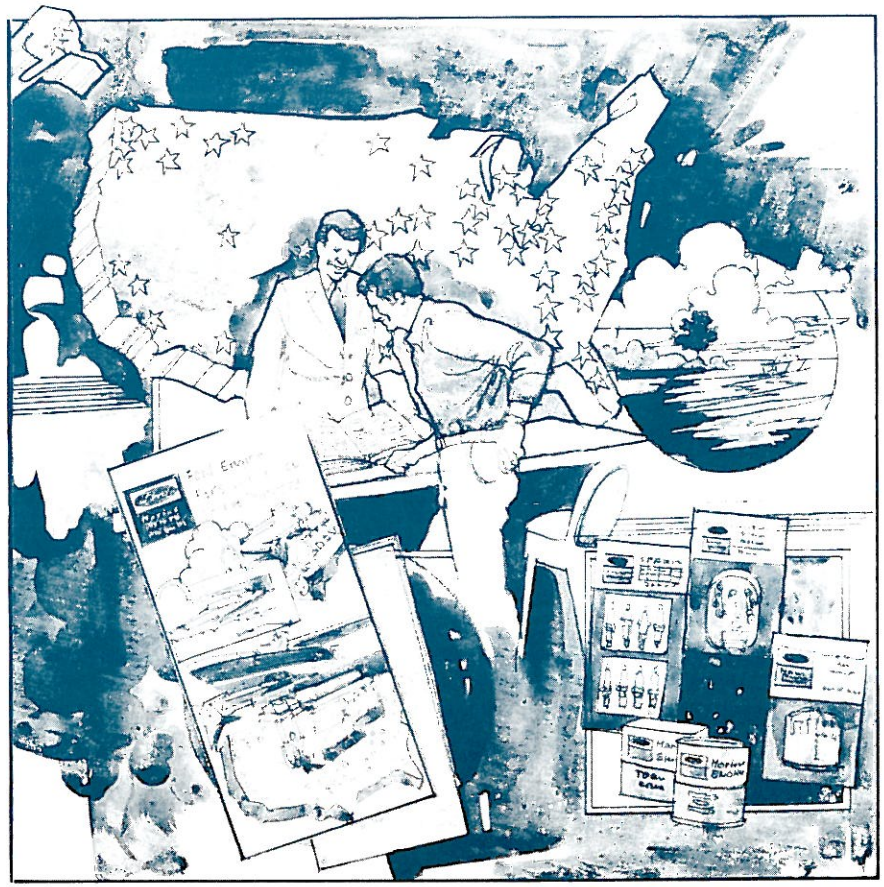
Ford

Power Products

LSG-423
2.3 LITRE
(140 CID)

MAINTENANCE AND OPERATOR'S MANUAL



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INTRODUCTION

We are highly pleased that you have selected a Ford unit for your engine requirements. The Ford Motor Company takes great pride in the long tradition of quality products and great values that the Ford name represents.

Ford Industrial Engines are tested and inspected before leaving the factory. However, certain checks should be made before putting them into regular operation. Read the Initial Start Up requirements in the Maintenance Instructions.

HOW TO USE THIS MANUAL

We wrote this manual especially for you. We hope you use it to get to know your engine and how to get the most out of it. That is why we urge you to read this manual from cover to cover. First, you'll become familiar with the various controls and instruments. As you read further, we tell you how to maintain your engine and what services need to be performed to keep it in excellent running condition.

The Subject Index on the title page permits you to quickly open the manual to any section. The Alphabetical Index at the back of the manual provides a page reference to a particular item or procedure.

Ford Industrial Engines are built with a variety of standard and/or optional components to suit a wide range of customer requirements. This manual does **not** identify equipment as standard or optional. All the equipment described in this manual may not be found on your engine or power unit.

The descriptions and specifications contained in this manual were in effect at the time it was approved for printing. The Ford Companies reserve the right to discontinue models at any time, or to change specifications or design without notice and without incurring obligation.

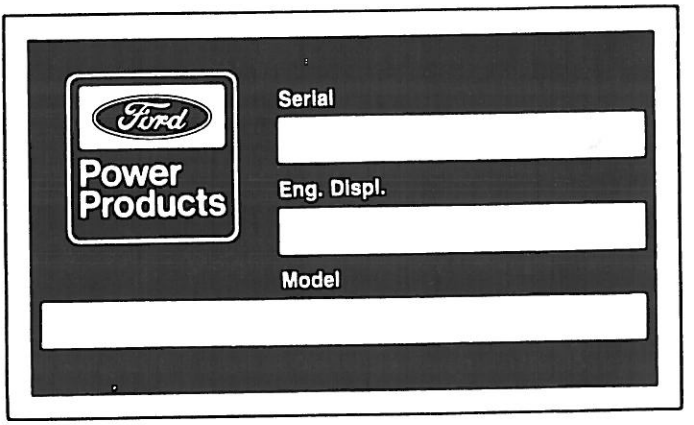
Ford

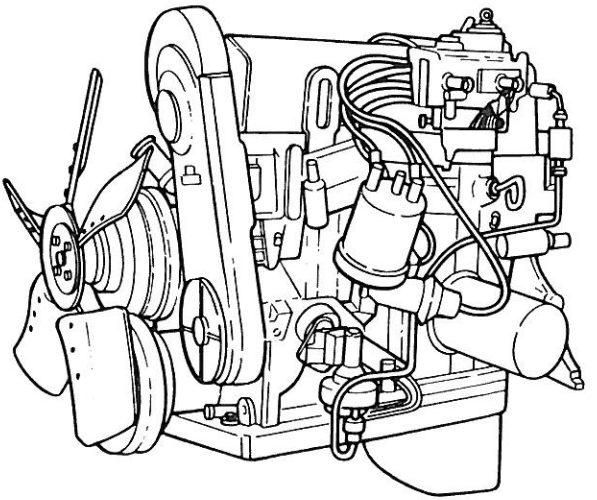
GEOMETRIC RESULTS

Power Products Division
Geometric Results Incorporated
19855 W. Outer Drive
Dearborn, MI 48124

ENGINE IDENTIFICATION

An Identification Decal is affixed to the rocker cover of each engine. The decal contains the engine serial number which identifies this unit from all others. Next is the engine displacement which determines the engine specifications, then the model number and S.O. or special options which 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, record the information on the decal below.





PARTS AND SERVICE

Replacement parts can be obtained through your local Ford Power Products Distributors and Dealers. They are listed in the accompanying directory or can be found in the yellow pages under "Engines."

Ford Power Products Distributors and Dealers are equipped to perform major and minor repairs. They are anxious to see that all of your maintenance and service needs are quickly and courteously completed.

SERVICE LITERATURE

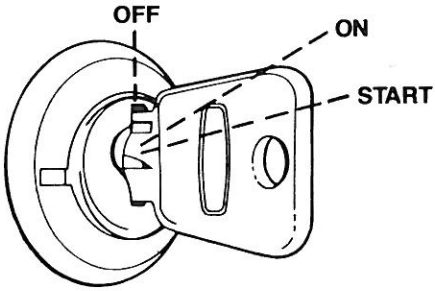
A service manual can be purchased from your distributor or dealer. This publication will provide the necessary servicing and overhaul information for your Ford Industrial Engine.

SERVICE MANUAL PPO 194-216

CONTROLS

IGNITION SWITCH

This three position switch is located on the control panel. 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 choke control is connected to the carburetor and operates the choke butterfly to enrich the fuel mixture on cold starts. Pulling the control out closes the choke and pushing it in opens the choke.

THROTTLE CONTROL

The throttle control is connected to the carburetor throttle shaft. 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.

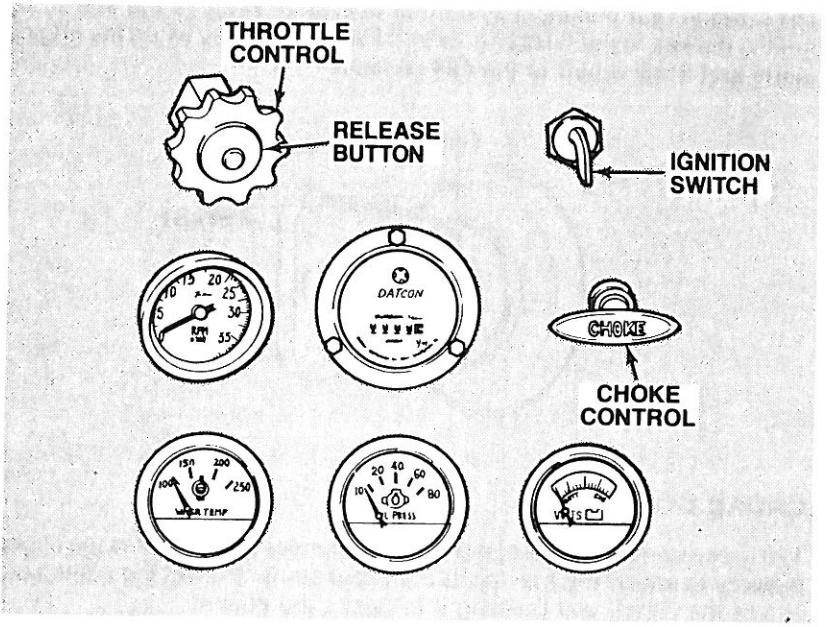
A final fine speed adjustment is obtained by turning the throttle control counterclockwise to increase engine speed or clockwise to decrease engine speed.

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. The normal force required to engage the clutch is 55 pounds for the overcenter type and 25 pounds for the spring loaded type.



INSTRUMENTS

OIL PRESSURE GAUGE

The oil pressure gauge registers the lubricating system pressure in pounds-per-square-inch and should be frequently checked to ensure that the system is functioning correctly. Normally the pressure registered by the gauge should remain constant for a given engine speed (see Specifications).

Should the pressure fluctuate or drop, stop the engine and find the cause. Do not operate the engine at lower than normal oil pressures.

VOLTMETER

The voltmeter measures the battery charging voltage. If the meter consistently indicates less than 13 volts or more than 15.5 volts under normal operation, have your engine's electrical system checked.

TEMPERATURE GAUGE

The temperature gauge registers the coolant temperature and will indicate overheating which may arise from low coolant level, clogged radiator, loose fan belt or faulty thermostat.

By operating the engine at the correct temperature, maximum power, longer life and better fuel economy will be ensured.

SAFETY SWITCH

The optional low oil pressure — high water temperature safety switch automatically shuts off the ignition when the oil pressure drops below a preset value, or when the water temperature rises above a preset value. The switch operates in conjunction with contacts integral with the oil pressure warning mechanism and the water temperature gauge. The contacts are adjusted by an Allen head screw on the face of the gauge. A button on the instrument panel is used to override the safety switch when starting the engine. **The safety switch override button must be depressed to start the engine.**

TACHOMETER

The tachometer (optional) indicates the engine speed in hundreds of revolutions per minute. It serves as a guide to maintain engine speed in the most desirable operating ranges.

HOURMETER

This instrument (optional) records the hours of operation and is used to determine when periodic maintenance is required.

STARTING THE ENGINE

Release the load on the power take-off, or if the engine is equipped with a transmission, disengage the clutch. If the engine is started with the load engaged, it imposes an unnecessary strain on the starter and battery.

CAUTION — 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

Pull the throttle out about 1/2 inch and the choke out about halfway. Turn the ignition switch to the START position. After the engine starts, release the key, decrease the throttle setting and adjust the choke for fast idle warm-up. When the engine is at normal operating temperature, push the choke in all the way.

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 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 COLD

Pull the throttle out about 1/2 inch and the choke all the way out. Turn the ignition switch to the START position. When the engine starts, release the key, adjust the choke setting to keep the engine running smoothly. When the engine is at normal operating temperature, push the choke in all the way.

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 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 push the choke in all the way. 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 the starter. This will prevent possible damage to the starter 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.

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 loss of coolant, it is best to stop the engine immediately, if necessary by applying the load. Add engine oil if necessary, then after the engine has returned to a normal temperature, add coolant slowly until the radiator is full.

CAUTION — 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 the engine stops due to low oil pressure, do not restart until the cause has been determined.

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 climatic conditions, operating conditions, change of servicing or fueling source, or change of operator.

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.

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 the 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 start switch 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 tank. You may be out of fuel. If there is fuel in the tank the trouble may be in either the ignition system or in the fuel system.
2. Check the ignition system. Remove the wire from one of the spark plugs by grasping the moulded cap of the wire only, and insert a short piece of bare wire or other metal in the terminal of the wire.

NOTE — 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.

Hold the cap 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, air leaks in the fuel line or a faulty fuel pump.
4. Check the manual choke. The choke linkage may be binding or damaged so that the choke plate in the carburetor is not opening and closing properly.

ENGINE RUNS HOT

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

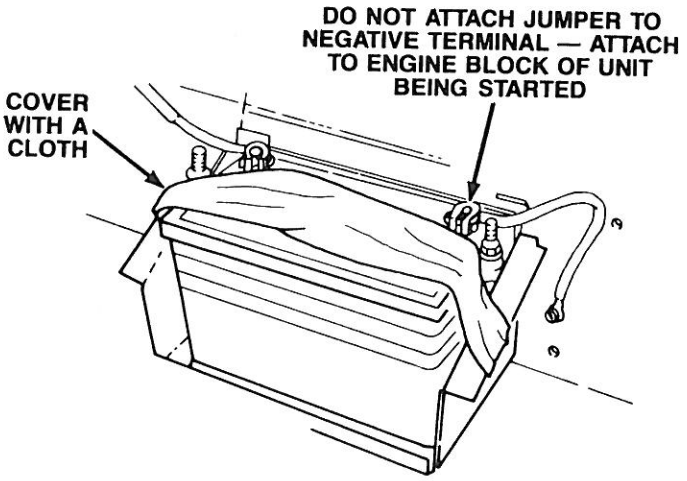
1. Low coolant level
2. Loose or broken fan belt(s)
3. Inoperative thermostat
4. Dirty cooling system
5. Radiator fins restricted with leaves, dirt, etc.
6. Prolonged idling
7. Running engine with frozen coolant
8. Leaky head gasket
9. Overloading, especially during hot weather

EMERGENCY STARTING

Use of Booster Battery and Jumper Cables — Particular care should be used when connecting to a booster battery in order to prevent sparks. To jump start (negative grounded battery):

1. Remove vent caps and cover the battery fill openings with a cloth
2. Shield eyes
3. Connect end of one cable to positive (+) terminals of each battery
4. Connect one end of other cable to negative (−) terminal of "good" battery
5. 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.



REMOVE CELL CAPS AND COVER THE BATTERY FILL OPENINGS WITH A CLOTH WHEN CHARGING OR USING 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.

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.

MAINTENANCE SCHEDULE AND RECORD

Initial Start-Up Sequence Checks	Operation	Daily	Every 100 Hours	Every 400 Hours	Every 800 Hours
1	Oil, Engine, Check Level	X			
2	Coolant, Check Level in Radiator ④	X			
3	Fuel, Oil and Coolant Leaks, Check	X			
	PTO Release Bearing, Lubricate	X			
4	Governor, Check Oil Level ②		X		
	Oil, Engine, Change ① ③		X		
	Oil Filter, Change ① ③		X		
5	Air Cleaner (Dry Type), Replace Element ①		X		
6	Battery, Check Charge and Fluid Level ③		X		
	Battery Cables, Clean ③		X		
7	PTO Bearings, Lubricate		X		
9	Fan, Alternator, and Governor Belts, Check and Adjust		X		
	Throttle, Governor and Choke Linkage, Lubricate		X		
13	Idle Speed, Check and Adjust		X		
14	Idle Mixture, Check and Adjust		X		
	Radiator, Inspect and Clean Exterior ③			X	
	Cooling System, Check or Refill ③			X	
	Fuel Filter, Replace			X	
	Spark Plugs, Clean, Adjust and Test or Replace			X	
	Distributor, Clean and Check Points (If so equipped)			X	
10	Ignition Timing, Check and Adjust (check advance)			X	
	PCV Valve, Replace			X	
	PCV Hoses, Tubes, and Fittings, Clean				X
11	Intake Manifold Bolts, Torque				X
15	Throttle and Governor Adjust ③				X
	Spark Plugs, Replace ③				X
	Points, Replace (If so equipped) ③				X
12	All Bolts and Nuts, Check for Tightness ③				
8	PTO Clutch Release and Shaft Bearings, Adjust ③				

① More frequent intervals may be required in dusty areas. (example dusty quarry or equivalent atmosphere use 50 hour change intervals).
② Mechanical Governor (belt driven).
③ Seasonal or as required.
④ Reference cooling air bleed caution on page 17

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 Preventive Maintenance Schedule (page 13) provides a handy check-off list as well as a sign-off and record as to when the operations were performed. **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:

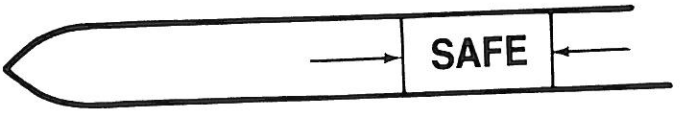
- Keep the fuel tank filled. A full tank reduces the possibility of condensation forming in the tank and moisture entering the fuel lines.
- Make frequent check of the engine oil and coolant levels.
- Check the battery fluid level often, especially if your engine is being operated in a warm, dry climate (if applicable).
- Keep engine air filter clean.
- Watch the engine temperature.
- Watch the engine oil pressure.
- Watch the voltmeter.
- Lube power take-off regularly (if applicable).

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
Check Oil Level

The oil level should be checked frequently, at least daily, and maintained between the SAFE 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 safe area on the dipstick.

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 operating in dusty areas, for extended idling or low speed operation, or frequent stops during cold weather. No break-in oil change is required.

> **WARNING — The American Petroleum Institute (API) has announced that continuous contact with USED motor oil has caused skin cancer in laboratory mice. The effects of used motor oil ON HUMANS has not been established. It is recommended, however, that as a precautionary measure, humans protect their skin by washing with soap and water after coming in contact with USED motor oil.**

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 (API Classification-SH). If SH oils are not available, SG oils are acceptable.

Gasoline engines that are converted for LPG or Natural Gas applications must use oils labeled SG and/or SH. Do not use oils that are specifically formulated for Diesel Engines only. CC or CD classification, even when labeled Heavy Duty or for Natural Gas Engines are not acceptable.

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 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.

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

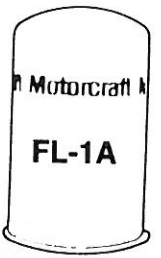
When Outside Temperature is Consistently	Use SAE Viscosity Number
Below +10°F.	*5W-20
Below +60°F.	5W-30
−10°F. to 90°F.	10W-30
Above −10°F.	10W-40 or 10W-50
Above +20°F.	20W-40 or 20W-50

*Not recommended for severe service — including high RPM Operation.

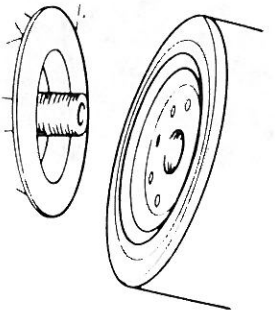
Oil Viscosity Recommendations

Oil Filter

Your engine is equipped with a Motorcraft oil filter. A filter of this quality should be used throughout the life of the engine. It is designed to protect your engine by filtering harmful abrasive and sludgy particles without clogging up or blocking the flow of the oil to vital engine parts. This filter is especially designed for use in engines built by Ford to give successful operation with the recommended oil filter change intervals.



Spin-On Type Filter Replacement — To replace the spin-on filter, place a drain pan under the filter and unscrew the filter unit. Discard the entire unit. Coat the gasket surface of the new filter with engine oil and hand-tighten it onto the adapter until the gasket contacts the adapter face; then advance another one-half turn. Fill the crankcase and run the engine to check for leaks. Tighten filter if necessary.



CAUTION — Do not handle a hot oil filter with bare hands.

AIR CLEANER

Air that contains dirt and grit produces an abrasive fuel mixture, and can cause severe damage to the cylinder walls and piston rings. Your air cleaner filters air entering the engine induction system and acts as a silencer. 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.

Dry Type

Replace the air cleaner paper filter element.

Remove the paper filter element from the air cleaner. Inspect the element for mud caking or signs of excessive wear or damage. Replace as necessary.

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

Check the air inlet housing before installing the air cleaner assembly on the engine. The inlet will be dirty if air cleaner servicing has been neglected or if dust laden air has been leaking past the air cleaner to air inlet housing seals.

Make sure that the air cleaner is seated properly on the inlet housing with the seal installed.

COOLING SYSTEM
Coolant Level

To refill the cooling system, fill radiator to the proper level with the recommended coolant mixture.

CAUTION — Bleed the air from the cooling system by disconnecting the by-pass hose at the "TEE" on the right side of the engine. When coolant flows from both the hose and the "TEE," reconnect and clamp the by-pass hose. Failure to bleed the cooling system may cause the engine to overheat.

Operate engine until thermostat opens and the radiator upper hose becomes hot.

Stop the engine and add coolant to approximately one inch below the filler neck.

CAUTION — 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 downward and finish removing cap. Do not add coolant to an 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 the 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 compressed air or a stream of water in the opposite direction to normal air flow.

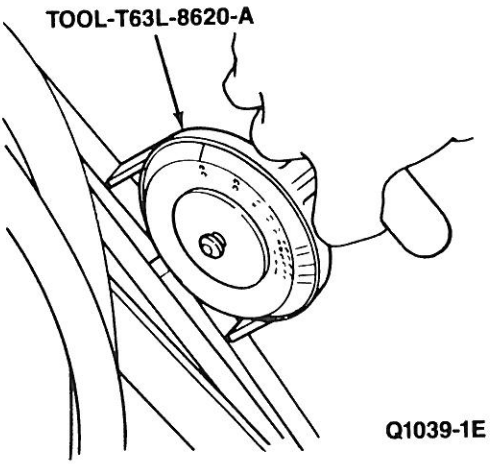
Check all hoses and connections for leaks. If any of the hoses are cracked, frayed, or feel spongy, they should be replaced.

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 excesive 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.

Belt Tension

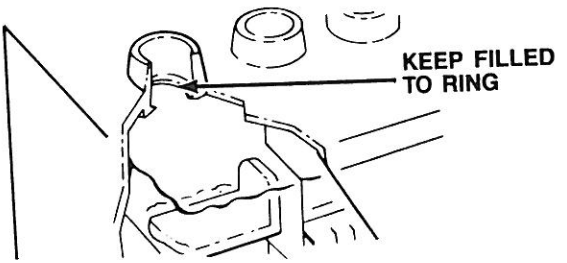
Install the belt tension tool on the drive belt and check the tension following the instructions of the tool manufacturer.



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
Checking Fluid Level

Because the battery is the "heart" of your unit's electrical 12 volt system, periodic checks are necessary to keep functioning properly. Keep the battery fluid level up to the ring under the filler cap (if applicable).



Adding Water

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.

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

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.

CRANKCASE VENTILATION SYSTEM

All engines are equipped with a positive crankcase ventilation system.

Clean air is supplied from the air cleaner by a tube to the closed cap on the rocker cover. The fumes are vented through an oil separator on the left side of the engine, then through a regulator valve and into the intake manifold. The P.C.V. valve (regulator valve) must be replaced at 400 hours. The hoses, tubes and fittings of this system must be cleaned at 800 hours.

FUEL FILTER

Disposable Filter

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.

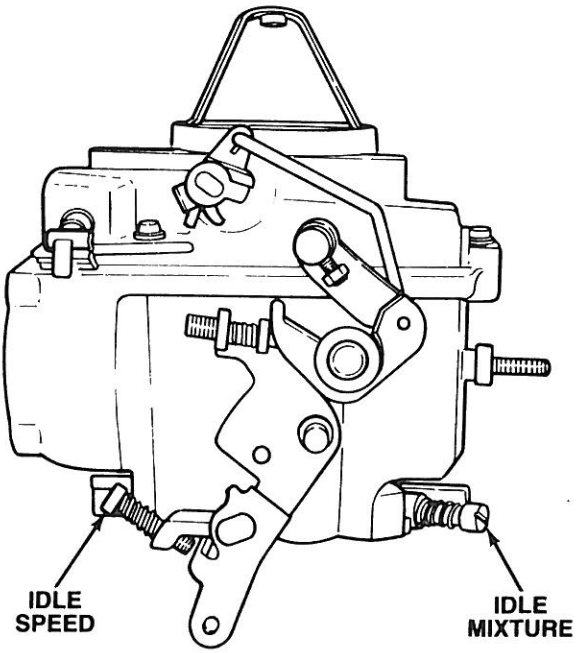
CARBURETOR ADJUSTMENTS
Idle Speed and Idle Mixture Adjustment

The idle speed adjustment screw, and the idle fuel mixture adjustment needle are accessible on the exterior of the carburetor.

There are three factors that control 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 600 rpm. Then turn the 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 600 rpm.



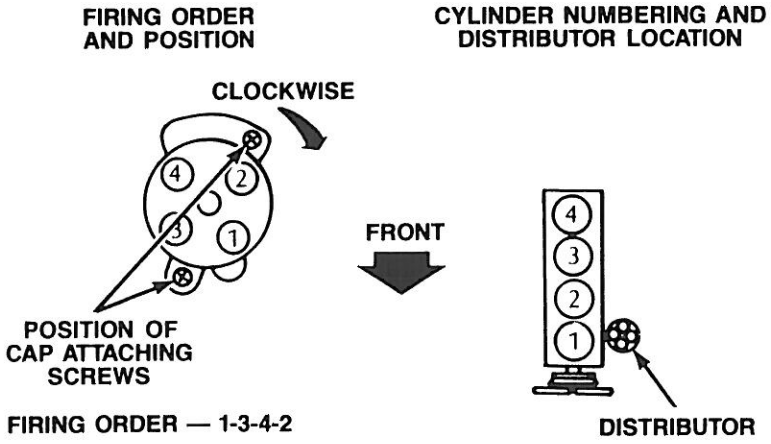
IGNITION SYSTEM

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

A dual advance distributor with a centrifugal and vacuum spark advance system is used with both systems.

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

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



Breaker Points

Disconnect the coil high tension lead and the spark plug wires at the distributor cap. Remove the distributor cap and rotor. Clean the inside of the cap and the rotor with a mild cleaning solvent. Remove dirt or corrosion from the terminals on the distributor cap. Inspect the rotor for cracks or a burned tip. Replace cap or rotor as required.

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.

To replace the breaker points, remove the primary lead to the breaker assembly. Remove the screw that secures 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 to cam. **Do not use engine oil.**

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

The breaker points must be accurately aligned and strike squarely in order to realize the full advantage provided by this design and to insure normal breaker point life. Turn the distributor cam (energize starter if distributor is in engine) so that breaker points are closed. Check the alignment of the points with a magnifying glass. Align the points to make full face contact by bending the stationary point bracket. **Do not bend the movable arm.** It is recommended that a special tool be used for this operation.

After the breaker points have been aligned, they 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. Lubricate the felt under the rotor using two drops of engine oil.

Ignition Timing

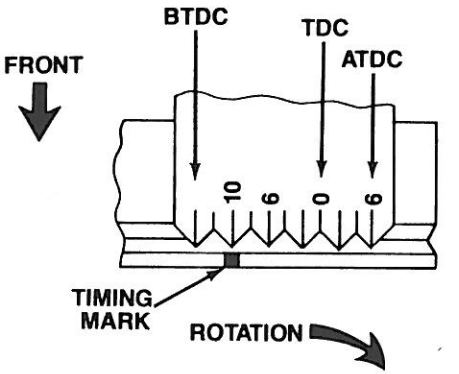
The ignition timing should be checked and adjusted at the recommended intervals. Proper adjustment of ignition timing must be maintained to provide maximum engine power output and best possible fuel economy.

The timing marks are located on the timing belt cover. These marks and a notch on the engine crankshaft are used to time the engine. The recommended timing setting is 10° BTDC Adjust the ignition timing as follows:

Disconnect and plug the distributor vacuum line. 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. Clean and chalk the timing mark to improve legibility.

Operate the engine until temperatures are normal, reduce the engine to idle (600 rpm max.) and direct the timing light at the stationary timing scale located on the timing belt cover. The timing light should flash as the notch on the crankshaft pulley aligns with the 10° BTDC position on the timing scale (reference illustration below).

If the pulley notch and 10° do not align, loosen the distributor retaining bolt and rotate the distributor until they do align, retorque the distributor retaining bolt.



CRANKSHAFT TIMING MARK

NOTE — Ignition timing is advanced by counterclockwise rotation of the distributor body — retarded by clockwise rotation.

When the proper timing is obtained, tighten the distributor retaining bolt, unplug and connect the distributor vacuum line. Accelerate the engine while watching the timing mark with the timing light to determine if the advance mechanism is functioning. The mark on the crankshaft pulley should advance as engine rpm increases. This check will confirm whether or not the advance mechanism is functioning, but it does not indicate proper distributor calibration.

In order to properly adjust the distributor advance, the distributor must be removed from the engine and checked on a distributor testing machine. If you do not have the proper equipment, your local Ford Power Products Dealer will be pleased to perform this operation for you. The distributor advance specifications are given in the Specifications Section.

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 cap of the wire only. **Do not pull directly on the wire because the wire connection inside the cap may become separated.**

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.

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 hose, insert the plug.

Adjustment

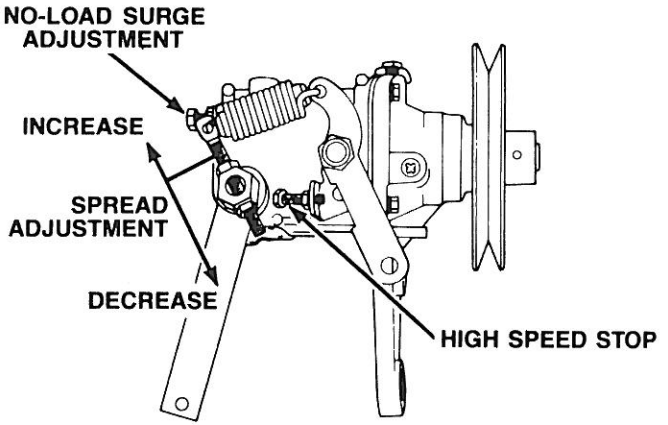
Before making any governor adjustments, check the governor drive belt tension with a belt tension gauge. Set the belt to the tension listed in the Specification Section.

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.

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 increase the throttle to desired maximum no load engine speed (5-10% higher than full load 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.

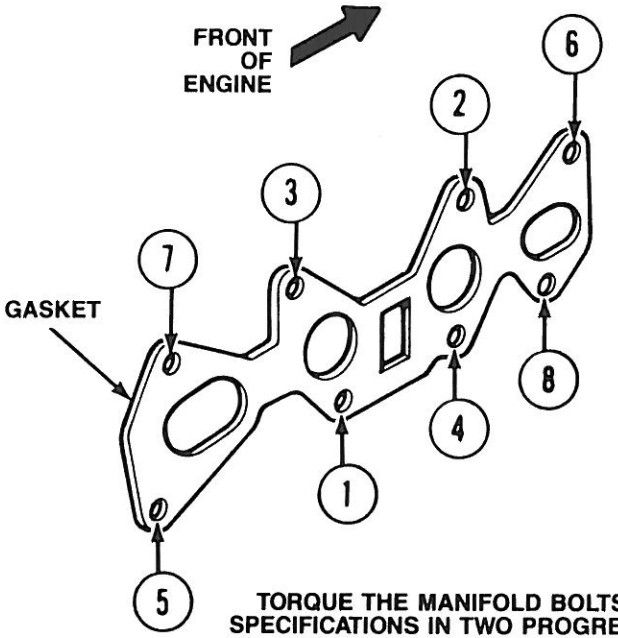


To increase the rpm spread, adjust the screw to move the spring away from the lever hub.

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 to 75 rpm lower than the maximum no-load desired control rpm. Then loosen the no-load surge adjustment screw locknut and turn the screw inward until the rpm increases to the desired control rpm.

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.



TORQUE THE MANIFOLD BOLTS TO SPECIFICATIONS IN TWO PROGRESSIVE STEPS IN THE SEQUENCE SHOWN

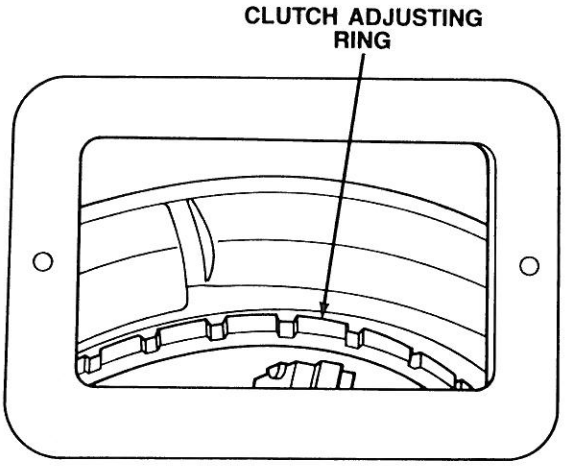
INTAKE MANIFOLD BOLT TORQUE

The intake manifold bolts are tightened in two steps. Torque the bolts to 5-7 ft-lbs in the sequence shown.

POWER TAKE-OFF
Rockford Over Center Clutch

A new clutch generally requires several adjustments until the friction surfaces are worn in. Do not let a clutch slip as this will glaze the friction plates and may ruin them.

To adjust the clutch, place the shifter lever in the released position, then remove the patent plate on the top of the housing. Rotate the clutch until adjusting lock and lock screw can be reached. Remove or disengage the adjustment ring lock. Then turn the adjusting ring. Counterclockwise rotation tightens the adjustment. Turn the adjusting ring until a pressure of 65-80 lbs. is required to engage the clutch. Reinstall the adjustment lock. Lubricate the friction points on the levers and linkage inside the housing with SAE 30 engine oil.



POWER TAKE-OFF ADJUSTING RING

FUNK SPRING LOADED CLUTCH

The clutch does not require adjustment. However, the free travel of the shift lever will decrease as the clutch lining wears.

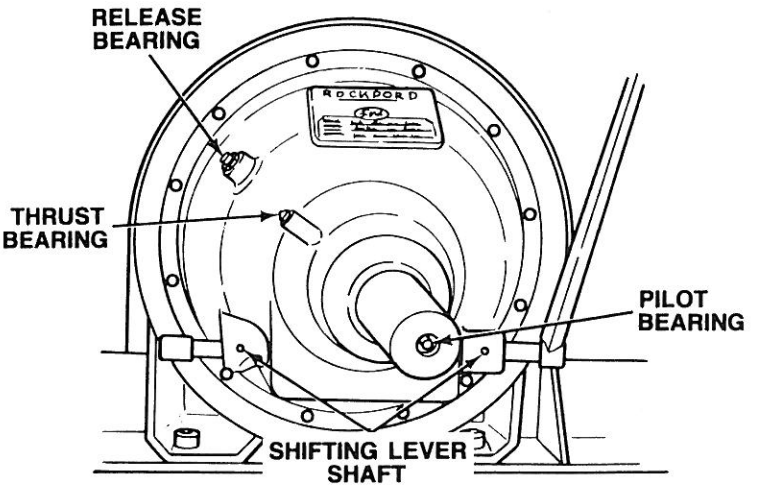
LUBRICATION

Use a high grade, Lithium Base #2, short fiber grease, such as Ford CIAZ-19590-B. Clean the fittings before and after greasing.

CAUTION — Do not use excessive force when greasing, and do not overgrease. Use grease sparingly. Excessive grease can coat the clutch plates and cause slippage.

On the Rockford PTO, lubricate the release bearing, thrust bearing, shifting lever bearings, and the pilot bearing.

On the Funk PTO, lubricate the thrust bearing and shifting lever bearings only. The pilot bearing and release bearing are pre-lubricated.



LUBRICATION FITTING

STORAGE

ONE MONTH

While the engine is running, treat upper cylinders by spraying recommended engine oil (SAE 10) or equivalent into the air intake for about two minutes. Open throttle for short burst of speed, shut off engine and allow it 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 dustproof caps or shields.

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

Check coolant protection.

FOR INDEFINITE PERIOD

Drain crankcase completely and refill with recommended engine oil, (SAE 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 recommended engine oil into the air intake for about two minutes. Open throttle for short burst of speed, shut off engine and allow it 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 Nonhydroscopic Adhesive Tape. 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 plates are not in contact.

SPECIFICATIONS

GENERAL SPECIFICATIONS

Displacement	2.3L
Number of Cylinders	4
Bore and Stroke	3.780 x 3.126
Firing Order	1-3-4-2
Idle Speed	600 rpm
Rated Engine Speed	Marine — 5600 rpm, Industrial — 4000 rpm

CYLINDER HEAD

Combustion Chamber Volume (cc)	59.55 - 62.55
Compression Pressure	PSI of the lowest cylinder must be at least 75% of the highest cylinder
Valve Guide Bore Diameter — Standard	
Intake and Exhaust	0.3433 - 0.3443
Valve Seat Width —	
Intake	0.060 - 0.080
Exhaust	0.070 - 0.090
Valve Seat Angle (Int. & Exh.)	45°
Valve Seat Runout (Max.)	0.0016
Valve Arrangement (Front to Rear)	E-I-E-I-E-I-E-I
Valve Tappet Bore Diameter	0.8430 - 0.8449
Gasket Surface Flatness	0.003 inches in any 6 inches 0.007 overall
Head Gasket Surface Finish RMS	60-150

VALVE ROCKER ARMS, ROCKER ARM SHAFT, PUSHRODS AND TAPPETS

Rocker Arm Lift Ratio	1.4 - 1.6:1
Valve Tappet or Lifter —	
Standard Diameter	0.8422 - 0.8427
Clearance to Bore	0.0007 - 0.0027
Service Limit	0.005
Hydraulic Leakdown Rate (Seconds)	2 - 8
Collapsed Tappet Gap —	
Allowable @ Cam	0.035 - 0.055
Desired @ Cam	0.040 - 0.050

VALVE SPRINGS

Compression Pressure (Lbs @ Spec. Length) with Damper Removed.	
Intake and Exhaust (Installed)	71 - 79 @ 1.52 inches
Industrial (Open Gage)	142 - 156 @ 1.12 inches
Marine (Open Gage)	152 - 166 @ 1.12 inches
Service Limit	5% loss of pressure
Valve Spring Free Length (Approx.)	1.877 inches
Valve Spring Assembly Height	1-17/32 - 1-19/32 inches
Valve Spring Out of Square (Max.)	5/64 (0.078 inches)

VALVES

Valve Stem to Valve Guide Clearance	
Intake	0.0010 - 0.0027
Exhaust	0.0015 - 0.0032
Service Limit	0.0055
Valve Head Diameter	
Intake	1.73 - 1.74
Exhaust	1.49 - 1.51
Valve Face Angle	44°
Valve Face Runout (Max.)	0.002
Valve Stem Diameter	
Standard	
Intake	0.3416 - 0.3423
Exhaust	0.3411 - 0.3418
0.003 Oversize	
Intake	0.3446 - 0.3453
Exhaust	0.3441 - 0.3448
0.0015 Oversize	
Intake	0.3566 - 0.3573
Exhaust	0.3561 - 0.3568
0.030 Oversize	
Intake	0.3716 - 0.3723
Exhaust	0.3711 - 0.3718

CAMSHAFT

Lobe Lift	
Intake & Exhaust (Industrial)	0.2382
Intake & Exhaust (Marine)	0.2437
Allowable Lobe Lift Loss (Max.)	0.005
Theoretical Valve Lift @ Zero Lash	
Intake & Exhaust (Industrial)	0.333 - 0.381
Intake & Exhaust (Marine)	0.341 - 0.390
Camshaft	
End Play	0.001 - 0.007
Service Limit	0.009
Camshaft Journal to Bearing Clearance	0.001 - 0.003
Service Limit	0.006
Camshaft Journal Diameter	1.7713 - 1.7720
Camshaft Journal Maximum Runout (T.I.R.)	0.005
Camshaft Journal Maximum Out-of-Round (Max.)	0.0005
Camshaft Bearings Location	
Distance in inches that the front edge of the bearing is installed towards the rear from the front face of the bearing tower	0.000 - 0.010

CYLINDER BLOCK

Cylinder Bore Diameter	3.7795 - 3.7831
Maximum Out-of-Round	0.0015
Service Limit — Out-of-Round	0.005
Service Limit — Taper	0.010
Cylinder Bore Surface Finish RMS	18 - 38
Main Bearing Bore Dia.	2.5902 - 2.5910
Distributor Shaft Bearing Bore Dia.	0.5155 - 0.5170
Head Gasket Surface Flatness	0.003 inch in any 6 inches 0.006 inch overall
Head Gasket Surface Finish RMS	60 - 150
Crankshaft to Rear Face of Block Runout	
TIR Maximum	0.005

CRANKSHAFT AND FLYWHEEL

Main Bearing Journal Diameter	2.3990 - 2.3982
Main Bearing Journal Max. Out-of Round	0.0006
Main Bearing Journal Runout — Max.	0.0020
Service Limit	0.005
Main Bearing Journal Thrust Face Runout	0.001
Main Bearing Journal Taper — Max.	0.0006 per inch
Thrust Bearing Journal Length	1.2010 - 1.1990
Main and Rod Bearing Journal	
Finish RMS — Max.	12
Main Bearing Thrust Face	
Finish RMS	35 Front/25 Rear (Max.)
Connecting Rod Journal Diameter	2.0464 - 2.0472
Rod Bearing Journal Maximum Out-of-Round	0.0006
Connecting Rod Bearing Journal	
Maximum Taper	0.0006 per inch
Crankshaft Free End Play	0.004 - 0.008
Service Limit	0.012
Flywheel Clutch Face Runout Limit	0.005
Flywheel Ring Gear Lateral Runout (T.I.R.)	
Standard Transmission	0.025
Automatic Transmission	0.060

CRANKSHAFT BEARINGS

Connecting Rod Bearings	
To Crankshaft Clearance — Desired	0.0008 - 0.0015
— Allowable	0.0008 - 0.0026
Wall Thickness - (Standard)	0.0619 - 0.0624
0.002 U.S. Thickness — Add 0.001 to Standard Thickness	
Main Bearings	
To Crankshaft Clearance — Desired	0.0008 - 0.0015
— Allowable	0.0008 - 0.0026
Wall Thickness - (Standard)	0.0951 - 0.0956

CONNECTING ROD

Piston Pin Bore	0.9096 - 0.9112
Connecting Rod Bearing Bore Dia.	2.1720 - 2.1728
Out-of-Round (Max.)	0.0004
Taper (Max.)	0.0004

Connecting Rod Alignment — Maximum total diff. Pin Bushing and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8-inch long bar measured 4 inches on each side of rod.

Twist	0.024
Bend	0.012
Connecting Rod Assembly (assembled to Crankshaft)	
Side Clearance	0.0035 - 0.0105
Service Limit	0.014
Length (Center to Center)	5.2031 - 5.2063

PISTON

Diameter (Measured 90° to pin centerline and at pin centering height.)	
Coded Red	3.7780 - 3.7786
Coded Blue	3.7792 - 3.7798
0.003 Oversize	3.7804 - 3.7810
Piston to Cylinder Bore Clearance	0.0014 - 0.0022
Piston Pin Bore Diameter	0.9123 - 0.9126
Ring Groove Width	
Top Compression Ring	0.080 - 0.081
Bottom Compression Ring	0.080 - 0.081
Oil Ring	0.1880 - 0.1890

PISTON PIN

Length	3.010 - 3.040
Diameter	
Standard	0.9119 - 0.9124
To Piston Clearance	0.0002 - 0.0004
To Connecting Rod Clearance (approx. 0.00175)	Interference Fit

PISTON RINGS

Ring Width	
Compression Ring (Top & Bottom)	0.077 - 0.078
Side Clearance	
Compression Ring (Top & Bottom)	0.002 - 0.004
Oil Ring	Snug Fit
Service Limit	0.006 Maximum
Ring Gap	
Compression Ring (Top & Bottom)	0.010 - 0.020
Oil Ring	0.015 - 0.055

SPECIFICATIONS

LUBRICATION SYSTEM

Oil Pressure — (Operating Temp. @ 2000 RPM) ..... 40 - 60 psi
Relief Valve Spring Tension —
Lbs. @ Specified Length ..... 15.2 - 17.2 @ 1.20
Drive Shaft to Housing Bearing Clearance ..... 0.0015 - 0.0030
Relief Valve Clearance ..... 0.0015 - 0.0030
Rotor Assembly End Clearance —
Pump Assembled ..... 0.0010 - 0.0040
Outer Race to Housing — Radial Clearance ..... 0.001 - 0.013
Crankcase Capacity (Quarts) 4
Add one quart extra when changing oil filter.

APPROXIMATE COOLANT CAPACITIES

Coolant Capacity (Quarts) (Power Unit) 11.5

NOTE — Read Coolant System & Level on page 17 before operating the engine.

FUEL PUMP

Static Pressure (P.S.I.) ..... 5.0 - 7.0
Minimum Volume Flow ..... 1 Pint in 25 Seconds
Eccentric Total Lift (Inches) ..... 0.304 - 0.326

TORQUE SPECIFICATIONS — General Applications	
U.S. THREAD SIZES	**TORQUE**
1/4-20	6-9
5/16-18	12-18
5/16-24	14-20
3/8-16	22-32
3/8-24	27-38
7/16-14	40-55
7/16-20	40-60
1/2-13	55-80
METRIC THREAD SIZES	**TORQUE**
M-6	6-9
M-8	14-21
M-10	28-40
M-12	50-71
M-14	80-114
PIPE THREAD SIZES	**TORQUE**
1/8	5-8
1/4	12-18
3/8	22-33
1/2	25-35

TORQUE LIMITS

NOTE — All values are in ft-lbs unless otherwise stated. Oil threads with lightweight engine oil unless the threads require oil resistant or water resistant sealer.

TORQUE SPECIFICATIONS — Special Application		
ITEM	**SIZE**	**TORQUE (FT. LB)**
Auxiliary Shaft Gear Bolt	M-10	28-40
Auxiliary Shaft Thrust Plate Bolt	M-6	6-9
Belt Tensioner (Timing) Pivot Bolt	M-10	28-40
Belt Tensioner (Timing) Adjusting Bolt	M-8	14-21
Camshaft Gear Bolt	M-12	50-71
Camshaft Thrust Plate Bolt	M-6	6-9
Carburetor to Spacer Stud	M-8	7.5-15
Carburetor Spacer to Manifold Bolt	M-8	10-14
Connecting Rod Nut	M-9	30-36 ⑤
Crankshaft Damper Bolt	M-14	103-133
Cylinder Head Bolt	M-12	80-90 ⑥
Distributor Clamp Bolt	M-10	14-21
Distributor Vacuum Tube to Manifold Adapter		5-8
Exhaust Man to Cyl Head Bolt Stud or Nut	M-10	20-30 ⑦
Flywheel to Crankshaft Bolt	M-10	56-64
Fuel Pump to Cylinder Block	M-8	14-21
Intake Manifold to Cyl Head Bolt or Nut	M-8	14-21
Main Bearing Cap Bolt	M-12	75-85 ⑧
Oil Pressure Sending Unit to Block		8-18
Oil Pump Pickup Tube to Pump	M-8	14-21
Oil Pump to Block	M-8	14-21
Oil Pan Drain Plug to Pan	M-14	15-25
Oil Pan to Block	M-6	10-13.5
Oil Filter Insert to Block		20-35
Rocker Arm Cover to Cylinder Head	M-6	5-8
Spark Plug to Cylinder Head	M-14	5-10
Temperature Sending Unit to Block		8-18
Water Jacket Drain Plug to Block		23-28
Water Pump to Block Bolt	M-8	14-21
Auxiliary Shaft Cover Bolt	M-6	6-9
Water Outlet Connection Bolt	M-8	14-21
Cylinder Front Cover Bolt	M-6	6-9
Inner Timing Belt Cover Stud	M-8	14-21
Outer Timing Belt Cover Bolt	M-6	6-9

⑤ Torque in sequence — Two steps 25-30 & 30-36
⑥ Torque in sequence — Two steps 50-60 & 80-90
⑦ Torque in sequence — Two steps 14-17 & 20-30
⑧ Torque in sequence — 50-60 & 75-85

STARTER

Positive Engagement Starter Motor					
Diameter	Current Draw Under Normal Load (Amps)	Normal Engine Cranking Speed (rpm)	Min. Stall Torque @ 5 Volts	Max. Load (Amps)	No Load (Amps)
4 in. (101.6mm)	150	110	9.0 ft.-lbs. 1.245 kg-m	460	70

Starter Brushes				
Mfg. Length	Wear Limit	Spring Tension (Ounces)	Through Bolt Torque	Mounting Bolt Torque
0.50 in. (12.7mm)	0.25 in. (6.35mm)	40	55-75 in.-lbs. 98.23-133.95 gm-cm	15-20 ft.-lbs. 2.075-2.766 kg-m

Maximum Commutator runout is 0.005 inch. Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

IGNITION SYSTEM

DISTRIBUTOR

Gear Location Dimension — Distributor
(Distance from bottom of mounting flange to bottom of gear) ..... 2.220 - 2.230
Shaft End Play Clearance — Distributor ..... 0.022 - 0.033
Voltage (D.C.) ..... 12 volts

BREAKER POINT TYPE

Initial Spark Advance — BTDC	10°
Breaker Arm Spring Tension	17-21 oz.
Contact Spacing	0.025
Dwell Angle at Idle Speed	37°-41°
Condenser	
Capacity — Microfarads	0.21 - 0.25
Minimum Leakage — Megohms	10
Maximum Series Resistance Ohms	1
Coil	
Primary Resistance — Ohms	1.40 - 1.54 (75°F.)
Secondary Resistance — Ohms	7600 - 8800 (75°F.)
Amperage Draw	
Engine Stopped	4.5
Engine Idling	2.5
Primary Circuit Resistance — Ohms	1.30 - 1.40 (75°F.)
Spark Plugs	
Plugs (Motorcraft)	AWSF-42
Gap (Inches)	0.032 - 0.036

SOLID STATE TYPE

Coil

Primary Resistance Wire — Ohms	1.13 - 1.23 (75°F.)
Secondary Resistance — Ohms	7700 - 9300 (75°F.)
Amperage Draw	
Engine Cranking	4.0
Engine Idling	5.0
Emitter (Ohms)	0.31 - 0.35 (75°F.)
Collector (Ohms)	0.41 - 0.45 (75°F.)
Base (Ohms)	7.1 - 7.9 (75°F.)
Rotor Air Gap Voltage Drop (KV Max.)	8.0
Spark Plugs	
Plugs	AWSF-52
Gap (Inches)	0.042 - 0.046

DISTRIBUTOR ADVANCE CHARACTERISTICS

Centrifugal Advance. Set the test stand to 0° at 250 rpm and 0 inches at vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
500	0 - 1/2	0
850	3 - 5	0
1000	5 - 7	0
1500	9-1/2 - 11-1/2	0
2100	10-1/2 - 13	0

Vacuum Advance. Set the test stand to 0° at 1000 rpm and 0 inches of Hg.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	0 - 2-1/2	5
1000	4 - 7	10
1000	6-3/4 - 9-1/4	15
1000	6-3/4 - 9-1/4	20

BELT TENSION

Belt Tension
- New ..... 120-150 ft.-lbs.
- Used ..... 90-120 ft.-lbs.

Governor
- New ..... 120-150 ft.-lbs.
- Used ..... 90-120 ft.-lbs.

A used belt is one that has been in operation for 10 minutes or more.

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