



# Power Products



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# INTRODUCTION

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## INTRODUCTION

We are highly pleased that you have selected a Ford unit for your engine requirements. The Ford Motor Company takes a 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.




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INDUSTRIAL ENGINE OPERATIONS  
FORD PARTS AND SERVICE DIVISION  
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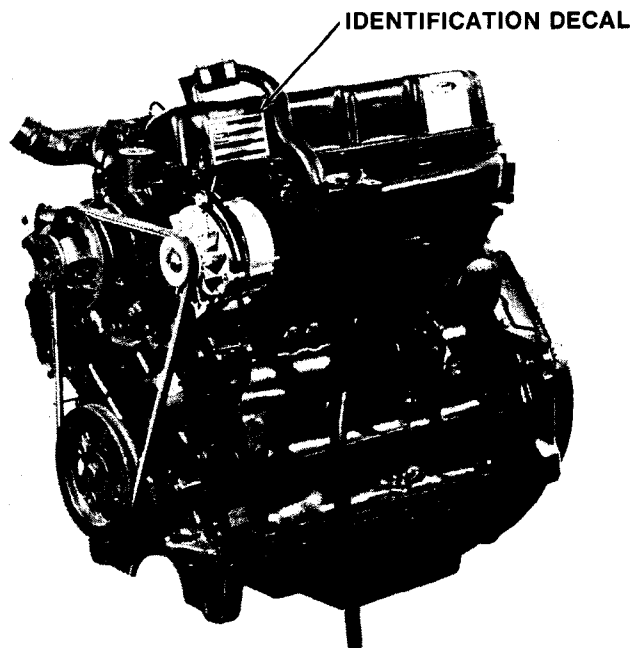
# INTRODUCTION

## 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"/>

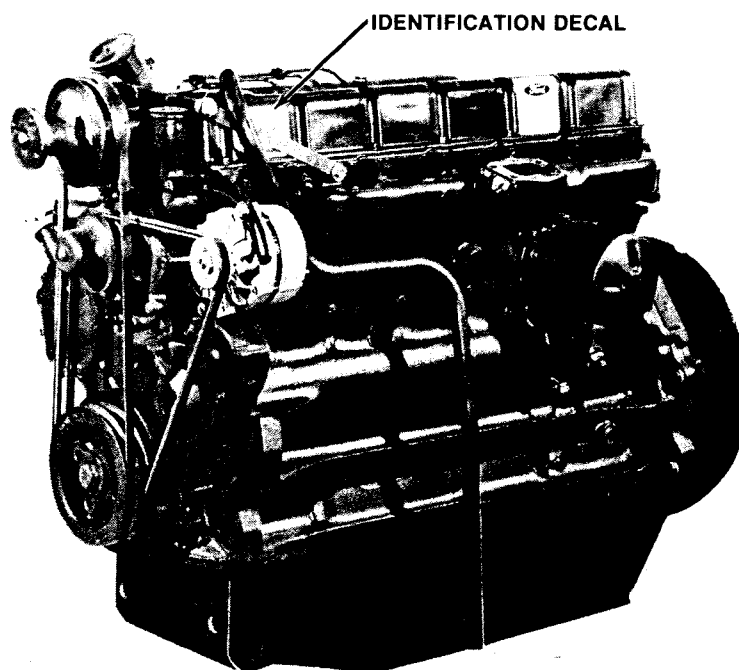
Identification Decal



BSG 442 Four Cylinder Engine

# INTRODUCTION

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**BSD 666 Six Cylinder Engine**

## **Parts and Service**

Replacement parts can be obtained through your local Ford Power Products Distributors and Dealers. They are listed in the directory which accompanies this manual 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 and parts list can be obtained from your distributor or dealer. These publications will provide the necessary information for servicing, overhaul, and ordering replacement parts for your Ford Industrial Engine.

SERVICE MANUAL IEO 194-163  
PARTS LIST IEO 194-140A

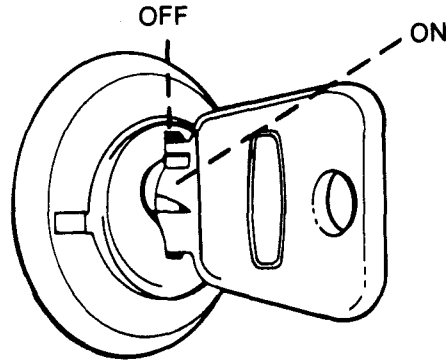
# OPERATING INSTRUCTIONS

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## CONTROLS

### Ignition Switch

This two 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. In the ON position, the switch connects the auxiliary electrical equipment and the starting circuit to the battery.



**Ignition Switch**

### Starter Button

Engage the starter by turning the ignition switch to the ON position and depress the starter button. Release the button when the engine starts.

### Throttle Control

The throttle controls the engine rpm. 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.

### Choke Control (Gasoline Engines)

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.

# OPERATING INSTRUCTIONS

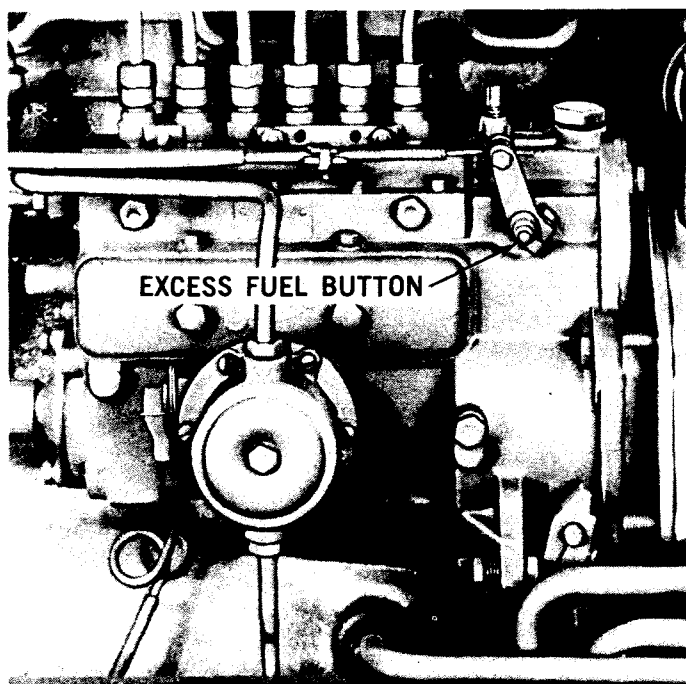
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## **Excess Fuel Control Button (Diesel Engine)**

The excess fuel control button assists the operator in starting the engine in cold weather conditions. The button is located on the out-board side of the fuel injection pump toward the front of the pump.

To operate, move the throttle control lever to the maximum speed position and push in on the button. The button will remain in this position until the engine starts.

Do not hold the button in. If the engine starts then stops, push the button in again before starting.

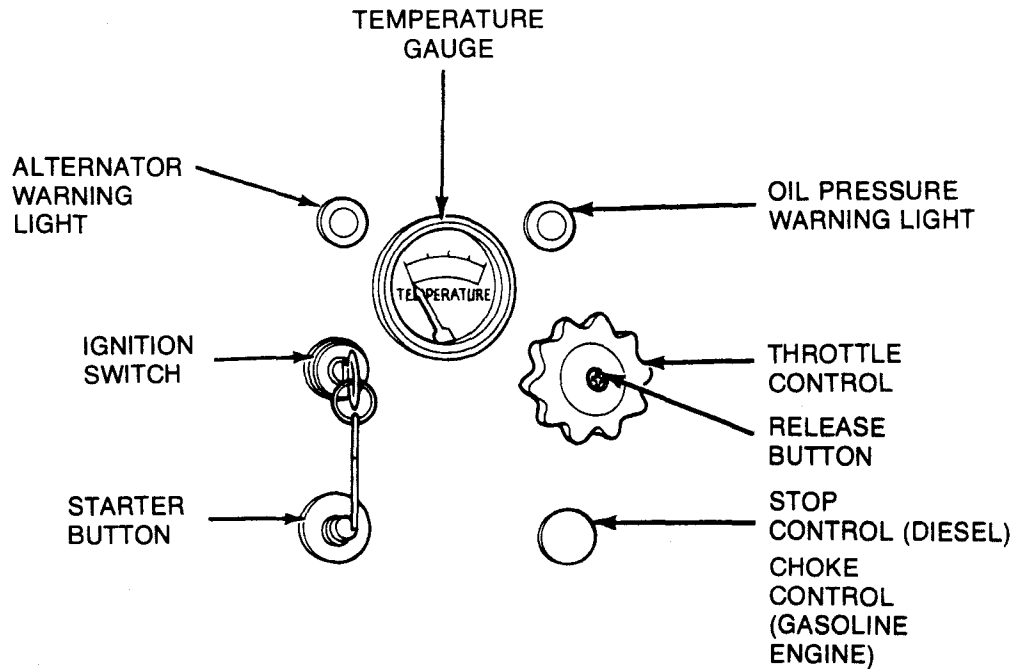


**Excess Fuel Button — In-Line Injection Pump**

## **Stop Control Knob (Diesel Engine)**

The engine stop control knob controls the fuel delivery to the engine. To stop the engine, pull the knob all the way out. This movement stops the flow of fuel to the cylinders. If the knob isn't pulled out all the way, the engine might not stop. To start the engine, push the knob all the way in. This movement allows fuel to flow to the cylinders. If the knob is not pushed in all the way, the engine might not start, or maximum rpm cannot be obtained.

# OPERATING INSTRUCTIONS



**Typical Instrument Panel**

## **Power Take-Off**

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

On Rockford units, moving the lever towards the engine engages the clutch. Pulling the lever away from the engine disengages the clutch.

On Funk units, moving the lever away from the engine engages the clutch.

When moving the handle to engage the clutch and pick up the load, do so in a smooth manner. Moving the clutch handle too slowly will cause slippage and wear. 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 Rockford unit clutch is 65-80 pounds.

## **INSTRUMENTS**

Power units are equipped with: a temperature gauge; a low oil pressure warning light or an oil pressure gauge, and an alternator warning light or a voltmeter.

Some power units also may have; an engine hour meter and/or a tachometer..



# OPERATING INSTRUCTIONS

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## 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 inoperative thermostat.

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

## Oil Pressure Gauge

The oil pressure gauge (optional) 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 (optional) 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.

## Engine Warning Lights

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

## 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.

## ENGINE BREAK-IN

Your new engine does not require extensive "break-in". However, for the first 100 hours of operation, keep the following in mind:

- Allow the engine to idle for a few minutes after every cold start.
- Do not idle engine for long periods of time.

# OPERATING INSTRUCTIONS

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- Do not operate the engine at maximum power for long periods of time.
- Check the oil level frequently and replenish as necessary.

A special "break-in" oil is not used. The oil in the engine crankcase is the same specified for regular oil changes. Change the oil and replace the oil filter at the intervals specified in the Maintenance Schedule. **Do not** add special additives or special "break-in" components to the crankcase.

## 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

### Diesel Engine — Naturally Aspirated

- Push the engine stop control all the way in.
- Set the throttle control to the fully open position.
- Push in the excess fuel button for starting in cold weather.

**NOTE** — If the engine kicks over but doesn't continue to run, the excess fuel button will have to be pushed again.

- Turn the ignition switch to the ON position and push the starter button to operate the starter motor. As soon as the engine starts, release the button. Set the throttle control to the required engine speed.

**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

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## **Diesel Engine — Turbocharged**

Before the basic engine start up procedure which is listed under naturally aspirated engines is carried out, the following turbocharger oil priming instructions should be adhered to in order to prevent damage to the turbocharger unit.

The engine should be cranked for a maximum of 15 seconds with the *stop control in the "Stop" position*. If during this period oil pressure is recorded on the oil pressure gauge or the low oil pressure warning light is extinguished (whichever is installed) the engine can be started. Only if no oil pressure is indicated is it necessary to carry out a priming procedure.

### **Perform Turbocharger Priming as Follows:**

Check that there is sufficient oil in the engine sump, but do not add at this stage. Disconnect the oil feed pipe at the turbocharger end and fill the housing with oil. Reconnect the pipe.

Remove a plug from the oil gallery and, using a suitable syringe, inject a minimum of 4 pints (2.3 litres) of clean oil at 20 psi (138kN/m<sup>2</sup>) through the opening. Install the plug.

Start the engine and allow to idle for one minute before opening the throttle. After one minute the engine speed can be increased.

Stop the engine and, after allowing sufficient time for the oil to return to the oil pan, check that the oil level is correct. If low, add engine oil of the correct grade. If the oil level is above the full mark the surplus oil should be drained off.

**NOTE** — At all times, immediately after starting and prior to stopping, the engine must be allowed to idle for one minute to prevent damage to the turbocharger unit.

## **Gasoline Engine**

To start the engine:

- Turn the ignition switch to the ON position.
- Pull the throttle out 1/2 inch and the choke out about halfway.
- Push the starter button to activate the starter. Release the starter button immediately when the engine starts.
- After engine starts, decrease the throttle setting and adjust the choke for fast idle warm-up.
- Release the choke when the engine reaches normal operating temperature.

# **OPERATING INSTRUCTIONS**

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**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.

## **Cold Starts**

Hard starting is the most common difficulty in cold weather. A complete tune-up and winterization of the engine should minimize or eliminate starting difficulties.

## **DIESEL ENGINE**

- Turn the ignition switch to the ON position.
- Push the engine stop knob all the way in.
- Set the throttle control to the fully open position.
- Push in the excess fuel button.

**NOTE** — If the engine kicks over but doesn't continue to run, the excess fuel button will have to be pushed again.

- Push the starter button to activate the starter. Release the starter button immediately when the engine starts.
- Set the throttle to the desired position after the engine starts.

## **GASOLINE ENGINE**

- Turn the ignition switch to the ON position.
- Pull the throttle out about 1/2 inch and the choke all the way.
- Push the starter button to activate the starter. Release the starter button immediately when the engine starts.
- Set the throttle to the desired position after the engine starts up.
- Push in the choke after the engine warms up.

## **STOPPING THE ENGINE**

### **Diesel Engine — Normal Conditions**

The engine should always be allowed to run at idle for approximately two minutes before stopping, particularly after extended periods of full load and full speed operations.

- Decrease the engine speed to an idle after normal operation before engine shut down.

# OPERATING INSTRUCTIONS

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- Then, move the throttle control to the idle (fully closed) position.
- Pull the engine stop control knob all the way out to stop the engine.
- Turn the ignition switch to the OFF position to disconnect the electrical circuits.

**NOTE** — The engine will not stop by just turning off the ignition switch.

## Gasoline Engine — Normal Conditions

- Decrease the engine speed to an idle after normal operation before engine shut down.
- Turn the ignition switch to the OFF position.

## ABNORMAL CONDITIONS

Under abnormally overheated conditions, 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. 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 with a thick cloth and turn it slowly counterclockwise to the first stop. After the pressure has completely dissipated, press the cap downward and finish removing the cap.

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

## SPECIAL SITUATIONS

### Problem Diagnosis

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

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

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

# OPERATING INSTRUCTIONS

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Engine troubles that occur as a result of normal use and wear usually give plenty of advance warning. These troubles usually result from overlooking the Scheduled Preventative 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 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 starter relay when the ignition switch is turned to ON position 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 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. On gasoline engines check the ignition system. Remove the wire from one of the spark plugs by grasping the moulded cap of the wire only, and insert a short piece of bare wire or other metal in the terminal of the wire.

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

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

3. The fuel system may have a restricted fuel line, plugged fuel filter, air leaks in the fuel line or a faulty fuel pump.

# OPERATING INSTRUCTIONS

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4. Check the manual choke (gasoline engines). 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

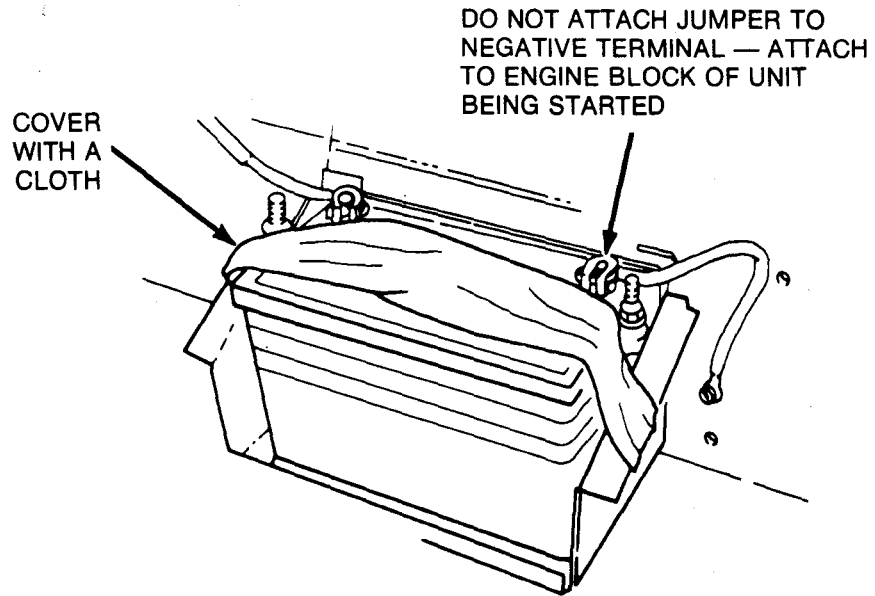
Use of Booster Battery and Jumper Cables — Particular care should be used when connecting to a booster battery in order to prevent sparks. To jump start (negative grounded battery):

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

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

## Emergency Starting — Typical

**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

## DIESEL ENGINE MAINTENANCE SCHEDULE

Initial Start Up Sequence	Operation	100 Hours	200 Hours	300 Hours	400 Hours	500 Hours	600 Hours	700 Hours	800 Hours	900 Hours	1000 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	Injection Pump Housing. Oil Change 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
	Fuel Filters. Drain Condensation	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 Belts. Check and Adjust		X		X		X		X		X
	Throttle Linkage. Lubricate		X		X		X		X		X
	Fuel Filters. Replace ①				X				X		
	Cooling System. Check or Refill				X				X		
	Injectors. Clean and Test				X				X		
13	Idle Speed. Check and Adjust				X				X		
12	Valve Clearance. Check and Adjust				X				X		
14	Throttle. Adjust								X		
11	All Bolts and Nuts. Check for Tightness ③										
8	PTO Clutch Release and Shaft Bearings. Adjust ③										
10	Cylinder Head Bolts, Torque										

① More frequent intervals may be required in dusty areas.

② Check level on initial start-up.

③ Seasonal or as required.



Not Applicable.


# MAINTENANCE INSTRUCTIONS

## GASOLINE ENGINE MAINTENANCE SCHEDULE

Initial Start Up Sequence	Operation	100 Hours	200 Hours	300 Hours	400 Hours	500 Hours	600 Hours	700 Hours	800 Hours	900 Hours	1000 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									
	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
	Fuel Filter, Sediment Bowl. Clean	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
	Distributor. 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 & Belts. Check and Adjust		X		X		X		X		X
	Throttle and Choke Linkage. Lubricate		X		X		X		X		X
	Cooling System. Check or Refill				X				X		
15	Idle Speed. Check and Adjust				X				X		
14	Idle Mixture. Check and Adjust				X				X		
	Spark Plugs. Clean, Adjust and Test				X				X		
	Distributor. Clean and Check Points				X				X		
12	Ignition Timing. Check and Adjust (Check Advance)				X				X		
13	Valve Clearance. Check and Adjust				X				X		
16	Throttle. Adjust								X		
	Spark Plugs. Replace								X		
	Points. Replace								X		
11	All Bolts and Nuts. Check for Tightness ②										
8	PTO Clutch Release and Start Bearings. Adjust ②										
10	Cylinder Head Bolts, Torque										

① More frequent intervals may be required in dusty areas.

② Seasonal or as required.

 Not Applicable.

# **MAINTENANCE INSTRUCTIONS**

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## **INITIAL START-UP**

Your Ford Industrial Engine or Power Unit was inspected before leaving the factory. However, make the initial start-up checks before putting the unit into operation. The Preventative Maintenance Schedule (Pages 16-17) provides a handy check-off list. Perform the operations in the sequence noted in the left-hand column of the Schedule at initial start-up.

## **ROUTINE SERVICE**

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

- Keep the fuel tank filled. A full tank will reduce the possibility of condensation forming in the tank and moisture entering the fuel lines.
- Check engine oil level and coolant level frequently.
- Keep the engine air filter clean.
- Watch engine oil pressure.
- Watch the engine temperature.
- Watch the voltmeter.
- Lube power take-off regularly.

## **SCHEDULED PREVENTATIVE MAINTENANCE**

The operations listed in the maintenance schedule are covered in detail in the following pages. Whenever your equipment requires maintenance of any kind, your authorized distributor or dealer has technicians who will do a professional job of keeping your engine in prime condition.

### **Engine Oil**

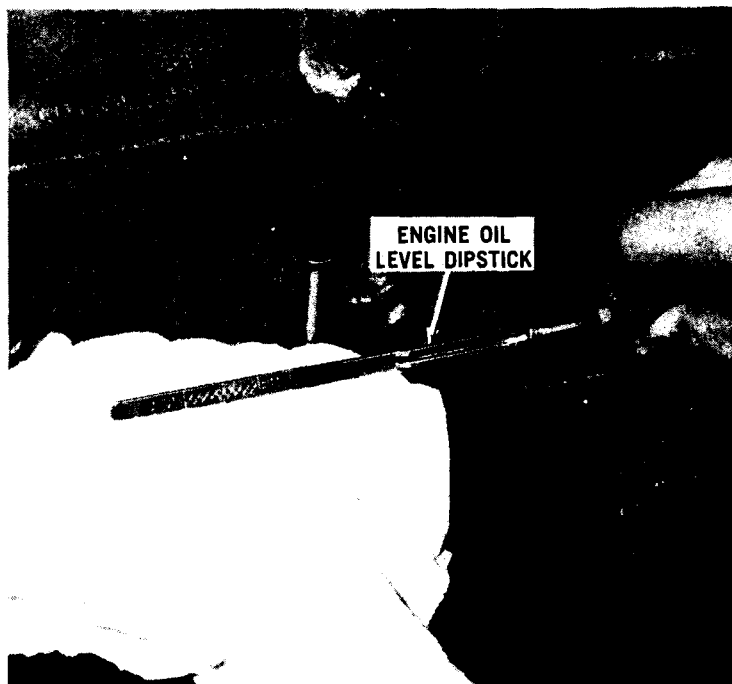
#### **CHECK OIL LEVEL**

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

# MAINTENANCE INSTRUCTIONS

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**Engine Oil Level 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 in dusty applications, or if your equipment operation included: high power and high temperature operation, extended idling or low-speed operation, or frequent stops during cold weather.

## **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 ventilating system which reduces air pollution.

# MAINTENANCE INSTRUCTIONS

On turbocharged diesel engine, use only those oils that meet API classification CD.

On gasoline and naturally aspirated diesel engine use only those oils that meet API classification SE.

## OIL VISCOSITY

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

### SINGLE VISCOSITY OILS

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

### MULTI VISCOSITY OILS

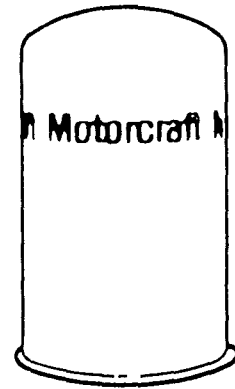
When Outside Temperature is Consistently	Use SAE Viscosity Number
Below +14°F.	*5W-20
Below +60°F.	5W-30
-10°F. to 90°F.	10W-30
Above -10°F.	10W-40 or 10W-50
Above +20°F.	20W-40 or 20W-50

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

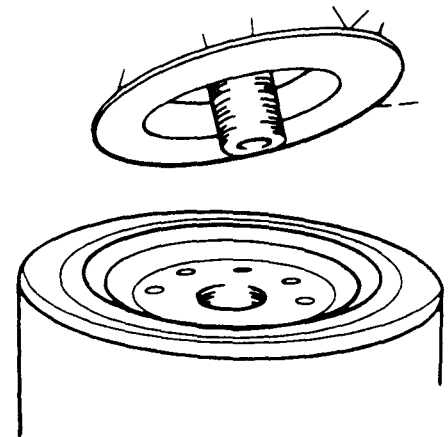
# MAINTENANCE INSTRUCTIONS

## 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** (on all engines except BSD 666) — 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.



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

BSD 666 engines are equipped with a replaceable element type oil filter.

To replace the oil filter element, slowly unscrew the retaining bolt. Catch the drain oil in a suitable container as you remove the filter body and filter element. Throw away the used oil filter element, filter body sealing gasket and the filter retaining bolt gasket. Clean the filter body. Be sure the end of the new filter element marked "Engine End" is toward the engine. Lubricate the filter body retaining bolt gasket and the filter body sealing gasket with clean, new crankcase oil, and install the filter body with new filter element on the engine. Tighten the filter retaining bolt securely.

# MAINTENANCE INSTRUCTIONS

## Air Cleaner

The air cleaner should be inspected constantly for leaks. A damaged air cleaner can seriously affect the performance and life of the engine. The following service steps should be made each time the engine is serviced.

- Watch all connections for mechanical tightness. Be sure cleaner outlet pipe is not fractured.
- If cleaner has been dented or damaged, check all connections immediately.
- In case of leakage and if adjustment does not correct the trouble, replace necessary parts or gaskets.

## DRY TYPE

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.

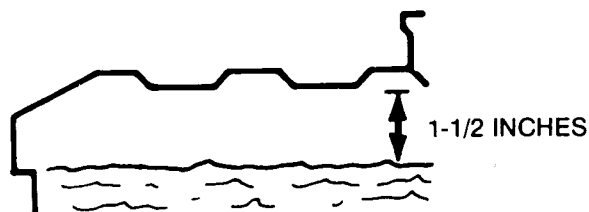
Check the air inlet housing before installing the air cleaner assembly on the engine. The inlet will be dirty if air cleaner servicing has been neglected, if dust laden air has been leaking past the air cleaner to air inlet housing seals, or if the flex tubing is ruptured.

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

## Cooling System

### COOLANT LEVEL

Check the coolant level daily with the engine cold. Add coolant as necessary to maintain the level 3/4 inch to 1-1/2 inches below the filler neck seal.



**Radiator Coolant Level**

# **MAINTENANCE INSTRUCTIONS**

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**CAUTION** — Avoid injury when checking a hot engine. Cover the radiator cap in a thick cloth and turn it slowly counterclockwise to the first stop. After the pressure has been completely released, press downward and finish removing cap. Do not add coolant to an engine that has become overheated until the engine cools. Adding coolant to an extremely hot engine can result in a cracked block or cylinder head.

Use only a permanent-type coolant that meets Ford Specifications 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. The same belt, at times, drives the fan and alternator. The drive belt should be properly adjusted at all times. A loose drive belt causes improper alternator, fan, and water pump operation, and can result in overheating. Over-tightening 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. 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

## 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 cylinder head bolts are tightened in three progressive steps, starting with the center bolts and working outward. Torque the bolts to 70-75 ft-lbs then to 80-85 ft-lbs and finally to 95-105 ft-lbs.

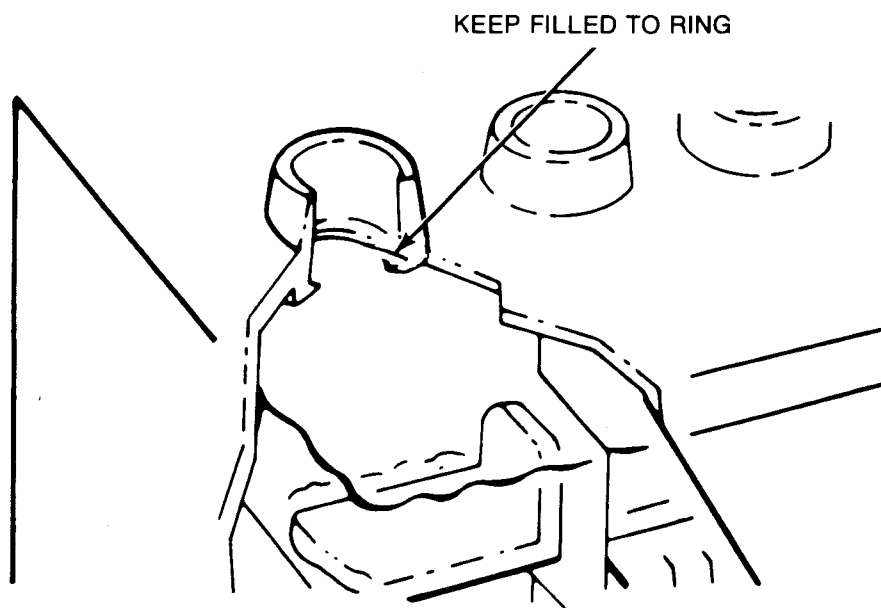
Torque the cylinder head bolts cold, before starting your engine.

## Battery

Keeping the top of the battery clean and dry will give you longer, trouble-free operation. Also, make certain the battery cables are tightly fastened to the battery terminals. If there is any corrosion on the battery cables or terminals, remove the cables and clean the cables and terminals with a wire brush. Neutralize the acid with a solution of baking soda and water. After installing the cables, apply a small amount of grease to the top of each battery terminal to help prevent corrosion.

## 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.



Water Level — Battery

# MAINTENANCE INSTRUCTIONS

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## 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, operate 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.

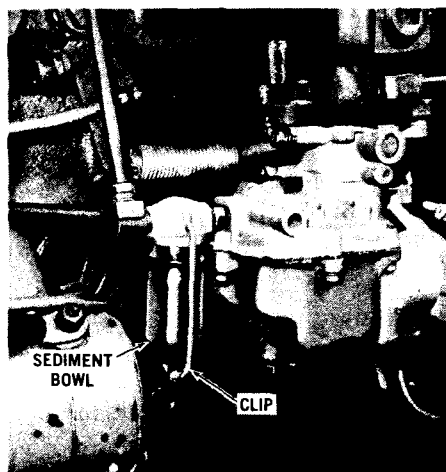
Keep fire away from the top of open battery cells. Combustible gas is always present.

## Fuel System

### Gasoline Engine

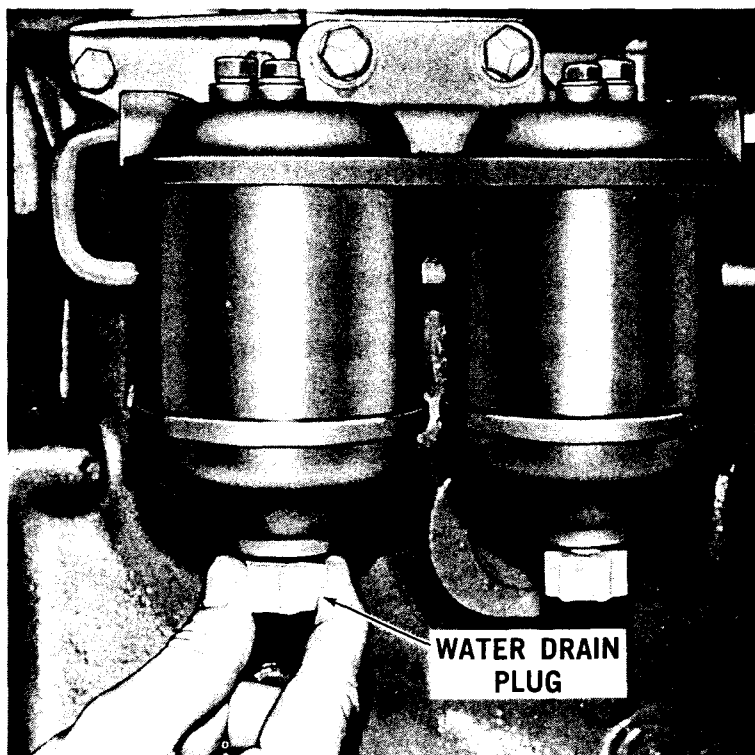
#### CLEANING FUEL SEDIMENT BOWL AND FILTER

Close the fuel shut-off valve, if so equipped, before starting to clean the fuel sediment bowl and filter. Then loosen the fuel sediment bowl clamp. Remove the glass bowl and disc-type filter. Wash them in clean fuel. Check the condition of the gasket between the glass bowl and casting; install a new gasket if necessary. Install the disc-type filter. Position the bowl and clamp over the filter, but do not tighten the clamp. Open the fuel shut-off valve and allow the bowl to fill with fuel, then tighten the clamp and screw assembly.



**Sediment Bowl Removal**

# MAINTENANCE INSTRUCTIONS



Fuel Filters Drain Plug

## Diesel Engine

### DRAINING FUEL FILTERS

Be sure there is plenty of fuel in the tank. Then unscrew the drain plugs in the base of the filter and operate the pump lever. Allow fuel to drain until all the water has been removed and only diesel fuel flows from the filter. Close the drain plugs.

### FUEL FILTER REPLACEMENT

Close the fuel shut-off valve, if so equipped. Then unscrew the filter retaining bolts. Remove the filter bases and elements. Discard the elements and sealing rings. Wash the filter bases and the adapter with a brush and clean diesel fuel. Install new elements and rubber sealing rings. Do not overtighten the retaining bolts or the sealing rings might be damaged. Open the fuel shut-off valve and allow fuel to flow into the fuel filters. Bleed the fuel system as outlined below.

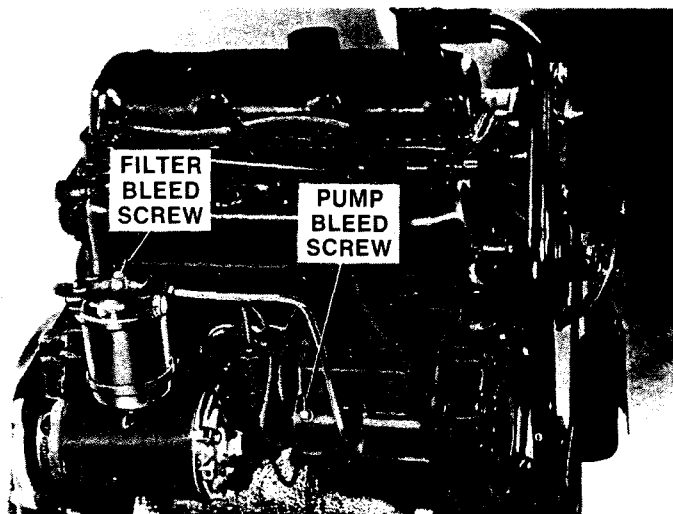
### BLEEDING THE FUEL SYSTEM

#### Distributor Type Pump

1. Make sure there is adequate fuel in the tank.
2. Tighten all fuel line connections.
3. Loosen the bleed screws on top of the fuel filters. Operate the priming lever on the lift pump. Allow the fuel to flow until it is free of air bubbles. Tighten the bleed screws.

# MAINTENANCE INSTRUCTIONS

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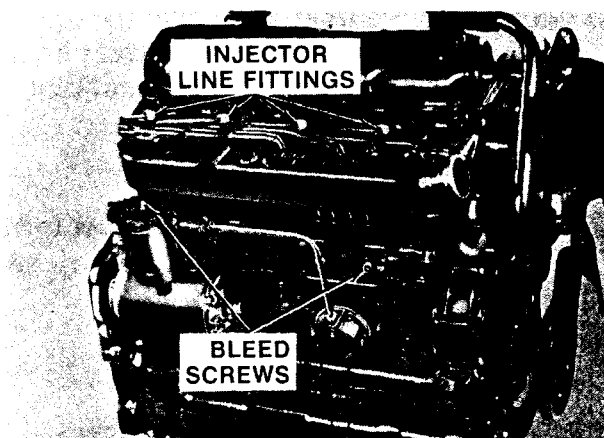


**Distributor Type Pump**

4. Loosen the bleed screw on the injection pump. Crank the engine until fuel flowing from the bleed screw is free from air bubbles. Tighten the bleed screw.

## **In-Line Type Pump**

1. Make sure there is adequate fuel in the tank.
2. Tighten all fuel line connections.
3. Loosen the bleed screws on top of the fuel filters, and operate the priming lever on the fuel lift pump until a stream of fuel, free from air bubbles, flows from the filters. Tighten the bleed screws.
4. Loosen the front bleed screw on the injection pump gallery and operate the lift pump. Tighten the bleed screw when the fuel flowing from the pump is free from air bubbles.

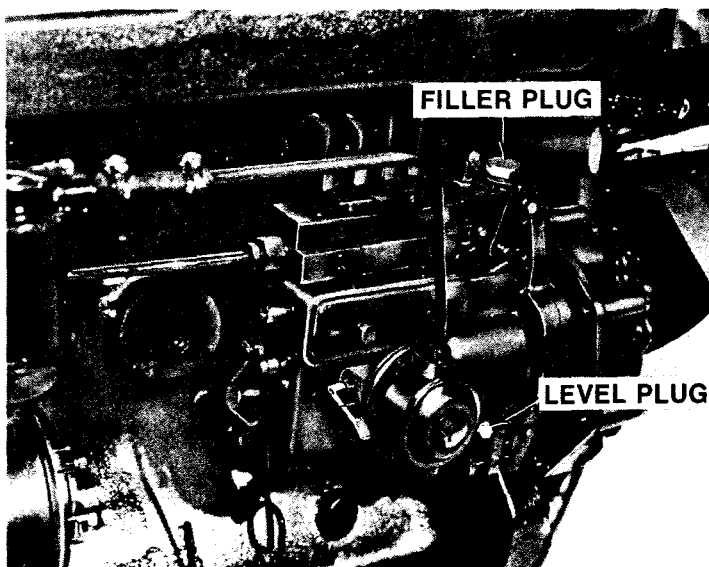


**Bleed Screw — In-Line Type**

# MAINTENANCE INSTRUCTIONS

## Injector Lines

1. Loosen the bleed screw in the injection pump.
2. Loosen the injector lines at the injectors.
3. Set the throttle lever at wide open position.
4. Crank the engine and when fuel without air is emitted from the injector lines and bleed screw in the pump body, tighten the line nuts.



**Fuel Injection Pump Housing Oil**

## Fuel Injection Pump Housing Oil

### IN-LINE TYPE PUMP

When the maintenance schedule requires, change the oil in the injection pump housing. Clean the area around the filler plug, level plug and drain plug of any dirt or other foreign material. Remove the drain and filler plugs and drain the lubricating oil. Install the drain plug. Remove the level plug. Fill the injection pump to the level plug hole with oil of the same grade and quality as used in the crankcase of the engine. Install the level and filler plug.

### SERVICING FUEL INJECTORS

**Do not** attempt to disassemble or adjust the fuel injectors yourself. Remove them from the engine and have them serviced by your Ford Industrial Products Dealer.

## Injection Pump Adjustments

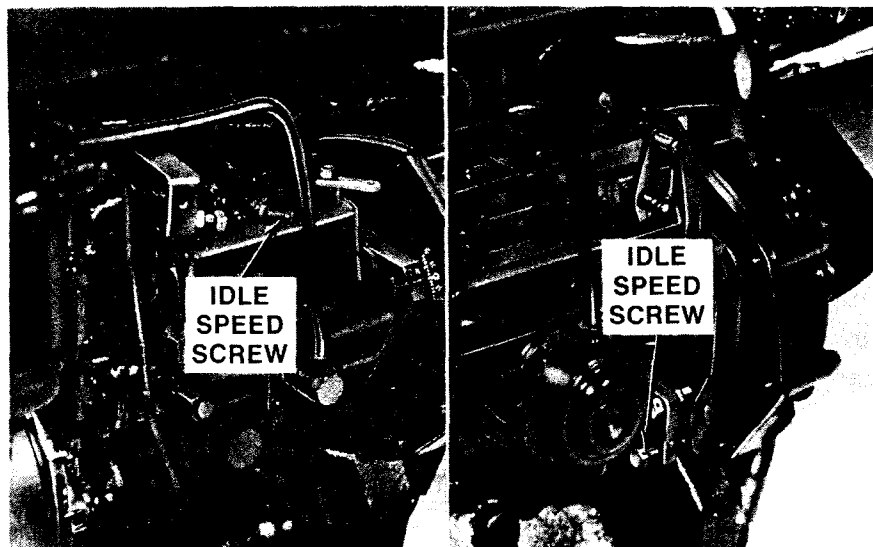
### ENGINE IDLE SPEED ADJUSTMENT

Start the engine and run until it reaches normal operating temperature. With engine idling, loosen idle speed screw locknut. Adjust idle

# MAINTENANCE INSTRUCTIONS

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speed screw until engine idles to specification. Tighten idle speed screw locknut.



**Engine Idle Speed Adjustment**

Recheck idle speed setting by increasing engine speed and returning to idle several times. The engine should return to the idle speed previously set.

## **MAXIMUM NO-LOAD SPEED ADJUSTMENT**

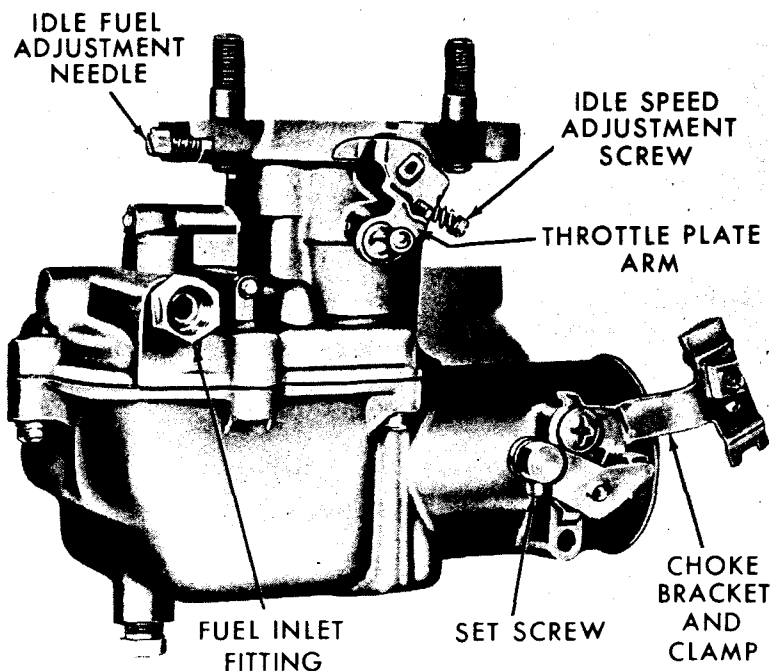
1. Start the engine and allow it to reach normal operating temperature.
2. Position the throttle for maximum no-load speed.

**NOTE** — The maximum no-load speed screw is sealed at the factory for correct fuel delivery and maximum no-load speed. If the maximum no-load speed varies more than 50 rpm above or below the specified range, return the unit to the distributor or dealer for adjustment.

# MAINTENANCE INSTRUCTIONS

## Gasoline Engine — Carburetor Adjustments

There are two adjustments on the gasoline carburetor, as shown. They are the idle fuel adjustment and the idle speed adjustment.



**Carburetor Adjustments**

### **IDLE SPEED ADJUSTMENT**

Start the engine and allow it to run until it reaches normal operating temperature, then adjust the low idle adjustment screw in or out until the engine maintains 600-650 rpm.

### **IDLE FUEL MIXTURE ADJUSTMENT**

Adjust the idle fuel mixture screw in or out until the engine reaches its highest idle rpm, then recheck the low idle speed and readjust if necessary.

### **MAXIMUM NO-LOAD SPEED ADJUSTMENT:**

1. Start the engine and allow it to reach normal operating temperature.
2. Position the throttle for maximum no-load speed.

**NOTE** — The maximum no-load speed screw is sealed at the factory for correct fuel delivery and maximum no-load speed. If the maximum no-load speed varies more than 50 rpm above or below the specified range, return the unit to the distributor or dealer for adjustment.

## Gasoline Engine — Ignition System

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

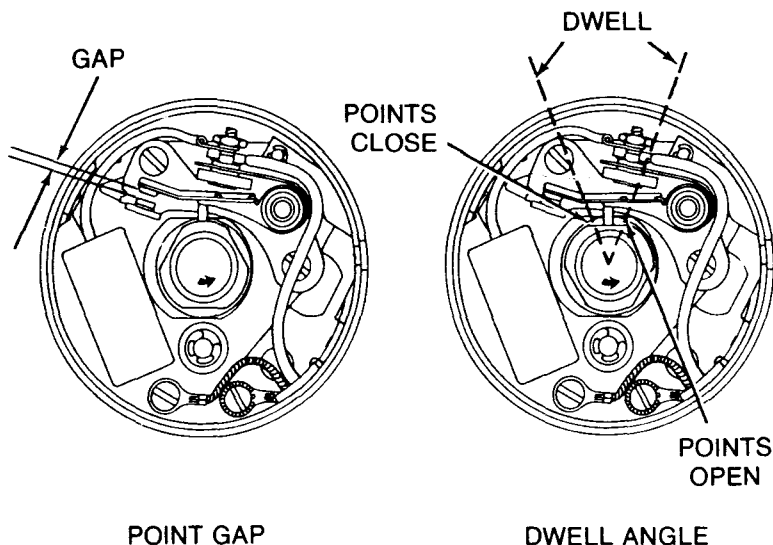
The direction of distributor rotation is counterclockwise as viewed from the top of the distributor.

The spark plug wires are inserted in the distributor cap according to the firing order of the engine. (Refer to Specifications Section in this book.) Number one socket is identified by the number 'one' stamped on the cap.

### 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.



### Distributor Point Gap and Dwell Angle

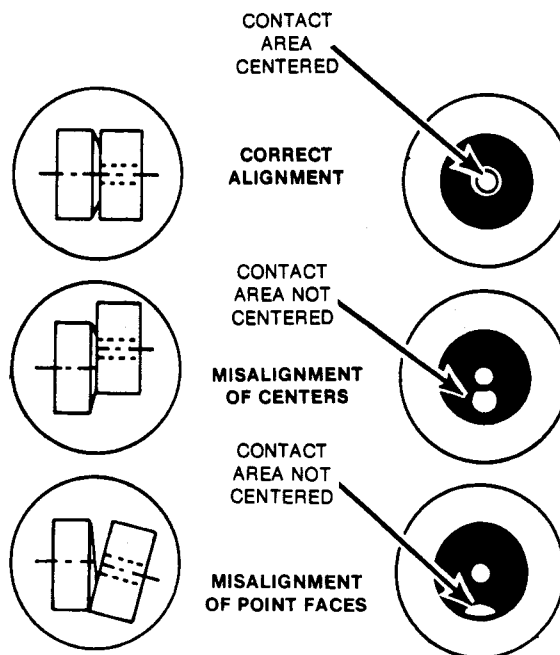
To replace the breaker points, remove nut and washer retaining the condenser lead and primary wire to the breaker assembly. Remove the screws that secure the assembly to the breaker plate, then remove the assembly. Remove the condenser retaining screw and remove the condenser.



# MAINTENANCE INSTRUCTIONS

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.

## ADJUSTING IGNITION TIMING

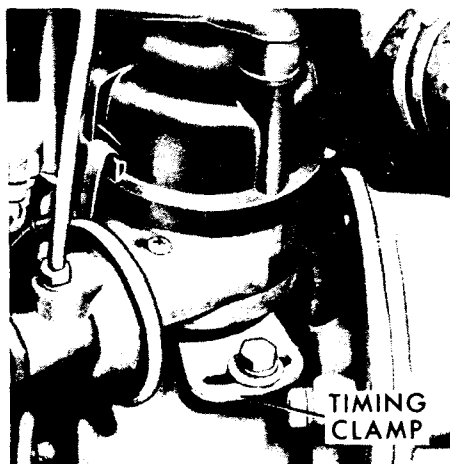
### Initial Ignition Timing with a Timing Light

**NOTE** — Always check ignition timing with the vacuum line disconnected.

# MAINTENANCE INSTRUCTIONS

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1. Disconnect the No. 1 spark plug wire from the distributor cap. Plug a timing light adapter into the distributor cap and into the spark plug wire. Connect the secondary (high tension) lead of the timing light to the adapter.
2. Connect the primary negative (black) lead of the timing light to the battery ground terminal. Connect the primary positive (red) lead to the battery positive terminal.
3. Start the engine and direct the timing light onto the flywheel housing opening. The timing should be as outlined in the specifications, section of this book.
4. If the timing is not correct, loosen the distributor timing clamp bolt and turn the distributor clockwise to advance the timing or counterclockwise to retard the timing. Tighten the timing clamp bolt after setting the timing.
5. Reconnect the vacuum line.



**Distributor Timing Clamp**

The distributor can only be calibrated on a distributor testing machine. Your Ford Industrial Products Distributor is qualified to properly calibrate your distributor and he has the tools and equipment to do this operation for you.

## **SERVICING SPARK PLUGS**

Remove the distributor-to-spark plug wire from the spark plug to be removed.

**NOTE** — DO NOT pull on the spark plug wire. Pry the protective boot from the spark plug and then pull on the boot.

# MAINTENANCE INSTRUCTIONS

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Remove the spark plug with a spark plug socket. Inspect the spark plug for a damaged insulator, fouling and excessive electrode erosion. Test the plug and clean with sandblasting equipment, if required. Gap the plug with a wire gauge. Install the spark plug and torque to specification. Wipe away any oil, grease or dirt from the outside of the plug and the plug wire boot. Connect the plug wire to the plug and firmly press the protective boot over the plug.

## Adjusting Valve Lash (Gas and Diesel)

These engines have solid valve lifters and adjustable rocker arms. Although a preliminary valve adjustment is made at the factory, you should recheck the valve lash before putting the unit in regular operation.

Before adjusting the valve lash setting, run the engine at approximately 1200 rpm for 10 to 30 minutes to stabilize engine temperatures. With the engine idling proceed with valve lash settings. Remove the rocker arm cover. Use "go" and "no-go" feeler gauges of the following sizes:

Intake Valves .....	0.014" go; 0.016" no-go
Exhaust Valves .....	0.017" go; 0.019" no-go

Loosen or tighten the rocker arm screw until the "go" feeler gauge will fit between the rocker arm and the valve stem. The "no-go" gauge should not fit in the gap. The rocker arm nuts are self-locking and require no further tightening after the proper valve lash setting is reached.

After all valves are adjusted to specifications, clean the gasket surfaces. Using a new gasket, install the rocker arm cover.

## Power Take-Off

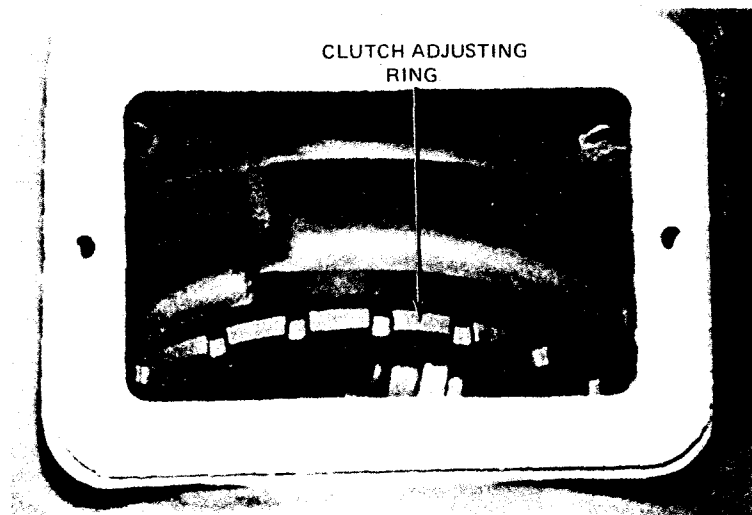
### CLUTCH

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.

# MAINTENANCE INSTRUCTIONS

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**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 into a notch on the bearing retainer and turn it counter-clockwise (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**

### **Lubricating the Power Take-Off**

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.

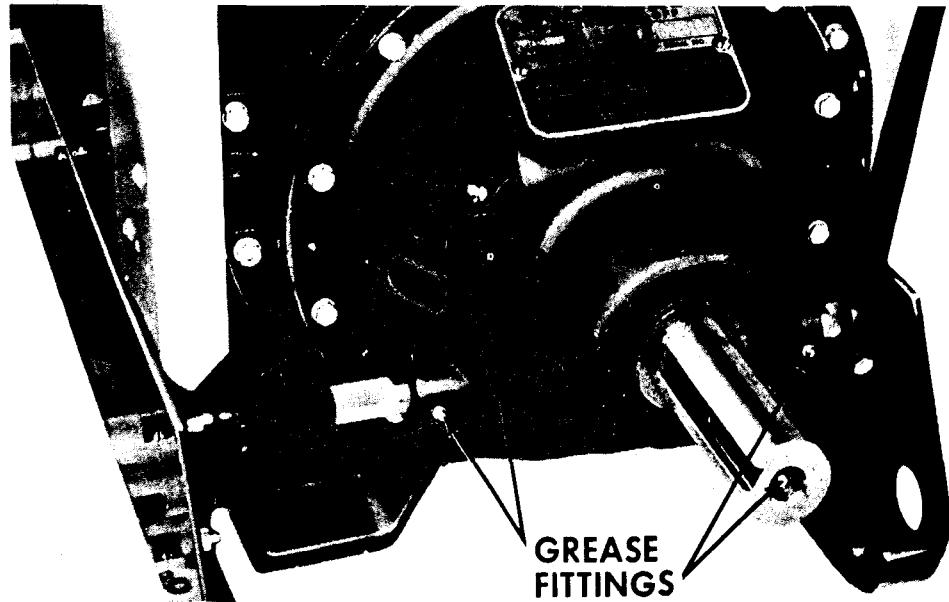
The release bearing must be lubricated daily.

**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.

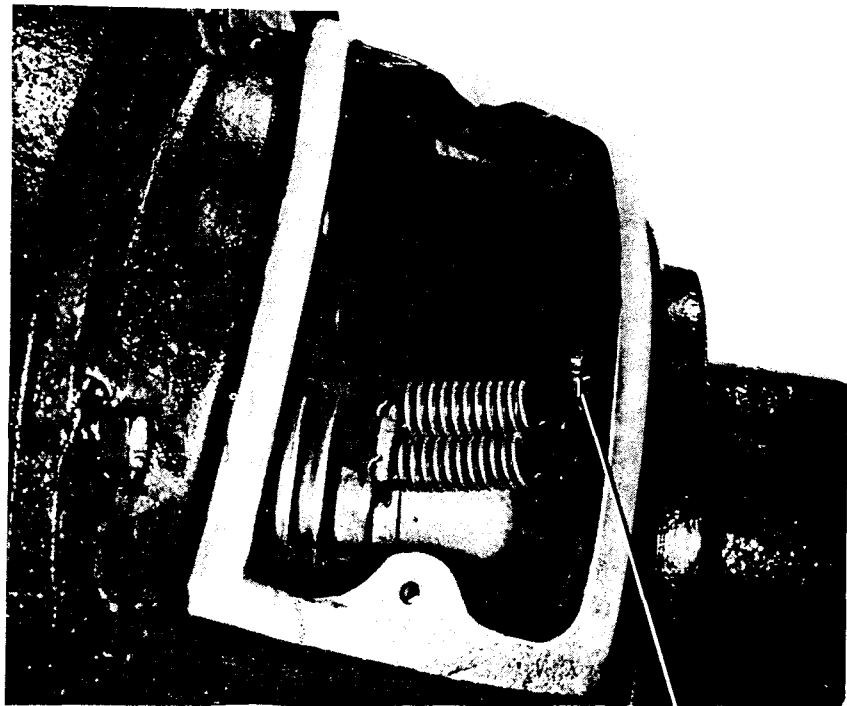
If your engine is equipped with a truck-type clutch, lubricate the clutch linkage.

# MAINTENANCE INSTRUCTIONS

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**Rockford P.T.O. Grease Fittings**



**Funk P.T.O. Grease Fittings**

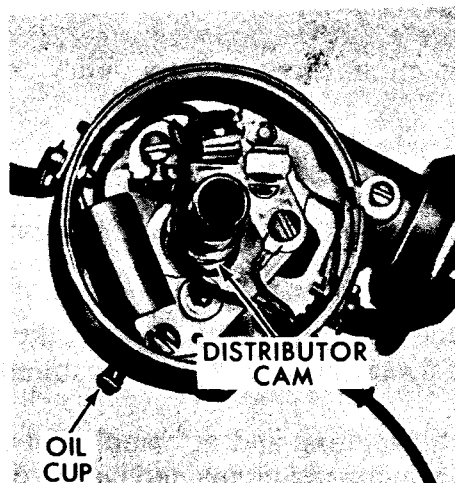
## **Lubricating the Throttle, Choke and Governor Linkage**

Lubricate all wear points of the throttle, governor and choke linkage with SAE 30 engine oil. One or two drops of oil at each point will provide sufficient lubrication.

# MAINTENANCE INSTRUCTIONS

## Lubricating the Distributor

Squirt a few drops of engine oil into the oil cup on the distributor.



**Distributor Lubrication Points**

Release the spring clips and remove the distributor cap, rotor and dust cover. Drip two drops of engine oil on the distributor cam center spindle. Reinstall the dust cover, rotor and distributor cap and snap the spring clips in place.

## STORAGE

### Less Than 120 Days

#### DIESEL ENGINE

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

Check coolant protection.

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.

#### GASOLINE ENGINE

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.

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.

# **MAINTENANCE INSTRUCTIONS**

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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**

### **DIESEL ENGINE**

Drain crankcase completely and refill with recommended engine oil, or equivalent.

Run engine until completely out of diesel fuel, then restart and run on engine oil stabilized diesel fuel for at least 10 minutes.

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

Check coolant protection.

Disconnect and remove battery.

Remove grease and oil from exterior surface of engine.

Seal all openings in engine and accessories with non-hygroscopic 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 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.

Store indoors in dry area.

### **GASOLINE ENGINE**

Drain crankcase completely and refill with recommended engine oil, or equivalent.

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

# MAINTENANCE INSTRUCTIONS

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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 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.

Store indoors in dry area.



# SPECIFICATIONS

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## ENGINE-GENERAL

### Displacement

BSD 326 .....	3 cylinder 2.6 liter (158 CID)
BSD 329 .....	3 cylinder 2.9 liter (175 CID)
BSD 333 .....	3 cylinder 3.3 liter (201 CID)
BSD 442 .....	4 cylinder 4.2 liter (256 CID)
BSD 442 T .....	4 cylinder 4.2 liter (256 CID)
BSD 444 .....	4 cylinder 4.4 liter (268 CID)
BSD 444 T .....	4 cylinder 4.4 liter (268 CID)
BSD 666 .....	6 cylinder 6.6 liter (401 CID)
BSD 666 T .....	6 cylinder 6.6 liter (401 CID)
BSG 326 .....	3 cylinder 2.6 liter (158 CID)
BSG 333 .....	3 cylinder 3.3 liter (201 CID)

BSD = Basildon Series Diesel

BSG = Basildon Series Gas

T = Turbo-charged

### Bore

BSD 326, BSD 329, BSG 326 .....	4.2 in. (106.7 mm.)
BSG 333, BSD 333, BSD 442, BSD 442 T, BSD 444, BSD 444 T, BSD 666, BSD 666 T .....	4.4 in. (111.8 mm.)

### Stroke

BSG 326, BSD 326 .....	3.8 in. (96.5 mm.)
BSG 333, BSD 329, BSD 442, BSD 442 T .....	4.2 in. (106.7 mm.)
BSD 333, BSD 444, BSD 444 T, BSD 666, BSD 666 T .....	4.4 in. (111.8 mm.)

### Compression Ratio

BSG 326, BSG 333 .....	8.0:1
BSD 326 .....	17.3:1
BSD 329, BSD 333, BSD 442, BSD 444, BSD 666 .....	16.3:1
BSD 442 T, BSD 444 T, BSD 666 T .....	15.6:1

### Firing Order

BSG 326, BSG 333, BSD 326, BSD 333, BSD 329 .....	1-2-3
BSD 442, BSD 442 T .....	1-3-4-2
BSD 666, BSD 666 T .....	1-5-3-6-2-4

### Idle Speed

BSG 326, BSG 333, BSD 326, BSD 333, BSD 329, BSD 442, BSD 442 T, BSD 444, BSD 444 T .....	600-700 RPM
BSD 666, BSD 666 T .....	700-800 RPM

# SPECIFICATIONS

## ENGINE-GENERAL (Cont'd.)

### Maximum No-Load Speed

All Models ..... 2400-2500 RPM

**NOTE:** The RPM in some applications may differ, consult equipment manufacture specification.

## ENGINE OIL CAPACITY

### With Filter Change

BSG 326, BSG 333, BSD 326,  
BSD 329, BSD 333 ..... 7 U.S. qts. (5.85 Imp. qts.)  
(6.6 L)

BSD 442, BSD 442 T,  
BSD 444, BSD 444 T ..... 9 U.S. qts. (7.5 Imp. qts.)  
(8.5 L)

BSD 666, BSD 666 T ..... 20 U.S. qts. (16.7 Imp. qts.)  
(18.9 L)

### Without Filter Change

BSG 326, BSG 333, BSD 326,  
BSD 329, BSD 333 ..... 6 U.S. qts. (5 Imp. qts.)  
(5.65 L)

BSD 442, BSD 442 T,  
BSD 444, BSD 444 T ..... 8 U.S. qts. (6.6 Imp. qts.)  
(7.6 L)

BSD 666, BSD 666 T ..... 18 U.S. qts. (15 Imp. qts.)  
(17 L)

## ENGINE OIL GRADE

All engines, except turbo-chargers, use an oil that meets API classification at SF. Turbo-charged engines use a CD classification.

## BELT TENSION

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.

## VALVE LASH

Intake Valves ..... 0.014 inch (0.355 mm.) go;  
0.016 inch (0.406 mm.) no go

Exhaust Valves ..... 0.017 inch (0.431 mm.) go;  
0.019 inch (0.482 mm.) no go

## IGNITION SYSTEM

Distributor Rotation ..... Counterclockwise

Initial Timing ..... 0

### Breaker Point

Gap ..... 0.024-0.026 inch

Dwell ..... 35°-38°

### Spark Plugs

#### Type

Gap ..... 0.023-0.027

Torque ..... 26-30 ft. lbs.

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