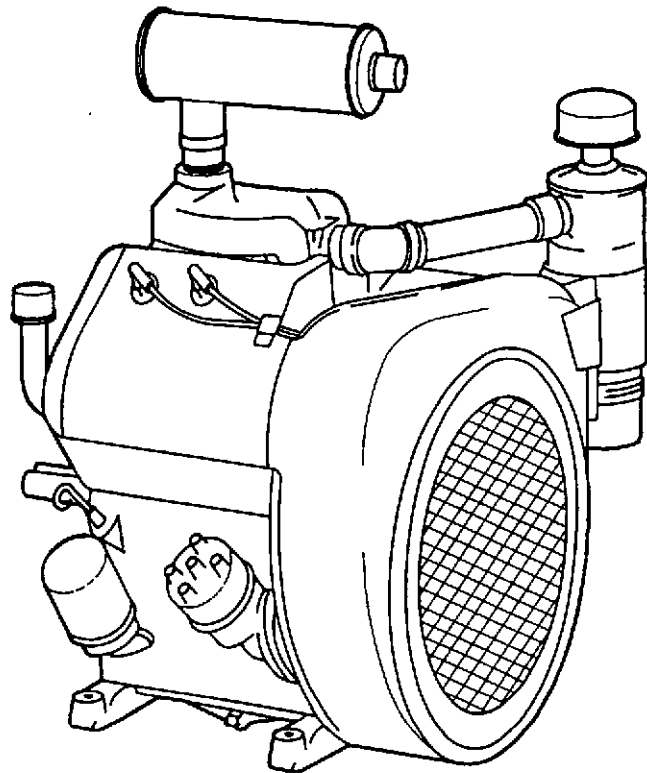


# WISCONSIN MODELS

VH4D • W4-1770 • VG4D • V465D

# STARTING AND MANUAL OPERATING



## Introduction

Wisconsin heavy duty air cooled engines are of the most advanced design and are built in a modern factory, equipped with the latest machinery available. Only the best materials, most suitable for the particular part, are used. During production, every part is subject to rigid inspection, along with the completely assembled engines. After assembly, every engine is operated on its own power and all adjustments are carefully made so that each engine will be in perfect operating condition when it leaves the factory.

Wis-Con Total Power is backed by over 85 years of engineering experience in the design of internal combustion engines for every conceivable type of service. The performance of these engines is proof of the long satisfactory service you too can expect from your Wisconsin engine.

Like all fine machinery, the engine must be given regular care and be operated in accordance with the instructions.

## Specifications

### Model VH4D

Bore .....	3 1/4 "
Stroke .....	3 1/4 "
Piston Displacement .....	
cu. in. ....	107.7
Horsepower	
1400 R.P.M. ....	17.2
1600 R.P.M. ....	20.0
1800 R.P.M. ....	22.5
2000 R.P.M. ....	24.7
2200 R.P.M. ....	26.5
2400 R.P.M. ....	28.0
2600 R.P.M. ....	29.2
2800 R.P.M. ....	30.0

### Model W4-1770

Bore .....	3 1/4 "
Stroke .....	3 1/4 "
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

### Model VG4D

Bore .....	3 1/2 "
Stroke .....	4 "
Piston Displacement .....	
cu. in. ....	154
Horsepower	
1400 R.P.M. ....	25
1600 R.P.M. ....	29
1800 R.P.M. ....	32
2000 R.P.M. ....	34
2200 R.P.M. ....	36
2400 R.P.M. ....	37

### Model V465D

Bore .....	3 3/4 "
Stroke .....	4 "
Piston Displacement .....	
cu. in. ....	177
Horsepower	
1600 R.P.M. ....	41.6
1800 R.P.M. ....	47.5
2000 R.P.M. ....	52.4
2200 R.P.M. ....	56.7
2400 R.P.M. ....	60.0
2600 R.P.M. ....	63.0
2800 R.P.M. ....	64.5
3000 R.P.M. ....	65.9

Engine rated performance is documented in Engine Test Code - SAE J-1349. Continuous duty operation is recommended at 80% of horsepower shown.

Low idle RPM (all models listed)= 1000 to 1200 RPM.

## 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 operator's guide - 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.

## Safety Precautions

(continued)

- Do not start engine with clutch engaged.
- Never run engine with governor disconnected, or operate at load speeds in excess of 2800 R.P.M. for model VH4D, 2400 R.P.M. for model VG4D and 3000 R.P.M. for models V465D and W4-1770.
- Never make adjustments on equipment while it is connected to the engine without first disconnecting the ignition cables from the spark plugs. Turning the equipment over by hand during adjustment or cleaning might start the engine and equipment 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.

## New Engine Instructions

### • LUBRICATION

Operating without oil will ruin engine.

Refer to *GRADE OF OIL* chart (page 4) and fill with proper oil before starting engine.

### IMPORTANT

There is **NO OIL** in this unit. Fill crankcase to proper oil level, also clutch or gear box if furnished, and oil bath air cleaner.

### • AIR CLEANER

**Oil bath type** - Add same oil grade as used in crankcase to the level indicated on cleaner bowl. Maintain oil level or dirt will be drawn in and damage engine.

**Dry element type** - DO NOT OIL - Follow instructions on cleaner body.

### • FUEL

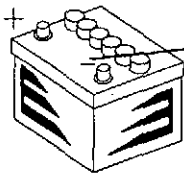
Engine will operate satisfactorily on gasoline intended for automotive use. A minimum of 87 octane is recommended.

Use clean, fresh, LEAD-FREE gasoline. Leaded gasoline may be used if lead-free is not available. Use of lead-free gasoline results in fewer combustion deposits and longer valve life. Purchase fuel in quantity that can be used within 30 days. This will assure fuel freshness and volatility tailored to the season.

Note: We DO NOT recommend the use of gasoline which contains alcohol, such as gasohol. However, if gasoline with alcohol is used, it MUST NOT contain more than 10 percent Ethanol and MUST be removed from the engine during storage. DO NOT use gasoline containing Methanol.

### • NEGATIVE GROUND CIRCUIT

If engine is equipped with Starting Motor, Distributor Ignition and Flywheel Alternator, or Belt Driven Alternator.



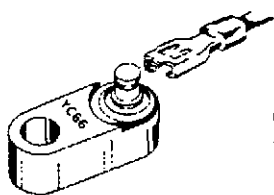
GROUND ENGINE TO NEGATIVE TERMINAL ON BATTERY.



### CAUTION

Be absolutely sure of proper connection or damage to the ALTERNATOR and CHARGING CIRCUITS will result.

## • PREVENT OVERHEATING

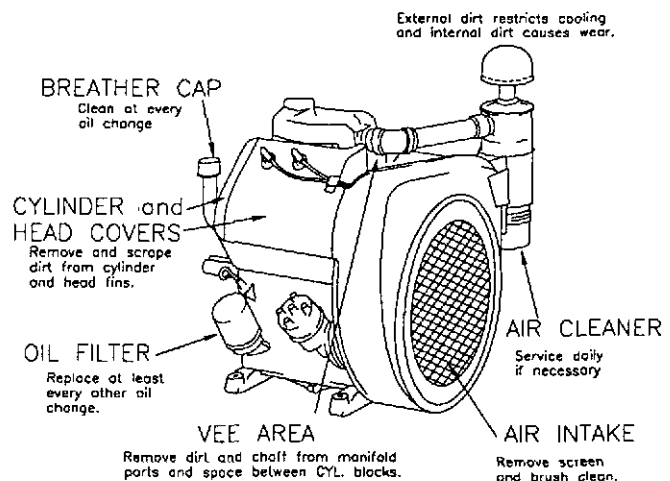


### HIGH TEMPERATURE SAFETY SWITCH

Do not disconnect wire or allow terminal to touch head fins or shrouding.

Optional (Standard on V465D) accessory mounted to cylinder head bolt near spark plug - TO PROTECT ENGINE AGAINST OVERHEATING. If engine stops, check first to see if engine is overheated. Other conditions may have caused the engine to stop. Clean air cleaner, air intake screen, fins and check oil level, spark plugs and wiring. Let engine cool at least 10 minutes before restarting.

## • KEEP ENGINE CLEAN



## • NEW ENGINE BREAK-IN

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 as follows:

1/2 hour	1000-1200 R.P.M.	No load
1 hour	50% rates R.P.M.	25% load
1 hour	75% rated R.P.M.	50% load
1 hour	100% rated R.P.M.	75% load
5 minutes	low idle	No load

For break-in of new engines, use same oil as recommended in oil chart.

## General Information

These engines are of the four cycle type in which each of the four operations of intake, compression, expansion and exhaust constitutes 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 from a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffles to insure uniform cooling of all parts.

NEVER OPERATE AN ENGINE WITH ANY PART OF THE SHROUDING REMOVED - this will restrict cooling.

### IGNITION

The spark for ignition of the fuel mixture is furnished by a high tension magneto driven by the timing gears at crankshaft speed (models VH4D and VG4D).

### SOLID STATE IGNITION DISTRIBUTORS

Most Wisconsin engines are now being equipped with a solid state ignition distributor. Detailed troubleshooting, repair and parts information can be found in the REPAIR MANUAL.

### ROTATION

The rotation of the crankshaft is clockwise when viewing from the flywheel or front end of the engine and counterclockwise rotation of the power takeoff or rear end of the engine.

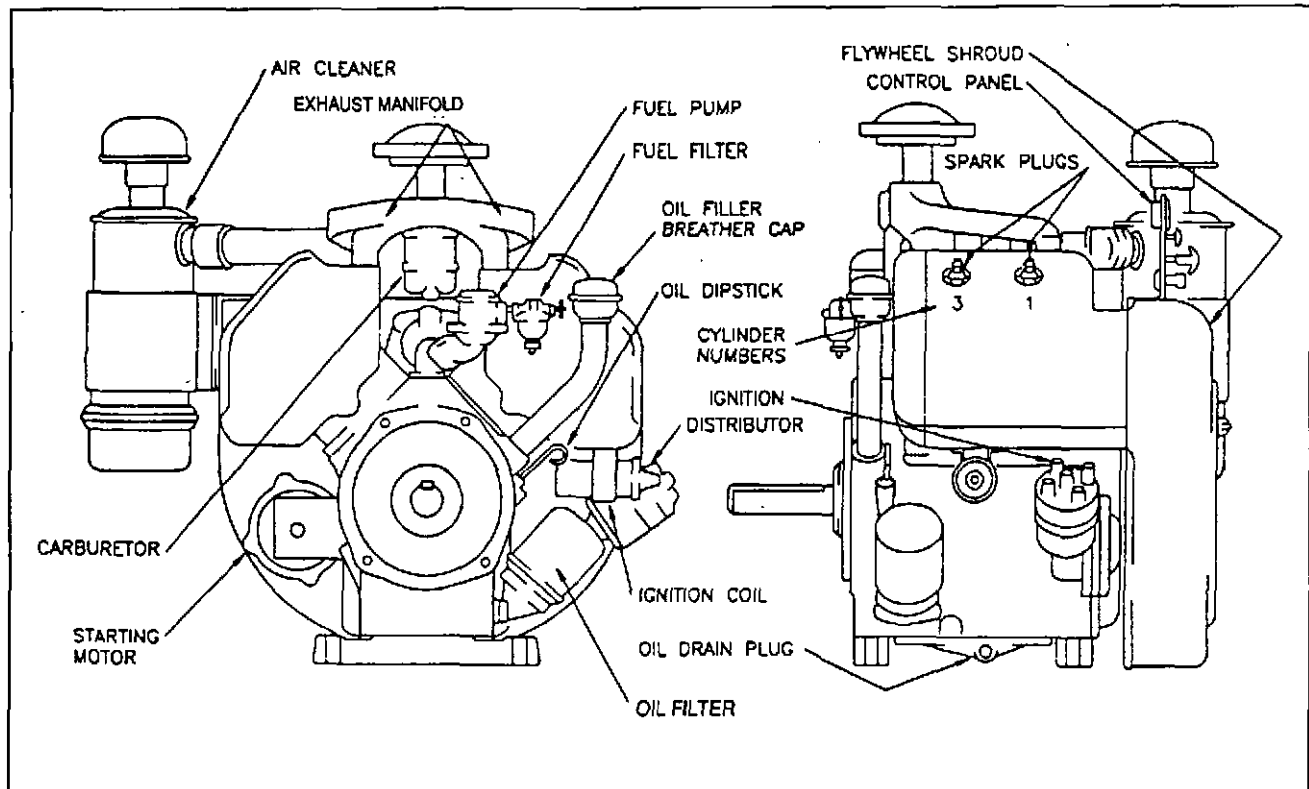


Figure 1 - Reference Views

## BEFORE STARTING NEW ENGINE

1. Fill tank with unleaded or leaded REGULAR grade gasoline.

NATURAL GAS fueled engines require a B.T.U. content of at least 1000.

2. Fill crankcase base with the proper grade of engine oil as specified in "GRADE OF OIL" chart. Fill through the breather tube opening to the level indicated by the FULL mark on DIPSTICK.

For run-in of new engines, use same oil as recommended in GRADE OF OIL chart.

Check crankcase oil level every 8 hours; change oil every 50 hours of operation.

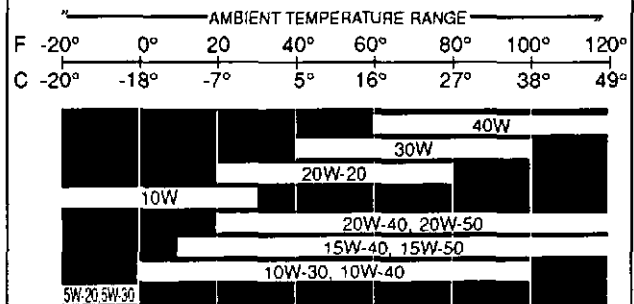
To change oil, remove drain plug from oil pan. Oil should be drained while engine is hot; it will flow more freely.

3. Clutch and gear reduction unit lubrication differs between the various engine models. All units operating in oil are furnished with oil filler, level and drain plugs, suitable for any take-off shaft position.

### IMPORTANT

DO NOT overfill crankcase. DO NOT allow oil level to go below ADD mark on dipstick.

### Recommended SAE Lubricating Oil Viscosity



Must meet or exceed API Service Classification SSE/CC.

Wis-Con Total Power Corp. recommends engine lubricating oils with a designated minimum API<sup>1</sup> Service Classification of SE/CC for Wisconsin Cast Iron Engines. Refer to the "recommended SAE<sup>2</sup> Lubricating Oil Viscosity" grades chart above for recommended viscosity grades and temperature ranges.

Crankcase Capacity	VH4D W4-1770	VG4D	V465D
New Engine	3-1/2 qts.	4-1/2 qts.	6 qts.
Oil and filter change	4 qts.	5 qts.	7 qts.
Less - oil filter or filter change	3-1/2 qts.	4-1/2 qts.	6 qts.

<sup>1</sup>API = American Petroleum Institute

<sup>2</sup>SAE = Society of Automotive Engineers

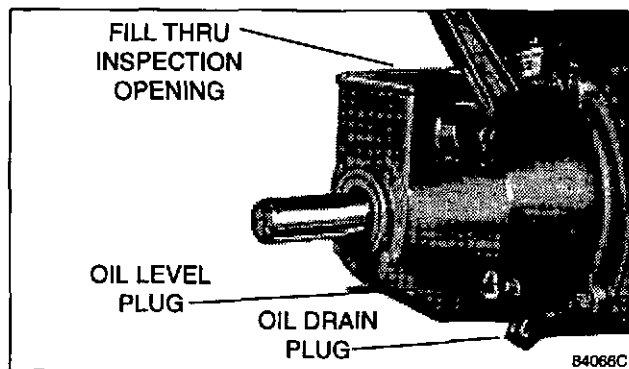


Figure 2 - VH4D, W4-1770 Clutch Lubrication

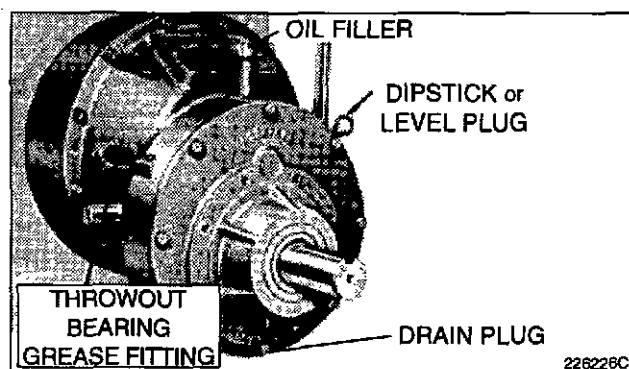


Figure 5 - VG4D, V465D Clutch Reduction Lubrication

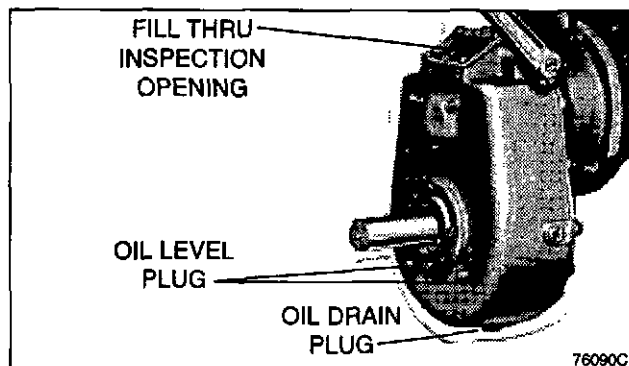


Figure 3 - VH4D, W4-1770 Clutch Reduction Lubrication

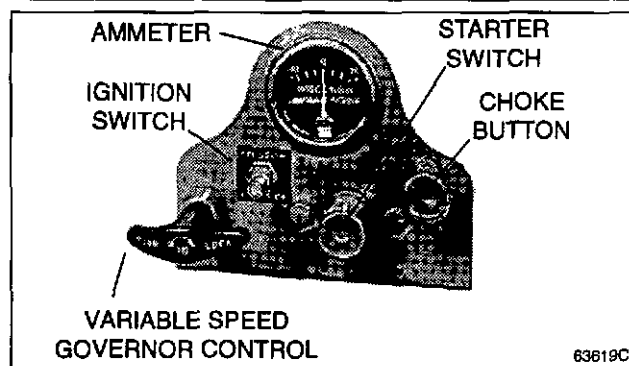


Figure 6 - VH4D, W4-1770, VG4D Control Panel (typical)

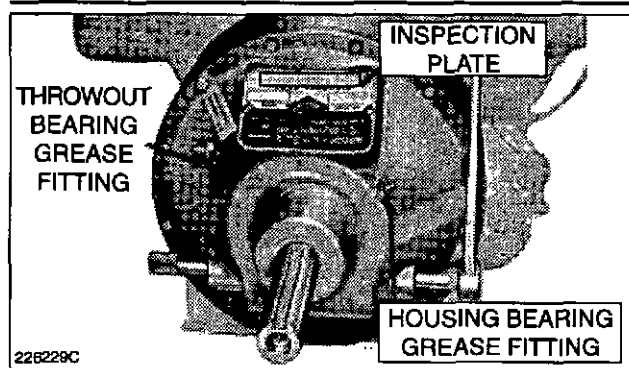


Figure 4 - VG4D, V465D Clutch Lubrication

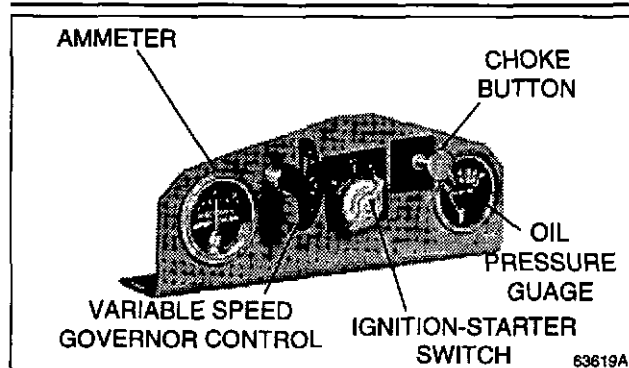


Figure 7 - V465D Control Panel (typical)

### Model VH4D, W4-1770, Fig. 2 and Fig. 3

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.

### Models VG4D and V465, Fig. 4 and Fig. 5

The clutch in both the power take-off and clutch reduction units is of the dry disc type, therefore NO OIL should be put into the clutch housing. Grease fittings are provided for periodic lubrication of the bearings. The HOUSING BEARING should be greased every 50 hours of operation and the THROWOUT

BEARING every day before starting. Use Mobil Gargoyle grease BrB No. 3, Sinclair Af-1 grease, or equal.

The PILOT BEARING is sealed and requires no external lubrication.

The SHIFTER SHAFT should be lubricated periodically if external oil fittings are provided.

THE REDUCTION UNIT IS OPERATED IN OIL and the gear case oil level must be maintained to the oil DIPSTICK mark or PLUG opening, which ever is applicable. In ROCKFORD units use No. 30 S.A.E. crankcase oil, for TWIN DISC units use high grade transmission oil, S.A.E. No. 90 to No. 110 viscosity. Change oil every 500 hours of service, while unit is warm.

## 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. 6, Push Button Start

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.
4. Close choke by pulling choke button to extreme out position.
5. Pull out ignition switch button, if tag reads "To Stop Push In."

### 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.

6. Depress starter switch to start engine.
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.

## 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.

## Fig. 7, Turn Type Starting Switch

1. Set throttle as per step 3. Turn IGNITION STARTING SWITCH to "Start" position and at the same time pull out choke button only sufficient to start the engine.
2. Release choke button to open position after engine starts but rechoke if it tends to stop. **EVEN A HOT ENGINE REQUIRES MOMENTARY CHOKING WHEN STARTING.** When engine starts, release switch to "Run" position.

If flooding should occur, continue cranking with the starting motor but with the choke open (choke button in).

## WARM-UP

If all conditions are right, engine will start promptly in one or two attempts. 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. Break-in new engine per instructions on page 3.

## TO STOP ENGINE

Magneto ignition (open engines) have a lever type ground switch on the side of the magneto. **DEPRESS AND HOLD DOWN UNTIL ENGINE STOPS.**

Engines with distributor ignition are furnished with an ignition switch. To stop push in or turn the switch to the off position. See Fig. 6 or 7.

If the engine has been running hard and is hot, do not stop it abruptly from full load. Remove the load and allow the engine to run idle (1000 to 1200 R.P.M.) for 3 to 5 minutes. Air circulation from the flywheel will reduce the temperature of the engine much faster and minimize engine wear.

## Maintenance

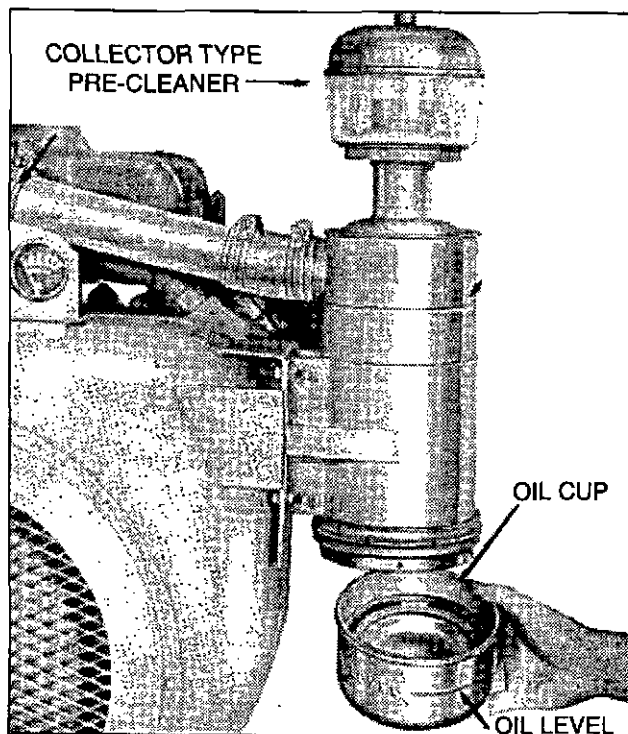
### OIL BATH AIR CLEANER

#### Fig. 8

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.

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.



*Fig. 8 Oil Bath Air Cleaner*

Once a year; or more often 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.

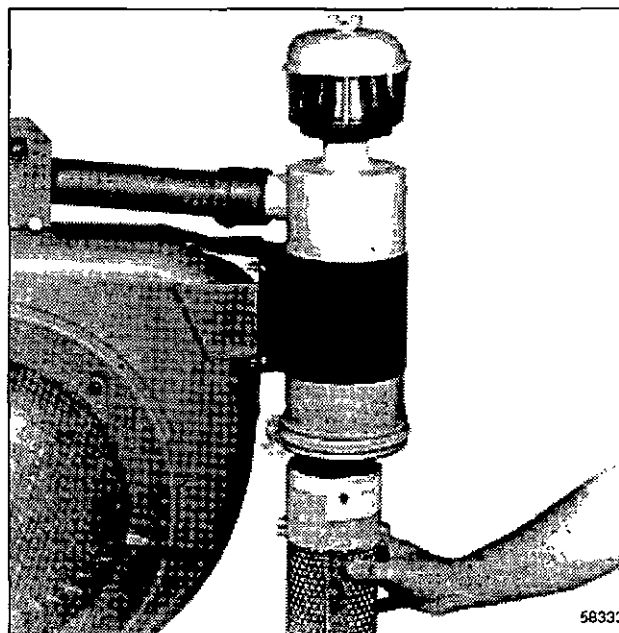
## DRY TYPE AIR CLEANER

### Fig. 9

Squeeze the rubber dust unloader at the bottom of the air cleaner once or twice daily. Check the unloader for possible obstruction. Under normal conditions, remove the filter element weekly (approx. every 40 to 50 hours) and shake out the accumulated dirt. (Under severe conditions, it may be necessary to inspect and clean the element daily.)

When cleaning, do not tap or strike the element. This may cause unseen filter damage which, in turn may cause serious engine damage due to dirt ingestion. Inspect the element and replace it if it is damaged or if there are any dirt accumulations in the paper pleats that cannot be removed by shaking. Using compressed air to "blow out" the dirt can easily damage the filter element. Limit air pressure of a blow gun to 10 psi to lessen the possibility of tearing the paper in the filter element. Also if you do use a blow gun, always blow from the inside of the element through to the outside.

Before installing the filter element, clean the inside of the air cleaner canister with a clean damp cloth in order to remove any loose dirt. Empty the dirt that may have accumulated in the metal cup on the bottom of the air cleaner. The dirt is easily removed from the



*Fig. 9 Dry Type Air Cleaner*

metal cup by first removing the rubber baffle. Wipe the inside of the metal cup with a damp cloth.

During installation of the element, make certain that there is a sealing washer between the element and the wing nut. If the sealing washer is a combination rubber and steel washer, the rubber side goes against the element. Tighten the wing nut for the filter element securely. Check and tighten all air cleaner hose clamps.

Replace the filter element once a year or every 500 hours under normal conditions (as required under severe conditions).

## PRE-CLEANER

The collector type pre-cleaner, mounted to the top of the air cleaner as illustrated in Fig. 8, removes the larger dirt and dust particles before the air reaches the main cleaner.

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

## BREATHER CAP

### Fig. 1

The crankcase is ventilated through a breather cap mounted to the top of the oil filler tube. At every oil change, it is recommended that the cap be cleaned by washing in parts cleaning solvent.

## DISTRIBUTOR

Most new Wisconsin engines use solid state breakerless ignition distributors. There are no internal adjustments required or recommended except to keep the distributor dry of liquids and free of dirt.

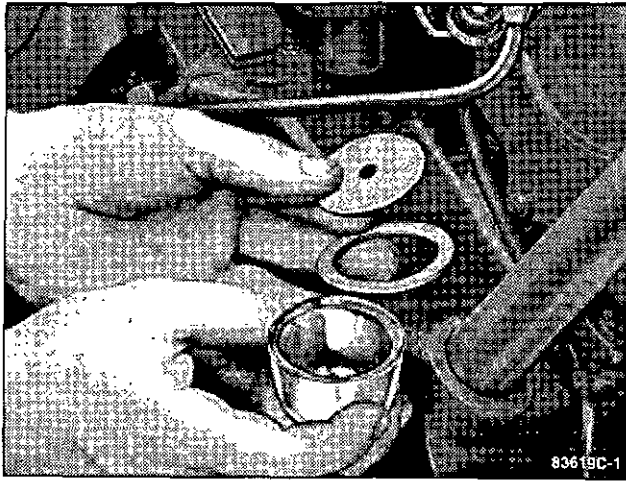


Fig. 10 - Fuel Filter

## FUEL FILTER

### Fig. 10

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.

## OIL FILTER

### Fig. 1

A BY-PASS type of oil filter is furnished on all Model VH4D, W4-1770 and VG4D engines, except where the use of other accessories prevent mounting of an oil filter.

A Full-Flow oil filter is furnished on model V465D engines as standard equipment. Since all of the circulated oil passes through the filter, it is very important that it be serviced regularly. The oil filtering cartridge should be replaced after EVERY OTHER OIL CHANGE. If operating conditions are extremely dusty, replace cartridge after every oil change. To prevent possible engine damage, we recommend that you use original Wis-Con oil filters available from your nearby Wis-Con Total Power Service Center.

## CARBURETOR

The carburetor MAIN METERING JET is of the fixed type; 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 neces-

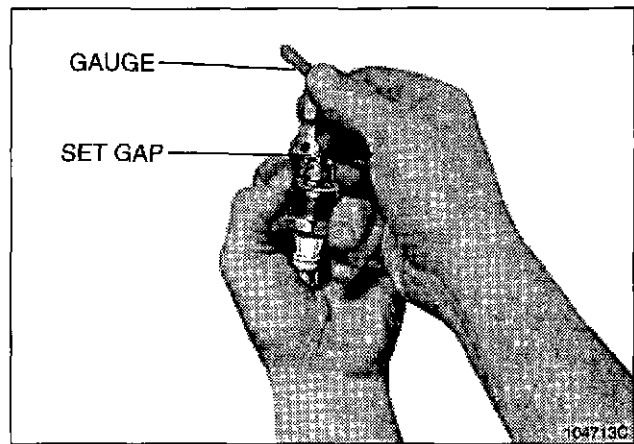


Fig. 11 - Spark Plug Gap Setting

## SPARK PLUGS

### Fig. 11

Incorrect gap, fouled or worn spark plug electrodes, will have an adverse affect on engine operation. Remove spark plugs periodically — clean, regap or replace if necessary.

Spark plug gap - .030 inch.

Use new spark plugs at the beginning of a new season. Replacement plug must of the correct heat range, equal to:

Model	Thread Size	Make
VH4D, W4-1770 & VG4D	18mm	Wisconsin YD6
V465D	14mm	Wisconsin YD301

Torque spark plugs 25 to 30 foot pounds for Models VH4D, W4-1770, VG4D, and to 22 foot pounds for Model V465D.

## 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 starter drive by brushing with Kerosene. Do not oil starter drive.

## Adjustments

sary. The Idle Adjustment is for smooth low speed operation, and this adjustment, if necessary, must be made with the carburetor throttle lever closed. Initial setting is approximately 1-1/2 turns open.

## MAGNETO BREAKER POINTS, FIG. 12

At least once each season or when ignition spark becomes weak, remove magneto end cover, inspect

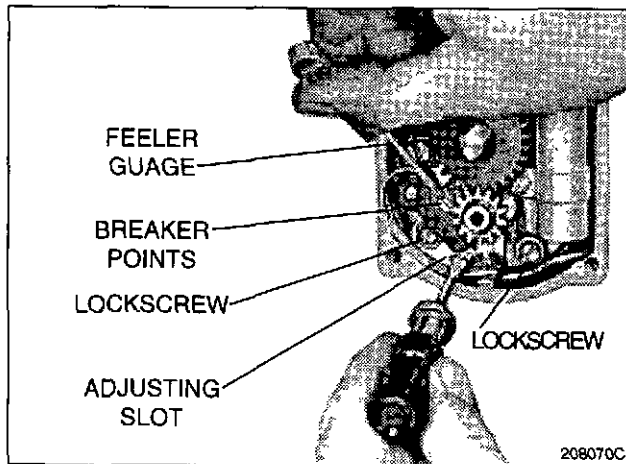


Fig. 12 - Magneto Breaker Point Gap Adjustment

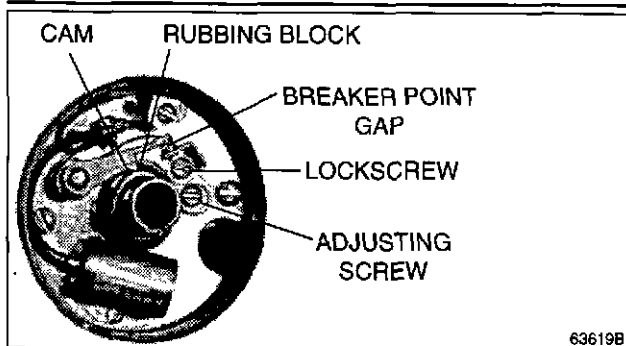


Fig. 13 - Distributor Breaker Point Gap Adjustment

points and check gap opening. If there is evidence of pitting or pyramiding and it becomes necessary to re-surface or replace points, it will also be necessary to readjust the gap clearance. The BREAKER POINT GAP should be:

.015 inch at full separation.

Turn engine crankshaft over until breaker points are at their maximum opening. Loosen the two lock screws on breaker plate just enough so that plate can be moved. Place a 0.015 inch feeler gauge between points. Insert end of small screwdriver into adjusting slot at bottom of breaker plate until a slight drag is felt when sliding the feeler gauge from between the points. Tighten lock screws and recheck point gap.

Before placing end cover on frame, clean contact surfaces, coat with gasket cement and mount new gasket. Assemble cover, rotor and end cap.

## DISTRIBUTOR

### Early design with points, Fig. 13

The breaker point gap should be:

.020 inch at full separation.

To readjust point gap, turn engine over until the distributor breaker arm RUBBING BLOCK is on a high point of the CAM. Loosen the stationary contact

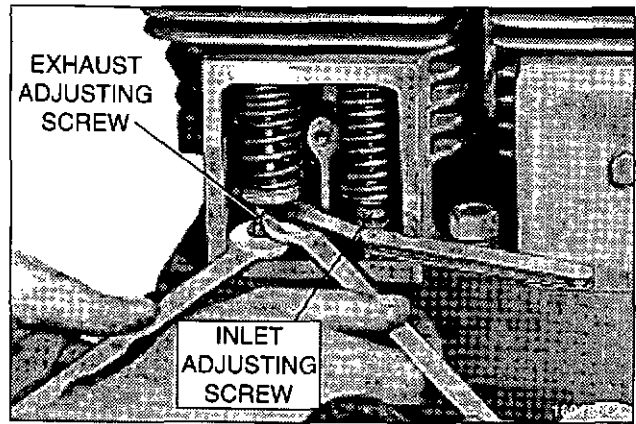


Fig. 14, VH4D, W4-1770, VG4D  
Valve Tappet Adjustment

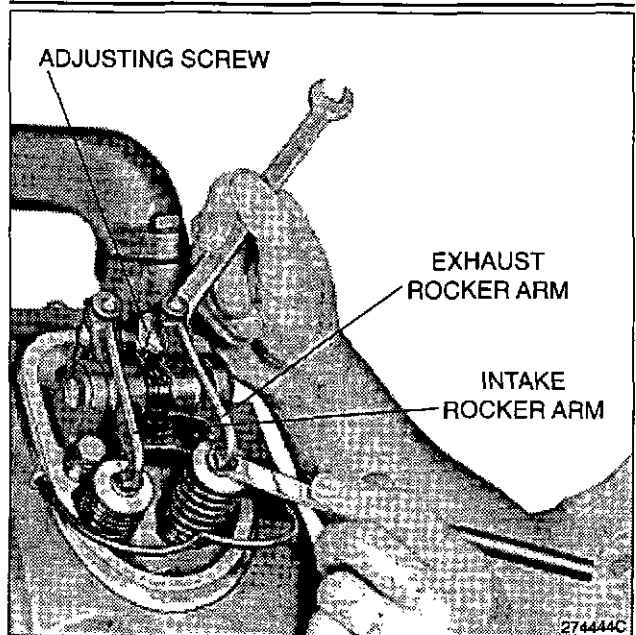


Fig. 15, V465D  
Valve Tappet Adjustment

LOCKSCREW slightly and insert a feeler gauge between the POINTS. By means of a screwdriver, turn ADJUSTING SCREW until correct gap is obtained. Tighten lock screw and recheck gap.

Points that are badly pitted or worn should be replaced.

## VALVE TAPPET ADJUSTMENT

### Models VH4D, VG4D, W4-1770, Fig. 14

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"

Exhaust - .016"

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.

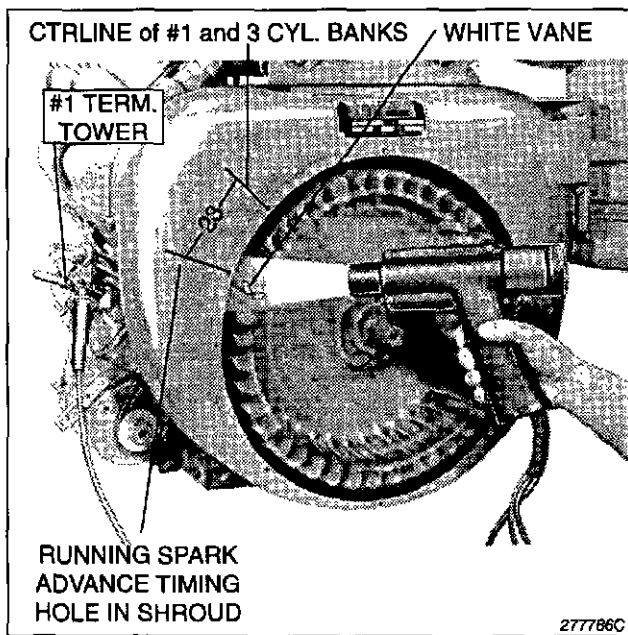


Fig. 16 - Ignition Timing Check

### Model V465, Fig. 15

The clearance between the valve and rocker arm with the tappet in its lowest position (valve completely closed) and the engine cold:

Inlet - .008"      Exhaust - .014"

The rocker arms can be identified as follows: When facing toward the side of the engine, the Exhaust rocker arm is to the right of the cylinder head and the inlet rocker arm to the left.

Measure clearance between the top of the valve and nose of the rocker arm with a feeler gauge as shown. By means of a tappet wrench, turn the adjusting screw clockwise to decrease valve clearance and counter-clockwise to increase the clearance.

The sequence in which the tappets are adjusted is determined by the 1-3-4-2 firing order. Start by adjusting no. 1 inlet valve clearance first, then by just a short turn of the crank, No. 3 inlet can be adjusted. Return to No. 1 cylinder and adjust the exhaust clearance, then adjust the NO. 3 exhaust.

The same procedure applies to the No. 2 and No. 4 bank of cylinders, starting with No. 4 inlet valve. Mark each rocker arm with chalk as adjustment is completed to prevent repetition.

## TIMING

### Firing Order

The firing order of the cylinders is 1-3-4-2, and the magneto or distributor rotor turns at one-half engine speed, as is the case with conventional "In Line" engines.

The intervals between the firing of the cylinders is 180 degrees. 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, and No. 4 is the other cylinder in this bank. The cylinders are numbered on the head covers.

Note: When disconnecting ignition wires, mark cap and tag wires for correct reassembly.

### Timing Check, Fig. 16

The running spark advance for both magneto and battery ignition is 23 degrees, and timing must be checked with the engine running at 2000 R.P.M. or over.

Insert a small screwdriver into the NO. 1 terminal tower on the distributor cap, making contact with the ignition wire terminal. Connect the red terminal clip from an automotive TIMING LIGHT to the metal part of the screwdriver. Connect the other two wires of the timing light; one to the positive side of the battery, the other to ground. Chalk or paint the end of the "X" marked vane of 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 white vane. At the time of the flash, the leading edge of the vane should line up with the running spark advance timing hole in the front face of the flywheel shroud.

Note: Timing can be checked without removing flywheel shroud screen (Fig. 16 shows screen removed) by illuminating leading edge of white vane with timing light through the 3/8" diameter hole in rim face of flywheel screen. For W4-1770, use "VH" timing slot.

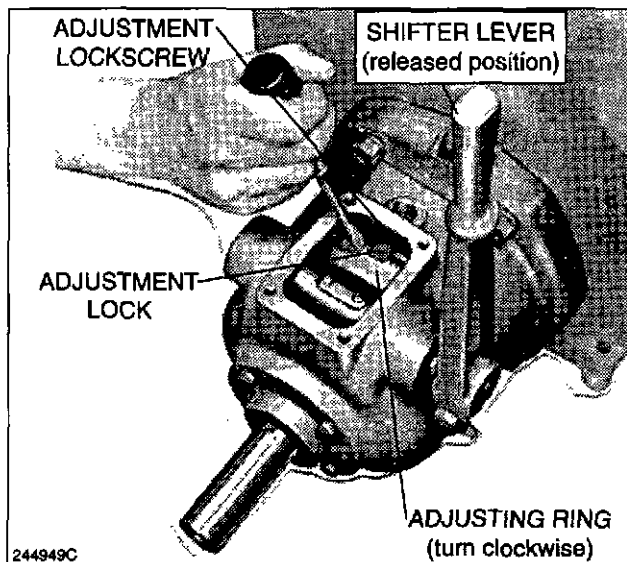


Fig. 17, VH4D, W4-1770  
Clutch Adjustment

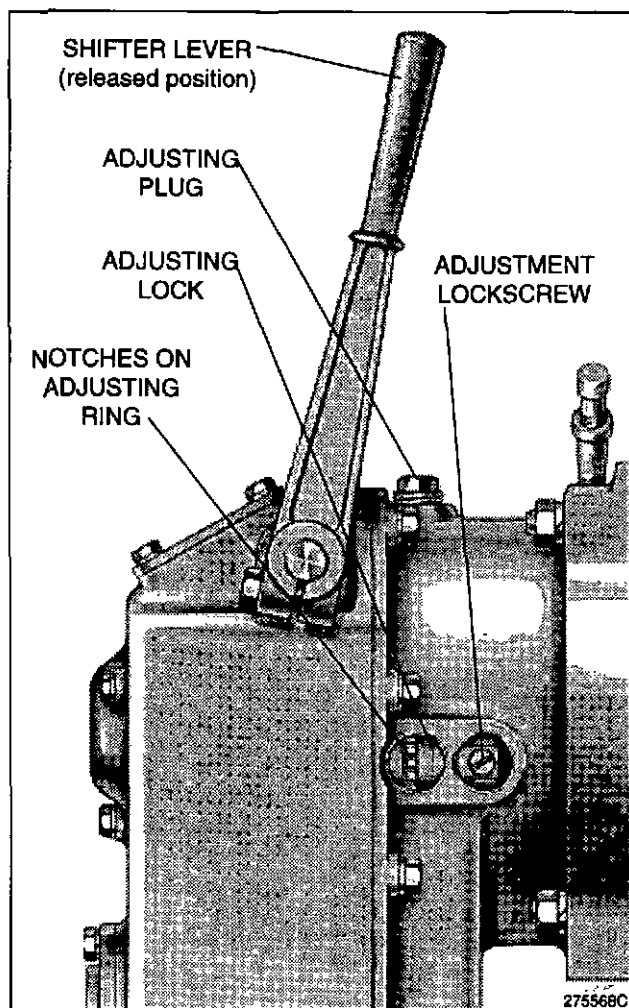


Fig. 18, VH4D, W4-1770  
Clutch Reduction Adjustment

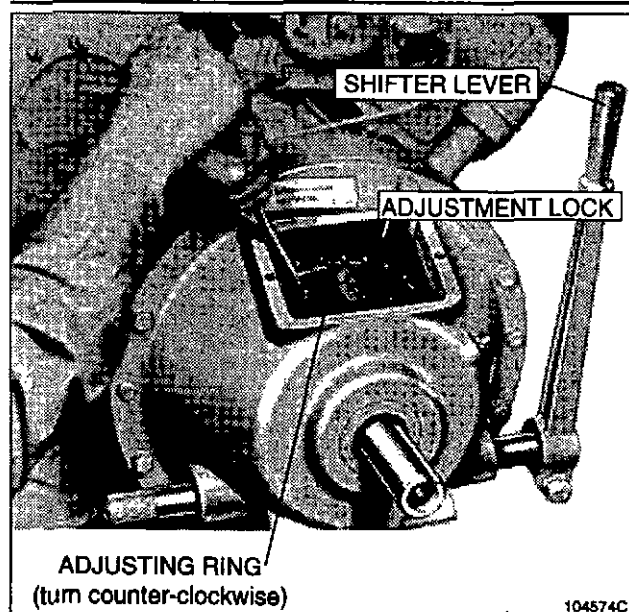


Fig. 19, VG4D, V465D  
Rockford Clutch Adjustment

Timing Adjustment for either battery or magneto ignition: Refer to the Repair Manual of the specific engine model for adjustment procedure.

### Clutch Adjustment, Fig. 17

If the clutch begins to slip, it should be readjusted to prevent it from becoming overheated and damaged. First, remove inspection plate to expose the adjusting ring. Release clutch by pushing shifter level forward (toward engine).

Turn engine over until clutch adjustment lock is visible through the inspection opening. Loosen adjustment lock screw one full turn. Keep clutch from turning by securing the crankshaft. Then, by means of a screw driver, turn adjusting ring one notch at a time in a clockwise direction until a very firm pressure (approximately 70 foot/pounds) is required when engaging the clutch shifter lever, and as the clutch snaps into engaged position. Securely tighten adjustment lock screw.

### VH4D, W4-1770 Clutch Reduction, Fig. 18

The clutch in the clutch reduction unit is the same as used in the power take-off unit and is adjusted through two pipe tap openings; one for the adjustment lock screw and the other for turning the adjusting ring. If one of the taps is inaccessible, adjustment can be made through just one opening by rotating clutch slightly after adjustment lock screw is loosened. Follow adjustment procedures as outlined in preceding paragraph.

### VG4D, V465D Clutch Adjustment, Fig. 19

Rockford Clutch: After removing the inspection cover and disengaging clutch with shifter lever, turn engine over until the clutch adjustment lock is visible through the inspection opening of the clutch housing. Prevent take-off shaft from turning by means of a drift punch wedged in place as shown.

Then, loosen the lock screw holding the adjustment lock in place. Insert a screwdriver in one of the notches and turn the adjusting ring in a counterclockwise direction, one notch at a time, until a very firm pressure is required to engage the clutch with the shifter lever. Tighten adjusting lock screw and mount inspection cover.

### ELECTRICAL EQUIPMENT

The 12 volt SOLID STATE IGNITION DISTRIBUTOR with COIL and STARTING MOTOR are standard equipment. Options include: 25 amp or 30 amp FLY-WHEEL ALTERNATOR, 37 amp BELT DRIVEN ALTERNATOR, INSTRUMENT PANEL, HIGH-TEMPERATURE SAFETY SWITCH and SOLENOID STARTING. Battery is not normally furnished with engine.

## Electrical Equipment

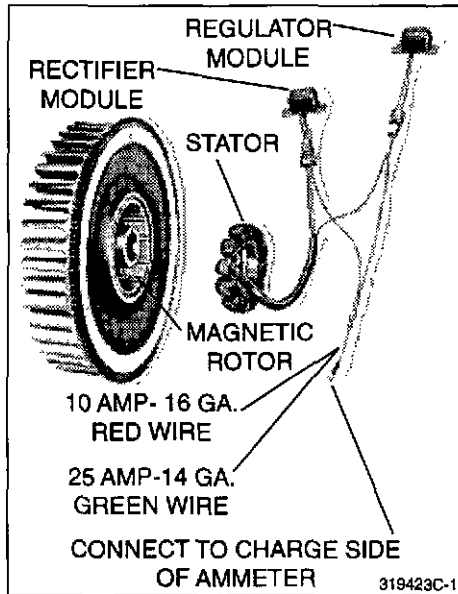


Fig. 20 Flywheel Alternator (10 and 25 amp systems)

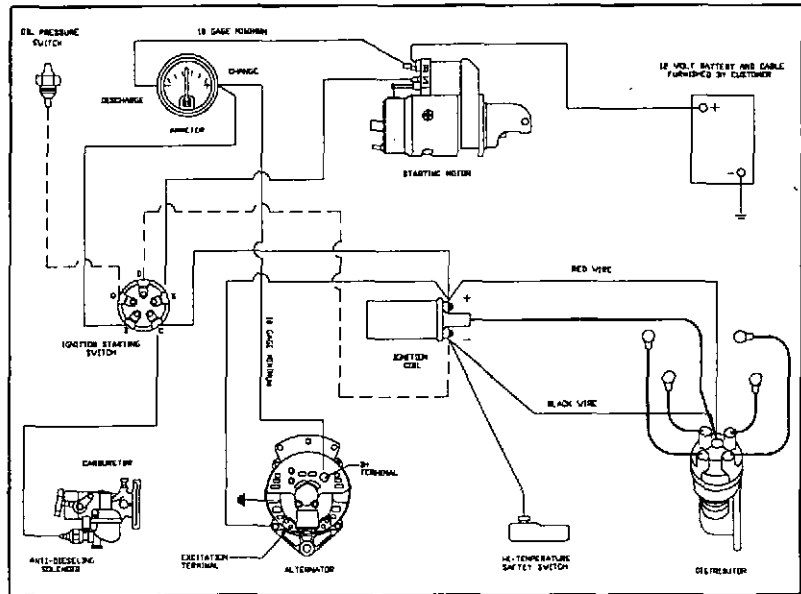


Fig. 21 Typical Wiring Diagram, Model V465D with belt driven alternator and solid state ignition

### FLYWHEEL ALTERNATOR

#### Figs. 20-23

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

Since the physical appearance of both 10 amp and 25 amp FLYWHEEL ALTERNATOR systems are very simi-

#### IMPORTANT:

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

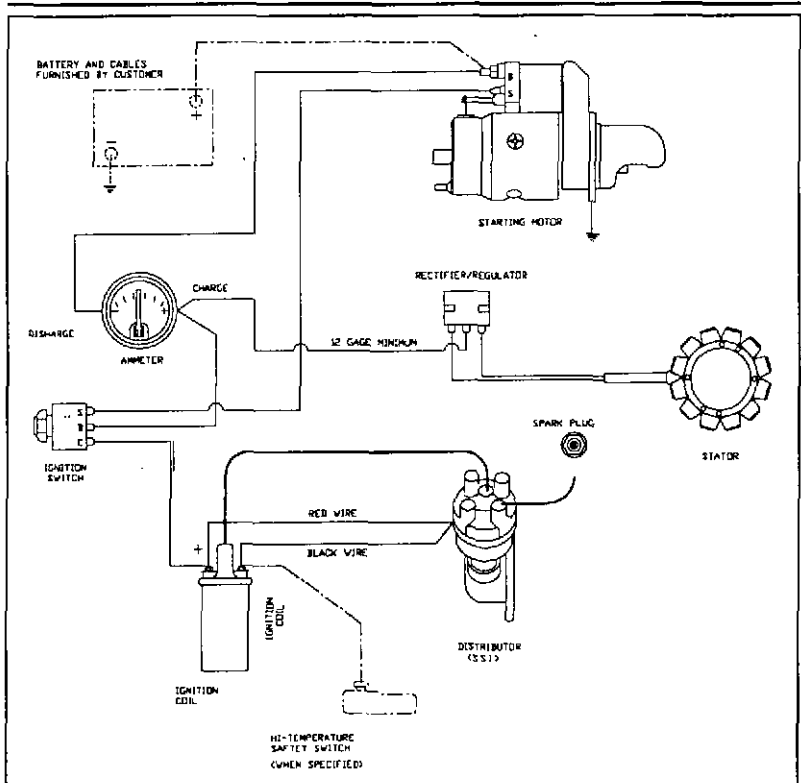


Fig. 22, Typical Wiring Diagram, 30 amp Flywheel alternator with positive engagement Starter and Solid State Ignition, Models VH4D, W4-1770, VG4D, V465D

lar, 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.

### CAUTION

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

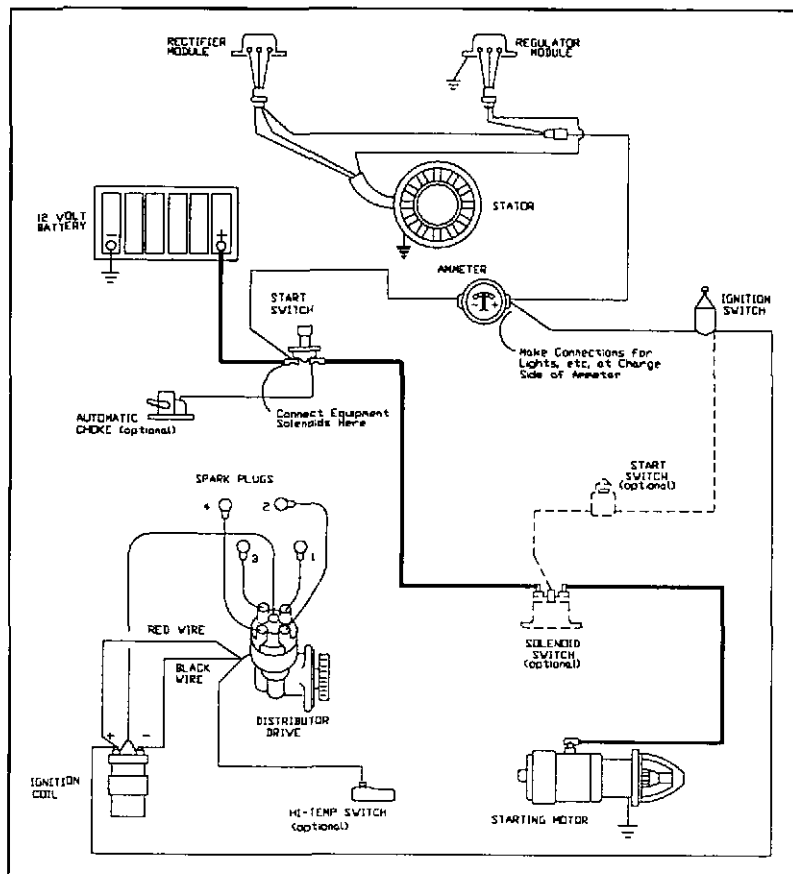


Fig. 23, Typical Wiring Diagram, 25 amp Flywheel Alternator with inertia Drive Starter and Solid State Ignition, Models VH4D, VG4D, W4-1770

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

## Trouble Shooting

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.

As a guide to locating some of the difficulties in starting, causes are listed under the three main headings of:

### FUEL MIXTURE, COMPRESSION AND IGNITION.

#### FUEL MIXTURE

No fuel in tank or fuel valve closed.

Plugged vent hole in fuel tank cap.

Fuel line clogged.

Fuel pump diaphragm worn or punctured.

Anti-diesel solenoid valve at carburetor inoperative (model V465D).

Check for disconnected, loose or broken wire.

Carburetor not choked sufficiently, especially if engine is cold.

Water, dirt or gum in gasoline interfering with free flow of fuel to carburetor.

Poor grade, stale or out-of-season gasoline.

Carburetor flooded, caused by too much choking, especially if engine is hot.

Carburetor float needle valve stuck open. This condition would be indicated if fuel continues to drip from carburetor with engine standing idle.

#### COMPRESSION

Cylinders dry due to engine having been out of use. Pour one fluid ounce of crankcase oil through spark plug holes.

Loose or broken spark plug. A hissing noise will be heard in cranking 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.

Valve stuck open. Piston rings stuck or worn.

Valves adjusted with insufficient clearance.

#### IGNITION

Test for spark by removing spark plugs and observe spark at plug gap while turning engine over. No spark or weak spark may be attributed to the following:

Ignition wires loose or disconnected at magneto, spark plug, distributor or coil.

Broken or frayed ignition wires.

Spark plug insulator broken.

Spark plugs wet or dirty.

Spark plug gap incorrect.

Condensation on spark plug electrodes.

Breaker point gap incorrect

Breaker points pitted or fused.

Breaker arm sticking.

Condenser leaking or grounded.

Spark timing wrong.

Weak battery. Faulty ignition coil.

#### ENGINE MISSES

Spark plug gap incorrect.

Worn, leaking or loose ignition cables.

Weak spark. See "Ignition" test for spark.

Breaker points pitted or worn.

Water in gasoline.

Poor compression. See "Compression."

Sticky valves.

#### 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."

Vapor lock in fuel lines due to using winter gas (too volatile) in hot weather.

Air vent hole in fuel tank cap plugged.

Ignition troubles. See "Ignition."

#### OVERHEATING

Crankcase oil supply low.

Ignition timing wrong.

Low grade of gasoline.

Engine overloaded.

Restricted cooling air circulation.

Part of air shroud removed from engine.

Dirt between cooling fins.

Intake or rotating screen clogged with dirt.

Restricted exhaust.

<b>ENGINE MAINTENANCE SCHEDULE</b>	<b>Page Ref.</b>	<b>Daily</b>	<b>Weekly or 50 hrs.</b>	<b>100 hrs.</b>	<b>250 hrs.</b>	<b>Seasonally or 500 hrs.</b>
<b>CHECK OIL LEVEL.</b> Add to full mark - Do not overfill.	4	•				
<b>CHECK AIR CLEANER.</b> Shake out accumulated dirt from dry element cleaner - Maintain oil level in oil bath type cleaner.	7	•				
<b>CHECK AIR INTAKE SCREEN.</b> Clean cooling fins if necessary.	3	•				
<b>GREASE CLUTCH THROWOUT BEARING (VG4D, V465D).</b>	5	•				
<b>CHANGE CRANKCASE OIL.</b>	4		•			
<b>CLEAN AIR FILTER ELEMENT.</b> Dry element and oil bath types.	6,7		•			
<b>CLEAN CRANKCASE BREATHER CAP.</b>	7		•			
<b>GREASE CLUTCH HOUSING BEARING (VG4D, V465D).</b>	5		•			
<b>REPLACE OIL FILTER.</b> In adverse conditions, replace every oil change.	8			•		
<b>ADJUST VALVE TAPPET CLEARANCE.</b>	9,10				•	
<b>CHECK COMPRESSION.</b> Pressure should not vary more than 10 p.s.i. between cylinders. Remove head - clean out carbon deposits. Reset valves if necessary.	-				•	
<b>INSPECT SPARK PLUGS AND BREAKER POINTS.</b> (if equipped with points) Replace if necessary and regap to specification.	8,9				•	
<b>INSPECT FUEL FILTER.</b> Clean filter screen and glass bowl.	7		•			
<b>INSPECT DISTRIBUTOR CAP AND ROTOR.</b> Replace if necessary.	-				•	
<b>INSPECT COOLING SYSTEM.</b> Remove shrouding and scrape off dirt from between fins, around cylinders and from shrouding. Inspect more often in very dirty conditions.	3				•	
<b>INSPECT STARTING MOTOR.</b> Check for loose mounting and cable connections.	8				•	
<b>CHANGE OIL IN CLUTCH AND REDUCTION GEAR HOUSINGS.</b>	5					•

<b>FOR YOUR RECORD</b>	
<b>Model</b>	
<b>Spec. No.</b>	
<b>Serial No.</b>	
<p>Copy the above from the Engine Name Plate. The Model, Spec. No. and serial No. must be given when requesting specific engine information and when ordering service Replacement Parts.</p> <p>Individual Repair and Service Parts Catalogs are available from all Wisconsin Distributors.</p>	

## LIMITED ENGINE WARRANTY

**WIS-CON TOTAL POWER CORPORATION** (herein "Wis-Con"), warrants to the original retail purchaser (herein "Purchaser"), that each new Wis-Con engine or service engine assembly (herein "engine(s)") will be free from defects in material and workmanship for a period of one (1) year after delivery, or for up to 2,000 hours of operation by the Purchaser, whichever occurs first. Wis-Con's obligation under this Limited Warranty shall be limited, at Wis-Con's option, to repairing or replacing the engine, which upon examination is found to be defective in material or workmanship. The repair or replacement of any engine under this Limited warranty shall not extend the term of the engine warranty beyond the original term as set forth above.

All repairs qualifying under this Limited Warrant must be performed by Wis-Con or one of its authorized Distributors or Warranty Stations. In the event that any engine is found to be defective during the warranty period, the Purchaser shall notify Wis-Con or one of its authorized Distributors or Warranty Stations, of any claimed defect within thirty (30) days after such defect is discovered. The engine claimed to be defective must then be promptly delivered to an authorized Distributor or Warranty Station for inspection, repair or replacement. The Purchaser is responsible for all transportation charges in connection with covered warranty work. In connection with a covered warranty repair or replacement, Wis-Con may, in its sole discretion, assume responsibility for a portion of the labor necessary for removal and reinstallation of an engine. However, the Purchaser shall be responsible for other labor charges not assumed by Wis-Con and for all labor charges and travel expenses incurred in connection with travel to and from Purchaser's location.

This Limited Warranty shall not apply to:

- A. Defective conditions caused, in whole or in part, by an engine which has, in Wis-Con's opinion, been subjected to negligence in use, misuse, abuse, improper installation or application, improper maintenance or repair, alteration, repair or alteration by an unauthorized repair facility, over-speeding, casualty, or improper storage, transportation, or handling; and
- B. Engine tune-ups and normal maintenance service as specified in the Operator's Manual, including, but not limited to, valve adjustment, normal replacement of service items, fuel and lubrication oils, fan belts, antifreeze, etc.

Wis-Con reserves the right to modify, alter or improve any engines without incurring any obligation to modify or replace any engines previously sold without such modification, alteration or improvement.

Written and oral representations made by Wis-Con's employees or agents, before or after sale of the engine, are not to be considered warranties or additional obligations unless they are in writing and signed by an officer or authorized employee of Wis-Con.

THIS LIMITED WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO WIS-CON'S ENGINES AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES OF ANY NATURE WHATSOEVER, WHETHER EXPRESS, IMPLIED OR ARISING BY OPERATION OF LAW, TRADE, USAGE OR COURSE OF DEALING, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTIES RELATING TO MATERIALS OR COMPONENTS MANUFACTURED BY ANY PARTY OTHER THAN WIS-CON TO MATERIALS OR COMPONENTS MANUFACTURED BY ANY PARTY OTHER THAN WIS-CON, PURCHASER REPRESENTS THAT IT ALONE HAS DETERMINED THAT THE ENGINES PURCHASED ARE SUITABLE FOR AND WILL MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Limitation of Liability and Remedy. In no event, whether arising out of breach of contract, warranty or tort (including negligence, failure to warn or strict liability) or otherwise, shall Wis-Con be liable to Purchaser, or to Purchaser's officers, employees, or representatives, or to any third party, for any special, indirect, consequential or incidental damages, including, but not limited to loss of profit or revenues, loss of use of equipment or services furnished by Wis-Con, damage to associated equipment, cost of capital, cost of substitute products, facilities, service or replacement power or downtime costs. In no event shall Wis-Con's liability for any claim for any engine exceed Wis-Con's price for the engine or engine component part that gives rise to the claim. Purchaser assumes all other risks and liabilities for any loss, damage, or injury to persons, property, or the environment arising out of, connected with or resulting from the use or subsequent sale of the engines, either alone or in combination with other products, Purchaser expressly agrees that the remedies granted to it hereunder are Purchaser's sole and exclusive remedies with respect to any claim of Purchaser arising under this Limited Warranty.

(LIT00235)

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## Engine Storage

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 pipetap 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.

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.

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

**⚠ WARNING ⚠**

**California Proposition 65**

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

**WIS-CON**  
**TOTAL POWER CORP.**  
Visit our web site at: <http://www.totalpower.com>

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