



I. REPAIR

Manual

STEYR-DAIMLER-PUCH OF AMERICA CORP.

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SECTION I

LUBRICATION AND MAINTENANCE

LUBRICATION AND MAINTENANCE

ROUTINE MAINTENANCE SCHEDULE:

The general and periodic maintenance required for the MAGNUM X is clearly described in the following pages, and should be performed at the mileage (hourly) intervals shown in the following chart.

LUBRICATION AND MAINTENANCE CHART

LUBRICATION AND MAINTENANCE CHART

The following periodic maintenance can be carried out at home.

Pre-riding check list	After 300 mi. (20 hours)	After 600 mi. (40 hours)	Job Description
●	●	●	Check front and rear wheel brake, adjust if necessary
—	●	●	Check spark plug and clean
—	—	●	Clean carburetor, fuel cock and fuel line
●	●	●	Check air cleaner, clean if necessary
●	●	●	Check chain tension
—	●	●	Lubricate chain
—	—	●	Check the chain and sprockets for wear
●	●	●	Check cables
—	●	●	Grease chassis parts
—	●	●	Check transmission oil level
●	●	●	Check bolts and nuts for tightness*)
●	●	●	Check tire pressure
●	●	●	Check position of inflation valves
●	●	●	Check wheels and tires, spokes for tightness
—	—	●	Check steering bearing
—	—	●	Decarbonize the engine
—	—	●	Decarbonize exhaust
—	—	●	Check hub bearings, replace if necessary
—	●	●	Check oil in transmission

*) Retighten cylinder head nuts every 5 operating hours.

LUBRICATION AND MAINTENANCE

RECOMMENDED LUBRICANTS

GASOLINE-OIL MIX

- 1) Mixture of regular gasoline (leaded).
- 2) Mixture ratio 50 : 1 with special two stroke oil.

TRANSMISSION FLUID

7,44 oz (220 cc) Automatic Transmission Fluid, Type "F".

MACHINE LUBRICATION

GREASE (TYPE) LUBRICATION

Lithium base grease

OIL (TYPE) LUBRICATION

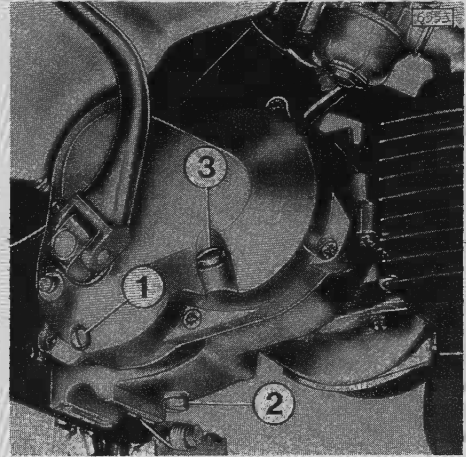
SAE 90

LUBRICATION AND MAINTENANCE

LUBRICATION

CHANGING THE TRANSMISSION FLUID

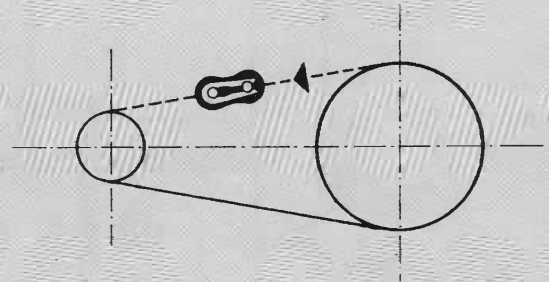
Warm engine up. Remove fluid level plug (1) and drain plug (2). Incline machine somewhat to the right so that the fluid may escape entirely. Through the filler hole (3) fill approx. 7.44 US-oz.fl. (220 cc) of Automatic Transmission Fluid (Type "F" only). If the fluid level is correct, refit plug and filler plug. At any oil change clean oil drain plug from metal chips.



Cleaning and oiling the chain

CAUTION: ENGINE SHOULD NOT BE RUNNING.

The long life of chains depends to a great extent on care and maintenance. Chains should always be cleaned and lubricated regularly. Never ride with a dry chain. When refitting the chain, take care that the tension is correct and the connecting link is properly placed — with the closed end pointing in the direction of chain travel.



Greasing cycle parts
By means of lubricating grease

Front and rear wheel bearings.
Steering head bearings.

LUBRICATION AND MAINTENANCE

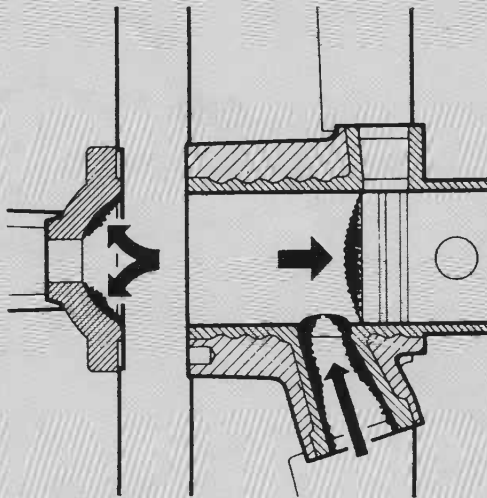
By means of oil
Brake adjusting screw on front and rear wheel.
Chain tensioning screws.
Working surfaces of both brake levers.
Side stand bearing.
Foot rest bearings.
Drive chain.

MAINTENANCE

Please contact an authorized PUCH Service Center for work you do not wish to carry out yourself. The agent will be pleased to advise and help.

Checking spark plugs

Unscrew spark plug, connect to high tension lead and place plug body to ground, for instance on the cylinder head. A strong spark must be visible between the spark plug electrodes when operating the starter. Oiled up plugs or dirty electrodes do not spark and must be cleaned first with a piece of wood or a steel wire brush. Fit only replacement plugs having the recommended heat value (see technical data).



MAINTENANCE

Decarbonizing the engine

Carbon deposits on the cylinder head, piston crown and in the exhaust ports are normal with all two-stroke engines and can eventually lead to trouble if not removed in time. Combustion deposits from oil as well as from fuel must therefore be removed regularly.

Cylinder head and piston crown

Carbon deposits on the cylinder head and piston crown should be removed only with a soft, blunt edged instrument to avoid damage to the light alloy casting. Scratching should be avoided since every new scratch will harbour more carbon in future use.

Only scally deposits need be removed from the piston crown, there is no need to disturb the piston if it is covered only by a uniform layer of oil carbon. Before refitting the cylinder head, thoroughly remove all carbon deposits and scrapings from the cylinder wall with a nonfraying soft cloth and smear the surface lightly with motor oil. Before assembly, turn over the engine a few times to make sure it runs easily. Then clean the jointing surfaces with a clean rag. Tighten the four cylinder head nuts crosswise 7 ft/lb (10 Nm).

LUBRICATION AND MAINTENANCE

Exhaust port

In order to clean the exhaust port, remove the exhaust pipe. By cranking, turn the engine over (with the spark plug removed to reduce compression) until the piston reaches its lowest point. Remove the oil carbon from the exhaust port. Cautiously take care not to damage the piston or cylinder working surfaces.

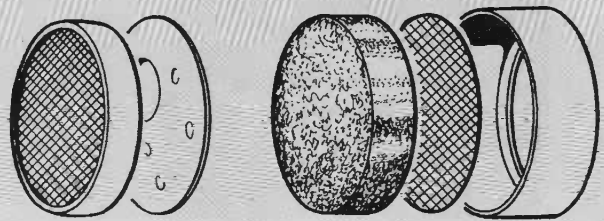
Cleaning the air cleaner

Remove the right hand engine shroud. Undo retaining strap from rear of carburetor and remove filter. Clean filter with gasoline or similar cleaning material, blow completely dry with compressed air and spray filter element lightly with engine oil. Replace by reversing removal steps.

Cleaning the fuel pipes and lines

Empty fuel tank.

Pull the fuel pipe from the fuel valve and carburetor and blow it clear. Unscrew the fuel valve. Clean the valve and strainer by means of gasoline.

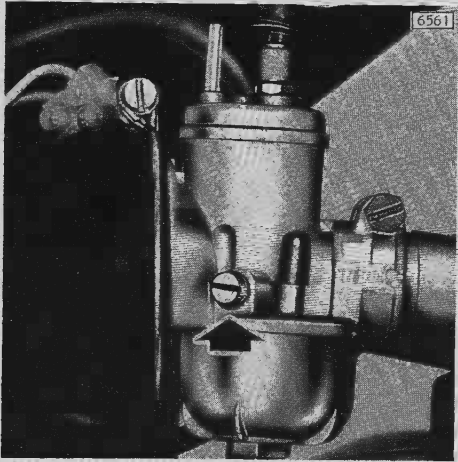


Cleaning the carburetor

Cleaning the main jet, needle jet and float chamber.

- 1) Close the fuel valve.
- 2) Remove the right hand engine shroud.
- 3) Remove the air cleaner.
- 4) Loosen carburetor clamping screw.
- 5) Pull the fuel pipe from the carburetor.
- 6) Remove carburetor from the intake manifold.
- 7) Undo top cover screws and pull out the top parts with throttle piston and choke.
- 8) Screw off the float chamber.
- 9) Unscrew the main jet, being located in the needle jet, and clean by blowing through or by using a stiff bristle. Never use a piece of wire. Also, unscrew needle jet and clean.
- 10) Clean the float chamber with gasoline.
- 11) Wash carburetor body and blow through. Make sure that the bores are not clogged with dirt.
- 12) When refitting the jets, tighten them properly.

LUBRICATION AND MAINTENANCE

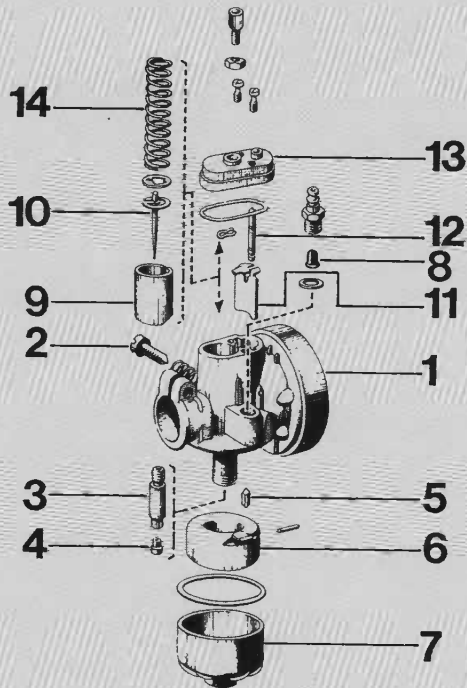
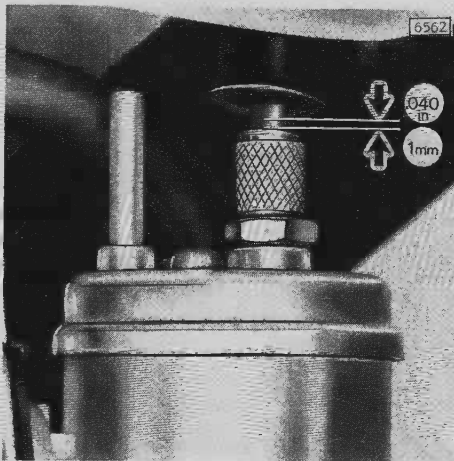


Adjusting the idling speed

- 1) Warm up the engine.
- 2) Completely close the twist grip (throttle down).
- 3) If the engine threatens to stall, screw in the adjuster (see arrow) until the engine, in warm condition, regains its even tickover.

Now, with the idling adjusted, adjust the play of the throttle control cable.

- 1) Loosen counter nut of the cable adjuster.
- 2) Screw counter nut of the cable adjuster until there is a play on both the throttle cable and the throttle twist grip. The cover of the throttle cable can be pulled out from the cable adjuster by appr. .040 in. (1 mm), before the throttle slide is lifted, i. e. before the engine starts running faster.
- 3) Maintain position of the adjuster and tighten the counter nut.



Exploded view of the carburetor

- 1 Carburetor body
- 2 Throttle slide stop screw
- 3 Needle jet
- 4 Main jet
- 5 Float needle
- 6 Float
- 7 Float housing
- 8 Fuel strainer
- 9 Throttle slider
- 10 Jet-needle
- 11 Choke valve
- 12 Choke lever
- 13 Top cover
- 14 Slide spring.

LUBRICATION AND MAINTENANCE

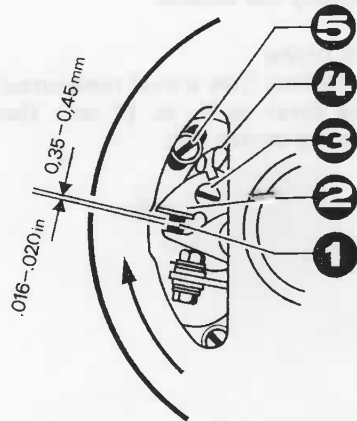
Checking the ignition system

Ignition timing

The engine will reach maximum output if the ignition is correctly adjusted. This is a very specialized operation and should be left to your service agent.

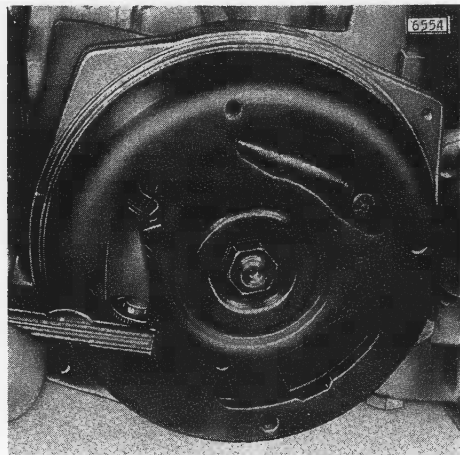
For correct ignition timing, the following points should be taken into account:

- 1) breaker point gap.
- 2) Firing point.



Check and adjust the gap through the windows in the flywheel magneto (after removing the cover). When adjusting the breaker gap (1) loosen the fastening screw (3) enabling the anvil (2) (fixed contact) to be removed. For readjusting the position of the anvil, put a screwdriver into the setting seat (4). If the gap has been altered, it is necessary to check the ignition point.

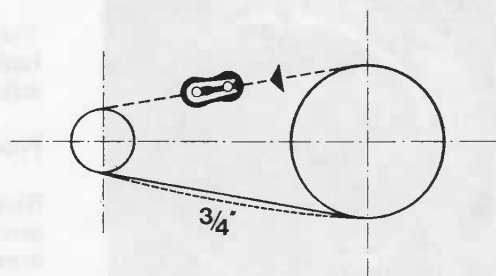
For correct adjustment of the ignition timing see Section IV, page 42.



Checking drive chain tension

The proper slack of the chain midway between the sprockets should be $(\frac{3}{4} \text{ in.})$ about 2 cm.

To readjust the chain, loosen both axle nuts and tighten both chain adjusters uniformly. This procedure enables the back wheel to be kept in track. Retighten both axle nuts.

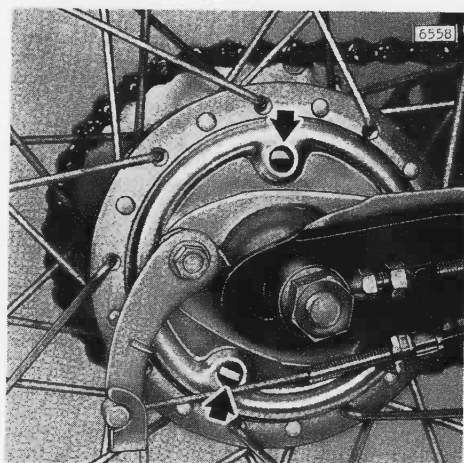
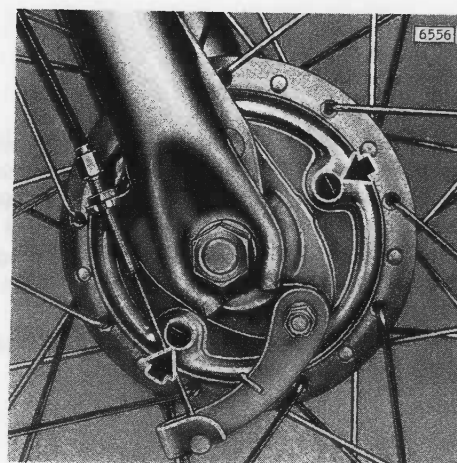
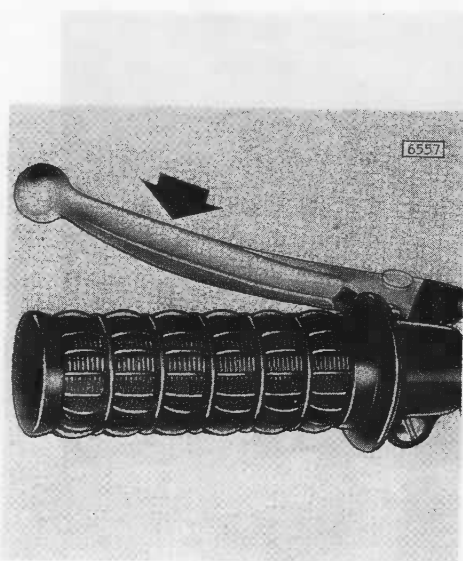
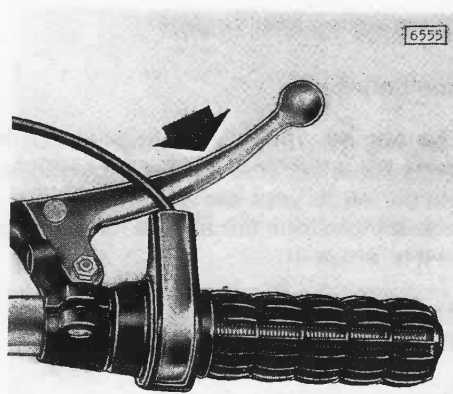


LUBRICATION AND MAINTENANCE

Checking the brakes

Front brake

The correct free travel measured at the end of the hand-brake lever is $\frac{3}{4}$ in. (2 cm). Readjust by means of the adjusting screw (A).



Rear brake

The correct free travel (measured at the end of the handbrake lever) is $\frac{3}{4}$ in. (2 cm). Readjust by means of the adjusting screw (B).

Front and rear brake linings

Remove the rubber plugs from the inspection holes (see arrows) and insert a flat feeler gauge between the brake drum and the brake lining. The gap should not exceed .050 in. (1.2 mm) at either inspection hole. If it does, the brake linings must be replaced. Disconnect cable before measurement is taken.

LUBRICATION AND MAINTENANCE

REMOVING THE FRONT WHEEL

Undo flexible speedo shaft at the speedometer drive.

Remove cable adjuster (1) and disengage brake cable. Unscrew both axle nuts (2).

Remove the wheel.

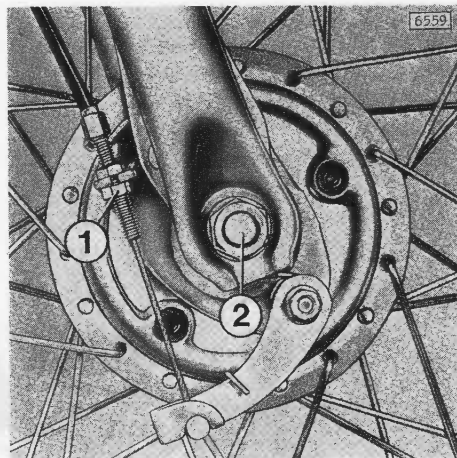
Checking and greasing the hub bearings. Refer to Section Front and Rear Hubs.

Checking and greasing steering head bearings. Refer to Section V. Front Suspension.

Retighten nuts and bolts

Check nuts and bolts for tightness. Above all, be sure that the engine fixing bolts, the wheel axles and the shock absorbers are tight.

Retighten cylinder head nuts every 5 operating hours.



REMOVING THE REAR WHEEL

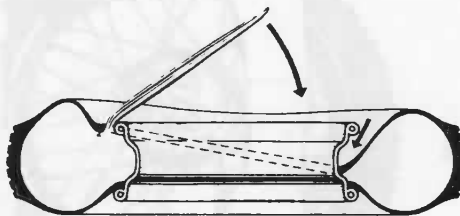
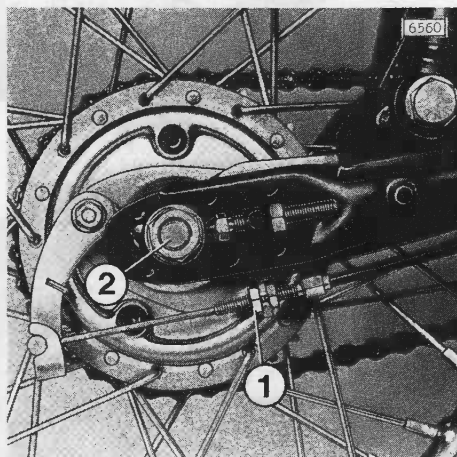
Loosen brake adjusting nut and disengage brake cable (1). Remove both axle nuts and remove axle (2). Install wheel and axle in the reverse procedure to dismantling.

Changing tires

To remove tire, unscrew valve cap, depress valve needle to let out the air, unscrew rim nut and completely press back valve. Loosen the steel wire reinforced tire section from the rim, and press the tire opposite the valve into the center groove of the rim. This gives sufficient space to lift the tire at the valve end over the rim with the tire lever.

Hold the tire outside the rim with the tire lever, and work round the rim with the second lever until the whole circumference of the tire is outside the rim.

Now, remove inner tube. When assembling, fit lightly pumped-up inner tube coated with chalk into the tire, having already fitted half of the tire over the rim. Ensure the tube is not jammed or twisted and make sure that the rim band separating the tube from the rim is flat in the rim center well.



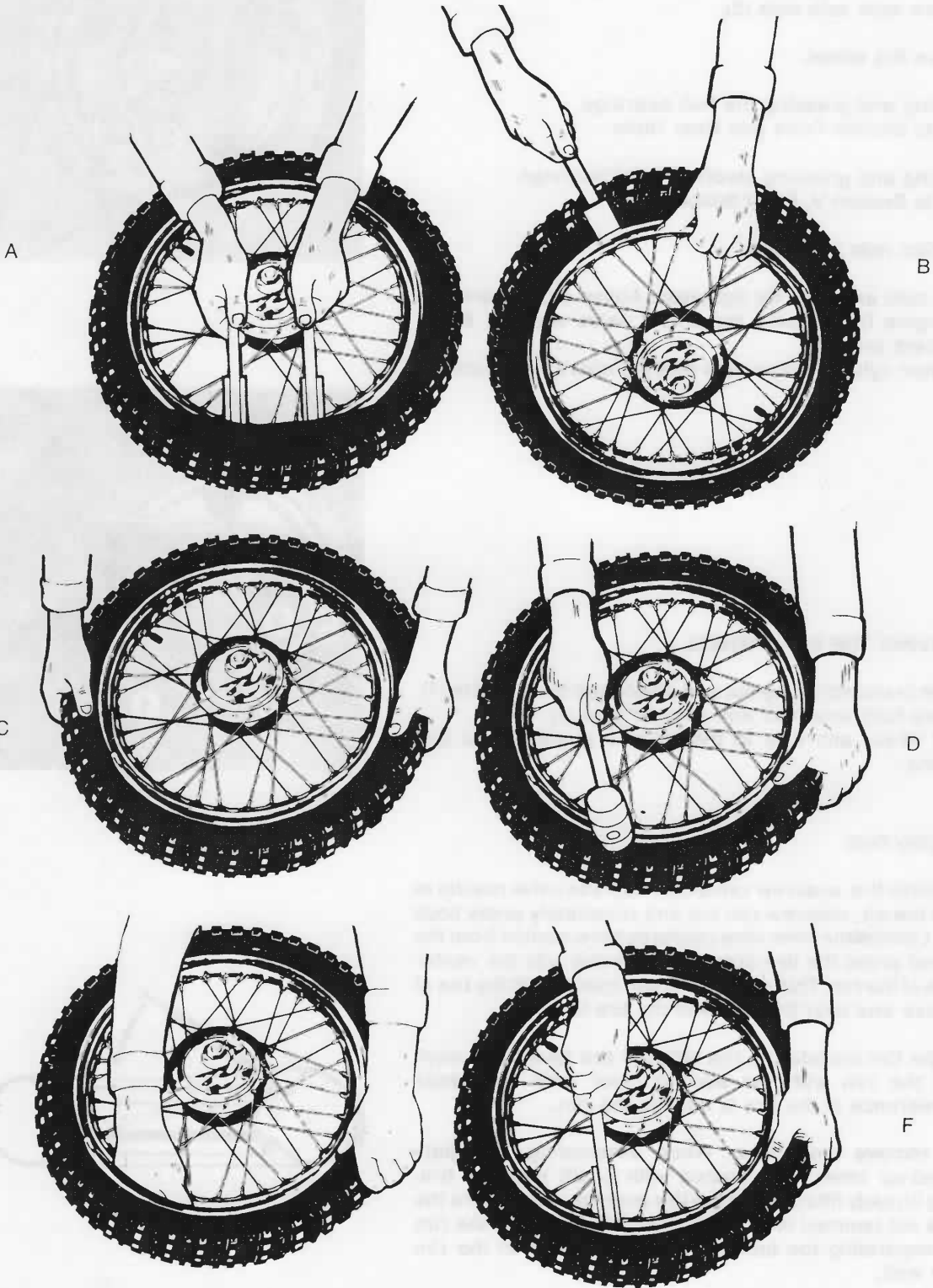
LUBRICATION AND MAINTENANCE

TIRE PRESSURES

FRONT — 11—18 PSI (0.8—1.3 bar)

REAR — 14—21 PSI (1.0—1.5 bar)

TIRE CHANGING SCHEMATIC



SECTION II

ENGINE, CLUTCH, REDUCTION GEAR

Item No.	Description	Quantity
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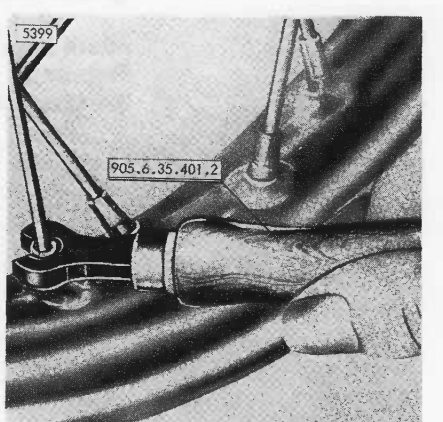
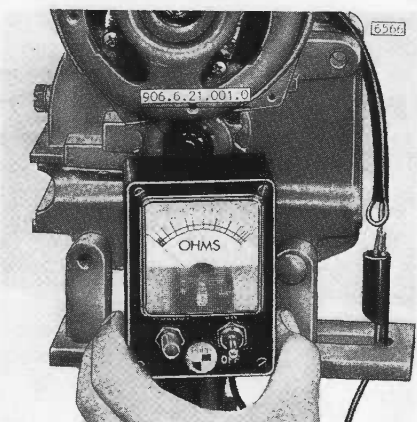
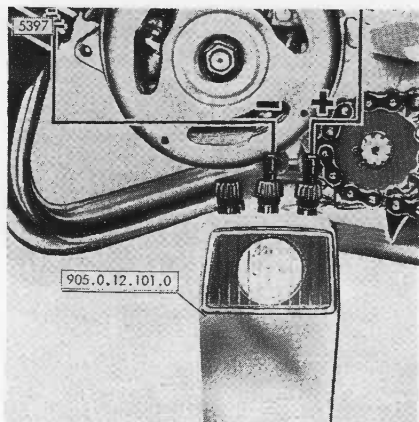
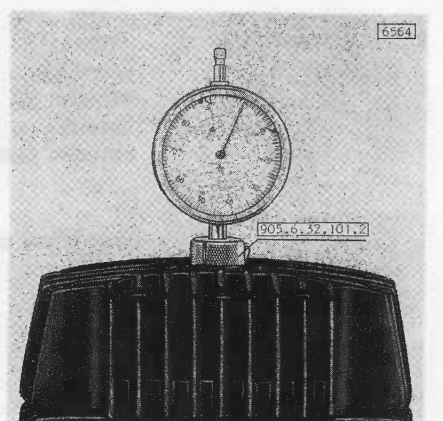
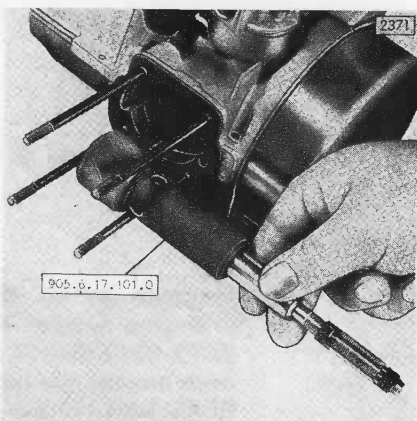
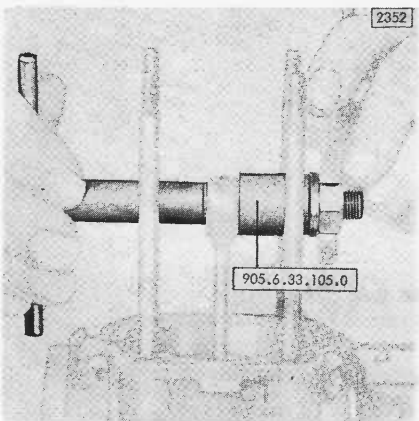
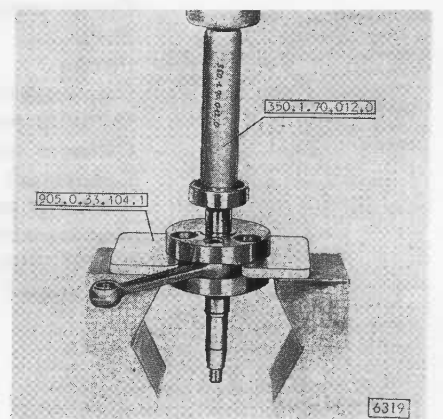
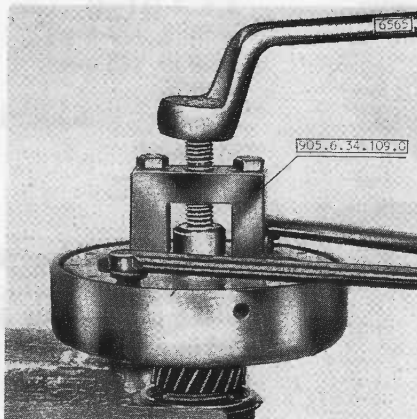
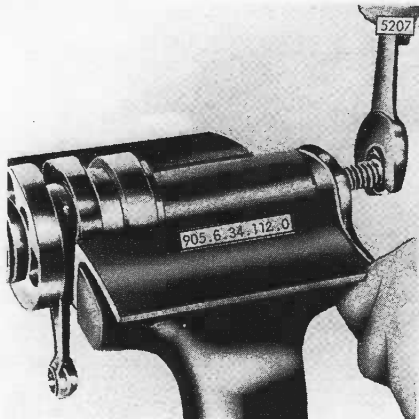
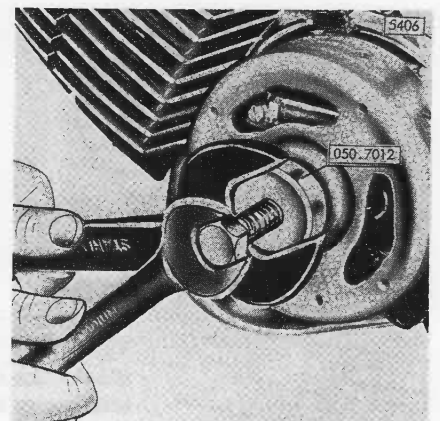
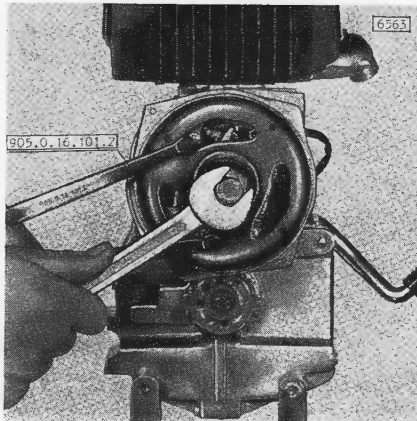
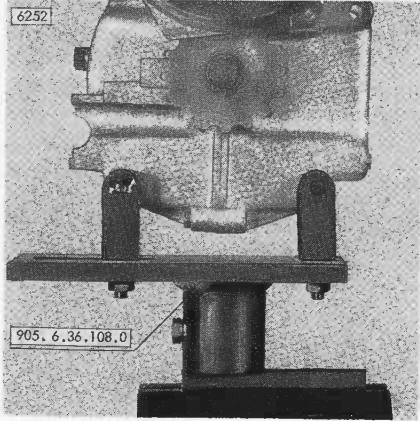
1. Make sure that the correct tools are used for the job. 2. Use the correct torque for the fasteners. 3. Use the correct oil grade for the engine.

SPECIAL TOOLS

Description	
1 Engine Holder	905.6.36.108.0
2 Locking device for flywheel*)	905.0.16.101.2
3 Flywheel Puller	050.7012
4 Main bearing puller	905.6.34.112.0
5 Clutch extractor	905.6.34.109.0
6 Pressing sleeve for main bearing	350.1.70.012.0
6 Support plate	905.0.33.104.1
7 Connecting rod brush remover	905.6.33.105.0
8 Reaming and centring tool for connecting rod brush	905.6.17.101.0
9 Dial indicator	normal workshop equipment
9 Dial indicator holder	905.6.32.101.0
10 Ignition timing device	905.0.12.101.0
11 LDW Scale OHM Meter	906.6.21.001.0
Feeler gauge	normal workshop equipment
Caliper rule	normal workshop equipment
Torque wrench	normal workshop equipment
12 Spoke spanner	905.6.35.401.2
Cup installer	905.6.34.501.0

*) Alter your existing locking device by simply grinding the two pins on the inside to allow them to be placed inside centrifugal clutch.

SPECIAL TOOLS



TECHNICAL DATA

Engine

Type	1-cylinder-2stroke engine, air-cooled
Maximum output	3.5 hp at 7000 rpm
Maximum torque	2.75ft/lb at 5000 rpm (0.38 mkp)
Compression ratio	8.5 : 1 (11 : 1)
Bore	1.49 in. (38 mm)
Stroke	1.69 in. (43 mm)
Displacement	48.8 cc
Cylinder material	Alu-alloy with cast iron liner
Cylinder head	Alu-alloy
Crankshaft	Steel
Inlet and exhaust	Ports
Port control	Piston
Lubrication	Petrol lubrication 50 : 1
Top speed	20 m.p.h. (32 km/h); without restrictive devices 31 m.p.h. (50 km/h)

Carburetor

Type	Bing 1/17
Main jet	84
Needle jet	2.20
Needle	1
Needle position	3 rd notch from top

Electrical equipment

Ignition	Magneto ignition, Bosch 6 V to engine number 4401270 RCP1 0 212 124 043 from engine number 4401271 RCP1 0 204 110 002
Ignition timing	.040—.050 in. (1.0—1.2 mm) in advance of TDC
Spark plug	Champion L 5
Plug gap	.016—.020 in. (0.4—0.5 mm)
Breaker point gap	.014—.018 in. (0.35—0.45 mm)

TECHNICAL DATA

Transmission

Gearbox	1-speed gearbox
Type of gearbox	1-speed automatic transmission
Clutch	Centrifugal running in oil
Primary transmission	Helical gears
Secondary transmission	Chain 1/2"x3/16"
Gear ratios	
Engine gear	106:21, i = 5.05
Gear rear wheel	34:13, i = 2.61*
Frame	Tubular frame
Suspension front	Telescopic fork, 3.14 in. (80 mm) spring travel
Suspension rear	Control arm with suspension unit, 2.16 in. (55 mm) spring travel
Brakes	Internal expanding shoe brakes
Dia. of brake drums	3.49 in. (90 mm)
Tire, front	2.50 x 14
Tire, rear	2.75/3.00 x 12
Tire pressure, front/rear	11, —18, / 14, —21, psi (0.8—1.3/1.0—1.5 bar) depending on the type of terrain and the weight of the rider.
Fuel tank	0.39 US-gal; 3.5 litres

Dimensions

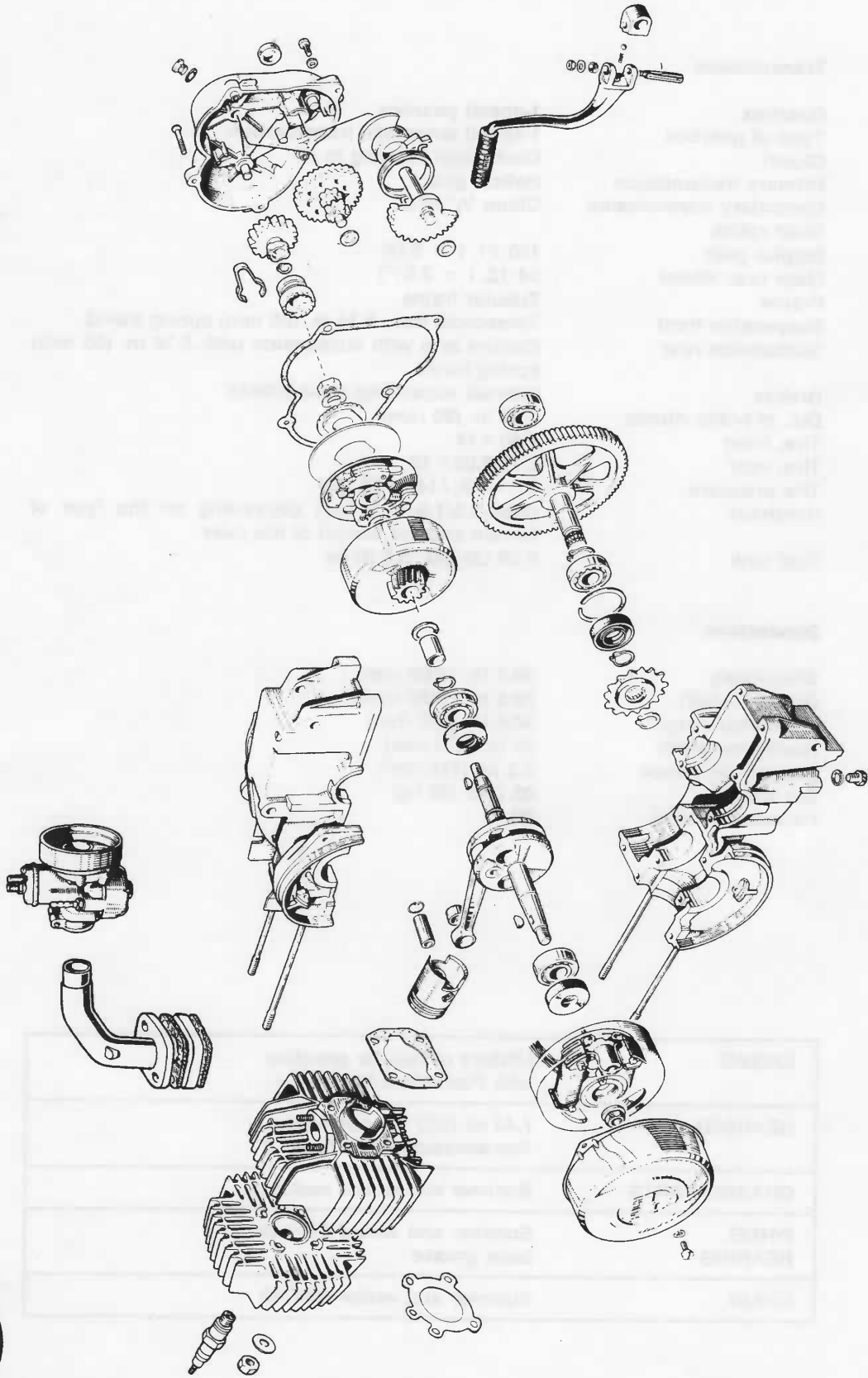
Wheelbase	39.3 in. (1000 mm)
Overall length	58.6 in. (1490 mm)
Handlebar height	34.6 in. (880 mm)
Handlebar width	26 in. (680 mm)
Ground clearance	6.8 in. (175 mm)
Dry weight	83.7 lb. (38 kg)
Permissible load	98 lb.

ENGINE	Mixture of regular gasoline with Puch Maxi Mix 50:1
GEARBOX	7.44 oz (220 cc) Automatic-Transmission-Fluid Type "F"
CHASSIS PARTS	Summer and winter motor oil
WHEEL BEARING	Summer and winter Lithium base grease
CHAIN	Summer and winter SAE 90

*) 12-tooth-sprocket bypacked. It should only be used when riding on soft terrain. When riding on solid terrain the engine might be overrevved.

MAGNUM X

1 SPEED AUTOMATIC-ENGINE 50-CC



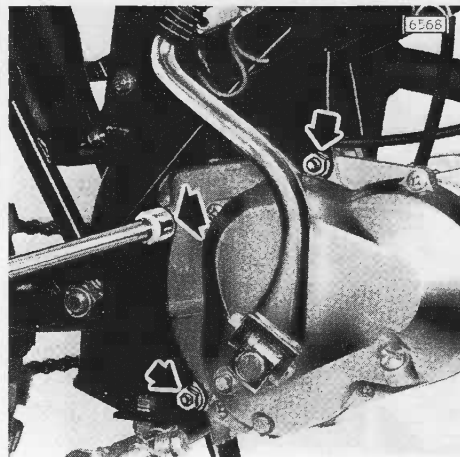
DISMANTLING THE ENGINE

ENGINE REMOVAL

Place the moped on a bench and support by its side stand.
Remove transmission drain plug and drain transmission oil.



Remove left and right engine shrouds.
Disconnect fuel line.
Remove carburetor from manifold.
Remove engine wiring from junction block.
Remove exhaust system.
Remove three (3) engine mounting bolts (arrows).
Remove engine.



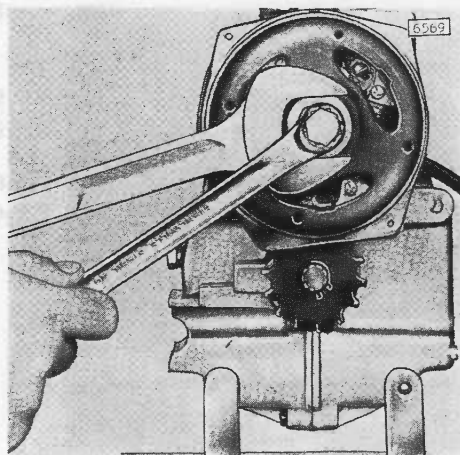
ENGINE DISASSEMBLY

Place engine into engine holder (905.6.36.108.0).

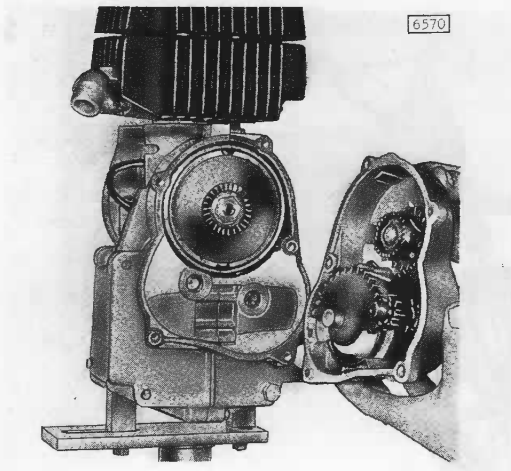
Remove magneto cover, lock flywheel with locking tool (905.0.16.101.2) and remove crankshaft nut.
Using puller (050.7012), remove flywheel.

NOTE: Do not lose woodruff key.
Remove magneto stator plate.

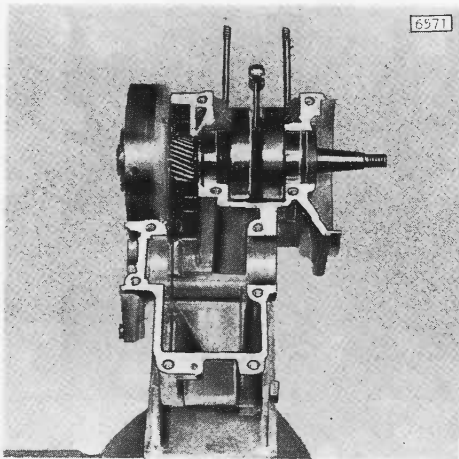
Remove cylinder head, gasket, cylinder and cylinder base gasket.



DISMANTLING THE ENGINE

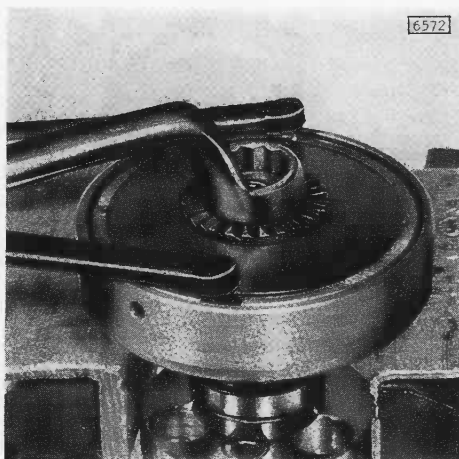


Remove kick-starter, clutch cover screws and clutch cover assembly.
Remove circlips from piston, press out the wrist pin and remove the piston.



Mount engine in engine stand so that the lower crankcase half is facing upward.

Remove all crankcase screws.
Tap crankcase lower half with a soft hammer to loosen sealant grip.
Remove lower crankcase half.
Crankshaft/clutch assembly and transmission main shaft assembly may now be removed.



Using aluminum jaws, clamp clutch side flywheel in an vise.

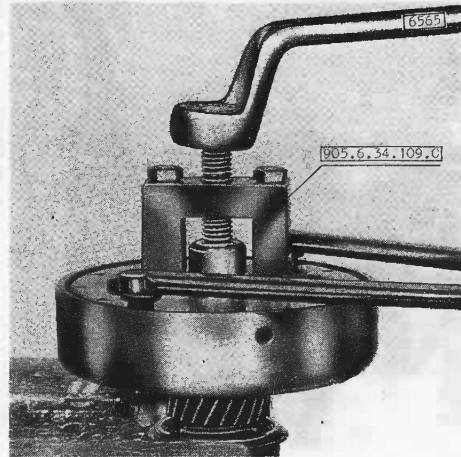
CAUTION: Do not clamp crankshaft with both webs in vise (lutch side only) or damage to crankshaft is unavoidable.

Remove the clutch hub retaining nut, retainer washer engaging disc and friction damper.

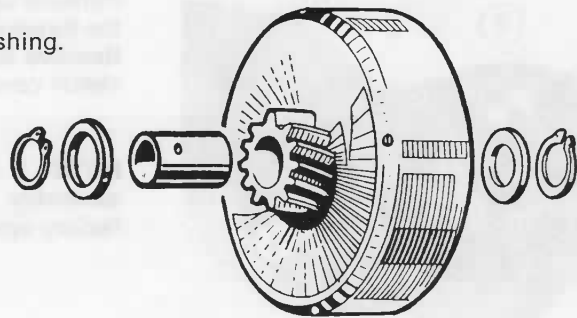
DISMANTLING THE ENGINE

Use special puller 905.6.34.109.0 to remove centrifugal clutch from crankshaft.

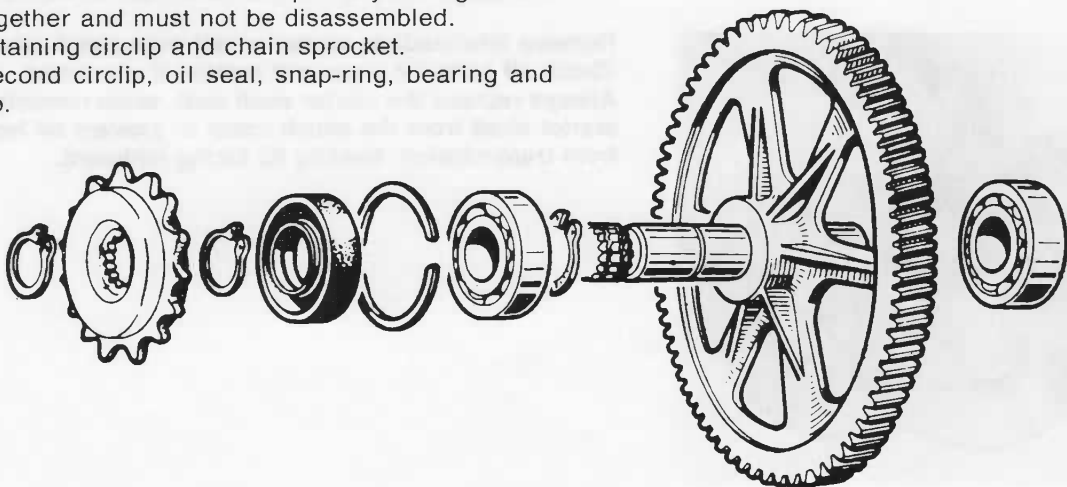
NOTE: Clutch assembly may also be dismantled with the engine still mounted in the frame.



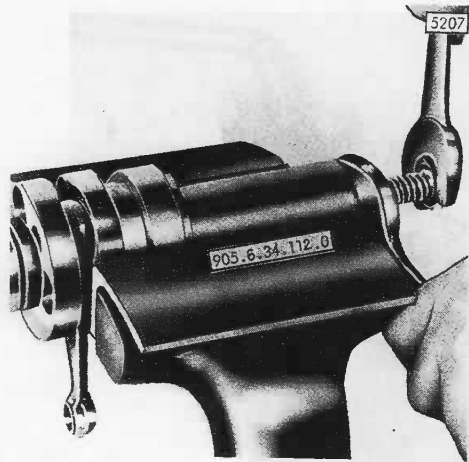
Remove circlip, thrust washers, clutch drum and bushing.



NOTE: Transmission main shaft and primary drive gear are pressed together and must not be disassembled. Remove retaining circlip and chain sprocket. Remove second circlip, oil seal, snap-ring, bearing and third circlip.



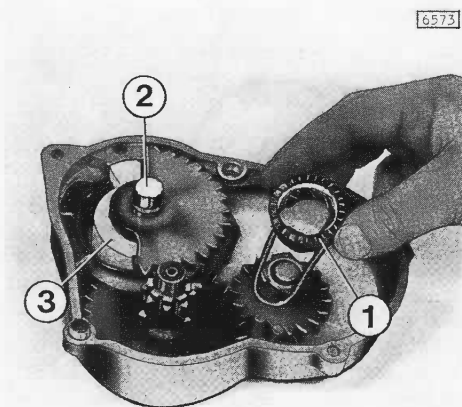
DISMANTLING THE ENGINE



Using puller 905.6.34.112.0 to remove main bearings from crankshaft.

Crank case

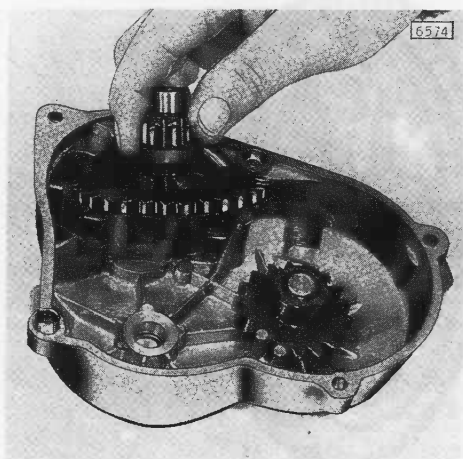
Remove all traces of sealing compound and gaskets, thoroughly clean all parts in degreasing solvent and visually inspect all parts for wear and damage.



Dismantle kick-starter assembly

Remove engaging gear (1) with start brake spring. Remove the thrust washers from starter shaft and intermediate gear. Remove starter gear (2), spring guide (3) with spring from clutch cover.

NOTE: It is not warranted to dismantle the kick start assembly on a small engine repair, only on a dissatisfactory operation.



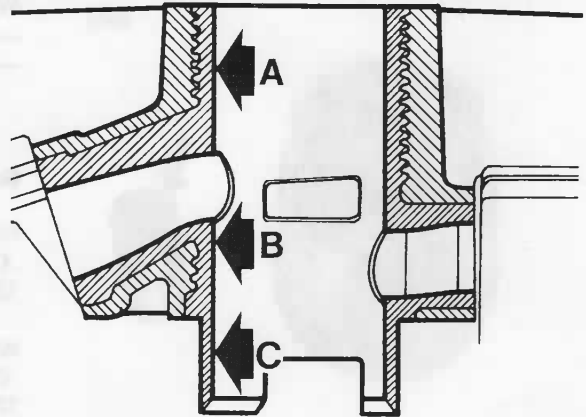
Remove intermediate starter wheel from clutch cover. Check all parts for wear and replace if warranted. Always replace the starter shaft seal, when removing the starter shaft from the clutch cover to prevent oil leakage from transmission. Sealing lip facing outboard.

ENGINE SPECIFICATIONS & TOLERANCES

MEASURING THE CYLINDER

The bore must be measured at six positions, once parallel with and once diametrically opposed the wrist pin at the three positions indicated in fig. The specified temperature of 68° F (20° C) is important if reliable results are to be obtained. To read the results swivel the unit in the directions indicated by the arrows in fig. The lowest position of the pointer indicates the bore diameter.

Maximum permissible ovality of cylinder: .002 in. (0.03 mm).

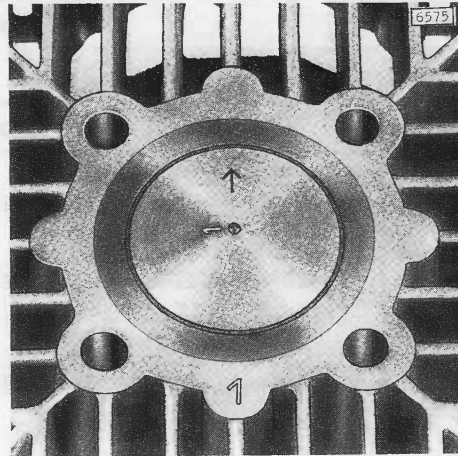


Piston-cylinder

Piston and cylinder are matched together and marked on the piston crown and on the joint surface of the cylinder top.

SORTING TABLE

Group	Cylinder Diameter	Piston Diameter
1	1.4961 in. – 1.4964 in. 38.001 mm – 38.008 mm	1.4943 in. – 1.4947 in. 37.956 mm – 37.965 mm
2	1.4964 in. – 1.4967 in. 38.009 mm – 38.016 mm	1.4947 in. – 1.4951 in. 37.966 mm – 37.975 mm



NOTE: The 0/size pistons are available for the MAGNUM-Cylinder only. The boring has to be done locally.

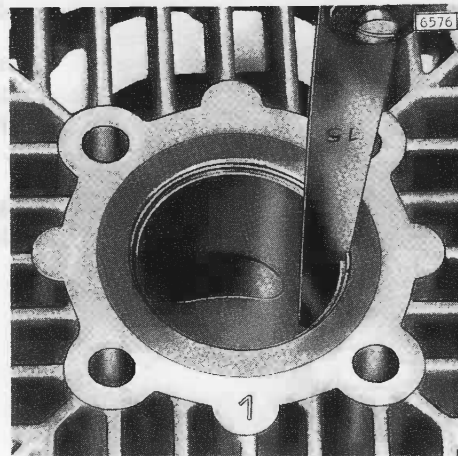
Piston/cylinder clearance limits

Ring gap

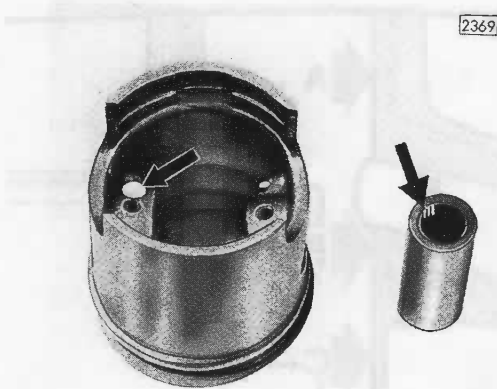
.006–.018 in.
0.15–0.30 mm

MAGNUM-Cyl. Min. .001 in. (0.029 mm)
Max. .002 in. (0.055 mm)

NOTE: When boring a cylinder for 0/size piston, note piston sort type number, and refer to respective sorting table and add .0098 in. (0.25 mm) to cylinder sorting (diameter) size.



ENGINE SPECIFICATIONS & TOLERANCES



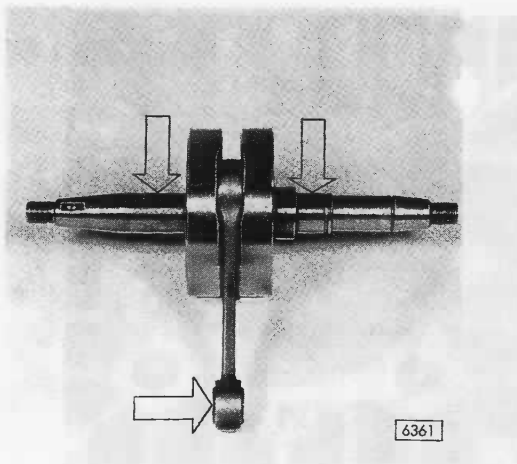
Wrist pin/piston fit is matched and coded as follows:
 — yellow or blue dot inside piston
 — 2 or 3 dots on end of wrist pin (fig. 11).

Small end bush

Fitting limits
 .473— .474 in.
 12.008—12.020 mm

Wear limit
 .475 in.
 12.025 mm

SORTING TABLE				
Wrist pin boss		Wrist pin		Clearance
Group	Diameter	Group	Diameter	
yellow	.4728— .4727 in.	2	.4726— .4724 in.	.0001— .0003 in.
	12.008—12.006 mm		12.003—12.000 mm	0.0030—0.0085 mm
blue	.4727— .4726 in.	2	.4726— .4724 in.	.0001— .0002 in.
			12.003—12.000 mm	0.0005—0.0060 mm
	12.006—12.003 mm	3	.4725— .4723 in.	.0001— .0003 in.
			12.000—11.997 mm	0.0035—0.0090 mm



CHECKING CRANKSHAFT BY SIGHT

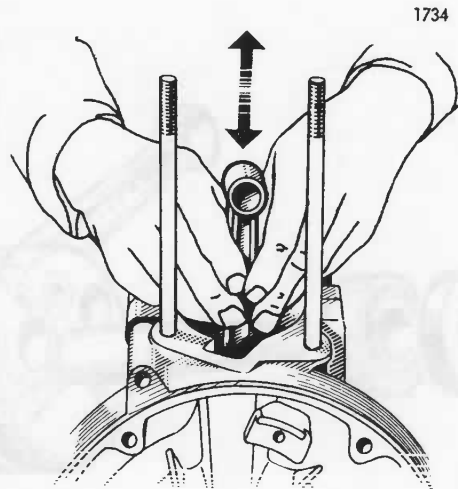
Whenever dismantling or fitting a new crankshaft, check bearing seating and seal running areas. Repair works to the crankshaft are not possible.

NOTE: A out of balance or damaged crankshaft will have to be replaced.

ENGINE SPECIFICATIONS & TOLERANCES

CAUTION: If over-heating, jamming or wear is apparent, crankshaft assembly must be replaced.

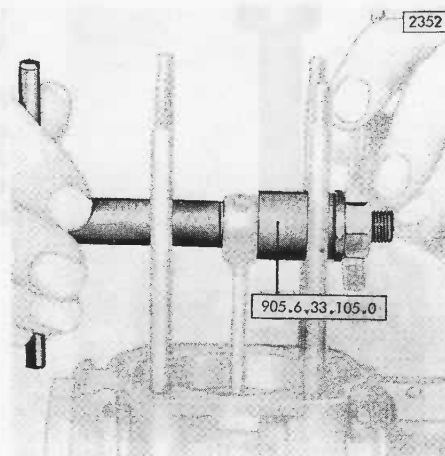
Firmly grasp connecting rod and check for big end bearing wear. If rod is free but no play is noticeable, big end bearing is in good condition.



Before assembling an engine, always check the small end bush for wear. If excessive wear is noticeable replace small end bush.

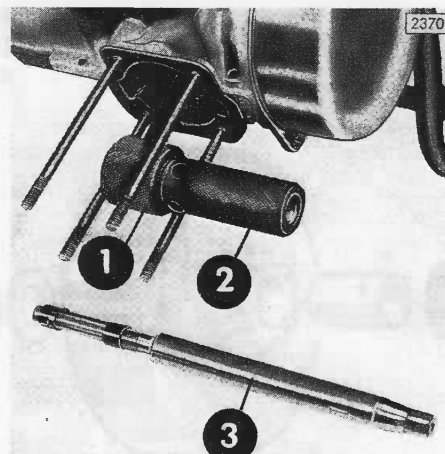
REPLACING SMALL END BUSH

Use special tool 905.6.33.105.0 to remove and replace bush.



For centralizing and reaming use special tool 905.6.17.101.0. To enable accurate reaming place centralizing nut (1) over little end, insert guide sleeve (2) in centralizing nut.

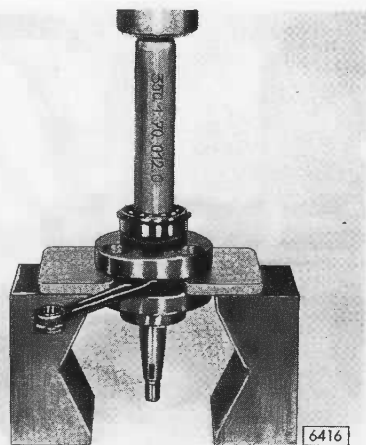
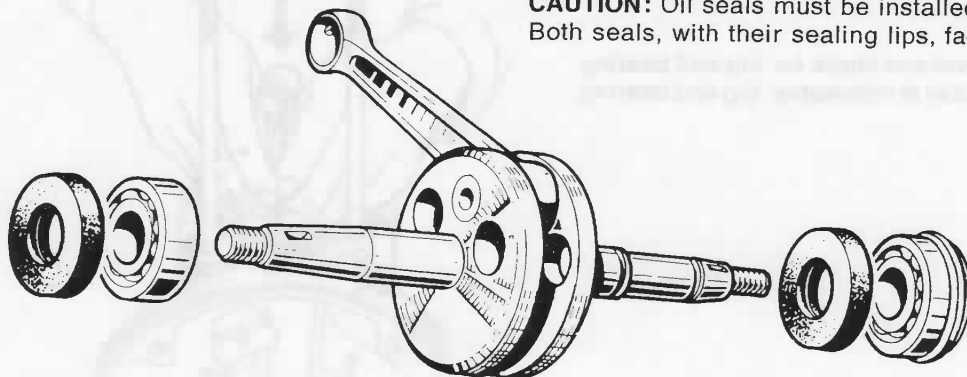
Insert the reamer shaft (3) in guide sleeve and centralize tool over little end bush. Tighten guide sleeve to centralizing nut.



ASSEMBLING THE ENGINE

Fit new oil seals

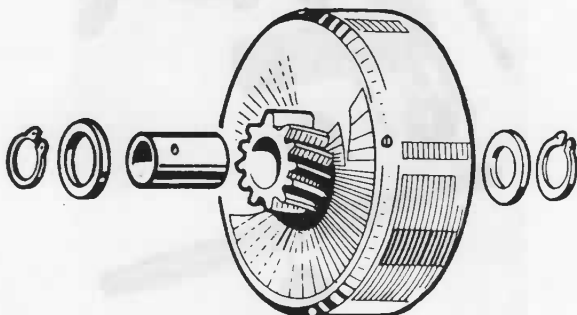
CAUTION: Oil seals must be installed as shown. Both seals, with their sealing lips, facing the clutch side.



Lubricate oil seal and install crankshaft seal, sealing lips facing outward, on clutch side of crank pin.

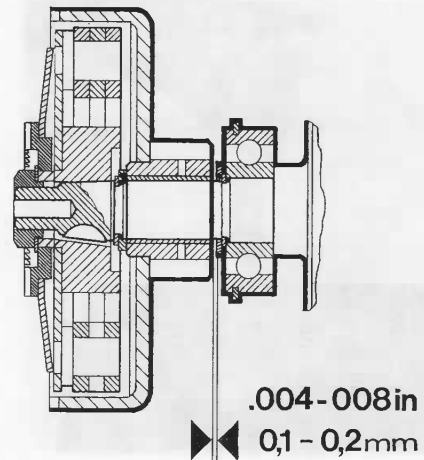
Place special tool 905.0.33.104.1 between crank webs to prevent damage to crankshaft. Use installation sleeve 350.1.70.012.0 to install main bearing on crankshaft, with the locating ring groove facing the outside. Install flywheel side main bearing in the same procedure.

Install inner circlip, clutch drum bushing and a .067 in. (1.7 mm) inner shim over the bushing. Further, install clutch drum and outer circlip.

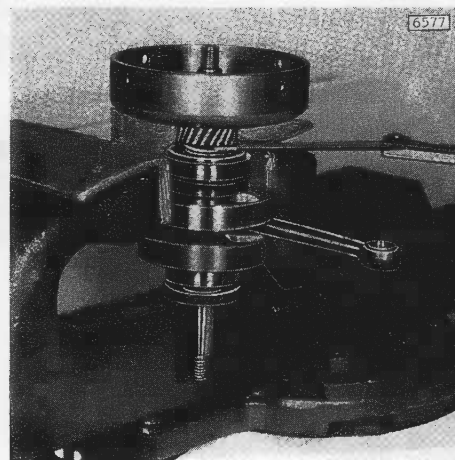


ASSEMBLING THE ENGINE

Clutch drum must be shimmed to allow .004—.008 (0.1—0.2 mm) end-float on crankshaft.



Firmly hold clutch drum against outer circlip measure gap between primary gear and inner shim on crankshaft (not circlip on bearing). Measure gap with a feeler gauge.



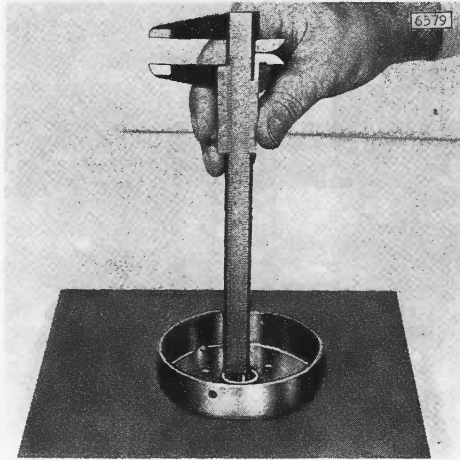
From this measurement deduct end-float required of clutch drum, this will give required outer shim.

NOTE: Upper shim (22/15 mm) is available as follows:

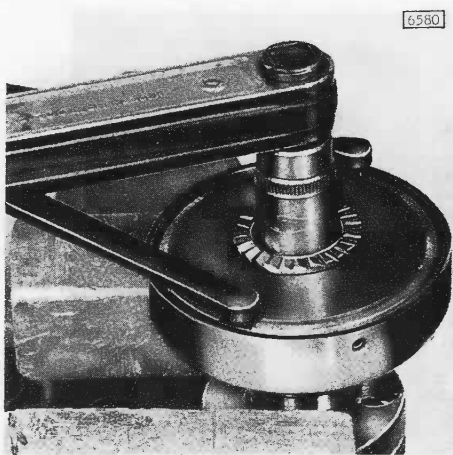
.043 in.	.051 in.	.059 in.	.067 in.	.070 in.	.073 in.
.075 in.	.077 in.	.079 in.	.083 in.	.087 in.	
1.1 mm	1.3 mm	1.5 mm	1.7 mm	1.8 mm	1.85 mm
1.9 mm	1.95 mm	2.0 mm	2.1 mm	2.2 mm	



ASSEMBLING THE ENGINE

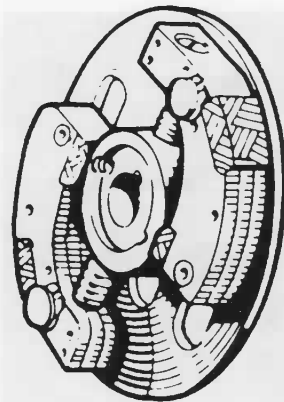


If ever the clutch drum is being replaced with the engine installed just simply take the measurements of both clutch drums and adjust the difference with available outer shims.



Once the required shims are established, remove clutch drum and reassemble with established shim. Torque nut to 20 ft/lb (27 Nm).

By operating the kick-starter the starting mechanism which is located in the clutch cover, will move the starting gear toward the engaging disc, which is solidly mounted on the crankshaft, thus rotating the engine.



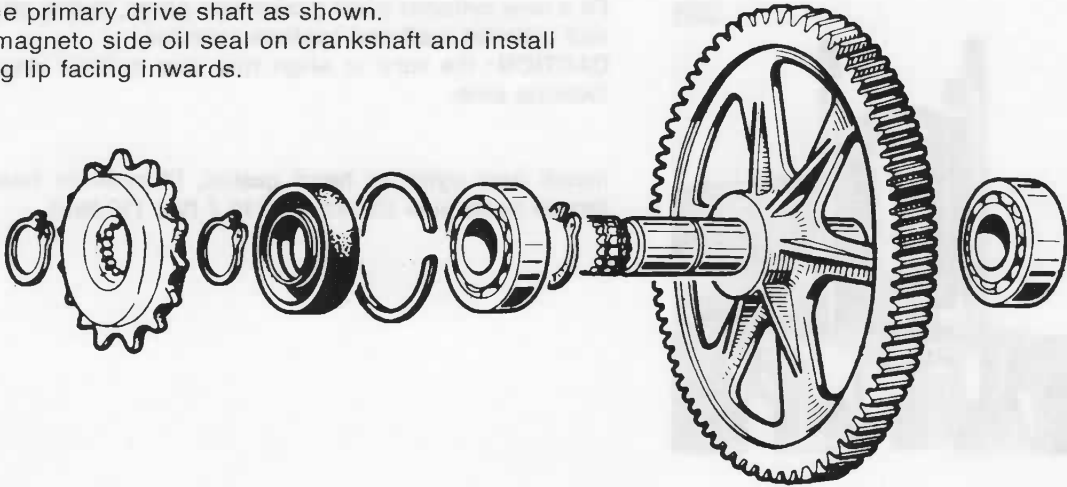
CAUTION: After the engine has started quickly, release the kick-starter to prevent damage to the starting mechanism. By increasing the engine r.p.m. the centrifugal clutch will engage between 1200—1500 r.p.m. and is fully engaged between 2600—3000 r.p.m. The clutch begins to disengage between 1400—1150 r.p.m. (when engine speed is reduced).

Centrifugal clutch must be replaced when linings are worn and limit pins (on shoes) prevent drum contact.

CAUTION: Use only recommended lubricants in transmission or clutch slippage will occur.

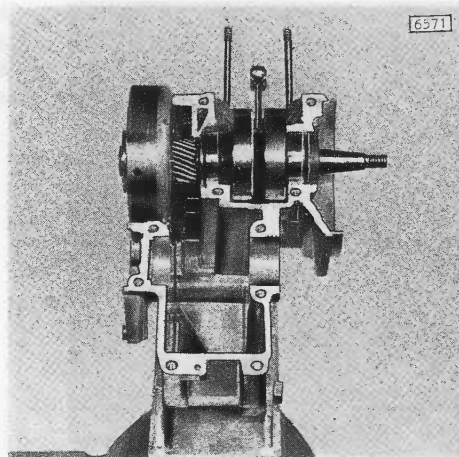
ASSEMBLING THE ENGINE

Reassemble primary drive shaft as shown.
Lubricate magneto side oil seal on crankshaft and install with sealing lip facing inwards.



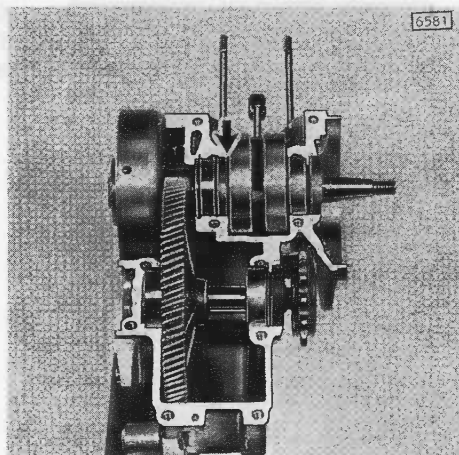
Fit primary drive shaft into crankcase.

NOTE: Ensure sufficient gap between magneto side bearing and oil seal appr. .040 in. (1 mm) to allow oil flow to bearing. Install crankshaft and clutch assembly in housing half.

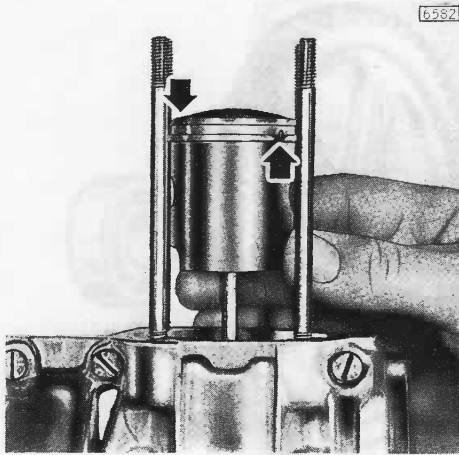


Install primary drive assembly, ensure that open ends of retainer circlips are facing upward, so that correct location is assured.

Apply jointing compound (non-hardening) to crankcase joint, fit crankcase half into place and torque crankcase screws to 6 ft/lb (8 Nm).



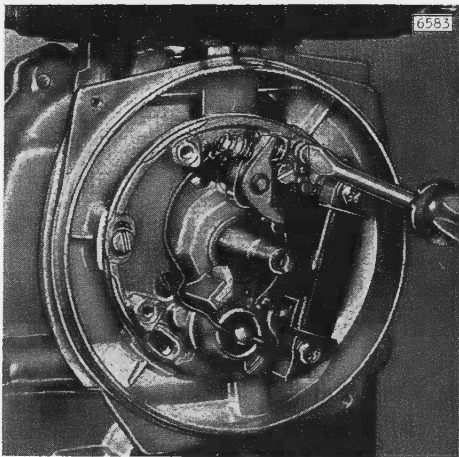
ASSEMBLING THE ENGINE



Fit a new cylinder base gasket into place, lightly oil piston and cylinder wall and replace cylinder.

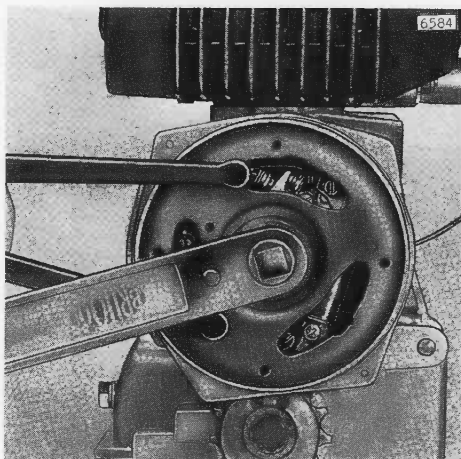
CAUTION: Be sure to align ring gap to their respective locating pins.

Install new cylinder head gasket, fit cylinder head and torque head nuts (crosswise) to 7 ft/lb (10 Nm).



Install generator base assembly so that the locating screws are in the center of the locating holes.

NOTE: Ensure no wires are squeezed between base plate and housing.

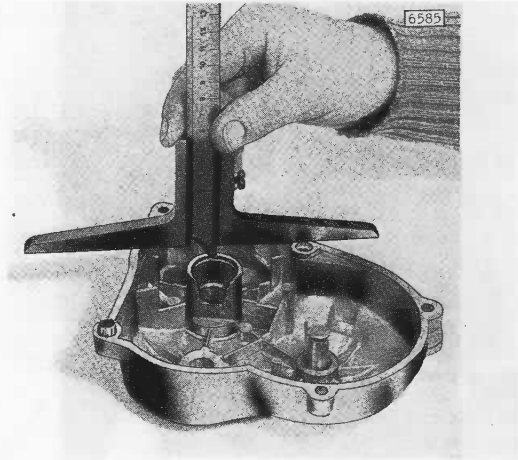


Clean crankshaft taper, fit woodruff key into keyway, install flywheel. Use locking device 905.0.16.101.2 to lock flywheel and torque nut to 25 ft/lb (35 Nm).

ASSEMBLING THE ENGINE

NOTE: By replacing a clutch cover, starter shaft or intermediate gear the following measurements have to be taken.

1. Place a new gasket on the clutch cover and measure down from the surface of the clutch cover to the upper edge of the starter shaft locating flange.

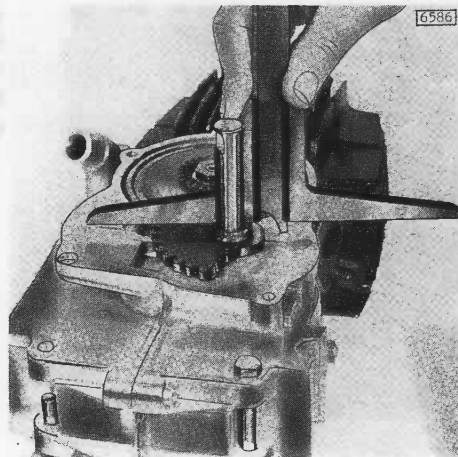


2. Locate starter shaft in guide hole of the crank case. Take the measurement from the upper edge of the starter shaft gear to the surface of the crankcase. Add .004 in. (0.2 mm) crush of the new gasket. Now deduct this measurement from the above taken measurement. This will give the clearance of the starter shaft within the clutch cover. The end-float of the starter shaft and the intermediate gear is .008—.024 in. (0.2—0.6 mm).

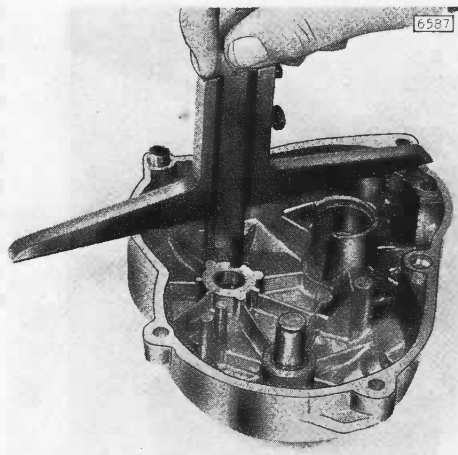
Example:

First measurement taken	35.0 mm
second measurement taken	—33.8 mm
crush of gasket	— 0.2 mm
clearance	1.0 mm

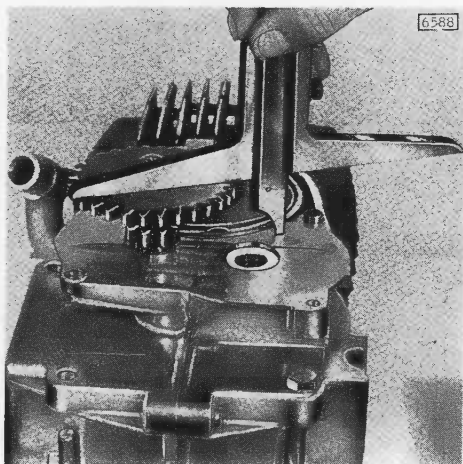
For this example a .024 in. (0.6 mm) shim would be required to achieve the correct end-float of .008—.024 in. (0.6—1 mm).



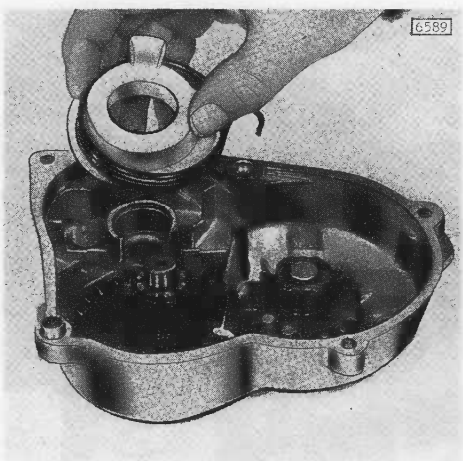
3. Take the measurement from the surface of the clutch cover (new gasket still in place) to upper edge of the intermediate gear locating flange.



ASSEMBLING THE ENGINE



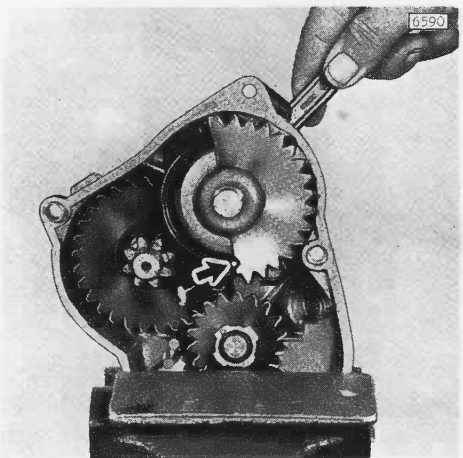
4. Take the measurement from the upper edge of the intermediate gear to the surface of the crank case. Add .004 in. (0.2 mm) crush of the new gasket. To get clearance of intermediate gear within clutch cover, see example on previous page.



ASSEMBLING KICK-STARTER

Place idle gear in housing and secure with circlip. Install intermediate gear, spring and guide in clutch cover.

NOTE: Ensure that notch of spring guide is correctly placed in cut-away of clutch cover.

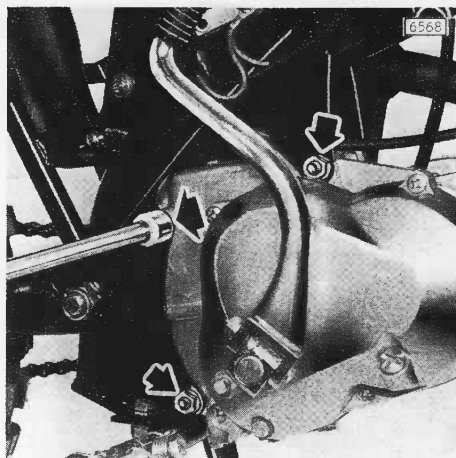


Place clutch cover in vise.

Install starter shaft and assure that spring is correctly located on end of gear (see arrow). Place an open-end wrench over the starter shaft and tension the spring till upper edge of the gear has just gone past the cut-away in the clutch housing. Now push in starter shaft to the correct location in the clutch housing. Place the correct thrust shim on the starter shaft and on the intermediate gear. Remove clutch cover from vise and install engaging gear with brake spring on idler gear. Install clutch cover assembly and torque screws to 6 ft/lb (8 Nm).

INSTALLING THE ENGINE

Place engine in frame and secure with three mounting bolts; torque nuts to 23 ft/lb (32 Nm).



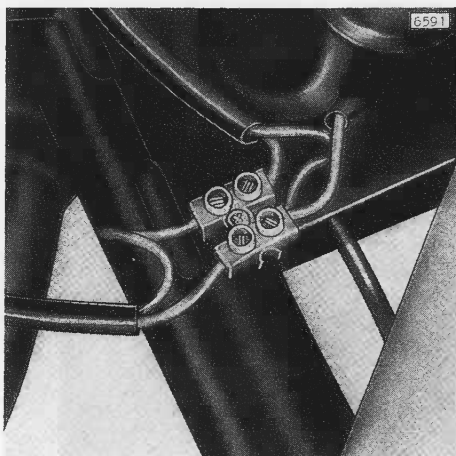
Connect electrical wires on junction block

with Bosch generator 0212 124 043
to engine number 44 01270

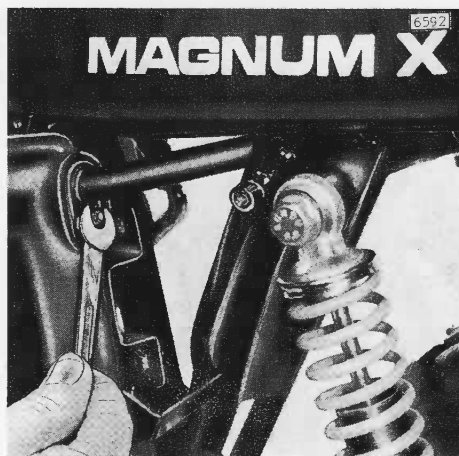
blue wire	—	blue
	—	gray
blue/black wire	—	brown

with Bosch generator 0204 110 002
from engine number 44 01271

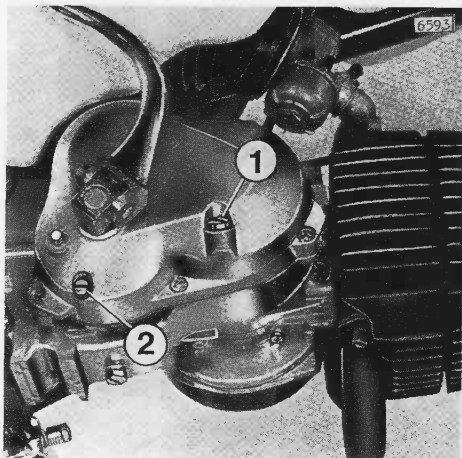
blue wire	—	blue
	—	black
brown wire	—	brown



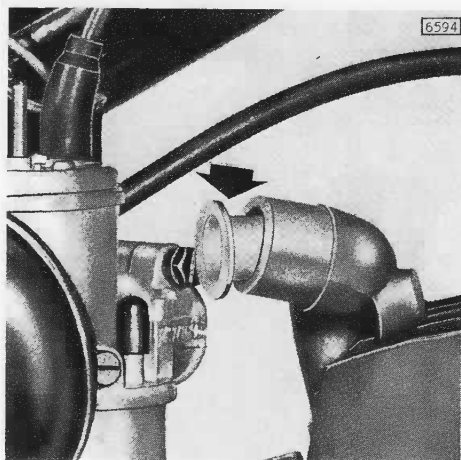
Install exhaust system (fit new gasket to exhaust flange). Fit tail pipe between frame and rear fender and secure pipe to muffler. Fit drive chain and chain master link.



INSTALLING THE ENGINE

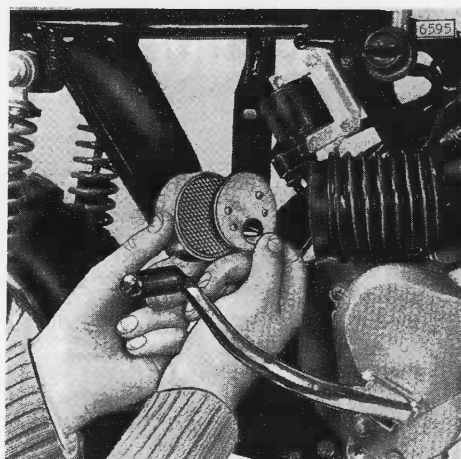


Install carburetor ensure perfect seating on flange. Remove filler and oil level plug. Fill with Type "F" automatic transmission fluid 7.44 oz (220 cc). For carburetor adjustments see "SECTION III".



POWER SPEED RESTRICTOR

To increase power and speed simply remove carburetor from intake manifold and remove restrictor orifice (see arrow).



Also remove restrictor plate from rear of carburetor (on some units restrictor is fitted inside air-cleaner element on rear of intake house).

(The carburetor is the device which provides the fuel mixture to the engine.)

The carburetor is a device which provides the fuel mixture to the engine. It is a device which provides the fuel mixture to the engine. It is a device which provides the fuel mixture to the engine.

SECTION III

FUEL SYSTEM AND CARBURETION

The fuel system and carburetion are the two main parts of the engine. The fuel system provides the fuel to the carburetor, and the carburetor provides the fuel mixture to the engine.

The fuel system consists of the fuel tank, fuel pump, fuel filter, and fuel lines. The carburetor consists of the carburetor body, fuel jets, and air filter.

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CARBURETOR

CARBURETOR OPERATION

(The numbers quoted in the brackets refer to the illustration.)

The carburetor on your MAGNUM-X is a Bing variable venturi (slide type) carburetor. The term variable venturi comes from the fact that the slide varies the amount of the restriction of air through the throat of the carburetor and the term venturi denotes a restriction in an air passage.

The components in the carburetor are simple. Please, refer to the accompanying drawing for identification of each part number. The slide (ref. no. 11) is attached to a cable which is operated by the twist grip on the handlebar. Turning the twist grip either raises or lowers the slide and this in turn either increases or decreases the amount of air allowed to flow through the throat of the carburetor.

Protruding from the bottom of the slide is a tapered rod or "needle" (ref. no. 10). Its position in relation to the slide is determined by a small clip (ref. no. 9) which is inserted in one of four grooves at the top of the needle. This clip then rests on the inside of the bottom of the slide.

Underneath the slide in the body of the carburetor is a brass tube with a carefully selected inside diameter. This tube is called a "needle jet" (ref. no. 18). The needle hanging out of the slide, hangs down into this needle jet.

Threaded into the bottom of the needle jet is a small brass plug called the "main jet" (ref. no. 19). The main jet has a precisely drill passage through it and is available in various sizes.

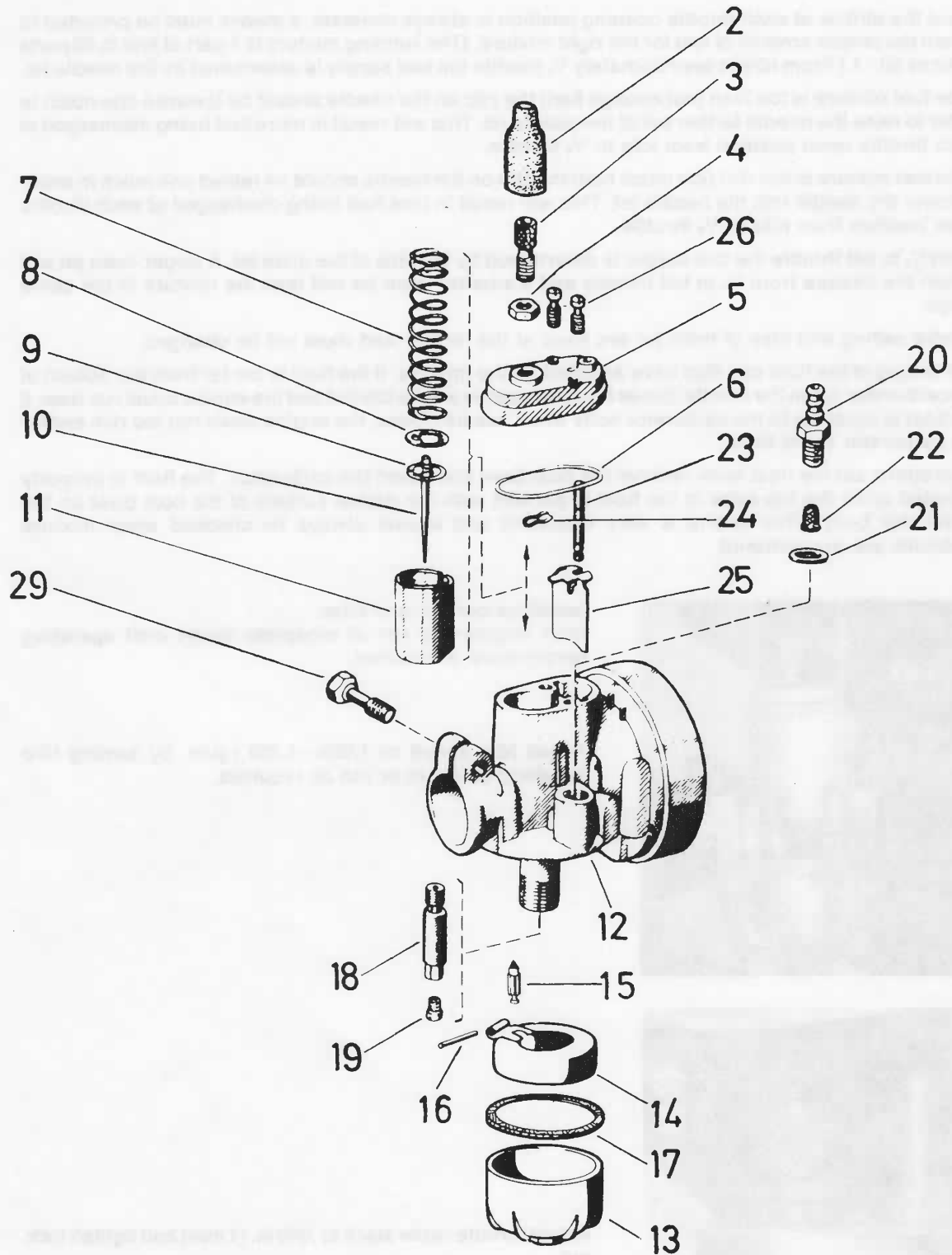
At the bottom of the carburetor is a removable aluminum fuel reservoir called the "float bowl" (ref. no. 13). The float bowl threads onto the base of the carburetor body. Inside the float bowl is a styrofoam ring which is called the "float" (ref. no. 14). There is a small brass arm attached to the float on one end and pinned to the carburetor on the other by the float pin (ref. no. 16). Underneath this arm is a steel "inlet needle" (ref. no. 15) which is inserted into a "needle seat" in the carburetor body.

The method of operation of the carburetor is as follows:

1. When the float bowl is empty and the fuel petcock on the fuel tank is opened, fuel flows through the fuel line and into the carburetor through the inlet banjo (ref. no. 20) and the filter screen (ref. no. 22) to the top of the inlet needle. Because the float bowl is empty, the float is hanging down and the needle is off its seat allowing fuel to enter the bowl. As the bowl fills, the float rises to a predetermined level at which point the needle presses against its seat and the flow of the fuel is stopped. As fuel is consumed by the engine the float goes up and down to maintain a constant level of fuel in the float bowl.
2. In order to start a cold engine a very rich fuel air mixture is required. (A rich mixture would be 1 part of fuel to 5 parts of air or 5 : 1.) This can be accomplished by either increasing the amount of fuel or decreasing the amount of air. In the Bing carburetor there is a choke plate (ref. no. 25) which when pushed down cuts off most of the airflow through the throat of the carburetor and thus creates a very rich mixture.

When the engine starts and the throttle is opened, the slide pushes the choke plate up out of the carburetor throat removing the restriction.

CARBURETOR



The carburetor fitted to the MAGNUM-X is tuned to specifications established by intensive factory research: should not be altered in any way.

Dismantle carburetor, clean all components and reassemble.

CARBURETOR

3. Since the airflow at each throttle opening position is always constant, a means must be provided to obtain the proper amount of fuel for the right mixture. (The running mixture is 1 part of fuel to 50 parts of air or 50 : 1.) From idle to approximately $\frac{3}{4}$ throttle the fuel supply is determined by the needle jet.

If the fuel mixture is too lean (not enough fuel) the clip on the needle should be lowered one notch in order to raise the needle farther out of the needle jet. This will result in more fuel being discharged at each throttle open position from idle to $\frac{3}{4}$ throttle.

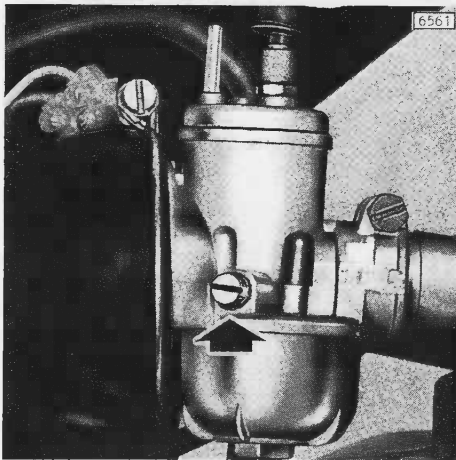
If the fuel mixture is too rich (too much fuel) the clip on the needle should be raised one notch in order to lower the needle into the needle jet. This will result in less fuel being discharged at each throttle open position from idle to $\frac{3}{4}$ throttle.

From $\frac{3}{4}$ to full throttle the fuel supply is determined by the size of the main jet. A larger main jet will richen the mixture from $\frac{3}{4}$ to full throttle and a smaller main jet will lean the mixture in the same range.

Needle setting and size of main jet are fixed at the factory and must not be changed.

4. The setting of the float can also have an effect on the mixture. If the float is too far from the bottom of the carburetor when the needle closes the fuel reserve will be limited and the engine could run lean. If the float is too close to the carburetor body when needle closes, the engine could run too rich and/or the carburetor could flood.

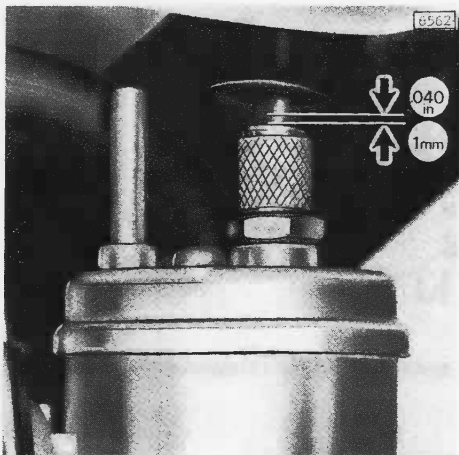
To properly set the float level remove the float bowl and invert the carburetor. The float is properly adjusted when the top edge of the float is parallel with the gasket surface of the float bowl on the carburetor body. This setting is very important and should always be checked when mixture problems are encountered.



Install carburetor and filter.

Start engine and run at moderate speed until operating temperature is reached.

Adjust idle speed to 1,000—1,200 r.p.m. by turning idle adjusting screw in or out as required.



Adjust throttle cable slack to .040 in. (1 mm) and tighten lock nut.

CAUTION: Insufficient cable slack will hold throttle partially open and idle adjusting screw will not function.

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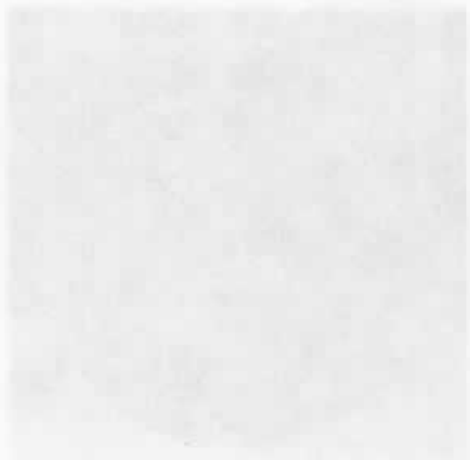
SECTION IV

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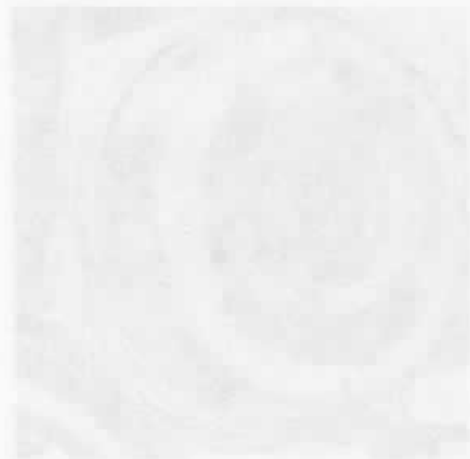
IGNITION SYSTEM



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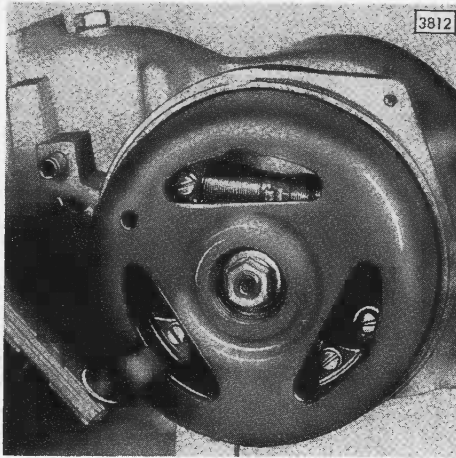


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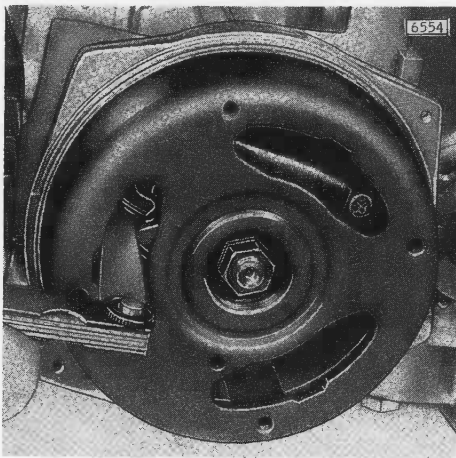
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IGNITION TIMING



If ignition coil has been replaced, measure air gap between coil pole shoes and flywheel. Gap should be .016—.024 in. (0.40—0.60 mm). If gap is incorrect, loosen coil mounting screws and adjust as necessary.

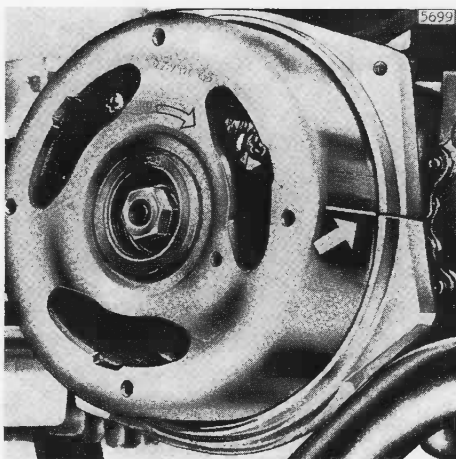
CAUTION: Always check and adjust ignition timing if flywheel has been removed.



ADJUSTING BREAKER POINTS

Rotate flywheel until fully opened points gap is visible through flywheel port.

Loosen fixing screw and adjust point gap to .014—.018 in. (0.35—0.45 mm)



CHECKING IGNITION TIMING

Connect ignition timing device 905.0.12.101.0 to the blue lead of the H. T. coil and the other lead to ground. Turn flywheel in engine direction till the buzzing noise on the timing device alters. At that point the ignition timing mark on the flywheel should coincide with the parting line of the housing halves.

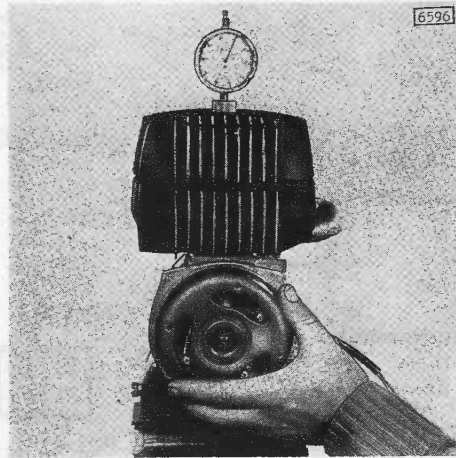
If the timing is not correct recheck breaker point gap or readjust till the correct ignition timing is achieved.

IGNITION TIMING

FITTING NEW FLYWHEEL (WITHOUT TIMING MARK)

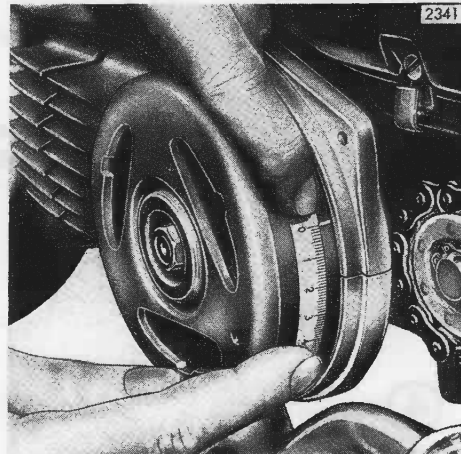
Adjust breaker point gap to correct setting. To find T. D. C. on piston travel insert a dial indicator into the plug hole (with holder). Find T. D. C. and turn engine .039—.047 in. (1—1.2 mm) measured on the dial indicator, backwards (against engine direction) and mark flywheel in line with the parting line of the two housing halves. This is ignition timing mark.

Recheck ignition timing as described on a previous page.



ADJUST IGNITION TIMING WITH UNMARKED FLYWHEEL (without dial indicator)

Adjust breaker point gap to correct setting. Find T. D. C. of piston travel (inserting a drift into plug hole). Make a pencil mark on the flywheel at the parting line of the two housing halves. From that pencil mark measure .630—.709 in. (16—18 mm) forward on flywheel (in engine direction) and mark the flywheel. This is ignition mark. Recheck ignition timing as described on previous page.

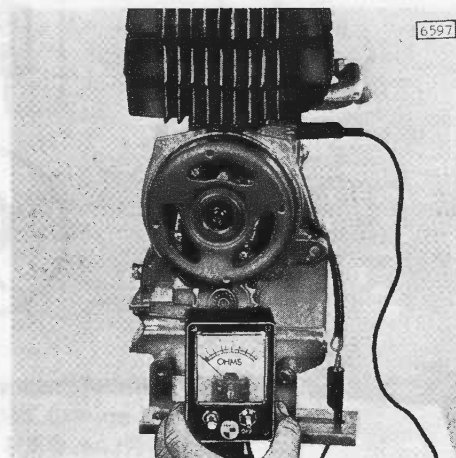


Ignition coil resistances in Ohms:

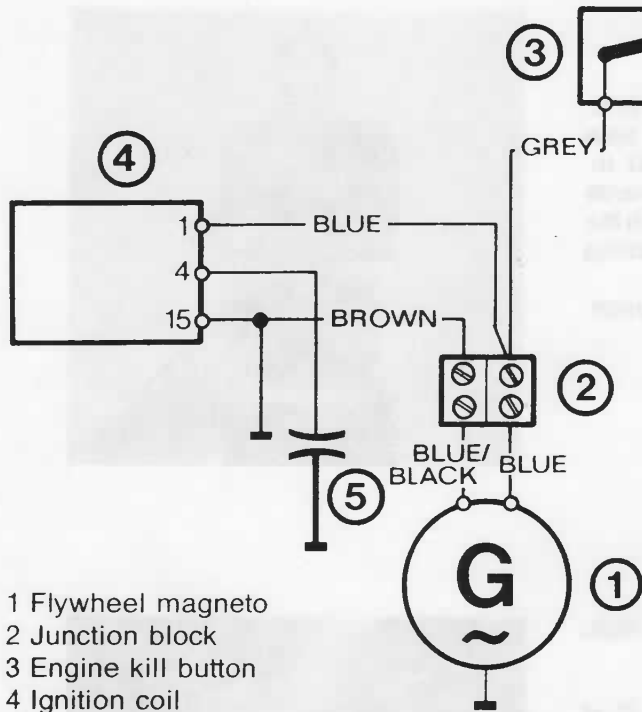
Primary coil	2
Secondary coil	5.4
Spark plug cap	1000

SPARK PLUG

Plug gap .016—.020 in. (0.4—0.5 mm)
Champion L 5.



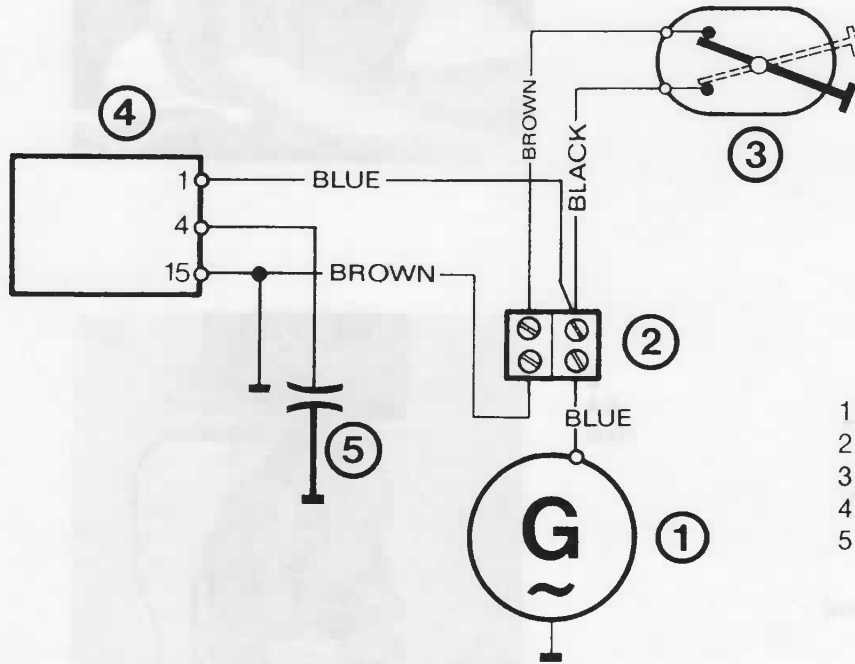
WIRING DIAGRAMM



- 1 Flywheel magneto
- 2 Junction block
- 3 Engine kill button
- 4 Ignition coil
- 5 Spark plug

NOTE: If stop button replacement is warranted for this ignition system, replace with part no. 349.1.53.830.0 and install additional ground wire as shown in wiring diagram below.

Flywheel magneto 6 V
 Part no. 349.3.50.800.0
 Bosch no. 0212 124 043 RDP 1 (R) up to engine number 4401270

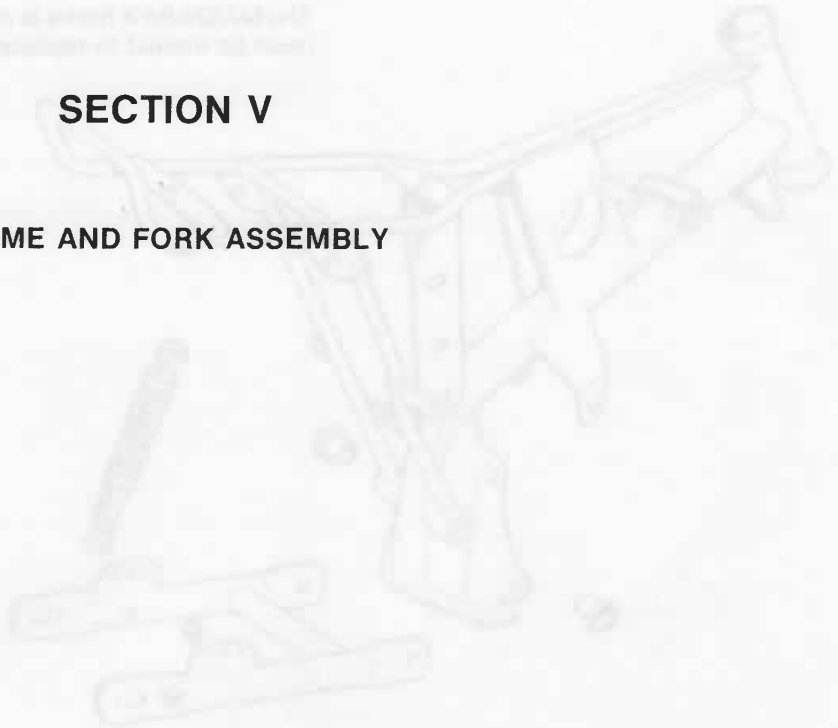


- 1 Flywheel magneto
- 2 Junction block
- 3 Engine kill button
- 4 Ignition coil
- 5 Spark plug

Flywheel magneto 6 V
 Part no. 349.3.50.300.0
 Bosch no. 0204 110 002 RDP 1 (I) from engine number 4401271

SECTION V

FRAME AND FORK ASSEMBLY



Remove the front fork tubes from the frame. To do this, first remove the front fork tubes from the frame. Then, remove the front fork tubes from the frame. Finally, remove the front fork tubes from the frame.

FRONT FORK

Remove the front fork tubes from the frame. To do this, first remove the front fork tubes from the frame. Then, remove the front fork tubes from the frame. Finally, remove the front fork tubes from the frame.

Remove the front fork tubes from the frame. To do this, first remove the front fork tubes from the frame. Then, remove the front fork tubes from the frame. Finally, remove the front fork tubes from the frame.

REAR SWING ARM

Remove the rear swing arm from the frame. To do this, first remove the rear swing arm from the frame. Then, remove the rear swing arm from the frame. Finally, remove the rear swing arm from the frame.

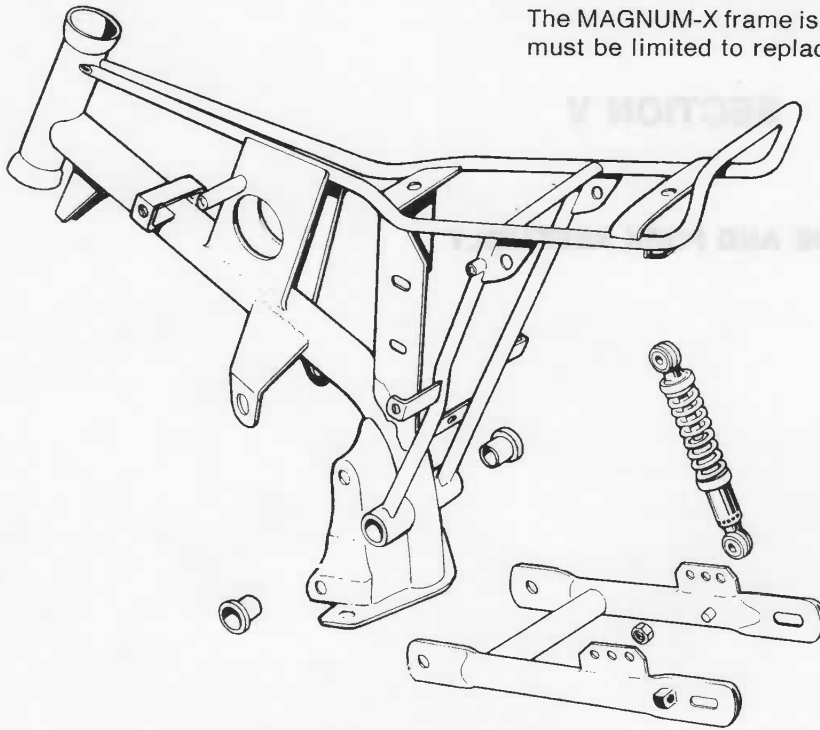
SHOCK ABSORBER

Remove the shock absorber from the frame. To do this, first remove the shock absorber from the frame. Then, remove the shock absorber from the frame. Finally, remove the shock absorber from the frame.

FRAME, REAR SWING ARM, SHOCK ABSORBER

FRAME

The MAGNUM-X frame is made of tubular steel and repairs must be limited to replacement of worn bearings.



Serious bends, cracks or other accidental damage cannot be repaired without weakening the frame. Impaired steering or wheel misalignment are indications of a twisted or damaged frame.

STEERING HEAD

Remove steering stem nut, lift off top bridge and handlebar assembly and place over frame. Remove lower steering stem nut and pull down fork yoke assembly.

Knock out steering head bearing cups and install with special tool 905.6.34.501.0.

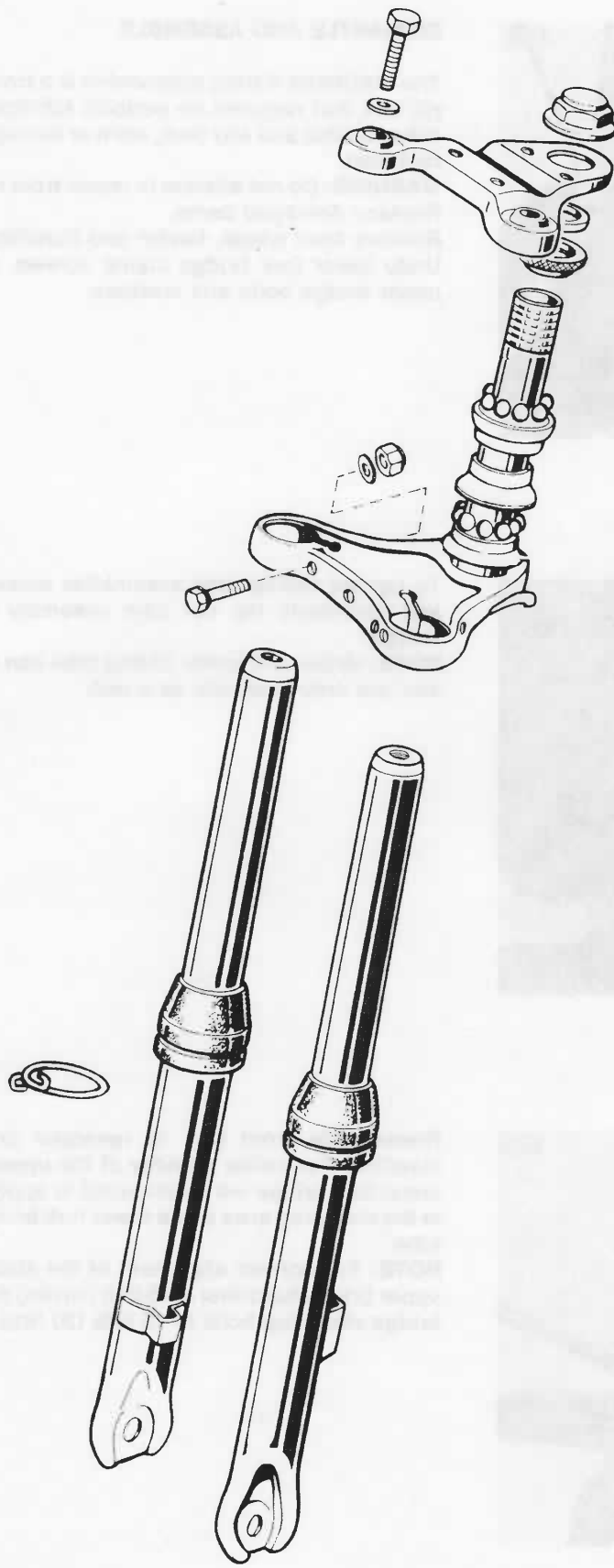
REAR SWING ARM

Inspect swing arm and replace if twisted or bent. If excessive side movement of the swing arm is noticeable replace swing arm bushes.

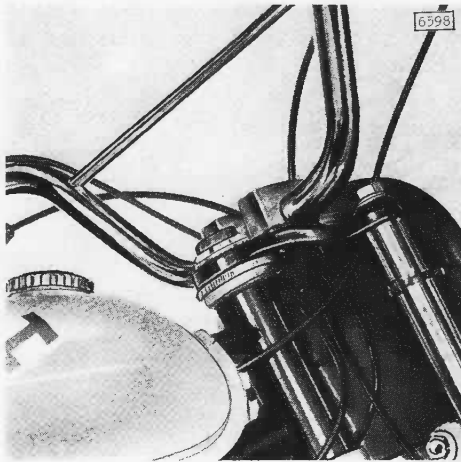
SHOCK ABSORBER

Shock absorbers are not serviceable. Faulty suspension units must be replaced.

FRONT SUSPENSION



FRONT SUSPENSION

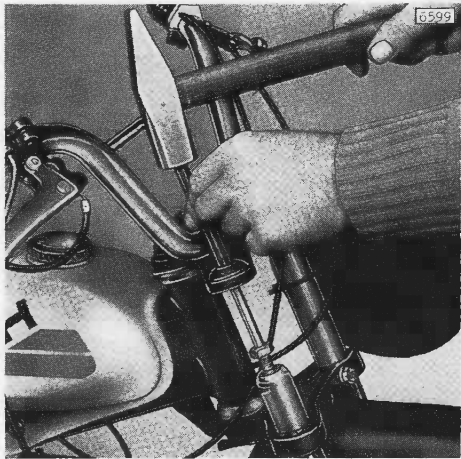


DISMANTLE AND ASSEMBLE

The MAGNUM-X front suspension is a trouble-free telescopic fork that requires no periodic lubrication. Spare parts are available and any bent, worn or damaged parts must be replaced.

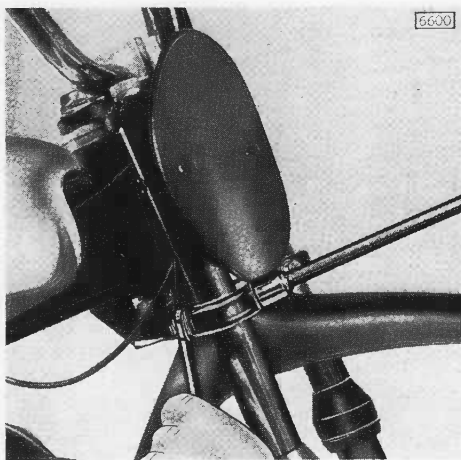
WARNING: Do not attempt to repair front suspension parts. Replace damaged items.

Remove front wheel, fender and handlebar assembly. Undo lower fork bridge clamp screws. Remove the two upper bridge bolts and washers.



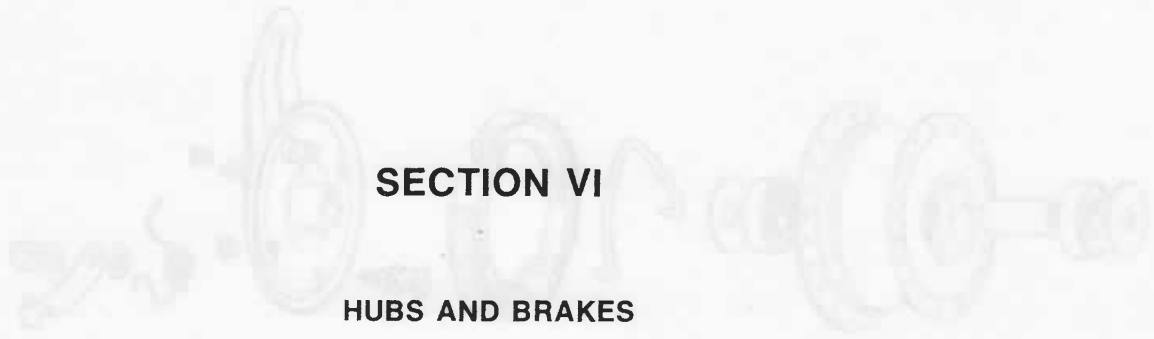
To tap out sliding tube assemblies screw in retainer bolt and cautiously tap out tube assembly from lower fork bridge.

NOTE: Upper and lower sliding tube can not be separated and are only available as a unit.



Reassemble front fork in reversed procedure to dismantling. For better stability of the upper tube within the lower fork bridge we recommend to apply some "Loctite" in the clamping area of the lower fork bridge and the upper tube.

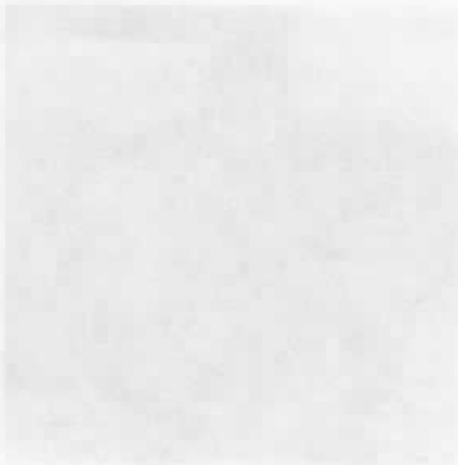
NOTE: For correct alignment of the sliding tubes torque upper bridge bolts first to 25 ft/lb (30 Nm) then the lower fork bridge clamping bolts to 15 ft/lb (20 Nm).



SECTION VI

HUBS AND BRAKES

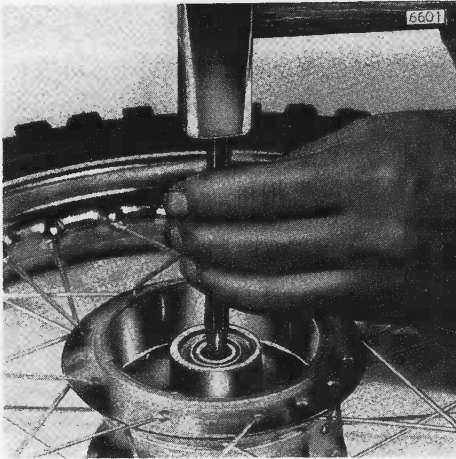
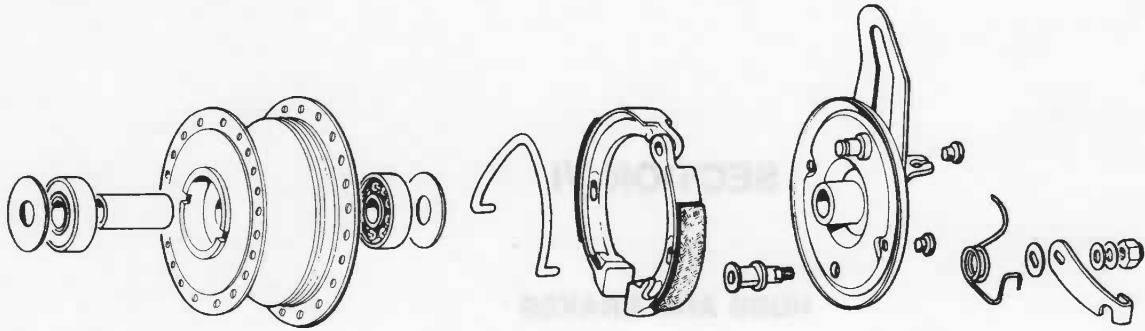
When the brake is applied, the brake shoes are forced against the brake drum, which causes the drum to rotate and the vehicle to stop. The brake shoes are held in place by a brake shoe adjuster, which is a small metal piece that is attached to the brake shoe and the brake drum. The brake shoe adjuster is used to adjust the gap between the brake shoe and the brake drum, which is important for proper braking performance.



The brake drum is a cast iron component that is attached to the axle. It is used to convert the kinetic energy of the vehicle into heat, which is then dissipated into the air. The brake drum is a critical component of the brake system, and it must be inspected regularly for wear and tear. If the brake drum is worn, it can cause the brake shoes to wear prematurely and can also cause the vehicle to pull to one side.



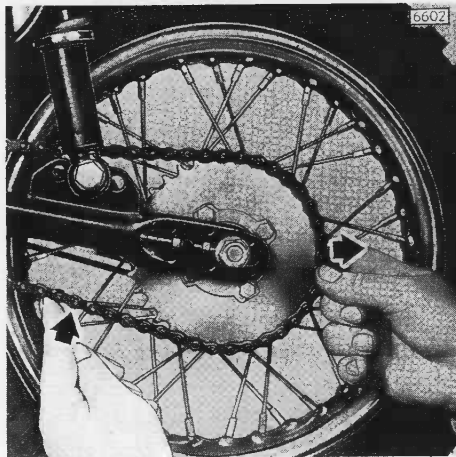
BRAKES, HUBS



Replace wheel bearings

Use a drift to knock out wheel bearings. Before installation of the new bearings, pack bearings with fibrous bearing grease. Replace both dust covers.

CAUTION: When installing the new bearings apply pressure only to the outside ring of the bearing and not on the inside ring, damage will occur.



Drive sprocket and chain

A simple method to find out whether the chain can still be used.

Press the chain by hand upwards so that it is tightly tensioned. If now the chain permits to be lifted from the sprocket by the other hand by more than half the diameter of the roller, the chain must be replaced. If the sprocket is worn as shown have it replaced.

SECTION VII

TORQUE SPECIFICATION, CONVERSIONS

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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Engine unit

Cylinder head	7 ft/lb (10 Nm)
Flywheel nut	25 ft/lb (35 Nm)
Clutch retaining nut	20 ft/lb (27 Nm)
Crankcase screws	6 ft/lb (8 Nm)
Clutch cover screws	6 ft/lb (8 Nm)
Engine mounting screws	23 ft/lb (32 Nm)

Frame assembly

Front/rear axle nuts	20 ft/lb (27 Nm)
Rear suspension unit, upper and lower	17 ft/lb (23 Nm)
Rear swing arm mounting bolt	29 ft/lb (40 Nm)
Handlebar clamping screws	20 ft/lb (27 Nm)
Top fork bridge bolts	25 ft/lb (30 Nm)
Lower clamping bolts	15 ft/lb (20 Nm)

Tightening torque to be within a tolerance of 10%

NOTE: Nm stands for Newton-meter which is an European standard measure. Its conversion factor to receive ft/ lb (foot-pounds) is .735.

METRIC CONVERSION TABLE

MILLIMETERS TO INCHES

mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
.01	.00039	.41	.01614	.81	.03189	21	.82677	61	2.40157
.02	.00079	.42	.01654	.82	.03228	22	.86614	62	2.44094
.03	.00118	.43	.01693	.83	.03268	23	.90551	63	2.48031
.04	.00157	.44	.01732	.84	.03307	24	.94488	64	2.51968
.05	.00197	.45	.01772	.85	.03346	25	.98425	65	2.55905
.06	.00236	.46	.01811	.86	.03386	26	1.02362	66	2.59842
.07	.00276	.47	.01850	.87	.03425	27	1.06299	67	2.63779
.08	.00315	.48	.01890	.88	.03465	28	1.10236	68	2.67716
.09	.00354	.49	.01929	.89	.03504	29	1.14173	69	2.71653
.10	.00394	.50	.01969	.90	.03533	30	1.18110	70	2.75590
.11	.00433	.51	.02008	.91	.03583	31	1.22047	71	2.79527
.12	.00472	.52	.02047	.92	.03622	32	1.25984	72	2.83464
.13	.00512	.53	.02087	.93	.03661	33	1.29921	73	2.87401
.14	.00551	.54	.02126	.94	.03701	34	1.33858	74	2.91338
.15	.00591	.55	.02165	.95	.03740	35	1.37795	75	2.95275
.16	.00630	.56	.02205	.96	.03780	36	1.41732	76	2.99212
.17	.00669	.57	.02244	.97	.03819	37	1.45669	77	3.03149
.18	.00709	.58	.02283	.98	.03858	38	1.49606	78	3.07088
.19	.00748	.59	.02323	.99	.03898	39	1.53543	79	3.11023
.20	.00787	.60	.02362	1.00	.03937	40	1.57480	80	3.14960
.21	.00827	.61	.02402	1	.03937	41	1.62417	81	3.18897
.22	.00866	.62	.02441	2	.07874	42	1.65354	82	3.22834
.23	.00906	.63	.02480	3	.11811	43	1.69291	83	3.26771
.24	.00945	.64	.02520	4	.15748	44	1.73228	84	3.30708
.25	.00984	.65	.02559	5	.19685	45	1.77165	85	3.34645
.26	.01024	.66	.02598	6	.23622	46	1.81102	86	3.38582
.27	.01063	.67	.02638	7	.27559	47	1.85039	87	3.42519
.28	.01102	.68	.02677	8	.31496	48	1.88976	88	3.46456
.29	.01142	.69	.02717	9	.35433	49	1.92913	89	3.50393
.30	.01181	.70	.02756	10	.39370	50	1.96850	90	3.54330
.31	.01220	.71	.02795	11	.43307	51	2.00787	91	3.58267
.32	.01260	.72	.02835	12	.47244	52	2.04724	92	3.62204
.33	.01299	.73	.02874	13	.51181	53	2.08661	93	3.66141
.34	.01339	.74	.02913	14	.55118	54	2.12598	94	3.70078
.35	.01378	.75	.02953	15	.59055	55	2.16535	95	3.74015
.36	.01417	.76	.02992	16	.62992	56	2.20472	96	3.77952
.37	.01457	.77	.03032	17	.66929	57	2.24409	97	3.81889
.38	.01496	.78	.03071	18	.70866	58	2.28346	98	3.85826
.38	.01535	.79	.03110	19	.74803	59	2.32283	99	3.89763
.40	.01575	.80	.03150	20	.78740	60	2.36220	100	3.93700

METRIC CONVERSION TABLE

METRIC TO AMERICAN CONVERSION TABLE

AMERICAN TO METRIC CONVERSION TABLE

MULTIPLY (LINEAR)	by	to obtain
Millimeters (mm)	.03937	Inches
Millimeters (mm)	.00328	Feet
Centimeters (cm)	.3937	Inches
Centimeters (cm)	.0328	Feet

(DISTANCE)		
Meters (m)	39.37	Inches
Meters (m)	3.28	Feet
Kilometers (km)	3281	Feet

(AREA)		
Square Centimeters (cm ²)	.155	Square Inches
Square Centimeters (cm ²)	.001076	Square Feet
Square Meters (m ²)	10.76	Square Feet

(VOLUME)		
Cubic Centimeters (cc)	.06102	Cubic Inches
Liters (l)	61.02	Cubic Inches

(LIQUID CAPACITY)		
Liters (l)	2.113	Pints
Liters (l)	1.057	Quarts
Liters (l)	.2642	Gallons
Cubic Centimeters (cc)	.0338	Fluid Ounces
U. S. Gallons	1.2	Imperial gals.
Imperial Gallons	277,274	cu. in.

(WEIGHT)		
Grams (gm)	.03527	Ounces
Kilograms (kg)	2.205	Pounds

(OTHER)		
Newton Meters (Nm)	.723	Foot-Pounds (ft. lbs.)
Kilometers/Liters (km/l)	2.352	Miles/Gallon (mpg)
Metric Horsepower (ps)	1.014	Brake Horsepower (bhp)

MULTIPLY (LINEAR)	by	to obtain
Inches (in.)	25.4	Millimeters
Inches (in.)	2.54	Centimeters
Feet (ft.)	304.8	Millimeters
Feet (ft.)	30.48	Centimeters

(DISTANCE)		
Inches (in.)	.0254	Meters
Feet (ft.)	.03048	Meters
Miles (mi.)	1.609	Kilometers

(AREA)		
Square Inches (in ²)	6.452	Square Centim.
Square Feet (sq. ft.)	929	Square Centim.

(VOLUME)		
Cubic Inches (cu. in.)	16.39	Cubic Centim.
Cubic Inches (cu. in.)	.01639	Liters

(LIQUID CAPACITY)		
Pints (pt.)	.4732	Liters
Quarts (qt.)	.9463	Liters
Gallons (gal.)	3.785	Liters
Fluid Ounces (fl. oz.)	29.58	Cubic Centim.
U. S. Gallons	1.2	Imperial gals.
Imperial gallons	4.537	Liters
Imperial gallons	277.274	cu. in.

(WEIGHT)		
Ounces (oz.)	28.35	Grams
Pounds (lb.)	.4536	Kilograms

(OTHER)		
Foot-Pounds (ft. lbs.)	1.383	Newton Meters (Nm)
Miles/Gallon (mpg)	.4252	Kilometers/Li-ter (km/l)
Brake Horsepower (bhp)	.9862	Metric Horsepower (ps)