FIAT TECHNICAL SERVICE ASSISTANCE

AUTOMOBILE MODEL 8V

PRINCIPAL DATA

DIMENSIONS OF THE CAR

--Length	m 4.040
--Width	m 1.570
--Height	m 1.290

GENERAL CHARACTERISTICS

--Wheel Base	m 2.400
--Front Track	m 1.290
--Rear Track	m 1.290
--Ground Minimum Height	m 0.150
--Minimum Turning Radius	m 5.000
--Total automobile Weight (with Fuel, Spare Tire, Tools, & Accessories)	kg 1.000
--Seating Capacity	no. 2

PERFORMANCE

--Top Speed with Full Load on a Flat & Good Condition Road with a Broken-In Motor:

First Gear	Approx.	Km/h	63
Second "	"	"	96
Third "	"	"	136
Fourth "	"	"	180

--Maximum Incline Capability with the Full Load on a Flat & Good Condition Road with a Broken-In Motor:

First Gear	Approx.	43%
Second "	"	26%
Third "	"	17%
Fourth "	"	13%

FUELS

Fillable Parts	Amount	Type of Fuels
Fuel Tank	82 Liters	Gasoline No (Research) 87 min.
Radiator & Motor	10 "	Water
Crankcase Sump	5.50 Kg	Fiat Oil W (SAE 30) for temperatures above 0° C, Fiat Oil VI (SAE 20) for temperatures below 0° C.
Gear Box	1.20 Kg	Fiat CP Oil (SAE 90 EP)
Hydraulic Break System	0.70 Kg	Special Fiat Blue Break Liquid for Hydraulic Breaks
Shock Absorbers Box-- Front & Rear (Each)	0.850 Kg	Fiat Oil S.A.I.
Telescoptic Rear Hydraulic Shock Absorber (Each) (1)	0.200 Kg	Fiat Oil S.A.I.
Same as Above (2)	0.135 Kg	Fiat Oil S.A.I.
Lubrication Pressure Joint (Connectors)	" Kg	Fiat Oil E.

(1) Up to Car with Serial No. Spare Parts 000030 (Shock Absorber mm32)
(2) Up to Car with Serial No. Spare Parts 000031 (Shock Absorber mm27)

MOTOR

TYPE	104.000 or 104.003
Valves	overhead
Number of Cylinders (arranged in V in double line of 4)	8
Diameter of Cylinders	72 mm
Pistons Stroke	61.3 mm
Engine Displacement	1996 cubic centimeters
Bhp (without muffler & vent)	105 HP 115
Maximum HP	rpm 6000
Compression Ratio	8.5
Maximum Torque (without muffler & vent)	1490 kgcm. 1475
Maximum Torque rpm	rpm/min. 3600 4600
Nominal Horsepower	25 HP
Firing Order	1-5-3-7-4-8-2-6

PISTON AND CONNECTING RODS

Piston Material	aluminum
Weight of Piston without rings & Piston Pin	0.340 Kg
Holding Rings	1
Scraper Rings	2
Piston Pin	Sealed in the Piston

Length of connecting rod (from the centers).....mm.....139 (+-) 0.04
Weight of connecting rod ..... kg.....0.615
Type of connecting rod bearings.....with soft shell bearing
Outside diameter of connecting road.....mm.....54.520
Width of connecting rod..... .mm.....1.835-1.841

CRANKSHAFT AND BANK BEARINGS

Crankshaft in stainless steel, with three supports with counterweights, with hardened surface.

Type of bank connecting rods.....in lead copper with indium lining with soft shell
Outside diameter of bank connecting rods 60.845
Width of bank connecting rods ..... mm 1.835-1.841
Thrust of bank connecting rods.....support washer on front connecting rods

DISTRIBUTION

Distribution with overhead valve controlled by rods and levers from the shaft located in the crankcase.
Control of the distributor.....with triple chain
Opening of intake valve.....first p/m/s..... 12 degree 37 degree
Closing of intake valves.....after p/m/i.....37 " 63 "
Opening of exhaust valves.....before p/m/i.....39 " 47 "
Closing of exhaust valve after p/m/s.....10 " 21 "
Clearance between valve and spring with cold engine
intake.....mm.....0.15 - exhaust .....mm.....0.25

VALVES

Head diameter.....intake.....mm.....33
exhaust.....mm.....31
Cone angle on the valve (intake and exhaust.....45º 30' (+ -) 5'
Valve inside diameter.....intake..... mm.....29
exhaust .....mm.....27
Valve housing angle.....intake and exhaust.....45º (+ -) 5'
CYLINDER HEAD in aluminum with valve housing insert

LUBRIFICATION

Pump with gear mechanism. Oil Filter type "full flow" with adjustment valve on the lubrification circuit of the shaft, shaft bearing distributor of the valves support lever.

Normal pressure of lubrification.....about 50 meters of water

Oil radiator reflux on the main circuit

Radiator thermostat. Eccentric lubrification distribution with special oil circuit .

FEED

Carburators (No. 2) type Weber 36 DC. F3 with double-inverted barrel, equipped with pick-up pump and starting mechanism.

Barrel diameter	mm	36
Chokes diameter	mm	24
Main nozzle diameter	mm	1.35
Idle nozzle diameter	mm	0.70
Starting nozzle diameter	mm	1.50
Minimum air intake diameter	mm	1.25
Starting air screw diameter	mm	3.00
Break screw diameter	mm	2.50
Jet pump diameter	mm	0.70
Main jet pump diameter	mm	1.90
Weight of float	gr	18

Carburetor fed by.....pump with membrane, controlled by engine

INSIDE CRANKCASE SCAVENGER

With dynamic intake in the engine with one air exhaust intake located between the air duct and the crankcase and a second one located between the cylinder head and the air duct.

COOLING

Water circulation with centrifugal pump

Water and fan control	with trapezoidal belt
Fan	with 4 offset blades
Water circulation control	thermical
Front radiator space	mq 0.26
Radiator type	with vertical tubes

CHASSIS

Suspensions

Front & Rear independent wheel, with spring and hydraulic shock absorbers with vertical boxes and stabilizer bar.
Telescopic hydraulic shock absorbers only for the rear suspension.
Size of front hydraulic shock absorbers (0 Piston).....mm.....32
Size of rear hydraulic shock absorbers (0 Piston).....mm.....32
Size of hydraulic rear shock absorber (0 Piston) till at car with spare part No. 000030.....mm.....32
Size of rear hydraulic telescopic shock absorber (0 Piston) from car with spare car No. 000031.....mm.....27
Angle of incidence for front wheel (1).....7 degree
Angle of inclination for front wheel (1).....1 degree 30'
Inclination of front wheel measured on 0 of the wheel .....(1) mm 11-12
Angle of inclination of the stub axle joint...(1)..... ..7 degree
Front wheel convergence (1).....mm.....2 - 4
(1) With a full-loaded car.

STEERING

Type of steering.....with screws & bearing
Independent tie-rod control per each wheel
Ratio of reduction of the steering.....1/16.4
Steering wheel diameter.....mm.....420
Turn of the steering from left to right.....2 3/4

CLUTCH

Single disc clutch (dry) with disc installed on elastic hub. Diameter .....8"1/2
Characteristic of the clutch's spring:
--height of free spring.....mm.....53.1
--load on the spring with clutch engaged (height of the spring mm 37).....kg.....85 (+-)4.2
--load on the spring with clutch disengaged (height of the spring mm 34.5).....kg...92.8 (+-) 4.9

TRANSMISSION

Four speed plus reverse with first & second gear grip. Engaging of the second, third & fourth gear by synchronized free ring.

Gear box control lever is located on the cover of the box. The transmission box is made of aluminum.

Gear ratio.....in first gear.....2.694
second " 1.768
third "..... 1.257
fourth "..... 1.000
reverse..... 2.694

DRIVE SHAFT

Tubular with universal joint at the extremities.

REAR SPEED REDUCER

Type of gears.....hypoidal couple
Crown pinion ratio.....9/40
Apparatus support.....in aluminum
Drive shafts with universal joint from the driving wheel.

BRAKES

Brake type F.B. hydraulic with double jaws, on the four wheels.
Drum diameter.....mm.....290
Brake lining width.....mm.....55
Front Brake cylinder diameter.....1"1/8
Rear Brake cylinder diameter.....3/8"
Emergency brake with ribbon which acts on the transmission, hand-controlled lever located between the seats.
(*) Till chassis # 000069 and from 000086 to 000090 were installed cylinder 0 1"

TIRES AND WHEELS

Tire size.....165 x 400
Spoke wheels.....165 x 400
Maximum tire pressure, Pirelli tires (front).....kg/cm 2 1.6
Maximum tire pressure, Pirelli tires (rear).....kg/cm 2 1.8
Maximum tire pressure, Michelin tires (front).....kg/cm 2 1.85
Maximum tire pressure, Michelin tires (rear).....kg/cm 2 1.90

ELECTRICAL SYSTEM

Voltage of the System.....12 V

BATTERY

Capacity 35 AH.
Length, Width & Height.....mm 227 x 167 x 200
Located inside the right side of the engine hood

GENERATOR

Generator Type FIAT.....R-115-300/12-2000 - Variant 2.
w/ regulator unit of 300 watts power
Regulator unit Type FIAT.....A/3 - 300/12 with 3 elements (switch for the minimum tension regulator, current limitator).
Tension Adjustment at half load.....15.5 (+-) 0.3 V
Maximum Output on the batteries.....22.5 (+-) 1 A
Minimum Speed for battery, w/ lights off:
Engine.....1200 R.P.M.
Car in direct drive.....km/h 32.4

STARTER

FIAT Type.....E 90-0.7/12 Variant 1
Starter Gear Ratio.....1/13.4
Starter Engagement.....with pinion driven by free wheel, together with the switch, by an electromagnet located on the starter, activated by a tie-rod switch, located on the dashboard.

IGNITION

Battery ignition w/ distributor fed by 2 coils
Initial Advance.....5 degrees
Automatic Advance of the distributor....(illus. 2). .30 degrees (+-) 2 degrees
Total maximum advance.....37 degrees
Play between contact breaker.....0.32 + 0.38
Spark plug, Marelli type.....M 14 - 12/240
Space between electrodes of plugs.....mm.....0.4 + 0.5
Spark plugs tread size.....mm.....14 x 1.25

LIGHTING system w/ head lights of 40 W for low beams which are located on the fender, and by 45 W for high beams and are located on the lower part of the air vent, front head light, of three 20 W for parking lights and turn signals located on the fenders, rear license plate light 3 W, rear lights parking lights 3-20 W, turn signal, reflectors on the rear fenders on the latest production car, the low beam 40 W, and parking light 3 W are located in the same lighting system, while the light 20 W for the turn signal are located inside the light which are the orange reflector light which are located sideways on the fenders.

SWITCH - Pedal light switch -- low beams

TURN SIGNAL with flashing light with switch, with turn signal (5 W) located on control.

ELECTRIC WINDSHIELD WIPERS with mechanism with double blades w/ automatic stop.
N. 1 HORN with short panel and one horn without panel w/ switch together, on steering wheel.
LIGHT SWITCH with control on steering.
INTERIOR LIGHT 3W with separate switch
THERMOSTAT with electric contact to signal maximum water temperature
GASOLINE INDICATOR switch
PRESSURE switch for brake lights
VALVES with five fuses 8 A, which are housed in a special box located on the turn signal system.
ELECTRIC HEATER with separate switch
ELECTRIC Unipolar outlet
DASHBOARD CONTROLS - Multiple indicator including odometer w/ total kilometer indicator and R.P.M. indicator, clock, multiple instumentation which includes, oil gauge, fuel gauge, which features lighted low-fuel warning, light warning for maximum water temperature, generator indicator, electric parking lights indicator, ignition switch w/ key, and outside lights with 5 different settings, (which 1 of 0 corresponds to the ceasing of the services, light, etc...); switch for dashboard light; spare switch for eventual special purpose, electric windshield wiper switch, switch for inside light; switch tie-rod for starter, handle for fuel pump, fuel pedal control, switch for electrical heating system.

COACHWORK

--Berlina 2-seater, 2 doors, 2 side lights
--aerodynamical outline metallic body
--Front grill for air duct
--Front light stationary with 2 curved headlight covers, electric windshield wipers with 2 blades.
--Side door with hinges on the front. Each door has a light made out of synthetic clear material. (Plexiglass or similar). Side window operated by manual control. The rear light, behind the doors are made of clear material type plexiglass.
--Door lock with hidden handle located in line with the outside lock; lock controlled by key and located on the door on driver's side and safety lock located on the opposite side.
--Rear light in plexiglass with 2 curves.
--Hood moveable with hinges located on the front with catch inside.
--High beam lights located on the grill. Low beam lights installed on the front fender, parking light and direction light located on the front fenders under the low beam lights.
--On the latest-made cars, the parking lights are located in the low-beam lights while the turn signal which have an orange lighting shell are located on the side of the fenders.
--Front and rear bumper limited to the corner of the car with the outline installed on the chassis and blended in with the chassis by rubber parts.
--Rear license plate totally incorporated into the body. Rear parking and direction light located on the rear fenders.
--Seats: driver's seat adjustable with an inclined rail with stop. Side rail stationary.
--Front and rear floors covered with carpet "mouquette" color-coordinated with car body's color.
--Control and command panel.
--Spare tire secured to the chassis.
--Vents for cooling and heating system with windshield defroster.
--Rear view mirror.
--Special metallic paint. Interior finishing in the color coordinated with the upholstery. Seats and inside doors panel covered with Resinflex or similar material.

ASSEMBLY DATA AND VALUES ADJUSTMENT FOR ENGINE OVERHAUL

Cylinder Head

The bolt should be tightened at 6200 kg mm. The bolt should be tightened in 2 phases. First, with a torque of 3,000 kg mm and then with a torque till 6200 kg mm; Check the torque after 2 hours. The sequence which should be followed for the fastening is shown on illustrated #3.

ENGINE CRANKCASE AND CYLINDER LINERS.

According to the distance between the cylinder head

-- 9 cont. --

and the crankcase, the cylinder lining are selected according to three classes: Ax, Bx, Cx. These classes differ one from the other by mm 0.01. The letters which distinguishes the class is engraved on the outside of the upper part.
Having three different types of lining available, as indicated, it is possible to install the lining itself in such a manner that the upper part of the lining (and as a result, the tolerance in the thickness for the lower part) is of 0.15 (+-) 0.02.
The adjustment between the tappets and their housing on the crankcase should have play of mm 0.010 + 0.032.

VALVES

The valves and their guides should have play of mm 0.033 - 0.043.
The valve springs have the following characteristics:
--free-spring height.....mm.....47.3
--load on the spring with valve closed (height of spring mm 39)
.....kg.....40.1 - 42.7
--minimum load allowed after the operation with spring closed.....kg 38
--load of the spring with open valve (height of spring mm 31.6)
.....kg.....75.9 - 80.7
--minimal load allowed after operation of spring w/ valve open..kg.....74

FLYWHEEL ADJUSTMENT

Rotating the flywheel, with assembled crown. The indicator placed on outside should not register variation higher than mm 02.
Rotating the flywheel with indicator placed on the side towards the crankcase at the distance of 80 mm from the axle of rotation should not register variation superior to mm 0.025.
With the indicator placed on the face of the anular on clutch side should not register variation higher to mm 0.025.
Torque of the screw that assembles flywheels to the crankshaft kgmm 7.000.
When overruling the engine, the flywheel should be placed on the crankshaft in a way that the mark engraved on the lower part of the flywheel (on the side to the hole of the crankshaft), with the reference engraved on the crankshaft.

SET-UP OF THE DISTRIBUTOR

In order to set up the engine at the work bench, it is necessary to turn the flywheel in such a way that the mark 1/4 which is engraved on the outside face, is even with the mark engraved on the top of the gear box plate of the engine, which is located in the mid-area of the engine (illus. 4).

Under these conditions, the pistons of cylinders #1, and #4 are at the higher dead point.

In order to set up the engine, when the engine is in the car, it is necessary to remove the cover which is located on the gear box, and covers the lower part of the flywheel, (on the engine's side) while the flywheel is turned in such a way that the reference mark 1/4 engraved on the front of the face of the flywheel is even with the point engraved on the lower part of the gear box.

Under these conditions, the pistons of cylinders #1 and #4 are located exactly

10 cont.

on the higher dead point.

By adjusting the distributor with the clearance of mm 0.375 between the rod and the rocker lever (without giving consideration to the valve's control mechanism), the timing should be as follows:

	104.000	104.003
Intake opening	12 degree	37 degree before P.M.S.
Intake closing	37 degree	63 degree after P.M.I.
Exhaust opening	39 degree	47 degree after P.M.I.
Exhaust closing	10 degree	21 degree after P.M.S.

with a tolerance greater than 2 degree and less than 4 degree.

The final clearance for the adjustment between the valves and rocker levers should be of mm. 0.15 for the intake and of mm. 0.25 for the exhaust (with cold engine).

IGNITION SET UP

The initial advance of the ignition is of 5 degree. In order to adjust the distributor in such position, it is necessary to rotate the crankshaft in such a manner that the reference point 1/4 (which is engraved on the front part of the flywheel) is in a position of about 13 mm before the mark engraved on the edge of the front of the gearbox (illus 5).

The three eyelets located on the flange where the distributor is fastened, allows to move angularly the contact breakers in respect to the tappets of the control. This will allow small future adjustment of the timing.

DISTRIBUTOR SHAFT AND ITS BEARINGS

The clearance between the pins of the distributor and their bearings:

Front and middle support	mm 0.030 - 0.106
Rear support	mm 0.025 - 0.089

PISTONS AND CONNECTION RODS

The connecting rods installed on the engine should have a maximum weight tolerance of 3 grams.

In assembling the connecting rods in the cylinders, it is necessary to take in consideration the number engraved on the connecting rod and on the cap- which matches the number on the cylinder that was obtained during the casting of the crankcase (and is located on the outside). The valve's niche, on the top of the piston, should face the center of the engine.

The torque required in assembling the rods and the cap should be of kgmm 4.100.

The connections of the rods should be as follows:

Rod Eye-piston pin	clearance mm 0.001 - 0.009
Piston pin-piston interferance	mm 0.009-0.017
Piston-cylinder, clearance	mm 0.13-0.16
Rod-crankshaft, clearance	mm 0.058-0.096

CRANKSHAFT AND MAIN BEARINGS

Examining the crankshaft while being supported at the two ends by tailstock:

a) the maximum ovality for each main bearing should be mm 0.02.
b) each pair of rod pin of the same axle should be parallel to the engine axle with a maximum tolerance of mm 0.02.
c) The distance between the main bearings and the outside of the rod bearings should have a maximum tolerance of (+ -) 0.025.

The bolt for the strudt that fastens the support of the crankshaft should be tightened with a torque of kgmm 12.200.

The connections between the crankshaft and the bearings should have a play of mm 0.059-0.096.

NOTE: The main bearings and rod bearings of the crankshaft, which have a hardened surface, cannot be grinded, therefore, when these rods are worn it is necessary to replace them.

FAN AND WATER PUMP

The lower angle formed by the blades which are fastened on the spoke, should be of 70 degree (+ -) 1 degree. The external profile of the blade should be within a tolerance of (+ -) 30.3 degree with respect to theoric profile which will result in a projection on a normal axle parallel to the axle of the two.

The maximum static unbalance allowed to the fan should be of 30 grams mm.

In assembling the fan wheel on the water pump, check the play between the pump and the blades of the wheel. The play should be within the range of 0.8-1 mm. The play between the rear turning area and the support point where the pump lodges on the cover should be in a range of 0-0.2 mm.

In installing the bearings and the shaft on the water pump, make sure to fill the area between the water pump casing and the two bearings with grease type FIAT GCS 31.

LUBRICATION SYSTEM

Before installing the oil filter on the engine and on the car, the oil radiator and hoses, should be cleaned thoroughly with petrolium and then blown out with compressed air, and finally washed and rinsed out with cleaning oil.

Engine oil pressure.....m H20 50.

SUPPLEMENT TO MODEL 8 V SPECIFICATIONS

On some cars engine 104.004 was installed. This type of engine differs from engine 104.000 for the following characteristics:

Maximum horsepower (without muffler & vent)	127 HP
R.P.M. at maximum horsepower	6600 R.P.M.
Compression Ratio	8.75
Maximum Torque (without muffler & vent)	1530 kg cm
R.P.M. at Maximum Torque	5400 R.P.M.

DISTRIBUTION

Opening of intake valve	37 degrees before the P.M.S.
Closing of intake valve	63 degrees after the P.M.I.
Opening exhaust valve	49 degrees after the P.M.I.
Closing of exhaust valve	29 degrees after the P.M.S.

Intake valve inside diameter is 32 mm, exhaust valve 28 mm.

CARBURETOR

Carburetor (No.2) type Weber 36l F 4 C, with quadruple-inverted barrel equipped with pick-up pump and starting mechanism.

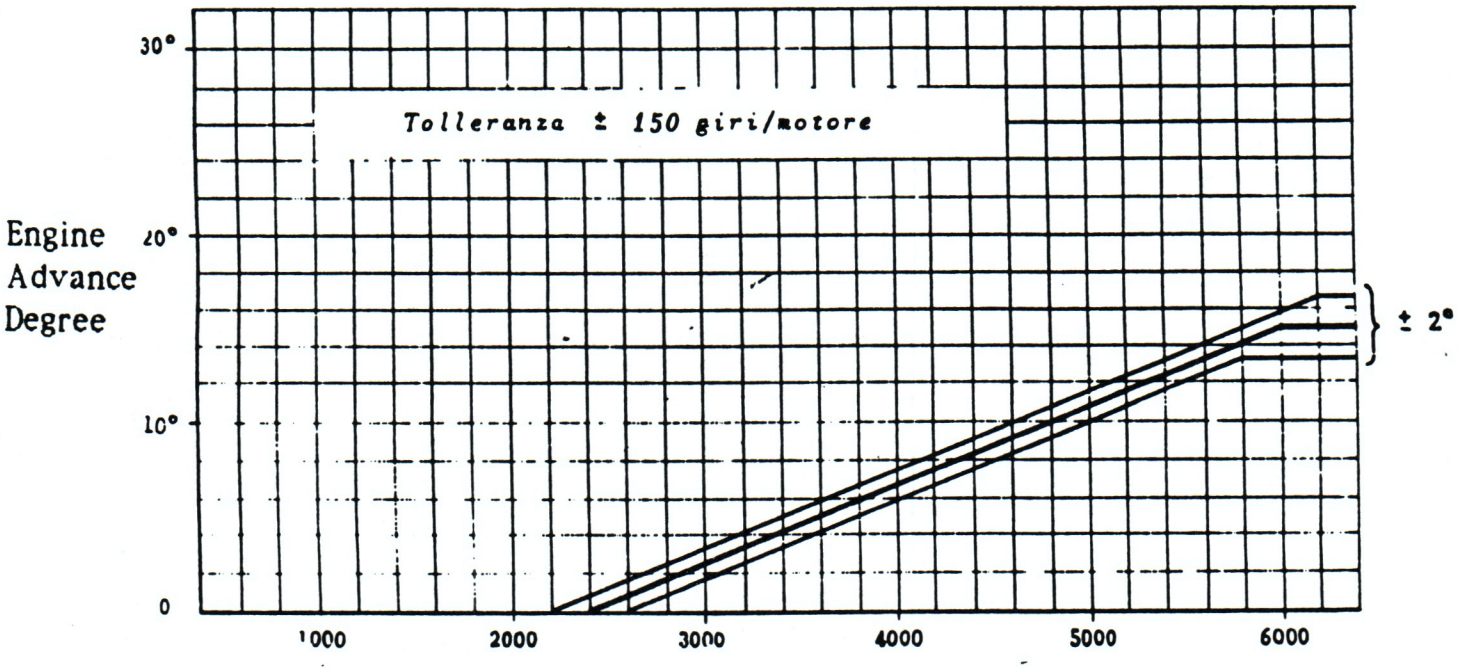
Barrel diameter	36 mm
Choke diameterr	22 mm
Main jet diameter	1.05 mm
Jet diameter for minimum	0.70 mm
Jet pump diameter	0.60 mm
Main jet pump diameter	1.75 mm
Minimum air jet diameter	1.20 mm
Needle housing diameter	3.00 mm
Weight of float	65.00 grams

IGNITION

Initial advance	17 degrees
Automatic advance of the distributor	15 degree (+-) 2 degree
Total maximum advance	34 degrees

Engine automatic advance variation

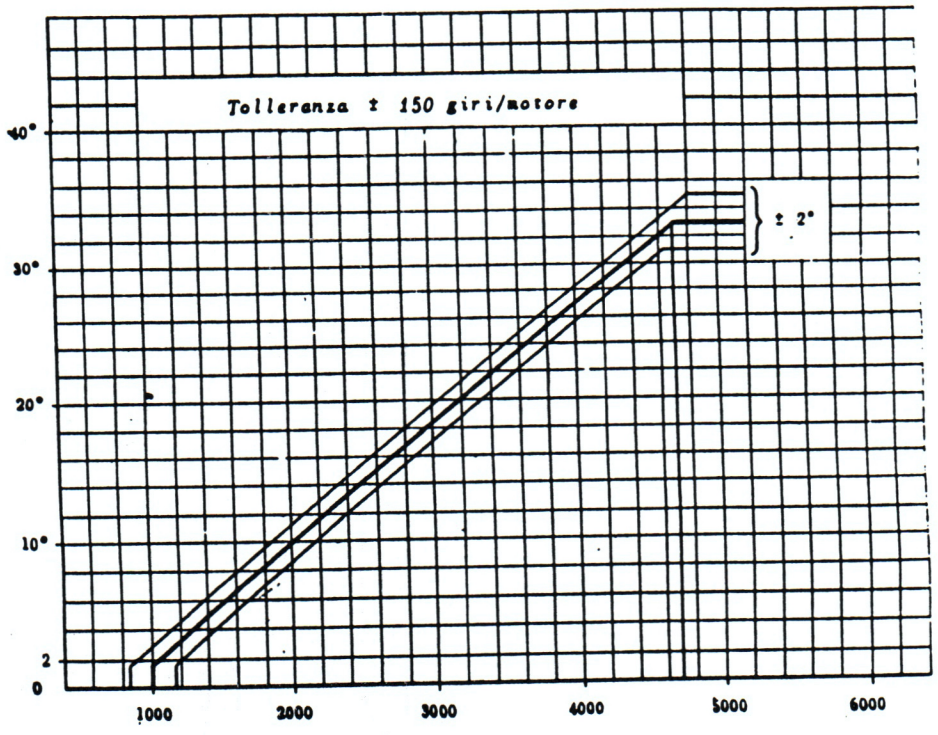
Tolerance (+-) 150 R.P.M.



Illus. 2

Engine automatic advance variation

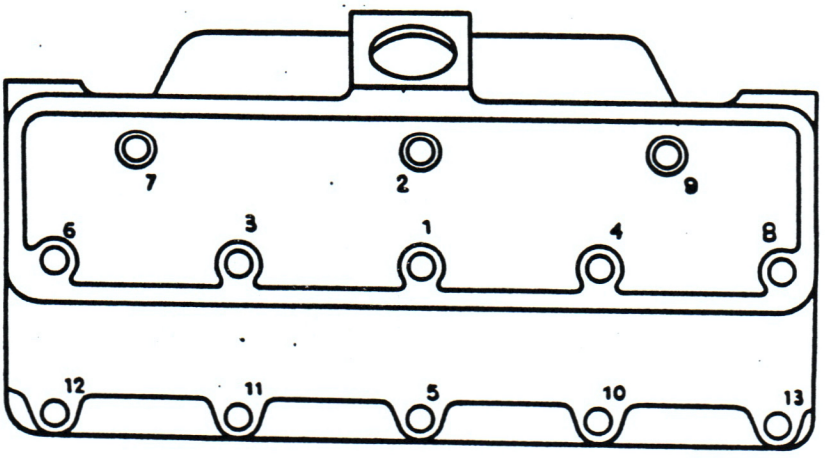
Tolerance (+-) 150 R.P.M.



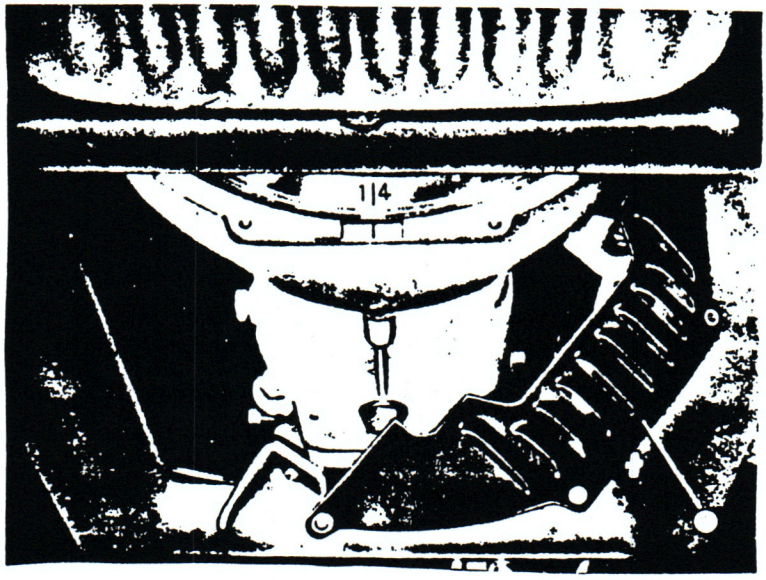
Degree of Engine Advance

Engine revolution per minute

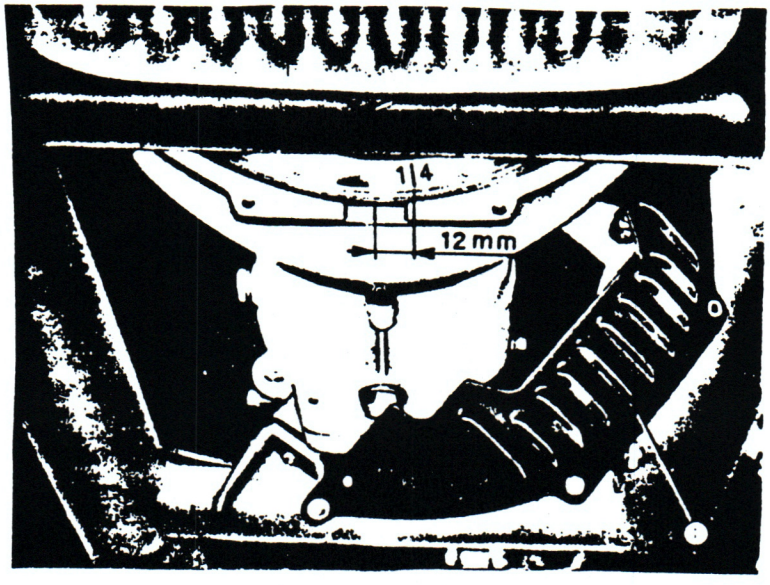
Illus. 3



Illus. 4

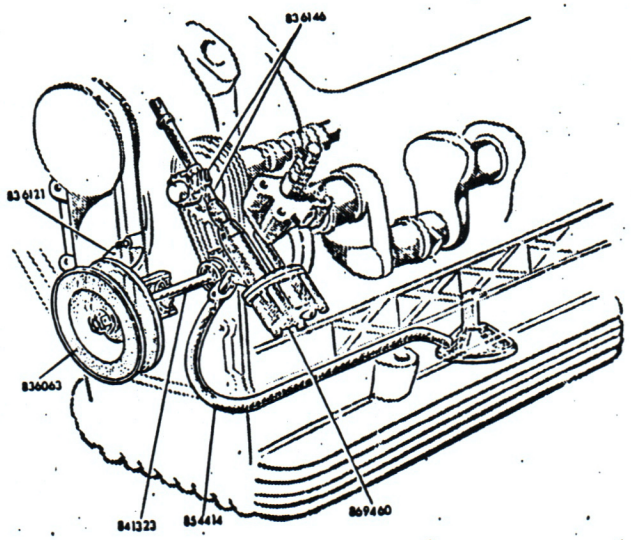


Illus. 5



MODEL 8 V

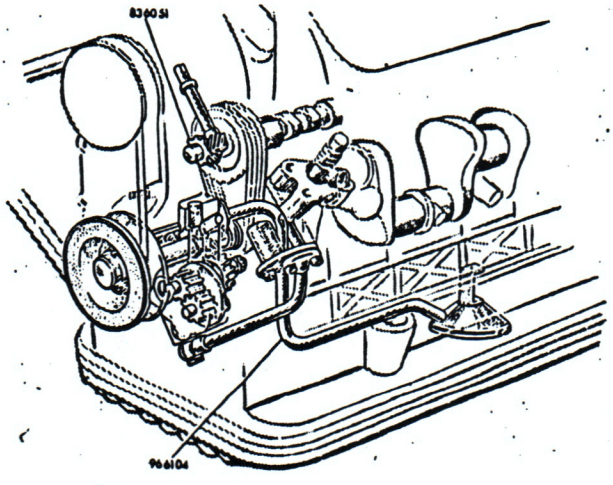
Illus. 1



Illus. 2

Oil Pump installed on the cover of crankcase

For racing purpose, on request, an oil pump will be installed on the front cover of the crankcase, and will be directly operated by the crankshaft.



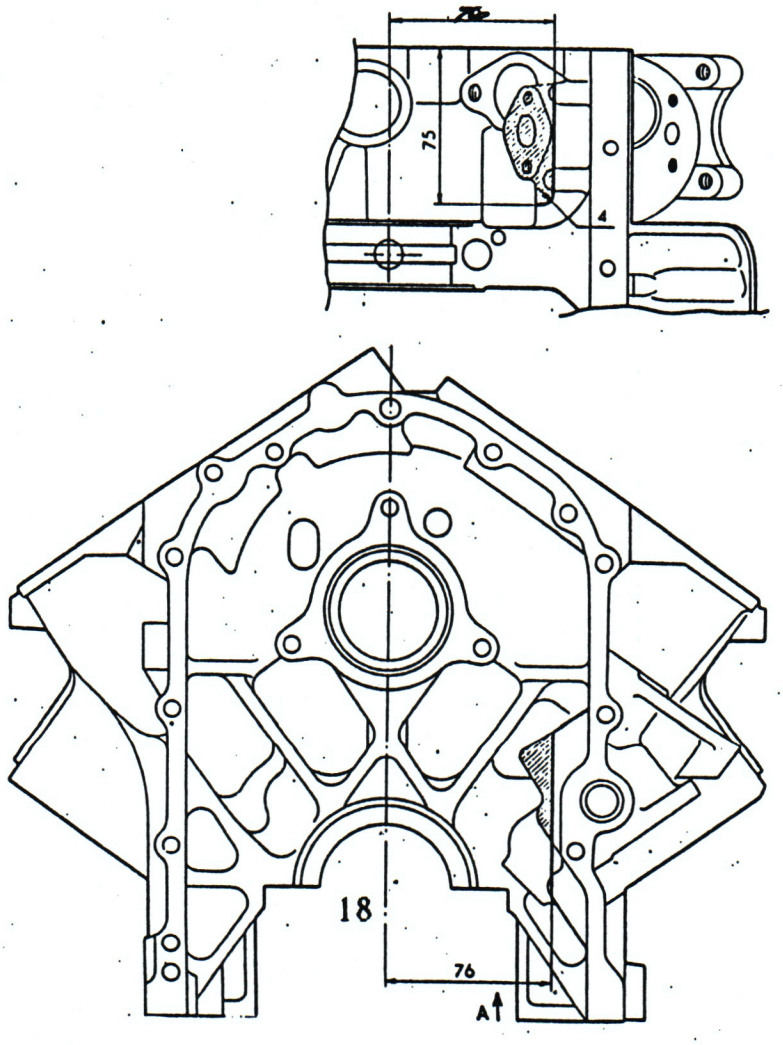
To install it is necessary:

a) eliminate the following parts: Illus. #1: oil pump 869460, pump driving gear and engine speed indicator 836146 including the gear, joint and pin, complete of filter assembly intake of oil pump 854414, crankcase front cover, control shaft for fan, and generator 841323, with its bearings and cover gasket, control lever for fan, and generator 836063.

b) make changes to the crankcase: remove the parts outlined in illus.#3 · which are: the oil filter assembly flange for oil pump intake 854414 and part of the support, inside the crankcase, of pump 869460, in order not to have any interference with the new filter intake hose set up.

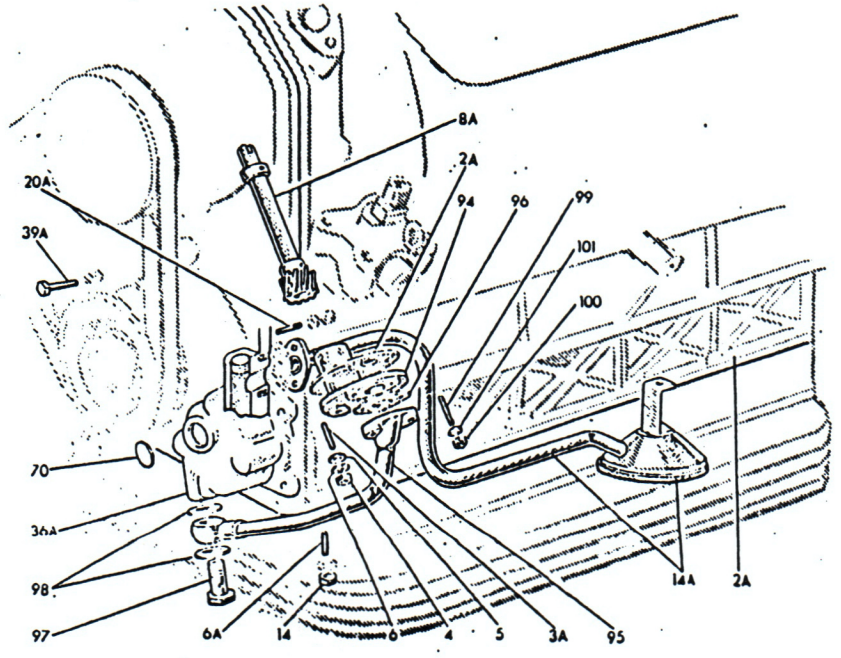
c) install the parts shown on illus. #4, 5, & 6.
After the installation, the gear 836051 drives only the distributor for the start and the engine speed indicator, illus. #2.

illus. 3



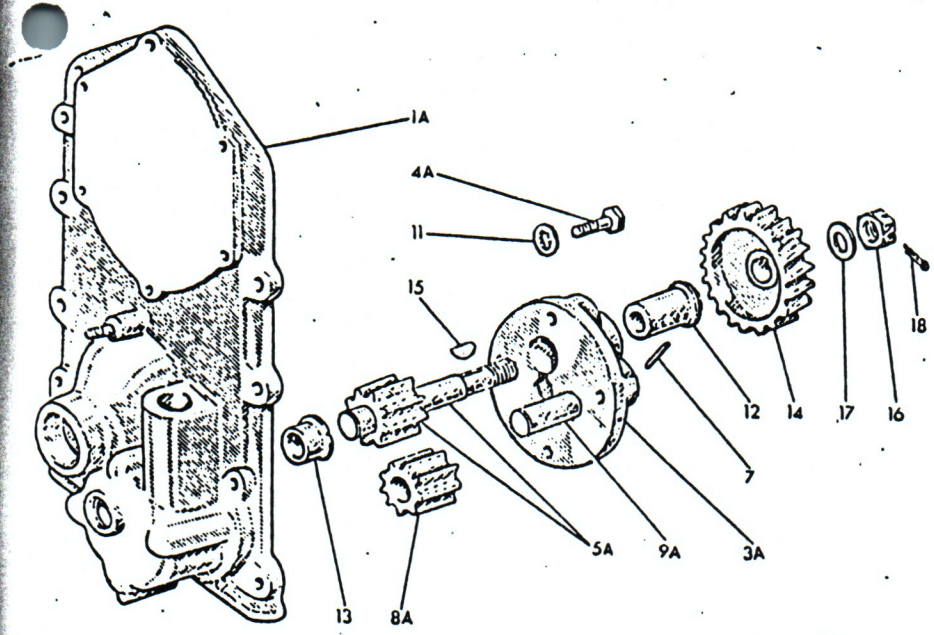
INSTALLATION OF THE OIL PUMP AND ITS TUBES ON THE ENGINE illus.4

Sgr.	Ill.	Order N. (for engine with oil pump in the front	Quant.	DESCRIPTION	Order N. (for engine with oil pump on the left side	Quant.
1	--	966576	1	Engine Assembly	858175	1
	2A	966084	--	Complete crankcase (with crank-shaft bearing caps & dist. bushing)	853727	1
	36	---	--	Front cover for crankcase	866508	1
	36A	966087	1	Front cover for crankcase & oil pump assembly		
	39A	Nr 9032	1	Cover Fastener Screw	Nr 9027	1
	70	Nr 1587	1	Cap & Expandable Dia. Cap = mm 18 for front cover		
2	6A	Nr 15004	1	Stud Bolt for fastening of the sump to the front cover of the crankcase	Nr 9027	1
	14	Nr 58962	1	Bolt for screw	--	

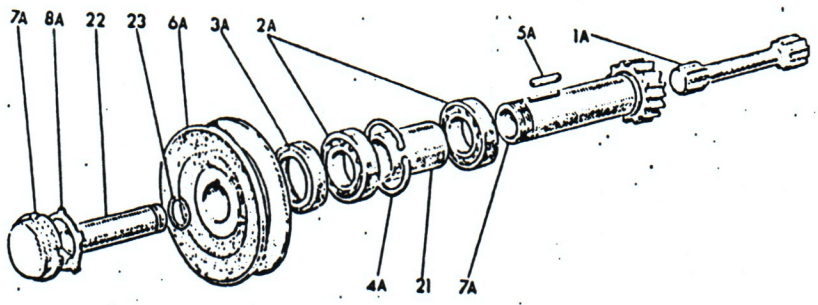


Sgr.	Ill.	Order N. for engine with oil pump in the front	Quan.	DESCRIPTION	Order N. for engine with oil pump on the left side	Quan.
16	--	---------	--	Complete Oil Pump	869460	--
"	2	---------	1	Gasket for oil pump support	836144	1
"	2A	966103	1	Gasket for cover of main line control	---------	--
"	3	---------	--	Stud bolt for assembly of the pump to the crankcase	Nr 24307	4
"	3A	Nr 24296	--	Stud bolt for cover fastener	----------	--
"	4	Nr 17016	2	Bolt for screw	Nr 17016	4
"	5	BS 390574	2	Shared washer for bolt	BS 390574	4
"	6	Nr 26055	2	Elastic washer for bolt	Nr 26055	4
"	7	---------	--	Gear control for tachometer	836139	1
"	7A	966092	1	Gear for oil pump control (See illus. #6)	----------	--
"	8	---------	--	Gear shaft for oil pump & tachometer control	836146	1
"	8A	887630	1	Gear shaft for tachometer	----------	--
"	14A	966104	1	Complete assembly for filter of intake for oil pump	854414	1
"	20A	Nr 15001	2	Stud bolt for fastening unit to the crankcase front cover	Nr 9801	2
"	94	966102	1	Crankcase cover for control of main oil duct	--------	--
"	95	966438	1	Complete tubing from the oil pump to the crankcase	--------	--
"	96	966441	1	Gasket for flange of the pipe of the pump to the crankcase	--------	--
"	97	Nr 1826	1	Filler cap for adjustable unit for the pipe from the oil pump to the crankcase	-----	--
"	98	Nr 2633	2	Filler cap gasket	---------	--
"	99	Nr 24299	2	Stud bolt for fastening of the cover of oil pump, & pipe from oil pump to the crankcase	--------	--
"	100	Nr 17016	2	Bolt for screw	----------	--
"	101	Nr 26055	2	Elastic washer for bolt	----------	--

Sgr.	Ill.	Order N. for engine with oil pump in the front	Quant.	DESCRIPTION	Order N. for engine with oil pump on the left side	Quant.
17	1	---------	--	Oil pump casing	836187	1
"	1A	966087	1	Front cover for crankcase & oil pump casing	---------	--
"	2	---------	--	Gasket for oil pump casing	836143	1
"	3A	966091	1	Oil pump cover	--------	--
"	3	--------	--	Oil pump support	836138	2
"	4	--------	--	Screw for fastening the support	Nr 3521	2
"	4A	Nr 11004	2	Screw for fastening oil pump cover to the front cover of crankcase	---------	--
"	4A	Nr 11006	2	"	---------	--
"	5A	887427	1	Oil pump control shaft complete with driving shaft	844279	1
"	6	----------	--	Joint for driving shaft of oil pump & tachometer	836147	1
"	7	----------	--	Cylindrical pin for connection of joint to the shaft	Nr 3326	1
"	8A	887418	1	Oil pump driving gear	844277	1
"	9A	887419	1	Driving shaft for oil pump gear	844278	1


1A
4A
11
15
18
12
14
17
16
7
5A
9A
3A
13
8A

– Fig. 6


7A
8A
22
23
6A
3A
2A
5A
1A
4A
21
7A

Sgr.	Ill.	Order N. for engine with oil pump in the front	Quant.	DESCRIPTION	Order N. for engine with oil pump on the left side	
17	11	Nr 26055	4	Elastic washer for screw	----------	--
"	12	887425	1	Front bushing for driving shaft gear of oil pump	----------	--
"	13	887426	1	Rear bushing for driving shaft gear of oil pump	----------	--
"	14	966090	1	Driving gear for oil pump control	-----	--
"	15	Nr 2057	1	Disk tongue for driving shaft gear control of the oil pump	-----	--
"	16	Nr 7931	1	Nut for fastening of the gear driving control of the oil pump	-------	--
"	17	Nr 26386	1	Flat washer for nut	-------	--
"	18	Nr 7344	1	Split-pin for nut	-------	--

OIL PUMP AND FAN DRIVING GEAR (illus. #6)

Sgr.	Ill.	Order N. for engin with oil pump in the front	Quant.	DESCRIPTION	Order N. for engine with oil pump on the left side	Quant.
22	1A	-------	--	Shaft for driving pulley of the vent and generator	842323	1
"	1A	966093	1	Joint shaft for driving gear control of oil pump	--------	--
"	2	--------	--	Shaft ball bearing	Nr 88689	1
"	2A	966095	2	Ball bearing for oil pump driving gear	Nr 88696	1
"	3	--------	--	Front crankcase gasket for driving-shaft housing for fan & generator control	836035	1

Sgr.	Ill.	Order N. for engine with oil pump in the front	Quant	DESCRIPTION	Order N. for engine with oil pump on the left side	Quant.
22	3A	966086	1	Front crankcase gasket of driving shaft housing for generator in oil pump control	---------	--
"	4A	Nr 10600	1	Elastic safety ring	Nr 10599	1
"	5	-----	--	Disk tongue for fastening of the pulley to the shaft	Nr 2058	1
"	5A	Nr 5518	1	Straight tongue for fastening pulley to the shaft	----------	--
"	6A	966110	1	Driving pulley complete with fan & generator control	836083	1
"	7A	966109	1	Fastening nut for pulley control of the vent & generator	836066	1
"	8	--------	--	Flat washer for nut	836067	1
"	8A	Nr 29480	1	Safety washer for nut	----------	--
"	9	--------	--	Split pin for nut	Nr 7346	1
"	21	966094	1	Spacer for gear bearing control shaft of oil pump	--------	--
"	22	966096	1	Seal ring for holder of oil pump driving gear control	--------	--
"	23	966097	1	Seal ring for holder of the oil pump driving gear control	--------	--

Cylinder Head

The torque for the bolts for the fastening of the cylinder head is of kgmm. 6.2000. The bolt should be done in 3 phases as follows: 1) with a torque of 3.000 kgmm., 2) with a torque till 6.200 kgmm. by going over two or three times all the nuts, checking that they have been tightened with the same torque, 3) after one or two hours check again how tight the nuts are, and retighten any bolts that are loosened. The order in which the nuts have to be tightened is indicated in the illustration that has been included.

Engine crankcase & cylinder liners

According to the distance between the cylinder head and cylinder lining the crankcase of the engine are selected in three different classes: Ax, Bx. Cx. These classes differ one from the other by mm.0.01. The letter which distinguishes the class is marked with a chemical ink on the edge in the upper part where the cylinder head rests.

According to the diameter of the valve tappets housings, the crankcases are divided into two different classes: A and B. These two classes differ one from the other by mm.0.01. The letter which distinguishes the class is marked with a chemical ink on the edge in the upper part where the cylinder rests.

The cylinder lining is selected according to three classes: Ax, Bx, Cx according to the distance between the cylinder head and the cylinder lining in the crankcase according to the upper cylinder head rest. These classes differ one from the other by mm.0.01. The letter which distinguishes the class is printed on the outside edge of the upper support.

The tappets are divided into two classes A and B according to the outside diameter. The classes differ one from the other by mm.0.01. The letter which distinguishes the class is imprinted with a chemical ink on the outside of the valve tappets.

The assembly of the cylinder lining on the crankcase of the engine has to be done in such a manner that the lining and its housing have the same letter imprinted.

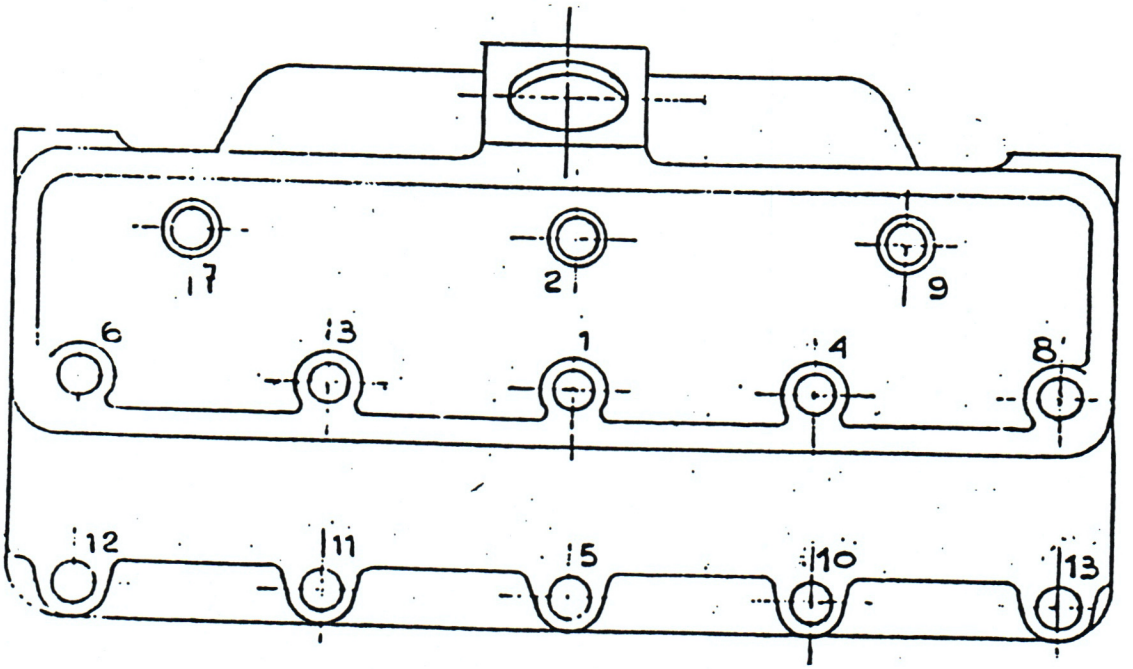
By doing so, the overhanging from the upper part of the liners from the upper section of the crankcase (as a result of the tolerance of the thickness of the lower part of the liner) should be of mm 0.15 (+ -) 0.02 mm.

The assembly of the valve tappets to the crankcase of the engine should be done in such a manner that the tappets and its housing in the crankcase have the same letter imprinted.

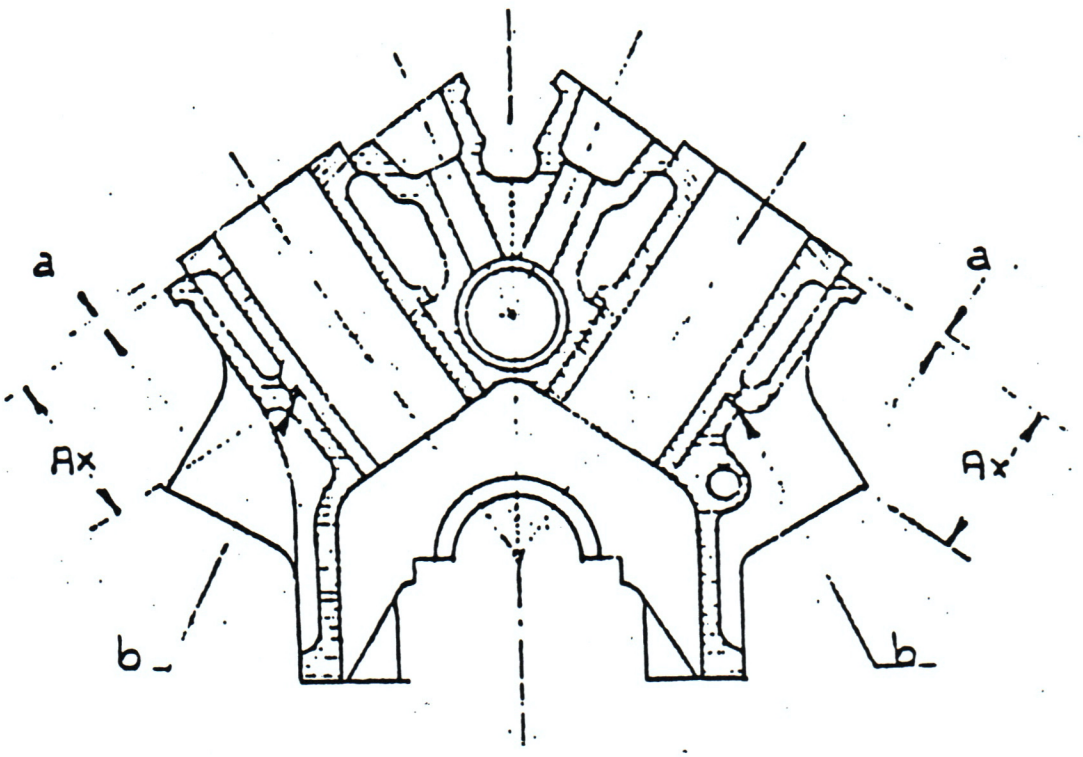
The adjustment between the valve tappets and their housing should have a play of 0.010-0.032 mm.

DIAGRAM OF TIGHTENING OF THE CYLINDER HEAD

Order of cylinder head closing



ASSEMBLY OF CYLINDER LINERS ON THE CRANKCASE OF THE ENGINE



RULES:

The assembly between the crankcase and cylinder liners should be done in such a manner that the overhanging "a" of the plane of the lining is of mm.0.15 (+-) 0.02 after installing the lower gasket "b" of mm.0.5 with a tolerance of (+-) 0.01.

Valves

The valves are divided in three classes: A, B, and C according to the diameter of the stem, and differ one from the other by mm. 0.005. The letter which identify the class is stamped with a chemical ink on the right side of the valve head.

The lining for the intake and exhaust valve which had been installed on the cylinder head and after being finished are selected according to the inside diiameter, in three classes: A, B. C which differ one from the other by mm. 0.005. The letter which identify the class is imprinted on the lower section of the cylinder head in an area does not involve the gasket with the cylinder head.

The assembly of valves in the valves housing should be done in such a manner that the valve and its guide are marked with the same letters.

The adjustment between the guides and the valves should have a play of mm. 0.033-0.043.

Flywheel Adjustment

Rotating the flywheel, with assembled crown, the indicator placed on the outside should not register variations greater that mm. 0.2.

Rotating the flywheel with the indicator placed on the side towards the crankshaft at a distance of 80 mm. from the axle of rotation should not register variations higher than mm 0.025. With the indicator placed on the face of the anular of the clutch side should not register variation higher than mm 0.025.

The torque of the screw that seembles the flywheel to the crankshaft should be of 7.000 kg.

When overruling the engine, the flywheel should be placed on the crankshaft in a way that the mark engraved on the lower part of the flywheel (on the side to the hole of the crankshaft) with the reference mark engraved on the crankshaft.

Engine Timing

In order to set up the timing of the engine while the flywheel is uncovered (exposed), it is necessary to turn the flywheel in such a way that the reference mark 1/4 which is engraved on the exterior, is even with the mark which is engraved on the plate which attaches the engine to the gearbox.

Under these conditions, the pistons of cylinders #1, and #4 are at the higher dead point.

In order to set up the timing of the engine while the flywheel is covered, it it necessary to remove the cover of the gearbox, which covers the lower part of the flywheel (on the engine's side) and turn the flywheel till the mark (reference point) 1/4 which is engraved on the front of the face of the flywheel, is even with the reference point engraved on the lower part of the gear box. Under these conditions, the pistons of cylinders 1 and 4 are located exactly at highter dead point.

Adjusting the distributor with a play of mm 0.375 between the flywheel and the valve rocker (without preloading the control of the valve), the timing should be within the following limits:

Opening of intake	14 degree - 7 degree	before P.M.S
Closing of intake	30 degree - 40 degree	after P.M.I.
Opening of exhaust	41 degree - 34 degree	before the P.M.I.
Closing exhaust	3 degree - 13 degree	after the P.M.S.

NOTE: P.M.S.: Upper dead point; P.M.I.: Lower dead point

The final adjustment of the play between valves and rockers has to be of mm 0.15 for the intake, and mm 0.25 for the exhaust, while the engine is cold.

Distributor shaft and its bearings

The play between the pins of the distributor and its bearings should be as follows:

	.0012"- .0042"
front and central support	mm 0.030-0.106
rear support	mm 0.025-0.089
	.001"-.0035"

PISTONS AND CONNECTING RODS

The pistons are divided in three classes 1, 2, and 3 which have a hole diameter of the cylinder's pin which differs mm 0.004 one from the other. The number which identify the class is engraved on the top of the piston.

The piston's pins are divided in three classes 1, 2, and 3 and they have a diameter which differs mm 0.004 one from the other. The number which identify the class is imprinted with a chemical ink on the exterior of the pin.

The connecting rods are divided into two classes A, and B according to their weight; the difference between one class and the other is of 20 grams: the letter which identify the class is marked on the stem.

On the same engine are installed connecting rods which are of the same class and is allowed a tolerance of 3 grams.

The connecting rods are further divided into three classes 1, 2, and 3 according to the diameter of the eye of the connecting rod: between one class and the following class the difference in the diameter is of mm 0.004. The number which identify the class is imprinted on the stem below the eye.

For assembling the connecting rods, the pistons and their pins are selected with connecting rods of the same class, and for each connecting rod a pin is chosen, and then the correct piston is selected, in such a way that it is of the same class as the eye of the connecting rod.

In installing the connecting rods to the pistons, the number imprinted on the side of the connecting rod and of the cap should be on the opposite side of the niches for the valves which are on the top part of the piston. In assembling the connecting rods in the cylinder liners, you have to make sure that the number imprinted on the connecting rod and the cap matches the number of the cylinder (a number which was obtained during the casting of the crankcase) and is located on the outside of the crankcase itself. The niches of the valves, on the top of the piston faces the center line of the engine.

The torque for fastening the bolts that connects the connecting rod and the cap is of kg 4.100.

Following the instructions given the fit should be as follows:
Connecting rod eye - piston pin, play mm 0.001 - 0.009
Piston pin - piston, interference mm 0.009 - 0.017
Piston cylinder lining, play mm 0.13 - 0.16
Connecting rod - crankshaft, play mm 0.058 - 0.096

Crankshaft and main bearings

Examining the crankshaft while being supported at the two ends by tailstocks:

a) the maximum ovality for each main bearing should be of mm 0.02
b) each pair of rod pin of the same axle should be parallel to the engine axle with a maximum tolerance of 0.02..
c) the distance between the main bearings and the outside of the rod bearings should have a maximum tolerance of (+ -) 0.025.
In installing the crankshaft in the crankcase this should be kept into consideration:

In the crankcase, the housing for the front middle and rear support caps are marked with a number for the position (1 for the front housing, 2 for the middle housing, and 3 for the rear housing) and by a letter according to the width of the housing itself (class A, B, C, D, which differ one from the following by 0.010 mm). The number that identifies each type of housing, followed by the letter which identifies the class of the width of the housing is marked on the lower section of the crankcase against which rest the oil sump.

The caps for the front middle and rear supports of the crankshaft are marked and selected according to their type (1 front, 2 middle, 3 rear) and according to the width (class A, B, C, D, which differ one from the following class by mm 0.010). The number that identifies its type and the letter that identifies the class to which it belongs according to their width, are marked on the side of the cap.

In assembling the caps to the crankcase, it is necessary to choose the caps according to the number and to the letter marked on the crankcase for each of the supports. The caps should be installed in their proper housings in the crankcase in order to make it possible for the six numbers and the six letters which identify them are on the same side.

The stud bolt that fastens the supports of the crankshaft should be tightened with a torque of kg 12.200.

Operating in the manner indicated earlier, the assembly between their housings and their caps have a play of 0.000-0.020 mm and between the crankshaft and its supports a play of 0.059-0.096 mm.

Fan and Water Pump

The lower angle formed by the blades which are fastened on the spoke should be of 70 degree (+ -) 1 degree. The external profile of the blade should be within a tolerance of (+-) 0.3 mm with respect to the theoric profile which will result in a projection on a normal axle parallel to the axle of the two. The maximum static unbalance allowed to the fan should be of 20 g. mm.

In assembling the fan wheel on the water pump, check the play between the pump and the blades of the wheel. The play should be within the range of 0.8 - 1 mm. The play between the rear turning area and the support point where the pump lodges on the cover should be in a range of 0-0.2 mm.

In installing the bearings and the shaft on the water pump, make sure to fill the area between the water pump casing and the two bearings with the grease type FIAT GCS 31.

Lubrication System

Before installing the oil filter on the engine, it has to be carefully cleaned with "Persil" at about 80 degree centigrades and finally blown with compressed air.

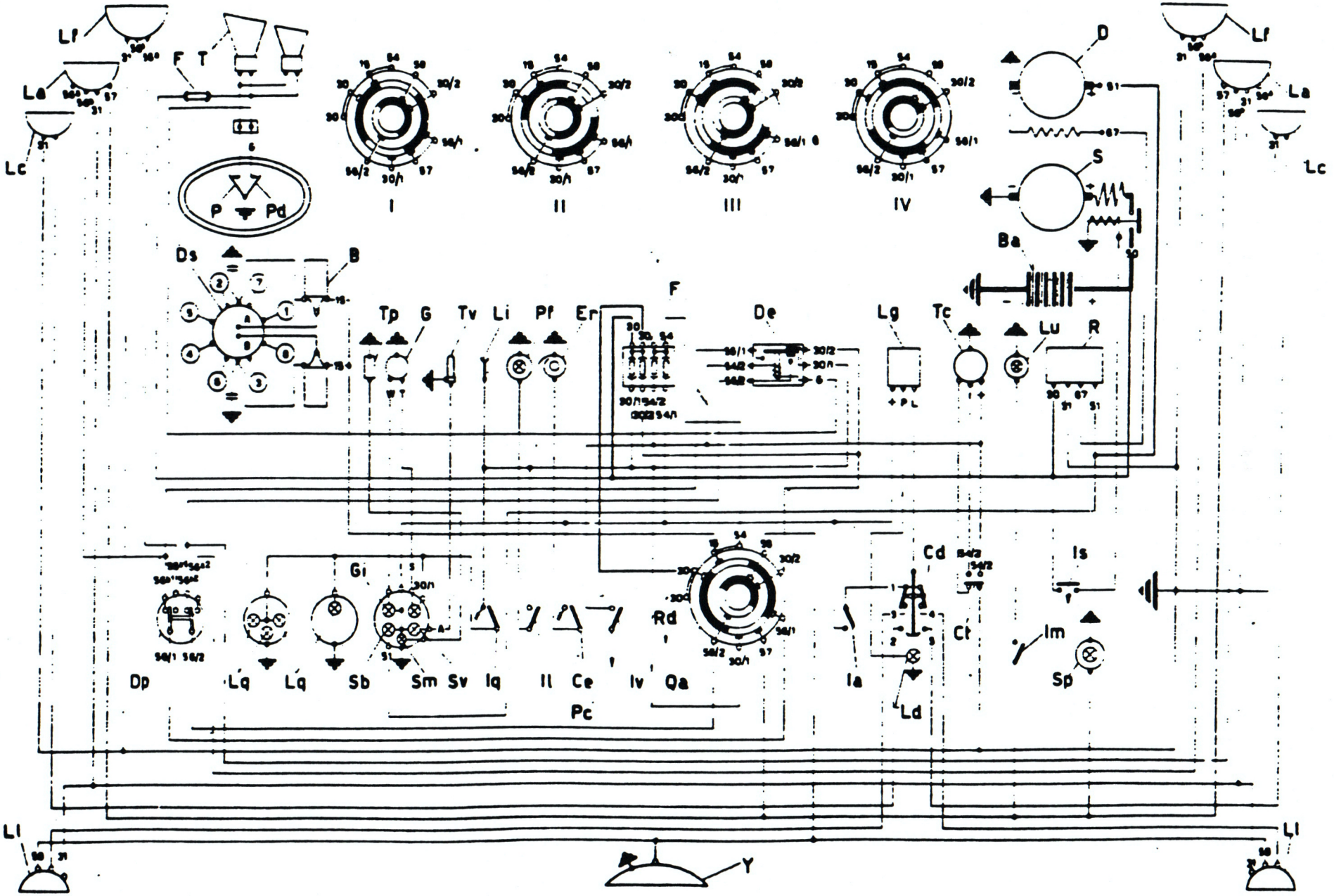
An identical cleaning treatment should be done to the hoses.

Engine oil pressure m.H20 50.

Location of the switch for outside lights

Illus. 6 Diagram of the electrical system.

B. Strarter Coils
Bb. Battery
Cd. Switch for the control of the turn-signal lights
Ce. Switch, with speed regulating rehostat, for the electric fan.
Ct. Windshield wiper switch.
D. Generator.
De. Electromagnetic switch, for low beam lights.
Dp. Pedal switch for high beam or low beam lights.
Ds. Coil ignition.
Er. Electric fan.
F. 8 A fuse for the electrical system.
G. Control switch for the fuel gauge.
Gi Fuel gauge, with warning light for low fuel level.
Ia Tail light switch for brake.
Il. Switch for interior light.
Iq. Switch with speed regulating rehostat, for the dashboard.
Is. Starter switch.
Iv. Switch for a possible additional electric pump, and for low fuel light.
La. Lights for low beam.
Lc. Front parking and direction lights.
Ld. Electric indicator for the operation of the turn signals.
Lf. High beam lights.
Lg. Winking light for turn signal.
Li. Outlet for inspection light.
Ll. Tail lights for parking lights, turn signals, brake and reflectors.
Lq. Light bulbs for indirect lighting of the control switches.
P. Push-button for horn.
Pb. Possible additional electric pump, and for the low fuel light.
Pd. Pressure ring for low beam lights.
Pf. Interior light bulb.
Qa. Switch for outside light and starter.
R. Generator regulator.
Rd. Possible radio.
S. Starter
Sb. Warning for low charge of the generator to the battery.
Sp. Warning light for parking lights.
Sv. Warning light for dangerous temperature of water for cooling system.
T. Electric Horn
Tc. Windshield wiper switch.
Tv. Thermometer, with electric switch, on the water radiator.
Y. License plate light.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