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V-8 GASOLINE ENGINES

LSG-861

LSG-870

LSG-875

MAINTENANCE AND OPERATOR'S MANUAL



CONTENTS

INTRODUCTION	2
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OPERATING INSTRUCTIONS

Controls	5
Instruments	6
Starting the Engine	7
Stopping the Engine	8
Special Situations	9
Emergency Starting	11

MAINTENANCE INSTRUCTIONS

Preventive Maintenance Schedule Chart	13
Initial Start Up	14
Routine Service	14
Scheduled Preventive Maintenance	14
Storage	30

SPECIFICATIONS	32
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INDEX	47
--------------------	----

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 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 Motor Company reserves the right to discontinue models at any time or to change specifications or design without notice and without incurring obligation.




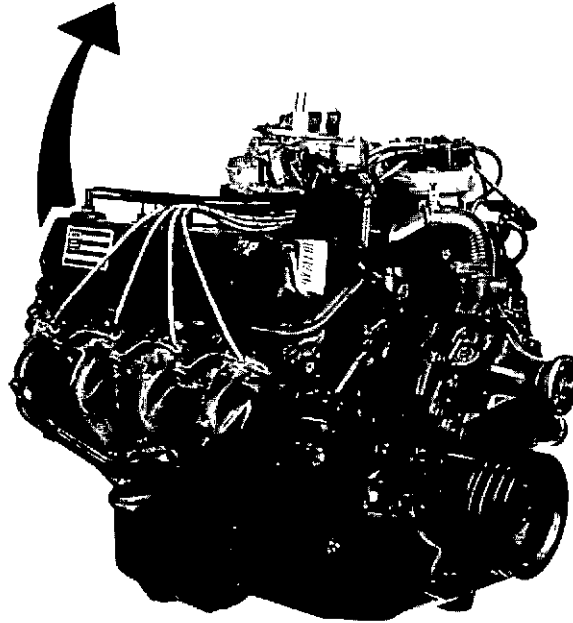
FORD MOTOR COMPANY
INDUSTRIAL ENGINE OPERATIONS
FORD PARTS AND SERVICE DIVISION
300 RENNAISSANCE CENTER
P.O. BOX 43338
DETROIT, MICHIGAN 48243

INTRODUCTION

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.

	Serial	<input type="text"/>
	Eng. Displ.	<input type="text"/>
	Model	<input type="text"/>



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

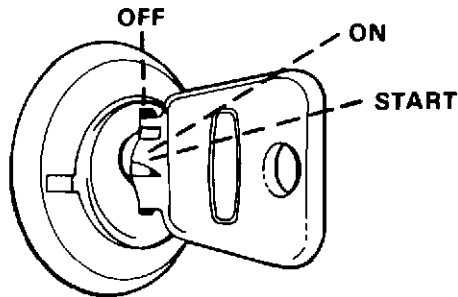
SERVICE MANUAL IEO 194-232

OPERATING INSTRUCTIONS

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.

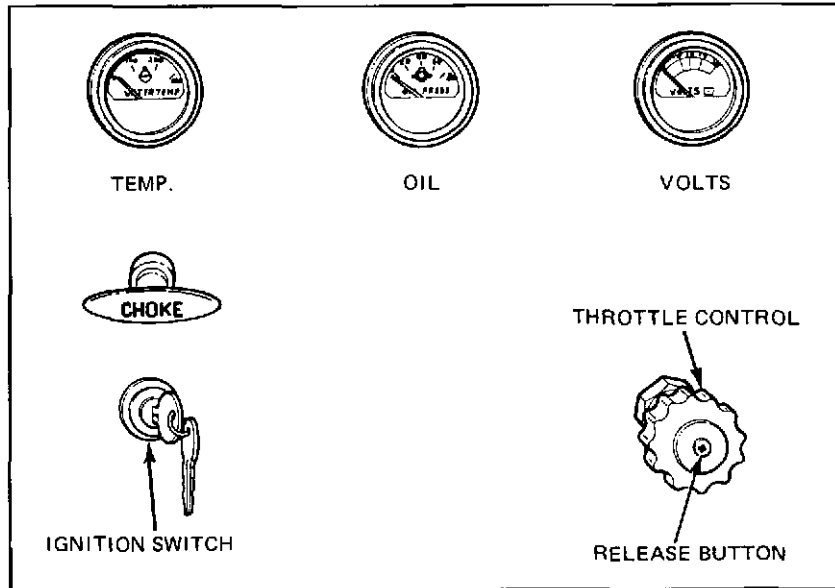
Power Take-Off

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.

OPERATING INSTRUCTIONS

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 65-80 pounds.



TYPICAL CONTROL PANEL

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.

OPERATING INSTRUCTIONS

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.

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 ½ 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.

OPERATING INSTRUCTIONS

Engine Cold

Pull the throttle out about $\frac{1}{2}$ inch and the choke all the way out. Turn the ignition switch to the START position. When the engine starts, release the key and 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.

OPERATING INSTRUCTIONS

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.

OPERATING INSTRUCTIONS

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 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 $\frac{1}{4}$ 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.

OPERATING INSTRUCTIONS

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.

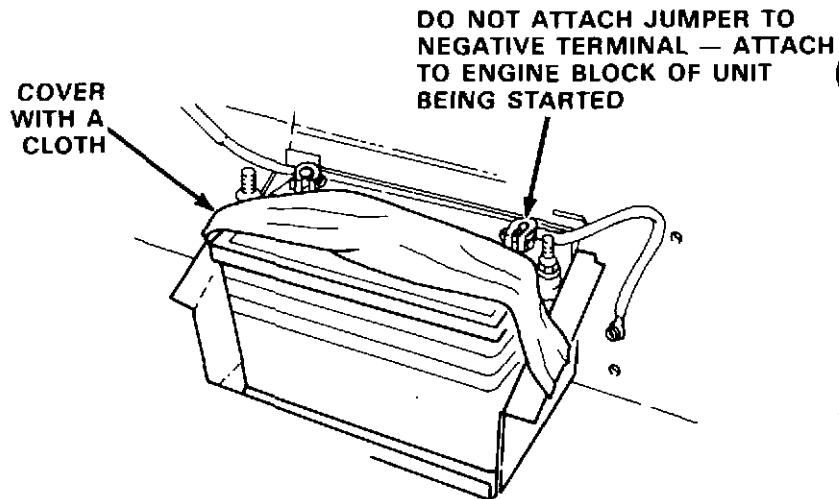
EMERGENCY STARTING

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.

OPERATING INSTRUCTIONS



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 INSTRUCTIONS

MAINTENANCE SCHEDULE

Initial Start Up Sequence	Operation	100	200	300	400	500	600	700	800	900	1000
		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
1	Oil, Engine, Check Level	Daily									
2	Coolant, Check Level in Radiator	Daily									
3	Fuel, Oil and Coolant Leaks, Check	Daily									
	PTO Release Bearing, Lubricate	Daily									
4	Governor, Check Oil Level ②	X	X	X	X	X	X	X	X	X	X
	Oil, Engine Change ①	X	X	X	X	X	X	X	X	X	X
	Oil Filter, Change ①	X	X	X	X	X	X	X	X	X	X
5	Air Cleaner, Clean or Replace Element ①	X	X	X	X	X	X	X	X	X	X
6	Battery, Check Charge and Level	X	X	X	X	X	X	X	X	X	X
7	PTO Bearings, Lubricate	X	X	X	X	X	X	X	X	X	X
	Radiator, Inspect and Clean Exterior		X		X		X		X		X
	Battery Cables, Clean		X		X		X		X		X
9	Fan, Alternator & Governor Belts, Check and Adjust		X		X		X		X		X
	Throttle, Governor and Choke Linkage, Lubricate		X		X		X		X		X
	Fuel Filter, Replace ①				X				X		
	Cooling System, Check or Refill				X				X		
12	Idle Speed, Check and Adjust				X				X		
13	Idle Mixture, Check and Adjust				X				X		
	Spark Plugs, Clean, Adjust and Test				X				X		
	Distributor, Clean and Check Points				X				X		
10	Ignition Timing, Check and Adjust (Check Advance)				X				X		
	PCV Valve, Replace				X				X		
14	Throttle and Governor, Adjust								X		
	Spark Plugs, Replace								X		
	Points, Replace (if so equipped)								X		
11	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.
- ② Mechanical governor (belt driven).
- ③ Seasonal or as required.

MAINTENANCE INSTRUCTIONS

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. 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.
- Keep engine air filter clean.
- Watch the engine temperature.
- Watch the engine oil pressure.
- Watch the voltmeter.
- Lube power take-off regularly.

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.

MAINTENANCE INSTRUCTIONS

Engine Oil

CHECK OIL LEVEL

The oil level should be checked frequently, at least daily, and maintained between the ADD and 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 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 operating 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

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-A (API Classification SE).

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 temperature range you expect to encounter for the next 100 hours of operation.

MAINTENANCE INSTRUCTIONS

SINGLE VISCOSITY OILS

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

MULTI VISCOSITY OILS

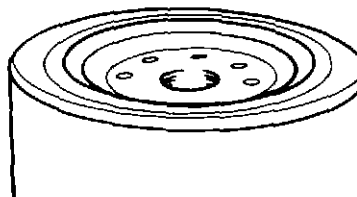
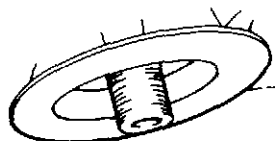
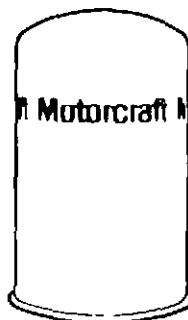
When Outside Temperature is Consistently	Use SAE Viscosity Number
Below +10°F.	*5W-20
Below +60°F.	5W-30
-10°F. to 90°F.	10W-30
Above -10°F.	10W-40 or 10W-50
Above +20°F.	20W-40 or 20W-50

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

OIL FILTER

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 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.



MAINTENANCE INSTRUCTIONS

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

Air Cleaner

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

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

Clean or 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.

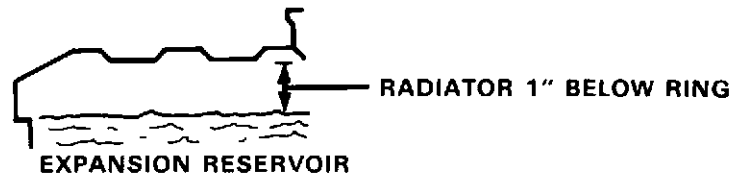
Remove all dust and foreign matter from the air cleaner housing.

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

Cooling System

COOLANT LEVEL

Maintain the coolant level at one inch below the top of the radiator upper 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.

MAINTENANCE INSTRUCTIONS

Use only a permanent-type coolant that meets Ford Specification ESE-M97B18-C, 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

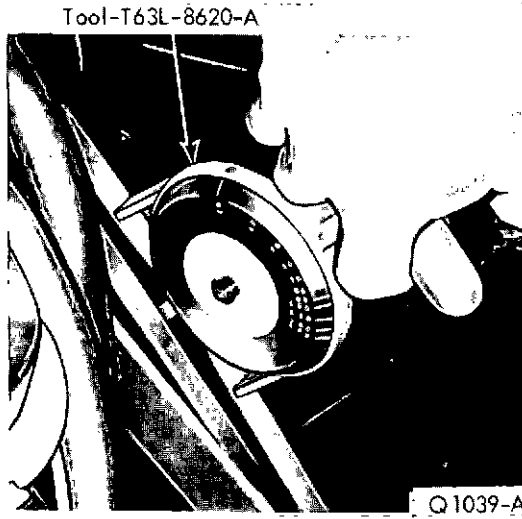
The water pump is belt driven. This same belt may also drive the fan and/or alternator. The drive belt(s) should be properly adjusted at all times. A loose drive belt causes improper alternator, fan and water pump operation, in addition to overheating. Overtightening the belt may result in excessive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

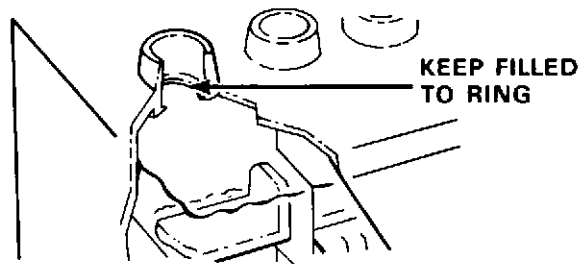
If the tension is not to specification, loosen the alternator mounting and adjusting arm bolts. Move the alternator away from the engine until the correct tension is obtained. Remove the gauge. Tighten the alternator adjusting arm and mounting bolts. Install the tension gauge and recheck the belt tension.

MAINTENANCE INSTRUCTIONS



Battery **CHECKING FLUID LEVEL**

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



MAINTENANCE INSTRUCTIONS

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 oil filler cap on the left rocker cover. The fumes are vented out through a regulator valve on the right rocker cover and into the intake manifold. The P.C.V. valve (regulator valve) must be replaced and the hoses, tubes and fittings of this system must be cleaned at the recommended intervals.

Fuel Filter

DISPOSABLE FILTER

The fuel filter is found adjacent to the fuel pump. Remove the filter by unscrewing the canister. Remove the filter element and gasket. Place a new filter element in the canister. Coat a new gasket with light engine oil and position the gasket on the canister. Screw the canister onto the filter body. Hand tighten the filter until the gasket contacts the body and then advance it 1/8 turn. Start 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(s) are accessible on the exterior of the carburetor. Actually, there are three factors that control the conversion of the fuel and mixture into

MAINTENANCE INSTRUCTIONS

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.

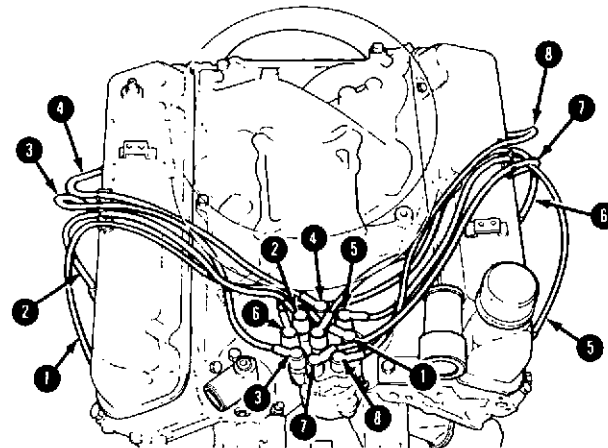
Start the adjustments by setting the idle speed screw to obtain an engine speed of 600 rpm. Then turn idle fuel mixture adjustment needle(s) in (clockwise) until the engine begins to roll. Then, back it out slowly until the engine is running smoothly. Reset the idle speed to 600 rpm.

Ignition System

A dual advance distributor, with a centrifugal and vacuum spark advance system, is used with this engine.

The direction of distributor rotation is counterclockwise 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 1-5-4-2-6-3-7-8. Number one socket is identified by the number one on the cap. The cylinders are numbered from front to rear — 1-2-3-4 right side, and — 5-6-7-8 left side as viewed from the rear of the engine.



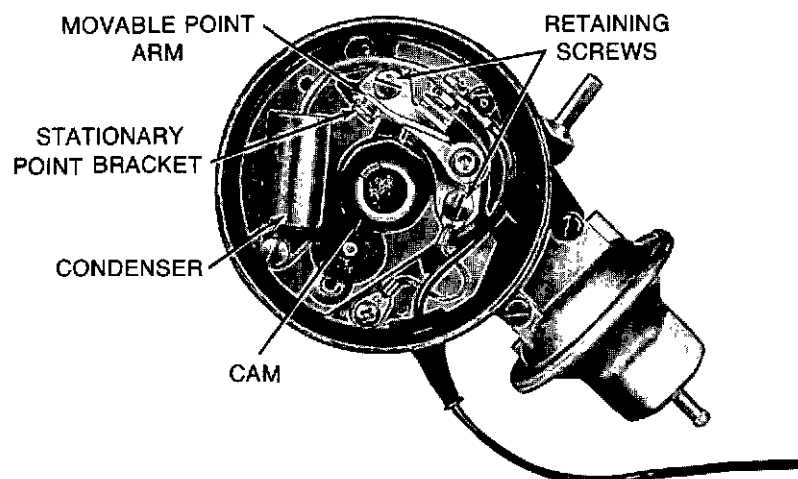
Engine Ignition Wiring

MAINTENANCE INSTRUCTIONS

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 and corrosion from the sockets 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.



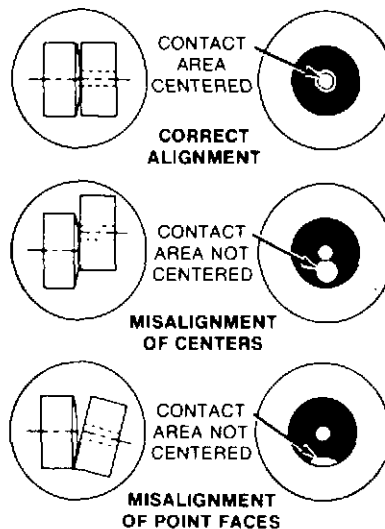
Dual Advance Distributor

MAINTENANCE INSTRUCTIONS

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

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

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



Breaker Point Alignment

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.

MAINTENANCE INSTRUCTIONS

IGNITION TIMING

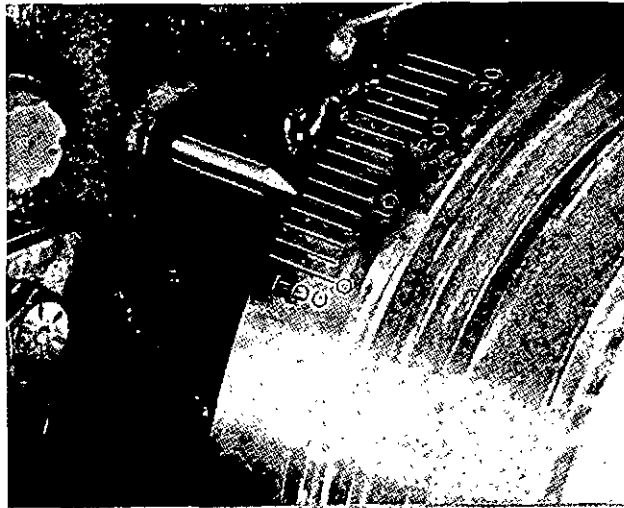
Proper adjustment of ignition timing must be maintained to provide maximum engine power output and best possible fuel economy.

The timing marks are located on the crankshaft damper and can be seen from the right side. These marks and a pointer on the engine front cover are used to time the engine. The recommended timing setting is 10° B.T.D.C. 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 (right front cylinder), and the other two leads to the proper battery terminals. Clean and chalk the timing marks to improve legibility.

Operate the engine at a maximum of 600 rpm, and direct the timing light at the pointer. The light should flash just as the 10° mark on the damper lines up with the pointer.

If the 10° mark and the pointer do not line up, loosen the distributor retaining bolt, and rotate the distributor until the mark and notch are in line.



Ignition Timing Marks

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

MAINTENANCE INSTRUCTIONS

When the proper timing is obtained, tighten the distributor retaining bolt and unplug and connect the distributor vacuum line, then accelerate the engine while watching the timing mark with the timing light to determine if the advance mechanism is functioning. The marks on the crankshaft damper 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 Industrial 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.

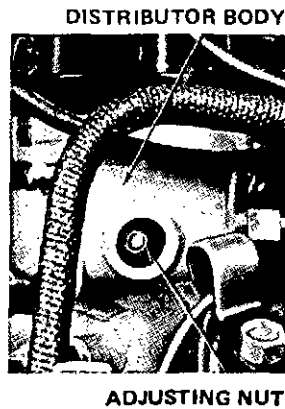
Connect the spark plug wires.

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

MAINTENANCE INSTRUCTIONS

Governor

Three types of governors are used on these engines. A centrifugal type (Centri-Vac) has components in the distributor and on the carburetor, and an electronic governor control system. Both limit engine speed to a pre-determined maximum speed and allow full power output at governed speeds. **The electronic governor is not adjustable.** Where variable speed control is required, the engine is fitted with a mechanical-type governor. This unit is attached to the front of the engine and driven by a belt from the crankshaft damper.



Centri-Vac Governor Adjustment

Centri-Vac Governor Adjustment

These governors are checked and set at the factory and normally do not require adjustment. However, if a different setting is desired, or replacement parts are installed, the no-load cut-off speed can be adjusted as follows:

Connect a tachometer to the engine. Operate the engine until normal operating temperature is reached. With the load disengaged, operate the engine at wide open throttle to determine the maximum governed speed.

NOTE — The no-load governed speed is approximately 10% greater than the fully loaded governed speed.

MAINTENANCE INSTRUCTIONS

Stop the engine and remove the adjusting hole plug from the distributor housing. With the ignition switch off, turn the engine over until the governor adjusting nut appears in the hole. A 1-1/8 inch socket on the crankshaft damper bolt can be used to turn the engine over. Turn the adjusting nut clockwise to increase speed and counterclockwise to decrease speed. One full turn of the adjusting nut will change the governed speed about 150 rpm. If necessary, repeat the above procedure until the correct top governed speed is attained. After adjustment is correct, install the adjusting hole plug and tighten it securely. Attach a new locking wire and lead seal to the adjusting hole plug and the adjacent fin.

Mechanical Governor

OIL LEVEL

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

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

ADJUSTMENT

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

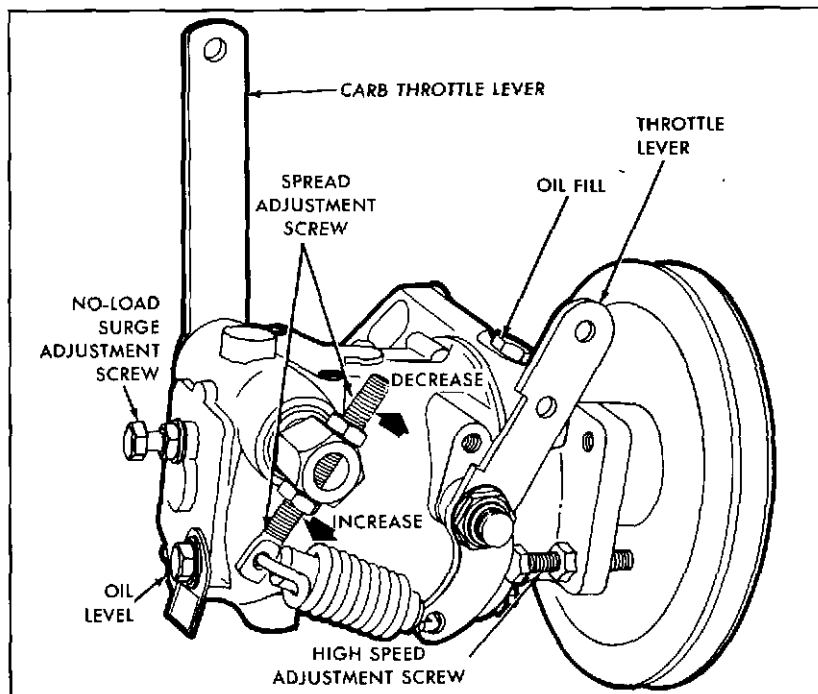
The first adjustment is the governor-to-carburetor control rod adjustment. With the control rod connected, manually move the governor throttle lever to the maximum open throttle position. Check that the carburetor throttle shaft lever is set from 1/32 to 1/16 of an inch from its maximum open position 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 pull the throttle to desired maximum engine speed.
- Adjust the high speed stop screw on the governor to attain the desired maximum engine speed — do not exceed the recommended maximum rpm.
- Tighten the locknut.

MAINTENANCE INSTRUCTIONS

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.

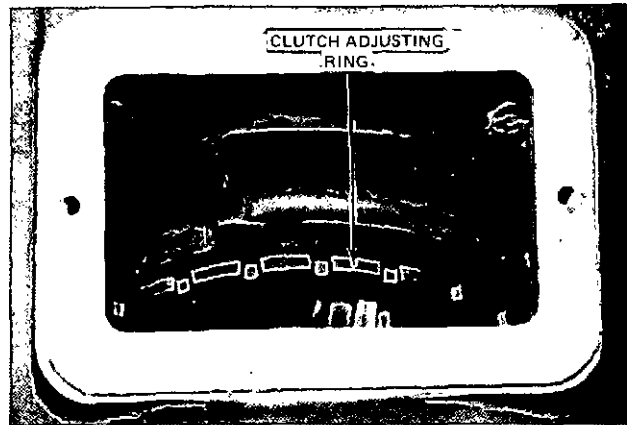
MAINTENANCE INSTRUCTIONS

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.

Power Take-Off 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 the 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

SHAFT BEARINGS

To adjust the shaft bearings, place the shifter lever in the released position, then remove the patent plate on the top of the housing. Loosen the lock plate bolt to free the bearing retainer. Place the end of a long bar

MAINTENANCE INSTRUCTIONS

into a notch on the bearing retainer and turn it counterclockwise (facing engine from rear) to remove play from bearings. The bearing retainer should be just tight enough to remove any play from the shaft, yet not so tight as to impose any pre-load on the bearing. Pre-loading the bearing will prevent free turning of the shaft and shorten bearing life. Tighten the lock plate bolt.

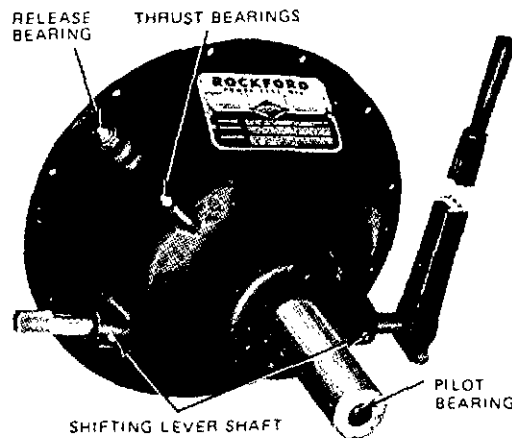
LUBRICATION

Lubricate the release bearing, thrust bearing, shifting lever bearings, and the pilot bearing. Use a high grade, Lithium Base #2, short fiber grease. Clean the fittings before and after greasing.

The release bearing must be lubricated daily.

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

If your engine is equipped with a truck-type clutch, lubricate the clutch linkage.



Lubrication Fittings

Storage

LESS THAN 120 DAYS

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

MAINTENANCE INSTRUCTIONS

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

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

Check coolant protection. Store indoors in dry area.

FOR INDEFINITE PERIOD

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

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

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

Check coolant protection

Disconnect and remove battery.

Clean exterior surface of engine.

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

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

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

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

SPECIFICATIONS

GENERAL SPECIFICATIONS

Displacement	
861	8 cyl. 6.1 litre (370 cubic in.)
870	8 cyl. 7.0 litre (429 cubic in.)
875	8 cyl. 7.5 litre (460 cubic in.)
Bore and Stroke	
861	4.05 x 3.59 in. (102.9 x 91.2 mm.)
870	4.36 x 3.59 in. (111.0 x 91.2 mm.)
875	4.36 x 3.85 in. (111.0 x 97.8 mm.)
Firing Order	1-5-4-2-6-3-7-8

CYLINDER HEAD

Valve Guide Bore Diameter (Standard)	
Intake and Exhaust	
861, 870 .....	.3728-.3738 in. (9.46-9.49 mm.)
875 .....	.3433-.3443 in. (8.71-8.74 mm.)
Valve Seat Angle .....	.45°
Valve Seat Width	
Intake	
	.060-.080 in. (1.52-2.03 mm.)
Exhaust	
861 .....	.090-.100 in. (2.28-2.54 mm.)
870 .....	.0925-.1075 in. (2.34-2.73 mm.)
875 .....	.060-.080 in. (1.52-2.03 mm.)
Valve Seat Bore Diameter	
861	1.6675-1.6685 in. (42.35-42.37 mm.)
870	1.7775-1.7785 in. (45.14-45.17 mm.)
Valve Seat Insert to Bore Interference Fit	
	.002-.0035 in. (.05-.08 mm.)
Valve Seat Runout TIR Max. ....	.002 in. (.05 mm.)
Gasket Surface Finish	RMS 60-110
Gasket Surface Flatnes .....	.003 in. (.07 mm.) in any 6 in. (.152 mm.) .006 in. (.15 mm.) overall

SPECIFICATIONS

VALVE ROCKER ARMS, SHAFT, PUSH RODS AND LIFTERS

Rocker Arm Lift Ratio	1.73 to 1
Push Rod Runout .....	.015 in. (.38 mm.)
Hydraulic Lifter Standard Diameter .....	.8740-.8745 in. (22.19-22.21 mm.)
Hydraulic Lifter Clearance to Bore .....	.0007-.0027 in. (.017-.068 mm.)
Service Limit .....	.005 in. (.127 mm.)
Hydraulic Lifter Collapsed Gap	
Allowable .....	.075-.175 in. (1.90-4.44 mm.)
Desired .....	.100-.150 in. (2.54-3.81 mm.)
Leakdown Rate	5 to 50 seconds for .0625 in. (1.58 mm.) with 50 lb. load

VALVE SPRINGS

Valve Spring Pressure at Specified Length	
Intake .....	.76-84 ft. lbs. (104-113 Nm.) @ 1.72 in. (43 mm.)
.....	.219-241 ft. lbs. (296-326 Nm.) @ 1.26 in. (32 mm.)
Service Limit	10% Loss of Pressure
Exhaust .....	.76-84 ft. lbs. (104-113 Nm.) @ 1.78 in. (45 mm.)
.....	.218-241 ft. lbs. (296-326 ft. lbs.) @ 1.32 in. (33 mm.)
Valve Spring Free Length	
Approximate	
Intake	1.97 in. (50.03 mm.)
Exhaust	1.97 in. (50.03 mm.)
Valve Spring Assembled Height	
Pad to Retainer	
Intake	1.69-1.75 in. (42.92-44.45 mm.)
Exhaust	1.69-1.75 in. (42.92-44.45 mm.)
Valve Spring Out of Square	5/64 (.078 in.) (1.98 mm.)

SPECIFICATIONS

VALVES

Valve Stem to Guide Clearance

Intake0010-.0027 in.
(.02-.06 mm.)

Service Clearance0055 in. (.139 mm.)

Exhaust

8610016-.0035 in.
(.04-.08 mm.)

Service Clearance0055 in. (.139 mm.)

8700016-.0035 in.
(.04-.08 mm.)

Service Clearance0055 in. (.139 mm.)

8750010-.0027 in.
(.02-.06 mm.)

Service Clearance0055 in. (.139 mm.)

Valve Face Angle44°

Valve Head Diameter

Intake

8611.779-1.789 in.
(45.18-45.44 mm.)

8702.059-2.069 in.
(52.29-52.55 mm.)

8752.075-2.090 in.
(52.70-53.08 mm.)

Exhaust

8611.557-1.567 in.
(39.54-39.80 mm.)

8701.667-1.677 in.
(42.34-42.59 mm.)

8751.646-1.661 in.
(41.80-42.18 mm.)

Valve Face Runout-Max.

861, 700015 in. (.038 mm.)

875002 in. (.05 mm.)

Valve Stem Diameter

Standard Intake

861, 8703711-.3718 in.
(9.42-9.44 mm.)

8753416-.3423 in.
(8.67-8.69 mm.)

SPECIFICATIONS

VALVES (Cont'd)

861	.....	.3703-.3712 in. (9.40-9.42 mm.)
870	.....	.3703-.3712 in. (9.40-9.42 mm.)
875	.....	.3416-.3423 in. (8.67-8.69 mm.)

CAMSHAFT

Lobe Lift

Intake

861, 870	.....	.2526 in. (6.41 mm.)
875	.....	.253 in. (6.42 mm.)

Exhaust

861, 870265 in. (6.73 mm.)
875278 in. (7.06 mm.)

Max. Allowable Lift Loss005 in. (.127 mm.)
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Theoretical Valve Lift @ Zero Lash

Intake

861, 8704377 in. (11.11 mm.)
8754470 in. (11.35 mm.)

Exhaust

861, 870	.....	.4809 in. (12.21 mm.)
875	.....	.4830 in. (12.26 mm.)

Camshaft Endplay

861, 870003-.007 in. (.07-.17 mm.)
875001-.006 in. (.025-.152 mm.)

Service Limit009 in. (.22 mm.)
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Camshaft Journal to

Bearing Clearance001-.003 in. (.02-.07 mm.)
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SPECIFICATIONS

CAMSHAFT (Cont'd)

Service Limit006 in. (.152 mm.)
Camshaft Journal Diameter	
Standard	2.1238-2.1248 in. (53.94-53.96 mm.)
Camshaft Journal Runout-Max .....	.005 in. (.127 mm.)
Assembled Gear Runout	
Crankshaft .....	.005 in. (.127 mm.)
Camshaft .....	.005 in. (.127 mm.)
Camshaft Bearing	
Inside Diameter	2.1258-2.1268 in. (53.99-54.02 mm.)
Camshaft Front Bearing Location .....	.040-.060 in. (1.01-1.52 mm.)
Timing Chain Deflection-Max. ....	.50 in. (12.7 mm.)

*Distance that the front edge of the bearing is installed below the front face of the cylinder block.

CYLINDER BLOCK

Cylinder Bore Diameter	
861	4.0500-4.0535 in. (102.87-102.95 mm.)
870	4.3600-4.3636 in. (110.74-110.83 mm.)
875	4.3600-4.3636 in. (110.74-110.83 mm.)
Maximum Out-of-Round .....	.0015 in. (.038 mm.)
Service Limit .....	.005 in. (.127 mm.)
Maximum Taper-Service Limit .....	.010 in. (.25 mm.)
Cylinder Bore Surface Finish	RMS 18-38
Main Bearing Bore Diameter	3.1922-3.1934 in. (81.08-81.11 mm.)
Crankshaft to Rear Face	
of Block Runout — Max. ....	.005 in. (.127 mm.)
Head Gasket Surface Flatness .....	.003 (.07 mm.) in any 6 in. (152 mm.) .006 in. (.152 mm.) overall
Head Gasket Surface Finish	
861, 870	RMS 60-110
875	RMS 90-150
Tappet Bore Diameter .....	.8752-.8767 in. (22.23-22.26 mm.)

SPECIFICATIONS

CRANKSHAFT AND FLYWHEEL

Main Bearing Journal	
Diameter .....	.2.9994-3.0002 in. (76.18-76.20 mm.)
Max. Out-of-Round .....	.0006 in. (.015 mm.)
Main Bearing Journal	
Runout-Max. ....	.002 in. (.05 mm.)
Service Limit .....	.005 in. (.12 mm.)
Main Bearing Thrust	
Face Runout-Max. ....	.001 in. (.02 mm.)
Main Bearing Journal Taper	
Max. per inch .....	.0005 in. (.012 mm.)
Thrust Bearing Journal Length .....	.1.124-1.26 in. (28.54-28.60 mm.)
Main and Rod Bearing Journal	
Finish RMS Max.	12
Main Bearing Thrust Face	
Finish-RMS Max.	
861	25 Front 23 Rear
870	20 Front 16 Rear
875	25 Front 23 Rear
Connecting Rod	
Journal Diameter .....	.2.4992-2.500 in. (63.47-63.50 mm.)
Max. Out-of-Round .....	.0006 in. (.015 mm.)
Connecting Rod Journal	
T-per inch-Max. ....	.0006 in. (.015 mm.)
Crankshaft Free Endplay .....	.004-.008 in. (.10-.20 mm.)
Service Limit .....	.012 in. (.30 mm.)
Flywheel Ring Gear	
Lateral Runout (Auto. Trans.) .....	.060 in. (1.52 mm.)

CRANKSHAFT BEARINGS

Connecting Rod Bearing to	
Crankshaft Clearance-Selective Fit	
Desired .....	.0008-.0015 in. (.02-.03 mm.)
Allowable .....	.0008-.0028 in. (.02-.07 mm.)
Bearing Wall Thickness-Standard .....	.0757-.0762 in. (1.92-1.93 mm.)
(For .002 in. (.05 mm.) undersize, add .001 in. (.02 mm.) to standard wall thickness.)	
Main Bearing to Crankshaft	
Clearance-Selective Fit	
Desired .....	.0008-.0015 in. (.02-.03 mm.)
Allowable .....	.0008-.0026 in. (.02-.06 mm.)

SPECIFICATIONS

CRANKSHAFT BEARINGS (Cont'd)

Bearing Wall Thickness-	
Standard .....	.0955-.0960 in. (2.42-2.43 mm.)
(For .002 in. (.05 mm.) undersize, add .001 in. (.02 mm.) to standard wall thickness.)	

CONNECTING ROD

Rod Bearing Bore	
Inside Diameter	2.6522-2.6530 in. (67.36-67.38 mm.)
Max. Out-of-Round .....	.0006 in. (.015 mm.)
Rod Length Center to Center	
861, 870	6.358-6.362 in. (161.49-161.59 mm.)
875	6.6035-6.6065 in. (167.72-167.80 mm.)
Connecting Rod Alignment	
Maximum Total Difference	
Twist* .....	.024 in. (.60 mm.)
Bend* .....	.012 in. (.30 mm.)
Side Clearance .....	.010-.020 in. (.25-.50 mm.)
Service Limit .....	.023 in. (.58 mm.)

*Pin Bushing and crankshaft bore must be parallel and in the same vertical plane within specified total difference when measured at the ends of an 8 inch (203 mm.) long bar, 4 inches (101 mm.) on each side of rod centerline.

PISTON

Diameter	
Coded Red	
861	4.0476-4.0482 in. (102.80-102.82 mm.)
870	4.3575-4.3581 in. (110.68-110.69 mm.)
Coded Blue	
861	4.0486-4.0492 in. (102.83-102.84 mm.)
870	4.3587-4.3592 in. (110.71-110.72 mm.)
875	4.3597-4.3603 in. (110.73-110.75 mm.)

SPECIFICATIONS

PISTON (Cont'd)

.003 Oversize	
861	4.0496-4.0502 in. (102.85-102.87 mm.)
870	4.3599-4.3605 in. (110.74-110.75 mm.)
875	4.3609-4.3615 in. (110.76-110.78 mm.)

Piston to Bore Clearance

Selective Fit

861 .....	.0018-.0039 in. (.04-.09 mm.)
870 .....	.0019-.0037 in. (.04-.09 mm.)
875 .....	.0022-.0030 in. (.05-.07 mm.)

Piston Pin Bore Diameter

861, 870	1.0403-1.0406 in. (26.42-26.43 mm.)
875	1.0402-1.0405 in. (26.42-26.43 mm.)

Ring Groove Width

Top Compression

861, 870 .....	.0955-.0965 in. (2.42-2.45 mm.)
875 .....	.0805-.0815 in. (2.04-2.07 mm.)

Bottom

861, 870 .....	.080-.081 in. (2.03-2.05 mm.)
875 .....	.0805-.0810 in. (2.04-2.05 mm.)

Oil

861 .....	.188-.189 in. (4.77-4.80 mm.)
870 .....	.1885-.1895 in. (4.78-4.81 mm.)
875 .....	.188-.189 in. (4.77-4.80 mm.)

SPECIFICATIONS

PISTON PIN

Length	3.290-3.320 in. (83.56-84.32 mm.)
Diameter	
Standard	1.0398-1.0403 in. (26.41-26.44 mm.)
.001 in. Oversize	1.0410-1.0413 in. (26.4414-26.4490 mm.)
Piston Pin to Piston	
Pin Bore Clearance	
861, 870 .....	.0003-.0006 in. (.007-.015 mm.)
875 .....	.0002-.0004 in. (.005-.010 mm.)
Piston Pin to Connecting	
Rod Bore Clearance	Interference Fit

PISTON RINGS

Top Compression Ring Width	
861, 870 .....	.0926-.0936 in. (2.35-2.37 mm.)
875 .....	.077-.078 in. (1.95-1.98 mm.)
Bottom Compression Ring Width .....	.077-.078 in. (1.95-1.98 mm.)
Oil Ring Width .....	.1860-.1865 in. (4.72-4.73 mm.)
Top Compression Ring Side Clearance	
861 .....	.0019-.0039 in. (.04-.09 mm.)
870 .....	.0019-.0036 in. (.04-.09 mm.)
875 .....	.0019-.0036 in. (.04-.09 mm.)
Wear Limit-Max. Increase	
in Total Clearance .....	.002 in. (.05 mm.)
Bottom Compression Ring	
Side Clearance .....	.002-.004 in. (.05-.10 mm.)
Wear Limit-Max. Increase	
in Total Clearance .....	.002 in. (.05 mm.)

SPECIFICATIONS

PISTON RING (Cont'd)

Oil Ring Side Clearance	
861 .....	.0015-.003 in. (.03-.07 mm.)
870 .....	.002-.0035 in. (.05-.08 mm.)
875	Snug
Wear Limit-Max. Increase in Total Clearance	
	.002 in. (.05 mm.)
Top Compression Ring Gap	
861 .....	.010-.022 in. (.25-.55 mm.)
870 .....	.013-.025 in. (.33-.63 mm.)
875 .....	.010-.020 in. (.25-.50 mm.)
Bottom Compression Ring Gap	
861 .....	.010-.023 in. (.25-.58 mm.)
870, 875 .....	.010-.020 in. (.25-.50 mm.)
Oil Ring Gap	
861	Steel Rails
870 .....	.013-.028 in. (.33-.71 mm.)
875 .....	.010-.035 in. (.25-.88 mm.)

LUBRICATION SYSTEM

Standard Engines Only

Oil Capacity	
With Filter Change	
861, 870	9 qts. (7.5L)
875	6 qts. (5.6L)
Without Filter Change	
861, 870	8 qts. (8.5L)
875	5 qts. (4.7L)
Oil Pressure Hot	
@ 2000 RPM	40-65 psi (276-448 kpa)
Relief Valve Spring Pressure	
@ Specified Length	20.6-22.6 lbs. (28-30 Nm) @ 2.49 in. (63 mm.)
Driveshaft to Housing	
Clearance .....	.0015-.0030 in. (.03-.07 mm.)

SPECIFICATIONS

LUBRICATION SYSTEM (Cont'd)

Relief Valve to Housing Clearance .....	.0015-.0030 in. (.03-.07 mm.)
Rotor Assembly End Clearance .....	.004 in. (.10 mm.)-Max.
Outer Race to Housing Clearance .....	.001-.013 in. (.02-.33 mm.)

FUEL PUMP

Static Pressure .....	.6-8.0 psi (42-48 kpa)
Volume Flow-Minimum .....	.1 pint (.47L) in 20 sec.)
Eccentric Lobe Lift .....	.890-.910 in. (22.7-23.1 mm.)

IGNITION SYSTEM

DISTRIBUTOR

Gear Location Dimension — Distributor (Distance from bottom of mounting flange to bottom of gear)	4.031-4.038
Shaft End Play Clearance — Distributor	0.024-0.035
Rotation	Counterclockwise

BREAKER POINT TYPE

Initial Spark Advance — BTDC .....	.10°
Breaker Arm Spring Tension	17-21 oz.
Contact Spacing .....	.0014-.0020
Dwell Angle at Idle Speed	21°-30°
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

SPECIFICATIONS

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 - ½	0
850	3 - 5	0
1000	5 - 7	0
1500	9½ - 11½	0
2100	10½ - 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 - 2½	5
1000	4 - 7	10
1000	6¾ - 9¼	15
1000	6¾ - 9¼	20

BELT TENSION

(All belts including governor)

New	120-150 ft. lbs. (163-203 Nm.)
Used-Reset	90-120 ft. lbs. (123-162 Nm.)
Minimum	75 ft. lbs. (101 Nm.)

A used belt is one that has been in operation for 10 minutes or more. Reset belt tension when it meets minimum specification.

SPECIFICATIONS

POSITIVE ENGAGEMENT STARTER

Positive Engagement Starter Motor					
Dia. (Inches)	Current Draw Under Normal Load (Amps)	Normal Engine Cranking Speed (rpm)	Min. Stall Torque @5 Volts (Ft-Lbs)	Max. Load (Amps)	Current Draw No. Load (Amps)
4-1/2	150-180	150-290	15.5	670	80

Starter Brushes				
Mfg. Length (Inches)	Wear Limit (Inches)	Spring Tension (Ounces)	Through Bolt Torque (In-Lbs)	Mounting Bolt Torque (Ft-Lbs)
0.50	0.25	80	55-75	15-20

Maximum Commutator runout is 0.0005 inch. Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

TORQUE LIMITS

Camshaft Sprocket	
Gear to Camshaft	40-45 ft. lbs. (55-61 Nm.)
Camshaft Thrust Plate	
to Cylinder Block	9-12 ft. lbs. (13-16 Nm.)
Connecting Rod Nut	
861, 870	45-50 ft. lbs. (62-67 Nm.)
875	40-45 ft. lbs. (55-67 Nm.)
Cylinder Front Cover and Engine Mount	
861, 870	
5/16 Bolts (4)	12-18 ft. lbs. (17-24 Nm.)
7/16 Bolts (2)	45-57 ft. lbs. (62-77 Nm.)
875	15-21 ft. lbs. (21-28 Nm.)

SPECIFICATIONS

TORQUE LIMITS (Cont'd)

Cylinder Head Bolts	
Step 1	70-80 ft. lbs. (95-108 Nm.)
Step 2	100-110 ft. lbs. (136-149 Nm.)
Step 3	130-140 ft. lbs. (177-189 Nm.)
Damper to Crankshaft	
861, 870	150-175 ft. lbs. (204-237 Nm.)
875	70-90 ft. lbs. (95-122 Nm.)
Fuel Pump to Cylinder Block or Front Cover	
	19-27 ft. lbs. (26-36 Nm.)
Flywheel to Crankshaft	
	75-85 ft. lbs. (102-115 Nm.)
Main Bearing Cap Bolts	
	95-105 ft. lbs. (129-142 Nm.)
Manifold to Cylinder Head	
Intake	22-32 ft. lbs. (30-43 Nm.)
Manifold to Cylinder Head	
Exhaust	28-33 ft. lbs. (38-44 Nm.)
Oil Filter Insert to Cylinder Block/Adapter	
	45-55 ft. lbs. (62-74 Nm.)
Oil Filter to Adapter or Cylinder Block	
	1/2" turn after gasket contacts sealing surface-oiled gasket
Oil Filter Center Bolt	
875	40-50 ft. lbs. (55-67 Nm.)
Oil Inlet Tube to Pump	
	10-15 ft. lbs. (14-20 Nm.)
Oil Pan Drain Plug	
	15-25 ft. lbs. (21-33 Nm.)
Oil Pan to Cylinder Block	
861, 870	12-18 ft. lbs. (17-24 Nm.)
875	9-11 ft. lbs. (13-14 Nm.)
Oil Pump to Cylinder Block	
	22-32 ft. lbs. (30-43 Nm.)

SPECIFICATIONS

TORQUE LIMITS (Cont'd)

Pulley to Damper Bolt	35-50 ft. lbs. (48-67 Nm.)
Rocker Arm Bolt to Cylinder Head	18-25 ft. lbs. (25-33 Nm.)
Spark Plug to Cylinder Head	5-10 ft. lbs. (7-13 Nm.)
Valve Rocker Arm Cover	5-6 ft. lbs. (7-8 Nm.)
Water Outlet Housing	
861, 870	12-18 ft. lbs. (17-24 Nm.)
875	10-15 ft. lbs. (14-20 Nm.)
Water Pump to Cylinder Block or Front Cover	
861, 870	12-18 ft. lbs. (17-24 Nm.)
875	15-21 ft. lbs. (21-28 Nm.)
Alternator Bracket to Cylinder Block-Bolt	30-45 ft. lbs. (41-61 Nm.)
Alternator Pivot Bolt	45-57 ft. lbs. (62-77 Nm.)
Alternator Adjusting Arm to Cylinder Block Bolt	35-50 ft. lbs. (48-67 Nm.)
Alternator Adjusting Arm to Alternator Bolt	24-40 ft. lbs. (33-54 Nm.)
Carburetor Attaching Nuts	12-15 ft. lbs. (17-20 Nm.)

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

1/4-20	6-9 ft. lbs.	(9-12 Nm.)
5/16-18	12-18 ft. lbs.	(17-24 Nm.)
5/16-24	14-20 ft. lbs.	(19-27 Nm.)
3/8-16	22-32 ft. lbs.	(30-43 Nm.)
3/8-24	27-38 ft. lbs.	(37-51 Nm.)
7/16-14	45-57 ft. lbs.	(62-77 Nm.)
7/16-20	40-60 ft. lbs.	(55-81 Nm.)
1/2-13	55-60 ft. lbs.	(75-81 Nm.)
9/16-18	85-120 ft. lbs.	(116-162 Nm.)

Index

Air Cleaner	17
Antifreeze	18
Battery	19
Belt Adjustment	18
Carburetor Adjustment	20
Choke Control	5
Controls	5
Coolant Level	17
Cooling System	17
Crankcase Ventilation System	20
Distributor Points Adjustments	23
Distributor Points Replacement	23
Emergency Starting	11
Fuel Filter	20
Governor Adjustments	26
Hourmeter	7
Identification Decal	3
Ignition Switch	5
Ignition Timing	24
Initial Start Up	14
Instruments	6
Maintenance Schedule	13
Oil Filter	16
Oil Level	15
Oil Pressure Gauge	6
Oil Recommendations	15
Parts and Service	4
Power Take-Off Adjustments	29
Power Take-Off Control	5
Power Take-Off Lubrication	30
Problem Diagnosis	9
Radiator	18
Spark Plugs	25
Specifications	32
Starting the Engine	7
Stopping the Engine	8
Storage	30
Tachometer	7
Temperature Gauge	7
Throttle Control	5
Voltmeter	6

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