

LANCIA

4WD

Service
Manual



INTRODUCTION
TECHNICAL DATA

ENGINE

CLUTCH

GEARBOX
DIFFERENTIAL

PROPELLER
SHAFT

REAR
DIFFERENTIAL

BRAKING SYSTEM

STEERING

SUSPENSION AND
WHEELS

AUXILIARY UNITS

ELECTRICAL EQUIPMENT

BODYWORK

This publication has been divided into sections headed by two figure numbers which appear in the parts microfiches and in the repair time schedules.

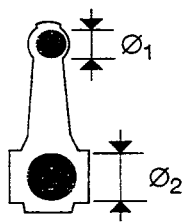
The section titled **INTRODUCTION and TECHNICAL DATA (00.)** has a dual purpose of introducing the model and reinforcing the remaining part of the manual. It contains tables of technical data and information relating to the chapters in the remaining section of the manual.

The remaining sections (10. - 18. etc) include descriptions of the servicing operations.

NOTE *The operations involved in removing-refitting the power unit are illustrated in section 10. The procedure for overhauling the engine at the bench is described in a separate booklet which has its own print number. It should be inserted, according to the size of the engine, in the appropriate section, in either the "Overhauling petrol engines" or "Overhauling Diesel engines" binder.*

This publication contains graphic representations and symbols in place of descriptions for mechanical components, operations and servicing techniques. The use of colour for a component or part of one serves to draw the operator's attention to the object to be measured or checked.

Example:



Small end diameter

Big end bearing housing



Tighten to torque

THIS PUBLICATION HAS BEEN PRODUCED IN A LOOSE LEAF FORMAT TO FACILITATE THE OPERATION OF UPDATING THE MODEL. ANY SUBJECTS DEALT WITH IN THE SERVICE BULLETINS SHOULD BE INSERTED, FROM TIME TO TIME, UNDER THE APPROPRIATE SECTION.

The **DELTA HF 4WD** is a 2 box saloon with a load carrying structure; it has a 1995 cc 4 cylinder in line engine transversely mounted at the front which runs on super petrol, has an electronic ignition/injection system, is supercharged by a turbocharger and develops a power output of 122 kW (165 bhp).

It has permanently engaged four wheel drive.

Ferguson type viscous joints are fitted to the central differential. The rear differential is the Torsen self-locking type.

THE PRISMA 4WD is a three box saloon with a load carrying structure; it has a 4 cylinder in line 1995 cc engine transversely mounted at the front, runs on super petrol, is equipped with an electronic injection/ignition system and develops a power output of 84.5 kW (115 bhp).

It has permanently engaged four wheel drive.

Ferguson type viscous joints are fitted to the central differential. The rear differential has electro-pneumatic engagement for locking.

DELTA-PRISMA 4WD Graphic representations and symbols

	Remove Disconnect		Operation
	Refit Connect		Tolerance Difference in weight
	Removing Dismantling		Pre-load
	Fitting Reassembly		Rotation
	Tighten to torque		Rolling torque
	Tighten to torque plus angle		Angle Angular value
	Stake nut		Compression ratio
	Adjustment Regulation		Grades Classes
	Visual inspection Check		Oversize Greater than Maximum
	Warning		Undersize Smaller than Minimum
	Lubricate Grease		Number of revs
	Replacement Genuine spares		Ratio
	Bleed braking system		Pressure
	Machined surface Finished surface		Temperature
	Interference Force fit		Temperature <0°C Cold Winter
	Distance to be measured Measurement - Check Thickness - Clearance		Temperature >0°C Hot Summer
	Inlet		Windscreen wiper with electric washer pump
	Exhaust		Rearscreen wiper with electric washer pump
	Engine		

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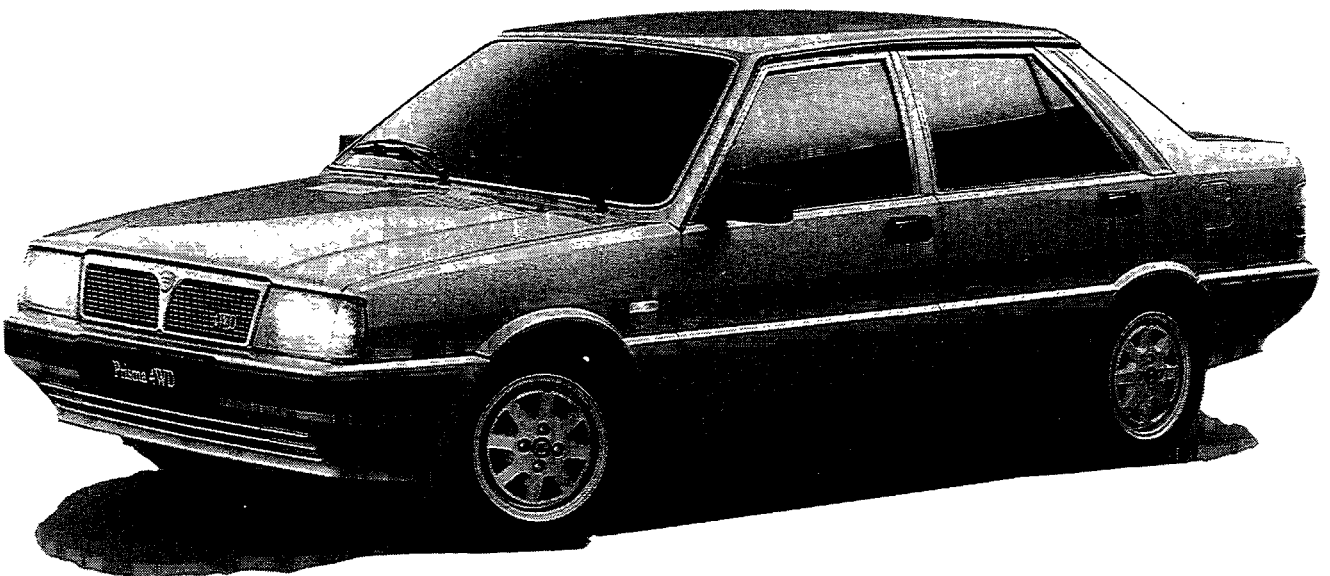
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3/4 front view of DELTA HF 4WD

As an alternative air vents for cooling the front brakes are fitted in place of the driving lights

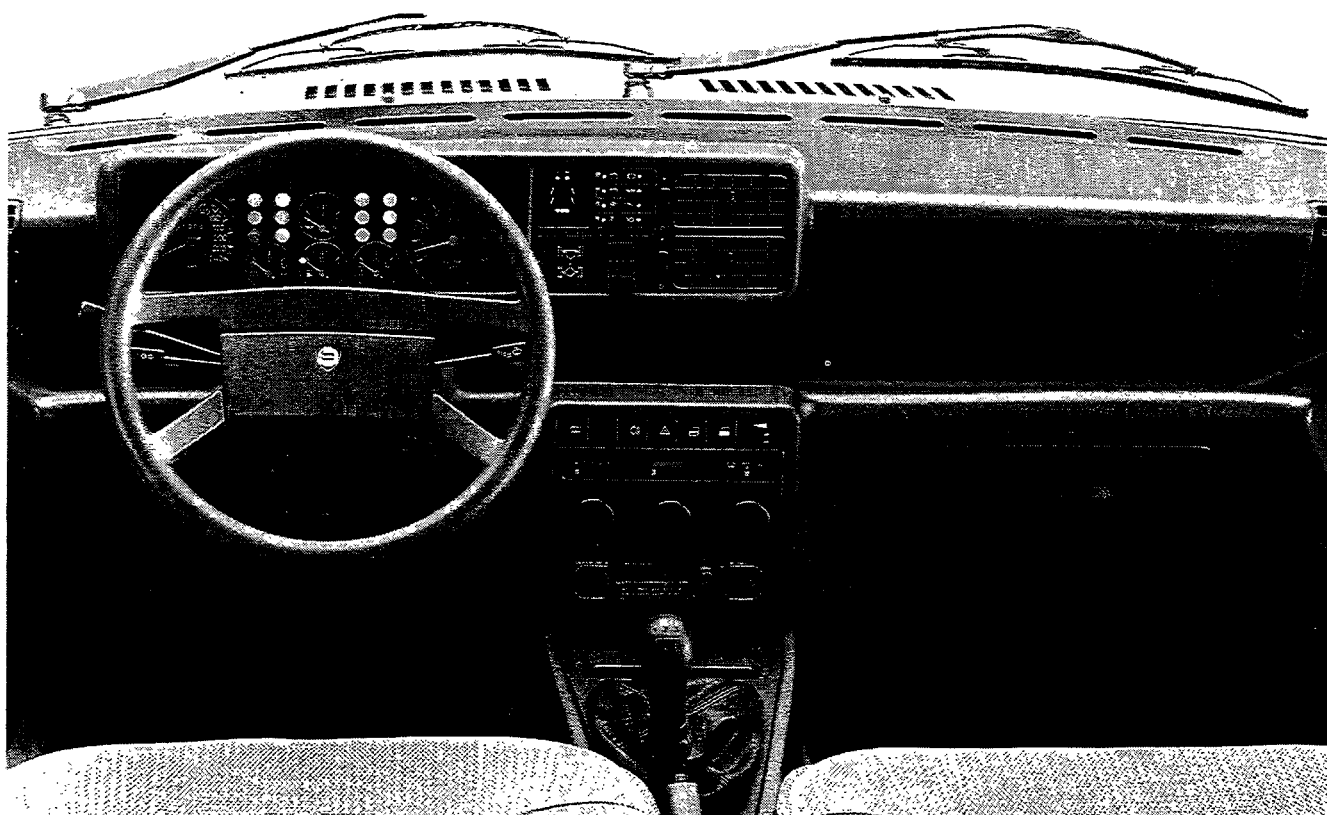


3/4 front view of PRISMA 4WD

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View of the dashboard on the DELTA HF 4WD



View of the dashboard on the PRISMA 4WD



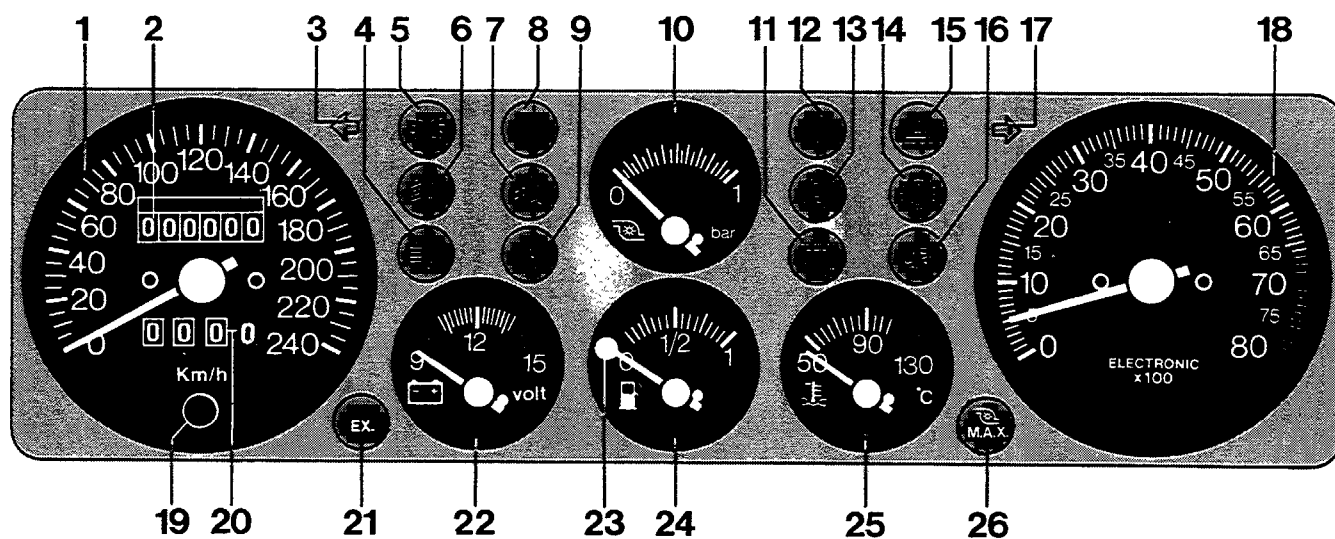
View of the interior of the DELTA HF 4WD



View of the interior of the PRISMA 4WD

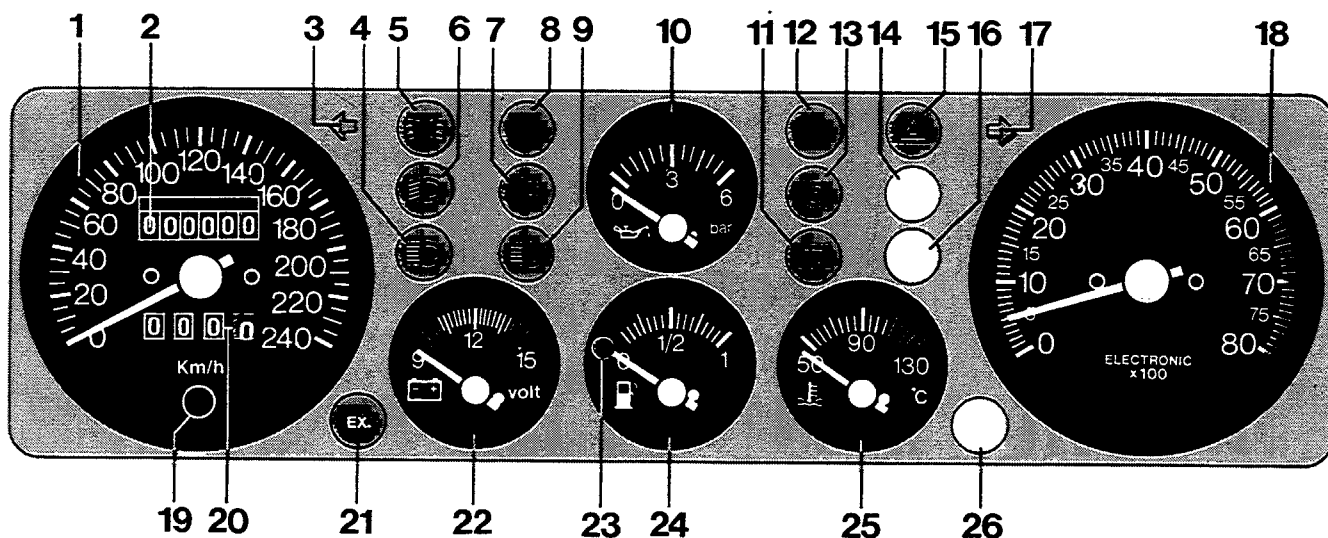
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Instrument panel on the DELTA HF 4WD



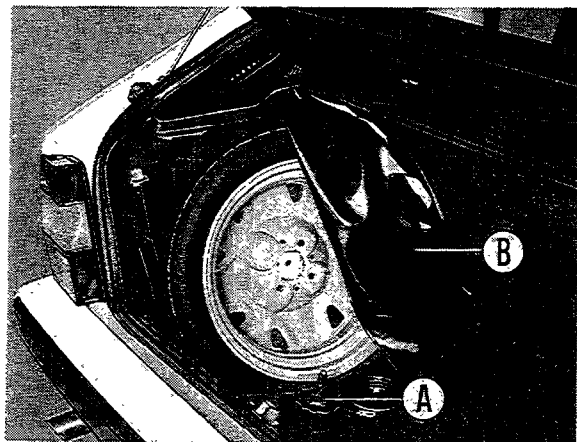
- | | |
|--|---|
| 1. Speedometer | 14. Brake pad wear warning light |
| 2. Milometer | 15. Hazard warning lights warning light |
| 3. Left direction indicator signal | 16. Coolant overheating warning light |
| 4. Main beam headlamps warning light | 17. Right direction indicator signal |
| 5. Dipped headlamps warning light | 18. Rev counter |
| 6. Lights warning lights | 19. Push button for zeroing trip meter |
| 7. Fog lamps warning light | 20. Trip meter |
| 8. Starting go ahead signal | 21. Catalytic silencer maximum temperature warning light (for specific markets) |
| 9. Rear fog lamps warning light | 22. Volt meter |
| 10. Turbocharger pressure gauge | 23. Fuel reserve warning light |
| 11. Heated rear windscreen warning light | 24. Fuel gauge |
| 12. General warning light | 25. Coolant temperature gauge |
| 13. Handbrake warning light | 26. Overboost engaged warning light |

Instrument panel on the PRISMA 4WD

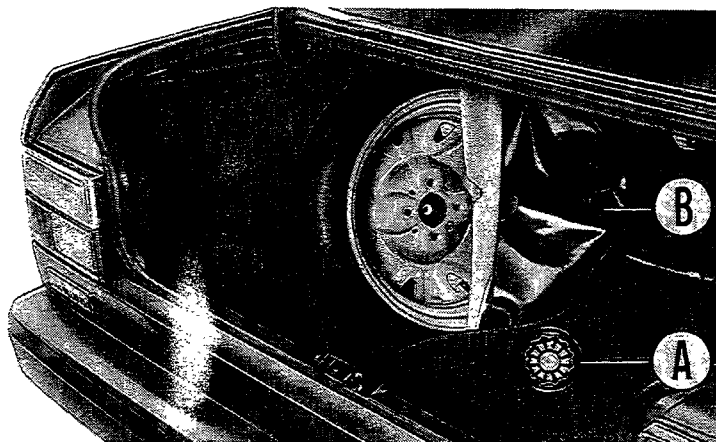


- | | |
|--|---|
| 1. Speedometer | 14. Spare warning light |
| 2. Milometer | 15. Hazard warning lights warning light |
| 3. Left direction indicator signal | 16. Spare warning light |
| 4. Main beam headlamps warning light | 17. Right direction indicator signal |
| 5. Lights warning light | 18. Rev counter |
| 6. Dipped headlamps warning light | 19. Push button for zeroing trip meter |
| 7. Rear fog lamps warning light | 20. Trip meter |
| 8. General warning light | 21. Catalytic silencer maximum temperature warning light (for specific markets) |
| 9. Driving lights warning light | 22. Volt meter |
| 10. Engine oil pressure gauge | 23. Fuel reserve warning light |
| 11. Heated rear windscreen warning light | 24. Fuel gauge |
| 12. Starting go ahead signal | 25. Coolant temperature gauge |
| 13. Handbrake warning light | 26. Spare warning light |

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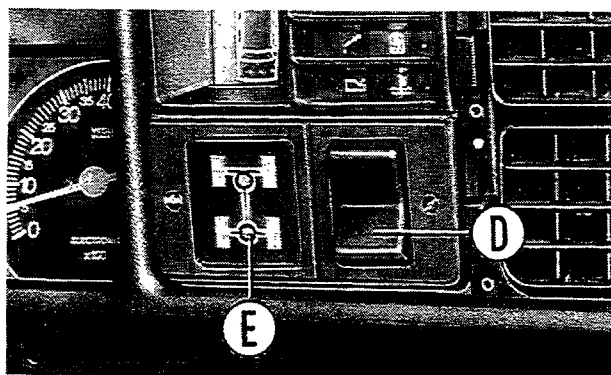


Spare wheel housing on the DELTA HF 4WD



Spare wheel housing on the PRISMA 4WD

NOTE The spare wheel is smaller; in order to remove it from its housing undo the clip **A** and remove the cover **B**. This wheel should only be used for essential journeys to reach a garage where repairs can be carried out. Maximum speed 80 kph (50 mph).



Engaging-releasing rear differential for the PRISMA 4WD

In order to lock the rear differential press the lower section of switch **D** and LED **E** should come on. To release the differential press the upper section of switch **D**

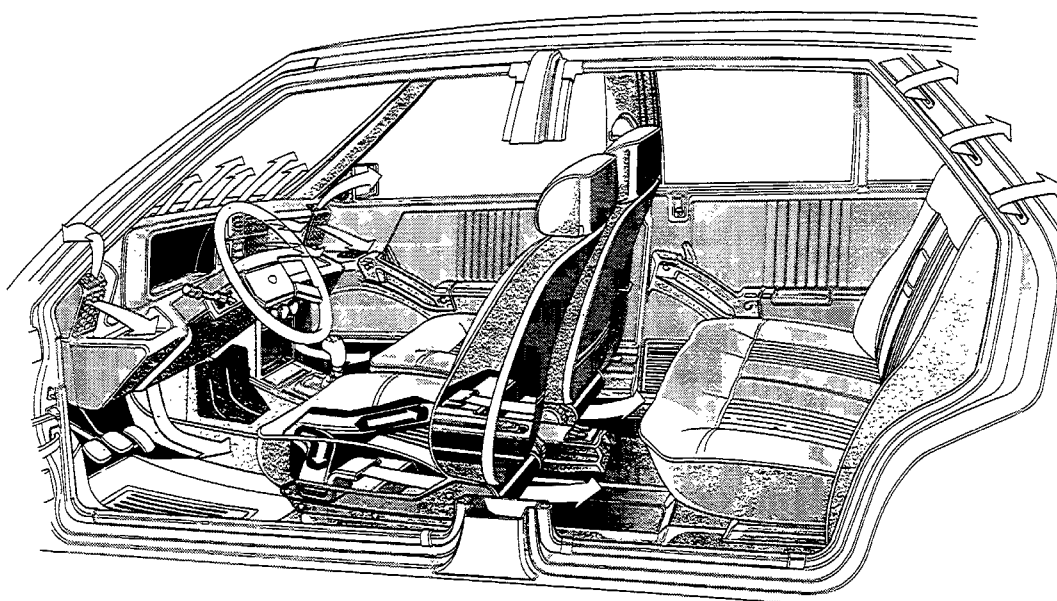


Diagram showing passenger compartment ventilation on the PRISMA 4WD

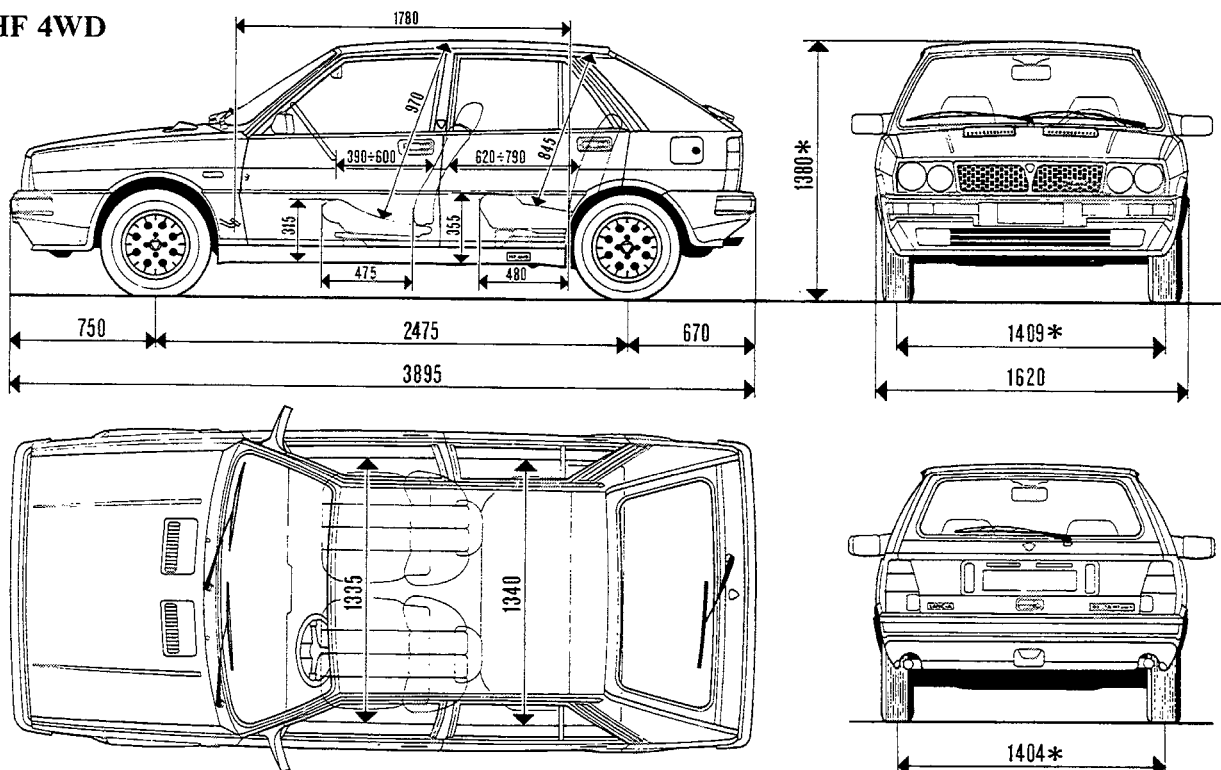
Introduction

Dimensions

DELTA-PRISMA 4WD

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DELTA HF 4WD

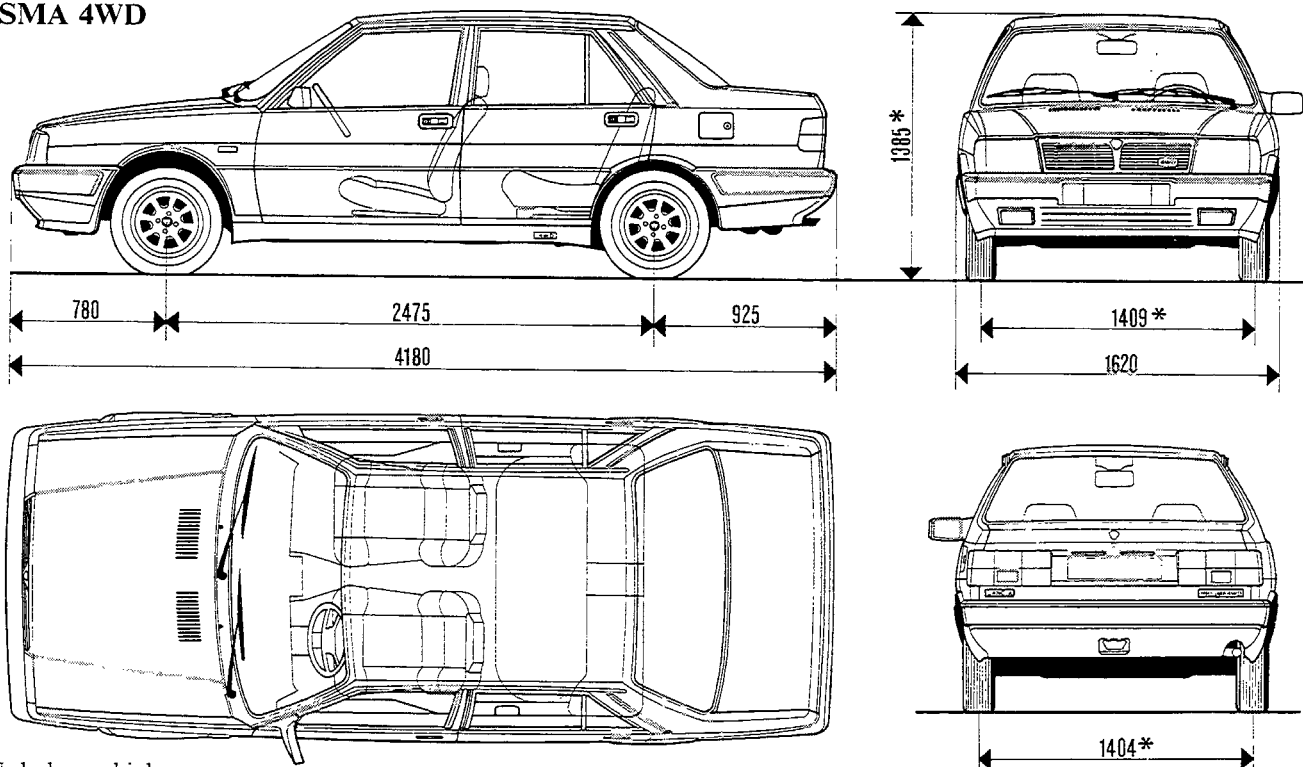


(*) Unladen vehicle

Luggage compartment capacity with the rear seat backrest in its normal position: 200 litres (7.06 cu ft).

Luggage compartment capacity with the rear seat folded down : 940 litres (33.19 cu ft)

PRISMA 4WD



(*) Unladen vehicle












Luggage compartment capacity with rear seat backrest in upright position: 360 litres (12.71 cu ft).

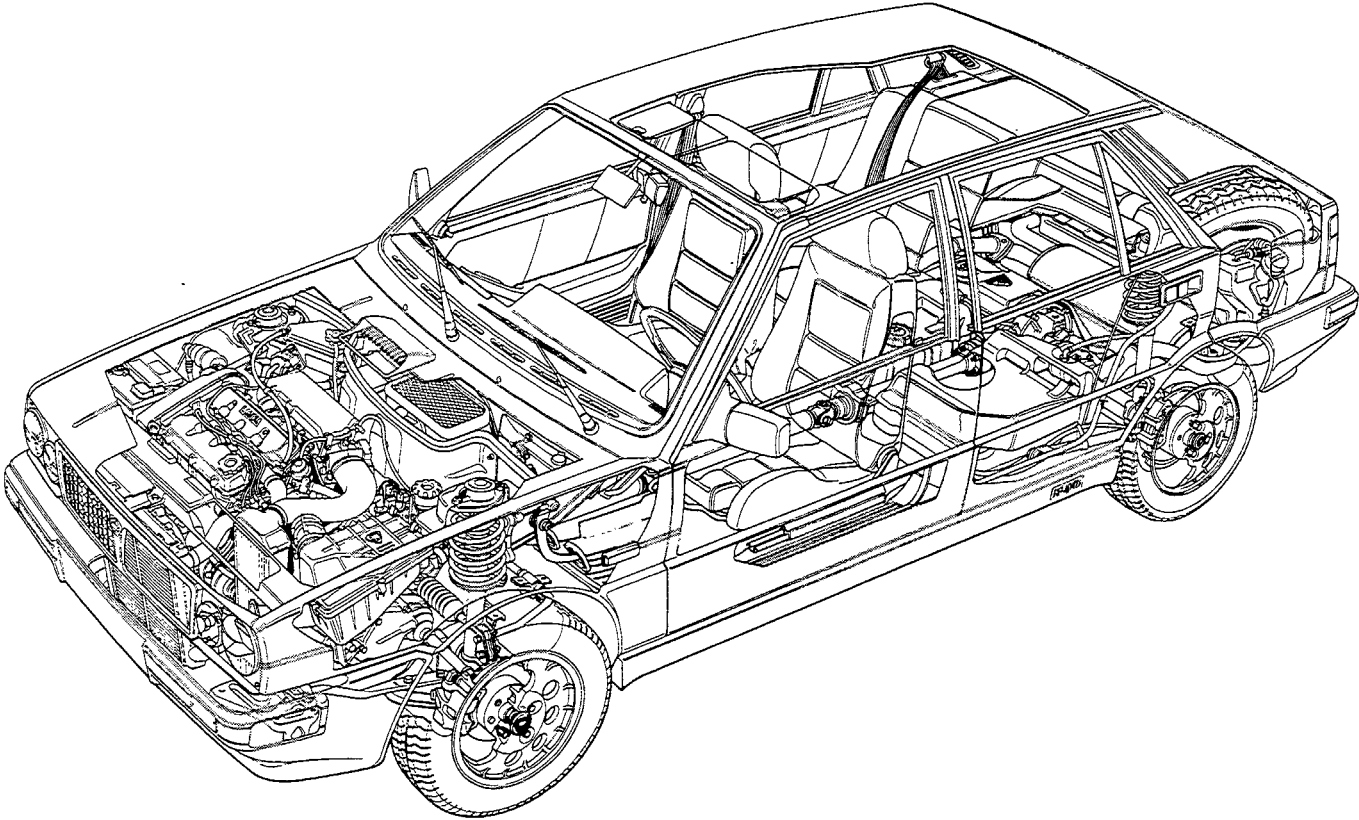
Luggage compartment capacity with rear seat folded down to level of rear parcel shelf: 650 litres (22.95 cu ft).

DELTA-PRISMA 4WD

Introduction
Weights
00.0

WEIGHTS (in kg)

	 2000 cc turbo	 2000 cc
	1190	1180
+ 450  	1640	1630
 +   	865	855
Kerb weight 	775	775
	1200	




















Arrangement of mechanical components in the DELTA HF 4WD

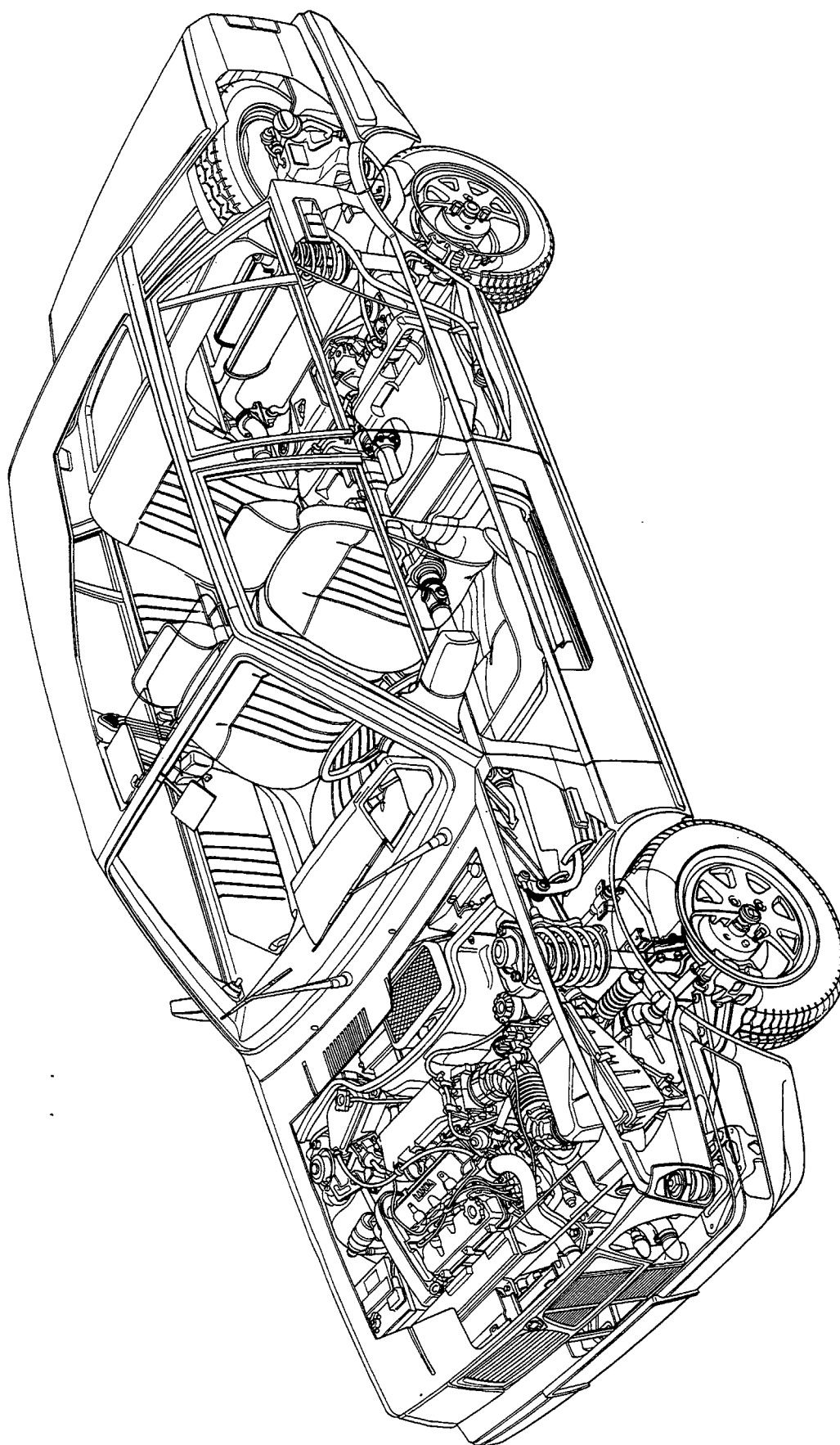
Introduction

Performance - Fuel consumption

DELTA-PRISMA 4WD

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		 2000 cc turbo	 2000 cc
Speed in kph 		65	55
		105	90
		155	130
		200	170
		208	184
		65	55
Maximum climbable gradient 		58	42
		37	23
		23	15
		16	10
		11	7
		68	40
EEC fuel consumption figures (litres/100 km) (mpg) 	Urban cycle (A)	10,8 (26.15)	11 (25.68)
	Constant speed 90 kph (B)	7,8 (36.21)	7,8
	Constant speed 120 kph (C)	10,2 (27.69)	10 (28.24)
	Average consumption (CCMC proposal) $\frac{A + B + C}{3}$	9,6 (29.42)	9,6










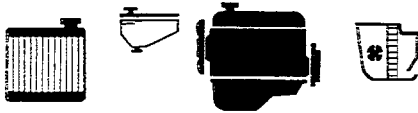









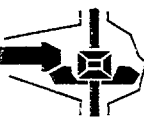




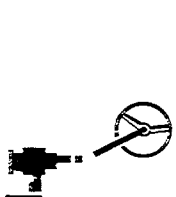
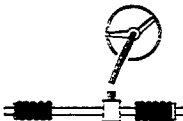


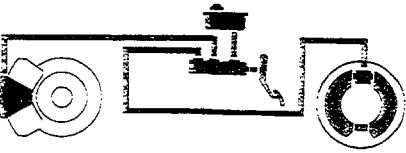









Arrangement of mechanical components on the PRISMA 4WD

Introduction

Capacities



DELTA-PRISMA 4WD

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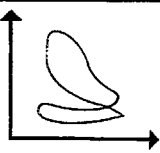



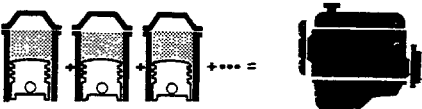
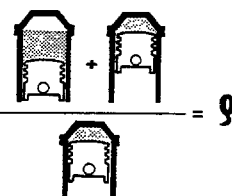
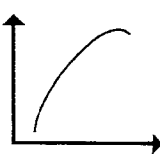
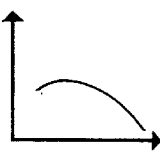
Description	Unit	Quantity	
		dm ³	(kg)
 Petrol O.R. (98–100)	 	57	–
 50%   	 Total capacity of cooling system	6	–
 VS- Superstagionale (SAE 10 W) (SAE 20 W) (SAE 30) (SAE 40) VS- Supermultigrade (SAE 15 W/40) VS- Turbo Synthesis (SAE 15 W/40)	Total capacity  <hr/> Partial capacity (periodic replacment) 	–	5,20
 a = TUTELA ZC 80S  b = TUTELA GI/A 	 	a	–
		b	–
 TUTELA W 90/M DA	a  b  Self-locking	a	–
		b	1
 a e b = TUTELA GI/A c = TUTELA W 90/M-DA  d = K 854	a  c  d  b 	a	–
		b	–
		c	–
		d	–
 TUTELA DOT 4	Total capacity 	–	0,30
 	 3%  PRISMA 4WD   ~ –10°C 50%  DELTA 4WD   ~ –20°C 100%	2,50	–
		2	–

▲ Distilled water

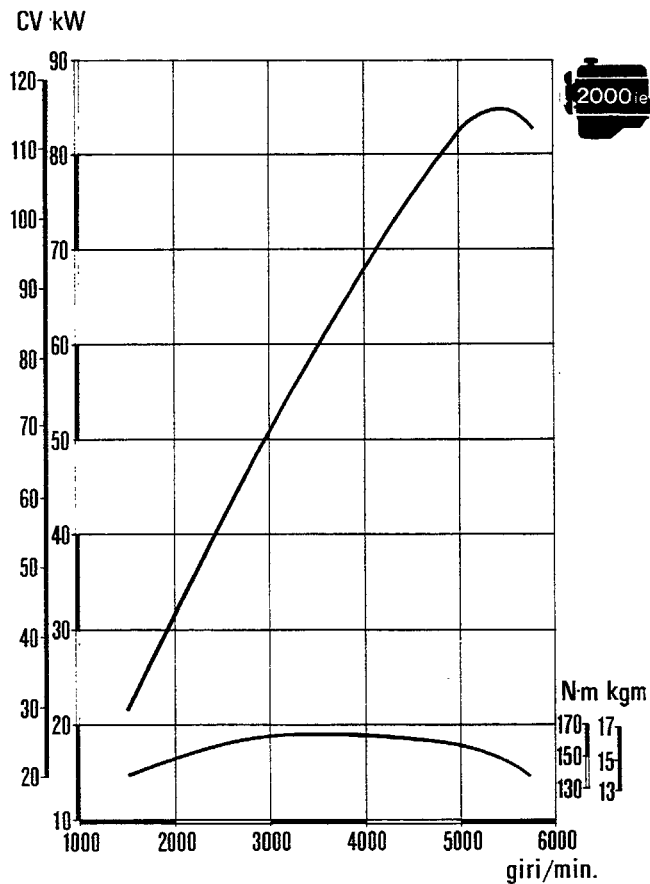
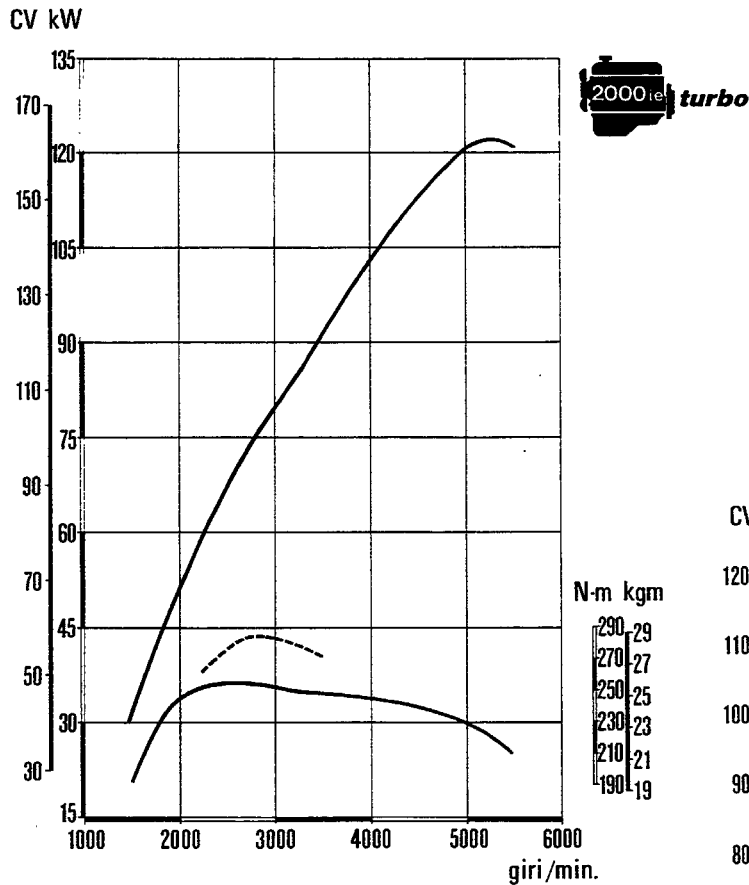
Name of product	Description International designation	Usage
VS+ Supersta- gionale	SAE 40 SAE 30 SAE 20 W SAE 10 W Low ash content detergent oil for petrol engines. Service API "SE". Satisfies standard MIL-L-46152. Exceeds European CCMC specifications	Temperature 0°C ÷ > 35°C
		Temperature 0°C ÷ < 35°C
		Minimum temperature - 15°C ÷ 0°C
		Minimum temperature below - 15°C
VS- Super- multigrade	SAE 15 W/40 Low ash content detergent oil for petrol engines. Service API "SE". Satisfies standard MIL-L-46152. Exceeds European CCMC specifications	Temperature - 15°C ÷ > 35°C
VS Turbo Synthesis SAE 15 W/40	Synthetic based detergent oil for petrol engines. Service API "SE". Satisfies standard MIL-L-46152. Exceeds European CCMC specifications.	Temperature - 15°C ÷ > 40°C
VS Diesel	SAE 40 SAE 30 SAE 20 W SAE 10 W Oil for Diesel engines. Service API "CD". Satisfies standard MIL-L-2104 C.	Temperature 0°C ÷ 50°C
		Temperature - 5°C ÷ 30°C
		Temperature - 15°C ÷ 15°C
		Temperature below - 15°C
VS Diesel Supermultigrade	Oil for Diesel engines. Service API "CD". Satisfies standard MIL-L-2104 C	Temperature - 20°C ÷ 40°C
TUTELA ZC 80S	SAE 80/W oil. Satisfies standard MIL-L-2105 API GL4	Manual gearboxes and differentials
TUTELA ZC 90	Non EP SAE 80 W/90 oil for manual gearboxes, containing anti-wear additives.	Gearboxes and non hypoid differentials
TUTELA W 90/M DA	EP SAE 80 W/90 oil for normal and self-locking differentials. Satisfies standard MIL-L-2105 C.	Hypoid differentials Self-locking diffs. Steering boxes
TUTELA GI/A	DEXRON II type oil for automatic transmissions.	Automatic gearboxes Power assisted steering
TUTELA JOTA 1	Lithium soap based grease, N.L.G.I.N.1 consistency	Greasing vehicle except for components particu- larly exposed to water requiring special greases
TUTELA MRM2	Lithium soap based molybdenum disulphide water repellent grease, N.L.G.I.N.2 consistency	Constant velocity joints
TUTELA MR3	Lithium soap based grease, N.L.G.I.N.3 consistency	Wheel hub bearings, steering rods, various components
TUTELA DOT 4	DOT 4 hydraulic brake fluid, meeting F.M.V.S.S. standard no. 116	Hydraulic brakes and hy- draulically operated clutch
K 854	Lithium soap based grease, N.L.G.I. 000 consistency, containing molybdenum disulphide	Rack and pinion steering boxes
SP 349	Special castor oil and sodium based grease containing graphite and molybdenum disulphide, compatible with brake fluid and rubber circuit seals	Load proportioning valve Load proportioning valve control bar bush
Liquido Autofà DP1	Alcohol based liquid detergent	To be used undiluted or dilu- ted for windscreen washers and headlamps washers
Liquido Paraflu ¹¹ FIAT	Mono ethylene glycol based anti-freeze for cooling system	Cooling circuits Percentage to be used 35% up to - 25°C 50% up to - 35°C

	
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CHARACTERISTICS

	831 B5.000		831 B4.000	
	Cycle	OTTO 4 stroke		
	Number of cylinders	4		
	Cylinder liner (bore)	mm	84	
	Stroke	mm	90	
	Capacity	cc	1995	
	Compression ratio	8 ± 0,1		9,75 ± 0,15
	Max power EEC	kW (CV)	122 (165)	84,5 (115)
		rpm	5250	5400
	Max torque EEC	daNm (kgm)	25,5 (26)	16,3 (16,6)
		rpm	2500 2750▲	3250

(▲) With overboost engaged



Characteristic power curves from EEC method

The power curves shown can be obtained with the engine overhauled and run in without a fan and with a silencer and air filter fitted at sea level.

Test bench test cycle with overhauled engine

In the bench test of the overhauled engine it is not advisable to run the engine at maximum speed but to stick to the figures given in the table; complete the running in of the actual engine in the car.

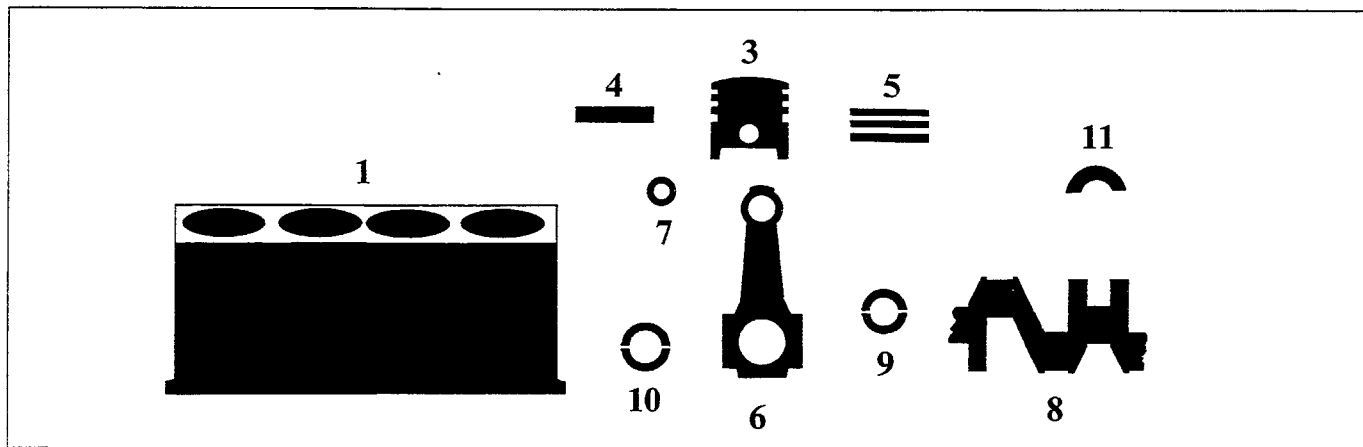
Test speed (rpm)	Time in minutes	Load on the brakes
800 ÷ 1000	10'	no load
1500	10'	no load
2000	10'	no load

Technical data

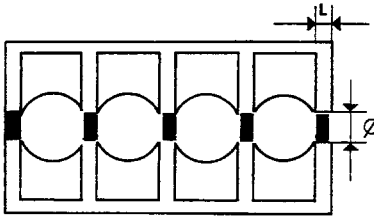

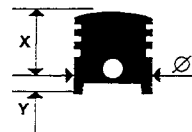


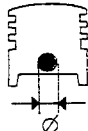
DELTA-PRISMA 4WD


Engine: cylinder block/crankcase, crankshaft and associated components

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

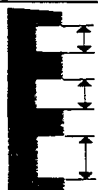
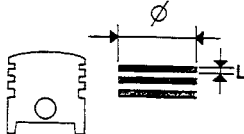




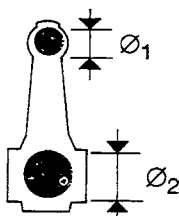


DESCRIPTION

			Values in mm
	L		23,100 ÷ 23,200
	A		56,717 ÷ 56,723
	B		56,723 ÷ 56,729
	C		56,729 ÷ 56,735
1 Main bearing supports 	Cylinder bore	Ø (0,010)	84,000 ÷ 84,050
3 Piston 	Y		25
	A		83,940 ÷ 83,950
	C		83,960 ÷ 83,970
	E		83,980 ÷ 83,990
Ø LANCIA >			0,4
3 	Difference in weight between pistons		± 5 g
3-1 	Piston-Cylinder bore		0,050 ÷ 0,070
3 	Gudgeon pin housing	Ø {	1 21,996 ÷ 21,999
			2 21,999 ÷ 22,002

	
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DESCRIPTION

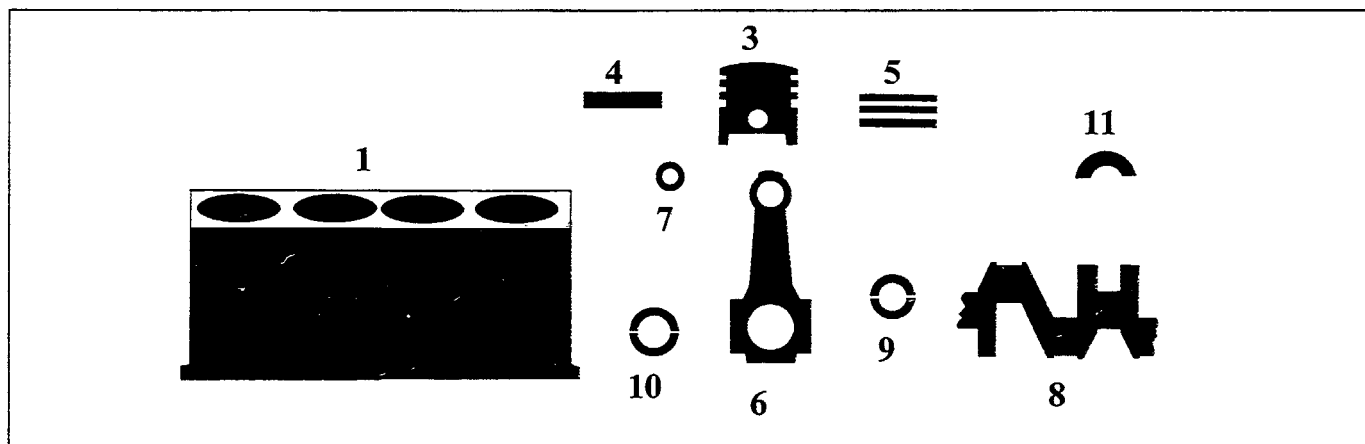
DESCRIPTION			Values in mm	
4		$\varnothing \left\{ \begin{array}{l} 1 \\ 2 \end{array} \right.$	1	21,991 ÷ 21,994
			2	21,994 ÷ 21,997
Gudgeon pin \varnothing LANCIA $>$			0,2	
4-3		Gudgeon pin-Housing		0,002 ÷ 0,008
3			1	1,535 ÷ 1,555
			2	2,030 ÷ 2,050
			3	3,967 ÷ 3,987
5		$L \left\{ \begin{array}{l} 1 \\ 2 \\ 3 \end{array} \right.$	1	1,478 ÷ 1,490
			2	1,978 ÷ 1,990
			3	3,925 ÷ 3,937
Piston rings \varnothing LANCIA $>$			0,4	
5-3			1	0,045 ÷ 0,077
			2	0,040 ÷ 0,072
			3	0,030 ÷ 0,062
5-1			1	0,30 ÷ 0,45
			2	0,30 ÷ 0,45
			3	0,25 ÷ 0,40
Opening at end of rings in cylinder bore				
6		$\varnothing_2 \left\{ \begin{array}{l} 1 \\ 2 \\ 3 \end{array} \right.$	\varnothing_1	24,988 ÷ 25,021
			1	53,904 ÷ 53,910
			2	53,898 ÷ 53,904
			3	53,892 ÷ 53,898

Technical data

DELTA-PRISMA 4WD

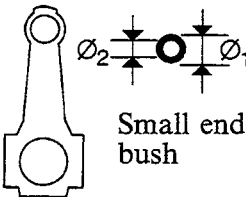
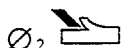



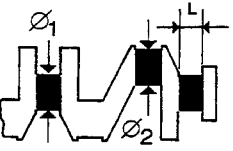
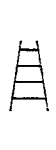
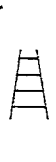
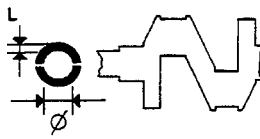
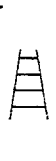
Engine: cylinder block/crankcase, crankshaft and associated components

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	2000 i.e. turbo	2000 i.e.
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DESCRIPTION

7		Small end bush		{ 	1	25,065 ÷ 25,090		
					2	22,004 ÷ 22,007		
					2	22,007 ÷ 22,010		
4-7		Gudgeon pin Small end bush			0,010 ÷ 0,016			
7-6		Small end bush Housing			0,044 ÷ 0,102			
8		Main journals	Ø ₁	{ 	A	52,998 ÷ 53,004		
					B	52,992 ÷ 52,998		
					C	52,986 ÷ 52,992		
					1	50,799 ÷ 50,805		
						2	50,793 ÷ 50,799	
		3	50,787 ÷ 50,793					
		Crank pins	Ø ₂	{ 	L	27,975 ÷ 28,025		
					L	A	1,838 ÷ 1,844	1,836 ÷ 1,842
						B	1,844 ÷ 1,850	1,842 ÷ 1,848
						C	1,850 ÷ 1,856	1,848 ÷ 1,854
9					Crankshaft bearings	L	{ 	Ø LANCIA <
		0,254 – 0,508						




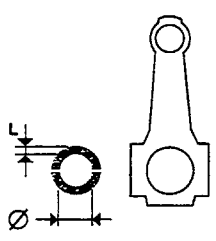

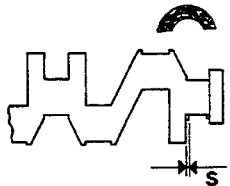

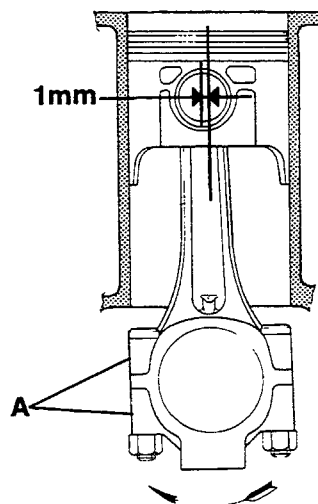
			
DESCRIPTION		Values in mm	
9-8	 Crankshaft bearings-Main journals	0,025 ÷ 0,049	0,029 ÷ 0,053
10	 Big end bearings L { A B C Ø LANCIA <	1,527 ÷ 1,533	
		1,533 ÷ 1,539	
		1,539 ÷ 1,545	
		0,254 - 0,508	
10-8	 Big end bearings-Pins	0,033 ÷ 0,057	
11	 Thrust washers S LANCIA >	2,310 ÷ 2,360	
		0,127	
11-8	 Crankshaft end float	0,055 - 0,305	

Diagram showing connecting rod-piston assembly and direction of rotation in engine

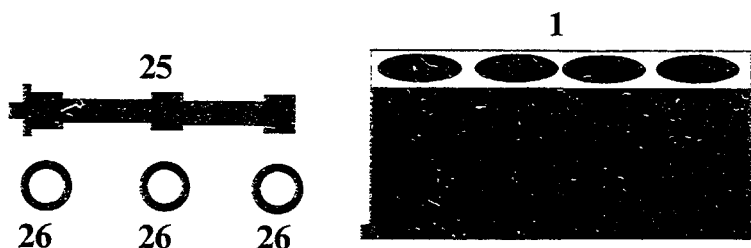
A = Area where number of cylinder bore to which connecting rod belongs is stamped.

The arrow shows the direction of rotation of the engine as seen from the timing side.

1mm = Gudgeon pin offset on the piston.



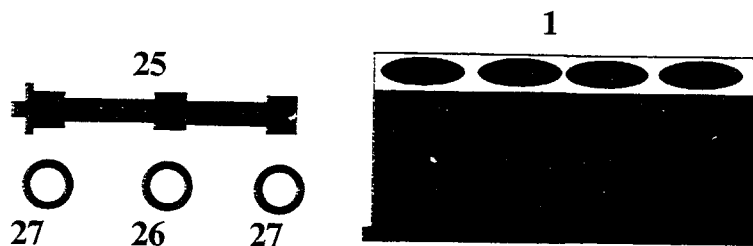
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DESCRIPTION

Values in mm

25	Counter-balance shafts	n° 2
	Shafts operated	by toothed belt
26		\varnothing_1 36,920 ÷ 36,940
		\varnothing_2 37,020 ÷ 37,040
		\varnothing_3 38,020 ÷ 38,040
25	Counter-balance shaft bearings	\varnothing_1 36,850 ÷ 36,870 \varnothing_2 36,950 ÷ 36,970 \varnothing_3 37,950 ÷ 37,970
26-1	Bushes for shaft Housings	0,080 ÷ 0,140
25-26	Shaft bearings - Bushes	0,050 ÷ 0,090



DESCRIPTION

Values in mm

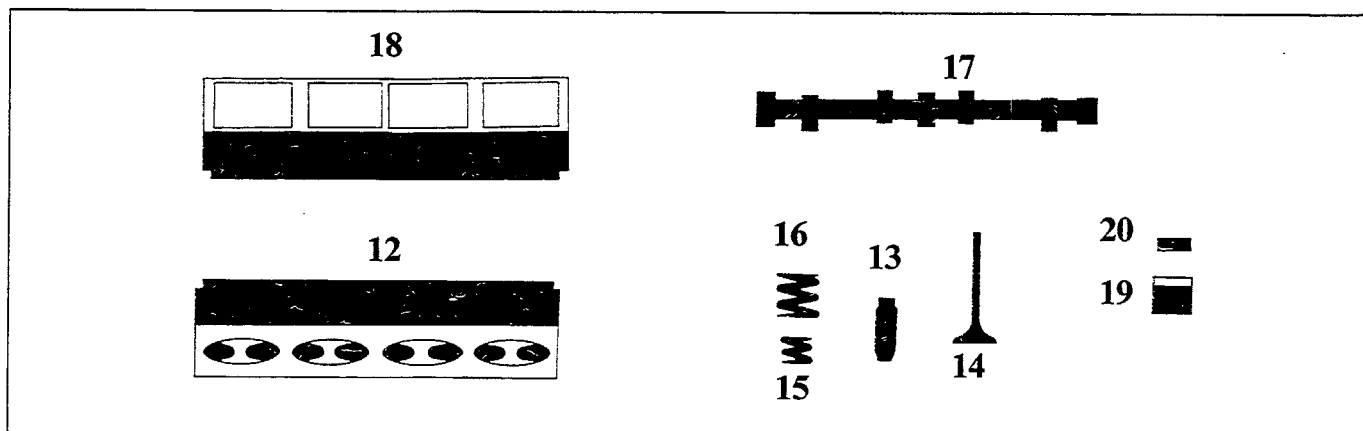
25	Counter-balance shafts	n° 2
	Shafts operated	by toothed belt
26	 Central bush for counter-balance shafts in housing	$37,020 \div 37,040$
27	 Ball bearings for counter-balance shafts	$19,990 \div 20,000$
25	 Counter-balance shaft central bearing	$36,945 \div 36,960$
25	 Counter-balance shaft bearings	$19,980 \div 19,993$
26-1	 Bushes for shaft Housings	$0,080 \div 0,140$
25-26	 Shaft bearings - Bushes	$0,060 \div 0,095$
27-1	 Ball bearings Housings	$+0,011 \div -0,025$
25-27	 Shaft bearings Ball bearings	$+0,020 \div -0,003$

Technical data



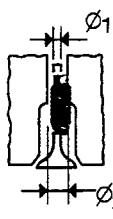

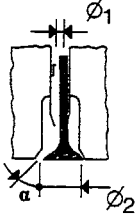
DELTA-PRISMA 4WD




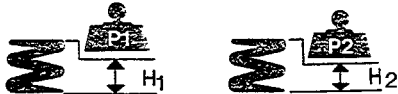
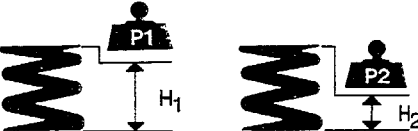
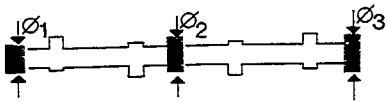
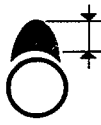


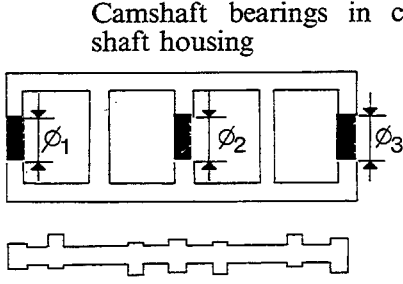


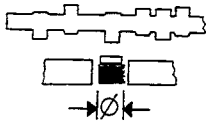
Engine: cylinder head and valve gear components

00.10



DESCRIPTION

			Values in mm	
12		Valve guide bore in cylinder head	\varnothing 13,950 ÷ 13,977	
		Valve seats	$45^\circ \pm 5'$	
		α	$45^\circ \pm 5'$	
		L	~2	
13		Valve guide	\varnothing_1 8,022 ÷ 8,040	
		\varnothing_2	14,040 ÷ 14,058	
		\varnothing_2	13,988 ÷ 14,016	14,040 ÷ 14,058
		\varnothing_2 LANCIA	> 0,05-0,10-0,25	
13-12		Valve guide Bore in cylinder head	0,063 ÷ 0,108	
			0,021 ÷ 0,066	0,063 ÷ 0,108
14		Valves	\varnothing_1	7,974 ÷ 7,992
			\varnothing_2	43,300 ÷ 43,700
			α	$45^\circ 30' \pm 5'$
			\varnothing_1	7,974 ÷ 7,992
			\varnothing_2	35,850 ÷ 36,450
			α	$45^\circ 30' \pm 5'$

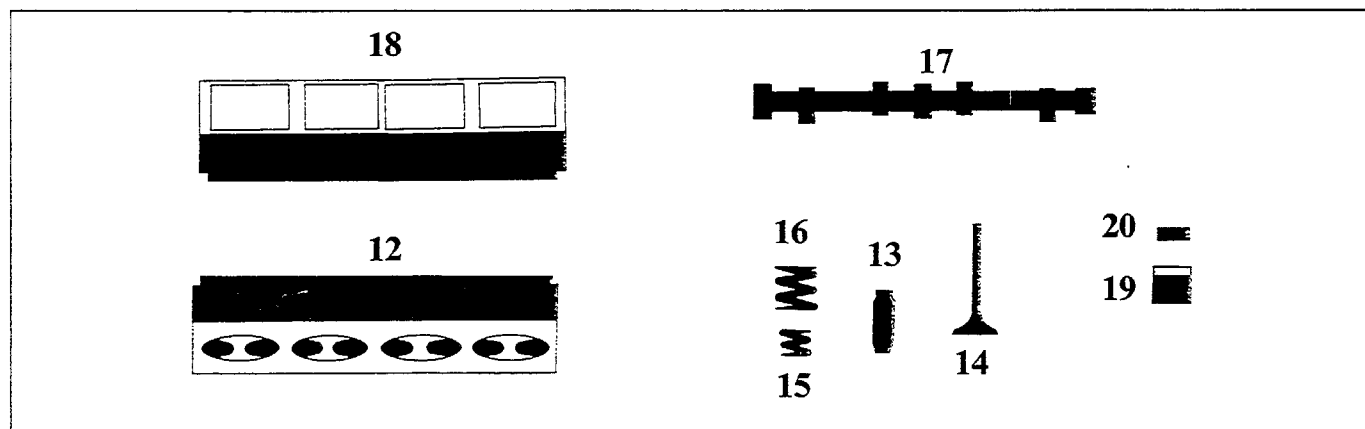
		 	
DESCRIPTION		Values in mm	
14-13	 Valve-Valve guide	0,030 ÷ 0,066	
15	 Internal valve spring	P ₁	14,13 ÷ 15,11 daN
		H ₁	31
		P ₂	26,39 ÷ 28,74 daN
		H ₂	21,5
16	 External valve spring	P ₁	36,68 ÷ 39,6 daN
		H ₁	36
		P ₂	55,91 ÷ 60,82 daN
		H ₂	26,5
17	 Camshaft bearings	Ø ₁	29,944 ÷ 29,960
		Ø ₂	45,755 ÷ 45,771
		Ø ₃	46,155 ÷ 46,171
	 Cam lift	 9,1	10,033
		 8,6	10,033
18	 Camshaft bearings in camshaft housing	Ø ₁	30,009 ÷ 30,034
		Ø ₂	45,800 ÷ 45,825
		Ø ₃	46,200 ÷ 46,225
17-18	 Tappet housings	Ø	37,000 ÷ 37,025
17-18	 Camshaft bearings housing	Ø ₁	0,049 ÷ 0,090
		Ø ₂ - Ø ₃	0,029 ÷ 0,070
19	 Tappet	Ø	36,975 ÷ 36,995




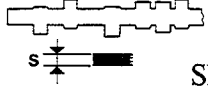
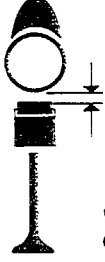


Technical data

DELTA-PRISMA 4WD

Engine: cylinder head and valve gear components



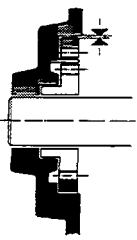
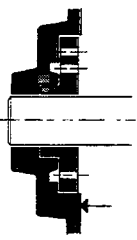




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DESCRIPTION			Values in mm	
19-18		Tappet Housing in cylinder head	0,005 ÷ 0,050	
20	 Shim	$S \left(\begin{array}{c} \text{A} \\ 0,05 \end{array} \right)$	3,25 ÷ 4,70	
17-20	 Clearance for timing check operational-clearance	 	0,80	
			0,80	
			0,35 ± 0,04	0,40 ± 0,04
			0,40 ± 0,04	0,48 ± 0,03

TIMING ANGLES

inlet	opens BTDC	8°	7°
	closes ABDC	42°	52°
exhaust	opens BBDC	42°	53°
	closes ATDC	1°	6°

			
		Values in mm	
Oil pump		lobe gears	
Pump operated		by crankshaft	
Oil pressure relief valve		incorporated in crankshaft front cover	
	between pump casing housing and driven gear	0,080 ÷ 0,186	
	between upper side of gears and pump cover	0,025 ÷ 0,056	
Full flow filter		cartridge	
Insufficient oil pressure sender unit		electrical	
  	Operating pressure at a temperature of 100°C	3,4 ÷ 4,9 bar (3,5 ÷ 5 kg/cm ²)	
	P ₁	11,3 ÷ 12,1 daN	
Oil pressure relief valve spring	H ₁	35,3	







Technical data

DELTA-PRISMA 4WD

Engine: cooling system-fuel system-supercharging

00.10

COOLING SYSTEM

			
COOLING SYSTEM			
Cooling circuit		coolant circulation via centrifugal pump, radiator and electric fan operated by thermostatic switch	
Water pump operation		through belt	
	Thermal switch to engage fan		90° ÷ 94°C
			85° ÷ 89°C
Engine cooling water thermostat	opens	81° ÷ 85°C	
	max opening	97°C	
	valve travel	≥ 7,5 mm	
Clearance bewteen impeller blades and pump casing			0,8 – 1 mm
Pressure for checking water tightness of system		0,98 bar	
Pressure for checking overflow valve on expansion tank		0,98 bar	

FUEL SYSTEM

Pump	electric
Capacity	~ 120 litres/h






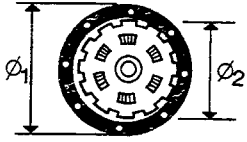
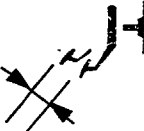
SUPERCHARGING (with turbocharger operated by exhaust gases with wastegate valve)

Turbocharger type:	KKK K26	Garrett T3	–
Maximum supercharging pressure	0,9 bar		–

Checking engine idle speed and carbon monoxide emissions



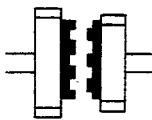


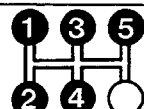




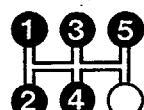


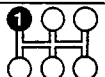
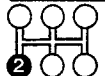
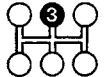
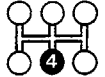
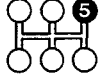



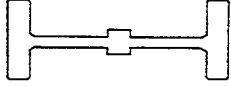
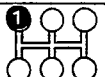
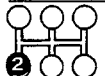
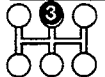
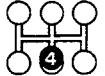
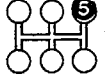

Engine speed	rpm	800 ÷ 900	(750 ÷ 800)*
CO idle emissions	(%)	1,5 ± 0,5	

(*) With VAE valve disconnected

			
		Values in mm	
Type		 dry, single plate	
Operating mechanism		 diaphragm spring	
Spring loading		575 daN	
 Lining	Ø ₁	230	
	Ø ₂	155	
 Clutch pedal setting		8 ÷ 10 mm below the level of the brake pedal	
Clutch release		mechanical	

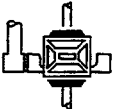




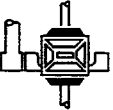
00.21-27

GEARBOX



			 2000 cc turbo	 2000 cc
 Synchronizers	spring ring (Porsche type)		—	
	baulk ring type			
 Gears	straight toothed			
	helical toothed			
 Gear ratios			3,500	3,750
			2,235	2,235
			1,518	1,518
			1,132	1,132
			0,928	0,928
			3,583	3,583
 Crown wheel and pinion reduction			53/18 (2,944)	65/19 (3,421)
 Ratio at the wheels			10,304	12,828
			6,580	7,645
			4,468	5,193
			3,332	3,872
			2,732	3,174
			10,548	12,257





















CENTRE DIFFERENTIAL



 <p>Differential internal casing bearing</p>	 <p>conical roller bearings</p>
 <p>Adjustment of bearing pre-loading</p>	 <p>by shims</p>
 <p>LANCIA $\left(\begin{array}{c} \text{Ladder} \\ 0,05 \end{array} \right) \text{ mm}$</p> <p>Thickness of shims</p>	<p>1,00 ÷ 1,60</p>
 <p>Interference to obtain exact bearing pre-loading</p> <p>mm</p>	<p>bearings not pre-loaded = 0,12 bearings pre-loaded (350 daN) = 0,08</p>

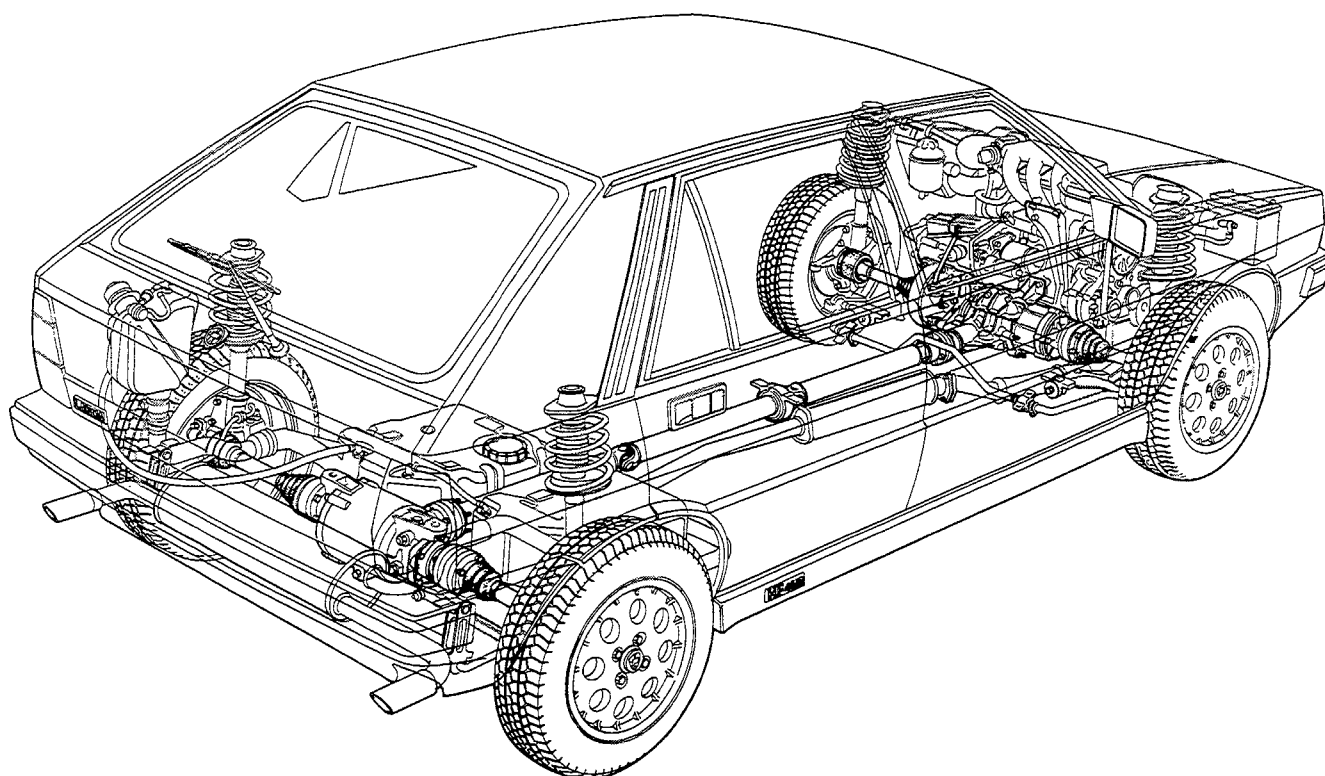
FRONT DIFFERENTIAL

 <p>Clearance between satellite and planet gears</p> <p>mm</p>	<p>$\leq 0,10$</p>
 <p>Adjustment of clearance between planet and satellite gears</p>	<p>no adjustment is carried out</p>




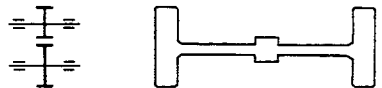











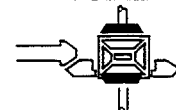


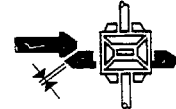
00.21-27



			
IDLER GEAR			
 Spur gear set ratio		43/19 (2,263)	
 Ring gear bearing rolling torque	daNm	0,18 ÷ 0,20	
 Adjustment of ring gear bearings		 by shims	
 LANCIA  0,025 mm Thickness of shims		1,475 ÷ 2,90	
 Adjustment of idler gear bevel pinion		 by shims	
 LANCIA  0,02 mm Thickness of shims		2,55 ÷ 3,35	
 Bevel pinion bearing rolling torque	daNm	0,08 ÷ 0,12	
 Clearance between pinion and ring gear	mm	0,08 ÷ 0,15	
 Adjustment of clearance between pinion and ring gear		 by shims	
 LANCIA  0,025 mm Thickness of shims		1,475 ÷ 2,90	






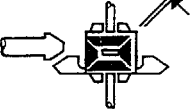
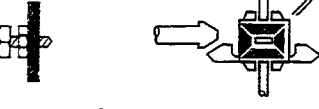



		 2000 ie turbo	 2000 ie
Type		in three sections	
Supports		2 { <ul style="list-style-type: none"> 1 on the centre section with a ball bearing on the support 1 on the rear section with a ball bearing inside the support dust cover 	
Sliding constant velocity joints		1, on the front section	
Universal joints		2, on the centre section	
Splined joint		1, on the rear section	
Spider radial clearance	mm	0,01 - 0,04	
Thickness of shims for adjusting spider radial clearance	mm	1,50-1,53-1,56-1,59-1,62	
Spline backlash	mm	0,175 - 0,350	

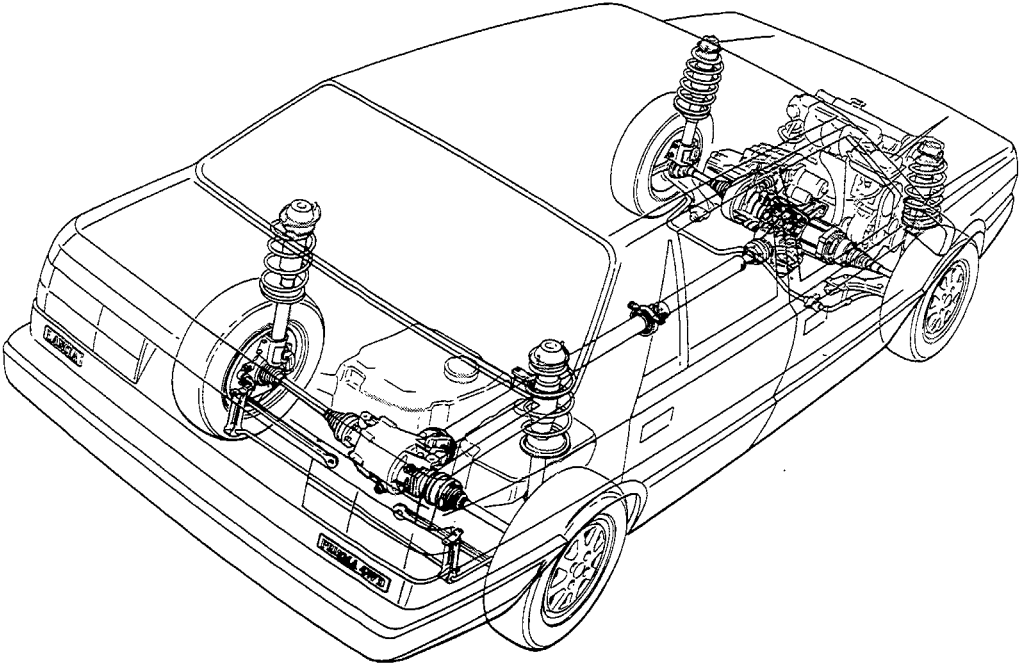


00.27

			
 Crown wheel and pinion reduction		19/43 (2,263)	
 Ratio at the wheels		10,304	12,828
		6,580	7,645
		4,468	5,193
		3,332	3,872
		2,732	3,174
		10,548	12,257
 Bevel pinion bearings rolling torque		daNm 0,08 ÷ 0,12	
 Adjustment of bevel pinion position		 by shims	
 LANCIA  0,05 mm Thickness of shims		2,55 ÷ 3,35	
 Differential internal casing bearing		 conical roller bearings	
 Crown wheel bearings rolling torque		daNm 0,18 ÷ 0,20	
 Clearance between pinion and crown wheel		mm 0,08 ÷ 0,15	

	
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 Adjustment of clearance between pinion and crown wheel	 by shims	
 Adjustment of bearing pre-loading		
 LANCIA  0,05 mm Thickness of shims for differential internal casing bearings	0,18 ÷ 0,20	
 Clearance between planet and satellite gears	mm	≤ 0,10
 Adjustment of clearance between planet and satellite gears	—	 by shims
 LANCIA  0,05 mm Thickness of shims	—	2,75 ÷ 3,25



00.33



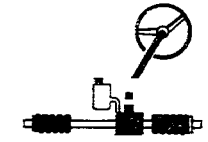


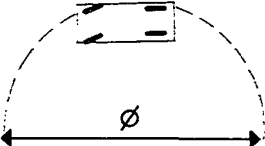


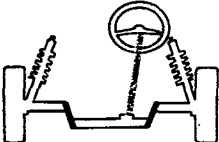



FRONT BRAKES

Values in mm			
			257
			19,20 ÷ 20,10
			18,55
			18,2
	allowed		11,90 ÷ 12,10
	allowed		11,30
	allowed		10,8
	allowed		1,5
	Ø		48
	Ø		19,05 (3/4")
			ISOVAC 7" hydro-pneumatic vacuum servo acting on all four wheels
	L		0,3 ÷ 0,5

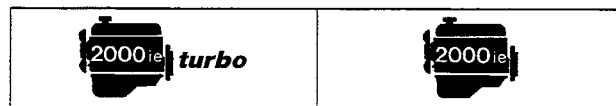
REAR BRAKES





			227
			10,70 ÷ 10,90
			9,70
			9
	allowed		1,5
	allowed		34
			acting on the rear wheels
			0,36

			
Type		 rack and pinion power assisted	
Ratio	 no. of turns lock to lock	2,835	
	 rack travel	134 mm	
	Minimum turning circle	10,4 m	
Steering angle	 outer wheel α_1	30°46'	
	 inner wheel α_2	35°4'	
	Steering column	 with 2 universal joints	

00.44

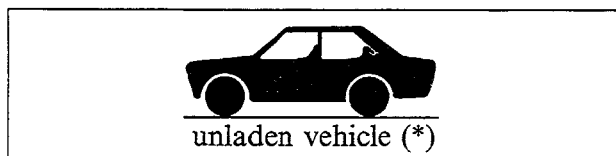
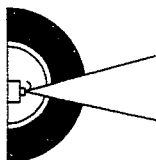
WHEELS



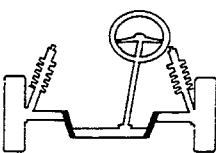

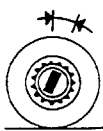
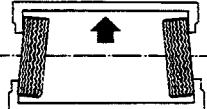
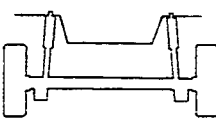

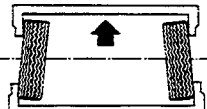
	Tyre		type	185/60 R14" 82 H 165/65 R14" 80 H*
		front	average load	2 bar
			heavy load	2,2 bar
		rear	average load	2 bar
			heavy load	2,2 bar
	Wheel rim	type	light alloy 5½ J x 14" AH2-45 5½ J x 14" H2-45*	

NOTE Spare wheel with 4J x 15" FH4 rim and 115/70 R15" XTL tyre
Speed limit: 80 kph Inflation pressure: 4,2 bar

(*) Available on request



WHEEL GEOMETRY



	camber (**)			$-40' \pm 30'$
	caster (**)			$3^{\circ}10' \pm 30'$
	toe in			$-0,5 \pm 1,5 \text{ mm } (\bullet)$
	camber (**)			$-55' \pm 30'$
	toe in			$2 \div 4 \text{ mm } (\bullet)$

(*) With tyres inflated to the correct pressure and the vehicle in running order

(**) Angles cannot be adjusted (●) Measured on a 360 mm diameter

Front suspension independent, Mac Pherson type with lower track control arm and damper comprising double acting, hydraulic, telescopic shock absorber with offset coil spring.
Stabilizer bar

Coil spring

Coil spring				
Diameter of wire	mm	12,7 ± 0,05	12,4 ± 0,05	
Number of turns		5,4	5,4	
Direction of coil		clockwise		
Height of spring release	mm	436	445	
Height of spring under a load of:	$\left\{ \begin{array}{l} 378 \text{ daN} \\ 374 \text{ daN} \end{array} \right.$	mm	205	—
		mm	—	205
The springs are divided into two categories identifiable by a mark:				
yellow (1) for those under a load of:	$\left\{ \begin{array}{l} 378 \text{ daN} \\ 374 \text{ daN} \end{array} \right.$	having a height of mm	> 205	—
		having a height of mm	—	> 205
green (1) for those under a load of:	$\left\{ \begin{array}{l} 378 \text{ daN} \\ 374 \text{ daN} \end{array} \right.$	having a height of mm	≤ 205	—
		having a height of mm	—	≤ 205

(1) Springs of the same category must be fitted.



Shock absorbers

Type: telescopic, hydraulic, double acting		Way-Assauto
Travel	mm	158
Maximum extension	mm	521,5

00.44

Rear suspension independent, Mac Pherson type with two transverse track control arms and a lower longitudinal track control arm plus a damper comprising a double acting, telescopic, hydraulic shock absorber with an offset coil spring.
Stabilizer bar

Coil spring

 2000 ie turbo	 2000 ie
---	--

Diameter of wire	mm	11,9±0,05	11,6±0,05	
Number of turns		3,86	3,86	
Direction of coil		clockwise		
Height of spring released	mm	316	331	
Height of spring under a load of:	258 daN	mm	173	—
	268 daN	mm	—	173
The springs are subdivided into two categories identifiable by a mark:				
yellow (1) for those under a load of:	258 daN	having a height of mm	> 173	—
	268 daN	having a height of mm	—	> 173
green (1) for those under a load of:	258 daN	having a height of mm	≤173	—
	268 daN	having a height of mm	—	≤173

(1) Springs of the same category must be fitted.

Shock absorbers

Type: telescopic, hydraulic, double acting		Way-Assauto
Travel	mm	190
Maximum extension	mm	590



STARTER MOTOR	M. Marelli E95 - 1,1 kW - 12 V
ALTERNATOR	M. Marelli AA125R - 14 V - 65 A
VOLTAGE REGULATOR	M. Marelli RTT 119 AC
BATTERY	12 V - 45 Ah - 225 A
IGNITION SYSTEM	Weber injection/ignition
IGNITION DISTRIBUTOR	DT 453 AX
IGNITION COIL	M. Marelli BAE 504 CK
IGNITION COIL WITH POWER MODULE	M. Marelli AEI 600 A
SPARK PLUGS	Fiat V45 LSR M. Marelli F8 LCR Bosch WR6 DC Champion RN7 YC

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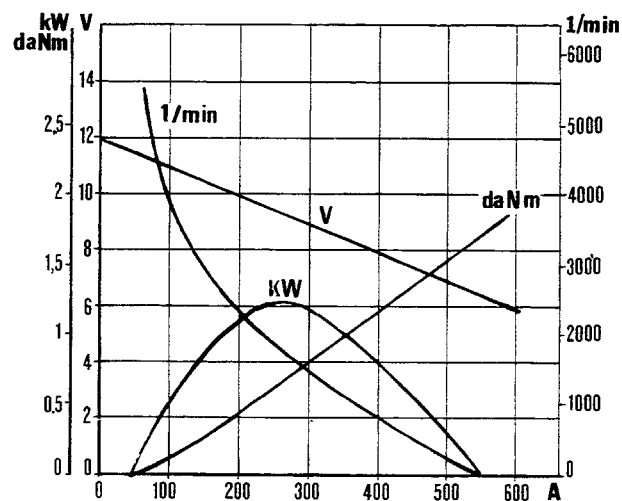


Motor: type		M. Marelli E95 - 1,1/12
Voltage	V	12
Nominal power	kW	1,1
Rotation, pinon side		clockwise
No. of poles		4
Field coil		series-parallel
Engagement		free wheel
Operation		solenoid
End float of armature shaft	mm	0,15 ÷ 0,45
Data for bench test	Operating test (*):	
	current	A
	speed	rpm
	voltage	V
	torque developed	daNm
	Engagement test (*):	
	current	A
	voltage	V
	torque developed	daNm
Relay	Free running test (*):	
	current	A
	voltage	V
	speed	rpm
	Winding resistance (*)	
	pull in Ω	
	hold in Ω	
	Internal splines and shaft bushes	
	Sleeve and intermediate disc	

(*) Data obtained at an ambient temperature of 20°C.

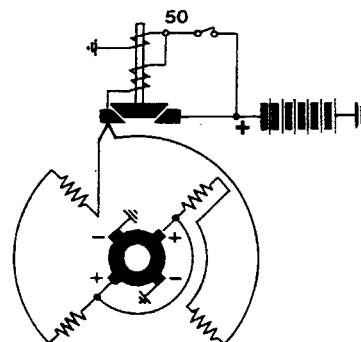
NOTE When overhauling it is not necessary to undercut the insulator between the commutator bars

STARTER MOTOR - TYPICAL CURVES





M. Marelli E95 - 1,1/12

Wiring diagram showing M. Marelli E95 - 1,1/12 starter motor



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ALTERNATOR

			
Make and type		M. Marelli AA125R-14V-65A	
Nominal voltage	V	12	
Maximum current	A	65	
Cut in speed	rpm	1050 ÷ 1150	
Current delivery on the battery at 7000 rpm	A	≥ 63	
Field winding resistance, between the slip rings (*)	Ω	2,6 ÷ 2,8	
Direction of rotation (as seen from the control side)		clockwise	
Engine/alternator ratio		1 : 2	
Rectifier diodes		bridge	

(*) Data obtained at an ambient temperature of 25°C

VOLTAGE REGULATOR

Type		Built in electronic RTT 119 AC
Alternator test speed	rpm	7000
Thermal stabilization current	A	30 ÷ 35
Test current	A	32 ÷ 33
Regulation voltage (*)	V	14 ÷ 14,3

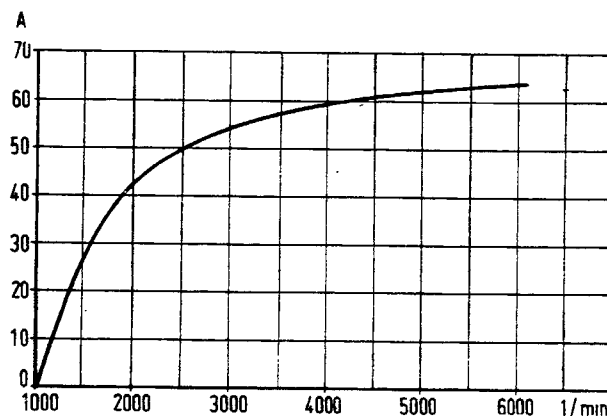
(*) Data obtained at an ambient temperature of 20°C

BATTERY

Nominal voltage	V	12
Capacity (20 hour discharge)	Ah	45

ALTERNATOR – TYPICAL OUTPUT CURVES

(the data in these curves refer to outyut at a constant voltage of 13.5 V with bedded in brushes)



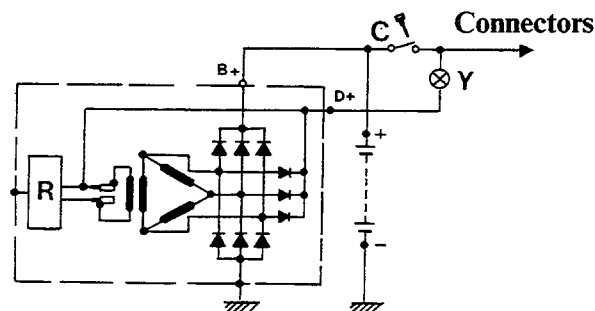
M. Marelli AA125R - 14 V - 65 A

Marelli alternator wiring diagram

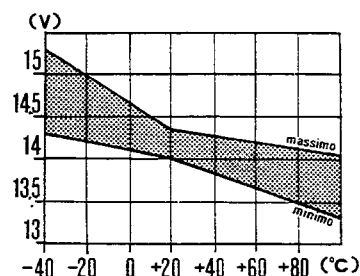
C = Ignition switch with key

Y = Alternator recharging warning light (12V - 3/5W)

R = Electronic voltage regulator



FIMM RTT 119 AC voltage regulator typical curve



Technical data

DELTA-PRISMA 4WD

Electrical equipment: electronic injection/ignition

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POWER MODULE ELECTRONIC IGNITION



Make and type	M. Marelli AEI 600A
Firing order	1 - 3 - 4 - 2

DISTRIBUTOR

Make	M. Marelli
Type	DT 453 AX
Built in rotor arm resistance Ω	1000
Electro-magnetic impulse generator winding resistance at 20°C Ω	758 \div 872

COIL

Make	M. Marelli
Type	BAE 504 CK
Primary winding resistance at 20°C Ω	0,415 \div 0,495
Secondary winding resistance at 20°C Ω	4320 \div 5280

TDC AND RPM SENSOR

Make and type	M. Marelli SEN 8 D
Sensor winding resistance Ω	612 \div 748
Distance (gap) between sensor and crankshaft pulley teeth mm	0,4 \div 1

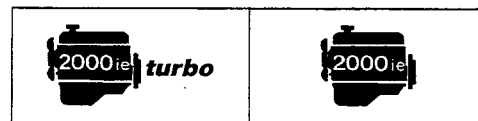
ENGINE ADVANCE

Minimum from 800 to 850 rpm at 0.43 bar (0,60 bar)*	15° \pm 2°	18° \pm 2° (*)
Maximum at 4000 rpm at 0.43 bar (0,299 bar)*	40° \pm 2°	39° \pm 2° (*)

SPARK PLUGS

Make and type	Fiat V 45 LSR	Bosch WR 6 DC	Champion RN7YC	M.Marelli F8LCR
Thread	M 14 x 1,25			
Electrode gap	0,6 \div 0,7 mm			

IAW INJECTION SYSTEM COMPONENTS

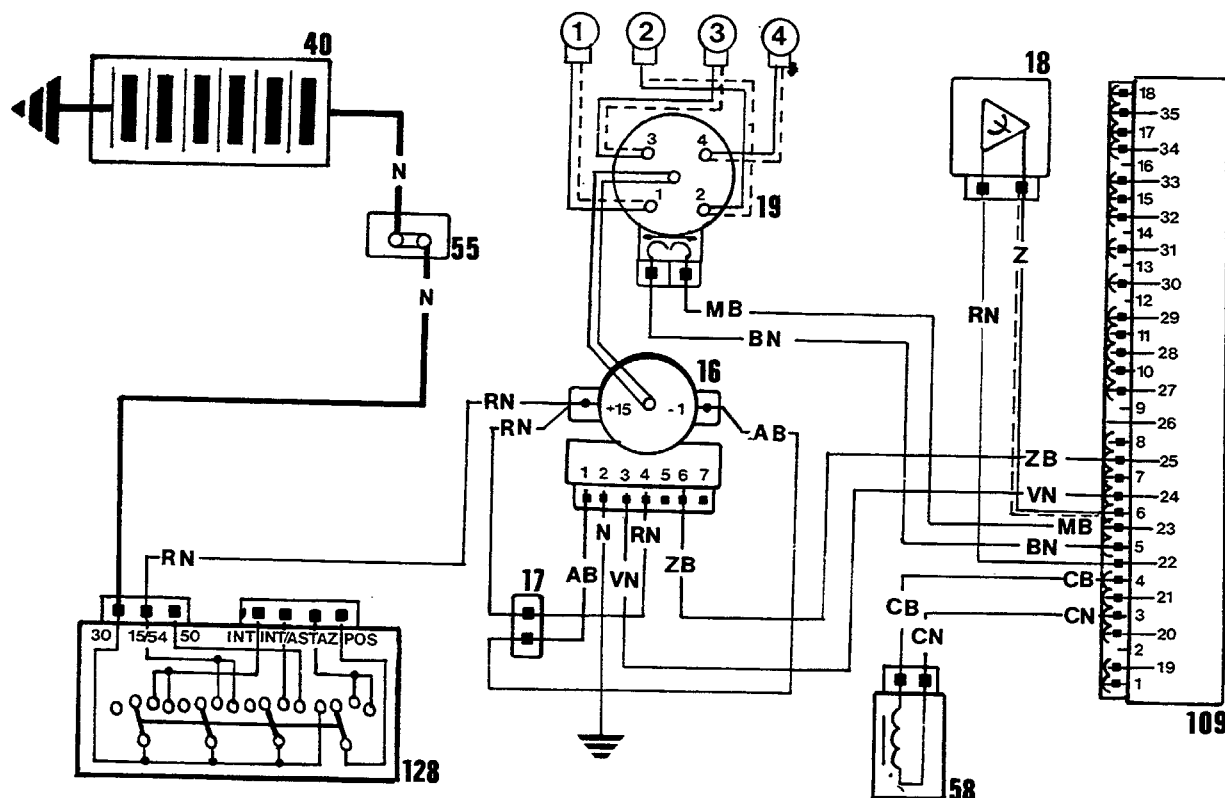


DESCRIPTION	QUANTITY	TYPE	
ELECTRONIC CONTROL UNIT	1	WH4E.03/085-F6 black label	WH26.03/HAI-BB yellow label
BUTTERFLY CASING	1	52 CFL 15	56 CFL 18
INJECTOR	4	IW 025/01	IW 024/03
ENGINE IDLE AUTOMATIC ADJUSTMENT SOLENOID VALVE	1	VAE 02	
PRESSURE REGULATOR	1	RP 1/3 bar	
AIR TEMPERATURE SENSOR	1	ATS 04	
WATER TEMPERATURE SENSOR	1	WTS 05	
ABSOLUTE PRESSURE SENSOR	1	APS 02/01	APS 03/01
BUTTERFLY VALVE POSITION SENSOR	1	PF 09/01	
FUEL FILTER	1	FI 02/01	
ELECTRIC FUEL PUMP	1	PI 022/2	

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DIAGRAM SHOWING INJECTION/IGNITION CONTROL UNIT CONNECTIONS (CONCERNING ELECTRONIC IGNITION ONLY)

The identification numbers for the components are the same as those given in the wiring diagrams

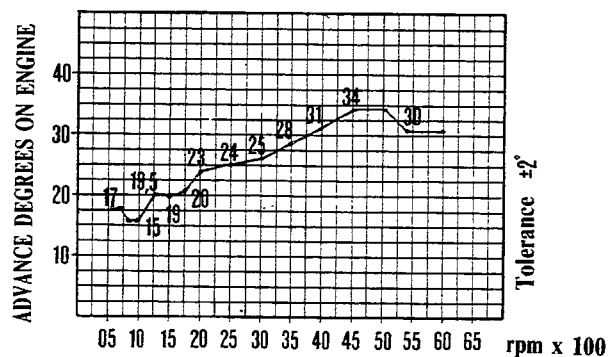


- 16. Ignition coil with power module
- 17. Connection
- 18. Anti-detonation sensor
- 19. H.T. distributor with built in timing sensor
- 40. Battery

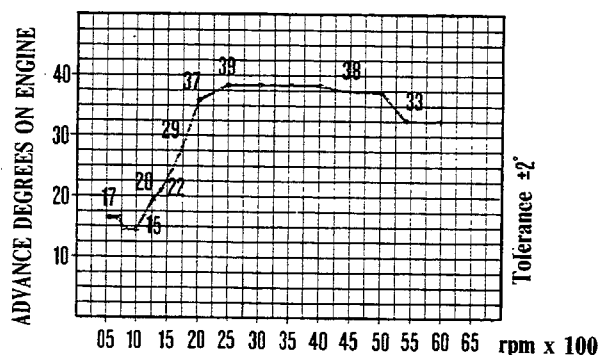
- 55. Connector
- 58. Rpm and TDC sensor
- 109. Injection/ignition electronic control unit
- 128. Ignition switch

CHARACTERISTIC IGNITION ADVANCE CURVES FOR EIGHT VACUUM VALUES IN THE INLET MANIFOLD

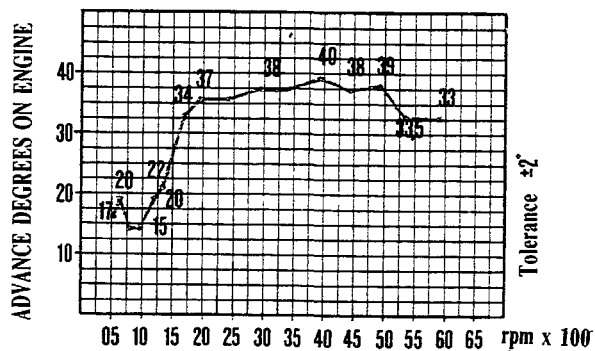
at an absolute pressure of 0,18 bar (135 mmHg)



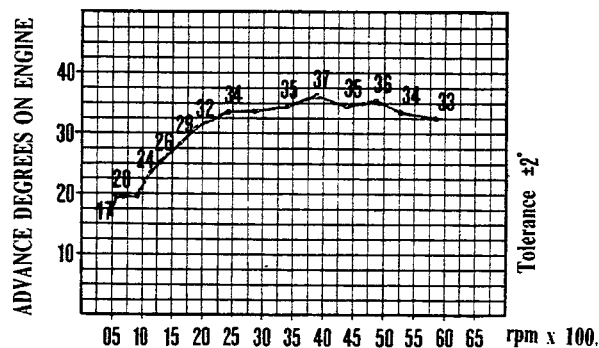
at an absolute pressure of 0,299 bar (225 mmHg)



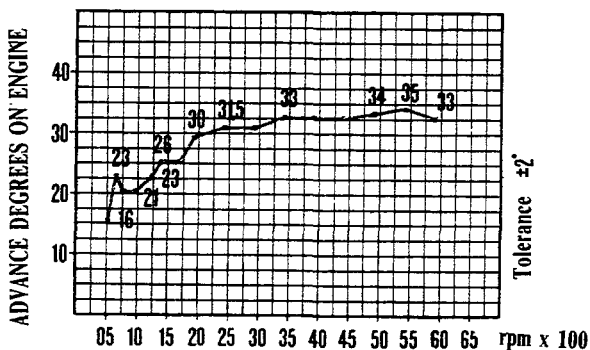
at an absolute pressure of 0,43 bar (321 mmHg)



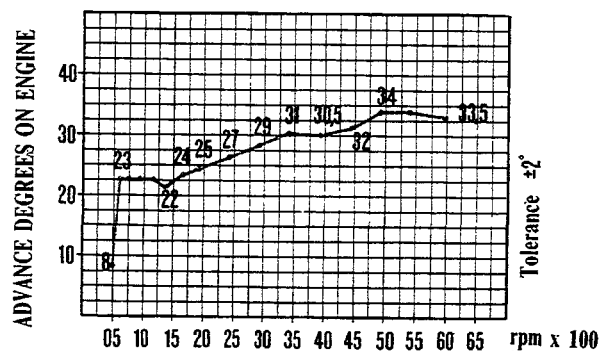
at an absolute pressure of 0,54 bar (405 mmHg)



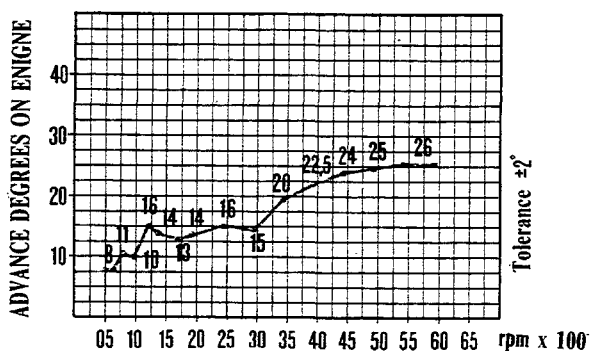
at an absolute pressure of 0,70 bar (525 mmHg)



at an absolute pressure of 0,92 bar (690 mmHg)



at an absolute pressure of 1,38 bar (1035 mmHg)



at an absolute pressure of 1,80 bar (1350 mmHg)

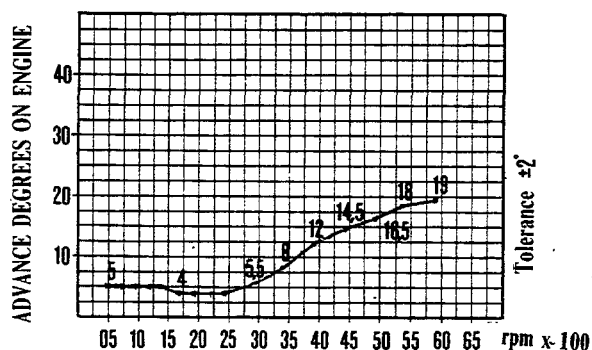
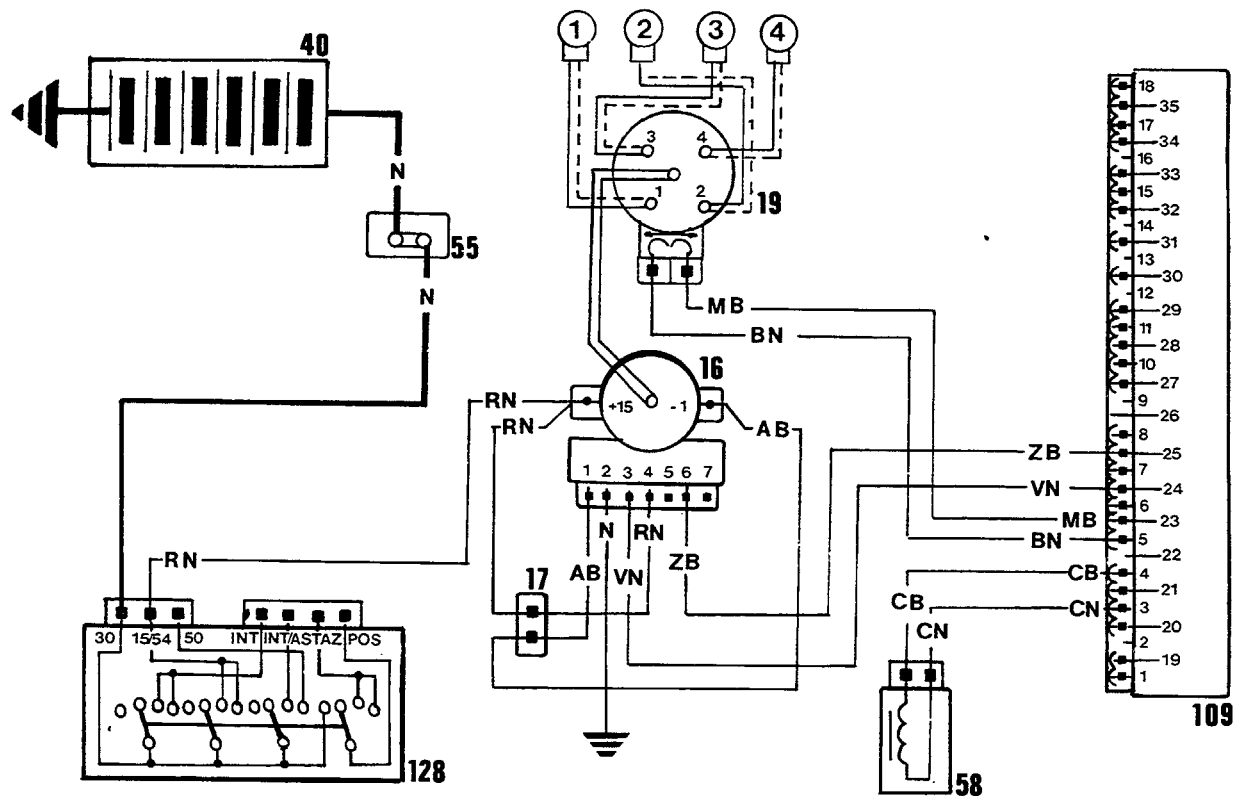


DIAGRAM SHOWING INJECTION/IGNITION CONTROL UNIT CONNECTIONS (CONCERNING ELECTRONIC IGNITION ONLY)

The identification numbers for the components are the same as those used in the wiring diagrams



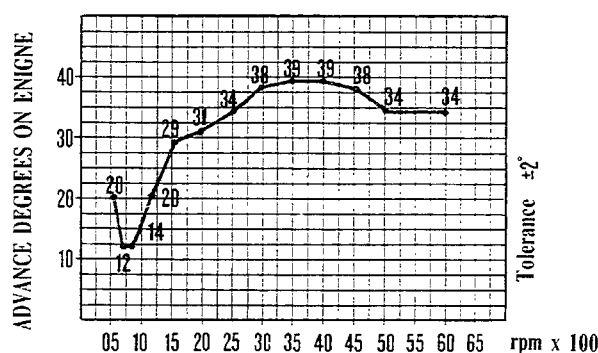
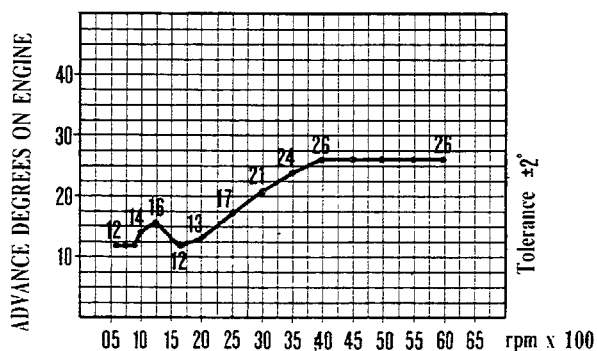
- 16. Ignition coil with power module
- 17. Connection
- 19. H.T. distributor with built in timing sensor
- 40. Battery

- 55. Connector
- 58. Rpm and TDC sensor
- 109. Injection/ignition electronic control unit
- 128. Ignition switch

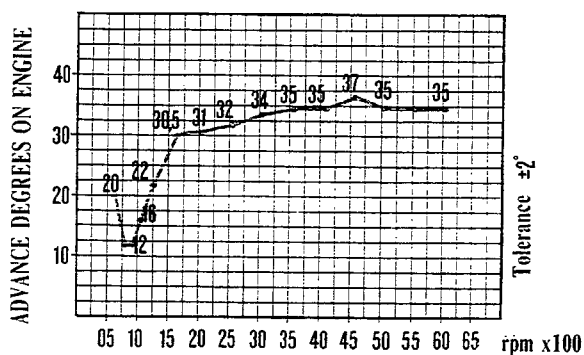
CHARACTERISTIC IGNITION ADVANCE CURVES FOR EIGHT VACUUM VALUES IN THE IN-LET MANIFOLD

at an absolute pressure of 0,17 bar (129 mmHg)

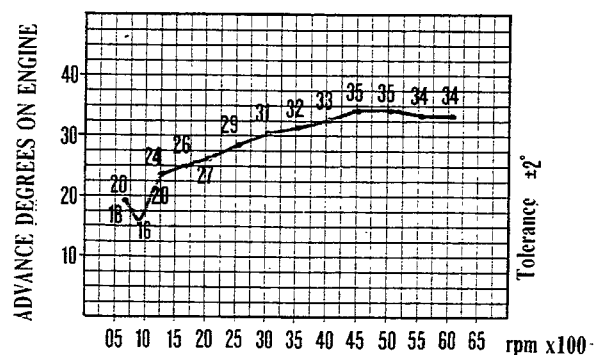
at an absolute pressure of 0,299 bar (225 mmHg)



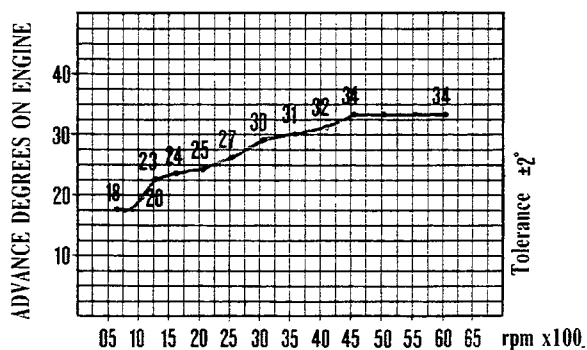
at an absolute pressure of 0,39 bar (294 mmHg)



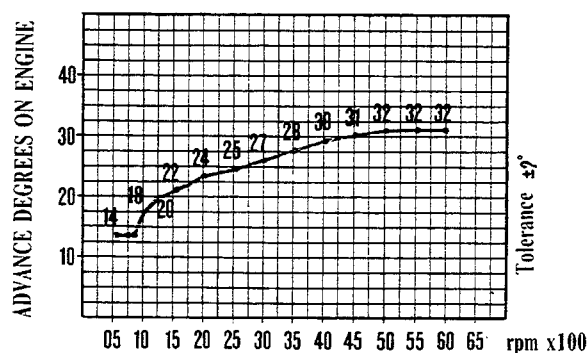
at an absolute pressure of 0,53 bar (399 mmHg)



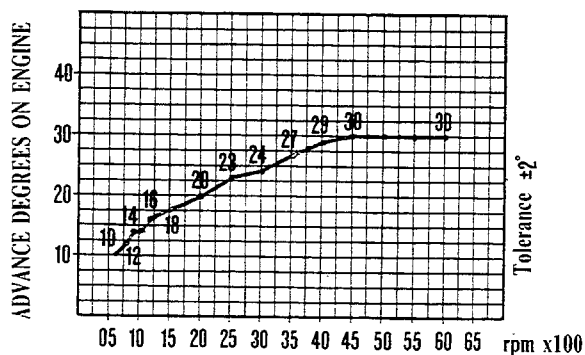
at an absolute pressure of 0,60 bar (450 mmHg)



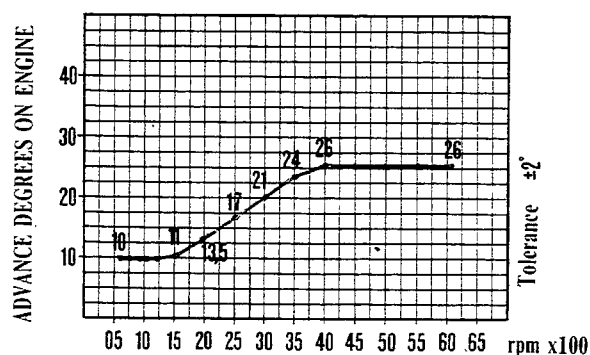
at an absolute pressure of 0,73 bar (549 mmHg)



at an absolute pressure of 0,82 bar (615 mmHg)



at an absolute pressure of 0,82 bar (619 mmHg)



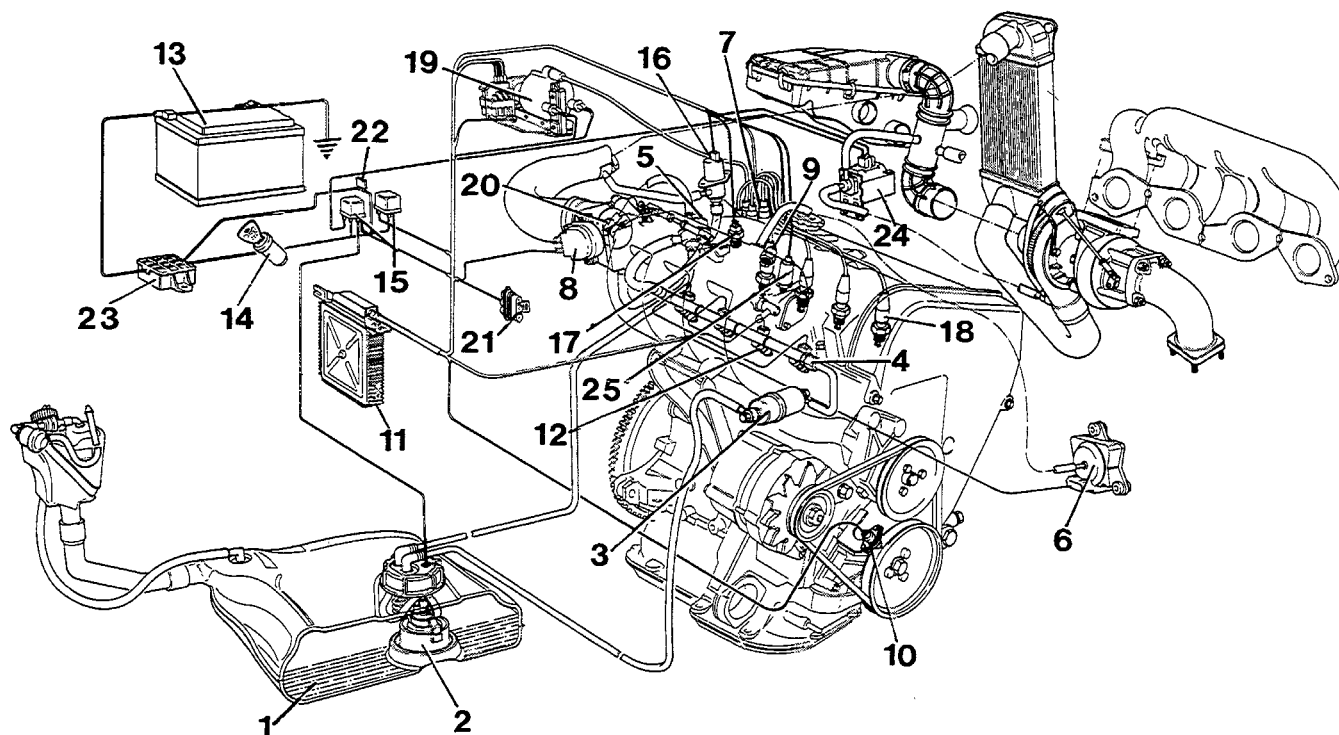


Diagram showing IAW injection/ignition system

- | | |
|--|---|
| 1. Fuel tank | 15. Injection/ignition relays |
| 2. Electric fuel pump | 16. Additional air solenoid valve for automatic adjustment of engine idling |
| 3. Fuel filter | 17. Coolant temperature sensor |
| 4. Fuel inlet | 18. Spark plugs |
| 5. Fuel pressure regulator | 19. Ignition unit |
| 6. Absolute air pressure sensor | 20. Butterfly valve |
| 7. HT distributor with injection timing sensor | 21. Diagnostic socket |
| 8. Butterfly valve position sensor | 22. W.I.I. system protective fuse |
| 9. Inlet air temperature sensor | 23. Vehicle electrical system connector |
| 10. Rpm and TDC sensor | 24. Overboost solenoid valve |
| 11. Electronic control unit | 25. Detonation sensor |
| 12. Injector | |
| 13. Battery | |
| 14. Ignition switch | |

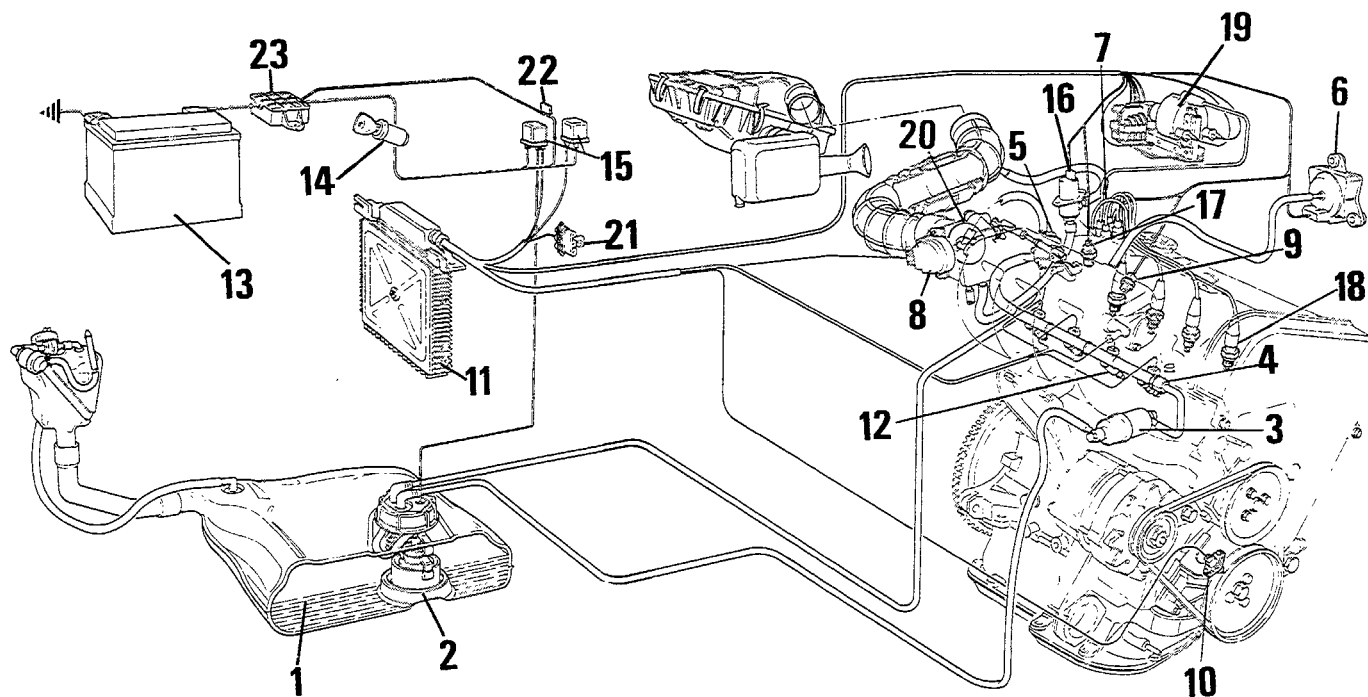


Diagram showing IAW injection/ignition system

- | | |
|--|---|
| 1. Fuel tank | 15. Injection/ignition relays |
| 2. Electric fuel pump | 16. Additional air solenoid valve for automatic adjustment of engine idling |
| 3. Fuel filter | 17. Coolant temperature sensor |
| 4. Fuel manifold | 18. Spark plugs |
| 5. Fuel pressure regulator | 19. Ignition unit |
| 6. Inlet air absolute pressure sensor | 20. Butterfly valve |
| 7. HT distributor with injection timing sensor | 21. Diagnostic socket (located near injection control unit connector) |
| 8. Butterfly valve position sensor | 22. IAW system protective fuse |
| 9. Inlet air temperature sensor | 23. Vehicle electrical system connector |
| 10. Rpm and TDC sensor | |
| 11. Electronic control unit | |
| 12. Injectors | |
| 13. Battery | |
| 14. Ignition switch | |

- Removing-refitting power unit

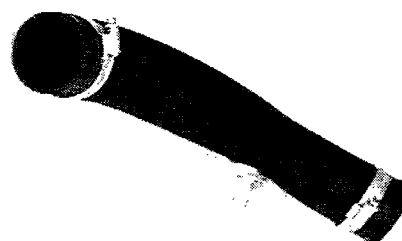
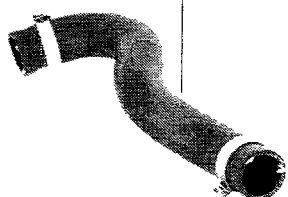
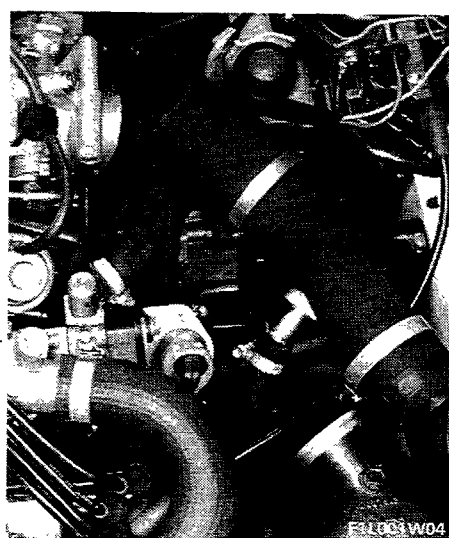
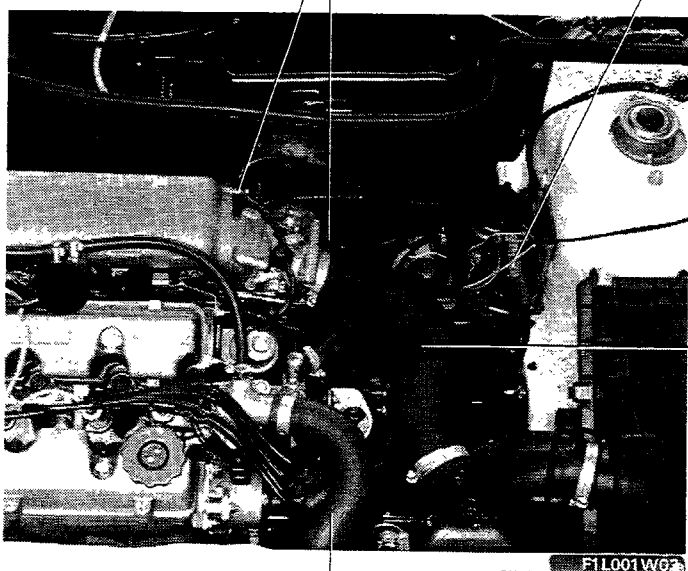
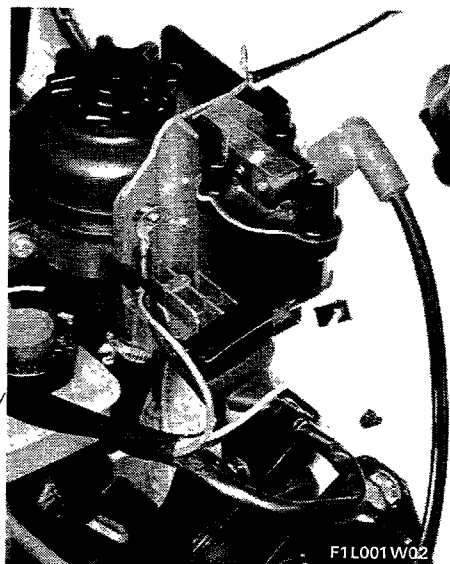
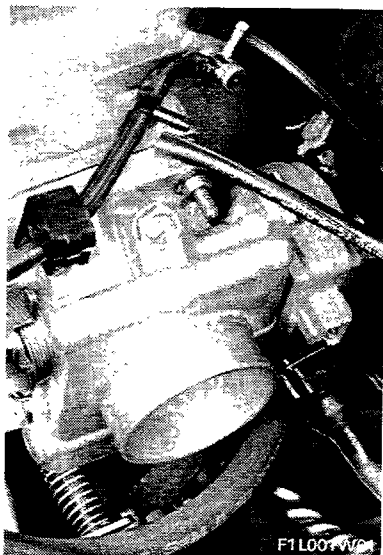
1

Position the car on the lift.

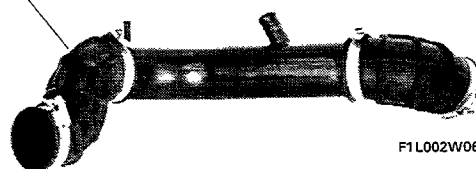
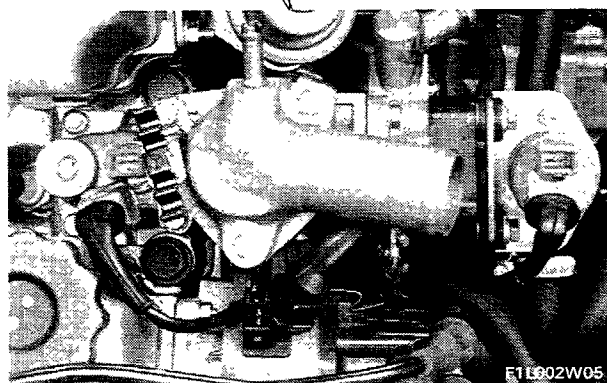
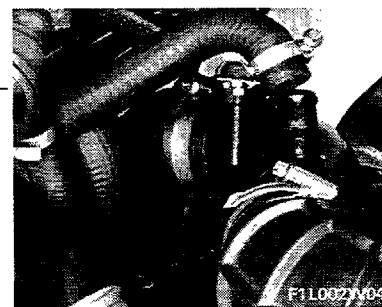
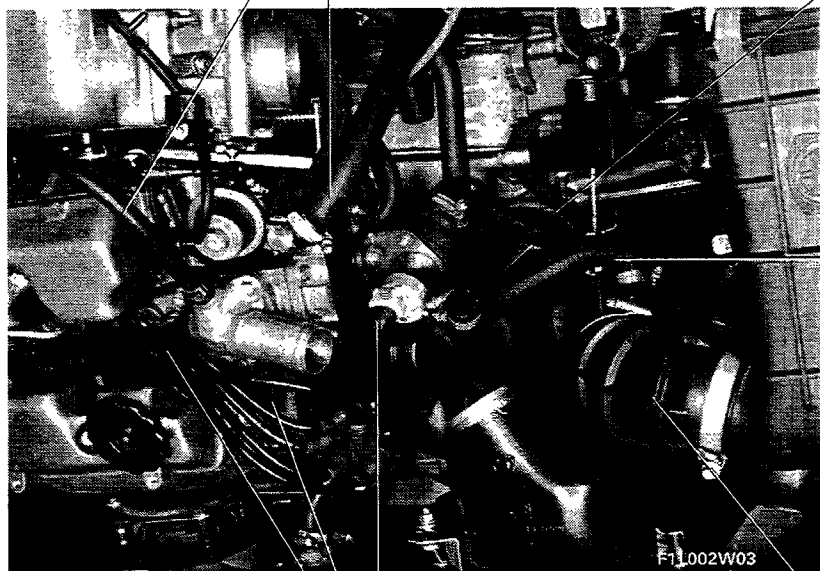
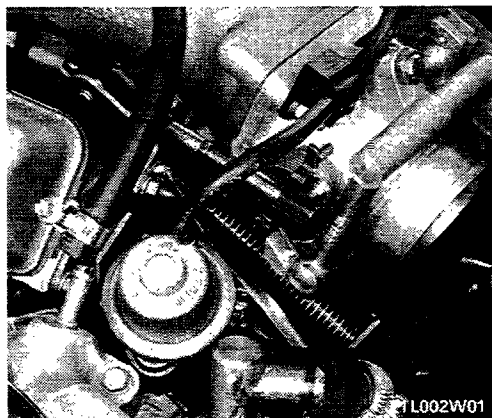
Proceed as follows:

- drain off the coolant;
- remove the bonnet;
- disconnect the negative lead from the battery;
- carry out the following operations:

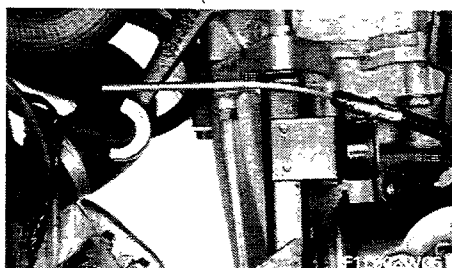
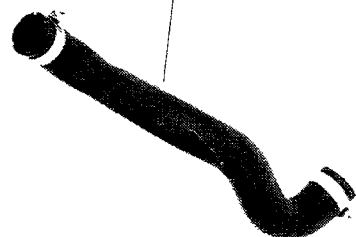
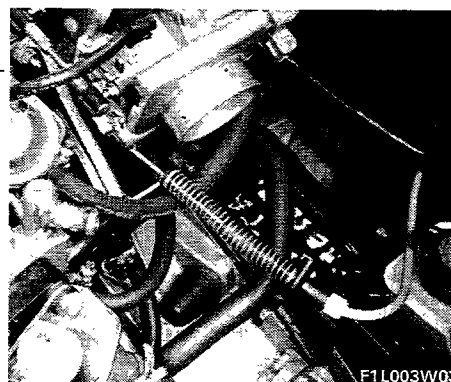
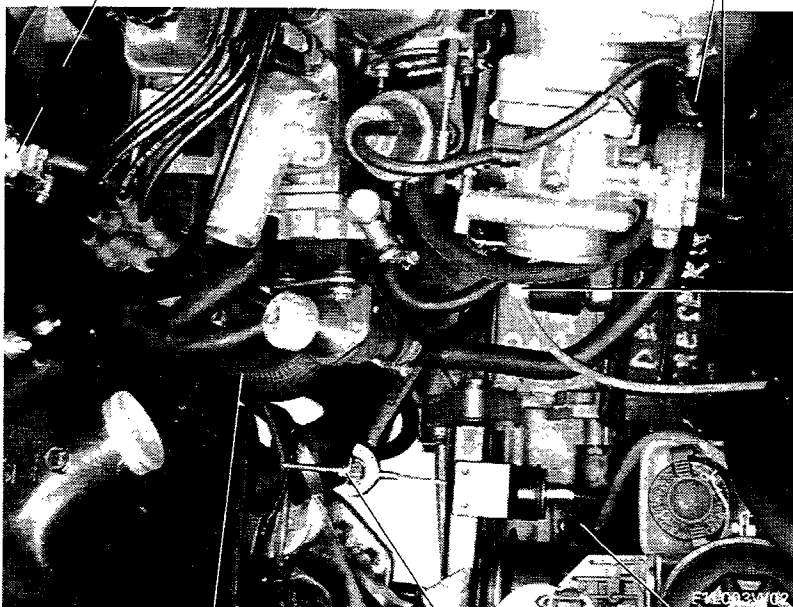
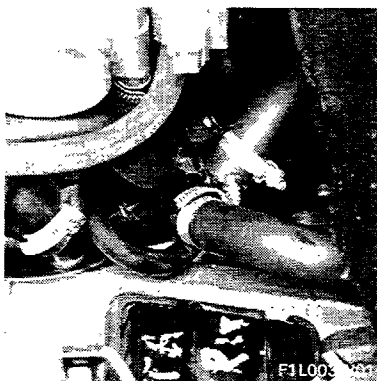
2000 i.e. turbo ENGINE



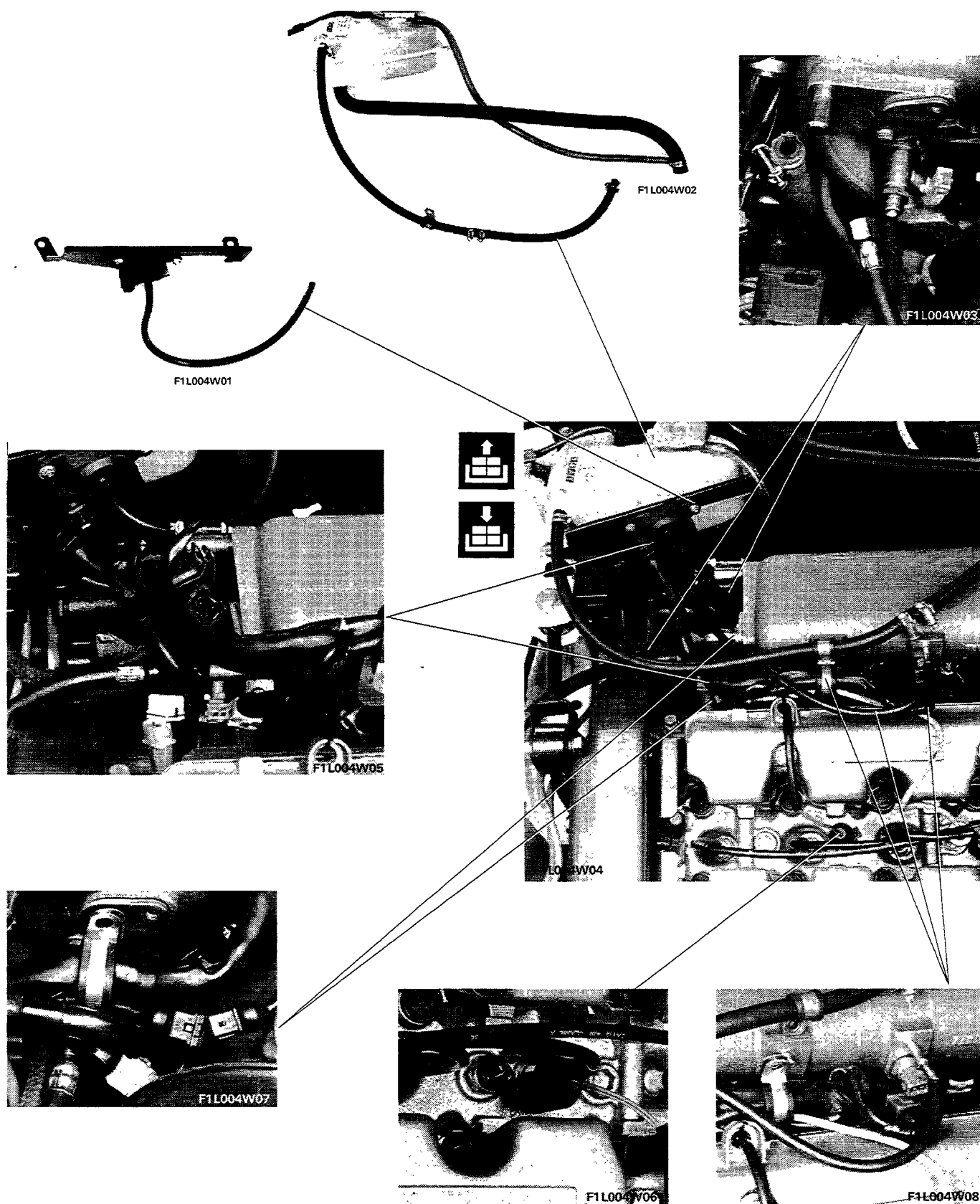
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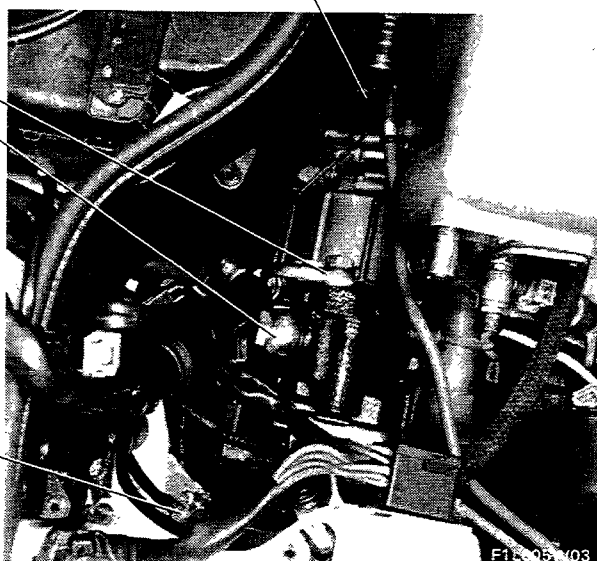
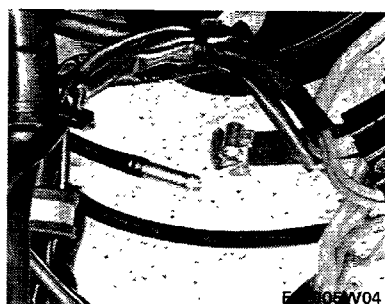
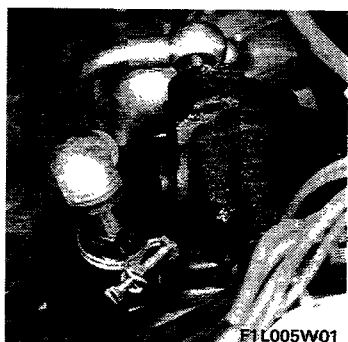


- Disconnect electrical connections from over-boost control solenoid;

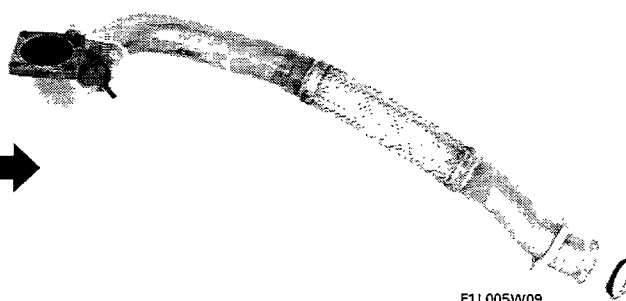
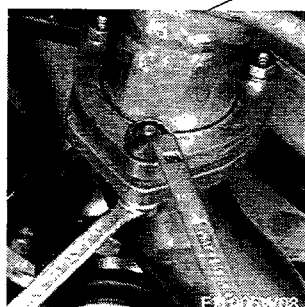
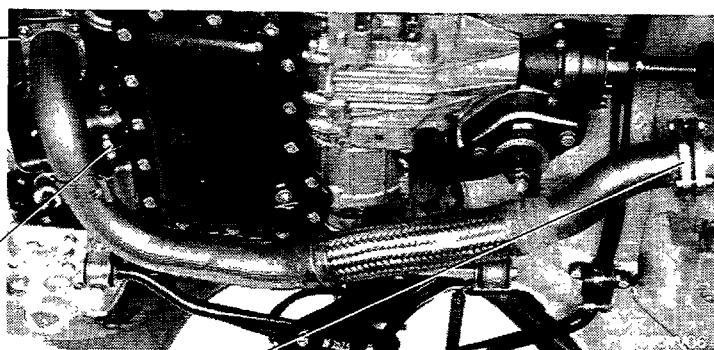


10.

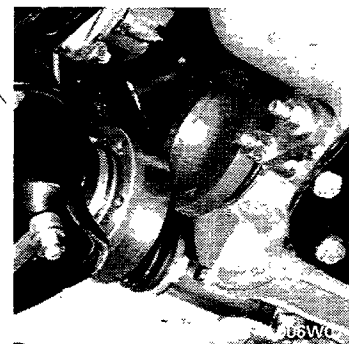
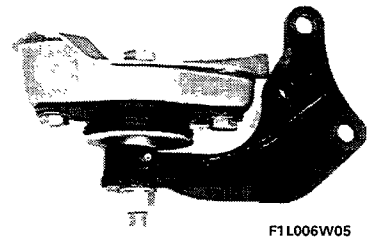
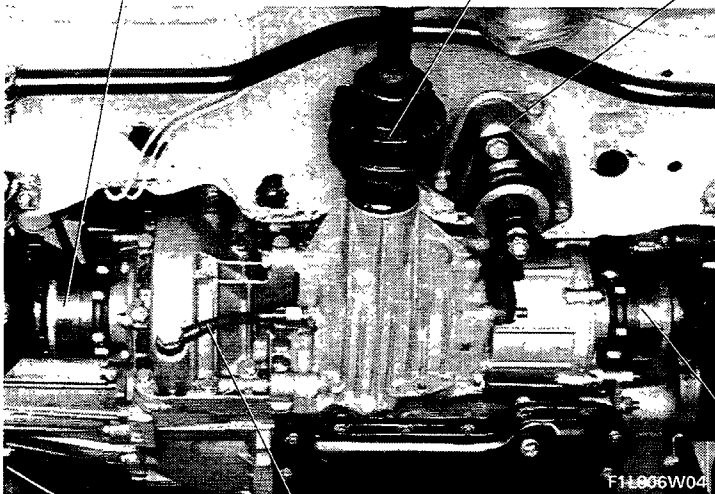
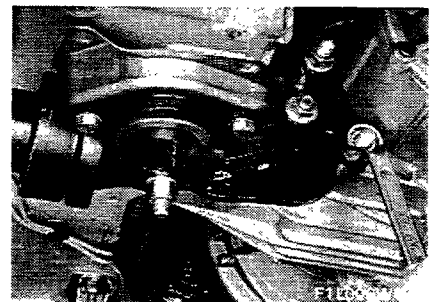
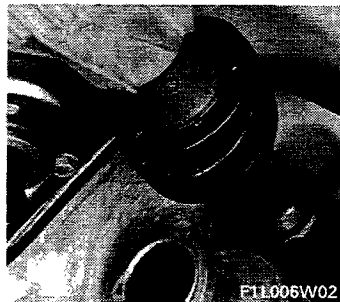
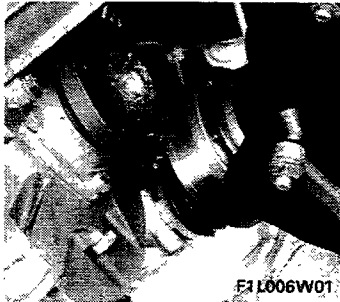


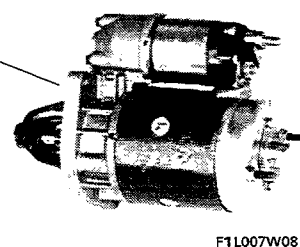
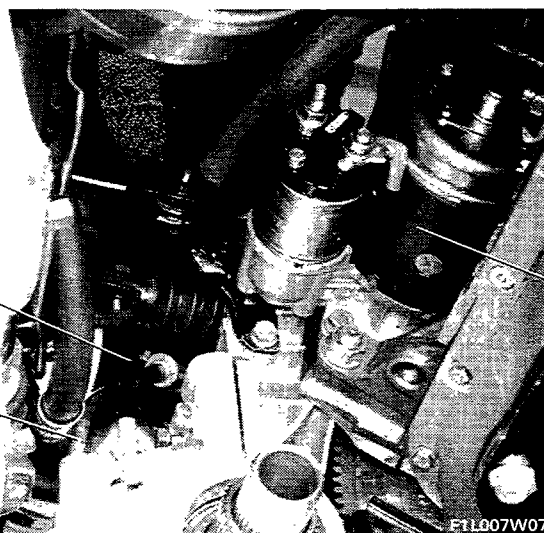
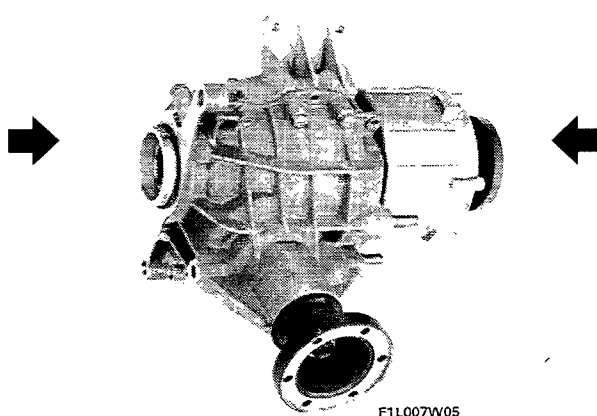
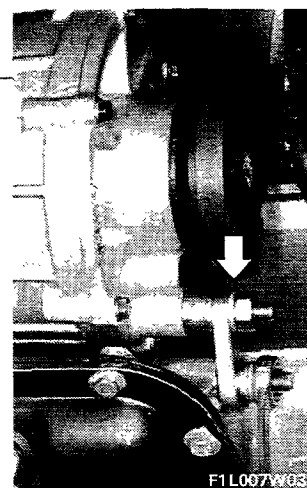
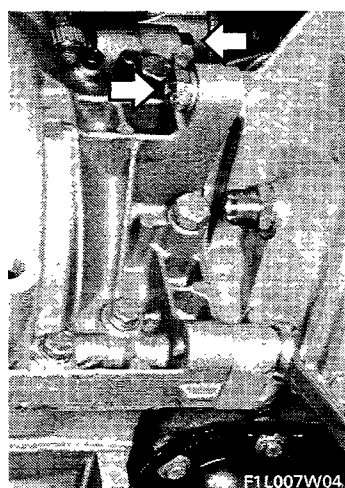
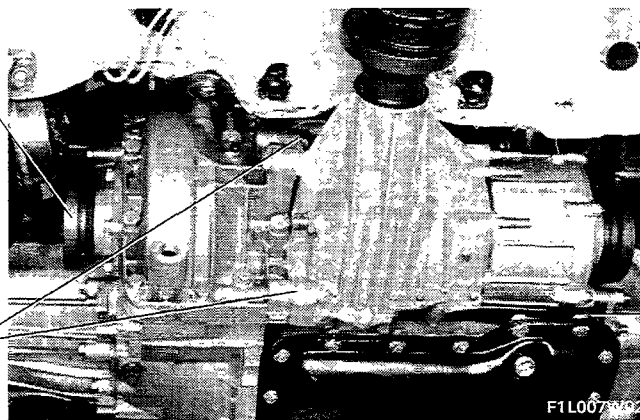
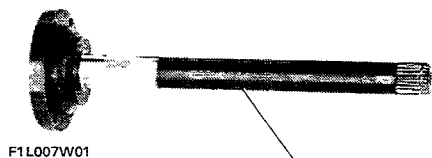


- remove the front wheels;
- raise the car and, working from underneath, drain the gearbox oil; then proceed as follows:

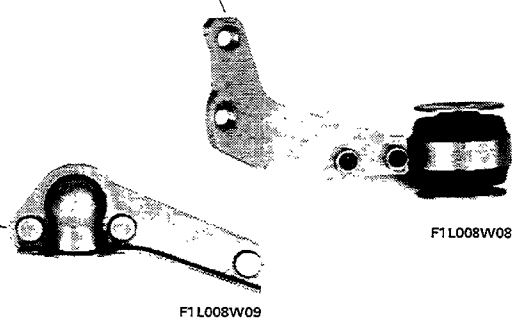
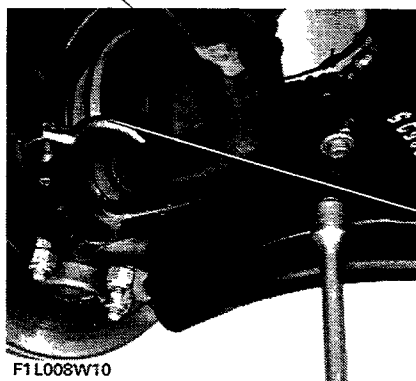
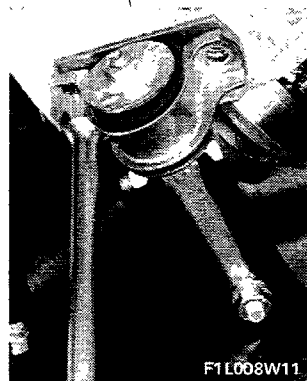
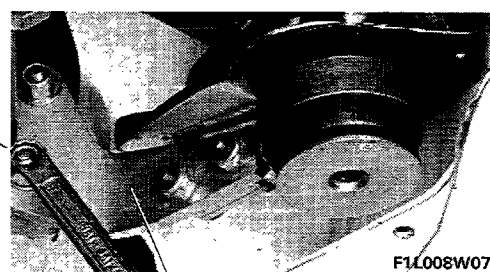
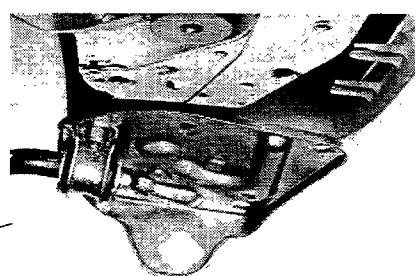
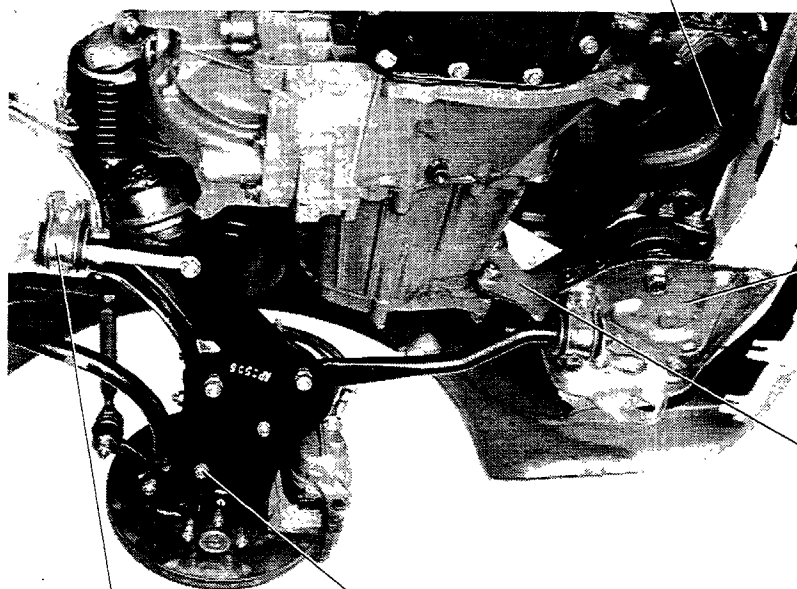
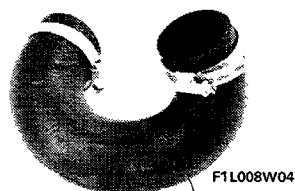
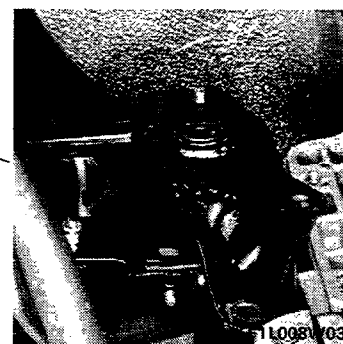
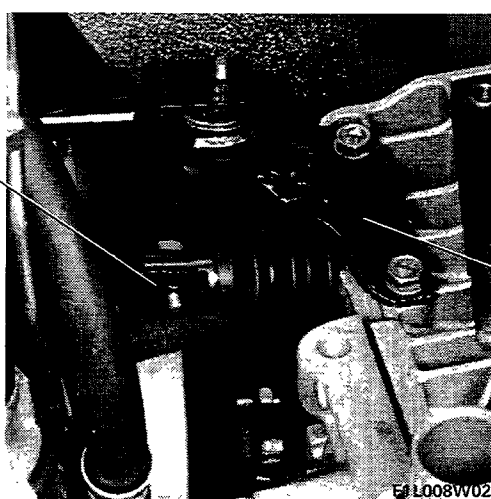


10.



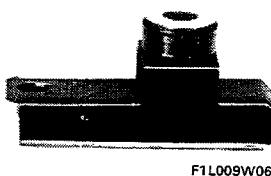
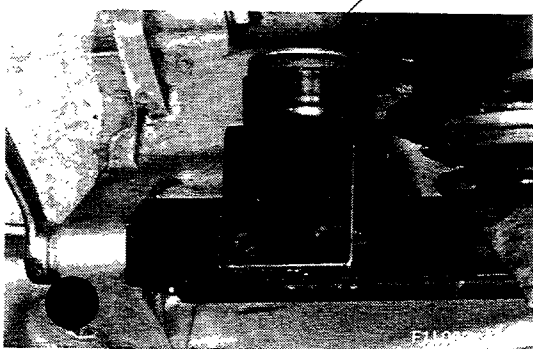
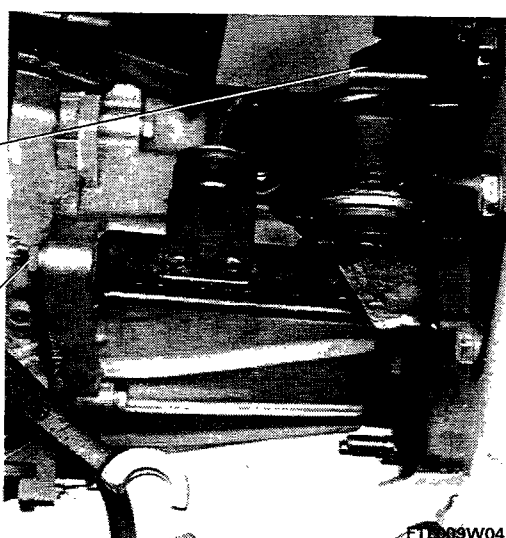
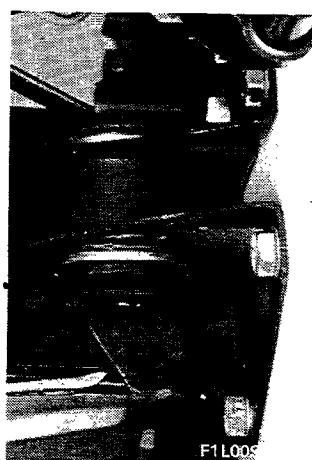
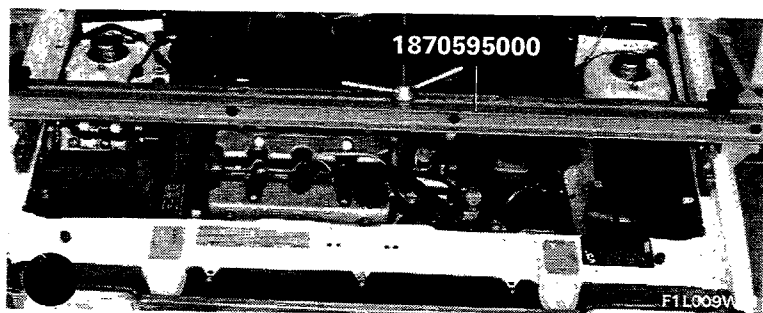


10.



F1L008W08

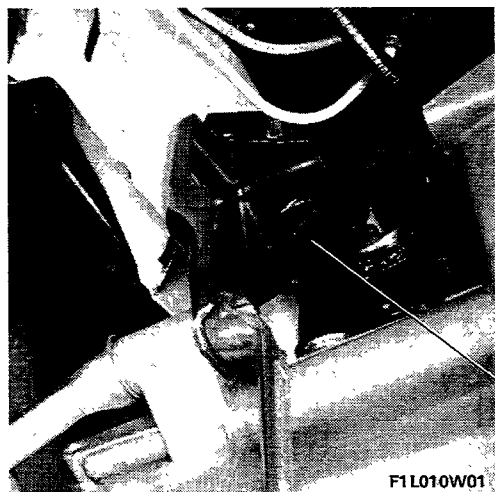
- disconnect electrical connections from alternator;
- lower lift, position crossbeam 1870595000 in engine compartment and support the engine using special hook;



F1L009W06

10.

- raise the lift and, working from beneath, proceed as follows:



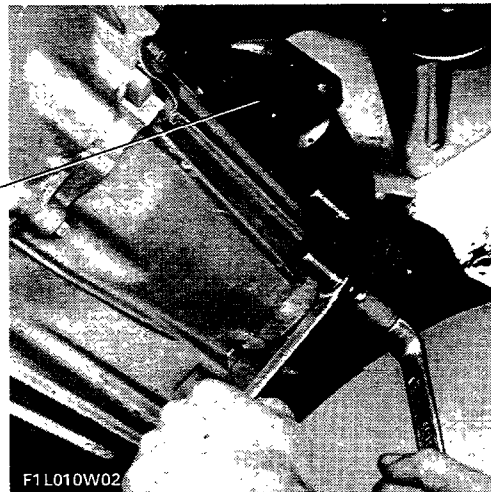
Removing-refitting rear gearbox support bracket



F1L010W02

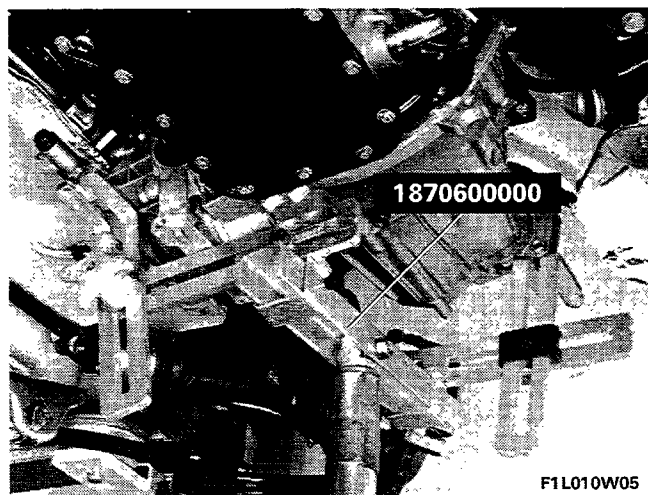


F1L010W03



F1L010W02

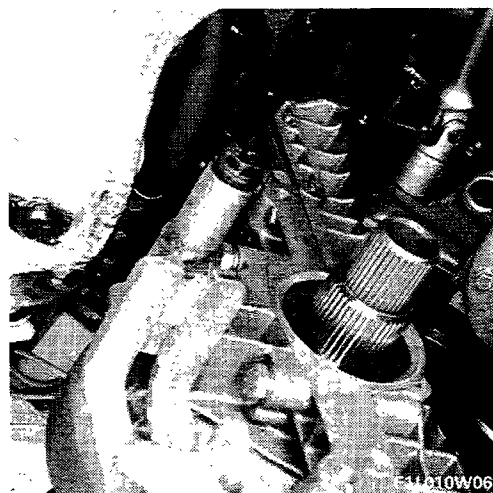
Removing-refitting front gearbox support bracket



F1L010W05



- remove flywheel cover retaining bolts, arrange gearbox-differential support 1870600000 as shown in the diagram and position the hydraulic jack;
- remove bolts retaining gearbox-differential unit to engine;

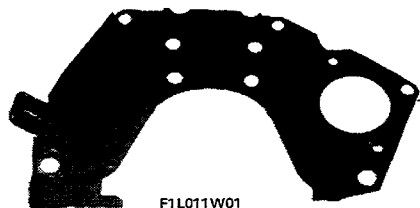


F1L010W06

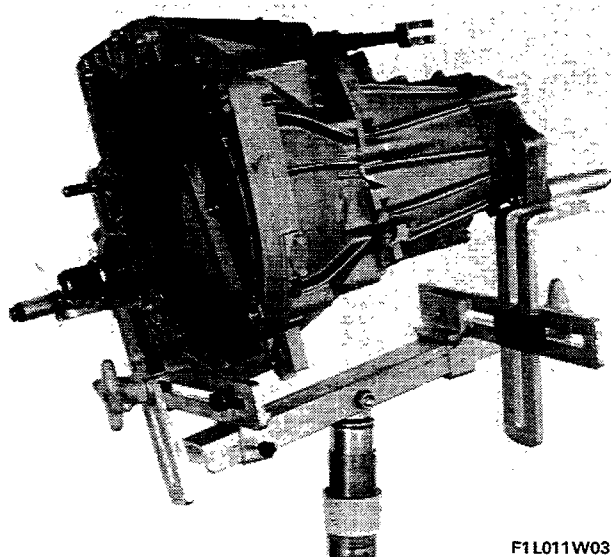


F1L010W07

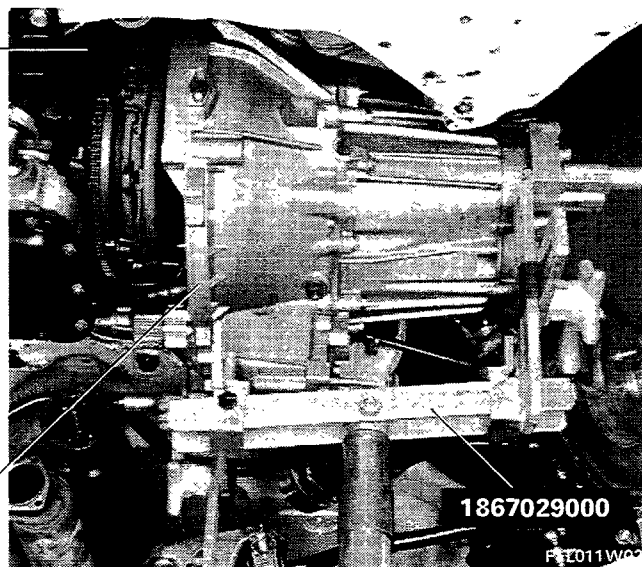




F1L011W01

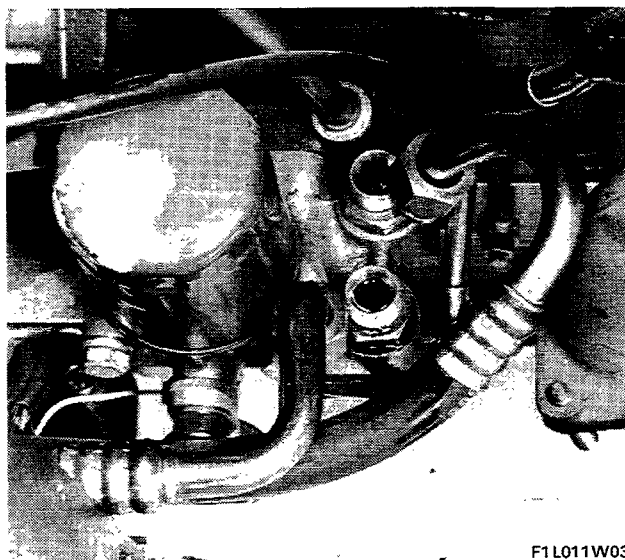


F1L011W03



- move the gearbox-differential unit until it is free of the centring pins on the engine and the clutch shaft slides out of the driven plate;

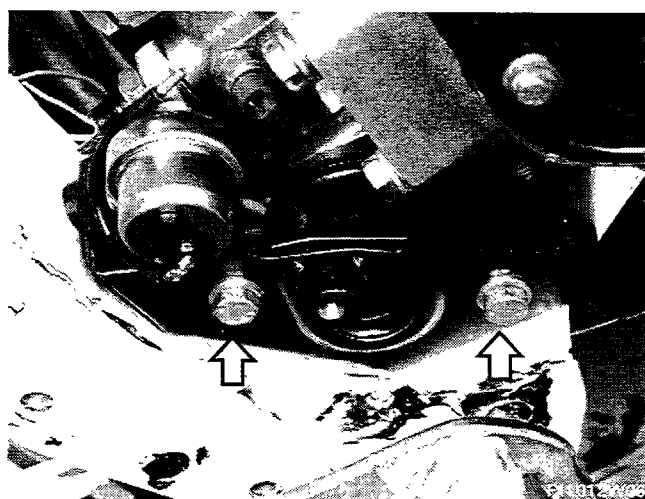
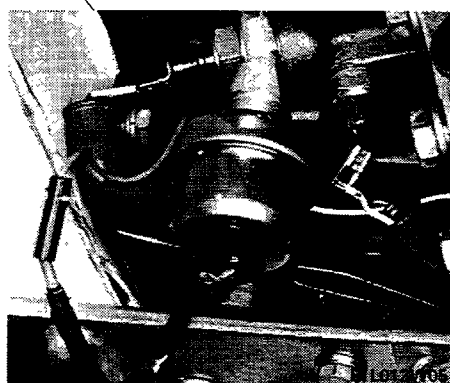
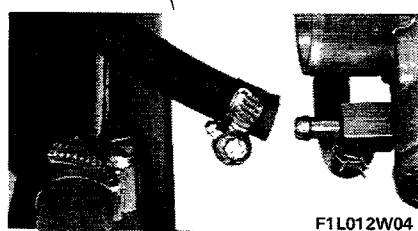
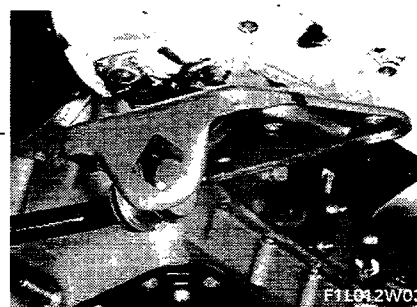
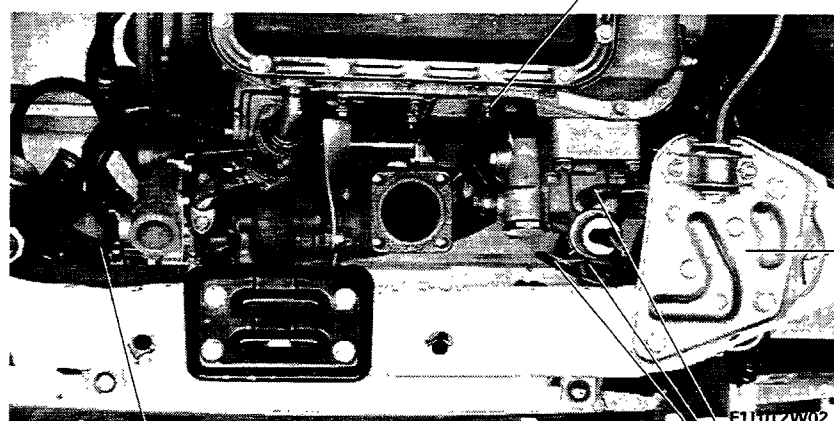
- lower the lift, remove the radiator grille and the hose connecting the radiator to the turbocharger and then withdraw the radiator together with the fan. Now proceed as follows:



F1L011W03

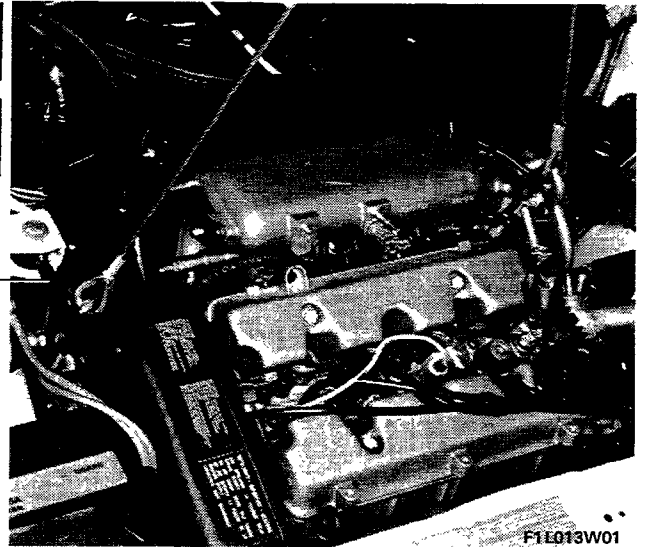
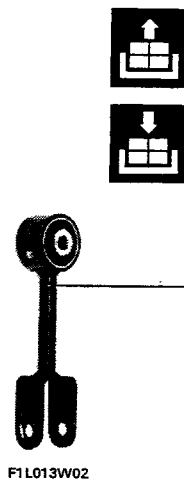
Removing-refitting oil lines from thermostatic valve on oil filter support

10.

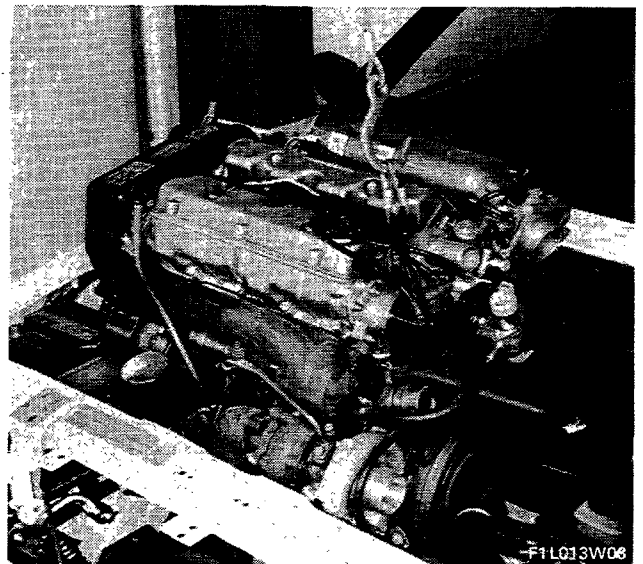


- disconnect the camshaft end front engine supports via bolts shown in diagram;

- lower the lift, position universal hook 1860592000 in attachment brackets on engine then take up the slack on power unit using the hoist;
- disconnect support beam 1870595000;



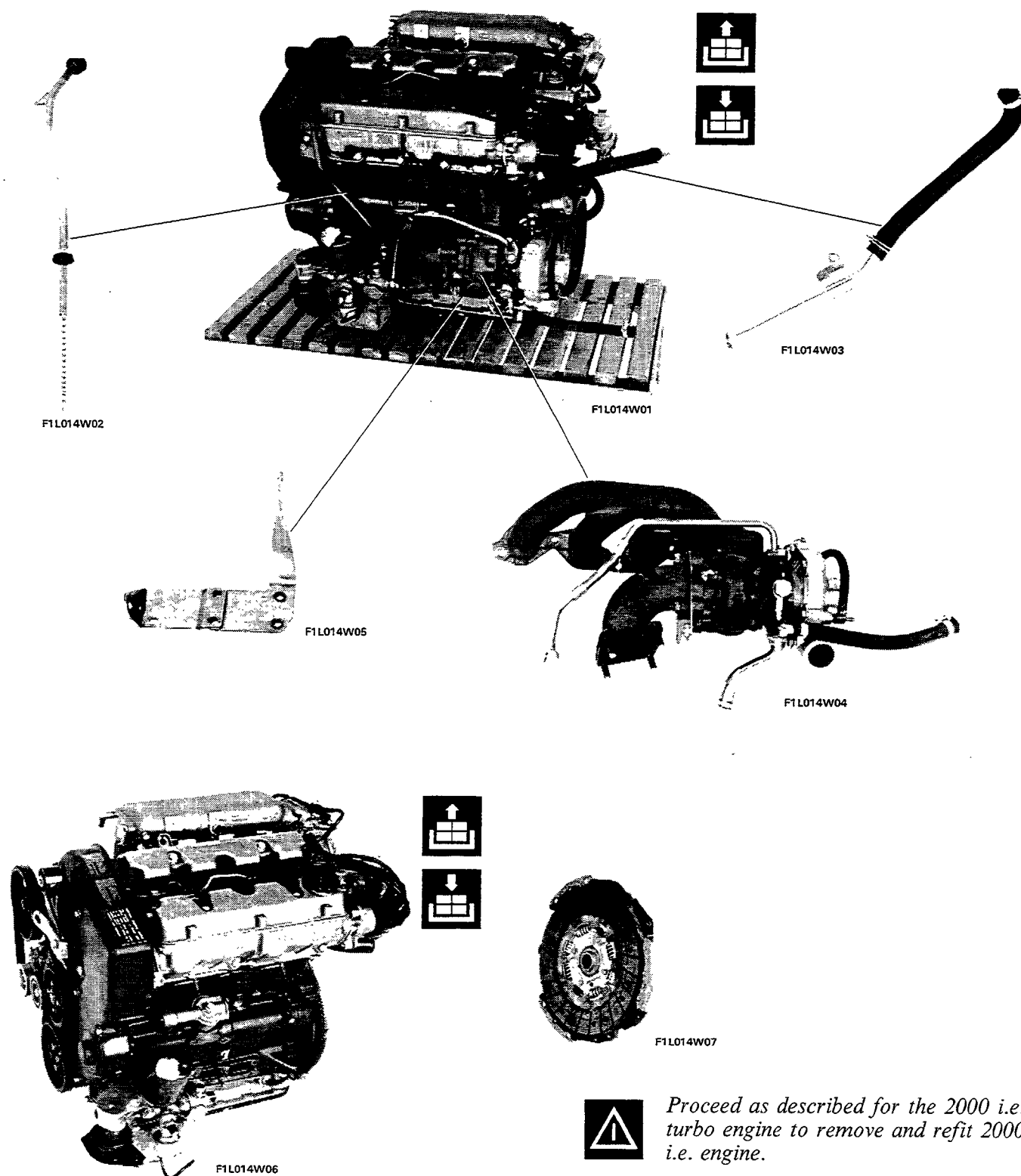
- remove the link fastening engine to body shell;



- raise engine with hoist;

10.

- rest engine on platform and then proceed as follows:



NOTE To re-install power unit carry out removal instructions in reverse order.

PART	Thread	Tightening torques
		daNm

ENGINE

Bolt retaining central cap to engine block	M 12 x 1.25	2 + 130°
Self-locking bolts retaining caps to engine block	M 12 x 1.25	2 + 90°
Nut retaining link to aluminium sump and torque distributor	M 8	2.3
Bolt retaining vent housing to engine block	M 8	2.3
Bolt retaining reaction bracket to torque distributor	M 10 x 1.25	5.9
Bolt retaining cylinder head to engine block	M 10 x 1.25	4 + 90° + 90°
Bolt retaining top end of cylinder head	M 8	2.2
Bolt retaining intake manifold to cylinder head	M 8	2.5
Nut retaining intake manifold to cylinder head	M 8	2.5
Nut retaining reaction bracket to intake manifold	M 8	2.3
Bolt retaining reaction bracket to intake manifold	M 8	2.3
Self-locking bolt retaining exhaust manifold	M 8	2.9
Connecting rod cap retaining bolt	M 10 x 1	2.5 + 50°
Bolt retaining flywheel to crankshaft	M 12 x 1.25	14.2
Bolt retaining auxiliary pulley to timing gear	M 8	2.5
Bolt retaining timing gear to crankshaft ▲	M 14 x 1.5 Left	19
Bolt retaining belt tensioner bearing to support	M 10 x 1.25	4.4
Bolt retaining belt tensioner support to alternator and power steering support	M 8	2.3
Poly-V belt tensioner adjustment screw locknut	M 10 x 1	4.4
Timing gear retaining bolt	M 12 x 1.25	11.8
Belt tensioner retaining bolt	M 10 x 1.25	4.4

▲ Do not lubricate the bolt

10.

PART	Thread	Tightening torque
		daNm

Counter-rotating shaft gear retaining bolt	M 12 x 1.25	11.8
Counter-rotating shaft cover retaining bolt	M 8	2.3
Counter-rotating shaft belt tensioner retaining nut	M 8	2.3
Self-locking nut retaining turbocharger to exhaust manifold	M 10 x 1.5	5.9
Self-locking nut retaining flange to turbocharger	M 8	2.9
Bolt retaining turbocharger support bracket to engine block	M 8	2.9
Nut retaining turbocharger support bracket and exhaust pipe support bracket to engine block	M 8	2.9
Bolt retaining oil delivery lines to turbocharger	M 8	2.3
Union for adjustable fitting retaining oil delivery lines to oil filter support	M 14 x 1.5	5
Bolt retaining oil delivery line support bracket to exhaust manifold	M 10 x 1.25	4.3
Bolt retaining oil return line from turbocharger to sump	M 8	2.3
Union for adjustable fitting retaining turbocharger coolant delivery and return hoses	M 16 x 1.5	3.2
Bolt retaining oil filter and engine suspension support to engine block	M 10 x 1.25	4.3
Plug for thermostatic valve on oil filter support	M 35 x 1.5	11.8
Bolt retaining water pump to engine block	M 8 x 1	2.5
Bolts retaining water pump and power unit suspension bracket to engine block	M 8 x 1	2.5
Bolt retaining water pump hose to pump	M 8	2.5
Bolt retaining coolant return lines to cylinder head	M 10 x 1.25	4.3
Nut retaining power steering pump alternator support to engine block	M 10 x 1.25	4.3
Bolts retaining power steering pump alternator support to engine block	M 10 x 1.25	4.3
	M 8	2.5

PART	Thread	Tightening torque
		daNm

Bolt retaining alternator bracket to support	M 10 x 1.25	4.3
Alternator bracket retaining nut	M 10 x 1.25	4.3
Alternator retaining nut	M 12 x 1.25	6.9
Bolt retaining support brackets to power steering pump	M 8	2
Bolt retaining power steering support brackets to support	M 10 x 1.25	4.3
Nut retaining power steering pump driven pulley	M 14 x 1.5	9.5
Spark plugs	M 14 x 1.25	3.7
Oil temperature sending unit	M 14 x 1.5	3.7
Coolant temperature sending unit	M 16 x 1.5 bevel	4.9
Oil pressure switch	M 14 x 1.5	3.2
Oil sump plug	M 22 x 1.5 bevel	5

EXHAUST

Nut for stud fastening exhaust pipe to turbocharger	M 10 x 1.5	3.7
Bolt retaining silencer flange on exhaust pipe	M 8 x 1.25	1.5
Bolt securing bracket retaining exhaust pipe to collar	M 10 x 1.25	5
Nut retaining collar on exhaust pipe to bracket	M 8 x 1.25	2.5
Nut retaining exhaust pipe to rubber bush	M 8 x 1.25	1

POWER UNIT MOUNTING

Bolt retaining support for crankshaft end rubber engine mounting block	M 8 x 1.25	1.7
Bolt retaining rubber block, crankshaft end, to engine	M 12 x 1.25	5
Bolt retaining engine block to crankshaft end support	M 10 x 1.25	3.1

10.

PART	Thread	Tightening torques
		daNm

Bolt retaining crankshaft end power unit fastening link	M 10 x 1.25	4.2
Bolt retaining body shell end power unit fastening link	M 10 x 1.25	4.2
Bolt retaining gearbox end rubber block bracket	M 8 x 1.25	1.6
Bolt retaining rubber block to gearbox end bracket	M 12 x 1.25	8.5
Bolt retaining support for rubber block to body shell, gearbox end	M 10 x 1.25	3.1
Bolt joining gearbox end rubber block brackets	M 10 x 1.25	6
Bolt joining rubber block to gearbox end support	M 10 x 1.25	6
Self-locking nut for retaining rubber block to gearbox	M 10 x 1.25	6
Bolt retaining gearbox end rubber block	M 12 x 1.25	8.5
Self-locking nut retaining middle rubber block bracket	M 12 x 1.25	5
Bolt retaining middle rubber block bracket to differential	M 10 x 1.25	5
Bolt joining middle rubber block to supports	M 12 x 1.25	8.5
Bolt retaining middle block to body shell support	M 10 x 1.25	3.1
Bolt retaining middle block support to body shell	M 8 x 1.25	1.8

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WEBER INJECTION/IGNITION SYSTEM

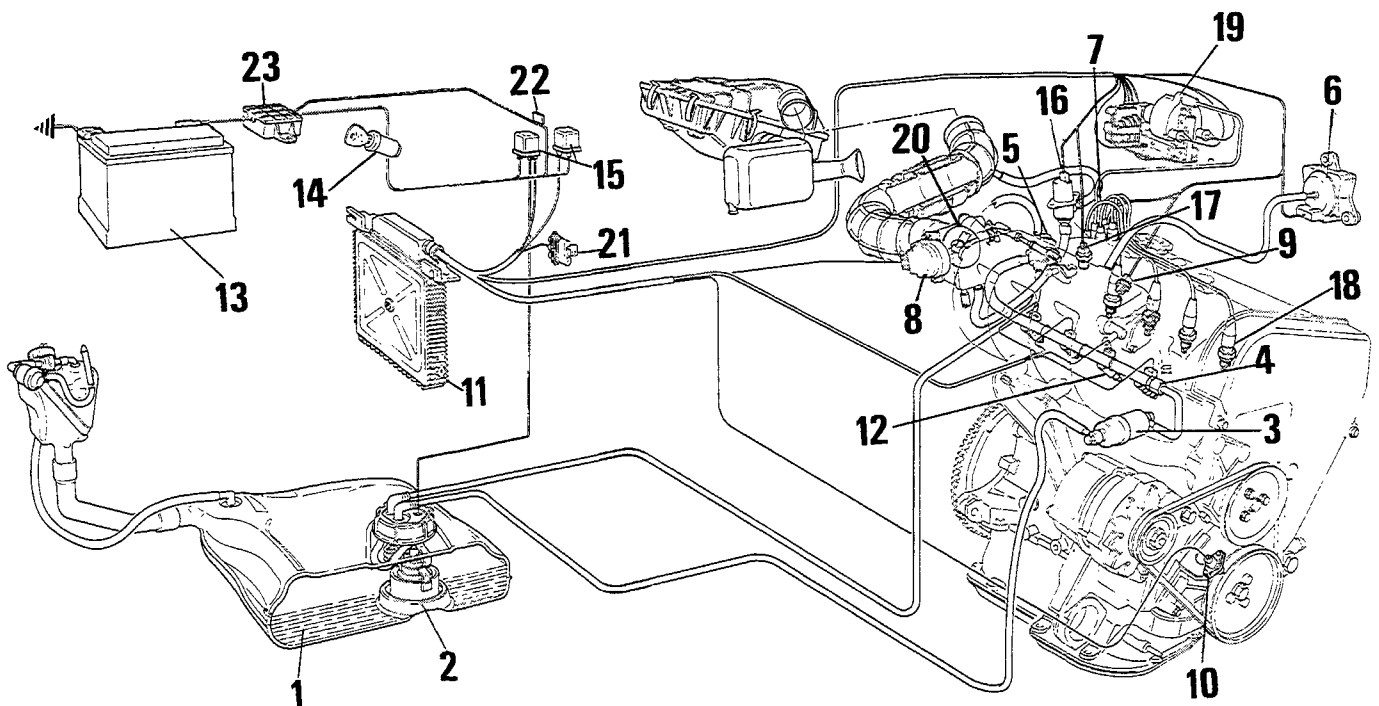
The IAW (Weber injection/ignition) system integrates the static advance digital electronic ignition system with an intermittent type, multipoint, low pressure electronic fuel injection system developed by Weber S.p.A. in conjunction with marelli Autronica.

This device reduces the number of elements which currently make up the ignition and injection systems by utilizing a single electronic control unit; it also has one set of cables and a single set of common sensors.

Ignition system operating principle

The electronic control unit **memorizes a mpa containing the entire range of optimum advance values which the engine can use in its operating range according to the engine speed and load (= instant vacuum value in the manifold) developed.**

These values have been obtained experimentally, using an exhaustive series of practical tests carried out on prototypes at the test bench, until it was possible to determine the advances which give the best compromise between the contrasting requirements of maximum power and minimum fuel consumption and harmful exhaust emissions.



Wiring diagram for Prisma 4WD injection/ignition system

- | | |
|--|---|
| 1. Fuel tank | 14. Ignition switch |
| 2. Electric fuel pump | 15. Injection/ignition relays |
| 3. Fuel filter | 16. Supplementray air soleonid valve for automatic engine idle adjustment |
| 4. Fuel manifold | 17. Coolant temperature sensor |
| 5. Fuel pressure regulator | 18. Spark plugs |
| 6. Intake air absolute pressure sensor | 19. Ignition unit |
| 7. HT distributor with injection timing sensor | 20. Butterfly valve |
| 8. Butterfly valve position sensor | 21. Diagnostic socket (located near the injection control unit connector) |
| 9. Intake air temperature sensor | 22. IAW system protective fuse |
| 10. Rpm and TDC sensor | 23. Vehicle electrical system connector block |
| 11. Electronic control unit | |
| 12. Injectors | |
| 13. Battery | |

10.

The optimum advances are then memorized in the system control unit. Whilst the engine is operating the central control unit (11) is constantly supplied information concerning the following conditions **speed** (= engine speed) and **load** (= vacuum in the inlet manifold of the engine and on the basis of this information it **selects from its memory the advance value required** by the engine to control the ignition unit power module so that the spark reaches the spark plug in the cylinder during the explosion stroke with the optimum advance. Following the command from the control unit (11), the unit ignition module (19) causes a current to pass through the ignition coil primary circuit until it is completely energized and consequently cuts off the passage of this current and through self-induction there is an extremely high voltage in the secondary winding and the spark reaches the spark plug.

This information which the control unit (11) needs is transmitted by means of electrical signals emitted by the following two sensors:

- Rpm and TDC sensor (10)** which produces a **single-phase alternating** signal whose frequency indicates the engine speed and together with the timing sensor helps to determine the TDC position for the pairs of pistons in cylinders 1-4 and 3-2.
- Absolute pressure sensor (6)** which produces a **continuous current** signal whose voltage value is proportional to the absolute pressure value in the inlet manifold to which the sensor is connected by means of a pipe.

Injection system operating principle

This consists of calculating **the exact weight of the air drawn in by the engine at each phase** of its operation by means of an indirect measuring system (*) known as : **engine speed - density** of the air drawn in. This injection system uses a **micro computer** to calculate the exact weight of the air drawn in by the engine during the various operating stages in order to control the correct length of the injection period for the cylinder which is pre-set according to the instant read out of the engine operating conditions supplied by the following sensors:

1. Rpm and TDC sensor
2. Timing sensor located in the H.T. distributor
3. Absolute pressure sensor
4. Coolant temperature sensor and air intake temperature sensor
5. Butterfly valve position sensor

In addition, the solenoid valve for the automatic adjustment of the idle speed is also connected to the control unit. It causes the flow of supplementary air:

- a) to sustain the "idling" with the engine warm (operating temperature) even when the external engine load varies suddenly when one of the accessories is switched on;
- b) to determine a "fast idle" speed capable of sustaining the engine during cold starting and when testing its efficiency.

(*) The engine speed-intake air density method is based on the following calculation of the weight (mass) of the air drawn in and the weight of petrol to be injected to obtain the correct mixture strength (= air/petrol weight ratio):

Theoretical volume (V_T) of air drawn in per cycle

$$V_T = \frac{\text{engine idle speed}}{2} \times \text{capacity}$$

Actual volume (V_R) of air drawn in per cycle

$$V_R = V_T \cdot \mu_v$$

where μ_v = engine volumetric output at various speeds

Actual volume (M_R) (mass) of air drawn in by engine per cycle

$$M_R = V_R \cdot \frac{P}{T}$$

where:

P = absolute pressure in engine inlet manifold

T = absolute temperature of intake air.

The amount (Q_B) of petrol to be injected depends on the stoichiometric ratio α desired and also on the injector flow constancy characteristic K

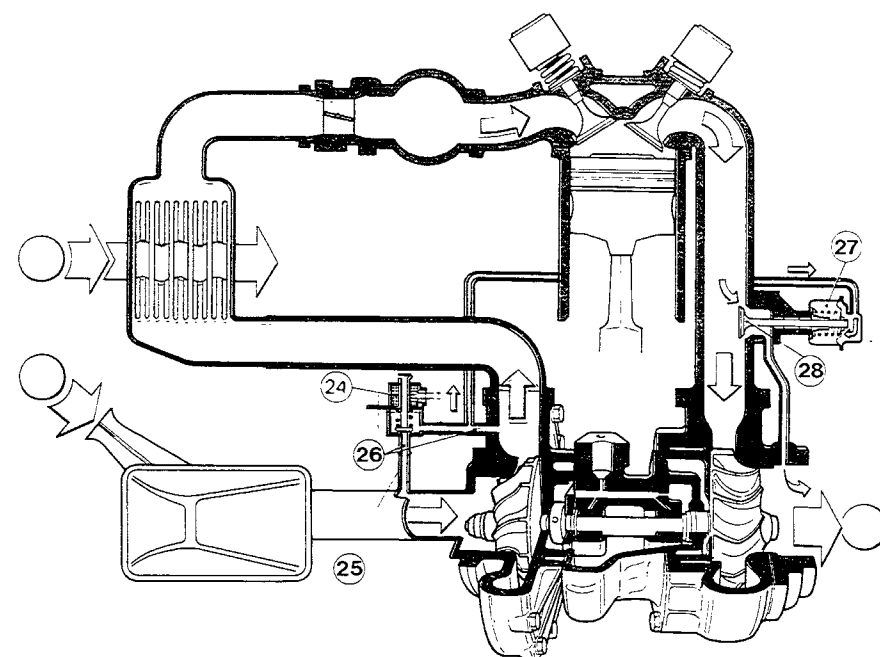
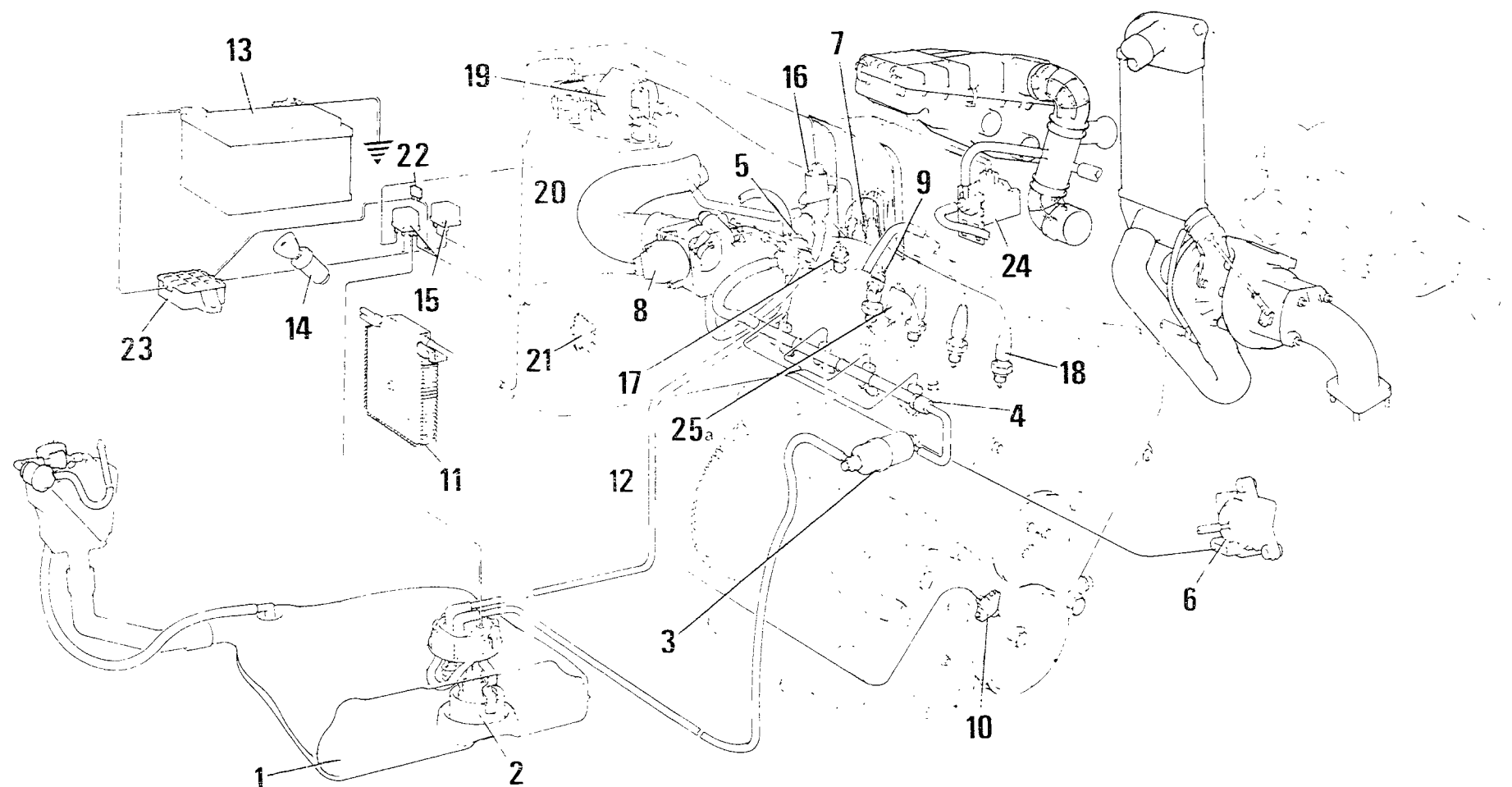
$$Q_B = \frac{1}{\alpha} \cdot K \cdot V_R.$$

Since during normal operation the injector injects fuel for each half revolution of the crankshaft, it makes a note of the engine speed and the amount of fuel to be injected to each open injector.

To sum up:

$$Q_B = K \cdot \frac{\mu_v}{\alpha} \text{ rpm} \cdot \frac{\text{capacity}}{2} \cdot \frac{P}{T}$$

DELTA HF 4WD TURBO IAW INJECTION/IGNITION SYSTEM WIRING DIAGRAM



Key

- | | |
|--|---|
| 1. Fuel tank | 16. Additional air solenoid valve for automatic adjustment of the engine idle speed |
| 2. Electric fuel pump | 17. Coolant temperature sensor |
| 3. Fuel filter | 18. Spark plugs |
| 4. Fuel manifold | 19. Ignition unit |
| 5. Fuel pressure regulator | 20. Butterfly valve |
| 6. Intake air absolute pressure sensor | 21. Diagnostic socket |
| 7. HT distributor with injection timing sensor | 22. Fuse |
| 8. Butterfly valve position sensor | 23. Connector |
| 9. Intake air temperature sensor | 24. Over-boost solenoid valve |
| 10. Rpm and TDC sensor | 25. Air intake duct from the filter |
| 11. Electronic control unit | 25a. Detonation sensor |
| 12. Injector | 26. Compressed air ducts from the turbocharger |
| 13. Battery | 27. Supercharging adjustment actuator |
| 14. Ignition switch | 28. Wastegate valve |
| 15. Injection/ignition relays | |

ANTI-DETONATION AND OVER-BOOST DEVICES

The IAW system fitted on the Delta 4WD differs from the one on the Prisma 4WD through the addition of anti-detonation and over-boost devices.

Anti-detonation device: this comprises a sensor (25a) bolted onto the cylinder head and connected to terminals 6 and 22 of the ignition injection control unit (11) in order to adjust the intensity of the vibrations (knocking) caused by the detonation in the combustion chamber whilst the engine is running. If this is the case, the sensor (25a) informs the ignition injection control unit (11) so that it can quickly reduce the engine ignition advance values. The reduction of the advance values takes place when the system recognizes "engine knock" due to detonation as distinct from normal combustion.

The advance curve for a given engine load is reduced by around 5°.

If the detonation should still persist, the advance is further reduced by 5° at a time up to a maximum of 15°. After a certain number of operating cycles without knocking the advance is then gradually reinstated to its original value. The advance curve cannot be reduced by more than 15° in relation to the original curve according to the engine load conditions, supercharging pressure and engine speed.

This device is essential in safeguarding the life of the engine as detonation can very easily occur whilst the engine is being supercharged.

Over-boost device: this closes the wastegate valve (28) so that all the exhaust gases blow into the turbine increasing the revs so that the speed of the compressor, connected to it, increases and causes an increase in the engine supercharging pressure (with a consequent increase in torque and or engine power). When the device is activated the ignition injection control unit operates the solenoid valve (24), through terminal 16, which, on opening, places the wastegate valve actuator diaphragm (27) at atmospheric pressure via sleeves (25) and (26). The decrease in pressure at the wastegate actuator (27) obtained in this way causes the closure of the valve (28) and as a result prevents a substantial amount of exhaust gases from by-passing (i.e. avoiding) the turbine.

This device operates in two ways: it can increase the torque by 10% for a short period if the accelerator pedal is fully depressed when the engine speed is between 2000 rpm and 5300 rpm (it operates for a maximum of 30 secs to a minimum of secs). Or it can increase the maximum power of the engine for a limited length of time if the accelerator pedal is fully depressed starting at a speed of ≥ 5000 rpm. The information concerning the engine speed is transmitted to the injection/ignition control unit by means of the rpm and TDC sensor (10).

COMPOSITION OF IAW SYSTEM

The Weber electronic injection/ignition system comprises three independent circuits, namely:

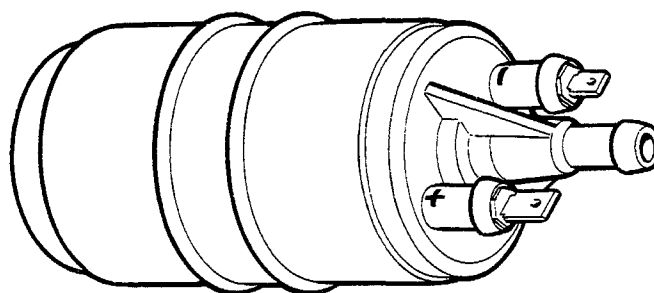
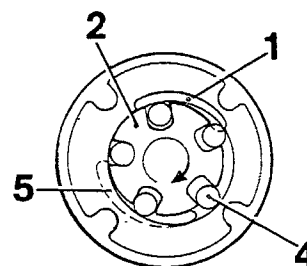
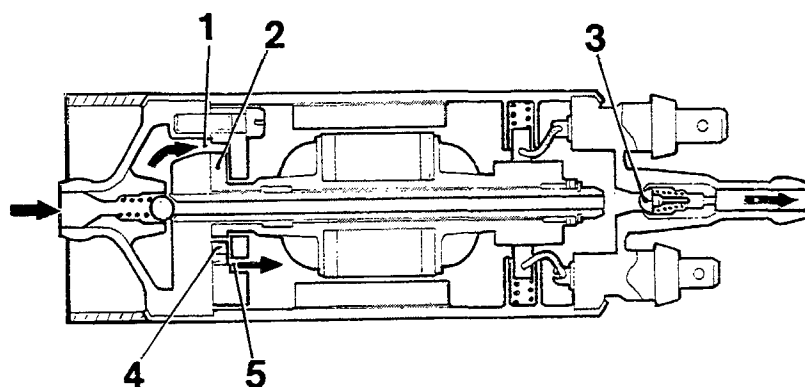
A. FUEL SUPPLY CIRCUIT

It comprises the following components: (see key on page 1)

- a tank (1)
- an electric pump (2)
- a filter (3)
- a fuel pressure regulator (5)
- four injectors (12)

Electric fuel pump

The electric pump (2) is located in the tank where it draws in the fuel and sends it through the filter (3) to a distribution manifold (4) which shares it out equally amongst the injectors (12). The pressure of the fuel in the circuit is kept constant by means of a pressure regulator (5) which keeps the excess fuel in check by making it flow back to the tank (1).



Electric fuel pump assembly and cross sections

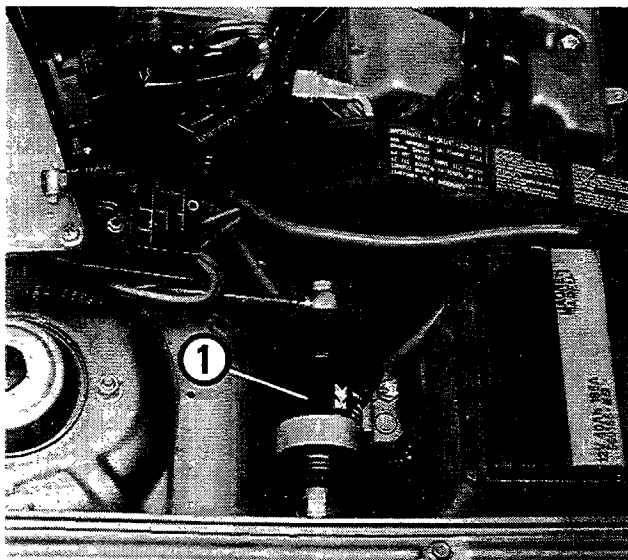
1. Inlet opening
2. Impeller
3. Non-return valve
4. Rollers
5. Delivery opening
6. Excess pressure valve

The electric pump is of the volumetric roller type with a motor energized by permanent magnets immersed in the fuel (2).

The impeller rotates, driven by the motor, creating volumes which move from the inlet opening (1) to the delivery opening (5). These volumes are defined by the rollers (4) which adhere to the outer race whilst the motor rotates.

The pump has two valves: one non-return valve to prevent the fuel circuit emptying when the pump is not operating and an excess pressure valve which short circuits the delivery with the inlet when the pressure exceeds 5 bar to prevent the electric motor from overheating.

10.



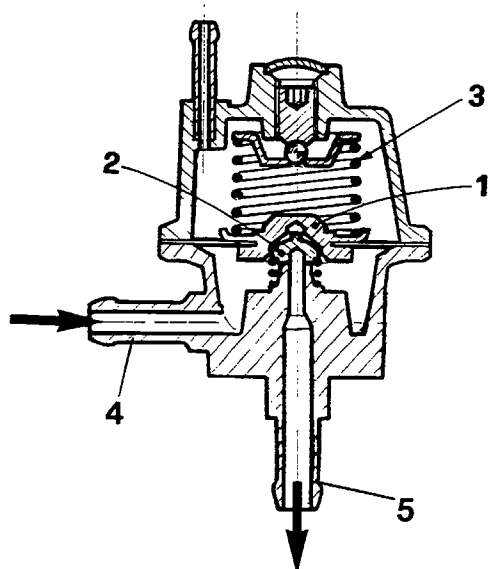
Fuel filter (1)

It has the task of trapping any impurities which may be present in the fuel as the injectors are extremely sensitive to foreign bodies.

It comprises a paper filter element with a surface area of around 1200 cm² and a filtering capacity of 10 µm.

The filter is fitted in the engine compartment between the pump and the fuel manifold.

NOTE *An arrow stamped on the filter casing shows the direction of the fuel. The filter should be replaced every 20,000 km or if it has been incorrectly fitted and worked like that even for a short length of time.*



Fuel pressure regulator

1. Diaphragm plate
2. Valve
3. Opposing spring
4. Fuel arriving under pressure from the injector manifold
5. Excess fuel outlet returning to the tank

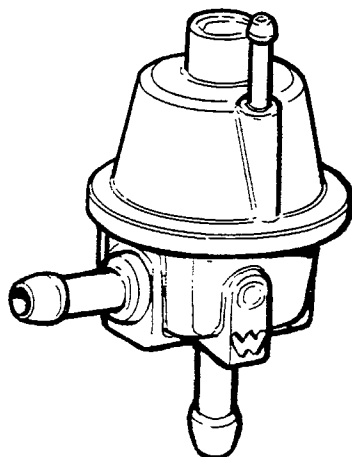
The regulator is a device which maintains the pressure rise at the injectors constant.

It is of the differential diaphragm type and is adjusted during assembly at a pressure of 2.5 bar.

The fuel coming from the pump at a given pressure causes a thrust which is opposed by the calibrated spring (3) on the diaphragm plate (1) and the valve (2) below.

When the pressure exceeds the pre-set value (2.5 bar) the valve (2) moves and consequently the excess fuel flows back into the tank.

In order to maintain the rise in pressure at the injectors constant the difference between the pressure of the fuel and the absolute pressure of the air in the inlet manifold should be constant; this has been achieved by connecting the chamber housing the calibrated spring (3) with the inlet manifold by means of a pipe.



NOTE *The pressure regulator has been pre-adjusted and if it is faulty it must be replaced.*

Injectors

The injectors control the amount of fuel which enters the engine.

An injector is a device which can only assume two positions: open or closed.

It comprises a casing (1) and a needle (2) which are fixed to the magnetic armature (3).

The needle (2) is thrust against the seat by a helical spring (4) whose loading is determined by an adjustable pusher.

In the rear section of the injector casing there is a winding (5) whilst in the front part there are the needle seats.

The electrical impulses coming from the electronic control unit create a magnetic field in the winding which attracts the armature (3) and causes the injector to open.

Taking the physical characteristics of the fuel (viscosity, density) and the rise in pressure (due to the pressure regulator) as constant, the amount of fuel injected depends solely on the length of time the injector is open (injection time) which is established by the electronic control unit according to the engine operating conditions.

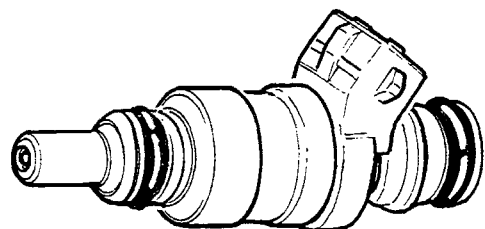
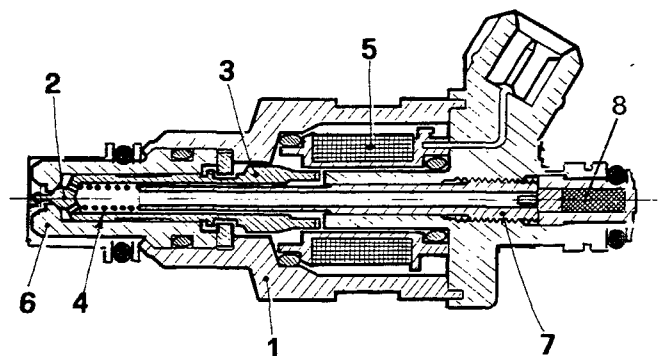
The jet of fuel at the differential pressure of 3 bar which comes out of the injector nozzle is instantly atomized forming a cone of around 30°.

The fuel is injected into the inlet manifold for each cylinder upstream of the inlet valve.

The control of the injectors is of the "sequential phased" type, in other words, the four injectors are controlled according to the intake order of the engine cylinders whilst the supply can already start for each cylinder during the expansion stroke until the intake stage has already begun.

Injector assembly and longitudinal section

1. Injector casing
2. Needle
3. Magnetic armature
4. helical spring
5. Winding
6. Front section of injector
7. Adjustable pusher
8. Fuel filter



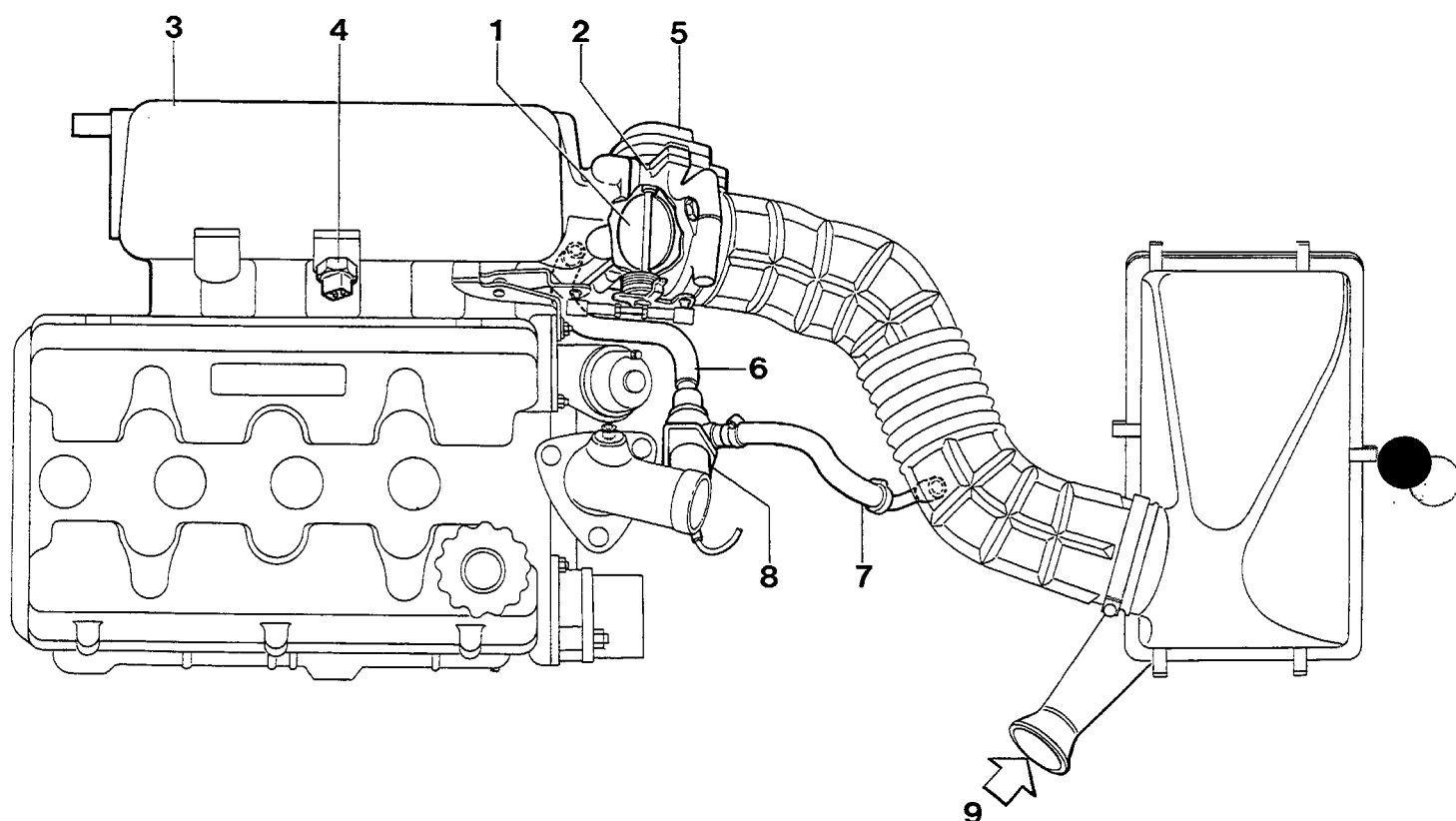
B. AIR INTAKE CIRCUIT

It basically comprises the following components:

- air filter
- air inlet manifold
- butterfly casing
- intake air temperature sensor
- intake air absolute pressure sensor
- idle speed automatic adjustment additional air solenoid valve.

10.

Inlet manifold and butterfly casing



1. Butterfly valve
2. Butterfly casing
3. Inlet manifold
4. Intake air temperature sensor
5. Butterfly valve position sensor
6. Supplementary air sleeve solenoid valve
7. Supplementary air intake solenoid valve
8. Supplementary air solenoid valve for automatic adjustment of idle speed and checking efficiency of engine when cold
9. Air filter

The manifold contains the air temperature sensor (4) and the vacuum pick ups for the absolute pressure sensor, the fuel pressure regulator and the servo brake.

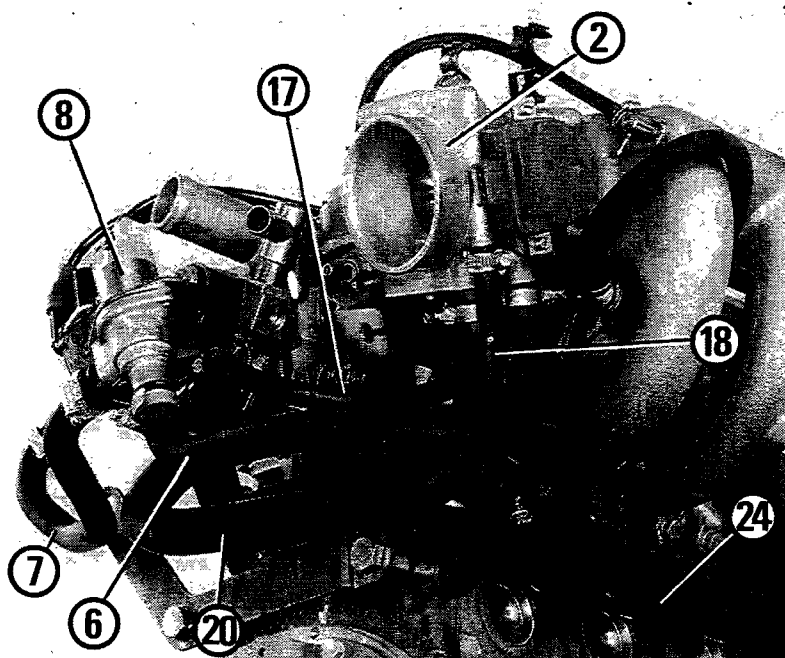
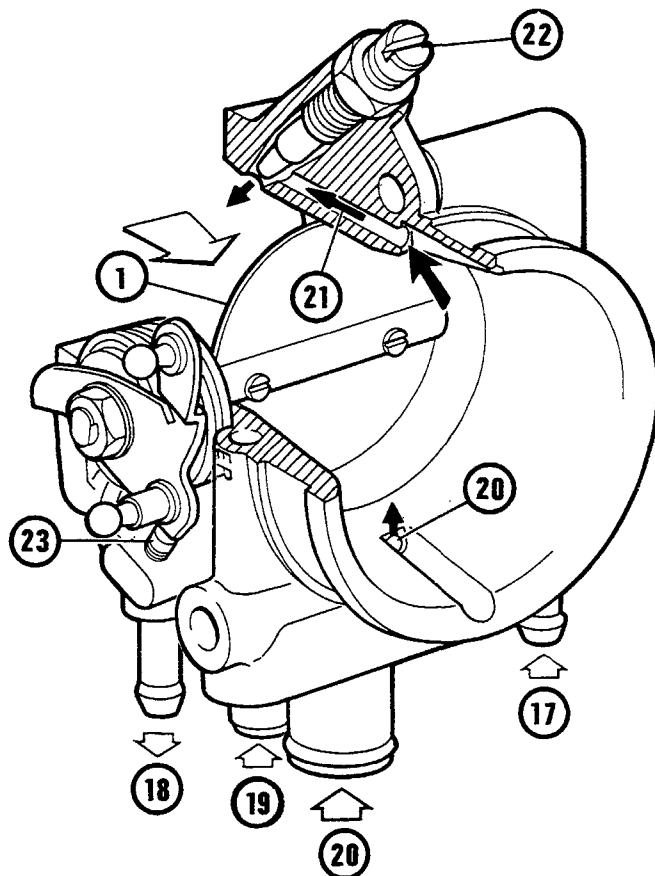
In addition, it also houses the sets for fixing the injectors.

The amount of air drawn in during idling depends on the adjustment of the butterfly valve closing position. **The butterfly stop adjustment screw in the butterfly casing (23) (see overleaf) should not be tampered with; it is checked by "fluxing" the butterfly casing during assembly at the factory.**

It is possible to alter the opening of the by-pass channel (21) by means of the idle pre-adjustment screw (22) to ensure that when the engine is warm the idle speed is 50 rpm below the normal idle speed (compared with when it is adjusted by the idle speed adjustment solenoid valve).

Lastly, the butterfly casing is heated by the coolant to prevent the engine being supplied with cold air since this could cause condensation of the fuel and consequently poor carburation.

- 17. Coolant arriving from the engine to heat the butterfly casing
- 18. Coolant returning from the butterfly casing to the engine
- 19. Air arriving from the idle speed adjustment solenoid valve
- 20. Gas arriving for ventilation of the crankcase
- 21. By-pass channel
- 22. Idle speed pre-adjustment screw
- 23. Butterfly valve stop screw
- 24. Coolant return sleeve to the pump

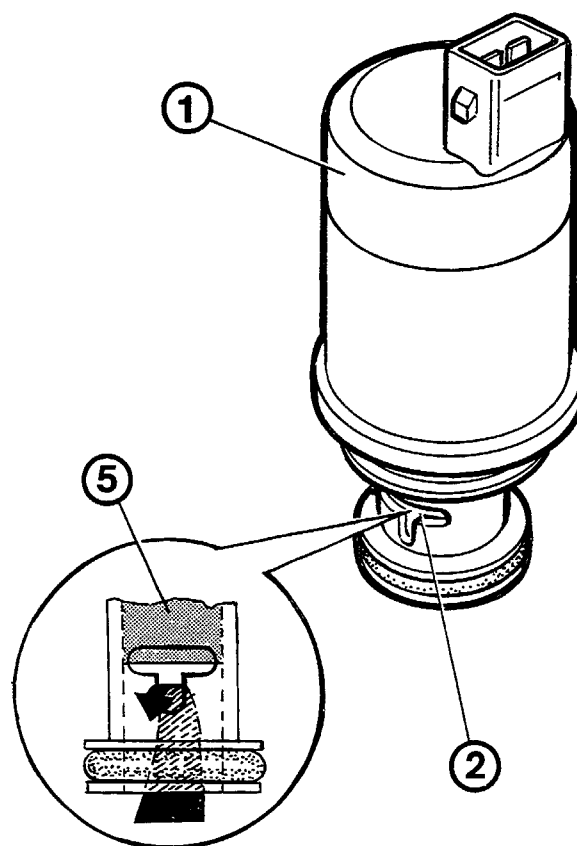


Engine components:
butterfly casing and connecting pipes

10.

Idle speed supplementary air solenoid valve

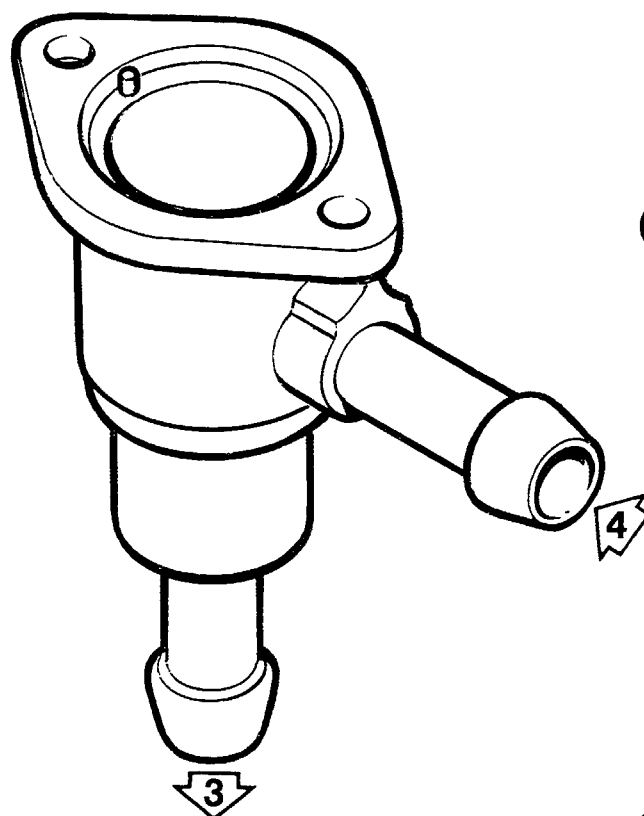
1. Solenoid
2. Flow of supplementary air for automatic adjustment of idle speed and checking efficiency of engine when cold
3. Air outlet towards the butterfly casing downstream of the butterfly valve
4. Arrival of air from the filter
5. Piston adjusting air flow quantity. It is moved by the variation in magnetic flux developed in the solenoid (1).



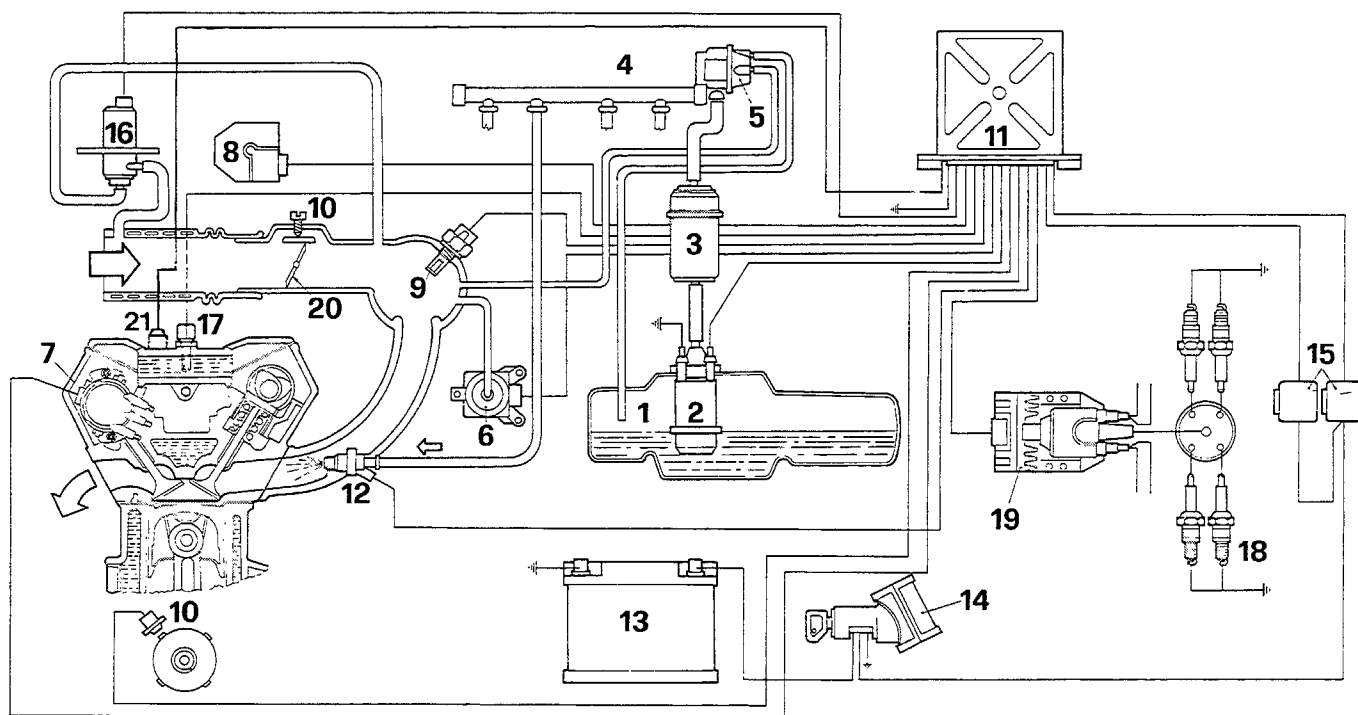
This involves a proportional type solenoid valve with a variable size air flow.

A variable duty cycle electronic device with a frequency of 90 Hertz controls the supply to the winding of the above mentioned valve. If the engine speed frequency decreases during idling the effective current which supplies the solenoid valve winding (1) increases creating the maximum air flow opening (2). If the engine speed increase during idling the effective current absorbed by the solenoid winding decreases to a few tenths of an Ampere. consequently, the opening (1) of the additional air flow is restricted and the engine speed decreases.

This device makes it possible to (automatically) maintain the engine speed constant during idling even when the external load conditions vary slightly because the automatic gearbox is engaged or the power assisted steering is at the end of its travel or the alternator is operating a maximum output. When the engine is running cold or when it is warming up this valve allows the engine to operate at the fast idle speed. **In these conditions the coolant temperature sensor signals the need for enrichment of the mixture strength to the control unit.**



WIRING DIAGRAM



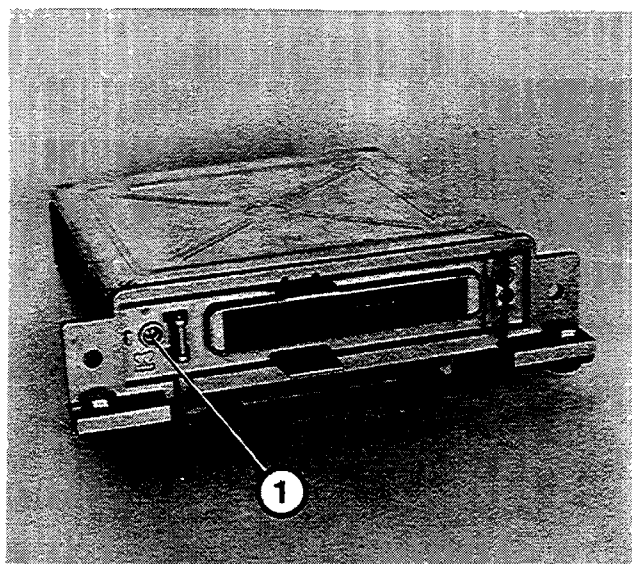
- | | |
|--|---|
| 1. Fuel tank | 12. Injector |
| 2. Electric fuel pump | 13. Battery |
| 3. Fuel filter | 14. Ignition switch |
| 4. Fuel manifold | 15. IAW injection/ignition system relays |
| 5. Fuel pressure regulator | 16. Engine idle speed automatic adjustment supplementary air solenoid valve |
| 6. Intake air absolute pressure sensor | 17. Coolant temperature sensor |
| 7. High tension distributor with injection timing sensor | 18. Spark plug |
| 8. Butterfly valve position sensor | 19. Ignition unit |
| 9. Intake air temperature sensor | 20. Butterfly valve |
| 10. Rpm and TDC sensor | 21. Anti-detonation sensor (for Delta HF 4WD turbo only). |
| 11. W.I.I. electronic control unit | |

C) ELECTRICAL CIRCUIT

It basically comprises an electronic control unit (11) to which the following components are connected:

- Butterfly valve position sensor (8)
- Air temperature sensor (9)
- Four injectors (12)
- Absolute pressure sensor (6)
- Electric fuel pump (2)
- Rpm and TDC sensor
- Injection timing sensor (7) in the H.T. distributor
- Coolant temperature sensor
- Ignition coil with power module (19)
- Two relays (15)
- Ignition switch with key (14)
- Battery (13)

10.



Electronic control unit

The Weber electronic injection/ignition system control unit is of the digital type with a micro computer which controls the parameters concerning the supply and ignition of the engine, namely:

- the amount of fuel supplied to each cylinder in sequence (1-3-4-2- in a single delivery;
- the start of the fuel supply (injection timing) in relation to the intake for each cylinder;
- the ignition advance.

In order to calculate the above parameters the control unit makes use of the following input signals:

- absolute pressure inside the inlet manifold;
- air intake temperature;
- coolant temperature;
- engine speed;
- position of each pair of cylinders in relation to TDC and engine timing;
- opening (or closure) position of the butterfly valve.

The control unit governs the operation of the ignition unit and the length of the sequence opening and timing of the individual injectors.

In addition to the above mentioned parameters it makes use of the following:

- a) **Cut-off:** this device cuts off the flow of fuel into the engine each time the accelerator pedal is released when the vehicle is slowing down. It has a fixed cut-off operating range whilst the speed at which the injection is renewed is variable and takes place when the engine is warm at speeds above 1100 rpm and when the engine is cold at speeds above 1800 rpm with the butterfly valve closed. At lower speeds the injection is renewed.
- b) When the butterfly opening is $> 30^\circ$, in other words during maximum power conditions, in order to exploit the maximum flame speed propagation during combustion, the mixture strength is suitably **enriched**.
- c) During acceleration the amount of fuel injected must be considerably higher than the stoichiometric ratio for when the engine is operating at a normal speed.
The condition of acceleration is recognized by the control unit by a rapid variation in the opening angle of the butterfly valve which the appropriate sensor undergoes when the accelerator is opened rapidly.
- d) During cold starting the mixture strength is enriched in a manner which is inversely proportional to the temperature of the coolant.
In addition, under these conditions the engine speed is increased (**fast idle**) given that the control unit activates the automatic idle speed adjustment supplementary air solenoid valve.

NOTE *There is a special screw protected by an anti-tamper plug (1) in the electronic control unit to adjust the percentage of CO in the exhaust gases.
This screw should be adjusted very carefully making sure not to force it or break the adjustment trimmer which would mean that the complete control unit would have to be replaced.*

Butterfly valve position sensor (3)

This comprises a potentiometer (1) the moveable part (2) of which is directly operated by the butterfly valve shaft.

During operation, the control unit supplies the potentiometer with a voltage of 5 Volts at terminals (a) and (c).

At terminal (b) the voltage is inversely proportional to the butterfly valve opening position. According to the voltage sent by the terminal (b) the control unit recognizes the opening condition of the butterfly valve and corrects the mixture strength accordingly.

When the butterfly is closed an electrical voltage signal of ~ 0.5 V reaches the control unit: from this the latter recognizes the idle and cut-off condition (which is differentiated on the basis of the engine speed).

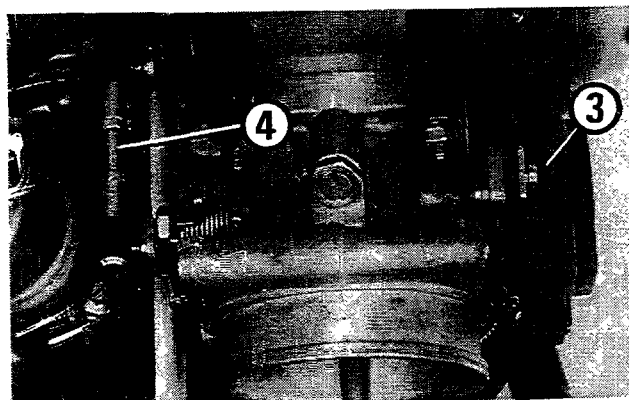
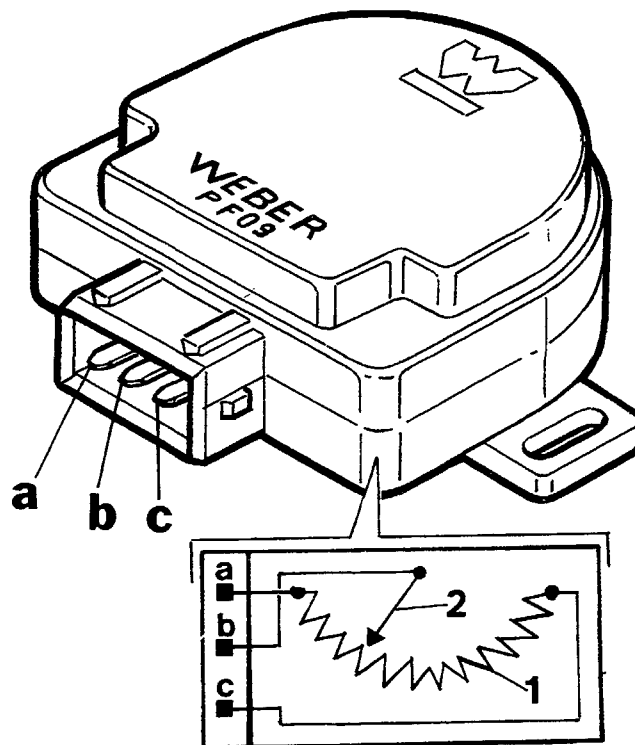
For butterfly valve openings greater than $\sim 30^\circ$ a voltage signal of around 3.3 V returns to the control unit and increases progressively until it reaches a voltage value of around 5 Volts when the butterfly valve reaches the maximum opening of 80° .

NOTE When the butterfly valve reaches openings greater than 30° the control unit activates progressive enrichment by operating the injectors for a greater length of time than is necessary to achieve the fuel/air stoichiometric ratio. This strategy is also decided on the basis of the engine vacuum signal.



Each type of injection control unit works with its own type of butterfly valve position sensor.

Butterfly valve position sensor wiring diagram



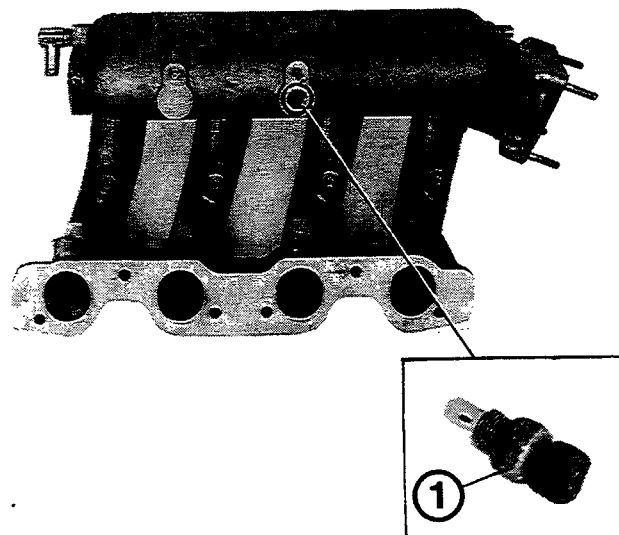
Butterfly valve sensor (3) with control rod (4)

Air temperature sensor (1)

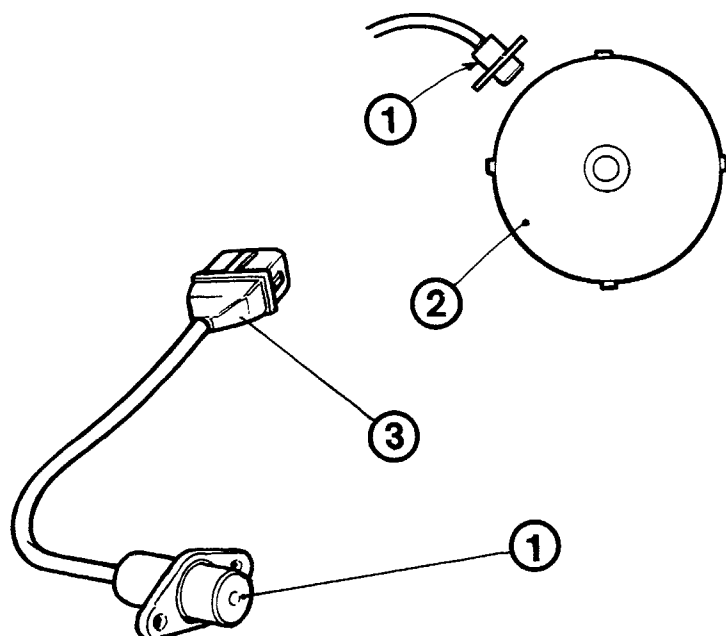
This sensor measures the temperature of the air in the inlet manifold (2) by means of an NTC thermistor.

The electrical signal obtained reaches the electronic control unit where, together with the manifold pressure signal, it is used to calculate the density of the air.

NOTE NTC means that the resistance of the thermistor decreases as the temperature increases.



10.



Rpm and TDC sensor (1)

1. Sensor or magnetic impulse generator
2. Crankshaft pulley with 4 projections
3. Connector for connection with electronic control unit

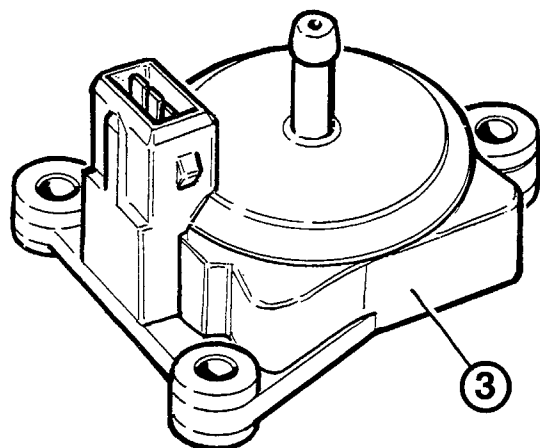
The sensor used is of the variable reluctance type and is facing the pulley (2) fitted on the crankshaft.

The latter has 4 projecting teeth 90° from one another and as each of these pass under the sensor they cause a variation in the flux and consequently an alternating electrical signal.

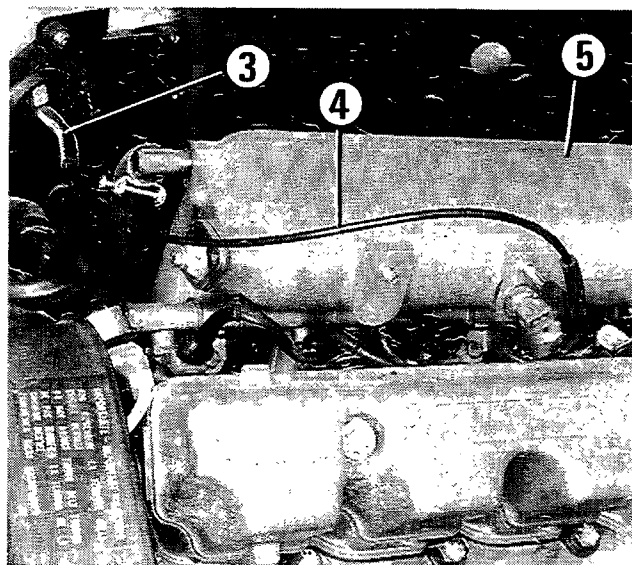
From the frequency of this signal the electronic control unit is able to obtain information on the engine speed and the TDC position of the pair of cylinders nos. 1 and 4 or 2 and 3 through the 2 projections which are 180° apart.

NOTE *Each TDC measurement for the pulley is facing the sensor exactly at TDC for each pair of cylinders.*

Absolute pressure sensor



Location of absolute pressure sensor in the engine compartment



The pressure sensor (3) is a transducer connected by a rubber pipe (4) to the inlet manifold (5) which supplies a voltage signal proportional to the absolute pressure of the air.

The sensor is supplied by the electronic control unit and provides information concerning the absolute pressure of the air in the inlet manifold.

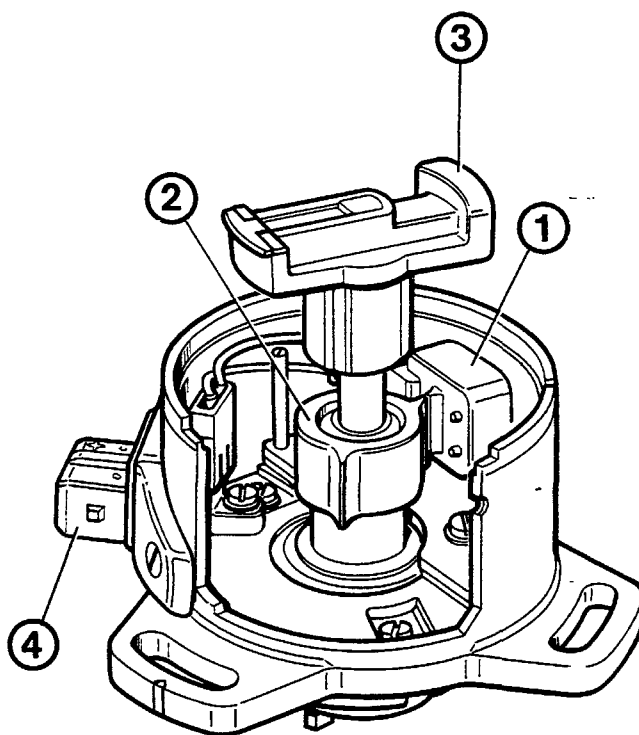
This information, together with the measurement of the temperature of the air and volumetric output corresponding to the engine operating speed, is used to calculate the density of the air.

H.T. distributor with injection timing sensor

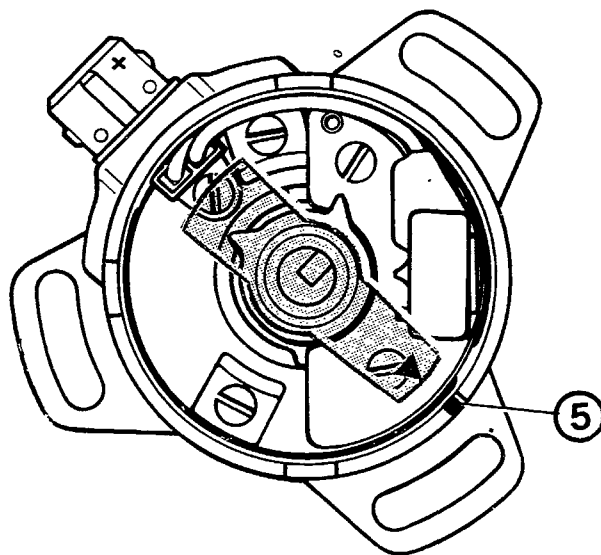
The sensor (1) used is of the variable reluctance type and it is opposite a cam (2) with two teeth (90° apart) fitted on the distributor control shaft.

As each tooth passes in front of the sensor an alternating electrical signal is produced in the sensor winding which is sent to the control unit. The superimposing of the timing sensor and rpm sensor signals on a single map, memorized in the control unit, makes it possible for the latter to identify the operating stage for each cylinder to control the injection adhering to the following sequence (cylinders 1,3,4,2).

A rotor arm (3) with a built in resistance of **1000Ω** distributes the sparks to the 4 spark plugs. This is the only part of the distributor (together with the cap) belonging to the ignition system.



If the distributor (and consequently the timing sensor) is not fitted correctly in relation to the correct timing, the control unit will no longer be able to control the injection because it will no longer recognize the engine timing in its memory.


Distributor with rotor arm and casing optioned for correct timing with engine in TDC position

1. Timing sensor or magnetic impulse generator
2. 2 tooth cam or timer
3. H.T. rotor arm
4. Control unit connector terminal
5. Rereference mark with H.T. rotor arm centre line for distributor timing.

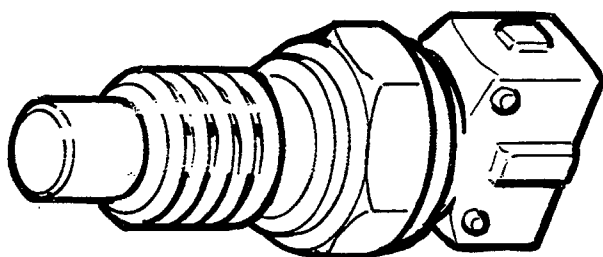
10.

Coolant temperature sensor

The sensor comprises an NTC thermistor which measures the temperature of the coolant near the thermostat.

The electrical signal obtained reaches the electronic control unit and is used to correct the mixture strength.

NOTE *N.T.C. means that the resistance of the thermistor decreases as the temperature increases.*



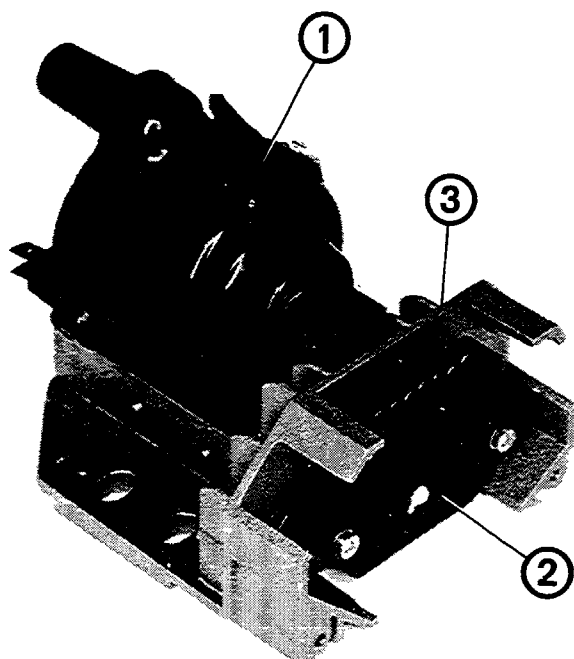
Ignition unit (coil and power module)

1. Ignition coil
2. Power module or ignition control
3. Heat dissipation plate

The ignition system used is of the inductive discharge type.

The ignition unit is composed of a coil and a power module. The latter receives the order to cut off the current from the electronic control unit, which processes the desired ignition advance.

The power module ensures a charge for the constant energy coil whatever the battery charge conditions.



Relays

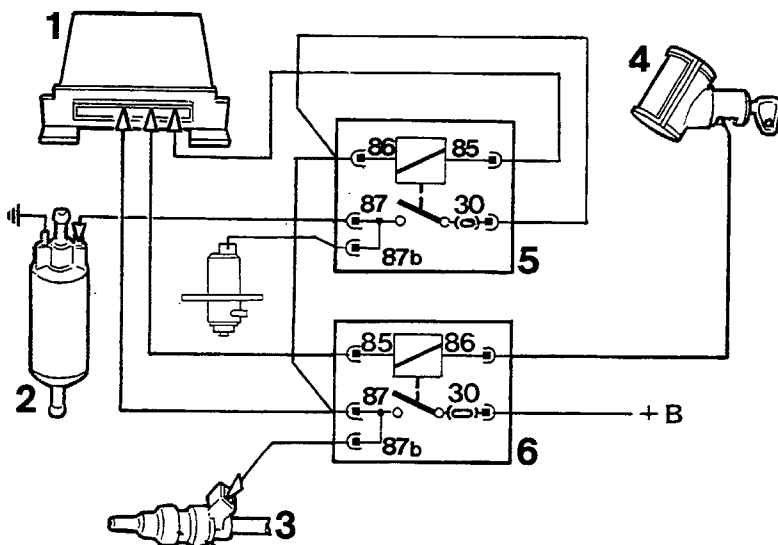
1. Electronic control unit
2. Electric fuel pump
3. Injector
4. Ignition switch with key
- 5.6. Relays

The post-modification relays are no longer protected by a fault in fuse.

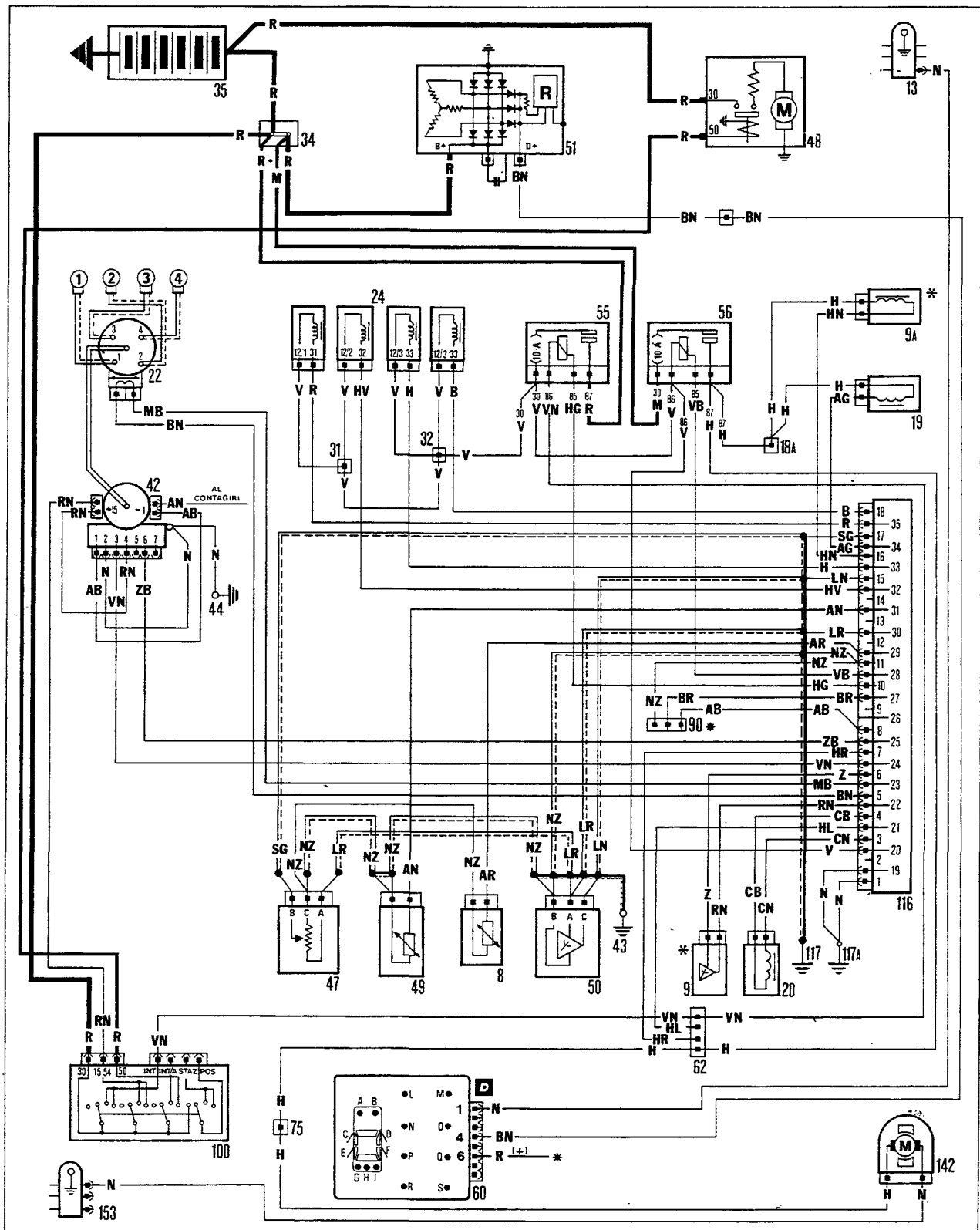
Two relays are used in the WEBER injection/ignition system.

The connection to earth of the relay energizing circuits is carried out by the electronic control unit and is protected against pole reversal.

A relay (5) supplies the electric fuel pump and the automatic idle adjustment valve; whilst a second relay (6) supplies the injectors, control unit and electric pump relay feed.



WEBER INJECTION/IGNITION SYSTEM (ante-modification) (see page 17 for key and cable colour code)



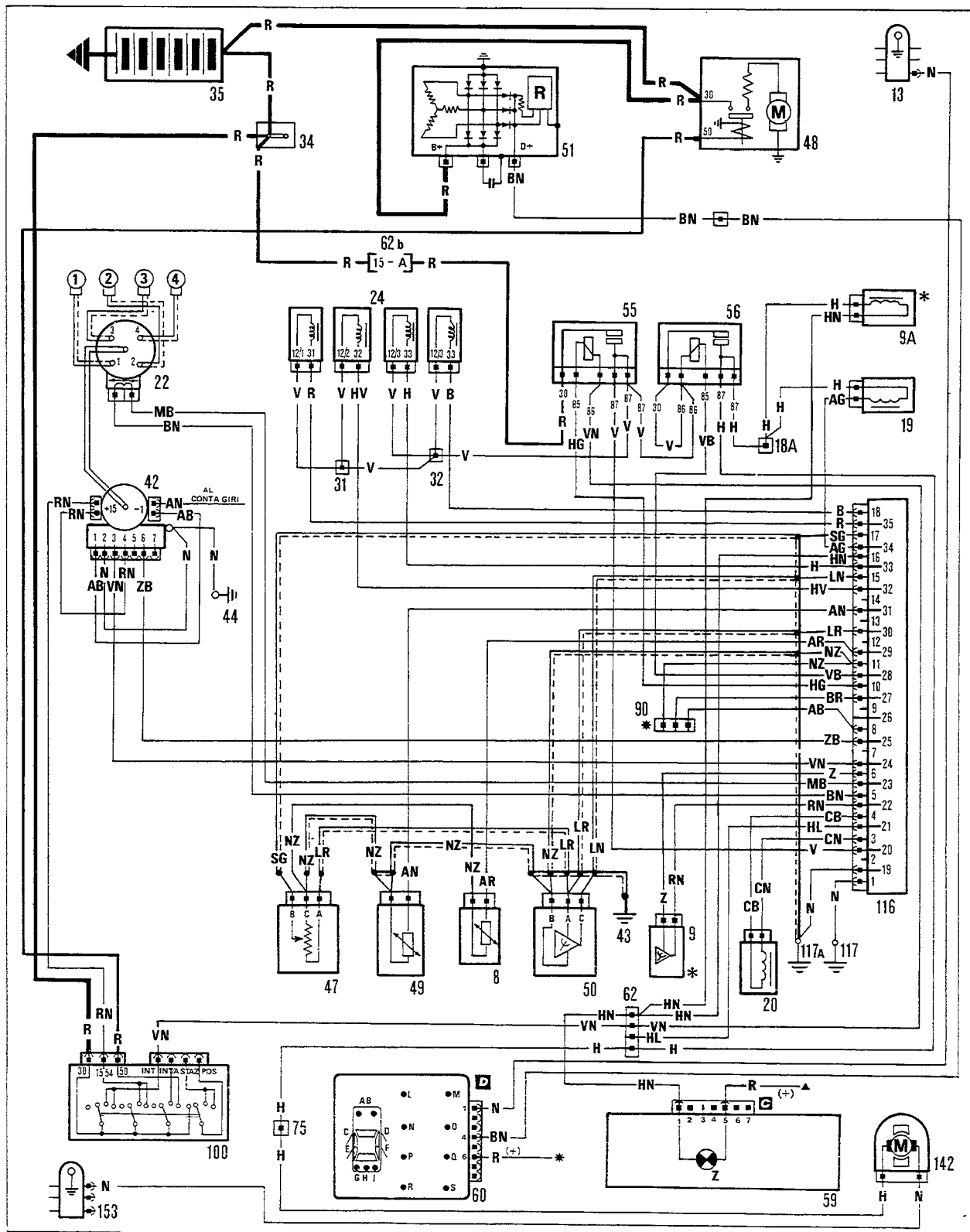
- * TO CONNECTOR 6F OF THE CONTROL BOX FUSE BOX
- * FOR THE DELTA 4WD TURBO

FOR THE PRISMA 4WD

10.

WEBER INJECTION/IGNITION SYSTEM (post-modification)

(see page 17 for key and cable colour code)



* TO CONNECTOR 61 OF THE CONTROL BOX FUSE BOX
* FOR DELTA 4WD TURBO

FOR PRISMA 4WD

IAW injection/ignition system wiring diagram key for pages 15 and 16

- | | |
|--|---|
| 8. Coolant temperature sensor | 49. Intake air temperature sensor |
| 9. Detonation sensor | 50. Absolute pressure sensor |
| 9A. OVER-BOOST solenoid valve (power increase) | 51. Alternator with built in regulator |
| 13. Right front earth cable loom | 55. Injector control relay |
| 18A. Connector | 56. Electric fuel pump control relay |
| 19. Automatic idle adjustment solenoid air valve | 60. Control-system |
| 20. Rpm and TDC sensor | 62. Connector block (located in tunnel near the IAW electronic control unit) |
| 22. Ignition distributor with built in timing sensor | 62b. 15 A protective fuse located between relays (55) and (56) |
| 24. Fuel injectors | 75. Connector block |
| 31. Connector | 90. Diagnostic socket for Fiat-Lancia tester (located in tunnel near IAW electronic control unit) |
| 32. Connector | 100. Ignition switch with key |
| 34. Connector | 116. IAW injection/ignition electronic control unit |
| 35. Battery | 117. Connector |
| 42. Ignition coil with power module | 117A. Connector |
| 43. Earth connector | 142. Electric fuel pump |
| 44. Earth | 153. Left rear earth cable loom |
| 47. Butterfly valve position sensor | |
| 48. Starter motor | |

Cable colour code

A	Light Blue	AB	Light Blue-White	HN	Grey-Black
B	White	AG	Light Blue-Yellow	HR	Grey-Red
C	Orange	AN	Light Blue-Black	LB	Blue-White
G	Yellow	AR	Light Blue-Red	LG	Blue-Yellow
H	Grey	AV	Light Blue-Green	LN	Blue-Black
L	Blue	BG	White-Yellow	LR	Blue-Red
M	Brown	BL	White-Blue	LV	Blue-Green
N	Black	BN	White-Black	MB	Brown-White
R	Red	BR	White-Red	MN	Brown-Black
S	Pink	BV	White-Green	NZ	Black-Violet
V	Green	BZ	White-Violet	RB	Red-White
Z	Violet	CA	Orange-Light Blue	RG	Red-Yellow
		CB	Orange-White	RN	Red-Black
		CN	Orange-Black	RV	Red-Green
		GN	Yellow-Black	SN	Pink-Black
		GL	Yellow-Blue	VB	Green-White
		GR	Yellow-Red	VN	Green-Black
		GV	Yellow-Green	VR	Green-Red
		HG	Grey-Yellow		

10.

HT distributor with
built in timing sensor

coolant temperature
sensor

anti-detonation
sensor (*)

air temperature
sensor
(in manifold)

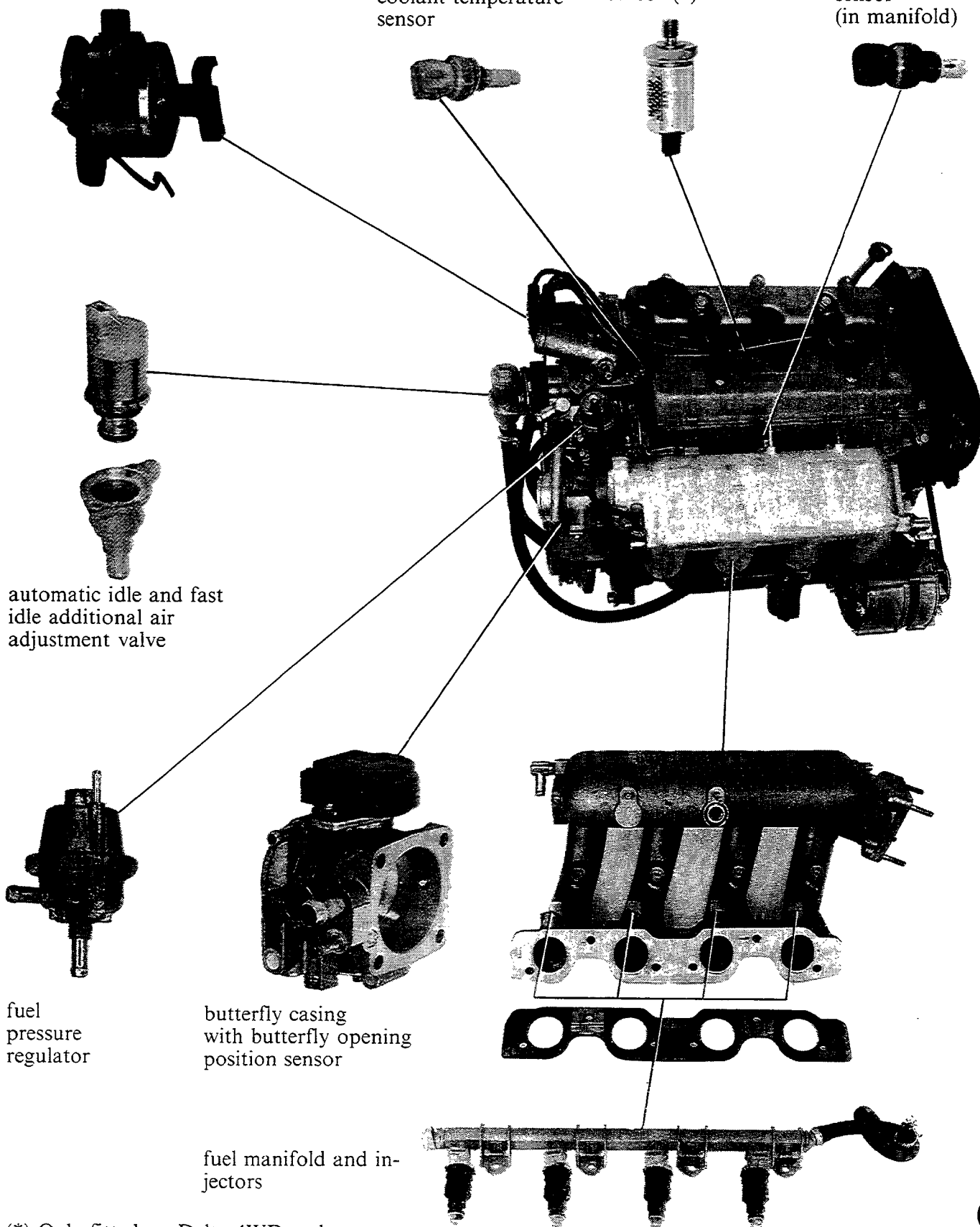
automatic idle and fast
idle additional air
adjustment valve

fuel
pressure
regulator

butterfly casing
with butterfly opening
position sensor

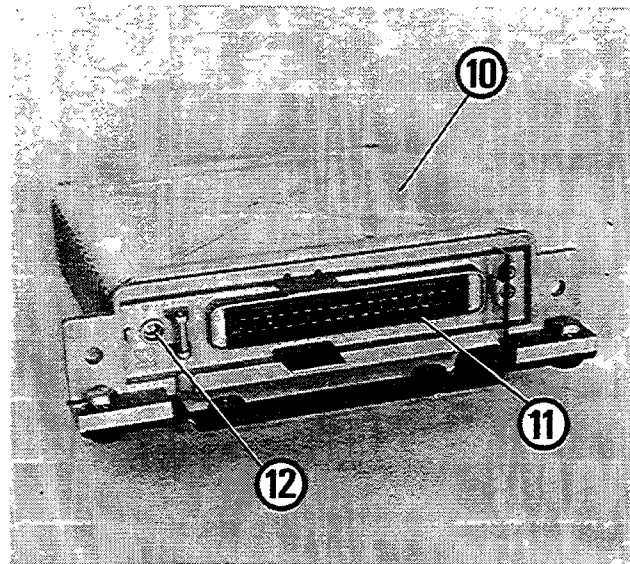
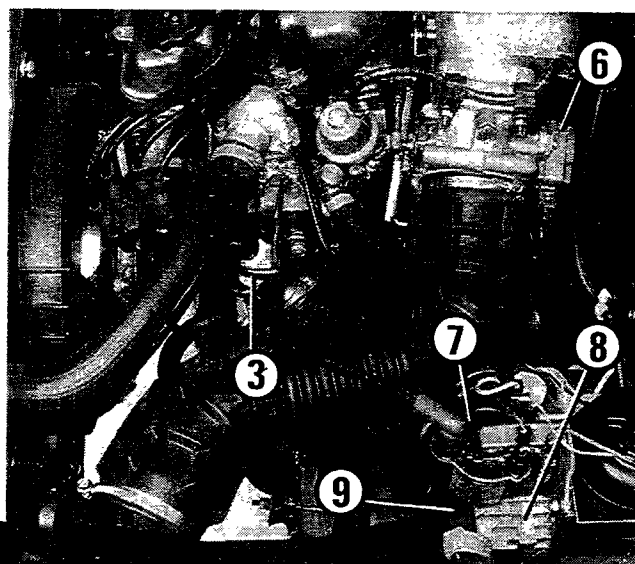
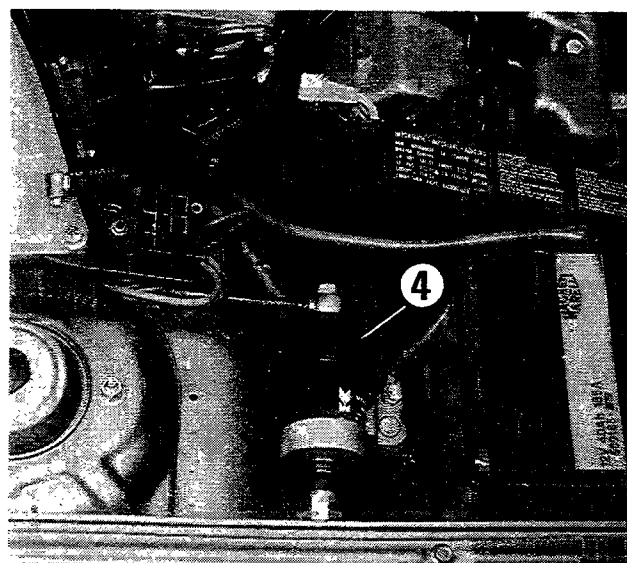
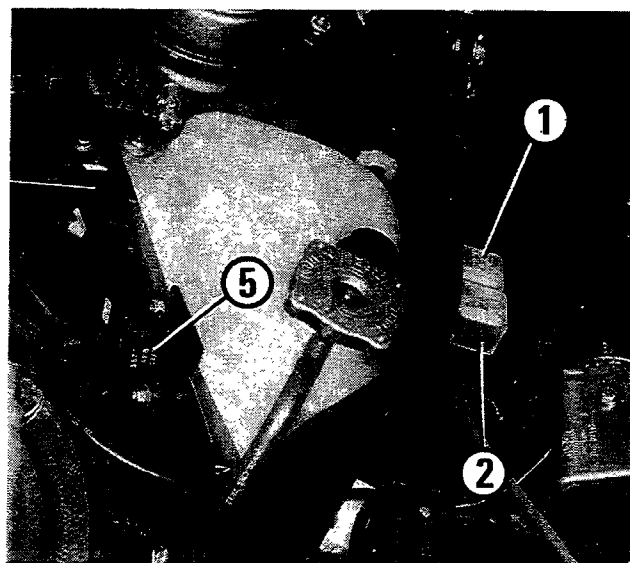
fuel manifold and in-
jectors

(*) Only fitted on Delta 4WD turbo



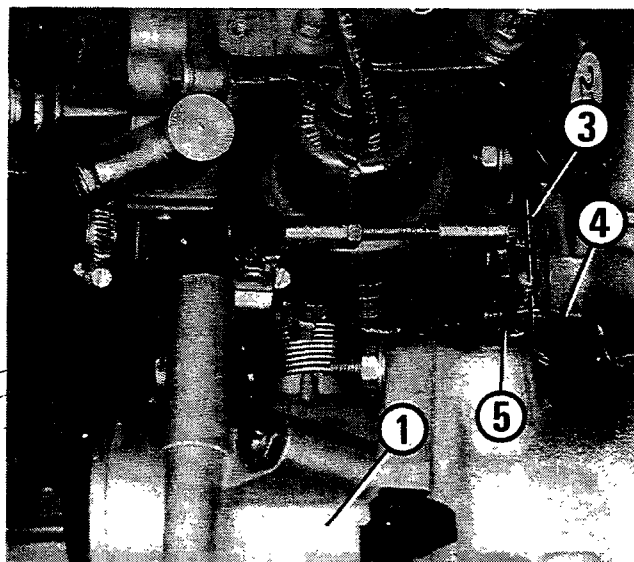
Location of IAW system components

1. Electric fuel supply pump relay (with or without fuse)
2. Injector control and control unit supply relay (with or without fuse)
3. Automatic idle adjustment supplementary air solenoid valve
4. Fuel filter
5. Absolute pressure sensor
6. Butterfly valve position sensor
7. Ignition coil
8. Ignition unit heat dissipator plate
9. Ignition module connector
10. Injection/ignition electronic control unit (located on the right side of the tunnel, under the dashboard)
11. Injection/ignition control unit terminals for connection to the system
12. CO adjustment screw (protected by an anti-tamper plug).



10.

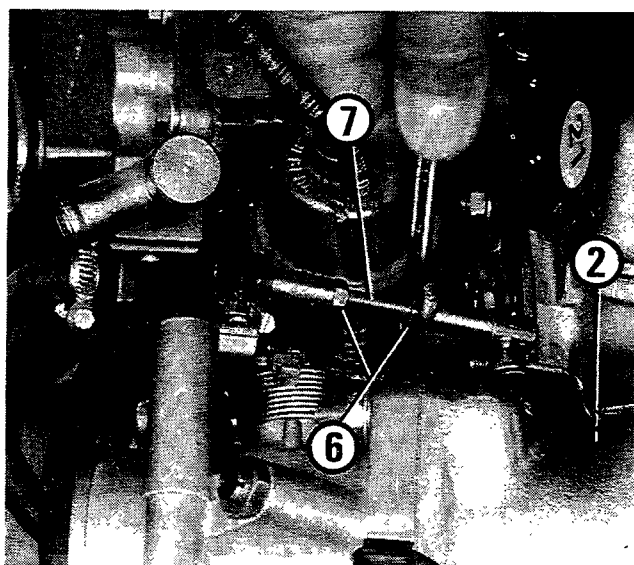
IAW SYSTEM CHECKS AND ADJUSTMENTS



ADJUSTING BUTTERFLY VALVE CONTROL ROD

NOTE *The butterfly valve stop screw (5) is adjusted in the factory and should never be tampered with because it is adjusted in such a way that a specific amount of air enters the engine with the butterfly closed.*

View of accelerator



1. Butterfly casing
2. Butterfly valve control cable
3. Butterfly valve control rod
4. Control lever
5. Butterfly valve stop screw
6. Rod lock nuts
7. Rod length adjustment screw

Adjustment of butterfly valve control rod

In order to check whether the valve control rod is properly adjusted (in terms of length) simply start up the engine, let it warm up until it reaches the operating temperature and let it idle.

At this point disconnect the end of the rod from the control lever: the engine should continue to idle without any alternation in speed. If the engine speed does change it is necessary to adjust the length of the rod by regulating the adjustment screw (7) after having undone the lock nuts (6).

The length of the control rod is correct when the engine idle speed is 800 - 850 rpm without any alternations when the end of the rod (3) is refitted to the butterfly valve control lever (4).

ADJUSTING IDLE SPEED AND CARBON MONOXIDE (CO)

Firstly check the condition of the connecting pipes between: the inlet manifold and the absolute pressure sensor, the fuel pressure regulator and the inlet manifold; the servo brake vacuum pipe; the air pipes for the automatic idle adjustment solenoid valve.

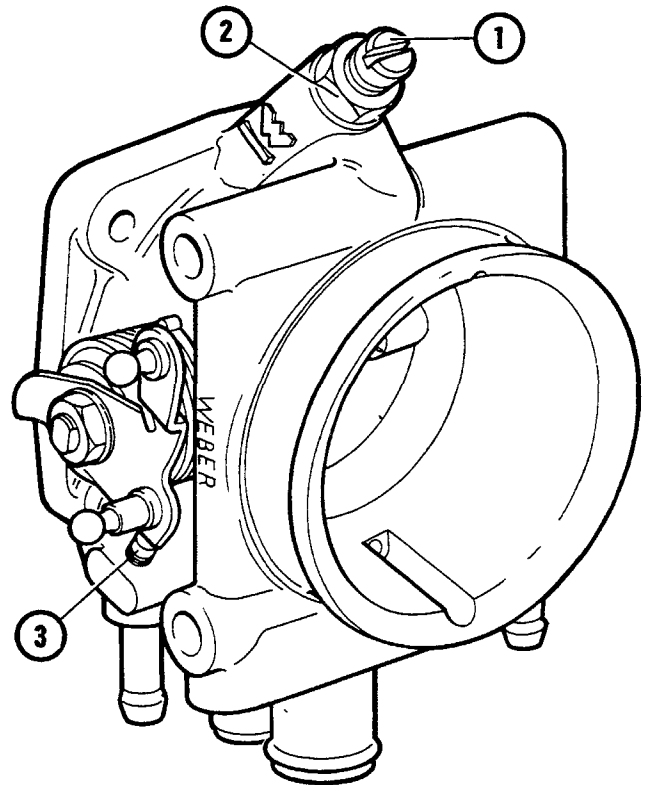


The idle speed is adjusted with the engine at the operating temperature, in other words when the cooling circuit fan has come on at least twice.

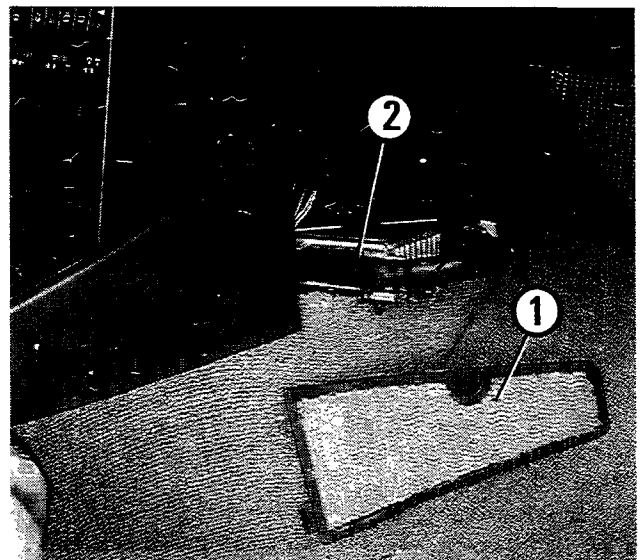
The adjustment of the idle speed is carried out with the fan switched off and without any other connectors engaged (heated rear windscreen, air conditioning, headlamps, etc.).

If the electric fan comes on during the adjustment, do not operate until it is completely still.

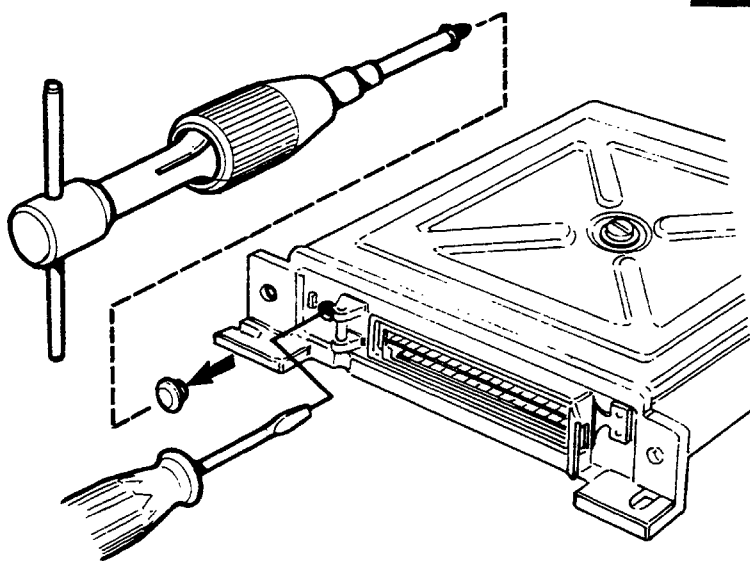
In order to adjust the exhaust CO correctly, the engine should operate with the correct ignition advance. ($15^\circ \pm 2^\circ$ for the Delta and $18^\circ \pm 2^\circ$ for the Prisma).



- Connect a rev counter to the engine
- Insert the exhaust gas analyzer sensor probe into the silencer
- Disconnect the solenoid air valve connector and check that the idle speed is between 750 and 800 rpm for both vehicles with a manual gearbox or automatic transmission and that the CO percentage is between 1% and 2%.
- If the idle speed is not correct, loosen the by-pass screw (2) lock nut (1) and adjust it until the speed is between 750 and 800 rpm
- Reconnect the automatic idle adjustment solenoid valve connector: the engine operating speed should increase sharply (up to 1500 - 2000 rpm) but should then adjust itself straight afterwards to 800 - 850 rpm without any oscillations in speed.

**Removing-refitting injection control unit**

If the CO percentage measured is outside the permissible tolerance of 1.5 ± 0.5 it is necessary to remove the control unit plastic shield (1) on the right side of the tunnel and then free the control unit (2) by loosening the two bolts fixing it to the bodyshell



Adjusting CO content in control unit

Using tool 1848007000, remove the CO anti-tamper plug from the control unit and proceed to adjust the CO percentage with the engine at the operating temperature and correct idle speed, using a 4 mm maximum broad screwdriver, by tightening or loosening the adjustment screw until the correct CO percentage is obtained. The CO adjustment screw has a rotation field of around 270°.

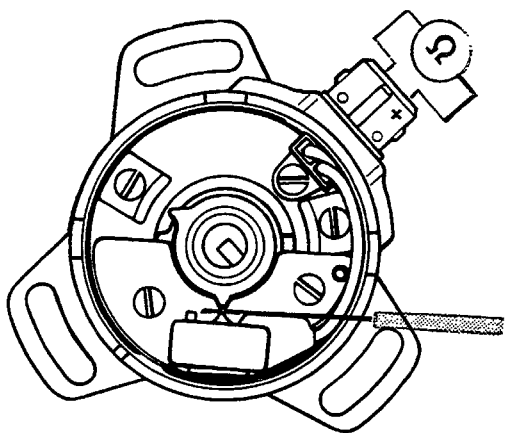
Never force this screw under any circumstances or this will damage the control unit.

Check that the rotation speed does not vary during this operation; if this is not the case, reset the speed at the nominal value by adjusting the butterfly casing by-pass screw and check that the CO percentage has not altered. Fit the new anti-tamper plug (black).



If the idle speed is irregular or cannot be adjusted, the problem may lie in the automatic idle adjustment solenoid valve (short circuit or break) or in the electronic control unit idle adjustment supply valve control.

In addition, the fault may be due to an overflow of air in the valve supply ducts or the seals inside the actual valve.



Checking HT distributor timing sensor gap

Rotate the distributor control shaft until each timer tooth is facing the sensor. Using a feeler gauge, measure the distance between the two, i.e. the gap, which should be between 0.3 and 0.4 mm.

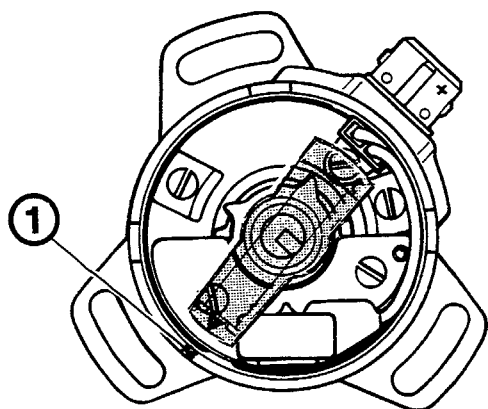
Checking timing sensor winding resistance

Using an ohmmeter, measure the resistance value between the 2 connector terminals as shown in the diagram: the reading should be between 758Ω and 872Ω at 20°C.

HT distributor timing on engine



Position pistons 1 and 4 at TDC and the distributor rotor arm centre line facing the reference mark (1) on the distributor casing. Then fit the distributor and fix it, in this position, to the cylinder head.



In order to position the distributor correctly, fit tool 1895896000 on the distributor, after having removed the cap, in such a way that the centering pin inside the tool fits into the reference mark (1) in the distributor casing.

This tool eliminates the parallax error in checking the reference marks.

When the engine is operating at the correct idle speed the ignition advance (memorized in the IAW control unit) should be $15^{\circ} \pm 2^{\circ}$ for the Delta and $18^{\circ} \pm 2^{\circ}$ for the Prisma. If this is not the case, the rpm and TDC sensor is incorrectly positioned or the control unit memory is faulty.



In order to check the resistance values for the various WII injection/ignition system sensors it is necessary to use precision digital testers for the temperature of the sensors being checked. It is advisable therefore, when the sensors are not short circuited or broken, to try and replace them with a test sensor before discarding them as faulty.

Method for determining TDC for piston no. 1

Checking rpm and TDC sensor position

Rotate the crankshaft to the TDC position; remove spark plug no. 1 and insert tool 1895879000 complete with dial gauge 1895881000 in its place; zero the dial gauge when piston no. 1 is exactly at TDC (i.e. the highest point reached during its stroke). Position tool 1895895000 in place of the sensor: the projection on the pulley should fit perfectly in the groove in the tool.

If this is not the case, loosen the sensor carrier plate and fix it with the above mentioned tool inserted in the pulley indentation.

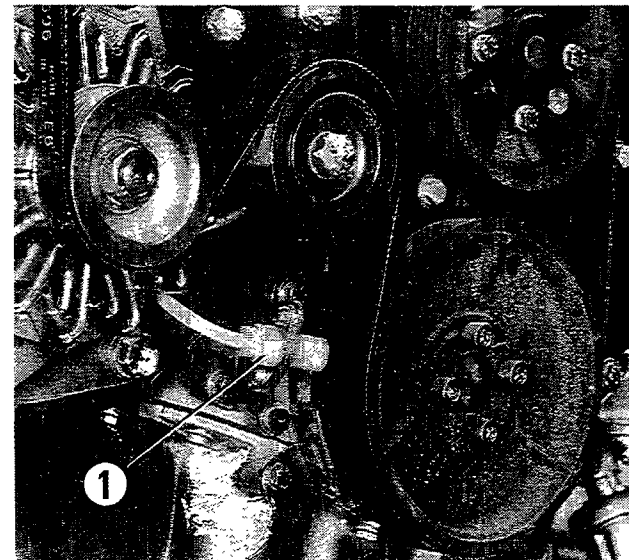
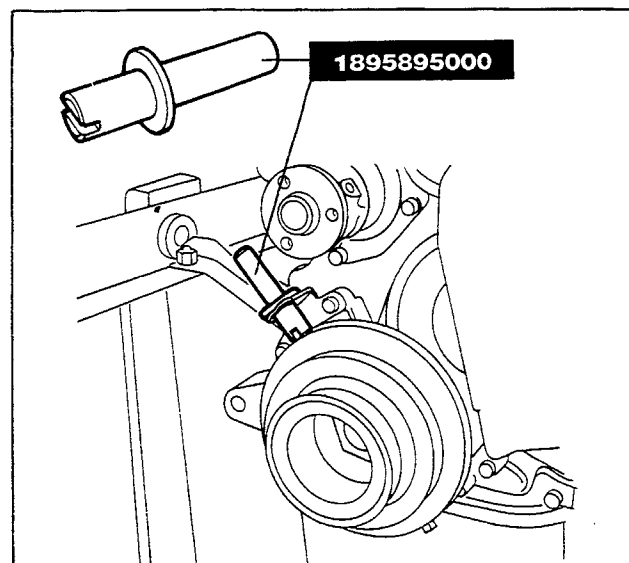
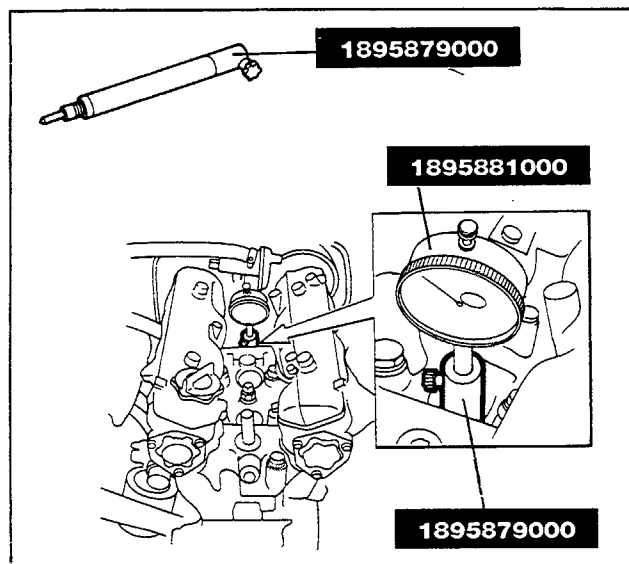
Checking correct positioning of rpm and TDC sensor

Checking rpm and TDC sensor (1) winding resistance

Disconnect the sensor connector and using an ohmmeter measure: the value between the 2 connector terminals which should be between 618Ω and 748Ω at 20°C .

Checking rpm and TDC sensor gap

Using a feeler gauge (1) check that the distance between each of the 4 notches in the crankshaft pulley and the sensor core, when they are facing, is between 0.6 and 1.2 mm.



10.

Checking butterfly valve position sensor potentiometer

Insert an ohmmeter between contacts b and c of the sensor terminal, then gradually open the butterfly valve: the resistance value should vary without any sudden changes from $\sim 450\Omega$ up to $\sim 80\Omega$ with the butterfly valve completely open (approximate figures)

Checking efficiency of temperature sensors

Disconnect the sensor connectors; using an ohmmeter connected between the 2 contacts of the sensor being checked, check the resistance values.

They should be within the following limits:

1. Coolant sensor for engine temperatures at

- 10°C from $\sim 15,27\text{ k}\Omega \div 17,93\text{ k}\Omega$
- + 20°C from $\sim 3,56\text{ k}\Omega \div 3,93\text{ k}\Omega$
- + 80°C from $\sim 0,34\text{ k}\Omega \div 0,41\text{ k}\Omega$

2. Intake air temperature sensor for air temperatures

- 10°C from $\sim 15,27\text{ k}\Omega \div 17,93\text{ k}\Omega$
- + 20°C from $\sim 3,56\text{ k}\Omega \div 3,93\text{ k}\Omega$
- + 80°C from $\sim 0,68\text{ k}\Omega \div 0,82\text{ k}\Omega$

CHECKING FUEL PRESSURE, PRESSURE REGULATOR AND ELECTRIC PUMP

- Make sure that the ignition switch is in the OFF position.
- Remove the union fixing the fuel inlet pipe to the fuel injector manifold and insert the pressure gauge complete with unions no. 1895890030 in its place.

NOTE *The pressure gauge should be between the pressure regulator and the pressure gauge tap. The operation of fitting the pressure gauge should be carried out taking special care as regards cleanliness in order not to introduce any foreign bodies into the injectors which would obstruct them.*

- Open the pressure gauge tap (lever in line with tap axis).
- Turn the ignition switch to the ON position without starting up the engine (this energizes the fuel pump for a moment). Repeat this several times.

The reading on the pressure gauge should be 2.5 ± 0.2 bar whilst the electric pump is operating.

NOTE *In order to reach the regulation pressure more quickly: remove the electric pump control relay (the outermost one) and connect terminals 30 and 87 to one another using a bridge incorporating a 20A fuse.*

The electric fuel pump should be supplied directly from the connection.

When the fuel pressure test is carried out the following may occur:

a) The pressure shown on the pressure gauge is greater than $2,5 \pm 0,2$ bar

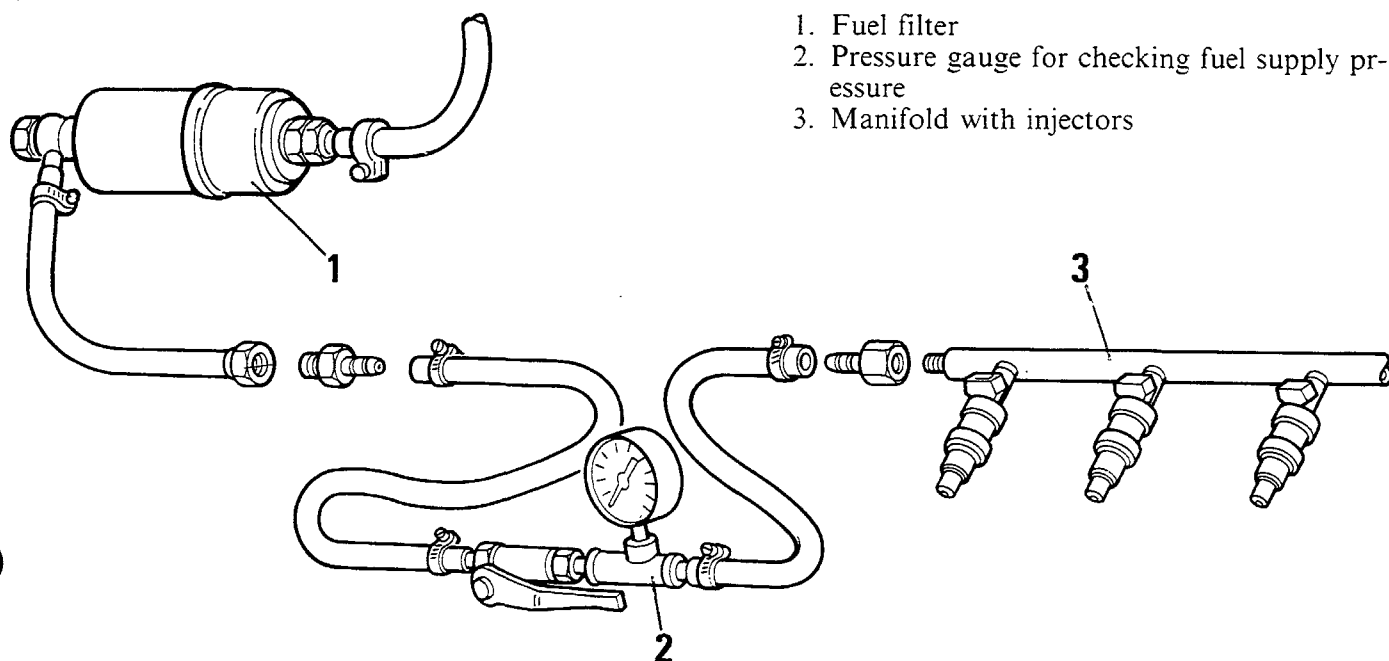
If this is the case, proceed as follows:

disconnect the return pipe from the pressure regulator and fit a temporary pipe in its place from the regulator to a petrol collection tray. Repeat the test turning the ignition switch to the ON position. If the pressure is now 2.5 ± 0.2 bar, the defect should be sought in a blockage of the vehicle return pip; if the pressure is still above 2.5 ± 0.2 bar, replace the pressure regulator.

b) The pressure reading on the gauge is less than 2.5 ± 0.2 bar, or reaches this value very slowly: this may be caused by the filter being blocked (the filter should be replaced every 20,000 km), or by an obstruction in the pump inlet.

If neither of the above anomalies is encountered:

- using special pliers, close the regulator return pipe whilst the ignition switch is turned to the ON position. If the pressure goes above 5 bar, replace the pressure regulator as it is faulty; if the pressure remains at a value below 2.5 ± 0.2 bar, replace the pump because it is worn or defective.



1. Fuel filter
2. Pressure gauge for checking fuel supply pressure
3. Manifold with injectors

c) The pressure shown in the gauge falls rapidly even after being stabilized.

NOTE The stabilization pressure varies according to the elasticity and length of the pressure gauge pipes. It may settle at 2.0 - 1.5 bar after a short time.

If this condition occurs, turn the ignition switch to the ON position and whilst the pump is turning shut the pressure gauge tap.

The pressure reading on the gauge once it stabilizes should not vary.

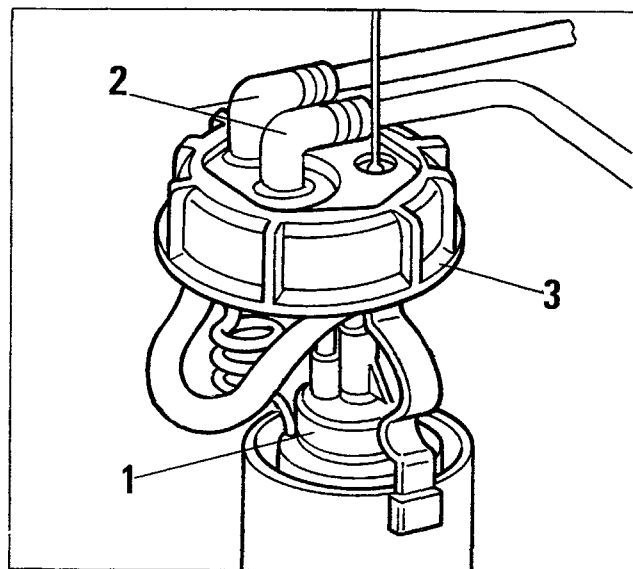
If this is not the case, the fall in pressure is caused by the imperfect seal of the pressure regulator valve or one of the injector valves.

In order to locate the fault, open the pressure gauge tap once again: turn the ignition switch to the ON position; close the return pipe using pliers and keep it tightly closed throughout the duration of the test; shut the pressure gauge tap again and observe whether the pressure falls rapidly. If this is the case, one or more injectors is dripping and they should be found and replaced. If this is not the case, the pressure regulator should be replaced because the internal valve is not properly sealed (observe whether or not there are leaks between the regulator ring seal and the injector manifold seat).

When the above tests have been completed, remove the pressure gauge and restore the fuel supply connections, making sure that there are no leaks.

Removing-refitting electric fuel pump (1)

The electric fuel pump is the immersion type and is located in the fuel tank. Remove the rear seat, disconnect the two petrol pipes (2) (removing the retaining springs) and loosen the securing ring nut (3) using tool A. 1854033000



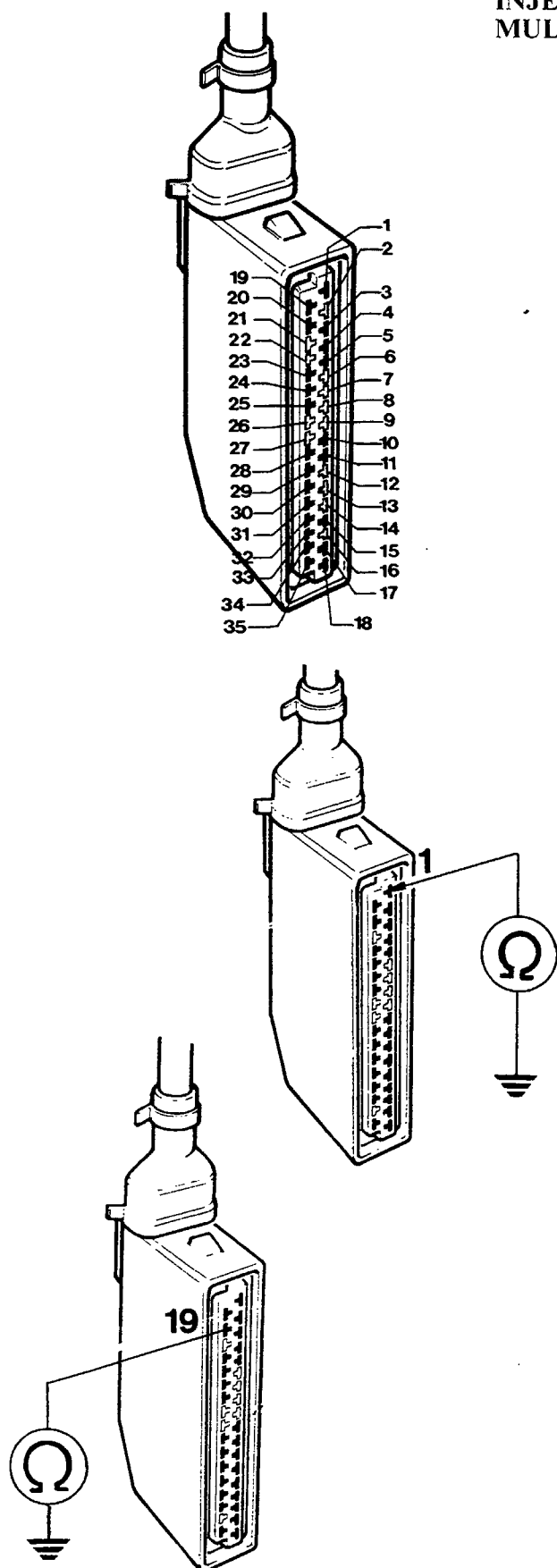
10.

**INJECTION/IGNITION ELECTRONIC CONTROL UNIT
MULTIPLE CONNECTOR**

Checking continuity of connection cables and sensor resistance

Remove the control unit protective cover on the right hand side of the tunnel, under the dashboard, then loosen the 2 bolts fixing the latter to the bodyshell and extract it. Make sure that the ignition switch is in the OFF position. Disconnect the multiple connector and, using an ohmmeter, check the continuity or the resistance of the following:

1. Negative supply (-)
2. Not used
3. Rpm and TDC sensor negative
4. Rpm and TDC sensor positive
5. Distributor timing sensor negative
6. To the over-boost solenoid valve (*)
7. Not used
8. To the Fiat-Lancia tester diagnostic socket
9. Not used
10. Negative at terminal 85 of the injector control relay
11. Absolute pressure, butterfly valve position and air intake temperature sensor negative
12. Not used
13. Not used
14. Not used
15. Absolute pressure sensor signal intake
17. Butterfly valve position sensor signal intake
18. Cylinder no. 4 injector
19. Negative supply (-)
20. Control unit supply (+) from injector control relay
21. Signal for idle adjustment solenoid valve for switching on air conditioning
23. Distributor timing sensor positive
24. Ignition period control
25. Ignition period control
26. Not used
27. To the diagnostic socket
28. To terminal 85 of the electric fuel pump relay feed
29. Coolant temperature sensor supply
30. Absolute pressure sensor and butterfly valve position sensor supply
31. Air intake temperature sensor supply
32. Cylinder no. 2 injector
33. Cylinder no. 3 injector
34. Supply intake from engine idle speed adjustment solenoid valve



(*) Only used on the Delta 4WD



Before carrying out the checks illustrated below it is absolutely vital to make sure that the ignition switch is in the OFF position (switched off).

Disconnect the multiple connector from the control unit, then carry out the following checks.

Checking continuity of multiple connector earth cables

There should not be any breaks but continuity between terminal 1 and an earth point and between terminal 19 and an earth point.

Renew any possible broken connections, ensuring that the earths are working properly.

Checking control unit supply cables continuity

Connect an ohmmeter between terminal 20 and terminal 87 of the injector relay carrier socket (disconnect the relay).

Checking rpm and TDC sensor resistance

Connect an ohmmeter between terminals 3 and 4. The reading should be around 612 - 748 Ω at 20°C.

Checking timing sensor resistance (located in the distributor)

Connect an ohmmeter between terminals 5 and 23. The reading should be about 750 - 880 Ω at 20°C.

Checking injector winding resistance

Connect an ohmmeter between terminal 20 and terminals 18 (cylinder no. 4); 33 (cylinder no. 3); 32 (cylinder no. 2) and 35 (cylinder no. 1), respectively. The reading should be between 2 - 3 Ω at 20°C.

Checking coolant sensor resistance

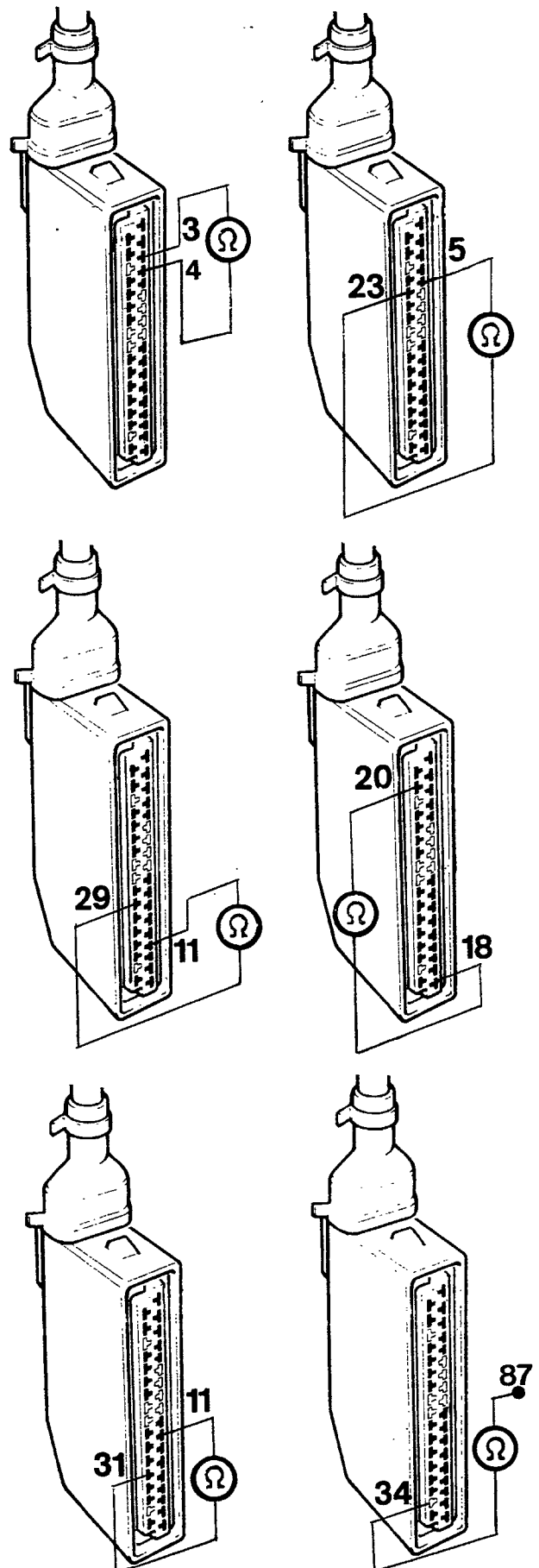
Connect an ohmmeter between terminals 29 and 11 (during the check disconnect the connector for the intake air temperature sensor, the butterfly valve position sensor and the absolute pressure sensor). The reading should be 15.2 - 17.9 k Ω at - 10°C, 3.5 - 3.9 k Ω at + 20°C, 0.3 - 0.4 k Ω at + 80°C.

Checking air temperature sensor resistance

Connect an ohmmeter between terminals 11 and 31 (during this check disconnect the connectors for the butterfly valve position sensor, absolute pressure sensor, coolant temperature sensor). The reading should be 15.2 - 17.9 k Ω at - 10°C, 3.5 - 3.9 k Ω at + 20°C, 0.6 - 0.8 k Ω at 80°C.

Checking automatic idle adjustment valve winding

Connect an ohmmeter between terminal 34 of the multiple connector and terminal 87 (relay disconnected) of the electric fuel pump relay carrier socket. The reading should be 7 $\Omega \pm 0.4$ at 20°C.



10.**Operation of control relays (refer to wiring diagram on page 16)**

When the ignition switch is turned to the ON position the injector control relay winding (55) is energized; in actual fact, the current arrives from terminal 15/54 and goes to earth through terminal 10 of the electronic control unit.

The relay (55) contacts close and the battery voltage is available to supply the control unit (terminal 20), the injectors (but their earth is inhibited with the engine not running) and the electric pump relay (56) winding. Since the relay (56) winding is closed to earth, through terminal 28 of the control unit, the current passes through it and closes the contacts: therefore both the electric pump and the idle air adjustment valve (19) are supplied.

If the engine is not started up, the electric fuel pump cuts out almost immediately (given that the control unit disconnects the relay earth by means of a timer).

Checking efficiency of relays

First of all check that the injection system protective fuse 62b located between the 2 relays is working properly.

If one of the relays does not click, replace it with a test relay. Remember that if the injector control relay (55) is not working then neither can the electric pump control relay (56).

If, after replacing the relays, they are still not working, check the continuity of the supply circuits - post-modification system - **relay (55)**: between terminal 85 and earth terminal 10 of the injection control unit connector; between terminal 86 and terminal 15/54 of the ignition switch; **relay (56)**: between terminal 85 and terminal 28 of the injector control unit connector; between terminal 86 and terminal 87 of the relay (55).

IAW ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS

DESCRIPTION	QUANTITY	PRISMA 4WD	DELTA 4WD
ELECTRONIC CONTROL UNIT	1	WH2G.03/HAI-B8	WH4E.03/085-F6
BUTTERFLY CASING	1	56 CFL 18	52 CFL 15
INJECTOR	4	IW 023/03	IW 025/01
AUTOMATIC IDLE ADJUSTMEN AND ENGINE TIMING SOLENOID VALVE	1	VAE 02	VAE 02
PRESSURE REGULATOR	1	RP 1/3 bar	RP 1/3 bar
AIR TEMPERATURE SENSOR	1	ATS 04	ATS 04
WATER TEMPERATURE SENSOR	1	WTS 05	WTS 05
ABSOLUTE PRESSURE SENSOR	1	APS 03/01	APS 02/07
BUTTERFLY VALVE POSITION SENSOR	1	PF 09/01	PF 09/01
FUEL FILTER	1	FI 02/01	FI 02/01
ELECTRIC FUEL SUPPLY PUMP	1	PI 022/2	PI 022/2

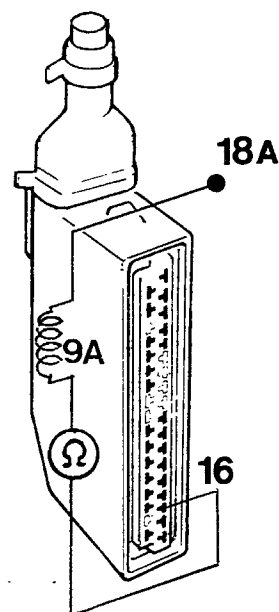
SYSTEM VARIANTS FOR DELTA 4WD HF TURBO

This model is equipped with two additional devices: **anti-detonation** and **over-boost** devices which have been described previously (see page 2 bis).

Below is a description of the check on the anti-detonation sensor and the over-boost solenoid valve wiring.

Checking continuity of connection cables and over-boost solenoid valve resistance

Before carrying out the checks described below it is absolutely vital to make sure that the ignition switch is in the OFF position (switched off)



Disconnect the multiple connector from the injection/ignition control unit, then carry out the following checks:

connect an ohmmeter between terminal 16 of the connector for the injection/ignition control unit and terminal 9A for the solenoid valve (after having disconnected the latter from connector 18A). The resistance value measured should be $\sim 40 \Omega$ at 20°C .

If this is not the case, replace the solenoid valve as it is faulty.

If the solenoid valve is not defective, but the device does not work, check the mechanical operation of the valve supplying it with 12 Volts. Also make sure that the rubber pipes are securely connected to the inlet manifold and the turbocharger (see diagram on page 2 BIS)

Checking detonation sensor

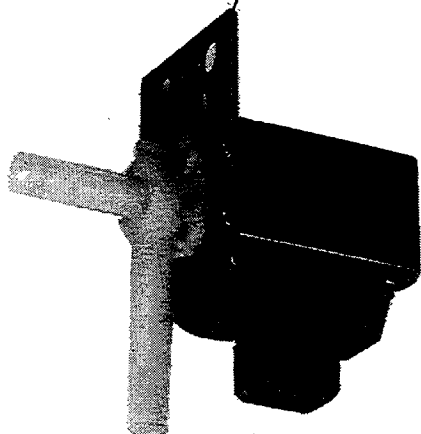
This check can only be carried out by replacing and road testing the sensor having previously replaced the sensor with a test sensor.

In order to check the continuity of the connection cables, disconnect the sensor connector and, using an ohmmeter, check that the resistance is virtually nil between the respective connector terminals and terminals 6 and 22 of the injection/ignition control unit. If this is not the case, locate and renew the broken connection.

10.



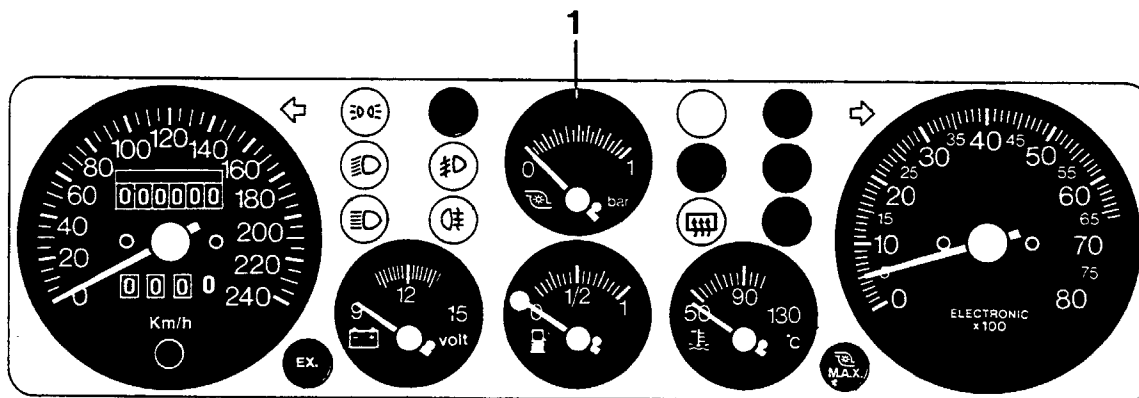
Location of over-boost solenoid valve device in engine compartment



Over-boost solenoid valve control device

Magnetic winding resistance: around 40 Ω at 20°C.
Supply: 12 Volts.

Delta 4WD instrument panel



The test lamp (2) should remain on (in the instrument panel) for the entire length of time that the over-boost valve is working. The supercharging pressure can be read off the pressure gauge (1).

IAW IGNITION SYSTEM CHECKS

As the fuel system is inter-connected with the ignition system it is difficult, in the case of a problem, to determine in which of the 2 systems (or possibly in both) the fault lies.

IN ORDER TO CHECK THE IAW ELECTRONIC INJECTION SYSTEM MORE EASILY AND QUICKLY USE THE FIAT-LANCIA AUTOMATED DIAGNOSTIC EQUIPMENT AND THE APPROPRIATE MEMORY WHICH CAN BE ORDERED FROM THE PARTS DEPARTMENT AT VOLVERA BY QUOTING PART NOS. 1806039000 AND 1806040000, RESPECTIVELY

1. Checking efficiency of ignition control unit (or power) module and IAW control unit module control.

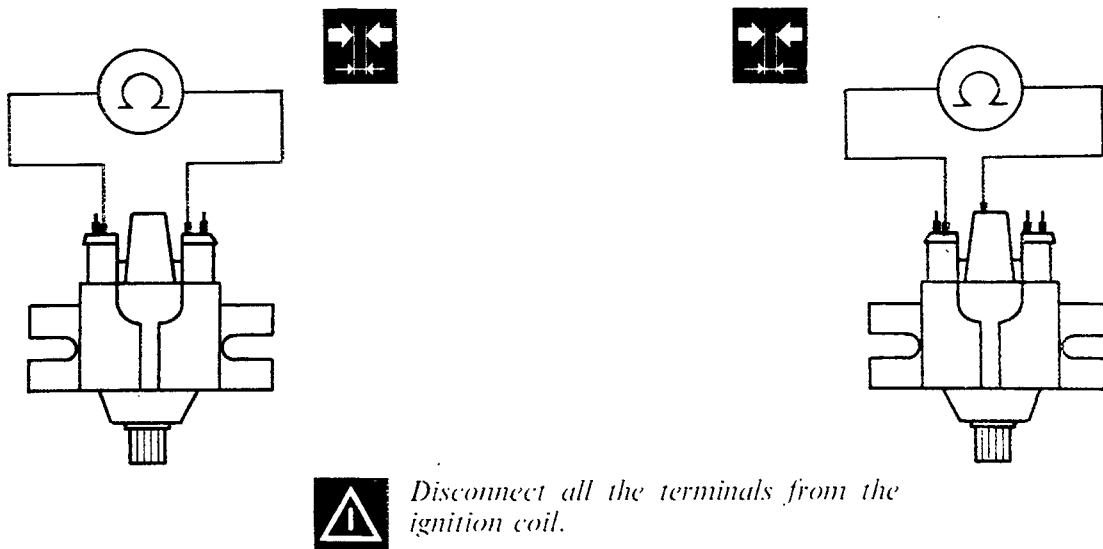
Open the bonnet lid.

Turn the ignition switch to the ON position: if the spark can clearly be heard in the distributor cap this means that the ignition module and the control unit are working properly. If this is not the case (as one or the other or both may be defective) firstly replace the power module and, only if the fault still persists afterwards, replace the injection ignition control unit

NOTE Before replacing the ignition unit power module, it is necessary to *carefully* check the ignition coil (especially the resistance of the primary winding) because a short circuited coil can quickly damage even a new replacement module.

If the check described above has a positive result, the following components must be checked:

1. Ignition coil

**Primary winding resistance check**

Check the resistance using an ohmmeter inserted between the two low voltage terminals: the reading should be 0.415 - 0.495 Ω at 20°C.

Secondary winding resistance check

Check the resistance using an ohmmeter inserted between the centre high tension terminal and one of the low voltage terminals: the reading should be between 4320 and 5280 Ω at 20°C.

The resistance of the rotor arm should be about 1000 Ω .

10.

2. Rpm and TDC sensor

Carry out the checking procedures illustrated on page 23.



Disconnect all the terminals for the cables whose continuity is being checked.

3. IAW control unit connection circuits - power module - ignition coil supply

there should be continuity (= almost nil resistance) between terminals 24 and 25 of the IAW control unit multiple connector and terminals 3 and 6 of the ignition unit power module.

In addition, there should be continuity (= almost nil resistance):

- between terminal 15/54 of the ignition and terminal +15 of the coil;
- between terminal -1 of the coil and terminal 1 of the ignition unit power module.

4. Distributor cap - HT leads and spark plugs

Check, in the same way as for conventional ignition, that the distributor cap is not cracked, the rotor arm is not broken (resistance 1000 Ω), that the HT leads are not oxidized or broken and that the spark plugs are working properly.

NOTE *A fault in the coolant temperature sensor, intake air temperature sensor, butterfly valve position sensor, relays or IAW control unit ignition advance curve control sector would adversely affect the operation of the ignition system.*

DELTA-PRISMA 4WD

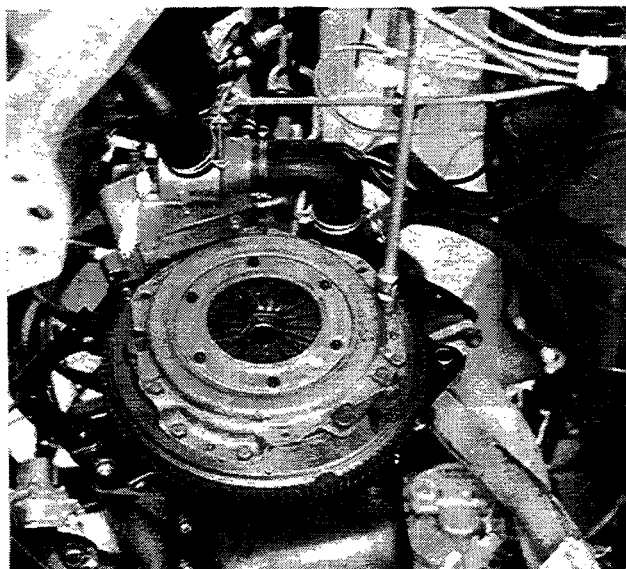
Clutch



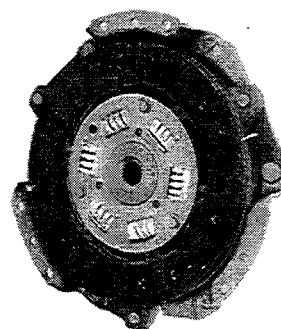
**Service
Manual**

NOTE When removing the clutch it is necessary to remove the gearbox-differential unit.
See section 21-27 for details.

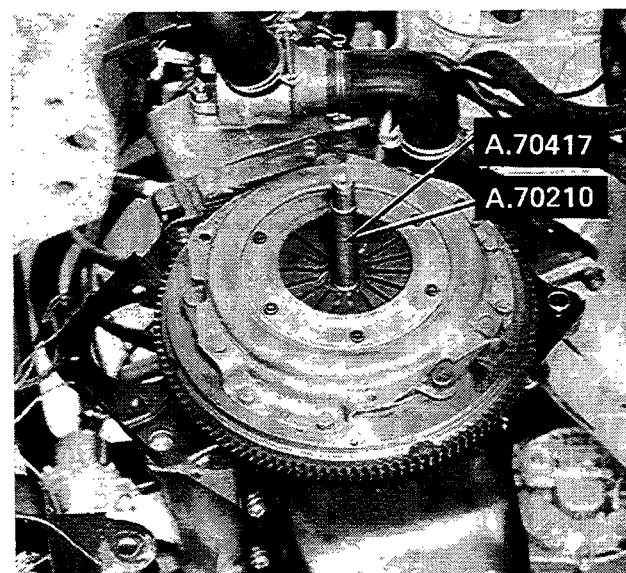
When the gearbox-differential unit has been removed, proceed as follows:



Removing clutch assembly

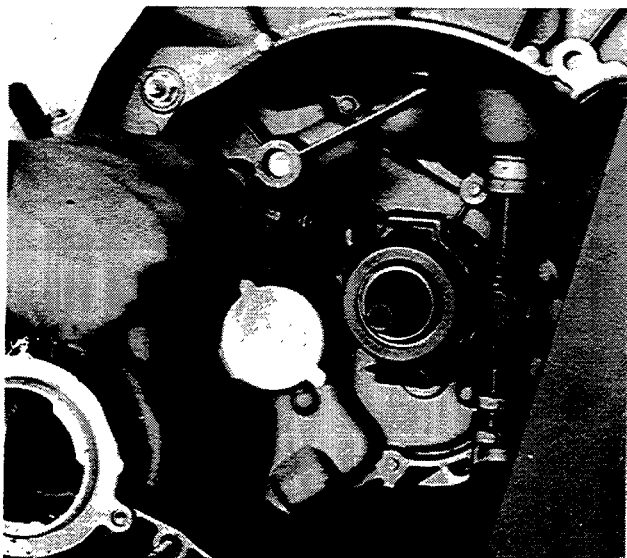


Clutch assembly



Alignment of driven plate when refitting
clutch using centering pin A.70417 (1300)
or A.70210 (1500 and 1600)

18.

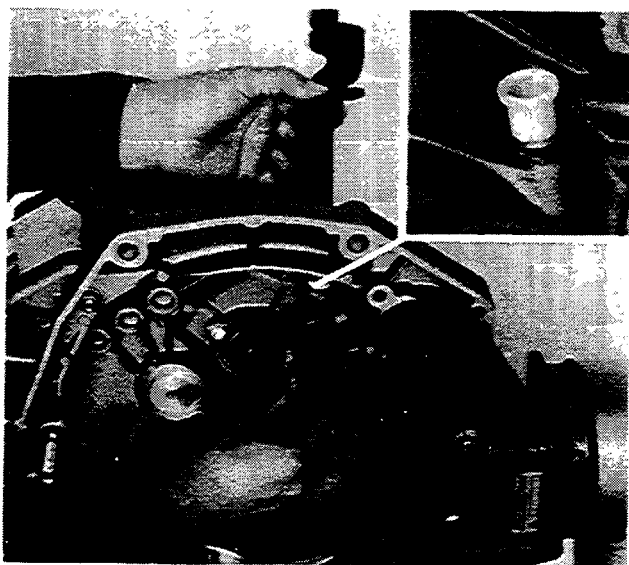


THRUST BEARING



Removing-refitting

There should be no jerkiness or noise when rotating or the bearing should be replaced.

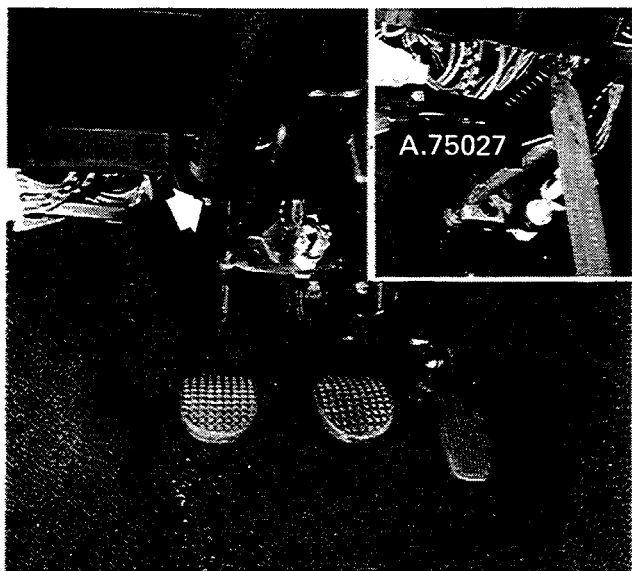


THRUST FORK



Removing-refitting thrust fork and relative control shaft

The bush must be replaced whenever the fork control shaft shows excessive play.



CLUTCH PEDAL



Removing-refitting clutch pedal using tool A.75027

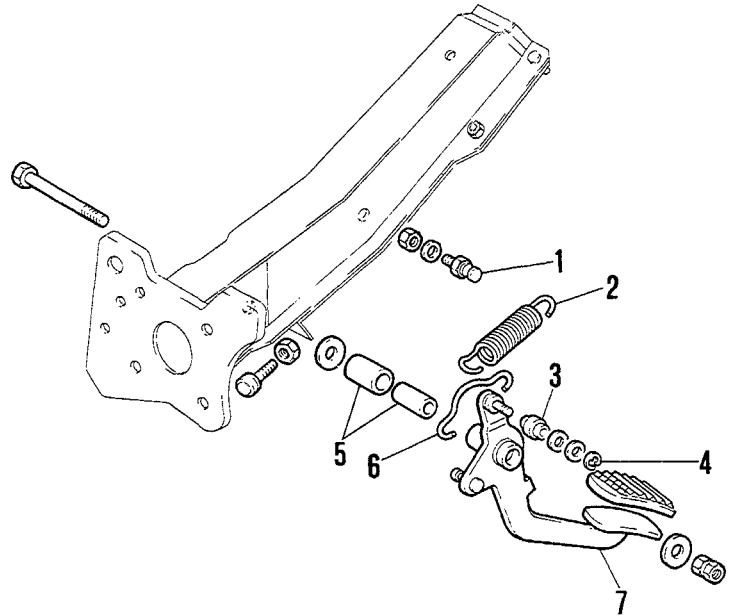
NOTE *The remove the clutch pedal, press where shown by the arrow after having first disconnected the clutch cable.*



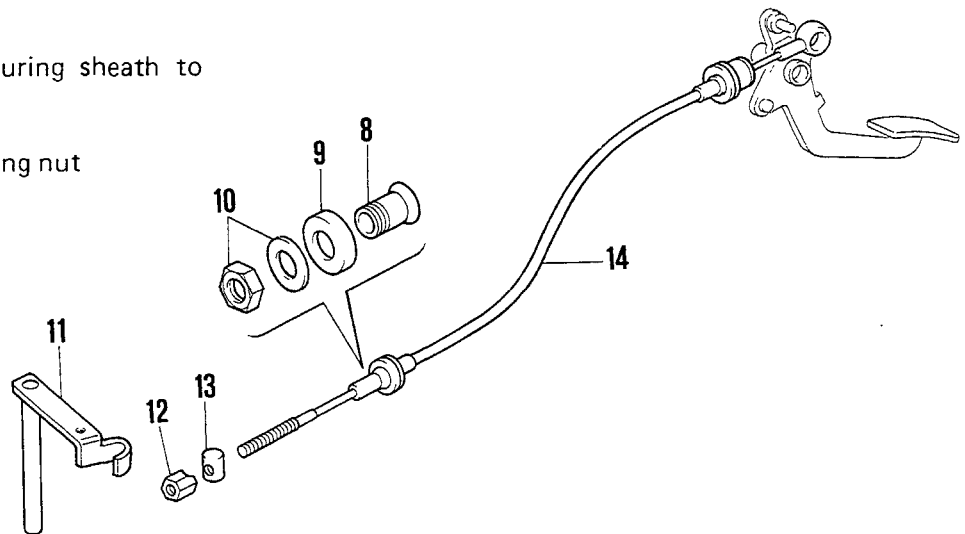
Grease the parts concerned before fitting.

Clutch pedal components

1. Spring retainer
2. Clutch spring
3. Bush for end of flexible cable
4. Clip for end of cable
5. Bushes for pedal
6. Spring tie
7. Clutch pedal

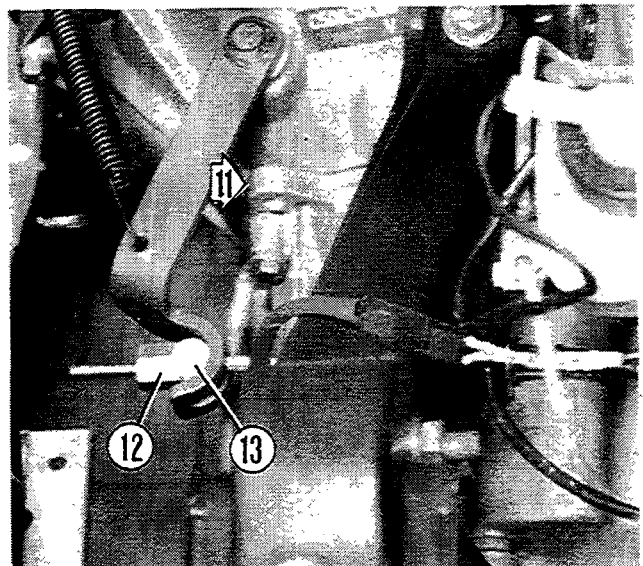
**Complete flexible cable components**

8. Sheath sleeve
9. Rubber spacer
10. Nut and washer for securing sheath to gearbox casing
11. Clutch operating lever
12. Clutch pedal travel adjusting nut
13. Pawl
14. Sheathed flexible cable

**Adjusting clutch pedal travel**

Pull lever (11) in the direction of the arrow until nut (12) comes out of its pawl (13); screw or unscrew nut (12) depending on whether the free travel of the pedal is less than or greater than about 15mm.

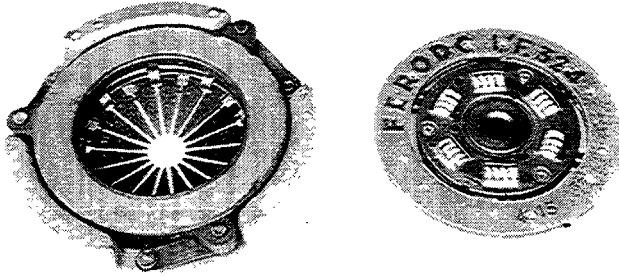
Release lever (11) making sure that nut (12) engages in pawl (13).



18.

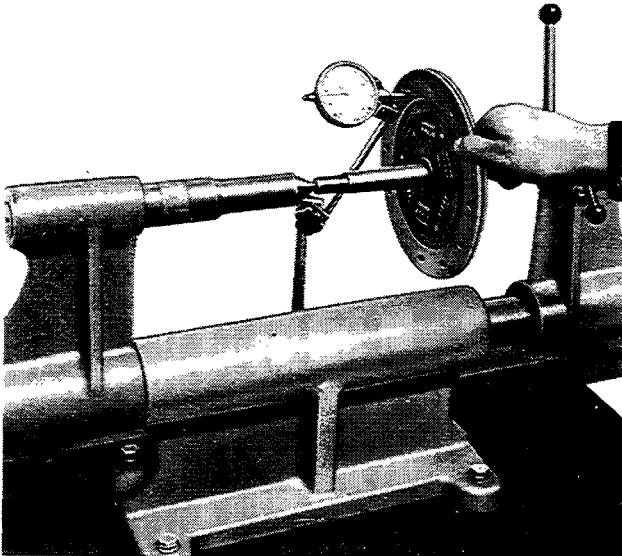


DRIVEN PLATE – PRESSURE PLATE



Checking

NOTE *If there is excessive wear on the driven plate linings, either replace the linings or the entire driven plate.
If there is wear, overheating or deep grooves on the pressure plate, replace the assembly.*



Driven plate alignment check

The run out on the plate must not be more than 0.25mm.

- A.70210 Guide pin for centering clutch plate (1500 and 1600)
- A.70417 Guide pin for centering clutch plate (1300)
- A.75027 Tool for removing-refitting clutch pedal spring

REMOVAL-REFITTING

- Operation sequence 1

BENCH DISASSEMBLY

- Operation sequence 8

GEARS

- Layshaft (disassembly) 17
- Main shaft (disassembly) 19
- Synchronisers 20
- Layshaft (assembly) 21
- Main shaft (assembly) 25

ASSEMBLY

- Rods and forks 29

CENTRAL DIFFERENTIAL UNIT: DISTRIBUTOR

- Four wheel drive 38
- Drive transmission 38
- Disassembly and checks 42
- Assembly 43
- Differential adjustment 46

FRONT DIFFERENTIAL UNIT: TRANSMISSION

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- Assembly and adjustment 55
- Calculating rear bevel pinion bearing cone thickness 57
- Ring wheel rolling torque 58
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- Checking pinion-ring wheel bevel tooth contact pattern 62
- "Ferguson" viscous coupling 63
- Adjusting "Ferguson" viscous coupling 67
- "Ferguson" viscous coupling housing cover 69

DRIVE SHAFTS

- Removal-refitting 71
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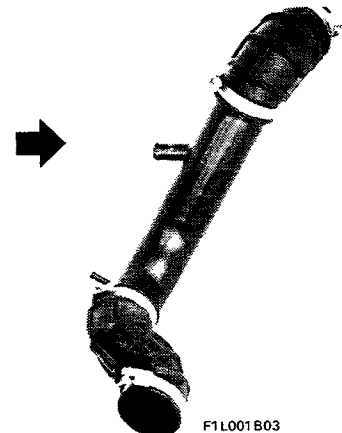
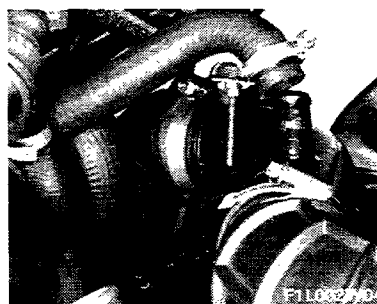
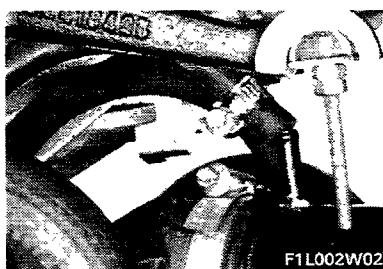
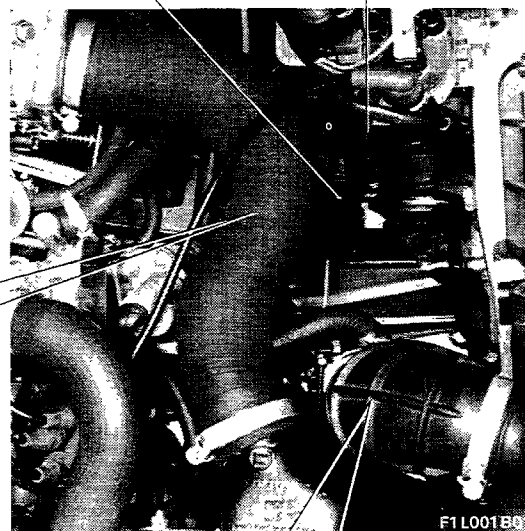
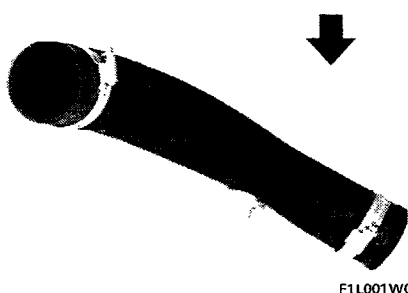
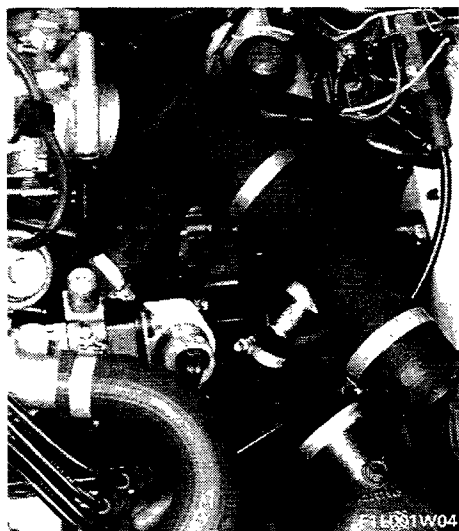
TIGHTENING TORQUES

76

Position car on lift.

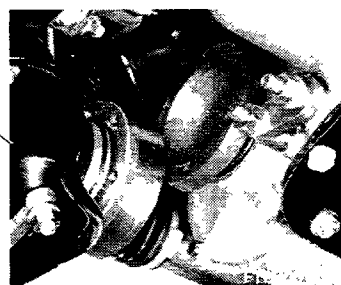
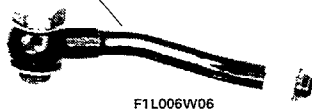
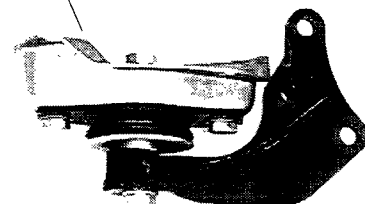
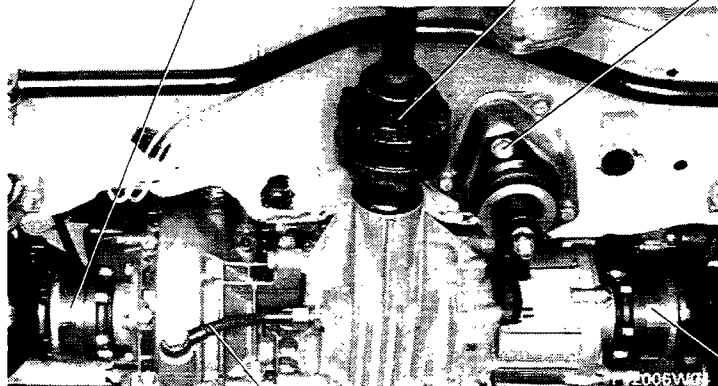
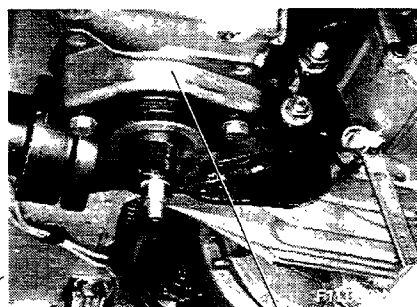
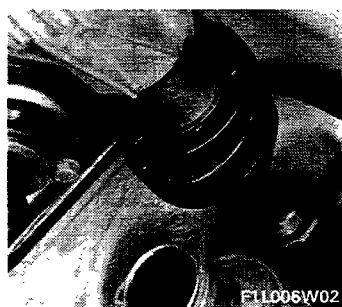
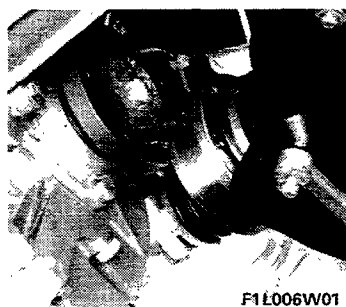
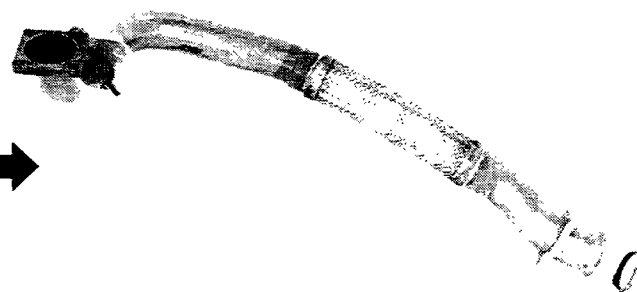
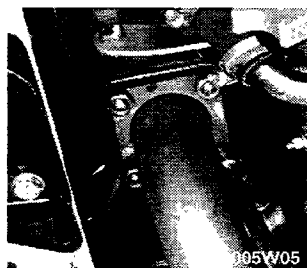
Proceed as follows:

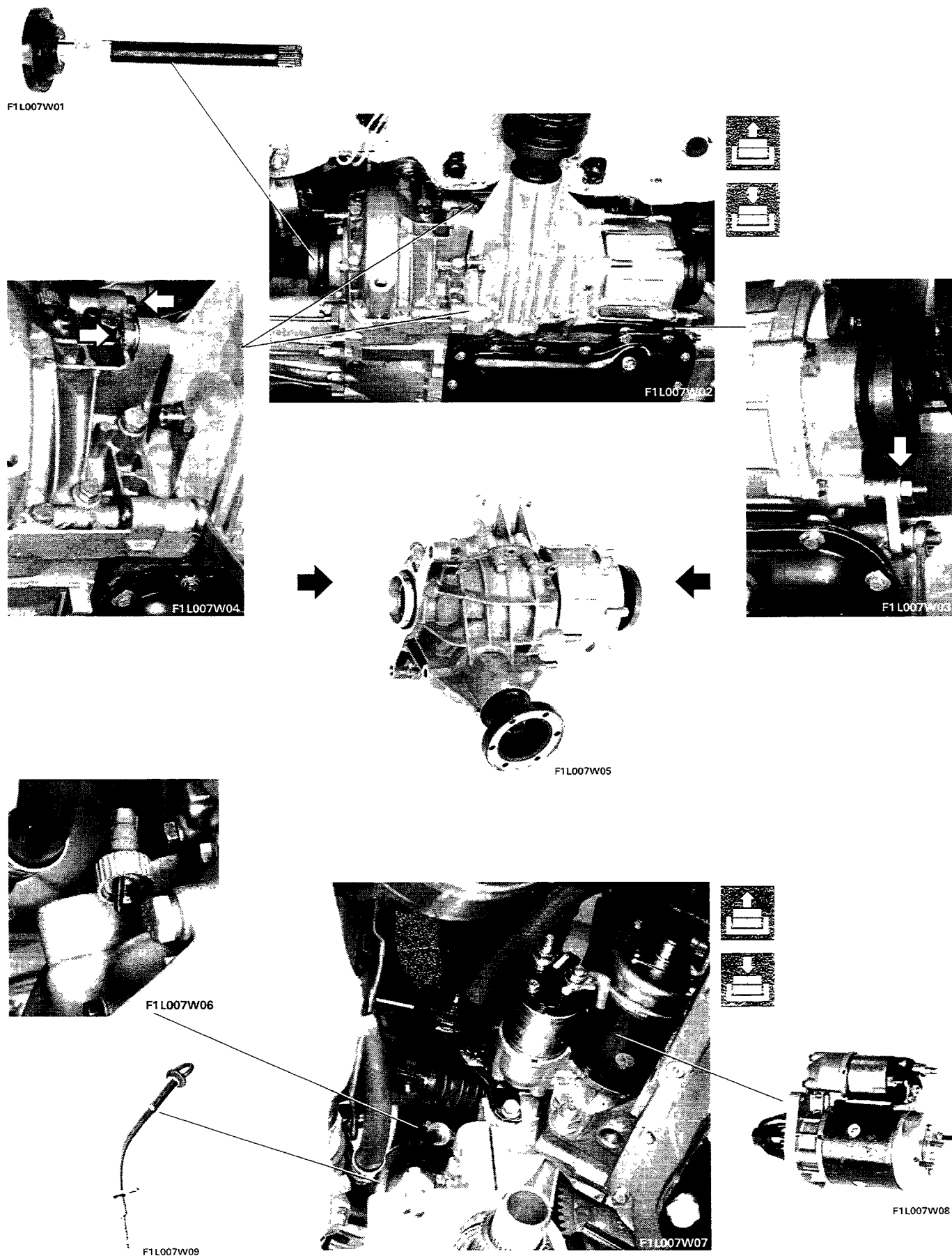
- disconnect negative lead from battery;
- carry out the following operations:



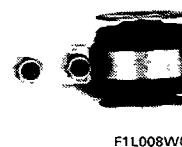
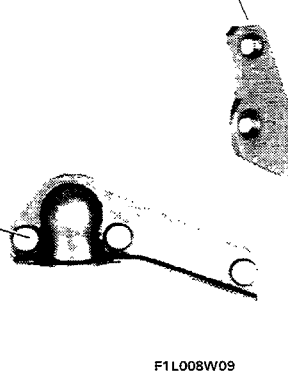
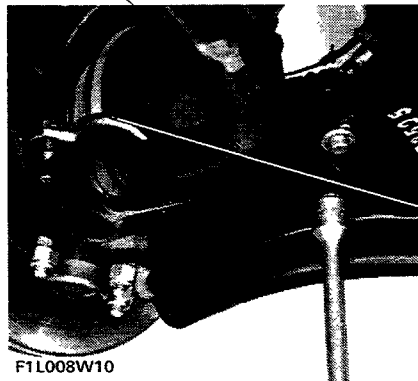
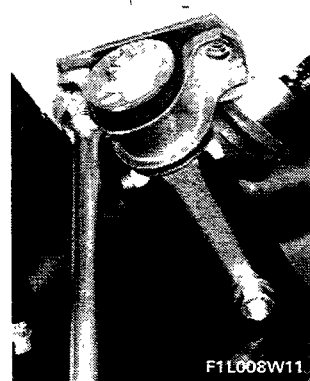
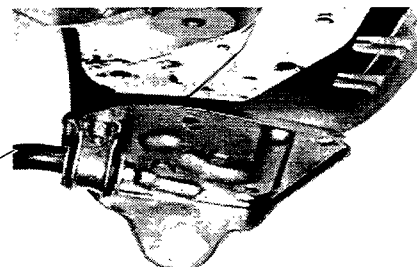
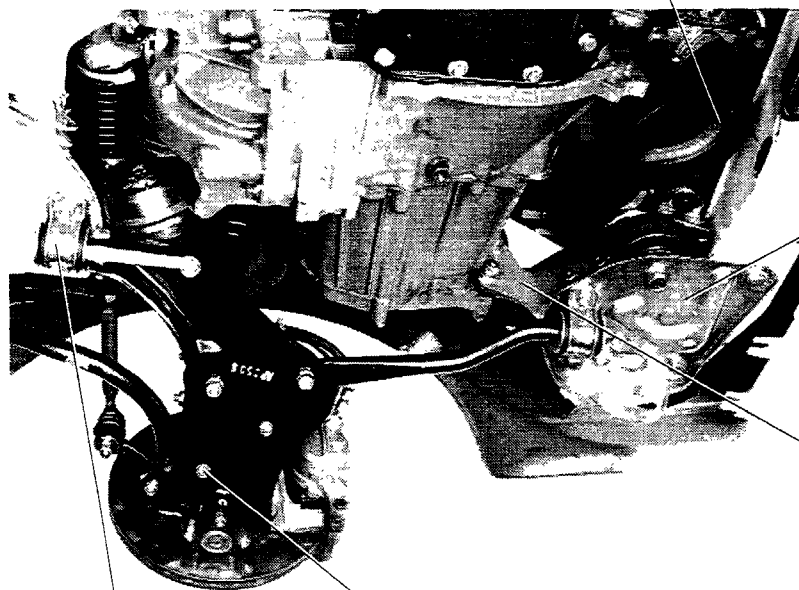
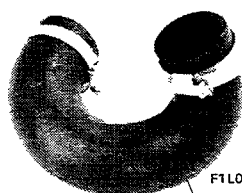
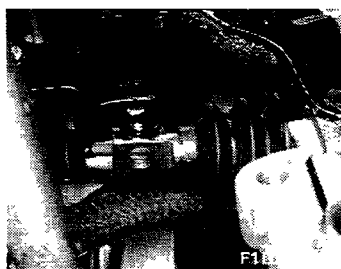
21-27.

- remove the front wheels;
- raise the lift and, working from beneath the car, drain the gearbox oil;
- carry out the following operations:

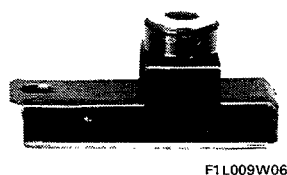
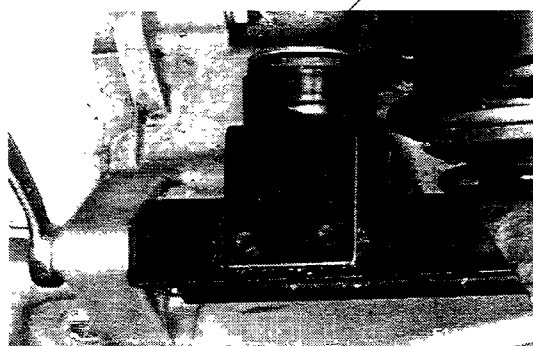
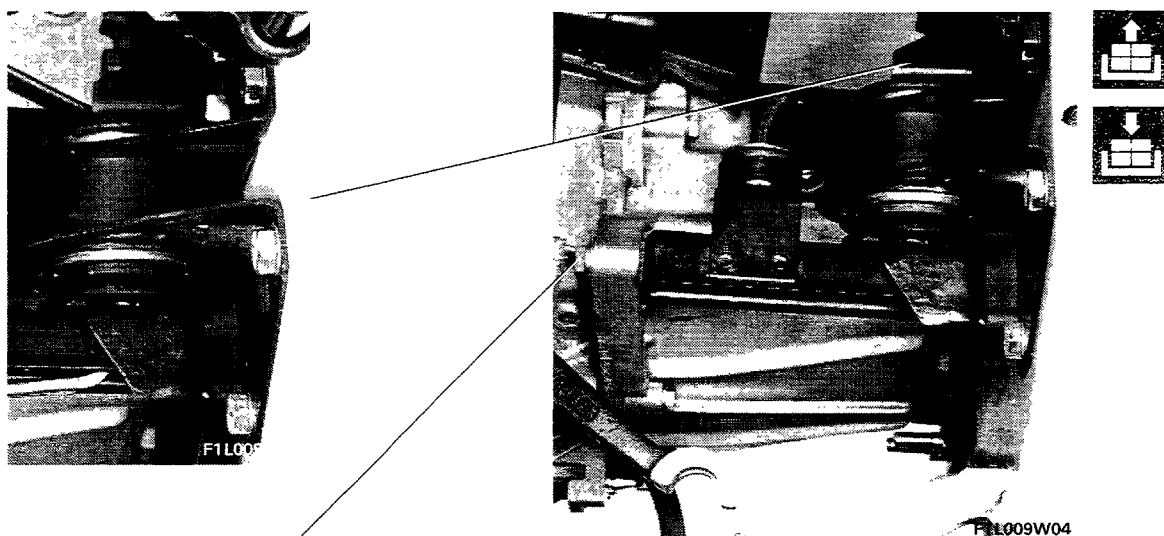
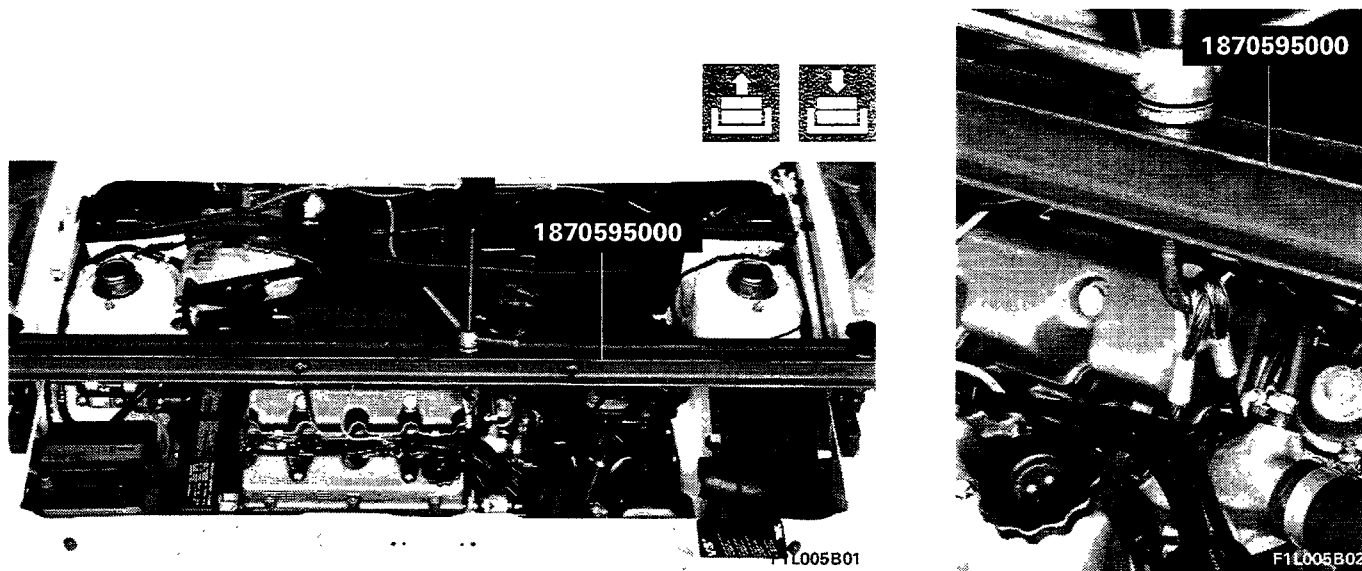




21-27



- lower the lift, position crossbeam 1870595000 in engine compartment and support engine using special hook;
- then carry out the following operations:



21-27.

- raise the lift and, working from beneath, proceed as follows:



F1L010W01



F1L010W02



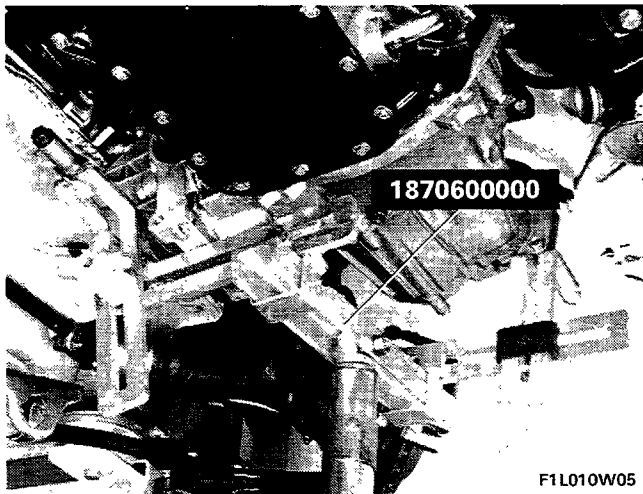
F1L010W03



F1L010W02

Removing-refitting rear gearbox support bracket

Removing-refitting front gearbox support bracket



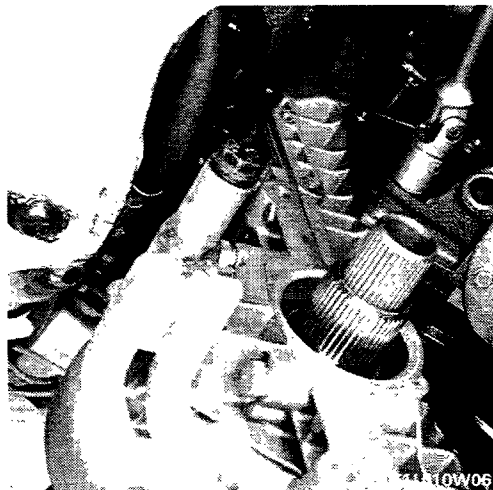
1870600000

F1L010W05



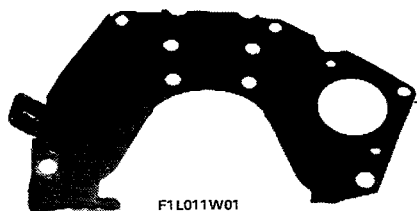
- remove bolts retaining the flywheel cover, arrange gearbox-differential support 1870600000 as shown in the diagram and position the hydraulic jack;

- remove the bolts retaining the gearbox-differential unit to the engine;

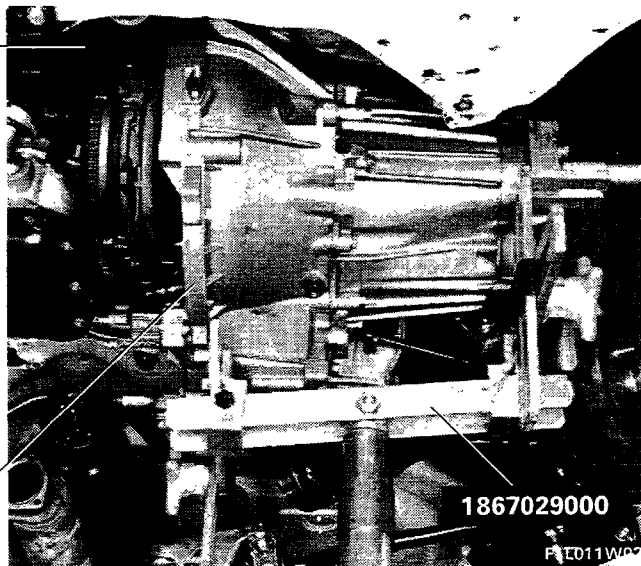


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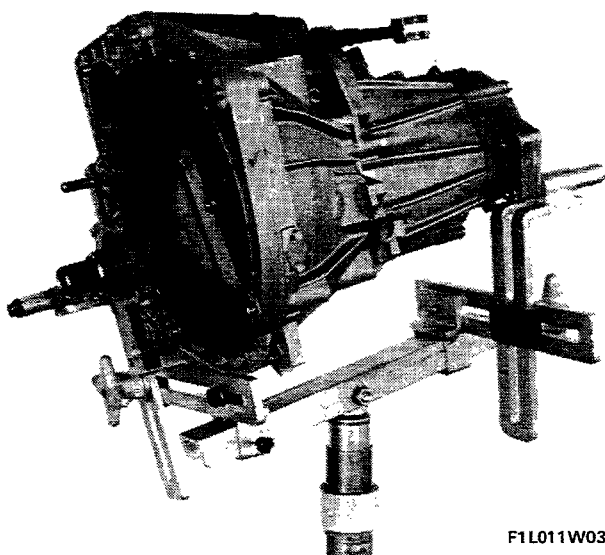


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F1L011W01



F1L011W03

- move the gearbox-differential unit until this is free of the engine centring pins and the clutch shaft slides out of the driven plate;

NOTE Carry out removal operations in reverse order to refit the gearbox-differential unit.

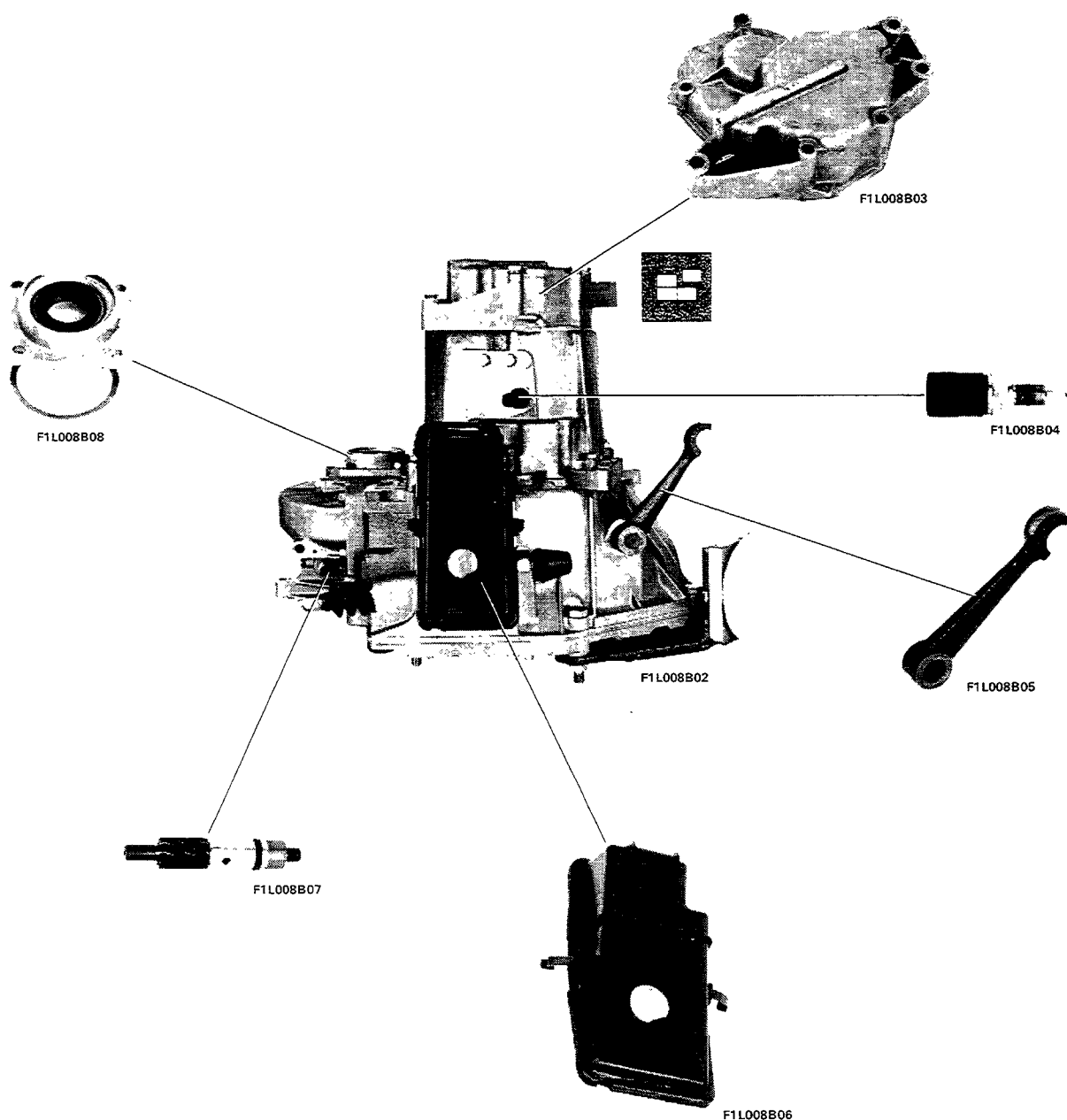
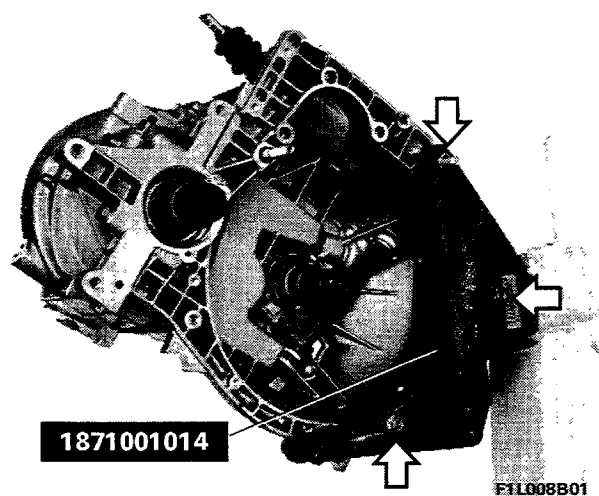


Clutch pedal height.

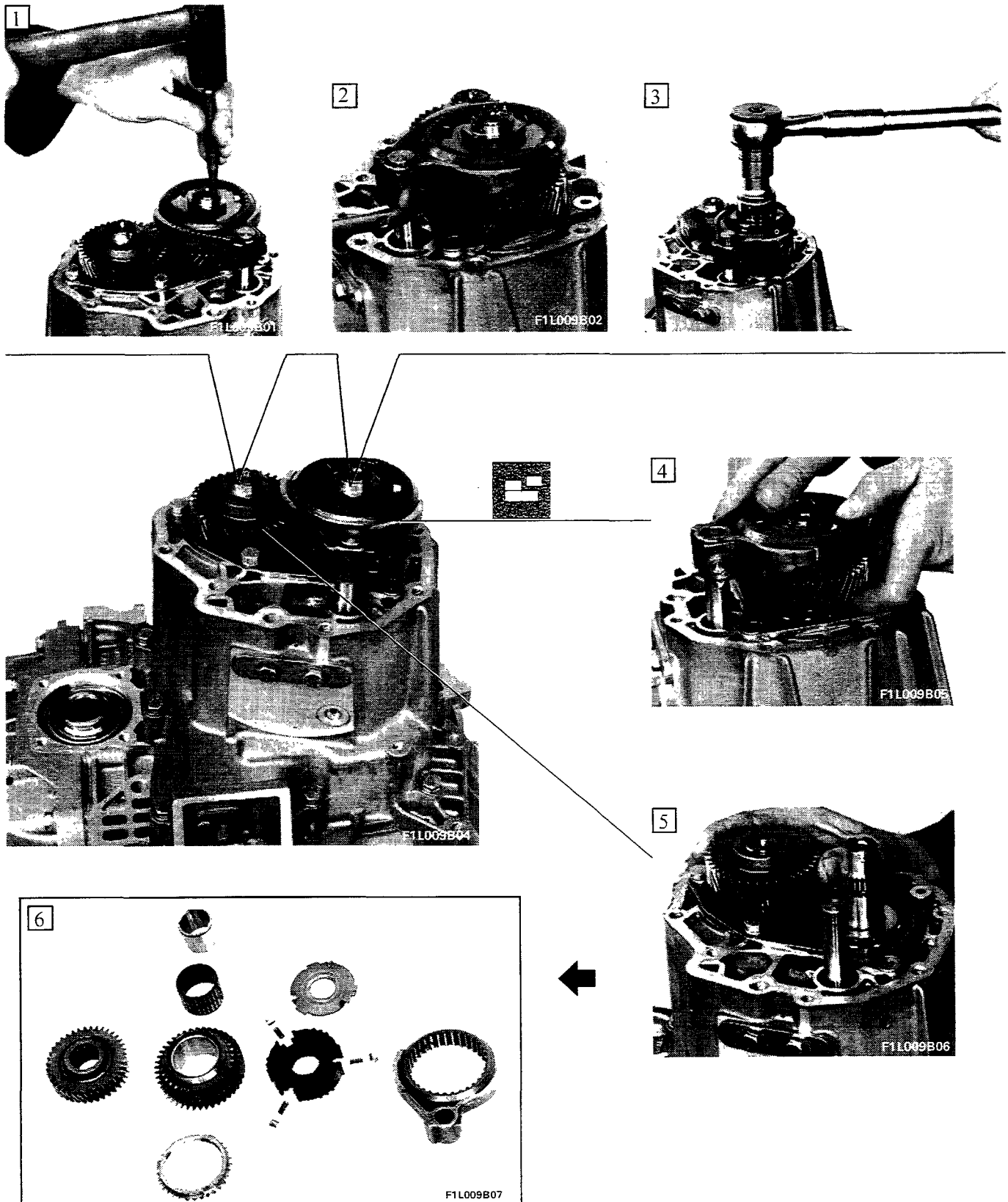
21-27.

OPERATION SEQUENCE

- Position gearbox on rotary stand using support 1871001014;
- carry out the following operations:

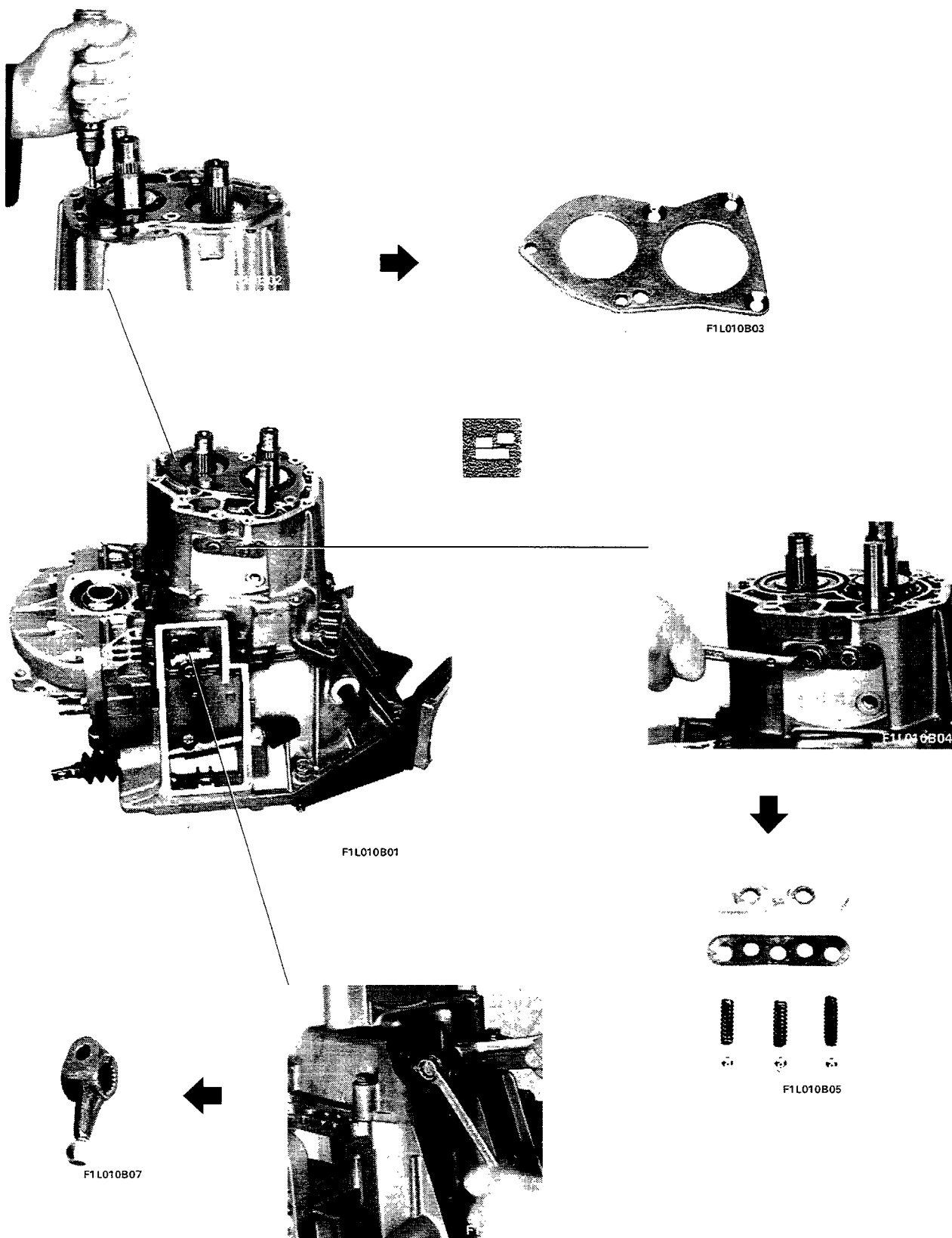


- engage 5th gear by hand and then use the gear lever to engage any speed. This operation is necessary to release the lock collars that secure the gears.



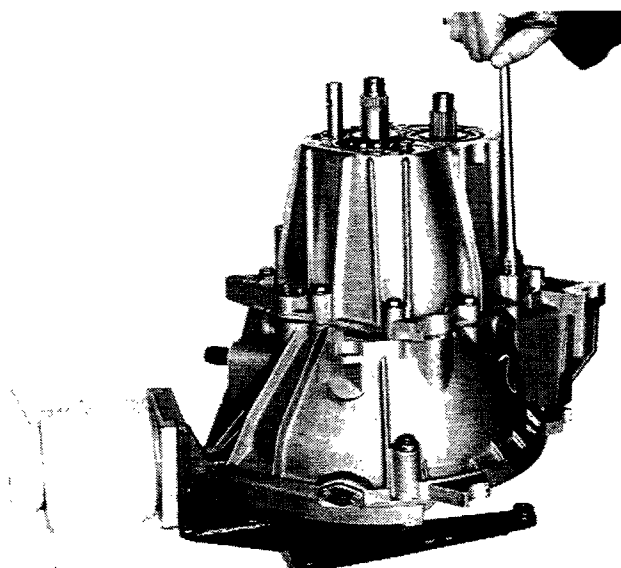
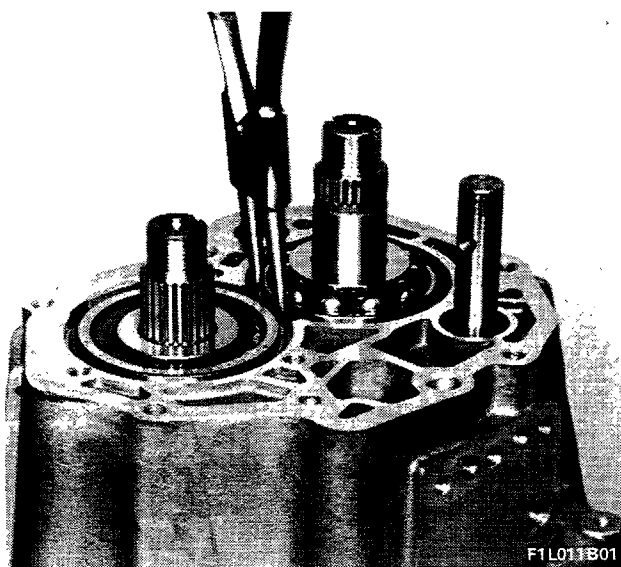
The numbers shown at the top left of the illustrations indicate the order in which the operations must be carried out.

21-27.

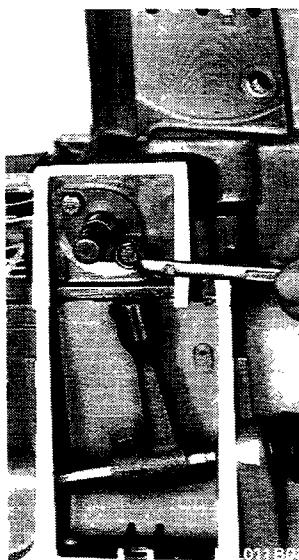


Removing rear bearing retaining rings

NOTE To extract bearing retaining rings, turn until the opening is at the front as shown in the diagram.

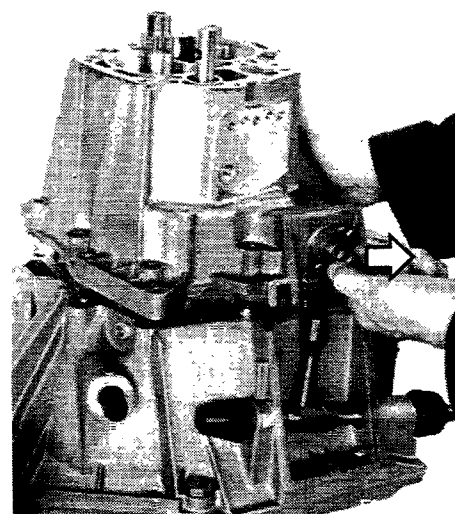


Removing gearbox casing

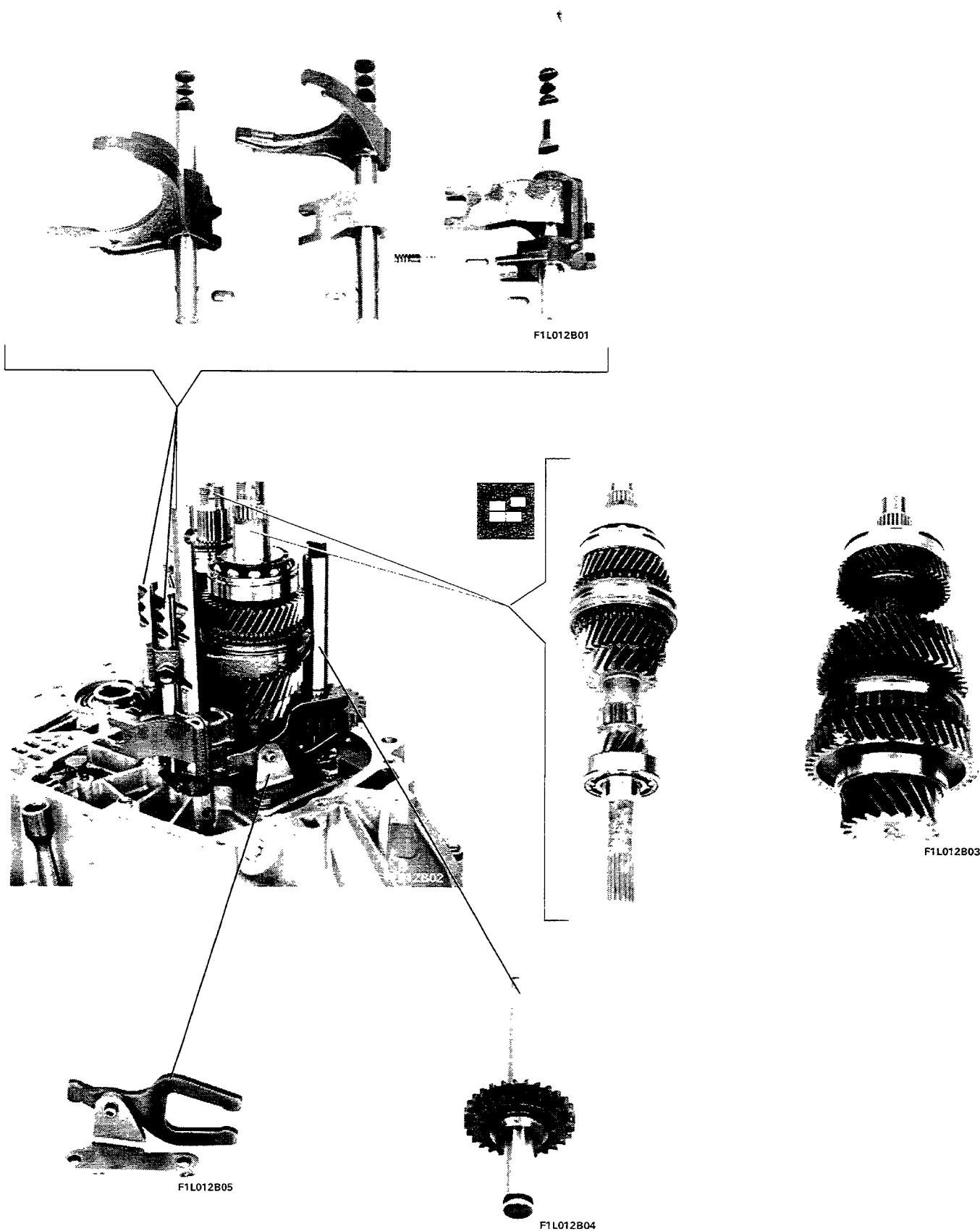


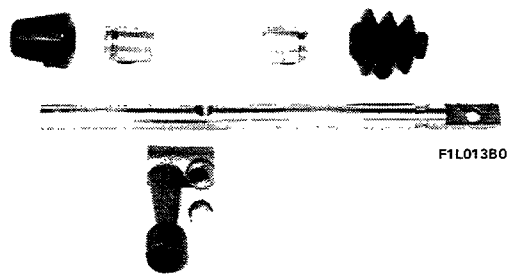
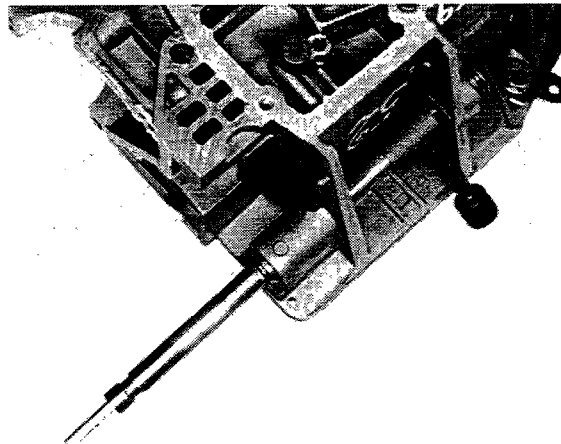
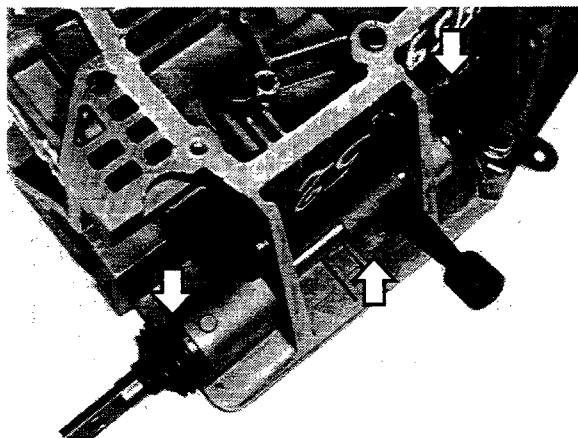
Removing gearbox casing

Slacken bolts retaining bushing to gearbox to release the end of the gear shift lever from the dogs. Move gear shaft backward in the direction arrowed and then remove gearbox casing.

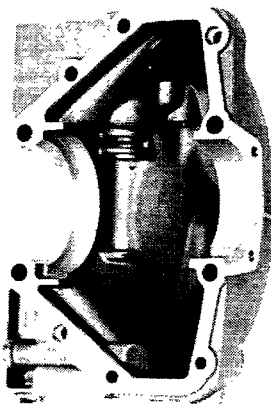
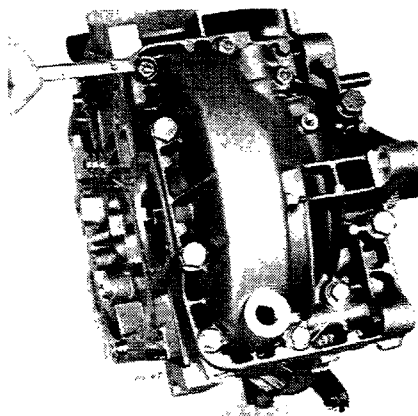
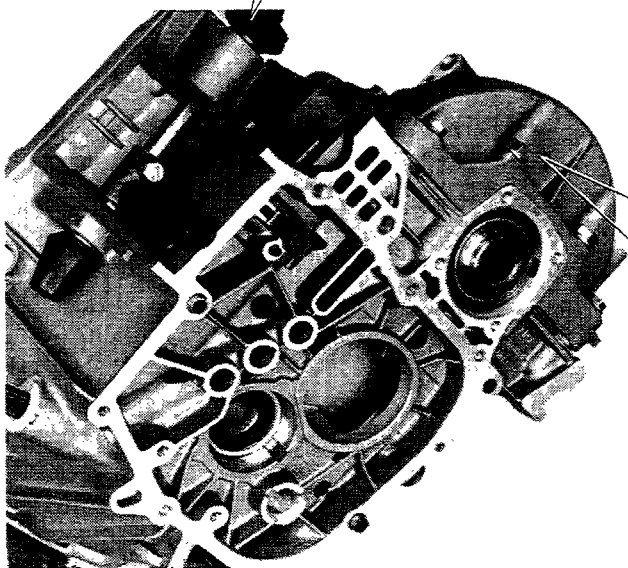


21-27.

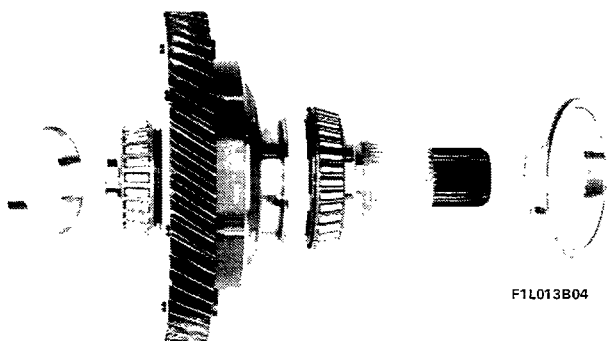




F1L013B07

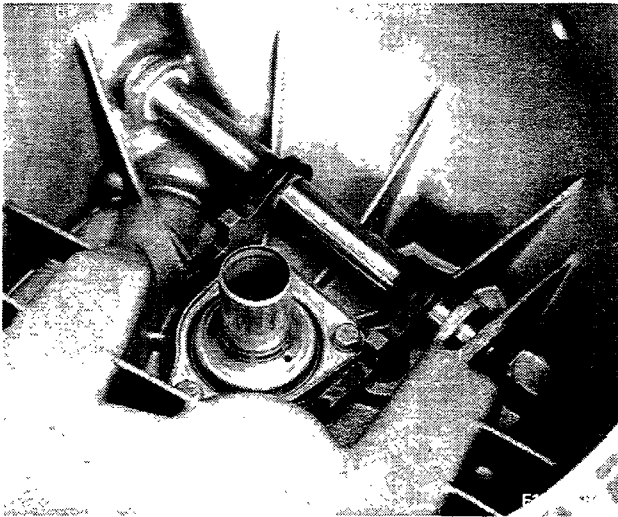


F1L013B03

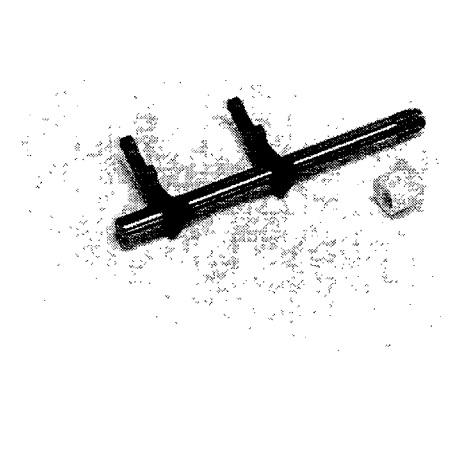
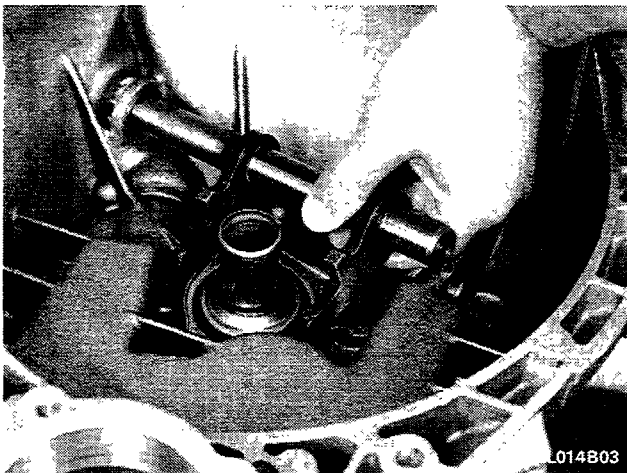


F1L013B04

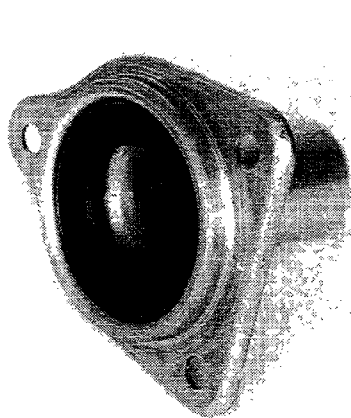
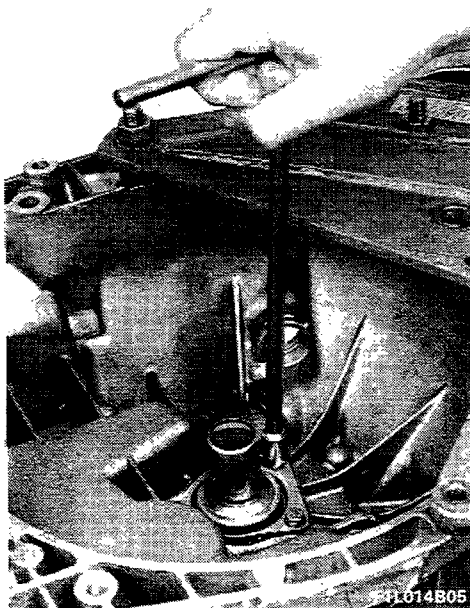
21-27.



Removing-refitting fork and thrust bearing control shaft



Replace the bushing whenever excessive play is noted in the fork control shaft.



Removing-refitting thrust bearing sleeve

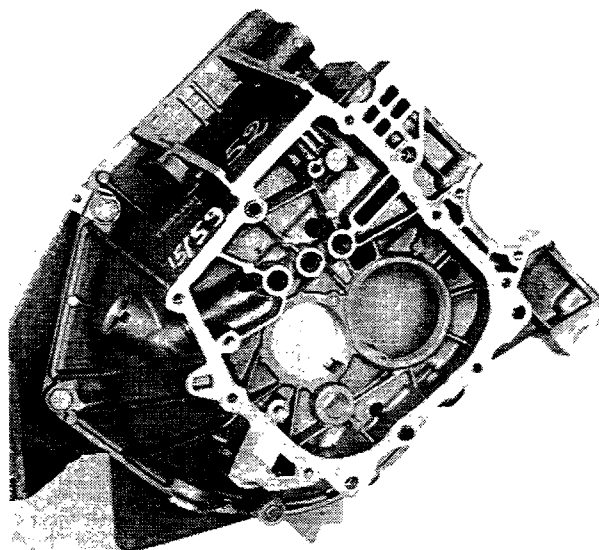
Replace the sleeve and gasket whenever gear oil leaks are noted.



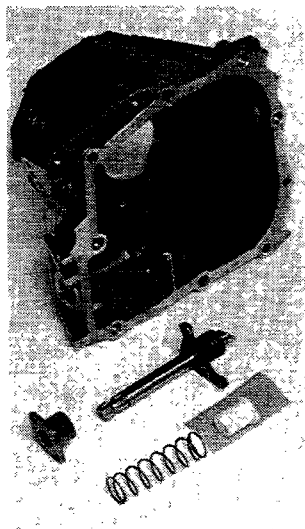
Checking bell housing, central housing, rear cover and differential cover

The housing, cover, support and differential cover should not show signs of cracks. The bearing and rod seats should not be worn or damaged.

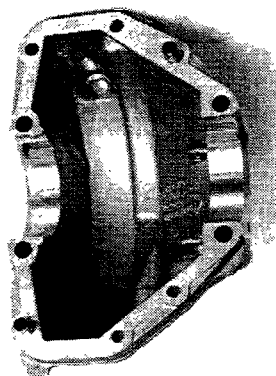
The contact surfaces should be flat (use a fine file for slight unevenness).



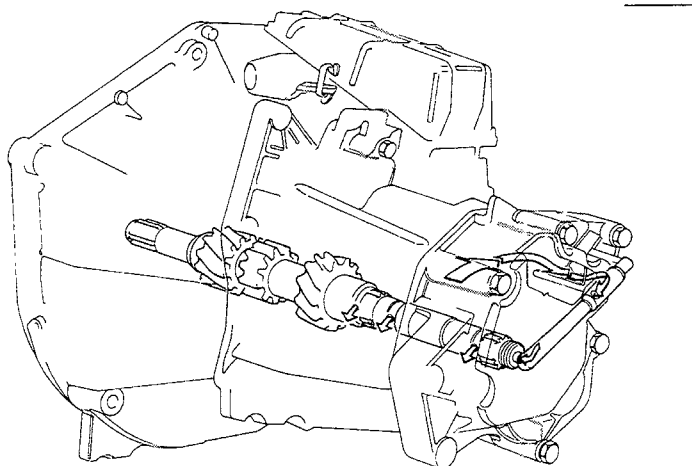
Bell housing



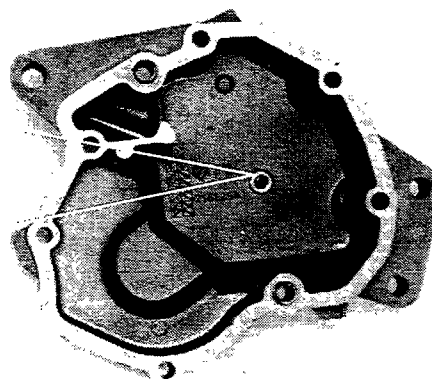
Central gearbox housing



Differential cover



F1L015B05

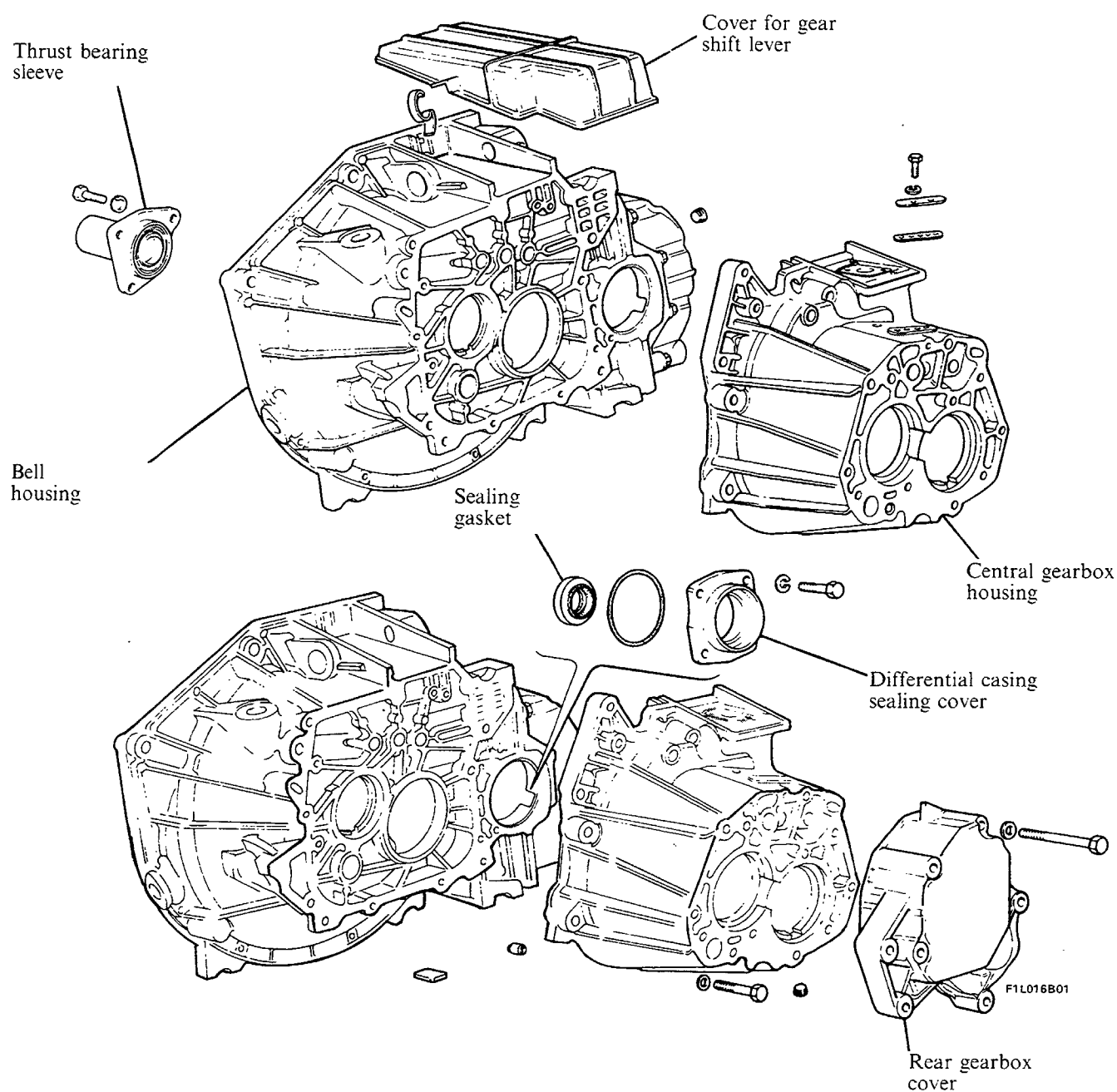


Rear gearbox cover

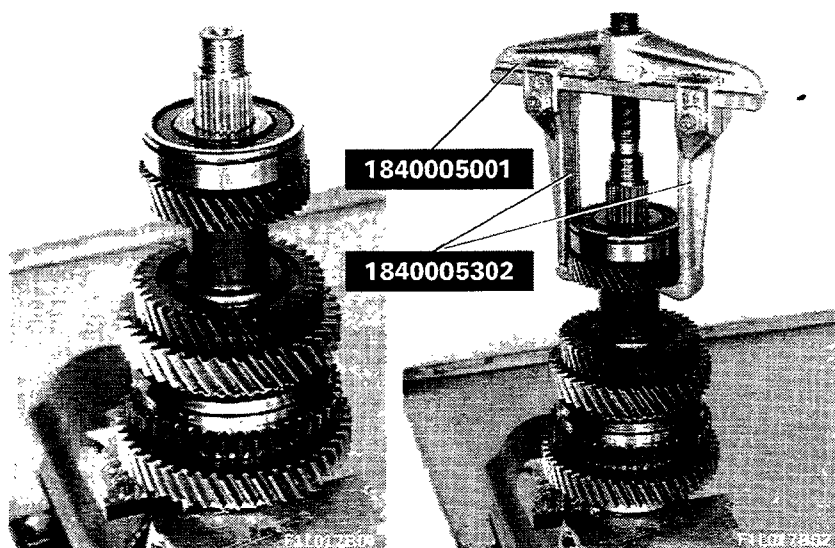
NOTE The inner main shaft lubrication duct located inside the rear gearbox cover must not be obstructed. (Only for Delta HF 4WD).

21-27.

External gearbox parts, supplied as spares

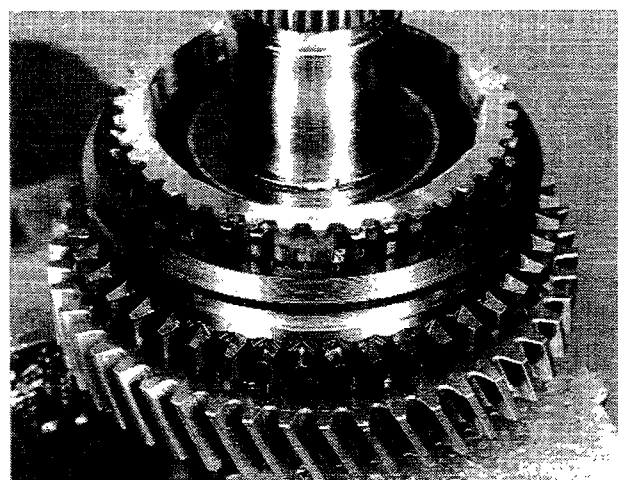


LAYSHAFT (disassembly)

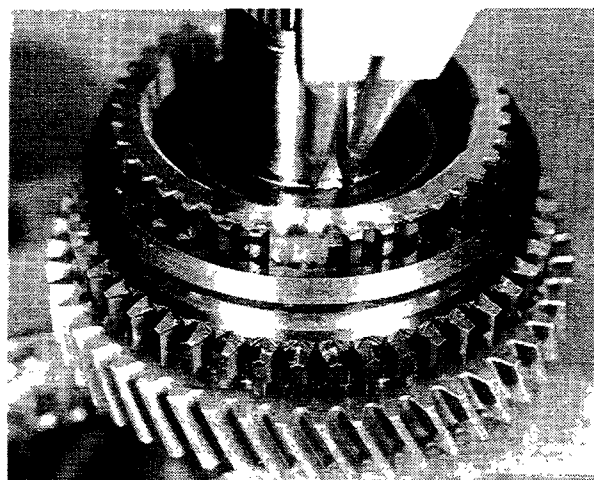


Extracting rear bearing and 4th speed driven gear from layshaft

Removing 3rd and 2nd speed driven gears and spacer

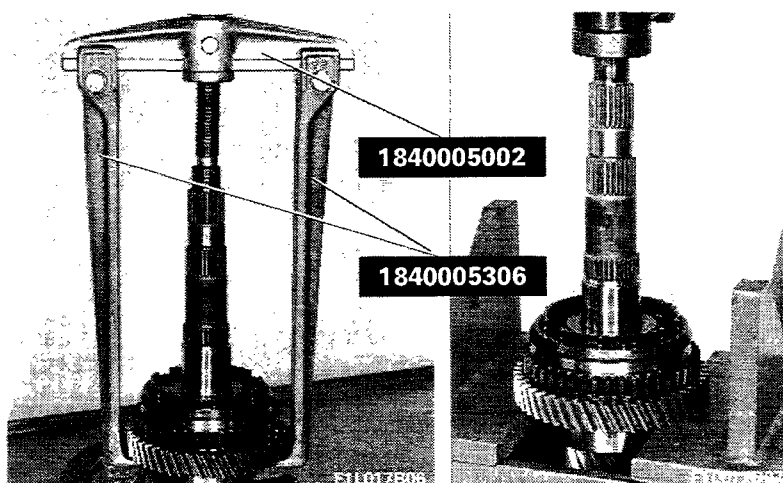


Removing 1st and 2nd speed sliding engagement hub retaining ring, reverse gear (outer part) and 1st speed gear from layshaft using tool 1881101000.

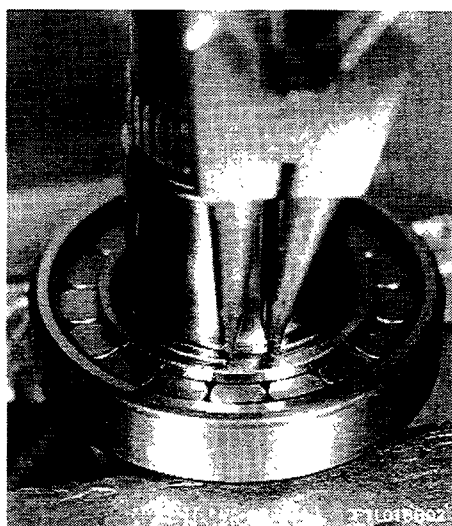
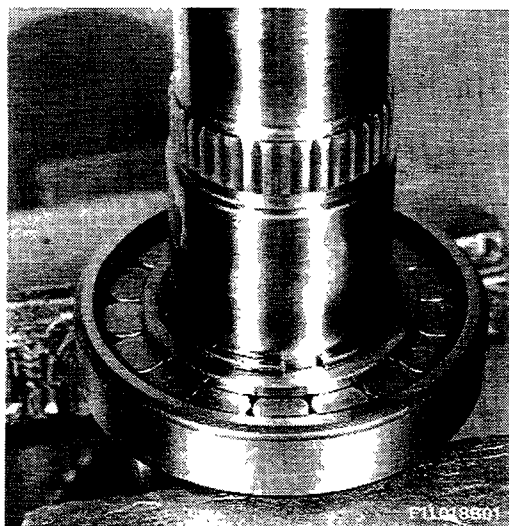


Extracting 1st and 2nd speed sliding engagement hub, reverse gear (external part) and 1st speed gear from layshaft

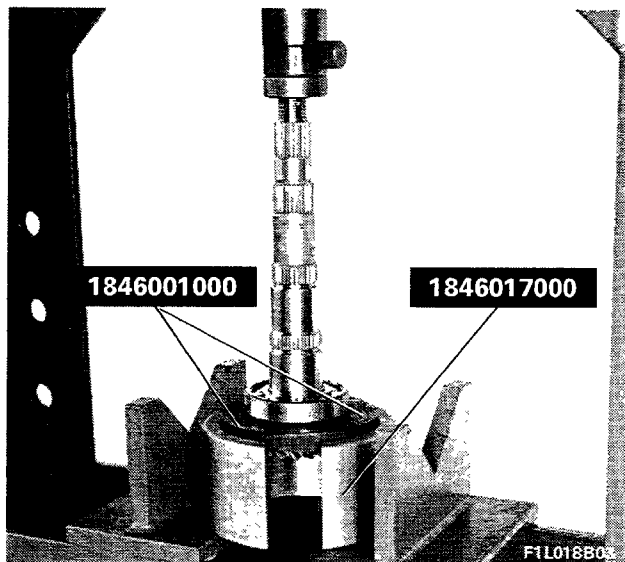
Disassembly operations may also be carried out using a press.



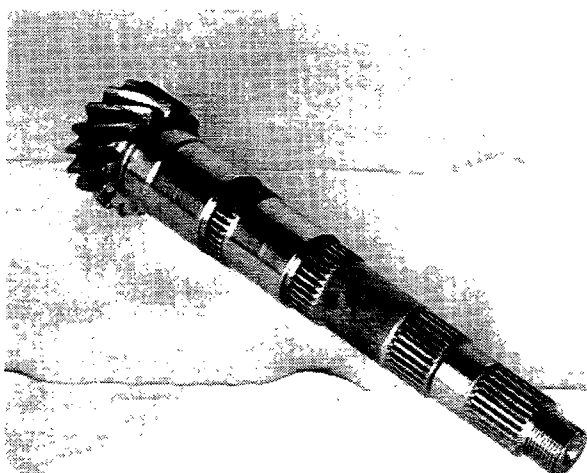
21-27.



Removing front bearing retaining ring from layshaft



Extracting front bearing from layshaft



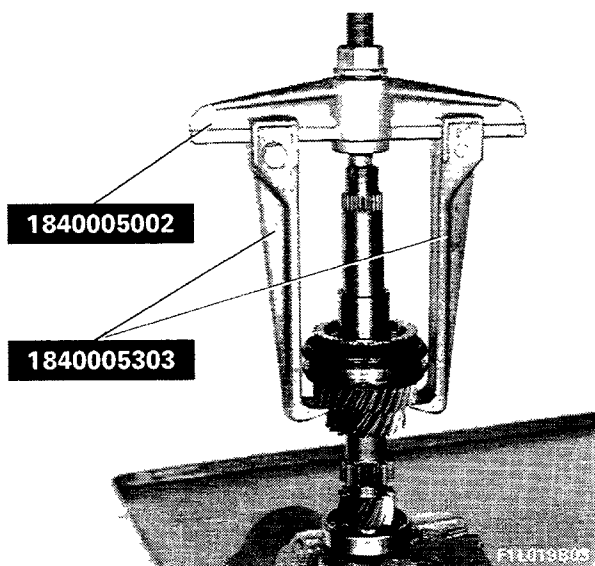
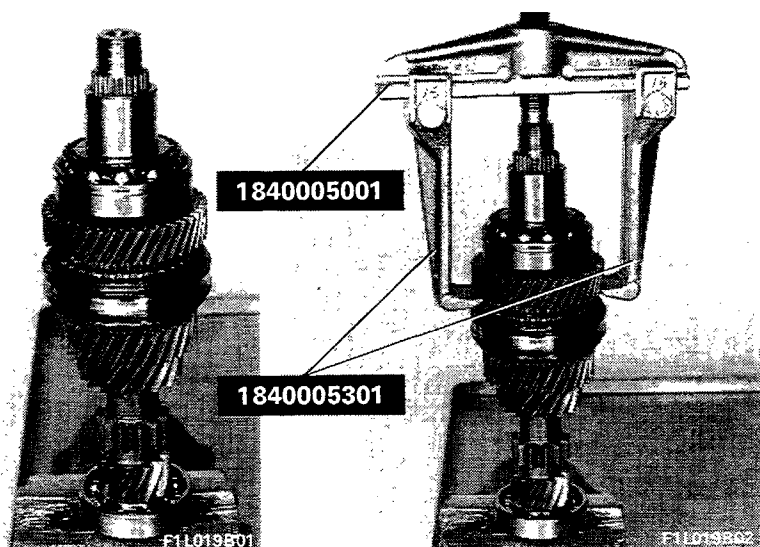
Layshaft - pinion for spur gear-pinion set

Whenever the layshaft-pinion assembly is replaced, the crown wheel must also be replaced.

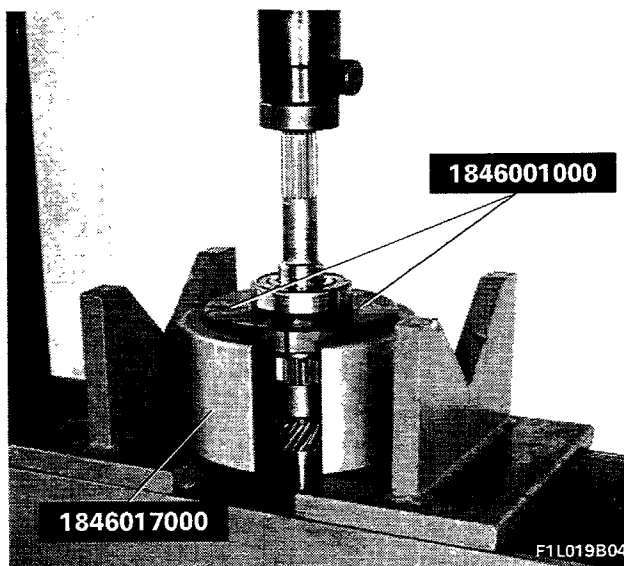
MAIN SHAFT (disassembly)



Removing rear bearing and 4th speed driving gear from main shaft



Extracting 3rd speed driving gear and sliding sleeve complete with 3rd-4th speed engagement hub from main shaft



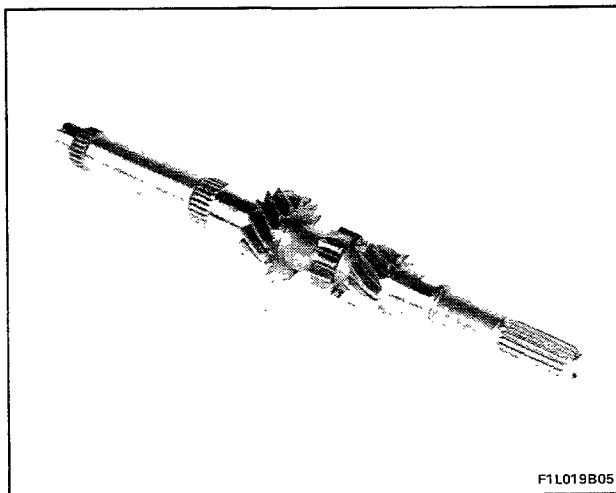
Extracting front bearing from main shaft using hydraulic press

Checking main shaft

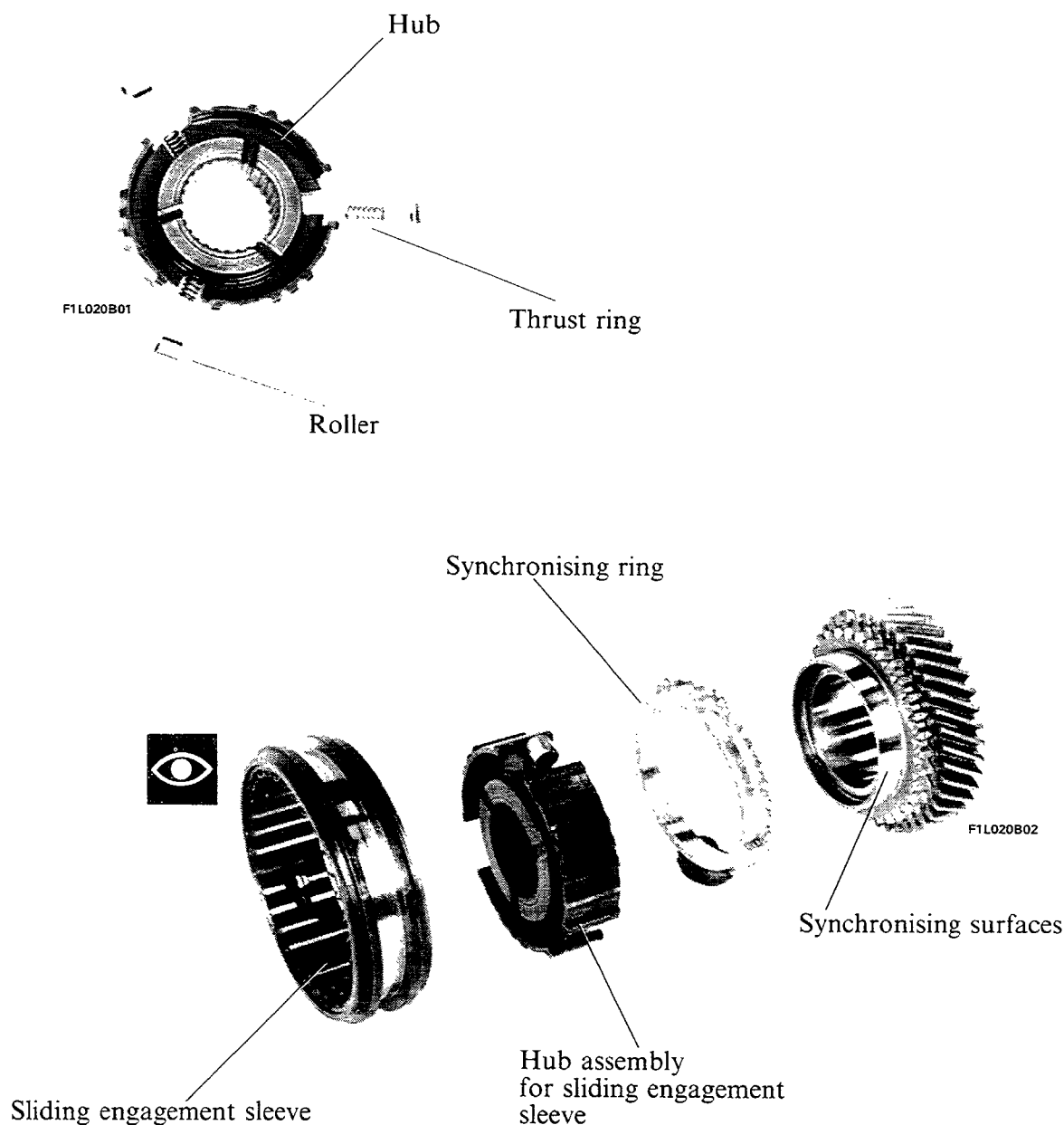
Checking gears for signs of binding or excessive wear.

If a high mileage has been driven, it is advisable to replace all main shaft gears whenever the main shaft is replaced.

On the Delta HF 4WD the main shaft has a port for lubricating 3rd and 4th speed gears.



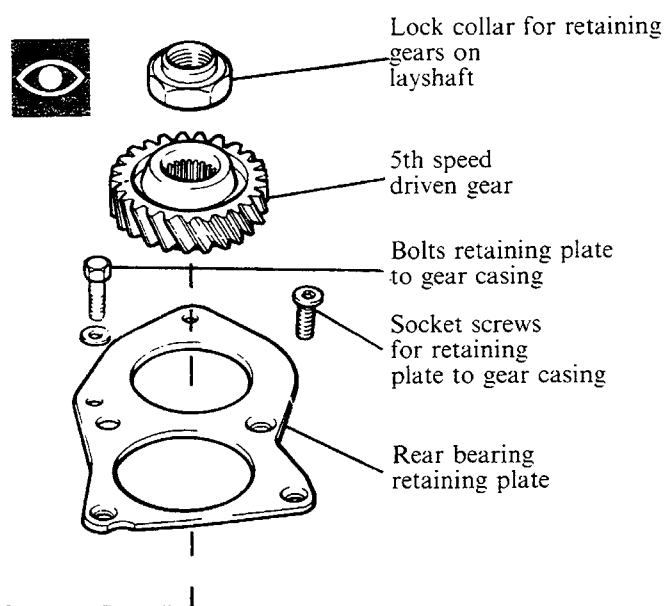
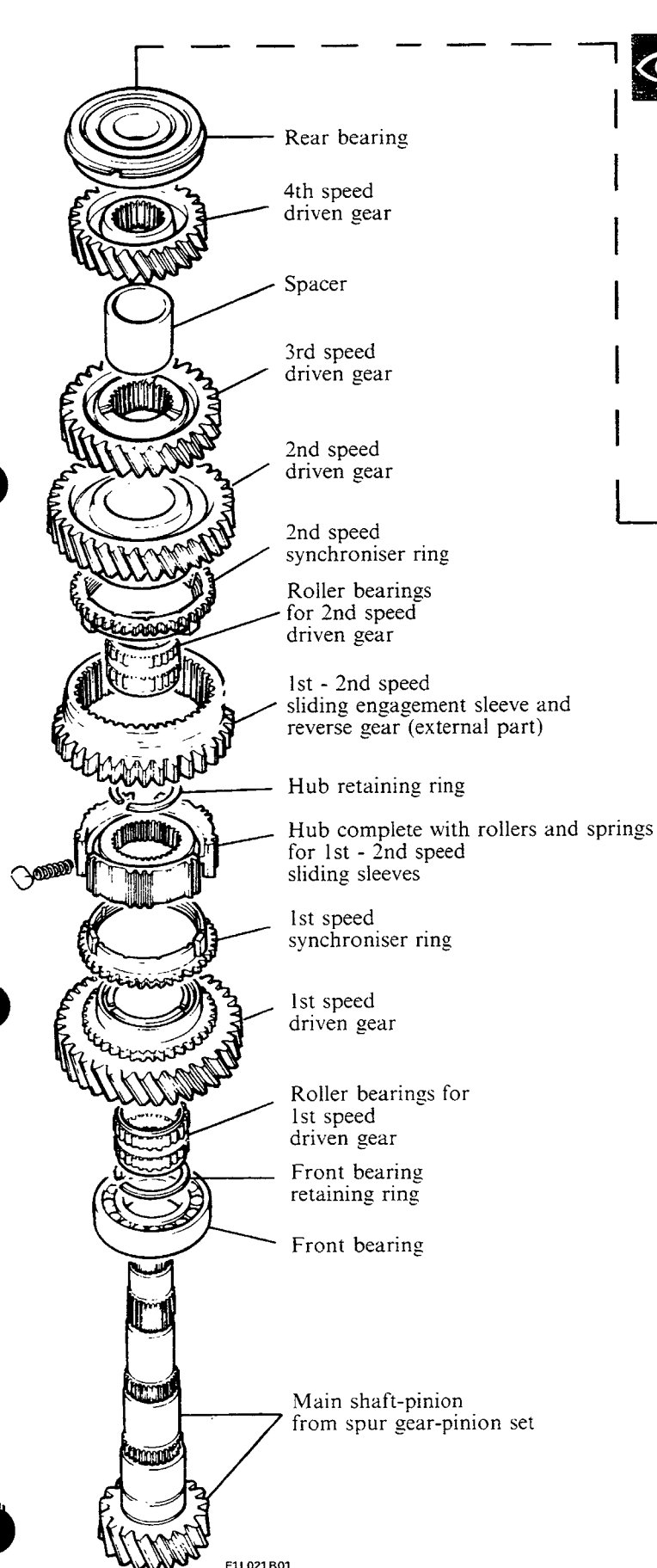
SYNCHRONISING RINGS



Checking synchroniser components

The synchronising ring should not show signs of wear or ovalisation on its inner surface. It is advisable to replace the synchroniser in all cases.

Check that the hubs and sliding engagement sleeves are unnotched and that the two slide over one another without excessive play or binding. Replace sleeve inner teeth if they show signs of wear. Check condition of thrust springs and rollers. Replace if necessary.

**LAYSHAFT (assembly)****GEARS - BUSHINGS**

The gear teeth and side engagement teeth (synchroniser crown) should not be notched or excessively worn.

Also check that the inner gear surfaces do not show signs of binding or excessive wear.

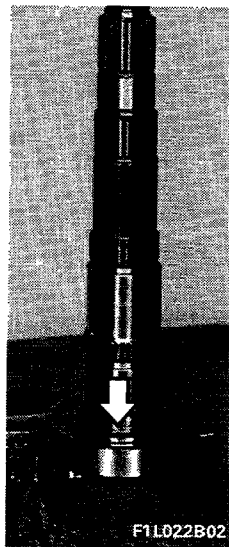
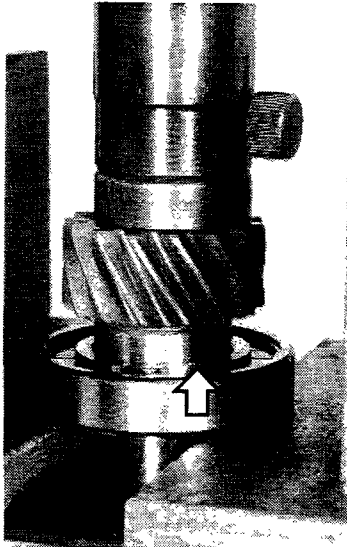
HUBS - SLEEVES

Check that the 1st-2nd gear hubs and sliding sleeves do not show signs of notching and that they slide over one another without excessive play or binding. Replace internal sleeve teeth if they are worn.

BEARINGS

Replace bearings whenever scoring, excessive play or wear are noted.

21-27.

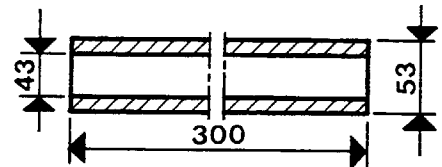


parts involved with transmission oil prior to final assembly.

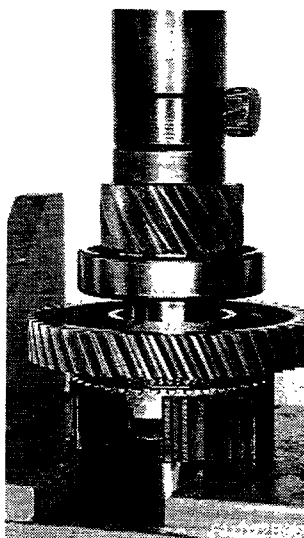
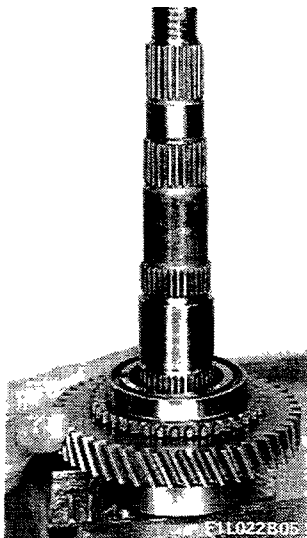
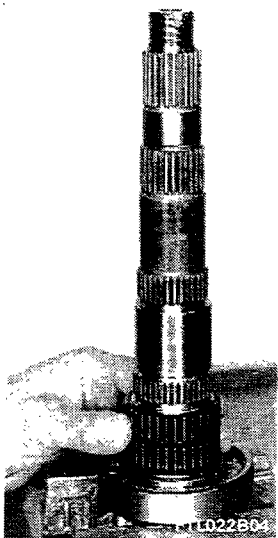
Installing front bearing and retaining ring on layshaft



Use a tool of the size and shape shown below in order to fit front bearing properly.



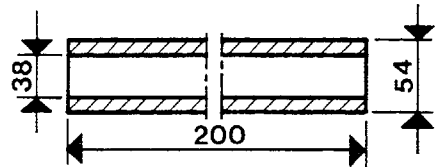
F1L022B03



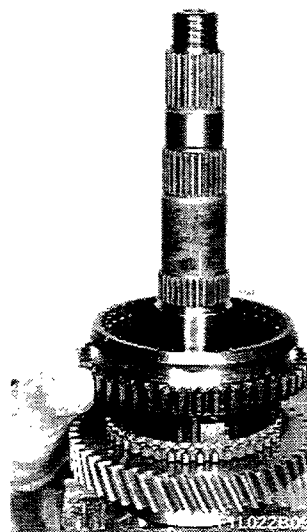
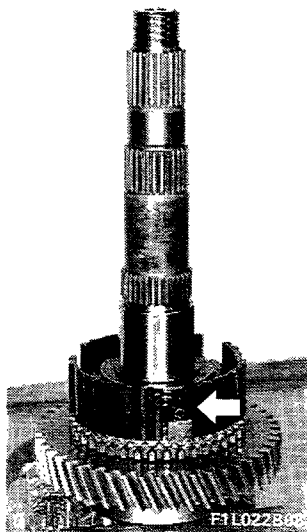
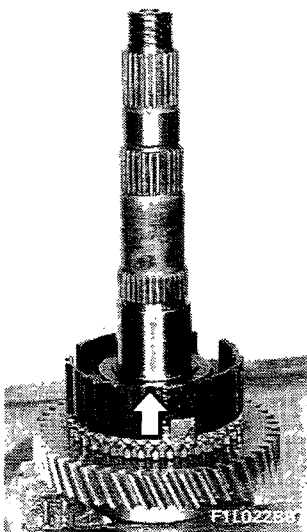
Installing roller bearing, 1st speed driven gear and hub for 1st-2nd speed sliding sleeve



Use a tool of the size and shape shown below to fit hub properly.



F1L022B10

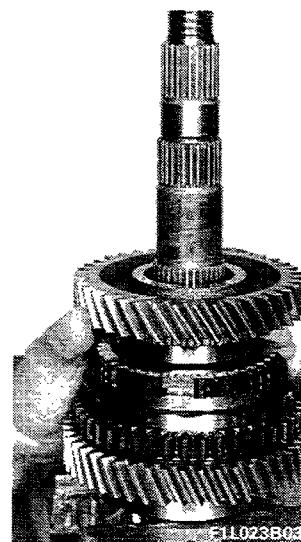
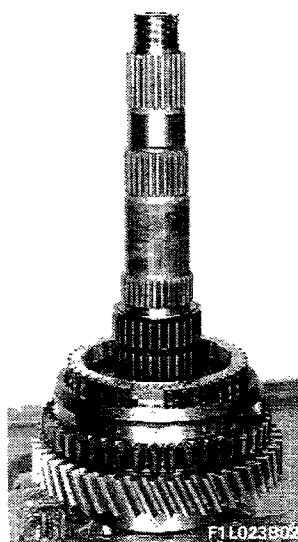
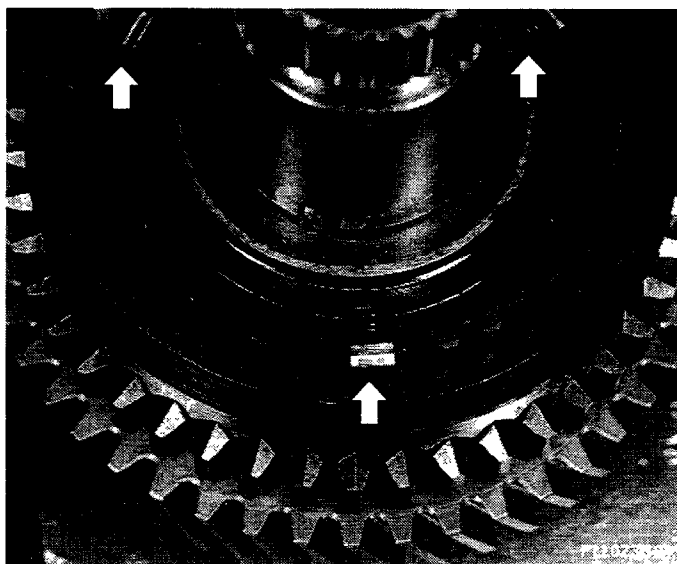


Installing hub retaining ring, springs for rollers and 1st-2nd speed sliding gears and reverse gear (external part)

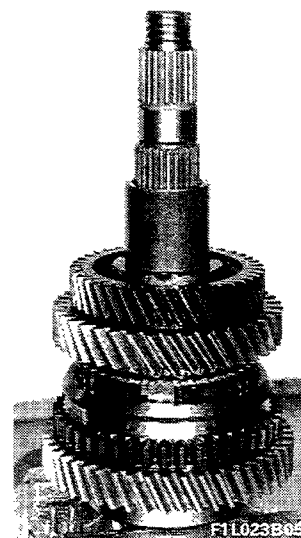
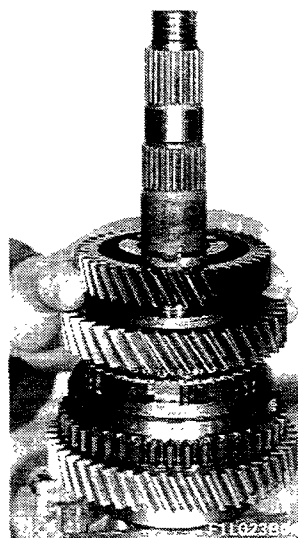


Move the sliding sleeve to neutral position in order to avoid losing synchroniser rings and rollers

Using a screwdriver, fit the three synchroniser rollers between the springs positioned on the hub and the grooves on the 1st-2nd speed engagement sleeve

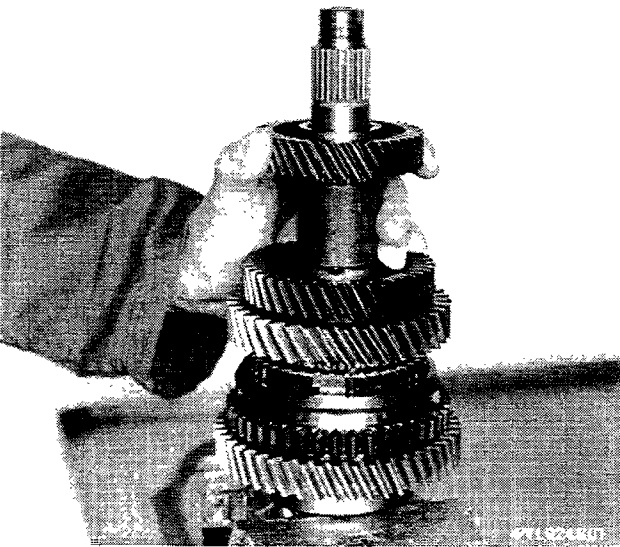


Installing 2nd speed synchroniser ring and 2nd speed driven gear

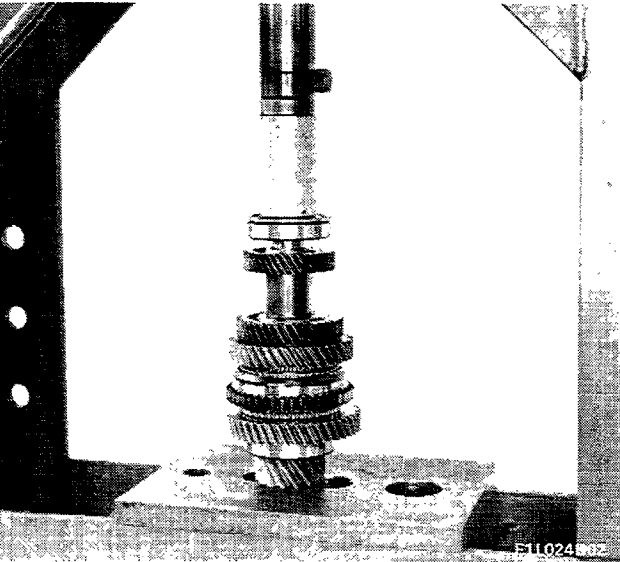


Installing 3rd speed driven gear and spacer

21-27.



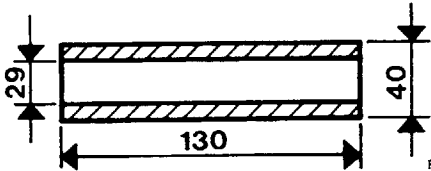
Installing 4th speed driven gear



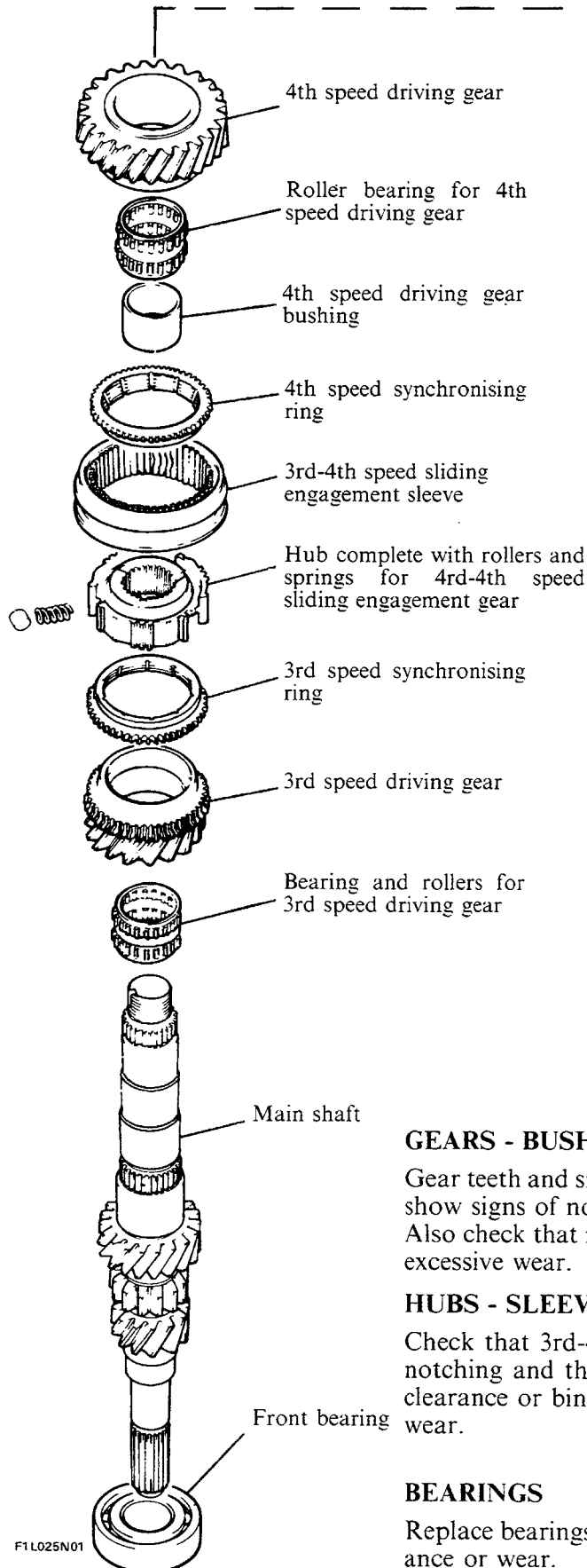
Fitting rear bearing to layshaft



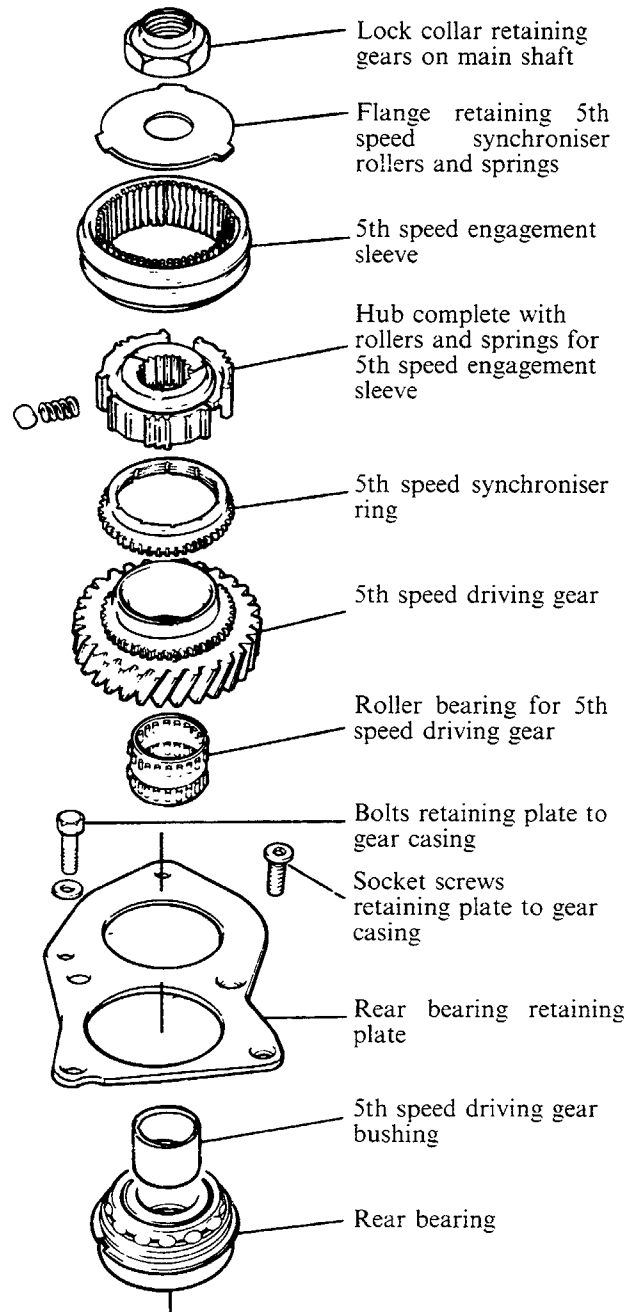
Use a tool of the size and shape shown below in order to fit rear bearing properly.



F1L024B03

LAYSHAFT (assembly)

F1L025N01

**GEARS - BUSHINGS**

Gear teeth and side engagement teeth (synchroniser crown) should not show signs of notching or excessive wear.

Also check that internal gear surfaces do not show signs of binding or excessive wear.

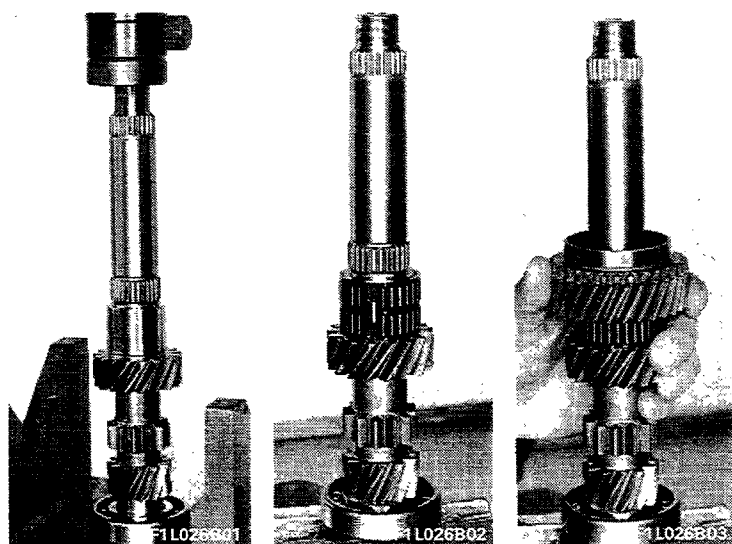
HUBS - SLEEVES

Check that 3rd-4th-5th speed hubs and sliding sleeves are free from notching and that the two slide over one another without excessive clearance or binding. Replace sleeves if inner surfaces show signs of wear.

BEARINGS

Replace bearings whenever they show signs of scoring, excessive clearance or wear.

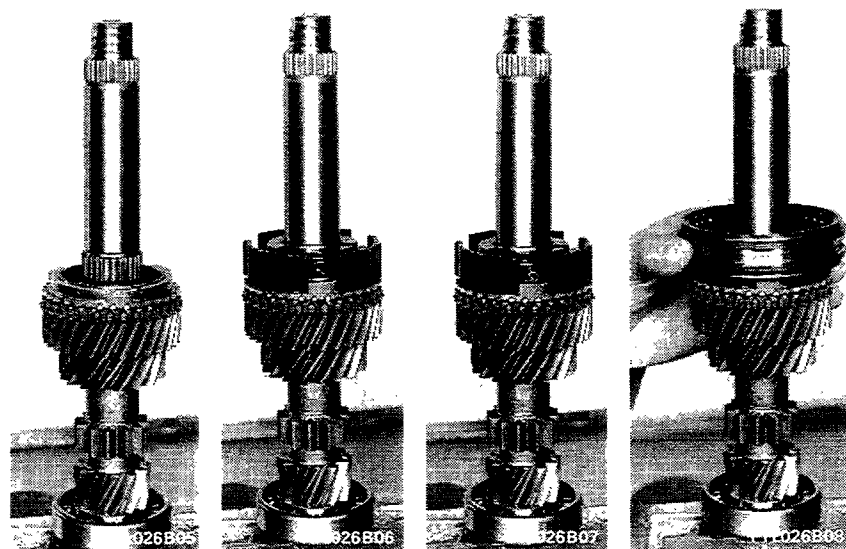
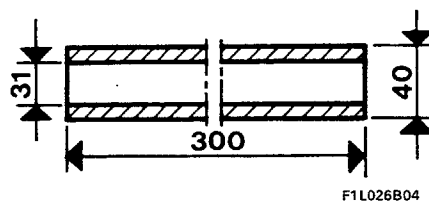
21-27.



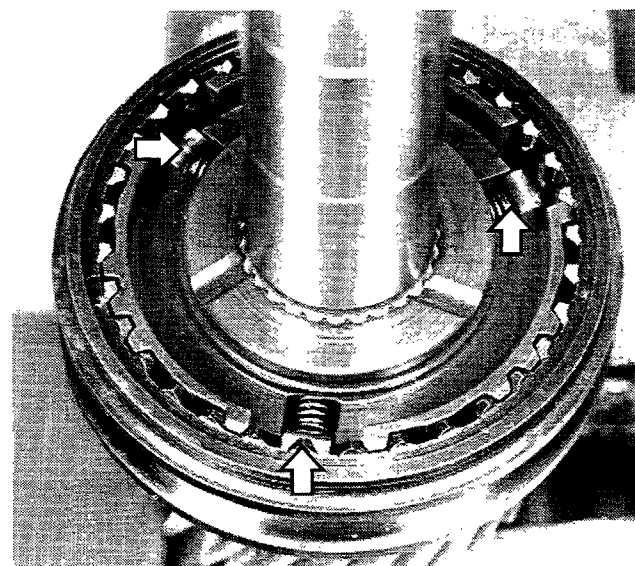
Fitting front bearing, roller bearing and 3rd speed driving gear to main shaft



Use a tool of the size and shape shown below in order to fit front bearing properly.



Installing 3rd speed synchroniser ring, 3rd-4th speed engagement sleeve hub, springs for rollers and 3rd-4th speed engagement sleeves



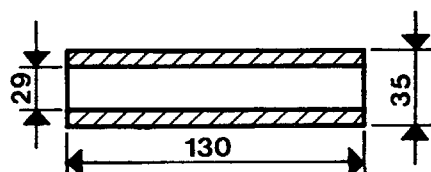
Move sliding sleeve to neutral position to avoid losing synchroniser springs and rollers.

Using a screwdriver, fit the 3 synchroniser rollers between the springs positioned on the hub and the grooves on the 3rd-4th speed engagement sleeve

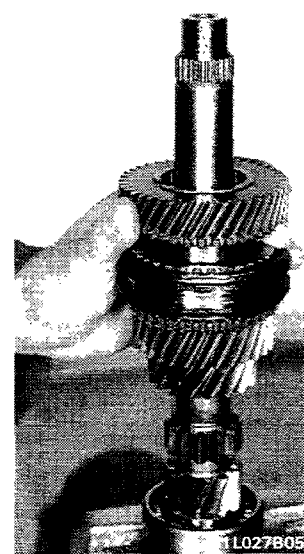
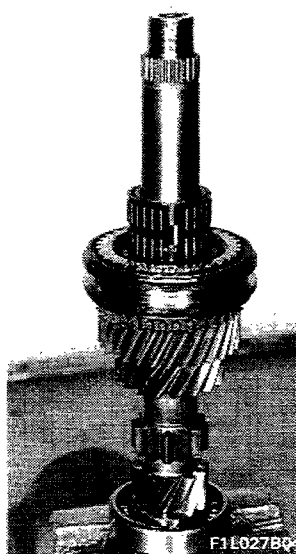
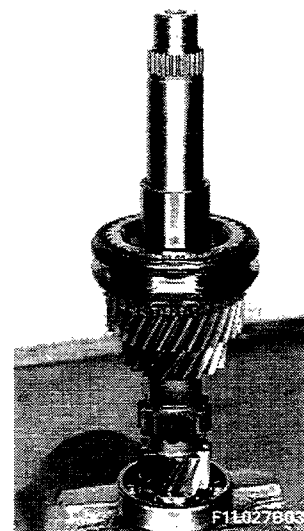
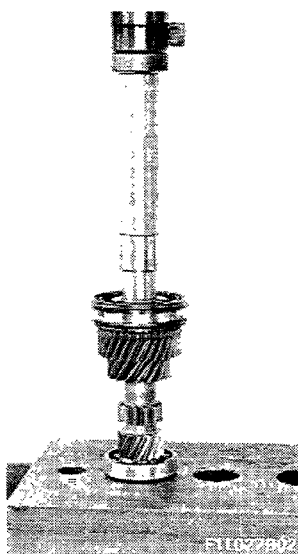
Fitting bushing for 4th speed driving gear and 4th speed synchroniser ring



Use a tool of the size and shape below in order to fit 4th speed driving gear bushing properly.



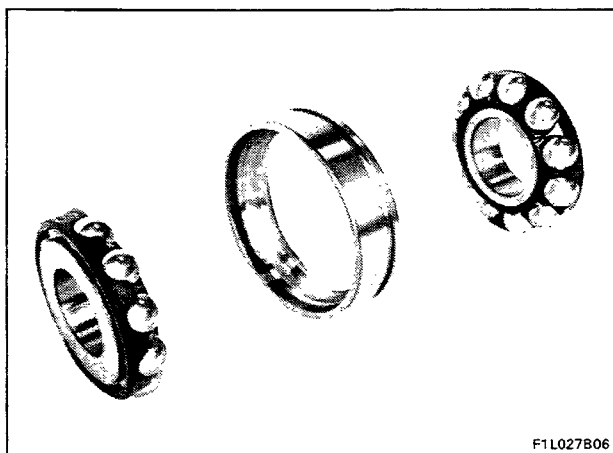
F1L027B01



Fitting roller bearings and 4th speed driving gear

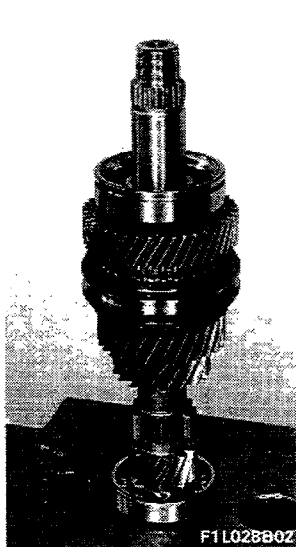
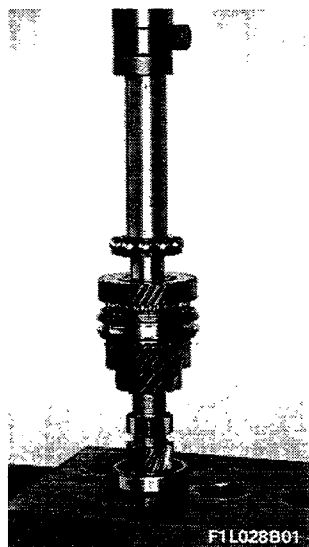
Rear bearing

Check that the outer race, inner race and balls do not show signs of scoring, overheating or excessive wear - otherwise replace entire rear bearing unit.



F1L027B06

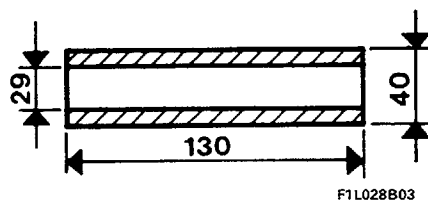
21-27.



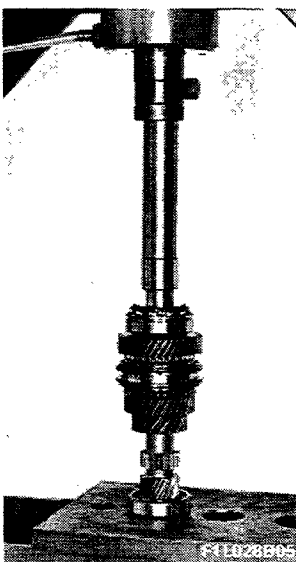
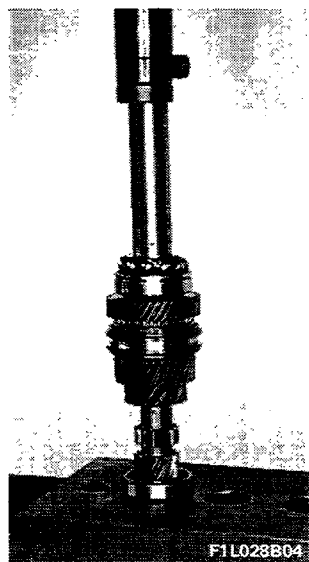
Fit the inner race, cage and ball ring (front)



Use a tool of the size and shape shown below in order to fit components correctly.



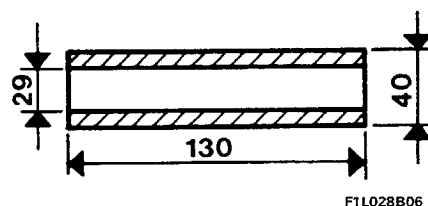
Fit rear bearing outer race



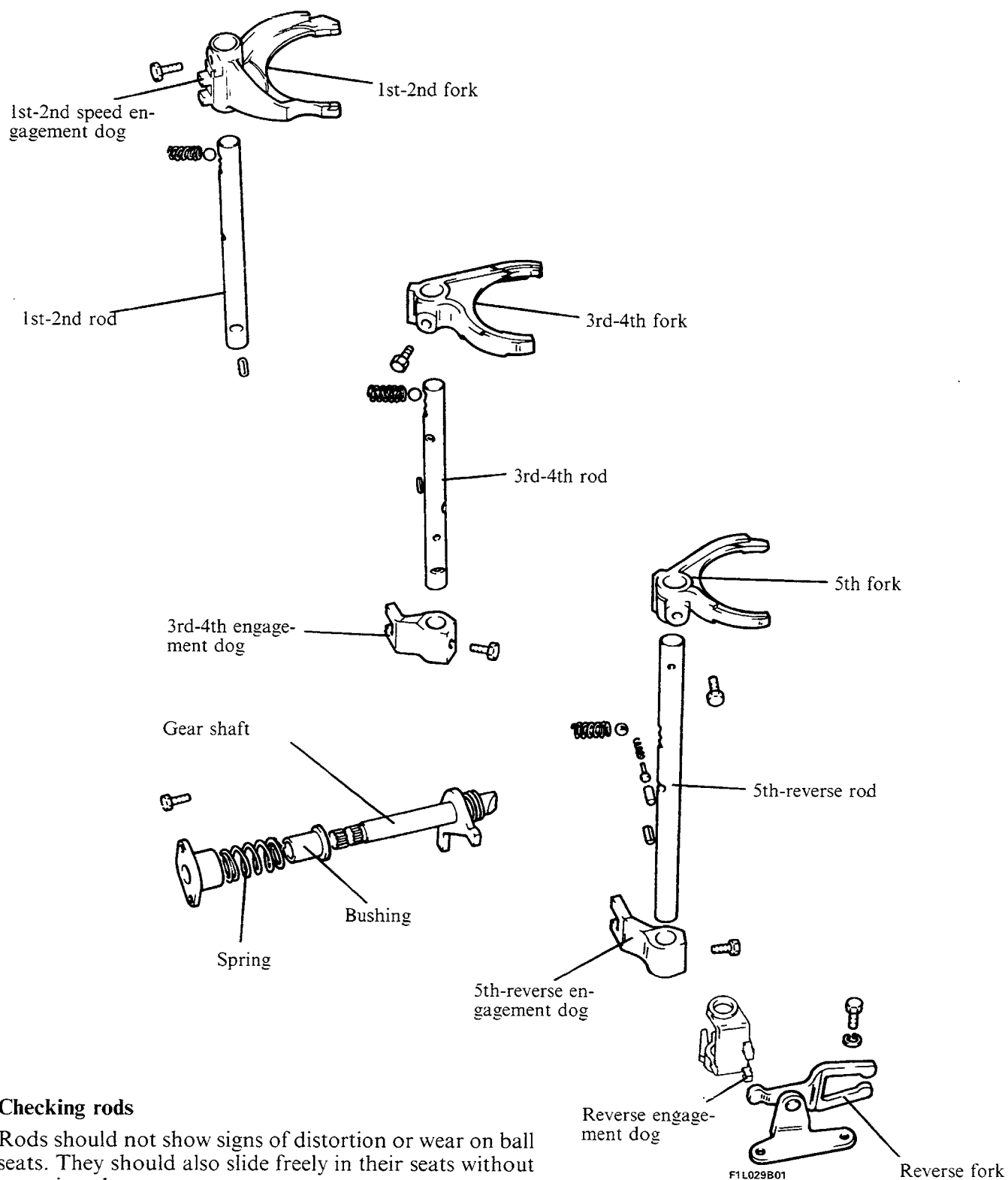
Fit the inner race, cage, ball ring (rear) and bushing for 5th speed driving gear



Use a tool of the size and shape shown below in order to fit above components properly.



RODS AND FORKS

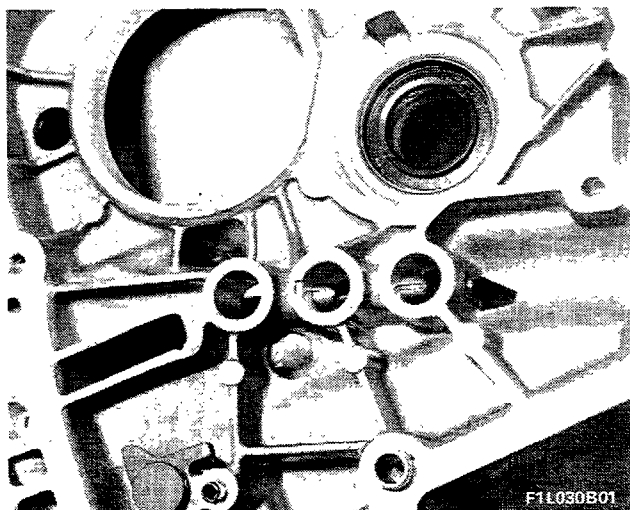
**Checking rods**

Rods should not show signs of distortion or wear on ball seats. They should also slide freely in their seats without excessive play.

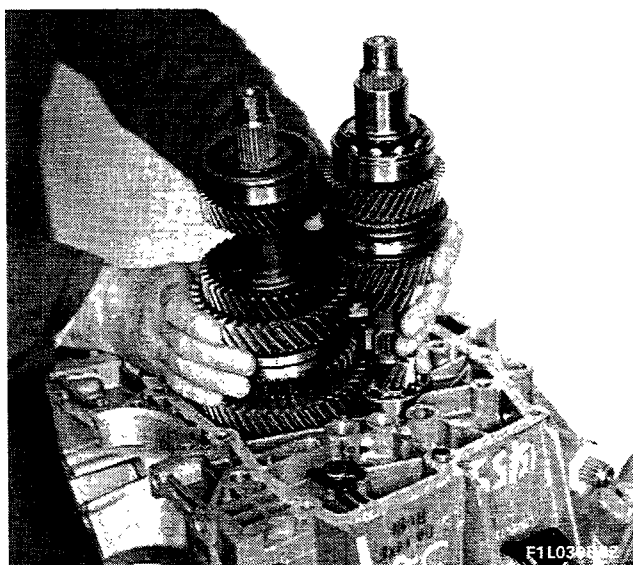
Checking forks

Forks should not show signs of distortion or wear on sliding sleeve contact surfaces.

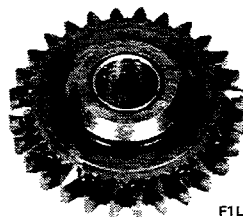
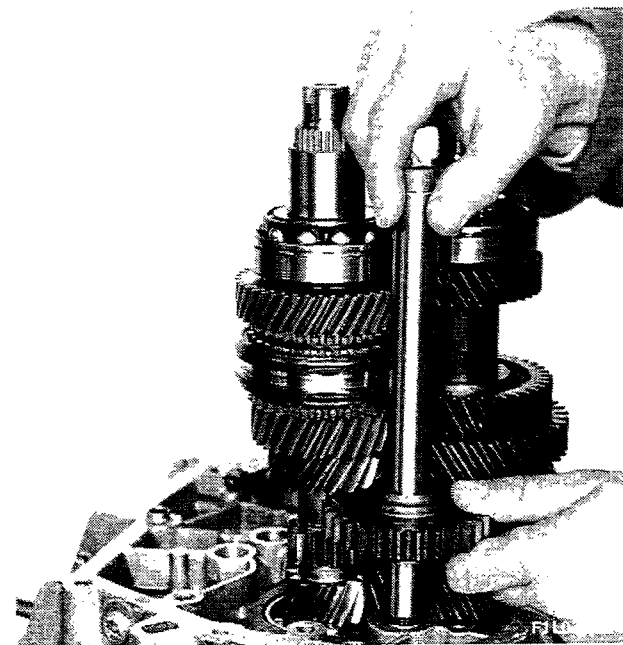
21-27.



Fitting safety pawls



Fitting main and layshaft assembly



F1L030B05

Fitting reverse idler shaft and gear

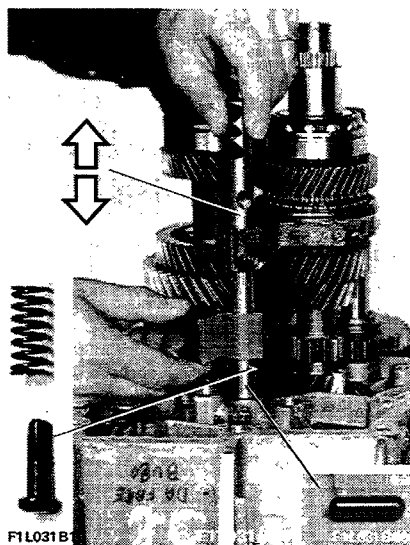


The reverse idler gear must be fitted so that the engagement teeth face downward.

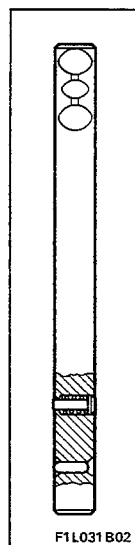
Fitting 3rd-4th speed rod, fork and dog



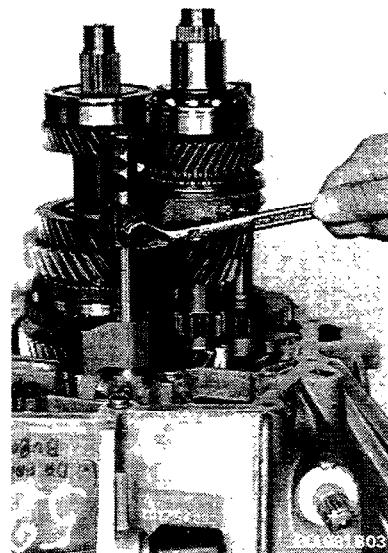
Before fitting the rod, position the spring, safety catch for locking reverse dog (when 5th speed is engaged) and safety pawl that prevents simultaneous engagement of more than one gear.



F1L031B1



F1L031B02

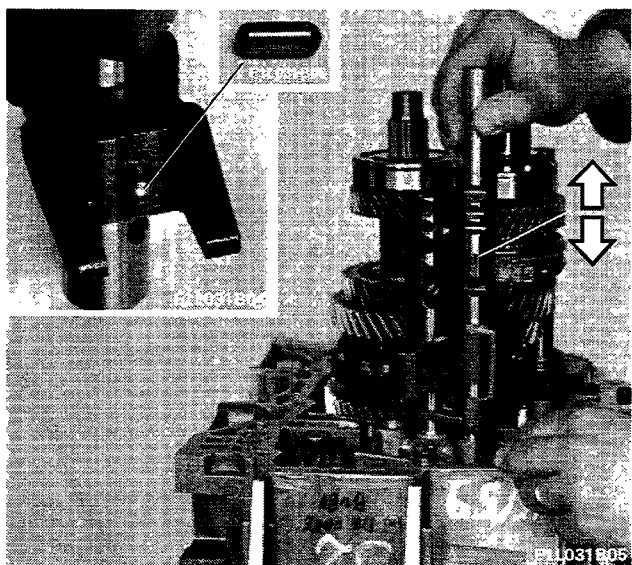


F1L031B03

Fitting 5th speed and reverse rod and dog



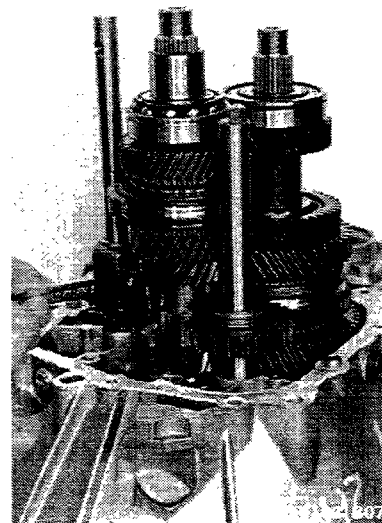
Before fitting dog, position the safety pawl for locking reverse dog during engagement of 5th gear.



F1L031B05



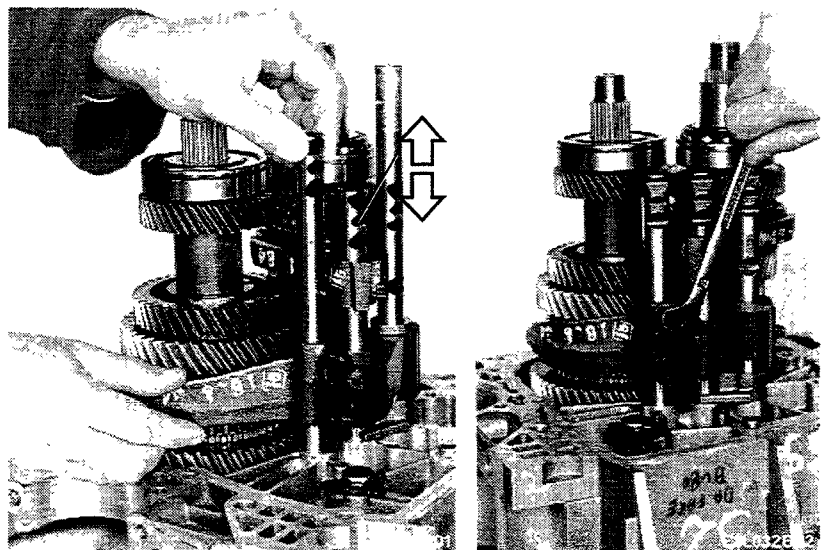
F1L031B06



F1L031B07

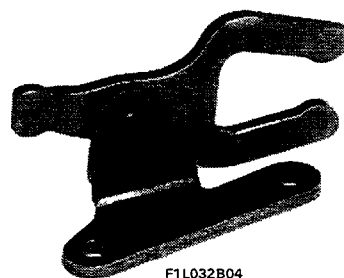
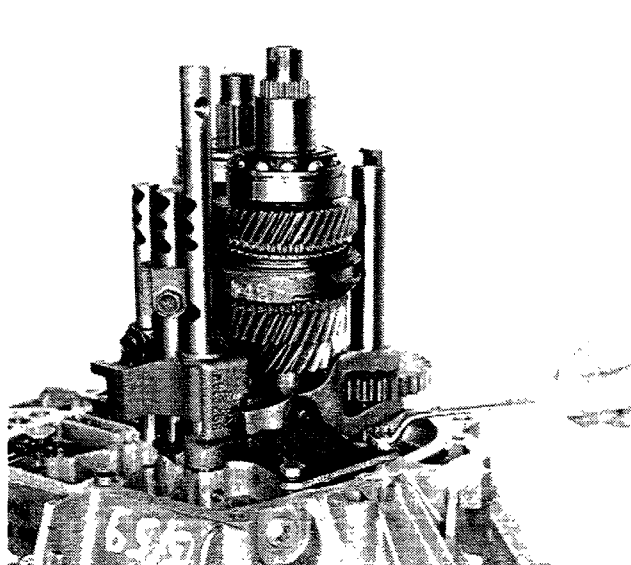
Fitting 5th speed and reverse dog retaining bolt to rod

21-27.

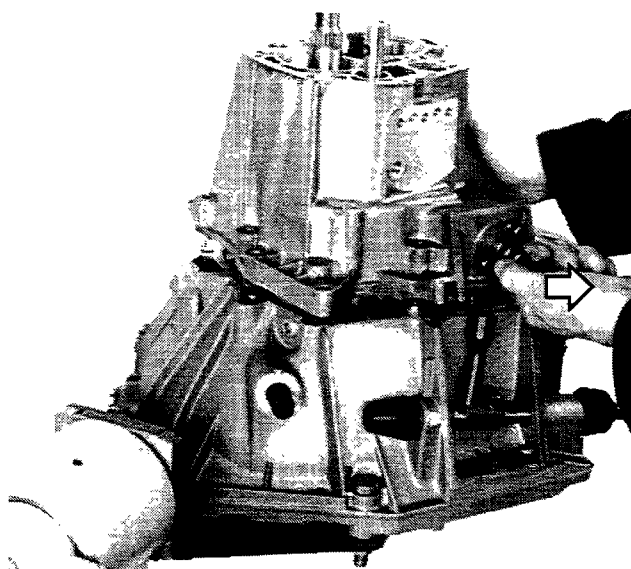


Fitting 1st-2nd speed rod and fork

Move 3rd-4th speed rod to and fro as arrowed to facilitate assembly.



Fitting reverse idler gear fork



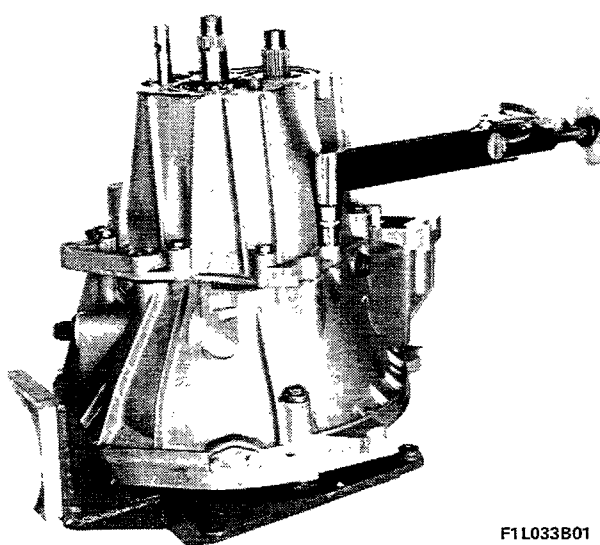
Fitting gear casing

Move gear shift lever back as indicated by the arrow so that the end of the lever engages with the dogs.

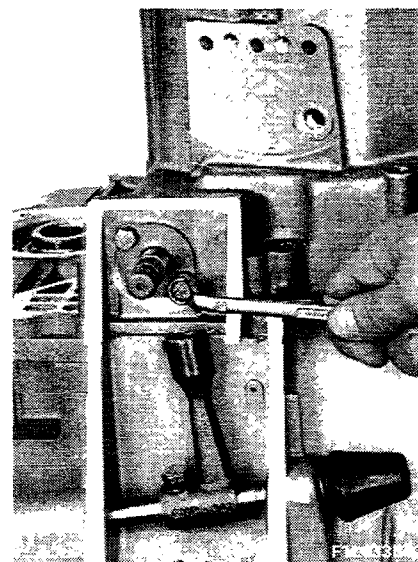


Spread LOCTITE (573) sealant over the contact surfaces between the bell housing and gear casing.

Fitting gear casing
and final tightening of
bolts retaining
bushing to gear casing



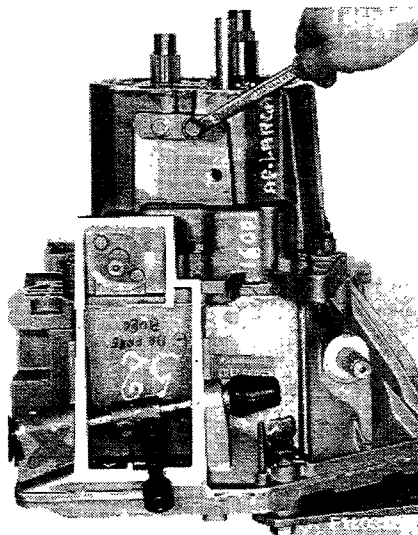
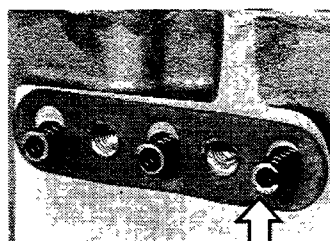
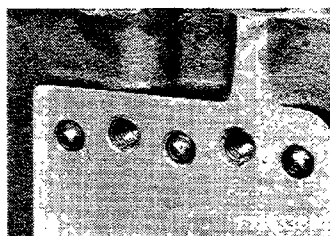
F1L033B01



Fitting gear lever positioning balls and
springs



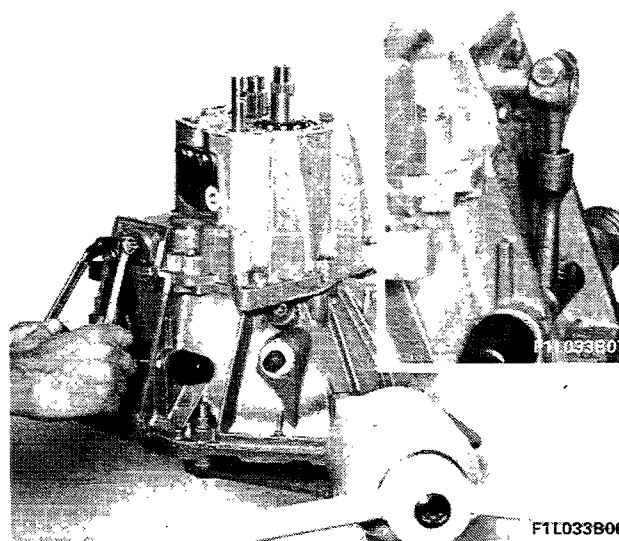
*The arrow indicates the spring
with the largest wire diameter to be
fitted to the 5th speed and reverse
rod.*



Fitting idler lever for gear engagement

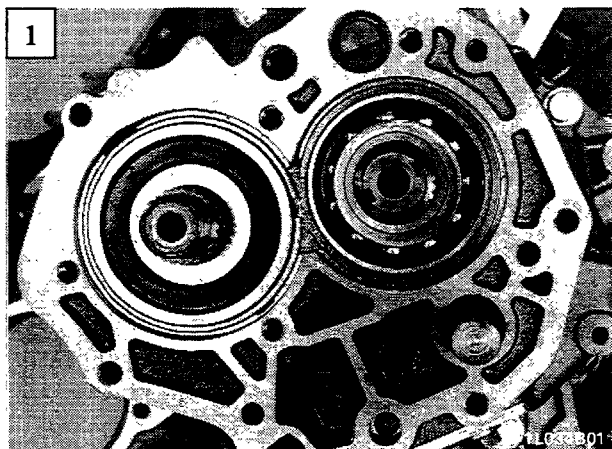


*Fit the idler lever as shown in the illus-
tration to ensure efficient gear engage-
ment.*



F1L033B06

21-27.



Fit bearing retaining rings



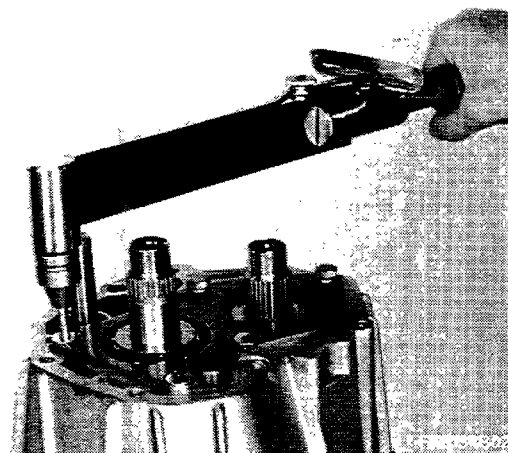
To facilitate installation of retaining rings, arrange them so that their openings face to the front as shown.



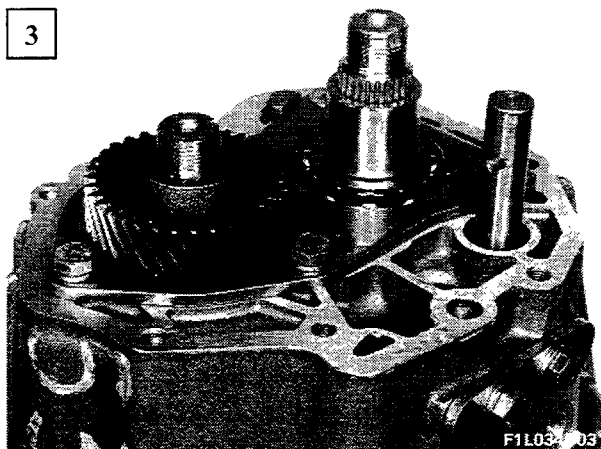
2



2,5 daNm



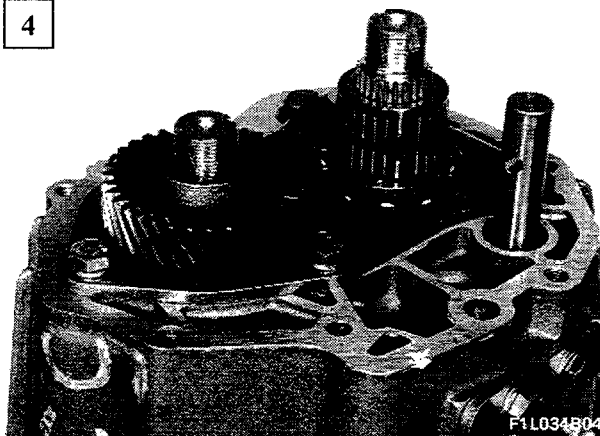
Fit rear bearing retaining plate



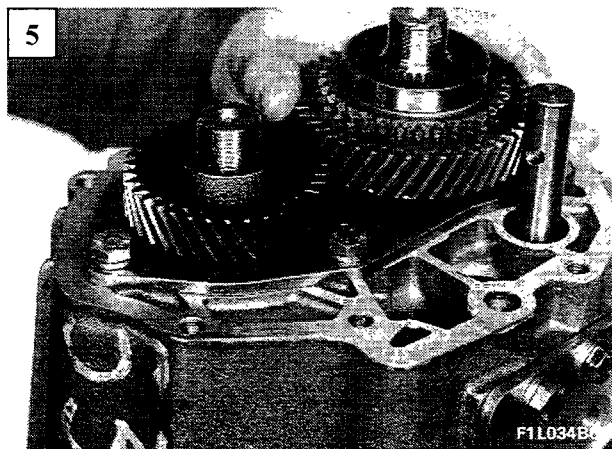
Fit 5th speed driven gear to layshaft



4



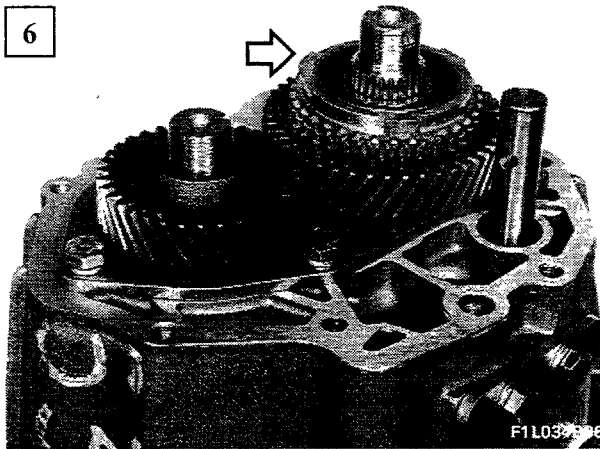
Fit needle roller bearing for 5th speed driving gear to bushing (located on mainshaft)



Fit 5th speed driving gear on roller bearing

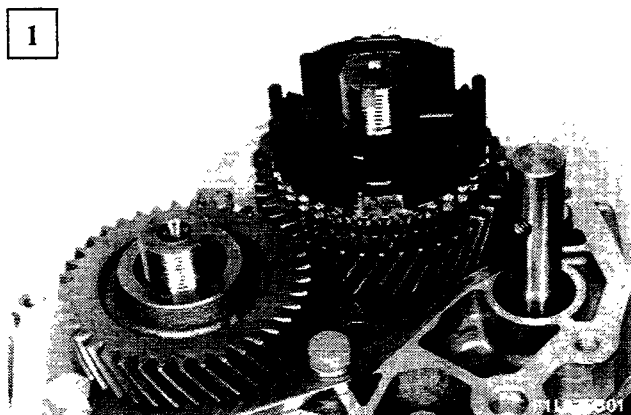


6

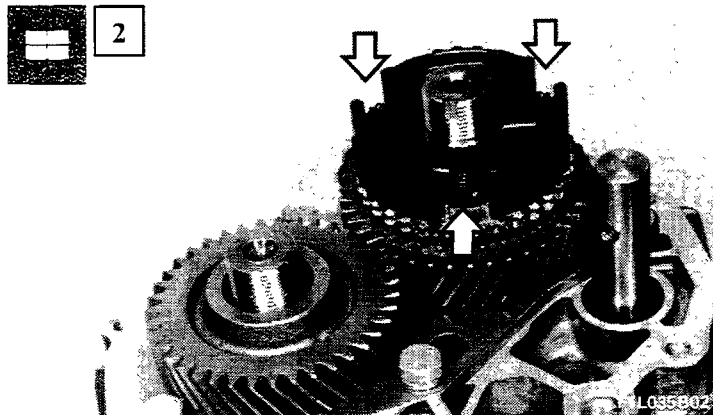


Fit synchroniser ring on 5th speed driving gear

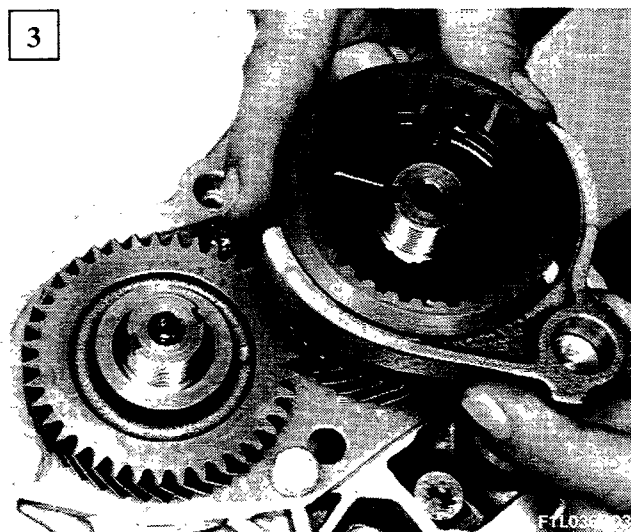
The numbers on the top left of the illustrations indicate the order in which the operations should be carried out.



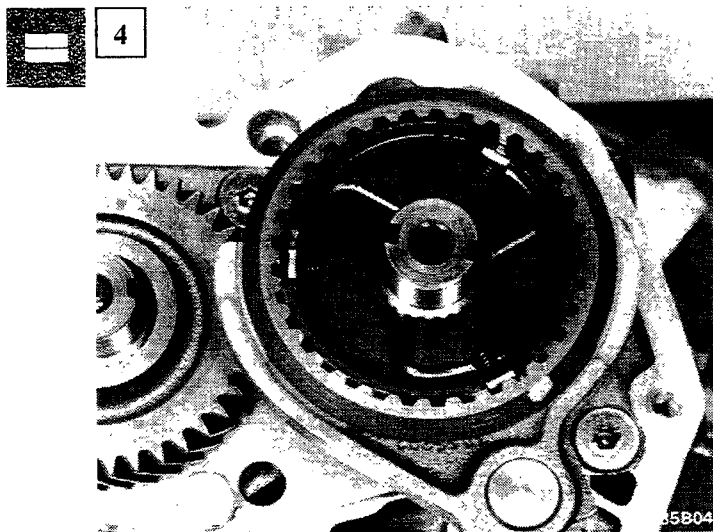
Fitting 5th speed engagement sleeve hub



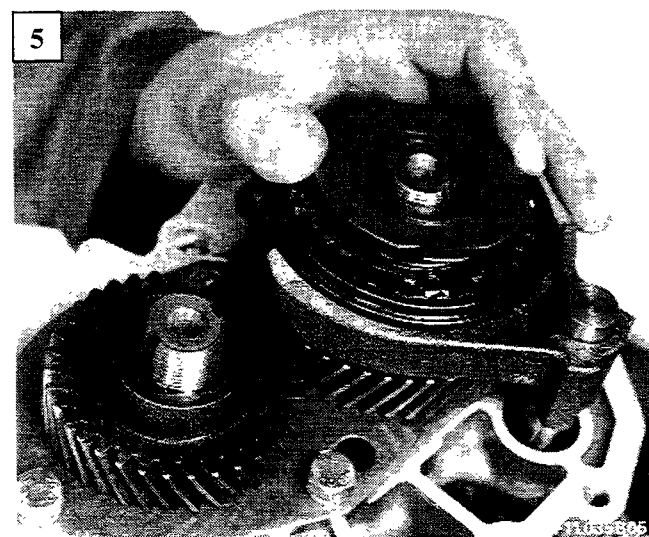
Fitting synchroniser spring on 5th speed engagement sleeve hub



Fitting 5th speed sliding sleeve and fork



Using a screwdriver, fit the 3 synchronisation rollers between the springs on the hub and the grooves on the 5th speed engagement sleeve

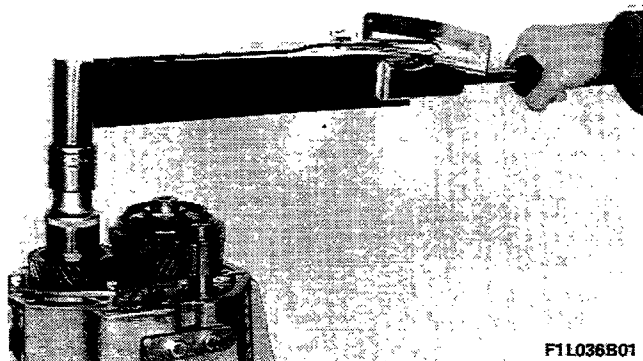


Move the sliding sleeve to neutral position to avoid losing the springs and synchroniser rollers

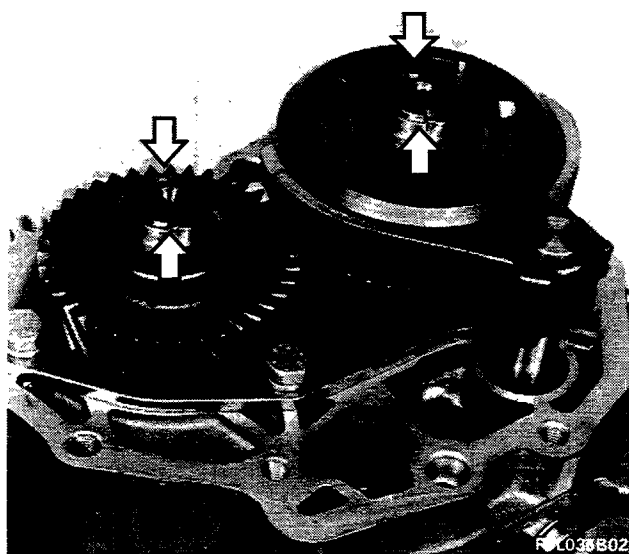
Fit roller retaining flange and 5th speed synchroniser springs

The numbers on the top left of the illustrations indicate the order in which the operations are to be carried out.

21-27.



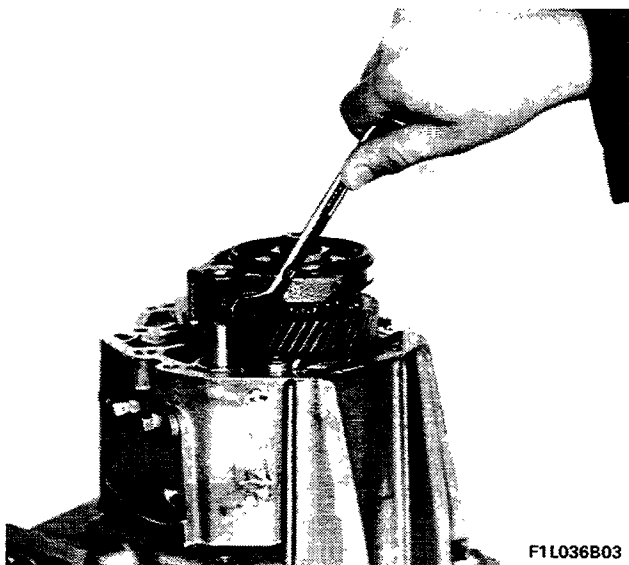
Tightening main and layshaft gear lock collars



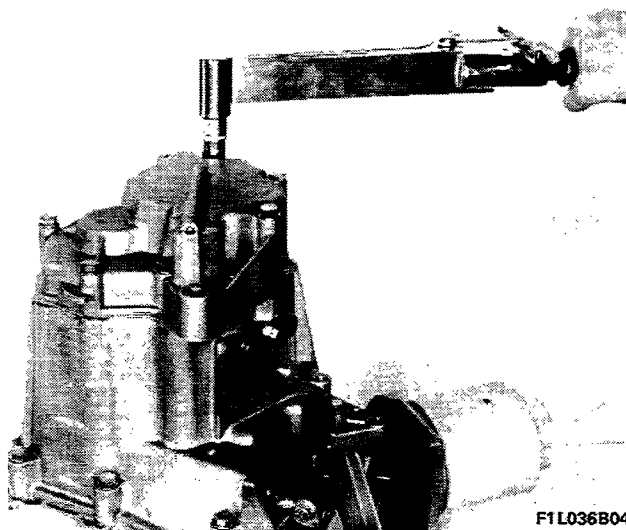
Staking main and layshaft gear lock collars



Renew gear lock collars whenever they are removed.



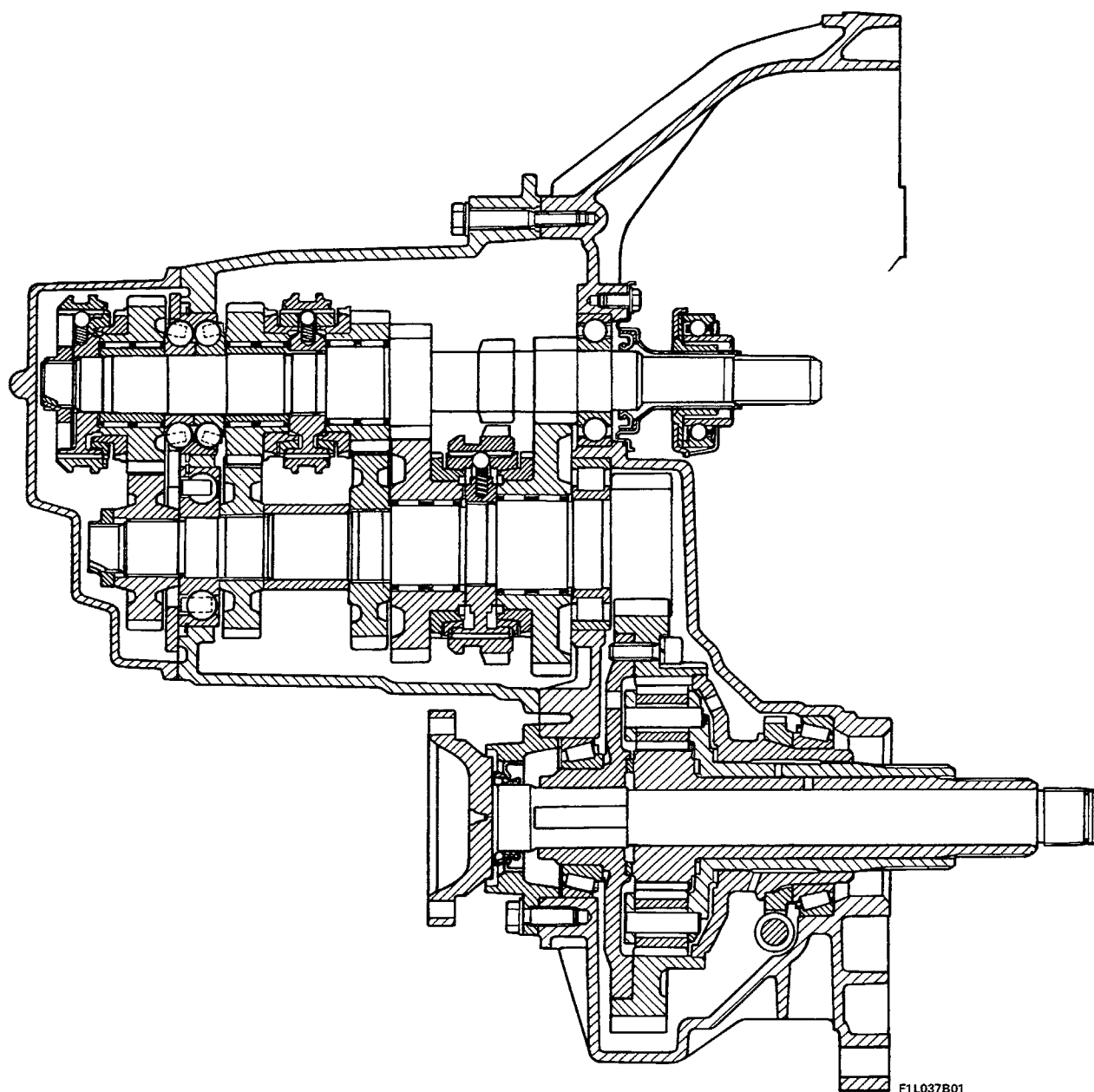
Fitting 5th speed fork retaining bolt



Fitting rear cover

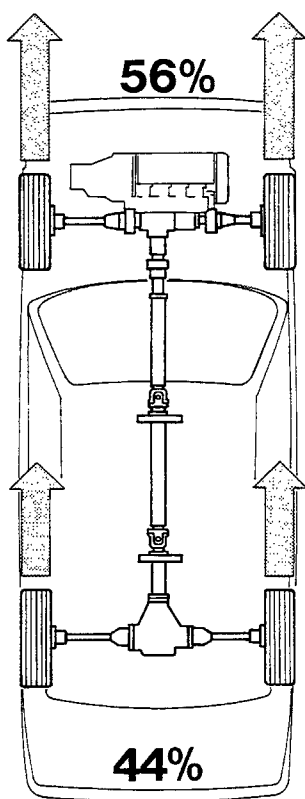


Spread LOCTITE (573) on the contact surfaces between bell housing and rear cover.



Longitudinal section through gearbox-differential

21-27.



FOUR WHEEL DRIVE

The main feature of the LANCIA four wheel drive system is an asymmetrical torque distribution of 56% to the front axle and 44% to the rear axle. This system provides slightly more driving torque at the front axle to permit maximum possible speed under slippery conditions for a front-engined vehicle.

Compared to two-wheel drive, a four-wheel drive system permits the torque to be distributed over two wheel contact surfaces. This permits:

- Better traction on poor road surfaces, especially when the friction coefficient is extremely low as on gravel, snow, ice, mud etc.
- improved hill-climbing ability
- better grip during cornering.

DRIVE TRANSMISSION

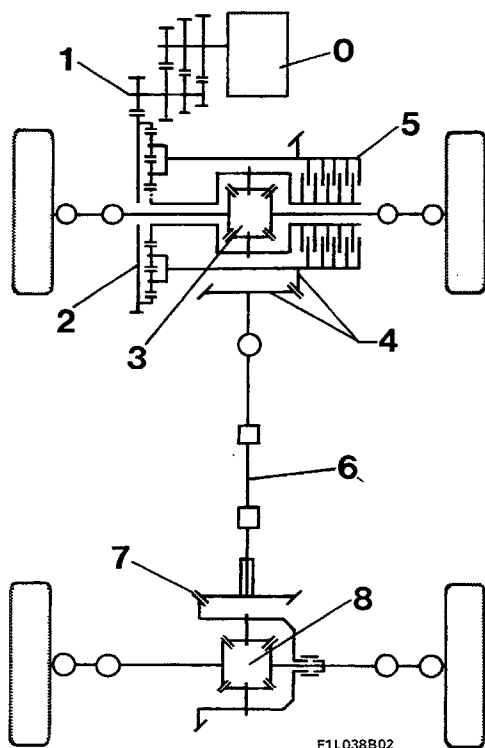
The four wheel drive system hinges around an epicyclic differential or torque distributor (2). This receives drive produced by the engine via the gear layshaft (1) and transmits it via an epicyclic gear system to the differentials at the front (3) and rear (8) axles.

The epicyclic distributor consists of a crown wheel (A) with internal and external teeth that receives drive via its external teeth and transmits it via the internal teeth to the first satellite (C) which meshes with the second satellite (D) that in turn meshes with pinion (E). Three pairs of satellites (120° apart) evenly distribute the transmitted force. The satellites turn freely on their shafts that are fixed to carrier (F). Hollow shaft (G) is integral with ring wheel (H) that transmits drive across bevel pinion (I) and propeller shaft (6) to rear differential (8).

The pinion hollow shaft is integral with front differential casing (L) and drive is therefore transmitted directly to the front wheels.

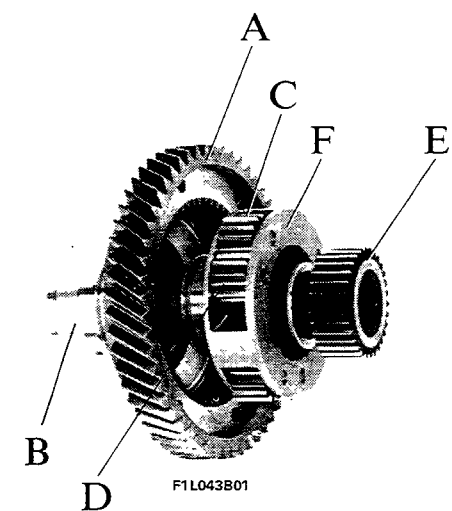
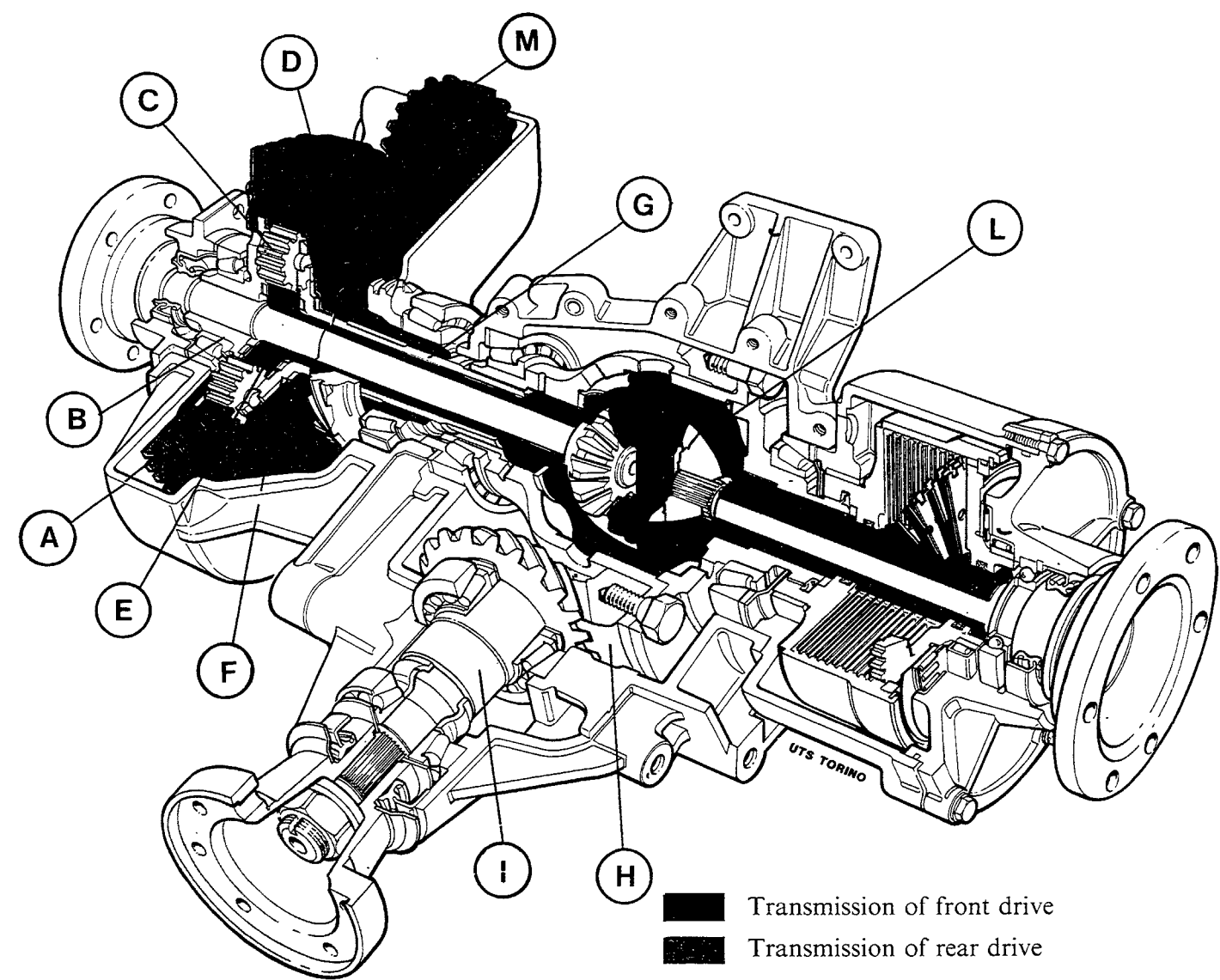
Key

0. Engine
1. Gearbox
2. Epicyclic differential or torque distributor
3. Car front differential
4. Bevel drive
5. Ferguson viscous coupling
6. Propeller shaft
7. Bevel reduction drive
8. Car rear differential



* A conventional differential can only transmit an equal torque to each satellite and thus to each drive shaft. The torque distributor or central differential can: 1) transmit the same torque, or different torques, to the 2 axles of the car 2) produce a different number of revs at front and rear axles. This function is essential since it prevents transmission components and tyres being subjected to harmful forces (when one set of wheels faces a bump or pot-hole while the other travels over flat ground) and therefore permits safe driving up to top speed.

DIFFERENTIAL ASSEMBLY WITH EPICYCLIC DISTRIBUTOR (photograph) AND FRONT DIFFERENTIAL



- Key**
- A. Crown wheel of epicyclic system
 - B. Crown wheel shaft
 - C. 1st satellite
 - D. 2nd satellite
 - E. Pinion
 - F. Epicyclic gear train
 - G. Epicyclic train hollow shaft
 - H. Ring gear
 - I. Propeller shaft bevel pinion
 - L. Front axle differential
 - M. Gearbox spur pinion.

Operation of epicyclic differential with good grip on road

If the wheels do not slide over the ground, the 3 components of the epicyclic system turn together with the same angular velocity. The satellites are locked and transmit drive through the system components without turning about their shafts. In this case Ferguson coupling (5) that can connect the pinion shaft to the satellite carrier does not come into operation. Each pair of satellites is subject to a force system in equilibrium.

The difference between the torques transmitted by the planetary train (rear axle) and pinion (front axle) arises because, although the same force is transmitted to both systems by the crown wheel, their torque arms (i.e. arms through which the force acts) are very different and therefore give rise to two quite different torques. A first glance suggests that the torques transmitted by the planetary train and pinion should be very different from the stated ratio of 56 (front) to 44 (rear). Indeed one would imagine that the torque transmitted by the planetary train (with its much larger arm) would be greater than that transmitted by the pinion (with its much smaller arm).

In order to resolve this apparent discrepancy (see explanation on following page) we need only consider that although all teeth engaged transmit the same force, i.e. that produced by the crown wheel, the reaction of the pinion, an equal and opposite force, acts on the second satellite. As a result of this the resultant force acting on the first satellite shaft will be directed in the direction of rotation whereas the force acting on the shaft of the 2nd satellite is lesser and directed in the opposite direction. The resultant force generated by the two satellites on the epicyclic train is thus much smaller than the force transmitted by the crown wheel (and therefore than the force acting on the pinion) and acts with an arm equal to the mean radius of the rays passing through the 2 satellite shaft centre lines. For this reason the torque transmitted to the epicyclic train connected to the rear axle (44%) is smaller than the force (56%) transmitted to the pinion shaft (front axle).

21-27.

Operation of epicyclic differential on roads with low friction coefficient

If the friction coefficient of one of the 2 axles is very low and does not permit the transmission of all the torque, the other axle will transmit a reduced torque that still respects the 56%-44% ratio. The 2 satellites will now start to turn on their shafts and the revs of the crown wheel will be discharged to the epicyclic train and pinion according to the reactions offered by these components. In this event, the Ferguson coupling comes into operation almost immediately to establish a measured degree of locking with continual variations between pinion and epicyclic train dependent on the reciprocal difference in revs. Ferguson coupling operation is described on page 64. When drive reaches the 2 front or rear differentials it is relayed to the 2 drive shafts with equal or differential speed depending on the grip of the 2 wheels on the ground. The torque transmitted by each of the 2 wheels is always the same whatever the circumstances. Rear differential operation is explained on page 74.

Demonstration of asymmetrical torque distribution

T = Drive - R = Resistance applied at pinion (R equal and opposite to T) - Resultant of T and R : on satellite 1 S_1 , on satellite 2 S_2 - Tangential resultants of S_1 and S_2 : $S_1 = T_1$; $S_2 = T_2$ - Momentum generated by forces acting on satellite shafts: $T_1 \times r_1 = M_1$ (clockwise); $T_2 \times r_2 = M_2$ (anticlockwise) - $M_1 - M_2 = M_{TR}$ (resultant momentum applied to epicyclic train)

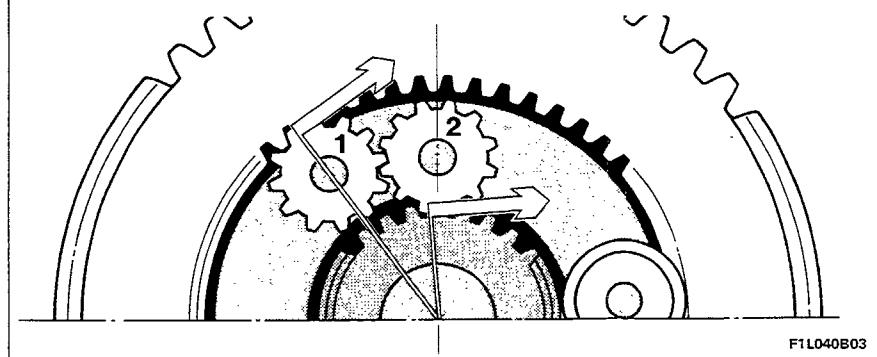
Simplified indirect demonstration of asymmetrical distribution of drive

Let us suppose that the crown wheel transmits a force of 10 daN to the 1st satellite, since the two satellites have the same no. of teeth, the 2nd satellite is bound to transmit the same force to the pinion. In a system of meshed gears, the primary radii are proportional to the number of teeth and therefore the drive transmitted by the crown wheel is proportional to 10×54 (54 = No. of crown wheel teeth) = 540; while the drive transmitted by the pinion (front axle) is proportional to 10×30 (30 = no. of pinion teeth) = 300. The drive component that must be transmitted to the other part of the system, i.e. the epicyclic train, will be $540 - 300 = 240$

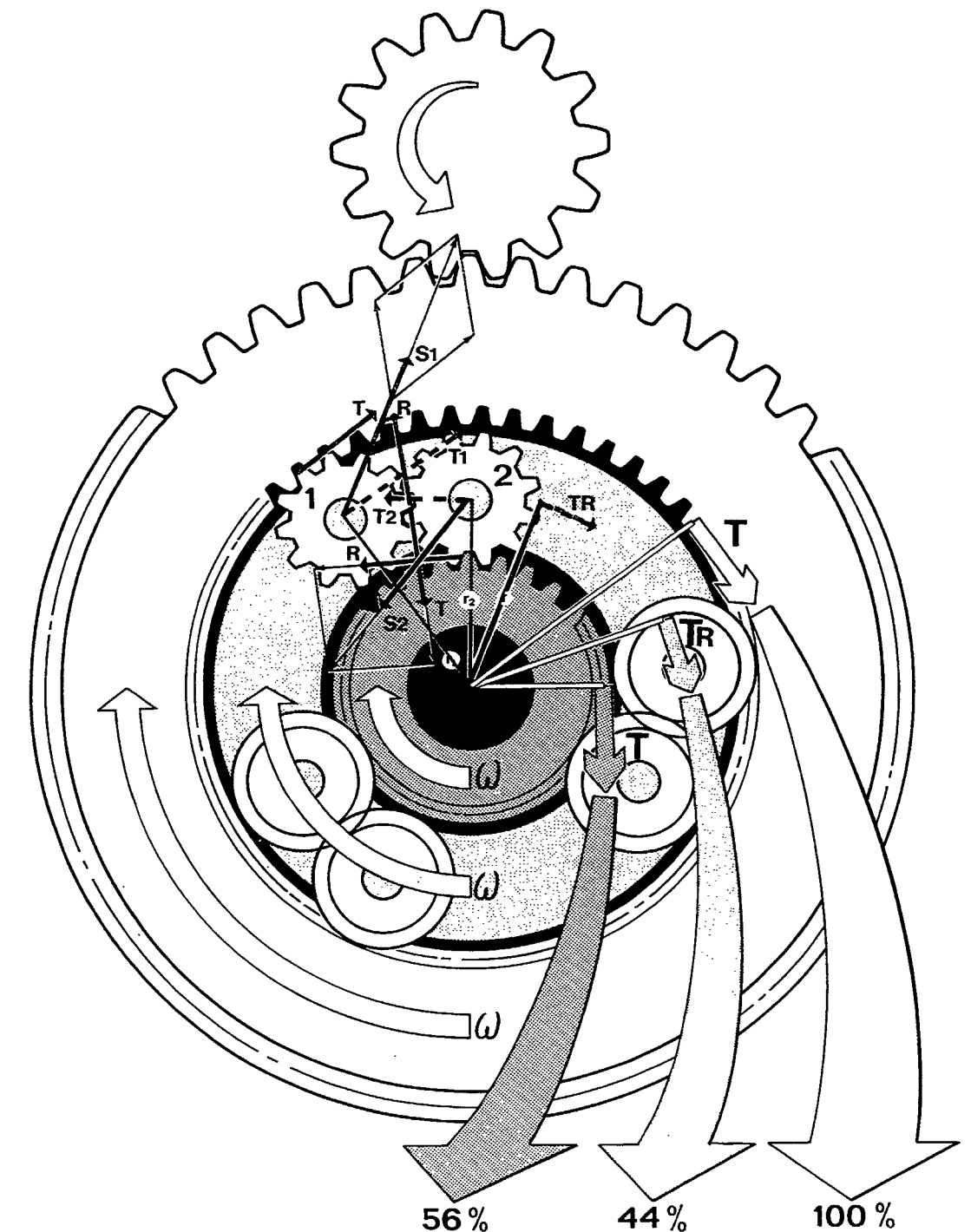
If we now compare the torques transmitted, we will obtain:

$$\frac{300}{240} = \frac{\text{pinion torque}}{\text{epicyclic train torque}} = \frac{56 \text{ (front axle)}}{44 \text{ (rear axle)}}$$

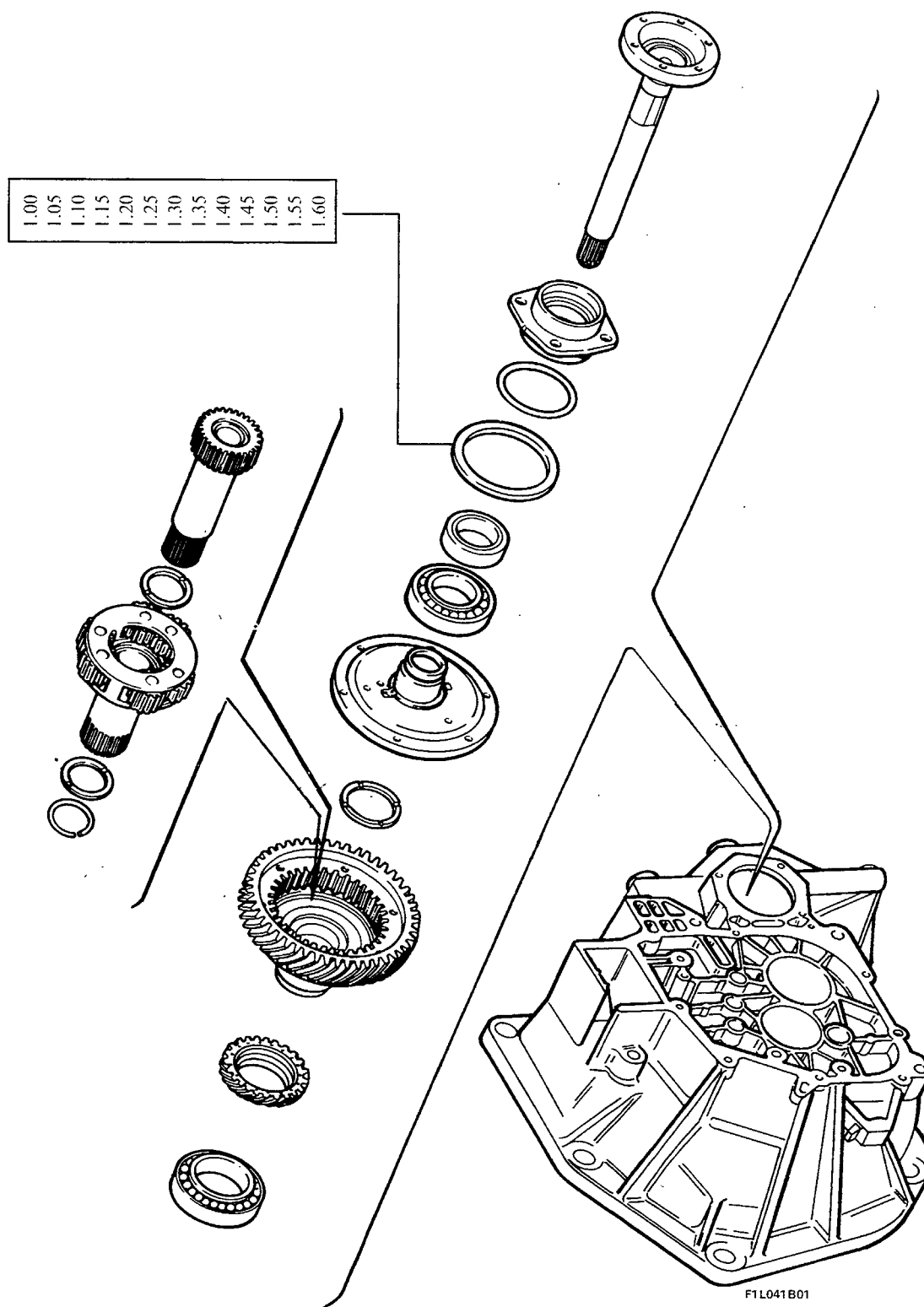
NOTE If we decrease the no. of pinion teeth and the no. of crown wheel teeth remain the same, the ratio will approach 50:50.



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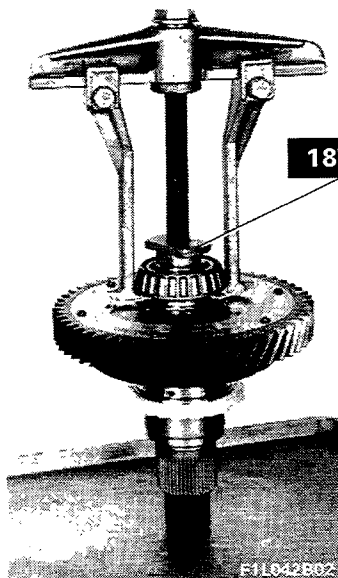
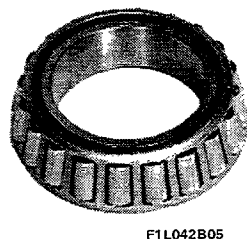
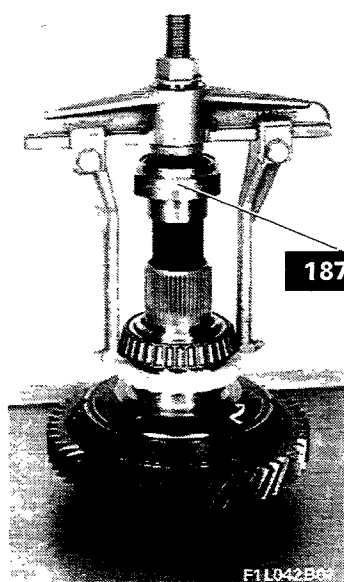


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F1L040B02



Components of central differential unit

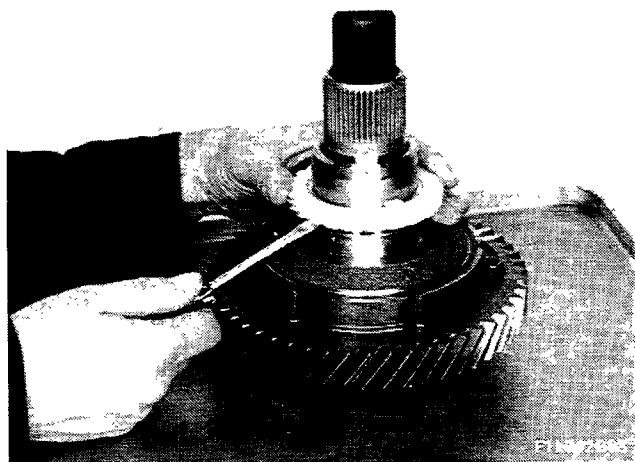
21-27.



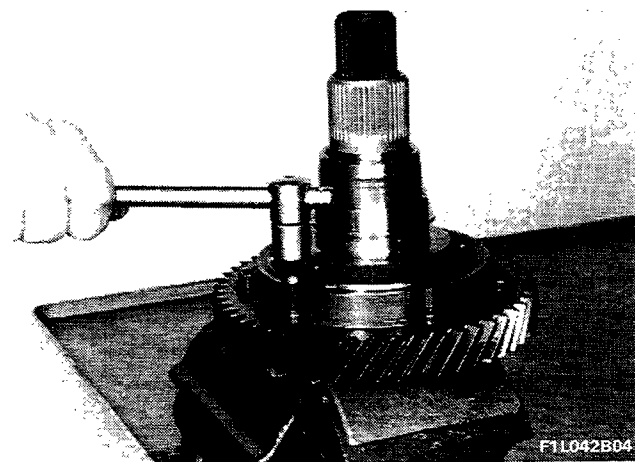
DISASSEMBLY
AND CHECKS

Remove roller bearings from differential housing

Replace bearings whenever they show signs of scoring, hot spots or excessive wear.

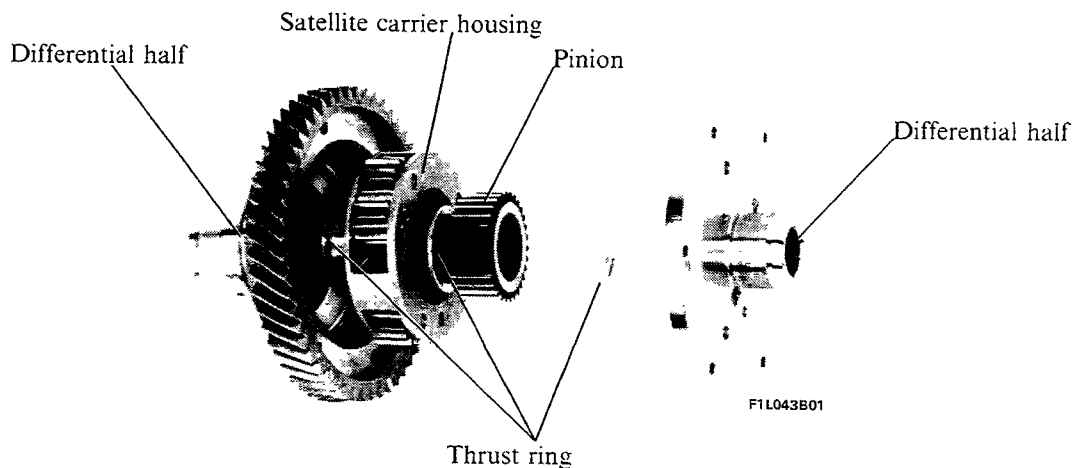


Removing mileometer gear



Removing central differential-distributor halves

Whenever it is necessary to replace the crown wheel also replace the pinion from the spur gear/pinion set.

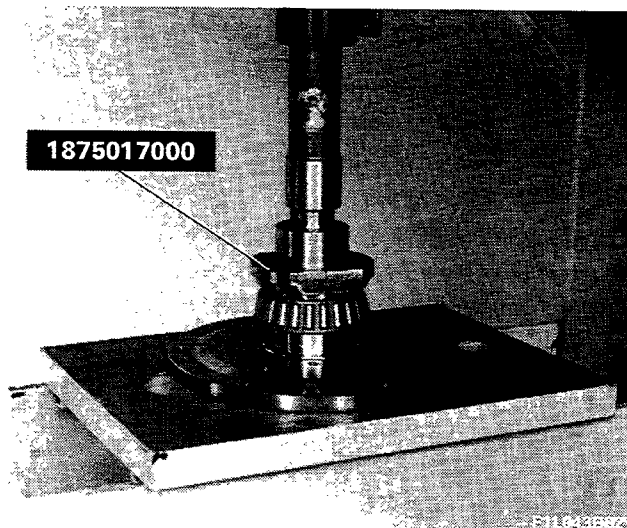


Central differential unit

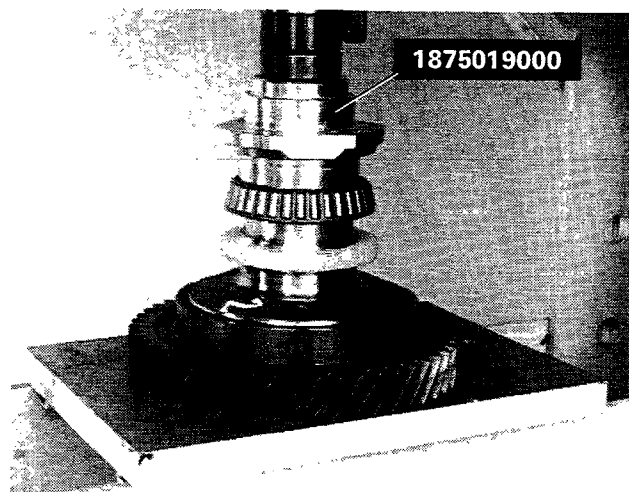


Replace parts as necessary in case of defects, noise, broken teeth or play in satellite shafts.

ASSEMBLY



Fitting roller bearing in seat on differential half



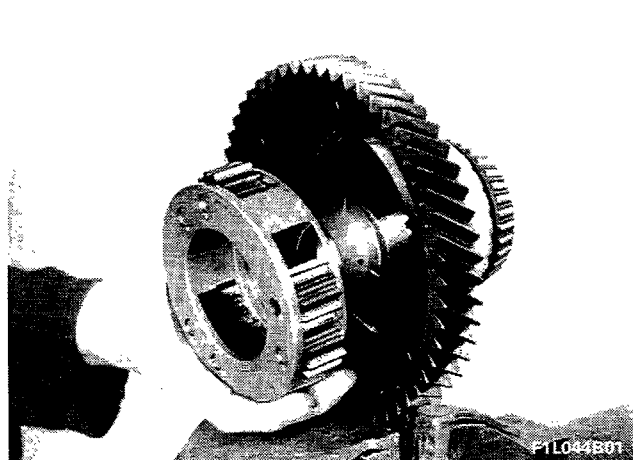
Fitting roller bearing in seat on differential half

Gearbox and differential

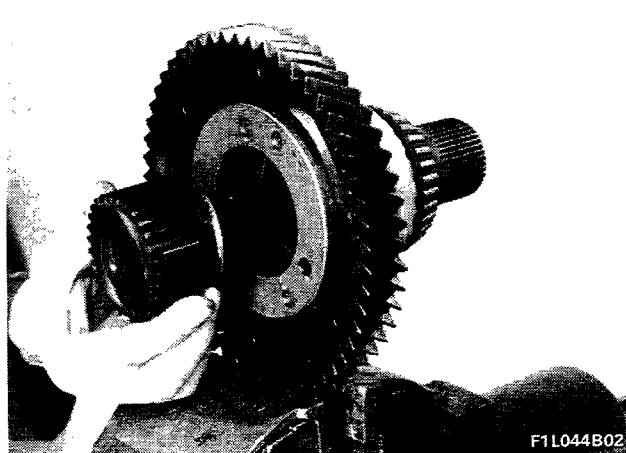
Central differential unit: distributor

21-27.

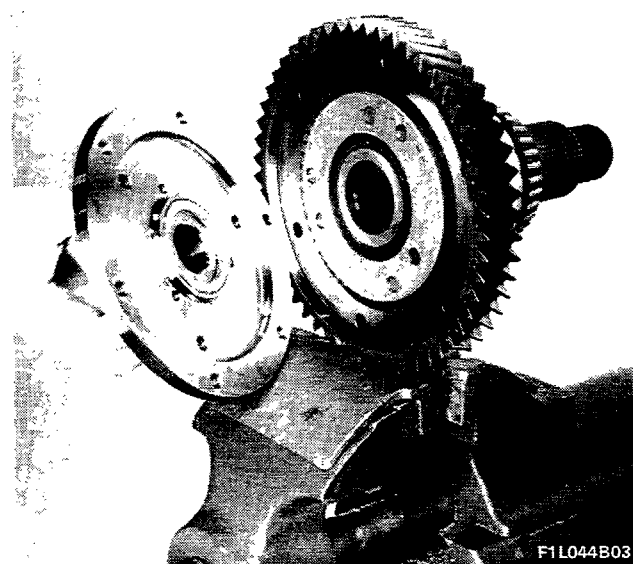
DELTA-PRISMA 4WD



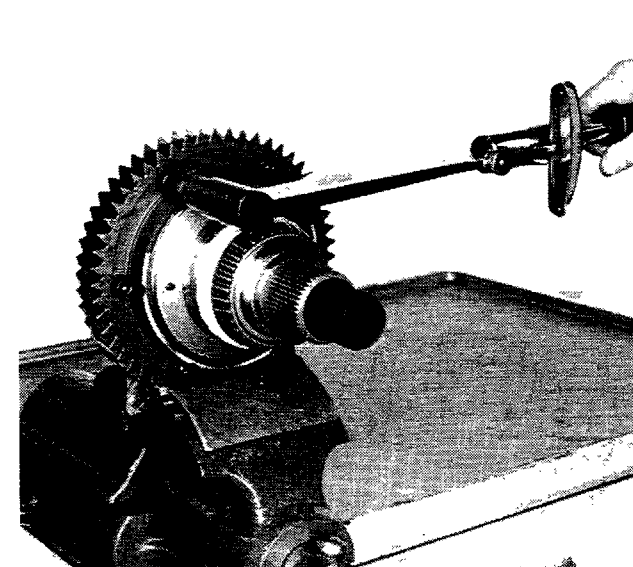
Fitting satellite carrier housing



Fitting pinion



Fitting differential housing

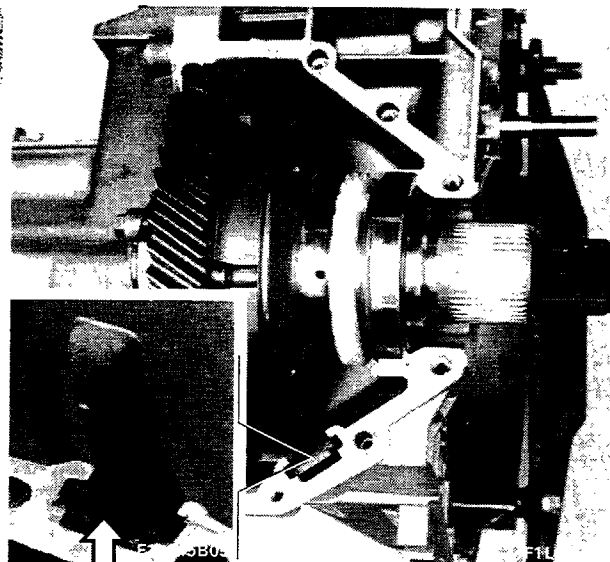


Torque tightening differential half

Installing differential assembly



Before installing differential cover, ensure that the magnet is in its seat.



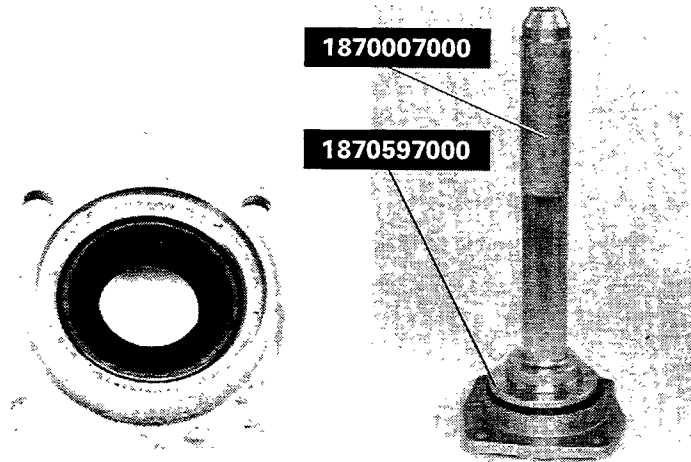
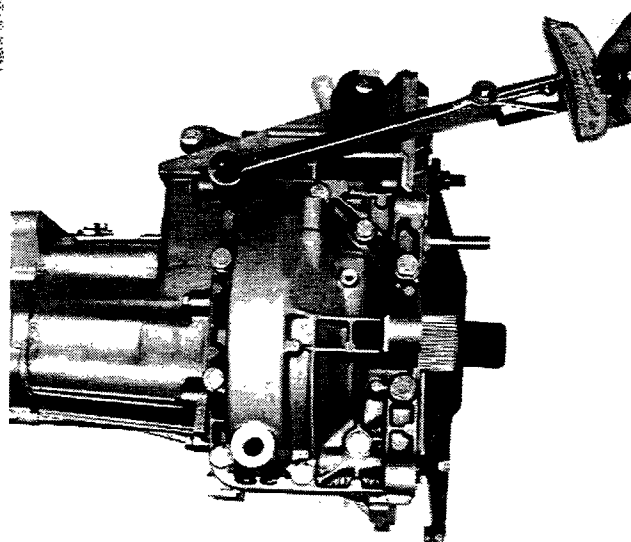
2,5 daNm



Installation and torque tightening of differential cover



Spread LOCTITE (573) on contact surfaces between differential cover and bell housing.



Fit gasket to differential housing cover

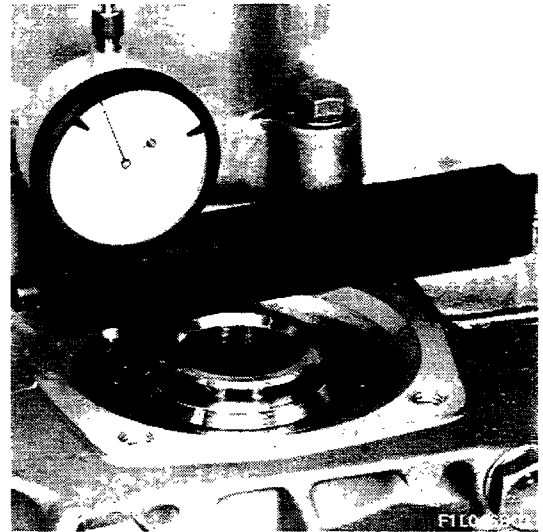
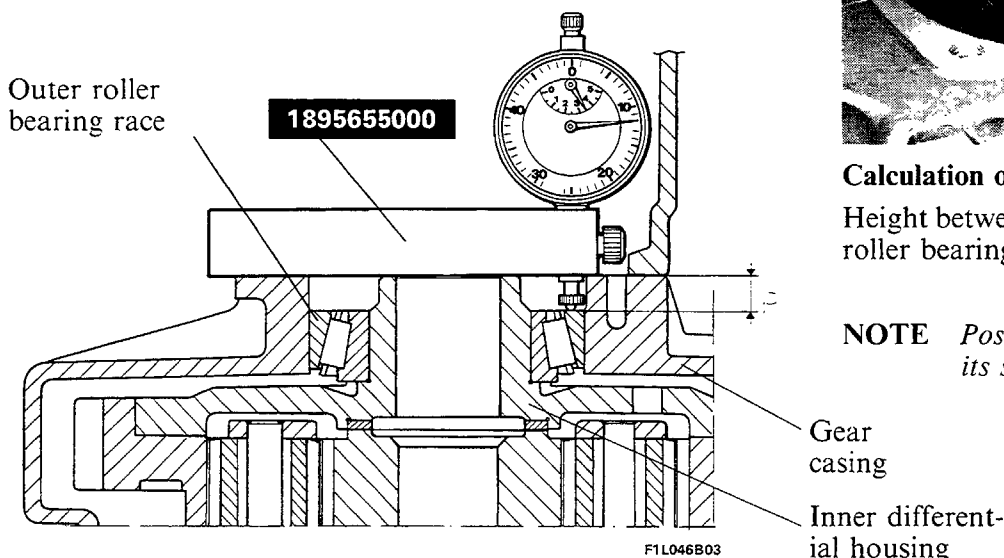
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21-27.

DIFFERENTIAL ADJUSTMENT

Calculation of differential housing bearing shim thickness "S".

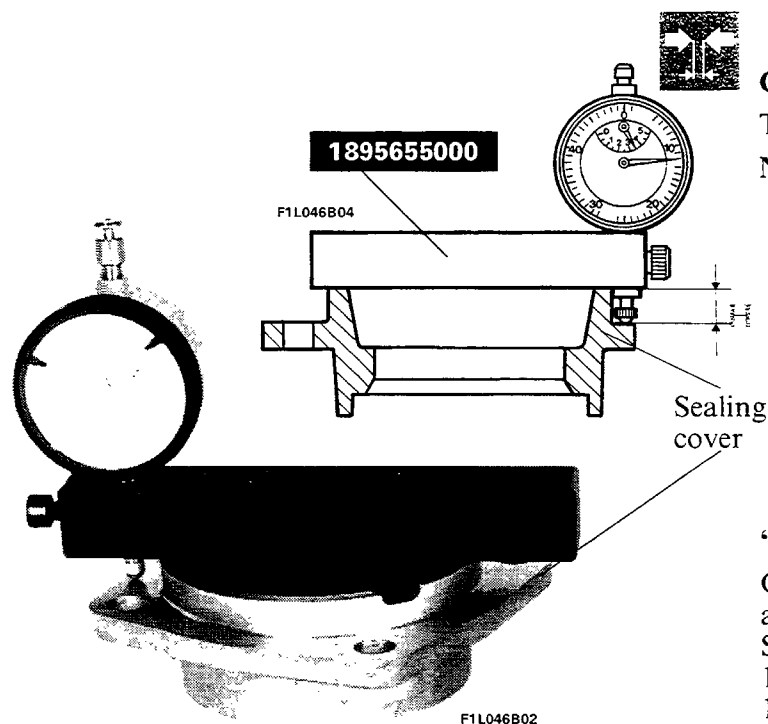
$$S = P - H + 0.12$$



Calculation of "P"

Height between cover rest plane and outer roller bearing race.

NOTE Position the outer bearing race in its seat.



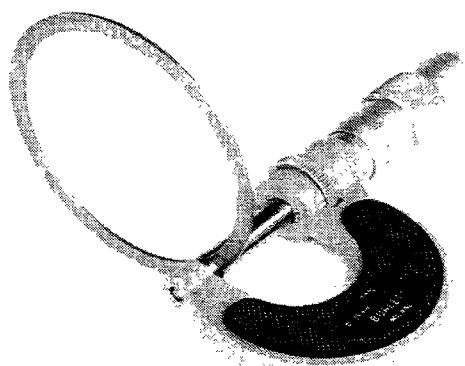
Calculation of "H"

Thickness of sealing cover.

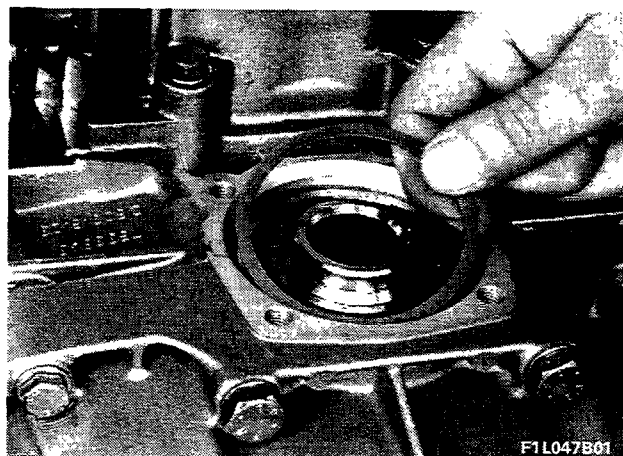
NOTE After calculating the exact shim thickness, combine shims supplied to obtain a value as near to the calculated value as possible.
If the thickness obtained does not correspond to one of the shims or the sum of two shims, fit the next thickness up.

"0.12" - Fixed number

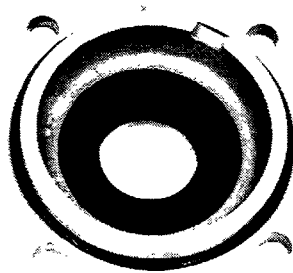
Corresponding to the specified interference for adjustment of differential housing bearings.
Shims come in the following sizes: 1.00 - 1.05 - 1.10 - 1.15 - 1.20 - 1.25 - 1.30 - 1.35 - 1.40 - 1.45 - 1.50 - 1.55 - 1.60 mm.



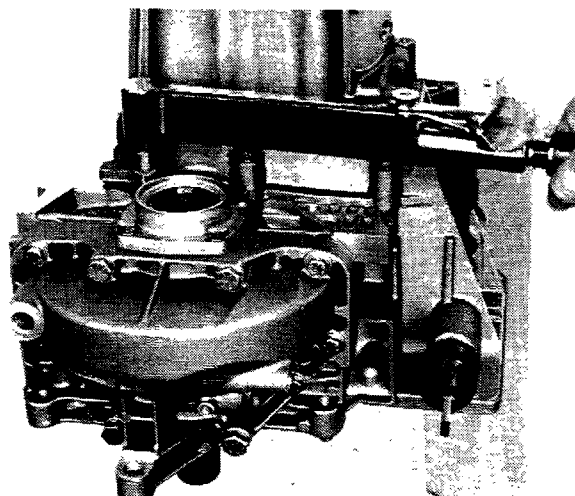
Fitting shims



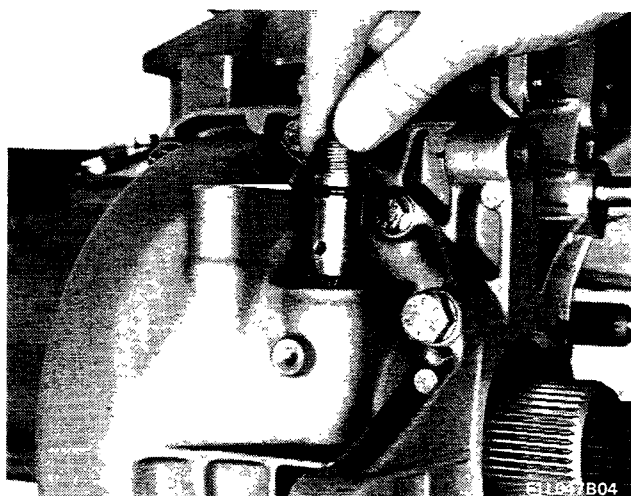
F1L047B01



F1L047B02

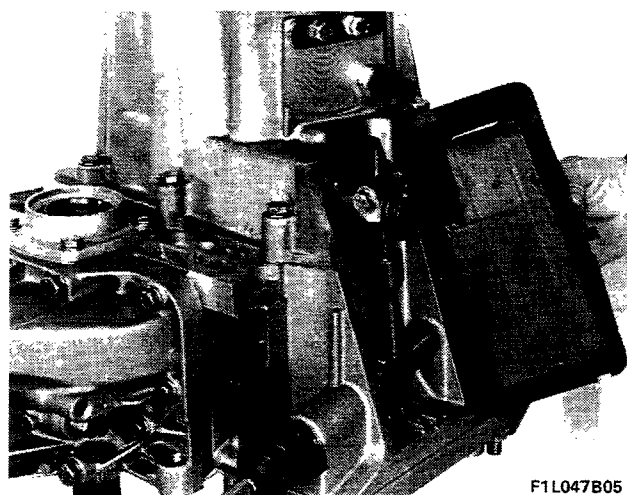


Fitting and torque closure of sealing cover complete with gasket



F1L047B04

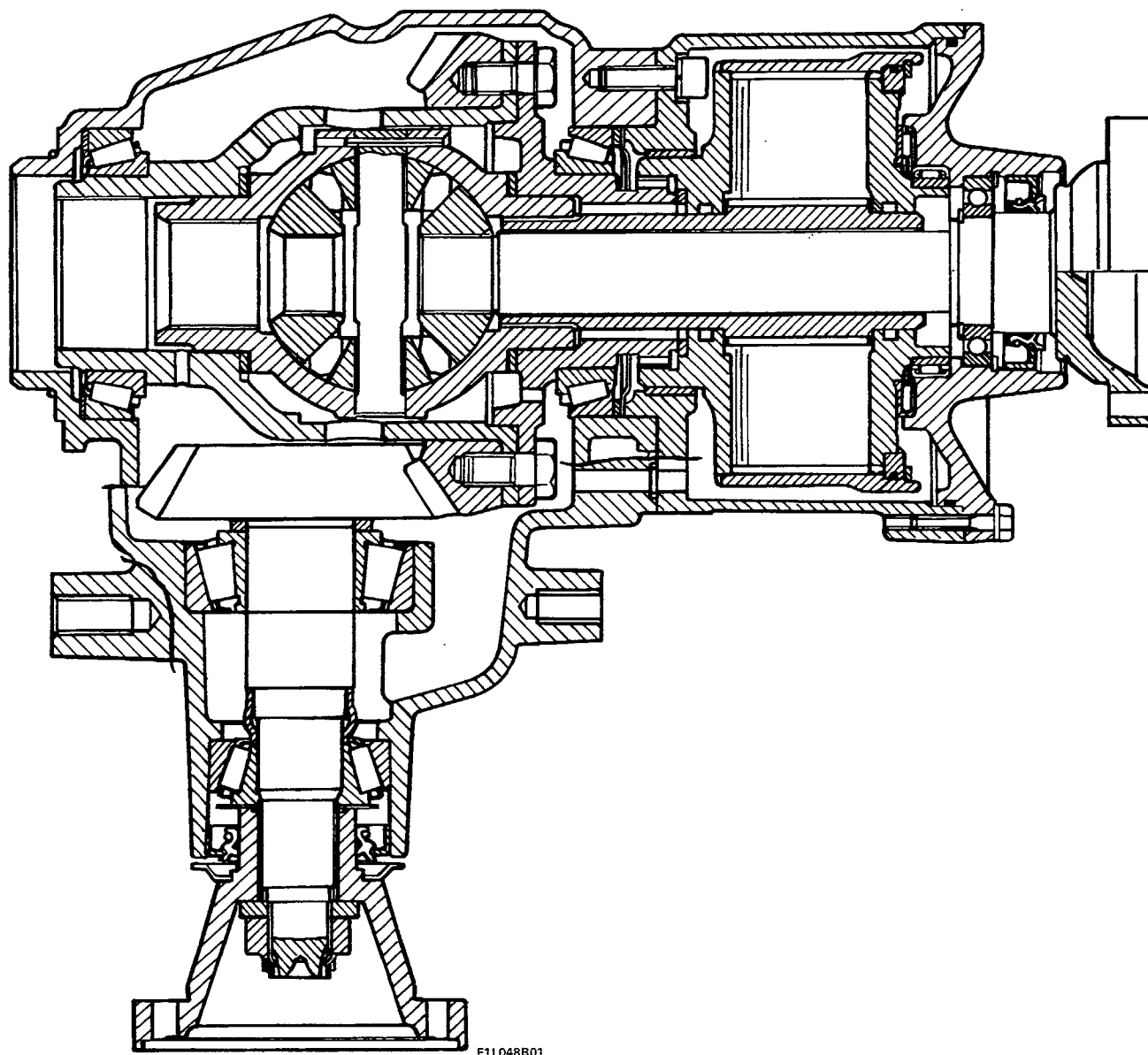
Fitting milometer gear



F1L047B05

Fitting side cover and reverse switch

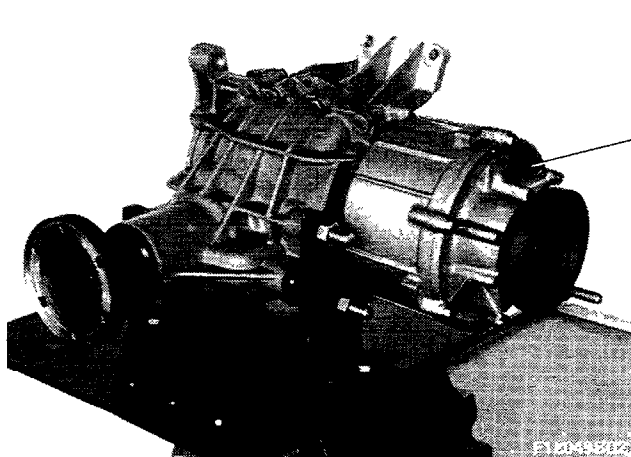
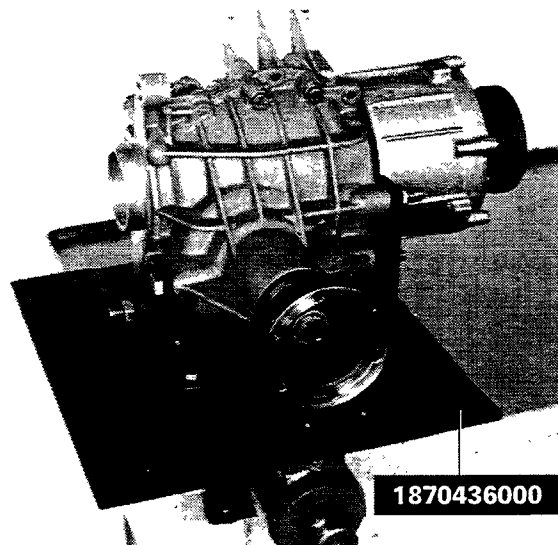
21-27.



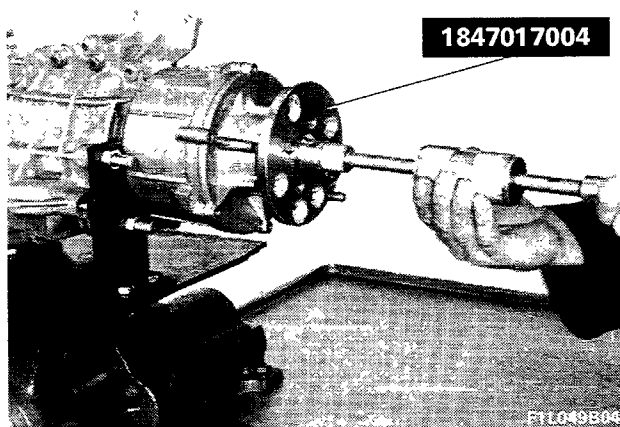
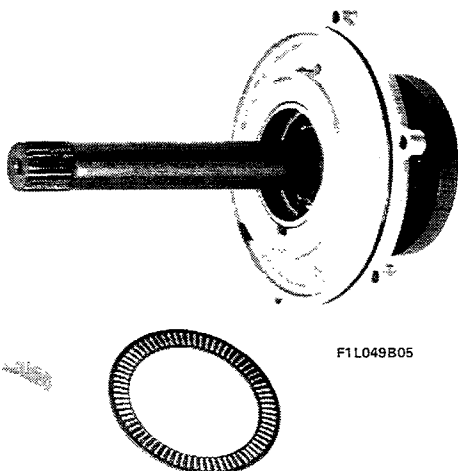
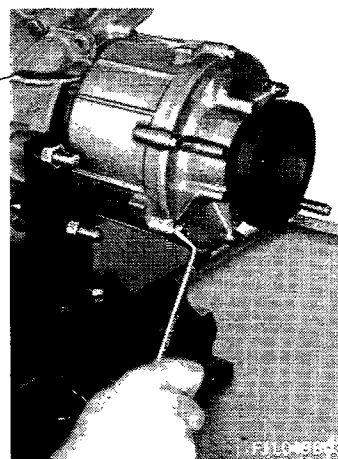
Longitudinal section through front differential - transmission unit

DISASSEMBLY AND CHECKS

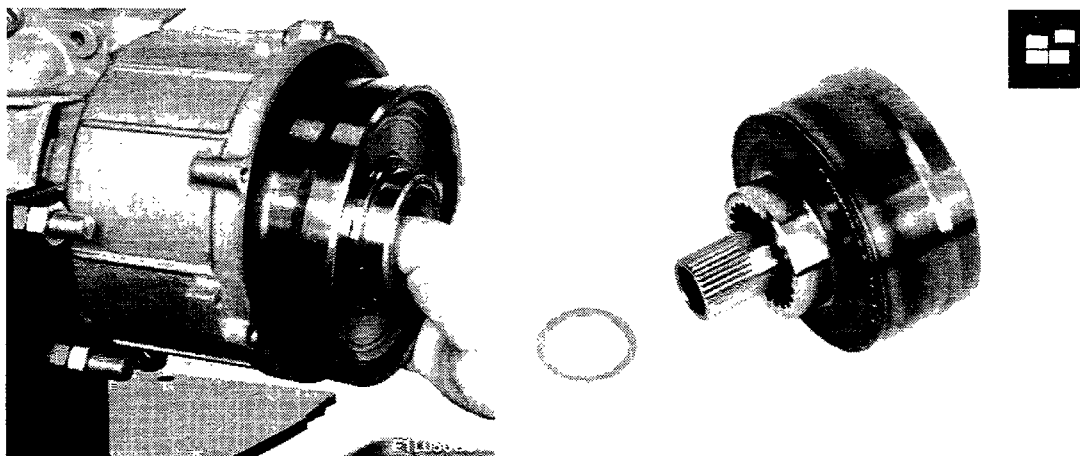
Installing front differential - transmission unit on overhaul stand 1870436000



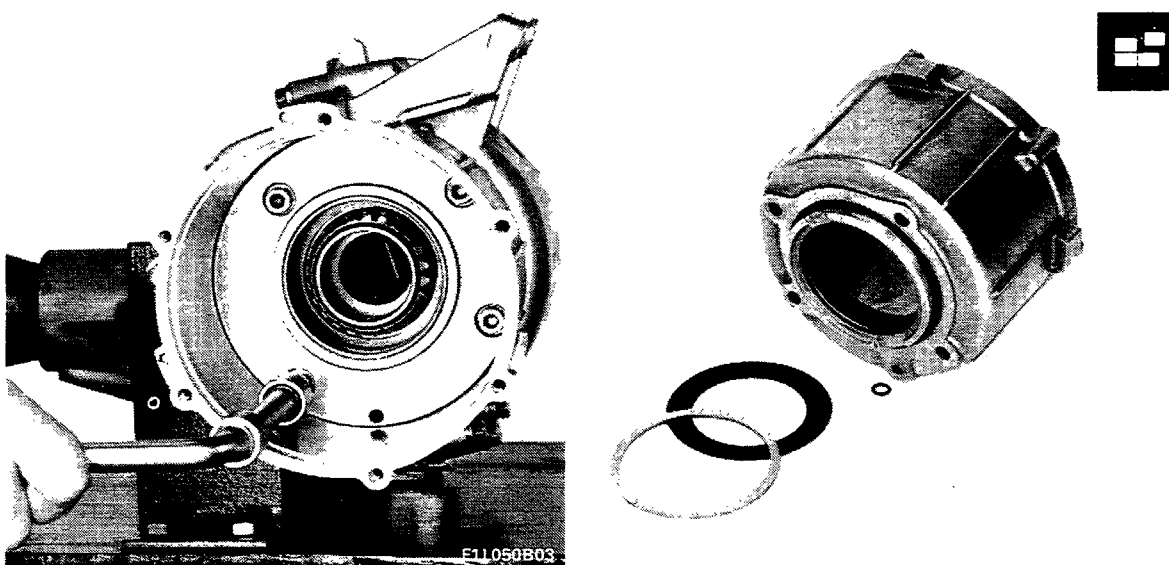
Removing cover for "Ferguson" viscous coupling complete with intermediate shaft



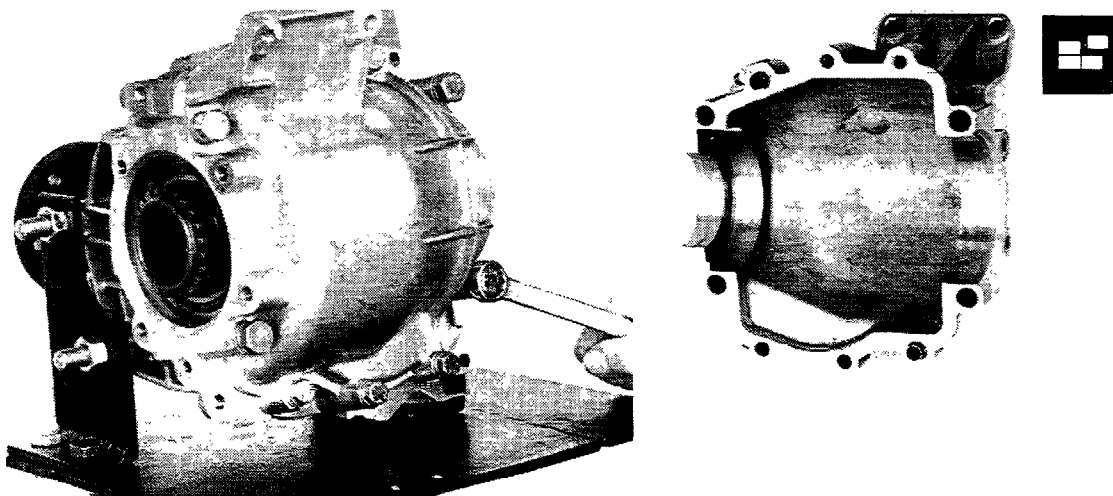
21-27.



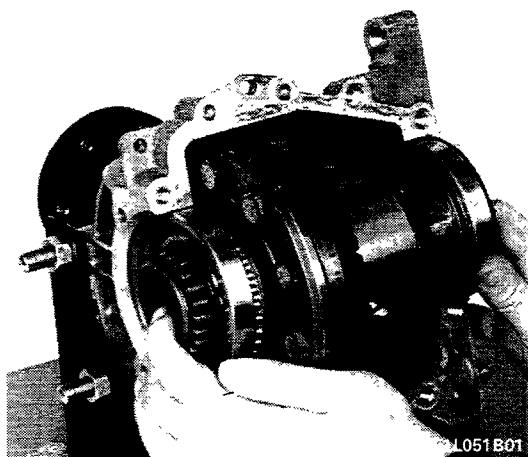
Removing "Ferguson" viscous coupling complete with shim



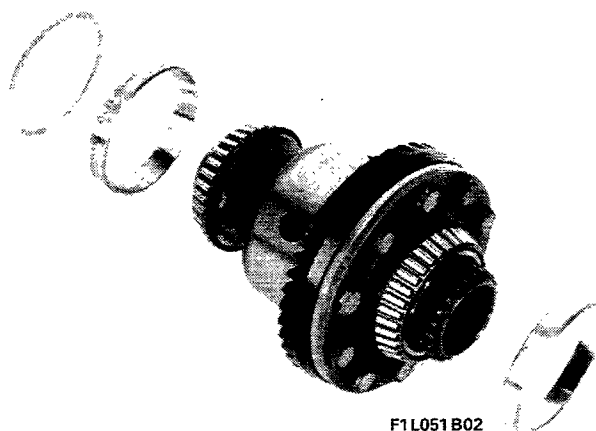
Removing "Ferguson" housing complete with gaskets, thrust rings and cups



Removing differential housing cover



F1L051B01



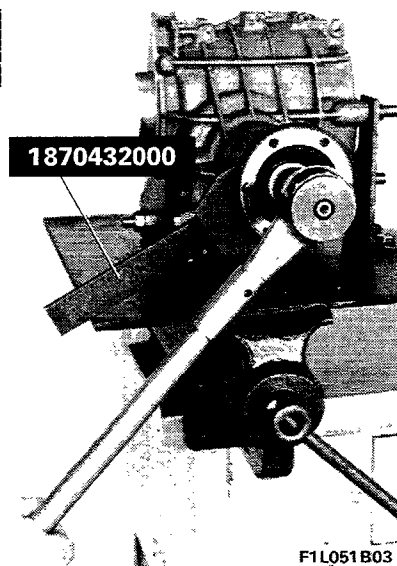
F1L051B02

Removing front transmission unit from housing



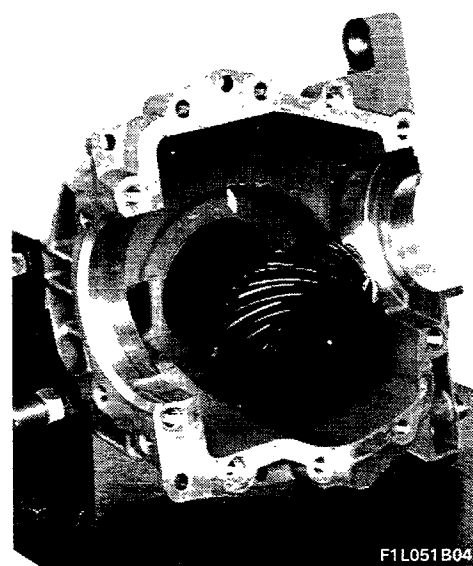
Removing bevel pinion retaining nut and extracting pinion complete with bearings and flange

NOTE When removing the pinion retaining nut, prevent the flange from rotating using tool 1870432000, as shown in the diagram.

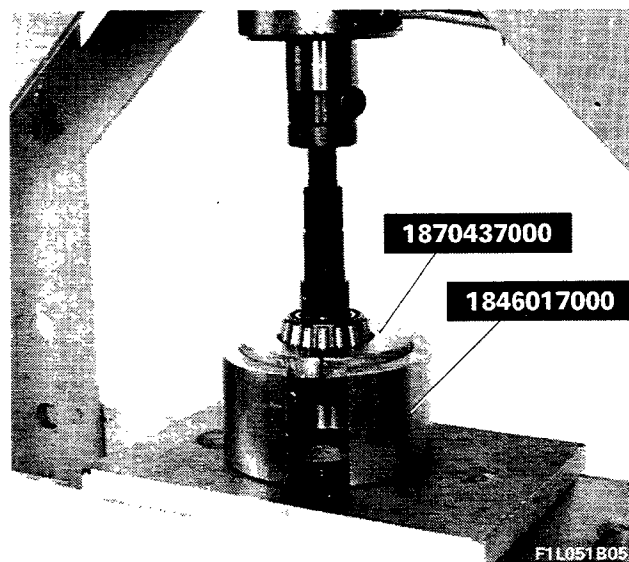


1870432000

F1L051B03



F1L051B04



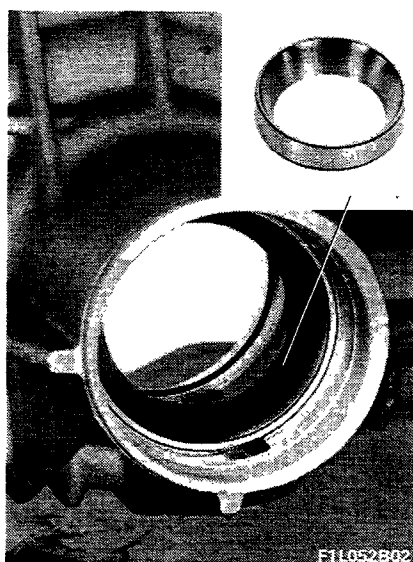
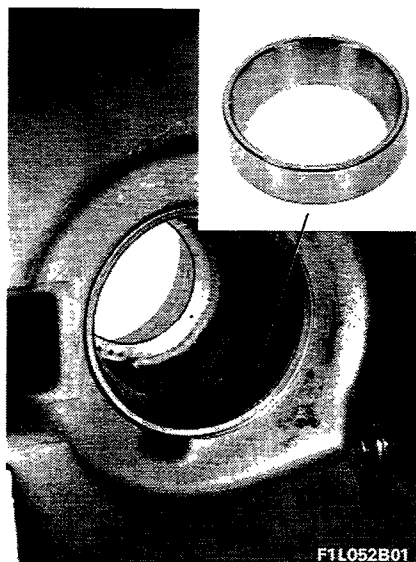
1870437000

1846017000

F1L051B05

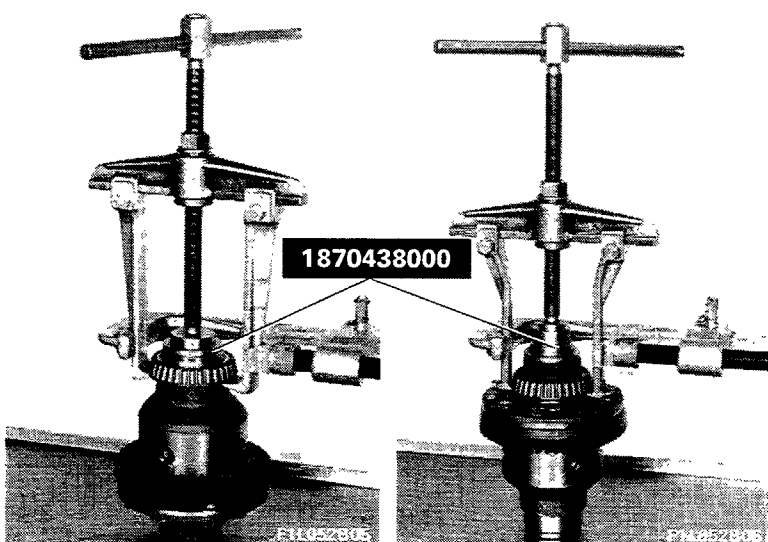
Removing inner race of rear bevel pinion bearing using hydraulic press

21-27.

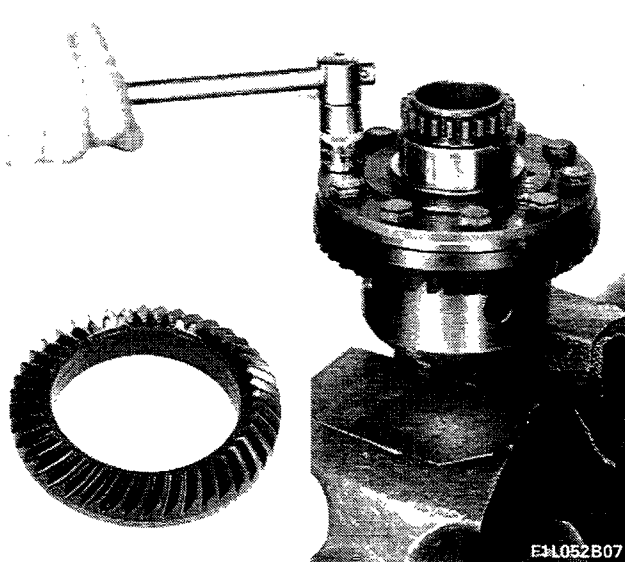


Removing outer races of bevel pinion roller bearings

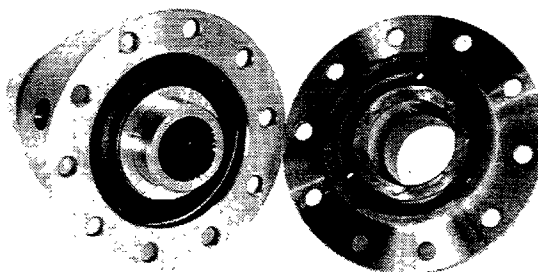
Remove outer races using a steel driver.

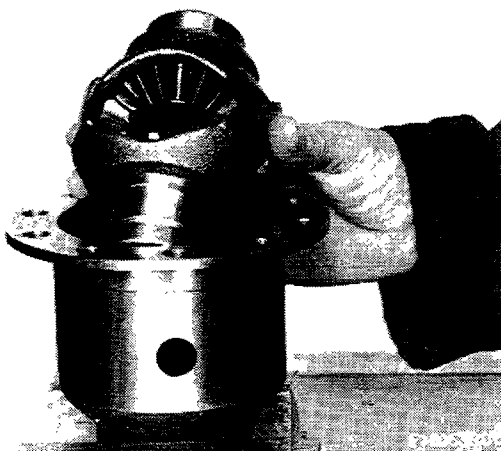


Removing roller bearings from differential unit

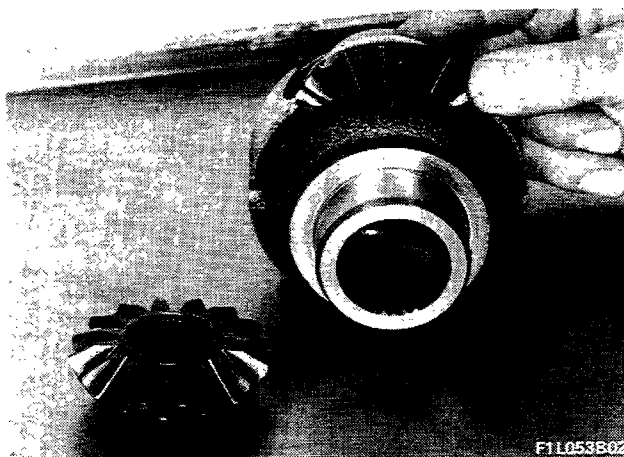


Removing ring gear from differential unit and disassembly of differential halves



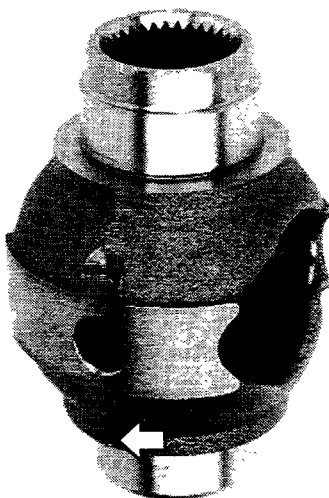


Removing front differential from differential half

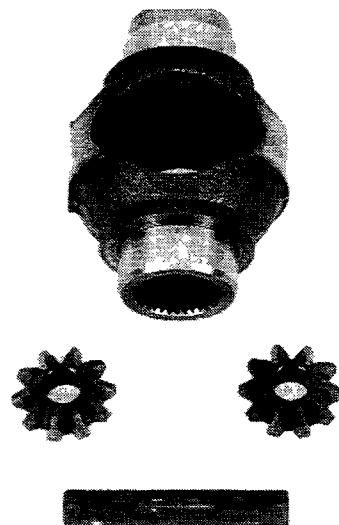


Removing planet wheels from housing

NOTE Planet wheels are fitted in differential housing without shims. It is not therefore possible to adjust clearance between satellite and planet gears.



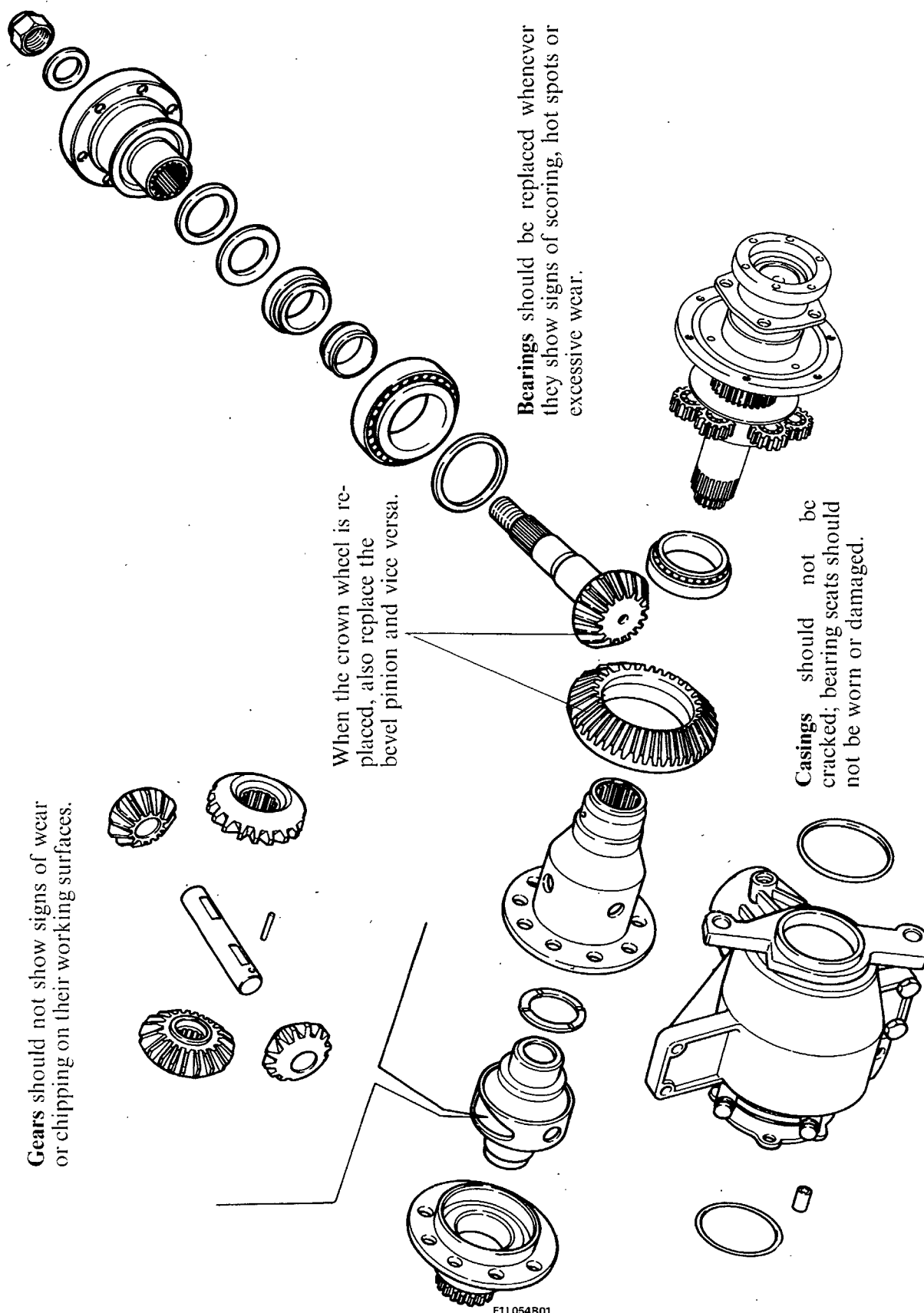
Extraction of retaining pin and removal of satellite carrier shaft



Removing satellites from housing

NOTE Install satellite and planet gears in housing by carrying out removal operations in reverse order.

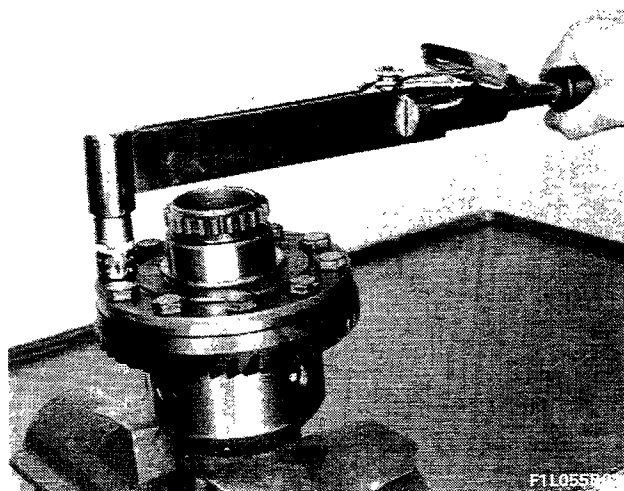
21-27.



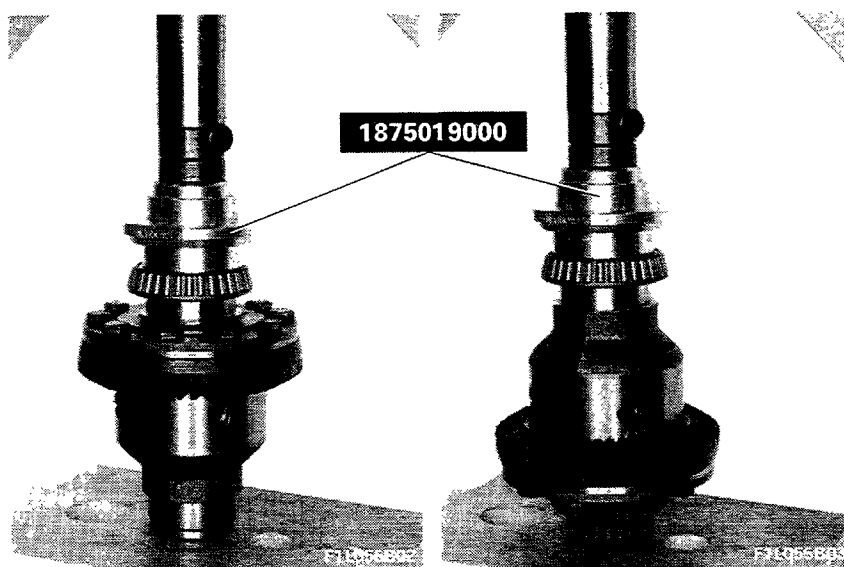
Components of front differential - transmission unit

FITTING AND ADJUSTMENT

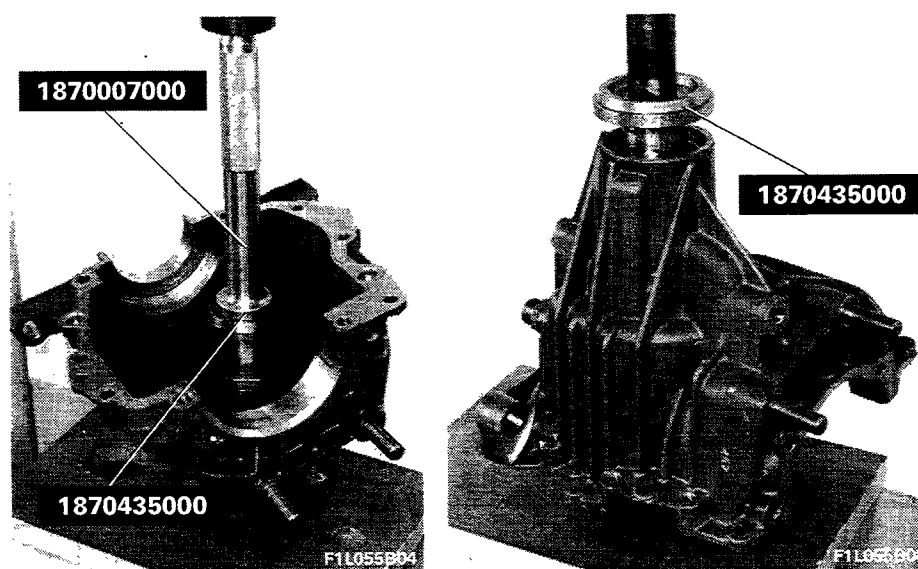
8,8 daNm



Fitting and torque closure of ring gear and differential halves

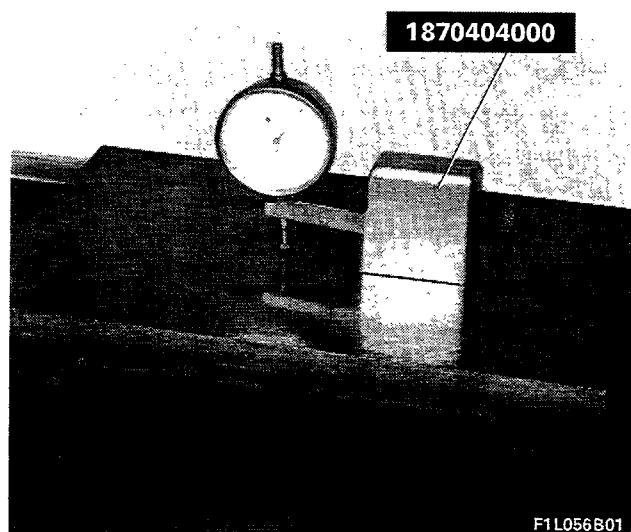


Fitting roller bearings in seats on differential halves

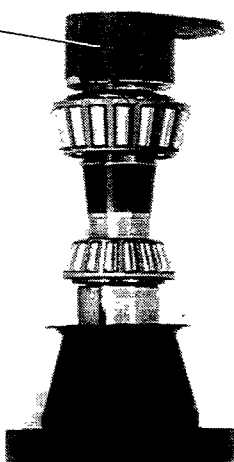
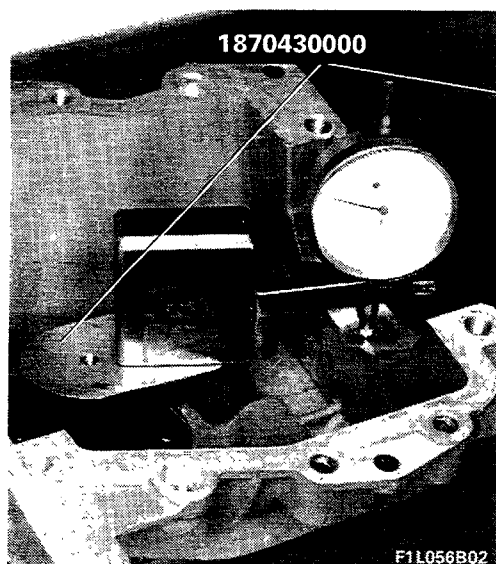


Fitting outer races on bevel pinion roller bearings

21-27.



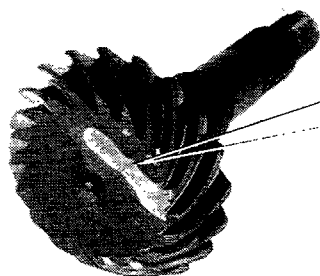
Zeroing centesimal gauge installed on stand 1870404000 using surface plate



Calculating thickness of thrust ring for rear bevel pinion bearing

To fit dummy pinion 187043000, proceed as for installation of bevel pinion but leave out the rubber spacer between front and rear bearings.

Tighten nut and flat washer to secure tool. Adjust bearings and tighten fully.



Bevel pinion

1st case - centesimal value of difference between actual and nominal installation gaps.

(e.g.: -2, 0, +3)

2nd case - Actual installation gap in millimetres.

(e.g.: 80.45 - 80.5 - 80.52).

Always obtain value expressed as in first case by subtracting 80.50 mm from this measurement.

(e.g.: $80.45 - 80.50 = -0.05 \text{ mm} = -5 \text{ hundredths}$)

($80.52 - 80.50 = +0.02 \text{ mm} = +2 \text{ hundredths}$).

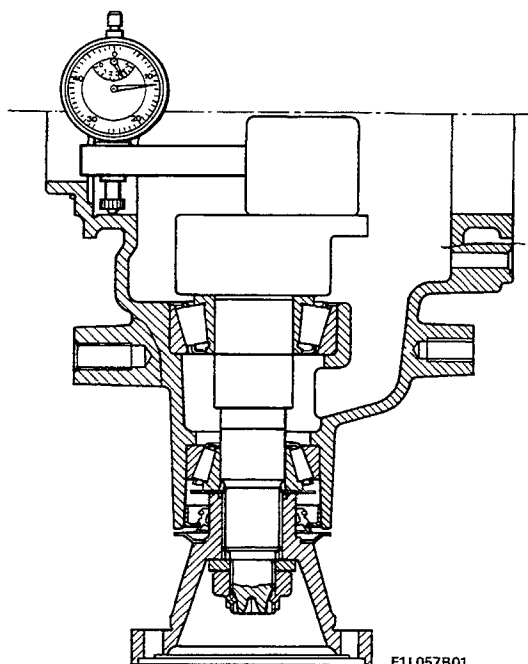
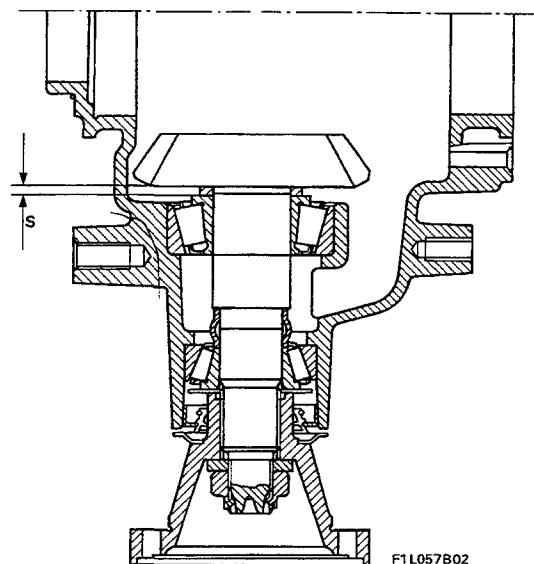


Diagram showing application of dummy pinion 1870430000 and gauge for calculation of thickness S of thrust ring for rear bevel pinion bearing



Bevel pinion installation diagram

Thrust rings for rear bevel pinion roller bearings are supplied in the following sizes: 2.55 - 3.35 mm in steps of 0.02 mm.

CALCULATION OF THICKNESS OF THRUST RING FOR REAR BEVEL PINION BEARING

If "a" is the reading on the gauge and "b" the value stamped on the bevel pinion at the factory, thickness "S" of thrust ring to be fitted is given by the following equation:

$$S = a - (+ b) = a - b$$

$$S = a - (- b) = a + b$$

in other words:

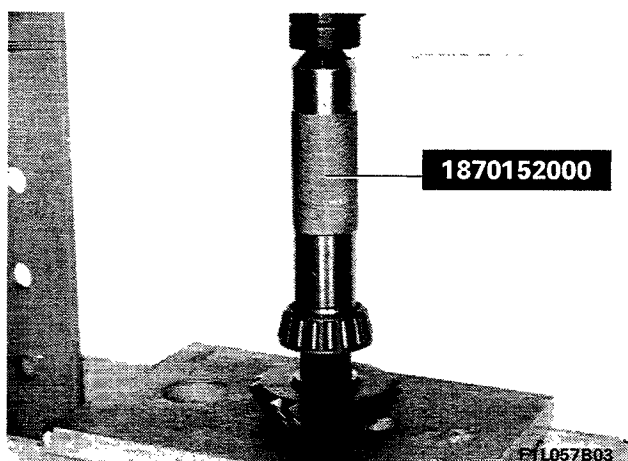
- if the number stamped on the pinion is preceded by a (+) thrust ring thickness is obtained by subtracting this number from the reading on the gauge;
- if the number marked on the pinion is preceded by a (-) ring thickness is obtained by adding the number to the gauge reading.

Example: let **a** = 2.90 (gauge reading);
and let **b** = - 5 (number written on pinion);
then: **S** = **a** - (- **b**);
S = 2.90 - (- 0.05);
S = 2.90 + 0.05;
S = 2.95

In this case, we need to fit a thrust ring of 2.95 mm thickness.



If the calculated value does not correspond to the one of the spare thrust rings, fit the next size up.

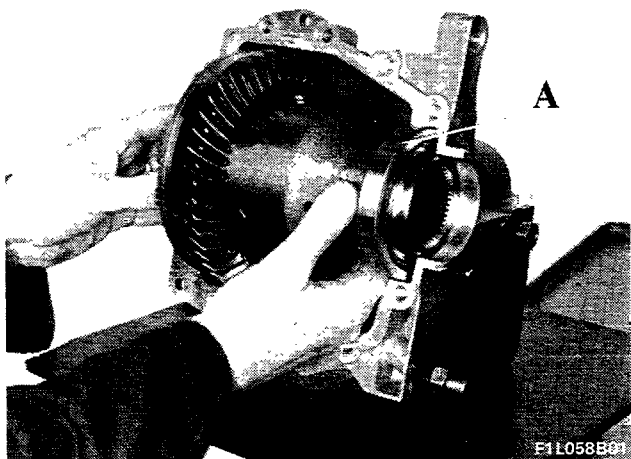


Fitting rear roller bearing inner race to bevel pinion.

21-27.

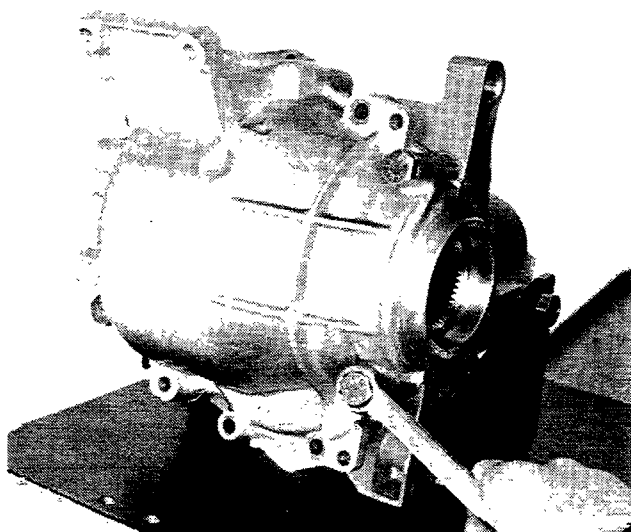


BEVEL PINION ROLLING TORQUE

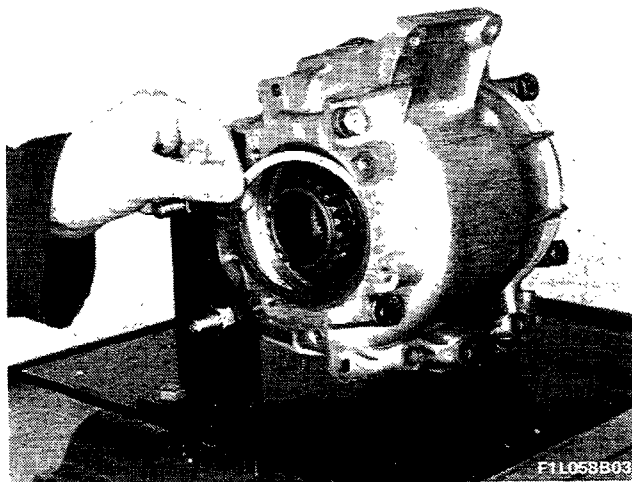


Fitting differential unit complete with ring gear in bell housing

Position shim (A) of known thickness between bell housing and bearing.

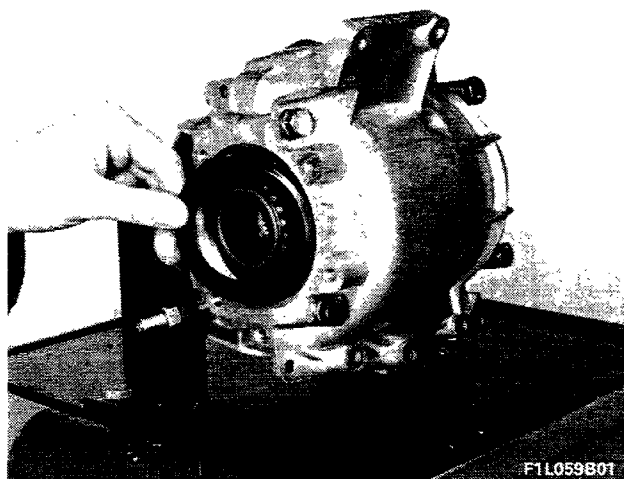


Fitting cover for differential unit bell housing and

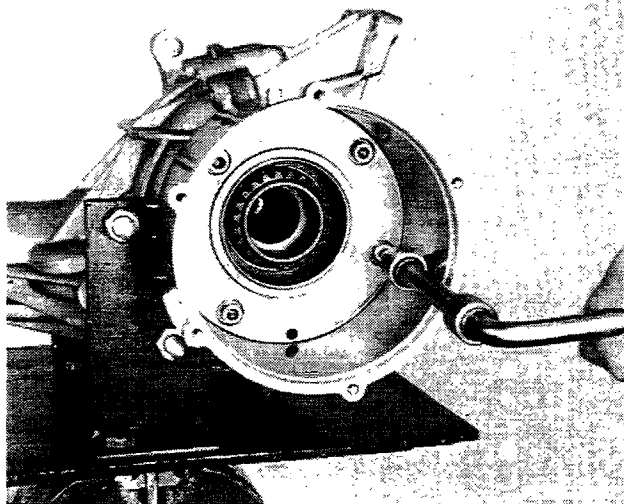


Fitting shim

Position shim of known thickness between bearing and "Ferguson" housing.



Fitting cup



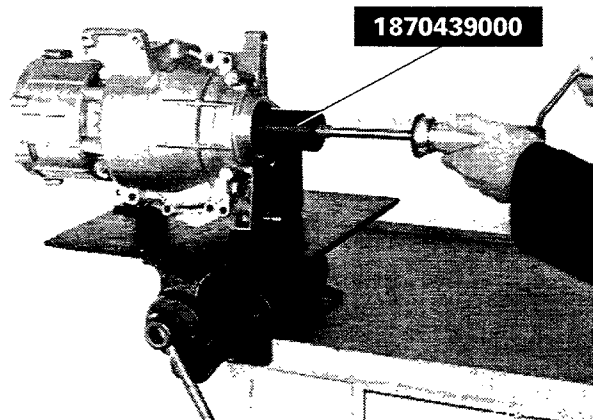
Fitting "Ferguson" housing

0,12÷0,15 daNm

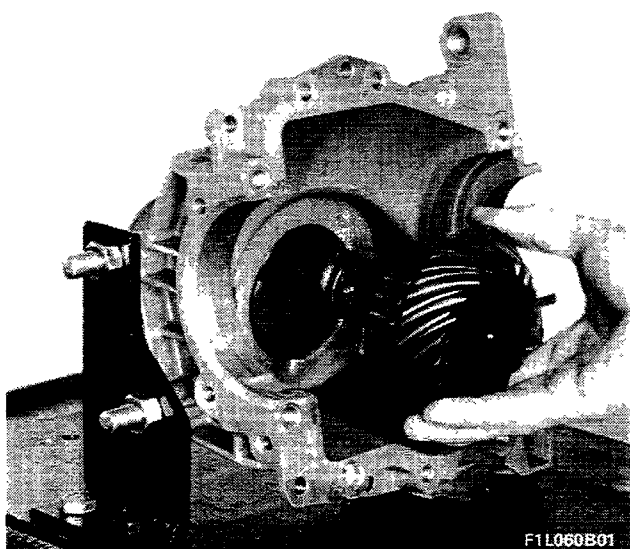


Ring gear rolling torque

If the rolling torque is too high, reduce shim thickness. Otherwise increase thickness. Then remove differential unit.

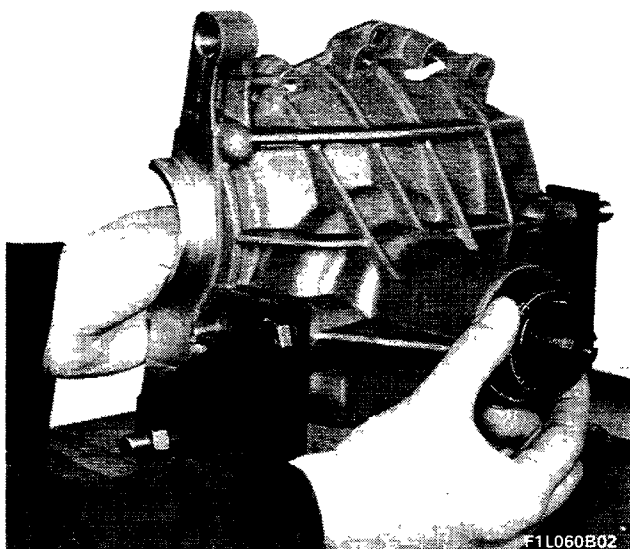


21-27.

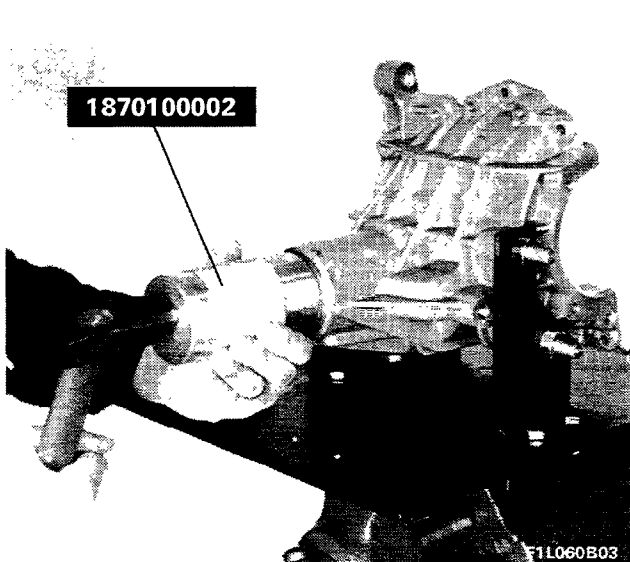


BEVEL PINION ROLLING TORQUE

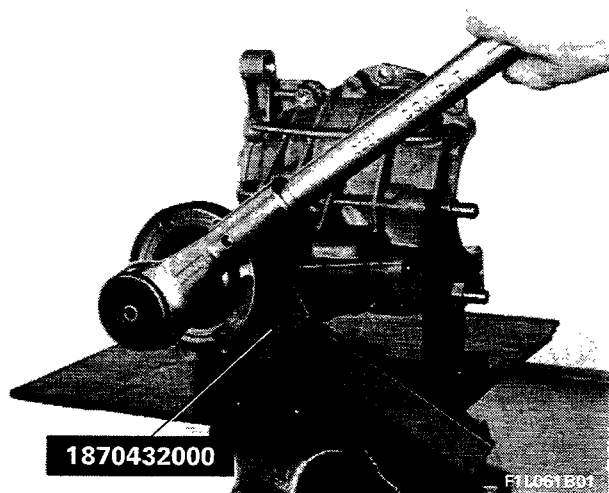
Fitting bevel pinion complete with rubber spacer



Fitting roller bearing inner race, sleeve side



Fitting bevel pinion gasket

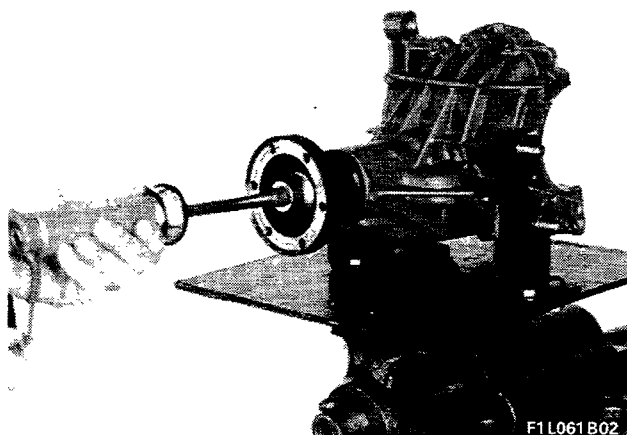


Tightening nut retaining sleeve to bevel pinion

Tighten nut to a torque of 17-28 daNm to produce a rolling torque of 0.08-0.12 daNm at pinion. Since this type of differential is fitted with a rubber spacer, remember when installing that bevel pinion retaining nut must never be slackened, otherwise the rubber spacer must be replaced.



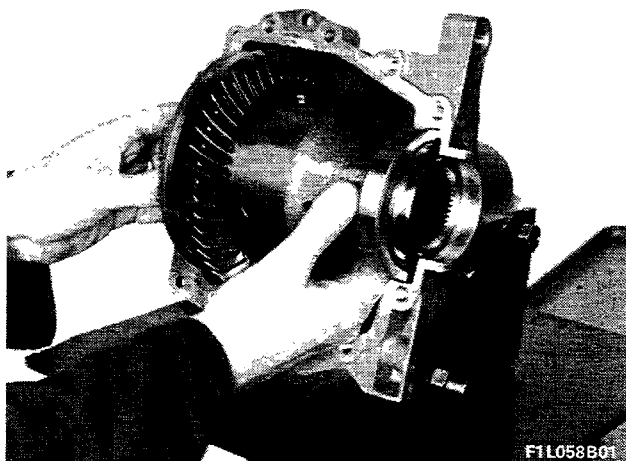
0,08÷0,12 daNm



Checking bevel pinion rolling torque

If maximum bevel pinion rolling torque is exceeded during preloading, installation and checks must be repeated using a new rubber spacer.

CHECKING PINION-CROWN WHEEL BACKLASH



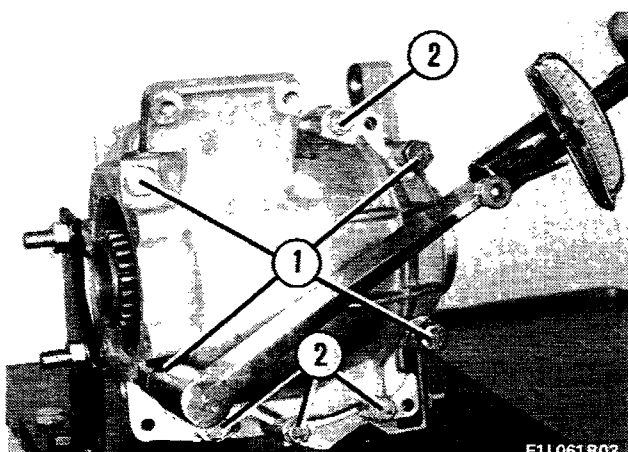
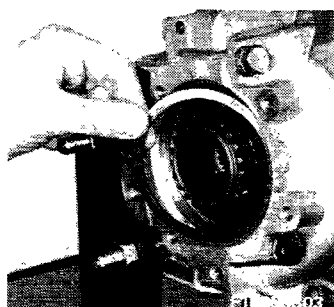
Fitting differential unit and shim

1	5 daNm
2	2,5 daNm



Fitting differential bell housing and shim

NOTE Shim thickness must be as calculated previously.

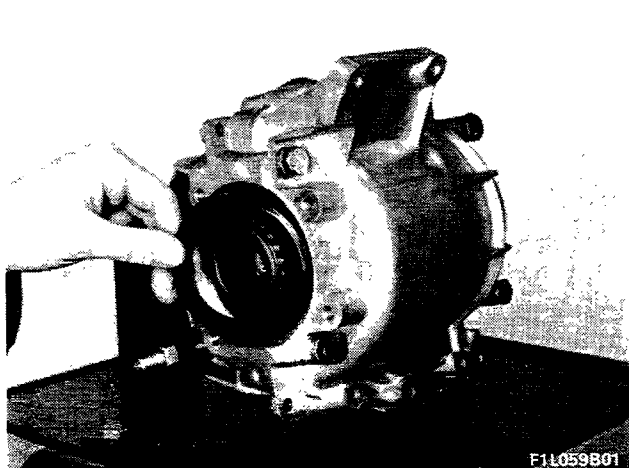


Gearbox and differential

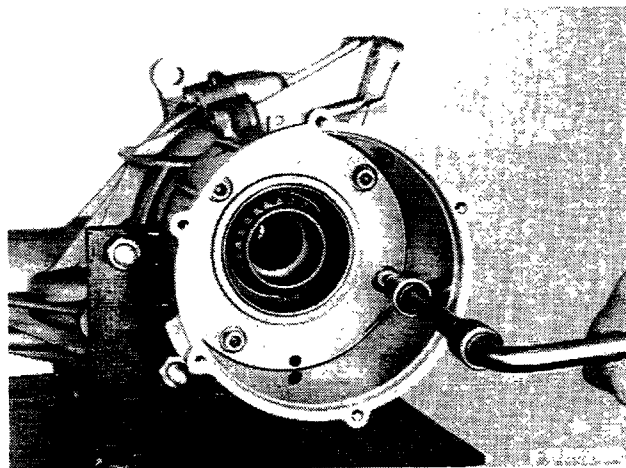
Front differential unit: transmission

DELTA-PRISMA 4WD

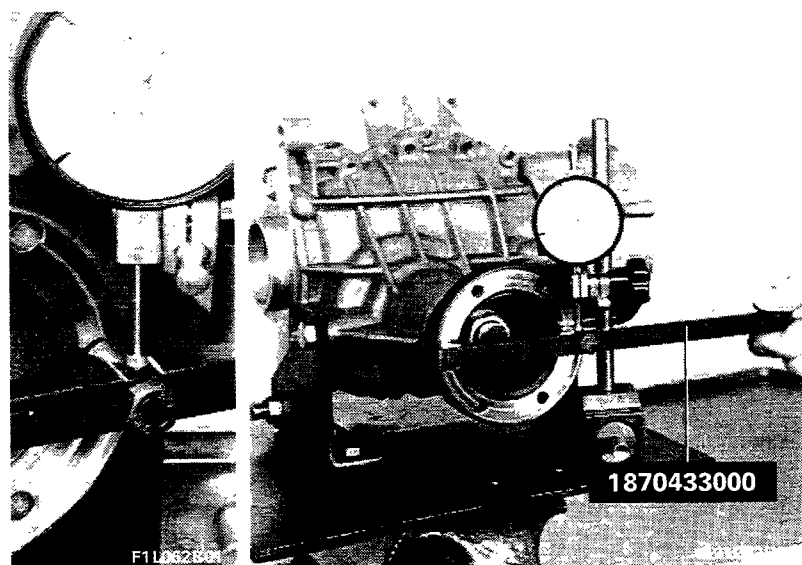
21-27.



Fitting cup



Fitting "Ferguson" housing

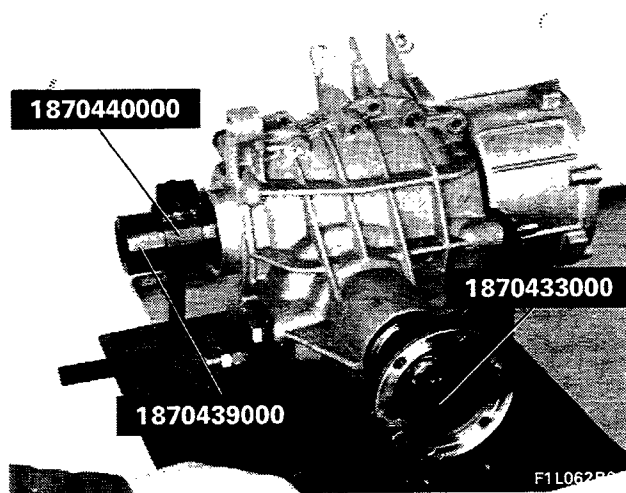
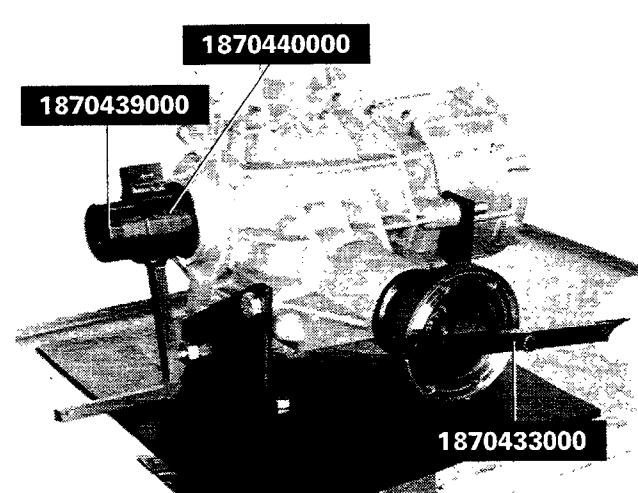


0,08 ÷ 0,15

Checking and adjusting pinion-crown wheel backlash

If backlash is lower or higher than specified value, gap between crown wheel and pinion must be altered by fitting shims of different thickness. Take care to keep overall value as calculated during adjustment of crown wheel rolling torque.

CHECKING AND ADJUSTING BEVEL PINION AND CROWN WHEEL TOOTH CONTACT PATTERN



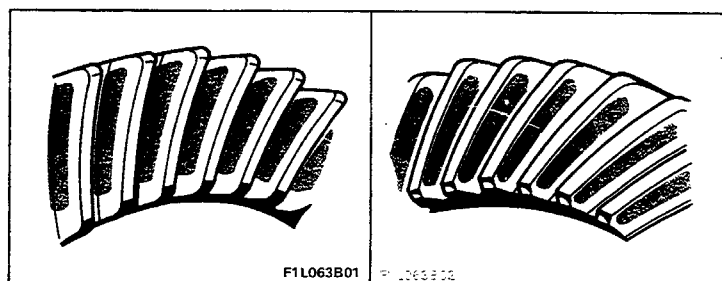
Checking bevel pinion-crown wheel tooth contact pattern on drive and coast surfaces

Exact mesh

The contact pattern should be evenly spread over both faces of the tooth, i.e. the drive and coast sides.

DRIVE SIDE

COAST SIDE

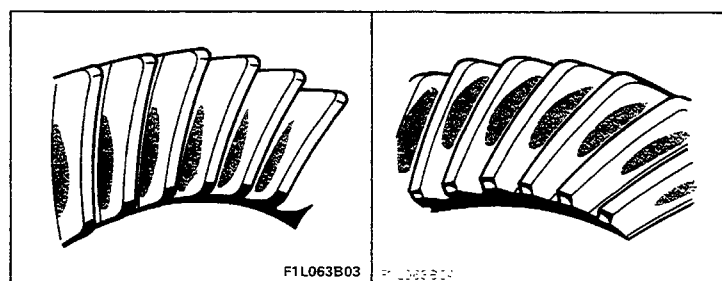


Inexact mesh

Drive side: contact on the tooth tip and towards the middle area.

Coast side: contact on tooth heel and towards the middle area.

Move the pinion further from the crown wheel by decreasing thrust ring thickness

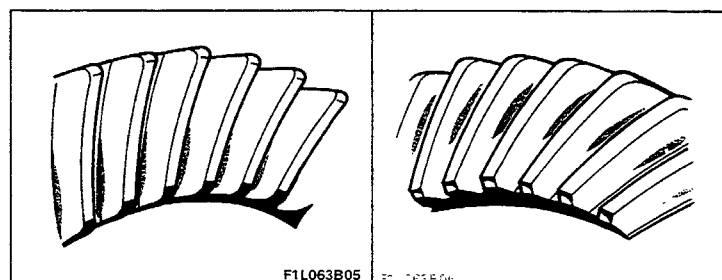


Inexact mesh

Drive side: contact on top, localised on side of tooth at bottom.

Coast side: contact on heel, localised on side of tooth at bottom.

Move the pinion further from the crown wheel by decreasing thrust ring thickness.

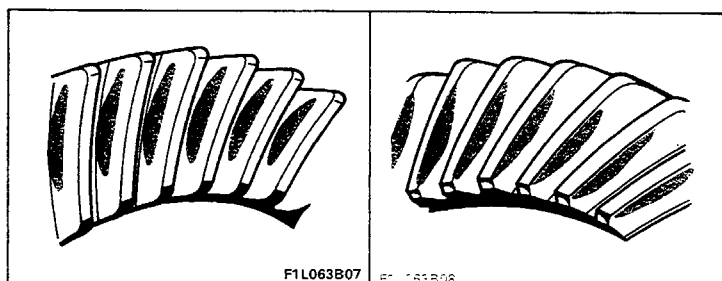


Inexact mesh

Drive side: contact on heel and towards middle of tooth.

Coast side: contact on tip and towards middle of tooth.

Move pinion closer to crown wheel by increasing thrust ring thickness.

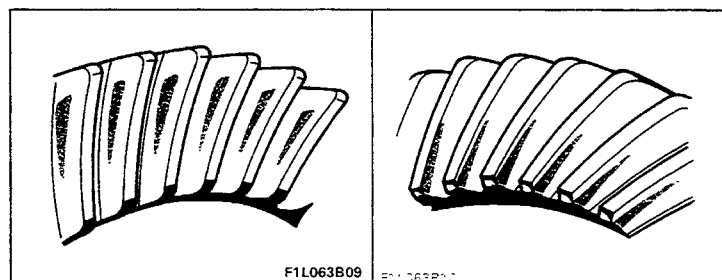


Inexact mesh

Drive side: contact on heel, localised on crest of tooth.

Coast side: contact on tip, localised on crest of tooth.

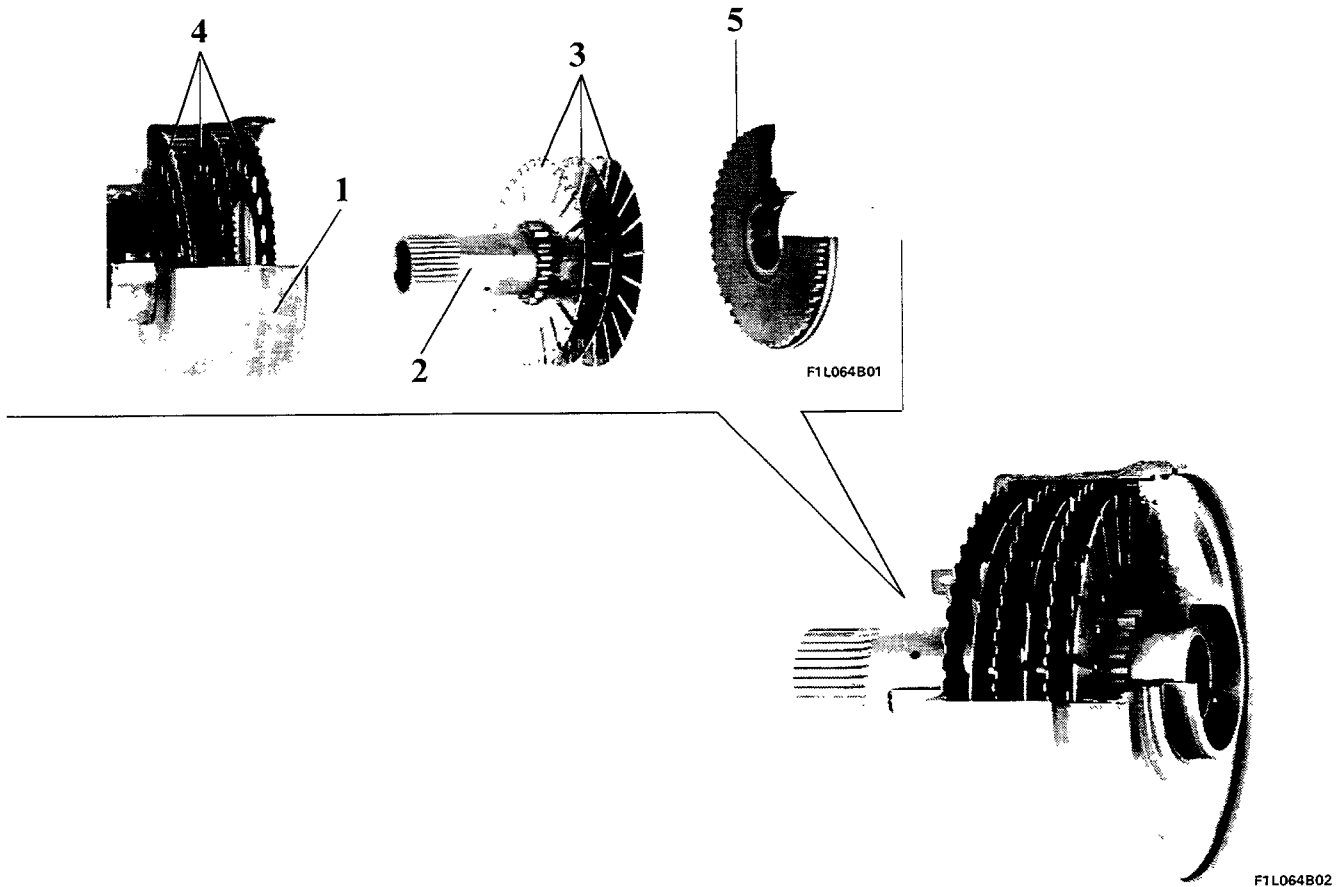
Move pinion closer to crown wheel by increasing thrust washer thickness.



The unit must be removed again in all the above cases. The pinion-crown wheel backlash must be readjusted when the unit is fitted again.

21-27.

"FERGUSON" VISCOUS COUPLING



General remarks

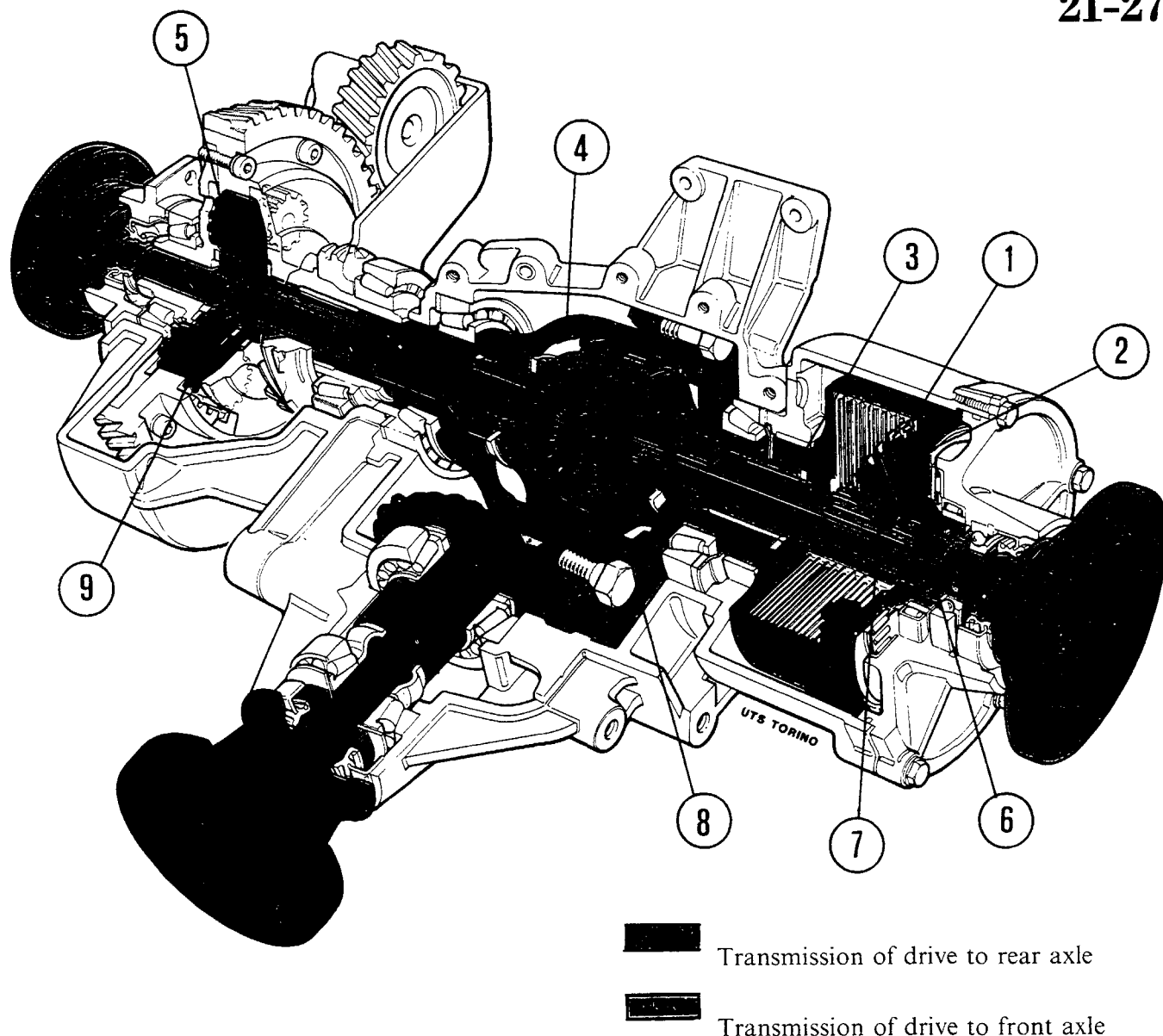
The "Ferguson" viscous coupling applied to the central differential restricts front axle slide in relation to the rear axle and vice versa by transferring part of the torque from front to rear axle when slide occurs. Loss of grip by one of the axles is prevented or at least restricted in this way and optimal torque distribution over front and rear axles is obtained despite the loss of grip even in poor driving conditions. The viscous coupling offers the advantage of permanent operation, without manual intervention, and of not transmitting anomalous signals to the various transmission components.

This coupling is maintenance free and cannot be overhauled. It must therefore be replaced if found to be defective

The "Ferguson" viscous coupling consists of:

1. Outer casing
2. Inner hub
3. Series of plates integral with hub
4. Series of plates integral with outer casing
5. External housing cover

The coupling is filled with a special ultra-high viscosity, silicone-based fluid.



Operation

The outer casing (1) and integral plates (2) receive the drive via a spur toothed fitting (3), from the transmission cover (4), connected to the satellite carrier housing (5) (rear axle) of the central differential or torque distributor.

The hub (6) and integral plates (7) receive drive via differential casing (8), from pinion (9) (front axle) of central differential.

When front and rear axles are turning at the same speed, all parts of the viscous coupling turn at the same speed. When the axles start to turn at different speeds (cornering, bumpy road, slippery road) the two sets of plates (2 and 7) also tend to move at different speeds but are slowed by the viscous fluid thus restricting slide between the axles. As a result of the difference between the speeds of plates (2 and 7), the viscous fluid is "cut", i.e. subjected to a cutting force. This force increases with increasing speed difference.

The cutting force acting on the opposing plates leads to a considerable increase in torque on the axle that tends to turn at a lower speed (normally the axle with the best grip) with benefits in terms of traction and stability.

Even during small skids, the torque crossing the viscous coupling (i.e. the torque that the viscous coupling takes from the faster axle and yields to the slower axle) is high.

21-27.

All else being equal, it is possible to increase or decrease torque transfer by varying plate number and size and/or fluid viscosity.

The viscous coupling may lock, i.e. transmit very high torques with no slide. In other words, a very high torque may cross the viscous coupling that has been taken from the faster axle and yielded to the slower axle even when there is no slide.

This happens when the unit runs for a long time with high slide and the heat produced raises the temperature of the viscous fluid (150° - 200°C).

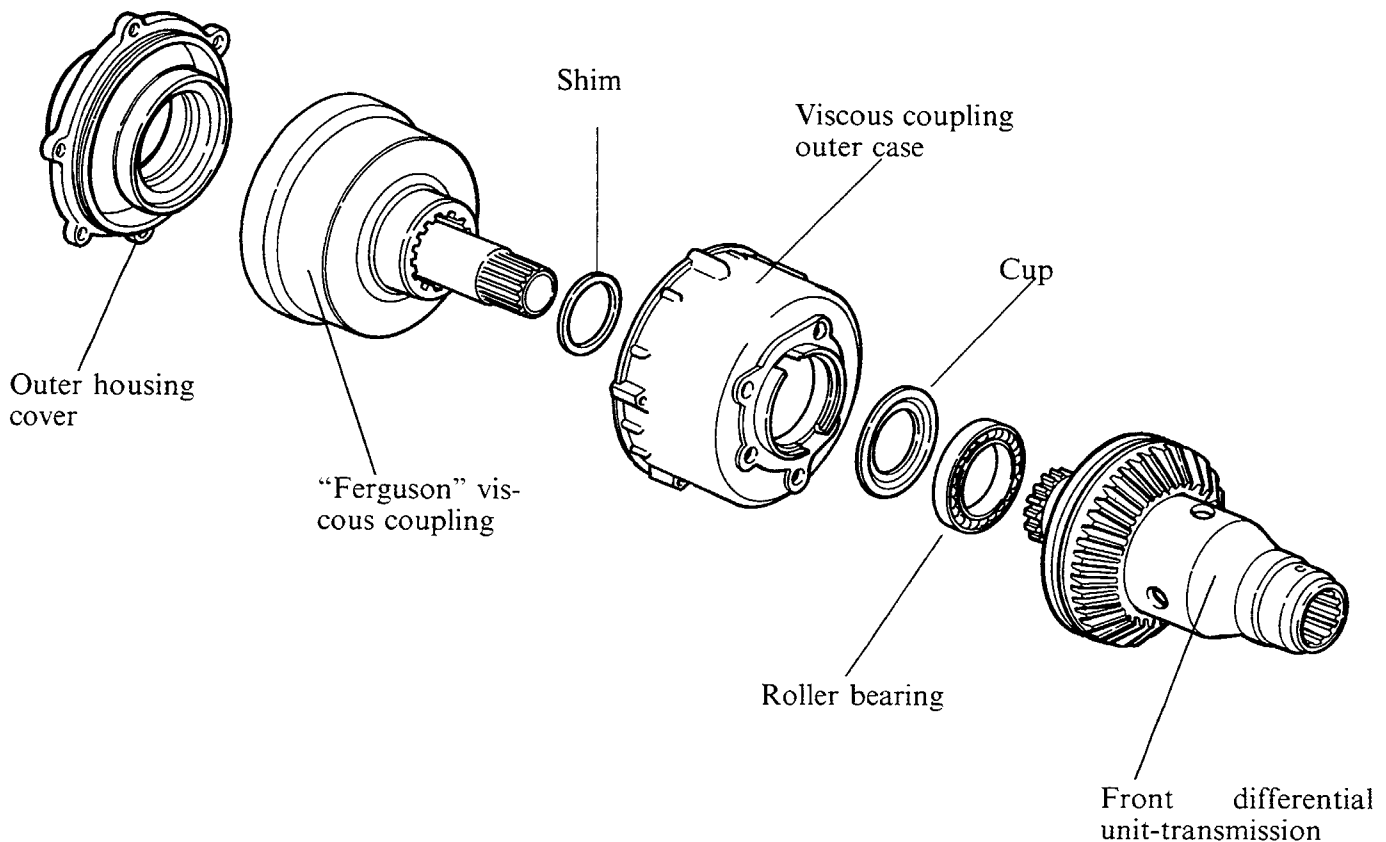
The air present inside the viscous coupling forms an emulsion with the fluid to bring about an increase in pressure (about 90 bar). This brings about an abrupt change in the properties of the viscous coupling and makes slide between the plates impossible.

The viscous coupling is designed to stand up to the above conditions for short periods. If subjected to such conditions for long periods as a result of high stress or defective operation (such as disconnecting the rear transmission and driving the car as if it only had two drive wheels) the viscous coupling could become damaged.



In the case of breakdown or accident, the car must be towed using a bar so that the wheels can turn or loaded onto a breakdown truck.

Components of "Ferguson" viscous coupling

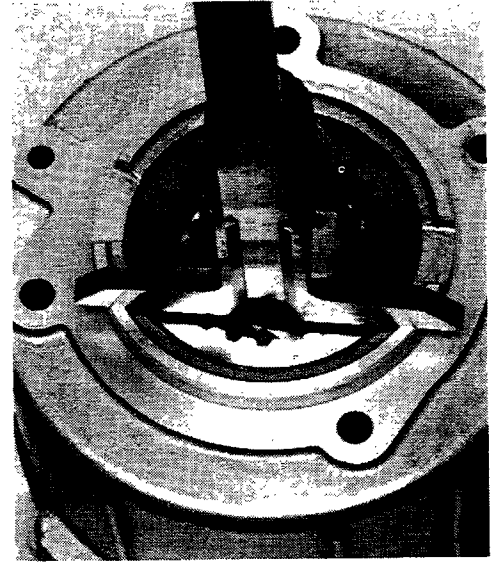
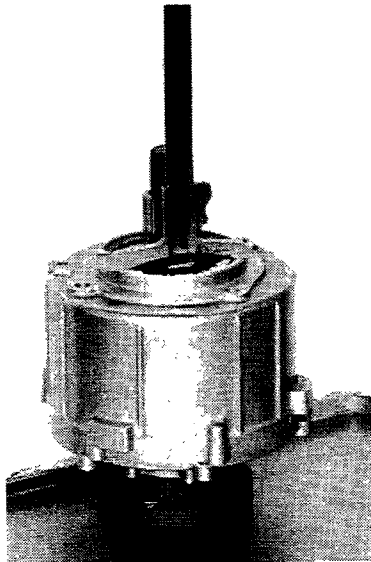


ADJUSTMENT

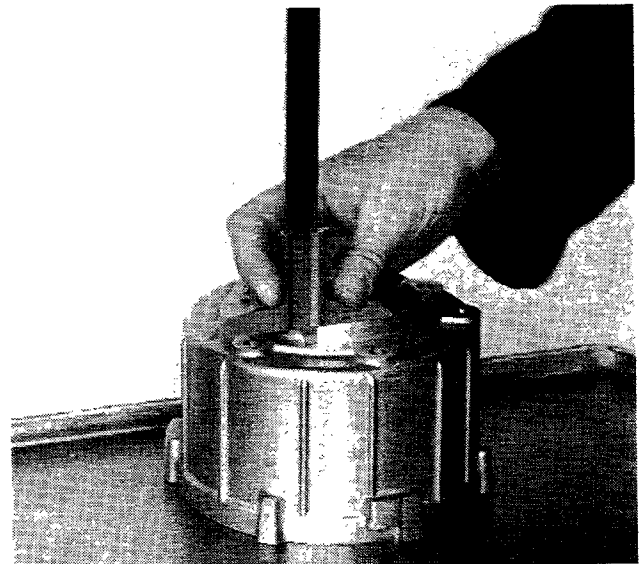


Calculating shim thickness "S"

Fit the viscous coupling and cover on the housing and use a depth gauge to measure the gap between the outer edge of the housing and the rest plane of the shim on the viscous coupling. You will therefore obtain dimension "X".



Measure the gap between the outer edge of the viscous coupling housing and the rest surface on the differential unit support housing. You will therefore obtain dimension "Y".

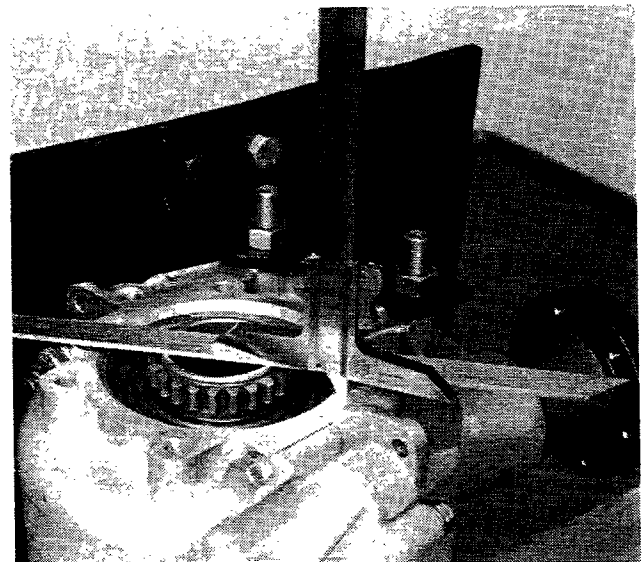


Measure the gap between the meshed gear and rest plane on differential unit bell housing. You will obtain dimension "Z".

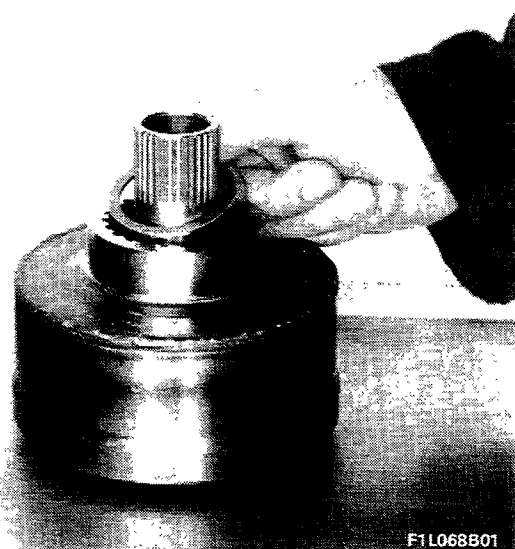
Thickness "S" of shim for adjustment of clearance between viscous coupling and gear is obtained using the following equation:

$$S = X - Y - Z - (0.13 - 0.25 \text{ mm})$$

Where 0.13 - 0.25 mm is the clearance between viscous coupling and gear.

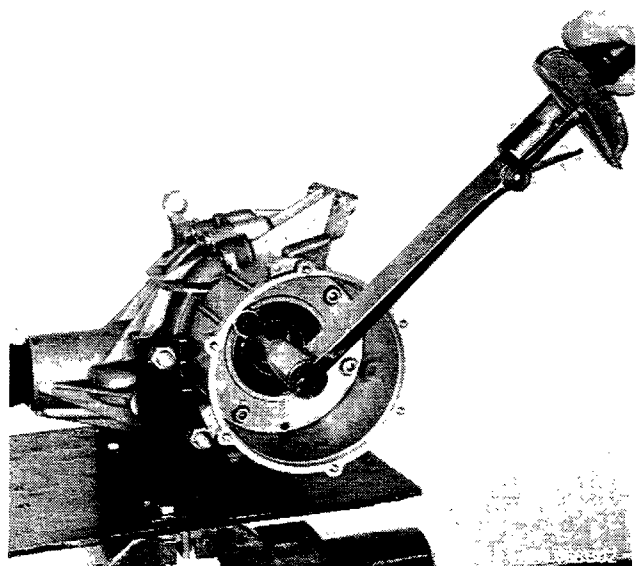


21-27.



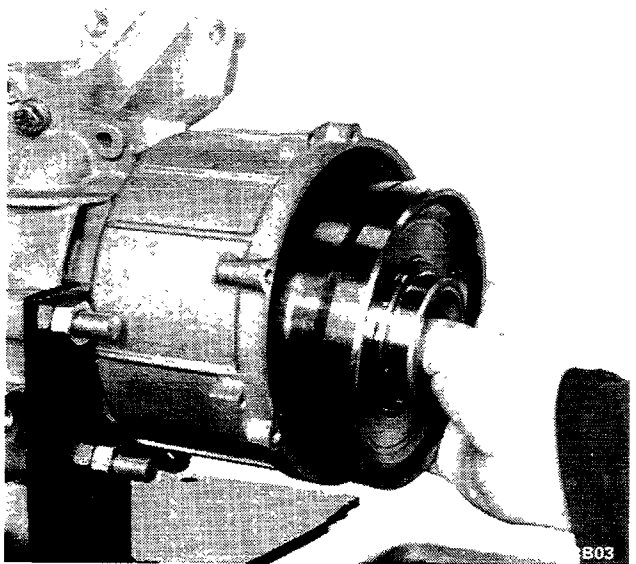
Fitting shim to “Ferguson” viscous coupling

Shims are supplied as spares in the following sizes:
2.45 - 3.05 mm in 0.05 mm steps.



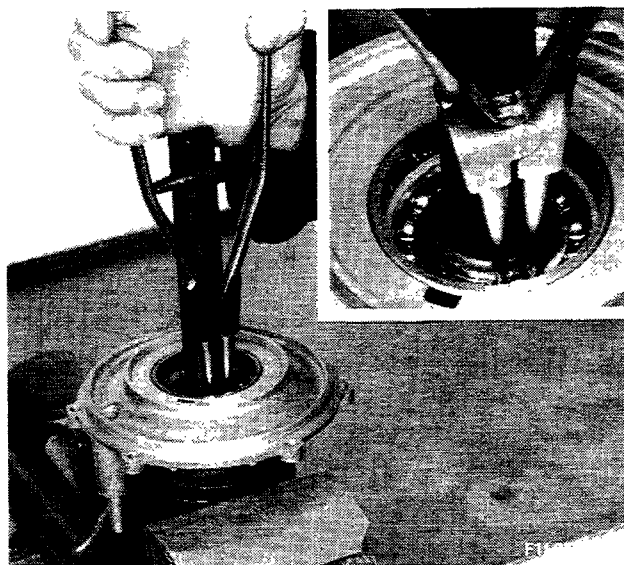
2,5 daNm

Fitting and torque tightening of outer “Ferguson” coupling housing

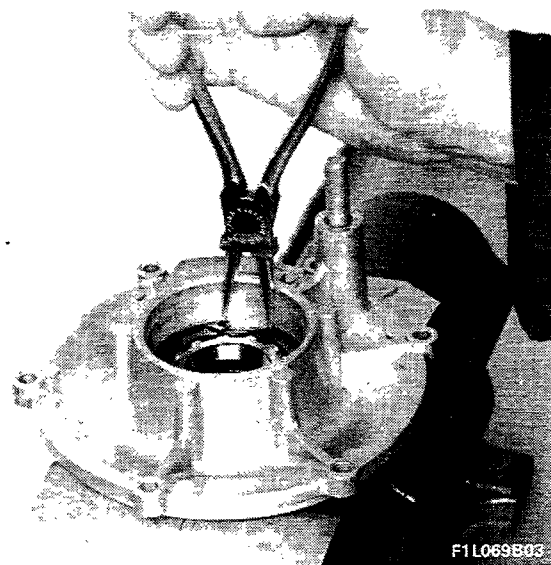


Fitting “Ferguson” viscous coupling complete with shim

"FERGUSON" HOUSING COVER

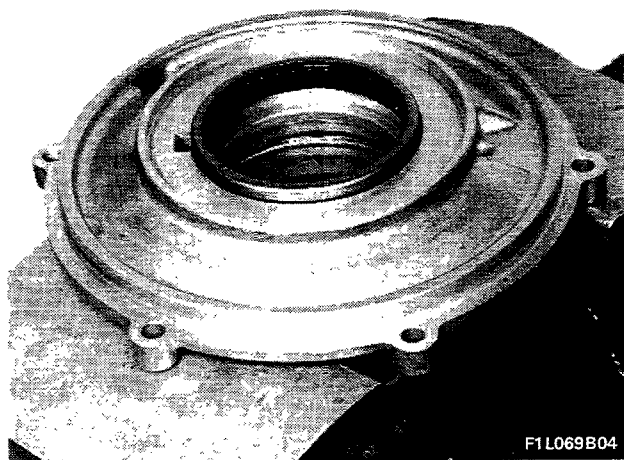


Removing-fitting intermediate shaft retaining ring



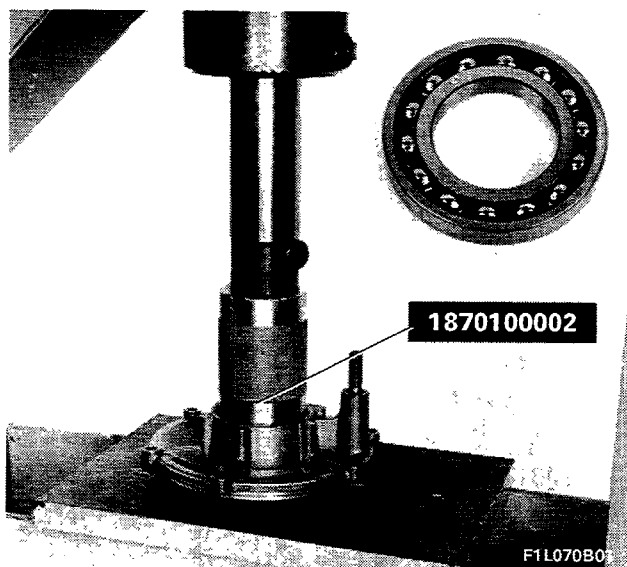
Removing-fitting retaining ring for intermediate shaft mounting ball bearing

Remove the bearing using a driver.

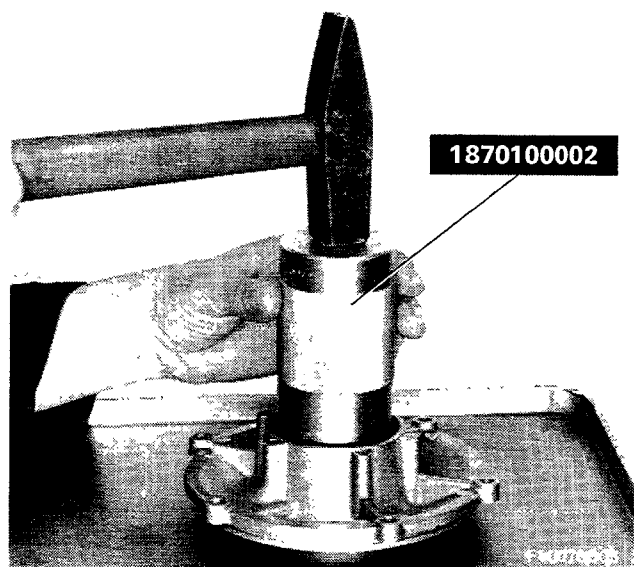


Removing-fitting "Ferguson" coupling mounting roller bearing

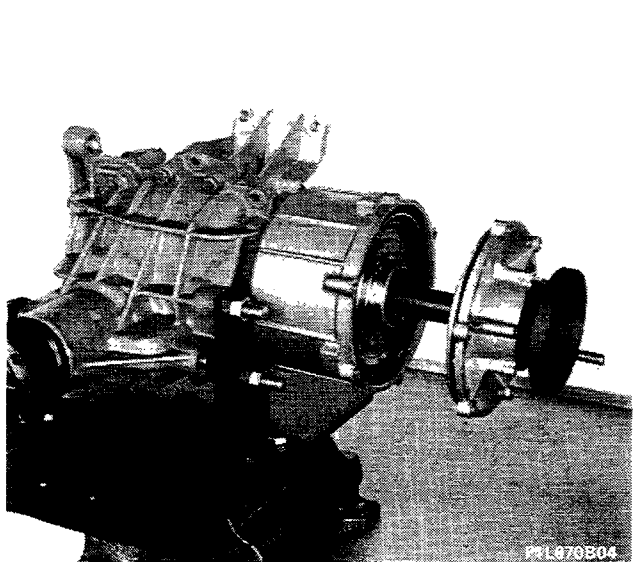
21-27.



Fitting intermediate shaft mounting ball bearing using hydraulic press

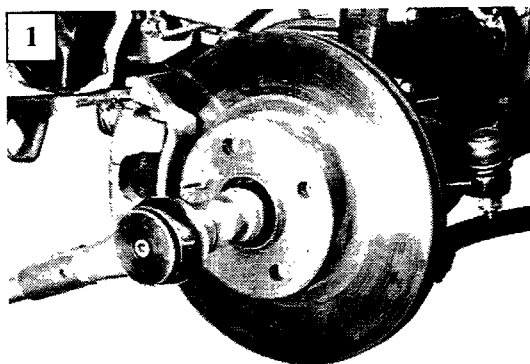


Fitting intermediate shaft seal

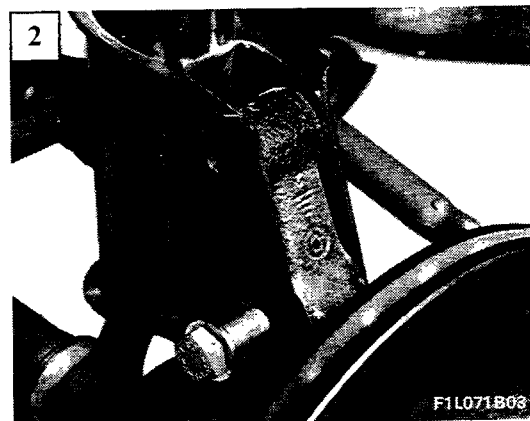


Fitting "Ferguson" housing cover complete with intermediate shaft

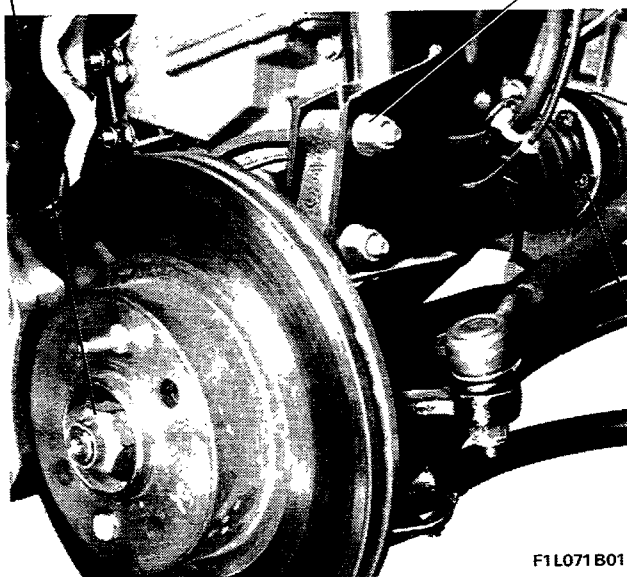
REMOVAL - REFITTING



F1L071B02

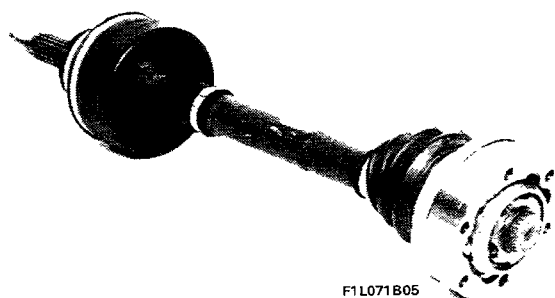


F1L071B03

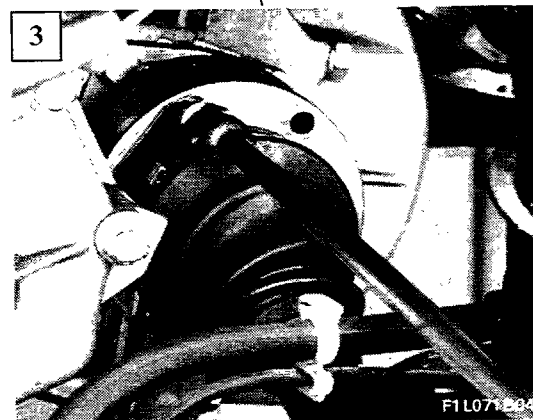


F1L071B01

4



F1L071B05

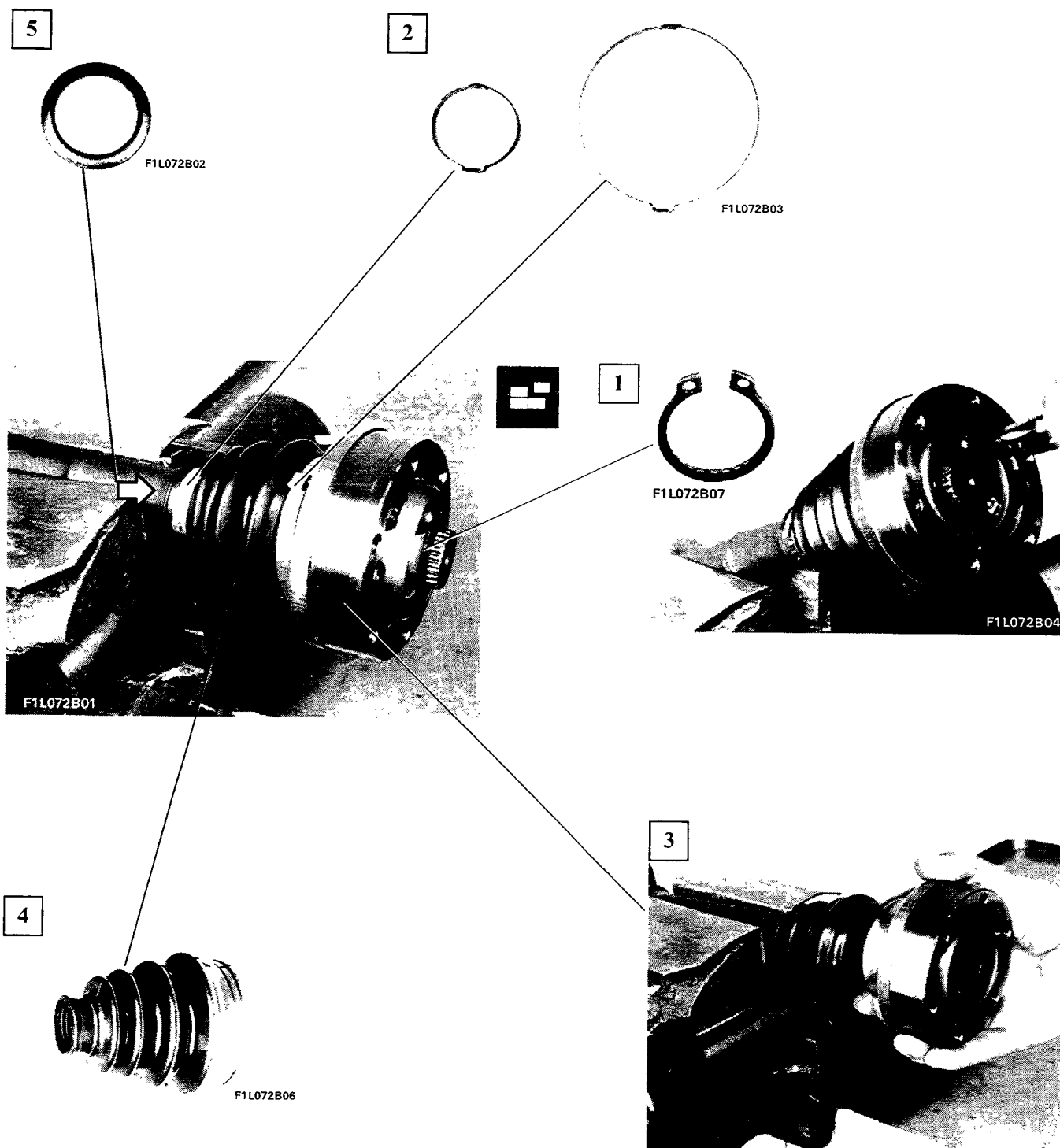


F1L071B04

The numbers next to the illustrations indicate the order of operations.

21-27.

DISASSEMBLY AND CHECKS



Removing gearbox side constant velocity joint

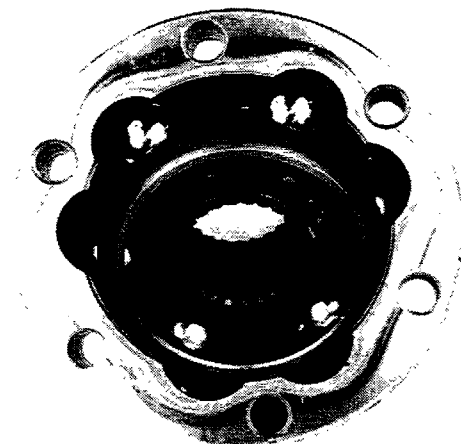
Removing constant velocity joint retaining ring **1** two boot retaining clips **2** constant velocity joint **3** protective boot **4** and lastly, withdraw the rubber washer (cup) **5**.

Gearbox side constant velocity joint

Thoroughly wash constant velocity joints with petrol or diesel and check that the balls and their seats are smooth and show no signs of binding or scoring.

Upon reassembly the gearbox side constant velocity joints must be fitted to the shaft as indicated in the table below.

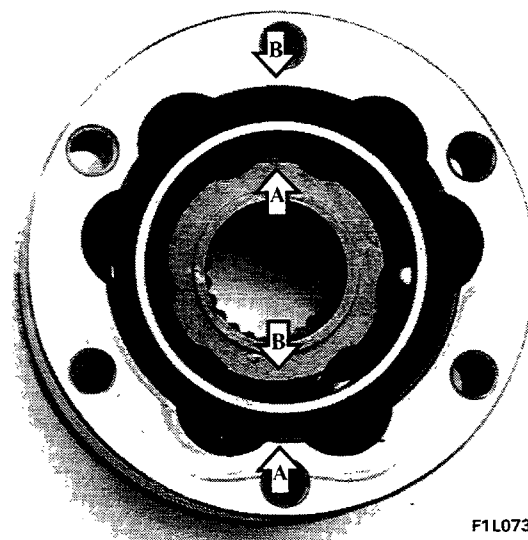
Shaft classification		Joint classification	
Category	Colour	Category	Colour
A	Dark blue	A	Dark blue
C	Red	B	White



F1L073B01

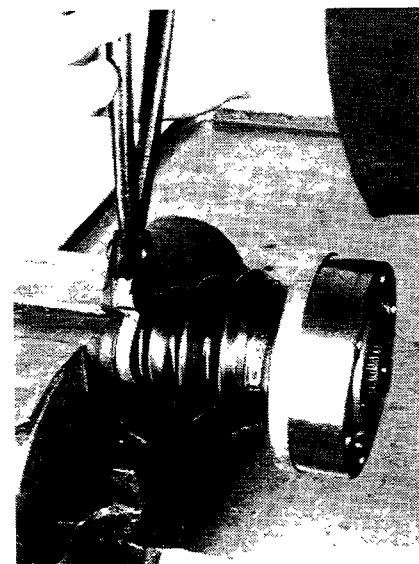
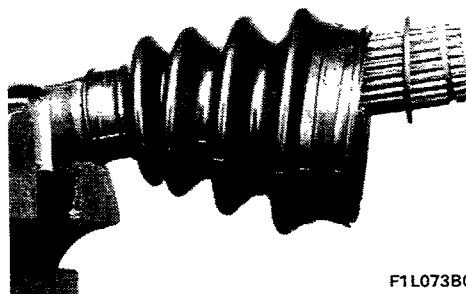
**Positioning gearbox side constant velocity joints**

If the balls come out of their seats when the joints are withdrawn, consult references shown in diagram to refit. The joint will lock otherwise.



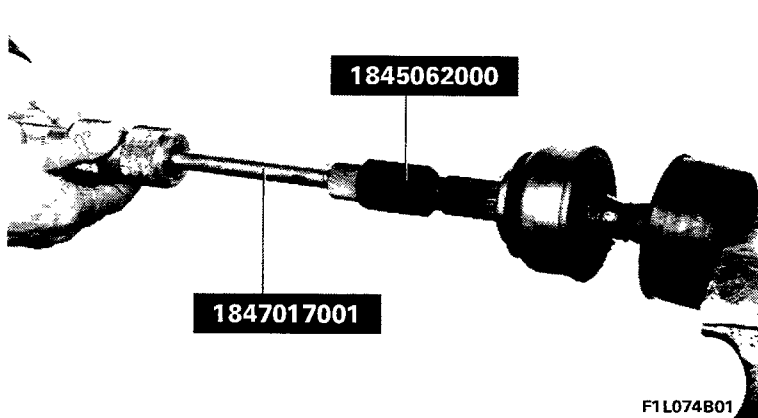
F1L073B02

- A. Smallest distance between ball seats
- B. Greatest distance between ball seats



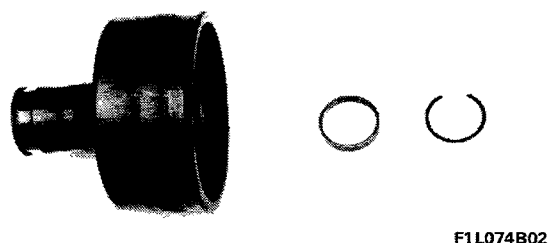
F1L073B03

Fitting protecting boot, rubber washer and closing retaining clips



Removing wheel side constant velocity joint

Remove boot retaining clips before removing joint. This operation is destructive.



Removing retaining ring, spacer and boot



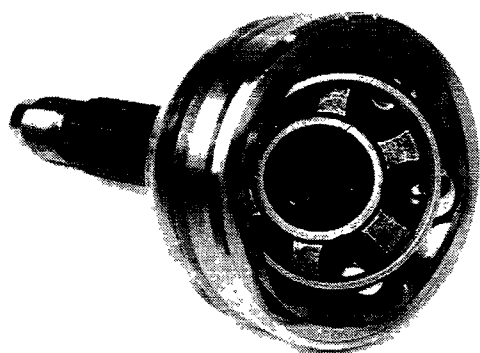
It is advisable to renew the boot whenever it is removed.

Pack constant velocity joint and protective boot with TUTELA MRM2 grease.



During assembly, use an adjustable clip to compress the constant velocity joint retaining ring.

Position the constant velocity joint on the half shaft and hammer into its seat.



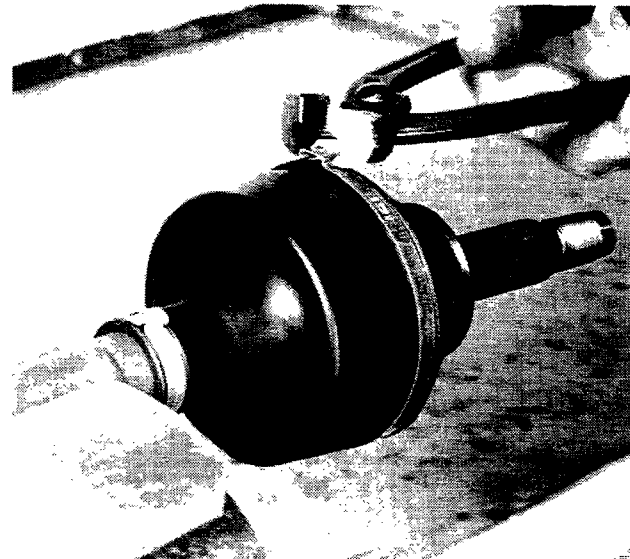
Wheel and drive shaft side constant velocity joint

Carefully wash constant velocity joints with diesel or petrol and check that the balls and seats are perfectly smooth and free from binding or scoring.

When installing, fit wheel side constant velocity joints to shaft as indicated in the table below.

Shaft classification		Joint classification	
Category	Colour	Category	Colour
A	Dark blue	A	Dark blue
		B	White
C	Red	C	Red

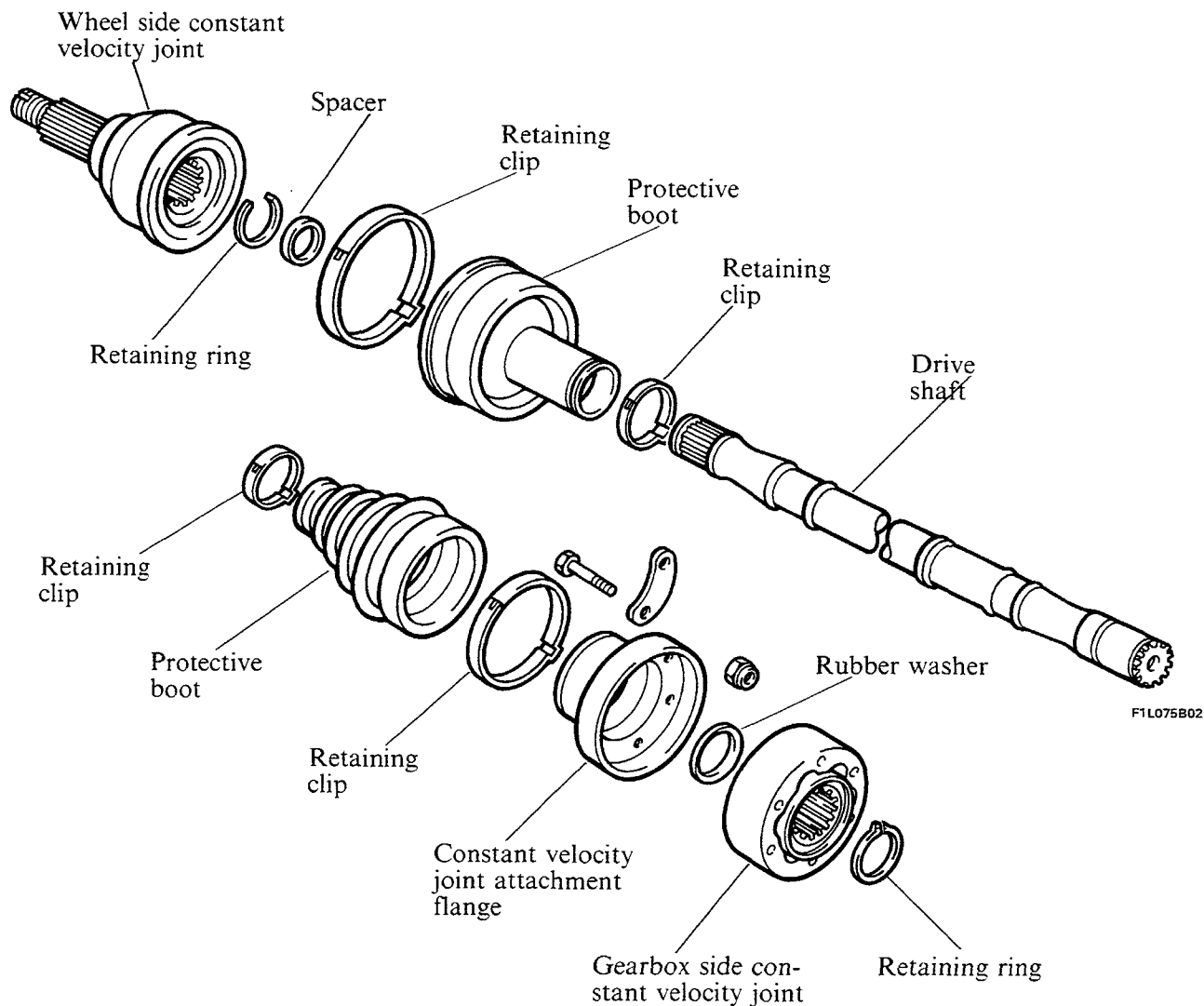
Category B joints can be fitted to both drive shaft categories



Fitting wheel side boot retaining clip



Fix drive shaft during power unit removal-installation in order to avoid damaging the boot.



Drive shaft assembly components

21-27.

PART	Thread	Tightening torque
		daNm

MECHANICAL GEARBOX - DIFFERENTIAL

Bolt retaining clutch release sleeve support cover	M 6 x 1	0.75
Bolt retaining left side cover to housing	M 8 x 1.25	2.5
Bolt retaining gear casing to support	M 8 x 1.25	2.5
Bolts retaining rear cover to gear casing	M 8 x 1.25	2.5
Bolt retaining differential cover to bell housing (length 55 mm)	M 8 x 1.25	2.5
Bolt retaining differential cover to bell housing (length 80 mm)	M 10 x 1.25	5
Bolt retaining gear rod spring	M 8 x 1.25	2.5
Magnetic plug	M 22 x 1.5	4.6
Main shaft gear lock collar	M 22 x 1.5	15
Lay shaft gear lock collar	M 22 x 1.5	15
Bolt retaining main rear bearing retaining plate	M 8 x 1.25	2.5
Bolt retaining secondary rear bearing retaining plate	M 8 x 1.25	2.5
Self-locking screw securing 1st and 2nd speed forks	M 8 x 1.25	2.5
Self-locking screw securing 3rd and 4th speed dog	M 8 x 1.25	2.5
Self-locking screw retaining 3rd and 4th speed fork	M 8 x 1.25	2.5
Self-locking screw retaining 5th speed and reverse dog	M 8 x 1.25	2.5
Bolt retaining reverse lever assembly	M 8 x 1.25	2.5
Self-locking screw retaining 5th speed fork	M 8 x 1.25	2.5
Bolt retaining gearbox shaft bushing on housing	M 6 x 1	0.75
Self-locking nut retaining gear lever to inner shaft	M 8 x 1.25	2.5
Bolt retaining outer shaft gear lever	M 8 x 1.25	2.

PART	Thread	Tightening torques
		daNm

Bolt retaining milometer support	M 6 x 1	1
Socket screw retaining spur gear	M 8 x 1.25	3.5
Reversing light switch bolt	M 12 x 1	3
Socket screw retaining drive shaft joints to front differential	M 8 x 1.25	4.2

MECHANICAL GEARBOX OUTER CONTROL

Bolt retaining rear gear engagement reaction rod rubber block	M 6 x 1	0.6
Bolt retaining gear lever ball joint to rod	M 6 x 1	0.9
Bolt retaining gear lever to floating support	M 6 x 1	0.6
Bolt retaining rubber bushing to gear engagement rod (rubber coupling)	M 6 x 1	0.9
Bolt retaining gear engagement rod ball joint to gear output shaft	M 6 x 1	0.9
Bolt retaining end of gear engagement reaction rod to rubber bush	M 6 x 1	0.9
Bolt retaining support bracket of rubber bushing anchoring reaction rod to gearbox	M 8 x 1.25	2
Nut retaining support for rubber bushing joining reaction rod to gearbox bracket	M 8 x 1.25	1.3

ENGINE-GEARBOX FASTENERS

Bolt for stud on support retaining gearbox assembly to engine	M 12 x 1.25	8.5
Nut retaining bell housing to engine	M 12 x 1.25	8
Bolt retaining bell housing to engine	M 12 x 1.25	8.5
Bolt retaining flywheel cover to bell housing	M 6 x 1	0.8

21-27.

PART	Thread	Tightening torques
		daNm

Bolt retaining starter motor to bell housing	M 8 x 1.25	2.2
Bolt retaining bell housing to engine	M 12 x 1.25	5.5

FRONT DIFFERENTIAL: TRANSMISSION

Bolt retaining viscous coupling support	M 8 x 1.25	2.5
Bolt retaining viscous coupling support cover	M 6 x 1	0.75
Bolt retaining cover for front differential-transmission support housing cover	M 8 x 1.25	2.5
Bolt retaining cover for front differential-transmission support housing cover	M 10 x 1.25	5
Staked nut for locking bevel pinion	M 20 x 1.5	17 - 28 ▲
Ring gear retaining bolt	M 10 x 1.25	8.8

FASTENERS RETAINING FRONT DIFFERENTIAL TO DISTRIBUTOR

Union for adjustable fitting retaining oil delivery lines to bevel pinion support	M 16 x 1.5	3.5
Fitting straight end section for retaining oil delivery line to bevel pinion support	M 16 x 1.5	3.5
Nut retaining front differential link to sump	M 10 x 1.25	5.1
Bolt retaining bevel pinion support to gearbox	M 12 x 1.25	8.8
Bolt retaining bevel pinion support	M 8 x 1.25	2.5

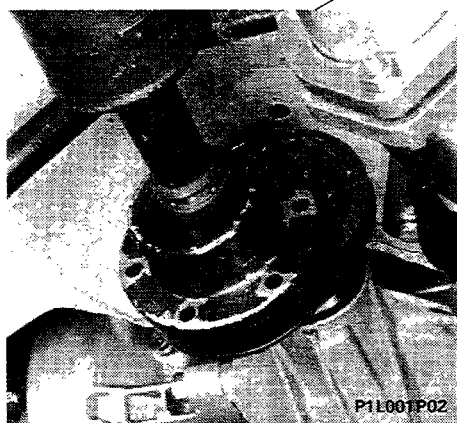
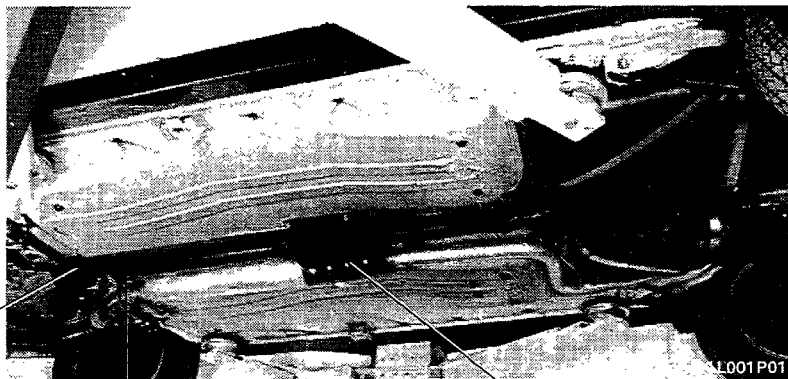
▲ Tighten nut as indicated on page 61

- Removing - refitting	1
- Dismantling and checks	3
- Tightening torques	11

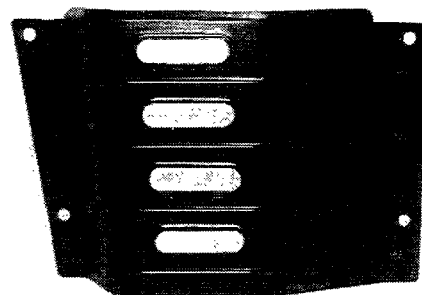
Position the vehicle on a lift.

Then, proceed as follows:

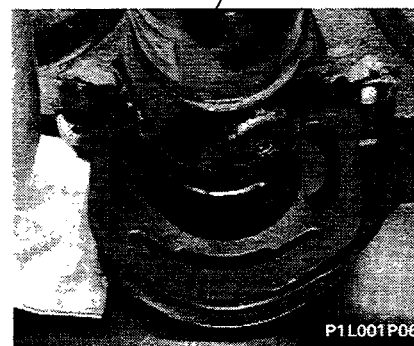
- remove the items illustrated below:



P1L001P03



P1L001P04



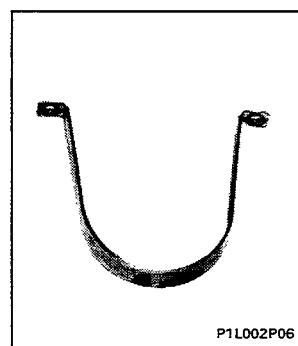
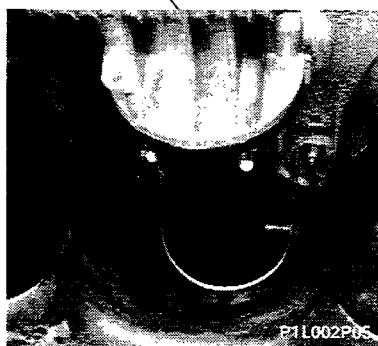
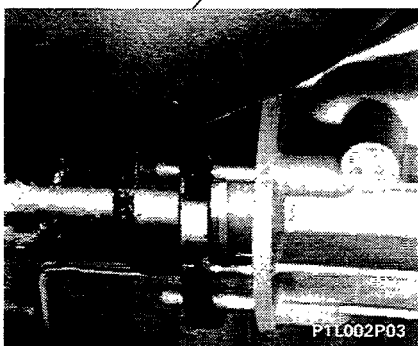
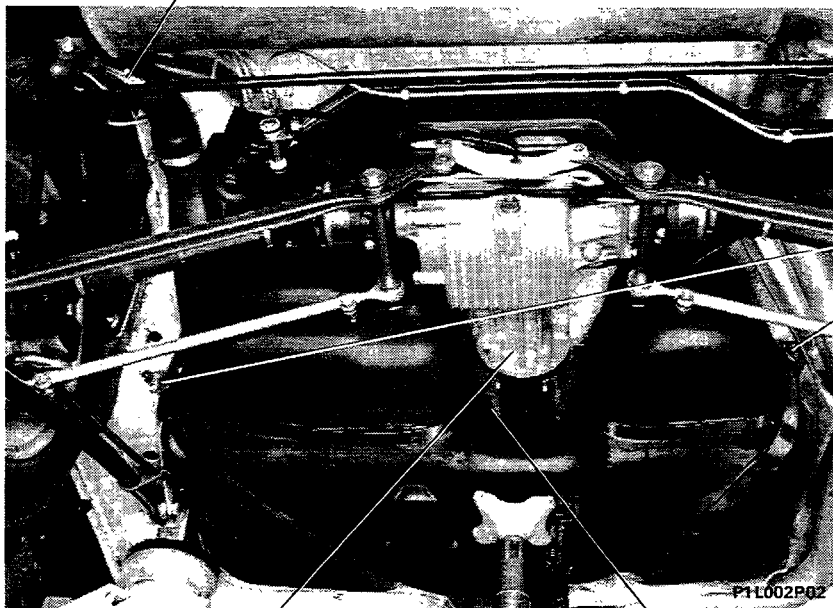
Propeller shaft

Removing - refitting

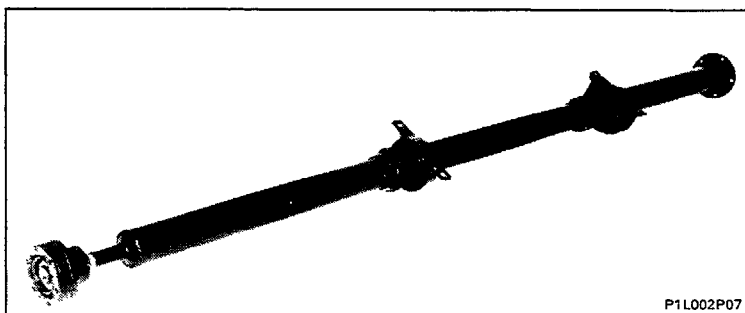
DELTA-PRISMA 4WD

24.

Position the hydraulic jack under the fuel tank.
Then, remove the items illustrated below:

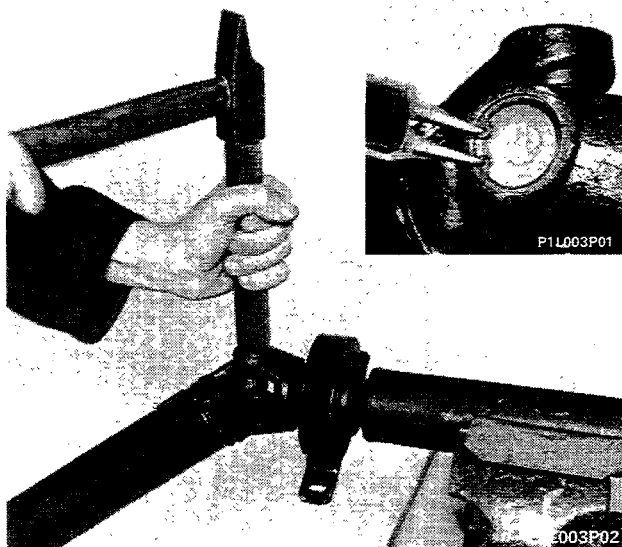


In order to gain access to the bracket, lower the tank using the hydraulic jack.



DISMANTLING AND CHECKS

It is advisable to mark the position of the components before starting to remove them.



Removing spider for universal joint using drift

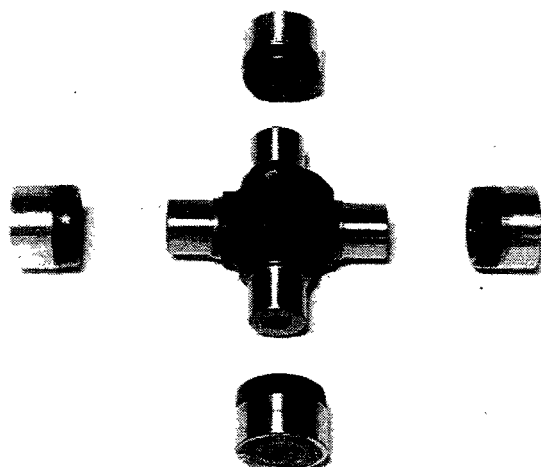
Before removing the spider, remove the circlip using pliers.



Universal joint

Check the condition of the spider and the roller bearings: if there is any interference or excessive clearance between the components, replace the entire spider.

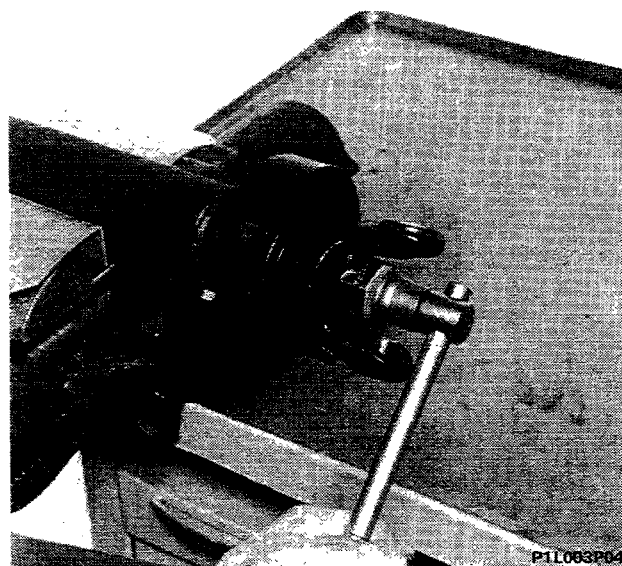
NOTE *The universal joint spiders are available as spares complete with roller bearings.*



P1L003P03



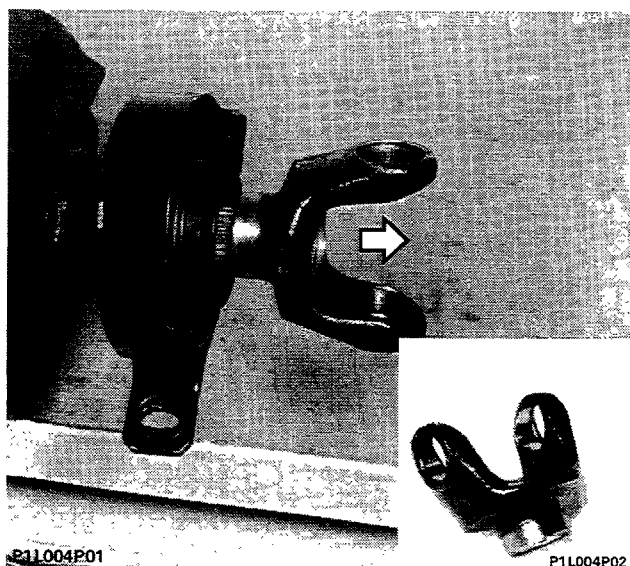
generously with Tutela MRM2 grease.



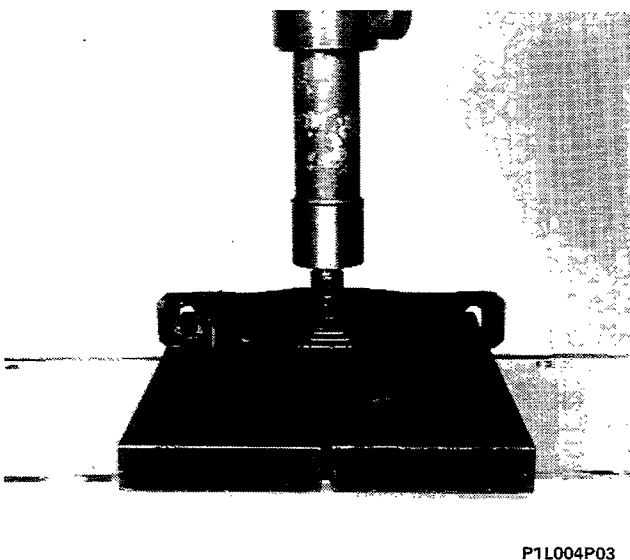
P1L003P04

Removing nut retaining fork sleeve from end of front propeller shaft

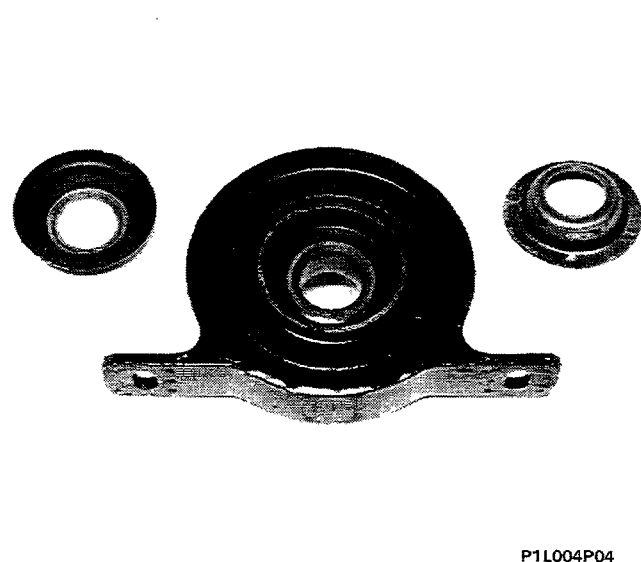
24.



Removing fork sleeve

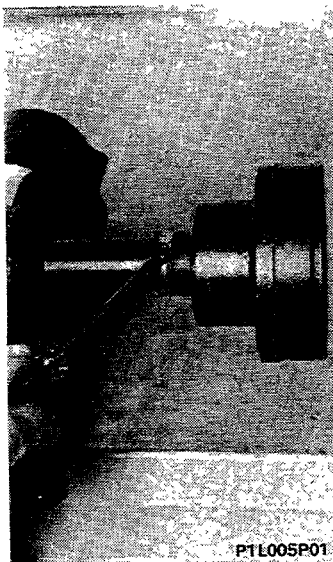


Removing flexible mounting from end of propeller shaft using hydraulic press



Centre flexible mounting

Check that the ball bearing clearance is not excessive and that it rolls smoothly.
Check that the flexible mounting has not been distorted and that the rubber section is not worn and still retains its original elasticity.



P1L005P01



P1L005P02

Removing boot retaining band and constant velocity joint circlip



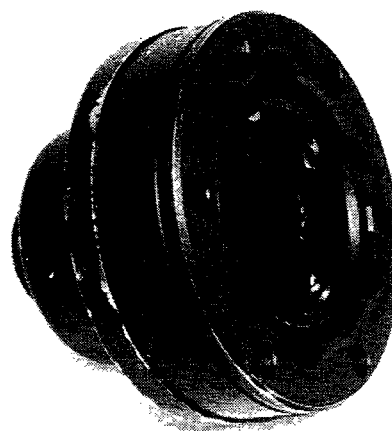
P1L005P03

Removing constant velocity joint



Constant velocity joint

Carefully wash the constant velocity joint with solvent and visually check that the ball joints and seats are perfectly specular and free from any traces of seizing or grooves.

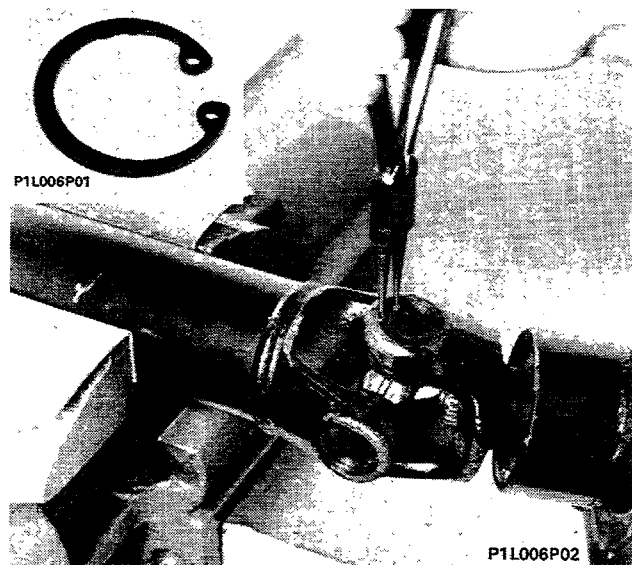


P1L005P04

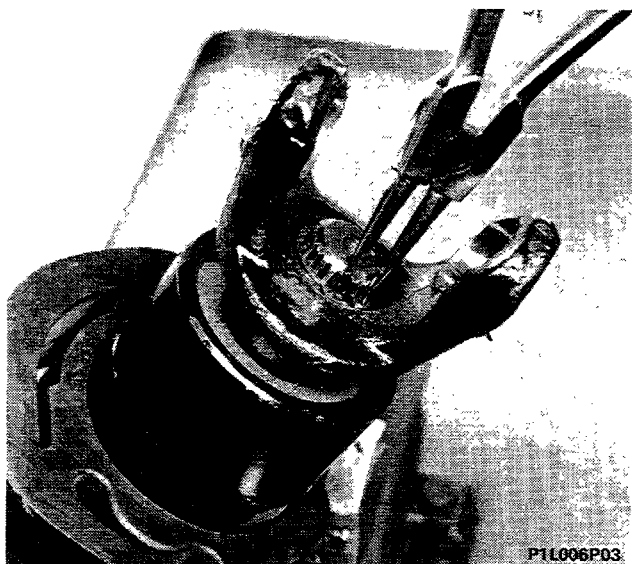


Carefully fill the cavities and the constant velocity joint with "Tutela MRM2" grease.

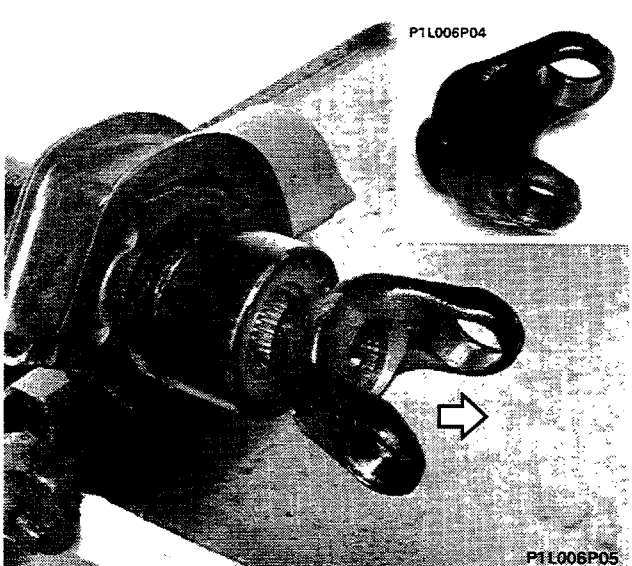
24.



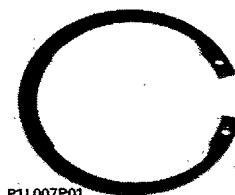
Removing spider for universal joint between middle and rear sections of propeller shaft



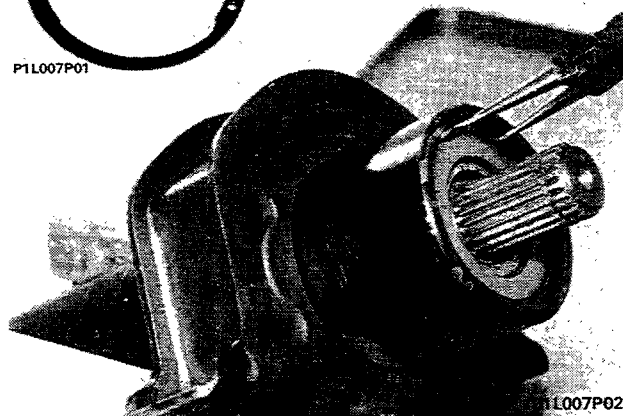
Removing fork sleeve circlip



Removing propeller shaft rear section fork sleeve



P1L007P01



P1L007P02

Removing bearing circlip

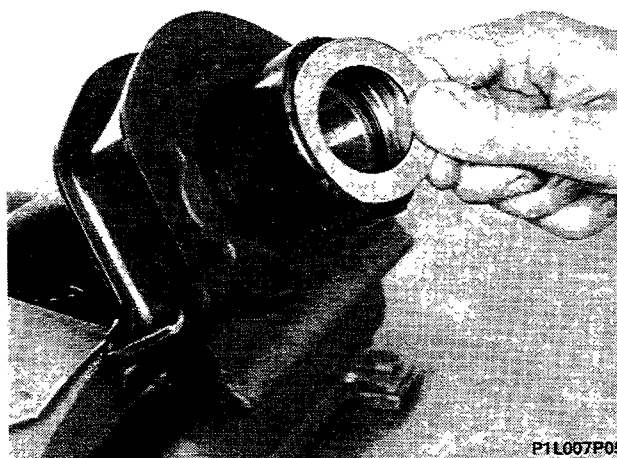


P1L007P03

Removing rear shaft from propeller shaft dust cover using drift



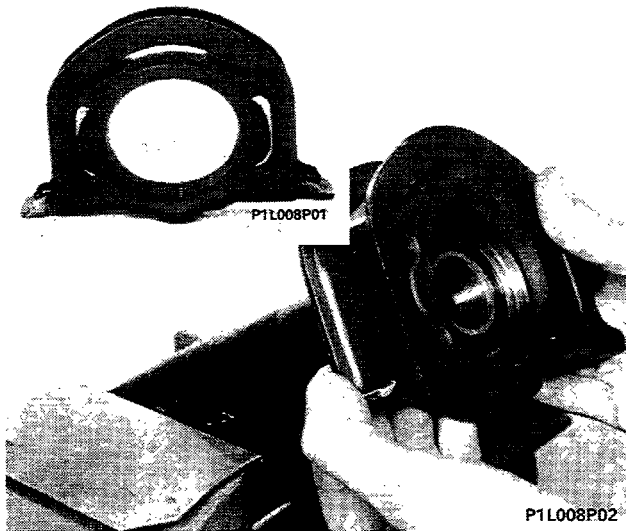
P1L007P04



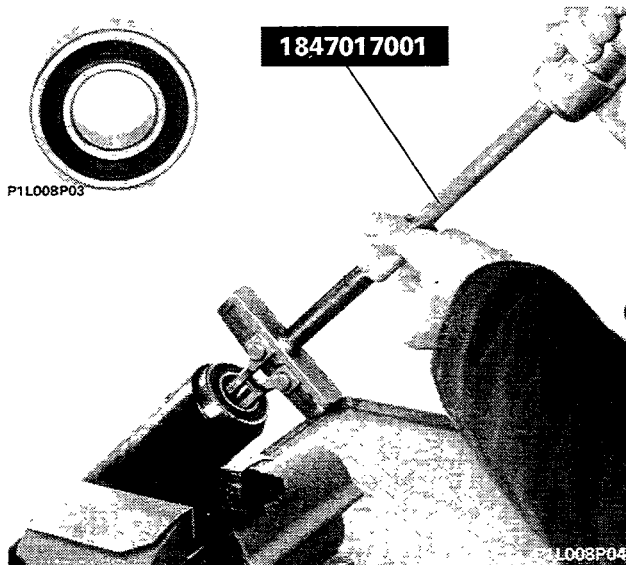
P1L007P05

Removing shim for ball bearing from inside of dust cover

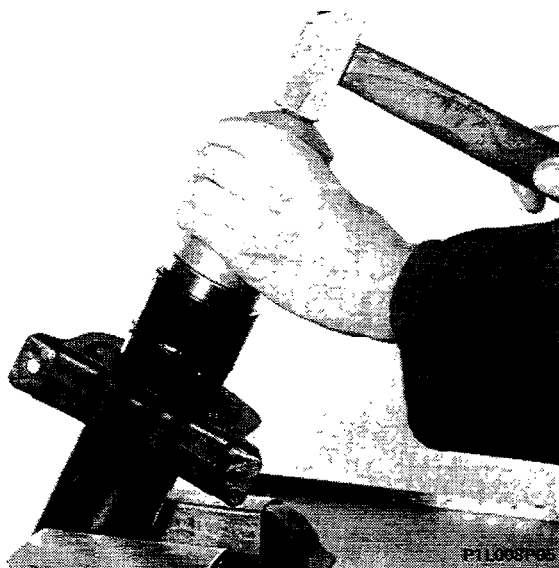
24.



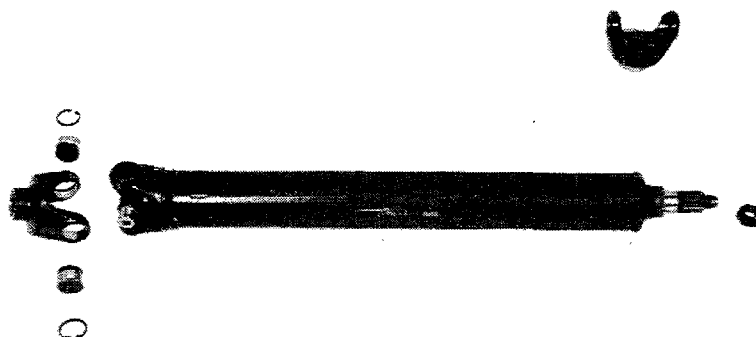
Removing flexible mounting from propeller shaft dust cover



Removing ball bearing from inside of propeller shaft dust cover using tool 1847017001



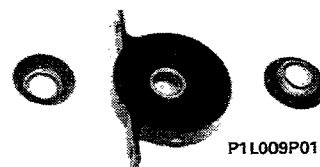
Fitting ball bearing in propeller shaft dust cover using drift



Propeller shaft front section components



The spider radial clearance is 0.01 - 0.04 mm.



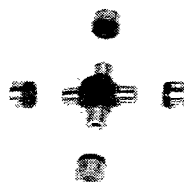
If the clearance measured exceeds the one given then the safety shims which are available as spares in the following sizes: 1.50 - 1.53 - 1.56 - 1.59 - 1.62 mm must be replaced.



Propeller shaft middle section components



The spider radial clearance is 0.01 - 0.04 mm.



P1L009P02



Propeller shaft rear section components



NOTE *When refitting the propeller shaft simply reverse the order of the operations carried out for its removal.*

P1L009P03

Fig. 1

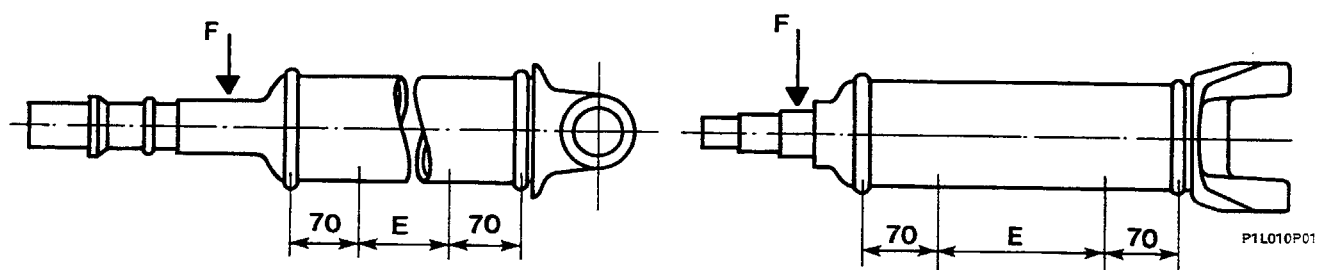
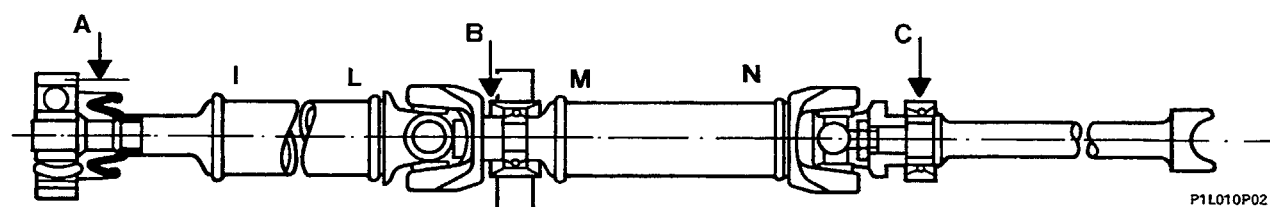


Fig. 2



CHARACTERISTICS	TEST CONDITIONS	TOLERANCE LIMITS
Equilibrium check	Fit the shaft on a balancing machine. Let the shaft rotate at 4500 rpm and check the imbalance corresponding to supports A - B - C (fig. 2)	$\leq 1,18 \text{ Nmm}$ with the maximum use of 2 balancing plates of 25g each positioned in the following areas: I - L - M - N shown in fig. 2
Eccentricity check	With the shafts suspended between counter-points and with a dial gauge resting on points F and E (fig.1)	$\left. \begin{array}{l} F \leq 0,15 \text{ mm} \\ E \leq 0,35 \text{ mm} \end{array} \right\} \text{Total reading}$

DESCRIPTION	Thread size	Tightening torque
		daNm

Propeller shaft to front differential fixing, bolt	M 8 x 1,25	4,2
Propeller shaft intermediate support cross members fixing, nut	M 8 x 1,25	1,5
Propeller shaft rear differential fixing, nut for stud	M 10 x 1,25	5
Propeller shaft safety cross member fixing, nut	M 6 x 1	0,6
Propeller shaft shield fixing, nut	M 8 x 1,25	1

REMOVAL-REFITTING

- Procedure 1

DELTA 4WD**BENCH DISASSEMBLY**

- Procedure 3
- Left differential housing cover 7
- Right differential housing cover 9

"TORSEN" differential

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ASSEMBLY

- Procedure 14
- Procedure for calculating thickness of rear bearing thrust ring on bevel pinion 16
- Bevel gear rolling torque 17
- Bevel pinion rolling torque 18
- Checking pinion-crown wheel backlash 19
- Checking and adjusting pinion-bevel gear contact pattern 20

"TORSEN" unit

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PRISMA 4WD

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BENCH DISASSEMBLY

- Procedure 25
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Differential unit

- Removal-refitting-checks 32

ASSEMBLY

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- Procedure for calculating thickness of rear bearing thrust ring on bevel pinion 37
- Bevel gear rolling torque 38
- Bevel pinion rolling torque 39
- Checking pinion-crown wheel backlash 40
- Checking and adjusting pinion and gear tooth contact pattern 41
- Lock device 43

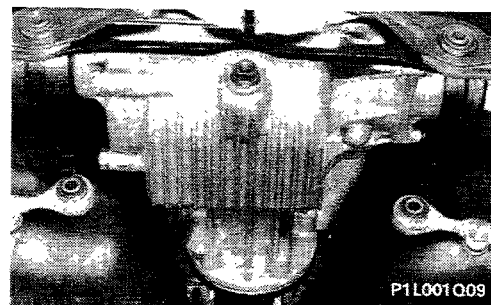
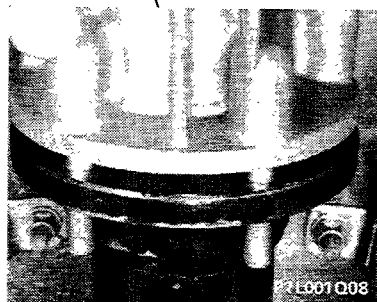
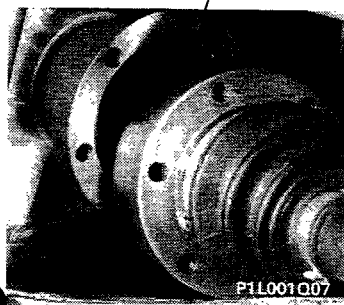
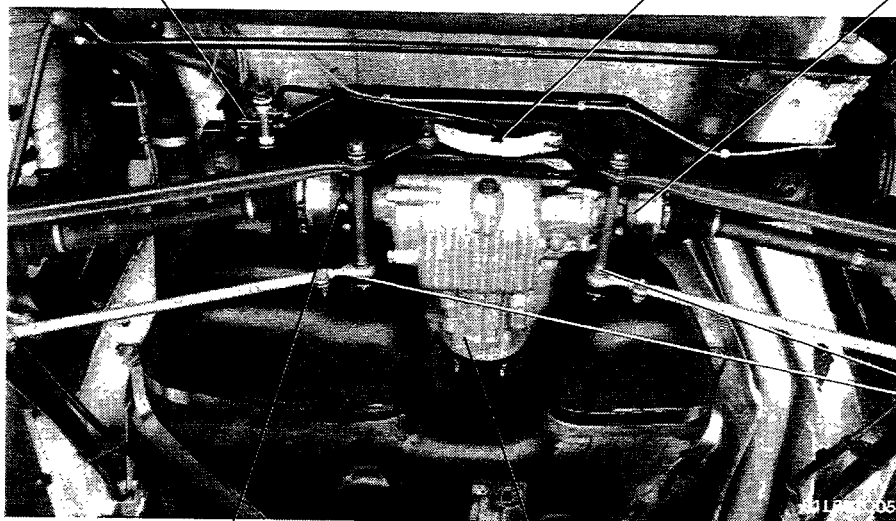
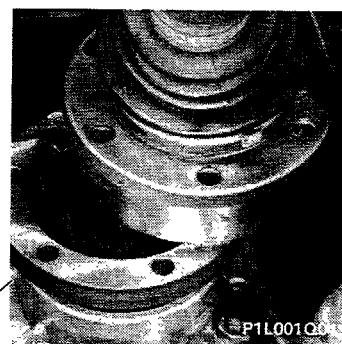
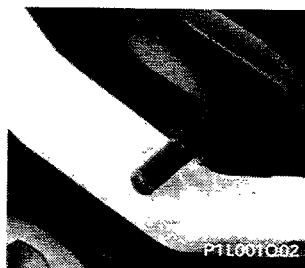
- TIGHTENING TORQUES 44**

PROCEDURE

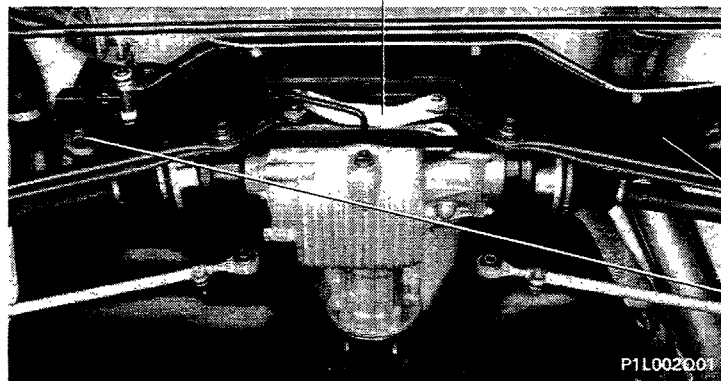
Position car on lift.

Proceed as follows:

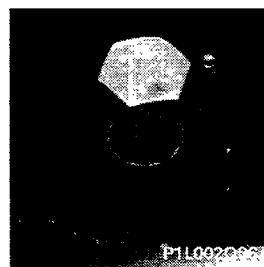
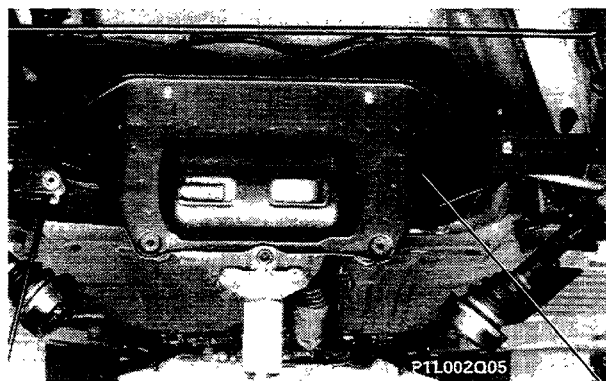
- remove back wheels;
- raise lift and, working from underneath the car, drain oil from differential;
- then proceed as follows:



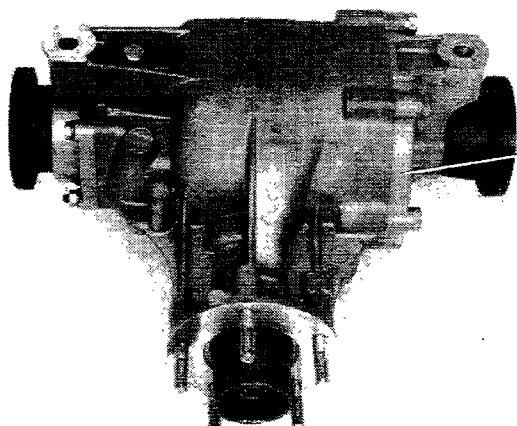
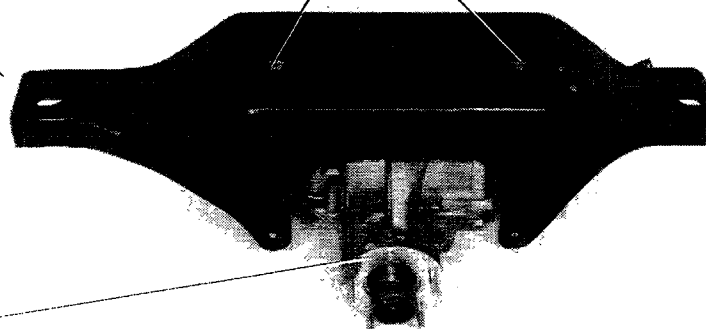
27.



Position hydraulic jack under differential unit, then proceed as follows:



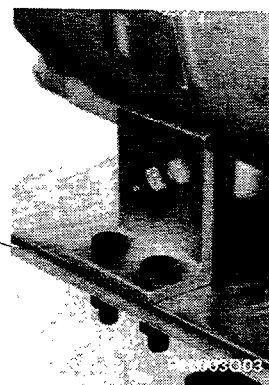
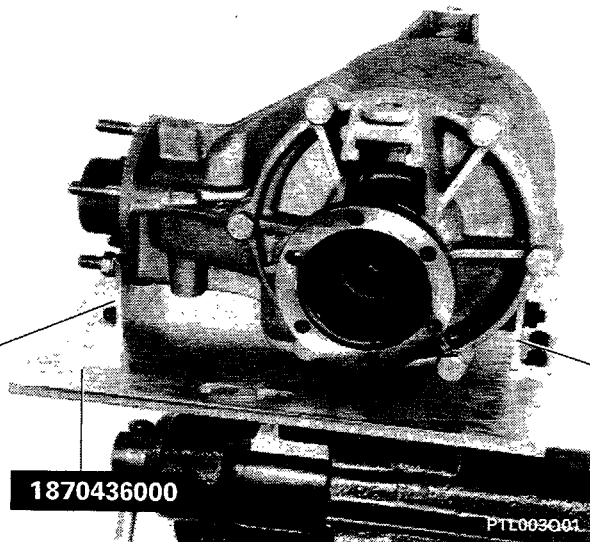
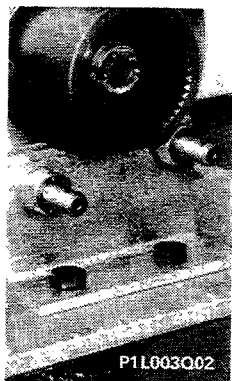
P1L002Q07



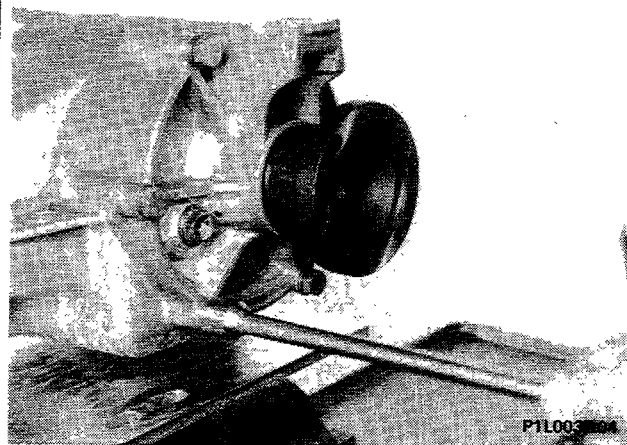
NOTE When refitting rear differential unit, carry out removal operations in reverse order.

PROCEDURE

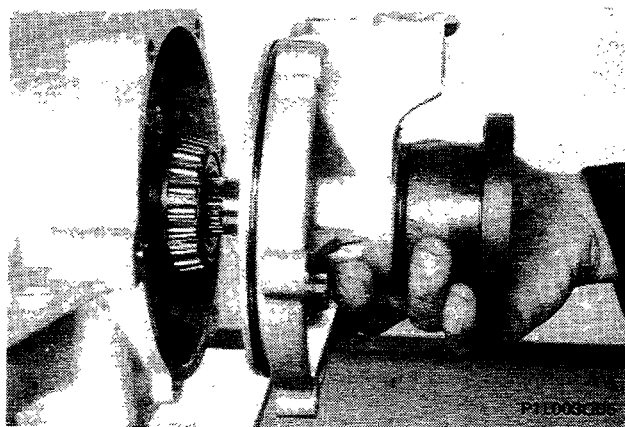
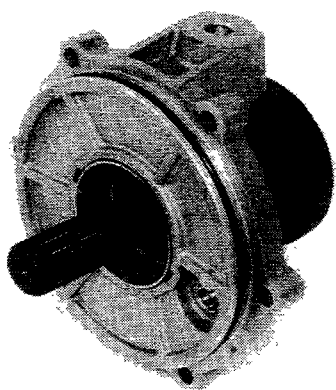
Position differential unit on stand 1870436000 secured in clamp for overhaul; then proceed as follows:



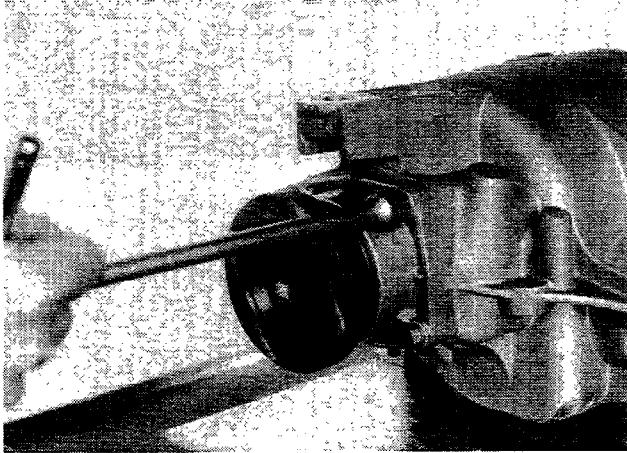
Points for securing differential unit to overhaul stand 1870436000



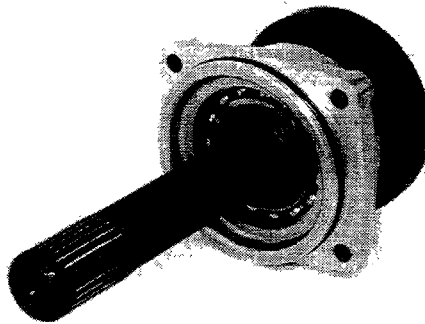
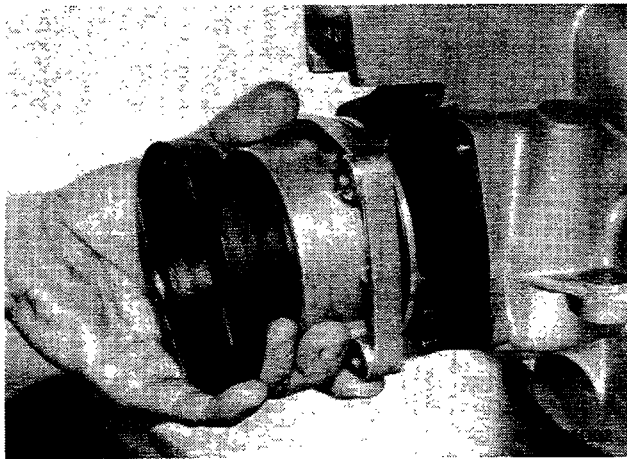
Removing left side of cover complete with shaft



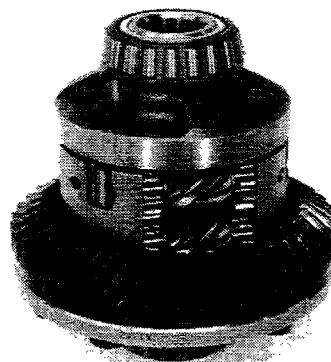
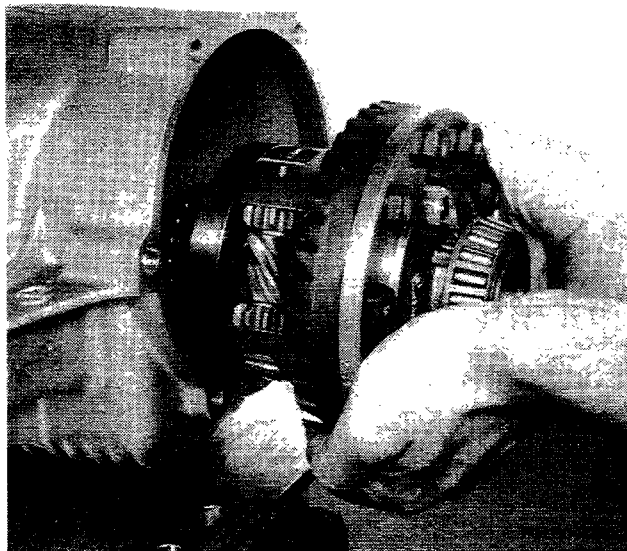
27.



Removing right side of cover complete with shaft



P1L004Q03



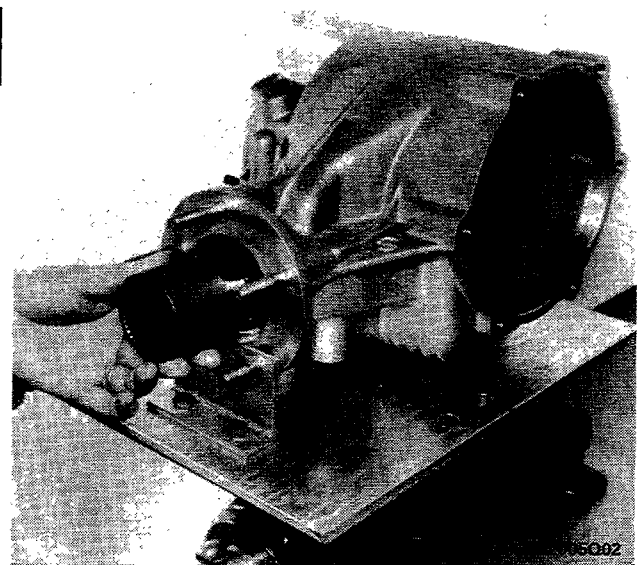
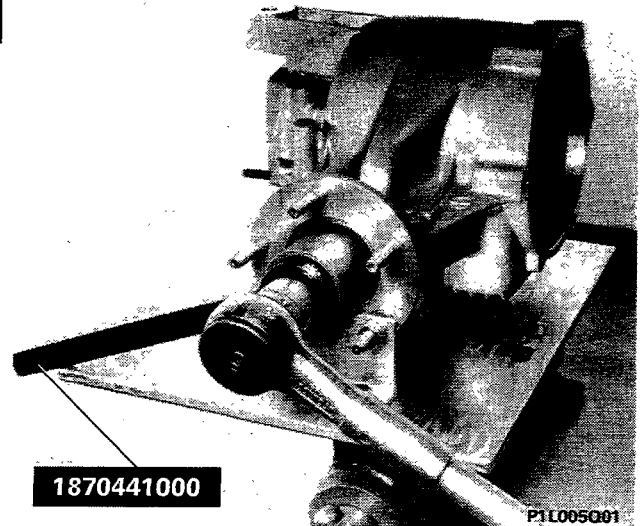
P1L004Q05

Removing "TORSEN" differential from housing

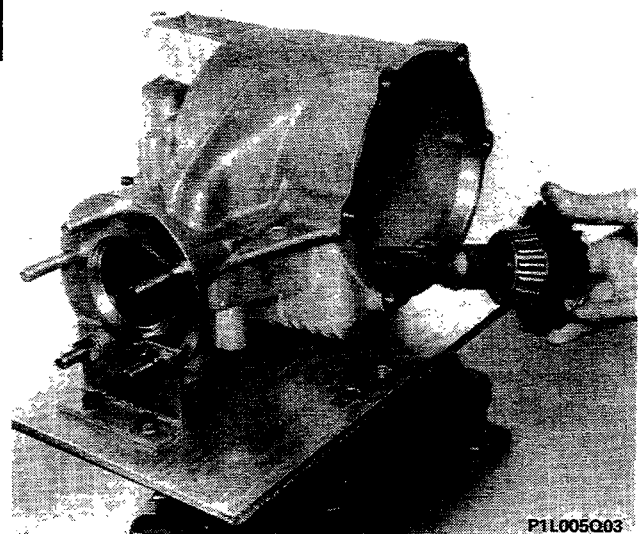


Removing pinion retaining nut

NOTE When removing pinion retaining nut, prevent pinion from turning using tool 1870441000 as shown in the diagram.

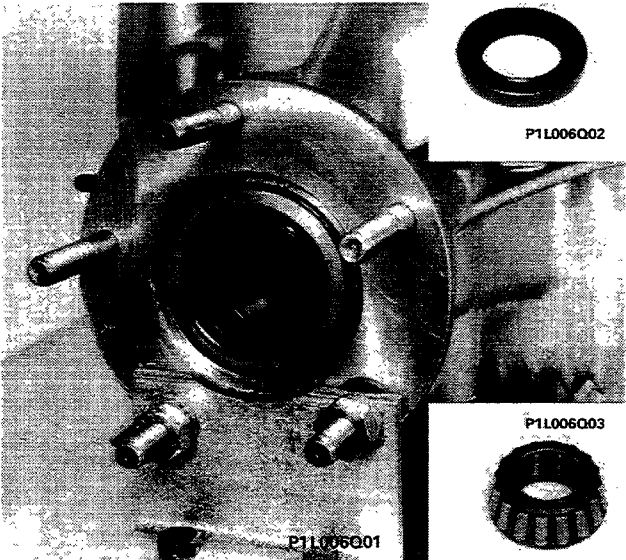


Remove toothed sleeve from pinion

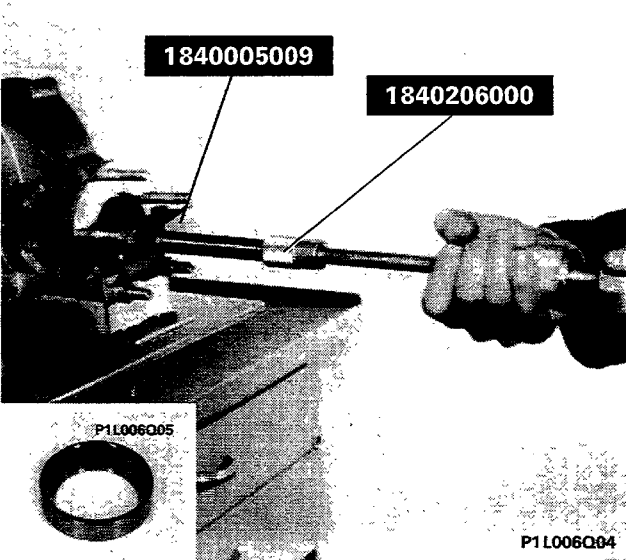


Remove pinion complete with bearing and compressible spacer from housing

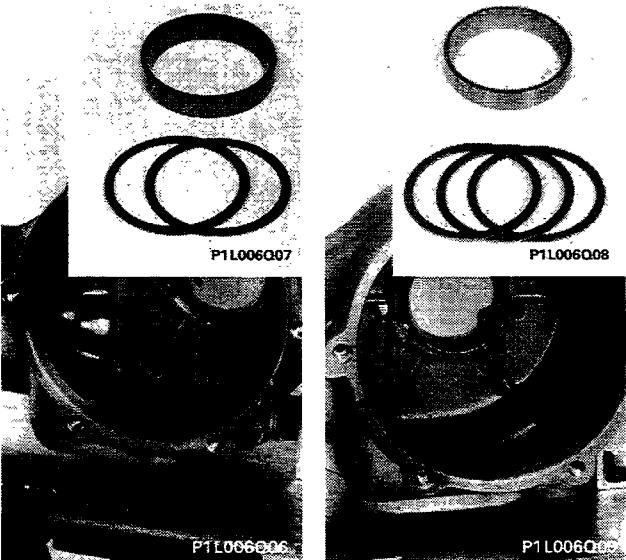
27.



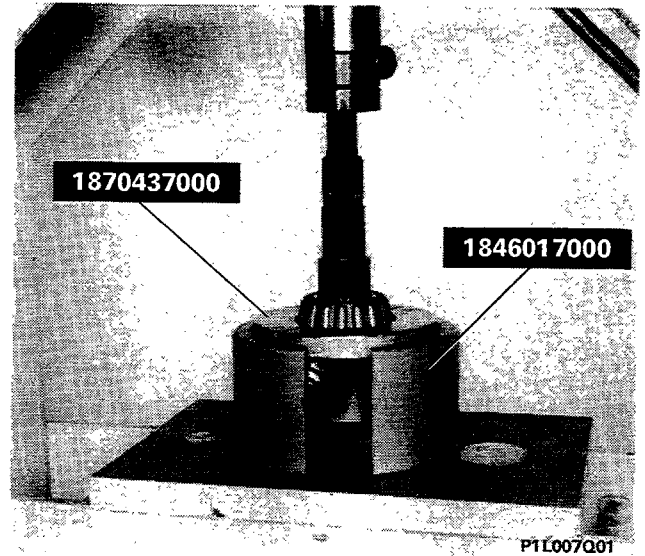
Removing differential pinion gasket and bearing



Removing differential pinion bearing outer race



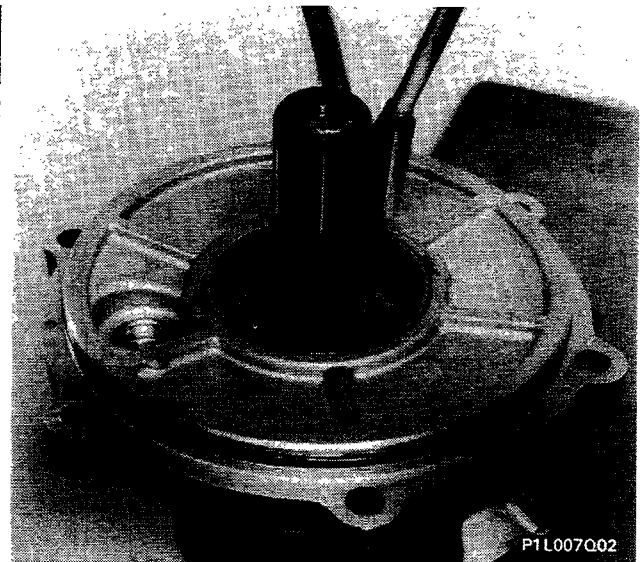
Removing bearing outer races with shims for pinion and crown wheel



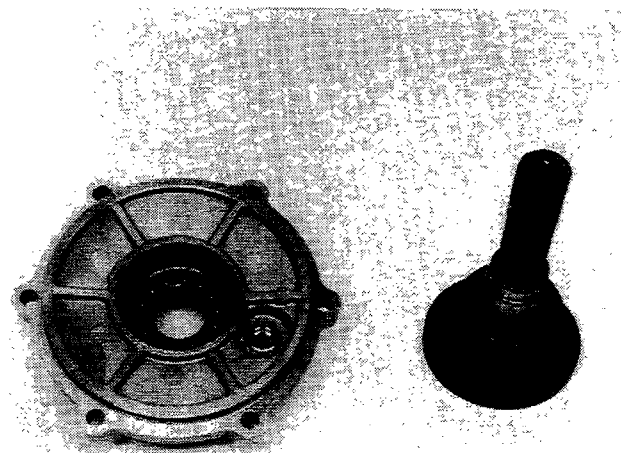
Removing pinion rear bearing inner race using hydraulic press

LEFT DIFFERENTIAL HOUSING COVER

Removal-refitting and checks



Removing-refitting drive shaft sealing ring to cover



View of left cover separated from drive shaft

NOTE Check that the drive shaft is not distorted and that surfaces and splines are not damaged. Replace if necessary.

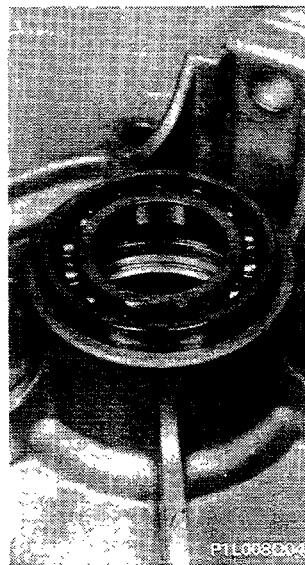
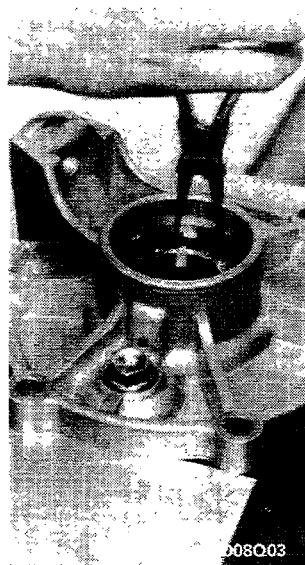
P1L007Q03

27.

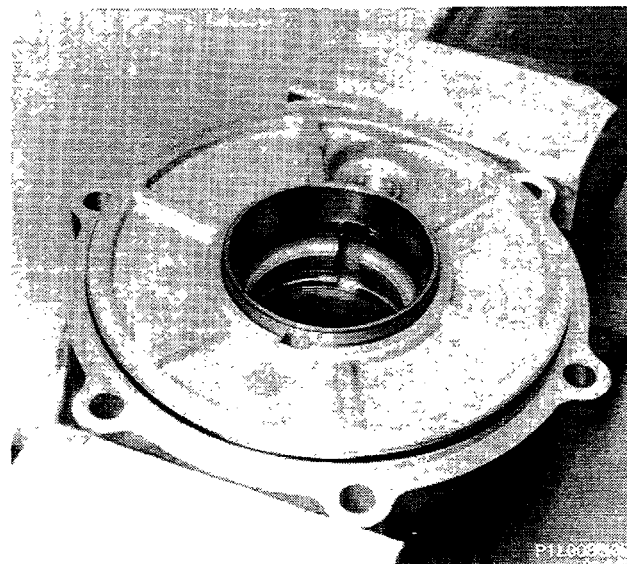


Removing-refitting left drive shaft seal

Use tool 1870100002 to fit seal as shown in diagram.



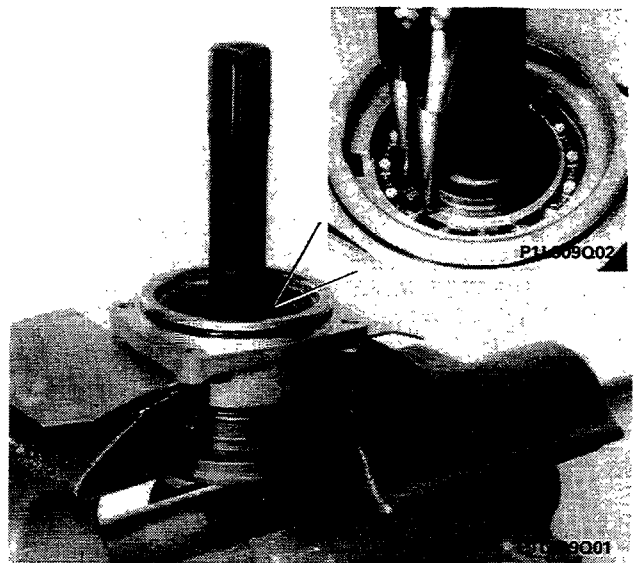
Removing-refitting retaining ring and left drive shaft ball bearing



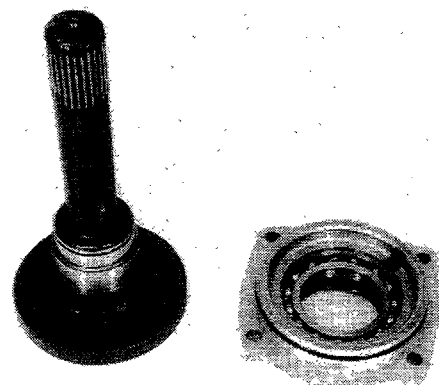
Removing-refitting "Torsen" differential support ball bearing outer race

RIGHT DIFFERENTIAL HOUSING COVER

Removing-refitting and checking



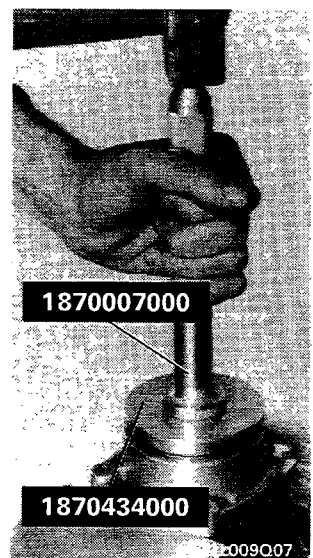
Removing right drive shaft sealing ring



View of right cover separated from drive shaft

NOTE Check that drive shaft is not distorted and that surfaces and splines are not damaged. Replace if necessary.

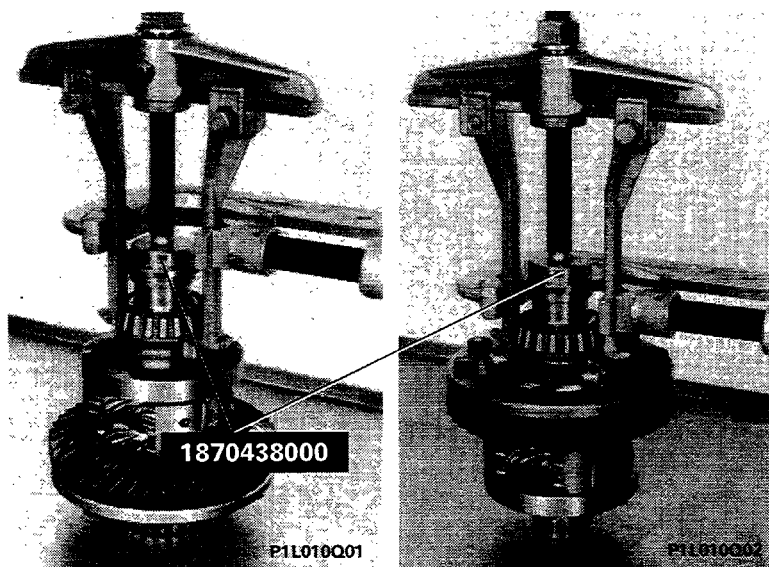
P1L009Q03



Removing-refitting retaining ring and right drive shaft ball bearing

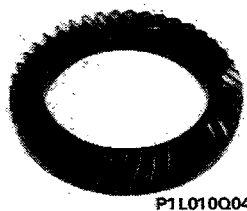
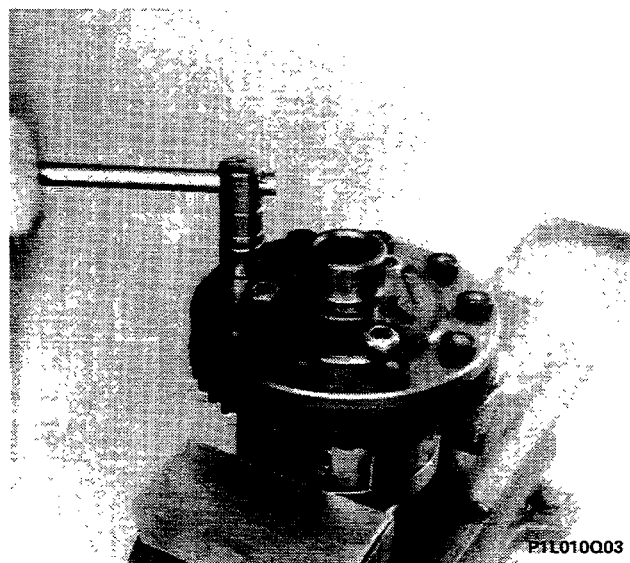
Fitting right drive shaft seal

27.

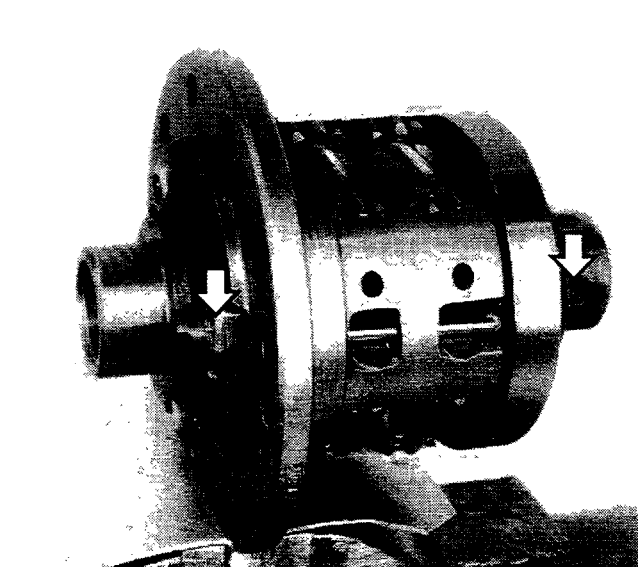


"TORSEN" differential
Removing-refitting and checking

**Removing roller bearings from dif-
ferential unit**

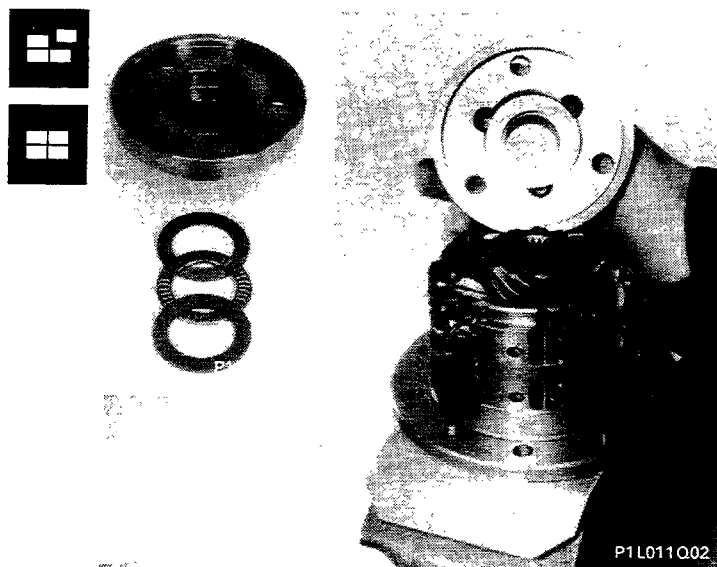


Removing crown wheel from differential unit



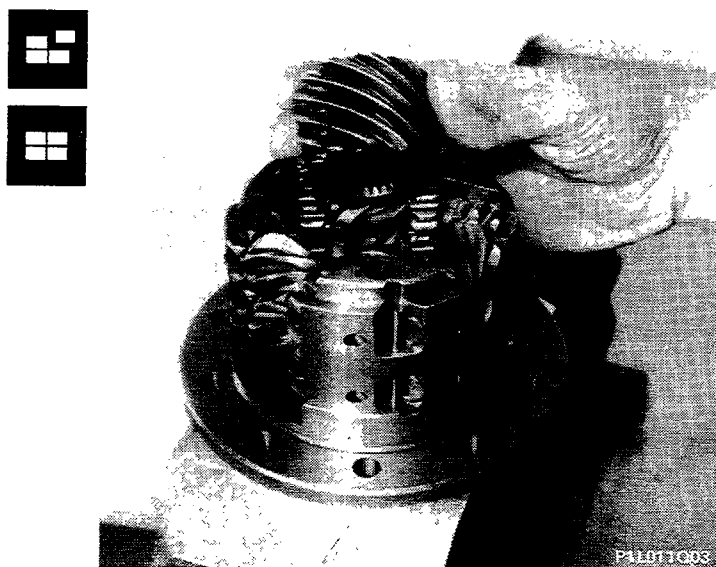
**Removing-refitting bolts retaining cover to
'Torsen' differential cover**

Removing-refitting differential casing cover complete with roller bearings



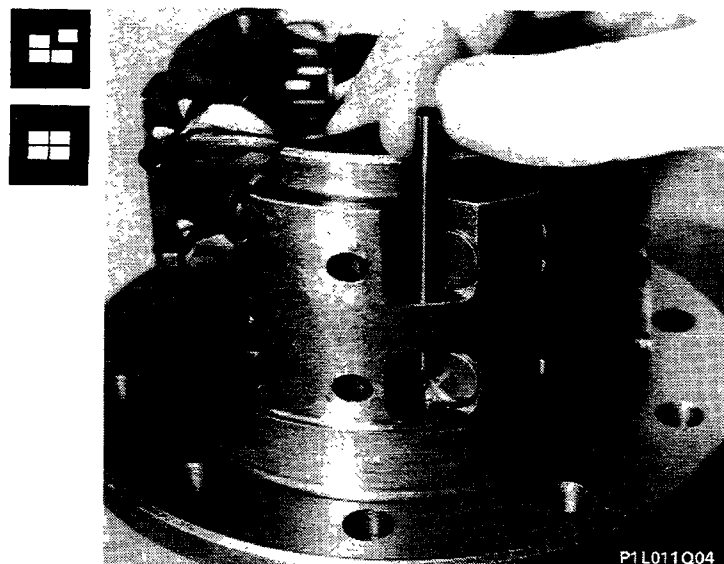
P1L011Q02

Removing-refitting planet wheel from differential casing



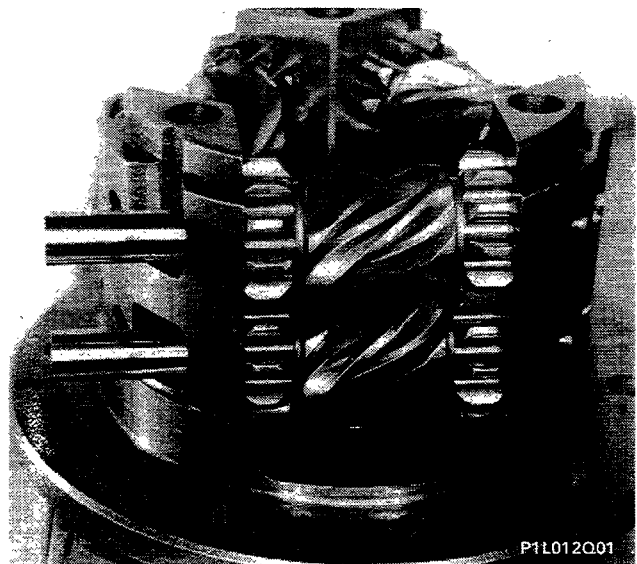
P1L011Q03

Removing-refitting satellite carrier shaft retaining pin

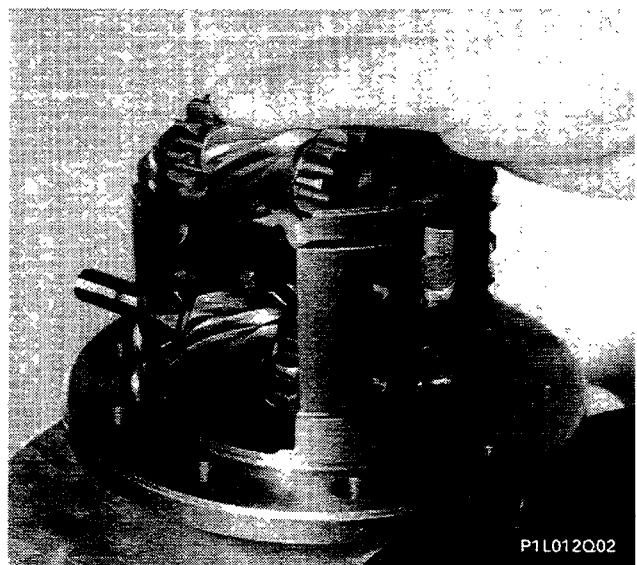


P1L011Q04

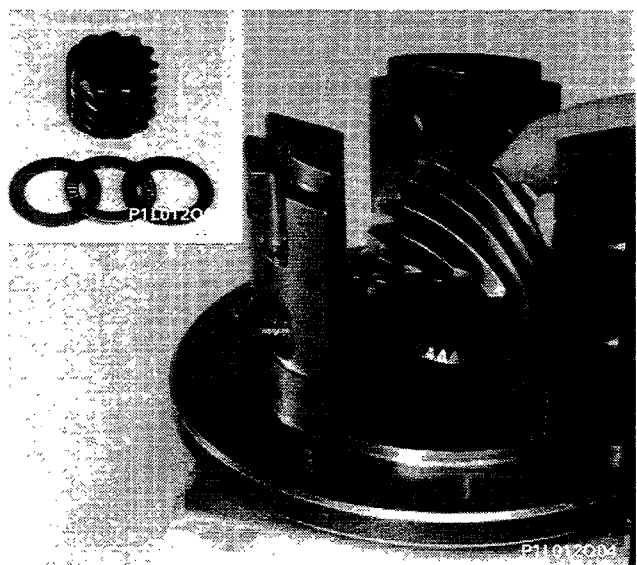
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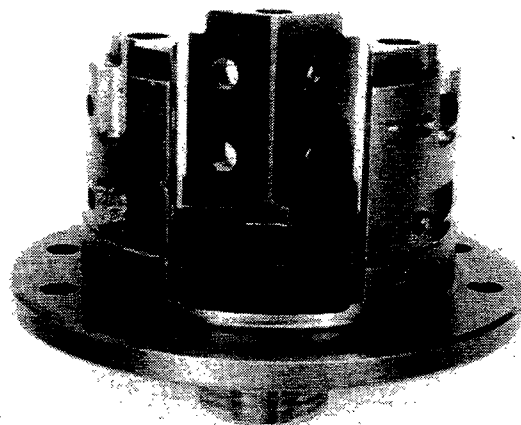
Removing-refitting satellite carrier shafts



Removing-refitting satellites from differential casing



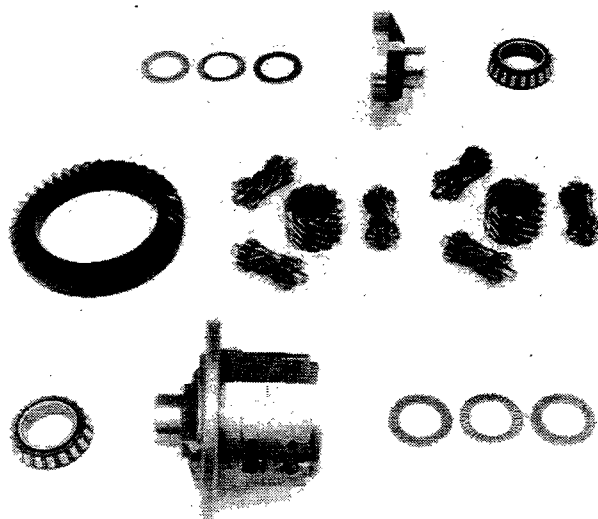
Removing-refitting planet wheel complete with roller bearing from differential casing



P1L013Q01

"Torsen" differential casing

NOTE *The differential casing should not be cracked. Bearing seats should not be worn or damaged. Replace if necessary.*

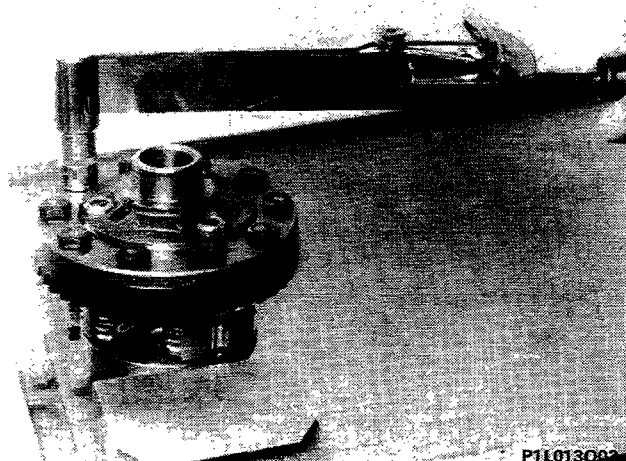


P1L013Q02

Components of "Torsen" differential unit

Gear working surfaces should not be worn or chipped. Whenever crown wheel replacement is necessary, replace bevel pinion as well, or vice versa.

Bearings should be replaced whenever they show signs of scoring, hot spots or excessive wear.

8 daNm

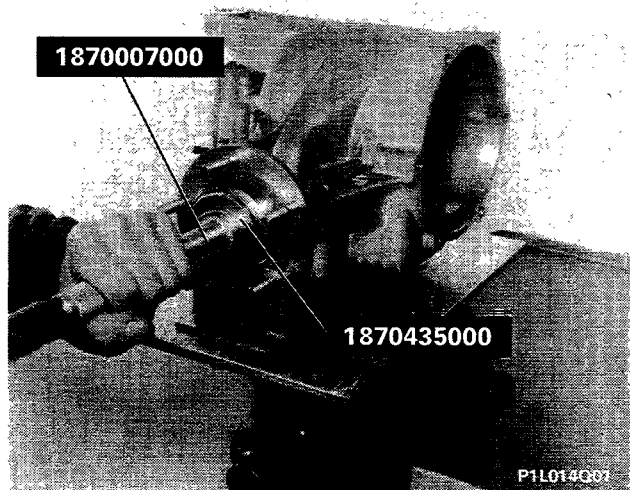
P1L013Q03

Installation and torque tightening of crown wheel

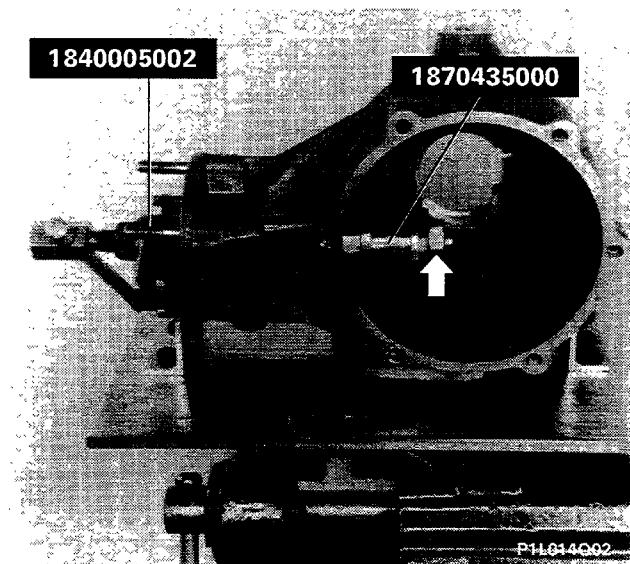
27.



PROCEDURE



Fitting outer race of outer bevel pinion bearing

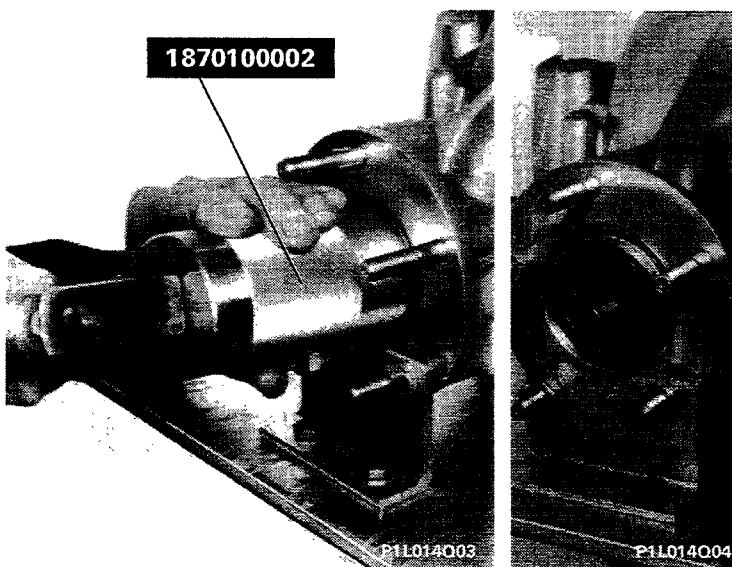


Fitting outer race of inner bevel pinion bearing

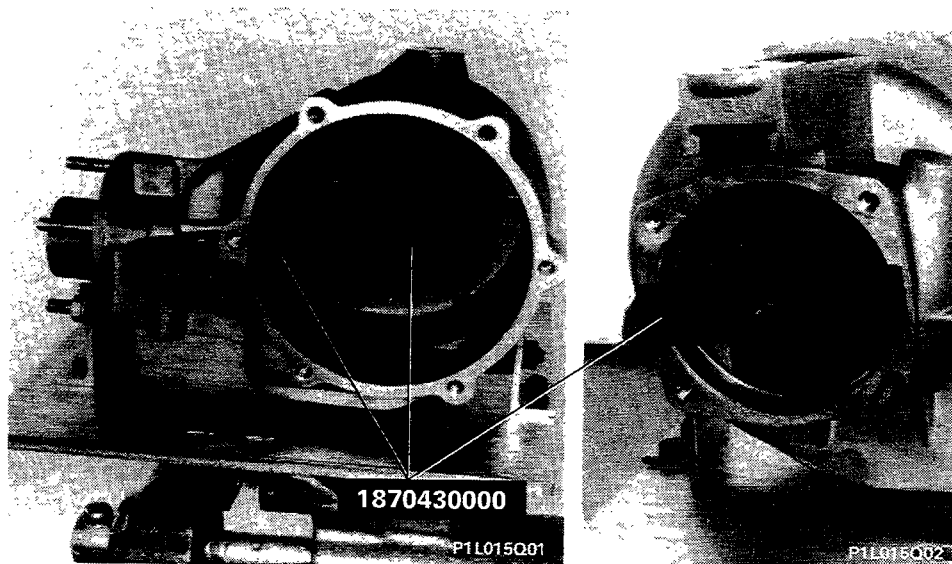
Use a service nut (shown by arrow) to obtain a thrust reaction during installation as shown in diagram.



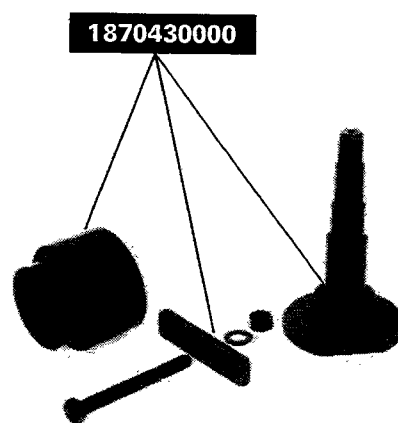
Before installing, check that outer race is properly positioned in its seat.



Fitting bevel pinion oil seal



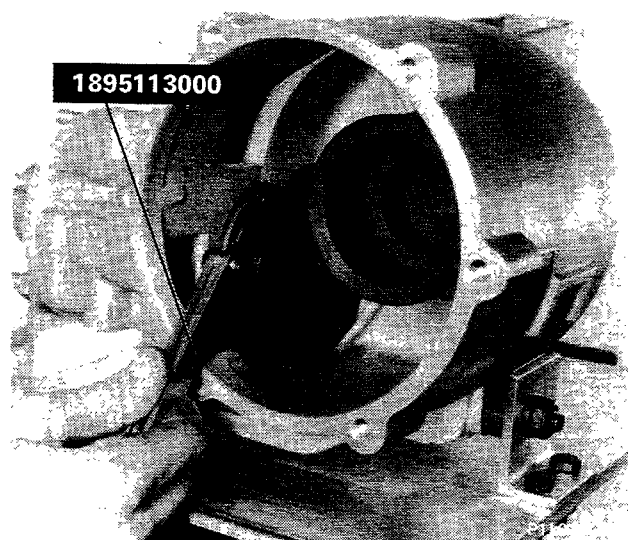
Fitting tool 1870430000
in differential casing



To fit dummy pinion 1870430000 proceed as for installation of bevel pinion, except miss out compressible spacer between front and rear bearings.

Tighten nut complete with flat washer to secure tool, adjust bearings and fully tighten.

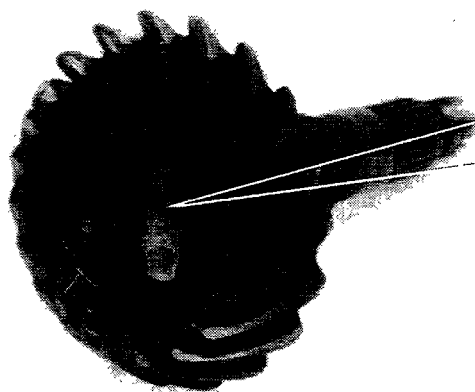
P1L015Q03



Measurements for calculation of thrust ring
thickness for rear bevel pinion bearing

To measure thrust ring thickness, use tool 189511300 as shown in the diagram.

27.



P1L016Q02



Bevel pinion

1st case - Difference between nominal and actual fitting clearance in hundredths of a millimetre.

(examples: -2, 0, +3)

2nd case - Actual fitting clearance in millimetres.

(examples: 80.45 - 80.5 - 80.52).

You will always obtain value expressed in first case by subtracting 80.50 mm from this measurement.

(examples: 80.45 - 80.50 = - 0.05 mm = - 5 hundredths)

(80.52 - 80.50 = + 0.02 mm = + 2 hundredths).

PROCEDURE FOR CALCULATING THICKNESS OF REAR BEARING THRUST RING ON BEVEL PINION

If "a" is value measured with tool 1895113000 and "b" is the value stamped on the bevel pinion by the Factory, then thickness "S" of thrust ring to be fitted is given by the following equation:

$$S = a - (+ b) = a - b$$

$$S = a - (- b) = a + b$$

in other words:

- if the number stamped on the pinion is preceded by a (+) sign, ring thickness is obtained by subtracting stamped number from value measured with tool 1895113000;
- if the number marked on the pinion is preceded by a (-) sign, ring thickness is obtained by adding the number to the value obtained with tool 1895113000.

Example: let **a** = 2.90 (value measured with tool 1895113000)

and let **b** = - 5 (amount in 100ths of a mm stamped on pinion);

then: $S = a - (- b)$;

$$S = 2.90 - (- 0.05);$$

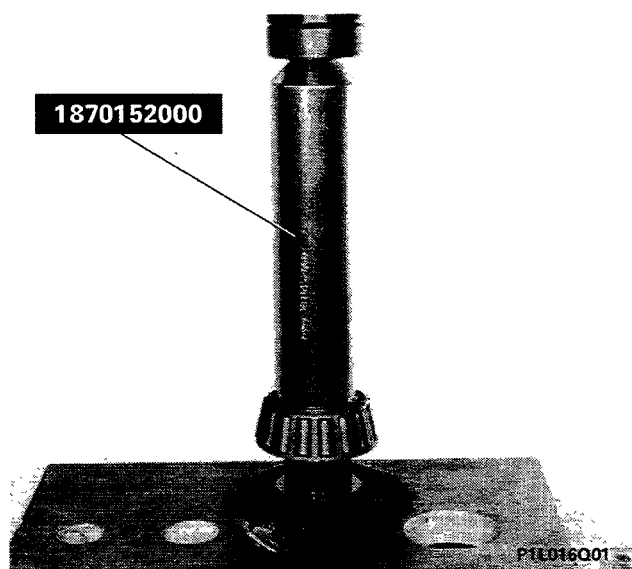
$$S = 2.90 + 0.05;$$

$$S = 2.95$$

In this case a thrust ring 2.95 mm thick must be added.



If the value obtained does not correspond to one of the spare thrust rings provided, fit the next size up.



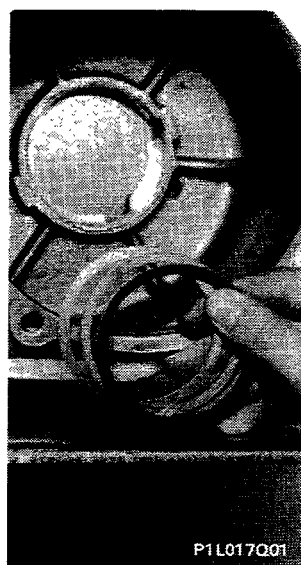
Fitting roller bearing inner race to bevel pinion using hydraulic press.

CROWN WHEEL ROLLING TORQUE

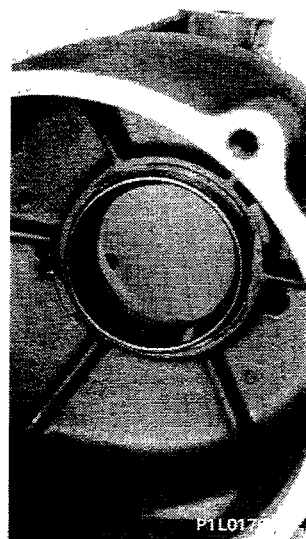


Fitting shims and differential casing bearing outer race

NOTE Shim thickness may be increased or decreased until differential casing bearing rolling torque is as specified.



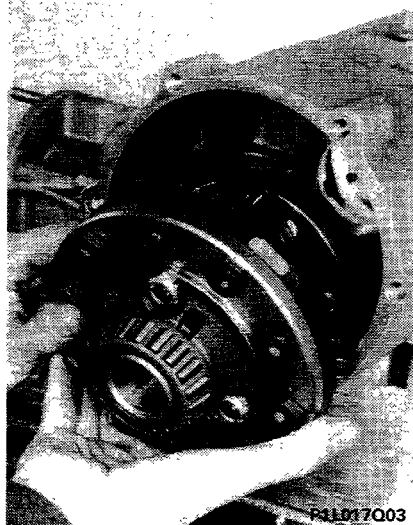
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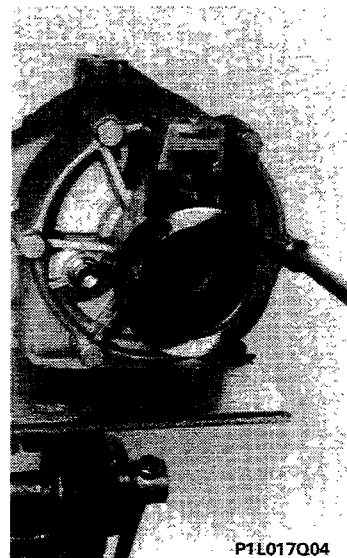
P1L017Q02



Fitting "Torsen" differential in the casing and left cover



P1L017Q03



P1L017Q04

0,12 ÷ 0,15 daNm



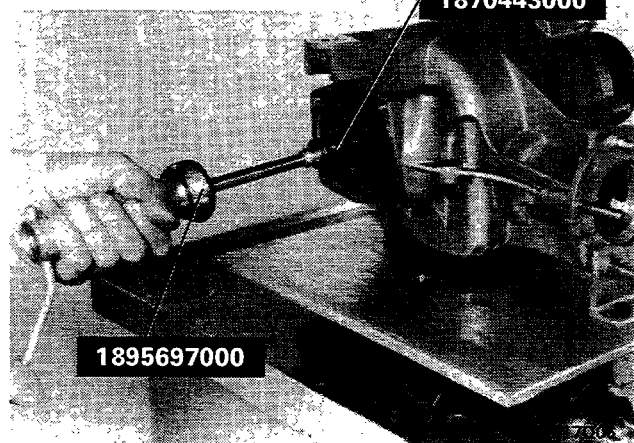
P1L017Q05



1870443000

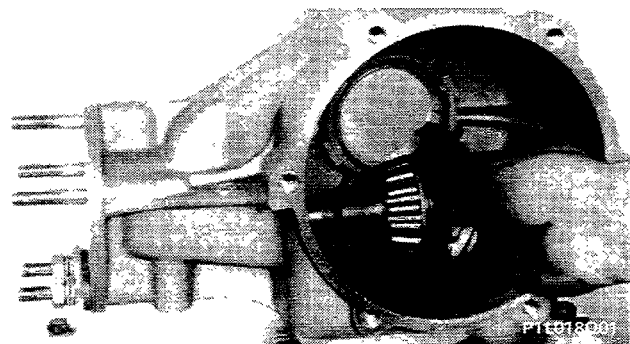
Crown wheel rolling torque

If the rolling torque is too high, decrease shim thickness. Otherwise increase thickness. Then remove differential unit.



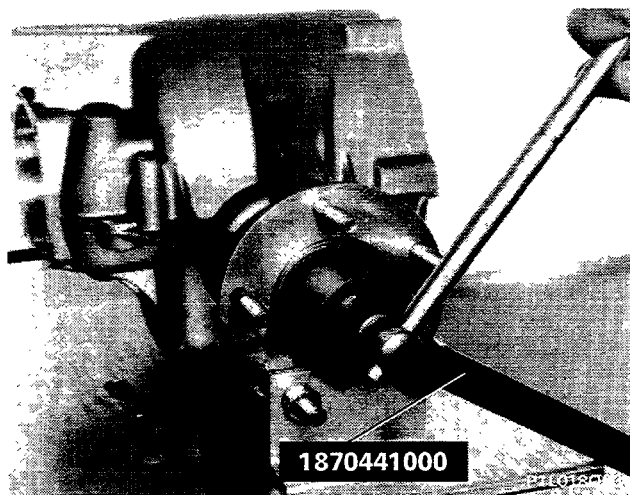
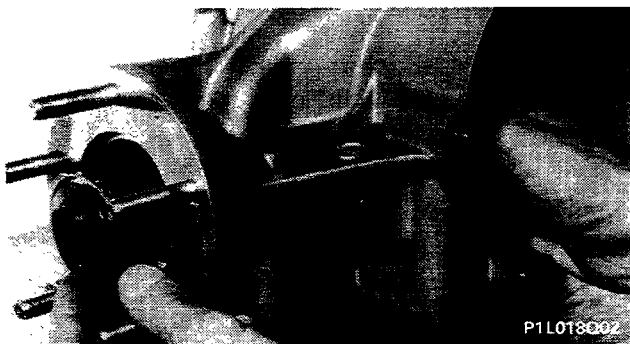
1895697000

27.



BEVEL PINION ROLLING TORQUE

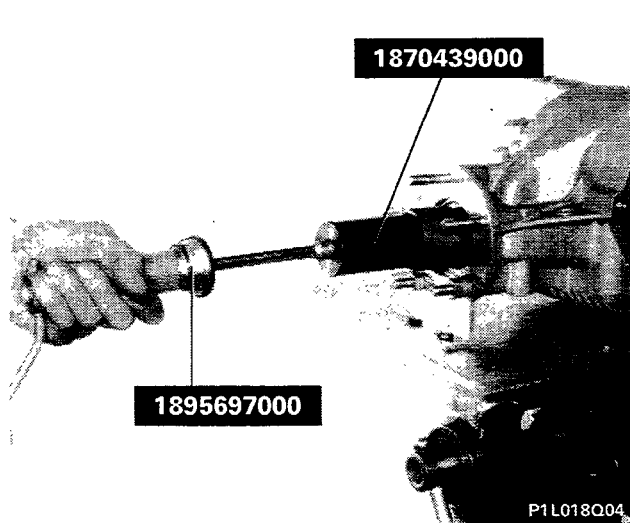
Fitting bevel pinion complete with compressible spacer and sleeve side roller bearing inner race



Tightening sleeve retaining nut to bevel pinion

Nut must be tightened to a torque of 17 - 28 daNm to produce a rolling torque of 0.08-0.12 at the pinion.

With this type of differential fitted with a compressible spacer, note that bevel pinion retaining nut must never be slackened during assembly or the spacer will have to be replaced.

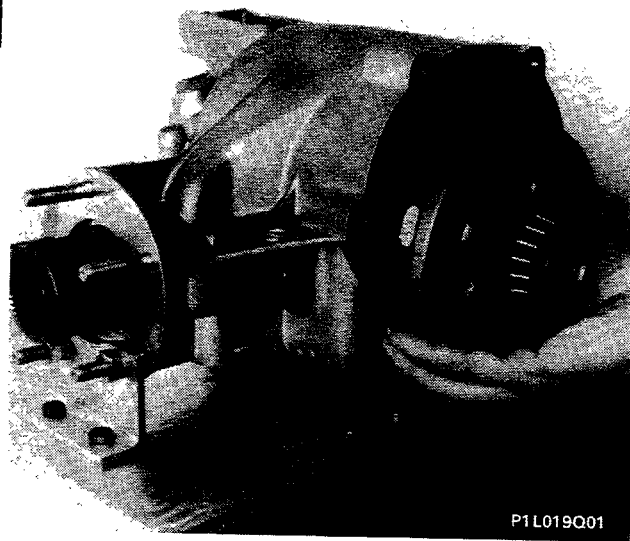


0,08 ÷ 0,12 daNm

Check bevel pinion rolling torque

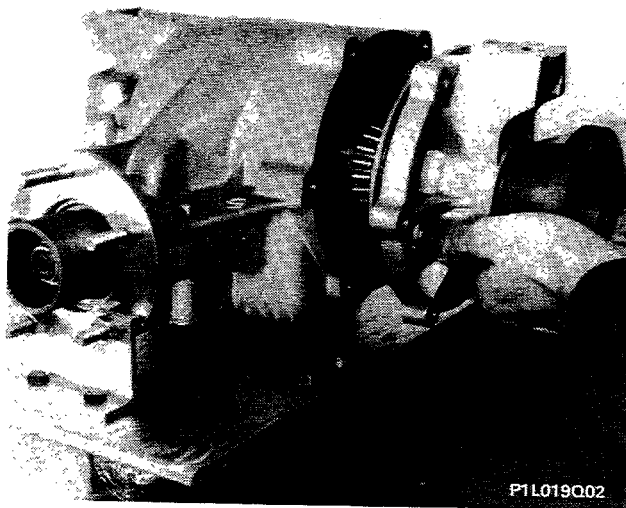
If maximum bevel pinion rolling torque is exceeded during preloading, assembly and checks must be carried out again using a new spacer.

CHECKING PINION - CROWN
WHEEL BACKLASH



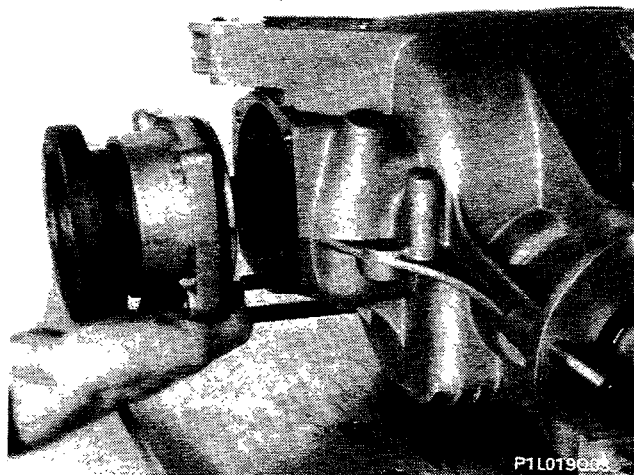
P1L019Q01

Fitting "Torsen" differential unit in casing



P1L019Q02

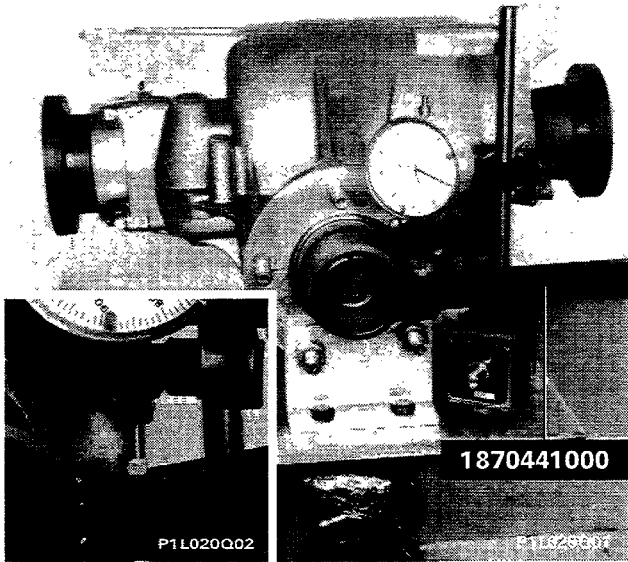
Fitting left cover on differential casing



P1L019Q03

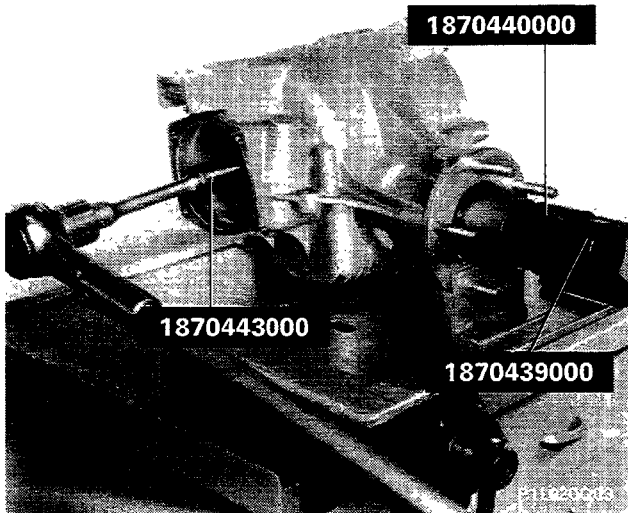
Fitting right cover on differential housing

27.



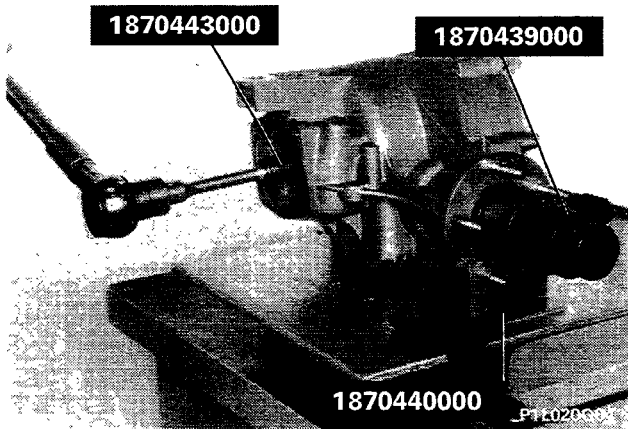
Checking and adjusting pinion backlash

If backlash is less than or greater than specified, the crown wheel must be moved closer to or further away from the pinion by adjusting shim thickness, taking care to maintain overall value calculated during adjustment of crown wheel rolling torque.



CHECKING AND ADJUSTING BEVEL PINION AND CROWN WHEEL TOOTH CONTACT PATTERN

Checking contact pattern of pinion-crown wheel teeth on drive and coast sides

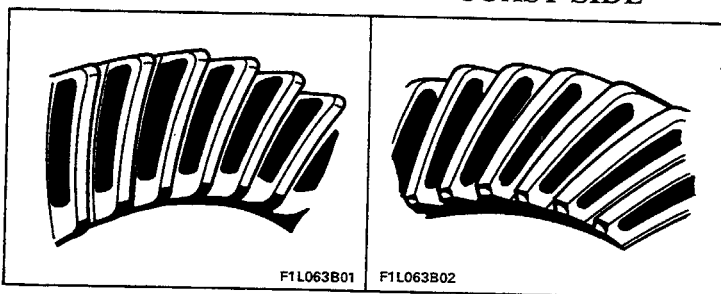


Correct mesh

The contact pattern must be uniformly distributed over both tooth faces, i.e. drive and coast.

DRIVE SIDE

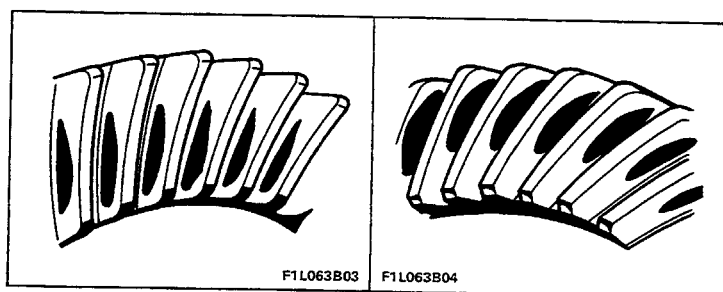
COAST SIDE

**Incorrect mesh**

Drive side: contact on toe of tooth and towards centre.

Coast side: contact of heel of tooth and towards centre.

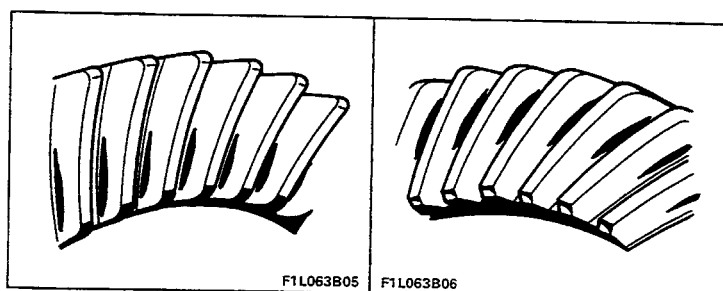
Move pinion out of mesh using thinner thrust ring

**Incorrect mesh**

Drive side: toe contact, localised at root.

Coast side: heel contact, localised at root.

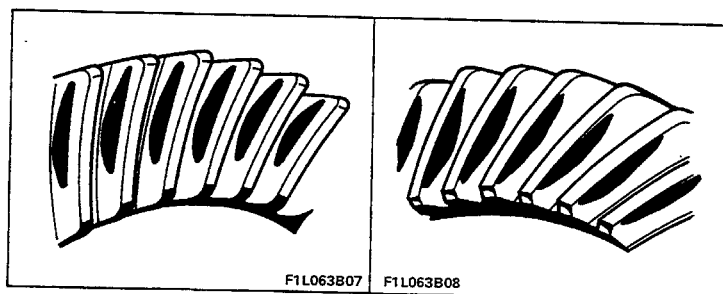
Move pinion out of mesh using thinner thrust ring.

**Incorrect contact**

Drive side: contact at heel and towards centre of tooth.

Release side: contact at toe and towards centre of tooth.

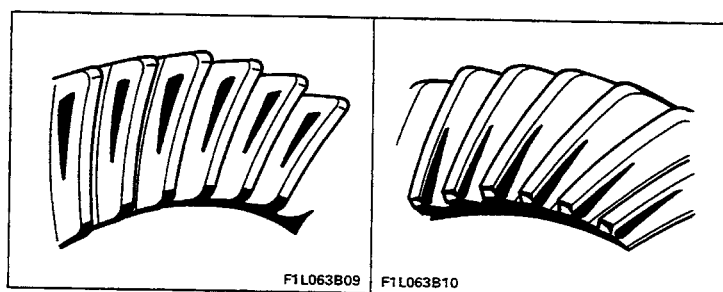
Move pinion into mesh, using thicker thrust ring.

**Incorrect contact**

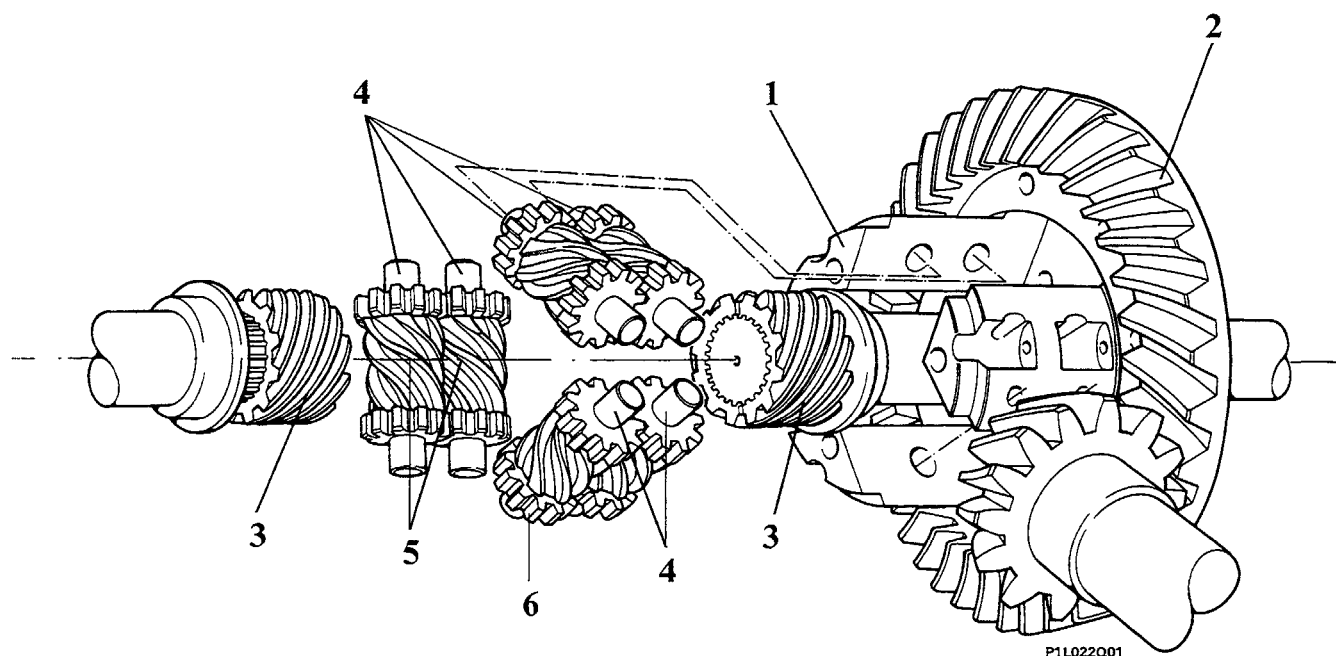
Drive side: Heel contact, localised on crest of tooth.

Coast side: Toe contact, localised on crest of tooth.

Move pinion into mesh, using thicker thrust ring.



In all above cases, unit must be removed. When refitting, repeat pinion-crownwheel backlash adjustment.



General

The differential unit consists of a casing with covers fixed to the rear crossbeam via rubber blocks.

The casing contains: a pinion-crownwheel unit, "Torsen" differential casing plus thrust rings and shims to ensure proper unit operation.

All internal casing components can be overhauled and are therefore supplied as spares. The casing cannot be overhauled and should therefore be replaced if defective.

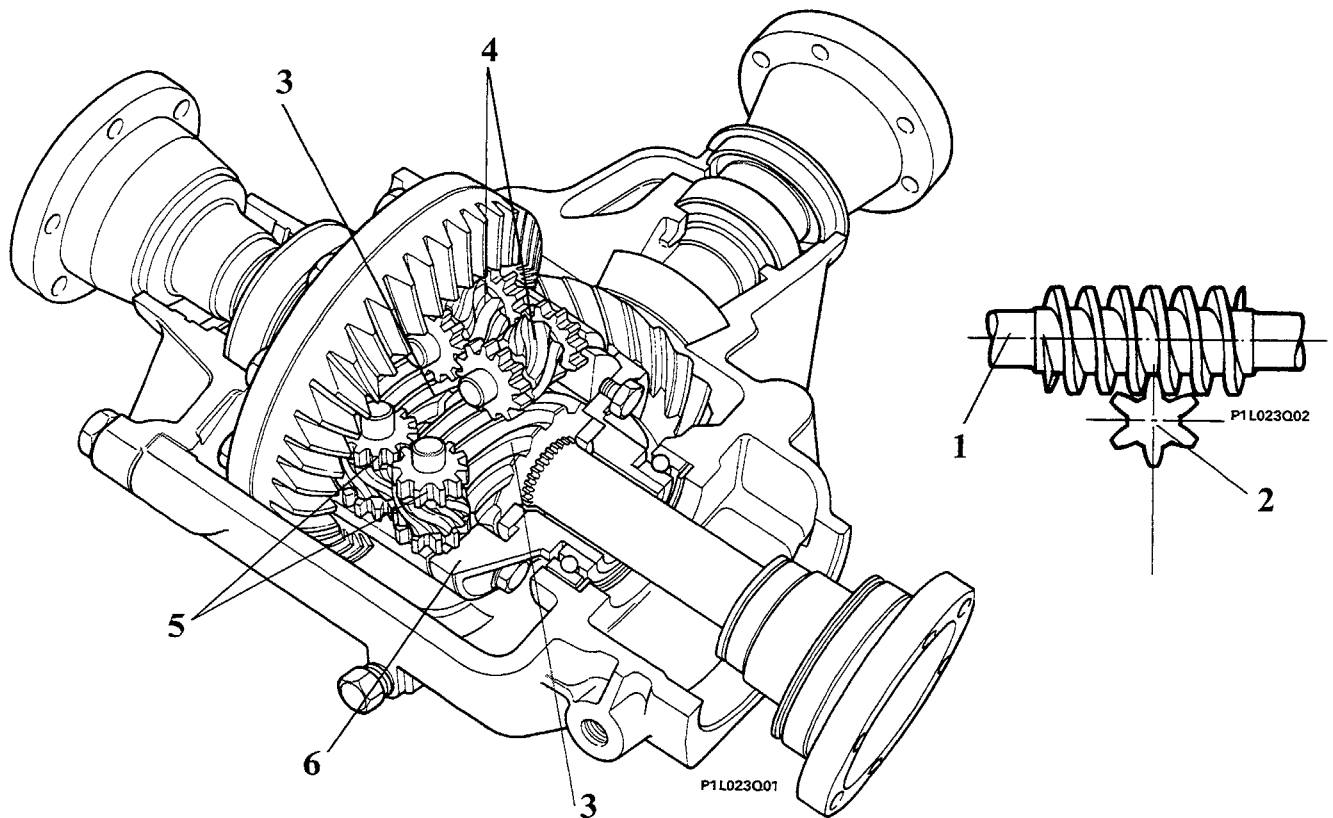
The "Torsen" differential is designed to prevent skidding if one wheel slides and causes the wheels to turn at different speeds.

This new system could be described as a "geared computer" that strictly meters the amount of torque to be transmitted to each wheel. At the point of skidding, therefore, wheel grip on the road will be low and the wheel will receive less torque.

The "Torsen" unit consists of:

- outer casing (1) that receives drive from the propeller shaft through a crownwheel (2);
- two planet wheels (3) consisting of worm screws, one connected to the right wheel and one to the left wheel;
- three pairs of satellites (4) consisting of helical gears (5) pivoted on outer casing and meshed with planet wheels, and linked spur gears (6).

The "Torsen" unit is maintenance free. During service operations, the unit may be completely replaced or the bevel gear set and bearings may be replaced.



Operation

"Torsen" unit operation is based on a worm gear set. This type of drive can allow, under certain conditions (choice of material-tooth angle), drive in a single direction. The worm screw (1) can turn gear (2) with which it meshes whereas the gear cannot turn the worm screw.

In the "Torsen" unit, the worm screws (3) are connected to the drive shafts and face one another. The three pairs of helical gears (4) mesh with the screws. They also mesh with one another via link gears (5) and are pivoted on the differential casing (6).

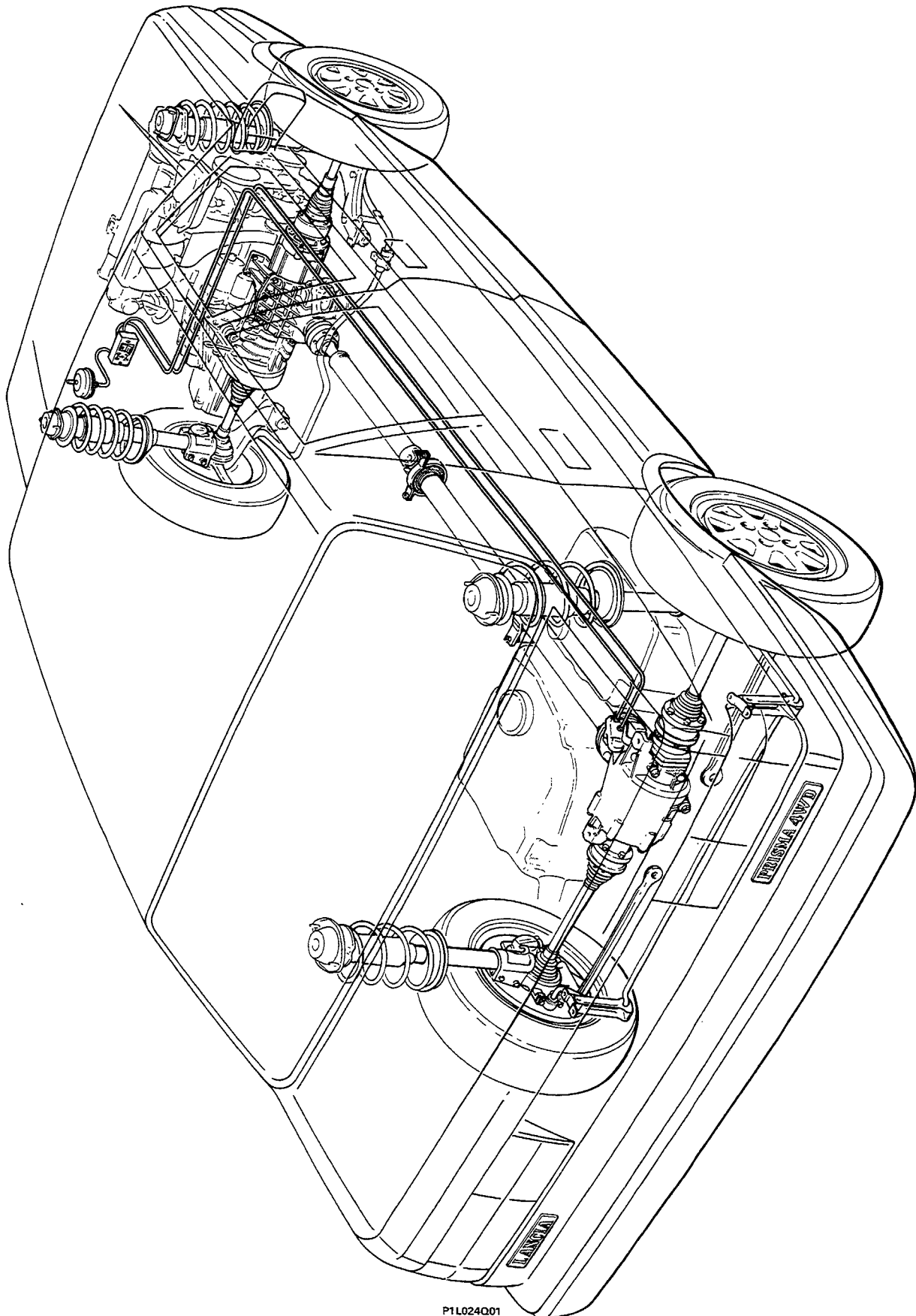
The main feature of Torsen system operation is, as already mentioned, the irreversibility of the worm gear set. Total irreversibility is obtained when the thrust angle between worm screw teeth and helical gear approaches 90° . This represents 100% locking, i.e. complete prevention of escape due to loss of grip. An angle of nearly 90° actually poses two problems:

- rough operation;
- bad differentiation on bends: the thrust exercised by the helical gear on the worm screw would mainly be discharged to the steering system to generate considerable friction.

For good cornering differentiation and good lock, the angle must be moderated. Torsen system currently available have torque ratios between one drive shaft and the other of between 4 : 1 and 7 : 1, i.e. one wheel may receive a torque 4-7 times greater than the other. Expressed in percentage terms, the 4 : 1 and 7 : 1 torque ratios represent a locking percentage of 60-80%. In a Torsen differential, the transfer of torque from one half shaft to another is totally independent of the differential action; this permits safe driving in all situations and takes place in a completely automatic, uniform manner.

27.

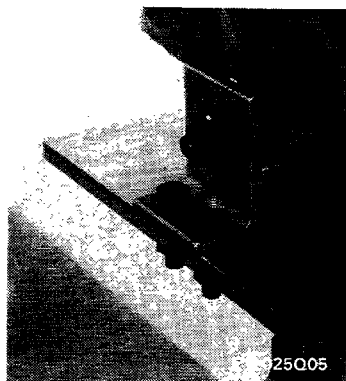
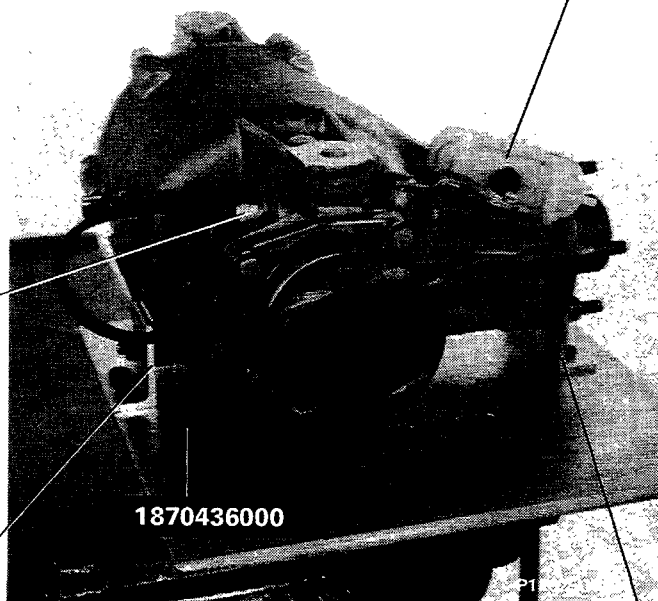
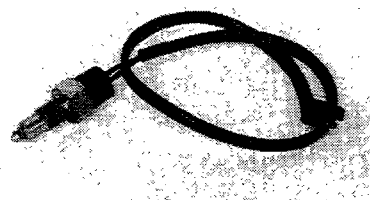
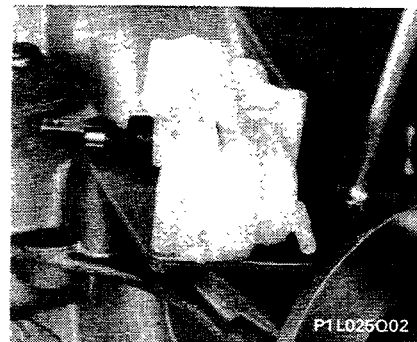
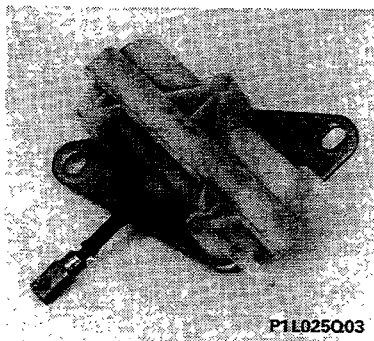
DIAGRAM OF REAR DIFFERENTIAL LOCK UNIT



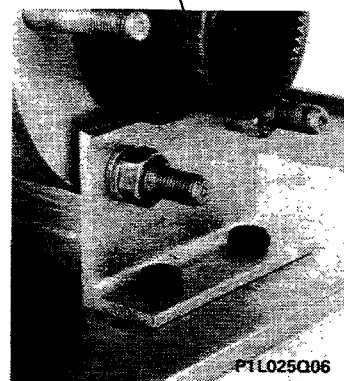
P1L024Q01

PROCEDURE

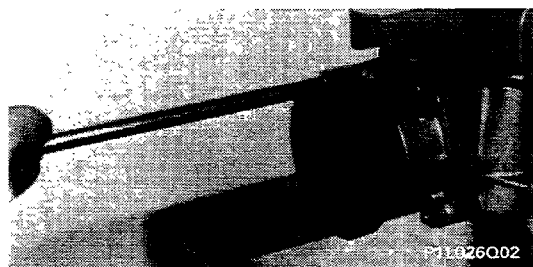
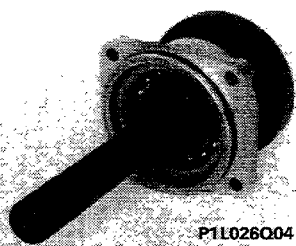
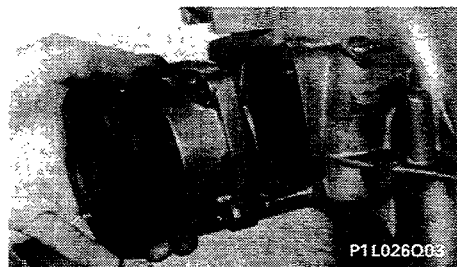
Position differential unit on stand 18704360 fixed in clamp for overhaul; then proceed as follows:



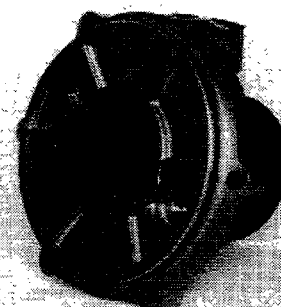
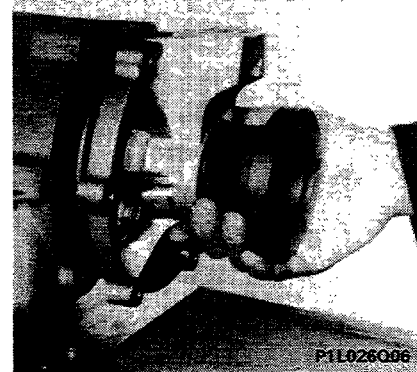
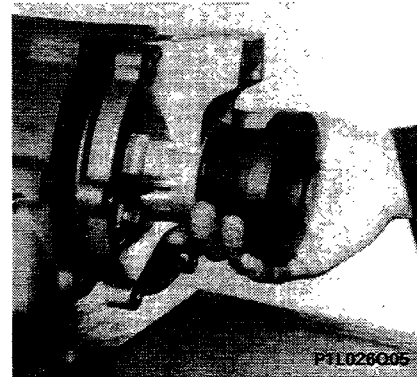
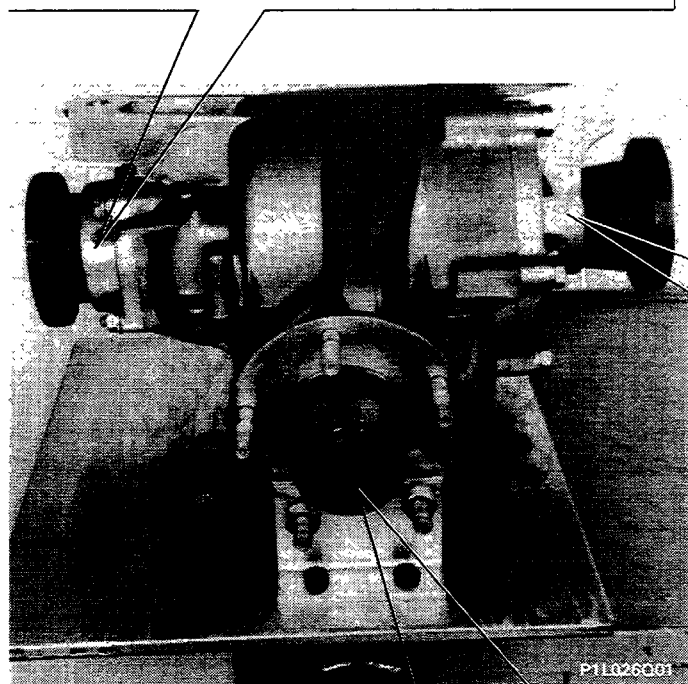
Points for fastening differential unit to
overhaul stand 1870436000



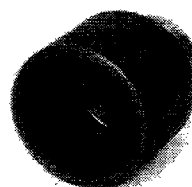
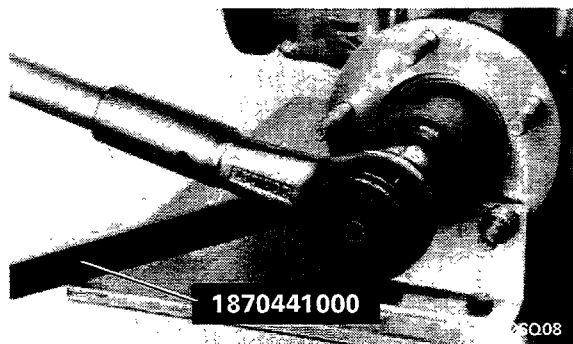
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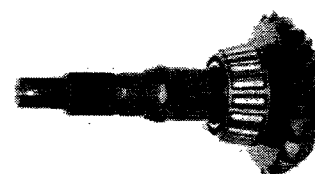
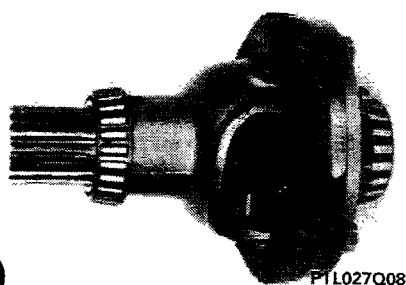
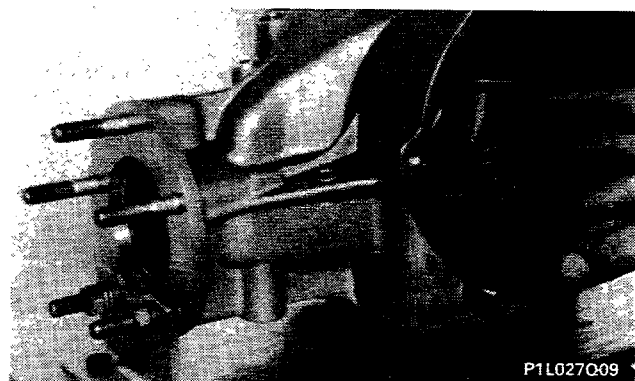
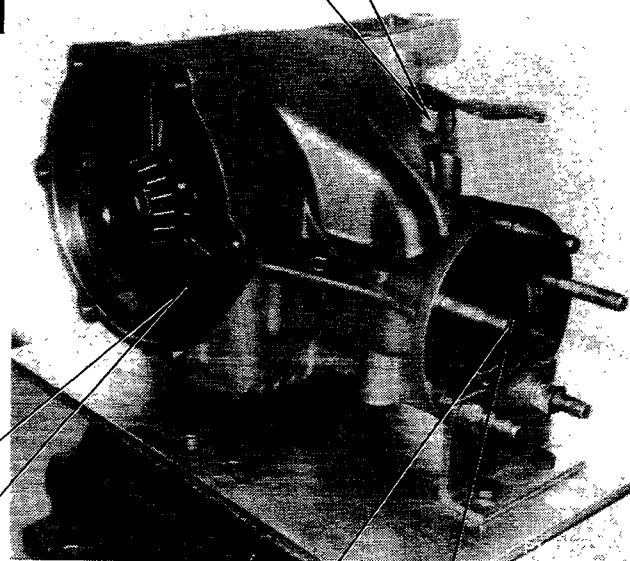
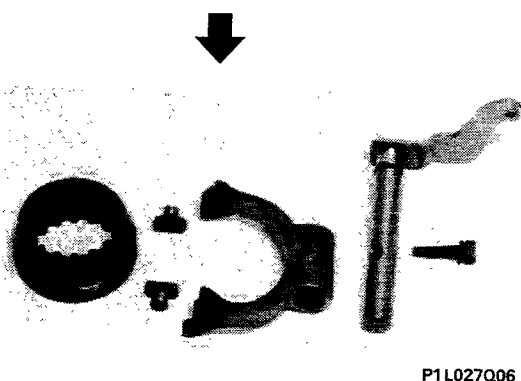
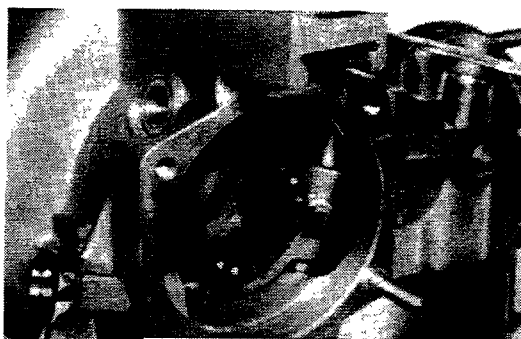
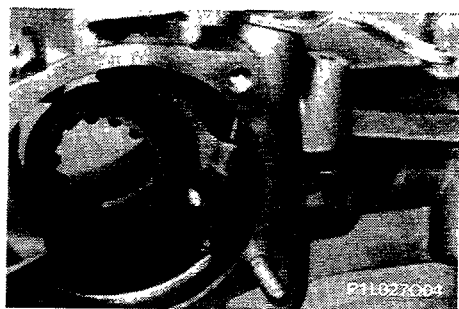
Remove right differential casing cover



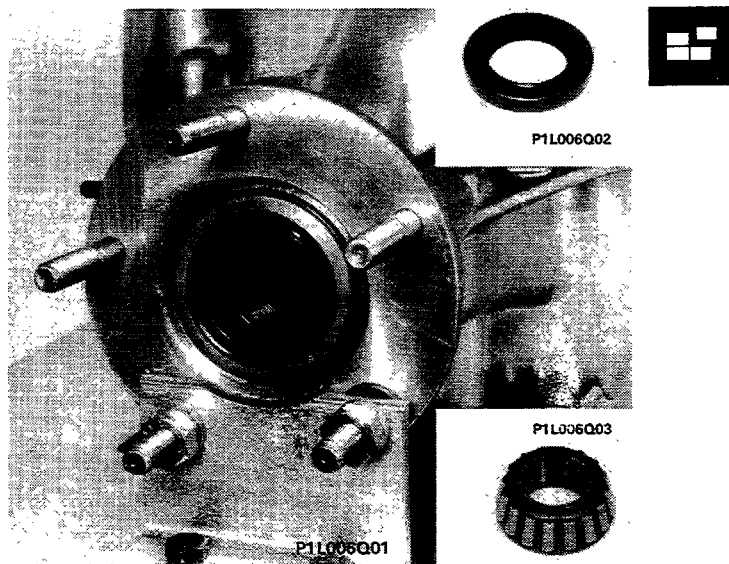
Remove left differential casing cover



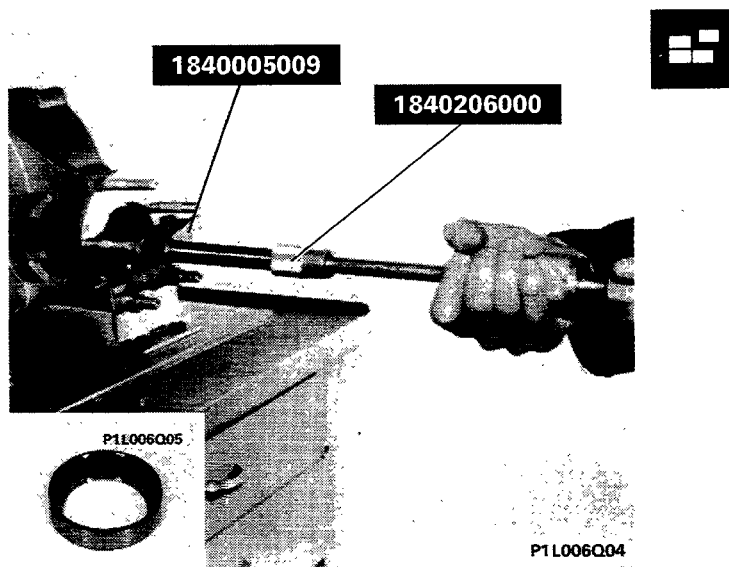
Remove bevel pinion sleeve



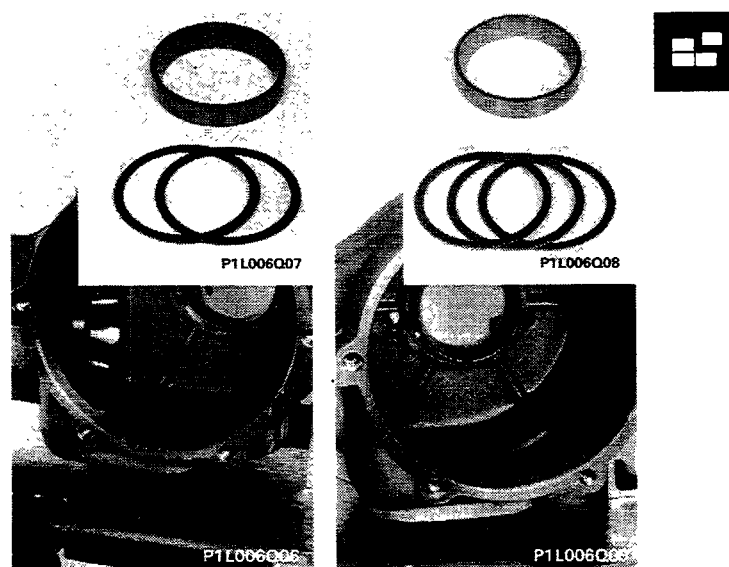
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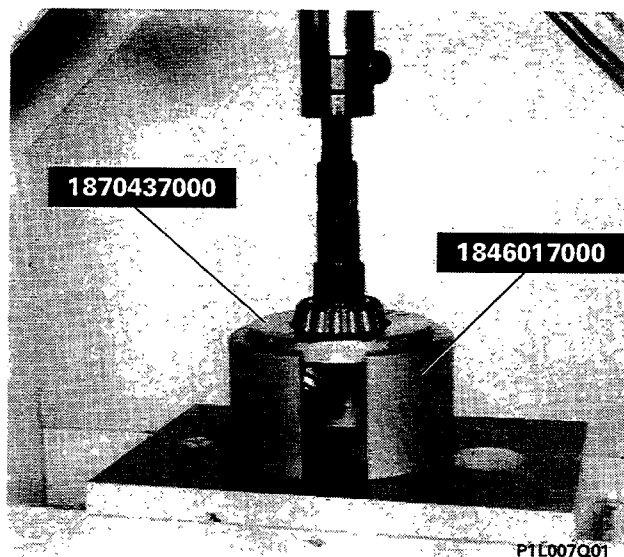
Removing differential pinion gasket and bearing



Removing outer differential pinion bearing race



Removing bearing outer races with shims for pinion and crownwheel

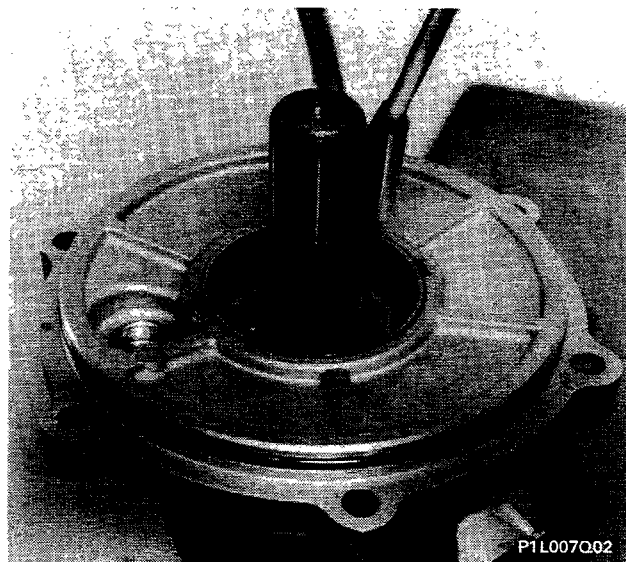


P1L007Q01

Removing rear pinion bearing inner race using hydraulic press

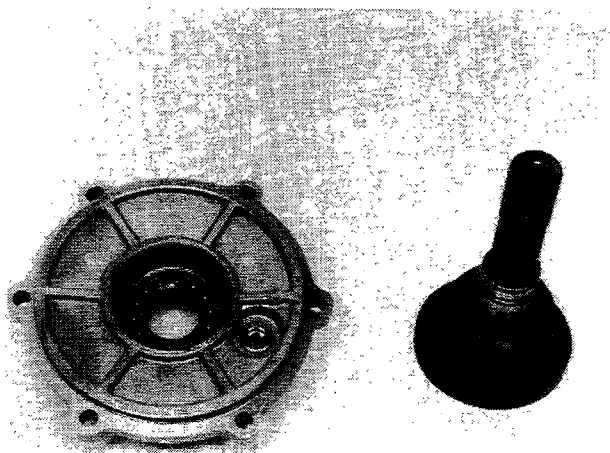
LEFT DIFFERENTIAL CASING COVER

Removing-refitting and checks



P1L007Q02

Removing-refitting drive shaft sealing ring to cover

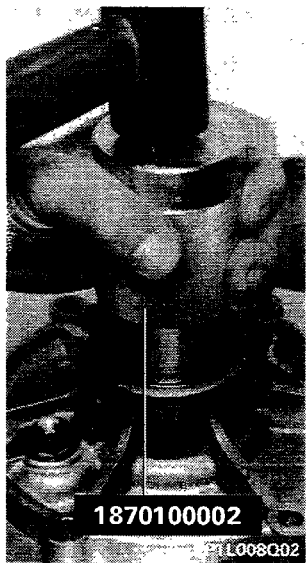
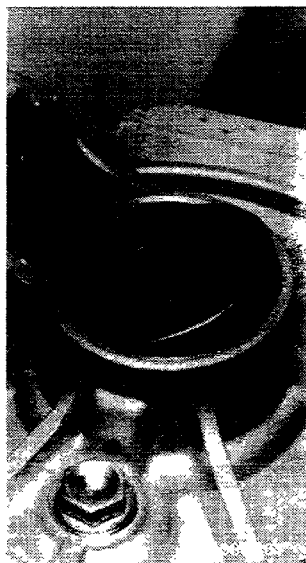


View of left cover separated from drive shaft

NOTE Check that drive shaft is not distorted and that surfaces and splines are not damaged. Replace if necessary.

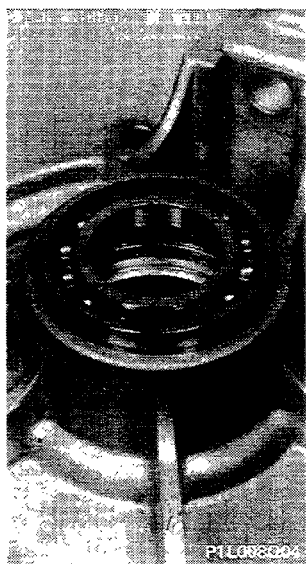
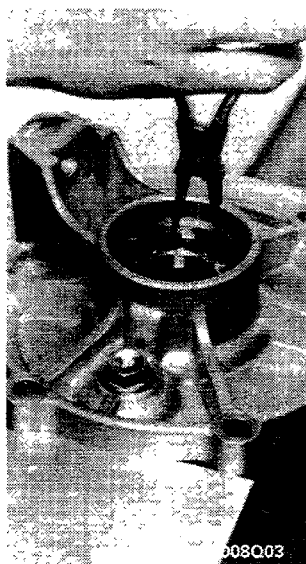
P1L007Q03

27.

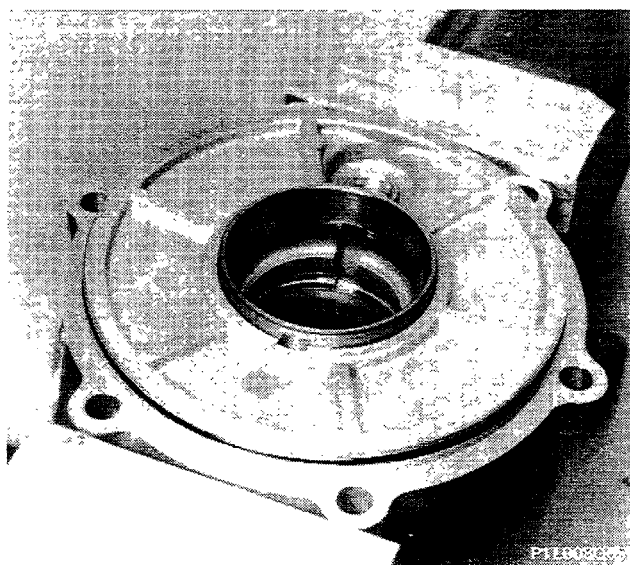


Removing-refitting left drive shaft seal

To fit seal, use tool 1870100002 as shown in diagram.



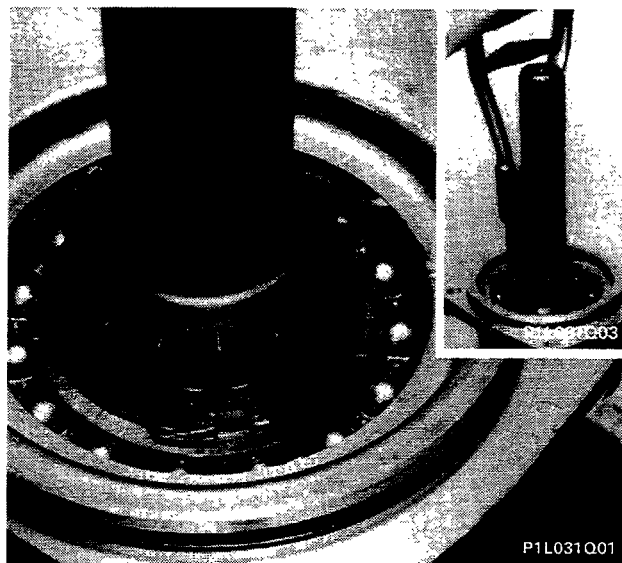
Removing-refitting retaining ring and left drive shaft ball bearing



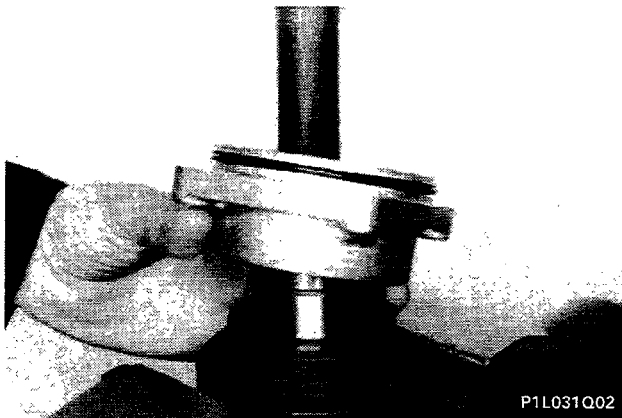
Removing-refitting outer ball bearing race for "Torsen" differential

RIGHT DIFFERENTIAL CASING COVER

Removing-refitting and checks

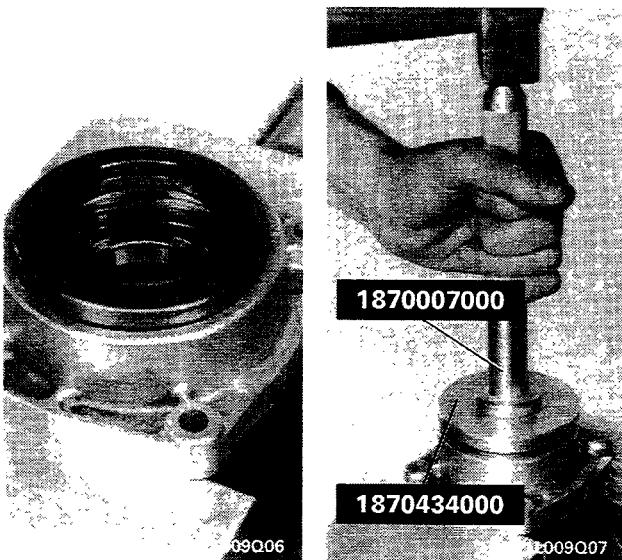


Removing right drive shaft retaining ring



Removing right cover from drive shaft

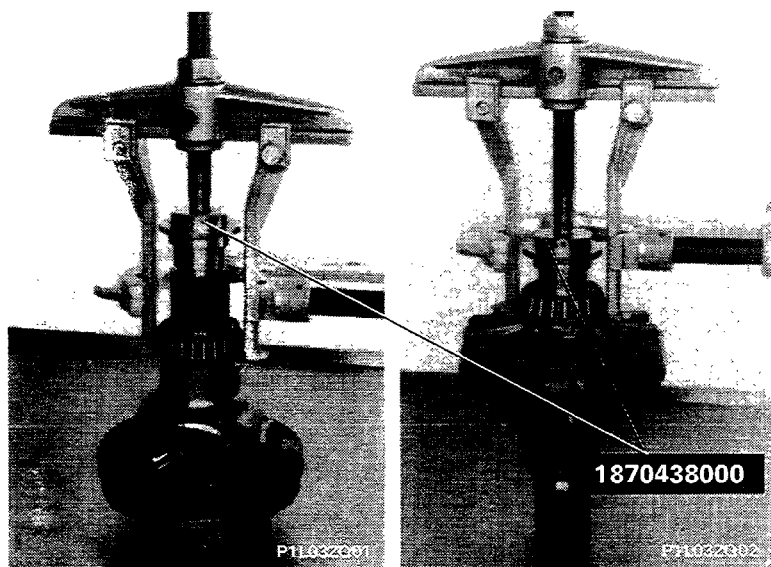
NOTE Check that drive shaft is not distorted and that surfaces and splines are not damaged. Replace if necessary.



Removing-refitting retaining ring and right drive shaft ball bearing

Fitting right drive shaft seal

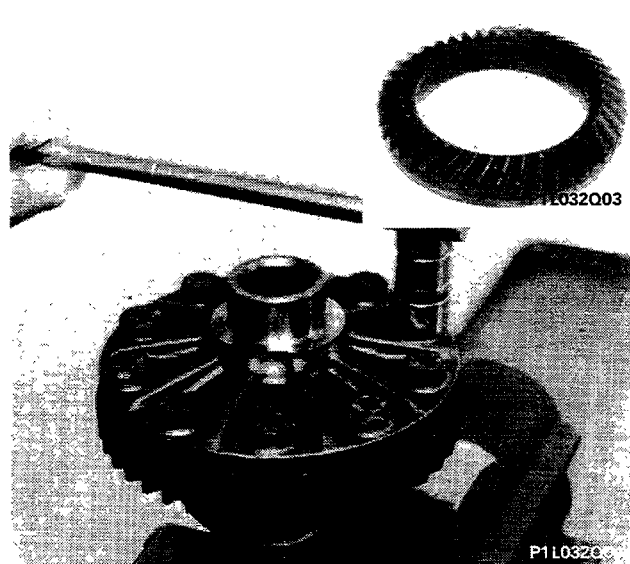
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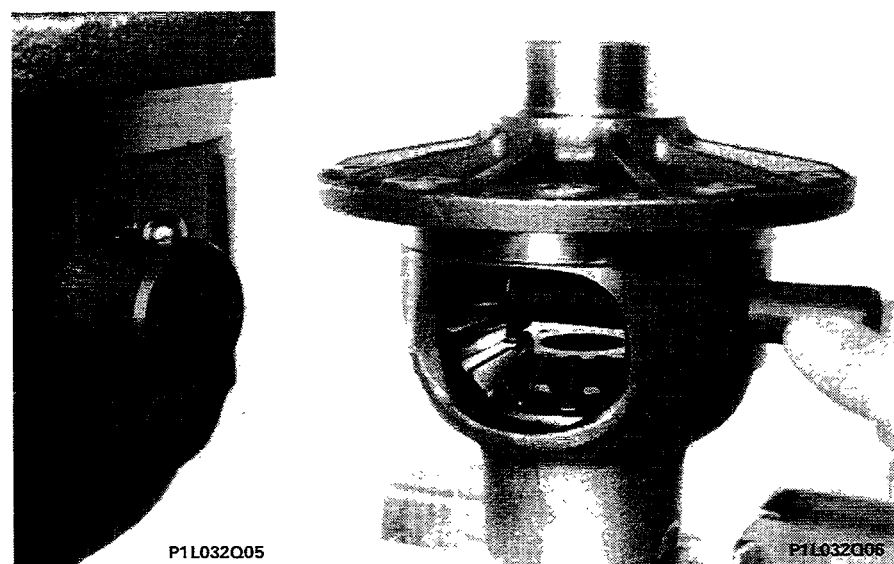
DIFFERENTIAL UNIT
Removing-refitting and checks

Removing roller bearings from differential casing

Bearings should be replaced if they show signs of scoring, hot spots or excessive wear.

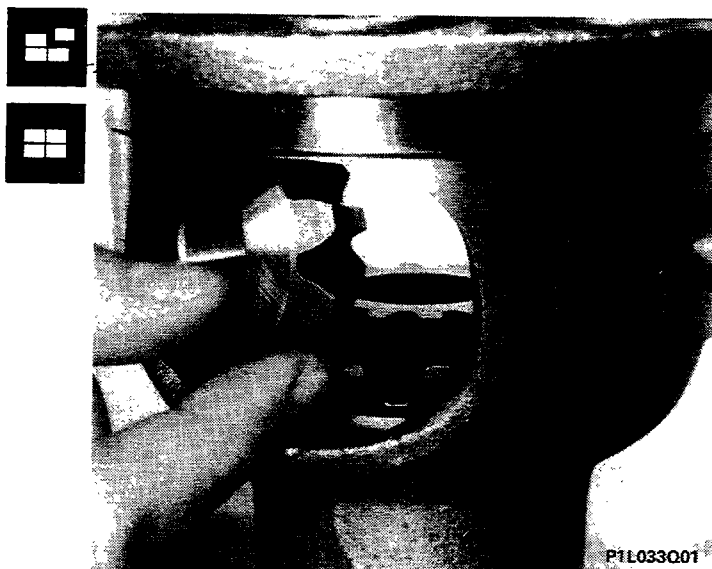


Removing crown wheel from differential unit



Removing-refitting satellite carrier shaft after removing ball stop

Removing-refitting satellites from differential casing



Removing-refitting planet wheels from differential casing



Differential casing

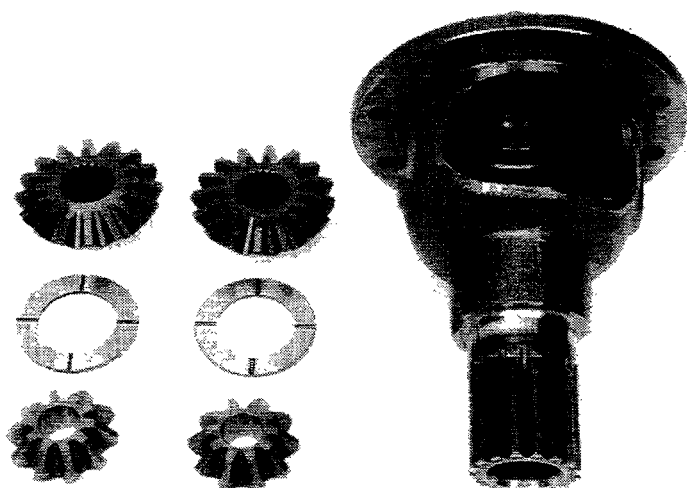
NOTE *The differential casing should not be cracked. Bearing seats should not be worn or damaged. Replace if necessary.*



27.



PROCEDURE



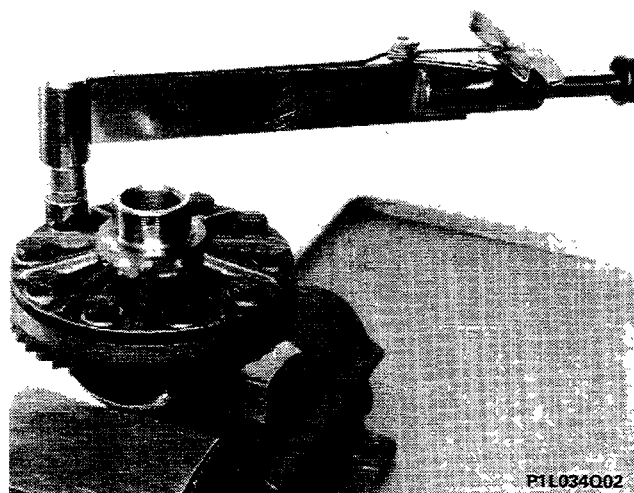
P1L034Q01

Differential unit components

Satellite and planet gears should not shown signs of wear or chipping on their working surfaces.

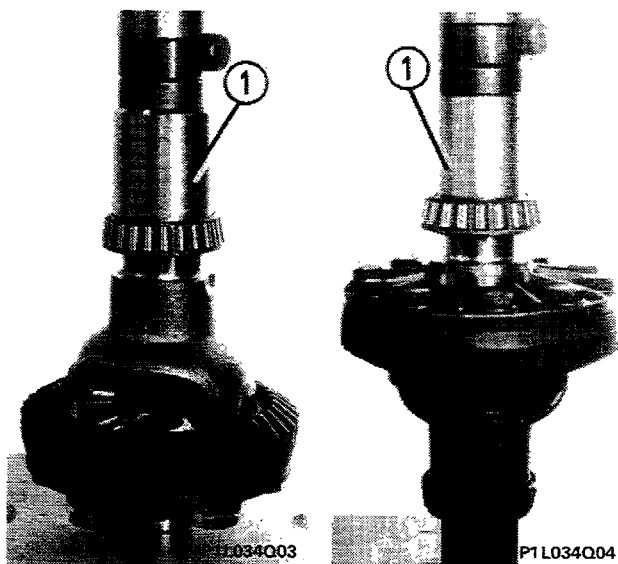


8,8 daNm



P1L034Q02

Fitting and torque tightening of crownwheel

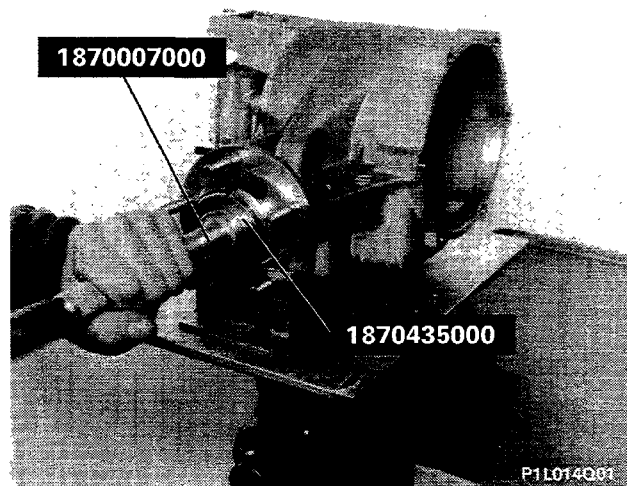


P1L034Q03

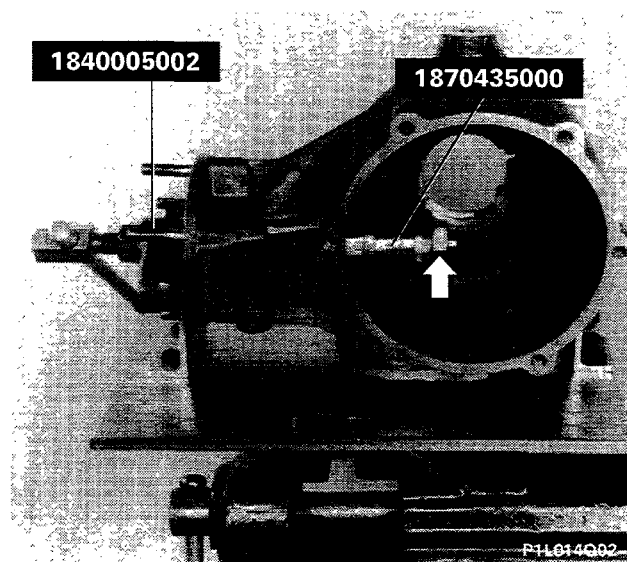
P1L034Q04

Fitting roller bearings in differential casing using hydraulic press

1. Thrust element



Fitting outer race of outer bevel pinion bearing

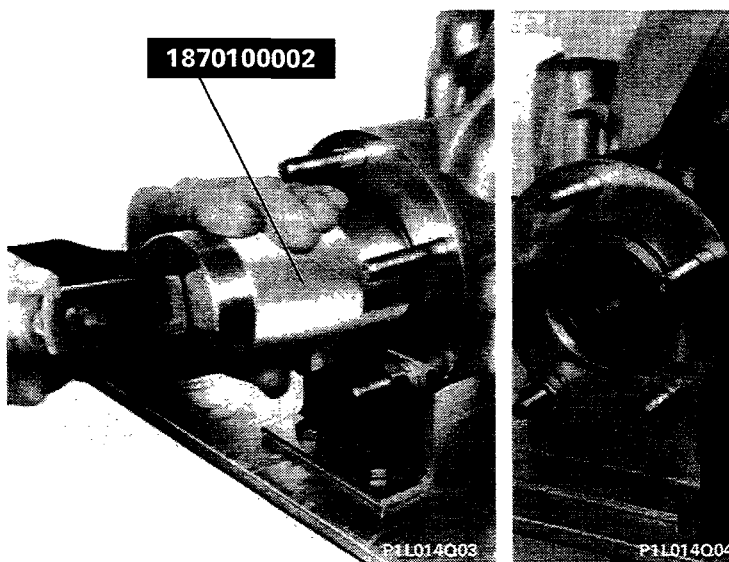


Fitting outer race of inner bevel pinion bearing

Use a service nut (shown by arrow) to obtain a thrust reaction during installation as shown in diagram.

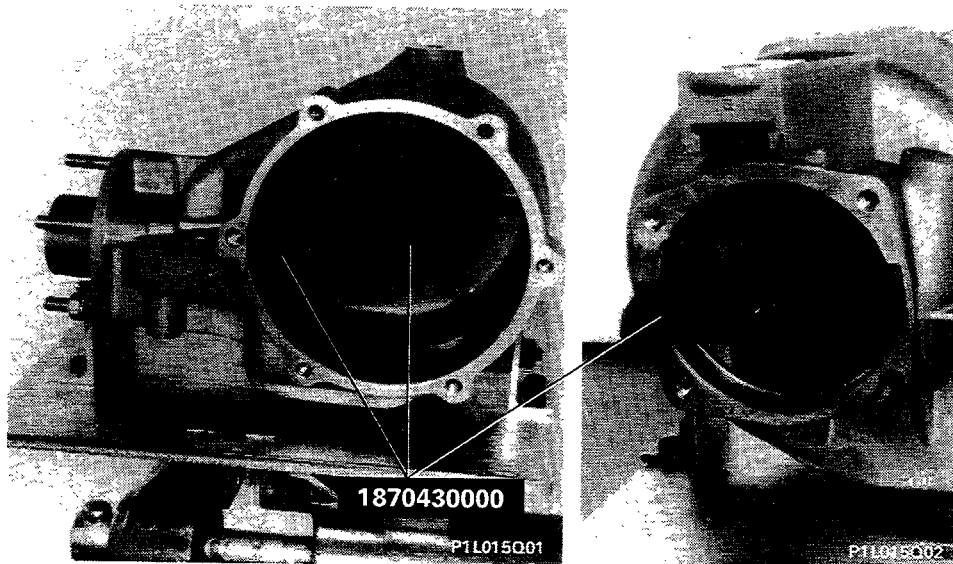


Before installing, check that outer race is properly positioned in its seat.

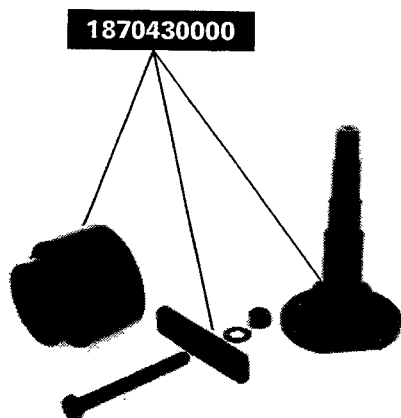


Fit bevel pinion oil seal

27.



Fitting tool 1870430000
to differential casing



P1L015Q03

To fit dummy pinion 1870430000 proceed as for installation of bevel pinion, except miss out compressible spacer between front and rear bearings.

Tighten nut complete with flat washer to secure tool, adjust bearings and fully tighten.



Measurements for calculation of thrust ring
thickness for rear bevel pinion bearing

To measure thrust ring thickness, use tool 18951130000 as shown in the diagram.

Bevel pinion

1st case - Difference between nominal and actual fitting clearance in hundredths of a millimetre.

(examples: -2, 0, +3)

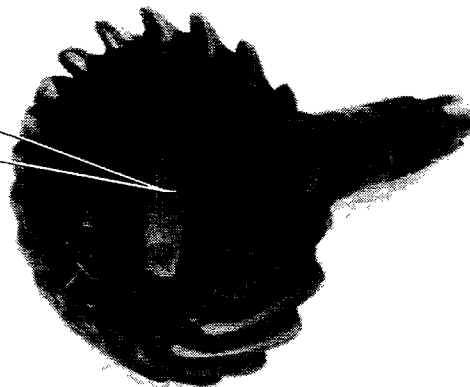
2nd case - Actual fitting clearance in millimetres.

(examples: 80.45 - 80.5 - 80.52).

You will always obtain value expressed in first case by subtracting 80.50 mm from this measurement.

(examples: $80.45 - 80.50 = -0.05$ mm = - 5 hundredths)

$(80.52 - 80.50 = +0.02$ mm = + 2 hundredths).



P1L016Q02

PROCEDURE FOR CALCULATING THICKNESS OF REAR BEARING THRUST RING ON BEVEL PINION

If "a" is value measured with tool 18951130000 and "b" is the value stamped on the bevel pinion by the Factory, then thickness "S" of thrust ring to be fitted is given by the following equation:

$$S = a - (+ b) = a - b$$

$$S = a - (- b) = a + b$$

in other words:

- if the number stamped on the pinion is preceded by a (+) sign, ring thickness is obtained by subtracting the number from value measured with tool 1895113000;
- if the number marked on the pinion is preceded by a (-) sign, ring thickness is obtained by adding the number to the value measured with tool 1895113000.

Example: let **a** = 2.90 (value measured with tool 1895113000)

and let **b** = - 5 (amount in 100ths of a mm stamped on pinion);

then: $S = a - (- b)$;

$$S = 2.90 - (- 0.05);$$

$$S = 2.90 + 0.05;$$

$$S = 2.95$$

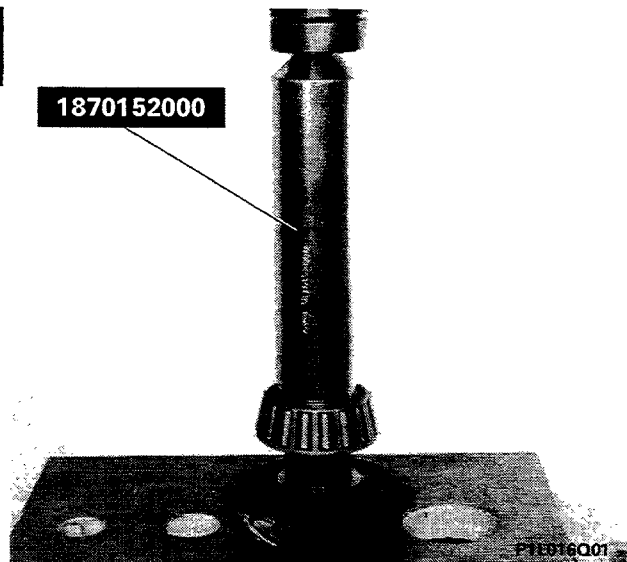
In this case a thrust ring 2.95 mm thick must be added.



If the value obtained does not correspond to one of the spare thrust rings provided, fit the next size up.



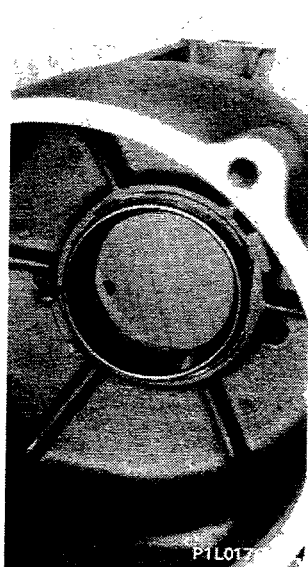
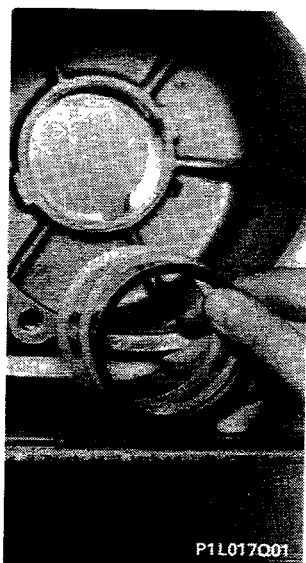
1870152000



P1L016Q01

Fitting rear roller bearing inner race to bevel pinion using hydraulic press.

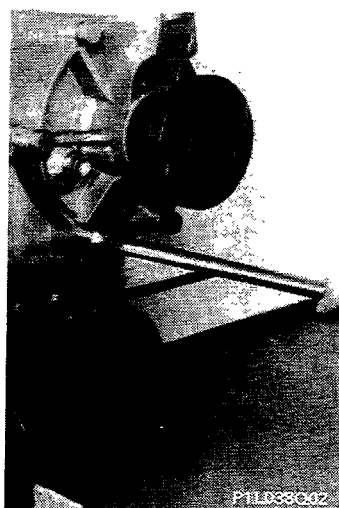
27.



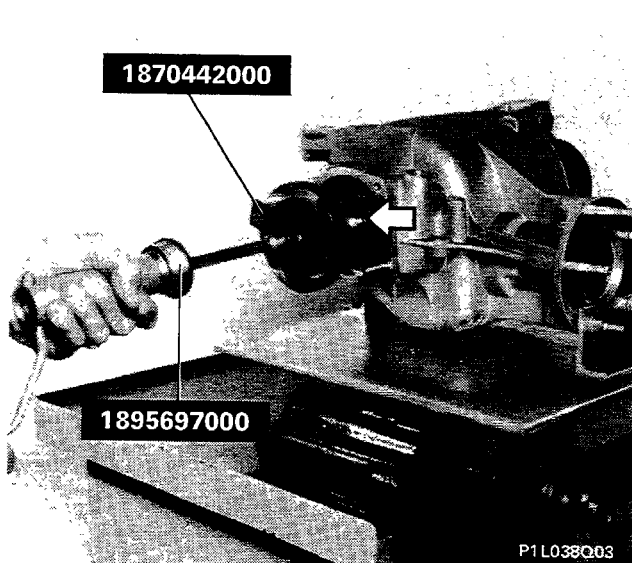
CROWNWHEEL ROLLING TORQUE

Fitting shims and differential casing outer race

NOTE *Shim thickness may be increased or decreased until differential casing bearing rolling torque is as specified.*



Fitting differential unit and left cover on casing



0,12 ÷ 0,15 daNm

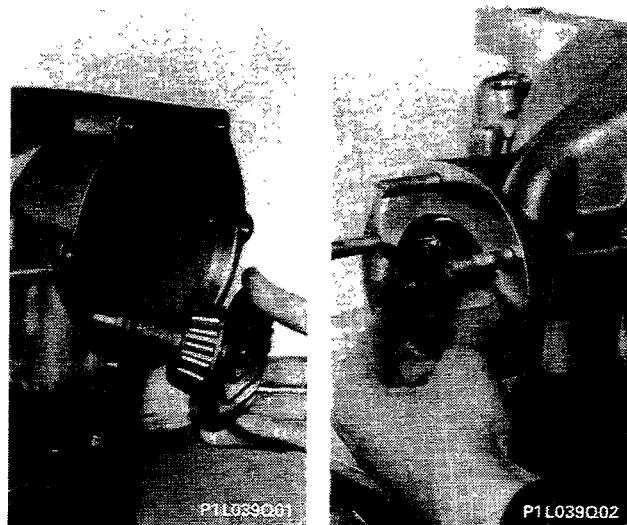
Crownwheel rolling torque

To carry out this check, fit sleeve (arrowed) to lock right drive shaft. If the rolling torque is too high, decrease shim thickness. Otherwise increase thickness.
Then remove differential unit.

BEVEL PINION ROLLING TORQUE



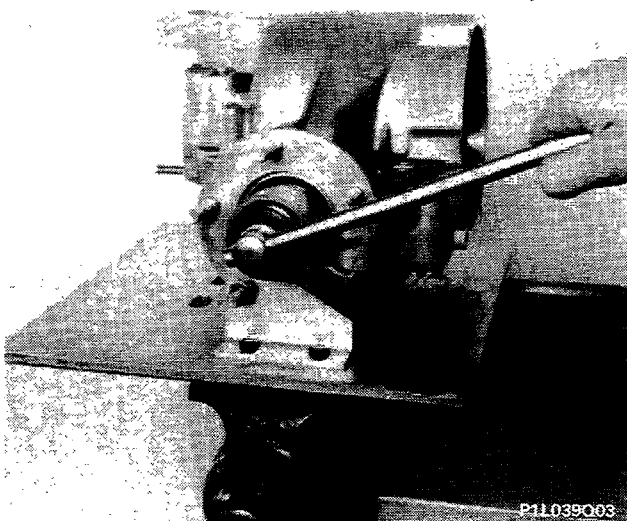
Fitting bevel pinion complete with compressible spacer and sleeve side roller bearing inner race



Tightening nut retaining sleeve to bevel pinion

Tighten nut to a torque of 17 - 28 daNm in order to produce a rolling torque of 0.08-0.12 daNm at pinion.

With this type of differential fitted with a compressible spacer, note that bevel pinion retaining nut must never be slackened during assembly or the spacer will have to be replaced.



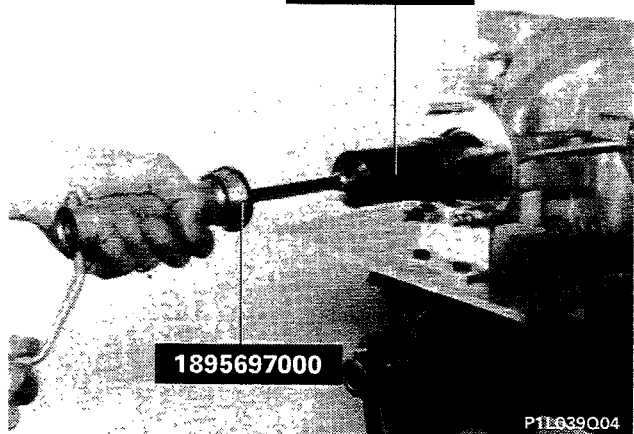
0,08 ÷ 0,12 daNm



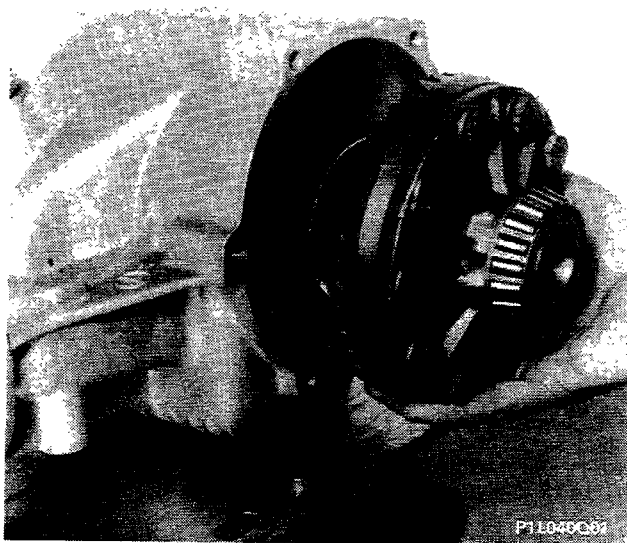
1870439000

Check bevel pinion rolling torque

If maximum bevel pinion rolling torque is exceeded during preloading, assembly and checks must be carried out again using a new spacer.

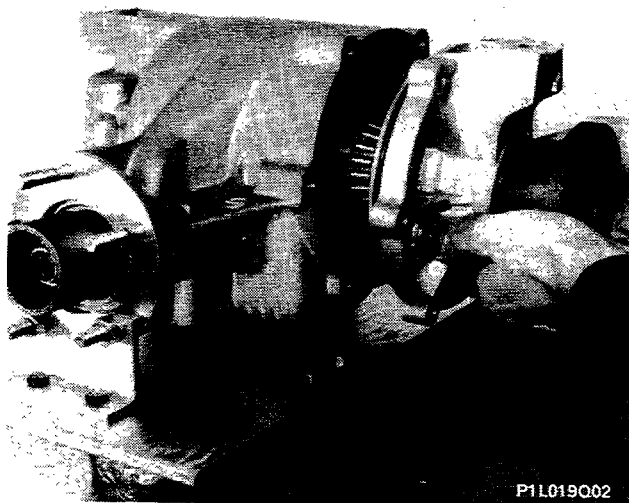


27.

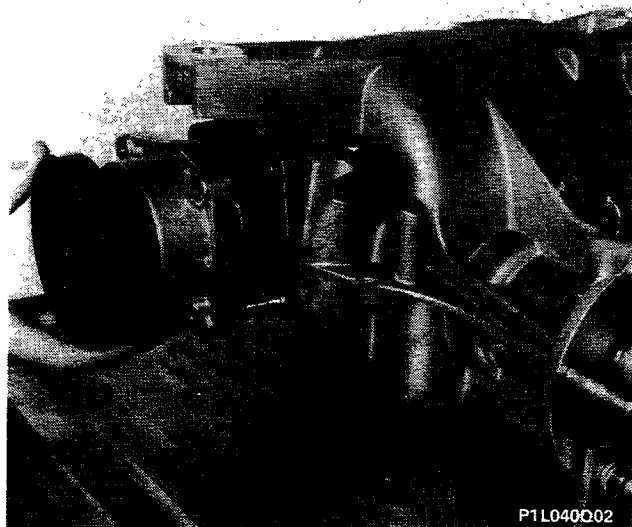


CHECKING PINION - CROWN-
WHEEL BACKLASH

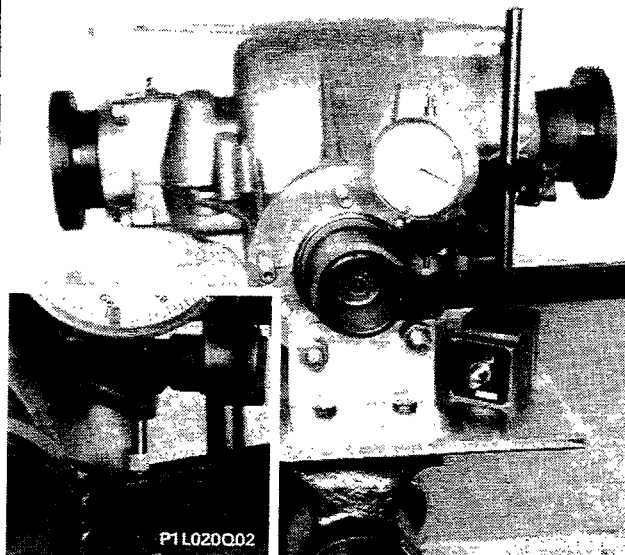
Fitting differential unit in casing



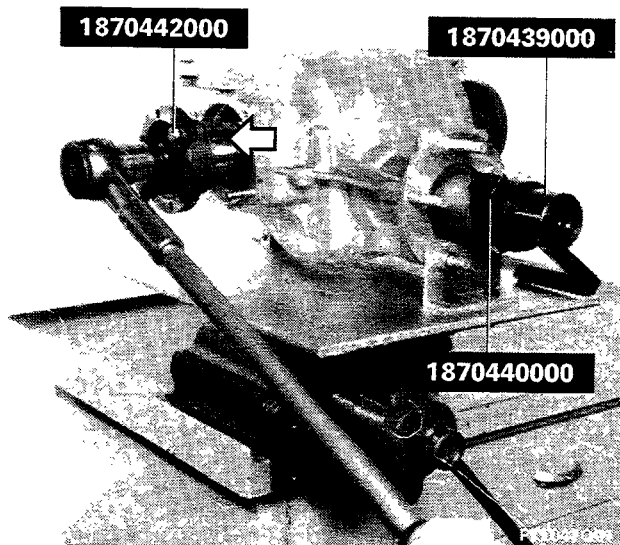
Fitting left cover on differential casing



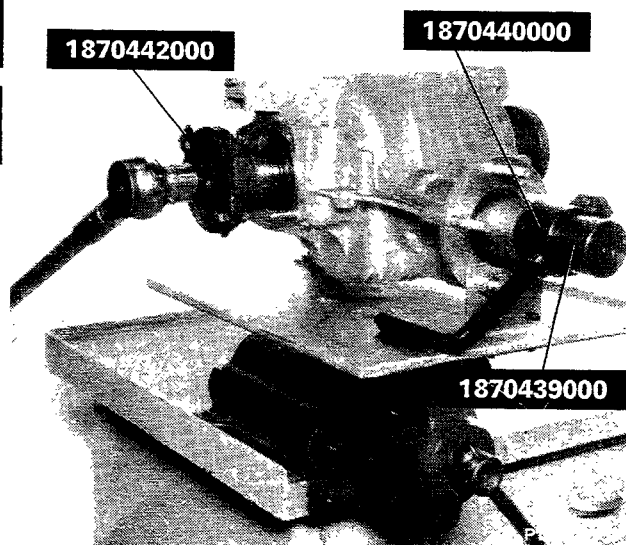
Fitting right cover on differential casing

**Checking and adjusting pinion backlash**

If backlash is less than or greater than specified, the crownwheel must be moved closer to or further away from the pinion by adjusting shim thickness, taking care to maintain overall value calculated during adjustment of crown-wheel rolling torque.

CHECKING AND ADJUSTING BEVEL PINION AND CROWN WHEEL TOOTH CONTACT PATTERN**Checking contact pattern of pinion-crownwheel teeth on drive and coast sides**

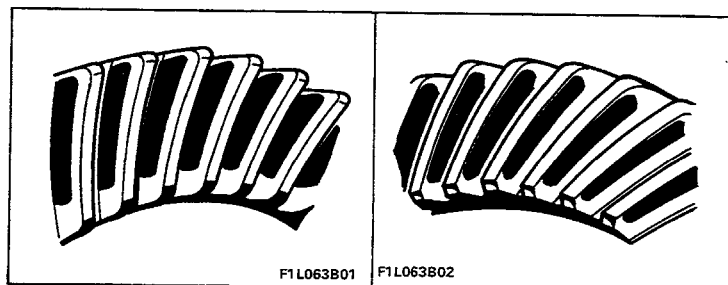
To carry out this check, first fit sleeve (arrowed) to lock right half shaft.



27.

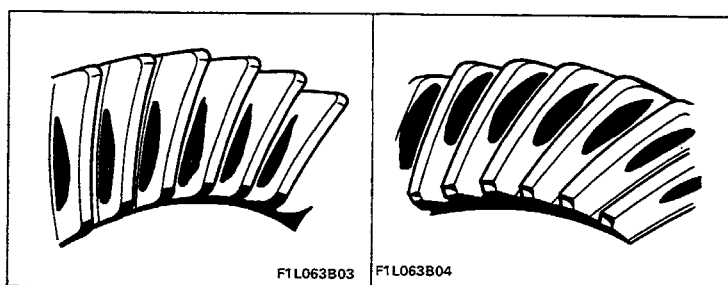
DRIVE SIDE

COAST SIDE



Correct mesh

The contact pattern must be uniformly distributed over both tooth faces, i.e. drive and coast.

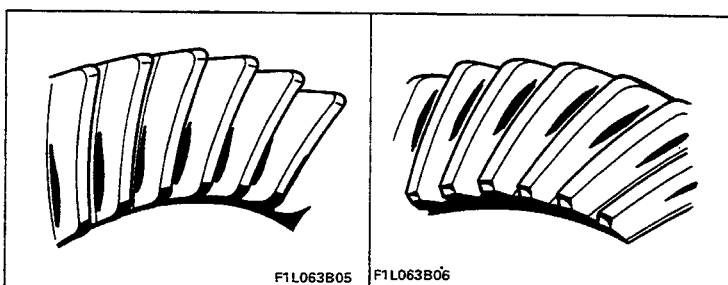


Incorrect mesh

Drive side: contact of toe of tooth and toward centre.

Coast side: contact of heel of tooth and towards centre.

Move pinion out of mesh using thinner thrust ring

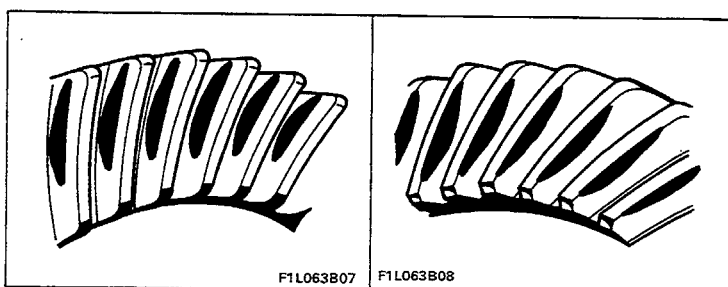


Incorrect contact

Drive side: toe contact, localised at root.

Coast side: heel contact, localised at root.

Move pinion out of mesh using thinner thrust ring.

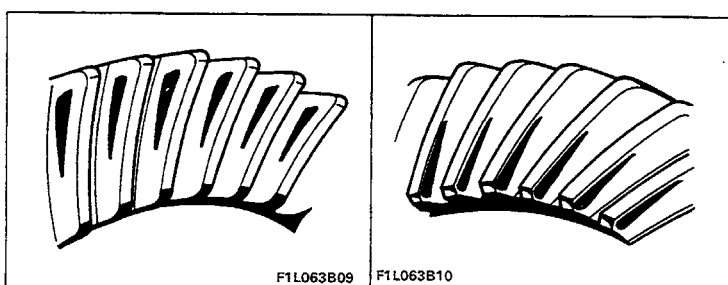


Incorrect contact

Drive side: contact at heel and towards centre of tooth

Coast side: contact at toe and towards centre of tooth.

Move pinion into mesh using thicker thrust ring



Incorrect contact

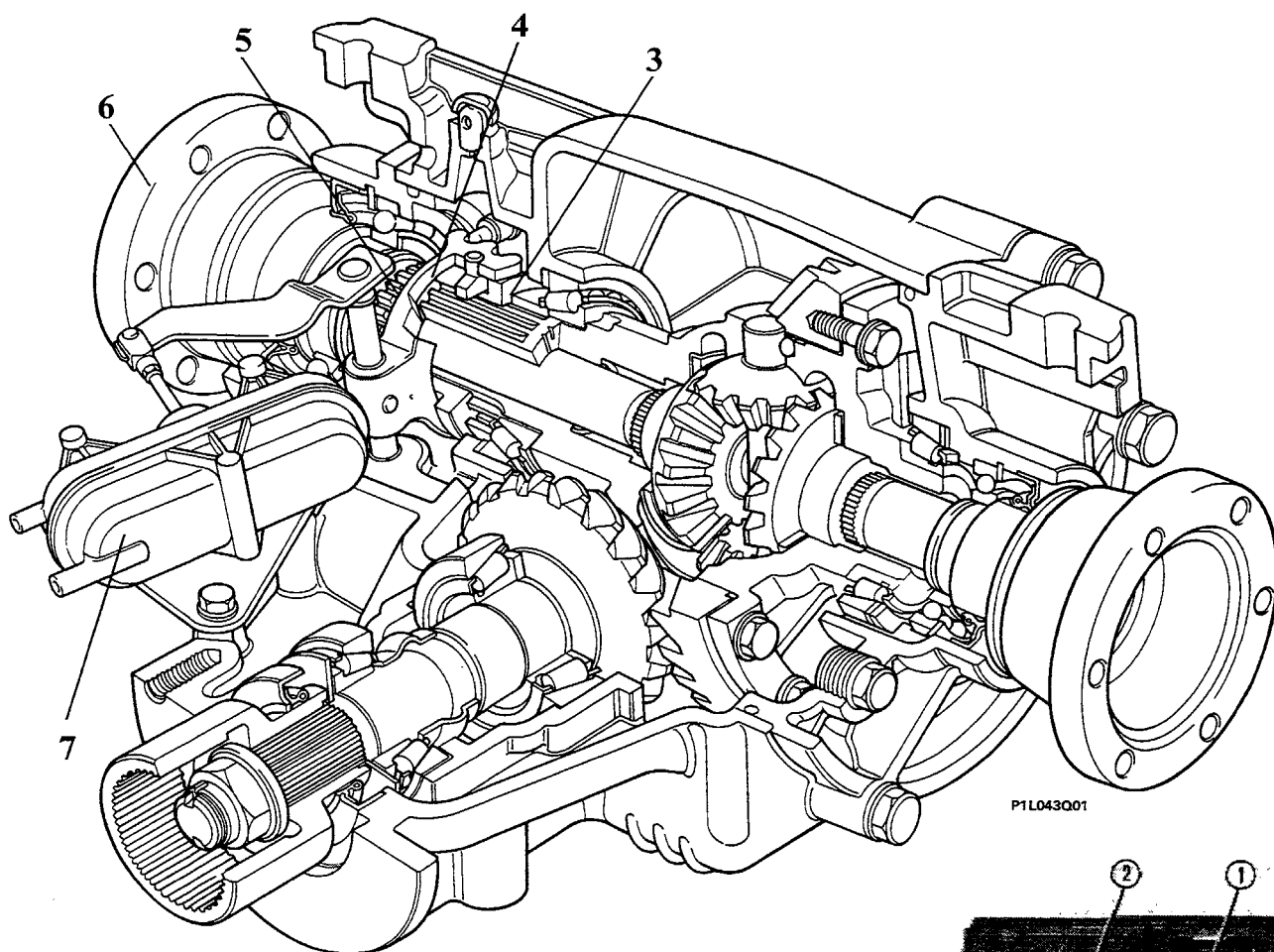
Drive side: heel contact, localised on crest of tooth.

Coast side: contact on toe, localised on crest of tooth.

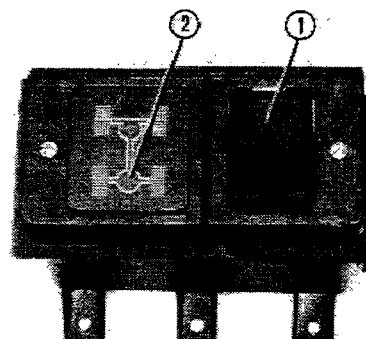
Move pinion into mesh, using thicker thrust ring.



In all above cases, unit must be removed. When refitting, repeat pinion-crownwheel backlash adjustment.



P1L043Q01



P1L043Q02

Differential lock

1. Differential lock control button
2. Differential lock warning light
3. Engagement sleeve
4. Fork
5. Gear
6. Right differential shaft
7. Pneumatic actuator

The differential lock is located inside the differential casing. It consists of engagement sleeve (3) with spur teeth that slides upon a splined, cylindrical section of the differential casing. When operated by fork (4) it engages with gear (5) integral with right differential shaft (6) so that the shaft is fixed to the case. The effect of the differential is thus cancelled. The engagement fork is operated by pneumatic actuator (7) and linkage. Engagement is controlled via pushbutton (1), and the warning light comes on when lock is engaged. Both pushbutton and warning light are located on the car control panel.

The device must be engaged only when one of the car's rear wheels is not gripping due to muddy or slippery ground and a skid is feared. The lock must be used only in cases of absolute necessity and pushbutton immediately returned to rest position.

Engagement should be carried out when the car is at a standstill or moving slower than 50 kph.

27.

PART	Thread size	Tightening torque	MODEL	
		daNm	DELTA	PRISMA

Staked nut retaining pinion	M 20 x 1.5	★	●	●
Crownwheel retaining bolt	M 10 x 1.25	8.8		●
Crownwheel retaining bolt	M 10 x 1.25	8	●	
Fork retaining bolt	M 6 x 1	1.1		●
Male threaded plug for ratchet	M 12 x 1.25	8.5		●
Pushbutton switch	M 14 x 1.5	4		●
Tapered magnetic threaded oil drain plug	M 22 x 1.5	4.6	●	●
Bolt retaining left cover	M 10 x 1.25	5	●	●
Tapered threaded oil filler plug	M 22 x 1.5	4.6	●	●
Bolt retaining right cover	M 8 x 1.25	2.5	●	●
Nut for stud on right cover	M 8 x 1.25	2.5	●	●

★ Procedure for staking pinion nut is described on page 18 for Delta models and on page 39 for Prisma models

HYDRAULIC OPERATION

- Diagram showing operation of hydraulic braking system and mechanical handbrake 1
- Pedal - Brake fluid reservoir 3
- Master cylinder 4
- Servo brake 6

FRONT BRAKES

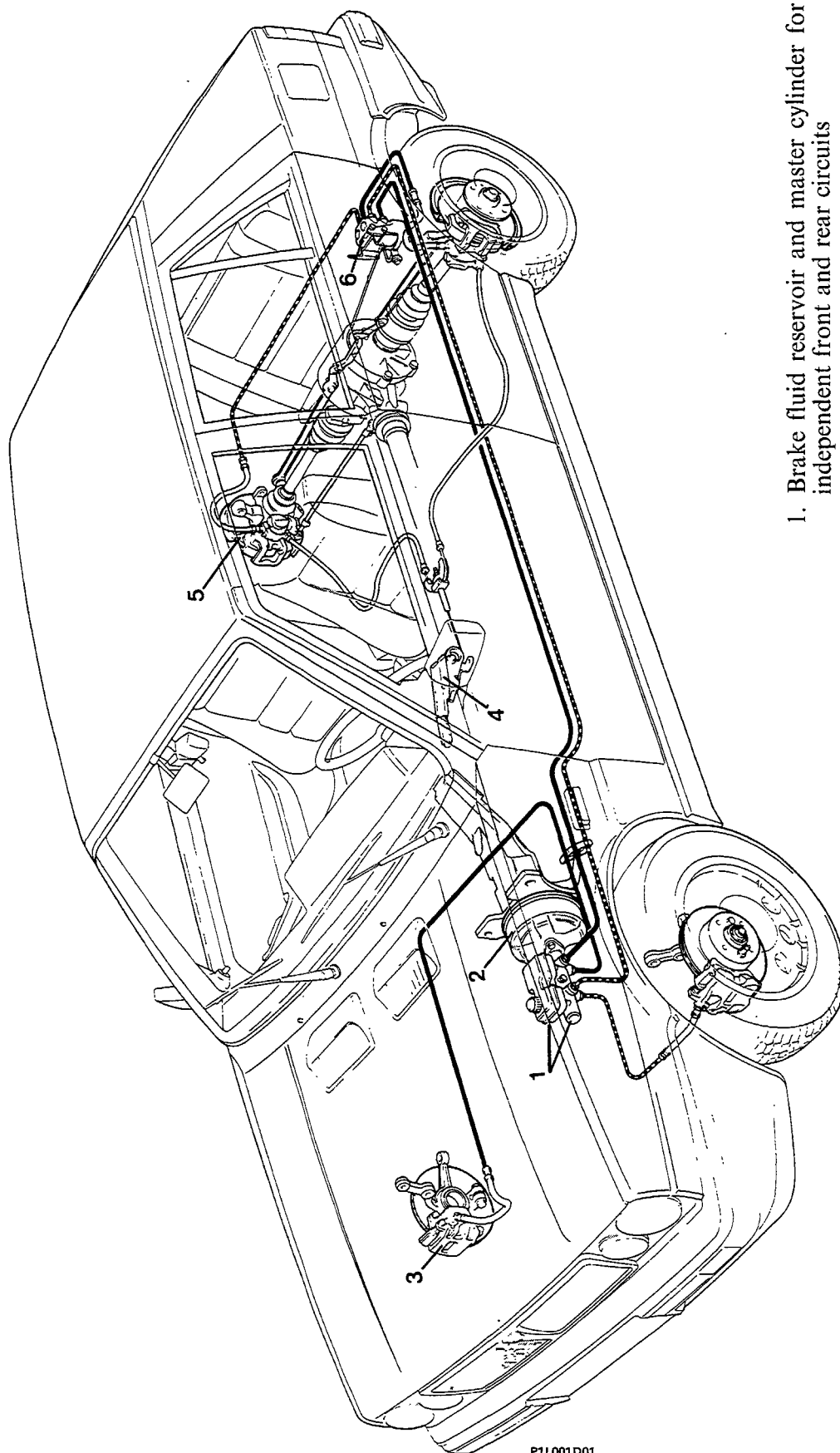
- Removing-refitting 7
- Brake caliper 10
- Brake discs 11
- Brake pads - Bleeding - Replacing brake pads 12

REAR BRAKES

- Removing-refitting 13
- Brake caliper 16
- Device for the automatic adjustment of the clearance between the rear brake pads and disc and the handbrake 19
- Brake discs - Brake pads 21
- Load proportioning valve 22
- Bleeding - Handbrake 24

TIGHTENING TORQUES 25

DIAGRAM SHOWING HYDRAULIC OPERATION AND MECHANICAL HANDBRAKE FOR THE DELTA 4WD

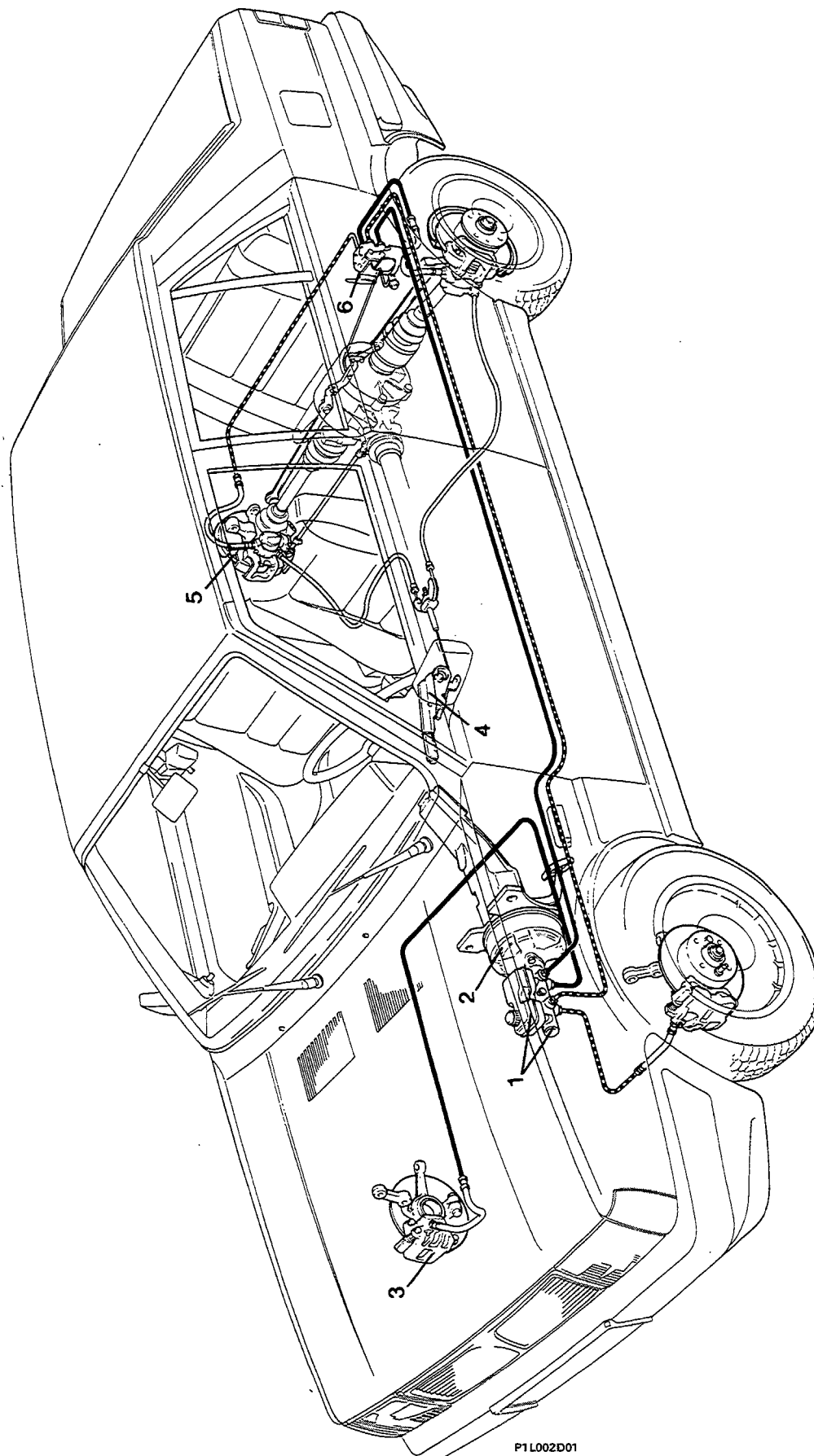


P1L001D01

- Hydraulic circuit for right front and left rear brakes
- - - Hydraulic circuit for left front and right rear brakes

33.

DIAGRAM SHOWING HYDRAULIC OPERATION AND MECHANICAL HANDBRAKE FOR PRISMA 4WD



1. Brake fluid reservoir and master cylinder for independent front and rear circuits
2. Vacuum servo brake
3. Front disc brakes
4. Handbrake lever
5. Rear disc brakes
6. Load proportioning valve for rear brakes hydraulic circuit

— Hydraulic circuit for right front and left rear brakes

- - - Hydraulic circuit for left front and right rear brakes

P1L002D01

PEDAL

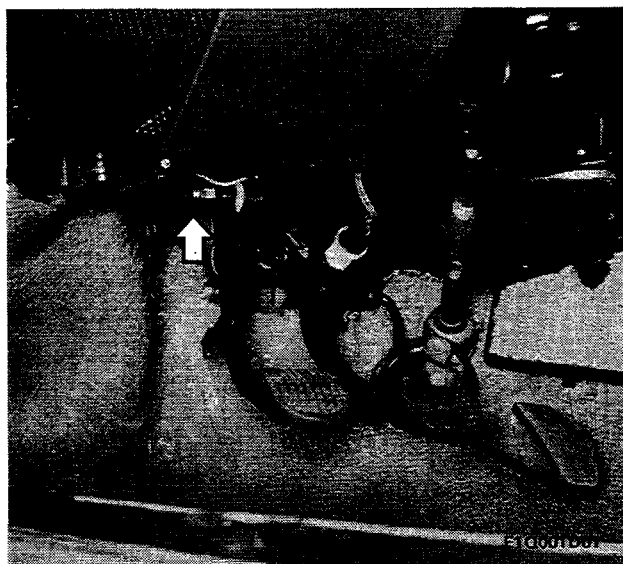
Removing-refitting brake pedal

In order to remove the brake pedal the nut shown by the arrow has to be undone after having previously removed the clutch cable and the pedal.

Remove the pedal mounting pin and release the brake pedal from the servo brake push rod.



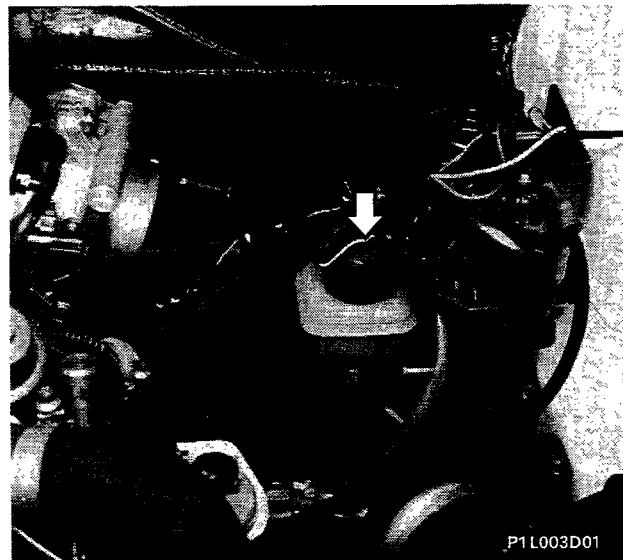
the parts concerned with grease before fitting.



BRAKE FLUID RESERVOIR

Checking insufficient brake fluid level warning device

NOTE Periodically check the operation of the warning device by pressing on the top of the brake fluid reservoir cover (as shown by the arrow); with the ignition switch in the "ON" position the warning light should come on.



Removing-refitting reservoir from master cylinder

In order to gain access to the reservoir the power assisted steering fluid reservoir and the coil assembly have to be removed.



Before removing the reservoir drain the brake fluid.



Bleeding hydraulic system.



33.



MASTER CYLINDER



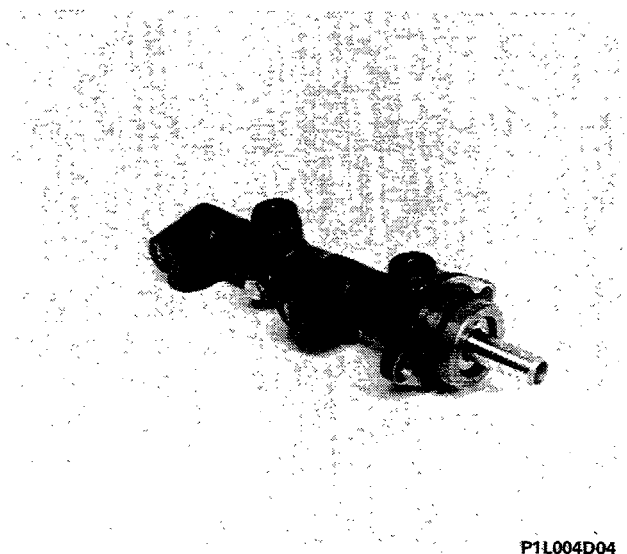
Removing-refitting brake pipes and master cylinder



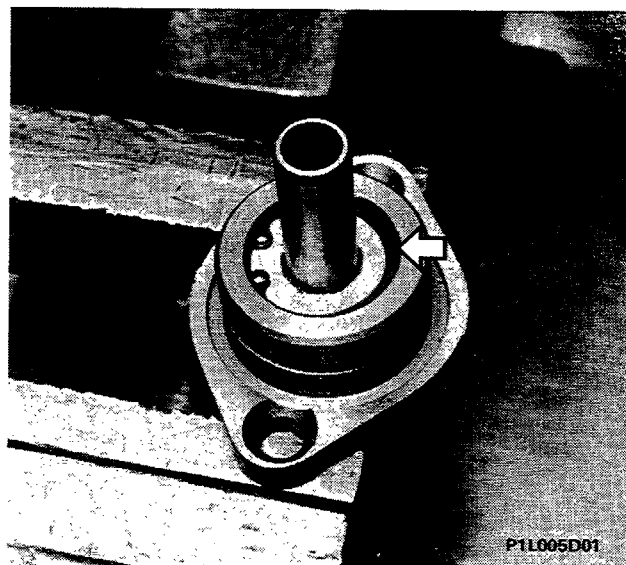
Removing-refitting master cylinder



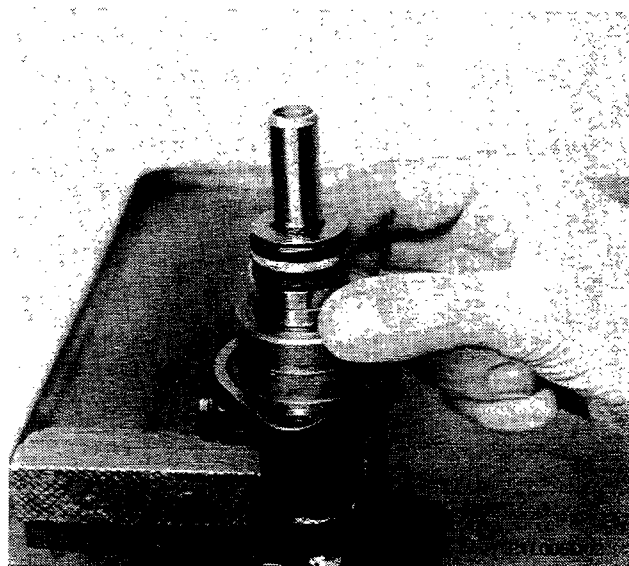
Bleeding braking system



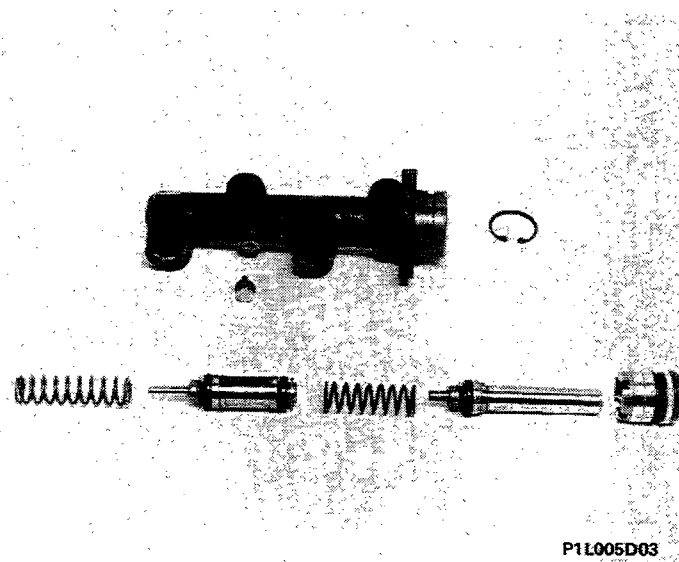
Master cylinder assembly removed from vehicle



Removing-refitting master cylinder internal assembly circlip



Removing-refitting master cylinder internal assembly



Master cylinder assembly components

When overhauling, always replace the seals; if any traces of abrasion or seizing are noticed on the master cylinder casing the assembly must be replaced.

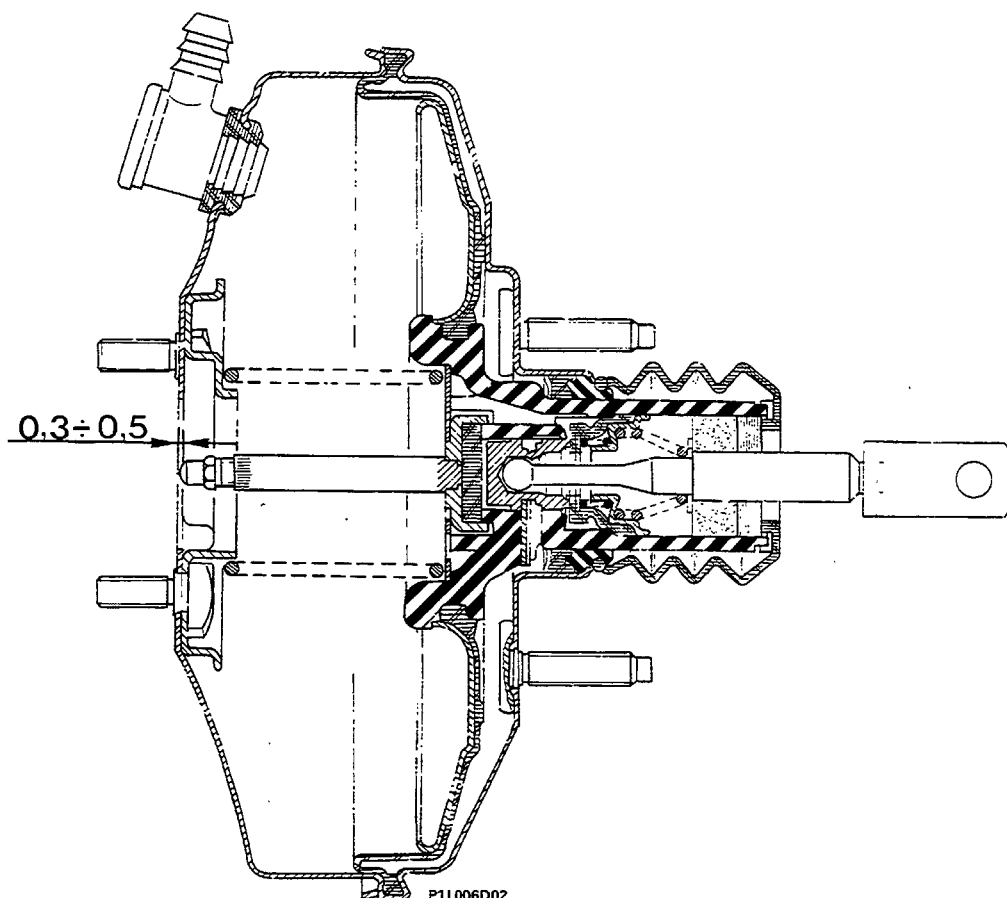
33.



SERVO BRAKE

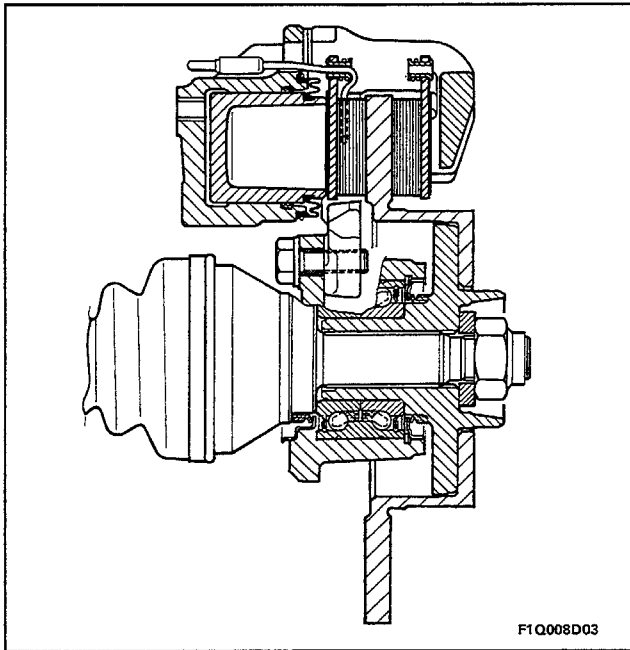
Servo brake fitted on vehicle

NOTE *The servo brake is adjusted using the adjustment screw at the end of the rod. In the rest position the end of the adjustment screw should be recessed in relation to the plane of the front cover by 0.3 - 0.5 mm.*

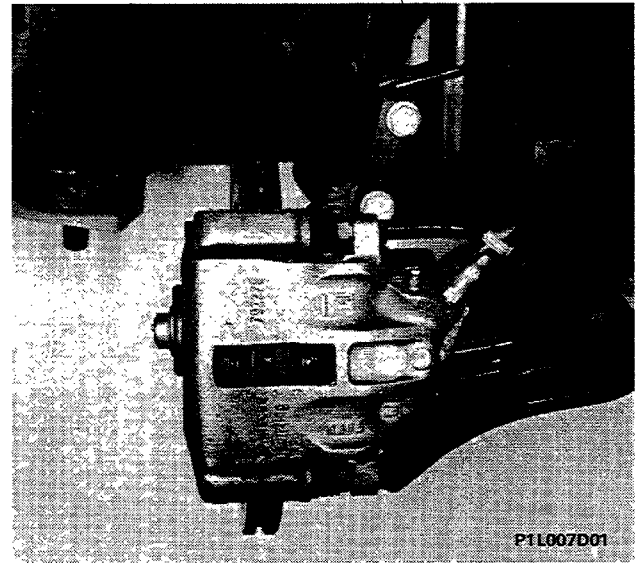


Longitudinal section of servo brake

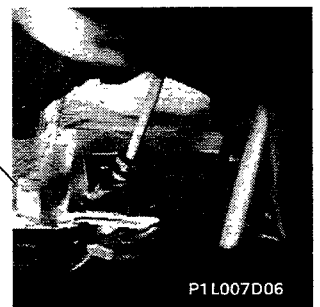
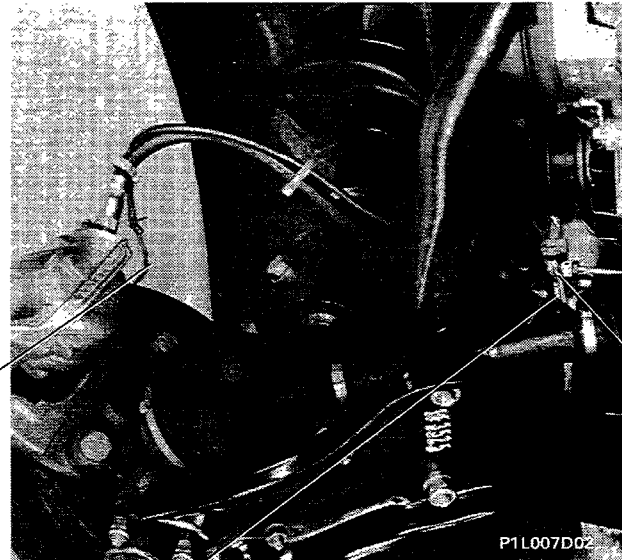
REMOVING-REFITTING



Cross section of front brake caliper and wheel hub



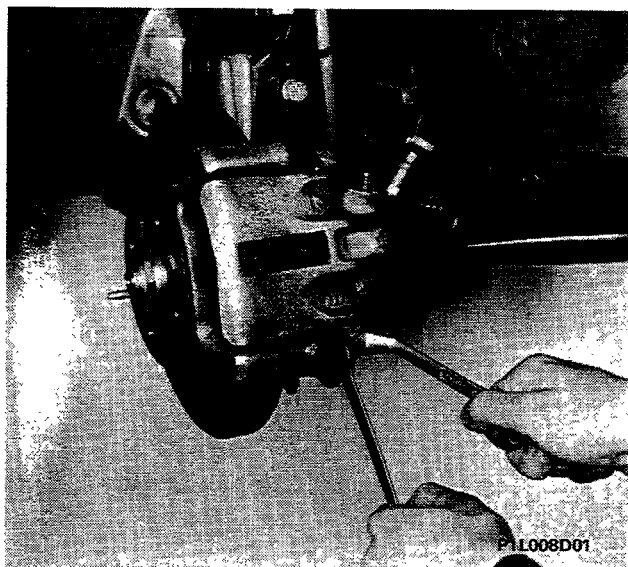
Front brake assembly fitted on vehicle



Removing-refitting flexible pipe and electrical connection from brake pad



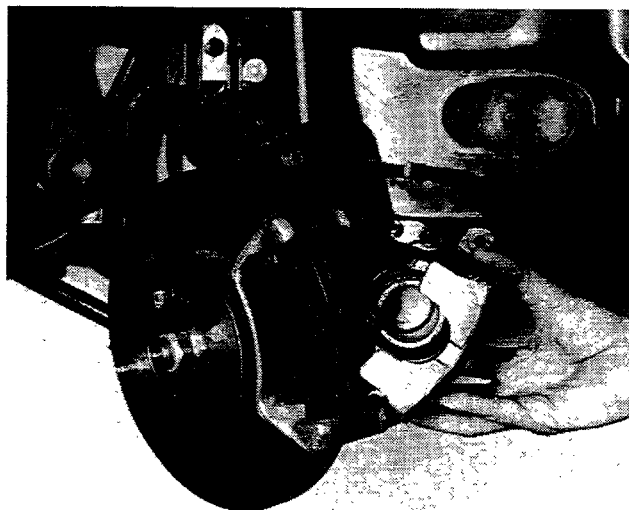
33.



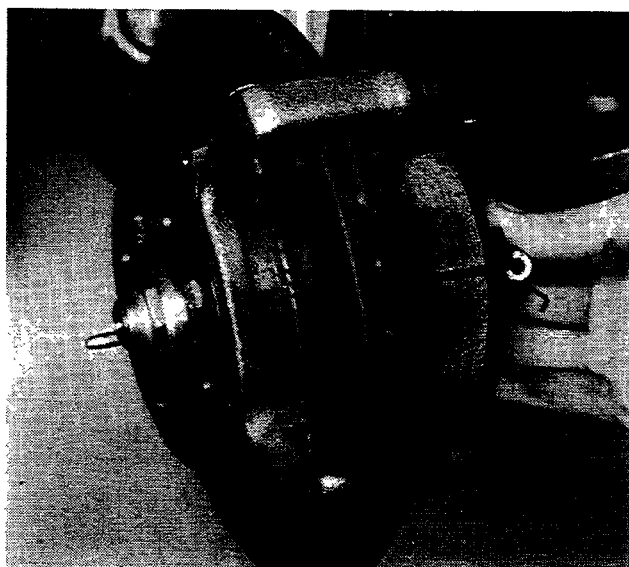
Removing-refitting brake caliper self-locking bolts



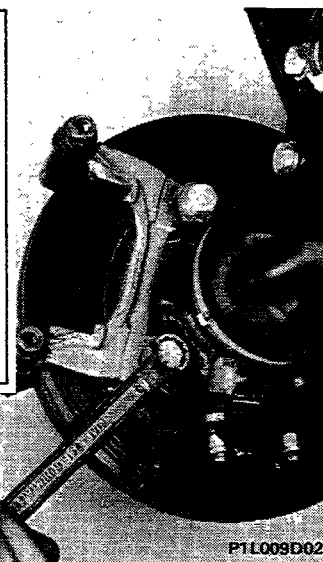
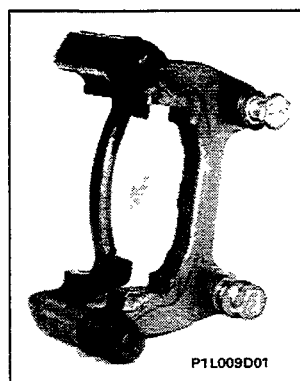
The bolts fixing the brake caliper are self-locking and must always be replaced each time they are loosened or undone.



Removing-refitting brake caliper



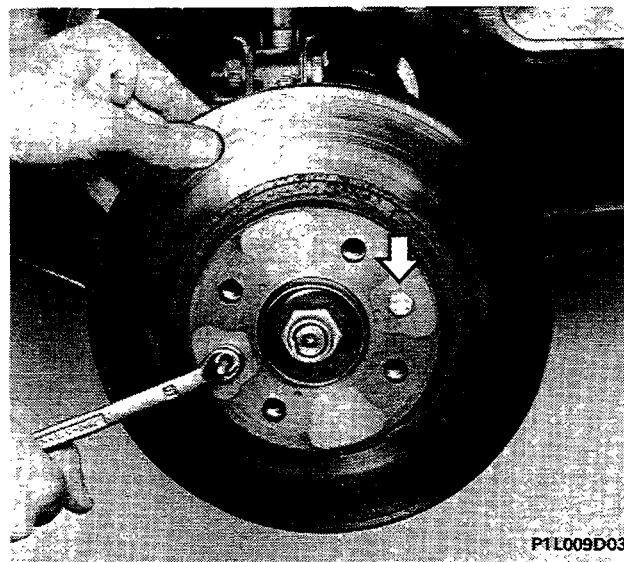
Removing-refitting brake pads



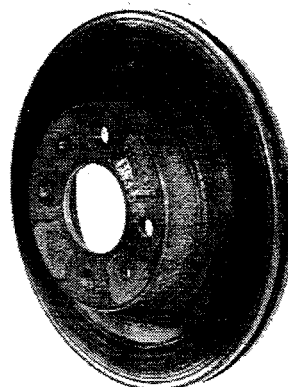
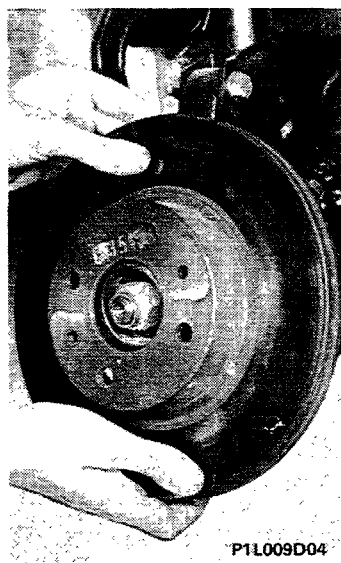
Removing-refitting caliper support bracket



Before refitting the caliper support bracket, check that the rubber boots are intact; if they are not, they must be replaced.



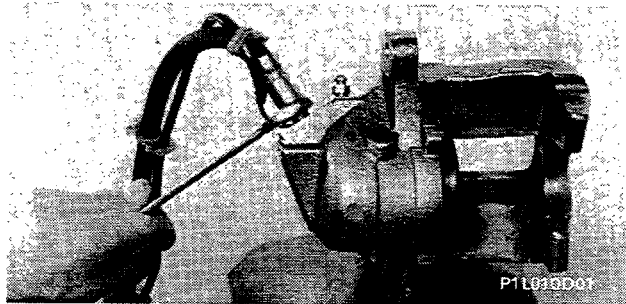
Removing-refitting brake disc fixing bolts



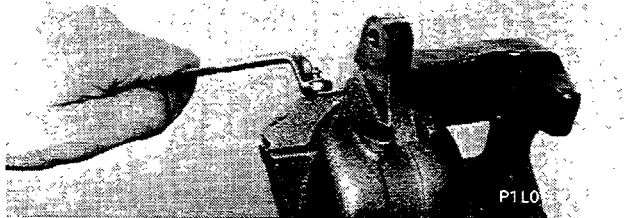
Removing-refitting brake disc

When refitting, remove any possible traces of rust to ensure that the disc is perfectly perpendicular in relation to the hub.

33.



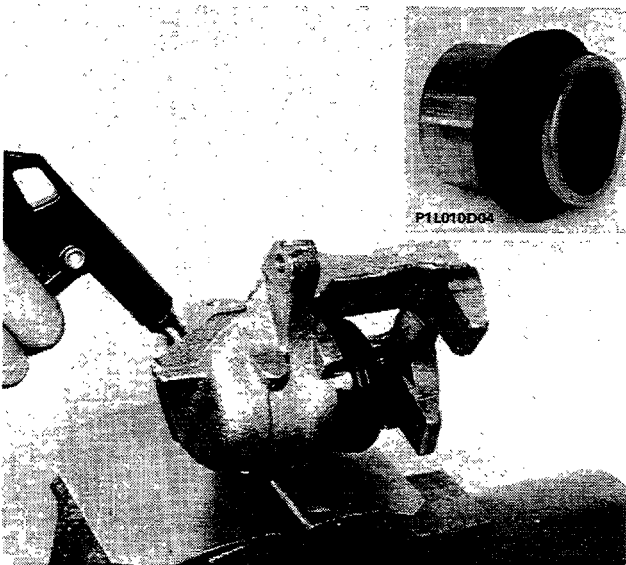
BRAKE CALIPER



Removing-refitting flexible pipe union and bleed screw

NOTE *The flexible pipe should not show any signs of bulges or cracks or else it must be replaced.*

It is advisable to replace both pipes.



Removing piston and protective boot and checking caliper assembly components



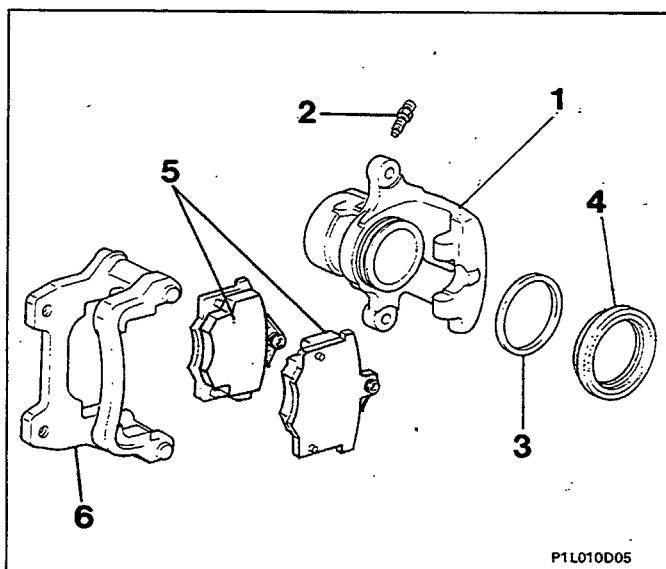
The piston casing is removed by directing a jet of compressed air into the brake fluid inlet opening.

The piston and the caliper casing should not show any signs of abrasion or seizing; if they do, the entire caliper must be replaced.

The protective boot and the seal must be replaced each time also making sure that the bleed screw is not obstructed.

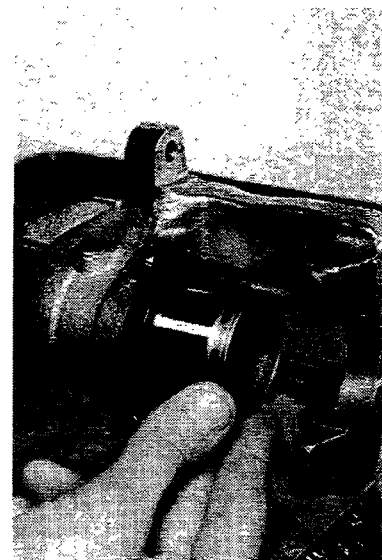


A solution of warm water and FIAT LDC detergent should be used to wash the metal components.



Exploded view of brake caliper

1. Caliper casing
2. Bleed screw
3. Seal
4. Protective boot
5. Brake pads
6. Caliper support bracket



Fitting seal and piston on caliper casing



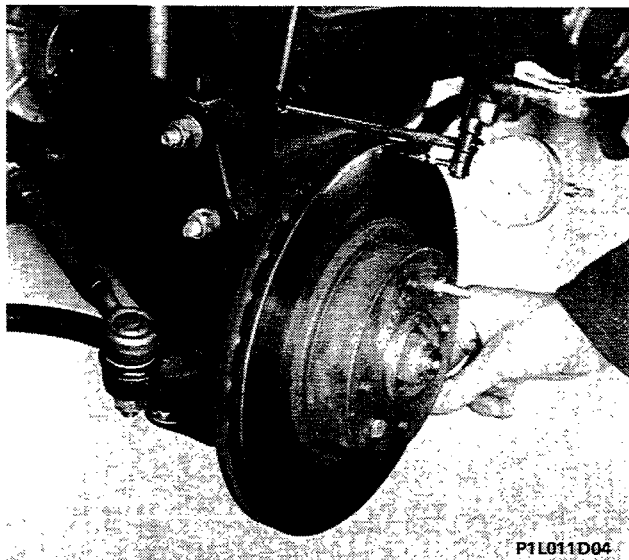
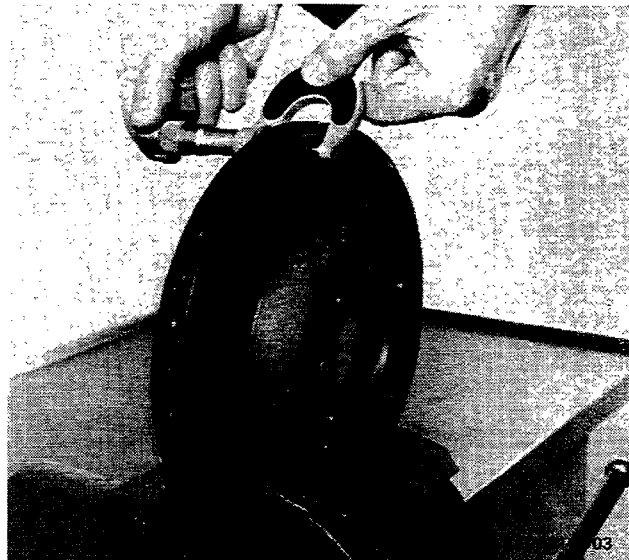
the parts concerned with brake fluid before fitting.

BRAKE DISCS

Checking and measuring disc

The minimum allowable thickness for brake discs due to wear is 10.8 mm for the Prisma 4WD and 18.2 mm for the Delta 4WD; if the brake disc measures less than this then it must be replaced.

In the case of deterioration or deep grooves, the surfaces of the brake disc should be refaced using a grinder; when the operation is completed the thickness of the brake disc should not be less than 11.3 mm for the Prisma 4WD and 18.55 for the Delta 4WD.

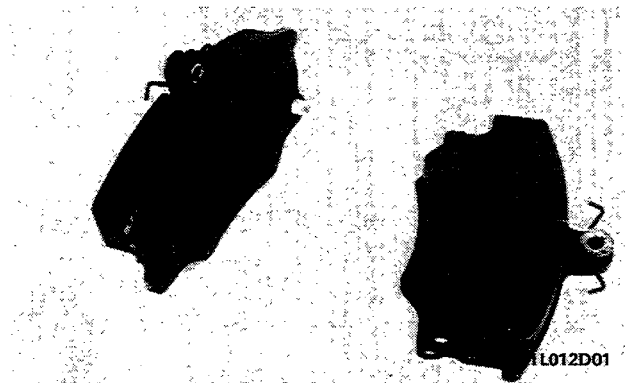


Checking run out of brake disc

If the brake pads have to be replaced, it is advisable to check that the disc is no more than 0.15 mm off centre.

This is measured 2 mm from the external diameter of the disc.

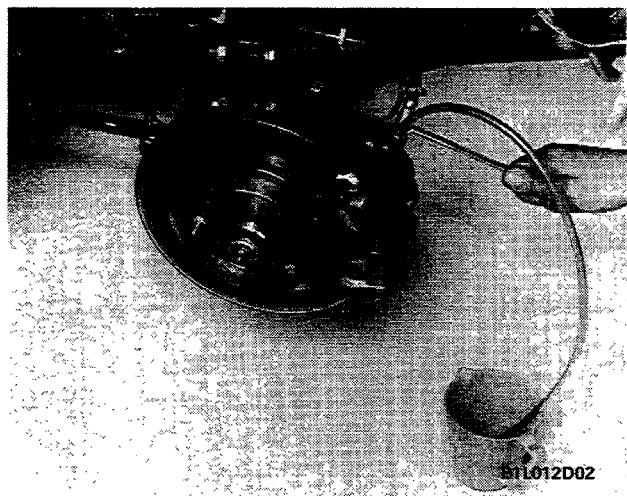
33.



BRAKE PADS

Checking brake pads

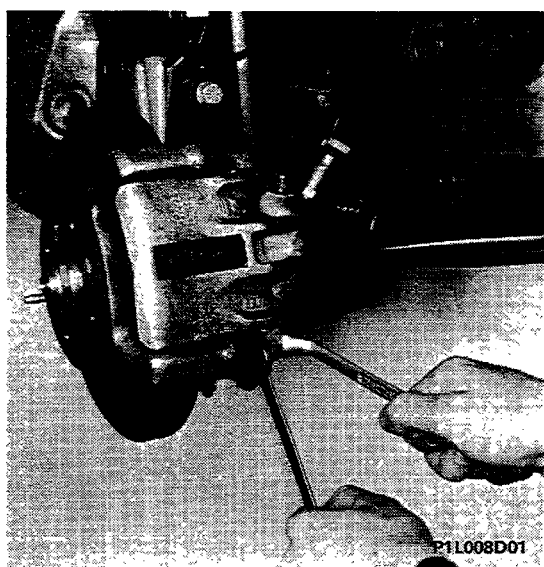
The brake pads must be replaced when the thickness of the lining is less than 1.5 mm. Check that the same type of pads are fitted on each pair of wheels.



BLEEDING

It is not advisable to reuse the brake fluid collected. The reservoir should be topped up with new brake fluid.

REPLACING BRAKE PADS



If only the brake pads are being replaced, the flexible pipe does not have to be removed.



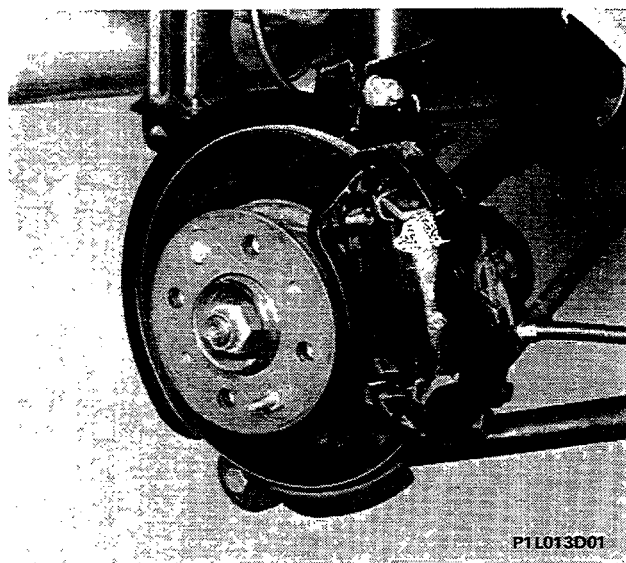
The bolts fixing the caliper casing are self-locking and must always be replaced each time they are loosened or undone.



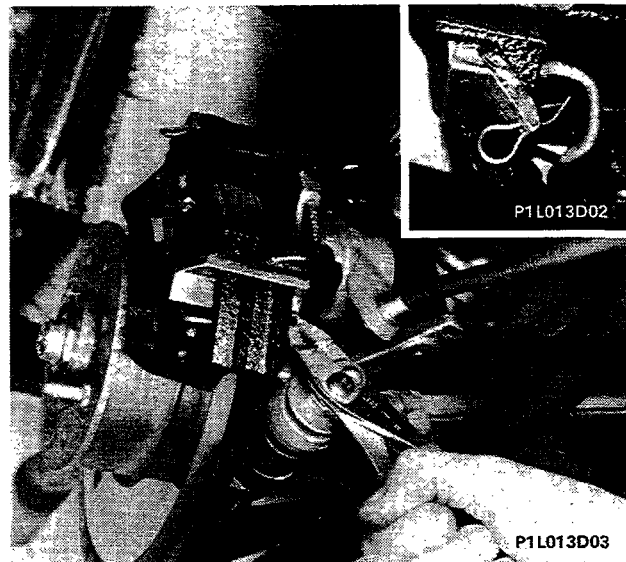
Bleeding hydraulic system.

REMOVING-REFITTING

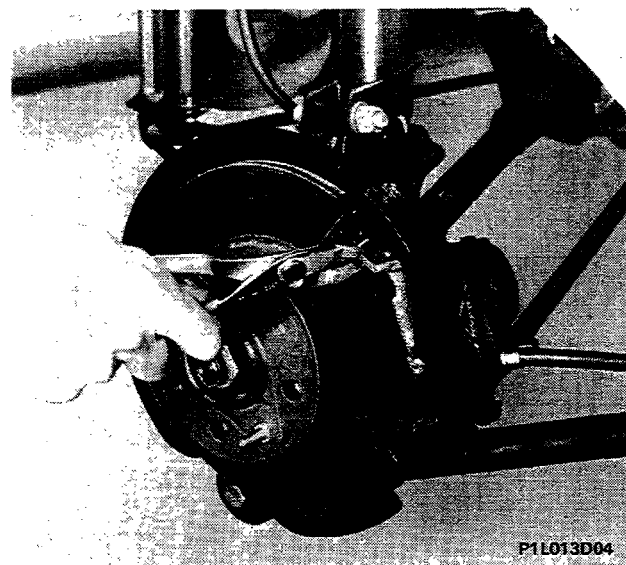
Rear brake assembly fitted on vehicle



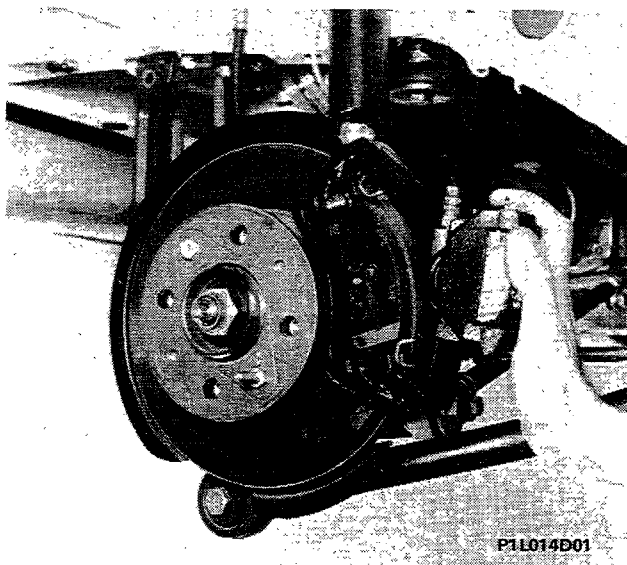
Removing-refitting sliding pad split pins



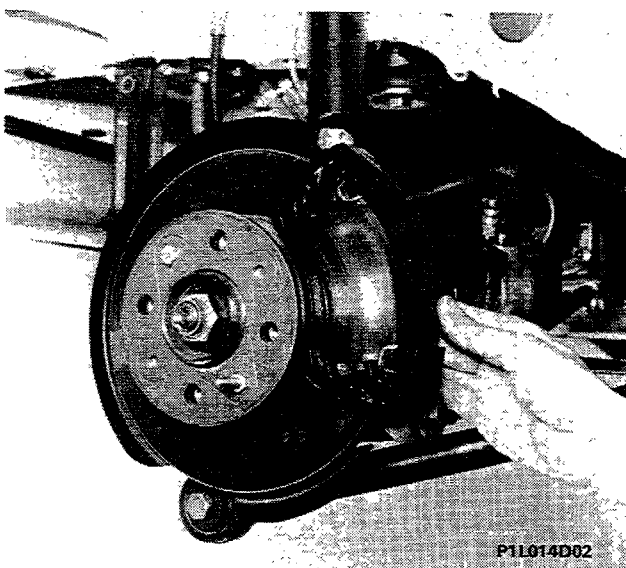
Removing-refitting sliding pads



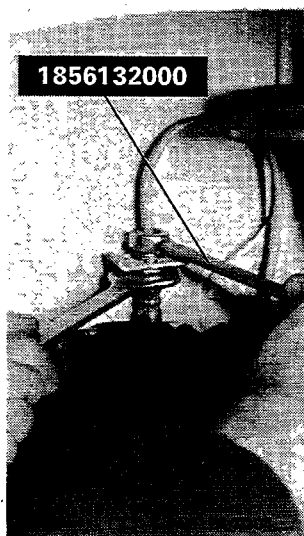
33.



Removing-refitting brake caliper from support bracket



Removing-refitting brake pads



Removing-refitting flexible pipe

If only the brake pads are being replaced then the flexible pipe does not have to be removed.

**Removing-refitting brake caliper**

Before proceeding to remove-refit the brake caliper, the handbrake cable has to be released from the actual caliper.



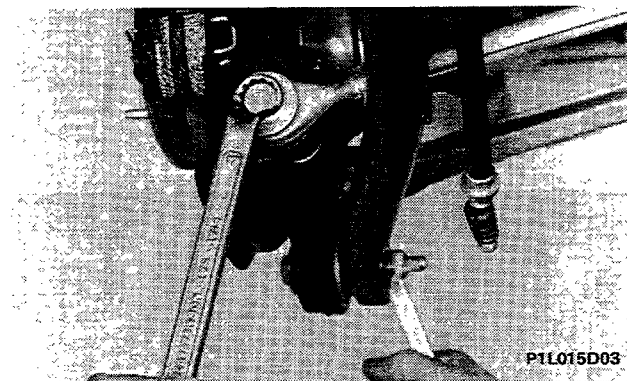
P1L015D01



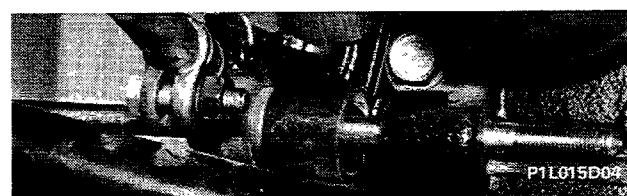
P1L015D02

**Removing-refitting nut fixing transverse rod**

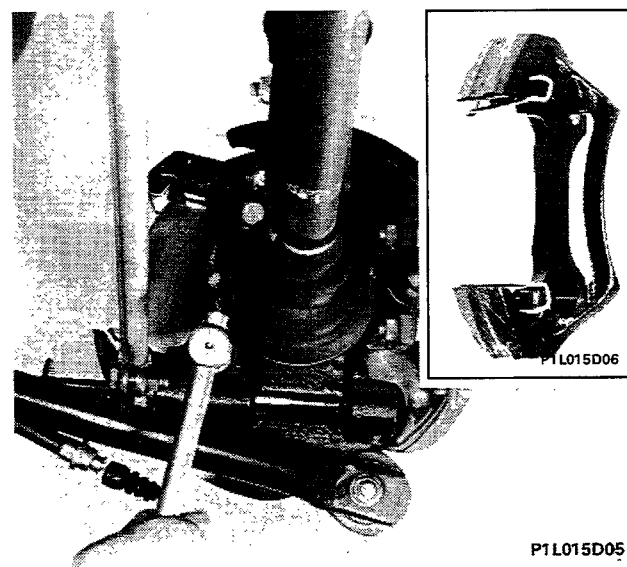
In order to gain access to the caliper support bracket bolts, the nut fixing the transverse rod has to be removed and the rod moved away from the stub axle.



P1L015D03



P1L015D04

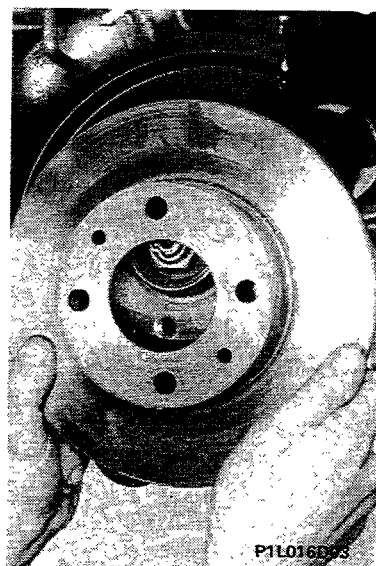
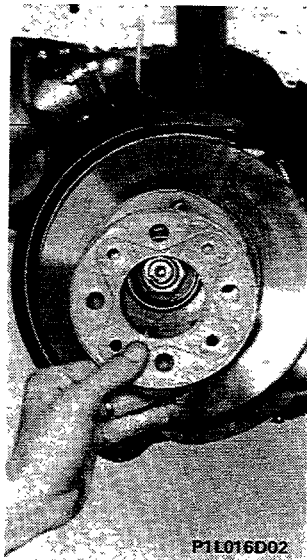
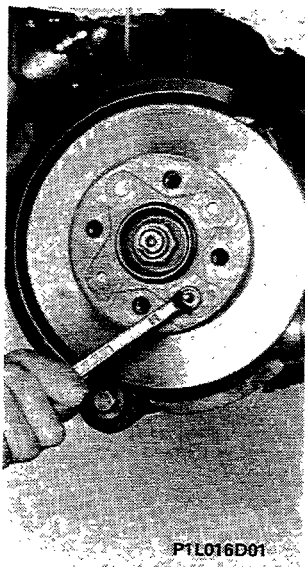


P1L015D06

P1L015D05

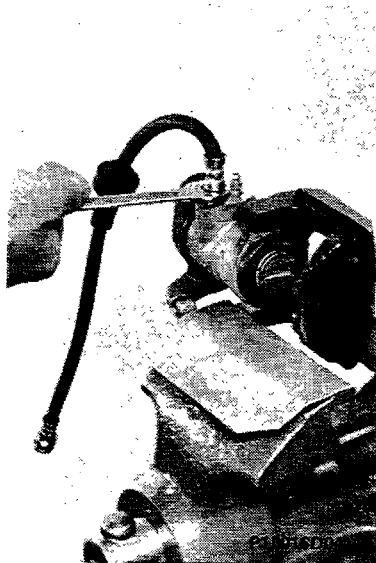
Removing-refitting brake caliper support bracket

33.



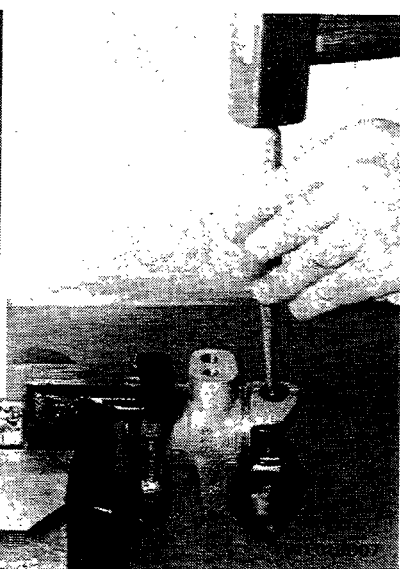
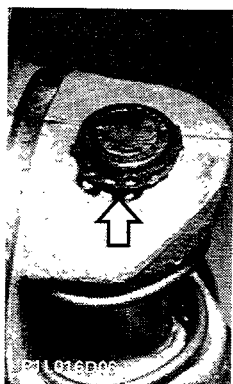
Removing-refitting brake disc from hub

When refitting, remove any possible traces of rust to ensure that the disc is perfectly perpendicular in relation to the hub.



BRAKE CALIPER

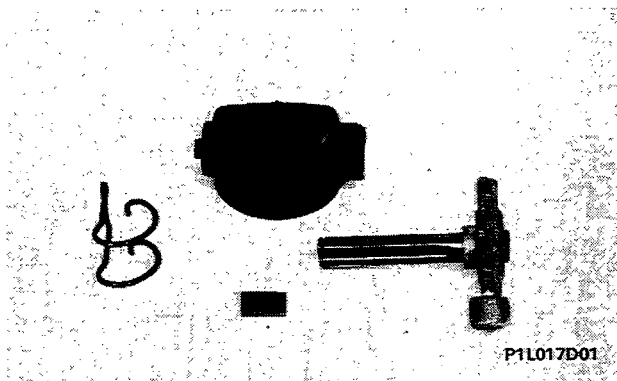
Removing-refitting flexible
pipe and bleed screw and
removing protective boot



Removing-refitting handbrake control from brake caliper

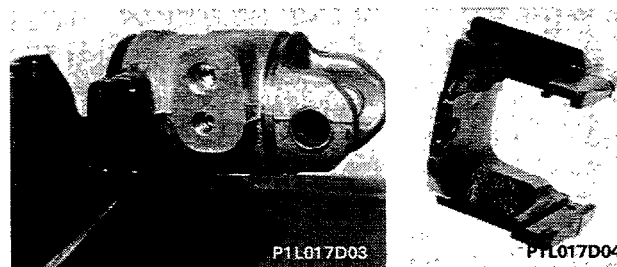
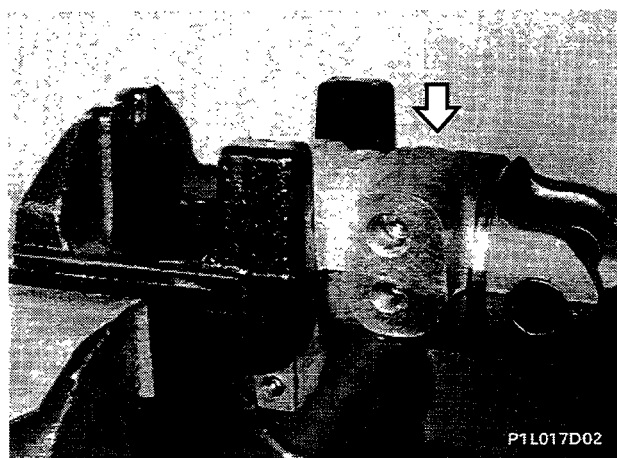
Before removing the device pin, the circlip shown by the arrow has to be removed.

Handbrake components

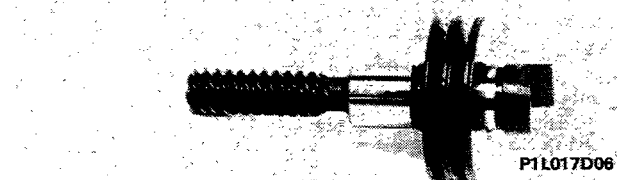
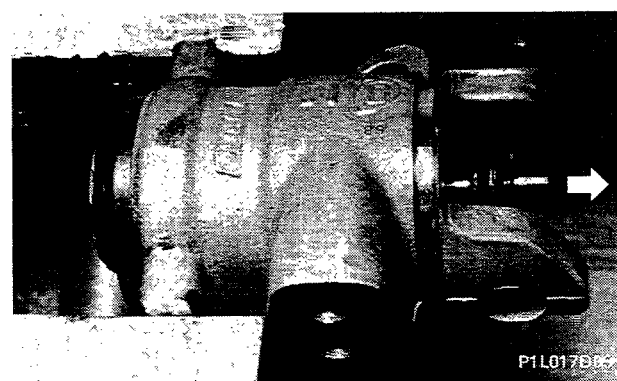


Removing-refitting cylinder support from caliper casing

In order to proceed with the removal of the cylinder support from the caliper casing the retaining pin has to be released using a point as illustrated in the diagram.



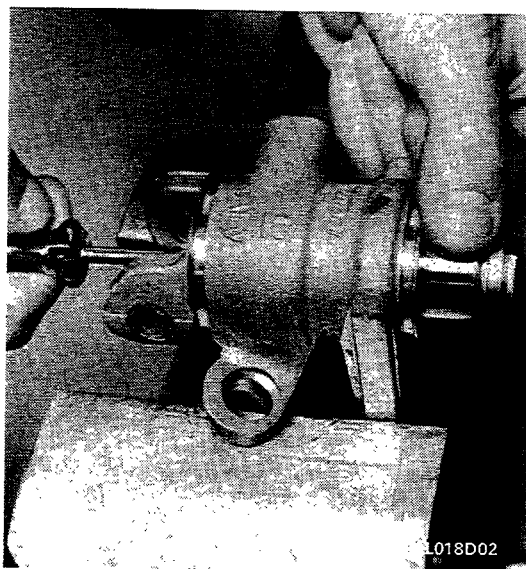
Removing-refitting device adjusting clearance between brake pads and brake disc



33.



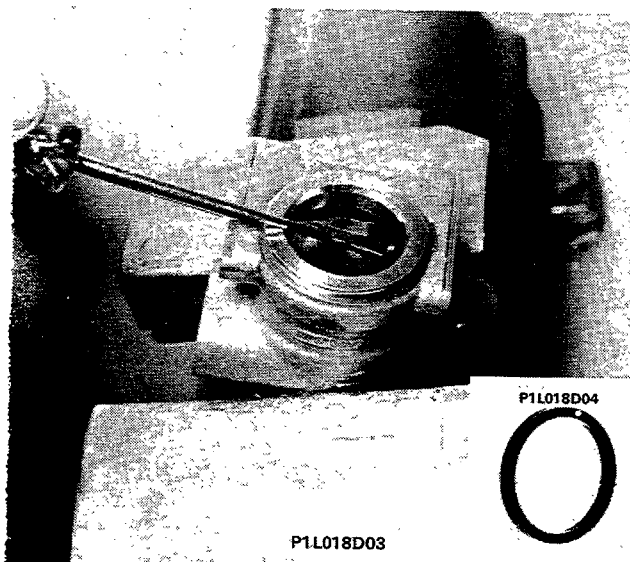
P1L018D01



P1L018D02



Removing-refitting protective boot and piston



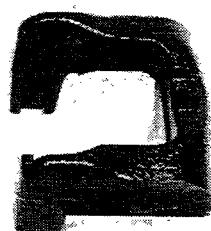
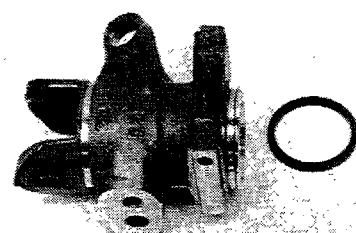
P1L018D03



P1L018D04



Removing-refitting seal



P1L018D05

Brake caliper components

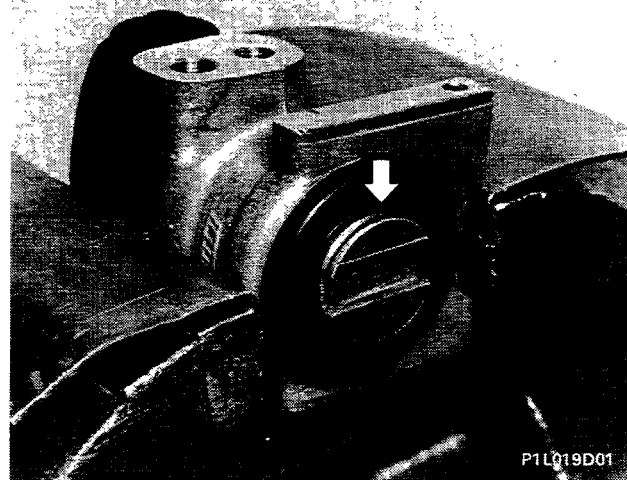
**Fitting piston and dust cover in caliper casing**

the parts concerned with brake fluid before fitting.



The reference mark on the piston (shown by the arrow) should be parallel to the surface of the bleed screw and turned towards it.

If this procedure is not followed it results in the malfunction of the braking system because it is not possible to bleed the system effectively.



P1LQ19D01

AUTOMATIC DEVICE FOR ADJUSTING THE CLEARANCE BETWEEN THE REAR BRAKE PADS AND DISCS AND THE HANDBRAKE**Operation**

The rear brake caliper piston contains a device which allows the distance between the brake discs and pads to be adjusted automatically.

This device comprises a spring (3), a self-adjustment female thread screw (4), a bearing (5), a plate (12), a clip (11) and a five-start threaded pin for self-adjustment (6).

In the rest position the position of the self-adjustment device, in relation to the piston (1), is shown in fig. A. Whilst braking, the piston (1) moves in the cylinder assuming the position illustrated in fig. B, allowing the brake pads to make contact with the disc; the piston travel therefore corresponds to clearance G1 between the bearing (5) and the plate (12) fixed by the clip (11).

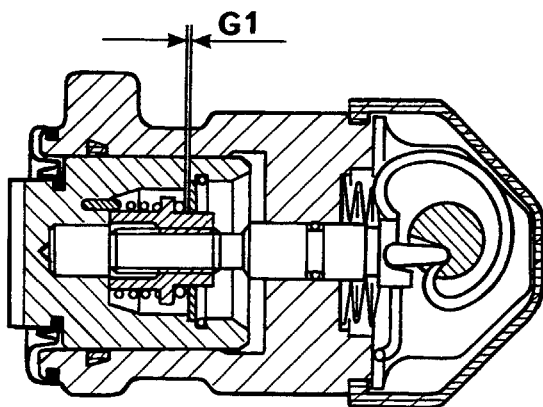


Fig. A

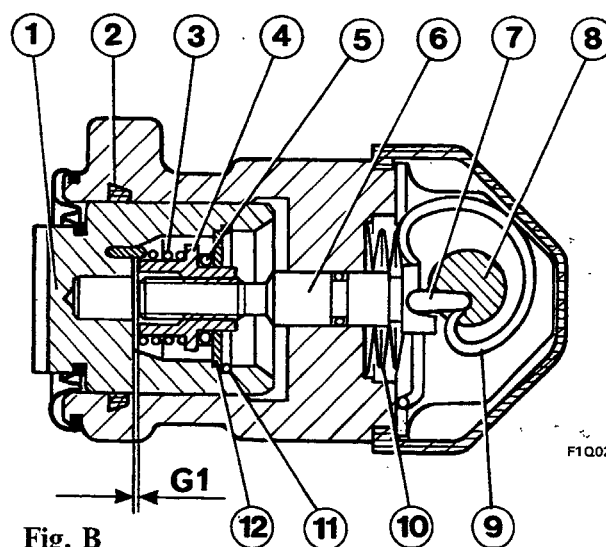


Fig. B

F1Q022D02

Cross section of rear brake caliper cylinder

1. Piston
2. Piston seal
3. Spring for female thread screw
4. Female thread screw for self-adjustment
5. Ball bearing
6. Pin for self-adjustment

7. Plate for piston with handbrake
8. Plate (7) control lever shaft
9. Spring for shaft (8)
10. Flexible washer
11. Clip
12. Plate

33.

After the sliding of the piston the seal (2) is distorted.

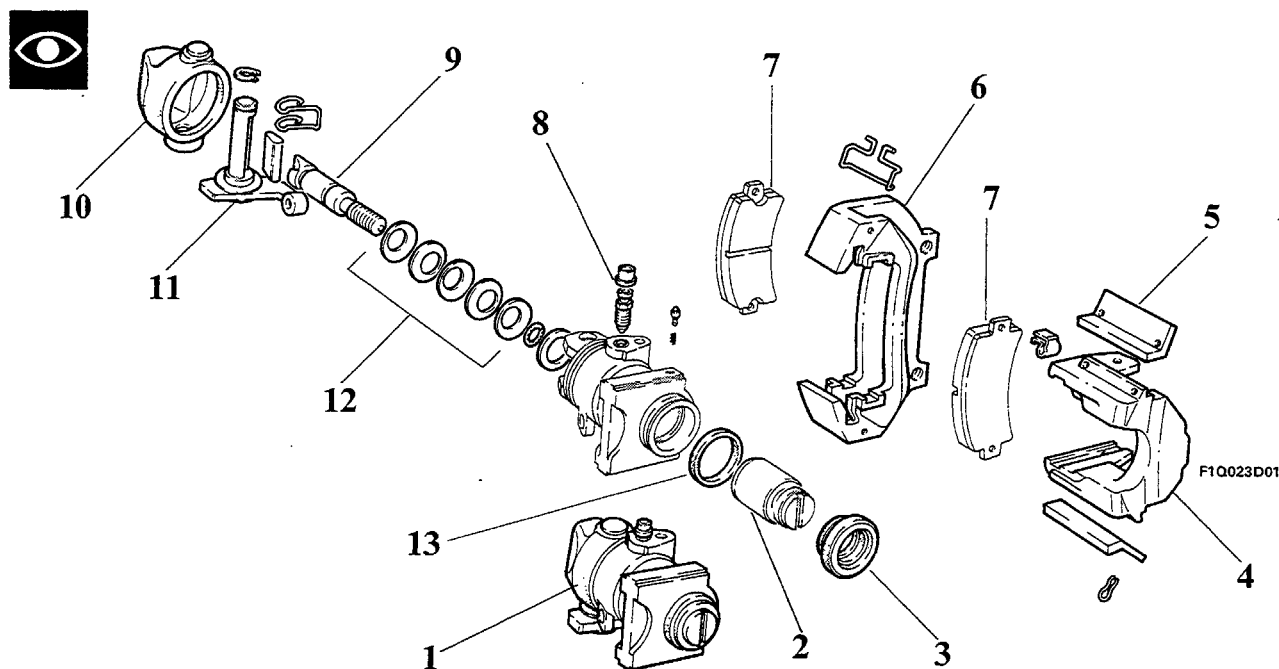
If the distance between the brake pads and the brake disc is greater than clearance G1, because the pads are worn, then the piston moves further into the cylinder forcing the female thread screw (4) to rotate in a clockwise direction on the threaded pin (6) by means of the plate (12).

During this rotation, the spring (3) turns in an anti-clockwise direction on the female thread screw and fixed to the piston at one end it tends to unwind allowing the female thread screw to rotate.

Once the braking action is over, the piston recedes under the action of the seal (2) which resumes its original shape.

However, the return stroke of the piston is always equal to the value of clearance G1 as it will stop when it makes contact with the female thread screw (4) as shown in fig. A.

In its turn the female thread screw cannot recede because in order to do this it would have to rotate in the same direction as the spring (3) is wound but the friction between the spring and the screw is such that the latter remains fixed in position. In this way whatever the wear to the pads, obviously assuming it is within the permissible limits, the exact clearance between the pads and the disc is automatically renewed; the handbrake is also adjusted at the same time since the shaft (8), controlled by the handbrake lever, acts directly on the pin (6) via the plate (7).



Brake caliper assembly components

- | | |
|----------------------------|--|
| 1. Caliper casing | 8. Bleed screw |
| 2. Piston | 9. Pin for self-adjustment |
| 3. Dust cover | 10. Protective boot |
| 4. Cylinder mounting | 11. Lever with pin for controlling handbrake |
| 5. Sliding pads | 12. Flexible washers |
| 6. Caliper support bracket | 13. Piston seal |
| 7. Brake pads | |

NOTE *The piston and the caliper casing should not show any signs of abrasion or seizing; if this is not the case then the complete caliper must be replaced.*



Use a solution of warm water and FIAT LDC detergent to wash the metal components.

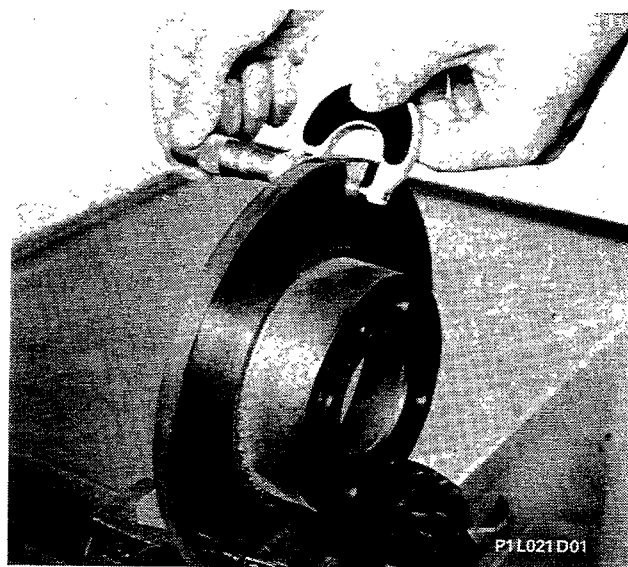
BRAKE DISCS



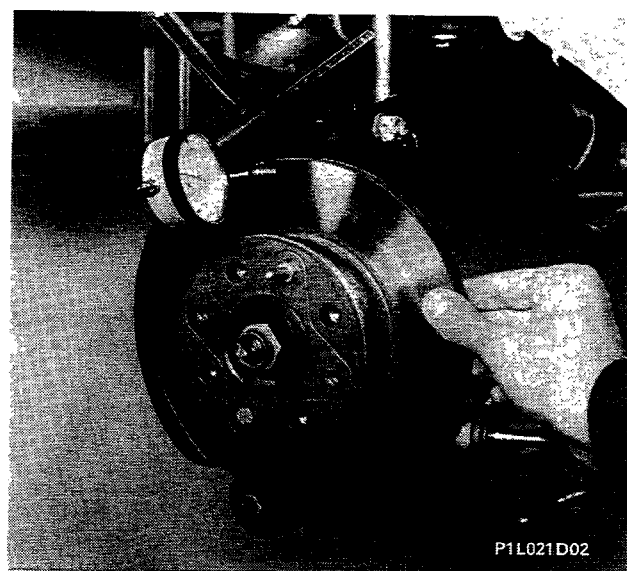
Checking and measuring brake disc

The minimum allowable thickness for brake discs is 9 mm; if it measures less than this, the disc must be replaced.

In the case of wear or deep grooves, the surfaces of the brake disc can be machined. After grinding the brake disc must not be less than 9.7 mm thick.



P1L021D01



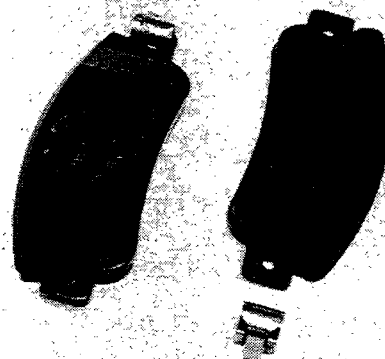
P1L021D02

Checking run out of brake disc

If only the brake pads have to be replaced, it is advisable to check that the disc is no more than 0.15 mm off centre.

This is measured 2 mm from the external diameter of the disc.

BRAKE PADS



P1L021D03

Checking brake pads

The brake pads must be replaced when the thickness of the lining is less than 1.5 mm.

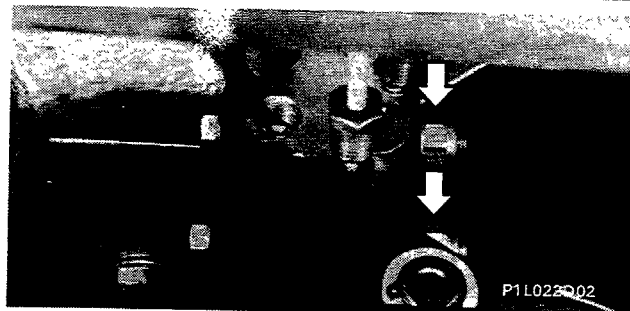
Check that the same type of pads are fitted on each pair of wheels.

33.

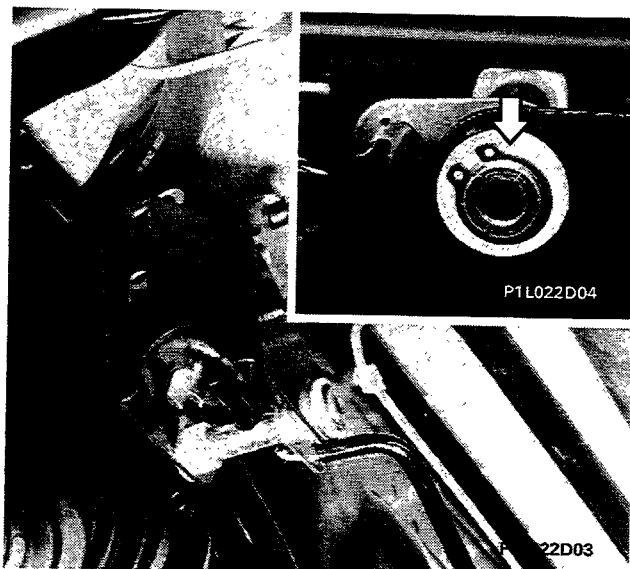


LOAD PROPORTIONING VALVE

Removing-refitting



Removing-refitting unions and nuts fixing load proportioning valve to mounting



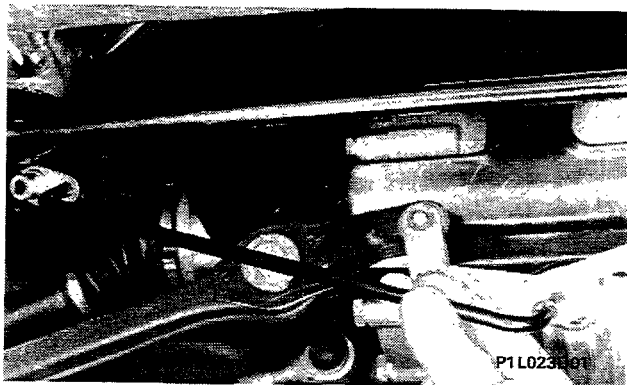
Removing-refitting bar mounting pin from load proportioning valve

In order to remove the bar mounting pin, the circlip shown by the arrow in the diagram has to be removed.



Removing-refitting bar from mounting after having removed circlip





Removing-refitting bar



Removing-refitting load proportioning valve



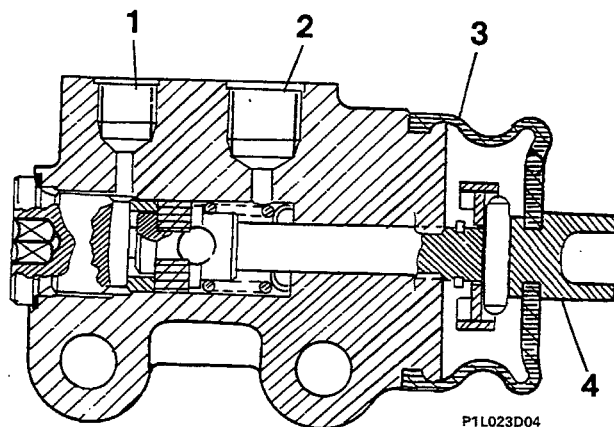
Bleeding hydraulic system

The load proportioning valve for the rear wheels, fixed to the rear suspension transverse rods cross member, differentiates between the pressure in the rear brake circuit and the pressure in the front circuit according to the vehicle load and deceleration conditions.

The variation in pressure is caused by the position which the bar connected to the rear suspension transverse rods which acts on the load proportioning valve piston assumes.

Cross section of load proportioning valve

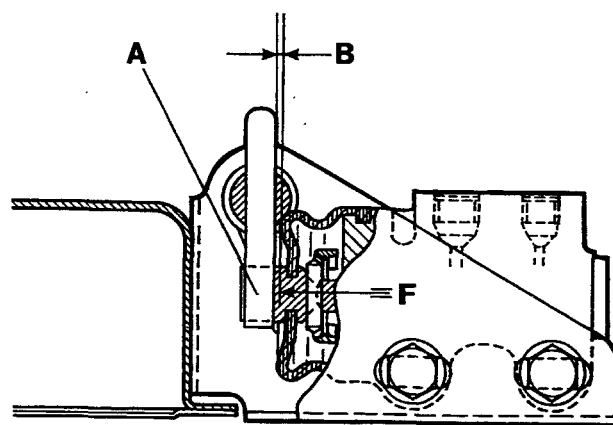
1. Seat for rear brake pipe unions
2. Seat for front brake pipe unions
3. Dust cover
4. Piston



Adjusting load proportioning valve

- Raise the vehicle at the back;
- loosen the load proportioning valve fixing bolts;
- bring point F of the load proportioning valve to distance B from end A of the bar;
- then lock the fixing bolts.

Distance B = 1.1 ± 0.2 mm



33.

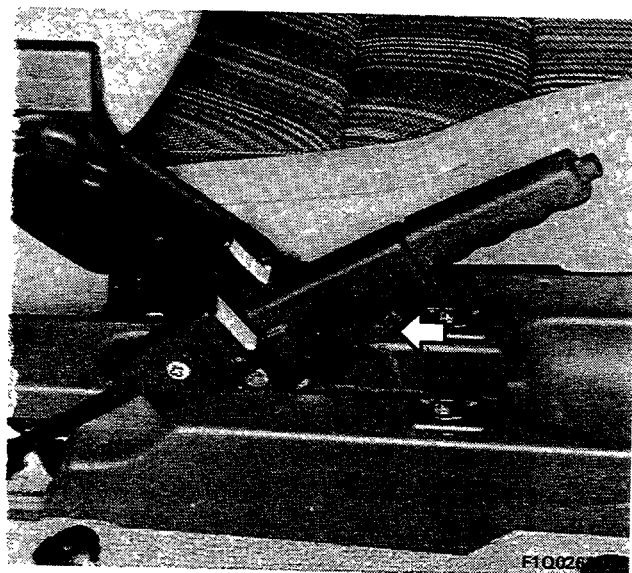


BLEEDING

It is not advisable to reuse the brake fluid collected.
The level should be topped up using new brake fluid.



In order to carry out the bleeding the suspension must be compressed in such a way that the load proportioning valve comes into operation.



HANDBRAKE

Handbrake adjustment

NOTE *After carrying out the adjustment, the handbrake lever should not travel through more than 4 or 5 notches and the wheels should turn freely when it is released.*

DESCRIPTION	Thread size	Tightening torque
		daNm

Front brake caliper to steering knuckle fixing, bolt	M10 x 1,25	4,8
Front brake disc to hub fixing, bolt	M8 x 1,25	1,2
Front brake disc to hub fixing, bolt	M8 x 1,25	2,3
Load proportioning valve to bracket fixing, bolt	M8 x 1,25	2,5
Unions for tubes with split cone ends for fixing brake pipes to pump and load proportioning valve	M10 x1	1,8
Union for fixing brake pipes to load proportioning valve	M12 x1	1,8
Union for fixing flexible pipe to front brake cylinder	M10 x1	2,3
Union for fixing flexible brake pipe to rear brake cylinder	M10 x 1	1,2
Rear brake caliper to support bracket fixing, bolt	M10 x 1,25	3,6
Brake caliper mounting bracket to stub axle fixing, bolt	M8 x 1,25	2,5
Rear brake disc to hub fixing, bolt	M8 x 1,25	1,2
Rear brake disc to hub fixing, bolt	M8 x 1,25	2,3

STEERING GEAR

- Removing - refitting 1
- Dismantling - reassembling 3

POWER ASSISTED STEERING BOX

- Removing - refitting 4
- Dismantling - reassembling and checks 8

POWER ASSISTED STEERING

- Composition and operation 9
- Front wheel toe in 11

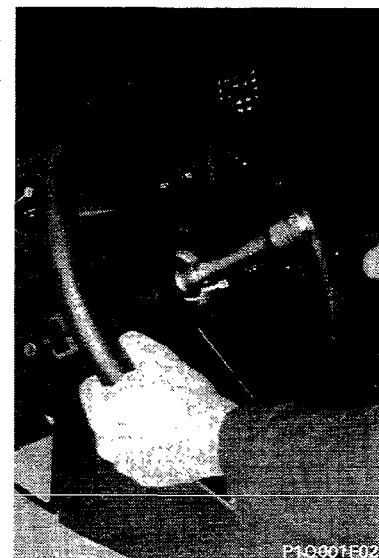
TIGHTENING TORQUES 12

REMOVING - REFITTING

NOTE *The operations of removing-refitting illustrated refer to the Delta 4WD model.
The procedure for the Prisma 4WD is the same.*

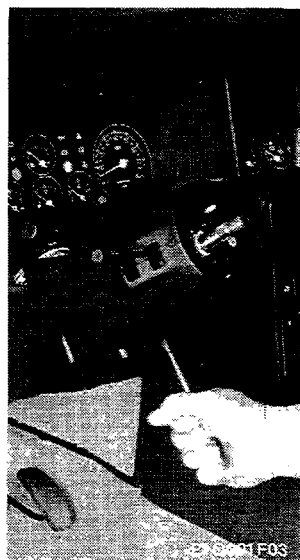


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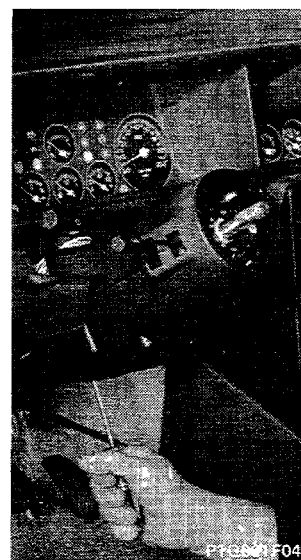


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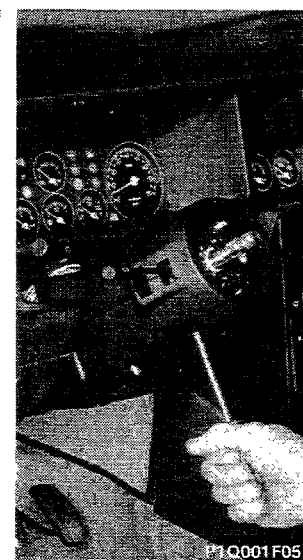
Removing-refitting steering wheel



P1Q001F03

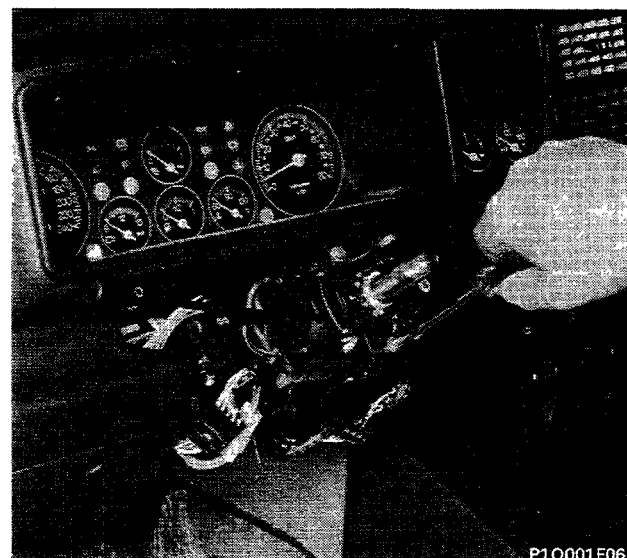


P1Q001F04



P1Q001F05

Removing-refitting upper shaft shields



P1Q001F06

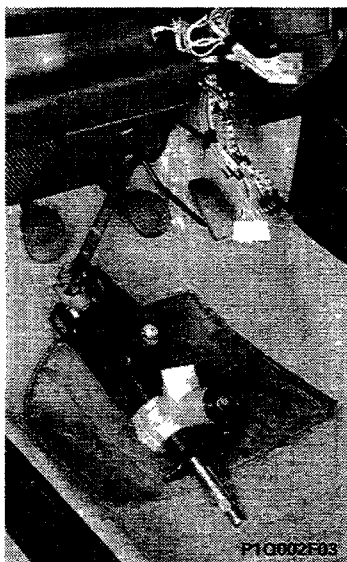
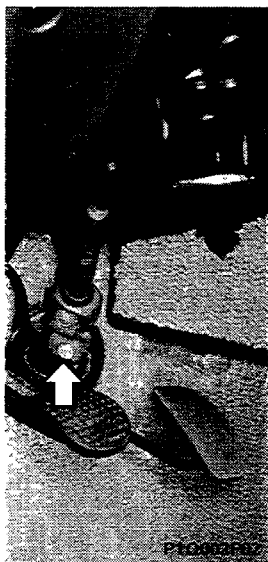
Removing-refitting steering column switch unit assembly

NOTE *Disconnect all the electrical connectors from the steering column switch unit.*

41.

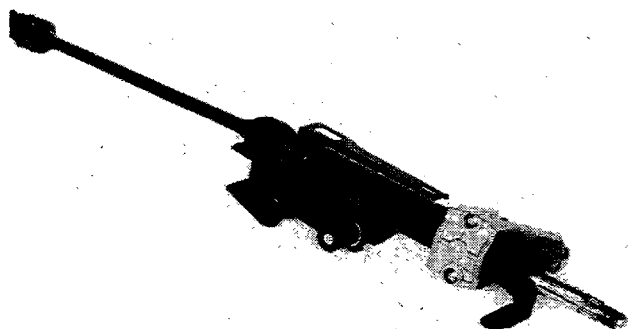


Removing-refitting upper shaft mounting from
bodyshell



Removing-refitting lower shaft from steering box
pinion

NOTE *Lastly, disconnect the upper shaft from
the lower one.*

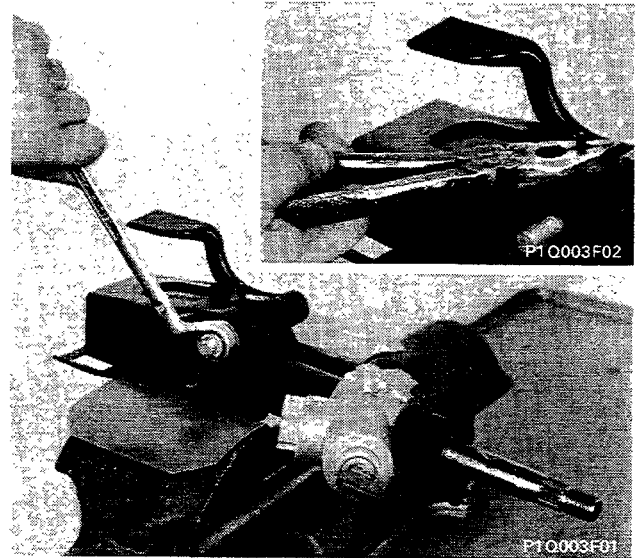


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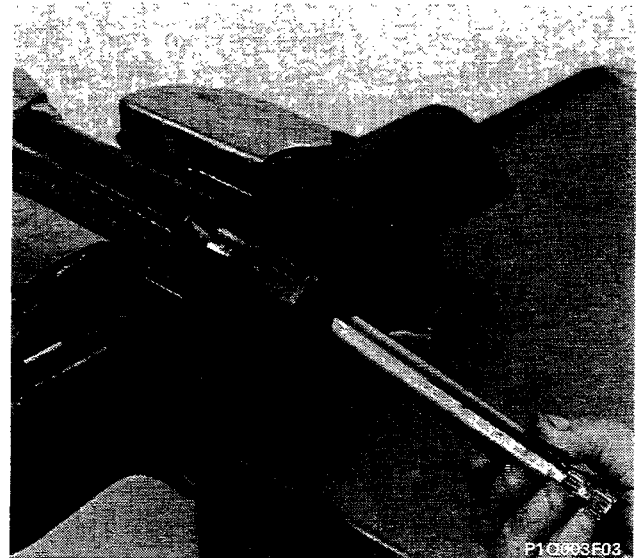
Steering gear assembly

DISMANTLING - REASSEMBLING

Dismantling-reassembling steering wheel height adjustment device



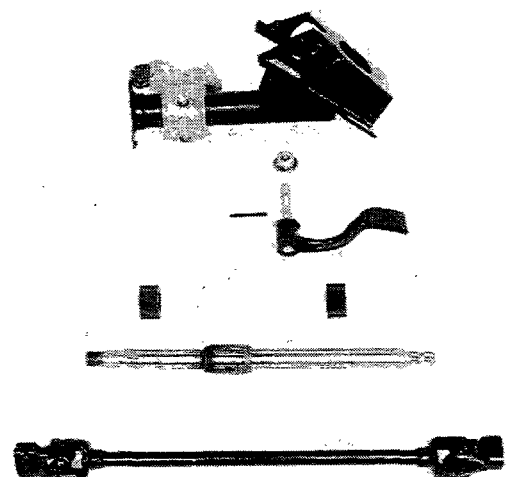
Dismantling-reassembling upper shaft from mounting at the bench



Checking steering gear components

Check that the clearance between the upper steering control shaft and the flexible bushes is not excessive and that the shaft is not off centre. Check that there is not too much clearance in the universal joints for the lower steering control shaft.

If anything seems to be wrong, replace the affected component.



P1Q003F04

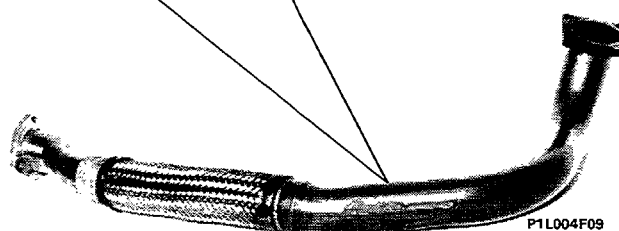
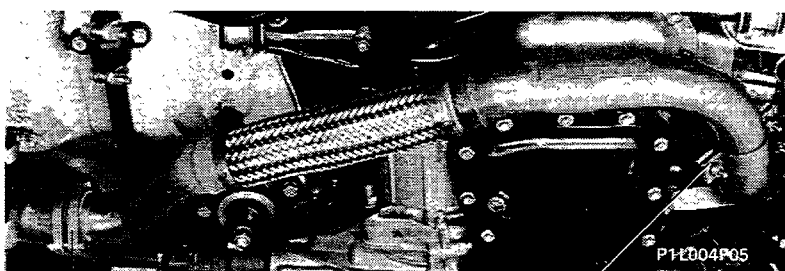
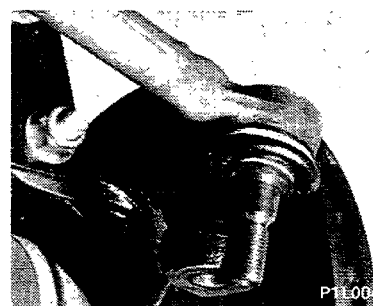
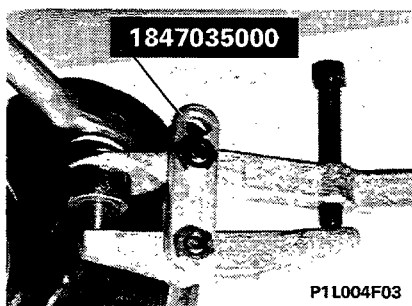
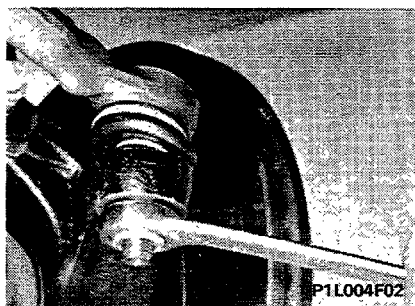
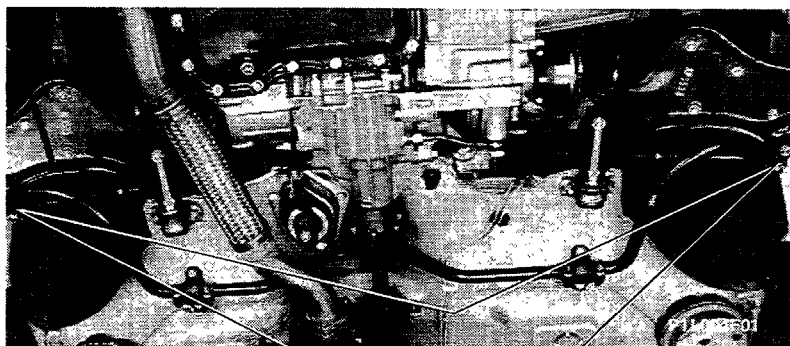
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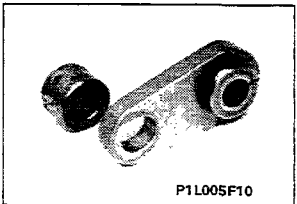
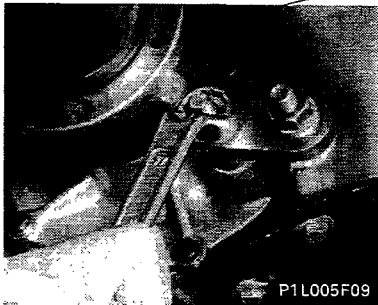
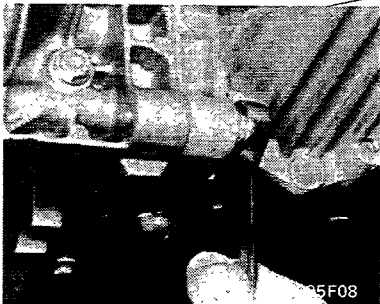
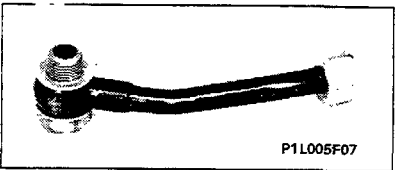
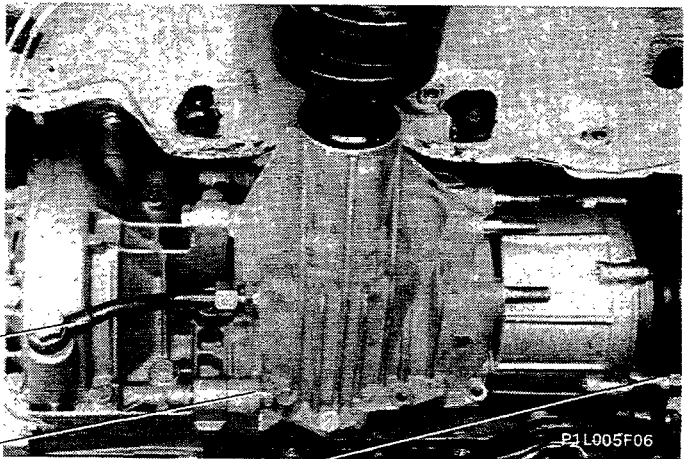
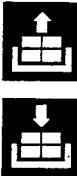
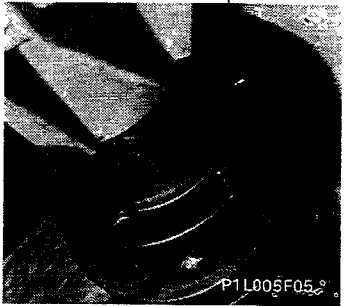
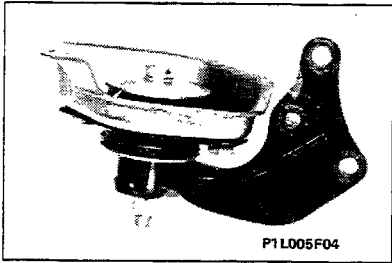
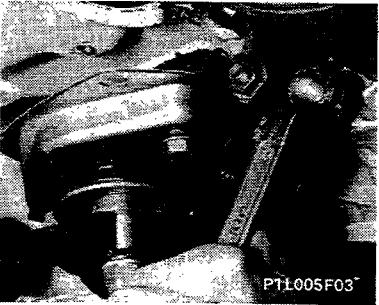
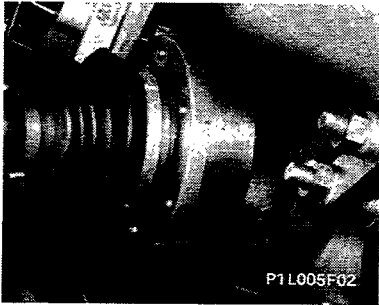
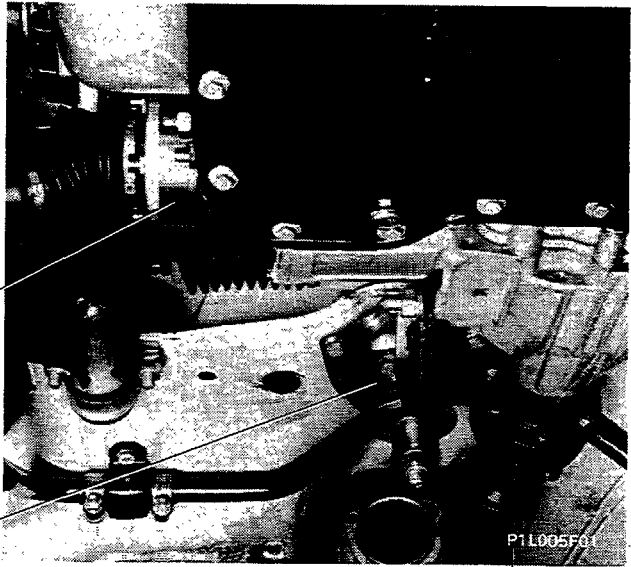
REMOVING-REFITTING

Position the vehicle on a lift.

Then, proceed as follows:

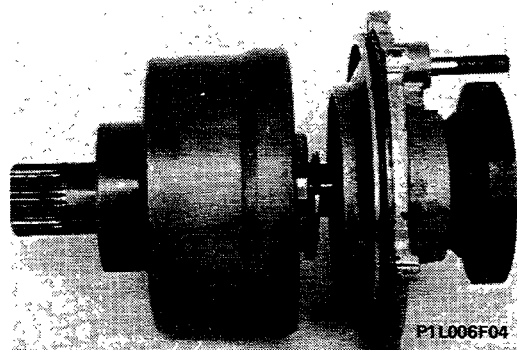
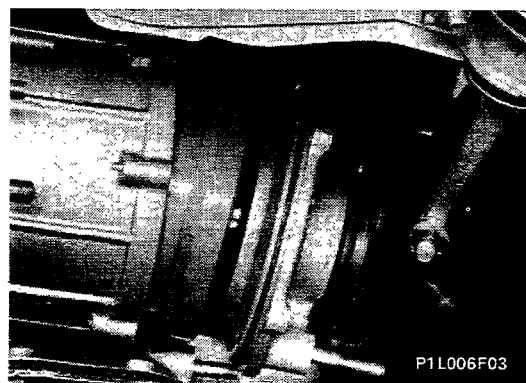
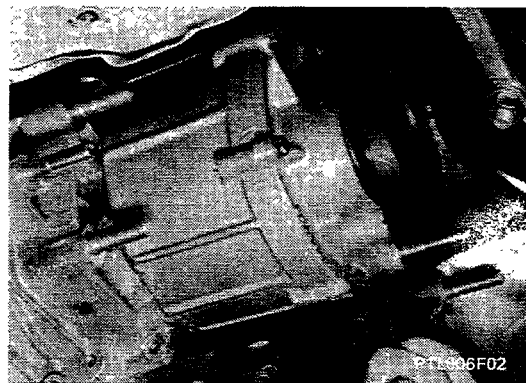
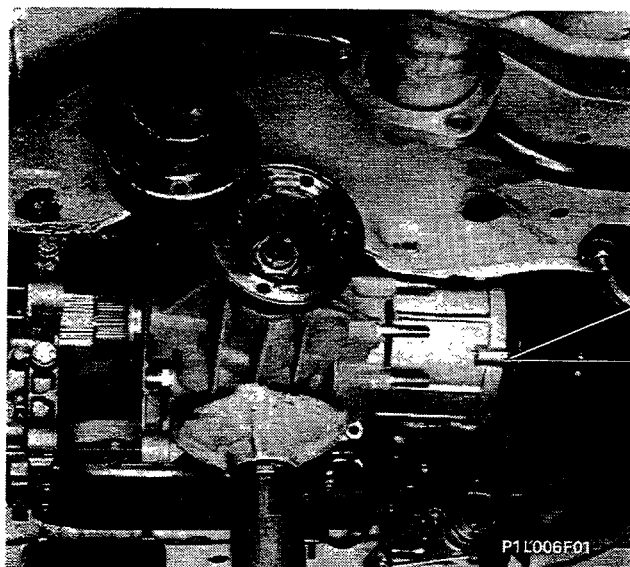
- drain the fluid from the power assisted steering reservoir, in the engine compartment;
- remove the front wheels;
- raise the lift and, from underneath the vehicle, drain the fluid from the idler unit;
- then, remove the items illustrated below:

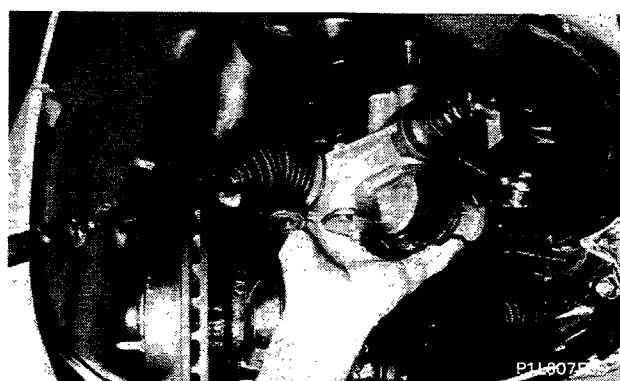
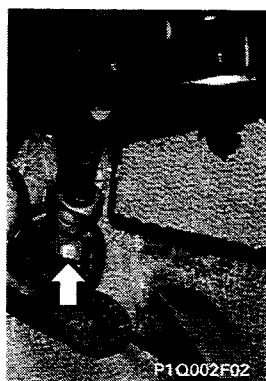
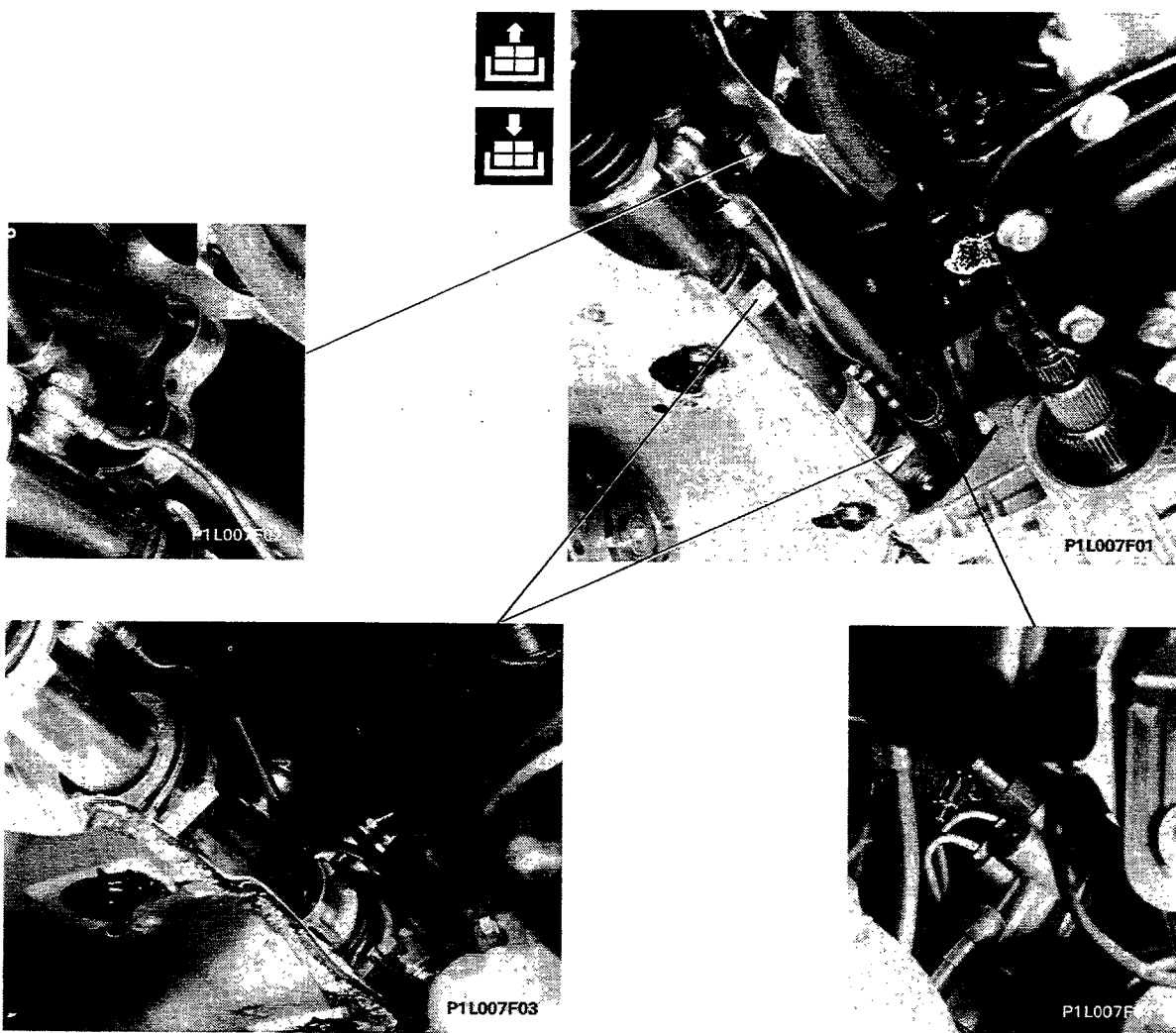




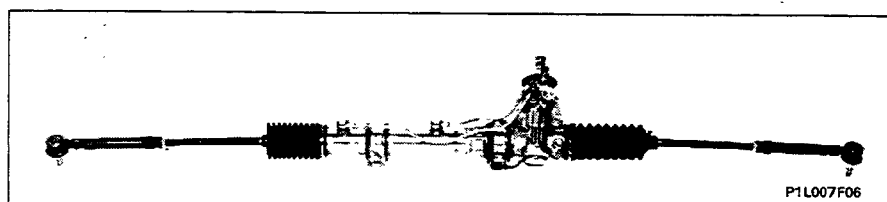
41.

- position the hydraulic jack under the idler unit;
- then, remove the items illustrated below:

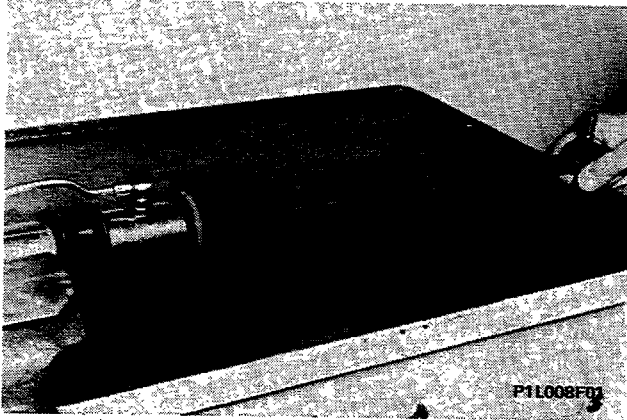




– from inside the vehicle, disconnect the upper shaft from the lower one



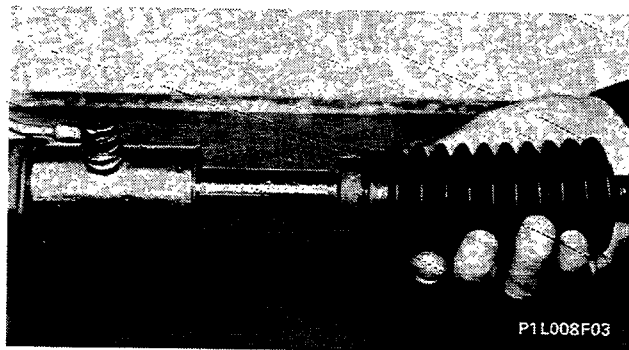
41.



DISMANTLING-REASSEMBLING AND CHECKS



Dismantling-reassembling rod complete with track rod end



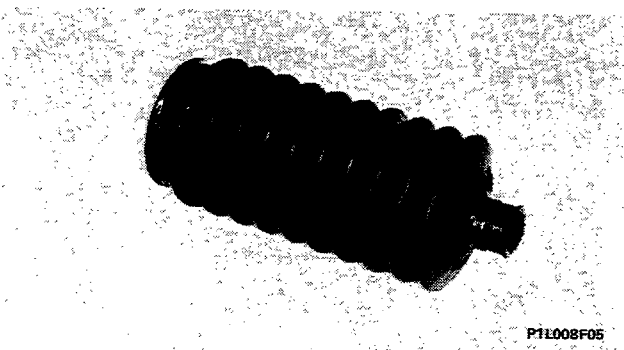
Dismantling-reassembling protective boot and lubricating seal

Before removing the protective boot the plastic collar has to be removed.



Rod complete with track rod end

Check that the track rod end shows no signs of hardening or excess clearance or else it has to be replaced.



Protective boot

Check carefully that there are no holes or tears in the boot or else it must be replaced.



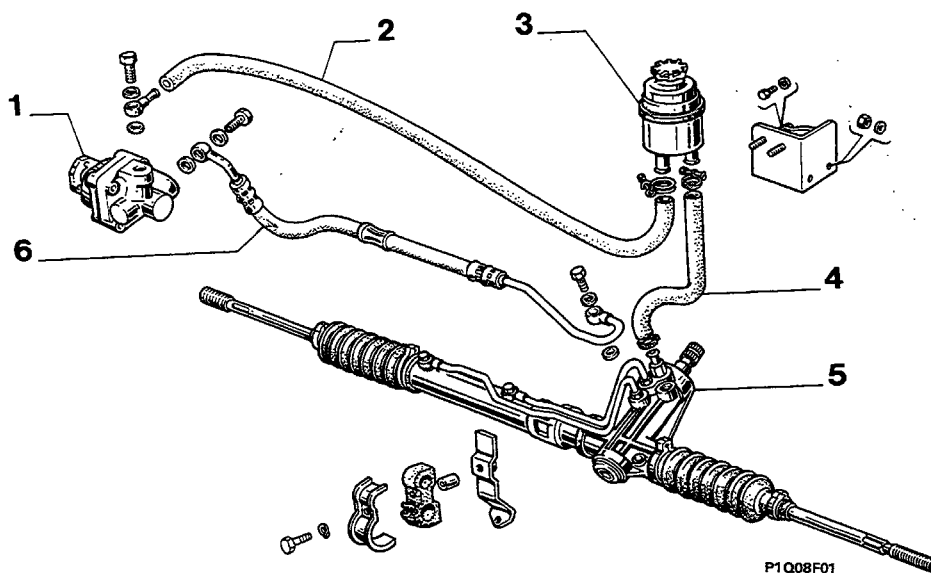
Before fitting the last boot (pinion side), apply the recommended amount of grease.

COMPOSITION AND OPERATION

The power assisted steering system comprises:

- a supply reservoir located in the engine compartment;
- a vane type pump, driven by the engine with a maximum capacity and pressure valve;
- a set of pipes connecting the pump - distributor valve - operating cylinder - reservoir;
- a rack and pinion hydraulic steering box.

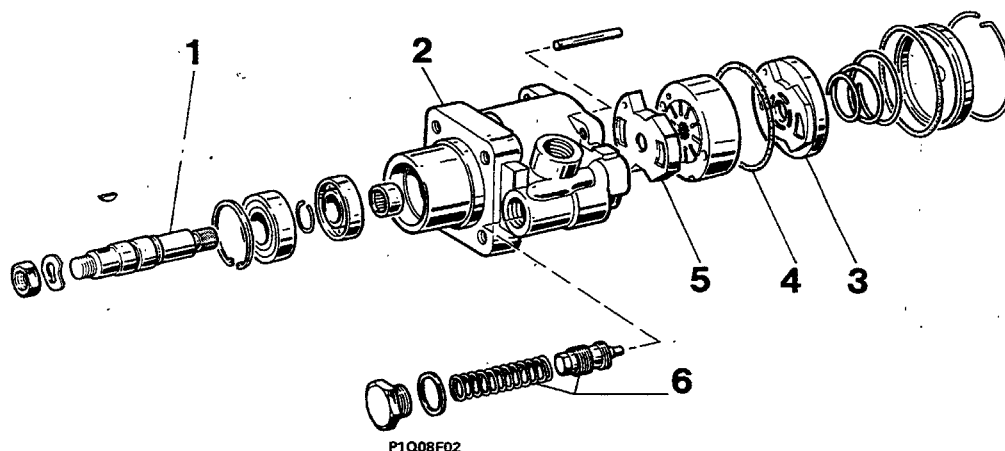
Power assisted steering components



1. Pump
2. Pipe supplying oil to the pump
3. Reservoir

4. Oil return pipe from the reservoir
5. Power assisted steering
6. Oil under pressure supply pipe

Power assisted steering pump components



1. Control shaft
2. Pump casing
3. Impeller

4. Seal
5. Impeller side plate
6. Adjustment valve

41.

Power assisted steering distributor valve

The power assisted steering pump is operated by the engine through a belt and is capable of supplying a pressure which varies from 3.5 bar in the "neutral" position to a maximum of 85 bar in the "full steering" position.

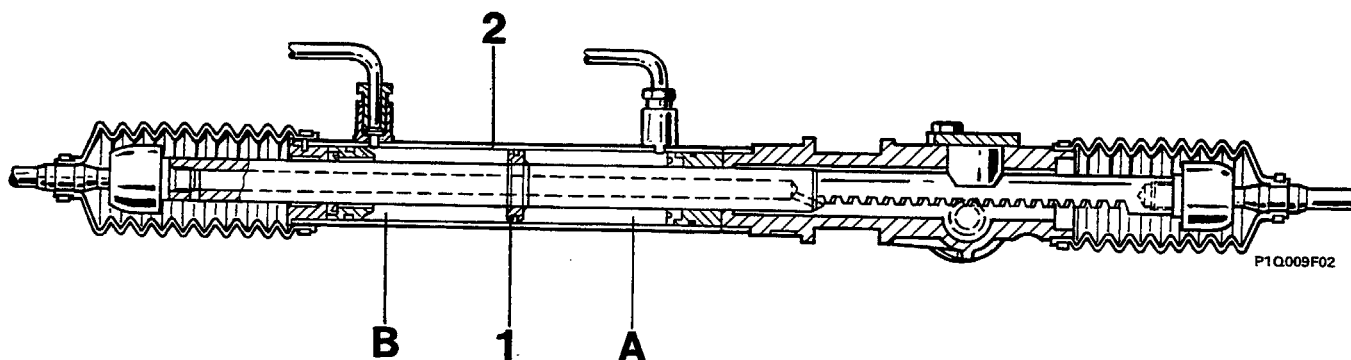
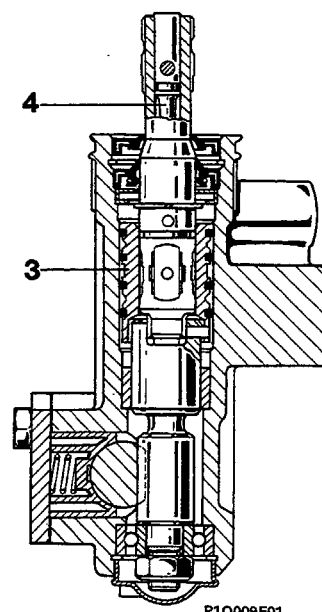
In addition, there is also a fast idle control valve located in the pump which increases the engine speed when the power assisted steering is working at pressures exceeding 16 bar.

The power assisted steering unit is similar to a mechanical rack and pinion steering box with the exception of the following features:

- a. there is an operating cylinder (2) in the steering box in which a double acting piston (1) fixed to the rack rod slides;
- b. there is a distributor valve (3) and ducts located in the worm screw housing. This valve is controlled by a torsion device (4) positioned in the end of the worm screw.

According to the torion trasmitted by the steering wheel to the device, the oil from the pump is sent to the reservoir or to one of the 2 chambers A or B for the operating cylinder.

The force generated by the pressure of the oil on the side surface of the piston causes the movement of the latter and consequently of the rack.



Longitudinal section of rack and pinion power assisted steering

Checking operation

Check the steering wheel rooling torque with the vehicle stationary and the engine running. The torque should be between 0.6 daN with the engine idling and 0.75 daN with the engine at maximum speed; if it exceeds these values, check the pressure of the system with the wheels on full lock. In order to do this, insert a pressure gauge, using a T pipe union, on the tube bringing the oil under pressure to the power assisted steering (from the pump) and turn the steering completely in one direction. Rotate the steering wheel further;; the pressure on the gauge should go up to around 85 bar. If this does not take place, there is a fault in the oil pump or in the power assisted steering valve group.

Check the operation of the pump with the engine running at 1000 - 4000 rpm by squeezing the delivery pipe: if the pressure of around 85 bar is not reached then the pump is faulty and should be replaced.

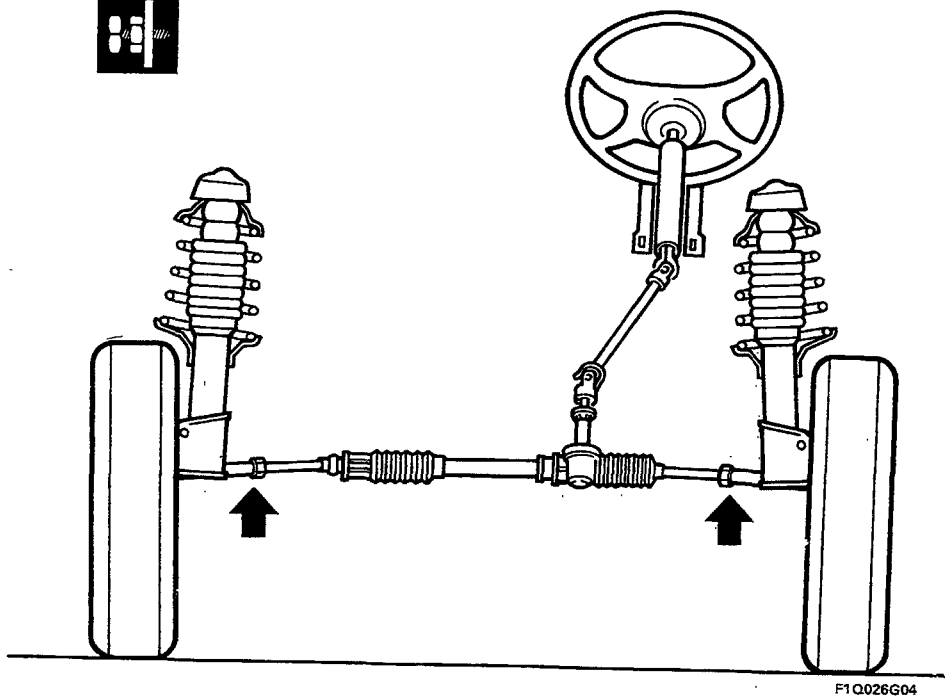
NOTE *The power assisted steering and the vane pump should not be dismantled for any reason whatsoever but sent to the Manufacturer for overhauling.*

Checking oil level: the oil level should be checked with the engine running, topping up to renew the level if necessary.



The power assisted steering system is self-bleeding; it is achieved by applying full lock alternately to the right and left with the car stationary and the engine running. This operation should be carried out each time the connecting pipes are removed-refitted.

NOTE *The hardening of the steering may be due to the pump control pulley belt sliding or to insufficient oil. If the pump or the operating cylinder or the distributor valve is not working properly, then the power assisted steering system will operate like an ordinary, mechanical steering box.*

FRONT WHEEL TOE IN

The adjustment of the front wheel toe in is carried out on versions with both mechanical steering boxes and power assisted steering by undoing the nut fixing the rod and tightening or loosening the steering rod until the correct toe in is achieved without altering the position of the steering wheel spokes.

41.

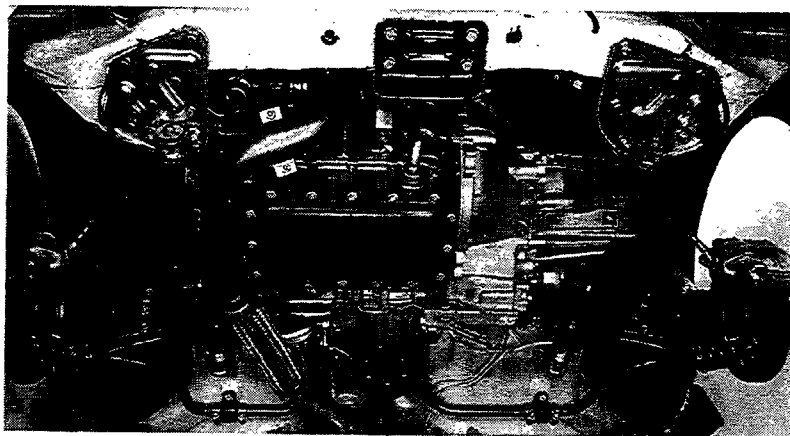
DESCRIPTION	Thread size	Tightening torque
		daNm

Steering wheel to upper section of steering column fixing, nut	M 16 x 1,5	5
Steering column support bracket to mounting fixing, bolt	M 6 x 1	0,5
Steering column universal joint forks to splined shaft fixing, bolt	M 8 x 1,25	2,6
Steering box to bodyshell fixing, bolt	M 8 x 1,25	2,1
Steering rod ball joint to steering knuckle lever fixing, nut	M 10 x 1,25	3,5

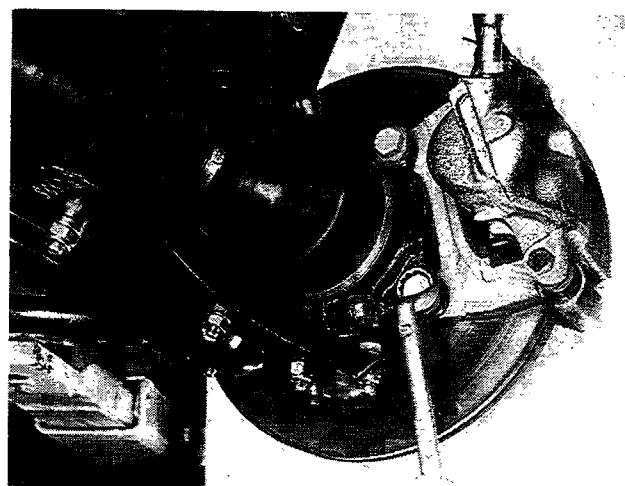
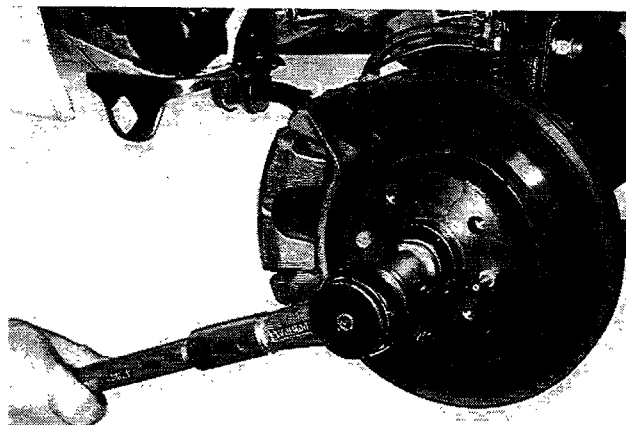
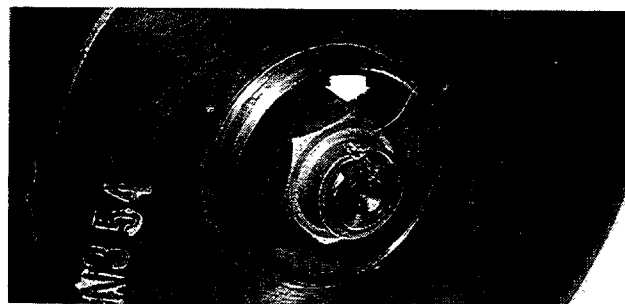
	page
FRONT SUSPENSION	
- Removing-refitting	1
- Dismantling-Reassembly	6
- Wheel hub	9
- Coil spring and shock absorber assembly	13
- Stabilizer bar	14
REAR SUSPENSION	
- Removing-refitting	15
- Dismantling-Reassembly	20
- Wheel hub	21
- Coil spring and shock absorber assembly	25
WHEEL GEOMETRY	
- Front wheel geometry	26
- Rear wheel geometry	27
SPECIAL TOOLS	28

REMOVING-REFITTING**Front suspension assembly**

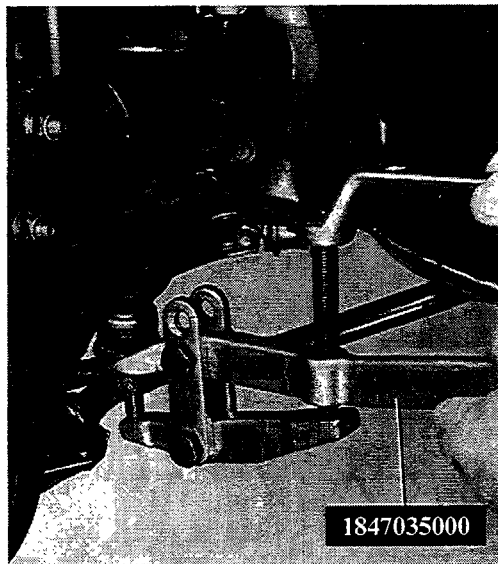
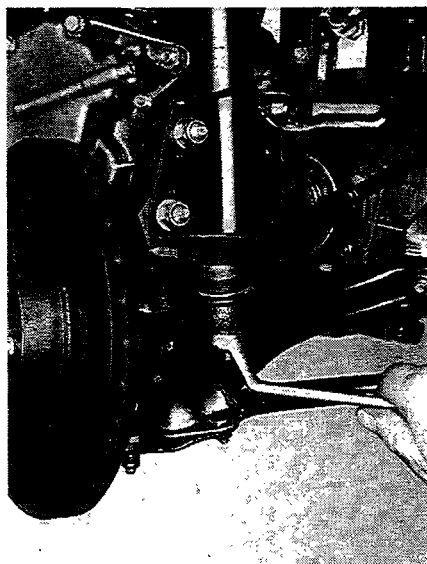
In order to remove and refit the front suspension, position the vehicle on a lift and after having removed the front wheels, proceed as illustrated below.

**Removing nuts fixing constant velocity joints**

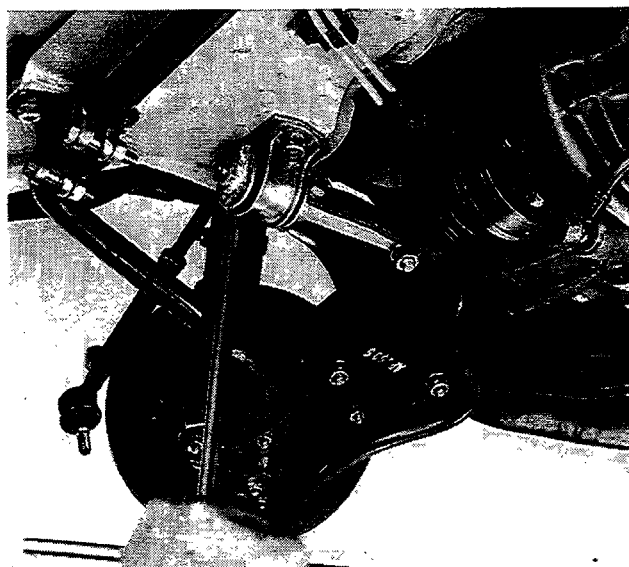
Before removing the nuts fixing the constant velocity joints, remove the staking as illustrated in the photo.

**Removing brake caliper assembly from steering knuckle**

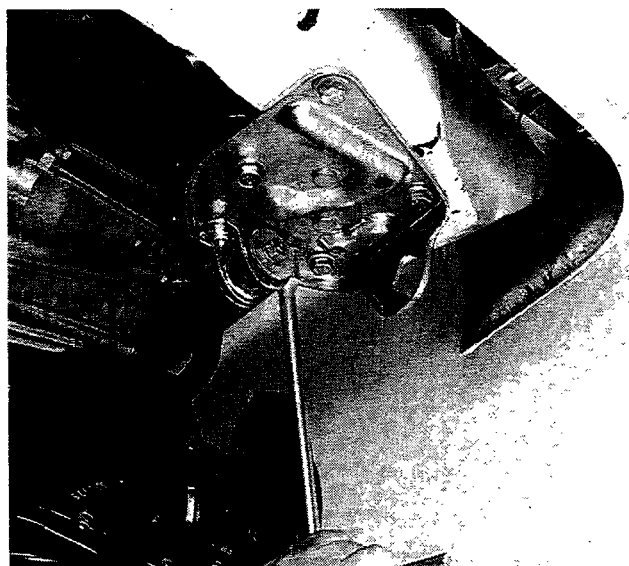
44.



Removing ball joint pin for side steering rod

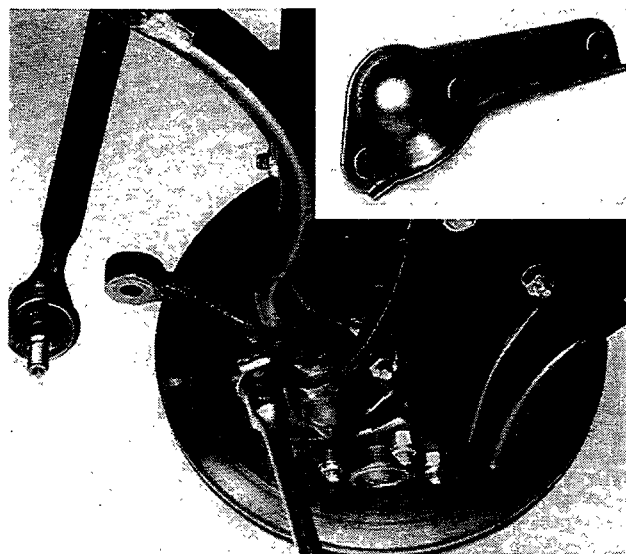


Removing track control arm from bodyshell

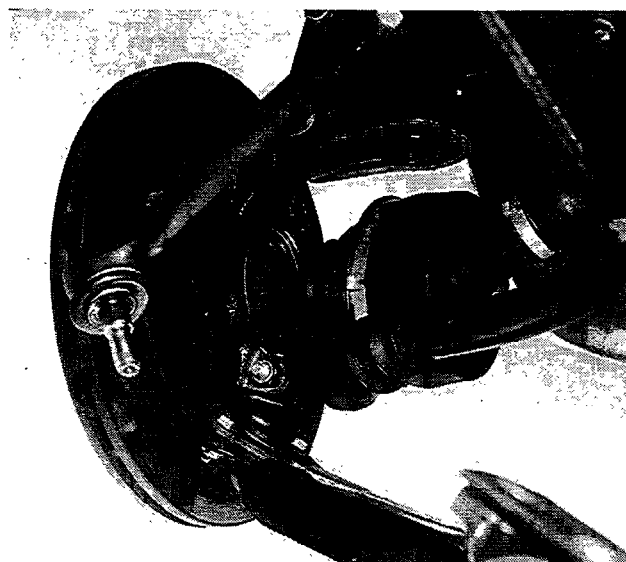


Removing strut (rod) from bodyshell

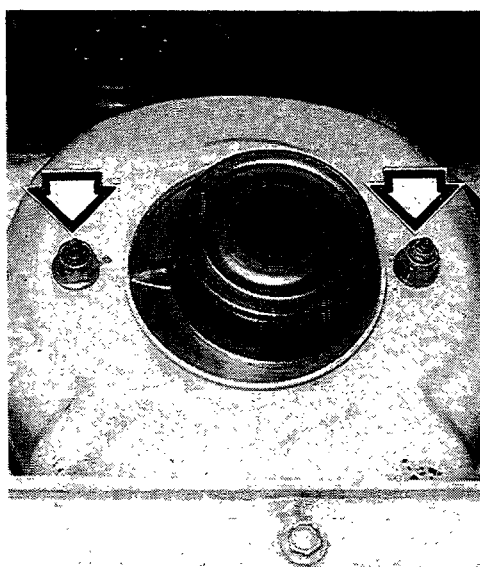
44.



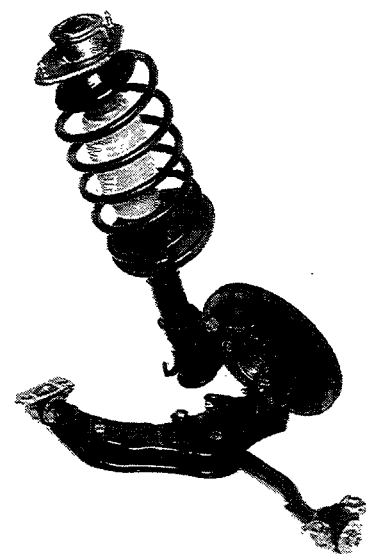
Removing stabilizer bar from track control arm



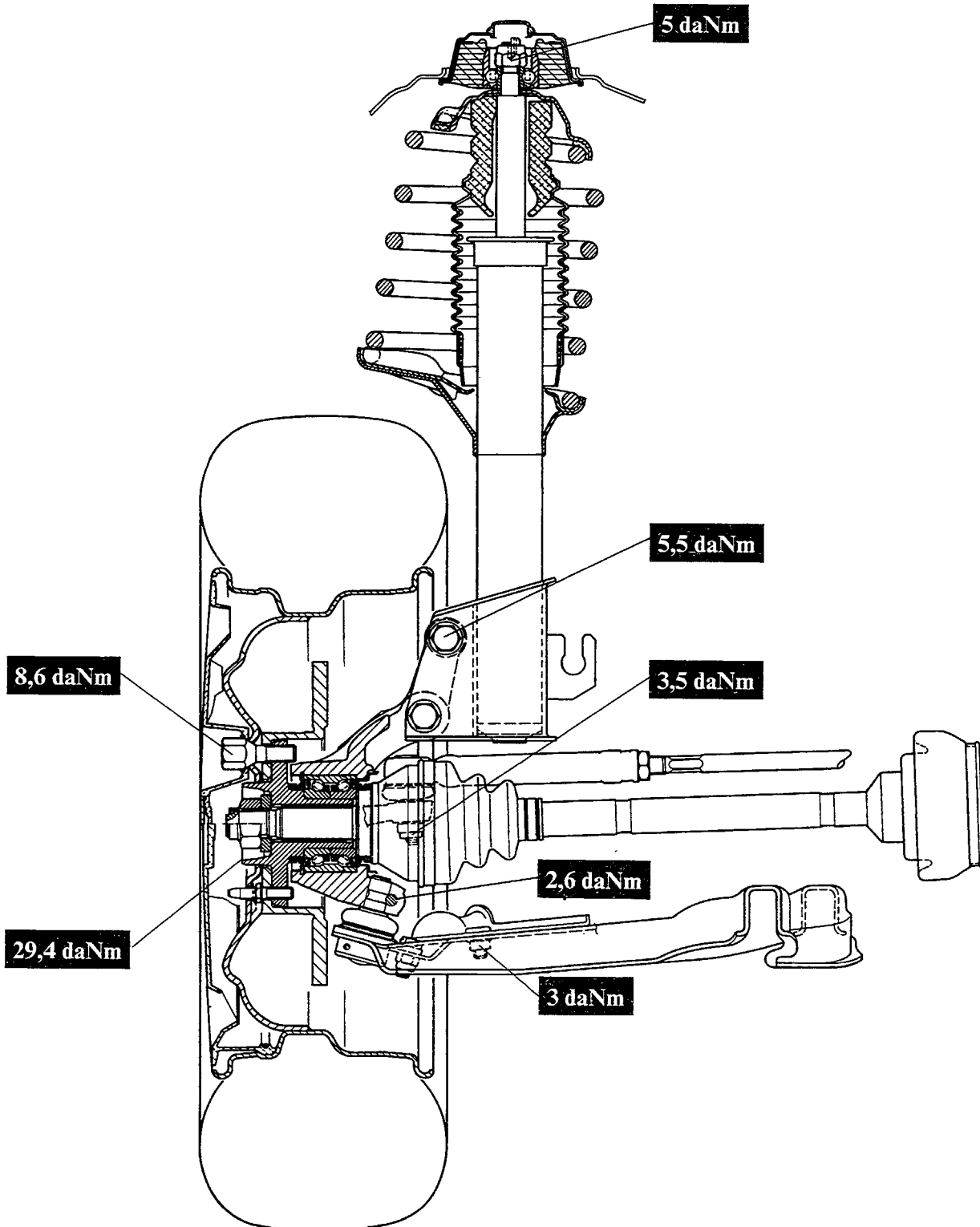
Removing drive shaft from wheel hub



Removing shock absorber assembly from turret (engine compartment) and removing suspension unit



FRONT SUSPENSION CROSS SECTION



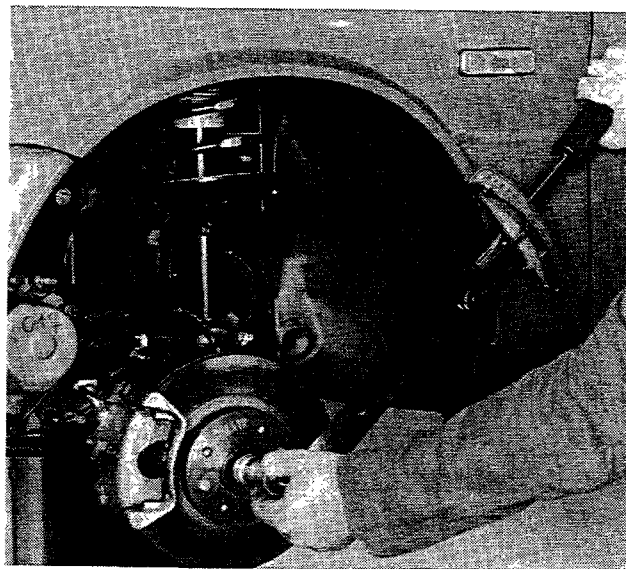
NOTE *In order to refit the front suspension simply reverse the order of the operations carried out for its removal.*



The final tightening of the front suspension components should be carried out with the vehicle on a lift with 3 persons on board (2 in the front seats and 1 in the rear seats) + 20kg of luggage on the rear seat. (1 person = 70kg). The design load conditions are recreated in this way which guarantees the correct operation of the suspension components.



29,4 daNm



Fitting wheel hub retaining nut and tightening to torque

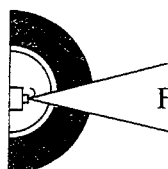


The nuts fixing the constant velocity joints to the hubs should always be replaced.

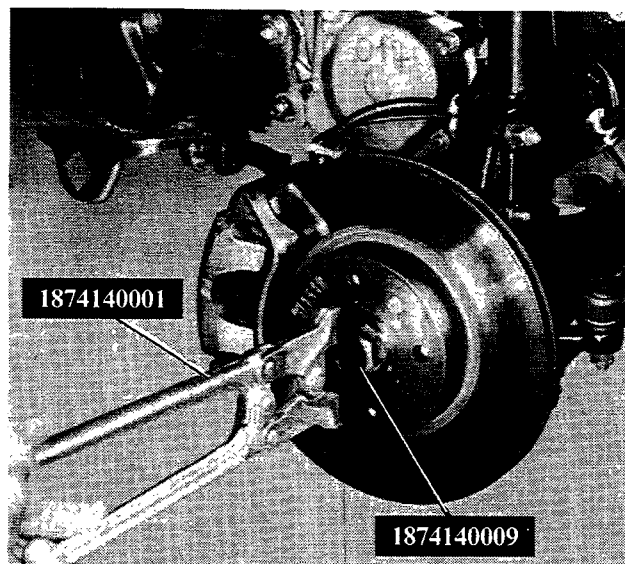


Staking constant velocity joint fixing nut

In addition check the:

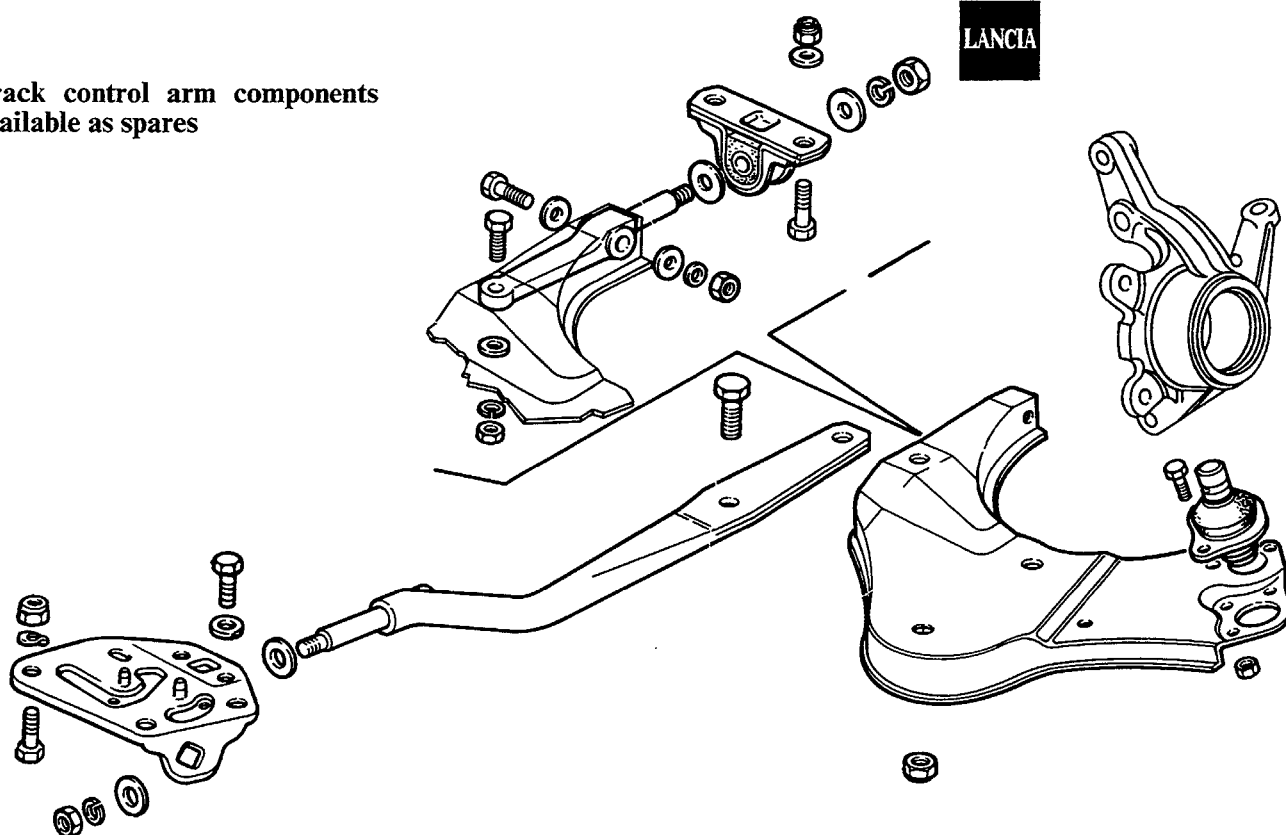


Front wheel geometry

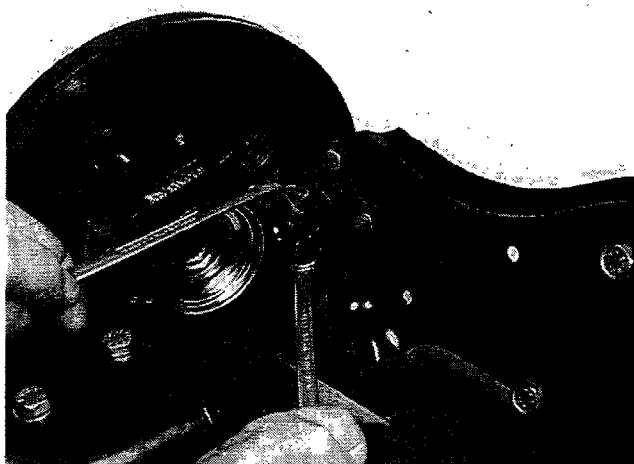


44.

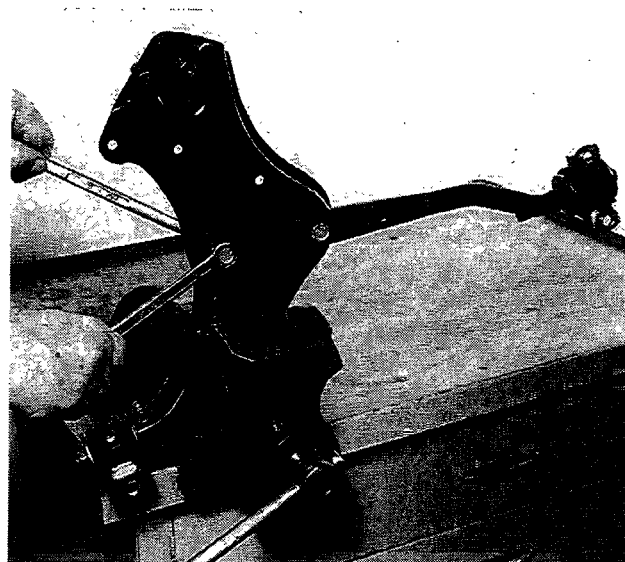
Track control arm components
available as spares



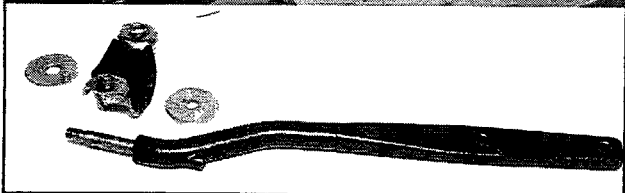
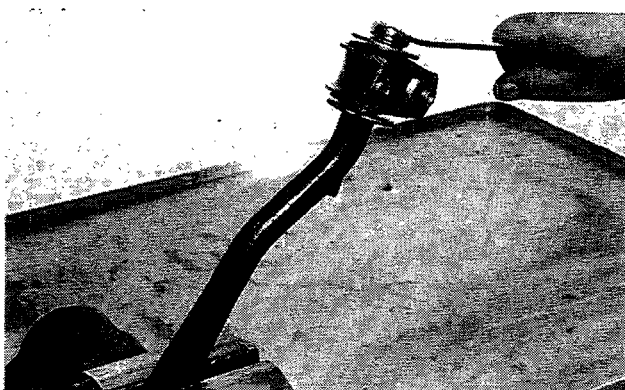
DISMANTLING-REASSEMBLY



Removing-refitting track control arm from steering knuckle

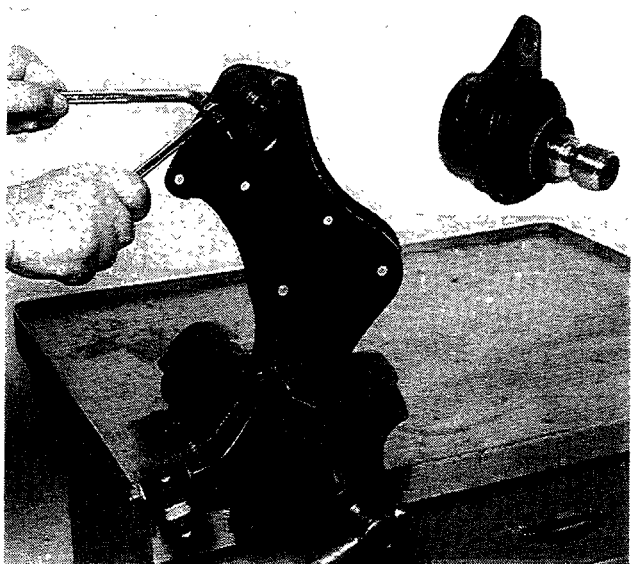


Removing-refitting strut from track control arm



Removing-refitting flexible mounting from strut

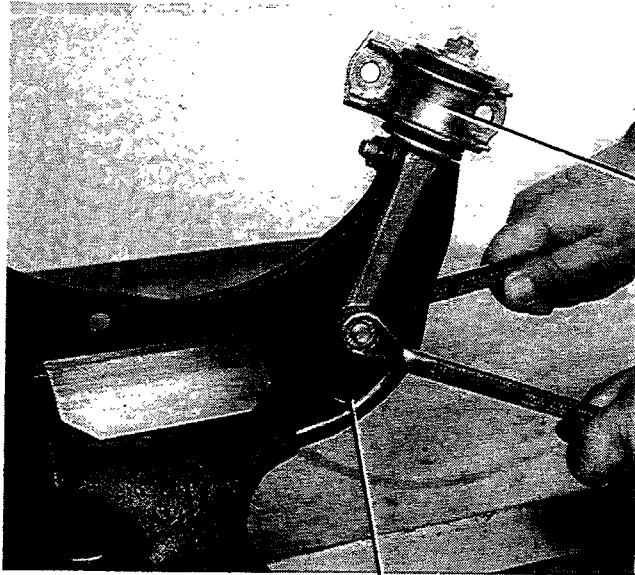
Check that the strut is not distorted and that the flexible mounting is not worn.



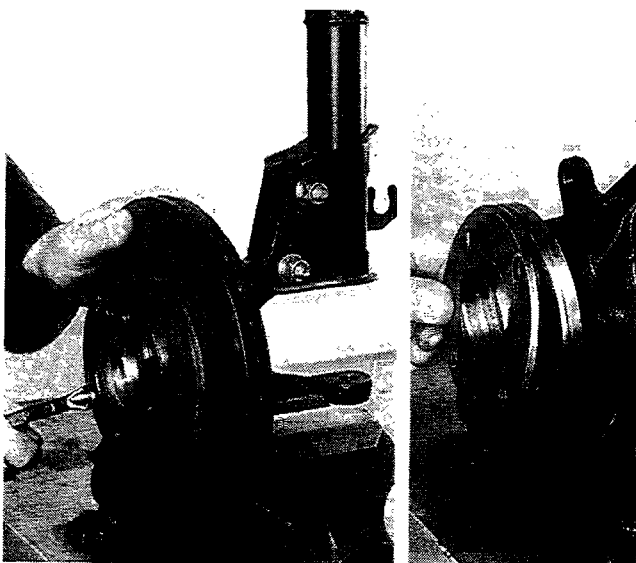
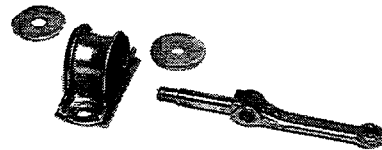
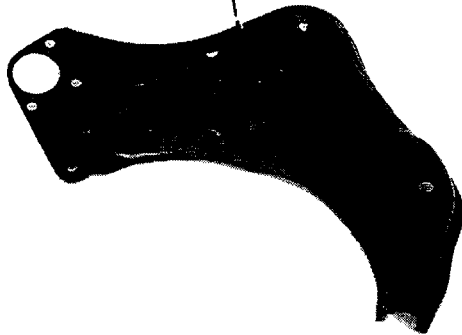
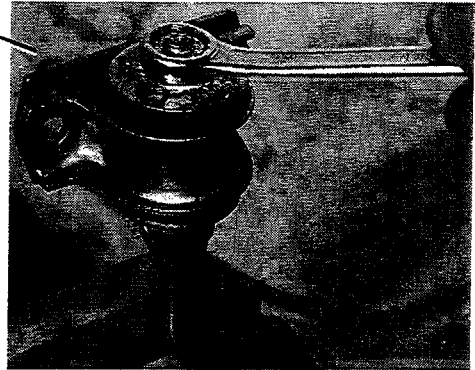
Removing-refitting ball joint from track control arm

Check that the ball joint shows no signs of grooves and that the rubber part is intact.

44.

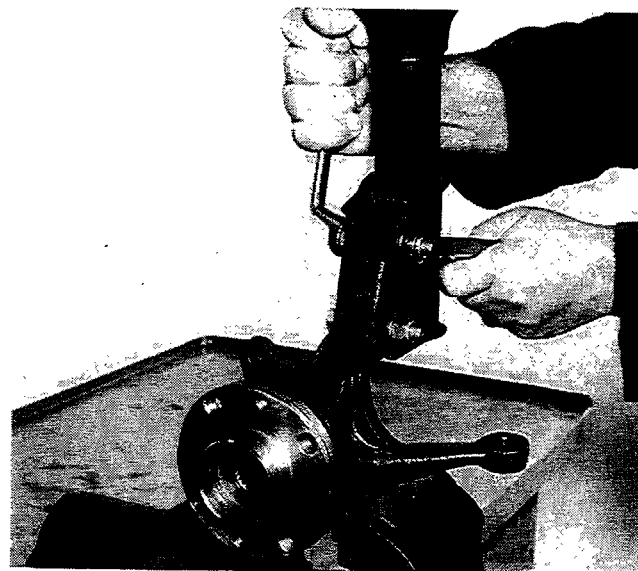


Removing-refitting flexible mounting from track control arm and dismantling at the bench

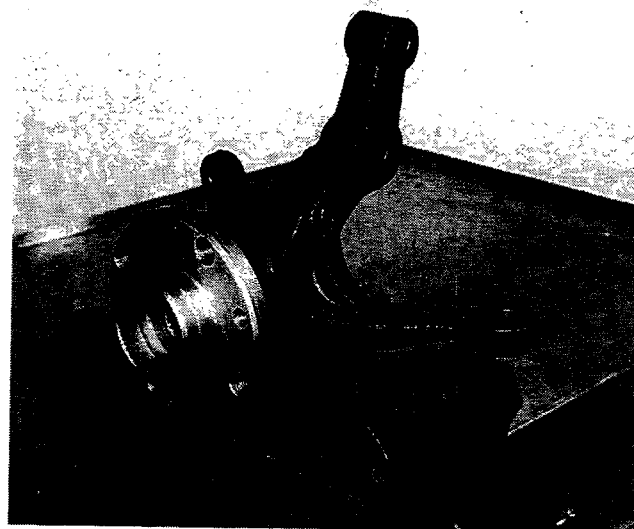


Removing-refitting brake disc and spacer

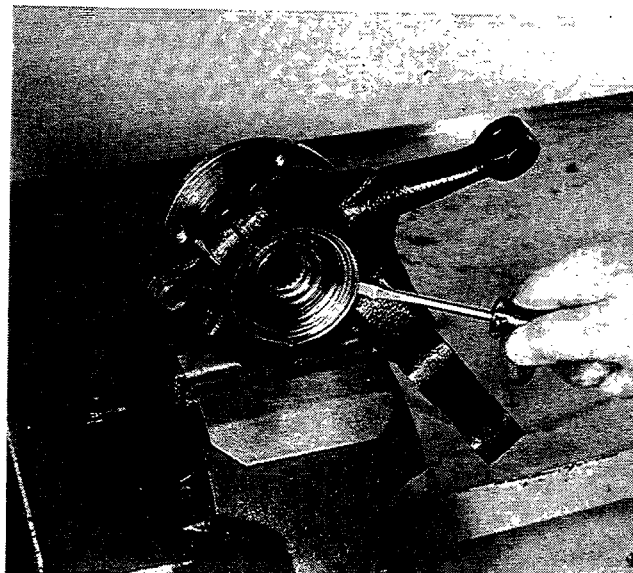
WHEEL HUB



Removing-refitting shock absorber and spring from steering knuckle

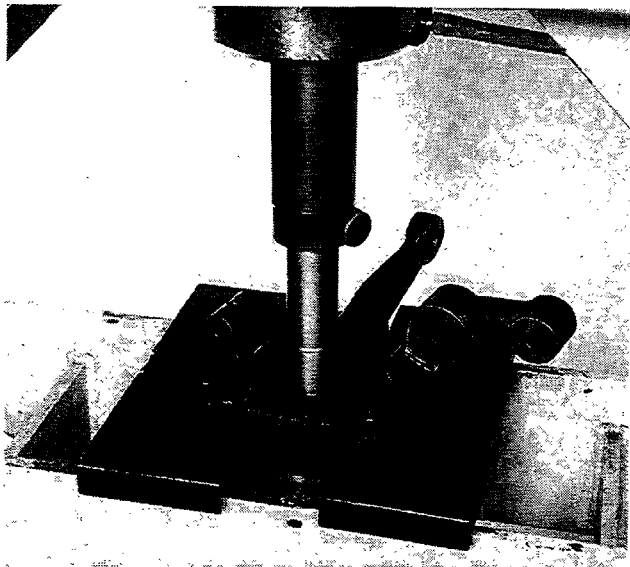


View of steering knuckle assembly



Removing dust cover cap

44.



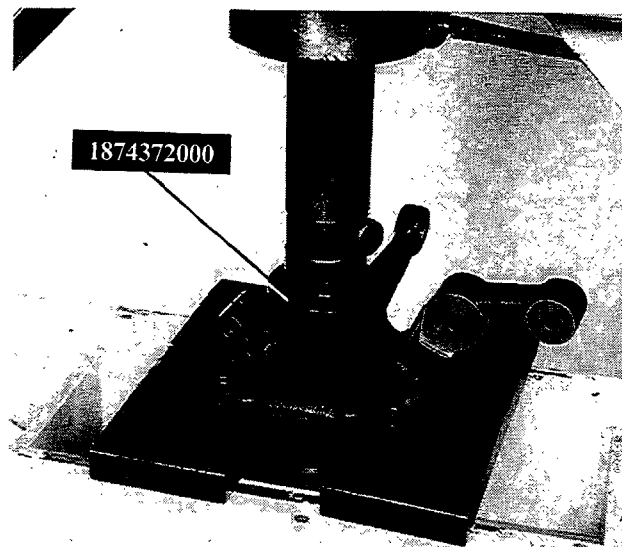
Removing hub from steering knuckle using hydraulic press



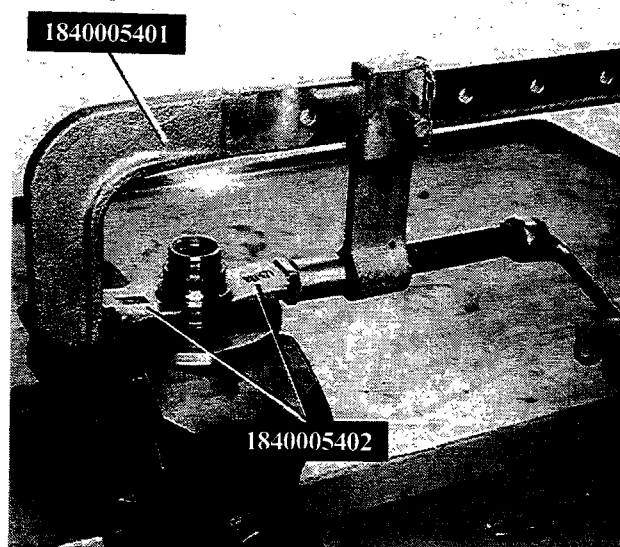
Removing-refitting dust cover cap, seal and bearing inner race from steering knuckle



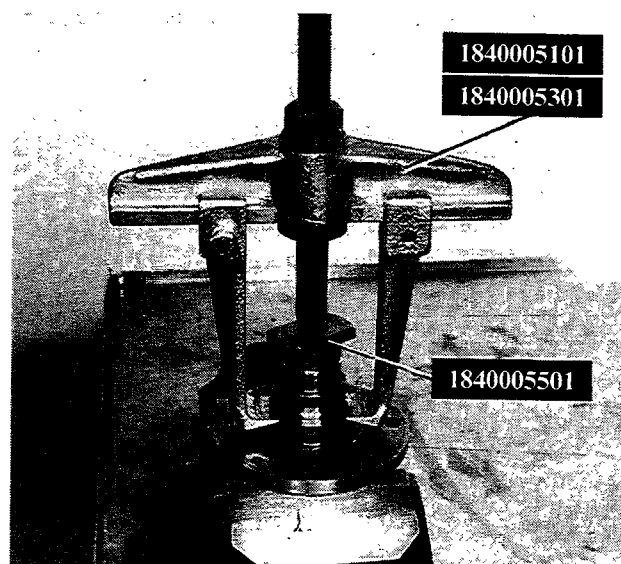
Removing-refitting bearing circlip



Removing outer race from steering knuckle using the hydraulic press

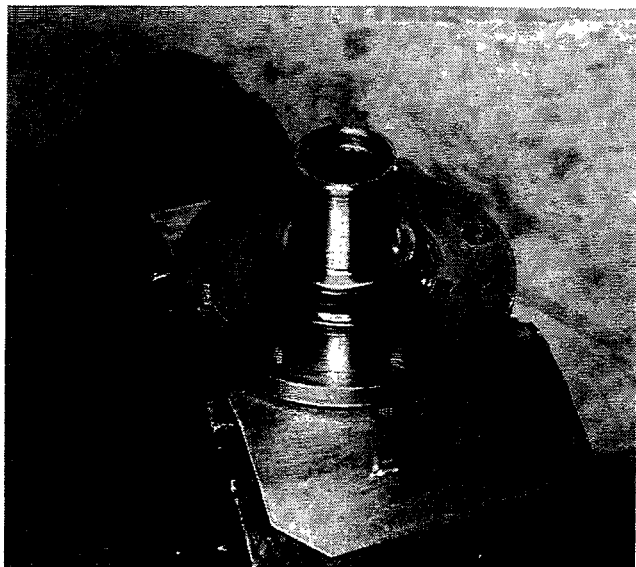


Initial removal of bearing inner race from hub



Removing bearing inner race from hub

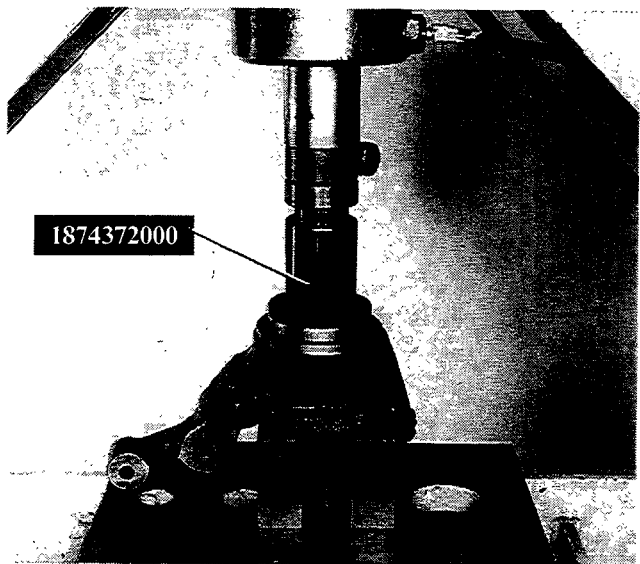
44.



Fitting rubber seal on hub

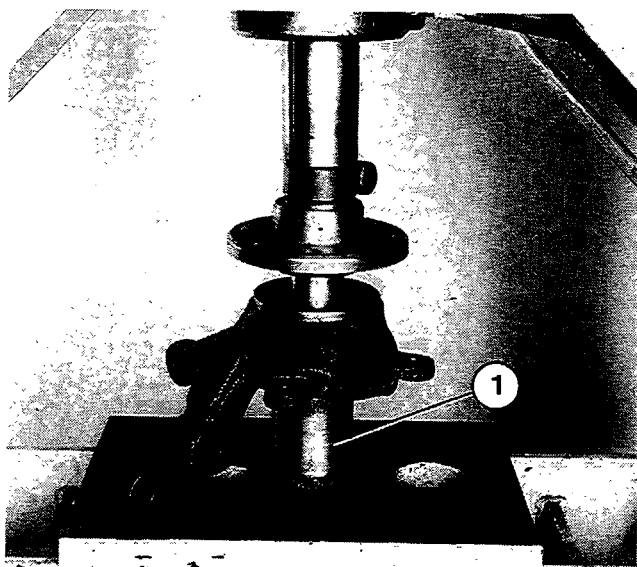


*The seal generously with
TUTELA MR 3.*



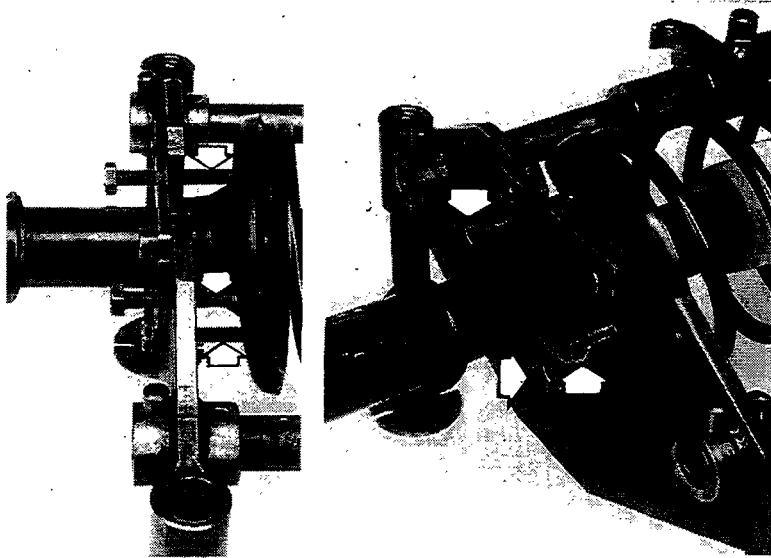
Fitting bearing in steering knuckle on the press

Fit the bearing circlip and the dust cover cap using tool 1874372000.



Fitting hub in bearing on the steering knuckle

Support the bearing inner race using a cylinder (1) of the appropriate diameter.

**COIL SPRING AND SHOCK ABSORBER ASSEMBLY**

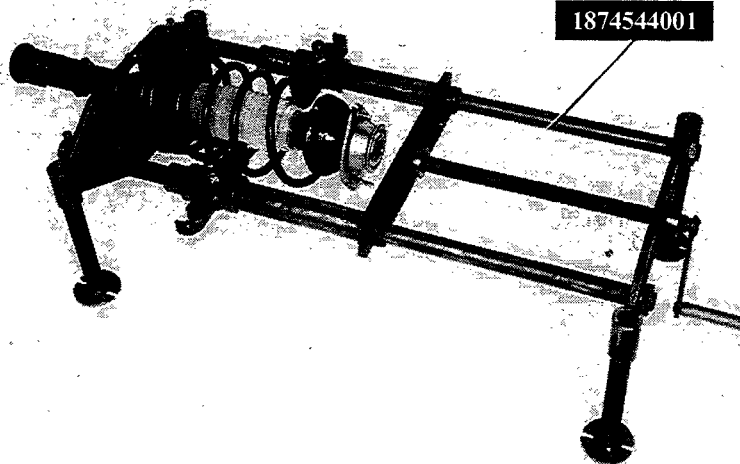
Adjusting support adjustment screws



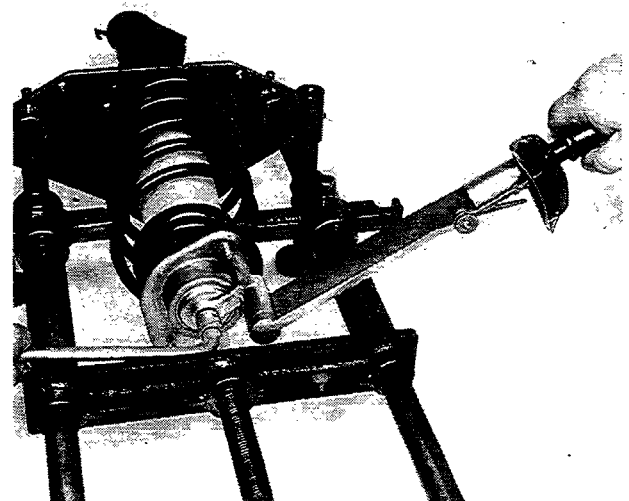
NOTE Before compressing the spring, make sure that the position of the assembly corresponds to the illustration and that the shock absorber stem is perpendicular to the support plate. This can be achieved by regulating the adjustment screws shown by the arrows.

Shock absorber

If any anomalies which can be attributed to the shock absorber are found, the stem is always replaced in one piece.

**Coil spring**

NOTE The coil springs are subdivided into two categories identifiable by a stripe of either yellow or green paint. Springs of the same category must be fitted.

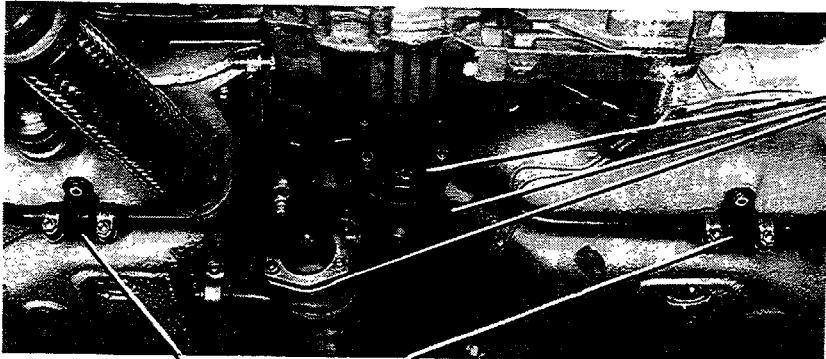
Removing-refitting coil spring - shock absorber assembly**5 daNm**

Removing-refitting nut fixing shock absorber stem and tightening to torque

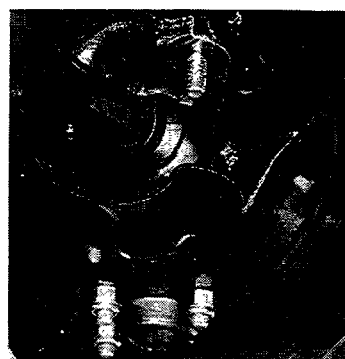
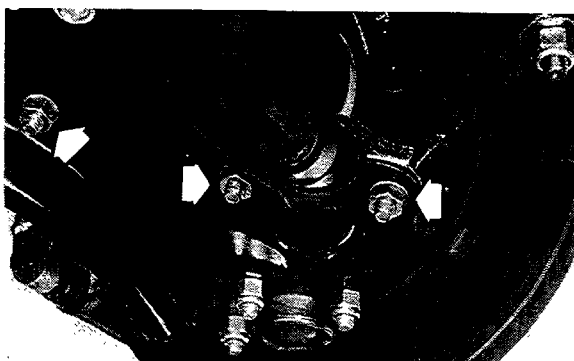
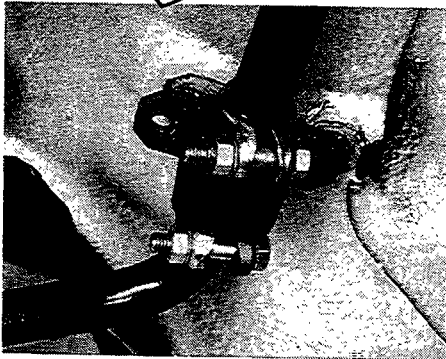
44.

STABILIZER BAR

Removing - refitting



In order to remove the stabilizer bar, the drive shaft has to be removed from the front differential unit joint and the shaft support bracket and the exhaust pipe also have to be removed.

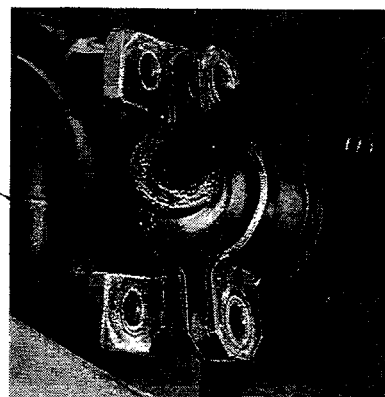
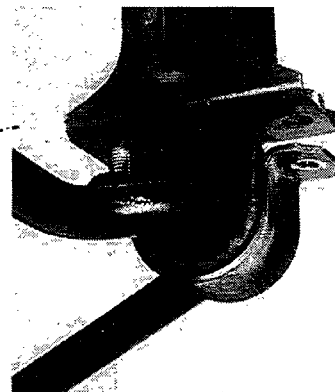
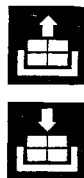
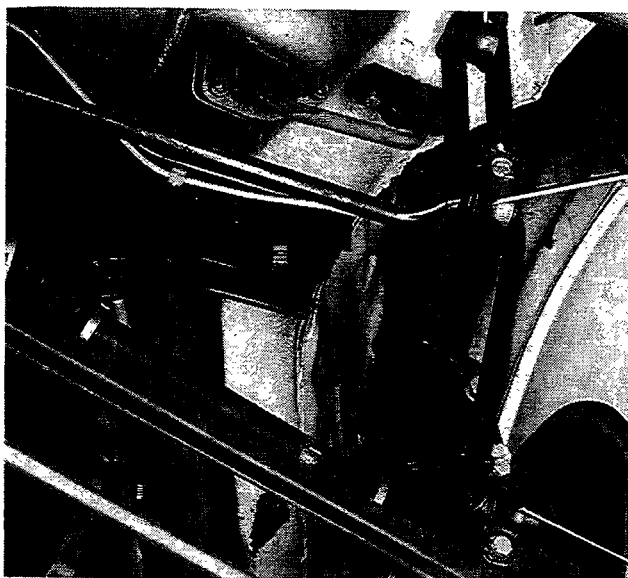
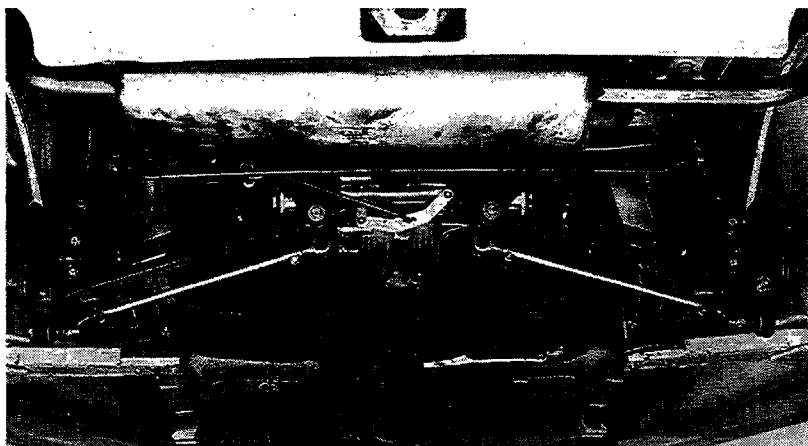


NOTE To refit the stabilizer bar simply reverse the order of the operations carried out for its removal.

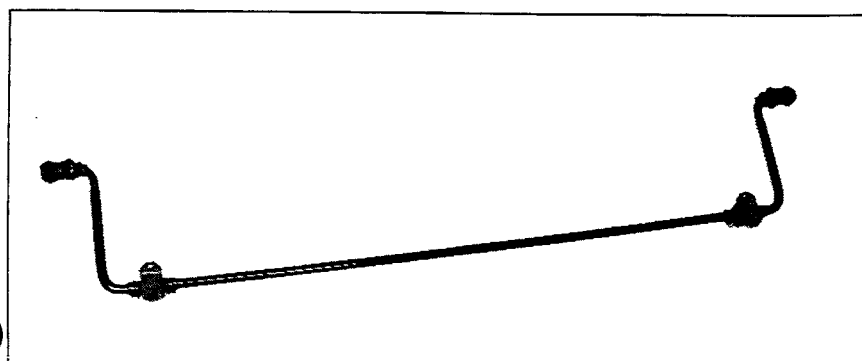
REMOVING-REFITTING

View of rear suspension assembly on vehicle

In order to remove and refit the rear suspension, position the vehicle on a lift, remove the rear wheels and then proceed as illustrated below.

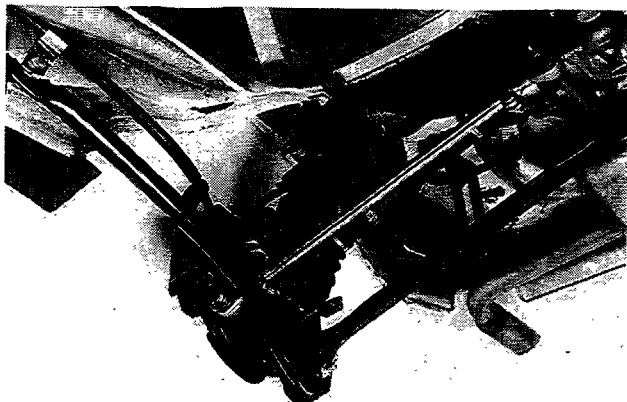


Removing stabilizer bar

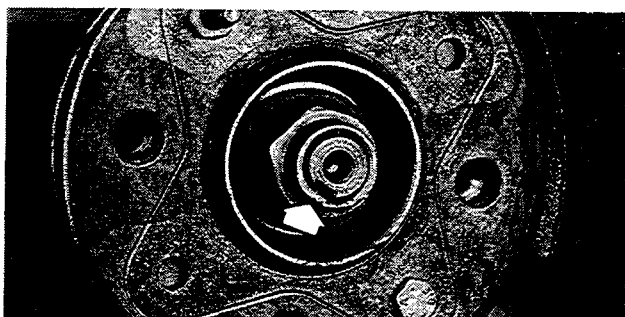


View of stabilizer bar

44.

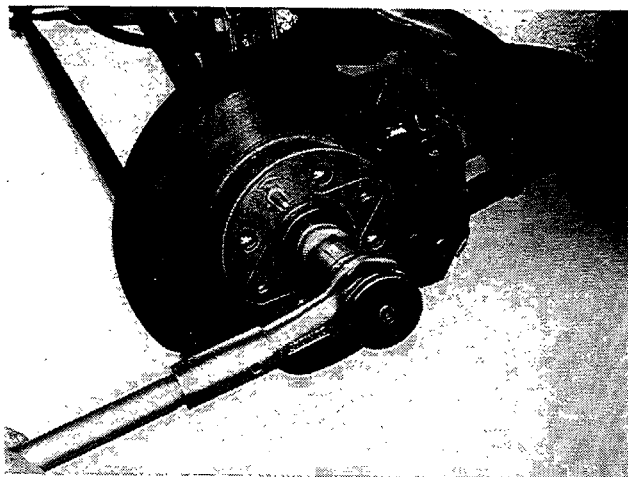


Right rear suspension unit fitted on vehicle

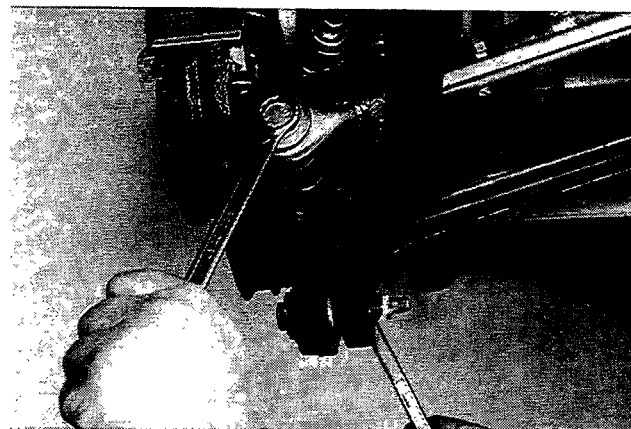


Removing nuts fixing constant velocity joints

Before removing the nuts fixing the constant velocity joints, remove the staking from them as illustrated in the photo.

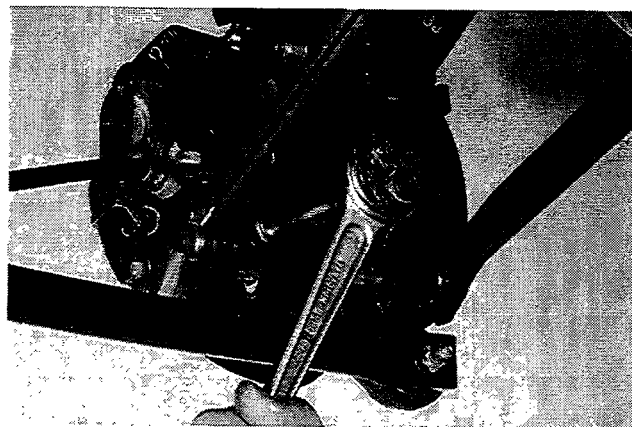
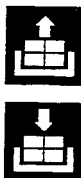
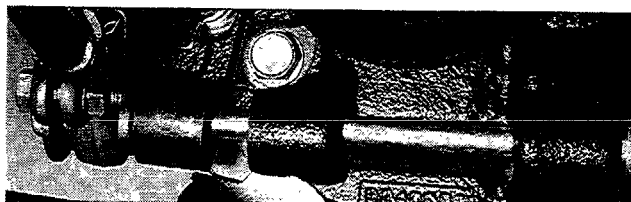


Removing longitudinal rod from the vehicle

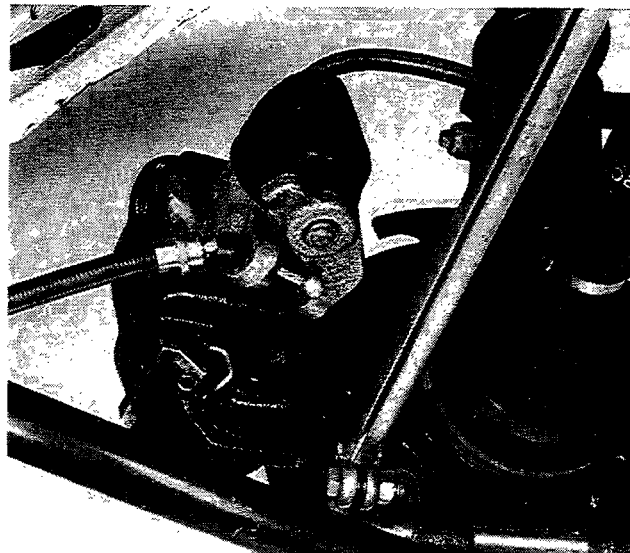


Removing-refitting side rod fixing nut

In order to gain access to the bolts fixing the caliper support bracket, the nut fixing the transverse rod has to be removed and moved away from the stub axle.

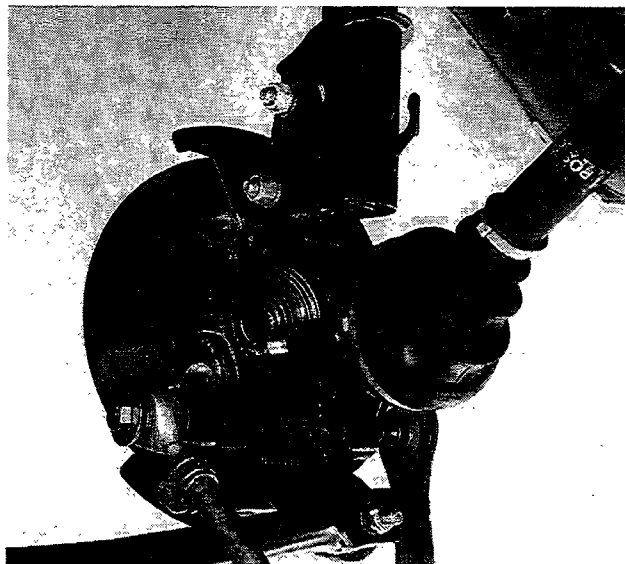


Removing-refitting brake caliper support bracket

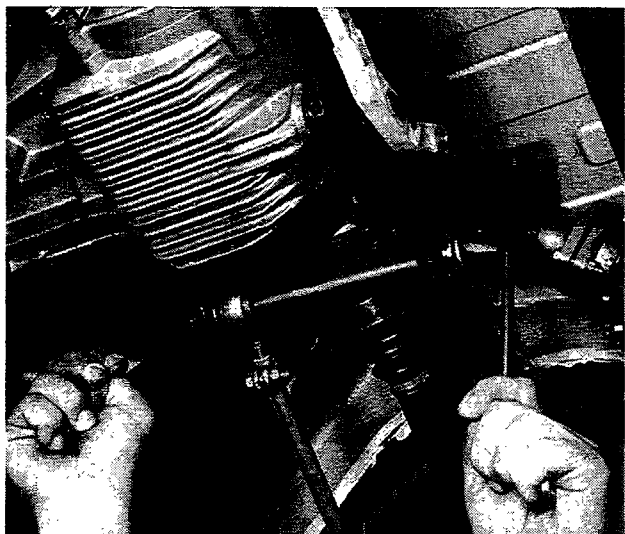


Removing-refitting handbrake cable from caliper device

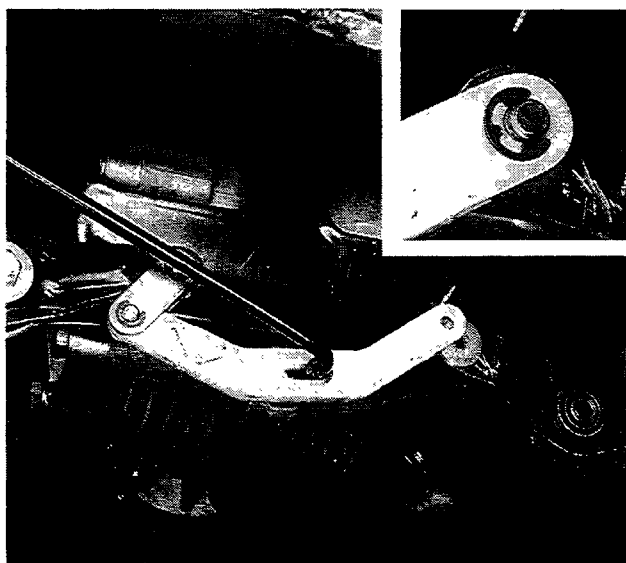
44.



Removing drive shaft from wheel hub



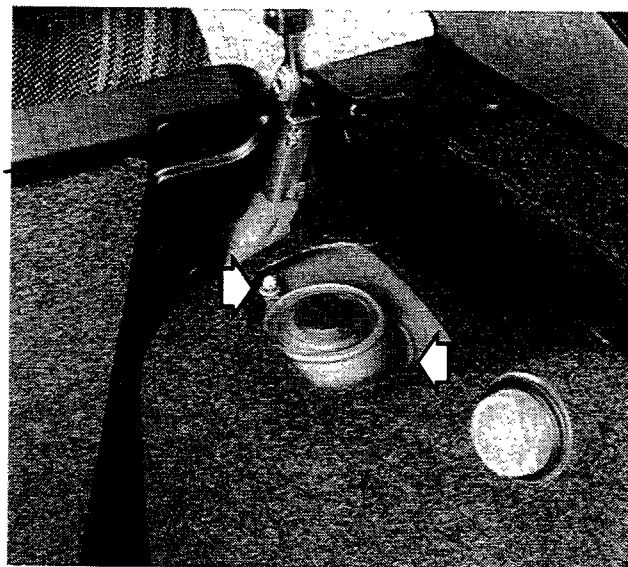
Removing-refitting transverse rods from cross member



Removing-refitting load proportioning valve bar from mounting after removing clip

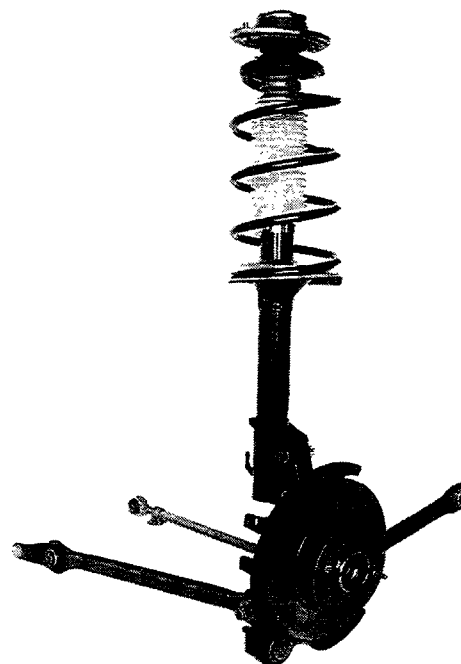


Removing-refitting shock absorber assembly
from turret (luggage compartment)



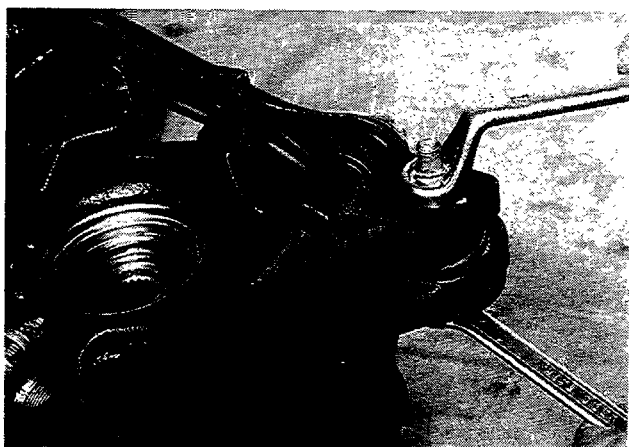
Right rear suspension unit

NOTE *In order to refit the right rear suspension simply reverse the order of the operations carried out for its removal.*



The final tightening of the rear suspension components should be carried out with the vehicle on a lift, with 3 persons on board (2 in the front seats and 1 in the rear seats) + 20 kg of luggage on the rear seat. (1 person = 70kg). This recreates the design load conditions and guarantees the correct operation of the suspension components.

44.

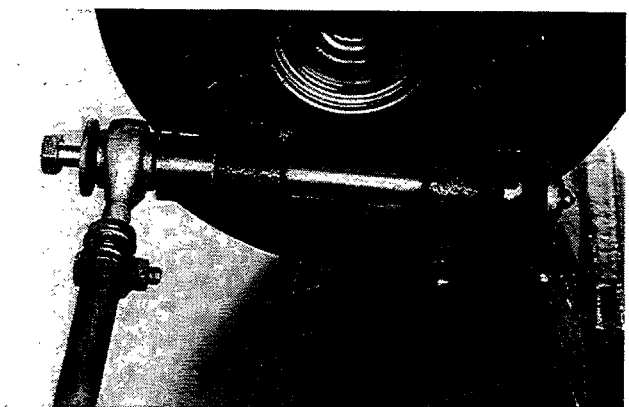
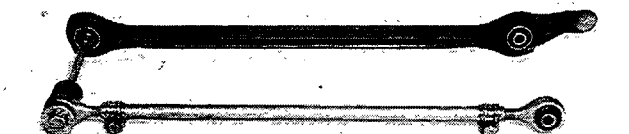


REMOVING-REFITTING



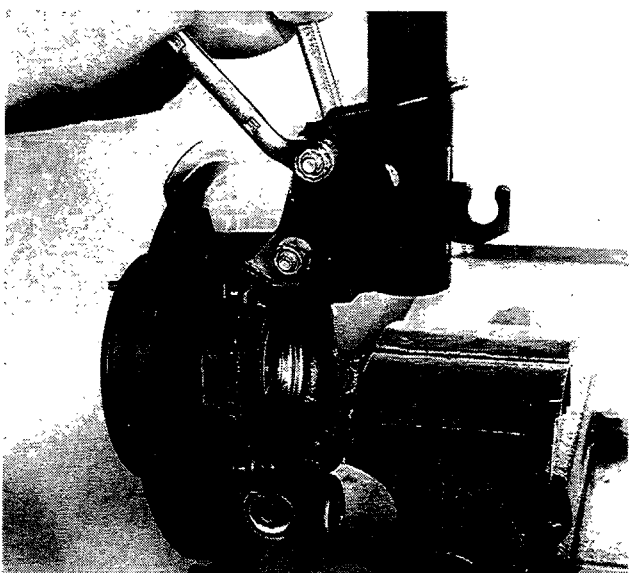
Removing-refitting side rod

Check that the side rod is not distorted and that the flexible bush is also not distorted; if this is not the case, replace the complete rod.

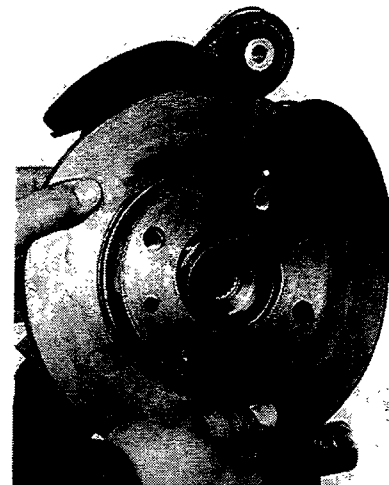
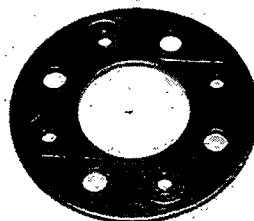
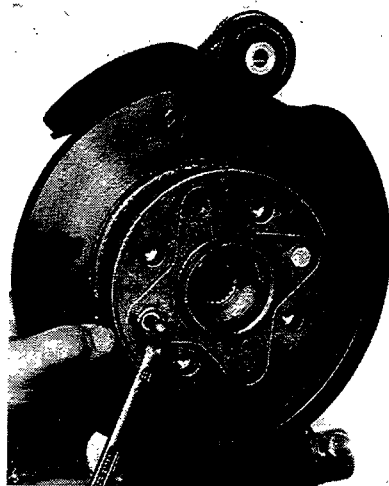


Removing-refitting longitudinal rods

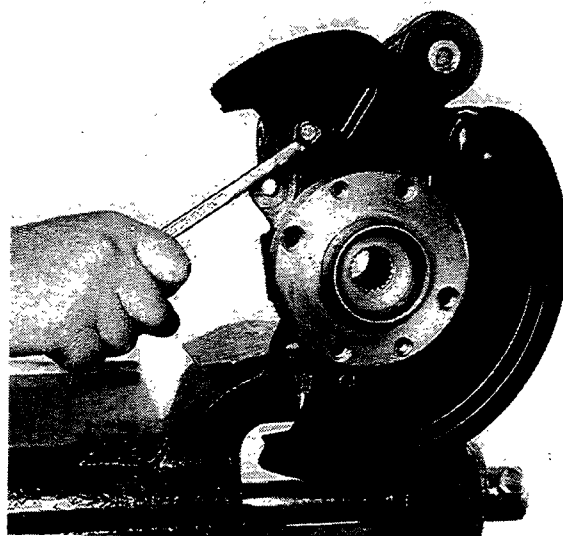
Check that the longitudinal rods are not distorted and that the flexible bushes are not worn; if this is not the case, replace the complete rods.



Removing-refitting shock absorber assembly from stub axle

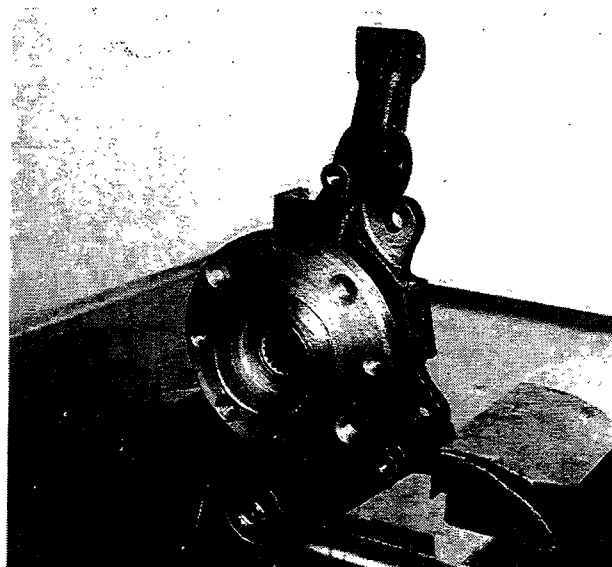


Removing-refitting spacer and brake disc



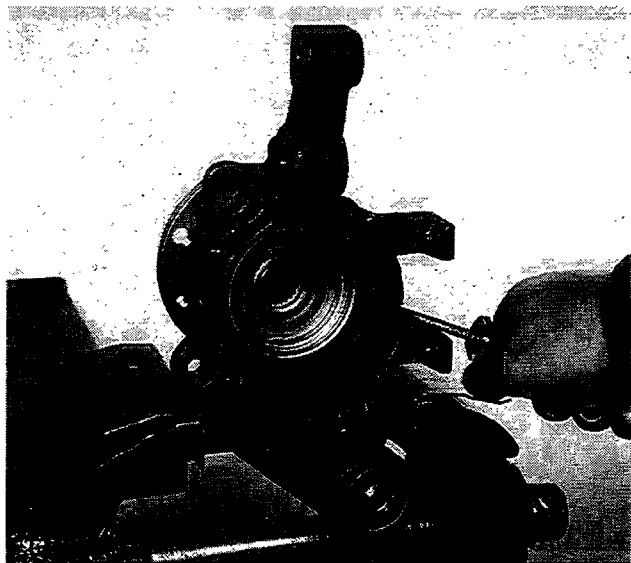
Removing-refitting dust cover disc from stub axle

WHEEL HUB

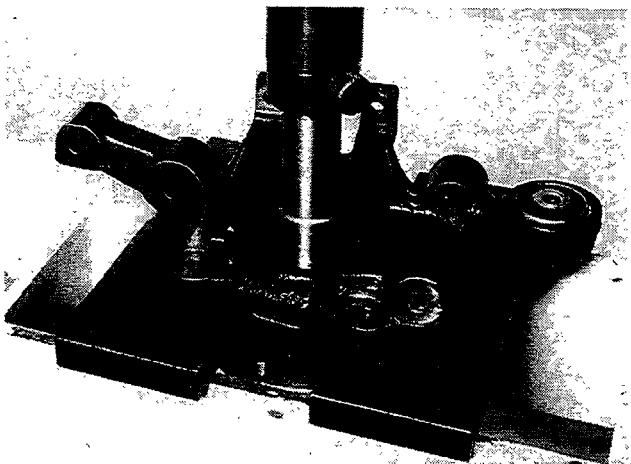


View of stub axle assembly

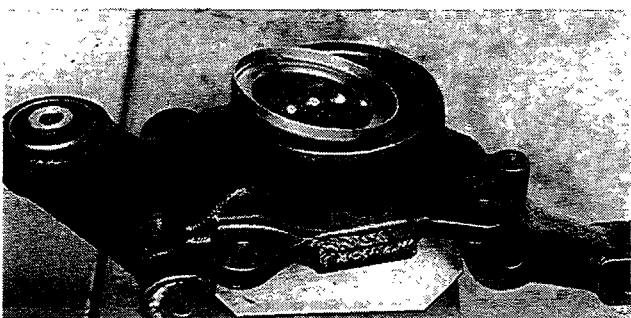
44.



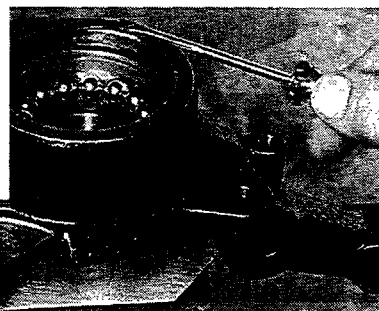
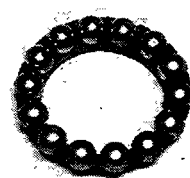
Removing dust cover cap

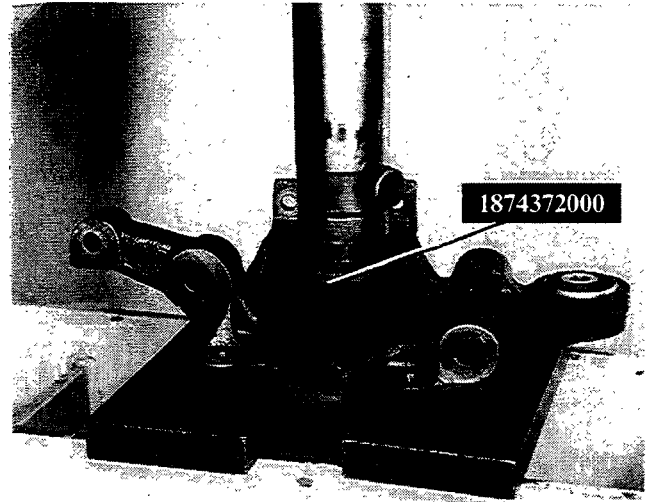


Removing hub from stub axle using the hydraulic press

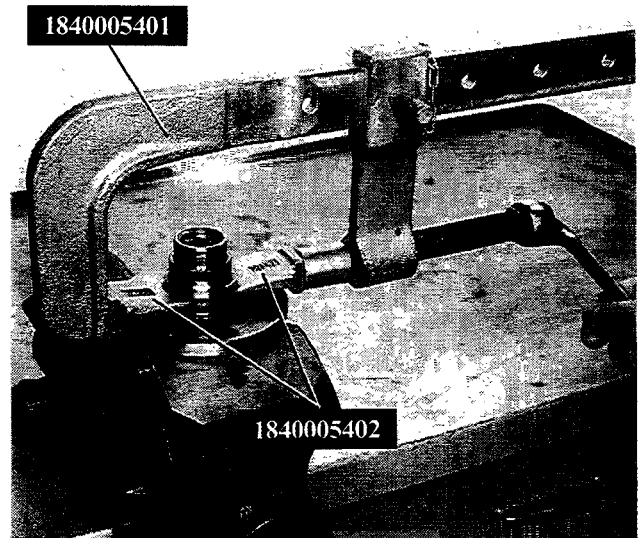


Removing-refitting dust cover cap, seal, circlip and bearing inner race from the stub axle

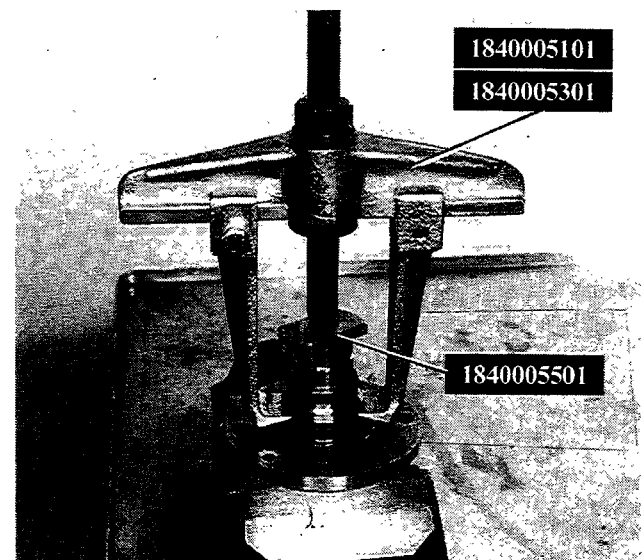




Removing bearing outer race from stub axle using hydraulic press



Initial removal of bearing inner race from hub



Removing bearing inner race from hub.

44.



Fitting rubber seal on hub

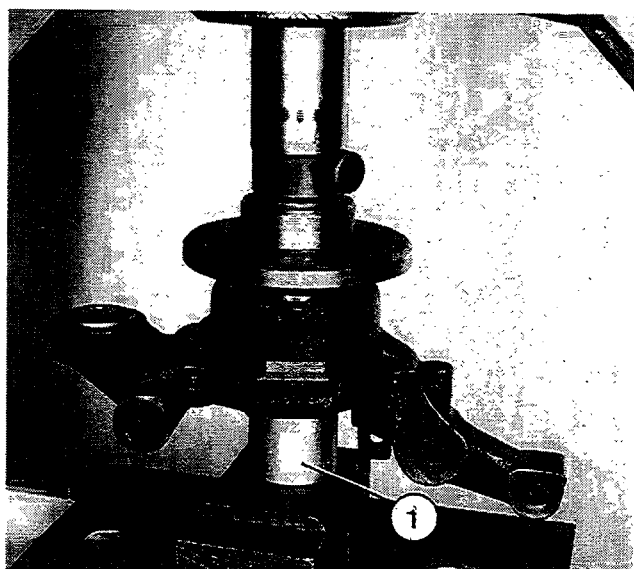


*The seal generously with
TUTELA MR3.*



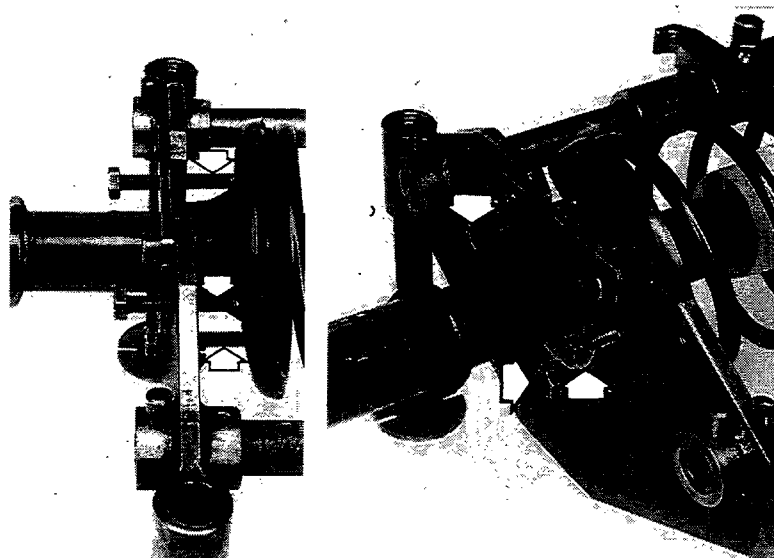
Fitting bearing in stub axle on the press

Fit the bearing circlip and the dust cover cap
using tool 1874372000.



Fitting hub in bearing on stub axle

Support the bearing inner race using a cylinder
(1) of the appropriate diameter.



COIL SPRING AND SHOCK ABSORBER ASSEMBLY



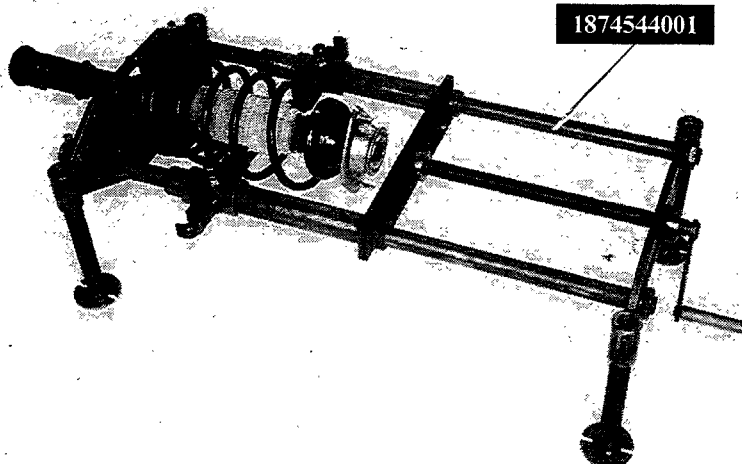
Adjusting support adjustment screws



NOTE Before compressing the spring, make sure that the position of the assembly corresponds to that shown in the photo and that the shock absorber stem is perpendicular to the support plate. This is achieved by regulating the adjustment screws shown by the arrows.

Shock absorber

If any anomalies are found in the shock absorber, the stem is always replaced in one piece.



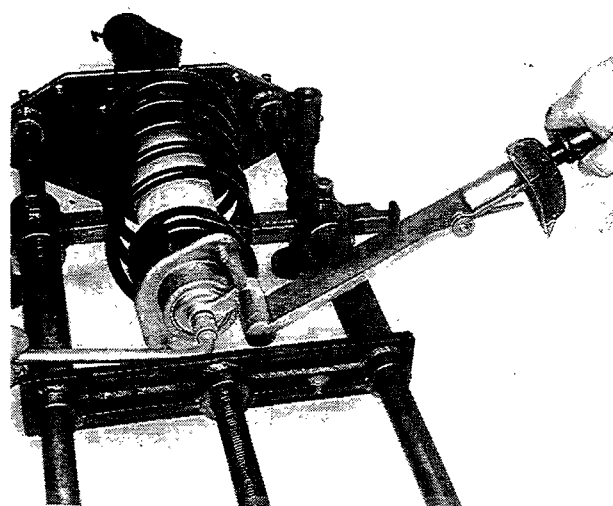
Coil spring

NOTE The coil springs are subdivided into two categories identifiable by a stripe of either yellow or green paint. Springs of the same category must be fitted.

Removing-refitting coil spring - shock absorber assembly



5 daNm



Removing-refitting nut fixing shock absorber stem and tightening to torque

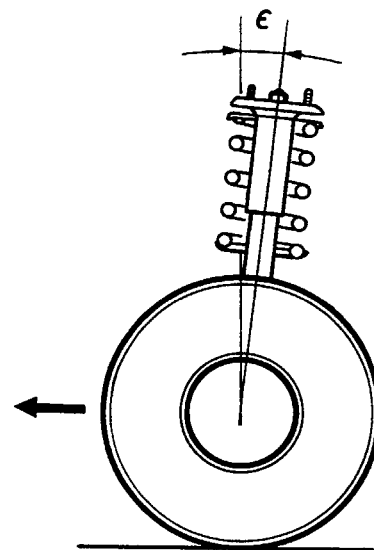
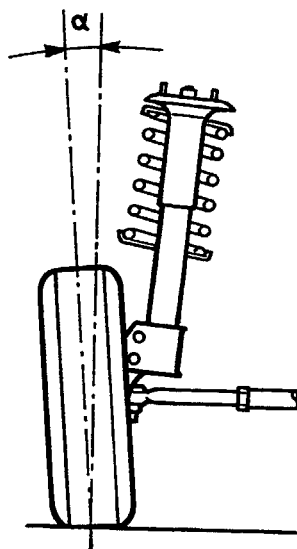
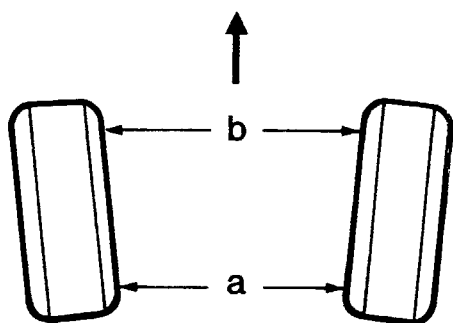
Wheel geometry

44.

FRONT WHEEL GEOMETRY

The front wheel geometry should be checked after subjecting the components affecting the wheel geometry to the following checks:

- tyre inflation pressure check;
- the eccentricity and squareness of the wheel rims should not exceed 3 mm;
- wheel bearing end float check;
- clearance between steering knuckle and track control arm ball joint;
- steering track rod end clearance.



TOE IN

$$a - b = 2 - 1.5 \text{ mm}^*$$

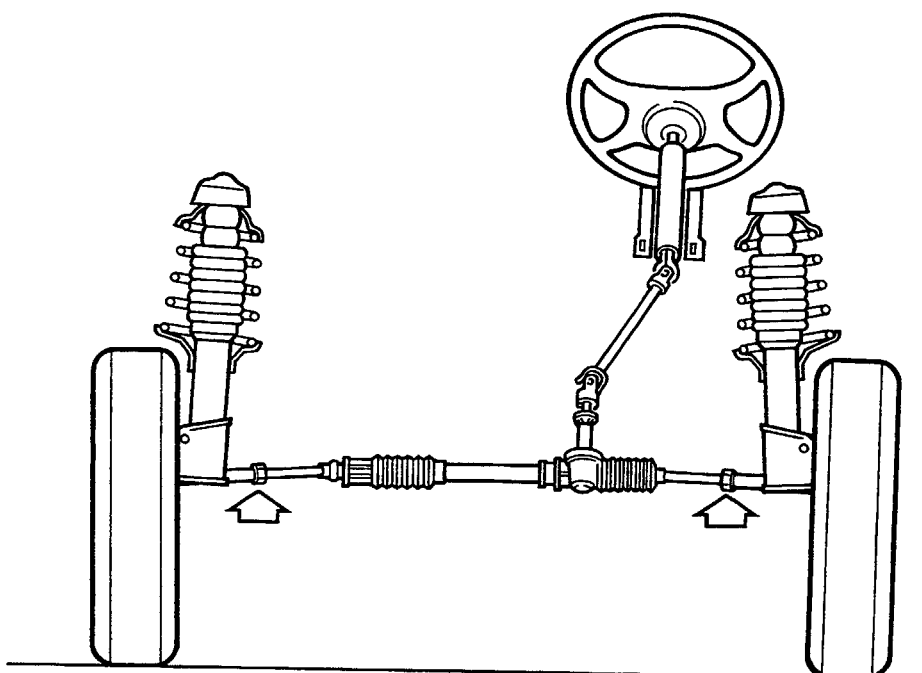
* Measured on the 360 mm diameter

CAMBER (cannot be adjusted)

$$\alpha = -40 \pm 30$$

CASTER (cannot be adjusted)

$$\epsilon = 3^\circ 10' \pm 30'$$

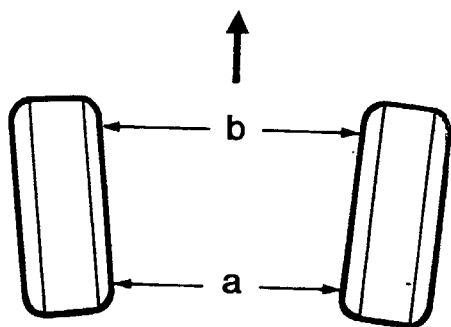


If, after checking the toe in, the values differ from the figures given, adjust the steering box rods after having loosened the fixing nuts.

REAR WHEEL GEOMETRY

The wheel geometry should be checked after the following checks have been carried out:

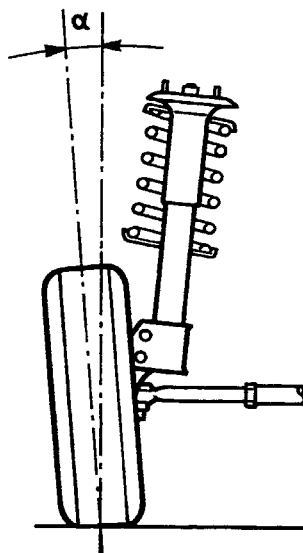
- tyre inflation pressure check;
- the eccentricity and the squareness of the wheel rims should not exceed 3 mm;
- wheel bearing end float check.



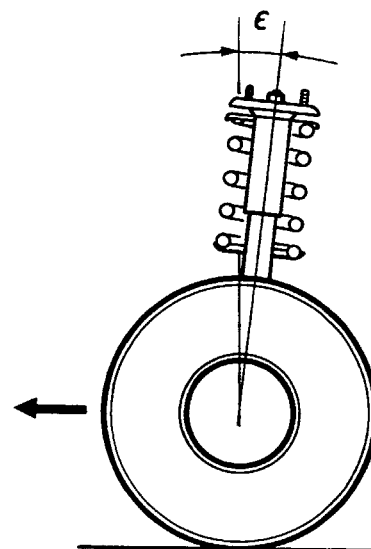
TOE IN



* Measured on the 360 mm diameter.



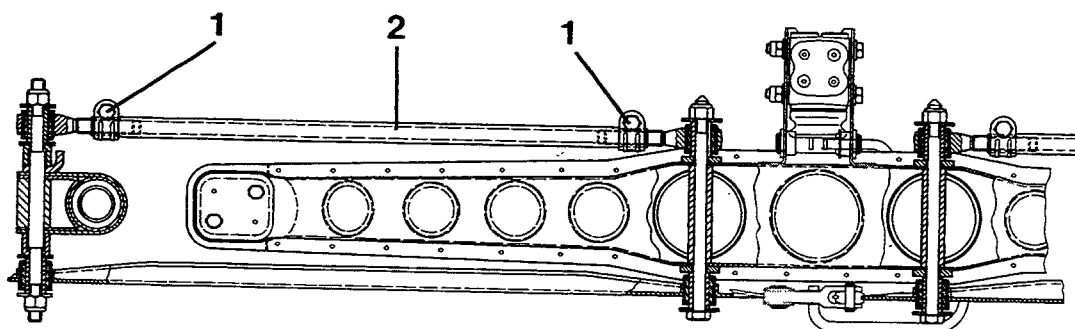
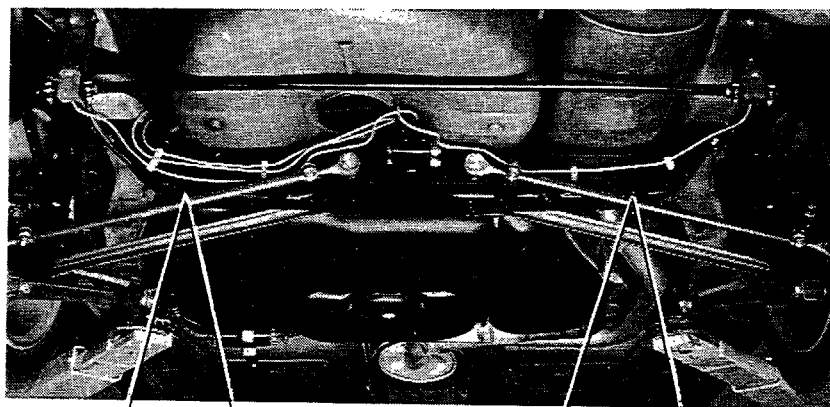
CAMBER (cannot be adjusted)



CASTER (cannot be adjusted)



If, after checking the toe in, the values differ from the figures given, loosen the nuts (1) and turn the rod (2) until the desired conditions are achieved. The adjustment should be carried out by regulating the rods for both wheels.



44.

DESCRIPTION	Thread size	Tightening torque
		daNm

FRONT SUSPENSION

Track rod end to ball joint fixing, bolt	M8 × 1,25	2,6
Track rod end to suspension arm fixing, bolt	M8 × 1,25	3
Ball joints to suspension arm fixing, bolt	M10 × 1,25	5,6
Ball joints to suspension arm fixing, bolt	M10 × 1,25	5,6
Flexible bushes to suspension arm fixing, nut	M10 × 1,25	4,5
Brackets (for suspension arm flexible bushes) to bodyshell fixing, bolt	M10 × 1,25	4
Left and right bracket to flexible bush bracket fixing, bolt	M10 × 1,25	4
Shock absorber to track rod end fixing, bolt	M10 × 1,25	5,5
Shock absorber stem to flexible mounting fixing, nut with polyammide ring	M12 × 1,25	5
Shock absorber stem flexible mounting to suspension turret fixing, nut	M8 × 1,25	1,8
Bracket (for stabilizer bar flexible mounting) to suspension arm fixing, nut	M8 × 1,25	1
Clamps to stabilizer bar fixing, bolt	M8 × 1,25	1,9
Flexible mounting to bodyshell fixing, bolt	M8 × 1,25	1,2
Rod to suspension track control arm fixing, bolt	M10 × 1,25	6
Wheel hub to constant velocity joints fixing, nut	M20 × 1,5	29,4
Wheel to hub fixing, bolt	M12 × 1,25	8,6

DESCRIPTION	Thread size	Tightening torque
		daNm

REAR SUSPENSION

Shock absorber to flexible mounting fixing, nut	M12X1,25	5
Shock absorber to stub axle fixing, bolt	M10X1,25	5,8
Flexible mounting to bodyshell turret fixing, nut	M8X1,25	1,8
Stabilizer bar joint to bodyshell fixing nut	M8X1,25	1,2
Stabilizer bar to joint mounting fixing, bolt	M6X1	1
Stabilizer bar to stub axle fixing, bolt	M8X1,25	2,3
Rear cross member to bodyshell fixing, bolt	M12X1,25	6
Longitudinal rod fixing, bolt	M10X1,25	6
Transverse rod fixing, bolt	M10X1,25	6
Wheel hub to constant velocity joint fixing, nut	M20X1,25	29,4
Wheel to rear hub fixing, bolt	M12X1,25	8,6

DELTA-PRISMA 4WD

Auxiliary units



**Service
Manual**

50.

Composition

The heating-ventilation unit consists of a plastic casing containing:

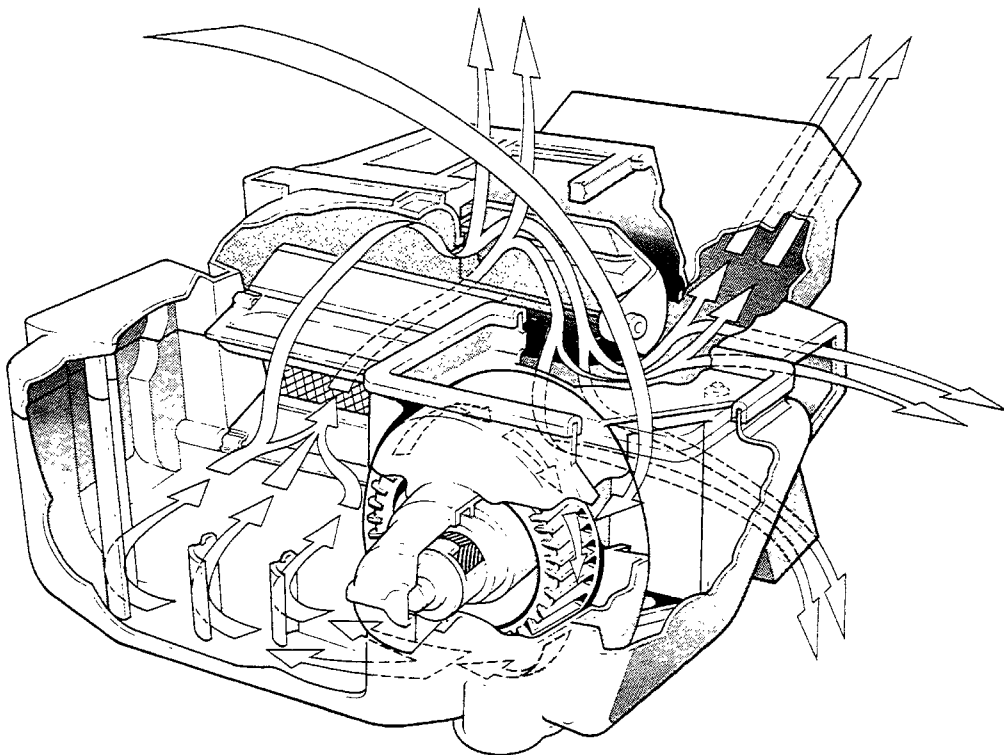
- 1) an electric fan for blowing the air through at different speeds.
- 2) a heater radiator connected to the engine cooling circuit and the relevant coolant inlet tap.
- 3) Three flaps for adjusting and distributing the flow of air inside the unit and the relevant control mechanisms.
- 4) In addition, at the exit point from the heating-ventilation unit, in a box section in the body shell under the windscreen, are located 2 flaps for distributing air inside the car, which are controlled by means of a shaft with a universal joint at either end.

Operation

By operating the inlet flap air gathered from outside the car — in the so-called "fish tank" area underneath the windscreen — is allowed into the heating-ventilation unit.

Operating the blend flaps causes the coolant inlet tap — by means of a special system of levers — to open simultaneously allowing heated coolant into the radiator. In this way varying amounts of air will pass through the radiator and will blend with the air coming directly from outside so as to heat masses of air to different temperatures.

Finally by operating the air distribution flaps by means of a shaft with a universal joint at either end (as well as the previously mentioned flaps) varying amounts of warm air will be distributed along ducts and out into the passenger compartment either through vents in the middle and at the sides of the instrument panel and beneath the windscreen, or in the foot well, thus heating the passenger compartment. To get the unit to act as a ventilator, on the other hand, all the driver (or passenger) need do is to refrain from operating the blend flaps and the relevant coolant inlet tap.

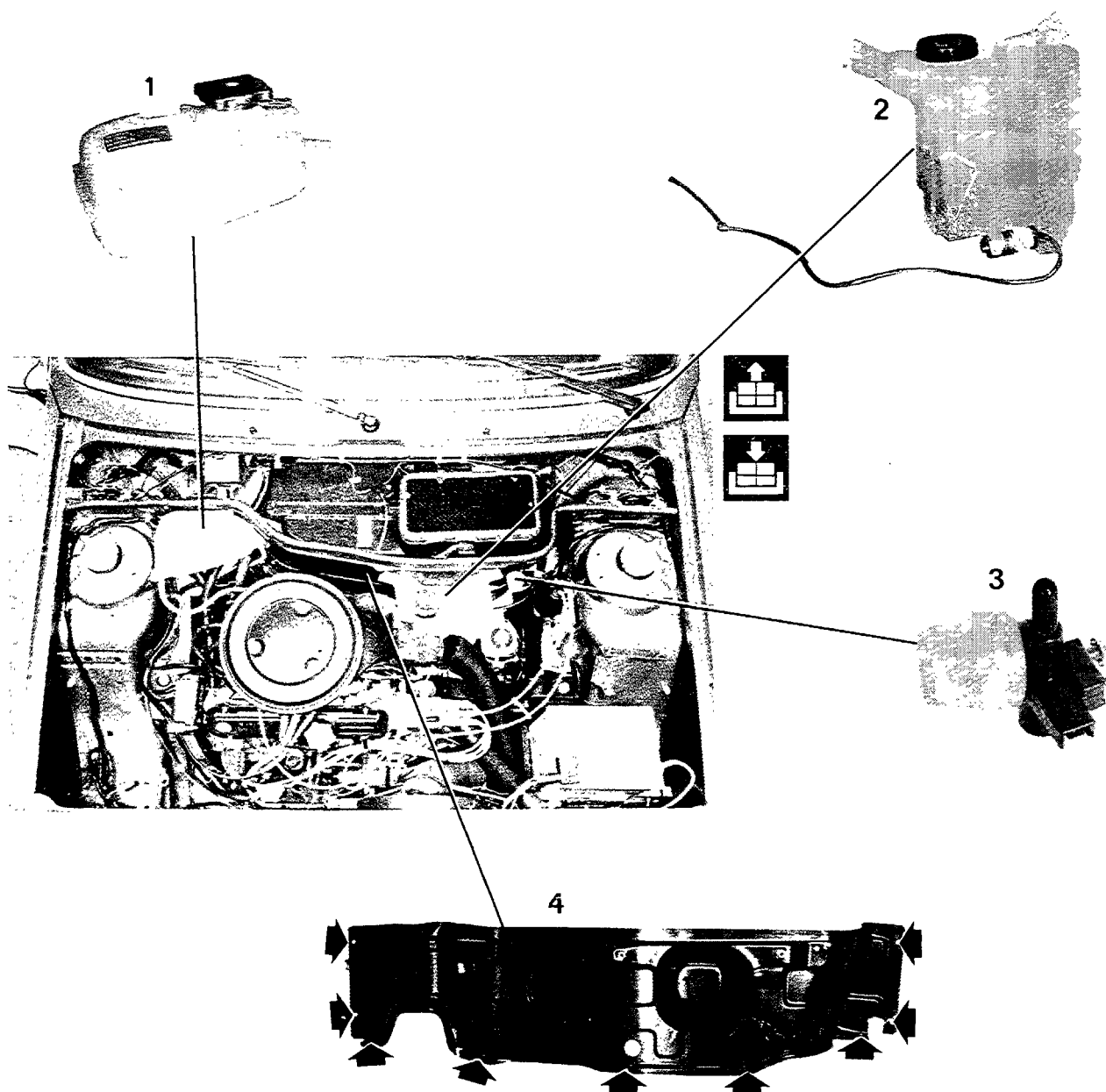


REMOVING – REFITTING

This is done from the engine compartment by releasing the bulkhead (4) from components (1) – (2) – (3) by unscrewing the bolts, respective securing nuts and the windscreen wiper pump connection. Then:

Remove the bulkhead (4) by unscrewing the bolts securing it to the body shell.

- Unscrew the 3 bolts securing the heating-ventilation unit to the rear of the dashboard.



- Disconnect the 2 electric fan connectors.
- Disconnect the 2 coolant pipes on the heater side.

Remove the air filter in order to make it easier to get the complete heating-ventilation unit out.

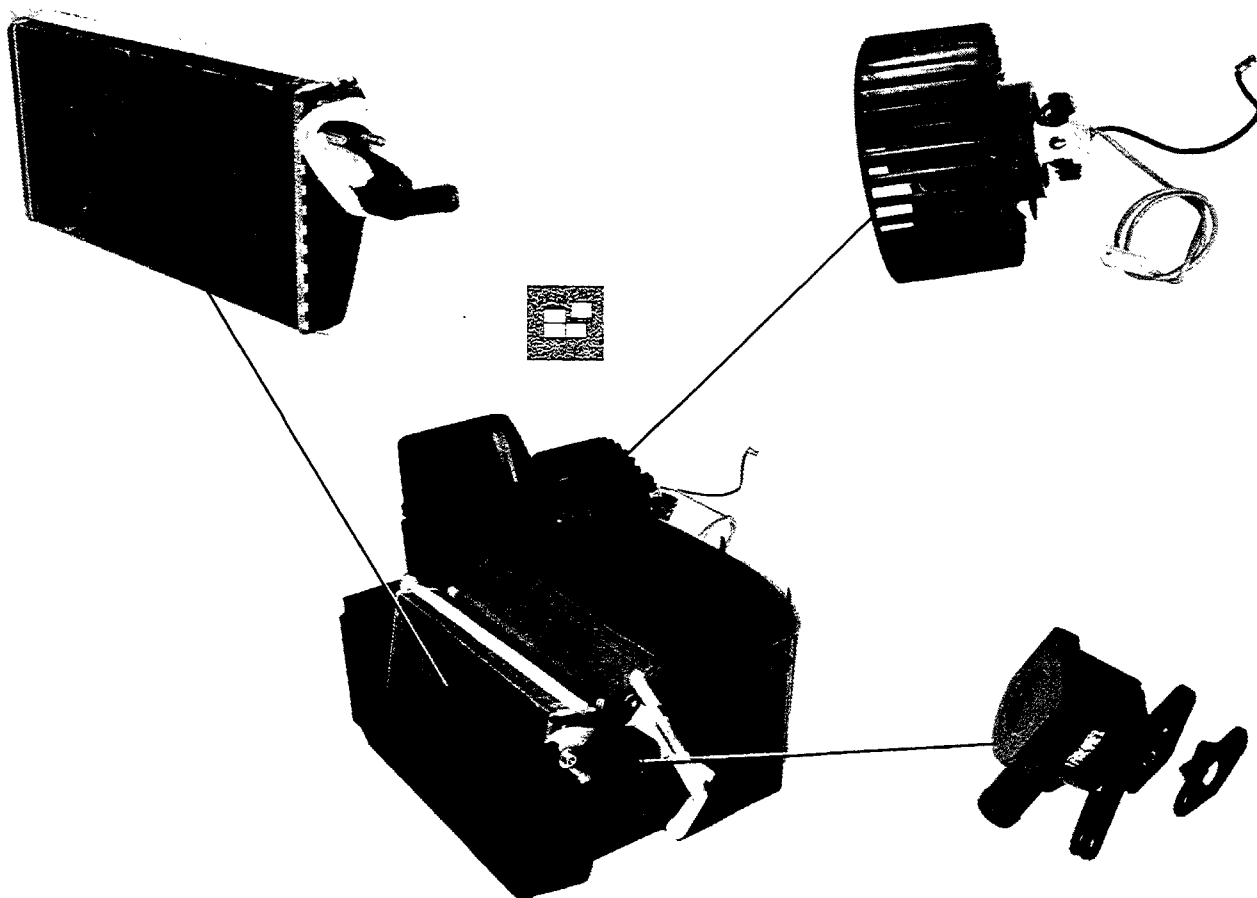
NOTA When dismantling, collect the coolant contained in the radiator.

When refitting the heating-ventilation unit, reverse the order of the operations described for its removal, as appropriate.

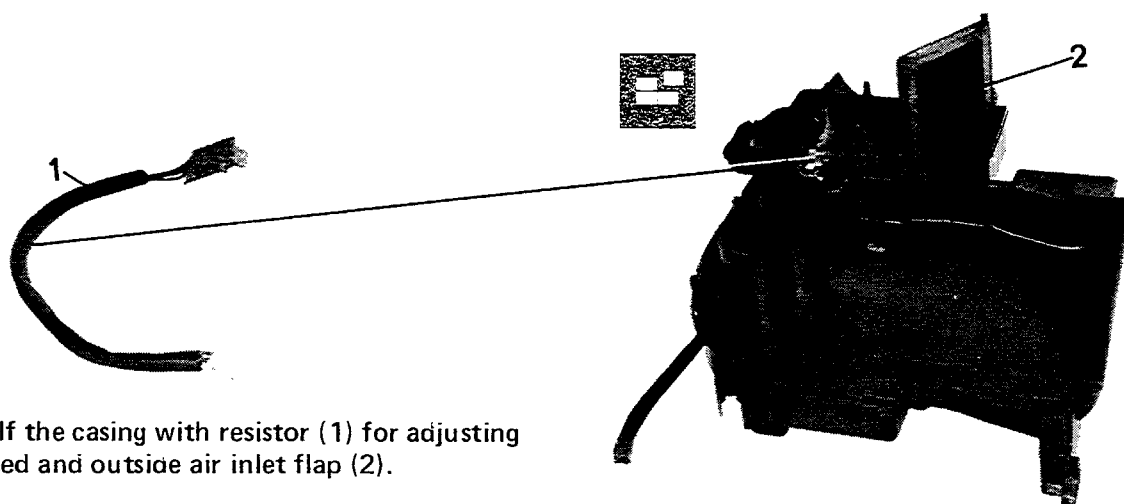
50.

DISMANTLING

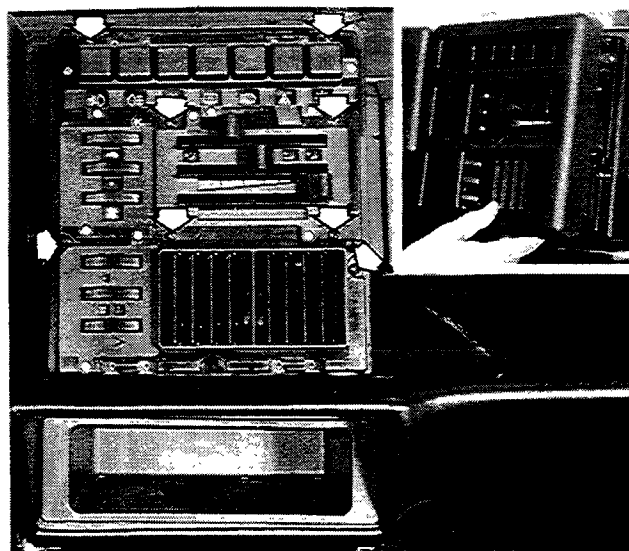
- Remove the 5 clips and the bolt retaining the 2 covers.
- Using a screwdriver force the 2 covers, in the areas near the 7 retaining lugs, until they come apart.
- Remove the heater radiator, disconnecting the coolant inlet tap control rod.



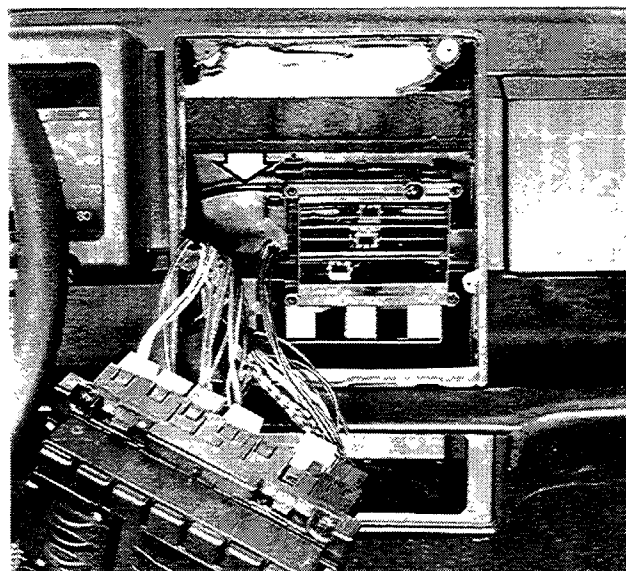
- Remove the electric fan unit by unscrewing the 2 bolts securing it to the bottom half of the casing.



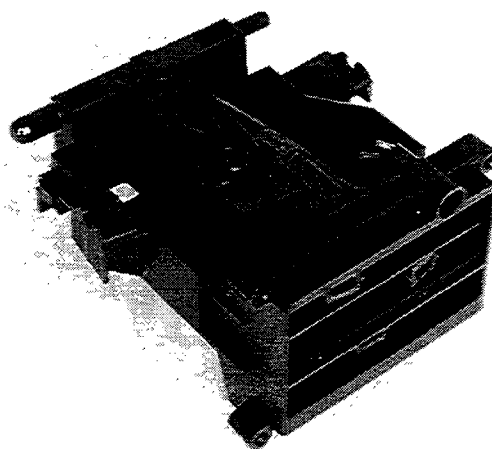
Bottom half the casing with resistor (1) for adjusting the fan speed and outside air inlet flap (2).

AUXILIARY SERVICES INSTRUMENT
PANEL

Removing - refitting binnacle cowl and auxiliary services instrument panel



Removing bowden cables controlling the air conditioning system and relevant levers



View of the air conditioning system control lever unit

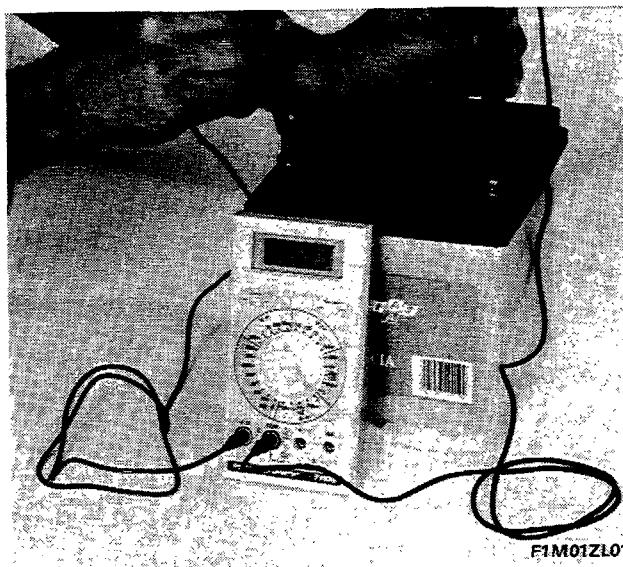
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BATTERY

All batteries fitted to Prisma versions are ES (Energy Sealed) and do not require maintenance.

This type of battery offers the following advantages over conventional batteries:

- negligible consumption of electrolyte due to the use of a new type of alloy for grille and plate construction;
- negligible standing charge loss that allows efficient starting for a period of 7 months and is thus suitable for extended storage (at temperatures below 28°C);
- reduction in the volume of gas produced during charging that is normally responsible for corrosion and consequent bad contact of terminal poles.



F1M01ZL01

If the battery appears to be flat, **leave the battery disconnected for at least two hours**, measure the no-load voltage by connecting a digital voltmeter over its terminals: if this is less than 12.3 V it holds 50% charge, if it reaches 12.48 V it is 75% charged and if it reaches 12.66 V it is 100% charged.



If the electrolyte level drops below the minimum level marked on the plastic container in one or more cells, open the cover sealing the plugs and add distilled, deionised water (as used to top up ordinary batteries).

NOTE Do not subject the battery to rapid recharging at voltages over 15.5 V or at high currents and recharging ampere.

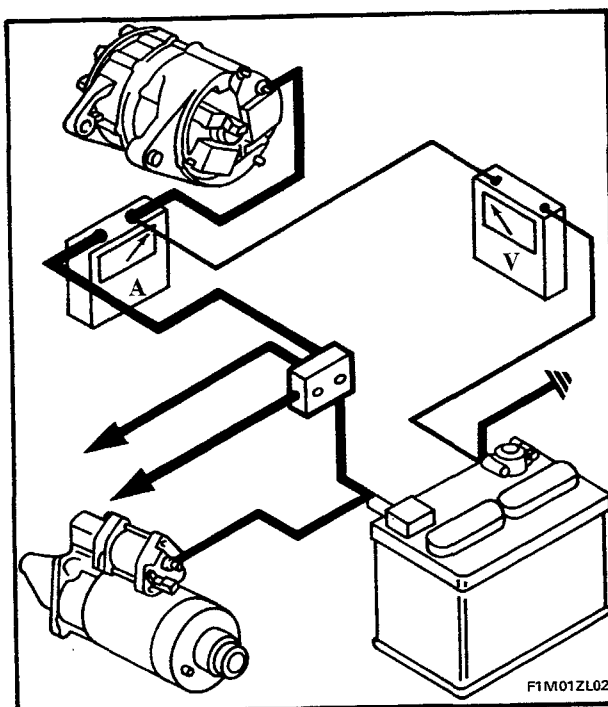
ALTERNATOR

Checking maximum charge rate on car produced by alternator with built-in electronic regulator:

Carry out the following operations:

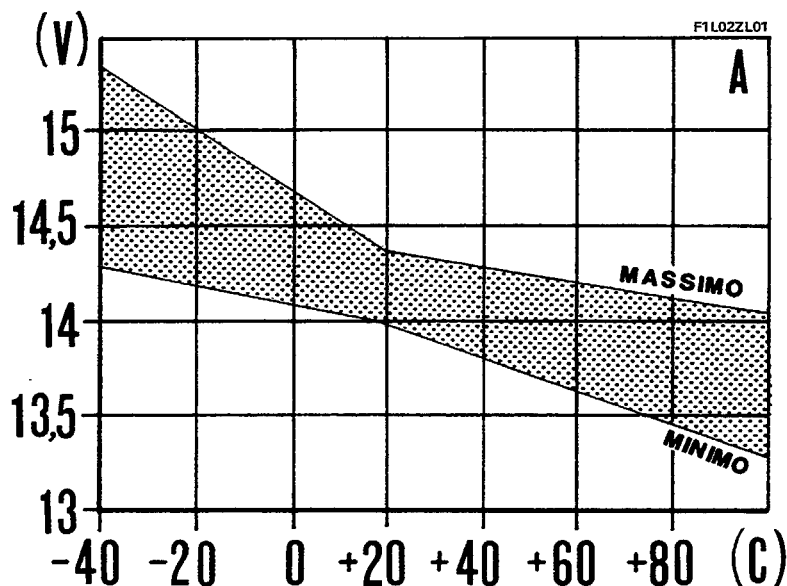
- release the cable connected to the alternator from the junction box;
- connect an ammeter across the above cable and the junction or the battery positive terminal;
- connect a voltmeter across the negative pole of the battery and the cable connected to the alternator and ammeter (see diagram);
- start the engine and run it at a speed of 3000 - 4000 rpm;
- connect all available connections one by one;
- measure the maximum current when the voltage read off the voltmeter falls below 13.5 V.

If the current reading is over 5A below specified levels, overhaul the alternator.



F1M01ZL02

55.



Graph of regulated voltages -regulator ambient temperature

Checking voltage regulator on car

Maintain previous connections and engine speed and then disconnect some connectors until an absorption of about **half maximum load** is reached.

Under these conditions the voltage should fall between the maximum and minimum values given in the diagram alongside, depending on the ambient temperature of the electronic regulator (alternator).

Diagram A refers to electronic regulator RTT 119 A incorporated in Marelli alternators

Checking stability of electronic regulator

Maintaining the same electrical contacts and engine speed, connect a few connectors until the current load is about 2/3 of the alternator current rating.

Under these conditions the voltage should drop by over 0.4 V.

Then disconnect connections to obtain a current load of about 5A. The voltage previously recorded for about half load should not alter by more than ± 0.2 V.

If the voltage change does not fall within specified limits, the electronic voltage regulator must be replaced since it is faulty.

ADJUSTING TENSION OF ALTERNATOR, WATER PUMP AND POWER STEERING DRIVE BELT

Fit the new belt (Poli-V) type, ensuring that it slides through the grooves in the pulleys. Adjust belt tensioner screw to obtain a load of 50-100 daN as measured with tool 1895760000.

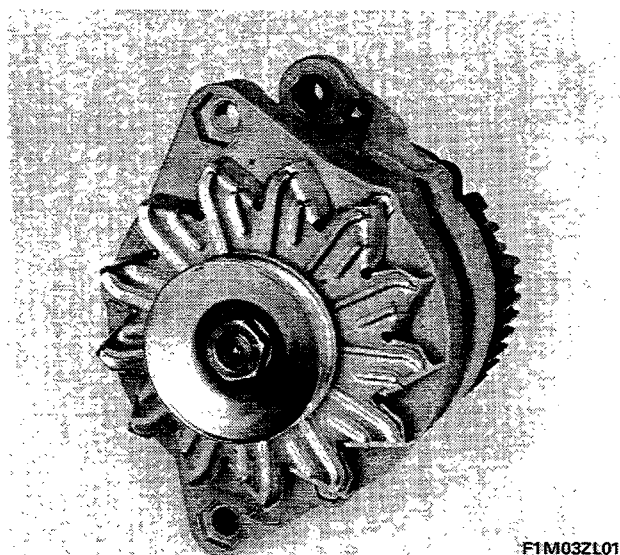
Belt tension need not be readjusted for this belt type

NOTE *Always adjust belt tension when the engine is cold.*

OVERHAULING M. MARELLI ALTERNATOR



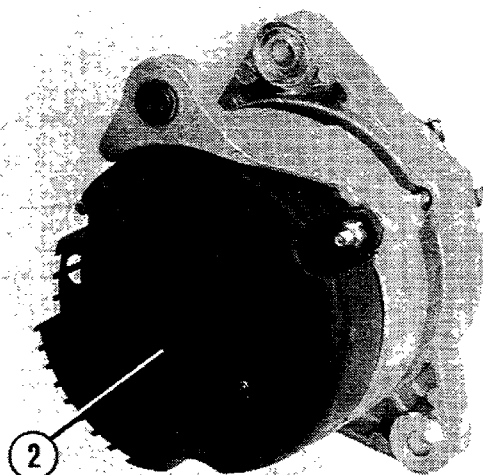
Never run the engine with temporary or slack recharging circuit electrical connections since this could damage the alternator diodes. Never carry out diagnostic checks on the electronic regulator using test lights since this could cause damage.



F1M03ZL01

M. Marelli AA125R-14V-65A alternator

NOTE *All M. Marelli alternators are manufactured to practically identical specification. Follow the instructions and illustrations in the following pages for all models.*

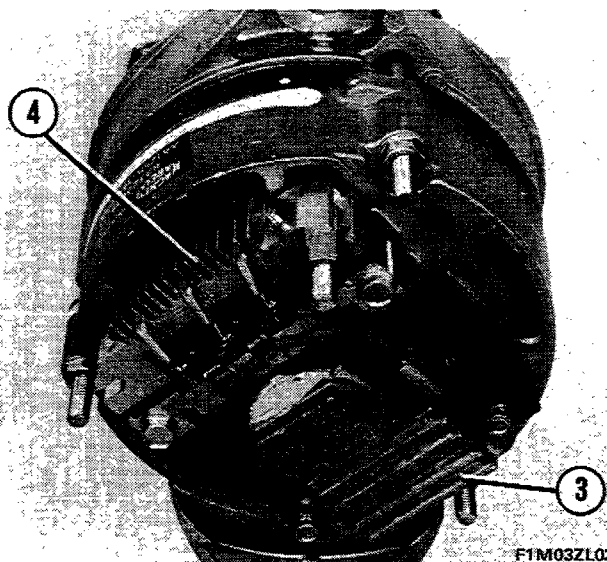


F1M03ZL02

Rear view of alternator

Remove guard (2) after removing nuts retaining it to the alternator.

Before completely disassembling the alternator, carry out the operations and checks described in the following pages.

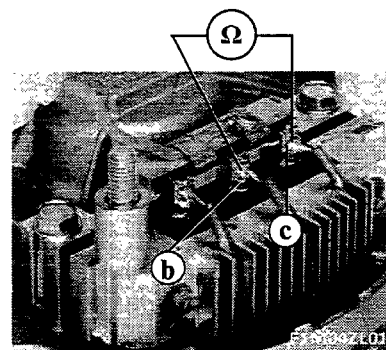
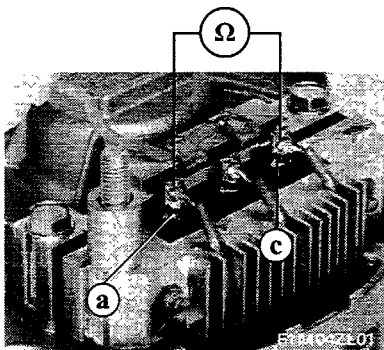
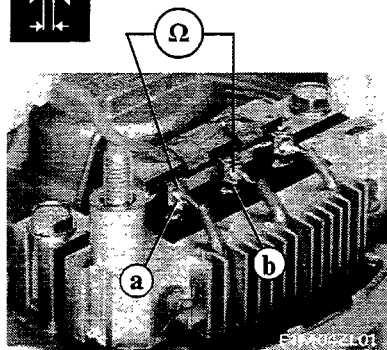


F1M03ZL03

Rear view of alternator without guard

- 3. RTT 119A electronic voltage regulator.
- 4. 9 diode rectifier bridge.

55.



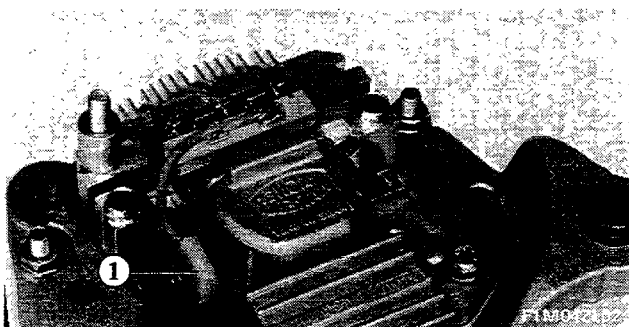
Checking continuity of 3 stator windings

Connect the terminals of an ohmmeter (adjusted to a scale of $\times 1$) to the ends of the stator windings (a-b-c) in the three possible ways as shown.

For each measurement, the instrument should show a certain resistance value that is equal for all measurements.

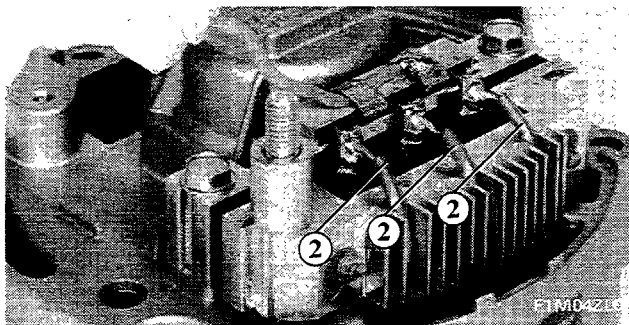


If the instrument needle does not move (infinite resistance) or fully deflects (resistance nil), the winding in question is broken or short-circuited and the stator must be replaced.

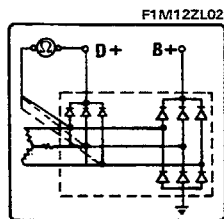
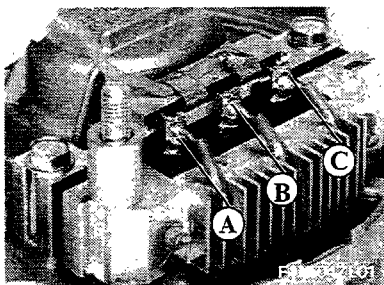


CHECKING DIODES

Disconnect connector (1) of the terminal lead of the flat pin exciter diodes connected to the positive brush.



Disconnect terminals (2) of the stator windings from the rectifier bridge.



Checking excitation diodes

Insert the terminal of an ohmmeter in connector (1) above.

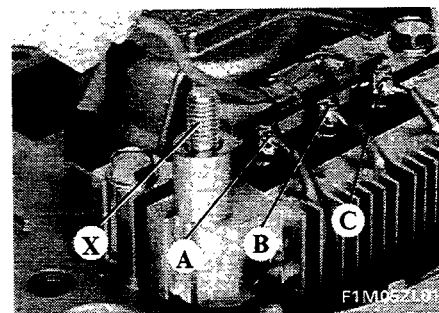
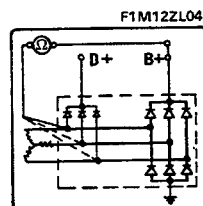
The second instrument terminal must be placed into contact with each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the terminal connection on the instrument.

Checking positive diodes

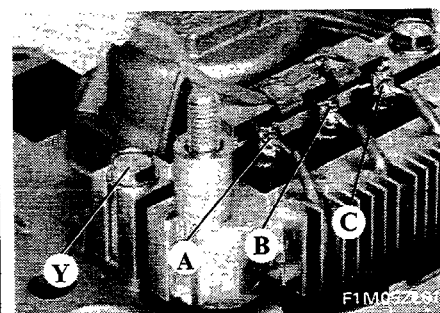
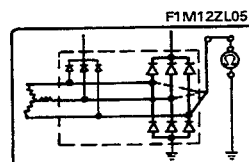
Connect one ohmmeter probe to the alternator positive terminal (X) and the other to each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the connections of the probes on the instrument.

**Checking negative diodes**

Connect one ohmmeter probe to the negative diode plate (Y) and the other probe with each of the three terminals (A-B-C) in turn.

Repeat the three measurements after reversing the probe connection order.



For each of the three checks described previously, a resistance value should be measured for each instrument terminal (A-B-C).

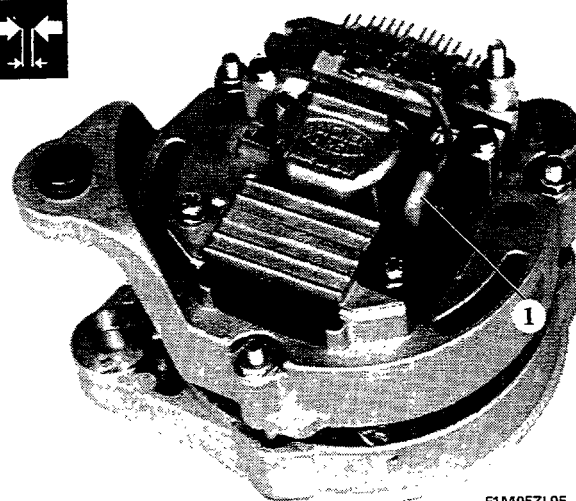
When the connection of the two probes on the instrument is reversed, the needle should not move. If the needle moves for both connections (diode short-circuited), or never moves (diode interrupted) the rectifier bridge assembly must be replaced.

ROTOR**Check rotor winding resistance measured across the brush connectors**

Disconnect connector (1) of exciter diode terminal cable from the blade connected to the positive brush.

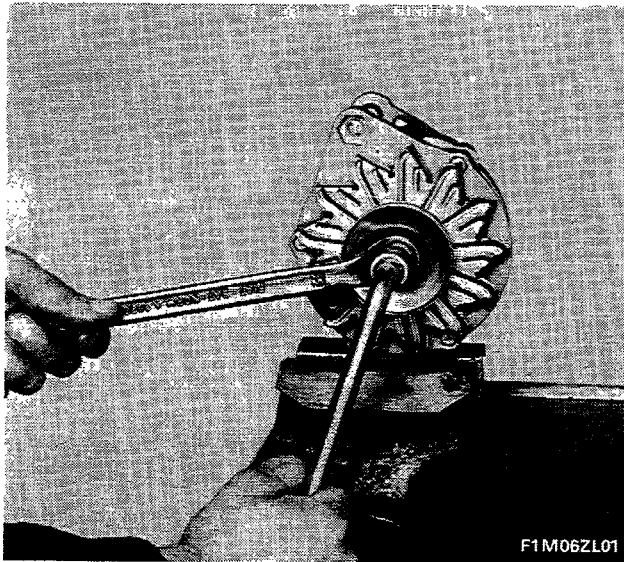
Connect the ohmmeter probes (set to a scale of $\Omega \times 1$) with the two blades of the brush carrier - voltage regulator support.

If the resistance reading is not as specified or infinite (interrupted circuit), the rotor must be checked and replaced if necessary.



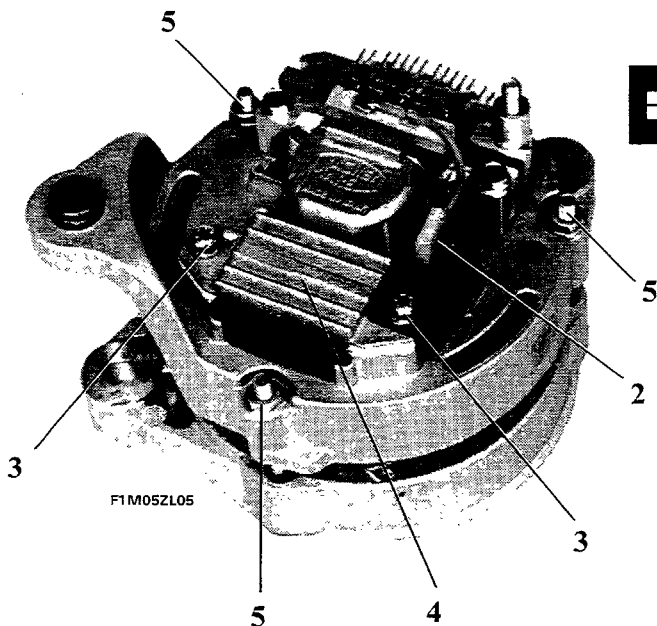
F1M05ZL05

55.



Disassembly

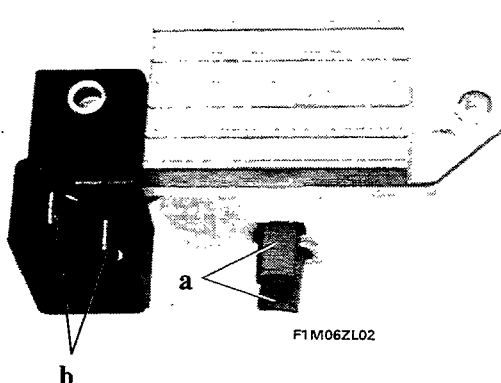
Insert a socket wrench in the hexagonal hole on the alternator shaft to hold the alternator shaft still and use another wrench to back off the nut retaining the fan and pulley to the rotor. Withdraw the above components with their spacers and washers from the alternator shaft.



Disconnect connector (2) of the exciter diode terminal cable from the blade connected to the positive brush.

Back off bolts (3) retaining the electronic voltage regulator (4) complete with brushes to the rear alternator support plate.

Back off bolts (5) and withdraw bolts that join the main outer parts of the alternator.

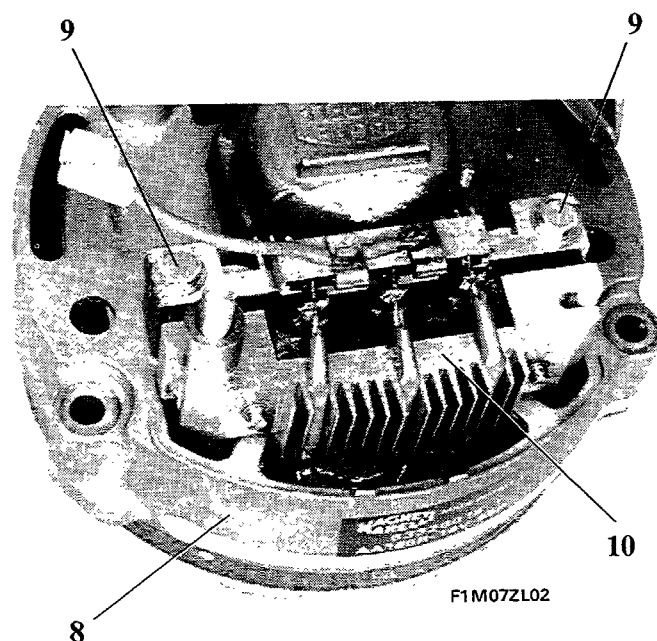
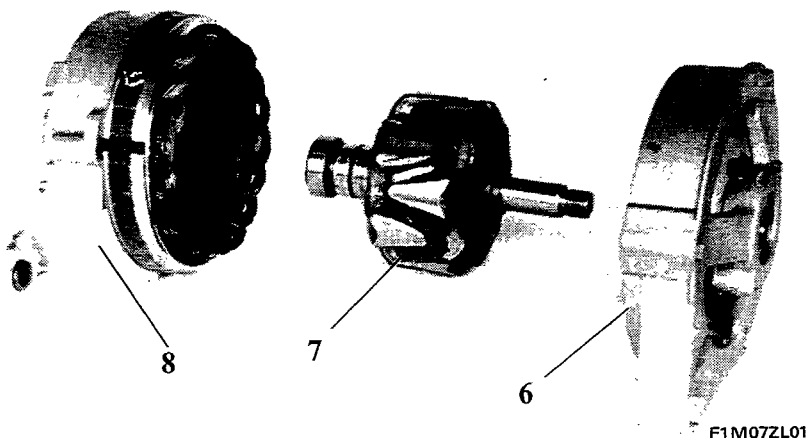


Electronic voltage regulator

- a. Brushes
- b. Blades

Disassemble the various components (as shown), remembering that pressure must be exerted on the rotor shaft in order to release it from the support plate.

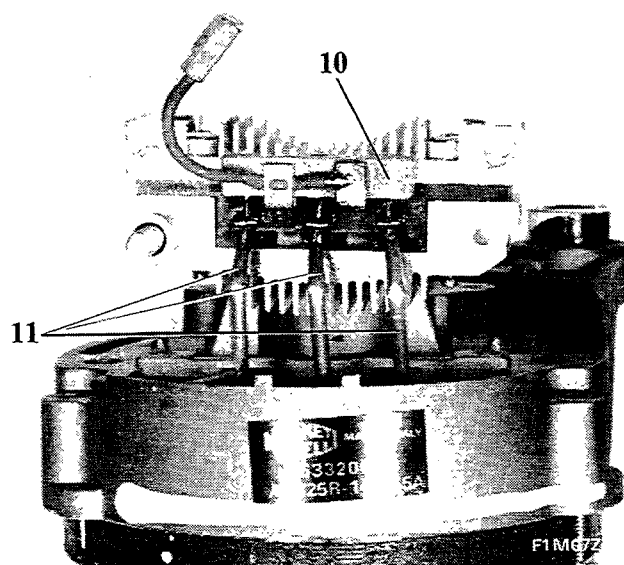
NOTE *If a press is not available, use a brass driver to avoid damaging the thread.*



Back off bolts (9) retaining rectifier bridge (10) to the rear support plate (8).

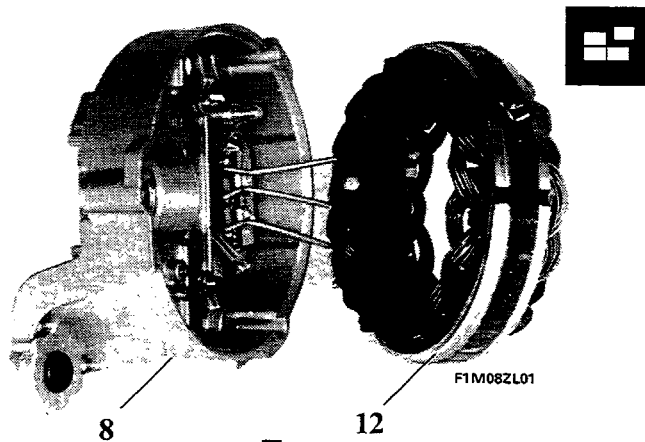


The rectifier bridge should not be disassembled; this is supplied as a complete spare.

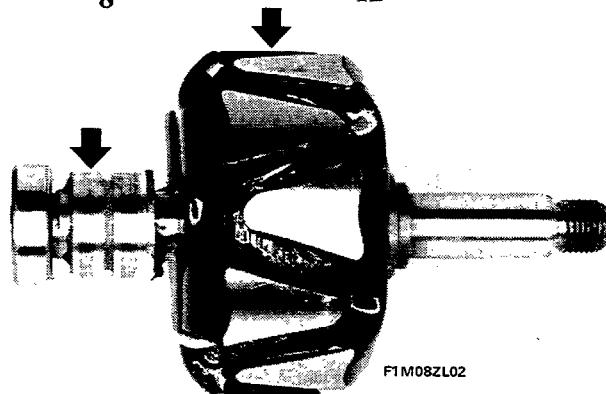


Move rectifier bridge (10) away from the support plate and unsolder terminals (11) of the stator winding.

55.



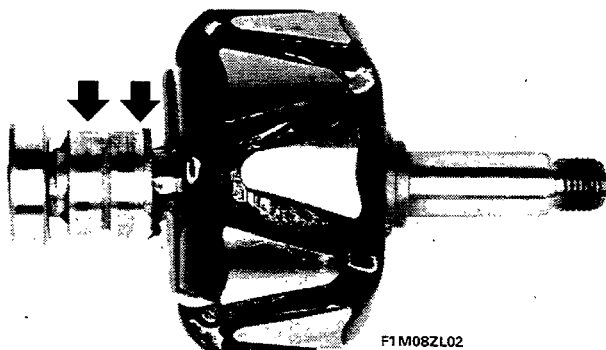
Remove stator (12) with its terminals (11) from rear support plate (8).



Check inductor winding insulation

Connect the two probes of an ohmmeter (set to a scale of $\Omega \times 1$) to a slip ring and the rotor case (see arrows).

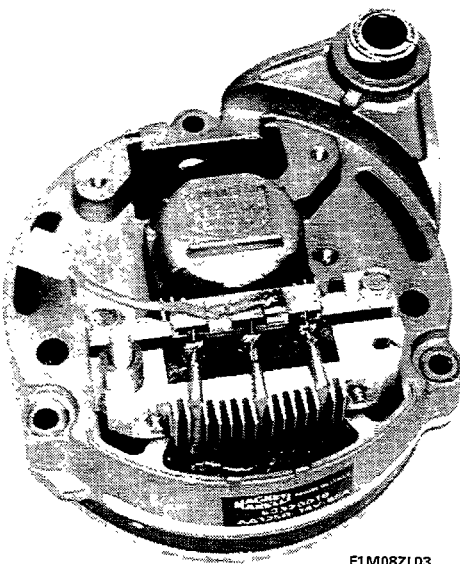
The instrument should give an infinite resistance reading, otherwise replace the rotor.



Checking resistance of inductor winding (rotor) on slip rings

Connect the two probes of an ohmmeter (set to a scale of $\Omega \times 1$) to the rotor slip rings (see arrows): the instrument should show a certain resistance reading.

If the resistance reading is not as specified or infinite (circuit interrupted), the rotor must be replaced.



Check that the bearing turns freely without binding or noise.

Check that the slip rings have not been grooved by the brushes, otherwise replace the rotor assembly.

Reassembly

Carry out disassembly instructions in reverse order for assembly.

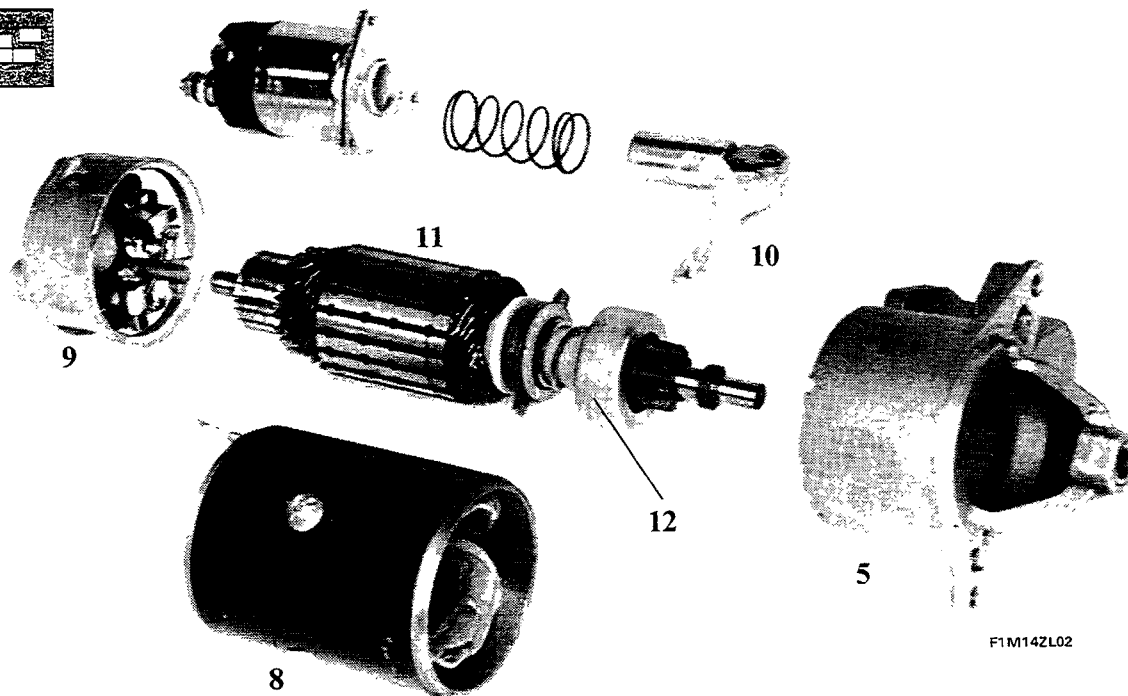
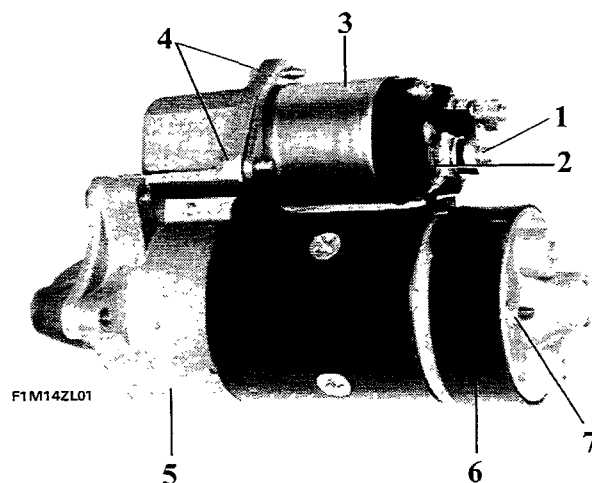
OVERHAULING M. MARELLI STARTER MOTOR



Before overhauling the starter motor, check that the cause of the insufficient starting torque is not due to a flat battery.

Removal

To remove the starter motor first disconnect the supply leads and then back off the bolts retaining the unit to the gearbox.



Disassembly

Proceed as follows to disassemble the starter motor:

- back off nut (1) and release cable (2) from solenoid (3);
- back off bolts (4) retaining solenoid (3) to front support (5);
- remove brush protective band (6);
- back off nuts (7) and withdraw bolts that join front support (5) to the central part (8) and brush carrier support (9);
- disassemble the parts and release fork (10) from front support (5) and rotor (11).

Checks

Carry out the following checks on motor components:

rotor: check continuity, short-circuit and earth insulation

stator: check continuity and earth insulation

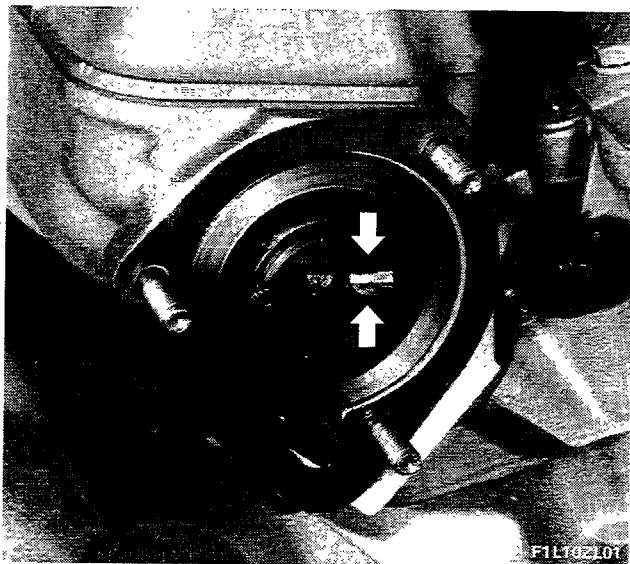
brush carrier: earth insulation

solenoid: check continuity and earth insulation



Free wheel (12) must be replaced whenever the starter motor makes a noise upon starting.

55.

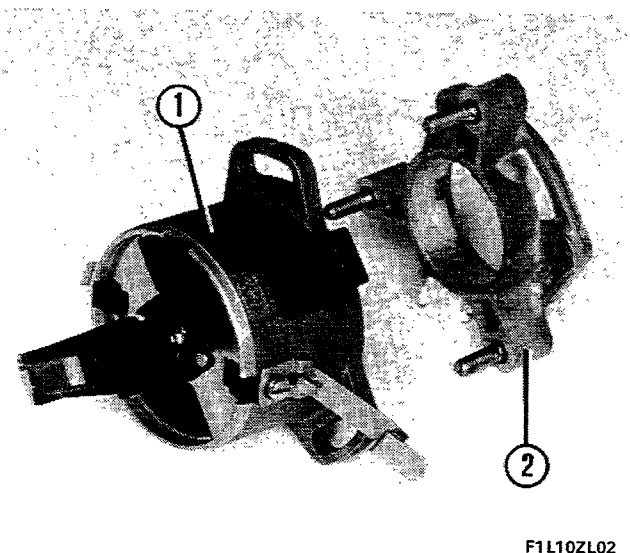


I.A.W. IGNITION-INJECTION SYSTEM

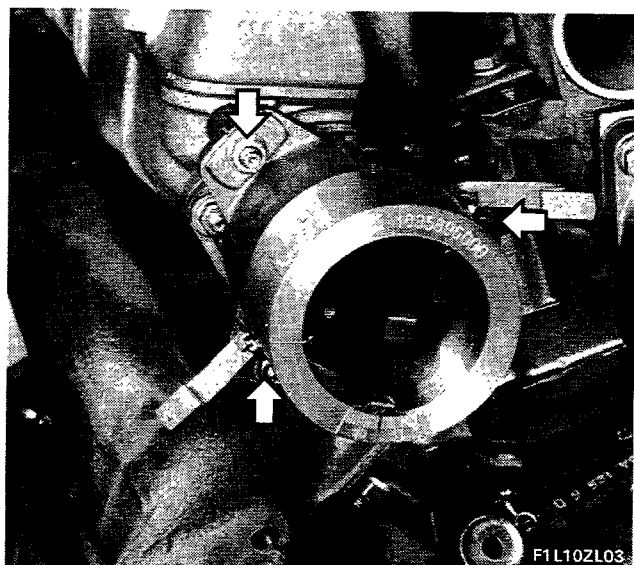


The WEBER-MARELLI integrated electronic intermittent, multipoint, low pressure ignition-injection system adopted on the DELTA HF 4WD and PRISMA HF 4WD is described in detail on section 10 in the Fuel System section.

Asymmetrically milled end (→) of timing shaft

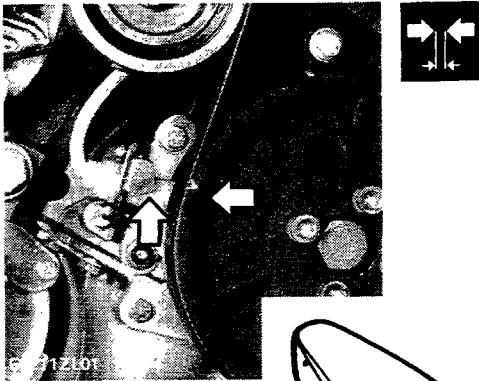


High tension distributor (1) with incorporated phase sensor and support (2) for attachment to cylinder head



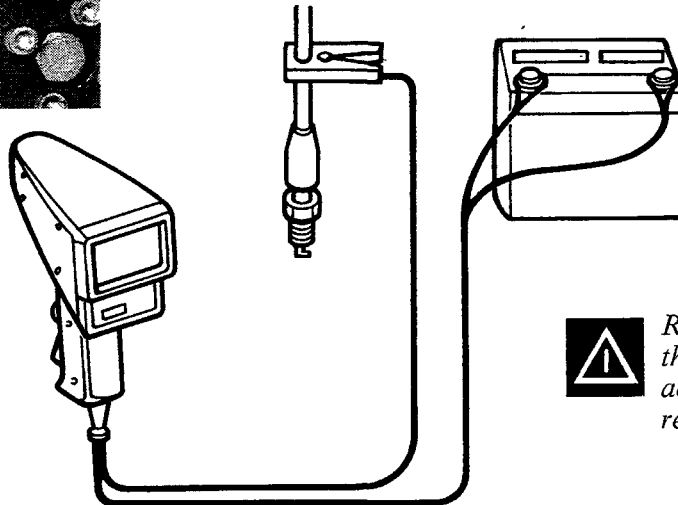
Timing adjustment

- Pistons 1 and 4 at T.D.C.
- Tool 1895896000 fitted to distributor: the rotary brush centre line must align with the central zero on the gauge. Otherwise turn the distributor in its seat until the reading is zero, then fully tighten the retaining bolts (→).



Checking ignition advance angles using stroboscopic lamp

PRISMA 4WD -	Idle speed: 8080-850 rpm
	Advance: $18^{\circ} \pm 2^{\circ}$
DELTA HF 4WD -	Idle speed: 800 - 850 rpm
	Advance: $15^{\circ} \pm 2^{\circ}$



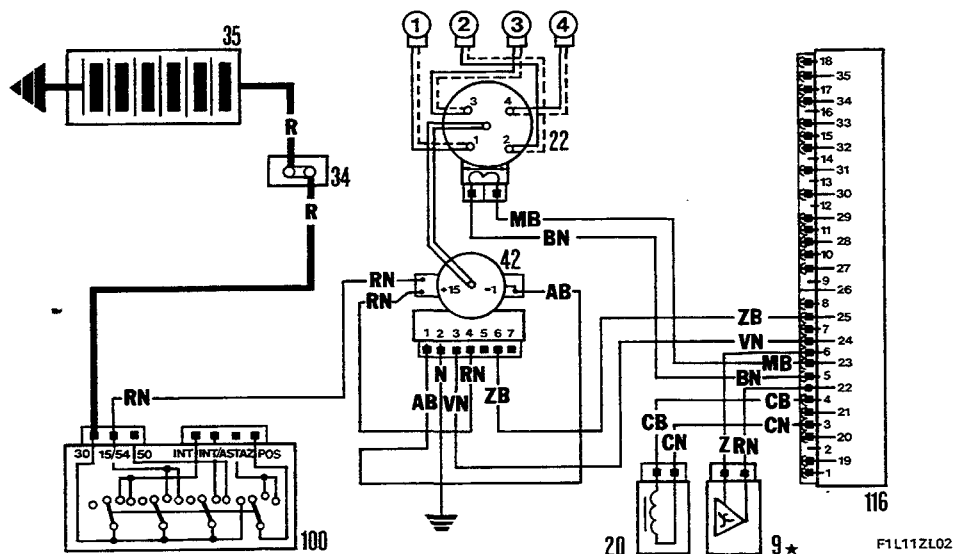
F1M19ZL03



Remove the plastic guard under the right front wheel arch to gain access to the engine advance reference marks.

NOTE The first cars manufactured had fixed references on the timing belt cover that cannot be seen through the relevant opening. On these cars it is therefore necessary to remove the bulkhead separating the engine compartment from the front right wheel arch in order to check the ignition advance.

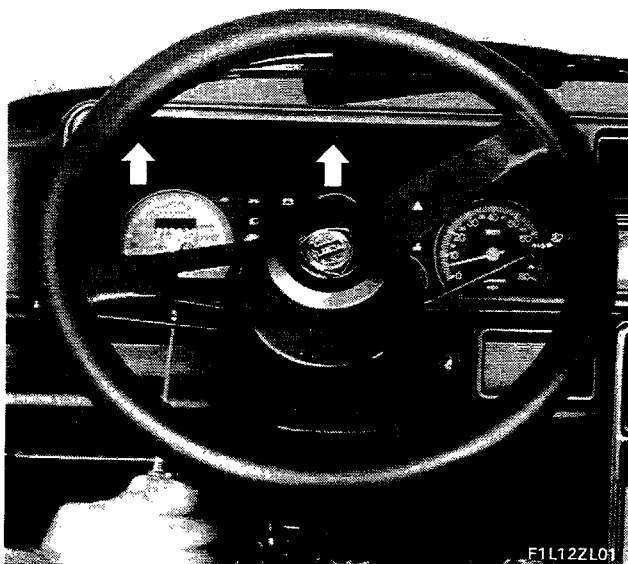
DIAGRAM SHOWING I.A.W. IGNITION SYSTEM COMPONENTS



- 9. Anti-knock sensor (only on DELTA HF 4WD)
- 20. Rpm and T.D.C. sensor
- 22. Ignition distributor with built-in phase sensor
- 34. Joint

- 35. Battery
- 42. Ignition coil
- 100. Ignition commutator
- 116. Electronic ignition injection control unit

55.



REMOVAL-REFITTING (DELTA HF 4WD)

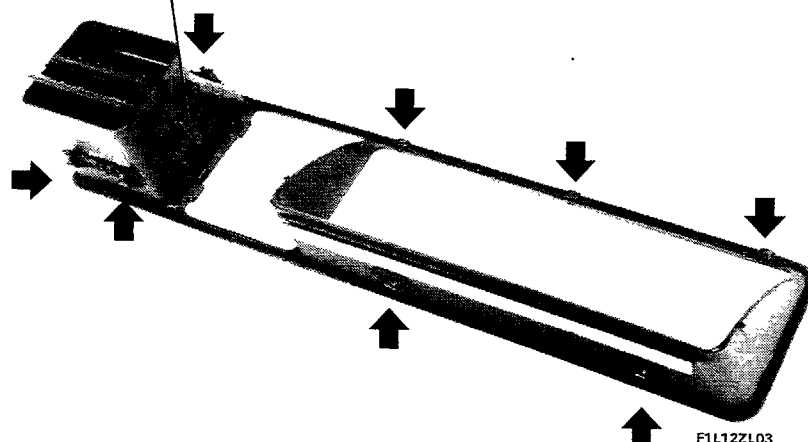
Removing-refitting control panel frame

- Bolts retaining (→) frame to facia.

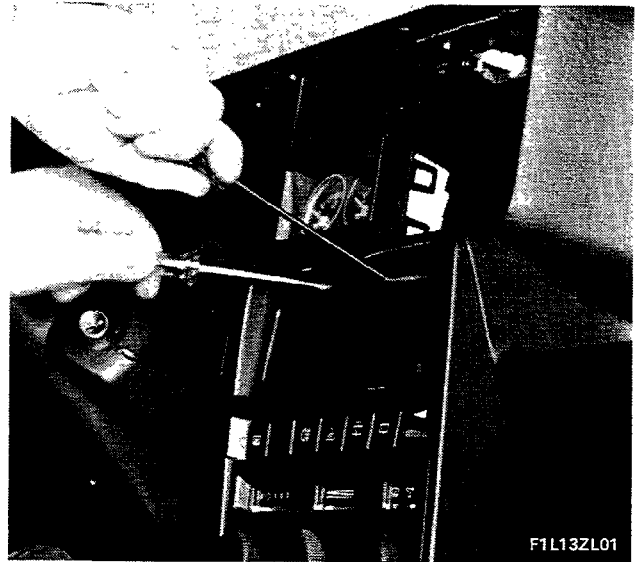


Removing frame from facia

- The frame is secured by flexible tabs (→), see photo below, to the facia.

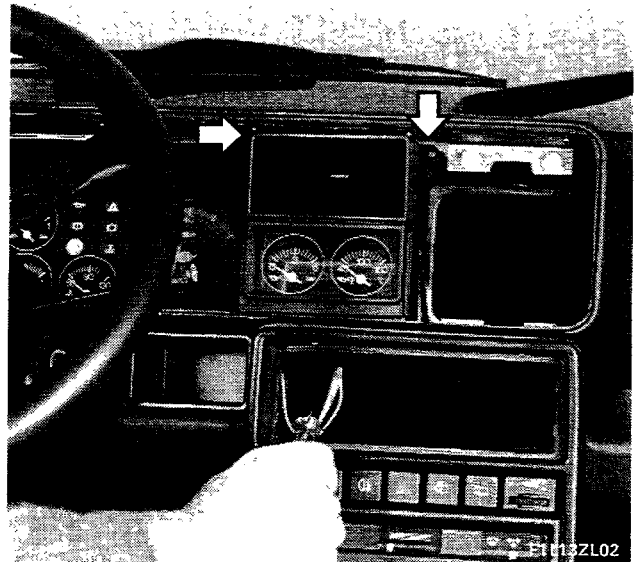


Rear of protective control panel frame



F1L13ZL01

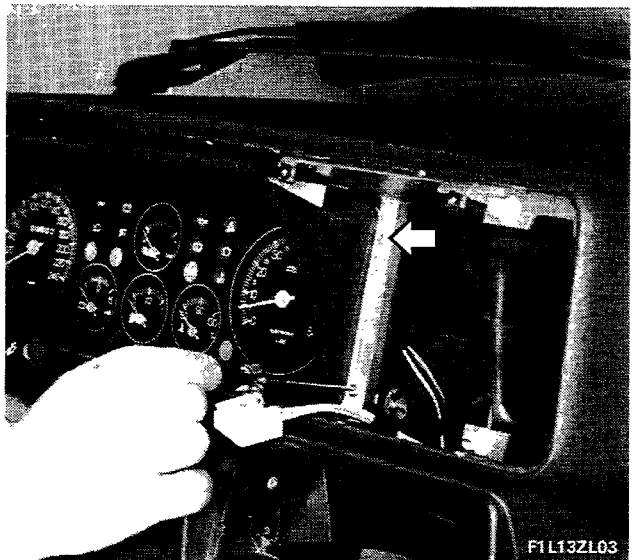
Removing radio compartment grille



Removing-refitting auxiliary control panel

(→) Bolts retaining auxiliary panel to fascia.

- Disconnect electrical connections and extract panel from its compartment.

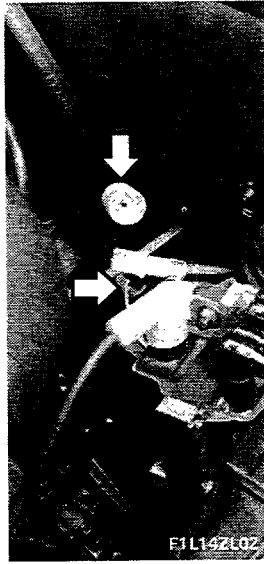
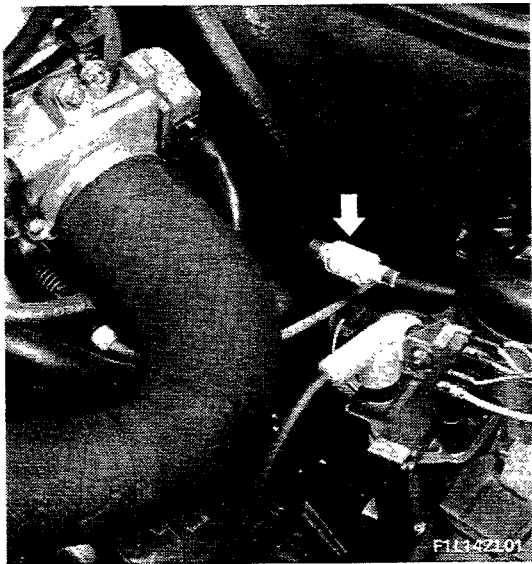


Removing-refitting control panel from fascia

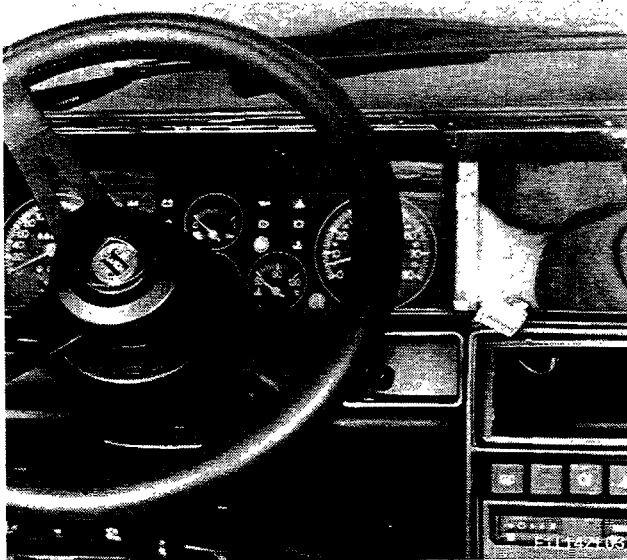
(→) Bolts retaining auxiliary panel to bodyshell

F1L13ZL03

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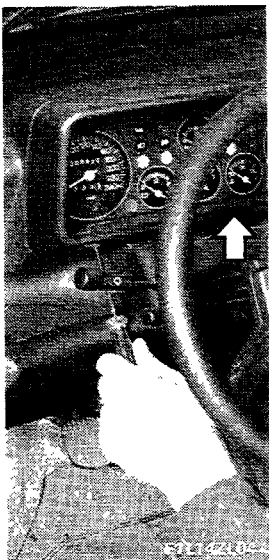


Disconnecting milometer cable in engine compartment (to facilitate removal of control panel from facia compartment)



Removing control panel from facia

- Disconnect milometer control cable (press-fit) from panel.
- Disconnect all electrical connections from panel.



REMOVAL-REFITTING (PRISMA 4WD)

Removing frame from facia

- Back off bolts retaining (→ Φ bottom end of frame to facia).

NOTE *The top side of the frame is secured with flexible tabs.*

Removing-refitting control module - Check system display and rear differential lock

(→) Bolts retaining panel to fascia.

- Disconnect electrical connectors from module.

NOTE *Connectors can only be fitted one way round.*

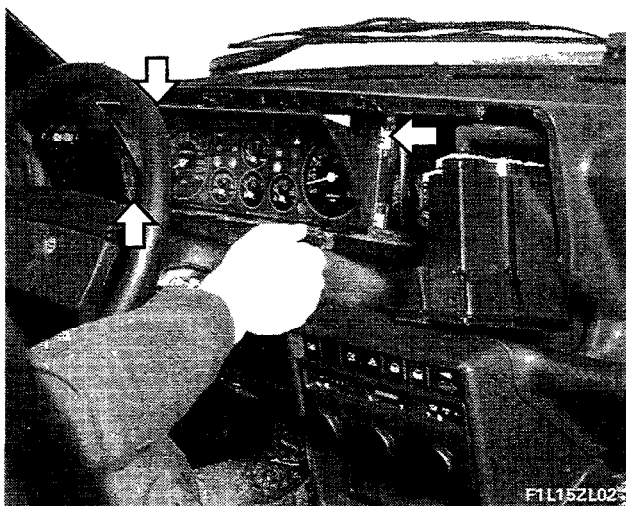
- Disconnect milometer control cable in engine compartment (see previous page, top illustration).

Removing-refitting control panel from fascia

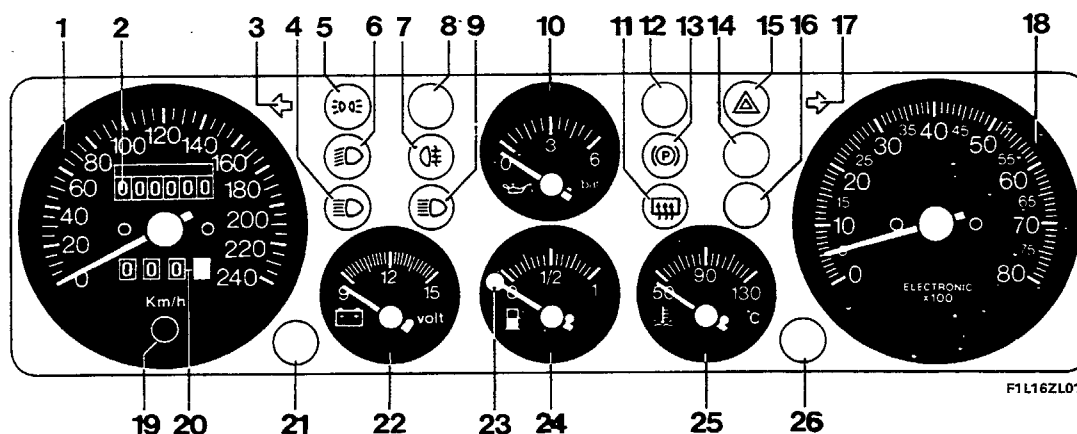
(→) Bolts retaining panel to fascia.

- Disconnect press-fit milometer control cable and electrical connectors from control panel.

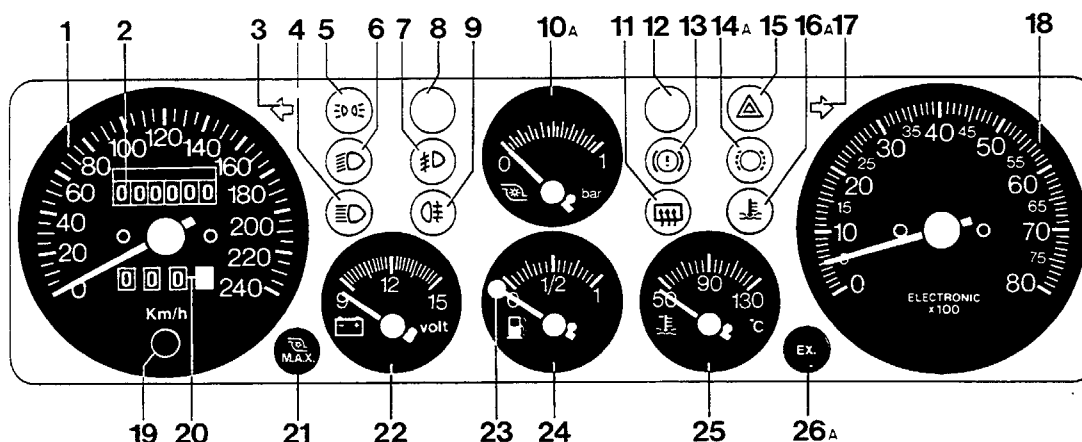
Removing control panel from fascia compartment



Control panel PRISMA 4WD



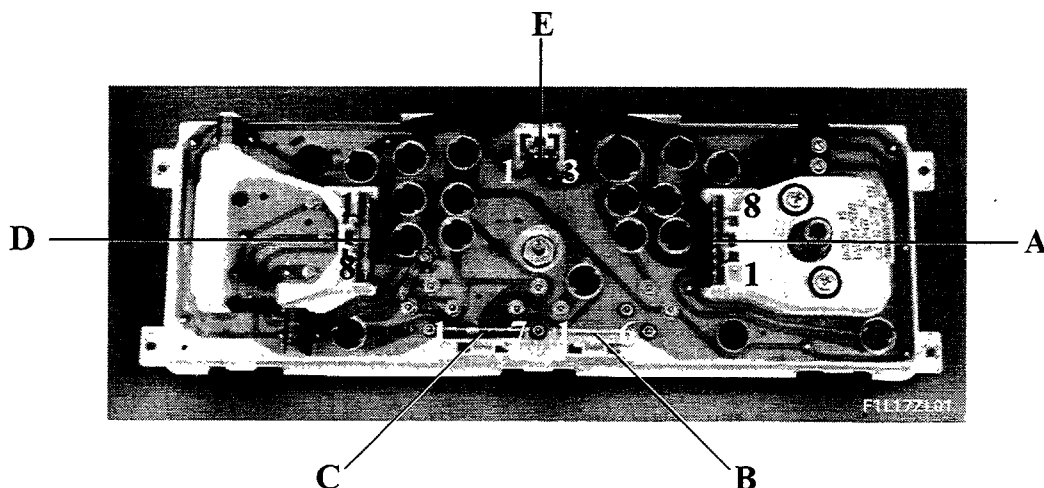
Control panel DELTA HF 4WD



Key

- | | |
|--|---|
| 1. Speedometer | 15. Hazard warning flasher warning light |
| 2. Milometer | 16. Spare (PRISMA 4WD) |
| 3. Left turn signal | 16A. Excessive coolant temperature warning light (DELTA HF 4WD) |
| 4. Main beam warning light | 17. Right turn signal |
| 5. Lights on warning light | 18. Rev counter |
| 6. Dipped beam warning light | 19. Trip counter reset button |
| 7. Fog lamp warning light | 20. Trip counter |
| 8. Check panel monitor light upon car start-up | 21. Maximum catalytic converter temperature warning light (certain markets) |
| 9. Rear fog lamp warning light | 22. Voltmeter |
| 10. Oil pressure gauge (PRISMA 4WD) | 23. Low fuel level warning light |
| 10A. Turbo boost gauge (DELTA HF 4WD) | 24. Fuel level gauge |
| 11. Heated rear window warning light | 25. Coolant temperature gauge |
| 12. Main Check Panel warning light | 26. Spare (PRISMA 4WD) |
| 13. Parking brake warning light | 26A. Overboost warning light (DELTA HF 4WD) |
| 14. Spare (PRISMA 4WD) | |
| 14A. Brake pad wear warning light (DELTA HF 4WD) | |

Rear control panel terminals for connection of car electrical system connectors



NOTE The blades and terminals are identified using the same numbers and letters adopted in the **WIRING DIAGRAMS**.

CONNECTOR A		
cable colour	N°	PARTS CONNECTED
N	1	General instrument earth to FRONT RIGHT body shell section
GN	2	Control panel lighting from UT terminal of dimmer
HR	3	Rear fog lamp warning light from blade 1 H of control box
MB	4	Fog lamp warning light from terminal 87 of control relay
VB	5	Main beam warning light from blade 7 I of control box (fuse 7)
HN	6	Dipped beam warning light from blade 2 C of control box (fuse 5)
G	7	Side light warning light from blade 2 of control box connector M (fuse 4)
AN	8	Right turn signal warning lights from connector A on steering column switch unit

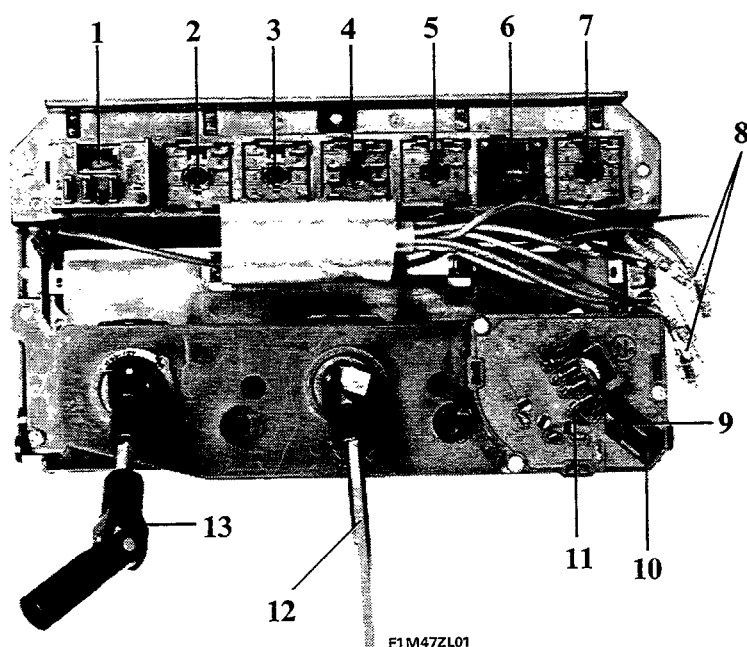
CONNECTOR B		
cable colour	N°	PARTS CONNECTED
MB	1	Low fuel level warning light to terminal 1 connector E of Check panel control module
HR	2	Maximum coolant temperature warning light from terminal 2 of Check Panel control module connector E
V	3	Green start-up monitor warning light from terminal 3 of Check Panel connector E through check socket
RV	4	+ green and red Check Panel warning lights from terminal 4 connector E of Check Panel control module through the check socket
RN	5	Red Check Panel warning light from terminal 5 connector E of Check Panel control module through the check socket
G	6	Check panel lighting supply outlet (to terminal 6, connector E of Check Panel module)

CONNECTOR C		
cable colours	N°	PARTS CONNECTED
HN	1	Spare (PRISMA 4WD) Over-boost warning light: from block no. 62 (over-boost solenoid) (DELTA HF 4WD)
AR	2	From coolant temperature sending unit
	3	Spare
BN	4	Heated rear window warning light from blade 9 connector I of control box (fuse 11)
R	5	+ instrument supply from blade 10 connector I of control box (fuse 1)
V	6	Fuel level warning light from sending unit via control box (2I and 2L)
M	7	Low fuel level warning light from sending unit via control box (3I and 3L)

CONNECTOR D		
cable colour	No.	PARTS CONNECTED
AB	1	Right turn signal warning light from blade 4 of connector C of control box
AR	2	Hazard warning flasher warning light from terminal L of hazard warning switch unit
	3	Spare
	4	Spare
HN	5	Excessive coolant temperature warning light from sending unit on engine
BR	6	Handbrake warning light from terminal L of control flasher
	7	Spare
AN	8	Rev counter signal from terminal 1 of ignition coil

CONNECTOR E: ALL THREE SPARE

55.



Rear view of auxiliary control console (PRISMA 4WD)

- 1-7. Auxiliary device control buttons.
- 8. Button symbol lighting bulbs.
- 9-10. Vacuum connection pipes to external air flap control.
- 11. Motor speed variation connector for fan and outside air intake flap opening actuator cam.
- 12. Shaft with two universal joints for control of blender flaps and coolant intake cock
- 13. Shaft with two universal joints for control of distribution flaps.

Removing-refitting pushbutton

Remove the pushbutton by inserting a screwdriver between the button and its seat on the console.

Connectors for connection between central console pushbuttons and devices (terminals are indicated from left to right and top to bottom)

1. Instrument light dimmer (white connector)

- Yellow-black cable to control panel (terminal 2 connector A)
- Yellow cable to a box lamp:
yellow cable from control box (terminal 6 connector I)
- Supply from INT terminal of ignition commutator (under fuse 4)
- Black cable from earth carrier, under right side of facia
black cable from door release control

2. Door release control (green connector)

- Black cable, to earth loom, under right side of facia via instrument light dimmer
- white-dark blue cable to terminal 2 of door lock control unit through a multiple connector and branch of the door lock system

3. Door lock control button (dark blue connector)

- Black cable to box light switch
- Dark blue-white cable to terminal 3 of door lock control unit passing through a multiple connector and a branch of the door lock system

5. Rear fog lamp switch (red connector)

- Grey-red cable to control box: enters (1-C); exits (1-I) for warning light of control panel (3-A) and (9-D) for Check Panel module. Goes from inside the module to the lights via the control unit
- Grey-black cable from control box (2-C). Supply under fuse no. 5

4. Hazard warning light switch (white connector)

- Spare
- B. Red cable from control box (terminal 7 connector M). Direct emergency supply (fuse 13)
- C. Red-black cable to + terminal of flasher unit (hazard warning)
- D. red-green cable from control box (3-M). Turn signal supply (fuse 1) below key
- E. Light blue-white cable to turn signal via control box: input (4-C); output (7-A), (2-A). Hazard warning light on control panel (1a-d) also comes from 4-C.
- F. White cable to steering column switch unit connector (turn signal stalk)
- H. Light blue-black cable to turn signal via control box: enters (3-C); exits (3-F), (6-A). Turn signal warning light of control panel (8-A) also comes from 3-C

6. Provision for fog lamps

- Black cable for connection to earth loom under right side of facia (via turn signal - hazard warning flasher terminal)
- White-red cable to terminal 86 of fog lamp relay for relay activation

7. Heated rear screen pushbutton

- Black cable to earth loom under right side of facia
- Black-purple cable to control box (6-H). Activation of control unit heated rear screen relay

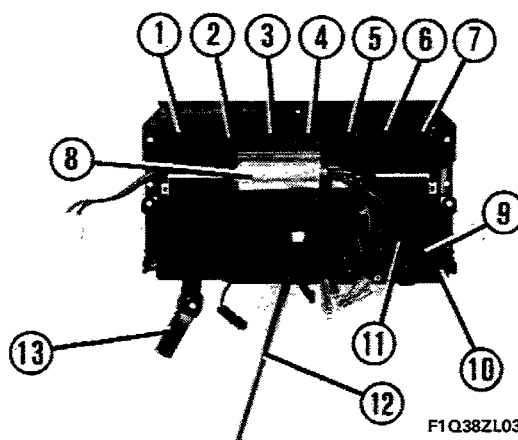
11. Interior fan speed control switch

- Black cable to earth loom under right side of facia
- Grey cable from fan resistor (1st speed)
- Red cable from fan resistor (2nd speed)
- Brown cable from fan resistor

NOTE Behind the console there is a 3-way connector for checking Check Panel efficiency at the end of the production line (not used during service).

MODEL DELTA HF 4WD VARIANTS

1. Instrument light dimmer
2. Rear wiper switch
3. Rear wash/wipe intermittent switch
- 4.....13 As for mod. PRISMA 4WD



1. Instrument light dimmer

- Black cable to earth loom under facia on right hand side
- Yellow supply cable from ignition cable INT across steering column side light control (protected by fuse 4) and blade 6 of connector I of control box: supply to box lamp (yellow cable)
- Yellow-black supply cable regulated in intensity at control panel from terminal 2, connector A of control box

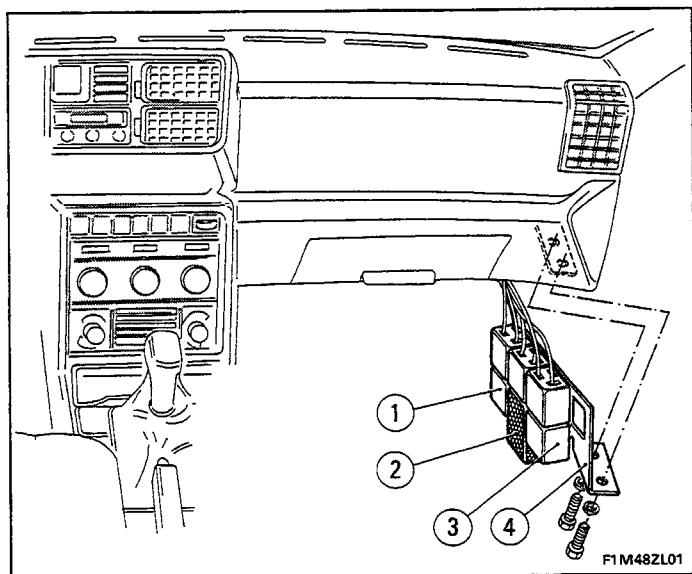
2. Rear wiper switch

- Yellow-black cable supply from fuse no. 2 under INT/A key from blade 2, connector G of control box
- Connection (green cable) to windscreen wiper motor for normal operation via multiple connector
- To rear wash/wipe intermittent switch via a red-green cable

3. Rear window wash/wipe intermittent switch

- E - Red cable: to rear wiper motor via a multiple connector
- F - Red-green cable: to rear washer pump motor via multiple connector
- B - Red cable for supply of electric motors from control box (5.H) protected by fuse no. 2 (under key)
- C - Red-green cable: to rear wiper switch (switch supply)
- D - Grey-black cable: to rear wiper motor via multiple connector

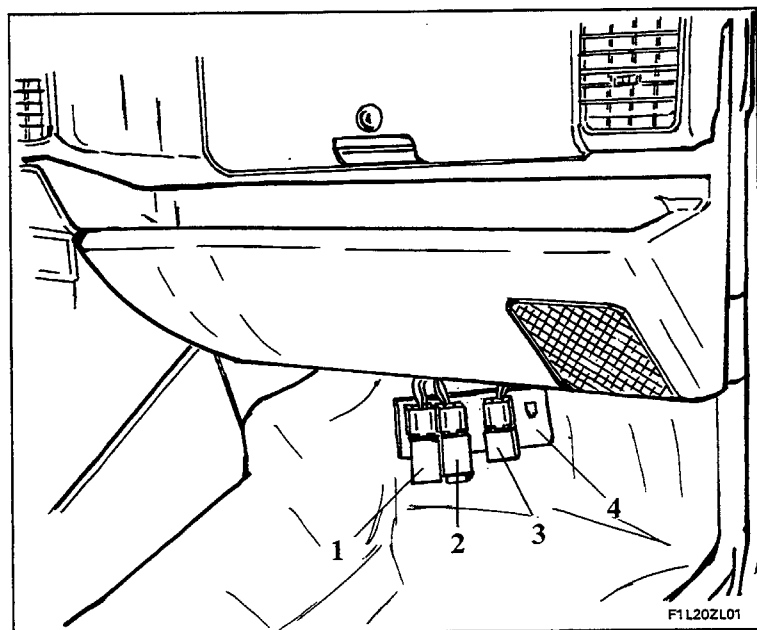
55.



LOCATION OF AUXILIARY DEVICES
(PRISMA 4WD)

Key

- | | |
|---|----------------------------------|
| 1. Hot wire device for ignition switch slot light delay | 3. Supplementary high beam relay |
| 2. Turn signal-hazard warning light flasher unit | 4. Bracket |



LOCATION OF AUXILIARY DEVICES
(DELTA HF 4WD)

Key

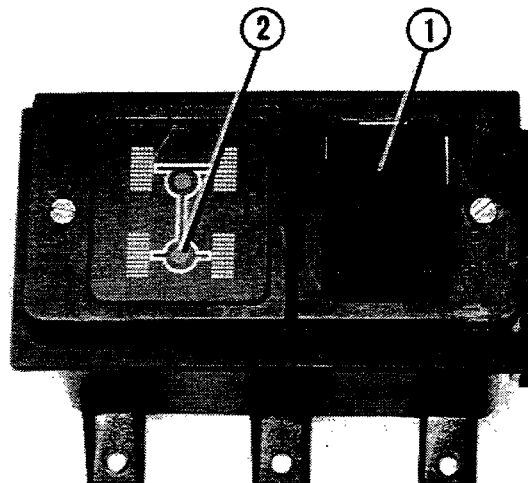
- | | |
|--|-------------------------|
| 1. Turn signal-hazard warning flasher unit | 3. Main beam relay |
| 2. Fog lamp relay | 4. Device carrier plate |

REAR DIFFERENTIAL VACUUM LOCK

NOTE *This device cuts out the rear differential so that the two rear wheels are integral. This is used only in certain critical driving conditions when the ground is very slippery or bumpy.*

Front view of differential lock controls and warning light

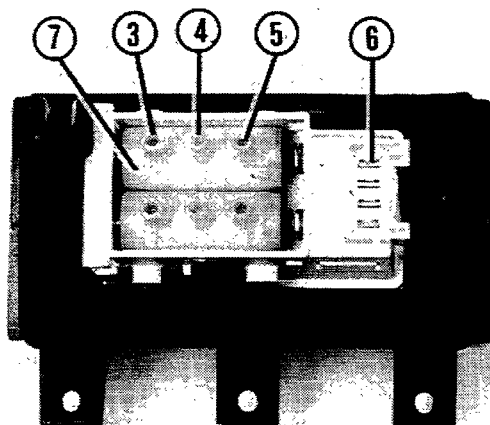
1. Rear differential lock control button
2. Rear differential lock sleeve engagement warning light



F1 L21ZL01

Rear view of rear differential lock control and warning light

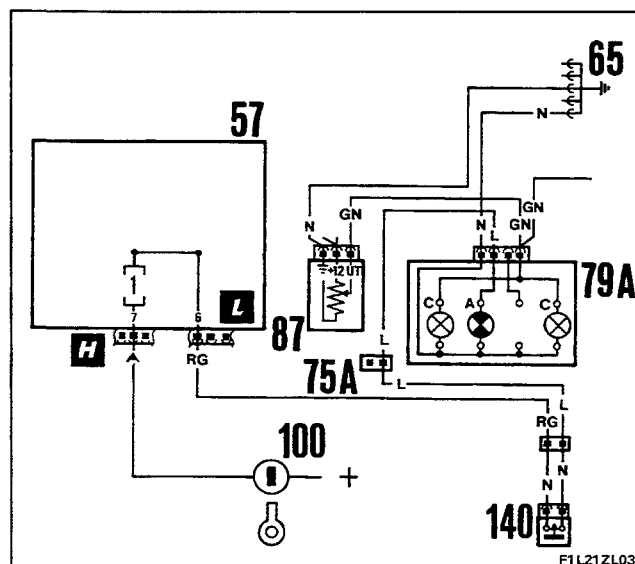
3. Piping (yellow) connected to one end of pneumatic differential lock actuator
4. Piping (red) connected to vacuum tank
5. Piping (yellow) connected to other side of actuator
6. Warning light and symbol illumination connection
7. Distributor casing (atmospheric pressure and vacuum)



F1 L21ZL02

Rear differential lock symbol and warning light electrical lighting circuit

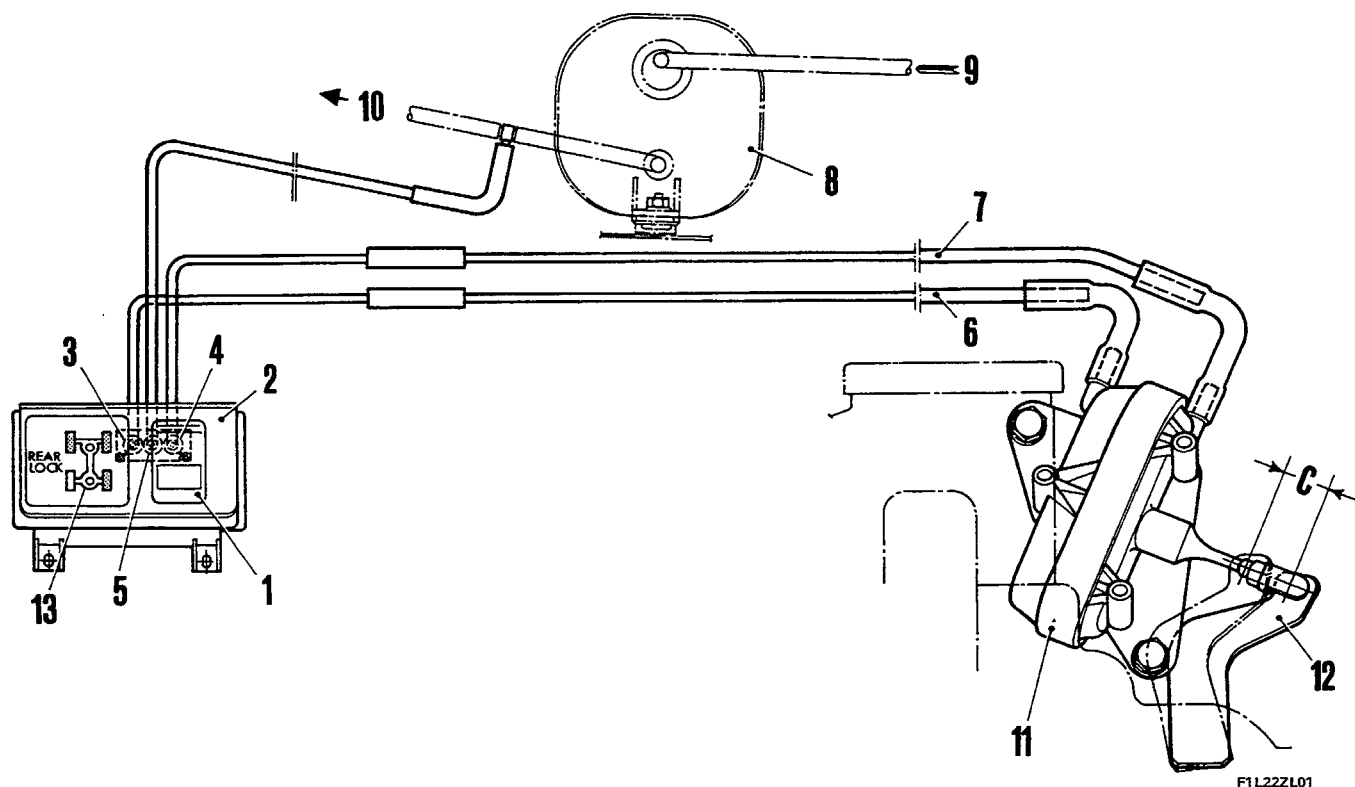
57. Control box and fuse holder
65. Earth loom under facia on right hand side
- 75A. Connection
- 79A. Control instruments and rear differential engaged warning light
87. Control panel lighting warning light
100. Ignition control switch
140. Rear differential lock switch (on rear differential)



F1 L21ZL03

55.

REAR DIFFERENTIAL LOCK CONTROL AND WARNING LIGHT



- | | |
|---|--|
| 1. Control button | 7. Actuator connection pipe |
| 2. Instrument | 8. Vacuum tank |
| 3. Socket for connection of distributor to actuator | 9. From inlet manifold |
| 4. Socket for connection of distributor to actuator | 10. To interior air intake flap |
| 5. Socket for connection of distributor to inlet manifold | 11. Actuator and rear differential lock engagement diaphragm |
| 6. Actuator connection pipe | 12. Rear differential lock sleeve control lever |

OPERATION

When device button (1) is pressed, a distribution system within the instrument (2) moves to open up communication with passage (5) - connected permanently to engine intake manifold vacuum - alternatively passages (3) or (4) and, at the same time, to bring the passage cut off by the connection into contact with the atmosphere.

Two connection pipes (6) and (7) between passages (3) and (4) of the distributor and the two opposite sides of a diaphragm actuator - located in the rear differential - are used to transmit the vacuum to one side of the diaphragm and atmospheric pressure to the other. The force set up due to the different pressures acting on the diaphragm pushes the diaphragm, lever and toothed differential lock engagement sleeve (12) until engagement takes place.

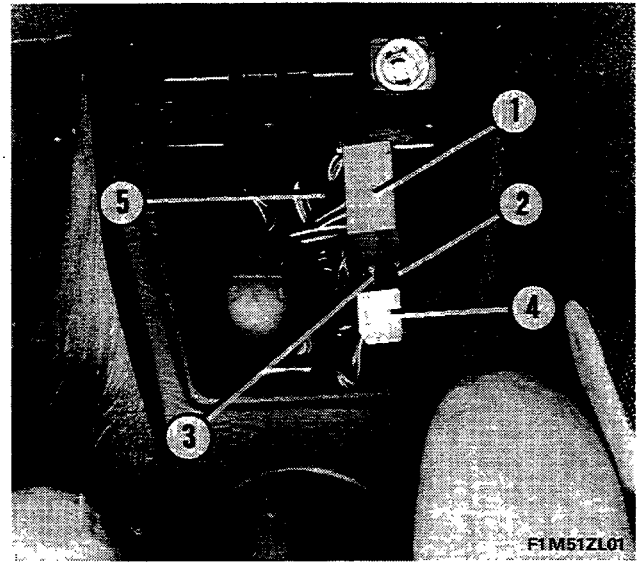
When the differential is engaged, a switch on the differential closes. This causes the differential lock warning light (13) to come on.



The differential lock should never be engaged on tarmac roads or at high speed because it does not allow the car to corner.

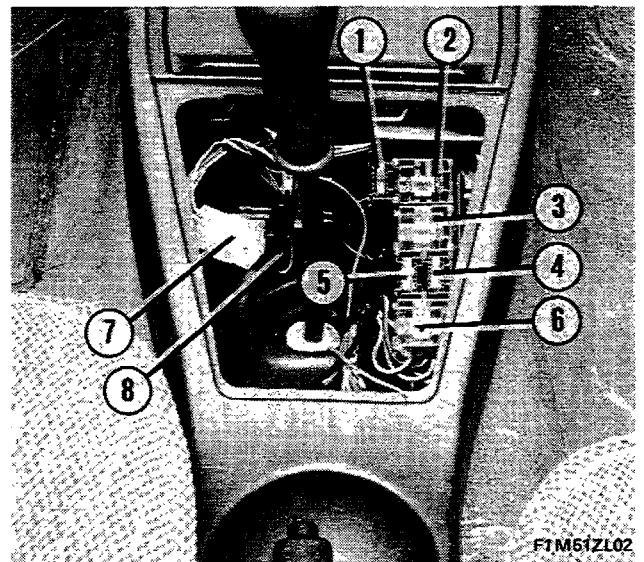
LOCATION OF POWER WINDOW AND DOOR LOCK CONTROL AND FUSES (PRISMA 4WD)

1. Door lock control unit
2. Rear power window reduction unit fuse
3. Front power window reduction unit fuse
4. Power window motor relay
5. Connector



The **unlocked power supply** reaches the + terminal of the door lock control unit (3) directly from the battery through the junction and fuse (1).

Locked power reaches the relay of power windows (6), terminal 86 pink lead, from INT/A terminal of ignition switch.



Location of control unit mount, relay and fuses

Key (last photo)

1. Electric door lock control unit fuse
2. Green mount for door lock control unit
3. Red mount for door lock control unit
4. Rear power window reduction unit fuse
5. Front power window reduction unit fuse
6. Red mount for power window motor relay
- 7-8. Multiple connectors

55.

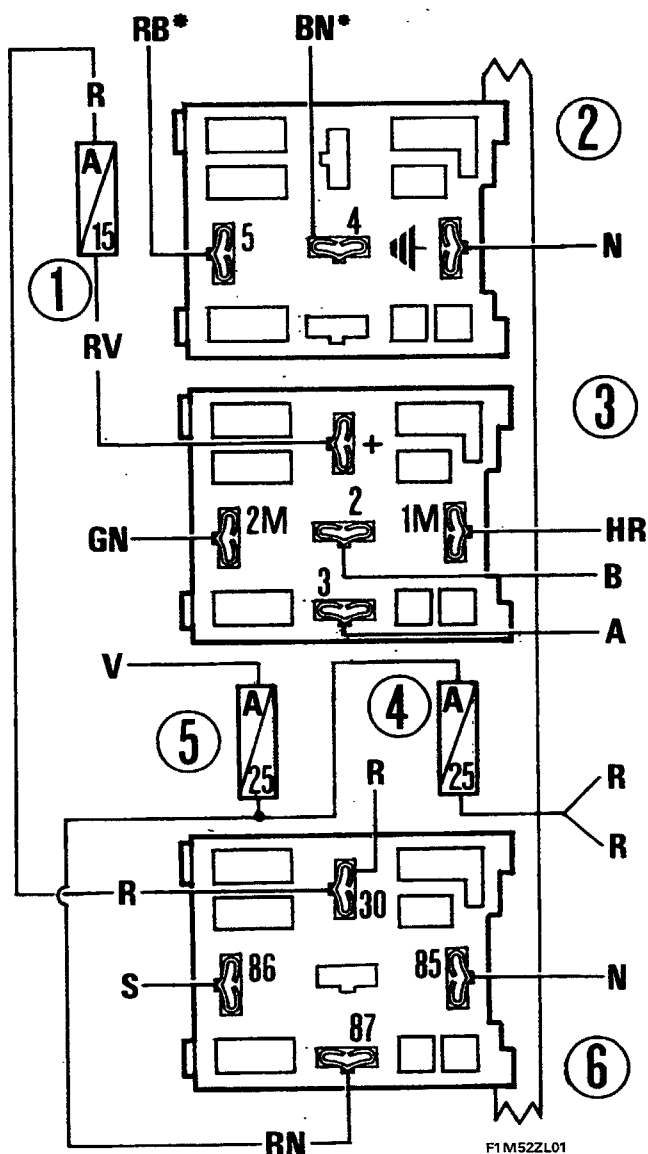
Vehicle electrical system socket cable connection

Key - see bottom photo on previous page
(PRISMA 4WD)

Socket n° 2 - (green) - for central locking control unit		
N°	Cable color	CABLE CONNECTION
5	RB	Wiring for boot lid geosed motor
4	BN	Wiring for fuel filler flap geosed motor
	N	To the right side under dashboard earth cable loom

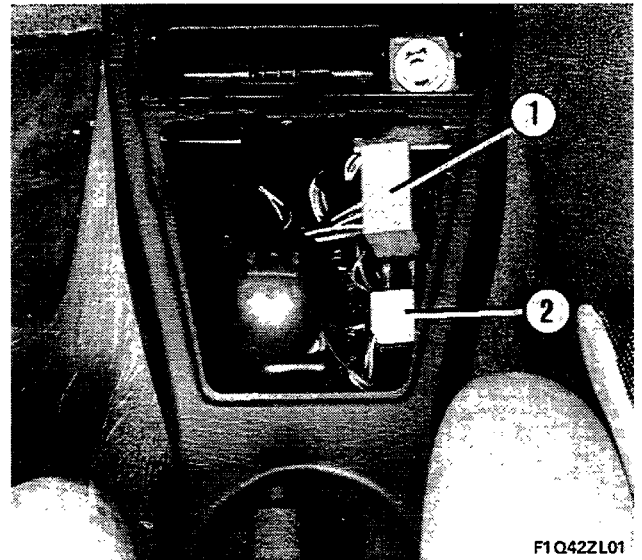
Socket n° 2 - (green) - for central locking control unit		
N°	Cable color	CABLE CONNECTION
+	RV	Central locking supply (via connector block) through socket (6) and fase (1)
1M	HR	To the front and rear door geared motors for rotation in clockwise direction (through a multiple fastening for the various terminals located nearby.
2M	GN	To the front and rear door geared motor for rotation in an anti-clockwise direction (via a multiple fastening for the various terminals located nearby.
2	B	To the end of travel microswitches for the electric front window geared motors for maintenance without rotating the motors
3	A	To the end of travel microswitches for the electric front windows for reversal without rotating the motors

Socket n° 6 - (red) - for electric windows relay		
N°	Cable color	CABLE CONNECTION
30	R	Supply from electrical system connector block
	R	Central locking control unit direct supply via fuse (1)
87	RN	Supply for electric front window motor, via protective fuse (5) and for rear windows via fuse (4)
85	N	To earth
86	S	INT/A terminal of ignition switch, supply. Coming from



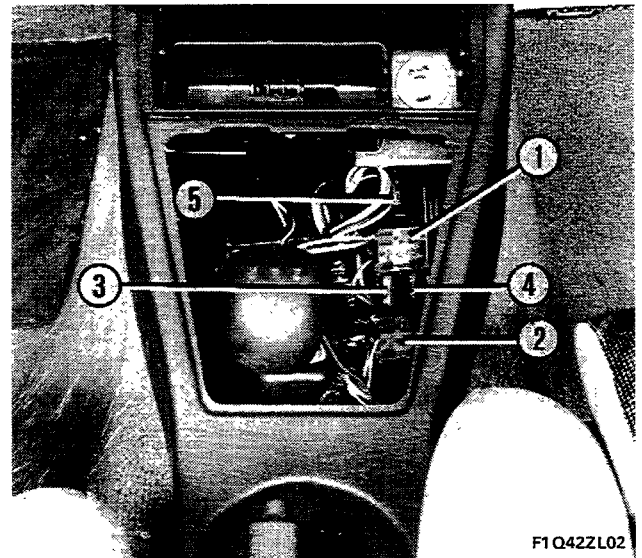
LOCATION OF POWER WINDOW AND DOOR LOCK CONTROL UNIT AND FUSES (DELTA HF 4WD)

1. Door lock control unit
2. Front power window supply relay

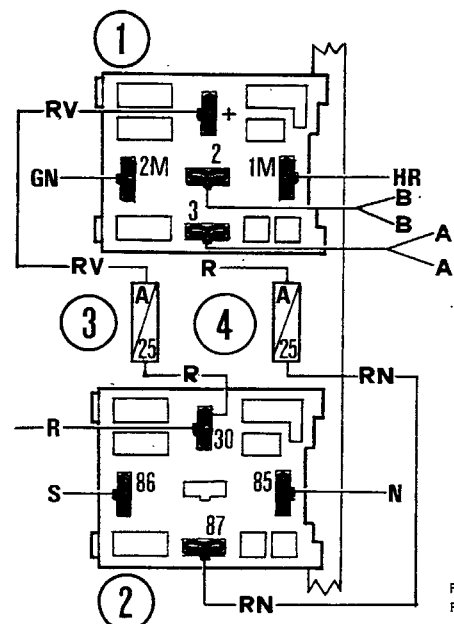


F1Q42ZL01

1. Door lock control unit mount
2. Front power window relay mount
3. Door lock control unit supply fuse
4. Front power window reduction unit fuse
5. Door lock control unit earth lead



F1Q42ZL02



F1Q42ZL03
F1Q42ZL04

Relay and door lock control unit mounts with fuses

55.

Connection of mount cables to car electrical system (DELTA HF 4WD)

Mount no. 1 for door lock control unit		
Terminal no.	Cable colour	DESCRIPTION
+	RV	Door lock control unit supply from fuse (3) through terminal 30 of power window supply relay
1M	HR	To front and rear door lock reduction units by clockwise rotation (via multiple clips)
2M	GN	To front and rear door lock reduction units by anticlockwise rotation (via multiple clips)
2	B	To front door reduction unit end stop microswitches to maintain motor rotation direction
3	A	To front door reduction unit end stop microswitches to reverse motor rotation direction

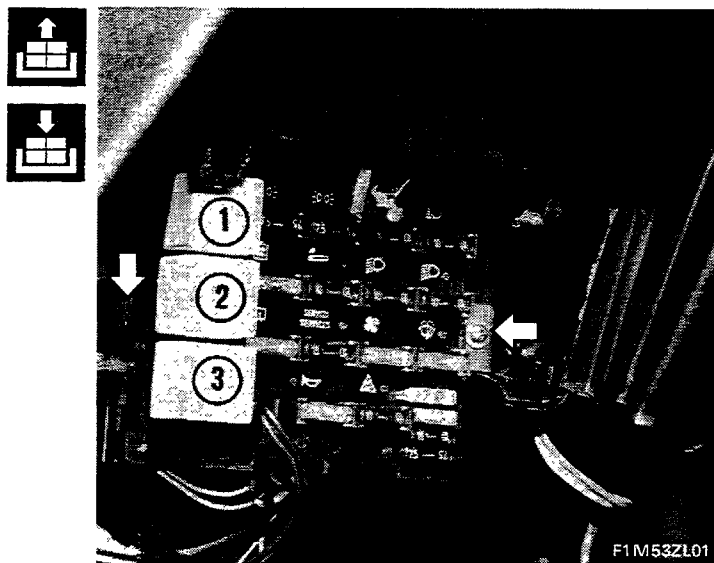
Mount no. 2 for front power window relay		
Terminal no.	Cable colour	DESCRIPTION
30	R	Direct supply cable from battery junction
	R	Door lock control unit supply
87	RN	Supply for front power window motors via fuse (4) and power window switches
85	N	Earth cable
86	S	Power window relay excitation supply from INT/A terminal of ignition switch

CONTROL BOX

1. Horn control relay
2. Heated rear window relay
3. Car interior fan relay

Removing-refitting control box from facia

- Back off bolts retaining (→) unit to facia.



F1M53ZL01

Rear view of control unit with shape of terminals for connection to car electrical system

The control box contains all electrical system fuses, with symbols showing main function protected.

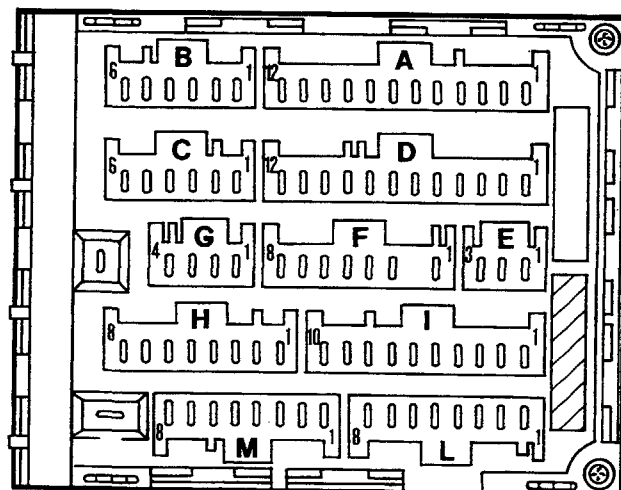
It is also equipped with connections for insertion of some relays.

Internally it consists of a flexible support for connection of the various wires.



It is impossible to mistake one connector for another as they all have their own special shape.

Connector identification letters are as adopted in the wiring diagrams.

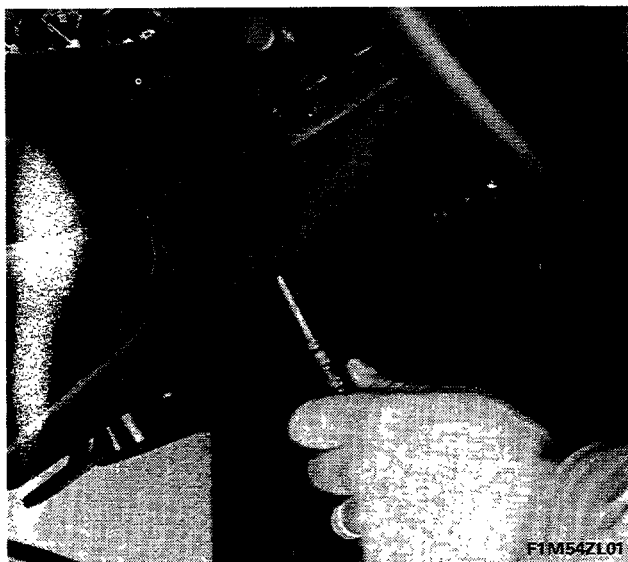


F1M53ZL02

Classification of connection unit connectors with cable colours

	1	2	3	4	5	6	7	8	9	10	11	12
A	GV	HR	VN	GR	RV	AN	AB	RN	GN	SN	MB	G
B	H	AB	Z	A	-	V						
C	HR	HN-HN	AN-AN	AB-AB	G	BN						
D	RV	RN	V	-	A	-	HR	MB	H	HG	VG	-
E	BR	GR	GR									
F	GN	-	AN-AN	-	HN	R	-	VN				
G	-	GN-GN	V	H								
H	RA	M	RV	-	R-S	NZ	A	C				
I	HR	V	M	R	-	G-G	VB	RN	BN	R-R		
L	-	V	M	R	-	-	SN	N				
M	-	G	RN	H-H	-	GN	R	S				
Q	R											

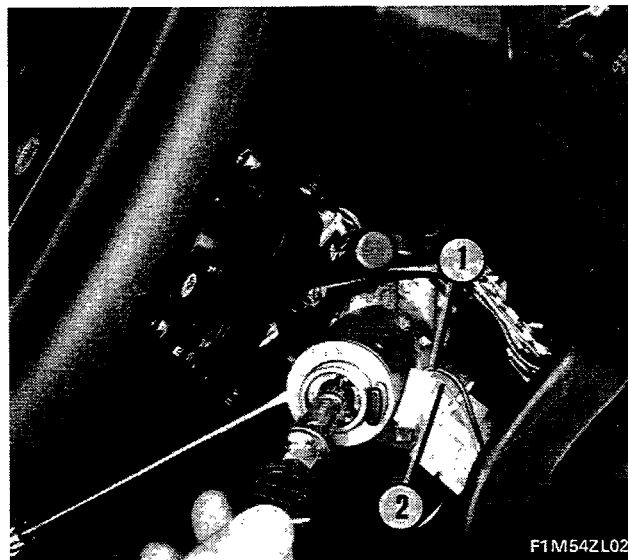
55.



IGNITION SWITCH

Removing-refitting top steering control shaft guards

Back off the five bolts fastening the bottom of the guard to the steering column.

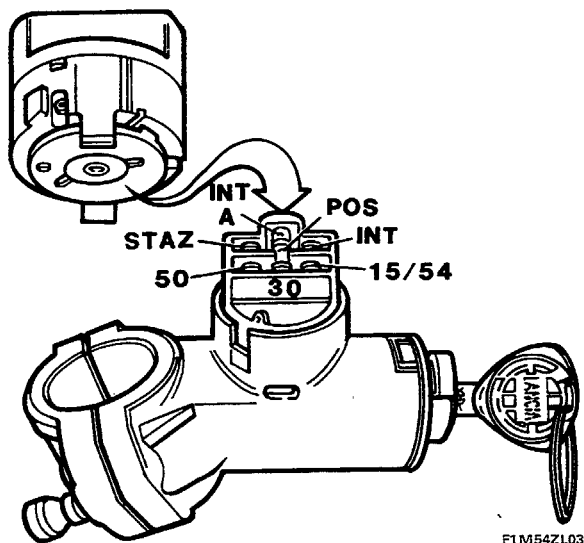


Ignition switch bulb supply cable

1. Black cable to earth loom under facia on right side, via radio connector
2. Red-green supply cable to ignition switch light from ignition switch light delay

Replacement of block with ignition key

Turn key to running position. Press relevant groove with screwdriver and simultaneously extract key and block.



Replacement of ignition switch electrical contacts

With key in "STOP" position, withdraw the two switch connectors.

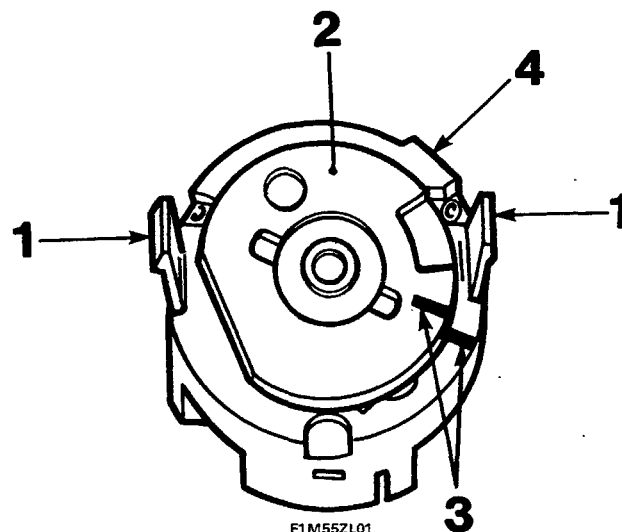
Turn the key to "MAR" position.

Using a screwdriver, push fins (1) inward and simultaneously withdraw switch from housing (see following illustration).

Position cam (2) of new switch so that reference notches (3) are aligned.

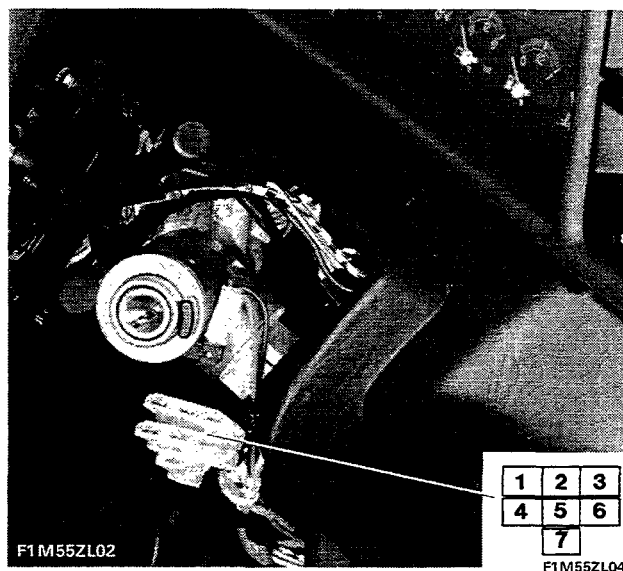
Insert switch into seat on steering lock until fins lock in grooves. Reference tooth (4) will ensure correct positioning.

Turn key to "STOP" position and connect the two connectors previously removed.



Cables connecting ignition switch to car electrical system

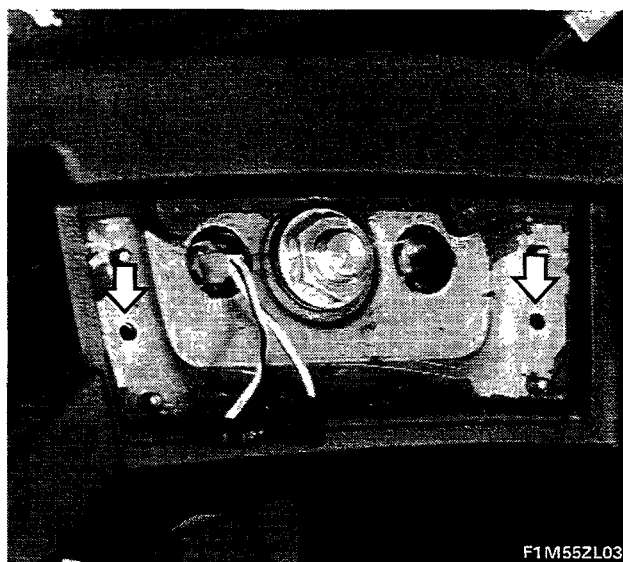
Term.	No.	Cable colour	CABLE CONNECTION
15/54	1	RN	To terminal +15 of ignition coil
30	2	RN	To cut-off control module (1300)
		R	To terminal 50 of starter motor
INT	4	A	To steering column connector for main-dipped beam switch
POS	5	GN	To control box (terminal 6 - connector M) supplying fuses nos. 3-4
STAZ	6	G	To side light switch steering column connector
INT/A	7	S	To control box (connector M - terminal 8) for car interior fan relay, screen wipers, headlamp wipers, heated rear screen (switch discharge)
		SN	To amendment 04 device fuse
		S	To connector for power windows, door lock and air conditioner



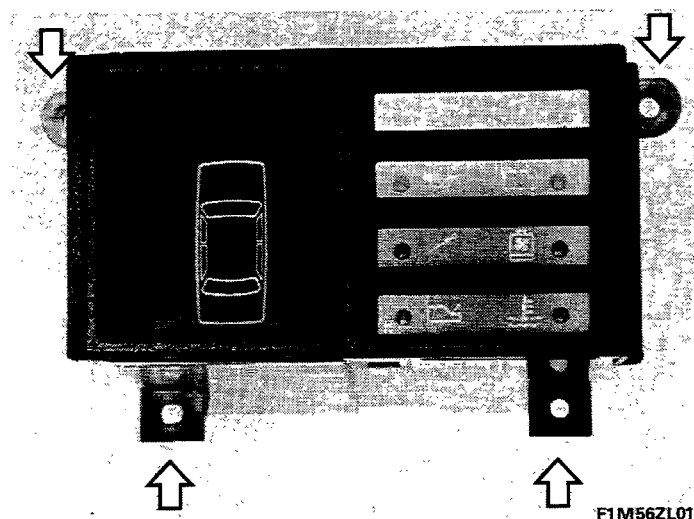
Removing-refitting steering wheel

Back off the 2 steering wheel cover retaining bolts from below (→).

Back off the steering wheel retaining nut and pull this off the steering column.



55.

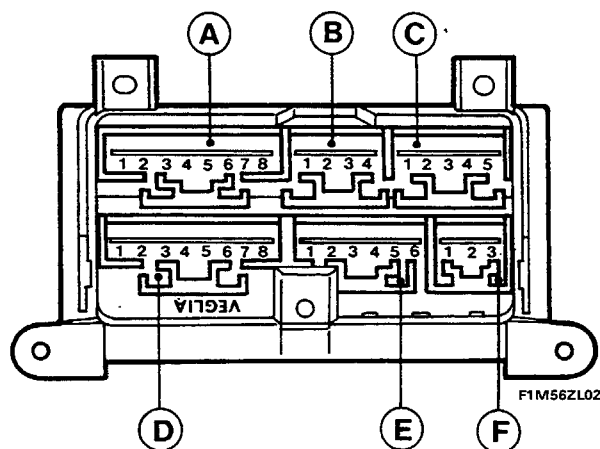


CAR OPERATION MONITORING DEVICE (CHECK PANEL)

Car operation monitoring check and display unit (Check Panel)

See page 41 for removal-refitting operations.

(→) Bolts retaining Check Panel module to fascia



A-B-C-D-E-F. Terminals for connection to various functions monitored.

Back of Check Panel with connection terminals

TERMINAL BLOCK A		
Cable colour	No.	CABLE CONNECTION
HR	1	To left fog lamp bulb via control box 7D-2A
MB	2	To right fog lamp bulb via control box 8D-11A
RN	3	To left stop light bulb via control box 2D-8A
RV	4	To right stop light bulb via control box 1D-5A (may be exchanged for 3)
AR	5	From stop light switch working contacts
H	6	To rear fog lamp light switch and control panel warning light via control box 9D-1C-1I
VG	7	Supply of side lights from fuse no. 3 (under POS ignition switch) from 11-D on control box (also number plate and cigarette lighter light)
HG	8	Supply of side lights from fuse no. 4 (under POS) from 10-D of control box (also digital clock display, dimmer, luggage compartment light and control panel lighting)

TERMINAL BLOCK B		
Cable colour	No.	CABLE CONNECTION
BR	1	To right front side light
V	2	To left rear side light via control unit 3D-4A (may be exchanged with no. 4)
GN	3	To left front side light
A	4	To right rear side light via control unit 5D-9A (may be exchanged with no. 2)

TERMINAL BLOCK C		
Cable colour	No.	CABLE CONNECTION
R	1	From switch resting contacts
BN	2	To right front door button (via front door transverse cable connectors)
BR	3	To left rear door button (via door lock connector)
VB	4	To left front door button (via front door transverse cable connector)
CB	5	To right rear door button (via power window connector, door lock)

TERMINAL BLOCK D Various devices		
Cable colour	No.	CABLE CONNECTION
N	1	To right front earth loom
	2	Spare
VN	3	To coolant level sensor located in expansion tank
BN	4	Battery charge warning light from +D generator
HV	5	Low oil pressure warning light from associated switch
R	6	+ from INT terminal of ignition switch via fuse no. 1 of control box &h-6F for battery charging warning light
HG	7	To engine oil level sensor
HR	8	To engine oil level sensor

TERMINAL BLOCK E		
Cable colour	No.	CABLE CONNECTION
MB	1	Low fuel level warning light from blade 1. terminal B of control panel
HR	2	Maximum coolant temperature warning light from blade 2, terminal B of control panel
V	3	To check socket, then to blade 3, terminal B of panel for general Check Panel start-up signal
RV	4	To Check Panel check socket, then to blade 4, terminal B of panel for supply of GREEN and RED Check Panel warning lights
RN	5	To Check Panel check socket, then to blade 5, terminal B of Check Panel general FAILURE warning light
G	2	To blade 6, terminal D of panel for lighting

TERMINAL BLOCK F To sensors		
Cable colour	No.	CABLE CONNECTION
S	1	To brake fluid level sensor
SN	2	To left front brake lining wear sensor
VG	3	To right front brake lining wear sensor

MULTIPLE SUPPLY CABLES		
Cable colour	No.	CABLE CONNECTION
RN	1	Supply from fuse 12, not locked, via blade 8, of connector I of control box and courtesy light transverse cable bundle connector
G	2	Supply from fuse 4 (locked, POS terminal) from blade 6, of connector I of control box
N	3	General earth to left front earth loom
	4	Supply from fuse 1 (locked, INT terminal) via blade 4, of connector M of control box

Composition

This system for checking the operation of several important electrical circuits and various car functions (oil level, brake fluid etc.) comprises:

- An electronic CONTROL UNIT incorporating a light circuit check module and a check monitor that memorises and displays faults;
- A general GREEN warning light and a RED light located in a prominent position on the control panel;
- a system of connecting cables joining car circuits to be checked and the control unit;
- some N.C. sensors i.e. with contacts normally closed during correct operation of monitored service and other N.O. sensors, i.e. normally open, with contacts normally open during correct operation of monitored service.

Characteristics of check panel

This multifunctional electronic device checks the functions listed below as follows:

Checks with engine off (ignition key in MARCIA position)

- low oil level. If the level is too low, the fault is memorised so that it can be displayed when the engine is started up;
- low coolant level. If the level is too low, the fault is memorised so that it can be displayed when the engine is started up.

55.

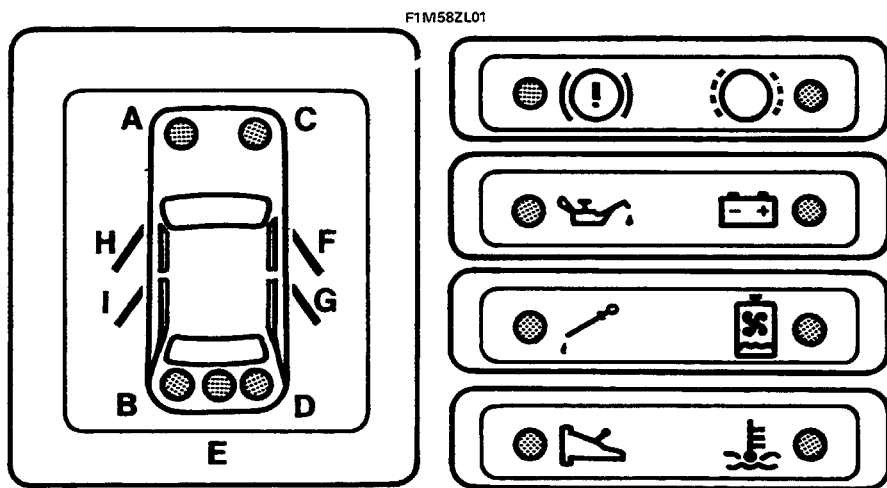
- low oil pressure;
- alternator is not providing sufficient current (failure).

Checks run with engine off and running:

- brake fluid level;
- excessive coolant temperature;
- excessive automatic transmission fluid temperature (for cars with this feature);
- wear (maximum) of front brake linings.

The device also checks the following services if activated (with ignition key in MARCIA position or with engine running):

- side lights (side light switch on);
- rear fog lamps (dipped beam and fog lamp switches on);
- stop lights (brake pedal depressed);
- brake lining wear signal (initial) (brake pedal depressed).



Symbols(from left to right - from top to bottom)

Low brake fluid level, front brake linings excessively worn, low oil pressure, alternator defective, low oil level, low coolant level, excessive automatic transmission fluid level, excessive oil temperature.

Check Panel display

- A-C. Front side lights
- B-D. Rear side lights
- E. Rear fog lamps

- H-F. Incomplete front door closure
- I-G. Incomplete rear door closure

All device functions are first monitored as described, then DISPLAYED. Display only takes place a few seconds after the engine has been started up however. At this point any defects (or open doors) are identified by the lighting of the corresponding LED and the general RED Check Panel warning light on the control panel.

NOTE *If oil or coolant levels drop below specified limits, this information is memorised. Once the engine has been started up, the red LED corresponding to the fault and the general RED warning light will both come on for the time that the ignition key is in MARCIA position.*
To turn the lights off you must not only top up the levels but also turn the ignition key to STOP position in order to delete the previously memorised information.

In order to be sure that one of the leds (light emitting diodes), the low fuel level warning light or the general failure warning light (RED) have not failed and have not therefore indicated a fault, all red LEDs and above warning lights should come until the general signal (GREEN) lights up to indicate the car is ready to start when the ignition key is turned to MARCIA position.

NOTE *The low oil pressure and battery charge checks are carried out only when the engine is running.*

Operation

With engine OFF

When the ignition key is turned to MARCIA position, the following warning lights come on: all red LEDs on the display, the low fuel level warning light, excessive coolant temperature warning light and the general RED warning light on the control panel.

After about 2 seconds, the oil level check will be over. If this is satisfactory the general signal (GREEN) will come on. Otherwise this will go off and the general failure warning light (RED) will come on. If the GREEN warning light comes on all the components and services monitored are working properly and the engine may be turned on. If the engine is not started, the general GREEN signal will start to flash.

With engine RUNNING

As soon as the engine has been running for a sufficient length of time for the oil pressure and battery charge lights to go off, a time switch comes into operation that causes the general GREEN signal to go off after a few seconds if all services monitored are working properly.

When the car is running or the engine is on, the electronic device monitors the following services continually:

- generator and circuit;
- engine oil pressure;
- brake fluid level;
- excessive coolant temperature;
- external lighting;
- excessive transmission fluid temperature;
- front brake lining wear;
- incomplete door closure.

When one or more of the above services fails, the relevant red LED comes on immediately together with the red general warning light.

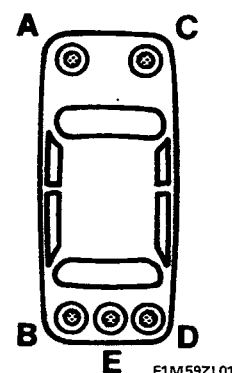
LIGHT CIRCUITS MONITORED

Side lights and number plate lights

One or more LEDs on the display come on to indicate:

- individual or simultaneous failure of two bulbs in a diagonal (ignition of corresponding LED: A-C-B-D);
- Fuse failure brings about ignition of the LEDs situated diagonally (A + D come on for fuse 3 or C + B for fuse 4).

NOTE *Simultaneous failure of the two fuses 3 and 4 is not indicated on the DISPLAY.*



55.

Rear fog lamps

The display indicates:

- Individual or simultaneous failure of the two bulbs (LED E comes on).
- Fuse failure is not indicated.

NOTE The rear fog lamp must be turned on in order to carry out this check.

Stop lights

The display indicates:

- failure of a single bulb (LED B or D comes on);
- interruption of working contacts of switch below brake pedal (LEDs B and D come on);

NOTE Operate the brake pedal in order to carry out these checks.

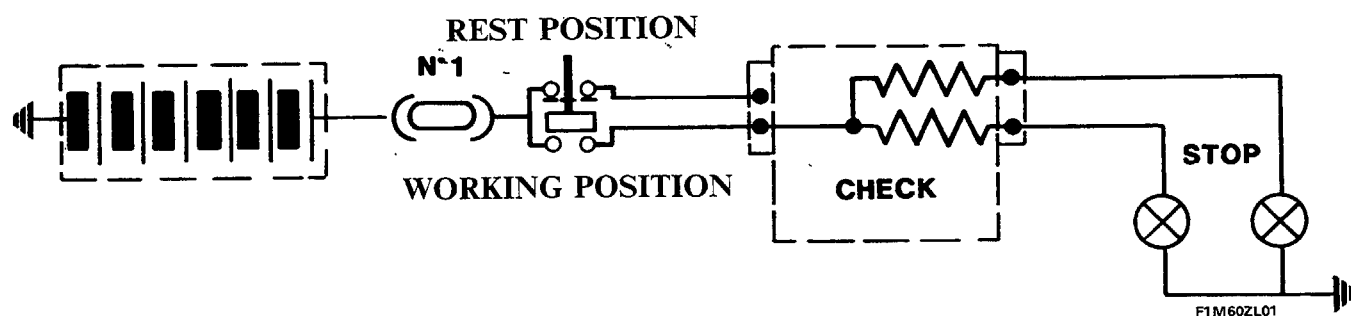
- simultaneous failure of both bulbs (LEDs B and D come on);
- failure of fuse 1 (LEDs B and D come on);
- inefficiency of resting contacts of switch under brake pedal (LEDs B and D come on).

NOTE These defects are also indicated even if the service is not on.

To conclude, note how the two following services are checked:

Stop lights

The circuit fuse (no. 1) and resting contacts of switch under brake pedal are checked even when the brake pedal is not depressed. The two bulbs or working contacts of the switch under the brake pedal are monitored only WHEN THE BRAKE PEDAL IS OPERATED.

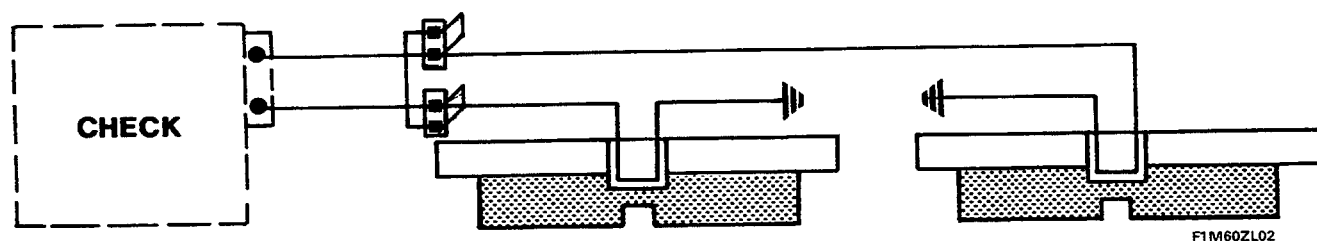


Front brake lining wear

When the brake lining insert wire is earthed due to being brought into contact with the brake disc while braking the check system indicates the defect.

When the pedal is released, the defect is no longer displayed.

When linings become so worn that the insert wire is cut, the defect is indicated CONTINUALLY and not only at the time of braking.



CONSTITUTION AND OPERATION OF MAIN SENSORS



Check system sensors include normal switches adopted on cars not fitted with Check Panels, such as an excessive coolant temperature switch, excessive brake pad wear inserts etc.

Coolant level sensor

This consists of a pair of electrical contacts (Reed) enclosed in a glass bulb located in the coolant expansion tank and a control magnet located on the end of a float immersed in the tank fluid. When the hydrostatic thrust exercised by the fluid (at normal level) against the float moves the magnet closer to the contacts, the strong magnetic flux generated in the bulb closes them.

When fluid is lost from the coolant circuit and the level drops excessively, the contacts open because the magnet moves away, thus depriving them of the magnetic flux necessary to stay open. The warning light therefore comes on.

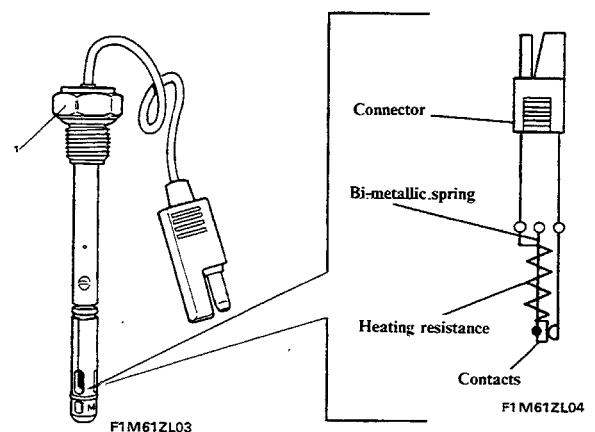
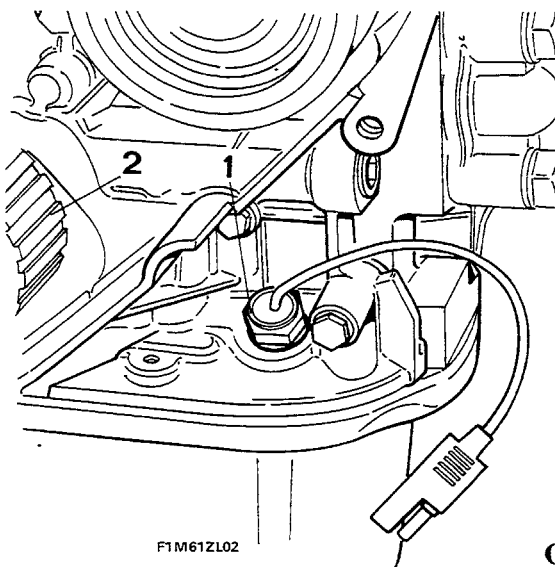
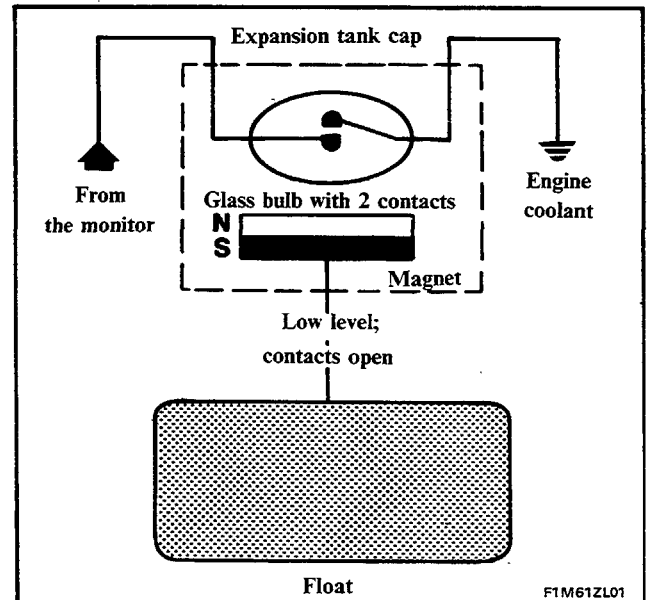
NOTE If the cable is disconnected, the warning light comes on.

Engine oil level sensor

This is located on the end of a rod immersed in the sump oil. It consists of a pair of electrical contacts located at the end of a bimetallic strip heated by an electrical resistance.

Part of the heat produced by the current passing through the sensor resistance is dissipated by the engine oil (even if this is hotter than 100°C). The bimetallic strip therefore fails to bend sufficiently and the sensor contacts stay closed.

When the oil level drops below a certain limit, heat dissipation no longer takes place with the same intensity. The contacts therefore open as a result of the curving of the bimetallic strip and the warning light on the monitor display comes on.

**Oil level sensor location**

1. Sensor socket screw
2. Crankshaft pulley

55.

CHECKS IN CASE OF DEFECTIVE DEVICE OPERATION

If the DISPLAY indicates faults that do not exist in the circuit monitored, proceed as follows:

Check the connections to the various sensors, light circuits and electronic control unit

If a conductor is broken or a connector disconnected (or its terminals oxidised) this is indicated by the device as a DEFECT in the relevant service if the sensor is N.C. type.

On the other hand **failure or disconnection of a connector fitted with a N.O. connector would prevent indication of a defect.**

CHECKING SENSORS

If the previous check does not reveal any defects, check the sensors associated with the defective service as follows:

Brake fluid level sensor

- Check that level is correct;
- turn ignition switch to "MARCIA" position;
- press brake reservoir cap where sensor is located in order to close the contacts: if the warning light does not go off on the display **the sensor is working properly.** Otherwise it is defective and must be replaced.

Coolant level sensor (N.C. type)

- Check that expansion tank level is correct.
If so, remove the sensor from its seat and use an ordinary ohmmeter to check electrical continuity between the two pins of the connector by putting the float in completely raised and completely lowered positions. If continuity or lack of continuity is noted in both cases, replace the sensor since it is defective.

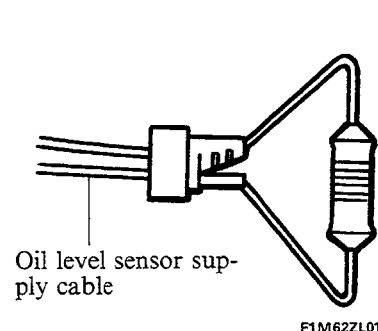
Incomplete door closure sensor

- Check that sensor contacts are not oxidised.

Oil level sensor (N.C.)

- Check oil level when car is on a flat surface. Check that oil level in sump is at least 2 mm above minimum mark.
- Disconnect and connect the oil level sensor supply cable several times in order to remove any oxidation on the contacts.
- Start engine **after leaving engine off for at least 10 mins.** (to allow the oil pumped through the engine ducts to fall back into the oil sump).

If the check panel level warning light goes out after the waiting time, the sensor is working properly and need not be replaced.



Otherwise, detach the sensor and fit a 12Ω resistance in its place, as shown in the diagram, then turn the ignition key to MARCIA position: if the check panel warning light does not go off after the waiting period, the check panel module is defective and must be replaced.

NOTE *Inform customers that the low oil level warning light may come on if the engine is restarted immediately after stalling. In this case the level is recorded when the oil ducts have not completely emptied and the oil has not all returned to the sump.*



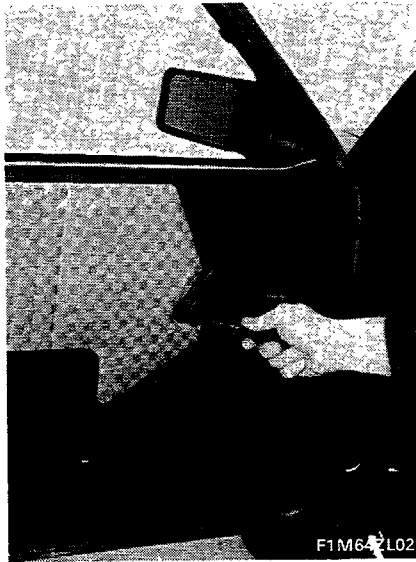
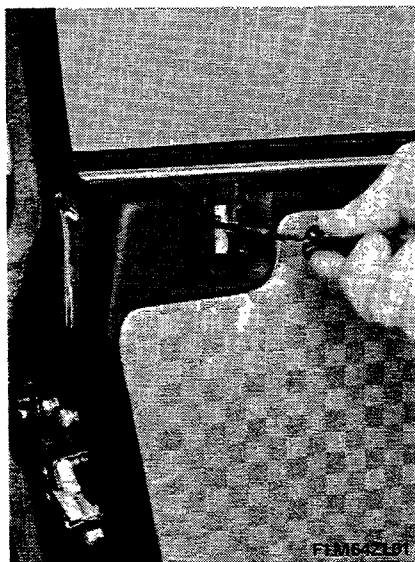
Never short-circuit the supply cables of this sensor since this would irreparably damage the control unit. If the defect is due to low oil level, top up and then turn the ignition switch to STOP position to delete the previous MEMORY before reading the display again.

SUMMARY TABLE OF OPERATION AND DIAGNOSIS

Services	Conditions for carrying out check	Possible check system defects	Repair	Notes
Side lights and fuses 3 and 4	Engine on or off Side light switch on	Conductor joining lights to control unit broken or with oxidised terminals Power module of defective control unit	Reset, connect or clean Replace the electronic control unit	
Car stop lights and fuse no. 1 Car stop light switch resting contacts (under brake pedal) *	Engine on or off Brake pedal activated Engine on or off	Control unit defective Conductor connecting lights to control unit broken or with oxidised terminal Cable connecting switch or control unit broken or disconnected Control unit defective	Replace, connect, clean or reset Connect or reset Replace electronic control unit	
Rear fog lamps	Engine on or off, but with dipped beams and fog lamp on	Conductor connecting light to control unit broken or failed Control unit power module defective	Connect or reset Replace electronic control unit	
Engine coolant level	Only with engine off (signal MEMORISED)	Sensor defective Cable connecting disconnected or broken sensor Defective control unit	Replace, connect or reset Replace electronic control unit	
Engine oil level	Only with engine off (signal MEMORISED)	Sensor defective Control unit sensor cable disconnected or interrupted Defective control unit	Replace, connect or reset Replace electronic control unit	If a sensor connection cable is earthed, the electronic control unit would be irreparably damaged
Low engine oil pressure	Only with engine on	Sensor defective Control unit defective	Replace Replace	If a sensor connection cable is disconnected, any fault will not be indicated
Low battery charge	Only with engine on	Generator cable disconnected Control unit cables broken	Connect Connect	
Initial front brake lining wear Maximum front brake lining wear	Engine running or off, operating brake Engine running or off	Control unit connection cables broken, disconnected or terminals oxidised Control unit sensor connection cables interrupted, disconnected or terminals oxidised	Connect, reset or clean Connect, reset or clean	If a cable is disconnected, the display indicates a DEFECT

NOTE Defects are displayed only if the engine is running.

55.

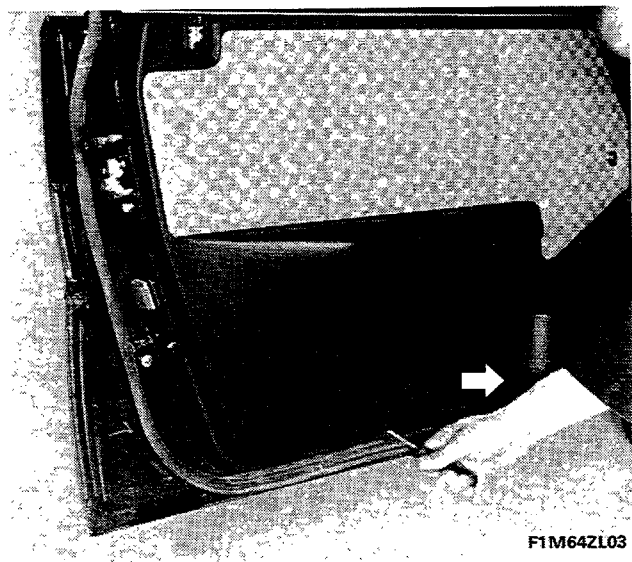


POWER WINDOWS

The power windows are controlled by a switch in door. The driver side door has a dual switch to control both windows.

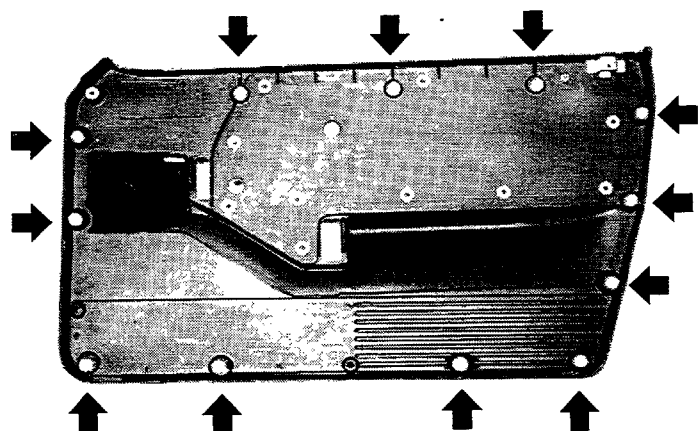
- Back off the two bolts retaining the arm rest.

Remove inner safety catch and door opening handles



- Disconnect the power window electric switches from the door panel by pressing in the retaining tabs with a screwdriver;
- back off bolts retaining the panel to the door frame;
- insert a screwdriver near each flexible panel retaining button.

Removing door panel from door frame (levering flexible retaining buttons)



Rear view of door panel

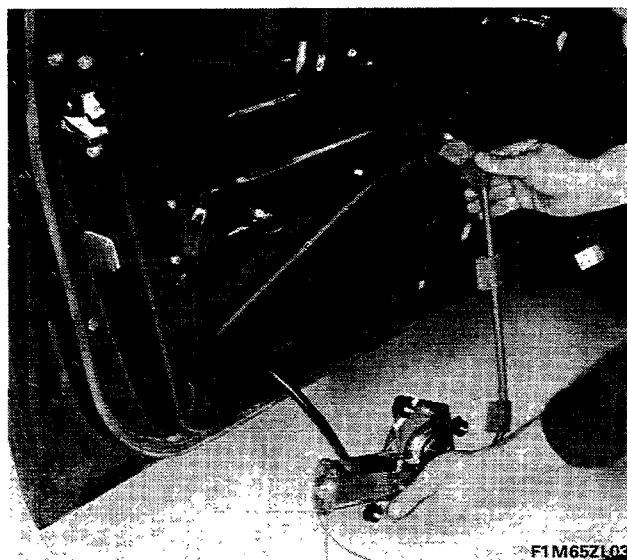
All flexible buttons retaining panel to door frame can be seen.



Removing window support retaining bolts (→) and bolts retaining power window assembly to door frame (→)



- Turn power window assembly to extract from door frame, as shown in diagram.



Removing power window assembly from door

NOTE After fitting the assembly, adjust the window support in the lift support slots (3) after applying tension to the system to ensure that the window slides smoothly.

Constitution and operation

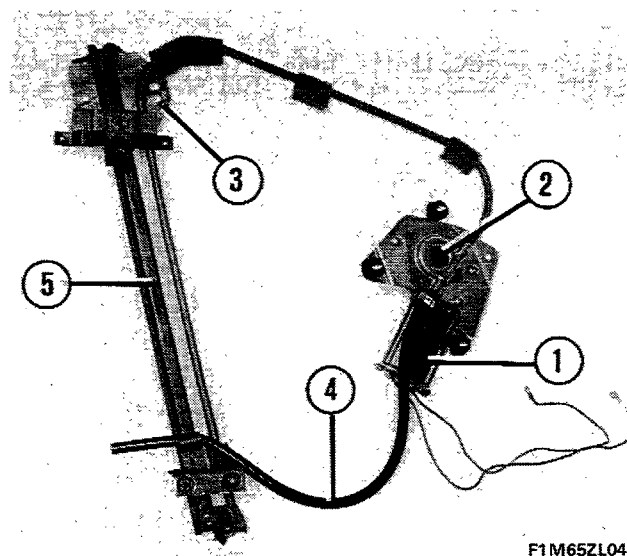
Motor (1) operates a worm screw and wheel mechanism (2).

This controls a coaxial pinion that engages the control cable coils.

The coil is fixed to power window support (3), which slides in a vertical guide (5).

The door window is secured to the support with a special bracket.

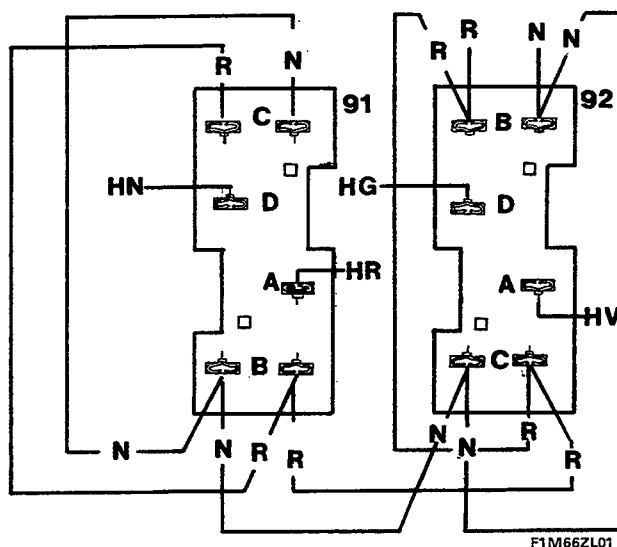
A plastic pipe (4) houses the free section of the control cable that slides within a moulded tube. The motor may turn clockwise or anticlockwise to move the control cable in rack-like fashion. The motor is fitted with a circuit breaker that consists of 2 contacts and a bimetallic strip.



55.

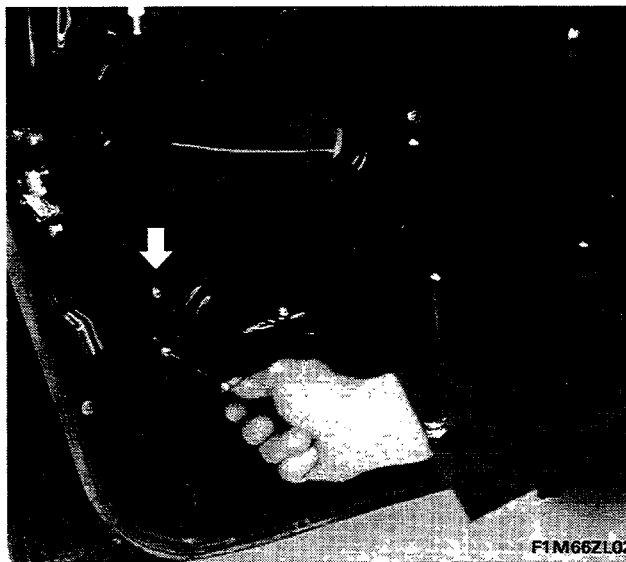
Power window switch mount (driver side window)

- 91. White left door power window switch mounting
- 92. Red right door power window switch mounting
- A-D. Connection cables to the two front power window motors (clockwise and anticlockwise)
- C-D. Connection cables to the two front power window motors: black cable to earth, red cable to auxiliary fuses (25 Amps).



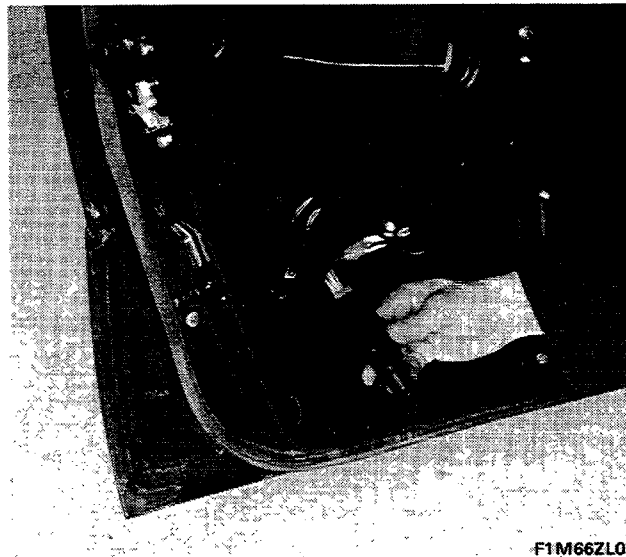
ELECTRIC DOOR LOCK

- Remove the door panel and inside safety catch handle as described on the previous pages.



Removing-refitting reduction unit and door lock from door frame

The reduction unit consists of an electric motor that operates a rack via a pinion. The front reduction unit is also fitted with an end stop microswitch.



Extracting door lock reduction unit from door frame

- Disconnect electrical connector.

REPAIR OPERATION IN CASE OF POWER WINDOW FAILURE

If power windows fail, follow the following instructions

1. - Turn the ignition switch to "MARCIA" position.
2. - Check that the fuses 113 (only PRISMA 4WD) - 114 located near power window control switch have not blown.

For front power window failure (Mod. DELTA-PRISMA 4WD)

3. - Remove power window control button/s and disconnect from mounting/s
 - Check positive and negative power supply to button mounting (using check light or multimeter);
 - **red supply cables**
 - **negative supply cables (continuity for return to earth): black (only driver door)**
- (*) If positive supply is lacking, the failure should be sought in the following components:
 - Ignition switch failed (INT/A terminal no voltage)
 - Power window relay failed or with excitation circuit inoperative due to defective earth
 - Driver or passenger side under facia connection blocks, defective.

NOTE *If there is no connection to earth (negative supply) check the earth loom contact under the facia.*

If positive and negative supply are present, refit the power window control button and move on to point 6.

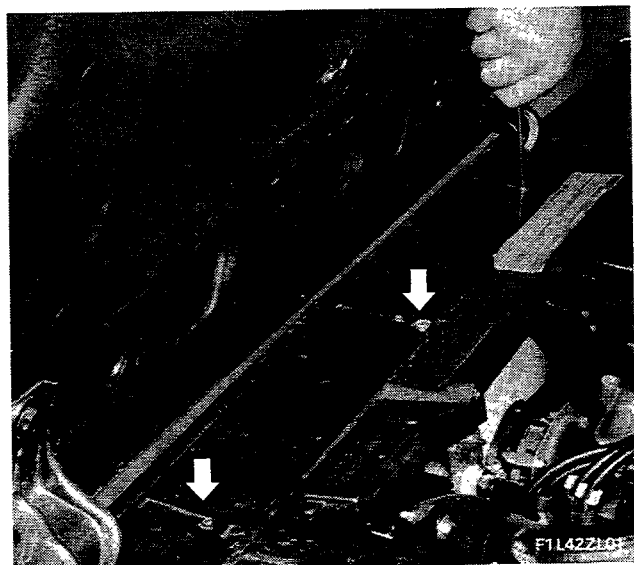
For failed rear power windows (only for PRISMA 4WD)

4. - Remove the rear power window inhibition button located on the drive side tunnel and defective rear button/s located at end of tunnel and disconnect from mounts.
 - Check positive power supply to rear power window operation inhibition switch (green cable) on tunnel.
 - Refit this switch and check operation, making sure that the power supply reaches the red cable.
If no power reaches the green cable, the causes are the same described at point (*) previously
If power does not reach the red cable, replace the inhibitor switch since it is defective.
 - Refit the control buttons to tunnel.
5. - Check positive and negative power supplies to rear power window button mountings located in the rear of the tunnel:
 - **positive power supply: red cable**
 - **negative power supply: black cable**
 - If no voltage is present, the defect lies in the following:
 - 2 way connector block defective or earth contact loose
 - red cable from rear window inhibition switch to control switches broken
 - Refit control buttons.
6. - Disconnect the defective window door panel, disconnect the 2-way window motor supply connector and check that this is supplied by both cables when the control button on the tunnel is pressed (both ways).
If no voltage is obtained, replace the control button since it is defective. If voltage is obtained, replace the window motor since this is defective.

NOTE *Also search for faults or binding of mechanical glass guide assembly by supplying the window motor directly (with 25A fuse) with buffers at top and bottom.*

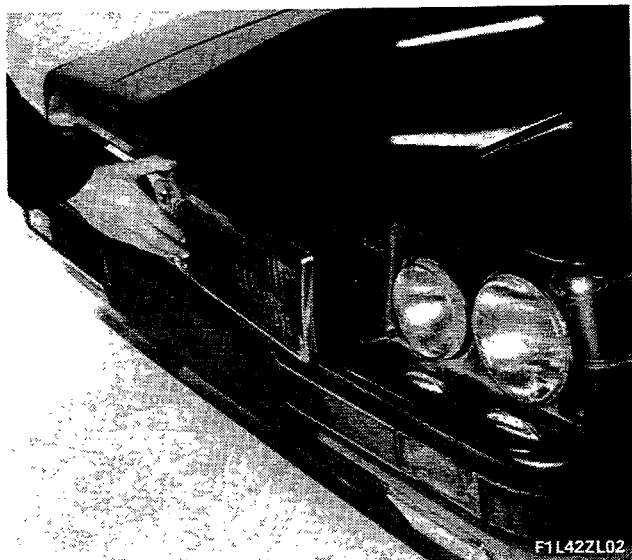
*Repeat the test without the glass.
Ensure that the ducts do not slow down the glass.*

55.



REMOVING-REFITTING FRONT LIGHT CLUSTER

Removing-refitting radiator grille assembly

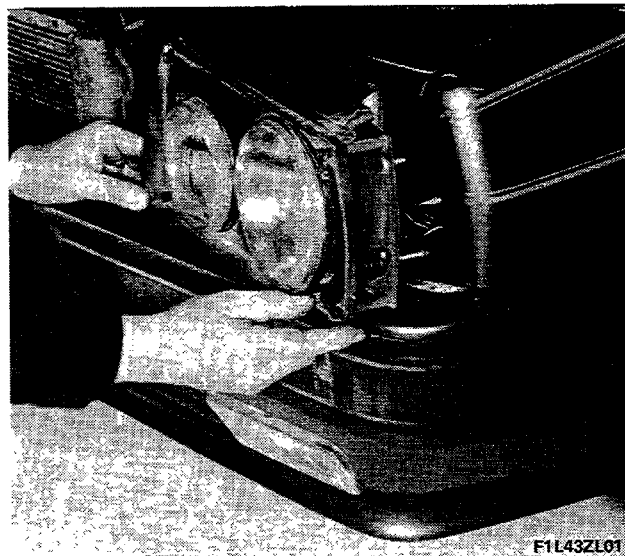


Removing radiator grille assembly from housing



Removing-refitting bolts retaining light cluster to body

- Disconnect bulb connectors

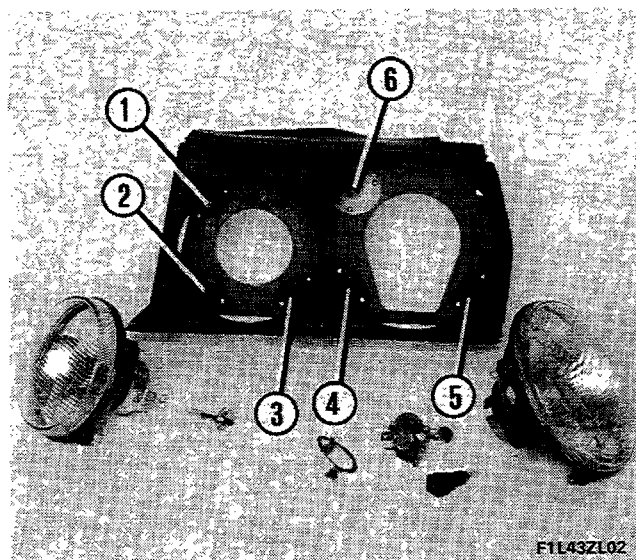


F1L43ZL01

Removing light cluster from seat

Components of front light cluster

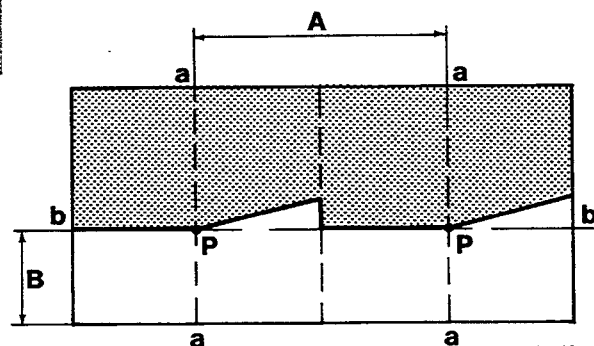
1. Vertical supplementary beam adjustment screw
- 2-3. Horizontal supplementary beam adjustment screw
- 4-5. Horizontal main-dipped beam adjustment screw
6. Vertical main-dipped beam adjustment screw



F1L43ZL02

HEADLAMP ALIGNMENT

On a screen located 10 m away, the demarcation line between the dark area and area lit by the dipped beam (b-b) must be 12 cm lower than height B when the car is new, 10cm when the car has been run in.



F1M67ZL02

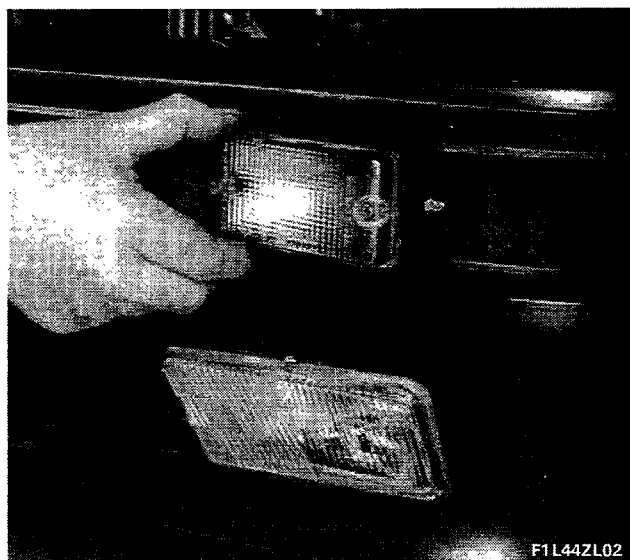
Headlamp alignment diagram

- A. Line connecting headlamp centre lines
- B. Height of headlamp centre from ground during alignment

55.



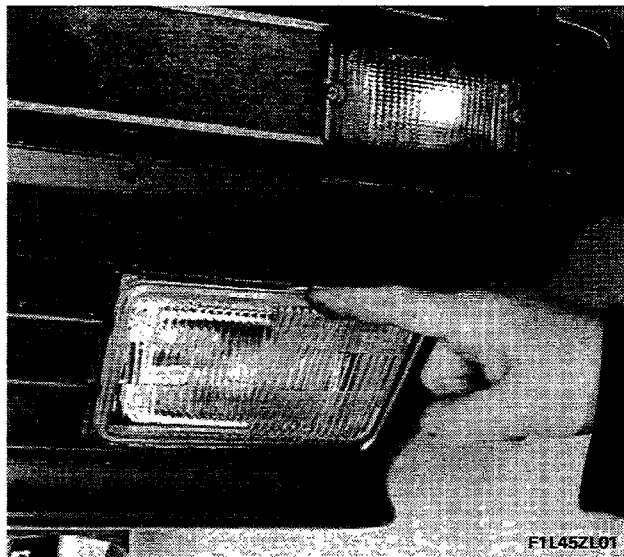
Removing-refitting bolts retaining side lights to body shell (with car raised)



Removing side lights from body shell

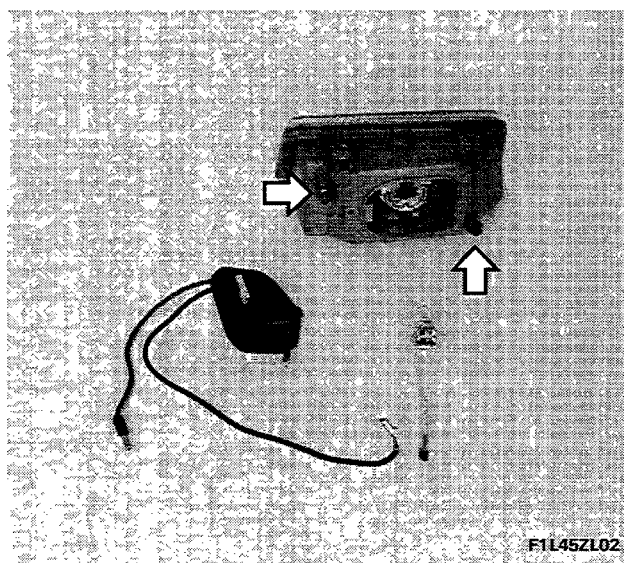


Removing-refitting bolts retaining fog lamps to body shell (with car raised)



F1L45ZL01

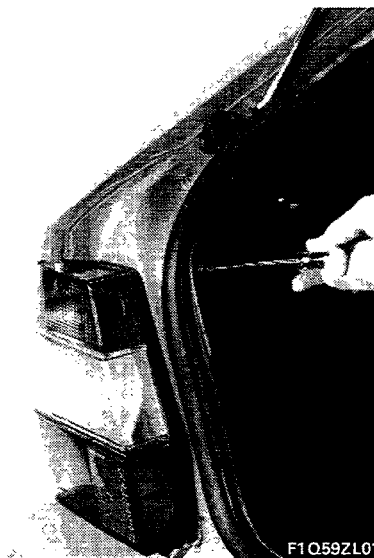
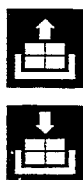
Operation of fog lamp locking device in order to remove device from the body shell



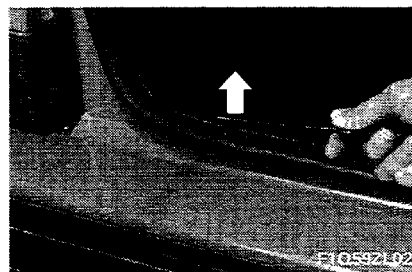
F1L45ZL02

Components of fog lamp

(→) Bolts retaining lamp to body shell.



F1Q59ZL01



F1Q59ZL02

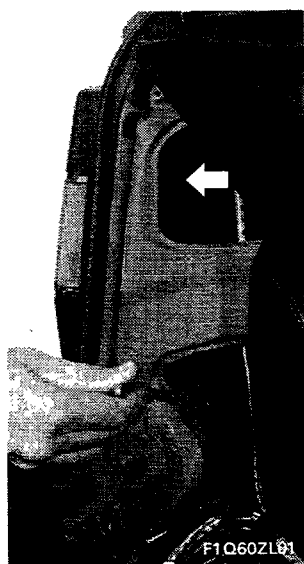


F1Q59ZL03

Removing-refitting rear light from body shell

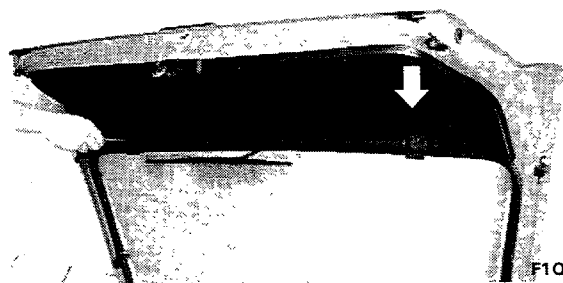
- Remove cover to gain access to the bolts.

55.



Removing rear light

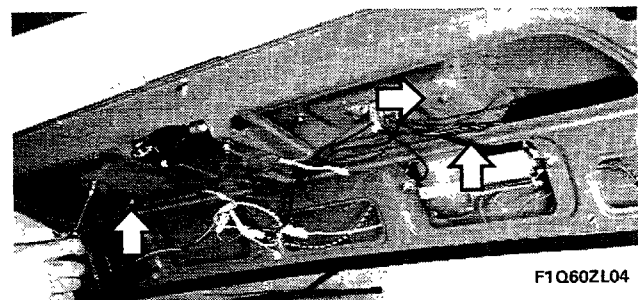
- Back off nuts retaining light to body shell.



F1Q60ZL03



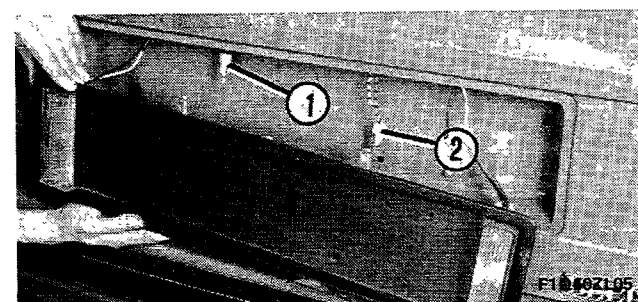
REMOVING-REFITTING NUMBER PLATE HOLDER WITH ASSOCIATED BULB HOLDERS AND REVERSING LIGHTS



F1Q60ZL04



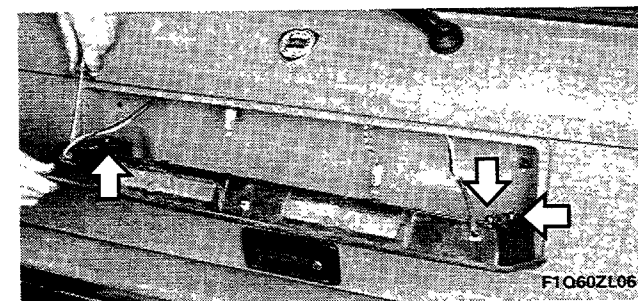
Removing tailgate interior trim



F1Q60ZL05



Removing nuts retaining plate holder to tailgate



F1Q60ZL06



Removing plate holder from seat

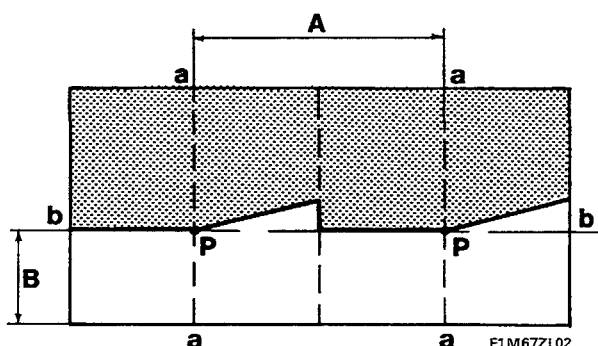
1-2. Number plate light bulb

Removing reversing lights

1. Horizontal headlamp adjustment screw
2. Vertical headlamp adjustment screw
3. Manual dipped-main beam alignment correction device

HEADLAMP ALIGNMENT

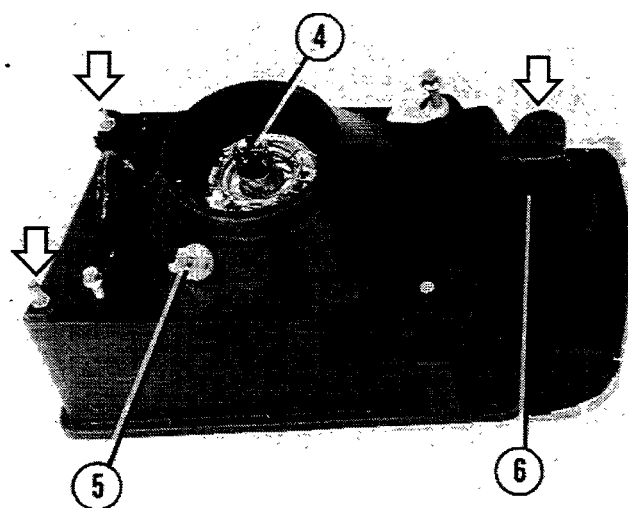
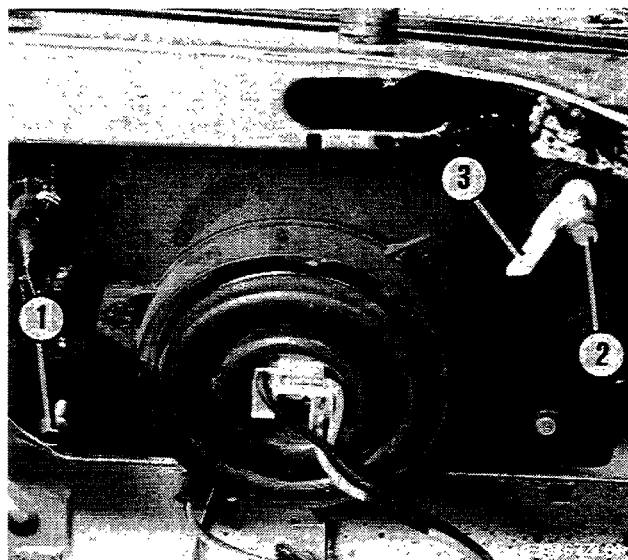
On a screen located 10m away the demarcation line between the dark area and the area lit by the main beam (b-b) should be 12cm lower than height B when the car is new, 10cm when the car has been run in.



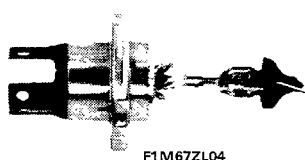
Headlamp alignment diagram

- A. Line joining headlamp centre lines
- B. Height of headlamp centre from ground, measured upon alignment

4. Headlamp bulb connection plug
5. Side light bulb connection plug
6. Side turn signal connector housing (→) pins retaining lights to body shell.



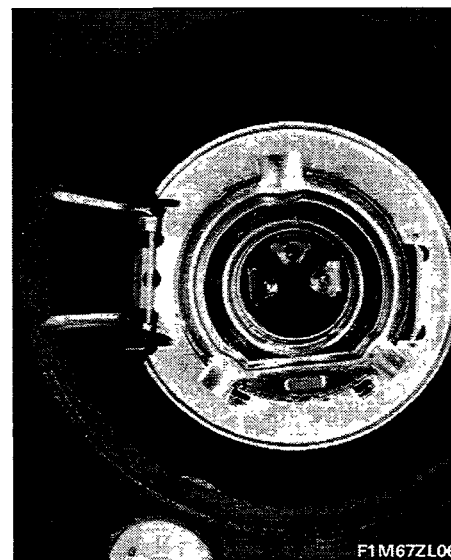
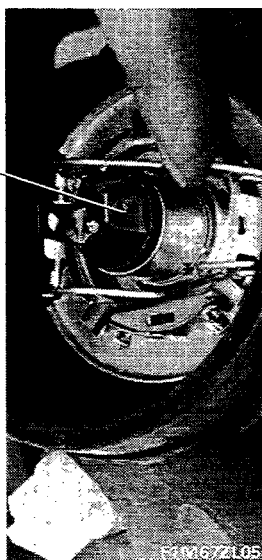
F1M67ZL03



- withdraw the rubber protective boot;
- extract connection plug;
- press and turn the spring to release from the light cluster cup and remove the bulb.

Replacing dipped-main beam bulb

NOTE Since the bulb is halogen type its brightness will be lost if it is touched with the hands.



55.



REMOVING-REFITTING
CLUSTERS

LIGHT



Removing-refitting bolts retaining lights to body
shell



Removing front light assembly (including turn
signal)

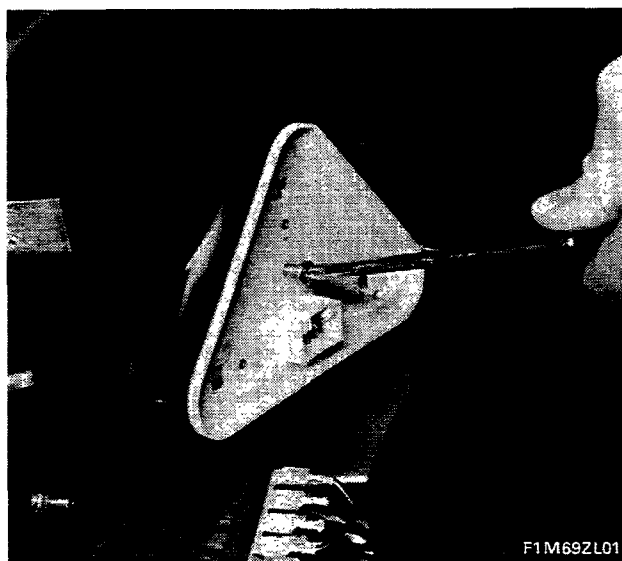


REMOVING-REFITTING REAR LIGHTS
AND BULBS

Removing rear light connector

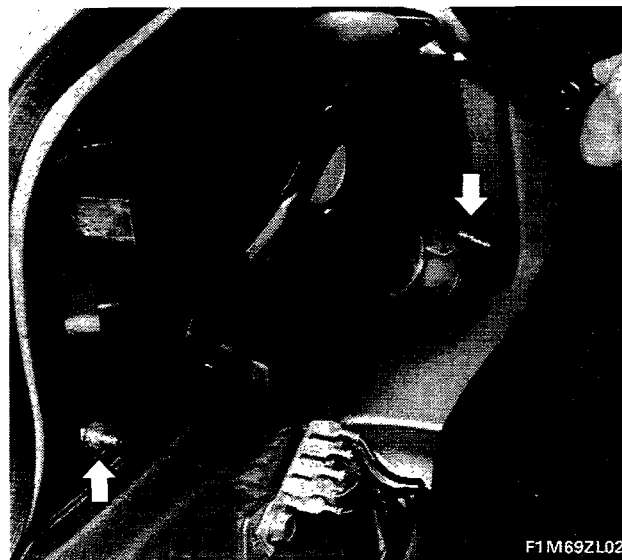
NOTE Remove locking device using a screwdriver.

Removing-refitting rear side light, turn signal and stop light bulb holders



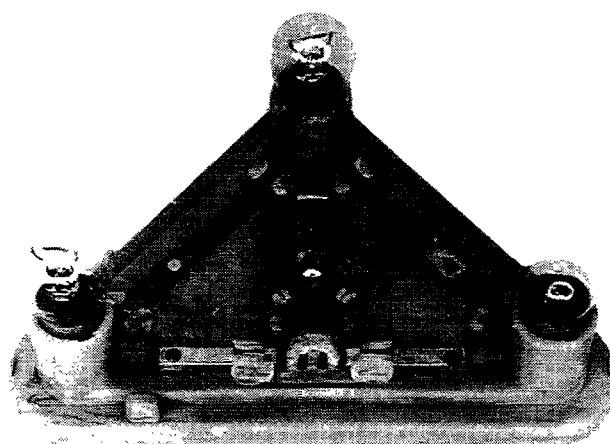
F1M69ZL01

Removing-refitting rear side light, turn signal and stop light cluster (→) from body shell



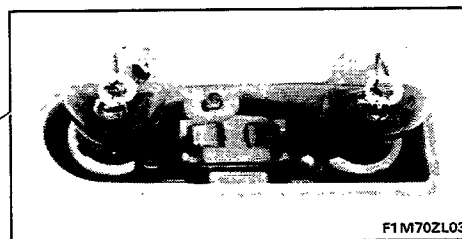
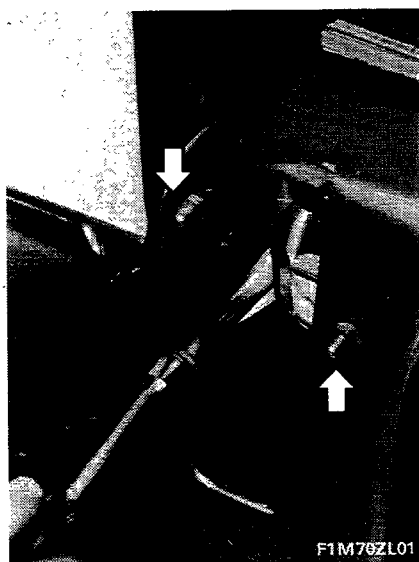
F1M69ZL02

Rear bulb holder for side lights, turn signal and stop light



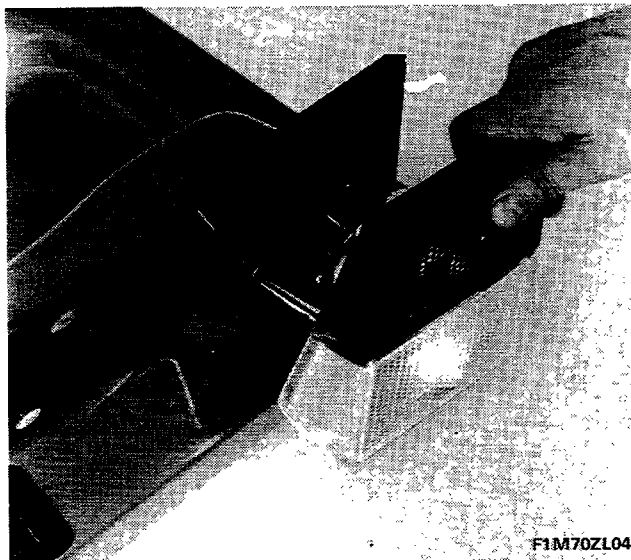
F1M69ZL03

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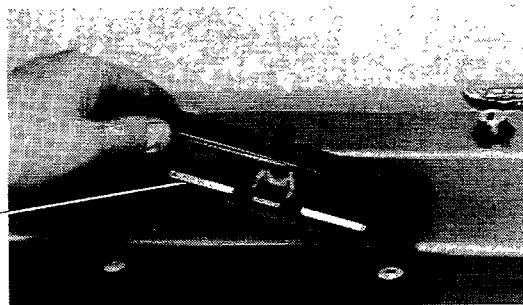
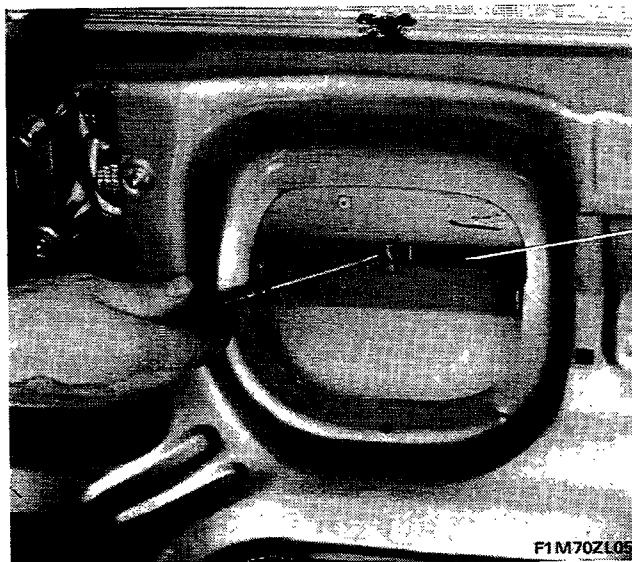
- Remove electrical connector

Removing-refitting reverse-rear fog lamp lights and bulb holder



To remove light from boot back off retaining bolts (→) (top photo).

Removing rear reversing light and fog lamp

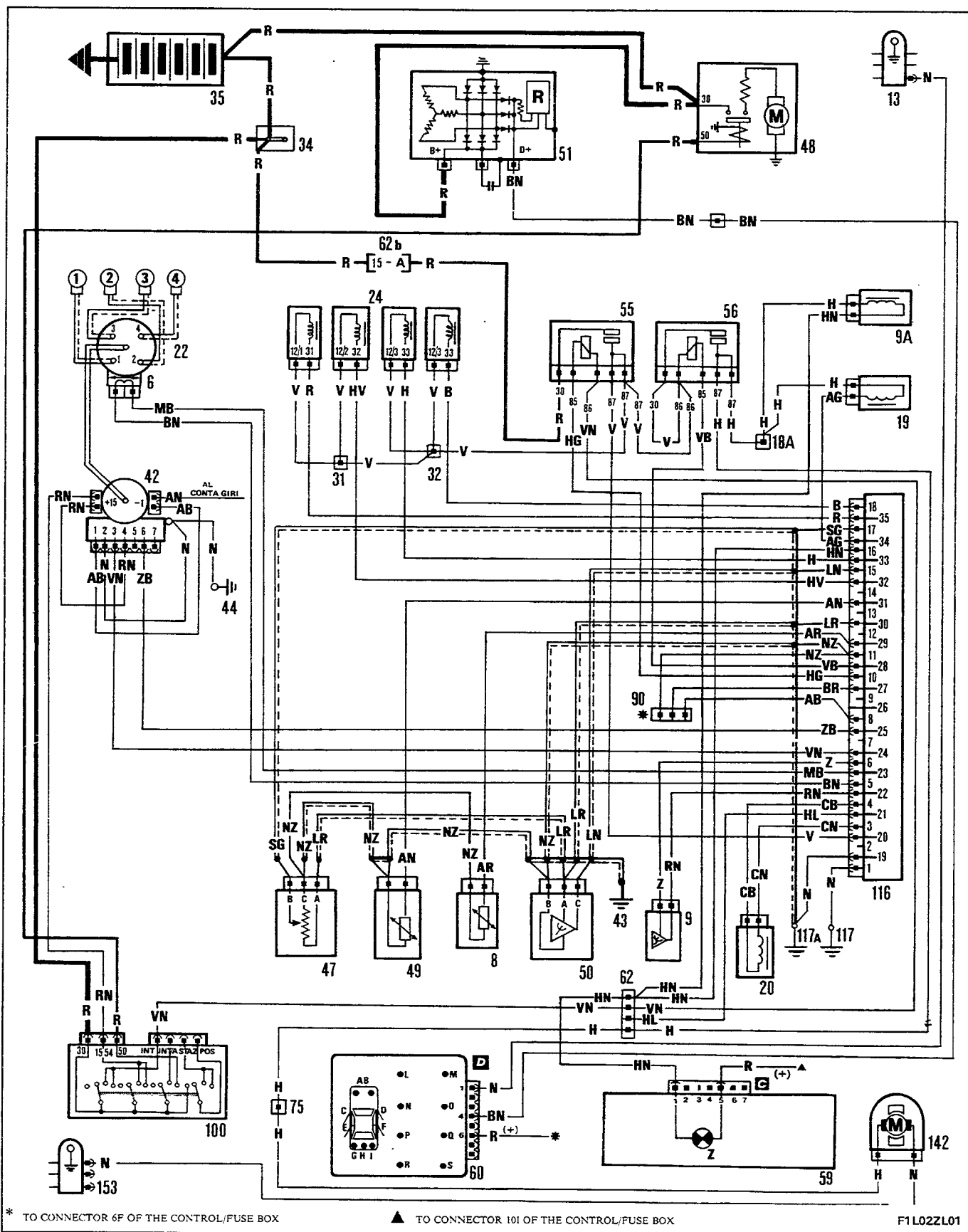


Cutting out rear number plate locking and fitting device

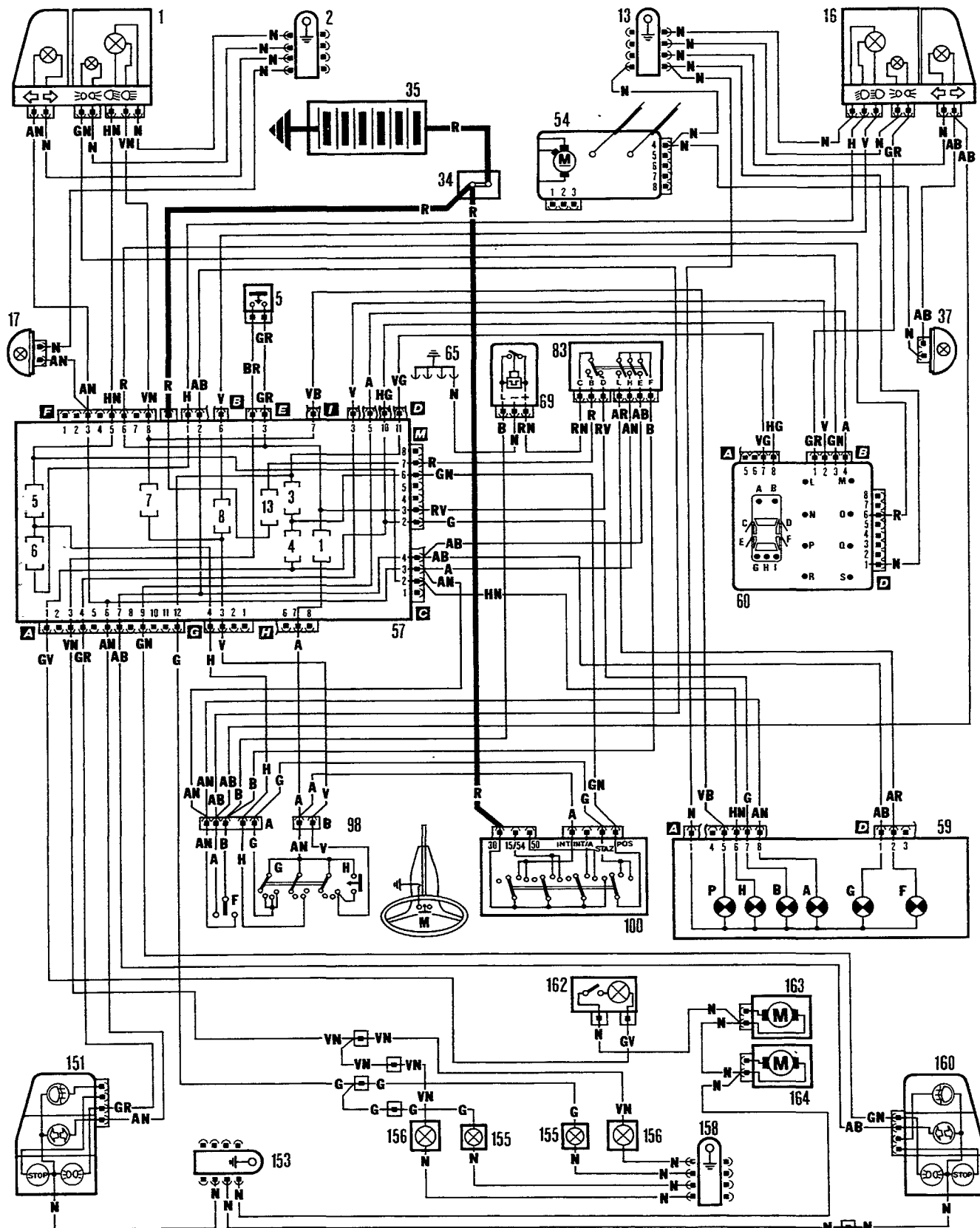
– Wiring diagrams	1
– Key	13

55.

Starting - Recharging - WEBER Ignition/Injection (post-modification I.A.W.) - Electric fuel pump (see page 13 for key).

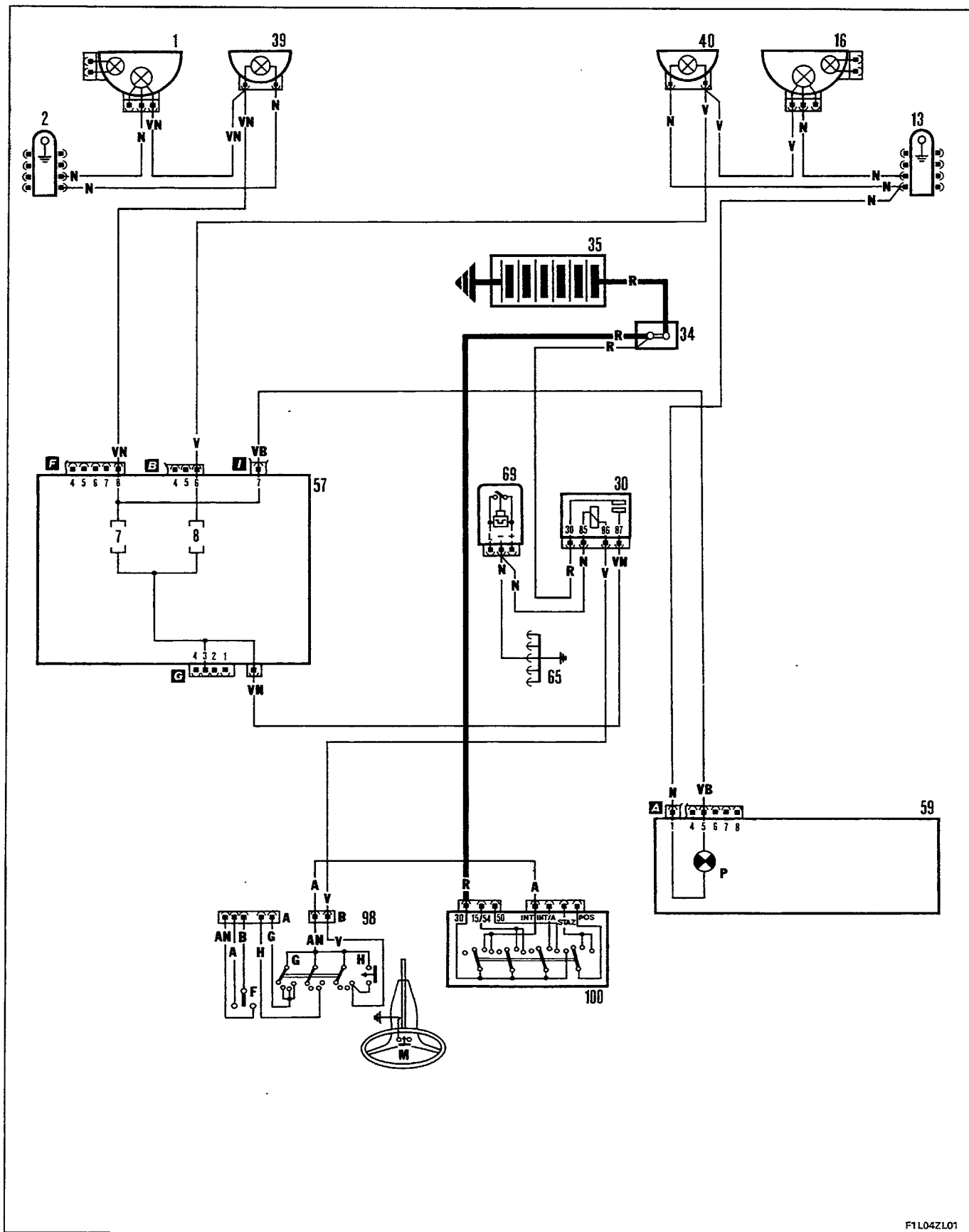


Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light (additional driving lights - see wiring diagram on page 4) - Flashers - Direction indicators and warning light - Hazard warning lights and warning lights - Reversing lights - No. plate lights - Luggage compartment light (see page 13 for key).



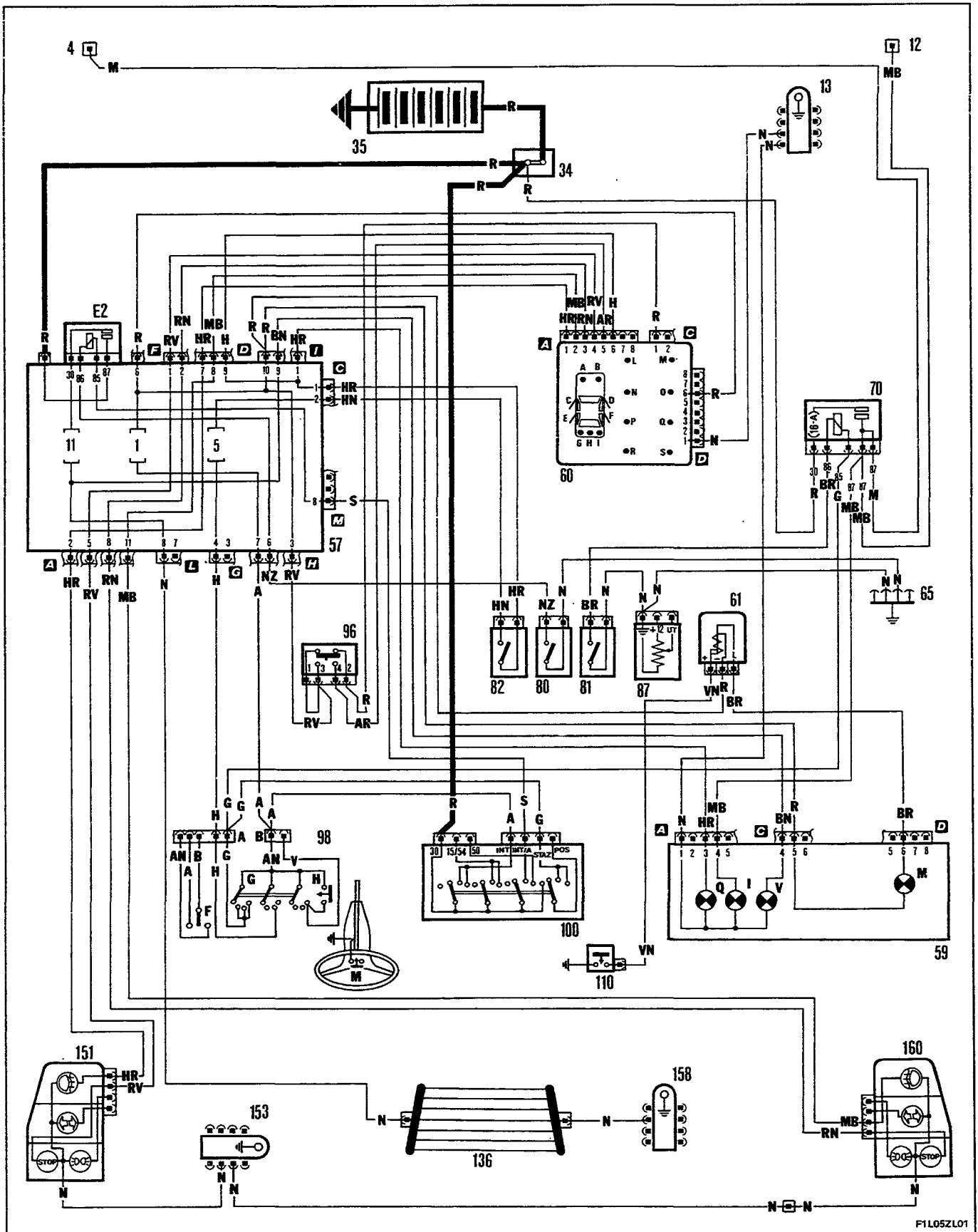
55.

Additional driving lights (see page 13 for key).



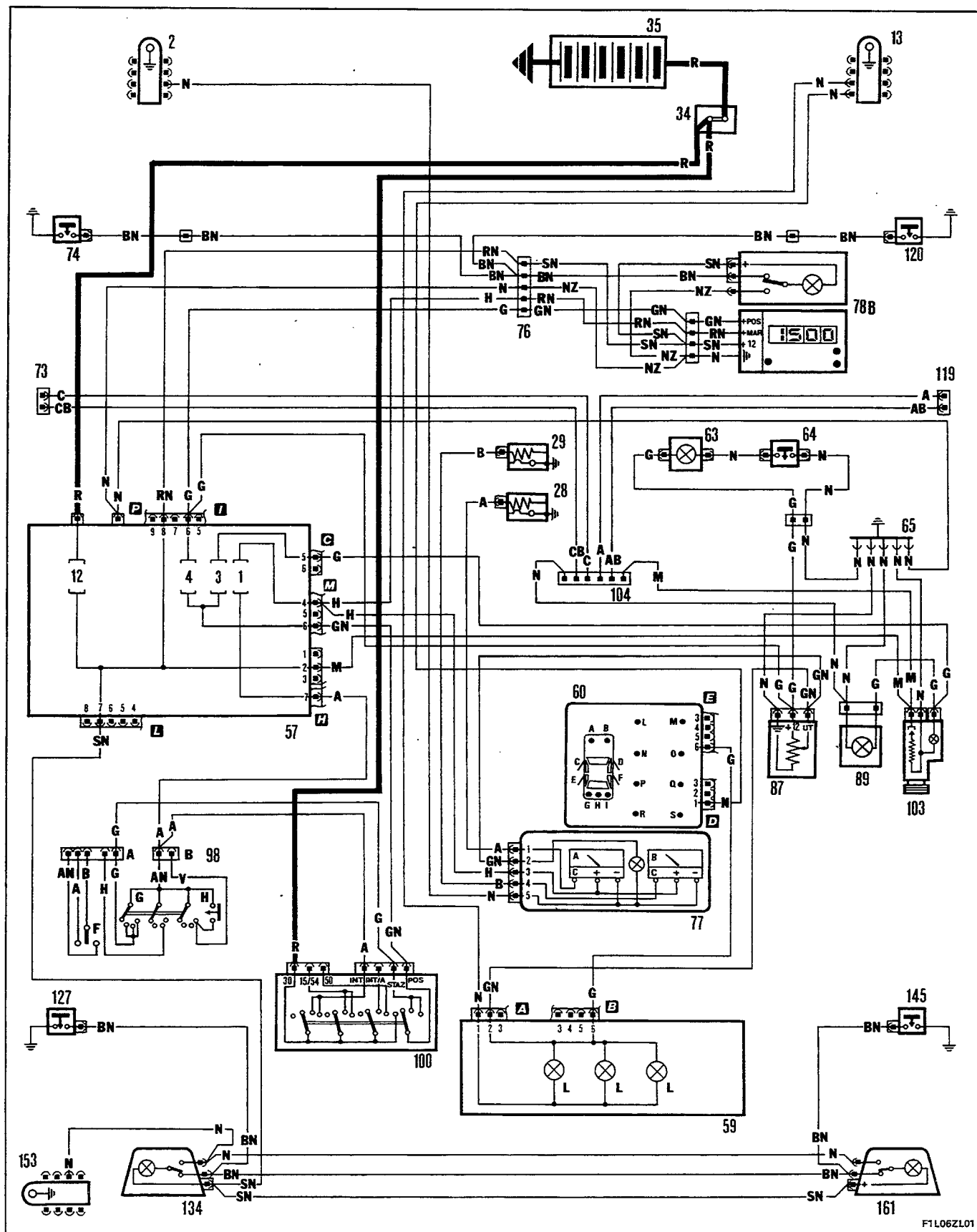
F1L04ZL01

Heated rear windscreen and warning light - Wiring for fog lamp and warning light - Rear fog lamps and warning light - Brake lights - Handbrake warning light (see page 13 for key).



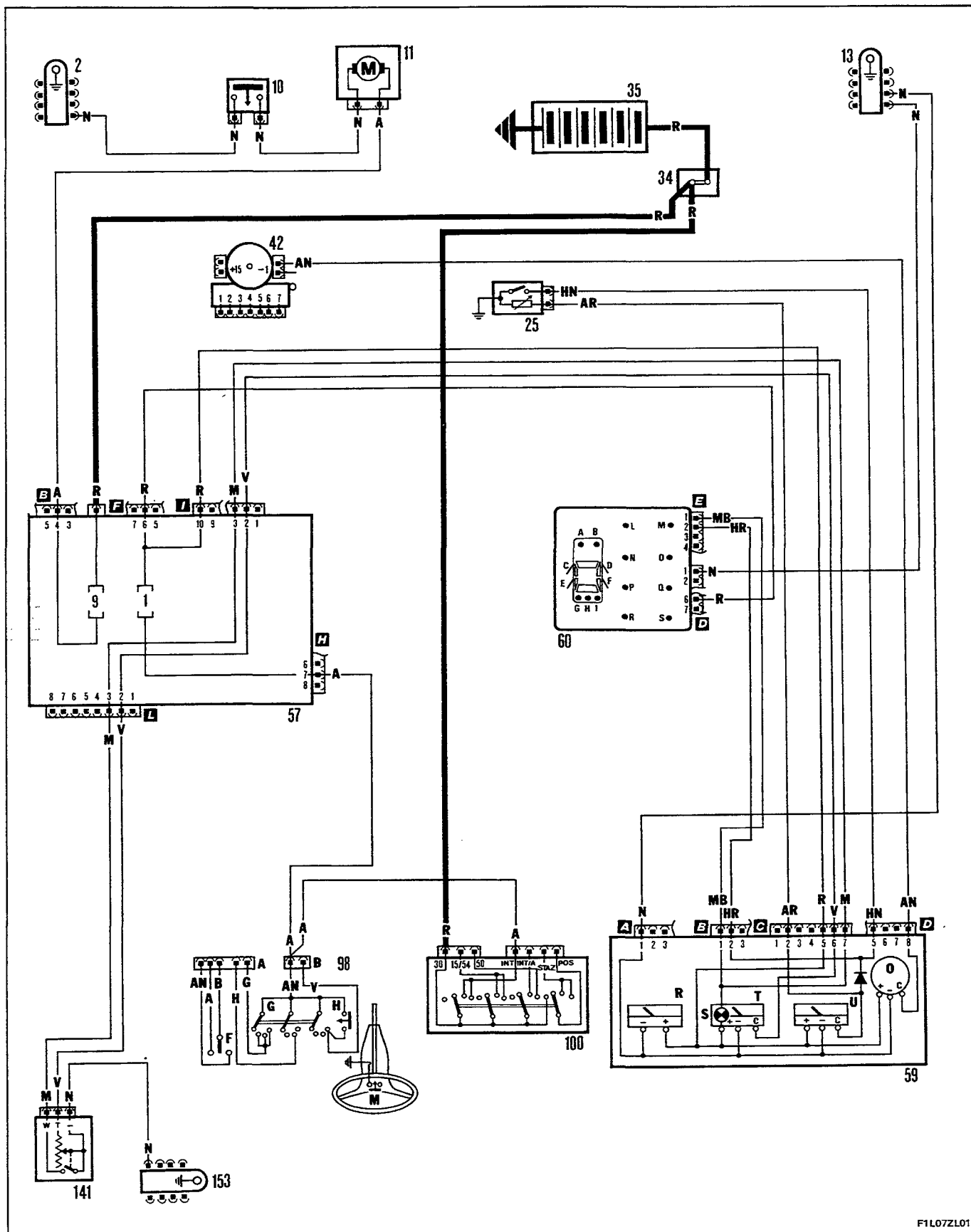
55.

Courtesy lights - Glove compartment light - Cigar lighter - Combination of instruments (A. Oil pressure gauge - B. Oil temperature gauge) - Digital clock - Wiring for radio - Fibre optic lights for switches - Instrument panel and Control-System light (see page 13 for key).



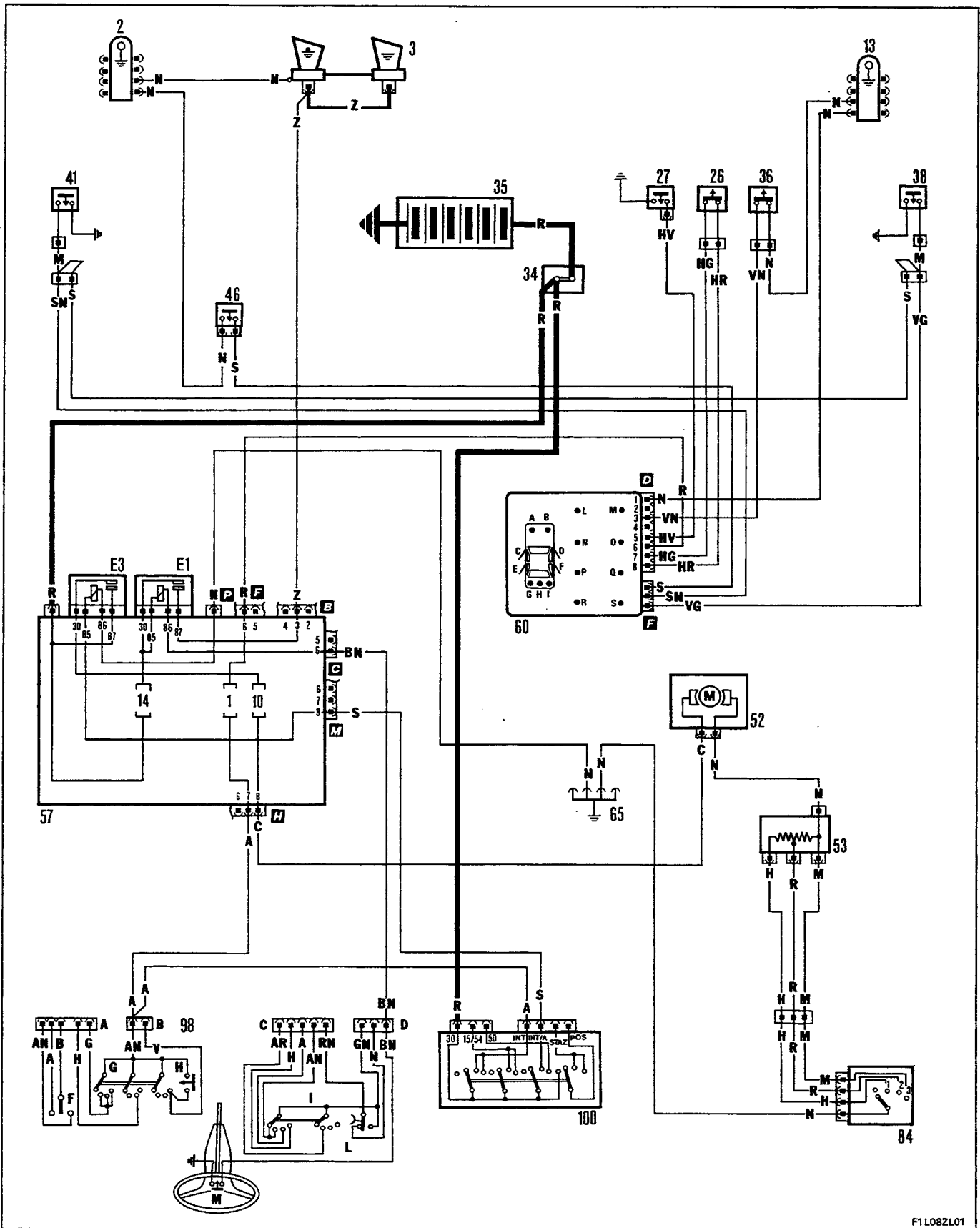
F1L06ZL01

Engine radiator - Fuel gauge and reserve warning light - Rev counter - Voltmeter - Coolant temperature gauge and overheat warning light (see page 13 for key).



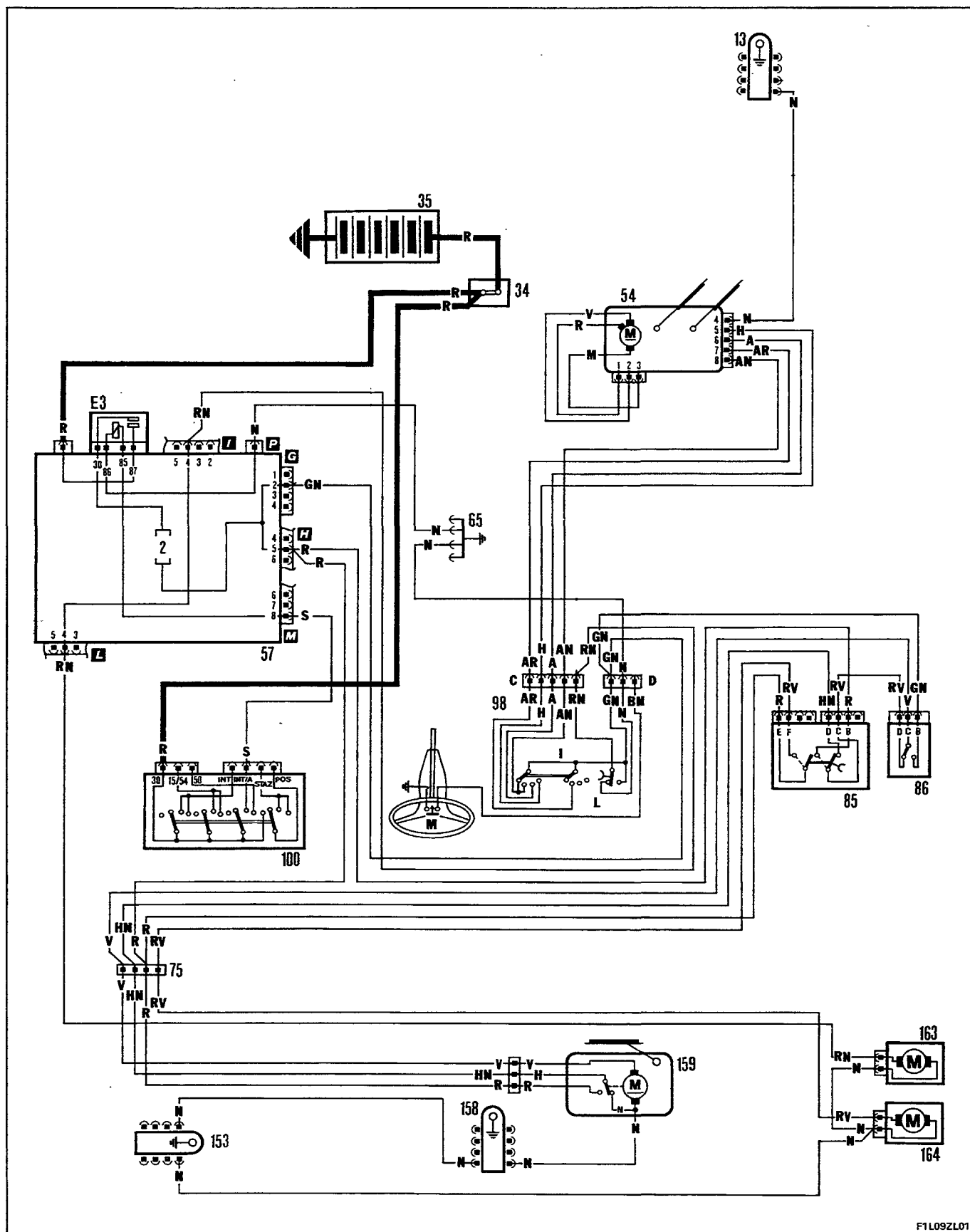
55.

Electric horns - Car interior ventilation - Front brake pad wear - Insufficient brake fluid level - Insufficient engine oil pressure - Insufficient engine oil level - Insufficient coolant level (see page 13 for key).



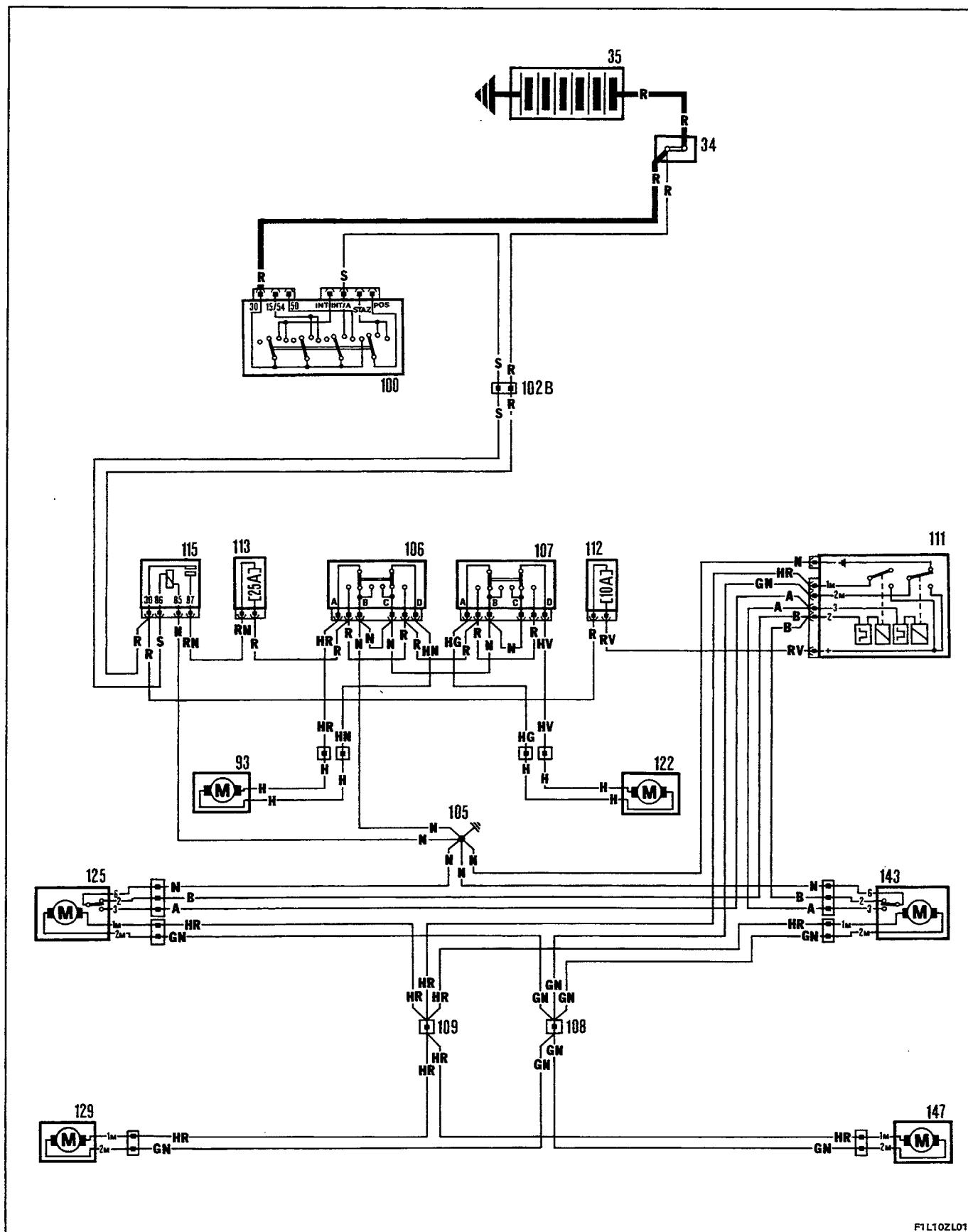
F1L08ZL01

Windscreen wiper - Electric windscreen washer pump - Rearscreen wiper - Electric rearscreen washer pump (see page 13 for key).



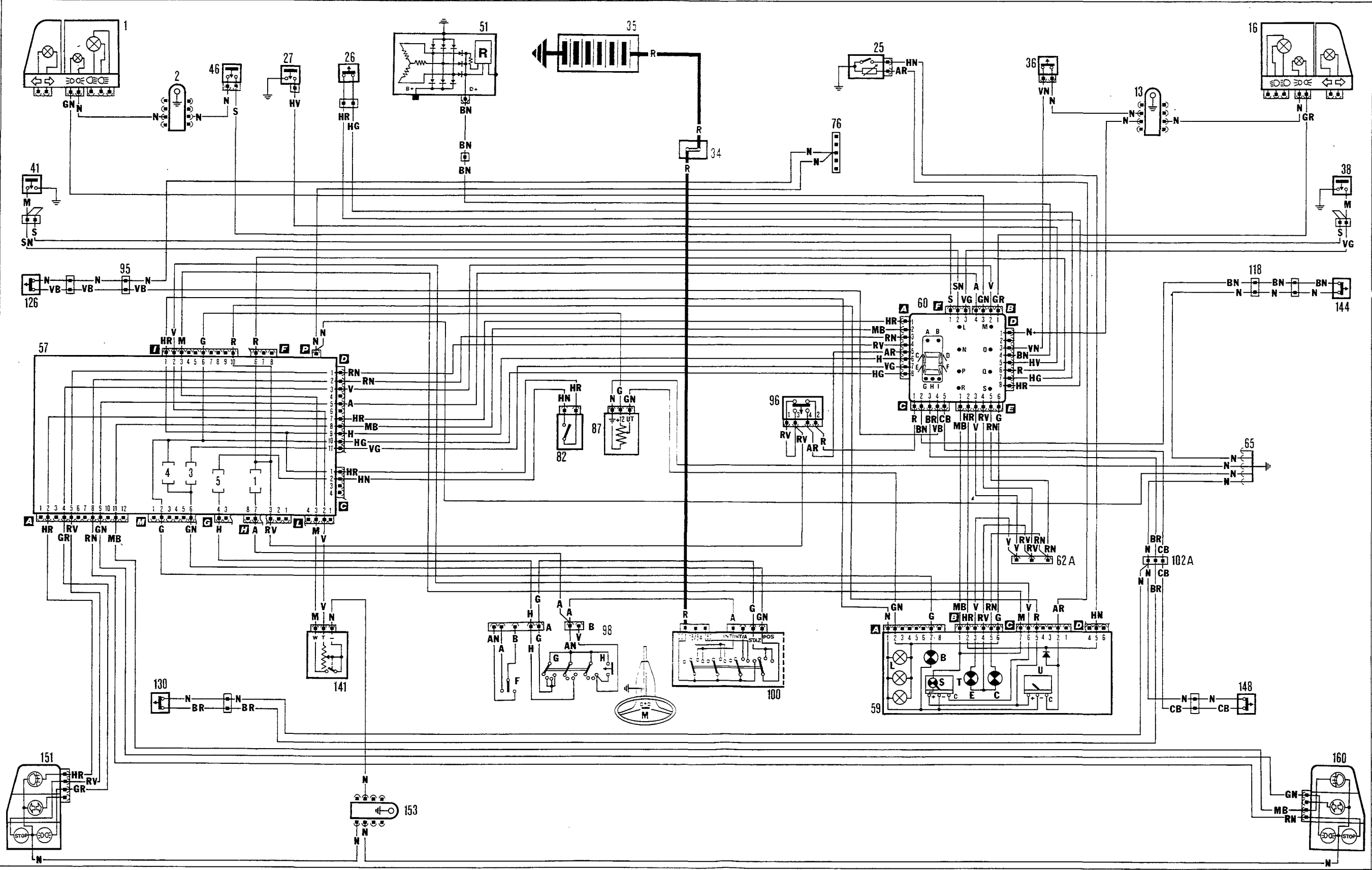
55.

Electric front windows - Central door locking (see page 13 for key).



F1L10ZL01

Control-System



1. Left front light cluster

2. Left front earth cable loom

3. Electric horns

4. Wiring for left fog lamp

5. Reversing lights switch

6. Timing sensor (located in distributor)

7. Left headlamp wiper

7A. Starter inhibitor switch on automatic gearbox

7B. Automatic gearbox oil temperature sender unit

8. Coolant temperature sensor (I.A.W.)

9. Detonation sensor

9A. Over-boost valve

10. Thermostatic switch for radiator cooling fan

10A. Thermostatic switch for radiator cooling fan

11. Electric radiator cooling fan

11A. Additional radiator cooling fan

12. Wiring for right fog lamp

13. Right front earth cable loom

15. Right headlamp wiper

16. Right front light cluster

17. Left side direction indicator

18A. Connector block

19. Automatic idle adjustment solenoid air valve (I.A.W.)

20. Engine rpm and TDC sensor (I.A.W.)

21. Earth points

22. Distributor

23. Spark plugs

23B. Heater plugs

24. Fuel injectors

25. Coolant temperature sender unit

26. Engine oil level sensor

27. Insufficient engine oil pressure switch

28. Engine oil pressure sender unit

29. Engine oil temperature sender unit

30. Additional driving lights relay

31. Connector block

32. Connector block

33. Resistor for radiator cooling fan 1st speed

34. Connector block

35. Battery

36. Engine coolant level sensor

37. Right side direction indicator

38. Right front brake pad wear sensor

39. Left additional driving light

40. Right additional driving light

41. Left front brake pad wear sensor

42. Ignition coil

43. Earth on bodywork

44. Earth on engine

45. Electric headlamp washer pump

46. Brake fluid level sensor

47. Butterfly valve position sensor (I.A.W.)

48. Starter motor

49. Air temperature sensor (I.A.W.)

50. Absolute pressure sensor (I.A.W.)

51. Alternator

52. Heater fan

53. Resistor for adjusting heater fan speed

54. Windscreen wiper with built in intermittent device

55. Fuel injector relay

56. Fuel pump relay

57. Control box for fuses and relays
- E1. Electric horn relay

E2. Heated rear windscreen relay

E3. Relay for heater fan - windscreen wiper - rearscreen wiper - headlamp wiper

58. Connector block

59. Instrument panel

A. Left direction indicator warning light

B. Side lights warning light

C. Control System general warning light (red)

E. Go-ahead signal (green)

F. Hazard warning lights warning light

G. Right direction indicators warning light

H. Dipped headlamps warning light

I. Fog lamps warning light

L. Instrument panel light bulbs

M. Handbrake warning light

O. Rev counter

P. Main beam headlamps warning light

Q. Rear fog lamps warning light

R. Voltmeter

S. Fuel reserve warning light

T. Fuel level gauge

U. Coolant temperature gauge

V. Heated rear windscreen warning light

X. Heater plugs warning light

Y. Water in fuel warning light

Z. Over-boost warning light

W. Engine oil pressure gauge

K. Speedometer switch for trip computer

59A. Instrument panel (version without Control-System)

C. Battery recharging warning light

E. Insufficient engine oil pressure warning light

M. Handbrake and insufficient brake fluid level warning light

N. Front brake pad wear warning light

Z. Coolant overheating warning light

60. Control-System

A. Left front side light failure warning light

B. Right front side light failure warning light

C. Right front door open warning light

D. Left front door open warning light

E. Right rear door open warning light

F. Left rear door open warning light

G. Failure in left rear side lights, brake lights warning light

H. Rear fog lamps failure warning light
 I. Right rear side lights, brake lights failure warning light
 L. Insufficient brake fluid level warning light
 M. Front brake pad wear warning light
 N. Insufficient engine oil pressure warning light
 O. Battery recharging warning light
 P. Insufficient engine oil level warning light
 Q. Insufficient coolant level warning light
 R. Automatic gearbox oil overheating warning light
 S. Coolant overheating warning light
 61. Intermittent device for handbrake warning light
 62. Connector block
 62A. Diagnostic socket for Control System
 62B. Fuel injector and electric fuel pump protective fuse
 63. Glove compartment light
 64. Glove compartment light push button
 65. Earth cable loom under dashboard
 66. Radiator cooling fan relay
 67. Fuse
 68. Heater plugs control unit
 69. Intermittent device for direction indicators and hazard warning lights
 70. Rear fog lamps relay
 71. Sensor for water in fuel filter warning light
 73. Wiring for left front speaker
 74. Front courtesy light push button on left front pillar
 75. Connector
 76. Connector for courtesy light
 77. Combined instrument
 A. Oil pressure gauge
 B. Oil temperature gauge
 77A. Digital clock
 78. Front courtesy light
 78A. Trip computer
 78B. Front courtesy light with digital clock
 79. Engine cut out solenoid on injection pump
 80. Heated rear windscreen switch
 81. Fog lamps switch
 82. Reversing lights switch
 83. Hazard warning lights switch
 84. Heater fan switch
 85. Rearscreen wash/wipe switch
 86. Rearscreen wiper switch
 87. Instrument panel and Control System light dimmer
 88. Rev counter signal electro-magnetic sensor
 89. Fibre optic light for switches
 90. Diagnostic socket
 91. Fuse
 92A. Thermal switch on automatic choke (P.T.C.)
 92B. Thermal switch on idle duct (P.T.C.)
 92C. Thermal switch for accelerator pump outlet opening cut out valve
 92D. Plate
 93. Left front electric window motor
 94. Accelerator pump outlet opening cut out valve
 95. Connector
 96. Brake lights switch
 96A. Brake lights switch
 98. Steering column switch unit

A. Connector
 B. Connector
 C. Connector
 D. Connector
 F. Direction indicators control
 G. Side lights, dipped headlamps, main beam headlamps control
 H. Main beam flasher control
 I. Windscreen wiper control
 L. Windscreen washer and headlamp wash/wipe control
 M. Electric horn control
 100. Ignition switch
 102A. Wiring for Control-System
 102B. Wiring for electric windows - central locking
 103. Cigar lighter
 104. Wiring for radio
 105. Earth stud
 106. Left front electric window switch
 107. Right front electric window switch
 108. Connector block
 109. Connector block
 110. Handbrake warning light push button
 111. Central locking control unit
 112. Central locking control unit protective fuse
 113. Electric front windows protective fuse
 115. Electric windows relay
 116. Injection/ignition control unit (I.A.W.)
 117. Connector block
 117A. Connector block
 118. Connector
 119. Wiring for right front speaker
 120. Front courtesy light push button on right front pillar
 122. Right front electric window motor
 123A. Resistor (P.T.C.) on automatic choke
 123B. Resistor (P.T.C.) on idle duct
 124. Cut-off device electronic control unit
 125. Left front door locking motor
 126. Left front door open warning light push button
 127. Rear courtesy light push button on left centre pillar
 128. Idle cut out device (cut-off)
 129. Left rear door locking motor
 130. Left rear door open warning light push button
 131. Butterfly valve position switch on carburettor (cut-off)
 132. Digiplex electronic ignition control unit
 133. Diagnostic socket for Digiplex control unit
 134. Left rear courtesy light

135. TDC and rpm sensor on pulley (2nd generation Digiplex)
 136. Heated rear windscreen
 137. Stater inhibitor with gear engaged relay (automatic transmission)
 138. Fast idle valve relay (for automatic transmission)
 139. Gear selector ideogram light
 140. Fuel flow meter
 141. Fuel level gauge and reserve warning light
 142. Electric fuel pump
 143. Right front door locking motor
 144. Right front door open push button
 145. Rear courtesy light push button on right centre pillar
 146. External temperature sensor
 147. Right rear door locking motor
 148. Right rear door open push button
 151. Left rear light cluster
 153. Rear earth cable loom
 155. No. plate lights
 156. Reversing lights
 158. Earth cable loom on tailgate
 159. Rearscreen wiper
 160. Right rear light cluster
 161. Right rear courtesy light
 162. Luggage compartment light
 163. Electric windscreen washer pump
 164. Electric rearscreen washer pump
 165. Fast idle valve
 166. Air conditioning system compressor pulley electro-magnet coupling
 167. Electro-magnet coupling protective fuse
 168. Air conditioning system electro-magnet coupling relay
 169. Radiator cooling fan protective fuse
 170. Radiator cooling fan relay
 171. Air conditioning system switch
 172. Thermal switch for air conditioning radiator and condenser fan
 173. Thermal switch for air conditioning system safety device
 174. Idle pressure switch
 175. Anti-frost thermostat

Cable colour code

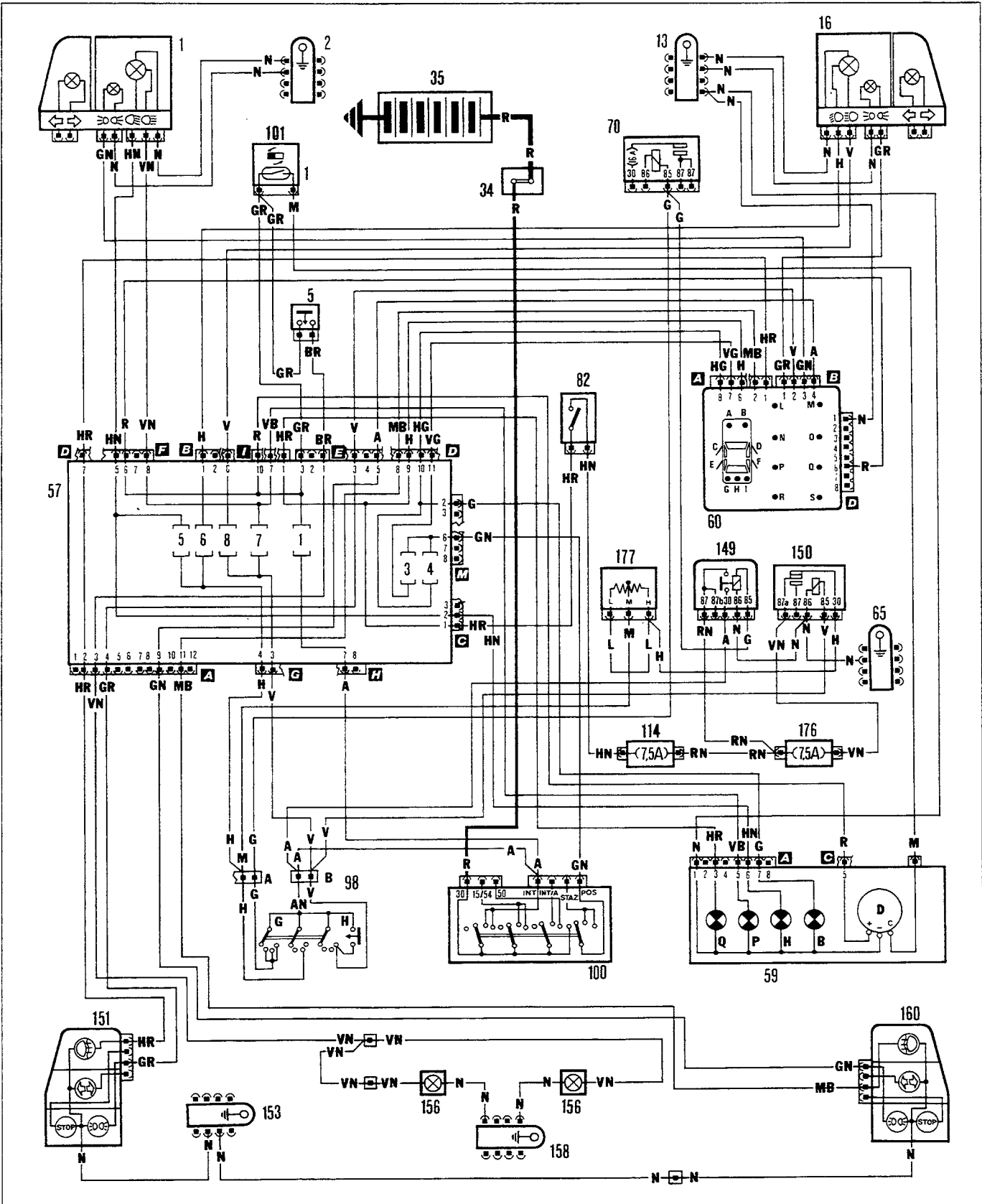
A Light Blue
 B White
 C Orange
 G Yellow
 H Grey
 L Blue
 M Brown
 N Black
 R Red
 S Pink
 V Green
 Z Violet
 AB Light Blue-White
 AG Light Blue-Yellow
 AN Light Blue-Black
 AR Light Blue-Red
 AV Light Blue-Green
 BG White-Yellow
 BL White-Blue
 BN White-Black
 BR White-Red
 BV White-Green
 BZ White-Violet
 CA Orange-Light Blue
 CB Orange-White
 CN Orange-Black
 GN Yellow-Black
 GL Yellow-Blue
 GR Yellow-Red
 GV Yellow-Green
 HG Grey-Yellow
 HN Grey-Black
 HR Grey-Red
 LB Blue-White
 LG Blue-Yellow
 LN Blue-Black
 LR Blue-Red
 LV Blue-Green
 MB Brown-White
 MN Brown-Black
 NZ Black-Violet
 RB Red-White
 RG Red-Yellow
 RN Red-Black
 RV Red-Green
 SN Pink-Black
 VB Green-White
 VN Green-Black
 VR Green-Red

Version: RIGHT HAND DRIVE

Side lights and warning light - Dipped beam dimmed with DIM-DIP device - Main beam and warning light - Flasher - Number plate light - Electronic speedometer (see key on page 19)

Key

- 1. L. front light cluster
- 2. L. front earth loom
- 5. Reversing light switch
- 13. R. front earth loom
- 16. R. front light cluster
- 34. Shunt node
- 35. Battery
- 57. Fuse and relay control box
- 59. Control panel
 - B. Side light warning light
 - H. Dipped beam warning light
 - P. Main beam warning light
 - Q. Rear fog lamp warning light
- 60. Check Panel
- 65. Under facia earth loom
- 70. Supplementary beam control relay
- 82. Rear fog lamp switch
- 98. Steering column switch
- 100. Ignition switch
- 101. Pulse generator
- 114. Rear fog lamp fuse
- 149. DIM-DIP cut-out relay
- 150. DIM-DIP cut-out remote control switch
- 151. L. rear light
- 153. Rear earth loom
- 156. Reversing lights
- 158. Rear earth loom
- 160. R. rear light
- 176. DIM-DIP circuit fuse
- 177. Additional DIM-DIP circuit fuse



P1Q19ZL01

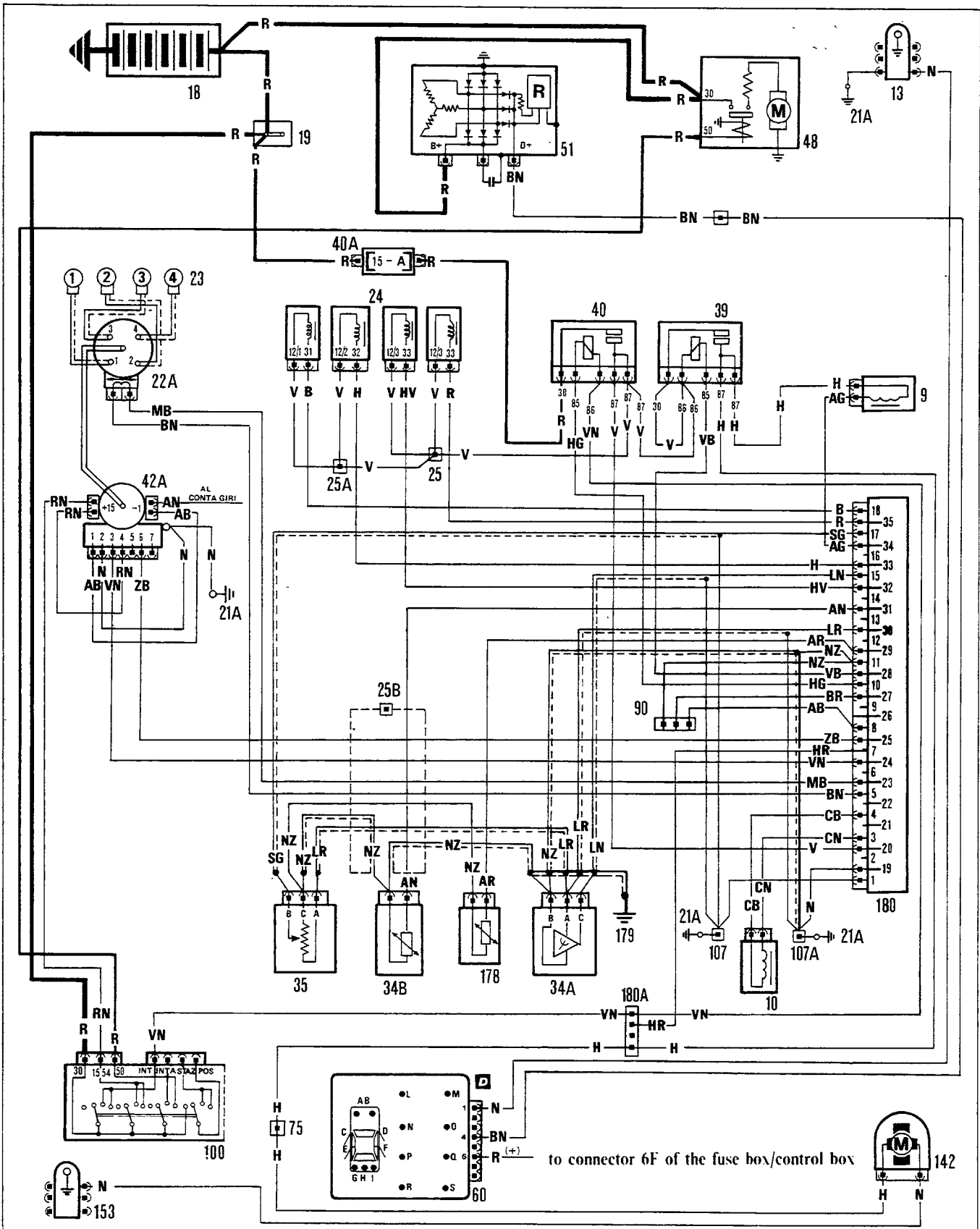
page

Wiring diagrams	1
Wiring diagrams key	13

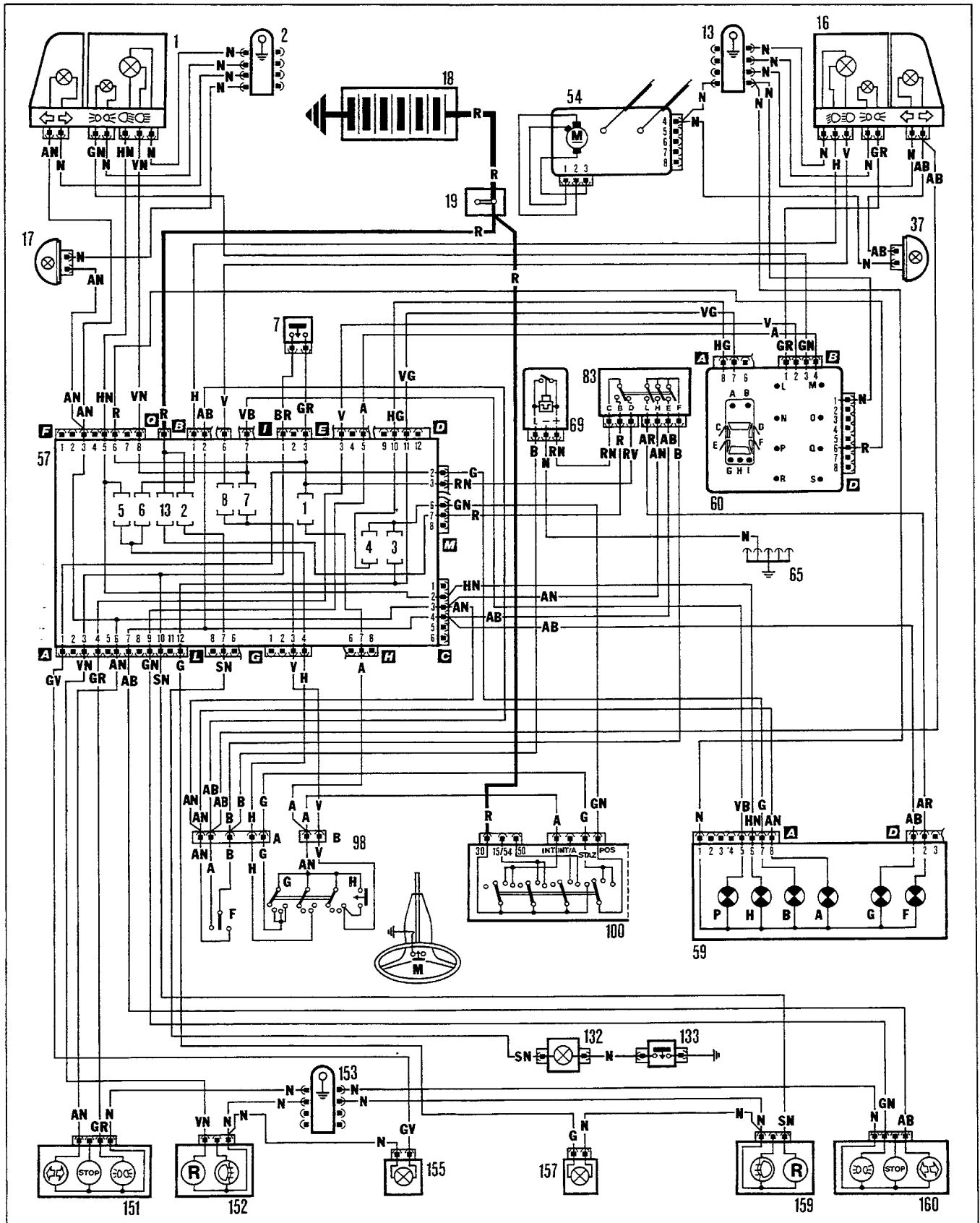
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55.

Starting - Recharging - Weber injection/ignition (IAW post-modification) - Fuel pump (see page 13 for key)

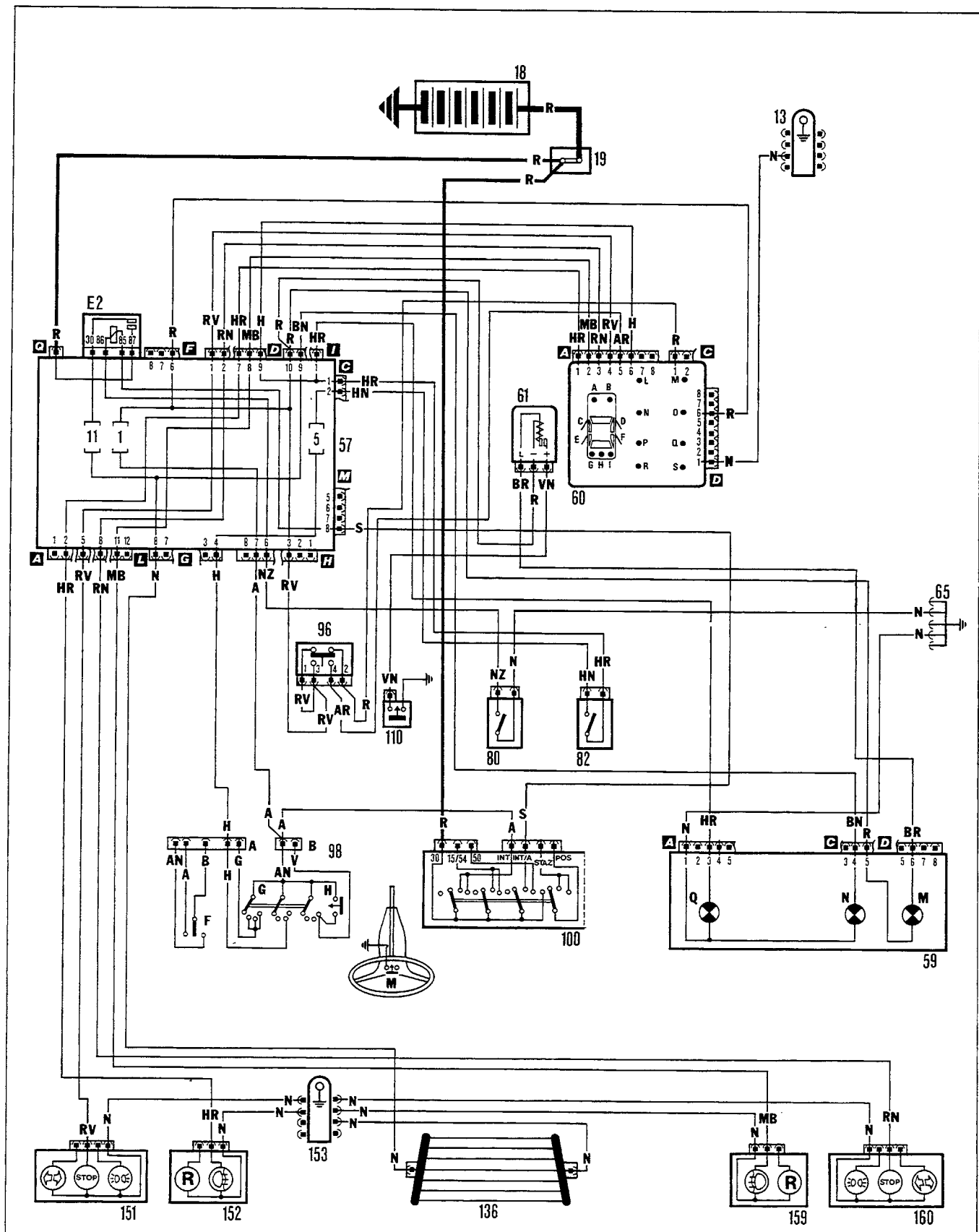


Side lights and warning light - Dipped headlamps - Main beam headlamps and warning light - Driving lights - Direction indicators and warning light - Hazard warning lights and warning light - No. plate light - Luggage compartment light (see page 13 for key)

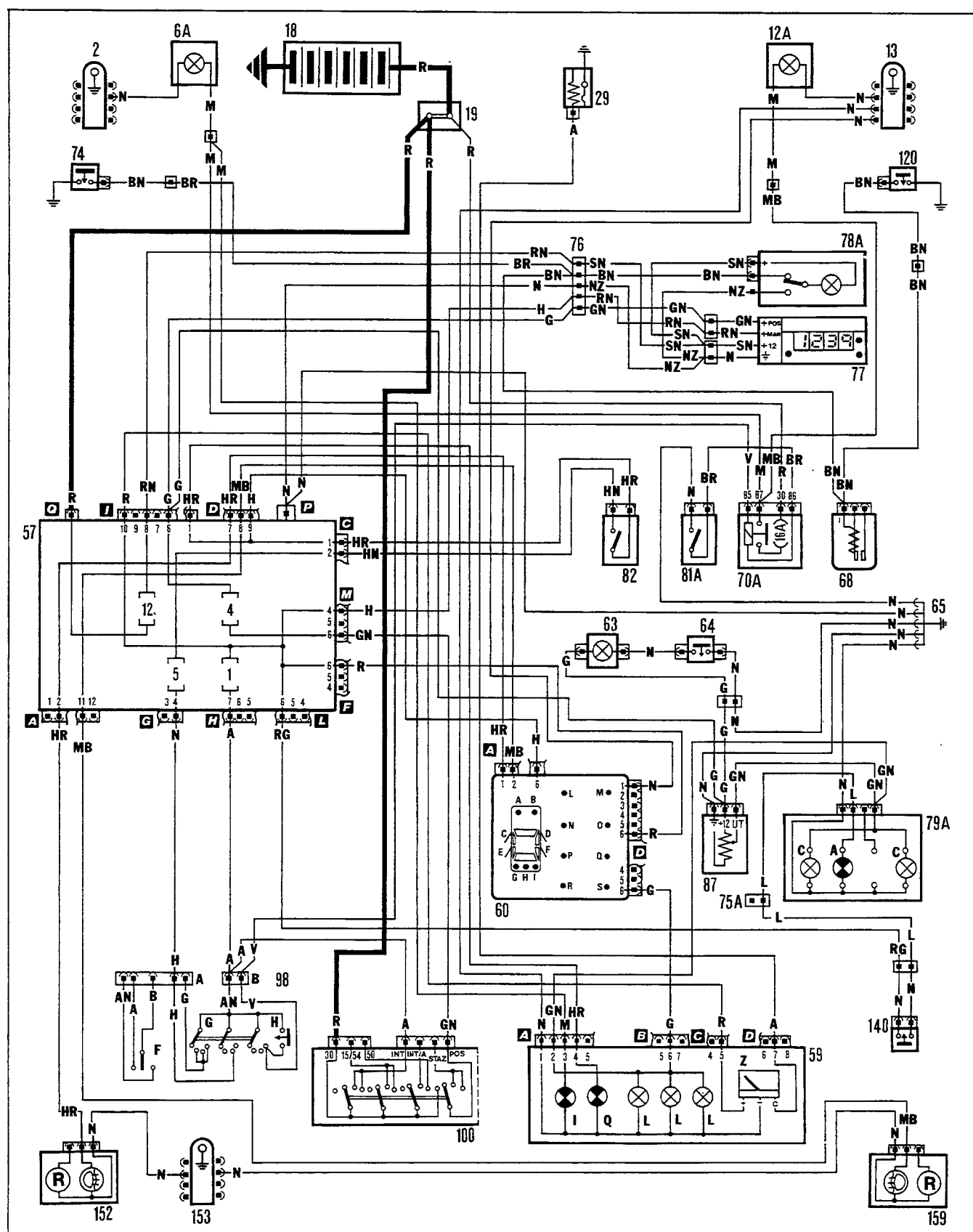


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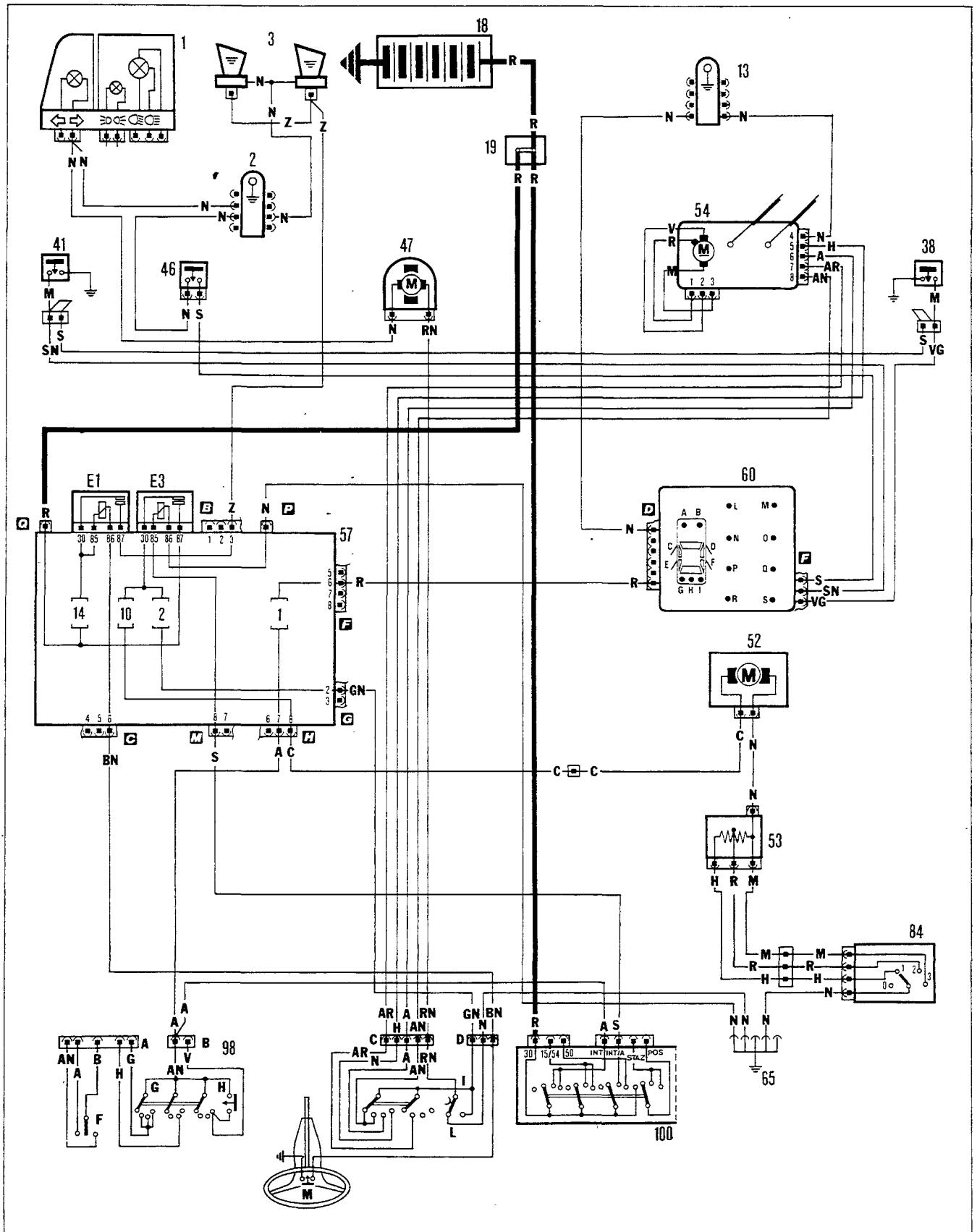
Heated rear windscreen and warning light - Rear fog lamps and warning light - Brake lights - Handbrake warning light (see page 13 for key)



Rear differential engaged warning light - Additional driving light and warning light - Rear fog lamps and warning light - Front courtesy light - Digital clock - Engine oil pressure gauge (see page 13 for key)

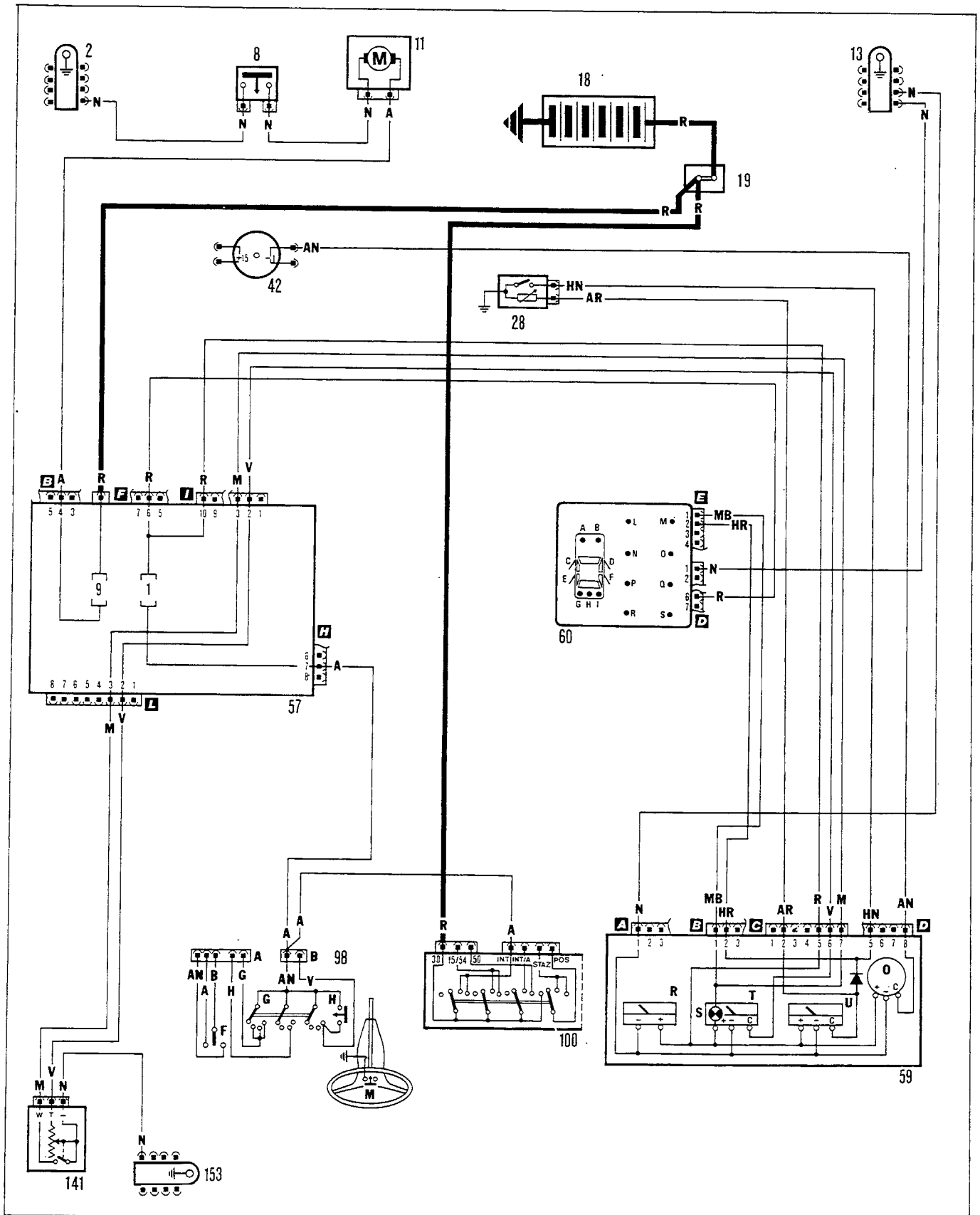


Windscreen wiper - Electric windscreen washer pump - Electric horns - Car interior ventilation - Insufficient brake fluid level - Front brake pad wear (see page 13 for key)

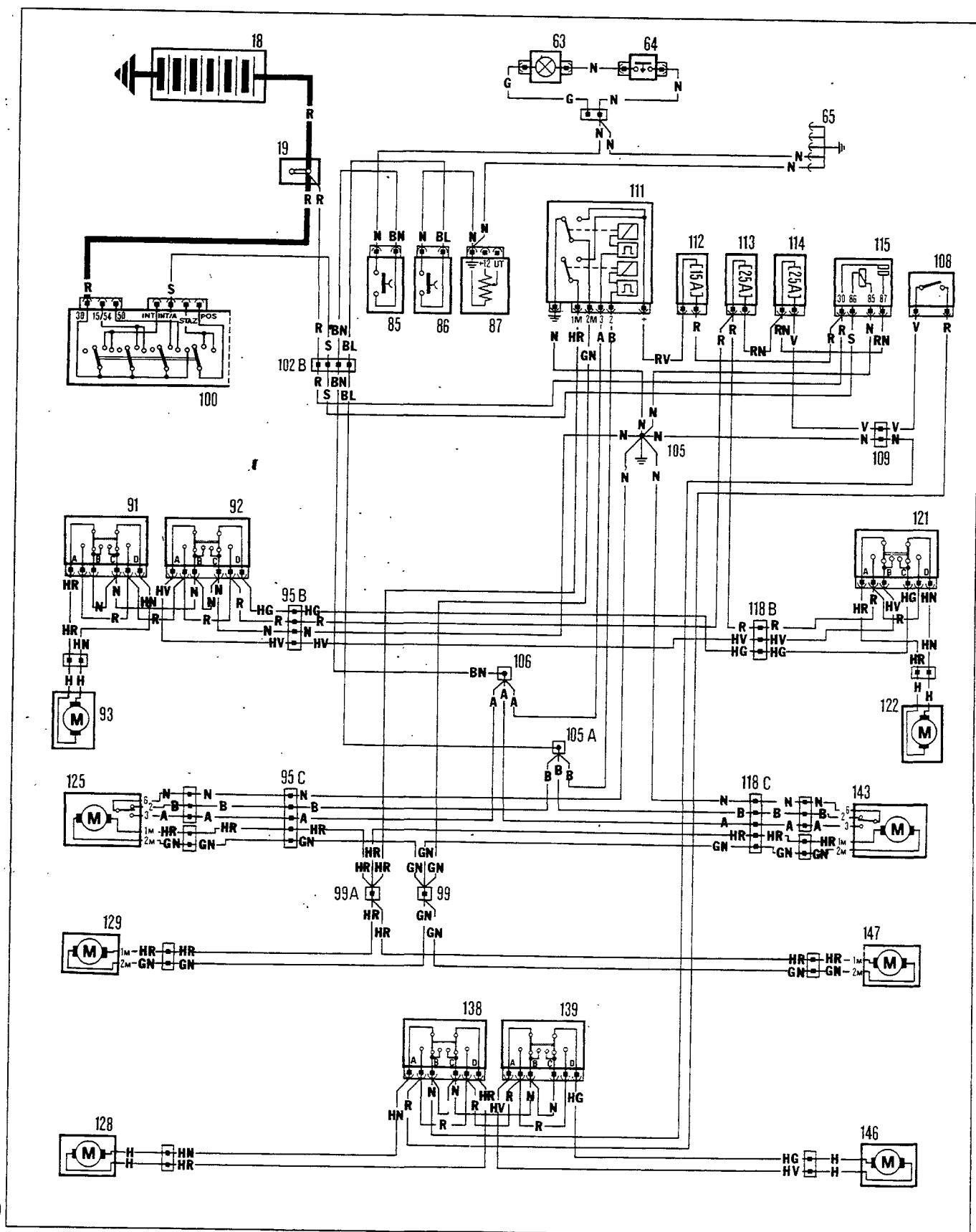


55.

Fuel gauge and reserve warning light - Engine coolant temperature and overheating warning light - Voltmeter - Radiator cooling fan - Rev counter (see page 13 for key)

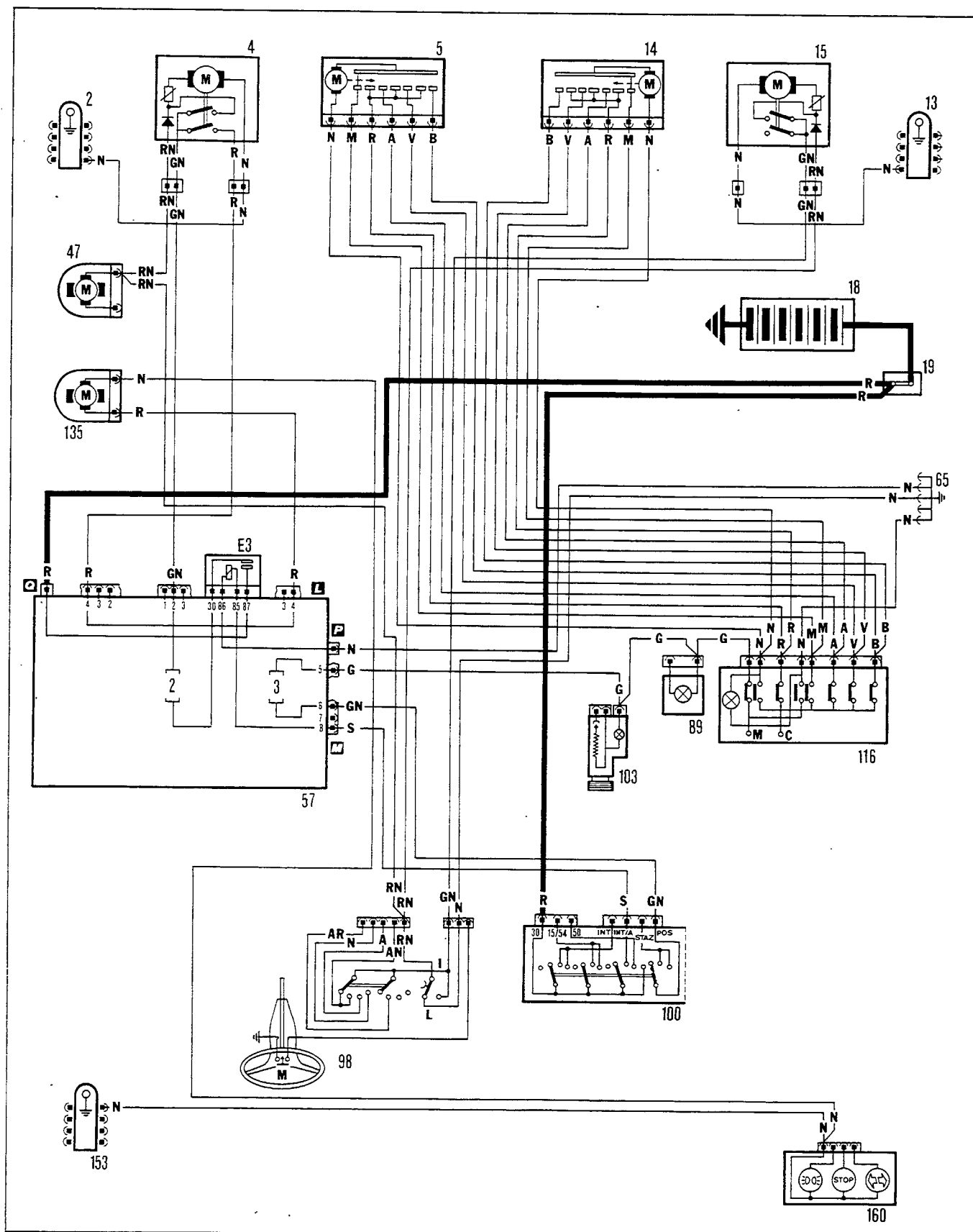


Electric front windows - Electric rear windows - Central locking system (see page 13 for key)

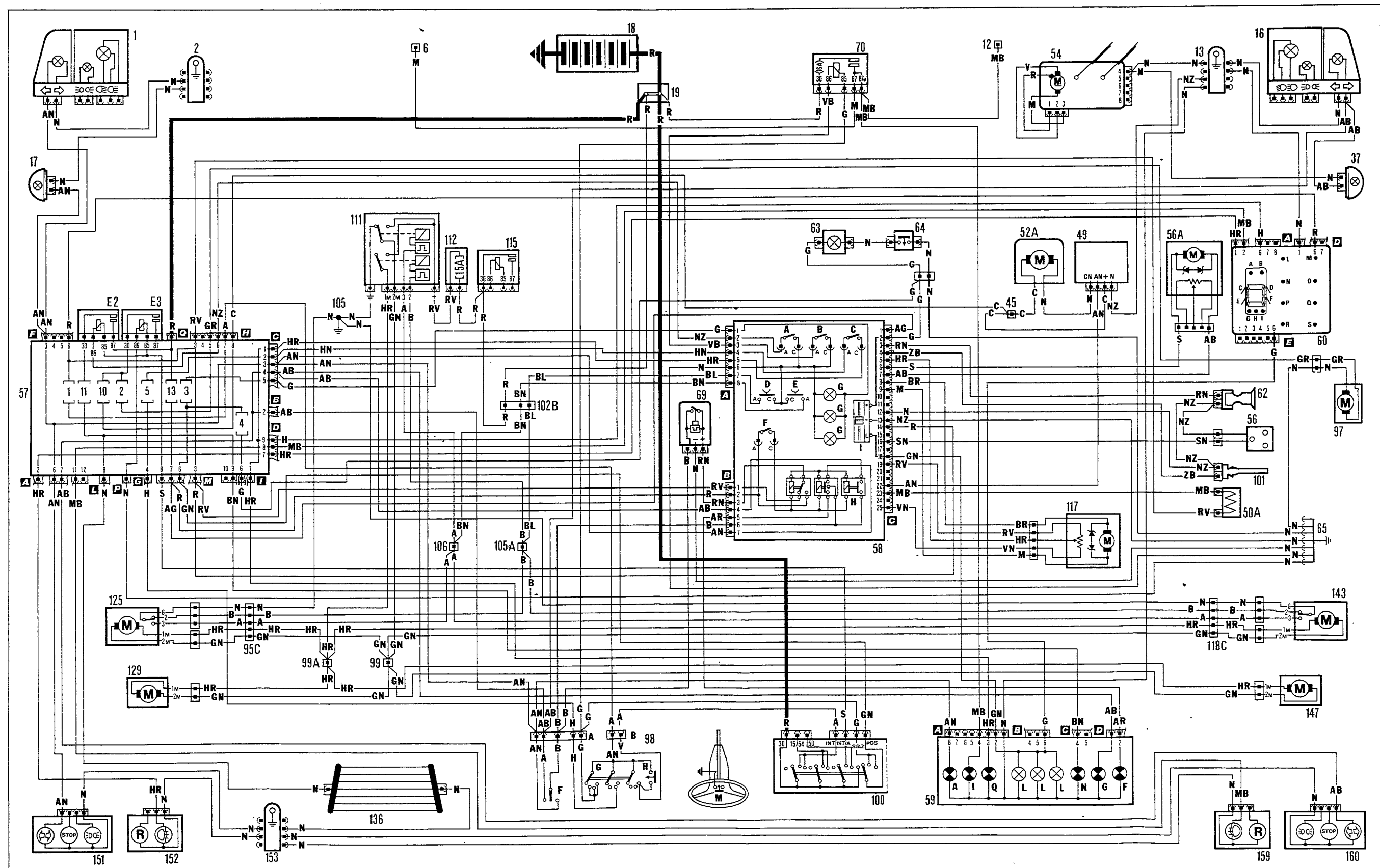


55.

Headlamp alignment - Headlamp wipers - Electric headlamp washer pump (see page 13 for key)

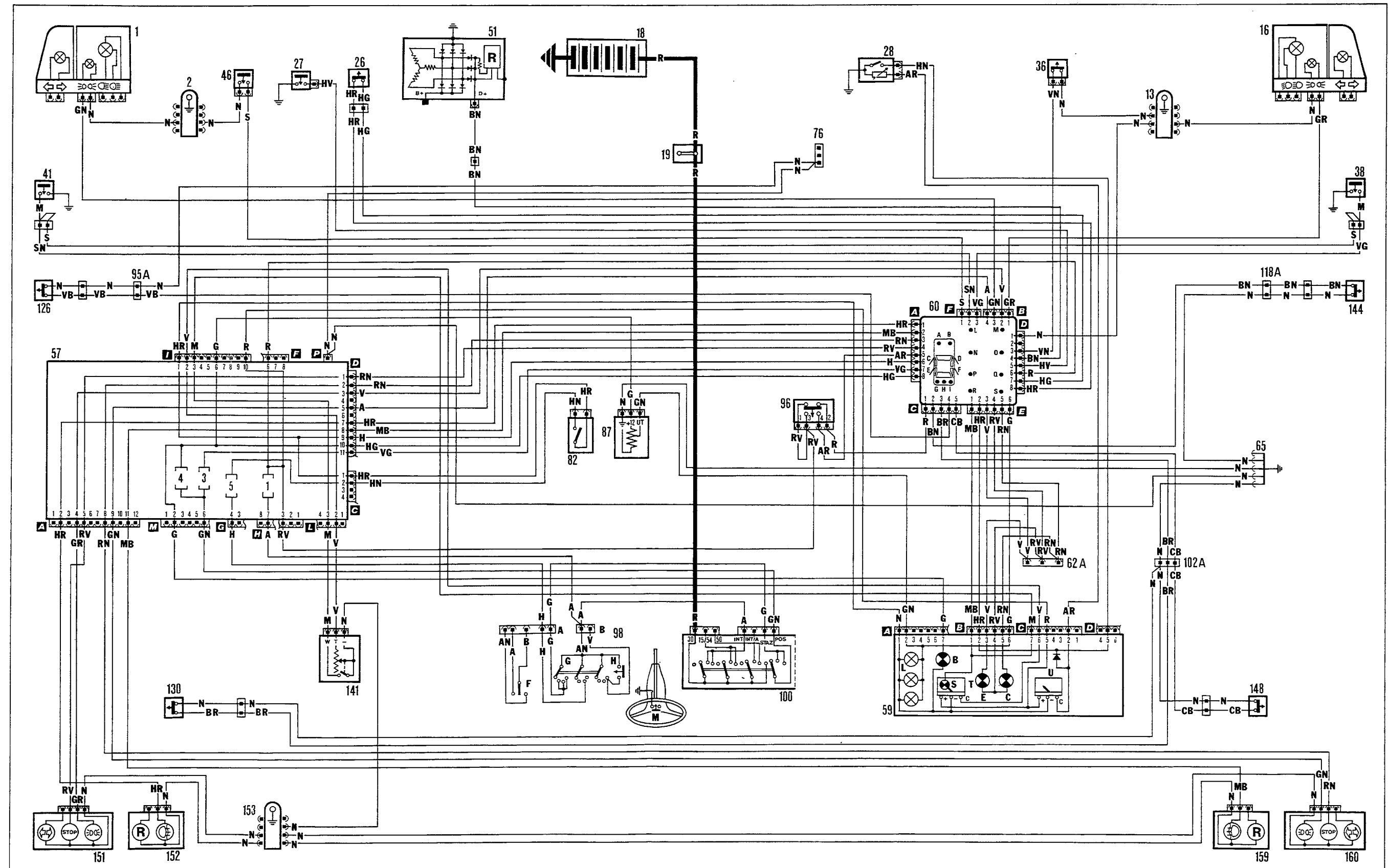


Version with automatic heater (see page 13 for key)



55.

Control System (see page 13 for key)



1. Left front light cluster
2. Left front earth cable loom
3. Electric horns
4. Left headlamp wiper motor
5. Left headlamp alignment corrector
6. Left fog lamp wiring
- 6A. Left front additional driving light
7. Reversing lights switch
- 7A. Starter inhibitor switch on automatic transmission
- 7B. Automatic gearbox oil maximum temperature thermostatic switch
8. Radiator fan thermostatic switch
9. Automatic idle adjustment solenoid valve (IAW)
- 9A. Fuel flow meter
10. Rpm and TDC sensor (IAW)
11. Radiator cooling fan
- 11A. Additional radiator cooling fan
12. Right fog lamp wiring
- 12A. Right front additional driving light
13. Right front earth cable loom
14. Right headlamp alignment corrector
15. Right headlamp wiper
16. Right front light cluster
17. Left side direction indicator
- 17A. External temperature sensor
18. Battery
19. Connector
20. Diagnostic socket
21. Digiplex electronic ignition control unit
- 21A. Earths on engine
22. Ignition distributor
- 22A. Ignition distributor
23. Spark plugs
24. Fuel injectors
- 24A. Cut-off device electronic control unit
25. Connector
- 25A. Connector
- 25B. Connection
26. Engine oil level sensor
27. Insufficient engine oil pressure sensor
28. Coolant temperature sender unit and overheating warning light
29. Engine oil pressure sender unit
30. Butterfly valve position switch on carburettor
- 30A. Thermal switch for P.T.C. on automatic choke
31. Dipped headlamp resistor
32. Diode carrier plate
33. Sensor on TDC pulley (rpm and TDC sensor for 2nd generation Digiplex)
34. Idle cut out device
- 34A. Absolute pressure sensor (IAW)
- 34B. Air temperature sensor (IAW)
35. Butterfly valve position sensor (IAW)
- 35A. Rpm sensor on flywheel
36. Coolant level sensor
37. Right side direction indicator
38. Right front brake pad wear sensor
39. Electric fuel pump relay
40. Injector supply relay
- 40A. Injector and electric fuel pump supply fuse
41. Left front brake pad wear sensor
42. Ignition coil
- 42A. Ignition coil with power module
43. Heated seat protective fuse
44. Heated seat supply relay
45. Connection
46. Brake fluid level sensor
47. Electric windscreen washer pump
- 47A. Thermal switch for P.T.C. on automatic choke
- 47B. Thermal switch for P.T.C. on idle manifold
- 47C. Thermal switch for accelerator pump outlet opening idle cut out solenoid valve
- 47D. Plate
48. Starter motor
49. Electronic speed regulator for heater fan
- 49A. P.T.C. on idle manifold
- 49B. P.T.C. on automatic choke
50. Accelerator pump outlet opening idle cut out solenoid valve
- 50A. Outside air intake flap control valve
51. Alternator
52. Heater fan
- 52A. Ventilation fan
53. Resistor for adjusting heater fan speed
54. Windscreen wiper with built in intermittent device
55. P.T.C. supply fuse
56. Outside air temperature sensor
- 56A. Air mixture motor
57. Fuse and relay control box
 - E1. Electric horn relay
 - E2. Heated rear windscreen relay
 - E3. Heater fan - windscreen wiper - headlamp wiper relay
58. Automatic heater and dashboard controls control unit
 - A. Heated rear windscreen switch
 - B. Fog lamps switch (additional headlamps for 4WD)
 - C. Rear fog lamps switch
 - D. Central locking switch
 - E. Central unlocking switch
 - F. Hazard warning lights switch
 - G. Control unit light bulbs
 - H. Relay for hazard warning lights
 - I. Instrument panel and Control System light dimmer
59. Instrument panel
 - A. Left direction indicators warning light
 - B. Side lights warning light
 - C. Control System (red) general warning light
 - E. (Green) go ahead signal

- F. Hazard warning lights warning light
- G. Right direction indicators warning light
- H. Dipped headlamps warning light
- I. Fog lamps warning light (additional headlamps on 4WD)
- L. Instrument panel light
- M. Handbrake warning light
- N. Heated rear windscreen warning light
- O. Rev counter
- P. Main beam headlamps warning light
- Q. Rear fog lamps warning light
- R. Volt meter
- S. Fuel reserve warning light
- T. Fuel gauge
- U. Coolant temperature gauge
- V. Speedometer switch for trip computer
- X. Heater plugs warning light
- Y. Water in fuel warning light
- Z. Engine oil pressure gauge
- 59A. Instrument panel (version without Control-System)
- C. Battery recharging warning light
- E. Insufficient engine oil pressure warning light
- M. Handbrake and insufficient brake fluid level warning light
- N. Front brake pad wear warning light
- V. Heated rear windscreen warning light
- Z. Coolant overheating warning light
- 60. Control-System
- A. Left front side light failure warning light
- B. Right front side light failure warning light
- C. Right front door not properly shut warning light
- D. Left front door not properly shut warning light
- E. Right rear door not properly shut warning light
- F. Left rear door not properly shut warning light
- G. Left rear side lights and brake lights failure warning light
- H. Rear fog lamps failure warning light
- I. Right rear side lights and brake lights failure warning light
- L. Insufficient brake fluid level warning light
- M. Front brake pads wear warning light
- N. Insufficient engine oil pressure warning light
- O. Battery recharging warning light
- P. Insufficient engine oil level warning light
- Q. Insufficient coolant level warning light
- R. Automatic gearbox oil overheating warning light
- S. Coolant overheating warning light
- 61. Intermittent device for handbrake warning light
- 62. Car interior air temperature sensor
- 62A. Diagnostic socket for Control-System
- 63. Glove compartment light bulb
- 64. Push button for glove compartment light
- 64B. Switch signalling low engine oil pressure
- 64C. Relay for P.T.C. supply
- 65. Earth cable loom under dashboard
- 66. Supply fuse for P.T.C.
- 67A. Relay for starter inhibitor with gear engaged
- 68. Delay device for ignition switch light
- 69. Intermittent device for direction indicators and hazard warning lights
- 70. Fog lamps relay
- 70A. Additional headlamps relay

- 71. Dipped headlamps relay
- 71A. Main beam headlamps relay
- 73. Left front speaker wiring
- 74. Push button for front courtesy light on left front pillar
- 75. Connection
- 75A. Connection
- 76. Connection for courtesy light
- 76A. Connection for courtesy light with digital clock
- 77. Digital clock
- 78. Front courtesy light
- 78A. Front courtesy light with digital clock
- 79. Trip computer
- 79A. Panel for warning light showing rear differential engaged
- A. Warning light signalling rear differential engaged
- C. Panel lights
- 80. Heated rear windscreen switch
- 81. Fog lamps switch
- 81A. Additional headlamps switch
- 82. Rear fog lamps switch
- 83. Hazard warning lights switch
- 84. Heater fan switch
- 85. Central locking switch
- 86. Central unlocking switch
- 87. Instrument panel and Control System light dimmer switch
- 88. Driver's seat heated pad
- 89. Switch fibre optic light
- 90. Diagnostic socket
- 91. Left front electric window switch
- 92. Right front electric window switch
- 93. Left front electric window motor
- 95A. Connection
- 95B. Connection
- 95C. Connection
- 96. Brake lights switch
- 96A. Brake lights switch
- 97. Car interior temperature sensor fan
- 98. Steering column switch unit
- F. Direction indicators control
- G. Side light, dipped and main beam headlamps control
- H. Driving lights control
- I. Windscreen wiper control
- L. Windscreen washer and headlamp wash/wipe control
- M. Electric horn control

- 99. Connector
- 99A. Connector
- 100. Ignition switch
- 101. Air mixture temperature sensor
- 102A. Wiring for Control-System
- 102B. Wiring for electric front windows and central locking
- 103. Cigar lighter
- 103A. Gear selector ideogram fibre optic light
- 104. Wiring for radio
- 105. Earth stud
- 105A. Connector
- 106. Connector
- 107. Connector
- 107A. Connector
- 108. Electric rear windows cut out switch
- 109. Wiring for electric rear windows
- 110. Push button for handbrake warning light
- 111. Central locking control unit
- 112. Central locking control unit supply fuse
- 113. Electric front windows supply fuse
- 114. Electric rear windows supply fuse
- 115. Electric windows relay feed
- 116. Headlamp alignment controls
- 117. Car interior air mixture and distribution motor
- 118A. Connection
- 118B. Connection
- 118C. Connection
- 119. Right front speaker wiring
- 120. Push button for front courtesy light on right front pillar
- 121. Switch for right front electric window
- 122. Motor for right front electric window
- 125. Left front door locking motor
- 126. Push button signalling left front door open
- 127. Push button for rear courtesy light on left centre pillar
- 128. Left rear electric window motor
- 129. Left rear door locking motor
- 130. Push button signalling left rear door open
- 132. Luggage compartment courtesy light
- 133. Luggage compartment courtesy light switch
- 134. Rear courtesy light
- 135. Electric headlamp washer pump
- 136. Heated rear windscreen
- 138. Left rear electric window switch
- 139. Right rear electric window switch
- 140. Rear differential engaged warning light
- 141. Fuel gauge and reserve warning light
- 142. Electric fuel pump
- 143. Right front door locking motor
- 144. Push button signalling right front door open
- 145. Push button for rear courtesy light on right centre pillar
- 146. Right rear electric window motor
- 147. Right rear door locking motor
- 148. Push button signalling right rear door open
- 151. Left rear light
- 152. Left rear light on tailgate
- 153. Rear earth cable loom
- 155. Left no. plate light
- 157. Right no. plate light
- 159. Right rear light on tailgate

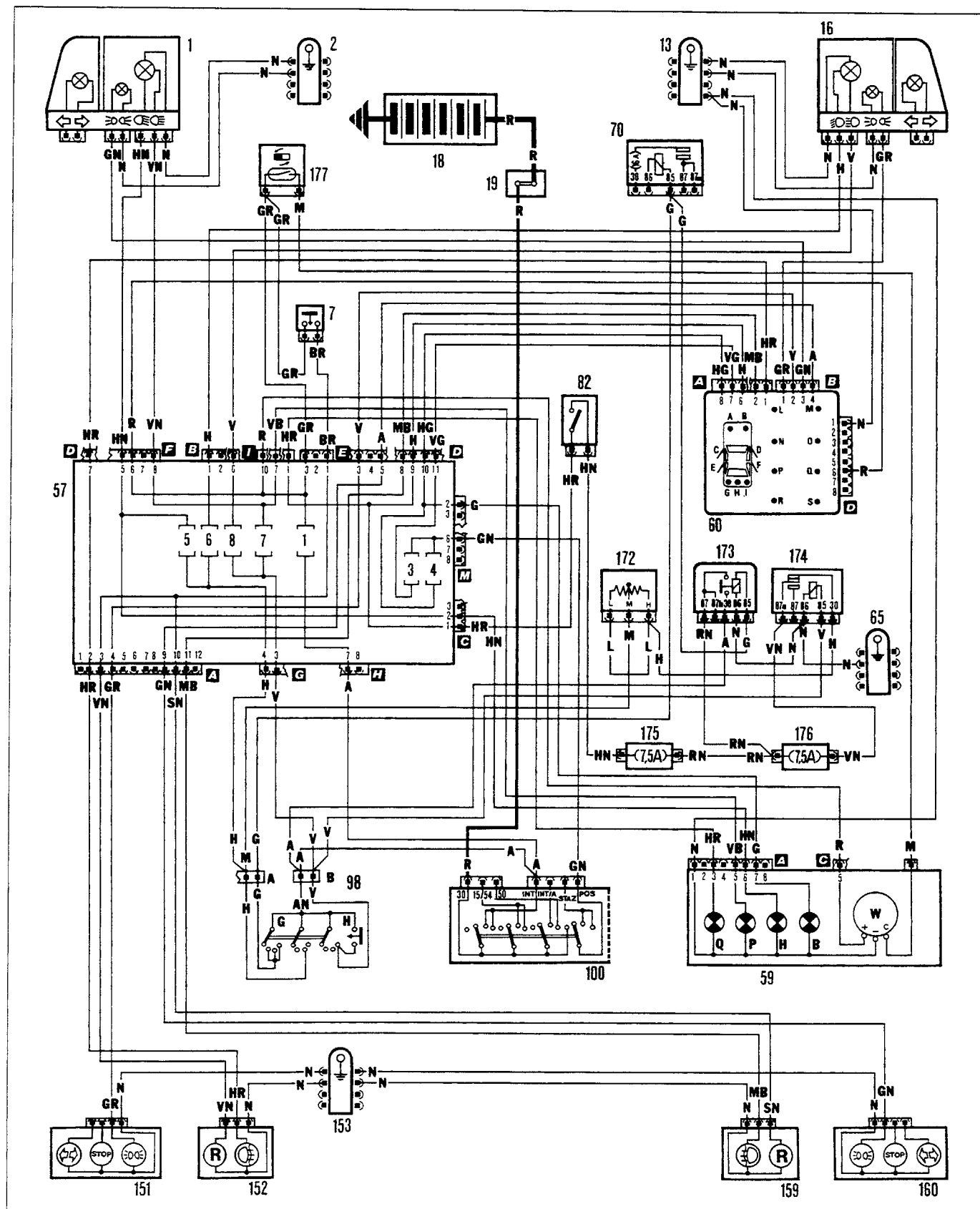
- 160. Right rear light
- 161. Thermal switch for air conditioning system radiator and condenser fan
- 162. Thermal switch for air conditioning system safety device
- 363. Idle pressure switch
- 164. Anti-frost thermostat
- 165. Fast idle solenoid valve
- 166. Air conditioning system compressor pulley electro-magnet coupling
- 167. Electro-magnet coupling protective fuse
- 168. Fast idle solenoid valve and electro-magnet coupling relay feed
- 169. Radiator cooling fan protective fuse
- 170. Radiator cooling fan relay feed
- 171. Air conditioning system switch
- 178. Coolant temperature sensor (IAW)
- 179. Earth on bodywork
- 180. Injection/ignition system electronic control unit (IAW)
- 180A. Connection
- 181. Resistor for radiator cooling fan 1st speed
- 183. Thermal switch for dual operating range radiator fan
- 185. Heater plugs control unit
- 186. Heater plugs
- 187. Sensor for water in fuel filter warning light
- 188. Engine cut out solenoid valve on injection pump
- 191. Thermal switch for air conditioning system compressor electro-magnet coupling

Cable colour code

- | | |
|-----------|-------------------|
| A | Light Blue |
| B | White |
| C | Orange |
| G | Yellow |
| H | Grey |
| L | Blue |
| M | Brown |
| N | Black |
| R | Red |
| S | Pink |
| V | Green |
| Z | Violet |
| AB | Light Blue-White |
| AG | Light Blue-Yellow |
| AN | Light Blue-Black |
| AR | Light Blue-Red |
| AV | Light Blue-Green |
| BG | White-Yellow |
| BL | White-Blue |
| BN | White-Black |
| BR | White-Red |
| BV | White-Green |
| BZ | White-Violet |
| CA | Orange-Light Blue |
| CB | Orange-White |
| CN | Orange-Black |
| GN | Yellow-Black |
| GL | Yellow-Blue |
| +R | Yellow-Red |
| GV | Yellow-Green |
| HG | Grey-Yellow |
| HN | Grey-Black |
| HR | Grey-Red |
| LB | Blue-White |
| LG | Blue-Yellow |
| LN | Blue-Black |
| LR | Blue-Red |
| LV | Blue-Green |
| MB | Brown-White |
| MN | Brown-Black |
| NZ | Black-Violet |
| RB | Red-White |
| RG | Red-Yellow |
| RN | Red-Black |
| RV | Red-Green |
| SN | Pink-Black |
| VB | Green-White |
| VN | Green-Black |
| VR | Green-Red |

Version: RIGHT HAND DRIVE

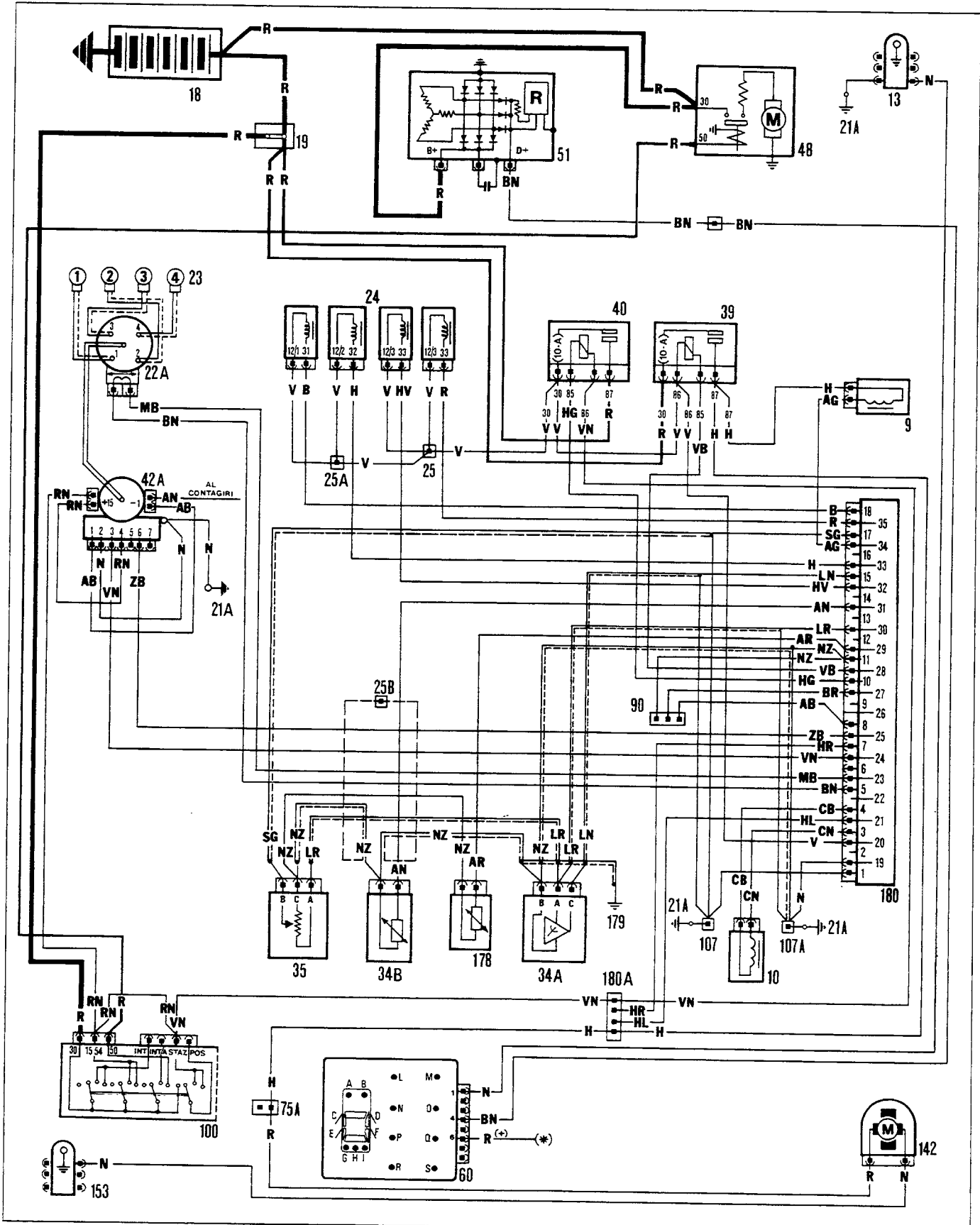
Side lights and warning light - Dipped beam dimmed with DIM-DIP device - Main beam and warning light - Flasher (see key on page 19)



55.

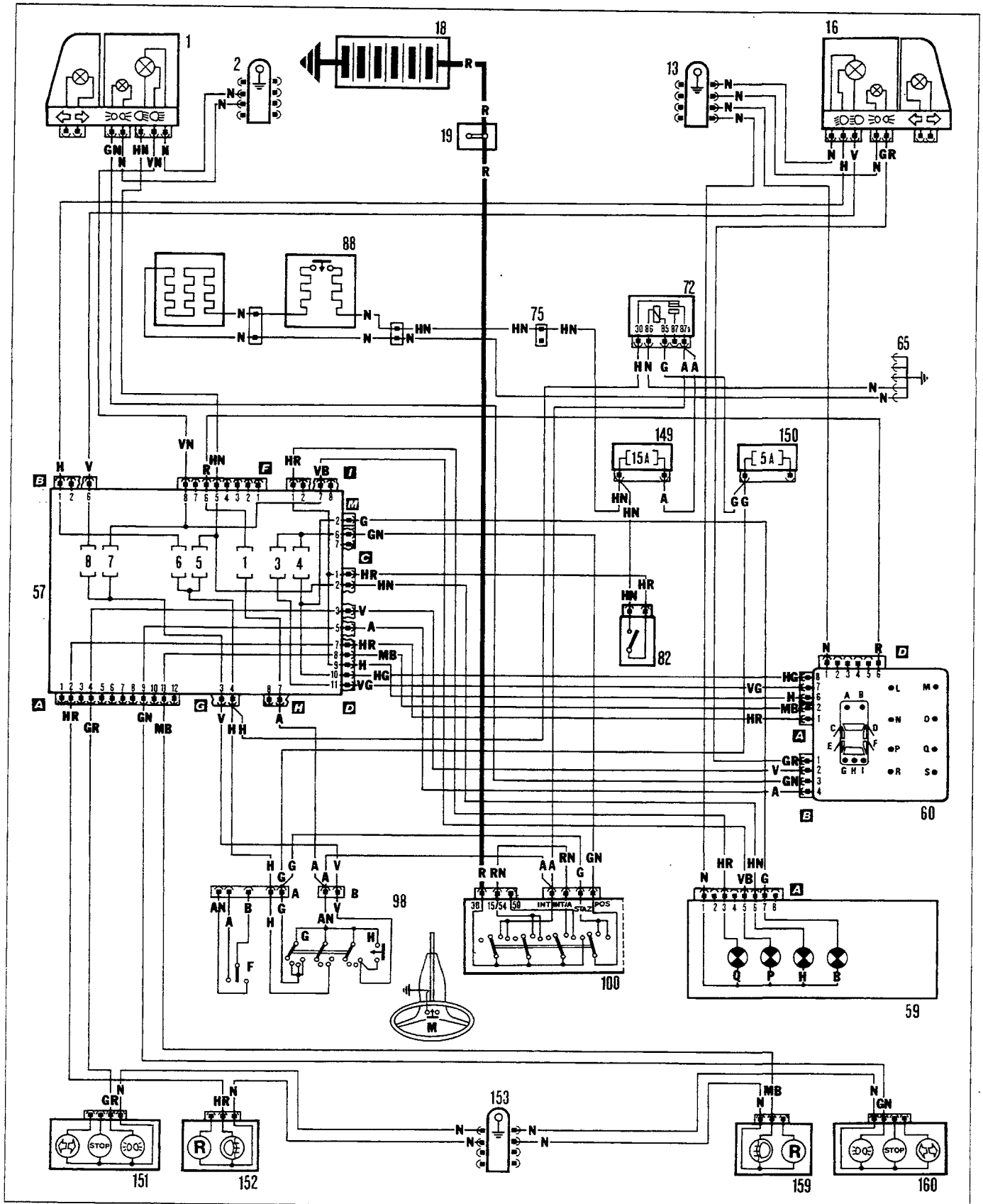
Version: SCANDINAVIA

Starting- Recharging-Weber ignition injection (I.A.W.) - Fuel feed pump (see key on page 19)



Version: RIGHT HAND DRIVE

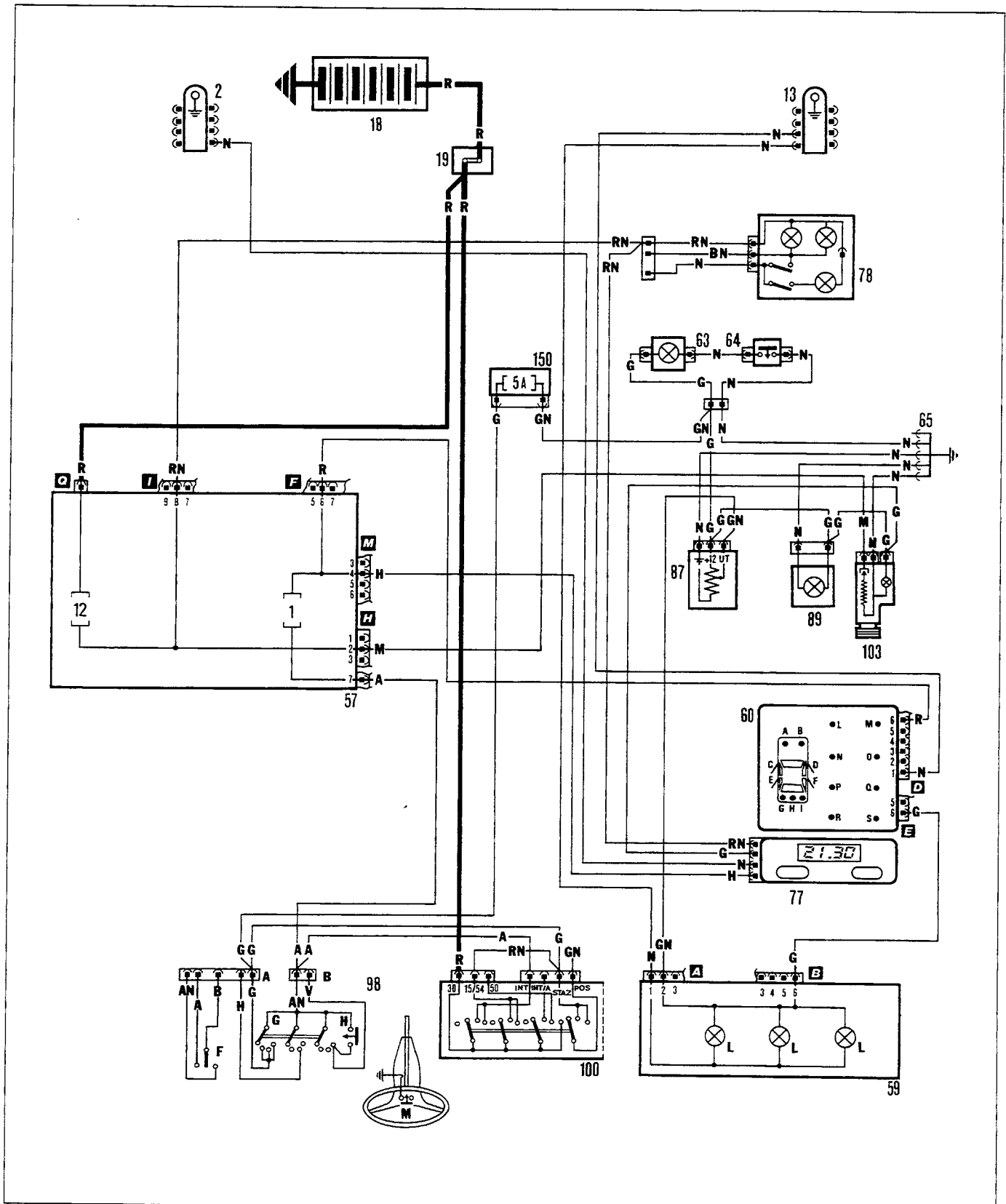
Side lights and warning light - Dipped beam and warning light - Main beam and warning light - Flasher - Rear fog lamp and warning light - Heated seats (see key on page 19)



55.

Version: SCANDINAVIA

Digital clock - Control panel and Check Panel lighting - Glove compartment lighting - Switch symbol lighting fibre-optic bulb - Cigarette lighter (see key on page 19)



Key

- 1. L. front light cluster
- 2. L. front earth loom
- 7. Reversing light switch
- 9. Solenoid
- 10. Rpm and TDC sensor
- 13. R. front earth loom
- 16. R. front light cluster
- 18. Battery
- 19. Shunt node
- 21A. Engine earth
- 22A. Ignition distributor
- 24. Electric fuel injector
- 25. Shunt node
- 25A. Shunt node
- 25B. Connection
- 34A. Absolute pressure sensor
- 34B. Air temperature sensor
- 35. Throttle position sensor
- 39. Electric fuel pump relay
- 40. Electric injector supply relay
- 42A. Ignition coil with power module
- 48. Starter motor
- 48. Starter motor
- 51. Alternator
- 57. Fuse and relay control box
- 59. Control panel
- B. Side light warning light
- H. Dipped beam warning light
- L. Control panel lighting bulbs
- P. Main beam warning light
- Q. Rear fog lamp warning light
- W. Electronic speedometer
- 60. Check Panel
- 63. Glove compartment light bulb
- 64. Glove compartment light control button
- 65. Under facia earth loom
- 72. Daytime light relay
- 75. Connection
- 75A. Connection
- 77. Digital clock
- 78. Front courtesy light
- 82. Rear fog lamp switch
- 87. Check Panel and control panel light dimmer
- 88. Heated seat
- 89. Fibre-optic switch lighting bulb
- 90. Check socket
- 98. Steering column switch unit
- 100. Ignition switch
- 103. Cigarette lighter
- 107. Shunt node
- 107A. Shunt node
- 142. Electric fuel pump
- 149. Rear fog lamp and heated seat fuse
- 150. Instrument lights. Check Panel and clock fuse
- 151. L. rear light
- 152. L. rear light on tailgate
- 153. Rear earth loom
- 159. R. rear light on tailgate
- 160. R. rear light
- 172. DIM-DIP circuit resistance
- 173. DIM-DIP circuit relay
- 174. DIM-DIP circuit cut-out remote control switch
- 175. Rear fog lamp circuit fuse
- 176. DIM-DIP circuit fuse
- 177. Tachymetric generator
- 178. Coolant temperature sending unit
- 179. Body earth
- 180. Weber electronic injection control unit
- 180A. Connection

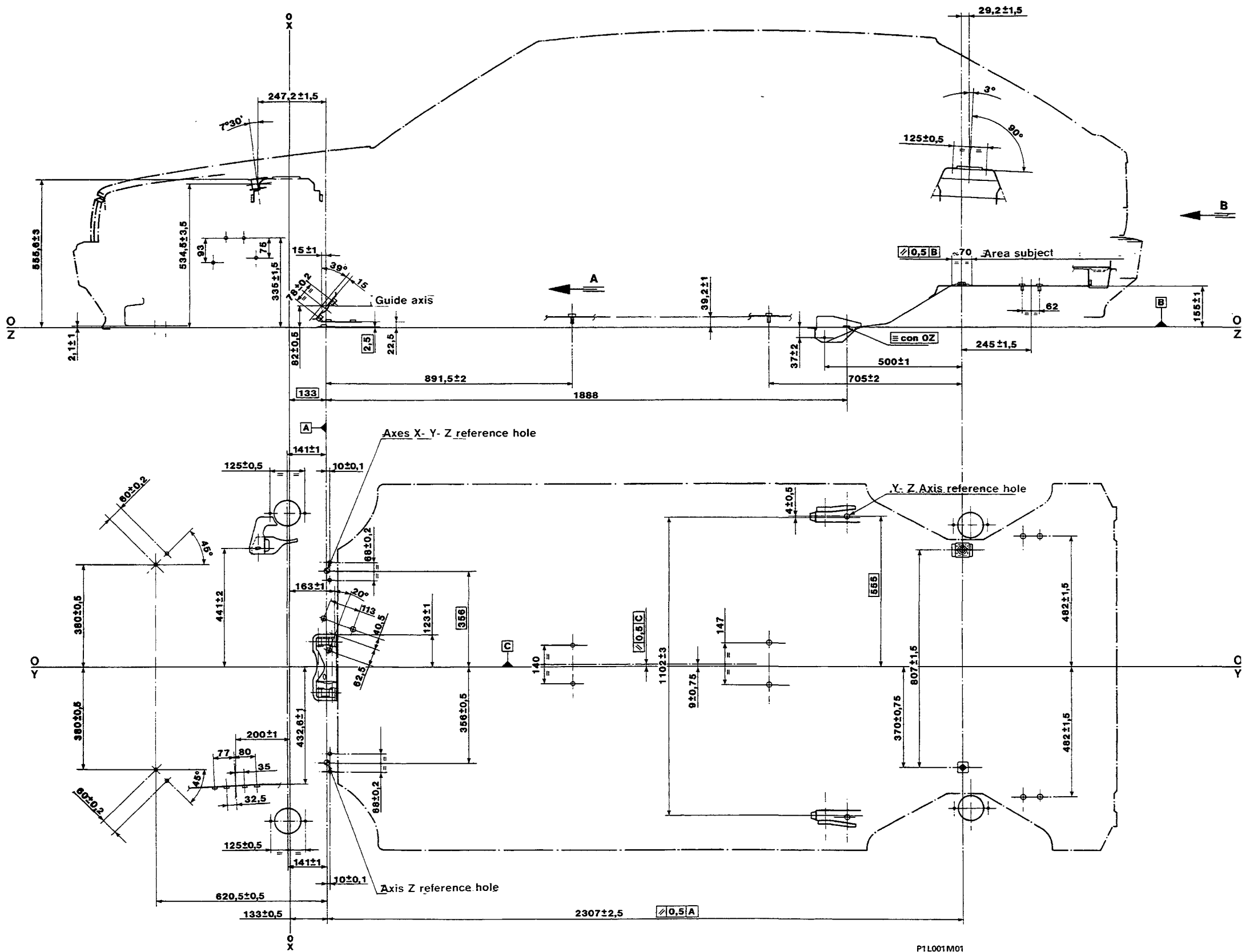
DELTA-PRISMA 4WD

Bodywork



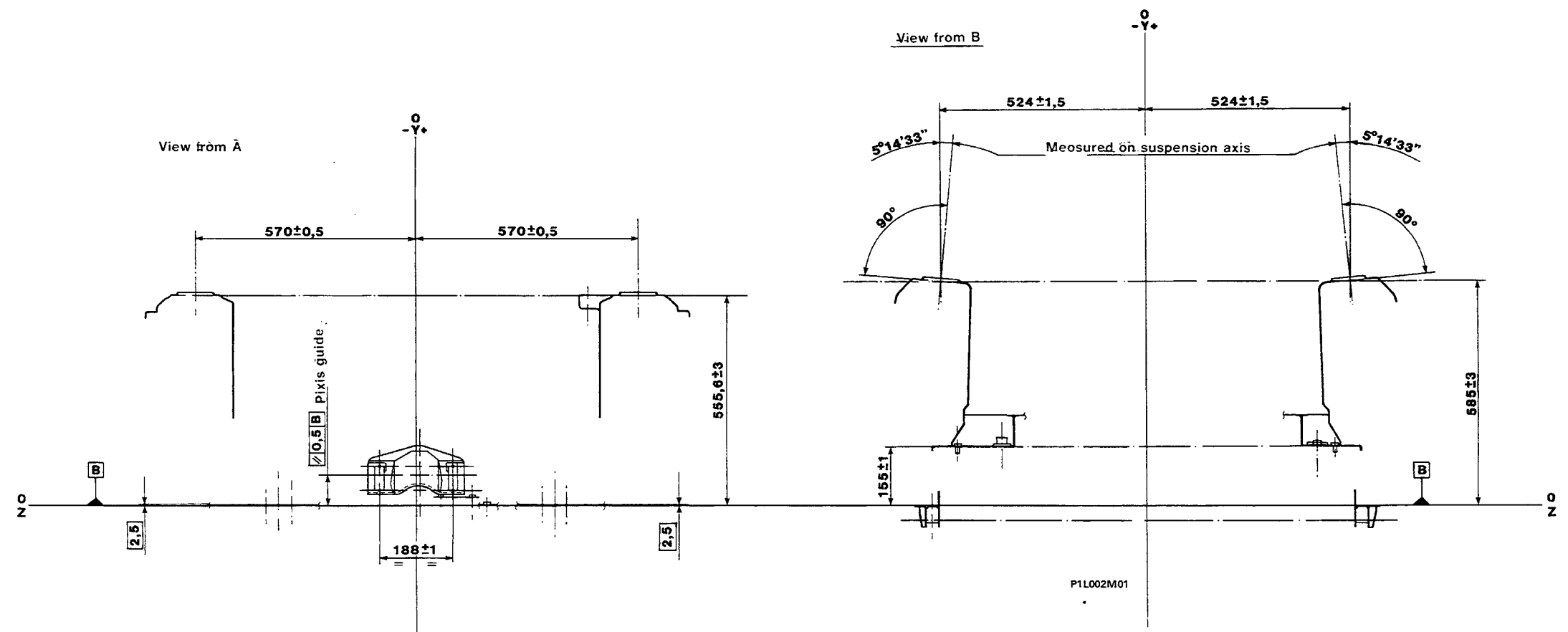
**Service
Manual**

DIAGRAM FOR CHECKING UNDERBODY



P1 L001 M01

70.

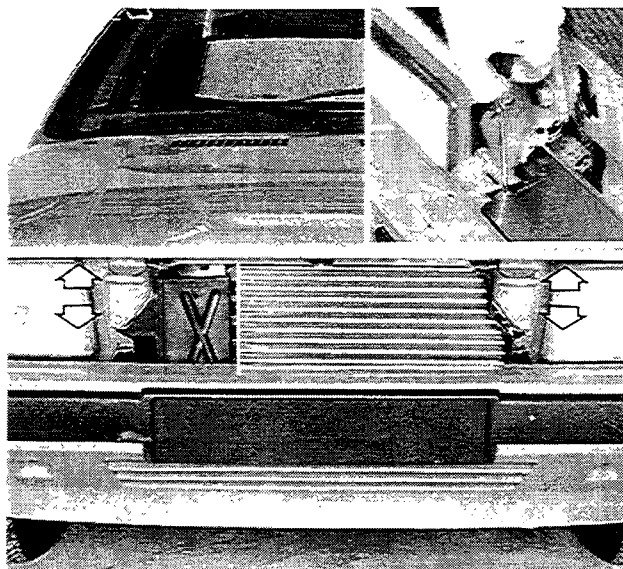


BONNET LID

Vertical adjustment

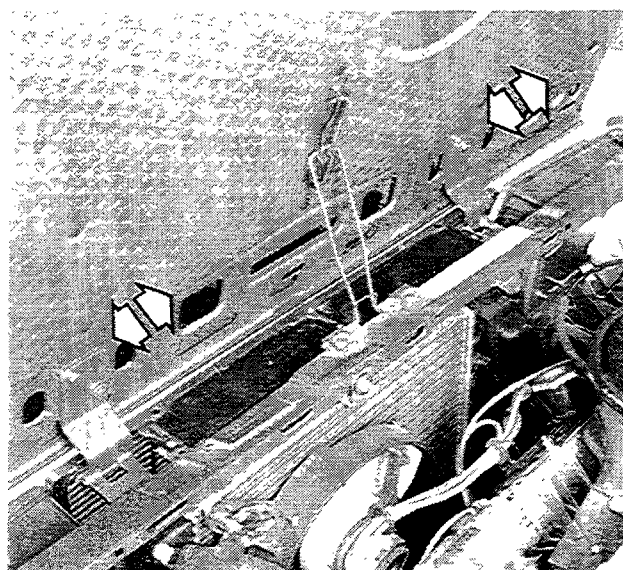
The arrows show the direction in which the bonnet lid can be adjusted by means of the slots on the hinges.

NOTE *It is necessary to remove the radiator trim in order to be able to get at the bolts for making vertical adjustment to the bonnet lid.*



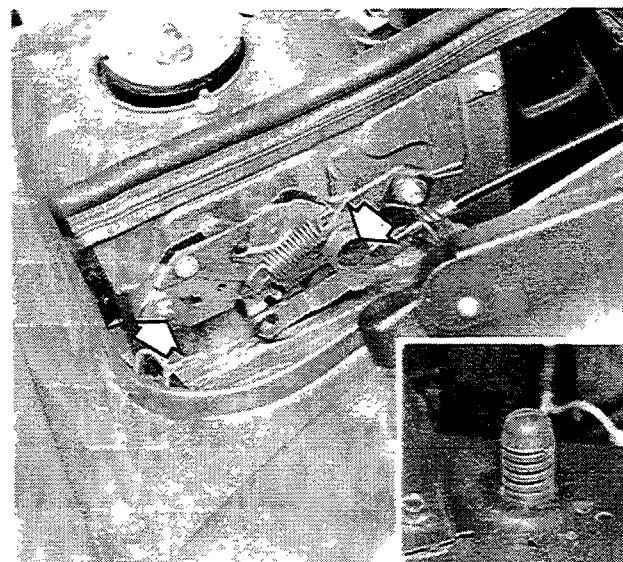
Adjusting transverse position

The arrows show the direction in which the bonnet lid can be adjusted by means of the slots on the hinges.

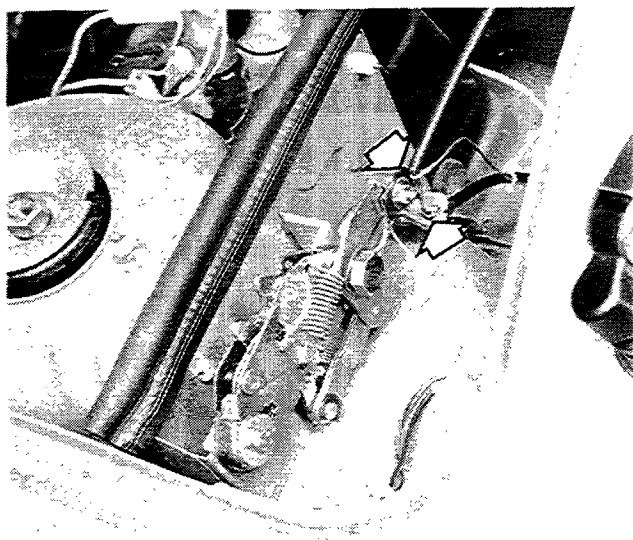


Adjusting the device for locking the bonnet lid

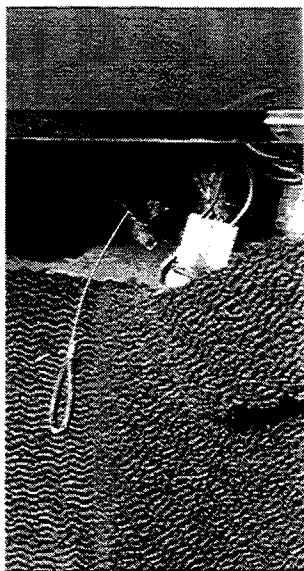
Getting the bonnet lid to lock properly is done by adjusting not only the bolts securing the 2 locking devices, but also the rubber blocks at the ends of both the engine compartment and the bonnet lid.



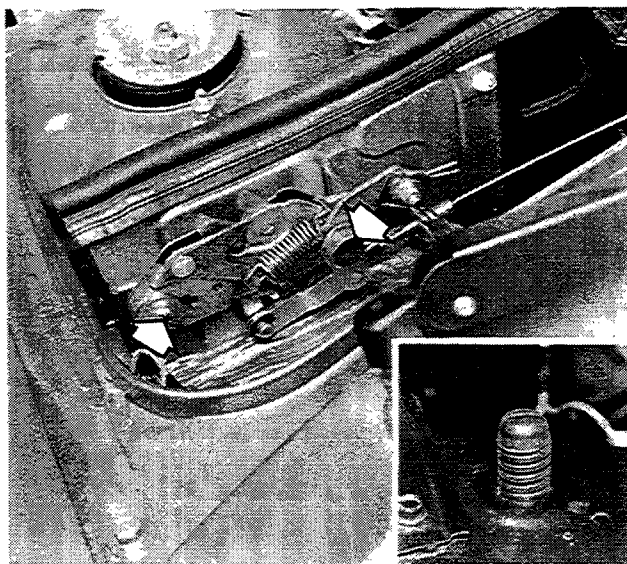
70.



Removing — refitting bonnet release rods from lock.



Removing — refitting body release rod from operating lever and replacing rod for emergency opening.



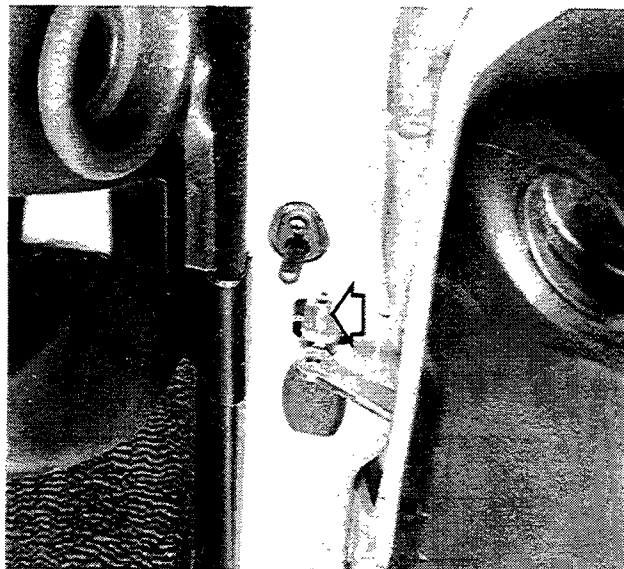
Removing — refitting and adjusting device for locking bonnet lid.

When refitting, check that the bonnet lid is correctly lined up and that it closes properly. If necessary, loosen the screws and move the lock sideways.

NOTE *If the bonnet lid locks properly but is either too high or too low with respect to other parts with which it should line up, adjust the rubber blocks accordingly.*

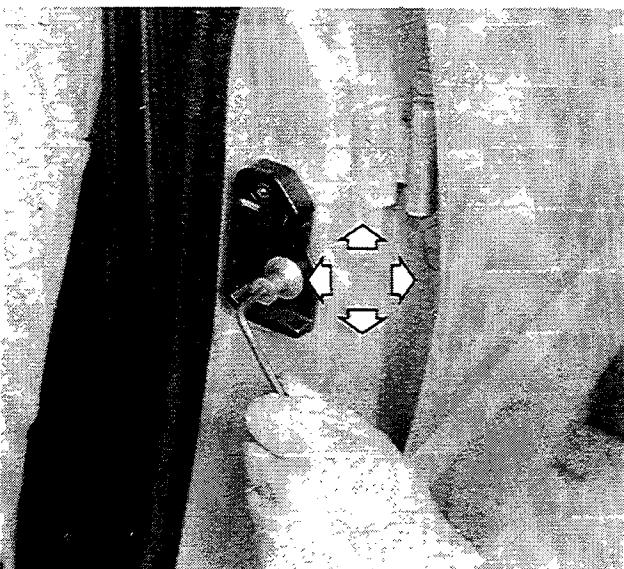
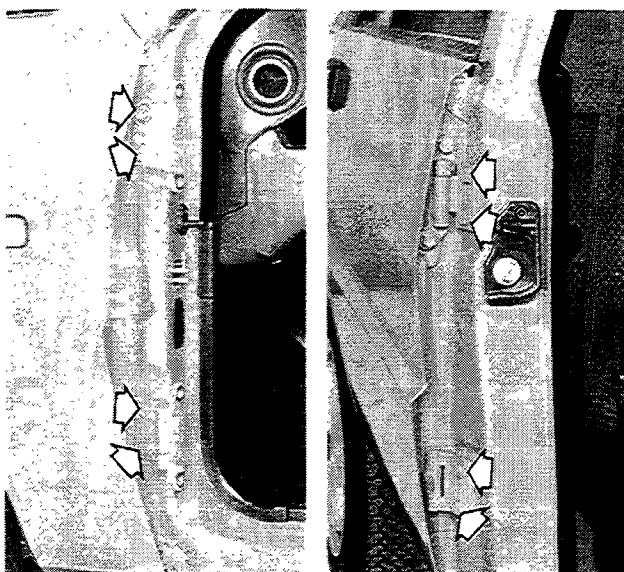
DOORS

Removing — refitting device for limiting door openings.



Removing — refitting and adjusting front and rear doors.

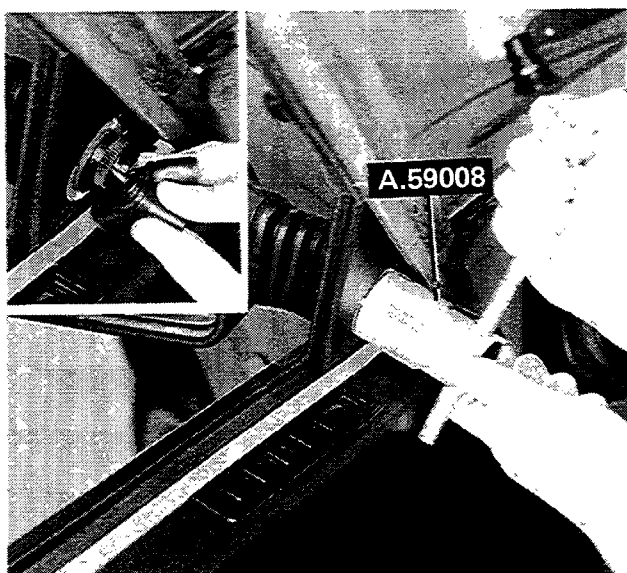
NOTE After having refitted the door check on its position. If it is too far in or too far out with respect to the rest of the bodywork, either add or remove shims between the hinge and the pillar. If, on the other hand, the clearance between the door and the wheel arch or the ribs does not coincide with what it ought to be, loosen the bolts shown by the arrows and move the door accordingly.



Adjusting lock striker

The arrows show the ways in which the striker can move to adjust the door locks.

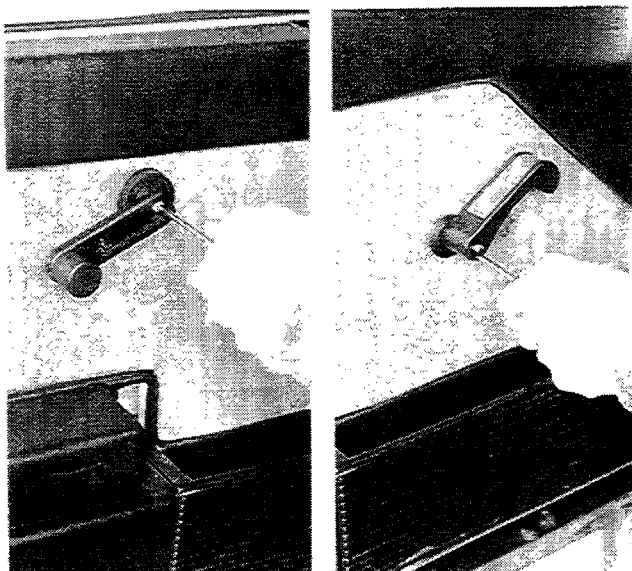
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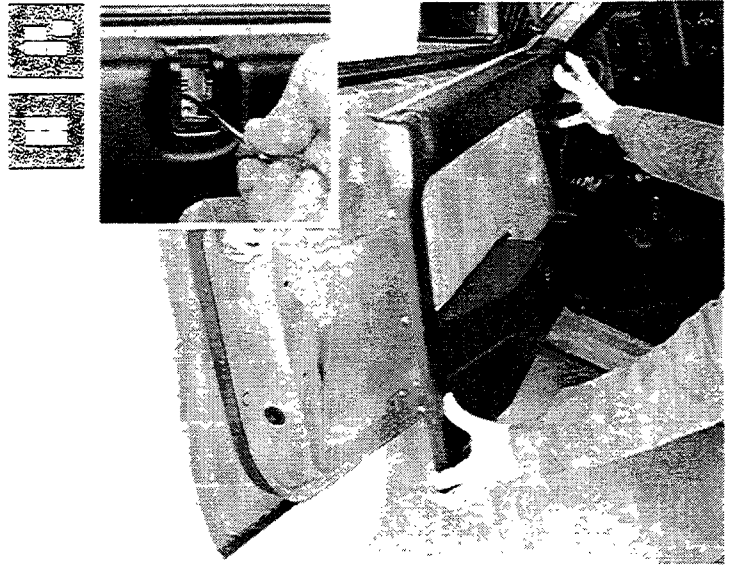
Removing – refitting external rear view mirror



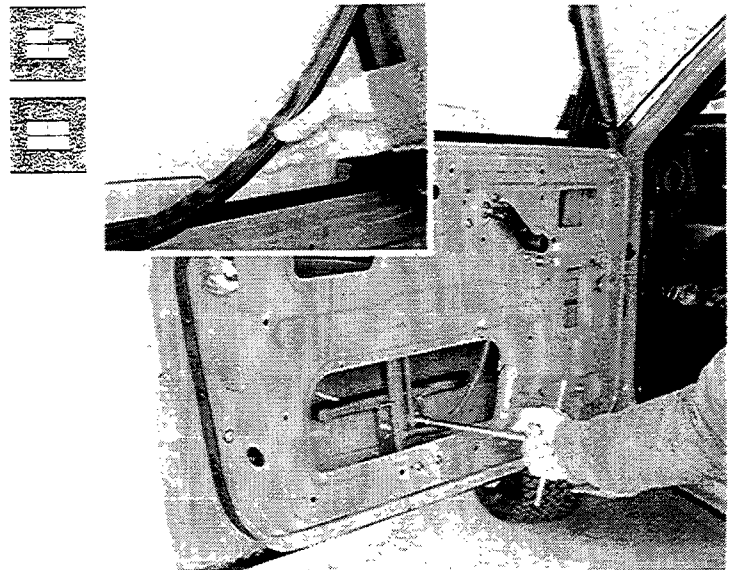
Removing – refitting interior door safety device and handle.



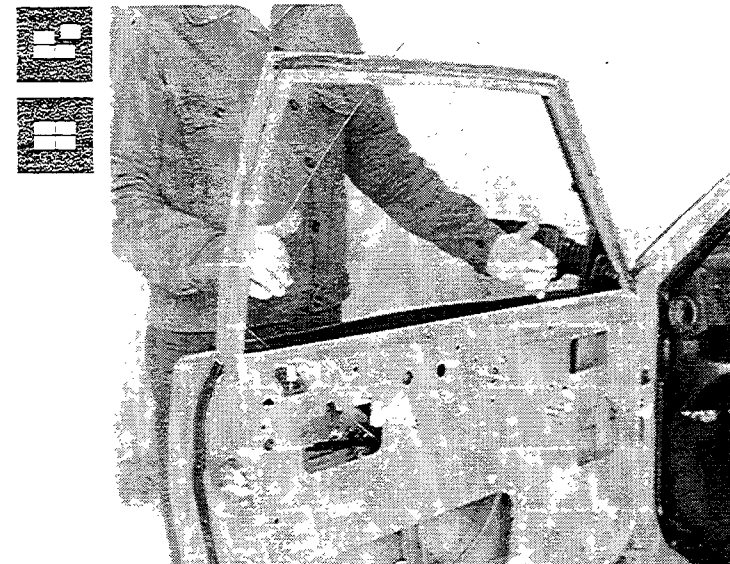
Removing – refitting window winder and door opening lever.



Removing – refitting door panel

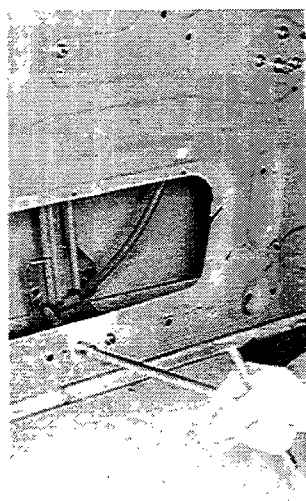
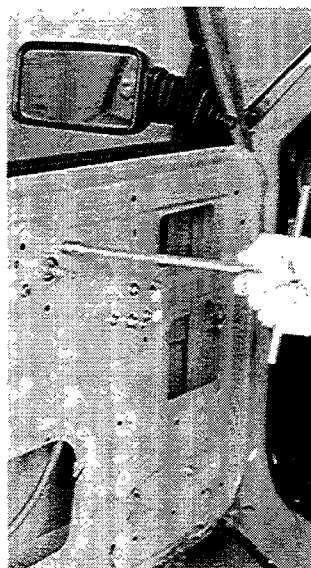


Removing – refitting window glass from
window winder device

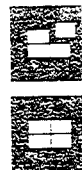
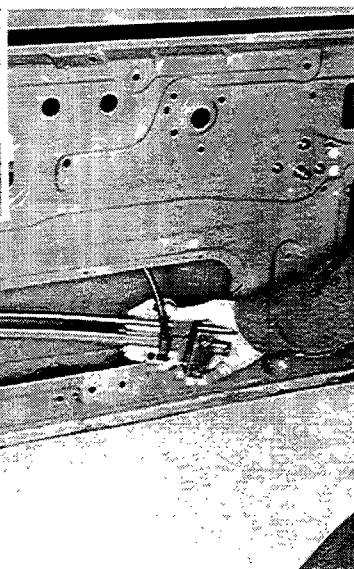
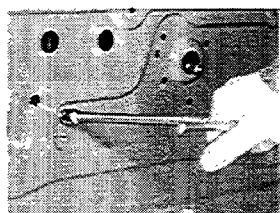


Removing – refitting window glass from
door.

70.

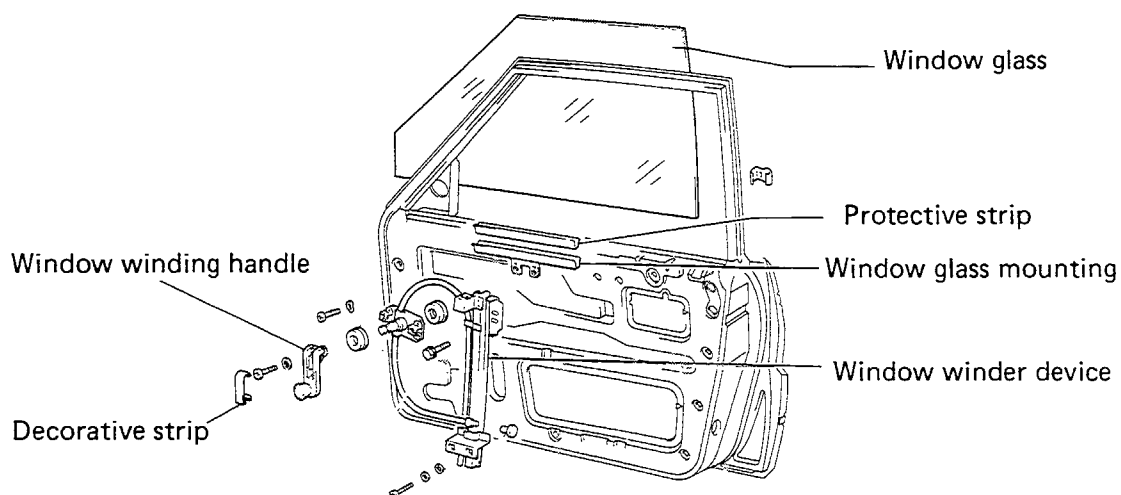


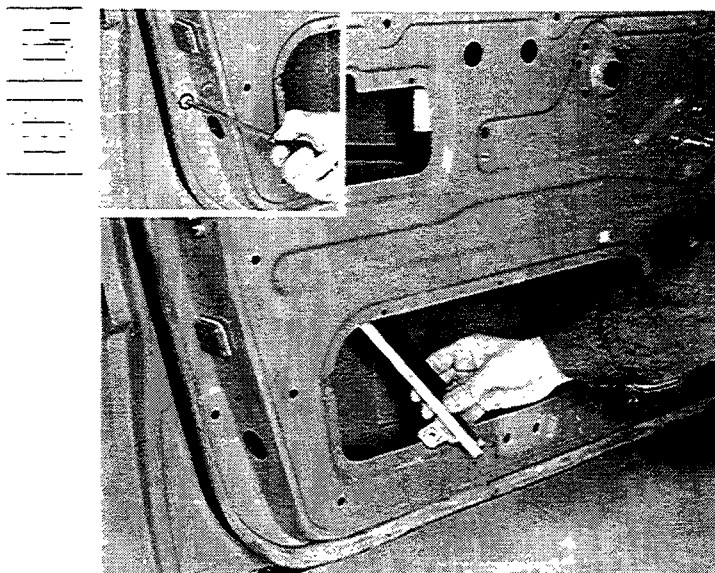
Detaching - reattaching window winder device



Removing - refitting window winder device from door

Window winder device components

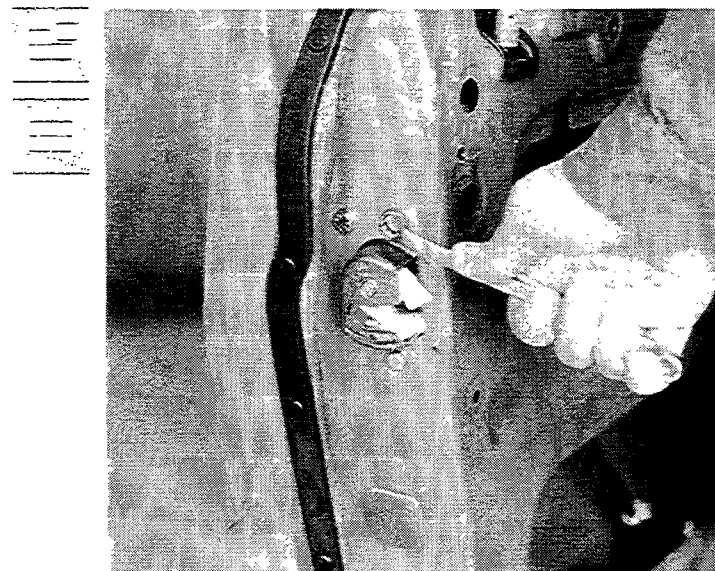




Removing - refitting window glass rear guide channel

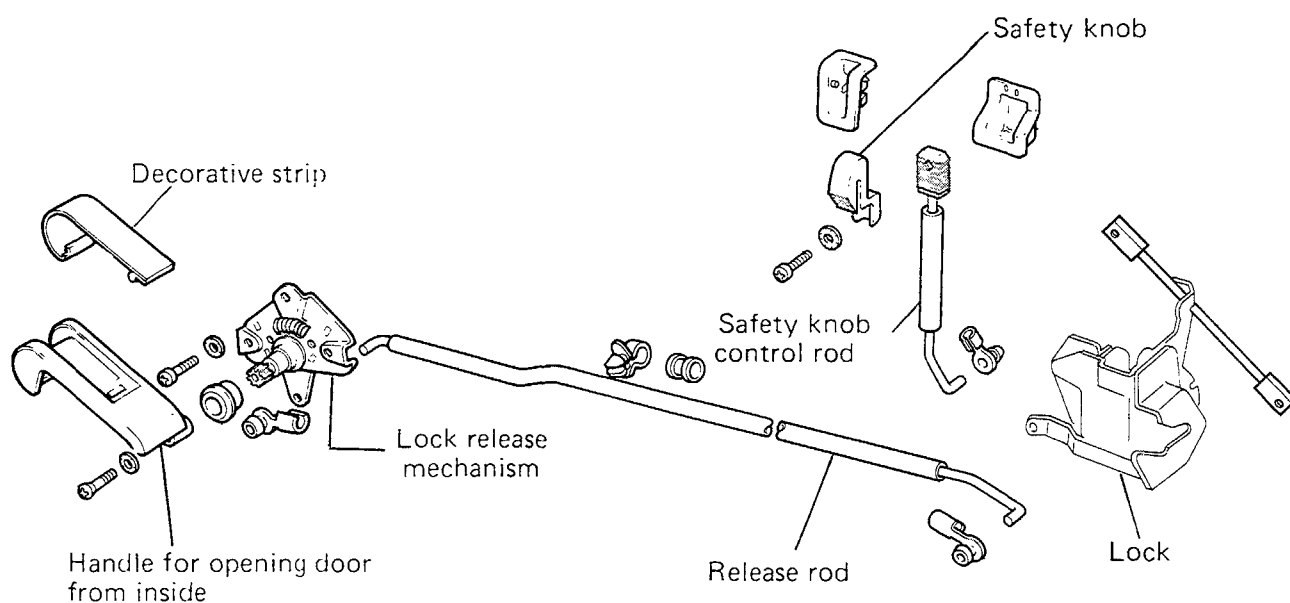


Removing - refitting door opening control

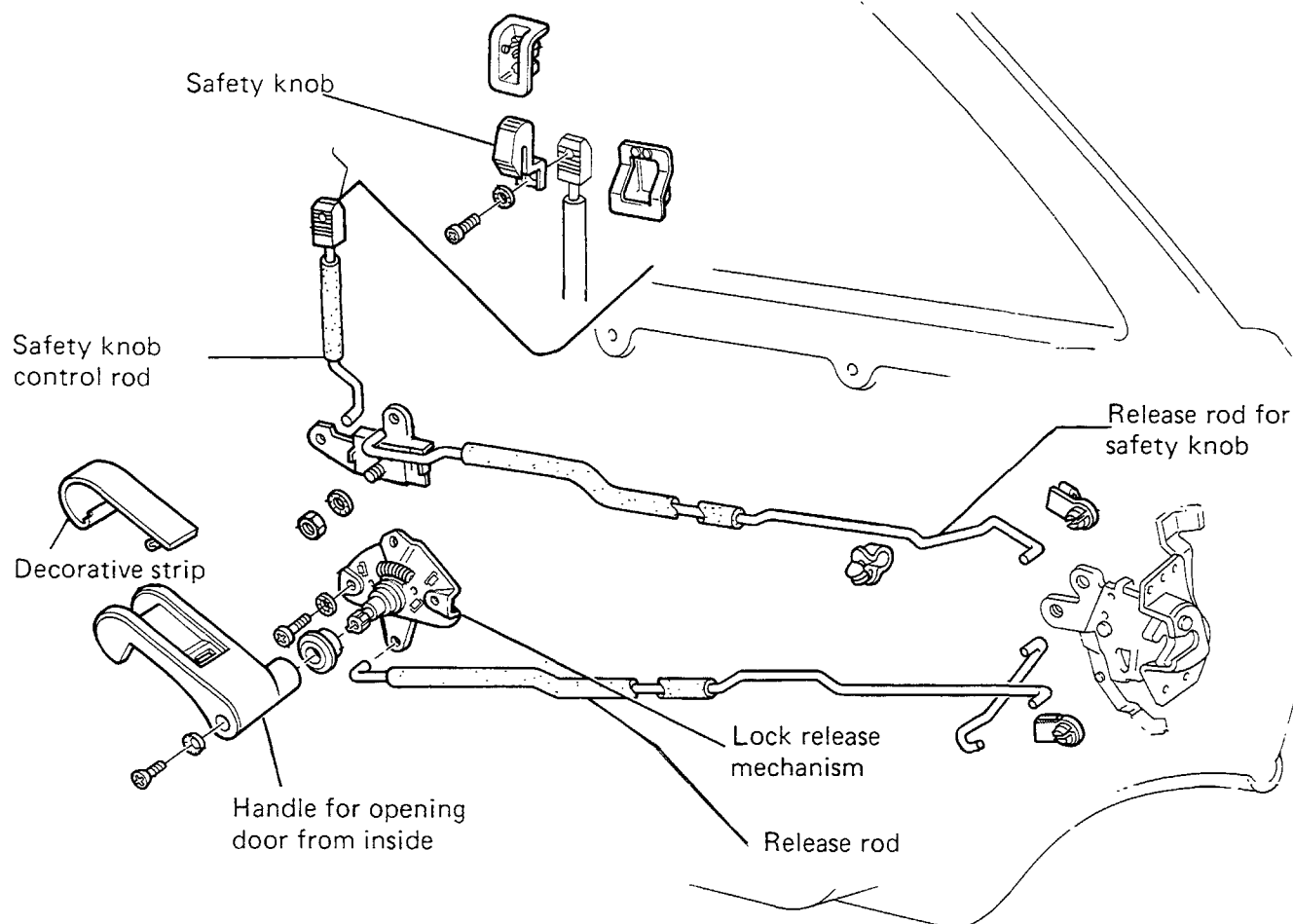


Removing - refitting lock

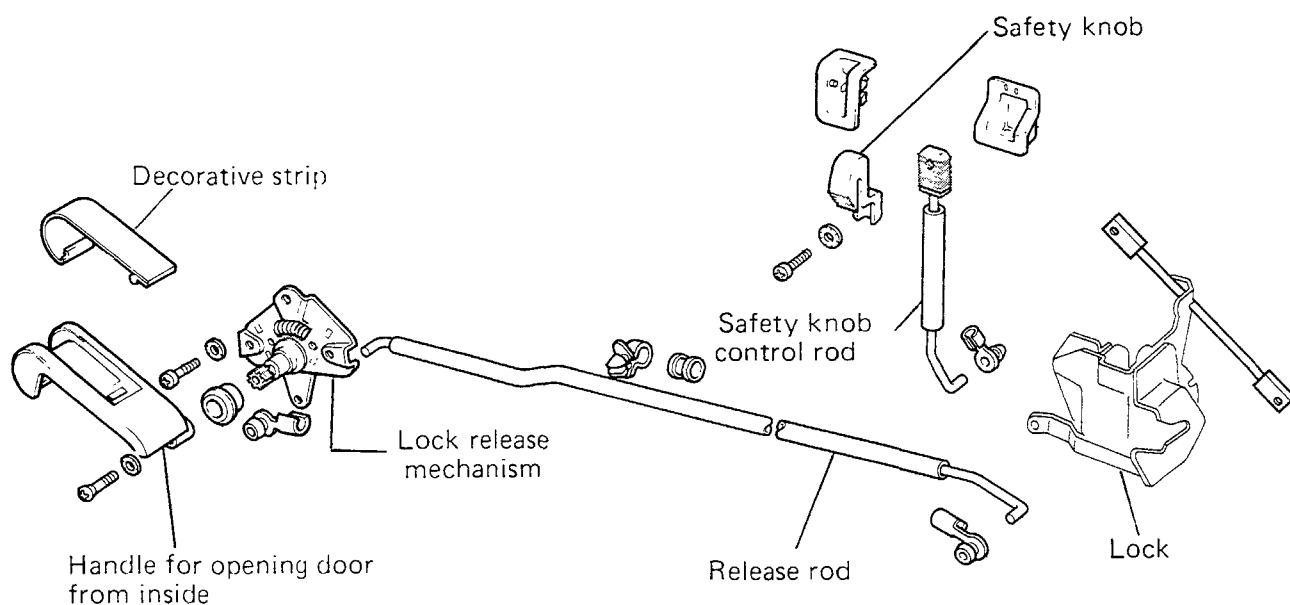
Front door lock components



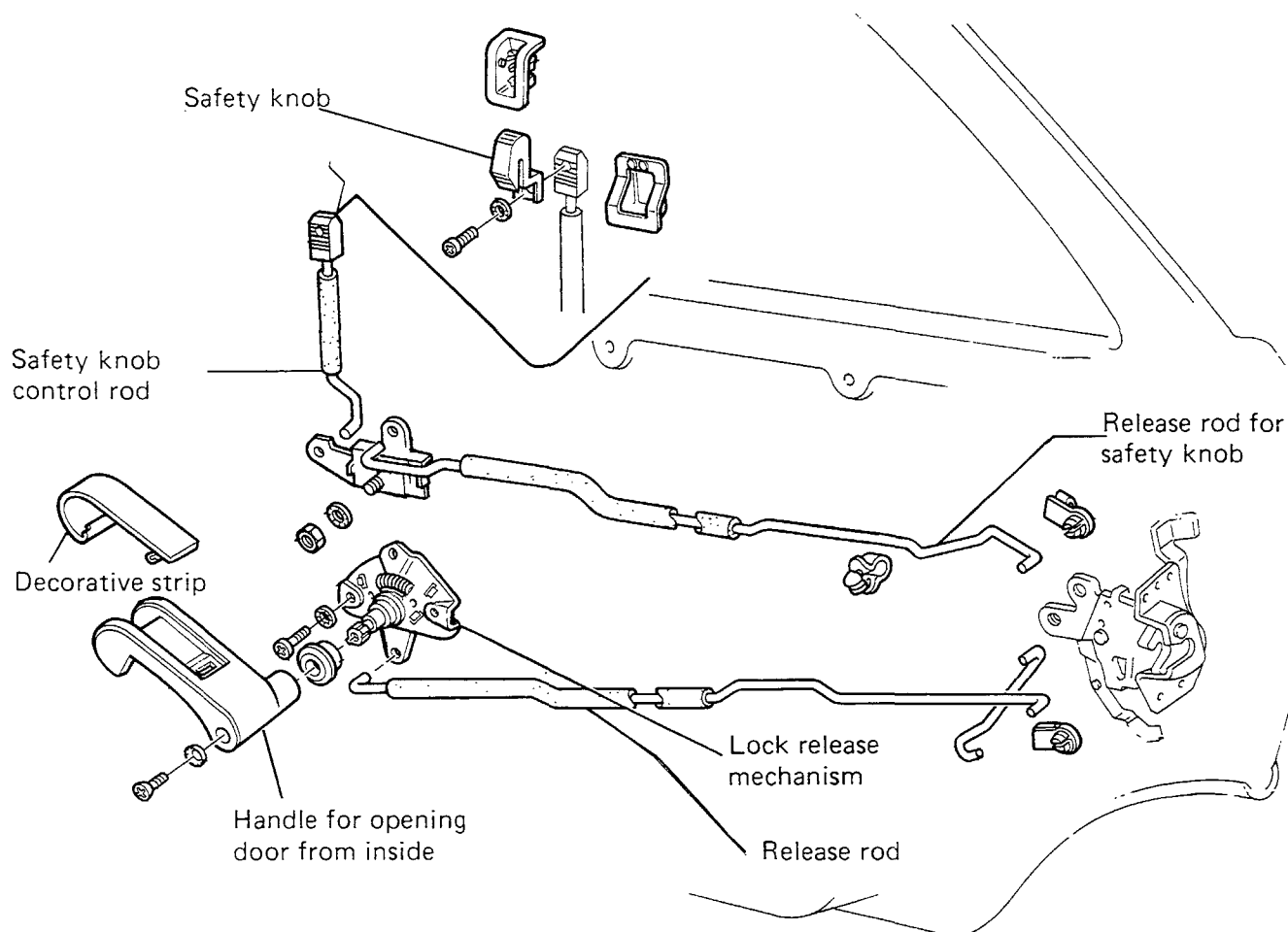
Rear door lock components



Front door lock components



Rear door lock components

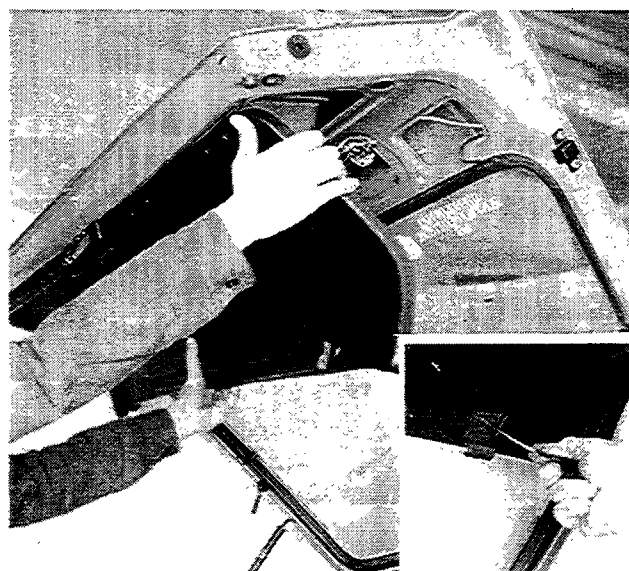


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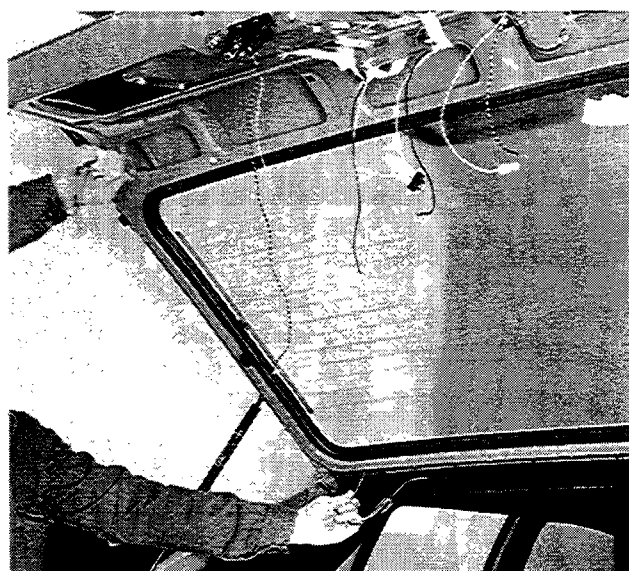


HATCHBACK

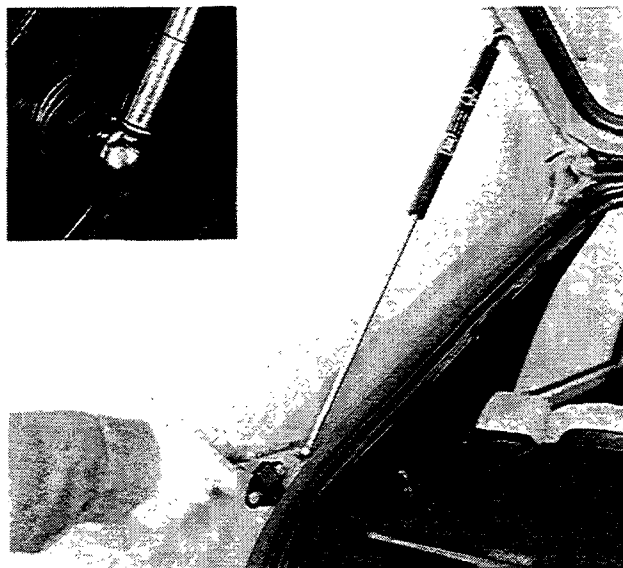
Removing - refitting wiper arm complete with blade



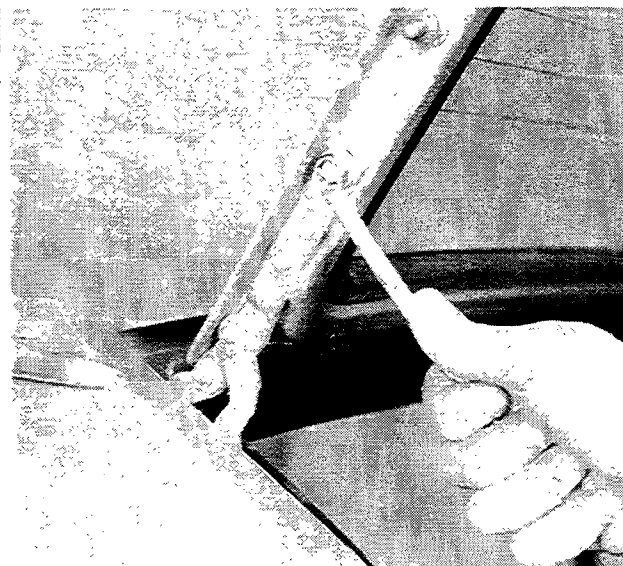
Removing - refitting internal cover



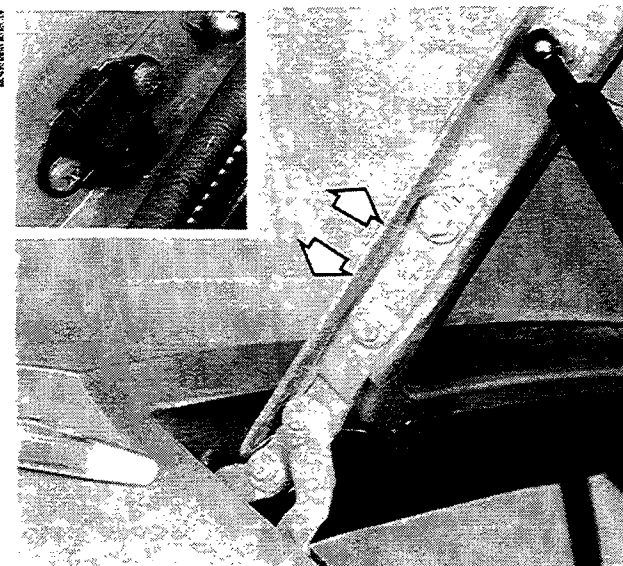
Removing - refitting electrical cables from hatchback



Removing - refitting hatchback support/controlled closing arm



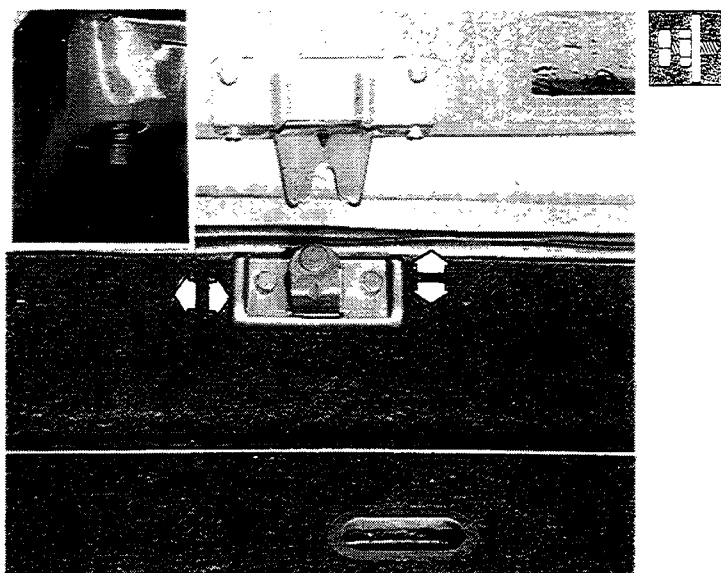
Removing - refitting



Adjusting positioning of hatchback

NOTE *Adjusting the positioning of the hatchback is done by making appropriate adjustments to the securing bolts. Also check that when the hatchback is closed the catch projections shown in the inset are in the lowered position; if not, place suitable shims between them and the body shell.*

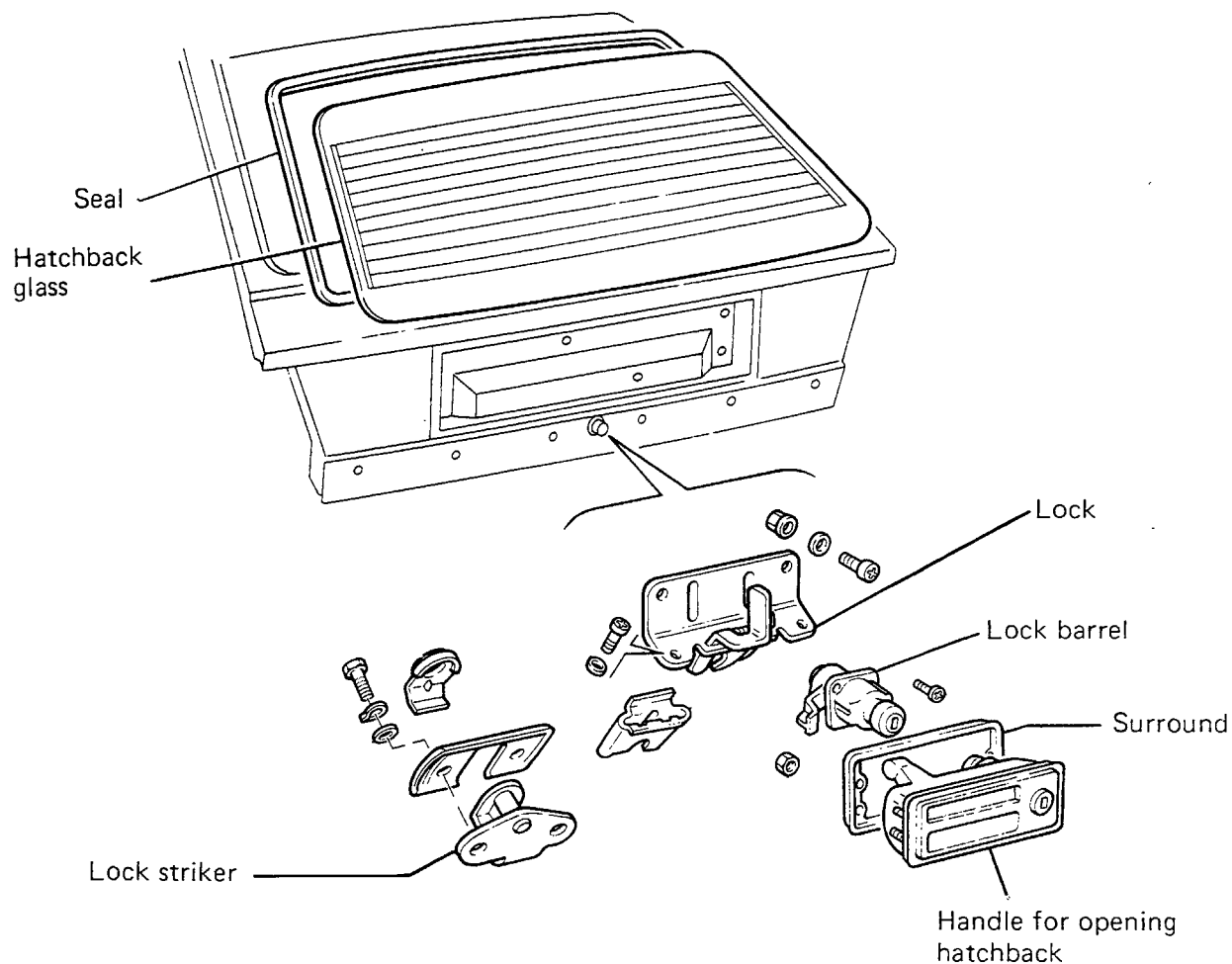
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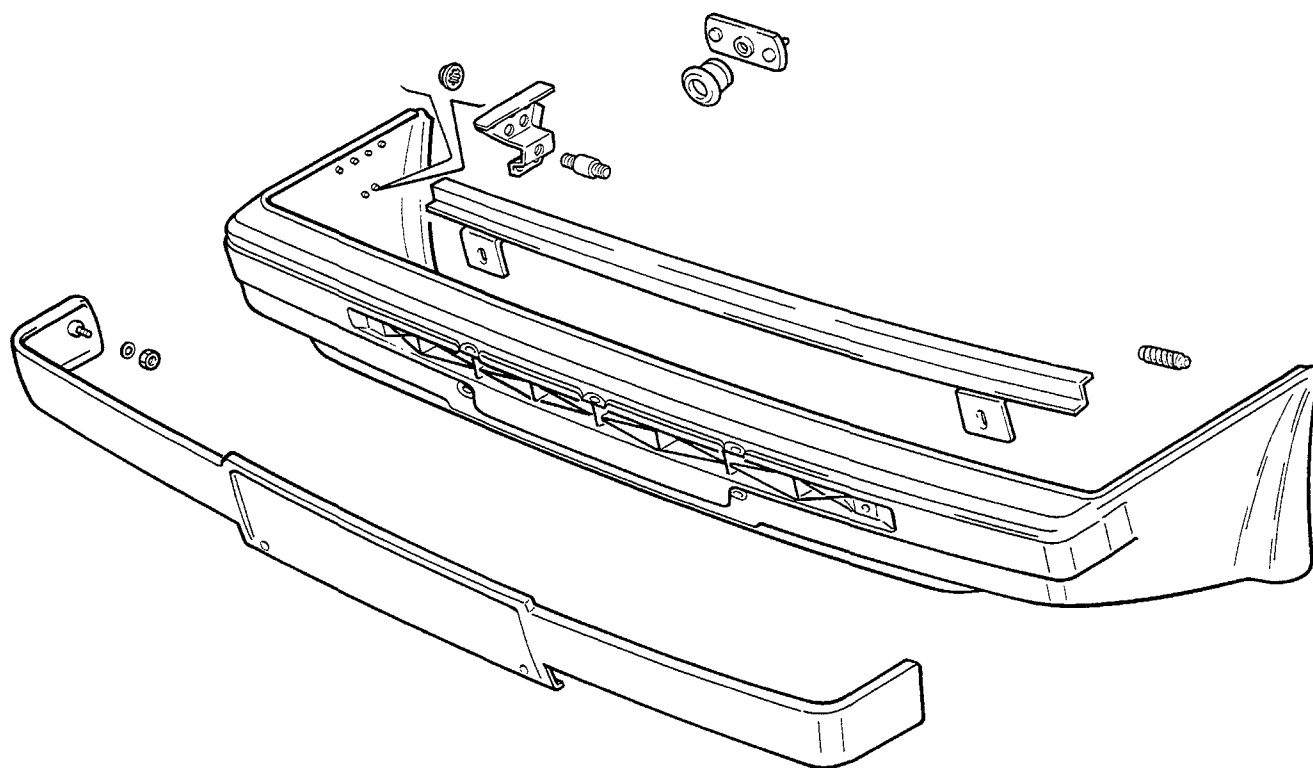
Adjusting lock striker

To adjust the hatchback lock move the striker in the direction of the arrows as appropriate. If the hatchback closes properly but it is either too far out or too far in with respect to other parts with which it should line up, adjust the rubber blocks accordingly.

Hatchback components



FRONT BUMPER

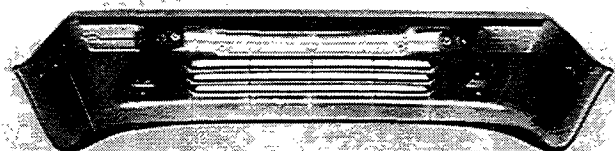


Fixing components



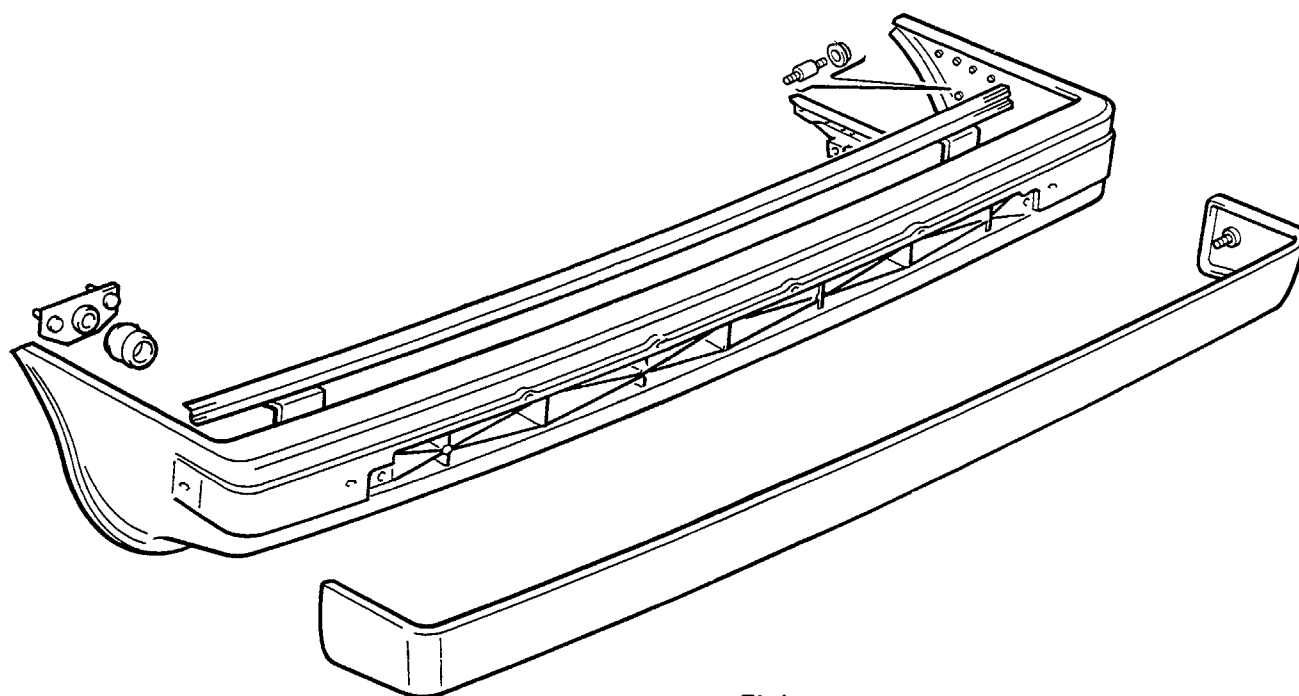
Removing - refitting

The arrows show the bolts for fixing the bumper to the body shell

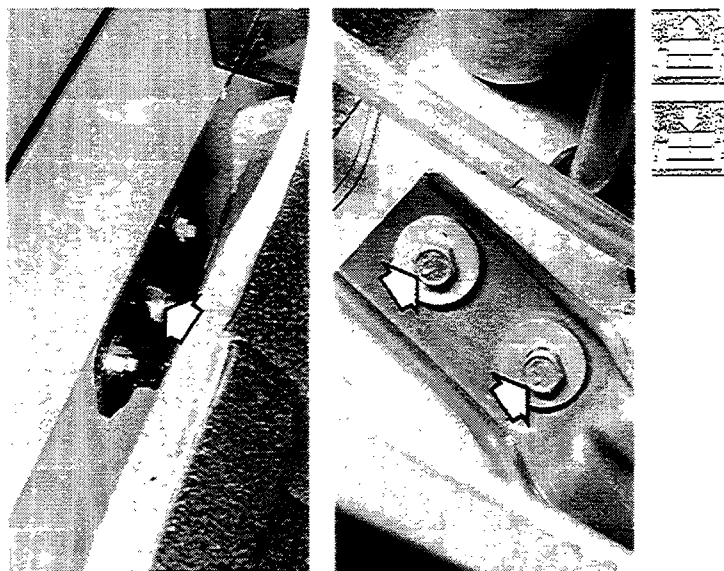


70.

REAR BUMPER

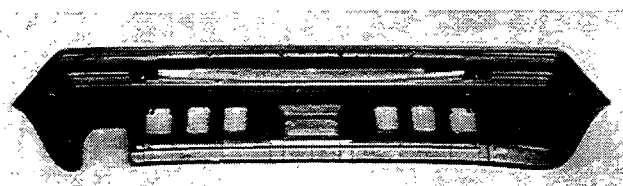


Fixing components

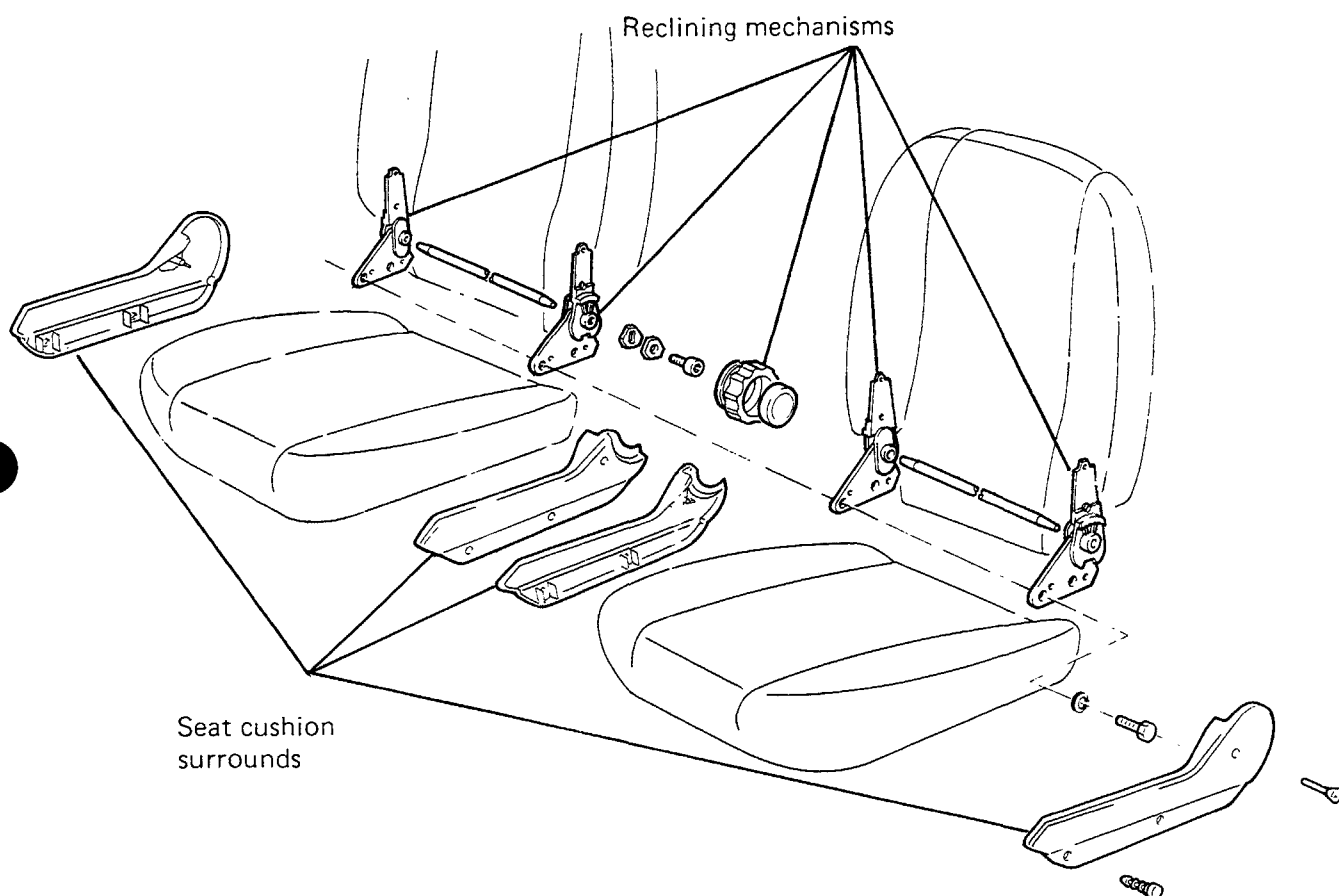


Removing - refitting

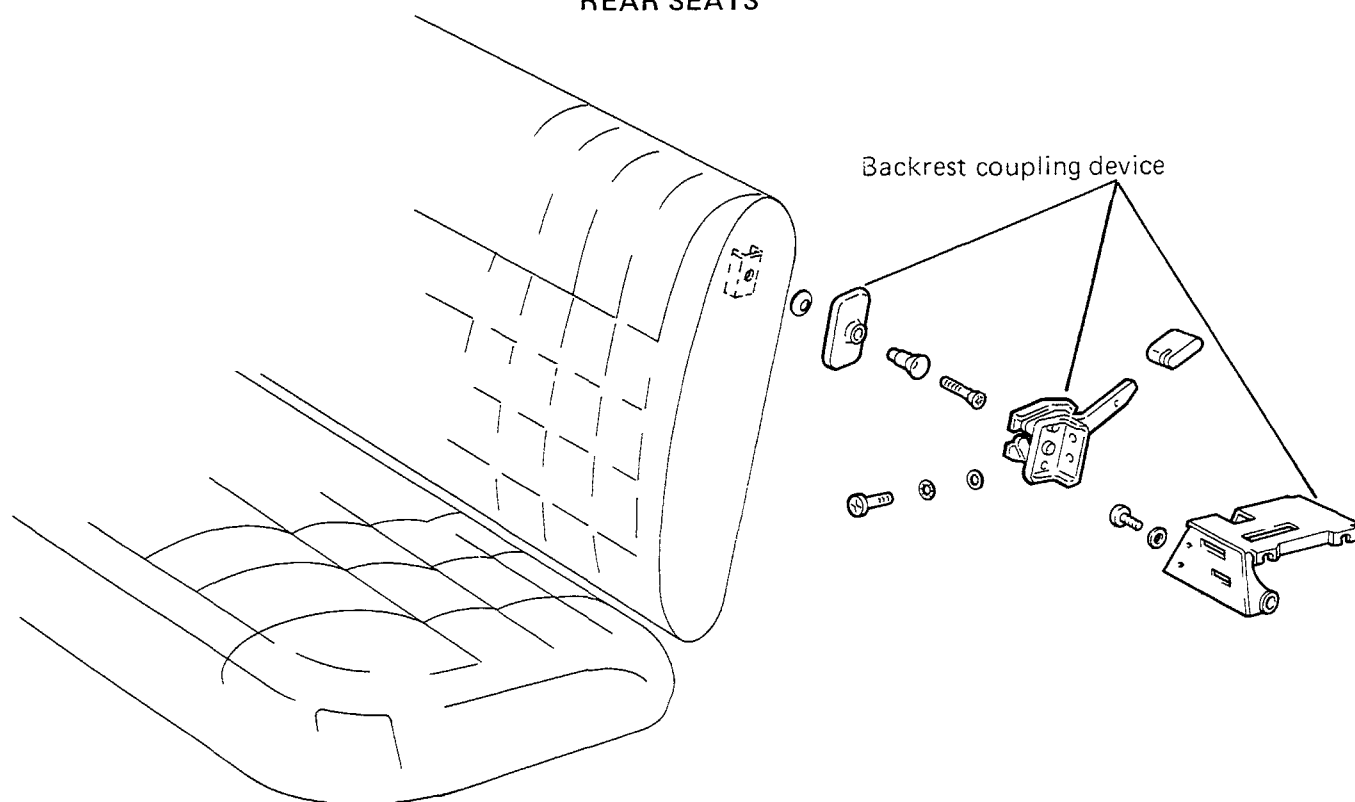
The arrows show the bolts for fixing the bumper to the body shell



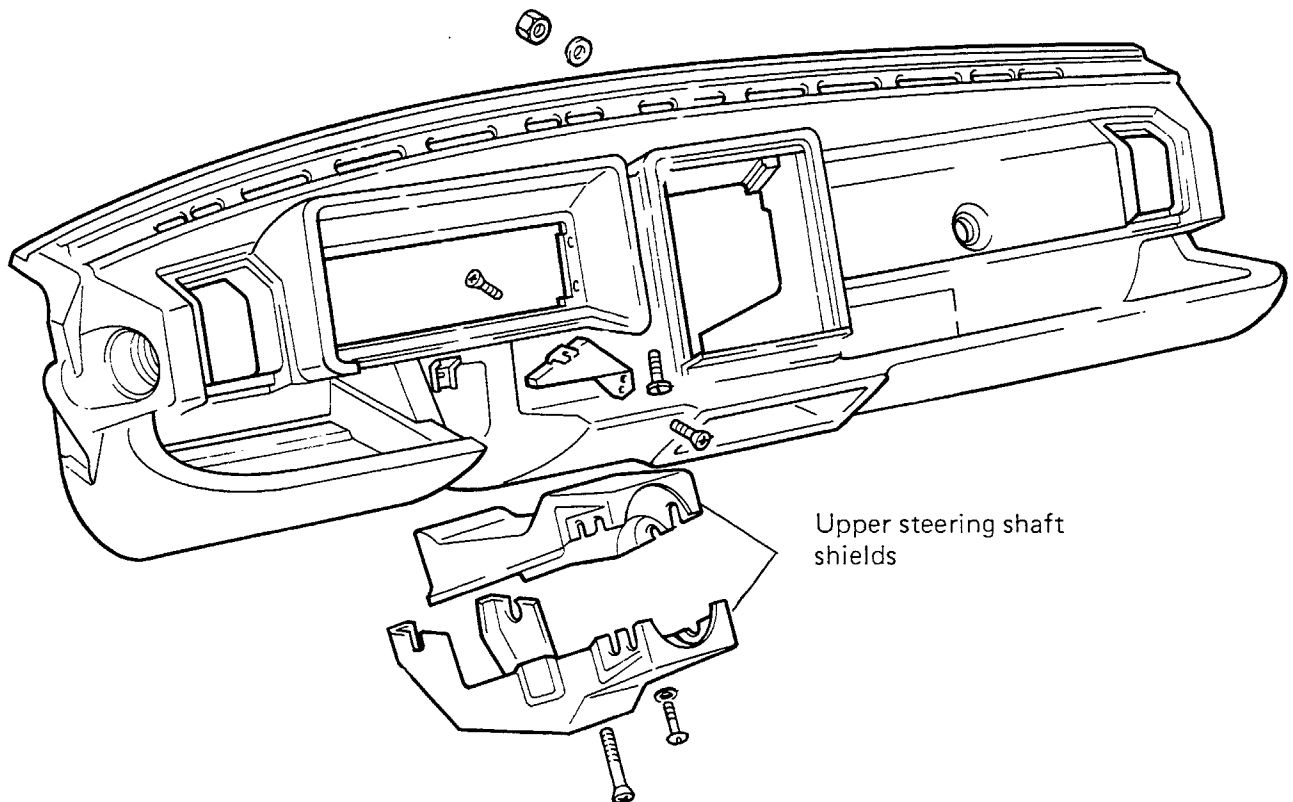
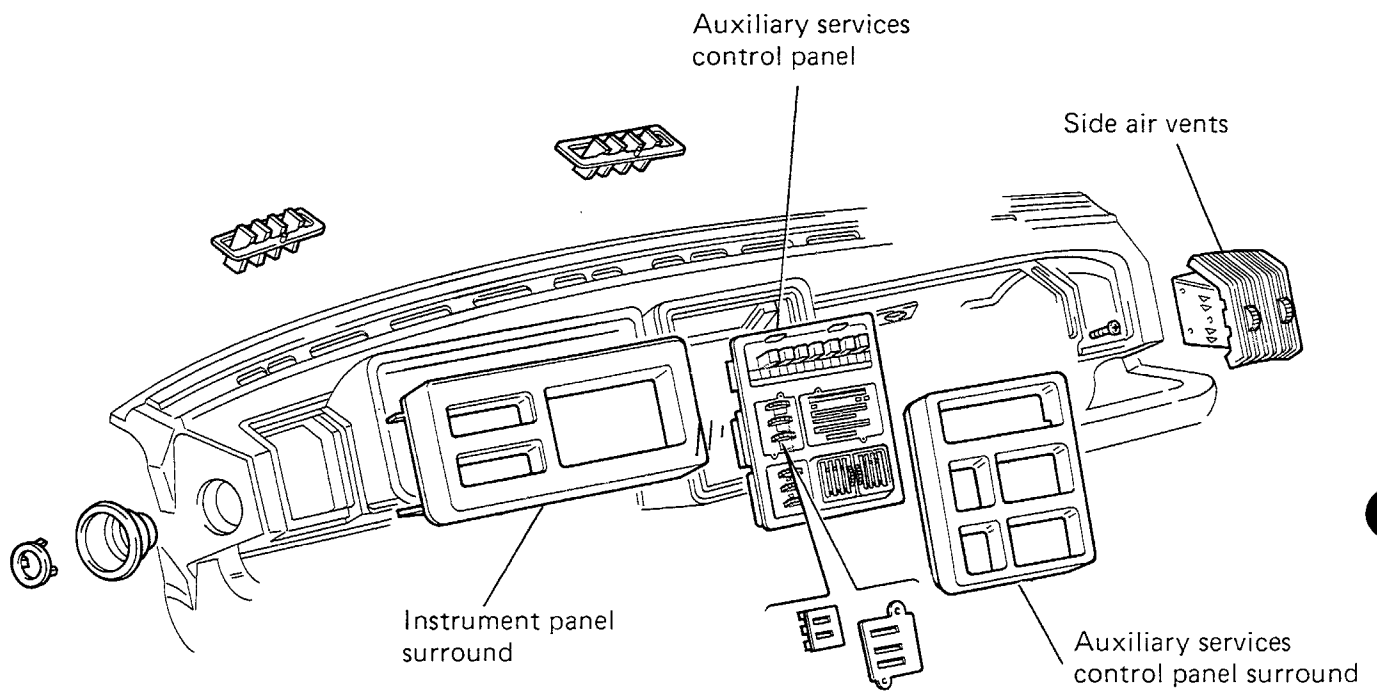
FRONT SEATS



REAR SEATS



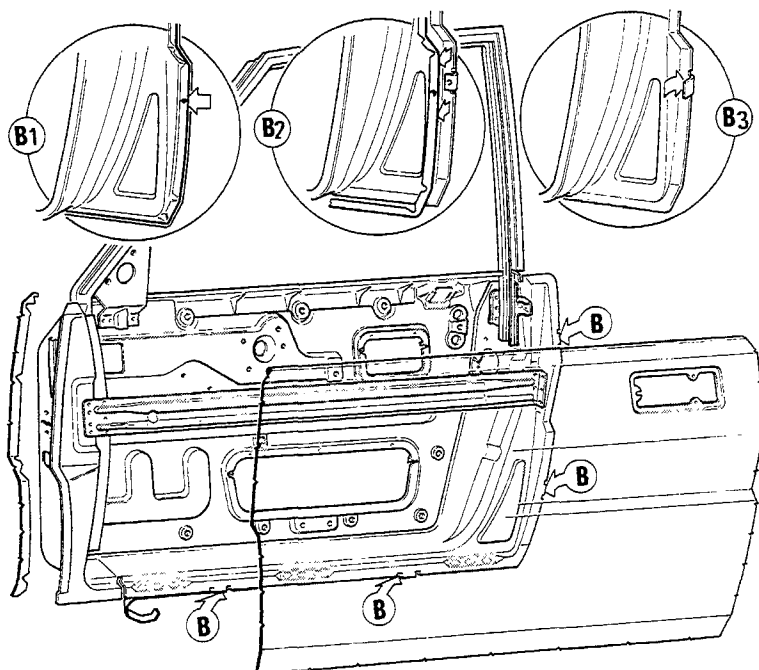
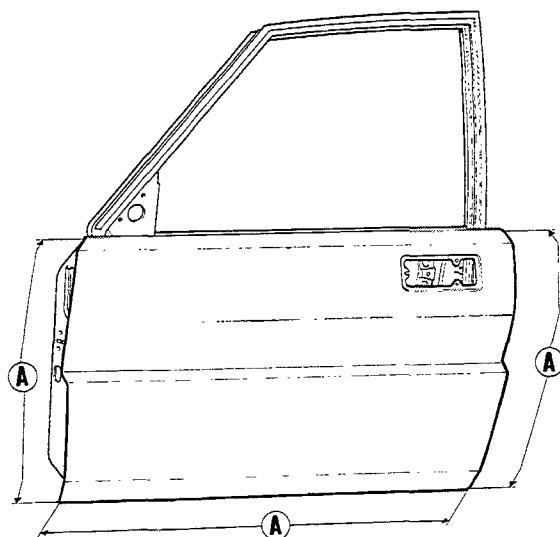
70.



REPLACING OUTER DOOR SKIN

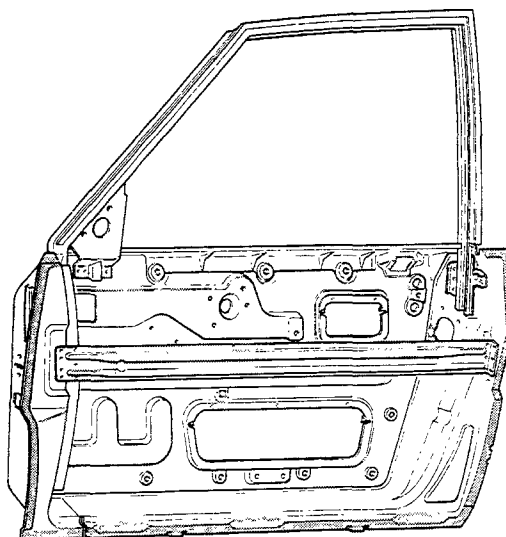
View of a damaged front lefthand side door

Using a disk grinding wheel, grind all the way round the perimeter of the outer door panel (as shown by the lines marked A) until it becomes detached from the edge which is folded over (carry out this operation carefully so as not to cut into the framework of the door itself).

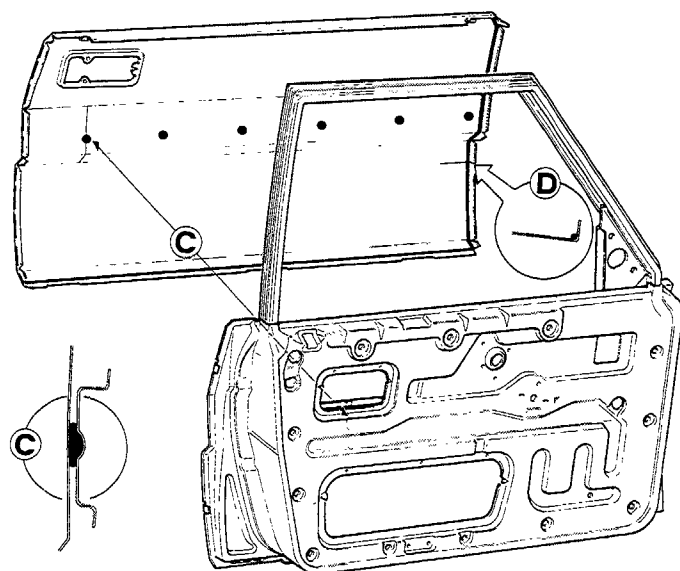


Remove the outer panel, detach the points where the fins, marked B, are spot welded (B₁), remove the scraps of sheet panel from the framework (B₂) and fold the fins through 90° (B₃).

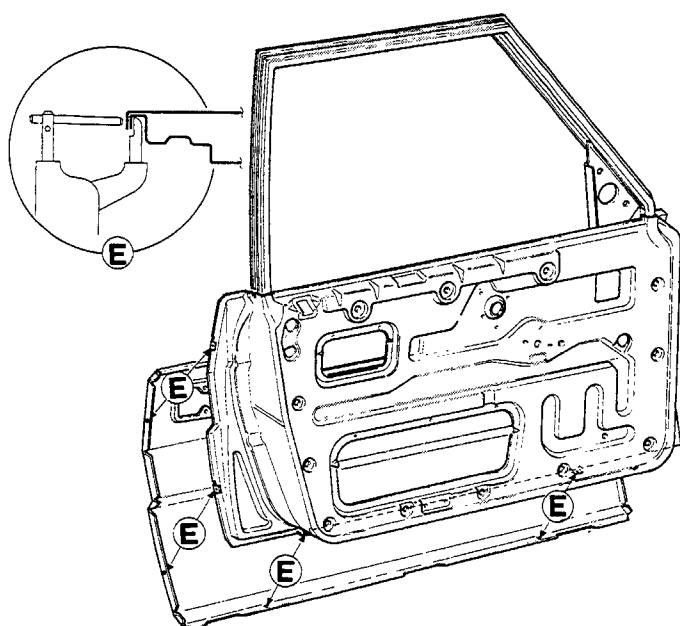
Straighten and grind the welding edges of the door frame and protect them with a zinc-based anti-rust agent. Remove the coat of protective paint from the replacement door panels at those points where it is anticipated that it will be welded to the door frame.



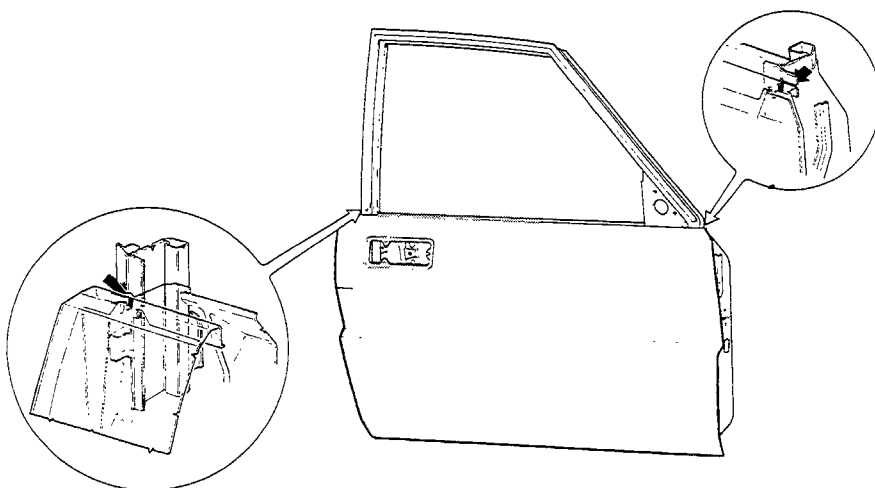
70.



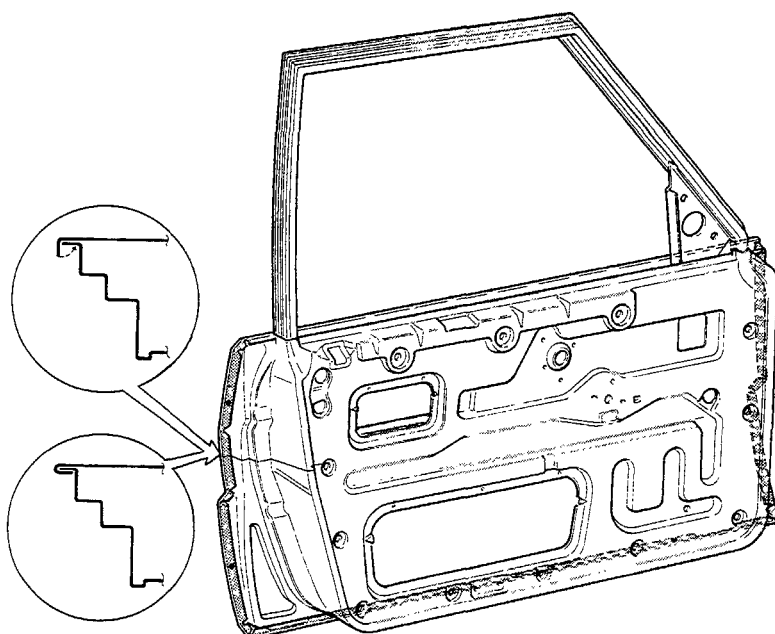
Apply hot thermosetting adhesive mastic to the panel at the points shown by the reference C. Apply structural adhesive in the areas shown by the black lines and by the cross section marked D.



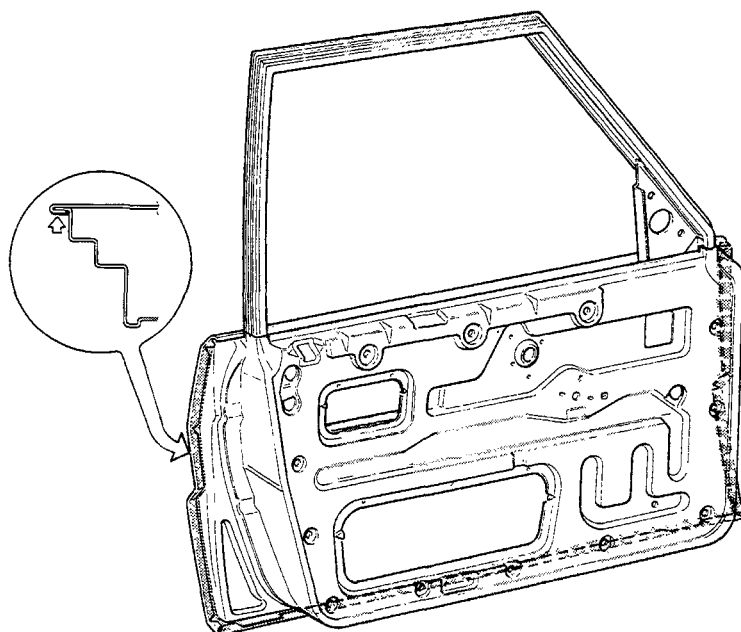
Weld the outer panel to the fins on the framework marked E using an electric spot welder.



Weld the outer panel to the framework using an inert gas electrode at the 2 points shown by the black arrows.



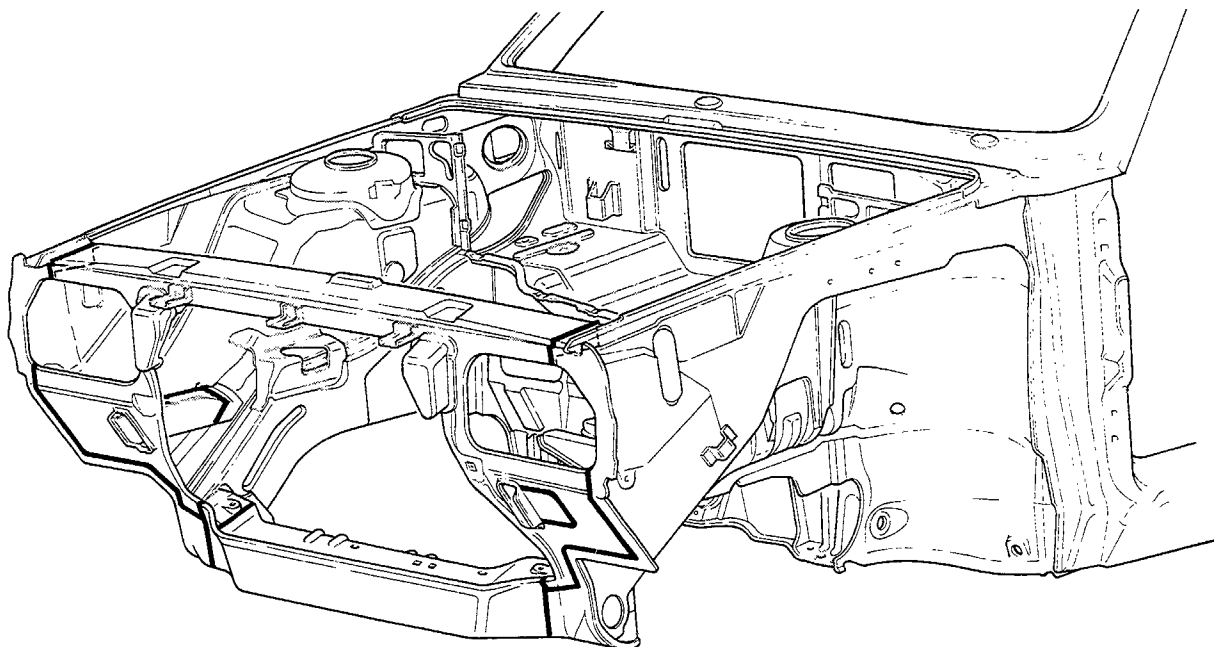
Fold the edge of the outer panel over the framework of the door using a hammer and block.



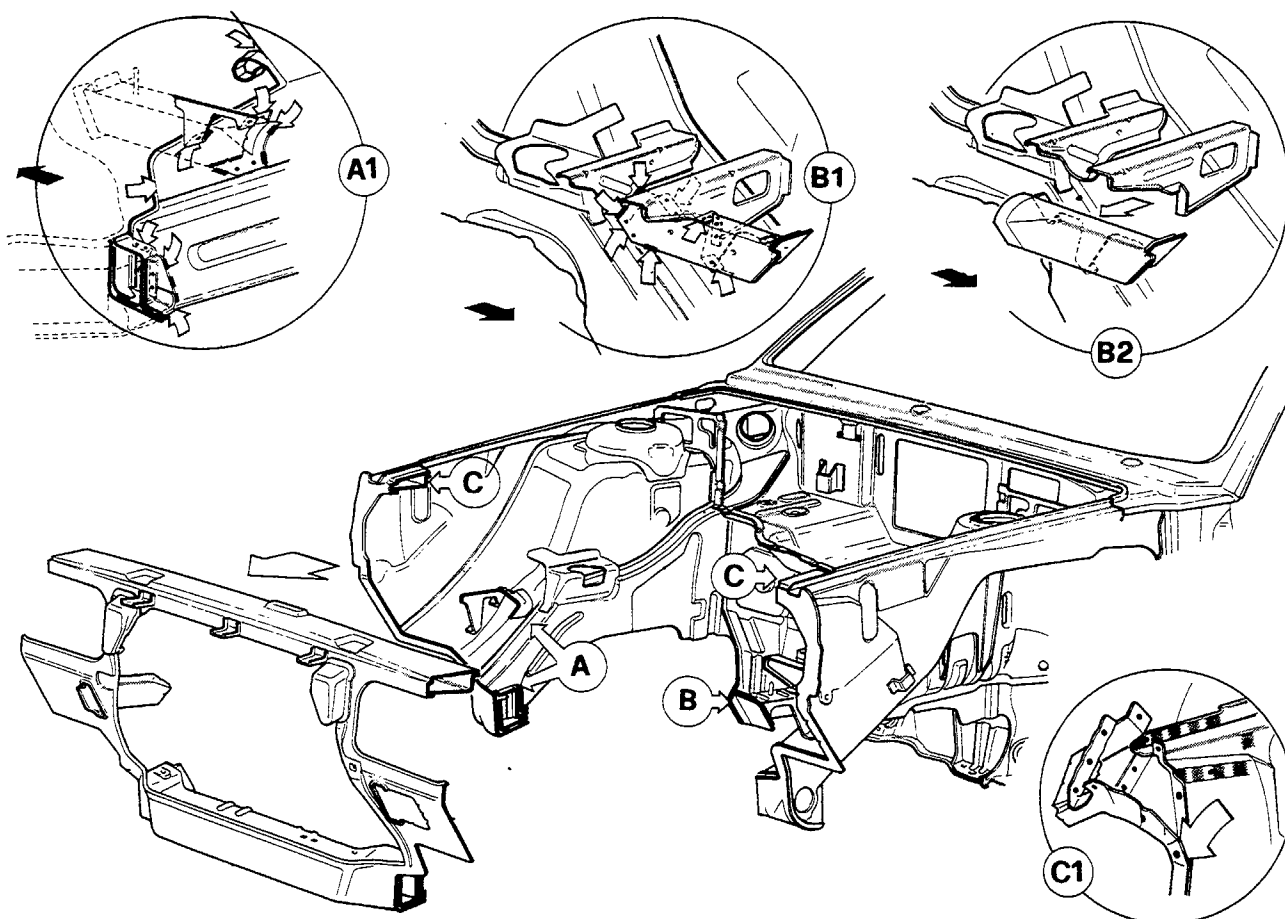
Complete the operation by sealing the shaded areas: this is done by smearing them with hot-setting sealant for interior use.

70.

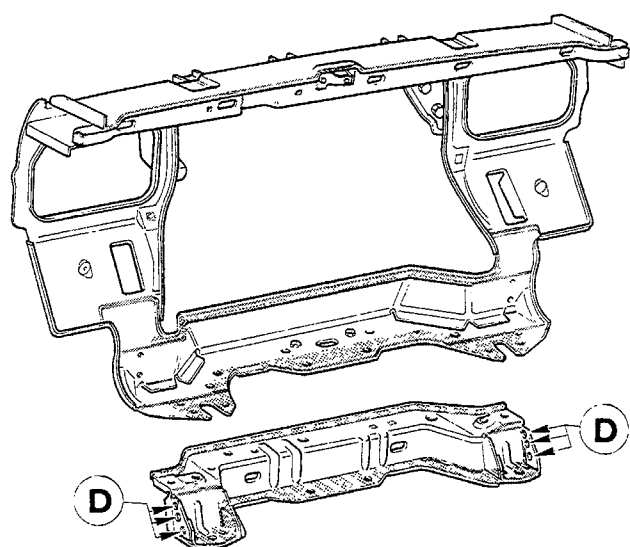
REPLACING FRONT SECTION, FRONT CROSSMEMBER AND MOUNTINGS FOR FIXING BUMPER



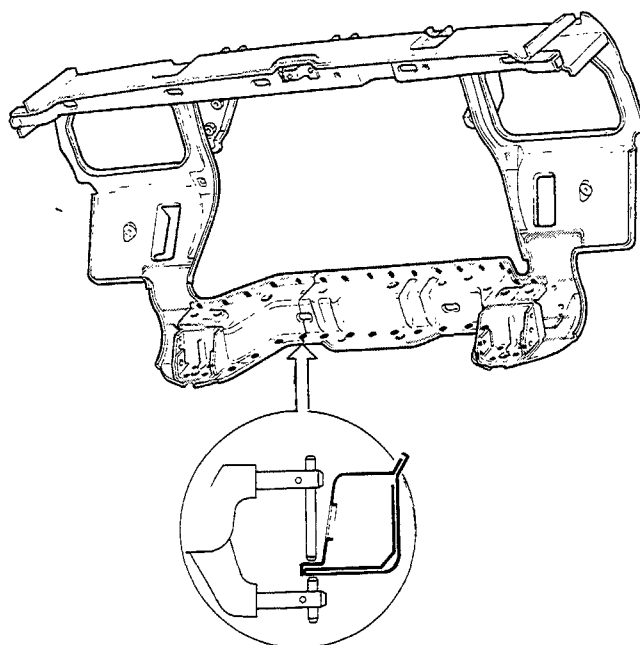
The lines show where to cut, using a pneumatic hacksaw, in order to remove those parts which are to be replaced.



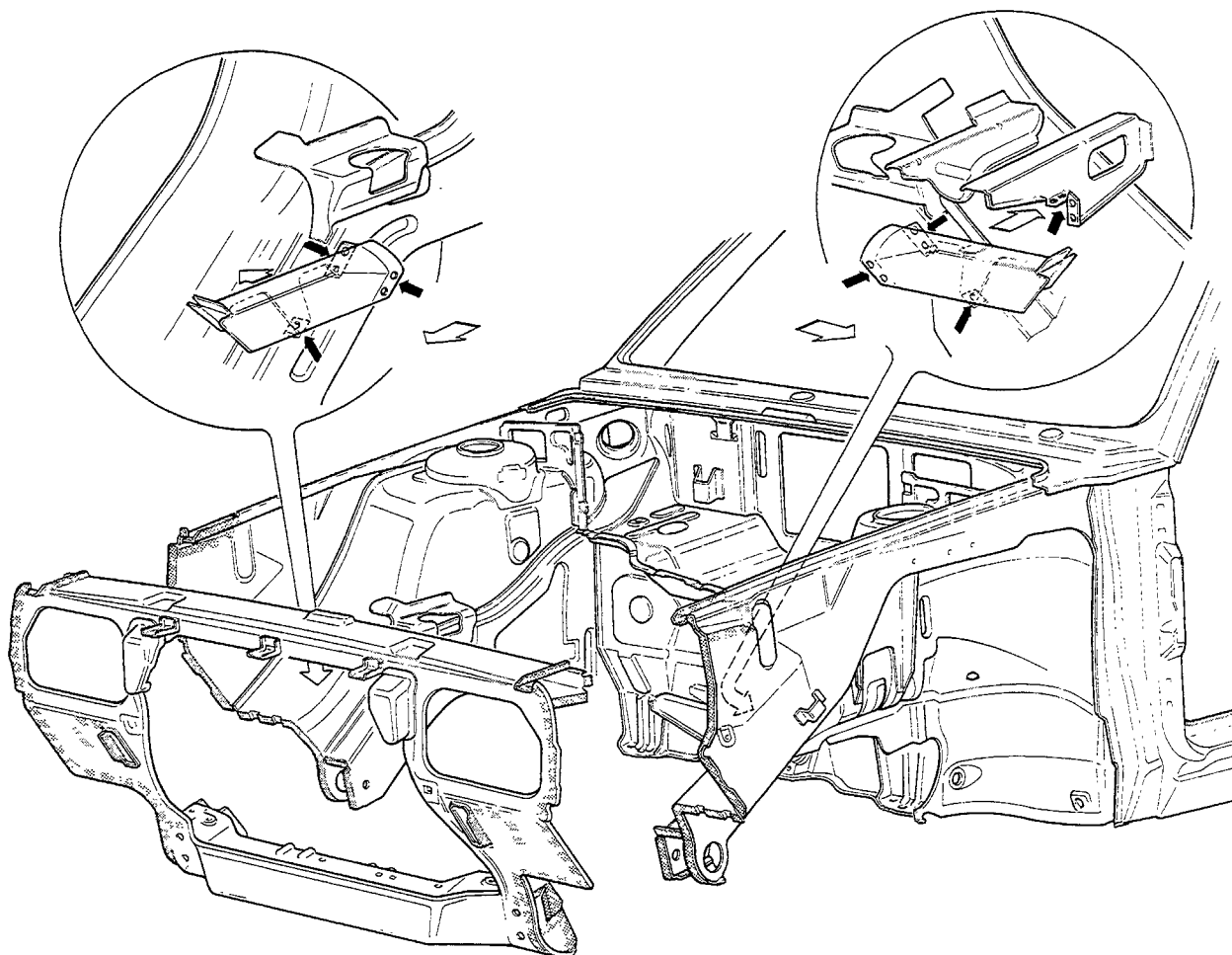
Remove the scraps of sheet metal (shown by the letters A, B and C and in greater magnification by details A₁, B₁, B₂ and C₁) using a milling cutter for detaching joining points, a pneumatic or manual chisel and tongs.



Drill 6 6mm holes in the lower crossmember as shown by reference marks D.
Grind the shaded welding areas and protect them with a zinc-based anti-rust agent.

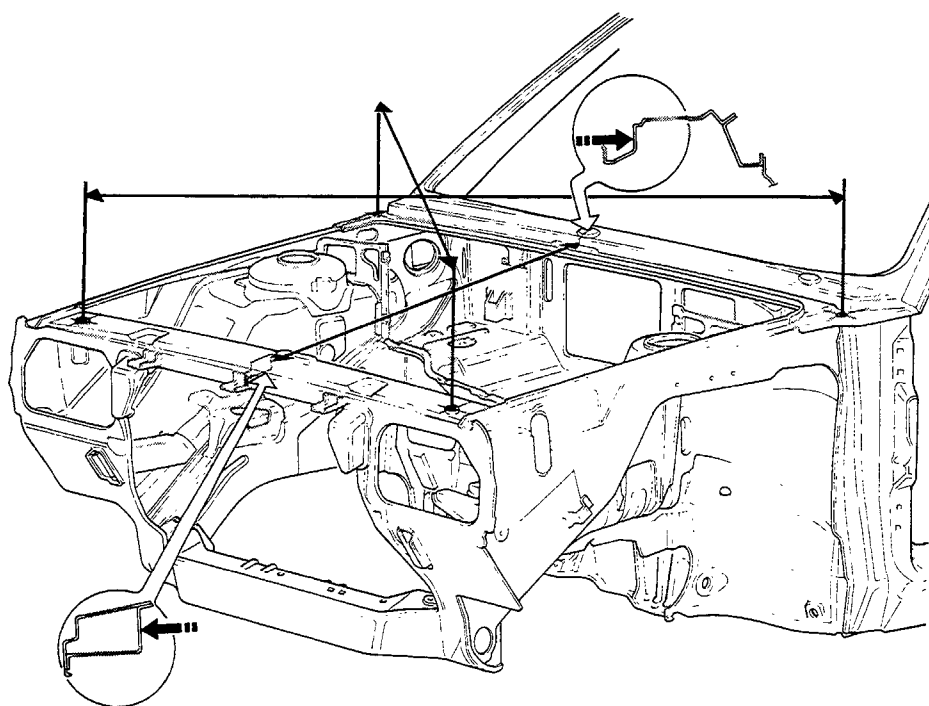


Weld the crossmember to the front section using a spot welder.



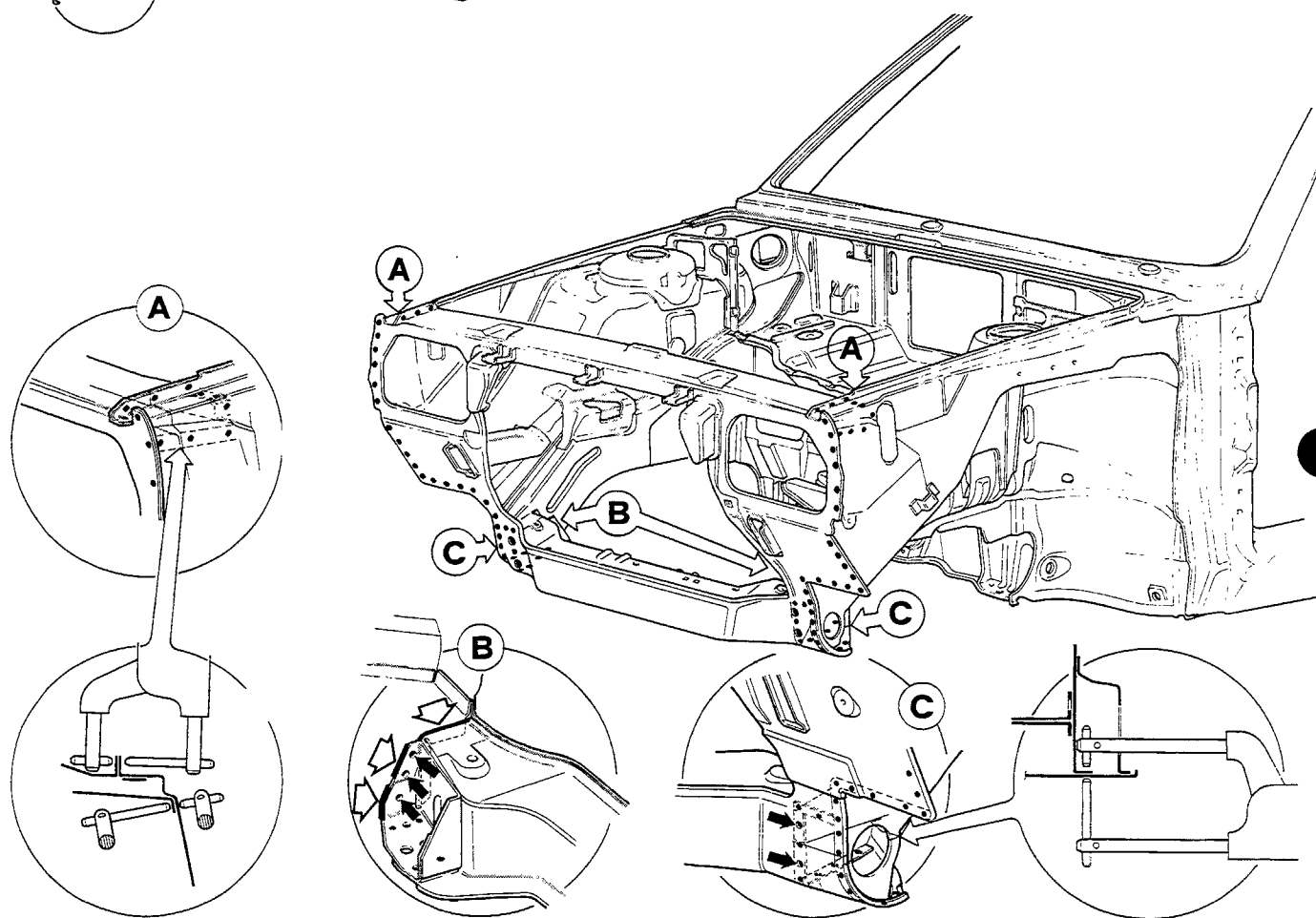
Straighten and grind the welding edges on the body shell, grind the welding edges on the replacement part and protect the shaded welding areas with zinc-coating.
Drill a series of 6 mm holes in the mountings for fixing the bumper, at the points shown by the arrows.

70.



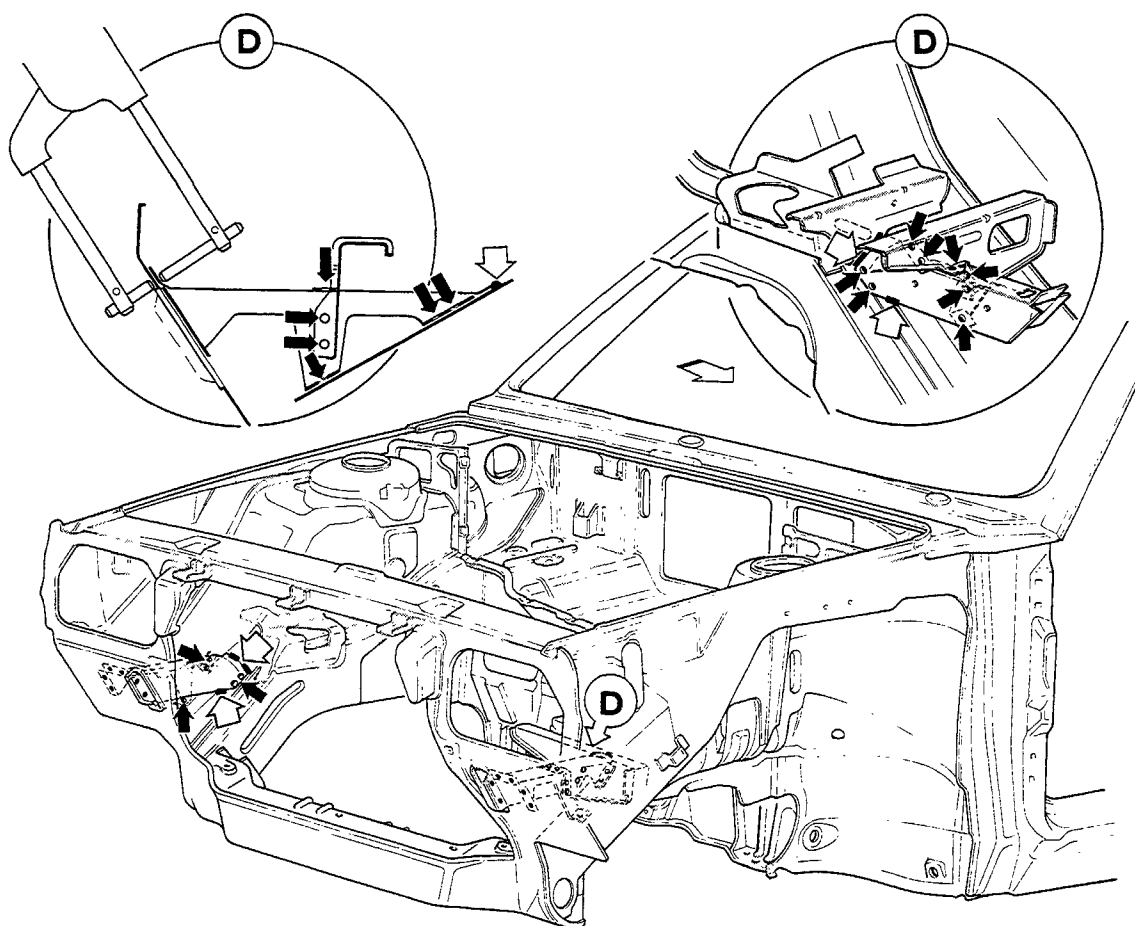
Fit the replacement part in place and fasten it with self-locking pliers, check that the diagonals are of equal length and check the depth of the engine compartment.

Provisionally fit the bonnet lid and check that it locks properly



Weld the front section to the wheel arch using a spot welder.

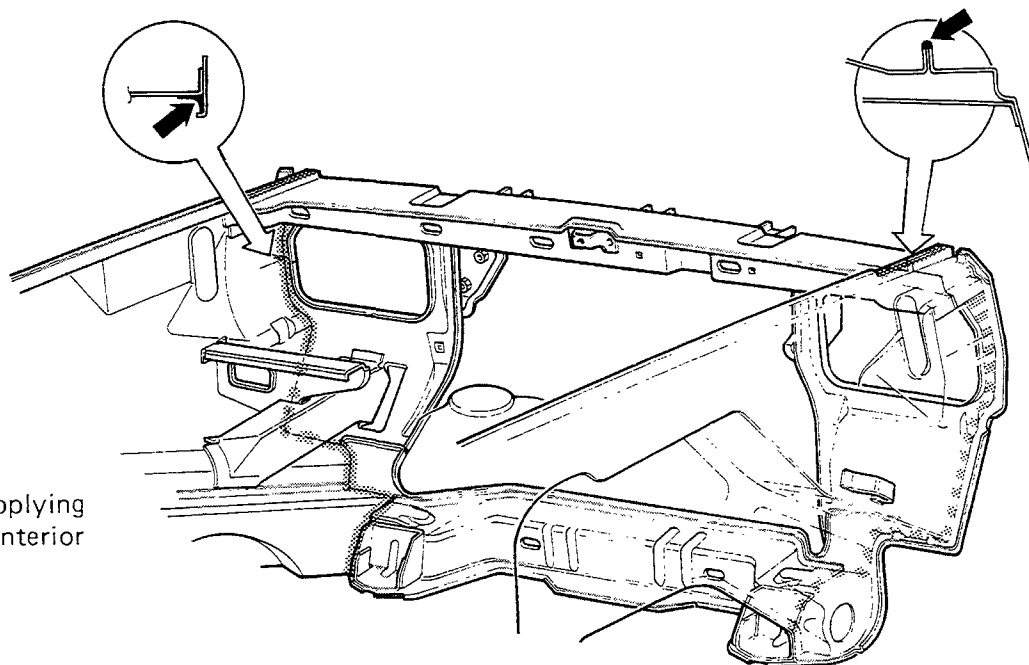
Weld the front crossmember to the longitudinal members and to the wheel arches filling the holes shown by the black arrows, using an inert gas electrode welder.



Position the lefthand mounting for fixing the bumper, marked D, and weld it to the side member and to the battery housing bracket filling the holes shown by the black arrows in the two magnified details, marked D, using an inert gas electrode welder.

To make a stronger job of fixing the mounting, carry out inert gas electrode welding where shown by the white arrows in the magnified details marked D.

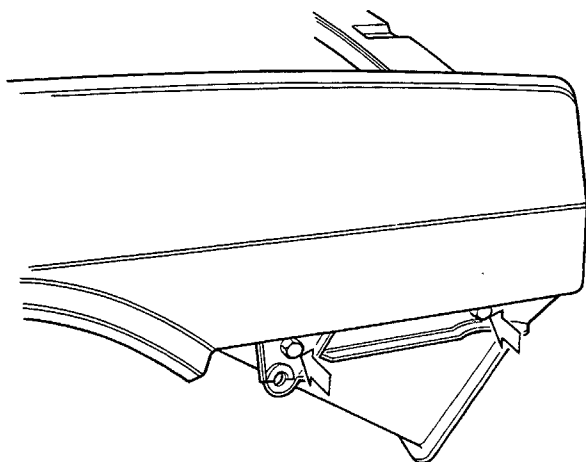
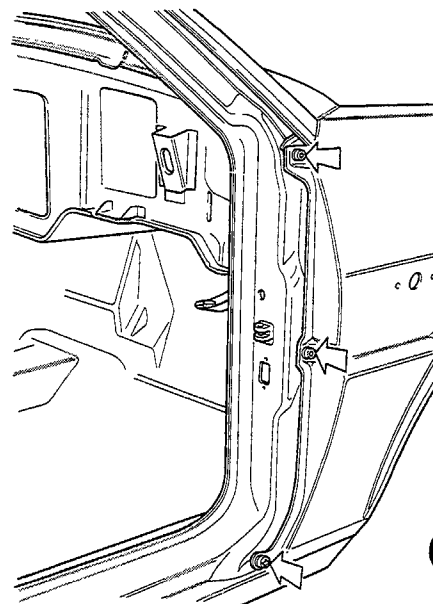
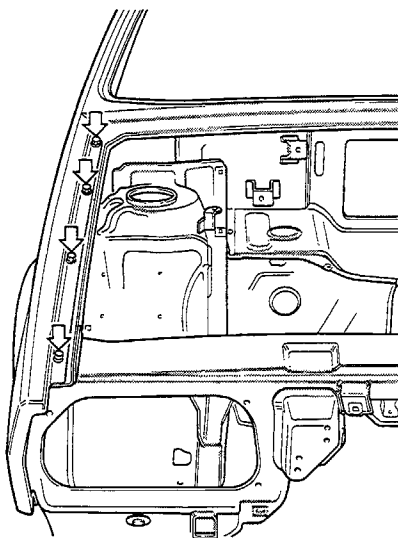
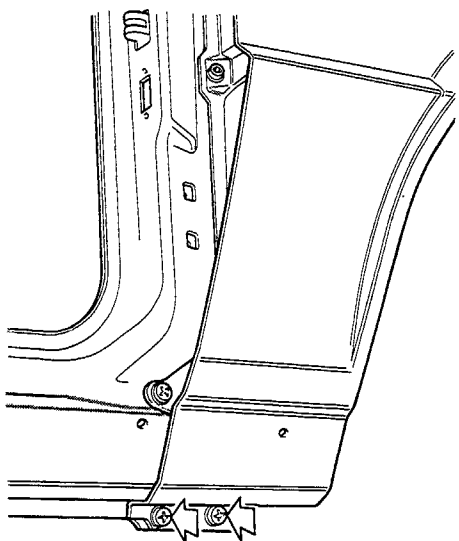
Continue fixing the mounting by spot welding the areas shown.



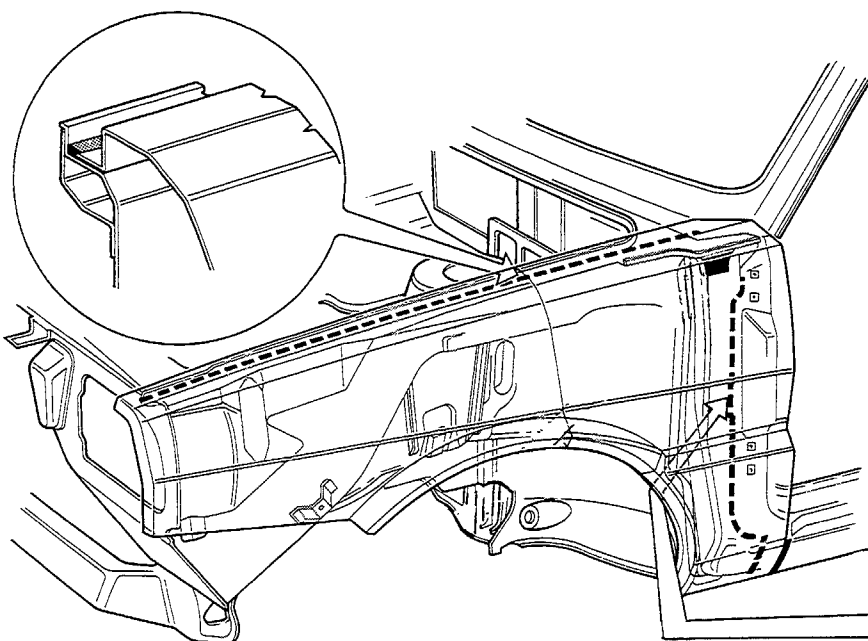
Re-seal the joints by applying hot-setting sealant for interior use in the areas shown.

70.

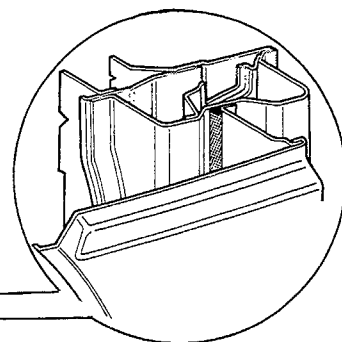
REPLACING FRONT WING

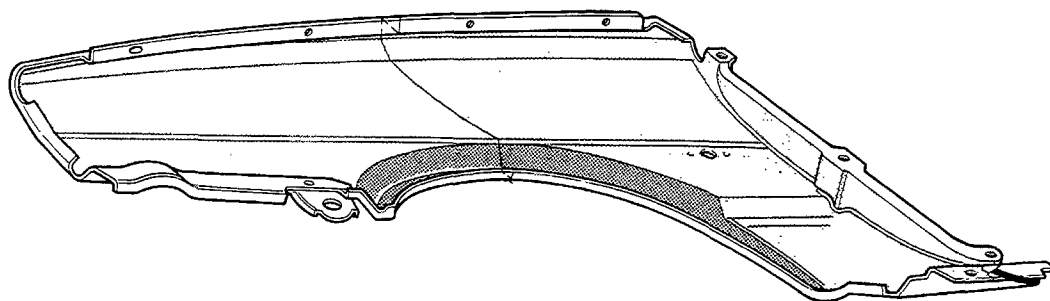


To remove the wing, remove the bolts securing it to the wheel arch, door pillar and door sill.
The illustrations show where the bolts are located.

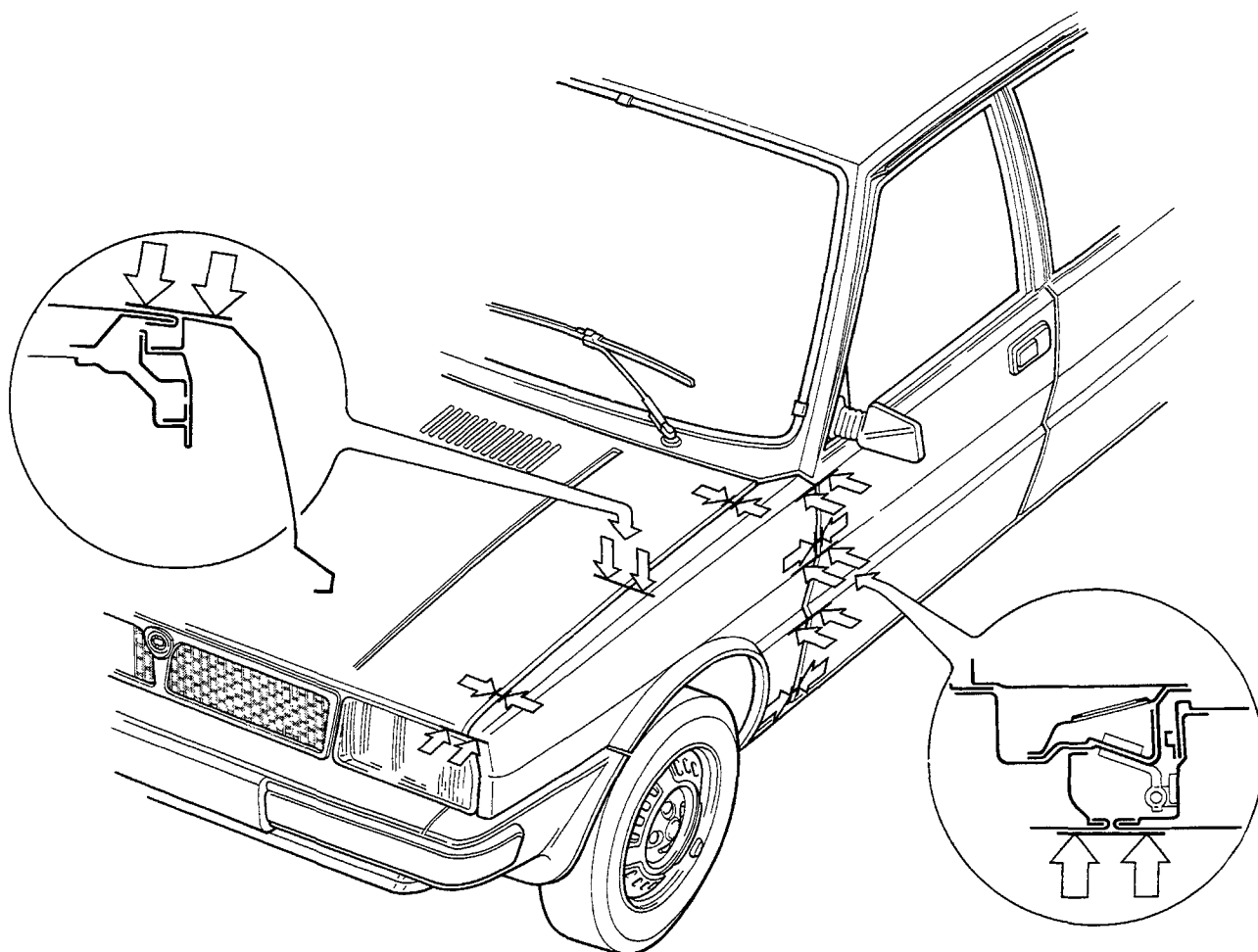


Renew the bead of plastic (Sigilflex) sealant along the joints marked with the broken lines.





Renew the anti-rust protection and soundproofing on the inside of the wing.



Fit the wing without fully tightening the bolts for securing it to the bodyshell.

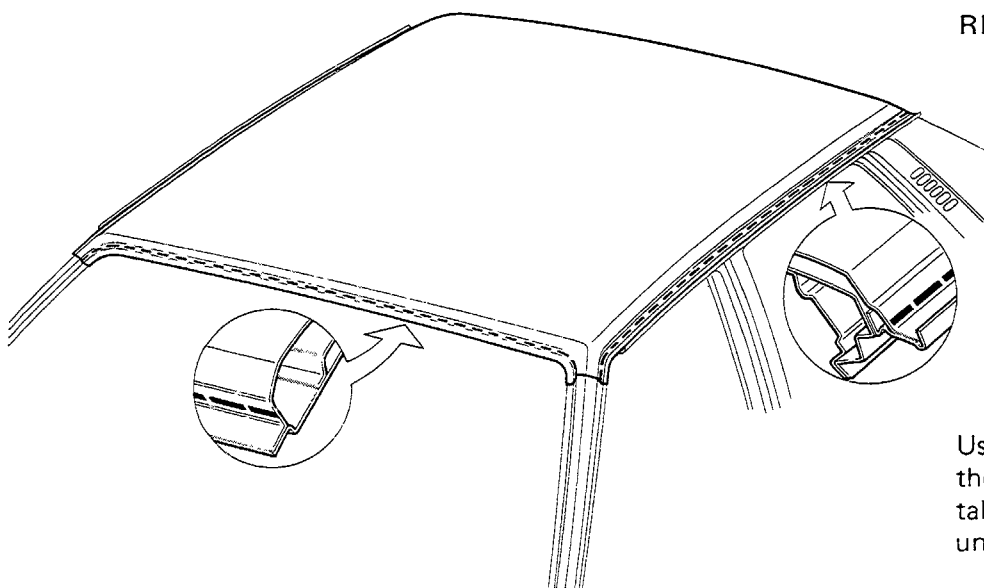
Make sure that the door and the bonnet lid open and close properly.

Check that the ribs line up and that all the way round the perimeter of the wing it lies in the same plane as adjacent parts and that the clearance is the same all the way round. If all is well, tighten the bolts securing it to the bodyshell fully.

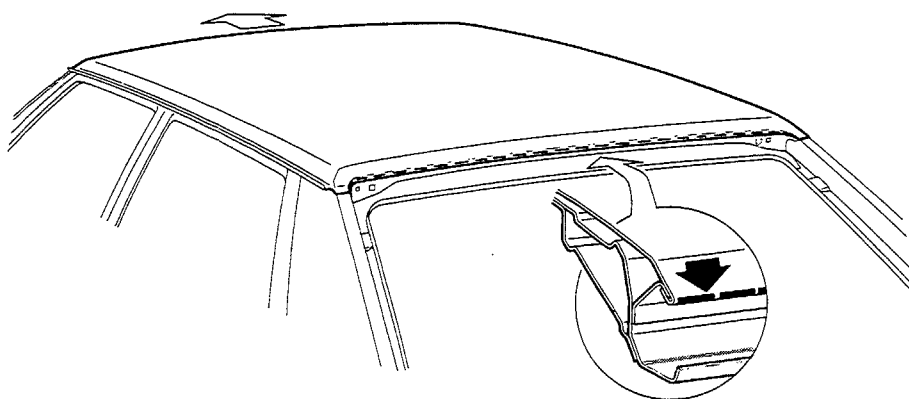
Seal the joints between the wing and the front section properly.

70.

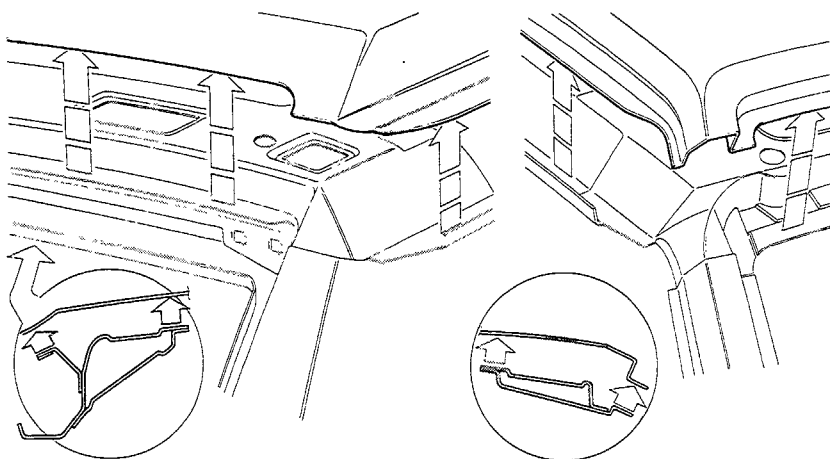
REPLACING ROOF



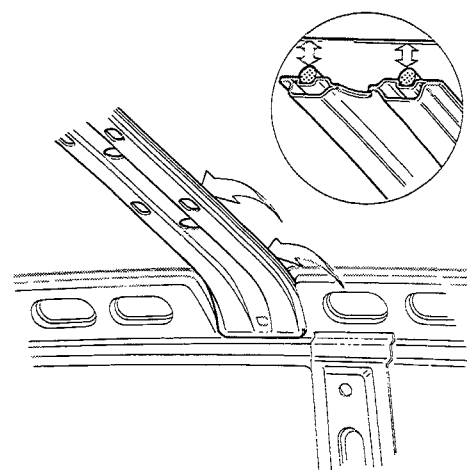
Using a pneumatic hacksaw, cut the roof along the broken lines, taking care not to cut into the underlying framework.



Grind along the rear edge of the roof until it becomes detached from the part of it which was folded over, taking care not to damage the underlying curved rib.

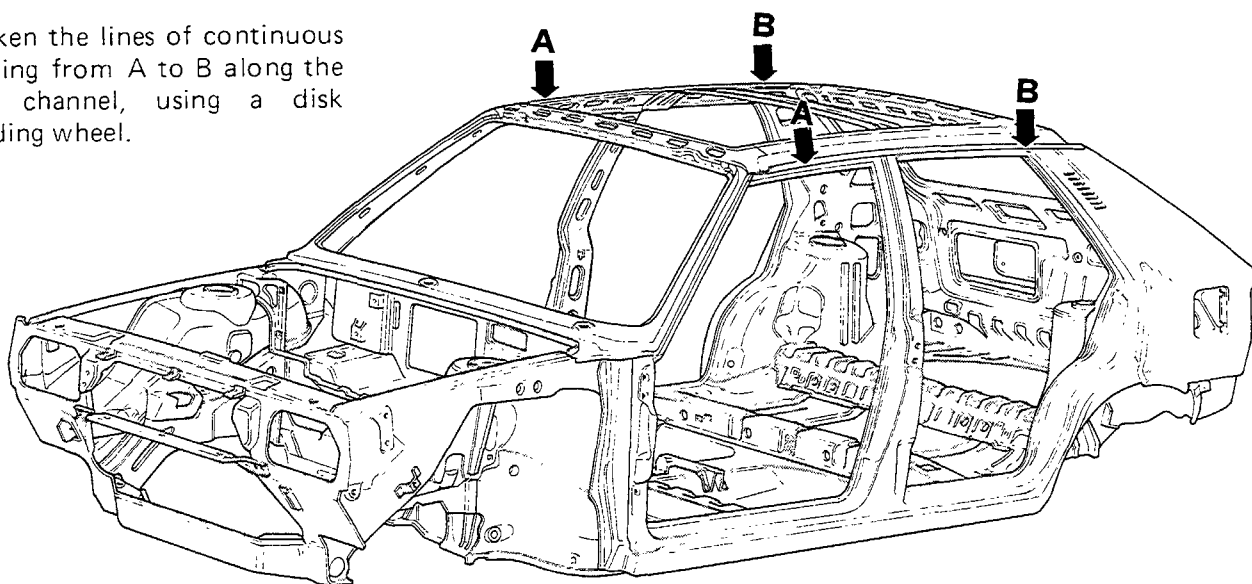


Near where the roof is welded to the pillars (on the parts which have not been replaced) spread a mixture consisting of crumbled asbestos worked into a dough with water and, using an oxyacetylene torch and a wire brush, unweld the joints.

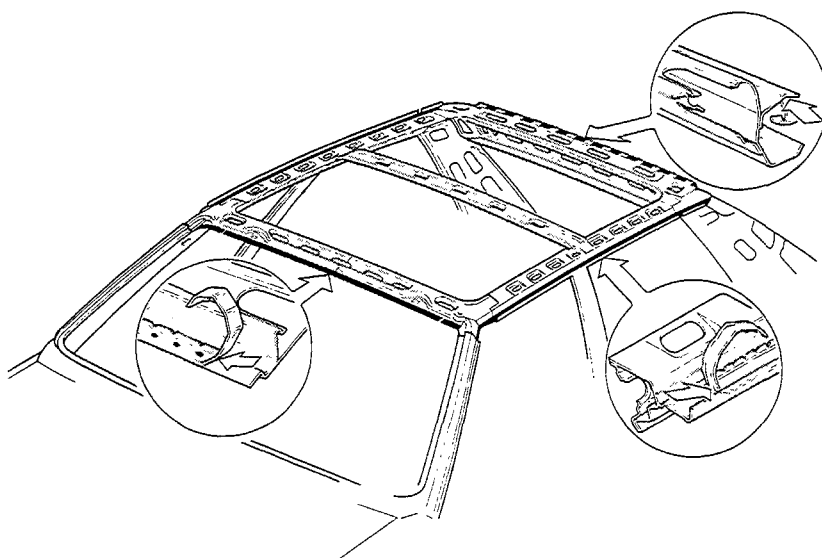


Remove the roof from the central curved rib by inserting a chisel between the vibration-deadening material and the roof

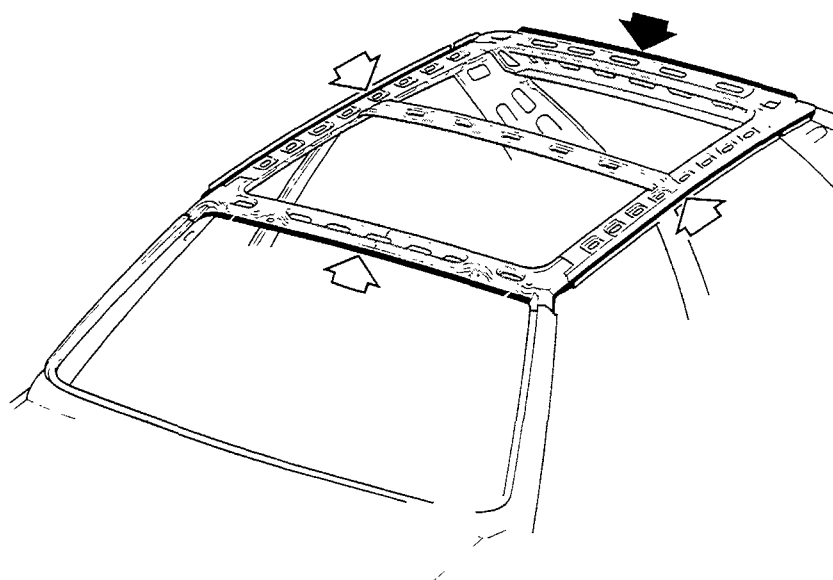
Weaken the lines of continuous welding from A to B along the drip channel, using a disk grinding wheel.



Detach the remaining joining points from the scraps of sheet metal using a suitable milling cutter. Remove the scraps of sheet metal using tongs.



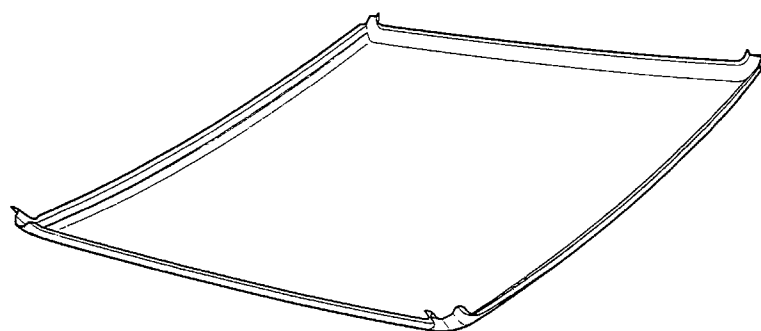
Using a torch, burn off every trace of oxide, sealant or paint from the welding edges, then brush them.



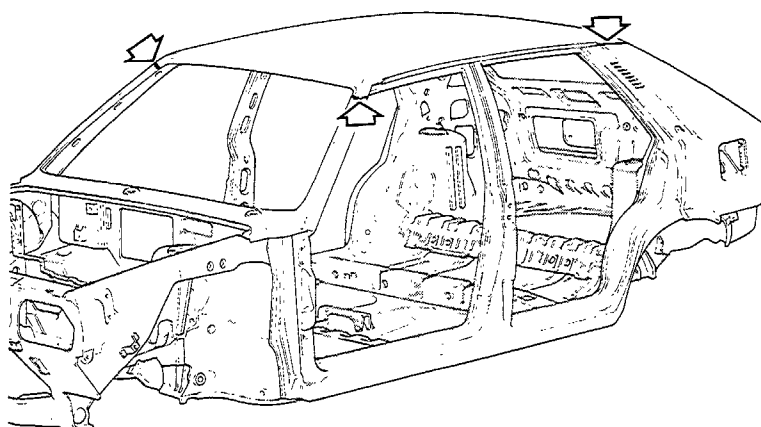
Straighten and grind the fins shown by the white arrows and protect them with a zinc-based anti-rust agent.

Spread structural adhesive on the fin shown by the black arrow.

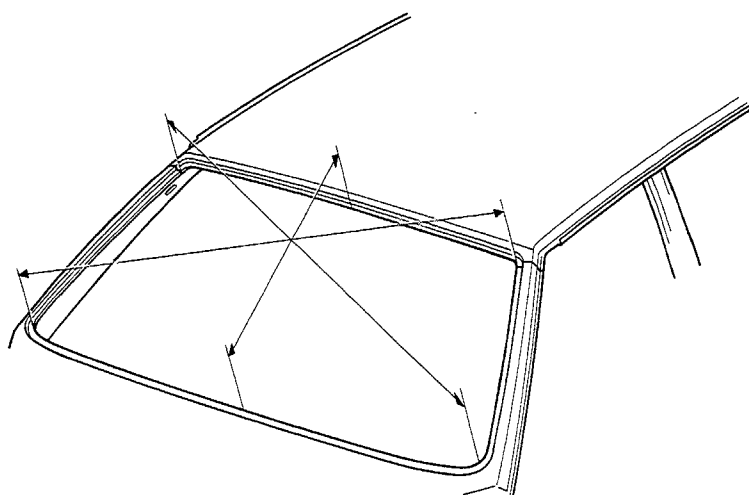
70.



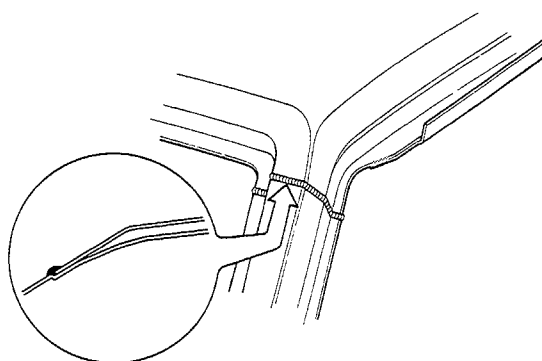
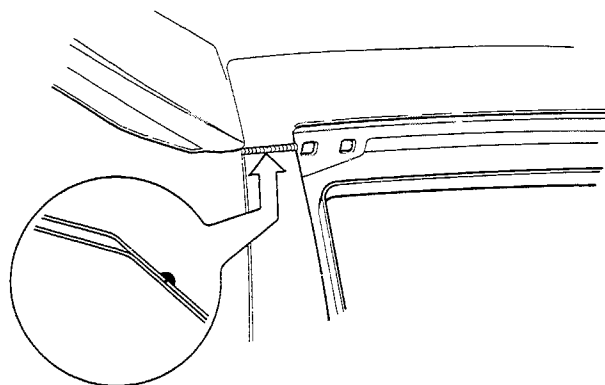
Grind the welding edges of the replacement part and protect them with a zinc-based anti-rust agent.



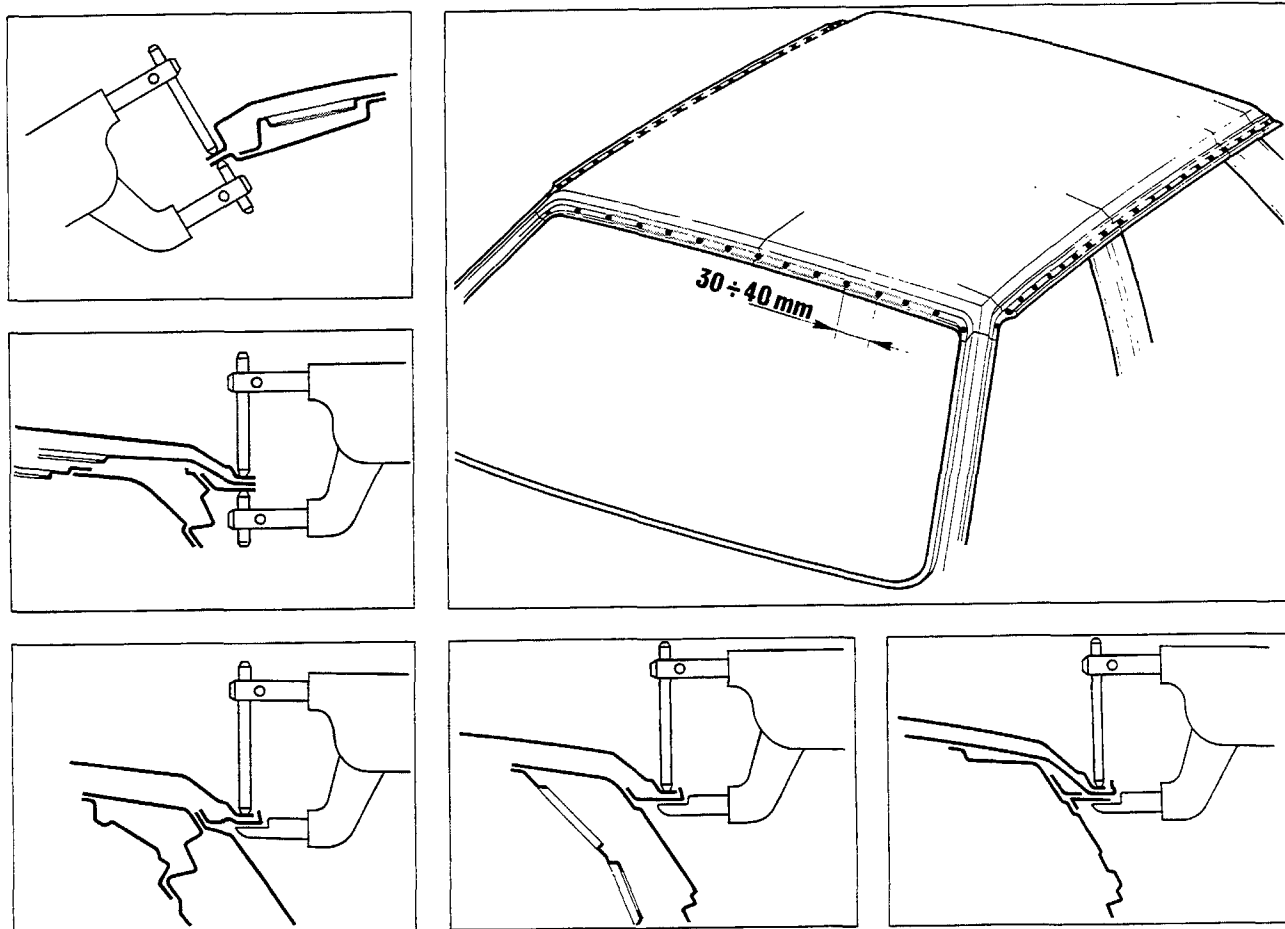
Fit the replacement part in position, fix it with self-locking pliers and check that it joins up with the pillars correctly.



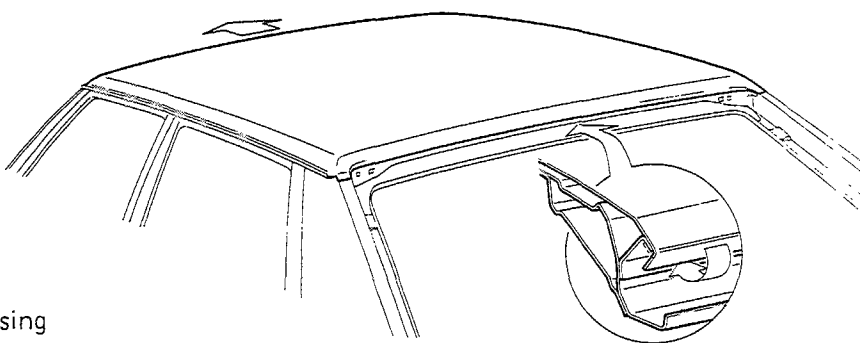
Check the depth of the space for housing the windscreen and also that the diagonal measurements across this space are the same.



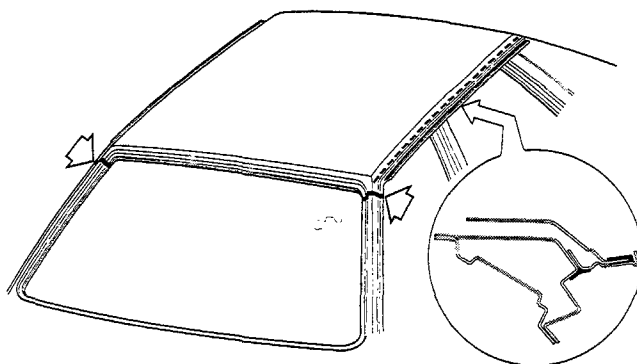
Initially perforate the roof-pillar junctions, then complete the welds using an inert gas electrode.



Continue welding the roof in the areas shown using an electric spot welder.



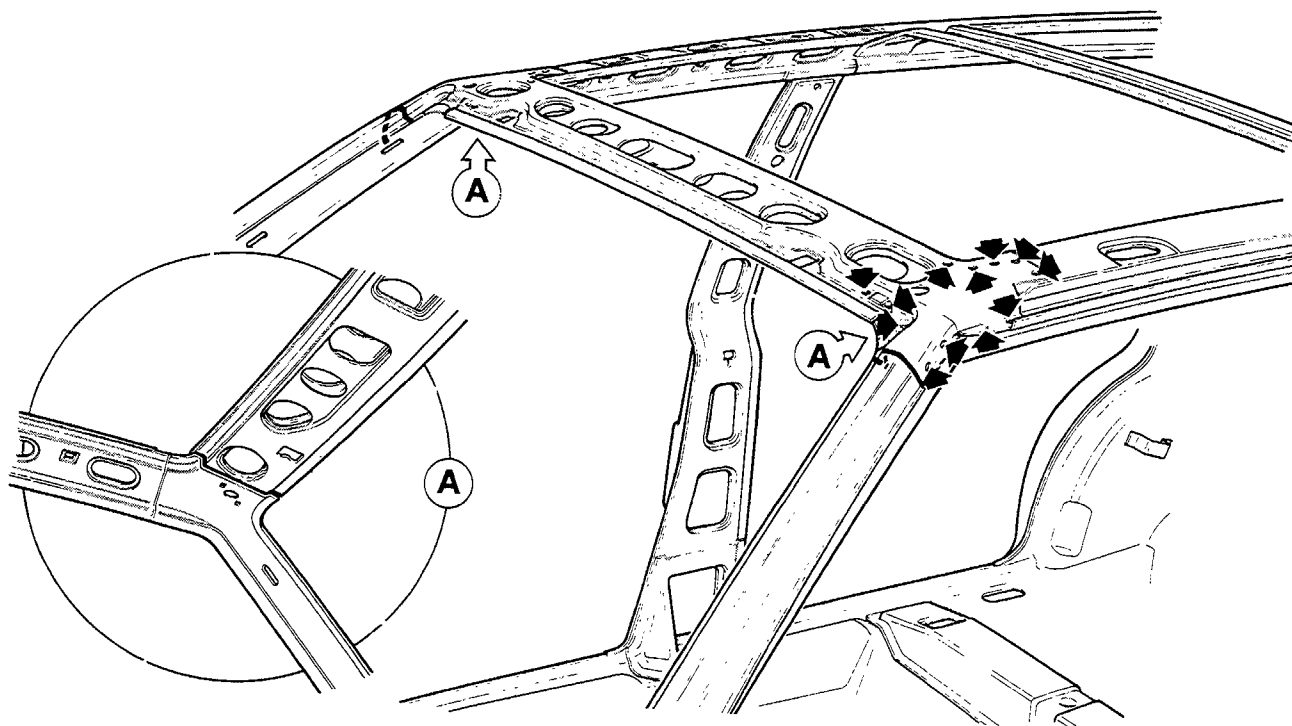
Fold the rear edge of the roof over using a hammer and steel block



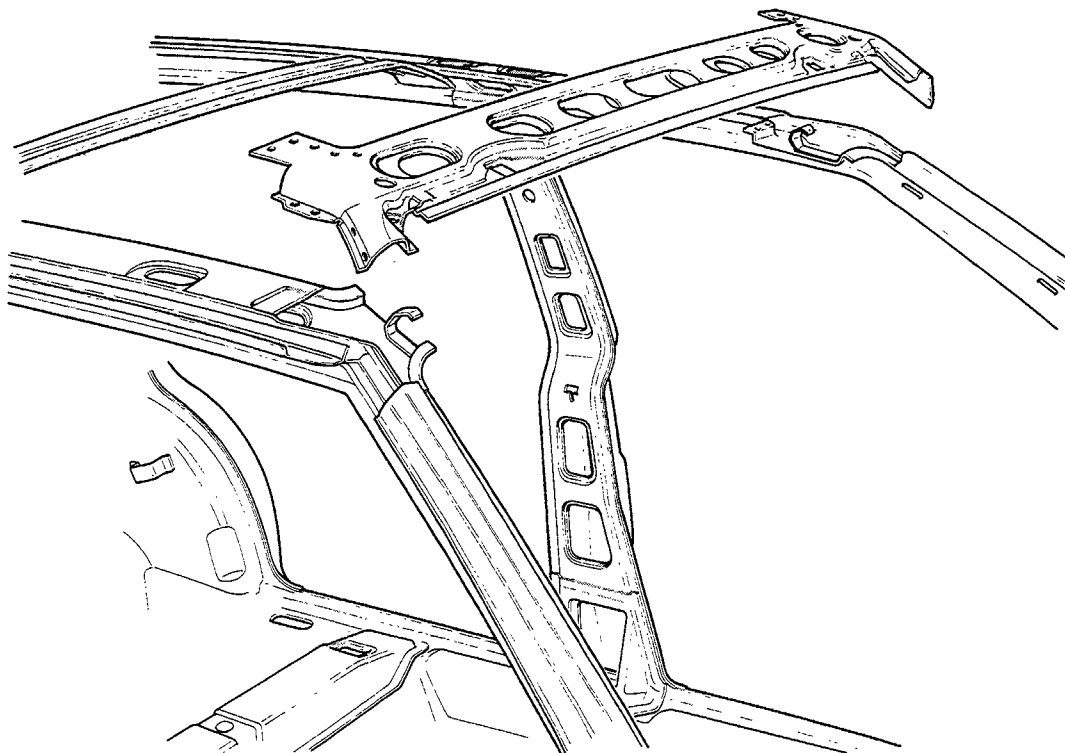
Complete the operation by smearing hot setting sealant for external use in the areas shown.

70.

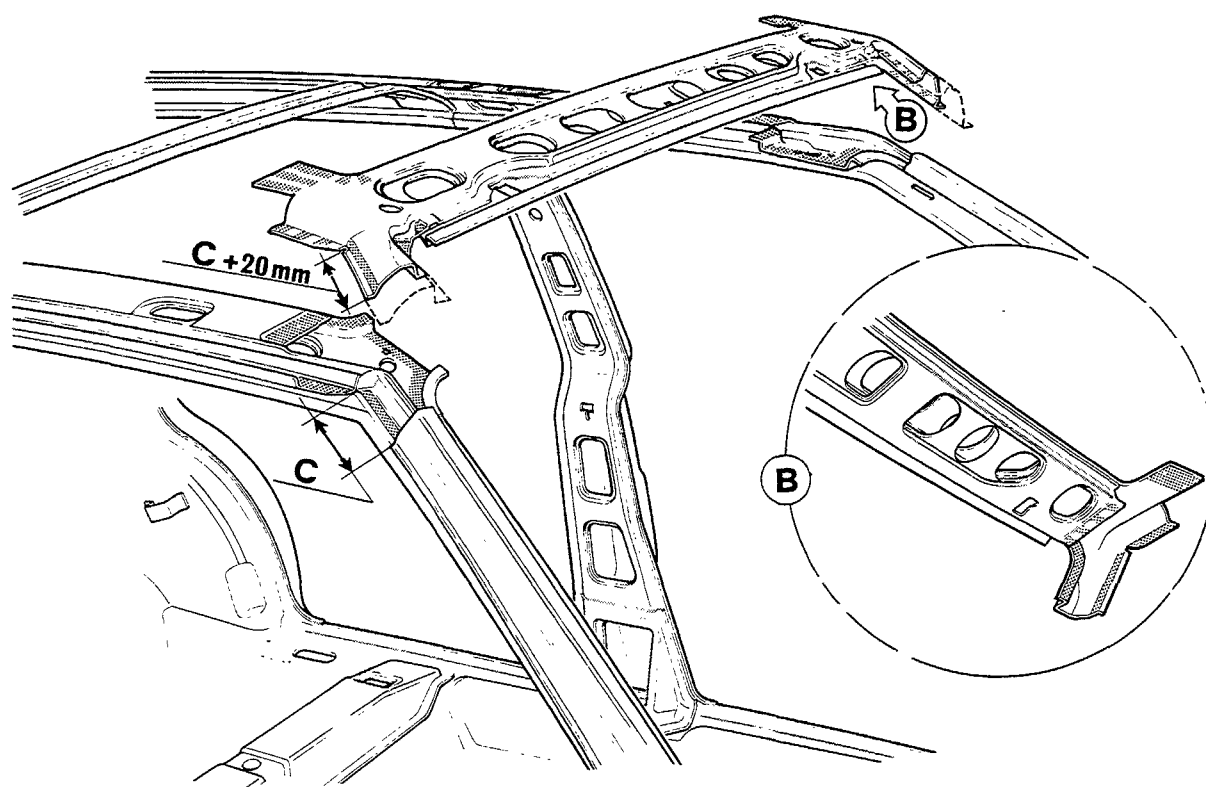
REPLACING UPPER WINDSCREEN CROSSMEMBER (FRONT CURVED RIB)



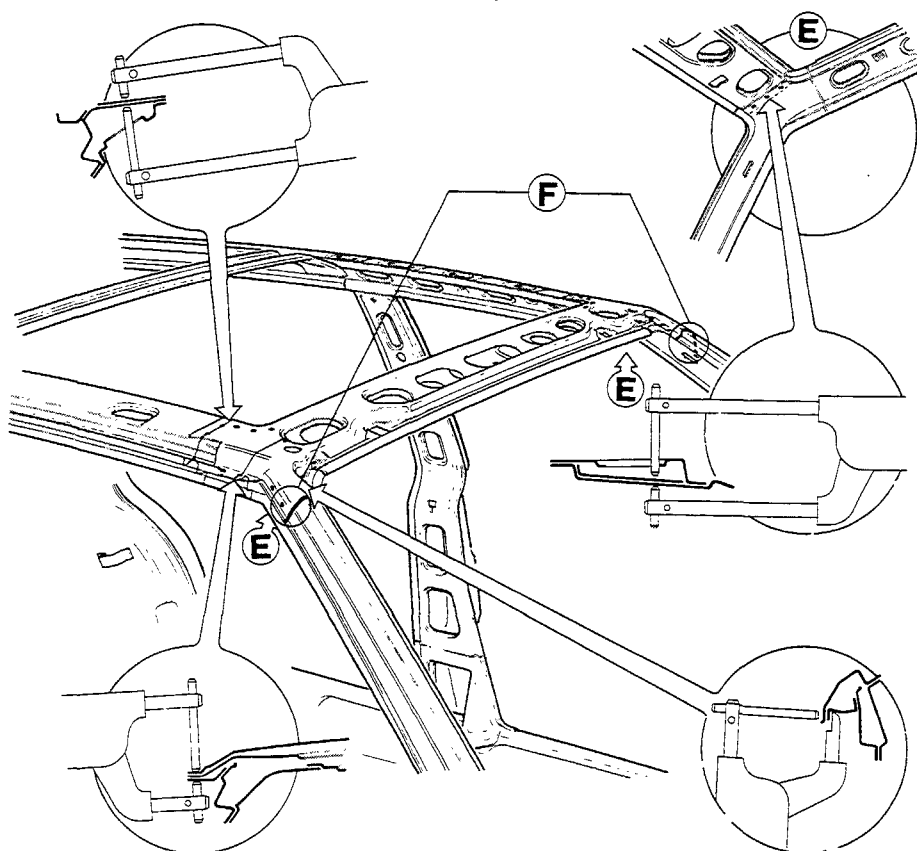
Using a pneumatic hacksaw cut the crossmember in the areas marked A.
Detach the welding points marked by the black arrows using a suitable milling cutter.



Remove the scraps of sheet metal and straighten and grind the welding edges.



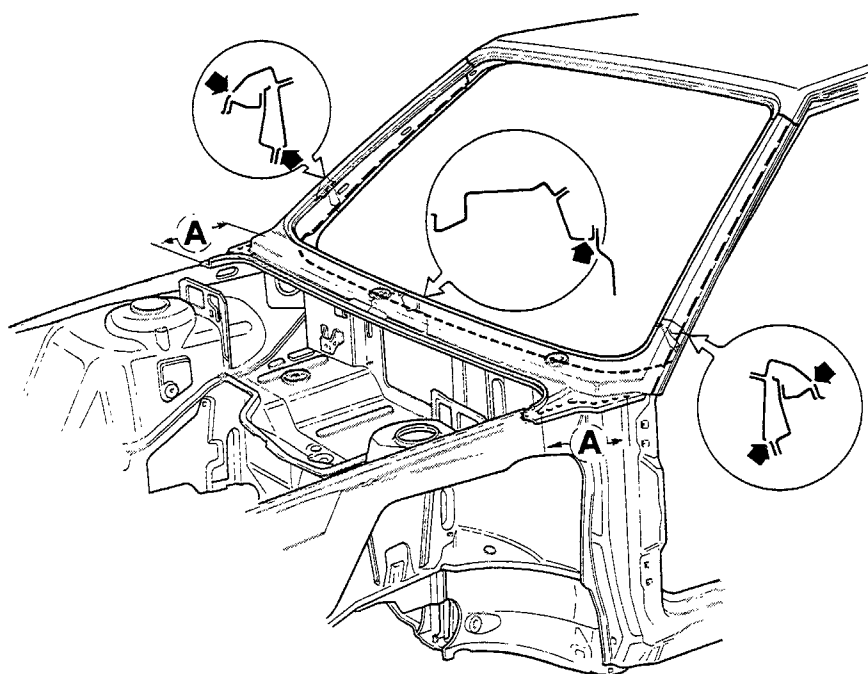
Measure dimension C and mark off the same dimension + 20mm on the replacement part and cut it to this measurement. Grind the welding areas on the replacement part and protect the shaded areas B with a zinc-based anti-rust agent. Fit the replacement part in position, laying it over the non-replaced part, fix it with self-locking pliers and cut both parts together (on the overlap). Check, using a test gauge, the depth of the housing for the windscreen and also check that the diagonal measurements of this housing are the same.



Weld the upper windscreen crossmember to the interior framework using a spot welder. Then weld along the lines marked F using an inert gas electrode.

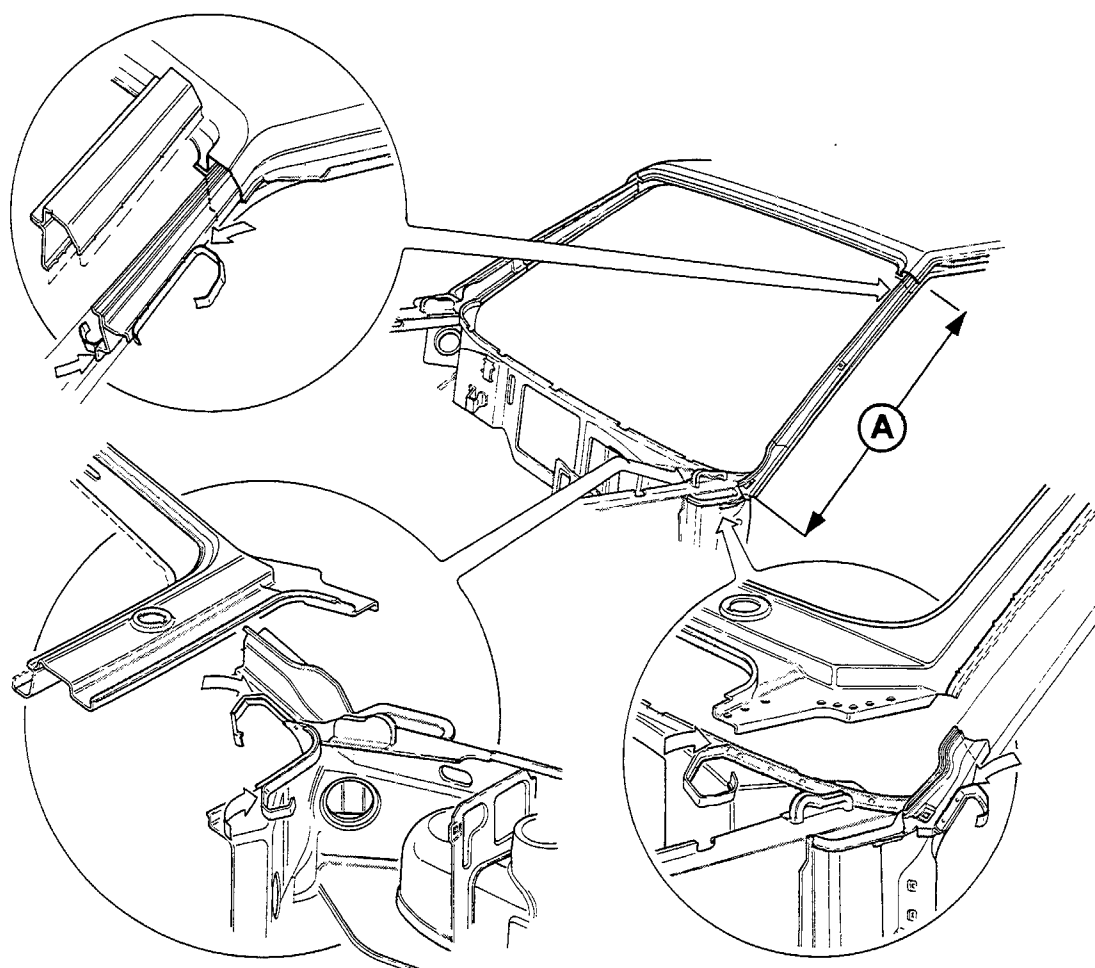
70.

REPLACING WINDSCREEN SURROUND



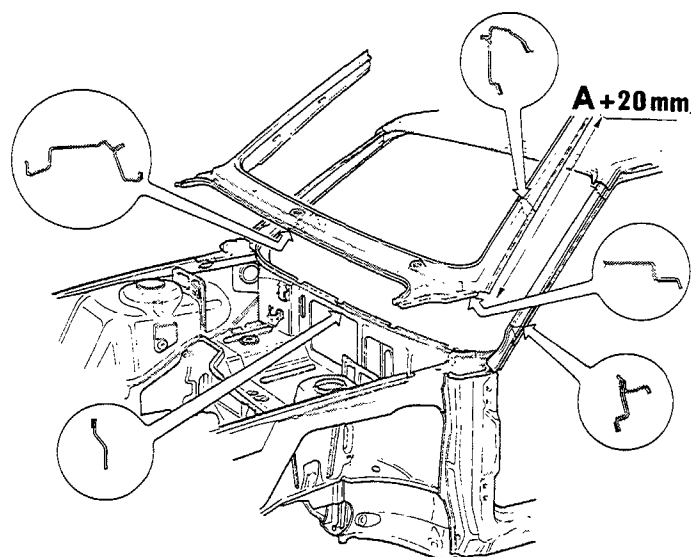
Cut the windscreen surround along the broken lines using a pneumatic hacksaw.

Detach the welding points in the sections marked A using a milling cutter, then remove the damaged part.



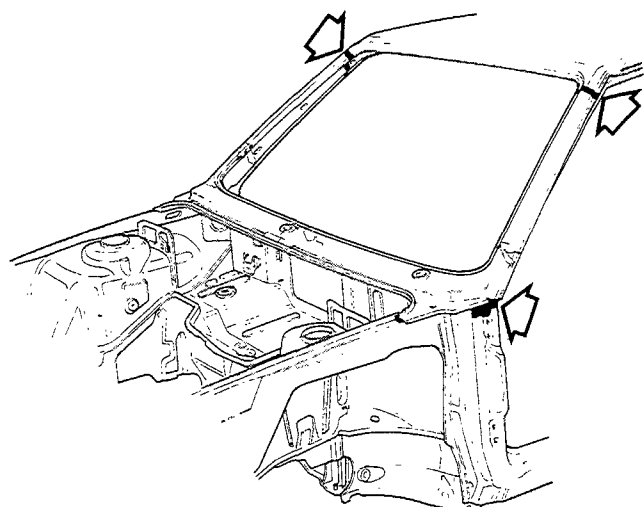
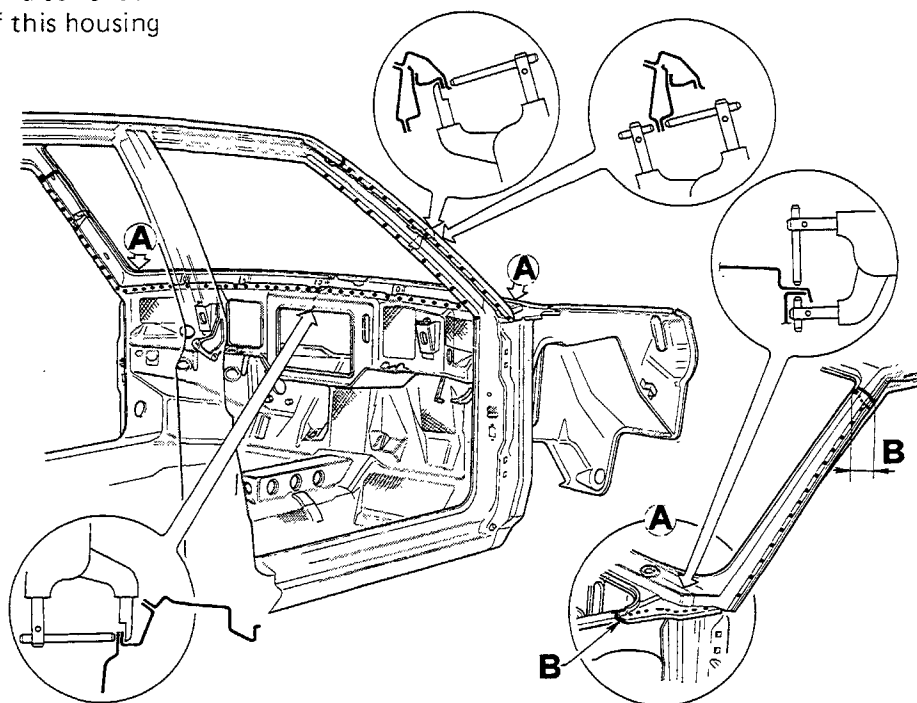
Detach the joining points in the scraps of sheet metal using a suitable milling cutter. Remove the scraps of sheet metal using tongs. Clean up the welding edges and measure dimension A.

Mark off dimension $A + 20\text{mm}$ on the replacement part and cut it to this measurement; grind the welding fins on the replacement part and protect all the welding areas, as shown, using a zinc-based anti-rust agent. Fit the replacement part in position laying it over the non-replaced parts, fix it with self-locking pliers and cut both parts together (on the overlap). Check the depth of the housing for the windscreen and also check that the diagonal measurements of this housing are the same.



Spot weld the windscreen surround to the interior framework.

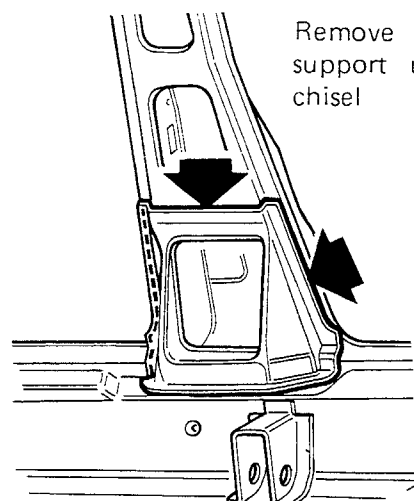
Complete the job of fixing the windscreen surround by welding it using the inert gas electrode method at the points shown by the letter B.



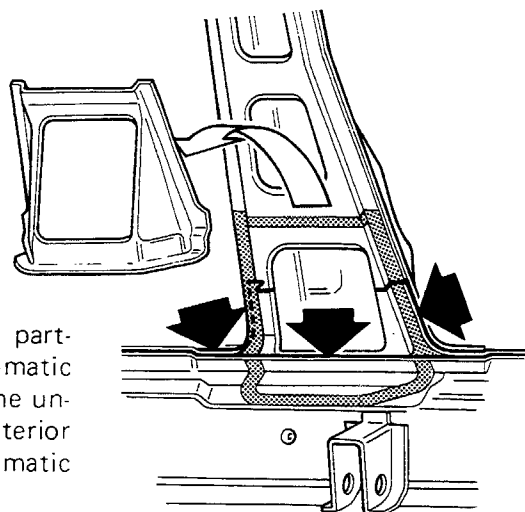
Re-seal the joints using hot thermosetting plastic sealant in the sections shown by the arrows.

70.

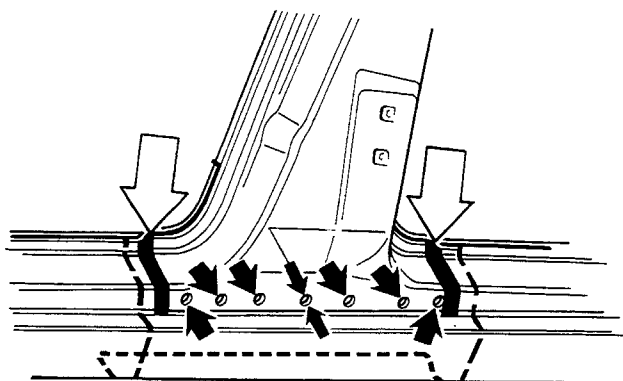
REPLACING COMPLETE DOOR SILL



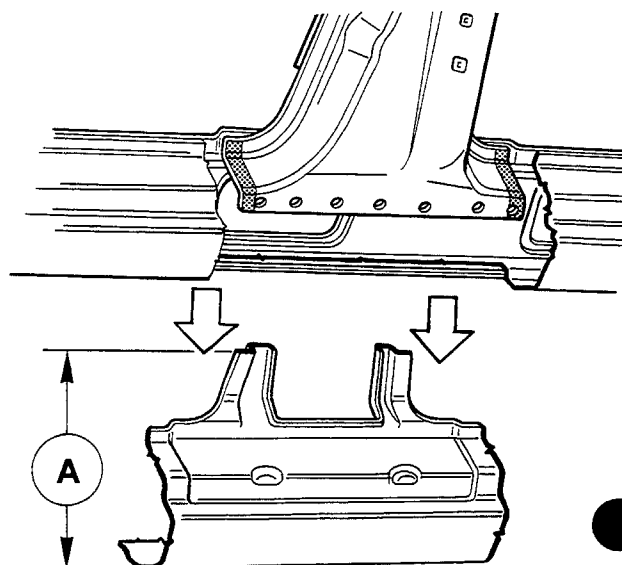
Remove the interior pillar support using a pneumatic chisel



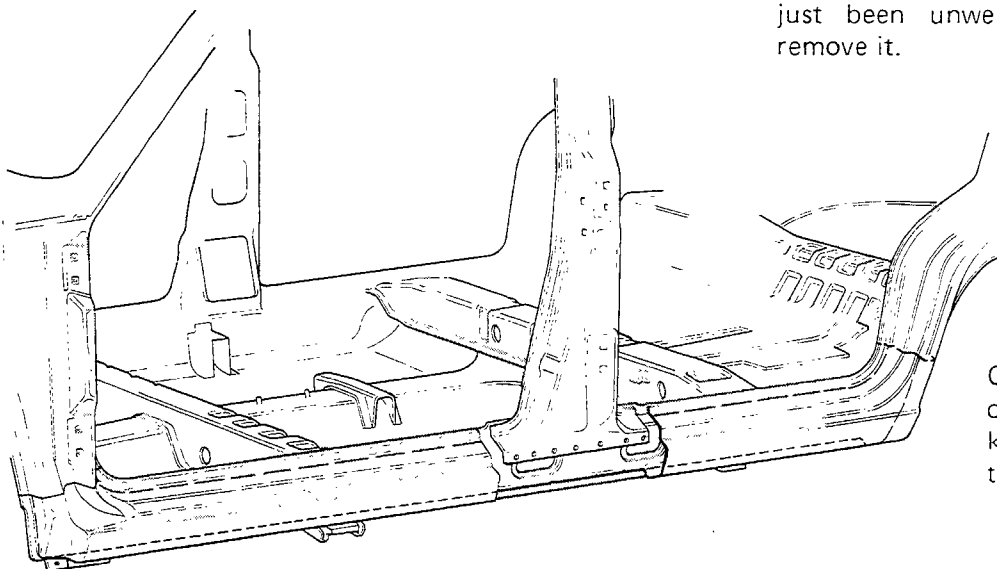
Cut the interior pillar partway up using a pneumatic hacksaw and remove the underlying part of the interior pillar using a pneumatic chisel.



Using an oxyacetylene torch, unweld the sections of welding marked with white arrows. Detach the welding points shown by the black arrows and cut the section of door sill along the broken lines.



Release the section of door sill which has just been unwelded from the pillar and remove it.



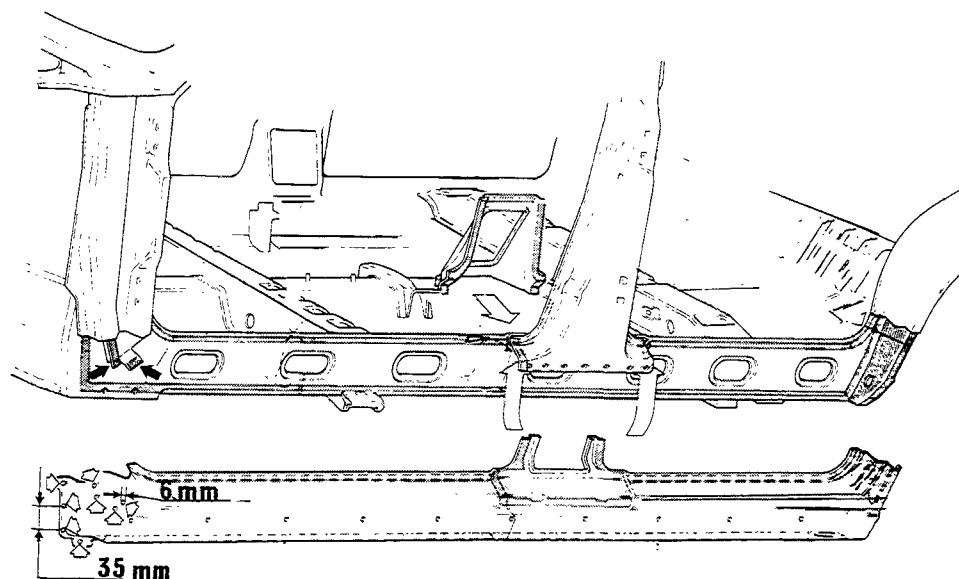
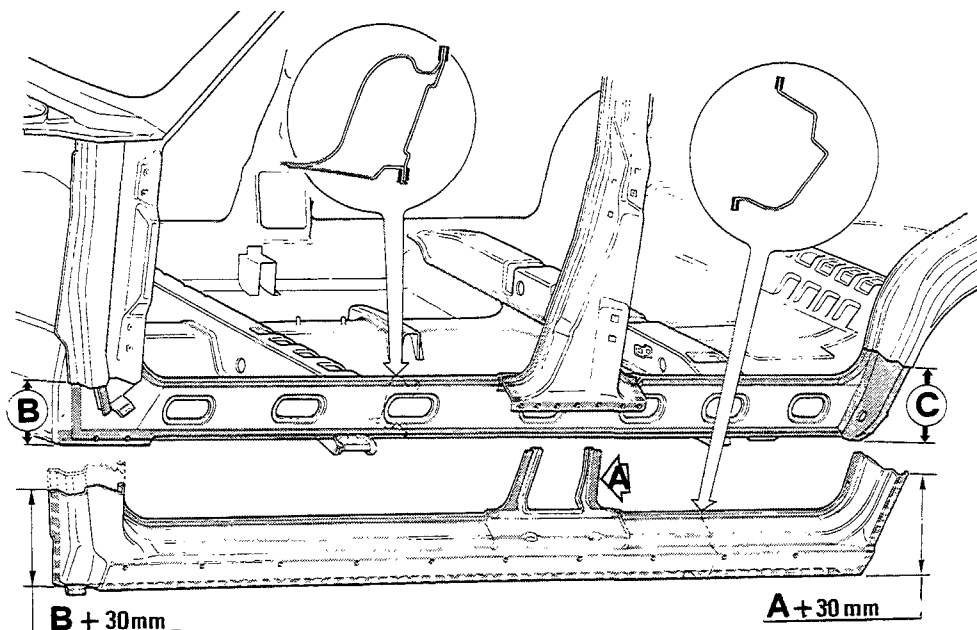
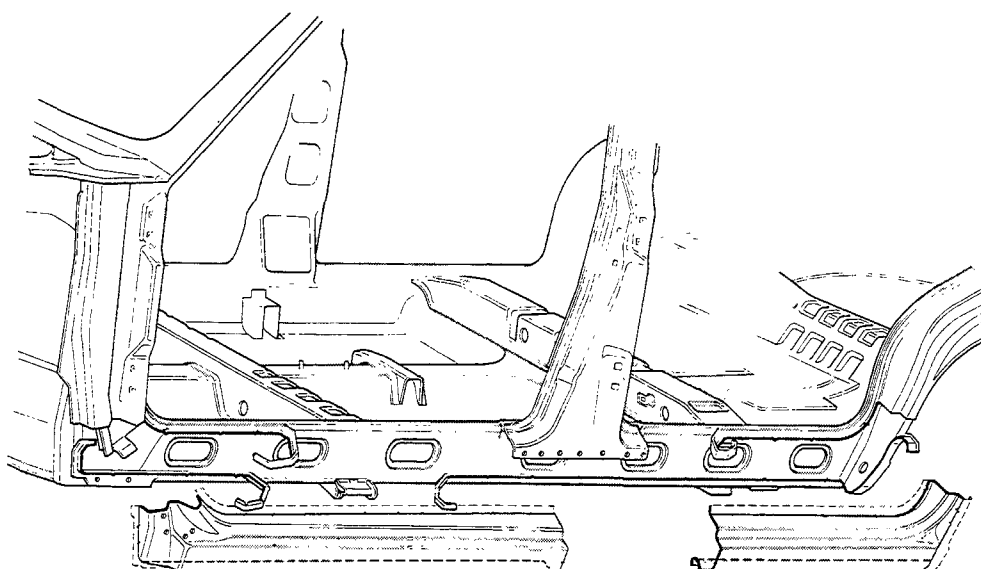
Cut the remaining section of door sill along the broken lines using a pneumatic hacksaw or chisel.

Detach the joining points of the scraps of sheet metal using a suitable milling cutter. Remove the scraps of sheet metal using tongs. Burn off every trace of oxide, paint or protective from the welding edges, then brush them. Straighten the welding edges using a hammer and shaped block.

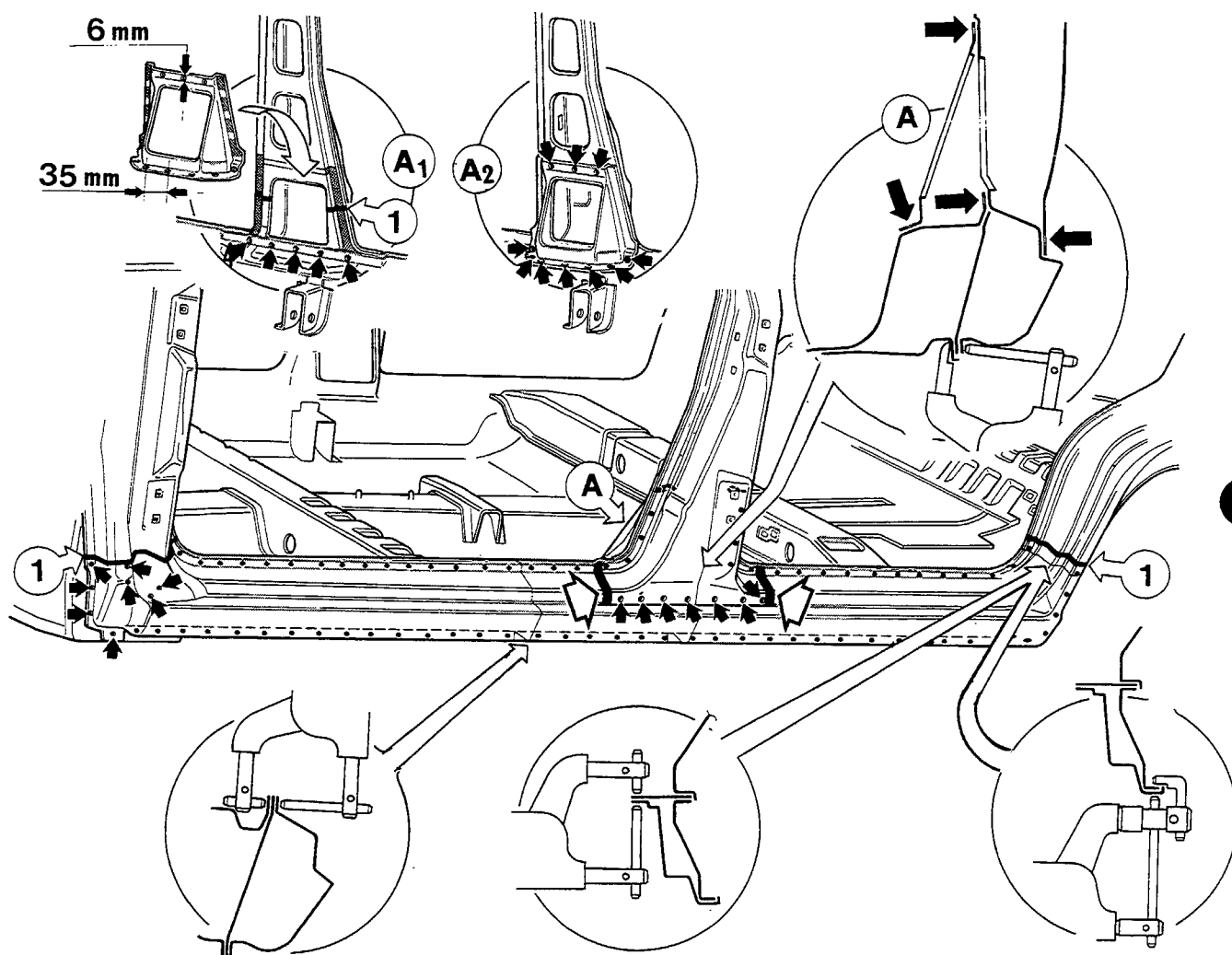
Take the measurements of the parts which are to be replaced, and mark off the same measurements + 30mm on the replacement part and cut it to these measurements.

Cut off the upper limit of the central pillar, shown by the arrow laying part A, previously removed on top. Grind the welding edges on the bodyshell and on the replacement part using a disk grinding wheel.

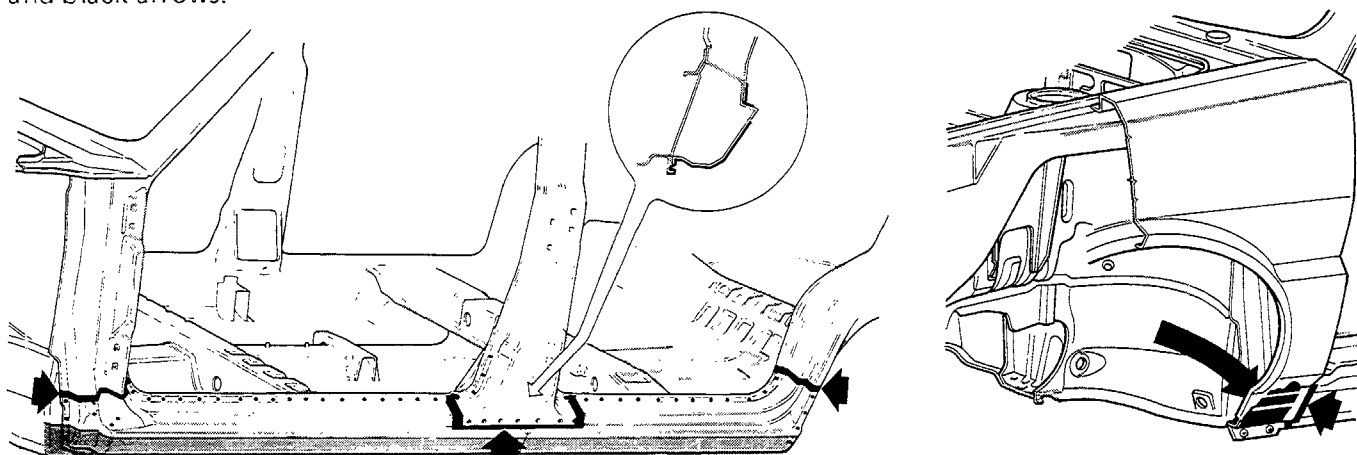
Apply zinc-based anti-rust protection to the welding edges shown by the shading. Fit the complete door sill in position, fixing it with self-locking pliers, and cut the parts together (on the overlap) and remove the scraps. Drill 8 holes in the replacement part at the points shown by the white arrows corresponding to the position of the fins on the bodyshell (shown by the black arrows) and the front edge of the door sill.



70.



Weld the joints marked (1) by the inert gas electrode method. Weld the interior pillar to the bodyshell using a spot welder. Drill a series of holes in the interior support and in the body shell as shown magnified in detail A₁. Weld the support to the interior pillar filling the holes which have just been drilled by the inert gas electrode method as shown magnified in detail A₂. Weld the complete door sill to the body shell and to the fitted interior support using a spot welder. Weld the base of the pillar to the door sill by the inert gas electrode method as shown by the white and black arrows.

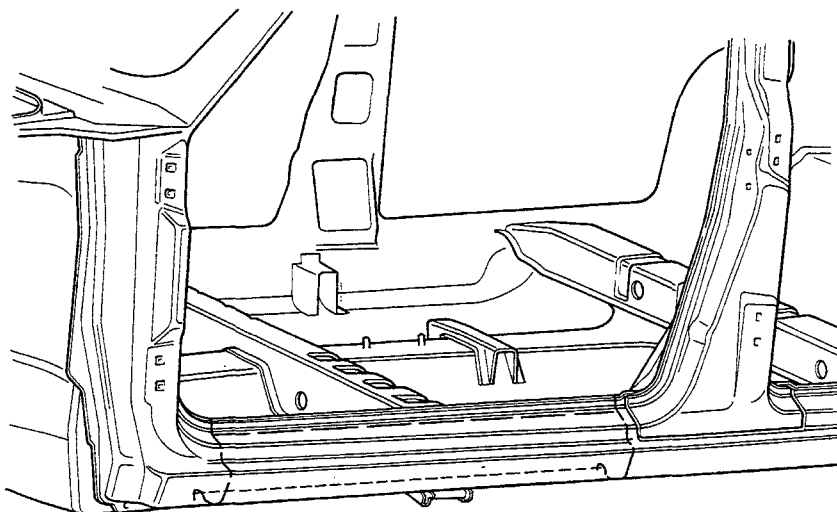


Using a brush, spread hot-setting sealant for external use in the areas indicated by the black arrows. After applying a primer to the shaded areas, spray them with a vinyl protective.

With the wing fitted, renew the hot-setting sealant for external use in the areas shown.

REPLACING A SECTION OF DOORSILL (METHOD A)

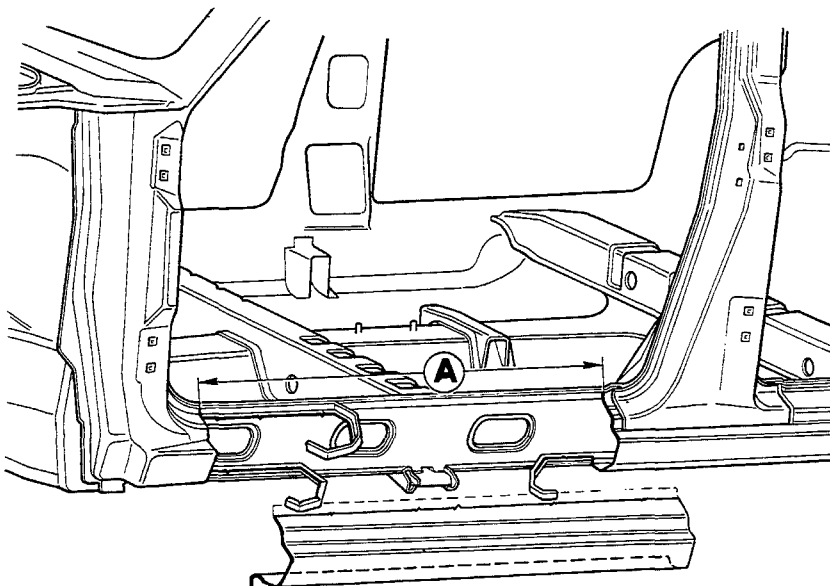
Cut the door sill at the points shown by the broken lines, using a pneumatic hacksaw or chisel.



Detach the welding points using a suitable milling cutter.

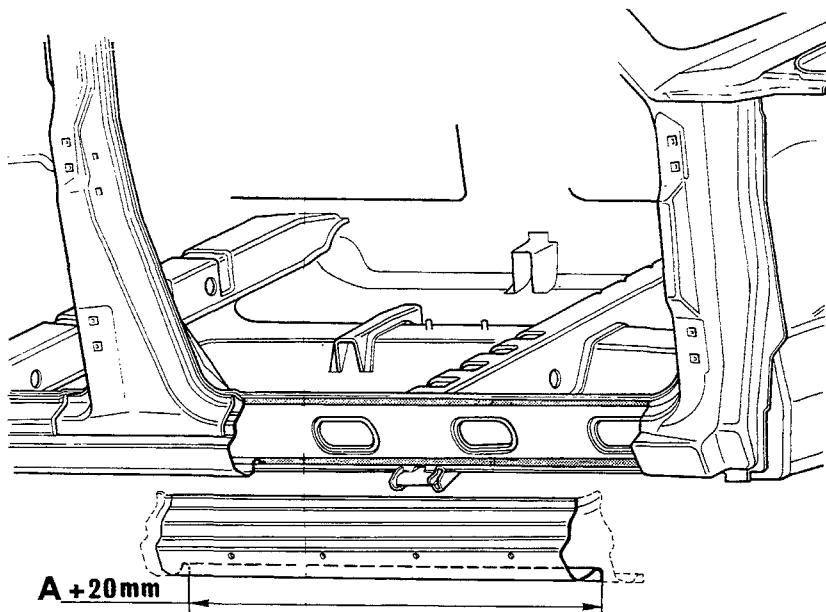
Remove the scraps of sheet metal using tongs.

Measure the length of door frame needing to be replaced A.

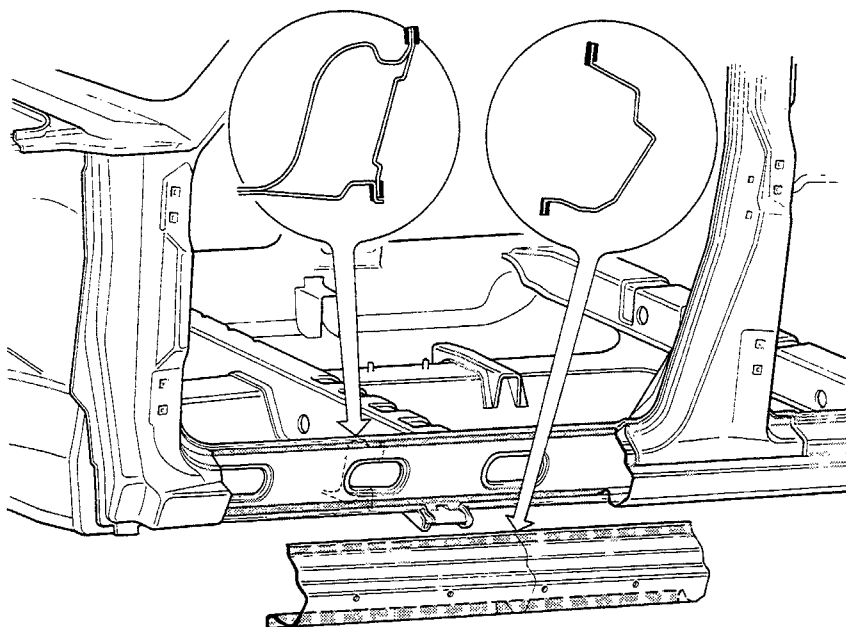


Mark off the same measurement + 20mm on the replacement part and cut it to this measurement.

Straighten the welding edges (shaded areas) and clean them using an oxyacetylene flame.

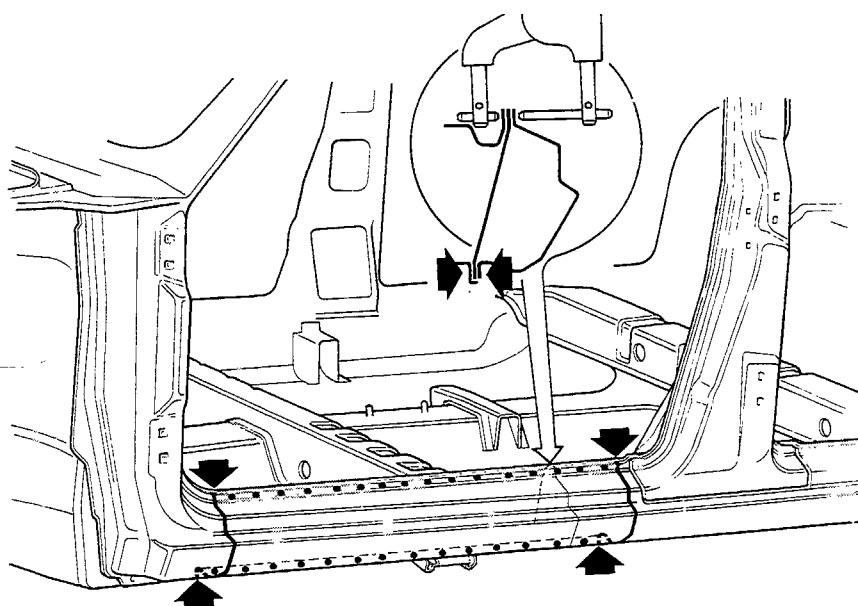


70.



Grind the points on the replacement parts which are to be welded.

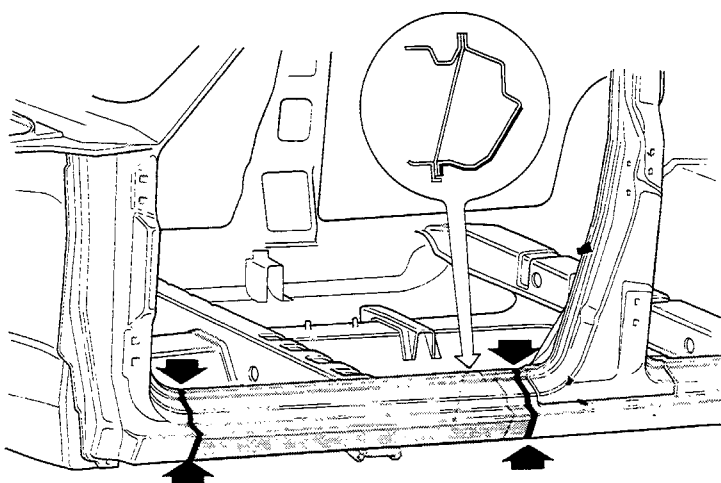
Protect the areas shown using a zinc-based anti-rust agent.



Fit the replacement part in position, fixing it with self-locking pliers, and cut the parts together (on the overlap). Fit the door and check that it is parallel with the longitudinal member and that there is a uniform gap.

Weld the joints shown by the arrows using the inert gas electrode method.

Spot weld the door sill to the bodyshell as shown magnified in the detail.



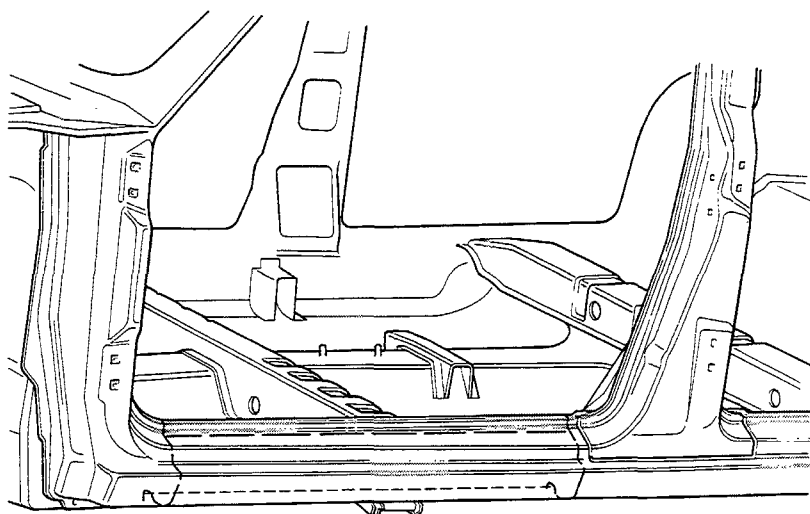
Touch up the side joints as appropriate by grinding.

Smear hot-setting sealant for outside use along the joints shown by the arrows.

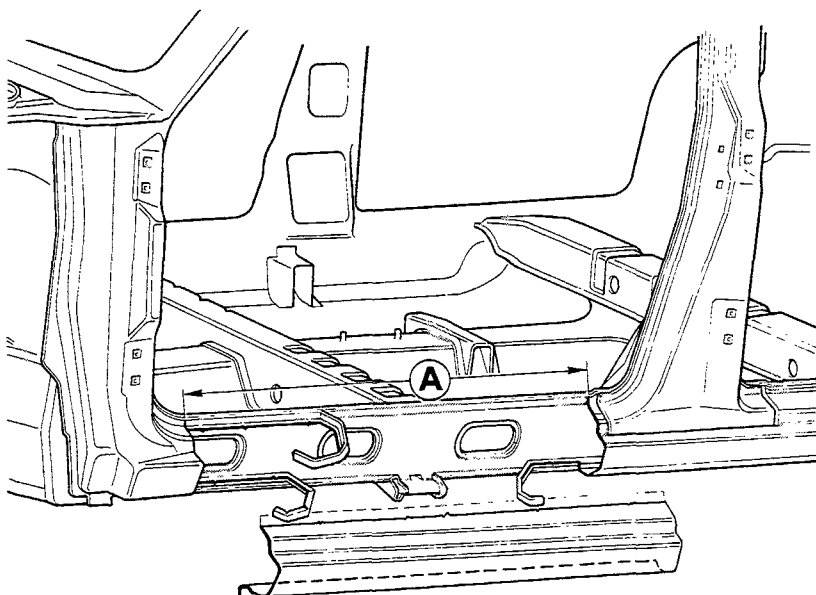
Spray a waxy-oil protective into the replaced box section and - after applying a coat of primer - renew the vinyl-based protective in the shaded area.

REPLACING A SECTION OF
DOORSILL (METHOD B)

Cut the doorsill at the points shown by the broken lines, using a pneumatic hacksaw or chisel.

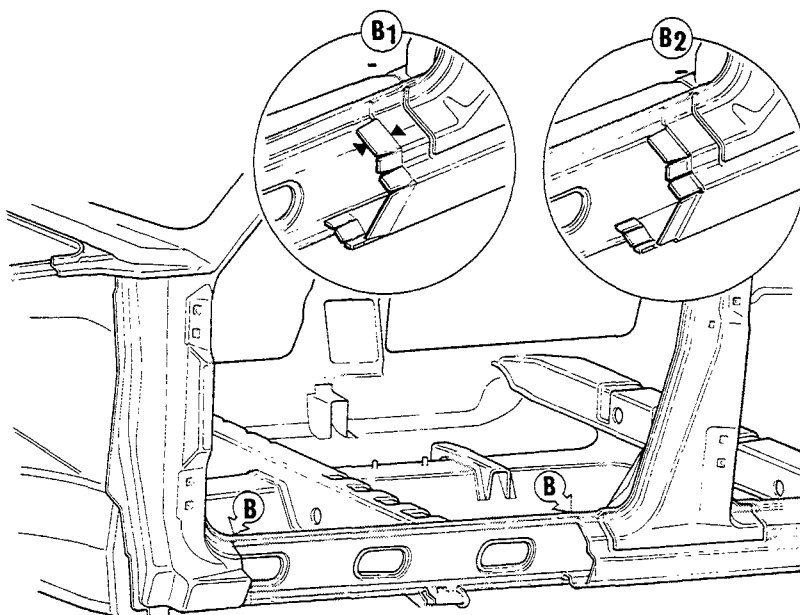


Detach the welding points using a suitable milling cutter.
Remove the scraps of sheet metal using tongs.
Measure the length of door sill which needs to be replaced A.

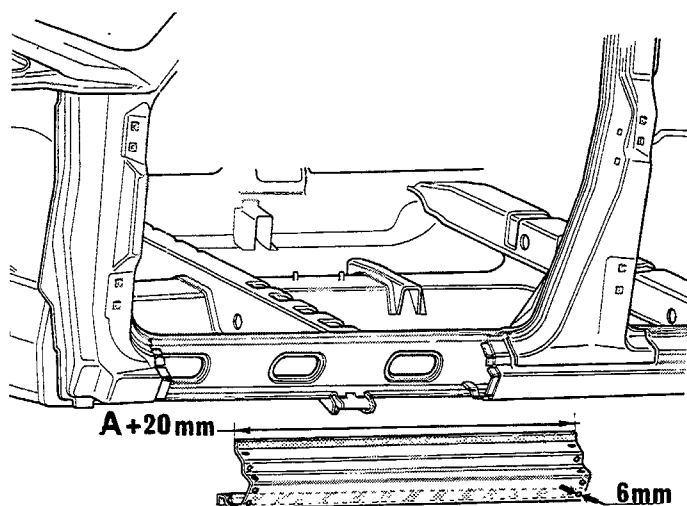


Using plate-shears, cut and lower the joining surfaces along the 2 cuts marked B, as shown magnified in details B₁ and B₂.

Straighten the welding edges, grind them externally and internally and apply a zinc-based anti-rust agent (shaded areas)



70.



Mark off length A + 20mm on the replacement part and cut it to this measurement.

Drill a series of holes, each with its centre between 6 and 7mm from the edge.

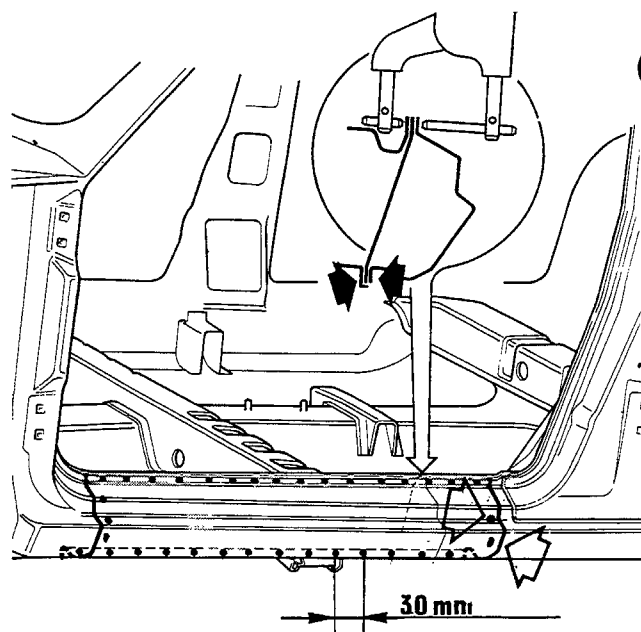
Grind the welding areas shown and protect them with a zinc-based anti-rust agent.

Position the replacement part, fixing it with self-locking pliers.

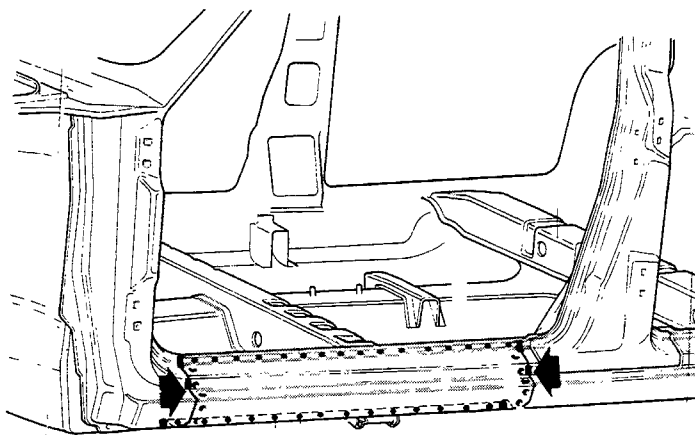
Fit the door and check that it is parallel with the longitudinal member and that there is a uniform gap.

Weld the replacement part on the overlap filling the holes (white arrows) using the inert gas method.

Spot weld the door sill to the bodyshell as shown magnified in the detail.

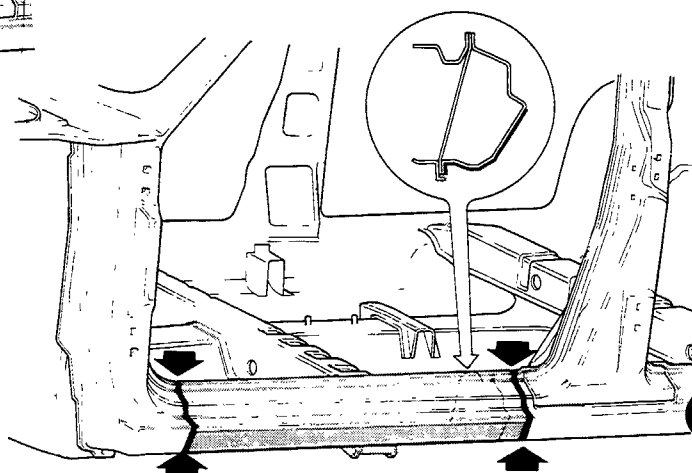


Apply sealing compound to the joints shown, remove any surplus and finish off the surfaces with a file.



Smear hot-setting sealant for outside use along the joints shown by the arrows.

Spray a waxy-oil protective into the replaced box section and - after applying a coat of primer - renew the vinyl-based protective over the shaded area.

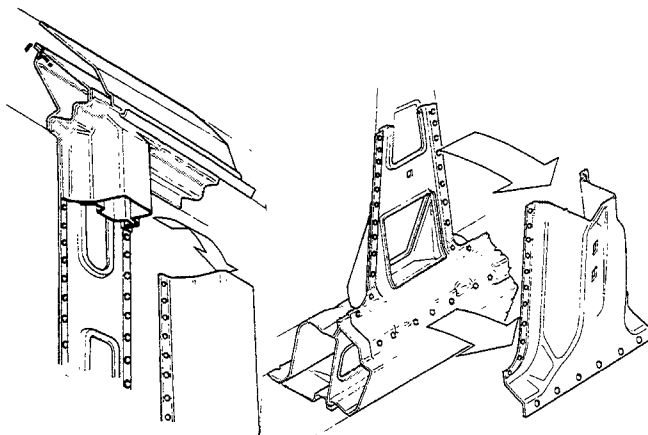


REPLACING PART OF CENTRAL PILLAR (METHOD A)

Cut the outer section of the pillar at the distance from the top shown in the illustration using a pneumatic hacksaw.

Detach the welding points by milling, in the areas shown.

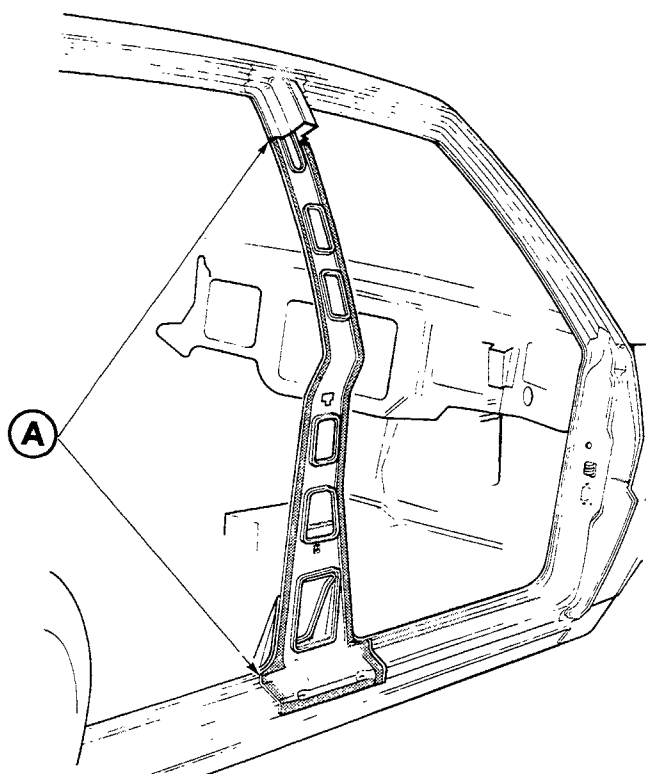
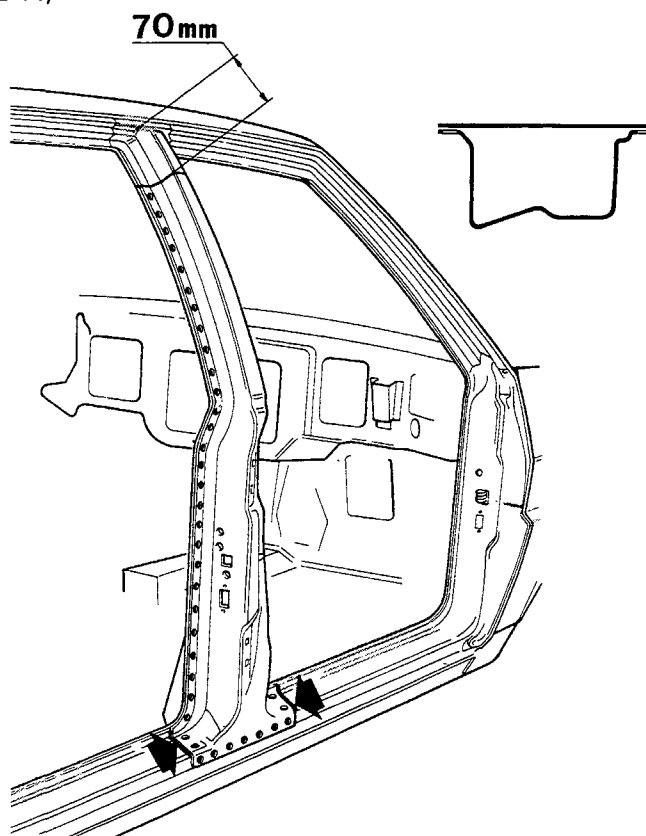
Complete the job of removing the pillar by unwelding or grinding the sections of brazing shown by the arrows.



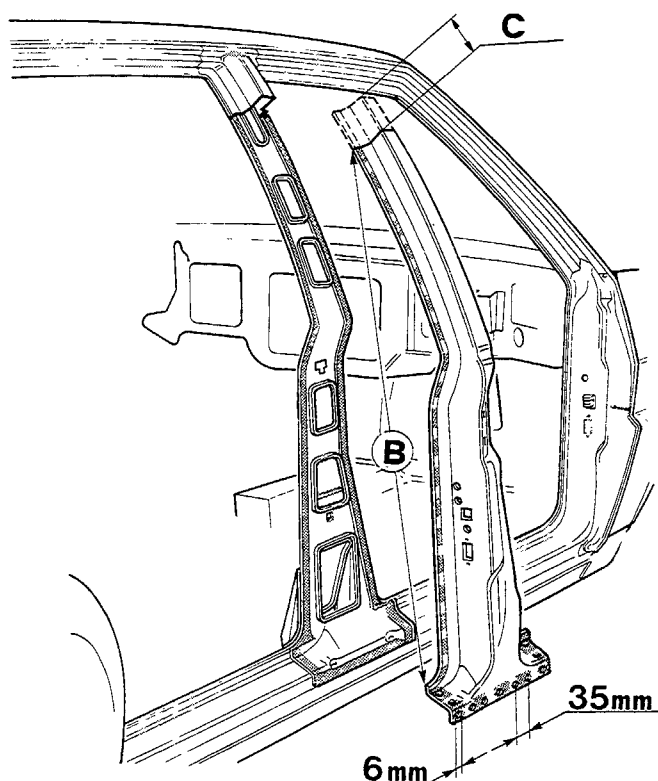
Get rid of every trace of paint from the welding edges using an oxyacetylene torch and wire brush.

Straighten the welding edges using a pneumatic hammer and shaped steel block. Remove the welding points using a disk grinding wheel.

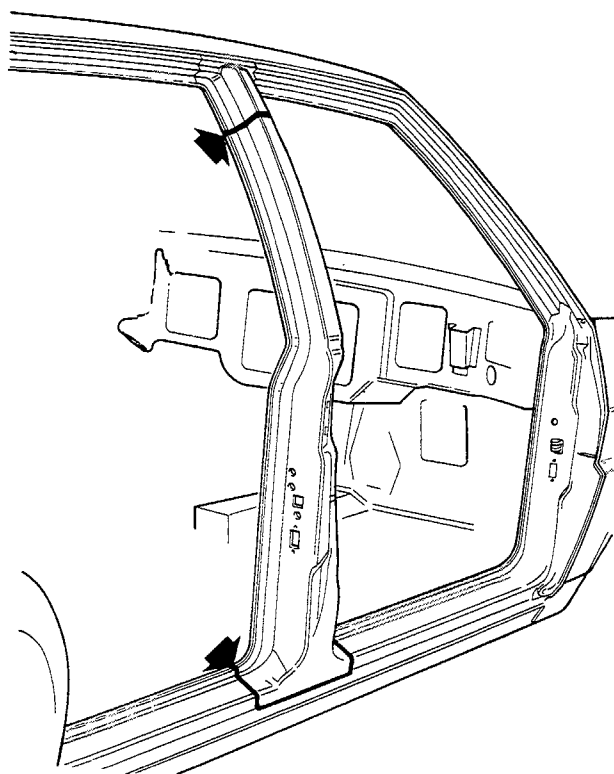
Measure distance A; apply a protective coat of zinc-based paint to the (shaded) areas which are to be welded.



70.



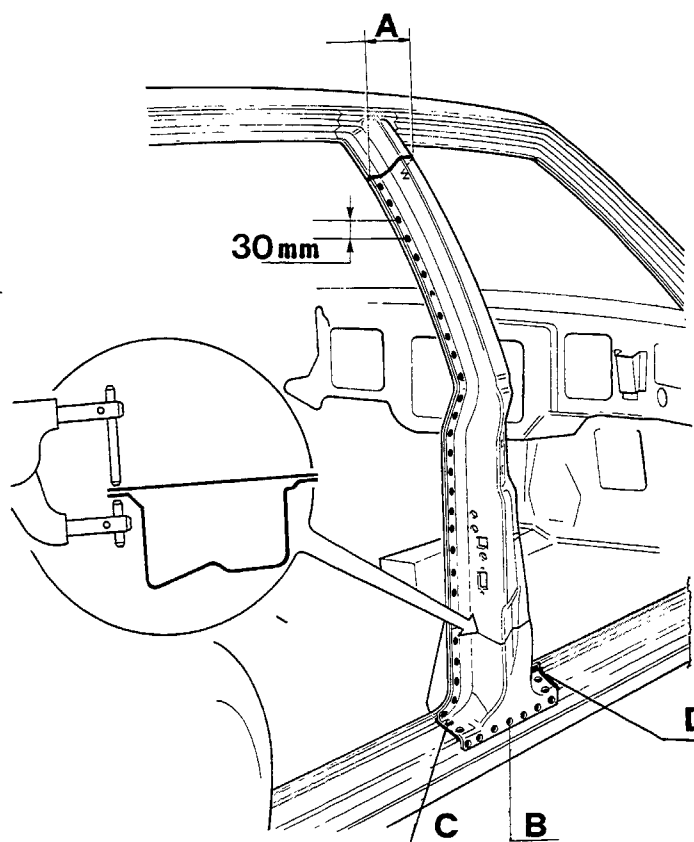
Check the width of the door spaces.
Weld joint A and joint B by the inert gas electrode method.
Spot weld the outer section to the inner pillar.
Brazing along sections C - D.



Mark off distance $B = (A + 20\text{mm})$ on the replacement part and remove part C which is not going to be replaced.

Drill a series of holes as shown and grind and protect the welding areas with a zinc-based anti-rust agent.

Fit the replacement part in position, laying it over the non-replaced part; fix it with self-locking pliers and cut the overlapping ends together. Then remove the scraps.



Finish off all the welds carried out using the inert gas electrode method by grinding. If necessary, make the joints on the pillar water-tight and finish by filing.

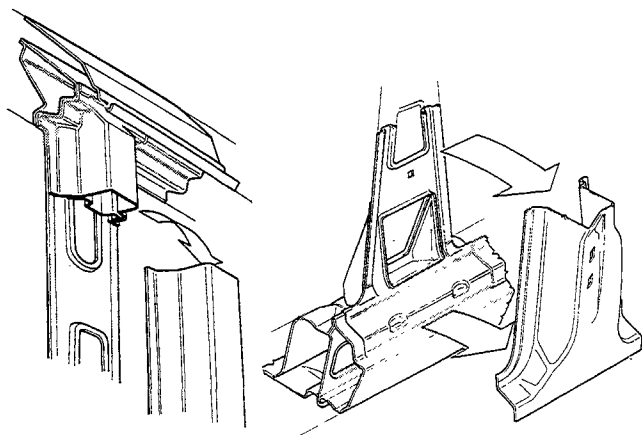
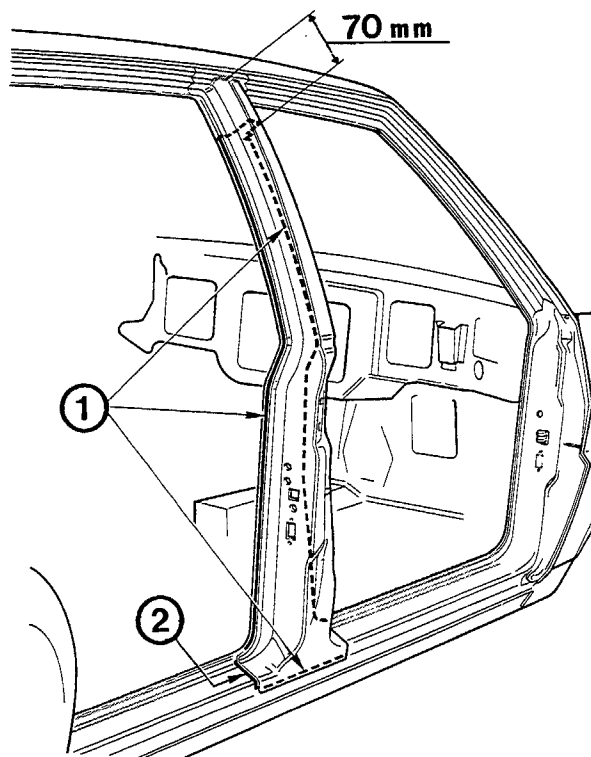
Complete the operation by renewing the hot-setting sealant in the areas shown by the arrows.

REPLACING PART OF CENTRAL PILLAR (METHOD B)

Cut the outer section of the pillar at the distance from the top shown in the illustration using a pneumatic hacksaw.

Cut with a pneumatic chisel, following the lines marked by the arrows (1).

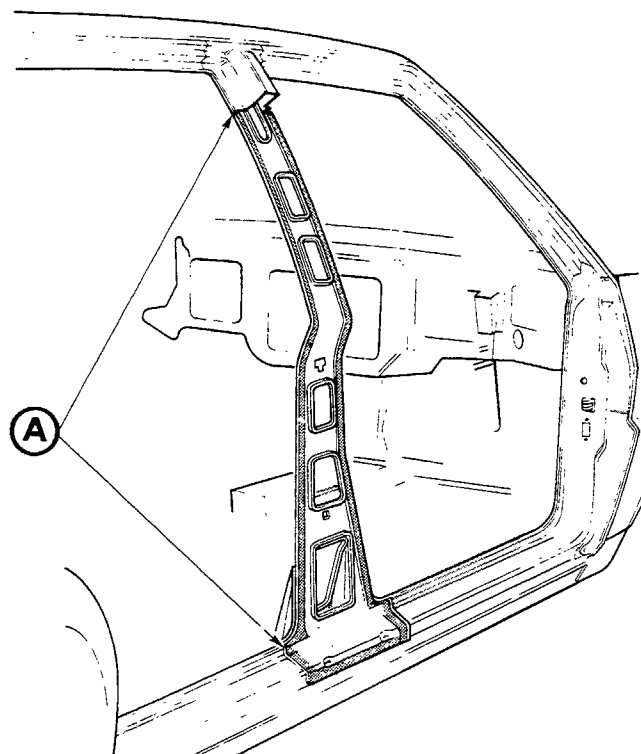
Complete the job of removing the pillar by grinding or unwelding with an (oxyacetylene) torch the sections of brazing in the area marked (2).



Remove the scraps of sheet metal using tongs. Get rid of every trace of paint from the welding edges using an oxyacetylene torch and wire brush.

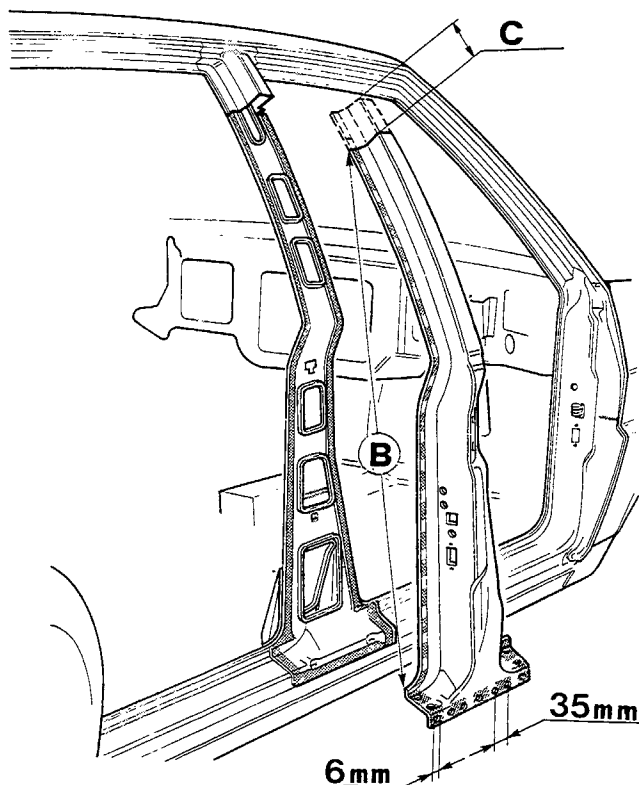
Straighten the welding edges using a pneumatic hammer and shaped steel block.

Then finish them by grinding.

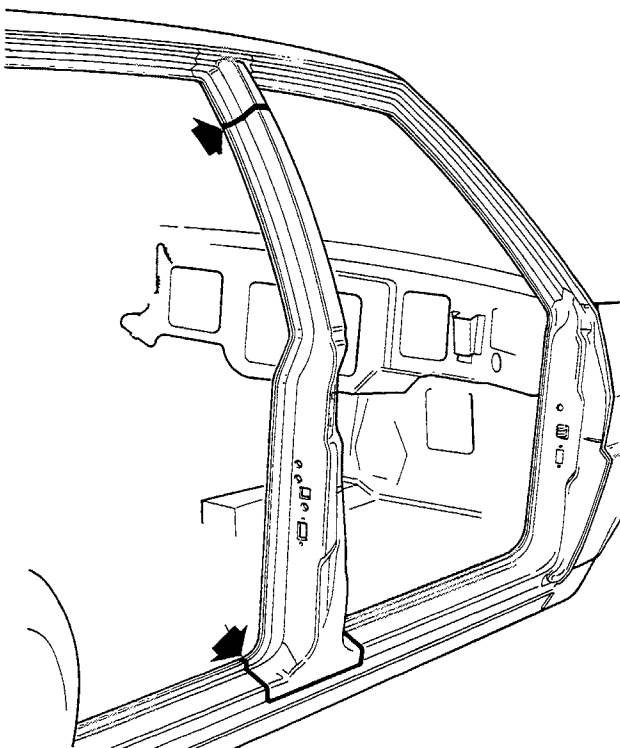


Measure distance A; apply a coat of protective zinc-based paint to the (shaded) areas which are to be welded.

70.

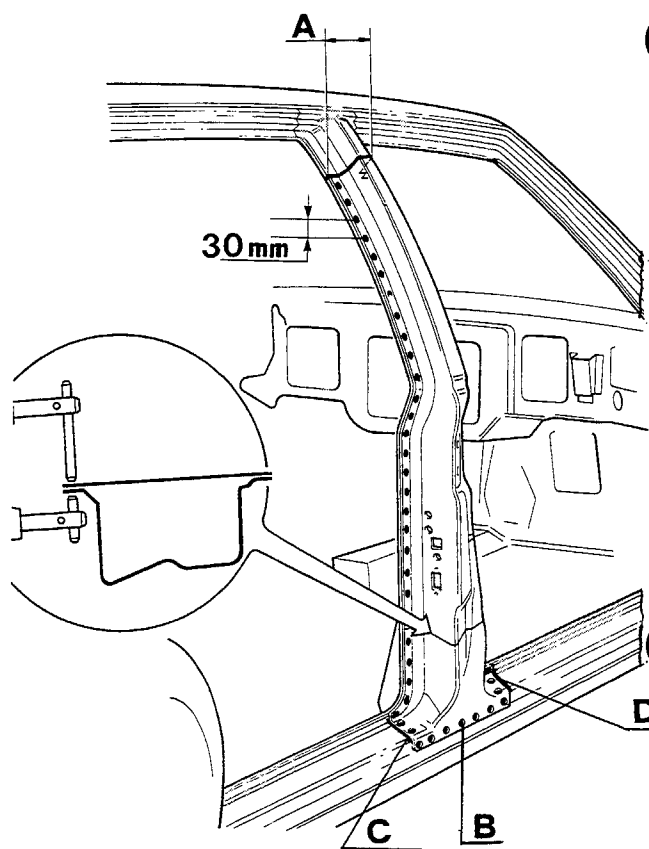


Check the width of the door spaces.
Weld joint A and joint B by the inert gas electrode method.
Spot weld the outer section to the inner pillar.
Braze along sections C - D.



Mark off distance $B = (A + 20\text{mm})$ on the replacement part and remove part C which is not going to be replaced.
Drill a series of holes as shown and grind and protect the welding areas with a zinc-based anti-rust agent.

Fit the replacement part in position, laying it over the non-replaced part; fix it with self-locking pliers and cut the overlapping ends together. Then remove the scraps.

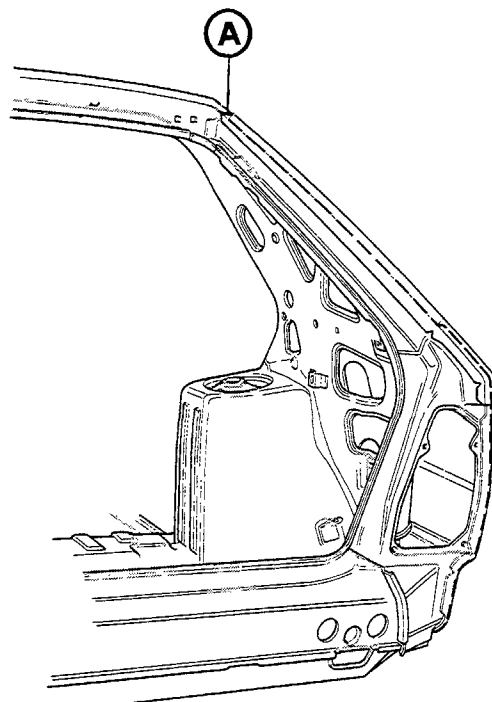
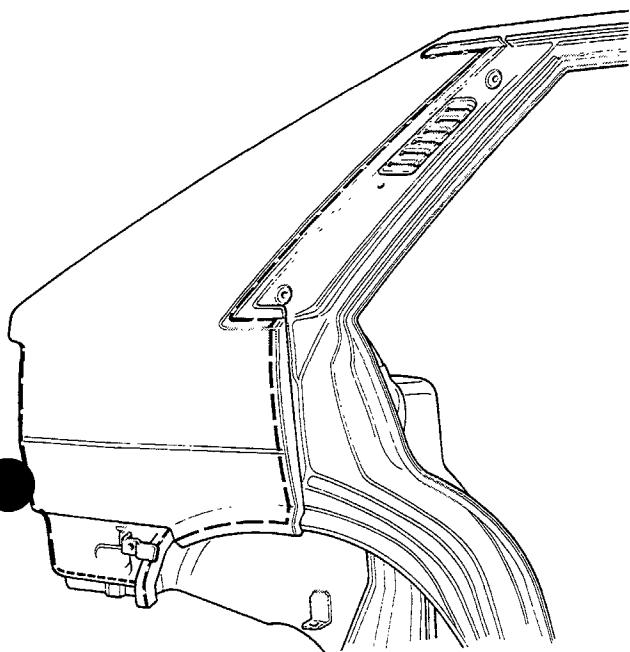


Finish all the welds carried out using the inert gas electrode method by grinding.

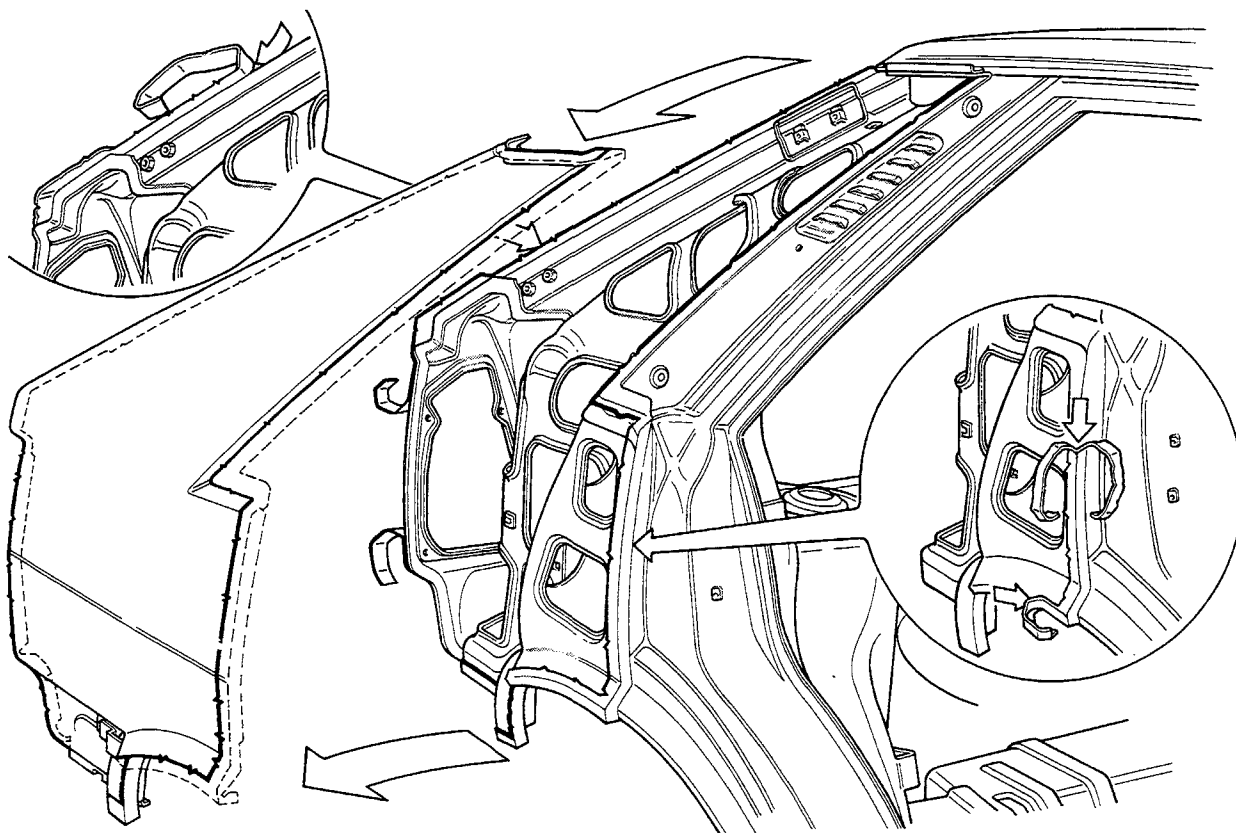
If necessary, make the joints on the pillar watertight and finish by filing.

Complete the operation by renewing the hot-setting sealant in the areas shown by the arrows.

REPLACING REAR WING

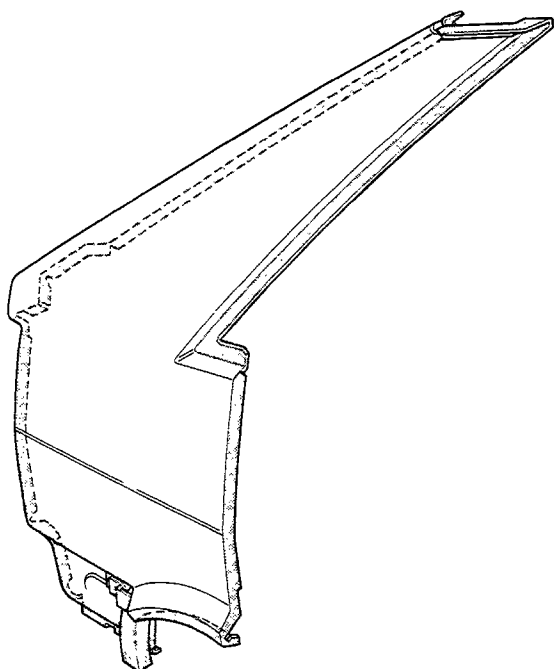


Cut the rear wing, along the broken lines, using a pneumatic chisel. Unweld the section marked A using an oxyacetylene torch.

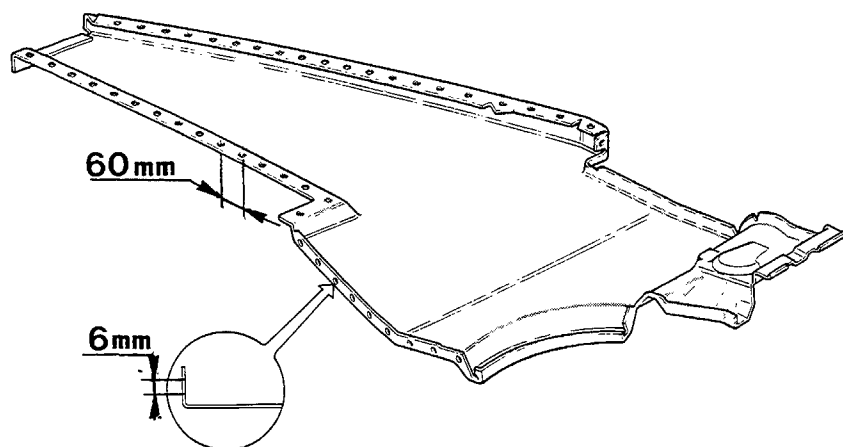


Detach the joining points from the scraps of sheet metal: remove the scraps of sheet metal and get rid of every trace of paint. Straighten the welding edges, remove the welding points using a grinder and protect by applying a zinc-based anti-rust agent.

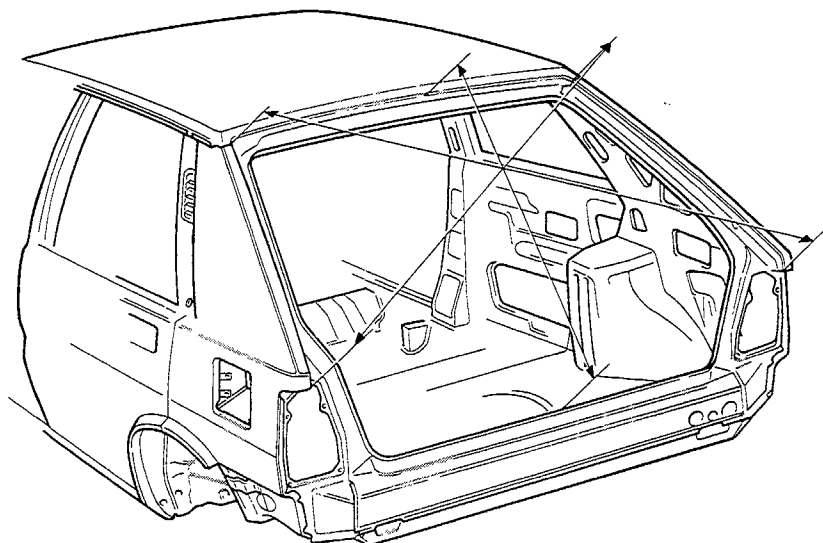
70.



Grind the welding edges of the replacement part and protect by applying a zinc-based anti-rust agent along all the ground edges.



Drill a series of holes along the edges of the replacement part as shown in the illustration.

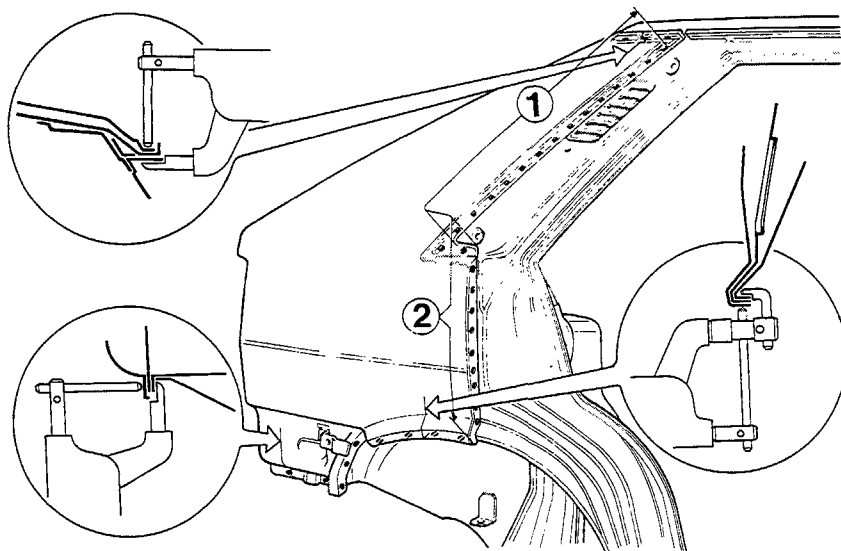


Fit the replacement part provisionally and check the diagonals.

Fit the door and the hatchback and check that the ribs line up, that the clearances are uniform and that the surfaces of the wing lie in the same plane as adjacent parts.

Weld the wing to the door surround through the previously drilled holes in sections (1) and (2) by the inert gas electrode method.

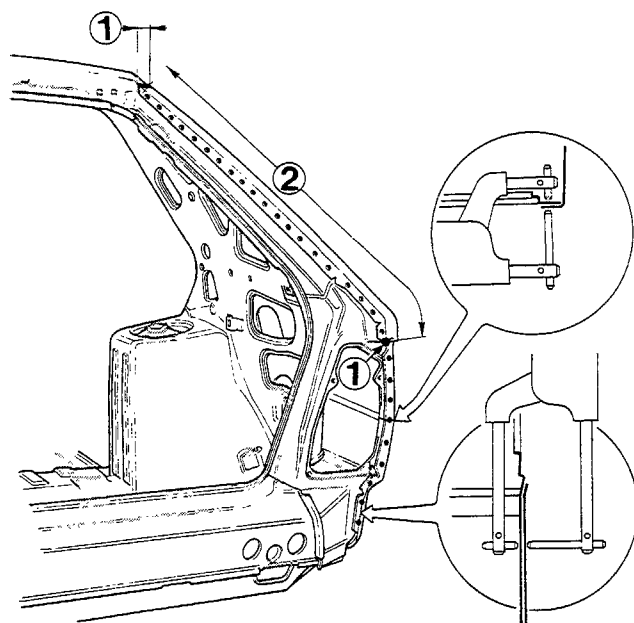
Spot weld the surround to the wheel arch and to the roof channel.



Braze the replacement part to the roof along section (1).

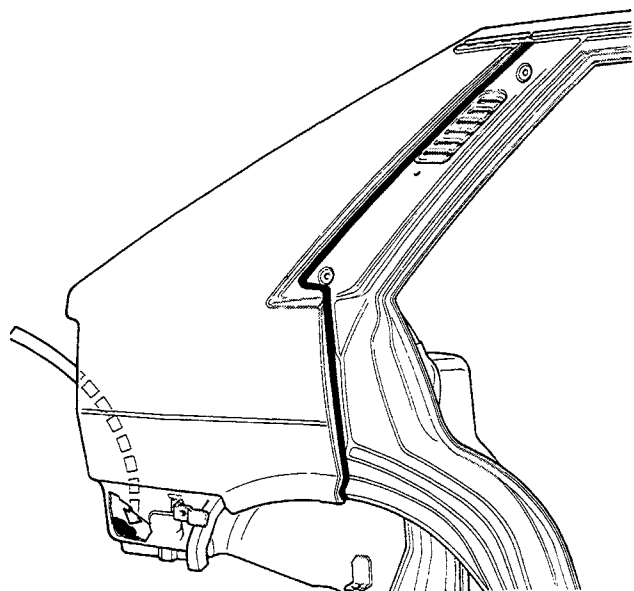
Weld the wing to the hatchback compartment framework through the holes previously drilled in section (2) by the inert gas electrode method.

Complete the welding of the replacement part using an electric spot welding gun.



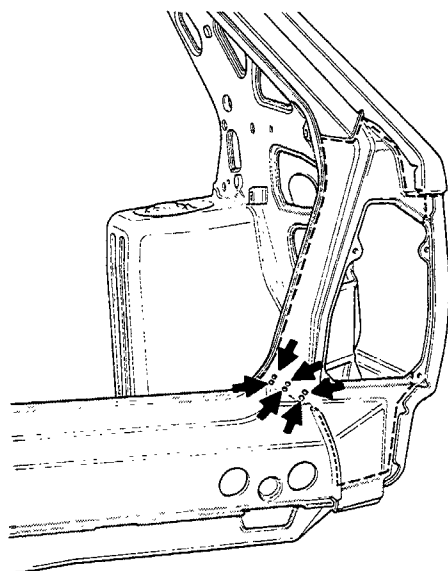
Apply hot-setting sealant for exterior use at the points shown.

Renew the anti-rust protection and soundproofing in the replaced box section.

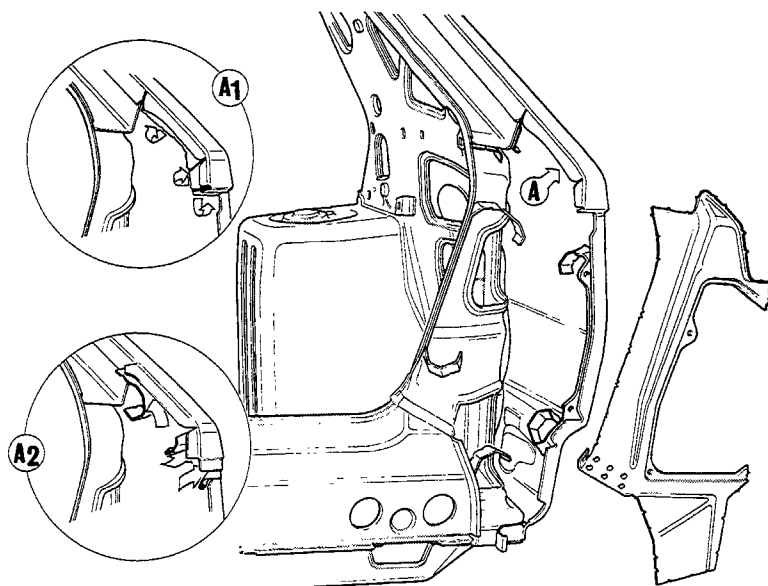


70.

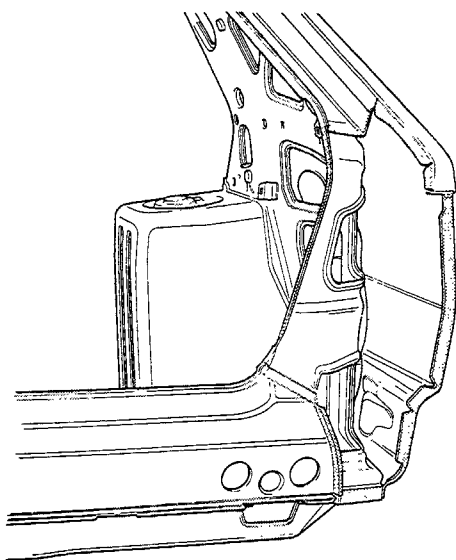
REPLACING REAR LIGHT CLUSTER SURROUND



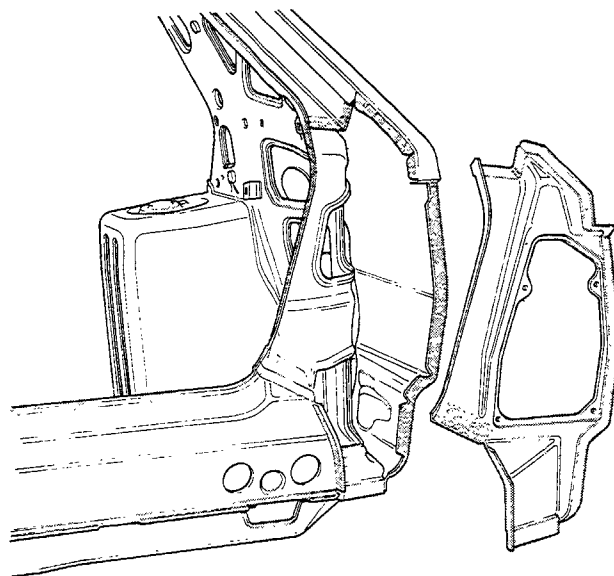
Cut the surround at the points shown using a pneumatic chisel and detach the welding points shown by the arrows, using a suitable milling cutter.



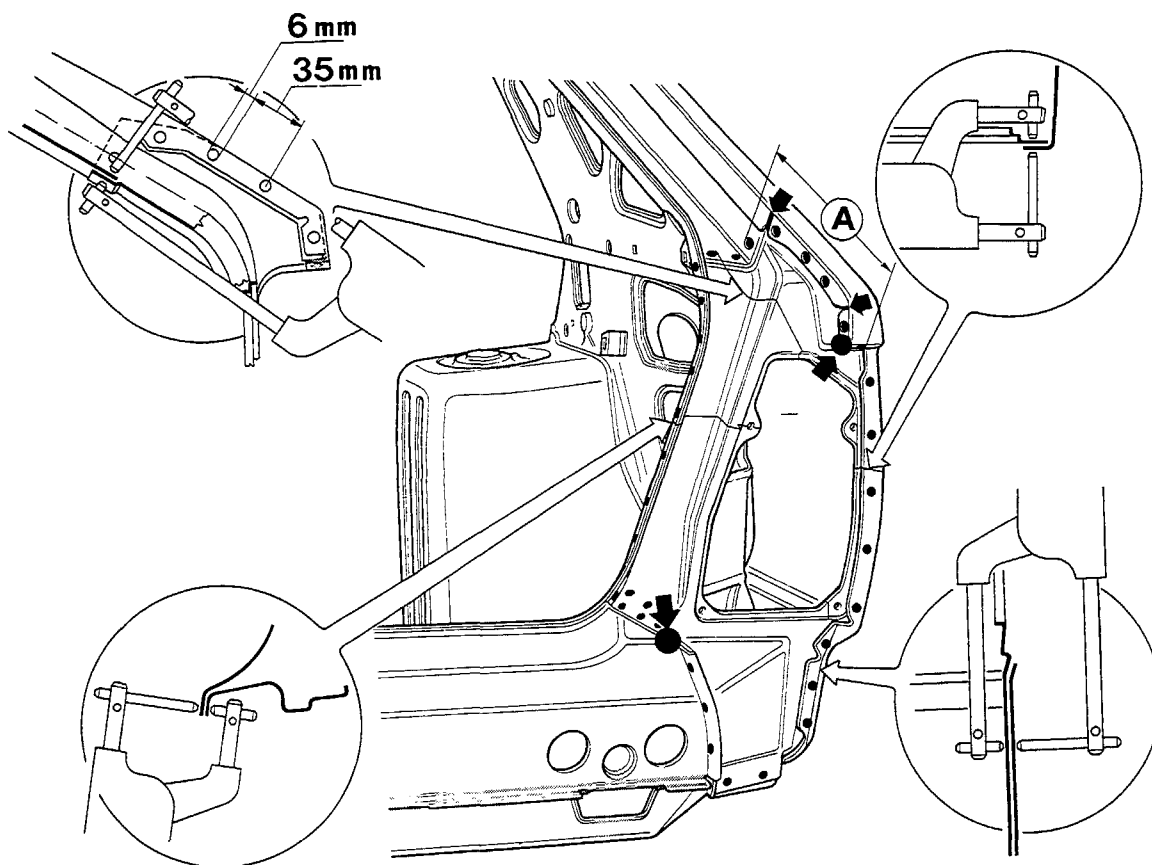
Remove the remaining scraps of sheet metal using tongs. Details A₁ - A₂ show in close-up the sequence of operations to be carried out in fin section A.



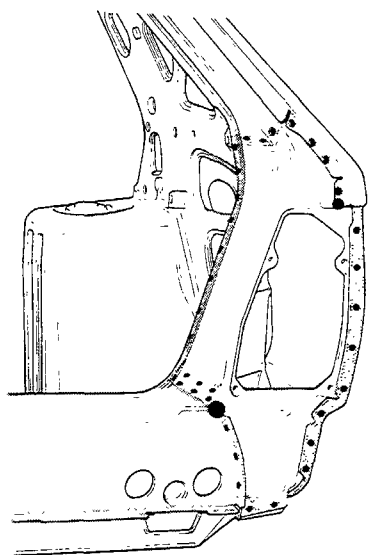
Straighten the fins shown using a hammer and shaped block and finish them using a grinder.



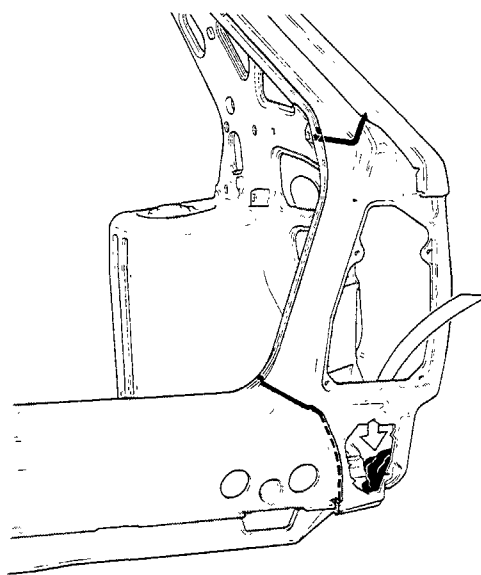
Grind the welding edges of the replacement part and protect the areas shown by applying a zinc-based anti-rust agent.



Fit the replacement part in position and fix it using self-locking pliers. Drill a series of blind holes in section A of the wing, the dimensions of which are shown in the close-up view, and then weld the wing to the replacement part by the inert gas electrode method. Spot weld the other parts of the replacement part to the bodyshell. Complete the operation by brazing the points shown by the black arrows.



Finish the brazing at the points shown using a grinder.



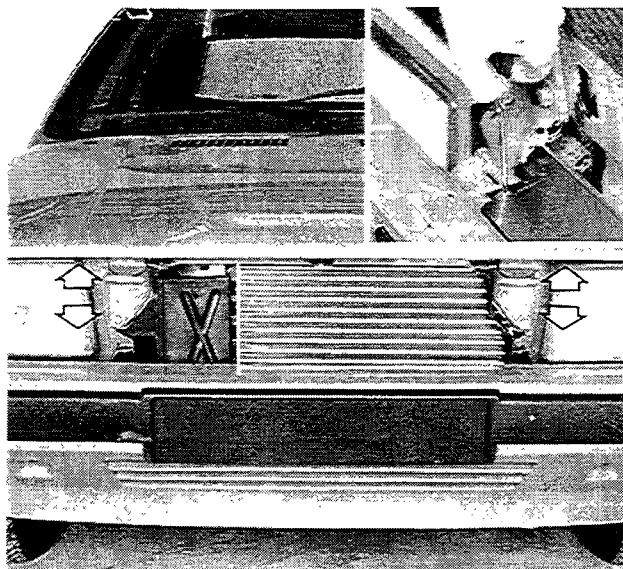
Renew the sealant for exterior use in the areas shown. Apply anti-rust protection and soundproofing in the replaced box section.

BONNET LID

Vertical adjustment

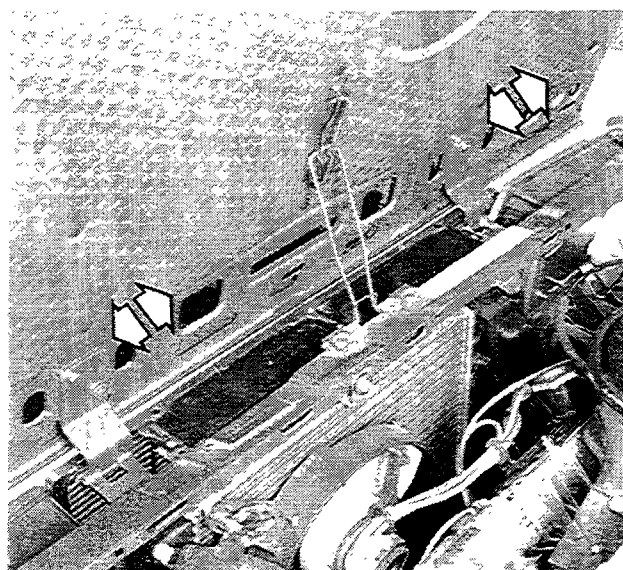
The arrows show the direction in which the bonnet lid can be adjusted by means of the slots on the hinges.

NOTE *It is necessary to remove the radiator trim in order to be able to get at the bolts for making vertical adjustment to the bonnet lid.*



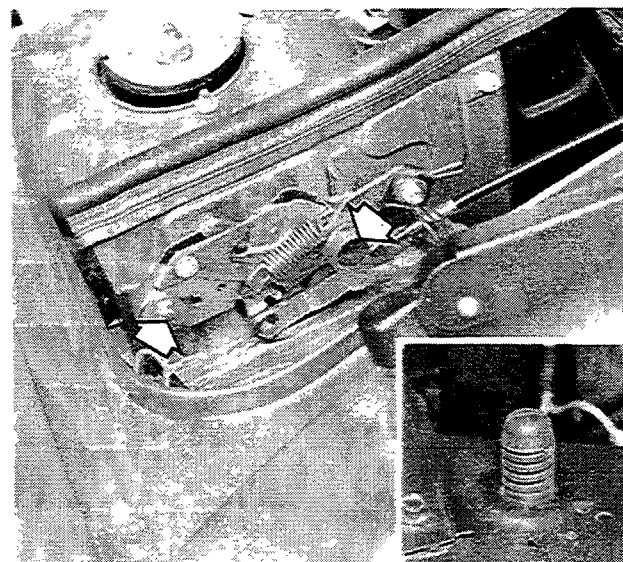
Adjusting transverse position

The arrows show the direction in which the bonnet lid can be adjusted by means of the slots on the hinges.

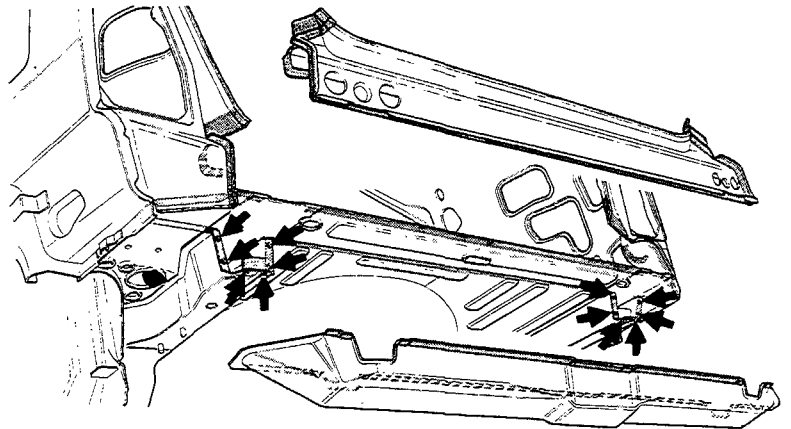


Adjusting the device for locking the bonnet lid

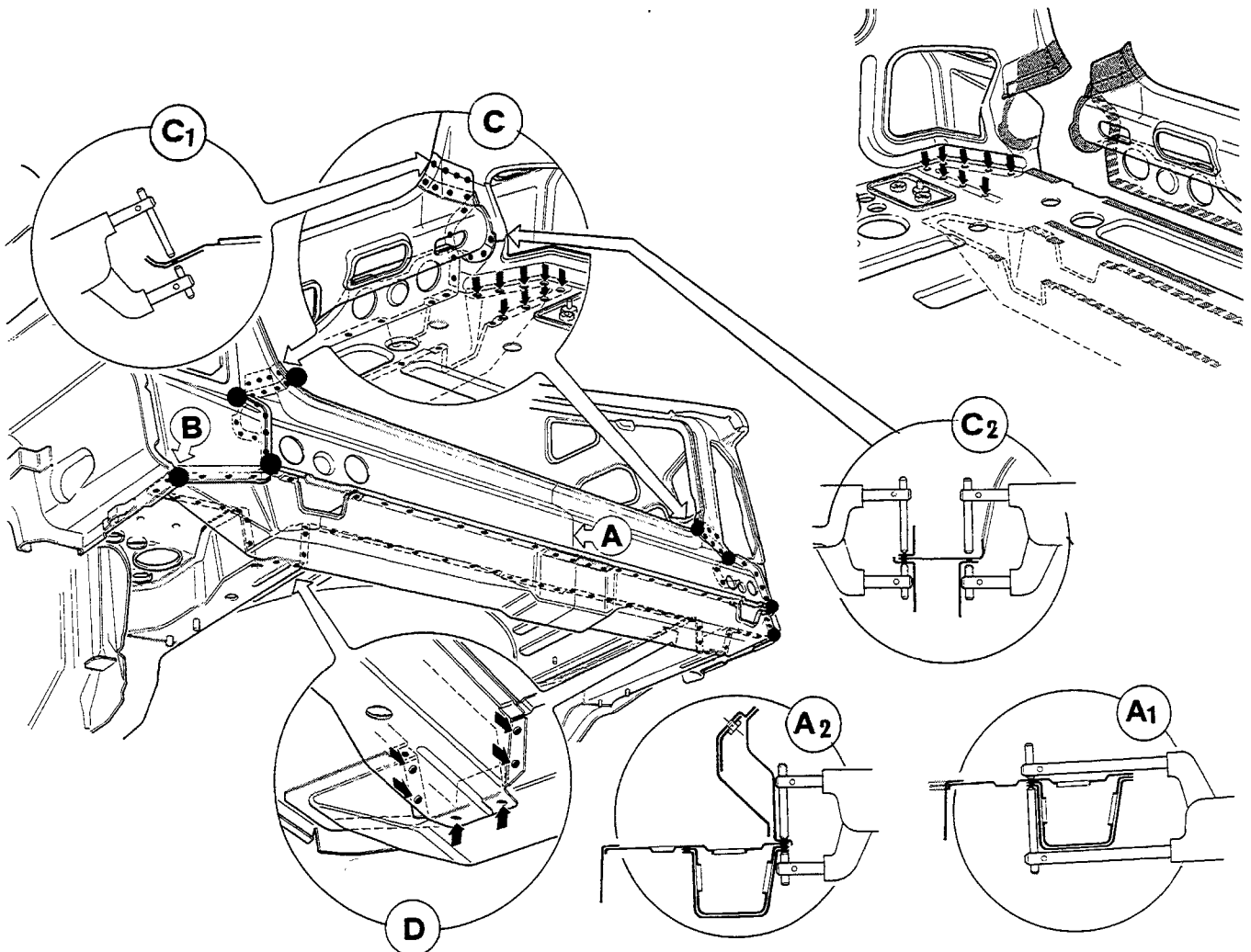
Getting the bonnet lid to lock properly is done by adjusting not only the bolts securing the 2 locking devices, but also the rubber blocks at the ends of both the engine compartment and the bonnet lid.



Straighten the welding edges on the body shell using a hammer and shaped block. Grind all edges on which the welds shown by the shading are to be carried out. Protect all the shaded areas on which the welds are to be carried out by coating with zinc. The black arrows show the holes previously drilled for removing the welding points: check that these holes go right the way through and if they do not, re-drill them using a 6mm drill bit.

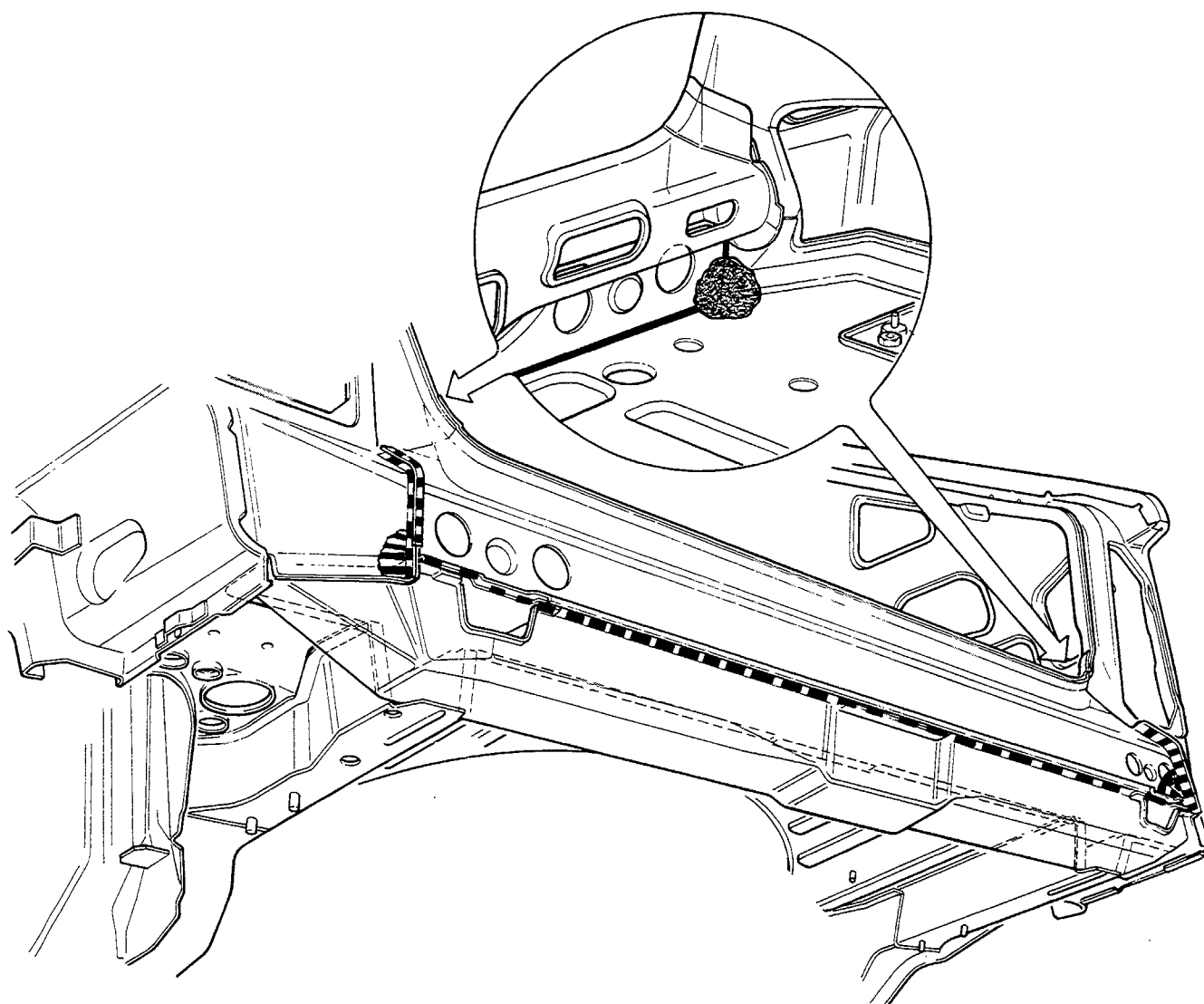


Drill the floor in the area shown by the arrows using a 6mm diameter drill bit in order to enable the fins of the underlying crossmember to be welded to the floor. Fit the 2 replacement parts in position fixing them by means of self-locking pliers and check the depth of the rear door space and that the diagonals of this space are equal. Spot weld the lower crossmember to the floor as shown in close-up A₁.



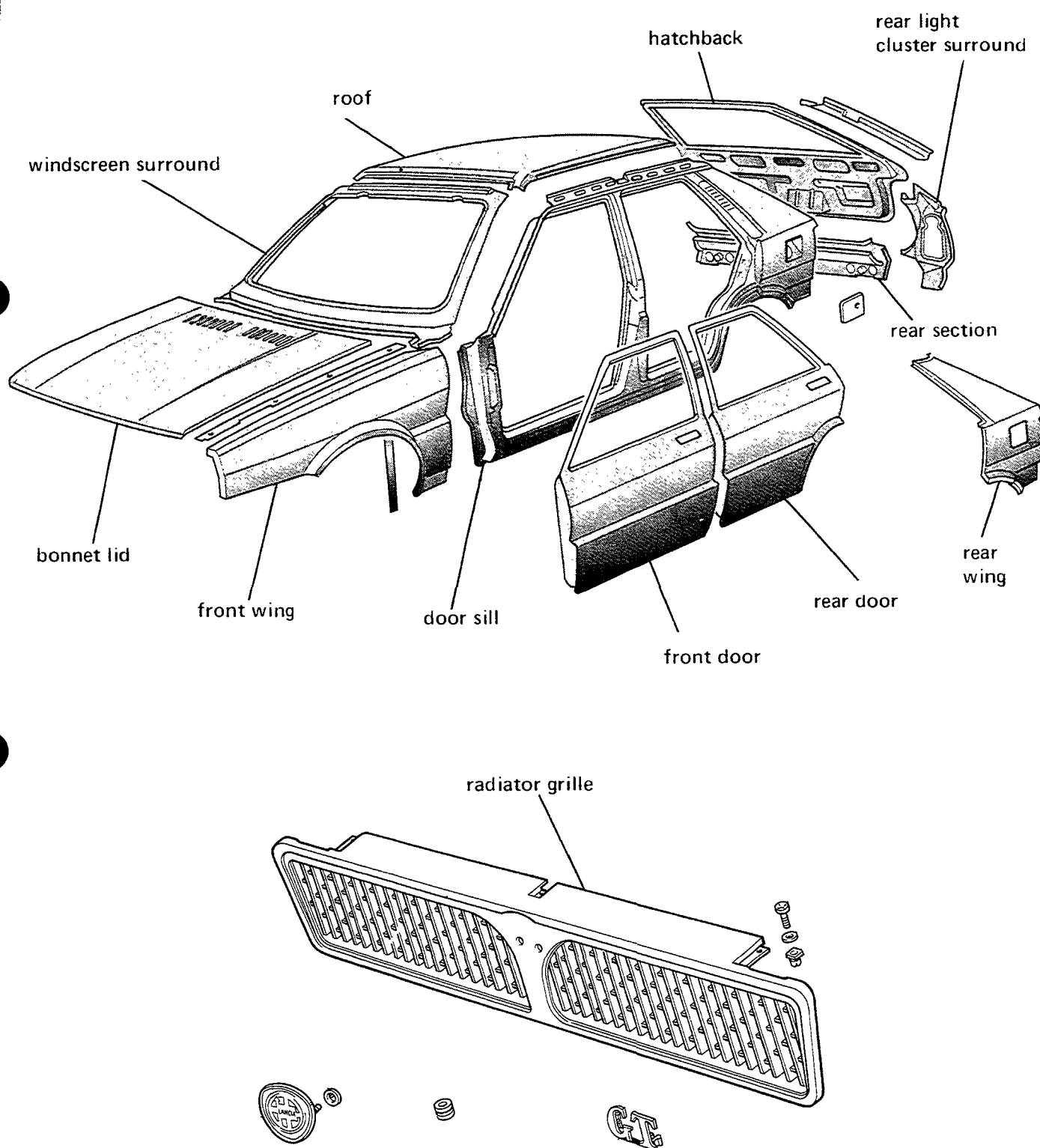
Continue welding the fins to the crossmember filling the holes shown in close-up C by the arrows using an inert gas welder. Weld the crosspiece to the longitudinal members filling the holes shown in close-up D using an inert gas welder. Spot weld the rear section to the crossmember and laterally to the light cluster surround, as shown in close-ups A₂, C₁ and C₂.
Braze the joints at the points shown by the letter B.

70.

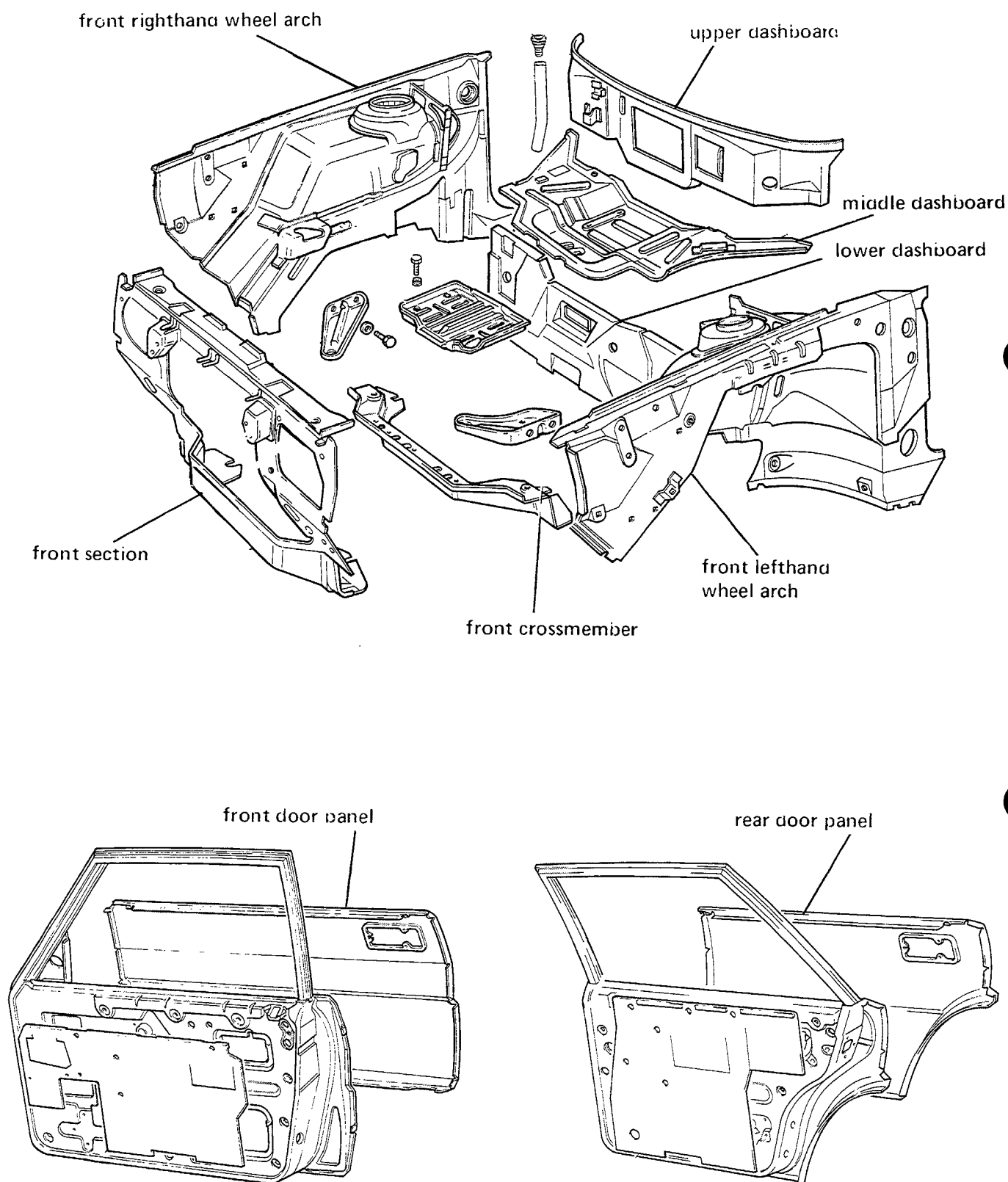


Finish the brazing work using a grinder. Renew the sealing in the areas shown with a heat-setting plastic sealant for interior use. Apply anti-rust protection and soundproofing in the replaced box sections.

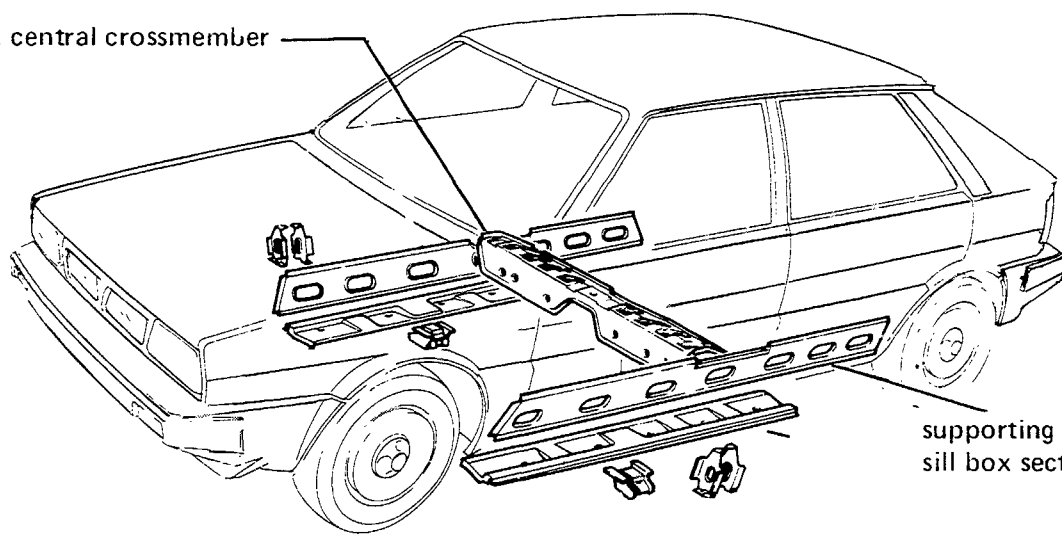
BODYWORK COMPONENTS SUPPLIED AS SPARES



70.



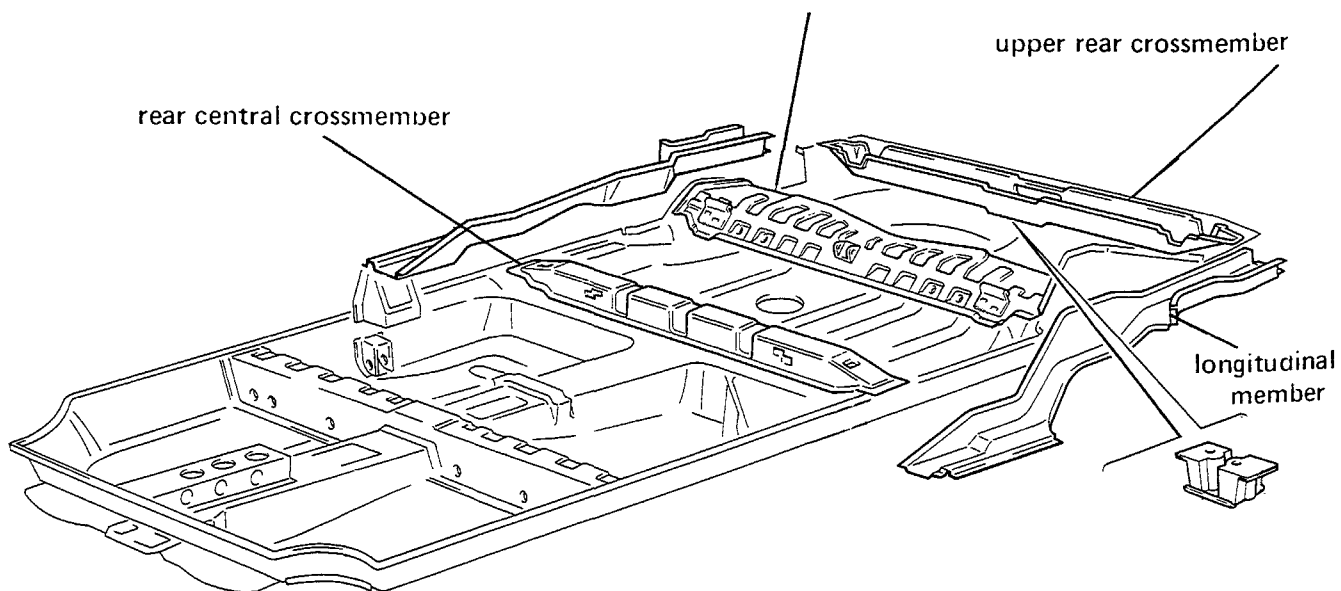
forward central crossmember

supporting member for door
sill box section

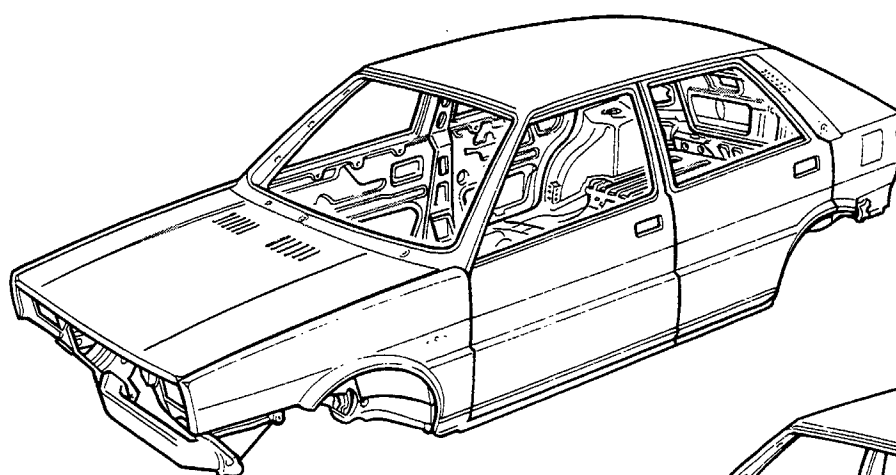
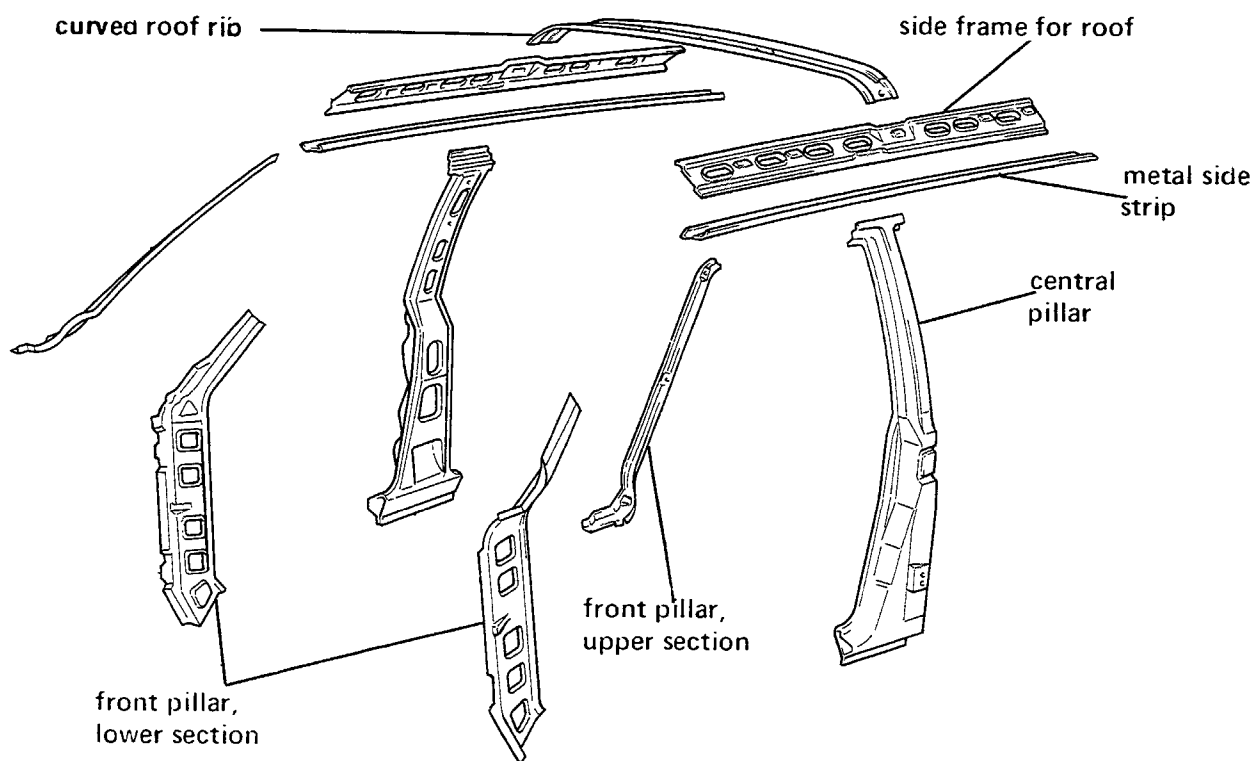
lower rear crossmember

upper rear crossmember

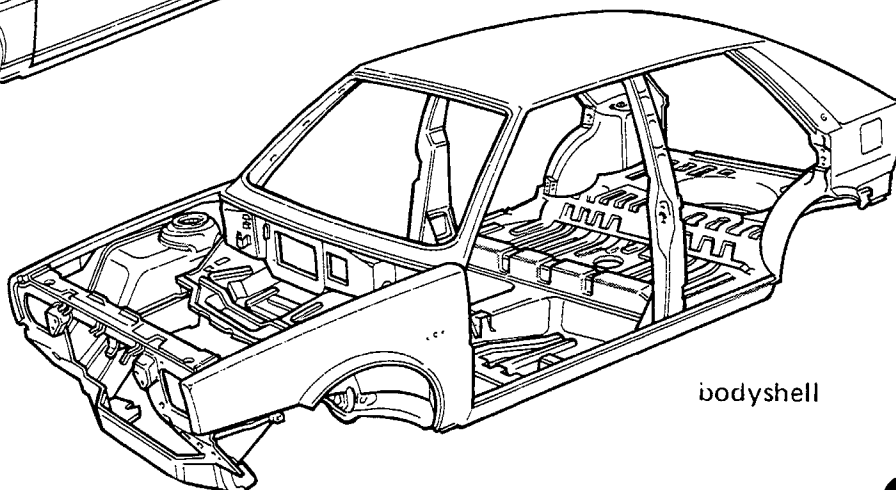
rear central crossmember

longitudinal
member

70.

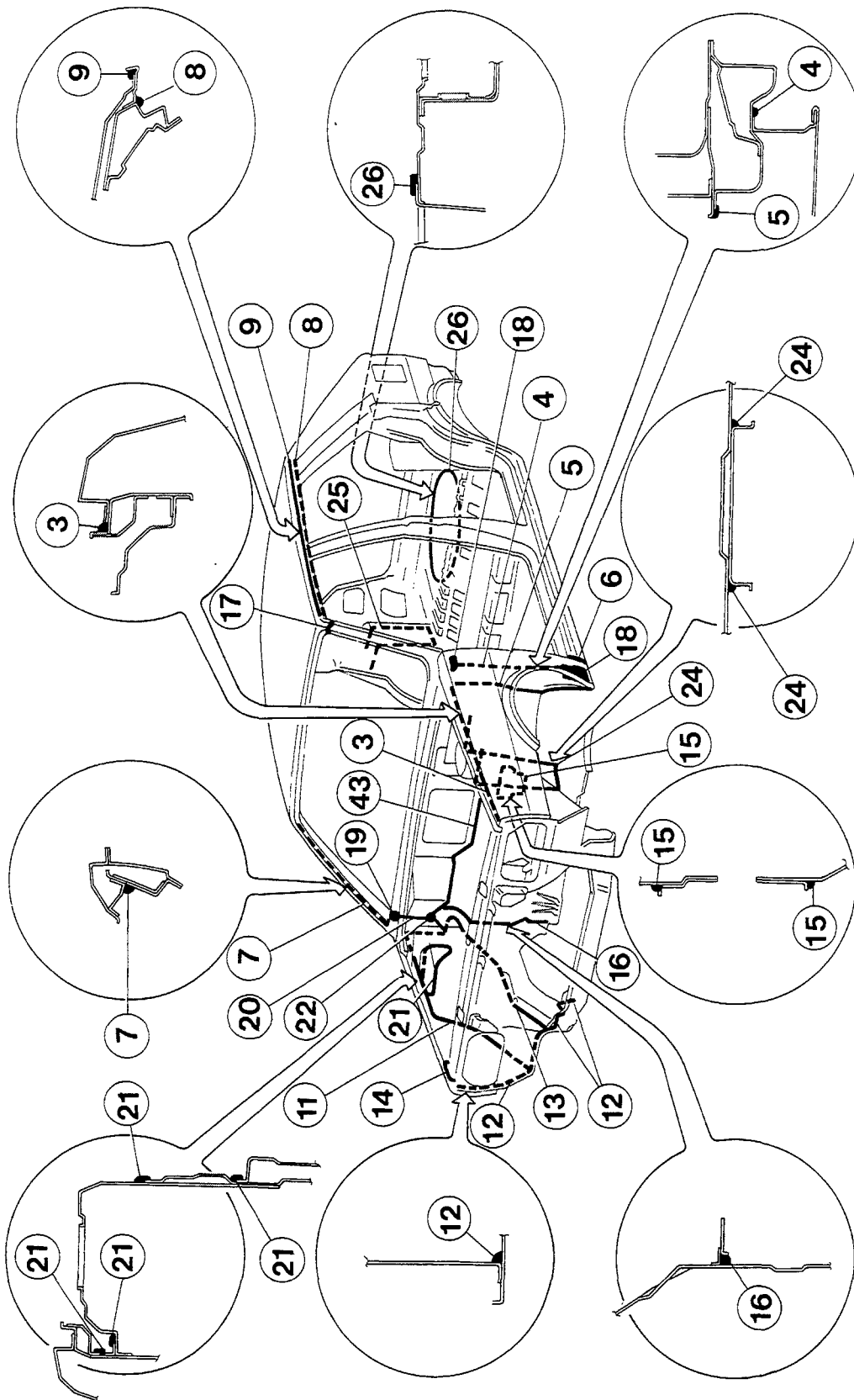


bodyshell complete with doors,
hatchback and boot lid

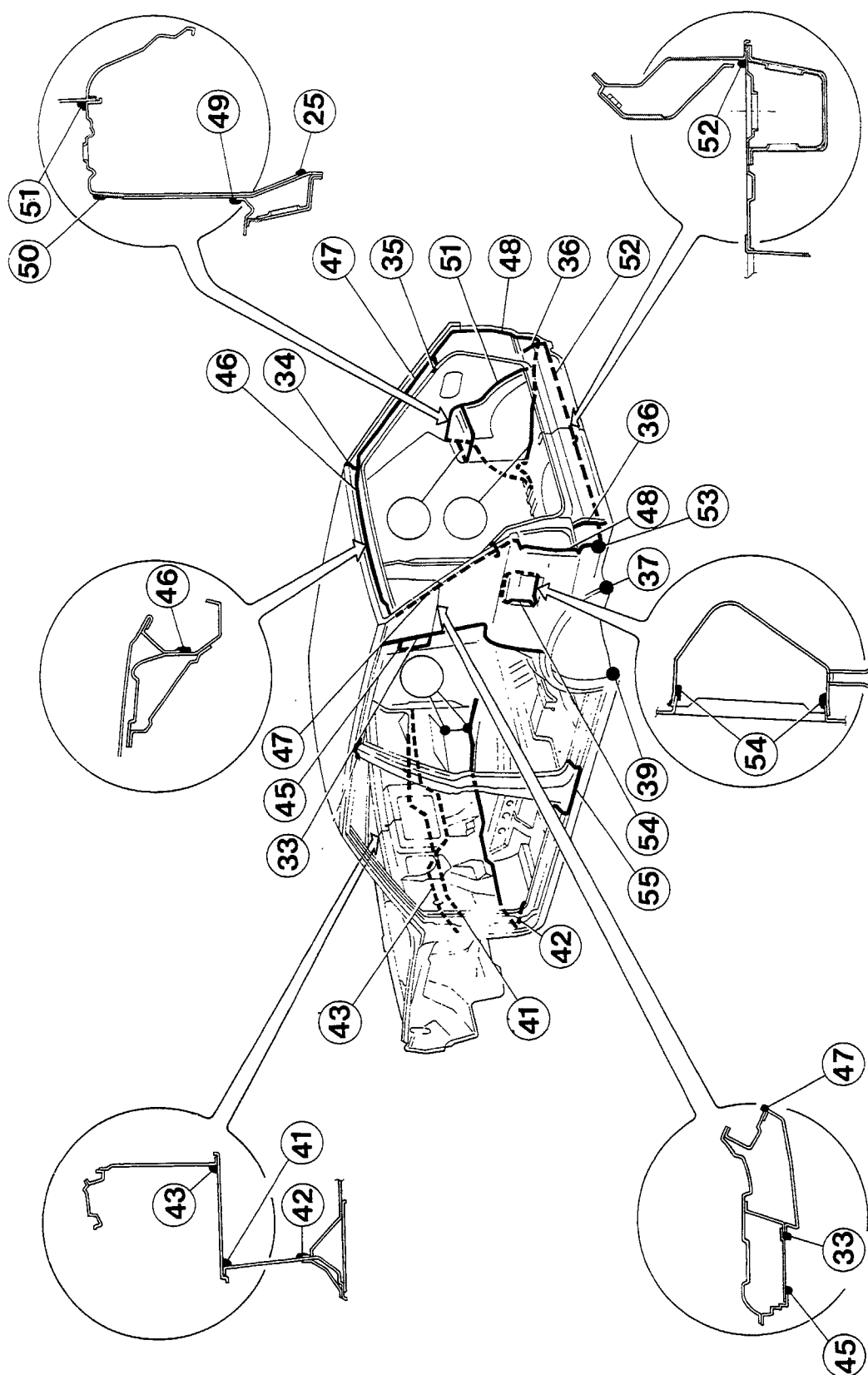


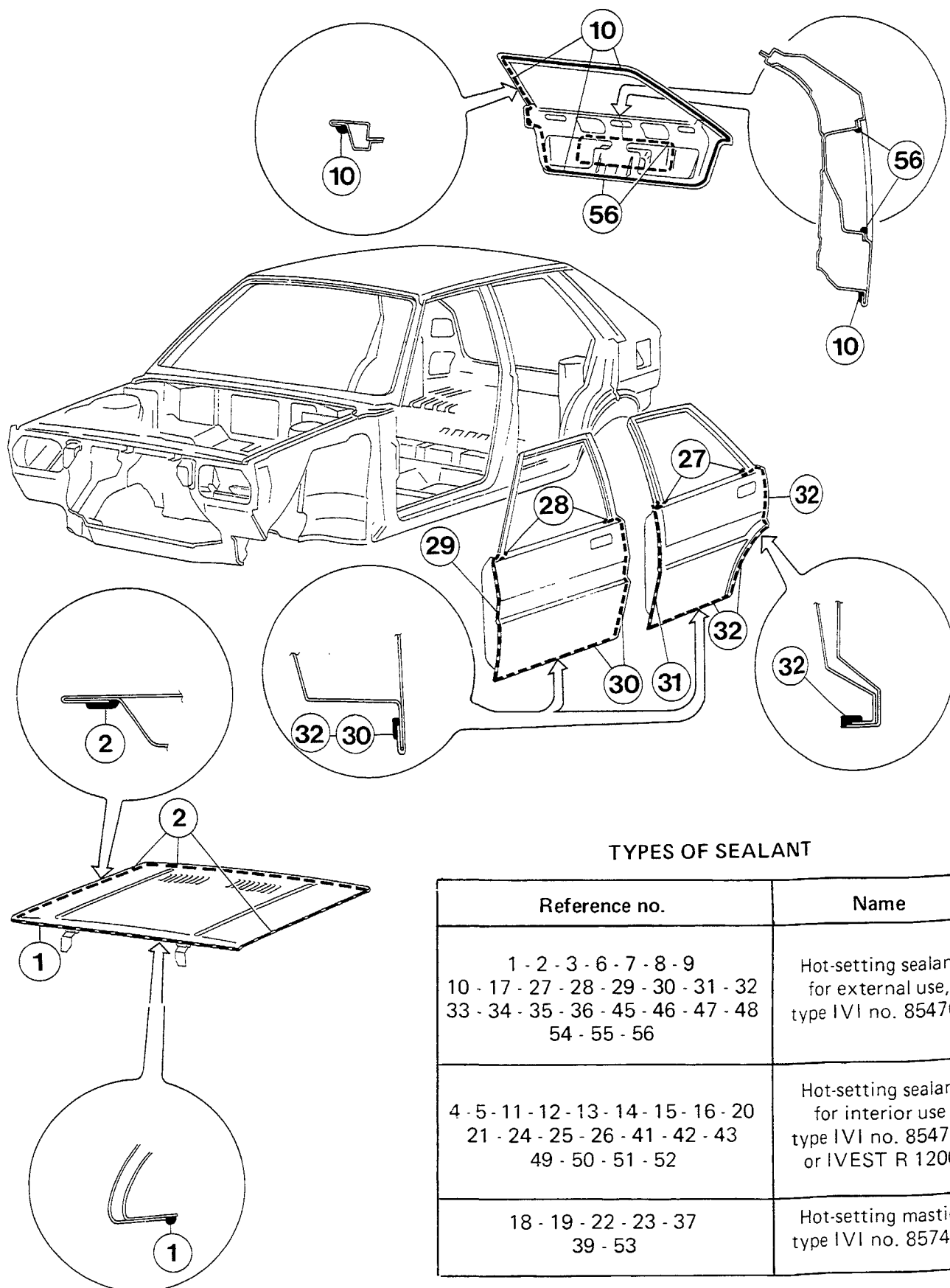
bodyshell

DIAGRAM SHOWING WHERE TO APPLY SEALANTS PRIOR TO PAINTING



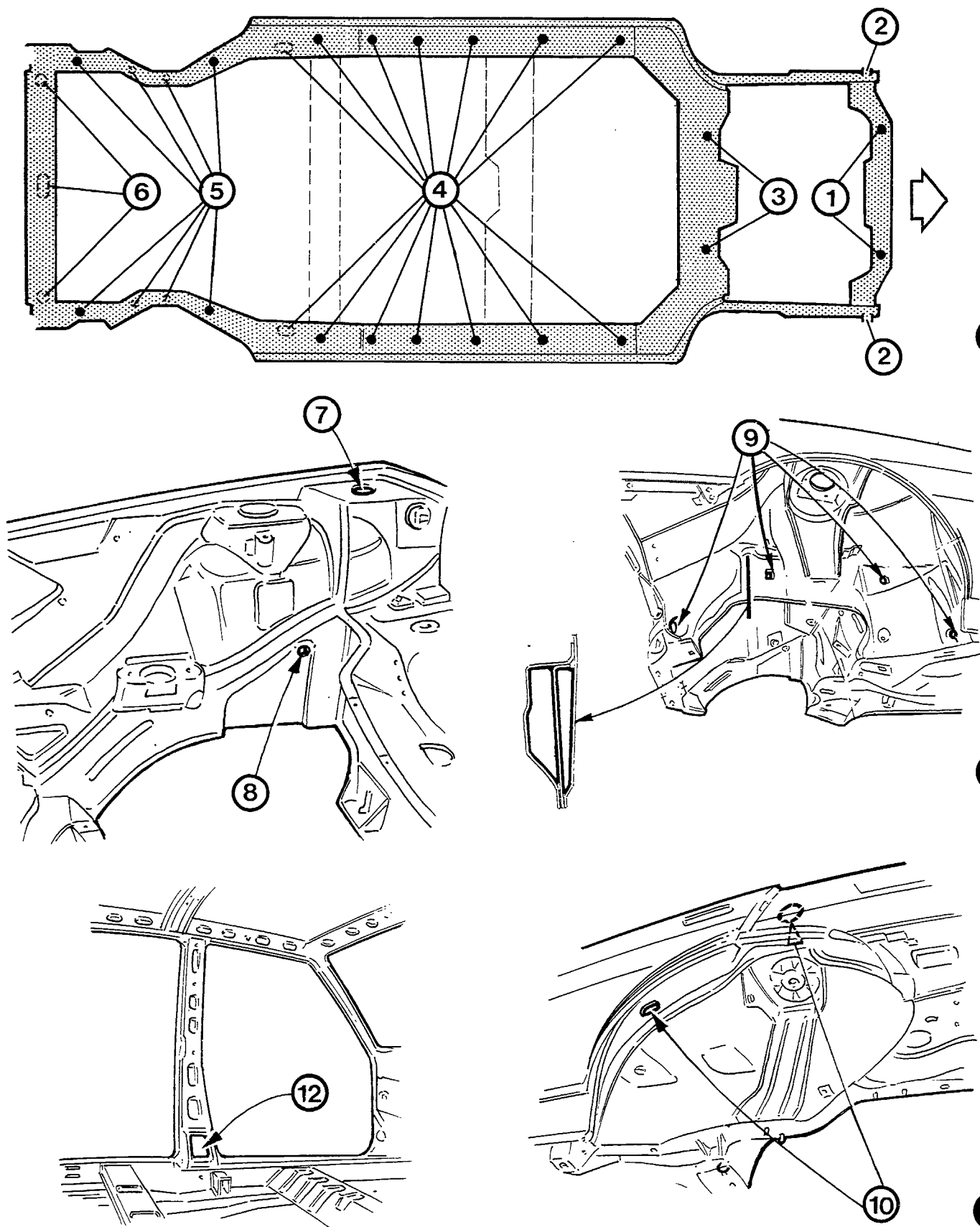
70.

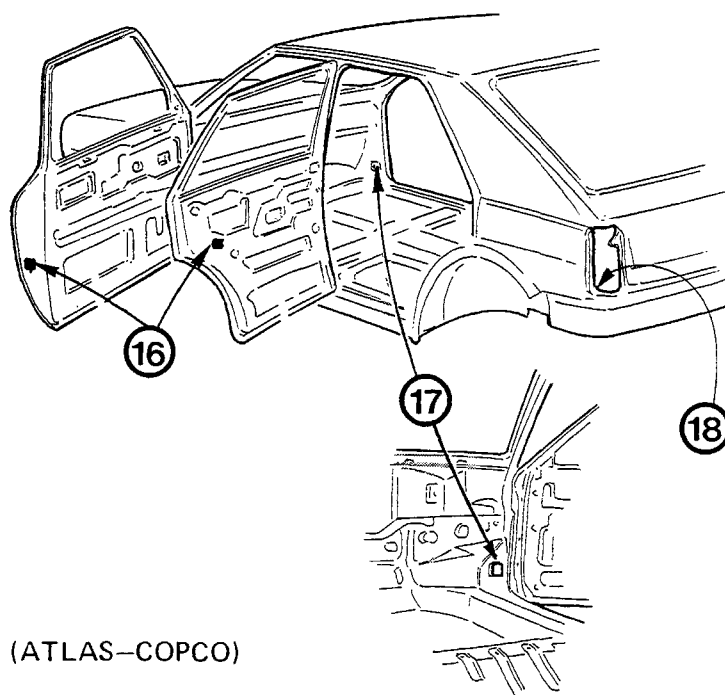
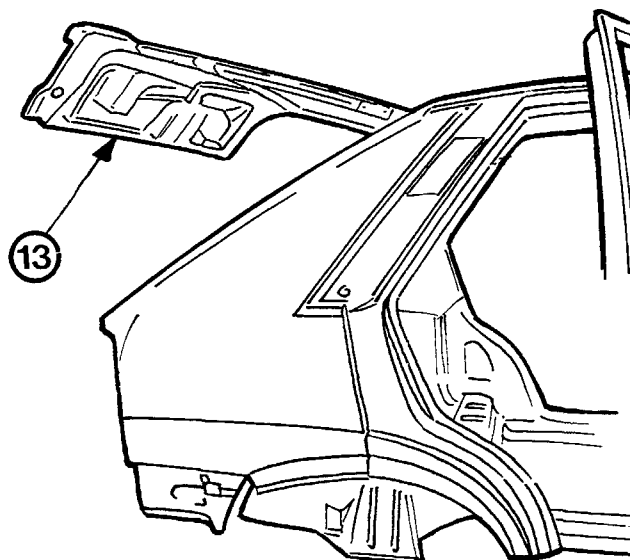
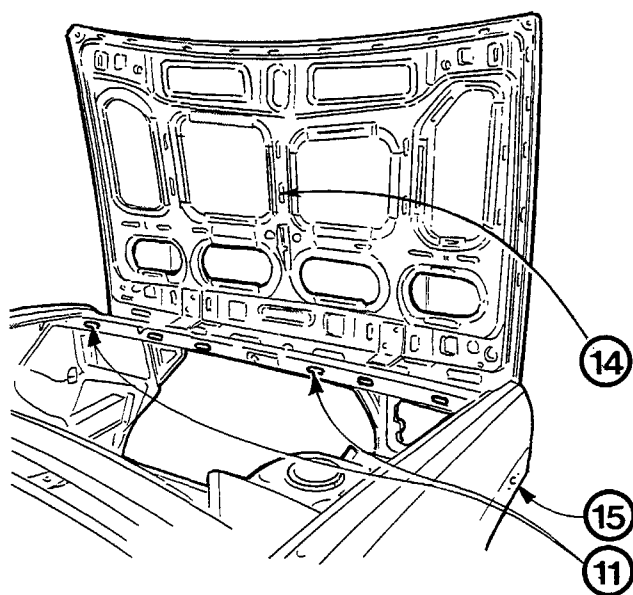




70.

BODYWORK COMPONENTS PROTECTED WITH WAXY-OIL





AREAS PROTECTED WITH (ATLAS-COPCO) HIGH PRESSURE SYSTEM

1. Front section lower crossmember
2. Front side longitudinal members
3. Boxed front suspension supporting cross-member
4. Door sill box section, external part
5. Rear floor side longitudinal members
6. Lower rear boot crossmember
7. Front wheel arch upper box sections
8. Front wheel arch lower box sections
9. Front wheel arches, shock absorber fixing turret area
10. Rear wheel arches, shock absorber fixing turret area
11. Front section upper crossmember

AREAS PROTECTED WITH (PROBE) LOW PRESSURE SYSTEM

12. Central pillar lower support
13. Lower framework for boot lid
14. Lower and upper framework for bonnet lid
15. Front wings, internal headlamp housing area
16. Front and rear door framework
17. Front pillars
18. Rear wing near the wheel arch, from the inside of the car

70.

DIAGRAM SHOWING PANEL SECTIONS PROTECTED WITH ZINCROMETAL

