ENGINE-POWER TORQUE TYPE

1. SPECIFICATIONS

Bore	61.493 mm (2.421 ins)
Stroke	53.975 mm (2.125 ins)
Piston taper:	
Bottom of skirt	61.366 mm (2.416 ins)
Top ring land	61.239 mm (2.411 ins)
Piston rings:	
Number	2
Size	2.381 mm × 61.493 mm (.093 in × 2.421 ins)
Big end bearing type	Caged roller bearing
Little end bearing type	Needle roller bearing
Connecting rod material	Aluminium
Connecting rod material	Aluminium
Crankpin material	Hardened alloy steel
Crankshaft type	Alloy steel forging
Type	Ball bearing
Size -	
Upper	25 mm × 50 mm open
Lower	20 mm × 50 mm with inregral seal
'C' core air gap	0.254 mm (.010 in)
Spark plug gap	0.635 mm (.025 in)
Spark plug type	Champion CJ8
Fuel requirement	2 stroke petrol-oil mixture, 25:1 ratio

TORQUE WRENCH SETTINGS

Crankpin	67–75 Nm (50–55 ft/lb)
Starter housing retaining screws	13.5–16 Nm (10–12 ft/lb)
Cylinder head retaining bolts	13.5–16 Nm (10–12 ft/lb)
Blade disc retaining nut	67–75 Nm (50–55 ft/lb)
Starter pulley retaining nut	16–21 S Nm) (12–16 ft/lb)

2. DESCRIPTION

The Power Torque Series 80 engine is a two stroke single cylinder engine of 160cc capacity which includes many new features.

The cylinder and crankcase are a one piece iron casting which by its design is much quieter in operation. The cylinder can quite readily be rebored if necessary.

A recoil type starter assembly forms the top cover of the crankcase.

Readily replaceable rubber 'O' rings are used as the sealing medium between the starter housing and the crankcase and also between the starter housing and centre shaft of the starter.

The lower seal is integral with the lower crankshaft main bearing.

The crankshaft is a one piece half shaft which is supported by two ball type main bearings which are a press fit onto the crankshaft and into the crankcase.

The aluminium connecting rod is attached to the crankshaft by a threaded hardened steel crankpin. The connecting rod and crankpin are fully accessible after removal of the starter assembly, this makes it possible to remove and instal the piston and connecting rod without removing the engine from the chassis.

The engine mounting bolt spacing conforms to S.A.E. specification which makes the Power Torque Series 80 engine a possible replacement of four stroke engines in certain applications.

WARNING: Where fitted, any heat shields, partition plates or ducts must be installed to their correct positions on the engine and chassis before the engine is run.

3. BASIC TWO-CYCLE ENGINE OPERATION

The Victa Power Torque two-cycle (two stroke) engine operates on the loop scavenge principle, utilising the crankcase as a compressor in its cycle of operations, and the piston to close or open the various cylinder ports as required. As the piston ascends on the compression stroke it creates a vacuum in the crankcase. When the stroke is almost completed the lower edge of the piston uncovers the inlet port in the cylinder to which the carburettor is attached. At this stage atmospheric pressure causes a charge of fuel and air to enter as a gas below the piston and more or less fill the crankcase. (See illustration A).

Just before the piston reaches top dead centre, a spark occurs across the electrodes of the spark plug, igniting the gas in the combustion chamber (see illustration B) so that maximum combustion pressure occurs as the piston reaches the top of its stroke, thrusting the piston down on the power stroke. As the piston descend, its lower edge seals off the inlet port, cutting off the entry of the gas mixture, and compression of the mixture in the crankcase commences. As the power stroke of the piston continues, the exhaust port in the cylinder is uncovered and the burnt gas escapes into the muffler. (See illustration C). At this time the top openings of the transfer passages are uncovered and because the lower ends of these passages communicate with the crankcase, the gas mixture compressed there is discharged into the combustion chamber in such a way that the final dregs of burnt gas are blown through the exhaust port, this is called loop scavenge. (See illustration D). The piston then reaches and passes bottom dead centre. As it ascends again it closes the transfer

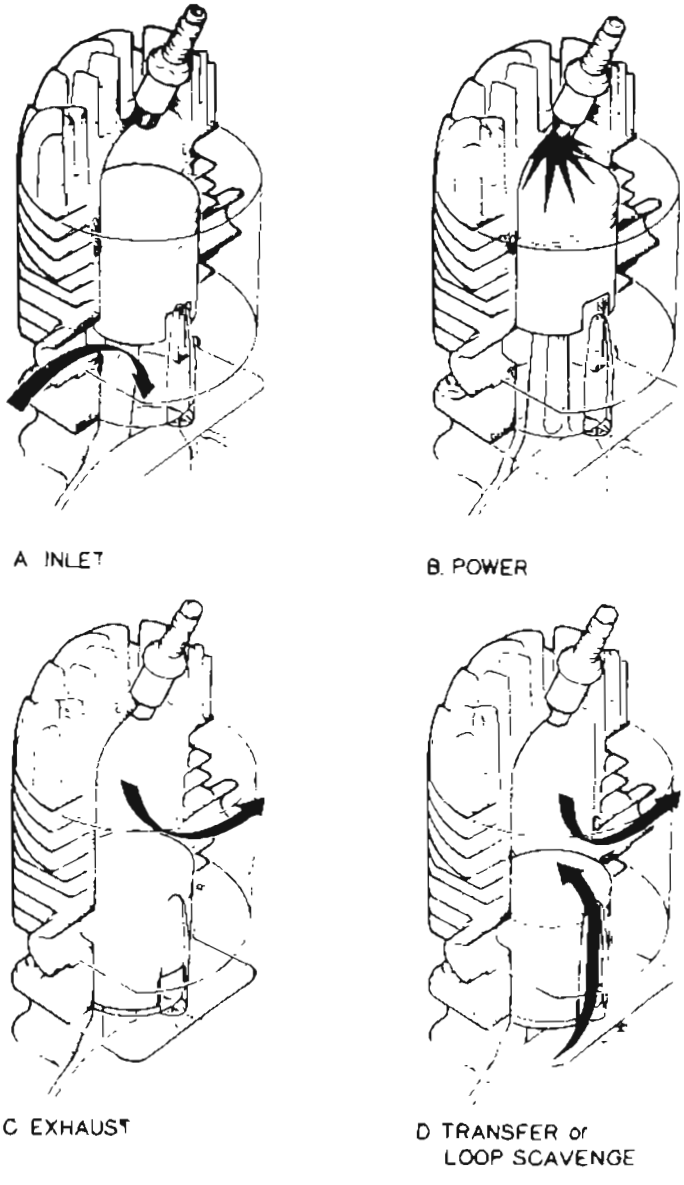


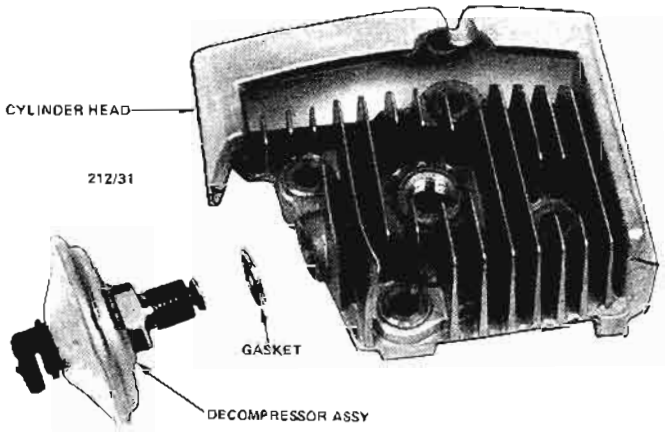
Illustration showing the operation of a Two-Cycle engine.

and exhaust ports, commences to compress the charge of gas in the combustion chamber, and the cycle is repeated.

As the fuel-air mixture contains a proportion of lubricating oil, it will be seen that all the moving parts of the engine are bathed in an oil mist at some stage of the operations, and the importance of having the correct grade of oil in the petrol in the right proportions will be readily understood.

4. AUTOMATIC DECOMPRESSOR ASSEMBLY

An automatic decompressor is used on Victa Power Torque Series 80 engines. The use of a decompressor valve places far less strain on the starter components of the



View of decompressor assembly removed from the cylinder head.

engine and also makes the engine easier to start.

OPERATION OF THE VALVE

When the engine is at rest a large spring, places a load on the top diaphragm washer and holds the valve off its seat.

As the engine is pulled over with the starter, the passage of gas past the valve gradually forces it onto its seat, the engine then fires and starts.

The vaccum pipe is connected to the carburettor, the resulting vacuum working in conjunction with the diaphragm holds the valve on the seat while ever the engine is running. When the engine stops the vacuum drops, then the large spring takes over and pushes the valve off its seat again ready for the next start.

5. PREOVERHAUL CHECK

COMPRESSION

It is important to note that compression cannot be checked without first isolating the decompressor.

The decompressor may be isolated by disconnecting the vacuum pipe at the carburettor and attaching a length of fuel line or similar to the vacuum pipe, whereupon sucking gently will close the valve. The following operation to test compression can then take place.

Every time a two-cycle engine is serviced both the combustion chamber and crankcase compression should be checked. To do this open the throttle, disconnect the spark plug lead, close the fuel tap and turn the mower on its side. The engine crankshaft can then be rotated by turning the blade holder by hand. In each revolution there should be two positions where resistance or compression is felt. One is when the charge in the combustion chamber is being compressed, the other when the charge in the crankcase is being compressed. The combustion chamber compression is much the higher of the two.

With a little practice spread over a number of engines with varying degrees of wear, it soon becomes possible to form a good idea of an engines condition.

If little or no resistance is felt when turning the engine it should be dismantled for further examination so that a decision may be made so rebore or merely instal new piston rings.

CYLINDER AND PISTON

If the cylinder bore is polished and free from scores the decision rests on the condition of the piston. Providing the piston is free from scores and that its skirt size is such that the clearance between the skirt and the cylinder bore does not exceed 0.28 mm (0.011 in) the fitting of new piston rings would restore most of the efficiency.

If the piston to cylinder bore clearance exceeds 0.28 mm (0.011 in), the cylinder should be rebored and an oversize piston fitted.

Never fit a new piston in a worn two-cycle cylinder. This type of cylinder wears to a barrel shape, large in the middle, tapering to each end. No matter how good the cylinder bore appears to be, it should be rebored and have an oversize piston fitted to obtain full value from the piston.

EFFECT OF DUST

Dust is the worst enemy of the internal combustion engine; it causes rapid wear on the piston skirt resulting in the loss of the pumping effect necessary for the induction of the fuel/air mixture.

The symptoms exhibited by an engine damaged by dust are:

(1) Little or no crankcase compression but some combustion chamber compression. The worn piston skirt fails to seal the inlet port, not enough fuel/air is taken into the crankcase. The piston rings, if chrome plated, retain some sealing effect in the early stages of dust damage.

(2) The engine hard to start or will start only after removal of the air filter and/or muffler. Removal of these parts takes the load off the pumping section, piston skirt and ports.

REMEDY FOR WORN CYLINDER

When dust damage occurs it is necessary to rebore the cylinder and fit an oversize piston. This eliminates the dust impregnated surface of the cylinder bore and so provides a clean surface for the new piston to run on.

As the dust would be distributed throughout the engine, the crankshaft should be removed and a thorough cleaning job carried out, not forgetting the inside of the snorkel and carburettor bore.

Causes of dust entry are: Punctured, torn or poorly fitted snorkels, punctured filter elements and leaks around the starter housing and inlet manifold 'O' rings.

PREVENTION OF WEAR

Ensure that filter elements, snorkels and all other parts of the induction tract are maintained in good condition according to the manufacturers instructions.

6. SERVICING THE ENGINE

REMOVING THE ENGINE FROM THE CHASSIS

(1) Disconnect the high tension lead from the spark plug.

(2) Turn off the fuel tap, disconnect the fuel line from the carburettor, remove the dress cowl retaining screws and lift the dress cowl and fuel tank from the engine.

NOTE: On Vortex models it will be necessary to remove the retaining screw and closing plate from the dress cowl to allow the starter handle to pass through it.

(3) Where fitted, remove the retaining screws and withdraw the muffler heat shield.

(4) Remove the carburettor and snorkel as described in the relevant sections.

(5) Turn the mower onto its side and insert a suitable length of 3/8 in steel bar into the hole in the side of the tapered sleeve, which is located above the blade holder on the engine crankshaft.

(6) Hold the steel bar securely and remove the blade holder retaining nut and washer. Withdraw the blade holder from the mower.

(7) Remove the four engine retaining bolts and washers and lift the engine assembly from the chassis.

NOTE: On self propelled mowers it will be necessary to disconnect the drive belt before removing the engine.

(8) If necessary, remove the engine lower baffle retaining clip and withdraw the baffle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the engine and chassis mating surfaces are clean and free from corrosion.

(2) Tighten the engine retaining bolts evenly and securely.

(3) Ensure that the blade holder, washer and retaining nut are correctly located. Tighten the blade holder retaining nut to the specified torque.

(4) Instal the carburettor and snorkel as described in the relevant sections.

(5) Instal the fuel tank and dress cowl to the engine and connect the fuel line and high tension lead.

DECARBONISING AND FITTING NEW RINGS

NOTE: It is not necessary to separate the engine from the chassis to remove the piston and connecting rod.

(1) Thoroughly clean the engine and chassis assembly to prevent the entry of dirt or foreign matter into the engine crankcase and cylinder.

(2) Disconnect the high tension lead from the spark plug.

(3) Turn off the fuel tap, disconnect the fuel line from the carburettor, remove the dress cowl retaining screws and lift the dress cowl and fuel tank from the engine.

NOTE: On Vortex models it will be necessary to remove the retaining screw and closing plate from the dress cowl to allow the starter handle to pass through it.

(4) Remove the retaining screws and withdraw the sub cowl and duct assembly.

(5) Disconnect the decompressor vacuum pipe from the carburettor.

(6) Remove the cylinder head retaining bolts progressively and in a diagonal fashion. Withdraw the cylinder head from the engine.

(7) On Vortex models, remove the retaining screws and withdraw the muffler heat shield from the engine.

(8) Remove the starter housing assembly retaining screws and gently prise the starter assembly from the crankcase.

(9) Turn the mower onto its side and insert a suitable length of 3/8 in steel bar into the hole in the side of tapered sleeve, which is located above the blade holder on the engine crankshaft.

(10) Hold the steel bar securely and using the special socket, Part No. TL 18036B, loosen and remove the crankpin.

NOTE: The crankpin has a right hand thread.

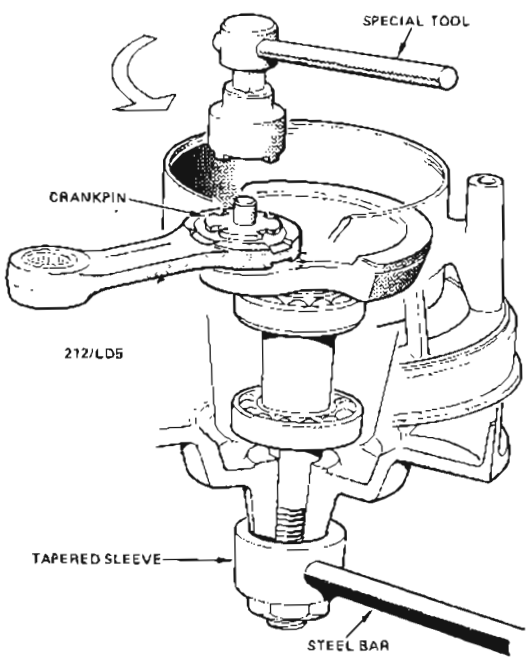
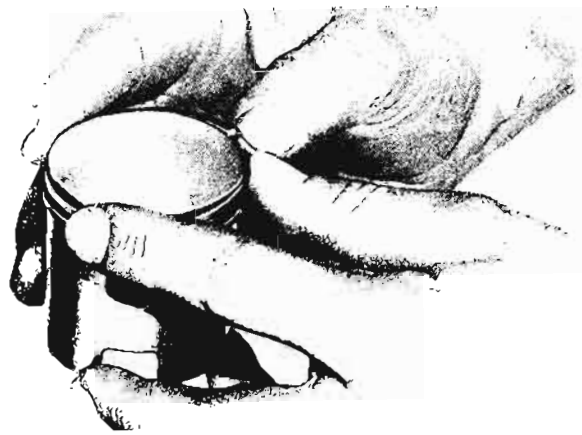


Illustration showing correct method of loosening crankpin.



Only apply enough pressure to the piston ring to allow it to slide from the piston.

(11) Carefully push the piston and connecting rod through the top of the cylinder bore and out of the engine.

(12) Using a suitable screwdriver, lever off the muffler retaining clips.

(13) If necessary, remove the carburettor and snorkel as described in the relevant sections.

(14) Remove the inlet manifold retaining screws and remove the inlet manifold from the cylinder block. Discard the inlet manifold 'O' ring.

(15) Using long nosed pliers, remove the circlip from each side of the piston. Push out the gudgeon pin from the piston just far enough to allow the piston to be removed from the connecting rod. If the gudgeon pin cannot be removed by hand pressure, use the service tool, Part No TL 18008A, or a suitable punch. If a punch is used, take care not to damage the piston or connecting rod. Put a scratch mark inside the piston so that it can be refitted the same way round.

NOTE: Do not remove the bearings from the connecting rod.

(16) Piston rings may be removed by either of the following methods:

(a) Hold the piston securely on a bench. With the thumbs on the ends of the piston ring press gently apart until it is possible to clear the ring from the piston. Care must be taken not to exert too much pressure or the piston ring may break.

(b) Insert three thin strips of metal between the piston and the rings. Insert the strips one at a time and work them around the piston until they are equally spaced. The rings may then be eased up over the strips until they clear the piston.

(17) At this stage it would be advisable to check the clearance between the piston and the cylinder bore; if the clearance is excessive, it would be desirable to rebore the cylinder and fit a new oversize, piston rather than fit new rings, which might, if the cylinder bore is badly worn, become trapped in the ports and break.

The piston rings may be removed from the piston using three thin strips of metal

The clearance may be checked in two ways:

(a) With a micrometer, measure the diameter of the piston at the lower end of the skirt. The standard size at this point is 61.366 mm (2.416 ins), giving a clearance of 0.127 mm (0.005 in) in the cylinder bore. If the piston measures 61.188 mm (2.409 ins) or less, the clearance will exceed 0.28 mm (0.011 in) and the cylinder should be rebored and an oversize piston assembly fitted.

(b) Place the piston, without the rings fitted, into the cylinder bore at the top of its normal stroke. Now see if it is possible to insert a 0.25 mm (0.010 in) feeler gauge between the skirt of the piston and the cylinder wall; if this feeler gauge or a larger one will go in, excessive piston clearance is indicated and the cylinder should be rebored and an oversize piston assembly fitted.

(18) Before installing new rings ALL carbon must be carefully removed from the piston rings grooves. To do this, break one of the old piston rings and file the end to a chisel point; the section of the ring may then be wedged in a file handle to provide a convenient scraper of just the right width. Scrape the carbon from the top of the piston, being careful not to damage the comparatively soft aluminium alloy. Wash the piston in clean kerosene and dry off with a clean cloth.

(19) Check the gap of the new piston rings by placing each ring squarely in the lower, unworn end of the cylinder bore; the gap between the ends of each ring should be not less than 0.203 mm (0.009 in) or more than 0.432 mm (0.017 in). Carefully file the end of the ring if there is insufficient gap.

(20) Assemble the new rings to the piston, using three thin strips of metal if necessary, ensuring that the cutaway for the ring peg is the right way up. The crimped expander ring may be fitted last by feeding it between the ring joint into the lower groove.

(21) Remove all traces of carbon from the ports in the cylinder, taking care not to mark the bore. Do not file or alter the shape of the ports, otherwise the efficiency of the cylinder may be destroyed. Clean off all traces of old gaskets and wash the cylinder with clean kerosene, taking care not to allow any cleaning fluid to enter the crankcase area.

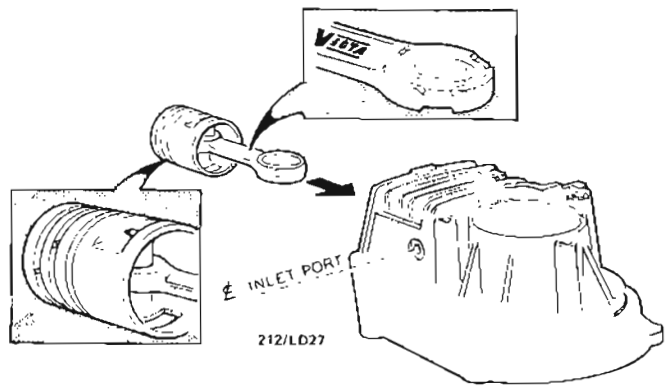
(22) Scrape all traces of carbon from the cylinder head and all traces of gasket from the joint face, taking care not to damage the surface of the aluminium alloy casting.

If the cylinder head joint face is warped, it may be reconditioned as follows:

Take a sheet of medium grade emery cloth and lay it on perfectly flat surface; place the cylinder head face down on the cloth and work it backwards and forwards; keep the head flat down on the cloth and turn it 90 degrees every few strokes. Examine the head at frequent intervals and cease the lapping operation when a clean, flat face has been obtained. Wash the head in clean kerosene and dry off thoroughly.

(23) Lubricate the little end bearing and the gudgeon pin with oil and instal the pistoh to the connecting rod, using the same care as was called for during dismantling.

NOTE: The ring locating pegs on the piston must face the inlet port and the connecting rod must be installed to the piston with the word 'VICTA' facing up.



Line drawing showing correct relationship of piston and connecting rod to cylinder block.

(24) Carefully instal the gudgeon pin circlips in the grooves in the piston.

(25) For compressing the piston rings in their grooves while the piston is installed to the cylinder, the use of a piston ring clamp, service tool TL 18013A is recommended, but a successful substitute can be made from a clean 12.7 mm (0.5 in) wide metal strip. The strip should be 203 mm (8 in) long. Put a 90 degree bend in it 19 mm (0.75 in) from each end. There should be a gap of approximately 6.35mm (0.25 in) between the turned up ends when the strip is wrapped tightly around the piston skirt.

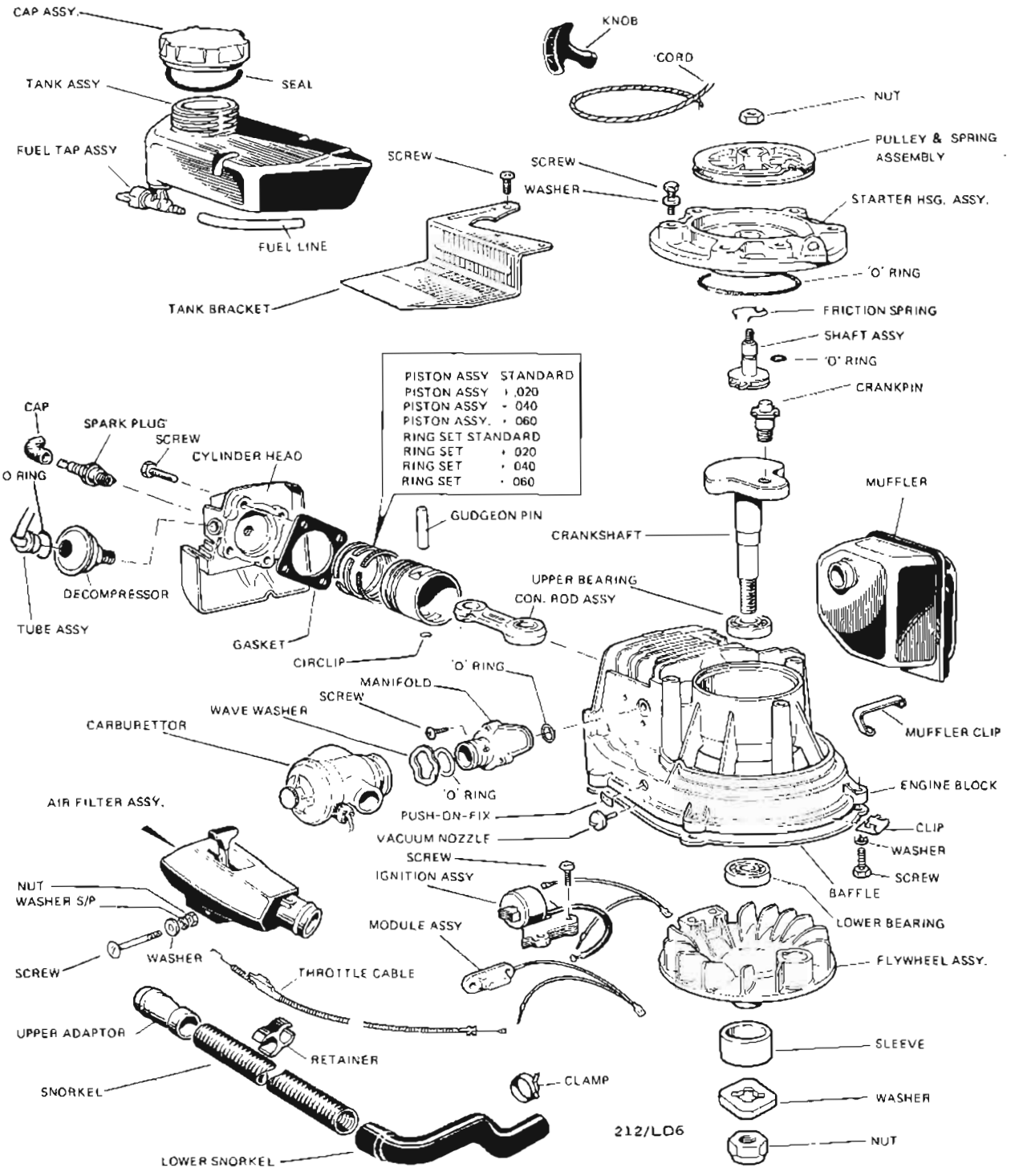
(26) Apply liberal amounts of clean oil to the piston rings and to the bore of the cylinder. Locate the rings so that the gaps are lined up with the pegs in the piston and place the clamp or compression strip over the rings to pull them tightly into the grooves; use a pair of pliers if finger pressure is insufficient. Slide the piston and connecting rod assembly into the cylinder allowing the top of the cylinder to push the clamp or compression strip off the rings.

NOTE: Ensure that the ring locating pegs on the piston are facing the inlet port and the word 'TICTA' on the connecting rod is facing up.

(27) Align the connecting rod big end bearing with the hole in the crankshaft and instal the crankpin to the crankshaft finger tight only at this stage.

(28) Turn the mower onto its side and insert a suitable length of 3/8 in steel bar into the hole in the side of the tapered sleeve, which is located above the blade holder on the engine crankshaft.

(29) Hold the steel bar securely and, using the special socket, Part No. TL 18036B, tighten the crankpin to the specified torque.



Dismantled view of Power Torque engine.

NOTE: It is not necessary to use any type of locking compound on the crankpin thread.

(30) Remove and discard the starter housing to crankcase sealing 'O' ring. Lightly lubricate a new starter housing 'O' ring with grease and instal it to the groove in the housing.

(31) Instal the starter housing to the crankcase, apply some Loctite (262) to the retaining screws if they are not of the Tufloc type and tighten the screws to the specified torque.

(32) Instal the muffler to the cylinder block, no gasket is required because the muffler is spigotted and retain it in position with the retaining clips.

NOTE: If removed, the lower muffler retaining clip must be installed to its locating hole before the cylinder head is installed.

(33) On Vortex models, place the heat shield over the muffler, instal the retaining screws a few turns, push the shield against the cylinder and tighten the screws securely.

(34) Instal a new cylinder head gasket and the cylinder head to the engine, instal the retaining bolts and tighten them evenly and progressively to the specified torque.

(35) Instal the inlet manifold using a new 'O' ring and tighten its retaining screws securely. Late model inlet manifolds have a longer spigot to improve sealing. The inlet port on late model cylinder blocks is machined deeper to accept this spigot.

If fitting a late model inlet manifold to an early model block it will be necessary to fit thin washers to each manifold retaining screw to achieve a satisfactory mounting and seal.

(36) Where removed, instal the carburettor and snorkel as described in the relevant sections.

(37) Instal the decompressor vacuum pipe to the carburettor.

(38) Instal the duct assembly and sub cowl to the engine, instal and securely tighten the retaining screws.

(39) Position the dress cowl and fuel tank on the engine ensuring that the starter handle is fed through the hole in the cowl. Instal and tighten the retaining screws securely.

(40) On Vortex models, instal the dress cowl closing plate, instal and securely tighten the retaining screw.

(41) Connect the fuel line to the carburettor.

(42) Connect the high tension lead to the spark plug.

TO RENEW CRANKSHAFT BEARINGS

(1) Remove the engine from the chassis as previously described.

(2) Remove the piston and connecting rod from the engine as described under the heading Decarbonising And Fitting New Rings.

(3) Remove the engine lower baffle retaining clip and withdraw the baffle.

(4) Support one side of the tapered sleeve, which is attached to the lower end of the crankshaft, on a steel block and strike the opposite side of the sleeve with a hammer to free it from mating taper on the flywheel. Slide the sleeve from the crankshaft.

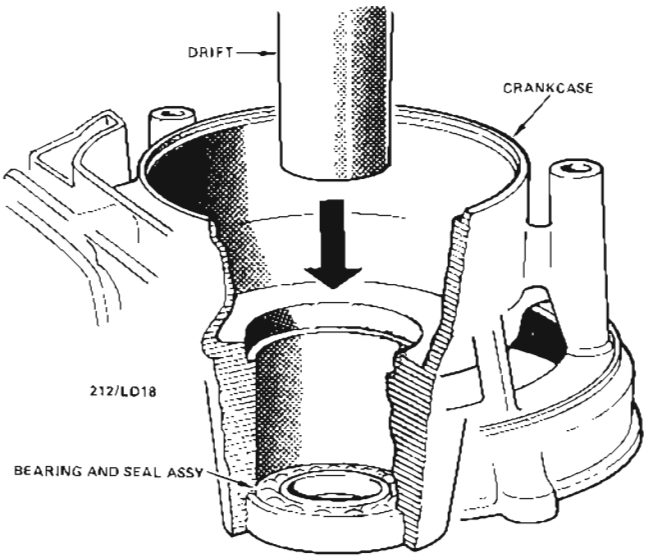


Illustration showing correct method of pressing the crankshaft and upper bearing from the crankcase.

NOTE: Take care not to damage the mating face of the tapered sleeve.

(5) Using two suitable screwdrivers placed opposite each other, gently lever the engine flywheel from the crankshaft.

(6) Place the engine assembly upside down on a suitable press and carefully press the crankshaft from the crankcase.

(7) Invert the engine assembly on the press and

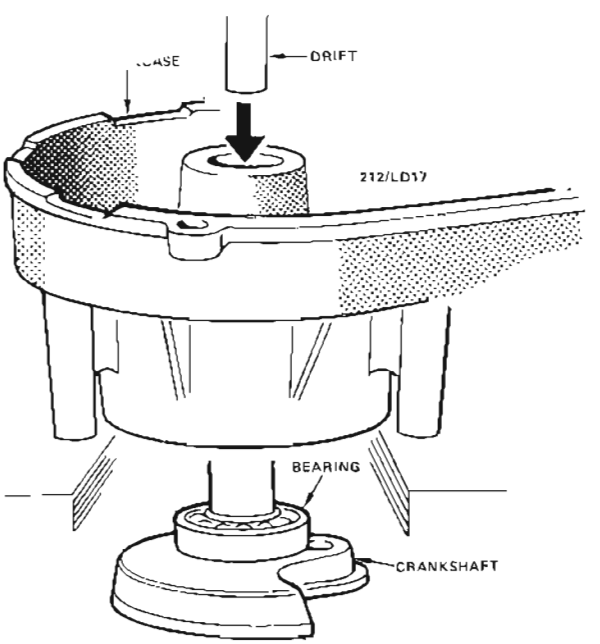


Illustration showing correct method of pressing lower bearing and seal assembly from the crankcase

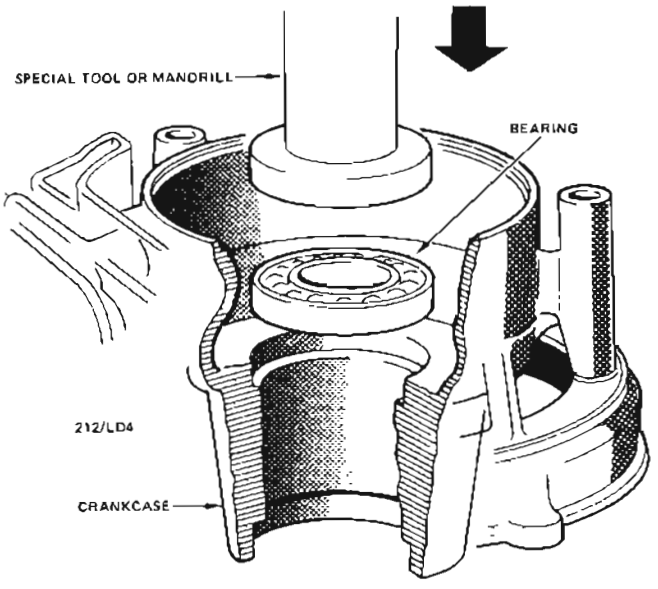


Illustration showing correct method of pressing new crankshaft upper bearing into the crankcase.

using a suitable drift, carefully press the lower bearing and seal assembly from the crankcase.

(8) Using a suitable Litchfield puller, withdraw the upper bearing from the crankshaft.

NOTE: New bearings must be installed whenever the crankshaft is removed.

(9) Using a special tool, Part No. TL 18037A, or a suitable mandrill which will apply the pressing force to the outer race of the bearing, press a new upper crankshaft bearing into the crankcase until the bearing outer race abuts the shoulder in the crankcase.

NOTE: The crankcase must be supported on a flat surface while pressing in the bearing. The bearing must be installed with the ball cage uppermost.

Do not press on the inner race of the bearing as damage to the bearing will result.

(10) Insert the crankshaft through the upper bearing, support the bearing inner race with the special tool, Part No. TL 18037A, and press the crankshaft into the bearing until the crankshaft web abuts the bearing inner race.

(11) Lubricate the ball cage and seal of the new lower bearing with oil. Smear the periphery of the bearing outer race with Loctite 601.

(12) Invert the engine assembly on the press and support the crankshaft web with the special tool, Part No. TL 18038A.

(13) Ensuring that the seal side of the bearing is facing away from the crankcase, carefully press the lower bearing onto the crankshaft and at the same time into the crankcase until the bearing outer race abuts the shoulder in the crankcase.

NOTE: Ensure that equal pressing force is applied to the inner and outer bearing races during the installing operations.

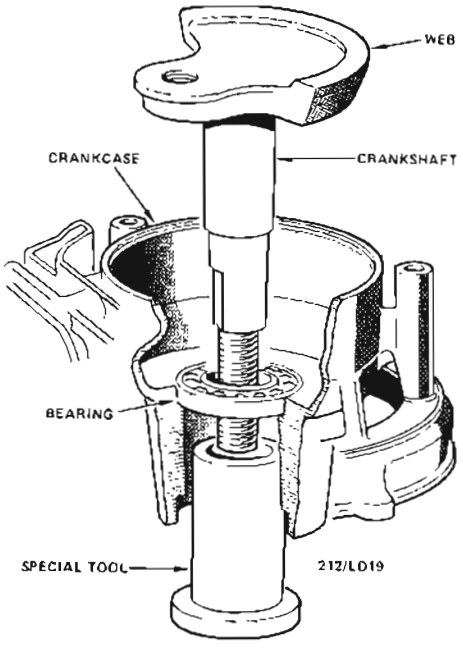


Illustration showing correct method of pressing crankshaft into upper bearing.

(14) Check the crankshaft and bearings for smooth rotation and noise.

(15) Instal the engine flywheel to the crankshaft. Ensure that flywheel taper is lubricated with oil or grease then instal the tapered sleeve.

(16) Place the engine lower baffle in position on the engine and instal the baffle retaining clip.

(17) Instal the piston and connecting rod to the engine as described under the heading Decarbonising And Fitting New Rings.

(18) Instal the engine to the chassis as previously described.

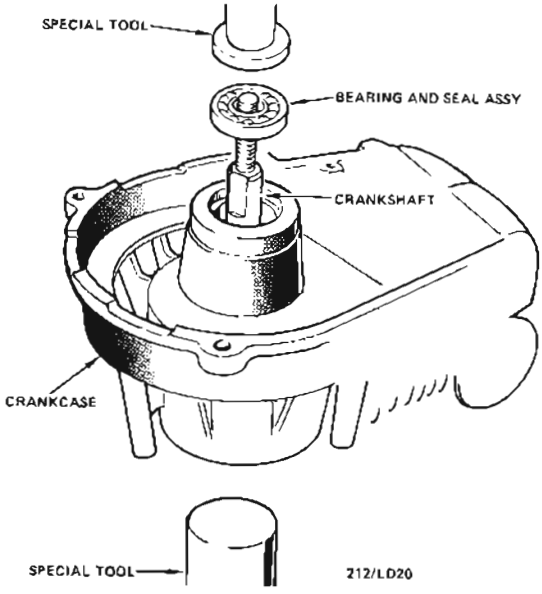


Illustration showing correct method of pressing lower bearing and seal assembly into the crankcase and onto the crankshaft.