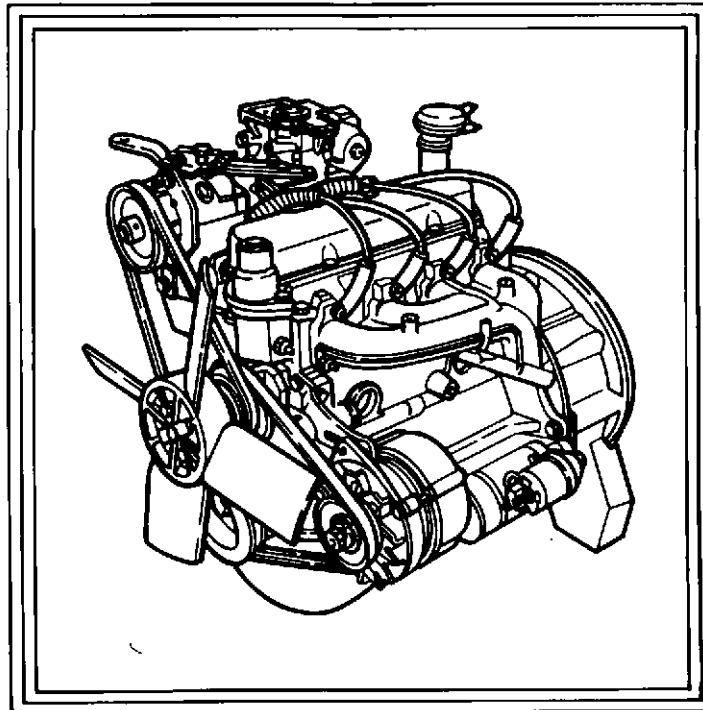




**VSG-411/413**

**4 CYLINDER  
1.1/1.3 LITER  
GASOLINE  
ENGINES**

**MAINTENANCE AND OPERATOR'S MANUAL**



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FORD MOTOR COMPANY



Ford Parts and Service Division  
Power Products Operations  
3000 Schaefer Road  
P.O. Box 6011  
Dearborn, Michigan 48121

## **To Our Engine Owners**

At Ford Motor Company, excellence is the continuous commitment to achieve the best possible result. It is dedication to learning what the customer wants, determination to develop the right concept and execution of that concept with care, precision and attention to detail. In short, excellence means being the standard by which others are judged.

Our Guiding Principles;

**Quality comes first.** To achieve customer satisfaction, the quality of our products and services must be our number one priority.

**Customers are the focus of everything we do.** Our work must be done with our customers in mind, providing better products and services than our competition.

**Continuous improvement is essential to our success.** We must strive for excellence in everything we do: in our products, in their safety and value — and in our services, our human relations, our competitiveness and our profitability.

**Employee involvement is our way of life.** We are a team. We must treat each other with trust and respect.

**Distributors and suppliers are our partners.** The Company must maintain mutually beneficial relationships with dealers, suppliers and our other business associates.

**Integrity is never compromised.** The conduct of our Company worldwide must be pursued in a manner that is socially responsible and commands respect for its integrity and for its positive contributions to society.

# INTRODUCTION

---

Ford Motor Company welcomes you to its growing family of new engine owners.

This manual will familiarize you with operational, maintenance and safety information about your new engine. We urge you to read this publication carefully and follow the recommendations to help assure enjoyable and safe operation of your new engine.

When you require service, remember that your distributor knows your engine best, has the factory-trained technicians, recommended special tools and genuine Ford and Motorcraft replacement parts, and is dedicated to your complete satisfaction.

If you need special service assistance while traveling anywhere in the United States or Canada, any Ford Power Products Distributor will be happy to assist you.

Because subsequent owners require this important information as well, this publication should remain with the engine when it is sold.

Ford Motor Company offers a great variety of options, components and features on its numerous models. Therefore, the equipment described in this manual and the various illustrations may not all be applicable to your particular engine. If you have questions, always check with your distributor.

The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or to change specifications or design, without notice and without incurring obligation. The equipment described within this guide may not be identified as either standard or optional.

## **CAUTIONS AND WARNINGS**

Throughout this manual, you will find **CAUTIONS** and **WARNINGS**. **WARNINGS** remind you to be especially careful to avoid personal injury. **CAUTIONS** are given to prevent you from making an error which could damage the engine and possibly cause personal injury.

# INTRODUCTION

---

## **PARTS AND SERVICE**

### **FEDERAL HIGHWAY ADMINISTRATION REGULATION**

Regulations such as those issued by the Federal Highway Administration or issued pursuant to the Occupational Safety and Health Act (OSHA), and/or state and local laws and regulations may require additional equipment for the way you intend to use the engine. It is the responsibility of the registered owner to determine the applicability of such laws and regulations to your intended use for the engine, and to arrange for the installation of required equipment. Your Ford Power Products Distributor has information about the availability of many items of equipment which may be ordered for your vehicle.

### **WARRANTIES**

The warranties covering this engine are stated in detail in the Warranty Registration Form (#194-103-B).

- Engine Warranty Coverage
- Component Warranty Coverage

You should read the Warranty Statement carefully. It contains a basic statement of your rights and responsibilities.

If you lose or misplace your Warranty copy that came with your new engine, you may obtain a replacement copy free of charge from Ford Parts and Service Division by writing to: Ford Parts and Service Division, P.O. Box 6011, Dearborn, Michigan 48121.

### **SERVICE LITERATURE**


A service manual and parts list can be obtained from your distributor or dealer. These publications will provide the necessary servicing, overhaul and replacement parts information for your Ford Industrial Engine.

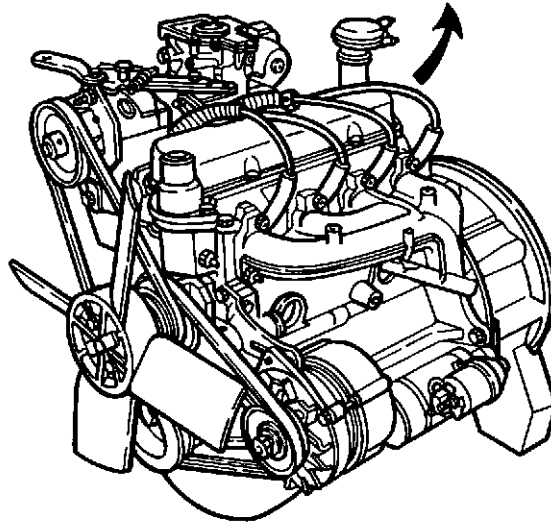
Shop Manual	IEO 194-264
Parts List	IEO 194-265A

# INTRODUCTION

## ENGINE IDENTIFICATION

An Identification Decal is affixed to the left side of the engine. The decal contains the engine serial number which identifies this unit from all others. The model number and S.O. or special options determine the parts or components required on this unit. Use all numbers when seeking information or ordering replacement parts for this engine. For a handy reference, this information is recorded on your Ford Power Products Operations Engine Registration copy (Form #194-103-B).

	<b>SERIAL NUMBER</b>
	_____
	<b>MODEL NUMBER</b>
	_____
<b>S.O./OPTIONS</b>	<b>MODEL CODE</b>
_____	_____

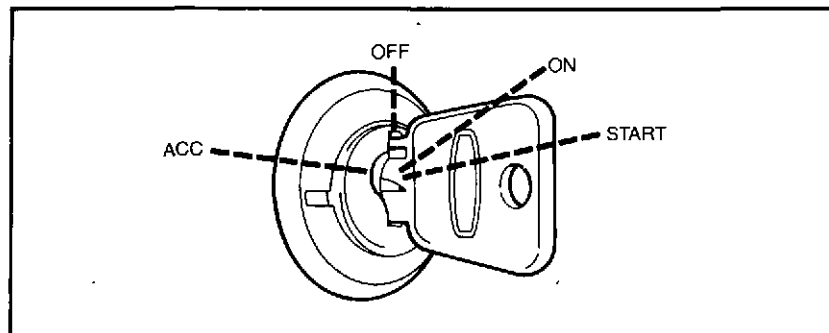


# OPERATING INSTRUCTIONS

## CONTROLS

### Ignition Switch

The four position switch is located on the control panel. In the ACC position, electrical accessories can be operated without electricity flowing through the ignition circuit. In the OFF position, the switch disconnects the electrical system from the battery. The key can be removed from the switch when it is in this position. In the ON position, the electrical system is activated. Engage the starter by turning the key to the START position. Release the key when the engine starts and it will return to the ON position.



### Choke Control

The manual choke control is connected to the carburetor and operates the choke butterfly to enrich the fuel mixture on cold starts.

### Throttle Control

The throttle control adjusts engine speed. Initial engine speed adjustment is obtained by pressing the throttle control release button while pulling the throttle knob out to increase the engine speed or pushing it in to decrease the engine speed.

A final fine speed adjustment is obtained by turning the throttle control counterclockwise to increase engine speed or clockwise to decrease engine speed.

### Override Button (if so equipped)

The button on the control panel is used to override the automatic shut down system when starting the engine. Low oil pressure or high coolant temperature will automatically shut off the engine. The automatic shut down system operates in conjunction with the oil pressure and coolant temperature gauges.

# OPERATING INSTRUCTIONS

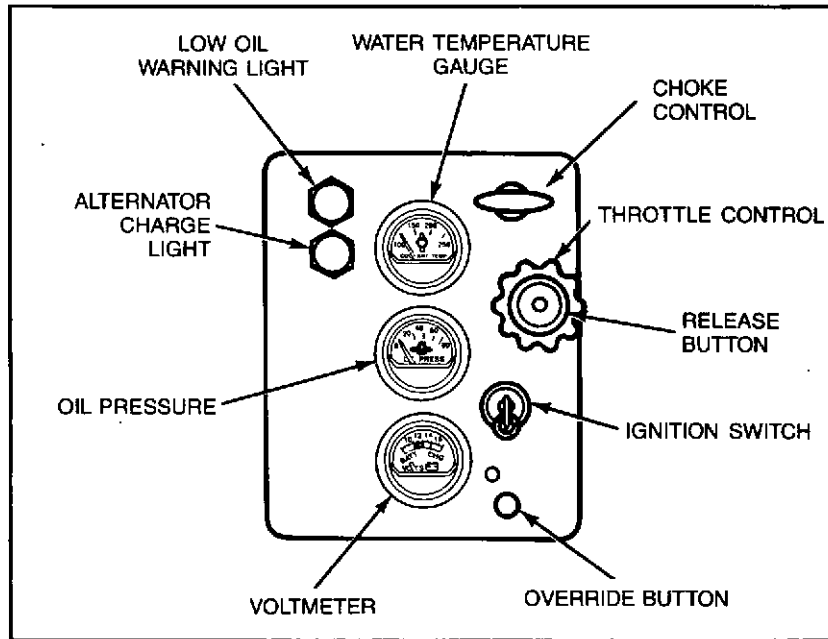
## Power Take-Off

The power take-off control handle allows engagement and disengagement of the power take-off clutch.

Moving the lever towards the engine engages the clutch, and pulling the lever away from the engine disengages the clutch.

When moving the handle to engage the clutch and pick up the load, do so in a smooth manner. Moving the clutch handle too slowly will cause slippage and wear, while moving it too fast will cause quick engagement and possible damage to the power take-off, engine or driven equipment.

## INSTRUMENTS



## Engine Warning Lights

Units equipped with an engine warning light system have indicator lights mounted on the control panel. These lights come on to indicate dangerously low oil pressure or alternator not charging. If any light comes on with engine running, stop and correct cause of low oil pressure or alternator not charging before restarting the engine.

# OPERATING INSTRUCTIONS

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## Engine Coolant Temperature Gauge

When the ignition switch is in the ON or ACC position, this gauge indicates the temperature of the engine coolant. The pointer will move to the NORMAL band as the engine warms up. Under certain conditions, such as very heavy loads or operating in very hot weather, the pointer may read at the very top of the NORMAL band. If the pointer moves out of the NORMAL band towards the H (hot) position, the engine is overheating and damage may result. After idling for 2 minutes, turn off the engine and let it cool. Check the coolant level following the instructions under Engine Coolant in the "Servicing Your Engine" section of this guide.

**CAUTION** — If the engine continues to overheat, have the cooling system checked and serviced.

## Battery Voltage Gauge (Voltmeter)

This gauge indicates the battery voltage when the ignition key is in the ON position.

After starting the engine, the pointer will move into the white marked area. Under normal operation the pointer will remain in the white marked area (12.8-14.8 volts).

When the electrical accessories are operated with either the engine not running or the engine running with low idle speed, the pointer may move toward the red marked area.

If the pointer remains in either red marked area, have your engine's electrical system checked.

## Engine Oil Pressure Gauge

This gauge indicates the engine oil pressure, not the oil level, although too little oil could affect the operation of the engine's oil pressure system. Under normal operating conditions and continuous speeds, the pointer will remain at the same pressure position. If the pointer drops below the normal position when the engine is running, there is a loss of pressure. If this occurs, stop your engine as soon as possible, and check the oil level. Add oil if necessary.

**CAUTION** — Do not continue to operate your engine as long as the pointer is below the normal operating pressure range. Otherwise your engine may be severely damaged.

# OPERATING INSTRUCTIONS

---

## STARTING THE ENGINE

Release the load on the power take-off, or if the engine is equipped with a transmission, disengage the clutch and/or select a neutral position if an automatic transmission. If the engine is started with the load engaged, it imposes an unnecessary strain on the starter, starter pinion, ring gear and battery.

If your unit is equipped with the engine warning light system, always turn the ignition switch to the ON position to make sure that each warning light is operating before starting engine.

**WARNING** — All internal combustion engines give off various fumes and gases while running. Do not start or run the engine in a closed or poorly ventilated building where the exhaust gases can accumulate. Avoid breathing these gases as they may contain poisonous carbon monoxide which can endanger your health or life if inhaled steadily for even a few minutes.

### Normal Starts — Standard Models

Put the throttle in the closed position and the choke about three quarters to the ON position. Turn the ignition switch to the START position. When the engine starts, release the key, adjust the throttle and the choke for fast idle warm-up. When the engine is at normal operating temperature, put the choke in the off position.

**CAUTION** — If the engine stalls or falters in starting, wait three or four seconds before re-engaging starter. This will prevent possible damage to the starter, flywheel or engine.

The starter should not be operated for periods longer than 30 seconds at a time. An interval of at least two minutes should be observed between such cranking periods to protect the starter from overheating.

# OPERATING INSTRUCTIONS

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## **Engine Cold — Standard Models**

Put the throttle in the closed position and the choke all the way to the ON position. Turn the ignition switch to the START position. When the engine starts, release the key and adjust the throttle and choke setting to keep the engine running smoothly. When the engine is at normal operating temperature, put the choke in the OFF position.

To assure satisfactory operation in cold weather, allow approximately five minutes for engine warm-up before engaging load.

**CAUTION** — If the engine stalls or falters in starting, wait three or four seconds before re-engaging starter. This will prevent possible damage to the starter, flywheel or engine.

The starter should not be operated for periods longer than 30 seconds at a time. An interval of at least two minutes should be observed between such cranking periods to protect the starter from overheating.

## **Engine Flooded**

To start a "flooded" engine, press the throttle control release button and pull the throttle out all the way and put the choke in the off position. Turn the ignition switch to the START position until the engine starts. Release the key. Push the throttle in gradually as engine speed increases.

**CAUTION** — If the engine stalls or falters in starting, wait three or four seconds before re-engaging starter. This will prevent possible damage to the starter, flywheel or engine.

The starter should not be operated for periods longer than 30 seconds at a time. An interval of at least two minutes should be observed between such cranking periods to protect the starter from overheating.

## **STOPPING THE ENGINE**

### **Normal Conditions**

Following normal operating conditions, lower the engine speed to idle, disengage the clutch, and then turn the ignition switch to the OFF position. If the engine has been running under high power, let it run at fast idle speed a few minutes to cool the engine down.

# OPERATING INSTRUCTIONS

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Never turn off the ignition, then suddenly pull the choke out, with the thought in mind that this will "prime" the system for the next start. This is poor practice because the large quantity of raw gasoline entering the combustion chambers will wash all the oil off the cylinder walls. When started again, the engine will operate for a few moments without any lubrication on the cylinder walls, which may result in scuffing of the pistons, rings, and cylinder walls. At best, engine life will be shortened considerably.

## **Abnormal Conditions**

Under abnormally overheated conditions, the engine may continue to run after the ignition switch is turned off. If this case is ever encountered, turn on the ignition switch immediately and allow the engine to idle until it has cooled enough to stop. If the engine is overheated due to a loss of coolant, it is best to stop the engine immediately, if necessary by applying the load. Allow the engine to cool, then check the coolant and oil levels. Add engine oil if necessary, then after the engine has returned to a normal temperature, add coolant slowly until the radiator is full.

**WARNING** — Avoid injury when checking a hot engine. Cover the radiator cap in a thick cloth and turn it slowly counterclockwise to the first stop. After the pressure has been completely released, press the cap downward and finish removing the cap.

The above instructions also apply to engines that stop due to operation of the low oil pressure-high water temperature safety switch. However, if engine stops due to low oil pressure, do not restart until the cause has been determined and corrected.

## **SPECIAL SITUATIONS**

### **Problem Diagnosis**

Most operating troubles that might be encountered with a new or well maintained unit will be of a minor nature. Therefore, if you have troubles starting or operating your engine, look for some simple cause rather than failure of a major component. For instance: loose or corroded battery connections are much more likely than battery failure.

A loose ignition wire is much more likely than distributor, coil or ignition system failure.

In many cases, engine operating troubles are coupled with outside factors such as climate conditions, operating conditions, change of servicing or fueling source, or change of operator.

## **OPERATING INSTRUCTIONS**

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Engine troubles that occur as a result of normal use and wear usually give plenty of advance warning. These troubles usually result from overlooking the Scheduled Preventive Maintenance Services (page 11).

Whenever engine performance seems less than normal in any category, it is best to consult with your dealer at the first symptom rather than wait until a serious problem develops. One of the aims of regular maintenance is to help you in just these circumstances.

### **Engine Won't Crank**

1. Turn the key to the START position. If nothing happens, an electrical lead(s) may be loose or disconnected, the battery cables may be loose, disconnected or corroded or the battery discharged.
2. Another indication of loose battery connections or low battery condition is a stuttering noise from the starter relay when the ignition switch is turned to START position. Check the connections to the starter motor and the solenoid switch in addition to the battery and ground connections.
3. Try operating the starter button several times. Should the switch be corroded, this operation may clean the contacts enough to make the switch temporarily operable until you can reach your dealer.
4. If all the electrical connections are tight and you need assistance to start, read the instructions under Emergency Starting.

### **Engine Cranks But Won't Start**

1. Check the fuel supply. You may be out of fuel. If there is fuel in the tank, the trouble may be in either the ignition system or the fuel system.
2. Check the ignition system. With the engine not operating and the ignition switch is in the OFF position, remove the wire from one of the spark plugs by grasping the moulded boot of the wire only, and insert a short piece of bare wire or other metal object in the terminal of the wire.

**WARNING** — Spark plug wires carry high-tension electrical current capable of giving a shock. Be sure to grasp the moulded boot well back from the open end.

## OPERATING INSTRUCTIONS

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Hold the boot so that the inserted bare wire is about 1/4 inch from the engine block and crank the engine (with the ignition switch on) for at least three seconds. If there is no spark between the wire and the metal, the trouble may be in the distributor or coil. If you see a spark, then check the fuel system for trouble.

3. The fuel system may have a restricted fuel line, plugged fuel filter, or air leaks in the fuel line.
4. Check the electrical and/or manual choke system. The choke linkage may be binding or damaged so that the choke plate in the carburetor is not opening and closing properly. Check the wire continuity from the electrical choke to the alternator, replace if open.

### **Engine Runs Hot**

Listed below are items which could cause an engine to overheat.

- Low coolant level
- Loose or broken fan belt(s)
- Inoperative thermostat
- Dirty cooling system
- Radiator fins restricted with leaves, dirt, etc.
- Prolonged idling
- Running engine with frozen coolant
- Leaky head gasket
- Overloading, especially during hot weather
- Ambient temperatures 125°F or higher

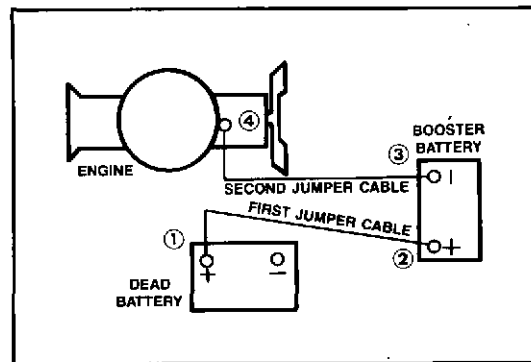
# OPERATING INSTRUCTIONS

## EMERGENCY STARTING

**WARNING** — Use of booster battery and jumper cables — particular care should be used when connecting a booster battery in order to prevent sparks. To jump start (negative grounded battery):

- Shield eyes.
- Connect ends of one cable to positive (+) terminals of each battery.
- Connect one end of other cable to negative (-) terminal of "good" battery.
- Connect other end of cable to engine block on unit being started (**NOT TO NEGATIVE [-] TERMINAL OF BATTERY**).

To prevent damage to other electrical components on unit being started, make certain that engine is at idle speed before disconnecting jumper cables.



**WARNING** — Batteries contain SULFURIC ACID. In case of acid contact with skin, eyes, or clothing, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF FIVE MINUTES. Get "on-the-spot" medical attention immediately.

Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are brought near the battery. When charging or using battery in an enclosed space always provide ventilation.

# OPERATING INSTRUCTIONS

---

Keep fire away from the top of open battery cells. Combustible gas is always present.

**CAUTION** — Avoid the use of a 24-volt battery and jumper cable hookup to start an engine with a dead battery, as this will damage the unit's electrical system.

## FUEL RECOMMENDATION

The 1984-85 engines are designed to operate on "regular" gasoline. When the engine is adjusted to factory recommended specifications, you may use a fuel with an octane rating of 89" (R + M)/2".

The 1986 and onward engines are designed to operate on unleaded 87 octane gasoline and do have valve seat inserts for dry fuel use if required.

**CAUTION** — Dry fuel (LPG and Natural Gas) usage requires valve seat inserts. Contact your Ford Power Products Distributor with your engine identification information (Page 3) to determine suitability of your engine for this usage.

## Fuel Quality

Using a high quality regular or unleaded gasoline will help maintain the power, fuel economy and emissions performance of your engine. A properly formulated gasoline will be comprised of well refined hydrocarbons and chemical additives and will perform the following functions:

- Minimize varnish, lacquer, and other induction system deposits.
- Prevent gum formation or other deterioration during storage.
- Protect fuel tank and other fuel system components from corrosion or degradation.
- Provide the correct seasonally and geographically adjusted volatility. This will provide easy starting in the winter and avoid vapor lock in the summer.
- Avoid fuel system icing.

In addition, the fuel will be free of water, debris, and other impurities.

We also recommend that the fuel supply be kept fresh; when the vehicle is in storage (especially in hot weather), the fuel tank should be kept at least 3/4 full.

If you anticipate storage of your engine in excess of two months, consult your dealer or other qualified technician.

# OPERATING INSTRUCTIONS

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## **Anti-Knock Index (Octane Rating)**

Your engine has been designed to operate using gasoline with an (R + M)/2 minimum anti-knock index rating of 87 or 89. Federal regulations require that each retail gasoline dispensing pump must display a label bearing the minimum anti-knock index rating.

Use of unleaded gasoline with anti-knock index ratings lower than 87, can cause persistent, heavy spark knock, which can lead to engine damage. If your engine knocks heavily when you use gasoline with an anti-knock index rating of 87 or higher, or if you hear continuous spark knock while maintaining constant operating speeds, consult your dealer or another qualified technician.

## **Gasohol and Alcohol/Gasoline Blends**

Gasohol, a mixture of gasoline and ethanol (grain alcohol), is available in some areas. Ford engines should operate satisfactorily on gasohol blends containing no more than 10% ethanol by volume and having an anti-knock index of 87 or 89, reference engine specifications.

**CAUTION** — In some cases, methanol (wood alcohol) or other alcohols may be added to gasoline. Ford engines should operate satisfactorily on blends containing up to 5% methanol by volume when cosolvents and other necessary additives are used. If not properly formulated with appropriate cosolvents and corrosion inhibitors, such blends may cause driveability problems or damage emissions and fuel system materials. Insufficient data is available to insure the suitability of all methanol/gasoline blends at this time. To avoid jeopardizing your engine warranty or incurring unnecessary repairs costs, **DO NOT USE** blends containing more than 5% methanol by volume, or blends that do not contain cosolvents and corrosion inhibitors.

If you are uncertain as to the presence of alcohols in the gasoline you are purchasing, check the label on the pump or ask the station attendant.

**CAUTION** — Discontinue use of any gasohol or alcohol/gasoline blend if driveability of fuel system problems occur. Do not use such fuels unless they are **UNLEADED**.

# MAINTENANCE INSTRUCTIONS

## MAINTENANCE SCHEDULE

Initial Start-up Sequence	Operation	100 Hrs.	200 Hrs.	300 Hrs.	400 Hrs.	500 Hrs.	600 Hrs.	700 Hrs.	800 Hrs.	900 Hrs.	1000 Hrs.
1	Oil, Engine, Check Level	Daily									
2	Coolant, Check Level(7)	Daily									
3	Fuel, Oil and Coolant Leaks, Check	Daily									
	PTO Release Bearing, Lubricate	Daily									
4	Governor, Check Oil Level(2)	X	X	X	X	X	X	X	X	X	X
	Oil, Engine, Change(1)	X	X	X	X	X	X	X	X	X	X
	Oil Filter, Change(1)	X	X	X	X	X	X	X	X	X	X
5	Air Cleaner, Replace Element(1)				X				X		
6	Battery, Check Charge and Level	X	X	X	X	X	X	X	X	X	X
	Crankcase Vent System Breather Cap, Clean(4)	X	X	X	X	X	X	X	X	X	X
7	PTO Bearings, Lubricate	X	X	X	X	X	X	X	X	X	X
8	Transmission-Manual Fluid Level, Check(4)		X		X		X		X		X
	Radiator, Inspect and Clean Exterior(1)		X		X		X		X		X
	Battery Cables, Clean		X		X		X		X		X
10	Fan, Alternator or Governor Belts, Check and Adjust Tension(5)(6)		X		X		X		X		X
	Throttle, Governor and Choke Linkage, Lubricate		X		X		X		X		X
	Fuel Filter, Replace(1)(4)				X				X		
	Cooling System, Check or Refill(3)(7)				X				X		
12	Idle Speed, Check and Adjust				X				X		
13	Idle Mixture, Check and Adjust				X				X		
	Spark Plugs, Clean, Adjust and Test or Replace				X				X		
	Distributor, Clean and Check Points(4)				X				X		
	Distributor Bushings, Lubricate				X				X		
11	Ignition Timing, Check and Adjust (Check Advance)(4)				X				X		
	PCV Valve, Replace								X		
14	Throttle and Governor, Adjust								X		
	Coolant — Replace 24 Months or Points Replace(4)								X		
									X		
11	Intake Manifold Bolts, Torque(3)								X		
15	All Bolts and Nuts, Check for Tightness(3)								X		
9	PTO Clutch Release Bearings, Adjust(3)								X		
16	Valve Clearance, Check and Adjust(3)				X						

① More frequent intervals may be required in dusty areas — 50 hours for oil & filter.

② Mechanical governor (belt driven).

③ Seasonal or as required.

④ If so equipped.

⑤ Replace worn, frayed, cracked or damaged belts.

⑥ Replace governor belts every 24 months.

⑦ Check engine coolant condition and protection, hoses and clamps annually — prior to cold weather.

**NOTE:** Scheduled Maintenance beyond 1000 hours should be continued at the same intervals as before.

# MAINTENANCE INSTRUCTIONS

## INITIAL START-UP

Your Ford Industrial Engine was inspected before leaving the factory. However, the initial start-up checks must be made before putting the unit into operation. The Preventative Maintenance Schedule (page 17) provides a handy check-off list. Perform the initial start-up operations in the sequence listed in the left-hand column.

## ROUTINE SERVICE

Make sure your unit is ready to go whenever you need it. There are some things that you can do, or have done, to be sure it is well cared for:

- Make frequent checks of the engine oil and coolant levels.
- Keep engine air filter clean.
- Watch the engine temperature.
- Watch engine oil pressure.

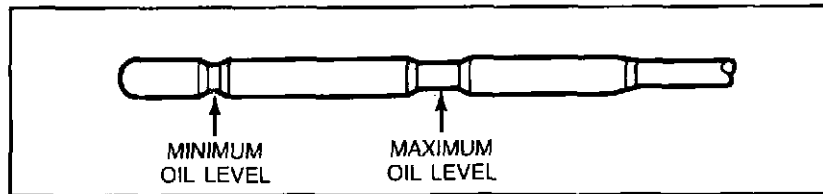
## SCHEDULED PREVENTIVE MAINTENANCE

The operations listed in the maintenance schedule are covered in detail on the following pages. Whenever your engine requires maintenance of any kind your Ford Power Products distributor or dealer has skilled technicians who will do an expert job of keeping your engine in its prime condition.

### Engine Oil

#### Checking Oil Level

The oil level should be checked frequently, at least daily, and maintained between the minimum and maximum marks on the dipstick. Allow a few minutes after shutting the engine off for the oil to drain down before checking.



**CAUTION** — Do not operate the engine with the oil level below the bottom mark. Never add oil above the top mark since the excess oil is wasted and oil consumption is increased.

# MAINTENANCE INSTRUCTIONS

## Adding Oil

It is normal to add some oil between oil changes. The amount will vary with the severity of operations. When adding or replacing engine oil be sure oils meet the specifications listed.

## Changing Oil and Filter

For most operations, the engine oil and filter must be changed every 100 hours or seasonally. Under normal operating conditions, you do not need to change more often if you use oil and filters of the recommended quality.

The oil and filter should be changed more often if the engine is operated in dusty areas, for extended idling or low-speed operations, or frequent stops during cold weather. No oil additives or break-in oil change is required.

## Oil Quality

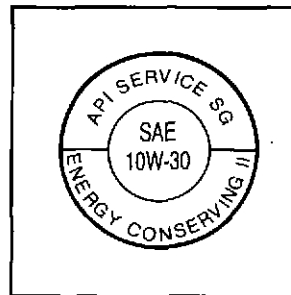
To help achieve proper engine performance and durability, it is important that you use only engine lubricating oils of the proper quality in your engine. Proper quality oils also provide maximum efficiency for the crankcase ventilation system which reduces pollution.

Use Ford or Motorcraft oil or equivalent that meets Ford Specification ESE-M2C153-E and API categories SG, SG/CC or SG/CD.

It is best not to mix different brands of lubricants and oils, because sometimes they are not compatible and deteriorate when mixed. Stay with one brand to assure compatibility.

## Oil Identification Logo

A logo has been developed to help you select the proper quality oil. It will be included on the oil can you purchase. The top section of the logo shows the oil quality by the API designation. The center section will show the S.A.E. viscosity grade. The lower section will state "energy conserving" if the oil has proven fuel-saving capabilities.



## Oil Viscosity

When you change or add oil, you should select oil with the proper specifications and with the viscosity (selected from the following table) which most closely matches the temperature range you expect to encounter for the next 100 hours of operation.

# MAINTENANCE INSTRUCTIONS

## SINGLE-VISCOSITY OILS

When Outside Temperature is Consistently	Use SAE Viscosity Number
-10°F to +60°F	*10W
+10°F to +90°F	20W-20
Above +32°F	30
Above +50°F	40

## MULTI-VISCOSITY OILS

When Outside Temperature is Consistently	Use SAE Viscosity Number
Below +10°F	*5W-20
Below +60°F	5W-30
+10°F to 90°F	10W-30
Above -10°F	10W-40 or 10W-50
Above +20°F	20W-40 or 20W-50

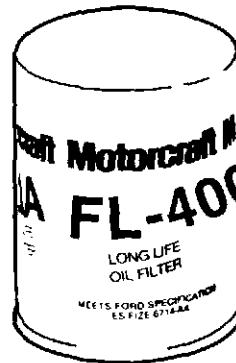
\*Not recommended for severe service — including high RPM operation.

### Oil Filter

Use a Motorcraft FL-400A Long-Life Oil Filter or equivalent which meets Ford specification ES-E1ZE-6714-AA.

These filters protect your engine by filtering harmful, abrasive, or sludgy particles without blocking the flow of oil to vital engine parts.

To replace, use a filter wrench to remove filter.



Clean the filter mounting base lightly coat the gasket surface of the new filter with engine oil and hand-tighten until the gasket contacts the base, then tighten another half turn. Fill the crankcase and run the engine to check for leaks. (Tighten the oil filter more if necessary.)

**WARNING** — Do not handle a hot oil filter with bare hands. Continuous contact with USED motor oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water.

# MAINTENANCE INSTRUCTIONS

## Air Cleaner

Your air cleaner filters air entering the engine induction system and acts as a silencer and a flame arrester when assembled to induction system. Air that contains dirt and grit produces an abrasive fuel mixture and can cause severe damage to the cylinder walls and piston rings. Damage to the cylinder walls and piston rings will cause high oil consumption and short engine life. A restricted or dirty air cleaner will also cause a rich fuel mixture. Thus, it is extremely important that the air cleaner be serviced at recommended intervals.

**CAUTION** — Service the air cleaner more frequently under severe dust conditions.

Remove the paper filter element from the air cleaner assembly. Inspect the element for foreign material restrictions or signs of excessive wear or damage. Replace as necessary.

Remove all dust and foreign matter from the air cleaner housing.

Make sure that the air cleaner assembly is seated properly on the carburetor with the seal installed.

## COOLING SYSTEM

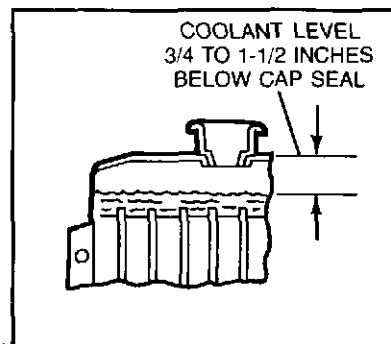
### Coolant Level

Check the coolant level in the expansion chamber or radiator daily, only when the engine is cool.

Maintain the coolant level at approximately 3/4 to 1-1/2 inches (19-38mm) below the filler neck seat on the radiator when the coolant is cold.

For marine expansion tank systems, reference the manufacturers recommendations for filling levels.

Whenever coolant level checks are made check condition of radiator cap rubber seal. Make sure it is clean and free of any dirt particles. Rinse off with clean water if necessary. When replacing cap on radiator, also make sure radiator filler neck is clean.



# MAINTENANCE INSTRUCTIONS

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**WARNING** — Never remove the radiator cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the radiator, use extreme care when removing the cap from a hot radiator. If possible, wait until the engine has cooled, then wrap a thick cloth around the radiator cap and turn it slowly to the first stop. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, press down on the cap (still with a cloth), turn and remove it.

Do not add coolant to any engine that has become overheated until the engine cools. Adding coolant to an extremely hot engine can result in a cracked block or cylinder head.

Use only a permanent-type coolant that meets Ford Specification ESE-M97B44-A, such as Ford Cooling System Fluid. Refer to the coolant mixture chart on the container for additional antifreeze protection information. Do not use alcohol or methanol antifreeze, or mix them with the specified coolant.

Plain water may be used in an emergency, but replace it with the specified coolant as quickly as possible to avoid damage to the system. With only water in the system, do not let engine run hot.

## Radiator

Inspect exterior of the radiator for obstructions. Remove all bugs, dirt or foreign material with a soft brush or cloth. Use care to avoid damaging the fins. If available, use low pressure compressed air or a stream of water in the opposite direction to normal air flow.

Check all hoses and connections for leaks. If any of the hoses are cracked, frayed, or feel spongy, they should be replaced.

## Drive Belts

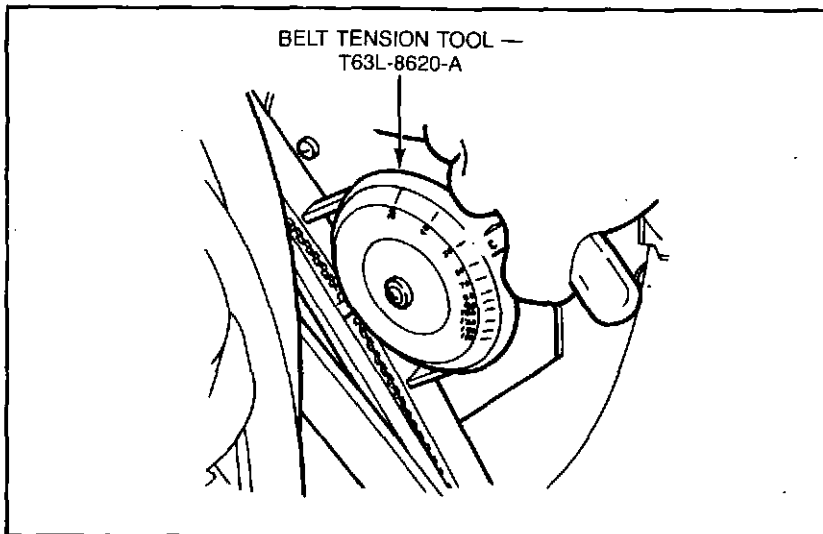
The water pump is belt-driven. This same belt may also drive the fan and/or alternator. The drive belt(s) should be properly adjusted at all times. A loose drive belt causes improper alternator, fan and water pump operation, in addition to overheating. Overtightening the belt may result in excessive wear on the alternator and water pump bearings, as well as premature wear on the belt itself. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt**, and when adjusted, it must be adjusted to the reset tension shown in the specifications.

# MAINTENANCE INSTRUCTIONS

## Belt Tension

Install the belt tension tool on the drive belt and check the tension following the instructions of the tool manufacturer.

If the tension is not to specification, loosen the alternator mounting and adjusting arm bolts. Move the alternator away from the engine until the correct tension is obtained. Remove the gauge. Tighten the alternator adjusting arm and mounting bolts. Install the tension gauge and recheck the belt tension.



## Battery

If there is any corrosion on the cables and terminals, remove it with a wire brush and neutralize the acid with a solution of baking soda or ammonia with water. After cleaning, flush the top of the battery with clean water, install the terminal clamps on the battery posts, and coat the parts with grease to retard further corrosion.

### Fluid Level (Non-Maintenance Free Battery)

Because the battery is the "heart" of your unit's electrical system, periodic checks are necessary to keep it functioning properly. Keep the battery level in each cell up to the level indicator.

# **MAINTENANCE INSTRUCTIONS**

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Ordinary tap water may be used except in areas where the water is known to be exceptionally hard or to have a high mineral or alkali content. In such areas, use distilled water. If water is added during freezing weather, run the engine 20 to 30 minutes before shutting it off. This mixes the added water with the electrolyte and will prevent it from freezing and damaging the battery. Have the battery charge checked regularly during extreme cold weather. When the specific gravity falls below 1.230 (corrected to 80°F), recharge the battery. Make sure the cables are clean and tightly clamped to the battery terminals. Keep the top of the battery clean and dry.

**WARNING** — Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or any ignited object to come near the battery. When charging or working near a battery, always shield your eyes. Always provide ventilation.

When lifting a plastic-cased battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.

## **Crankcase Ventilation System**

The closed system is known as the positive crankcase ventilation (PCV) system. Clean air is supplied from the air cleaner by a tube to the oil filler cap on the rocker cover. A calibrated port in the cap regulates the flow of fumes. A second tube vents the fumes via the intake manifold into the cylinder for combustion. The cap should be cleaned in a petroleum solvent at the recommended interval.

## **Fuel Filters**

### **Disposable Filter (If so Equipped)**

The disposable filter is an in-line type located in the line between the pump and the carburetor. Replace the filter by removing the inlet and outlet hose clamps. Disconnect the hose and discard filter. Install the new filter by connecting the hose from the fuel pump to the inlet side and the hose from the carburetor to the outlet side. Position the hose clamps and tighten. Start the engine and check for leaks.

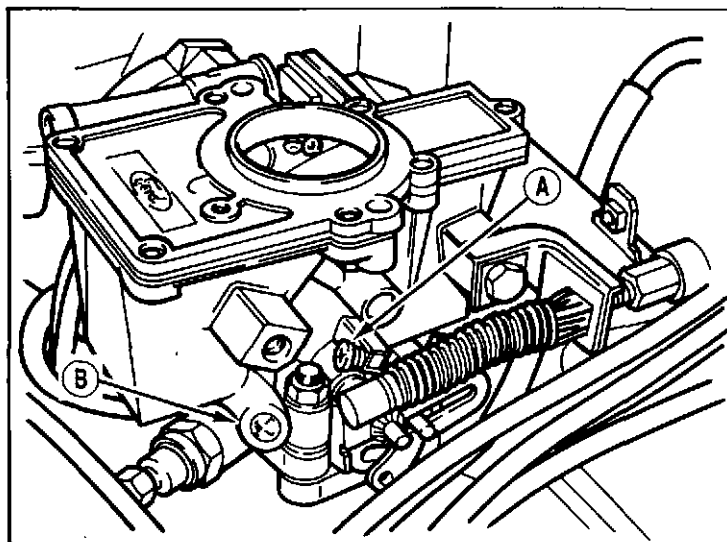
# MAINTENANCE INSTRUCTIONS

## VARIABLE VENTURI CARBURETOR ADJUSTMENTS

### Idle Speed and Idle Mixture Adjustment

The idle speed adjustment screw is accessible on the exterior of the carburetor. No adjustment of the fuel mixture will normally be required during routine maintenance. Therefore, the mixture adjusting screw is sealed with a tamper-proof plastic plug. Actually, there are three factors that control the conversion of the fuel and mixture into engine power. These factors are engine compression, ignition and correct carburetor adjustment. *Correct carburetor adjustment cannot be obtained, however, unless engine compression and ignition meet specifications.*

To make the adjustment, start the engine and operate it until it has reached normal operating temperature. Be sure the choke and throttle controls are pushed all the way in. Set idle rpm to specification.



IDLE ADJUSTING SCREWS. A — IDLE SPEED ADJUSTING SCREW  
B — IDLE MIXTURE ADJUSTING SCREW

# MAINTENANCE INSTRUCTIONS

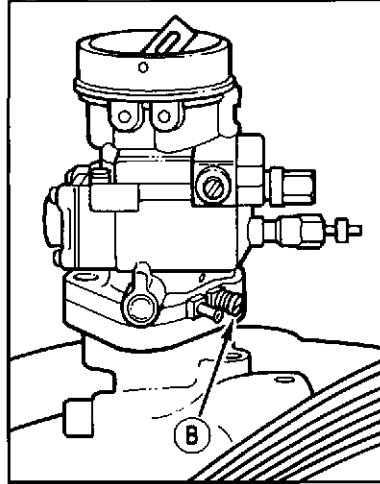
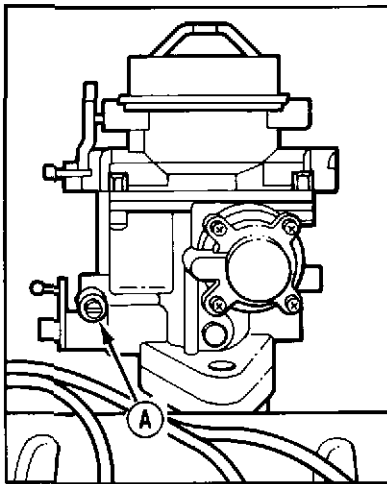
## Facet Carburetor Adjustments

### Idle Speed and Idle Mixture Adjustment

The idle speed adjustment screw, and the idle fuel mixture adjustment needle are accessible on the exterior of the carburetor. Actually, there are three factors that control the conversion of the fuel and mixture into engine power. These factors are engine compression, ignition and correct carburetor adjustment. Correct carburetor adjustment cannot be obtained, however, unless engine compression and ignition meet specifications.

To make the adjustments, start the engine and operate it until it has reached normal operating temperature. Be sure the choke and throttle controls are pushed all the way in.

Start the adjustments by setting the idle speed screw to obtain an engine speed of 750 rpm. Then turn idle fuel mixture adjustment needle in (clockwise) until the engine begins to roll. Then, back it out slowly until the engine is running smoothly. Reset the idle speed to 750 rpm.



IDLE ADJUSTING SCREWS. A — IDLE SPEED ADJUSTING SCREW  
B — IDLE MIXTURE ADJUSTING SCREW

### Fuel Level Adjustment

The fuel level float adjustment is made with the carburetor air intake body removed. First, turn the fuel shut-off valve to the OFF position, if so equipped. Remove the carburetor from the engine. Remove the 4 screws that retain the air intake body to the throttle body.

**CAUTION** — Lift the air intake body off slowly as the accelerator jet assembly is spring loaded and may be lost.

# MAINTENANCE INSTRUCTIONS

The float pontoons should be level when the valve is seated. If not, bend the tab carefully to adjust.

Reassemble the carburetor in reverse order of removal.

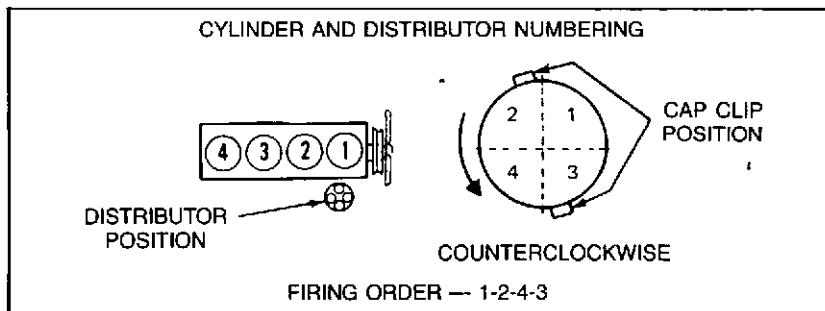
Adjust the carburetor idle speed and idle fuel/air mixture.

## IGNITION SYSTEM

Three types of ignition systems are used on this series of engines. The conventional type with breaker points, the breakerless solid state, and distributorless type. Use the appropriate maintenance procedures for the system on your engine.

A dual advance distributor, with a centrifugal and vacuum spark advance, is used with the distributor type systems.

The direction of distributor rotation is counterclockwise as viewed from the top of this distributor.



The spark plug wires are inserted in the distributor cap in the firing order of the engine 1-2-4-3. The cylinders are numbered from front to rear 1-2-3-4.

Disconnect the coil high tension lead and the spark plug wires at the distributor cap. Remove the distributor cap and rotor. Apply a few drops of engine oil to the distributor oil felt. Clean the inside of the cap and the rotor with a mild cleaning solvent. Remove dirt or corrosion from the sockets on the distributor cap. Inspect the rotor for cracks or a burned tip. Replace cap or rotor if they are defective.

### Breaker Point Ignition

Open the points and inspect them for a badly pitted or burned condition. Replace the points whenever inspection indicates or at the recommended interval. Replacement can be made without removing the distributor.

## **MAINTENANCE INSTRUCTIONS**

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To replace the breaker points, disconnect the primary lead. Remove the screws that secure the assembly to the breaker plate, then remove the assembly. Remove the condenser retaining screw and remove the condenser.

Clean the breaker plate and cam. Apply a **light** film of distributor cam lubricant C4AZ-19D530-A to cam. **Do not use engine oil.**

To install, place the assembly in position and install the retaining screws. Position the condenser and install the retaining screw. Attach primary lead from breaker assembly to the condenser terminal.

The breaker points should be adjusted to the correct gap with a feeler gauge or dwell meter. To adjust the points with a feeler gauge, turn the distributor shaft until the rubbing block rests on the peak of a cam lobe. Insert the correct blade of a clean feeler gauge between the points. The gap should be set to the larger opening because the rubbing block will wear down slightly while seating to the cam. When setting the points with a dwell meter, adjust the dwell angle to the low setting. This will also compensate for rubbing block wear.

### **Solid State Ignition**

The Solid State Ignition system has a large rotor, distributor cap and adapter, ignition secondary wires and wide gap spark plugs to take advantage of the higher energy produced.

No adjustments are made to the ignition system except initial timing and spark plug gap.

When installing a new distributor cap or rotor, coat the brass rotor electrode surfaces on all sides outboard of the plastic, including the outer edge, with D7AZ-19A331-A silicone dielectric compound, or equivalent to approximately 1/32 inch thickness. Do not reapply or attempt to remove any silicone coating from the distributor cap electrode. As this compound ages, it has the appearance of being a contaminant of the cap and rotor electrode. This condition is normal and causes no performance loss.

Coat the inside of each spark plug boot with silicone dielectric compound D7AZ-19A331-A or equivalent, using a small screwdriver blade. Connect each spark plug wire to the plug from which it was removed. Be sure each wire is fully depressed on each plug and molded boot is firmly in place.

# **MAINTENANCE INSTRUCTIONS**

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## **Distributorless Ignition System**

This system comprises the following components:

### **Crankshaft Position/Engine Speed Sensor**

This is located on the rear of the engine block and points towards the flywheel. A pattern of depressions on the flywheel is monitored by the sensor and one special longer depression corresponds to 90° before T.D.C. on piston number one. As the engine speed increases, so does the frequency and amplitude of the variable reluctance sensor voltage output signal.

### **ESCH II Module**

This receives the alternating signals from the sensor and computes this information together with engine load and temperature; to determine the optimum ignition advance for all engine operating conditions. It then interrupts the primary voltage to the DIS coils releasing the ignition spark at the optimum moment.

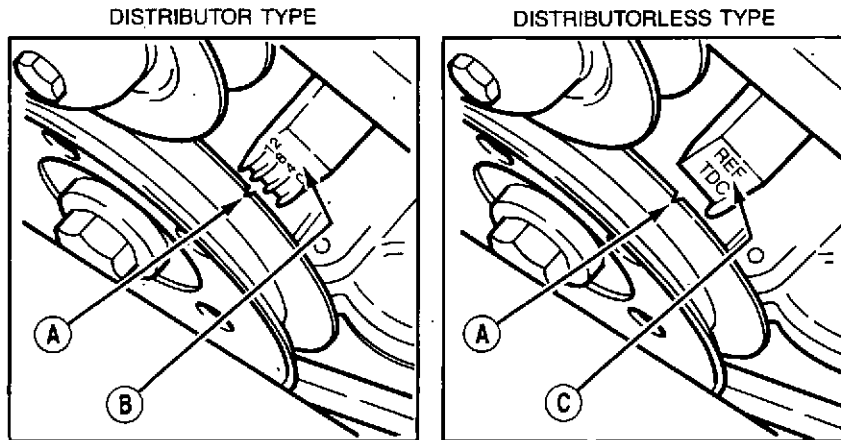
### **DIS Coil Assembly**

Internally, the DIS coils has two primary windings and two high voltage secondary windings. One secondary coil supplies high tension voltage to cylinders 1 and 4 and the other supplies cylinders 2 and 3 via high tension leads and spark plugs. When either of the two secondary coils is energised, two sparks are released, one going to a cylinder on the compression stroke, e.g. No. 1 and the other to No. 4 which is on the exhaust stroke. The unused spark does not have any detrimental effect.

The ignition circuit effectively becomes a maintenance free item with only the spark plugs requiring inspection and replacement at the specified service intervals.

Ignition timing is fixed with octane.

# MAINTENANCE INSTRUCTIONS



- A — TIMING NOTCH ON FRONT PULLEY  
B — TIMING MARKS ON FRONT COVER  
C — TIMING MARK FOR TOP DEAD CENTER REFERENCE

## Ignition Timing

Proper adjustment of ignition timing must be maintained to provide maximum engine power output and best possible fuel economy.

The degree marks or TDC reference pointer are located on the front cover. They are visible on the left side of the engine. The front pulley has a notch.

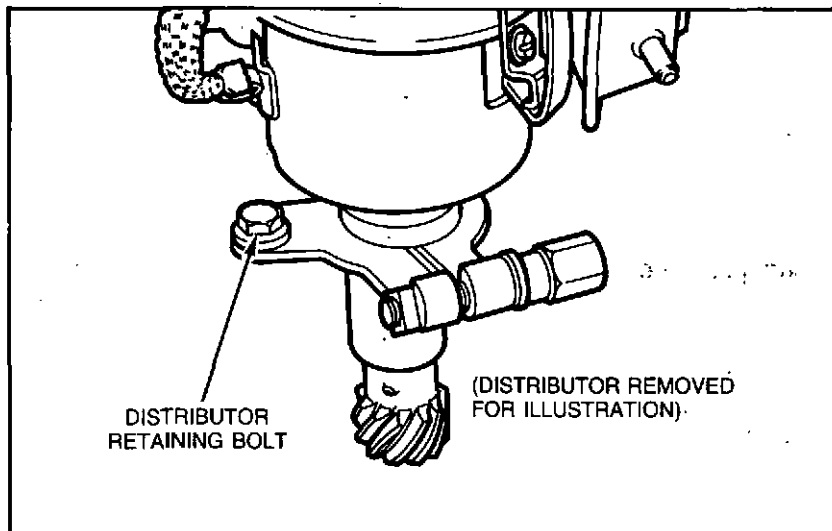
Connect the timing light high tension lead to the No. 1 spark plug (front cylinder), and the other two leads to the proper battery terminals. If necessary, clean the dirt from the timing marks, and chalk the marks and the notch to improve legibility. Disconnect and plug vacuum hose from the distributor (if applicable).

Operate the engine at idle rpm and direct the timing light on the timing marks. The light should flash just as the notch on the front pulley lines up between the 4 and 8. Check specifications for correct initial ignition timing.

If the degree marks on the front cover and the notch are not in line, loosen the distributor retaining bolt, and rotate the distributor body until the marks are in line.

**NOTE** — *The ignition timing is advanced by clockwise rotation of the distributor body, while counterclockwise rotation retards timing.*

## MAINTENANCE INSTRUCTIONS



When the proper timing is obtained, tighten the distributor retaining bolt, then accelerate the engine while watching the timing marks with the timing light to determine if the advance mechanism is functioning. The notch should advance as engine rpm increases. This check will confirm whether or not the advance mechanism is functioning. Remove plug and connect vacuum hose.

### Distributorless Ignition Timing

The ignition system does not require any mechanical external adjustments, however the spark plug high tension leads must be inserted correctly at each numbered coil position to the corresponding spark plug number in the cylinder (front to rear #1, 2, 3 & 4).

#### DISTRIBUTORLESS COIL TOWER NUMBER LOCATIONS

The ESC module controls the timing position in the start mode at 10° BTDC until the rpm reaches 250, thereafter the sensors are processed and timing is set to be compatible with engine speed, crankshaft position, engine load, engine coolant temperature and overspeed by the module.

### Spark Plugs

The spark plugs should be replaced at the recommended intervals.

Remove the wires from each spark plug by grasping, twisting and then pulling the moulded boot of the wire only. Do not pull directly on the wire because the wire connection inside the cap may become separated.

# **MAINTENANCE INSTRUCTIONS**

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After loosening each spark plug one or two turns, clean the area around each spark plug port with compressed air, then remove the spark plugs.

Set the spark plug gap to specifications by bending the ground electrode. All spark plugs new or used should have the gap checked.

Install the spark plugs and torque each plug to specifications.

Connect the spark plug wires.

**NOTE** — *Do not overtighten spark plugs. The gap may change considerably due to distortion of the plug outer shell.*

## **VALVE CLEARANCE**

The valve clearance can also be adjusted without the engine running. Rotate the crankshaft until No. 1 cylinder is at the top of the compression stroke. Check the timing marks. It should read 0 or TDC. Both valves on No. 1 cylinder are now closed. Set the valve clearance on both valves. Next, rotate the crankshaft 180° and set the valve lash on both valves on No. 2 cylinder. Again rotate the crankshaft 180° and set the valve lash on both valves on No. 4 cylinder. Rotate the crankshaft another 180° and set the valve lash on both valves on No. 3 cylinder.

## **GOVERNOR**

### **Oil Level**

Clean the body of the governor in the area of the fill plug.

Check the oil level by slowly removing the oil level plug. If oil drips out, the oil level is full. If oil doesn't drip out, slowly add engine oil into the oil fill hole. As soon as it begins dripping out the oil level hole, insert the plug.

### **Adjustment**

Before making any governor adjustments, check the governor drive belt tension with a belt tension gauge. Set the belt to the tension listed in the Specification Section. (Replace the belt if any damage is visual eg., cracks or shipping damage, etc.)

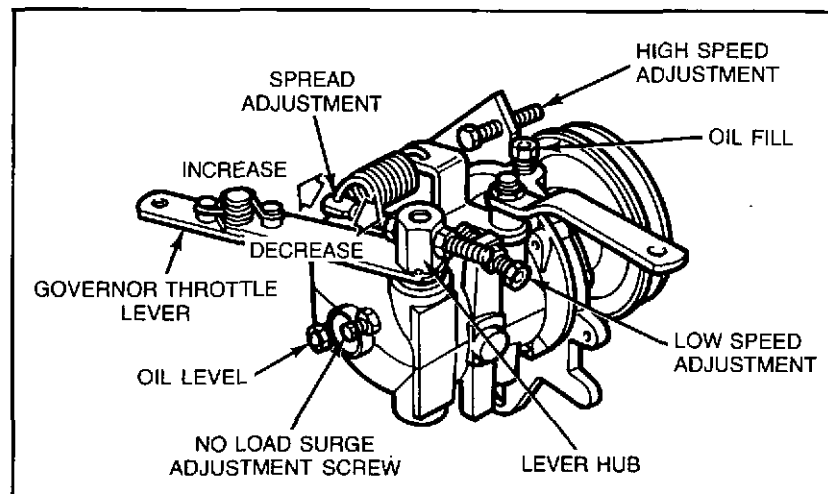
## MAINTENANCE INSTRUCTIONS

The first adjustment is the governor-to-carburetor control rod adjustment. With the control rod connected, manually move the governor throttle lever to the maximum open throttle position. Check that the carburetor throttle shaft lever is set from 1/32 to 1/16 of an inch from its maximum open position stop. If necessary adjust length of the control rod to obtain the setting. (3/8 to 7/16 of an inch on variable Venturi carburetors.)

To perform a high-speed adjustment, attach a tachometer to the engine, then run the engine until it reaches normal operating temperature.

- Loosen the locknut on the high speed stop screw.
- Disengage engine load.
- Slowly pull the throttle control to desired maximum no load engine speed.
- Adjust the high speed stop screw on the governor to attain the desired maximum engine speed — do not exceed the recommended maximum rpm.
- Tighten the locknut.

The next adjustment is for spread. Proper governor operation requires a difference between full-load and no-load governor speed. Too small an rpm spread between the two speeds will cause governor hunting and surging. Too large a spread will cause the low response. For this governor, normal rpm spread is approximately 250 rpm within the full load speed range of 2000-2800 rpm.



# **MAINTENANCE INSTRUCTIONS**

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To increase the rpm spread, adjust the screw to move the spring away from the lever hub.

To decrease the rpm spread, adjust the screw to move the spring closer to the lever hub.

The no-load surge adjustment is set at the factory and rarely requires adjustment. If necessary, this adjustment can be used to prevent **hunting and surging at no-load speeds only, provided the rpm spread adjustment is set properly**. Make the adjustment with the tachometer installed. Increase the engine speed with the hand throttle control to 75 rpm lower than the maximum no-load desired control rpm. (NOTE: At this point if the engine continues to surge, light pressure applied to governor throttle lever will dampen surges.) Then loosen the no-load surge adjustment screw locknut and turn the screw inward until the rpm increases to the desired control rpm. Reset high speed adjustment screw and tighten lock-nuts.

**CAUTION** — Do not turn the screw in all the way. It will interfere with proper governor operation and prevent the governor from returning the engine to idle speed.

## **Lubrication**

At the specified intervals, apply an appropriate lubricant, such as Lubriplate (COAZ-19584-A) at the pivot points of the throttle, governor and choke linkage.

## **STORAGE**

### **Less Than 120 Days**

While engine is running, treat upper cylinders by spraying recommended engine oil (S.A.E. 10), or equivalent into carburetor air intake for about 10 to 15 seconds. Open throttle for short burst of speed, shut off ignition and allow engine to come to a stop while continuing to spray recommended engine oil into air intake.

Leave spark plugs in holes or seal spark plug holes with suitable threaded metal plugs and cover all openings into engine with suitable non-hygroscopic material.

If engine is less transmission, spray flywheel and ring gear with mixture of one part recommended engine oil, and one part Stoddard Solvent, or equivalents.

Check coolant protection. Store indoors in dry area.

# **MAINTENANCE INSTRUCTIONS**

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## **For Indefinite Period**

Drain crankcase completely and refill with recommended engine oil (S.A.E. 10), or equivalent.

Run engine until completely out of gasoline, then restart and run on unleaded, undyed gasoline for at least 10 minutes.

While engine is still running and at completion of above run, treat upper cylinders by spraying one to two ounces of recommended engine oil into carburetor the air intake for about 10 to 15 seconds. Open throttle for short burst of speed, shut off ignition and allow engine to come to a stop while continuing to spray recommended engine oil into air intake.

Check coolant protection.

Disconnect and remove battery.

Clean exterior surface of engine.

Leave spark plugs in holes or seal spark plug holes with suitable threaded metal plugs.

Seal all openings in engine and accessories with Non-hygroscopic material. Mask off all areas to be used for electrical contact.

Make sure all surfaces are dry, then spray all taped openings, all engine accessories including ignition wiring, and all exterior surfaces of engine with Insulation Compound.

If engines are equipped with automotive type clutch, block clutch in slightly disengaged position so that lining and pressure plate are not in contact.

# SPECIFICATIONS

Engine Model Year		
	1984 to 1988	1989-
<b>General Specifications</b>		
VSG-411	4 Cylinder — 1.1 liter	
VSG-413	4 Cylinder — 1.3 Liter	
<b>Bore and Stroke</b>		
1.1	73.96 x 64.98 mm	68.68 x 75.48 mm
1.3	73.96 x 75.48 mm	
Firing Order	1-2-4-3	
Idle speed 1.1 and 1.3L	700-800	
Engine Maximum Speed 1.1 and 1.3L No Load	3050 RPM	
Engine Maximum Speed 1.1 and 1.3L Full Load	2800 RPM	
Lubrication Pressure (Hot @ 2000 RPM) Minimum	1.5 Bar (21.7 psi)	
<b>Belt Tension</b>		
Alternator New	79-101 lbs.	
Used-Reset Minimum	56-75 lbs.	
Governor New	75 lbs.	
Used-Reset Minimum	50 lbs.	
A used belt is one that has been in operation for 10 minutes or more. Reset belt tension when it meets minimum specification.		
<b>Capacities</b>		
Lubrication System — with Filter Change	3.25 Liter (3.5 qts.)	
Cooling System — Power Unit	11.35 Liter (12 qts.)	
<b>Fuel</b>		
1.1 and 1.3L Regular 1984-1985	89 Octane	—
1.1 and 1.3L Unleaded 1986-	—	87 Octane
$\frac{M + R}{2} = \text{Octane Avg.}$		
<b>Ignition System</b>		
Firing Order	1-2-4-3	
Distributor Rotation	Counter-clockwise	N/A <sup>#</sup>
Initial Timing (with 89 Octane Regular Gasoline) 1.1 & 1.3L	6° BTDC	N/A
DIS <sup>#</sup> (with 87 Octane Unleaded Gasoline) 1.1 & 1.3L	N/A	Fixed
Spark Plugs — (All) AGSF 22C Gap	0.75 mm	1.0 mm

<sup>#</sup>Not Applicable.

<sup>#</sup>Distributorless Ignition System.

**Conversion Factors**

Bar x 14.5 = Lbs/Sq. In.

Liter x 61.024 = Cubic In.

Millimeter x 0.03937 = Inches

# SPECIFICATIONS

	Engine Model Year	
	1984 to 1988	1989-
<b>Breaker Type</b>		
Distributor Point Gap	0.40-0.50 mm	N/A
Dwell Angle	48°-52°	N/A
Dwell Variation	Max 4°	N/A
Coil — Primary Resistance (Ohms)	1.20-1.40 (75°F)	N/A
Secondary Resistance (Ohms)	5.000-9.000 (75°F)	N/A
Primary External Resistor (Ohms)	1.50	N/A
Condenser — (Micro Farads)	0.21-0.25	N/A
<b>Solid State Type</b>		
Coil, Ignition — Primary Resistance (Ohms)	0.72-0.88	N/A
Secondary Resistance (Ohms)	4500-7000	N/A
Coil, Trigger — Resistance (Ohms)	1000-1200	N/A
Wire, Spark Plug Leads — Resistance	3000 Ohms Maximum Per Lead	N/A
<b>Distributorless Type</b>		
Coil Type	N/A	High Output DIS Coil
Coil Output	N/A	37.0 KV Min.
Primary Resistance (at the Coil Tower)	N/A	0.50-1.0 Ohm
High Tension Leads	N/A	30,000 Ohms per Lead Max.
<b>Valve Clearance</b>		
Intake Lash — Cold	0.22 mm	0.22 mm
Exhaust Lash — Cold	0.59 mm	0.32 mm

#/Not Applicable.

#/Distributorless Ignition System.

**Conversion Factors**

Bars x 14.5 = Lbs/Sq. In.

Liter x 61.024 = Cubic In.

Millimeter x 0.03937 = Inches

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