Ford

Power Products

IRRIGATION ENGINE LSG-875

MAINTENANCE AND OPERATOR'S MANUAL

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INTRODUCTION

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 Irrigation 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 the 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 operating instructions. 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 particlar item or procedure.

Ford Irrigation 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 MOTOR COMPANY
INDUSTRIAL ENGINE OPERATIONS
FORD PARTS AND SERVICE DIVISION
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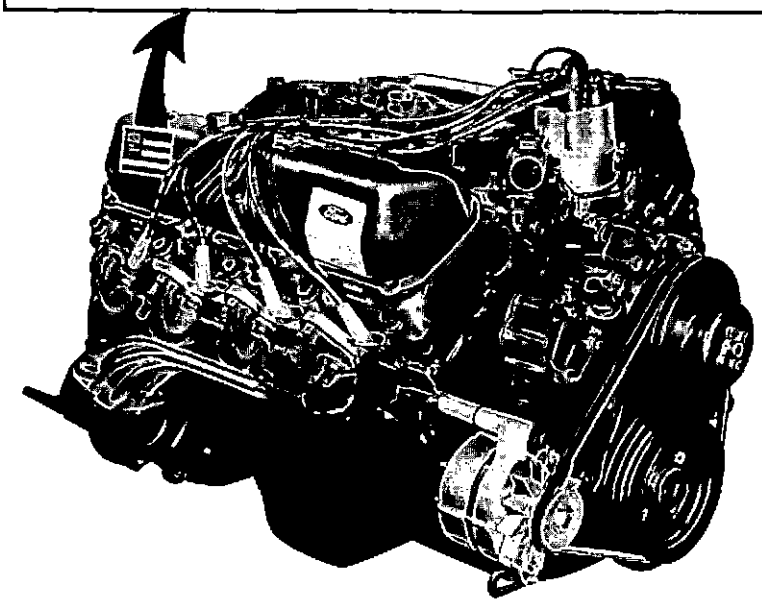
INTRODUCTION

ENGINE IDENTIFICATION

An Identification Decal is affixed to the right side 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 determines 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.



INTRODUCTION

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 parts list can be obtained from your distributor or dealer. This publication will provide the necessary service replacement parts information for your Ford Irrigation Engine.

PARTS LIST IEO 194-198

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. If the engine is started with the load engaged, it imposes an unnecessary strain on the starter and battery.

Normal Starts

Pull the throttle out about ½ inch and the choke out about halfway. Turn the ignition switch to the ON position. Push the starter button. After the engine starts, decrease the throttle setting and adjust the choke for fast idle warm-up. When the engine is at normal operating temperature, release the choke.

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 ½ inch and the choke all the way out. Turn the ignition switch to the ON position. Press the starter button. When the engine starts, adjust the choke setting to keep the engine running smoothly. When the engine is at normal operating temperature, release the choke.

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.

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 fuel 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.

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 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 maintainted 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 (Page 10).

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 ON position and press the starter button. 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 engine compartment when the ignition switch is turned to ON and the starter button depressed. 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 (Page 8).

Engine Cranks But Won't Start

1. Check the fuel supply. You may be out of fuel. If there is fuel available, the trouble may be in either the ignition system or 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 object 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 ¼ 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 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 belt.
3. Inoperative thermostat.
4. Inoperative water pump.
5. Leaky head gasket.

EMERGENCY STARTING

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):

(1) remove vent caps and cover the battery fill openings with a cloth

(2) shield eyes

(3) connect ends of one cable to positive (+) terminals of each battery

(4) connect one end of other cable to negative (−) terminal of "good" battery

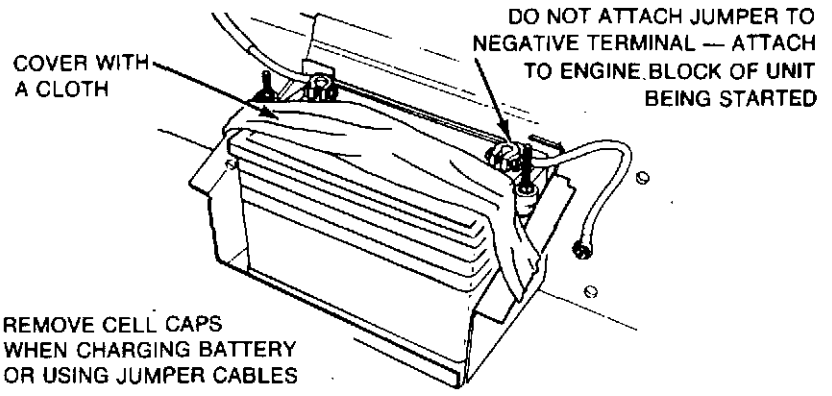
(5) connect other end of cable to engine block on unit being started (NOT TO NEGATIVE (−) TERMINAL OF BATTERY).

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.

OPERATING INSTRUCTIONS



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 booster and jumper cable hook-up to start an engine with a dead battery, as this will damage the unit's electrical system.

MAINTENANCE INSTRUCTIONS

MAINTENANCE SCHEDULE AND RECORD

Initial Start-up Sequence	Operation	Daily	Every 100 Hours	Every 200 Hours	Every 400 Hours	Every 800 Hours	Seasonal or As Required
1	Oil, Check Level						
2	Coolant, Check Level						
3	Fuel, Oil and Coolant Leaks, Check						
	Oil, Change						
	Oil Filter, Change						
4	*Air Cleaner (Dry Type)*, Clean or Replace Element						
5	Battery, Check Charge and Level						
	Distributor, Lubricate						
	Crankcase Vent System Breather Cap, Clean						
	Battery Cables, Clean						
6	Water Pump and Alternator, Belt, Check and Adjust						
	Throttle, and Choke Linkage, Lubricate						
	Fuel Filter, Replace						
	Cooling System, Check or Refill						
11	Idle Speed, Check and Adjust						
12	Idle Mixture, Check and Adjust						
13	Load Adjustment						
	Spark Plugs, Clean, Adjust and Test						
	Distributor, Clean and Check Points						
7	Ignition Timing, Check and Adjust (Check Centrifugal Advance)						
	PCV Valve, Replace						
	PCV Hose and Fitting, Clean						
9	Intake Manifold Bolts, Torque						
14	Throttle Adjust						
	Spark Plugs, Replace						
	Points, Replace						
8	Cylinder Head Bolts, Torque						
10	All Bolts and Nuts, Check for tightness						

MAINTENANCE INSTRUCTIONS

INITIAL START UP

Your Ford Irrigation 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 10) provides a handy check-off list as well as a sign-off and record as to when the operations were performed. Perform the 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.
- Check the battery fluid level often, especially if your engine is being operated in a warm, dry climate.
- Keep engine air filter clean.
- Watch the engine temperature.
- Watch engine oil pressure.

SCHEDULED PREVENTIVE MAINTENANCE

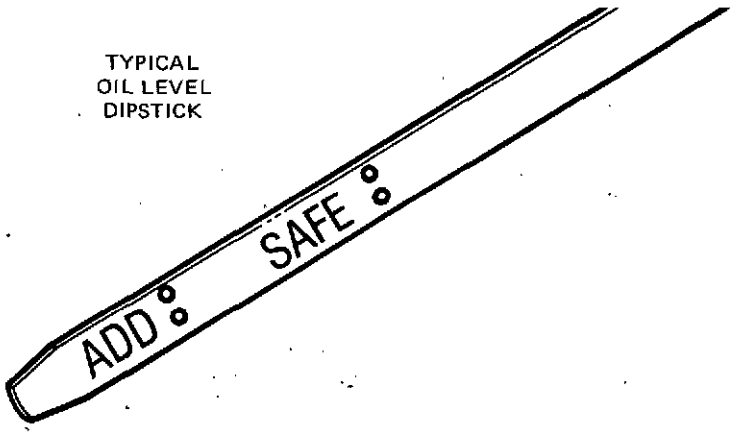
The operations listed in the maintenance schedule are covered in detail on the following pages. Whenever your vehicle requires maintenance of any kind your Ford Power Products distributor or dealer has skilled technicians who will do an expert job of keeping your engine in its prime condition.

Engine Oil

Checking Oil Level

The oil level should be checked frequently, at least daily, and maintained between the SAFE and ADD 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 ADD mark 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 operated in dusty areas, for extended idling or low speed operation, or frequent stops during cold weather. No break-in oil change is required.

Oil Quality

Use Ford or Motorcraft oil or equivalent that meets Ford Specification ESE-M2C153-A (API Classification SE). Improved engine oils labeled "API Classification SF" (Ford Specification ESE-M2C153-B) are expected to be introduced. Oils labeled API SF or in combination with other classifications, i.e., SF SE, SF CC, SF CD are preferred as they offer improved wear protection. These improved oils should be used as soon as they are available.

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 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.	20W-20
+32°F. to +90°F.	30
Above 60°F.	40

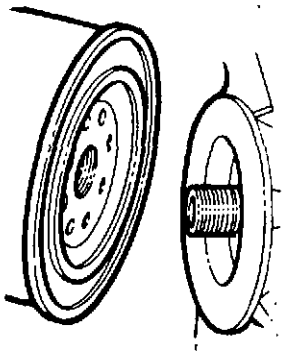
MULTI-VISCOSITY OILS

When Outside Temperature is Consistently	Use SAE Viscosity Number
10°F. to +90°F.	10W-30
10°F. to +90°F. (or above)	10W-40
Above +10°F.	20W-40

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 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 and 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 adaptor until the gasket contacts the adapter face; then advance another one-half turn. Fill the crankcase and run the engine to check for leaks.



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

Refer to the maintenance schedules for the proper intervals for changing the oil filter.

Air Cleaner

Clean or replace the air cleaner paper filter element.

Remove the paper filter element from the air cleaner and clean by directing compressed air on the pleats on the inside of the element.

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 seals.

Make sure that the air cleaner is seated properly on the carburetor and the seal is installed correctly.

Cooling System

Coolant Level

Maintain the coolant level at one inch below the top of the surge tank.

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.

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

When refilling the cooling system with plain water, add one can of Ford Rotunda Rust Inhibitor #8A-19546-C. If temperatures below −32° F. are anticipated, replenish coolant with equal parts water and Ford Rotunda Long Life Coolant Concentrate #8A-19549-A. This will provide protection to −35° F., and at the same time will permit engine operation up to temperatures of +240° F. If coolant other than this is used it must meet Ford Specification #M-97B18-C.

Drive Belt

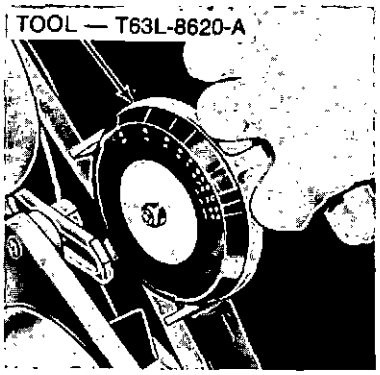
The water pump is belt driven. This same belt may also drive the alternator. The drive belt should be properly adjusted at all times. A loose drive belt causes improper alternator and water pump operation, in addition to overheating. Overtightening the belt may result in excessive wear on the alternator 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.

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.

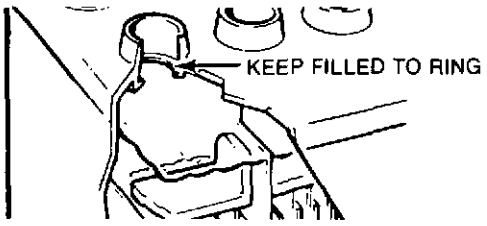


Checking Belt Tension

Battery

Checking Water Level

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



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 extremely 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 and 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

The engines are equipped with a breather cap, located on the left rocker cover. The fumes are vented through a regulator valve (P.C.V.), located in the right rocker cover. A hose connects the regulator valve to the induction system.

The breather cap should be cleaned in a petroleum solvent at every oil change. The regulator valve (P.C.V.) must be replaced at 400 hours. The hose and fittings of this system must be cleaned at 800 hours.

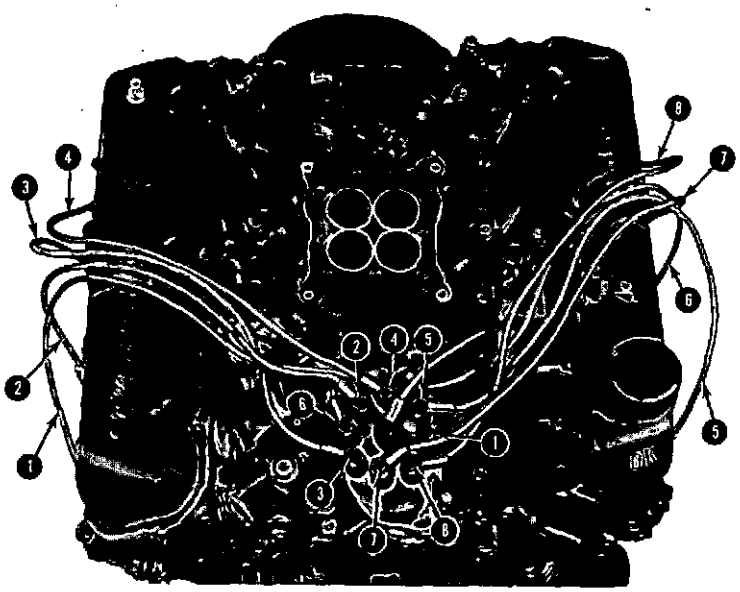
Ignition System

Distributor and Breaker Points

A centrifugal advance distributor is used with this engine.

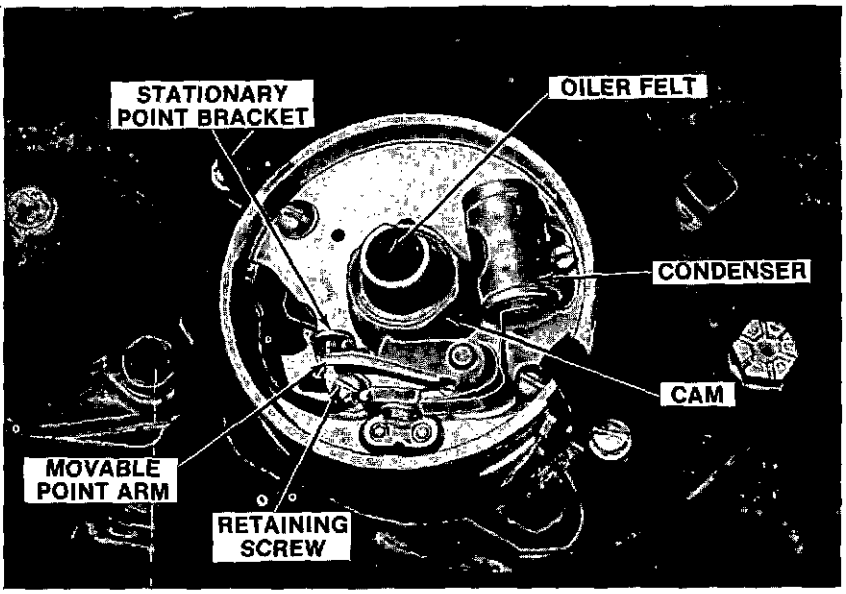
The direction of distributor rotation is counterclockwise as viewed from the top of this distributor.

The spark plug wires are inserted in the distributor cap in the firing order of the engine 1-5-4-2-6-3-7-8. The cylinders are numbered from front to rear 1-2-3-4 on the right side and 5-6-7-8 on the left side.



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 sockets on the distributor cap. Inspect the rotor for cracks or a burned tip. Replace cap or rotor if they are defective.

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.



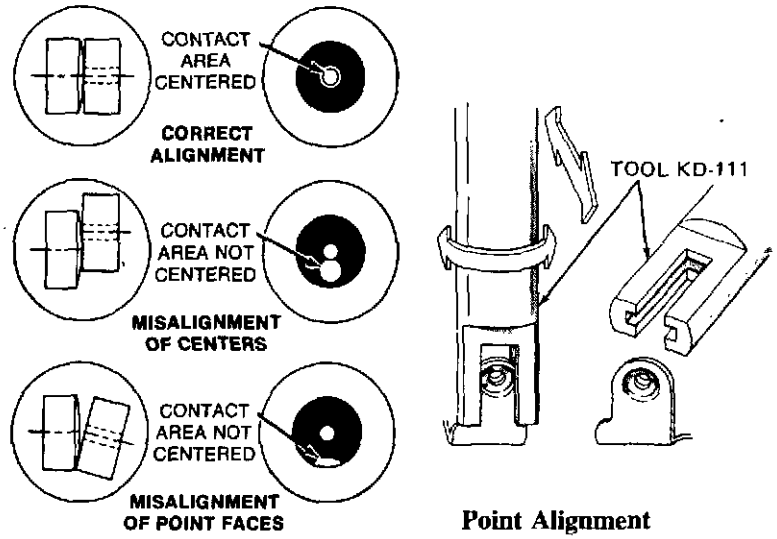
To replace the breaker points, remove nut and washer retaining the condenser lead and primary wire to the breaker assembly. Remove the screw that secures the assembly to the breaker plate, then remove the assembly. Remove the condenser retaining screw and remove the condenser.

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 wire to breaker assembly and install washer and nut.

The vented-type 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



Point Alignment

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.

Ignition Timing

Each time the distributor points are replaced or adjusted, the ignition timing should be checked and adjusted as necessary. Proper adjustment of ignition timing must be maintained to provide maximum engine power output and best possible fuel economy.

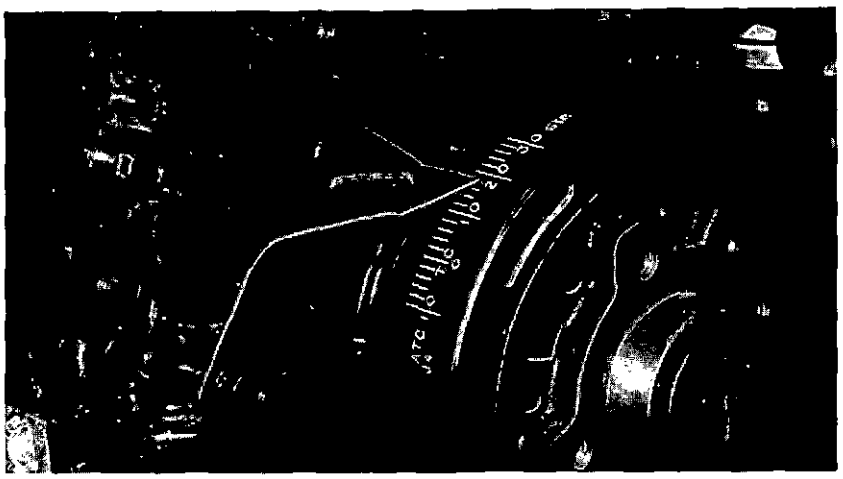
The timing marks are located on the vibration damper. The timing pointer is visible from the right side.

Connect the timing light high tension lead to the No. 1 spark plug, and the other two leads to the proper battery terminals. If necessary, clean the dirt from the timing marks, and chalk the marks to improve legibility.

Operate the engine at a maximum of 600 rpm, and direct the timing light onto the damper from the right side of the engine. The light should flash just as the 18° (natural gas) mark lines up with the pointer.

If the 18° mark and the pointer do not line up, loosen the distributor hold down bolt, and rotate the distributor body until they are in line.

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



When the proper timing is obtained, tighten the distributor body clamp, then accelerate the engine while watching the timing mark with the timing light to determine if the advance mechanism is functioning. The pointer 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 Distributor or 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 cleaned, tested and gapped 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.

Clean the plugs using a brass or wire brush.

NOTE — Do not use a power wire brush.

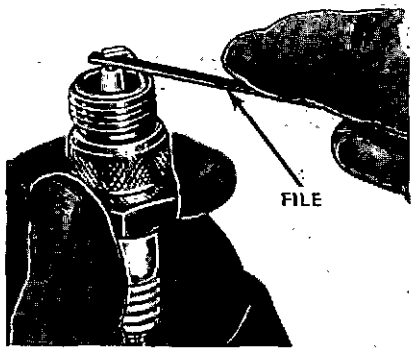
After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of malfunction. Replace as required.

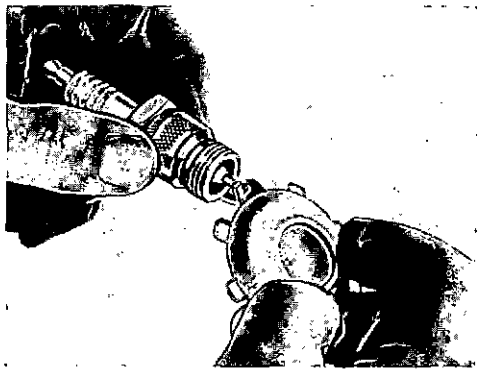
After cleaning, dress the electrodes with a small file to obtain flat parallel surfaces on both the center and side electrodes. Set the spark plug gap to specifications by bending the ground electrode. All spark plugs new or used should have the gap checked and reset as required.

Install the spark plugs and torque each plug to specifications.

Connect the spark plug wires.

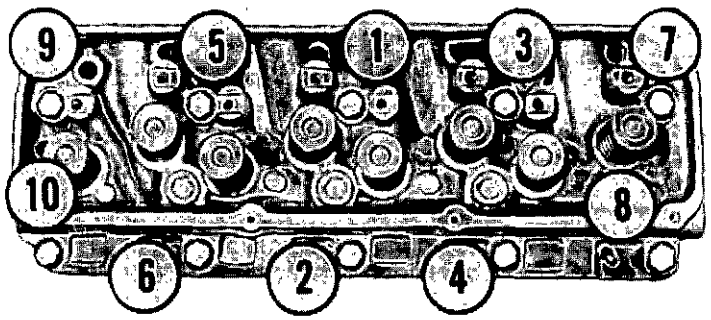
NOTE — Do not overtighten spark plugs. The gap may change considerably due to distortion of the plug outer shell.





Cylinder Head Bolt Torque

Proper tightening of the cylinder head bolts is important in preventing leaky cylinder head gasket or cylinder head and block distortion. The bolts must be tightened with a torque wrench in three progressive steps, in the sequence shown. Torque the bolts to 70-80 ft.-lbs., then to 100-110 ft.-lbs. and finally to 130-140 ft.-lbs.



Torque the cylinder head bolts before starting your engine and also after the engine has been warmed up to normal operating temperature.

Lubrication

At the specified intervals, apply a few drops of engine oil to the distributor oil cup, and apply an appropriate lubricant, such as Lubriplate (COAZ-19584-A) at the pivot points of the throttle, governor and choke linkage.

STORAGE

One Month

While engine is running, treat upper cylinders by spraying M-4834-A, Engine Oil (S.A.E. 10), or equivalent into carburetor air intake for about two minutes. Open throttle for short burst of speed, shut off ignition and allow engine to come to a stop while continuing to spray M-4834-A 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 M-4850, Anti-Rust Bodied Oil, and one part M-4970, Stoddard Solvent, or equivalents.

Check coolant protection.

For Indefinite Period

Drain crankcase completely and refill with M-4834-A, Engine Preservative Oil (S.A.E. 10), or equivalent.

MAINTENANCE INSTRUCTIONS

Run engine until completely out of gasoline, then restart and run on M-534-H or equivalent unleaded, undyed gasoline for at least 10 minutes.

While engine is still running and at completion of above run, treat upper cylinders by spraying M-4834-A into carburetor air intake for about two minutes. Open throttle for short burst of speed, shut off ignition and allow engine to come to a stop while continuing to spray M-4834-A 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 M-6471, Non-hydroscopic Adhesive Tape, or equivalent. 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 M-4858-B, Insulation Compound, or equivalent.

SPECIFICATIONS

GENERAL

Compression Ratio 8.0:1
Bore and Stroke 4.36x3.850
Firing Order 1-5-4-2-6-3-7-8

CYLINDER HEAD

Valve Guide Bore Diameter
Standard Intake and Exhaust 0.3433-0.3443

Valve Seat Width
Intake 0.060-0.080
Exhaust 0.060-0.080

Valve Seat Angle ..... 45°

Valve Seat Runout — Maximum Desired 0.0015

Gasket Surface Flatness ..... 0.003 in any 6 inches, 0.006 overall

Headgasket Surface Finish RMS 80-200

VALVE ROCKER ARMS, PUSH RODS AND LIFTERS

Rocker Arm Lift Radio 1.71:1

Valve Push Rod [Maximum Runout] 0.015

Valve Lifter
Standard Diameter 0.8740-0.8745
Clearance To Bore 0.0007-0.0027
Wear Limit 0.005
Hydraulic Lifter Leakdown Rate .. 5-50 Seconds Maximum — Measured at 1/16 inch plunger travel.

Collapsed Tappet Gap
Allowable 0.075-.175
Desired ..... .100-.150

VALVE SPRINGS

Valve Spring Pressure Lbs. @ Specified Length
Pressure ..... 240-265 @ 1.330
76-84 @ 1.810

Valve Spring Free Length Approximate 2.030

Valve Spring Assembled Height Pad to Retainer 1-51/64-1-53/64

Valve Spring Out-of-Square (Maximum) ..... 5/64 [.078]

SPECIFICATIONS

VALVES

Valve Stem to Valve Guide Clearance
- Intake & Exhaust 0.0010-0.0027
- Wear Limit 0.0055

Valve Head Diameter
- Intake 2.075-2.090
- Exhaust 1.646-1.661

Valve Face Angle ..... 44°
- Valve face runout — maximum 0.0020

Valve Stem Diameter
- Standard — Intake & Exhaust 0.3416-0.3423
- 0.003 Oversize 0.3466-0.3453
- 0.015 Oversize 0.3566-0.3573
- 0.030 Oversize 0.3716-0.3723

CAMSHAFT

Lobe Lift
- Intake 0.2530
- Exhaust 0.2780
- Maximum allowable lobe lift loss 0.005

Theoretical Valve Lift
- Intake 0.4470
- Exhaust 0.4509

Camshaft
- End Play 0.001-0.006
- Wear Limit 0.009

Camshaft Journal To Bearing Clearance
- Clearance 0.001-0.003
- Wear Limit 0.006

Camshaft Journal Diameter
- Standard — Nos. 1, 2, 3, 4, 5 ..... 2.1248-1.1248
- Camshaft Journal Maximum Runout 0.005
- Camshaft Journal Maximum Out-of-Round 0.0005

Camshaft Bearings Inside Diameter.
- Bearing Nos. 1, 2, 3, 4, 5 ..... 2.1258-2.1268

Camshaft Bearing Location —
- Distance in inches that the front edge of the bearing is installed towards the rear from the front of the cylinder block 0.0400-0.0600

Timing Chain Deflection — [Maximum] 0.500

SPECIFICATIONS

CYLINDER BLOCK

Cylinder Bore Diameter (Standard) 4.3600-4.3636
Maximum Out-of-Round ..... .0015
Wear Limit 0.005
Cylinder Bore Surface Finish RMS 18-38
Maximum Taper 0.001
Wear Limit 0.010

Tappet Bore Diameter 0.8752-0.8767

Main Bearing Bore Diameter 3.1922-3.1930

Cylinder Block Distributor Shaft
Bearing Bore Diameter 0.5160-0.5175

Head Gasket Surface Flatness .... 0.003 inch in any 6 inches, 0.006 inches overall
Head Gasket Surface Finish RMS 60-150

CRANKSHAFT AND FLYWHEEL

Main Bearing Journal Diameter 2.9994-3.0002
Main bearing journal maximum out-of-round 0.0006

Main Bearing Journal Runout — Maximum 0.002

Main Bearing Journal Thrust Face Runout 0.001

Main Bearing Journal Taper — Maximum .... 0.0006 per inch

Thrust Bearing Journal Length 1.124-1.126

Main Bearing Surface Finish RMS Maximum
Journal 12
Thrust Face ..... 25 Front — 23 Rear

Connecting Rod Journal Diameter 2.4992-2.5000
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

Crankshaft To Rear Face of Block Runout TIR Maximum 0.005

Flywheel OD Runout 0.017

SPECIFICATIONS

CRANKSHAFT BEARINGS

Connecting Rod Bearings
- To Crankshaft Clearance — Desired 0.008-0.0015
- To Crankshaft Clearance — Allowable 0.0008-0.0028

Wall Thickness — Standard 0.0756-0.0761
For Each 0.002 Undersize Thickness — Add 0.001 To Standard Thickness

Main Bearings
- To Crankshaft Clearance — Desired .... Nos. 2, 3, 4 and 5 0.0010-0.0020
- To Crankshaft Clearance — Allowable .. Nos. 2, 3, 4 and 5 0.0012-0.0028
- Wall Thickness — Standard 0.0955-0.0958
- For Each 0.002 Undersize Thickness — Add 0.001 To Standard Thickness

CONNECTING ROD

Piston Pin Bore 1.0386-1.0393
- Maximum out-of-round 0.0005
- Maximum taper 0.001

Connecting Rod Bearing Bore Diameter 2.6522-2.6530
- Connecting rod bearing maximum out-of-round and taper 0.004

Connecting Rod Length Center to Center 6.6035-6.6065

Connecting Rod Alignment — Maximum Total Difference
Pin 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 ..... .024
- Bend ..... .012

Connecting Rod Assembly [Assembled to crankshaft]
- Side Clearance 0.010-0.020
- Wear Limit 0.023

PISTON

Diameter —
[Measured at the piston pin bore centerline at 90° to the pin bore.]
- Coded Red 4.3585-4.3591
- Coded Blue 4.3597-4.3603
- 0.003 Oversize 4.3609-4.3615

PISTON (Cont.)

Piston To Cylinder Bore Clearance (Select Fit) . 0.0014-0.0022

Piston Pin bore Diameter 1.0402-1.0405

Ring Groove Width
- Upper Compression Ring ..... .0805-.0815
- Lower Compression Ring ..... .0805-.0815
- Oil Ring 0.188-0.189

PISTON PIN

Length 3.290-3.320

Diameter
- Standard 1.0399-1.0402
- 0.001 Oversize 1.0410-1.0413

To Piston Clearance 0.0002-0.0004
- Wear Limit 0.0008

To Connecting Rod Clearance ..... Interference Fit

PISTON RINGS

Ring Width
- Compression Ring
  - Top 0.077-0.078
  - Bottom 0.077-0.078

Side Clearance
- Compression Ring
  - Top 0.002-0.004
  - Bottom 0.002-0.004
  - Wear Limit 0.006
- Oil Ring ..... Snug

Ring Gap Width
- Compression Ring
  - Top 0.010-0.020
  - Bottom 0.010-0.020

Oil Ring — Steel Rail Gap 0.015-0.055

OIL PUMP

Rotor-Type Oil Pump Relief Valve Spring Tension
Lbs. @ Specified Length ..... 20.6-22.6 @ 2.49

Drive Shaft To Housing Bearing Clearance 0.0015-0.0029

Relief Valve Clearance 0.0015-0.0029

SPECIFICATIONS

OIL PUMP (Cont.)

Rotor Assembly End Clearance	0.001-0.004
Outer Face to Housing (Radial Clearance)	0.006-0.013
Oil Pressure — Hot @ 2000 RPM	35-75 PSI
Oil Capacity	Less Filter — 4 Qts. With Filter — 5 Qts.

DISTRIBUTOR

Shaft Eng Play	.024-.035
Breaker Point	
Gap	.017
Dwell	24°-30°
Rotation	Counterclockwise

IGNITION

Initial Timing (Below 1000 RPM) (Natural Gas)	18° BTDC
Start of Advance	1100 RPM
Advance at 1800 RPM (Crankshaft)	34°
Total Advance at 4000 RPM (Crankshaft)	48°
Spark Plugs	ARF 32
Gap	.035

COIL

Primary Resistance (Ohms) (75°)	1.40-1.54
Secondary Resistance (Ohms) (75°)	7600-8800
Primary Circuit Resistor (Ohms) (75°)	1.30-1.40

TORQUE LIMITS

Camshaft Sprocket To Camshaft	40-45
Camshaft Thrust Plate In Block	9-12
Connecting Rod Nuts	40-45
Cylinder Front Cover	15-20
Cylinder Head bolts	
Step One	70-80
Step Two	100-110
Step Three	130-140
Damper To Crankshaft	70-90
Flywheel To Crankshaft	75-85
Main Bearing Cap Bolts	95-105
Manifolds To Cylinder Head	
Intake	25-30
Exhaust	28-33
Oil Filter Adapter To Cylinder Block	20-30

Oil Filter To Cylinder block — with oil on the gasket surface, hand-tighten until gasket contacts adapter face, then tighten ½ turn more.

TORQUE LIMITS (Cont.)

Oil Inlet Tube To Oil Pump	Press Fit
Oil Pan Drain Plug	15-25
Oil Pan to Cylinder Block	9-11 (5/16) 7-9 (1/4)
Oil Pump Cover Plate	6-10
Oil Pump To Cylinder Block	20-25
Pulley To Damper Bolts	35-50
Valve Rocker Arm Bolt To Cylinder Head	18-25
Valve Rocker Arm Cover	5-6
Water Outlet Housing	12-15
Water Pump To Cylinder Block Or Front Cover	12-15

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

CAUTION: If any of the torque limits listed in this table disagree with any of those listed in the preceding tables, the limits listed in the preceding tables prevail.

Size (inches)	Torque (ft-lbs)
1/4-20	6-9
5/16-18	12-18
3/8-16	22-32
7/16-14	40-56
1/2-13	55-80
9/16-18	85-120

SEALERS

Silastic (RTV)	ESE-M4G195-A

LUBE OIL SPECIFICATIONS

There are numerous commercial crankcase oils marketed today. Lubricants marketed for gasoline and/or diesel service consist of refined crude oil to which has been added additives compounded to meet desired engine performance levels. Oil additive selection is based on evaluations conducted by the oil supplier. (The term oil supplier refers to refiners, blenders and rebranders of petroleum products and does not include distributors of such products.) Experience has shown that oil performance in commercial gasoline and diesel service applications varies from brand to brand.

Ford industrial engines have given optimum performance and experienced the longest service with oils which meet Ford Specification ESE-M2C101-C or API rating SD/SE.

The oil filter elements must be replaced each time the oil is changed. It is recommended that only oil filters that meet Ford Specification ESE-C8AF-6714-A, or "C" be used. Oil filters that state on the filter or container that they are acceptable for engine manufacturers' warranty coverage replacement are acceptable to Ford Industrial Engine and Turbine Operations.

The importance of adhering to the foregoing recommendation — particularly in service applications — cannot be over-emphasized. Operators should be cautioned that failure to adhere to Ford lubrication system recommendations can void their warranty coverage.

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