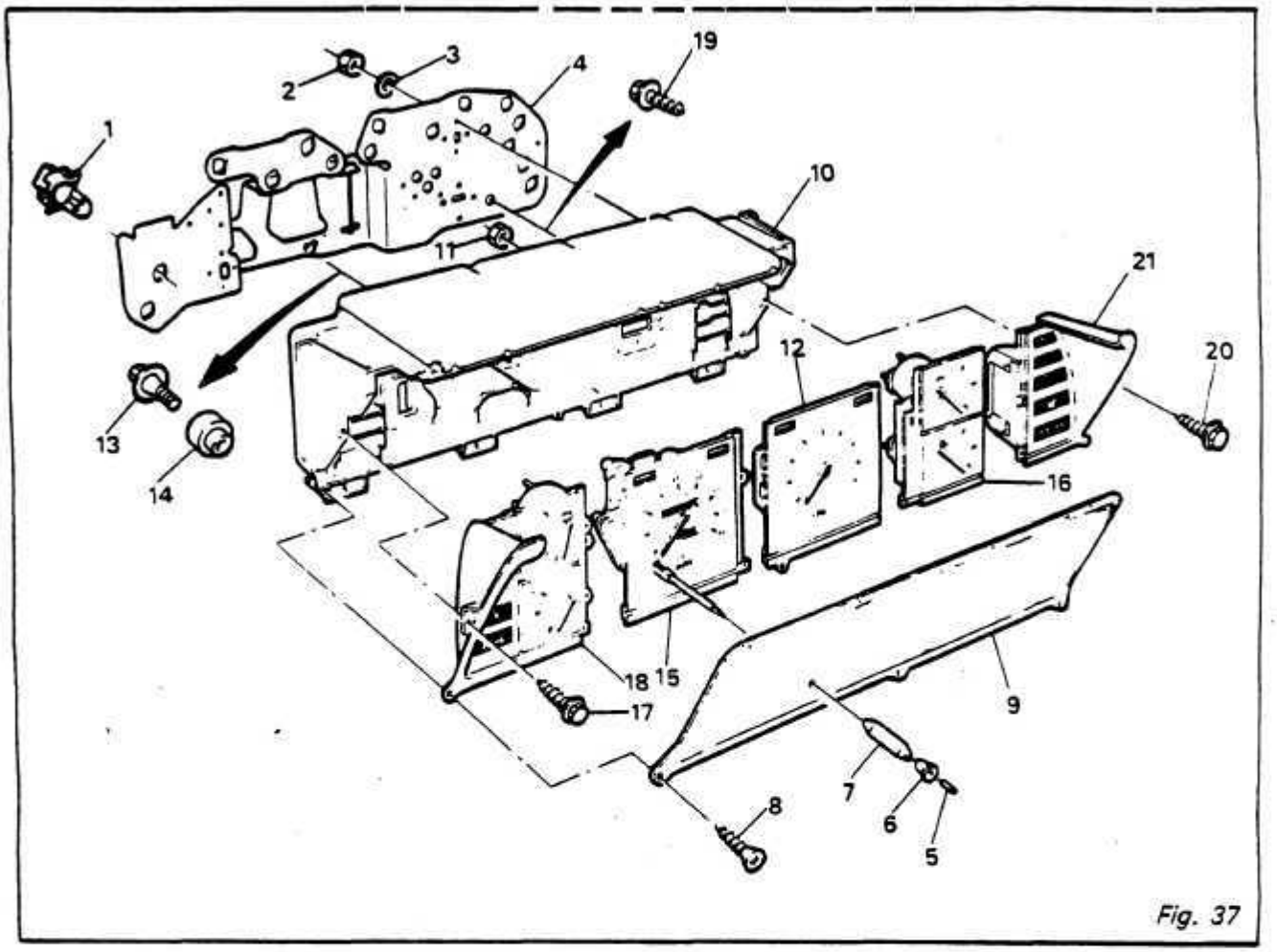


Fig. 37

REMOVING INSTRUMENT CLUSTER

To remove instrument cluster from car see section "P" (Body).

Dismantling — Fig. 37

- Note bulb holder colours and positions before removing.
- Remove all bulb holders (1) by twisting counter clockwise and pulling out.
- Remove all nuts (2) securing the printed circuit (4) noting those used with washers (3) and carefully pull off printed circuit (4) from locating pegs. Ensure the printed circuit (4) is not contaminated with greasy finger marks, etc.
- Release screw (5) securing trip re-set knob (6), remove knob (6) and spacer sleeve (7).
- Remove six screws (8) securing front window (9) to instrument casing (10).
- Release three nuts (11) on rear of casing securing tachometer (12).
- Remove two screws (13) and rubber washers (14) on rear of casing (10) securing speedometer (15) and remove speedometer (15).
- Withdraw oil/fuel gauge assembly (16).
- Release screw (17) on L.H. front securing mask (18) to casing (10) and remove.
- Release two screws (19) at rear and one screw (20) at R.H. front, securing R.H. mask (21).

Refitting

REVERSE THE REMOVAL PROCEDURE.

LIGHTING SYSTEM

HEAD LAMP UNIT
REMOVING – REFITTING – Fig. 38

Removing

- Remove screws (1) holding headlight centre trim panel (2).
- Release four headlight rim retaining screws (3) and withdraw rim (4).
- Withdraw headlight (5) and unplug connector block (6).

Refitting

REVERSE REMOVAL PROCEDURE.

Note:
Ensure headlamp unit is fitted the correct way up and that the sealing lugs are properly located.

- Fit and tighten four headlight rim retaining screws (3).
- Check headlight aim and adjust if necessary.
- Re-fit headlight centres trim panel (2) and retaining screws (1).

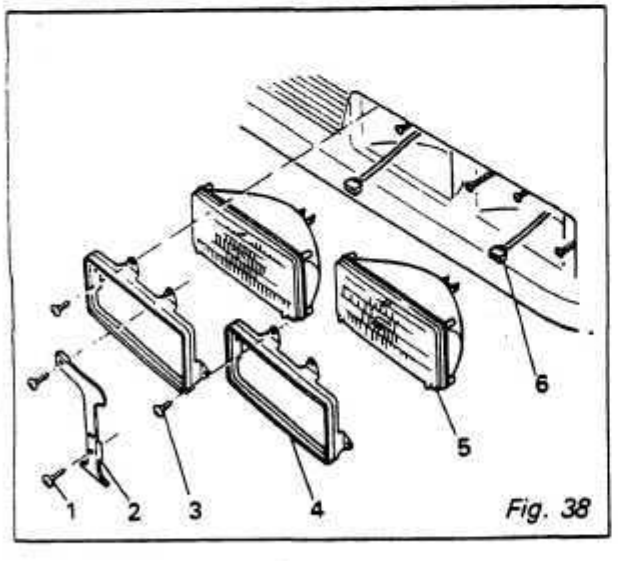


Fig. 38

ADJUSTING HEADLIGHTS

- Position the car on level ground.
- Bounce the vehicle to ensure correct settlement of the suspension.
- Using 'free standing' beam setting equipment follow manufacturer's recommendation.
- Switch on headlamps to 'dipped beam'.
- By means of the two screws adjust the position of the light projected by the lamp.
- Note top screws give vertical adjustment.
- Switch to main beam and proceed to similarly adjust.

REAR CLUSTER AND BULBS
REMOVING – REFITTING – Fig. 39

Removing

- Withdraw six screws (1) from around light cluster (2).
- Withdraw light cluster and unplug from connector block (3).
- Slide printed circuit board (4) to disengage retaining tongue (5) on cluster and withdraw board from cluster.
  (Replace bulbs as necessary.)

Refitting

REVERSE REMOVAL PROCEDURE.

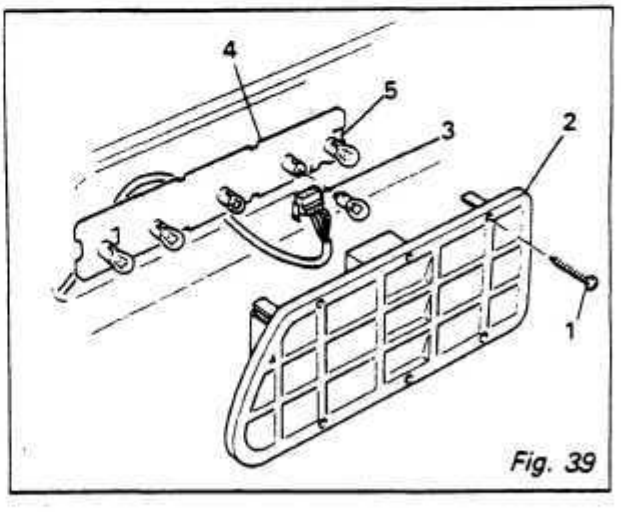


Fig. 39

NUMBER PLATE LIGHT
REMOVING – REFITTING – Fig. 40

Removal

- Release two screws (1) securing light lens (2) to plastic rear fascia (3).

- Withdraw light (2) and disconnect spade terminal (4) taking care not to lose retaining plate (5) on inside of plastic rear section.
- Unclip festoon bulb (6).

Refitting

REVERSE REMOVAL PROCEDURE.

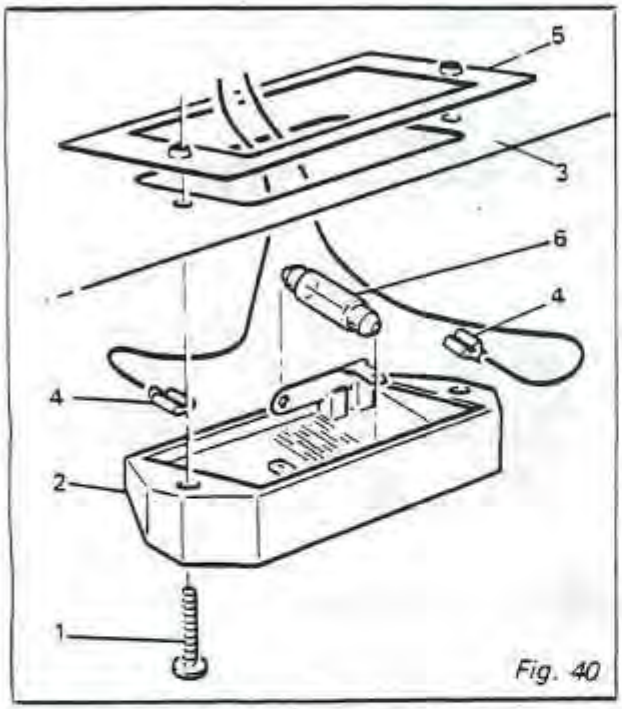


Fig. 40

FRONT TURN SIGNAL LIGHT REMOVING – REFITTING – Fig. 41

Removing

- Undo two retaining screws (1) and rubber washers (2).
- Withdraw lamp (3) from bumper aperture.
- Twist bulb holder (4) a quarter turn counter clockwise to release bulb.

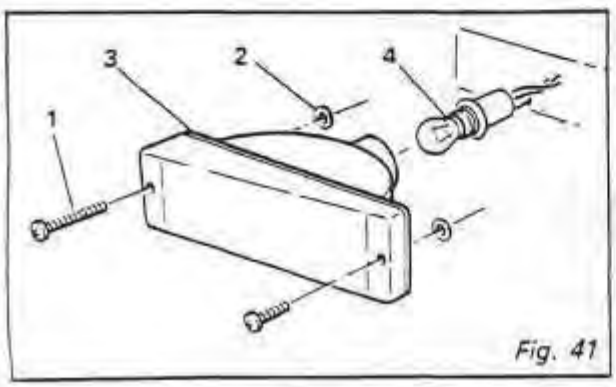


Fig. 41

Refitting

REVERSE REMOVAL PROCEDURE.

FRONT AND REAR SIDE MARKER LIGHT REMOVING – REFITTING – Fig. 42

Removing

- Release two marker light retaining screws (1).
- Withdraw light (2) and pull out bulb holder (3).

Refitting

REVERSE REMOVAL PROCEDURE.

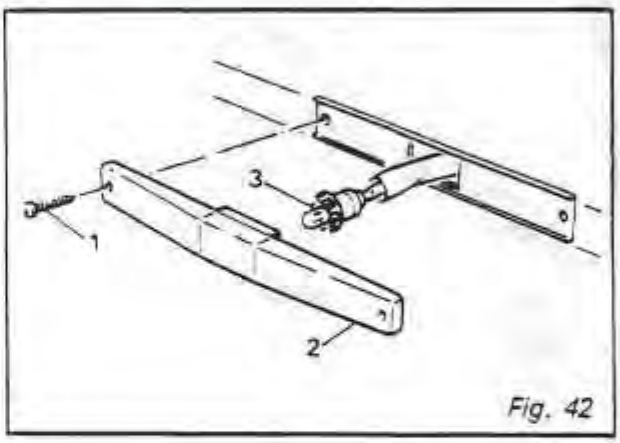


Fig. 42

INTERIOR LIGHTS REMOVING – REFITTING – Fig. 43

Removing

Carefully lever light (1) from head lining.

- Release spade terminal connectors (2).
- Lever off lens (3).
- Remove festoon bulb (4).

Refitting

- Fit festoon bulb (4).
- Fit black earth wire to spade terminal (1).
- Fit purple 'on' wire to spade terminal (3).
- Fit purple/white 'courtesy' wire to spade terminal (2).

Re-fit light (2) ensuring that single terminal end of light is towards R.H. side of car.

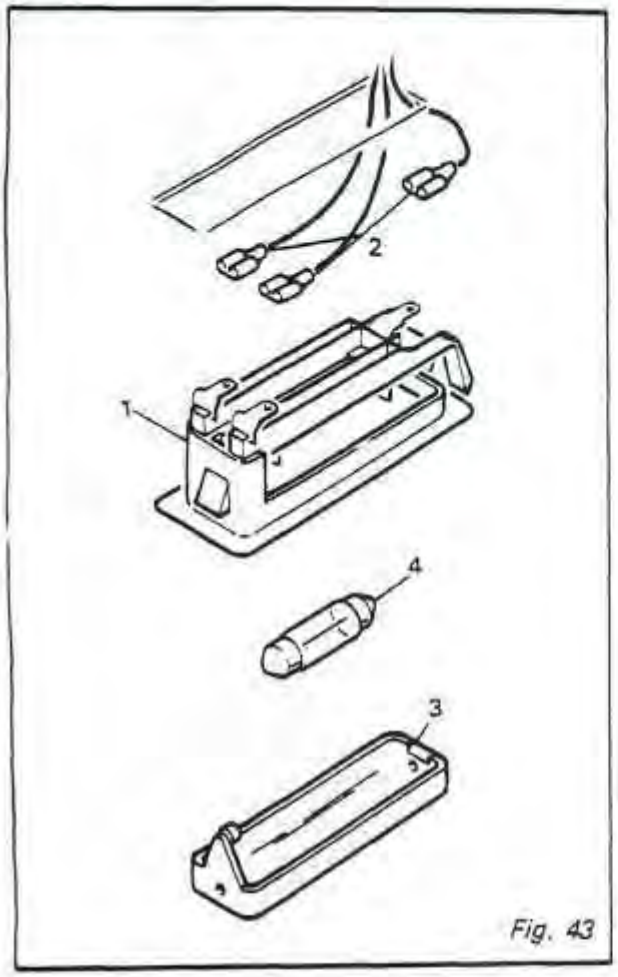


Fig. 43

DOOR LIGHTS
REMOVING – REFITTING – Fig. 44

Removing

- Ease back rubber rim around lens (1).
- Carefully prise lens (2) out of rubber.

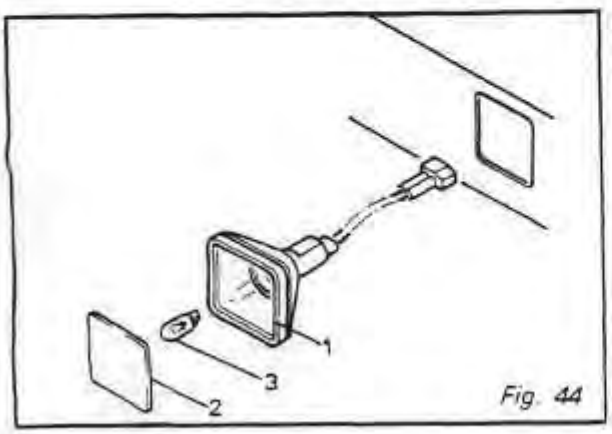


Fig. 44

- Pull out rubber (1) and bulb (3) from door sufficiently to disconnect harness plug.

Note:
Bulb is of a capless type and plugs in.

Refitting

REVERSE REMOVAL PROCEDURE.

GLOVE BOX LIGHT
REMOVING – REFITTING – Fig. 45

Removing

- Open the glovebox.
- Locate light on right side of glove box.
- From rightside under glovebox unplug electrical connectors (1).
- Unscrew bulb holder (2).
- Remove securing nut (3).
- Withdraw the lens (4) and washer (5) from inside glove box.
- Unscrew bulb (6) from holder (2).

Refitting

REVERSE REMOVAL PROCEDURE.

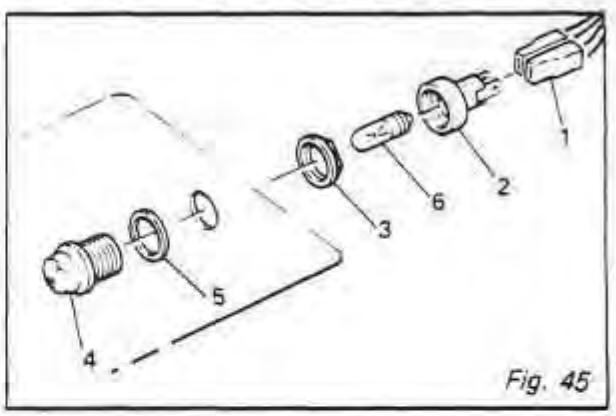


Fig. 45

LUGGAGE COMPARTMENT COVER LIGHT
REMOVING – REFITTING – Fig. 46

Removing

- Open the hood.
- Using a narrow bladed screwdriver carefully prise the light (1) from its location.
- Disconnect the wiring connections (2).
- Unclip bulb (3).

Refitting

REVERSE REMOVAL PROCEDURE.

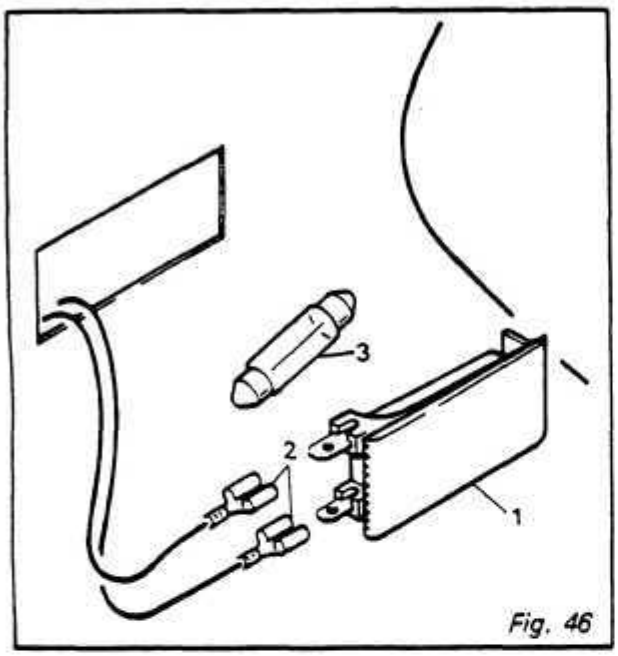


Fig. 46

ENGINE COMPARTMENT LIGHT REMOVING — REFITTING — Fig. 47

Removing

- Open engine louvre.
- Open engine compartment lid.
- Light is situated on right hand side of the inside of the back fascia panels.
- Remove two screws (1).
- Remove lens (2).
- Remove bulb (3).
- Disconnect wiring connectors (4).
- Drill out two pop rivets securing light (6).
- Withdraw light (5).

Refitting

- Locate lamp and secure with 2 pop rivets.
- Reconnect wiring.
- Re-fit bulb.
- Re-fit lens and secure with two posi-drive screws.

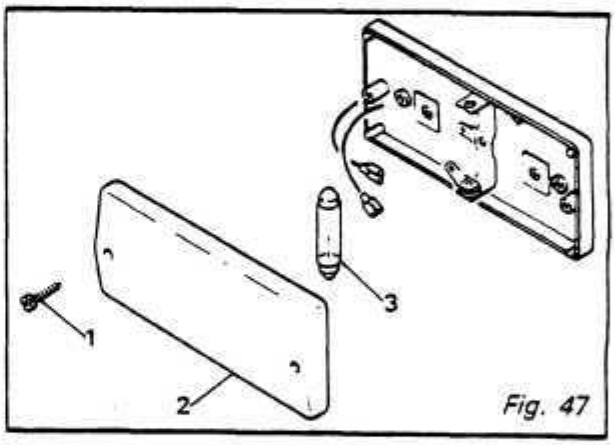


Fig. 47

IGNITION SWITCH

REMOVING – REFITTING – Fig. 48

Removing

- Remove lower switch shroud (1) by releasing the three screws (2) and (3) on underside. Remove two screws (4) on inside of top shroud (5). Remove top shroud (5).
- Release switch retaining screw (6) and withdraw switch (7) noting loose connector yoke (8) between switch (7) and lock (9).
- Disconnect loom connector (10) and wire to terminal on lock (9) and remove switch (7).

Refitting

REVERSE REMOVAL PROCEDURE.

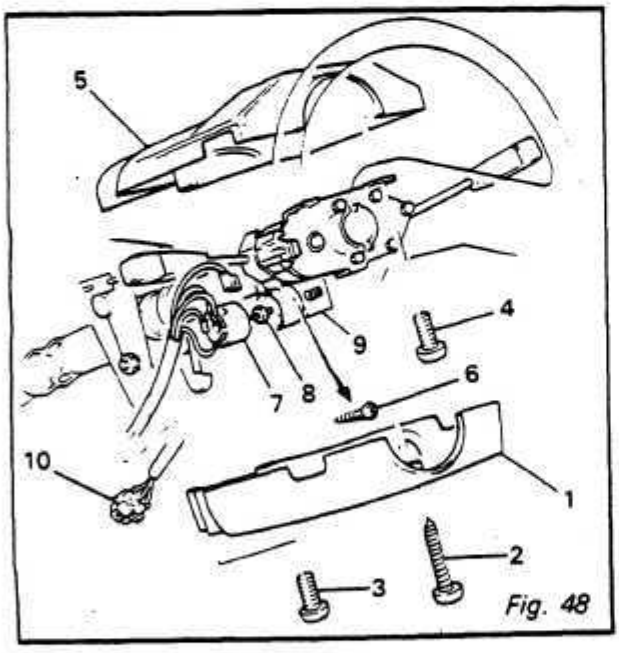


Fig. 48

COLUMN MOUNTED SWITCHES REMOVING – REFITTING – Fig. 49

For removal of upper and lower shroud on column see IGNITION SWITCH REMOVAL.

Removing

- Disconnect the relevant block connectors (1) in the wiring loom under the dash.
- Release cable ties as necessary.
- Remove screws (2), screw (2) and washer (3) holding windshield wiper switch (4) to mounting bracket of signal/headlamp flasher/horn switch unit (5).
- Before removing signal/headlamp flasher/horn switch unit (5) removal of steering wheel is necessary. First remove centre trim from wheel, remove nut and washer retaining wheel, with firm pressure withdraw wheel from spline of column.
- Removing signal/headlamp flasher/horn switch (5) from column.
- Loosen pinch screw (6) and withdraw switch unit (5) from column.

Refitting

REVERSE REMOVAL PROCEDURE.

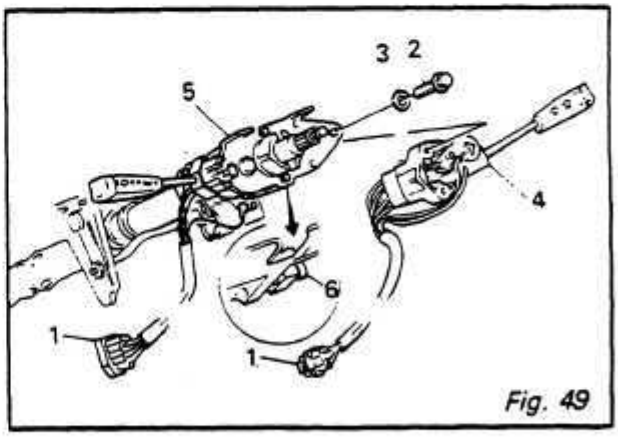


Fig. 49

HAZARD WARNING LIGHT SWITCH

REMOVING – REFITTING – Fig. 50

Removing

- Locate switch (1) on centre console R.H.S.
- Remove three heater control knobs (2) from fascia panel.
- Remove screw under centre knob and lift out fascia panel and unplug warning lights.
- Place hand behind centre console.
- Disconnect harness plug (3).
- Push in retaining clips.
- Withdraw switch (1).
- Press retaining lugs at rear of switch to release bulb holder (4).
- Pull out bulb (5).

Refitting

REVERSE REMOVAL PROCEDURE.

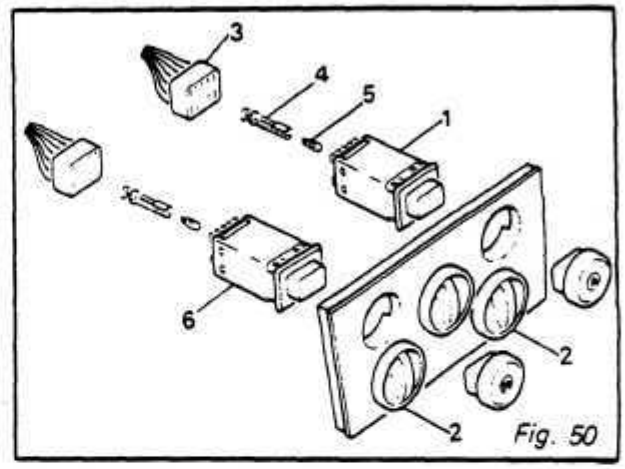


Fig. 50

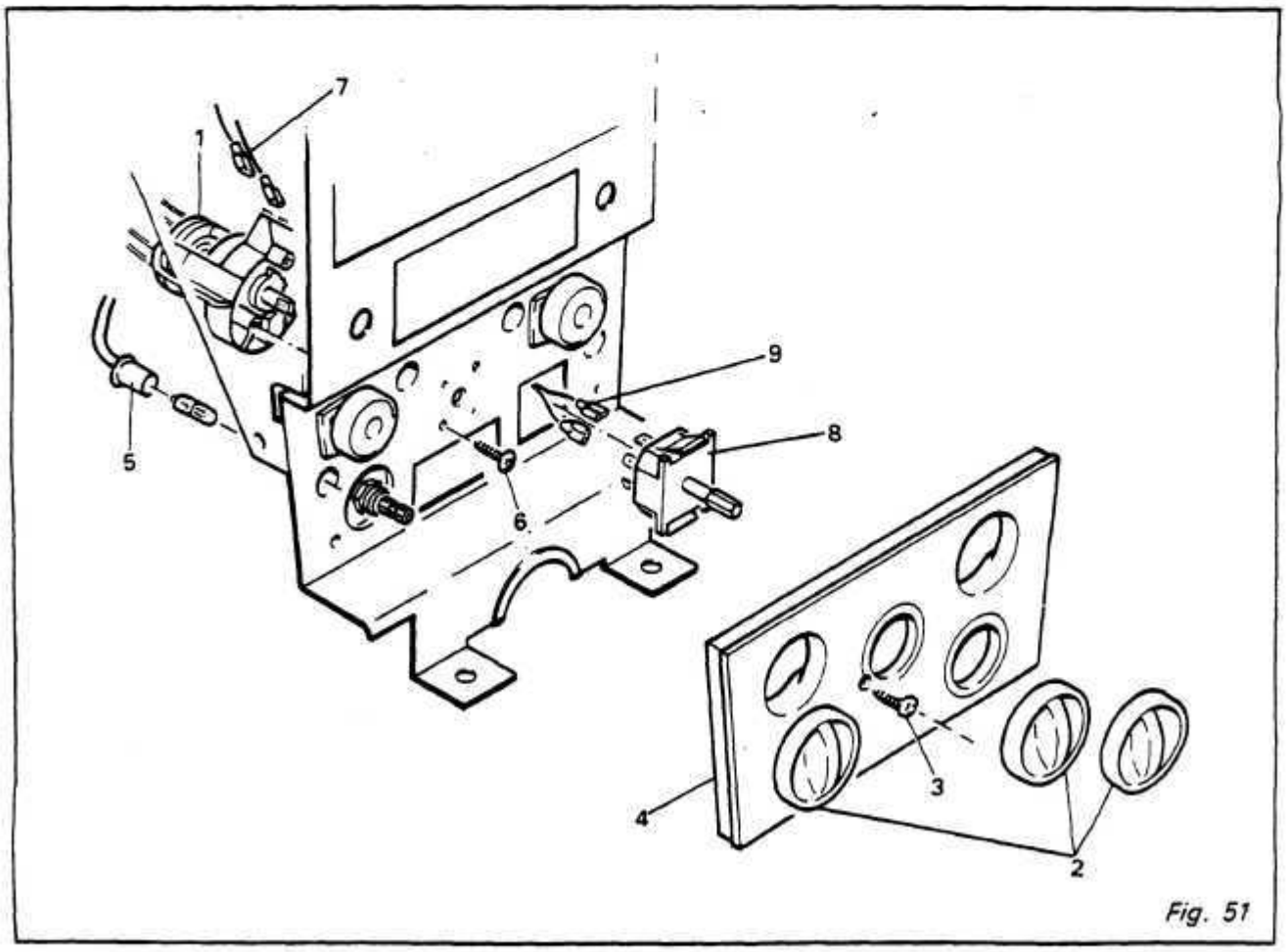


Fig. 51

CENTRE CONSOLE MOUNTED SWITCHES

SIDE/HEADLAMP SWITCH
REMOVING — REFITTING — Fig. 50

Removing

- Locate switch (6) on console L.H.S.
- Procedure as HAZARD WARNING LIGHT SWITCH.

A.C. MODE SWITCH
REMOVING — REFITTING — Fig. 51

Removing

- Locate switch (1) on centre console.
- Pull off control knobs (2).
- Remove screw (3) and lift out fascia panel (4) and unplug warning lights (5).
- Remove two posi-drive securing screws (6).
- Withdraw switch (1) from rear of console.
- Remove vacuum tubes and two spade connectors (7).

Note:
Care must be taken to note the position of the vacuum tubes.

Refitting

REVERSE REMOVAL PROCEDURE.

FAN SPEED SWITCH
REMOVING — REFITTING — Fig. 51

Removing

- Locate switch (8) on centre console.
- Pull off control knobs (2).
- Remove screw (3) and lift fascia panel (4) and unplug warning lights (5).
- Pull down switch shaft to release clip.
- Pull out switch (8).
- Disconnect.

Refitting

REVERSE REMOVAL PROCEDURE.

PANEL RHEOSTAT
REMOVING — REFITTING — Fig. 52

Removing

- Pull knob (1) off switch (2).
- Remove two posi-drive screws (3), situated behind gear shift.
- Lift rear of panel up.
- Remove electrical connections (4) from rheostat switch (2).
- Remove three nuts (5) and spring washers (6) securing bracket (7) to panel.
- Remove nut (8) and spring washer (9) securing switch (2) to bracket (7).
- Withdraw switch (2).

Refitting

REVERSE REMOVAL PROCEDURE.

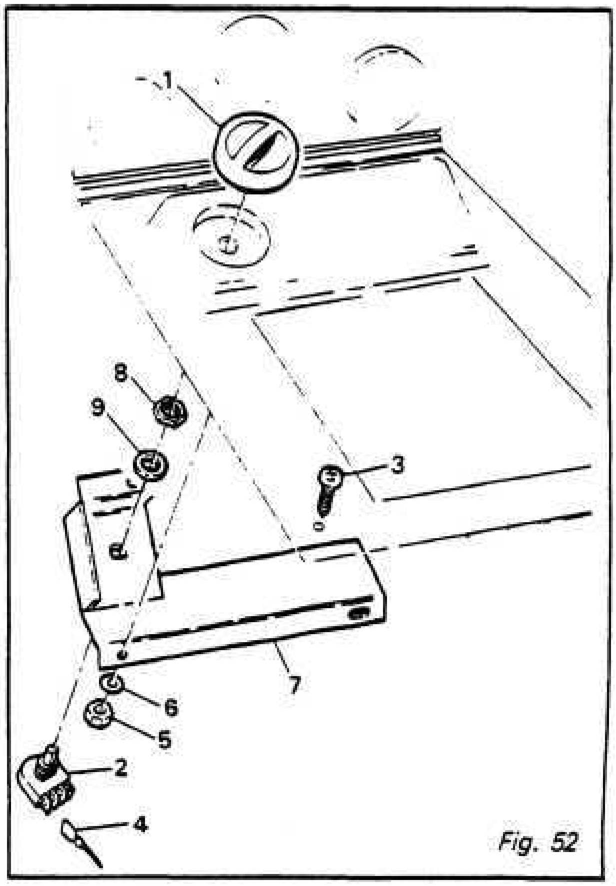


Fig. 52

POWER WINDOW OR DEFROST SWITCHES REMOVING – REFITTING – Fig. 53

Removing

- Pull switches (1) from console tray.
- Disconnect block connector (2) and remove switches (1).

Refitting

REVERSE THE REMOVAL PROCEDURE.

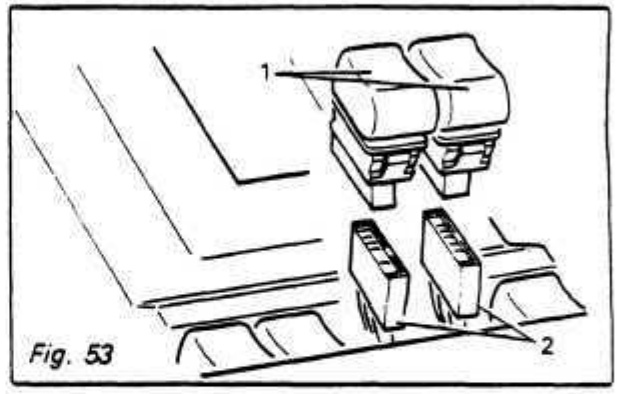


Fig. 53

DOOR LIGHT SWITCH

REMOVING — REFITTING — Fig. 54

Removing

- Disconnect electrical connectors (1) from behind switch (2).
- Remove posi-drive screw (3), being careful not to loose, spade connector (4), star washer (5) and nut (6).

Refitting

REVERSE REMOVAL PROCEDURE.

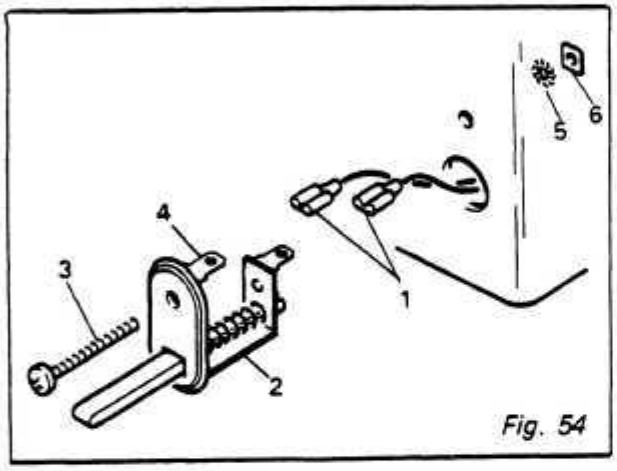


Fig. 54

GLOVE BOX LIGHT SWITCH REMOVING — REFITTING — Fig. 55

Removing

- Open glove box.
- Using a narrow bladed screwdriver carefully prise the switch (1) from the front edge of the glove box.
- Disconnect electrical connections (2).

Refitting

REVERSE REMOVAL PROCEDURE.

ENGINE COMPARTMENT SWITCH REMOVING — REFITTING — Fig. 56

Removing

- Open engine louvre.
- Open engine compartment lid.
- Switch is located far L.H.S. of engine compartment.

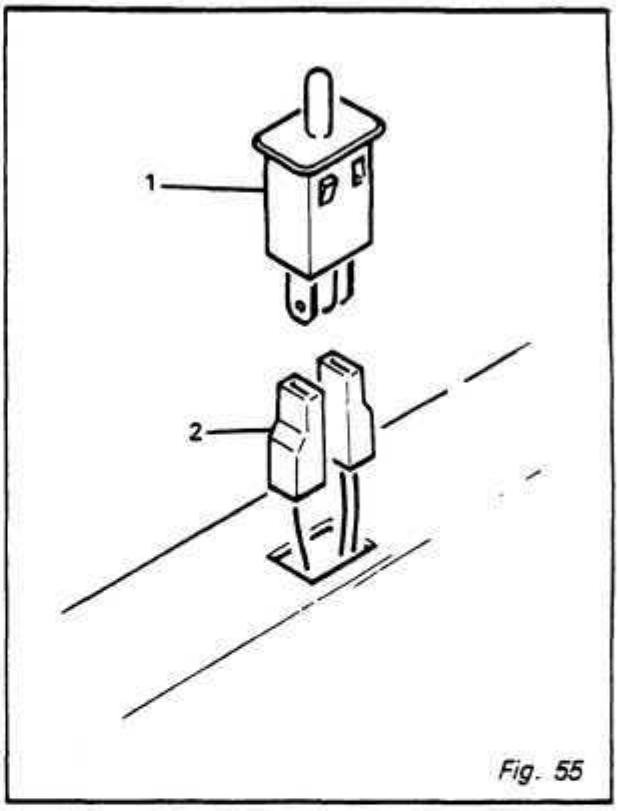


Fig. 55

- Disconnect electrical connectors (1).
- Compress retaining clips with fingers and lift switch (2) out of bracket (3).

Refitting

REVERSE REMOVAL PROCEDURE.

LUGGAGE COMPARTMENT COVER LIGHT SWITCH REMOVING — REFITTING — Fig. 57

Removing

- Open Luggage Compartment Cover.
- Using a narrow bladed screwdriver carefully prise the switch (1) from the hood.
- Disconnect electrical connectors (2).

Refitting

REVERSE REMOVAL PROCEDURE.

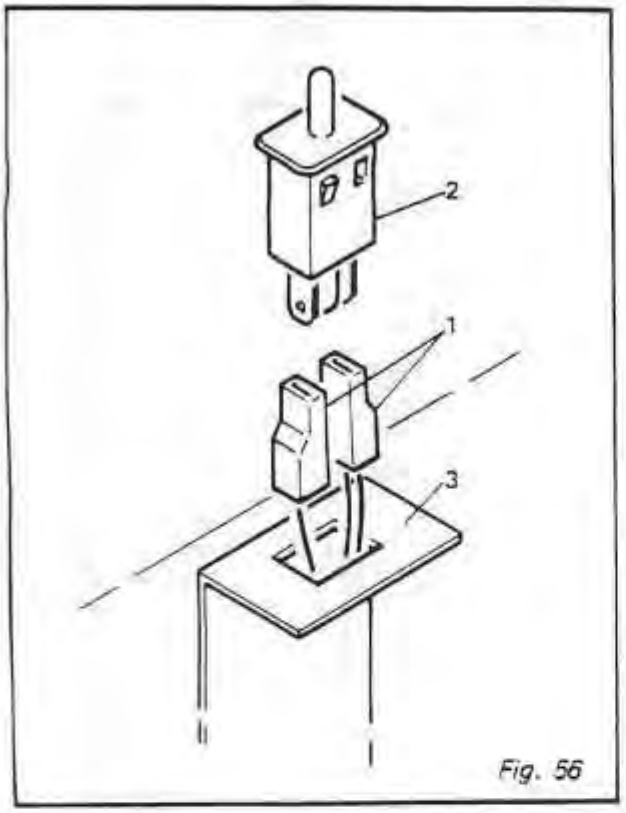


Fig. 56

INERTIA SWITCH

The inertia switch provides the ground earth circuit for the electric fuel pump. In the case of an accident where high impact is involved the inertia switch will de-activate the fuel pump.

The inertia switch also activates the door lock circuit to unlock the doors upon high impact.

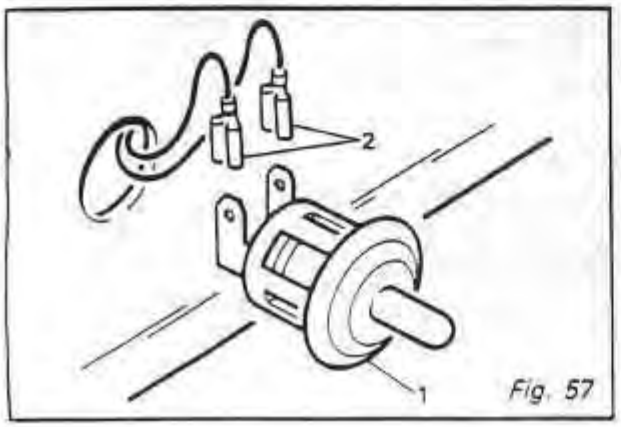


Fig. 57

REMOVING – REFITTING – Fig. 58

Removing

- Locate inertia switch (1) forward of Luggage Compartment Cover release bracket (2)
- Disconnect electrical connectors (3).
- Remove two posidrive screws (4) and remove switch.

Refitting

REVERSE REMOVAL PROCEDURE.

Note:
When refitting inertia switch, make note of plunger position on switch. It should be in the closed position.

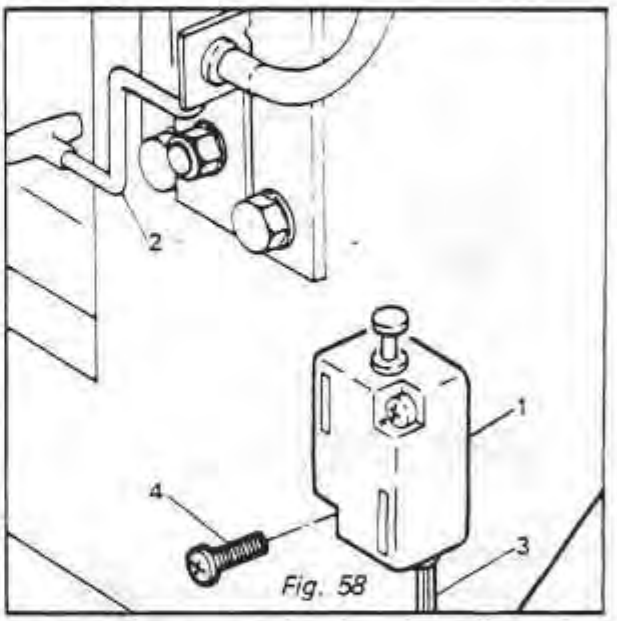


Fig. 58

STOP LIGHT SWITCH
REMOVING – REFITTING – Fig. 59

Removing

- Stop light switch is located on the RHS of pedal support bracket (1).
- Disconnect electrical connectors (2).
- Loosen thin locknut (3).
- Withdraw the switch (4) and thin locknut (5) from bracket.
- Remove the thin nut (5) from the switch.

Refitting

REVERSE REMOVAL PROCEDURE.

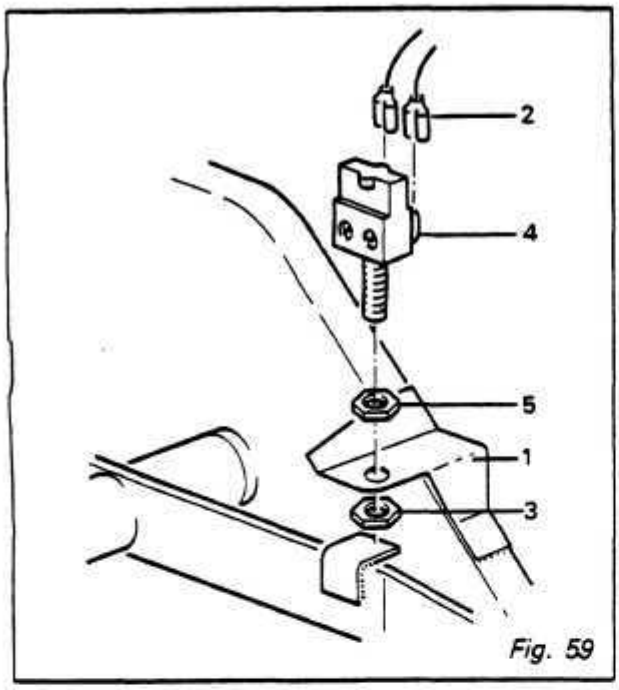


Fig. 59

TURN SIGNAL/HAZARD WARNING FLASHER UNIT REMOVING – REFITTING – Fig. 60

Removing

- Locate flasher unit (2) under dash pad to L.H.S. of steering column.
- Pull unit out of wiring socket.

Refitting

REVERSE REMOVAL PROCEDURE.

DOOR LOGIC BUZZER BOX REMOVING – REFITTING – Fig. 60

Removing

- Locate logic buzzer box (1) beside flasher unit.
- Remove one posidrive screw (3).
- Disconnect harness plug (4).
- Withdraw logic box.

Refitting

REVERSE REMOVAL PROCEDURE.

WIPER DELAY CONTROL BOX REMOVING – REFITTING – Fig. 60

SEE WIPER SECTION M:09:03.

HANDBRAKE SWITCH REMOVING – REFITTING

Removing

- Remove carpet handbrake cover.
- Slide rubber sheath from handbrake lever.
- Apply handbrake.
- Using a 90° angle posidrive screwdriver remove two posidrive securing screws.
- Disconnect wiring connection.
- Remove switch.

Refitting

REVERSE REMOVAL PROCEDURE.

SEAT BELT SWITCH

- The seat belt switch is incorporated within the seat belt anchor and must be replaced as an anchor unit.

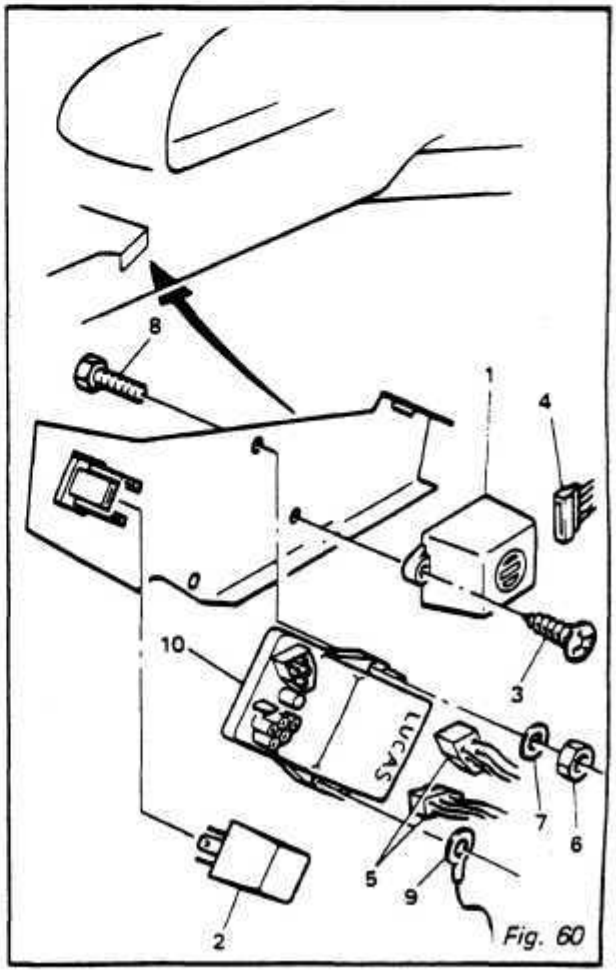


Fig. 60

ENGINE COOLING

FAN SWITCH (OTTERSTAT SWITCH) REMOVING – REFITTING – Fig. 61

CAUTION: This operation must be carried out with the engine cold.

Note:
The engine cooling fan switch is located in the engine bay on the lower L.H. side of the engine, in the engine to radiator water pipe.

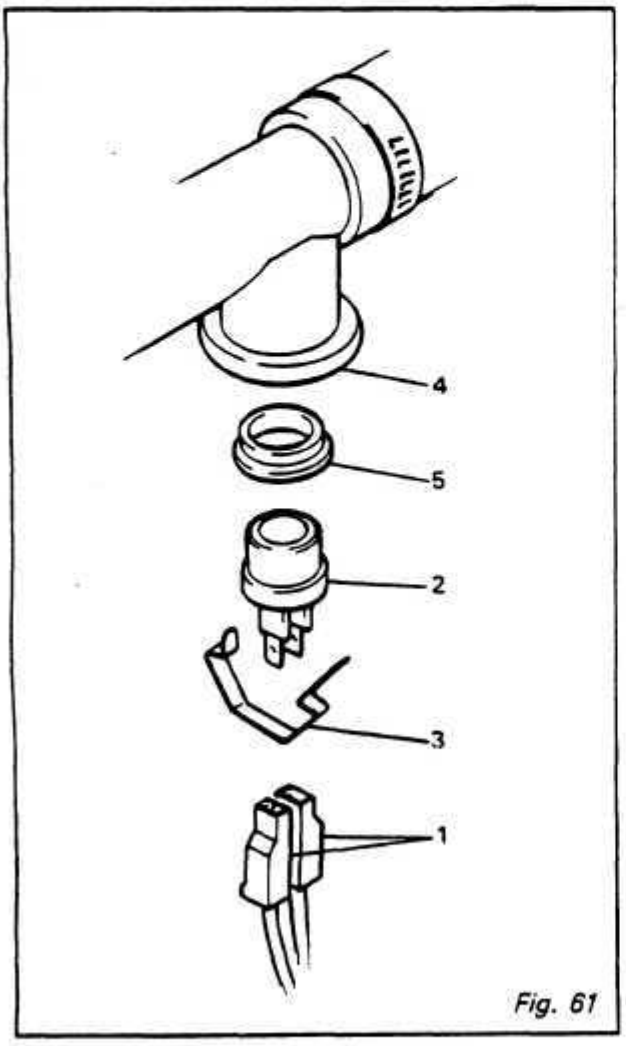


Fig. 61

Removing

- Partly drain cooling system.
- Disconnect wiring (1) connection to switch (2).
- Remove spring clip (3) securing switch (2) in pipe (4).
- Remove switch (2).
- Remove and discard grommet (5).

Refitting

- Fit new grommet (5) and refit spring clip (3).
- Reconnect wiring terminals (1).
- Top up cooling system to correct level with recommended mixture.

FUEL TANK SENDER UNIT REMOVAL – REFITTING – Fig. 62

Removal

- Remove spare wheel from luggage compartment.
- Remove carpet.
- Remove screws (1) holding panel (2) at rear of spare wheel well and remove panel (2).
- Disconnect electrical connector (3) to sender (4).
- Unscrew sender retaining cap (5).
- Withdraw sender unit (4).

Refitting

REVERSE REMOVAL PROCEDURE.

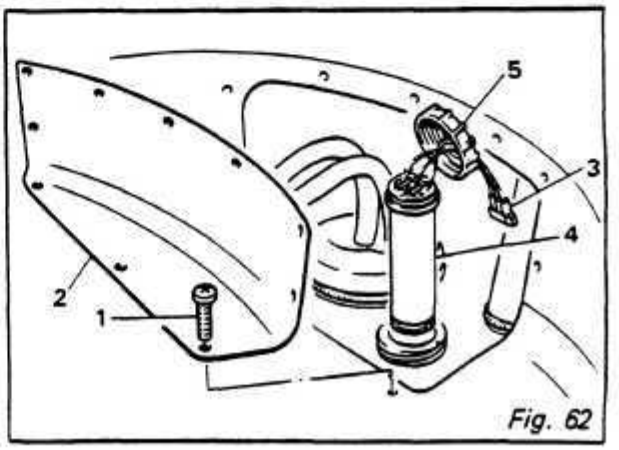


Fig. 62

RADIO

REMOVAL – REFITTING – Fig. 63

Removal

- Remove knob assembly (1).
- Remove nut (2) and washer (3).
- Remove trim plate (4).
- Remove air vents from centre console, working through aperture in centre console withdraw radio (5).
- Disconnect connector from radio to earth terminal, speaker wires from harness plug and disconnect aerial plug.

Refitting

REVERSE REMOVAL PROCEDURE.

FRONT FASCIA SPEAKERS REMOVING – REFITTING – Fig. 64

Removing

- Remove two securing nuts (1).
- Withdraw the speaker and rubber shroud (2).
- Disconnect snap connectors (3).

Refitting

- Connect two snap connectors (3).
- Insert the speaker and shroud (2).
- Fit the two securing nuts (1) and tighten.

REAR RADIO SPEAKERS REMOVING – REFITTING – Fig. 65

Removing

- Locate rear quarter trim panel.
- Partially remove door seal from around trim panel.
- Remove upper seat belt securing bolt.
- Remove top and bottom trim panel securing screws.
- Pull back trim panel.

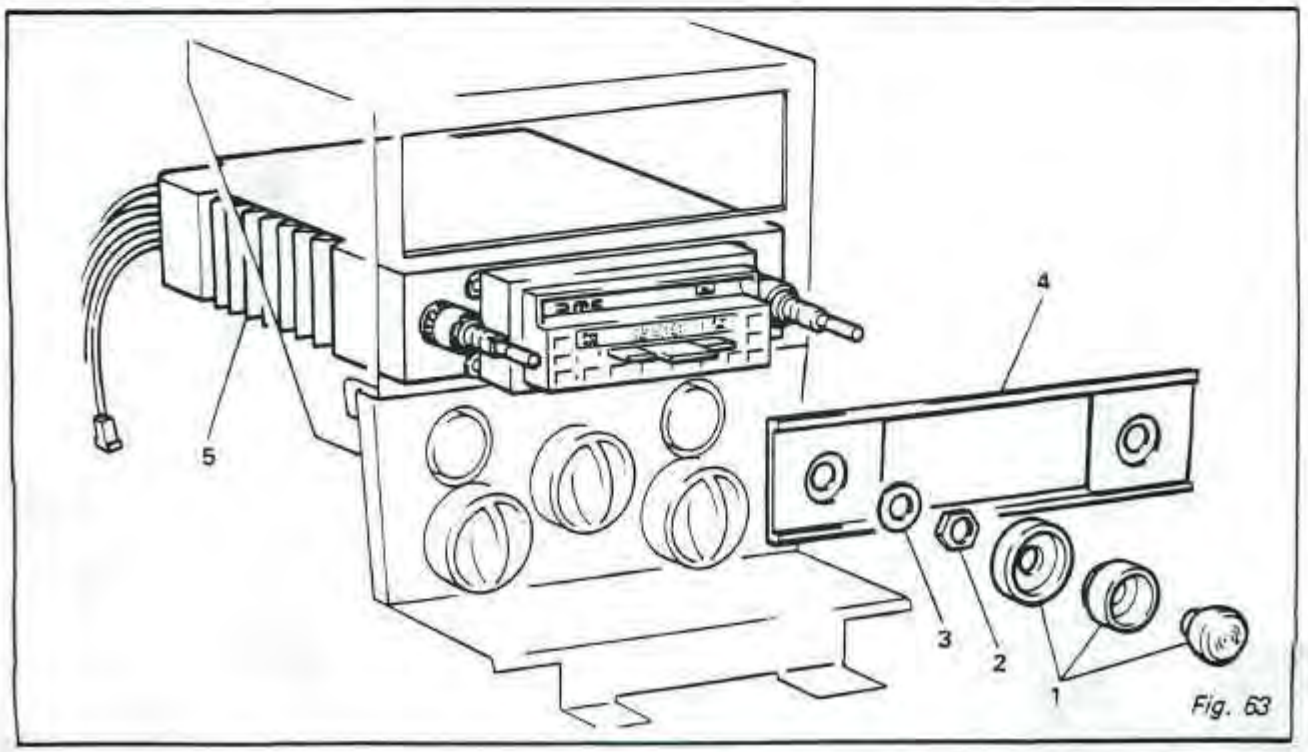


Fig. 63

- Disconnect electric connections (1) to speaker.
- Loosen off jubilee clip (2) securing speaker to bracket (3).
- Remove speaker (4).

Refitting

REVERSE REMOVAL PROCEDURE.

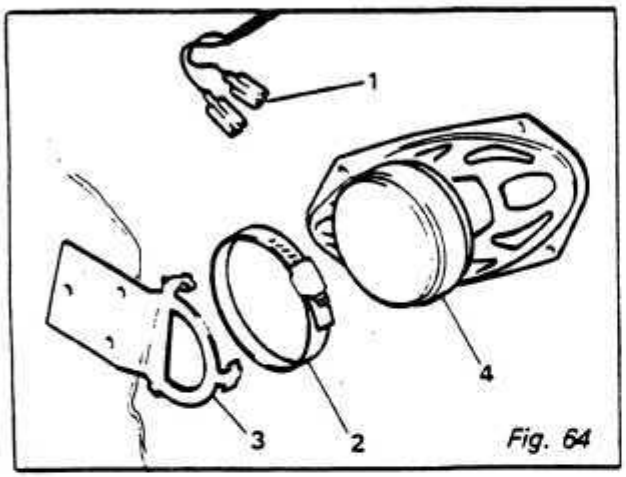


Fig. 64

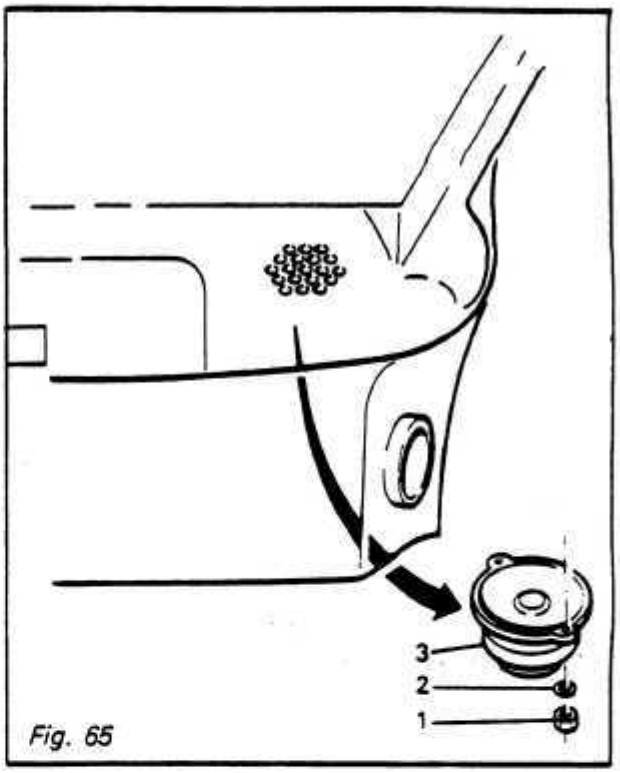


Fig. 65

DOOR ELECTRICS

DOOR ELECTRICS

- Pull off trim panel.
- Remove armrest fixing screw and remove armrest.
- Remove door handle and switch support bracket.
- Remove polythene post seal.

DOOR LOCK SOLENOID REMOVING – REFITTING – Fig. 66

Removing

- Disconnect wire (1) from loom.
- Remove two bolts (2) holding solenoid (3) and earth wire to door frame.
- Remove solenoid (3).

Refitting

REVERSE REMOVAL PROCEDURE.

DOOR SOLENOID SWITCH REMOVING – REFITTING – Fig. 66

Removing

- Disconnect electrical cable (4) to switch.
- Remove all mechanical linkage to switch (5).
- Remove two screws (6) holding switch to door.
- Remove switch (5).

Refitting

REVERSE REMOVAL PROCEDURE.

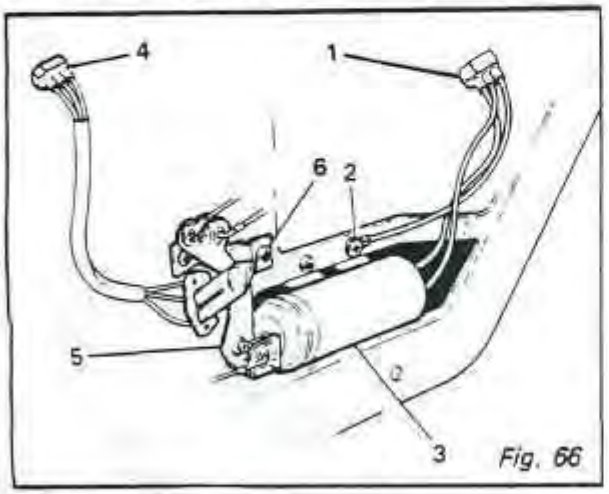


Fig. 66

WINDOW LIFT MOTOR REMOVING – REFITTING – Fig. 67

Removing

- Remove window seal support bracket.
- Remove two nuts (1) and washers (2) at top end of drive shaft.
- Remove nut (4) securing drive shaft to bracket on door frame.
- Remove two screws (5) and one screw (6) and nut (7) holding motor bracket (8) to door frame.
- Remove three screws (9) holding motor (3) to bracket (8).
- Remove electrical connections (10) to motor (3).
- Withdraw motor (3) and drive shaft assembly.

Refitting

- Insert motor (3) drive shaft assembly and connect upper end to studs on door frame, replace nuts (1) and washers (2).

ALL OTHER OPERATIONS ARE A REVERSAL OF ABOVE.

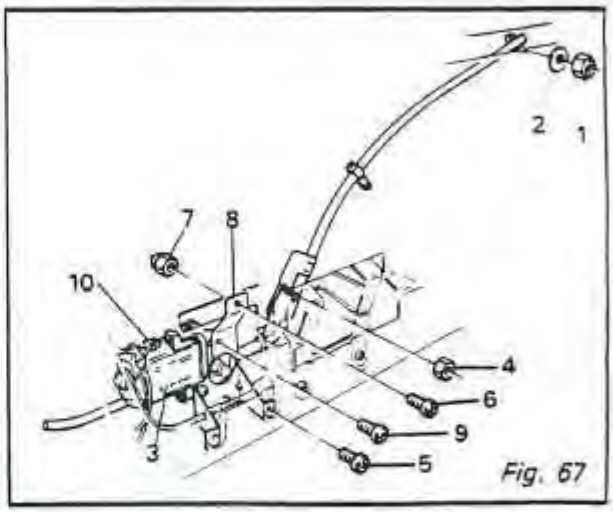


Fig. 67

DOOR MIRROR SWITCH

- Door mirror switch is located on driver's door armrest only.

REMOVING – REFITTING – Fig. 68

Removing

- Remove Escutcheon (1) by carefully levering with a screwdriver.
- Pull out switch (2) and disconnect wiring *harness connector* (3).

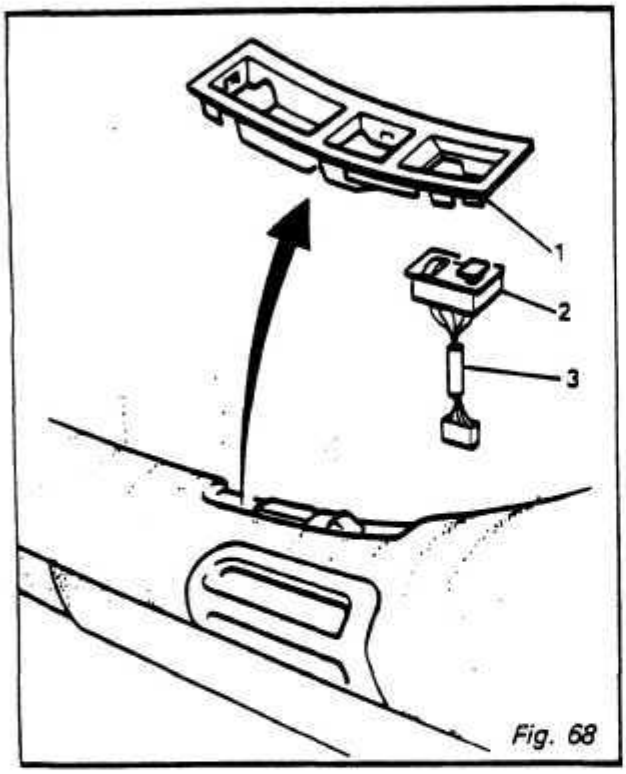


Fig. 68

Refitting

REVERSE REMOVAL PROCEDURE.

DOOR MIRROR
REMOVING – REFITTING – Fig. 69

- Remove door trim panel (2).
- Remove three screws (1) holding mirror to exterior of door.
- Disconnect electrical connection (3).

Refitting

REVERSE REMOVAL PROCEDURE.

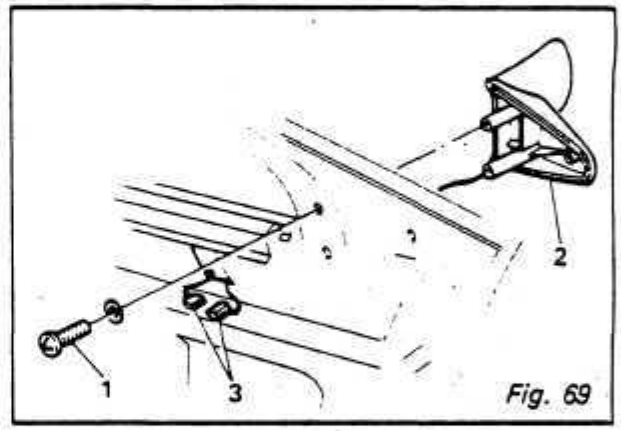
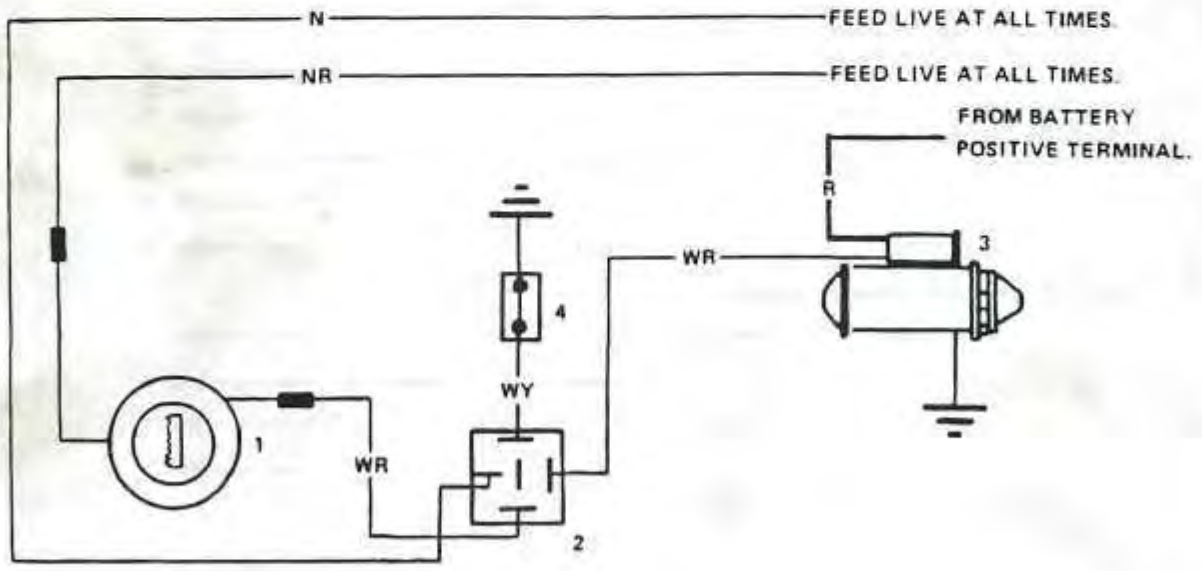


Fig. 69

ELECTRICAL WIRING DIAGRAMS

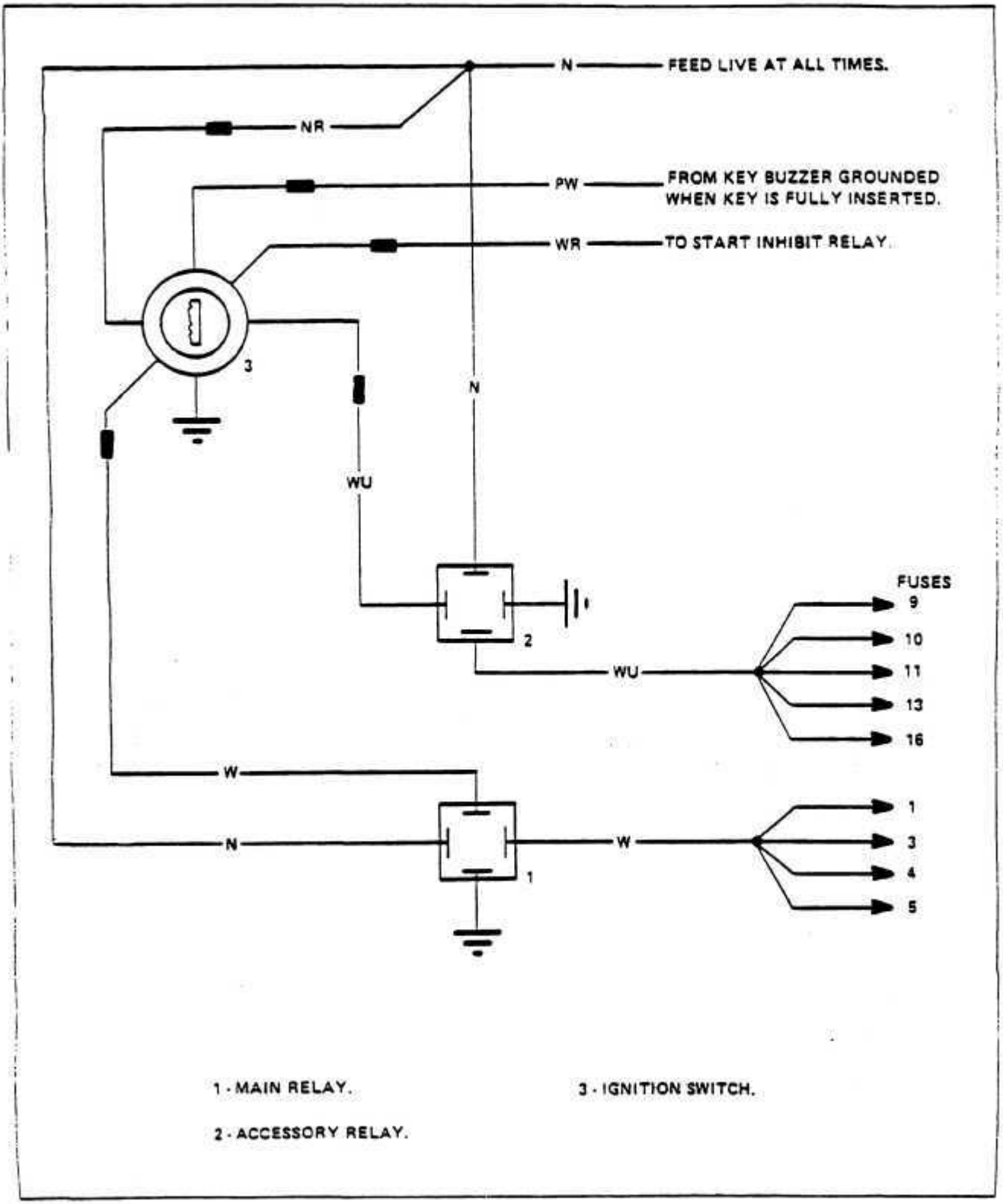
CABLE COLOUR CODE	
B – BLACK	P – PURPLE
G – GREEN	R – RED
K – PINK	S – SLATE
LG – LIGHT GREEN	U – BLUE
N – BROWN	W – WHITE
O – ORANGE	Y – YELLOW

STARTING CIRCUIT

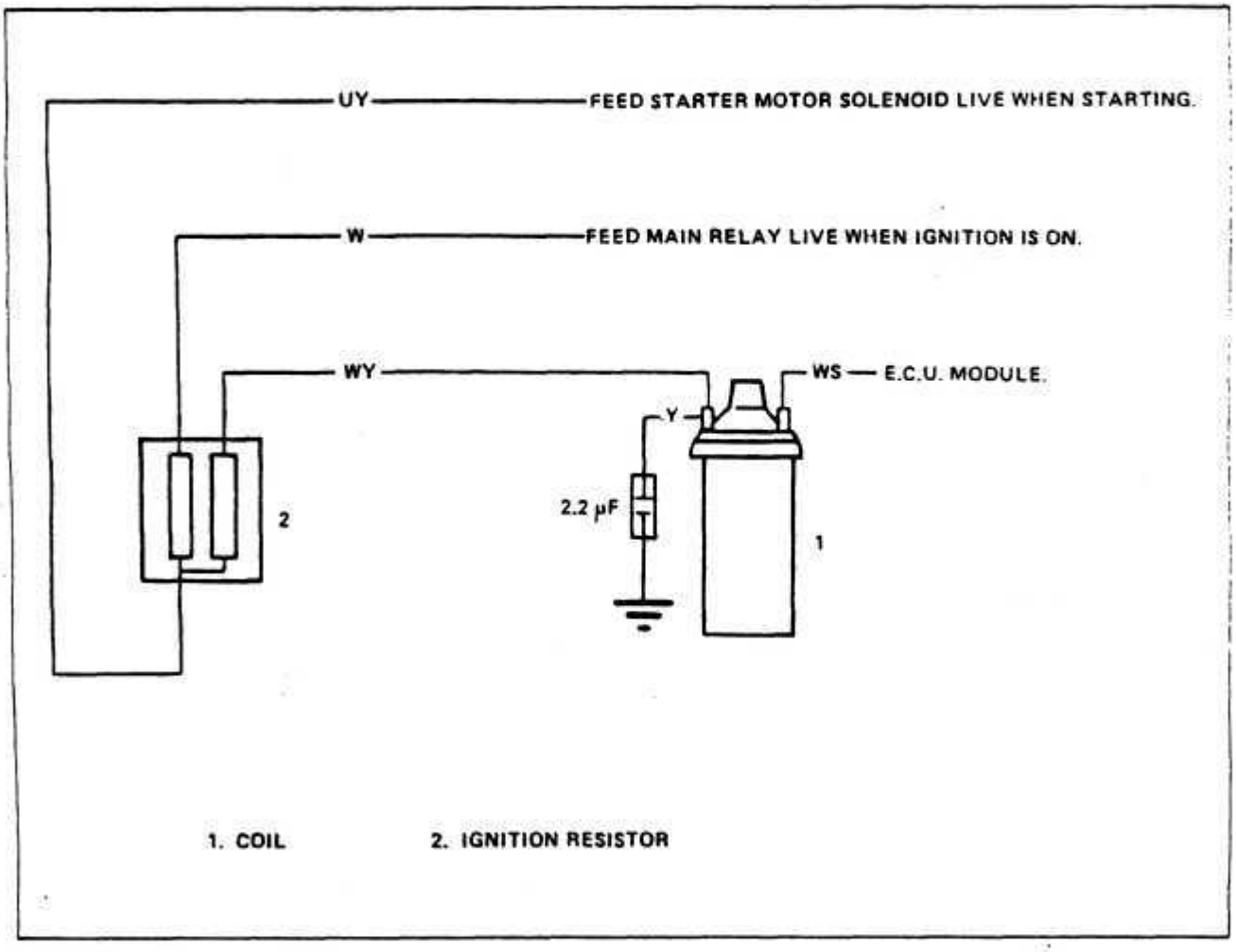


1. IGNITION/START SWITCH
2. STARTER INHIBIT RELAY
3. STARTER MOTOR SOLENOID.
4. NEUTRAL START SWITCH (AUTO TRANSMISSION ONLY)

IGNITION SWITCH CIRCUIT

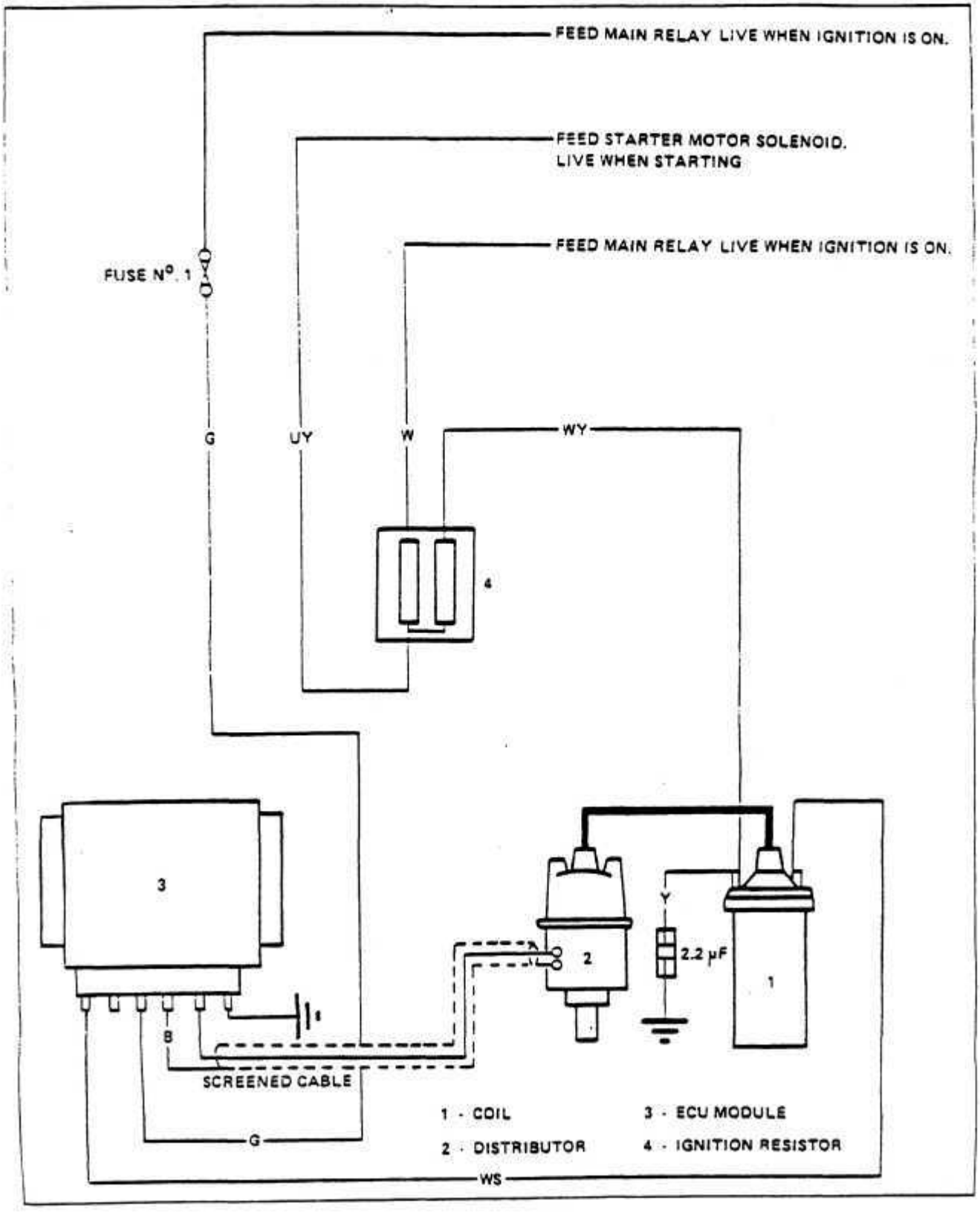


COIL CIRCUIT

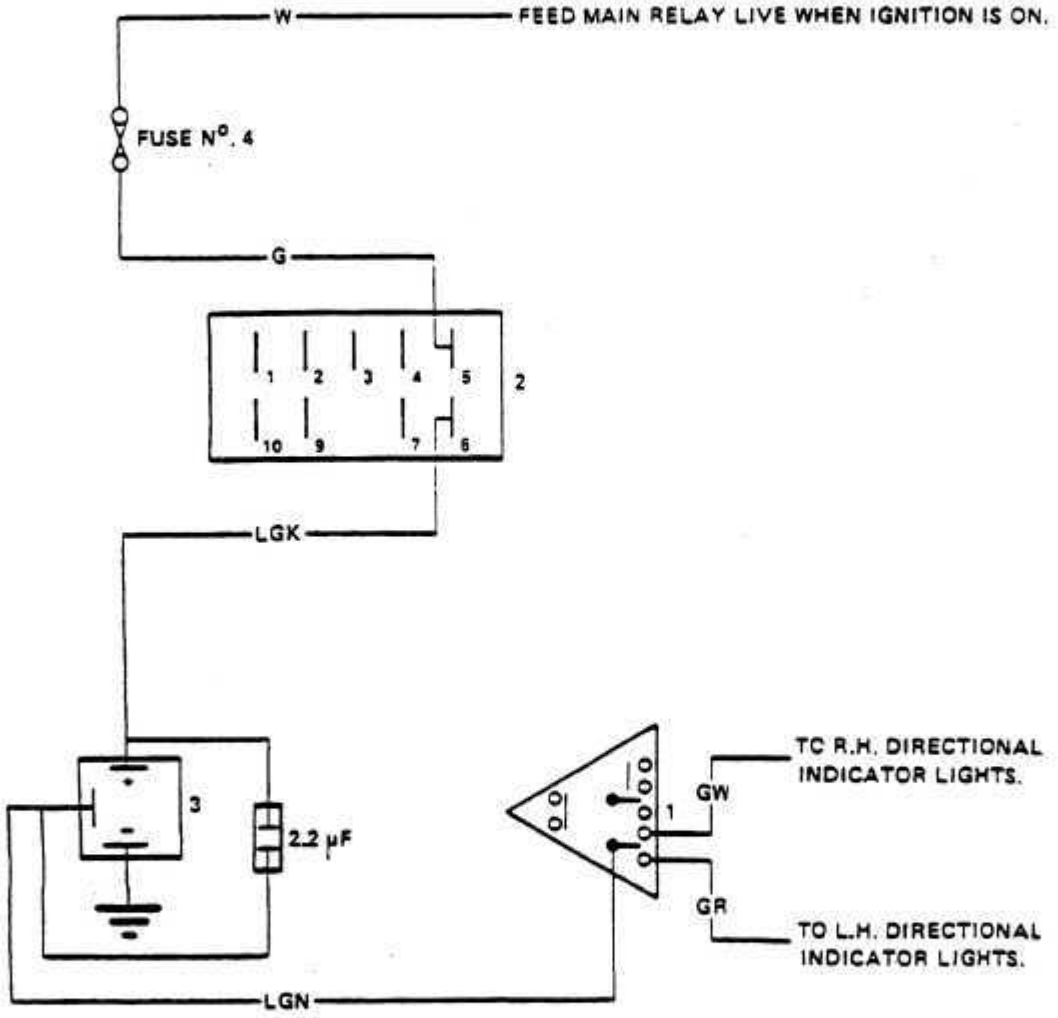


1. COIL
2. IGNITION RESISTOR

ELECTRONIC IGNITION CIRCUIT



DIRECTIONAL INDICATOR CIRCUIT

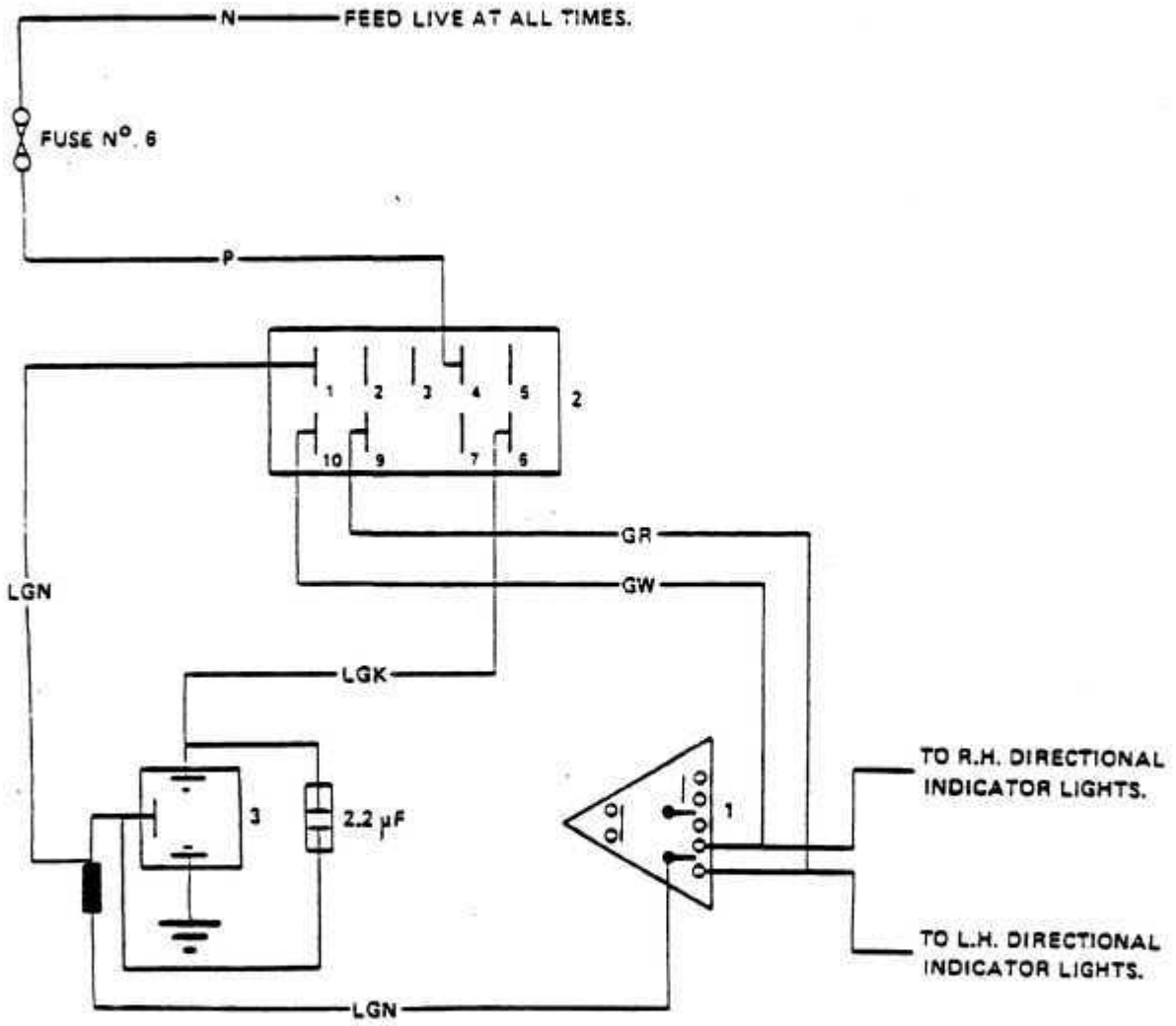


1 - DI/DIP/HORN PUSH SWITCH.

2 - HAZARD SWITCH.

3 - FLASHER UNIT

HAZARD WARNING CIRCUIT

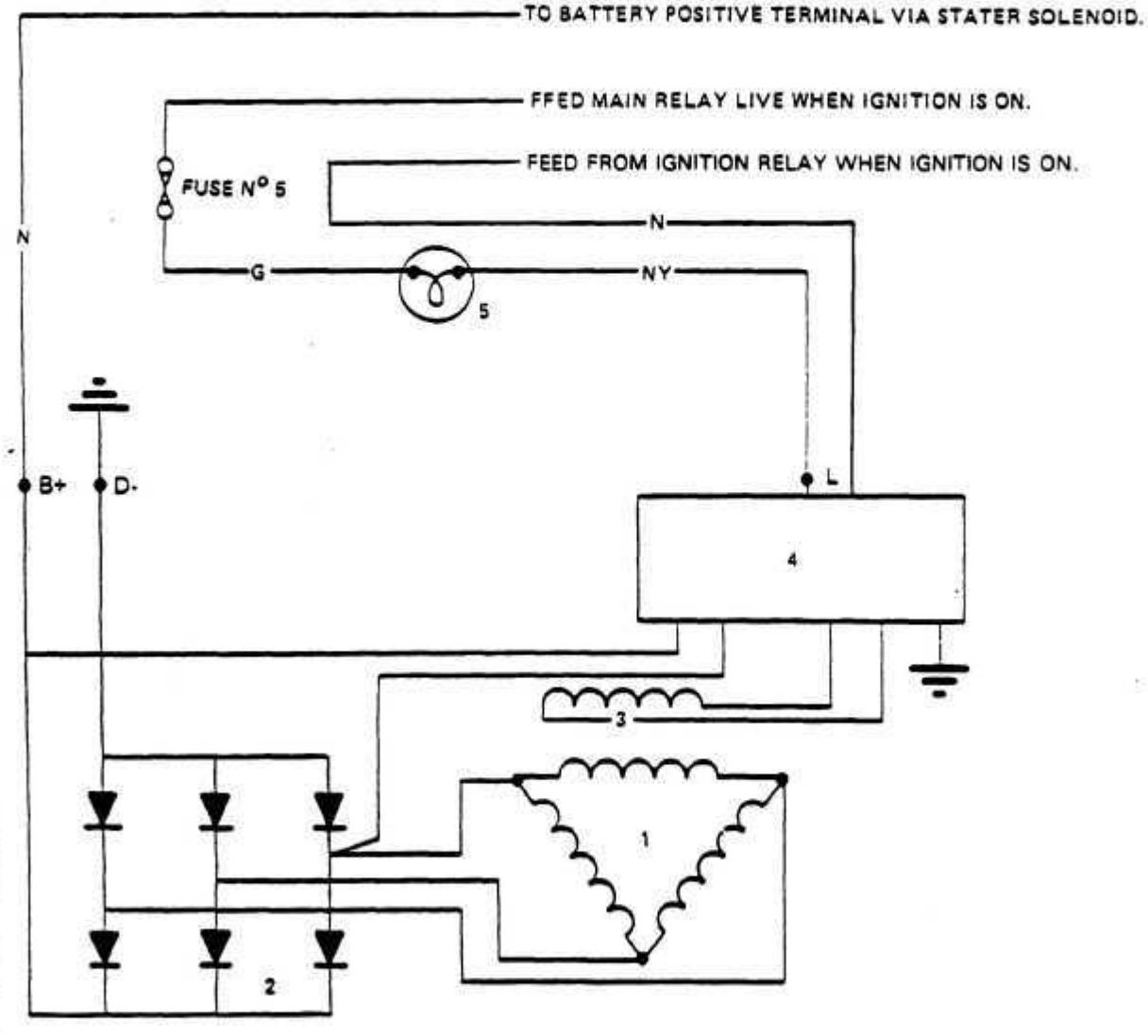


1 - DI/DIP/HORN PUSH SWITCH.

2 - HAZARD SWITCH.

3 - FLASHER UNIT.

DUCELLIER ALTERNATOR



1 STATOR.

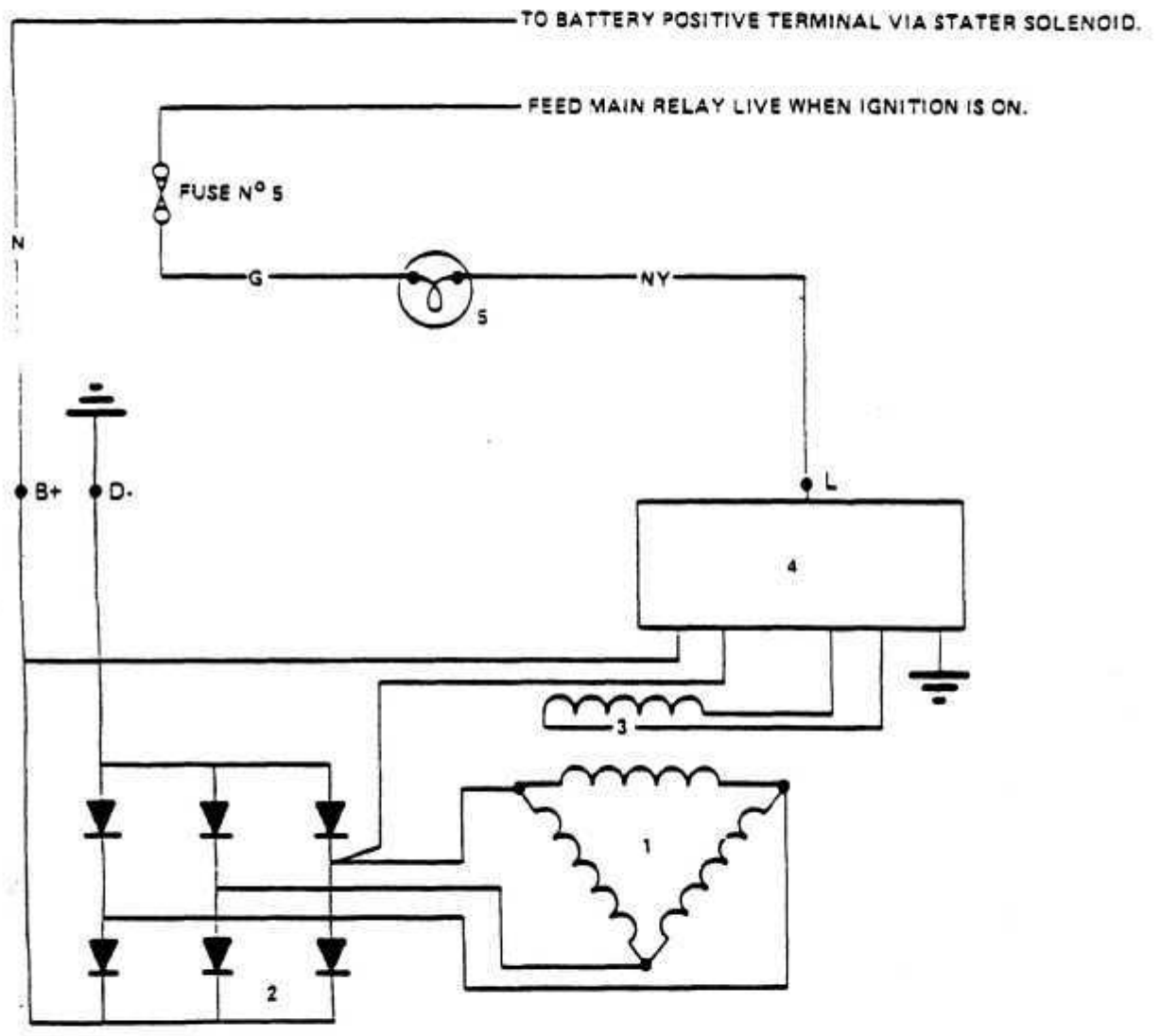
2 DIODE CARRIER.

3 ROTOR.

4. VOLTAGE REGULATOR.

5 WARNING LIGHT.

MOTOROLA ALTERNATOR



1 STATOR.

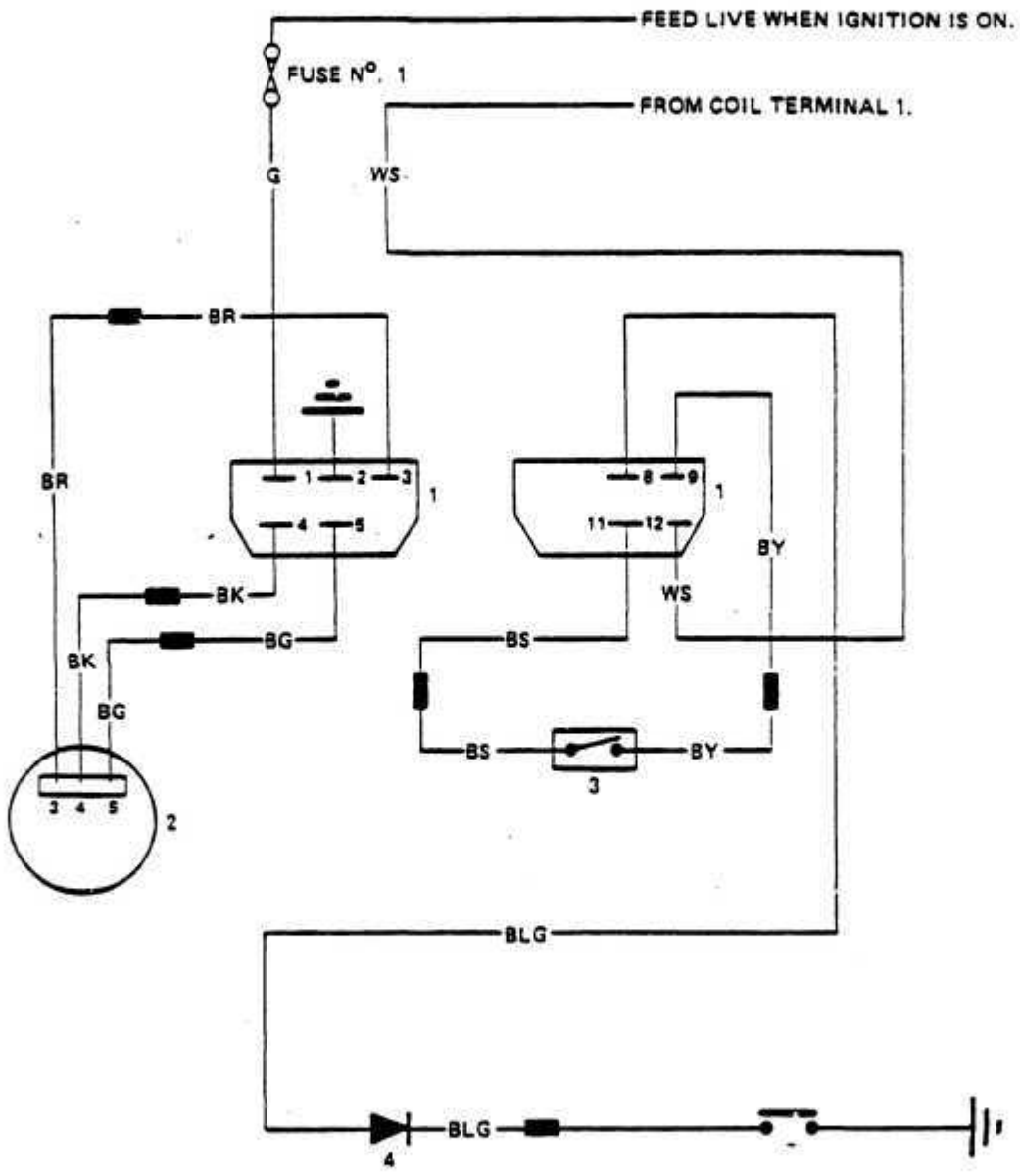
2 DIODE CARRIER.

3 ROTOR.

4. VOLTAGE REGULATOR.

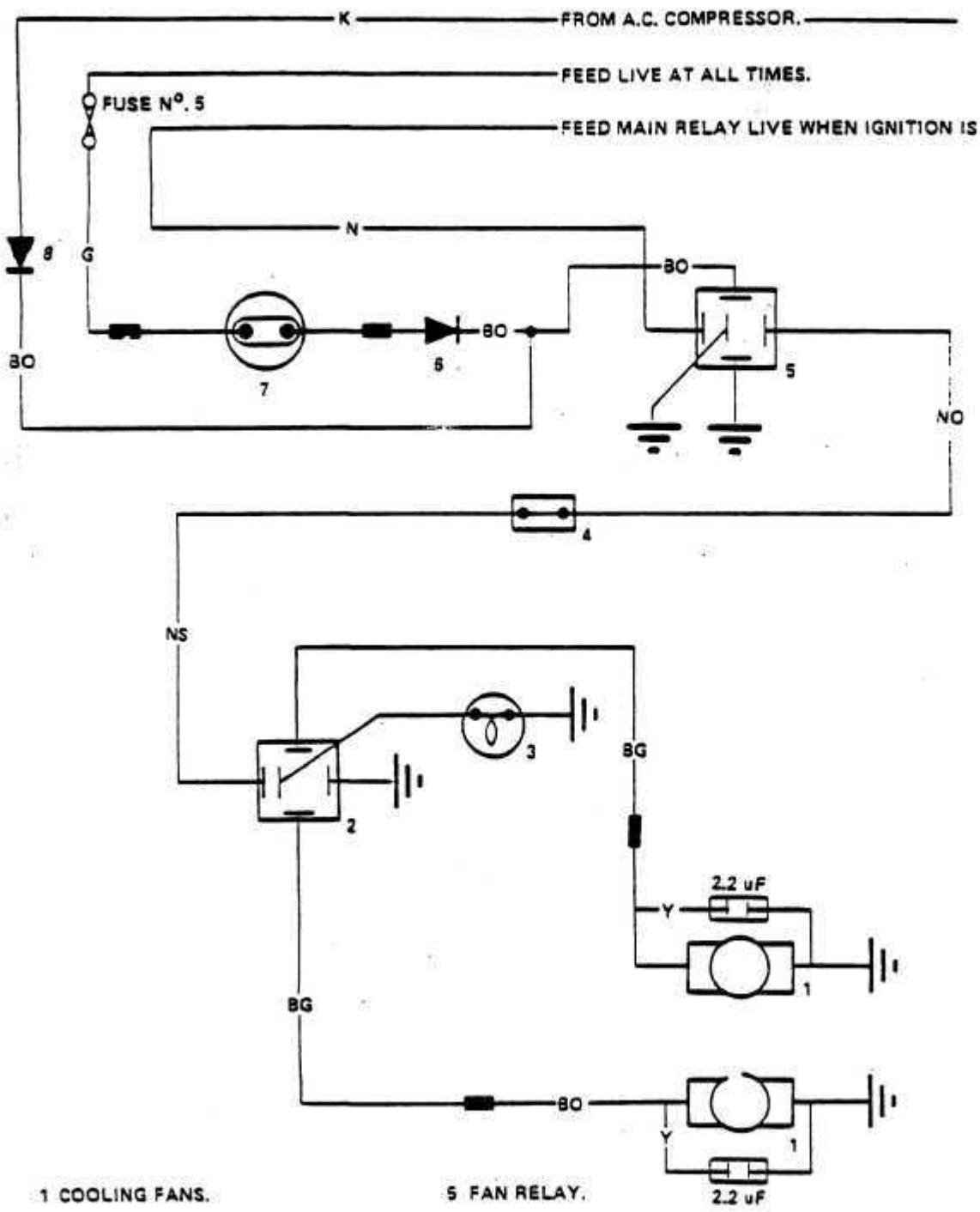
5 WARNING LIGHT.

IDLE SPEED CONTROL CIRCUIT



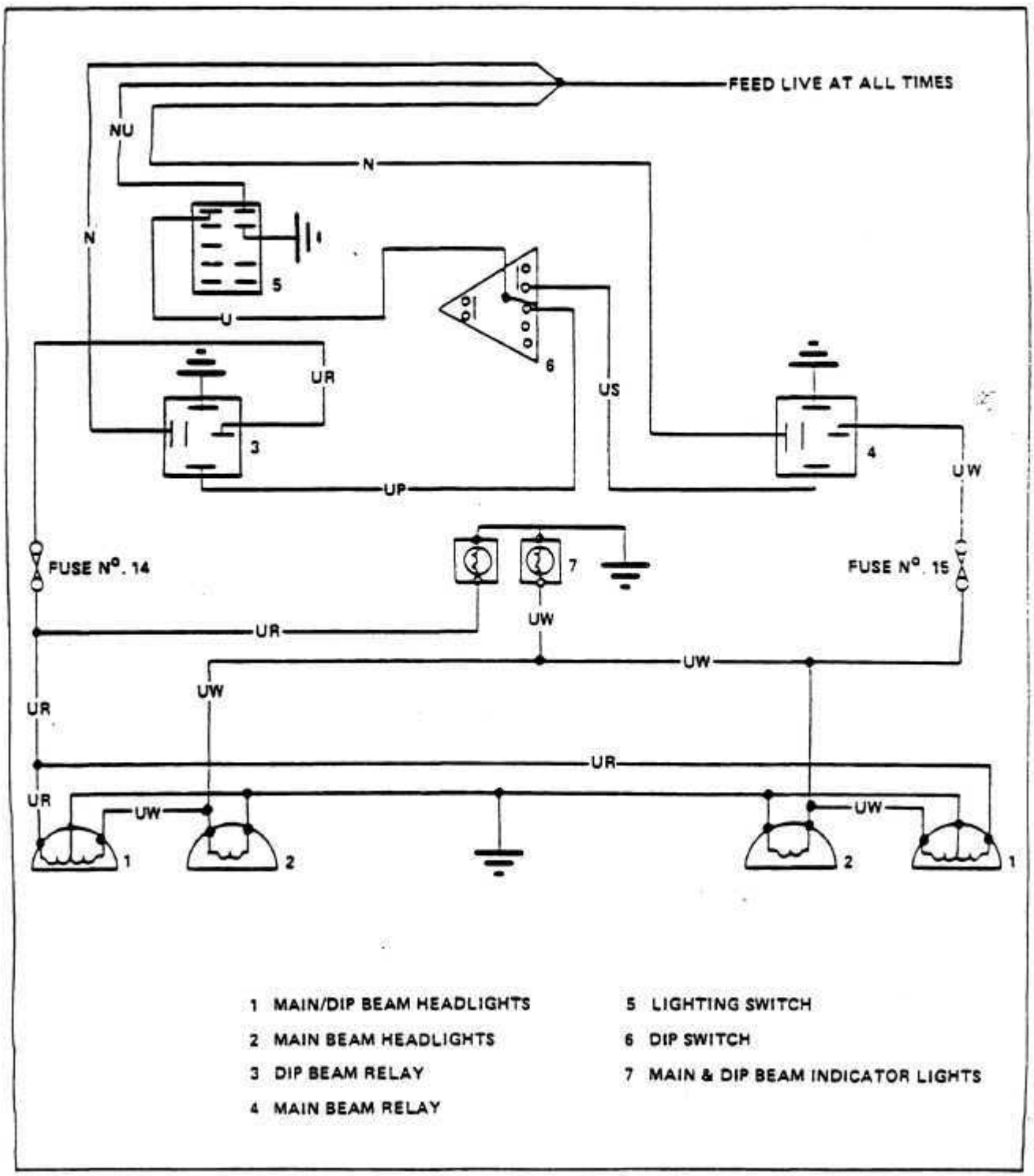
1. ECU MODULE
2 REGULATOR
3 THERMAL TRIP
4 DIODE
5 MICRO - SWITCH

COOLING FAN CIRCUIT



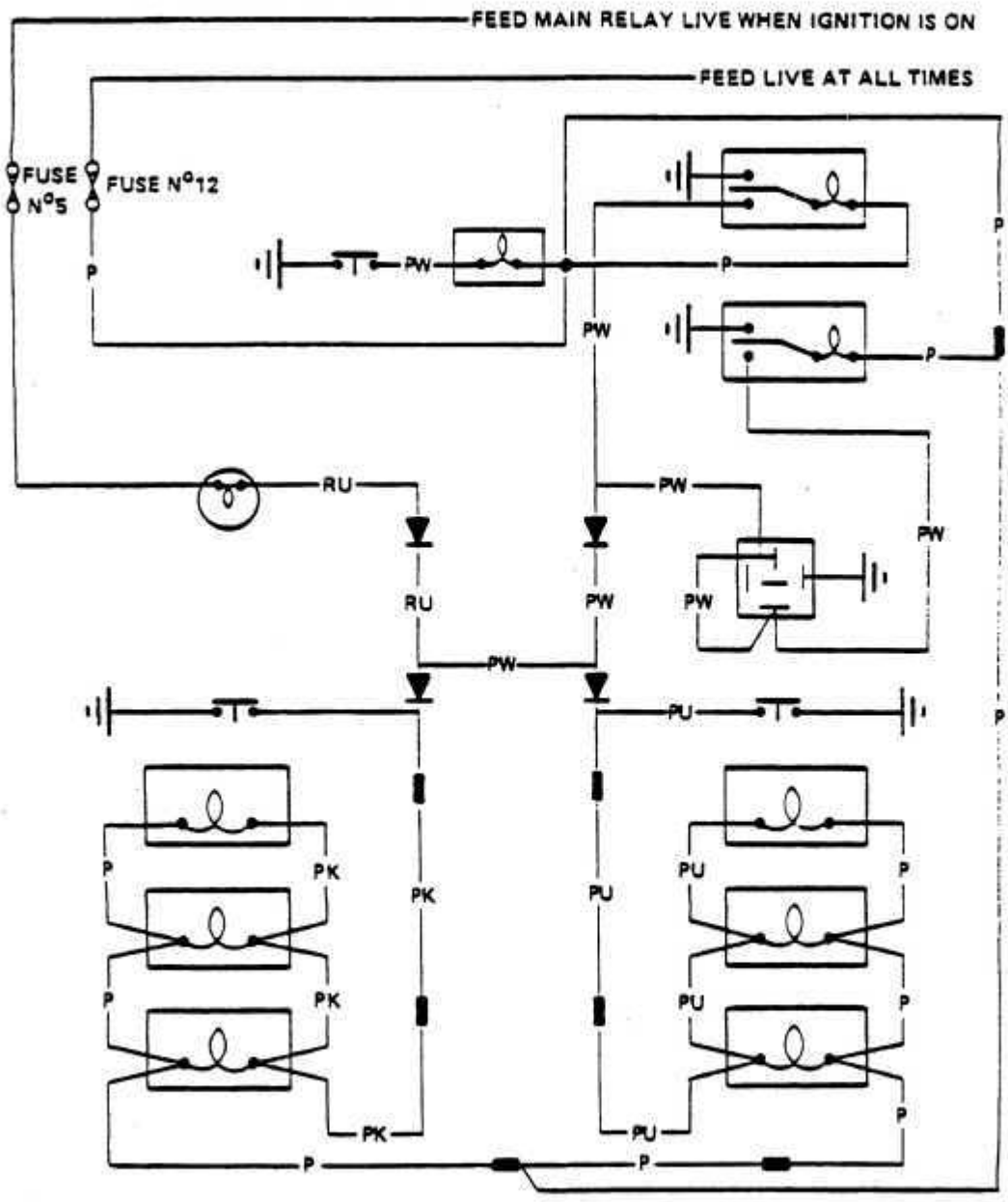
1 COOLING FANS.
2 FAN FAIL MODULE.
3 FAN FAIL TELLTALE.
4 THERMAL TRIP.
5 FAN RELAY.
6 DIODE.
7 OTTERSTAT.
8 A.C. DIODE.

HEADLAMP CIRCUIT



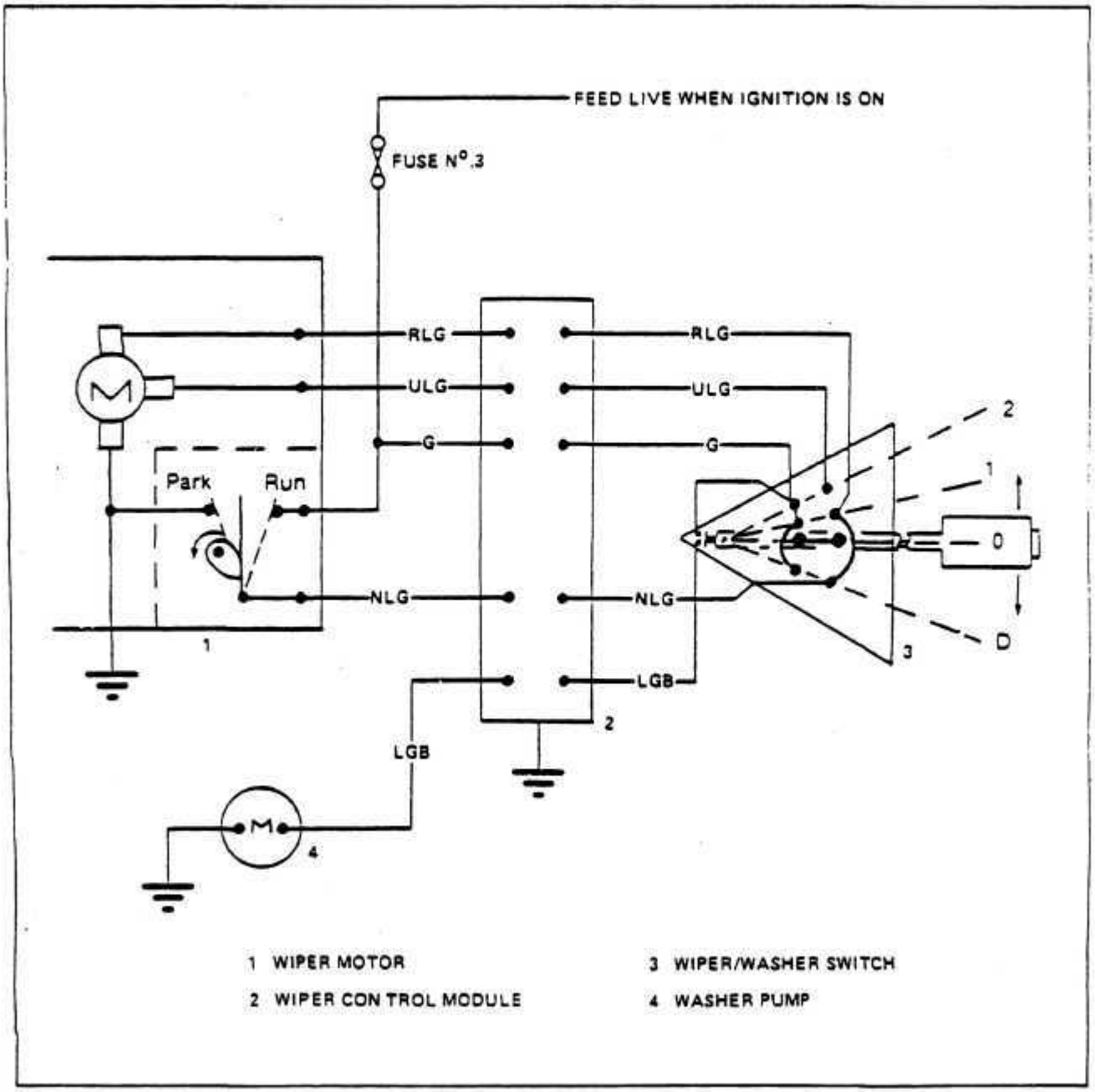
1 MAIN/DIP BEAM HEADLIGHTS
2 MAIN BEAM HEADLIGHTS
3 DIP BEAM RELAY
4 MAIN BEAM RELAY
5 LIGHTING SWITCH
6 DIP SWITCH
7 MAIN & DIP BEAM INDICATOR LIGHTS

DOOR AND INTERIOR LIGHT CIRCUIT



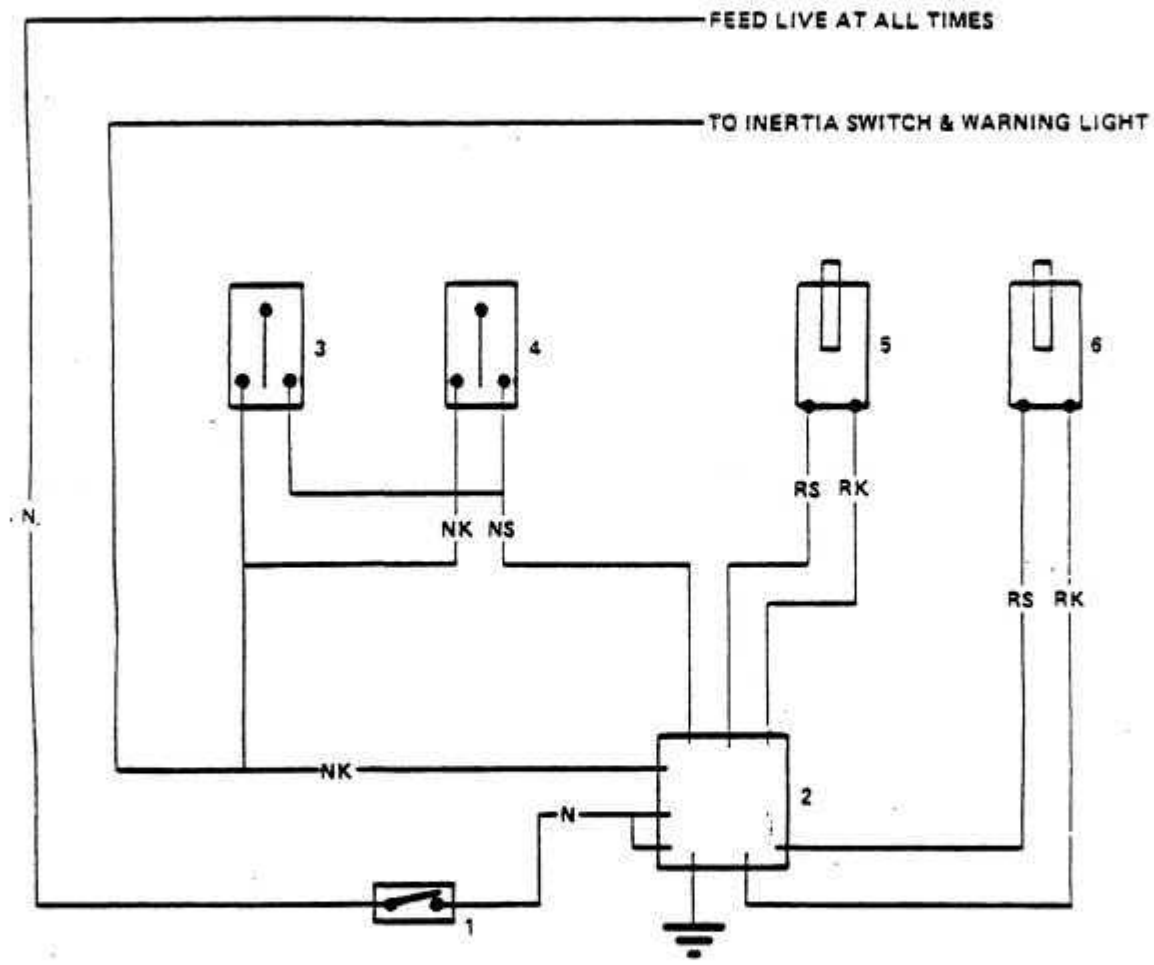
1 RH DOOR LIGHTS
2 LH DOOR LIGHTS
3 DOOR SWITCH DIODE
4 INTERIOR LIGHTS
5 INTERIOR LIGHT DIODE
6 DIODE
7 WARNING LIGHT
8 DELAY UNIT
9 LH DOOR SWITCH
10 RH DOOR SWITCH

WINDSCREEN WIPER AND WASHER CIRCUIT



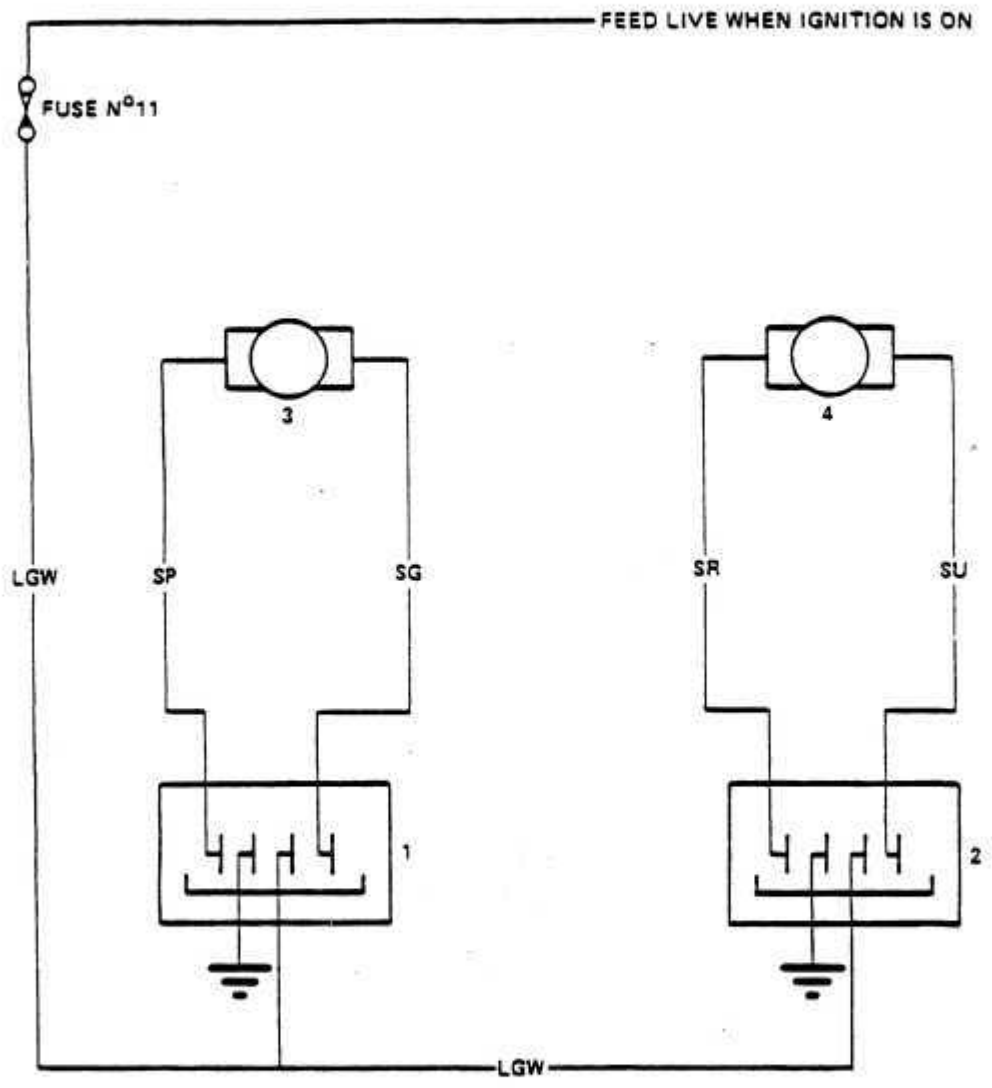
1 WIPER MOTOR
2 WIPER CON TROL MODULE
3 WIPER/WASHER SWITCH
4 WASHER PUMP

DOOR LOCK CIRCUIT



1 THERMAL TRIP
2 RELAY
3 LH SWITCH
4 RH SWITCH
5 LH SOLENOID
6 RH SOLENOID

POWER WINDOW CIRCUIT



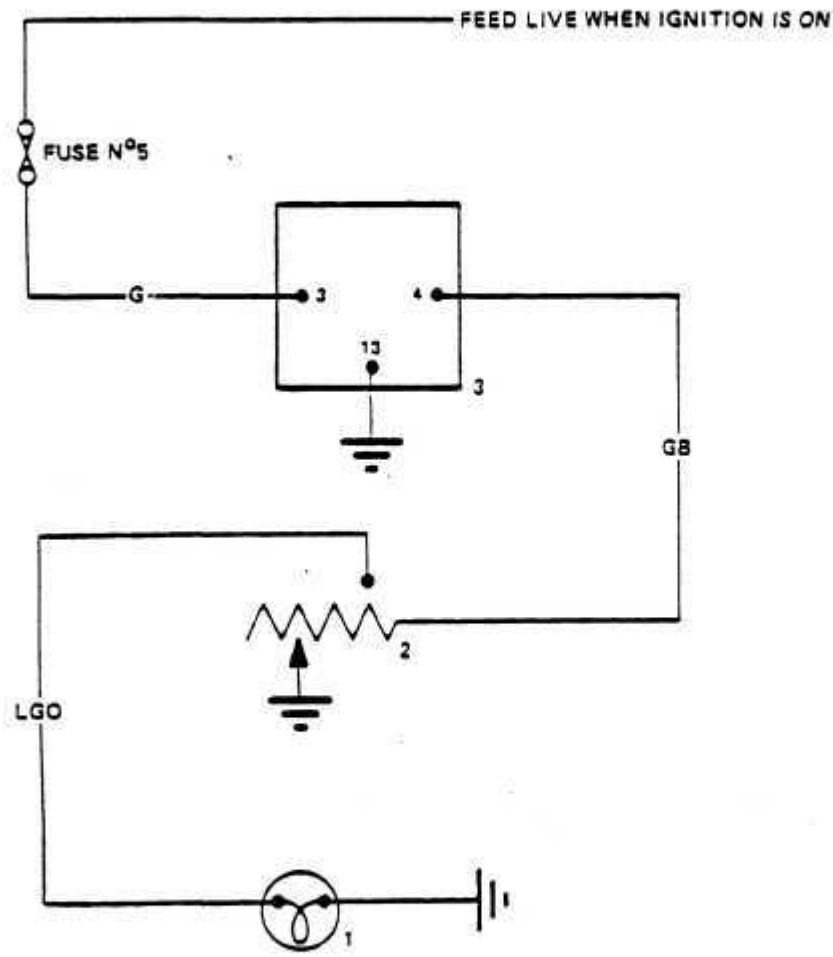
1 LH WINDOW SWITCH

2 RH WINDOW SWITCH

3 LH MOTOR

4 RH MOTOR

FUEL GAUGE CIRCUIT

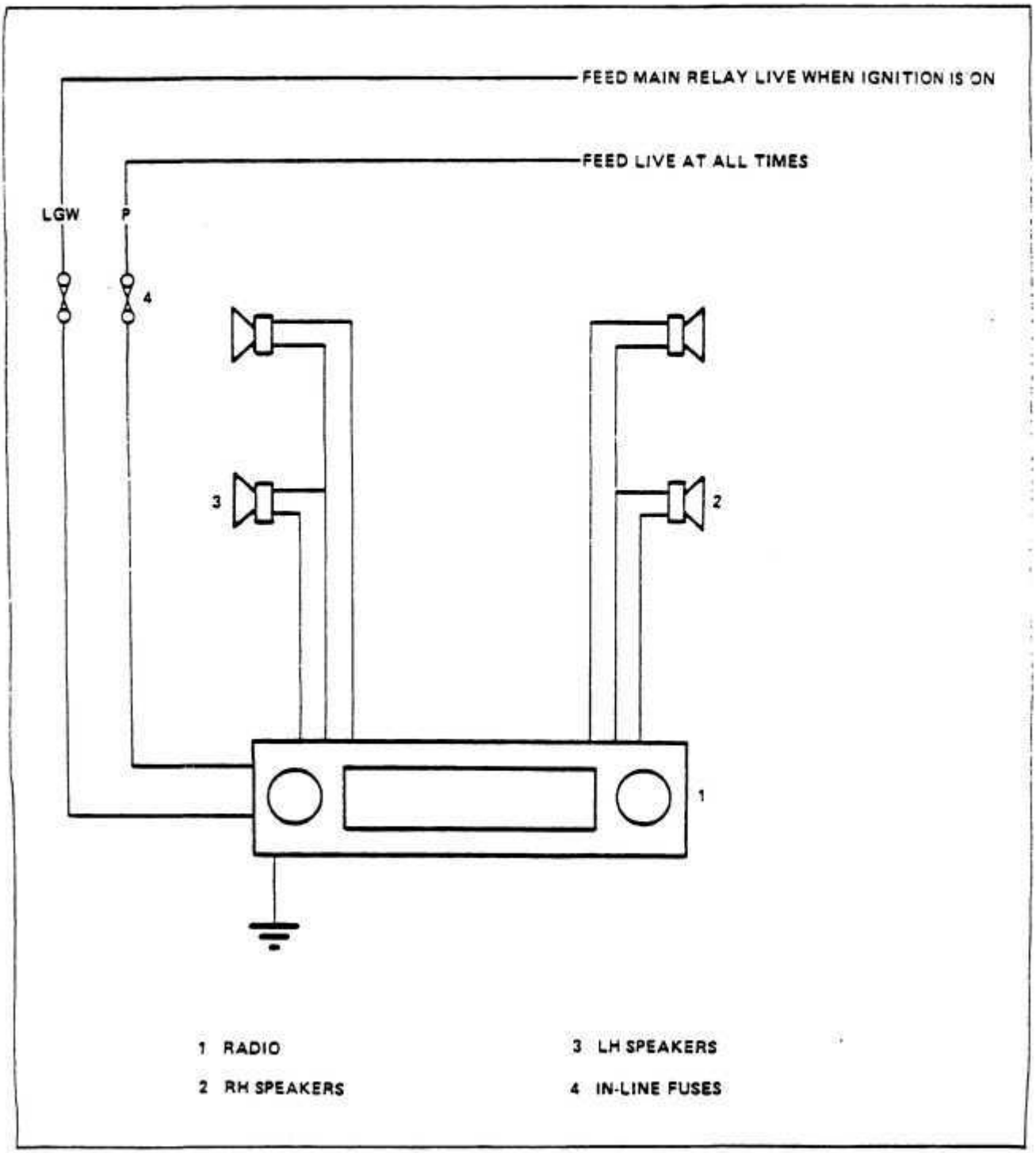


1 WARNING LIGHT

2 TANK SENDER UNIT

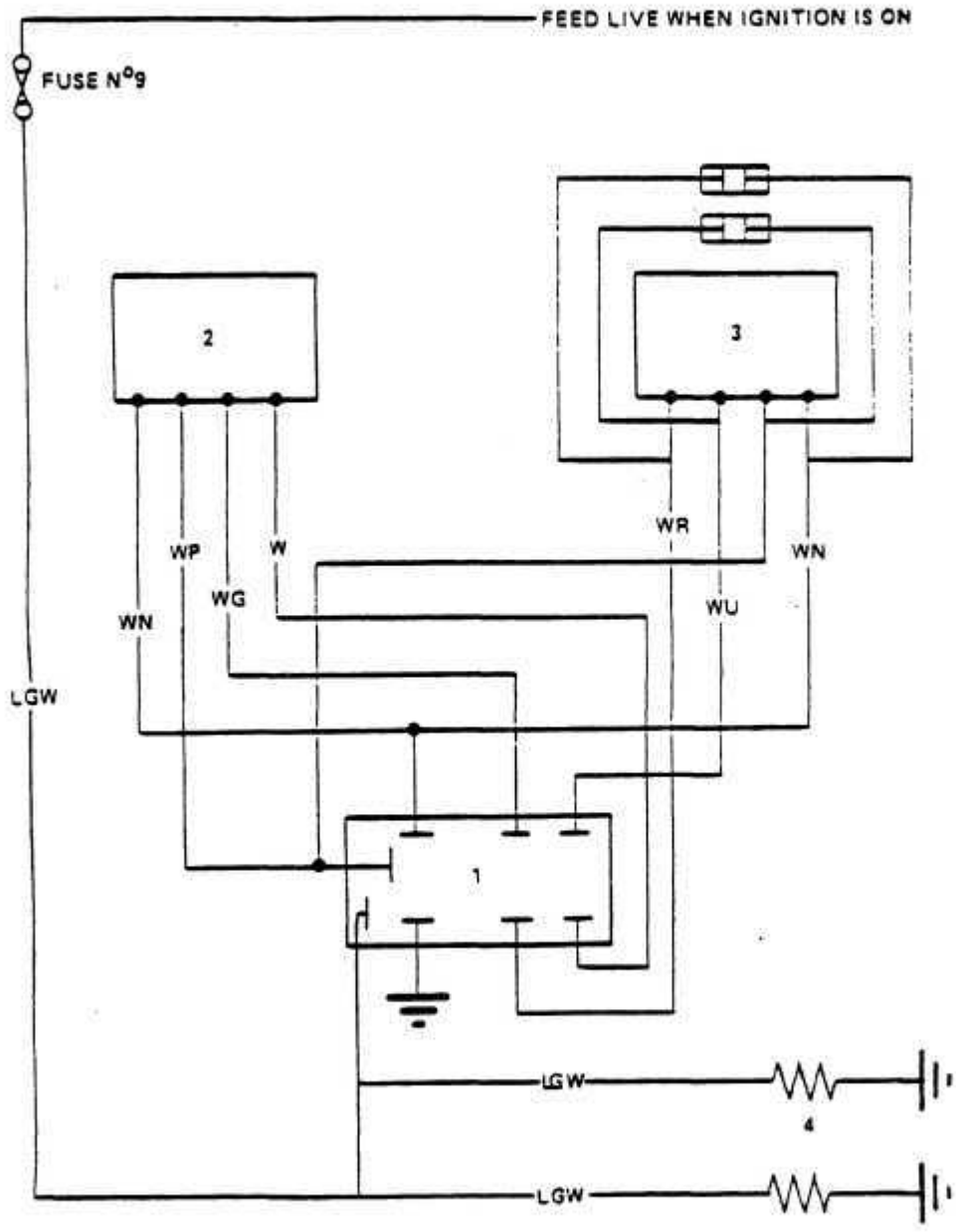
3 FUEL GAUGE

RADIO CIRCUIT



1 RADIO
2 RH SPEAKERS
3 LH SPEAKERS
4 IN-LINE FUSES

DOOR MIRROR CIRCUIT



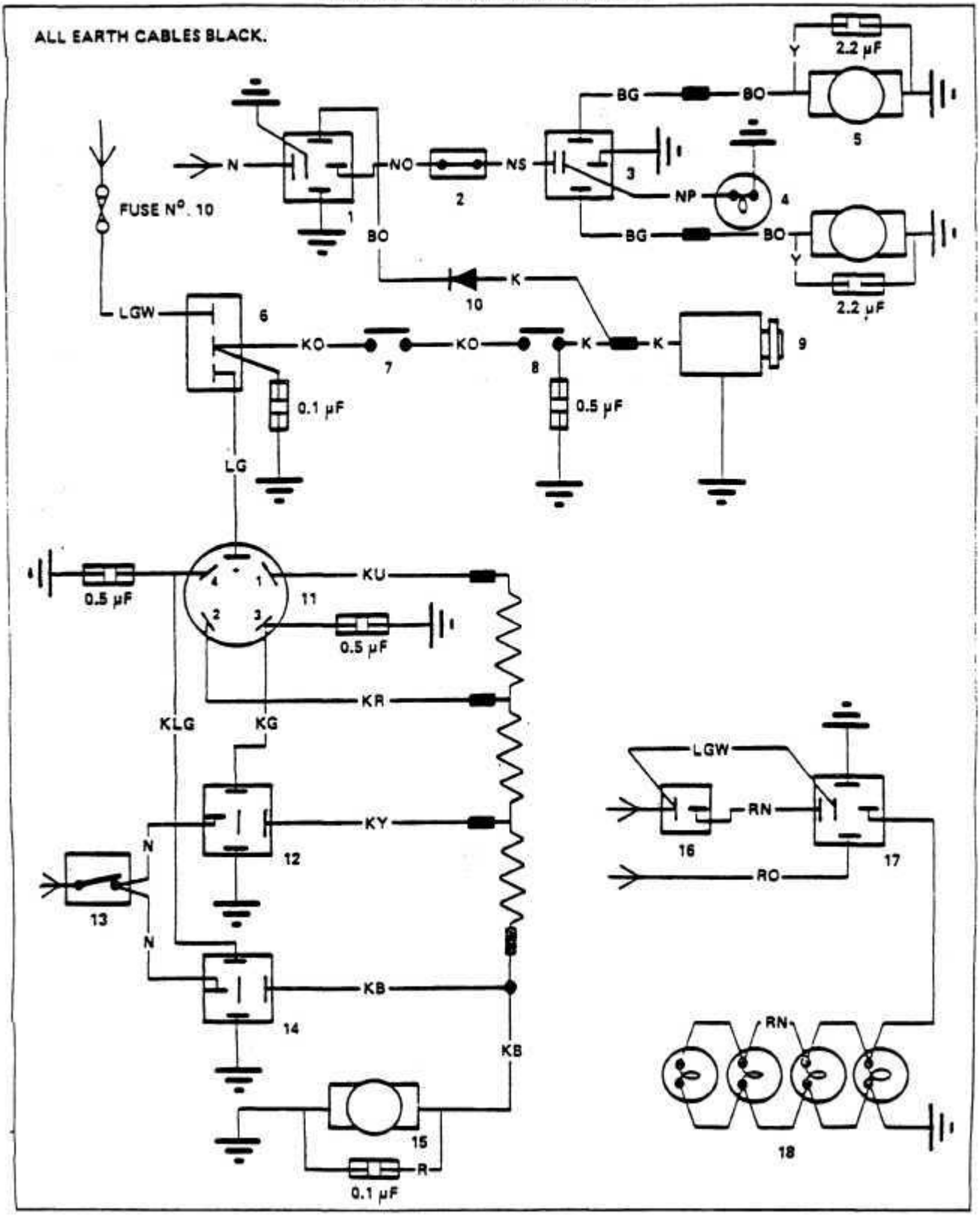
1 MIRROR SWITCH

2 LH MIRROR

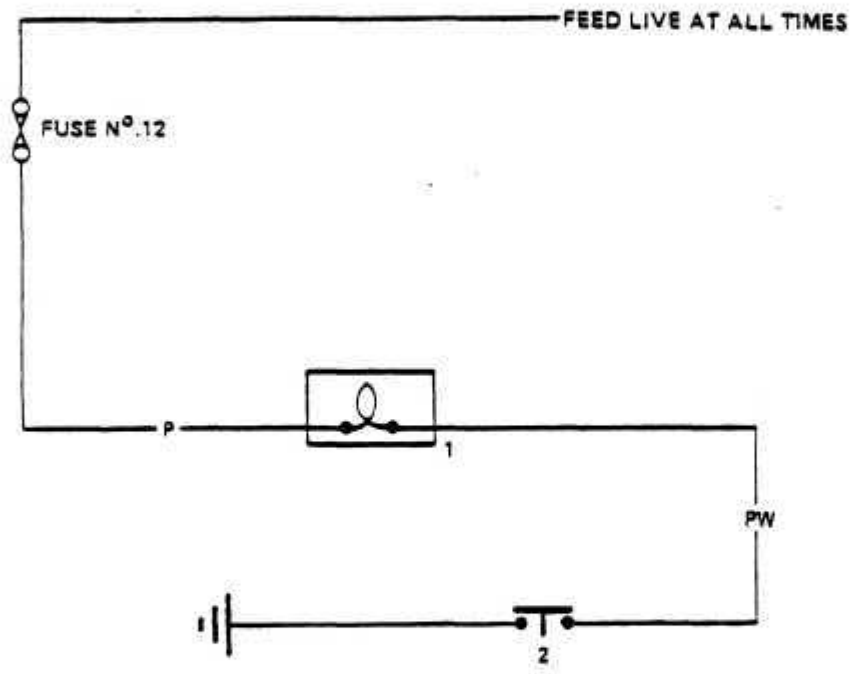
3 RH MIRROR

4 MIRROR HEATER (IF FITTED)

AIR CONDITIONING CIRCUIT



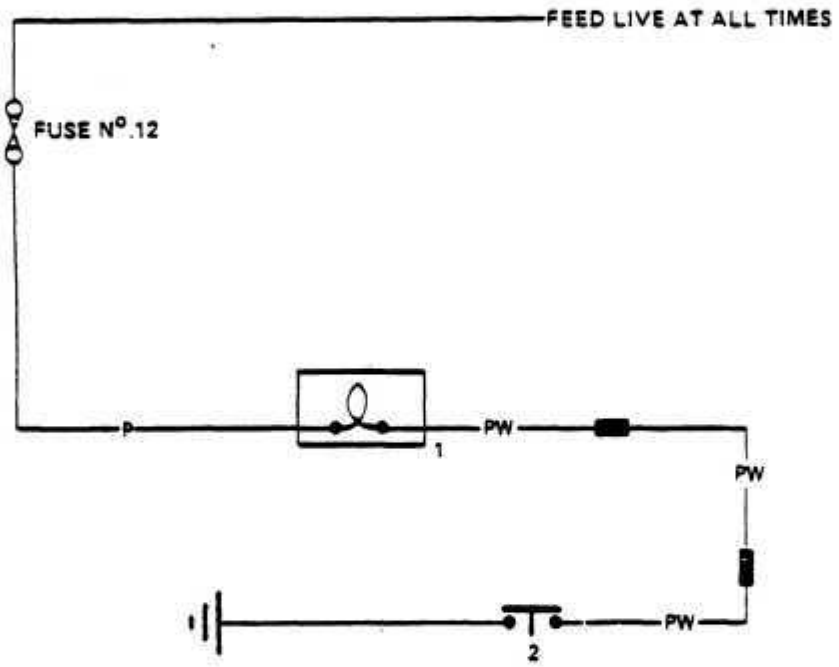
TRUNK LIGHT CIRCUIT



1 TRUNK LIGHT

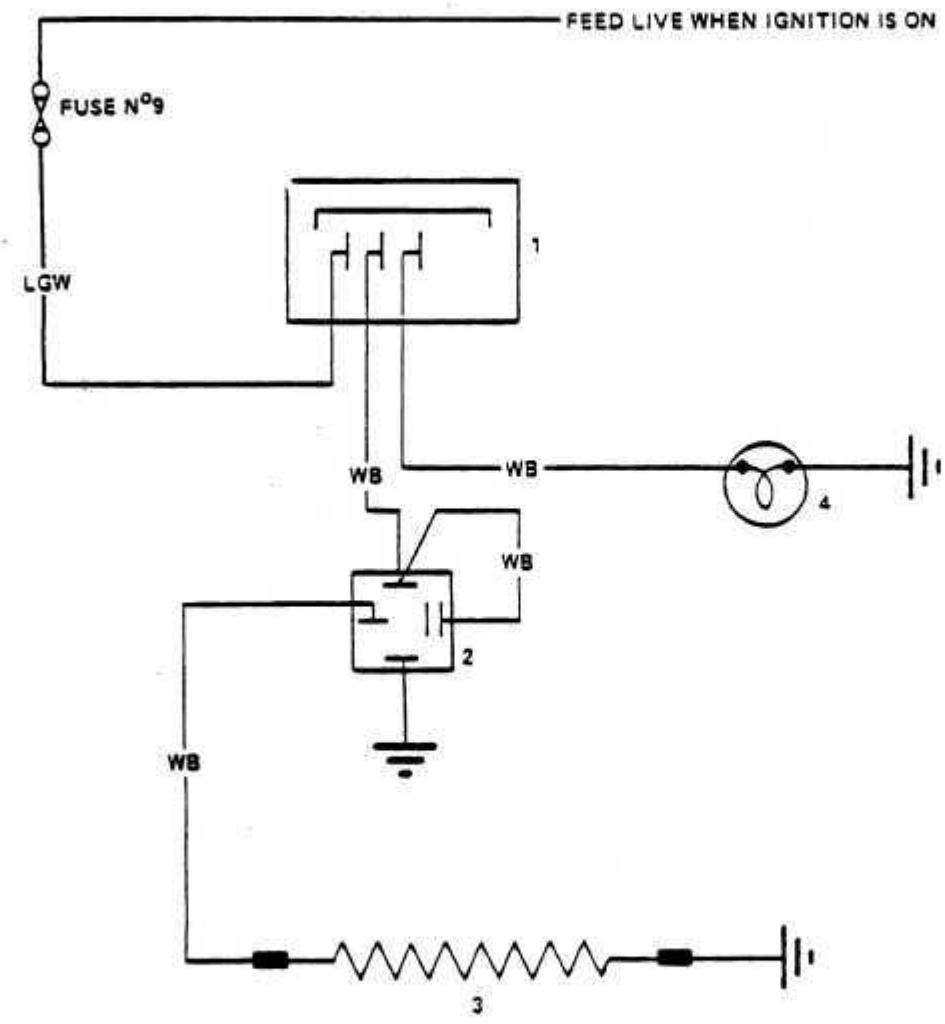
2 SWITCH

ENGINE COMPARTMENT LIGHT CIRCUIT



1 ENGINE COMPARTMENT LIGHT 2 SWITCH

HEATED REAR SCREEN CIRCUIT



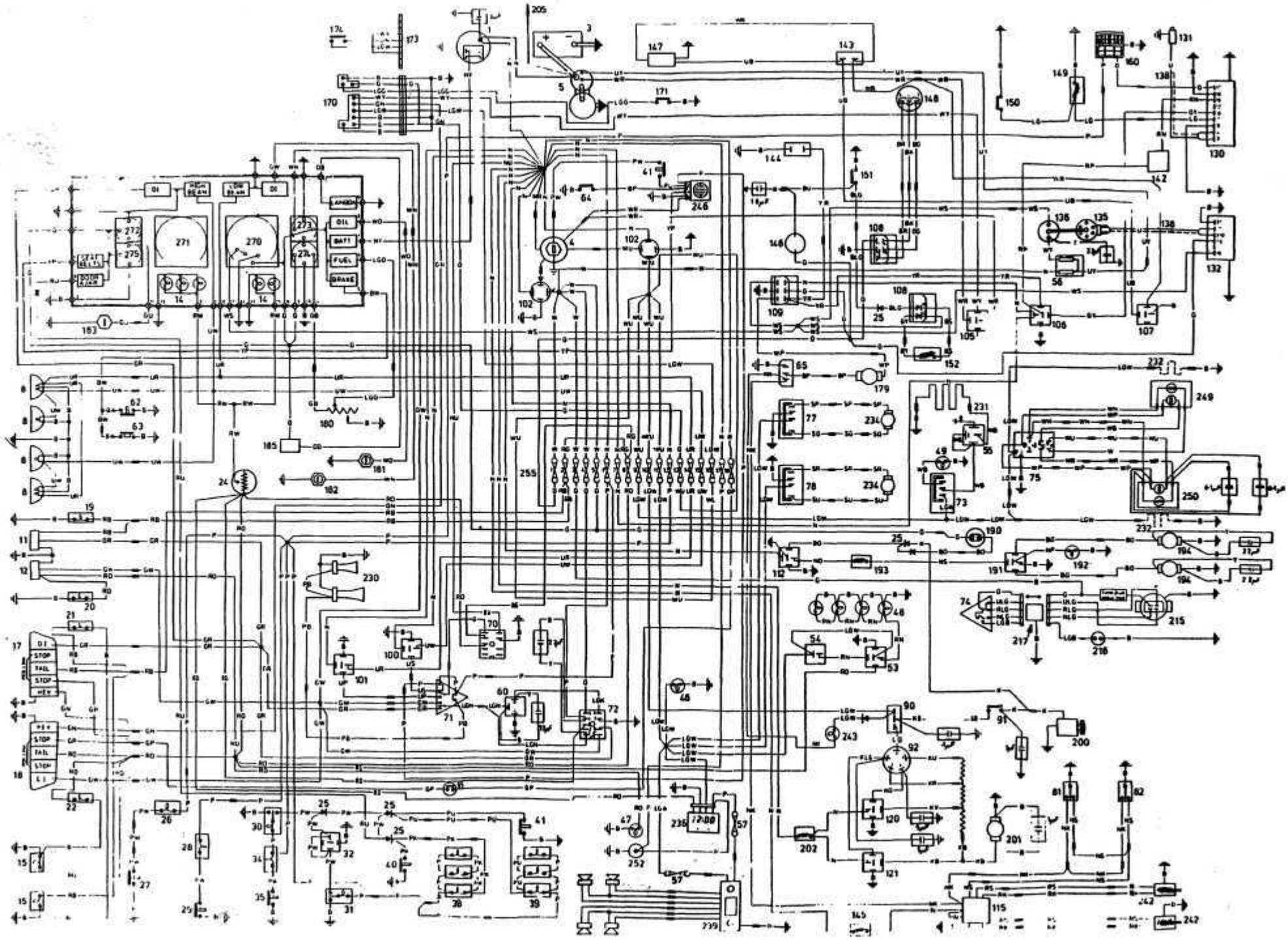
1 H.R.W SWITCH

2 RELAY

3 HEATED REAR SCREEN

4 INDICATOR LIGHT

MAIN WIRING CIRCUIT



Heating and Air Conditioning

CONTENTS

GENERAL DESCRIPTION

Very comprehensive heating and air conditioning is fitted on this vehicle. It is a dual function system which provides both heating and cooling.

The air conditioning system is of the cycling clutch orifice tube type. This uses a pressure sensing switch to prevent evaporative freeze up by cycling the compressor 'on' and 'off'.

Heating is controlled by the amount of air flow through the heater core and this flow is controlled by the temperature control knob.

Humidity, cleanliness and direction of air-flow are all controllable through a system of vacuum operated controls.

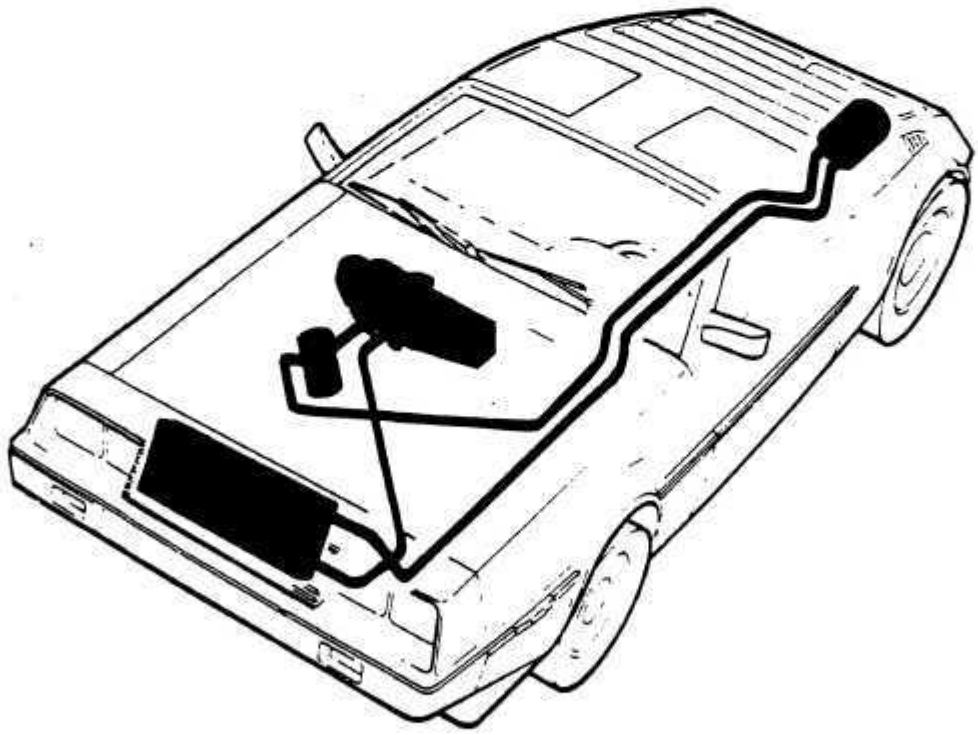


Fig. 1

Heating and Air Conditioning

The layout of the heater/air conditioning unit is shown in the diagram which is viewed from the top as fitted in the car. *Fig. 1*

Air is drawn by the fan either through the fresh air intake located just ahead of the windshield, or from the interior of the car dependent on the position of the re-circulation flap. Air is then blown by the fan through the air conditioning evaporator to the temperature flap, the position of which controls the proportion of air directed through the heater matrix.

Two mode flaps mounted on a common spindle then direct air to either the footwell/screen chamber, or to the door/face level vent chamber (or both). The footwell/screen chamber is incorporated in the L.H. end of the unit, and contains a horizontally pivoted flap which directs air either upwards to the screen vents, or downwards to the footwell vents. The door/face level vent chamber comprises of a separate moulding fixed to the rear of the unit and contains a horizontally pivoted flap which either shuts off the face level vents, or closes a bridging duct connecting with the screen vent. *Fig. 2*

All flaps with the exception of the temperature flap are vacuum operated via diaphragm activators. The temperature flap is cable operated, direct from the temperature control knob.

The heater/air conditioning selector switch has two functions. One is to supply a vacuum to the correct flap activator(s) whilst the other is to supply an electric current to the compressor of booster fan.

The vacuum distribution part of the control switch consists of a spring loaded rubber labyrinth which is rotated across five parts, connected by rubber pipes to flaps in the heater/air conditioning unit. Vacuum is supplied from the engine inlet manifold, and stored in a reservoir located in the left hand rear pontoon. A non-return valve in the supply line to the reservoir ensures that a vacuum is maintained when the engine is switched off.

The connection and switching sequence of the selector switch is as follows:

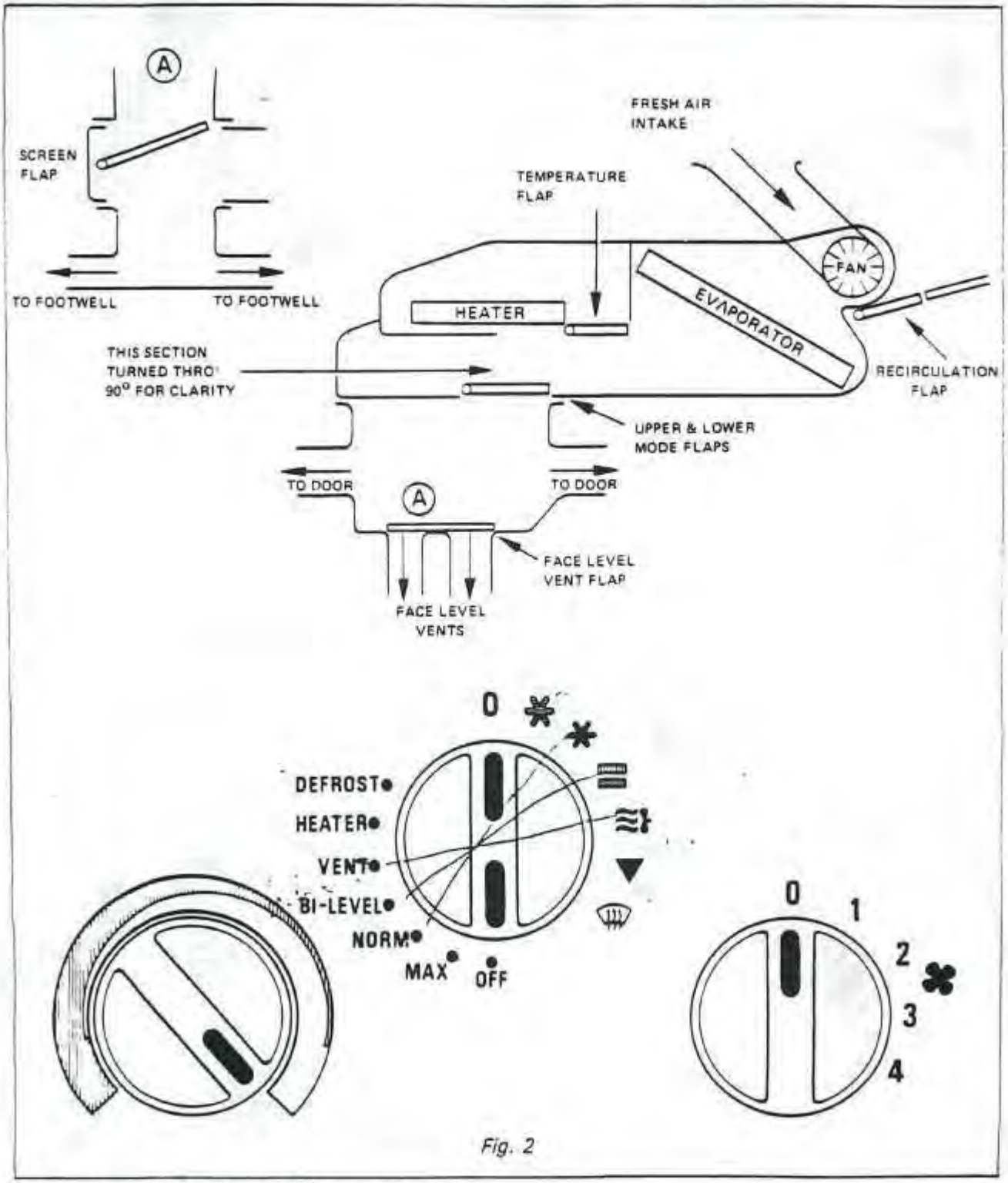


Fig. 2

The temperature control should be turned to cold.
The vacuum supply is sealed off and the switch contacts isolated.
The flaps assume the positions shown, whilst both the compressor and fan speed switch are inoperative.
Ventilation is provided via the footwells and also to the screen and door vents. *Fig. 2*

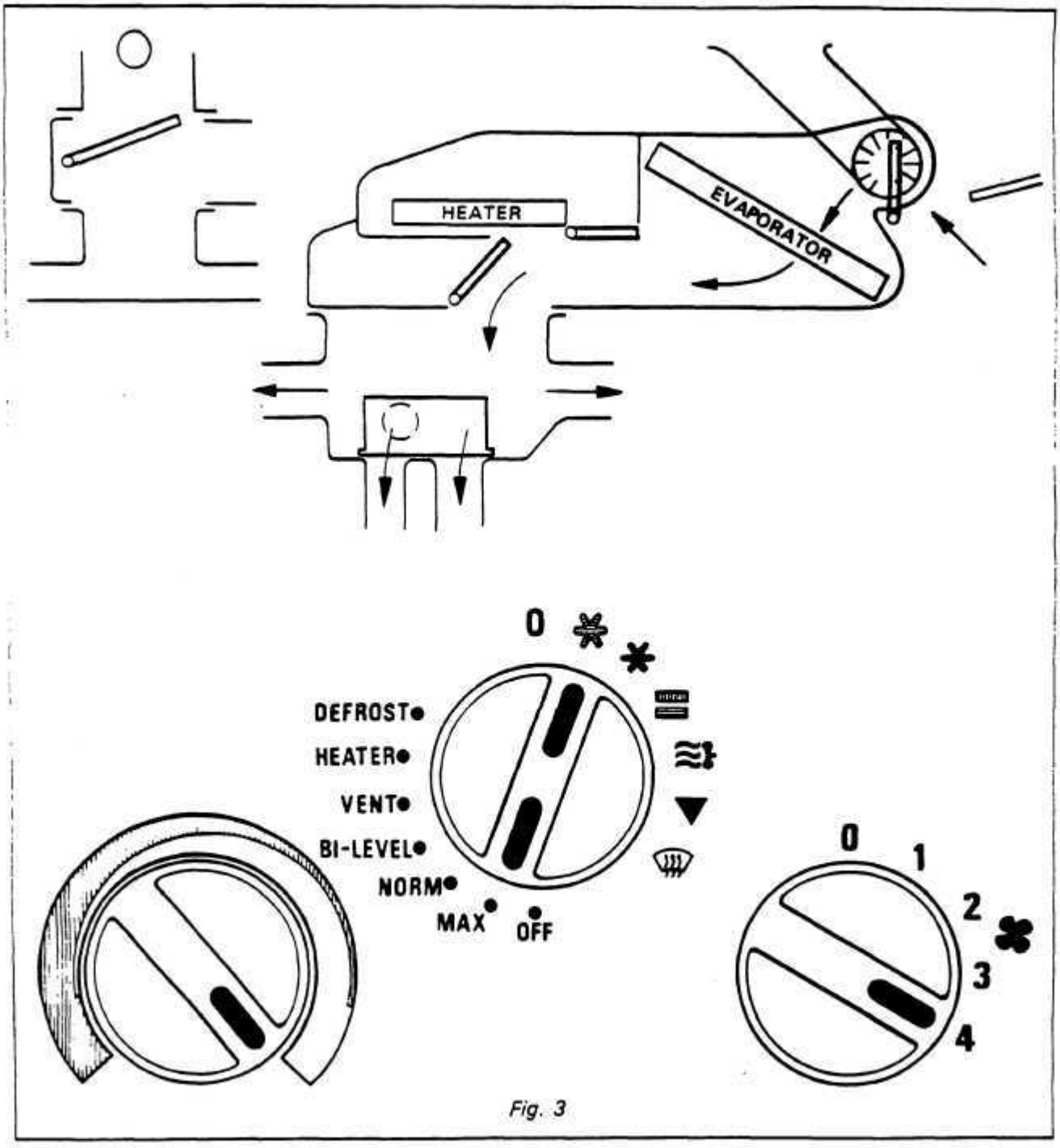


Fig. 3

The temperature control should be turned to full cold, and for maximum cooling fan speed 4 selected. *Fig. 3*
Vacuum is supplied to the re-circulation flap and water valve, lower mode flap, and the upper mode flap and face level vent flap. The compressor and fan speed switch are energised.
Air is drawn by the fan from the interior of the car through the re-circulation vent and in this way is constantly re-circulated through the evaporator, thus rapidly "pulling down" the temperature inside the car. A certain amount of fresh air is however drawn through the fresh air vent in order to prevent stale air within the car. The refrigerated air is supplied to the door vents and face level vents. Note that this is the only setting when the water valve is closed (heater matrix cold).

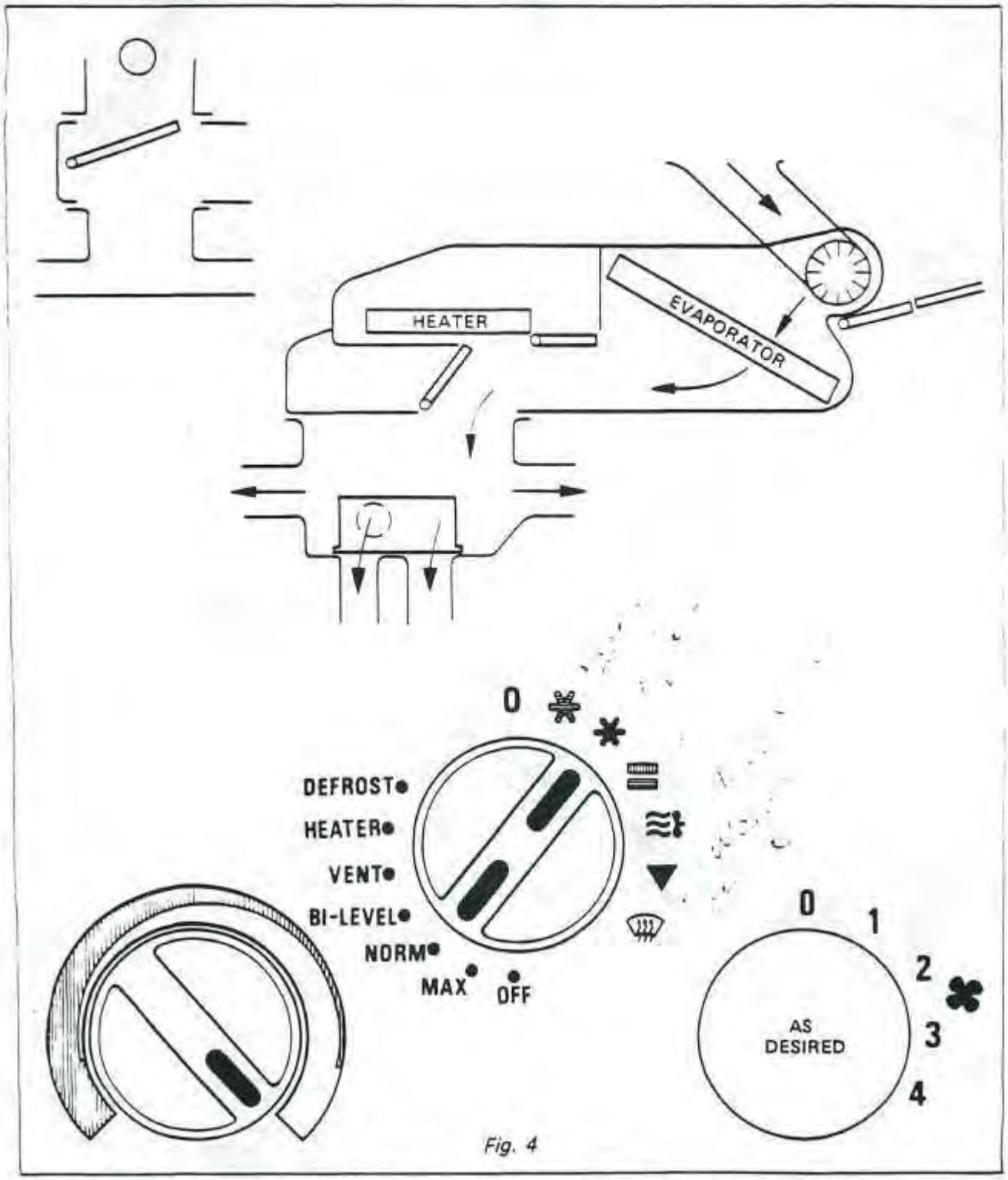


Fig. 4

The temperature control should be returned to full cold.
Vacuum is supplied to the lower mode flap and the upper mode flap and face level vent flap. The compressor and fan speed switch are energised.
Refrigerated fresh air is supplied to the door vents and face level vents. *Fig. 4*

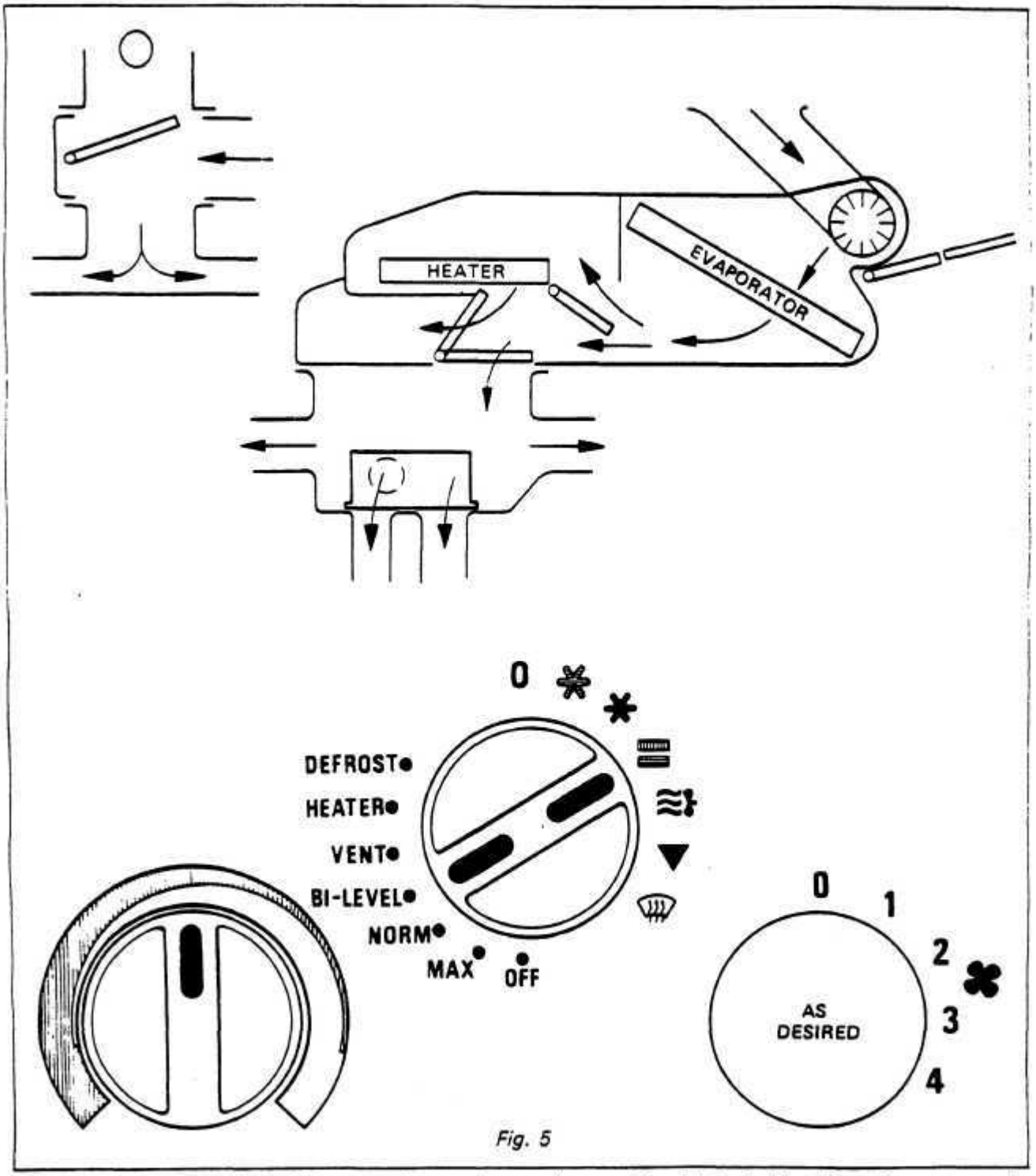
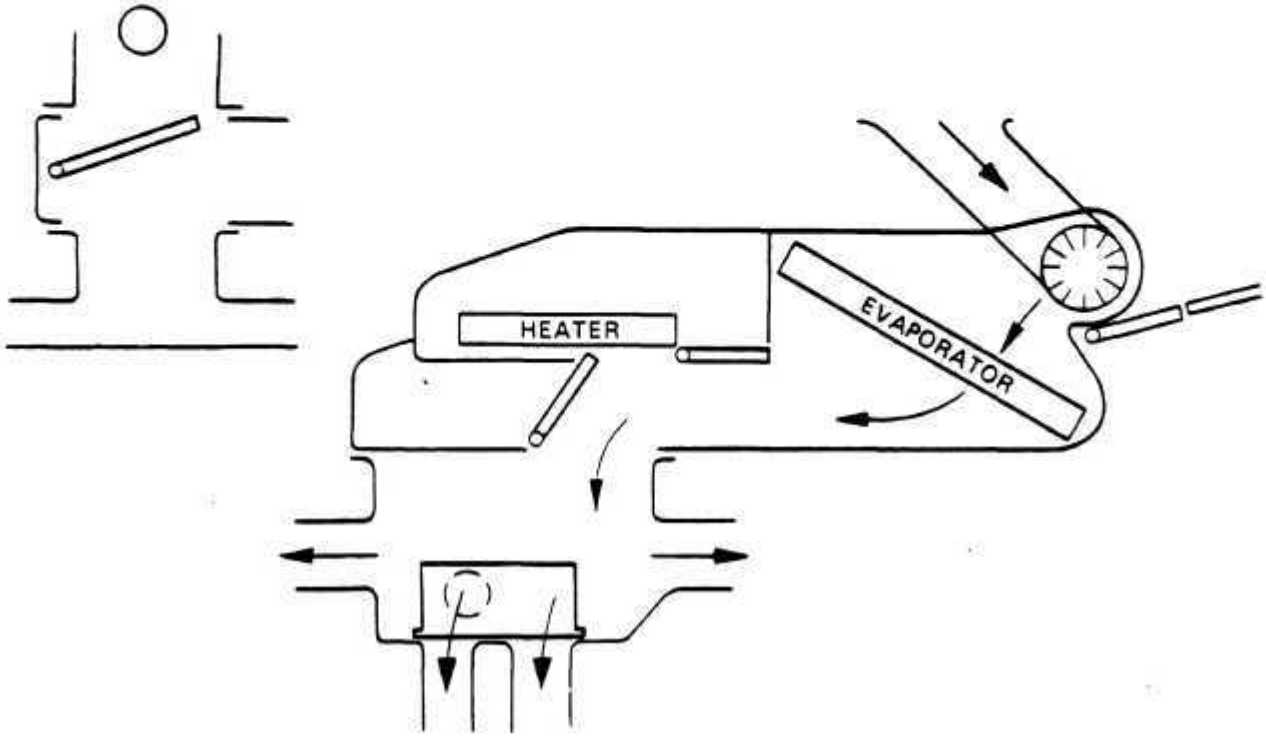


Fig. 5

The temperature control should be turned to an intermediate position. Note that in this setting, vacuum is supplied only to the **upper** mode flap and face level vent. In this way, refrigerated fresh air is supplied predominantly to the door vents and face level vents, whilst de-humidified warmer air is supplied predominantly to the footwells, with a small bleed off to the screen vent. Adjustment of the temperature control varies the temperature accordingly. *Fig. 5*
The compressor and fan speed switch are energised.



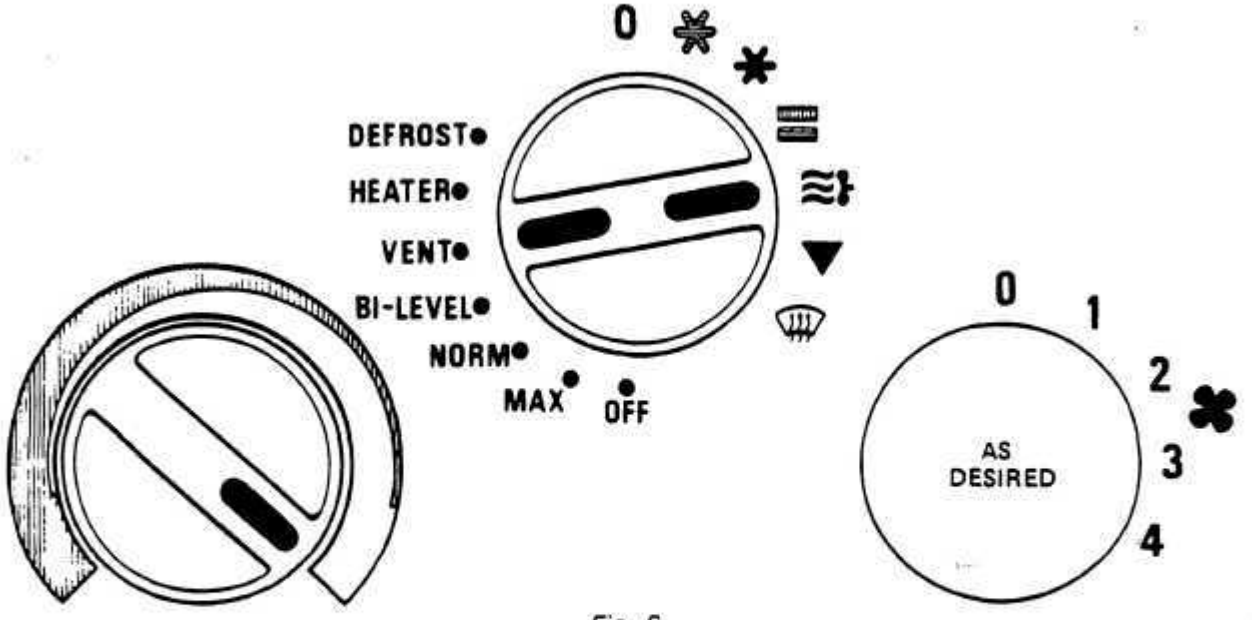


Fig. 6

The temperature control should be turned to full cold.
Vacuum is supplied to the lower mode flap, and also the upper mode flap and face level vent.
The compressor is switched off, with only the fan speed switch being energised.
Fresh air at ambient temperature is supplied to the door vents and face level vents. *Fig. 6*

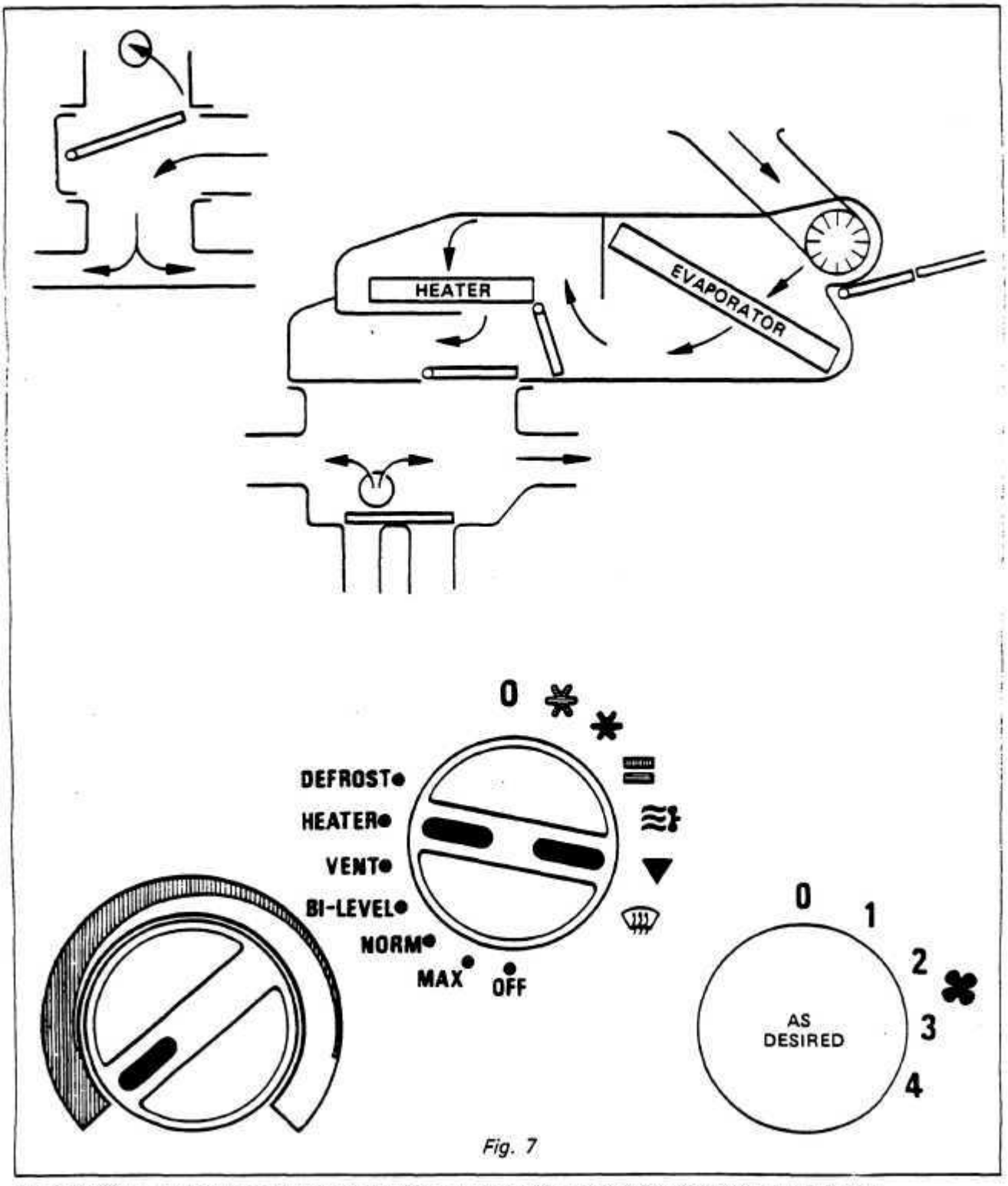


Fig. 7

In this position, the vacuum supply is sealed off and current is supplied only to the fan speed switch.
As the temperature control is turned towards the maximum setting, the temperature flap directs an increasing proportion of air through the heater matrix which then flows to the footwells, with a small bleed off to the screen and (via the bridging duct) to the door vents. *Fig. 7*

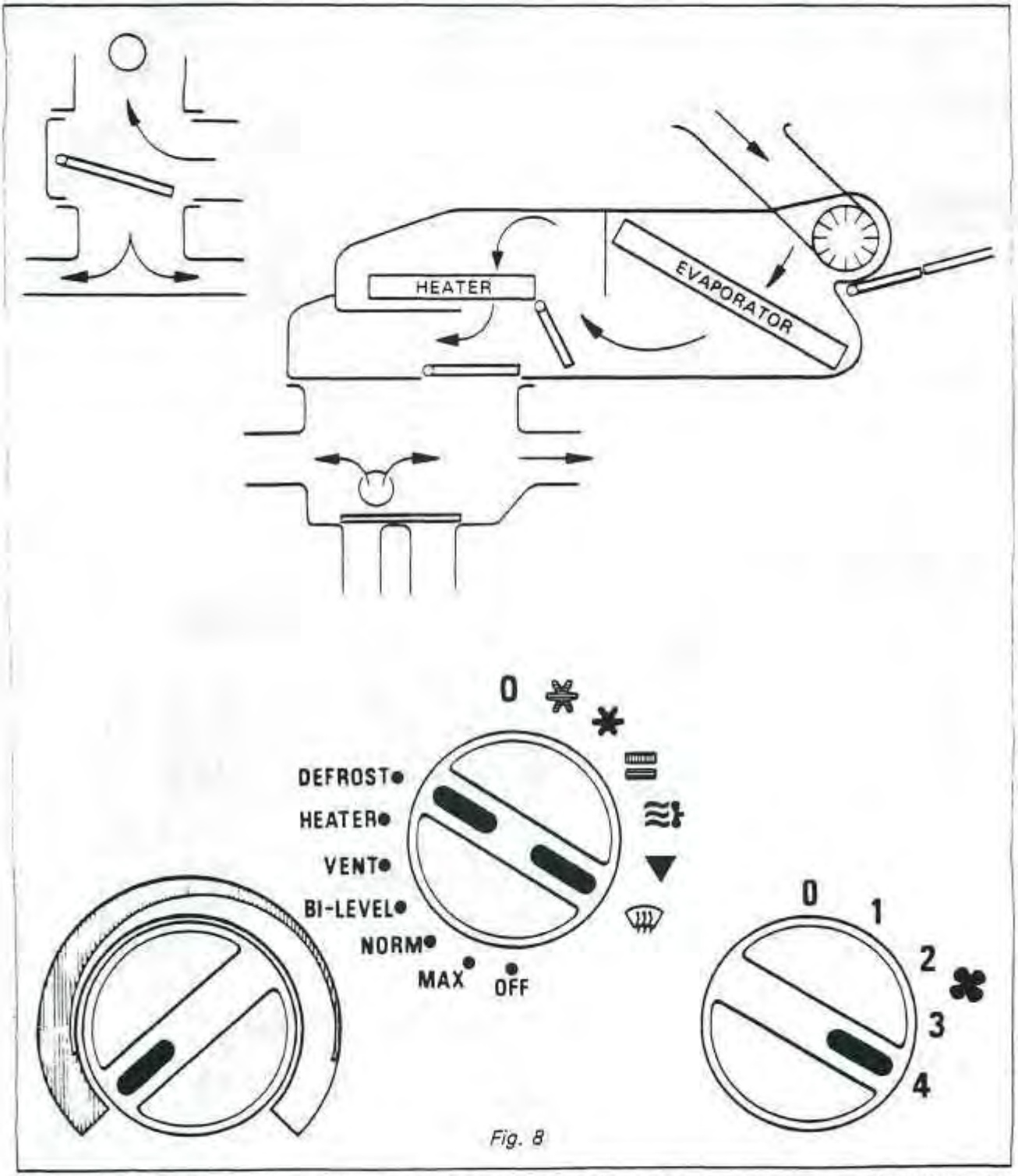


Fig. 8

For maximum windshield defrost performance, the temperature control should be turned to maximum heat, the fan to speed 4, and the door vents closed off at each door.
Vacuum is supplied only to the screen flap, and the current to the fan speed switch.
Heated air is supplied to the screen vent with a small bleed off to the footwells and, via the bridging duct, to the door vents. *Fig. 8*

SPECIAL TOOLS

FACTORY APPROVED TOOLS FOR AUTOMOTIVE AIR CONDITIONING

DE LOREAN AIR CONDITIONING KIT

DESCRIPTION	PART NO.
2200 gram station with 3 c.f.m. pump and Thermistor Vacuum Gauge	95301 *Fig. 9*
Leak Detector	14950 *Fig. 10*
Core Removers (2 required)	14650 *Fig. 11*
Thermometers (2 required)	40859 *Fig. 12*
Compressor Clutch Kit	10735 *Fig. 13*
23 Int. Snap Ring Pliers	14163 *Fig. 14*
24 Ext. Snap Ring Pliers	14164 *Fig. 15*
Orifice Tube Remover	10960 *Fig. 16*
Broken Orifice Tube Remover	10962 *Fig. 17*
Safety Goggles	12008 *Fig. 18*

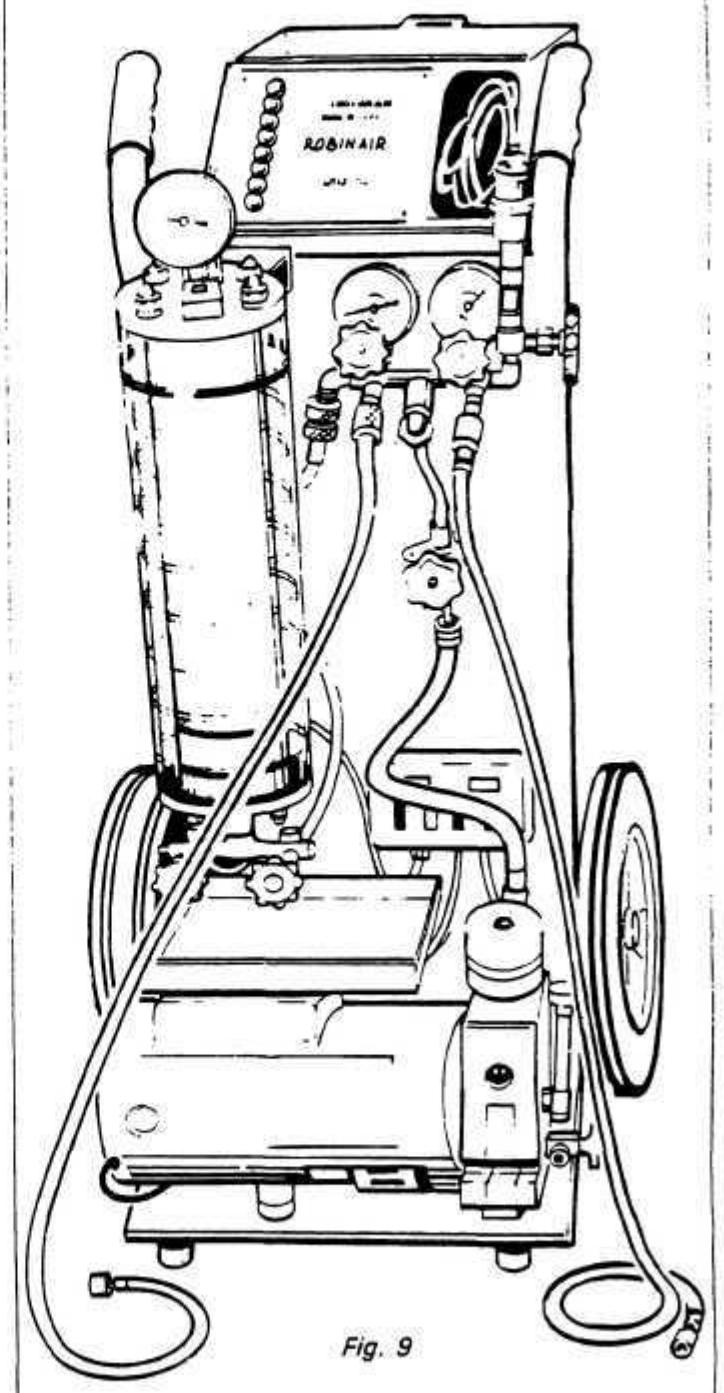


Fig. 9

95301 SERVICE STATION

14950
LEAK DETECTOR

Fig. 10

10960 ORIFICE TUBE REMOVER

Fig. 16

10962 BROKEN ORIFICE TUBE REMOVER

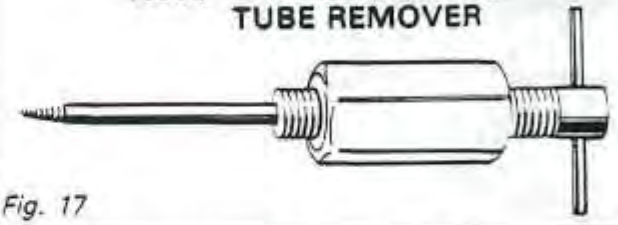


Fig. 17

14650 CORE REMOVERS

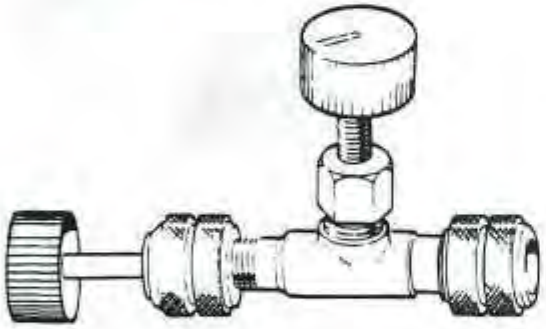
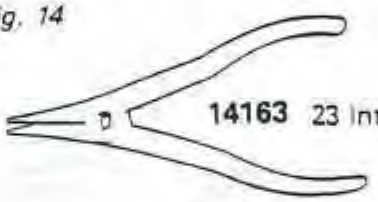


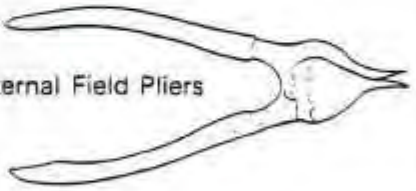
Fig. 11

SNAP RING PLIERS

Fig. 14



14163 23 Internal Field Pliers



14164 24 External Field Pliers

Fig. 15

40859 THERMOMETERS

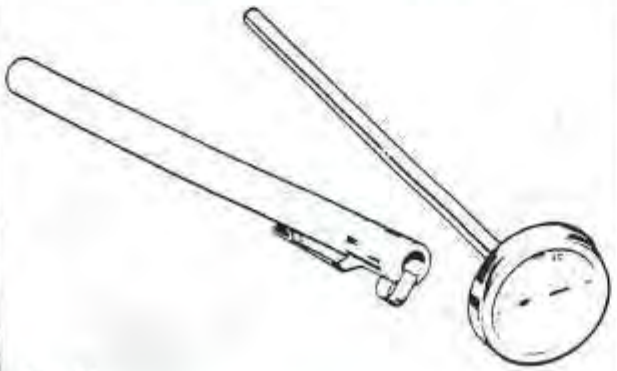
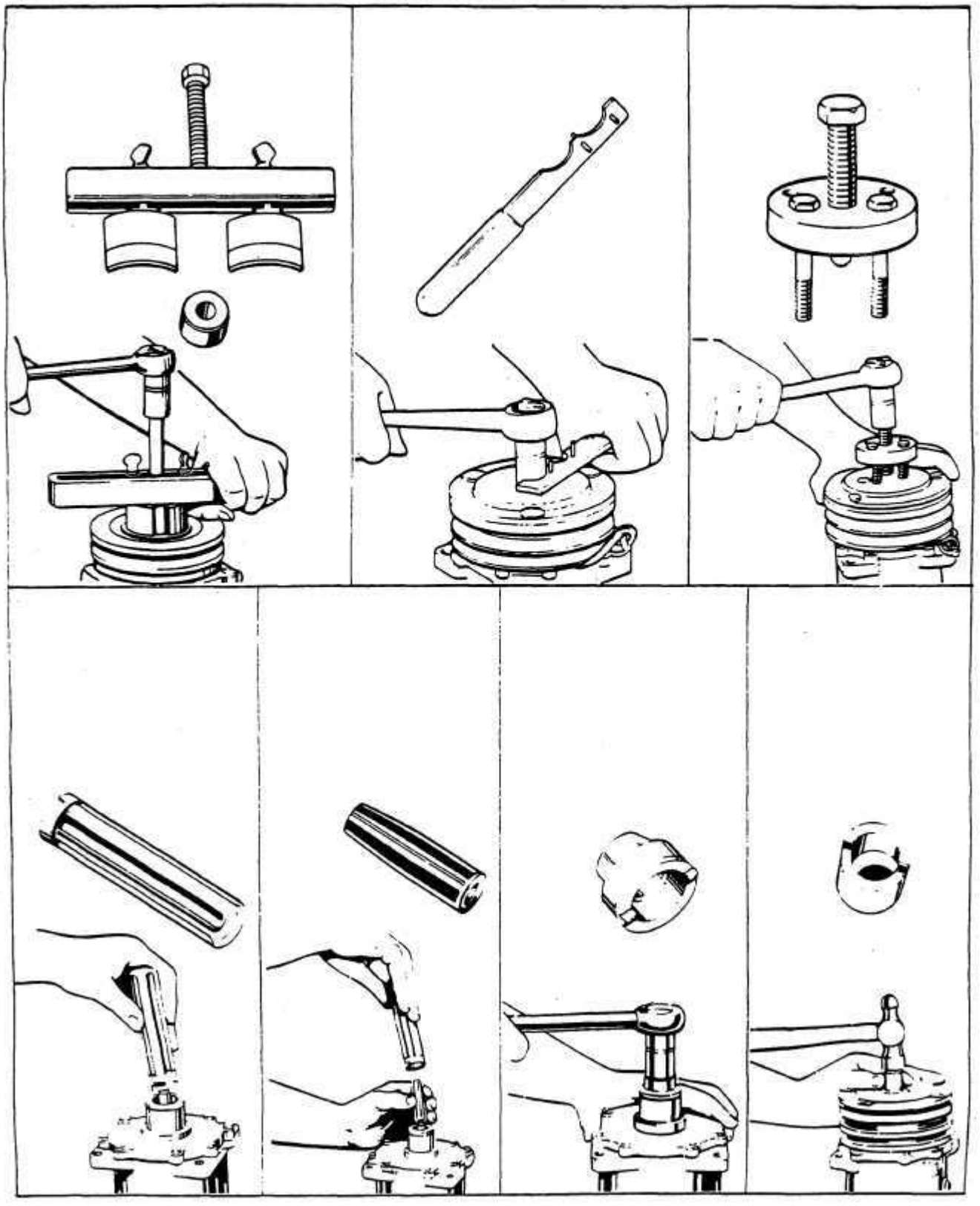


Fig. 12

12008 SAFETY GOGGLES

Fig. 18

Fig. 13 **10735 COMPRESSOR CLUTCH KIT**



MAJOR COMPONENTS

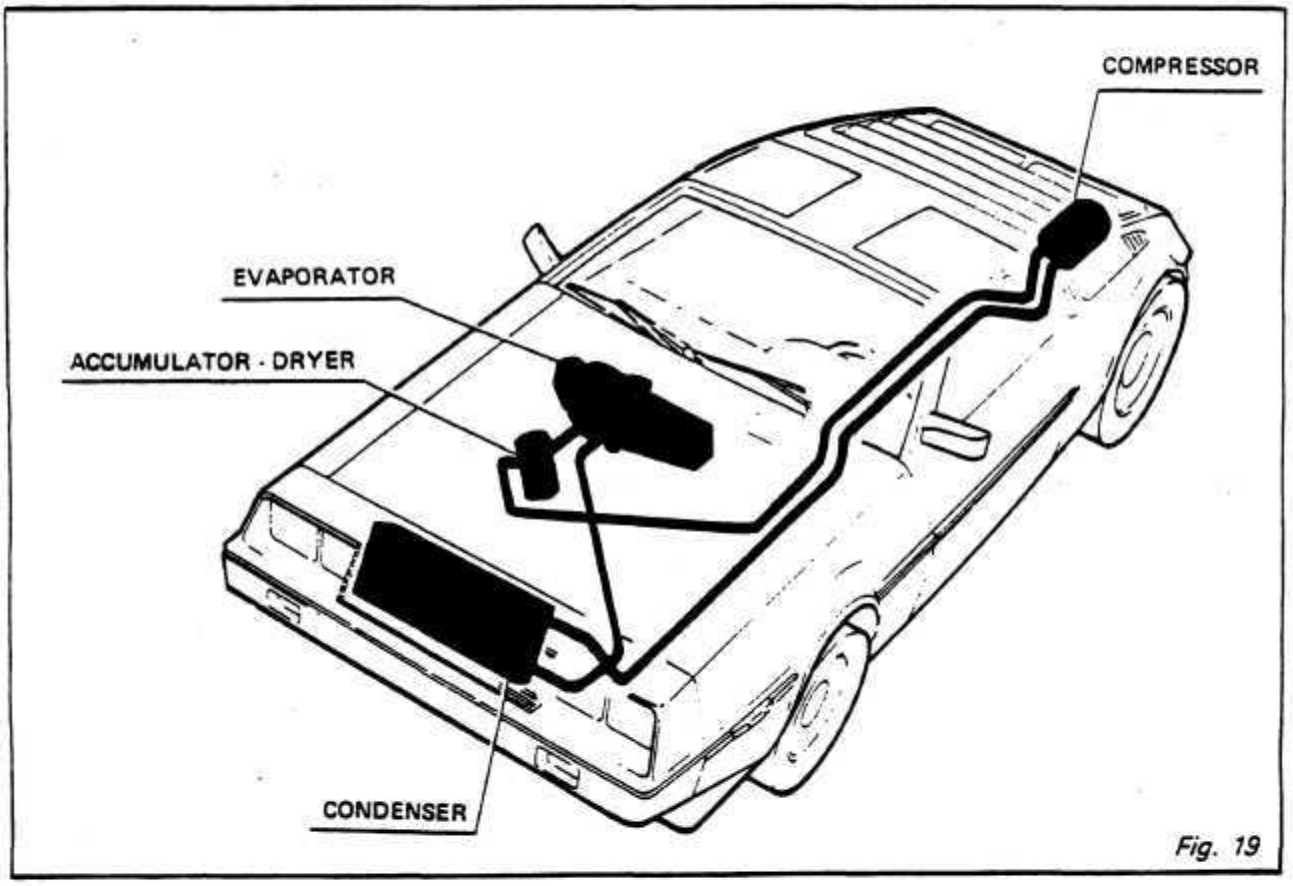


Fig. 19

COMPONENT DESCRIPTION

Compressor — Fig. 20

The compressor is belt driven by the crankshaft through a clutch pulley. When operating, the compressor pumps refrigerant vapor as required. The vapor is compressed, by the compressor, increasing its pressure and temperature.

Compressor Clutch and Pulley

The compressor clutch and pulley transmits power from the auto engine crankshaft, through belts, to the compressor. The electro-magnetic clutch provides a means of turning the compressor on or off by a simple switch built into the dash controls or by a cycling switch which senses cooling conditions at the evaporator.

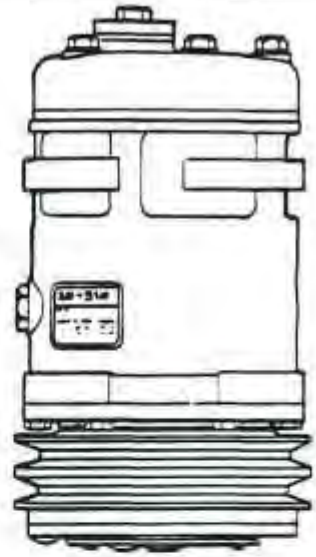


Fig. 20

Orifice Tube Assembly — Fig. 21

This assembly, which replaces the thermostatic expansion valve, meters the liquid refrigerant from the condenser to the evaporator. It is dependent on pressure differential and subcooling. When both the head pressure and subcooling increase at the same time, the orifice flow rate will increase. Suction pressure will have little or no effect on this flow rate.

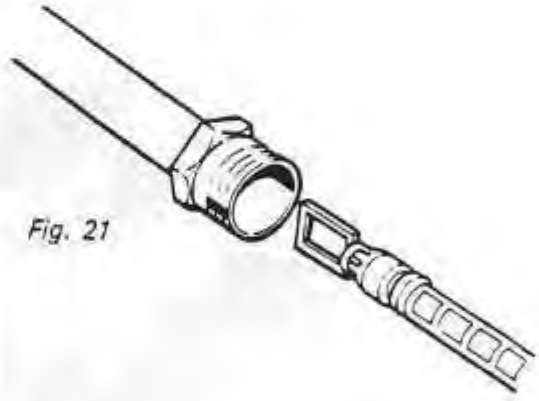


Fig. 21

High Pressure Switch and Safety Valve — Fig. 22

These are fitted adjacent to the accumulator and are designed to switch off the air conditioning system before the pressure within the system reaches a dangerous level due to a fault on the system.

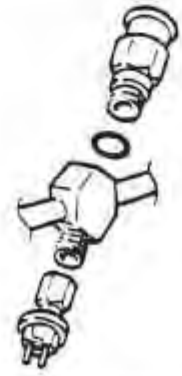
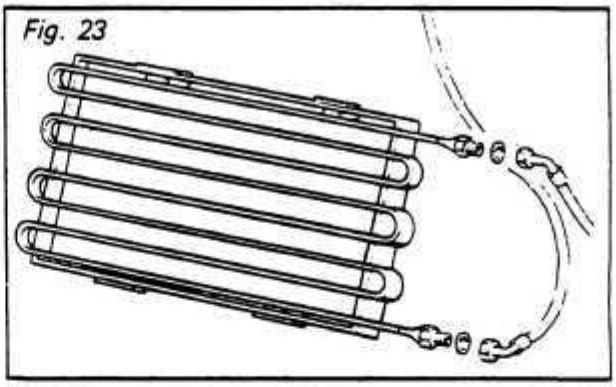


Fig. 22

Condenser — Fig. 23

The condenser is mounted in front of the radiator *and* functions much like a radiator, using outside air to remove the heat from the refrigerant vapor passing through it. By removing the heat, the vapor changes to a liquid to be recycled again. A condenser consists of inlet and outlet connections, a core of aluminium or steel, and mounting provisions.

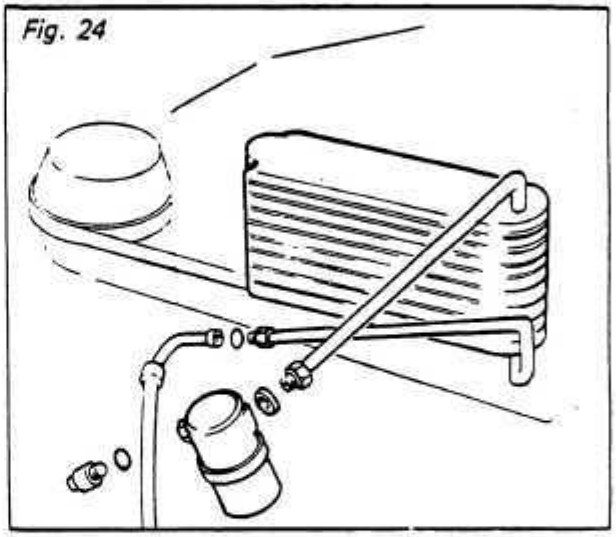
Fig. 23



Evaporator — Fig. 24

The evaporator is mounted within the A/C box behind the dashboard, using the fans to absorb the heat from within the car and transferring it to the liquid/gas within the pipes.

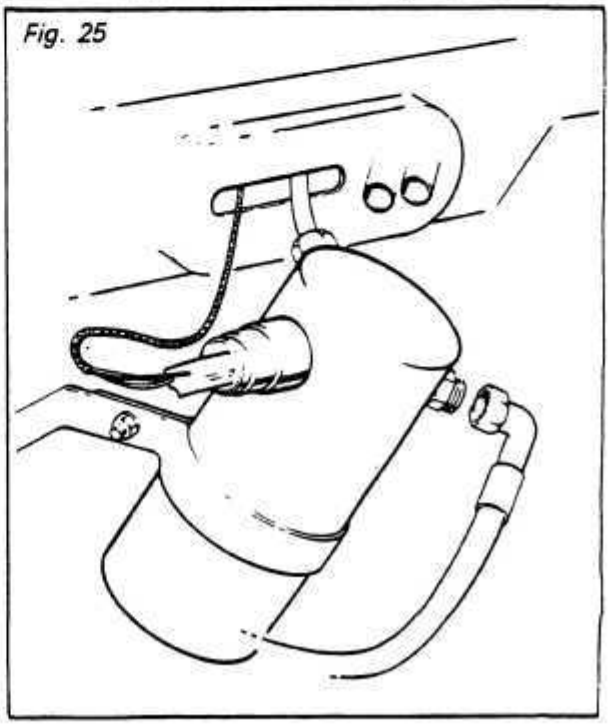
Fig. 24



Accumulator — Fig. 25

The accumulator-dehydrator separates the liquid refrigerant from the vapor. The liquid will remain in the cylinder, while the vapor passes on into the compressor. An oil bleed hole insures that there is a minimum entrapment of oil in the accumulator. This unit also removes small traces of moisture and sediment that may be in the system.

Fig. 25



SAFETY PRECAUTIONS

Air conditioning systems are filled with liquid or gaseous refrigerant which is under high pressure at most times.

The closed system must be kept free of any dirt, air, or water vapor and liquid. When servicing an air conditioned car, observe the following:

1. Do not steam clean, solder, weld or braze near the air conditioning hoses, connections or components.
2. Do not open a refrigerant line or connection except when necessary. Cover all openings with clean tape, caps, or plugs, if this occurs.
3. Do not adjust the refrigerant valves.

LIQUID REFRIGERANT

KEEP LIQUID REFRIGERANT AWAY FROM EYES AND SKIN. Liquid refrigerant can affect a person's eyes and skin because it freezes the tissues it contacts. SAFETY GOGGLES should always be worn when servicing refrigerant systems. If the refrigerant should come in contact with the eyes, do not rub them. Splash the eyes, or the affected area, with large quantities of cold water for several minutes. If further medication is necessary, the affected area should be checked and treated by a physician.

ALWAYS EXHAUST REFRIGERANT VAPORS AWAY FROM CAR OR THROUGH WALL OR ROOF VENTS

While Refrigerant – 12 is normally not poisonous, if large quantities are discharged in a room with an open flame or sucked into the car engine while running, dangerous chemicals will be produced. Engines will be connected to exhaust tubes — ventilated rooms are required when servicing the A/C System.

AVOID CONTACT WITH SKIN

The refrigerant at atmospheric pressure vaporizes rapidly so that if allowed to get on the skin, the latent heat of vaporization will rob the heat from the skin at that point with danger of frost bite at that part. It is especially dangerous to get the refrigerant in the eye as the moisture in the eyeball will be frozen with the risk of being blinded. Thus, when handling refrigerant, safety goggles should be worn and care taken not to get the refrigerant on the skin *(Fig. 26)*

Fig. 26

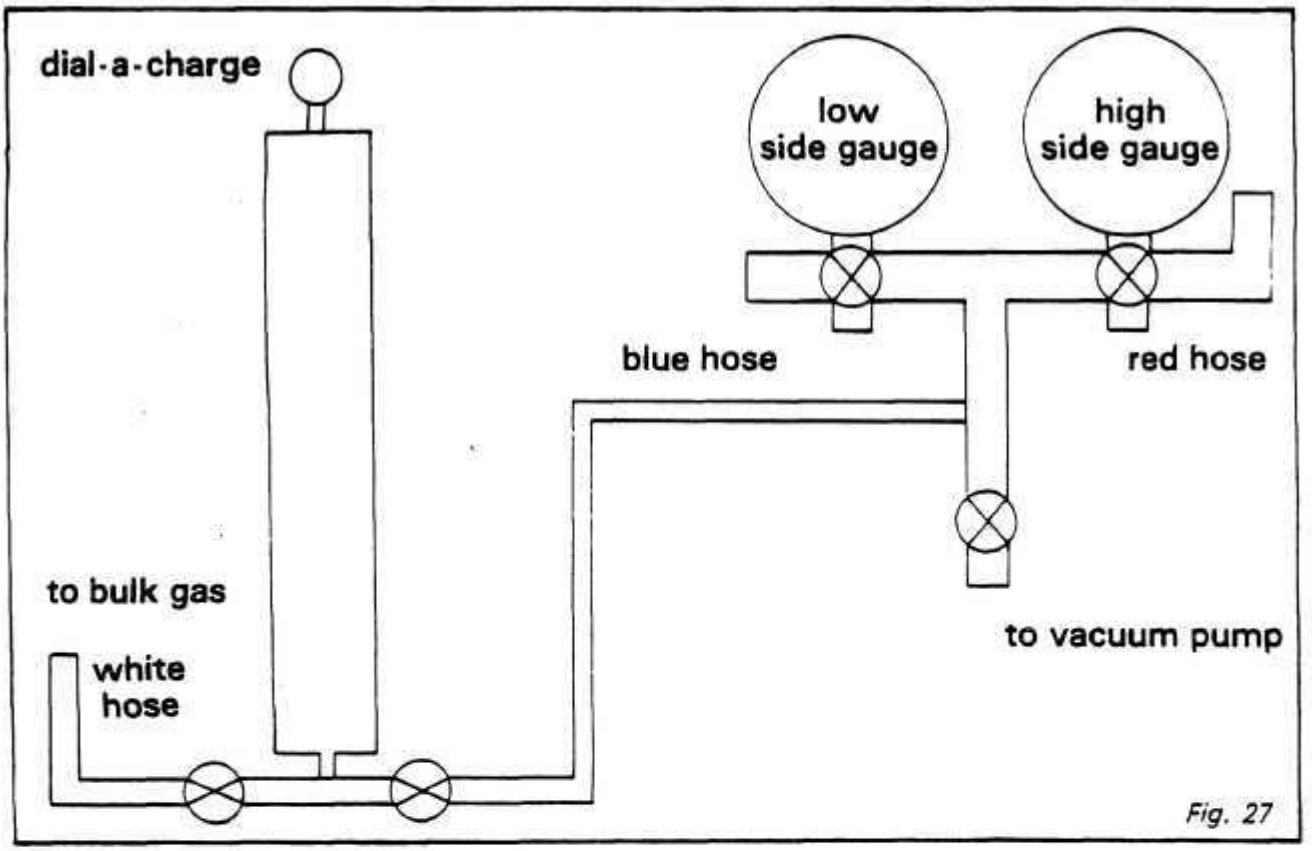


Fig. 27

This is the basic equipment required to check and service the air conditioning unit on De Lorean Motor Company cars.

The Service Station (95301) allows the service technician to diagnose any faults on the refrigeration side of the system, also to evacuate and dehydrate and recharge the R – 12 into the system without disconnecting, i.e. allowing air and moisture into the system. (**Note**: safety precautions when handling R-12 *Fig. 27 – 28.)*

Note:
Reference to colour coded hoses may only apply to DMC Service Tool No. 95301.

Extreme caution to be observed that **correct** connections are made.

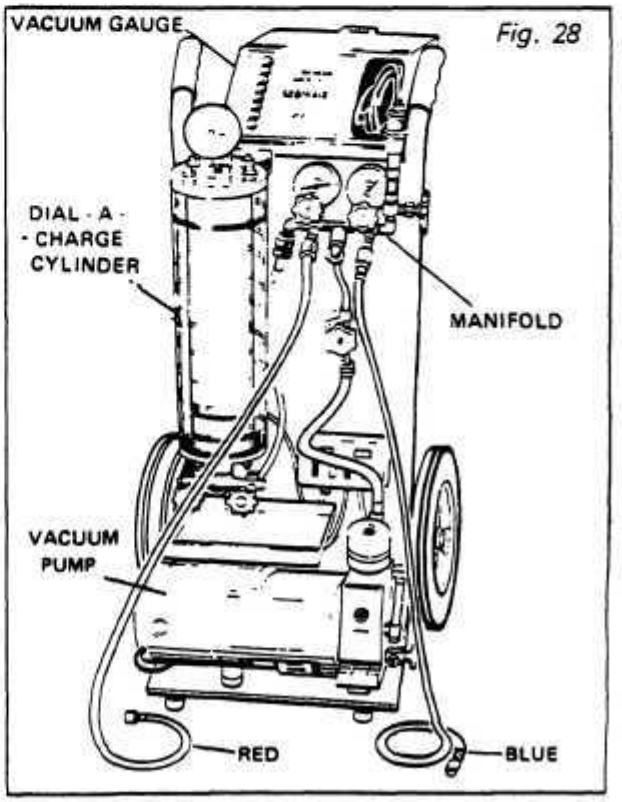


Fig. 28

ACCESS VALVE CORE REMOVER AND REPLACER WITH VALVE CORE REPLACEMENT FEATURE

CAUTION: GOGGLES SHOULD BE WORN WHEN WORKING WITH REFRIGERANTS.

SYSTEM SHOULD BE SHUT OFF AND PRESSURES EQUALIZED

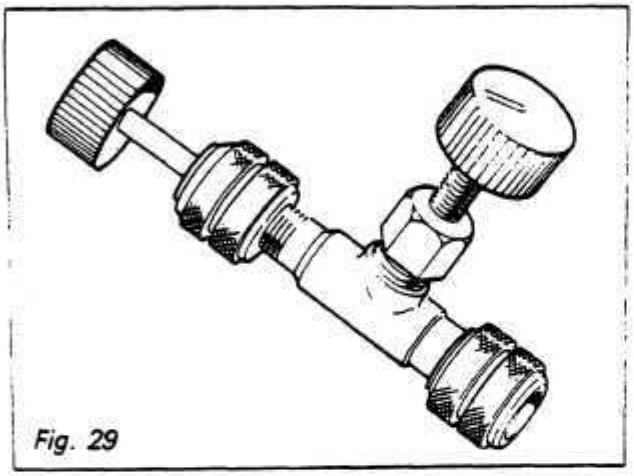


Fig. 29

1. Install tool on access valve by tightening female flare, finger tight.

   CAUTION: Overtightening may distort 'O' rings.

2. Push in tool shaft fully, then rotate to engage Schrader valve core.

   Note:
   Shut off should be unscrewed completely anti-clockwise.

3. Apply slight pressure forward, turn the tool shaft anti-clockwise until the core is removed — finger pressure will sense this.

4. Retract the main shaft completely — close shut off valve by turning fully clockwise till finger tight.

5. Unscrew top coupling and remove valve core. (At this point hoses can be connected and service to the air conditioning system performed.)

6. Reverse procedure to replace Schrader valve cores.

7. **CAUTION:** Remove hose connections slowly to allow any refrigerant in hose to escape.

LEAK TESTING

1. Connect station to car. See Section N:06:01.

2. Read pressure on gauges if over 60 p.s.i. Start leak check with Leak Detector 14950. To use 14950 — switch on — instrument will stabilise to a steady 'tick'. If leak detected unit will 'scream.'

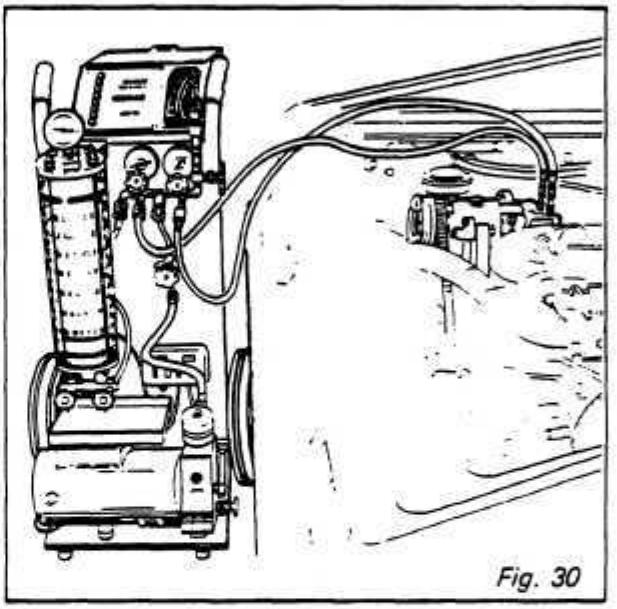


Fig. 30

3. Check all joints. Start below joint or connection as R – 12 is heavier than air so will collect below the joint.

4. If below 60 p.s.i. — open high and low side valves. Allow approximately ½ lb. R – 12 into system or until pressure is above 60 p.s.i. — leak test.

5. If pressure in D.A.C. is below 60 p.s.i. turn on heater.

* * *

Quick Check

An oil film often forms around the refrigerant outlet opening due to the refrigerant oil that is carried along out; this makes it possible to recognise a leak point easily.

PRESSURE CHECK

SYSTEM PRESSURE CHECK

1. Lift engine cover.

2. Locate A/C compressor on left hand side, See Illustration.

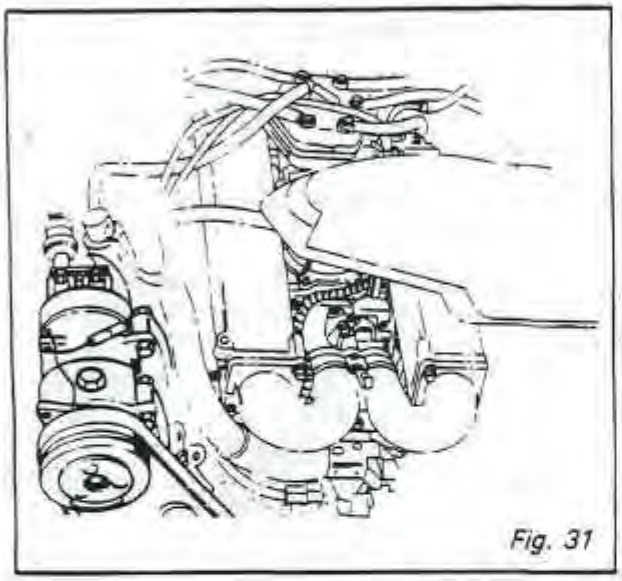


Fig. 31

3. Remove dust covers.

4. Connect service tools 14650 to high and low side to access points on compressor. Remove Schrader cores — valves, on 14650 closed.

5. Check all valves on service station are closed.

6. Connect blue hose to suction side.
   Left hand connection — on compressor.

7. Connect red hose to discharge side of compressor.
   Right hand connection.

8. Check static pressure on gauges.
   Suspect leak on system.

9. Start engine — A/C on max. cool — max. fan speed.

10. Check clutch is operating.

11. Read pressures on station gauges.

AMBIENT DEGREE F	COMPRESSOR OUT PRESSURE PSI	AD PRESSURE PSI
70	125 – 150	25 – 32
80	145 – 190	25 – 32
90	170 – 200	25 – 32
100	190 – 230	25 – 32
110	220 – 250	26 – 33
120	245 – 275	28 – 35
130	265 – 300	30 – 37

12. If pressures correct and clutch operating the system is all correct. If pressures incorrect see fault diagnosis charts.

13. All correct — switch off engine. Disconnect hoses carefully. Observe safety precautions.

DISCHARGE OF SYSTEM

See Safety Notes

1. Lift engine cover.

2. Engine switched off.

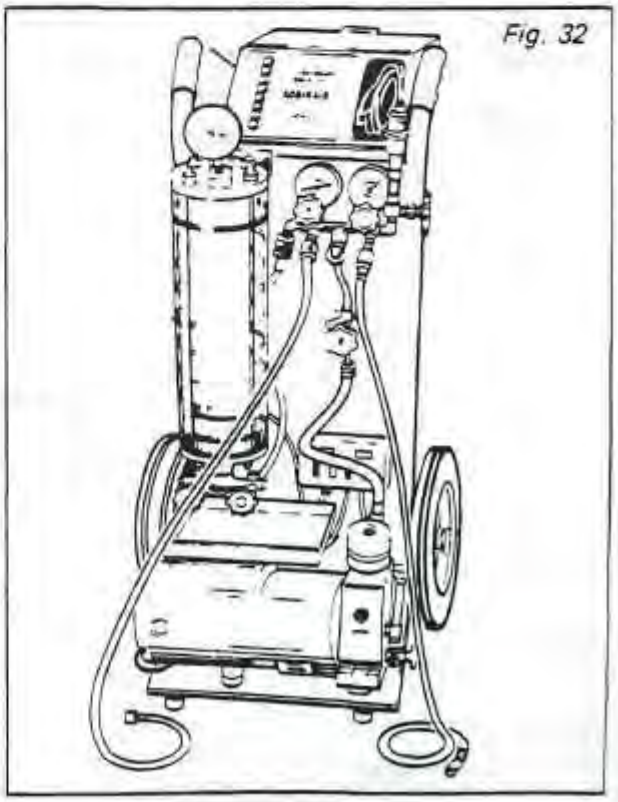


Fig. 32

3. Connect hoses to compressor. See Section No. N:06:01.

4. All valves on station closed.

5. Disconnect white hose from valve on Dial-a-Charge cylinder. Place loose end into clean receptacle.

6. Crack low side valve on manifold until hissing heard. Crack high side valve. If oil or white vapour seen coming out of hose, slow down gas release by closing valves slightly. Any oil loss can be trapped in receptacle to be replaced into system later.

7. Watch gauges on station until both read zero pressure. System now fully discharged. (ALLOW 20 minutes to discharge).

8. At this point any repairs or replacement parts can be fitted.

FILLING DIAL-A-CHARGE CYLINDER

WARNING NOTICE:

Goggles and gloves to be worn.

Handle refrigerant with care.

Well Ventilated Area

1. Valves on D.A.C. closed.
2. Connect white hose from left hand valve (2) *(Fig. 33)* to liquid connection on bulk supply.
3. Crack valve on bulk supply. Loosen connection on D.A.C. till slight hissing heard, tighten connection. This is to purge the hose of any air.
4. Open valve (2). Liquid flow into cylinder — visible in sight glass, until bulk tank and D.A.C. at same pressure.
5. Crack vent valve on top of cylinder to allow more liquid into cylinder.
6. Rotate shield to R – 12 position as marked on bottom of safety shield.
7. Allow liquid to flow into cylinder till approx. 3 – 3.5 lb. (1.36 – 1.58 kl). Measure by the liquid level in sight glass.
8. Close all valves.
9. Slacken white hose slowly to allow liquid in hose to disperse. Gloves must be worn at this point.
10. Disconnect hose from R – 12 supply.

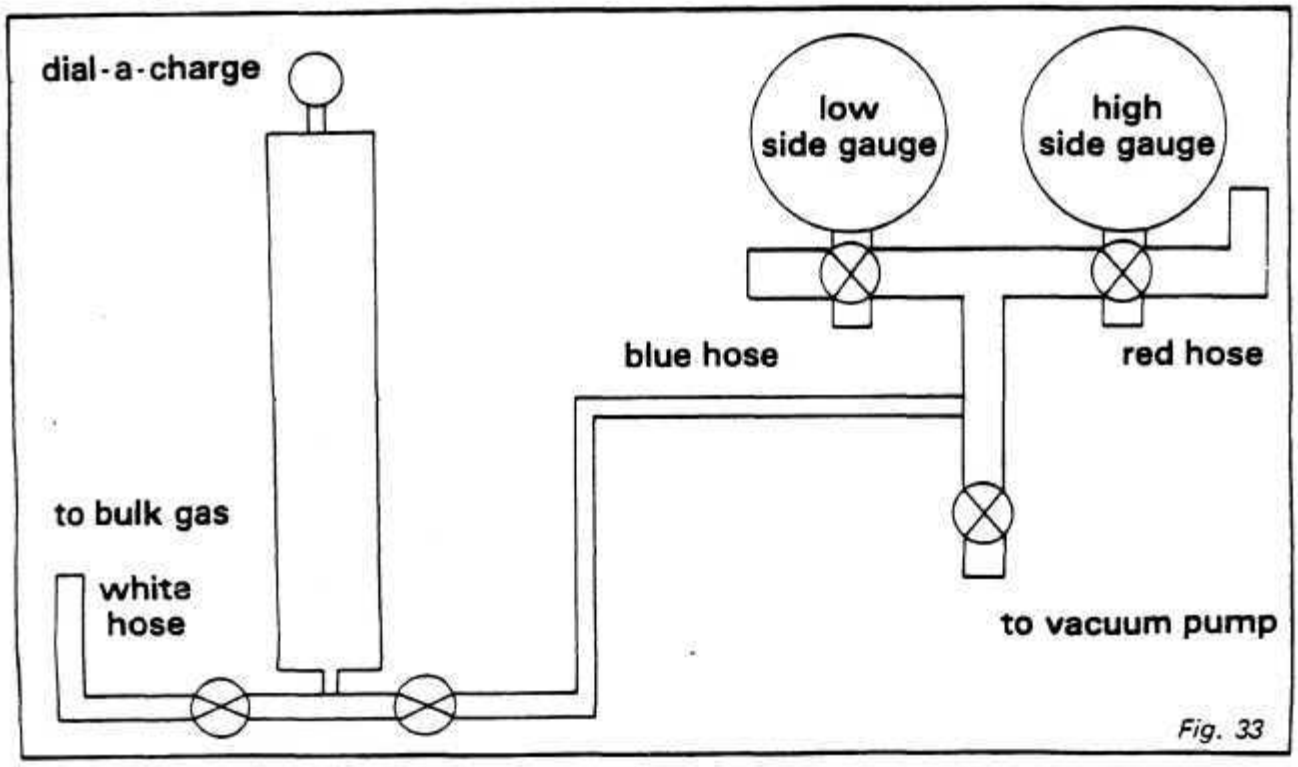


Fig. 33

EVACUATING — DEHYDRATING AND CHARGING SYSTEM

1. Reconnect white hose to Dial-a-charge.
2. Reconnect hoses to compressor — Schrader valves out.
3. Open low side valve — open high side valves. Valves on Dial-a-charge fully closed.
4. Switch on vacuum pump.
5. Open main vacuum valve.

   Allow vacuum pump to operate till 275 microns or below are shown on thermister gauge.

   Note:
   At this point the charging cylinder may be filled with correct quantity of refrigerant — See section N:06:01.

Close the main vacuum valve for 5 minutes. If the 700 micron bulb does not light up the system is not leaking. Proceed to charge system.

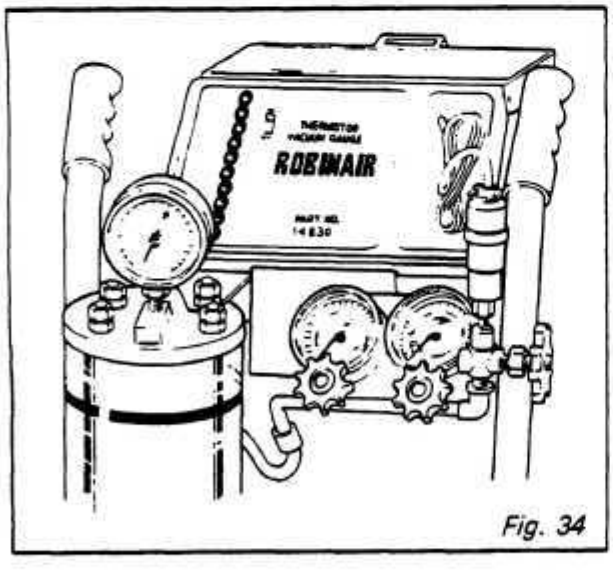


Fig. 34

If the 700 micron light operates but none higher resume vacuum for a further 5 minutes — retest vacuum.

If all the lights come on the system is leaking. Proceed to leak detection Section N:05:01.

1. Check that all taps on the refrigerant station are closed.
2. Open the "Refrigerant out" tap on the charging cylinder.
3. Open the high pressure (Red) tap and allow ½ lb. refrigerant to enter system. **Close the high pressure (Red) tap.**

Close outlet valve on D.A.C.

A high volume fan can be placed to blow the air over the condenser. This will help to keep the refrigerant in a liquid form and therefore cut down the charging time.

Disconnect and bridge LP switch at accumulator. Hand brake on — transmission in neutral.

Run engine at idle speed.

Match D.A.C. shield to pressure gauge.
Open the low pressure (Blue) tap on station. Open outlet valve on Dial-a-charge slowly.

Allow another 2 lbs. of R – 12 to enter system. This amount gives the total gas charge of 2.5 lbs.

TOTAL R – 12 CHARGE

2.5 lbs.

1130 gms.

When the full charge has entered the system (noted by charging cylinder sight glass) close the D.A.C. outlet tap by turning clockwise.
Close blue gauge valve.

Refit Schrader valves as previously stated, remove the high and low pressure pipes from the core access valves and screw them onto the storage bracket.

Remove the valve access *core removers* and refit the dust caps to the valve removers and the Schrader valve.

COMPONENT REMOVAL AND INSTALLATION

REMOVING HEATER/AIR CONDITIONING FAN

1. Working under right hand dash, disconnect spade terminal on fan.
2. Remove five hexagon screws attaching fan to fan housing.
   TOOL – 8 mm WRENCH
3. Drop unit, releasing rubber elbow from housing before withdrawing unit from vehicle.

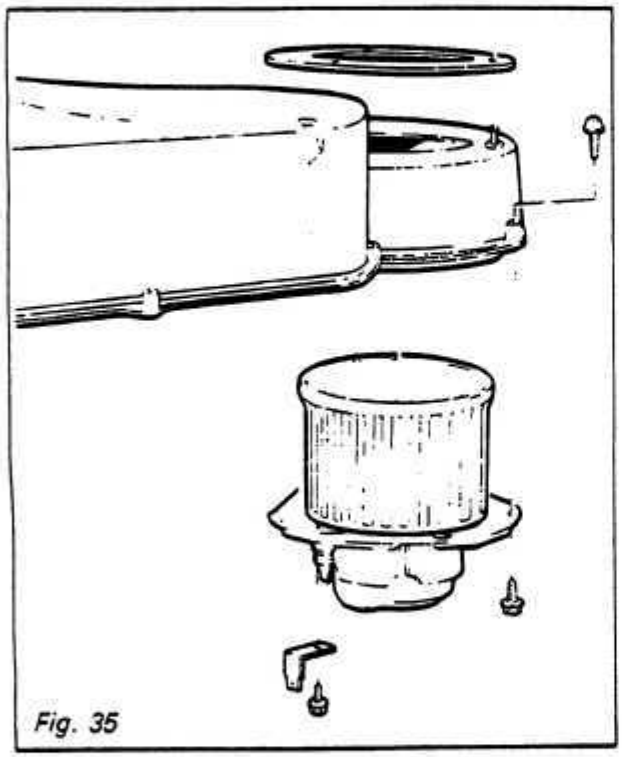


Fig. 35

INSTALLING HEATER/AIR CONDITIONING FAN

1. Refit fan to housing, connecting rubber elbow to housing and applying seal.
2. Fit five hexagon screws to secure fan in housing.
   TOOL – 8 mm WRENCH
3. Fit black ground wire to spade terminal secured by hexagon screw.
4. Fit pink/black wire to insulated spade terminal.

REMOVING HEATER/AIR CONDITIONING UNIT

1. De-pressurize air conditioning system (refer to N:07:01).
2. Drain 10 pints of coolant from cooling system.
3. Remove central control console (refer to Body Section).
4. Remove duct between unit and left hand crash pad.
5. Release glove box securing screws, unscrew glove box lamp bulbholder, and release wires from micro switch. Pull out glovebox.
6. Release four screws securing re-circulation vent flap. Disconnect vacuum pipe and remove flap.
7. Disconnect spade terminal connections on fan motor.
8. Disconnect spade terminal connectors on resistor panel underneath unit on fan housing.
9. Release four screws securing distribution chamber and remove chamber from heater/air conditioning unit.
10. Remove two screws securing de-mist duct to top of heater/air conditioning unit.
11. Withdraw duct.
12. Remove access cover in spare wheel well, and disconnect heater hose connections identifying one of the hoses with its heater core pipe to aid reassembly.

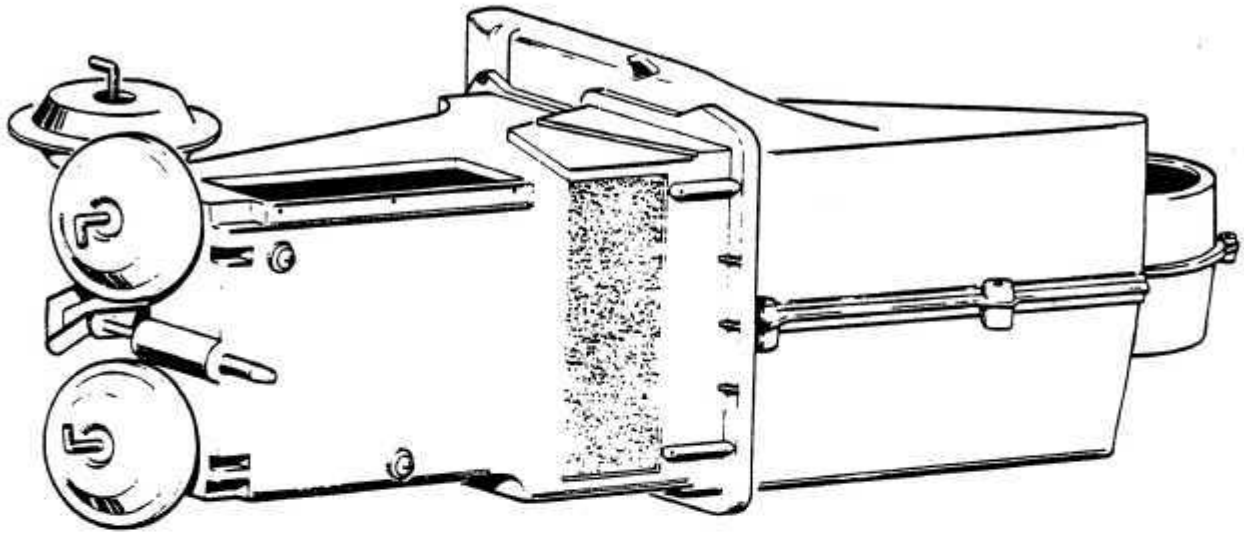


Fig. 36

Warning: Observe refrigerant handling precautions (refer to N:04:01).

13. ENSURE THAT THE SYSTEM IS FULLY DEPRESSURIZED BEFORE CARRYING OUT FURTHER WORK.

14. Release both evaporator pipe connections, using two spanners and cap the four connector ends immediately, releasing the accumulator mounting bracket from the body if necessary.

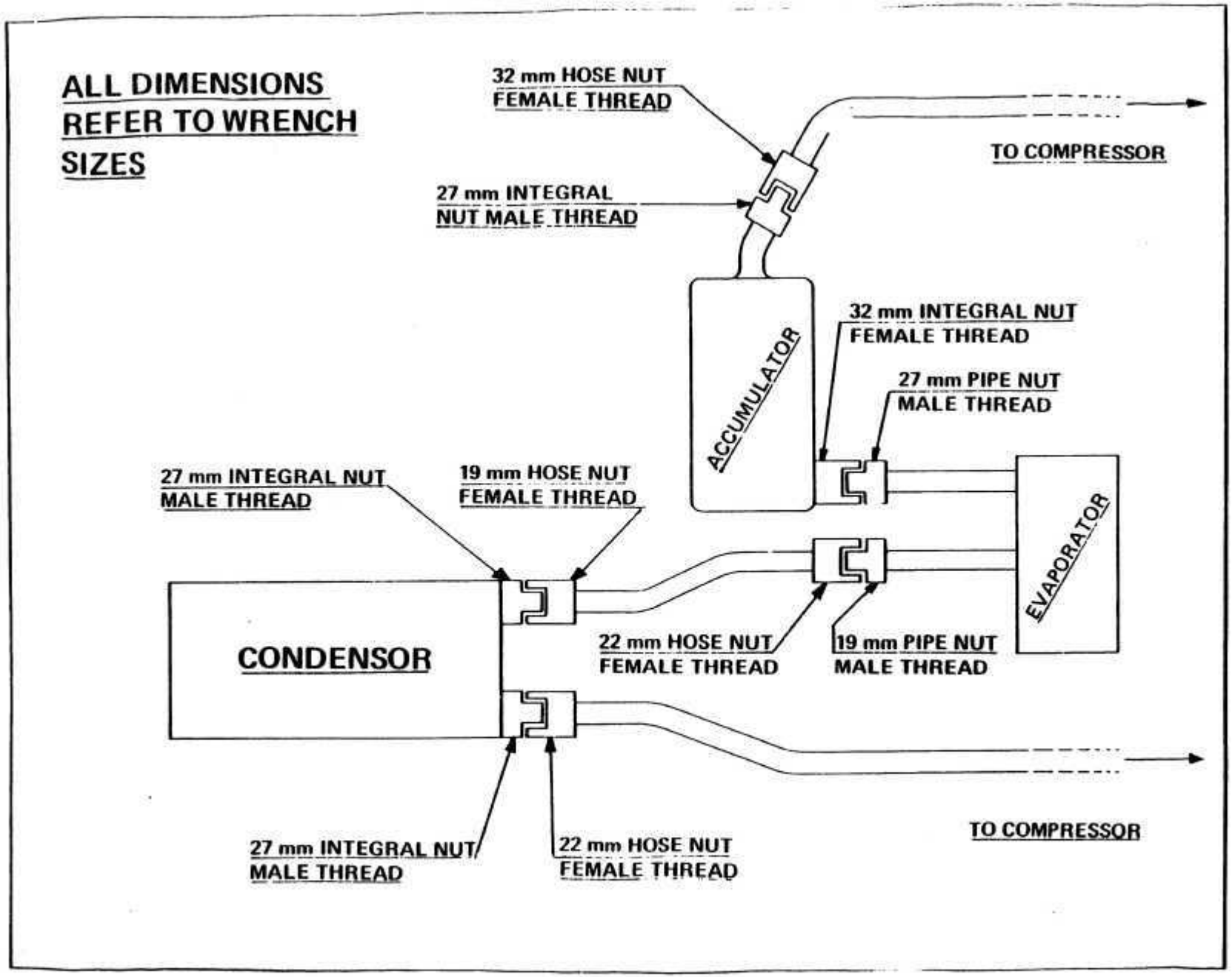
15. From inside re-circulation vent aperture, release screws securing fan housing to body.

16. Remove bracket securing heater/air conditioning unit to tunnel top.

17. Withdraw footwell duct from under heater/air conditioning unit.

18. Disconnect plain black vacuum supply pipe from port 1 of the selector switch plug, and disconnect the black and orange water valve/recirculator pipe from port 3.

19. Withdraw heater/air conditioning unit.


ALL DIMENSIONS REFER TO WRENCH SIZES
32 mm HOSE NUT FEMALE THREAD
TO COMPRESSOR
27 mm INTEGRAL NUT MALE THREAD
ACCUMULATOR
32 mm INTEGRAL NUT FEMALE THREAD
27 mm PIPE NUT MALE THREAD
27 mm INTEGRAL NUT MALE THREAD
19 mm HOSE NUT FEMALE THREAD
EVAPORATOR
CONDENSOR
22 mm HOSE NUT FEMALE THREAD
19 mm PIPE NUT MALE THREAD
TO COMPRESSOR
27 mm INTEGRAL NUT MALE THREAD
22 mm HOSE NUT FEMALE THREAD

INSTALLING HEATER/AIR CONDITIONING UNIT

WARNING: Observe Refrigerant handling precautions (refer to N:04:01).

1. Position heater/air conditioning unit in car, guiding heater matrix and evaporator pipes through bulkhead aperture and positioning drain tube through hole in body ensuring tube is not kinked or trapped. Connect plain black vacuum supply pipe to port 1 of the selector switch plug, and the black/orange water valve/re-circulation flap to port 3.
2. Insert footwell duct beneath heater/air conditioning unit.
3. Attach securing bracket to tunnel top.
4. Attach securing bracket and foot well duct to heater/air conditioning unit.
5. Insert screws inside re-circulation vent aperture to secure heater/air conditioning unit.
6. Locate and secure with four screws the re-circulation vent flap, and reconnect the vacuum pipe (via the tee piece to black/orange port 3 of selector switch).
7. Re-fit de-mist duct to top of heater/air conditioning unit.
8. Secure de-mist duct with two screws.
9. Re-fit distribution chamber.
10. Secure chamber with four screws.
11. Insert glove box in body aperture.
12. Secure with screws, re-fit glove box lamp bulb-holder and connect wires to micro switch.
13. Connect black ground wire to spade terminal attached to fan casing.
14. Connect pink/black wire to insulated spade terminal on fan casing.
15. Connect leads to resistor panel adjacent to fan motor in the following pattern:

    Terminal 1 — Pink/Black

    Terminal 2 — Pink/Yellow

    Terminal 4 — Pink/Blue

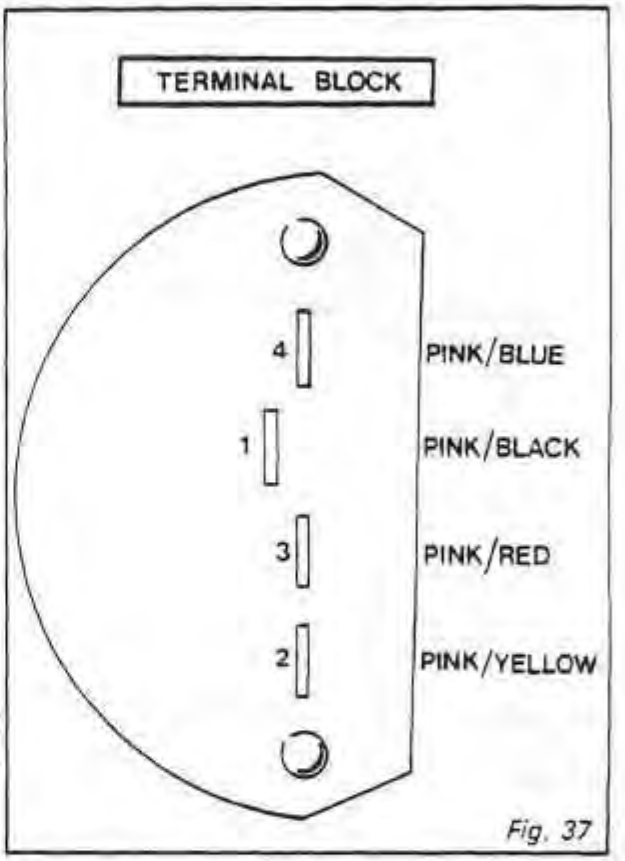


Fig. 37

16. Connect the plain black vacuum supply pipe to port 1 of the selector switch plug and connect the black and orange water valve re-circulation flap vacuum pipe to port 3.
17. Connect left hand door vent duct.
18. Re-fit centre console (refer to Body Section).
19. Reconnect the heater hoses.
20. Ensuring scrupulous cleanliness of evaporator pipe joints coat the new 'O' rings and connector threads, with Refrigerant oil — not any other Lubricant.

21. Re-fit grommet to seal hoses in firewall.

22. Re-fit access cover in spare wheel well.

23. Re-charge air conditioning system as described.

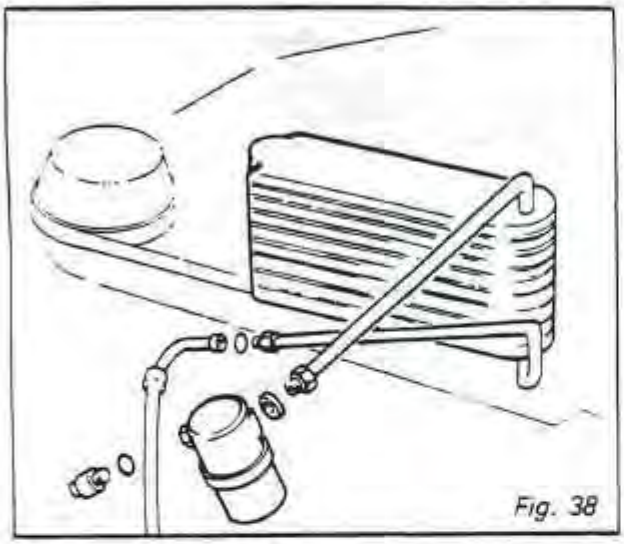


Fig. 38

REMOVING HEATER CORE

1. Remove heater/air conditioning unit (refer to N:08:01).

2. Loosen foam rubber strip stuck around inlet and outlet pipes sufficiently to allow withdrawal of unit.

3. Remove one screw adjacent to screen vent aperture.

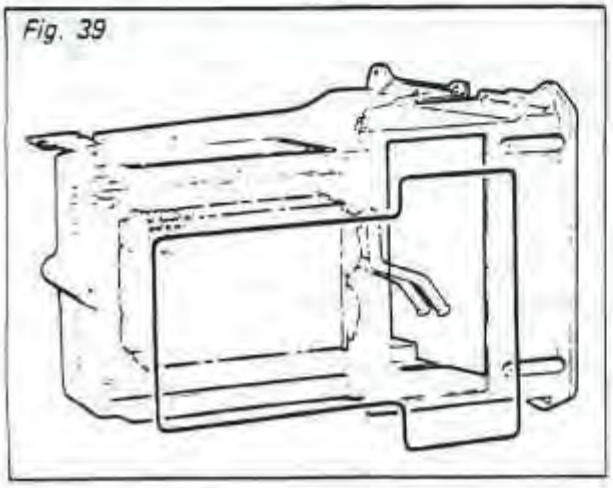


Fig. 39

4. Remove one screw adjacent to footwell aperture.

5. Remove two screws adjacent to mode flap actuators.

6. Remove sealant from around casing central joint face.

7. Withdraw temperature flap carrier complete with heater core.

8. Remove the single clamp screw and clamp adjacent to the temperature flap to remove heater core.

INSTALLING HEATER CORE

1. Remove old sealant from around the joint face on both temperature flap carrier and the heater casing.

2. Insert heater core into temperature flap carrier and secure with clamp and screw.

3. Apply a uniform bead of sealant around joint face of temperature flap carrier and heater casing.

4. Insert the carrier into the casing.

5. Secure with four screws.

6. Apply sealant around temperature flap pivot at the top and bottom of the casing.

7. Re-adhere foam rubber seal around inlet and outlet pipes.

8. Remove old sealant from joint faces of heater casing and evaporator casing.

9. Apply a uniform bead of sealant around the joint face of the heater casing.

10. Check the foam rubber strip is in position above evaporator outlet aperture.

11. Bring together the two sections and secure with four screws.

12. Re-fit heater/air conditioning unit to vehicle (refer to N:08:01).

REMOVING AIR CONDITIONING ACCUMULATOR

WARNING: Observe safety precautions regarding handling of freon gas refrigerant while undertaking this procedure.

1. De-pressurize air conditioning system (refer to N:07:01).

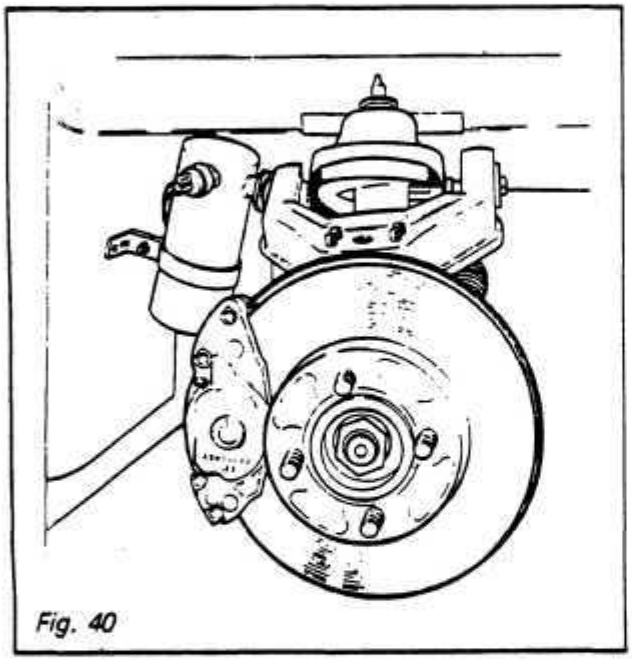


Fig. 40

2. Raise the car on a hoist lift.

3. Remove right hand front wheel.

4. Pull back protective boot from accumulator low pressure switch and disconnect leads from spade terminals.

5. Using two wrenches disconnect compressor hose from bottom of accumulator and cap both connections immediately.

6. Release the accumulator mounting bracket from the body.

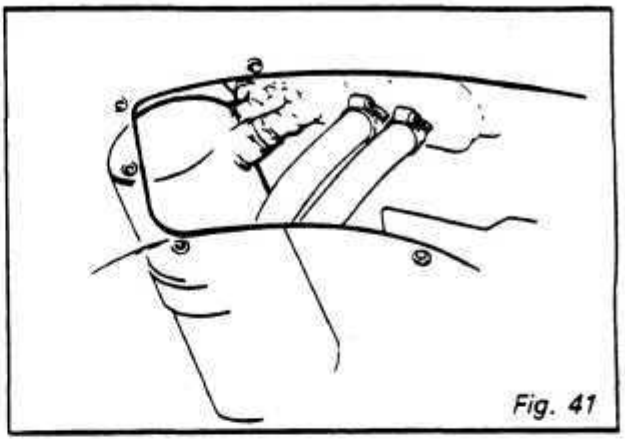


Fig. 41

7. Remove access cover at the back of the spare wheel well to gain access to evaporator/ accumulator top connection. Using two wrenches disconnect the joint, and cap both connections immediately.

8. Withdraw accumulator.

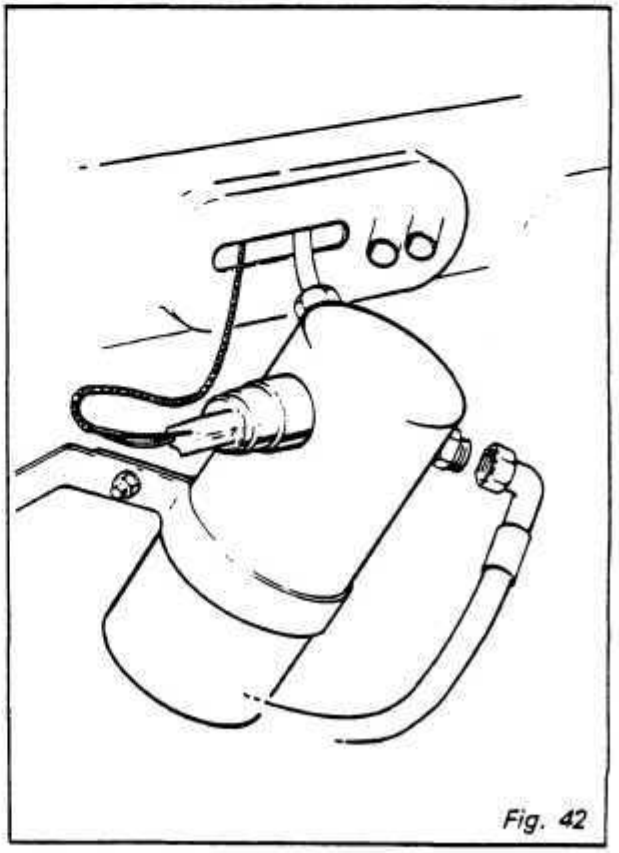


Fig. 42

INSTALLING AIR CONDITIONING ACCUMULATOR

1. Fit accumulator with bracket inside right hand front wheelarch and secure with screws.

2. Check that the evaporator hose connections are scrupulously clean, and coat both connections and new 'O' ring with a recommended refrigeration oil (NOT ANY OTHER LUBRICANT) before connecting to the top port on the accumulator.

3. With the aid of two spanners tighten the connection.

4. Ensure the compressor hose connections are scrupulously clean, and coat both connections and new 'O' ring with a recommended refrigeration oil (NOT ANY OTHER LUBRICANT) before connecting to the bottom port on the accumulator.

5. With the aid of two spanners tighten the connection.

6. Connect electrical leads to low pressure switch and re-fit rubber boot.

7. Re-fit right hand front wheel and torque tighten to 80 – 100 Nm (59 – 74 ft. lb.)

WARNING: Observe safety precautions regarding handling of freon refrigerant (refer to N:04:01).

8. Re-charge the system with 2.5 lbs. 1130 gms of R — 12 refrigerant, and test for leaks (see section N:05:01).

9. Re-fit access cover in luggage compartment.

REMOVING TEMPERATURE FLAP – Fig. 43

1. Remove temperature flap carrier (refer to Removing Heater Core N:08:05).

2. Clean off sealant from around temperature flap spindle.

3. Remove spring clips securing spindle in carrier.

4. Withdraw flap from carrier.

INSTALLING TEMPERATURE FLAP

To install the flap reverse the removal procedure.

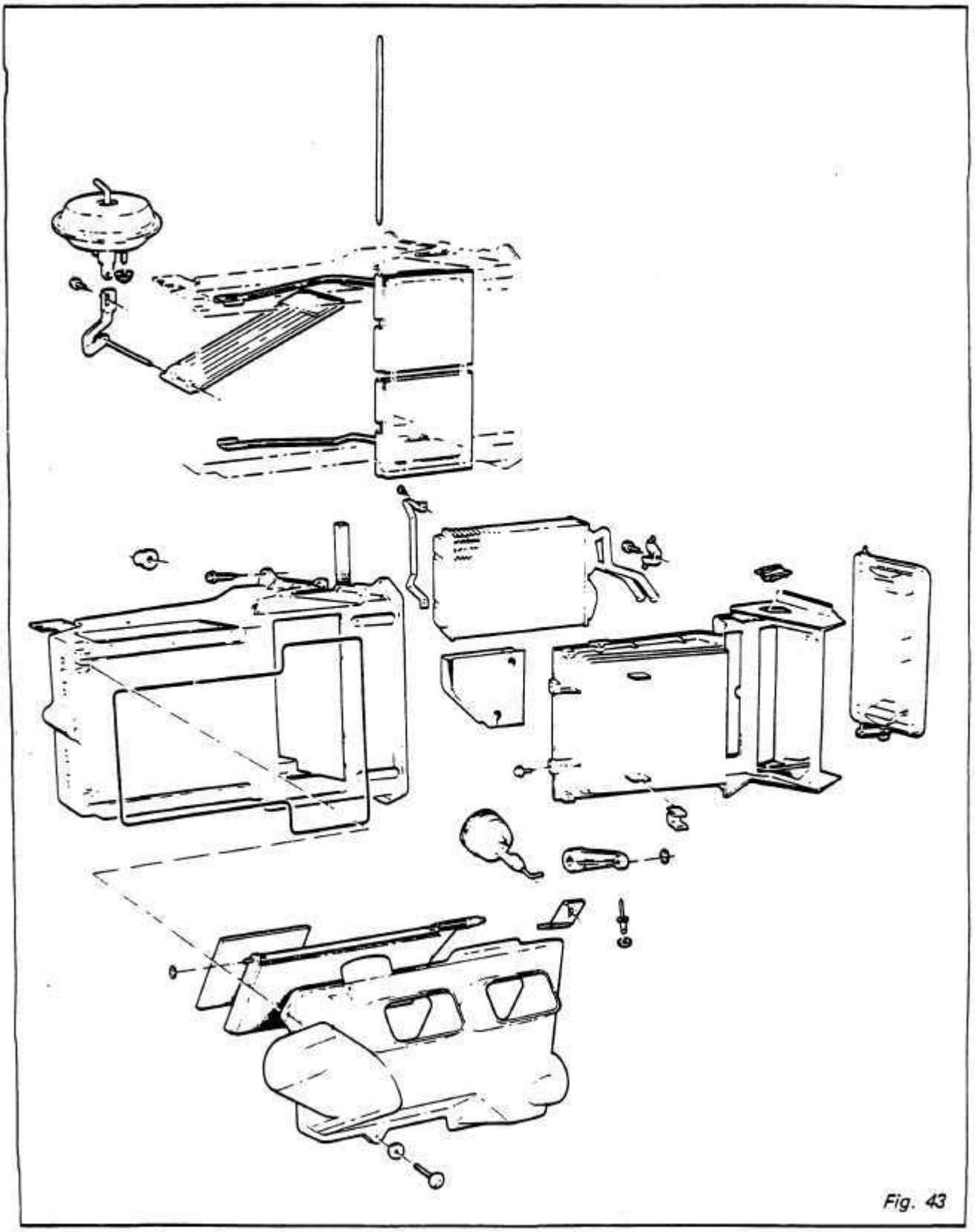


Fig. 43

REMOVING HEATER WATER VALVE

1. Release clip securing heater hose to water valve and pull off hose. Collect escaping coolant for re-use.
2. Release, at the water valve, the hose connecting engine to valve.
3. Disconnect vacuum supply pipe and remove the valve.

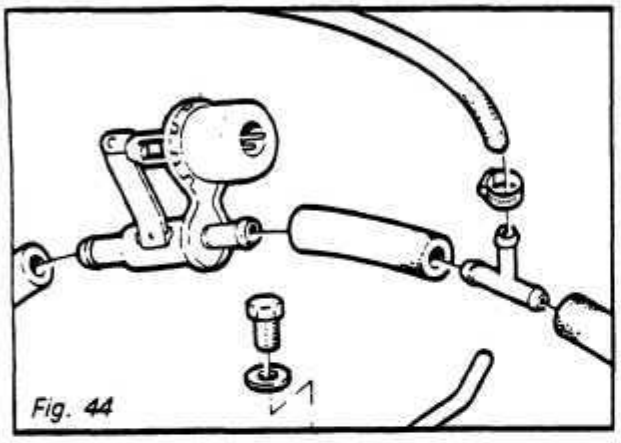


Fig. 44

INSTALLING HEATER WATER VALVE

Reverse the removal procedure, refilling the cooling system.

REMOVING CONDENSER — Fig. 45

WARNING: Observe all safety precautions regarding freon gas refrigerant while carrying out this procedure (see refrigerant handling precautions page N:04:01).

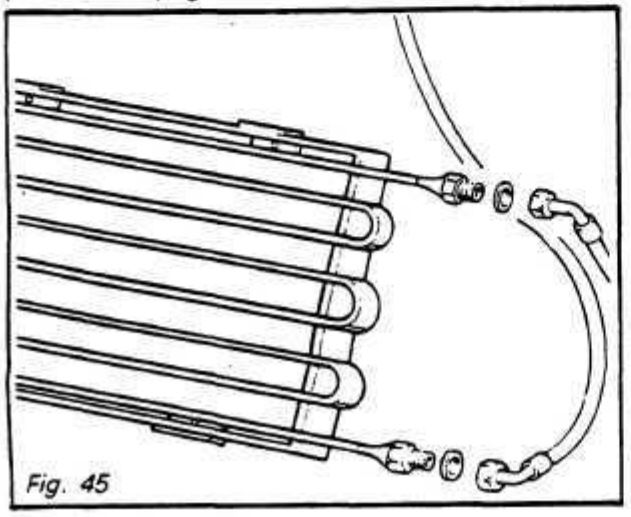


Fig. 45

1. De-pressurize air conditioning system (refer to page N:07:01).
2. Ensure that the system is de-pressurized and disconnect condenser hoses using two wrenches of the correct size. Cap the ends of the hoses and the condenser connections immediately after disconnection.
3. Remove screws securing air duct to body.
4. Remove nuts and bolts securing air duct to spoiler.
5. Remove the nut, washer and rubber buffer securing each radiator lower support bracket to the radiator.
6. Remove three bolts securing each radiator lower support bracket to the frame, disconnect the horn leads, and remove radiator brackets, horns and horn brackets *Fig. 46.*

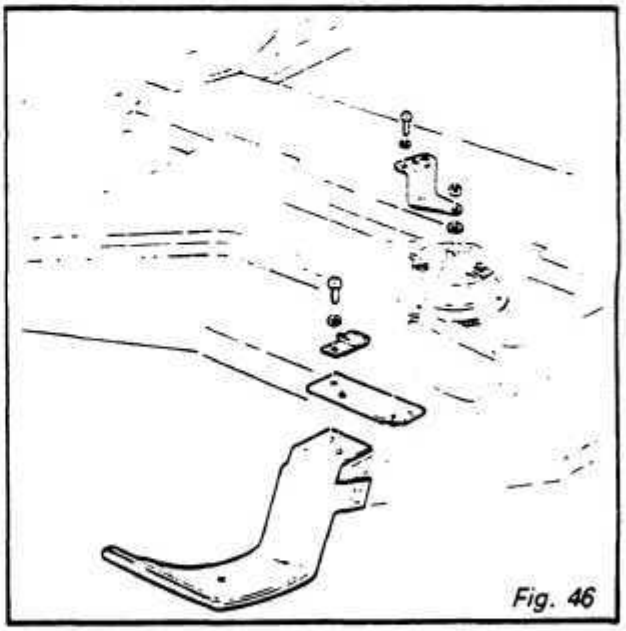


Fig. 46

7. Remove air duct by drawing downwards.
8. Provide alternative support for the radiator before removing both upper support brackets, by releasing the upper bracket/radiator nut and the bracket/chassis bolt.
9. Lower radiator sufficiently to gain access to top two nuts securing condenser to radiator.

10. Remove bottom nuts securing condenser to radiator.

11. Withdraw condenser by drawing forwards to disengage condenser bolts from radiator and then downwards to remove.

12. Secure radiator to ensure that the water hoses are not strained.

INSTALLING CONDENSER

WARNING: Observe all safety precautions regarding freon refrigerant gas while carrying out this installation procedure (see refrigerant handling procedures page N:04:01).

1. Release temporary fixings of radiator and support radiator while locating condenser studs on radiator.

2. Fit nuts to the condenser studs and tighten.

3. Ensure that the foam sealing strip is fitted between top of the radiator and body, and to the sides of the air duct.

4. Raise radiator into mounting position and support while fitting air duct.

5. Fit radiator right hand lower support bracket together with horn and bracket, and secure with the three bolts into frame. Connect horn leads.

6. Fit 17 mm nut to secure bracket to radiator, ensuring that rubber buffers are fitted on each side of bracket.

7. Repeat to fit left hand bracket. Do not overtighten the 17 mm radiator nuts.

8. Fit left hand upper support bracket and secure to radiator with nut.

9. Fit bolt to secure bracket to chassis.

10. Repeat for right hand brackets.

11. Fit securing screws to attach air duct to body and spoiler.

12. Re-connect hoses; ensure that connections are scrupulously clean, fit new 'O' rings and coat mating surfaces and 'O' rings with refrigerant oil. Use a spanner on the condenser connection whilst tightening Torque tighten upper connection.
Torque tighten lower connection.

13. Re-charge system (refer to N:07:01).

REMOVING COMPRESSOR – Fig. 47

1. De-pressurize refrigeration system (refer to N:07:01).

2. Slacken compressor drive belt adjuster bracket bolts.

3. Slacken tension adjusting screw to facilitate removal of drive belt.

4. Remove hose clamp plate (1) at rear of compressor by releasing single bolt.

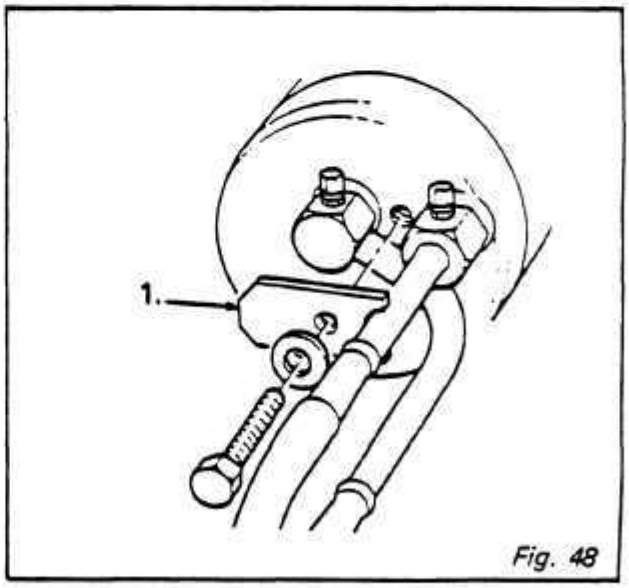


Fig. 48

5. Release hoses from compressor and cap the hose ends immediately. Seal the open ports of compressor.

6. Disconnect compressor clutch supply wire.

7. Release six compressor mounting bolts and withdraw compressor.

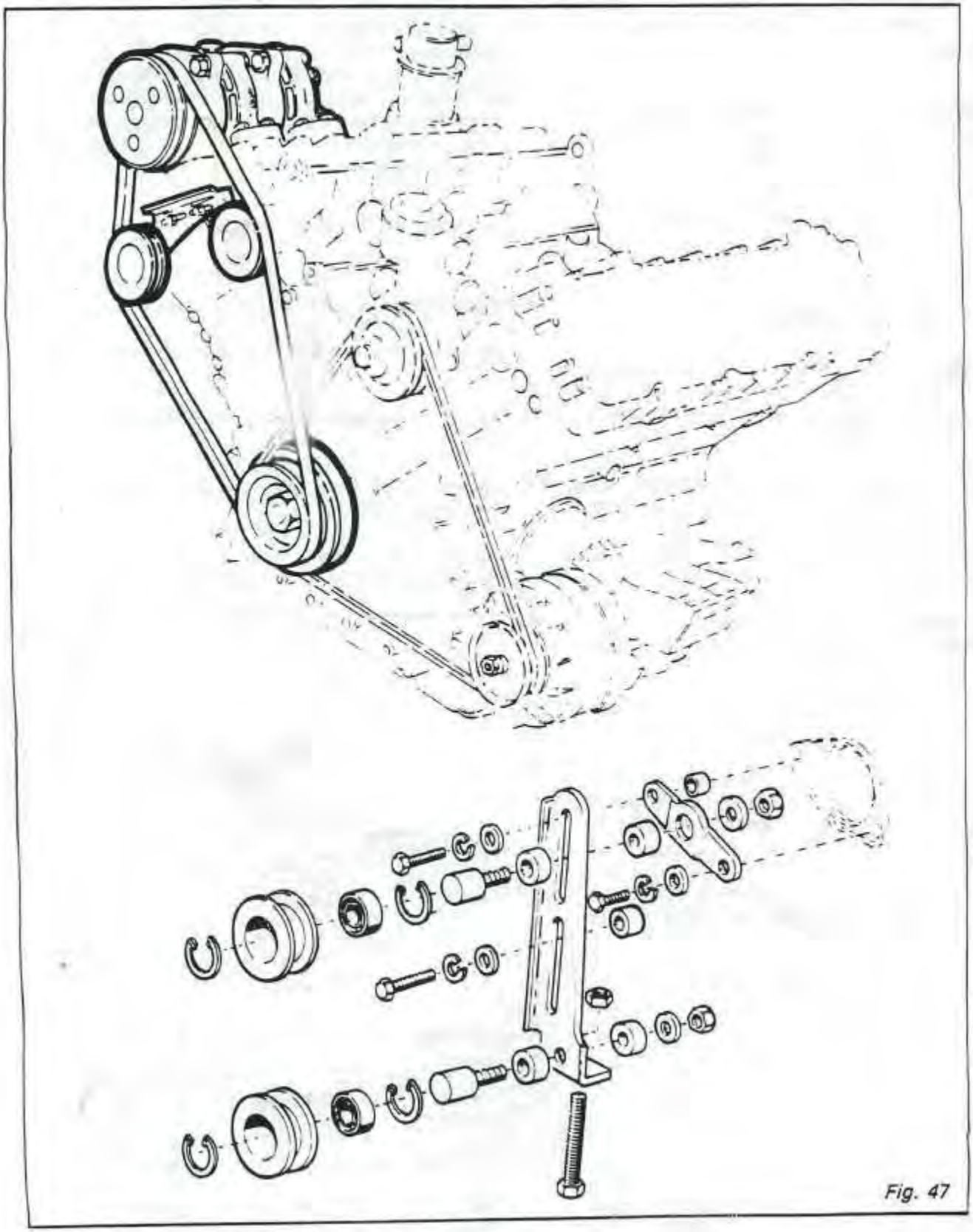


Fig. 47

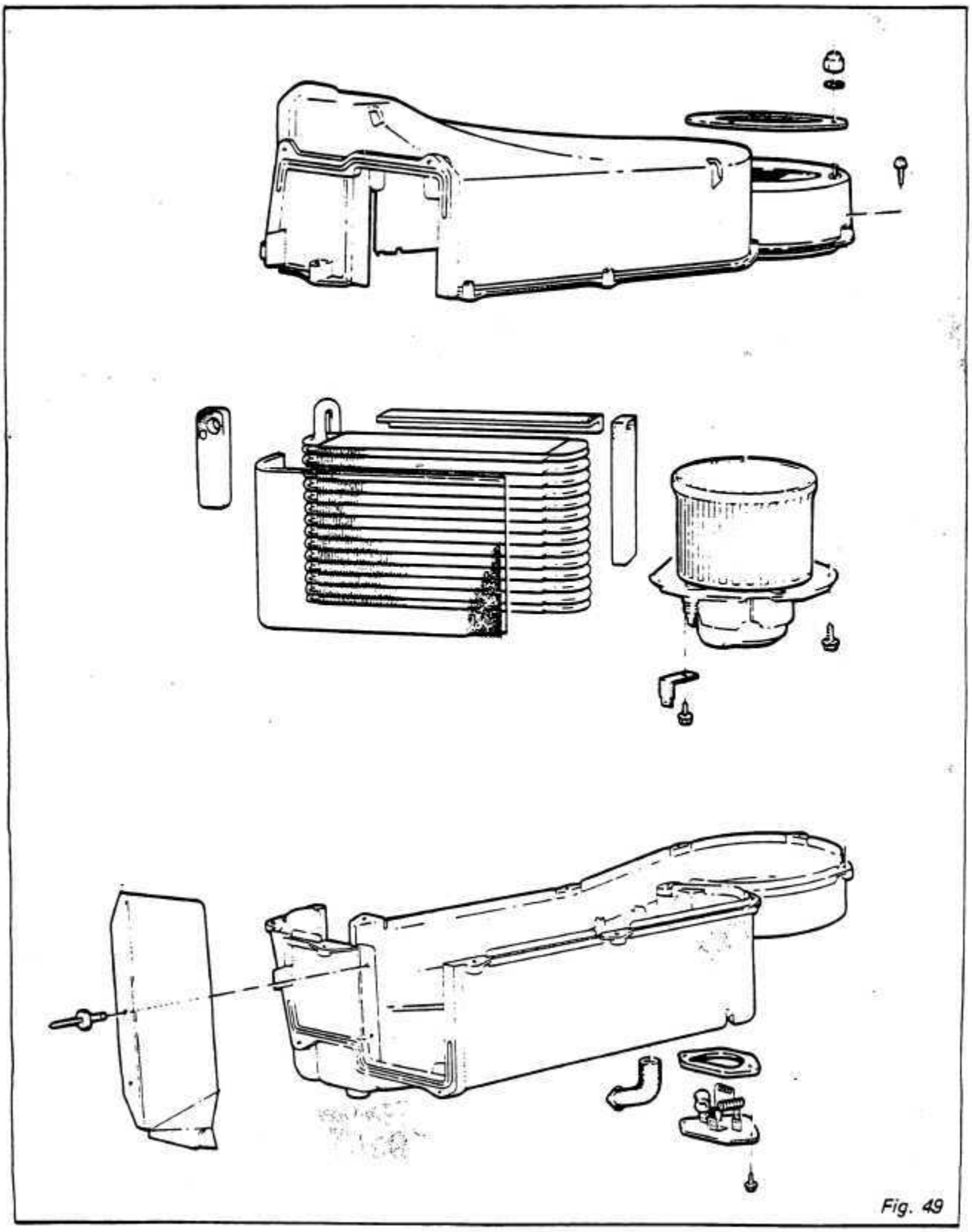


Fig. 49

INSTALLING COMPRESSOR

1. Locate compressor in mounting brackets and secure with six bolts and nuts.
2. Connect clutch supply wire.
3. Fit serviceable 'O' rings, coating them and the mating surfaces with refrigeration oil, and reconnect hoses to compressor.
4. Fit hose clamp plate and tighten.
5. Fit serviceable drive belt loosely over pulleys.
6. Tighten tension adjusting screw until the belt may be deflected 6 – 10 mm (¼" – ⅜") from the straight line using moderate thumb pressure between crank and upper jockey pulley.
7. Tighten tension screw lock-nut and adjuster clamp screws and re-check belt tension. Run engine briefly, switch off, and re-check belt tension.

REMOVING EVAPORATOR

1. Remove heater air conditioning unit.
2. Release four screws securing evaporator casing to heater casing.
3. Release eleven screws from periphery of evaporator casing.
4. Separate the two halves of the casing.
5. Remove the evaporator.

INSTALLING EVAPORATOR

1. Locate evaporator in evaporator casing.
2. Locate the two halves of the casing and secure with eleven screws.
3. Ensure that foam seal is fitted around inlet and outlet pipes and is properly fitted in the casing.
4. Clean off old sealant from joint faces of evaporator and heater casing.
5. Apply a uniform bead of sealant to the joint face of the evaporator casing.
6. Bring the two casing halves together and secure with four screws.

REMOVING VACUUM RESERVOIR — Fig. 50

The Reservoir is located in the LH rear pontoon, with access via the charcoal canister aperture.

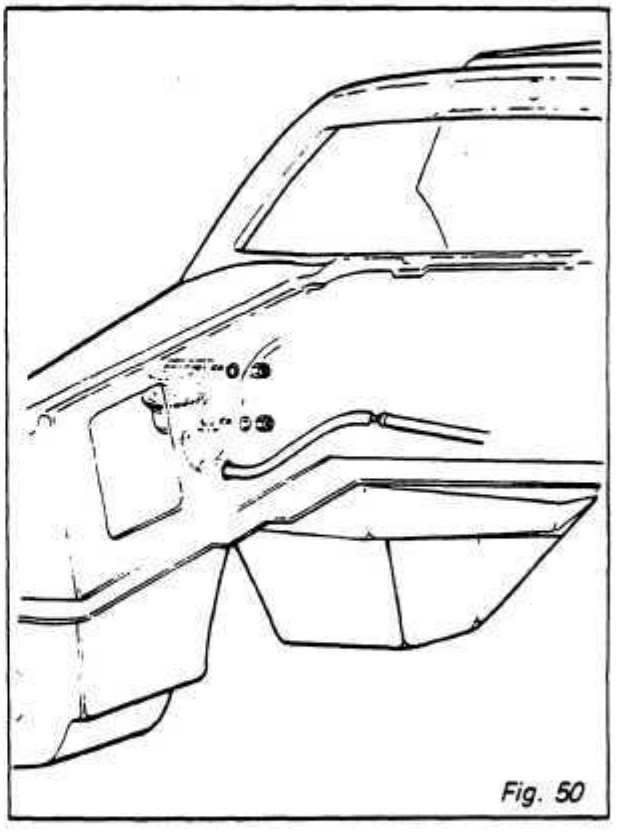


Fig. 50

1. Remove the four screws securing the charcoal canister mounting panel in the LH rear pontoon. Withdraw the panel and canister and lay aside.
2. Through the pontoon aperture revealed, pull off the elbow connector from the vacuum reservoir.
3. Release the two nuts securing the reservoir and withdraw through charcoal canister aperture.

TOOL — 10 mm WRENCH

INSTALLING VACUUM RESERVOIR – Fig. 51

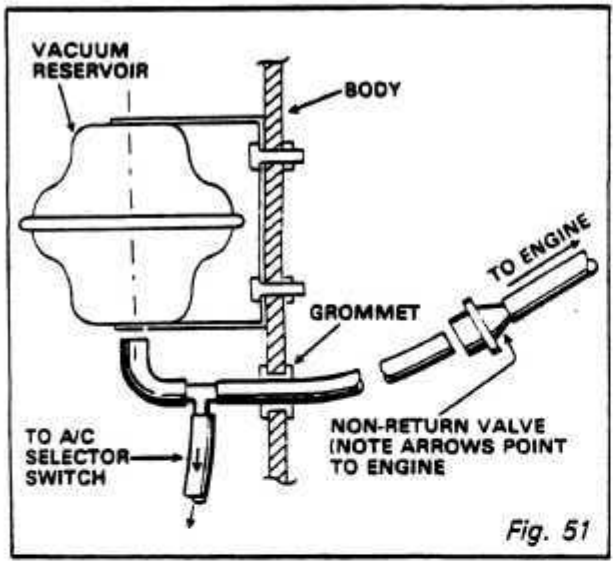


Fig. 51

Reverse the removal procedure ensuring that the vacuum pipe connections are as shown.

REMOVING AIR CONDITIONING COMPRESSOR HOSES

1. De-pressurize air conditioning system (see refrigerant handling precautions – Section N:07:01).

2. In order to release the hoses the body must be raised from the frame slightly to provide clearance. Raise car on lift.

3. Remove all screws securing the radiator air duct to the body, spoiler and intake grille, and withdraw the duct.

4. Remove both air deflector plates from underside, between frame and body, on each side of engine bay by releasing their screws and clips.

5. From inside the luggage compartment, remove the brake master cylinder access cover and fuel filler neck cover.

6. Remove the steering column upper universal joint pinch bolt. Slacken lower universal joint to column pinch bolt, and slide lower column into lower universal joint and off upper steering column (refer to Steering Section).

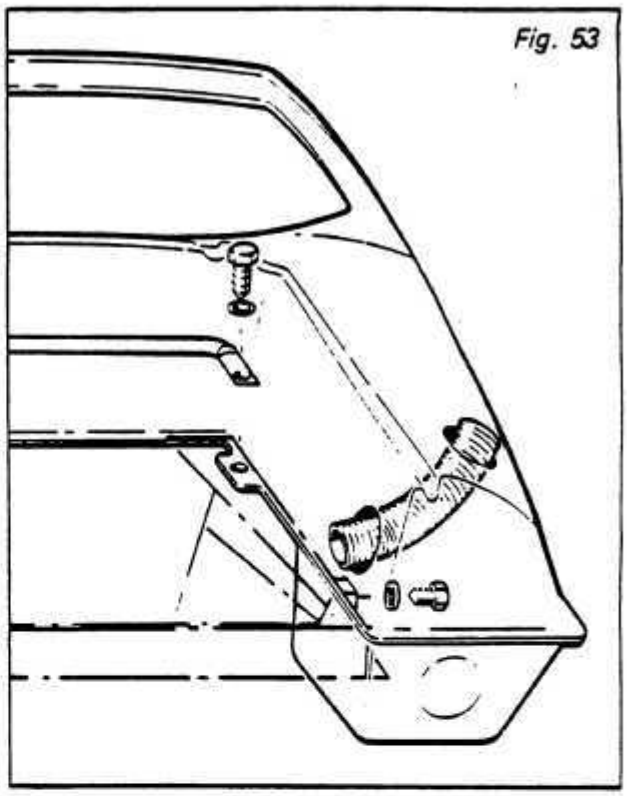


Fig. 53

7. Remove two nuts securing brake master cylinder to servo and separate. Support the master cylinder clear of the servo but **do not strain Brake Pipes.** Seal open ends of both components to prevent dirt ingress.

8. Remove body mounting bolt each side of engine bay above rear spring abutment.

9. Remove four screws securing charcoal canister panel to LH rear pontoon. Withdraw panel and canister, and lay aside.

10. Release cold air intake trunking from air temperature flap unit and push trunking into RH rear pontoon.

11. Through the aperture thus exposed, release the rear body mounting bolt inside each rear pontoon.

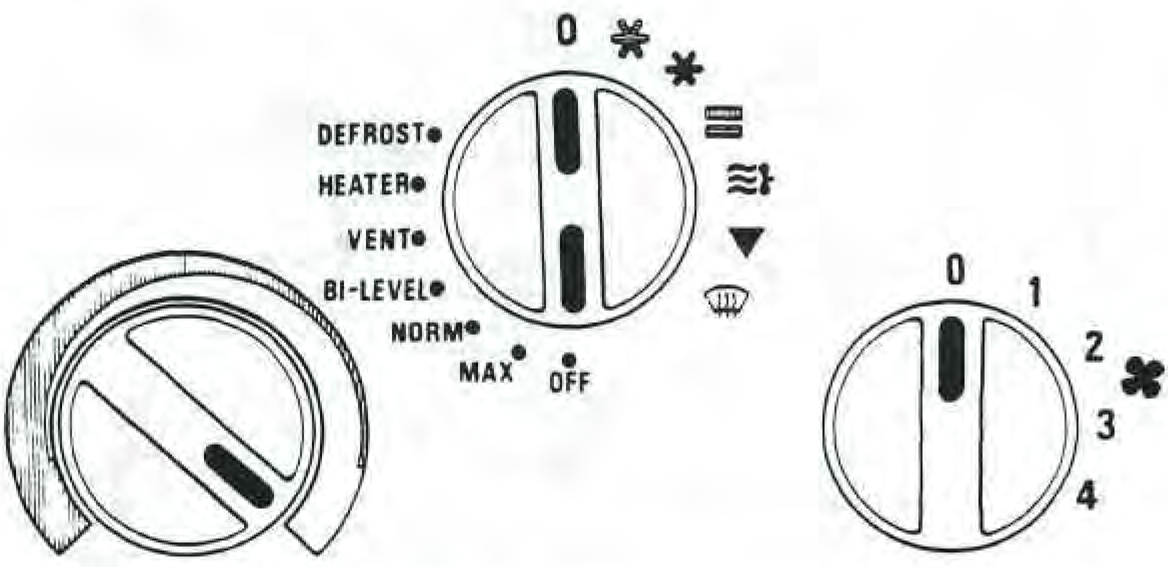
12. From the car interior, remove the two body mounting bolts and one seat belt mounting bolt on each side of the centre tunnel.

	CONNECTION	PIPE TRACE	SELECTOR POSITION						
			O	❄	✱	▤	≋	▼	[defrost symbol]
1	SOURCE		SEAL	VAC	VAC	VAC	VAC	SEAL	VAC
2	LOWER MODE FLAP	brown	VENT	··	··	VENT	··	VENT	VENT
3	RE-CIRC & WATER VALVE	orange	··	··	VENT	··	VENT	··	··
4	SCREEN FLAP	blue	··	VENT	··	··	··	··	VAC
5	TOP MODE & FLV FLAPS	red	··	VAC	VAC	VAC	VAC	··	VENT

VACUUM SWITCHING

ELECTRICAL CONNECTIONS

CONNECTION	WIRE COLOUR	SELECTOR POSITION						
		O	❄	✱	▤	≋	▼	[defrost symbol]
SUPPLY		ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ
COMPRESSOR		–	ϟ	ϟ	ϟ	–	–	–
FAN SPEED SWITCH		–	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ



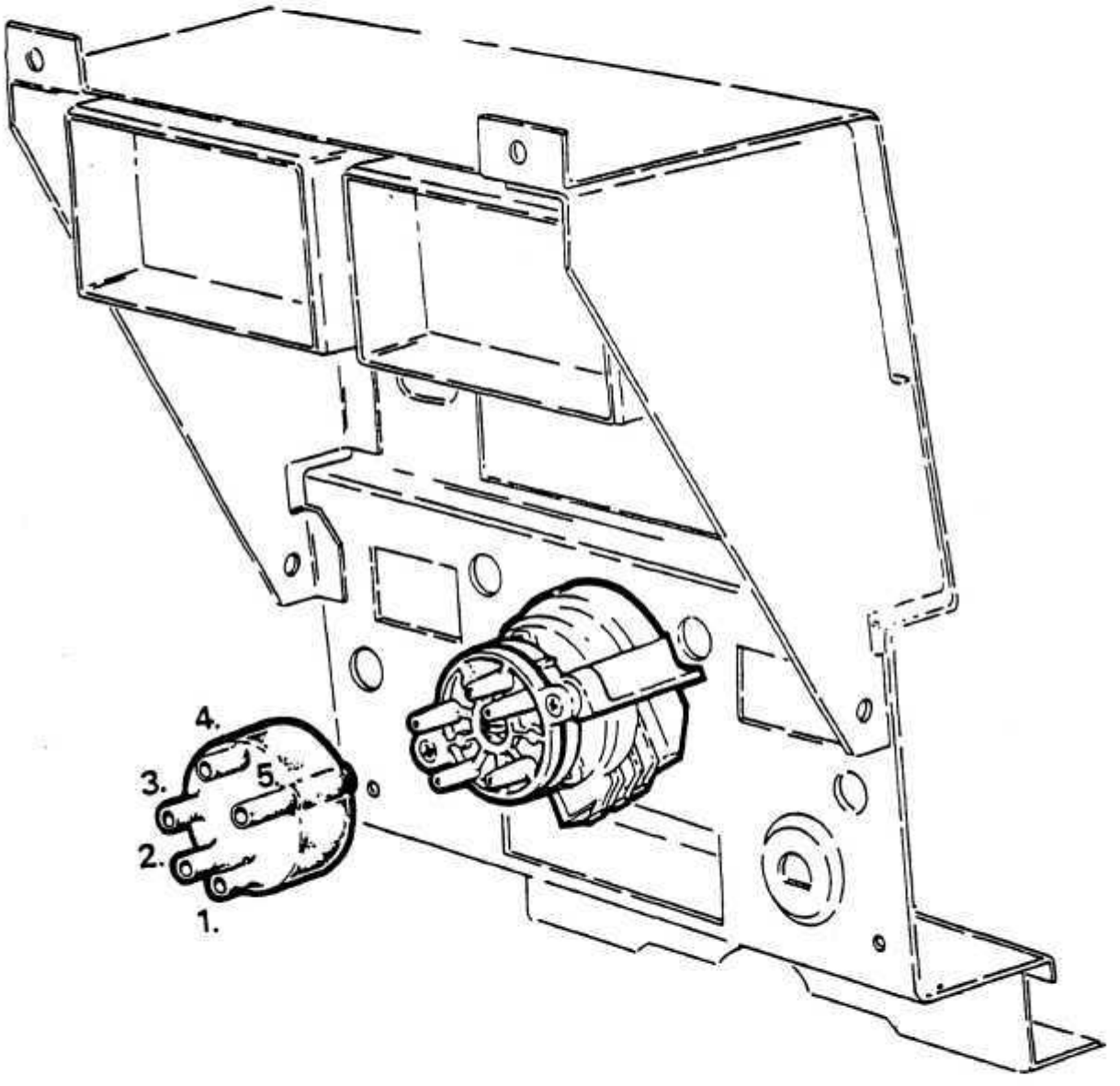


Fig. 52

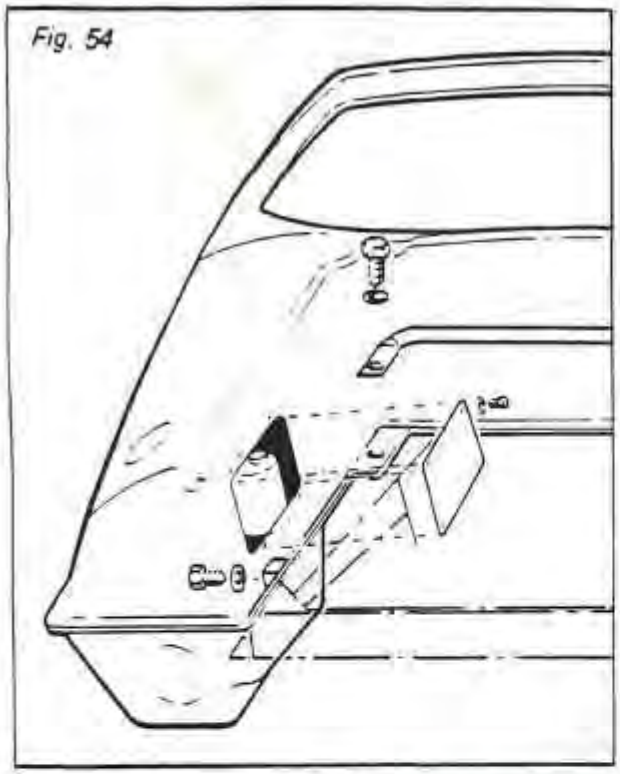


Fig. 54

13. Remove the recessed body mounting bolt each side in the front luggage compartment.

14. Ensure the air conditioning system has fully depressurized (see refrigerant handling precautions N:07:01) before releasing the compressor rear clamp bolt, and releasing the refrigerant hoses from the compressor. Cap hose ends and compressor parts immediately.

15. Release condenser hose connection, using two spanners of the correct size and capping ends immediately and/or accumulator bottom hose connection, slackening the accumulator mounting clamp if necessary to release hose. Cap ends immediately.

16. Release all hose retaining straps and clips.

17. Jack up the body from under the sills slowly and carefully JUST SUFFICIENTLY to enable the hose to be released and withdrawn from between the body and chassis. A lift of approximately 2 cm should be sufficient.

INSTALLING AIR CONDITIONING COMPRESSOR HOSES

1. Position the hose in its location along the frame, and check that the connection at each end can be made before fitting hose retaining clips.

2. Gently lower the body down onto frame checking for entrapment of wires etc.

3. Re-fit body mounting bolts in front luggage compartment, at front and rear either side of centre tunnel above rear spring platforms, and inside rear pontoons.

4. Re-connect compressor hose to accumulator and/or condenser ensuring that the connections are scrupulously clean, and coating the joints and threads with refrigeration oil – NOT ANY OTHER LUBRICANT. Tighten accumulator mounting clamp.

5. Re-fit hoses to compressor using new 'O' rings. Ensure that the connections are scrupulously clean and coat the joints and 'O' rings with refrigeration oil – NOT ANY OTHER LUBRICANT.

6. Re-fit seat belt mounting bolt on each side of centre tunnel.

7. By feeding hand through right hand pontoon aperture and into cold air trunking, feed trunking out through aperture into engine bay and connect to air temperature flap unit.

8. Re-fit charcoal canister and panel into LH rear pontoon, and secure with four screws.

9. Re-fit brake master cylinder to servo, and torque tighten two mounting nuts (refer to Brake Section).

10. With the front wheels pointing 'straight ahead' and the steering wheel centralised, slide the steering column upper universal joint onto the upper steering column. Torque tighten steering column upper and lower universal joint pinch bolts.

11. Re-fit luggage compartment access covers.

12. Re-fit both air deflector plates to rear underside, by clipping onto frame, and screwing to body.

13. Re-fit radiator air duct, and secure to body, spoiler and intake grille with screws.

14. Re-charge air conditioning system (refer to N:07:01).

REMOVING CONDENSER/EVAPORATOR HOSE

WARNING: Observe safety precautions regarding handling of Freon Gas Refrigerant while undertaking this procedure.

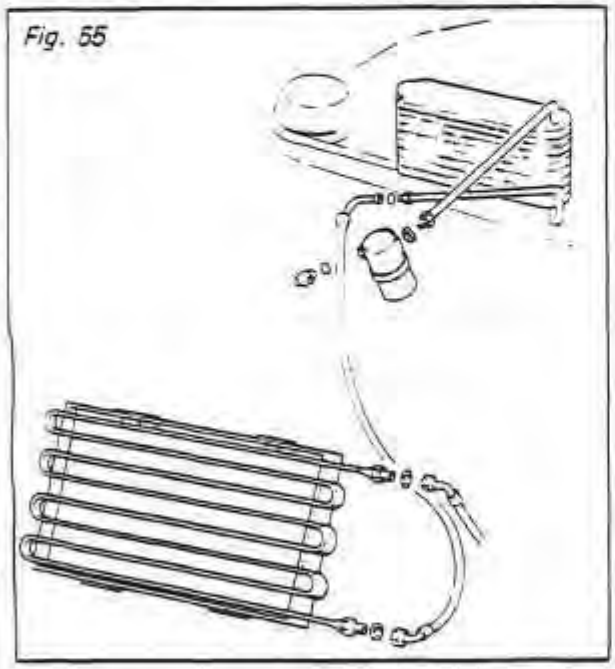


Fig. 55

1. De-pressurize air conditioning system (refer to N:07:01).

2. Release the condenser lower hose joint using two wrenches of the correct size to avoid twisting the condenser outlet tube. Cap ends immediately.

3. Release condenser hose from evaporator, using two wrenches and cap ends immediately.

4. Release all hose ties and remove hose from car.

INSTALLING CONDENSER/EVAPORATOR HOSE

1. Feed hose across front of chassis frame as removed.

2. Ensuring scrupulous cleanliness of accumulator and hose joint coat new joint 'O' ring and connector threads with refrigeration oil — NOT ANY OTHER LUBRICANT.

3. Ensuring scrupulous cleanliness of condenser and hose joint, coat new joint 'O' ring and connector threads with refrigeration oil — NOT ANY OTHER LUBRICANT.

Re-charge air conditioning system (refer to N:07:01).

REMOVING VACUUM ACTUATOR

Note:
The screen flap actuator may be replaced with the heater air conditioning unit in position in the vehicle.

1. Remove heater/air conditioning unit from the vehicle.

2. Remove the hexagon screw connecting the flap link rod to the actuator.

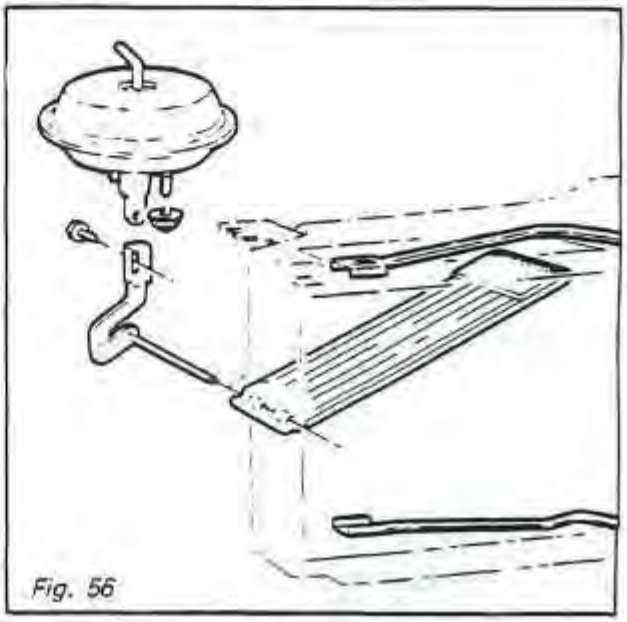


Fig. 56

3. Disconnect pipe to actuator if not already removed.

4. Remove two nuts securing actuator to casing or bracket, noting relative position of actuator to casing.

INSTALLING VACUUM ACTUATOR

1. Locate actuator, ensuring correct orientation, on casing or bracket and secure with two nuts.

2. Attach flap link rod to actuator link with hexagon screw.

3. While ensuring that the flap is fully seated, depress the actuator link 1 to 2 mm before tightening the link screw.

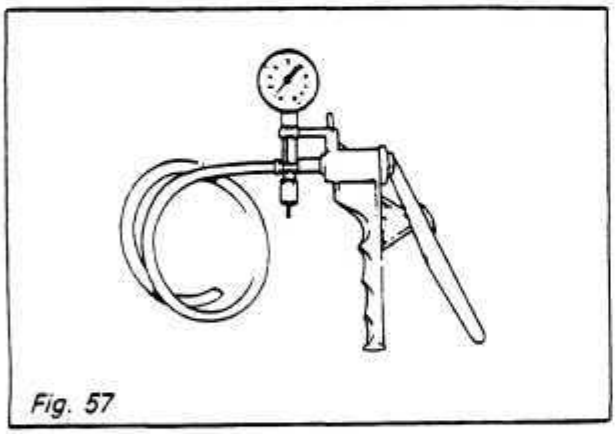


Fig. 57

4. Connect vacuum pump to actuator and test operation of flap to ensure that all flaps seat correctly in each operating position.

5. Re-fit heater/air conditioning unit to vehicle.

FITTING NEW COMPRESSOR DRIVE BELT

1. Release two adjuster bolts.

2. Slacken tension screw lock-nut and release belt tension by slackening tension screw.

3. Roll belt off compressor pulley.

4. Fit the new belt over the pulleys and tighten the tension screw until the belt may be deflected 6 – 10 mm (¼" – ⅜") from the straight line using moderate thumb pressure between crank and upper jockey pulley.

5. Tighten tension screw lock-nut, and adjuster clamp screws, and re-check belt tension. Run the engine briefly, switch off and re-check belt tension.

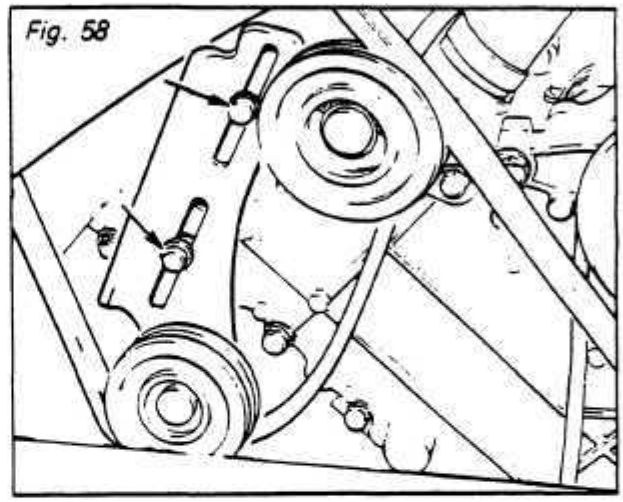


Fig. 58

REMOVING IDLER PULLEY ASSEMBLIES

1. Slacken two adjuster clasp bolts.

2. Slacken tension screw lock-nut and release belt tension by slackening tension screw.

3. Release adjuster clamp bolts and remove lower pulley and bracket assembly.

4. Re-fit clamp bolts and spacers to retain timing case inspection plate.

5. Release retaining bolt from upper pulley bracket and remove pulley assembly.

INSTALLING IDLER PULLEY ASSEMBLIES

1. Fit upper pulley bracket assembly, and secure with retaining bolt.

2. Fit compressor drive belt over crank, compressor, and upper idler pulleys.

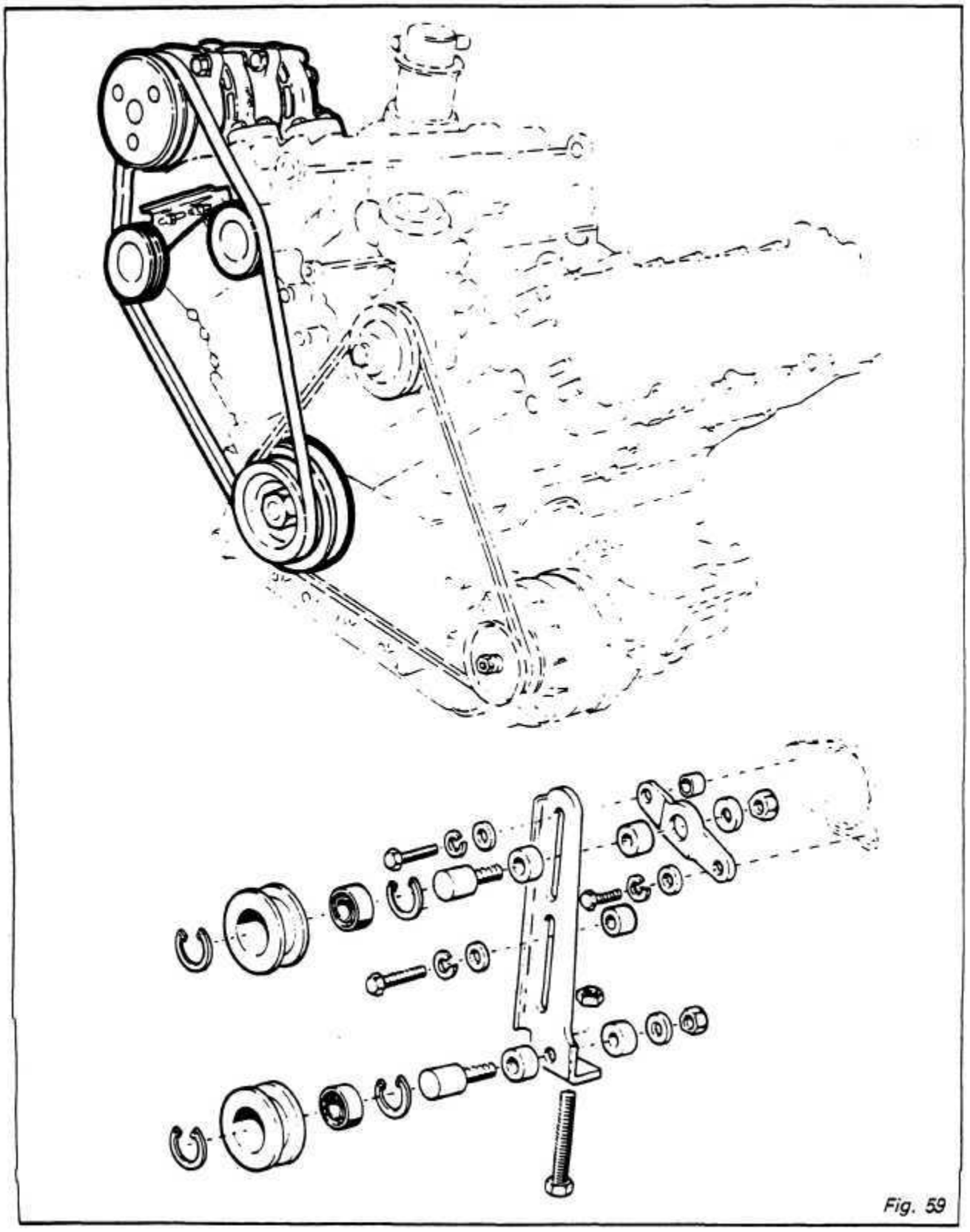


Fig. 59

3. Fit lower pulley assembly, engaging belt in pulley and retain bracket with two adjuster clamp bolts. Ensure the two clamp bolt spacers are fitted as shown.

4. Tighten the tension adjusting screw until the belt may be deflected 6 – 10 mm (¼" – ⅜") from the straight line using moderate thumb pressure between the crank and upper jockey pulley.

5. Tighten tension screw lock-nut and adjuster clamp screws and re-check belt tension. Run the engine briefly, switch off and re-check belt tension.

HEATING & FAULT DIAGNOSIS

PRESSURE CHECK DATA

AMBIENT DEGREE F	°C	High Side COMPRESSOR OUT PRESSURE PSI	Low Side PRESSURE PSI	AC DISCHARGE DEGREE F	°C
60	16	100 – 110	20 – 25	34 – 38	1 – 3
70	21	125 – 150	25 – 32	34 – 38	1 – 3
80	27	145 – 190	25 – 32	34 – 38	1 – 3
90	32	170 – 200	25 – 32	35 – 39	2 – 4
100	38	190 – 230	25 – 32	38 – 42	3 – 5
110	43	220 – 250	26 – 33	40 – 44	4 – 7
120	49	245 – 275	28 – 35	43 – 47	6 – 8
130	55	265 – 300	30 – 37	46 – 50	8 – 10

Temperatures and Pressures to be taken when Clutch cuts out.

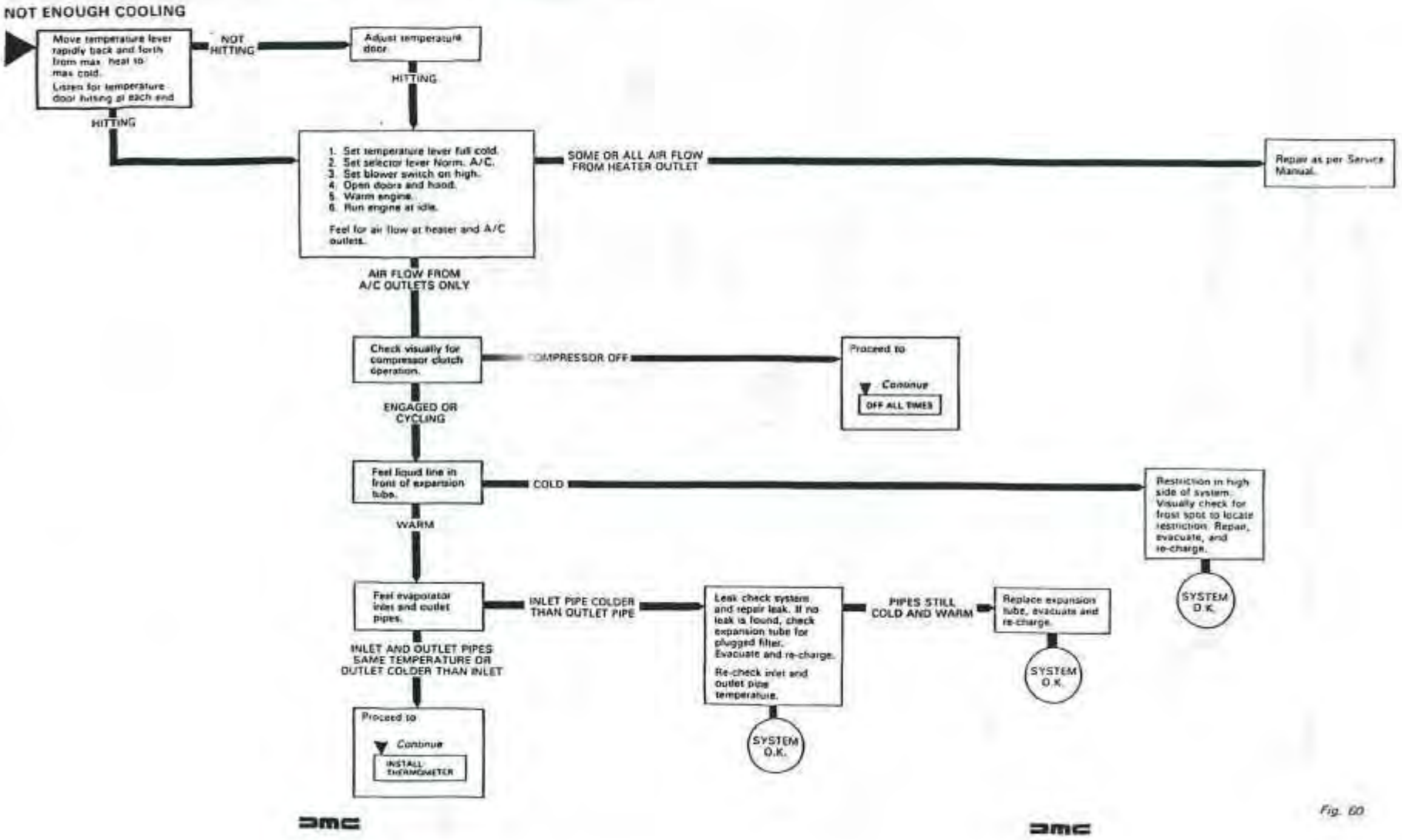

NOT ENOUGH COOLING
Move temperature lever rapidly back and forth from max. heat to max. cold.
Listen for temperature door hitting at each end
NOT HITTING
Adjust temperature door
HITTING
HITTING
1. Set temperature lever full cold.
2. Set selector lever Norm. A/C.
3. Set blower switch on high.
4. Open doors and hood.
5. Warm engine.
6. Run engine at idle.
Feel for air flow at heater and A/C outlets.
SOME OR ALL AIR FLOW FROM HEATER OUTLET
Repair as per Service Manual.
AIR FLOW FROM A/C OUTLETS ONLY
Check visually for compressor clutch operation.
COMPRESSOR OFF
Proceed to
Continue
OFF ALL TIMES
ENGAGED OR CYCLING
Feel liquid line in front of expansion tube.
COLD
Restriction in high side of system. Visually check for frost spot to locate restriction. Repair, evacuate, and re-charge.
SYSTEM O.K.
WARM
Feel evaporator inlet and outlet pipes.
INLET PIPE COLDER THAN OUTLET PIPE
Leak check system and repair leak. If no leak is found, check expansion tube for plugged filter. Evacuate and re-charge.
Re-check inlet and outlet pipe temperature.
PIPES STILL COLD AND WARM
Replace expansion tube, evacuate and re-charge.
SYSTEM O.K.
SYSTEM O.K.
INLET AND OUTLET PIPES SAME TEMPERATURE OR OUTLET COLDER THAN INLET
Proceed to
Continue
INSTALL THERMOMETER

Fig. 60

Continue

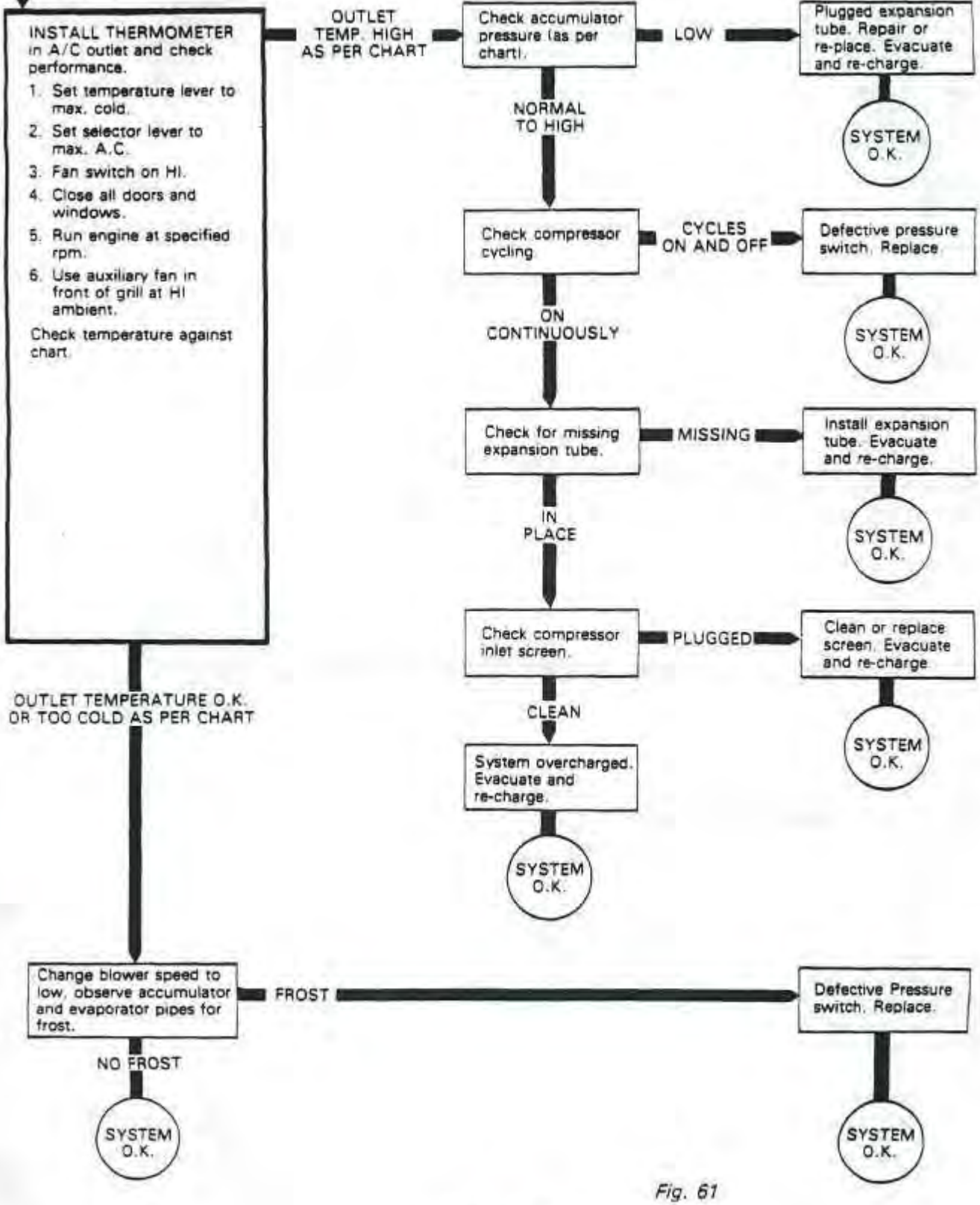


Fig. 61

Continue

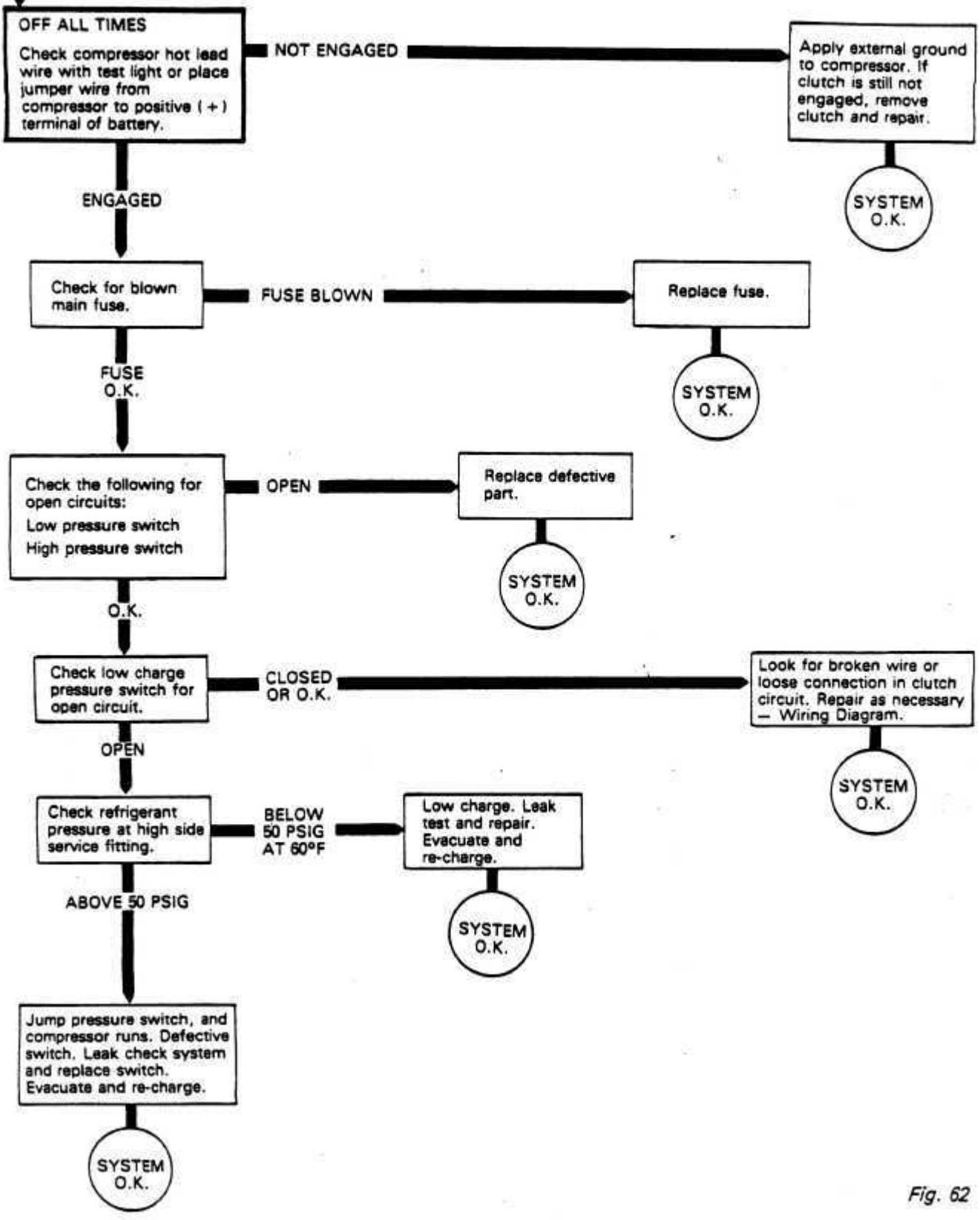


Fig. 62

NOT ENOUGH DE-ICE (DEFROST)

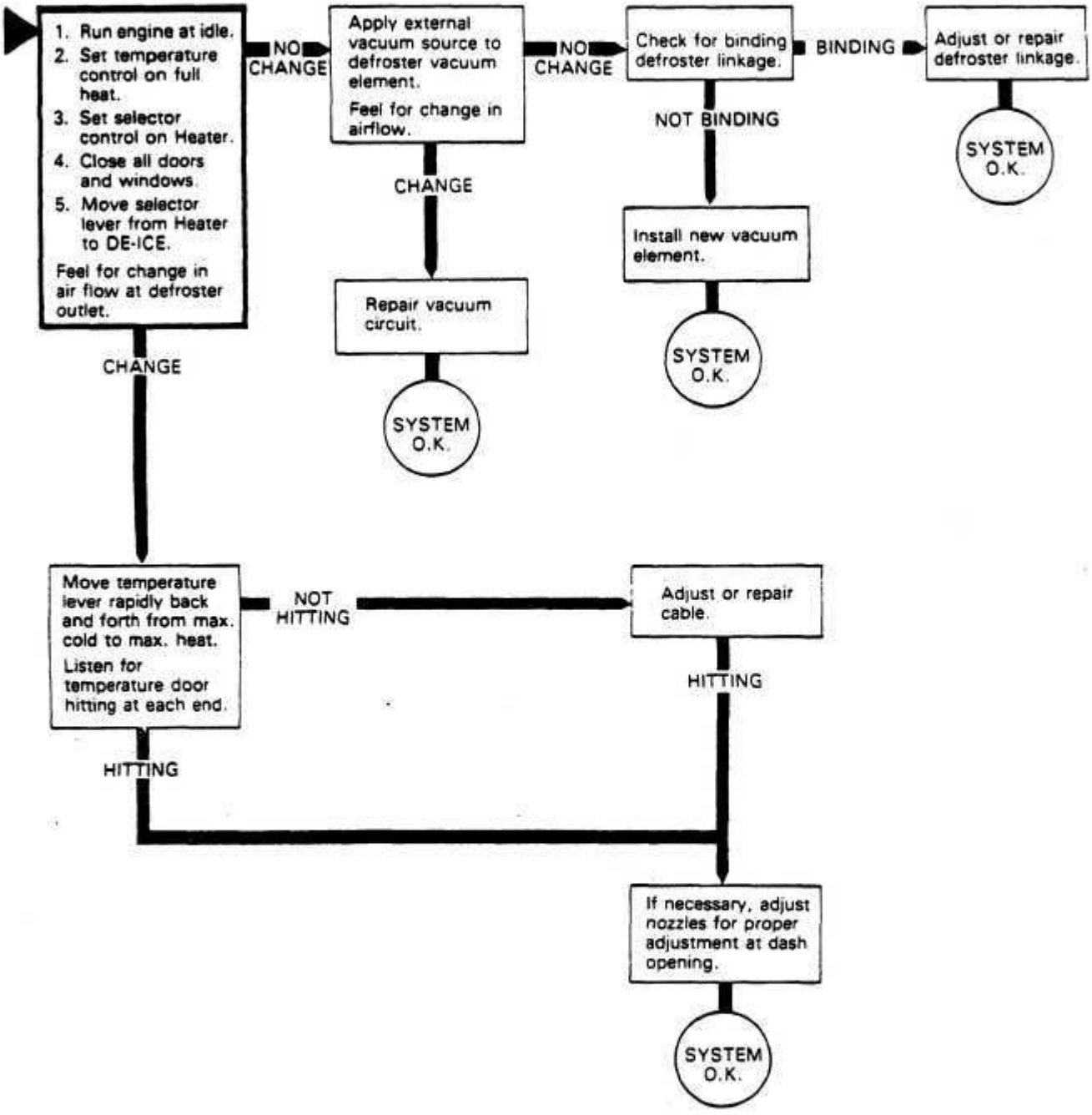
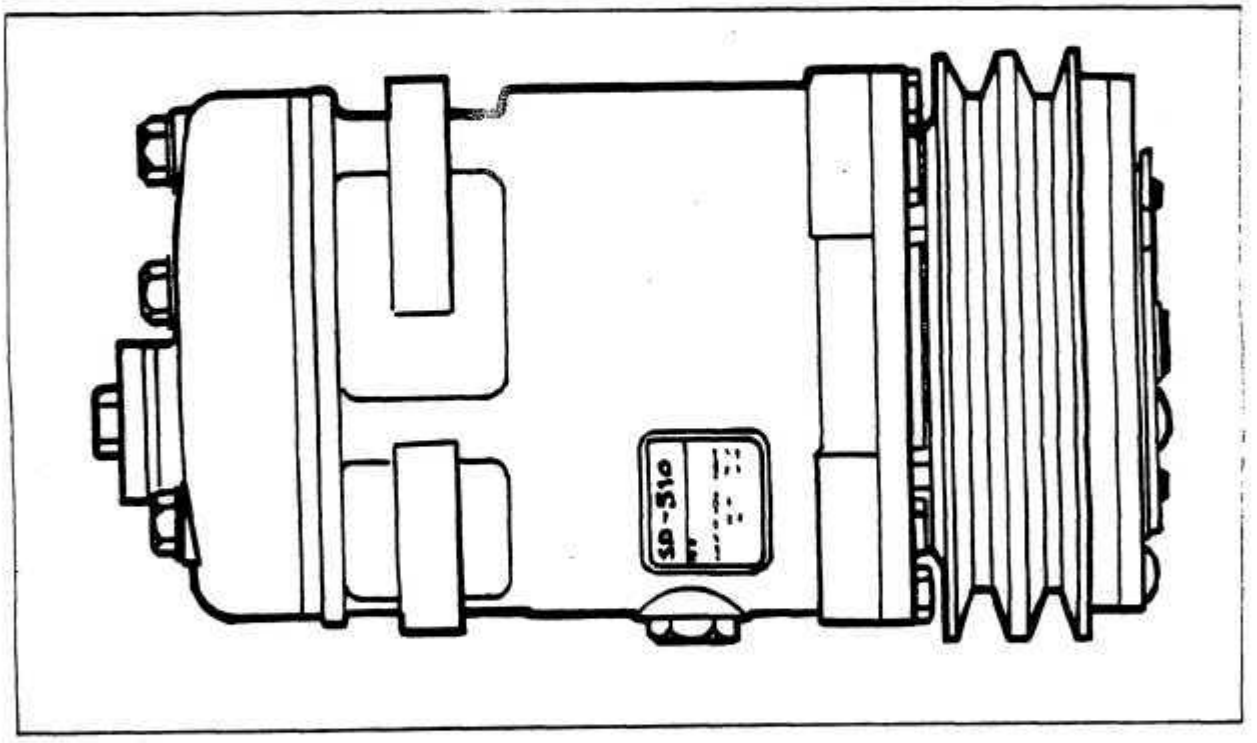


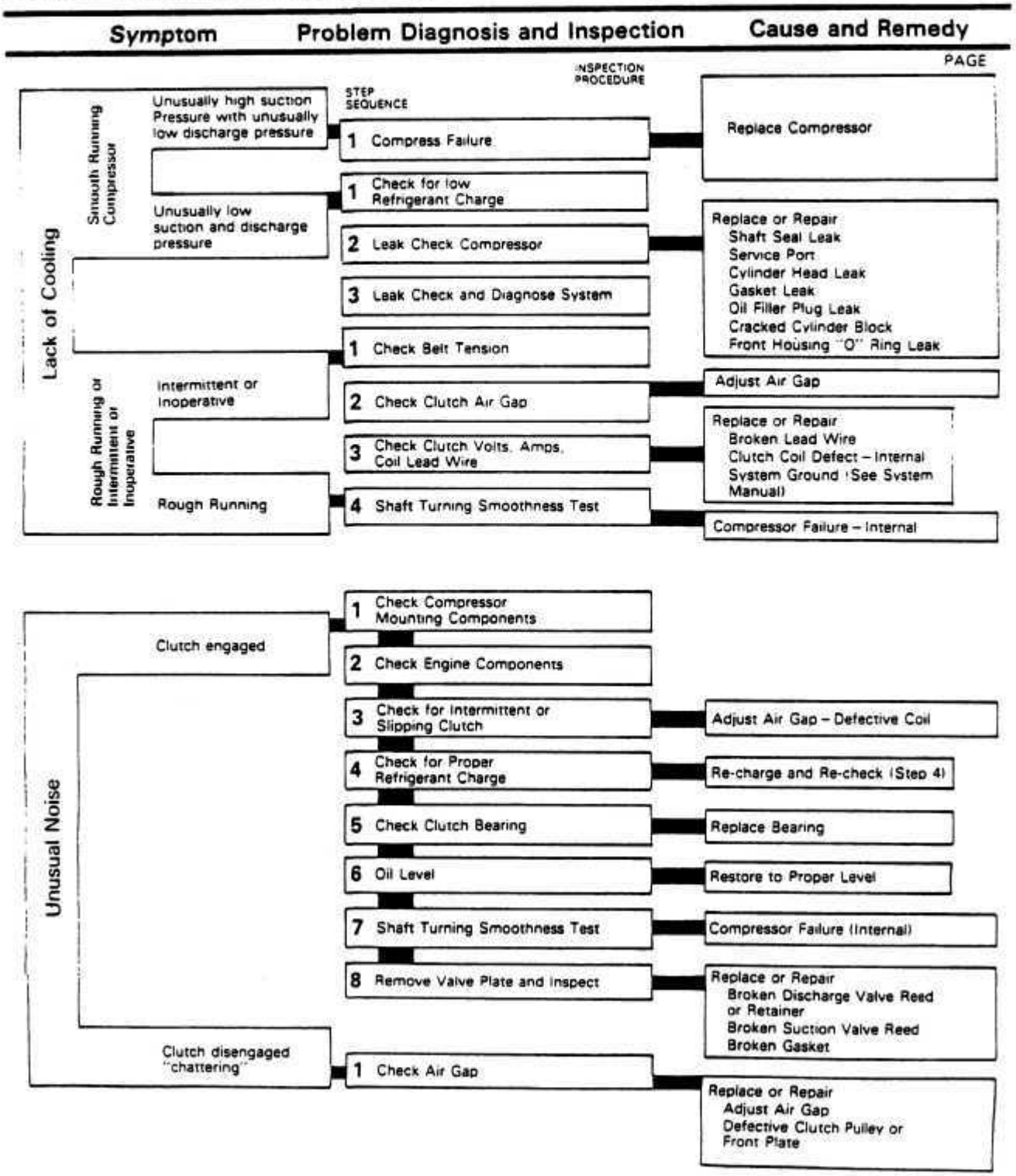
Fig. 63

COMPRESSOR



TROUBLE SHOOTING CHART

This chart refers specifically to the Sankyo compressor. During diagnosis follow the inspection procedures in the sequence shown until a defect is found. Then perform the repair in the Cause and Remedy Section. If this repair does not fully solve the problem, proceed to the next Inspection Step.



The preceding Trouble Shooting Chart is a useful tool for systematically pursuing a course of repair. The following are specific inspection procedures:

LEAK CHECK

(R) means the compressor can be repaired.

(NR) means non-repairable. The compressor will have to be replaced.

Visual

Seeping oil does not necessarily indicate leaking refrigerant. Look for the following problems:

- Shaft seal area seeping oil. Feel under seal area between clutch and compressor. (R)
- Dislocation of front housing "O" ring (protruding section). (NR)
- Oil around cylinder head (gasket, service port, fittings). (R)
- Oil around filler hole. "O" ring. (R) Stripped threads. (NR)
- Oil around crack in cylinder block. (NR)

General

Always clean away all oil, grease, etc. and blow away residual refrigerant before starting detection. Refer to System or Supplier Manuals for the proper techniques to be used for Halide or "Electronic" Leak Detectors.

Halide Flame Detectors — Any portion of the compressor, including the seals, which shows a leak indication on the flame will require leak repair.

"Electronic"–Shop-Type Detectors* — In the seal area, set the instrument ¼ to ⅓ range above maximum sensitivity. All other portions of the compressor — set the detector at maximum sensitivity. (*Detectors with a minimum leak rate of ½ to 1 oz. per year.)

"Soap Bubble" Detection — Any bubbles on any portion of the compressor indicate a leak requiring repair.

Note:
A useful device for finding a shaft seal leak, while the compressor is installed. Bend a 90° angle, making about a ¾" leg, on a 12" piece of ¼" copper tube. Insert the straight end into the detector hose. The "leg" can easily be inserted into one of the clutch front plate holes.

OIL CHECK PROCEDURES

Whenever a system component has been replaced or there is an obvious oil leak, follow the procedures below . . . after repairs have been made.

Procedure A — Fig. 65

Step 1 — Determine the mounting angle. Position the Angle Gauge (No. 32448) across the flat surfaces of the two front mounting ears. Centre the bubble. Read the mounting angle to the closest degree. (This will be important in Step 5.)

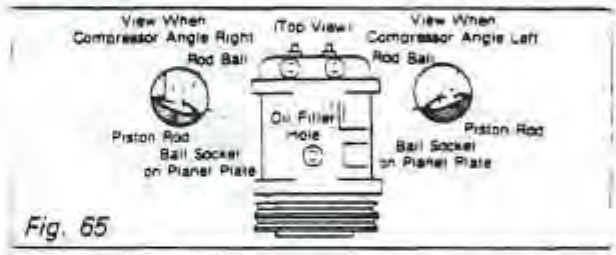


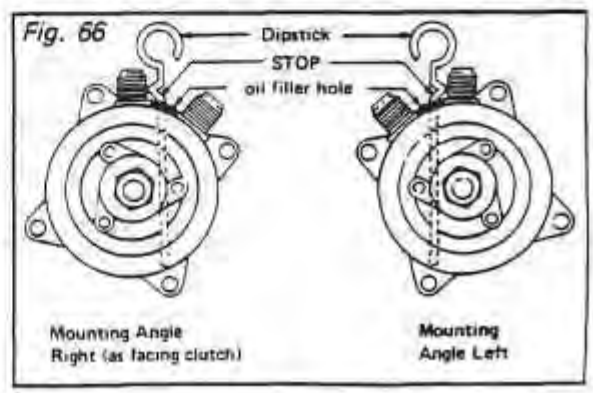
Fig. 65

Step 2 — Remove the oil filler plug. Look through the oil filler plug hole and rotate the clutch front plate to position the internal parts as shown in the figure above.

Compressor mounted to the right (facing clutch) — Center the parts as they are moving to the rear of the compressor (discharge stroke).

Compressor mounted to the left (facing clutch) — Center the parts as they are moving to the front of the compressor (suction stroke).

This step is necessary to clear the dipstick of internal parts and allow its insertion to full depth.



Step 3 — Insert the dipstick to its STOP position. (Use Figure above as a guide.) The STOP is the angle near the top of the dipstick. *Fig. 66*

- Point of the angle must be to the left, if mounting angle is to the right.
- Point of the angle must be to the right, if mounting angle is to the left.
- The bottom surface of the angle, in either case, **must be flush with the surface of the oil filler hole.**

Step 4 — Remove dipstick. Count increments of oil.

Step 5 — Use the table below to determine the correct oil level for the mounting angle of the compressor.

Step 6 — If the increments read on the dipstick do not match the table, add or subtract oil to the mid-range value. For example, if the mounting angle of the SD-508 is 10°, and the dipstick increment is 3, add oil in one (1) fluid ounce increments until 7 is read on the dipstick.

Mounting Angle Degree	Acceptable Oil Level in Increments			
	505	507	508	510
0	4-6	3-5	4-6	2-4
10	6-8	5-7	6-8	4-5
20	8-10	6-8	7-9	5-6
30	10-11	7-9	8-10	6-7
40	11-12	8-10	9-11	7-9
50	12-13	8-10	9-11	9-10
60	12-13	9-11	9-12	10-12
90	15-16	9-11	9-12	12-13

Step 7 — Install the oil filler plug.

- First check that the sealing "O" ring is not twisted.
- Seat and "O" ring must be clean.
- Torque plug to 6–9 foot-pounds (0.8–1.2 kg-m). Do not overtighten the plug to stop a leak. Remove the plug. Install a new "O" ring.

Procedure B

It is not necessary to check the oil level as routine maintenance. However, should there be good reason to suspect an incorrect oil level or it is specified in a diagnosis procedure to check the oil, follow these steps:

Step 1 — Run the compressor for 10 minutes at engine idle RPM.

Step 2 — Recover all Refrigerant-12 from the system. Be careful not to lose oil.

Step 3 — Proceed with Steps 1 through 7 in Procedure A above.

SHAFT TURNING SMOOTHNESS TEST (Compressor Installed)

Step 1 — Disconnect refrigerant hoses.

Step 2 — Disengage clutch.

Step 3 — Uncap fittings.

Step 4 — Rotate compressor shaft, using ¾" socket and wrench on shaft nut.

Step 5 — While rotating, if severe rough spots or "catches" are felt, replace the compressor.

CLUTCH TEST

Step 1 — If field coil lead wire is broken, replace field coil.

Step 2 — Check amperage and voltage. The amperage range requirement is 3.6 to 4.2 at 12 volts. Note the following symptoms and remedies:

- A very high amperage reading — A short within the field coil.
- No amperage reading — An open circuit in the winding.
- An intermittent or poor system ground results in lower voltage at the clutch. Check for tight fit of coil retaining snap ring or coil retaining screws for good ground. Consult Systems Manual to determine proper system ground.
- Replace field coil for open or short circuit.

Step 3 — Air Gap — An incorrect air gap could cause erratic engagement or disengagement and/or clutch rattle. Check the air gap with a feeler gauge (.016" – .031"). Adjust based on Clutch Service Section, page N:10:09.

Step 4 — Suspected Bearing Noise — Do the following:

- Remove belt. Disengage clutch.
- Rotate rotor pulley by hand.
- Listen for bearing noise. Feel for hard spots. If excessive, replace rotor pulley and clutch front plate assembly or bearing set.

UNUSUAL NOISE

Compressor Mounting Components

Check for:

- Loose belt, torque to 80 – 90 ft. lbs.
- Broken bracket and/or compressor mounting ear, replace broken component.
- Missing, broken or loose bolts at compressor and engine fixing points.
- Flush fit at all points and replace any bracket component not fitting properly. Torque bolts to engine using manufacturer's specifications.
- Loose or wobbling crankshaft pulley, and for center bolt torque and "bottoming". Repair to bracket manufacturer's specifications.
- Rough idler pulley bearing. Replace if necessary.

Engine Component Noise

Check for noise in:

- Alternator bearing.
- Air pump (if any).
- Water pump bearing.
- Engine valves.
- Timing mechanism.
- Loose engine mounting bolts.

Refrigerant Charge

- A 0 – 5 psig or lower suction pressure due to a low refrigerant charge can cause unusual noise. Restore refrigerant to proper level.
- Re-test by applying heat to evaporator for higher suction pressure.

Clutch Bearing

See Clutch Test.

Oil Level

Insufficient oil can cause unusual noise. See Oil Check — Procedure "B".

Valve Noise

Check for a broken or distorted reed valve or broken gasket.

VALVE PLATE TEST

Valve plate failures (suction or discharge valve or gasket) may be determined with the compressor installed on the car.

Discharge or Suction Valve Breakage — When compressor is operated at idling speed, compressor makes a "clacking" sound.

Head Gasket Breakage — At idling speed, discharge pressure does not increase to normal condition and suction pressure is high.

Checking Method of Discharge Valve and Head Gasket by Pressure Balancing Test —

Step 1 — Connect manifold gauge set to suction and discharge service ports.

Step 2 — Run compressor for 5 minutes at idling speed and stop.

Step 3 — Measure elapsed time that discharge pressure is balanced to suction pressure. If less than 2 minutes, it is determined that discharge valve or head gasket is broken.

CLUTCH SERVICE

General

All clutch service operations should be performed on the bench. Service operations described below apply to all clutches:

- The clutches for all models include a visible counterweight on the front plate to improve dynamic balance. The counterweight clutch fits all models which have a controlled compressor shaft keyway so that the counterweight offsets the cam angle. The clutch without the counterweight fits 1979 and prior models.

Steps for Clutch Removal

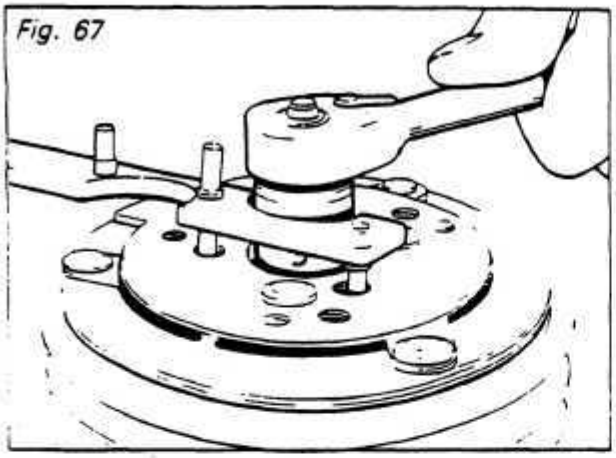


Fig. 67

Step 1 – Insert the two pins of the front plate spanner into any two threaded holes of the clutch front plate. Hold clutch plate stationary. Remove hex nut with ¾" (19 mm) socket. *Fig. 67*

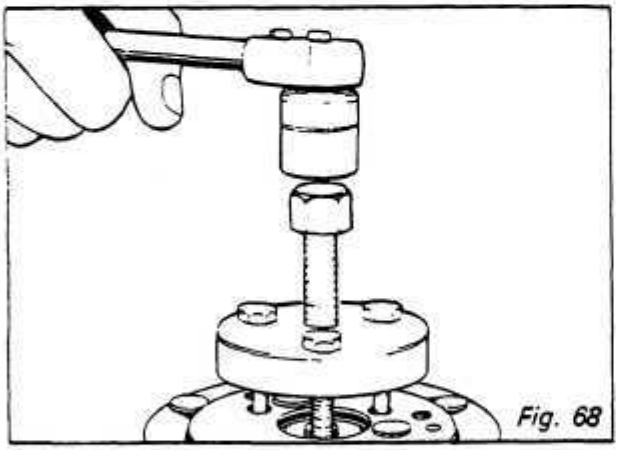


Fig. 68

Step 2

- Remove clutch front plate using puller (No. 32416). Align puller center bolt to compressor shaft. Thumb tighten the three puller bolts into the threaded holes.
- Turn center bolt clockwise with ¾" (19 mm) socket until front plate is loosened. *Fig. 68*

Note:
Steps 1 and 2 must be performed before servicing either the shaft seal or clutch assembly.

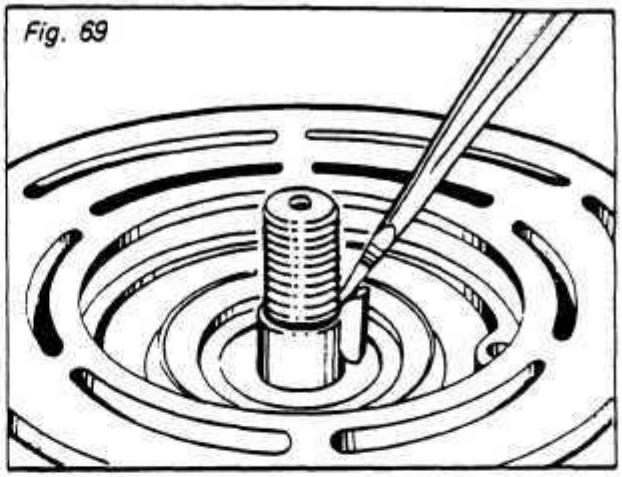


Fig. 69

Step 3 – Remove shaft key by lightly tapping it loose with a slot screw driver and hammer. *Fig. 69*

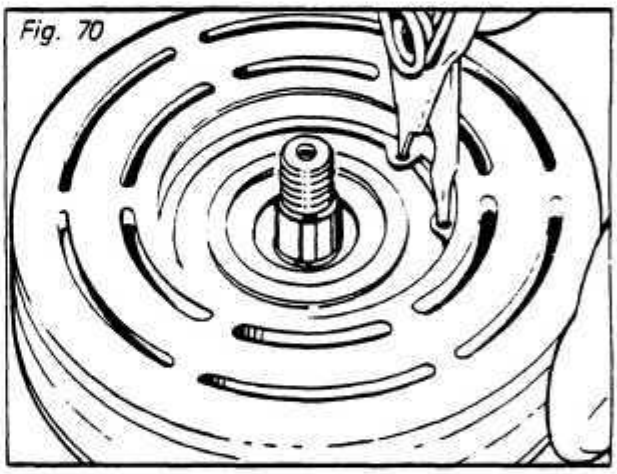


Fig. 70

Step 4 – Remove the internal bearing snap ring by using snap ring pliers (Pinch type). *Fig. 70*

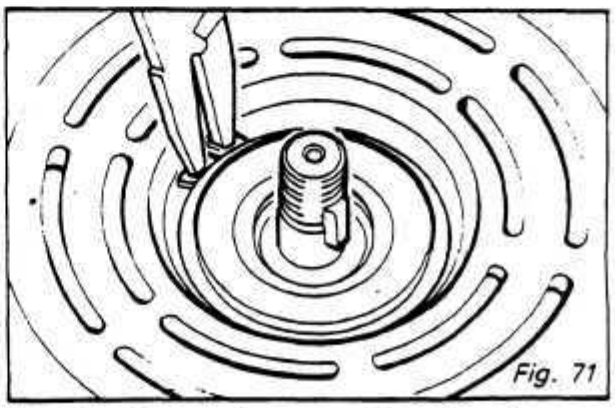


Fig. 71

Step 5 – Remove the external front housing snap ring by using snap pliers (Spread type). *Fig. 71*

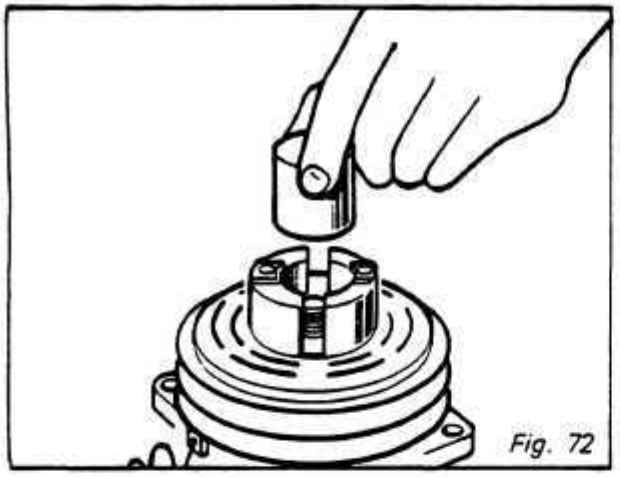


Fig. 72

Step 6 – Remove rotor pulley assembly:

- Insert the lip of the lip of the jaws into the snap ring groove. (Snap ring removed in Step 4.) Place rotor puller shaft protector (Puller set) over the exposed shaft. *Fig. 72*

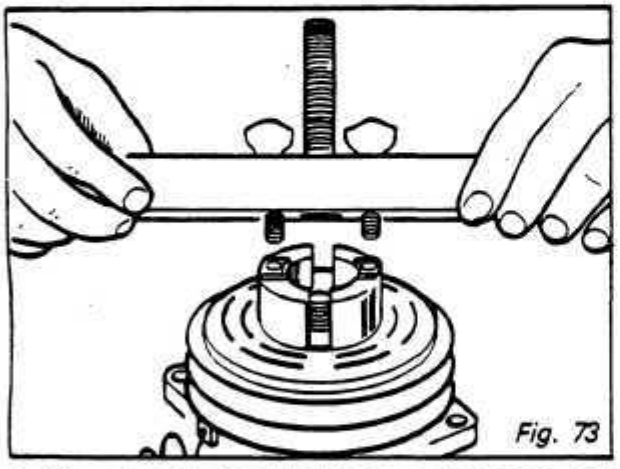


Fig. 73

- Align thumb head bolts to puller jaws and finger-tighten. *Fig. 73*

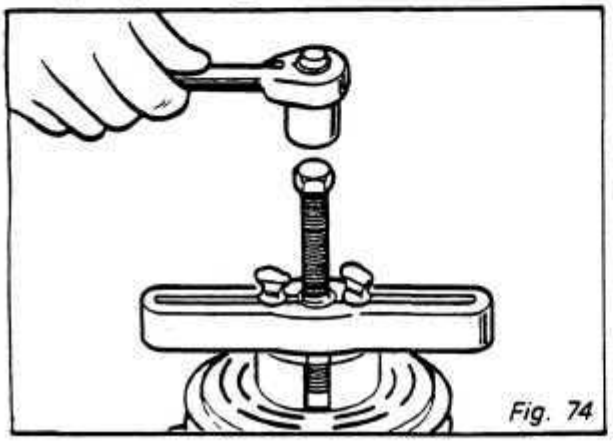


Fig. 74

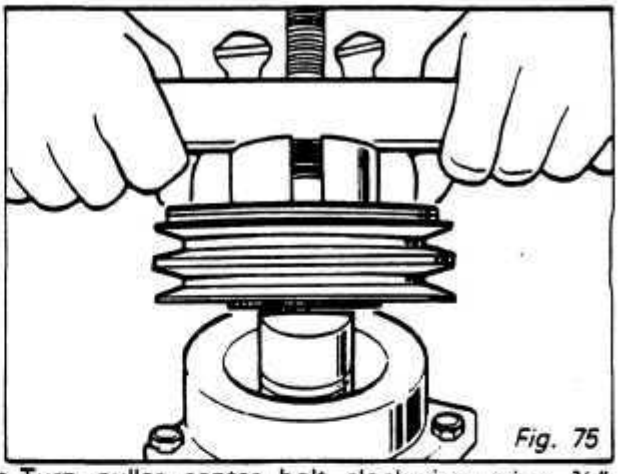


Fig. 75

- Turn puller center bolt clockwise using ¾" socket until rotor pulley is free. *Figs. 74 – 75*

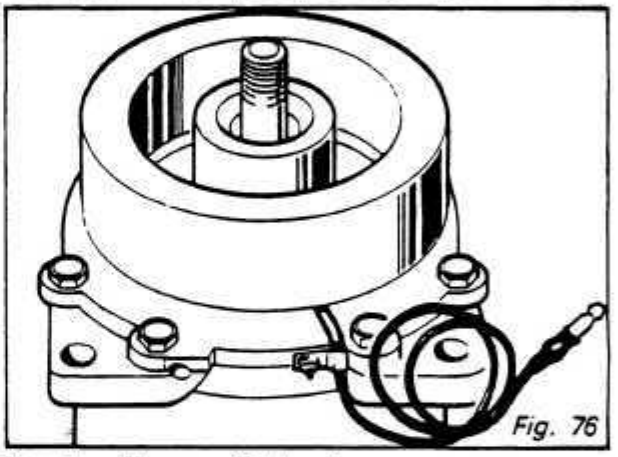


Fig. 76

Step 7 – Remove field coil:

- Loosen coil lead wire from clip on top of compressor front housing. (Earlier models do not use this clip.) *Fig. 76*

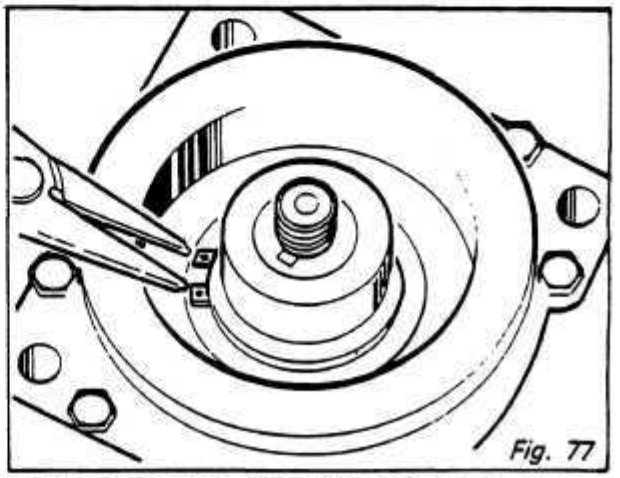


Fig. 77

- Using snap ring pliers (Spread type), remove snap ring and field coil. *Fig. 77*

Steps for Clutch Installation

Step 1 — Install field coil. Reverse the procedure outlined in Step 7 — Removing Clutch. Coil flange protrusion must match hole in front housing to prevent coil movement and correctly locate lead wire.

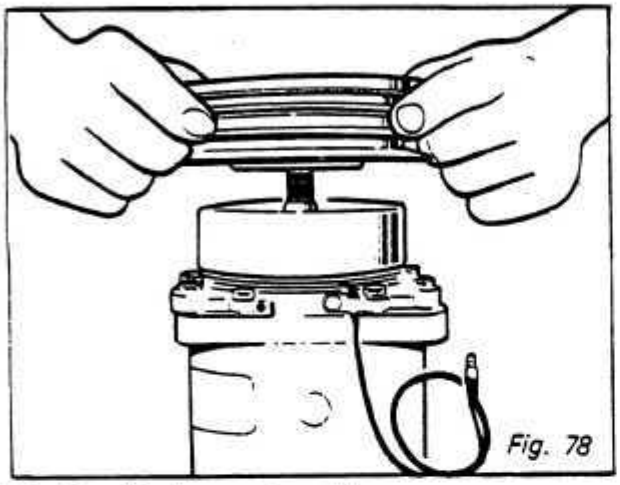


Fig. 78

Step 2 — Replace rotor pulley.

- Support the compressor on the four mounting ears at the compressor rear. If using a vice, clamp only on the mounting ears . . . **never on the compressor body.**
- Align rotor assembly squarely on the front housing hub. *Fig. 78*

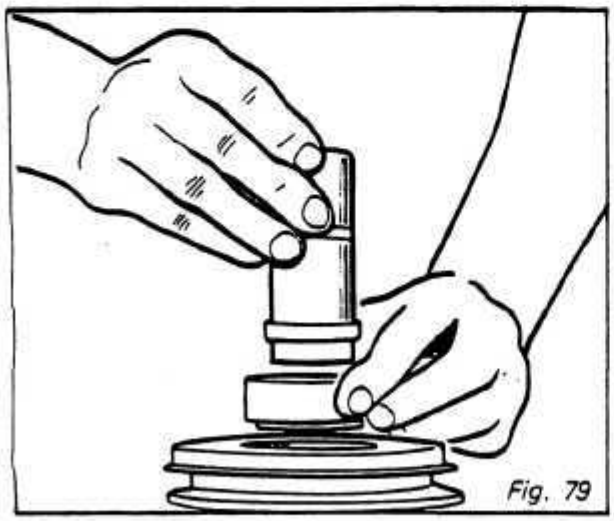


Fig. 79

Using Rotor Installer Set, place the ring part of the set into the bearing cavity. Make certain the outer edge rests firmly on the rotor bearing outer race.

- Place the tool set driver into the ring as shown. *Fig. 79*

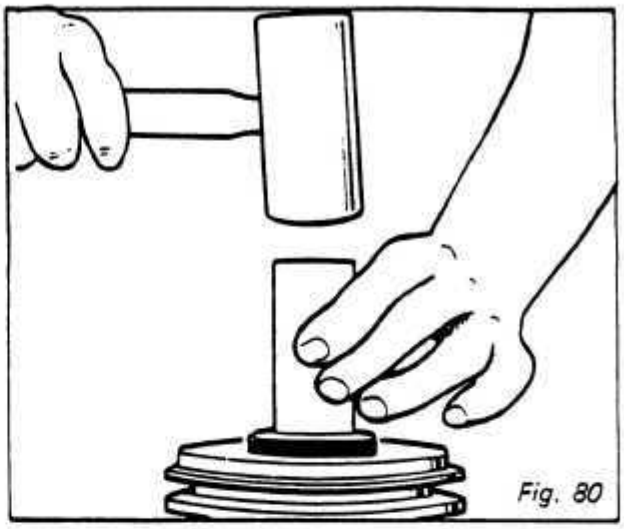


Fig. 80

- With a hammer, tap the end of the driver while guiding the rotor to prevent binding. Tap until the rotor bottoms against the compressor front housing hub. Listen for a distinct change of sound during the tapping process. *Fig. 80*

Step 3 — Reinstall internal bearing snap ring with pliers (Pinch type).

Step 4 — Reinstall external front housing snap ring with pliers (Spread type).

Step 5 — Replace front plate assembly.

- Check that the original clutch shims are in place on compressor shaft.
- Replace compressor shaft key.
- Align front plate keyway to compressor shaft key.

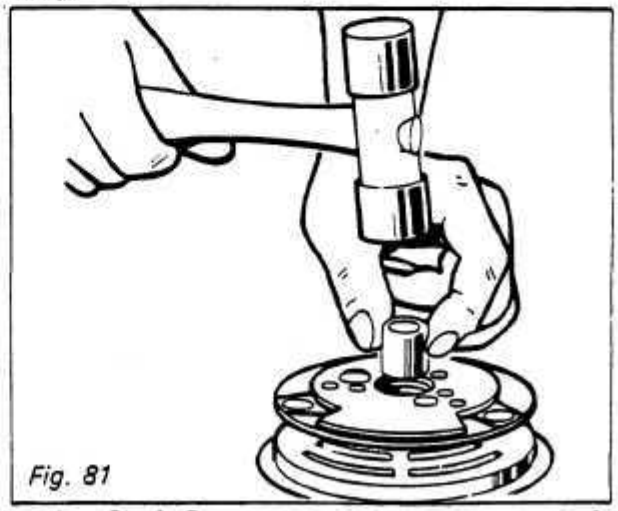


Fig. 81

- Using Shaft Protector, tap front plate to shaft until it has bottomed to the clutch shims. Note distinct sound change. *Fig. 81*

Step 6 — Replace shaft hex nut. Torque to 25 – 30 ft. lbs.

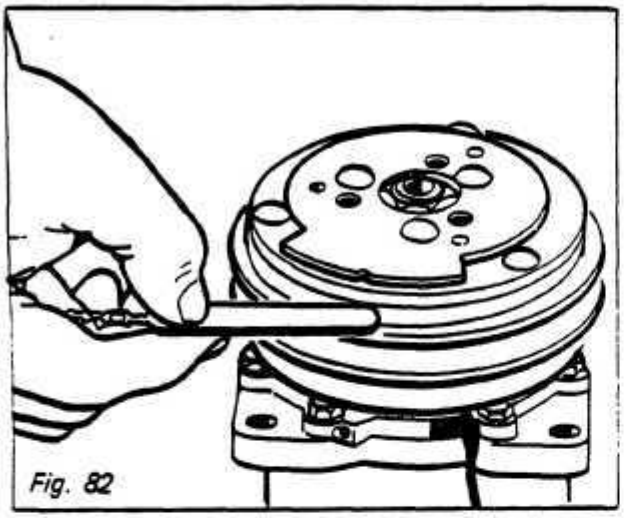


Fig. 82

Step 7 — Check air gap with feeler gauge (No. 32437) to .016" to .031". If air gap is not consistent around the circumference, lightly pry up at the minimum variations. Lightly tap down at points of maximum variation. *Fig. 82*

Note:

The air gap is determined by the spacer shims. When re-installing or installing a new clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use .040, .020, and .005 shims from the clutch accessory sack.

If the air gap does not meet the specification in Step 7, add or subtract shims by repeating Steps 5 and 6.

SHAFT SEAL SERVICE

Steps for Shaft Seal Removal

Step 1 — Repeat Steps 1 and 2 in Clutch Removal Section.

Step 2 — Refer to Figures 85 – 86

Shaft seal replacement should be done on the bench. Never use any old parts of the shaft seal assembly. Renew the complete assembly. A felt ring and retainer for oil absorption were introduced in production model year 1978.

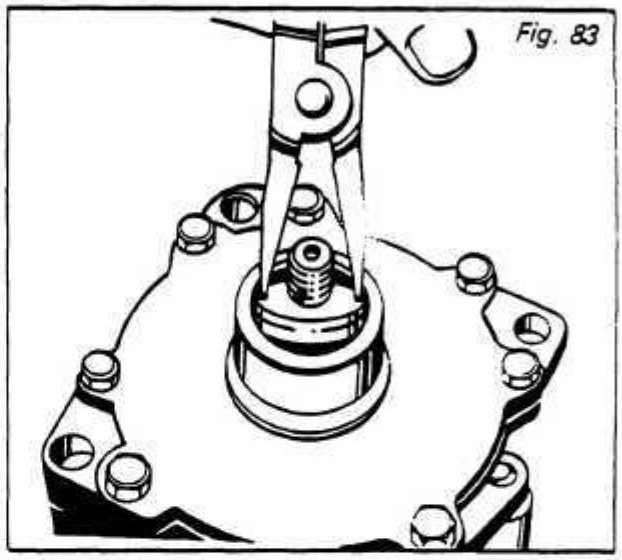


Fig. 83

Step 3 — Using either of the snap ring tools, insert the tool points into the two holes of the felt ring metal retainer and lift out the felt ring. *Fig. 83*

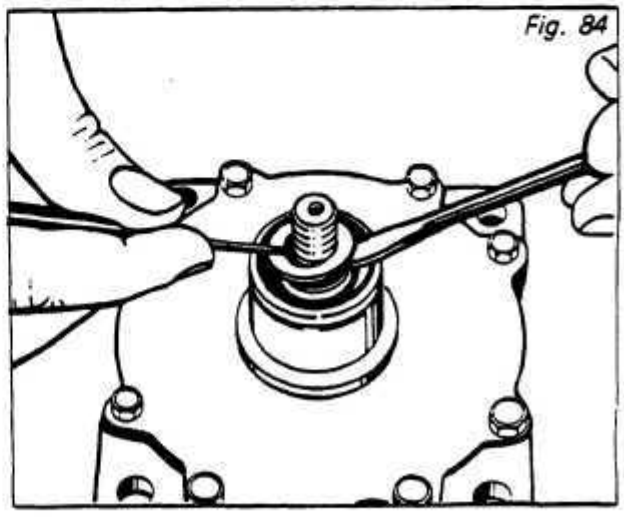


Fig. 84

Step 4 — Remove the clutch shims. Use "O" ring hook and a small screw driver (as shown) to prevent shim from binding on shaft. *Fig. 84*

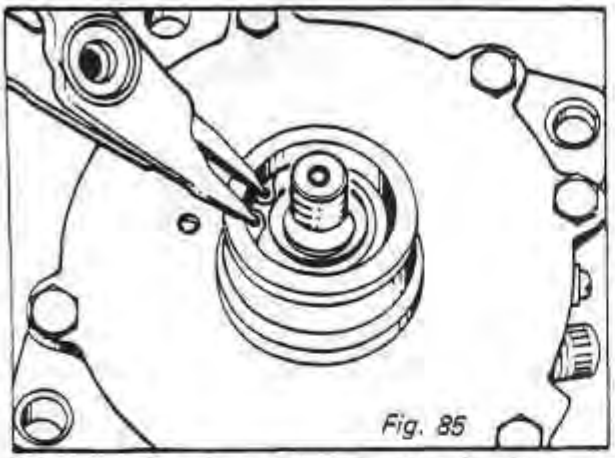


Fig. 85

Step 5 – Remove shaft seal seat retaining snap ring with pliers (Pinch type). *Fig. 85*

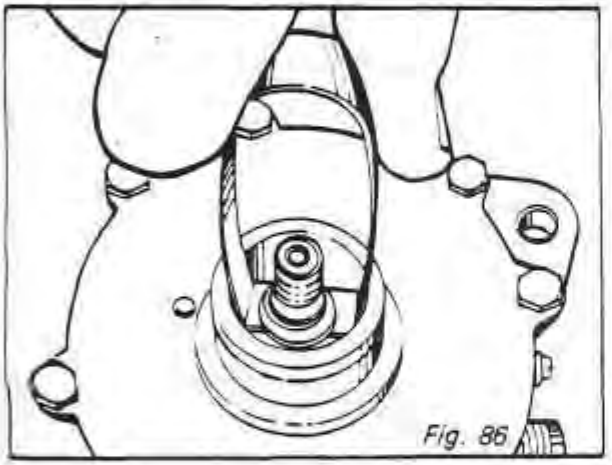


Fig. 86

Step 6 – Remove the shaft seal seat, using tongs. *Fig. 86*

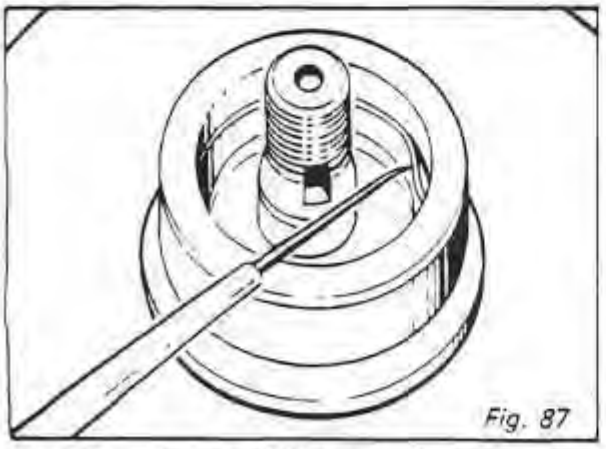


Fig. 87

Step 7 – *Use* the "O" ring hook to remove the shaft seal "O" ring. Be careful not to scratch the groove. *Fig. 87*

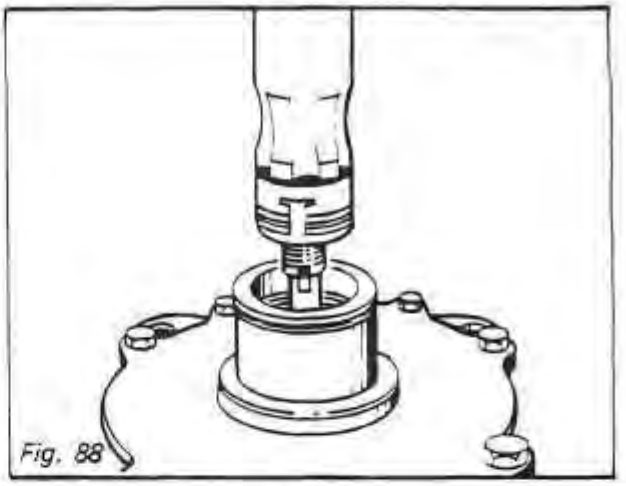


Fig. 88

Step 8 – Insert the Seal Remover and Installer Tool against the seal assembly. Press down against the seal spring and twist the tool until feeling it engage in the slots of the seal cage. Lift out seal assembly. *Fig. 88*

STEPS FOR SHAFT SEAL REPLACEMENT

Step 1 – Clean seal cavity thoroughly:

- Clean with R – 11 or R – 12. Blow out with **dry** pressurized vapor.
- Clean thoroughly with a "lint-free" or synthetic cloth and clean refrigerant oil. Then blow out with **dry** pressurized vapor.

Make sure all foreign substances are thoroughly removed.

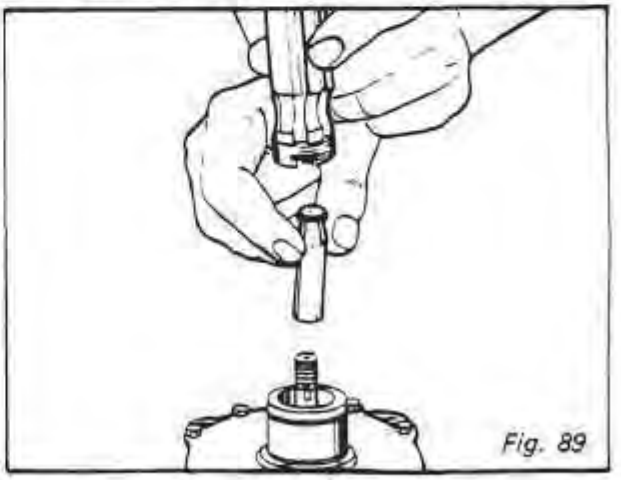


Fig. 89

Step 2 – Insert Seal Sleeve Protector over compressor shaft. *Fig. 89*

Step 3 – Do not touch the new seal lapping surfaces. Dip the mating surfaces in clean refrigerant oil before proceeding.

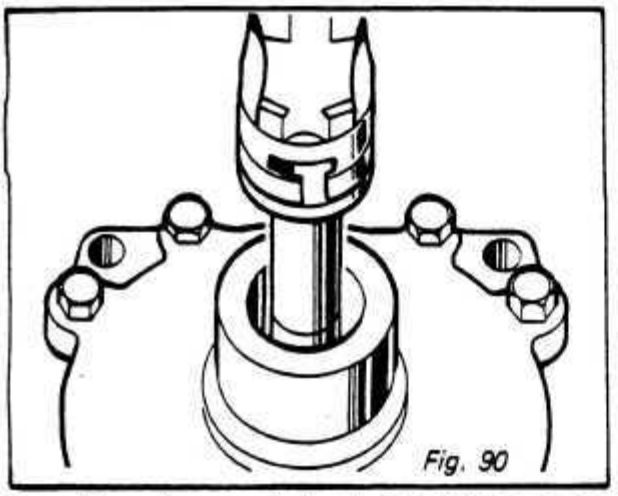


Fig. 90

Step 4 – Engage slots of Seal Remover and Installer to new seal cage and insert seal assembly firmly into place in the compressor seal cavity. Twist tool in opposite direction to disengage tool from seal cage. Remove tool. *Fig. 90*

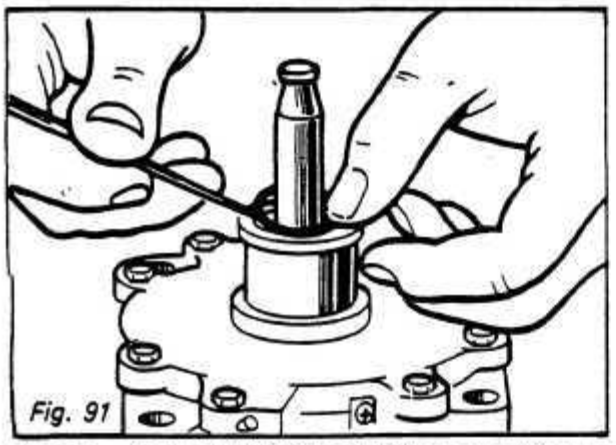


Fig. 91

Step 5 – Coat new "O" ring with clean refrigerant oil. Place carefully in the seal groove with "O" ring hook. Do not scratch surface. *Fig. 91*

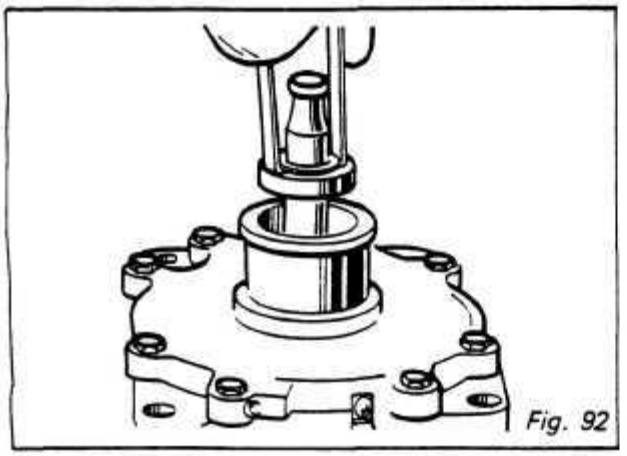


Fig. 92

Step 6 – Coat seal retainer with clean refrigerant oil. Use tongs to install. Press lightly against seal. *Fig. 92*

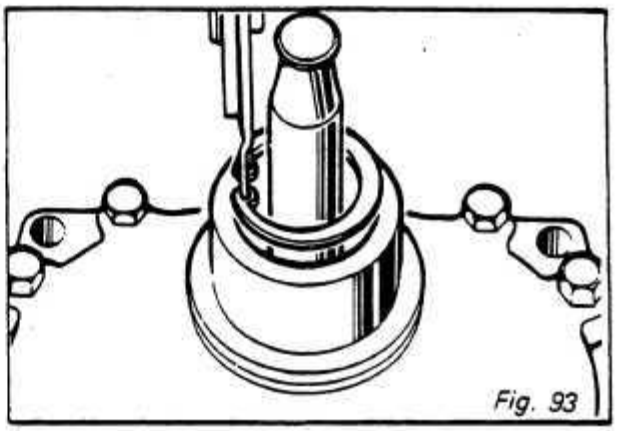


Fig. 93

Step 7 – Re-install snap ring. Beveled edge lies outward (away) from compressor. Flat side lies toward compressor. It may be necessary to lightly tap the snap ring to securely position it in its groove. *Fig. 93*

Step 8 – Replace clutch spacer shims.

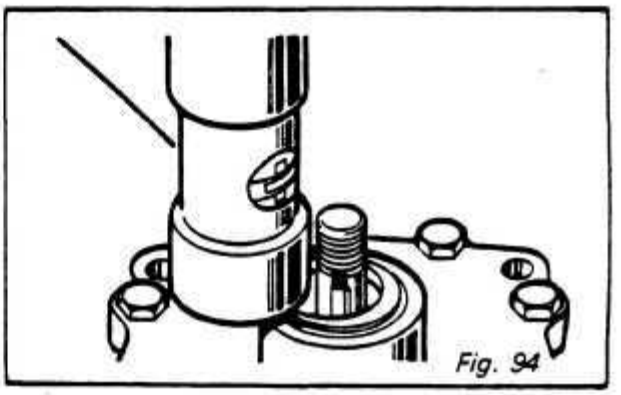


Fig. 94

Step 9 – Tap new felt ring into place.

Step 10 – Re-install clutch front plate. *Fig. 94*

REPLACING COMPRESSOR

Oil Level Check

When replacing a Sankyo compressor containing uncontaminated oil with a new Sankyo compressor, use the following procedure:

Step 1 – Drain the oil from the new compressor.

Step 2 – Drain and measure the oil from the old compressor.

Step 3 – Measure new oil equal to the amount drained from the old compressor. Add one fluid ounce (30 cc) of new oil to this amount and use it to refill the new compressor.

The DMC compressors are high-speed compressors. Satisfactory operation depends on sufficient lubrication. Too much oil decreases cooling efficiency.

Installation Tips

Trouble-free installation and operation of a Sankyo compressor is directly attributable to:

- Correct pulley alignment.
- Accurate fit of mounting bracket surfaces to the engine and compressor mounting ears.
- Correct torque of all securing bolts and nuts.
- Correct tension of the drive belt.

Never operate the compressor at fast speed or for a prolonged time with insufficient system refrigerant charge.

Flush Procedure

Flushing of a system is advisable:

- When replacing a compressor.
- When a system has been contaminated.

Purging with R – 12 vapor or other dry vapor under pressure is inadequate cleansing. Only recommended flushing materials should be used. Some satisfactory materials containing refrigerants, such as R – 11 as a liquid cleansing agent with R – 12 vapor propellant, are available. The following procedure is a method using R – 11.

Note:
When flushing with R – 11, do not allow it to enter the compressor.

Step 1 – Disconnect both hose connections to the compressor.

Step 2 – Remove and discard the Receiver-Drier.

Step 3 – Connect the R – 11 container at the discharge hose connection and allow approximately one pound of R – 11 to enter the discharge side of the condenser.

Step 4 – Then connect a dry vapor container at that same point, preferably a dry nitrogen with pressure set between 100 and 250 psig. Allow pressurized vapor to enter until all R – 11 liquid is purged out the inlet to receiver-drier hose connections.

Step 5 – Cap both connections.

Step 6 – Remove expansion valve and clean.

Step 7 – Using the same procedure above, flush and purge the liquid hose from the receiver-drier to the expansion valve and suction hose and evaporator.

AIR CONDITIONING WIRING DIAGRAM

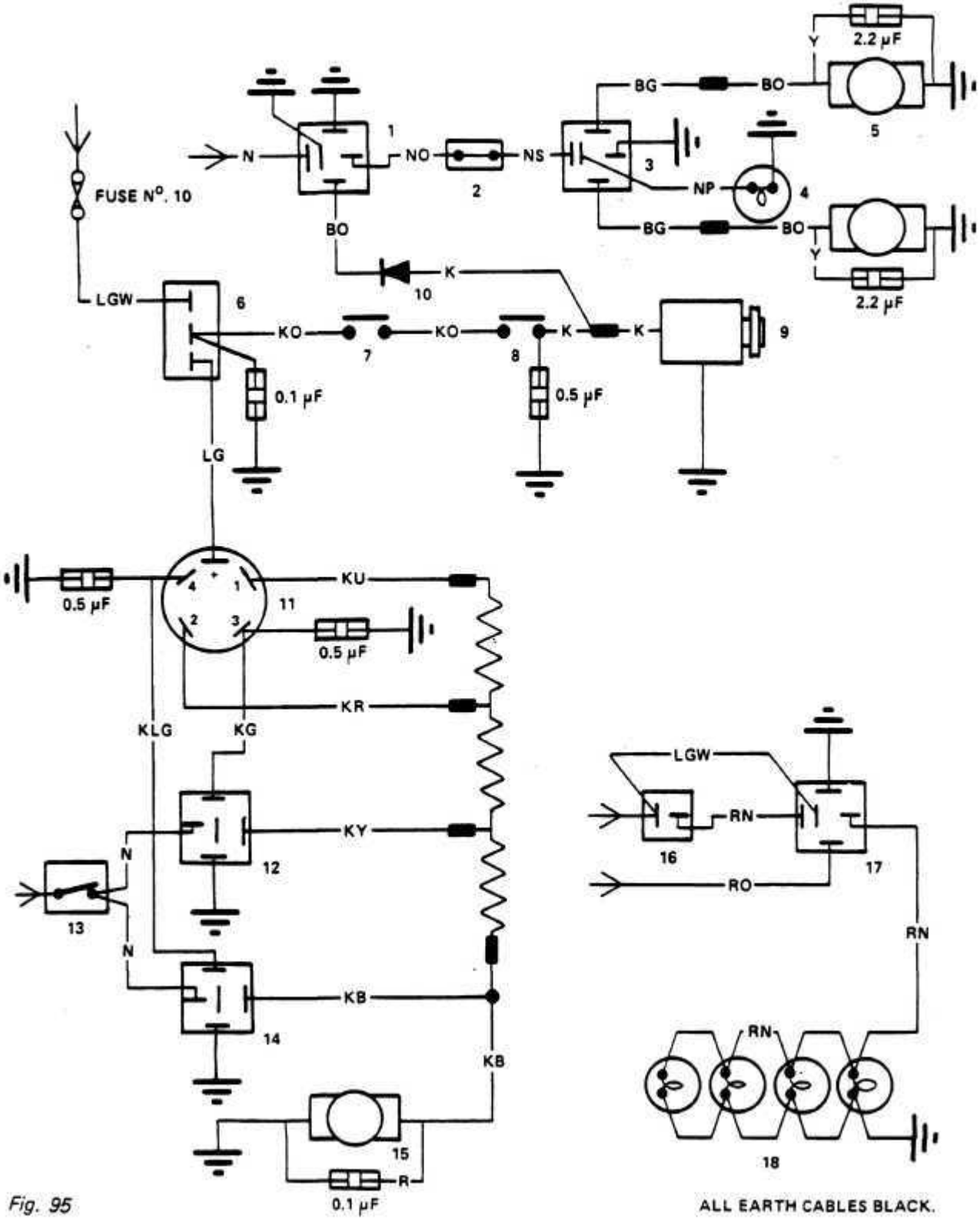
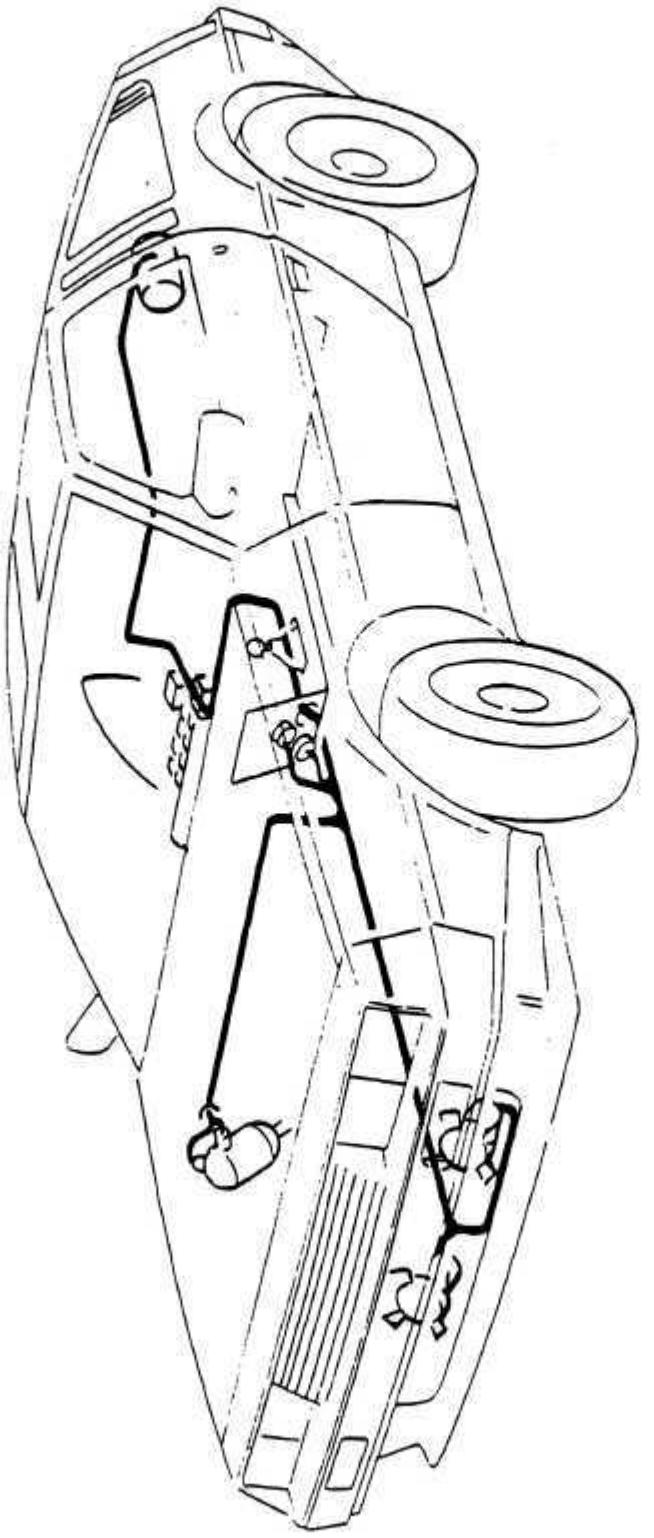


Fig. 95

ALL EARTH CABLES BLACK.



HEATING AND WIRING HARNESS LAYOUT

Fig. 96

Body

CONTENTS

G.R.P. BODY SHELL

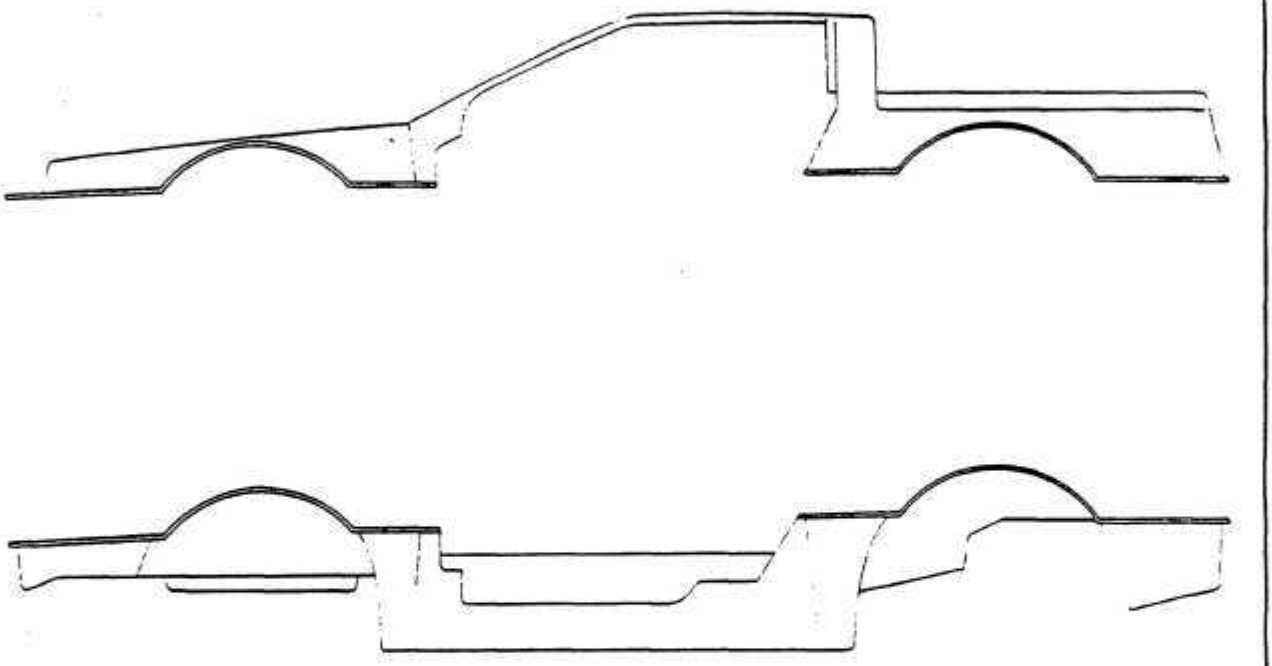


Fig. 1

The G.R.P. Body Shell is moulded in two separate halfs, top and bottom. The individual mouldings are manufactured from continuous strand, glass mat and polyester type 5567C 8226 resin.

The two halfs are bonded together to form an exceptionally strong rigid structure *Fig. 2* sections of which may be replaced or repaired using conventional fibre glass repair methods.

The body assembly is drilled to accept riv-nuts which provide attachment points for the stainless steel body panels. *Fig. 1*

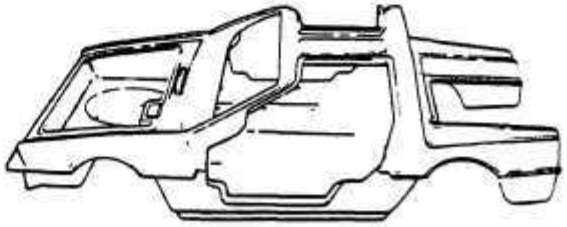


Fig. 2

STANDARD SECTIONAL REPAIR MOULDINGS

The various body panels *Fig. 3* which can be replaced are:—

(1) Short rear.

(2) Pontoon body rear — RH and LH.

(3) Front half body.

(4) Short front.

(5) Half short front RH and LH.

It is not recommended that Part No. 109990 — Front half body, be used to repair extensive structural damage, this part is provided to replace the body sections up to the 'A' Post only.

METHOD OF REPAIR

Inspect the body closely to ascertain the extent of the damage and the direction of impact and examine all areas which may have been affected. To facilitate a closer examination it may be necessary to remove parts and components to determine the extent of the damage. Where the repair of a damaged vehicle calls for replacement sections or panels it is recommended that STANDARD SECTIONAL REPAIR MOULDINGS are used.

Standard sectional repair mouldings cater for the repair of damage in areas of the body unit. These are so designed that they can be used individually or connected together for the manufacture of the required section of the body.

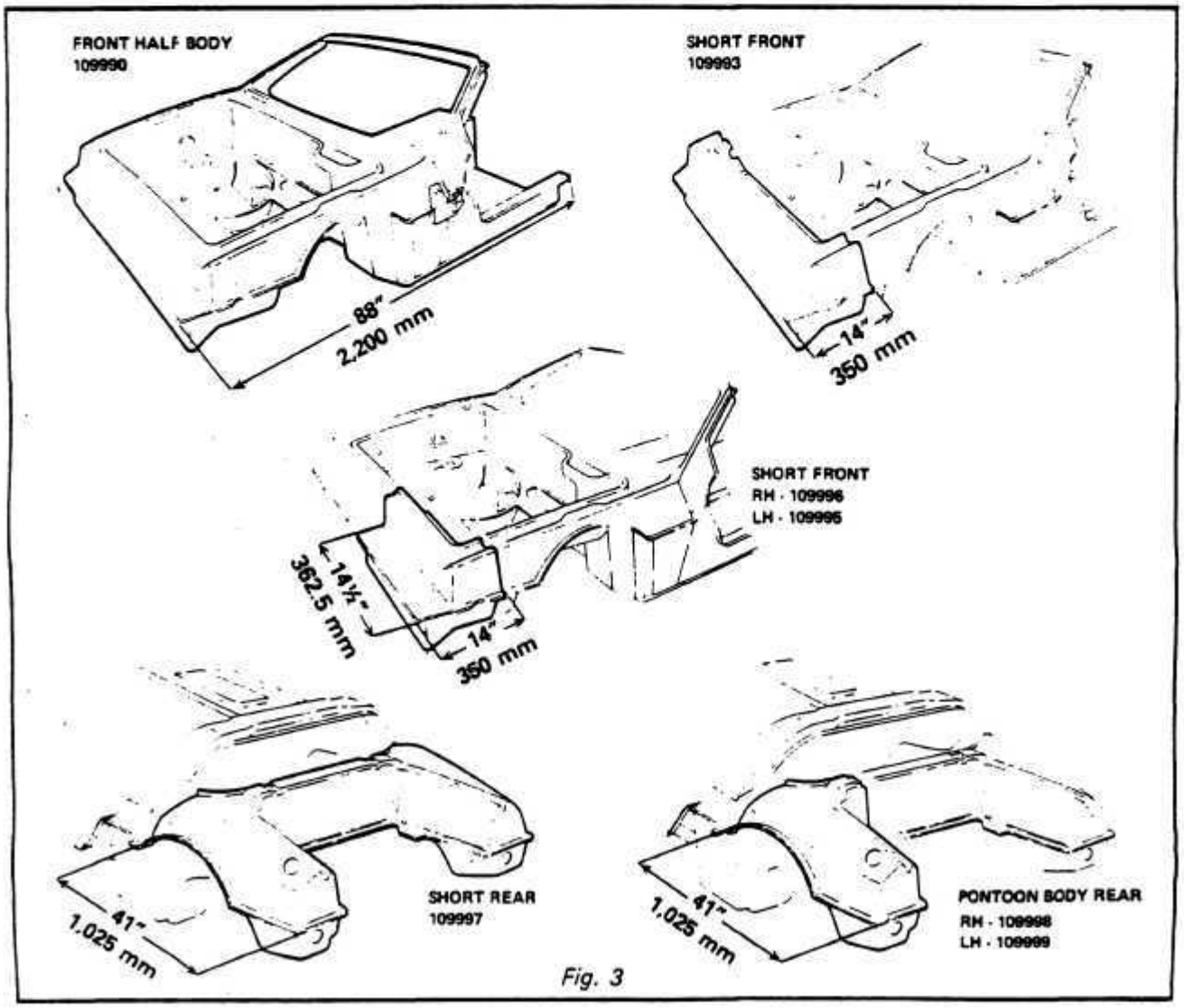


Fig. 3

Due to the material used in the construction of the body unit, cases of severe damage can be economically repaired. When determining which replacement mouldings are required, make sure the new sections will be attached to firm G.R.P. material, avoid badly grazed and badly burnt areas. Fire damage is the most difficult to assess but generally only the obviously burnt or charred sections will need to be replaced.

Before cutting away the damaged parts or ordering replacement sections the method of repair, positioning of joint lines, overlaps, should be clearly defined and understood.

BODY REPAIRS REQUIRE SPECIALISED KNOWLEDGE OF G.R.P. TECHNIQUES AND ON NO ACCOUNT SHOULD ANY REPAIR WORK BE CARRIED OUT BY AN INEXPERIENCED OPERATOR.

METHOD

1. Cut off the damaged portion after marking for re-positioning of the new section.

2. Clean and prepare both existing and new section paying special attention to removal of all contamination.

3. Check, and if necessary, cut the new section to fit. Abraid the interior surface of the two parts to be joined up to 90 mm from the joint line, using a sander with a 50 grit disc or use the 50 grit by hand. Remove all surface shine to provide a key for the repair.

4. Mate the two parts to be joined using packing as necessary to achieve a perfect match. Joining plates (of angled section) should be attached (as required) to the exterior of the panel across the joint to hold the join together with the aid of self tapping screws.

5. Wash abraided surfaces with acetone or methylene chloride. Using chopped strand glass fibre mat of 1½ sq. ft. (450 g/m^2) weight together with pre-accelerated hand lay up polyester resin containing approximately 2% of Trigonox 51 Akzo Chemie (Acetyl Acetone Peroxide-Catalyst) lay up 3 layers of the glass mat wet-on-wet to the abraided interior joint.

6. Stagger the three layers to overlap each side of the joint by 35 mm, 55 mm, 75 mm, respectively. Do not stray onto any unprepared areas.

7. Leave to cure (harden) in a temperature of not less than 15°C. When the repair has fully cured remove the joining plates from the exterior surface. Make good the exterior joint by filling with a Polyester body filler and add up to 5% black pigment. Allow to cure, sand down with carborundum paper to the original contour.

8. Where foam sections have been cut through the following technique should be used when bonding together:—

9. Before mating sections cut existing G.R.P. away to expose 100 mm of foam nearest the joint line. Completely remove exposed foam to reveal the inside surface of the G.R.P. to be bonded. Abraid this surface. The sections may now be mated and bonded together as described above. After bonding the foam is then replaced by free foaming in situ in the box formed by the repair using a Polyurethane Two Part Hand Mixed foam. When the foam has hardened cut back excess to original contour.

10. Laminate exposed foam with three layers of chopped strand mat and lap onto surrounding G.R.P. Prepare and laminate as described above.

PREPARING OF REPLACEMENT SECTIONS REINFORCED WITH FOAM BEAMS

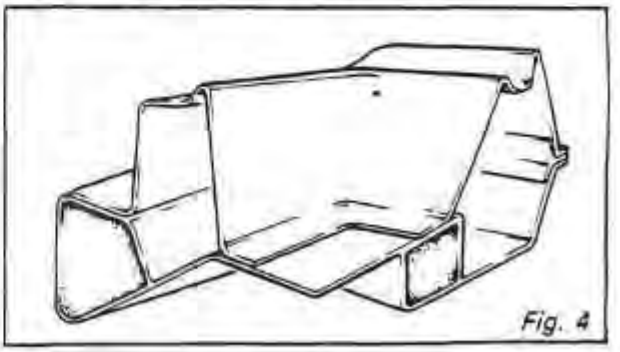


Fig. 4

In order to replace the foam section of the beam, the following procedure should be adopted.

(1) Remove foam at least 2 – 3" (50 – 75 mm) from beam thus creating a cavity.

(2) Bond in new panel as described above.

(3) When completely cured, drill a one inch diameter hole in the area to be refilled with foam on a horizontal face and refill with Polyurethane two part mix foam.

(4) When the foam has completely cured, remove any excess foam from the area above the hole and finally seal with three (3) laminants of chopped mat and resin, then sand to contour.

CAUTION: The Styrene fumes given off due to catalytic action are hazardous to health and also highly flammable. Therefore extreme caution should be taken when carrying out any G.R.P. repair.

Goggles and protective clothing should be used at all times. In the event of Resin or catalyst entering the eyes, quick medical attention is essential.

G.R.P. repairs must be carried out in a well ventilated area. The resins and catalysts must be stored in a cool area.

STAINLESS STEEL

GENERAL DESCRIPTION

The De Lorean body is made of high quality grade 304 brushed stainless steel, which gives the car its unique appearance.

Damaged panels are easily replaceable by unbolting the panel from the G.R.P. body shell and replacing with a new one. Scratches or superficial damage can be corrected using established stainless steel repair methods.

One of the major features of the De Lorean car is its Gull Wing Doors. These are counter balanced with pre-set torsion bars. The doors are held in the open position by the use of gas struts. The Gull Wing Doors open in less space than conventional doors and gives easier access to the interior to the car.

The drag coefficient of the car is 0.35. Rear louvres were incorporated to improve the overall aerodynamic drag and conserve fuel.

The front and rear fascias are made of premoulded impact absorbing polyurethane. The fascias blend with the stainless steel panels.

Appearance and Care

Wash the panels with warm water and a low sud detergent. Stains of tar and grease may be removed with gasoline or white spirit.

The car should be washed before applying the polish treatment recommended by DMC, to preserve the appearance of the stainless steel panels.

FRONT FENDER, LEFT OR RIGHT — Fig. 1

Removal

1. Remove front side marker light by removing two retaining screws, pull out bulb-holder and push back through lamp opening.
2. Remove five screws securing lower edge of front fascia panel to air intake screen.
3. Remove two nuts and bolts securing spoiler to adjacent lower edge of fascia panel and to body mounting brackets.
4. Remove three screws securing spoiler to adjacent lower edge of fender.
5. Remove two screws securing fender strap.
6. Open the hood and loosen the Phillips head screws securing adjacent side of the front fascia panel support bracket to the body angle bracket.
7. Ease fascia panel forward sufficiently to remove the three screws securing front edge of fender to body mounting bracket.
8. Remove front six screws securing bottom edge of rocker panel to body.
9. Pull back lower edge of panel to gain access to two screws securing rocker panel support to lower edge of front fender.

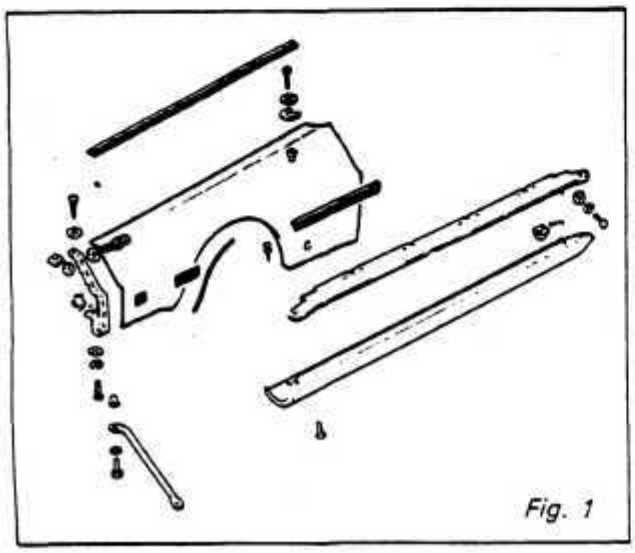


Fig. 1

10. Carefully unstick outer door seal along rear edge of fender. Remove two retaining screws.
11. Remove three screws securing rear edge of fender to door filler panel.
12. Carefully remove finisher seal over top edge of fender inside luggage compartment.
13. Remove nine screws securing top edge of fender inside luggage compartment.
14. Remove fender.

Note:
When performing a fender replacement, it is necessary to replace body side mouldings.

Installation

1. Ensure wheel opening seal strip is in good condition.
2. Locate fender in position on body, threading bulb-holder through its opening.
3. Fit nine screws along top edge of fender inside luggage compartment.
4. Fit three screws along rear edge of fender in door filler panel.
5. Pull back lower edge of rocker panel and insert two screws securing sill support panel to fender.
6. From inside wheel opening, fit screw securing fender to rocker panel.
7. Ease front fascia panel forward to enable refitting of three screws securing fender to body mounting bracket.
8. Lower the luggage compartment hood and shut adjacent door to check alignment of panel.
9. Adjust position as necessary and tighten screws.
10. Fit screws securing lower edge of rocker panel to body.

11. Position and secure front fender stay.

12. Fit two screws securing lower edge of fender to spoiler.

13. Fit five screws securing lower edge of fascia panel to air intake screen.

14. Fit two nuts and bolts securing spoiler to fascia panel and body mounting bracket.

15. Tighten screws on front fascia panel top edge support bracket, ensuring correct alignment of fascia panel.

16. Refit weather strip along top edge of fender inside luggage compartment.

17. Refit outer door seal along rear edge of fender in door filler panel.

18. Refit bulb-holder to side marker lamp and secure lamp with two screws.

REAR FENDER (QUARTER PANEL), LEFT OR RIGHT — Fig. 2

Removal

1. Remove spring clip and separate gas strut ball joint from fender bracket. Provide alternative louvre panel support, if necessary.

2. Remove side marker lamp by releasing two retaining screws and unplugging bulb-holder.

3. Remove two screws from each side, securing rear fascia reinforcement brackets to rear body pontoons.

4. Ease back end of rear fascia and remove four screws securing rear edge of fender to pontoon bracket.

5. Raise car on hoist.

6. Remove rearmost six screws securing lower edge of rocker panel to body.

7. Remove screw *inside* wheel opening, securing fender to rocker panel.

8. Pull back lower edge of rocker panel and remove screws securing fender to pontoon.

9. Remove three screws securing rear fender valance to support bracket, and remove.

Fig. 2

10. Remove screws securing rear lower edge of fender to pontoon.

11. Lower car on hoist.

12. Carefully unstick outer door seal sufficiently to remove the eight screws securing fender to "B" post filler panel. Remove fender.

Note:
When performing a fender replacement, it is necessary to replace the body side mouldings and transfer quarter glass. This can be achieved using same techniques as windscreen replacement — see appropriate section.

Installation

1. Ensure wheel opening seal is in good condition.

2. Position fender on vehicle, route side marker lamp harness through its opening.

3. Install eight screws securing fender to "B" post filler panel.

4. Install four screws securing rear edge of fender to pontoon bracket.

5. Raise car on hoist.

6. Install screws securing rearmost lower edge of fender to pontoon.

7. Pull back rocker panel and install screws securing fender to pontoon.

8. Lower car on hoist.

9. Close door and check alignment of fender to door. Adjust as required and tighten screws.

10. Raise car on hoist.

11. Position and secure rocker panel and rear valance.

12. Lower car on hoist.

13. Position and secure rear fascia.

14. Position and secure side marker lamp assembly.

15. Install gas strut ball joint onto fender bracket and secure with spring clip.

16. Position and secure outer door seal to front edge of fender with specified adhesive.

VALANCE, REAR

Removal

1. Remove bolt securing fender to valance inside wheel opening.

2. Remove two nuts and bolts securing lower edge of valance to body bracket.

3. Pull valance from retaining clips.

Installation

1. Check that valance retaining clips are serviceable.

2. Locate body bracket retaining pins in valance top edge clips, ensuring that rear valance tongue locates in rear fascia panel groove.

3. Install bolt securing fender to valance inside wheel opening.

4. Install two nuts and bolts securing lower edge of valance to body bracket.

ROCKER PANEL, LEFT OR RIGHT

Removal

1. From inside front and rear wheel openings, remove one bolt securing fender to rocker panel.

2. Remove bolts securing rocker panel to lower edge of body.

3. Pull downward to release top edge clips from rocker support panel pins.

Note:
The clips in the rocker panel may be broken in this operation. Ensure that replacements are available on refitting.

Installation

1. Insert new clips as necessary in the top edge of the rocker panel.

2. Push top edge onto support panel to engage clips on support panel retaining pins.

3. Fit screws on lower edge of rocker panel into rivnuts on body.

4. From inside front and rear wheel openings, install bolts securing fender to rocker panel. Tighten bolts.

ROOF T-PANEL — Fig. 3

Removal

1. Open both doors.

2. Carefully peel back upper outer door opening seal.

3. Remove three roof panel to underbody retaining screws located behind each outer door seal.

4. Open rear window sunshade louvre. Straighten the retaining clips along trailing edge of roof panel.

5. Close sunshade louvre. Pull roof panel rearward and remove.

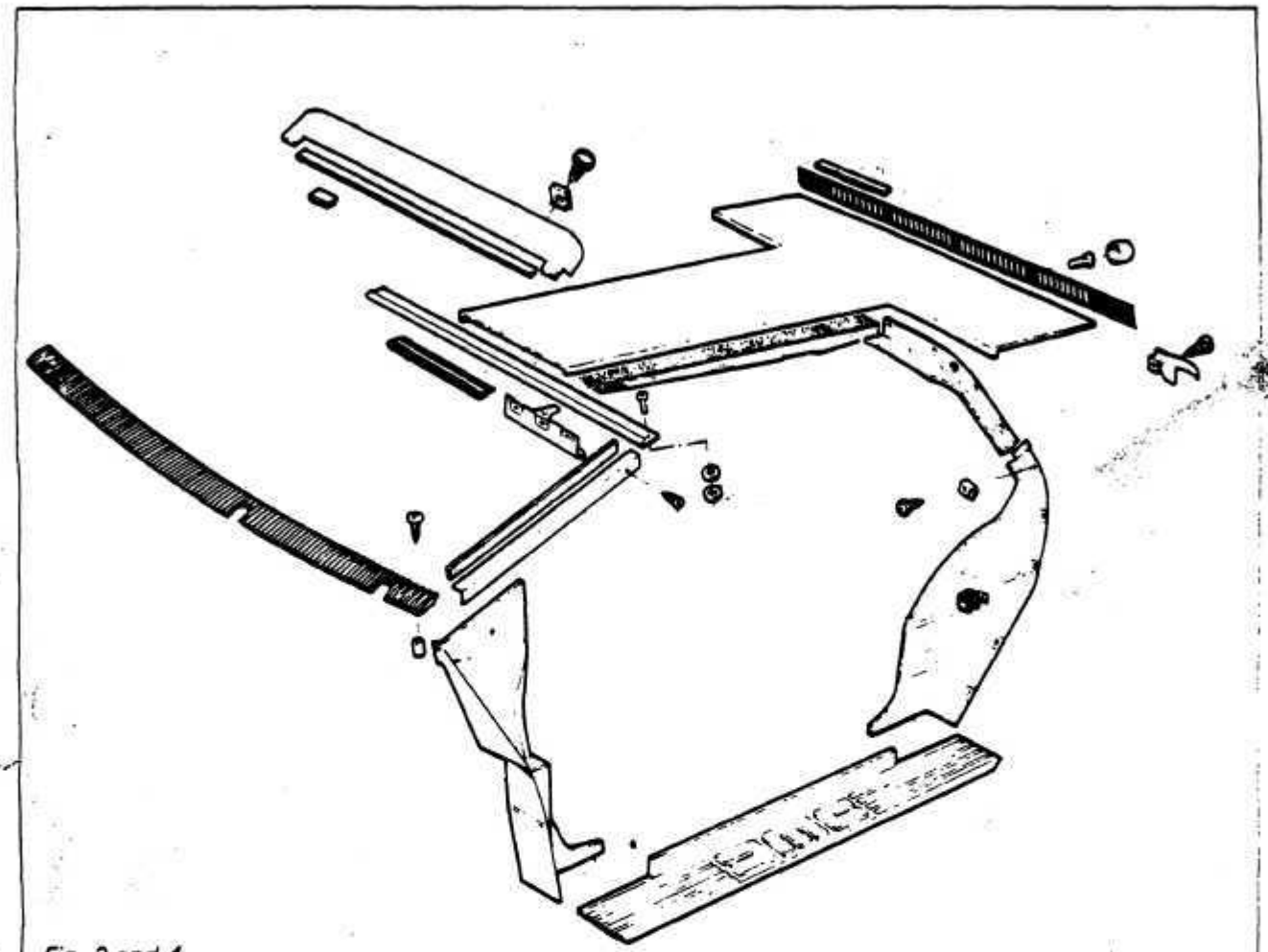


Fig. 3 and 4

Installation

Reverse Removal Procedure and secure outer door seal with specified adhesive.

HEADER PANEL, WINDSHIELD — Fig. 4

Removal

1. Open both doors and remove left and right windshield to door outer seals.
2. Remove left and right "A" post finishers (reveal mouldings).
3. Remove windshield header panel.

Installation

Reverse Removal Procedure.

DOOR SEALS AND STRUTS

OUTER DOOR SEAL

Remove outer door seal.

Installation

1. With solvent, remove the old adhesive from door seal mounting surface.
2. Position and secure new outer door seal with specified adhesive.

INNER DOOR SEAL

Removal and Installation

1. Carefully pull off inner door seal, working around door opening from one end of seal.

2. Before fitting replacement, check that trim secured by the door seal is correctly in position.

3. Starting at the centre bottom edge of door opening, fit inner door seal around door opening, pressing on fully. Ensure that seal is fully located on all corners.

DOOR, LEFT OR RIGHT — Fig. 5

Removal

1. Remove rear sunshade louvre.

2. Remove roof panel.

3. Disconnect door wiring harness connectors located inside roof channel.

4. Remove three caps and screws securing rear window upper finisher screen.

5. Place an alignment mark on both the front door hinge and torsion bar to ensure proper installation. Place a second alignment mark on both the rear restraint bracket and torsion bar to ensure proper torque adjustment during installation.

   Notice:
   When marking, do not scratch torsion bar with any sharp implement, torsion bar could fracture and fail.

6. With the aid of an assistant, support door, insert torsion bar pre-load tool (⅜" allen wrench) in allen socket of torsion bar. Apply balancing torque (counterclockwise for RH door — clockwise for LH door) to unload rear restraint bracket.

7. While holding torsion bar in position, remove the two restraint bracket retaining screws.

8. Pull restraint bracket off torsion bar spline and release torque on torsion bar.

9. Pull torsion bar out of front door hinge and remove.

10. Remove four screws and door wiring harness cover plate from roof channel.

11. While assistant supports door, disconnect gas strut from door pivot bolt.

12. Remove front and rear hinge to door retaining bolts.

13. Remove door assembly.

Installation

1. With the aid of an assistant, lift door and route wiring harness connectors through the roof channel. Position door to body and fully open.

2. Install front and rear hinge to door bolts, ensuring that the gas strut pivot bolt is located at the outer position on rear door hinge. Position and secure gas strut.

3. Reposition torsion bar (front of RH torsion bar and hinge socket are square, LH are hexagonal). Lubricate (with specified grease) front end of torsion bar. Insert through roof section and into front hinge socket as marked during removal.

4. Position restraint bracket on pre-load tool. Insert pre-load tool in socket of torsion bar. Apply sufficient torque to align marks on torsion bar and restraint bracket. Press bracket onto torsion bar spline and secure to roof mounting holes.

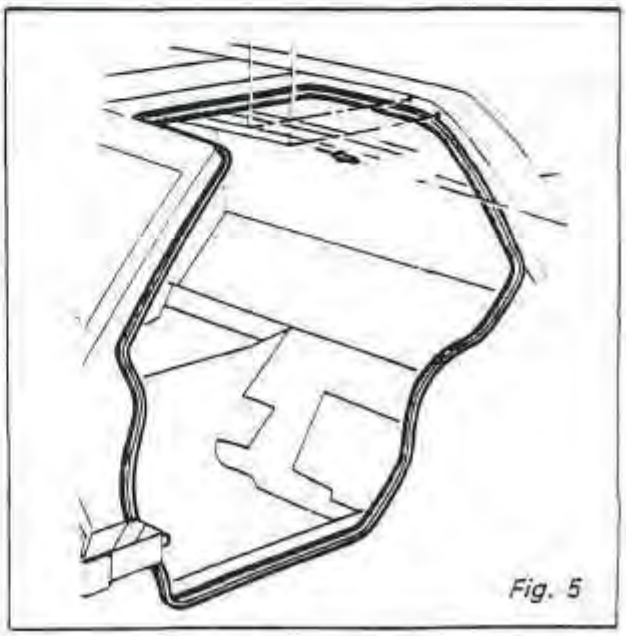


Fig. 5

5. Connect door wiring connectors.
6. Close and open door to check torsion bar torque adjustment and door alignment.
7. Position and secure rear window upper finisher screen.
8. Position and secure roof panel.
9. Position and secure rear window sunshade louvre.

GAS STRUT, DOOR

Removal

1. With the aid of an assistant, or with the proper brace, support door in the open position.
2. Unclip both gas strut to ball stud retaining clips.
3. Remove gas strut from each ball stud.

INSTALLATION

Reverse Removal Procedure.

DOOR HINGE, FRONT OR REAR — Fig. 6

Removal

Note:
Before starting this procedure, ensure that assistance is available. Also ensure that a replacement hinge is available to enable installation while door is supported.

1. Remove rear window sunshade louvre.
2. Remove rear window upper finisher screen.
3. Mark angular position of torsion bar in both restraint bracket and front hinge.

   Note:
   When marking, do not scratch torsion bar with any sharp implement. Torsion bar could fracture and fail.

4. With assistant supporting door, insert torsion bar pre-load (⅜" allen) in allen socket of torsion bar.
5. Apply balancing torque (counterclockwise for RH door, clockwise for LH door) to unload the rear restraint bracket.
6. Hold torsion bar in balancing position and remove two restraint bracket retaining bolts.
7. Remove restraint bracket from torsion bar spline, release balancing torque on torsion bar.
8. Remove torsion bar from hinge and roof section.
9. If the rear hinge is to be removed, with the aid of an assistant, support door, release the clip securing gas strut to rear hinge. Pull off hinge and swing strut clear.
10. Remove two screws securing appropriate hinge to door and two screws and one nut securing hinge to roof channel, noting any alignment shims.

    Notice:
    Do not allow door to strain remaining hinge while this procedure is carried out.

Installation

1. Install hinge, replacing alignment shims as applicable.
2. When applicable, locate gas strut pivot on door hinge and install retaining clip.
3. Insert torsion bar through rear roof section and into front hinge socket, aligning reference marks.
4. Insert pre-load tool with restraint bracket attached in allen socket of torsion bar and apply sufficient torque to align restraint bracket and secure to roof section.
5. Close door and check alignment.

TORSION BAR, DOOR — Fig. 7

Removal

1. Remove rear window sunshade louvre.
2. Remove rear window upper finished screen.

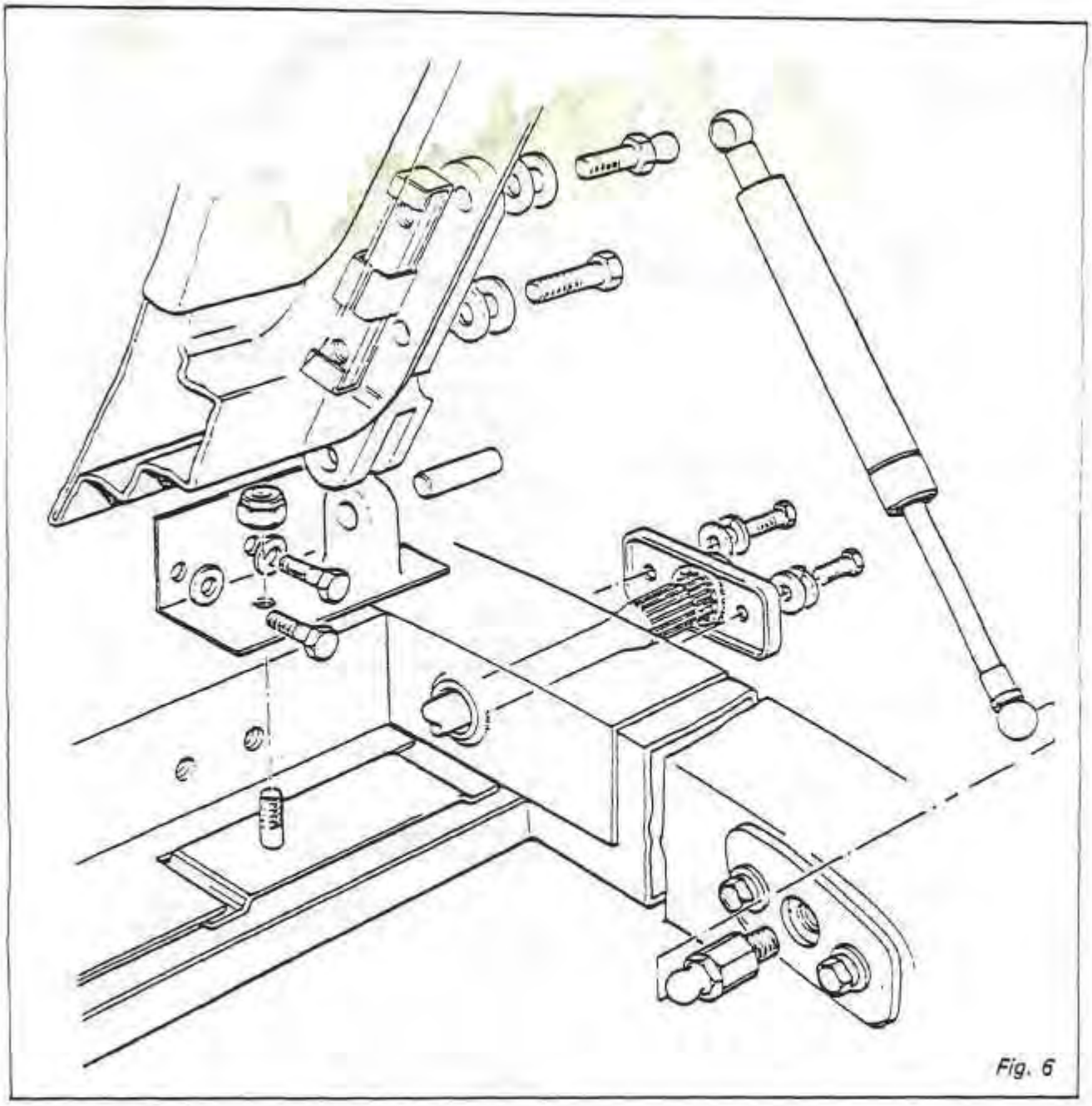


Fig. 6

3. Mark angular position of torsion bar in both restraint bracket and front hinge.

   Note:
   When marking, do not scratch torsion bar with any sharp implement. Torsion bar could fracture and fail.

4. With the aid of an assistant, support the door in the fully open position until the torsion bar is removed.

5. Use torsion bar pre-load tool (⅜" tool allen) and apply balancing torque (counterclockwise for RH door, clockwise for LH door). To unload the torsion bar restraint bracket bolts are removed and the bracket is withdrawn from the torsion bar splines.

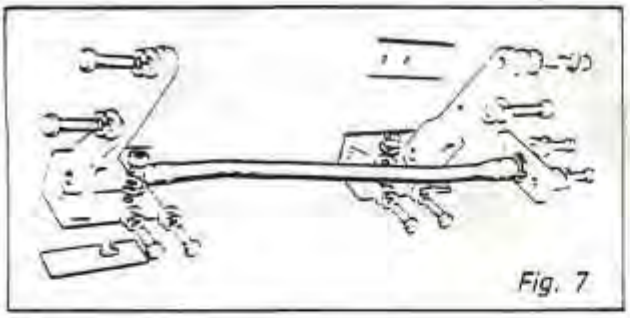


Fig. 7

Notice:
Failure to maintain the balancing torque during this operation may result in the anchor bracket striking and breaking the rear window.

6. Remove the torsion bar from the front hinge through the rear roof section.

Installation

1. Support the door in the fully open position, with the gas strut connected. Apply specified grease to the front end (square RH, hexagonal LH) of the torsion bar and insert through rear roof section and into front hinge socket, aligning reference marks if applicable.

2. Position restraint bracket temporarily on splines of torsion bar with the fixing holes aligned.

3. Using the pre-load tool, turn the torsion bar evenly and progressively (counterclockwise on RH door, clockwise on LH door) moving the restraint bracket one spline at a time to keep the fixing holes aligned. When bracket has been moved three splines (or a similar amount to align the reference marks) hold the torsion bar in that position until the restraint bracket securing bolts are fitted and tightened.

4. Release torque and remove tool.

Notice:
Release of pre-load torque until restraint bracket is fitted to torsion bar, but not secured to roof, may result in rear window breakage.

DOOR ALIGNMENT

Note:
Hinge height is adjusted by shims mounted horizontally between hinge and roof, while lateral adjustment is by shims mounted vertically between hinge and roof channel. Only one hinge should be adjusted at a time.

1. Determine which hinge requires adjustment and in which direction.

2. Raise and support door with a proper brake while re-aligning.

3. To shim rear hinge height, support door in the fully open position. Loosen two bolts and one nut securing hinge to roof channel sufficiently to insert or remove shims as required. Tighten bolts, lower door and check alignment.

4. If lateral adjustment of either hinge is required, the stainless steel roof section must first be removed.

5. Before shimming front hinge, the torsion bar must be removed as described above.

6. Loosen two bolts and one nut, securing hinge to roof section sufficiently to remove or install shims as required.

7. Tighten bolts and nut securing hinge to roof section.

8. Re-install door torsion bar as described above.

9. Close door and check alignment.

10. Install roof section if applicable.

11. Adjust door latches if necessary.

RELEASE HANDLE CABLE, EXTERIOR DOOR — Fig. 8

Removal

1. Remove upper door interior trim panel.

2. Working through opening in inner door, remove two nuts securing exterior door handle to door shell.

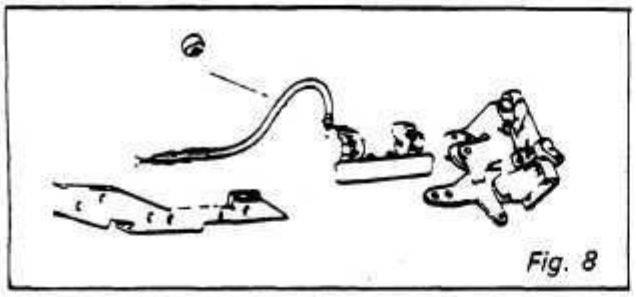


Fig. 8

3. Remove handle and disconnect release cable.

4. Disconnect cable from bellcrank, loosen lock nut and remove cable.

Installation

1. Position cable in door.

2. Install cable in exterior door handle, position and secure exterior door handle to door.

3. Position and secure cable to bellcrank and adjustment bracket.

Notice:
Do not pre-load bellcrank by overtightening cable.

4. Check exterior door handle release operation.

5. Position and secure interior door trim.

EXTERIOR DOOR RELEASE HANDLE

Removal

1. Remove door upper interior trim panel.

2. Remove two nuts securing handle to door shell.

3. Withdraw handle sufficiently to permit release of operating cable.

Installation

Reverse removal procedure and check cable adjustment.

DOOR LATCH, FRONT OR REAR

Removal

1. Lower the power window.

2. Working through the window opening, pry loose the upper trim panel restraining clips.

3. Open door and remove upper trim panel.

4. Remove screws securing the lower trim panel mounting bracket (upper edge) to the door assembly.

5. Pry loose the retaining clips securing the lower edge of the trim panel.

6. Pull trim panel away from the door to gain access to the door pull handle mounting bracket. Using a long Phillips screwdriver, remove two screws securing the door pull handle to its mounting bracket. Remove the lower trim panel.

7. Peel back inner door plastic water shield to gain access to door latch rods.

8. Disconnect both latch rods from their respective bellcranks.

   Note:
   Late model rods are colour coated.

9. Remove three screws securing the front/rear latch to door.

10. Pull latch and rods out through inner door.

Installation

1. Transfer rods from old latch to new. Be sure to locate rods in exactly the same mounting holes.

2. Position and secure latch and rods to inner door.

3. Perform door latch adjustments.

4. Remove two screws securing the pull handle bracket to inner door.

5. Position and secure pull handle to mounting bracket with two Phillips screws removed previously.

6. When working on left door, remove power mirror switch from door trim panel, when working on right, remove close-out plate.

7. Position and secure lower door trim panel. Install pull handle retaining screws.

8. Position and secure power mirror switch or close-out plate.

9. Position and secure upper door trim panel.

DOOR LATCH CONTROL SETTING PROCEDURE

1. Remove upper and lower interior door trim.

2. Disconnect interior door handle latch link at the release handle.

3. Disconnect the interior door lock link at the lock solenoid bellcrank.

4. Remove screws securing the release handle and locking lever mounting bracket, and set bracket aside.

5. Disconnect the rear latch release link from the latch release bellcrank.

6. Loosen exterior release handle control cable locknut, and release any pre-load on cable and bellcrank.

7. Lift exterior door handle approximately halfway. Secure in position with a prop that will not scratch door skin (i.e. rubber, wood).

8. Set front latch in the closed position. With a screwdriver or similar tool, apply pressure on latch. Slowly adjust the exterior release handle cable until latch opens.

9. Loosen rear latch link, turn buckle lock nut, and adjust link until it can be installed in bellcrank with no pre-load.

10. Set rear latch in the closed position. With a screwdriver or similar tool, apply pressure on latch. Slowly adjust rear link until latch opens. Be sure bellcrank position remains unchanged.

11. Secure rear latch adjustment with link, turn buckle lock nut.

12. Remove exterior release handle prop and recheck latch adjustments.

13. Turn exterior handle control cable adjuster enough to remove any pre-load on latch release bellcrank.

14. Secure adjustment with control cable lock nut. Lift exterior release handle and check front and rear latch release adjustment.

    Note:
    If latches do not open with handle fully raised, slowly shorten control cable adjustment to remove any slack. Too much adjustment (pre-load) will cause door locks to jam.

15. Check door lock adjustment.

16. Position and secure interior release handle and locking lever mounting bracket.

17. Position and secure interior door trim panels.

DOOR LOCK SETTING PROCEDURE

1. Disconnect proper fuse or negative battery cable.

2. Remove upper and lower interior door trim.

3. Disconnect the rear link and the front lock link from the bellcrank assembly.

4. Pivot the locking bellcrank assembly back and forth. Check that the contact wiper arm on the bellcrank makes effective contact to the electrical contact points at each limit of travel. If not, adjust the position of the door lock solenoid by loosening the solenoid's attaching screws. Re-tighten solenoid attaching screws.

5. Rotate the lock bellcrank to the "UNLOCK" position (solenoid plunger retracted).

6. Pull the front locking link rearward to remove the free play and connect to the bellcrank. Check that the switch's electrical contacts position has not changed (Step 3). If necessary, adjust the bend in the front locking link to obtain no free play; no pre-load, and a good electrical contact condition.

7. Pull the rear locking link forward to remove any free play. Adjust the rear locking link (if necessary) until it matches the established bellcrank position. Connect the rear locking link to bellcrank.

8. With the door open, manually close both the front and rear door latch assemblies.

9. Move the interior locking control rocker to the lock position and then back to the unlock position. Check both the mechanical and electrical operation of the locking system.

10. With the system in the unlock position and door open, return the latches to the release position.

DOOR STRIKER MOUNTING BRACKET, REAR

Removal

1. Make an alignment mark and remove rear striker pin.

2. Raise vehicle on hoist.

3. Remove screws securing rear of rocker panel to vehicle.

4. Pull rocker panel away from vehicle to allow access to screws securing rear quarter panel to body. Remove screws.

5. Lower vehicle on hoist.

6. Peel off outer door seal from rear quarter panel.

7. Remove screws securing rear quarter panel to body at rear of door opening.

8. Carefully pull quarter panel away from body enough to remove two striker mounting bracket retaining screws.

9. Partially remove door filler panel and remove two remaining screws securing striker mounting bracket.

10. Remove striker mounting bracket.

Installation

1. Position and secure striker mounting bracket.

2. Position and secure interior rear trim panel.

3. Position and secure rear quarter panel to filler panel.

4. Raise vehicle on hoist.

5. Install screws securing rear quarter panel to underbody.

6. Position and secure rocker panel.

7. Lower vehicle on hoist.

8. Position and secure outer door weather strip with specified adhesive.

9. Position and secure striker pin to alignment mark.

10. Close door and check striker pin alignment. Adjust as necessary.

DOOR, STRIKER MOUNTING BRACKET, FRONT

Removal

1. Make an alignment mark and remove front striker pin.

2. Raise vehicle on hoist.

3. Remove screws securing front of rocker panel to vehicle.

4. Pull rocker panel away from vehicle to allow access to screws securing front fender to underbody. Remove screws.

5. Lower vehicle on hoist.

6. Peel off outer door seal from front fender.

7. Remove screws securing front fender to filler panel.

8. Carefully pull fender away from vehicle enough to remove two screws securing striker mounting bracket to front pontoon.

9. Pull carpeting away from inner shroud and remove two remaining screws securing striker mounting bracket.

10. Remove striker mounting bracket.

Installation

1. Position and secure striker mounting bracket to body.

2. Position and secure carpeting to shroud panel.
3. Position and secure front fender to door filler panel.
4. Raise car on hoist.
5. Install screws securing lower edge of front fender to underbody.
6. Position and secure rocker panel.
7. Lower vehicle on hoist.
8. Position and secure outer door seal, with specified adhesive.
9. Position and secure striker pin to alignment mark.
10. Close door and check striker pin alignment. Adjust as necessary.

LUGGAGE COMPARTMENT COVER

Removal

1. Disconnect appropriate fuse or negative battery cable.
2. Remove front grille and disconnect wires to luggage compartment light.
3. Remove retaining clip on both strut ball joints adjacent to cover.
4. With assistant supporting cover release the ball joints.
5. Mark the position of each hinge on the cover to aid the assembly before removing four nuts securing each hinge to cover.
6. Remove luggage compartment cover.

Installation

1. With the aid of an assistant, locate cover in fully open position.
2. Install nuts to locate each hinge cover, but do not tighten fully at this stage.
3. Locate struts on cover ball joints and insert retaining clips.
4. Lower cover and adjust for alignment, tightening hinge bolts when correctly aligned. (Use previously made reference marks where applicable).
5. Reconnect luggage compartment light. Install grille.
6. Check operation of luggage compartment cover catch and adjust, if necessary by loosening the four mounting bolts and moving catch to the desired position.

FUEL FILLER FLAP

Removal

1. Open filler cap.
2. Remove two screws, securing filler flap to luggage compartment cover.
3. Remove filler flap and retainer.

Installation

1. Position flap and retainer to luggage compartment cover.
2. Close fuel filler flap.

LUGGAGE COMPARTMENT GAS STRUTS

Removal

Note:
Ensure that the luggage compartment hood is supported while removing strut.

1. Release retaining clips on strut ball joint and support luggage compartment hood.
2. Release ball joints from pivots.

Installation

1. Reverse removal procedures.

LUGGAGE COMPARTMENT HOOD RELEASE CABLE — Fig. 9

Removal

1. Open hood.
2. Working under left side of instrument panel, loosen nut securing cable to release lever.

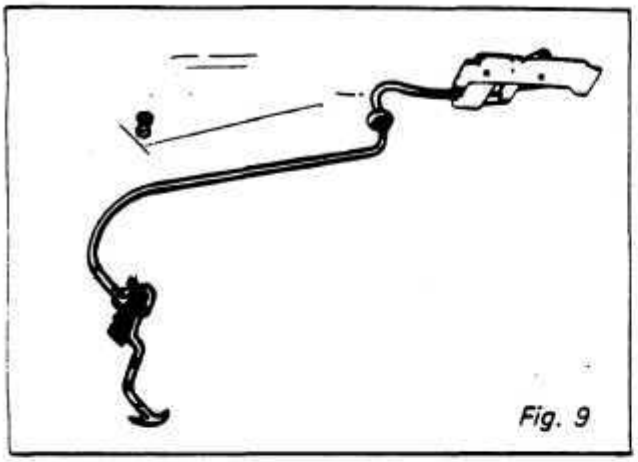


Fig. 9

3. Remove nut securing cable housing to lever mounting bracket.
4. Working under the hood, remove the hood latch cover.
5. Remove one nut securing the release cable to latch.
6. Remove one nut securing the release cable housing to the latch.
7. Pull the release cable through the cowl grommet and remove from vehicle.

Installation

1. Reverse removal procedure.

LUGGAGE COMPARTMENT COVER RELEASE LATCH

Removal

1. Open luggage compartment cover.
2. Remove release latch cover.
3. Disconnect and remove the release cable from latch.
4. Remove four screws securing latch to cowl. Remove latch.

Installation

1. Install latch to cowl. Connect release cable to latch.
2. Slowly lower cover. Check to see that cover striker is centered in latch.
3. Close cover, pull release handle and check cover release operation. Adjust if necessary.
4. Position and secure latch cover.

ENGINE COMPARTMENT COVER

Removal

1. Open rear window sunshade louvre.
2. Open engine compartment cover.
3. Remove nuts securing both left and right hinges to cover. Remove cover.
4. Remove left and right stops from engine cover.
5. Remove sunshade louvre and engine compartment cover striker.
6. Remove all engine compartment vents and retaining strips.

Installation

1. Secure anti-rattle strips around all engine compartment vent openings.
2. Position and secure vents and retaining strips.
3. Position and secure sunshade louvre and engine compartment vent openings.
4. Position and secure engine compartment cover stops.
5. Position and secure engine compartment cover to hinges.
6. Close cover, check alignment, and adjust if necessary.

   Note:
   If cover makes contact with rear fascia, it may not release from latch when release lever is pulled. If no more adjustment is available, remove cover and elongate hinge mounting holes.
7. Adjust cover stops and striker.
8. Close sunshade louvre and check striker operation. Adjust as necessary.

ENGINE COMPARTMENT RELEASE CABLE

Removal

1. Open rear window sunshade louvre.
2. Open engine compartment cover.
3. Remove cover plate from back to rear fascia reinforcement panel.
4. Loosen release cable adjustment nut. Scribe a latch alignment mark and remove screws securing latch to fascia reinforcement. Pull latch out through cover plate opening and disconnect latch from cable.
5. Remove four screws securing carbon canister assembly to left rear pontoon. Remove canister from pontoon and set aside.
6. Working inside passenger compartment, disconnect parcel net from behind seats. Remove screws securing parcel net clips and pull trim board forward to allow access of release cable retaining bracket.
7. Loosen release cable retaining nut and pull cable out through rear of passenger compartment.

Installation

1. Route cable through opening in rear of passenger compartment through left rear pontoon and into rear fascia reinforcement. Be sure cable is installed into rubber grommets and retainer clip located inside left rear pontoon.
2. Position and secure release cable to mounting bracket located in rear of passenger compartment.
3. Connect latch to cable and re-position latch with alignment mark. Secure to rear fascia reinforcement.
4. Position and secure cable to rear fascia reinforcement. Adjust and tighten cable adjustment lock nut.
5. Close engine compartment cover. Check alignment. Pull release handle and check operation. If necessary, reset cable adjustment.
6. Position and secure rear fascia reinforcement cover plate.
7. Position and secure carbon canister.
8. Working in passenger compartment, position and secure rear trim board and parcel net.

ENGINE COVER LATCH ASSEMBLY

Removal

1. Open rear window sunshade louvre.
2. Open engine cover.
3. Remove two screws securing access plate to rear fascia reinforcement panel.
4. Scribe two latch retaining screw alignment marks.
5. Remove two screws securing latch to rear fascia reinforcement panel.
6. Pull latch and cable out of reinforcement panel through access opening.
7. Disconnect release cable and remove latch.

Installation

1. Connect release cable to latch.
2. Position and secure latch to rear fascia reinforcement panel. Align with marks made during removal.
3. Slowly close engine cover. Check latch alignment and release operation. Adjust if necessary.
4. Position and secure rear fascia reinforcement panel access cover.

REAR WINDOW SUNSHADE LOUVRE

Removal

1. With the aid of an assistant, disconnect left and right gas struts at the sunshade.
2. While holding sunshade open, remove two nuts, each side, securing sunshade to hinges.
3. Remove sunshade and place on workbench. Remove two sunshade grilles, latch assembly, and both gas strut mounting balls.

Installation

1. Transfer all parts to replacement sunshade assembly.
2. With the aid of an assistant, position and secure sunshade to both hinges.
3. Connect both gas struts. Slowly close sunshade and check alignment and latch operation. Adjust as necessary.

BUMPERS AND FASCIAS

FRONT FASCIA — Fig. 10

Removal

1. Pull front grille forward to release clips, and remove.
2. Working through grille opening, disconnect luggage compartment lamp harness connectors. Remove screw securing centre support bracket to fascia.
3. Raise hood and peel back luggage compartment to left front fender weather strip. Remove one screw securing ground strap.
4. Remove nuts securing both left and right hood hinges to hood.
5. With the aid of an assistant, loosen both left and right gas strut to hood retaining clips. Disengage gas struts and remove hood assembly.

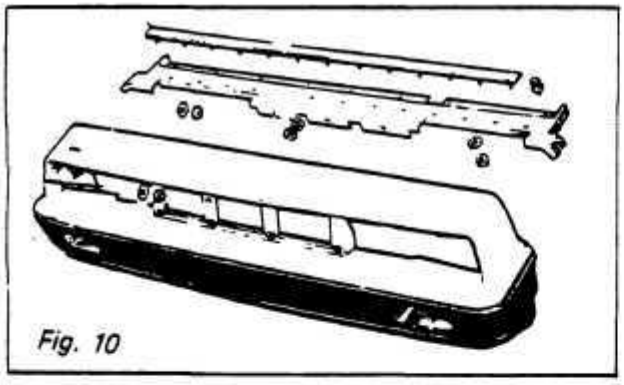


Fig. 10

6. Remove screws securing upper fascia reinforcement to front end panel.
7. Raise car on hoist. Remove both left and right fascia to underbody retaining brackets.
8. Remove five screws securing lower edge of fascia to front spoiler.
9. Lower car from hoist. Remove both left and right park and turn signal lamp assemblies.
10. With the aid of an assistant, lift front fascia over headlamps and remove.
11. Place fascia on work bench and remove fascia to reinforcement retainer strip *assembly* and reinforcement.

Installation

1. Install fascia reinforcement and retainer strip into replacement fascia.
2. With the aid of an assistant, position fascia over headlamps and front end impact absorber.

   Note:
   Front fascia to front end panel assembly fit should be as close as possible. To accomplish this, some front fender and hood alignment may be necessary. It may also be necessary to perform some fascia rework[1]

3. Check for interference of front and hardware with front fascia. Correct if necessary.
4. With the aid of an assistant, push fascia rearward until fascia makes contact with front fenders. Install screws securing reinforcement to front end panel.
5. Raise car on hoist and install five screws securing lower edge of fascia to front spoiler.
6. Position and secure left and right fascia to underbody retaining brackets.
7. Lower car on hoist.
8. Position and secure hood to hood hinges. Connect both gas struts and retaining clips.
9. Close and open hood. Be sure hood and fascia do not rub. Check hood alignment.
10. Install ground strap to fender and secure weather strip, with specified adhesive.
11. Working through grille opening, secure center fascia support bracket. *Connect* luggage compartment lamp harness.
12. Position and secure front park and turn signal lamp assemblies.

13. Position and secure front grille.

PROCEDURE FOR FRONT FASCIA ALIGNMENT

1. Raise hood and loosen fascia reinforcement attaching screws.
2. Remove grille, place on floor with DMC emblem facing up.
3. Remove headlamp assemblies (do not remove seal beams from housings). Use caution not to scratch fascia.
4. Remove headlamp supports. Use caution not to scratch fascia.
5. Pull fascia forward, reshape fender support bracket on both sides to remove raised area on both right and left upper corners.
6. Undercut end and top of fascia at 45° angle to allow fascia to fit fender properly. Top only needs to be undercut in area where fascia contacts fender.
7. Return fascia to original position and check alignment.
8. Align the hood to the fenders.
9. Remove or install shims as needed between the fascia reinforcement and the support bracket. Care must be taken when the shims are installed to insure proper alignment. This can be accomplished by selecting the correct shim and not over tightening the nuts on the fascia studs. If the fascia is too high with all the shims removed, it will be necessary to lower the support bracket by loosening the attaching bolts.
10. The fascia should now be ready to be secured in its permanent position. Have assistant apply pressure to the fascia reinforcement while the screws are tightened.
11. If the end of the fascia extends out past the fender it will be necessary to install a plate over the unused stud on the inside of the fascia at both ends. Place long end of plate inside fender flange with the stud protruding through the hole in the plate. Place a 6 mm nut on the stud and tighten until fascia is flush with the fender. If the fascia will not pull in, the front edge of the fender flange must be moved inward.
12. Reinstall headlamp support brackets, being careful not to scratch fascia.
13. Reinstall headlamp assemblies. Again care must be taken not to scratch the fascia.
14. Inspect the grille retaining clips and repair or replace as needed.
15. Install the grille making sure it is attached securely.

FRONT SPOILER — Fig. 11

Removal

1. Remove two screws securing fender to spoiler on each side of car.
2. Remove one bolt on each side securing wheel opening of fender to spoiler.
3. Raise car on hoist.
4. Remove the two nuts and bolts on each side securing spoiler to front fascia panel and body mounting brackets.
5. Remove seven nuts and bolts securing spoiler to air inlet screen.
6. Remove spoiler.

Installation

1. Reverse the removal procedure to install the spoiler.

FRONT IMPACT ABSORBER

Removal

1. Remove front end fascia panel.
2. Remove five bolts securing impact absorber to body and remove.

Installation

1. Reverse the removal procedure. The impact absorber retaining brackets on the rear of the front foam filled beam should be held while locating impact absorber retaining bolts.

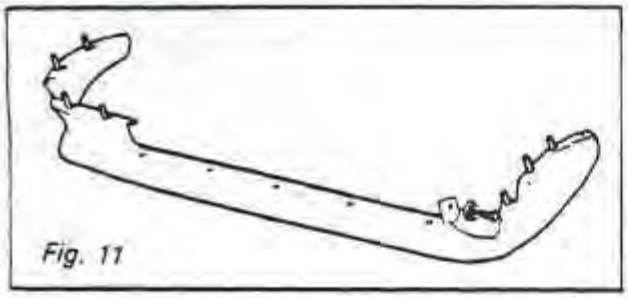


Fig. 11

AIR INLET SCREEN

Removal

1. Raise car on hoist.
2. Remove five screws securing air inlet screen to spoiler.
3. Remove one screw from each side securing the air inlet screen to underbody.
4. Remove five screws securing air inlet screen to front fascia. Remove screen.

Installation

1. Reverse removal procedures.

REAR FASCIA — Fig. 12

Removal

1. Remove both rear tail lamp assemblies.
2. Remove screws securing left and right fascia reinforcement brackets to rear pontoons.
3. Pull fascia assembly away from body.
4. Remove nine screws securing top edge of fascia to reinforcement panel.
5. Working under car, remove one nut, each side, securing lower edge of rear fascia to left and right pontoon brackets.
6. Remove seven nuts securing lower edge of rear fascia to lower support bracket.
7. Remove screws securing both license plate lamp assemblies to rear fascia.
8. Remove rear fascia.

Installation

1. Position fascia over reinforcement panel.
2. Position and secure rear license plate lamp assemblies.
3. Install nine screws securing top edge of fascia to reinforcement panel.
4. Working through tail lamp openings, loosely install nuts securing each side of fascia to reinforcement panel.

   Note:
   It may be necessary to place shims between the fascia and reinforcement panel for proper fascia to fender alignment. See rear fascia alignment procedures.

5. Install seven nuts securing lower edge of rear fascia to lower support bracket.
6. Install one nut, each side, securing lower outer edge of fascia to lower pontoon brackets.
7. Position and secure rear fascia assembly to rear pontoons.
8. Position and secure rear tail lamp assemblies.

PROCEDURE FOR REAR FASCIA ALIGNMENT

1. Raise sunshade louvre and engine cover.
2. Remove attaching bolts to pontoons and remove tail lights.
3. Pull back and secure rear fascia assembly to gain access to quarter panel braces and attaching bolts.
4. Drill ⅛" holes in quarter panel flange to allow installation of new screws to replace existing screws in flange.
5. Trim quarter panel flange back to center of old screw holes.
6. Notch fibre-glass reinforcement where quarter panel bracket makes contact on both outer ends.

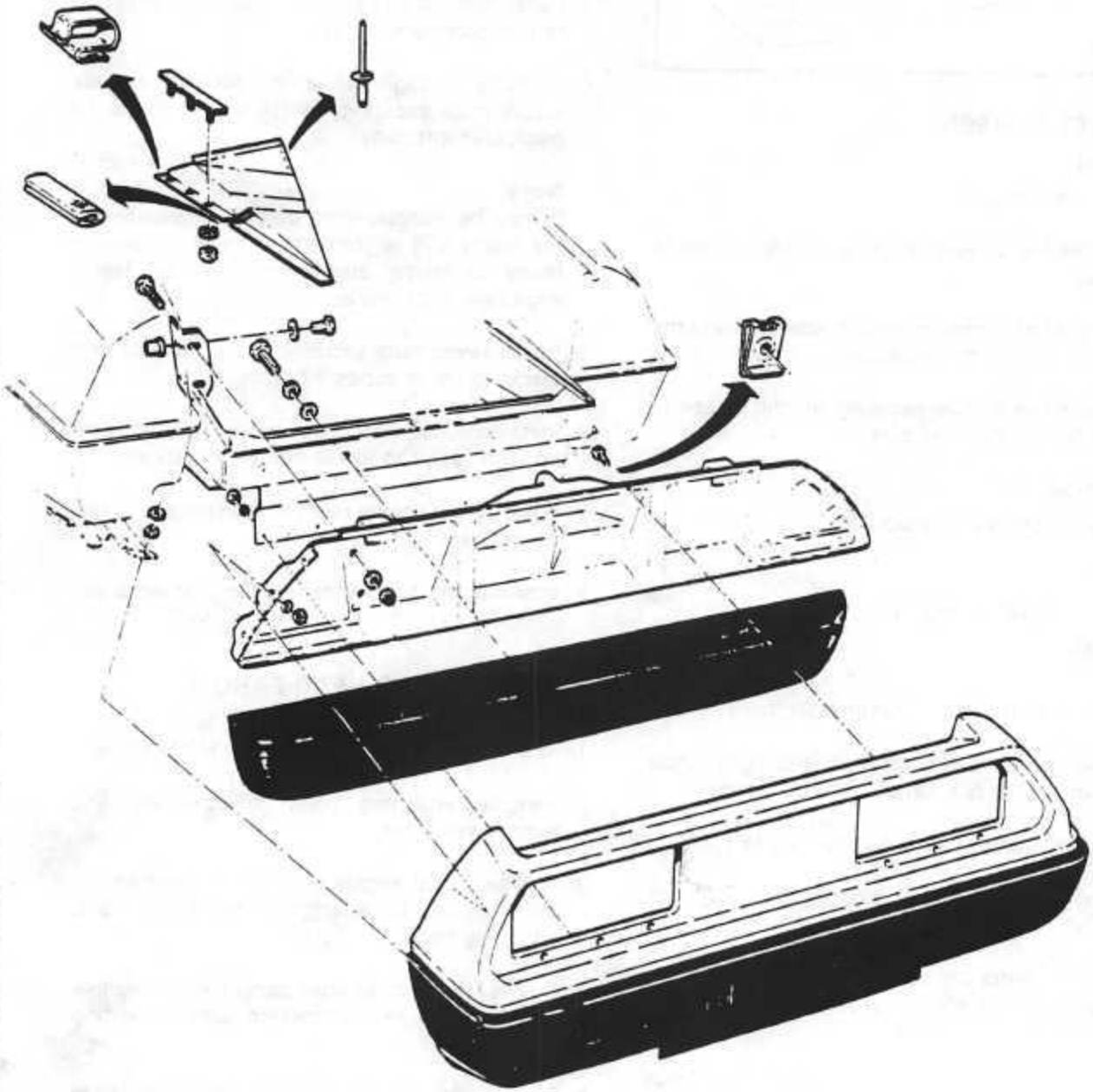


Fig. 12

7. Allow rear fascia to return to its original position and check for fit.

8. Trim edges of fascia (at 45° angle, with edge no thicker than $\frac{1}{32}$") to fit rear edge of quarter panel.

Installation

1. Position fascia over reinforcement panel.

2. Position and secure rear license plate lamp assemblies.

3. Install nine screws securing top edge of fascia to reinforcement panel.

4. Working through tail lamp openings, loosely install nuts securing each side of fascia to reinforcement panel.

   Note:
   It may be necessary to place shims between the fascia and reinforcement panel.

5. Install seven nuts securing lower edge of rear fascia to lower support bracket.

6. Install one nut, each side, securing lower outer edge of fascia to lower pontoon brackets.

7. Position and secure rear assembly to rear pontoons.

8. Position and secure rear tail lamp assemblies.

PROCEDURE FOR REAR FASCIA ALIGNMENT

1. Raise sunshade louvre and engine cover.

2. Remove attaching bolts to pontoons and remove tail lights.

3. Pull back and secure rear fascia assembly to gain access to quarter panel braces and attaching bolts.

4. Drill ⅛" holes in quarter panel flange to allow installation on new screws to replace existing screws in flange.

5. Trim quarter panel flange back to centre of old screw holes.

6. Notch fibre-glass reinforcement where quarter panel bracket makes contact on both outer ends.

7. Allow rear fascia to return to its original position and check for fit.

8. Trim edges of fascia (at 45° angle, with edge no thicker than $\frac{1}{32}$") to fit rear edge of quarter panel.

9. If quarter panel has not been secured with a 6mm bolt at the top bracket, remove screw and re-position quarter panel as necessary to obtain correct fit. DO NOT cut quarter panel bracket at pontoon seam.

10. Fascia is now ready for final adjustments. This is done by using metal shims placed between fibre-glass reinforcement and fascia. Care must be taken to obtain the correct alignment. Many times several shims may need to be tried before the correct shim is found. If more than one shim is used it helps to glue them together. This is an aid during installation.

11. If the fascia attaching bolts will not line up, elongate the holes for the attaching bolts in the fibre reinforcement. Tighten all the attaching bolts finger tight before you tighten any of them with a wrench.

12. Check to see if you have any dimples on the sides of the fascia, if you do the nuts on the attaching studs are too tight.

13. Reinstall tail lamps.

14. Check and adjust engine cover and sunshade louvre.

REAR IMPACT ABSORBER

Removal

1. Remove rear fascia assembly as described in this section.

2. Remove four bolts securing impact absorber to chassis.

Installation

1. Reverse removal procedure.

POWER WINDOW REGULATOR ASSEMBLY

Removal

1. Remove upper and lower interior door trim.
2. Partially lower power window to allow access to nuts securing window regulator arm to window carrier. Remove nuts.
3. Remove one nut securing lower portion of regulator arm to door handle mounting bracket.
4. Remove three screws securing regulator motor mounting bracket to inner door.
5. Position regulator motor to allow access to mounting bracket retaining screws. Remove screws and mounting bracket.
6. Disengage regulator arm retaining studs from window carrier and remove regulator assembly from inner door.

Installation

1. Position regulator assembly into inner door. Loosely install upper regulator arm to window carrier retaining nuts.
2. Loosely install lower regulator arm to pull handle mounting bracket retaining nut.
3. Position and secure regulator motor to mounting bracket.
4. Position and secure regulator assembly to inner door.
5. Tighten regulator arm retaining nuts.
6. Connect electrical connectors to motor and check window operation.
7. Position and secure upper and lower interior door trim.

POWER WINDOW ASSEMBLY — Fig. 13

1. Remove upper and lower interior door trim panels.
2. Partially lower power window to allow access to two nuts securing window regulator arm to window carrier. Remove nuts.
3. Disengage window carrier from window regulator arm. Pull the window assembly off the front and rear guide channels and remove.

Installation

1. Reverse removal procedure.

WINDSHIELD (REPLACEMENT)

Removal

1. Cover the car's interior, fenders and luggage compartment with dust covers.
2. Partially remove inner and outer door seals around both sides and header panel.
3. Remove both "A" post finisher panels.
4. Remove windshield header panel and retainer.
5. Remove both windshield wiper assemblies.
6. Remove cowl screen.
7. Remove interior rear view mirror.
8. Drill a small hole through the polyurethane adhesive bead at the "A" post. Feed piano wire through the hole. Attach lever tool handles to each end of the wire.

CAUTION: Both operators should wear protective gloves and goggles.

9. With the aid of an assistant, cut completely around windshield polyurethane adhesive bead. Remove windshield.
10. Remove all polyurethane adhesive from body flange with a razor blade knife.

Installation

1. With the aid of an assistant, position replacement windshield to the fitted position of the windshield opening. Mark the position of the support clips on the lower edge of windshield to aid alignment during installation.

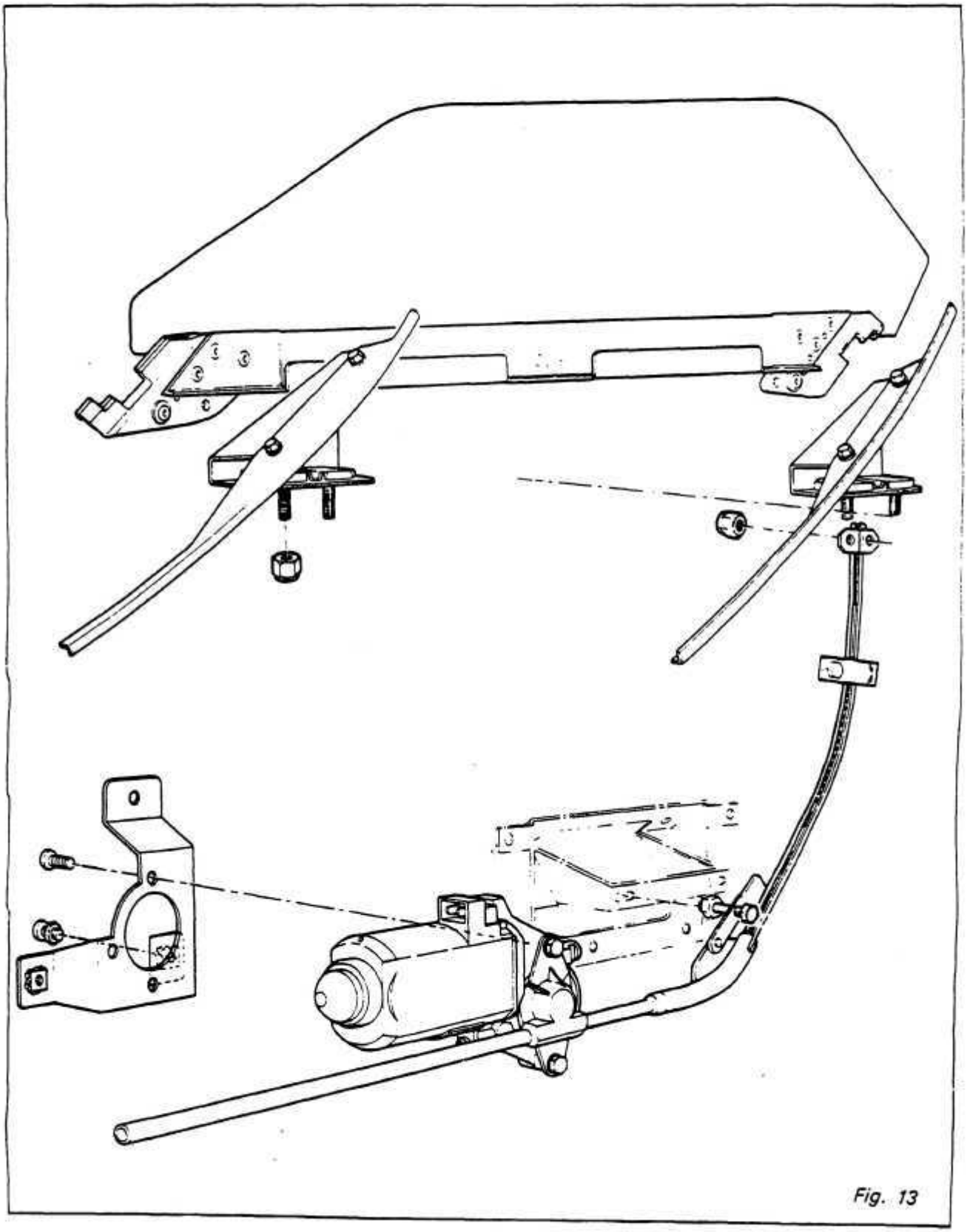


Fig. 13

2. Remove the windshield and lay on soft surface with inside facing up.

3. Apply a bead 12.7 mm (½") wide of Betaseal around the perimeter on the interior side of the glass.

4. Prepare and install windshield on vehicle.

5. Water test windshield for leaks, allowing at least six hours after installation. Fill leaks with Betaseal if necessary.

6. Let Betaseal dry approximately six hours at a constant room temperature then clean and trim excess with a razor blade knife.

7. Position and secure windshield rear view mirror.

8. Position and secure cowl screen.

9. Position and secure windshield header panel and retainer.

10. Position and secure left and right "A" post finisher panels.

11. Position and secure inner and outer door seals.

GLASS

FIXED DOOR GLASS

If replacement fixed glass is not assembled with the power window upper channel (guide), perform the replacement procedures described in this subsection.

Removal

1. Remove upper and lower door trim panels.
2. Remove inner power window seal.
3. Remove door assembly, and place on suitable work surface.
4. Using either piano wire or a hot knife, cut polyurethane bead securing glass to door assembly.
5. Remove excess polyurethane adhesive from door assembly where new glass will be installed.

Installation

Note:
With a new door replacement only, apply epoxy primer to stainless steel where glass will be secured. This is not necessary on original doors as they have been primed at the factory. Without this primer, bonding of the glass to the door will not be possible.

1. Using glass primer 2, apply a bead 13mm (½") wide around the perimeter on the exterior side of the fixed glass. Let primer dry approximately fifteen (15) minutes.
2. Apply a bead of polyurethane adhesive (16711) approximately 9mm (⅜") in diameter to the outside perimeter of the fixed glass.
3. Position fixed glass into door assembly, install spacers standing up on longest edge.
4. Hold glass in position. Install rubber trim between fixed glass and door assembly. This must be done while polyurethane is still wet. Let polyurethane dry for approximately six hours at a constant room temperature.
5. After polyurethane is dry it can be cleaned and trimmed with a razor blade scraper.
6. Position and secure door assembly.
7. Raise and lower power window to check alignment. Adjust power window inner door guides, if necessary.
8. Position and secure inner power window seal.
9. Position and secure lower and upper interior door trim panels.

REAR QUARTER GLASS

Removal

1. Remove rear quarter panel, and place on a suitable work surface.
2. Using either piano wire or a hot knife, cut polyurethane adhesive bead securing glass and air inlet grille to rear quarter panel.
3. Remove air inlet grille and glass from quarter panel.
4. Remove any excess polyurethane adhesive from quarter panel.

Installation

Note:
With a new rear quarter panel replacement only, apply epoxy primer to stainless steel where glass will be secured. This is not necessary on original quarter panels as they have been primed at the factory. Without this primer, bonding of the glass to the quarter panel will not be possible.

1. Using glass primer 2, apply a bead 12.7mm (½") wide around the perimeter on the exterior side of the glass. Let primer dry approximately fifteen (15) minutes.
2. Apply a bead of polyurethane adhesive approximately 9.15mm (⅜") in diameter to the outside perimeter of fixed glass and air inlet grille.

3. With a firm, even pressure, position and secure the air inlet grille to the quarter panel.

4. With a firm even pressure position and secure the fixed glass to the quarter panel. Let polyurethane adhesive dry for approximately six hours at a constant room temperature.

5. After polyurethane is dry, it can be cleaned and trimmed with a razor blade scraper.

6. Position and secure rear quarter panel.

POWER WINDOW UPPER CHANNEL (GUIDE)

Installation

1. Using glass primer 2, apply a bead 12.7mm (½") wide on both sides of the fixed glass along the perimeter where the power window channel is to be installed. Let primer dry approximately 15 minutes.

2. Apply polyurethane adhesive (16411) to the locating edge of the channel. Attach the channel to the fixed glass, and let adhesive dry for approximately six hours at a constant room temperature.

TRIM

CONSOLE — Fig. 14

Removal

1. Disconnect negative battery cable.
2. Remove three knobs from heater A/C control panel. Remove one screw located behind centre function knob and remove heater A/C control panel face plate.
3. Remove transmission shift level knob.
4. Remove two screws securing transmission shift level panel to console. Raise panel and remove interior lamps rheostat and digital clock. Remove panel.

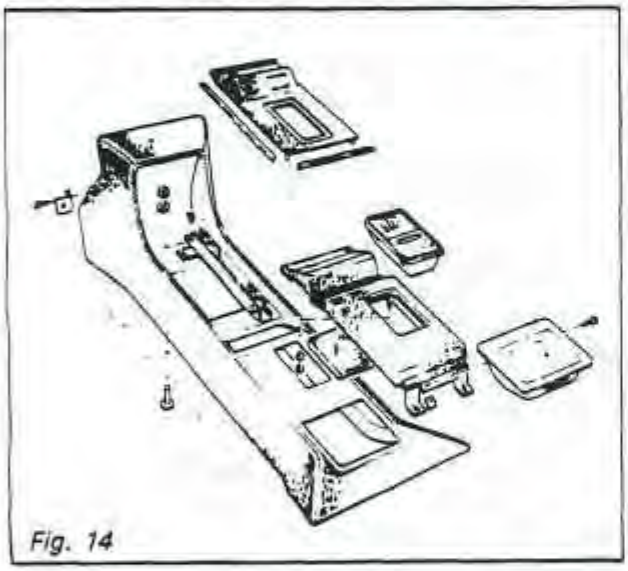


Fig. 14

5. Remove four nuts securing console to body through transmission shift level panel opening.
6. Remove one screw, each side, securing console front edge to crash pad.
7. Remove two screws securing the rear tray to console. Remove tray.
8. Remove two nuts securing rear console to body through rear tray opening.
9. Raise console sufficiently to disconnect cigar lighter and rocker switch connectors. Remove console.
10. Place console on work bench and remove four nuts securing upper panel to new console.

Installation

1. Reverse removal procedures.

REAR QUARTER TRIM PANEL

Removal

1. Remove inner door seal from rear of door opening.
2. With the use of heat gun, carefully unstick quarter panel trim from around door filler panel flange.
3. Carefully unstick carpet from around lower edge of quarter panel.
4. Remove plastic appearance cap from "B" post upper seat belt retaining screw.
5. Remove upper and lower seat belt mounting screw.
6. Remove seat belt opening trim from rear quarter panel.
7. Remove panel while feeding seat belt through opening.

Installation

1. Reverse removal procedures.

SEAT BELT RETRACTOR

Removal

1. Remove rear quarter trim panel.
2. Remove screw securing seat belt retractor to door striker plate reinforcement bracket. Remove retractor.

Installation

1. Reverse removal procedures.

RIGHT HAND INSTRUMENT PANEL KNEE PAD — Fig. 15

Removal

1. Working under the right hand side of the instrument panel, remove the A/C crossover duct.

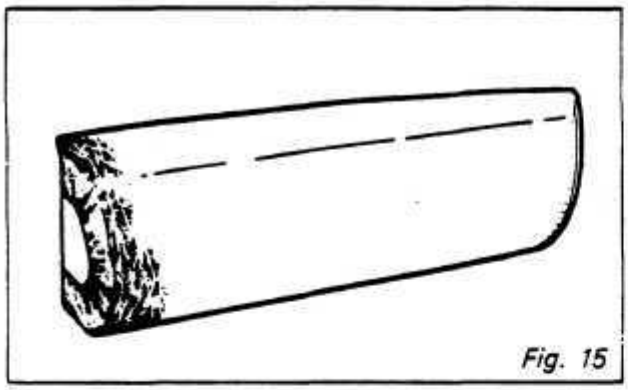


Fig. 15

2. Remove six nuts securing the knee pad to instrument panel assembly.

Installation

1. Reverse the removal procedure.

LEFT HAND INSTRUMENT PANEL KNEE PAD — Fig. 16

Removal

1. Working under left hand side of the instrument panel, remove the A/C crossover duct.

2. Remove four nuts securing the knee pad to instrument panel assembly.

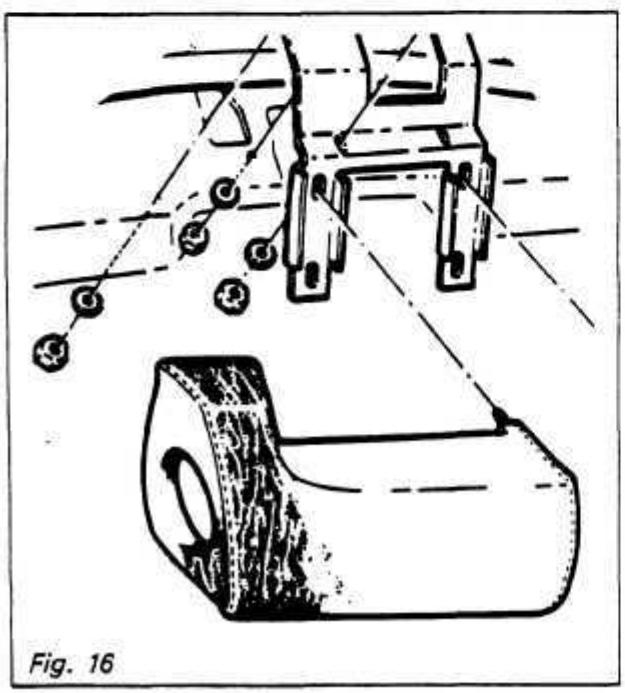


Fig. 16

Installation

1. Reverse removal procedure.

UPPER DOOR TRIM PAD

Removal

1. Lower power window.

2. Pry loose trim pad retaining clips located along upper edge of trim pad.

3. Lift trim pad upward and release armrest retaining tabs. Remove upper trim pad.

Installation

1. Reverse removal procedure.

LOWER DOOR TRIM PAD

Removal

1. Remove the upper trim panel described above.

2. Remove the screws securing lower trim panel mounting bracket to door assembly.

3. Pry loose the retaining clips securing the lower edge of the trim panel.

4. Pull the trim panel away from the floor to gain access to the door pull handle mounting bracket. Using a long Phillips screwdriver, remove two screws securing the door pull handle to its mounting bracket. Remove the lower trim panel.

5. When working on the left door, remove the power mirror switch. When working on the right door, remove the close-out plate.

6. Remove two screws securing the pull handle mounting bracket, and set aside.

Installation

1. Position and secure pull handle mounting bracket to the pull handle assembly.

2. Position pull handle assembly into the lower trim panel.

3. Position lower trim panel on door and secure two pull handle mounting screws.

4. Install lower trim panel upper mounting bracket screws.

5. Secure lower trim panel to door retaining clips.

6. Install either the left door power mirror switch, or the right door close-out plate.

7. Position and secure upper trim panel, as described above.

8. Position and secure door control panel bezel.

FRONT HEADLINER (REPLACE) — Fig. 17

Removal

1. Remove both left and right sunvisors.

2. Working along roof panel area, partially remove the left and right inner door seals.

3. Using an X-Acto knife or equivilent tool, cut front headliner material along edge secured to roof panel with adhesive.

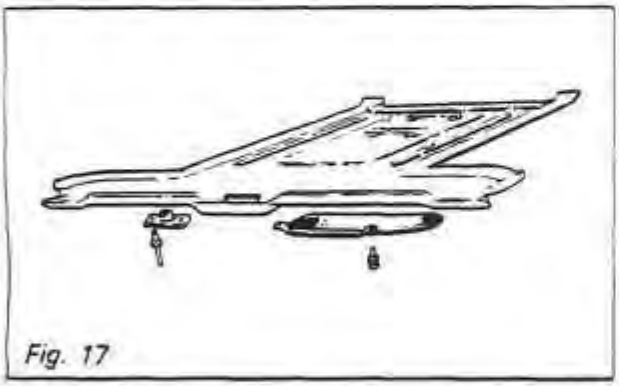


Fig. 17

4. Pull headliner forward. Disengage from roof panel retaining clips, lower headliner, disconnect courtesy lamp assembly and remove headliner.

5. Peel back and remove excess headliner material from roof panel.

6. Clean adhesive from roof panel with a general purpose adhesive cleaner.

Installation

1. Position and secure courtesy lamp assembly to headliner.

2. Position and secure front headliner into roof panel retaining clips.

3. Position and secure both left and right sunvisors.

4. Spread an even coat of specified adhesive along roof panel where the headliner material will be secured.

5. Pull headliner material tight, position over roof panel and apply a firm pressure to secure material to adhesive.

   Note:
   Be very careful not to create any wrinkles in headliner material.

6. Position and secure left and right inner door seals.

REAR HEADLINER (REPLACE) — Fig. 18

Removal

1. Working along roof panel area, partially remove left and right inner door seals.

2. Using X-Acto knife or equivalent tool, cut headliner material along edge secured to roof panel with adhesive.

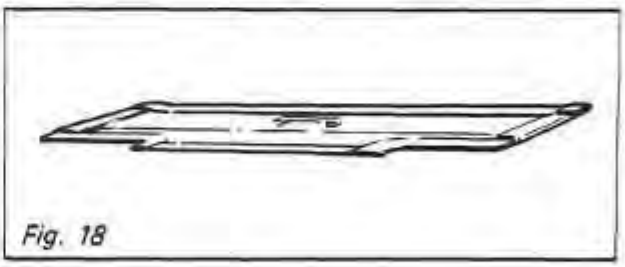


Fig. 18

3. Pull headliner forward, disengage from roof panel retaining clip and remove.

4. Peel back and remove excess headliner material from roof panel.

5. Clean adhesive from roof panel with a general purpose adhesive cleaner.

Installation

1. Position leading edge of rear headliner between trailing edge of front headliner and roof panel. Push rear headliner rearward to engage with roof panel retaining clip.

2. Spread an even coat of specified adhesive along roof panel where headliner material will be secured.

3. Pull headliner material tight, position over roof panel, and apply a firm pressure to secure material to adhesive.

Note:
Be very careful not to create any wrinkles in headliner material.

4. Position and secure left and right inner door seals.

Chassis

CONTENTS

GENERAL DESCRIPTION – CHASSIS

The chassis frame is constructed of high grade steel, consisting of five (5) main sections. All sections are boxed, thus giving immense strength and rigidity.

The front section, which is replaceable, carries the steering rack and radiator. The fuel tank is housed behind the front suspension crossmember. The centre box section houses the gearchange mechanism and also provides an extremely rigid platform for the G.R.P. body shell. The rear section of the assembly houses the engine, transmission and rear suspension.

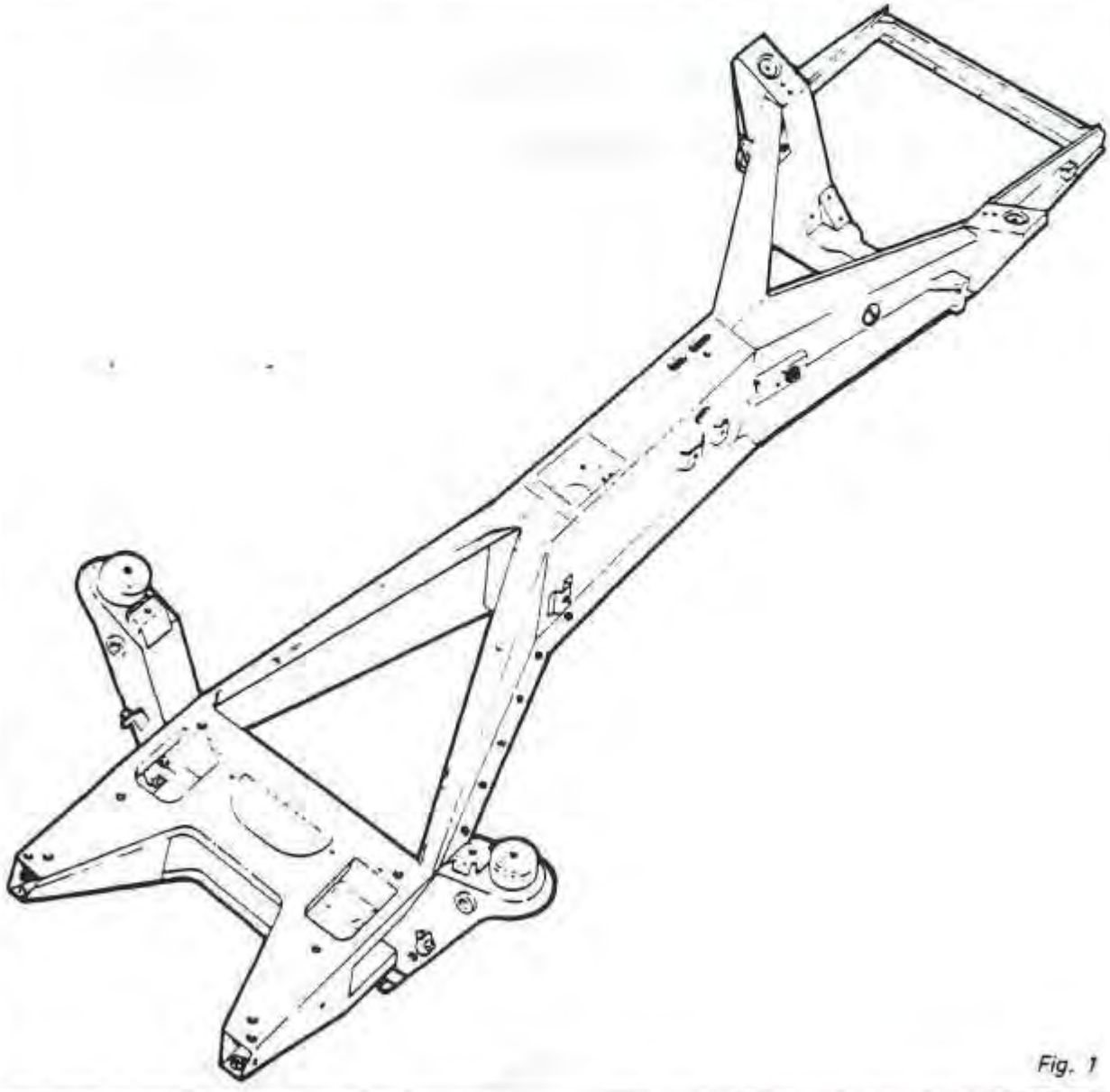


Fig. 1

The entire chassis frame is thickly coated with an epoxy coating to protect it from the elements. Should the chassis be damaged, due to impact, the critical dimensions *Fig. 2* may be checked using the chassis "drop check" method.

DIMENSIONS

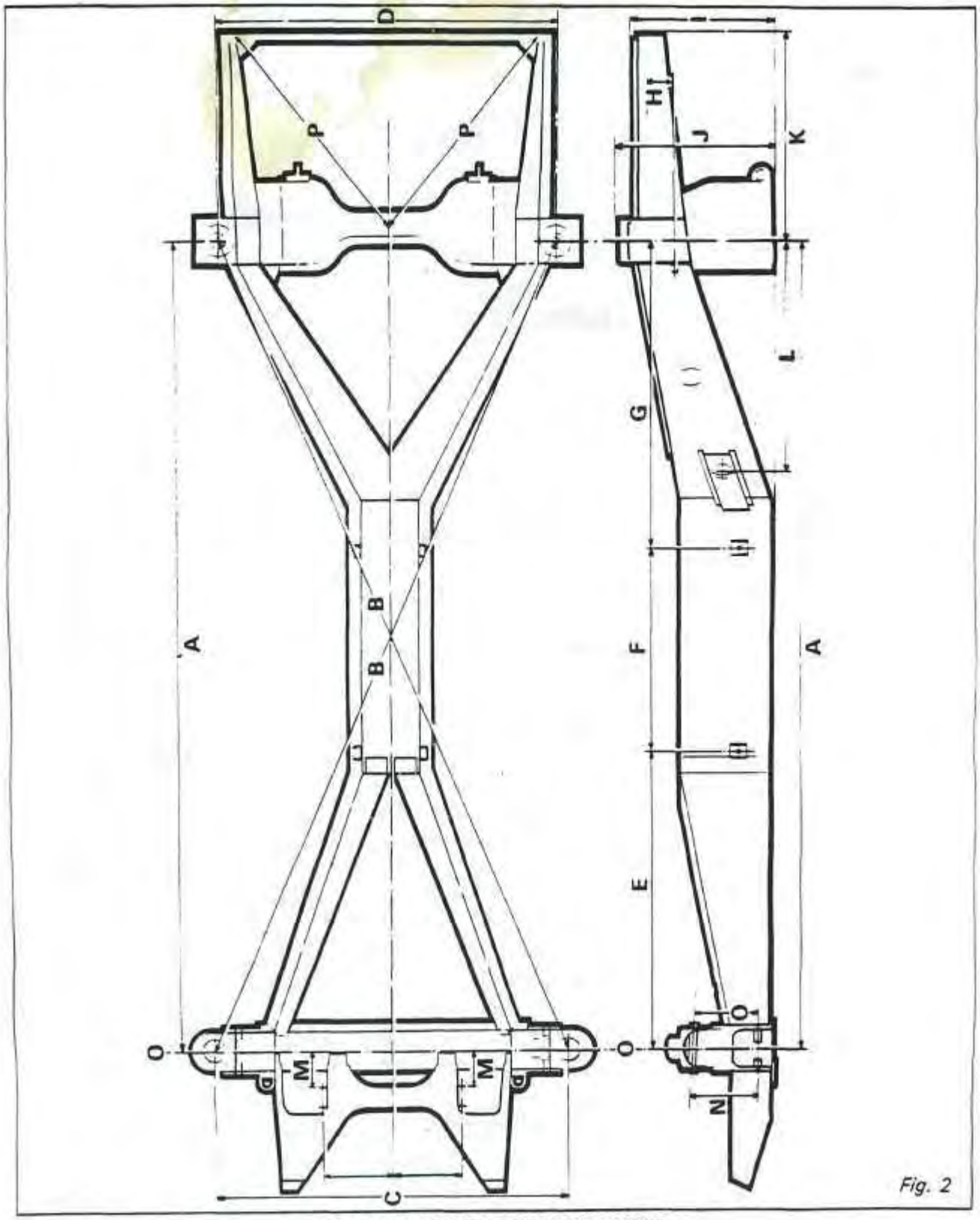


Fig. 2

FRAME DIMENSION REFERENCE POINTS

DIMENSIONS – CHASSIS FRAME – Fig. 2

A	2552.0 mm	100.47 in	Front to Rear Suspension Centres
B	2777.0 mm	109.33 in	Diagonal Suspension Towers (Shock Absorber Top Mounting)
C	1105.0 mm	43.62 in	Front Shock Absorber Upper Mounting Centres
D	1060.0 mm	41.73 in	Rear Shock Absorber Upper Mounting Centres
E	941.0 mm	37.05 in	Front Body Mounting to Front Shock Absorber Top Mounting
F	635.0 mm	25.00 in	Front to Rear Body Mountings
G	976.0 mm	38.45 in	Rear Body Mountings to Rear Top Shock Absorber Mounting
H	85.0 mm	3.35 in	Rear Top Wishbone Inner Mounting To Rear Body Mounting
I	436.0 mm	17.17 in	Datum Line to Top of Chassis Rear Extension
J	484.0 mm	19.05 in	Datum Line to Top of Rear Suspension Tower
K	644.0 mm	25.35 in	Centre Line of Rear Damper Top Mounting to Rear of Frame
L	729.1 mm	28.70 in	Rear Radius Arm Centre Line to Rear Shock Absorber Top Mount (to be measured along Datum)
M	118.0 mm	4.64 in	Front Suspension Cross Member Centre Line to Rear Rack Mounting
N	207.9 mm	8.18 in	Top Wishbone Mounting Front To Centre Line of Lower Control Arm
O	200.25 mm	7.88 in	Top Wishbone Mounting Rear to Centre Line of Lower Control Arm
P	1185.0 mm	46.63 in	Diagonal Rear Shock Absorber Top Mount to Top Flange of Rear Side Member

IMPACT TUBE REPLACEMENT

R:03:02	Chassis

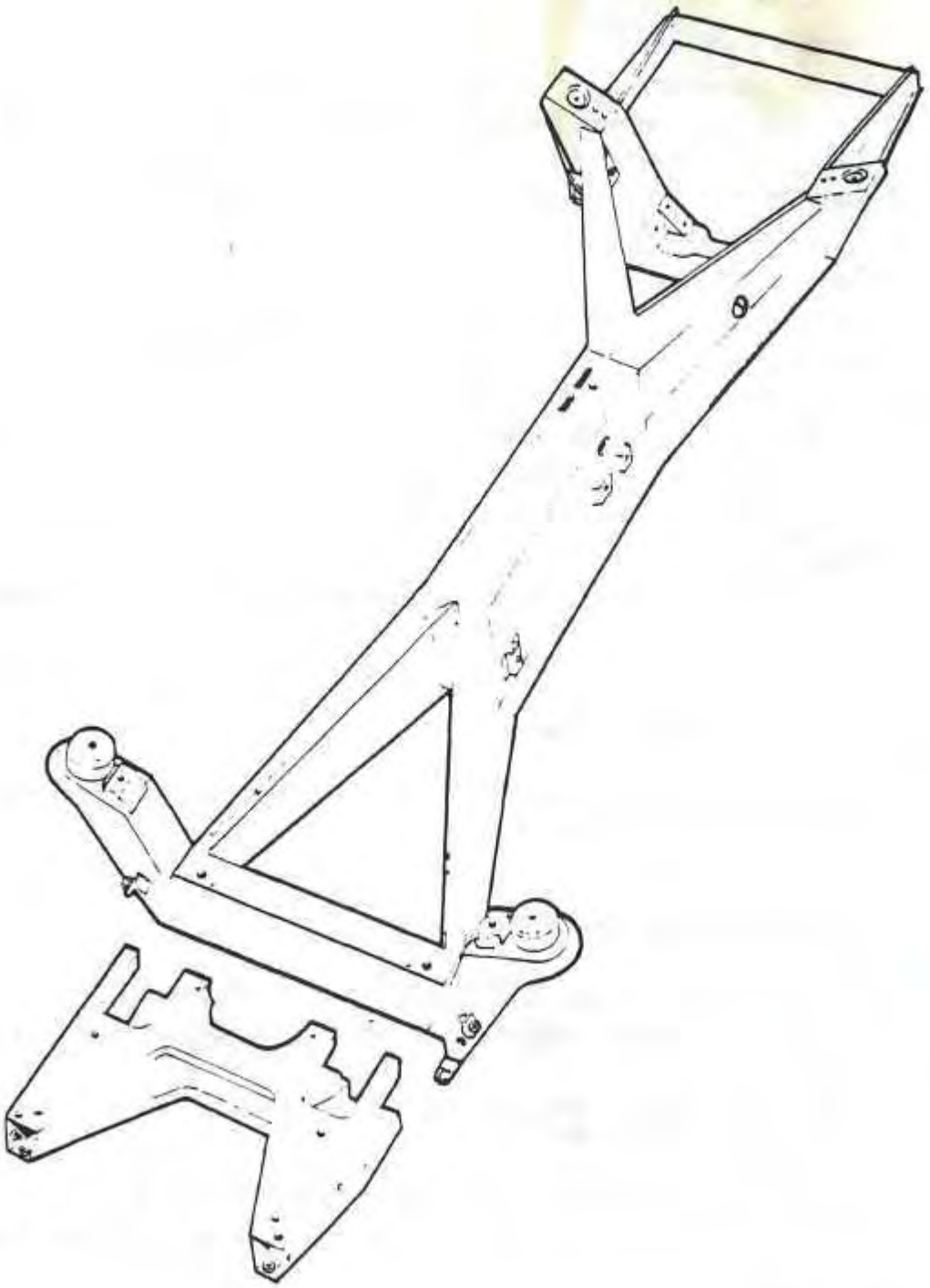


Fig. 3

REPLACEMENT PROCEDURE

If it is established that the Front Chassis Impact Tube Part No. 105829, is damaged, it may be replaced by the following:

1. Empty fuel tank.
2. Remove fuel pump and roll over valve inspection covers.
3. Disconnect fuel lines from fuel pump, fuel filler hose and vent hose from the fuel tank and fuel pump and fuel gauge wires.
4. Using the appropriate equipment, evacuate the air conditioning system.
5. Raise vehicle on a hoist.
6. Drain coolant system.
7. Remove air ducting shroud between air dam and radiator.
8. Disconnect air conditioning lines and coolant hoses from radiator.
9. Disconnect wiring loom from coolant fans.
10. Remove right and left side radiator mounting brackets and remove radiator and fans as a unit.
11. Remove fuel tank closing plate and remove fuel tank.
12. Undo lower steering rack u-joint, steering rack brackets and tie-rod ends.
13. Remove steering rack.
14. Using an air chisel, high speed rotary grinder, or metal saw remove damaged front chassis impact extension.

    Note:
    Do not put into parent metal.

15. Grind all surfaces to be welded flush with parent metal allowing approximately $\frac{1}{4}$ inch to 1 inch of clean metal at points to be welded.

    Note:
    Do not use oxyacetylene cutting torch.

16. Attach alignment tool jig J-33229 loosely to front crossmember.
17. Attach new chassis extension impack assembly to tool jig. Tighten all fasteners on jig and check alignment.
18. Tack weld at all major contact points and remove jig and continue welding process until all contact areas joined. Allow to cool.
19. Coat all bare metal surfaces with corrosion protective Kit Part No. 109264/5. This is an epoxy tw pack kit which should be mixed in equal quantities and allow to dry.
20. Refit all disassembled parts in reverse order. Torque all fasteners to specification.

    Note:
    Refill cooling system and pressure test.
    Recharge air conditioning system, check steering geometry and adjust if necessary.