Chapter 13 Supplement:
Revisions and information on later models

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

1 Introduction

Since its introduction in 1983, the FIAT Uno has had a number of modifications and improvements including the fitting of a twin choke carburettor, low profile tyres, tinted windows and remotely-controlled central door locking.

The major mechanical change was the introduction of the FIRE (Fully Integrated Robotised Engine) on 45 and 45S models to be followed by a new 1108 cc “FIRE” engine on the 60S model from 1989 on.

A 1301 cc Turbo ie engine model was available for a short period. This model had a Bosch LE2 Jetronic electronic fuel injection (ie) and a turbocharger to give added performance. To uprate the braking to suit, disc brakes were fitted to the rear in place of the original drum type brakes.

A 1372 cc engine model was introduced in 1989. Two versions were initially available. A Bosch Mono-Jetronic single-point fuel injection (SPi) system, as found on the 70 SX model and Bosch L3.1 or L3.2 Jetronic multi-point fuel injection (MPi) systems were fitted to Turbo models. L3.2 MPi system models were equipped with catalytic converters, to improve exhaust emission. All fuel injection engines are fitted with electronically controlled engine management systems.

A new style instrument panel, switchgear and a revised facia layout was introduced in 1989.

During 1992, SPi fuel systems were fitted to the 999 cc and 1108 cc engines, along with catalytic converters for improved exhaust emissions.

Five speed transmissions were introduced to 999 cc models in 1993.

It is recommended that this Supplement is always referred to before the main Chapters of the Manual.

Project vehicles

The vehicles used in the preparation of this supplement, and appearing in many of the photographic sequences were a 1986 Uno 45S FIRE, a 1988 1301 cc Uno Turbo ie and a 1991 1372 cc Uno SXie.

2 Specifications

Note: *All Specifications are in addition or revisions of those given in the preceding Chapters.*

Engine

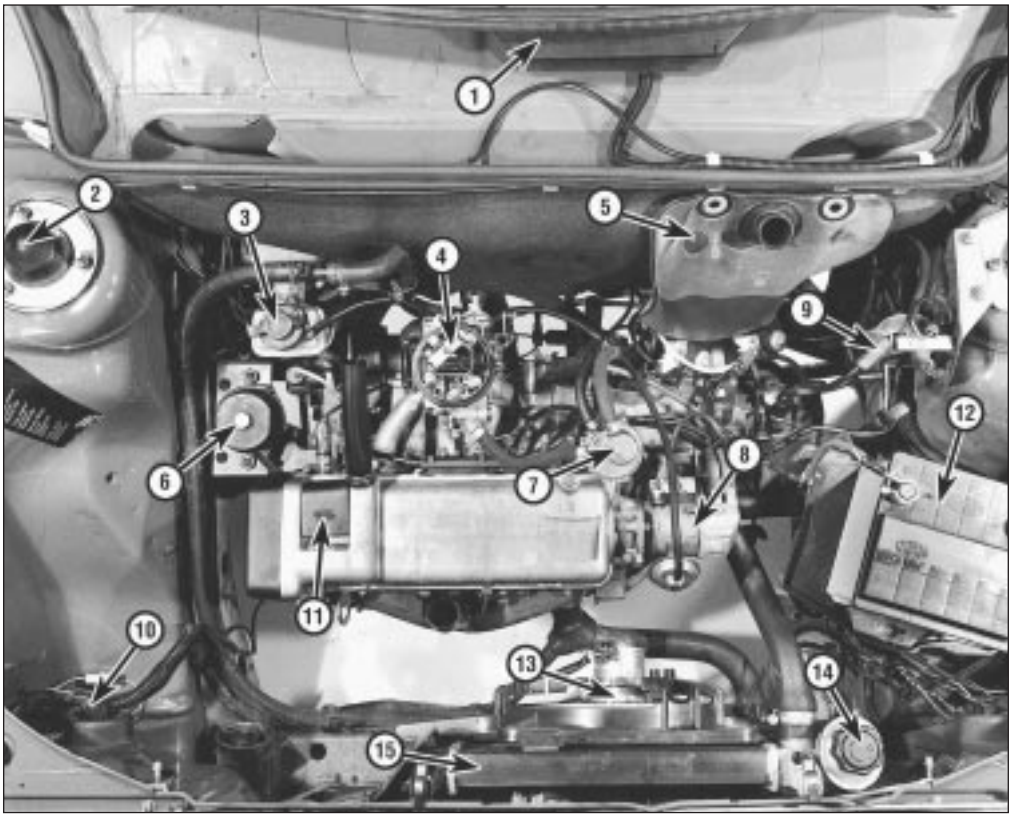
General

Type	Four-cylinder, in-line overhead camshaft. Transversely mounted with end-on transmission
Application:	
999 cc (FIRE)	45, and 45S
1108 cc (FIRE)	60S and 1.1 ie
1116 cc	55 and 60
1299/1301 cc	70, Turbo and ie
1372 cc	70S, Sxie. 1.4 ie and Turbo ie
Bore:	
999 and 1108 cc	70.0 mm
1116 cc	80.0 mm
1299/1301 cc	86.4 mm
1372 cc	80.5 mm
Stroke:	
999 cc	64.9 mm
1108 cc	72.0 mm
1116 cc	55.5 mm
1299 cc	55.4 mm
1301 cc	55.5 mm
1372 cc	67.4 mm
Compression ratio:	
999 cc:	
Up to mid 1988	9.8:1
From mid 1988*	9.5:1
1108 cc	9.6:1
1116 cc	9.1:1
1299 cc	8.1:1
1301 cc	7.7:1
1372 cc:	
Non-Turbo	9.2:1
Turbo	7.8:1
Maximum torque (DIN):	
999 cc:	
Up to mid 1988	80 Nm at 2750 rpm
From mid 1988*	78 Nm at 2750 rpm
1108 cc	87 Nm at 2900 rpm
1116 cc	86 Nm at 3000 rpm
1299/1301 cc Turbo ie	147 Nm at 3200 rpm
1372 cc ie	106 Nm at 3250 rpm
1372 cc Turbo	161 Nm at 3500 rpm
Maximum power (DIN):	
999 cc	33 kW at 5250 rpm
1108 cc	37 kW at 5250 rpm
1299/1301 cc Turbo ie	77 kW at 5750 rpm
1372 cc ie	54 kW at 6000 rpm
1372 cc Turbo ie	87 kW at 6000 rpm
Compression pressure (bore wear test):	
All models	11 ± 0.75 bars
Maximum pressure difference between cylinders:	
All models	0.96 bars
Firing order:	
All models	1-3-4-2 (No 1 at timing belt end)
Cylinder block and crankcase material:	
All models	Cast-iron
Crankshaft endfloat:	
All models	0.055 to 0.265 mm
Cylinder head material:	
All models	Light alloy

Valve clearances:	**Inlet**	**Exhaust**
999 and 1108 cc	0.25 to 0.35 mm	0.35 to 0.45 mm
1299, 1301 cc and 1372 cc	0.35 to 0.45 mm	0.45 to 0.55 mm

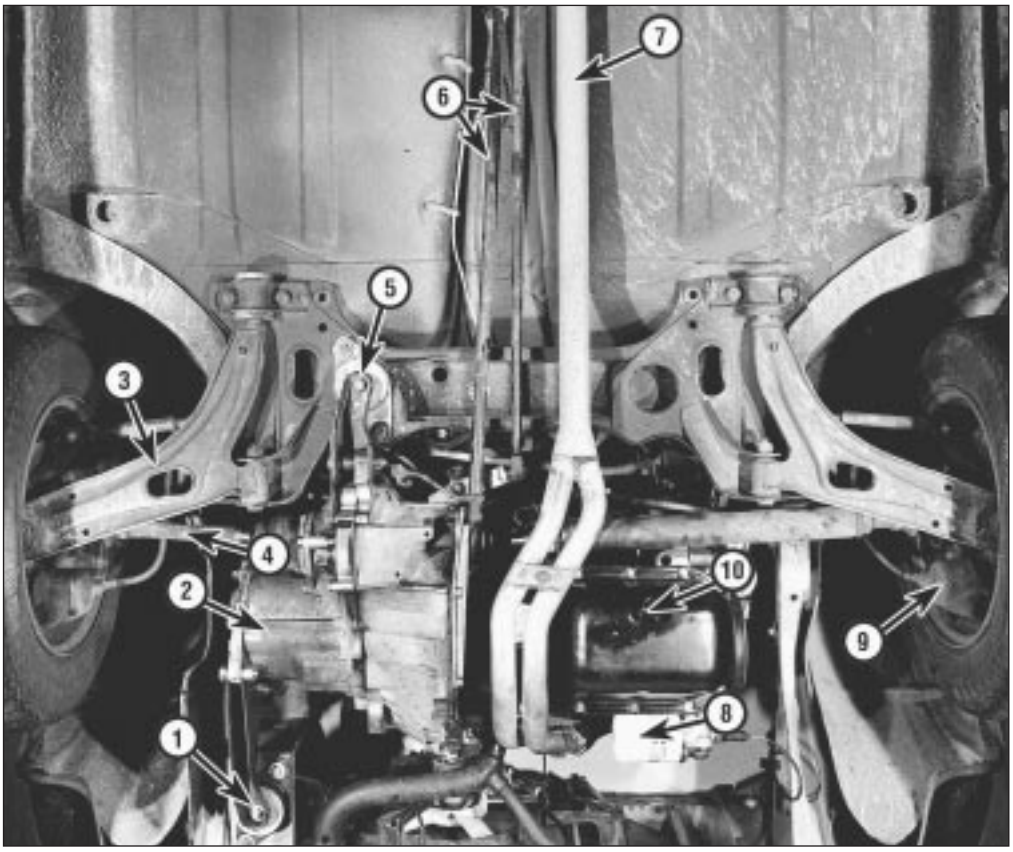
**95 RON (unleaded fuel) engines*

Valve timing clearance:		
999 cc	1.0 mm	
1108 cc	0.70 mm	
1372 cc	0.80 mm	
Valve timing:	**Inlet**	**Exhaust**
999 cc:		
Opens	1º BTDC	29º BBDC
Closes	19º ABDC	9º ATDC
1108 cc:		
Opens	2º BTDC	42º BBDC
Closes	19º ABDC	2º ATDC
1116 cc:		
Opens	7º BTDC	37º BBDC
Closes	35º ABDC	5º ATDC
1299/1301 cc:		
Opens	9º BTDC	39º BBDC
Closes	31º ABDC	1º ATDC
1299/1301 cc Turbo ie:		
Opens	0º TDC	30º BBDC
Closes	40º ABDC	10º ATDC
1372 cc ie:		
Opens	7º BTDC	37º BBDC
Closes	35º ABDC	5º ATDC
1372 cc Turbo ie:		
Opens	14º BTDC	36º BBDC
Closes	44º ABDC	6º ATDC
Cam lift:		
999 cc	7.1 mm	
1108 cc	8.0 mm	
1116 cc	8.8 mm	
1299/1301 cc	8.0 mm	
1372 cc ie	8.8 mm	
1372 cc Turbo ie		
Inlet valves	9.5 mm	
Exhaust valves	8.8 mm	



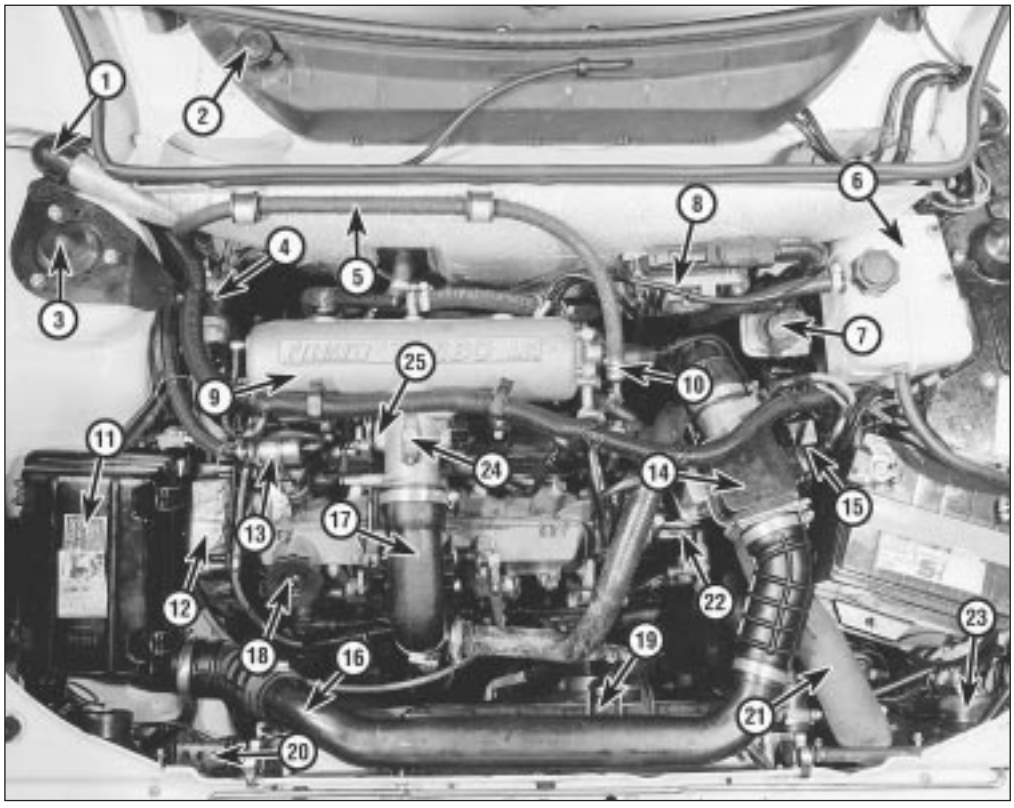
View of engine compartment (air cleaner removed) on the 999 cc FIRE engined model

1 Wiper motor cover
2 Suspension strut turret
3 Brake hydraulic fluid reservoir
4 Carburettor
5 Washer fluid reservoir
6 Right-hand engine mounting
7 Fuel pump
8 Ignition distributor
9 Ignition coil
10 Headlamp
11 Oil filler cap
12 Battery
13 Radiator cooling fan
14 Coolant filler/expansion tank
15 Radiator



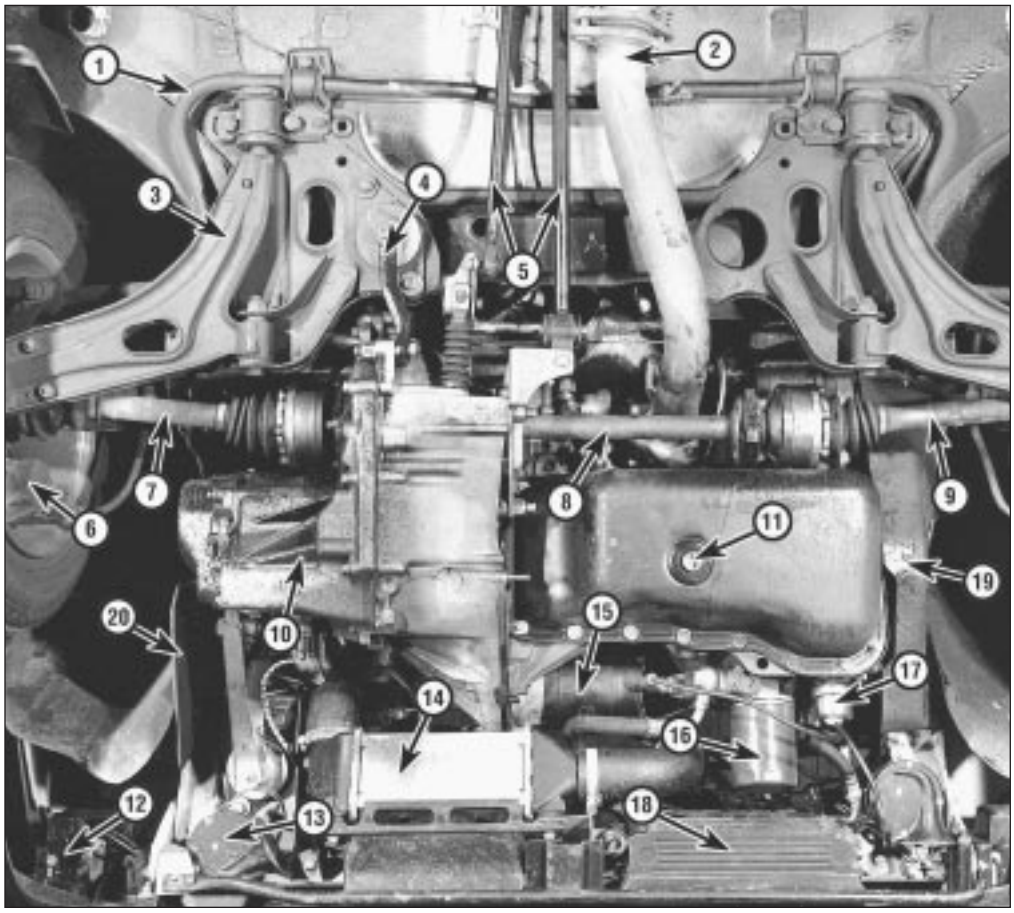
View of front end from below on the 999 cc FIRE engined model

1 Left hand front engine mounting
2 Transmission
3 Track control arm
4 Driveshaft
5 Left hand rear (lower) engine mounting
6 Gearchange rods
7 Exhaust pipe
8 Oil filter cartridge
9 Brake caliper
10 Sump pan drain plug



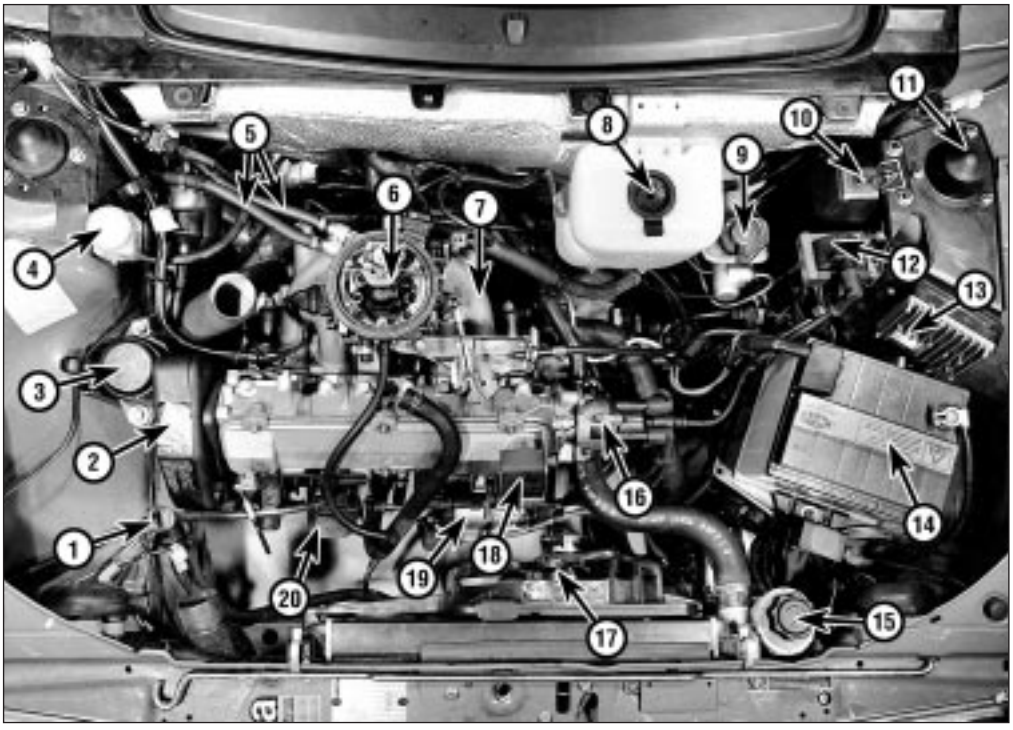
View of engine compartment on the 1301 cc Turbo ie engined model

1 Alternator air cooling intake
2 Washer fluid reservoir cap
3 Suspension strut turret
4 Secondary fuel filter
5 Fuel supply hose
6 Coolant expansion tank
7 Brake fluid reservoir cap
8 Ignition system ECU
9 Inlet manifold
10 Excessive pressure switch
11 Air cleaner
12 Timing belt cover
13 Fuel pressure regulator
14 Airflow meter
15 Throttle position switch
16 Air intake duct
17 Air intake to throttle valve housing
18 Engine oil filler cap
19 Radiator cooling fan
20 Headlamp dim-dip transformer
21 Intercooler air duct
22 Ignition distributor
23 Headlamp
24 Main idle speed adjusting screw
25 Base setting idle speed screw



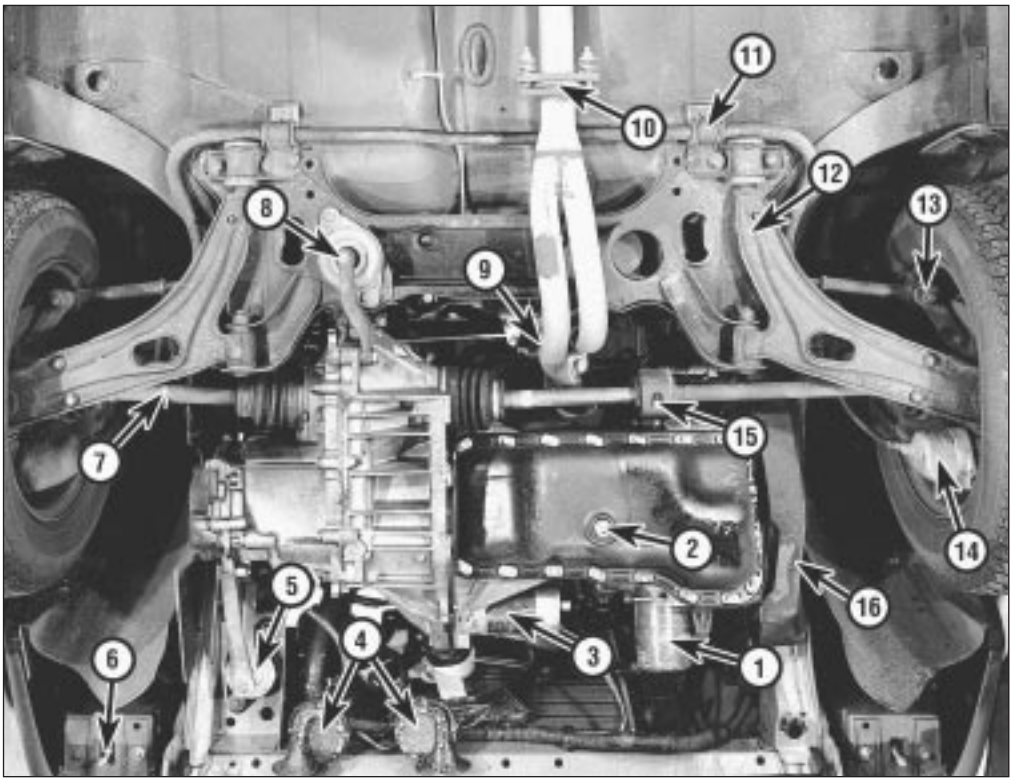
View of front end from below on the 1031 cc Turbo ie engined model

1 Anti-roll bar
2 Exhaust pipe
3 Track control arm
4 Engine centre mounting
5 Gearchange rods
6 Brake caliper
7 Left-hand driveshaft
8 Intermediate driveshaft
9 Right-hand driveshaft
10 Transmission
11 Engine oil drain plug
12 Auxiliary lamp
13 Horn
14 Intercooler
15 Starter motor
16 Oil filter cartridge
17 Oil pressure sender unit
18 Engine oil cooler
19 Right-hand underwing shield
20 Left-hand underwing shield



View of engine compartment (air cleaner removed) on the 1372 cc ie engined model

1 Engine oil level dipstick
2 Timing belt cover
3 Engine mounting (right-hand)
4 Clutch master cylinder fluid reservoir
5 Fuel supply and return hoses
6 Injection unit
7 Inlet manifold
8 Washer reservoir
9 Brake master cylinder and fluid reservoir
10 Injection system fuse/relay block
11 Suspension strut turret
12 Ignition coil
13 Ignition system ECU
14 Battery
15 Coolant filter expansion tank
16 Ignition distributor
17 Radiator cooling fan
18 Engine oil filler cap
19 Starter motor
20 Oil filter



View of front end from below on the 1372 cc ie engine model

1 Oil filter
2 Engine oil drain plug
3 Starter motor
4 Horns
5 Transmission front mounting
6 Front fog lamp and adjuster
7 Driveshaft
8 Transmission rear mounting
9 Gearchange linkage
10 Exhaust downpipe and system joint
11 Anti-roll bar
12 Track control arm
13 Tie-rod balljoint
14 Brake unit
15 Driveshaft damper
16 Underwing shield

Lubrication system

Oil pump type:	
999/1108 cc	Gear driven from front of crankshaft.
1372 cc	Pump operated from front of crankshaft. Oil pressure relief valve in front cover.
Tooth tip-to-body clearance (999/1108 cc)	0.080 to 0.186 mm
Gear endfloat:	
999/1108 cc	0.025 to 0.056 mm
1372 cc	0.040 to 0.106 mm
Oil pressure (at normal operating temperature)	3.4 to 4.9 bars
Oil filter:	
999/1108 cc	Champion F107
1372 cc	Champion C106

Torque wrench settings

	Nm	lbf ft
Auxiliary shaft sprocket bolt (1372 cc)	83	62
Big-end cap bolts:		
999/1108 cc	41	30
1372 cc	51	38
Camshaft bearing cap bolts:		
M8	19	14
M6	10	7
Camshaft cover screws	8	6
Camshaft housing to lower cylinder head securing bolt (1372 cc)	20	15
Camshaft housing to inlet manifold bracket bolt (1372 cc)	25	18
Camshaft sprocket bolt		
999/1108 cc	68	50
1372 cc	83	62
Centre mounting to final drive casing bracket (1201/1301 cc)	23	17
Coolant temperature switch	25	18
Crankshaft pulley bolts	25	18
Crankshaft pulley nut (1372 cc)	197	145
Crankshaft rear oil seal retainer bolts	10	7
Crankshaft sprocket bolt	79	58

Torque wrench settings (continued)	Nm	lbf ft
Cylinder head bolts:		
903 cc (from engine number 581470), 999 and 1108 cc:		
Stage 1	30	22
Stage 2	Angle tighten by another 90º	
Stage 3	Angle tighten by another 90º	
1299/1301 cc (10 main bolts):		
Stage 1	20	15
Stage 2	40	30
Stage 3	Angle tighten by another 90º	
Stage 4	Angle tighten by another 90º	
1299/1301 cc (4 next to spark plug holes)	30	22
1372 cc (M10):		
Stage 1	40	30
Stage 2	Angle tighten by another 90º	
Stage 3	Angle tighten by another 90º	
1372 cc (M8)	30	22
Engine mounting bracket body	25	18
Engine mounting bracket-to-body bolt (1299/1301 cc)	48	35
Engine mounting bracket-to-transmission nut (1299/1301 cc)	85	63
Engine mounting nuts:		
M10	57	42
M8	25	18
Engine mountings to brackets (1299/1301 cc)	23	17
Engine mounting to engine and transmission (999/1108 cc)	60	44
Engine mounting-to-engine bracket bolt (1299/1301 cc)	85	63
Flywheel bolts:		
999/1108 cc	43	32
1372 cc	83	62
Ignition distributor cover (in crankcase) bolt (1372 cc) *	25	18
Main bearing cap bolts:		
999/1108 cc:		
Stage 1	40	30
Stage 2	Angle tighten by another 90º	
1372 cc	80	59
Manifold nuts	27	20
Mounting bracket to final drive casing (1299/1301 cc)	95	70
Oil pressure sender unit (1372 cc) *	37	28
Oil pressure switch	31	23
Oil pump backplate screws	7	5
Oil pump mounting bolts:		
999/1108 cc	10	7
1372 cc *	25	18
Oil pump shaft driven gear bolt (1372 cc ie only)	83	61
Oil temperature sender unit (1372 cc) *	50	37
Sump pan fixing screws	10	7
Timing belt tensioner nut	27	20
Turbine-to-exhaust manifold and head nut *	29	21
Water pump-to-crankcase bolt (1372 cc) *	25	18

* *Turbo models only*

Cooling system

General

Thermostat:	
Begins to open:	
999/1108 cc	85 to 90ºC
1301 cc Turbo ie	78 to 82ºC
1372 cc	80 to 84ºC
Fully open:	
999/1108 cc	100ºC
1301 cc Turbo ie	95ºC
1372 cc	96ºC
Expansion tank pressure cap rating:	
1372 cc	0.98 bar

Cooling system (continued)

Radiator fan cut-in temperature:	
1301 cc Turbo ie:	
1st speed	86 to 90ºC
2nd speed	90 to 94ºC
1372 cc	90 to 94ºC
Radiator fan switch-off temperature:	
1301 cc Turbo ie:	
1st speed	81 to 85ºC
2nd speed	85 to 89ºC
1372 cc	85 to 89ºC
Coolant pump/alternator drivebelt tension:	
1372 cc	Approximately 10 mm deflection midway between crankshaft and alternator pulleys under firm thumb pressure

Torque wrench settings

	Nm	lbf ft
Coolant pump mounting bolts (999/1108 cc)	8	6
Coolant pump to crankcase (1372 cc)	25	18
Coolant temperature gauge sender unit (1372 cc ie)	30	22
Coolant temperature sender unit (1372 cc)	27	20
Fan thermostatic switch (1372 cc)	30	22
Thermal valve on inlet manifold (1372 cc):		
M10	20	15
M8	10	7
Water pump cover (1372 cc)	15	11

Fuel system

General

Air cleaner element	
999 cc and 1108 cc	Champion U520
1372 cc ie	Champion U533
1301/1372 cc Turbo ie	Champion U522
Fuel filter:	
999 cc and 1108 cc	Champion L101
1372 cc ie	Champion L201
1301/1372 cc Turbo ie	Champion L203

Carburettor calibration

Weber 32	ICEV 61/250	TLF 4/250
Application	903 cc	999 cc
Accelerator pump capacity (for 10 strokes)	3.8 to 6.3 cc	-
Air bleed jet	1.80 mm	50/90
Air compensating jet	-	165
Air idle jet	1.60 mm	-
Anti-flooding device (choke valve plate gap)	-	4.0 to 5.0 mm
Auxiliary venturi	3.5 mm	-
Fast idle (throttle valve plate gap)	-	0.65 to 0.75 mm
Float level (with gasket)	10.75 mm	26.75 to 27.25 mm
Full power jet	0.50 mm	50
Emulsion tube	F74	F70
Exhaust gas CO at idle	1.0 to 2.0%	1.0 to 2.0%
Idle air bleed	-	50/90
Idle jet	0.47 mm	47
Idle mixture adjustment port	1.50 mm	-
Idle speed	750 to 800 rpm	750 to 800 rpm
Main jet	1.10 mm	105
Needle valve	1.50 mm	1.5 mm
Pump jet	0.40 mm	35
Pump outlet	0.40 mm	-
Venturi	22 mm	22 mm

Weber 32	TLF 4/252 (and 251)	TLF 27/251
Application	999 cc	1108 cc
Accelerator pump capacity (for 10 strokes)	8 to 12 cc	8 to 12 cc
Air bleed jet	1.65 mm	1.65 mm
Air idle jet	0.50 mm	0.50 mm
Auxiliary venturi	4.5 mm	4.5 mm
Emulsion tube	F70	F70

Weber 32 (continued)	**TLF 4/252 (and 251)**	**TLF 27/251**
Exhaust gas CO at idle	1.0 to 2.0%	0.5 to 1.5%
Fast idle	0.65 to 0.75 mm	-
Float level (with gasket)	26.75 to 27.25 mm	26.75 to 27.25 mm
Float travel	33.7 to 34.7 mm	33.7 to 34.7 mm
Full power jet	0.50 mm	0.55 mm
Idle jet	0.47 mm	0.45 mm
Idle mixture adjustment port	1.50 mm	1.50 mm
Idle speed	750 to 800 rpm	800 to 850 rpm
Main jet	1.05 mm	1.05 mm
Needle valve	1.50 mm	1.50 mm
Pump jet	0.40 mm	0.40 mm
Pump outlet	0.40 mm	0.40 mm
Superfeed jet	0.40 mm	0.45 mm
Superfeed mixture jet	3.00 mm	3.00 mm
Venturi	22 mm	22 mm

Weber 30/32 DMTE 30/150		
Application	1116 cc engine (95 RON unleaded engine)	
Exhaust gas CO at idle	1.0 to 2.0%	
Float level (with gasket fitted)	6.5 to 7.5 mm	
Idle pull-down	3.0 to 3.5 mm	
Idle speed	800 to 900 rpm	
Needle valve	1.50 mm	
Pull down capsule bush	0.20 mm	
	Primary	**Secondary**
Air correction jet	2.10	1.80
Emulsion tube	F30	F30
Idle air jet	1.15	0.70
Idle jet	1.50	-
Idle jet	0.47	0.40
Full power jet	0.40	-
Main jet	0.90	1.05
Main venturi	19	23
Pump discharge	0.40	-
Pump jet	0.45	-
Secondary venturi	4.5	-

Weber 30/32 DMTE 10/150		
Application	1116 cc	
Accelerator pump capacity (ten strokes)	8.5 to 12.5 cc	
Anti-flooding device (automatic - Y)	3.75 to 4.25 mm	
Anti-flooding device (mechanical - X)	8.0 to 9.5 mm	
Excess fuel discharge orifice	0.40	
Exhaust gas CO at idle	0.5 to 1.5%	
Float setting (fuel level)	6.5 to 7.5 mm	
Idle speed	800 to 900 rpm	
Needle valve	1.5 mm	
Primary and secondary valve plate openings:		
X	13.5 to 14.5 mm	
Y	14.5 to 15.5 mm	
Primary valve plate opening (X)	6.45 to 6.95 mm	
Throttle valve plate opening - fast idle (A)	0.90 to 0.95 mm	
	Primary	**Secondary**
Air correction jet	195	195
Accelerator pump jet	40	40
Auxiliary venturi	3.5	5
Emulsion tube	F42	F38
Idle jet	47	70
Main jet	90	95
Venturi diameter	19.0 mm	23.0 mm

Solex C 30/32 - CIC8		
Application	1116 cc	
All calibration as for the Weber 30/32 DMTE 10/150 except for the following:		
	Primary	**Secondary**
Accelerator pump jet	50	50
Air correction jet	230	190
Idle jet	47.5	40
Main jet	100	100
Needle valve	1.6	1.6

Weber 30/32 DMTE 12/150

Application	1299/1301 cc

All calibration as for the Weber 30/32 DMTE 10/150 except for the following:

	Primary	Secondary
Accelerator pump jet	45	45
Air correction jet	2.20	1.75
Idle jet	45	70
Main jet	0.90	0.97

Fuel injection systems

System type:	
999/1108 cc ie (from 1992)	Bosch Mono-Jetronic SPi with catalyst
1301 Turbo ie	Bosch LE2 Jetronic MPi
1372 cc ie	Bosch Mono-Jetronic SPi
1372 cc Turbo ie (up to 1992)	Bosch L3.1 Jetronic MPi
1372 cc Turbo ie (from 1992)	Bosch L3.2 Jetronic MPi with catalyst
Fuel pump:	
All fuel injection models	Electric
Fuel pressure:	
999/1108/1372 cc	0.8 to 1.10 bars
1301 cc Turbo ie	1.6 bars
1372 cc Turbo ie	6.0 bars maximum
Fuel octane rating:	
Without catalyst	98 RON minimum (unleaded or leaded)
With catalyst	95 RON minimum (unleaded only)
Idle speed:	
999/1108 cc	850 ± 50 rpm
1301 cc Turbo ie	850 ± 50 rpm
1372 cc ie	850 ± 50 rpm
1372 cc Turbo ie	825 ± 25 rpm
Exhaust gas CO at idle:	
999/1108 cc	0 to 0.35%
1301 cc Turbo ie	0.5 to 1.5%
1372 cc Turbo ie	1.2 to 1.8%

Torque wrench settings

	Nm	lbf ft
Coolant pipe bolt to turbocharger	25	18
Coolant pipe union nut to turbocharger	38	28
Exhaust bracket nuts and bolts (999/1108 cc)	23	17
Exhaust manifold flange nut (1372 cc models)	18	13
Exhaust manifold to crankcase bracket (1372 cc)	25	18
Exhaust manifold to cylinder head (1372 cc)	25	18
Exhaust pipe flange-to-manifold nuts (999/1108 cc)	18	13
Fuel pump mounting bolts (999/1108 cc)	8	6
Fuel pump unions	15	11
Fuel pressure regulator nut	48	35
Inlet and exhaust manifold to cylinder head nuts (999/1108 cc)	27	20
Rear exhaust pipe/silencer mounting bracket nut	24	18
Turbocharger-to-exhaust manifold-and-cylinder head nut	28	21

Ignition system

"Breakerless" (999, 1108, 1116, 1299/1301 cc)

General

System type	Magnetic impulse generator electronic
Spark plug type	Champion RC9YCC or RC9YC
Spark plug electrode gap	0.8 mm
HT lead type (999 and 1108 cc)	Champion LS-20

Component testing values

Magnetic impulse generator resistance:	
Models with Marelli distributors	758 to 872 ohms
Models with the Ducellier distributor	171 to 209 ohms
Ignition coil resistance at 20ºC (68ºF):	
Models with BA506A coil:	
Primary	0.756 to 0.924 ohms
Secondary	3330 to 4070 ohms
Models with BA506D coil:	
Primary	0.666 to 0.814 ohms
Secondary	2970 to 3630 ohms

Ignition timing (in relation to distributor type)

At idle with vacuum hose disconnected and plugged:	
Marelli SE101A and Ducellier 525473A	2º BTDC
Marelli SE100EX, SE100CX and SE100NX	10º BTDC
Marelli SE101G	3º BTDC
Marelli SE100SX	Not available
Centrifugal advance (maximum):	
Marelli SE101A and Ducellier 525473A	26 to 30º BTDC
Marelli SE100EX and SE100CX	22 to 26º BTDC
Marelli SE100NX	18 to 22º BTDC
Marelli SE101G	23 to 27º BTDC
Marelli SE100SX	20 to 24º BTDC
Vacuum advance (maximum):	
Marelli SE101A, Ducellier 525473A and Marelli SE101G	12 to 14º BTDC
Marelli SE100NX	14 to 16º BTDC
Marelli SE100EX and SE100CX	10 to 14º BTDC
Marelli SE100SX	13 to 17º BTDC

Digiplex 2 (1372 cc ie)

General

System type	Marelli Digiplex 2 electronic
Spark plug type	Champion RN9YCC or RN9YC
Spark plug electrode gap	0.8 mm

Ignition timing

At 800 to 850 rpm	2 to 6º BTDC
Maximum advance (at 4500 to 6200 rpm with 0.6 bar/8.7 lbf/in² vacuum)	44 to 48º BTDC

Component testing values

Ignition coil:	
Primary resistance at 23ºC (73ºF)	0.405 to 0.495 ohms
Secondary resistance at 23ºC (73ºF)	4320 to 5280 ohms
Engine speed/TDC sensor:	
Resistance	680 to 920 ohms
Sensor-to-flywheel tooth gap	0.2 to 0.8 mm

Microplex (1301 cc Turbo ie)

General

System type	Marelli Microplex electronic
Spark plug type	Champion RC7YCC or RC7YC
Spark plug electrode gap	0.8 mm
Rotor arm resistance	800 to 1200 ohms

Ignition timing

At idle with vacuum hose detached:	
Up to mid 1988	8 to 12º BTDC
From mid 1988	8.5 to 11.5º BTDC
Maximum advance:	
Up to mid 1988	36 to 40º BTDC
From mid 1988	32.5 to 35.5 BTDC

Component testing values

Ignition coil:	
Primary winding resistance at 20ºC (68ºF)	0.31 to 0.37 ohms
Secondary winding resistance at 20ºC (68ºF)	3330 to 4070 ohms
Engine speed sensor:	
Resistance	612 to 748 ohms
Sensor-to-flywheel tooth gap	0.25 to 1.3 mm
TDC sensor:	
Resistance	612 to 748 ohms
Sensor-to-crankshaft pulley tooth gap	0.4 to 1.0 mm

Microplex (1372 cc Turbo ie)

General

System type	Marelli Microplex electronic ignition
Spark plug type	Champion RC7BYC4
Spark plug electrode gap	0.9 mm

Ignition timing

At idle	8º to 12º BTDC
Maximum advance (at 4000 to 6000 rpm with 0.377 bars/5.5 lbf/in² vacuum)	32º to 36º BTDC

Component testing values

Ignition coil:	
Primary resistance at 20ºC (68ºF)	0.40 to 0.49 ohms
Secondary resistance at 20ºC (68ºF)	4320 to 5280 ohms
Engine speed sensor:	
Resistance	612 to 748 ohms
Sensor to flywheel teeth clearance	0.25 to 1.3 mm
TDC sensor:	
Resistance	612 to 748 ohms
Sensor to crankshaft pulley tooth gap	0.4 to 1.0 mm

Clutch

Pedal height

All later models	136 to 146 mm

Driven plate diameter

903, 999 and 1301 cc	170 mm
1108 cc	180 mm
1372 cc ie	181.5 mm
1372 cc Turbo ie	200 mm

Transmission

General

Type number:	
903, 999,1108 and 1372 cc ie	C.501.5.10
999 and 1108 (from 1992)	C.514
1372 cc, Turbo ie	C.510.5.17

Final drive ratios

903 cc	4.071:1
999 and 1108 cc (except C514 type transmission)	3.733:1
999 cc (with C514 type transmission)	3.866:1
1108 cc (with C514 type transmission)	3.733:1
1301 cc Turbo ie (without Antiskid)	3.588:1
1301 cc Turbo ie (with Antiskid)	3.562:1
1372 cc Turbo ie	3.353:1

Oil type/specification:

1372 cc Turbo ie	Fiat ZC 80/S gear oil

Driveshafts

Roadwheels

Turbo ie	5 1/2 J x 13

Tyres

Turbo ie

Size	175/60 HR 13
Pressures:	
Front and rear, normal load	2.2 bars
Front, full load	2.3 bars
Rear, full load	2.5 bars
Spare wheel tyre size	5.50B x 13 FH
Spare wheel tyre pressure	2.2 bars

1372 cc ie with catalyst (1.4 ie S)

Size	155/70 SR 13
Pressures:	
Front	2.0 bars
Rear - normal load	1.9 bars
Rear - full load	2.2 bars

Torque wrench settings

	Nm	lbf ft
Driveshaft flange connecting bolts (Turbo ie)	43	32
Final drive output shaft bearing cover bolts (Turbo ie)	24	18
Intermediate shaft support to crankcase (Turbo ie)	48	35

Braking system (903, 999, 1108, 1116 and 1372 cc)

General

Note: *The following items differ, or are additional to those specified in Chapter 8*:

Master cylinder bore diameter:	
903 cc, 999 cc, 1108 cc and 1116 cc	19.05 mm
1372 cc ie	20.65 mm
Vacuum servo diameter	152.4 mm
Hydraulic push rod-to-master cylinder support plate clearance	0.825 to 1.025 mm

Braking system (1301 and 1372 cc Turbo ie)

General

System type	Four-wheel discs, ventilated front, solid rear. Vacuum servo. Pressure regulating valve on rear brakes
Master cylinder bore diameter	22.225 mm
Vacuum servo diameter	177.8 mm

Front disc brakes

Disc diameter	240.0 mm
Disc thickness - new	19.9 to 20.1 mm
Disc thickness - minimum (refinishing)	18.6 mm
Disc thickness - minimum (wear limit)	18.2 mm
Minimum thickness of pad friction material	1.5 mm
Caliper cylinder diameter	48.0 mm

Rear disc brakes

Disc diameter	227.0 mm
Disc thickness - new	10.7 to 10.9 mm
Disc thickness minimum (refinishing):	
1301 cc Turbo ie	9.7 mm
1372 cc Turbo ie	9.35 mm
Disc thickness - minimum (wear limit)	9.0 mm
Minimum thickness of pad friction material	1.5 mm
Caliper cylinder diameter	34.0 mm

Torque wrench settings

	Nm	lbf ft
Front caliper cylinder housing mounting bolts	52	38
Front caliper support bracket bolts	52	38
Front disc fixing bolts	25	18
Rear caliper support bracket bolts	25	18
Rear caliper cylinder housing mounting bolts	52	38

Electrical system

Battery

Turbo ie engine models	45 Ah

Fuses (903, 999, 1116, 1299/1301 and 1301 cc Turbo ie)

Fuse No.	Rating	Circuit
1	7.5	LH tail, RH front parking, rear number plate, check panel
2	7.5	RH tail, LH front parking, cigar lighting, clock light, heater control illumination, map reading lamp.
3	10	RH headlamp main beam
4	10	LH headlamp main beam and warning light
5	25	Radiator cooling fan, econometer and horns
6	10	Cigar lighter, courtesy lamps, digital clock, stop-lamp switch, clock and radio
7	10	RH headlamp dipped beam
8	10	LH headlamp dipped beam, rear fog warning lamp and indicator
9	20	Heated rear screen and warning lamp
10	10	Instrument panel, stop-lamps, direction indicators, reversing lamps and warning module
11	20	Heater fan, fan control illumination and digital clock
12	20	Windscreen wiper, washer pump and rear screen wiper
13	-	Spare
14	10	Hazard warning lamps and indicator

Fuses (903, 999, 1116, 1299/1301 and 1301 cc Turbo ie) (continued)

Fuse No.	Rating	Circuit
Supplementary fuses at side of main fuse block:		
A	20	Front fog lamps
B	30	Cooling fan (Turbo ie models)
C	10	Fuel injector cooling fan (Turbo ie models)
D	30	Electric windows
E	10	Fuel pump (Turbo ie models)

Fuses (later 903, 999, 1108, 1372 ie and 1372 cc Turbo ie)

Fuse	Rating	Circuit
1	7.5	LH tail, RH front parking, rear number plate lamps and check panel
2	7.5	RH tail, LH front parking, cigar lighter illumination, clock light, heater control illumination and map reading light
3	10	RH headlamp main beam
4	10	LH headlamp main beam and warning light
5	25	Radiator cooling fan (except Turbo ie models) and horn
6	10	Cigar lighter, courtesy lamps, digital clock, stop-lamp switch, clock and radio
7	10	RH headlamp dipped beam
8	10	LH headlamp dipped beam
9	10	Rear fog lamp and warning lamp
10	20	Heated rear screen and warning lamp
11	10	Instrument panel, stop-lamps, direction indicators, reversing lamps, warning module and carburettor cut-off (FIRE models only)
12	20	Heater fan, heater/ventilation control illumination lights and digital clock light
13	20	Windscreen wiper, windscreen washer pump and rear wiper/washer (where fitted)
14	20	Horns and relay
15	10	Hazard warning light and indicator light
Supplementary fuses at side of main fuse block:		
A	30	Electric windows
B	25	Central locking (where fitted)
C	10	Injector cooling fan (where fitted)
D	20	Headlamp washers (where fitted)
E	20	Foglamp and warning lamp
F	-	Spare
G	10	Fuel pump (fuel injection models)
-	10	Heated Lambda sensor
Supplementary fuses on steering column relay bracket:		
-	10	Antiskid monitor circuit (where fitted)
-	25	Antiskid supply circuit (where fitted)

Steering and suspension

General

1301 cc Turbo ie

Castor	1º 55’ to 2º 35’ positive
Number of turns of steering wheel, lock-to-lock	3.42

Later models

Steering angles:	
Camber	-30’ ± 30’
Castor	2º10’ ± 15’
Toe-in	0 to 2.0 mm

1301/1372 cc Turbo ie

Steering angles of roadwheels:	
Inner wheel	36º 43’
Outer wheel	31º 27’

Torque wrench settings

	Nm	lbf ft
Anti-roll bar clamp bolts (1301 and 1372 cc Turbo ie)	25	18
Anti-roll bar end fixing nuts (1301 and 1372 cc Turbo ie)	15	11

General dimensions, weights and capacities

Dimensions

Overall length	3689 mm
Overall width:	
Base and Super models	1558 mm
SX and Turbo models	1562 mm
Height (unladen):	
1372 cc (except Turbo)	1425 mm
1299/1301 cc (except Turbo)	1420 mm
Turbo	1405 mm
All other models	1415 mm

Weights (kerb)

Note: *3-door model weights are given. Add 15 kg to the following for 5-door models. Weight will also vary according to the model version*.

903 cc	740 kg
999 cc (45, 45 S and 45 SX)	740 to 775 kg
1108 cc (60 S and 60 SX)	760 to 795 kg
1299/1301 cc (70 SX)	770 kg
1301 cc Turbo ie	845 kg
1372 cc (1.4 ie S catalyst)	830 kg
1372 cc ie (70 SX)	795 to 845 kg
1732 cc Turbo ie	925 kg

Capacities

Fuel tank:	
1372 cc Turbo ie	50 litres
All other models	42 litres
Engine oil (with filter change):	
903, 999 and 1108 cc	3.8 litres
1116, 1299/1301 and 1372 cc	4.1 litres
Transmission:	
1301 cc Turbo ie	2.9 litres
1372 cc Turbo ie	2.0 litres
All other engines	2.4 litres
Cooling system:	
903, 999 and 1108 cc	4.6 litres
1116 and 1299/1301 cc, non-catalyst 1372 cc ie	6.2 litres
1372 cc ie with catalyst	6.5 litres
1301 cc Turbo ie	6.9 litres
1372 cc Turbo ie	7.7 litres

3 **Routine maintenance** - all models from June 1991

The maintenance intervals in this manual are provided with the assumption that you, not the dealer, will be carrying out the work. These are the minimum maintenance intervals recommended by us, for vehicles driven daily. If you wish to keep your vehicle in peak condition at all times, you may wish to perform some of these procedures more often. We encourage frequent maintenance, since it enhances the efficiency, performance and resale value of your vehicle.

If the vehicle is driven in dusty areas, used to tow a trailer, or driven frequently at slow speeds (idling in traffic) or on short journeys, more frequent maintenance intervals are recommended.

When the vehicle is new, it should be serviced by an authorised dealer to preserve the factory warranty.

Every 250 miles (400 km), weekly or before a long journey

- ☐ Proceed as described for the earlier models at the start of this manual

Every 6000 miles (10 000 km) or 12 months (whichever comes first)

- ☐ Renew the engine oil and oil filter (Turbo models only)

Every 9000 miles (15 000 km) or 12 months (whichever comes first)

- ☐ Check the tyre pressures and their condition (including the spare)
- ☐ Where a pad wear warning light is fitted, check its operation
- ☐ Check the front brake disc pads for excessive wear
- ☐ Check the underbody condition (fuel and brakes pipes, exhaust system, hoses, bushes and gaiters)
- ☐ Check the condition and tension of drivebelts
- ☐ Check the engine idle speed and CO emissions
- ☐ Check the EGR system (If fitted)
- ☐ Check fluid levels (coolant, brake fluid and windscreen washer)
- ☐ Renew spark plugs (1372 cc Turbo models)
- ☐ Renew the engine oil and oil filter (non-Turbo models)
- ☐ Check the HT leads and connections
- ☐ Check the condition of all coolant, fuel and hydraulic hoses and connections

Every 18 000 miles (30 000 km) or 24 months (whichever comes first)

In addition to the items listed for 9000 mile (15 000 km) or 12 months service

- ☐ Check the rear brake disc pads for wear (where applicable)
- ☐ Check/adjust the valve clearances
- ☐ Check and tighten (if necessary), inlet and exhaust manifolds
- ☐ Check the clutch adjustment (cable operated models)
- ☐ Renew the fuel filter (where applicable)
- ☐ Renew the air cleaner element
- ☐ Renew the spark plugs and check the HT leads and connections (all models)
- ☐ Where applicable, have the ignition and injection systems checked (special equipment needed)
- ☐ Renew coolant
- ☐ Renew brake fluid

Every 28 000 miles (45 000 km) or 36 months (whichever comes first)

In addition to the items listed for 9000 mile (15 000 km) or 12 months service

- ☐ Check Lambda (oxygen) sensors operation (special equipment needed)
- ☐ Check fuel evaporation system (where fitted)
- ☐ Check the transmission oil level
- ☐ Check the condition crankcase ventilation system

Every 37 000 miles (60 000 km) or 48 months (whichever comes first)

In addition to the items listed for 18 000 mile (30 000 km) or 24 months service

- ☐ Check the condition of the rear brake shoe linings
- ☐ Check the condition of the timing belt

Every 65 000 miles (105 000 km)

- ☐ Renew the timing belt

Every 74 500 miles (120 000 km)

- ☐ Renew the manual transmission oil

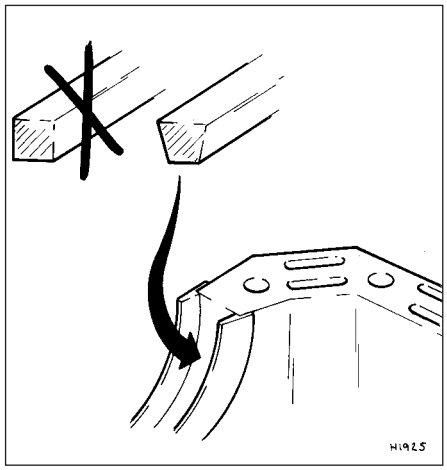


Fig. 13.1 Correct method of fitting sump pan sealing strip (Sec 4)

4 Engine - 903 and 1299/1301 cc

Sump pan sealing strips (903 cc engine) - modification

1 The design of the sealing strips which go between the sump pan and the main bearing caps has been changed. Make sure that the narrower side of the strip fits into the channel in the sump pan.

1299 cc engine - description

2 In April 1984, a 1299 cc engine was introduced, progressively replacing the 1301 cc units used previously. The new engine is identical to the 1301 cc engine described in Chapter 1, with the exception of having a slightly shorter stroke.

3 However, as of approximately September 1987, the 1299 cc unit was phased out, being progressively replaced by the 1301 cc engine used initially.

4 As mentioned above, the two engines are all but identical, so identification of the unit fitted should not be necessary in practice. Consult a FIAT dealer if in doubt.

Rocker cover (903 cc engine) - removal

5 Before removing the rocker cover, it will be necessary to remove the distributor, first. Refer to Chapter 4 for more details.

Cylinder head (903 cc engine) - refitting

6 Modified cylinder head bolts are fitted to 903 cc models, from engine number 8581470. When refitting the cylinder head, tighten each head bolt, as described in Chapter 1, by the torques and angles shown the Specifications in this Chapter.

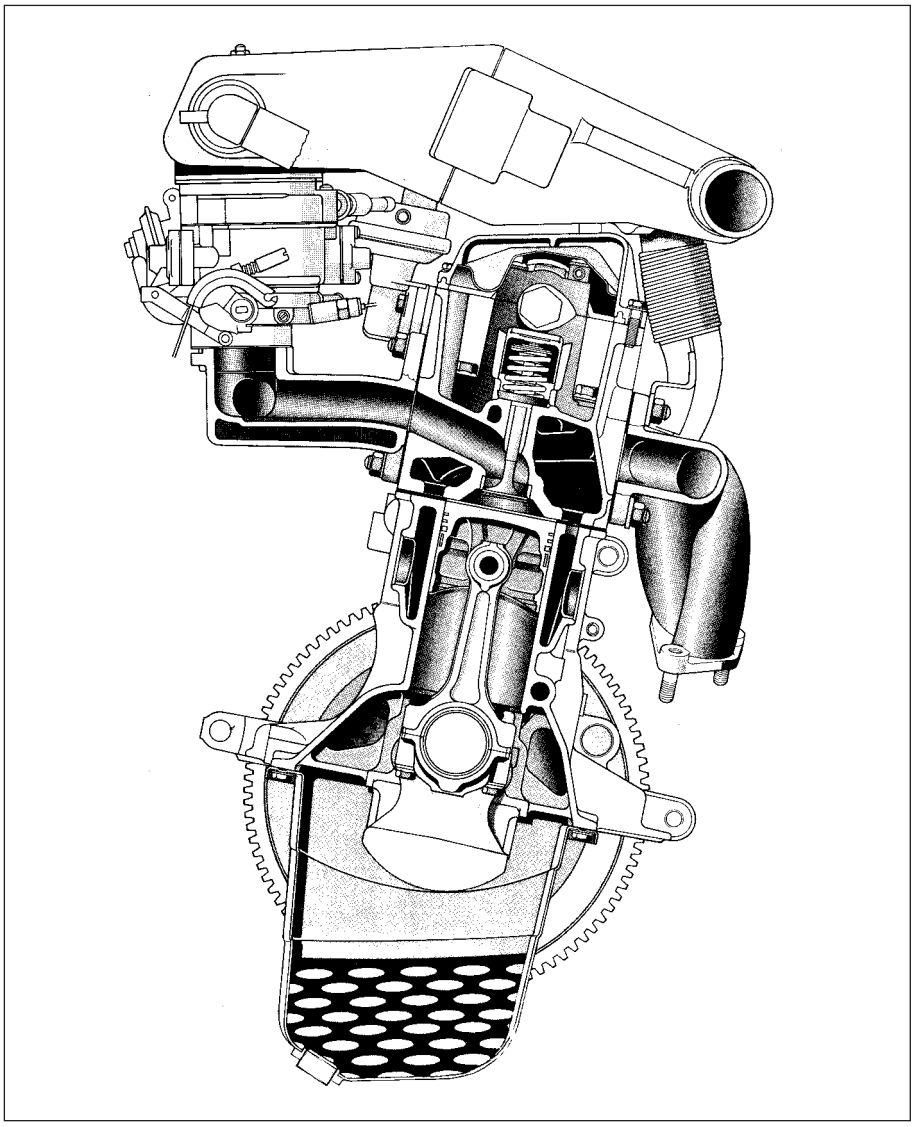


Fig. 13.2 Cross-section view of the 999 and 1108 cc engine (Sec 5A)

5 Engine - 999 and 1108 cc (FIRE)

Note: *Later models are fitted with SPi fuel injection. Where a procedure refers to a carburettor, if applicable, replace with throttle body.*

PART A: GENERAL

Description

1 Both of these engine types are designated FIRE (Fully Integrated Robotised Engine), being largely manufactured and assembled by computer-controlled mechanical robots.

2 The engine is of oversquare design, having four cylinders and a belt-driven overhead camshaft.

3 The high torque of this engine enables higher gear ratios to be used with the result that fuel economy is exceptionally good.

4 The cylinder head is of light alloy, while the cylinder block is cast-iron.

5 The camshaft is supported in three bearings which have detachable caps.

6 Valve clearances are maintained by shims located in the cam followers (tappets).

7 The cylinder head is of crossflow type having the intake manifold (coolant-heated) and exhaust manifold on opposite sides.

8 The pistons have two compression rings and one oil control ring and are connected to the connecting rods by means of a gudgeon pin which is an interference fit in the rod small-end.

9 The crankshaft is supported in five main bearings. The upper section of the centre bearing shell retains semi-circular thrust washers to control crankshaft endfloat.

10 The oil pump, which is of gear type, is

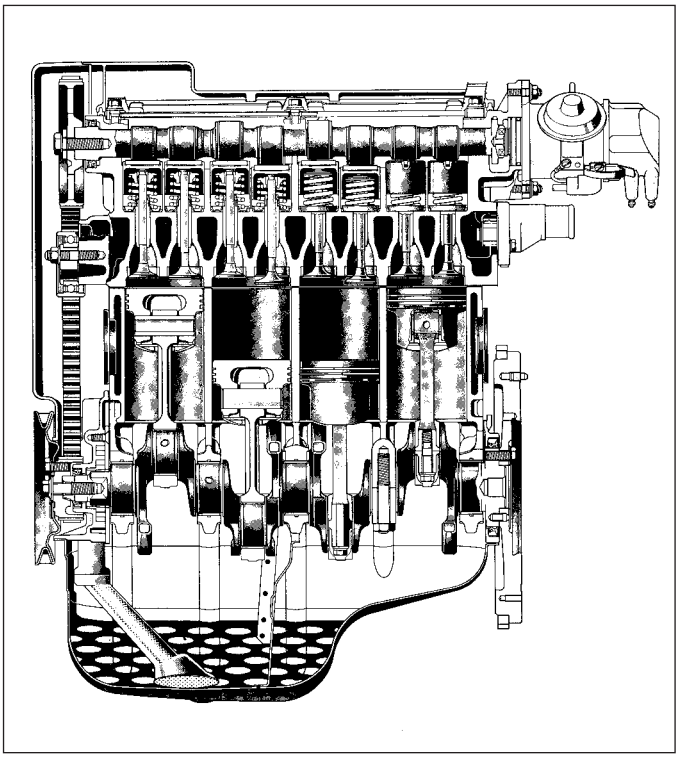


Fig. 13.3 Longitudinal sectional view of the 999 and 1108 cc engine (Sec 5A)

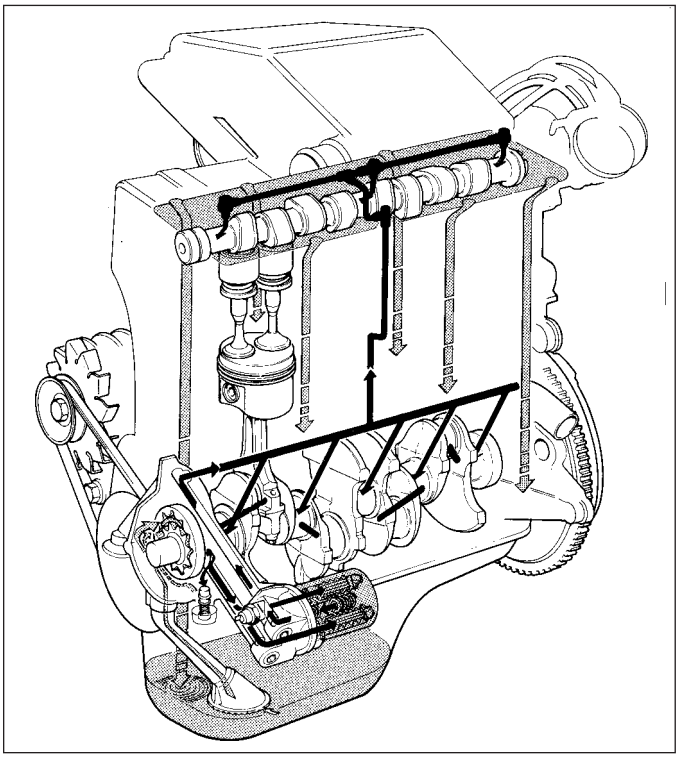


Fig. 13.4 999 and 1008 cc engine lubrication system (Sec 5A)

mounted on the front end of the crankshaft and driven by it.

11 The flexible toothed timing belt drives the camshaft and the coolant pump from a sprocket on the front end of the crankshaft. The belt is tensioned by an eccentrically-mounted pulley.

12 The distributor and the fuel pump (carburettor models) are driven from the flywheel end of the camshaft. The fuel pump on fuel injection models is an integral unit combined with the fuel gauge sender unit and immersed in the fuel tank.

5B.1A Checking a valve clearance

PART B: OPERATIONS POSSIBLE WITH ENGINE IN CAR

Valve clearances - adjustment

1 The operations are similar to those described in Chapter 1, Section 26, but note that the special tools referred to have different part numbers for the FIRE engine - 1860443000 and 1887001000 (photos).

2 Remember that the clearance for inlet and exhaust valves differs see Specifications at the beginning of this Supplement.

3 Counting from the timing cover end of the engine, the valve sequence is as follows.

Inlet 2-4-5-7
Exhaust 1-3-6-8

Timing belt - renewal

4 Remove the air cleaner.

5 Slacken and remove the alternator drivebelt, then remove the spark plugs.

6 Unbolt and remove the timing belt cover. Note the bolt located at the bottom of the cover, this can be easily overlooked (photo).

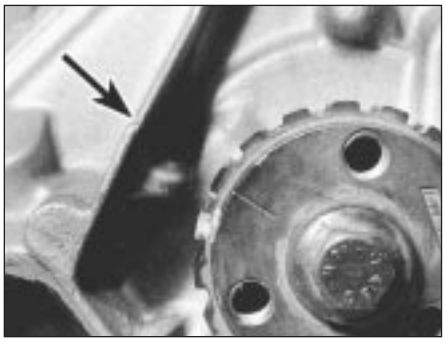
7 Unbolt and remove the crankshaft pulley (photo).

5B.1B Using a modified C-spanner and screwdriver to remove a shim

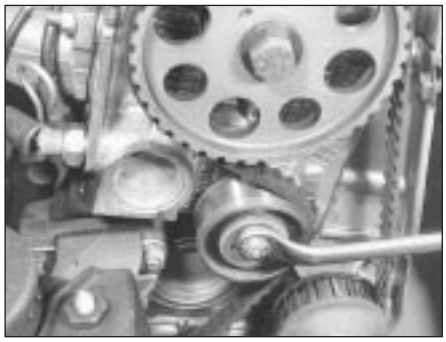
5B.6 Timing cover lower fixing bolt removal

5B.7 Unscrewing the crankshaft pulley bolts

5B.8A Camshaft sprocket timing mark and cylinder head timing mark in alignment



5B.8B Crankshaft sprocket timing mark and oil pump cover alignment mark (arrowed)



5B.9 Releasing the timing belt tensioner nut

8 Turn the crankshaft sprocket bolt, or engage top gear and raise and turn a front roadwheel, until the camshaft sprocket TDC timing mark is aligned with the mark on the cylinder head and the crankshaft sprocket timing mark is aligned with the mark on the oil pump cover (photos).

9 Release the nut on the timing belt tensioner, move the pulley away from the belt and retighten the nut to hold the pulley in the retracted position (photo).

10 Slide the drivebelt from the sprockets.

11 When refitting the new belt, make sure that the sprocket timing marks are still in alignment and fit the belt so that the arrows on the belt point in the direction of engine rotation, and the lines of the belt coincide with the sprocket marks.

12 Engage the timing belt with the crankshaft sprocket first, then place it around the coolant pump sprocket and the camshaft sprocket (photo). Finally slip the belt around the tensioner pulley.

13 Release the tensioner nut and push the pulley against the belt until the belt is quite taut. Check that the sprocket timing marks have not moved out of alignment. If they have, reset them by moving them over the belt teeth.

14 Still applying force to the pulley, tighten its nut.

15 Turn the crankshaft through two complete turns in the normal direction of rotation and check that when the centre of the longest run of the belt is gripped between finger and thumb it can just be twisted through 90º. If increased tension is required to achieve this, release the tensioner nut and prise the pulley against the timing belt. Note: *The above procedure serves only as a rough guide to setting the belt tension having it checked by a FIAT dealer at the earliest opportunity is recommended.*

16 Refit the timing belt cover, the crankshaft pulley, alternator drivebelt, spark plugs and the air cleaner.

Camshaft - removal and refitting

Warning: Refer to the beginning of Section 9 before starting any work.

17 Remove the air cleaner and the fuel pump (carb. models), as described in Section 9 of this Supplement.

18 Remove the distributor (Section 10).

19 Remove the timing belt cover.

20 Unbolt and remove the camshaft cover, having first disconnected the HT lead clip (photos).

21 Turn the crankshaft (by engaging top gear and raising and turning a front roadwheel) until No. 4 piston is at TDC. The timing mark on the camshaft sprocket will be in alignment with the mark on the cylinder head.

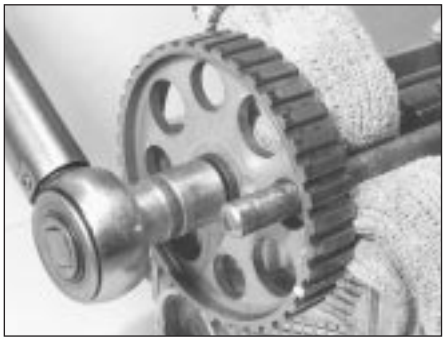
22 Pass a rod through one of the holes in the camshaft sprocket to prevent it rotating and then unscrew the sprocket fixing bolt. Slip the sprocket from the camshaft and out of the loop of the belt (photos).

23 Mark the camshaft bearing caps as to position and then unbolt and remove the

5B.12 Fitting the timing belt

5B.20A Camshaft cover HT lead clip

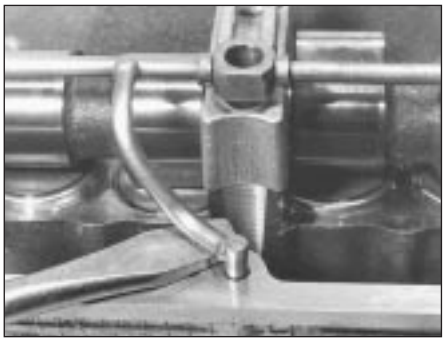
5B.20B Removing the camshaft cover



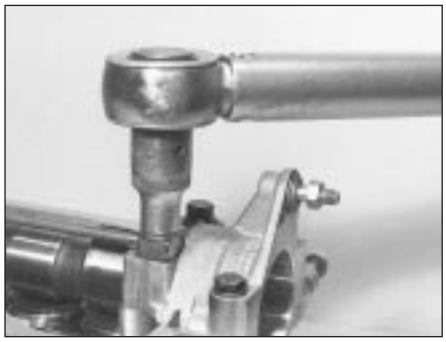
5B.22A Unscrewing the camshaft sprocket bolt

5B.22B Camshaft sprocket bolt and washer

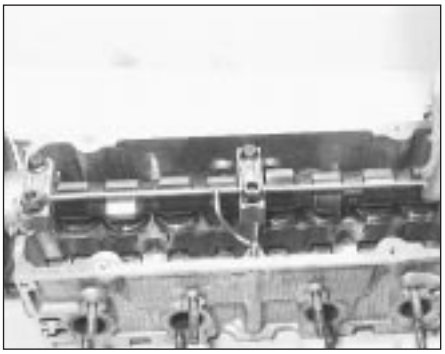
5B.22C Camshaft sprocket showing integral key (arrowed)



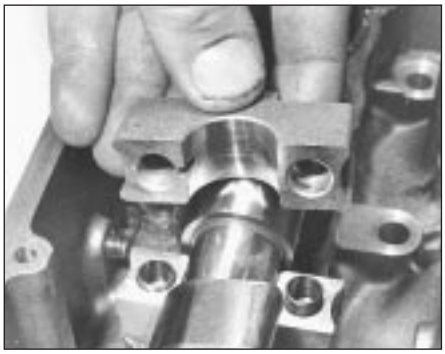
5B.23A Prising out the camshaft oil feed pipe stub



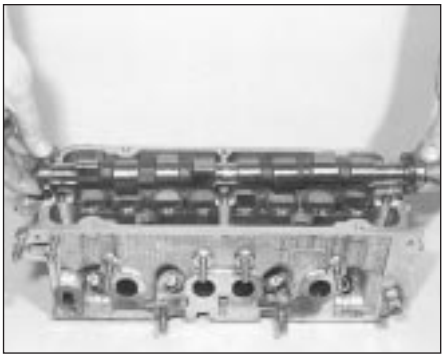
5B.23B Unscrewing the camshaft bearing/banjo union bolt



5B.23C Camshaft lubrication pipe



5B.23D Camshaft bearing cap showing short and long positioning dowels for correct fitting



5B.24 Removing the camshaft

2B.25A Valve clearance shim showing thickness mark

5B.25B Removing a cam follower (tappet) with shim

5B.26A Camshaft oil seal

5B.26B Camshaft cover gasket

lubrication pipe (prise the oil feed stub out with a screwdriver), unscrew the remaining bolts and take off the bearing caps (photos).

24 Lift the camshaft carefully from the cylinder head, checking that the valve clearance shims and cam followers are not withdrawn by the adhesion of the oil (photo).

25 If the shims and cam followers are to be removed, keep them in their originally fitted order (photos).

26 Refitting is a reversal of removal but use a new camshaft oil seal and camshaft cover gasket. Oil the camshaft bearings (photos).

27 Make sure that the timing belt is reconnected and tensioned as described previously.

28 Check the valve clearances.

29 Tighten all nuts and bolts to the specified torque.

Cylinder head - removal and refitting

Warning: Refer to the beginning of Section 9 before starting any work.

Note: *The cylinder head should be removed cold.*

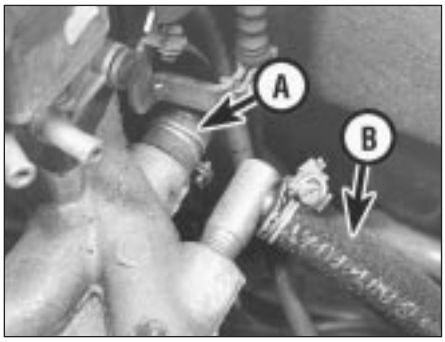
30 Drain the cooling system.

31 Remove the air cleaner.

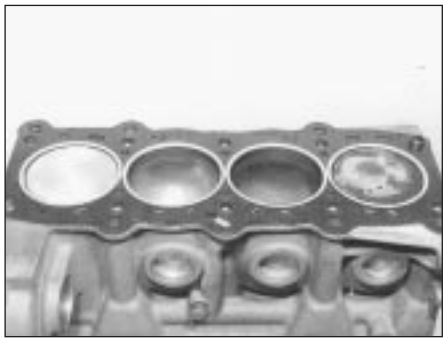
32 Disconnect the throttle and choke connections from the carburettor (photo).

33 On carburettor models, disconnect the fuel hoses from the fuel pump and the carburettor. On fuel injection models,

5B.32 Disconnecting the throttle cable



5B.34 Inlet manifold coolant hose (A) and brake servo vacuum hose (B)



5B.50A Cylinder head gasket

depressurize the fuel system, before disconnecting the fuel pipes and removing the throttle body, as described in Section 9D.

34 Disconnect the coolant and vacuum hoses from the cylinder head and inlet manifold (photo).

35 Disconnect the electrical lead from the coolant temperature switch, the LT leads from the distributor and the idle cut-off solenoid lead.

36 Remove the distributor cap, disconnect the plug leads and place the cap and leads to one side of the engine compartment.

37 Unbolt and remove the timing belt cover.

38 Set No. 4 piston to TDC and then release the timing belt tensioner and slip the belt from the camshaft and coolant pump sprockets.

39 Unbolt and remove the inlet manifold, complete with carburettor, or throttle body as applicable.

40 Unbolt the exhaust manifold from the cylinder head and tie it to one side of the engine compartment; the downpipe bracket will have to be disconnected.

41 Unscrew the cylinder head bolts, a half turn at a time in the reverse order to that shown in Fig. 1.30 of Chapter 1. When the bolts are free, remove them with their washers.

42 Lift the cylinder head from the block. If it is stuck tight, insert pieces of wood into the exhaust or inlet ports and use them as levers to “rock” the head off the block. On no account drive levers into the gasket joint or attempt to tap the head sideways as it is located on positioning dowels.

43 Remove and discard the cylinder head gasket and both manifold gaskets.

44 The cylinder head can be dismantled after removing the camshaft and cam followers as described in the preceding sub-Section.

45 Further dismantling and decarbonising are described in Chapter 1, Section 39. Note that single valve springs are used.

46 If the valves have been ground in, the valve clearances will require adjusting, as described previously. This should be done before the cylinder head is refitted to the engine.

47 Before refitting the assembled cylinder head, make sure that the head and block mating surfaces are perfectly clean, and that the block bolt holes have been cleared of any oil.

48 The camshaft sprocket timing mark must be aligned with the one on the cylinder head.

49 The new gasket should not be removed from its nylon cover until required for use. Fit the gasket dry to perfectly clean surfaces.

50 Place the gasket on the cylinder block so that the word ALTO can be read from above (photos).

51 Lower the cylinder head onto the block so that it locates on the positioning dowels (photo).

52 The cylinder head bolts must have clean threads, dipped in engine oil and allowed to drain for thirty minutes. Screw the bolts in

5B.50B Cylinder head gasket top surface marking

finger-tight and then tighten them in the sequence shown in Fig. 1.30 of Chapter 1, and in the stages specified (see Specification) (photos).

53 Refit the inlet manifold and carburettor using a new gasket.

54 Reconnect the exhaust manifold using a new gasket. Tighten all nuts to the specified torque. Reconnect the exhaust downpipe bracket.

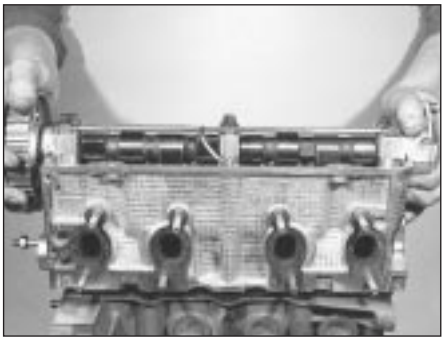
55 Reconnect the timing belt and tension it as described earlier.

56 Refit the timing belt cover and the distributor cap and camshaft cover.

57 Reconnect all hoses, electrical leads and controls.

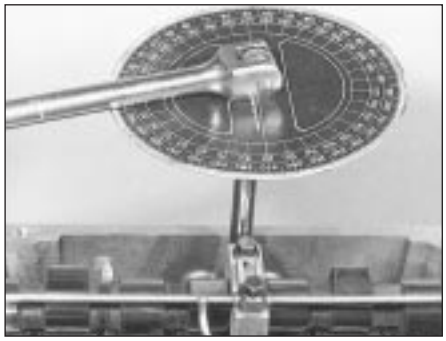
58 Fit the air cleaner.

59 Fill and bleed the cooling system.

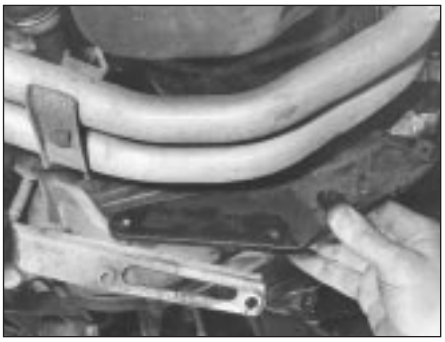


5B.51 Fitting the cylinder head

5B.52A Inserting a cylinder head bolt

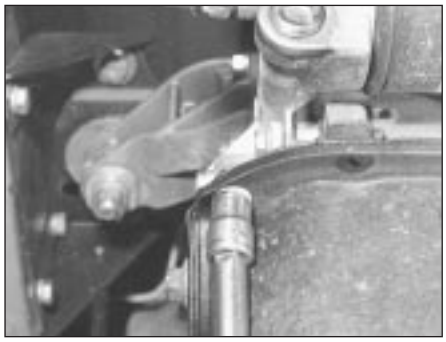


5B.52B Typical disc for angular tightening of cylinder head bolts



5B.61 Removing the flywheel housing cover plate

5B.62 Removing the sump pan



5B.63A Tightening a sump pan screw

Sump pan - removal and refitting

60 Drain the engine oil.
61 Unbolt and remove the cover plate from the lower part of the flywheel housing (photo). The two lower bolts retain the gearchange rod support strut.
62 Unscrew the sump pan securing screws and pull the sump pan downwards to remove it (photo). The joint sealant will require cutting with a sharp knife to release the pan. Clean away all old gasket material.
63 A bead 3.0 mm in diameter of RTV silicone instant gasket should be applied to the sump pan flange and then the pan offered up. Screw in the fixing screws and tighten to the specified torque. Note the flange end fixing screw nuts (photos).
64 Wait one hour before filling with engine oil.
65 Refit the flywheel housing cover plate.

Oil pump - removal, checking and refitting

66 Drain the engine oil and remove the sump pan as described in the last sub-Section. Unscrew and remove the oil filter cartridge.
67 Remove the timing belt.
68 Lock the crankshaft against rotation either by placing a block of wood between a crankshaft web and the inside of the crankcase or by jamming the flywheel starter ring gear with a suitable tool.
69 Unscrew and remove the crankshaft sprocket bolt and take off the timing belt sprocket. If it is tight, use two screwdrivers to lever it off or use a two- or three-legged puller.
70 Unbolt and remove the oil pick-up/filter screen assembly. Note the sealing washer.
71 Extract the oil pump fixing bolts and withdraw the pump.
72 The oil pump incorporates a pressure relief valve which can be removed for examination by depressing the spring plunger and pulling out the keeper plate (photos).
73 If pump wear is suspected, check the gears in the following way. Extract the fixing screws and remove the rear cover plate. The screws are very tight and will probably require the use of an impact driver to release them (photo).
74 Check the clearance between the outer gear and the pump housing using feeler blades, and also the gear endfloat by placing a straight-edge across the pump body and checking the gap between the straight-edge and gear face. If the clearances are outside the specified tolerance, renew the oil pump complete (photos).

5B.63B Sump pan flange end fixing screw and nut

5B.72A Removing the oil pump relief valve keeper plate

5B.72B Oil pump relief valve components

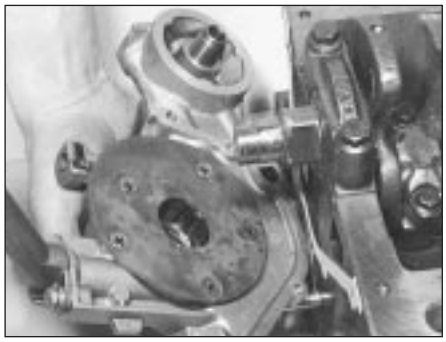
5B.73 Removing the oil pump rear cover plate screws

5B.74A Checking the oil pump gear-to-housing clearance

5B.74B Checking the oil pump gear endfloat

5B.77A Removing the oil pump seal

5B.77B Using a socket to fit the new oil pump oil seal

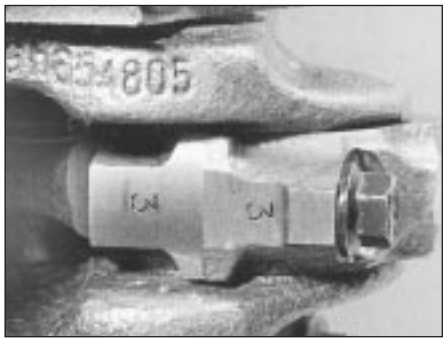


5B.78 Fitting the oil pump

75 If the pump is unworn, refit the rear cover plate and tighten the screws fully.
76 Apply air pressure from a tyre pump to the oil pump oil ducts to clear any sludge or other material and then prime the pump by pouring clean engine oil into its intake duct at the same time turning the oil pump inner gear with the fingers.
77 Lever out the oil seal and drive a new one squarely into the oil pump casing (photos). Lubricate the oil seal lips.
78 Bolt the pump into position using a new joint gasket. Note one bolt is longer than the others (photo).
79 Bolt on the oil pick-up assembly using a new sealing washer.
80 Fit the crankshaft sprocket and tighten the bolt to specified torque.
81 Fit and tension the timing belt.
82 Fit the sump pan. Screw on a new oil filter cartridge. Wait for the specified period of time (one hour) and then fill the engine with oil.
83 Run the engine for a few minutes, then check and top up the oil level.

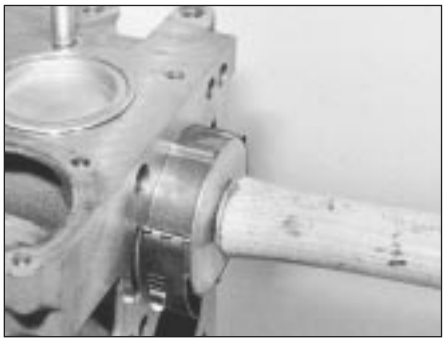
Pistons/connecting rods - removal and refitting

84 Remove the sump pan.
85 Unbolt and remove the oil pump pick-up/filter screen assembly.
86 The big-end bearing shells can be renewed without having to remove the cylinder head if the caps are unbolted and the piston/connecting rod pushed gently about one inch up the bore (the crankpin being at its lowest point). If these shells are worn, however, the main bearing shells will almost certainly be worn as well, necessitating a complete overhaul, including crankshaft removal.
87 To remove the piston/connecting rods, the cylinder head must be removed.
88 The big-end caps and their connecting rods are numbered 1, 2, 3 and 4 from the timing cover end of the engine. The numbers are located either side of the rod/cap joint on the engine oil dipstick tube side (photo).
89 Turn the crankshaft as necessary to bring the first connecting rod big-end crankpin to its lowest point, then unscrew the cap bolts and remove the cap and shell bearing.
90 Push the connecting rod/piston assembly up the bore and out of the cylinder block. There is one reservation; if a wear ridge has developed at the top of the bores, remove this by careful scraping before trying to remove the piston/rod assemblies. The ridge will otherwise prevent removal, or break the piston rings during the attempt.
91 Remove the remaining piston/connecting rods in a similar way. If the bearing shells are to be used again, tape them to their respective caps or rods.
92 Removal of the piston rings and separation of the piston from the connecting rod is covered in the next sub-Section.
93 Fit the bearing shells into the connecting rods and caps, ensuring that the recesses into which the shells seat are clean and dry.
94 Check that the piston ring gaps are evenly spaced at 120º intervals. Liberally oil the rings and the cylinder bores.
95 Fit a piston ring clamp to compress the rings, oiling the rings and the clamp interior surfaces liberally.
96 Insert the first piston/connecting rod into its cylinder bore. Make sure that the assembly is the correct one for its particular bore. The cap and rod matching numbers must be towards the engine oil dipstick guide tube and the arrow on the piston crown towards the timing belt (photo).
97 Push the piston into the bore until the piston ring clamp is against the cylinder block and then tap the crown of the piston lightly to push it out of the ring clamp and into the bore (photo).
98 Oil the crankshaft journal and fit the big-end of the connecting rod to the journal. Check that the bearing shells are still in position, then fit the big-end cap and bolts; check that the cap is the right way round (photo).



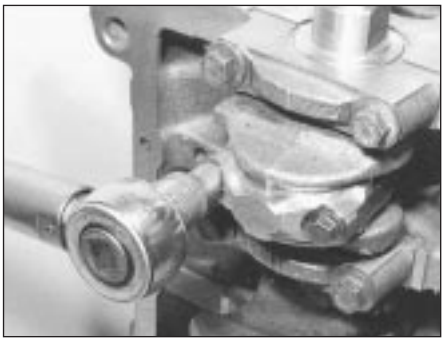
5B.88 Connecting rod and cap numbers

5B.96 Piston directional arrow



5B.97 Fitting a piston/connecting rod

5B.98 Fitting a big-end bearing cap



5B.99 Tightening a big-end cap bolt

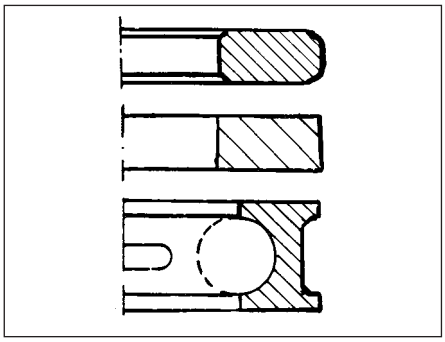


Fig. 13.5 Piston ring arrangement on the 999 cc engine (Sec 5B)

99 Tighten the big-end bolts to the specified torque (photo). The correct torque is important as the bolts have no locking arrangement. After tightening each big-end, check that the crankshaft rotates smoothly.
100 Repeat the operations on the remaining piston/rod assemblies.
101 Refit the oil pump pick-up assembly using a new sealing ring.
102 Refit the sump pan and the cylinder head as described in earlier sub-Sections.
103 Fill the engine with oil and coolant.

Pistons/connecting rods - separation and piston ring renewal

104 If the piston/connecting rods have been removed in order to renew the piston rings, refer to Chapter 1, Section 18, but note that the piston rings should be fitted so that the word TOP is uppermost.
105 If new pistons are to be fitted, it is recommended that the gudgeon pins are removed and refitted by a FIAT dealer as the connecting rods must be carefully heated in order to be able to push the gudgeon pin out of the rod small-end, change the piston and push the pin back into position. Locating the gudgeon pin will require a special tool. The gudgeon pin is a sliding fit in the piston but an interference fit in the connecting rod.
106 Refer to Fig. 13.6 for the correct assembly of the piston and connecting rod.

Engine/transmission mountings - renewal

107 Refer to Chapter 1, Section 33. Three mountings are used (photos).

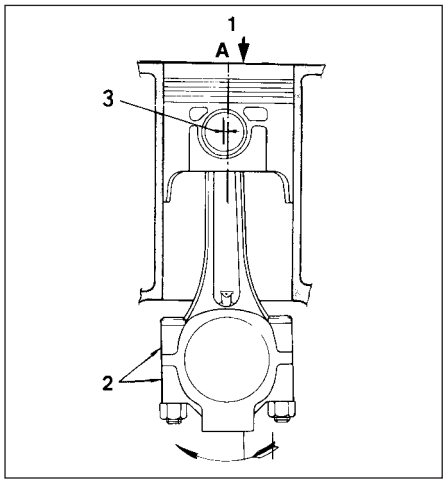


Fig. 13.6 Piston/connecting rod correctly assembled - 999 and 1108 cc engine (Sec 5B)

1 Piston grade (A) and directional arrow on piston crown (towards timing belt)
2 Rod/cap matching numbers
3 Gudgeon pin offset in piston (0.9 to 1.1 mm)
Arrow indicates crankshaft rotation direction

PART C: ENGINE REMOVAL AND DISMANTLING

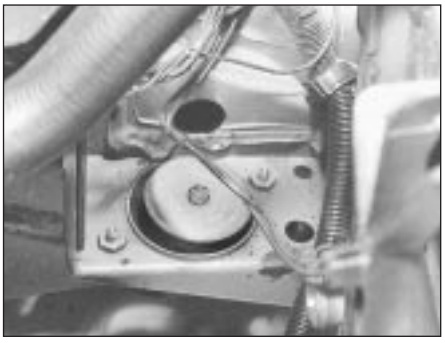
Method of removal - general

1 The engine, complete with transmission, should be removed upwards out of the engine compartment.

Engine/transmission - removal and separation

Warning: Refer to the beginning of Section 9 before starting any work.

2 Mark the position of the hinges on the underside of the bonnet and then, with the help of an assistant, unscrew the hinge bolts and lift the bonnet to a safe storage area.
3 Drain the coolant; a cylinder block drain plug is not fitted.
4 Drain the engine and transmission oils.
5 Disconnect the battery, negative lead first.
6 Remove the air filter.
7 Disconnect the radiator hoses from the engine (photos).



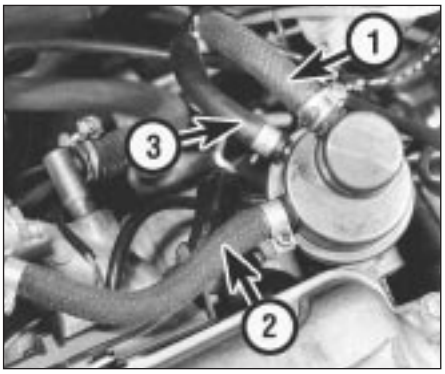
5B.107A Left-hand front engine/transmission mounting

5B.107B Left-hand rear engine/transmission mounting

5B.107C Right-hand engine mounting

5C.7A Radiator hose connection to coolant distribution tube

5C.7B Radiator hose at thermostat housing

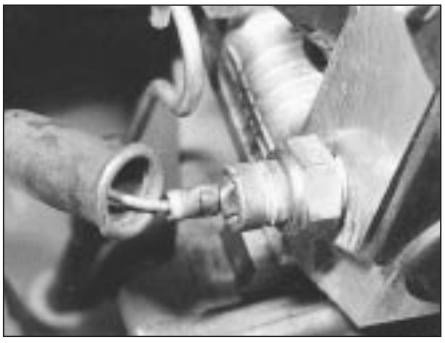


5C.9 Fuel hose identification at pump; inlet hose (1), hose to carburettor (2), return hose (3)

5C.12 Choke cable connection at carburettor

5C.15 Ignition coil HT lead connection

8 Disconnect the heater hose from the inlet manifold.
9 On fuel injection models, depressurize the fuel system (refer to Section 9D). Disconnect the fuel inlet and return hoses from the fuel pump (photo) or throttle body, as applicable.
10 Disconnect the brake servo vacuum hose from the inlet manifold.
11 Disconnect the throttle cable from the carburettor, or throttle body as applicable.
12 Disconnect the choke cable, if applicable (photo).
13 Disconnect the leads from the alternator.
14 Disconnect the battery earth lead from the transmission casing.
15 Disconnect the leads from the starter motor and the HT lead from the ignition coil (photo).
16 Disconnect the coolant temperature switch lead and the HT leads from the distributor (photo).
17 Disconnect the lead from the carburettor fuel cut-off (anti-diesel) solenoid valve, where applicable.
18 Disconnect the lead from the oil pressure switch (photo).
19 Although not essential, removal of the radiator is recommended as a precaution against its damage during removal of the power unit. Disconnect the wiring plugs from the fan and thermostatic switches (photos).
20 Disconnect the leads from the reversing lamp switch on the transmission.
21 Disconnect the clutch cable from the release lever on the transmission.
22 Disconnect the speedometer cable from the transmission by unscrewing the knurled ring.
23 Working under the car, disconnect the exhaust downpipes from the manifold and the lower support bracket (photos).
24 Disconnect the gearchange rods from the levers on the transmission. One rod is retained by a spring clip, the other by a



5C.16 Coolant temperature switch

5C.18 Oil pressure switch

5C.19A Radiator retaining clip

5C.19B Radiator fan motor wiring connector

5C.19C Radiator fan cut-out thermostatic switch

5C.19D Removing the radiator/fan assembly

5C.23A Exhaust downpipe flange nuts

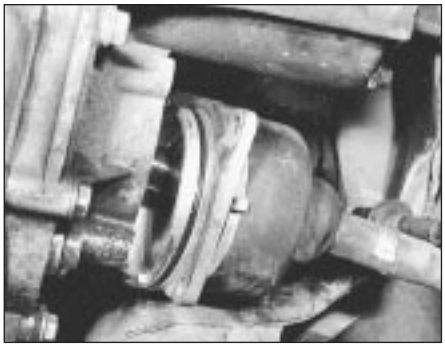
5C.23B Unscrewing the exhaust pipe lower support bracket bolt

5C.24A Gearchange rod connecting pin and spring clip

5C.24B Gearchange rod with ball socket connection

5C.24C Gearchange rod support bracket

5C.25A Two of the left-hand driveshaft joint gaiter retaining plate screws (arrowed)



5C.25B Driveshaft joint gaiter withdrawn

5C.26 Left-hand rear (lower) transmission mounting disconnected

5C.31A Right-hand engine mounting disconnected

5C.31B Left-hand engine mounting and bracket

snap-on ball socket. Unbolt the gearchange rod support bracket from the cover plate on the flywheel housing (photos).

25 Remove the screws from the driveshaft inboard gaiter retaining plates (photos). Expect slight oil loss.

26 Disconnect the rear left-hand transmission mounting. Do this by unscrewing the two outer bolts not the centre one. The engine will incline to the rear once the mounting is released (photo).

27 Raise the front of the car and support it securely so that the front roadwheels hang free.

28 Remove the front roadwheels.

29 Unscrew the tie-rod end balljoint taper pin nuts, and then using a suitable “splitter” tool, disconnect the balljoints from the eyes of the steering arms.

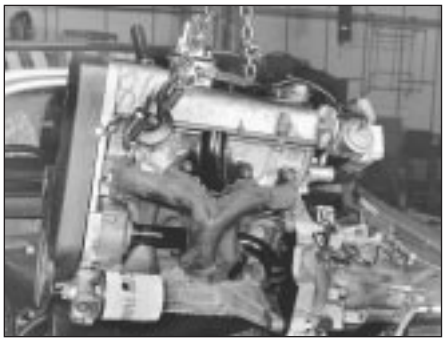
30 Unscrew the bolts from the clamps at the bottom of the front suspension struts, tilt the hub carriers outwards and partially disconnect the driveshaft inboard joints from the transmission.

31 Support the weight of the engine/transmission on a suitable hoist, and then disconnect the right-hand and left-hand front engine/transmission mountings (photos).

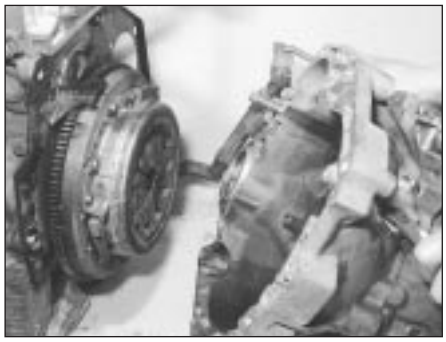
32 Unbolt and remove the engine mounting brackets from the engine and the transmission (photo).

33 Raise the power unit slowly until the driveshafts release from the transmission and

5C.32 Right-hand engine mounting brackets on body and engine



5C.34 Lifting out the engine and transmission



5C.39 Separating the engine and transmission

can be lowered to rest on the exhaust and bodymember.

34 Continue to raise the engine and the transmission until it can be removed from the engine compartment and placed on the work surface (photo).

35 Clean the exterior of the engine and transmission by steam cleaning or using a water soluble solvent.

36 Unbolt and remove the starter motor.

37 Unscrew the flywheel housing-to-engine flange bolts. Note the location of the engine lifting lug.

38 Unbolt and remove the lower cover plate from the flywheel housing.

39 Pull the transmission from the engine. It is located by two hollow dowels and one stud (photo).

Dismantling - general

40 Refer to Chapter 1, Section 14.

Complete dismantling

Warning: Refer to the beginning of Section 9 before starting any work.

41 Unbolt and remove the camshaft cover.

42 Unbolt and remove the timing belt cover.

43 Remove the distributor (Section 10).

44 Remove the hot air collector and the exhaust manifold.

45 Release, disconnect and remove the coolant distribution pipe from the rear of the coolant pump.

46 Unscrew and discard the oil filter cartridge.

47 Unbolt the thermostat housing, discard the joint gasket.

48 Remove the fuel pump, together with its insulator block and actuating pushrod, if applicable.

49 Remove the carburettor, or throttle body, as appropriate.

50 Remove the inlet manifold and discard the joint gasket.

51 Remove the alternator and its drivebelt and withdraw the engine oil dipstick.

52 Unbolt and remove the crankshaft pulley.

53 Unbolt and remove the timing belt tensioner.

54 Remove the timing belt.

55 Unbolt and remove the coolant pump.

56 Remove the cylinder head.

57 Remove and discard the cylinder head gasket.

58 Remove the clutch.

59 Lock the flywheel starter ring gear teeth and remove the crankshaft sprocket bolt and sprocket.

60 Unbolt and remove the sump pan, then the exhaust pipe support bracket (photos).

61 Prevent rotation of the crankshaft by locking the starter ring gear teeth and then unbolt and remove the flywheel. The flywheel can only be fitted in one position as it is located on a dowel.

62 Remove the engine rear plate. Note the small socket-headed screw which holds the timing index plate (photo).

63 Unbolt and remove the oil pump pick-up assembly, followed by the oil pump itself.

64 Turn the engine on its side and remove the piston/connecting rod assemblies.

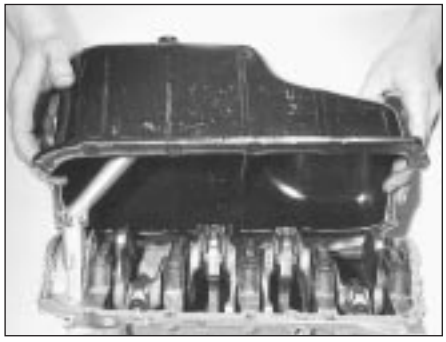
65 Stand the engine on its cylinder block machined face, and then unbolt and remove the crankshaft rear oil seal retainer. Discard the gasket.

66 Note the markings on the main bearing caps. One line on the cap nearest the timing belt, then two, C for centre cap, then three and four (photo).

67 The caps will only fit one way round.

68 Unbolt the main bearing caps, removing them with the shell bearings.

69 Lift the crankshaft from the crankcase and remove the bearing half shells from the

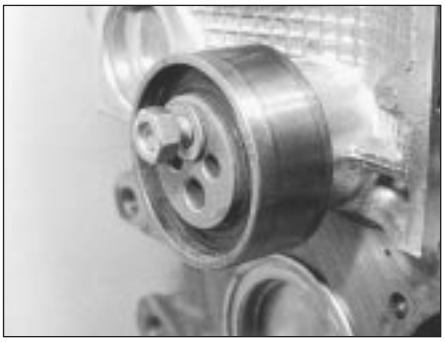


5C.60A Removing the sump pan

5C.60B Exhaust pipe support bracket attached to crankcase

5C.62 Unscrewing socket-head screw from timing index plate

5C.66 Main bearing cap markings



5C.80 Timing belt tensioner

crankcase. If the shells are to be used again, keep them with their respective bearing caps.
70 The thrust washers which control crankshaft endfloat are located in the crankcase, and retained by the turned-over edges of the centre main bearing shell.
71 The engine is now fully stripped.

Examination and renovation

72 The procedures for the following items are essentially as described in Chapter 1, Section 18.

Cylinder block and crankcase
Crankshaft and bearings
Flywheel
Oil seals and gaskets

Cylinder head

73 Using a straight-edge, check the cylinder head gasket surface for distortion. If it exceeds the specified tolerance, it must be surface ground by your dealer.

5D.2 Main bearing shell in crankcase

5D.3 Crankshaft thrust washer at centre bearing

Fig. 13.7 Metal removing areas (arrowed) on connecting rod - 999 and 1108 cc engine (Sec 5C)

74 Refer to Chapter 1, Section 39, for dismantling and renovation operations. Note that single valve springs are fitted.

Oil pump

75 Checking operations are described in sub-Section B.

Pistons and connecting rods

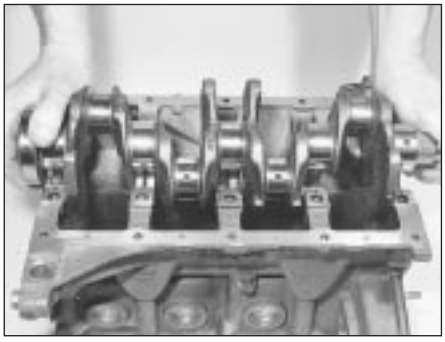
76 Refer to sub-Section B.
77 If one or more connecting rods are changed, it is important that its weight is identical to that of the original. Use an accurate balance to weigh them and remove metal if necessary from the new rod in the areas indicated in Fig. 13.7.

Camshaft and cam followers

78 If the camshaft journals or bearings show any sign of wear or scoring, then the camshaft, or cylinder head, or both must be renewed.
79 The cam followers should be checked for ovality using a micrometer. Unless unworn they should be renewed.

Timing belt tensioner and timing belt

80 The tensioner is a lubricant-sealed pulley, and it should be tested for smooth and quiet operation by turning it with the fingers. Any evidence of roughness or rattle will indicate the need for a new assembly (photo).



5D.4 Fitting the crankshaft

Fig. 13.8 Checking a cam follower for ovality - 999 and 1108 cc engine (Sec 5C)

81 The timing belt should be inspected at regular intervals for correct adjustment and condition (see Section 3 or "*Routine maintenance"* at the beginning of the Manual). If there is evidence of worn teeth, cracking or fraying, or oil contamination, renew the belt. The vehicle manufacturers recommend that the belt is renewed whenever it is removed, and it should certainly be renewed at the intervals specified in Section 3 or the main "*Routine maintenance"* section at the beginning of this Manual as a precautionary measure against belt breakage and consequent expensive engine damage.

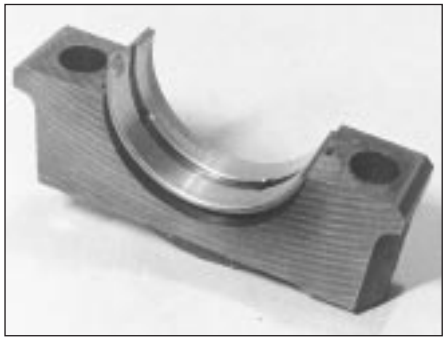
PART D: ENGINE REASSEMBLY AND REFITTING

Reassembly - general

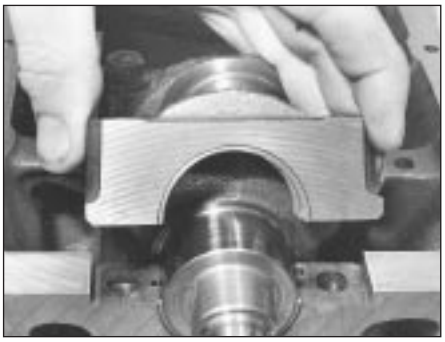
1 Refer to Chapter 1, Section 19.

Complete reassembly

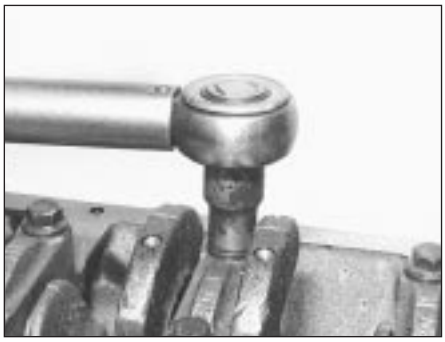
2 With the cylinder block/crankcase standing on the work surface, fit the bearing half shells into their crankcase seats (photo). Make sure that the seats are perfectly clean as dirt or grit trapped under the shell will cause binding when the crankshaft is turned.
3 The centre bearing crankcase web incorporates the thrust washers held by the lips of the bearing shell (photo).
4 Oil the shells and lower the crankshaft into the crankcase (photo).
5 Fit the bearing shells into the main bearing caps, again making sure that the shell seats are perfectly clean (photo).



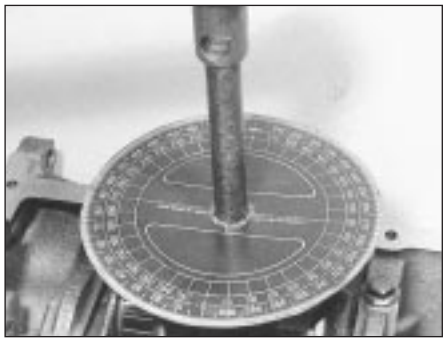
5D.5 Main bearing cap and shell



5D.6 Fitting a main bearing cap



5D.7A Initial tightening of a main bearing cap bolt



5D.7B Angle-tightening a main bearing cap bolt

6 Fit the main bearing caps in their numbered sequence and the correct way round (photo).
7 Clean the threads of the main bearing cap bolts, lightly oil them and screw them in finger-tight. Tighten all bolts progressively to the specified torque, then check that the crankshaft turns smoothly and evenly (photos).
8 Now check the crankshaft endfloat. Do this using a dial gauge or feeler blades inserted between the machined shoulder of a journal and the side of the bearing cap (photo). Move the crankshaft fully in one direction and then the other to ensure that full movement is obtained. If the endfloat is outside the specified tolerance and new bearing shells have been fitted, then a fault must have occurred during crankshaft regrinding.
9 Fit a new oil seal to the crankshaft rear oil seal retainer. Apply grease to the seal lips. A conventional gasket is not used at the oil seal joint face but a 3.0 mm diameter bead of RTV silicone instant gasket must be applied to a clean surface as shown in Fig. 13.9 (photo).
10 Bolt the retainer into position. One hour at least must be allowed for the RTV to cure before oil contacts it.
11 Turn the engine on its side and fit the piston/connecting rods as described in sub-Section B.
12 Fit a new oil seal to the oil pump, oil the seal lips and bolt on the pump using a new joint gasket (photos).
13 Use a new sealing washer and fit the oil pick-up/filter screen assembly.
14 Fit the engine rear plate and then the flywheel on its mounting flange. Apply thread-locking fluid to (clean) bolt threads and screw in the bolts to the specified torque (photo). Hold the flywheel against rotation by locking the starter ring gear with a suitable tool.
15 Fit the sump pan as described in sub-Section B.
16 Fit the crankshaft sprocket so that the timing mark is visible. Lock the flywheel starter ring gear teeth, and screw in and

5D.8 Checking crankshaft endfloat using a dial gauge

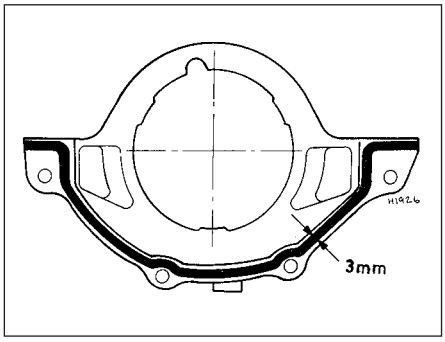
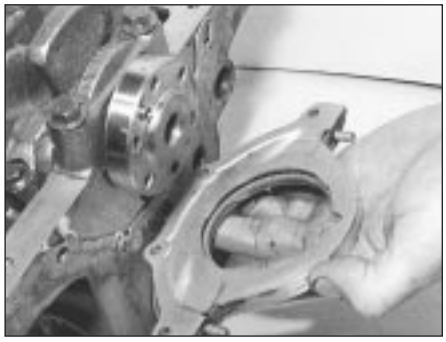
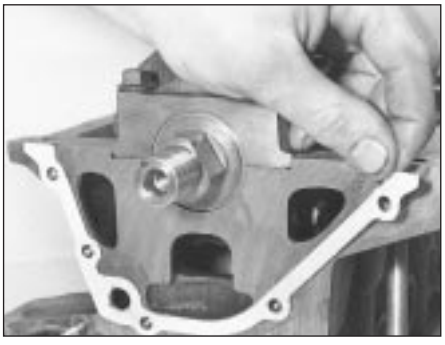


Fig. 13.9 Application area for silicone gasket on crankshaft rear oil seal retainer (Sec 5D)



5D.9 Fitting crankshaft rear oil seal retainer



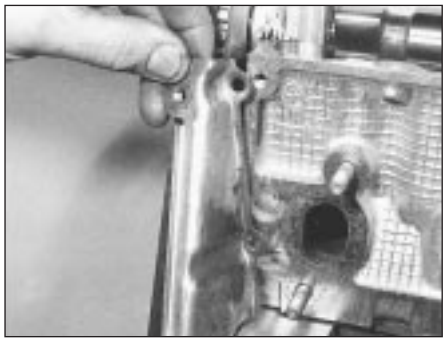
5D.12A Oil pump gasket

5D.12B Tightening an oil pump bolt

5D.14 Tightening a flywheel bolt

5D.16A Crankshaft sprocket showing integral key

5D.16B Tightening the crankshaft sprocket bolt



5D.20 Fitting the timing belt rear cover

tighten the sprocket bolt to the specified torque (photos).

17 Refit the clutch to the flywheel as described in Chapter 5. Make sure that the driven plate is centralised.

18 Fit the cylinder head.

19 Refit the coolant pump. A conventional gasket is not used at the joint face, but apply a continuous bead of RTV silicone instant gasket 3.0 mm in diameter to the pump mating surface. Allow at least one hour for curing before permitting coolant to contact it.

20 Fit the timing belt rear cover, then the timing belt tensioner and lock in its retracted position (photo).

21 Fit and tension the timing belt as described in sub-Section B.

22 Bolt on the crankshaft pulley (photo).

23 Refit the alternator and drivebelt (photo).

24 Refit the engine oil dipstick.

25 Using a new gasket, bolt on the inlet manifold, tightening the nuts to the specified torque (photos).

26 Refit the carburettor, or throttle body, as appropriate.

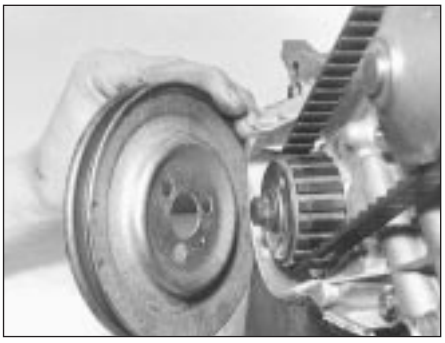
27 Fit the fuel pump, insulator block and actuating rod, if applicable. Make sure that a new gasket is placed on each side of the pump insulator block.

28 Using a new gasket, bolt on the thermostat housing.

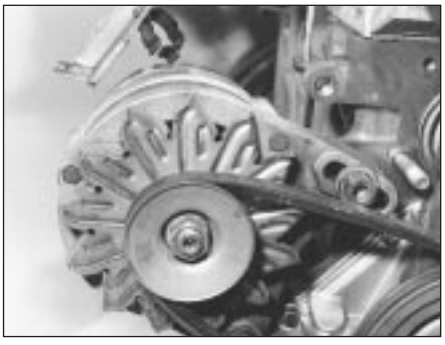
29 Oil the sealing ring of a new oil filter cartridge and screw it into position using hand pressure only (photo).

30 Refit the coolant distribution pipe to the rear of the coolant pump. Use a new seal (photo).

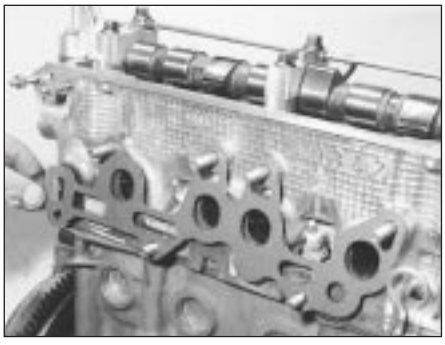
31 Using a new gasket, bolt on the exhaust manifold (photo).



5D.22 Crankshaft pulley installation



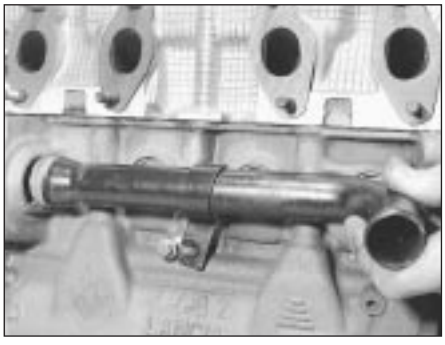
5D.23 Alternator and drivebelt



5D.25A Inlet manifold gasket

5D.25B Fitting the inlet manifold

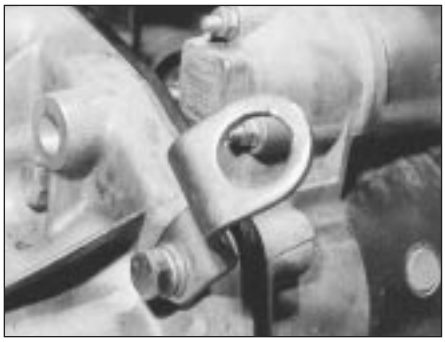
5D.29 Oil filter cartridge and mounting base



5D.30 Coolant distribution pipe

5D.31 Exhaust manifold

5D.32 Air cleaner hot air collector plate



5D.38 Lifting eye on flywheel housing flange

5D.45 Connecting ball socket type gearchange rod

32 Fit the hot air collector plate for the air cleaner (photo).
33 Refer to Section 10 and fit the distributor.
34 Bolt on the timing belt cover.
35 Fit the camshaft cover, using a new gasket unless the original one is in perfect condition.

Engine/transmission - reconnection and refitting

36 Locate the engine in an upright position on wooden blocks to allow for the greater depth of the transmission flywheel housing when it is joined to the engine.
37 Make sure that the clutch driven plate has been centralised, offer the transmission to the engine and locate the flywheel housing on the single stud and dowels.
38 Tighten the connecting bolts to specified torque, having located the lifting eye (photo).
39 Bolt on the starter motor.
40 Refit the cover plate to the flywheel housing, but do not insert the lower bolts at this stage as they retain the support bracket for the gearchange rod.
41 The engine and transmission are now ready for refitting. The operations are a direct reversal of the operations described earlier, but observe the following points.
42 Have the engine/transmission perfectly horizontal and suspended on the hoist.
43 Lower it into position very slowly until it is possible to engage the driveshaft inboard joints with the transmission.
44 Continue lowering until the driveshafts can be fully engaged and the mountings reconnected. Remove the hoist.
45 Tighten all nuts and bolts to the specified torque. Note the method shown for connecting the gearchange rod ball socket using pliers (photo).
46 Refill the engine with oil and coolant and replenish the transmission oil.

Initial start-up after major overhaul

47 Refer to Chapter 1, Section 45.

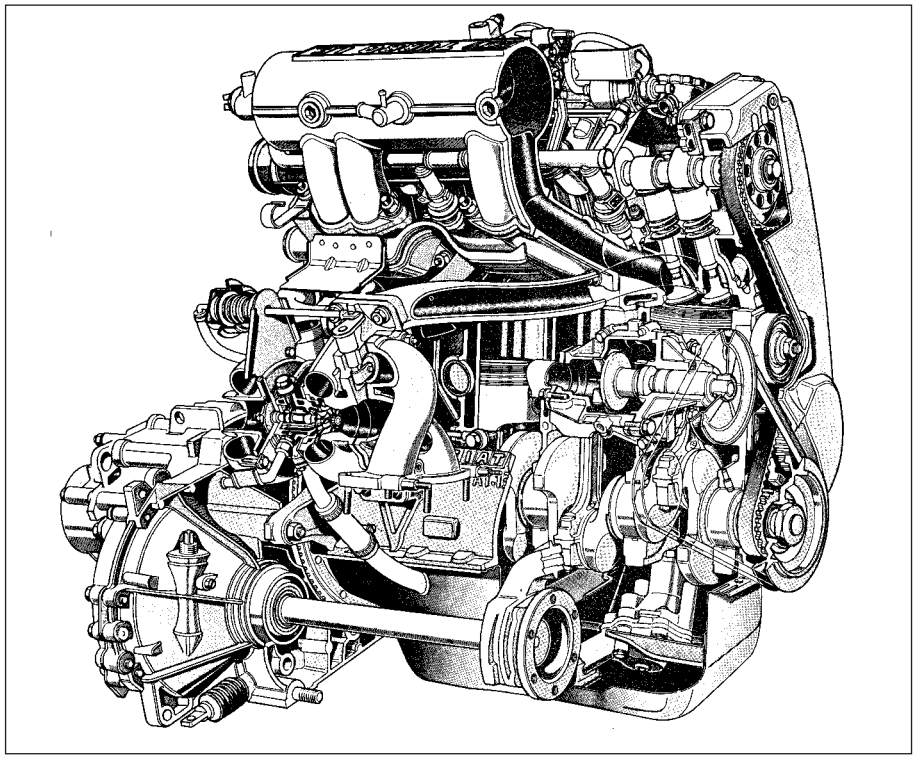


Fig. 13.10 Cutaway view of the 1301 cc Turbo ie engine (Sec 6A)

6 Engine - 1301 cc Turbo ie

PART A: GENERAL

Description

1 This engine is similar in design to the 1301 cc engine described in Chapter 1, but the fuel and ignition systems are different, and a turbocharger, oil cooler and intercooler are fitted.
2 Many dimensions and tolerances have been altered for this engine, and reference should be made to the Specifications at the beginning of this Supplement.
3 Operations which differ from those described in Chapter 1 are given in the following sub-Sections.

Lubrication system - description

4 The lubrication system differs from the non-Turbo 1301 cc engine in the following respects.
5 An oil cooler is fitted, which comprises a matrix with inlet and outlet hoses connected to the oil filter cartridge mounting base.
6 A thermostatic control switch is fitted, which diverts the oil flow through the matrix only at oil temperatures above 84ºC (183ºF). Note that a faulty switch will require renewal of the complete oil filter mounting base.
7 Special oil spray nozzles are located in the crankcase main bearing webs, to cool the underside of the pistons.
8 The ball-type valves in the nozzles open when the engine oil pressure reaches 1.2 bars (17.4 lbf/in^2).
9 An oil pressure sender unit is screwed into

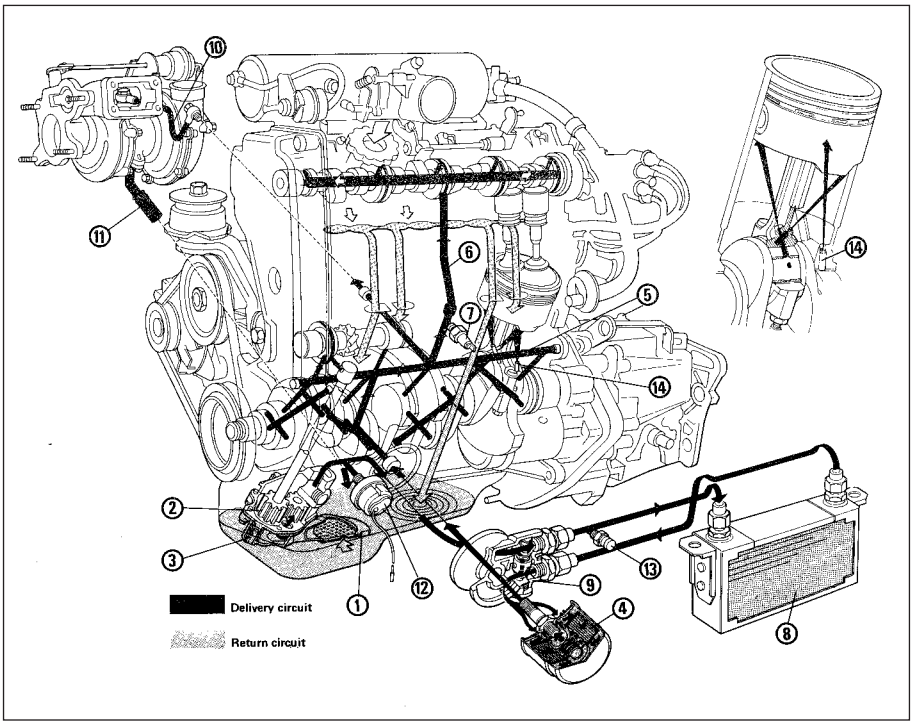


Fig. 13.11 1301 cc Turbo ie engine lubrication system (Sec 6A)

1 Oil pick-up strainer
2 Oil pump
3 Oil pressure relief valve
4 Oil filter cartridge
5 Main oil gallery
6 Camshaft oil feed
7 Low oil pressure switch
8 Engine oil cooler
9 Filter mounting base
10 Turbocharger oil feed
11 Turbocharger oil return
12 Oil pressure sender unit
13 Oil temperature sender unit
14 Piston oil spray nozzle

the crankcase to operate the oil pressure gauge. In addition, a low oil pressure switch screwed into the camshaft oil gallery actuates a warning light on the instrument panel in the event of the pressure dropping dangerously low (photo).

10 Oil supply/return ducts provide the turbocharger lubrication.

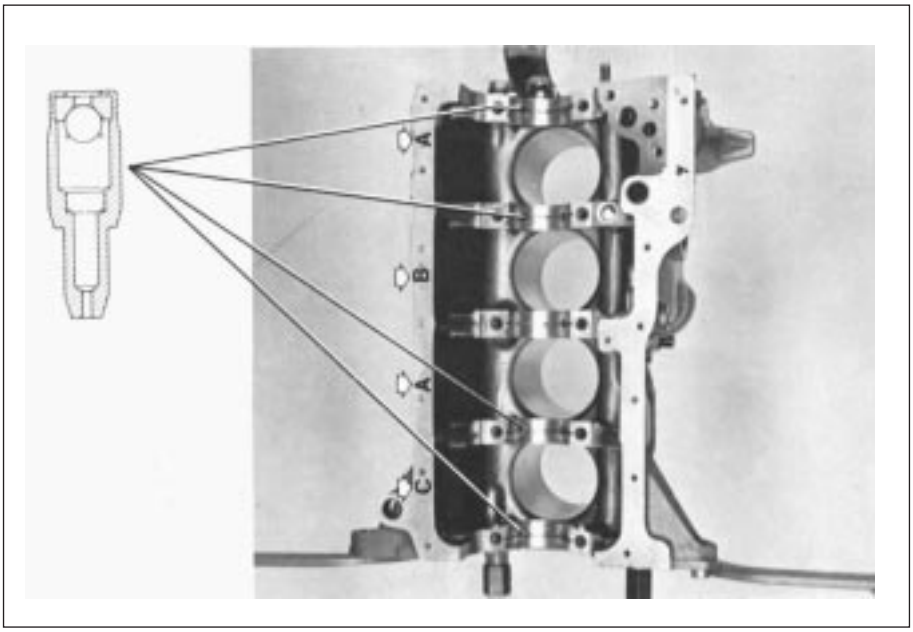


Fig. 13.12 Piston oil spray nozzle locations - 1301 cc Turbo ie engine (Sec 6A)

Letters denote cylinder bore grade

6A.9 Oil pressure sender unit

PART B: OPERATIONS POSSIBLE WITH ENGINE IN CAR

Camshaft and camshaft carrier - removal and refitting

Warning: Refer to the beginning of Section 9 before starting any work.

1 Disconnect the battery, negative lead first.
2 Disconnect its leads and unbolt the distributor from the end of the camshaft, and place it to one side.
3 Disconnect the air intake hose from the throttle valve housing.
4 Disconnect the short throttle control cable from its sector.
5 Remove the throttle cable support bracket.
6 Disconnect the earth leads from the camshaft cover.
7 Refer to Section 9, Part C of this Supplement and remove the following components.

Supplementary air valve
Inlet manifold with fuel pressure regulator and excess pressure safety switch
Injector cooling duct

8 Disconnect the wiring plug from the Microplex ignition anti-knock sensor.
9 Carry out the operations described in Chapter 1, Section 27, paragraphs 4 to 12.
10 Refitting is a reversal of removal, referring to Section 28 of Chapter 1 for the timing belt refitting procedure, and to Chapter 1, Section 27, paragraphs 15 to 18.

Cylinder head - removal and refitting

11 Carry out the operations described in paragraphs 4 to 9 in the preceding sub-Section, then refer to Chapter 1, Section 29, but ignore all references to the carburettor.
12 Note the distributor mounting cover.
13 Four additional cylinder head bolts are used on these engines, adjacent to the spark plugs (photo). Note that their tightening torque differs from the other cylinder head bolts - see Specifications. These four bolts are tightened

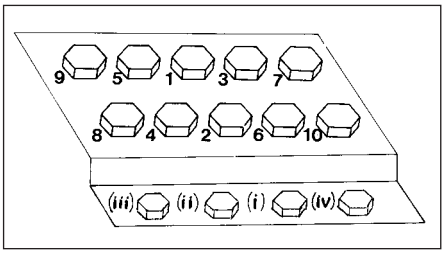


Fig. 13.13 Cylinder head bolt tightening sequence on the 1301 cc Turbo ie engine (Sec 6B)

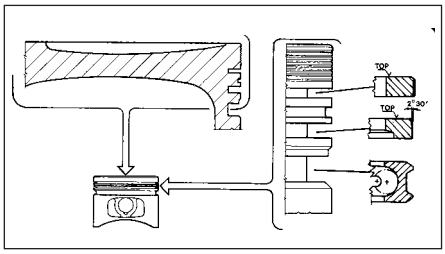
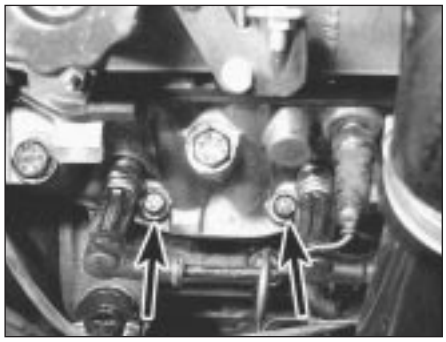


Fig. 13.14 Piston ring arrangement on the 1301 cc Turbo ie engine (Sec 6B)



6B.13 Two of the four additional cylinder head bolts (arrowed)

separately, after the ten main bolts (see Fig. 13.13).

Piston rings

14 The piston rings comprise two compression rings marked TOP, and an oil control ring.

15 Cross-sections and fitting details are shown in Fig. 13.14.

Engine mountings - renewal

16 The operations are essentially as described in Section 33 of Chapter 1, but note the design and fixings of the individual mountings used on the turbocharged engine (photos).

Timing belt - renewal

17 The operations described in Chapter 1, Section 28 generally apply, but the following differences should be noted.

18 Remove the engine compartment right-hand shield. This is secured by plastic clips. To remove a clip, push out its centre pin.

19 The TDC sensor must be unbolted to provide room to remove and refit the timing belt, which can be carried out without having to remove the crankshaft pulley (photos).

20 The belt tensioner on later versions does not incorporate a spring, but is of eccentric centre bolt hole type. Have the pulley bolt released, and tension the belt by turning the pulley using a pin wrench or circlip pliers in the two holes provided. Keep the tension applied while the lockbolt is tightened. Turn the crankshaft through two complete turns, and then check the belt tension. With moderate finger and thumb pressure, the belt should just twist through 90º when gripped at the mid-point of its longest run (photo). **Note**: *This procedure serves only as a rough guide to setting the belt tension - having it checked by a FIAT dealer at the earliest opportunity is recommended.*

Oil pump drivegear cover plate

21 Due to the fact that the distributor is driven from the end of the camshaft, the oil pump gear does not have an extension to drive the distributor, which would be the case if it was mounted on the crankcase.

22 The crankcase aperture is therefore covered by a plate and gasket, together with a wiring clip (photo).

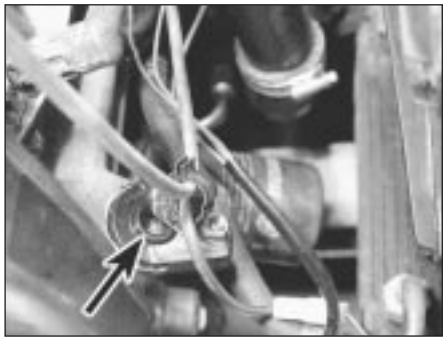
6B.16A Engine/transmission centre mounting

6B.16B Engine/transmission right-hand mounting

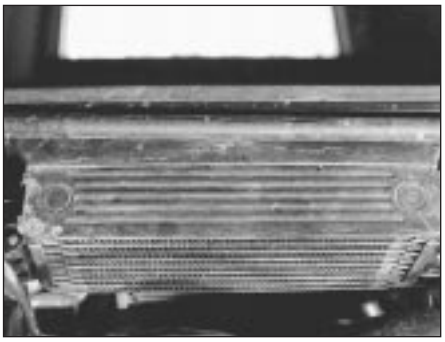
6B.19A Removing the TDC sensor

6B.19B Removing the timing belt

6B.20 Belt tensioner pulley locknut (arrowed)

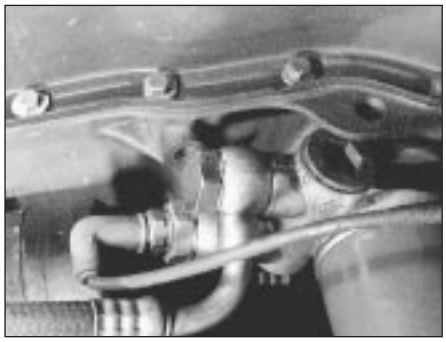


6B.22 Distributor drive hole cover plate (arrowed)



6B.23 Oil cooler

6B.24A Oil cooler pipe connection (arrowed)



6B.24B Connections at oil filter cartridge mounting base

Engine oil cooler - removal and refitting

23 The oil cooler is mounted behind the front bumper/spoiler (photo).
24 Disconnect the oil flow and return hoses, either from the cooler or the oil filter cartridge mounting base. Be prepared for some leakage of oil (photos).
25 Unscrew the mounting bolts and remove the oil cooler heat exchanger (photo).
26 When refitting, make sure that the banjo union sealing washers are in good condition.

PART C: ENGINE REMOVAL, DISMANTLING, REASSEMBLY AND REFITTING

Engine/transmission - removal and separation

Warning: Refer to the beginning of Section 9 before starting any work.

1 Refer to Chapter 1, Section 35, and carry out the operations described in paragraphs 1 to 11.
2 Disconnect the excessive air pressure switch from the inlet manifold.
3 Disconnect the ducts and remove the airflow meter.
4 Disconnect the leads from the spark plugs and the distributor LT connector, and unbolt and remove the distributor from the rear end of the camshaft carrier.
5 Disconnect the fuel return hose from the pressure regulator.
6 Disconnect the fuel inlet hose from the injector rail.
7 Disconnect the wiring plugs from the fuel injectors.
8 Disconnect the leads from the oil pressure sender unit, the low oil pressure switch and the coolant temperature switch.
9 Remove the hose/pipe assemblies from the intercooler.
10 Disconnect the throttle control rod at the balljoint.
11 Disconnect the hoses and ducts from the turbocharger and the mechanical bypass valve.
12 Disconnect the leads from the engine speed and anti-knock sensors.
13 Raise the front of the car and support it securely. As the engine/transmission will eventually be lowered to the floor, make sure that there is sufficient clearance under the front end for the assembly to be withdrawn. If the car is over an inspection pit, then the car need only be raised enough to lift the roadwheels from the floor.
14 Remove the front roadwheels.
15 Disconnect the transmission earth cable.
16 Working under the car, remove the engine shields from under the wheel arches.
17 Remove the engine oil cooler, and the intercooler.
18 Unscrew the fixing screws and disconnect the driveshafts from the flanges at the transmission final drive. The right-hand driveshaft will not release until the upper bolt on the suspension strut-to-hub carrier clamp has been removed, and the hub assembly tilted downwards.
19 Disconnect the exhaust downpipe from the manifold, and then remove the front section of the exhaust system.
20 Disconnect the coolant return pipe from the turbocharger.
21 Disconnect the gearchange control rods from the transmission selector rod. Do this by unscrewing the self-locking nut from the bolt which connects the clevis fork.
22 Attach suitable lifting gear to the engine lifting eyes, and take the weight of the engine/transmission.
23 Disconnect the left-front, centre-rear and the right-hand engine/transmission mountings. Do this by removing the bolts from the diamond-shaped mounting plates there is no need to disturb the flexible mounting centre bolts.
24 Lower the engine/transmission to the floor and withdraw it from under the car.
25 Carry out the operations described in Chapter 1, Section 35, paragraphs 27 to 31.

6B.25 Oil cooler mounting bolts (arrowed)

6C.27 Filling the engine with oil

Engine dismantling and reassembly

26 The operations are essentially as described for the 1301 cc engine in Chapter 1, but reference must be made to Sections 9 and 10 of this Chapter for the procedures for removing and refitting the components of the fuel injection, turbocharger and ignition systems.

Engine/transmission - reconnection and refitting

27 The operations are a reversal of those described in paragraphs 1 to 25, but otherwise the following (photo).

a) Tighten all nuts and bolts to the specified torque.
b) Use a new gasket at the exhaust downpipe-to-manifold flange.
c) Check and adjust the clutch pedal travel.
d) Refill the cooling system.
e) Refill the engine and transmission with oil.
f) Reconnect the battery, negative lead last.

7A.11 Topping up the engine oil level - 1372 cc engine

7A.12A Engine sump drain plug - 1372 cc engine

7A.12B Engine oil filter removal using a strap wrench - 1372 cc engine

Initial start-up after major overhaul

28 Refer to Chapter 1, Section 45, but note that an oil pressure gauge is fitted to indicate oil pressure.
29 Check the ignition static timing as described in Section 10.
30 Check the engine idle speed and CO level as described in Section 9.

7 Engine - 1372 cc ie and 1372 cc Turbo ie

PART A: GENERAL

Description

1 The 1372 cc engine is similar in design to the OHC engine fitted to the FIAT Tipo variants. The engine is of four-cylinder, in-line, overhead camshaft type, mounted transversely at the front of the vehicle.
2 The crankshaft runs in five main bearings. Thrustwashers are fitted to the rear (flywheel end) main bearing in order to control crankshaft endfloat.
3 The connecting rods are attached to the crankshaft by horizontally split shell-type big-end bearings. The pistons are attached to the connecting rods by fully-floating gudgeon pins which are secured by circlips. The aluminium alloy pistons are fitted with three piston rings: two compression rings and an oil control ring.
4 The camshaft is driven by a toothed belt and operates the valves via bucket and shim type cam followers. The camshaft is located in a separate housing on top of the cylinder head.
5 The inlet and exhaust valves are each closed by double valve springs, and operate in guides pressed into the cylinder head.
6 The auxiliary shaft, which is also driven by the toothed belt, drives the oil pump.
7 Lubrication is by means of a gear type pump which draws oil through a strainer located in the sump, and forces it through a full-flow filter into the engine oil galleries from where it is distributed to the crankshaft, camshaft and auxiliary shaft. The big-end bearings are supplied with oil via internal drillings in the crankshaft. The undersides of the pistons are cooled by oil spray nozzles located in each main bearing location in the crankcase.
8 A crankcase ventilation system is employed, whereby piston blow-by gases are drawn via an oil separator into the air cleaner, from where they are drawn into the inlet manifold and re-burnt with fresh air/fuel mixture.
9 The 1372 cc ie engine is fitted with a Bosch Mono-Jetronic single point fuel injection (SPi) system. Whilst the higher performance 1372 cc Turbo ie engine is fitted with a Bosch L3.1 (L3.2 from 1992) Jetronic multi-point injection (MPi) system and turbocharger with intercooler and oil cooling. The L3.2 system models are fitted with catalytic converters.

Maintenance

10 At the intervals specified in Section 3 or "*Routine maintenance*" at the beginning of this Manual, carry out the following tasks.
11 Check the engine oil level as follows. With the vehicle parked on level ground, and with the engine having been stopped for a few minutes, withdraw the oil level dipstick, wipe it on a clean rag, and re-insert it fully. Withdraw the dipstick again and read off the oil level relative to the MAX and MIN marks. The oil level should be between the marks. If the level is at or below the MIN mark, top up through the filler on the camshaft cover without delay (photo). The quantity of oil required to raise the level from MIN to MAX on the dipstick is approximately 1.0 litre (1.8 pints). Do not overfill.
12 Renew the engine oil and filter as described in Section 2 of Chapter 1 (photos).
13 Check and if necessary adjust the valve clearances as described in Part B of this Section.
14 Inspect the engine for signs of oil, coolant or fuel leaks and rectify as necessary.
15 Inspect the crankcase ventilation hose for blockage or damage. Clean or renew as necessary.
16 Check the condition and tension of the timing belt as described in Part B of this Section.
17 Renew the timing belt as described in Part B of this Section.

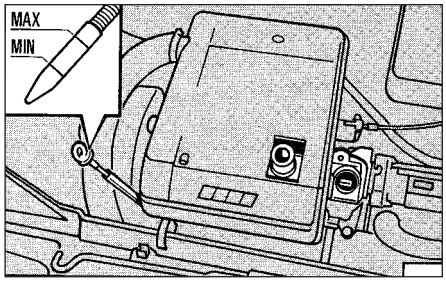
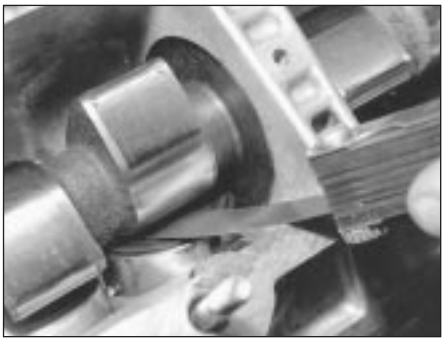


Fig. 13.15 Engine oil level dipstick location and level markings on the 1372 cc ie and Turbo ie engines (Sec 7A)

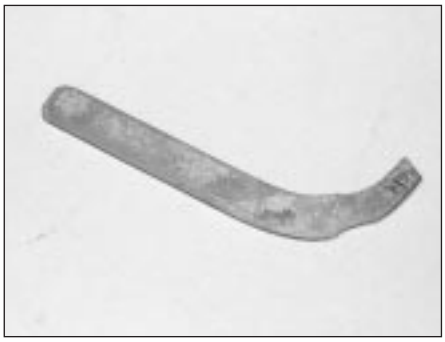
PART B: OPERATIONS POSSIBLE WITH ENGINE IN CAR

Valve clearances - checking and adjustment

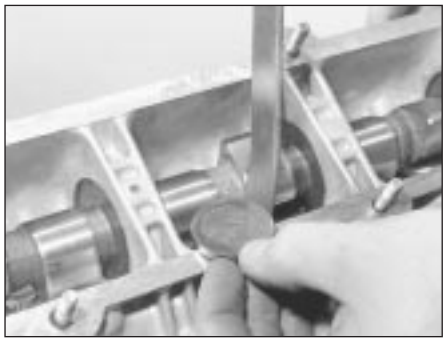
1 It is important to ensure that the valve clearances are set correctly, as incorrect clearances will result in incorrect valve timing thus affecting engine performance.
2 The clearances must be checked and adjusted with the engine cold.
3 On the ie engine, refer to Section 9 in this Chapter for details and remove the air cleaner unit.
4 On the ie engine disconnect the crankcase ventilation hose from the injector unit and position the hose out of the way.
5 On Turbo ie engines, loosen off the clips and remove the air hose to the inlet manifold (above the camshaft cover).
6 On Turbo ie engines, disconnect the accelerator cable from the throttle housing and the support bracket on the camshaft cover.
7 Unscrew the securing nuts and washers and remove the camshaft cover, noting that on later models two of the nuts also secure the hose clip assembly. Recover the gasket.
8 Numbering from the front (timing belt) end of the engine, the exhaust valves are 1, 4, 5 and 8, and the inlet valves are 2, 3, 6 and 7.



7B.10 Measuring a valve clearance (No 2 valve shown)



7B.14 Special tool for retaining cam follower in depressed position



7B.15 Removing a shim from a cam follower

9 Turn the engine clockwise using a suitable socket on the crankshaft pulley bolt, until the exhaust valve of No 1 cylinder (valve No 1) is fully closed; ie the cam lobe is pointing directly upwards. Alternatively, the engine can be turned by jacking up one front corner of the vehicle and supporting it securely on an axle stand (apply the handbrake and chock the diagonally-opposite rear wheel before jacking), engaging top gear and turning the raised roadwheel in the forward direction of travel. In both cases, it will be easier to turn the engine if the spark plugs are removed, but if this is done, take care not to allow dirt or other foreign matter to enter the spark plug holes.

10 Insert a feeler gauge of the correct thickness between the cam follower shim and the heel of the No 1 cam lobe (photo). If necessary, increase or reduce the thickness of the feeler gauge until it is a firm sliding fit. Record the thickness of the feeler gauge, which will represent the valve clearance for this particular valve.

11 Turn the crankshaft, and repeat the procedure for the remaining valves, recording their respective clearances. Note that the clearance for inlet and exhaust valves differs.

12 If a clearance is incorrect, the relevant cam follower shim must be removed, and a thicker or thinner shim must be fitted to achieve the correct clearance. To remove a shim proceed as follows.

13 Turn the crankshaft until the relevant cam lobe is pointing directly upwards.

14 The cam follower must now be depressed in order to extract the shim. FIAT special tool No 1860642000 is available for this purpose, but alternatively a suitable tool can be improvised (photo). The tool should locate on the rim of the cam follower, leaving enough room for the shim to be prised out by means of the cut-outs provided in the cam follower rim. Depress the cam follower by turning the crankshaft as described previously until the relevant cam lobe is pointing directly downwards, then fit the tool between the camshaft and the edge of the cam follower to retain the cam follower in the depressed position.

15 Ensure that the tool is securely located, as there is a risk of personal injury if the tool is dislodged whilst the cam follower is depressed, then turn the crankshaft until the relevant cam lobe is pointing directly upwards, leaving sufficient room to extract the shim (photo). A pair of angle-nosed pliers will greatly ease removal of the shim.

16 Once the shim has been extracted, establish its thickness. The thickness in mm should be stamped into the face of the shim, although it is possible for wear to obliterate the number, in which case the use of a metric micrometer is the only way to accurately establish the thickness.

17 Refer to the clearance recorded for the valve concerned. If the clearance recorded was larger than that specified, a thicker shim must be fitted, and if the clearance recorded was smaller than that specified, a thinner shim must be fitted. The required thickness of shim can be
calculated as follows.

Sample calculation - clearance too large:

Desired clearance (A)	0.40 mm
Measured clearance (B)	0.45 mm
Difference (B - A)	+ 0.05 mm
Original shim thickness	3.40 mm
Required shim thickness	3.40 + 0.05 = 3.45 mm

Sample calculation - clearance too small:

Desired clearance (A)	0.50 mm
Measured clearance (B)	0.35 mm
Difference (B - A)	0.15 mm
Original shim thickness	4.55 mm
Required shim thickness	4.55 - 0.15 = 4.40 mm

18 Shims are available in thicknesses from 3.20 to 4.70 mm, in steps of 0.05 mm. Note that if several shims have to be changed, they can often be interchanged, thus avoiding the need by buy more new shims than are necessary.

19 The shims should be fitted to the cam followers with the stamped thickness marking against the face of the cam follower.

20 After fitting a shim, rotate the crankshaft as described previously until the relevant cam lobe is pointing directly downwards (resting on the shim), then carefully remove the tool used to retain the follower in the depressed position.

21 Re-check each relevant valve clearance after fitting the shim.

22 On completion, where applicable, lower the vehicle to the ground.

23 Refit the camshaft cover, using a new gasket.

24 On the ie engine, reconnect the hoses and refit the air cleaner unit.

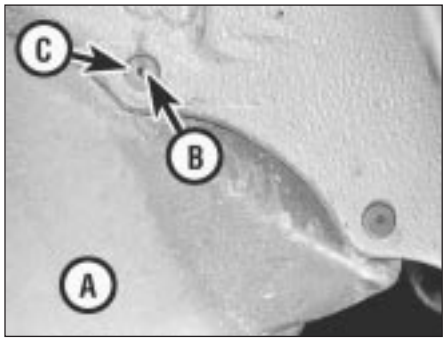
25 On the Turbo ie engine, reconnect the air hose and the accelerator cable.

Timing belt tensioner and sprockets - removal and refitting

Note: *The timing belt must be renewed after removal: never refit a used drivebelt. When fitting the new timing belt it will need to be correctly tensioned and to achieve this the manufacturers specify the use of special tools 1860745200 (18760745300 on Turbo model) and 1860745100. If these tools are not readily available, an approximate setting can be made, but in this instance it is strongly recommended that the car be taken to a FIAT dealer at the earliest opportunity to have the belt tension checked and correctly set using the recommended tools.*

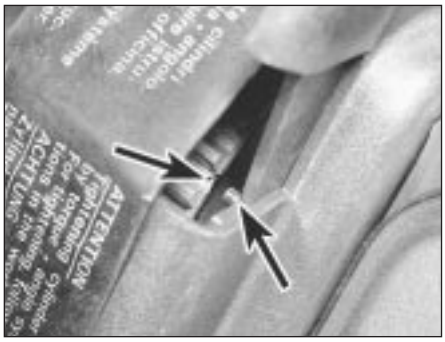
26 Loosen off the front right-hand side wheel bolts, then raise and support the car at the front end on axle stands. Remove the front right-hand roadwheel.

27 Remove the underwing shield from the right-hand wheel arch to allow access to the lower timing cover and alternator fixings (photo).

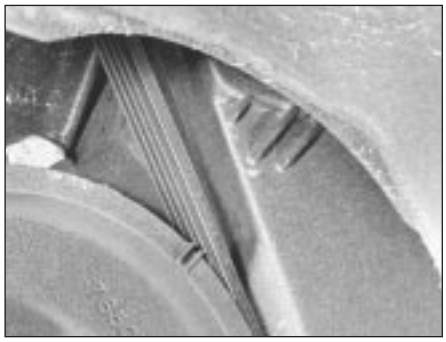


7B.27 Underwing shield (A) showing central compression pin (B) and retaining clip (C). Drive pin through clip to remove

7B.29 Slide back inspection cover in the timing case



7B.30A Camshaft sprocket timing notch aligned with timing (TDC) pointer in timing case

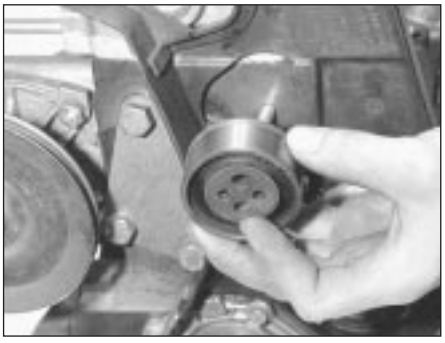


7B.30B Crankshaft pulley and timing cover timing marks

28 Loosen off the retaining clips and detach the air intake pipe from the air filter.
29 Slide back the inspection cover from the upper end of the timing cover (photo).
30 Turn the engine over by hand to bring the TDC timing marks of the flywheel-to-bellhousing and the camshaft sprocket-to-rear cover projection into alignment. The crankshaft pulley also has a TDC timing mark and this should be positioned as shown (photos).
31 Loosen off the retaining and adjustment strap fixings, then pivot the alternator towards the engine.
32 Unscrew the upper retaining bolts securing the timing cover.
33 Loosen off the nut securing the alternator and its drivebelt relay, then detach and remove the alternator drivebelt.
34 Unscrew and remove the crankshaft pulley nut. Where the engine is in the car, prevent the crankshaft from turning by engaging top gear and having an assistant apply the brake pedal hard. Unscrew and remove the flywheel housing lower cover bolts and remove the cover. The flywheel ring gear can now be jammed with a suitable lever or implement to prevent the crankshaft from rotating. It should be noted that the pulley nut is tightened to a considerable torque and a strong socket, together with an L-bar and extension tube, will therefore be required to loosen and remove it (photo). Take care not to damage the gearbox/flywheel housing by jamming the flywheel at a weak point.
35 Withdraw the crankshaft pulley (photo).
36 Unscrew and remove the lower retaining bolts and remove the timing cover upwards from the vehicle.
37 Check that the previously mentioned timing marks are still in alignment. Loosen off the timing belt tensioner nut, then with the tension released, withdraw the timing belt from the sprockets.
38 To remove the drivebelt tensioner, undo the securing nut and withdraw the tensioner pulley unit noting that it is in three sections (photos).
39 If desired, the sprockets and the rear timing belt cover can be removed as follows, otherwise proceed to paragraph 49.
40 To remove the camshaft sprocket, a suitable tool must be used to hold the camshaft stationary as the sprocket bolt is loosened. A suitable tool can be improvised as shown in photo 7B.48 using two pieces of steel bar joined together by a pivot bolt, with suitable bolts through the ends of the steel bars to engage with the holes in the sprocket.
41 Unscrew the sprocket bolt, then recover the plain washer, and the thrust washer which is bonded into a plastic sleeve (photo).
42 The sprocket can now be withdrawn from the end of the camshaft. If the sprocket is tight, carefully lever it from the camshaft using two screwdrivers, but take care not to damage the rear timing belt cover.
43 The crankshaft sprocket can be removed by simply pulling it from the end of the

7B.34 Crankshaft pulley nut removal

7B.35 Crankshaft pulley removal



7B.38A Timing belt tensioner removal

7B.38B The three sections of the timing belt tensioner

7B.41 Removing the crankshaft sprocket bolt, plain washer and thrust washer

7B.43 Remove the crankshaft Woodruff key if it is loose

7B.45 Withdrawing the auxiliary shaft sprocket

7B.46 Tightening the auxiliary shaft sprocket bolt

crankshaft after the pulley securing nut has been removed. Recover the Woodruff key from the end of the crankshaft if it is loose (photo).

44 To remove the auxiliary shaft sprocket, a suitable tool must be used to hold the sprocket stationary as the securing bolt is loosened (the bolt is extremely tight). In the workshop, a "scissors" style tool was improvised, using two pieces of steel bar joined together by a pivot bolt, with their ends bent through a right-angle to engage securely between the teeth on the sprocket - see photo 7B.46.

45 Unscrew the sprocket bolt, and recover the washer, then withdraw the sprocket from the end of the auxiliary shaft (photo). If the sprocket is tight, carefully lever it from the shaft using two screwdrivers.

46 Refit the auxiliary shaft sprocket, making sure that the lug on the end of the shaft engages with the hole in the sprocket, then tighten the securing bolt to the specified torque (ensure that the washer is in place under the bolt head). Prevent the sprocket from turning as during removal (photo).

47 Where applicable, refit the Woodruff key to the end of the crankshaft, then refit the crankshaft sprocket with the flanged side against the oil seal housing (photo).

48 Refit the camshaft sprocket to the end of the camshaft, making sure that the lug on the end of the shaft engages with the hole in the sprocket, then refit the thrust washer, plain washer, and bolt, and tighten the bolt to the specified torque. Prevent the camshaft from turning as during removal (photo).

49 Refit the belt tensioner pulley assembly, ensuring that the washer is in place under the securing nut, but do not fully tighten the nut at this stage.

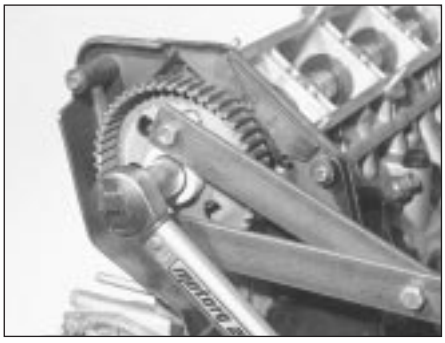
50 Before refitting the new timing belt into position, first ensure that the crankshaft and camshaft sprocket timing marks are still aligned as described in paragraph 30 (photo).

51 If the new timing belt has two timing marks on its outer face they must align with the corresponding marks on the crankshaft and camshaft sprockets. Do not distort or bend the belt any more than is necessary during its fitting or its structural fibres may be damaged.

52 Refit the belt around the sprockets and the tensioner pulley, starting at the crankshaft sprocket. One of the timing index marks must align with the scribed mark on the lower edge of the crankshaft sprocket (opposite the Woodruff key) whilst the second mark must align with the timing marks of the camshaft and rear timing belt cover (photos).

53 With the belt fitted over the sprockets and correctly aligned, temporarily refit the crankshaft pulley nut (tightening it to its full torque wrench setting) and then adjust the timing belt tension.

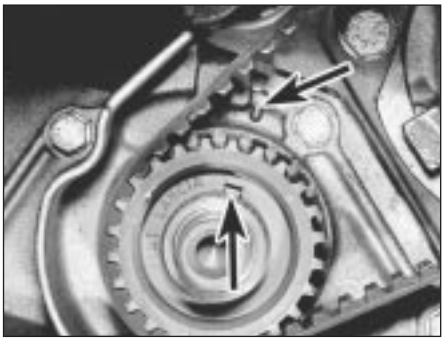
7B.47 Refitting the crankshaft sprocket



7B.48 Tightening the crankshaft sprocket bolt

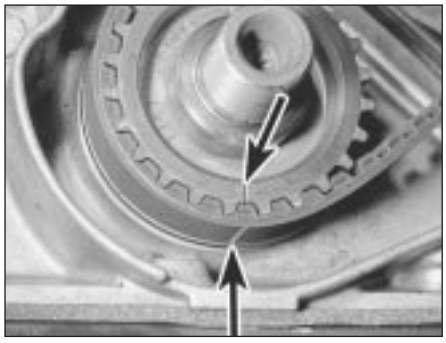
Approximate setting

54 The timing belt tension can be checked approximately by twisting it between the



7B.50 Crankshaft at TDC with key and timing mark aligned (arrowed)

7B.52A Timing belt refitted over the sprockets and tensioner



7B.52B Timing belt mark aligned with scribed mark on crankshaft sprocket (arrowed)

thumb and forefinger at the centre of the run between the auxiliary shaft sprocket and the camshaft sprocket. Using this method it should just be possible to twist the belt through 90º using moderate pressure.

55 To adjust the tension, loosen off the tensioner pulley nut then insert two rods (or screwdrivers) into position in the pulley holes and position a lever between them.

56 Gently lever the tensioner pulley in the required direction to set the tension as described, then initially tighten the pulley nut to lock the tensioner in the required position.

57 Remove the tools from the tensioner, recheck the tension and then tighten the tensioner pulley nut securely.

58 Rotate the crankshaft clockwise through two complete turns using a socket or spanner on the crankshaft pulley nut, then recheck the belt tension. To avoid the possibility of unscrewing the pulley nut, remove the spark plugs to enable the engine to be turned over easier.

59 If further adjustment is required, repeat the previously mentioned procedures. If in doubt, err on the slightly tight side when adjusting the tension. If the belt is set too loose, it may jump off the sprockets resulting in serious damage.

60 Remove the crankshaft pulley retaining nut, fit the timing belt cover, then refit and tighten the pulley nut to the specified torque setting.

61 Refit the remaining components in the reverse order of removal. Tighten the retaining nuts/bolts to the specified torque settings where given. Adjust the tension of the alternator drivebelt as described in Section 8.

Adjustment using FIAT special tools

62 Assemble the special tools and fit them to the belt tensioner pulley as shown in Fig. 13.16. When fitted, the tool rod must be as vertical as possible and it is important to note that no sliding weights must be attached to tool No. 1860745100.

63 Slacken the tensioner pulley nut, if not already done. Rotate the crankshaft clockwise through two complete turns using a socket or spanner on the crankshaft pulley nut. The special tool rod may move from the vertical as the engine is turned over, in which case the joint will need to be re-adjusted to return the rod to the vertical and the operation repeated.

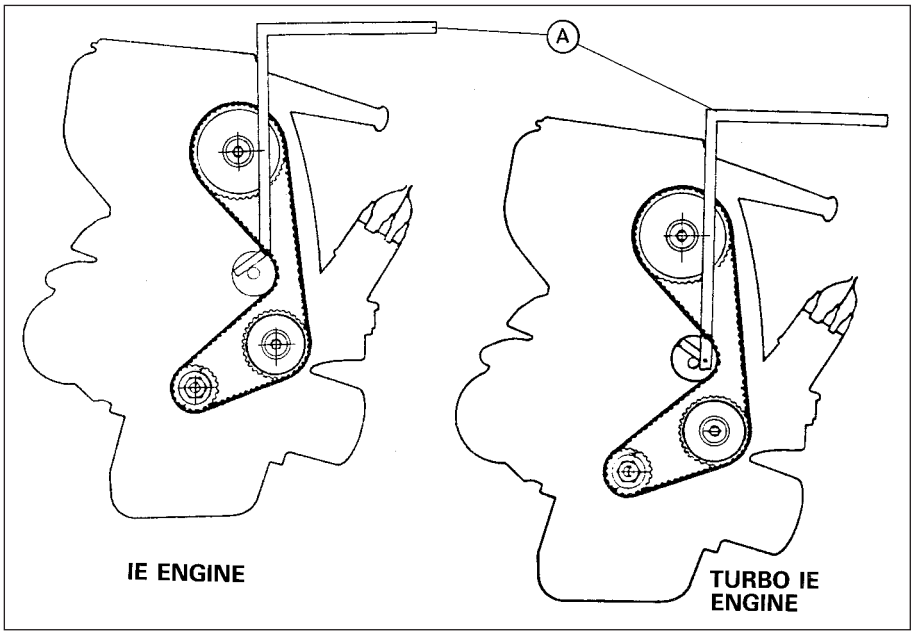


Fig. 13.16 FIAT special tool No. 1860745100 (A) for timing belt adjustment shown fitted to the tensioner pulley - 1372 cc ie and Turbo ie engines (Sec 7B)

Use with adapter No. 1860745200 on 1372 cc ie engines and No. 1860745300 on 1372 cc Turbo ie engines

64 With the two revolutions of the crankshaft completed, tighten the belt tensioner pulley nut securely and remove the special tools.

65 Remove the crankshaft pulley retaining nut, fit the timing belt cover, then refit and tighten the pulley nut to its specified torque setting.

66 Refit the remaining components in the reverse order of removal. Tighten the retaining nuts/bolts to the specified torque settings where given. Adjust the tension of the alternator drivebelt as described in Section 8.

Camshaft front oil seal - renewal

67 The camshaft front oil seal may be renewed with the engine in the vehicle, and the camshaft *in situ,* as follows.

68 Remove the timing belt and the camshaft sprocket as described previously in this Section.

69 Punch or drill a small hole in the centre of the exposed oil seal. Screw in a self-tapping screw, and pull on the screw with pliers to extract the seal.

70 Clean the oil seal seat with a wooden or plastic scraper.

71 Lubricate the lips of the new seal with clean engine oil, and drive it into position until it is flush with the housing, using a suitable socket or tube. Take care not to damage the seal lips during fitting. Note that the seal lips should face inwards.

72 Refit the camshaft sprocket and the timing belt as described previously in this Section.

Camshaft, housing and followers - removal and refitting

Note: *The engine must be cold when removing the camshaft housing. Do not remove the camshaft housing from a hot engine. New camshaft housing and camshaft cover gaskets must be used on refitting.*

73 If the engine is still in the vehicle, disconnect the battery negative lead.

74 Refer to paragraphs 3 to 7 in this part of this Section for details and remove the camshaft cover.

75 Remove the camshaft sprocket and timing belt as described previously in this Section.

76 Remove the three securing nuts and the single securing bolt, and withdraw the upper section of the rear timing belt cover.

77 Unscrew the camshaft housing securing bolts. There are seven bolts which are accessible from outside the camshaft housing, and five shorter bolts which are accessible from inside the housing (these bolts are normally covered by the camshaft cover). Note that each bolt is fitted with two washers (photo).

78 Carefully lift the camshaft housing from the cylinder head. Be prepared for the cam followers to drop from their bores in the camshaft housing as the camshaft housing is lifted, and ensure that the cam followers are identified for position so that they can be refitted in their original positions (this can be achieved by placing each cam follower over its relevant valve in the cylinder head).

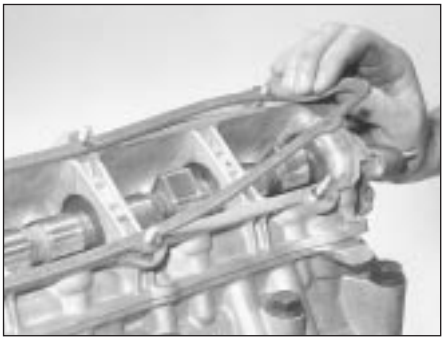
7B.77 Removing one of the camshaft housing shorter securing bolts

7B.82 Locating a new camshaft housing gasket on the cylinder head

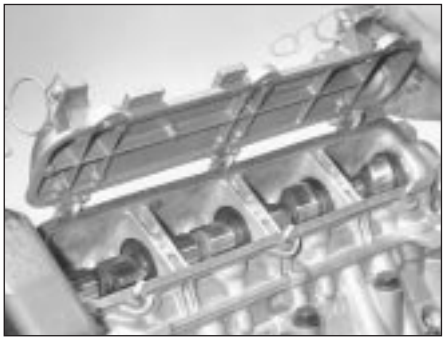
7B.84 Lowering the camshaft housing on to the cylinder head

7B.85 Tightening a camshaft housing securing bolt

79 Recover the gasket.
80 Removal of the camshaft from the housing, and inspection of the components is described in the following sub-Section.
81 Commence refitting by cleaning the gasket mating surfaces of the camshaft housing and cylinder head.
82 Locate a new gasket on the cylinder head, making sure that it is correctly positioned over the dowels (photo).
83 Ensure that the cam followers are correctly located over their relevant valves.
84 Liberally oil the cam follower bores in the camshaft housing, then carefully lower the housing over the cam followers, and onto the cylinder head (photo). Some manipulation will be required to engage the cam followers with their relevant bores in the camshaft housing.
85 Loosely refit all the camshaft housing securing bolts, ensuring that the washers are in place under their heads, then tighten them progressively to the specified torque, starting at the centre of the housing and working outwards in a spiral pattern (photo).
86 Refit the upper section of the rear timing belt cover.
87 Refit the camshaft sprocket and the timing belt as described previously in this Section.
88 Check the valve clearances as described earlier in this Section.
89 Refit the camshaft cover using a new gasket, and tighten the securing nuts, ensuring that the washers are in place (photos). Where applicable, ensure that the hose clip is in place before refitting the relevant camshaft cover securing nuts.
90 The remainder of the refitting procedure is a reversal of that given for removal.



7B.89A Locate a new gasket on the camshaft housing . . .

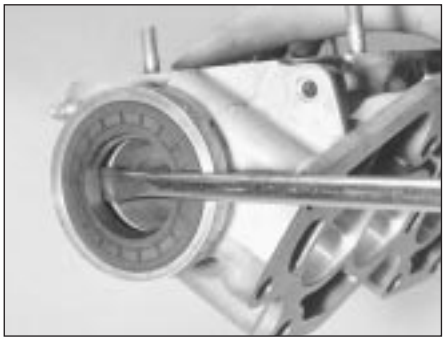


7B.89B . . . and refit the camshaft cover

Camshaft, housing and followers - dismantling, inspection and reassembly

91 With the camshaft housing removed from the cylinder head as previously described proceed as follows.
92 Unscrew the three securing bolts, and withdraw the blanking plate from the end of the camshaft housing. Recover the gasket.
93 The camshaft can now be carefully withdrawn from the blanking plate/distributor end of the camshaft housing, taking care not to damage the bearing journals (photo).
94 With the camshaft removed, examine the bearings in the camshaft housing, and the cam follower bores for signs of obvious wear or pitting. If evident, a new camshaft housing will probably be required.
95 The camshaft itself should show no signs of marks or scoring on the journal or cam lobe surfaces. If evident, renew the camshaft.
96 Examine the cam followers for signs of obvious wear, and for ovality, and renew if necessary.
97 It is advisable to renew the camshaft front oil seal as a matter of course if the camshaft has been removed. Prise out the old seal using a screwdriver, and drive in the new seal until it is flush with the housing, using a suitable socket or tube (photos).

7B.93 Withdrawing the camshaft from its housing



7B.97A Prising out the camshaft front oil seal

7B.97B Inserting the new camshaft front oil seal

7B.119 Locating a new cylinder head gasket on the cylinder block (engine shown on dismantling stand)

98 Commence reassembly by liberally oiling the bearings in the housing, and the oil seal lip.
99 Carefully insert the camshaft into the housing from the blanking plate/distributor end, taking care to avoid damage to the bearings.
100 Refit the blanking plate using a new gasket.
101 Refit the camshaft housing as described previously in this Section.

Cylinder head (1372 cc ie engine) - removal and refitting

Note: *The following instructions describe cylinder head removal and refitting leaving the camshaft, manifolds and associated items in situ In the head. If required, these items can be removed separately. When removing the cylinder head the engine must be cold - do not remove the head from a hot engine. A new cylinder head gasket and any associated gaskets must be used during reassembly. FIAT specify that the main cylinder head bolts should be renewed after they have been used (ie tightened) four times. If in any doubt as to the number of times that they have been used renew them as a precaution against possible failure.*

Warning: Refer to the beginning of Section 9 before starting any work.

102 Depressurise the fuel supply system as described in Section 9 of this Chapter.
103 Disconnect the battery negative lead.
104 Drain the engine coolant as described in Section 8.
105 Remove the air cleaner unit as described in Section 9.
106 Remove the timing belt as described previously in this Section.

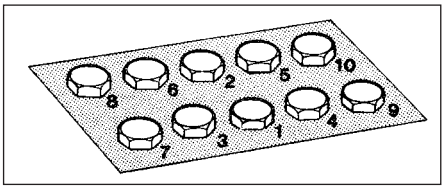


Fig. 13.17 Cylinder head bolt tightening sequence on the 1372 cc ie and Turbo ie engines (Sec 7B)

7B.120A Lower the cylinder head onto the block . . .

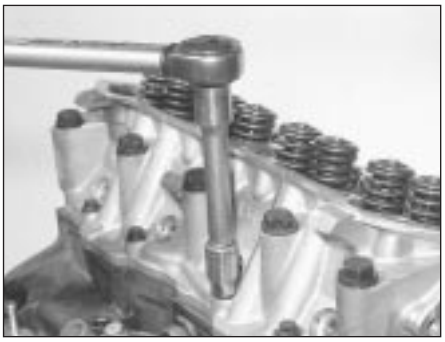
107 Disconnect the crankcase ventilation hose from the cylinder head and the SPi injector unit.
108 Disconnect the accelerator cable at the engine end.
109 Detach the engine idle speed check actuator lead, the inlet manifold vacuum sensor lead, the coolant temperature sensor lead, the injector supply lead, the throttle position switch lead and the distributor cap (with HT leads). Position them out of the way.
110 Disconnect the brake servo hose from the manifold.
111 Disconnect the coolant hoses from the thermostat and the inlet manifold.
112 Slowly release the fuel supply and return hose retaining clips and detach the hoses from the injector unit housing and connections. Catch any fuel spillage in a clean cloth and plug the hoses to prevent the ingress of dirt and further fuel loss.
113 Unbolt and detach the exhaust downpipe from the manifold.
114 Loosen off the cylinder head retaining bolts in a progressive manner, reversing the sequence shown in Fig. 13.17. When all of the bolts are loosened off, extract them and collect the washers.
115 Check that all fittings and associated attachments are clear of the cylinder head, then carefully lift the head from the cylinder block. If necessary tap the head lightly with a soft-faced mallet to free it from the block, but do not lever it free between the joint faces. Note that the cylinder head is located on dowels.

7B.120B . . . and engage the positioning dowels in their holes

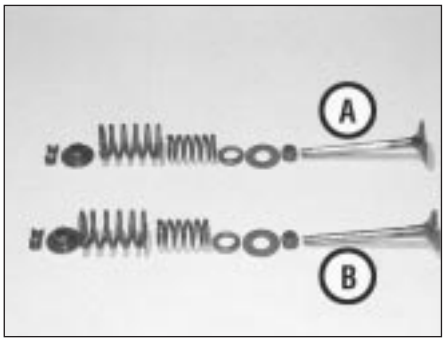
116 Recover the old cylinder head gasket and discard it.
117 Clean the cylinder head and block mating surfaces by careful scraping. Take care not to damage the cylinder head - it is manufactured in light alloy and is easily scored. Cover the coolant passages and other openings to prevent dirt and carbon from falling into them. Mop out all the oil from the cylinder head bolt holes - if oil is left in them, hydraulic pressure, caused when the bolts are refitted, could cause the block to crack.
118 If required the cylinder head can be dismantled and overhauled as described in paragraphs 129 to 131 of this Section.
119 The new gasket must be removed from its protective packing just before it is fitted. Do not allow any oil or grease to come into contact with the gasket. Commence refitting the cylinder head by locating the new gasket on the cylinder block so that the word “ALTO” is facing up (photo).
120 With the mating faces scrupulously clean, refit the cylinder head into position and engage it over the dowels. Refer to the note at the beginning of this part of the Section, then refit the ten main cylinder head bolts and washers. Screw each bolt in as far as possible by hand to start with. Do not fit the smaller (M8 x 1.25) bolts at this stage (photos).
121 The bolts must now be tightened in stages and in the sequence shown in Fig. 13.17. Refer to the specified torque wrench settings and tighten all bolts to the Stage 1 torque, then using a suitable angle gauge, tighten them to the second stage, then the third stage (photos).
122 With the main cylinder head bolts fully

7B.121A Tighten main cylinder head bolts to specified torque . . .

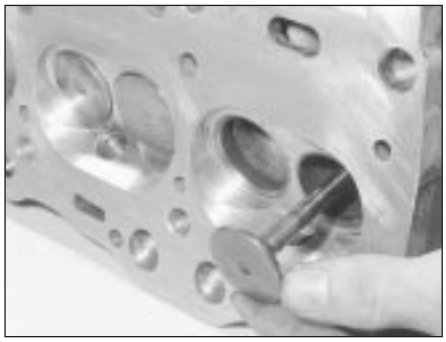
7B.121B . . . and then through the specified angle



7B.122 Tighten the smaller cylinder head bolts to their specified torque setting



7B.130A Inlet (A) and exhaust (B) valves and associate components - 1372 cc engine



7B.130B Valve assembly - 1372 cc engine; insert valve into guide . . .

tightened, refit the five smaller (M8 x 1.25) bolts adjacent to the line of the spark plug holes and tighten them to their specified torque wrench setting (photo).

123 Reconnect the associated fittings to the cylinder head in the reverse order of removal. Ensure that the mating faces of the exhaust manifold-to-downpipe are clean and fit a new gasket when reconnecting.

124 Ensure that all wiring connections are cleanly and securely made.

125 Top up the engine oil and coolant levels as required on completion.

Cylinder head (1372 cc Turbo ie engine) - removal and refitting

126 Proceed as described in paragraphs 102 to 125 above for the non-Turbo model, but note the following differences.

127 The cylinder head cannot be removed and refitted with the manifolds and turbocharger fitted. It is therefore first necessary to detach and remove the inlet manifold, then the turbocharger and the exhaust manifold as described in Section 9.

128 The ignition distributor is mounted on the side of the engine, not the rear end of the cylinder head as on the "ie" engine. It is therefore only necessary to disconnect the HT leads from the spark plugs.

Cylinder head - inspection and renovation

Note: *Refer to a dealer for advice before attempting to carry out valve grinding or seat recutting operations. These operations may not be possible for the DIY mechanic due to the fitment of hardened valve seats for use with unleaded petrol.*

129 Use a straight-edge to check the cylinder head gasket surface for distortion. If it exceeds the specified tolerance, it must be resurfaced by a FIAT dealer or automotive engineer.

130 Refer to Section 39 in Chapter 1 for the general details on dismantling and renovating operations on the cylinder head but note that there is a spring seat and a flat washer fitted between the cylinder head and the valve springs (photos).

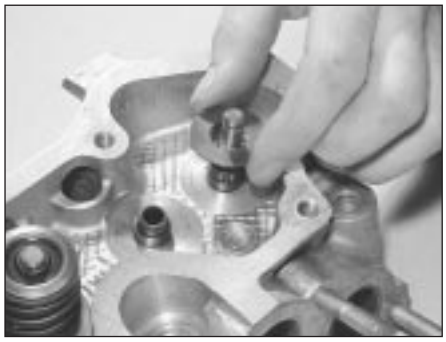
Crankshaft front oil seal - removal and renewal

131 Remove the timing belt as described earlier in this Section. Note that as mentioned previously, the timing belt will need to be renewed during reassembly.

132 Referring to Fig. 13.18, loosen off the bolt indicated from the timing belt rear cover.

7B.130C . . . locate stem oil seal . . .

7B.130D . . . and drive it into position



7B.130E Refit the flat washer . . .

7B130F . . . locate the spring seat . . .

7B.130G . . . the inner spring . . .

7B.130H . . . the outer spring . . .

7B.130I . . . and cap

7B.130J Compress spring and refit the split collets

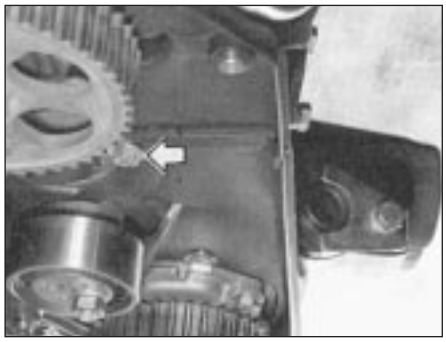


Fig. 13.18 Timing belt rear cover bolt (arrowed) - 1372 cc ie and Turbo ie engines (Sec 7B)

133 Drain the engine oil from the sump into a suitable container. Disconnect the lead from the engine oil level sensor in the sump.
134 Where applicable, unscrew and remove the bolts retaining the gear linkage mounting bracket and the clutch housing lower cover bolts. Remove the cover from the clutch housing.
135 Unscrew the sump retaining nuts and bolts, then lower and remove the sump.
136 Unscrew the timing belt rear cover retaining bolts.
137 Move the timing belt rear cover towards the front of the car to gain access to the retaining bolt and then unscrew and remove the three oil seal housing retaining bolts. Remove the crankshaft front oil seal housing.
138 Note the orientation of the seal in its housing prior to its removal. Support the underside of the housing and carefully drive the old oil seal from the housing using a punch or a tubular drift of suitable diameter. An alternative method is to punch or drill a small hole in the face of the oil seal (but take care not to drill into the housing) and insert a self-tapping screw into the seal. Withdraw the seal by gripping the screw with pliers and pulling the seal from the housing. If necessary, fit a second screw into the seal on the opposite side to provide an even pull.
139 Clean the mating faces of the housing and the front of the crankcase using a suitable scraper.
140 Drive or press the new seal into position in the housing in the reverse order of removal, but ensure that it is correctly orientated as noted during removal (photo).
141 Refit the oil seal housing with a new gasket and tighten the retaining bolts to the specified torque setting (photos).
142 Refit the sump as described later in this Section using a new gasket. Tighten its retaining nuts and bolts to the specified torque. Refit the clutch cover and the gear linkage mounting bracket.
143 Fit the new timing belt, adjust its tension and refit the crankshaft pulley as described earlier in this Section.
144 Reconnect the remaining components that were detached during removal in the reverse order and top up the engine oil level to complete.

Crankshaft rear oil seal - removal and renewal

145 If the engine is still in the car, disconnect the battery negative lead.
146 Remove the flywheel as described in the next sub-Section.
147 Punch or drill a small hole in the rear face of the rear oil seal (but take care not to drill into the housing) and insert a self-tapping screw into the seal. Withdraw the seal by gripping the screw with pliers and pulling it from the housing. If necessary, fit a second screw into the seal on the opposite side to provide an even pull.
148 Clean the seal housing, then locate the

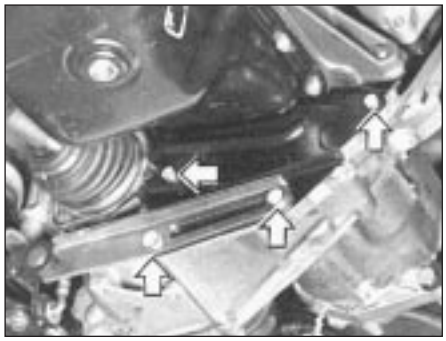


Fig. 13.19 Unscrew the bolts at the points indicated to release the gear linkage mounting bracket - 1372 cc ie and Turbo ie engines (Sec 7B)

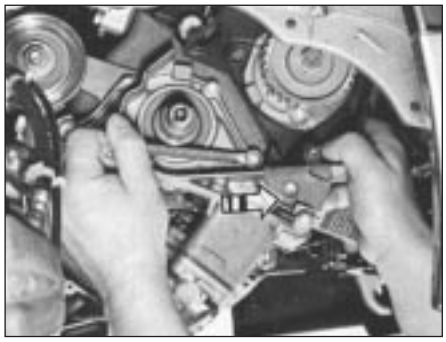
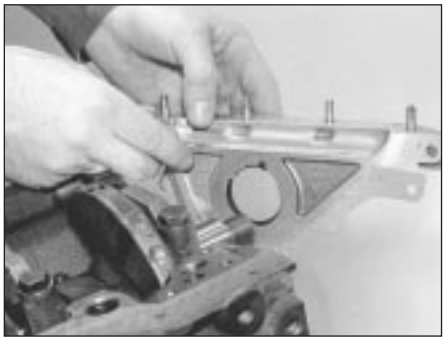


Fig. 13.20 Removing the timing belt rear cover on the 1372 ie and Turbo ie engines (Sec 7B)

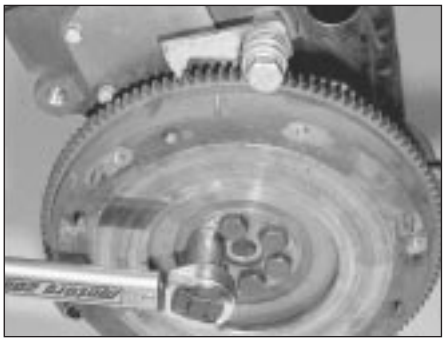
7B.140 Driving a new crankshaft front oil seal into its housing



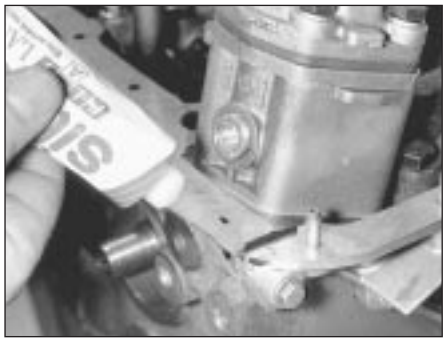
7B.141A Refit the crankshaft front oil seal housing . . .

7B.141B . . . ensuring it is flush with the face of the cylinder block

7B.158A Locate the flywheel, washer plate and bolts . . .



7B.158B . . . tighten the bolts to the specified torque



7B.165 Apply sealant to the front oil seal housing/cylinder block joint

new oil seal, ensuring that it is correctly orientated, and drive it squarely into position.

149 Refit all disturbed components.

Flywheel - removal, inspection and refitting

150 If not already done, remove the clutch as described in Chapter 5.

151 Prevent the flywheel from turning by jamming the ring gear teeth, or by bolting a strap between the flywheel and the cylinder block.

152 Make alignment marks on the flywheel and the end of the crankshaft, so that the flywheel can be refitted in its original position.

153 Unscrew the securing bolts and remove the washer plate, then withdraw the flywheel. Do not drop it, it is very heavy.

154 With the flywheel removed, the ring gear can be examined for wear and damage.

155 If the ring gear is badly worn or has missing teeth it should be renewed. The old ring gear can be removed from the flywheel by cutting a notch between two teeth with a hacksaw and then splitting it with a cold chisel. Wear eye protection when doing this.

156 Fitting of a new ring gear requires heating the ring to a temperature of 80ºC (176ºF). Do not overheat, or the hard-wearing properties will be lost. The gear has a chamfered inner edge which should fit against the shoulder on the flywheel. When hot enough, place the gear in position quickly, tapping it home if necessary, and let it cool naturally without quenching in any way.

157 Ensure that the mating faces are clean, then locate the flywheel on the rear of the crankshaft, aligning the previously made marks on the flywheel and crankshaft.

158 Fit the washer plate, and insert the securing bolts, then prevent the flywheel from turning as described in paragraph 151 whilst the bolts are tightened progressively to the specified torque setting in a diagonal sequence (photos).

159 If applicable, refit the clutch as described in Chapter 5.

Sump - removal and refitting

160 Drain the engine oil from the sump as described in Chapter 1.

161 Disconnect the lead from the engine oil level sensor in the sump.

162 Unscrew and remove the bolts retaining the gear linkage mounting bracket (where applicable) and the clutch housing lower cover bolts. Remove the cover from the clutch housing.

163 Unscrew and remove the sump retaining bolts and nuts and lower the sump from the crankcase. Recover the gasket.

164 Clean all traces of old gasket from the sump, crankcase and both oil seal housing mating surfaces.

165 Commence reassembly by applying sealing compound (FIAT No. 5882442 or equivalent) to the joints between the crankshaft front and rear oil seal housings and the mating face of the crankcase (photo).

166 Locate the new gasket in position on the crankcase then fit the sump. As it is fitted it will need to be twisted to avoid fouling the oil pump unit. Refit the retaining bolts and nuts and tighten them to the specified torque (photos).

167 Check that the sump drain plug is refitted and fully tightened. If the engine is in the car, top up the engine oil level.

Oil pump - removal, checking and refitting

168 Drain the engine oil and remove the sump as described in the previous sub-Section.

169 Unscrew the retaining bolts then withdraw the oil pump and intake pipe/filter from its location within the crankcase. Remove the gasket.

170 If oil pump wear is suspected, first check the cost and availability of new parts and the cost of a new pump. Then examine the pump as described below and decide whether renewal or repair is the best course of action.

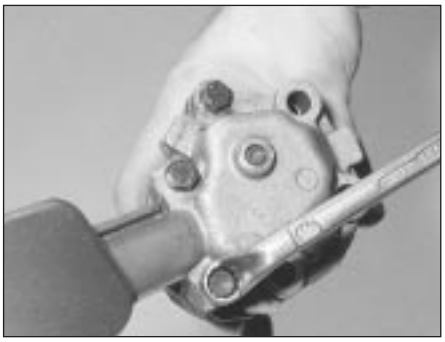
171 Unscrew the three securing bolts and remove the oil pump cover (photo). Note that as the cover is removed, the oil pressure relief valve components will be released.

172 Recover the oil pressure relief valve, spring and spring seat.

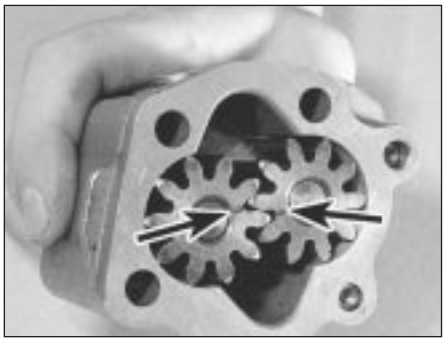
7B.166A Locate the new gasket . . .

7B.166B . . . refit the sump . . .

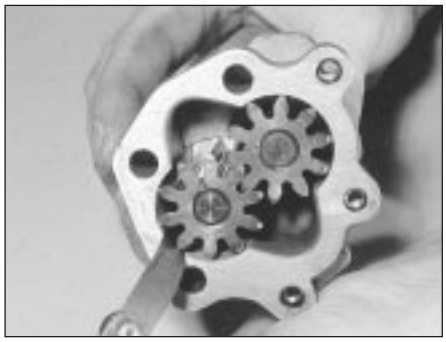
7B.166C . . . and insert the retaining bolts



7B.171 Undo the oil pump cover bolts



7B.175 Correct alignment of scribed marks (arrowed) on gears

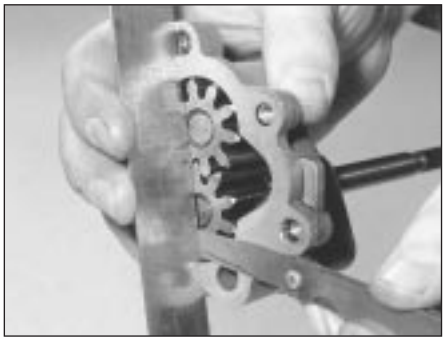


7B.176 Check gear-to-body clearance

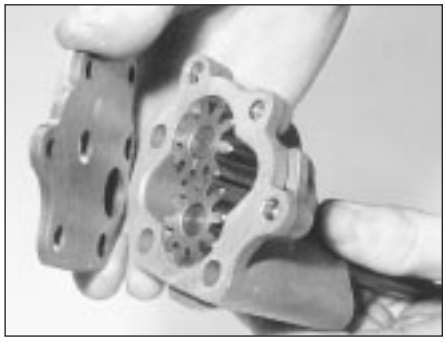
173 Lift the intermediate plate from the oil pump body.
174 The gears can now be removed from the oil pump body. Inspect them for obvious signs of wear or damage, and renew if necessary.
175 Commence reassembly by lubricating the gears with clean engine oil, and refitting them to the casing. Note that the scribed marks on the top faces of the gears should face each other with the gears installed (photo).
176 Using a feeler gauge, check that the clearance between the gears and the pump body is within the limits given in the Specifications (photo).
177 Using a straight-edge placed across the top of the pump body and the gears, and a feeler gauge, check that the gear endfloat is within the limits given in the Specifications (photo).
178 If either the gear-to-body clearance, or the gear endfloat is outside the specified limits, both gears should be renewed.
179 Locate the intermediate plate on the pump body (photo).
180 Place the pressure relief valve and spring over the pressure relief hole in the intermediate plate, and locate the spring seat over the boss in the pump cover, then refit the pump cover, ensuring that the pressure relief valve components seat correctly (photos).
181 Refit and tighten the pump cover securing bolts.
182 Thoroughly clean the mating faces of the pump and crankcase before refitting the pump. Prime the pump by injecting clean engine oil into it and turning it by hand.
183 Fit the pump using a new gasket, then insert the securing bolts and tighten them.
184 Refit the sump and top up the engine oil level.

Pistons/connecting rods - removal and refitting

185 Remove the sump and the cylinder head as described previously in this Section.
186 The big-end caps and connecting rods normally have identification marks stamped into their sides, facing the coolant pump side of the cylinder block. If no marks are present, use a centre-punch to identify the bearing caps and the connecting rods for location.
187 Turn the crankshaft so that No. 1 crankpin is at its lowest point, then unscrew the nuts and tap off the bearing cap. Keep the bearing shells in the cap and the connecting rod if they are to be re-used, taping them in position if necessary to avoid loss.
188 Using the handle of a hammer, push the piston and connecting rod up the bore and withdraw it from the top of the cylinder block. Loosely refit the cap to the connecting rod.
189 Repeat the procedure given in paragraphs 187 and 188 on No. 4 piston and connecting rod, then turn the crankshaft through half a turn and repeat the procedure on Nos 2 and 3 pistons and connecting rods.
190 The pistons and connecting rods and the big-end bearings can be examined and if

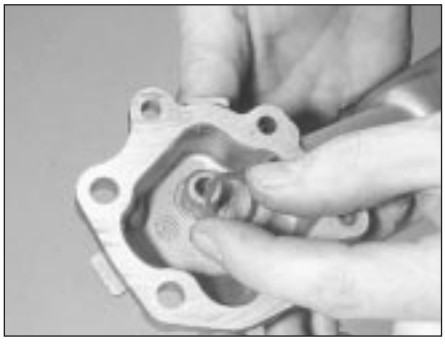


7B.177 Checking the gear endfloat



7B.179 Refitting the intermediate plate

7B.180A Locate pressure relief valve and spring on the intermediate plate

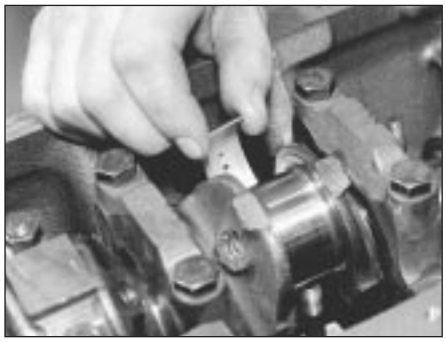


7B.180B Locate spring seat over boss within pump cover . . .

7B.180C . . . then fit the cover

7B.194A Fitting a ring compressor to a piston

7B.194B Tapping a piston into its bore



7B.195 Assemble the shell bearing to the connecting rod . . .

necessary renovated as described later in this Section.

191 Commence refitting as follows.

192 Clean the backs of the bearing shells and the recesses in the connecting rods and big-end caps.

193 Lubricate the cylinder bores with engine oil.

194 Fit a ring compressor to No. 1 piston, then insert the piston and connecting rod into No. 1 cylinder. With No 1 crankpin at its lowest point, drive the piston carefully into the cylinder with the wooden handle of a hammer (photos). Leave enough space between the connecting rod and the crankshaft to allow the bearing shell to be fitted. The piston must be fitted with the cut-out in the piston crown on the auxiliary shaft side of the engine, and the cylinder identification marking on the connecting rod and big-end cap on the coolant pump side of the engine - see Fig. 13.21.

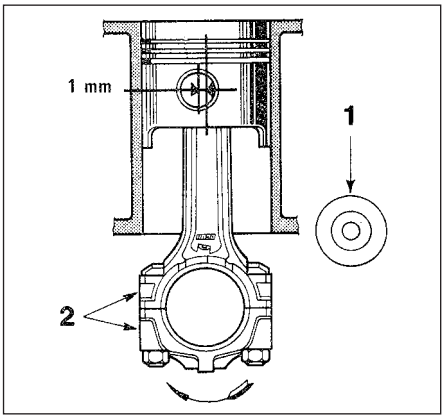


Fig. 13.21 Correct orientation of piston and connecting rod in engine - 1372 cc ie and Turbo ie engines (Sec 7B)

1 Auxiliary shaft
2 Cylinder identification markings on connecting rod and big-end cap
Arrow denotes direction of engine rotation
Note offset gudgeon pin

195 Slide the appropriate bearing shell into position in the connecting rod big-end, then pull the connecting rod firmly into position on the crankpin (photo).

196 Press the appropriate bearing shell into position in the big-end cap (photo).

197 Oil the crankpin, then fit the big-end bearing cap with the cylinder identification marking on the coolant pump side of the engine, and tighten the nuts to the specified torque setting (photos).

198 Check that the crankshaft turns freely.

199 Repeat the procedure in paragraphs 194 to 198 inclusive on the remaining pistons.

200 Refit the cylinder head and the sump.

Pistons/connecting rods - examination and renovation

201 The procedures for inspecting and renovating the pistons and connecting rod assemblies are in general the same as that described for the smaller engines in Section 18 of Chapter 1. However, the following additional points should be noted.

202 When renewing a gudgeon pin, first check the fit in the piston. It should be possible to fit the gudgeon pin using hand pressure, but the pin should be a tight enough fit that it does not drop out under its own weight. Oversize gudgeon pins are available as spares if necessary. Use new circlips when refitting the pistons to the connecting rods.

203 Before fitting the pistons to their connecting rods, weigh each piston and check that their weights are all within 2.5 g of each other. If not, the heavier pistons must be lightened by machining metal from the underside of the small-end bosses. This operation must be entrusted to a FIAT dealer or engine reconditioning specialist.

204 The pistons should be fitted to the connecting rods so that the higher, flat side of the piston crown is on the side of the connecting rod with the stamped cylinder identification number, ie the gudgeon pin is offset towards the cylinder identification number see Fig. 13.21.

205 The piston rings should be fitted with the word “TOP” on each ring facing uppermost, or if no marks are visible, as noted during removal. If a stepped top compression ring is being fitted, fit the ring with the smaller diameter of the step uppermost. The ring end gaps should be offset 120º from each other. Use two or three old feeler gauges to assist

7B.196 . . . and big-end bearing cap . . .

7B.197A . . . then fit the cap . . .

7B.197B . . . and tighten the nuts to the specified torque

fitting, as during removal. Note that the compression rings are brittle, and will snap if expanded too far.

206 If new pistons are to be fitted, they must be selected from the grades available, after measuring the cylinder bores. Normally, the appropriate oversize pistons are supplied by the dealer when the block is rebored.

207 Whenever new piston rings are being installed, the glaze on the original cylinder bores should be removed using either abrasive paper or a glaze-removing tool in an electric drill. If abrasive paper is used, use strokes at 60º to the bore centre-line, to create a cross-hatching effect.

Engine/transmission mountings - renewal

208 The engine/gearbox assembly is suspended in the engine compartment on three mountings, two of which are attached to the gearbox, and one to the engine.

Right-hand mounting

209 Apply the handbrake, then jack up the front of the vehicle and support it securely on axle stands.

210 Suitable lifting tackle must now be attached to the engine in order to support it as the engine mounting is removed. No lifting brackets are provided, so care must be taken when deciding on an engine lifting point. In the workshop, a right-angled bracket was made up by bending a suitable piece of steel plate. The bracket was then bolted to the engine using the rear right-hand camshaft housing securing bolt with suitable packing washers.

211 Attach the lifting tackle to the bracket on the engine and just take the weight of the assembly.

212 Working under the vehicle, unbolt the engine mounting bracket from the cylinder block, and unbolt the mounting from the body, then withdraw the bracket/mounting assembly.

213 Unscrew the nut and through-bolt, counter holding the bolt with a second spanner or socket, and separate the mounting from the bracket.

214 Fit the new mounting to the bracket, and tighten the nut to the specified torque, while counterholding the through-bolt using a suitable spanner or socket.

215 Refit the mounting bracket to the cylinder block, and tighten the securing bolts to the specified torque.

216 Refit the mounting to the body and tighten the securing bolts to the specified torque.

217 Disconnect the lifting tackle from the engine, and remove the engine lifting bracket.

218 Lower the vehicle to the ground.

Left-hand mountings

219 Apply the handbrake, then jack up the front of the vehicle and support it securely on axle stands.

220 Suitable lifting tackle must now be attached to the gearbox lifting bracket in order to support the weight of the assembly as the mounting is removed.

221 Attach the lifting tackle to the bracket on the gearbox, and just take the weight of the assembly.

222 Working under the vehicle, unbolt the mounting bracket from the gearbox, and unbolt the mounting from the body, then withdraw the bracket/mounting assembly.

223 Proceed as described in paragraphs 213 and 214.

224 Refit the mounting bracket to the gearbox, and tighten the securing bolts to the specified torque.

225 Refit the mounting to the body and tighten the mounting bolts to the specified torque.

226 Disconnect the lifting tackle from the engine.

227 Lower the vehicle to the ground.

PART C: ENGINE REMOVAL AND DISMANTLING

Method of removal - general

1 The engine (complete with transmission) is disconnected and lowered downwards through the engine compartment, then withdrawn from the front underside of the car.

1372 cc engine/ transmission - removal and separation

Warning: Refer to the beginning of Section 9 before starting any work.

2 Depressurize the fuel system as described in Section 9 of this Chapter.

3 Disconnect the battery negative lead.

4 Mark the position of the hinges on the underside of the bonnet, then with the aid of an assistant, unscrew the hinge bolts and lift the bonnet clear of the car. Store the bonnet in a safe area.

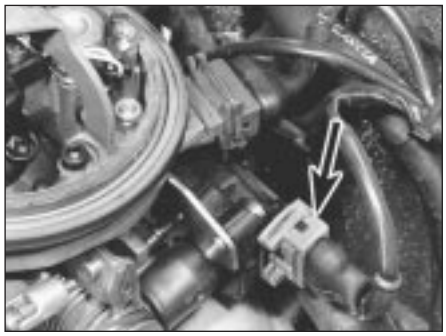
5 Drain the engine coolant.

6 Drain the engine and transmission oils.

7 Disconnect and remove the air filter.

8 Disconnect the coolant hoses from the engine, including the hose to the inlet manifold.

9 Detach the ignition coil (HT) lead from the distributor.



7C.10 Engine idle speed actuator/SPi unit lead connection (arrowed)

10 Compress the retaining clip and detach the engine idle speed actuator lead from the SPi unit (photo).

11 Disconnect the brake servo vacuum pipe from its connector on the inlet manifold.

12 Disconnect the throttle cable from the SPi unit.

13 Disconnect the engine speed sensor lead.

14 Release and detach the reversing light lead from the switch on the transmission (photo).

15 Before disconnecting the hydraulic hose from the clutch slave cylinder, remove the filler cap from the reservoir and place a piece of polythene sheet over the filler neck, then refit the cap; this will help prevent excess fluid loss. Once disconnected, plug the hose and its cylinder connection to prevent the ingress of dirt into the hydraulic system.

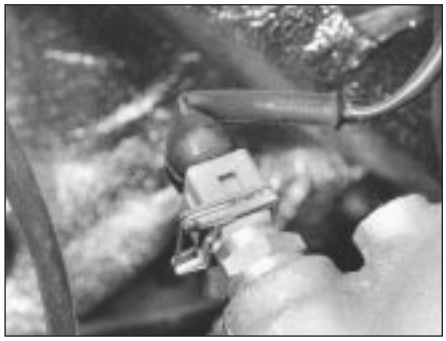
16 Disconnect the wiring connector from the alternator.

17 Position a clean rag under the fuel supply and return hose connections to the SPi unit, then slowly unscrew the hose clips to release the system pressure; catch fuel leakage in the rag and dispose of it safely. Detach the hoses and plug them to prevent ingress of dirt and any further fuel leakage. Position the hoses out of the way.

18 Detach the wiring connector from the engine coolant temperature sender unit (photo).

19 Release the retaining clip and detach the wiring connector from the throttle position switch. Also detach the associated earth leads from the cylinder head.

7C.14 Reversing light switch and lead



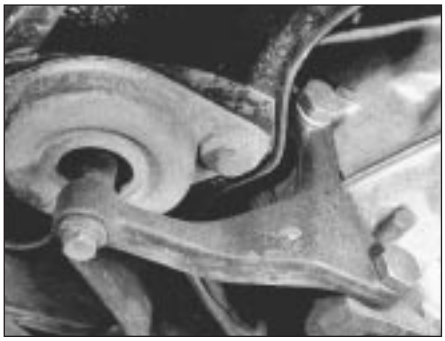
7C.18 Engine coolant temperature sender and wiring connector

7C.20 Fuel injector wiring connection

7C.32 Disconnecting the speedometer drive cable from the transmission

7C.33 Disconnect the transmission earth strap

7C.36A Engine right-hand mounting



7C.36B Transmission rear mounting

20 Release the retaining clip and detach the wiring connector from the fuel injector connection (photo).
21 Loosen off the front wheel bolts each side, then raise and support the car at the front end on axle stands. When raised, support at a height which will allow the engine and transmission to be withdrawn from the underside when fully disconnected. Ensure that the vehicle is securely supported before working underneath it.
22 Unscrew the wheel bolts and remove the front roadwheels.
23 Release the retaining clips and remove the underwing shield from the right- and left-hand front wheel arch.
24 Relieve the staking, then unscrew and remove the front hub nut using a socket and suitable extension. Repeat the procedure on the opposite front hub.
25 Unscrew the retaining nut and disconnect the tie-rod to steering arm balljoint using a suitable balljoint separator tool. Repeat the procedure on the other side.
26 Note the direction of fitting, then unscrew and remove the hub-to-strut retaining bolts and nuts on each side.
27 Unscrew and remove the anti-roll bar-to-track control arm retaining nuts each side.
28 Unscrew and remove the front brake caliper hydraulic pipe support bracket bolt each side.
29 Pull the wheel hub outwards and detach the driveshaft from it, noting that there may be a small amount of oil spillage as it is withdrawn. Repeat the procedure on the opposite side.
30 Disconnect the wiring connector from the engine oil level sensor lead.
31 Unscrew the retaining nuts to detach and remove the exhaust pipe front section or alternatively, remove the system complete.
32 Unscrew the knurled retaining nut and detach the speedometer cable from the transmission (photo).
33 Unscrew the retaining nut and detach the earth strap from the transmission (photo).
34 Extract the split pin and detach the gear selector rod from the transmission pin. Disconnect the gear engagement and selector levers from the balljoints.
35 The weight of the engine will now need to be supported from above. Connect a suitable lift hoist and sling to the engine. When securely connected, take the weight of the engine/transmission unit so that the tension is relieved from the mountings.
36 Unscrew and remove the engine and transmission support mounting bolts at the points indicated (photos).
37 The engine/transmission unit should now be ready for removal from the vehicle. Check that all of the associated connections and

Fig. 13.22 The underwing shield retaining clips (arrowed) on the 1372 cc ie and Turbo ie engines (Sec 7C)

Fig. 13.23 Engine oil level sensor wiring connector (arrowed) on the 1372 cc ie and Turbo ie engines (Sec 7C)

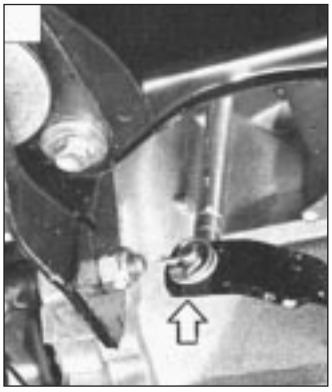


Fig. 13.24 Disconnect the gear selector rod at the connection indicated on the 1372 cc ie and Turbo ie engines (Sec 7C)

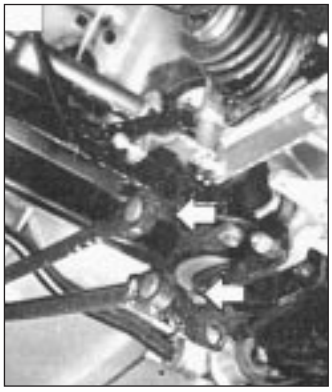
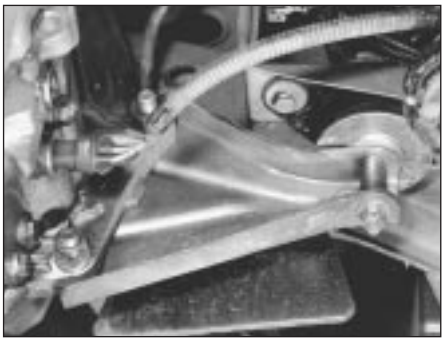
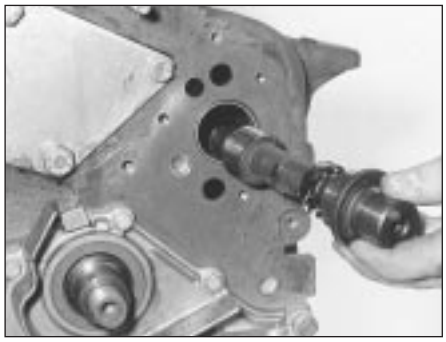


Fig. 13.25 Gear engagement and selector lever balljoints (arrowed) on the 1372 cc ie and Turbo ie engines (Sec 7C)



7C.36C Transmission front mounting

7C.53 Driving a new oil seal into the auxiliary shaft cover



7C.54 Inserting the auxiliary shaft into the cylinder block (rear timing belt cover removed)

fittings are disconnected from the engine and transmission and positioned out of the way. Enlist the aid of an assistant to help steady and guide the power unit down through the engine compartment as it is removed, If available, position a suitable engine trolley or crawler board under the engine/transmission so that when lowered, the power unit can be withdrawn from the front end of the vehicle and moved to the area where it is to be cleaned and dismantled.

38 Carefully lower the engine and transmission unit, ensuring that no fittings become snagged. Detach the hoist and withdraw the power unit from under the vehicle.

39 To separate the engine from the transmission, unbolt and remove the starter motor, then unscrew the retaining bolts and withdraw the transmission from the engine. As it is withdrawn, do not allow the weight of the engine or transmission to be taken by the input shaft.

40 To remove the clutch unit, refer to Chapter 5 for details.

1372 cc Turbo ie engine/transmission - removal and separation

41 The engine and transmission removal and refitting details for Turbo-engined models are similar to those described for the non-Turbo models in the previous sub-Section, but the following differences should be noted.

42 To provide access for the disconnection of the turbo and related components, first remove the inlet manifold. Removal of the inlet manifold and the turbocharger is described in Section 9 of this Chapter.

43 The ignition distributor on the Turbo engine is driven from the auxiliary shaft and is mounted at the front of the engine, towards the timing cover end.

44 The right-hand driveshaft has a steady bearing and this will need to be unbolted and detached.

Engine dismantling - general

45 Refer to Chapter 1, Section 14 for details.

Auxiliary shaft - removal, inspection and refitting

46 Remove the engine and transmission from the vehicle as described previously in this Section part.

47 Drain the engine oil and remove the sump as described in Part B of this Section.

48 Remove the oil pump as described in Part B of this Section.

49 Remove the timing belt and the auxiliary shaft sprocket as described in Part B of this Section.

50 Unscrew the three retaining bolts and remove the auxiliary shaft cover. Remove the gasket.

51 Withdraw the auxiliary shaft from the cylinder block.

52 Examine the shaft and its bearing bushes in the cylinder block for signs of excessive wear and/or damage and renew it if necessary. Bush renewal is described in paragraph 79 in this Section.

53 The cover gasket and the oil seal should always be renewed whenever the cover is removed. To renew the seal, support the cover on blocks of wood and drive out the old seal using a suitable drift inserted in the cut-out in the back of the cover. Clean the seal location in the housing. Drive the new seal into place using a suitable metal tube or socket (photo). The sealing lip must face towards the cylinder block. Smear the sealing lips with clean engine oil before installation.

54 Commence refitting by lubricating the auxiliary shaft journals with clean engine oil, then insert the shaft into the cylinder block (photo).

55 Refit the auxiliary shaft cover, using a new gasket, and tighten the securing bolts (photos).

56 Refit the auxiliary shaft sprocket, timing belt, cover and crankshaft pulley as described in Part B of this Section.

57 Refit the engine and transmission with reference to Part D of this Section.

Engine - complete dismantling

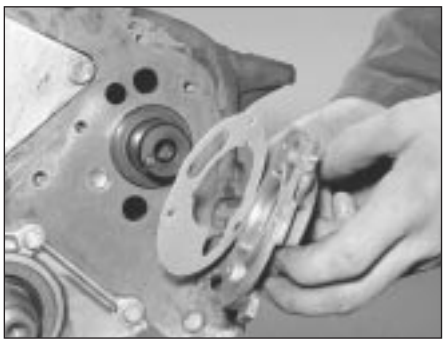
Warning: Refer to the beginning of Section 9 before starting any work.

58 Detach and remove the following ancillary items. Where applicable, refer to the appropriate Chapter or Section within this Chapter for more detailed removal instructions.

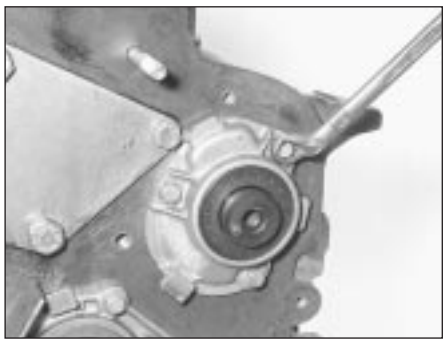
Engine oil dipstick
Ignition distributor and HT leads
Fuel pump
Alternator
Oil filter
Oil vapour recovery unit
Inlet and exhaust manifolds and associated fuel injection components (as applicable)
Clutch unit

59 Refer to Part B of this Section for details and remove the timing cover and drivebelt.

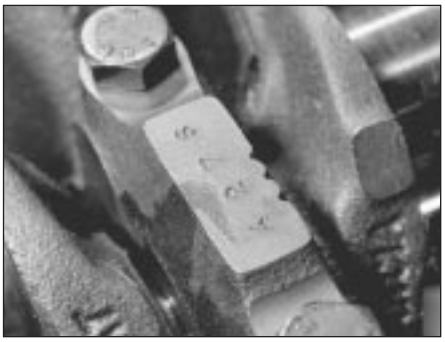
60 Refer to Part B of this Section for details and remove the cylinder head unit.



7C.55A Refit the auxiliary shaft cover with a new gasket . . .



7C.55B . . . and tighten the securing bolts



7C.69 Identification notches on No. 3 main bearing cap

7C.70 Measuring crankshaft endfloat using feeler gauge method

61 Refer to Part B of this Section for details and remove the flywheel.
62 Refer to the previous sub-Section for details and remove the auxiliary shaft.
63 Refer to Part B of this Section for details and remove the sump.
64 Refer to Part B of this Section for details and remove the oil pump unit.
65 Refer to Part B of this Section for details and remove the front and rear crankshaft oil seals.
66 Refer to Part B of this Section and remove the piston/connecting rod assemblies.
67 Refer to Part B of this Section for details and remove the crankshaft and main bearing assemblies.

Crankshaft and main bearings - removal

68 Unscrew the securing bolts and remove the front and rear crankshaft oil seal housings. Recover the gaskets.
69 Check the main bearing caps for identification marks and if necessary use a centre-punch to identify them. Normally the caps have identifying notches cut into their top face nearest the timing belt end of the engine, with the exception of No 5 cap (flywheel end) which has no marking (photo).
70 Before removing the crankshaft, check that the endfloat is within the specified limits. Ideally a dial gauge should be used, but alternatively feeler gauges can be used as follows. Push the crankshaft as far as possible towards the timing end of the engine, and using a feeler gauge, measure the gap between the rear face of the flywheel mounting flange on the crankshaft and the outer face of the thrust washer (photo). Now push the crankshaft as far as possible in the opposite direction and take the same measurement again. The difference between the two measurements is the crankshaft endfloat. If the endfloat is outside the specified limits, new thrustwashers will be required.
71 Unscrew the bolts and tap off the main bearing caps complete with bearing shells. If the bearing shells are to be re-used, tape them to their respective caps.
72 Lift the crankshaft from the crankcase.
73 Extract the bearing shells from the crankcase, keeping them identified for location if they are to be re-used, and recover the thrust washers from No. 5 main bearing location.

Engine components - examination and renovation

74 With the engine completely stripped, clean all the components and examine them for wear. Each part should be checked and where necessary renewed or renovated as described elsewhere in this Section. Renew main and big-end bearing shells as a matter of course, unless it is known that they have had little wear and are in perfect condition.
75 If in doubt as to whether to renew a component which is still just serviceable, consider the time and effort which will be incurred should the component fail at an early date. Obviously the age and expected life of the vehicle must influence the standards applied.
76 Gaskets, oil seals and O-rings must all be renewed as a matter of course. FIAT specify that the main cylinder head bolts should be renewed after they have been used (ie tightened) four times - if in any doubt as to the number of times the bolts have been used, renew them in any case as a precaution against possible failure.
77 Take the opportunity to renew the engine core plugs while they are easily accessible. Knock out the old plugs with a hammer and chisel or punch. Clean the plug seats, smear the new plugs with sealant and tap them squarely into position.
78 Clean and examine the cylinder block as described in paragraphs 2 to 7 of Section 18, Chapter 1.
79 If the auxiliary shaft bushes are excessively worn or are oval, they must be renewed. When the new bushes are installed, they may need to be reamed to suit. The renewal of the auxiliary shaft bushes is therefore best entrusted to an engine reconditioner or FIAT dealer. When the bushes are renewed, ensure that the oil hole in each bush is aligned with the oil channel in the cylinder block.

PART D: ENGINE REASSEMBLY

Reassembly - general

1 Refer to Chapter 1, Section 19.

Crankshaft and main bearings - refitting

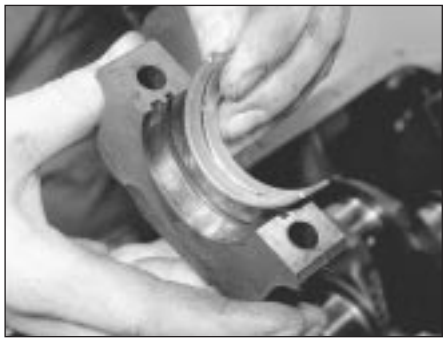
2 Ensure that the crankcase and crankshaft are thoroughly clean, and that the oilways are clear. If possible, blow through the oil drillings with compressed air, and inject clean engine oil into them.
3 Unless they are virtually new, the old main bearing shells should be renewed. Failure to do so is a false economy.
4 If new bearing shells are being fitted, wipe away all traces of protective grease.
5 Note that there is a tag on the back of each bearing shell, which engages with a groove in the relevant seat in the crankcase or bearing cap.
6 Wipe clean the bearing shell locations in the crankcase with a non-fluffy rag, then lubricate them and fit the five upper halves of the bearing shells to their seats. Note that the centre (No. 3) bearing shell is plain, whereas all the other shells have oil grooves (photos).
7 Fit the thrustwashers to the No. 5 main bearing shell location, with the grooved side of each washer facing away from the face of the cylinder block - ie towards the thrust face of the crankshaft (photos).
8 Wipe the bearing shell locations in the

7D.6A No. 3 main bearing shell is plain . . .

7D.6B . . . all others have oil groove

7D.7A Locate the thrust washer . . .

7D.7B . . . sliding them into position each side of the No. 5 main bearing



7D.8 Locate the bearing shells into the main bearing caps . . .

bearing caps with a soft non-fluffy rag, then fit the lower halves of the bearing shells to their seats. Again, note that the centre (No. 3) bearing shell is plain, whereas all the other shells have oil grooves (photo).

9 Lubricate the crankshaft journals and the upper and lower main bearing shells with clean engine oil (photo).

10 Carefully lower the crankshaft into the crankcase (photo). If necessary, seat the crankshaft using light taps with a rubber-faced hammer on the crankshaft balance webs.

11 Lubricate the crankshaft main bearing journals again, the fit the No. 1 bearing cap. Fit the two securing bolts, and tighten them as far as possible by hand.

12 Fit the No. 5 bearing cap, and as before tighten the bolts as far as possible by hand.

13 Fit the centre and then the intermediate bearing caps, and again tighten the bolts as far as possible by hand.

14 Check that the markings on the bearing caps are correctly orientated as noted during dismantling - ie the identification grooves should face towards the timing side of the engine, then working from the centre cap outwards in a progressive sequence, finally tighten the bolts to the specified torque (photo).

15 Check that the crankshaft rotates freely. Some stiffness is to be expected with new components, but there should be no tight spots or binding.

16 Check that crankshaft endfloat is within the specified limits, as described in paragraph 70 of Part C in this Section.

17 Examine the condition of the front and rear crankshaft oil seals and renew if necessary with reference to Part B of this Section. It is advisable to renew the oil seals as a matter of course unless they are in perfect condition.

18 Lubricate the oil seal lips with clean engine oil, then carefully fit the front and rear oil seal housings using new gaskets.

Pistons and connecting rods - refitting

19 Refer to Part B of this Section.

Oil pump - refitting

20 Refer to Part B of this Section.

Sump - refitting

21 Refer to Part B of this Section.

Flywheel - refitting

22 Refer to Part B of this Section. When the flywheel is bolted in position, refer to Chapter 5 for details and refit the clutch unit.

Auxiliary shaft - refitting

23 Refer to Part C of this Section.

Cylinder head - refitting

24 Refer to Part B of this Section. Note that this procedure describes cylinder head refitting complete with the camshaft housing assembly and manifolds as a complete unit. Details of refitting the camshaft housing (and followers) to the cylinder head will be found separately in Part B.

Timing belt and covers - refitting

25 Refer to Part B of this Section.

Engine/transmission - reconnection and refitting

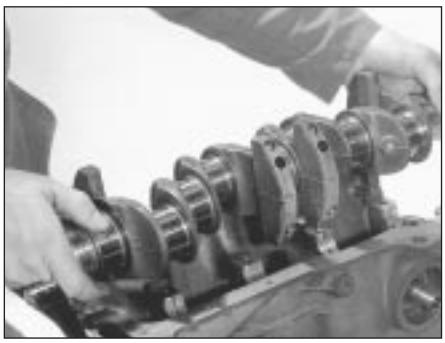
Note: *A suitable hoist and lifting tackle will be required for this operation. New locktabs will be required for the exhaust downpipe-to-manifold nuts, and suitable exhaust assembly paste, will be required when reconnecting the downpipes to the exhaust manifold.*

26 Before attempting to reconnect the engine to the gearbox, check that the clutch friction disc is centralised as described in Chapter 5, Section 8. This is necessary to ensure that the gearbox input shaft splines will pass through the splines in the centre of the friction disc.

27 Check that the clutch release arm and bearing are correctly fitted, and lightly grease the input shaft splines.

28 Mate the engine and gearbox together, ensuring that the engine adapter plate is correctly located, and that the gearbox locates on the dowels in the cylinder block, then refit the engine-to-gearbox bolts and the single nut, but do not fully tighten them at this stage. Ensure that any brackets noted during

7D.9 . . . and lubricate the shells



7D.10 Lower the crankshaft into position

7DS.14 Tighten the main bearing cap bolts to the specified torque setting

removal are in place under the engine-to-gearbox bolts. Do not allow the weight of the gearbox to hang on the input shaft as it is engaged with the clutch friction disc.

29 Refit the starter motor, ensuring that the wiring harness bracket is in position on the top bolt.

30 Locate the engine/transmission unit at the front of the car and move it into position under the engine compartment. Attach the lifting sling and hoist as during removal.

31 Enlist the aid of an assistant to help steady the combined units as they are raised into position and to locate the mountings in the engine compartment.

32 Once they are located, tighten the mountings to the specified torque settings, then disconnect the lifting hoist and sling.

33 The remainder of the refitting and reconnection procedures are a reversal of the removal procedure described in Part C. For further details on reconnecting the suspension and driveshaft components, refer to Chapter 7 and Section 13 of this Chapter.

34 Ensure that the exhaust downpipe-to-manifold connection is clean and renew the gasket when reconnecting this joint. Use a smear of exhaust assembly paste on the joint faces. Use new lockwashers and tighten the flange nuts securely.

35 Ensure that all fuel and coolant connections are cleanly and securely made.

36 Ensure that all wiring connections are correct and securely made.

37 Top up the engine and transmission oil levels.

38 Refill the cooling system.

39 Check that all connections are securely made, then reconnect the battery negative lead.

Initial start-up after major overhaul

40 Refer to Chapter 1, Section 45.

8 Cooling system

PART A: 999 AND 1108 CC ENGINES

Description

1 The operation and function of the cooling system is essentially as described in Chapter 2 but note the location of the various components and the routing of the coolant hoses in Fig. 13.26.

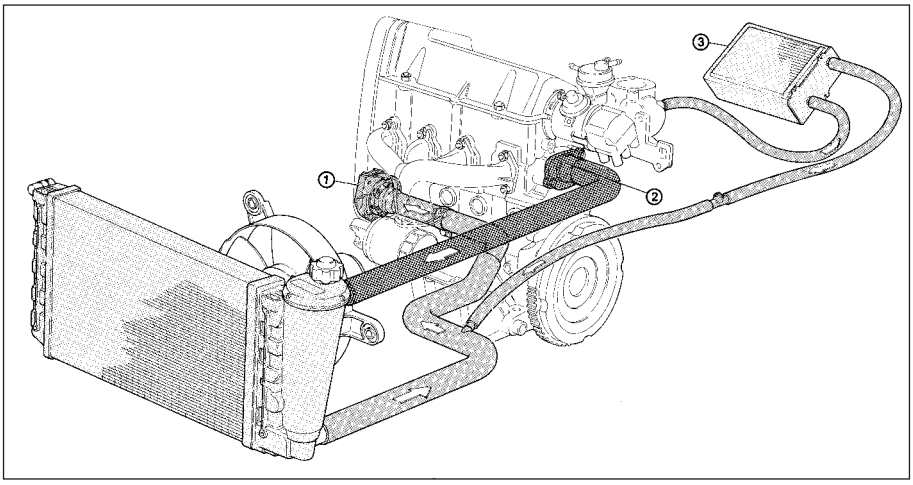


Fig. 13.26 Cooling system circuit - 999 and 1108 cc engines (Sec 8A)

1 Coolant pump 2 Thermostat 3 Heater matrix

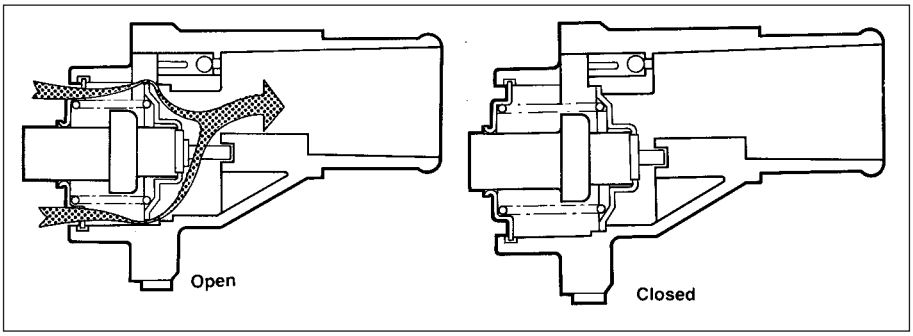


Fig. 13.27 Cooling system thermostat in open and closed positions - 999 and 1108 cc engines (Sec 8A)

Maintenance

2 Topping-up, draining and refilling procedures are as for 1116 and 1301 cc engines in Chapter 2, but note that the coolant capacity is different (see Specifications).

Thermostat - removal and refitting

3 The thermostat is located on the left-hand end of the cylinder head, below the distributor.

4 The thermostat cannot be renewed independently of its housing and if faulty the complete assembly must be renewed.

5 Drain the cooling system.

6 Although the thermostat housing can be removed directly from the cylinder head, better access is provided if the distributor is first withdrawn as described in Section 10 of this Chapter (photo).

7 Disconnect the coolant hose from the thermostat housing and unscrew the housing flange bolts. Remove the assembly. Note that it may be necessary to tap it free with a plastic-faced or wooden mallet if stuck in place.

8 Remove the gasket and clean the mating surfaces.

9 Use a new gasket and bolt the assembly into position (photo).

10 Reconnect the coolant hose, then fill and bleed the cooling system.

8A.6 The thermostat housing (shown with distributor removal) on the 999 cc engine

8A.9 Fitting the thermostat housing. Note the new gasket

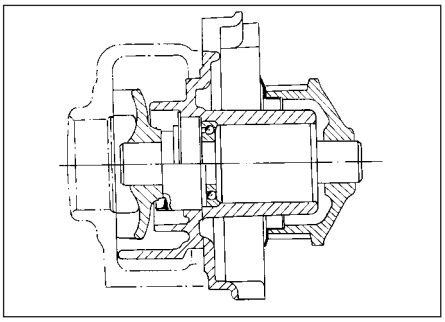
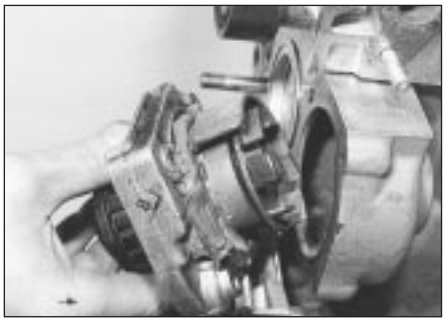
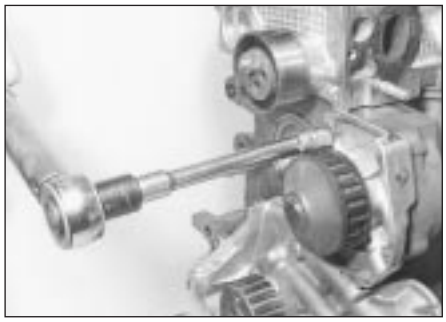


Fig. 13.28 Sectional view of the coolant pump on the 999 and 1108 cc engines (Sec 8A)



8A.17A Fitting the coolant pump to the 999 cc engine



8A.17B Tightening the coolant pump bolts

Coolant pump - removal and refitting

11 The coolant pump is located on the crankshaft pulley end of the engine and is driven by the timing belt.
12 The pump cannot be repaired and must be regarded as disposable.
13 Drain the cooling system.
14 Remove the timing belt cover and then set No. 1 piston to TDC. To achieve this, turn the crankshaft pulley bolt until the camshaft sprocket timing mark is aligned with the one on the cylinder head.
15 Release the belt tensioner and slip the timing belt off the camshaft and coolant pump sprockets.
16 Unbolt and remove the coolant pump and clean the mounting face of all old gasket material.
17 Apply a continuous bead of RTV silicone sealant (instant gasket) to the mounting face of the coolant pump and bolt it into position (photos).
18 Check that the camshaft sprocket and the crankshaft have not been moved and fit the timing belt to the camshaft and coolant pump sprockets. The pump sprocket does not require setting in any particular position before connecting the timing belt.
19 Tension the belt as described in Section 5B of this Chapter.
20 Fit the timing belt cover.
21 After allowing one hour for the gasket material to cure, refill and bleed the cooling system.

PART B: 1301 CC TURBO IE ENGINE

Description

1 The cooling system on this model has flow and return connections to the turbocharger, and is an essential means of cooling the turbocharger.
2 The radiator cooling fan is of two-speed type, being controlled by a two-stage thermostatic switch screwed into the radiator side tank.
3 According to the coolant temperature level, the fan speed is regulated to provide the most effective cooling.
4 The remote cooling system expansion tank is mounted in the left-hand rear corner of the engine compartment (photo).

PART C: 1372 CC IE AND 1372 CC TURBO IE ENGINES

Description

1 The cooling system layout and components for the 1372 cc engines is shown in Figs. 13.29 and 13.30.
2 The system on each engine operates in essentially the same manner as that described for the other models in Chapter 2, but the location of components and the coolant hose routings differ according to model. The cooling system expansion tank location differs according to model, being either located on the side of the radiator or mounted separately on the side of the inner wing panel.
3 On Turbo models, the cooling system also assists in cooling the turbocharger.

Maintenance

4 The maintenance procedures are essentially the same as those described for the other models in Chapter 2.

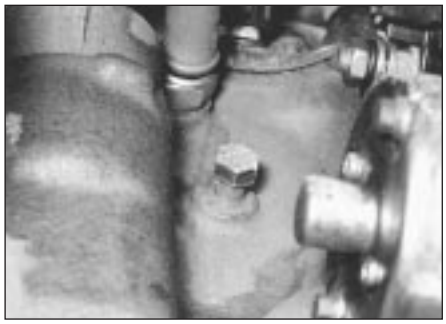
Cooling system - draining, flushing and refilling

Warning: Wait until the engine is cold before starting this procedure. Do not allow antifreeze to come into contact with your skin or painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell. Antifreeze is fatal if ingested.

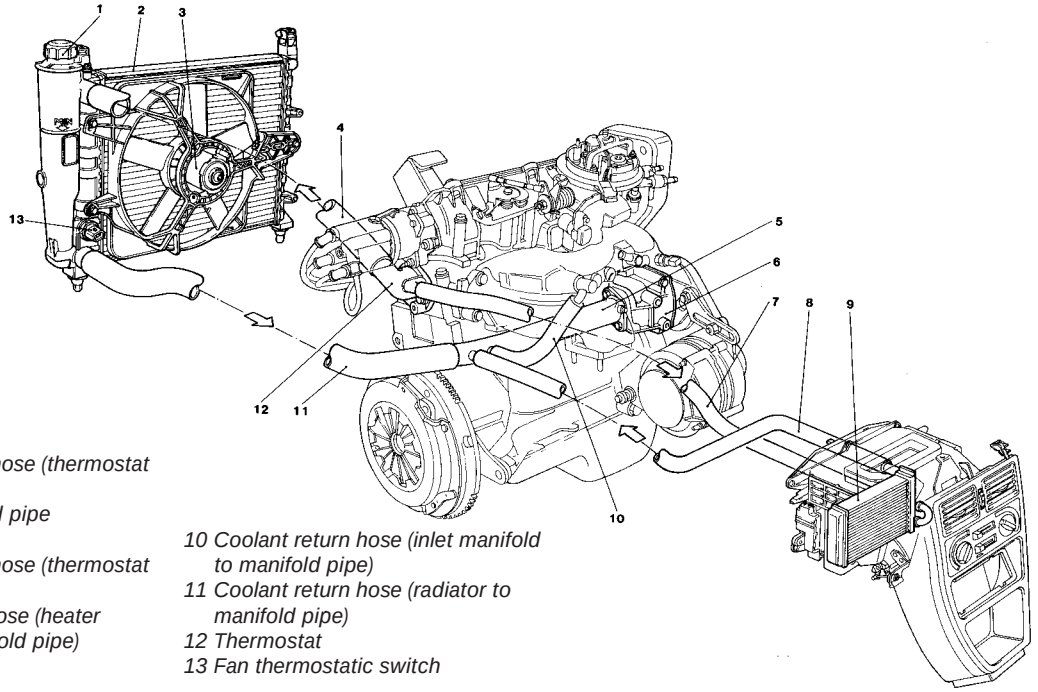
5 Disconnect the battery negative lead.
6 Working inside the vehicle, turn the heater temperature control knob fully to the right, which will fully open the heater coolant valve.
7 With the expansion tank cap removed, place a suitable container beneath the radiator bottom hose.
8 Loosen the clip and ease the bottom hose away from the radiator outlet (photo). Allow the coolant to drain into the container.
9 Reposition the container under the front of the cylinder block, and unscrew the cylinder block drain plug (photo). Allow the coolant to drain into the container.

8B.4 Topping up the expansion tank with antifreeze on the 1301 cc engine

8C.8 Bottom hose connection to the radiator



8C.9 Cylinder block drain plug



1 *Expansion tank*
2 *Radiator*
3 *Electric fan*
4 *Coolant supply hose (thermostat to radiator)*
5 *Coolant manifold pipe*
6 *Coolant pump*
7 *Coolant supply hose (thermostat to heater matrix)*
8 *Coolant return hose (heater radiator to manifold pipe)*
9 *Heater matrix*
10 *Coolant return hose (inlet manifold to manifold pipe)*
11 *Coolant return hose (radiator to manifold pipe)*
12 *Thermostat*
13 *Fan thermostatic switch*

Fig. 13.29 Cooling system circuit - 1372 cc ie engine (Sec 8C)

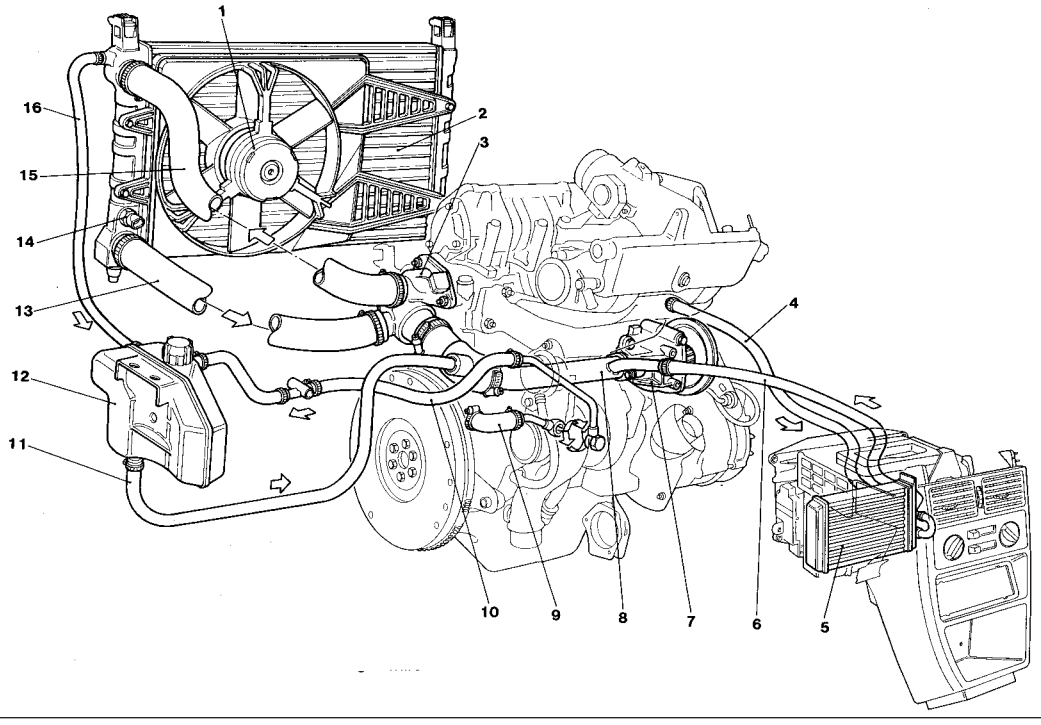
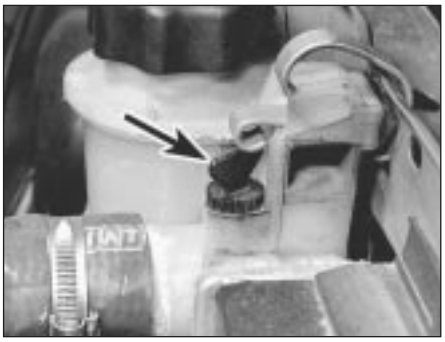


Fig. 13.30 Cooling system circuit - 1372 cc Turbo ie engine (Sec 8C)

1 *Electric fan*
2 *Radiator*
3 *Thermostat*
4 *Coolant supply hose (inlet manifold to heater matrix)*
5 *Heater matrix*
6 *Coolant return hose (heater matrix to the manifold pipe)*
7 *Coolant pump*
8 *Coolant manifold pipe*
9 *Coolant supply hose (cylinder block/crankcase to the turbocharger)*
10 *Coolant return hose (turbocharger to the expansion tank)*
11 *Coolant supply hose (expansion tank to the manifold pipe)*
12 *Expansion tank*
13 *Coolant return hose (radiator to the manifold pipe)*
14 *Fan thermostatic switch*
15 *Coolant supply hose (thermostat to the radiator)*
16 *Coolant return hose (radiator to the expansion tank)*



8C.14 Bleed screw location on top of the expansion tank (arrowed)

8C.21A Cooling fan and wiring connector

8C.21B Cooling fan switch wiring connector

10 Apply suitable sealant to the threads of the drain plug, then refit and tighten the plug.
11 Dispose of the drained coolant safely, or keep it in a covered container if it is to be re-used.
12 If required, the system can be flushed through as described in Section 2 of Chapter 2.
13 Before attempting to refill the cooling system, make sure that all hoses have been reconnected, that the hoses and clips are in good condition, and that the clips are tight. Also ensure that the cylinder block drain plug has been refitted and tightened. Note that an antifreeze mixture must be used all year round to prevent corrosion of the engine components - refer to Section 3, Chapter 2.
14 Open the bleed screw in the top of the expansion tank (photo).
15 Remove the expansion tank cap, and fill the system by slowly pouring the coolant into the expansion tank to prevent air locks from forming.
16 Top up the coolant until liquid free from air bubbles emerges from the radiator bleed screw orifice, then close the bleed screw.
17 Continue topping up until the coolant reaches the Maximum mark on the expansion tank.
18 Start the engine and run it until it reaches normal operating temperature, then stop the engine and allow it to cool. Normal operating temperature is reached when the cooling fan cuts into operation. Feel the radiator top hose to ensure that it is hot. If cool, it indicates an air lock in the system.
19 Check for leaks, particularly around disturbed components. Check the coolant level in the expansion tank, and top up if necessary. Note that the system must be cold before an accurate level is indicated. There is a risk of scalding if the expansion tank cap is removed whilst the system is hot.

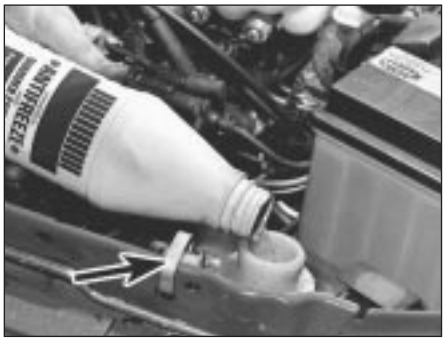
Radiator (and cooling fan) - removal and refitting

20 Disconnect the battery negative lead.
21 Detach the wiring connectors from the cooling fan and the fan switch located in the radiator (photos).
22 If preferred, the cooling fan unit can be removed separately from the radiator, by undoing the attachment bolts and carefully withdrawing the unit upwards from the vehicle. Take care not to damage the radiator core as it is lifted clear (photo).
23 Drain the cooling system as described earlier in this part of the Section, but note that it will not be necessary to remove the cylinder block drain plug.
24 Undo the retaining screws and remove the front grille panel.
25 Loosen off the retaining clips and detach the upper coolant hose and the expansion hose from the radiator.
26 Note their direction of fitting, then prise free the radiator retaining clips. Carefully lift the radiator from the car.
27 Refitting is a reversal of the removal procedure. Ensure that as the radiator is lowered into position, it engages in the two rubber location grommets.
28 With the radiator (and cooling fan) refitted, top up the cooling system as described earlier in this Section (photo).

Thermostat - removal and refitting

Note: *A new thermostat cover gasket must be used on refitting.*
29 Drain the cooling system as described earlier in this Section, but note that there is no need to drain the cylinder block.
30 Disconnect the coolant hoses from the thermostat cover (situated at the gearbox end of the cylinder head).
31 Unscrew the two thermostat cover securing bolts, noting that the left-hand bolt may also secure the HT lead bracket, and remove the thermostat/cover assembly. Recover the gasket (photo).
32 If faulty, the thermostat must be renewed complete with the housing as an assembly.
33 If desired the thermostat can be tested as described in Chapter 2.
34 Refitting is a reversal of removal, bearing in mind the following points.

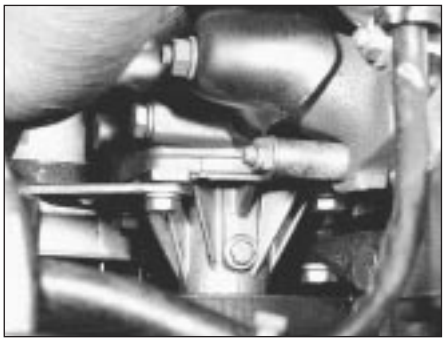
8C.22 Cooling fan to radiator securing bolt



8C.28 Topping up the radiator coolant level on the 1372 cc ie engine. Note orientation of radiator retaining clip (arrowed)

8C.31 Thermostat unit removal on the 1372 cc ie engine (distributor removed for clarity)

8C.40 Coolant pump/alternator bracket bolt removal



8C.48 Top side view of water pump, alternator and drivebelt

8C.49 Alternator/water pump drivebelt and tensioner viewed from the right-hand wheel arch

35 Clean the mating faces of the thermostat cover and cylinder head, and use a new gasket when refitting the cover.
36 Refill the cooling system as described earlier in this Section.

Coolant pump - removal and refitting

Note: *A new coolant pump gasket must be used on refitting. If the pump is found to be worn it must be renewed as a complete unit as dismantling and repair is not possible.*
37 Disconnect the battery negative lead.
38 Drain the cooling system as described earlier in this Section.
39 Remove the coolant/alternator drivebelt as described in the next sub-Section.
40 Unscrew the four coolant pump securing bolts, noting that two of the bolts also secure the alternator adjuster bracket, and withdraw the pump from the housing (photo). Recover the gasket.
41 Refitting is a reversal of removal, bearing in mind the following points.
42 Use a new gasket between the pump and the housing.
43 Refit and tension the coolant pump/alternator drivebelt as described in the next sub-Section.
44 On completion, refill the cooling system as described earlier in this Section.

Coolant pump/alternator drivebelt - checking, renewal and tensioning

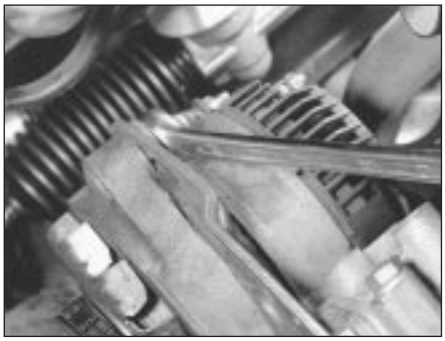
45 At the intervals specified in Section 3 or "*Routine maintenance"* at the beginning of this manual (as applicable), the drivebelt should be checked and if necessary re-tensioned.
46 Access to the drivebelt is made from the underside of the car on the right-hand side. Loosen off the front right-hand roadwheel retaining bolts, then raise and support the car on axle stands at the front. Remove the front roadwheel on the right-hand side.
47 Remove the underwing shield from the right-hand wheel arch by drifting the compression pins out from the retaining clips. Prise free the clips and remove the shield.
48 Additional, though somewhat restricted, access can be obtained from above by removing the air cleaner unit on the non-Turbo ie-engine (photo).
49 Check the full length of the drivebelt for cracks and deterioration. It will be necessary to turn the engine in order to check the portions of the drivebelt in contact with the pulleys. If a drivebelt is unserviceable, renew it as follows (photo).
50 Loosen the alternator mounting and adjuster nuts and bolts and pivot the alternator towards the cylinder block.
51 Slip the drivebelt from the alternator, coolant pump and crankshaft pulleys.
52 Fit the new drivebelt around the pulleys, then lever the alternator away from the cylinder block until the specified belt tension is achieved. Lever the alternator using a wooden or plastic lever at the pulley end to prevent damage. It is helpful to partially tighten the adjuster nut before tensioning the drivebelt (photo).
53 When the specified tension has been achieved, tighten the mounting and adjuster nuts and bolts (photo).

PART D: HEATER UNIT- LATER MODELS

Heater unit - removal and refitting

1 The heater unit is removed complete with the facia/control panel. Commence by draining the cooling system as described previously in this Section.
2 Disconnect the battery negative lead.
3 Refer to Section 15 of this Chapter for details and remove the ashtray/cigar lighter and the auxiliary control panel.
4 Undo the upper screw retaining the heater unit to the facia (see Fig. 13.31).
5 Remove the radio from the central facia.
6 Undo the retaining screw on each side at the front of the gear lever console. Prise free

8C.52 Fitting a new coolant pump/alternator drivebelt around the pulleys



8C.53 Tightening the alternator adjuster nut

Fig. 13.31 Removing the heater unit-to-facia upper retaining screw (Sec 8D)

Fig. 13.32 Heater unit facia to main facia retaining screw locations (arrowed) (Sec 8D)

the trim cover, undo the retaining screw at the rear of the console. Prise free and release the gear lever gaiter and lift clear the central console.

7 Undo the retaining screws and remove the steering column upper and lower shroud.

8 Detach and remove the lower facia trim on the side of the central facia.

9 Referring to Fig. 13.32, unscrew and remove the four heater facia to main facia retaining screws from the points indicated.

10 Undo the two retaining nuts securing the heater to the body on the driver's side.

11 Undo the retaining screws and remove the pipe shield from the side of the heater unit, then disconnect the coolant supply and return hoses from the heater. As the hoses are detached, be prepared to catch any remaining coolant as it flows from the hoses and heater connections.

Fig. 13.33 Heater pipe shield securing screw positions on later models (Sec 8D)

12 Undo the remaining two heater unit securing nuts and withdraw the heater unit from the car. As the unit is removed, detach the wiring and position the hoses with their ends pointing upwards to avoid further coolant spillage.

13 Refit in the reverse order of removal. Ensure that the hoses are securely reconnected. Top up the cooling system on completion.

Heater unit - dismantling and reassembly

14 Remove the heater unit as described previously.

15 Pull free the heater/fresh air and blower control knobs (photo).

16 Undo the two retaining screws and withdraw the control panel from the facia. Detach the wiring connectors from the panel illumination lights and remove the panel.

8D.15 Pull free the heater/fresh air and blower control knobs

17 Unscrew the retaining bolts and remove the centre panel from the heater unit.

18 Undo the retaining screws and remove the control lever mounting.

19 Loosen off the grub screws and detach the cables from the control levers.

20 Undo the retaining screws and remove the control valve.

21 Undo the two retaining screws and withdraw the heater matrix from the heater housing.

22 To separate the casing halves, drill out the pop rivet securing the mounting bracket, release the retaining clips and unscrew the securing bolts.

23 Reassemble in the reverse order of dismantling. Check that the control cables are correctly adjusted and that the controls operate in a satisfactory manner before refitting the heater unit to the car.

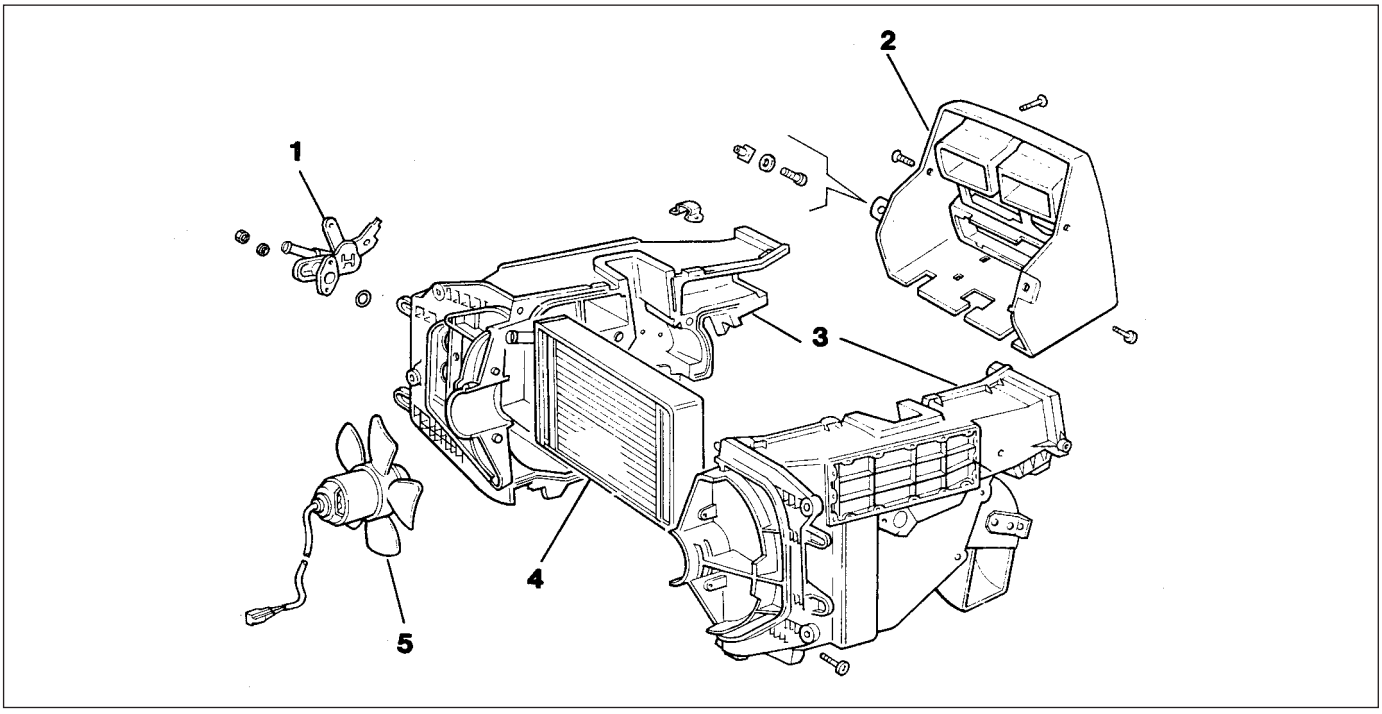
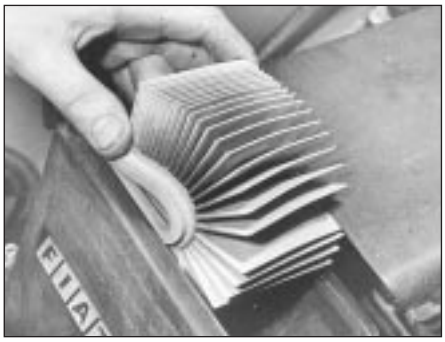


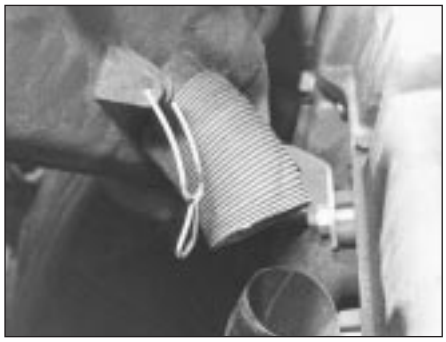
Fig. 13.34 Heater unit components on later models (Sec 8D)

1 Coolant inlet tap 2 Centre panel 3 Side casings 4 Heater matrix 5 Blower fan

9A.4A Air cleaner toggle clip on the 999 cc model



9A.4B Air cleaner element on the 999 cc model



9A.5A Air cleaner hot air intake and lower retaining clip on the 999 cc model

9 Fuel and exhaust systems

Warning: Many of the procedures in this Section require the removal of fuel lines and connections that may result in some fuel spillage. Before carrying out any operation on the fuel system refer to the precautions given in 'Safety first!' at the beginning of this Manual and follow them implicitly. Petrol is a highly dangerous and volatile liquid, and the precautions necessary when handling it cannot be overstressed.

Caution: On fuel injection models, the system is pressurised, therefore extra care must be taken when disconnecting fuel lines. When disconnecting a fuel line union, loosen the union slowly, to avoid a sudden release of pressure that may cause fuel to spray out and have a container and cloth ready to catch spillages. Fuel pressure checking must be entrusted to a Fiat dealer, or other specialist, who has the necessary special equipment.

PART A: GENERAL

Unleaded fuel

Note: *On models with catalytic converters* ***only unleaded*** *petrol must be used - the use of leaded petrol will destroy the catalyst.*

1 It is possible to use unleaded fuel (minimum 95 RON) in the following models with the indicated serial numbers.

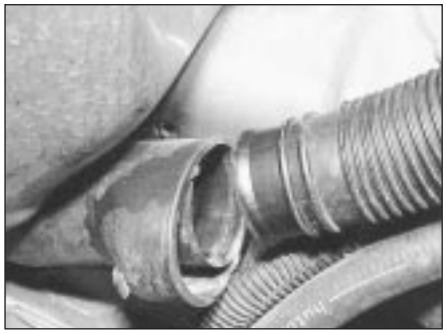
Engine	Serial number
903 cc	*146A.000*
	146A.046
	146A.048
999 cc	*156A2.00*
1108 cc	*160A3.000*
1116 cc	*138B.000*
	138B.046
	146A4000
	146A4.048
1299/1301 cc	*138B2.000*
	138B2.046
	149A7.000
	1149A7.000
	146A2.000
1372 cc	*146C1.000*
	146A8.000
	160A1.046

2 On all except the 903 cc engine, the use of unleaded fuel is conditional upon the avoidance of constant high speeds and sudden acceleration.

Air cleaner - modified types

3 The air cleaner on later models is of the automatic temperature controlled type. The need to move the intake control lever to winter or summer positions is no longer required.

4 The air cleaner on the 999 cc engine is of rectangular shape and the element is removed for renewal after prising back the toggle type clips (photos).

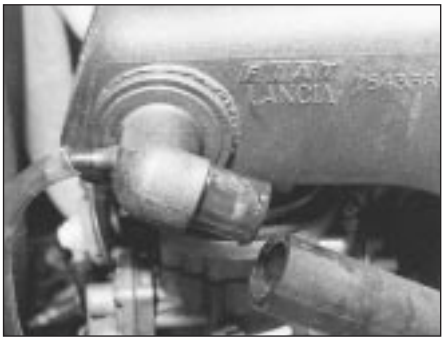


9A.5B Air cleaner cold air intake on the 999 cc model

5 To remove this type of air cleaner, disconnect the cold and hot air intake hoses and the large and small breather hoses (photos).

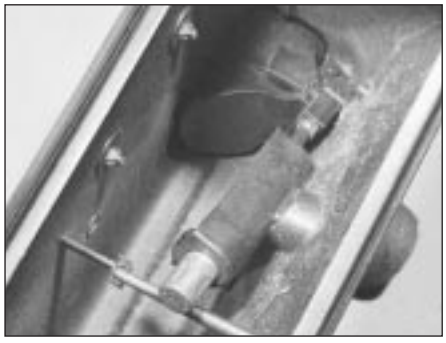
6 Unscrew the nut from the upper casing section and then release the lower toggle type clip and lift the air cleaner from the carburettor (photo). Note the sealing ring between the air cleaner and the carburettor. Unless the ring is in good condition, renew it.

7 If the thermostatically-controlled cold air flap opener in the air cleaner casing is faulty (checked by holding a mirror against the cold air intake when the engine is warm), renew the opener (single fixing screw); no repair is possible (photo).



9A.5C Air cleaner breather hoses on the 999 cc model

9A.6 Air cleaner casing nut on the 999 cc model

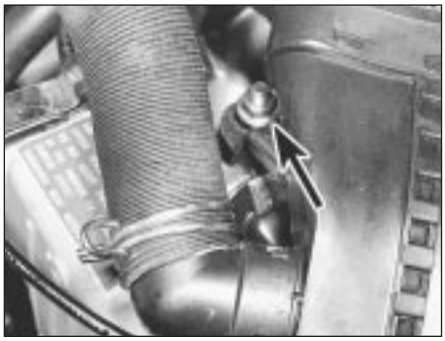


9A.7 Air cleaner thermostatic flap opener on the 999 cc model

9A.8A Air cleaner on the 1116 cc, 1299 cc and 1301 cc models

9A.8B Circular type air cleaner element

9A.9A Circular type air cleaner fixing nuts



9A.9B Circular type air cleaner nut on the camshaft cover (arrowed)

8 The air cleaner on the 1116 cc and 1299/1301 cc engine is of circular type. Access to the element is obtained by extracting the three cover nuts and lifting off the lid (photos).

9 The air cleaner casing can be removed after unscrewing the four nuts which hold it to the carburettor and the single nut on the camshaft cover bracket. As the casing is withdrawn, disconnect the hoses from it (photos).

10 The thermostatically-controlled cold air flap opener is similar to that described in paragraph 7.

11 The air cleaner on the 1372 cc ie engine is of rectangular shape. The element can be removed after releasing the spring clips at the front of the unit, followed by the two screws from its top face. The air cleaner end cover can then be withdrawn and the element removed. The air cleaner unit on the 1372 cc Turbo ie engine is located in the front right-hand corner of the engine compartment. Prise free the four clips to release the top cover and expose the element.

Fuel pump (999 and 1108 cc carburettor models) - description, removal and refitting

12 The fuel pump is mechanically-operated via a pushrod which is in contact with an eccentric cam on the camshaft. The pump is of sealed, disposable type - no repair or cleaning being possible.

13 To remove the pump, disconnect the flexible hoses and unbolt the pump from the cylinder head. Retain the pushrod and the insulator block.

14 Refitting is a reversal of removal, use new gaskets, one on each side of the insulator block.

Fuel tank (999 and 1108 cc engines)

15 In conjunction with the plastic type fuel tank, the breather and fuel level transmitter unit have been modified as shown in Fig. 13.35.

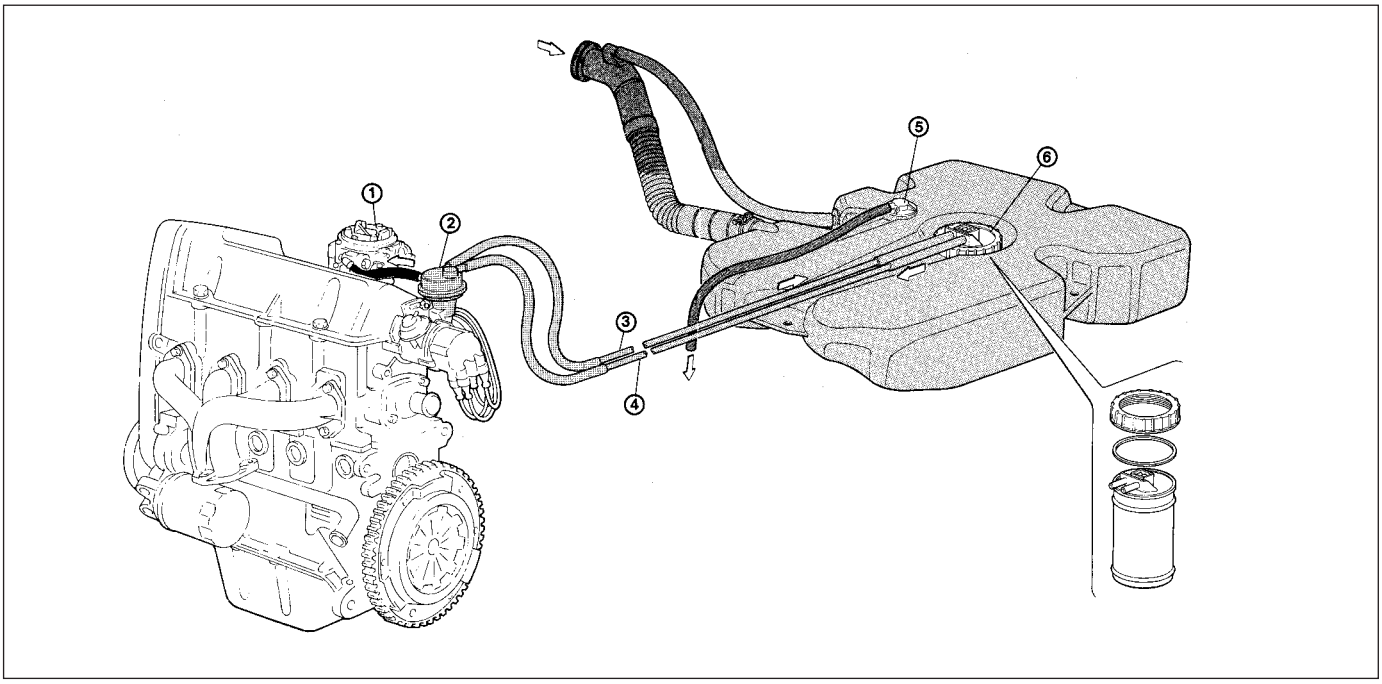
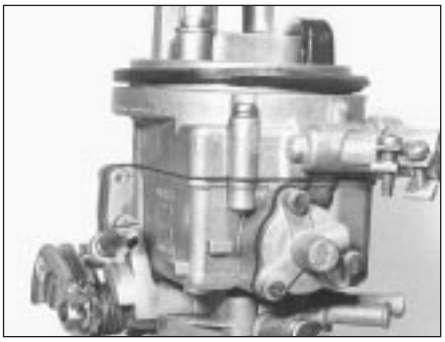
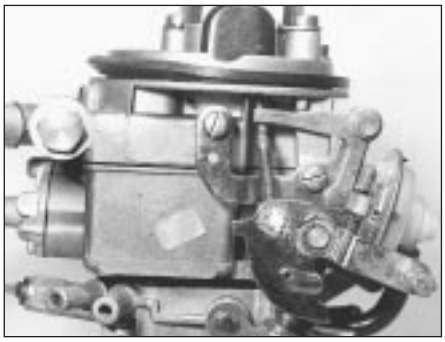


Fig. 13.35 Fuel tank and supply circuit on the 999 and 1108 cc engines (Sec 9A)

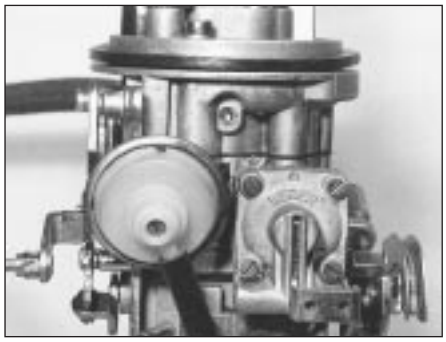
1 Carburettor 2 Fuel pump 3 Fuel return pipe 4 Fuel feed pipe 5 Tank vent valve 6 Fuel level sender unit



9B.2A Weber 32 TLF 4/250 carburettor from anti-run-on solenoid valve side



9B.2B Weber 32 TLF 4/250 carburettor from choke linkage side



9B.2C Weber 32 TLF 4/250 carburettor from accelerator pump side

PART B: CARBURETTOR MODELS

Carburettor (Weber 32 TLF) - description

Warning: Refer to the beginning of this Section before starting any work.

1 This carburettor is used on the 999 cc engine and is of the single venturi downdraught type, with a manually-operated choke (cold start).

2 The unit incorporates an automatic anti-flooding device, a full power valve and an accelerator pump (photos).

3 The throttle valve block, although incorporating coolant hose stubs, is not in fact coolant-heated.

4 A solenoid-operated idle cut-off valve is fitted to prevent running-on (dieseling) when the ignition is switched off.

Carburettor (Weber 32 TLF) - idle speed and mixture adjustment

5 If the car is not equipped with a rev counter, connect one in accordance with the manufacturer's instructions.

6 Have the engine at normal operating temperature and idling. Turn the idle speed screw on the carburettor until the speed matches that specified (photo).

7 The idle mixture is set in production, and the adjustment screw is sealed with a tamperproof cap. If, however, the idling is not smooth or the engine or carburettor have been extensively overhauled, the mixture may require adjusting.

8 Prise out the tamperproof plug and connect an exhaust gas analyser to the car in accordance with the instrument manufacturer's instructions (photo).

9 With the engine at normal operating temperature and idling at the specified speed, turn the mixture screw until the CO percentage is within the specified tolerance (photo).

10 If an exhaust gas analyser is not available, turn the mixture screw anti-clockwise to obtain maximum idle speed and then turn it clockwise until the speed just starts to drop. Re-adjust the idle speed screw to bring the idle speed to the specified level.

11 Switch off the engine and remove the test instruments. It is advisable to fit a new tamperproof cap to the mixture screw if it is intended to take the vehicle overseas. This is required to meet legislation in certain countries.

Carburettor (Weber 32 TLF) - removal and refitting

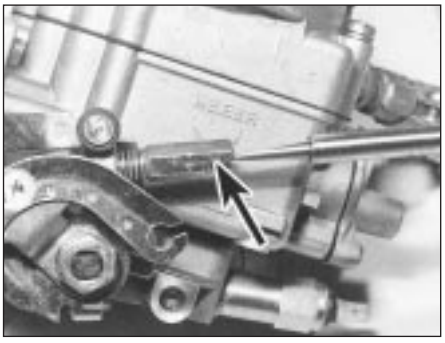
12 Remove the air cleaner.

13 Release the clips and disconnect the fuel hoses from the carburettor. Take extreme care that fuel spillage is contained and that there are no naked flames in the vicinity of the work area. Do not smoke.

14 Disconnect the distributor vacuum hose from the carburettor.

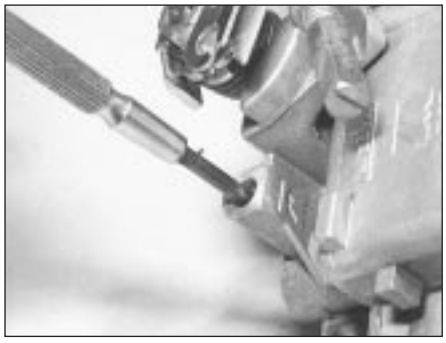
9B.2D Weber 32 TLF 4/250 carburettor from throttle linkage side

9B.2E Weber 32 TLF 4/250 carburettor from above

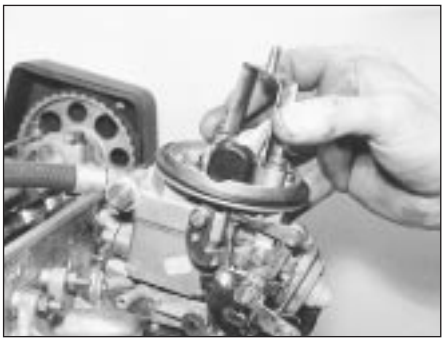


9B.6 Weber 32 TLF 4/250 carburettor idle speed screw (arrowed)

9B.8 Weber 32 TLF 4/250 carburettor mixture screw location under tamperproof plug (arrowed)



9B.9 Mixture adjustment - Weber 32 TLF carburettor



9B.18 Removing the Weber 32 TLF carburettor by gripping air cleaner mounting bracket

9B.19 Carburettor insulator block

9B.22 Fuel filter removal from the Weber 32 TLF carburettor

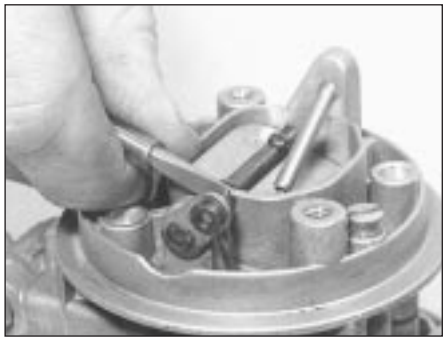
15 Release the clamp screw and pinch-bolt, and disconnect the choke cable.
16 Slacken the throttle cable by releasing the locknut and turning the adjuster sleeve, then slip the cable nipple out of the notch in the throttle spindle quadrant.
17 Disconnect the lead from the idle cut-off solenoid valve.
18 Unscrew the two long mounting bolts and lift the carburettor from the inlet manifold (photo).
19 Refitting is a reversal of removal, but observe the following points (photo).

a) Use a new flange gasket at each side of the insulator block.
b) Check that the choke cable is fitted so that full choke can be obtained but the choke is fully off when the choke control lever is pushed right in.
c) Adjust the throttle cable so that there is just a slight amount of slackness when the accelerator pedal is released, but when fully depressed, full throttle can be obtained (throttle valve plate quadrant up against its stop).

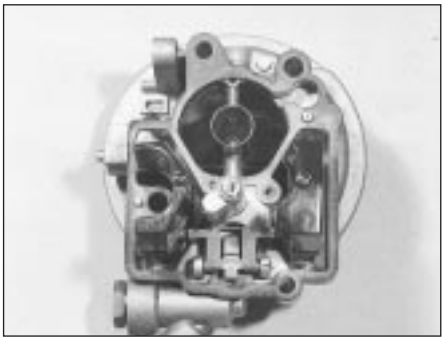
Carburettor (Weber 32 TLF) - overhaul

20 It is rare for a carburettor to require complete overhaul and if the unit has seen considerable service and wear is detected in the throttle valve spindle bushes, it is recommended that a new or rebuilt carburettor is obtained.
21 Normally, the following operations are all that will be required to keep the carburettor working perfectly. The unit need not be removed from the manifold unless the throttle block is to be detached; simply remove the air cleaner.
22 Periodically, unscrew the large hexagonal plug adjacent to the fuel inlet pipe, extract the filter and clean it. Refit the filter and plug (photo).
23 Obtain a repair kit for your carburettor which will contain all the necessary replacement gaskets and seals. Extract the top cover and choke diaphragm assembly fixing screws, remove the small plastic cover and push out the bush, then lift the top cover from the carburettor. Discard the gasket (photos).
24 Mop out fuel and sediment from the float chamber.
25 The various jets and calibrated bleeds can then be removed and cleared by blowing them through with air from a tyre pump. Do not attempt to clear them by probing with wire, as this will ruin the calibration.
26 Check the tightness of the fuel inlet needle valve. If necessary, remove the float and its pivot pin so that a close-fitting ring spanner can be used on the valve body. Take care to support the pivot pin pedestals as the pin is tapped out - they are brittle. The throttle valve plate block can be removed after extracting the screws (photos).
27 As reassembly progresses, carry out the following checks and adjustments.

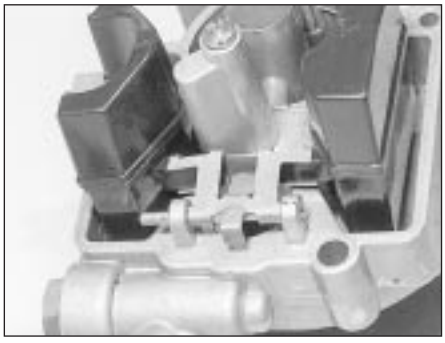
9B.23A Choke linkage cover removal from the Weber 32 TLF carburettor



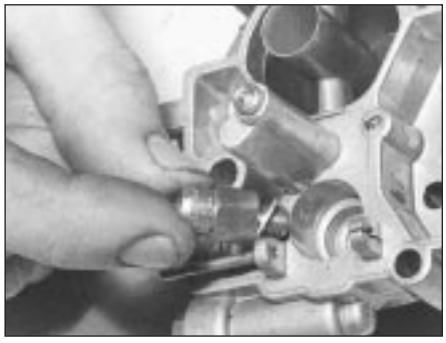
9B.23B Disconnecting the choke linkage on the Weber 32 TLF carburettor



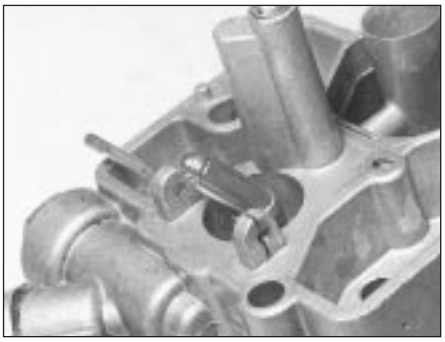
9B.23C Underside view of the cover on the Weber 32 TLF carburettor



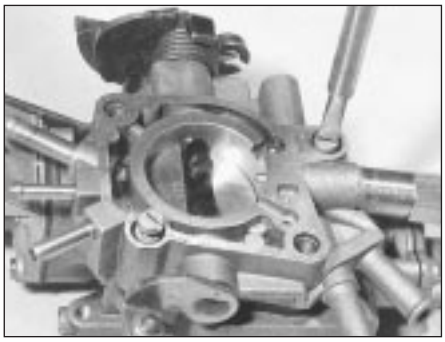
9B.26A Floats and pivot pin arrangement on the Weber 32 TLF carburettor



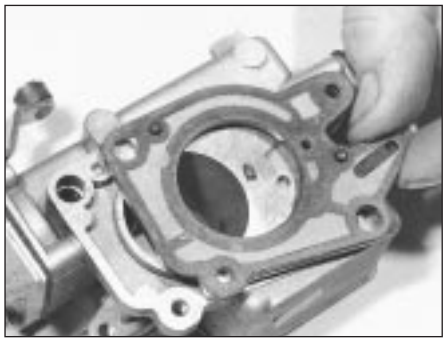
9B.26B Fuel inlet valve needle removal from the Weber 32 TLF carburettor



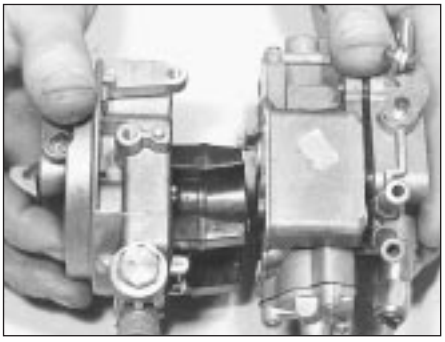
9B.26C Fuel inlet valve body and washer removal from the Weber 32 TLF carburettor



9B.26D Extracting the throttle valve block screws from the Weber 32 TLF carburettor



9B.26E Throttle valve block gasket on the Weber 32 TLF carburettor



9B.26F Main parts of the Weber 32 TLF carburettor

Float level - checking and adjustment

28 With the carburettor top cover held vertically so that the float arm just touches the fuel inlet needle valve ball, measure between the float and the surface of the flange gasket as shown in Fig. 13.36. If the dimension is not within the specified tolerance, bend the float tab which bears on the needle valve ball.

Fast idle - adjustment (requires removal of the carburettor)

29 Close the choke valve plate by moving the control lever fully. Retain the lever in this position with a rubber band.

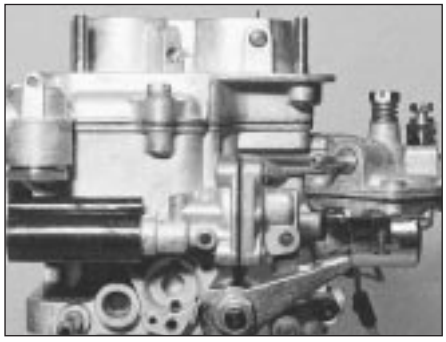
30 The throttle valve plate should now be open to give a gap between its edge and the progression holes as specified. Check the gap using a twist drill of equivalent diameter.

31 If adjustment is required, release the locknut and turn the adjustment screw. Retighten the locknut.

Automatic anti-flooding device - adjustment

32 Operate the choke valve plate lever fully.

33 Move the control lever on the automatic anti-flooding device downwards to simulate vacuum pull-down. The choke butterfly should open, leaving a gap (B - Fig 13.38) as specified. Measure the gap with a twist drill of equivalent diameter and make sure that the choke valve plate is in the position shown. If adjustment is required, turn the screw on the diaphragm unit.



9B.34A Weber 30/32 DMTE carburettor from anti-flood device link side

Carburettor (Weber 30/32 DMTE) - general

34 The carburettor is of twin barrel downdraught type with a manually-operated choke and an electronic fuel cut-off overrun valve (photos).

35 Periodically, remove the large hexagonal plug from its location at the fuel inlet pipe stubs, and clean any dirt from the filter gauge.

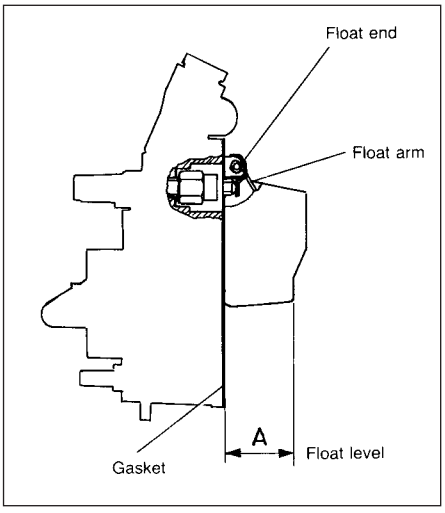


Fig. 13.36 Float level measurement - Weber 32 TLF carburettor (Sec 9B)

A = 26.75 to 27.25 mm (1.05 to 1.07 in)

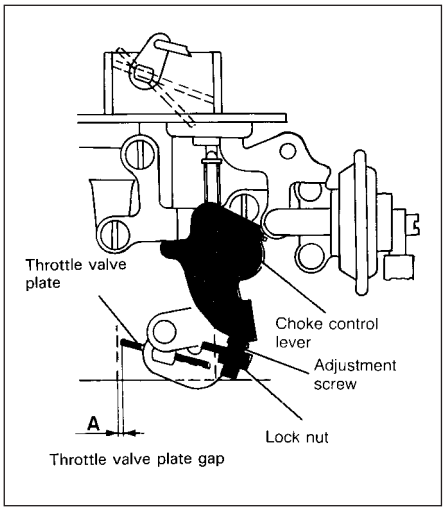


Fig. 13.37 Fast idle adjustment - Weber 32 TLF carburettor (Sec 9B)

A = 0.65 to 0.75 mm (0.026 to 0.030 in)

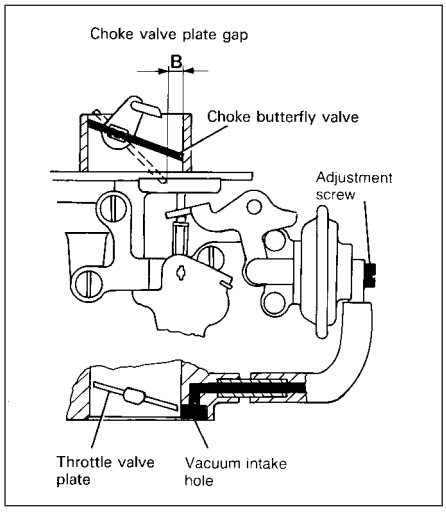
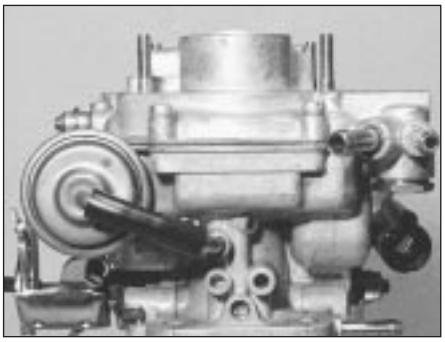
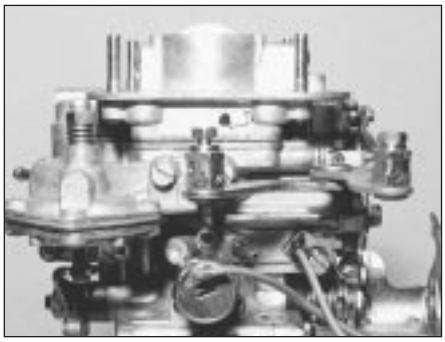


Fig. 13.38 Automatic anti-flooding device adjustment - Weber 32 TLF carburettor (Sec 9B)

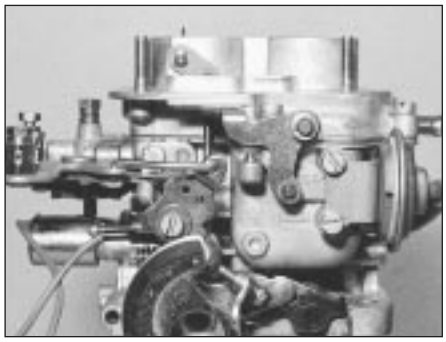
B = 4.5 mm (0.18 in)



9B.34B Weber 30/32 DMTE carburettor from diaphragm hose side



9B.34C Weber 30/32 DMTE carburettor from choke link side



9B.34D Weber 30/32 DMTE carburettor from throttle link side

Idle speed and mixture adjustment

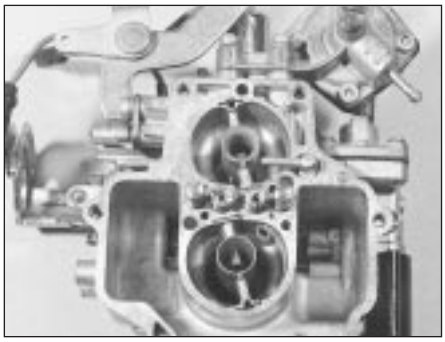
36 Refer to Chapter 3, Section 7 (photos).

Removal and refitting

37 The operations are similar to those described for the Weber 32 TLF earlier in this Supplement, but note that the carburettor is secured by four nuts and additional electrical leads must be disconnected (photos).

Carburettor (Weber 30/32 DMTE) - overhaul

38 The carburettor top cover with float may be removed without the need to withdraw the carburettor from the manifold. Other



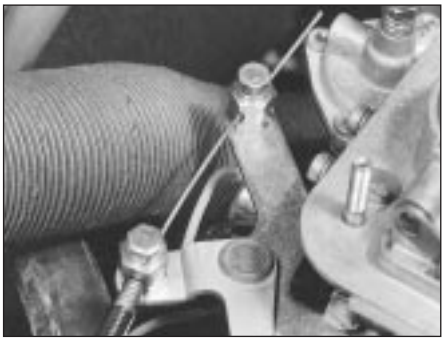
9B.34E Weber 30/32 DMTE carburettor from above (with cover removed)

9B.36A Showing idle speed screw (arrowed) and . . .

9B.36B . . . mixture screw (arrowed) on the Weber 30/32 DMTE carburettor

9B.37A Fuel inlet and return hoses on the Weber 30/32 DMTE carburettor

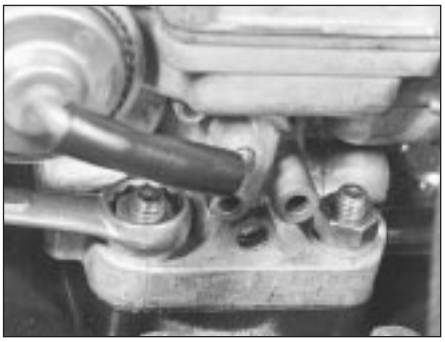
9B.37B Throttle cable connection on the Weber 30/32 DMTE carburettor



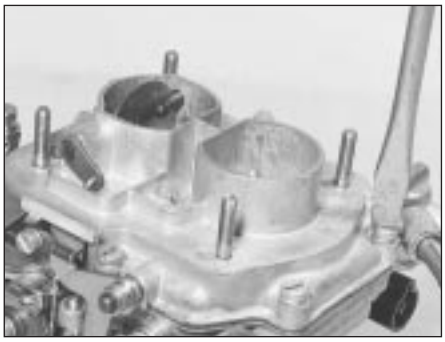
9B.37C Choke cable connection on the Weber 30/32 DMTE carburettor

9B.37D Electrical lead to automatic anti-flood device on the Weber 30/32 DMTE carburettor

9B.37E Carburettor lead connectors on the Weber 30/32 DMTE carburettor



9B.37F Unscrewing a carburettor fixing nut



9B.40 Unscrewing a top cover screw from the Weber 30/32 DMTE carburettor

9B.41 Jets on the Weber 30/32 DMTE carburettor (top cover removed)

9B.45 Float pivot arrangement and needle valve on the Weber 30/32 DMTE carburettor

adjustments described in this sub-Section, however, will require removal of the carburettor.

39 Disconnect the short, curved diaphragm hose from the top cover.

40 Extract the top cover screws, lift the cover from the carburettor body, and rotate it in order to release the cranked choke control rod from its key hole (photo). Mop out the fuel and clean the jets.

41 Check the jet sizes and other components against those listed in the Specifications, in case a previous owner has substituted incorrect components (photo).

42 Overhaul procedures are generally as given in Chapter 3, Section 14 for the Weber 30/32 DMTR, but use the Specifications listed in this Chapter. Additional overhaul procedures are given here.

Fuel inlet needle valve

43 If a high float level causing flooding of the carburettor has been evident, first check that the inlet valve housing is tight, and its washer is sealing satisfactorily. A leak here will cause fuel to bypass the inlet valve.

44 If the needle valve is to be renewed, remove it in the following way.

45 Access to the fuel inlet needle valve is obtained by carefully tapping out the float arm pivot pin. Take care, the pivot pin pillars are very brittle (photo).

46 Unscrew the fuel inlet valve body and remove the valve and washer.

47 When refitting the new valve, always use a new sealing washer.

Float stroke (travel) - see Fig. 3.10

48 The float stroke should be between 42.5 and 43.5 mm when measured from the top cover gasket. Adjust if necessary by bending the tab on the end of the arm.

Accelerator pump

49 Adjustment of the accelerator pump is very rarely required, but if performance is suspect, carry out the following operations.

50 Fill the carburettor float chamber and then operate the throttle valve plate lever several times to prime the pump.

51 Position a test tube under the accelerator pump jet and give ten full strokes of the throttle lever, pausing between each stroke to allow fuel to finish dripping.

52 The total volume of fuel collected should be as specified. Adjust the nut on the pump control if necessary to increase or decrease the volume of fuel ejected.

General

53 When the stage is reached where the valve plate spindle bushes have worn, then the carburettor should be renewed complete.

54 When reassembling the carburettor, use new gaskets which can be obtained in a repair pack.

Carburettor (Weber 32 ICEV 61/250 and DMTE 30/32, DMTE 30/150) - general

55 These carburettor types are fitted to later models according to engine type. They are similar in structure and operation to their equivalents described in Chapter 3. Reference can therefore be made to that Chapter for the description and any operations concerning them, but refer to Section 2 of this Chapter for their specifications.

Carburettor (Solex C 30/32-CIC 8) - description

56 This carburettor is fitted as an alternative to the Weber unit on 1116 cc models produced for certain markets. The removal, refitting and overhaul procedures are essentially the same as described earlier for the Weber carburettors.

PART C: BOSCH LE2-JETRONIC FUEL INJECTION SYSTEM

Description

Warning: Refer to the beginning of this Section before starting any work.

1 The Bosch LE2-Jetronic fuel injection system, fitted to the 1301 cc Turbo ie model, is an electronically controlled multi-point injection (MPi) system.

2 The fuel injectors are fed at constant pressure in relation to inlet manifold vacuum pressure.

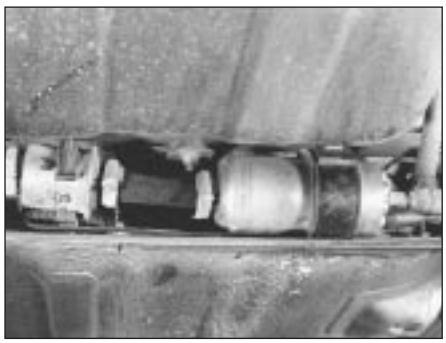
3 The system electronic control unit (ECU) actuates the injectors for variable duration, and so supplies the precise volume of fuel required for any given engine speed and load condition.

4 The ECU also monitors the air induction, air temperature, coolant temperature and throttle opening as additional parameters to compute the required opening of the fuel injectors, giving maximum power with fuel economy.

Fuel supply system

5 The fuel supply system consists of an electric pump and primary filter, located adjacent to the fuel tank. A fuel pressure peak damper is located next to the pump (photo).

6 Fuel is then pumped through a filter to the fuel rail and injectors. The injectors are of the



9C.5 Electric fuel pump/filter/pressure damper assembly location on a 1301 cc Turbo ie model

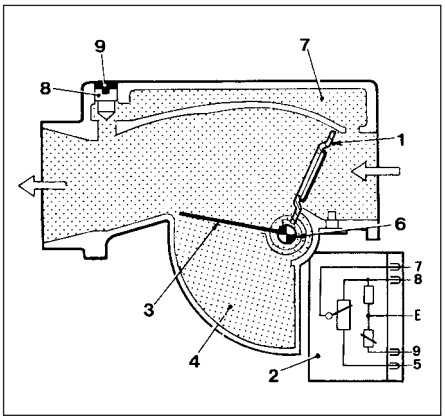


Fig. 13.39 Sectional view of airflow meter - 1301 cc Turbo ie engine (Sec 9C)

1 Floating plate
2 Potentiometer
3 Compensating butterfly valve
4 Damper chamber
6 Spring
7 Bypass channel
8 CO adjusting screw
9 Tamperproof plug

Terminals

5, 7, 8, Potentiometer
9 Air temperature sensor
E Sealed (not to be touched)

solenoid-operated type, actuated from the ECU.

7 Fuel pressure is regulated according to inlet manifold vacuum pressure by a fuel pressure regulator. Excess unpressurised fuel is returned to the fuel tank.

Airflow meter

8 This component measures the quantity of air drawn into the engine, and converts this into an electric signal which is transmitted to the ECU.

9 The intake air exerts a force on the floating plate (1) (Fig. 13.39) which is connected to a potentiometer (2).

10 A compensating butterfly valve (3) compensates for any reflex pressure which may occur, and is subject to the braking effect of the damper chamber (4).

11 The idle mixture (air/fuel ratio) is altered by means of the screw (8), which alters the cross-section of the bypass channel (7).

12 An integral-type temperature sensor is fitted, the resistance value of which decreases as the temperature of the intake air increases. This facility is used to correct the mixture strength within a pre-determined air temperature range.

Throttle valve housing

13 The housing incorporates a conventional butterfly-type throttle valve, actuated by cables and rods from the accelerator pedal.

14 The idle bypass channel (2) (Fig. 13.40) is fitted with an adjustment screw (3) to vary the idle speed.

15 The other screw (4) and locknut are used

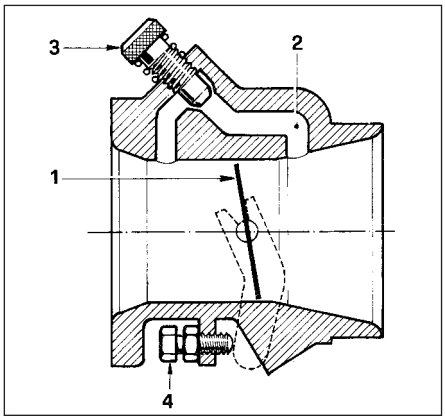


Fig. 13.40 Sectional view of throttle valve housing - 1301 cc Turbo ie engine (Sec 9C)

1 Butterfly-type throttle valve
2 Idle bypass channel
3 Idle speed adjusting screw
4 Throttle valve plate setting screw

to set the closing position of the throttle valve plate.

Supplementary air valve

16 This controls the air volume requirement during cold starting. Essentially, the valve is an electrically-heated bi-metallic strip, which rotates the plate (4) (Fig. 13.41) to vary the volume of air being drawn in through the aperture (1), according to the temperature of the engine.

17 The requirement for additional air during cold starting is to dilute the additional fuel, which is injected and controlled by the ECU as a result of monitoring the engine coolant temperature sensor.

Electrical control circuit

18 The main components of the system are the ECU and the system control relay. The relay incorporates a fuel cut-off facility, which cuts off the fuel supply in the event of engine failure, the vehicle turning over, or a fuel line breaking. The relay energises the following electrical components.

19 *Coolant temperature sensor,* which signals the coolant temperature to the ECU.

20 *Throttle position switch,* which signals the ECU when the throttle valve plate is closed, in order to actuate the deceleration fuel cut-off device at speeds above 2500 rpm.

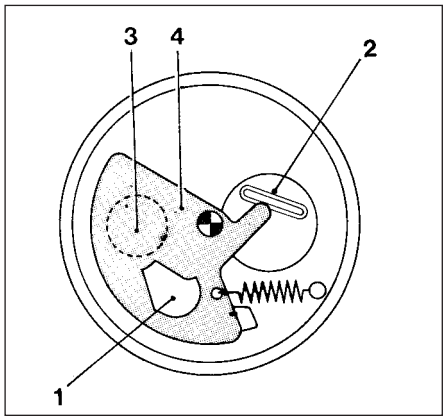


Fig. 13.41 Supplementary air valve - 1301 cc Turbo ie engine (Sec 9C)

1 Aperture
2 Bi-metallic strip
3 Passage
4 Rotating plate (closed position)

21 The switch also signals the ECU at full throttle, so that the mixture can be enriched to cope with full-power requirements.

22 The system control relay also monitors the engine speed directly from the ignition coil primary winding.

Maintenance

23 Regularly check the security of all system hoses, wiring connections and plugs.

24 At the intervals specified in Section 3, renew the fuel filter and the air cleaner element.

Fuel filter - renewal

25 This is located within the engine compartment just above the timing belt cover. Disconnect the fuel hoses, but be prepared for loss of fuel (photo).

26 When fitting the new filter, make sure that the arrow stamped on it is pointing towards the fuel injector rail.

Air cleaner element - renewal

27 Prise back the toggle-type clips and take off the air cleaner lid. Remove and discard the element, and wipe any dirt from the inside of the casing (photos).

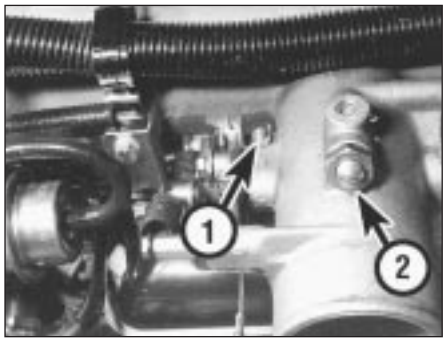
28 Fit the new element and replace the lid.

9C.25 Secondary fuel filter

9C.27A Removing the air cleaner lid

9C.27B Removing the air cleaner element

9C.31A Disconnecting the throttle valve housing intake duct



9C.31B Idle speed base setting screw (1) and main adjustment screw (2)

Idle speed and mixture adjustment

29 Before carrying out any adjustments, the engine must be at operating temperature, the fan having cut in at second speed and then switched off.

30 Release the locknut and turn the main idle speed screw in the throttle valve housing until the engine idles at the specified speed. This should be all that is necessary to obtain the correct idle speed, as the throttle valve plate base setting is set during production. However, if wear has taken place, or incorrect adjustment has been carried out previously, proceed in the following way.

31 Disconnect the intake duct from the throttle valve housing. Release the locknut on the base (small) adjusting screw, and turn the screw until there is a clearance between the lower edge of the throttle valve plate and the throat wall of between 0.05 and 0.1 mm (photos).

32 With the engine still at operating temperature, start the engine, and having released the locknut, turn the main (large) idle speed screw fully clockwise to close the bypass passage.

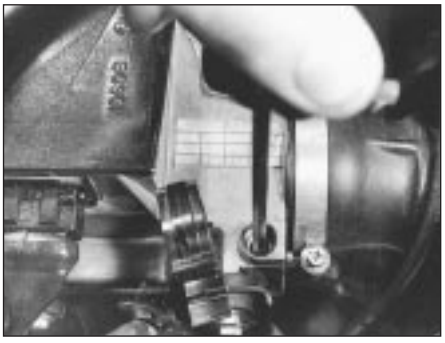
33 Now turn the base (small) screw until the engine idles at between 700 and 800 rpm. Tighten the locknut.

34 Finally, turn the main (large) adjusting screw to give an idle speed of between 800 and 900 rpm.

35 It is unlikely that the mixture will require alteration, but if it does, connect an exhaust gas analyser to the car in accordance with the equipment manufacturer's instructions.

36 With the engine at operating temperature, prise out the tamperproof cap, and turn the mixture screw, which is located in the airflow meter, until the CO level is as given in the Specifications. Turning the screw clockwise richens the mixture, turning it anti-clockwise weakens the mixture. Use a close-fitting Allen key for the adjustment (photo).

9C.31C Checking throttle valve plate opening with a feeler blade



9C.36 Using an Allen key to adjust the mixture (CO level)

Fuel injection system - electrical tests

37 When carrying out checks to trace a fault in the system, an ohmmeter should be used for the following tests.

38 Disconnect the multipin connector from the ECU, and also the one from the system control relay, and apply the probes of the ohmmeter in accordance with the following sequence to check for continuity in the cables. The component wiring plug will of course be disconnected for the test.

ECU connector plug terminal	Component connector plug terminal
1	*1 of ignition coil*
2	*2 of throttle position switch*
3	*3 of throttle position switch*
4	*50 of ignition switch*
5	*Earth*
5	*5 of airflow meter*
7	*7 of airflow meter*
8	*8 of airflow meter*
9	*9 of airflow meter*
9	*9 of throttle position switch*
9	*18 of supplementary air valve*
9	*87 main relay socket*
10	*10 of coolant temperature sensor*
12	*Injector terminals*
13	*Earth*

System control relay connector plug terminal	Component connector plug terminal
1	*1 of ignition coil*
15	*15 of ignition switch*
30	*Battery positive*
31	*Earth*
50	*50 of ignition switch*
87	*Injector terminals*
87	*18 of throttle position switch*
87	*9 of ECU multipin socket*
87b	*Fuel pump (fused)*

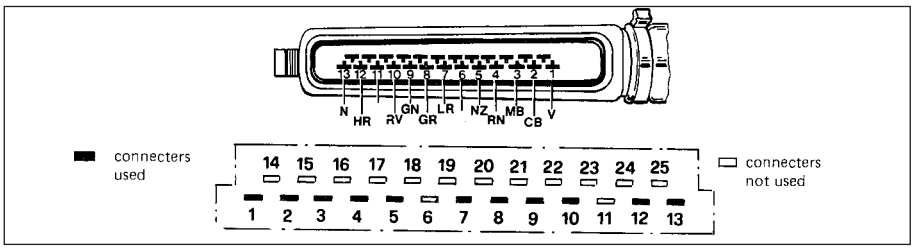


Fig. 13.42 ECU and component connector plug terminals - 1301 cc Turbo ie engine (Sec 9C)

For colour code see main wiring diagrams

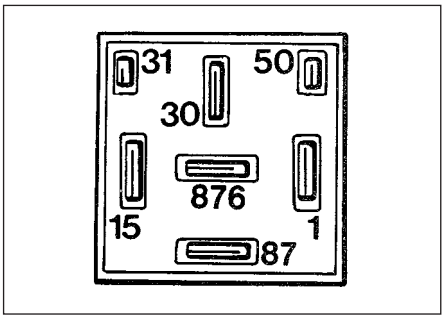


Fig. 13.43 System control relay connector plug terminals 1301 cc Turbo ie engine (Sec 9C)

9C.55A Disconnecting the duct from the air cleaner

9C.55B Removing the air cleaner casing upper bracket

39 Now use the ohmmeter to check the resistance of the following components.

Supplementary air valve

40 Resistance between the terminals should be between 40 and 60 ohms at 20ºC (68ºF).

Airflow meter

41 Resistance between terminals 5 and 8 of the potentiometer should be between 330 and 360 ohms at 20ºC (68ºF).

42 Resistance between terminals 8 and 9 of the internal circuit should be between 190 and 210 ohms at 20ºC (68ºF) and between 170 and 190 ohms at 60ºC (140ºF).

Coolant temperature sensor

43 At 20ºC (68ºF) the resistance should be between 2 and 4 k ohms. At 50ºC (122ºF) the resistance should be between 600 and 900 ohms. At 90ºC (194ºF) the resistance should be between 100 and 300 ohms.

Fuel injectors

44 The winding resistance should be between 15 and 17 ohms at 20ºC (68ºF).

Throttle position switch

45 With the throttle butterfly valve closed, there should be continuity between terminals 18 and 2, and with the valve fully open, there should be no continuity between terminals 18 and 3.

46 The throttle position switch should not be disturbed unless absolutely necessary. If it has to be removed, then refit it so that the microswitch is heard to click immediately the throttle butterfly is opened.

Fuel injection system - mechanical tests

Fuel pump

47 To test the pressure of the fuel pump, a pressure gauge will be required, connected into the fuel delivery hose.

48 Remove the multipin plug from the system control relay and bridge terminals 87b and 30.

49 Turn the ignition switch on. The pump should operate and indicate a pressure of between 2.8 and 3.0 bars (40 and 44 lbf/in^2).

50 To check the operation of the peak pressure regulator, pinch the fuel return hose. If the fuel pressure increases, the regulator must be faulty, and should be renewed.

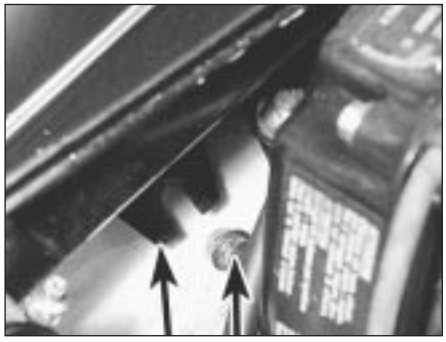
51 Check that the fuel pressure increases when, with the engine idling, the accelerator is depressed sharply.

Supplementary air valve

52 With the engine at normal operating temperature and idling, pinch the supplementary air valve hose using a pair of pliers. The engine speed should not drop by more than 50 rpm. If it does, renew the valve.

Fuel injection system components - removal and refitting

53 Disconnect the battery before carrying out any of the following operations.



9C.55C Air cleaner casing lower bracket and bolt (arrowed)

Air cleaner

54 Remove the cover and filter element as previously described.

55 Disconnect the duct from the air cleaner casing, and then unbolt and remove the casing. Note that the lower bracket bolt need not be completely removed, only unscrewed, due to the design of the bracket. The air cleaner metal duct is routed over the top of the radiator (photos).

Airflow meter

56 Release the securing clip and disconnect the air intake duct (photo).

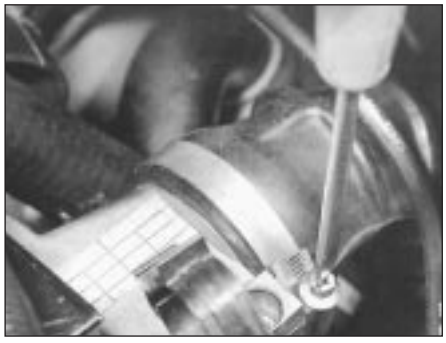
57 Release the securing clip and disconnect the air outlet duct (photo).

58 Disconnect the wiring plug.

59 Unscrew the fixing screws and remove the airflow meter from its mounting bracket.

9C.55D Air cleaner metal duct over radiator

9C.56 Air intake duct at airflow meter (securing clip arrowed)



9C.57 Air outlet duct securing clip removal from airflow meter

9C.60 Fuel pressure regulator

9C.70A Brake servo vacuum hose connection to inlet manifold

9C.70B Fuel pressure regulator vacuum hose connection at the inlet manifold

Fuel pressure regulator

60 Disconnect the vacuum hose from the regulator (photo).
61 Anticipate some loss of pressurised fuel, and then disconnect the fuel hose from the regulator. Unbolt and remove the unit.

Excessive air pressure switch

62 This is screwed into the end of the inlet manifold. Disconnect the electrical leads and unscrew the switch.

Coolant temperature sensor

63 This is screwed into the cylinder head and has wires connected to it. Drain the cooling system before commencing operations.
64 Disconnect the wiring plug and unscrew the sensor.

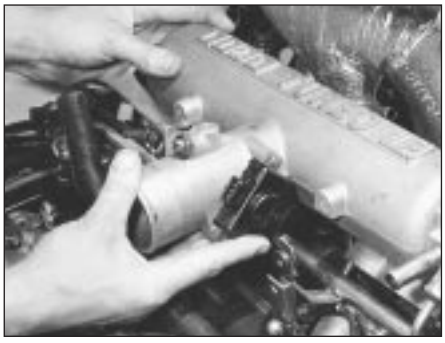
Throttle valve housing and inlet manifold

65 Disconnect the air inlet hose from the throttle valve housing, and also the supplementary air valve hose.
66 Disconnect the throttle control cable by swivelling the grooved sector and slipping the cable nipple from its recess.
67 Disconnect the wiring plug from the throttle position (potentiometer) switch.
68 Unbolt the fuel pressure regulator/wiring loom bracket, and also the wiring loom bracket at the other end of the inlet manifold. Move the wiring loom aside.
69 Unbolt and remove the throttle housing support bracket.
70 Disconnect the vacuum servo hose and the fuel pressure regulator vacuum hoses from the inlet manifold (photos).
71 Disconnect the leads from the excessive air pressure switch.
72 Unscrew the inlet manifold fixing nuts. Note that double nuts are used at the ends of the manifold in order to secure the exhaust heat shield (photo). The shield should be released and lowered to rest on the exhaust manifold.
73 Unscrew and remove the remaining two nuts now exposed by lowering the heat shield and lifting the inlet manifold away (photo).
74 If necessary, the injectors and cooling tube can be withdrawn, and the two twin inlet pipe stubs removed. These are retained with the exhaust manifolds using nuts and washers (photo).

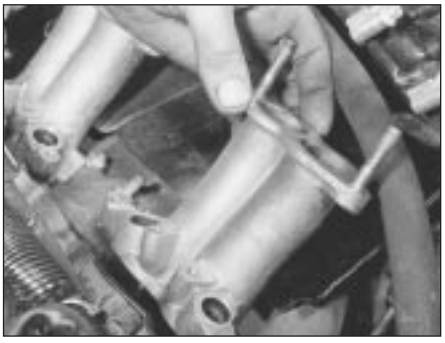
Fuel rail and injectors

75 Disconnect the fuel delivery hose from the fuel rail by unscrewing the union nut (photo). Be prepared for some loss of pressurised fuel.
76 Disconnect the fuel return hose.
77 Unbolt the fuel pressure regulator and the wiring loom brackets (photo).
78 Disconnect the air intake hose from the throttle valve housing, and then unbolt and remove the throttle valve housing support bracket (photo).
79 Disconnect the hose from the injector cooling fan, and also disconnect the fan thermo-switch on the underside of the injector cooling air duct (photo). Disconnect the injector wiring plugs, and then slide out the injector cooling air duct.

9C.72 Double nuts at the end of the inlet manifold



9C.73 Removing the inlet manifold

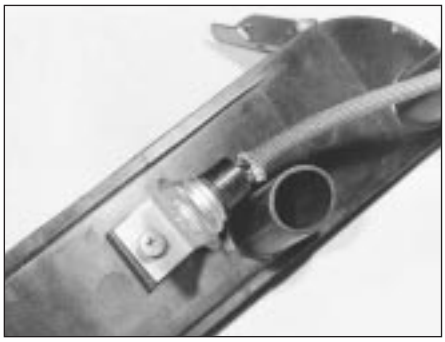


9C.74 Removing an inlet manifold twin pipe stub

9C.75 Disconnecting the fuel delivery hose union

9C.77 Wiring loom clip and bracket

9C.78 Throttle valve housing support bracket



9C.79 Fan thermostatic switch on underside of injector cooling air duct (duct removed for clarity)

9C.80A Extracting a fuel injector screw

80 The injector retaining plate socket-headed screws may now be removed using an Allen key. Withdraw the fuel injectors and insulators (photos).

81 New injectors, complete with the fuel rail, must be purchased as an assembly. Always use new seals when refitting the injectors and the insulators (photos).

Electronic control unit (ECU)

82 The ECU is located under the right-hand side of the facia panel.

83 Pull off the multipin connector plug and extract the fixing screws (photo).

System control relay

84 This is located adjacent to the airflow meter. Pull off the multipin connector and release the relay fixing (photo).

Fuel injector cooling fan

85 This is located low down on the left-hand side of the radiator (photo).

86 Remove the spiral-wire-wound hose which connects with the injector cooling duct.

87 Pull off the wiring plug, and unbolt and remove the fan.

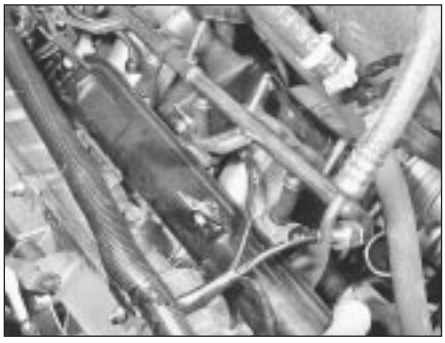
Supplementary air valve

88 Disconnect the hoses and wiring plug from the valve, which is located on the front face of the engine (photos).

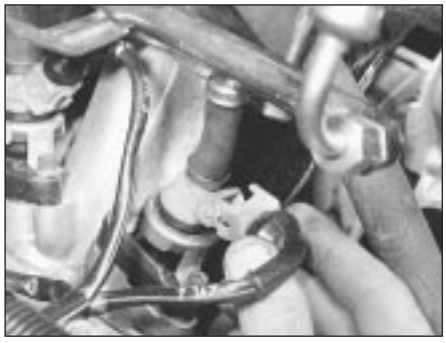
89 Unscrew the mounting bracket screws and withdraw the valve.

9C.80B Fuel injector removal

9C.81A Fuel injectors attached to fuel rail



9C.81B Fuel injector cooling air duct refitting



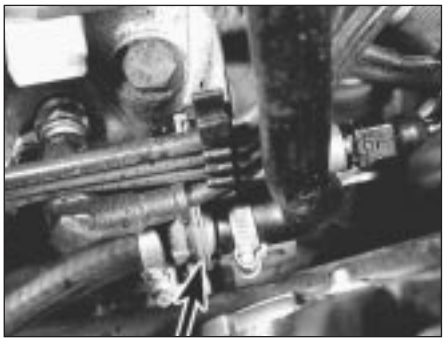
9C.81C Injector wiring plug refitting

9C.83 ECU multipin plug

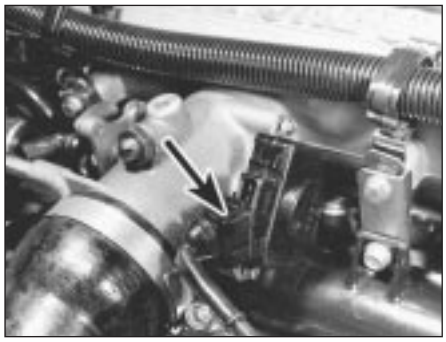
9C.84 Fuel injector system relay

9C.85 Fuel injector cooling fan

9C.88A Disconnecting the supplementary air valve hose from the inlet manifold



9C.88B Supplementary air valve (arrowed)



9C.90 Throttle position switch (wiring plug arrowed)

Throttle position switch (potentiometer)

90 This is located on the left side of the throttle valve housing (photo).

91 Disconnect the wiring plug, unscrew the two fixing screws and withdraw the switch.

Fuel filter

92 Unscrew the fuel line banjo unions from the filter, which is located in the right-hand rear corner of the engine compartment. Be prepared for some loss of pressurised fuel, and mop it up with rags.

Fuel pump

93 The fuel pump can be removed from its location beside the fuel tank after disconnecting the fuel hoses and wiring plug, and then releasing the mounting clamp.

Refitting all components

94 Refitting of all components is a reversal of removal, but observe the following points.

95 Use new seals and gaskets as applicable, noting that three rubber seals are used on each fuel injector and insulator (photos).

96 Adjust the throttle position switch as described in paragraph 46 of this Section.

97 When refitting a new fuel filter, make sure that the arrow marked on it is in the direction of the fuel flow.

98 Apply gasket cement to the threads of the coolant temperature sensor.

Throttle control linkage - general

99 This is of the cable and rod type. Adjust the cable by means of the end fitting and nut, to give the slightest play in the cable when the plastic socket is engaged with the ball on the link rod which runs across the camshaft cover (photos).

100 Keep the cross-shaft pivots and return springs lubricated.

Fuel tank - general

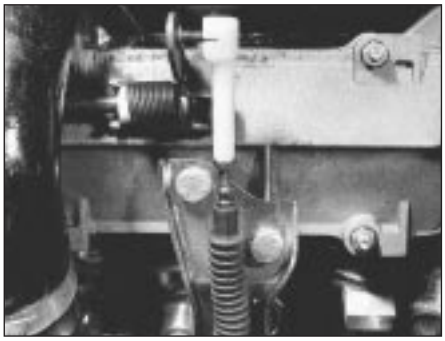
101 The fuel tank is of metal construction, but note the plastic anti-blow-back compartment between the filler cap and the tank. This is accessible from under the right-hand wheel arch (photo).

9C.95A Fuel injector large seal

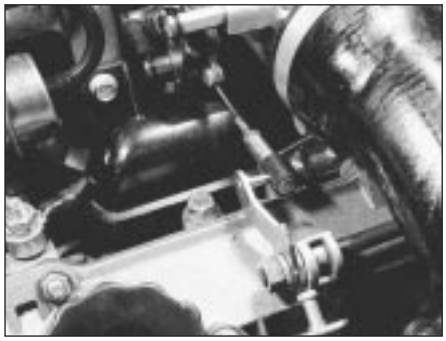
9C.95B Fuel injector small seal

9C.95C Fuel injector insulator seal

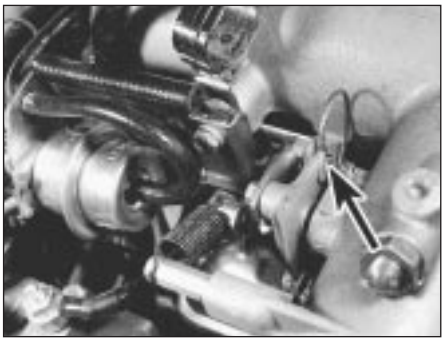
9C.95D Inlet pipe stub gasket



9C.99A Throttle cable and end fitting (primary section)

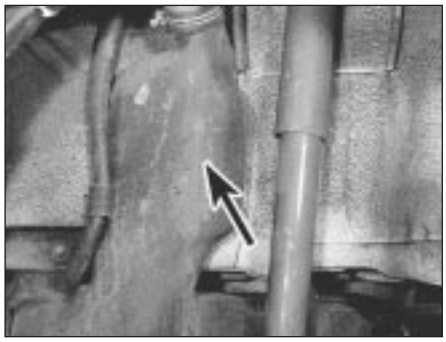


9C.99B Throttle cable (secondary section) and cross-shaft



9C.99C Throttle cable nipple (arrowed) in throttle linkage cut-out

9C.99D Throttle cable balljoint retaining spring clip (arrowed)



9C.101 Fuel tank anti-blow-back compartment (arrowed)

PART D: BOSCH MONO-JETRONIC FUEL INJECTION SYSTEM

Warning: Refer to the beginning of this Section before starting any work.

Description

1 The Bosch Mono-Jetronic fuel injection system fitted to the 1372 cc ie engine and later 999/1108 'FIRE' models is an electronically-controlled single point injection (SPi) system. The SPi system is a compromise between a conventional carburettor fuel supply system and a multi-point fuel injection (MPi) system.

2 Compared with a conventional carburettor, the SPi unit is a relatively simple device. Fuel is pumped to the SPi unit and then injected into the inlet system by a single solenoid valve (fuel injector), mounted centrally on top of the unit. The injector is energised by an electrical signal sent from the electronic control unit (ECU), at which point the injector pintle is lifted from its seat and atomised fuel is delivered into the inlet manifold under pressure. The electrical signals take two forms of current; a high current to open the injector and a low current to hold it open for the duration required. At idle speed the injector is pulsed at every other intake stroke rather than with every stroke as during normal operation.

3 The air-to-fuel mixture ratio is regulated by values obtained from the ignition coil (engine speed), engine coolant temperature sensor, throttle position switch, and the Lambda sensor in the exhaust system. No adjustments to the fuel mixture are possible.

4 The throttle position switch enables the ECU to compute both throttle position and its rate of change. Extra fuel can then be provided for acceleration when the throttle is suddenly opened. Throttle position information, together with the idle tracking switch, provide the ECU with the closed throttle position information.

5 The 1372 cc ie system layout and principal components are shown in Figs. 13.44 and 13.45. Note that the Digiplex 2 electronic ignition, is not fitted to FIRE models (999/1108 cc).

6 The fuel system pump is immersed in the fuel tank and forms a combined unit with the fuel level sender unit. A cartridge type in-line fuel filter is fitted to the fuel line, and is located in the engine compartment.

7 The fuel pressure in the system is controlled by a mechanical diaphragm regulator in the injection unit turret. High pressure in the system causes the diaphragm to operate and excess fuel is returned to the fuel tank.

8 The air intake temperature and volume is regulated to ensure the correct mixture ratio under all operating conditions. The temperature of the air passing through the injection unit is measured by a sensor which transmits such information to the ECU for the

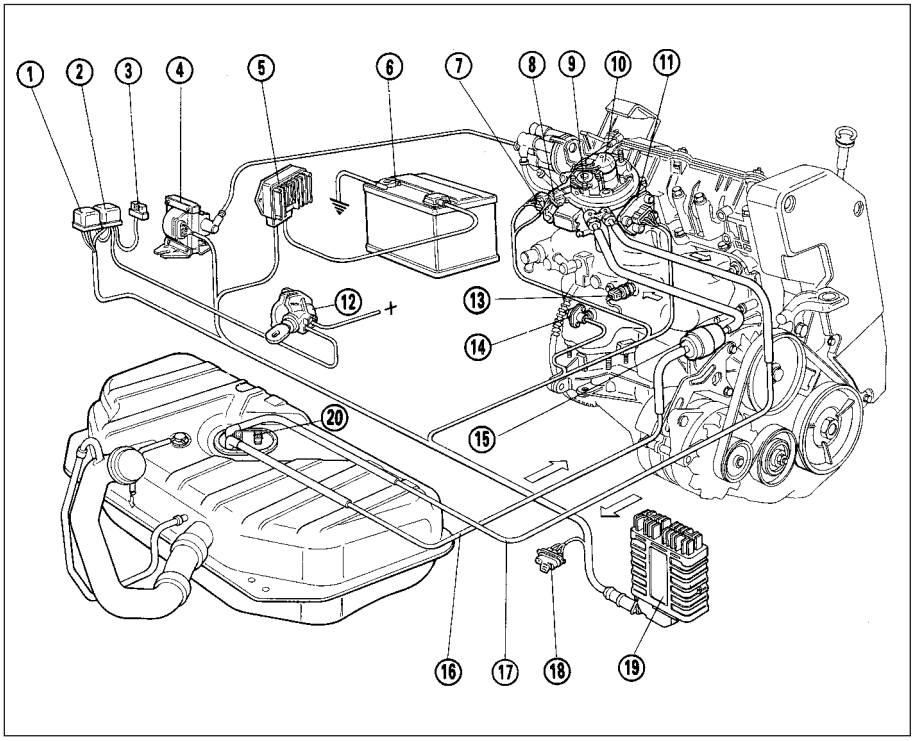


Fig. 13.44 Bosch Mono-Jetronic fuel injection system components and layout on the 1372 cc ie engine (Sec 9D)

1 Fuel pump relay
2 Injection system relay
3 Fuel pump fuse
4 Ignition coil
5 Digiplex 2 ECU
6 Battery
7 Idle speed check actuator
8 Injector connector
9 Fuel pressure regulator
10 Injector
11 Throttle position switch
12 Ignition switch
13 Coolant temperature sensor
14 Engine speed and TDC sensor
15 Secondary fuel filter
16 Fuel supply pipe
17 Fuel return pipe
18 Diagnostic socket
19 Fuel injection ECU
20 Fuel pump/level sender unit

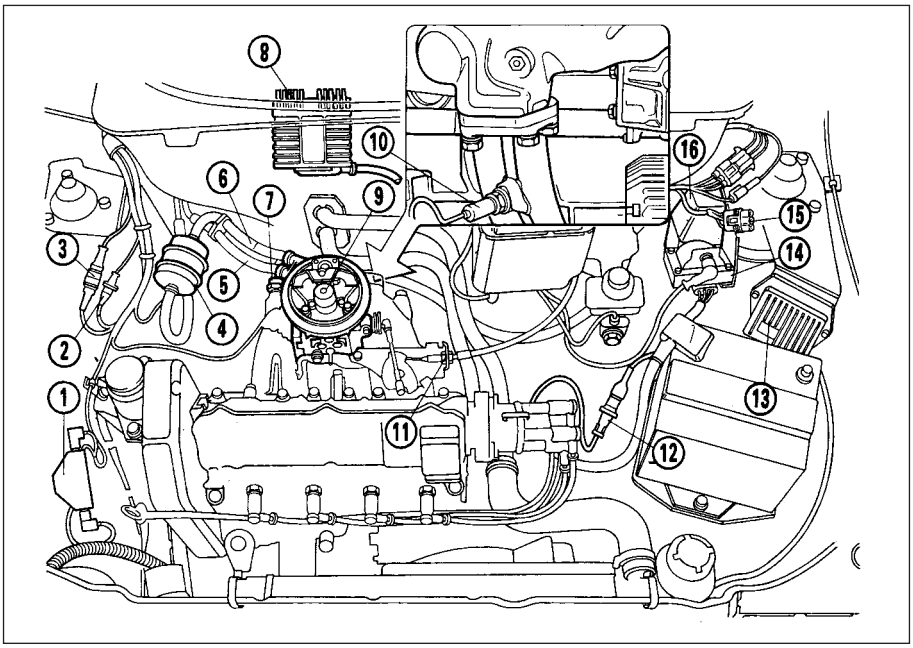


Fig. 13.45 Mono-Jetronic fuel injection component locations in the engine compartment - 1372 cc ie engine (Sec 9D)

1 Injector resistor
2 Lambda sensor signal connector
3 Lambda sensor heating connector
4 Secondary fuel filter
5 Fuel return pipe
6 Fuel supply pipe
7 Coolant temperature sensor
8 ECU
9 Injector holder turret
10 Lambda sensor
11 Nut for adjusting accelerator cable
12 Engine speed and TDC sensor connector
13 Ignition control unit
14 Ignition coil
15 Diagnostic socket
16 Fuel pump relay and system relay

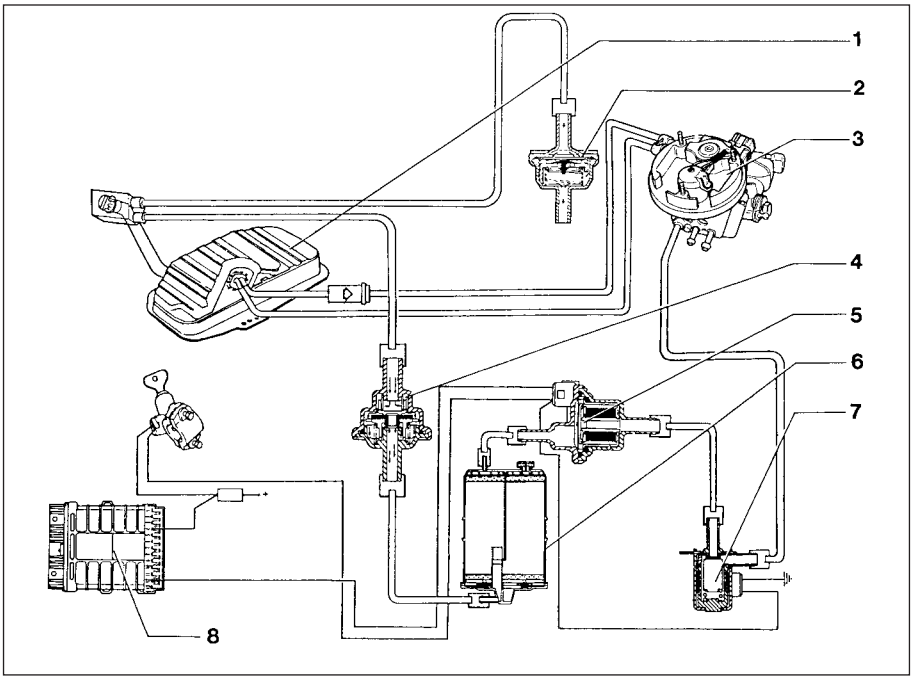
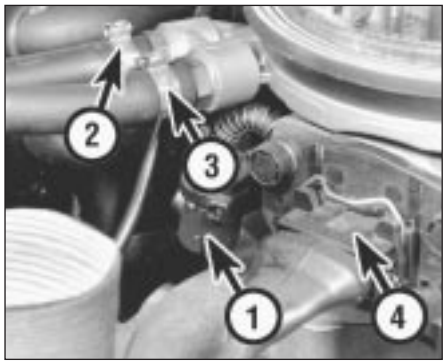


Fig. 13.46 Fuel evaporation control system (Sec 9D)

1 Fuel tank
2 Two-way safety valve
3 Throttle body
4 Two-way vapour vent valve
5 Vapour cut-off solenoid
6 Carbon filter
7 Elbi solenoid
8 ECU



9D.8 Atmospheric air intake for air temperature sensor (1). Also shown are the supply and return fuel line connections (2 and 3) and the throttle position sensor (4)

necessary processing (photo). A conventional paper type air filter element is used and this must be renewed at the specified intervals.

9 The ECU is specific to the model type, its function being to control the fuel system under all operating conditions, including starting from cold - it richens the fuel mixture as required but at the same time prevents flooding. As the engine temperature rises, the injection impulses are progressively reduced until the normal operation temperature is reached.

10 An integral emergency system enables the fuel injection system to remain operational in the event of any of the following components malfunctioning. These items are the coolant temperature sensor, the air intake sensor, the Lambda sensor, the idle speed check actuator and the throttle position switch. In the event of the throttle position switch malfunctioning, the fuel system becomes automatically inoperative.

11 The catalytic converter fitted in the exhaust system minimises the amount of pollutants which escape into the atmosphere. The Lambda sensor in the exhaust system provides the fuel injection system ECU with constant feedback which enables it to adjust the mixture to provide the best possible conditions for the converter to operate. The fuel tank ventilation is contained within the system. This is done by feeding any excess vapours through a carbon filter back into the engine intake, using solenoids and valves, as shown in Fig. 13.46.

Maintenance

12 Regularly check the condition and security of the system hoses and connections. Also check the system wiring connections for condition and security.

13 At the specified intervals, renew the air cleaner element and the fuel filter.

Fuel filter - renewal

14 The in-line fuel filter is secured to the right-hand suspension turret in the engine compartment. To remove the filter, first depressurize the fuel in the system as described later in this Part.

9D.15 Secondary fuel filter element

9D.17A Release the air cleaner end cover retaining clips . . .

9D.17B . . . remove the cover and extract the element

15 Undo the retaining strap bolt and withdraw the filter from its location bracket. Disconnect the inlet and supply hose from the filter. If crimp connectors are fitted they will have to be cut free and new screw type clips fitted (photo).

16 Connect the hoses to the new filter ensuring that the filter is correctly orientated (the arrow mark on the body indicates the direction of fuel flow). Ensure that the hose clips are secure before refitting the filter into the retaining strap and securing the retaining bolt. When the engine is restarted, check the hose connections to ensure that there is no fuel leakage from them.

Air cleaner element - renewal

17 Release the spring clip each side at the front of the air cleaner, then unscrew and remove the two screws from the top front face of the housing. Withdraw the end cover and element from the filter unit (photos).

18 Wipe any dirt from within the casing then locate the new element and refit it together with the end cover.

Idle speed and mixture adjustment

19 No manual idle speed and/or mixture adjustments to this type of fuel system are necessary or possible. Any such adjustments are automatically made by the ECU. If the engine idle speed and/or mixture adjustment is suspect, it must be checked using CO measuring equipment; a task best entrusted to a FIAT dealer or a competent garage. The most probable cause of a malfunction is likely to be a defective sensor or incorrectly adjusted accelerator control cable.

Accelerator control system - check and adjustment

20 To check the adjustment of the accelerator control system, it is essential that the engine is at its normal operating temperature. This is achieved by running the engine for a period of about fifteen minutes, by which time the cooling fan should have cut into operation several times. At this point, stop the engine, turn the ignition key to the OFF position and proceed as follows.

21 Remove the air cleaner unit.

22 Place a 10 mm shim (X) between the adjustment screw and the cam lever (between items 1 and 2 in Fig. 13.47), on the throttle body. This will open the thottle butterfly by 20º.

23 Loosen off the locknuts (C1 and C2) from each linkage end. Insert another 10 mm shim (Y) between the cable support bracket and the nut (C1). Carefully tighten the nut against the shim, ensuring that the cam does not move whilst making the cable slightly taut.

24 Remove the shim (Y) and carefully tighten the nut (C2) against the bracket without allowing the nut (C1) to move. Remove the shim (X) and release the accelerator pedal. Check that the butterfly is completely open when the the pedal is fully depressed.

Fuel system depressurisation

Warning: Refer to the beginning of this Section before starting any work.

25 The fuel system should always be depressurised whenever any fuel hoses and/or system components are disconnected and/or removed. This can easily be achieved as follows.

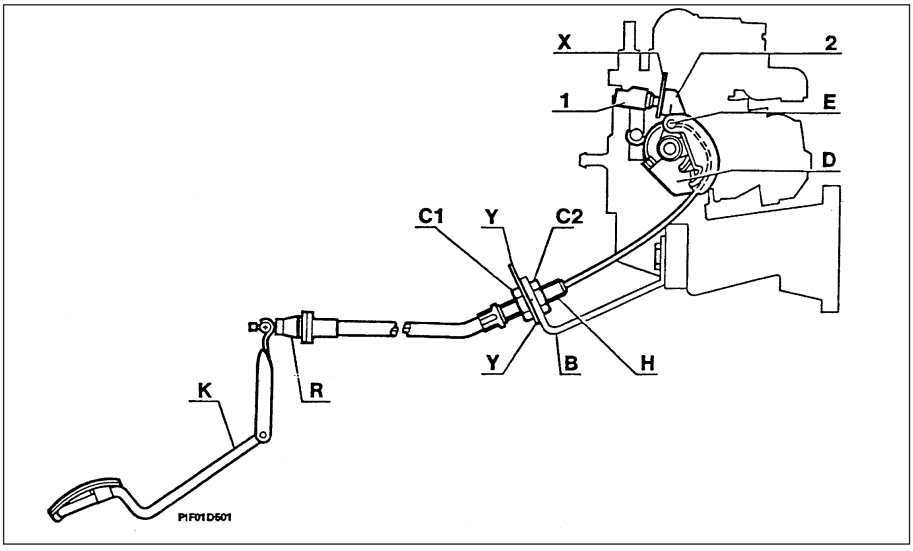
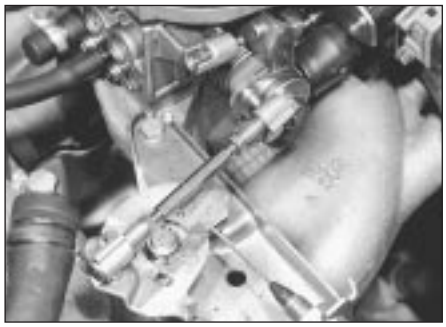
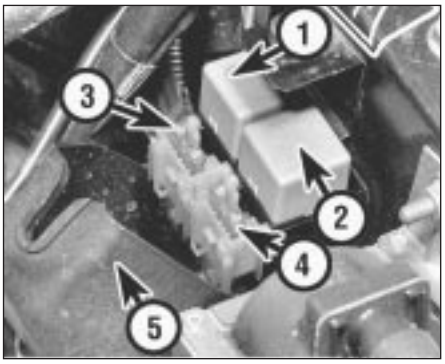


Fig. 13.47 Accelerator linkage and butterfly control lever - SPi models (Sec 9D)

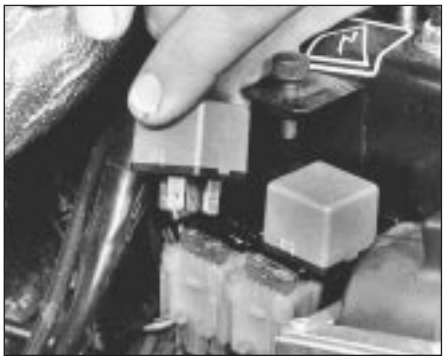
A Cable
B Bracket
C1 Locknut
C2 Locknut
D Pulley
E Pawl
H Protection
K Pedal
R Bush
X Shim
Y Shim
1 Adjustment screw
2 Cam lever



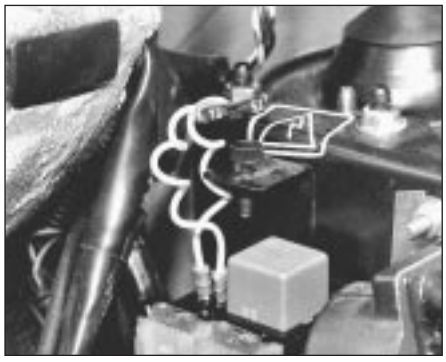
9D.22 Accelerator control rod and cable connections



9D.26 Fuel pump relay (1), injection control relay (2), Lambda sensor fuse (3) and pump fuse (4) with cover (5) removed



9D.27 Fuel pump relay removal



9D.30 Test lead connected to relay terminals 30 and 87

26 Loosen off the knurled retaining nut and remove the cover from the fuel pump relay. This is located on the left-hand suspension turret in the engine compartment (photo).

27 Carefully pull free the fuel pump relay, then start the engine and run it until it stops (photo). The fuel system is now depressurised. Turn the ignition off before removing/dismantling any components.

28 Do not refit the fuel pump relay or turn the ignition on until the system is fully reconnected. When the engine is ready to be restarted, refit the relay and its cover, then restart the engine in the normal manner.

Fuel pump and supply system checks

29 Specialised equipment is required to undertake accurate tests in the fuel supply system and such checks must therefore be entrusted to a FIAT dealer or a fuel injection specialist. If the fuel pump is suspected of malfunction, a basic check can be made by removing the fuel filler cap then listening through the filler pipe, get an assistant to turn on the ignition whilst you listen to hear if the pump is heard to operate in the tank. If the pump fails to operate, check that the pump fuse is sound and that its connection (and also that of the relay) are clean and secure.

30 The pump can be further checked by first depressurising the fuel system as described in the previous sub-Section, then disconnect the fuel supply pipe at the injector unit and locate it in a suitable container. With the fuel pump relay removed, connect up a suitable test lead with a 7.5 amp (10 amp on models with catalyst) fuse, in series, to the relay terminals 30 and 87, and check that fuel flows into the container from the supply pipe (photo). If a suitable pressure gauge is available for connecting into the fuel line between the engine compartment fuel filter and the injection unit, check that the fuel pressure is as specified at the beginning of this Chapter.

31 If the pump fails to operate, check that the battery is in good condition and that the pump wiring connections are clean and secure before condemning the pump. To remove the pump unit from the fuel tank, proceed as described in the following sub-Section.

Fuel pump - removal and refitting

32 Release the pressure from the fuel system as described previously.

33 Move the front seats forward, then tilt the rear seat cushions forward. Peel back the luggage area floor cover from the right-hand side towards the centre to expose the access cover above the pump/sender unit in the floor. Remove the access cover.

34 Detach the wiring connectors from the pump unit and the fuel level sender unit.

35 Loosen off the hose retaining clips and detach the fuel supply and return hoses from the pump unit connections. Mark the hoses for identity to avoid incorrect attachment during refitting.

36 Unscrew the retaining nuts then carefully lift out and withdraw the fuel pump/level sender unit from the fuel tank.

37 Refitting is a reversal of the removal procedure. A new seal gasket must be used and it is important to ensure that all connections are securely and correctly made.

Injector unit - removal and refitting

38 Depressurise the fuel system as described previously, then disconnect the battery negative lead.

39 Remove the air cleaner unit and the rubber seal (photo).

40 Disconnect the engine idle speed check actuator lead and the throttle position switch lead from the side faces of the injector unit.

41 Undo the retaining clips and detach the fuel supply and return hose from the injector unit. If crimped type retaining clips are fitted, they will have to be carefully cut free and new screw type clips obtained to replace them. Take care not to cut into the hoses when releasing the crimped type clips.

42 Detach the crankcase ventilation hose from the fuel injector unit.

43 Disconnect the accelerator linkage at the throttle lever on the injector unit.

44 Undo the four retaining screws and lift the injector unit from the inlet manifold. Remove the gasket (photo).

45 Clean the injector unit and the inlet manifold mating faces.

46 Refit in the reverse order of removal.

Intake air temperature sensor - removal and refitting

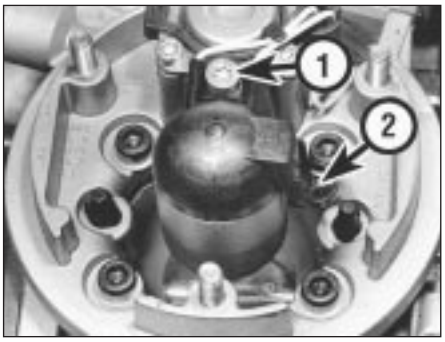
47 The air temperature sensor is located in the top of the injector unit. It is basically a resistor which varies its value in accordance with the air temperature entering the induction circuit from the air filter. The sensor can then transmit the registered air temperature at this point to the ECU temperature sensor (2).

48 Remove the air cleaner unit and its mounting bracket in the injector.

49 Disconnect the wiring connector from the

9D.39 Removing the filter seal from the injector unit

9D.44 Injector unit retaining screws (arrowed)



9D.49 Fuel injector unit sensor retaining screw (1). Also shown is the intake air temperature sensor (2)

9D.58A Detach the multiplug (arrowed) . . .

9D.58B . . . for access to the ECU retaining screw (arrowed)

air temperature sensor. Undo the retaining screw and remove the sensor from the injector unit (photo).

50 Refit in the reverse order of removal.

Fuel injector - removal and refitting

51 Depressurise the fuel system as described previously, then disconnect the battery negative lead.

52 Remove the air cleaner unit.

53 Release the injector feed wiring mutliplug and detach it from the injector.

54 Bend over the locking tabs retaining the injector screws, then undo and remove the screws. Withdraw the injector retaining collar, then carefully withdraw the injector (noting its orientation) followed by its seal.

55 Refit in the reverse order of removal. Always use new seals in the unit and the retaining collar and lightly lubricate them with clean engine oil prior to assembly. Take care not to damage the seals when fitting and also when the injector is fitted; check that it engages correctly.

Fuel injection electronic control unit (ECU) - removal and refitting

56 The control unit is located under the facia on the driver's side of the vehicle. Commence by disconnecting the battery negative lead.

57 To gain access to the control unit, detach and remove the trim panel from the underside of the facia on the driver's side of the car.

58 Disconnect the wiring multiplug from the control unit, then undo the retaining screw and remove the unit from the car (photos).

59 Refit in the reverse order of removal.

Inlet manifold - removal and refitting

60 Remove the fuel injector unit as described previously.

61 Drain the cooling system as described in Section 8 of this Chapter.

62 Detach the coolant hose and coolant temperature sensor from the inlet manifold.

63 Unbolt and remove the accelerator cable/throttle linkage support bracket from the top of the inlet manifold. The cable can be left attached to the bracket.

64 Detach the brake servo vacuum hose from the connector on the manifold.

65 Unscrew and remove the inlet manifold securing bolts and nuts and remove the manifold from the cylinder head. As they are removed, note the location of the fastenings and their spacers.

66 Remove the gasket and clean the mating faces of the manifold and the cylinder head. The gasket must be renewed when refitting the manifold.

67 Refitting is a reversal of the removal procedure. Ensure that the spacers are correctly located (where applicable) and tighten the retaining bolts and nuts to the specified torque settings.

Exhaust manifold - removal and refitting

68 Remove the inlet manifold as described previously (1372 cc models only).

69 Disconnect the Lambda sensor lead (photo).

70 Raise and support the car at the front end on axle stands to allow sufficient clearance to work underneath the car and disconnect the exhaust downpipe from the manifold.

71 Straighten the tab washers, then unscrew and remove the exhaust downpipe-to-manifold retaining nuts (photo). Detach the downpipe from the manifold. Support the downpipe so that the Lambda sensor will not get knocked and/or damaged.

9D.69 Lambda sensor in exhaust downpipe

72 Undo the manifold-to-cylinder head securing bolts/nuts and withdraw and remove the manifold and heat shield.

73 Remove the gasket and clean the mating faces of the manifold, cylinder head and downpipe flange. The gasket must be renewed when refitting the manifold.

74 Refitting is a reversal of the removal procedure. Tighten the retaining bolts/nuts to the specified torque setting.

Catalytic converter - general information

75 The catalytic converter is a reliable and simple device which needs no maintenance in itself, but there are some facts of which an owner should be aware if the converter is to function properly for its full service life.

a) DO NOT use leaded petrol in a car equipped with a catalytic converter - the lead will coat the precious metals, reducing their converting efficiency and will eventually destroy the converter.

b) Always keep the ignition and fuel systems well-maintained in accordance with the maintenance schedule - particularly, ensure that the air cleaner filter element the fuel filter and the spark plugs are renewed at the correct interval - if the intake air/fuel mixture is allowed to become too rich due to neglect, the unburned surplus will enter and burn in the catalytic converter, overheating the element and eventually destroying the converter.

9D.71 Exhaust downpipe to manifold flange connection showing retaining nuts and locktabs

c) If the engine develops a misfire, do not drive the car at all (or at least as little as possible) until the fault is cured - the misfire will allow unburned fuel to enter the converter, which will result in its overheating, as noted above.

d) DO NOT push- or tow-start the car - this will soak the catalytic converter in unburned fuel, causing it to overheat when the engine does start - see b) above.

e) DO NOT switch off the ignition at high engine speeds - if the ignition is switched off at anything above idle speed, unburned fuel will enter the (very hot) catalytic converter, with the possible risk of its igniting on the element and damaging the converter.

f) DO NOT use fuel or engine oil additives - these may contain substances harmful to the catalytic converter.

g) DO NOT continue to use the car if the engine burns oil to the extent of leaving a visible trail of blue smoke - the unburned carbon deposits will clog the converter passages and reduce its efficiency; in severe cases the element will overheat.

h) Remember that the catalytic converter operates at very high temperatures and the casing will become hot enough to ignite combustible materials which brush against it. DO NOT, therefore, park the car in dry undergrowth, over long grass or piles of dead leaves.

i) Remember that the catalytic converter is FRAGILE - do not strike it with tools during servicing work, take great care when working on the exhaust system, ensure that the converter is well clear of any jacks or other lifting gear used to raise the car and do not drive the car over rough ground road humps, etc., in such a way as to ground the exhaust system.

j) In some cases, particularly when the car is new and/or is used for stop/start driving, a sulphurous smell (like that of rotten eggs) may be noticed from the exhaust. This is common to many catalytic converter-equipped cars and seems to be due to the small amount of sulphur found in some petrols reacting with hydrogen in the exhaust to produce hydrogen sulphide (H_2S) gas; while this gas is toxic, it is not produced in sufficient amounts to be a problem. Once the car has covered a few thousand miles the problem should disappear - in the meanwhile a change of driving style or of the brand of petrol used may effect a solution.

k) The catalytic converter, used on a well-maintained and well driven car, should last for at least 50 000 miles (80 000 km) or five years - from this point on, careful checks should be made at all specified service intervals on the CO level to ensure that the converter is still operating efficiently - if the converter is no longer effective it must be renewed.

Fuel evaporation control system - general

76 As mentioned earlier, fuel evaporation is contained within the system. In high outdoor temperatures, when the vehicle is parked for a period of time, the fuel in the tank evaporates, building up pressure. When the pressure builds up to a predetermined level a vent valve opens to allow the vapours to pass on to and absorbed by a carbon filter. However, if extreme pressure or vacuum should build up, a two way safety valve opens to allow external venting.

77 If the safety valve needs replacing, note that it must be fitted correctly. The black end should be connected to the fuel tank and the blue to the carbon filter.

78 The vapours in the carbon filter are flushed by warm air passing through the filter on to a ECU controlled vapour cut-off solenoid.

79 The cut-off solenoid is closed when starting the engine and opens to allow vapours to be drawn into the inlet manifold, through a second solenoid. If the cut-off solenoid needs replacing ensure that the black arrow on the casing is pointing towards the inlet manifold.

80 The second solenoid, known as an Elbi solenoid, is closed when the engine is turned off, thus preventing engine run-on. The side facing connection is for the inlet manifold pipe.

PART E: BOSCH L3.1/2 JETRONIC FUEL INJECTION SYSTEMS

Warning: Refer to the beginning of this Section before starting any work.

Description

1 A Bosch L3.1 (or L3.2, as fitted from 1992) Jetronic fuel injection system is fitted to the 1372 cc Turbo ie engine. The system circuit and main component locations are shown in Figs. 13.48 and 13.49.

2 The L3.1/2 Jetronic system is a multi-point fuel injection (MPi) system. It operates in a similar manner to that of the LE2-Jetronic system fitted to the 1301 cc Turbo ie engine described in Part C of this Section. The L3.1/2 system is more sophisticated and has the ability to provide reasonably efficient engine operation when system sensors malfunction. As with the LE2 system, the fuel and air supply mixture circuits are regulated in accordance with the electronic control unit (ECU), but on the L3.1/2 system the control unit is attached to the upper part of the airflow meter.

3 The ECU analyses the information passed to it from the system sensors. These signals are then processed and the air/fuel mixture is constantly adjusted as required to provide the

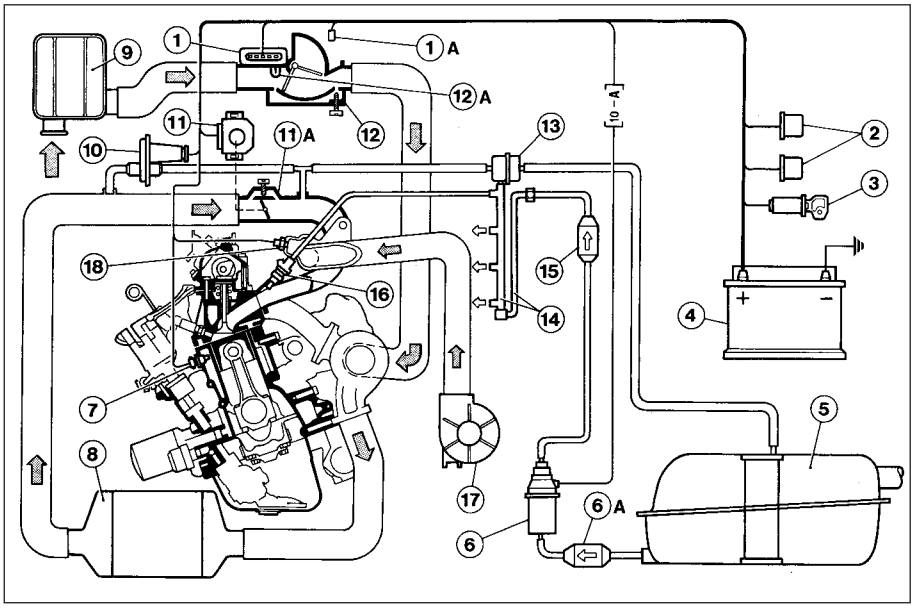


Fig. 13.48 Bosch L3.1 Jetronic fuel injection system - 1372 cc Turbo ie engine (Sec 9E)

1 ECU
1A Diagnostic socket
2 Injection system relay and fuel pump relay
3 Ignition switch
4 Battery
5 Fuel tank
6 Fuel pump
6A Primary fuel filter
7 Coolant temperature sensor
8 Intake air cooling radiator (intercooler)
9 Air cleaner
10 Supplementary air valve
11 Throttle position switch
11A Throttle housing
12 Airflow meter
12A Intake air temperature sensor
13 Fuel pressure regulator
14 Fuel rail (to injectors)
15 Secondary fuel filter
16 Injectors
17 Injector cooling fan
18 Thermostatic switch (to engage injector cooling fan)

optimum engine operating efficiency. In the event of a system sensor malfunction, errors in data passed to the ECU are overcome by an emergency operation, whereby the ECU supplies the injectors with one of two set injection periods independent of the sensors. One period (2.2 ms) is for idle speed and the other (2.5 ms) is for speeds above idle (actuated when the idle speed contact is opened).

4 An injection system relay and a fuel pump relay are fitted and are located in the engine compartment, adjacent to the ECU on the left-hand inner wing panel. In the event of the engine not being started within two seconds of the ignition being switched to the "ON" position, the fuel pump relay is deactivated. The fuel pump circuit fuse is located in the main fuse block located under the facia within the car. **Note:** *To avoid possible damage to the ECU, it is essential that the ignition is switched off before disconnecting (or connecting) the wiring multi-plug from the ECU.* A Lambda (or oxygen) sensor is fitted to L3.2 equipped models, to measure exhaust gas oxygen content. In sending signals to the ECU, optimum catalyst operation is maintained.

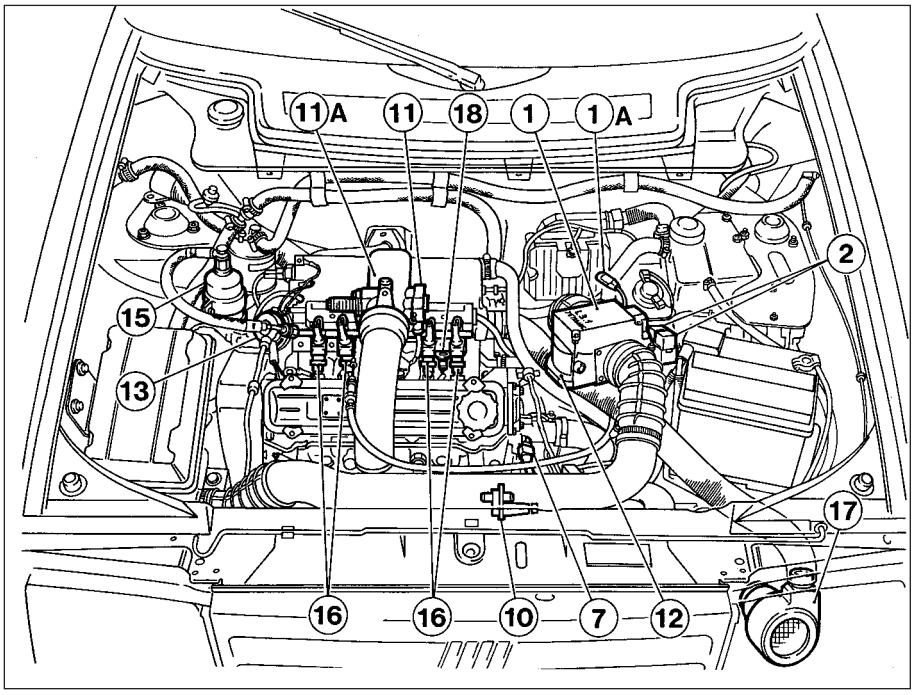


Fig. 13.49 Fuel injection system components layout in engine compartment on the 1372 cc Turbo ie engine (Sec 9E)

1 ECU
1A Diagnostic socket
2 Ignition system relay and fuel pump relay
7 Coolant temperature sensor
10 Supplementary air valve
11 Throttle position switch
11A Throttle housing
12 Airflow meter
13 Fuel pressure regulator
15 Secondary fuel filter
16 Injectors
17 Injector cooling fan
18 Thermostatic switch (to engage injector cooling fan)

Fuel system - depressurisation

5 The fuel system should always be depressurised whenever any fuel hoses and/or system components are disconnected and/or removed. This can easily be achieved as follows.

6 The fuel pump relay is located next to the ECU and airflow meter in the engine compartment. Carefully pull free the fuel pump relay, then start the engine and run it until it stops. The fuel system is now depressurised. Turn the ignition off before removing/dismantling any components.

7 Do not refit the fuel pump relay or turn the ignition on until the system is fully reconnected. When the engine is ready to be restarted, refit the relay and its cover, then restart the engine in the normal manner.

Maintenance

8 Regularly check the condition and security of the system hoses and connections. Also check the system wiring connections for condition and security.

9 At the specified intervals, renew the air cleaner element and the fuel filter.

Fuel filter - renewal

10 This is located in the engine compartment on the right-hand side. Disconnect the fuel inlet and outlet hoses, but be prepared for the loss of fuel. Loosen off the clamp and remove the filter.

11 Reverse the removal procedure to fit the new filter, but ensure that the arrow indicating fuel flow is pointing towards the fuel injector rail.

Air cleaner element - renewal

12 Prise free the four retaining clips, then remove the cover and the air cleaner element.

13 Wipe clean the inside surfaces of the air cleaner housing, then insert the new element, refit the cover and secure it with the four retaining clips.

Checks and adjustments

Engine idle speed and mixture adjustment

14 Before carrying out any adjustments, the engine must be at its normal operating temperature, the cooling fan having cut into

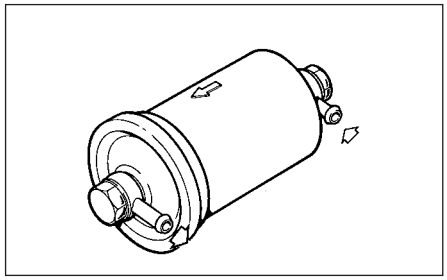


Fig. 13.50 Secondary fuel filter with arrows indicating direction of flow - 1372 cc Turbo ie engine (Sec 9E)

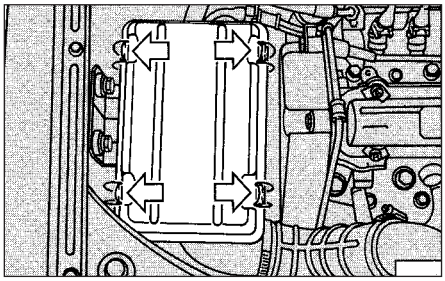


Fig. 13.51 Air cleaner cover securing clips (arrowed) on the 1372 cc Turbo ie engine (Sec 9E)

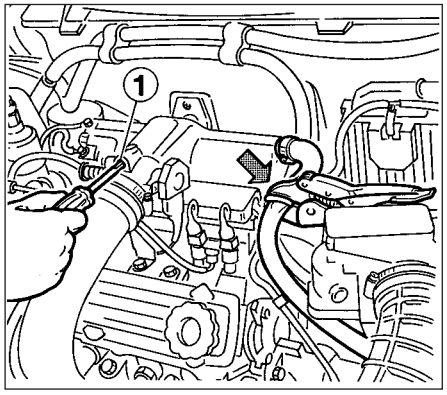


Fig. 13.52 Idle speed adjustment screw (1) on the 1372 cc Turbo ie engine (Sec 9E)

Note method of compressing the supplementary air valve pipe (arrowed)

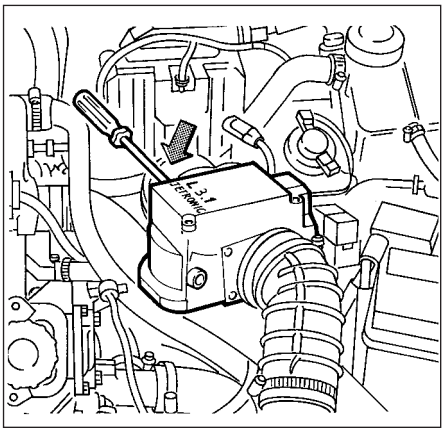


Fig. 13.53 Mixture adjustment screw location on the 1372 cc Turbo ie engine (Sec 9E)

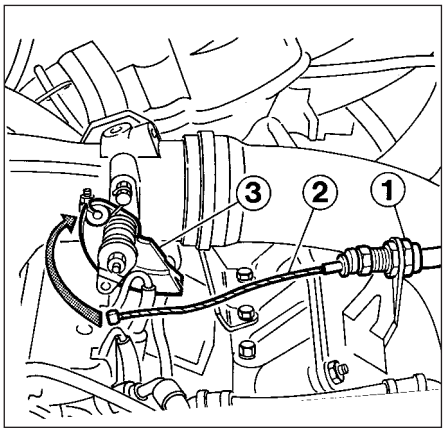


Fig. 13.54 Accelerator cable adjustment on the 1372 cc Turbo ie engine (Sec 9E)

1 Adjuster
2 Inner cable
3 Quadrant support

operation twice. Also prior to making adjustments ensure that the supplementary air valve pipe is in good condition, with no leaks. Compress the air valve pipe using a pair of grips to prevent incorrect adjustment caused by a defective supplementary air valve.

15 The air cleaner must be connected when checking and/or adjusting the engine idle speed. To adjust, turn the adjuster screw in the required direction to set the engine idle speed to that specified.

16 It is unlikely that the mixture will require adjustment and unless this is proven by measuring the exhaust gases using a CO content analyser, its setting should not be altered. As with idle speed adjustment, the engine must be at its normal operating temperature when making this check and adjustment. It is also necessary to ensure that the ignition idle advance is as specified. Checking and adjustment must not be made with the engine cooling fan, air conditioning (where fitted) or other related items switched on.

17 If adjustment to the mixture is required, prise free the tamperproof plug from the front of the mixture adjustment screw in the control unit, then turn the screw as required. Turn the screw inwards (clockwise) to increase the CO content or outwards (anti-clockwise) to weaken it.

Throttle position switch adjustment

18 This switch will not normally require adjustment having been set during production. The switch should not be loosened off or reset unless absolutely necessary.

19 If a new switch is fitted it can be set by loosely fitting the securing bolts, turning the switch fully anti-clockwise, then clockwise until one of the internal contacts is felt to click into engagement. Hold the switch in this position and tighten the retaining screws. Reconnect the wiring multiplug to the switch.

Accelerator cable adjustment

20 If the accelerator cable is removed or detached from the support bracket at the throttle control housing at any time, care must be taken to adjust it correctly. When the inner cable is connected to the throttle quadrant, set the outer cable in the bracket so that the inner cable has a minimal amount of free play, yet does not prevent the throttle valve from fully closing.

21 When the engine is restarted, check that the engine idle speed is as specified and that the action of the accelerator is satisfactory.

Fuel pump and supply system checks

22 Although the following basic checks can be made to the fuel pump and fuel supply system, specialised equipment is required to undertake full and accurate tests of the fuel supply system. Such checks must therefore be entrusted to a FIAT dealer or a fuel injection specialist.

23 If the fuel pump is suspected of malfunction, a basic check can be made by turning the ignition on and listening around the area of the pump unit to hear if it is operating. The pump is located on the underside of the car, just forward of the fuel tank. If the pump fails to operate, check that the pump fuse is sound and that its connection (and also that the relay) are clean and secure.

24 The pump can be further checked as described previously for the LE2 fuel injection system fuel pump in Part C of this Section.

Supplementary air valve check

25 With the engine at its normal operating temperature, allow it to idle, then pinch the supplementary air valve hose using suitable pliers as shown in Fig. 13.52 and check to see if the engine speed drops by more than 50 rpm. If it does, the supplementary air valve is defective and in need of renewal.

Injection system components - removal and refitting

Warning: Refer to the beginning of this Section before starting any work.

26 With the exception of the items mentioned below, the various components of the fuel injection system are removed in the same manner as that described for the equivalent items in Part C of this Chapter.

27 Disconnect the battery negative lead before carrying out any of the removal and refitting operations. Where fuel lines are to be disconnected it will first be necessary to depressurise the injection system.

Airflow meter

28 Release the retaining clips and detach the air intake and outlet ducts from the airflow meter.

29 Ensure that the ignition is switched off, then disconnect the multiplug from the ECU. Unscrew the retaining bolts and remove the airflow meter complete with the ECU.

30 If required, the ECU can be separated from the airflow meter by undoing the securing bolts.

Throttle valve housing/inlet manifold

31 Loosen off the retaining clip and detach the air intake duct from the throttle housing, the air cooling hoses for the injectors and the supplementary air valve.

32 Detach the accelerator cable from the throttle linkage.

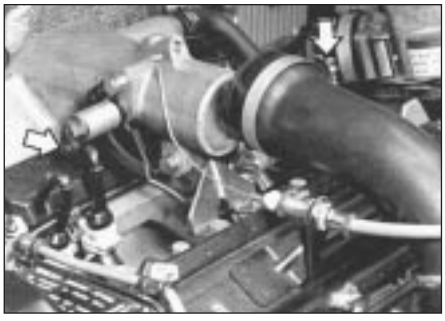


Fig. 13.55 Disconnecting the air intake duct and accelerator cable from the throttle housing on the 1372 cc Turbo ie engine (Sec 9E)

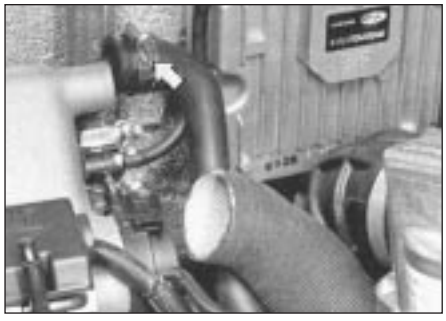


Fig. 13.56 Disconnecting the injector air cooling hoses and the supplementary air valve hose on the 1372 cc Turbo ie engine (Sec 9E)

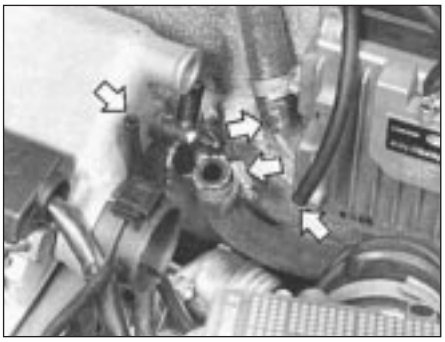


Fig. 13.57 Detach the vacuum pick-up pipes from the points arrowed on the 1372 cc Turbo ie engine (Sec 9E)

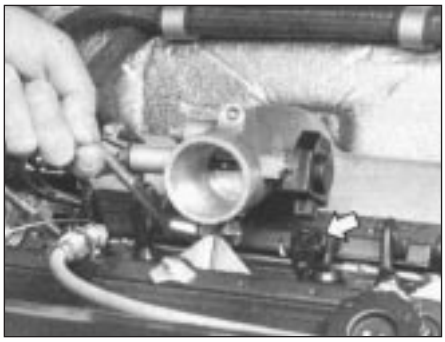


Fig. 13.58 removing the inlet manifold mounting bracket from the cylinder head on the 1372 cc Turbo ie engine (Sec 9E)

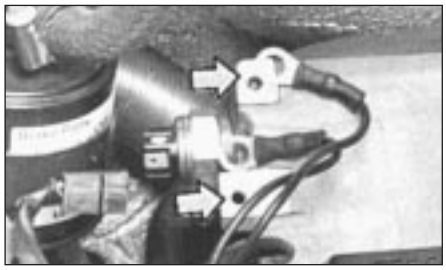


Fig. 13.59 Disconnecting the earth leads (arrowed) on the 1372 cc Turbo ie engine (Sec 9E)

33 Detach the vacuum pick-up pipes from the points indicated in Fig. 13.57.
34 Detach the wiring connector from the throttle position switch.
35 Unscrew and remove the inlet manifold mounting bracket-to-cylinder head retaining bolt shown in Fig. 13.58.
36 Unscrew and remove the injector cable shield retaining screws. Detach the cables from the injectors.
37 Disconnect the earth leads and the air intake sensor lead shown in Fig. 13.59.
38 Release and withdraw the injector cable shield from the left-hand underside of the throttle housing.
39 Unscrew and detach the injector fuel supply pipe and disconnect the fuel pressure regulator pipe from its inlet manifold union.
40 Disconnect the injector cooling fan thermostatic switch lead.
41 Unscrew the securing bolts and remove the fuel pressure regulator.
42 Unscrew and remove the heat shield-to-exhaust manifold retaining bolts. Unscrew the retaining bolts at the rear and withdraw the heat shield.
43 Undo the inlet manifold retaining bolts/nuts and carefully withdraw the manifold/throttle housing. Remove the gasket from the mating face.

Injectors and fuel rail

44 Depressurise the system as described previously.
45 Disconnect the fuel supply line from the fuel rail.
46 Disconnect the fuel return line from the base of the fuel pressure regulator. Unbolt and remove the pressure regulator from the fuel rail.
47 Unscrew and remove the injector cable shield retaining screws. Detach the cables from the injectors.
48 Disconnect the fuel rail/injector unit and withdraw the fuel rail, together with the injectors, from the engine.
49 With the injectors and the fuel rail removed, one or more injectors can be removed and renewed as described below. Note that the connecting hoses will be destroyed during removal and these together with the injector seals will therefore need to be renewed.

Injector(s) and connecting hoses

50 Remove the injectors and the injector fuel rail as described in the previous sub-Section and secure the fuel rail in a vice, but do not overtighten.
51 Cut free the hose between the fuel rail and the injector. Make the cut in-line with the hose and cut the hose as close as possible to the fuel rail connection, then pull the hose free from its retaining cap. Once the hose is detached, the retaining cap is released.
52 Repeat the procedure and release the hose and its retaining cap from the injector.
53 Whether or not the injector unit itself is to be renewed, the injector O-ring seals must always be renewed when disturbed.
54 Check that the connections of the fuel rail and the injector are clean, then push the new injector with retaining cap onto the new hose. Ensure that the hose is fully located in the retaining cap.
55 Check that the fuel rail-to-hose retaining cap is located on the connector, then push the other end of the injector hose over the fuel rail connector. Ensure that the hose is fully located in the retaining cap.
56 The interconnecting hose between the fuel rail sections can be removed and renewed in the same manner as that described above for the injector hoses.

Electronic control unit (ECU)

57 The ECU is mounted on the top face of the airflow meter. Ensure that the ignition is switched off before disconnecting the multiplug from the ECU. Disconnect the wiring multiplug connector by compressing the tag and pulling the connector free from the unit. Undo the retaining screws and remove the ECU from the airflow meter. Handle the unit with care and if removed for an extensive period, store it in a safe place where it will not get knocked or damaged.

Fuel pump - removal and refitting

58 Depressurise the fuel system as described previously.
59 Raise the car at the rear and support it on axle stands. Detach and remove the

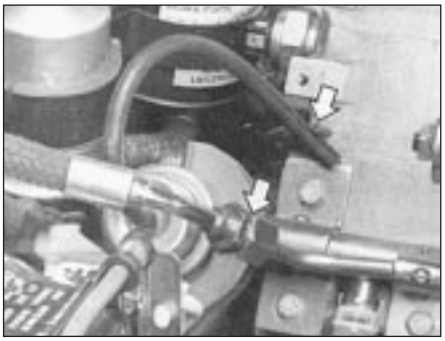


Fig. 13.60 Disconnecting the injector fuel supply pipe and fuel pressure regulator pipe on the 1372 cc Turbo ie engine (Sec 9E)

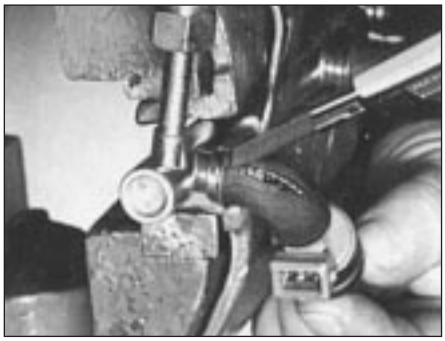


Fig. 13.61 Cutting free the hose from an injector on the 1372 cc Turbo ie engine (Sec 9E)

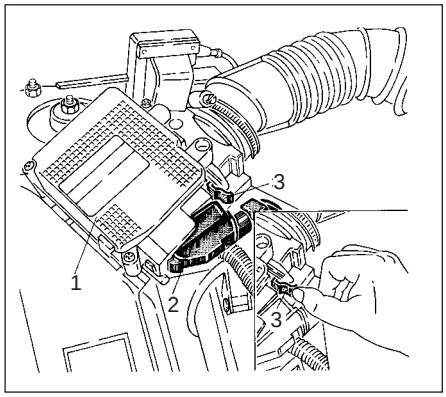


Fig. 13.62 ECU (1) wiring multiplug (2) and tag (3) - 1372 cc Turbo ie engine (Sec 9E)

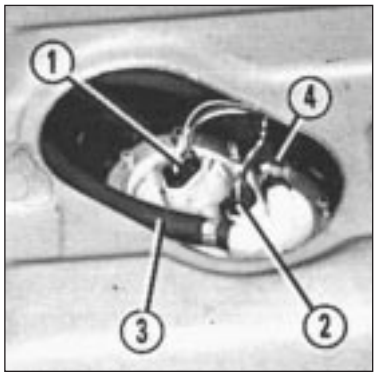


Fig. 13.63 Fuel pump and sender unit location on the 1372 cc Turbo ie engine (Sec 9E)

1 Fuel level gauge sender connector
2 Fuel pump connector
3 Fuel return hose
4 Fuel supply hose

protective shield to gain access to the pump which is located forward of the fuel tank.
60 Disconnect the fuel hoses and the wiring connector, release the retaining clamp and withdraw the pump unit.

Refitting all components

61 Refitting of all components is a reversal of the removal procedure, but note the following specific points.
62 Ensure that all components are clean prior to refitting and where applicable, use new seals and gaskets. Ensure that all connections are securely and correctly made.
63 Do not reconnect the battery until all the refitting procedures are complete.
64 When the engine is restarted, check around the fuel injection system for any signs of leakage from the fuel supply and return components.

Lambda sensor - general

65 The sensor is screwed into the exhaust in front of the catalytic converter.
66 A faulty sensor can damage the converter, therefore it must be checked regularly (see Maintenance schedule, Section 3) by a dealer using special equipment.
67 Use of leaded fuel will also damage this sensor, as well the converter.

PART F: TURBOCHARGER SYSTEM

Description

1 A turbocharger is fitted to certain 1301 and 1372 cc ie engines. The accompanying photographs are all taken from a 1301 cc engine, but the system is much the same for both engine types.
2 The turbocharger is basically a shaft with an exhaust gas-driven turbine at one end, and a compressor located at the other end which draws in outside air and forces it into the inlet manifold. By compressing the incoming air, a larger charge can be let into each cylinder, and greater power output is achieved than with normal aspiration.

9F.5 Maximum air pressure switch (arrowed)

9F.7 Bypass valve

9F.14 Alternator heat shield

9F.16A Turbocharger-to-exhaust flange nut (arrowed)

3 Lubrication of the turbocharger shaft bearings is provided by pressurised engine oil, and the unit is cooled by the coolant from the engine cooling system.
4 A wastegate valve is incorporated in the turbocharger to divert excessive exhaust gas pressure from the turbine into the exhaust pipe at a predetermined pressure level.
5 A maximum air pressure switch is located in the inlet manifold. Its purpose is to cut the ignition system off when the turbocharger system pressure continues to increase beyond 0.86 bars (12.5 lbf/in^2). This would otherwise damage the engine, due to high combustion temperatures and pressures (photo).
6 An intercooler (heat exchanger) is located between the turbocharger and the inlet manifold. Its function is to cool the inlet charge, thus increasing its density, to provide greater power output.
7 A mechanical bypass valve is located between the low-pressure pipe (downstream) and the high-pressure pipe (upstream), which reduces the inherent noise from the turbocharger when the accelerator pedal is released (photo).
8 None of the components of the turbocharger system can be repaired and parts are not available. Any fault will therefore mean that the turbocharger or associated assemblies will have to be renewed complete.

Precautions

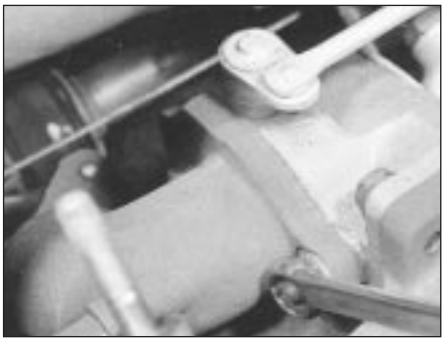
9 The following precautions should be observed when using a turbocharged vehicle.

a) Never operate the engine without the air cleaner fitted.
b) Never switch off the engine before its speed has dropped to idling. If the car has been driven hard, allow it to idle for a few minutes before switching off. Failure to observe these recommendations can cause damage to the turbocharger due to lack of lubrication.

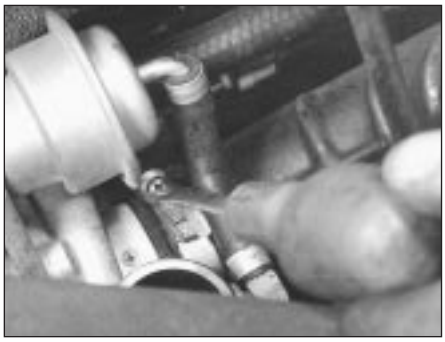
10 Always keep the fuel injection system well-maintained and tuned. Operating on a weak mixture can cause overheating of the turbocharger.

Turbocharger (1301 cc ie engine) - removal and refitting

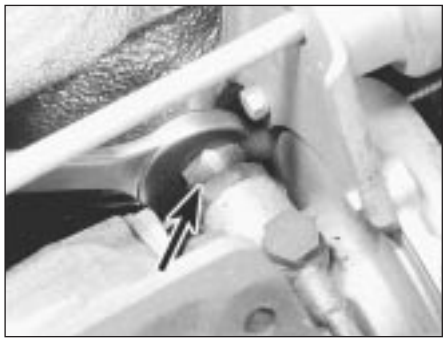
11 Disconnect and remove the airflow meter as described in Section 9C.
12 Disconnect the spiral-wound hose from the fuel injector cooling duct.
13 Remove the turbocharger air hoses from within the left-hand side of the engine compartment. Note particularly their routing.
14 Remove the throttle housing/inlet manifold as described in Section 9C, also the fuel rail, injectors and inlet manifold branch pipe stubs. Remove the alternator heat shield (photo).
15 Remove the exhaust heat shield.
16 Unscrew the turbocharger-to-exhaust pipe flange nuts (photos).



9F.16B Unscrewing turbocharger-to-exhaust manifold nut



9F.17 Releasing turbocharger air hose clip

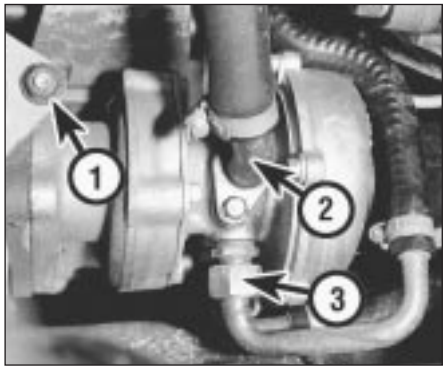


9F.18A Releasing turbocharger coolant inlet union (arrowed)

17 Disconnect the air hoses from the turbocharger (photo).
18 Drain the cooling system, and then disconnect the coolant hoses from the turbocharger (photos).
19 Disconnect the oil feed pipe, which has a banjo-type union (photo).
20 Disconnect the oil return pipe which runs to the engine sump pan (photo).
21 Working underneath the car, disconnect the exhaust manifold support bracket (photo).
22 Unbolt the exhaust manifold and lift it out of the engine compartment, complete with turbocharger.
23 The turbocharger may now be unbolted from the exhaust manifold (photo).
24 Refitting is a reversal of removal, but use new gaskets and seals throughout.

Turbocharger (1372 cc ie engine) - removal and refitting

25 Refer to Part E of this Section for details and remove the inlet manifold.
26 Drain the cooling system as described in Section 8 of this Chapter.
27 Unscrew the union bolt and disconnect the oil supply pipe from the turbocharger.
28 Loosen off the securing clip and detach the air hose from the turbocharger filter.
29 Raise and support the car at the front end on axle stands.
30 Working from underneath the car, unscrew the downpipe-to-exhaust system joint nuts then unscrew the retaining nuts and detach the exhaust downpipe from the turbocharger outlet flange. Remove the downpipe.



9F.18B Turbocharger connections

1 Exhaust connecting nut
2 Oil return hose *3 Coolant pipe union*

9F.19 Turbocharging oil feed pipe

9F.20 Turbocharger oil return pipe at sump

9F.21 Exhaust manifold support bracket

9F.23 Exhaust manifold bolts

Fig. 13.64 Turbocharger oil supply pipe connection (arrowed) (Sec 9F)

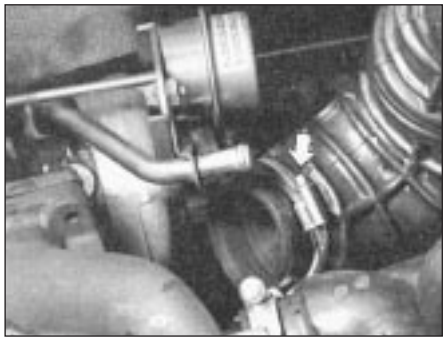


Fig. 13.65 Detach the air hose from the Turbocharger (arrowed) (Sec 9F)

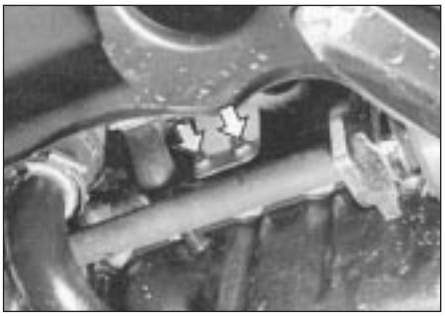


Fig. 13.66 Turbocharger mounting bracket bolts (arrowed) (Sec 9F)

Fig. 13.67 Disconnect the heat exchanger air hose and the oil return pipe (turbocharger-to-sump) (Sec 9F)

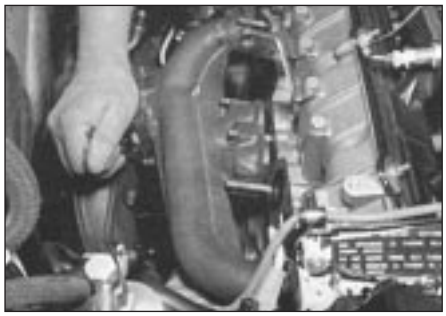
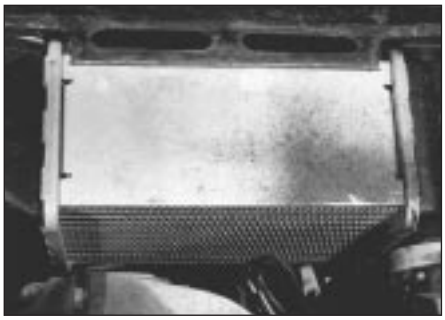


Fig. 13.68 Turbocharger mounting bracket bolts removal (Sec 9F)

Fig. 13.69 Turbocharger coolant pipe-to-pump bolt location (arrowed) (Sec 9F)



9F.40 Intercooler location (1301 cc engine)

9F.43 Intercooler mounting bolt (arrowed) on 1301 cc engine

31 Unscrew and remove the two turbocharger mounting bracket bolts.
32 Referring to Fig. 13.67, loosen off the retaining clip and detach the air hose from the heat exchanger and the oil return pipe from the turbocharger (to sump).
33 Working from above, undo the turbocharger mounting bracket bolts.
34 Unscrew and remove the coolant pipe-to-pump retaining bolts. The turbocharger can now be removed from above by withdrawing it together with the exhaust manifold from the engine compartment.
35 Locate and support the exhaust manifold in a vice. Fit protector clamps to the jaws of the vice to avoid possible damage to the manifold.
36 Note the orientation and fitted position of the turbocharger mounting bracket, then unscrew the retaining nuts and detach the bracket.
37 Undo the retaining nuts, separate and remove the exhaust manifold from the turbocharger.
38 The turbocharger and wastegate valve are not repairable and must therefore be renewed as a complete unit. This being the case, remove the following ancillary items from the turbocharger unit before renewing it.

a) Loosen off the retaining clip and remove the air outlet hose from turbocharger.
b) Undo the two retaining bolts and remove the oil return hose union.
c) Unscrew the union and bolt and coolant inlet pipe.
d) Undo the retaining nuts and remove the turbocharger-to-exhaust manifold connector.

39 Where applicable, always use new gaskets and ensure that the mating faces are clean before refitting the ancillary components to the turbocharger.

Intercooler - removal and refitting

40 The intercooler is mounted behind the left-hand side of the front bumper/spoiler (photo).
41 Disconnect the air ducts from the intercooler.
42 Unscrew the mounting bolts and lift the intercooler from the car.
43 Refitting is a reversal of removal (photo).

Injector cooling fan - removal and refitting

44 This unit is located on the left-hand side at the front of the car. It can be accessed for removal from above, in the engine compartment.
45 Detach and remove the air intake duct from the air cleaner unit to the ECU/airflow meter.
46 Disconnect and remove the air duct from the air blower unit.
47 Undo the air blower retaining nuts, withdraw the unit and detach its wiring connector.

Fault finding - fuel injection system

Difficult starting from cold

☐ Fuel pump fault
☐ Blocked fuel pipe or filter
☐ Supplementary air valve fault
☐ Coolant temperature sensor fault

Excessive fuel consumption

☐ Incorrect mixture setting
☐ Dirty air cleaner element
☐ Coolant temperature sensor fault
☐ Airflow sensor fault

Difficult to start when hot

☐ Choked air cleaner element
☐ Fuel pump fault

Uneven idling

☐ Incorrect mixture setting
☐ Intake system air leak
☐ Throttle position switch out of adjustment
☐ Loose ECU connector

Fault finding - turbocharger system

Noise or vibration

- ☐ Worn shaft bearings
- ☐ Lack of lubrication
- ☐ Inlet or exhaust manifold leaking
- ☐ Out-of-balance impeller shaft

Engine "pinking"

- ☐ High boost pressure, caused by faulty wastegate valve
- ☐ Fuel octane rating too low
- ☐ Faulty TDC sensor (ignition advanced)
- ☐ Incorrect spark plugs or plug gaps, or spark plugs worn

Indicated boost pressure too high

- ☐ Faulty wastegate valve
- ☐ Ice forming in exhaust pipe (during very cold weather)

Power loss/indicated boost pressure too low

- ☐ Turbocharger leaking, or leak at turbocharger mounting
- ☐ Incorrectly adjusted wastegate valve/wastegate valve not closing
- ☐ Blocked exhaust pipe
- ☐ Clogged air cleaner element
- ☐ Faulty TDC sensor (ignition retarded)
- ☐ Turbo/intercooler connecting hose leaking

Oil leaks from shaft oil seals, with blue exhaust fumes

- ☐ Oil return pipe blocked
- ☐ Air cleaner element clogged
- ☐ Worn oil seals

10 Ignition system

General

1 The ignition systems dealt with in this Section are all fully electronic and are referred to individually according to type as the "breakerless", Microplex and Digiplex 2 system. The Microplex system is used on the 1301 and 1372 cc Turbo ie engines, the Digiplex 2 on the 1372 cc ie engine and the "breakerless" system on all other models.

Ignition timing (all later models)

2 The ignition timing check on all systems covered in this Section is made using a stroboscope, connected up in accordance with the manufacturer's instructions and pointed at one of the two positions given below (photos).

a) The timing marks on the crankshaft pulley and the timing cover. The right-hand underwing shield will need to be detached and removed to allow access to view these marks (see photos 7B.27 and 7B.30B in this Chapter).

b) The timing marks on the flywheel and the clutch housing. The rubber plug will need to be extracted for access to these marks.

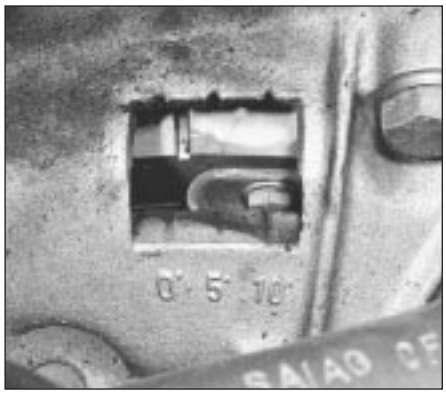
3 A dwell angle check is not possible on any of these systems.

4 When making the stroboscopic ignition timing check it is necessary to disconnect the vacuum hose from the distributor or inlet manifold to module (as applicable) and plug it. The engine must be at its normal operating temperature and running at the normal specified idle speed when making the check. Refer to the appropriate part of the Specifications at the start of this Chapter for the idle speed and ignition settings.

Breakerless ignition system - description

5 On 903 cc engines, the distributor is driven from an extension of the oil pump driveshaft which is geared to the camshaft.

10.2A Flywheel timing marks (999 cc engine)



10.2B Flywheel timing marks (1372 cc ie engine)

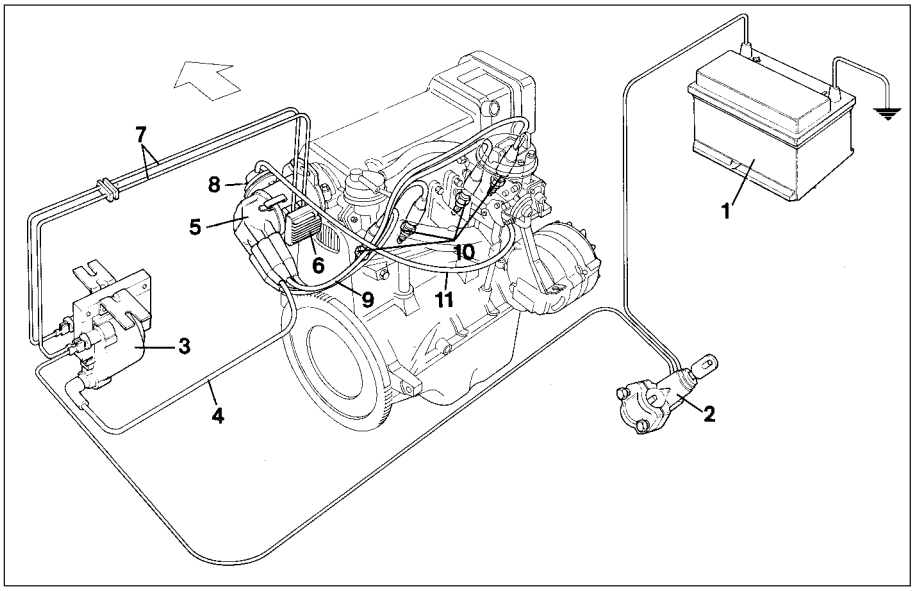


Fig. 13.70 Breakerless ignition system - 999 and 1108 cc engines (Sec 10)

1 Battery
2 Ignition switch
3 Ignition coil
4 Coil HT lead
5 Distributor
6 ECU
7 LT cables
8 Vacuum advance unit
9 Spark plug HT leads
10 Spark plugs
11 Vacuum hose

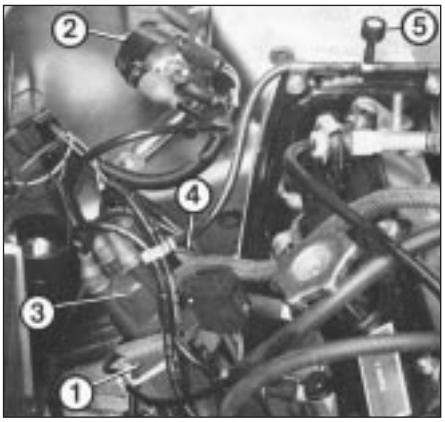


Fig. 13.71 Location of electronic ignition components on early models with breakerless ignition (Sec 10)

1 ECU
2 Ignition coil
3 Distributor
4 Vacuum advance unit
5 Pick-up filter with calibrated opening for atmospheric pressure

6 On 999, 1108 and 1372 cc engines, the distributor is driven from the rear end of the camshaft.
7 On the 1116 and 1299/1301 cc engines, the distributor is driven from an extension of the oil pump driveshaft which is geared to the auxiliary shaft.
8 The distributor contains a reluctor mounted on its shaft, and a magnet and stator fixed to the baseplate.
9 Ignition advance is controlled in the conventional way mechanically by centrifugal weights and a diaphragm unit for vacuum advance.
10 Instead of the conventional method of interrupting the low tension circuit to generate high tension voltage in the coil by means of a mechanical contact breaker, when the electronic ignition is switched on, the switching of the transistors in the electronic control unit (ECU) prevents current flow in the coil primary windings.
11 Once the crankshaft rotates, the reluctor moves through the magnetic field created by the stator and when the reluctor teeth are in alignment with the stator projections a small AC voltage is created. The ECU amplifies this voltage and applies it to switch the transistors and so provide an earth path for the primary circuit.
12 As the reluctor teeth move out of alignment with the stator projections the AC voltage changes, the transistors in the ECU are switched again to interrupt the primary circuit earth path. This causes a high voltage to be induced in the secondary winding.

Distributor (breakerless type) - removal and refitting

13 Removal of the distributor on the 903, 1116, 1299 and 1301 cc engines is as described in Chapter 4, Section 6.
14 On 999, 1108 and 1372 cc engines, mark the position of the distributor clamp plate in relation to the cylinder head surface.
15 Unclip the distributor cap and move it to one side with the HT leads attached.
16 Disconnect the LT lead plug and, where applicable, the vacuum hose (photo).
17 Unscrew the distributor fixing nuts and withdraw the unit.
18 The distributor drive is by means of an offset dog no special procedure is required to refit it. Providing the dog engages in its slot and the distributor body is turned to align the marks made before removal, the timing will automatically be correct.
19 If a new distributor is being fitted (body unmarked), set No. 4 piston at TDC (0º) by turning the crankshaft pulley bolt until the timing marks on the crankshaft pulley and engine front cover are in alignment.
20 Align the drive dog and fit the distributor then turn the distributor body until the contact end of the rotor is aligned with the arrow on the distributor dust shield.
21 Tighten the distributor clamp nuts. Refit the cap and disconnected components and then check ignition timing using a stroboscope.

Fig. 13.72 Rotor aligned with arrow on distributor dust shield - 999 and 1108 cc engines (Sec 10)

Distributor (breakerless type) - overhaul

22 It is recommended that a worn out or faulty distributor is renewed. However, individual components such as the cap, rotor, reluctor, magnet/stator/baseplate assembly, vacuum diaphragm unit, and drive gear or dog are available separately.

Breakerless ignition system components - testing

23 A voltmeter and an ohmmeter will be required for this work.

Primary circuit voltage

24 Turn on the ignition, and using a voltmeter check the voltage at the ignition coil LT terminals. Any deviation from battery voltage will indicate a faulty connection, or if these are satisfactory, then the coil is unserviceable.

10.16 Distributor LT lead connecting plug

Magnetic impulse generator winding

25 Remove the distributor and ECU and disconnect their connecting leads.
26 Connect an ohmmeter to the impulse generator terminals and note the reading. The resistance should be as given in the Specifications at the beginning of this Chapter.
27 Now check between one of the impulse generator terminals and the metal body of the distributor. Infinity should be indicated on the ohmmeter. If it is not, renew the impulse generator carrier plate. **Note:** *When carrying out this test it is imperative that the connections are remade as originally observed. Also ensure that there is no possibility of the ECU supply (red) cable and earth cable making contact in service.*

Ignition coil winding resistance

28 Check the resistance using an ohmmeter between the coil LT terminals. Refer to the Specifications for the expected coil resistance.
29 Check the resistance between the LT lead socket on the coil and each of the LT terminals. Refer to the Specifications for the expected coil resistance.
30 The rotor arm resistance should be approximately 5000 ohms.

Microplex ignition system - description

31 This system is fitted to the 1301 and 1372 cc Turbo ie models, and comprises the following components.

Electro-magnetic sensors

32 Two sensors are used to pick up engine speed and TDC position directly from the crankshaft.

Pressure and vacuum sensor

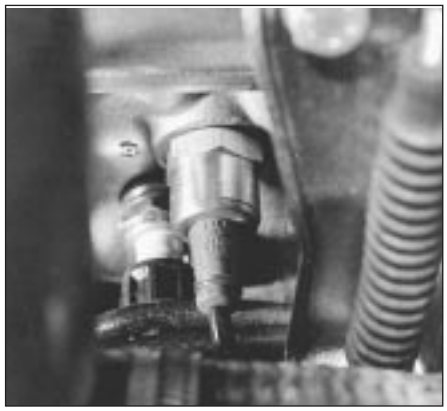
33 This converts inlet manifold vacuum pressure into an electrical signal for use by the electronic control unit (ECU).

Anti-knock sensor

34 This converts “pinking” detonations which occur within the combustion chambers into an electrical signal for use by the ECU (photo).

Electronic Control Unit (ECU)

35 This computes the optimum ignition advance angle from the sensor signals received, and controls the action of the ignition unit (photo).



10.34 Anti-knock sensor

10.35 Ignition ECU on rear bulkhead (1301 cc Turbo ie engine)

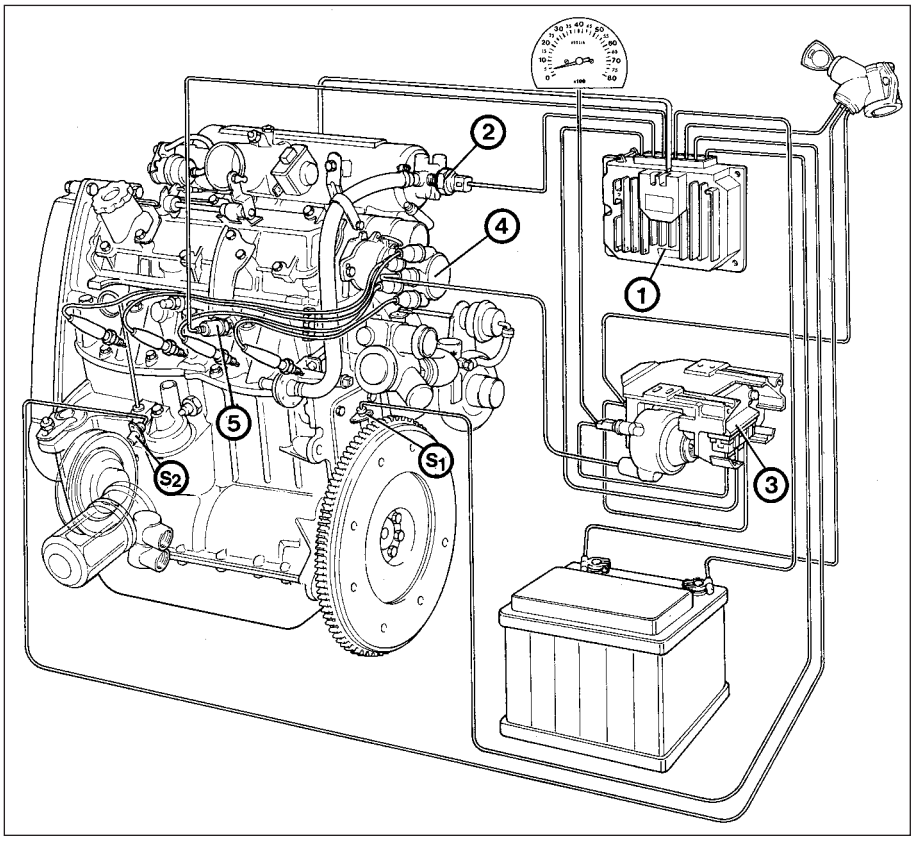
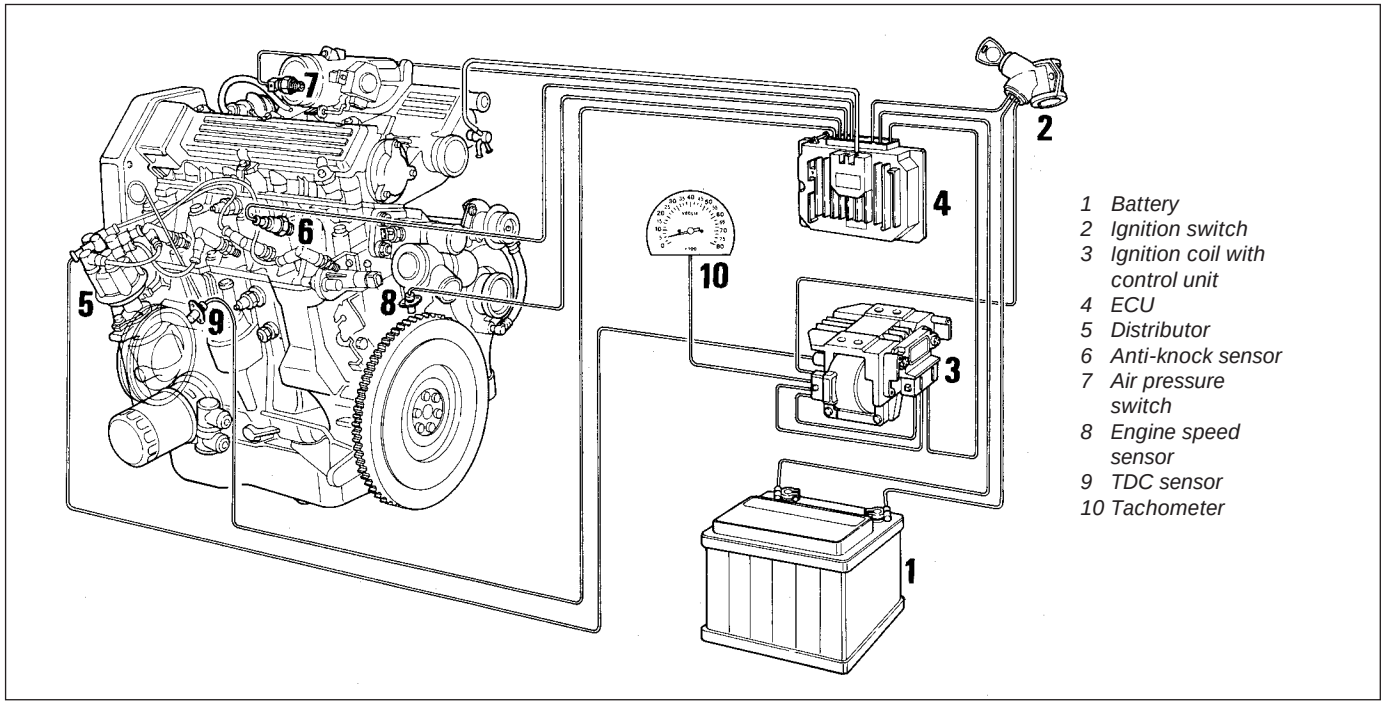


Fig. 13.75 Microplex ignition system components on the 1301 cc Turbo ie engine (Sec 10)

1 ECU
2 Safety pressure switch
3 Ignition unit and coil
4 Distributor
5 Anti-knock sensor
S1 TDC sensor
S2 Engine speed sensor



1 Battery
2 Ignition switch
3 Ignition coil with control unit
4 ECU
5 Distributor
6 Anti-knock sensor
7 Air pressure switch
8 Engine speed sensor
9 TDC sensor
10 Tachometer

Fig. 13.76 Microplex ignition system components on the 1372 cc Turbo ie engine (Sec 10)

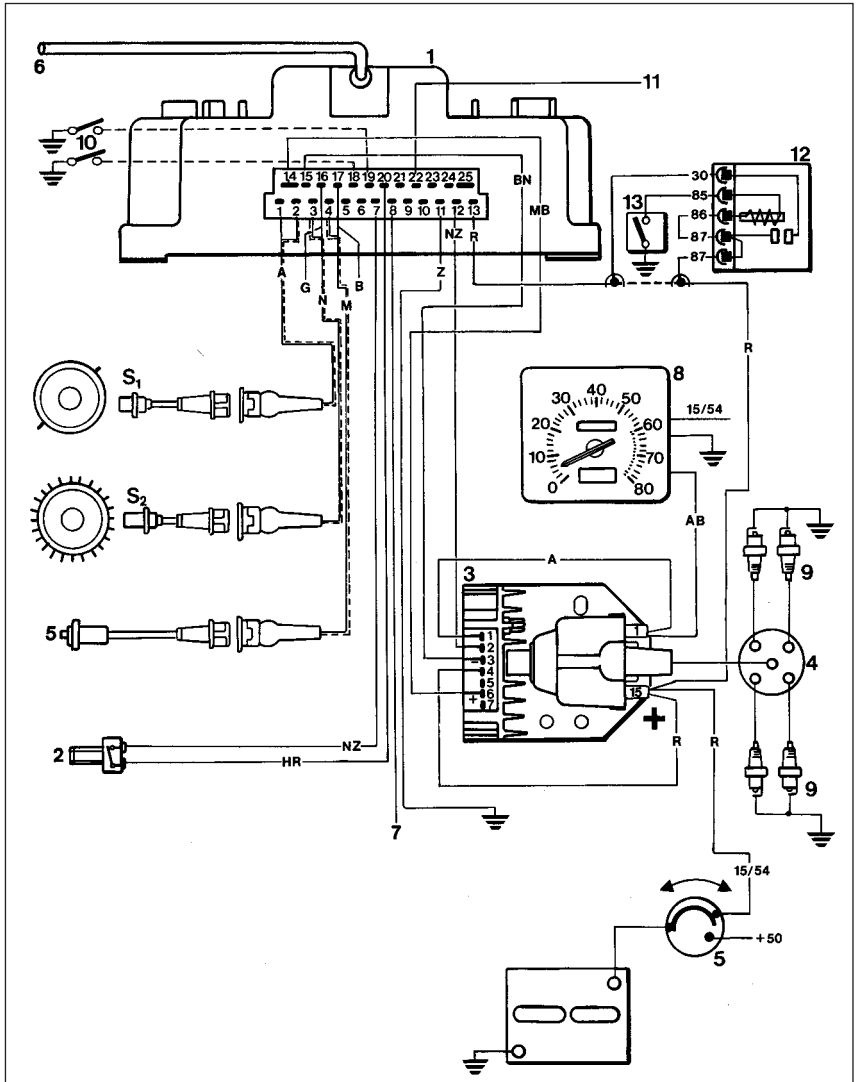


Fig. 13.73 Wiring diagram of the Microplex ignition system on the 1301 cc Turbo ie engine (Sec 10)

1 ECU
2 Safety pressure switch
3 Ignition unit with coil
4 Distributor
5 Anti-knock sensor
6 Vacuum/pressure pick-up in engine inlet manifold
7 Socket for diagnostic equipment
8 Tachometer
9 Spark plugs
10 Switch to earth (to retard advance curve if necessary)
11 Turbocharger operation warning light
12 Anti-theft relay (where fitted)
13 Hidden anti-theft switch (where fitted)

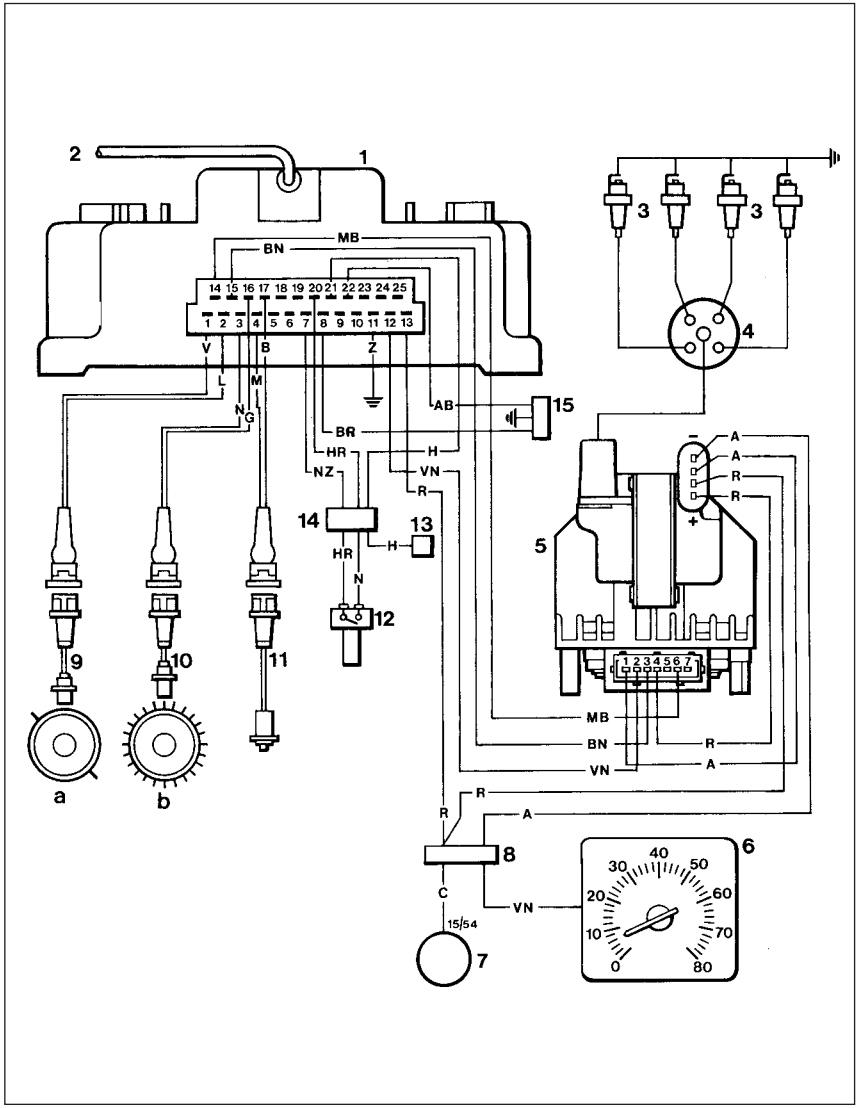
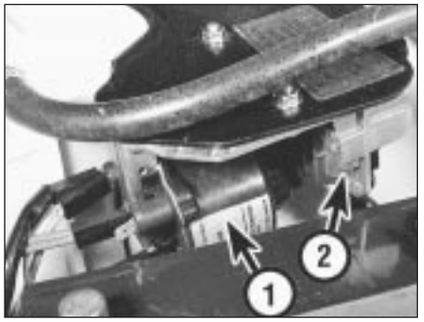


Fig. 13.74 Wiring diagram of the Microplex ignition system on the 1372 cc Turbo ie engine (Sec 10)

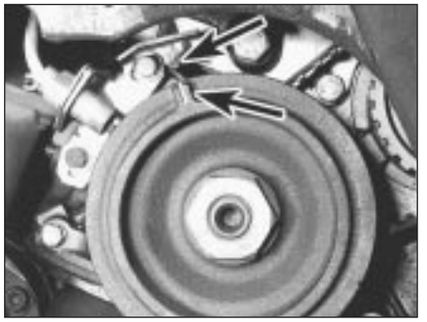
1 ECU
2 Pipe (pressure/vacuum in inlet manifold to control unit)
3 Spark plug
4 Distributor
5 Ignition coil (with control unit)
6 Tachometer
7 Ignition switch
8 Connector
9 TDC sensor
10 Engine speed
11 Anti-knock sensor
12 Air pressure safety switch
13 Speedometer signal for electronic injection
14 Connector
15 Diagnostic socket

a Crankshaft pulley
b Flywheel



10.36 Ignition coil (1) and power module (2) on 1301 cc Turbo ie engine

10.38 Removing the distributor cap



10.39 Crankshaft pulley timing marks (arrowed)

Ignition unit

36 This comprises four elements (photo).

a) Power module - receives the ignition advance command and controls the conduction angle of the primary current and energy stored in the coil.

b) Dissipater plate - eliminates the heat which is generated by the high volume of current.

c) Ignition coil with low primary resistance.

d) Distributor - a means of distributing high tension to the spark plugs. The rotor is driven in an anti-clockwise direction (viewed from transmission) by a dog on the end of the camshaft.

37 The system incorporates a safety pressure switch, which cuts out the ignition if the turbocharging pressure exceeds a value of between 0.84 and 0.93 bars (12.2 and 13.5 lbf/in^2) above atmospheric pressure.

Distributor (Microplex) - removal and refitting

38 Remove the distributor cap and place it to one side, complete with spark plug leads (photo).

39 Turn the crankshaft by means of the pulley nut, or by raising and turning a front wheel with top gear engaged, until No. 4 piston is on its firing stroke. This will be indicated when the contact end of the rotor arm is aligned with the mark on the distributor body rim, and the lug on the crankshaft pulley is aligned with the timing pointer on the engine. The right-hand underwing shield will have to be removed in order to see the marks (photo).

40 Unscrew the distributor fixing nuts and withdraw the distributor.

41 When fitting the distributor, the offset drive dog will automatically locate the distributor rotor in its correct position, but the distributor body may require rotating in order to align the rim mark with the rotor. The elongated slots for the fixing studs are to permit initial alignment, not for subsequent adjustment, as advance angle alterations are carried out automatically by the system ECU (photos).

42 Tighten the nuts and refit the cap with leads.

43 Unless a stroboscope and a vacuum pressure gauge are available, it will not be possible to check the advance values with the engine running. Where these instruments are available, connect the vacuum gauge to the inlet manifold, and the stroboscope in accordance with the equipment manufacturer's instructions. Refer to Fig. 13.79 according to the inlet manifold vacuum pressure indicated.

Microplex ignition system components - testing

44 An ohmmeter and a voltmeter will be required for these tests.

45 Remove the multipin plug from the ECU.

Engine speed sensor

46 Insert the probes of an ohmmeter between terminals 3 and 16 of the multipin connector; 618 to 748 ohms (1301 cc) or 578 to 782 ohms (1372 cc) should be indicated.

47 If necessary, carry out a check of the gap between the sensor and flywheel teeth as described in Chapter 4, Section 10.

10.41A Distributor body showing elongated slots in the mounting lugs

10.41B Distributor drive dog

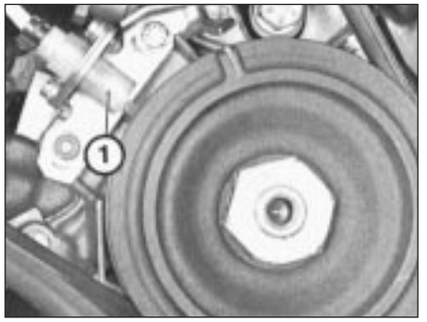


Fig. 13.77 Crankshaft pulley timing mark aligned with timing pointer - Microplex ignition system (Sec 10)

1 TDC sensor

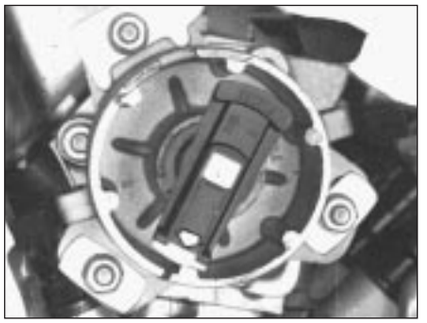


Fig. 13.78 Rotor aligned with distributor body rim mark - Microplex ignition system (Sec 10)

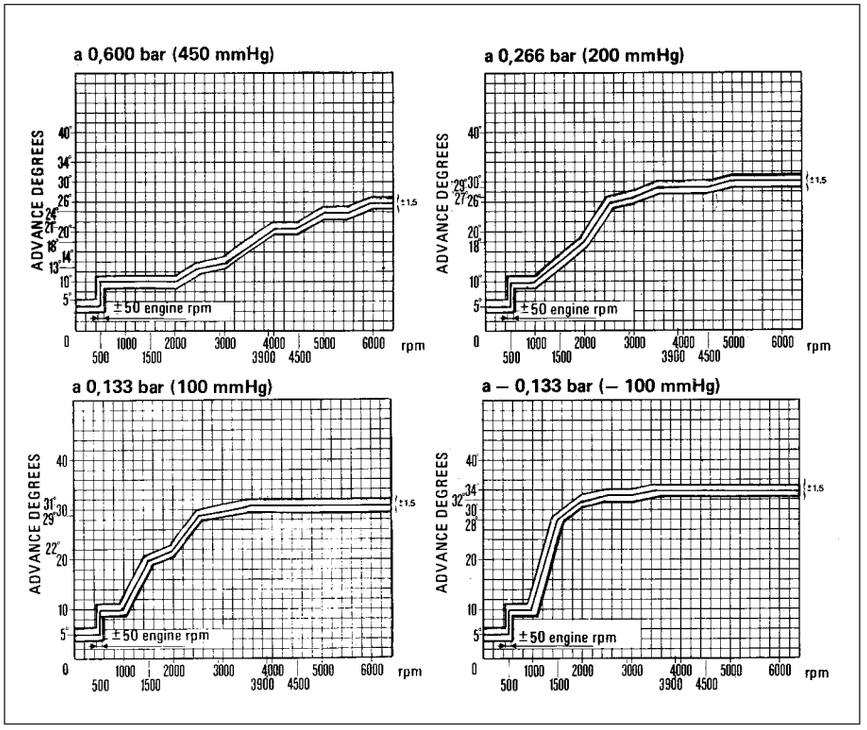


Fig. 13.79 Ignition advance curves - Microplex ignition system on the 1301 cc Turbo ie (Sec 10)

TDC sensor

48 Insert the probes of the ohmmeter between terminals 1 and 2 of the multipin connector; 618 to 748 ohms (1301 cc) or 578 to 782 ohms (1372 cc) should be indicated.

49 If necessary, carry out a check of the gap between the sensor and the crankshaft pulley, as described in Chapter 4, Section 10.

ECU supply

50 Switch on the ignition, and then insert the probes of a voltmeter between terminals 13 and 11 of the multipin connector. Battery voltage should be indicated. If not, check the battery earth, ignition switch or intermediate connector plug for security.

Power module supply (1301 cc)

51 Pull the multipin plug from the power module, and connect the probes of a voltmeter between terminal 4 of the connector and earth. If the reading is less than battery voltage, check the security of all connections between the ignition switch and terminal + 15 of the ignition coil.

52 Reconnect the multipin connector to the ECU, but have the one from the power module disconnected, and then switch on the ignition.

53 Connect the voltmeter between terminals 4 and 2 of the power module multipin connector. If the indicated voltage is less than battery voltage, check the security of all connections between the ignition switch and terminal + 15 of the ignition coil, and the battery earth. If all are satisfactory, check for continuity between terminals 11 and 12. If continuity is broken, renew the ECU.

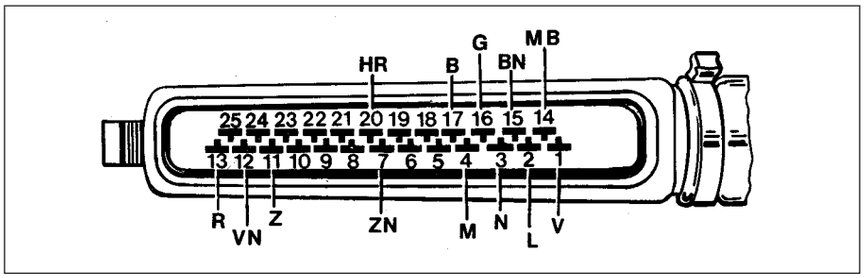


Fig. 13.80 Microplex ignition system ECU multipin connector (Sec 10)

For colour code, see main wiring diagrams

Power module (1372 cc)

54 Proceed as described in paragraph 53.

Anti-knock sensor

55 If "pinking" occurs, or loss of power is noticed, test the sensor by substitution of a new one.

Ignition coil

56 Disconnect the leads from terminals 1 and 15 on the coil before testing.

57 Using the ohmmeter, check the resistance of the primary winding. This should be between 0.31 and 0.37 ohms (1301 cc) or 0.40 to 0.49 ohms (1372 cc), at an ambient temperature of 20ºC (68ºF).

58 The secondary winding resistance should be between 3330 and 4070 ohms (1301 cc) or 4320 to 5280 ohms (1372 cc), at an ambient temperature of 20ºC (68ºF).

Distributor

59 Check the resistance of the rotor arm, which should be between 800 and 1200 ohms.

60 Where all the foregoing tests have proved satisfactory, then any problem must be due to a fault in either the power module or the ECU. These components can only be checked by the substitution of a new unit - power module first, then the ECU.

Safety pressure switch

61 The device protects the engine from excessive turbocharging pressure, cutting off the ignition by earthing the Microplex ECU. Testing is not possible without a special pressure pump, so the easiest way to check a suspected fault is to fit a new unit.

Digiplex 2 ignition system - description

62 This system operates in a similar manner to that of the earlier type described in Chapter 4, but the circuit layout differs to suit the Mono Jetronic fuel injection system. In operation, the main difference is that the Digiplex 2 system has a greater number of

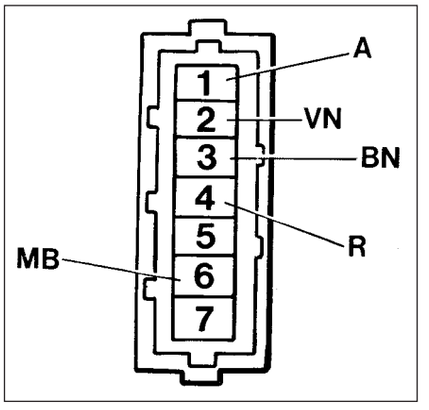


Fig. 13.81 Microplex ignition system control unit connection (Sec 10)

For colour code, see main wiring diagrams

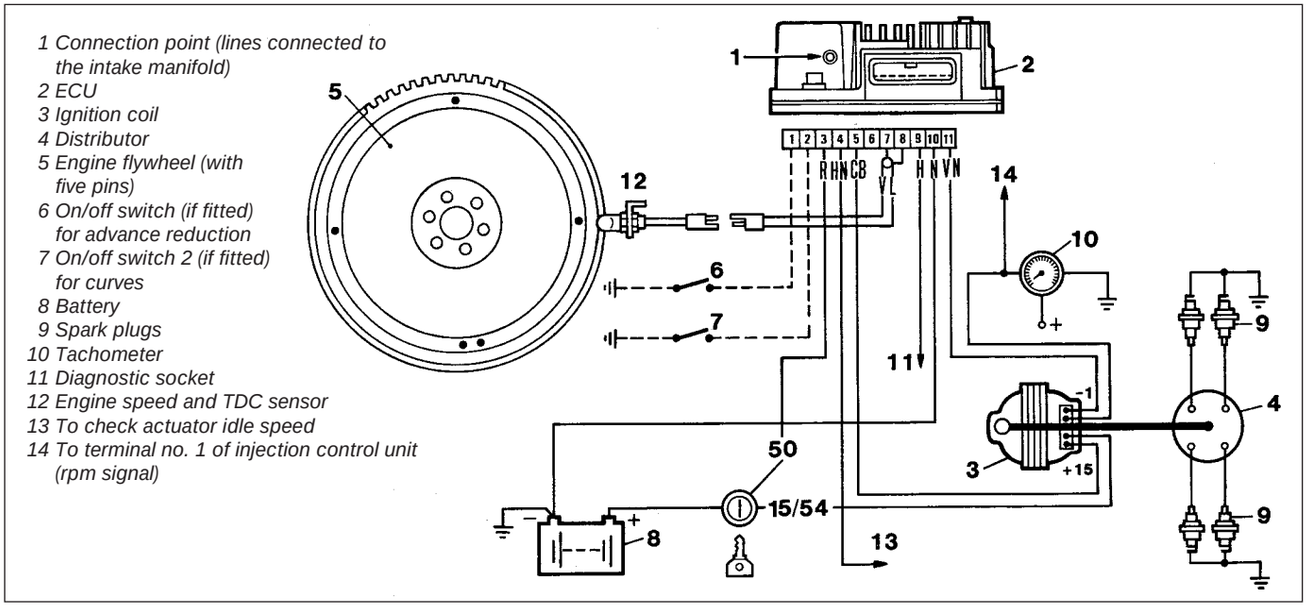


Fig. 13.82 Digiplex 2 ignition system wiring circuits and components (Sec 10)

advance points than the earlier system. Comparison of Fig. 13.82 with Fig. 4.2 illustrates the difference in layout. Note that the distributor is mounted on the rear end of the cylinder head and is driven by the camshaft.

63 When working on the Digiplex 2 ignition system or associated components, the precautionary notes outlined in Section 9 of Chapter 4 must be adhered to.

64 As with the earlier system, test procedures possible on the Digiplex 2 system are restricted due to the need for specialised testing equipment. The following checks are possible, however, using a conventional test meter.

Ignition coil check

65 To check the resistance of the coil's primary windings, connect the probes of an ohmmeter between the positive terminal and the negative terminal as shown in Fig. 13.83, and check that the resistance reading at 18 to 28ºC is 0.45 ohms ± 10% (photo).

66 To check the resistance of the coil's secondary windings, connect the probes of an ohmmeter between the positive terminal and the HT lead terminal as shown in Fig. 13.84. Check that the resistance reading at 18 to 28ºC (64 to 82ºF) is 4800 ohms ± 10%.

Ignition timing check

67 Refer to paragraph 2 in this Section.

Engine speed and TDC sensor check

68 To check the resistance between the sensor and the ECU, detach the wiring connector (photo). Connect the probes of an ohmmeter to the connector terminals and check that the resistance reading is between 600 and 760 ohms at 20ºC (68ºF). If the reading is not as specified, the sensor must be renewed.

69 The gap between the sensor and the pins on the rear face of the flywheel must be between 0.2 and 0.8 mm. Any deviation outside of this clearance will be due to mechanical damage to the sensor and necessitates its renewal. The sensor is accurately positioned during manufacture and secured with tamperproof screws; it does not require any adjustment during servicing. If it is necessary to renew the sensor, a special gap setting tool is required and the task is therefore best entrusted to a FIAT dealer.

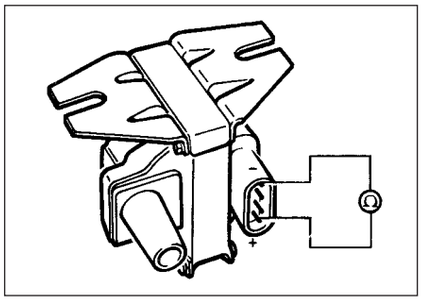
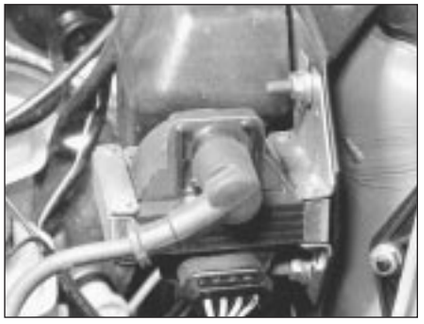


Fig. 13.83 Test connections for ignition coil primary windings check - Digiplex 2 ignition system (Sec 10)



10.65 Ignition coil and connections on the 1372 cc ie engine

10.68 ECU location on the 1372 cc ie engine

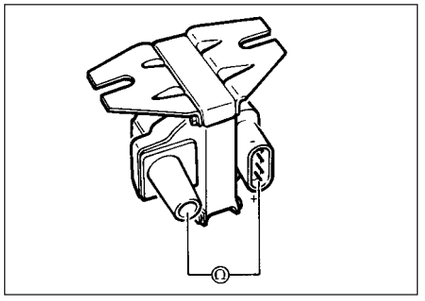
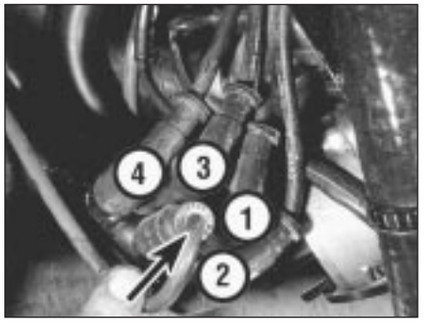


Fig. 13.84 Test connections for ignition coil secondary windings check - Digiplex 2 ignition system (Sec 10)

10.70 Ignition distributor and HT lead connections on the 1372 cc ie engine



10.72 HT lead connecting sequence on the 1301 cc Turbo ie engine

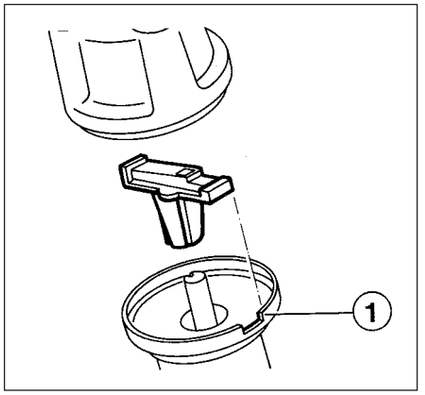


Fig. 13.85 Rotor arm must align with slot (1) in distributor housing when refitting distributor - Digiplex 2 ignition system (Sec 10)

Distributor (Digiplex Z) - removal and refitting

70 Proceed as described in paragraphs 14 to 21. When refitting the distributor, ensure that the engine is still set at the TDC position. Engage the rotor arm into position on the shaft so that its lug engages in the slot in the top end of the drive spindle. Align the rotor arm with the reference slot on the edge of the distributor housing as shown in Fig. 13.85, then fit the distributor into position and secure with the retaining nuts (photo). As previously mentioned, the fine timing is made automatically through the ECU.

Spark plugs and HT leads - general

71 Copper-cored spark plugs are now fitted to all models. The recommended types are given in the Specifications Section of this Supplement.

72 The HT lead connection sequence to the distributor cap on the 999 and 1108 cc engines is shown in Fig. 13.86. That for the 1301 cc Turbo ie is as shown (photo).

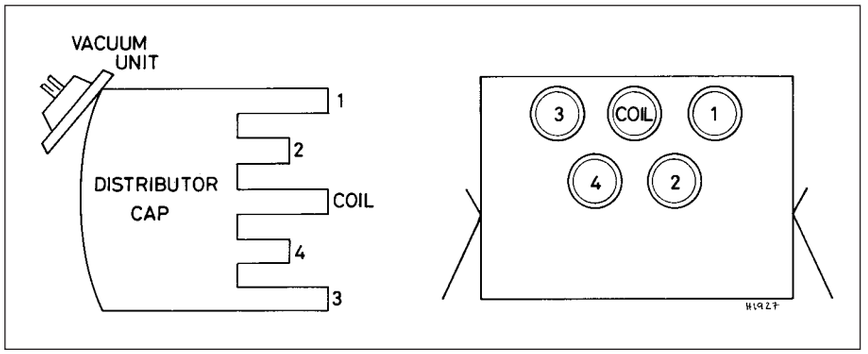


Fig. 13.86 HT lead connections on distributor cap of the 999 and 1108 cc engines (Sec 10)

Fault finding - Microplex ignition system

Starter motor turns but engine will not start

- ☐ Excessive TDC sensor gap
- ☐ Engine speed or TDC sensors short-circuited
- ☐ Faulty ECU
- ☐ ECU multipin contacts corroded
- ☐ Defective ignition coil
- ☐ Defective ignition switch
- ☐ ECU terminal 8 cable faulty

Engine firing on three cylinders

- ☐ Faulty spark plug
- ☐ Distributor cap cracked
- ☐ Faulty HT cable

Loss of power, excessive fuel consumption

- ☐ TDC sensor incorrectly located
- ☐ Fault in ECU advance angle facility

11 Clutch

Clutch pedal - adjustment (cable clutch)

1 The method of adjusting the clutch has been revised.

2 Fully depress the clutch pedal two or three times.

3 Using a suitable measuring stick placed in contact with the floor panel (carpet peeled back), measure dimension "X" in Fig. 13.87. This dimension must be taken between the centre of the pedal pad and the floor, first with the pedal in the fully depressed position, and then in the fully released position.

4 The dimension measured should fall within the range quoted in the Specifications for this Supplement.

5 Any adjustment which may be required should be carried out by slackening the locknut on the cable at the release lever (on top of the gearbox) and turning the adjusting nut. Tighten the locknut on completion.

Hydraulic clutch - description

6 Some later models are fitted with an hydraulically operated clutch in place of the cable operated type. The main components of the system are a master cylinder, with separate hydraulic fluid reservoir, and the operating cylinder. The master cylinder is

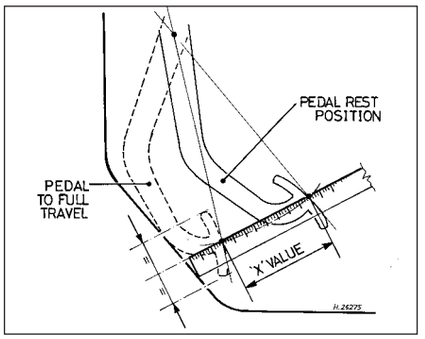


Fig. 13.87 Clutch pedal adjustment diagram - cable clutch (Sec 11)

For dimension "X" , refer to Specifications

mounted in-line with and just forward of the clutch pedal. The operating cylinder is mounted within a housing on top of the transmission. The fluid reservoir is located in the engine compartment and is mounted on the left-hand side near the bulkhead. No settings or specific procedures are given by the manufacturer at the time of writing.

Maintenance (hydraulic clutch)

7 Periodically check the fluid level in the reservoir. If the level has dropped, top it up with the specified fluid. The fluid level must not be allowed to drop below the MIN level mark on the side of the reservoir (photos). If the fluid level drops by a significant amount, it is indicative of a leak in the hydraulic circuit and this must therefore be traced and repaired at the earliest opportunity.

8 Inspect the fluid lines and connections for security and any signs of leaks.

Clutch master cylinder - removal, overhaul and refitting

9 If the cylinder is to be dismantled, it will first be necessary to obtain a cylinder repair kit. Start by detaching and removing the trim panel from the underside of the facia on the driver's side.

10 Place a suitable covering over the floor carpet to prevent staining in the event of fluid spillage. Clamp the fluid supply hose at the master cylinder end, then unscrew the retaining clip and detach the hose from the cylinder. Position the hose out of the way and with its end pointing up.

11 Detach the operating rod clevis from the brake pedal.

12 Unscrew and detach the hydraulic pipe to the operating cylinder from the master cylinder (photo).

13 Undo the two retaining nuts and withdraw the master cylinder.

14 To dismantle the cylinder, prise free and pull back the dust boot, extract the retainer and withdraw the operating rod.

15 Invert the cylinder and shake free the piston and seal assembly. If it is stuck inside the cylinder, apply moderate air pressure (from a foot pump) into the tail end and catch the assembly in a clean cloth as it is ejected.

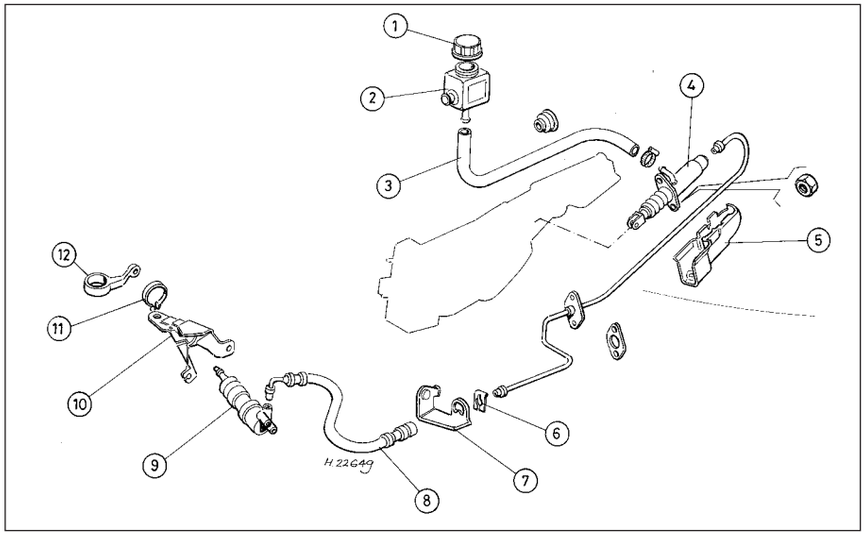


Fig. 13.88 Exploded view of the hydraulic clutch components (Sec 11)

1 Filler cap
2 Fluid reservoir
3 Hose
4 Master cylinder
5 Cover
6 Clip
7 Bracket
8 Hose
9 Operating cylinder
10 Bracket
11 Circlip
12 Operating lever

16 Remove the seals noting their orientation. Clean all components in methylated spirits or new hydraulic fluid. If the cylinder is damaged, scored or badly worn it must be renewed. The seals must always be renewed once they are removed.

17 Assemble the new seals to the piston and lubricate the cylinder, seals and piston assembly with new hydraulic fluid (of the specified type) before assembling them. Ensure that the seals are fitted the correct way round (as noted during removal).

18 Renew the dust boot, fit and secure the operating rod into position with the retainer, then refit the dust boot over the cylinder.

19 If the intake pipe connector was removed, this must be refitted using a new seal.

20 Refit the cylinder in the reverse order of removal. Connect and hand tighten the hydraulic pipe to the operating cylinder before fully tightening the cylinder securing nuts. The hydraulic pipe can then be fully tightened.

21 Reconnect the fluid supply hose to the cylinder and tighten the retaining clip to secure. Release the clamp.

22 Top up the clutch fluid level in the reservoir then bleed the system as described later in this Section.

Clutch operating cylinder - removal, overhaul and refitting

23 If the cylinder is to be dismantled once it is removed, it will first be necessary to obtain a cylinder repair kit. Access is much improved by first detaching the appropriate ducts and hoses from the areas directly above the cylinder, on top of the transmission/clutch housing.

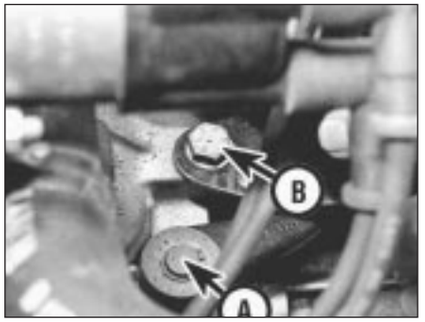
24 To avoid excessive fluid loss when the hydraulic line is detached from the operating cylinder, remove the filler cap from the reservoir, place a clean piece of polythene sheet over the filler neck and refit the reservoir cap.

11.7A Clutch hydraulic fluid reservoir showing MIN and MAX markings

11.7B Topping up the fluid level in the clutch fluid reservoir

11.12 Clutch master cylinder and hydraulic pipe connections

11.25 Clutch operating cylinder showing hydraulic line connection and bleed nipple (arrowed)



11.26 Clutch operating lever (A) and operating cylinder bracket-to-transmission housing bolt (B)

25 Unscrew the union nut and detach the hydraulic fluid line from the operating cylinder (photo).
26 Undo the cylinder/mounting bracket retaining bolts and lift clear the cylinder together with the bracket (photo). Release the retaining clip and separate the cylinder from the bracket.
27 To dismantle the cylinder, prise free and pull back the dust boot, withdrawing it together with the operating rod.
28 Invert the cylinder and shake free the piston and seal assembly. If it is stuck inside the cylinder, remove the bleed screw then apply moderate air pressure (from a foot pump) into the bleed port and catch the cylinder in a clean cloth as it is ejected.
29 Remove the seals noting their orientation. Clean all components in methylated spirits or new hydraulic fluid. If the cylinder is damaged, scored or badly worn it must be renewed. The seals must always be renewed once they are removed.
30 Assemble the new seals to the piston and lubricate the cylinder, seals and piston assembly with new hydraulic fluid (of the specified type) before assembling them. Ensure that the seals are fitted the correct way round (as noted during removal).
31 Renew the dust boot, fit and secure the operating rod into position then refit the dust boot over the cylinder. If removed, refit the bleed screw.
32 Reconnect the cylinder to the mounting bracket and refit the combined assembly to the vehicle in the reverse order of removal. Ensure the hydraulic union is clean and take care not to damage the threads as it is reconnected.
33 Remove the polythene seal from the hydraulic reservoir filler neck, top up the fluid level and bleed the system as described below.

Clutch hydraulic system - bleeding

34 The clutch hydraulic circuit is bled in much the same manner to that described for a brake circuit. Refer to Section 12 in Chapter 8 and proceed as described, but note that the bleed screw for the clutch circuit is located in the end of the operating cylinder (see photo 11.25). The clutch hydraulic circuit reservoir is mounted in the engine compartment on the left-hand side near the bulkhead and is separate from the master cylinder. As the system is being bled, ensure that the fluid level in the reservoir is maintained between the MIN and MAX level marks. Do not allow the fluid level to drop below the MIN level mark otherwise air will enter the system and greatly lengthen the operation. Wipe clean any fluid spillage from the paintwork or adjacent components as it has a corrosive effect if left.

12 Transmission

PART A: 1301 CC TURBO IE ENGINE

Description

1 The transmission is of five-speed type, based on that used in the Fiat Strada 105 TC.
2 For all practical purposes, the operations described in Chapter 6 apply, but observe the following differences.

Gearchange linkage - removal and refitting

3 This is of two-rod type.
4 Remove the gaiter and disconnect the rods at the gear lever end as described in Chapter 6, Section 3.
5 Disconnect the rods at the transmission end by unscrewing the nuts and bolts which connect the linkage rods to the selector rods (photo).
6 Extract the spring clip which retains the end of the short link rod (photo).

Gearchange linkage (Antiskid models) - general

7 The gearchange linkage and internal selector arrangement has been modified, as shown in Fig. 13.89.

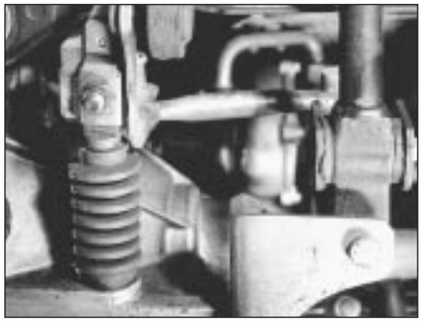
Final drive output shafts - description and oil seal renewal

8 The output shafts on this transmission incorporate a flange on the left-hand side, to which a coupling flange on the driveshaft is bolted. On the right-hand side, an intermediate shaft (see Section 13) is splined directly into the differential side gear.
9 A leaking oil seal may be renewed on the left-hand side of the final drive casing after first disconnecting the driveshaft. Then using two levers, prise out the flange/stub shaft against the tension of its retaining circlip.
10 Unbolt and remove the bearing cover. When refitting the cover, make sure that the O-ring is in good condition.
11 To renew the oil seal on the right-hand side, first remove the intermediate driveshaft, and then prise the defective seal out of the final drive housing using a suitable tool.
12 Apply grease to the new seal lips before refitting the intermediate shaft or the stub shaft. Tighten all bolts to the specified torque.

PART B: 1372 CC IE AND 1372 CC TURBO IE ENGINES

Description

1 The transmission is of five-speed type, based on that used in the FIAT Tipo. The transmission is mounted in-line with the engine and is located in the left-hand side of the engine compartment. Drive from the clutch is transferred through the input shaft and the mainshaft to the integrally-located



12A.5 Gearchange rod connections at transmission (1301 cc Turbo ie engine)

12A.6 Gearchange link rod spring clip (arrowed) on the 1301 cc Turbo ie engine

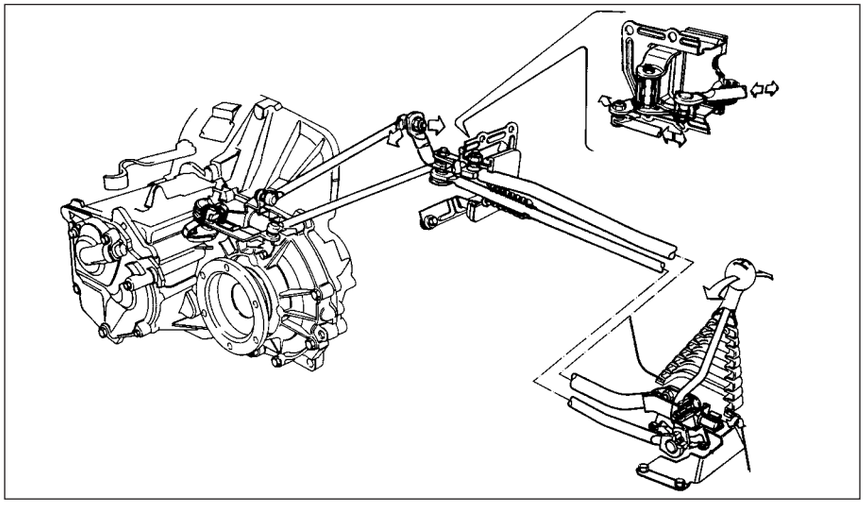


Fig. 13.89 Gearchange control linkage on the 1301 cc Turbo ie model with Antiskid (Sec 12)

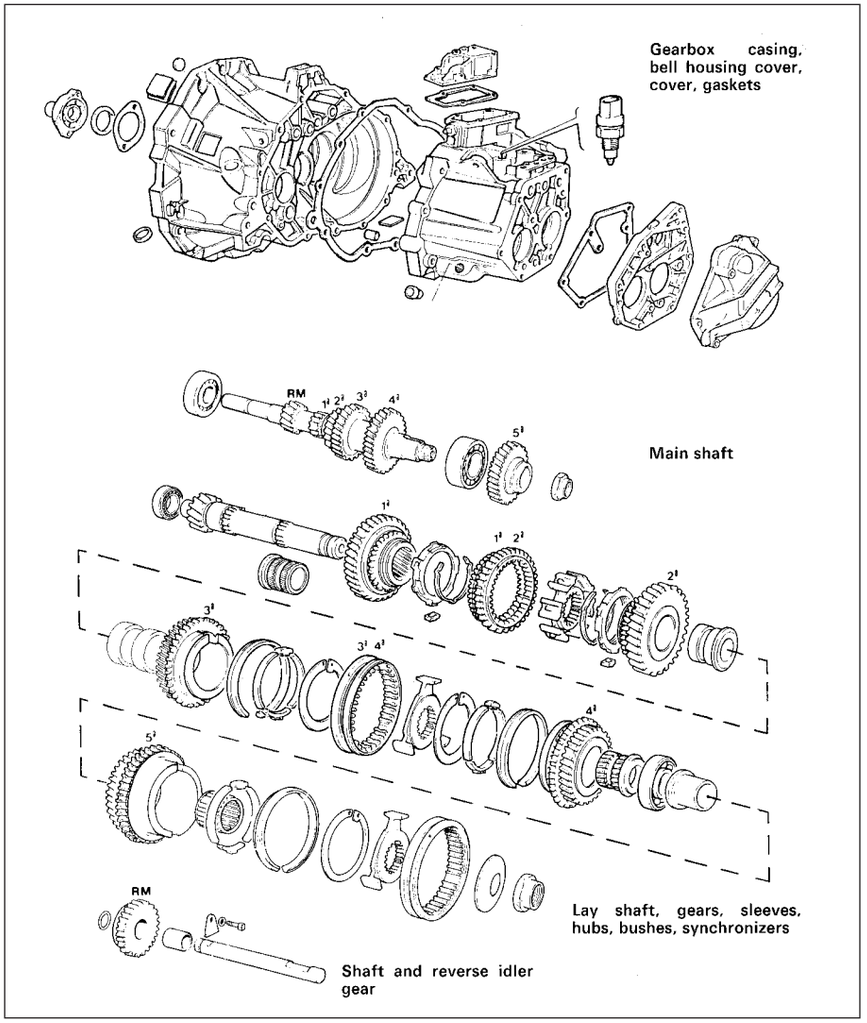


Fig. 13.90 Exploded view of the transmission unit fitted to 1372 cc models (Sec 12)

final drive unit. The inboard end of each driveshaft locates in the differential. All helical gear clusters are in constant mesh, with the fifth gear assembly located on an intermediate plate mounted on the rear end of the gearbox. Gear engagement is made by sliding synchromesh hubs. Gearchanges are made via a central floor-mounted gear lever.

Maintenance

2 Maintenance is limited to periodically checking the oil level, topping up as required, renewing the oil, and visually inspecting the transmission for oil leaks. The most likely source of an oil leak will be from the driveshaft seals.

Oil level - checking

3 For improved access, jack up the vehicle and support it on axle stands. Note that the vehicle must be level in order to carry out this check.

4 If the transmission is hot due to the car having been driven recently, allow it to cool before making the check; oil foams when hot and can produce a false level reading. Wipe the area around the filler plug then unscrew and remove the plug from its location in the front of the casing. The oil should be level with the base of the filler plug hole.

5 If necessary, top up with oil of the specified grade.

6 On completion refit the filler plug, wipe clean any oil spillage, then lower the car to the ground.

Oil - renewal

7 The transmission oil should ideally be drained when hot (directly after the vehicle has been used). For improved access, jack up the vehicle and support it on axle stands. Note that the vehicle must be level to ensure a correct level reading when topping up.

8 Wipe clean the area around the filler plug on the front face of the transmission casing, then unscrew and remove the plug.

9 Position a suitable container underneath the drain plug (located at the left-hand end of the transmission). Unscrew the plug and allow the oil to drain into the container. Oil will start to drain before the plug is fully withdrawn so take precautions against scalding. Wait about ten minutes to allow the oil to drain fully.

10 When the oil has finished draining, clean around the threads of the drain plug and its location in the transmission casing, then refit the plug and tighten it.

11 Refill the transmission with the specified quantity and grade of oil through the filler/lever plug hole. With the vehicle level and the transmission cold check the oil level as described above, then refit and tighten the plug. Lower the vehicle to complete.

Gearlever and linkages - general

12 The component parts of the gearchange and selector assemblies are shown in Figs. 13.91 and 13.92. They do not normally

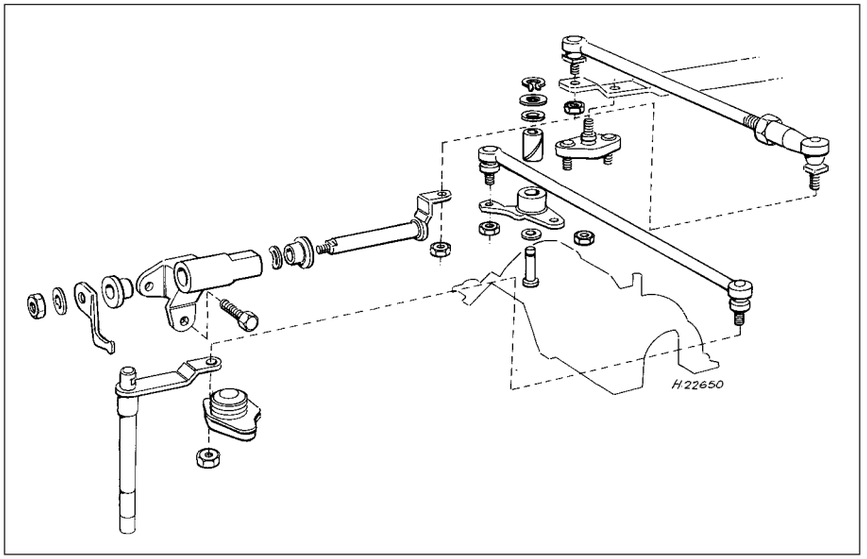


Fig. 13.91 Exploded view of the gear selector lever, rod and linkage components on 1372 cc models (Sec 12)

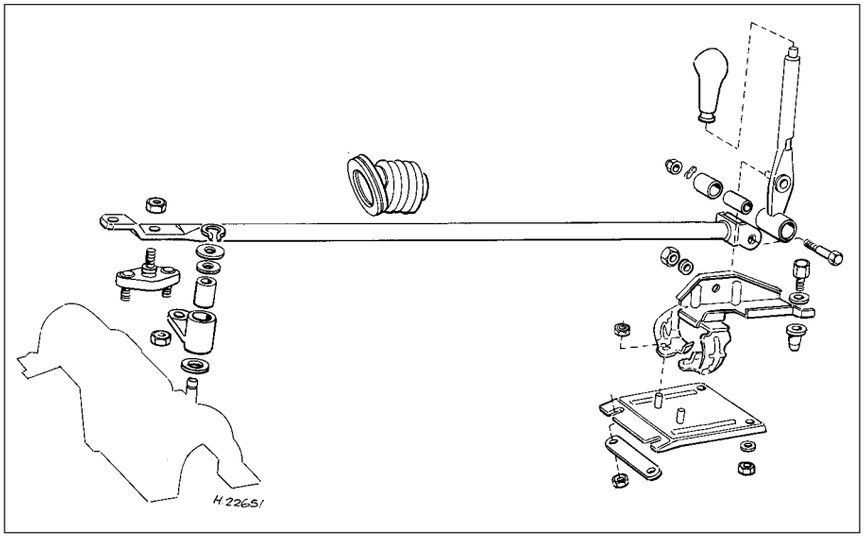
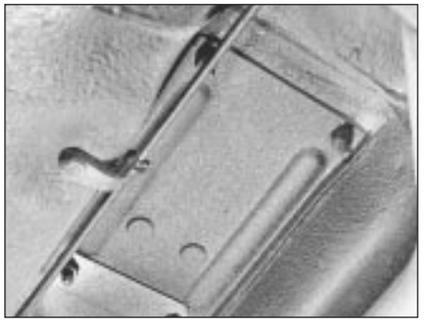


Fig. 13.92 Exploded view of the gear selector and control road assembly components fitted to 1372 cc models (Sec 12)

12B.15A Gear lever connection to the main connecting rod on the 1372 cc engine



12B.15B Access cover to gear lever lower connection to rod on the 1372 cc engine

require maintenance other than general inspection for wear in the linkage joints. If excessive wear is found in any of the joints, they can be individually detached and renewed.

13 Access to the control rods is eased by detaching and lowering the exhaust system from the exhaust manifold.

14 If a new adjustable control rod is to be fitted, remove the original rod as a unit, but do not alter its adjustment for length. The new rod can then (if required) be set to the same length as the original in order to maintain the original setting. Do so by loosening off the locknut and turning the balljoint as required; ensure that the angle of the joint is correct before tightening the locknut.

15 Access to the gear lever/main connecting rod joint from above is made by prising back the gear lever gaiter from the centre console. Access from underneath can be made by raising and supporting the car on axle stands. Working from the underside of the lever, undo the retaining nuts and remove the inspection plate from the floor (photos).

16 Any adjustment to the gear linkage should be entrusted to a FIAT dealer.

Transmission - removal and refitting

17 The transmission can be removed together with the engine and then separated as described in Section 7, or on its own (as described below), leaving the engine in position in the car. Before starting to remove the transmission, it should be noted that suitable equipment will be required to support the engine during this procedure.

18 Disconnect the battery negative lead.

19 Remove the bonnet as described in Chapter 12.

20 Refer to Section 11 in this Chapter for details and detach the clutch operating cylinder together with its mounting bracket from the top of the transmission, but do not disconnect the hydraulic fluid hose from the cylinder connection. Leave the cylinder attached to the bracket. Tie the cylinder and bracket up to support them out of the way.

21 Reaching down between the transmission and the bulkhead, unscrew the knurled retaining nut and withdraw the speedometer cable from the transmission.

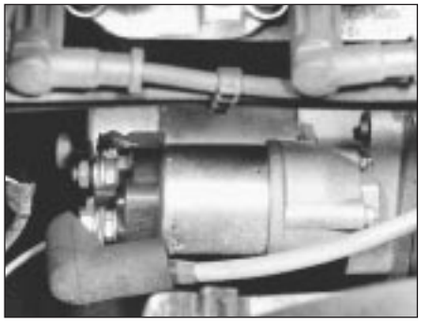
22 Remove the front roadwheel trims, then loosen off the front wheel retaining bolts. Raise the vehicle and support it on axle stands at a suitable height to allow working underneath and eventual transmission removal from under the front end.

23 Drain the transmission oil as described previously in this Section.

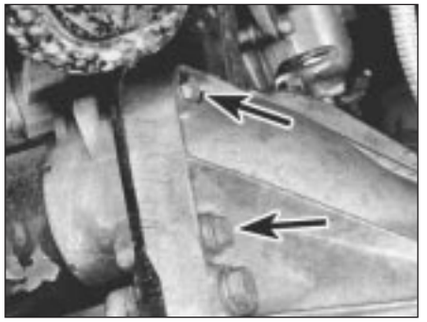
24 Disconnect and remove the starter motor (photos).

25 Detach the reversing light switch lead connector.

26 Undo the retaining bolt and detach the earth lead from the rear end of the transmission (see photo 7C.33). Refit the bolt once the lead has been disconnected.



12B.24A Starter motor electrical connection . . .



12B.24B . . . and retaining bolts (arrowed) on the 1372 cc ie engine

Fig. 13.93 FIAT lift beam/support bar in place to support the weight of the engine. Inset shows lift hook engagement point - 1372 cc models (Sec 12)

27 The engine must now be supported at its left-hand end. If the engine/transmission lift bracket is unbolted it can be attached at another suitable position on the engine and the lift sling/tool attached to it, but take care not to attach it to a weak fixing point.

28 The engine will need to be supported using an engine lift beam/support bar of the type shown in Fig. 13.93. A strong wood or metal beam resting on blocks in the front wing drain channels will suffice, or alternatively use an engine lift hoist and sling.

29 Refer to Section 13 in this Chapter and Section 2 in Chapter 7 for details and remove the front driveshaft each side.

30 Prise back the tabs of the retaining washers, then undo the retaining nuts and detach the exhaust downpipe from the manifold. Detach the exhaust mounting bracket (where applicable) and lower the exhaust to allow access to the gearchange linkages.

31 Disconnect the gearchange control and selector link rod balljoints (photo). Do not alter their lengths or the adjustment setting will be affected.

32 Using a small diameter pin punch, drive the retaining pins from the retaining clips which secure the left-hand side underwing shield. Prise free the clips and detach the shield.

33 Undo the retaining bolts and remove the lower cover plate from the flywheel housing (photo).

34 Position a trolley jack under the transmission with an interposed block of wood to protect the casing and spread the load. Raise the jack to support the weight of the transmission.

35 Check that the weight of the engine is securely supported, then unbolt and detach the front engine mounting unit, then the rear engine mounting unit.

36 Unscrew and remove the remaining bolts securing the transmission to the engine. As they are removed, note the position of any brackets or additional fixings secured by these bolts (photo).

37 Check around the transmission to ensure that all fixings are detached from it and out of the way, then carefully pull the transmission free from the engine dowel pins. If possible engage the aid of an assistant to help in guiding or lowering the unit as it is removed. As the unit is withdrawn from the engine, take care not to place any strain on the input shaft. Once the input shaft is clear of the clutch, the transmission can be lowered and manoeuvred from underneath the car. If available, lower the unit onto a suitable crawler board to ease its withdrawal from under the front end of the car.

38 Dismantling and overhaul of this transmission is not recommended. If the transmission has covered a high mileage it is likely that several internal components are in need of renewal. The cumulative cost of renewing all worn and defective components will almost certainly make overhaul uneconomical when compared with the cost of a new or service exchange transmission from a FIAT dealer or transmission specialist.

39 Refitting is a reversal of the removal procedure, but note the following special points.

a) Ensure that the engine and transmission mating surfaces and the dowel pins are clean and that all clutch components are in good condition.

b) Apply a thin smear of molybdenum disulphide grease to the splines of the input shaft. Do not over-lubricate though or the grease may work its way onto the clutch friction surfaces and cause clutch slip.

c) Raise the transmission so that it is in-line with the engine, engage the end of the input shaft into the clutch driven plate hub and align the splines of each to enable the transmission to be pushed home. It may well be necessary to turn the flywheel a fraction so that the splines align for re-engagement

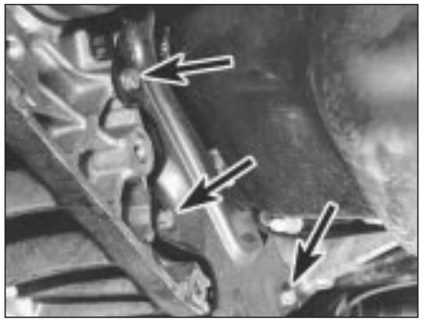
d) Do not fully tighten the engine and transmission retaining bolts until all are attached.

e) Tighten all retaining bolts and nuts of the specified torque wrench settings (where given).

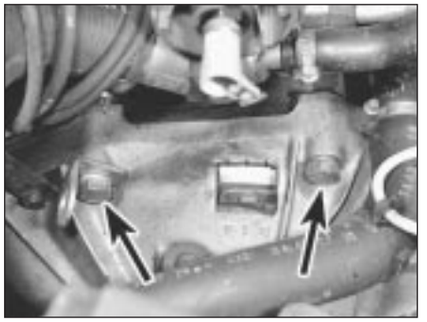
f) Refer to Section 13 in this Chapter for details on refitting the driveshafts.

g) Refill the transmission with the specified quantity and grade of oil before lowering the car to the ground (see paragraph 11).

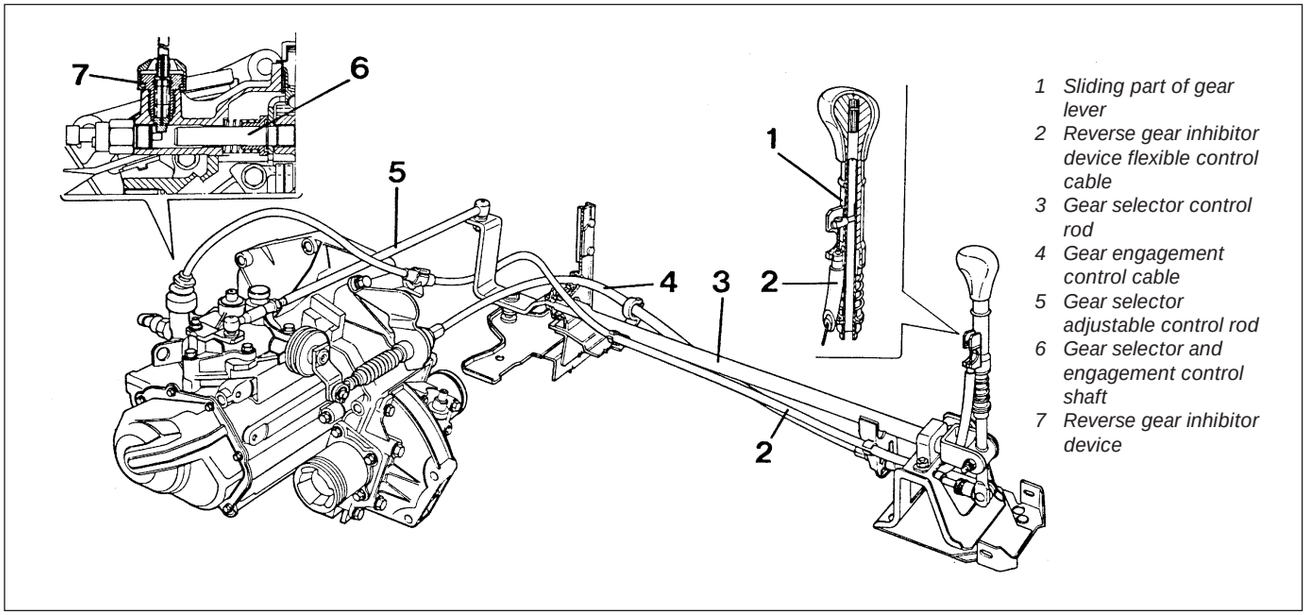
12B.31 Gear control and selector link rod joints



12B.33 Lower cover plate and retaining bolts (arrowed)



12B.36 Transmission upper retaining bolts. Note bracket under the left-hand bolt



1 *Sliding part of gear lever*
2 *Reverse gear inhibitor device flexible control cable*
3 *Gear selector control rod*
4 *Gear engagement control cable*
5 *Gear selector adjustable control rod*
6 *Gear selector and engagement control shaft*
7 *Reverse gear inhibitor device*

Fig. 13.94 C514 type 5-speed transmission

PART C: 999 CC AND 1108 CC WITH C514 TYPE TRANSMISSIONS

Description

1 A new 5-speed transmission was introduced to selected models during 1992. Identified by the way reverse gear is engaged. The gear knob needs to pressed downwards whilst pushing the lever to the extreme right.

2 The new design includes control cables as well as rods for gear selection, see Fig. 13.94.

Maintenance

3 At the time of writing, no maintenance instructions were available, however should selecting gears become difficult, check the following.

4 The gear lever should rest vertically in neutral. If it does not, alter the gear selector adjustable rod, as appropriate.

5 Whilst turning the adjustment nut, counterhold with a 10 mm open ended spanner, located in the notch built into the sleeve. Refer to Fig. 13.95.

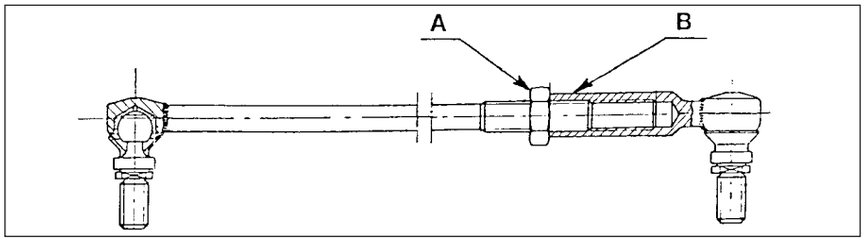


Fig. 13.95 Gear selector adjustable rod (C514 type transmissions)

A Adjusting nut B Location of notch in outer sleeve

13 Driveshafts

Inboard joint boots (non-Turbo models, September 1987 on) - modification

1 Modified boots have been fitted to the differential ends of the driveshafts on non-Turbo models produced after September 1987.

2 The new boots incorporate a seal/bearing assembly, and it is very important when a boot is being fitted to the driveshaft that it is located as shown in Fig. 13.96.

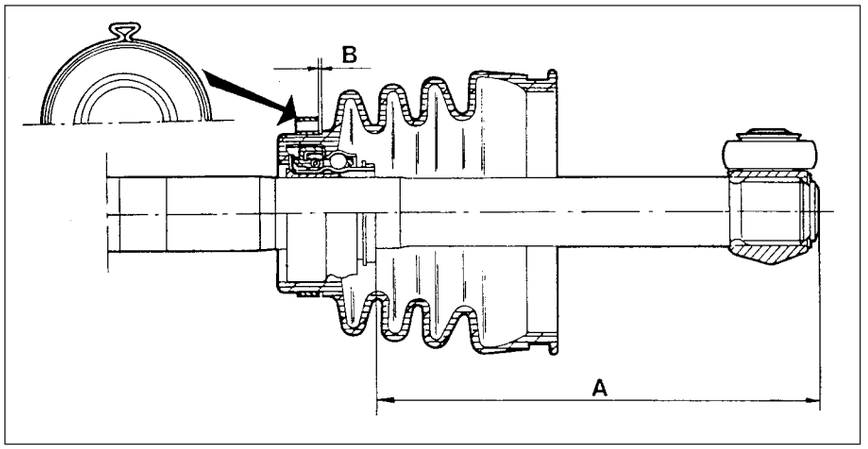


Fig. 13.96 Driveshaft boot positioning diagram - later non-Turbo models (Sec 13)

Left-hand shaft	***Right-hand shaft***
With 4-speed transmission, A = 143.0 mm (5.63 in)	*With 4-speed transmission, A = 123.0 mm (4.84 in)*
With 5-speed transmission, A = 133.0 mm (5.24 in)	*With 5-speed transmission, A = 108.9 mm (4.25 in)*

B = 0 to 1 mm (0 to 0.04 in)

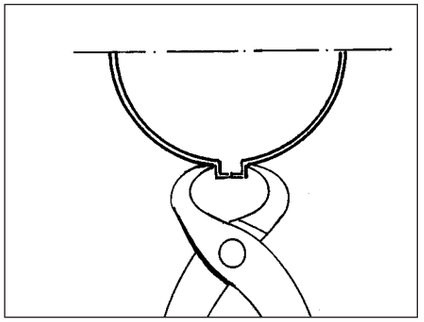


Fig. 13.97 Crimping the driveshaft boot securing band (Sec 13)

3 The boot retaining band must be crimped using suitable pinchers at the highest point on the boot.

Intermediate driveshaft (Turbo ie models)

Description

4 On these models, an intermediate driveshaft is fitted between the final drive of the transmission and the flange of the right-hand driveshaft.

5 A support bearing assembly for the intermediate shaft is bolted to the engine crankcase. The bearing carrier also acts as the alternator bracket.

Removal

6 Drain the transmission oil. Disconnect the right-hand driveshaft from the intermediate shaft flange, move the driveshaft aside, and support it.

7 Unscrew and remove the bolts which hold the intermediate shaft retainer plate to the crankcase support bracket.

8 Withdraw the intermediate shaft from the final drive housing. The shaft assembly, complete with bearing, will pass through the crankcase support bracket until the bearing retainer and flexible boot can be slipped off the shaft.

Bearing renewal

9 The bearing on the intermediate shaft can be renewed after removing the plate, circlip and washer, and pressing the shaft out of the bearing.

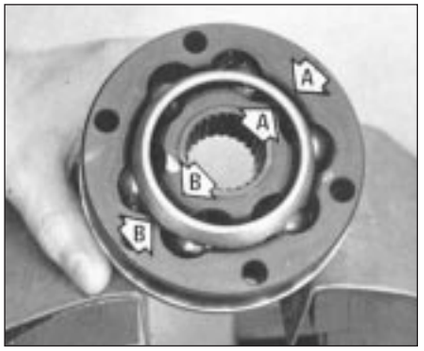


Fig. 13.100 CV joint housing and ball cage alignment marks (A and B) - Turbo ie models (Sec 13)

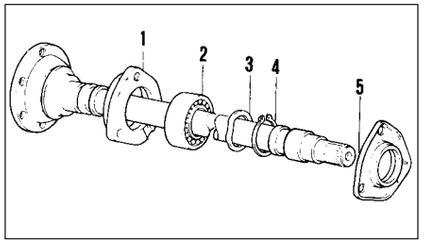


Fig. 13.98 Components of the intermediate driveshaft - Turbo ie models (Sec 13)

1 Bearing retaining plate
2 Ball bearing
3 Wave washer
4 Circlip
5 Bearing cap

10 When fitting the new bearing, apply pressure only to the inner track, and do not apply any heat.

Refitting

11 This is a reversal of removal. Tighten all bolts to the specified torque and replenish the transmission oil.

Inboard CV joints (Turbo ie models) - overhaul

12 A worn joint is best renewed, but it may be necessary to dismantle it for cleaning, if replacement of a split boot has been neglected.

13 Disconnect the boot securing clip and pull the boot up the shaft. Wipe away the old grease.

13.18 Removing inboard CV joint ball/cage assembly from outer track

13.19B Separating inner and outer cage members

Fig. 13.99 Extracting the CV joint circlip - Turbo ie models (Sec 13)

14 Extract the joint securing circlip and pull the joint from the shaft.

15 Renew the joint complete if it is worn or damaged.

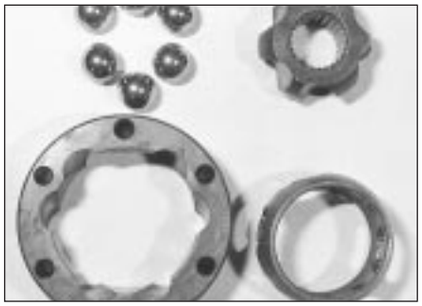
16 Before dismantling the joint, align the housing and ball cage marks “A” and “B” (Fig. 13.100).

17 Tap the joint from its backplate.

18 Turn the ball/cage assembly through 90º, mark its relative position to the outer track and withdraw it (photo).

19 The balls are a light snap fit in the cage. Once they are removed, the inner and outer cage members can be separated; again, mark the side of the cages in relation to the outer track (photos).

13.19A CV joint balls and cage



13.19C Components of CV joint

13.21 Outer track reference groove

13.24 Right-hand driveshaft damper weight

20 When reassembling, pack the joint with special FIAT Tutela MRM2 lubricant; if this is not available, use molybdenum disulphide grease.
21 The reference groove on the outer track must be assembled so that it is towards the final drive when refitted (photo).
22 Pack the joint and the inside of the boot liberally with the specified grease.
23 If a new joint is being fitted to the shaft, make sure that the joint and shaft colour codes match.

Shaft colour	Joint colour
Blue	*Blue or white*
Red	*Red or white*

Right-hand driveshaft damper weight (1108 cc and 1372 cc ie models) - removal and refitting

24 A damper weight is fitted to the longer, right-hand driveshaft to reduce vibration (photo).

14A.2A Front brake pad locking block is secured by a clip on the inboard end of the brake unit on certain models

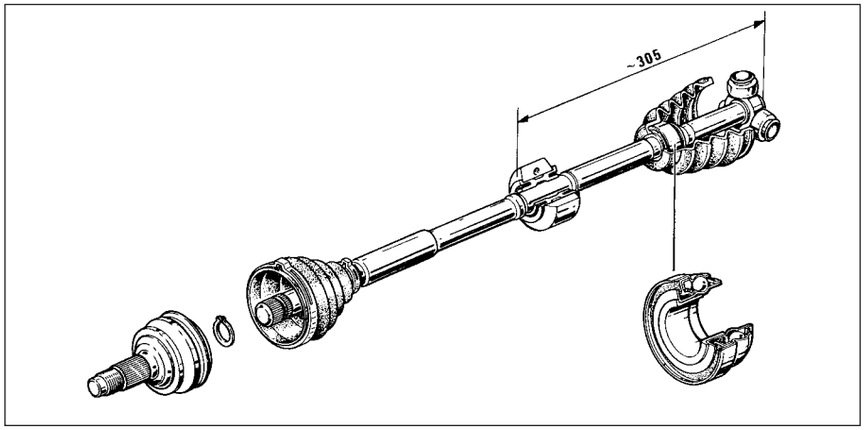


Fig. 13.101 Correct position of driveshaft damper weight on 1108 cc and 1372 cc ie models (Sec 13)

Dimensions in mm

25 It should not be necessary to remove the damper weight unless the driveshaft is to be renewed, or the weight has been damaged.
26 The weight is in two halves, and can be removed by simply unscrewing the two clamp bolts securing the two halves to the driveshaft. Note that the weight locates on a rubber mounting which is split along its length, and can simply be pulled from the driveshaft for renewal if necessary.
27 Refitting is a reversal of removal, but ensure that the damper weight is positioned exactly as shown in Fig. 13.101.

14 Braking system

PART A: BRAKING SYSTEM - GENERAL

Front brake pads - all later models

1 The front brake pads have modified anti-vibration plates and a wire spring fitted to prevent them from vibrating and knocking in operation.

14A.2B Front brake locking block orientation with inboard retaining clip

2 On some models the clip securing the disc pad locking block is located on the inboard end, rather than the outer end (shown in Chapter 8). To ensure correct reassembly, check the location of the original block retaining clip before dismantling the brake unit. The alternative fixing arrangement is shown in the accompanying photos, in this instance on a 1372 cc ie model (photos).

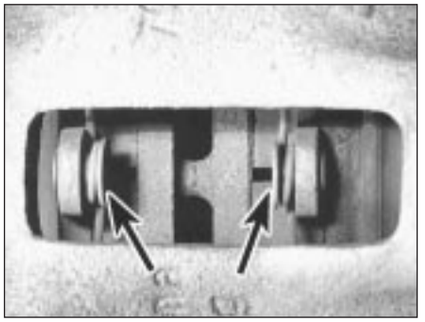
PART B: BRAKING SYSTEM - TURBO IE MODELS

Description

1 Disc brakes are fitted to all four wheels on the Turbo ie models. The front disc brakes are of different design from those used on other models, in that the wear in the pads can be checked without the need to remove the caliper cylinder housing.

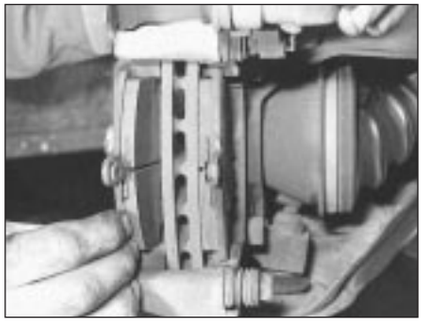
Front disc pads - renewal

2 Raise the front of the car and remove the roadwheels.
3 Check the thickness of the friction material on the pads through the aperture in the caliper cylinder body. If the thickness of the material is 1.5 mm or less, then the pads on both sides must be renewed (photo).



14B.3 Front disc pads (arrowed) on Turbo ie model

14B.4 Unscrewing the caliper cylinder housing lower guide bolt



14B.6 Disc pad and anti-rattle spring removal

14B.10 Applying thread-locking fluid to the bolt threads

4 Using a ring spanner and an open-ended spanner, unscrew and remove the caliper cylinder housing lower guide bolt (photo). Release the upper bolt, but do not remove it.
5 Swivel the cylinder housing upwards and tie it up out of the way. There is no need to disconnect the hydraulic hose. The sensor wiring plug will have to be disconnected (where fitted).
6 Remove the pads, complete with anti-rattle springs (photo).
7 Clean away all dust and dirt, taking care not to inhale it as it may be injurious to health.
8 The caliper piston must now be fully depressed to accommodate the new, thicker, pads. Do this using a G-clamp or lever, but anticipate a rise in the brake fluid reservoir level by syphoning out some of the fluid using a clean syringe.
9 Fit the new pads, which must be of the same type as the originals, complete with anti-rattle springs.
10 Locate the cylinder body. The fixing bolts are of self-locking type, and should be renewed whenever they are loosened or removed. If new ones are not available, clean the threads of the old ones thoroughly and apply thread-locking fluid (photo). Tighten the bolts to the specified torque. Check that the rubber dust excluders are in good condition.
11 Reconnect the sensor wiring plug.
12 Renew the pads on the other front wheel.
13 Refit the roadwheels, and then apply the footbrake several times to position the pads against the discs.
14 Top up the brake fluid reservoir if necessary (photo).

Front disc caliper - removal and refitting

15 Raise the front of the car and remove the appropriate roadwheel.
16 Using a ring spanner and an open-ended spanner, unscrew and remove the cylinder housing fixing bolts.
17 Withdraw the cylinder housing, and then, holding it firmly, release the flexible hydraulic hose union. Unscrew the cylinder body from the end of the flexible hose, and then cap the end of the hose to prevent loss of fluid.
18 If required, the disc pads can be removed and the caliper support bracket unbolted and removed.
19 Refitting is a reversal of removal, but use new fixing bolts.
20 Bleed the front hydraulic circuit.

Front disc caliper - overhaul

21 The operations are as described in Chapter 8, Section 5, paragraphs 6 to 13.

Front brake disc - inspection, renovation or renewal

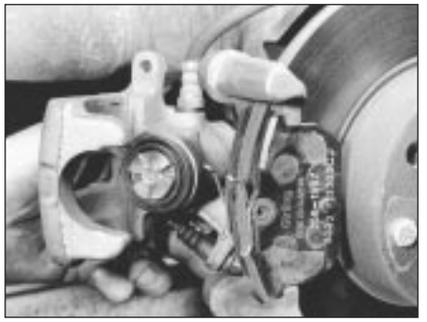
22 The operations are as described in Chapter 8, Section 6, but the caliper fixing bolts are secured with thread-locking fluid; lockplates are not used.

Rear disc pads - renewal

23 Any wear in the disc pads can be observed through the aperture in the caliper cylinder body, once the car has been jacked up and the roadwheels removed (photo).
24 If the thickness of the pad friction material is less than 1.5 mm, renew the pads on both sides in the following way.
25 Using a ring spanner and an open-ended spanner, unscrew the caliper cylinder body fixing bolts.
26 Withdraw the caliper and remove the disc pads, complete with anti-rattle springs (photo).
27 Clean away all dust and dirt, but avoid inhaling it, as it may be injurious to health.
28 Fully retract the caliper piston in order to accommodate the new, thicker, pads. To do this, rotate the piston clockwise, using a suitable tool engaged in the handbrake sectors (photo). Anticipate a rise in the brake fluid reservoir level by syphoning out some fluid, using a clean syringe.

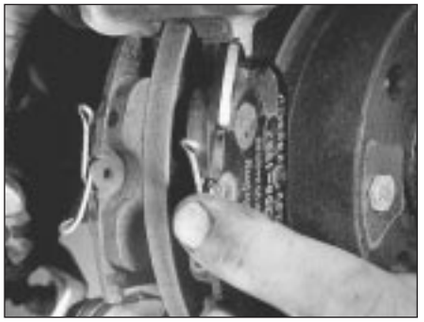
14B.14 Topping up the brake fluid reservoir (1301 cc Turbo ie model)

14B.23 Rear brake pad inspection aperture



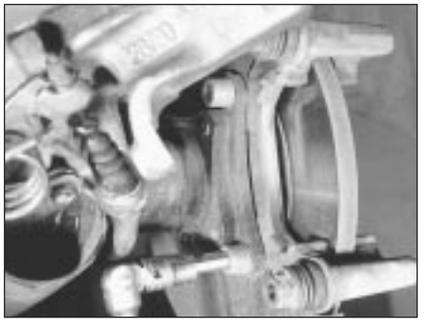
14B.26 Withdrawing the rear brake caliper

14B.28 Rotating a rear caliper piston



14B.29 Rear disc pad

14B.36 Disconnecting the handbrake cable from the caliper lever

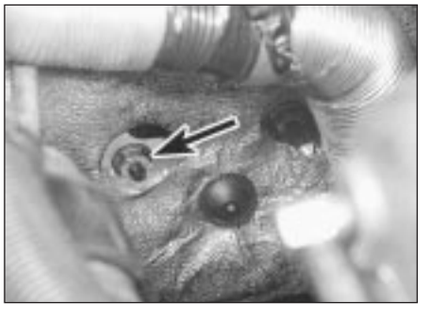


14B.42 Unscrewing a rear caliper bracket bolt

29 Fit the new pads, complete with anti-rattle springs (photo).
30 Refit the caliper using new self-locking bolts, or if not available, apply thread-locking fluid to clean threads of the original bolts. Tighten the bolts to the specified torque.
31 Apply the brake pedal several times to bring the disc pads up against the disc.
32 Top up the brake fluid reservoir if necessary.
33 Check the adjustment of the handbrake.
34 Refit the roadwheels and lower the car to the ground.

Rear disc caliper - removal, overhaul and refitting

35 Carry out the operations described in paragraphs 25 to 27.



14B.45 Brake pedal cross-shaft fixed nut (arrowed) on engine compartment rear bulkhead

36 Disconnect the handbrake cable from the caliper. To do this, grip the cable nipple and pull it until the cable can be slipped out of its lever groove (photo). If necessary, slacken the cable adjustment.
37 Using a pair of pliers or similar tool, turn the piston in an anti-clockwise direction until it can be removed from the cylinder.
38 Having obtained a repair kit, renew the seal and dust excluder.
39 Reassemble the piston to the cylinder, turning it clockwise as far as it will go.
40 Reconnect the handbrake cable.
41 Carry out the operations described in paragraphs 30 to 32.

Rear brake disc - inspection, renovation or renewal

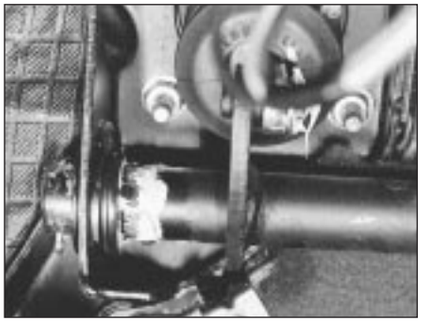
42 The operations are as described in Chapter 8, Section 6, but the caliper bracket fixing bolts are of the socket-headed type and thread-locking fluid is used, not lockplates (photo).

Pressure regulating valve

43 The valve renewal and adjustment operations are described in Chapter 8, Section 10, but the luggage compartment should be loaded with 45 kg and the load applied to the bracket eye should be 11 kg.

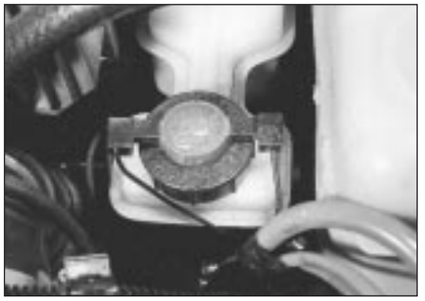
Brake pedal - removal and refitting

44 The brake master cylinder and vacuum servo are mounted on the left-hand side of the engine compartment rear bulkhead. In consequence, the brake pedal on right-hand drive cars operates through a cross-shaft, which is located underneath the facia panel inside the car.
45 The cross-shaft is supported in two brackets, whose mounting nuts can be reached through cut-outs in the insulation on the engine compartment rear bulkhead (photo).
46 To remove the cross-shaft, working inside the car, take off the cover from the left-hand end of the shaft, and then disconnect the servo pushrod from the crankarm on the cross-shaft (photo).
47 Disconnect the brake pedal from the right-hand crankarm on the cross-shaft (photo).
48 Disconnect the accelerator pedal by extracting the split pin which secures its pivot spindle.
49 The cross-shaft may now be removed after extracting the cotter pin from the left-hand end of the shaft.
50 Push the shaft first to the right, and then to the left, to release it from its brackets.
51 Alternatively, the cross-shaft, complete with brackets, may be removed as an assembly if the bulkhead nuts are unscrewed.
52 Removal of the brake and clutch pedals is described in Chapter 5, Section 4, but note that on hydraulic clutch models, the master cylinder will also require removal as described in Section 11 of this Chapter.
53 Refitting is a reversal of the removal procedure.



14B.46 Left-hand end of brake pedal cross-shaft

14B.47 Right-hand end of brake pedal cross-shaft



14B.54 Master cylinder/vacuum servo located next to the coolant expansion tank (1301 cc Turbo ie model)

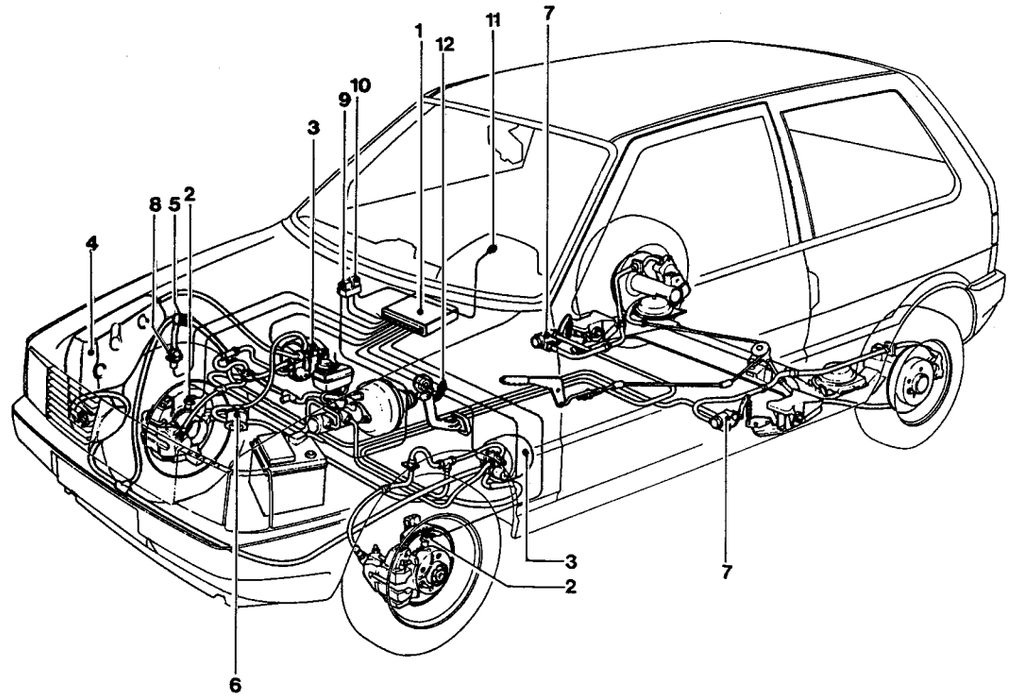


Fig. 13.102 Braking system on Turbo ie Antiskid models (Sec 14)

Vacuum servo unit and master cylinder - general

54 Access to the vacuum servo unit and the master cylinder can only be obtained after the cooling system expansion tank has been released and moved aside (photo).

Antiskid system - description

55 This system is available as an option on the Turbo ie models only.

56 The purpose of the system is to prevent the wheel(s) locking during heavy brake applications. This is achieved by automatic release of the brake on a roadwheel which is about to lock up, after which the brake is re-applied. This cycle is carried out many times per second under heavy braking, retaining full steering control to avoid any hazards.

57 The main components of the system are shown in Fig. 13.102. The control module processes the signals received from the sensors, and compares them with deceleration values of the roadwheel and the slip values of the tyre, which are stored in the module memory.

58 When reference values are exceeded and wheel lock is imminent, the control module signals the pressure modulators, which in turn decrease the brake hydraulic pressure.

59 Vehicle road speeds are also taken into account by the module's electronic circuits.

60 In order to retain optimum system performance, the tyres and wheels should always be of the type originally fitted by the vehicle manufacturer.

61 Maintenance of the system should be limited to checking the security of all electrical and hydraulic connections. Individual components are not repairable, and must be renewed complete if faulty.

15 Electrical system

Alternator (999 and 1108 cc models) - removal and refitting

1 To remove the alternator from 999 cc engine models, disconnect the leads from the terminals on its rear face.

2 Extract the screws and remove the plastic drivebelt guard.

3 Slacken the mounting and adjuster bolts, push the alternator in towards the engine and remove the drivebelt.

4 Remove the mounting and adjuster bolts, and withdraw the alternator downwards through the gap between the right-hand driveshaft and the engine sump pan (photo).

5 Refitting is a reversal of removal; re-tension the drivebelt.

Alternator (later models) - removal and refitting

6 Disconnect the battery negative lead.

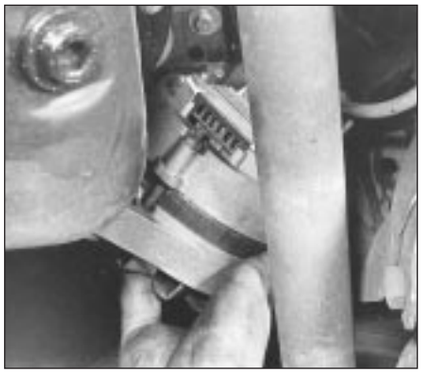
7 Loosen off the right-hand front roadwheel bolts, then raise and support the car at the front end on axle stands. Remove the right-hand roadwheel.

8 Remove the wheel arch underwing shield by driving the compression pins from the centre of the retaining clips (using a 2 mm drift), then prise free the panel retaining clips and remove the shield. Keep the pins and clips in a safe place and renew any that may have been damaged during removal (photo).

9 Detach the wiring connector from the alternator.

10 Release the alternator mounting and belt adjuster link bolts, and take off the drivebelt.

11 Take out the alternator top and bottom mounting bolts.



15.4 Removing the alternator from the 999 cc engine

15.8 Remove the wheel arch lower guard panel for access to the alternator

15.12A Alternator air cooling hose

15.12B Alternator rear cover and fixing nut

12 Disconnect the air cooling hose from the rear cover of the alternator, and then unscrew the fixing nuts and take off the rear cover with hose spout. Mark the position of the cover on the alternator before removing it, so that the spout will be correctly positioned when refitted (photos).

13 Unbolt the driveshaft bearing support/alternator bracket from the engine crankcase, and swivel the support downwards to provide space for withdrawal of the alternator (photo).

14 Withdraw the alternator from under the right-hand front wing (photo).

15 Refit in the reverse order of removal. Refit the drivebelt and ensure correct engagement with the pulleys, then set the drivebelt tension and tighten the alternator retaining nuts.

Alternator brushes - renewal

16 Depending on model, the brush holder is secured by two screws, which should be extracted and the brush holder removed (photos).

17 New brushes and the holder are supplied as an assembly.

Starter motor (999 cc models) - removal and refitting

18 To remove the starter motor from 999 and 1108 cc models, first disconnect the leads from the starter motor terminals.

19 Release the washer fluid reservoir flexible bag from the engine compartment rear bulkhead and move it to the left-hand side.

20 Unscrew the starter motor mounting bolts, withdraw the starter from the flywheel bellhousing, and then lift it out of the left-hand side of the engine compartment (photo).

21 Refitting is a reversal of removal.

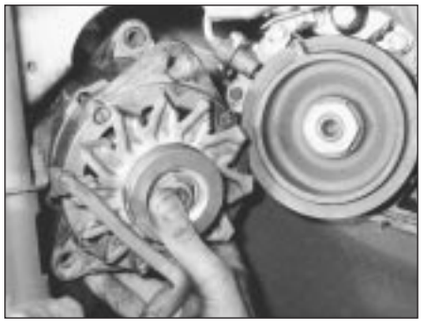
Starter motor (1301 cc Turbo ie, 1372 cc ie, 1372 cc Turbo ie) - removal and refitting

22 Disconnect the battery. Working from under the front end of the car, unscrew the starter motor mounting bolts and disconnect the electrical leads.

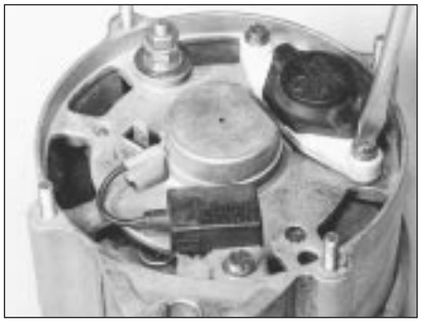
23 Withdraw the starter motor downwards. On Turbo models, there is just enough clearance, if the oil cooler hose and the oil pressure switch lead are deflected carefully aside (photos).

24 Refit by reversing the removal operations.

15.13 Driveshaft bracket swivelled downwards



15.14 Withdrawing the alternator



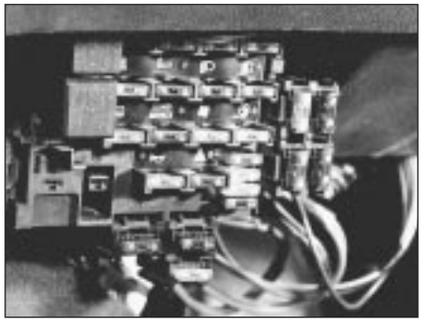
15.16A Extracting the alternator brush holder screw

15.16B Removing the alternator brush holder

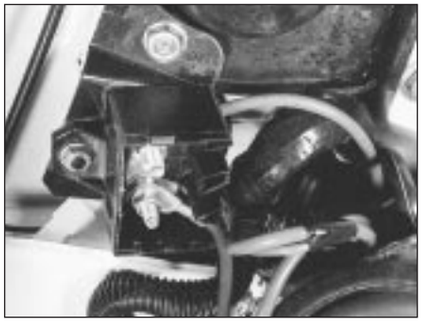
15.20 Starter motor removal from the 999 cc engine

15.23A Starter motor removal from the 1301 cc Turbo ie engine

15.23B Starter motor and wiring connections on the 1372 cc ie engine



15.26A Fuse block on the 1301 cc Turbo ie model



15.26B Battery lead terminal block on the 1301 cc Turbo ie model

Starter motor brushes (later models) - renewal

25 When renewing the starter motor brushes on later models, the old brushes will need to be crushed (in a vice or with a hammer) and their leads then soldered to the new brushes.

Fuses - later models

26 The fuse arrangement is slightly different on later models, but the circuits protected are still identified by a symbol. Refer to the Specifications Section for full details. Note also the terminal block with plastic cover, which can be used to isolate the battery from the electrical system by disconnecting the leads from the terminals (photos).

Relays (Turbo ie models) - general

27 On Turbo ie models, the relays mounted in the fuse block are as shown in Fig. 13.103. Additional relays are located as follows:

Headlamp relay - on lead under main fuse block

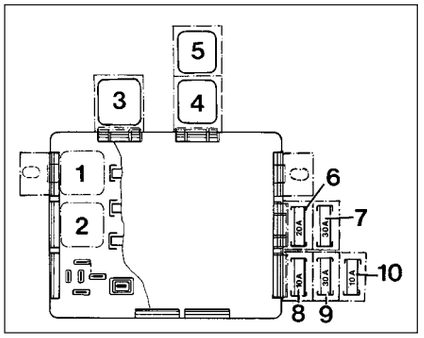


Fig. 13.103 Auxiliary fuses and relays on 1301 cc Turbo ie models (Sec 15)

1 Horn relay
2 Heated rear screen relay
3 Foglamps relay
4 Radiator fan relay
5 Electric windows relay
6 Foglamps fuse
7 Radiator fan second speed fuse
8 Fuel injector fan fuse
9 Electric windows fuse
10 Electric fuel pump fuse

Fuel injection system main control relay - adjacent to airflow meter

Headlamps later models

28 The headlamp units fitted on later models differ according to model, but the bulb and unit replacement details are generally the same as described for previous models in Chapter 9. Note that the rubber cover can only be fitted with the tab to the top as shown (photo).

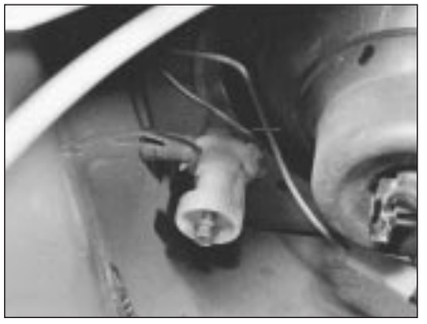
Headlamp beam adjusters for load compensation - later models

29 Some later models are fitted with headlamp beam adjusters which allow temporary resetting to be made (such as when the car is fully loaded). Access to these adjusters is made by lifting the bonnet (photo).

30 Turn the adjusters anti-clockwise to lower the beam to the normal level or clockwise to raise the beam (when the car is unloaded). Repeat the procedure on the opposite headlamp unit an equal amount.

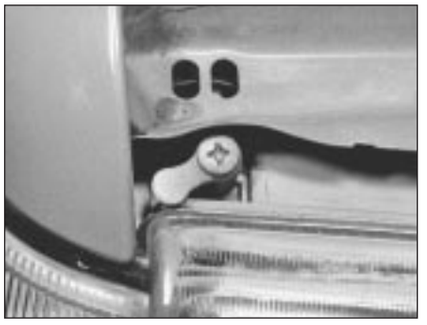
31 Other later models have separate horizontal and vertical beam adjusters, positioned as shown (photos). A load compensating lever is attached to the adjusters to enable temporary resetting of the headlamp beams, without changing the normal adjustment. Turn the lever to the appropriate side (right or left) to make the adjustment as required. The normal setting

15.28 Headlamp unit fitted to the 1372 cc ie model



15.29 Headlamp beam adjuster on the 999 cc Turbo ie model

15.31A Headlamp horizontal beam alignment adjuster screw on a 1372 cc ie model



15.31B Headlamp vertical beam alignment adjuster screw on a 1372 cc ie model. Note the load compensator lever which is set in the "O" (normal load) setting position

15.34 Headlamp dim-dip transformer

15.37A Undo the retaining bolts . . .

15.37B . . . and withdraw the front fog lamp unit . . .

adjustment procedures are the same as those outlined for the previous model units in Chapter 9, but ensure that the load compensation lever is turned to the "O" (normal load setting) position before making any adjustments.

Headlamp unit removal - later models

32 The removal and refitting procedures described in Chapter 9 also apply to the later headlamp type, but note that later units are secured in position by three retaining screws.

Headlamp dim-dip system - description

33 On later models, the wiring circuit has been modified to prevent the car being driven on parking lamps only in built-up areas.

34 Headlamp intensity is reduced by the transformer located at the front of the engine compartment (photo).

35 Any attempt to start the car with parking lamps only on will automatically cause the headlamps to switch on with a low-intensity dipped beam. Dipped and main beam function normally.

36 The headlamp dim-dip system is a legal requirement for all UK models registered after April 1st, 1987.

Front fog lamps - bulb/unit removal and refitting and beam adjustment

37 Ensure that the front fog lamps are switched off, then unscrew the two retaining screws and withdraw the lamp unit from the underside of the front bumper (photos).

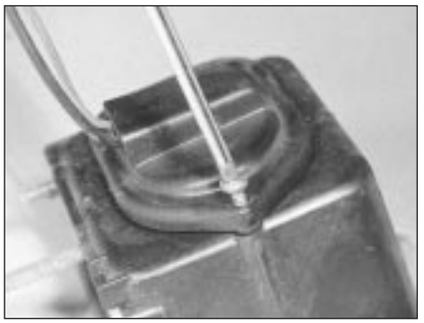
38 Undo the retaining screw and remove the access cover from the unit (photo).

39 Disconnect the wiring connector from the bulb, release the clips and withdraw the bulb from the lamp (photo).

40 Refit in the reverse order of removal. Check the light for satisfactory operation and if the beam requires resetting, turn the adjustment screw in the required direction.

41 To adjust the beam, position the car 5 m from, and square on to, a wall or similar.

42 Measure the height of the centre of the lamp lens from the ground and mark the position on the wall. Switch on the lamp. The demarcation line (cut-off) of the light should be below the mark on the wall by 50 mm plus one-third of the ground-to-lamp centre measurement. Adjust the beam as required using the long centre screw.



15.38 . . . remove the rear cover . . .

15.39 . . . detach the wires, extract the bulb

Horn - relocation

43 The single horn, on applicable models, is now located behind the grille, bolted on a bracket attached to the top rail (photo).

Steering column combination switches (later models) - removal and refitting

44 Disconnect the battery negative lead.

45 Undo the retaining screws and remove the steering column shrouds (photos).

46 Remove the steering wheel as described in Chapter 10.

15.43 Horn location

15.45A Undo the retaining screws . . .

15.45B . . . then remove the upper . . .

15.45C . . . and the lower column shroud . . .

15.47A Undo the retaining screw . . .

15.47B . . . and remove the column switch

47 Loosen off the switch-to-column clamp screw, disconnect the wiring connectors to the switch and withdraw the switch from the column (photos).

48 Refit in the reverse order of removal, but ensure that the lug of the switch aligns with the slot in the column as it is fitted into position. Check for satisfactory operation of the switches on completion.

Instrument panel (Turbo ie models) - removal and refitting

49 The instrument panel on these models incorporates an engine oil pressure gauge and a turbo boost gauge. The latter is connected directly to the inlet manifold.

50 Apart from disconnecting the boost gauge rubber hose, the instrument panel removal and refitting procedure is as described in Chapter 9 for the 1301 cc model or from paragraph 57 in this Section for the 1372 cc model.

51 A digital electronic instrument panel is available as an option on Turbo ie models. The removal and refitting procedures differ from analogue instrument panels in respect of the electrical connections - a speedometer drive cable is not used.

Facia-mounted switches (1301 cc Turbo ie model) - removal and refitting

52 Disconnect the battery.

53 Insert a thin-bladed screwdriver into the joint between the switch block and the switch block housing, to depress the plastic retaining tabs. Do this carefully, otherwise the switch block or casing will be damaged.

54 Withdraw the switch block. Individual switches can now be pushed out of the block. Fibre optics are used to illuminate some switches, these simply pull out of their sockets (photos). The illumination bulb is located on a crossmember found behind the instrument pack. Removal of instruments/top cover allows access.

55 The switch housing can be removed after extracting the fixing screws (photos).

56 Refitting is a reversal of removal.

Instrument panel (later models) - removal and refitting

57 Disconnect the battery negative lead.

58 Unscrew and remove the two instrument panel-to-facia retaining screws (photo).

59 Remove the lower facia trim panel, which is secured by two screws and a nut. Reach up to the rear of the instrument panel to disconnect the speedometer cable, then push the panel from its recess in the facia. Disconnect the multi-connectors from the rear face of the panel and withdraw it (photo).

60 Refit in the reverse order of removal. Ensure that the speedometer cable is fully engaged as the unit is refitted into position.

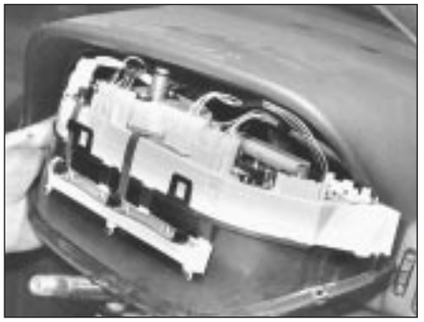
15.54A Switch block withdrawal on the 1301 cc Turbo ie model

15.54B Disconnecting a fibre optic cable from its holder on the 1301 cc Turbo ie model

15.55A Facia switch housing lower screw removal on the 1301 cc Turbo ie model

15.55B Facia switch housing inner screw removal on the 1031 cc Turbo ie model

15.58 Remove the retaining screws . . .



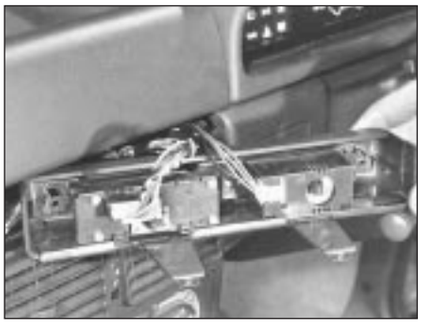
15.59A . . . withdraw the instrument panel . . .

15.59B . . . and disconnect the speedometer cable

15.62 Prise free the trim covers for access to retaining screws . . .

Auxiliary control panel (later models) - removal and refitting

61 Disconnect the battery negative lead.
62 Insert the flat of a screwdriver under the trim piece at the end of the auxiliary panel as shown and prise it free. Repeat the procedure and remove the trim piece at the other end of the panel (photo).
63 Undo the retaining screws, withdraw the panel from the facia. Disconnect the wiring connectors from the panel switches to remove the panel completely (photo).
64 A switch bulb can be renewed by untwisting the holder and removing the holder and bulb.
65 A switch unit can be removed from the panel by unscrewing the four retaining screws.



15.63 . . . and withdraw the auxiliary control panel

66 Refitting is a reversal of the removal procedure. Ensure that the wiring connections are securely made and check for satisfactory operation of the switches on completion.

Heater control panel (later models) - removal and refitting

67 Disconnect the battery negative lead.
68 Pull free the heater/fresh air and blower control knobs (photo).
69 Undo the two retaining screws and withdraw the control panel from the facia (photos). Detach the wiring connectors from the panel illumination lights and remove the panel.
70 Refitting is a reversal of the removal procedure. Ensure that the wiring connections are securely made and on completion check that the operation of the controls is satisfactory.

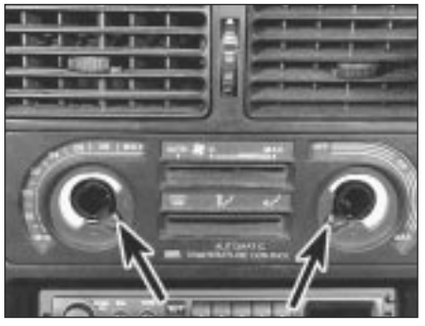
Trip master

71 This electronic instrument is fitted into the check panel of 1100SL and 1300SL models from 1986.
72 The device provides information on fuel consumption, range, speed and elapsed time.
73 With the ignition key turned to MAR, figures are displayed in respect of the last journey - average fuel consumption, average speed and elapsed time (up to switching off the ignition).
74 As soon as the engine is started, the instrument processes the current values to include fuel consumption, range and the actual time.
75 Fuel consumption is only displayed when the road speed exceeds 8.0 km/h (5.0 mph).
76 The fuel range is only displayed after a road speed of between 25.0 and 70.0 km/h (15.0 to 44.0 mph) has been maintained for at least 90 seconds or at higher speeds for 22 seconds.
77 A reset button is provided, also a display change button (from instant to average or total values). Should the instrument reading exceed 99 hours, 59 minutes or 1000 km (622 miles) depressing the display change button will display all zeros. Depress button E to resume normal function.
78 Refer to the end of the manual for a wiring diagram of the check panel, incorporating the trip master.

Interior roof mounted spotlamp, switch and/or clock - removal and refitting

79 Disconnect the battery negative lead.
80 Prise free the lamp unit from its aperture in the roof panel using a thin-bladed screwdriver. The lamp bulb can be inspected by untwisting the holder and withdrawing it from the rear of the unit (photos). Extract the bulb from the holder if it requires renewal.
81 To remove the lamp switch from the panel, reach through the lamp aperture and press it free from the roof panel (photo). Detach the wiring connectors.
82 To remove the clock, reach through the lamp aperture and undo the retaining screws (photo). Withdraw the clock and detach the wiring connectors.

15.68 Remove the control knobs . . .



15.69A . . . undo the retaining screws (arrowed)

15.69B . . . and withdraw the heater control panel

15.80A Prising free the roof-mounted spotlamp

15.80B Roof-mounted spotlamp bulb removal

15.81 Roof-mounted spotlamp switch removal

83 Refitting is a reversal of the removal procedure. Reset the clock on completion.

Central door locking system

84 Certain later models, equipped with a central door locking system, have an infra-red remote control for opening the door locks.
85 It is important that the battery used in the hand control is renewed when necessary with one of identical type (Duracell 7H34). This is only available as a FIAT spare part (No 7595393).
86 The remote control door lock receiver unit can be removed by carefully prising it free from the roof panel and disconnecting the wiring connector (photo).
87 If either this unit or the hand control are renewed at any time, recoding will be necessary and this is a task best entrusted to a FIAT dealer.

Cigar lighter (later models) - removal and refitting

88 Pivot back the cover and lift out the ashtray.
89 Undo the retaining screws and remove the trim together with the lighter unit. Detach the wiring connector and release the lighter unit from the panel.
90 Refit in the reverse order of removal.

Electrically operated windozw switches - removal and refitting

91 The window regulator switches on later models are located in the door pull trim. To remove a switch, prise it free from the trim by inserting a thin-bladed screwdriver under the switch flange, then lever it free from its aperture (photo). Take care not to damage the trim. Detach the wiring connector to fully remove the switch.
92 Refit in the reverse order of removal and then check the operation of the switch.

Windscreen wiper motor (later models) - removal and refitting

93 Disconnect the battery negative lead.
94 Remove the bonnet as described in Chapter 12.
95 Remove the wiper arm and blade as described in Chapter 9, then unscrew and remove the pivot nut (photo).
96 Undo the air inlet grille retaining screws noting that two are not fitted with washers. Where applicable, remove the washer reservoir filler cap from the reservoir neck protruding through the grille. Carefully prise free and lift the air inlet grille clear of the body.

15.82 Roof-mounted clock retaining screw removal

15.86 Remote control receiver unit removal

15.91 Prising free the window regulator switch from the armrest

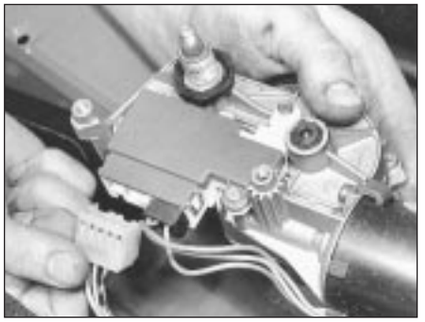
15.95 Unscrewing the wiper pivot nut

15.96A Release the air grille from its fixing points . . .

15.96B . . . and detach the windscreen washer hose

15.98A Remove the wiper motor retaining screws . . .

15.98B . . . separate the wiper motor from its cover . . .



15.98C . . . and detach the wiring connector

As it is lifted, invert it and detach the washer hose from the washer nozzle (photos).

97 Where applicable, detach and remove the washer reservoir from the recess in the front of the windscreen to allow access to the wiper motor.

98 Unscrew and remove the two wiper motor retaining screws. Lower and withdraw the unit, then detach the cover from the motor. Disconnect the wiring from the wiper motor and withdraw it from the car (photos).

99 Refit in the reverse order of removal. Check for satisfactory operation of the wiper and washer on completion.

Windscreen washer reservoir (Turbo ie models) - removal and refitting

100 Disconnect the battery negative lead.

101 Remove the bonnet as described in Chapter 12.

102 Remove the wiper arm and blade as described in Chapter 9, then unscrew and remove the pivot nut.

103 Undo the air inlet grille retaining screws noting that two are not fitted with washers. Where applicable, remove the washer reservoir filler cap from the reservoir neck protruding through the grille. Carefully prise free and lift the air inlet grille clear of the body. As it is lifted, invert it and detach the washer hose from the washer nozzle.

104 Syphon any remaining washer fluid from the reservoir, then disconnect it and partially withdraw it from the recess in front of the windscreen so that the wiring connection and the washer supply hoses (to the windscreen washer and the rear screen washer nozzles) can be detached from the pump unit. Remove the reservoir from the vehicle.

105 Refit in the reverse order of removal. If the washer pump unit was detached from the reservoir, use a new seal washer when refitting it. Top up the reservoir and check the screen washers for satisfactory operation before refitting the grille panel and the wiper arm/blade.

Tailgate wiper motor (later models) - removal and refitting

106 Although the tailgate wiper motor differs in appearance, its removal and refitting procedures are much the same as those described for the earlier models in Section 27 of Chapter 9 (photo).

Radio

107 All later models are now equipped with power supply and speaker leads for radio installation.

108 Installation of the standard FIAT aerial mounted on the windscreen pillar is shown (photos).

Check control system sensors - description

109 The locations of the sensors referred to in Chapter 9, Section 34 are given in the following paragraphs, and their construction differs according to their individual function.

Brake fluid level sensor

110 This is mounted in the master cylinder fluid reservoir cap, and comprises a pair of reed switches in a glass bulb, and a magnet at the end of a float.

111 When the fluid level is correct, the magnetic flux closes the switches. In the event of a leak in the system, the magnet moves away, the switches open and the warning lamp comes on.

Brake disc pad wear sensor

112 This is basically a circuit wire embedded in the pad friction material. As the pad wears, the wire is eventually exposed and contacts the disc, whereupon the warning lamp comes on to indicate that pad renewal is necessary.

Coolant level sensor

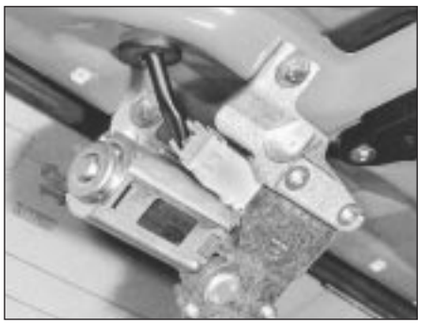
113 This is located in the cooling system expansion tank, and is of the reed switch type, which operates in a similar way to that described for the brake fluid sensor.

Engine oil level sensor

114 This is located at the end of the dipstick, and comprises a pair of switches at the end of a bi-metallic strip, heated by electrical resistance.

115 The heat is dissipated by the immersion of the dipstick in the engine oil, so preventing the bi-metallic strip from curving so much that the switches would open.

116 If the oil level drops, the heat is no longer dissipated, the switches open, and the warning lamp comes on.

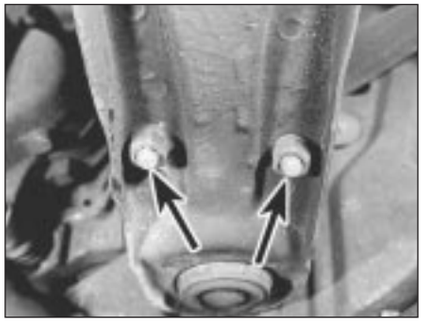


15.106 Tailgate wiper motor - later model

15.108A Pillar upper screws for aerial

15.108B Pillar lower screw for aerial

16.3 Anti-roll bar clamp



16.4 Anti-roll bar fixing nuts (arrowed)

16.7 Suspension strut upper mounting nuts, showing bracket and cable clip on the 1372 cc ie model

Door closure sensor

117 The sensor consists of a microswitch within the lock. The switch actuates the warning lamp according to whether the lock is in the open or closed mode.

Check control system sensors - testing

Brake fluid level sensor

118 With the fluid level correct, switch on the ignition and depress the centre of the reservoir cap. If the sensor switches are working correctly, then "FAULT" should be indicated on the check panel.

Coolant level sensor

119 With the coolant level in the expansion tank correct, switch on the ignition and then pull the wiring plug from the sensor. "FAULT" should be indicated on the check panel. If it is not, then it is the panel which is faulty.
120 An ohmmeter should be used to check for continuity, holding the float in both the full and low level positions.

Engine oil level sensor

121 With the oil level correct, disconnect the wiring plug from the dipstick, and then bridge the plug terminals (not dipstick side) with a 12 ohm resistor. Switch on the ignition.
122 If the red light on the check panel goes out, then the fault is due to the sensor.
123 If the light stays on, then it is the check panel module which is faulty.

Door closure sensor

124 Any fault in the lock microswitch can best be detected using an ohmmeter.

16 Suspension

Front anti-roll bar - removal and refitting

1 A front anti-roll bar is fitted to the 1301 cc, 1372 cc ie and 1372 cc Turbo ie engined models. Removal of the bar on all models is as follows. Firstly loosen off the front roadwheel bolts, then raise the front of the car, securely support it on axle stands and remove the front roadwheels.
2 Disconnect the two gearchange rods from the transmission.
3 Unbolt and disconnect the anti-roll bar insulating clamps from the floorpan (photo).
4 Unbolt the end links from the track control arms and withdraw the anti-roll bar (photo).
5 Refitting is a reversal of removal, but only tighten the nuts and bolts to the specified torque with the car parked on level ground, with four passengers and 40 kg of luggage inside.

Suspension strut - later models

6 The suspension strut upper mounting nuts on later models also secure the brackets for the mounting of ancillary components such as the fuel filter, fuel system relays and fuses, etc. (depending on model).
7 When removing the suspension strut units, it will therefore be necessary to detach and support these brackets and their fittings (photo).

17 Bodywork

Plastic components

1 With the use of more and more plastic body components by the vehicle manufacturers (e.g. bumpers, spoilers, and in some cases major body panels), rectification of more serious damage to such items has become a matter of either entrusting repair work to a specialist in this field, or renewing complete components. Repair of such damage by the DIY owner is not really feasible owing to the cost of the equipment and materials required for effecting such repairs. The basic technique involves making a groove along the line of the crack in the plastic using a rotary burr in a power drill. The damaged part is then welded back together by using a hot air gun to heat up and fuse a plastic filler rod into the groove. Any excess plastic is then removed and the area rubbed down to a smooth finish. It is important that a filler rod of the correct plastic is used, as body components can be made of a variety of different types (e.g. polycarbonate, ABS, polypropylene). Damage of a less serious nature (abrasions, minor cracks, etc.) can be repaired by the DIY owner using a two-part epoxy filler repair material. Once mixed in equal proportions, this is used in similar fashion to the bodywork filler used on metal panels. The filler is usually cured in twenty to thirty minutes, ready for sanding and painting.
2 If the owner is renewing a complete component himself, or if he has repaired it with epoxy filler, he will be left with the problem of finding a suitable paint for finishing which is compatible with the type of plastic used. At one time the use of a universal paint was not possible owing to the complex range of plastics encountered in body component applications. Standard paints, generally speaking, will not bond to plastic or rubber satisfactorily. However, it is now possible to obtain a plastic body parts finishing kit which consists of a pre-primer treatment, a primer and coloured top coat. Full instructions are normally supplied with a kit, but basically the method of use is to first apply the pre-primer to the component concerned and allow it to dry for up to 30 minutes. Then the primer is applied and left to dry for about an hour before finally applying the special coloured top coat. The result is a correctly coloured component where the paint will flex with the plastic or rubber, a property that standard paint does not normally possess.

Rear view mirrors

Interior

3 The mirror is of safety type, "breaking" off its ball fixing upon impact from a front seat occupant.
4 To remove the mirror, grip the head and

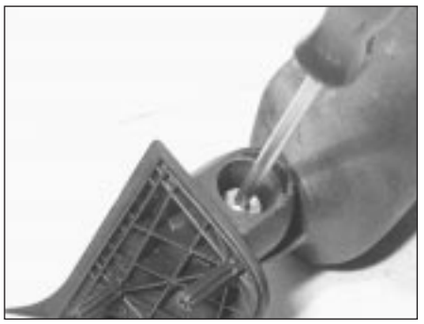
17.4 Interior mirror base

17.5 Interior mirror mounting plate

17.7A Exterior mirror trim plate

push it towards the windscreen; the ball socket will release (photo).

17.7B Withdrawing the exterior mirror



17.8 Extracting the mirror balljoint screw

5 Extract the screws from the mounting plate (photo).

6 When refitting the mirror, engage the front of the socket on the ball and then twist the mirror rearwards and upwards.

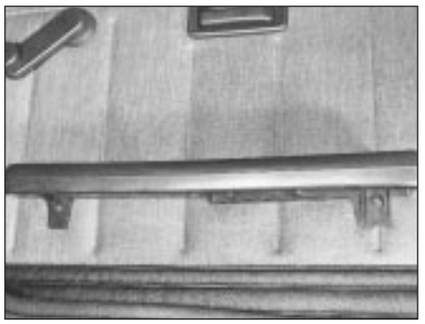
Exterior

7 On models without remotely-controlled type exterior mirrors, the ball-jointed mirror is held in position by the two self-tapping screws which secure the triangular trim plate inside the car (photos).

8 To dismantle the mirror, extract the balljoint fixing screw, but take care as considerable force is exerted by the interior coil spring (photo).

Door armrest

9 A redesigned armrest is used on some models. This is simply secured by two self-tapping screws (photo).



17.9 Door armrest

Tailgate (Turbo ie model) - component removal and refitting

10 The tailgate on these models is of plastic injection-moulded type, with a bonded window glass.

11 Renewal of the glass or repair of the tailgate should be entrusted to your FIAT dealer or a specialist repairer, due to the need for special products and techniques.

12 To remove the tailgate lock and handle, open the tailgate and extract the lock handle screws.

13 Prise off the link rod socket from the ball-pin (photos). Unbolt and remove the handle and lock.

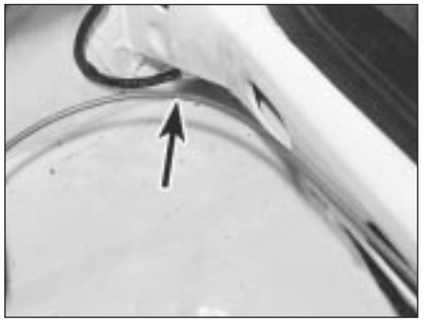
14 A remote type of tailgate release is fitted, with a control handle located by the driver's seat. Access to the handle can be obtained by removing the seat and sill trim, and peeling back the carpet.

15 If a new cable is to be fitted, disconnect it from the tailgate latch, tape the new cable to the old one, and draw it carefully around the side panel and sill trim (photo).

16 To remove the tailgate wiper motor, first take off the wiper arm and blade.

17 Extract the plastic clips and take off the wiper motor protective cover. Disconnect, unbolt, and remove the wiper motor (photo).

17.13 Tailgate handle link rod (arrowed)



17.15 Tailgate release cable (arrowed)

17.17 Tailgate wiper motor

17.19A Extracting a radiator grille screw

17.19B Prising down a radiator grille clip

17.20 Removing the radiator grille from a 1301 cc Turbo ie model

18 Refitting of all components is a reversal of removal.

Radiator grille (1301 cc Turbo ie model) - removal and refitting

19 The grille is secured by a central screw and two upper clips. Use a screwdriver to prise the tabs on the upper clips downwards (photos).
20 Lift the grille upwards and forwards to disengage its lower mountings (photo).
21 Refitting is a reversal of removal.

Radiator grille (1372 cc ie and 1372 cc Turbo ie models) - removal and refitting

22 The radiator grille on these models is secured by screws at the top edge (photo). Raise and support the bonnet. Undo the retaining screws, then lift the grille clear.
23 Refit in the reverse order of removal.

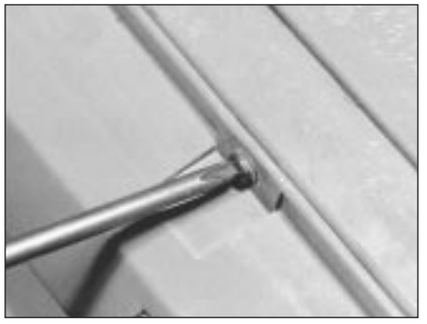
Bumpers (1301 cc Turbo ie, 1372 cc ie and 1372 cc Turbo ie models) - removal and refitting

Removal - front

24 Remove the radiator grille as previously described, to provide access to the bumper upper mounting screws (photo).
25 The ends of the bumpers are secured with bolts and captive nuts but to reach them, the underwing shields must be released and pulled away.
26 Disconnect the leads from the auxiliary lamps which are mounted in the spoiler, and then lift the bumper/spoiler from the car.

Removal - rear

27 Open the tailgate to provide access to the bumper upper mounting screws.
28 Disconnect the leads from the rear number plate lamp. Unscrew the lower mounting nuts (photo).
29 Disconnect the bumper end fixings, which are accessible under the rear wing edges (photo).



17.22 Radiator grille screw removal on a 1372 cc SX ie model

17.24 Front bumper upper mounting screw (arrowed)

17.28 Rear bumper lower mounting nut

17.29 Unscrewing a bumper end fixing nut

Refitting - front and rear

30 Refitting either front or rear bumpers is a reversal of removal.

Rear hinged windows - removal and refitting

31 These have toggle-type catches and hinges bolted directly through the glass (photo).
32 To remove the window glass, have an assistant support it, and then unscrew the cross-head hinge screws and the toggle catch anchor plate screws. Lift the glass away. If the toggle catch must be removed from the glass, first drive out the handle pivot pin and then, using a pin wrench or circlip pliers, unscrew

17.31 Rear window toggle-type catch

17.34A Armrest electric window switches

17.34B Disconnecting an electric window regulator switch plug

17.34C Door interior showing electric window motor (arrowed)

the ring nut which secures the handle to the glass.

33 When refitting the screws or ring nut to the glass, make sure that the insulating washers are in good condition to prevent metal-to-glass contact.

Door trim panel (Turbo ie model) - removal and refitting

34 The operations are similar to those described in Chapter 12, Section 11, except that electric windows are fitted instead of a conventional mechanical regulator and handle. Before the trim panel can be withdrawn, the window control switches must be disconnected from the wiring plug, and the plug fed through the panel aperture (photos).