

**WISCONSIN
MODEL W4-1770**

**REPAIR
MANUAL**

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 **WIS·CON
TOTAL POWER** CORP.

FOREWORD

Good operation and a planned maintenance program as outlined in this manual are vital in obtaining maximum engine performance and long engine life. The instructions on the following pages have been written with this in mind, to give the operator a better understanding of the various problems which may arise, and the manner in which these problems can best be solved or avoided.

The operator is cautioned against the use of any parts, other than genuine Wis-Con Total Power parts, for replacement or repair. These parts have been engineered and tested for their particular job, and the use of any other parts may result in unsatisfactory performance and short engine life. Wis-Con Total Power distributors and dealers, because of their close factory relations, can render the best and most efficient service.

THE LIFE OF YOUR ENGINE DEPENDS ON THE CARE IT RECEIVES.

The MODEL, SPECIFICATION and SERIAL NUMBER of your engine must be given when ordering parts. The MODEL and SPECIFICATION number are on the name plate. The SERIAL NUMBER is stamped either on the crankcase or the engine's identification tag.

Copy the MODEL, SPECIFICATION and SERIAL NUMBER in the spaces provided below so that it will be available when ordering parts.

MODEL

SPECIFICATION

SERIAL NUMBER

To insure prompt and accurate service, the following information must also be given:

1. State EXACTLY the quantity of each part and part number.
2. State definitely whether parts are to be shipped by express, freight or parcel post.
3. State the exact mailing address.

IMPORTANT

READ THESE INSTRUCTIONS CAREFULLY

All points of operation and maintenance have been covered as carefully as possible, but if further information is required, send inquiries to the factory for prompt attention.

When writing to the factory, **ALWAYS GIVE THE MODEL, SPECIFICATION AND SERIAL NUMBER** of the engine referred to.

Starting and Operating New Engines

Careful breaking-in of a new engine will greatly increase its life and result in troublefree operation. A factory test is not sufficient to establish the polished bearing surfaces, which are so necessary to the proper performance and long life of an engine. These can only be obtained by running a new engine carefully and under reduced loads for a short time.

- Be sure the engine is filled to the proper level with a good quality engine oil.
- For proper procedures to follow when breaking-in a new engine, see 'Testing Rebuilt Engine'.

The various bearing surfaces in a new engine have not been glazed, as they will be with continued operation, and it is in this period of "running in" that special care must be exercised, otherwise the highly desired glaze will never be obtained. A new bearing surface that has once been damaged by carelessness will be ruined forever.

IMPORTANT SAFETY NOTICE

Proper repair is important to the safe and reliable operation of an engine. This Repair Manual outlines basic recommended procedures, some of which require special tools, devices or work methods.

Improper repair procedures can be dangerous and could result in injury or death.

READ AND UNDERSTAND ALL SAFETY PRECAUTIONS AND WARNINGS BEFORE PERFORMING REPAIRS ON THIS ENGINE

Warning labels have also been put on the engines to provide instructions and identify specific hazards which, if not heeded, could cause bodily injury or death to you or other persons. These labels identify hazards which may not be apparent to a trained mechanic. There are many potential hazards for an untrained mechanic and there is no way to label the engine against all such hazards. These warnings in the Repair Manual and on the engine are identified by this symbol:



Operations that may result only in engine damage are identified in the Repair Manual by this symbol:



Wis-Con Total Power cannot anticipate every possible circumstance that might involve a potential hazard; therefore, the warnings in this manual are not all inclusive. If a procedure, tool, device or work method not specifically recommended by Wis-Con Total Power, Industrial Product Division is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the engine will not be damaged or made unsafe by the procedures you choose.

IMPORTANT: The information, specifications and illustrations in this manual are based on information that was available at the time it was published. The specifications, torques, pressures of operation, measurements, adjustments, illustrations and other items can change at any time. These changes can affect the service given to the product. Get the complete and most current information before starting any job. For parts, service, or information, contact Wis-Con Total Power, Memphis, Tennessee.



WARNING

Most sub-systems used in conjunction with Wis-Con Total Power industrial engines including (but not limited to) radiators, hoses, fans, fuel tanks, fuel lines or other fuel system components, batteries, electrical connections or other electrical components, clutches, transmissions, hydraulic pumps and generators, are not supplied by Wis-Con Total Power. These items are provided by the manufacturer of the end item in which the engine is used.

Some of the dangers associated with servicing such items are generally mentioned in this manual; however, the appropriate handbooks and safety instructions provided by the manufacturer of the end item should always be consulted prior to the undertaking of any work on sub-systems attached to the engine, to avoid any hazards inherent to these sub-systems.



WARNING

Read and observe all individual safety warnings as you use this manual to operate, service or repair your engine.

Always exercise caution whenever working with an engine or any associated system.

Injuries may be caused by lack of care when working with, or near, moving parts, hot parts, pressurized systems, electrical equipment, or fuel systems.

Always wear eye and hearing protection when working on or near engines.

Improper attire such as loose clothing, ties, rings, soft shoes or bare feet could be hazardous and should be avoided when servicing engines.

Use or service of the engine (including the use of modified parts or materials) not in accordance with manufacturer's specifications could damage your engine or cause personal injury.



WARNING

Some equipment and materials used in the overhaul or maintenance of an engine such as machine tools, electrical equipment, compressed air, solvents, gasoline or other fuels may be dangerous and can cause injury. Always observe safety precautions.

CONTENTS

<ul style="list-style-type: none"> Accessories - Service Instructions 35 <ul style="list-style-type: none"> Fuel Pump Carburetor Magneto Adjustments 9 <ul style="list-style-type: none"> Carburetor 9 Clutch Adjustment 9 Clutch Reduction Adjustment 10 Distributor - Breaker Point 10 Governor Adjustment 11 Magneto - Breaker Point 11 Valve Tappet 12 Before Starting Engine 5 Belt Driven Alternator 19 Charging System 5 Clutch 9 Clutch Reduction 10 Cooling 5 Disassembly and Reassembly - Safety Notice 23 <ul style="list-style-type: none"> Accessories 23 Air Cleaner 23 Air Shrouding 24 Camshaft Gear 27 Camshaft and Valve Tappets 33 Connecting Rods and Pistons 29 Control Panel 23 Cylinder Blocks 31 Cylinder Heads 25 Distributor and Accessory Drive 25 End Play 33 Engine Support and Oil Pan 28 Flywheel 24 Flywheel Alternator 26 Fuel Pump 25 Gear Cover 27 Gear Train 28 Governor 26 Idler Gear and Shaft 27 Main Bearing Plate and Crankshaft 32 Manifold and Carburetor 25 Oil Filter 24 Oil Pump 28 Outboard, 3rd Main Bearing 27 Piston Rings 30 Shell Bearings 29 Starting Motor 24 Tool Requirements 23 Valves and Seat Inserts 31 Valve Springs - Rotators-Guide 31, 32 Electrical Equipment 15 <ul style="list-style-type: none"> Flywheel Alternator 15 Wiring Circuit 16 Wiring Diagrams 16, 20 Flywheel Alternator - Service Procedure 16 <ul style="list-style-type: none"> Rectifier Tests 18 	<ul style="list-style-type: none"> Regulator Tests 17 Static Tests 18 Stator Tests 18 Trouble Shooting 16 Fuel 5 General Information and Design 5 Governor — Operation 10 Horsepower 2 Illustration of Engine 3 Lubrication System — Description 5 Lubrication System — Illustration 4 Maintenance Schedule 42 Maintenance 7 <ul style="list-style-type: none"> Air Cleaners 7 Breather System 8 Crankcase Oil 8 Fuel Filter 8 Ignition Distributor 8 Keep Engine Clean 9 Oil Filter 8 PCV System 8 Pre-Cleaner 7 Spark Plugs 9 Starting Motor 9 Oil - Grade of 5 Oil Pressure 5 Rotation 5 Safety Precautions 2 Solid State Ignition Distributors 8, 43 Specifications 2 Starting Procedure 6 Stopping Engine 7 Storage of Engine for Winter 34 Temperature Safety Switch 20 Testing Rebuilt Engine 34 Timing 12 <ul style="list-style-type: none"> Distributor Timing 12 Firing Order 12 Magneto Timing 14 Timing Check 13 Torque Specification, Std. hardware 42 Troubles - Causes and Remedies 20 <ul style="list-style-type: none"> Backfiring Through Carburetor 22 Compression 21 Fuel Mixture 21 Ignition 21 Ignition Spark 22 Knocking 22 Missing 21 Overheating 22 Starting Difficulties 21 Stops 21 Surging or Galloping 22 Warm-Up Period 6
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SPECIFICATIONS

MODEL W4-1770

Bore	3.25 inch
Stroke	3.25 inch
Piston Displacement -cu. in.	107.7
-cu. cm.	1765.2
Horsepower - 1400 R.P.M.	18.2
1600 R.P.M.	21.3
1800 R.P.M.	24.2
2000 R.P.M.	27.1
2200 R.P.M.	29.6
2400 R.P.M.	32.0
2600 R.P.M.	33.6
2800 R.P.M.	34.6
3000 R.P.M.	35.0

Engine rated performance is documented to Engine Test Code - SAE J1349.

Continuous duty operation is recommended at 80% of horsepower shown.

Horsepower specified in the accompanying chart is for an atmospheric temperature of 77° Fahrenheit and at a Barometric pressure of 29.52 inches of mercury.

For each inch lower the Barometric pressure drops, there will be a loss in horsepower of 3 1/2%.

For each 10° temperature rise there will be a reduction in horsepower of 1%.

For each 1000 ft. altitude above sea level there will be a reduction in horsepower of 3 1/2%.

The friction in new engines cannot be reduced to the ultimate minimum during the regular block test, but engines are guaranteed to develop at least 85 percent of maximum power when shipped from the factory. The power will increase as friction is reduced during the first few days of operation. The engine will develop at least 95% of maximum horsepower when friction is reduced to a minimum.

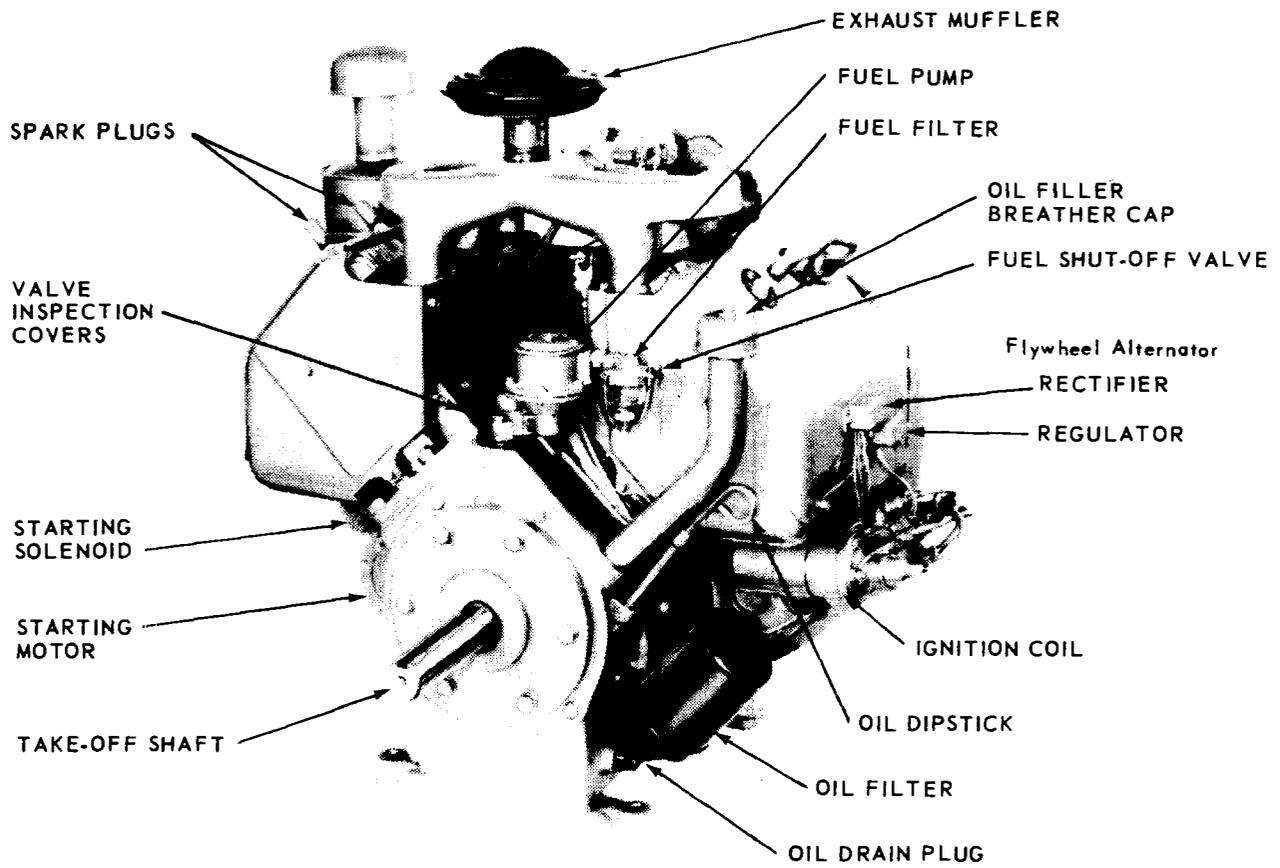
SAFETY PRECAUTIONS

Careless use of the engine causes a high percentage of accidents. Avoid serious injury by being alert, use common sense and be safety minded. Observe the following precautions and carefully enforce them when operating your *Wisconsin Engine*. Read operating instructions thoroughly - Know how to stop the engine in case of emergency.

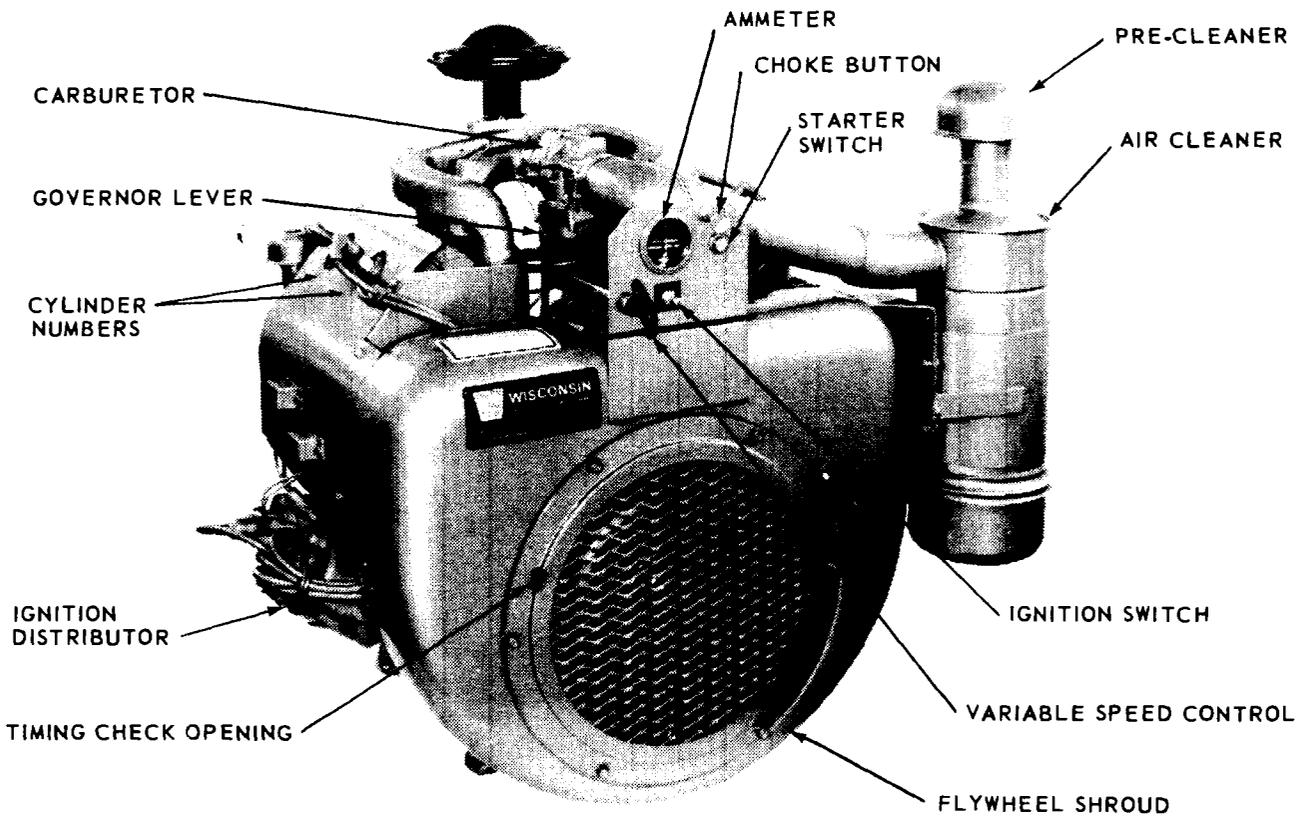


This symbol indicates important safety messages throughout this Repair Manual - *Read Them Carefully*.

- Engine should be operated only by qualified persons.
- Do not operate engine in a closed building unless the exhaust is piped outside. This exhaust contains carbon monoxide, a poisonous, odorless and invisible gas, which if breathed can cause serious illness and possible death.
- Keep exhaust connection tight and components in good condition; noise from a faulty exhaust system can also be harmful.
- Exhaust system parts get very hot - avoid touching these parts until the engine has stopped and has sufficiently cooled off.
- Never refuel a hot or running engine. Do not smoke while filling fuel tank or servicing fuel system.
- Always refuel slowly to avoid spillage.
- Make sure all fuel lines and connections are tight and in good condition.
- Handle batteries carefully; battery acid will burn skin and can cause blindness if it contacts the eyes.
- Avoid sparks near battery. Gas given off by battery is explosive.
- Keep engine and surrounding area clean and clear of trash.
- When starting engine maintain a safe distance from moving parts of equipment. Be sure all rotating parts are secure and in good condition.
- Do not start engine with clutch engaged.
- Never run engine with governor linkage disconnected, or operate at speeds in excess of 3000 R.P.M. load.
- Never make adjustments on machinery while it is connected to the engine, without first disconnecting the ignition cables from the spark plugs. Turning the machinery over by hand during adjusting or cleaning might start the engine and machinery with it, causing serious injury to the operator.
- Never run engine while safety switches are disconnected, or protective screening is removed from unit.
- Do not leave engine running while lubricating, making adjustments or repairs unless specifically recommended.
- Never leave engine unattended while it is running.
- Keep hands, feet and clothing away from all moving parts.
- Mount a fire extinguisher close to the engine. Maintain extinguisher properly and be familiar with its use.
- Precaution is the best insurance against accidents.



Take-off End-View



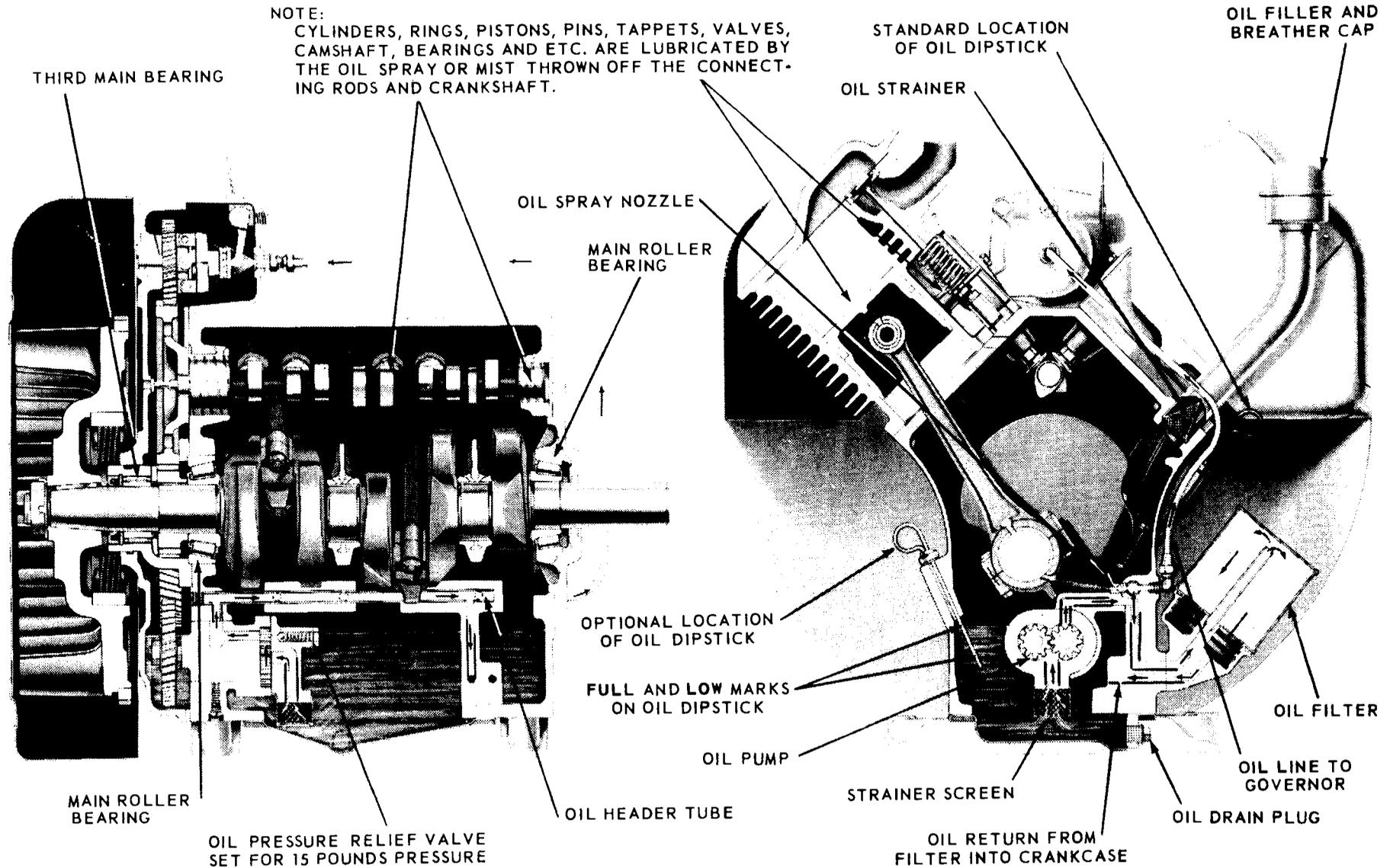
Flywheel End View

Fig. 1

MODEL W4-1770 AIR COOLED ENGINE

LUBRICATION SYSTEM

Fig. 2



WITH ENGINE AT OPERATING TEMPERATURE, OIL PRESSURE
IN HEADER WILL BE APPROXIMATELY 5 POUNDS.

GENERAL INFORMATION and DESIGN

Wisconsin engines are of the **four cycle** type, in which each of the four operations of **suction, compression, expansion and exhaust** requires a complete stroke. This gives one power stroke per cylinder for each two revolutions of the crankshaft.

COOLING

Cooling is accomplished by a flow of air, circulated over the cylinders and heads of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts.

Never operate an engine with any part of the shrouding removed—this will retard air cooling.

Keep the cylinder and head fins free from dirt and chaff. Improper circulation of cooling air will cause engine to overheat.

CARBURETOR

The proper combustible mixture of gasoline and air is furnished by a balanced carburetor, with a fixed main metering jet, that provides correct fuel to air ratios for all speeds and loads.

IGNITION SYSTEM

The spark for ignition of the fuel mixture is directed from the coil to the spark plugs, at the proper time, by **Battery ignition** (12 volt) **Distributor**.

Magneto ignition can be furnished in place of distributor, when specified. The high tension magneto used, is fitted with an impulse coupling that provides a powerful spark for easy starting.

CHARGING SYSTEM

Engines can be equipped with a 10 amp, 25 amp, or 30 amp flywheel alternator system or a 37 amp belt driven alternator.

LUBRICATION SYSTEM, Fig. 2

A gear type pump supplies oil to four nozzles which direct oil streams against fins on the connecting rod caps. Part of the oil enters the rod bearing through holes in the rods, and the balance of the oil forms a spray or mist which lubricates the cylinder walls and other internal parts of the engine. An external oil line from the oil header tube in the crankcase lubricates the governor and gear train.

OIL PRESSURE

At engine operating temperature the oil pressure will be about 4 to 5 pounds per square inch. Due to this low pressure system an Oil Pressure Gauge is not furnished as standard equipment but is optionally available, along with Low Oil Pressure and High Temperature Shut-off Switches. When engine is cold the oil pressure will be higher than 4 to 5 pounds. Under this condition, a relief valve in the oil pump limits the pressure to a maximum of 15 p.s.i.

GOVERNOR

A governor of the centrifugal flyweight type maintains the engine speed by varying the throttle opening to suit the load imposed upon the engine. These engines are equipped with either a **fixed speed** governor, a **variable speed control** to regulate the governed speed of the engine, or an **idle control**.

ROTATION

The rotation of the crankshaft is clockwise when viewing the flywheel or cranking end of the engine. This gives **counterclockwise rotation** when viewing the power take-off end of the crankshaft. The flywheel end of the engine is designated the **front end**, and the power take-off end, the **rear end** of the engine.

BEFORE STARTING ENGINE

1. FUEL

Fill fuel tank with a reputable well known brand of **Regular Grade** gasoline. **Leaded** gasoline is preferred with an *Anti-knock Index of **87 minimum**. Unleaded regular gasoline may be used, although shorter valve life may be experienced.

Note: *minimum Motor octane number must be 82.

Caution: Refuel slowly to avoid spillage. Do not smoke when filling tank.

Be sure that vent hole in fuel tank cap is clean and free of any obstruction.

2. LUBRICATION

Fill crankcase base with the proper grade of engine oil as specified in "**Grade Of Oil**" chart. Fill through the oil filler tube opening to the level indicated by the **Full Mark** on **Dipstick**. Approximately 3 1/2 quarts are required in a new engine — 4 quarts with oil and filter change.

IMPORTANT

Do Not overfill crankcase. **Do Not** allow oil level to go below **Add** mark on dip stick.

GRADE OF OIL

SEASON OR TEMPERATURE		GRADE OF OIL
Spring, Summer or Fall + 120°F to + 40°F		SAE 30
Winter + 40°F to + 15°F + 15°F to 0°F Below Zero		SAE 20-20W SAE 10W SAE 5W-20
Use Oils classified as Service SE, SF, SG or CC		
Crankcase Capacity	New engine	4 Qrs.
	Oil and filter change	4 Qrs.
	Less - filter or filter change	3½ Qrs.

If engine is used at near maximum performance, it is recommended that a single-viscosity oil of SE Quality be used; either grade SAE 30 or SAE 10W.

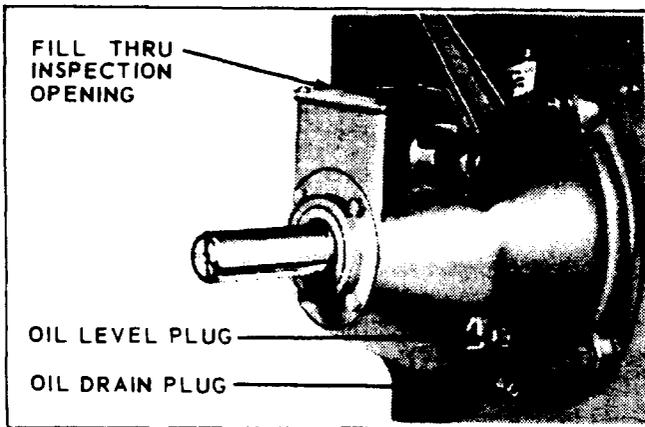


Fig. 3

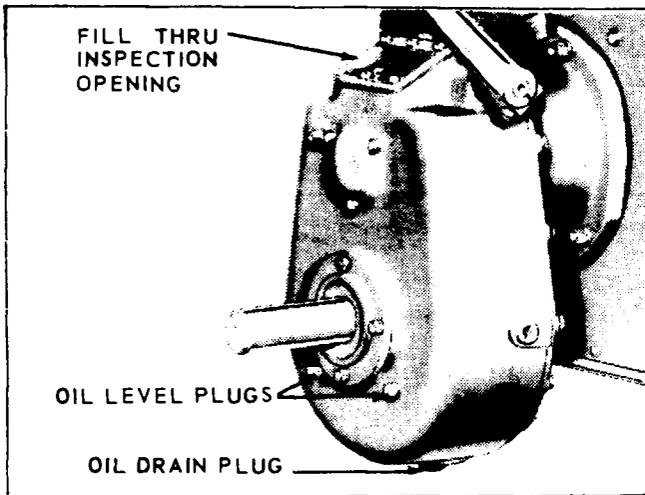


Fig. 4

Proven synthetic oils give superior service in air cooled gasoline engines and can be used, but the recommended oil change interval remains at 100 hours.

With reference to *Fig. 3* and *Fig. 4*, fill clutch and gear reduction units to the height of the oil level plug opening – Use same grade oil as used in engine crankcase. Add sufficient oil between changes to keep oil up to the level plug opening.

Change Oil In Clutch and Reduction Units at least every 500 hours of operation.

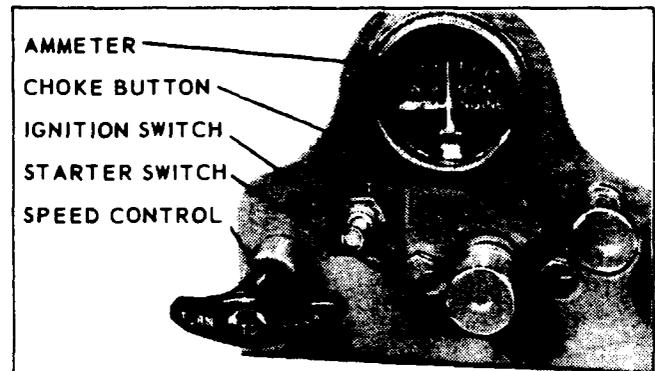
STARTING

⚠ Caution: Maintain a safe distance from moving parts of equipment. Know how to stop the engine quickly in case of emergency.

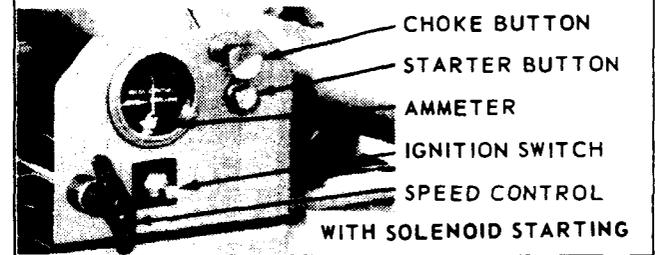
⚠ Caution: Do not operate engine in a closed building unless it is properly ventilated.

STARTING PROCEDURE, Fig. 5

1. Check crankcase oil level and gasoline supply. Open fuel shut-off valve in fuel strainer or tank.
2. Disengage clutch, if furnished.
3. Pull variable speed control 'T' handle out about half-way and lock in place. With a two speed control, start in full load position – idle after engine starts.



WITHOUT SOLENOID STARTING



WITH SOLENOID STARTING

Fig. 5, CONTROL PANELS

4. Close choke by pulling choke button to extreme out position.
5. Pull out ignition switch button, tag reads 'To Stop Push In'.
6. Depress starter switch to start engine.

IMPORTANT

Do not crank engine for more than 30 seconds at a time if engine fails to start, wait about 2 minutes between cranking periods to prevent starter from over-heating.

7. After engine starts, push choke button in gradually as required for smooth running. Choke must be completely open (button in) when engine is warmed up.

If flooding should occur, open choke fully by pushing choke button in and continue cranking. Less choking is necessary in warm weather or when engine is warm, than when cold.

WARM-UP

After engine starts, allow it to warm up a few minutes before applying load. **Do not race or gun engine** to hurry WARM-UP. The proper oil film on various surfaces of the pistons, cylinders, bearings, etc., cannot be established until the oil has warmed up and become sufficiently fluid.

⚠ Caution: Racing an engine by disconnecting the governor, or by doing anything to interfere with the governor controlled engine speed, is extremely dangerous.

The governor is provided as a means for controlling the engine speed to suit the load applied, and also as a safety measure to guard against excessive speeds, which not only overstrain all working parts, but which might cause wrecking of the engine and possible injury to bystanders.

TO STOP ENGINE

Depress ignition switch button, tag reads 'To Stop Push In'.

If engine has been running hard and is hot, do not stop it abruptly from full load. Cool the engine by removing the load and allowing the engine to run idle (1000 to 1200 R.P.M.), for 3 to 5 minutes.

Magneto ignition engines have a lever type stop switch on the side of the magneto. On these, to stop engine, depress lever and hold down until engine stops.

MAINTENANCE

AIR CLEANERS

The air cleaner is an essential accessory, filtering the air entering the carburetor and preventing abrasive dirt from entering the engine and wearing out valves and piston rings in a very short time.

The air cleaner must be serviced frequently, depending on the dust conditions in which the engine is operated. Check hose connections for leaks or breaks and replace all broken or damaged hose clamps.

Excessive smoke or loss of power are good indications that the air cleaner requires attention.

OIL BATH AIR CLEANER Fig. 6

Service Daily; or twice a day if engine is operating in very dusty conditions. *Once each week;* in comparatively clean conditions.

Remove oil cup from bottom of air cleaner and clean thoroughly. Add the same grade of oil, as used in the engine crankcase, to the **Level Line** indicated on the oil cup.

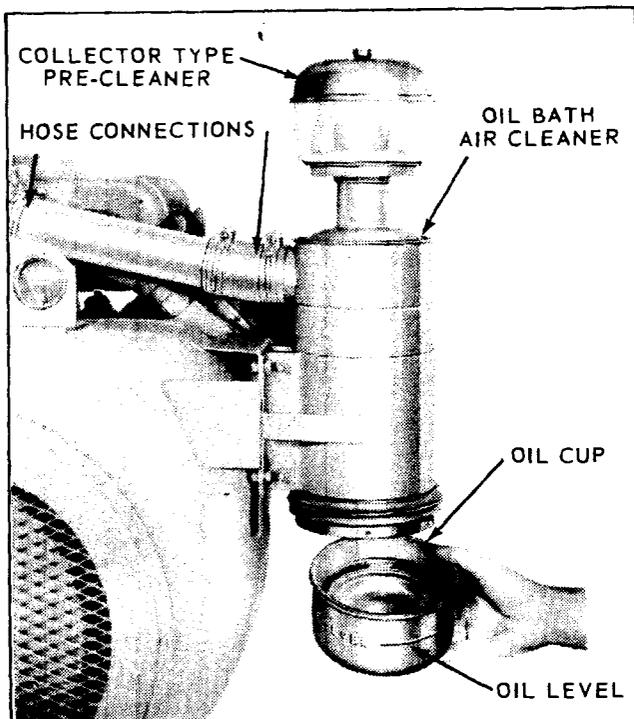


Fig. 6 OIL BATH AIR CLEANER

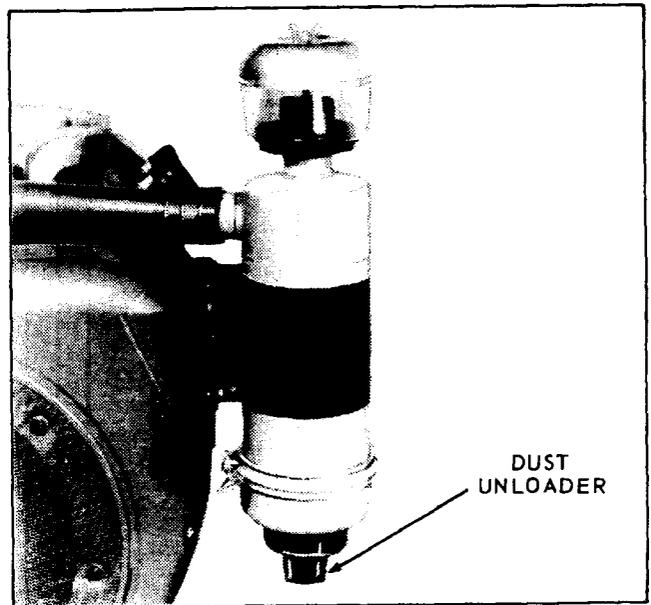


Fig. 7 DRY TYPE AIR CLEANER

IMPORTANT

Operating the engine under dusty conditions without oil in the air cleaner or with dirty oil, may wear out cylinders, pistons, rings and bearings in just a few days time.

Once a Year; or oftener if conditions are severe, the air cleaner should be removed from the engine and the element, which is not removable, should be washed in a solvent to clean out accumulated dust and dirt.

DRY TYPE AIR CLEANER, Fig. 7

Service Daily; squeeze rubber dust unloader once or twice a day to check for possible obstruction. If engine is operating in very dusty conditions, remove cartridge and shake out the accumulated dirt (do not tap or strike element - it may become damaged). Wipe out dirt from inside cover and bowl, after removing baffle and dumping out dust.

Once Each Week; The filtering cartridge should be taken out and rinsed under a faucet with cold water, then wash by repeated dippings for several minutes in a solution of lukewarm water and a mild, **Non-sudsing** detergent. Rinse in cold water from the inside out, and allow to dry over-night before re-installing. In cold weather, protect element from freezing until dry.

Do Not Use Gasoline, Kerosene or Solvent For Cleaning - Do Not Oil Element.

After ten washings or one year of service, replace cartridge. New cartridges are available at all **Wisconsin Distributors and Service Centers.**

PRE-CLEANER

The optionally furnished collector type pre-cleaner, mounted to the top of the air cleaner as illustrated in Fig. 7, removes the larger dirt and dust particles before the air reaches the main air cleaner.

Clean bowl regularly of accumulated dust and dirt. **Do not put oil or water in pre-cleaner, this must be kept dry.**

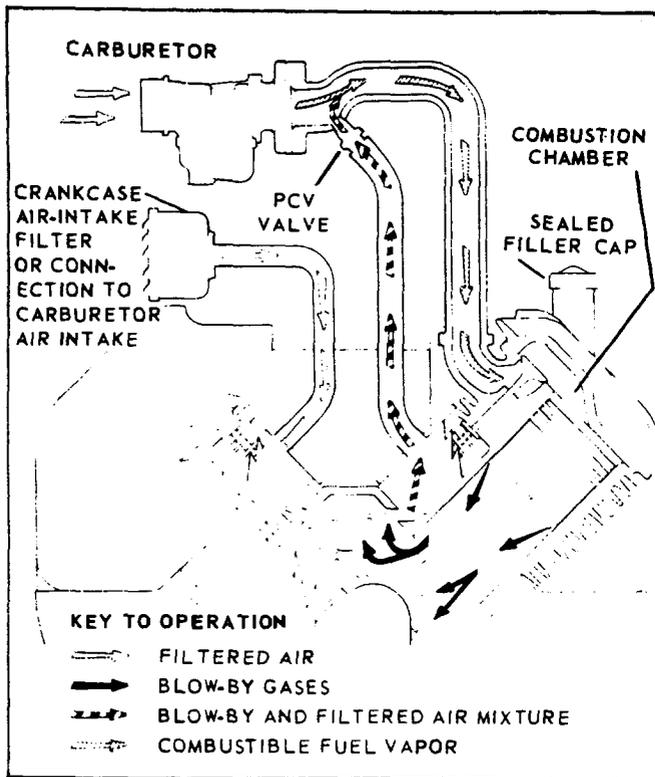


Fig. 8

BREATHER SYSTEM

The crankcase is ventilated thru a breather cap mounted to the top of the oil filler tube, as illustrated in Fig. 2. **At every oil change**, it is recommended that the cap be cleaned by washing in kerosene.

PCV SYSTEM, Fig. 8

If engine is optionally equipped with a positive crankcase ventilation (PCV) system: **Every 50 Hours**; wash air intake filter element in a solution of hot water and non-sudsing detergent.

Service Filter Daily; if engine is operating in extreme dust and dirty conditions.

Every 500 Hours; clean PCV valve with carburetor solvent or lacquer thinner.

Indications of Dirty or Faulty PCV valve are:

1. Excessive slug in or around engine.
2. Excessive smoke from crankcase Filter.
3. Excessive crankcase vacuum (over 2" H₂O).
4. Poor or rough idling.

CRANKCASE OIL

Check Oil Level Every 8 Hours. One quart of oil is required to raise the oil level from **Add** to **Full** mark on dipstick.

Change Oil Every 100 Hours under normal operating conditions. In extreme dusty and extensive idling conditions, change oil at 50 hour intervals. Remove drain plug and allow oil to drain into a suitable container. Drain oil while engine is hot – it will flow more freely.

Caution: Wear gloves when removing drain plug from hot engine.

IMPORTANT

D Not overfill crankcase. **D Not** allow oil level to go below **Add** mark on dipstick.

Refer to **Recommended Grades of Oil** chart, Page 5, for type and quantity of oil to be used.

OIL FILTER, Fig. 1

A **by-pass** type oil filter is furnished as standard equipment on this model engine, except in a few cases when the use of other accessories interferes with the standard oil filter mounting location.

Every Other Oil Change, replace filter cartridge. If operating conditions are extremely dusty, replace cartridge at every oil change. Use only Wisconsin **Micro-Fine** Oil filter cartridges available from your local Wis-Con Total Power Distributor or Service Center.

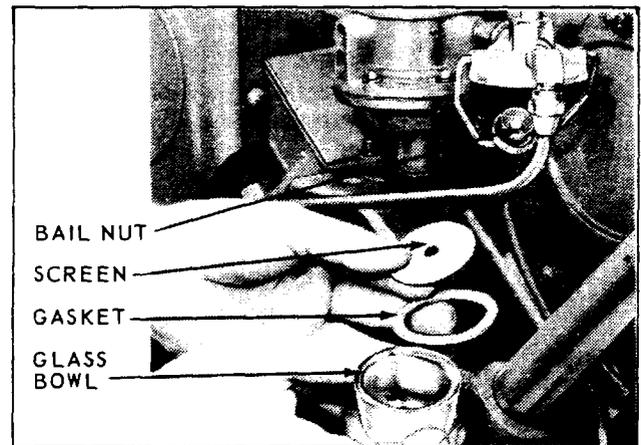


Fig. 9

FUEL FILTER, Fig. 9

It is very important that the fuel be filtered to prevent sediment, dirt and water from entering the carburetor and causing trouble or even complete stoppage of the engine. The glass filter bowl should be inspected frequently, and cleaned if dirt or water are present.

To remove sediment bowl, loosen nut below bowl, swing bail to one side and twist bowl as it is being removed. Clean screen and bowl thoroughly - replace gasket if it is damaged or hardened. **Repair Kits** are available for service replacement.

IGNITION DISTRIBUTOR, Fig. 14

Check for faulty and loose fitting wires, and for cracks in distributor cap.

SOLID STATE IGNITION DISTRIBUTORS

Many Wisconsin engines are now being equipped with a solid state ignition distributor. Detailed troubleshooting and repair information can be found in the rear section of this manual. For repair parts, see your W4-1770 Illustrated Parts Catalog.

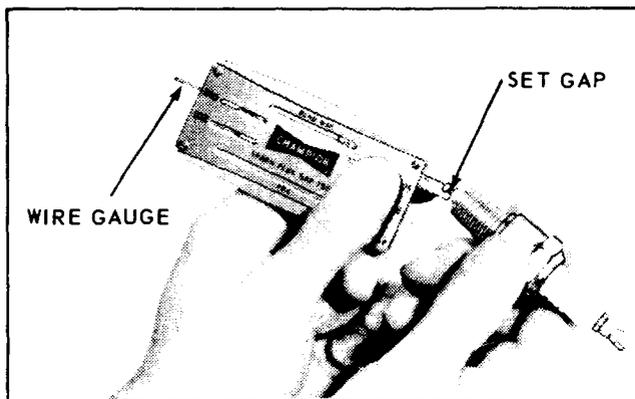


Fig. 10

SPARK PLUGS, Fig. 10

Incorrect gap, fouled or worn spark plug electrodes, will have an adverse affect on engine operation.

Every 250 Hours; remove spark plugs – clean, regap or replace if necessary.

Spark plug gap – 0.030 inch

Replacement plugs must be of the correct heat range, like Champion No. D-16J, AC No. C86 Commercial, (Wisconsin YD-6). Thread size is 18mm. In reassembly tighten spark plugs, **25 to 30 foot pounds torque.**

STARTING MOTOR, Fig. 1

No maintenance is required other than keeping the outside of the starting motor clean, and periodic inspection for insecure mounting and loose or corroded cable connections.

In extreme dust and dirt conditions it may be necessary to occasionally remove the starter from the engine and clean the Bendix by brushing with Kerosene. **Do not oil** Bendix drive – if necessary lubricate with powdered graphite.

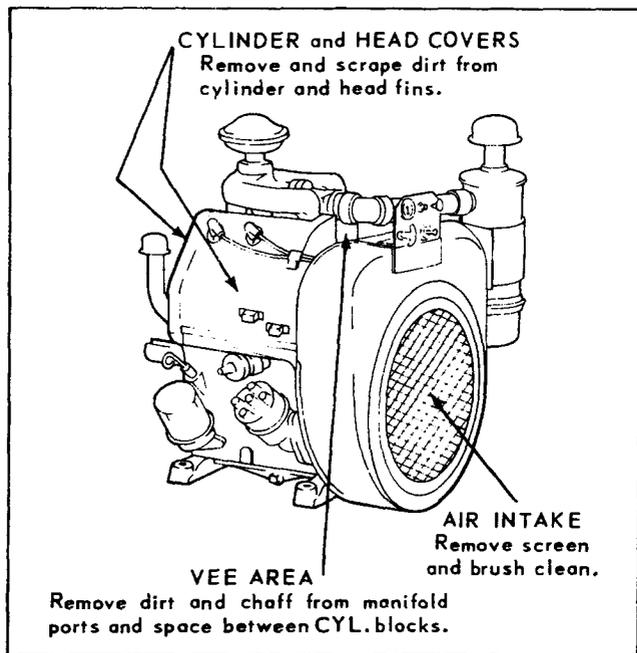


Fig. 11

KEEP ENGINE CLEAN, Fig. 11

This engine is cooled by blasts of air which must be allowed to circulate all around the cylinders and cylinder heads to properly cool the engine and thereby keep it in good running condition. If **dust, dirt or chaff is allowed to collect in the cylinder shrouding or in the V between the cylinders,** it will retard the flow of air and cause the engine to overheat. Keep **flywheel screen** clean, so as not to restrict the intake of cooling air.

IMPORTANT

Do Not operate engine with damaged or badly dented shrouding.

Do Not operate engine with any part of the shrouding removed. This will retard air cooling.

ADJUSTMENTS

CARBURETOR

The carburetor **Main Metering Jet** is of the fixed type and therefore no adjustment is necessary.

The correct amount of throttle plate opening for the proper low idle speed is obtained by means of the **Throttle Stop Screw.** However, this is set at the factory so that no immediate adjustment is necessary. The **Idle Adjustment** is for smooth low speed operation and this adjustment, if necessary, must be made with the engine running at idle speed (throttle valve closed). Initial setting is approximately **1 1/2 turns open.**

Refer to 'CARBURETOR' section, *Page 37,* for further Adjustment and Repair Information.

CLUTCH ADJUSTMENT, Fig. 12

If the clutch begins to slip, it should be re-adjusted to prevent it from becoming over-heated and damaged. First, remove inspection plate to expose the **adjusting ring.** Release clutch by pushing **shifter lever forward** (toward engine).

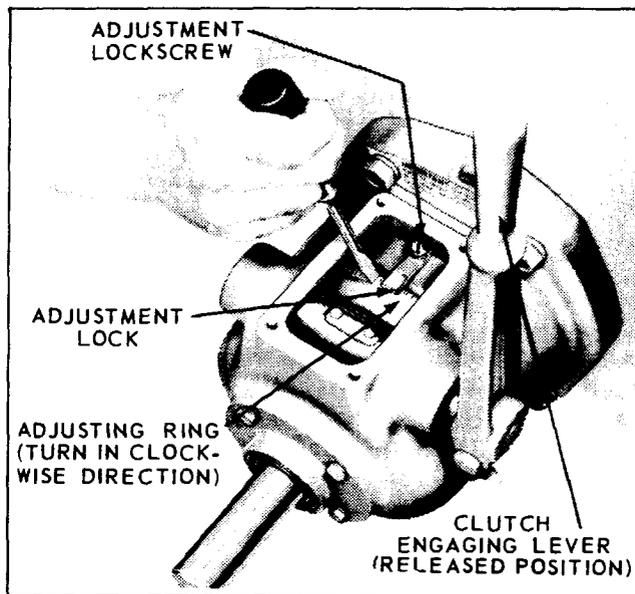


Fig. 12

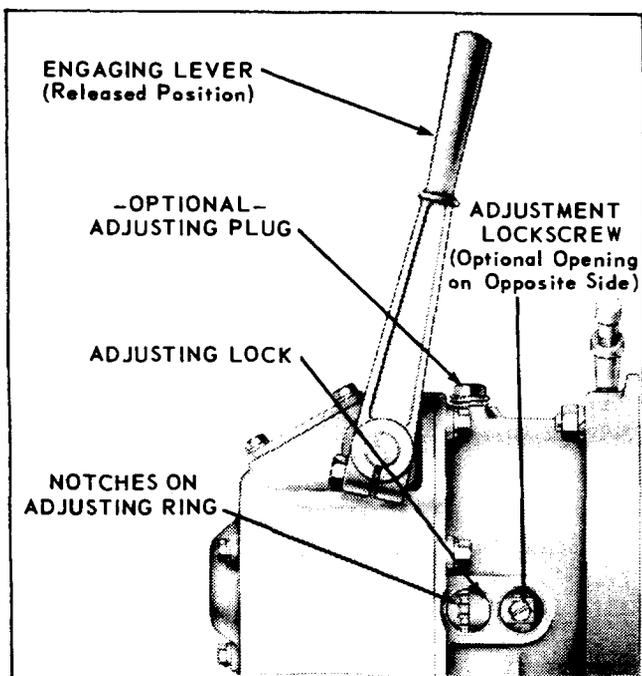


Fig. 13

Turn engine over until clutch *adjustment lock* is visible thru the inspection opening. Loosen *adjustment lock screw* one full turn. Keep clutch from turning by securing the crankshaft at flywheel end. Then, by means of a screw driver, turn *adjusting ring* one notch at a time in a clockwise direction, until a very firm pressure is required when engaging the clutch shifter lever, and as the clutch snaps into engaged position. Securely tighten adjustment lock screw. Assemble inspection plate, being sure that the gasket fits properly and is not broken.

CLUTCH REDUCTION ADJUSTMENT, Fig. 13

The clutch in the clutch reduction unit is the same as used in the power take-off unit and is adjusted thru *two pipe tap openings*; one for the *adjustment lock screw* and the other for turning the *adjusting ring*. There are *four adjusting plugs* in the housing to provide a means of adjusting the clutch regardless of what position the unit is mounted in.

Remove the two pipe plugs on the side of the housing (if not accessible, use the two optional taps). Disengage the clutch and turn engine over slowly with a hand crank until the *adjustment lock screw* is visible thru the pipe plug opening nearest to the engine. Loosen *lock screw* one full turn, or enough to relieve the tension of the lock against the notches on the *adjusting ring*. Then, turn engine over slightly to expose the *notches on adjusting ring*. Keep engine crankshaft from turning, while thru the adjacent pipe plug opening, turn the *adjusting ring* with a screw driver, one notch at a time in a clockwise direction (viewing from take-off end), until a very firm pressure is required to engage the clutch with the lever. Tighten adjustment lock screw and mount pipe plugs, when adjustment is completed.

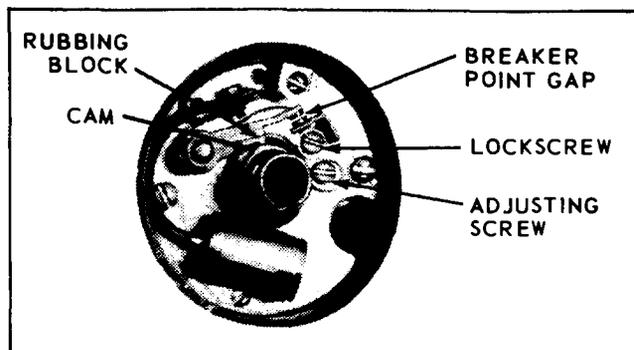


Fig. 14

DISTRIBUTOR BRK'R. POINT ADJUSTMENT, Fig. 14

The breaker point gap should be:

.020 inch at full separation

To readjust point gap, turn engine over slowly until the distributor breaker arm *Rubbing Block* is on a high point of the *Cam*. Loosen the stationary contact *Lockscrew* slightly and insert a feeler gauge between the points. By means of a screw driver, turn *Adjusting Screw* until a slight drag is felt when sliding the feeler gauge from between the points. Tighten lock screw and recheck point gap.

Points that are badly pitted or worn should be replaced and properly adjusted.

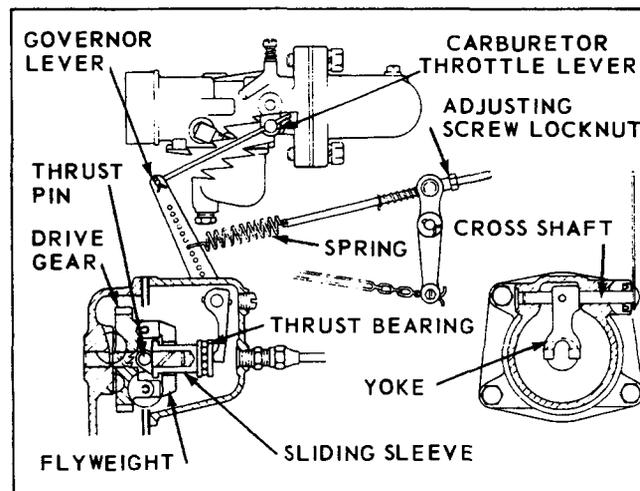


Fig. 15 GOVERNOR WITH SIDE/LOW MOUNT DISTRIBUTOR

GOVERNOR - OPERATION, Fig. 15

The centrifugal flyweight type governor rotates in the upper part of the timing gear cover, and is driven off the camshaft gear at *crankshaft speed*.

Flyweights are hinged to lugs on the drive gear. Hardened pins on the flyweights bear against the flanged sliding sleeve, moving it back and forth as the flyweights move in or out. The motion of the sleeve is transmitted through a ball thrust bearing to the governor lever, which in turn is connected to the carburetor throttle lever. A spring connected to the governor lever tends to hold the governor flyweights to their *inner* position, also to hold the carburetor

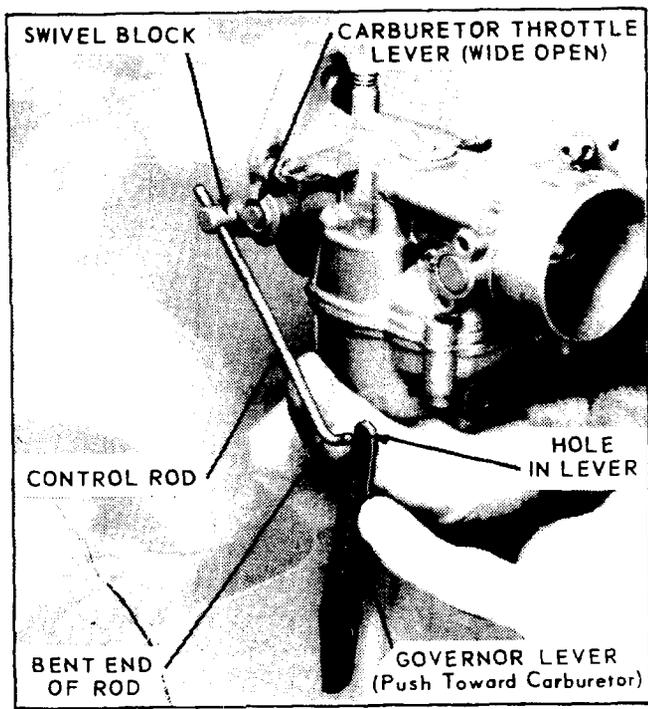


Fig. 16

throttle open. As the engine speed increases, the centrifugal force in the flyweights acts against the spring and closes the throttle to a point where the engine speed will be maintained practically constant under varying load conditions. This speed can be varied to suit conditions by adjusting the governor spring tension to suit.

GOVERNOR ADJUSTMENT, Fig. 16, Fig. 17

The governor rod connection to the carburetor must be very carefully adjusted for length, otherwise the governor will not function properly and cause the engine to surge badly. With the engine at rest, the governor spring will keep the flyweights *in*, and the control rod must be of such length as to hold the carburetor throttle wide open at that point. The adjustment of the governor varies depending upon whether the engine has a side/low mounted distributor or the optional top/high mounted distributor.

SIDE/LOW MOUNTED DISTRIBUTOR

With the *control rod* disconnected from the *governor lever*, as illustrated in *Fig. 16*, push the rod toward the carburetor as far as it will go. This will put the *carburetor throttle lever* in a wide open position. The governor lever should then be moved as far as possible in the same direction. Holding both parts in the above position, the rod should be screwed in or out of the *swivel block* on the carburetor, until the bent end of the rod will register with *hole* in lever, then screw rod in one more turn. The extra turn will *shorten* the linkage slightly and will enable the carburetor throttle lever to bounce back from the stop pin rather than jam against the pin, when a load is suddenly applied to an idling engine. This will eliminate excessive wear on the threads in the carburetor throttle swivel block.

Note: For the *top/high mounted distributor* the control rod must be *lengthened* one turn from the wide open throttle position to back the carburetor throttle lever off the stop pin.

LOAD R.P.M.	NO LOAD R.P.M.	HOLE NO.
1400	1600	4
1500	1735	5
1600	1775	5
1700	1905	6
1800	2050	7
1900	2115	7
2000	2230	8
2100	2300	8
2200	2430	9
2300	2480	9
2400	2625	10
2500	2685	10
2600	2795	11
2700	2930	12
2800	3005	12
2900	3100	12
3000	3200	12

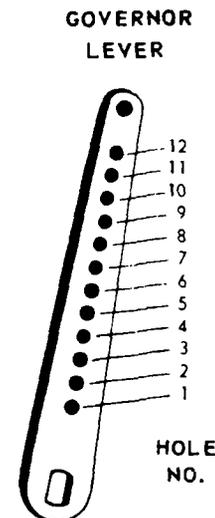


Fig. 17

The governor lever is furnished with 12 holes, as shown in *Fig. 17*, for attaching the governor spring. It is very important that the spring is hooked into the proper hole to suit the speed at which the engine is to be operated. The Governor Lever Chart, *Fig. 17*, shows the *full load* and *no load* speeds of the engine and the hole corresponding thereto. Note that the *full load* speed is less than the *no load* speed and this must be taken into consideration when readjusting the governor. As an example; if the engine is to be operated at 2000 revolutions per minute under load, the spring should be hooked into the *8th* hole in the governor lever, and the spring tension adjusted by means of the adjusting screw, to run *2230 R.P.M.* at no load. When load is applied, the engine will run at approximately 2000 R.P.M.

⚠ Caution: Do not operate engine above 3000 r.p.m. load. Do not operate with governor disconnected.

A tachometer or revolution counter should be used to check speed while adjusting the governor spring tension. Tightening the *adjusting screw locknut*, *Fig. 15*, will give higher speeds, while loosening the locknut will lower the spring tension and reduce the R.P.M.

MAGNETO BREAKER POINT ADJUSTMENT, FIG. 18

The magneto *breaker point gap* is *.015 inch* at full separation. If the ignition spark becomes *weak* after continued operation, the breaker points may have to be readjusted, resurfaced or replaced. Remove the magneto end cover, rotor and end cap in order to examine the points. If there is evidence of pyramiding or pitting, the points should be resurfaced with a small tungsten file.

Points that are badly worn or pitted should be replaced. Check breaker point gap by rotating the crankshaft with the starting crank, (this also rotates the magneto), until the breaker points are wide open. The opening or gap should then be measured with a feeler gauge as shown.

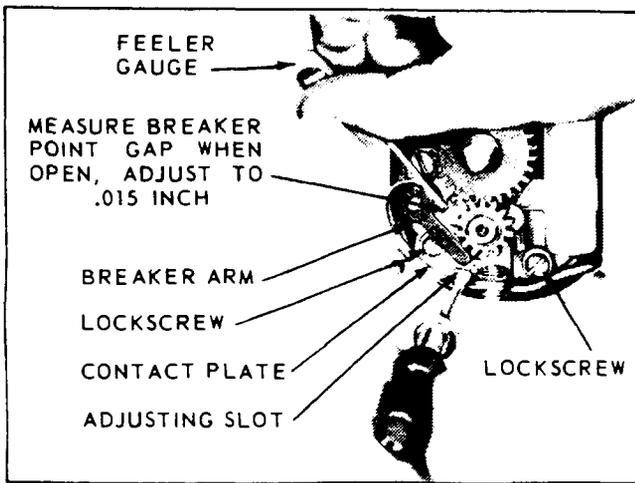


Fig. 18

Adjust breaker points as follows: First loosen the two lockscrews on the contact plate enough so that the plate can be moved. Insert the end of a small screw driver into the adjusting slot at the bottom of the contact plate and open or close the contacts by moving the plate until the proper opening is obtained. After tightening the lockscrews, recheck breaker point gap to make sure it has not changed. Place rotor on shaft before mounting end cover. **NOTE:** Rotor is so constructed that it can only be put on in the correct position relative to timing.

Mount magneto end cover and gasket carefully, so that they seal properly. Do not turn cover screws too tightly, otherwise cover may crack. Refer to 'Magneto' Section, page 40 for further adjustment and repair information.

VALVE TAPPET COVERS

There are early style and new style tappet cover gaskets that will be encountered when servicing this engine model. The new style is easily identified by a thin paper backing that is applied to one side of the gasket. The early style was plain on both sides. The installation procedures for both are as follows:

New Style Gasket-No Adhesive Required — Remove the protective paper backing from one side of the gasket and install the gasket onto the tappet cover. Be certain that the metal surfaces involved are clean and dry.

Early Style Gasket — Spread a thin coat of gasket adhesive onto the tappet cover to hold gasket in place. This will prevent gasket slippage or deformation when mounting the cover to the tappet chamber area of cylinder block.

VALVE TAPPET ADJUSTMENT, Fig 19

With the tappets in their lowest position (valves completely closed) and engine cold, the clearance between valve stem and tappet adjusting screw should be:

Inlet — .008 inch Exhaust — .016 inch

The inlet valves are to the inside of the cylinder block, the exhaust valves are toward the outside. Place feeler gauge between valve stem and tappet screw, and adjust clearance by means of two tappet wrenches.

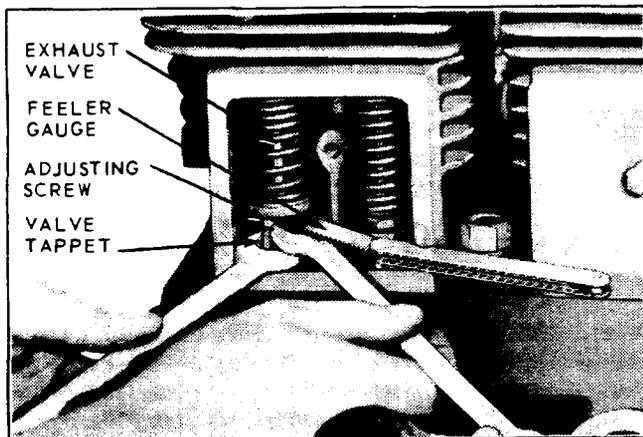


Fig. 19

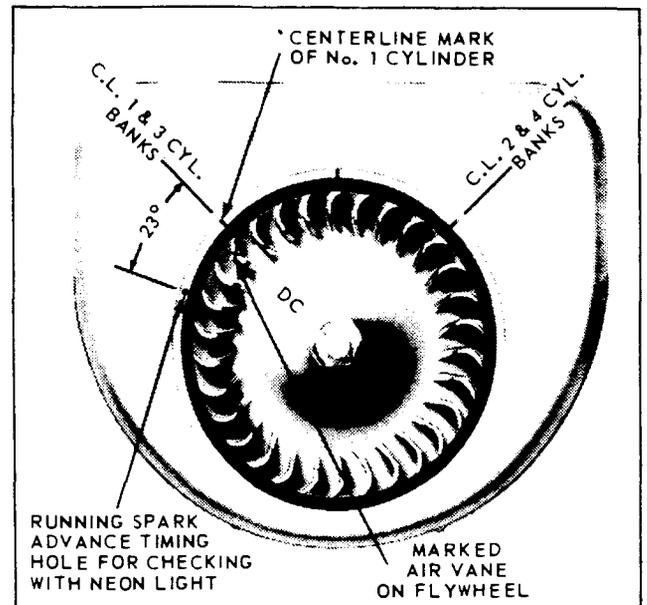


Fig. 20

TIMING

FIRING ORDER

The **firing order** of the cylinders is 1 - 3 - 4 - 2, and the Battery Type Distributor or Magneto rotates at one-half engine speed, as is the case with conventional 'in line' engines. The intervals between the firing of the cylinders is 180°. No. 1 cylinder is the one nearest to the flywheel in the left bank of cylinders, when viewed from the flywheel end of the engine. No. 3 cylinder is the other cylinder in this bank. No. 2 cylinder is the one nearest to the flywheel in the right bank of cylinders and No. 4 is the other cylinder in this bank. The cylinders are numbered from 1 to 4 on the cylinder head covers.

DISTRIBUTOR TIMING PROCEDURE, Fig. 20, 21, 22

Caution: Disconnect battery leads to engine, to prevent engine from accidentally starting.

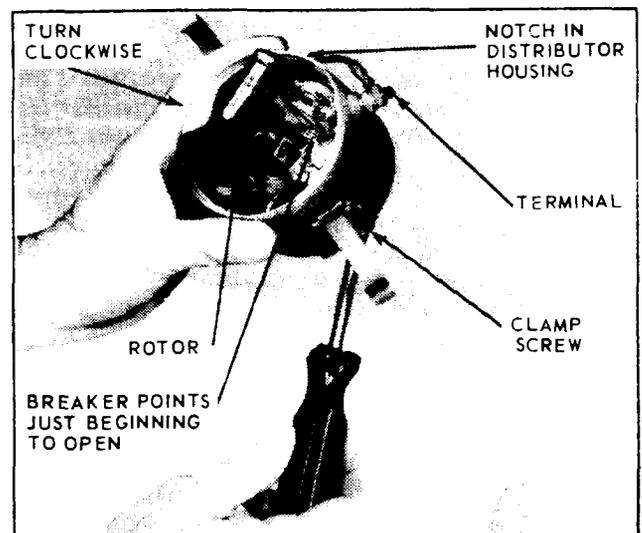


Fig. 21

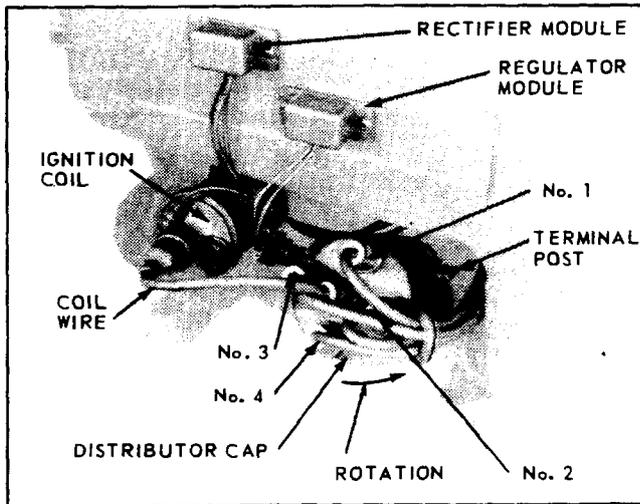


Fig. 22

The distributor has a built-in automatic advance and must be correctly mounted in order to obtain the proper *running spark advance of 23°*.

IMPORTANT: It is necessary that the distributor breaker point gap be *.020 inch*, because any change in gap opening will affect the ignition advance. Check, and adjust if necessary per Distributor Breaker Point Adjustment Page 10, before timing distributor to engine.

Remove screen over the flywheel air intake opening. This will expose the timing marks on flywheel shroud, also the *vane* on flywheel, marked by an 'X' and the letters 'DC', See Fig. 20. Next, remove the spark plug from No 1 cylinder and turn engine over slowly by hand. (Use a 1-11/16 inch box wrench on flywheel nut), and at the same time hold a finger over the spark plug hole to determine the compression stroke.

Upon reaching the compression stroke, continue turning the box wrench until the leading edge of the *marked vane* on the flywheel is in line with the *centerline mark* on the flywheel shroud of the *No. 1* cylinder. The No. 1 piston is on top dead center in the position shown in Fig. 20. Reassemble spark plug.

With the No. 1 piston now on *TDC* and on compression stroke, and assuming the distributor is removed from engine; take off cap, rotor and dust shield from distributor and mount to adapter housing in the following manner:

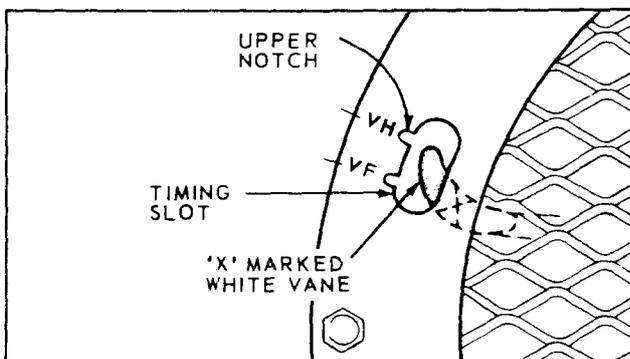


Fig. 23

1. Place rotor on distributor shaft so that center of rotor is aligned with center of notch (location of No.1 terminal tower), in distributor housing as illustrated in Fig. 21.
2. Mount distributor to housing so that notch (point ignition only) and No.1 terminal tower are in an approximate 1 o'clock location as shown in Fig. 21. Tighten advance arm mounting screw to adapter housing.
3. With the distributor clamp screw loose, see Fig. 21 turn the distributor body slightly in a counterclockwise direction until the breaker points are firmly closed. Then turn the distributor body in a clockwise direction until the breaker points are just beginning to open. At this point a slight resistance can be felt as the breaker point cam strikes the breaker point arm.
4. Tighten advance arm clamp screw. No.1 cylinder is now ready to fire in the retarded position.
5. Assemble dust cover and distributor cap. Connect ignition wires from distributor to spark plugs and coil per Fig. 22 and wiring diagram Fig. 27.

If care is exercised in the preceding instructions, the spark timing should be accurate enough for satisfactory starting, however, *checking spark advance* with a Timing Light, as described in the following 'Timing Check' paragraphs, is necessary.

TIMING CHECK, Fig. 23 and Fig. 24

The *running spark advance is 23°*, and timing must be checked with the engine running at *2000 R.P.M. or over*.

A slotted opening, see Fig. 23, is provided on the rim of the flywheel screen so that the 'X' marked flywheel fin, used for checking the running spark advance, will be visible without removing the screen.

! Caution: Do not operate engine with screen removed from front face of shroud.

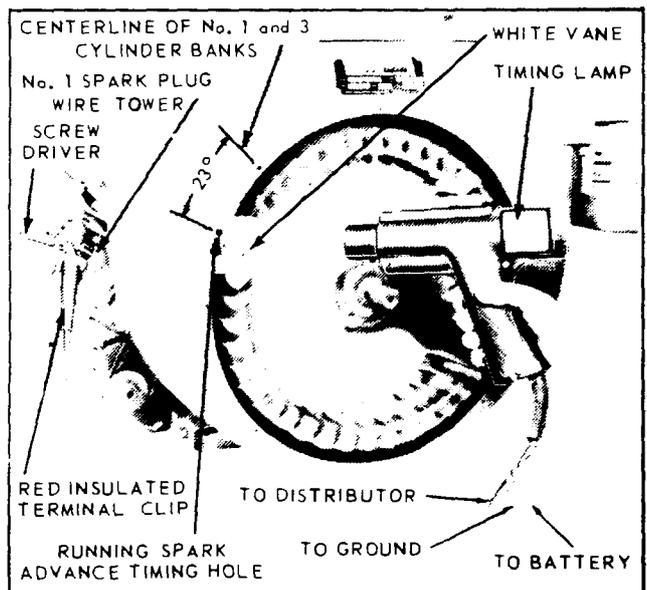


Fig. 24

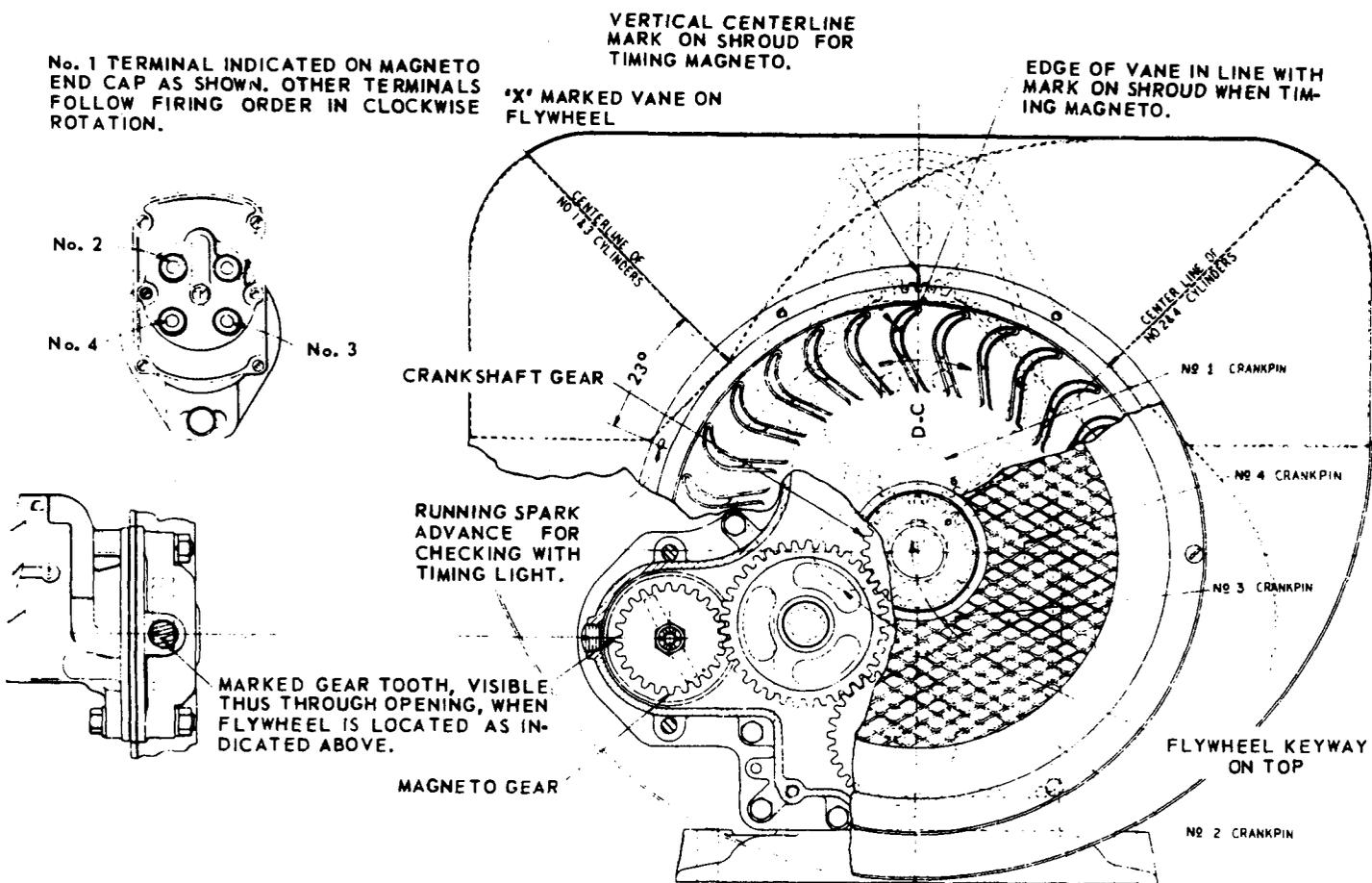


Fig. 25, MAGNETO TIMING DIAGRAM

Fig. 24 shows screen removed from flywheel shroud—this is for instruction purposes only. The screen is a protection against injury from a rotating flywheel, and from objects being drawn into the shroud and breaking off flywheel vanes.

With reference to Fig. 24, insert a small screw driver into the No. 1 terminal tower on the distributor cap, making contact with the spark plug wire terminal. Connect the red terminal clip, from a conventional automotive type *Timing Light*, to the metal portion of the screw driver. One of the other two timing light wires is connected to the battery, and the other to ground.

Chalk or paint the end of the 'X' marked vane on the flywheel, white. Then with the engine operating at 2000 R.P.M. or over, allow the flash from the timing light to illuminate the whitened vane. At the time of the flash, the leading edge of the vane should line up with the upper notch (marked VH) of the running spark advance timing slot in the front face of the flywheel screen as illustrated in Fig. 23.

If timing is off, loosen clamp screw in base of distributor and turn distributor body very slightly, clockwise or counter-clockwise as required, until white vane and timing notch, Fig. 24, match up. NOTE: Engine must be running at 2000 R.P.M. or above for distributor to be fully advanced. Securely tighten clamp screw when satisfactory timing is accomplished.

MAGNETO TIMING (optional ignition)

The running spark advance is 23°, the same as for distributor ignition. To check timing with a *timing light*, the running spark advance is indicated by a slotted hole in the rim of the air intake screen, 68° left of the flywheel shroud vertical centerline, marked VH, see Fig. 23, or if screen is removed, time to the lower half of the 1/4 inch elongated hole on the face of flywheel shroud 23° below the center-line of No. 1 and No. 3 cylinders as illustrated in Fig. 25. The end of the 'X' marked vane should be whitened with chalk or paint for this operation.

⚠ Caution: Do not operate engine with screen removed from front face of shroud.

To Time Magneto to Engine: Remove air intake screen to expose timing marks on both flywheel and shroud. See *Magneto Timing Diagram*, Fig. 25.

Next, remove the spark plug from No. 1 cylinder and slowly turn the flywheel clockwise, at the same time holding a finger over the spark plug hole, so that the compression stroke can be determined from the air blowing out of the hole.

The flywheel is marked with the letters 'DC' near one of the air circulating vanes. This vane is further identified by an 'X' mark cast on the end. When the air blows out of the No. 1 spark plug hole, continue turning the crank until the edge of the marked vane

on flywheel is on line with the *mark* on the *vertical centerline* of the *shroud* as shown on *Fig. 25*. Leave flywheel in this position. At this point the *keyway* for mounting the flywheel is also on top. Reassemble spark plug.

Next, remove the inspection hole plug from the magneto timing opening located in the gear cover at the magneto mounting flange.

Assuming that the magneto has been removed from the engine, the following procedure should be followed before remounting.

The Number 1 cylinder firing position of the magneto must be determined. Insert the ignition cable into the No. 1 tower terminal of the magneto end cap and hold the spark plug terminal at the other end, about 1/8" away from the magneto body. Turn the magneto gear in a clockwise rotation, tripping the impulse coupling, until the No. 1 terminal sparks, then hold the gear in this position. Mount the magneto to the engine, meshing the gears so that when the magneto is in place, the gear tooth marked with an 'X' will be visible through the *lower half* of the *inspection hole* in the gear cover, as shown in *Timing Diagram, Fig. 25*. Tighten the nut and capscrew for mounting the magneto to the gear cover, making sure the magneto flange gasket is in place.

The *No. 1* terminal is identified on the magneto cap. The terminals follow the proper firing order of 1-3-4-2 in a clockwise direction viewing the cap end. The leads from the magneto should be connected to spark plugs of corresponding numbers.

When the magneto is properly timed the impulse coupling will snap when the 'DC' and 'X' marked vane of the flywheel, line up with the *mark* on the flywheel shroud which indicate the *centerline* of the No. 1 and 3 cylinders. This can be checked by turning crankshaft over slowly by means of a hand crank. The impulse will also snap every 180° of flywheel rotation thereafter.

ELECTRICAL EQUIPMENT

The **12 volt** Battery Ignition Distributor with Coil and Starting Motor are standard equipment. Options include: 10 amp, 25 amp, or 30 amp Flywheel Alternator, 37 amp Belt Driven Alternator, Instrument Panel, High-Temperature Safety Switch and Solenoid Starting. **Battery is not normally furnished with the engine.**

FLYWHEEL ALTERNATOR, Fig. 26

This flywheel alternator is of the permanent magnet type and has **no brushes, commutator, belts or adjustments**. A series of coils (stator) is mounted to the engine gear cover, and the magnetic flux is provided by a permanent magnet in the flywheel which rotates around these stationary coils. Only four components make up this light weight space saving system; a

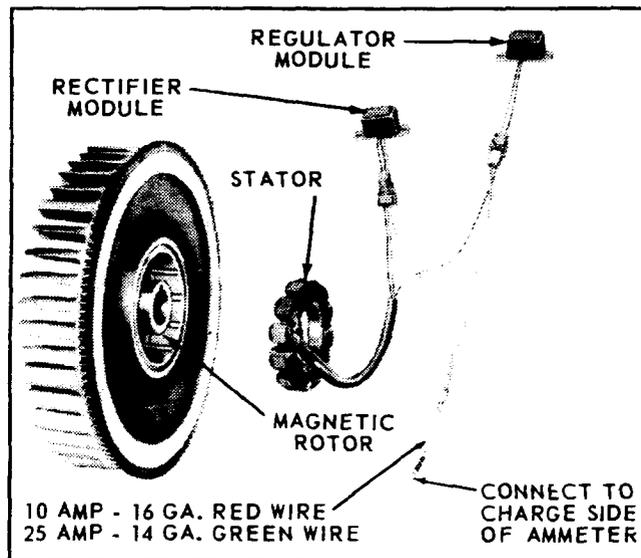


Fig. 26

flywheel with magnetic rotor, **stator, rectifier** module and **regulator** module. The 30 amp flywheel alternator system uses a combination rectifier/regulator module.

IMPORTANT

This is a **Negative Ground** system. Charging components will be damaged if grounded wrong in connecting or jumping batteries.

⚠ Caution: Handle battery carefully to prevent acid burns. Avoid sparks near battery – gas given off by battery is explosive.

Since the physical appearance of both 10 amp and 25 amp **Flywheel Alternator** systems are very similar, they can be distinguished from each other by the ammeter calibrations; 0 to 15 amps for the 10 amp circuit and 0 to 30 amps for the 25 amp circuit, or by the wire from ammeter to stator-regulator connector; **16 gage red wire** for 10 amp, **14 gage green wire** for 25 amp circuit.

PRECAUTIONS to be exercised in the use of Flywheel Alternator:

1. **Do not** reverse battery connections. Negative battery terminal must be grounded. Reverse polarity will damage rectifier.
2. Connect booster batteries – positive to positive and negative to negative.
3. **Do not** ground any wires from stator or modules which terminate at connectors, or from field terminal of belt driven alternator.
4. **Do not** operate engine with battery disconnected, or disconnect the alternator output lead while the alternator is operating, as damping effect of the battery will be lost. The voltage will rise to an extreme value and permanent damage to the regulator may occur.
5. **Do not** remove alternator from installation without first disconnecting the grounded battery cable.

- Disconnect ground battery lead if a battery charger is used.

When assured that the problem is with the alternator, follow the tests outlined in 'Trouble Shooting'.

WIRING CIRCUIT, Fig. 26, Fig. 27

The fool-proof type connectors used prevent incorrect wiring from the stator to the rectifier and regulator modules. To disconnect plugs, squeeze outer ends of receptical and pull apart.

The rectifier is insulated from ground, but the stator and regulator module are grounded to the engine through their mounting surface. The regulator module therefore should not be removed and mounted at some remote location. This is a *negative ground circuit*. Connect ground strap from negative post of battery to starting motor flange, or good clean grounding surface on engine.

FLYWHEEL ALTERNATOR SERVICE PROCEDURE:

PRELIMINARY TESTS

- Visual Inspection** should be made to eliminate conditions that may be interpreted as a defected alternator. Examine leads for broken or loose connections, and make sure modules are securely mounted. The *regulator module* must be mounted to a metal surface for grounding purposes, (Test 5.0) while the *rectifier module*, although insulated from ground, should be securely mounted for heat dissipation. The mounting surfaces must be clean and free of contaminants, oil, grease, etc.
- Check Battery.** Use a Automotive battery in good condition, fully charged and with clean, tight terminal connections.
- Check Ammeter.** Be certain the ammeter is functioning correctly. Amperage output is regulated by engine speed. The *maximum amperage* output for Model W4-1770 is:

Maximum RPM	10 AMP System	25 AMP System
3000	9.5 amps	22 amps

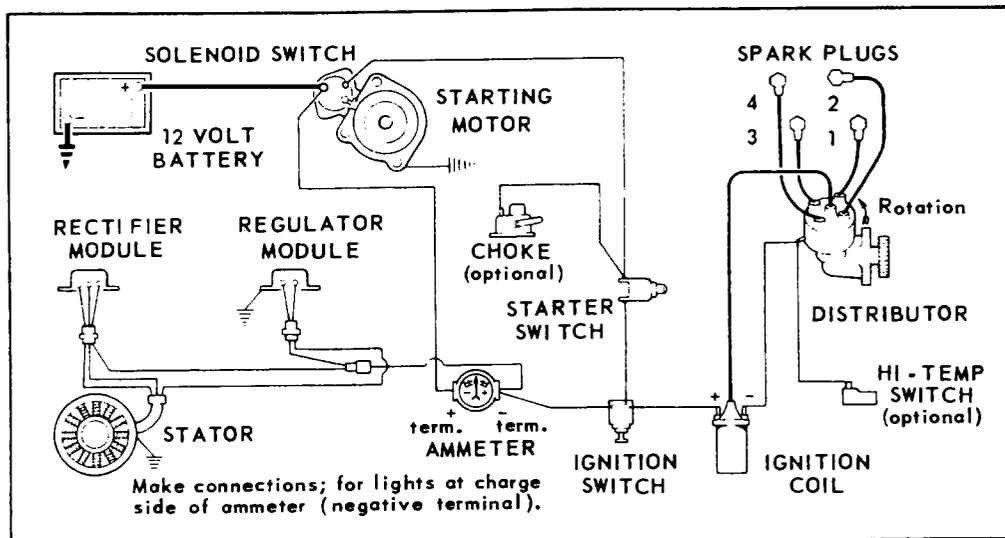
TROUBLE SHOOTING

FLYWHEEL ALTERNATOR 12 VOLT - 10 AMP and 25 AMP Systems

Trouble Shooting Procedure is a guide showing methods of testing the charging components. The following chart of *Tests 1.0 to 4.1* are with the *engine running*, and substituting known good components in place of suspected faulty components. *Static Tests 5.0 thru 7.2*, following the running tests, are more conclusive but some test require special Wisconsin Test Lights.

Problem: Battery Overcharge	Possible Cause & Remedy
Test 1.0 Engine not running check battery with DC Voltmeter. 1.1 If voltage is greater than 13.5 volts 1.2 With engine running at full RPM, check battery voltage with DC Voltmeter. 1.3 If the charge increases beyond 13.5 volts. 1.4 If the charge remains under 13.5 volts.	1.1 Place 12 volt light bulb or carbon pile across battery to reduce voltage to below 13.5 volts. 1.3 Faulty regulator. Replace, - static check regulator per Test No. 5.1. 1.4 Alternator functioning properly. Check battery condition.

Fig. 27. WIRING DIAGRAM
ELECTRICAL SYSTEM
WITH
10 AMP or 25 AMP
FLYWHEEL ALTERNATOR



FLYWHEEL ALTERNATOR COMPONENTS

STATIC TESTS

The following test equipment is required:

DF 83 Analyzer – Wisconsin Part, *Fig. 28*.

DF 81 Flashlite Tester – Wisconsin Part, *Fig. 28*.

VOLT-OHM-MILLIAMMETER Simpson 260 or equal.

The DF 83 Analyzer was developed for testing the solid state ignition and flywheel alternator components as furnished on *Wisconsin* engines. It is very efficiently and economically powered by four transistor radio type 9 volt batteries. The DF 81 Flashlite Tester is used primarily for checking continuity.

Problem: Low / No Charge	Possible Cause & Remedy
Test 2.0 Proceed with Test 1.0 and 1.1. It is necessary to slightly discharge battery to make system work.	
2.1 With engine running at full RPM, check battery voltage with DC Voltmeter.	
2.2 If the charge rate increases –	2.2 Alternator functioning properly. Battery was fully charged.
2.3 If system does not charge	2.3 Operate engine with regulator disconnected (continue with Test 2.4).
2.4 If charge rate increased with regulator disconnected.	2.4 Regulator was at fault. Replace regulator module, – static check regulator per Test No. 5.1.
2.5 If the charge rate does not increase with regulator disconnected.	2.5 Regulator not at fault. Check Rectifier per Test 3.0, 3.1 or static check per Test 6.0.

Problem: Low / No Charge	Possible Cause & Remedy
Test 3.0 Test conditions and procedure the same as 1.0 and 1.1 it is necessary to slightly discharge battery to make system work.	
3.1 Plug new Rectifier in system. Run engine at full RPM.	
3.2 If the charge rate increases with new rectifier in system.	3.2 Rectifier module was at fault. Permanently install new rectifier module.
3.3 If the charge rate does not increase with new Rectifier –	3.3 Rectifier not at fault. Check Stator per Test 4.0.

Problem: Low / No Charge	Possible Cause & Remedy
Test 4.0 With engine stopped, unplug all connectors between modules and stator. Start engine and run at 2400 RPM. With AC voltmeter check voltage between each of the black stator leads and ground.	
4.1 If one of the two voltages is zero or they are over 10% apart. –	4.1 The stator is defective and should be replaced. Static check stator per Tests 7.0, 7.1, 7.2.

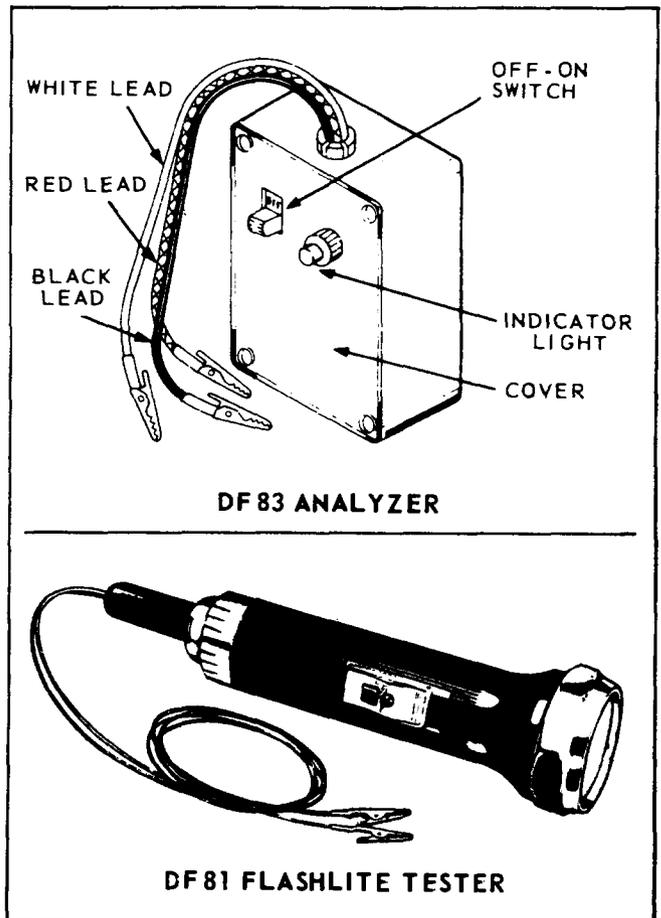


Fig. 28

REGULATOR TESTS

Test 5.0 REGULATOR GROUND

The YJ 60 Regulator module must be mounted to a metal surface for grounding purposes. Check for continuity with a VOM (R x 1 scale) or test light.

TESTER RED LEAD	TESTER BLACK LEAD	RESULT
To Regulator Body	To Ground	DF 83 - Light On DF 81 - Light On VOM - Continuity

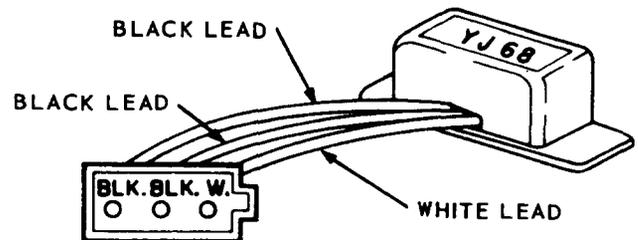
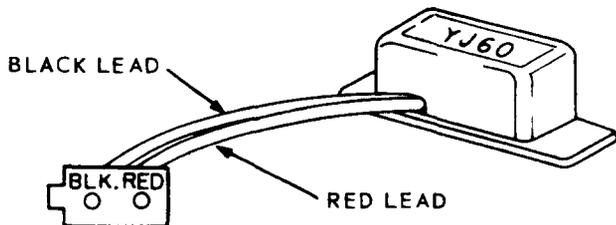
Test 5.1 REGULATOR STATIC CHECK

This test is an alternative or in addition to running tests 2.3 and 2.4 (omitting regulator). The DF 83 Analyzer is used.

YJ60 REGULATOR

NOTE: Module is defective if light indication is not as shown.

TEST NO.	ANALYZER RED LEAD TO:	ANALYZER BLACK LEAD TO:	ANALYZER WHITE LEAD TO:	LIGHT INDICATION
1	Module Base Plate	Module Red Lead	-	OFF
2	Module Red Lead	Module Base Plate	-	OFF
3	Module Red Lead	Module Base Plate	Module Black Lead Then Remove	On And Remain On



YJ68 RECTIFIER (using DF 81 Flashlite)

TEST NO.	TESTER RED LEAD TO:	TESTER BLACK LEAD TO:	LIGHT INDICATION
1	Module White Lead	Either Module Black Lead	ON
2	Module White Lead	Other Module Black Lead	ON
3	Either Module Black Lead	Module White Lead	OFF
4	Other Module Black Lead	Module White Lead	OFF

YJ68 RECTIFIER (using VOM equipment)

Note: Continuity shall be in one direction only. If readings are not as indicated, replace module.

TEST NO.	VOM RED LEAD TO:	VOM BLACK LEAD TO:	METER INDICATION
1	Module White Lead	Either Module Black Lead	No Continuity
2	Module White Lead	Other Module Black Lead	No Continuity
3	Either Module Black Lead	Module White Lead	Continuity
4	Other Module Black Lead	Module White Lead	Continuity

RECTIFIER TESTS

Test 6.0 RECTIFIER STATIC CHECK

The diodes in the Rectifier module can be checked with any continuity device such as the DF 83 analyzer, DF 81 Flashlite or VOM. Since various testing devices will differ in their operation, it should be noted in the following three Rectifier test charts that the results in tests 1 and 2 should always be opposite to the results of tests 3 and 4.

YJ68 RECTIFIER (using DF 83 Analyzer)

Module is defective if light indication is not as shown.

TEST NO.	ANALYZER RED LEAD TO:	ANALYZER BLACK LEAD TO:	ANALYZER WHITE LEAD TO:	LIGHT INDICATION
1	Module White Lead	Either Module Black Lead	-	OFF
2	Module White Lead	Other Module Black Lead	-	OFF
3	Either Module Black Lead	Module White Lead	-	ON
4	Other Module Black Lead	Module White Lead	-	ON

STATOR TESTS

YB81, 10 amp STATOR

YB82, 25 amp STATOR

The continuity tests for stators is not a 100% method of checking. However, if the stator fails the continuity tests, it is definitely defective. If it passes the tests but all other components have also checked out O.K., the stator may be the defective part of the system and should be replaced. Test can be made with Stator on engine.



Test 7.0 STATOR GROUND

Like the Regulator, the YB81 and YB82 Stators must be grounded. Stator ground can be checked with any type continuity device.

TEST NO.	TESTER RED LEAD	TESTER BLACK LEAD	RESULT
1	To Stator Black Lead	To Ground	DF 83 - Light On DF 81 - Light On VOM - Continuity
2	To Other Black Lead	To Ground	

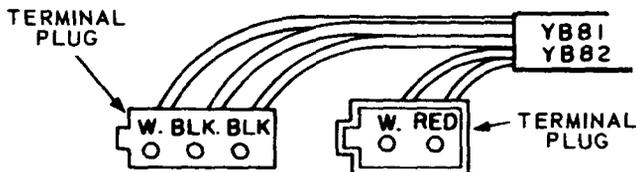
Test 7.1 STATOR CONTINUITY

This test should be performed after 7.0 stator ground test. Use continuity equipment such as DF81 Flashlite or VOM. *Results other than specified indicate a defective stator.*

TEST NO.	TESTER RED LEAD	TESTER BLACK LEAD	RESULT
1	To Ground	To Stator Red Lead	DF 81 - Light On VOM - Continuity
2	To Ground	To Stator Black Lead	
3	To Ground	To Other Black Lead	

Test 7.2 CONTINUITY with DF 83 Analyzer

TEST NO.	ANALYZER RED LEAD TO:	ANALYZER BLACK LEAD TO:	ANALYZER WHITE LEAD TO:	LIGHT INDICATION
1	Stator Black Lead	Ground	-	On
2	Stator Other Black Lead	Ground	-	On
3	Ground	Stator Red Lead	-	On
4	Ground	Stator Black Lead	-	On
5	Ground	Stator Other Black Lead	-	On



If light indication is other than shown, stator is defective. If stator checks out good, perform voltage test 7.3.

Test 7.3 STATOR RUNNING VOLTAGE

With the engine stopped, unplug all connectors between modules and stator. Start the engine and run at operating speed. Perform the following tests with an AC voltmeter:

TEST NO.	METER RED LEAD	METER BLACK LEAD	STATOR DEFECTIVE IF:
1	To Stator Black Lead	To Ground	Either Reading is 0 or Readings Vary more than 10%
2	To Other Stator Black Lead	To Ground	

BELT DRIVEN ALTERNATOR

The **12 volt - 37 Amp** Automotive type Alternator is optionally available in place of the Flywheel Alternator. No maintenance or adjustments are required other than periodically checking for loose, broken or dirty wire-terminal connections, and for proper drive belt tension. Bearings are pre-lubricated, no additional lubrication is necessary. The Regulator is an all electronic transistorized device, therefore no mechanical contacts or relay adjustments are necessary for voltage regulation.

The alternator is wired into the engine electrical system per Fig. 29.

IMPORTANT

This is a **Negative Ground** system. Charging components will be damaged if grounded wrong in connecting or jumping batteries.

Caution: Handle battery carefully to prevent acid burns. Avoid sparks near battery - gas given off by battery is explosive.

PRECAUTIONS to be exercised in the use of belt driven alternator:

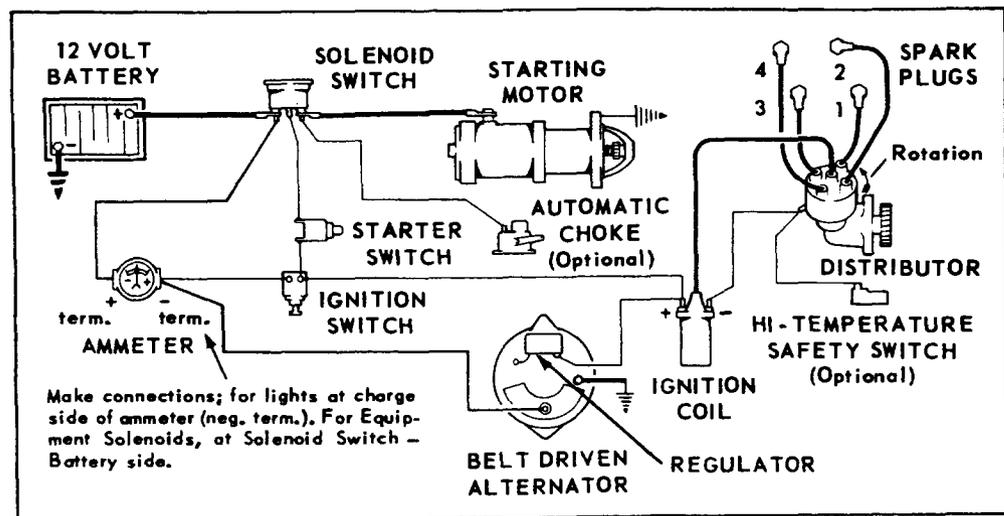
1. Observe proper polarity when installing battery; negative battery terminal must be grounded. Reverse polarity will destroy the rectifier diodes in alternator.
2. As a precautionary measure, disconnect ground battery terminal when charging battery in vehicle. Connecting charger in reverse will destroy the rectifier diodes in the alternator.
3. **Do Not**, under any circumstances, short the field terminal of the alternator to ground, as permanent damage to the regulator may occur.
4. **Do Not**, remove the alternator from the vehicle without first disconnecting the grounded battery cable.
5. **Do Not**, operate engine with battery disconnected, or disconnect the alternator output lead while the alternator is operating, as damping effect of the battery will be lost. The voltage will rise to an extreme value and permanent damage to the regulator may occur.
6. **Do Not**, disconnect the voltage regulator while the alternator is operating, because the large voltage transient that occurs when disconnection takes place may damage the regulator.
7. **Caution:** Output wires from Alternator to Ammeter, and from Ammeter to battery terminal on starting solenoid must be of sufficient size for charging 37 amps. Use No. 10 gage stranded wire, or larger.

30 AMP FLYWHEEL ALTERNATOR

An improved 30 amp flywheel alternator system is now available as an option on W4-1770 engines. This improved 30 amp system is capable of higher output at lower engine speeds over the 25 amp flywheel alternator system.

This new 30 amp system can be easily recognized by the single regulator-rectifier module. The combination regulator-rectifier (YJ70) is mounted to the cylinder shroud on the W4-1770. The YJ70 must be securely mounted to a location that will allow cooling of the unit.

Fig. 29, WIRING DIAGRAM
ELECTRICAL SYSTEM
WITH
BELT DRIVEN ALTERNATOR
AND
SOLENOID STARTING



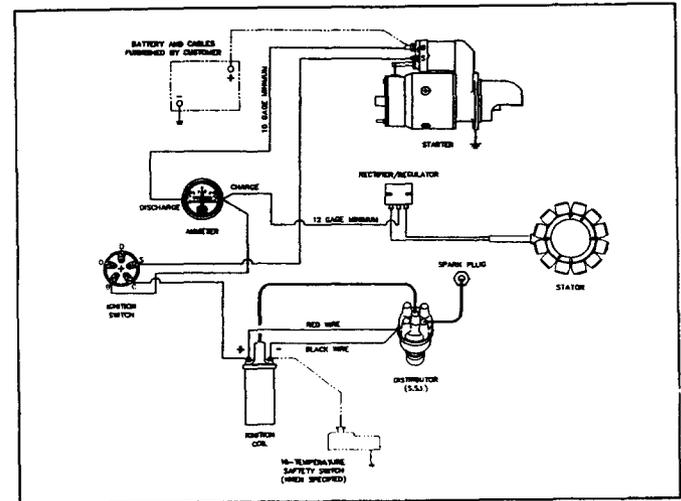
In addition to a new style regulator-rectifier, a new stator (YB84) is used for this 30 amp system. Also, the magnet ring in the flywheel is different than the 25 amp system. In order to change a W4-1770 from the 25 amp system to this improved 30 amp system, the regulator-rectifier, stator, flywheel, wiring and cylinder shroud must be changed.

30 AMP FLYWHEEL ALTERNATOR TESTING

When testing a charging system which uses the YJ-70 rectifier-regulator module, the following items should be checked:

1. That the charging system is properly wired.
2. That all connections are clean and tight.
3. That the battery is in good condition.

The testing should begin by testing the A.C. voltage output of the stator where the 2 leads attach to the YJ-70. Disconnect the stator leads from the YJ-70 and hook them up to a volt-ohm meter. Use the A.C. voltage scale and the reading should be between 20 and 50 volts A.C. depending upon the engine rpm. (The faster the engine speed, the higher the A.C. voltage should be.) This test checks the stator and magnet ring. If the charging system passes all the previously mentioned checks, then the YJ-70 module can be checked as shown below. Use a good quality ohm meter. All readings are done on the RX100 scale. **Do not attempt to use the DF83 analyzer or any other type continuity tester.**



WIRING DIAGRAM, 30 amp Flywheel Alternator with Positive Engagement Starter and Solid State Ignition, Models VH4D, VG4D and W4-1770.

HIGH TEMPERATURE SAFETY SWITCH, Fig. 30

As a safety precaution against overheating, engines are optionally equipped with a high temperature switch mounted to the cylinder head at No. 4 spark plug.

When cylinder head temperature becomes critically high, the safety switch will automatically stop the engine by shorting out the ignition system. A waiting period of about 10 minutes will be required before the switch has cooled off sufficiently to restart the engine. An overheated engine will score the cylinder walls, burn out connecting rod and crankshaft bearings, also damage pistons and valves. The cause of the overheating condition will have to be remedied before the engine is restarted. *See Engine Overheads paragraph in Troubles, Causes and Remedies section.*

Ohmmeter Leads	Module Terminals	Components Under Test and Indication
1. Neg. (-) → Pos. (+) →	B+ → Case →	Diode Assembly Insulator, Power SCR's. Meter should indicate no continuity. (Infinity)
2. Neg. (-) → Pos. (+) →	B+ → Each AC Terminal →	Power Diode Forward Bias Test. Meter should indicate continuity but should not indicate a complete short-circuit. (Some Resistance)
3. Pos. (+) → Neg. (-) →	B+ → Case →	Regulator Control Circuitry. Meter should indicate no less than 7500 ohms and may read as high as approximately 30,000 ohms.
4. Pos. (+) → Neg. (-) →	Case → Each AC Terminal →	Power SCR's. Meter should indicate no Continuity. (Infinity)
5. Pos. (+) → Neg. (-) →	B+ → Each AC Terminal →	Power diode reverse bias test. No continuity. A very high resistance (50,000 - 1,000,000 ohms) may be observed if measured on the high resistance scale of an Ohmmeter.

NOTE

If when performing the above test the YJ-70 tests bad, try reversing the Ohm meter leads and redo the test. Some brands of Ohm meters are reversed polarity from the Ohm meter used to develop this test and will give you incorrect readings unless you reverse the test leads.

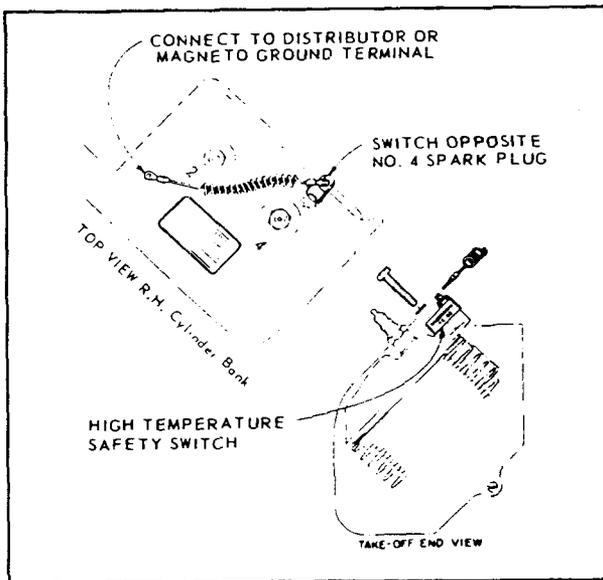


Fig. 30

ENGINE TROUBLES: CAUSES AND REMEDIES

The three prime requisites essential to starting and maintaining satisfactory operation of internal combustion engines are:

1. A proper fuel mixture in the cylinder.
2. Good compression in the cylinder.
3. Good spark, properly timed, to ignite the mixture.

If all three of these conditions do not exist, the engine cannot be started. There are other factors which will contribute to hard starting; such as, too heavy a load of the engine to turn over at a low starting speed, a long exhaust pipe with high back pressure, etc. These conditions may affect the starting but do not indicate that the engine is improperly adjusted.

As a guide to locating starting difficulties which might arise, the following causes are listed under the three headings: Fuel Mixture, Compression, and Ignition.

In each case, the causes of trouble are given in the order in which they are most apt to occur. If the remedy is apparent, no further remedies are suggested.

STARTING DIFFICULTIES

FUEL MIXTURE

- No fuel in tank or fuel shut-off valve closed.
- Plugged vent hole in fuel tank cap.
- Faulty Fuel pump. Diaphragm in pump worn or punctured.
- Carburetor not choked sufficiently, especially if engine is cold.
- Water, dirt, or gum in gasoline interfering with free flow of fuel to carburetor. Clogged fuel filter screen.
- Poor grade or stale gasoline that will not vaporize sufficiently to form the proper fuel mixture.

- Dirt or gum holding float needle valve in carburetor open. This condition would be indicated if fuel continues to drip from carburetor with engine standing idle. Often tapping the float chamber of the carburetor very lightly with the handle of a screw driver or similar tool will remedy this trouble.
- Restricted or dirty air cleaner.
- Faulty carburetor - requires overhaul.
- To test for clogged fuel line, loosen fuel line nut at carburetor slightly. If line is open, fuel should drip out at loosened nut.

COMPRESSION

Caution: Disconnect spark plug wires to prevent engine from accidentally starting.

If the engine has proper compression, considerable resistance will be encountered on the compression stroke when turning engine crankshaft over slowly by hand. If resistance is not encountered compression is faulty.

Restore Compression. To an engine that has been out of operation for a period of time, in which the oil has drained off the cylinders, by removing the spark plugs and pour about a fluid ounce of crankcase oil through the spark plug hole in each cylinder. Turn engine crankshaft over several times to distribute the oil over the cylinder walls, then reassemble spark plugs and compression should be satisfactory.

Compression. Check using a commercial compression test gauge; Wis-Con Total Power does not consider it practical to publish a p.s.i. compression figure because of the variables involved, engine, condition, method of testing, and rpm of test. Our recommendation is that whatever gauge test is performed, a variation of more than 10 p.s.i. between cylinder would indicate leaking rings, valves or any of the following:

- Valve stuck open due to carbon and gum on valve stem, or leaking valve seat, see *Valves*, page 31.
- Valve tappets adjusted with insufficient clearances under valve stems. See *Valve Tappets*, page 12.
- Piston rings worn, broken, or stuck in piston due to carbon accumulation. See *Piston and Connecting Rod*, page 29.

Loose spark plugs or broken spark plug. In this case a hissing noise will be heard when cranking engine, due to escaping gas mixture on compression stroke.

Damaged cylinder head gasket or loose cylinder head. This will likewise cause hissing noise on compression stroke.

IGNITION

Check Distributor or Magneto *'Ignition Spark'* per instructions and Fig. 31 on page 22. No spark or weak spark may be attributed to the following:

- Ignition cable loose or disconnected at coil, distributor or magneto, or spark plugs.
- Broken or frayed ignition wires.
- Spark plugs wet or dirty.
- Spark plug gap incorrect, (see page 9).
- Condensation on spark plug electrodes.

- Breaker point gap incorrect, (see page 10).
- Breaker points pitted or fused.
- Breaker arm sticking.
- Condenser leaking or grounded.
- Spark timing wrong, (see page 12).
- Weak battery. Faulty ignition coil.

ENGINE MISSES

- Spark plug gap incorrect, (see page 9).
- Worn, leaking or loose ignition cables.
- Weak spark or no spark in one of the cylinders, (see 'Ignition', test for spark, page 22).
- Loose connections at ignition cables.
- Breaker points pitted or worn.
- Water in gasoline.
- Poor compression, (see 'Compression', page 21).

ENGINE STOPS

- Fuel tank empty.
- Water, dirt or gum in gasoline.
- Gasoline vaporized in fuel lines due to excessive heat around engine (Vapor Lock), (see 'Stopping Engine', page 7).
- Vapor lock in fuel lines or carburetor due to using winter gas (too volatile) in hot weather.
- Air vent hole in fuel tank cap plugged.
- Engine scored or stuck due to lack of oil.
- Ignition troubles, (see 'Ignition', see page 21).

ENGINE OVERHEATS

- Crankcase oil supply low. Replenish immediately.
- Ignition spark timed wrong, (see 'Timing', page 12)
- Low grade of gasoline.
- Engine overloaded.
- Restricted cooling air circulation.
- Part of air shroud removed from engine.
- Dirt between cooling fins on cylinder or head.
- Intake screen clogged with dirt.
- Engine operated in confined space where cooling air is continually recirculated.
- Carbon in engine.
- Dirty or incorrect grade of crankcase oil.
- Restricted exhaust.
- Engine operated while detonating due to low octane gasoline or heavy load at low speed.

ENGINE SURGES OR GALLOPS

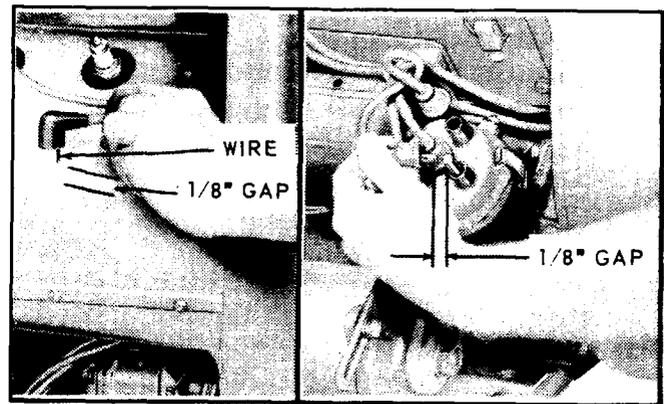
- Carburetor flooding
- Governor spring hooked into wrong hole in lever (see 'Governor Adjustment', page 11).
- Governor spring tension incorrectly adjusted.
- Governor or throttle linkage binding, worn or disconnected.

ENGINE KNOCKS

- Poor grade of gasoline or of low octane rating.
- Engine operating under heavy load at low speed.
- Carbon or lead deposits in cylinder head.
- Spark advanced too far, (see 'Timing', page 12).
- Loose or burnt out connecting rod bearing.
- Engine overheated due to causes under previous headings.
- Worn or loose piston pin.

ENGINE BACKFIRES THROUGH CARBURETOR

- Water or dirt in gasoline.
- Engine Cold.
- Poor grade of gasoline.
- Sticky inlet valves.
- Overheated valves.
- Spark plug heat range incorrect (too hot).
- Hot carbon particles in engine.



MAGNETO

DISTRIBUTOR

Fig. 31, IGNITION SPARK

If difficulty is experienced in starting the engine or if engine misses firing, the strength of the ignition spark may be tested as follows: Distributor Ignition, disconnect the cables from all towers on the distributor cap, except the center coil tower. Insert a stiff piece of wire or metal rod into one of the sockets. Hold the terminal of this tower 1/8 inch from the wire or rod. Magneto Ignition, disconnect No.1 ignition cable from spark plug, wedge a piece of bare wire up into the terminal boot and let an end of the wire extend out. Hold terminal so that wire is about 1/8 inch from metal turn engine crankshaft over two complete revolutions and watch for a spark to discharge during the cranking cycle.

Repeat this check with each of the other ignition cables. A good spark from each of the towers will eliminate the ignition coil and distributor (or magneto) as the source of trouble. If there is a weak spark, or no spark at all, check breaker point gap, condenser and ignition coil.

ENGINE DISASSEMBLY and REASSEMBLY

OVERHAUL

An engine overhaul shall be deemed necessary if at least one of the following occur:

1. A 10% loss in horsepower.
2. Oil consumption of *one quart* or more every 12 hours of operation.
3. A major engine part failure.

Under normal operating conditions and with scheduled maintenance, a suggested period between *overhaul*;

2000 Hours: For *Intermittent load* applications using 65 to 85% of horsepower at 1500 to 3000 r.p.m.

1500 Hours: For continuous load applications using 85 to 95% of horsepower at 2400 to 3000 r.p.m.

SAFETY NOTICE

Correct repair and adjustment are very important for safe and reliable engine operation. It is impossible to evaluate and advise of all the conceivable ways in which service work should be done, or of the unsafe consequences of each way. Use common sense and satisfy yourself that what you are doing will not jeopardize your safety, the safety of others, or cause damage to the engine.



Caution:

1. Engine repairs should be made only by an experienced mechanic.
2. Wear safety glasses and safety shoes.
3. Do not clean parts with gasoline – use a commercial petroleum solvent, or 'de-greaser', according to instructions.
4. When using air pressure for cleaning, wear safety glasses and protective clothing.
5. Keep work area clean of spilled fuel and oil.
6. Store oily rags in a fireproof container.
7. Do not smoke in work area or where batteries are stored.
8. Comply with recommended torque values when tightening screws and nuts.
9. Replacement screws must be of equal or better grade of steel.

PREPARATION and SUGGESTIONS

Clean the engine before attempting to repair it. Remove as much dirt and grime as possible before removing any parts. This will make the repair job much cleaner and reduce the possibility of getting harmful dirt particles inside the engine.

Provide a well lighted working area with enough space for parts and tools to be spread out. A work stand is essential for holding the engine securely while removing or tightening parts.

When disassembling the engine, lay the parts out in the order that they were removed. Have several boxes available so that parts belonging to certain groups can be kept together. Tag parts if there is a possibility of confusion.

It is suggested that reference also be made to engine PARTS MANUAL for reassembly. The exploded illustrations will help in identifying parts, show the components of individual assembly groups and presents a visual order of reassembly.

Drain Oil From Crankcase Before Disassembly

All parts should be thoroughly cleaned and inspected for possible replacement. *Use new gaskets* in reassembly and lubricate all bearing surfaces.

TOOL REQUIREMENTS

Other than the conventional socket wrenches, screw drivers, pliers, hammer, etc., the following tools may also be required.

Box wrench, 1-11/16" offset
Torque wrench (0-50 ft. lbs.)
Puller, idler shaft (Wisconsin DF 67)
Expander, piston ring
Compressor, piston ring
Valve Lifter
Puller, insert (Wisconsin DF 66 A)
Driver, insert (Wisconsin DF 69)
Driver, valve guide (Wisconsin DF 72)
Dial Indicators
Micrometers

DISASSEMBLY and REASSEMBLY PROCEDURES

With the disassembly operations, instructions on reassembly are also given, as often it will not be necessary to disassemble the entire engine. If it is desired to disassemble the entire engine, the reassembly instructions can be looked up under the headings of the various parts.

ACCESSORIES

Remove *clutch* or *clutch reduction* unit if engine is equipped with either of these accessories.

AIR CLEANER can be removed as a complete unit when flywheel shroud is removed. Disconnect tubing and elbow connection from carburetor to air cleaner.

CONTROL PANEL can remain on flywheel shroud, but disconnect: ignition wires, choke wire at carburetor and variable speed control if furnished.

OIL FILTER is removed by tapping side of cartridge with a mallet to break the seal. Then pierce can with screw driver or similar pointed tool to serve as a handle for unscrewing filter cartridge. Place a pan under the filter to catch oil leakage as filter is removed. Disassemble filter bracket from side of crankcase by taking off two mounting screws.

STARTING MOTOR is removed by disconnecting ignition wires at solenoid and taking out the three capscrews holding starter to flange on flywheel shroud.

SCREEN on front face of flywheel shroud must be removed in order to take off the flywheel.

FLYWHEEL, Fig. 32, 33

After the flywheel screen has been removed, straighten out the bent tabs on flywheel nut lockwasher. Then, by means of a 1-11/16 inch offset box wrench, loosen flywheel nut by striking the handle of wrench a sharp blow with a soft hammer. **Do not** use an open end, monkey or pipe. **Do not** remove flywheel nut, but unscrew it flush with the end of the crankshaft.

Caution: Wear safety glasses when using a hammer to straighten lockwasher tabs, loosening flywheel nut and flywheel.

The flywheel is mounted to a taper on the crankshaft. Take a firm hold on the flywheel fins, pull outward and at the same time strike the end of the flywheel nut several times with a babbitt hammer. See Fig. 32. The flywheel will slide off the taper of the crankshaft and can be taken off after the flywheel nut is removed. Striking the end of the flywheel nut instead of directly on the crankshaft will prevent serious damage to the threads at the end of the shaft. Also do not use a hard hammer as it may ruin the crankshaft and bearings.

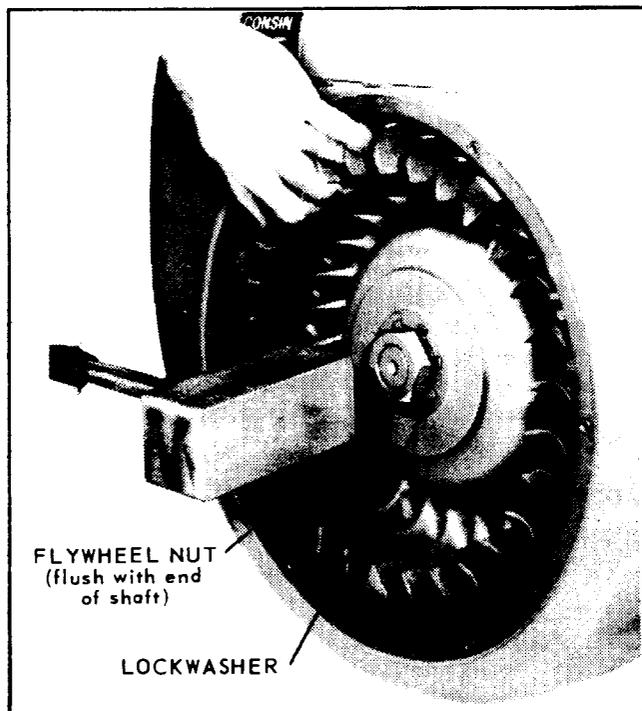


Fig. 32

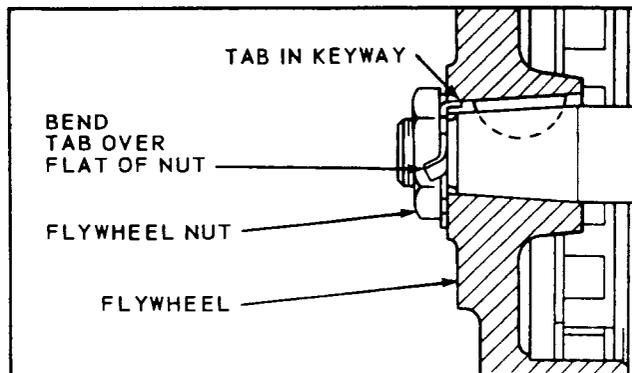


Fig. 33

Important: Carefully remove and reassemble flywheel so as not to damage flywheel alternator rotor and stator.

In Reassembly; be sure the Woodruff key is in position on the shaft and that the keyway in the flywheel is lined up accurately with the key. After mounting; seat flywheel on crankshaft taper by slipping a piece of pipe over the end of the crankshaft and against the hub of the flywheel, and striking the end of the pipe a sharp blow with a hammer.

Assemble new lockwasher with bent tab placed into flywheel keyway as illustrated in Fig. 33. Securely tighten flywheel nut, then bend at least one tab of lockwasher over flat of flywheel nut, to prevent nut from loosening.

AIR SHROUDING, Fig. 34

First disconnect ignition wires at spark plugs, then remove cylinder head covers, and the screws mounting flywheel shroud to lower cylinder shrouds and cylinder heat deflectors. Flywheel shroud with side cover attached can be removed after taking out the six screws mounted to the gear cover. Balance of shrouding can be removed when it is convenient to do so.

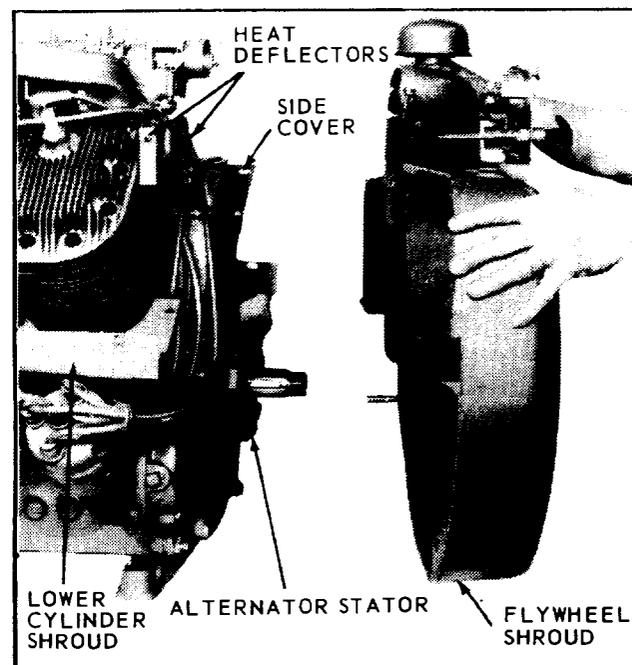


Fig. 34

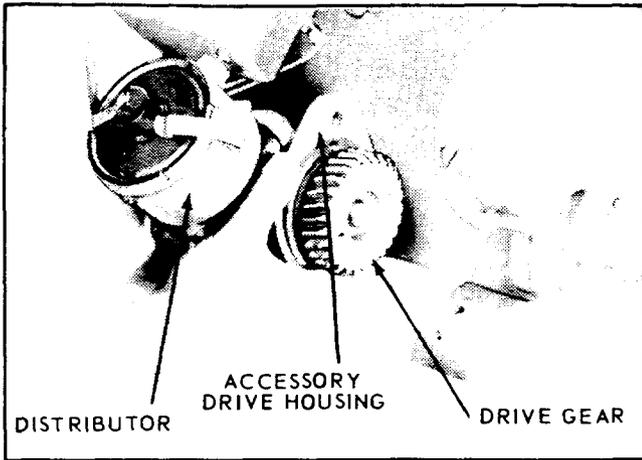


Fig. 35

In Reassembly; use the *thin head* capscrews, for mounting the flywheel shroud, in the two holes close to the horizontal centerline. This is for *stator* clearance on engines with flywheel alternator.

DISTRIBUTOR AND ACCESSORY DRIVE, Fig. 35

Disconnect ignition wire at distributor terminal and take off distributor cap, leaving high tension cables in place. Remove two capscrews holding the accessory drive housing to the gear cover. As illustrated in *Fig. 35*, the distributor and accessory drive housing can be withdrawn from the gear cover as a complete unit.

In Reassembly; Relative drive gear position is not important. Tighten mounting screws, *25 to 30 foot pounds torque*.

MANIFOLD AND CARBURETOR, Fig. 36

Disconnect fuel line at fuel pump and control rod at governor lever. Remove the four nuts and lockwashers that secure manifold to cylinder blocks, and take off manifold - carburetor as a complete unit.

In Reassembly; Be sure gaskets are in place in cylinder ports. Tighten manifold nuts to *18 ft. lbs. torque*. Tightening beyond specifications may cause the flanges to break.

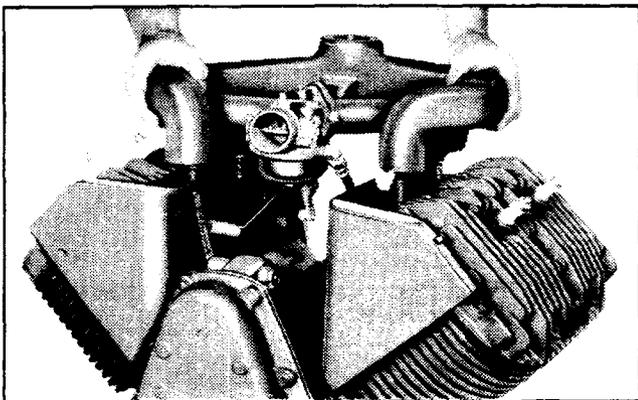


Fig. 36

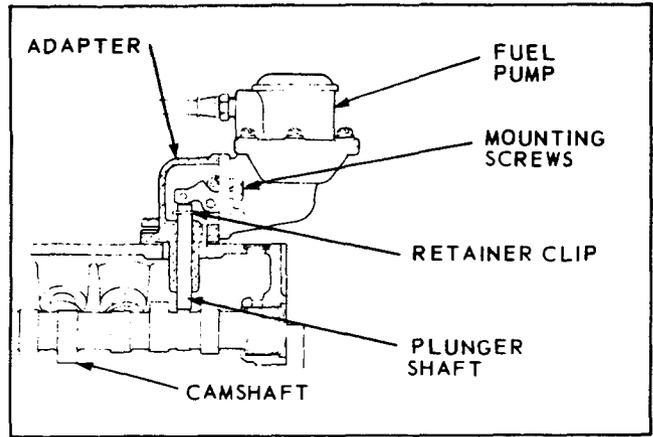


Fig. 37

FUEL PUMP, Fig. 37

Remove the two capscrews which secure the fuel pump adaptor to the top of the crankcase. The adapter, fuel pump, fuel filter and fuel line can be removed as a unit.

Check plunger shaft for excessive wear. If replacement is necessary, remove pump from adapter. By taking out the retainer clip from inside adapter, the plunger shaft can be removed.

Plunger shaft dia.	.3720/.3715 inches
Shaft hole in adapter	.3740/.3730 inches
Clearance	.0010/.0025 inches

When clearance becomes *.005 inch*, replace plunger shaft, or adapter and shaft assembly.

Refer to rear section of manual for Fuel Pump Repair.

CYLINDER HEAD, Fig. 38

The cylinder head must be removed if it is necessary to regrind valves, or to work on the piston, rings or

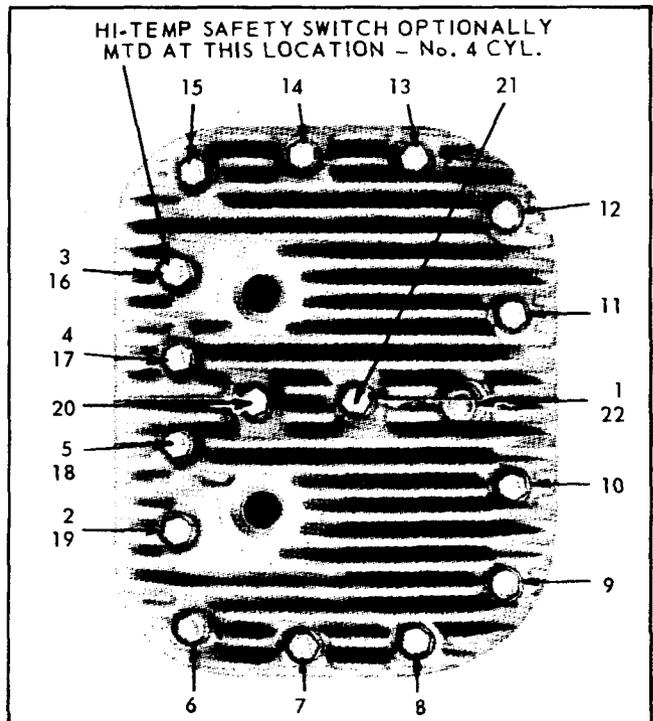


Fig. 38

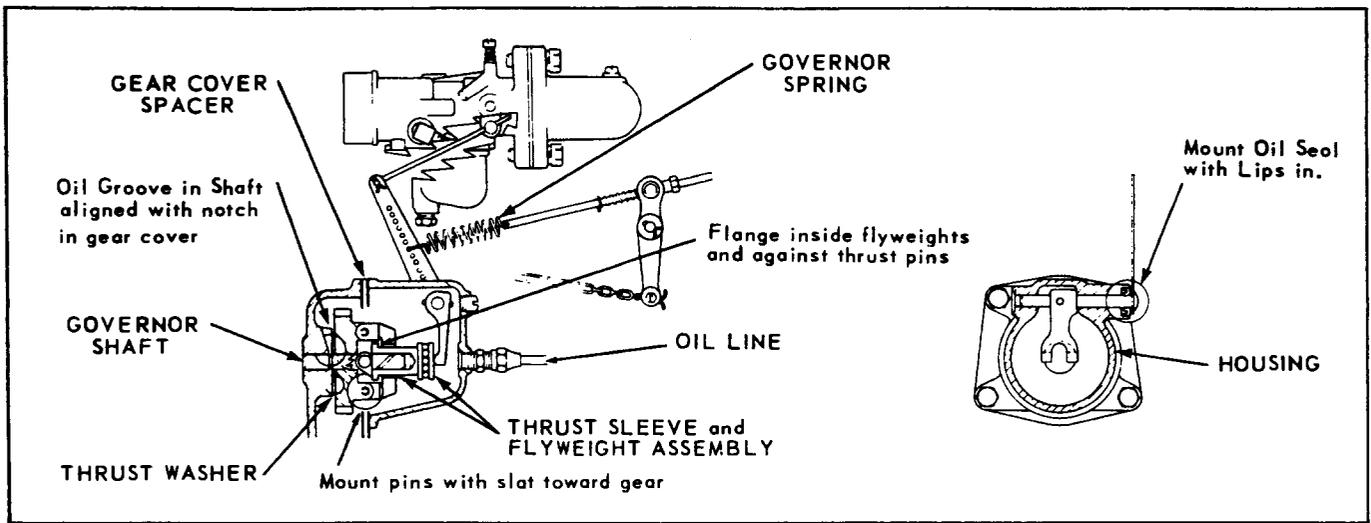


Fig. 39

connecting rods. All of the cylinder head screws are plainly in view and can be easily removed. Screws of different lengths are used but these can be properly reassembled according to the various lengths of cylinder head bosses.

Hi-temp Safety Switch, optionally furnished, is mounted to the cylinder head opposite the No. 4 spark plug, see Fig. 30. Switch must be remounted in this same location or it will not function properly.

In Reassembly; Remove all carbon and lead deposits from combustion chamber. It is recommended that new cylinder head gaskets be used as the old gaskets will be compressed and hard and may not seal properly. Use a mixture of graphite and oil on the cylinder head screws to prevent them from rusting tight against the cylinder block. Tighten cylinder head screws to **24 ft. lbs. torque** in the sequence shown on Fig. 38. After complete assembly and engine is run in, re-torque head screws.

GOVERNOR, Fig. 39

Unhook governor spring and disconnect oil line at governor housing. Take off the four screws and lock-washers that secure the governor housing to the gear cover spacer and remove housing. Slip flyweight assembly, along with thrust washer, off of stationary governor shaft in gear cover.

GOVERNOR - CLEARANCE and WEAR LIMITS (inches)

DESCRIPTION	ORIGINAL DIMENSION	CLEARANCE	WEAR LIMIT
Cross Shaft Diameter	.309 / .310		.002
Cross Shaft Hole dia. in Housing	.312 / .313	.002 - .004	.002
Gear Shaft Diameter	.4270 / .4275		.002
Gear Hole Diameter for Shaft	.429 / .430	.0015 - .003	.002
I.D. of Thrust Sleeve	.429 / .431	.0015 - .004	.003

Fig. 40

In Reassembly; Clean and lubricate all bearing surfaces. Replace parts that are damaged or if there is excessive wear, see Chart Fig. 40. Place thrust washer, gear-flyweight and thrust sleeve on to governor shaft. **NOTE:** flange of thrust sleeve must be inside the flyweights and against the flyweight thrust pins.

FLYWHEEL ALTERNATOR, Fig. 41

Stator can be left on gear cover and removed as a complete unit as illustrated in Fig. 42. Or **stator** can be removed if necessary by first taking out the four #10-32 screws by means of a 5/32 inch Allen wrench. Then, place a hook type pry bar alternately in the area behind the two stator dowel pins, and pry stator mounting surface loose. Be careful not to damage coil windings.

In Reassembly; With wire harness toward gear cover and in line with directional notch, place stator mounting surface over dowel pins and gently tap in place. Apply #242 Loctite to the Four #10-32 screw threads and securely tighten stator to gear cover.

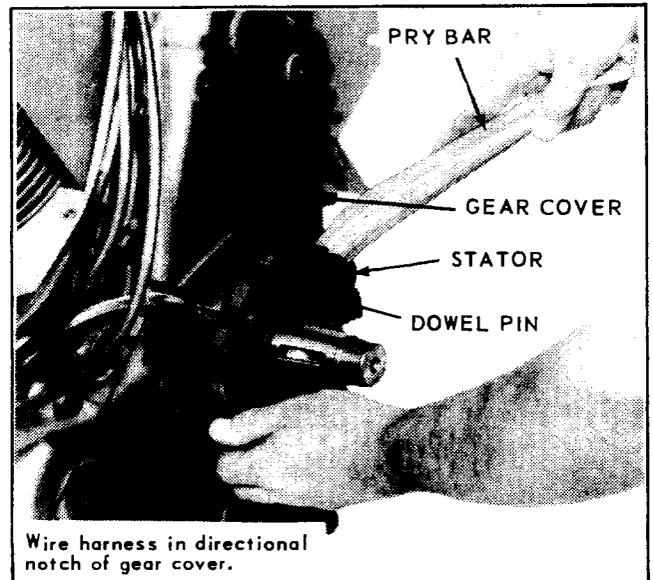


Fig. 41

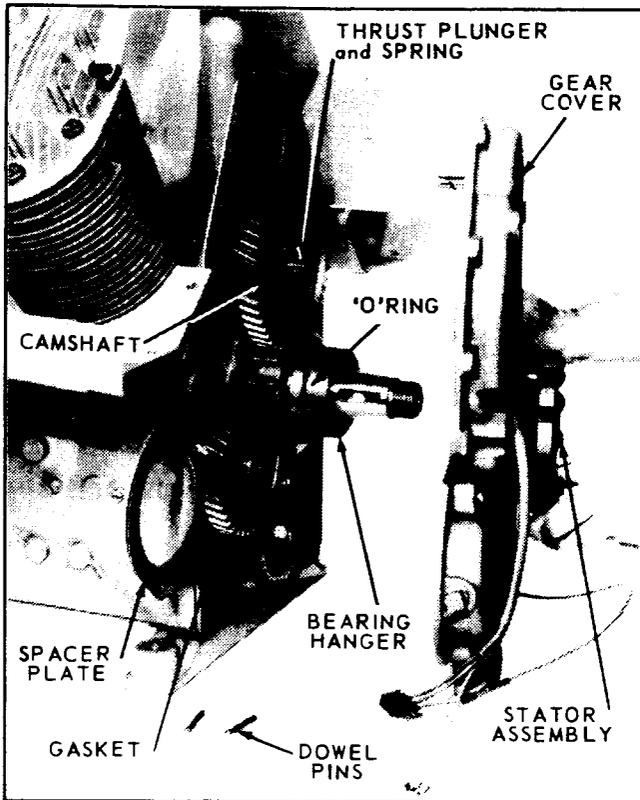


Fig. 42

GEAR COVER, Fig. 42

Remove ten capscrews and lockwashers from the outer gear cover flange and two from the spacer plate side near the governor. With a drift punch, drive the two dowel pins from the gear cover flange thru the crankcase face, then remove gear cover.

Take thrust plunger and spring, *Fig. 41*, out from end of camshaft to prevent them from falling out and being lost.

In Reassembly; Insert thrust plunger and spring into end of camshaft. Mount gasket to spacer plate face, using a thin coat of oil or grease to hold it in place. Assemble gear cover to spacer plate by means of the two dowel pins, be very careful not to damage 'O' ring seal on bearing hanger. Then, mount the twelve capscrews and lockwashers, and tighten 14 to 18 ft. lbs. torque.

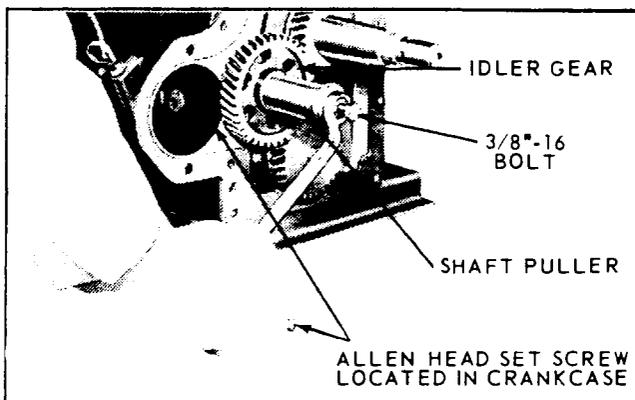


Fig. 43

IDLER GEAR AND SHAFT, Fig. 43

The idler shaft is locked in place by a set screw on the side of the crankcase below the oil header. Remove set screw with a 5/32 inch Allen wrench, and take off idler shaft by means of Wisconsin DF-67 puller and the 3/8"-16 tapped puller hole in end of shaft. Slip idler gear out from behind bearing hanger.

In Reassembly; Inspect for wear—maximum allowable clearance between idler shaft diameter and I.D. of gear is .0045 inches. Be sure oil groove in shaft is facing up. Then, with idler gear in place, drive shaft into crankcase with a soft metal hammer and maintain a .003 to .004 inch clearance between idler gear and shoulder of shaft. Lock shaft in place with the Allen set screw.

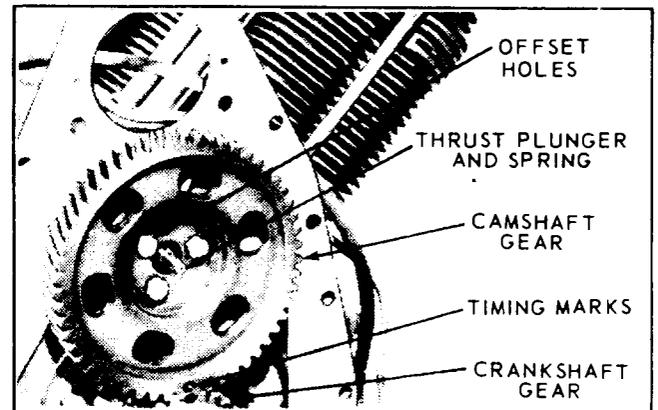


Fig. 44

CAMSHAFT GEAR, Fig. 44, 45

If either camshaft gear or outboard bearing housing have to be removed, they must be removed together. First, take out the three gear capscrews and lockwashers, then proceed to remove gear as far as it will come off by means of a large screw driver or similar wedge tool. Completely remove gear after outboard bearing housing is loosened.

In Reassembly; The off set mounting holes provide an accurate assembly for valve timing — the gear can only be put on the correct way. Position camshaft so that when gear is mounted the *timing mark* matches up with *marked gear tooth* on crankshaft gear, *see Fig. 41*.

Be sure that thrust plunger and spring are in place at end of camshaft before gear cover is mounted.

OUTBOARD, 3rd MAIN BEARING, Fig. 45, 46

Take out the three housing mounting screws using a 12 point, 3/8 inch socket. Slide housing off crankshaft enough so that *camshaft gear* can be taken off. Then, completely remove housing assembly.

In Reassembly; Check needle bearing and inner oil seal for possible replacement. Inner needle bearing race is mounted to the crankshaft using #601 Loctite. Oil seal is mounted with *lips facing, inward*, *see Fig. 46*. If main roller bearing is replaced, mount bearing cup extended out .125 (+.000-.002) inches from face of crankcase as shown.

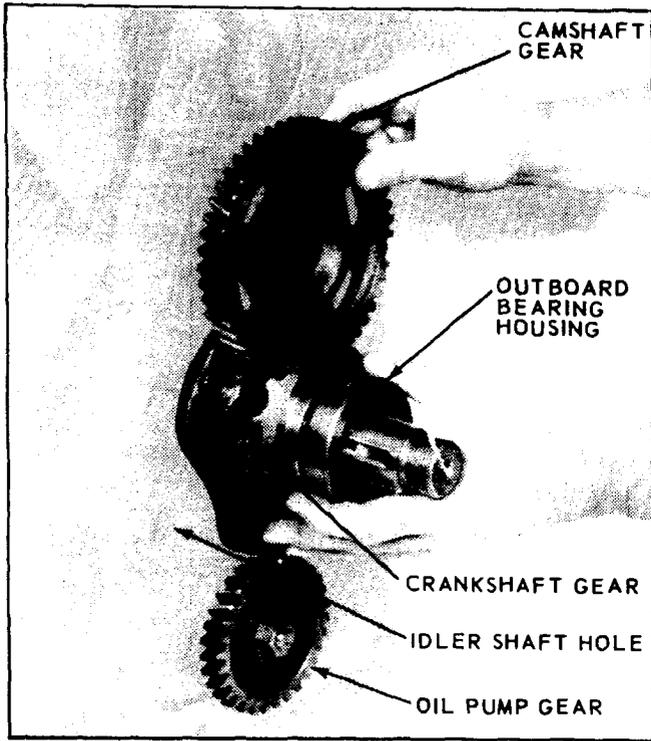


Fig. 45

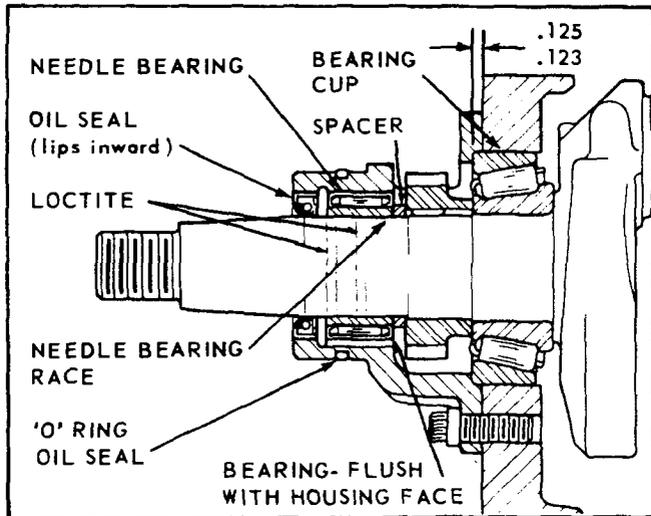


Fig. 46,

Tighten housing mounting screws **40 to 45 ft. lbs. torque** and use a new 'O'ring oil seal around outer diameter of housing.

GEAR TRAIN, Fig. 47

With the gear cover removed and without illustrating the outboard bearing, the complete gear train is shown.

Future reference can be made to *Fig. 47* when assembling crankshaft and camshaft, as accurate location of the timing marks is essential for proper engine operation.

ENGINE SUPPORTS AND OIL PAN, Fig. 48

Invert engine to a position where the bottom of the engine will be accessible. If possible, use a work bench with a clearance hole in it of about 4 inches in

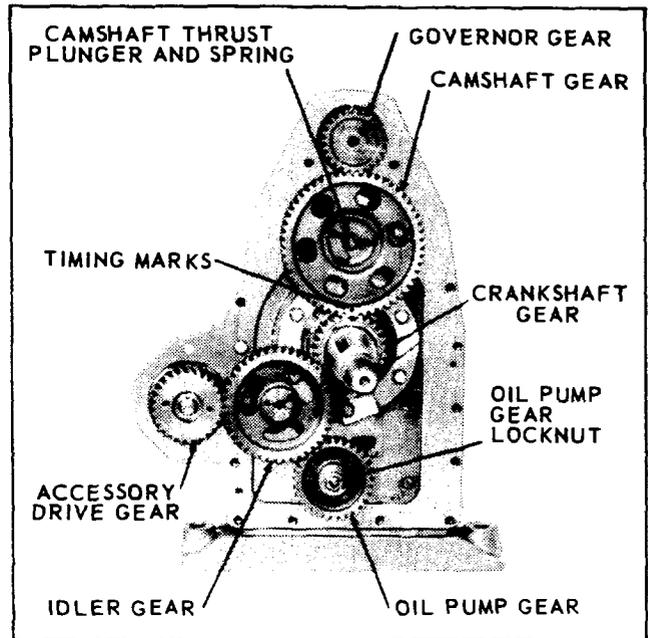


Fig. 47, GEAR TRAIN WITHOUT OUTBOARD BEARING

diameter. Extend the crankshaft thru the hole and rest the engine on the main bearing plate flange. Remove the engine support mounting screws with a 3/4 inch socket wrench, and the oil pan screws with a 1/2 inch wrench.

In Reassembly; Use a new oil pan gasket, and mount oil pan with oil drain to either side – oil filter side is standard. Use Perma-tex on screw threads and tighten **6 to 9 ft. lbs. torque**.

Mount engine supports and tighten cap screws to **40 ft. lbs. torque**.

OIL PUMP, Fig's. 49, 50

Remove locknut and oil pump drive gear from shaft, see *Fig. 50*. If gear is too tight to remove by hand, use a puller. **Hammering** on end of shaft to loosen gear will **damage pump**.

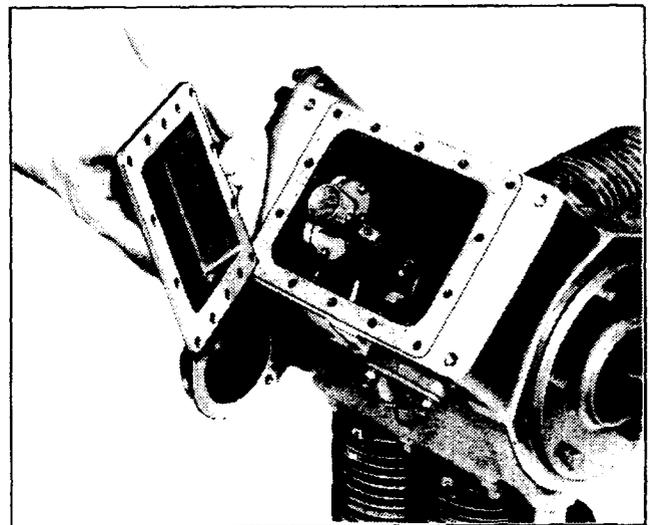


Fig. 48

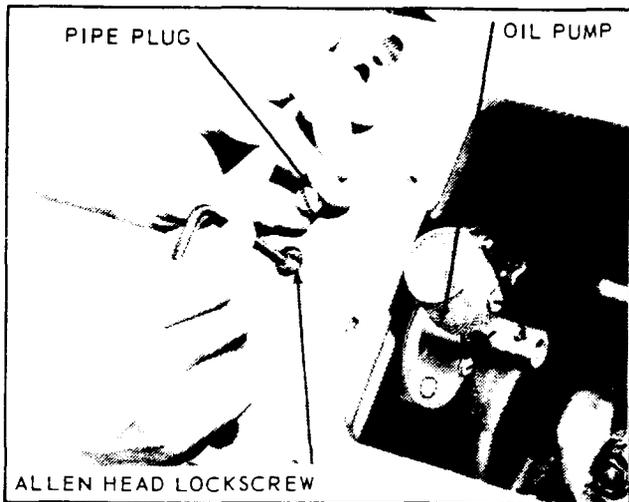


Fig. 49

Take out slotted pipe plug from bottom of crankcase. By means of a 5/32 inch Allen wrench, remove lock-screw from pipe plug hole. Withdraw oil pump from inside crankcase. If pump fits too tight to remove by hand, tap front of pump housing (not shaft), with hammer and brass rod.

Oil pump disassembly; is required for inspection and cleaning if faulty pump operation is suspected. Remove cover assembly and wash in a commercial cleaning solvent. Inspect relief valve and check cover for cracks. Thoroughly clean oil passages in body, and inspect gears, shafts and body for excessive wear, see Fig. 50 and Fig. 51. In addition to individual parts, body assembly complete with gears is available as a service replacement.

In Reassembly; Thoroughly oil internal gears, and use a new gasket (.003" thick), when assembling cover. Mount oil pump to crankcase in reverse order of disassembly, and lock body in place per Fig. 49.

CONNECTING RODS and PISTONS, Fig. 52,53,54,55

By means of a 1/2" socket wrench, loosen and remove the hex locknuts from connecting rod bolts. Then, by

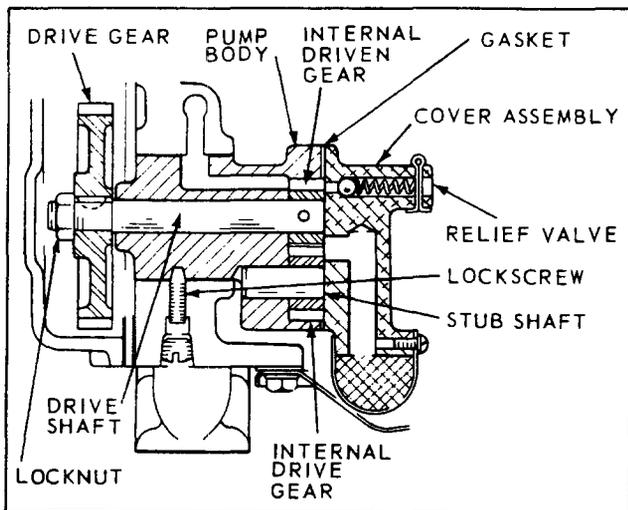


Fig. 50

OIL PUMP - CLEARANCE and WEAR LIMITS (inches)

DESCRIPTION	ORIGINAL DIMENSION	CLEARANCE	WEAR LIMIT
Drive Shaft Diameter	.5000 .4995		.002
Drive Shaft Hole Diameter in Body	.5015 .5005	.0005-.002	.002
Stub Shaft Diameter	.4975 .4970		.002
Gear Hole Diameter For Stub Shaft	.499 .498	.0005-.002	.002

Fig. 51

tapping the ends of the bolts lightly, the connecting rod cap will break free from the bolts.

Scrape off all carbon deposits that might interfere with removal of pistons from upper end of cylinder. Turn crankshaft until piston is at top, then push connecting rod and piston assembly upward and out thru top of cylinder. Be careful not to mar the crank pin by allowing the rod bolts to strike or scrape across it. Place caps on rods immediately so that they will not be mismatched in reassembly. **Note:** Tag connecting rod and piston assemblies so that they can be reassembled into the same cylinder that they were removed from.

Shell Bearings must be correctly mounted to the connecting rod in reassembly. The cap should be mounted to the rod so that the **locating lug** of both bearing halves are on the same side as illustrated in Fig. 52. Spread a film of oil on back of shell bearing before mounting to help hold them in place during assembly. Refer to chart, Fig. 51 for clearance between bearing and crank pin. **Undersize shell** bearing are available for service in sizes of .001", .002", .010" and .020".

Piston skirt is **cam-ground** to an elliptical contour. Clearance between the piston and cylinder must be measured at the center of the thrust face at the bottom of the piston skirt. Refer to Chart, Fig. 51 for proper clearance. The thrust face on the piston are the wide section of the piston, 90° from the axis of the piston pin hole, on both sides of the piston, see Fig. 57. The **maximum thrust face** is the wide side opposite the direction of crankshaft rotation. Diameter of piston at bottom of skirt thrust faces is 3.2455 / 3.2465 inches.

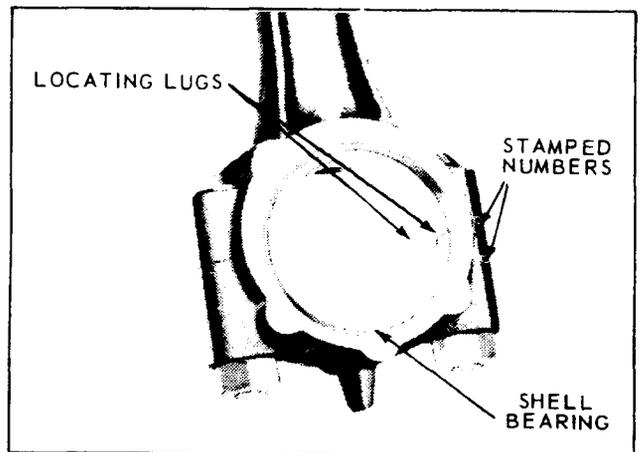


Fig. 52

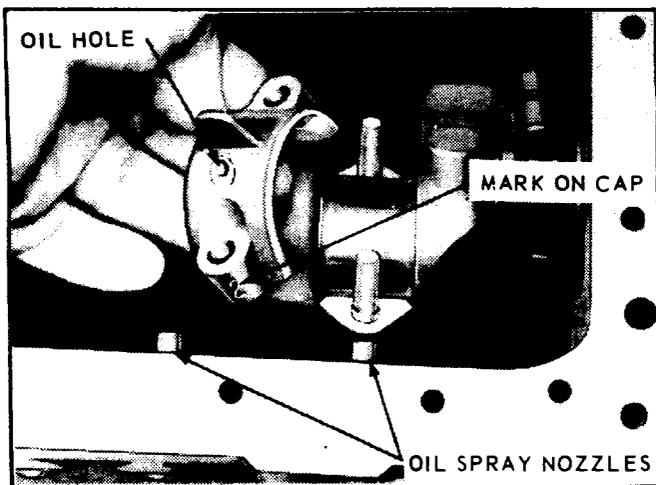


Fig. 53

In Reassembly; Be sure piston and connecting rod assemblies are put back into the same bore from which they were removed. Lubricate the crank pins, piston assembly and cylinder walls with No. 30 S.A.E. oil, and stagger the ring gaps 90° around the piston. Use a standard automotive type ring compressor, and insert rod end into cylinder from cylinder head end.
Note: Rod bearing should be parallel to crank pin.

**PISTON, RING, ROD CLEARANCES
and WEAR LIMITS (inches)**

CYLINDER BORE		3.249 /3.250	
PISTON DIA. AT BOTTOM OF SKIRT, THRUST FACES		3.2455/3.2465	
PISTON TO CYLINDER AT PISTON SKIRT THRUST FACE		CLEARANCE	WEAR LIMIT
		.003 / .994	.003
PISTON RING GAP		.010 / .020	.015
PISTON RING SIDE CLEARANCE IN GROOVES	TOP RING	.002 / .004	.002
	SCRAPER RING	.002 / .004	.002
	OIL RING	.001 / .003	.002
PISTON PIN TO CONNECTING ROD BUSHING		.0004 / .0012	.001
PISTON PIN TO PISTON		.0000 / .0008 tight	.001
CONNECTING ROD TO CRANK PIN - SIDE CLEARANCE		.009 / .016	.005
CONNECTING ROD SHELL BEARING TO CRANK PIN DIA. (VERTICAL)		.0012 / .0033	.003

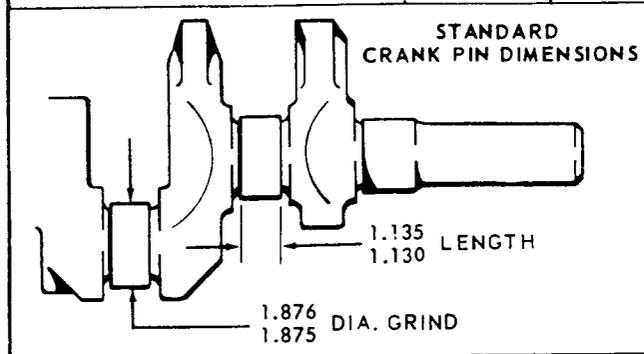


Fig. 54

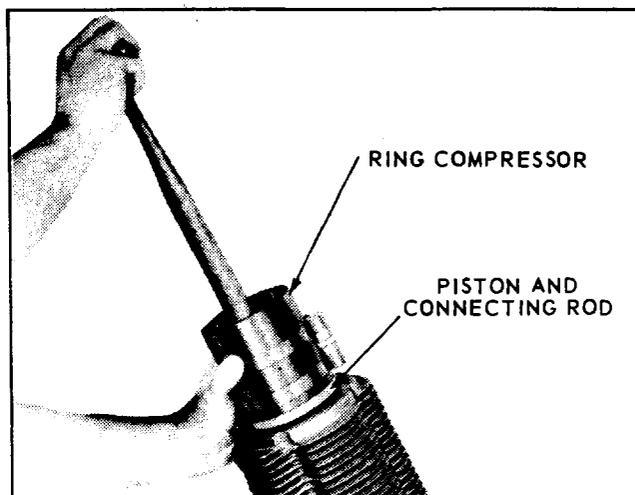


Fig. 55

Gently tap piston into cylinder until connecting rod bearing contacts the crank pin. Use the wooden handle end of hammer, as shown in Fig. 55.

Important: Identical numbers are stamped on the side of the rod with its corresponding cap. These numbers must be on the same side of the connecting rod when mounted in engine. Be sure that connecting rod *shell bearing* are in place and, *oil hole* in connecting rod cap is facing toward the oil spray nozzle, as illustrated in Fig. 53. **Install new nuts** on connecting rod bolts and tighten **22 to 28 ft. lbs. torque.**

PISTON RINGS Fig. 56, 57, 58

If a ring expander tool, Fig. 56, is not available, install rings by placing the open end of ring on piston first, as shown in Fig. 57. Spread ring only far enough to slip over piston and into correct groove, being careful not to distort ring. Install bottom ring first and work toward the head of the piston, installing top ring last. The word '**TOP**' on compression and scraper rings indicates direction of ring placement on piston.

Note: Be sure Expander Ring is in place in 3rd groove before mounting oil control ring.

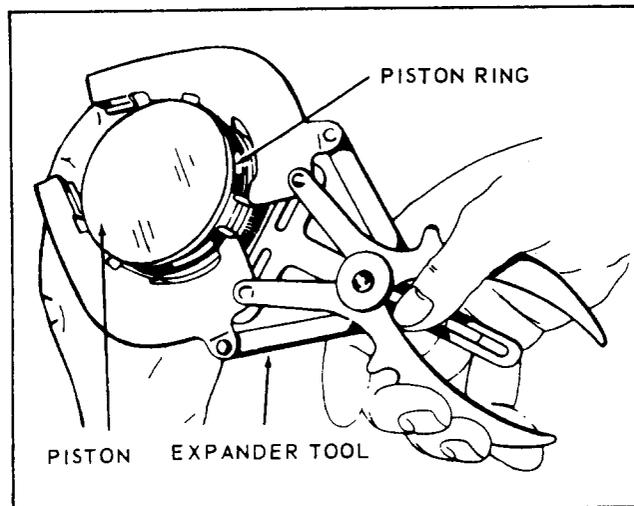


Fig. 56

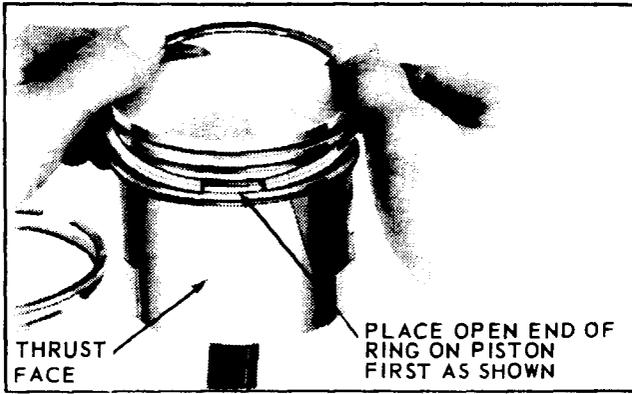


Fig. 57

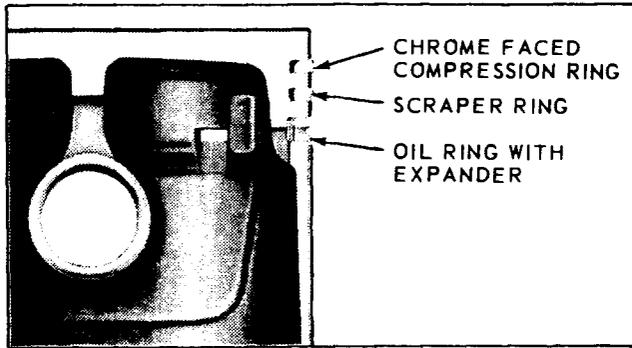


Fig. 58

The outer diameter of the compression ring is **chrome plated**. Mount scraper ring with scraper edge down, otherwise oil pumping and excessive oil consumption will result. Refer to *Fig. 58* for the correct placement of piston rings, and *Fig. 54* for clearance and wear limits.

CYLINDER BLOCKS

Clean all dirt and foreign deposits from between the cylinder fins and manifold ports.

The cylinder blocks do not have to be removed unless the cylinder bore is scored, out-of-round, or worn oversize more than **0.005** inch. The standard cylinder bore size is **3.250/3.249** inches.

Cylinder blocks can be rebored and fitted with pistons and ring of .010", .020" and .030" oversize. It is recommended that this work be done by an authorized Wis-Con Total Power Distributor or Service Center.

In Reassembly; Tighten the cylinder block mounting nuts, **40 to 50 ft. lbs. torque.**

VALVES and SEAT INSERTS, Fig. 59, 60, 61, 62

Remove valve tappet inspection plate and compress valve springs with a standard automotive type valve lifter as illustrated. Insert a rag in the opening at the bottom of valve chamber so the retaining locks do not fall into engine crankcase. Remove retaining locks, seats, springs, valves and clean these, as well as the ports and guides, of all carbon and gum deposits. Tag each valve so that in reassembly they will be mounted in the same guide they were removed from. Replace valves that are burned or pitted.

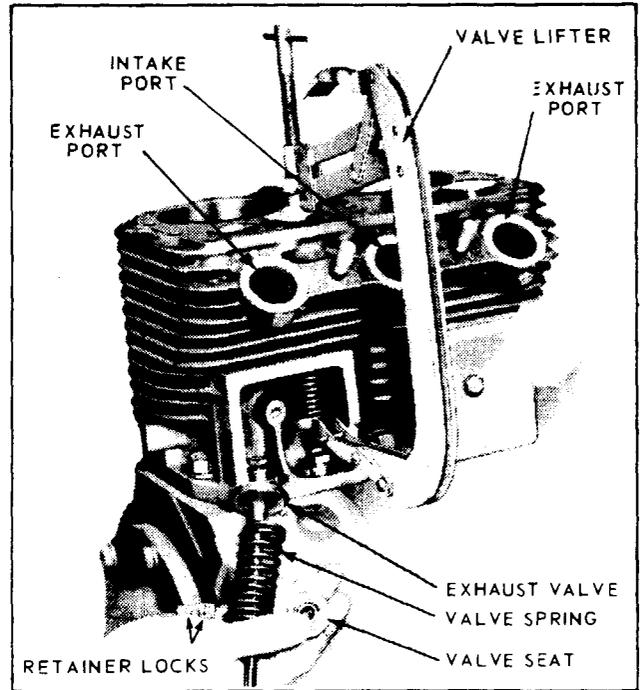


Fig. 59

Important; Exhaust type valves are used in the intake ports so as to be compatible in length of service with the special heat resistant alloy steel **long life** valves used in the exhaust ports. The exhaust valves that are used in the exhaust ports are identified with the letter **S** on the head, as illustrated in *Fig. 61*.

Valve springs that are weak will spoil a good overhaul, if they are not replaced. With reference to *Fig. 60*, check free length, compression strength and if both ends are parallel. Replace springs that are not within **7 lbs.** of the amount shown, when compressed to length when **valve is open**.

In Reassembly; Both ends of spring are square with one inactive coil, so either end can be mounted toward cylinder block or valve seat. The **exhaust valve spring** is of heavier gage material and is shorter in length because it is used with a Valve Rotator.

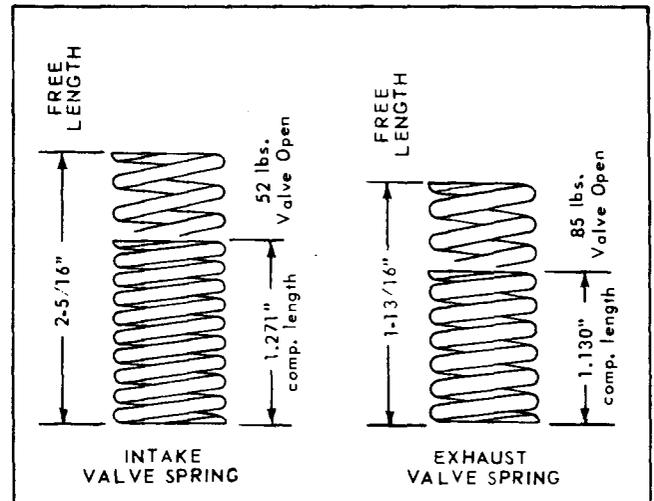


Fig. 60

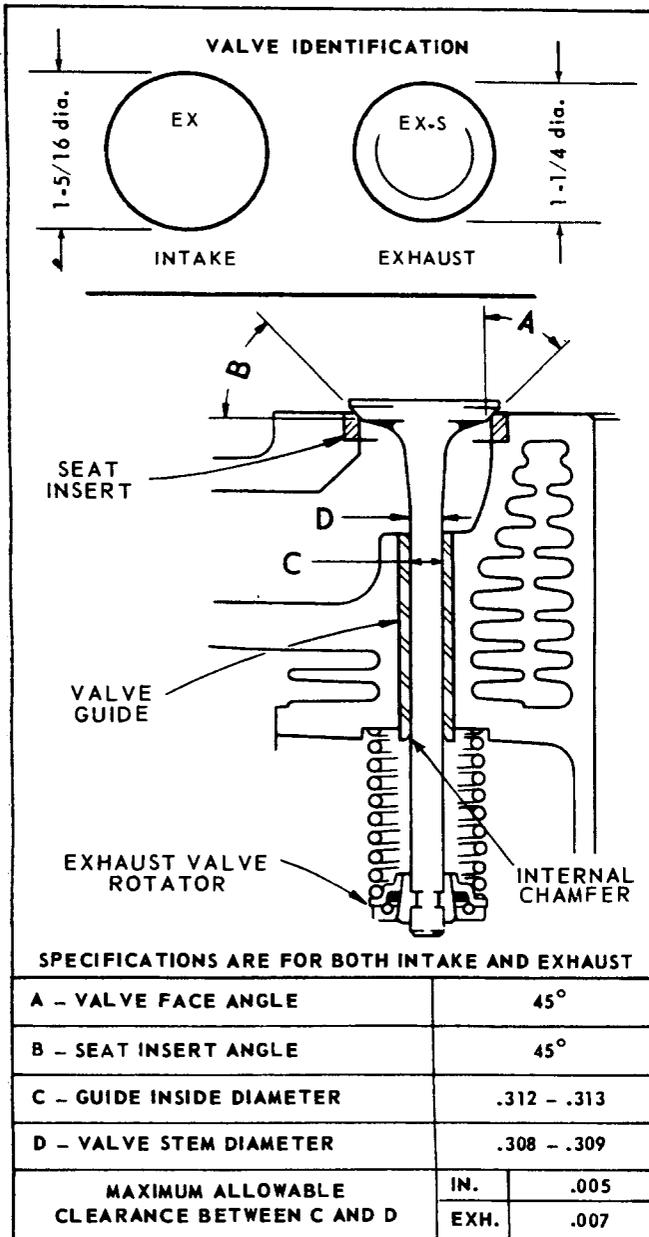


Fig. 61

Valve Rotators are furnished on the exhaust valves in place of the conventional valve seat. The action of the rotocap, which rotates the valve slightly each time the valve opens, helps prevent sticky valve and will impart a wiping action between the valve face and valve seat, thereby preventing the build-up of foreign deposits. Valve rotation will also avoid prolonged exposure of any one sector of the valve face to a local hot spot on the seat which will result in lower and more uniform valve face-seat temperatures. Clean and inspect operation of rotators - replace if faulty.

Seat Inserts for both intake and exhaust valves can be removed when replacement becomes necessary by means of a Wisconsin **DF 66A** insert puller, See Fig. 62.

Dimension wise the intake and exhaust seat inserts are identical, but the materials are different. The exhaust seat inserts are of a special **long life** heat re-

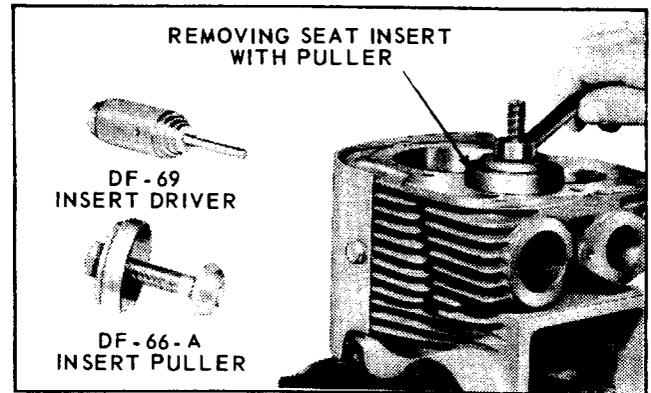


Fig. 62

sistant steel. For mounting seat inserts use Wisconsin **DF 69** insert driver.

Before grinding valves, inspect valve guides for possible replacement. Refer to *Valve Guide* paragraph. The valve face is ground at 45° to the vertical center line of the valve stem and the valve seat insert should also be ground at a 45° angle. **After grinding**, lap valves in place until a uniform ring will show entirely around the face of the valve. Clean valves and wash block thoroughly with a hot solution of soap and water. Wipe cylinder walls with clean lint free rags and light engine oil, especially if cylinders were rebored and honed.

Valve guides in the cylinder block are easily replaceable by use of Wisconsin **DF 72 driver tool**.

In Reassembly; Mount guides with inside chamfer down. The valve stem has a clearance of .003 to .005 inch in the guide. When the clearance becomes .007 inch, the guides should be driven out and replaced with new guides.

MAIN BEARING PLATE AND CRANKSHAFT, Fig's. 63, 64

Remove main bearing plate, gaskets and shim from take-off end of engine. Remove crankshaft from that end of crankcase, being careful not to damage bearing cup at gear cover end with crank gear.

Retain bearing plate shim and gaskets so that the same total thickness of new gaskets can be determined

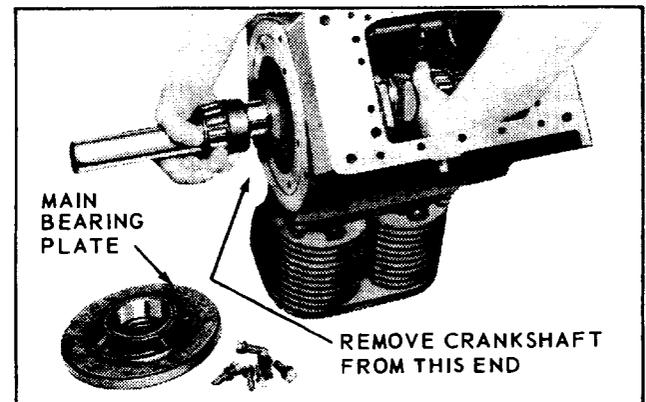


Fig. 63

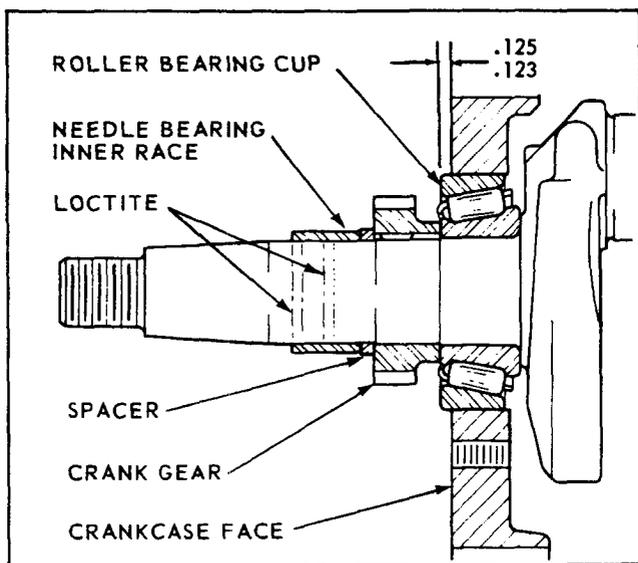


Fig. 64

for reassembling bearing plate. This may result in obtaining correct end play without having to remove or add gaskets later when end play is checked.

Outboard Needle Bearing (inner race) if replaced; apply a 1/8 inch wide bead of # 601 loctite to inside diameter of new bearing race at center, and to crankshaft. **Note:** Be sure spacer is in place against crank gear before applying loctite, see Fig. 64.

Main Roller Bearing (gear cover end) if replaced; mount bearing cup so that it extends out from crankcase face .125 (+.000-.002) inch, as illustrated in Fig. 64.

In Reassembly; Holes for the main bearing plate are off-set for correct mounting. Assemble main bearing plate, new gaskets with the same total thickness as those removed, and original shim. Place shim between the paper gaskets. Mount capscrews and lockwashers, and tighten 25 to 30 ft. lbs torque.

End Play can be determined after main bearing plate is tightened down. The end play is .002 to .005 inch and can be checked as follows:

1. Rap crankshaft from take-off end with a soft hammer so that crankshaft will shoulder against main bearing at gear cover end.
2. Rap crankshaft in the opposite end (from gear cover end) to seat against main bearing at take-off end.
3. Attach a Dial Indicator to the crankcase at the take-off end, and against the end of the crankshaft. Set dial at 0.
4. Wedge crankshaft toward gear cover end of crankcase - the movement of the crankshaft will register as end play on the indicator dial. Confirm the end play figures by repeating this sequence several times.

The bearing plate gaskets are .003 and .006 inch thick. If end play is more than .005 inch, remove a

corresponding thickness of gaskets from bearing plate. Less than .002 inch end play, gaskets will have to be added.

CAMSHAFT and VALVE TAPPETS, Fig's. 65, 66

The camshaft must be withdrawn from the gear cover end of crankcase as shown. Pull all valve tappets outward to clear cam lobes. Then assemble a camshaft gear screw, 5/16" - 18 thread, into one of the mounting holes at end of camshaft to act as a puller. Remove camshaft, being careful not to damage cam lobes.

In Reassembly; Check tappets and camshaft for excessive wear, replace if necessary. Refer to 'Clearance and Wear Limits' chart, Fig. 66. Lubricate body of tappets and assemble to crankcase before mounting camshaft.

Tappet Adjustment is made after cylinder block assemblies are mounted. See Fig. 19, Page 12 for tappet setting.

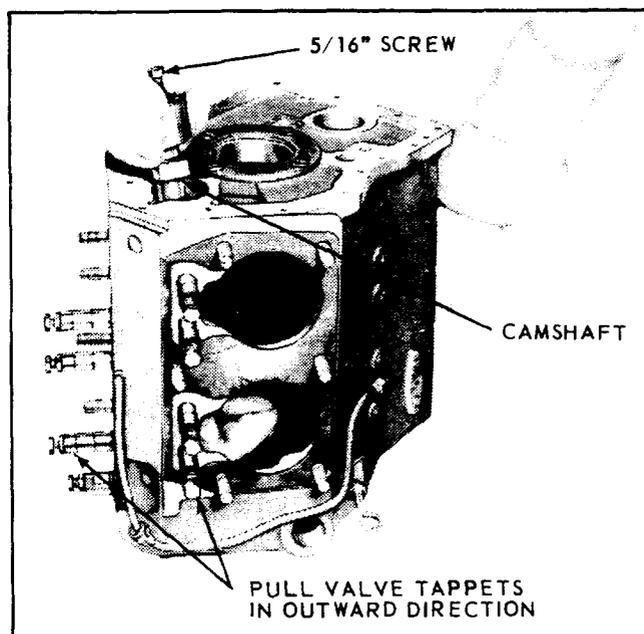


Fig. 65

CAMSHAFT and VALVE TAPPETS CLEARANCE and WEAR LIMITS (inches)

DESCRIPTION	ORIGINAL DIMENSION	CLEARANCE	WEAR LIMIT
Tappet Diameter	.624 / .623		.002
Tappet Hole Diameter In Crankcase	.6255 / .6245	.0005 - .0025	.002
Camshaft Bearing Diameter - Small End	1.248 / 1.2475		.002
Bearing Hole Diameter in Crankcase - Small End	1.251 / 1.250	.002 - .0035	.002
Camshaft Bearing Diameter - Large End	1.8730 / 1.8725		.002
Bearing Hole Dia. in Crankcase - Large End	1.876 / 1.875	.002 - .0035	.002

Fig. 66

TESTING REBUILT ENGINE

Proper *break-in* will lead to trouble-free operation and increased engine life. The factory test given to a new engine is not sufficient to establish the polished bearing surfaces which are so necessary for good performance and long engine life. There is no quick way to force the establishment of good bearing surfaces, and these can only be obtained by running a new engine carefully and under reduced speeds and loads for a short period of time. Run the engine for a half hour without load at low idle speed (1000 to 1200 r.p.m.). The speed should then be increased gradually, to engine operating r.p.m. still without load, for an additional two hours. If at all possible, operate the engine at light loads for a period totaling about eight hours, before maximum load is applied.

STORAGE OF ENGINE FOR WINTER

To protect the cylinders, pistons, rings and valves and keep them from rusting and sticking, a half and half mixture of kerosene and good "gasoline engine" oil (the same kind of oil as used in the crankcase of the engine), should be injected into the *pipe tap* opening on the *intake manifold* while the engine is warm and running at moderate speed. About a quarter of a pint is necessary, or enough so that a heavy bluish smoke will appear at the exhaust. The ignition switch should then be shut off and the engine stopped. This fogging operation will leave a coating of oil on the above mentioned parts, protecting them from the atmosphere.

Drain crankcase oil while engine is warm.

Drain fuel lines, carburetor, fuel pump and tank, to prevent lead and gum sediment from interfering with future operation. Gasoline fumes from gradual evaporation is a dangerous *fire hazard*.

The air cleaner and filter element should be thoroughly cleaned. Tape or otherwise seal off the exhaust and air cleaner openings for the duration of storage.

The outside of the engine, including the cooling fins on the cylinder block and head, should be thoroughly cleaned of all dirt and other deposits. All exposed unpainted metal parts should be coated with grease or heavy oil.

Before starting the engine, after the storage period, remove crankcase drain plug so that any condensation which may have collected may be drained, before new crankcase oil is added. It is advisable to remove the crankcase oil base and scrub off all sediment which may have collected there. Use a new gasket when reassembling the engine base. Replace oil filter.

Use new spark plugs at the beginning of the operating interval, especially if the engine has given considerable service.

It is highly recommended that machines be stored inside a building through the winter. If this is not possible, the engine should be protected from snow and ice by a proper covering.

ACCESSORIES & OPTIONS

OPERATION and SERVICE INSTRUCTIONS

FUEL PUMP

CARBURETOR

MAGNETO

SOLID STATE IGNITION DISTRIBUTORS

Major repairs of Alternator (automotive type), Ignition Distributor, Magneto and Starting Motor may require special tools and testing equipment. It is suggested that these repairs be done at either an Authorized Wisconsin Motor Distributor or the Accessory Manufacturer's dealer.

FUEL PUMP REPAIR INSTRUCTIONS

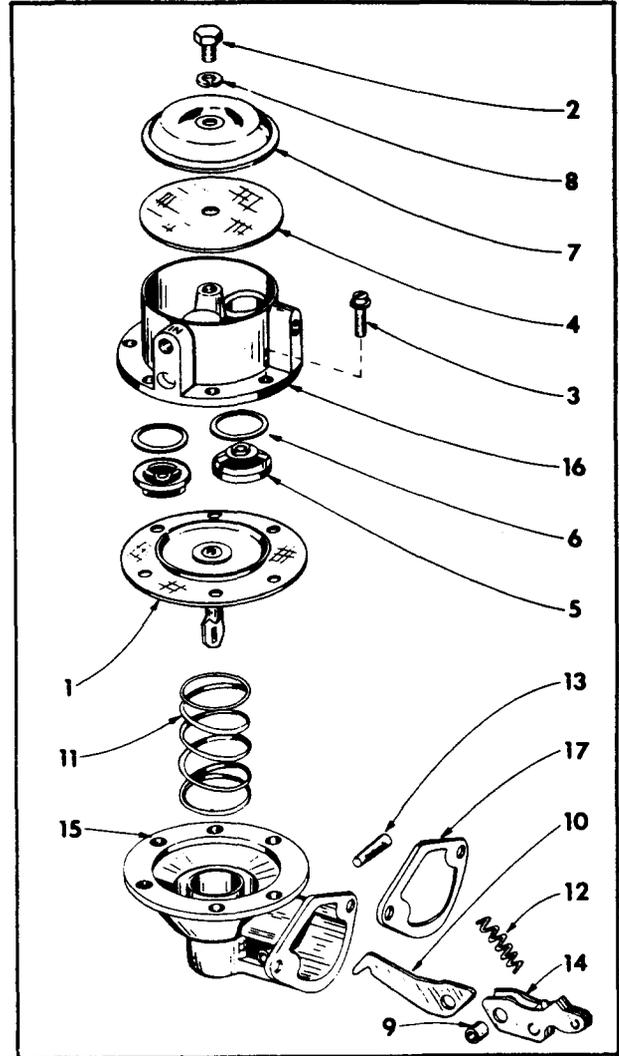
WISCONSIN FUEL PUMPS, No. LP-38E, LP-38H and LP-38F (Cold Weather: -65°F)

For all 4 cylinder engine models

The fuel pump, like all other parts of the engine, is subject to wear and you will find that any time after 500 hours of use, its efficiency will gradually decrease. This is indicated by the engines faltering at high speeds or when heavy loads are suddenly applied. The pump can easily be restored to its normal efficiency by the installation of a repair kit. Wisconsin LQ-46 (for LP-38E), LQ-47 (for LP-38H) or LQ-46A (LP-38F, cold weather, -65°).

1. Disconnect fuel lines from pump and remove fuel strainer if mounted to pump. Remove fuel pump from adapter housing by taking out the two mounting screws.
2. File a groove across a point at the union of castings (15 and 16). This is a positive location of the fuel INLET and OUTLET positions when reassembling. Remove six head to flange screws (3) and remove fuel head. Take off screw (2), remove cover (7) and discard cover gasket (4).
3. Turn fuel head (16) over and remove both valve assemblies (5), and gaskets (6). Note position of valves.
4. Clean head thoroughly with kerosene or diesel fuel and a fine brush.
5. Place fuel head (16) with diaphragm surface up. Assemble new valve gaskets (6) and mount valve assemblies (5) in positions shown on illustration. Press valves in evenly without distortion, and stake in place.
6. Mount new cover gasket (4), cover (7) and washer (8). Securely tighten in place with cover screw (2).
7. Set fuel head assembly aside and proceed to rebuild lower diaphragm section.
8. Insert the end of a small screw driver into the coils of rocker arm spring (12) and remove.
9. Hold mounting bracket (15) in the left hand, with the rocker arm toward your body and the thumb nail on the end of link (10). With the heel of right hand on diaphragm (1), compress the diaphragm spring (11), and at the same time pull toward your body. Unhook link (10) from end of diaphragm and remove.
10. Remove rocker arm pin (13). Note that pin is larger on one end. Drive pin out by means of a punch from small end.
11. Clean mounting bracket (15) with kerosene or diesel fuel.
12. Assemble new link (10), bushing (9) and pin (13) to bracket (15) along with rocker arm (14). Stake rocker arm pin (10) in bracket to keep it in place.
13. Place new diaphragm spring (11) into bracket (15). Repeat in reverse order paragraph 9, using a new diaphragm (1). Assemble new rocker arm spring (12).
14. Mount this assembly to adapter on engine using new flange gasket (17).
15. Crank the engine over to a position where the diaphragm (1) is laying flat on the mounting bracket (15). Place the fuel head assembly back in position so the locating grooves of Step 2 are in line, and start the six head screws approximately three turns. Again crank the engine over to where the diaphragm (1) is pulled down into mounting bracket (15) to its lowest position. Securely tighten the six head screws (3).
16. Mount fuel strainer to fuel inlet and connect fuel lines.

NOTE: The LQ-46, LQ-47 or LQ-46-A Repair Kit and the parts included there-in, which are identified by an asterisk (*), are the only parts of the fuel pump available for service.



Ref. No.	Description	No. Req.
* 1	DIAPHRAGM	1
2	COVER SCREW	1
3	SCREW, head to bracket mounting	6
* 4	GASKET, cover (pulsator in LQ-47)	1
* 5	VALVE ASSEMBLY	2
* 6	GASKET for valve	2
7	COVER	1
8	WASHER for cover screw	1
* 9	BUSHING for rocker arm	1
* 10	LINK for rocker arm	1
* 11	SPRING for diaphragm	1
* 12	SPRING for rocker arm	1
* 13	PIN for rocker arm	1
14	ROCKER ARM	1
15	MOUNTING BRACKET	1
16	FUEL HEAD	1
* 17	GASKET for mounting flange	1

CARBURETOR ZENITH MODEL 87 A8

WISCONSIN
L 57 Series

OPERATION and REPAIR INSTRUCTIONS

The Zenith 87-Series is a horizontal carburetor with a concentric fuel bowl. It is a "balanced" carburetor, because all air for fuel chamber and metering well ventilation and idling must come through the air cleaner. Air cleaner restrictions have a minimum influence on the fuel-air ratio when a carburetor is thus "balanced".

The main jet and discharge jet are centrally located. The metering well which completely surrounds the discharge jet is in the center of the fuel bowl assembly. This construction permits extremely high angle operation in any direction.

The venturi, which is part of the throttle body casting, measures the volume of air that passes through the carburetor.

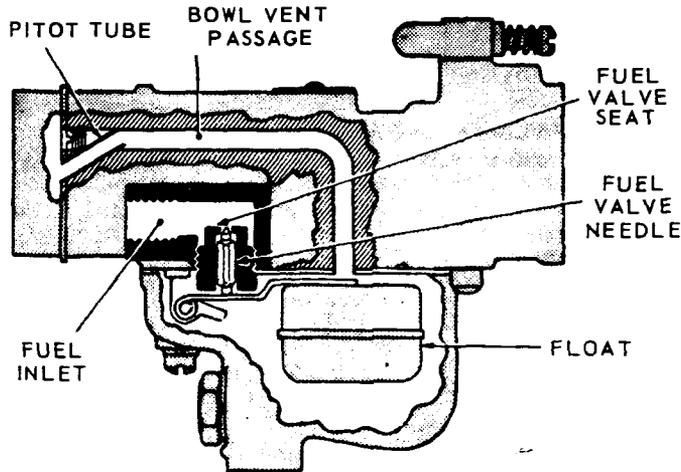


Fig. 1 FUEL SUPPLY SYSTEM

OPERATION

FUEL SUPPLY SYSTEM (Fig. 1)

Fuel under normal pressure entering the float chamber through the fuel valve seat is controlled by the twin float which, moving on its axle, closes the needle valve when the fuel reaches the proper level in the bowl.

IDLE SYSTEM (Fig. 2)

At idling speeds the throttle plate is almost closed, thus a very high suction exists at the edge of the throttle plate where the idle discharge holes are located. All fuel for idling and part throttle operation is supplied through the main jet. Fuel from the float chamber flows through the main jet into the metering well. Fuel for idling is drawn from this well through the calibration, or metering orifice, in the center of the idling jet. As the fuel reaches the idling channel it is mixed with air which

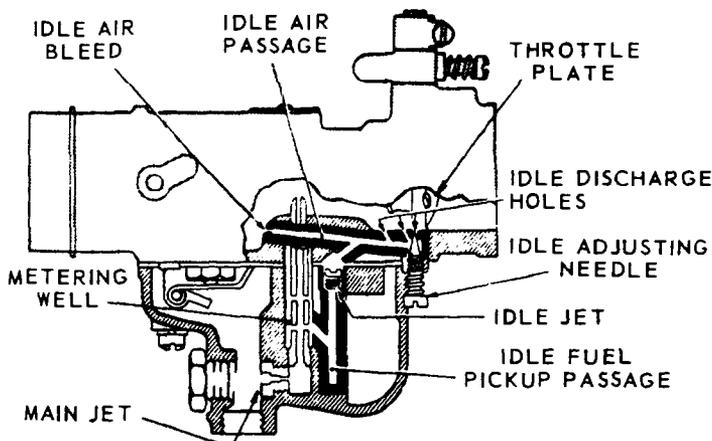


Fig. 2 IDLE SYSTEM

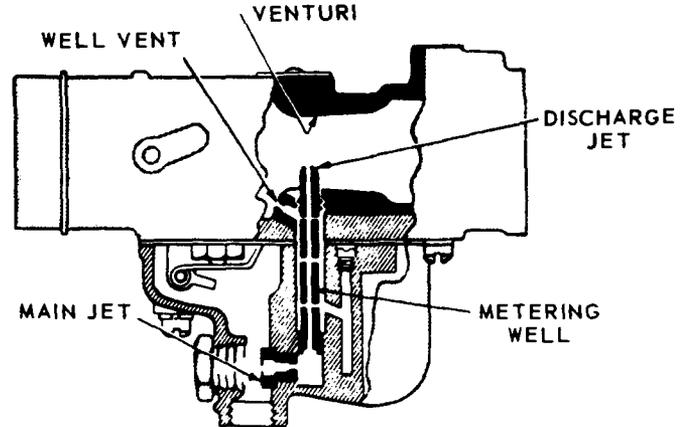


Fig. 3 HIGH SPEED SYSTEM

is admitted through a calibrated orifice in the channel from the inside of the air intake to form an emulsion. This emulsion is discharged into the air stream, to form the idling mixture, through two holes one of which is controlled by the idle adjusting needle. Turning the adjusting needle counter-clockwise (out) permits more of the emulsion to reach the air stream and make the idling mixture richer while turning the needle in (clockwise) cuts off the amount of the emulsion reaching the air stream and makes the mixture leaner.

HIGH SPEED SYSTEM (Fig. 3)

As the throttle is opened, the suction on the idling system diminishes, but the increased volume of air entering the engine through the venturi creates sufficient vacuum (suction) on the discharge jet to draw an emulsion of fuel and air from the metering well which receives its fuel from the main jet and its air from the well vent. The flow characteristics of the discharge jet are influenced by the size, location, and number of holes in the sides of that part of the jet which is in the metering well, as well as by the sizes of the discharge jet orifice, the size of the main jet, and the size of the well vent. The well vent is located in the air intake and permits air to enter the top of the metering well around the outside of the discharge jet. The flow of fuel through the main jet is controlled by the size of main jet opening, selected to give the best fuel economy at all speeds and under all load conditions.

CHOKE SYSTEM (Fig. 4)

Starting a cold engine requires a much richer mixture of fuel and air. Moving the choke lever to close the choke plate restricts the air entering the carburetor (except at the pitot tube, Fig. 1, to the bowl vent) and increases the suction on the idling system which makes the mixture richer.

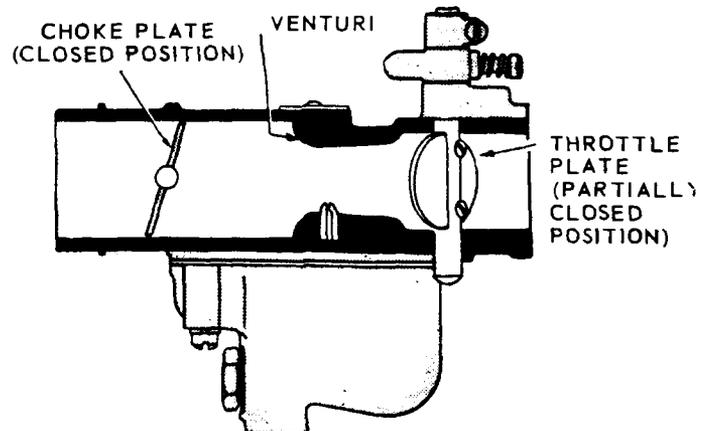


Fig. 4 CHOKE SYSTEM

CARBURETOR TROUBLES - CAUSES and REMEDIES

Dirt is the major cause of field service carburetor problems. An adequate Fuel Filter must be used between the tank and carburetor, and should be serviced frequently. Service Air Filter daily - Keep carburetor and linkage free of dirt.

FUEL LEAKS FROM CARBURETOR

Float level set too high: Remove bowl, invert carburetor and set float. See Fig. 5 and Float Setting Instructions, page 39.

Dirt under inlet needle valve: Remove inlet valve, clean seat by rinsing in mild solvent or clean fuel, and blow off with compressed air.

Bowl vent plugged: Remove bowl and blow clean with compressed air (bowl vent passage Fig. 1).

Collapsed float, caused by blowing assembled carburetor with compressed air: Replace float.

Carburetor gummed from storage - float stuck: Remove fuel bowl and clean.

ENGINE SMOKES AND RUNS RICH

Dirty air filter: Clean per instructions.

Improper adjustment: Set Idle Needle 1-1/2 turns open from seat. Refer to Adjustment Instruction, page 39.

Bowl to body gasket leaks: Tighten securely, or replace.

Air vent in carburetor plugged: Remove fuel bowl and idle needle. Clean air and idle channels thoroughly with compressed air.

ENGINE RUNS LEAN

Improper adjustment: Set Idle Needle 1-1/2 turns open from seat. Refer to Adjustment Instructions, page 39.

Idle holes plugged, Dirt in fuel delivery channels: Remove fuel bowl and idle needle. Clean thoroughly with compressed air.

Low fuel level: See Fig. 5 and Float Setting Instructions, page 39.

Fuel filter plugged: Remove and clean.

ENGINE STARTS HARD

Improper adjustment: Set Idle Needle 1-1/2 turns open from seat. Refer to Adjustment Instructions, page 39.

No fuel in carburetor: Check carburetor drain plug. Clean tank, filter and carburetor. Check fuel lines for obstructions, and test fuel pump.

Choke valve not closing: Check linkage for proper travel.

GOVERNOR SURGE

Governor sticking: Check linkage for binding.

Throttle shaft and valve binding: Remove and replace shaft if worn. Clean carburetor body and reassemble throttle shaft.

SERVICE AND REPAIR PROCEDURE

IDENTIFY CARBURETOR

Check the numbers on the metal identification disc pinned to the top of the throttle body or indented in it. The plain number is the Zenith assembly number, the number with the letter "L" pre-fixed to it is Wis-Con Total Power's part number for the complete assembly.

EXPLODED VIEW (Fig. 6)

The exploded view identifies the serviceable component parts of the carburetor and shows their relationship to the complete assembly. Use the key numbers on the exploded view to identify and locate parts when performing both the disassembly and assembly operations.

SPECIAL TOOLS recommended are:

1. C161-83 Main Jet Wrench.
2. C161-85 Fuel Valve Seat Wrench.

Before disassembling: Clean outside of carburetor from all foreign material.

IMPORTANT: When cleaning a completely assembled carburetor do not blow with compressed air, you may collapse the float.

IMPORTANT: Before removing Throttle and Choke levers, note their position and location. Optional mounting is available and may differ from exploded view illustration.

DISASSEMBLY

SEPARATE CARBURETOR BODIES

Remove the three bowl assembly screws (45, 46) and separate fuel bowl (39) from throttle body (26).

DISASSEMBLE FUEL BOWL

1. Remove the main jet plug (43) and fibre washer (42), using a 9/16" open end wrench.
2. Remove the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
3. Remove the Idle Jet (38), using a small screwdriver.
4. Remove the bowl drain plug (44).

DISASSEMBLE THROTTLE BODY

1. Remove the float axle (35) by pressing against the end with the blade of a screwdriver.
2. Remove the float (36).
3. Remove the fuel valve needle (31), using the fingers.
4. Remove the fuel bowl to throttle body gasket (37).
5. Remove the main discharge jet (32), using a small screwdriver.
6. Remove the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
7. Remove the idle adjusting needle (17) and spring (18).

CLEANING

Thoroughly clean all metal parts in Bendix Metalclene or Speedclene and rinse in cleaning solvent. Blow out all passages in throttle body and fuel bowl with reduced air pressure. Be sure all carbon deposits have been removed from throttle bore and idle discharge holes. Reverse the flow of compressed air through all passages to insure the removal of all dirt. **NEVER USE A DRILL OR WIRE TO CLEAN IDLE JETS OR IDLE HOLES.**

INSPECTION OF PARTS

1. Float Assembly - Replace if loaded with gasoline, damaged or if float axle bearing is worn excessively. Inspect float lever for wear at point of contact with fuel valve needle. Replace if wear is excessive.
2. Float Axle - Replace if any wear has occurred on the bearing surface.
3. Fuel Valve (Needle & Seat) Assembly - Replace as a complete unit. Wear of any of these parts can seriously affect the operation of the float.
4. Idle Adjusting Needle - Inspect tapered end of the needle to make sure it is smooth and free of grooves. Replace if pitted or grooved.
5. Gaskets, Seal and Retainer - Replace all gaskets, throttle shaft seal and retainer each time the carburetor is overhauled.
6. Check Specifications. Verify the correctness of the following parts. Numbers will be found on the parts. Main Jet, Idling Jet and Fuel Valve.

REASSEMBLY

ASSEMBLY OF THROTTLE BODY

1. Install the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
2. Install the main discharge jet (32), using a small screwdriver.
3. Install fuel valve needle in seat (31), followed by float (36) and float axle (35). **NOTE:** Insert tapered end of float axle (35) into float bracket on side opposite slot and push through the other side. Press float axle (35) into slotted side until the axle is centered in bracket.

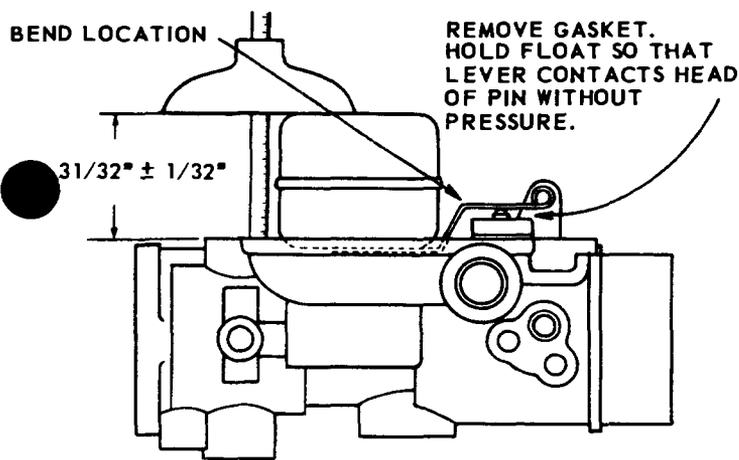


Fig. 5 FLOAT SETTING

4. FLOAT SETTING (Fig. 5)

- a. **Fuel Level.** Check position of float assembly (36) for correct measurement to obtain proper fuel level, by using a depth gage. **NOTE: Do not bend, twist, or apply pressure on the float body.**
- b. With throttle body in an inverted position, the float body must be centered and at right angles to the machined surface. The float setting is measured from the machined surface (no gasket) of float bowl cover to top side of float body at highest point. **This measurement should be 31/32", plus or minus 1/32".**
- c. **Bending Float Lever.** To increase or decrease distance between float body and machined surface, use long nosed pliers and bend lever close to float body. **NOTE: Replace with new float if position is off more than 1/16 inch.**

5. Install throttle body to fuel bowl assembly, gasket (37) on machined surface of throttle body (26).
6. Install idle adjusting needle (17) and spring (18). Screw needle **IN** (clockwise) until it seats lightly against the idle discharge hole, then back it out 1½ turns as a preliminary idle adjustment.

REASSEMBLE FUEL BOWL

1. Install the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
2. Install the main jet hex plug (43) and fibre washer (42), using a 9/16" open end wrench.
3. Install the idle jet (38), using a small screwdriver.
4. Install the bowl drain plug (44).

REASSEMBLE CARBURETOR BODIES

Install the three bowl assembly screws (45, 46) through the fuel bowl and into the throttle body and draw down firmly and evenly.

ADJUSTMENTS (Fig. 6)

Turn **Throttle Stop Screw** (22) in until throttle valve is slightly open. With engine warmed up and running, turn adjusting screw in or out as required to obtain desired low idle speed (1000 to 1200 r.p.m.).

The **idle adjusting needle** (17) should be seated lightly (clockwise), then backed out 1½ turns as a preliminary setting. With engine warmed up and running at about 1200 R.P.M., fine tune idle mixture for smooth steady running.

The **Main Metering Jet** (41) for high speed operation is fixed.

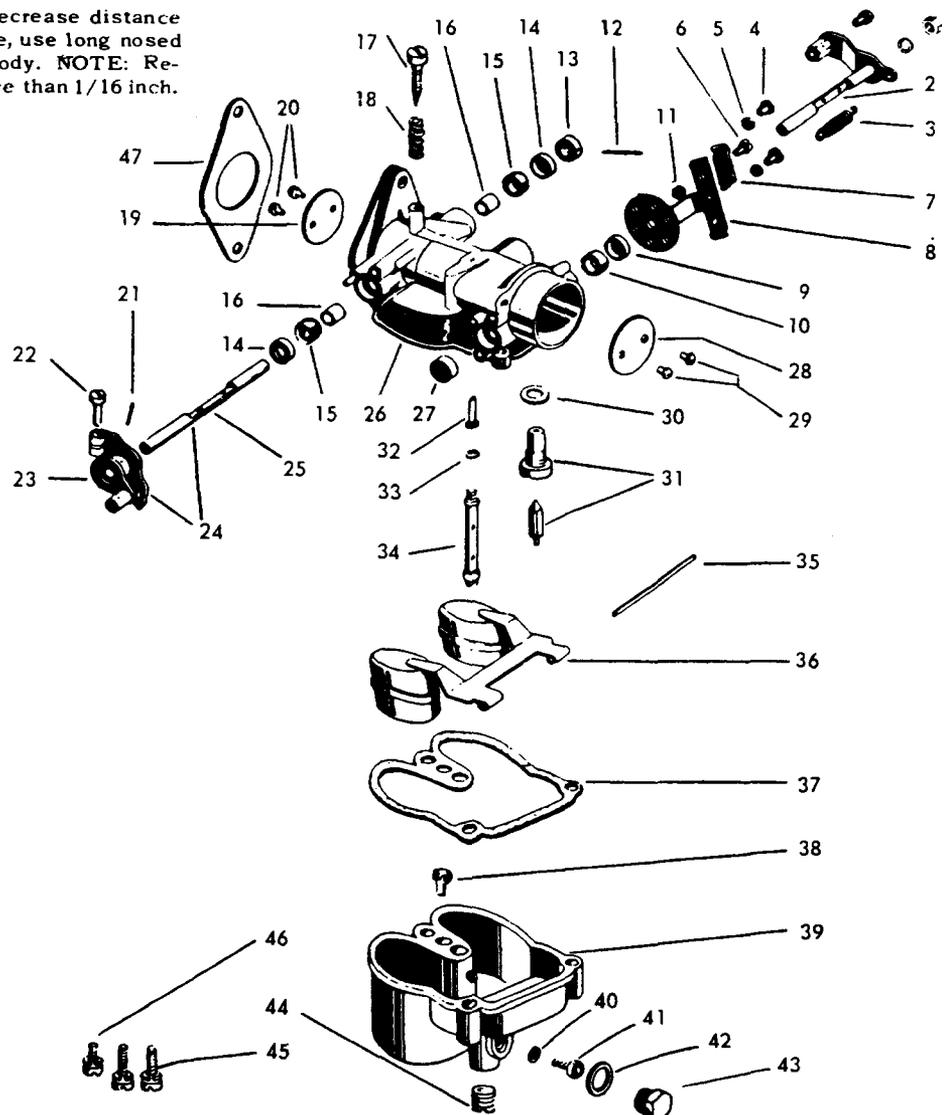
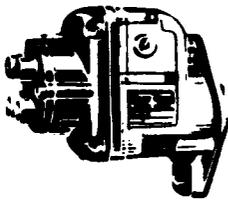


Fig. 6 EXPLODED VIEW

Item numbers included in Repair Kit:

- 9, 10, 14 (2), 15 (2), 17,
20 (2), 27, 29 (2), 30, 31,
33, 35, 37, 40, 42, 47



TYPE FM-X4B7A MAGNETO

Wisconsin No. Y9752 (with GD93C4 drive gear)

INSTRUCTIONS

GENERAL DESCRIPTION

Fairbanks-Morse Type FM-X4B7A Magneto is designed and engineered to provide quick easy starting and maximum dependability of operation with minimum service. The compact alnico magnetic rotor assures an intensely hot spark under most operating conditions.

SERVICE PROCEDURE

The first step in magneto field servicing is to examine the magneto for corroded high tension towers, broken wires, or high tension wires not pushed far enough into the magneto tower to make good contact.

Then test the ignition spark while engine is being cranked. If a strong spark is observed, the magneto is not the cause of engine malfunction. If no spark is seen, proceed with servicing magneto.

SERVICING BREAKER POINTS, FIG. 1

Remove the end cap cover, distributor rotor and the end cap. Then inspect the breaker points for pitting, oxidation and shorting. If points are worn or shorted, they should be replaced.

To remove the point set, take out the breaker arm terminal screw releasing the breaker arm spring, coil lead and condenser lead. Remove the fulcrum pin snap ring and slide the breaker arm off the fulcrum pin. Remove the contact support locking screws and lift off the contact support.

The installation of new points is the reverse of the removal. After the points have been installed, they should be adjusted to the correct clearance of 0.015 inch at high point of cam. Be sure the points are clean and bright before adjusting them. Insert a screwdriver in the slot of the support bracket and pivot it between the two small bosses on the bearing support until the desired clearance is obtained. Then clean the points again before sealing the magneto.

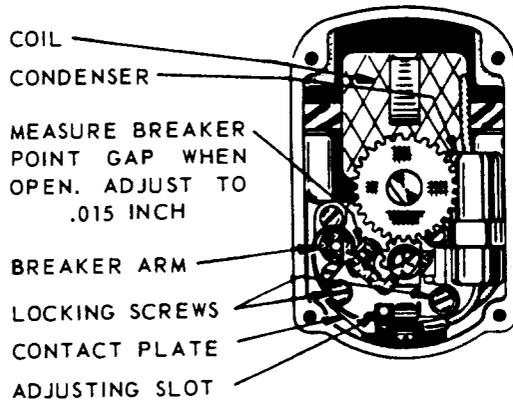


Fig. 1, BREAKER POINT ADJUSTMENT

FIELD SERVICE NOT RECOMMENDED

The cam wick, if dry or hard, should be replaced with a new factory impregnated wick. Other than this the magneto does not require field lubrication. No attempt should be made to oil or grease the magneto bearings. The magneto lubricant should be replaced only during the overhaul of the magneto by a Fairbanks-Morse authorized service station using recommended lubricant and factory engineered parts.

Coil and condenser replacement while simple are not recommended unless adequate test equipment is available. No attempt should be made to remove magnetic rotor from housing unless specific instructions for releasing the shaft are available.

INTERNAL TIMING, FIG. 2

If, for any reason, the magneto has been dismantled to the extent that the distributor gear has been removed the teeth must be properly meshed with those of the magnetic rotor gear upon reassembly. The gear teeth are marked to facilitate internal timing. The single marked tooth of the rotor gear must mesh between the two teeth of the distributor gear designated by the letter C.

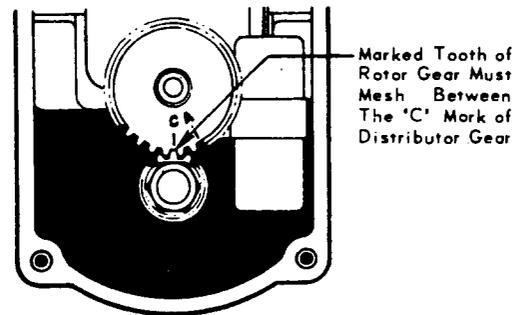


Fig. 2, INTERNAL TIMING GEARS

TIMING THE MAGNETO TO THE ENGINE

If the magneto has been removed from the engine for servicing, the operator must follow the engine manufacturer's instructions for timing the magneto to the engine. Refer to 'Magneto Timing' in engine instruction manual. When installing the magneto on the engine, be sure the magneto is properly attached and that the housing to engine gasket is in good condition.

SPECIAL DRIVE GEAR, FIG. 3

The magneto is equipped with a special drive gear mounted directly on the impulse coupling. If it is necessary to replace the drive gear, special care must be exercised in reassembly. It is possible to be off 180° in timing if gear is improperly mounted.

Assemble gear as follows: Remove magneto end cap cover and turn distributor rotor until it is in firing position for No. 1 cylinder. Retain rotor in this position and fit the drive gear to the impulse coupling lugs so that the prick punch mark on front of gear is located as shown.

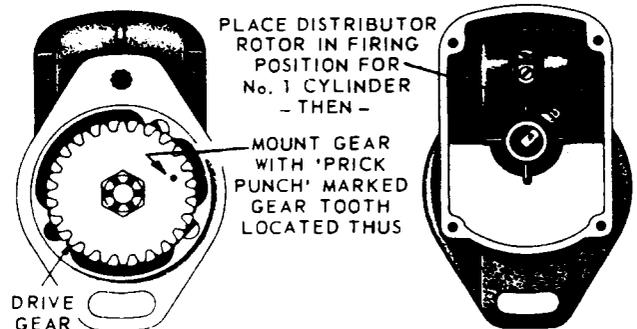
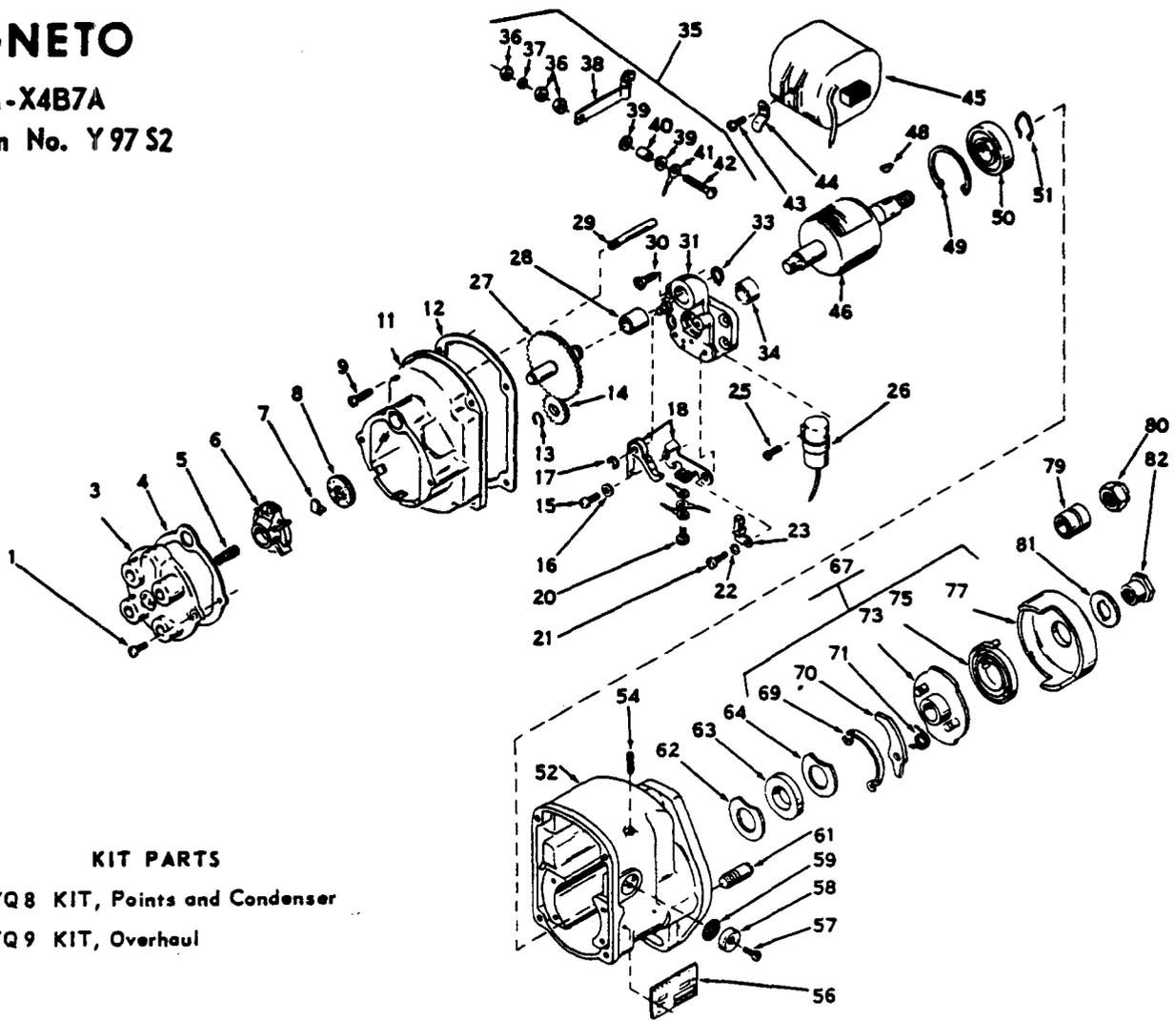


Fig. 3, DRIVE GEAR MARKING AND ASSEMBLY

MAGNETO

Type FM-X4B7A

Wisconsin No. Y97 S2



KIT PARTS

- p** YQ8 KIT, Points and Condenser
- YQ9 KIT, Overhaul

Ref. No.	Kit Parts	Description	No. Req.
1		SCREW, cover, 8-32 x 9/16	2
3		COVER, end cap	1
4	p	GASKET, end cap cover	1
5		BRUSH and SPRING	1
6		DISTRIBUTOR ROTOR	1
7		SPRING CLIP, rotor	1
8		SEAL, distributor shaft	1
9	o	SCREW, end cap, 10-24 x 7/8	4
11		END CAP	1
12	o p	GASKET, end cap	1
13		SNAP RING, rotor gear	1
14		ROTOR GEAR	1
15		SUPPORT SCREW, 6-32 x 3/8	1
16		WASHER, support screw, #6	1
17	o	SNAP RING, fulcrum pin	1
18		POINT SET - clockwise	1
20	pp	TERMINAL SCREW, 6-32 x 3/8	1
21		SUPPORT SCREW, 8-32 x 3/8	1
22		WASHER, support screw, #8	1
23	p	CAM WICK - clockwise	1
25	p	SCREW, condenser, 8-32 x 5/16	1
26	p	CONDENSER	1
27		SHAFT and GEAR, distributor	1
28		BEARING, distributor	1
29		LEAD ROD	1
30		SUPPORT SCREW, 8-32 x 3/8	4
31		SUPPORT, bearing	1
32		SNAP RING, distributor shaft	1
33		BEARING, cam end	1
34		SWITCH, assembly	1
35		NUT, switch screw	3
36		LOCKWASHER, switch screw	1

Ref. No.	Kit Parts	Description	No. Req.
38		INSULATED LEVER	1
39		INSULATING WASHER	2
40		INSULATING BUSHING	1
41		WIRE, assembly	1
42		SCREW, switch, 8-32 x 7/8	1
43		SCREW, clip, 6-32 x 1/4	1
44		COIL CLIP	1
45		COIL	1
46		MAGNETIC ROTOR	1
48		KEY	1
49	o	SNAP RING, bearing	1
50		BEARING, drive end	1
51		SNAP RING, shaft	1
52		HOUSING	1
54		SETScrew, coil - 5/16-24 x 7/8	2
56		NAME PLATE	1
57		SCREW, cover, 6-32 x 1/4	2
58		VENT COVER	2
59		VENT SCREEN	2
61		STOP PIN, pawl	1
62		WASHER, seal (inner)	1
63	o	SHAFT SEAL	1
64	o	WASHER, seal (outer)	1
67		COUPLING, complete (27° lag angle) ...	1
69		LOCK SPRING, pawl	1
70		COUPLING PAWL	2
71		PAWL SPRING	2
73		HUB, assembly (27° lag angle)	1
75		COUPLING SPRING	1
77		COUPLING SHELL	1
79		GEAR BUSHING	1
80		COUPLING NUT	1

ENGINE MAINTENANCE SCHEDULE	Page Ref.	Daily	Weekly or 50 hrs.	100 hrs.	250 hrs.	Seasonally or 500 hrs.
CHECK OIL LEVEL. Add to full mark - Do not overfill.	5	●				
CHECK AIR CLEANER. Shake out accumulated dirt from dry element cleaner - Maintain oil level in oil bath type cleaner.	7					
CLEAN AIR INTAKE SCREEN. Clean cooling fins if necessary.	9	●				
CLEAN AIR FILTER ELEMENT. Dry Element and Oil Bath types.	7		●			
CHANGE CRANKCASE OIL. Use grade and classification of oil recommended. In adverse conditions change oil every 50 hours of operation.	5			●		
REPLACE OIL FILTER every oil change. Replacement Filter RV-40.	8			●		
CLEAN CRANKCASE BREATHER CAP.	8			●		
CHECK COMPRESSION. Pressure should not vary more than 10 p.s.i. between cylinders. Remove head - clean out carbon deposits. Reseat valves if necessary	21					
INSPECT SPARK PLUGS and BREAKER POINTS. Replace if necessary and regap to specification.	9,10					
INSPECT FUEL FILTER. Clean filter screen and glass bowl.	8					
LUBRICATE DISTRIBUTOR CAM and breaker arm pivot.	8					
INSPECT COOLING SYSTEM. Remove shrouding and scrape off dirt from between fins, around cylinders and from shrouding.	9					
INSPECT STARTING MOTOR. Check for loose mounting and cable connections.	9					
CHANGE OIL IN CLUTCH and REDUCTION GEAR HOUSINGS.	6					

TORQUE SPECIFICATIONS FOR MACHINE HARDWARE (dry)

Recommended Torque Values

FT. LBS.	PART
22-28	Connecting Rod
40-50	Cylinder Block
24	Cylinder Head
110	Flywheel Nut
14-18	Gear Cover
25-30	Main Bearing Plate
18	Manifold (Intake & Exhaust)
6-9	Oil Pan (Engine Base)
25-30	Spark Plug
40-45	3rd Bearing Housing

General Torque Values - Maximum Foot Pounds

MARKINGS ON BOLT HEADS	SAE GRADE 1 or 2	SAE GRADE 5	SAE GRADE 8
			
SIZE	Foot Pounds Torque	Foot Pounds Torque	Foot Pounds Torque
10-24	2.3	3.5	5
10-32	2.5	4	5.6
1/4-20	6	11	12
1/4-28	7	13	15
5/16-18	13	21	25
5/16-24	14	23	30
3/8-16	23	38	50
3/8-24	26	40	60
7/16-14	37	55	85
7/16-20	41	60	95
1/2-13	57	85	125
1/2-20	64	95	140

Caution: Tightening into aluminum usually requires less torque. Increase Chart Torque Values by 20% if lubricant is used.

SOLID STATE IGNITION DISTRIBUTORS

Many new Wisconsin multi-cylinder engines are now being equipped with a solid state ignition distributor. Externally the new solid state ignition distributors are similar in appearance to a conventional point ignition distributor. Internally the major differences are:

1. Distributor cam which opens ignition points has been replaced with a magnet assembly.
2. Ignition points have been replaced with a "Hall effect type" electronic module.

This solid state ignition distributor uses two primary wire leads which attach to the ignition coil. The black or blue lead connects the negative (-) terminal of the ignition coil while the red lead connects to the positive (+) side of the ignition coil.

NOTE: The same Wisconsin coil is used on the solid state and point ignition systems.

TROUBLESHOOTING

The following steps should be performed if the engine's ignition system appears to be not operating properly:

1. Visually inspect plug wires, coil wire, distributor cap and rotor. Replace any components that show deterioration. It is especially important that the cap and plug wires be in good condition, free of oil, grease and moisture.
2. Check for loose or poor connections in ignition circuit. Check battery terminals for corrosion and loose connections.
3. Check battery voltage with engine off. It should be 12 to 15 volts.

If the above items have been checked and found to be proper and the engine's distributor is believed to be faulty, the distributor should be tested.

NOTE: Ignition timing adjustment specifications and procedures for the solid state ignition systems are the same as the corresponding point ignition distributor. An automotive type timing light should be used to check and adjust ignition timing.

TESTING

Testing can be done either with a voltmeter or a 12 volt test light.

VOLT METER TESTING

1. Connect the positive (+) lead of a voltmeter to the negative (-) side of the ignition coil. Ground the negative (-) lead of the voltmeter. Set the voltmeter to DC volts on at least a 15 volt scale.
2. Disconnect the high voltage wire from the center of the distributor cap and ground it to the engine block or chassis.
3. Crank engine.
4. The voltmeter should fluctuate from a range of 1 to 2 volts to a range of 10 to 12 volts as the engine is cranked.
NOTE: On some voltmeters the needle will appear to bounce between 1 and 12 volts.
5. If the voltmeter does not fluctuate, one of the following problems exist:

- a. If the voltmeter shows a constant 0 reading, there is an open circuit somewhere in the primary ignition circuit.
- b. If the voltmeter shows a constant voltage in the 1.0 to 3.5 volt range, the electronic module is shorted out.
- c. If the voltmeter shows a constant voltage equal to the battery voltage, the electronic module has an open circuit and requires replacement.

12 VOLT TEST LIGHT

1. Connect the test light between the positive (+) side of the ignition coil and ground. With the ignition switch in the "on" position the light should light.
NOTE: If there is no voltage present at the positive side of the coil, recheck the circuit from the battery through the ignition switch to the coil.
2. Disconnect the black primary lead going between the ignition coil negative (-) terminal and the distributor. Connect the test light to the negative (-) terminal of the ignition coil. Turn the ignition switch on - the test light should light, if not the ignition coil primary winding is open and the coil should be replaced.

Reconnect the black primary lead of the distributor to the negative (-) terminal of the ignition coil. Connect the test light again to the negative terminal of the ignition coil.

3. Disconnect the high voltage wire from the center of the distributor cap and ground to the engine.
4. Crank the engine.
5. The test light should flicker as the engine is cranked.
6. If the light does not flicker then the distributor electronic module is faulty.

NOTES

To avoid damage to the distributor components the following conditions must be avoided:

1. REVERSE POLARITY - **Do not** reverse the battery cables - (this distributor is for negative ground systems only) or the ignition coil wires. Black coil lead to negative terminal of the coil; red lead to positive terminal of the coil.

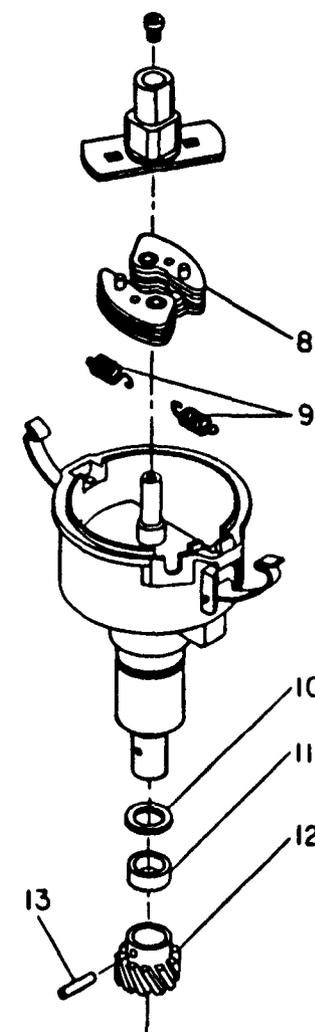
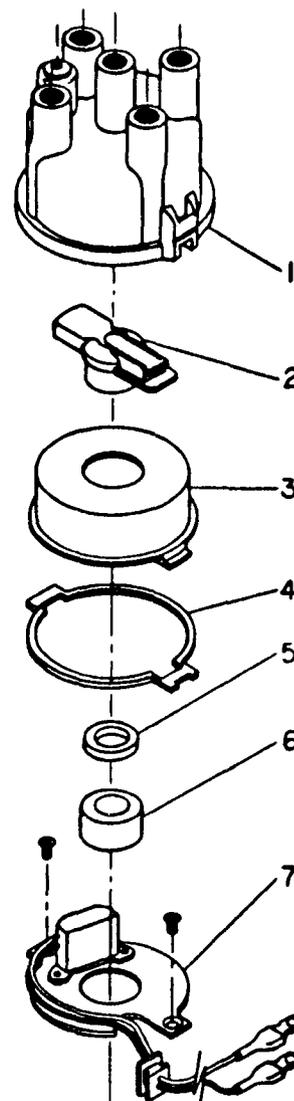
Some early production distributors have a blue lead instead of a black lead for the negative coil lead.

2. VOLTAGE SURGES - **Do not** operate the engine with the battery disconnected. Insure all electrical connections are made properly. Avoid using switches on the engine which cause excessive arcing.
3. Disconnect the ground (negative) cable when charging the battery.
4. JUMP STARTING - Only use another 12 volt battery for jump starting - be sure battery polarity is correct (positive to positive, negative to negative.)

NOTE: A HIGH AMPERAGE BOOST CHARGER CAN DAMAGE THE SOLID STATE COMPONENTS WITHIN THE DISTRIBUTOR.

SERVICE PARTS LIST PER-LUX YF50S1/YF50AS1 DISTRIBUTOR

<u>DISTRIBUTOR</u>		<u>APPLICATION</u>	
YF50S1		W4-1770, SIDE MOUNT	
YF50AS1		W4-1770, TOP MOUNT	
ITEM NO.	PART NO.	DESCRIPTION	QTY.
--	20121003	DISTRIBUTOR CAP & GASKET (INCLUDES #1 & #4)	1
1	.....	VENTED DISTRIBUTOR CAP	1
--	20121006	ROTOR AND SPACER (INCLUDES #2 & #5)	1
2	.....	ROTOR	1
3	20120003	DUST COVER	1
*4	20120010	DISTRIBUTOR CAP GASKET	1
*5	20120011	ROTOR SPACER	1
6	20120004	MAGNET ASSEMBLY	1
7	20120005	ELECTRONIC MODULE (INCLUDES SCREWS)	1
8	20120015	ADVANCE WEIGHTS SET	1
9	20120012	ADVANCE SPRING SET	1
--	20121001	GEAR KIT (INCLUDES #10, #11, #12, #13)	1
10	.....	THRUST WASHER SET (SELECT ONE)	1
11	.....	SPACER (YF50AS1 ONLY)	1
12	.....	GEAR	1
13	.....	ROLL PIN	1
--	YL394-18	WIRE, EXTENSION (NOT SHOWN)	2



SHAFT END PLAY: .001" - .015"

SOLID STATE IGNITION DISTRIBUTORS

* WIS-CON TOTAL POWER CORP.

* ALSO SOLD SEPARATELY

SERVICE AND PARTS
Available from your Authorized
WIS-CON TOTAL POWER
Service Center

W
4
-
1
7
7
0

 **WIS-CON**
TOTAL POWER CORP.

HEADQUARTERS:

3409 Democrat Road P.O. Box 181160 Memphis, Tennessee 38181
Phone: (901) 365-3600 TELEX: 462-1058 (ITT) FAX NO: (901) 369-4050

EUROPEAN:

Rue Joseph Deflandre, 13 B-4053 Chaudfontaine (Liege) Belgium
Phone: (32) (41) 675320 TELEX: 42631 TDY TP B FAX NO: (32) (41) 677987

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