HAGIE
FORD ENGINE MANUAL
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Hagie Manufacturing Company • Clarion, Iowa 50525
Phone 515-532-2861

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PREPARATION FOR OPERATION AND START-UP

Preparation for Immediate Use

Before placing your engine in operation, perform a thorough inspection to make sure it is not externally damaged, and all wiring, controls and hoses are properly connected.

Flush the cooling system thoroughly with clean water, then install the drain cocks in each side of the cylinder block and bottom of the radiator. If freezing weather is anticipated, fill the cooling system with antifreeze solution. If plain water is used, add one can of Rotunda Rust Inhibitor No. 8A-19546-C. Some entrapped air will remain in the system. After the engine has run a few minutes, check the level and add coolant as necessary. Fill to one inch below the bottom of the filler neck.

Pull out the dipstick and check the oil level. If it is necessary to add oil, use type and seasonal viscosity recommended for the prevailing ambient temperature. Fill the oil bath air cleaner with the proper grade and type of oil. Check the transmission or power take-off for complete lubrication.

After becoming acquainted with the instruments and operational procedures, and after making sure the cooling system and crankcase are filled, start the engine and let it run at fast idle speed (approximately 1200 rpm) and 30 minutes. Lower the engine speed to normal idle speed rpm and adjust idle speed stop screw and idle speed mixture. Perform any other necessary adjustments.

Certain precautions should be followed during the first few hours of operation to make sure the engine will not be damaged. During the first few hours of operation, check the oil level often (at least every two or three hours), until an oil consumption pattern is established. The top compression rings are hard chrome-plated and usually take longer to seat than regular cast iron rings. Consequently, oil consumption will be greater than normal. Add make-up oil as required to maintain the proper level between the "Full" and "Add Oil" marks on the dipstick. Use oil of the type and seasonal viscosity recommended.

To prevent excessive wear and possible damage, the engine should not be operated at high speed or full load immediately.

ADJUSTMENTS AND SERVICE

Perform the following services before placing the engine in regular service.

DISTRIBUTOR. Check point dwell and initial spark advance. Reset if necessary. Lubricate distributor oil cup with engine oil, if equipped.

OPERATION

Before starting the engine for the first time, the operator should be thoroughly familiar with the instruments and controls. Refer to the Instruments and Controls section. For smooth, fast starts, always follow the recommended starting procedure as outlined below.

COLD STARTS

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

Turn on the ignition switch. Pull the throttle out about 1/2 inch and the choke out about half-way. Push the starter and safety switch buttons. After the engine starts, push the throttle in and adjust the choke for fast idle warm-up. The throttle control can be locked in any position to maintain desired engine speed by turning the large wing nut behind the control handle clockwise.

NOTE: If the engine is hot or flooded with fuel and does not start promptly, pull the throttle out all the way and crank the engine continuously until it starts. Do not use the choke.

In warm weather, use of the choke while starting the engine may be limited, or may not be necessary at all.

When starting the engine in extremely cold weather, pull the choke out all the way until the engine starts. 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.

In cold weather, hard starting is the most common difficulty. In most instances, this problem can be eliminated or minimized by completely winterizing the engine and having a thorough tune-up performed as cold weather approaches.

WARM STARTS

With a warm engine, it is normally not necessary to use the choke. Pull out the throttle about 1/2 inch, disengage the load and push in the starter and safety switch buttons. If engine does not start promptly, pull choke out about 1/3 of its travel. As soon as engine starts, push choke in all the way. Do not over-choke.

WARM-UP

The greatest percentage of wear occurs when a cold engine is first started. After an engine has been shut down and allowed to cool, the majority of the lubricating oil drains off the reciprocating parts back into the oil pan. Engine oil does not flow freely or lubricate properly until it has reached normal operating temperature. If an engine is operated at

excessive speeds or under heavy loads when it is cold, wear will be accelerated tremendously. The greatest damage will be done to cylinder walls and pistons.

NOTE: Always operate the engine at fast idle speed for at least seven to ten minutes before engaging the load. Engine life will be increased considerably.

STOPPING

Following normal operation, lower the engine speed to idle, disengage the clutch, and then turn off the ignition switch. If the engine has been running hot, let it run at fast idle speed a few minutes to dissipate the excess heat.

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

WARNING: Use extreme care when removing radiator cap from an overheated engine. Use a heavy rag or gloves for protection and turn the cap only to the first notch to allow steam and excess pressure to escape. Then remove cap.

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

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.

MAINTENANCE AND LUBRICATION

In keeping an engine at peak operating efficiency, the importance of periodic maintenance and lubrication cannot be overemphasized. Operators or service personnel responsible for the care of the engine should be completely familiar with the type and frequency of the maintenance operations to be performed. To aid in this respect, the following pages outline the

ENGINE PREVENTIVE MAINTENANCE SCHEDULE	Initial Start up	Daily or 10 hours	Each 50 hours	Each 100 hours	Each 200 hours	Each 400 hours	Each 800 hours	As Required
Check oil level	X	X						X
Check coolant level	X	X						X
Check governor oil level	X		X	X				
Change engine oil				X				X
Change engine oil filter				X				X
Clean carburetor air filter				X				X
Check battery state of charge and water level	X			X				X
Lubricate distributor	X			X				
Clean crankcase ventilation system				X				
Clean exterior of radiator					X			X
Lubricate throttle, governor and choke linkage	X				X			
Lubricate exhaust control valve					X			X
Replace fuel filter						X		
Check cooling system						X		X
Clean, adjust, test spark plugs						X		
Replace spark plugs							X	
Check cylinder compression							X	
Tighten intake manifold bolts	X						X	
Check and tighten fan and generator belts	X				X			X
Clean distributor & check points						X		
Replace distributor points							X	X
Check; adjust ignition timing	X					X	X	
Check and adjust idle speed and mixture	X					X	X	
Check; refill cooling system	X						X	X
Check cylinder head bolt torque & all nuts, bolts for tightness	X							X
Check intake manifold vacuum							X	X
Adjust governor	X							X

maintenance services that must be performed on a daily basis, at each 100 hours, at each 200 hours, at each 400 hours, at each 500 hours, and on a seasonal or as required basis.

DAILY CARE

The following items should be checked or serviced each day or when the engine has been operated 10 hours, whichever comes first.

Engine Oil Level Check

Before engine start-up, check the engine oil level and add engine oil of the correct grade and viscosity as required. If the engine is running and an oil level check is required, shut the engine off and wait a few minutes before checking oil level. The waiting period allows the oil from the head and other areas of the engine to drain back into the crankcase. The dipstick is located on the left side of the engine.

Coolant Level

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

WARNING: When the engine is hot, remove the radiator cap carefully. Turn the cap to the first notch, then allow the pressure to escape before removing the cap.

In freezing weather, test the coolant for proper anti-freeze protection to anticipated lowest temperature. Add anti-freeze solution to maintain proper protection.

CAUTION: 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 craked block or cylinder head.

SERVICE EVERY 100 HOURS

After 100 hours of operation, check or service the following items as indicated.

Carburetor Air Cleaner

A heavy-duty hat-type oil bath air cleaner is used with the engine unit. Another type of heavy-duty air cleaner is supplied with the enclosed power unit. The use of a heavy-duty air cleaner is extremely important. Operation of this engine in any application without an adequate air cleaner will considerably shorten engine life. In addition, warranty claims for engines operated in industrial or vehicle applications without an adequate air cleaner will be disallowed.

The function of the carburetor air cleaner, in addition to its operating as a silencer, is to filter the air entering the engine induction system.

The air cleaner must filter approximately 10,000 gallons of air for every gallon of fuel consumed. When the air passes through the cleaner, it is mixed with fuel in the carburetor. Air that contains dirt and grit will naturally produce an abrasive fuel mixture, causing severe damage to the cylinder walls and piston rings. This damage will cause high oil consumption and short engine life. A restricted or dirty air cleaner will also cause a rich fuel mixture. In view of this, it is extremely important that the air cleaner be serviced at the recommended intervals.

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

Cleaning the Air Cleaner

Oil Bath Type

1. Loosen the wing bolt and remove the air cleaner assembly from the air inlet housing (Fig. 7). The cleaner may then be separated into two sections; the upper section or body assembly contains the filter element, the lower section consists of the oil cup, removable inner cup of baffle and the center tube.

2. Soak the body assembly and element in fuel oil to loosen the dirt; then flush the element with clean fuel oil and allow it to drain thoroughly.

3. Pour out the oil, separate the inner cup or baffle from the oil cup, remove the sludge and wipe the baffle and outer cup clean.

4. Push a lint-free cloth through the center tube to remove dirt or oil.

5. Clean and check all the gaskets and sealing surfaces to ensure air tight seals.

6. Refill the oil cup to the level mark only, install the baffle and reassemble the air cleaner.

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

8. Make sure that the air cleaner is seated properly on the inlet housing and the seal is installed correctly. Tighten the wing bolt until the air cleaner is secure.

Dry Type

Clean or replace the air cleaner paper filter element.

Remove the paper filter element from the air cleaner and clean by directing compressed air on the pleats on the inside of the element (Fig. 8). Inspect the element for mud caking or signs of excessive wear or damage. Replace as necessary.

1. Cover
2. Element
3. Oil Level

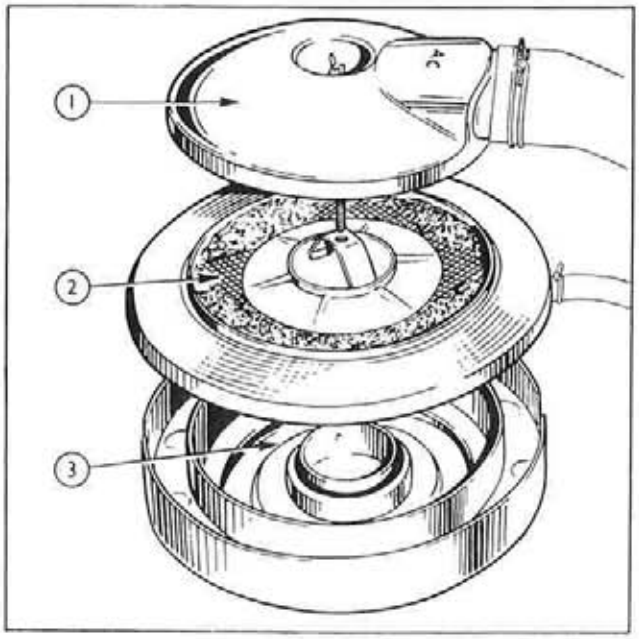
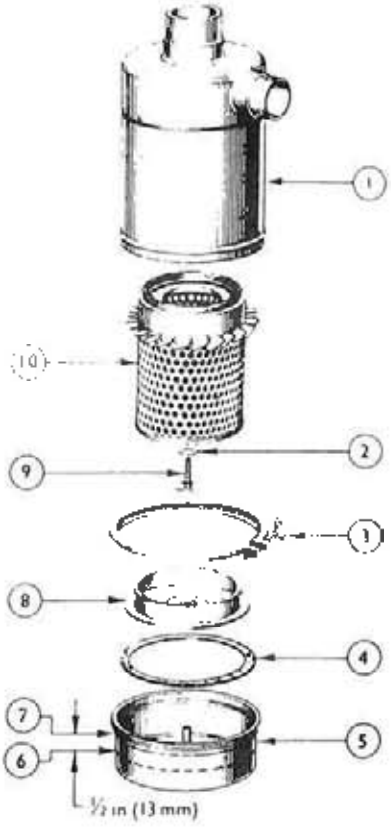


Fig. 7 – Oil Bath Air Cleaner



1. Body
2. Washer
3. Clamp
4. Gasket
5. Dust Cup
6. Dust Level
7. Slot
8. Baffle
9. Wing Nut
10. Element

Fig. 8 – Air Cleaner – Dry Type

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

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

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

Lubricate Distributor

Squirt a few drops of SAE 10W engine oil into the oil cup on the front of the distributor housing.

Battery

The battery supplies current to the starter and electrical system while starting the engine. After the engine starts, the generator or alternator supplies all the current needed to keep the engine running, and also replenishes the current supply drained from the battery during starting.

Each 100 hours fill the battery to the ring with distilled water or clean rain water. The battery terminals should be kept tight and free of corrosion. A solution of two tablespoons of baking soda to a pint of water makes an excellent cleaning agent for corroded battery terminals and a dirty battery case. Apply the solution with a paint brush or whisk broom, and thoroughly flush the outside of the battery with clean water when finished. Coat the battery terminals with light grease or petroleum jelly to inhibit corrosion.

The state of charge of the battery is indicated by the specific gravity of the battery solution. Check the specific gravity with a hydrometer, then refer to Table 1 to determine the condition of the battery. A battery which is used in tropical climates, where freezing rarely occurs, is supplies with a weaker acid solution, therefore the different specific gravity values. A high specific gravity affords the best protection against freezing. A difference in specific gravity between cells of 20% indicated battery trouble and the possibility of early failure especially in cold weather.

Rapid loss of battery solution is an indication that the battery is being overcharged. The generator or alternator and voltage regulator should be checked and adjusted to provide the specified output.

TABLE 1 SPECIFIC GRAVITY CHART

Specific Gravity Temperate Climates	State of Charge	Specific Gravity Tropical Climates
Above 1.280	Fully Charged	Above 1.225
1.250	75%	1.200
1.220	50%	1.175
1.190	25%	1.150
1.160	Limited Useful Capacity	1.120
1.130 or less	Discharged	1.090 or less

SERVICE EVERY 200 HOURS

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 prevent damaging the fins. If available, use compressed air or a stream of water to dislodge particles between the fins. Use compressed air or water in the opposite direction to normal air flow.

SEASONAL OR AS REQUIRED

Cleaning the Cooling System

Normally, rust, sludge, and other foreign material can readily be removed from the cooling system by using a cooling system cleaning solvent. However, in severe cases, pressure flushing may be required. Various types of flushing equipment are available. A pulsating or reversed-flow flushing will loosen sediment more quickly and more efficiently than a steady flushing in the normal direction of coolant flow. If pressure flushing is to be used, always remove the thermostat and make sure the cylinder head bolts are tightened properly before flushing. After the cooling system has been cleaned and filled, a good commercial rush inhibitor should be added. However, the rust inhibitor is not necessary if the cooling system is to be conditioned with permanent antifreeze containing rust inhibitor.

Draining and Filling the Cooling System

To drain the cooling system, open the drain cock on the right-hand side of the engine block, and the radiator outlet on the lower left-hand side of the radiator. Open the radiator pressure cap to speed draining. To fill the system, close the drain cocks, fill the system with coolant and add rust inhibitor or antifreeze, according to the season and locality. All permanent antifreeze sold by reputable manufacturers contains an anti-rust additive. Therefore, the addition of rust inhibitor, when permanent antifreeze is used, will not generally be necessary.

Remove the radiator cap and check the level of the coolant.

CAUTION: The cooling system is under pressure. Therefore, it is dangerous to remove the radiator cap while the system is hot. Always turn the cap slowly to the first stop and allow the pressure to escape before removing the cap completely.

Add clean water or antifreeze solution to a level of from 1 to 1 1/2 inches below the bottom of the filler neck.

DISTRIBUTOR AND IGNITION TIMING

Performance, fuel economy and life expectancy of the engine, largely depend on the correct distributor adjustment.

The distributor point dwell and the initial spark advance will be checked and reset if needed, at the initial start up and at the completion of each 200 hours.

If excessive fuel consumption, poor performance or overheating of the engine is encountered, the distributor adjustments should be checked.

THERMOSTAT INSPECTION AND REPLACEMENT

These engines are equipped with a single thermostat. The thermostat is mounted inside the water outlet elbow on the intake manifold. Proper operation of the thermostat is necessary to maintain efficient engine operating temperature. The thermostat should be tested every 1000 hours or every year, whichever occurs first.

Drain the radiator so that the coolant level is below the thermostat. Remove the water outlet housing retaining belts. Move the housing, with the hose attached, forward. Remove the thermostat and gasket from the intake manifold.

To test a thermostat, insert a piece of 0.003 inch feeler stock 1/8 inch wide under the valve sleeve. Suspend the thermostat, by the feeler stock, in a large container of water so that it is completely submerged, and 1 to 2 inches from the bottom.

NOTE: If the thermostat will not hold fast to the feeler stock when it is first inserted, replace the thermostat.

Suspend the thermometer in the water so that the bulb is at the same level as the thermostat element. Heat the water slowly, and stir it frequently to normalize the temperature. When the thermostat drops off the feeler stock, note the temperature on the thermometer. This is the "starts-to-open" temperature. If the valve opens at a temperature more than 5° below the start-to-open specification, (Table 3) or if the valve does not open at a temperature of more than 5° above the start-to-open specification, the thermostat should be replaced.

DIAGNOSIS-GOVERNOR

General Information

In general, suspected governor malfunctions can usually be traced to improperly adjusted throttle linkage, binding in the linkage, incorrect governor adjustments, slipping drive belt, or low oil level in the governor. Always investigate all suspected causes as described in the Diagnosis Guide before replacing the governor.

There are two designs of governors in service, identified as a late design and early design. The early design governor is shown in Fig. 22 and the late design governor is shown in Fig. 23.

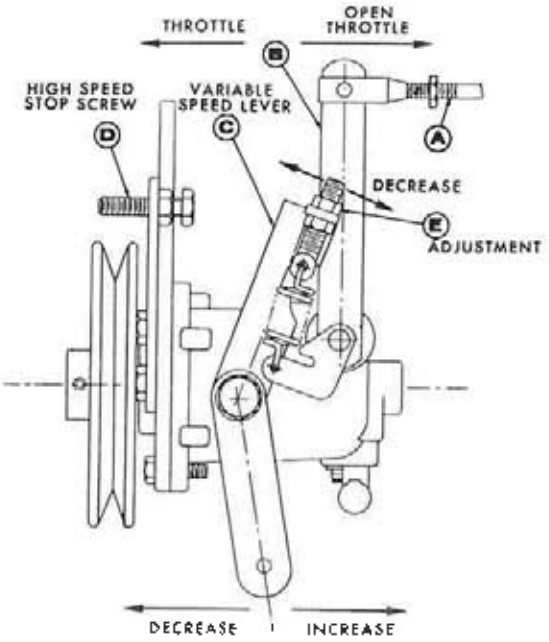


Fig. 22 Governor Adjustment Points (Early Design)

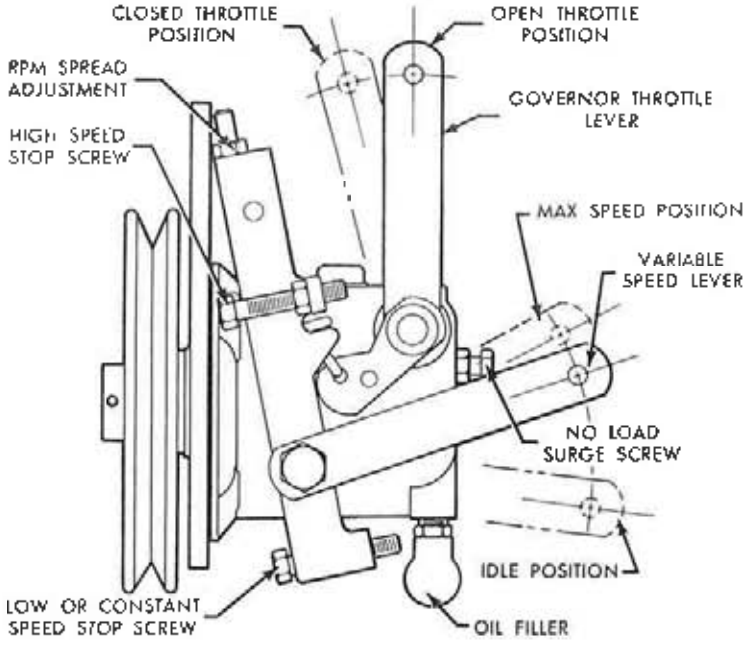


Fig. 23 – Governor Adjustment Points (Late Design)

DIAGNOSIS GUIDE

SYMPTOM	PROBABLE CAUSE
INCONSISTENT IDLE SPEED	Governor-to-carburetor linkage binding. Carburetor throttle plate or shaft binding. Carburetor idle mixture needle(s) not adjusted properly or carburetor idle system not functioning properly. Governor no-load surge adjustment screw not adjusted correctly. (Late design governor only). Governor oil level too low. Drive belt slipping. Governor defective.
INCONSISTENT HIGH SPEED OPERATION	Governor sensitivity adjustment not set properly. Governor-to-carburetor linkage binding. Carburetor dirty or not functioning properly. Governor drive belt slipping. Governor oil level too low. Governor no-load surge adjustment screw not adjusted properly.
ENGINE WILL NOT DEVELOP FULL POWER OR SPEED	Governor high-speed stop screw not adjusted correctly. Governor-to-carburetor throttle rod not adjusted properly to permit carburetor to move to wide open throttle position. Engine requires overhaul or ignition and fuel systems require adjustment or repair. Engine overloaded.

GOVERNOR ADJUSTMENTS

The mechanical governor used with these engines have several adjustments. Both the early and late design governors have a high-speed adjustment and a sensitivity adjustment between full-load and no-load. The late design governor also has a low-speed adjustment and a no-load surge adjustment. In addition, on all installations, the length of the control rod between the governor and carburetor is adjustable.

NOTE: The control rod length must be checked, and adjusted, if necessary, before making any governor adjustments. In addition, all governor and carburetor linkage must be free of binds and without play or the governor cannot be adjusted properly. Also, always check oil level in governor before making adjustments. If low, fill to level with MS-type 10W-30 engine oil.

Governor-to-Carburetor Control Rod Adjustment

With the control rod connected, manually move the governor throttle lever to the maximum open throttle position (Figs. 22 and 23). Check the carburetor throttle shaft lever. It should be positioned 1/32 inch from its maximum speed position and the load engaged, adjust stop screw in or out as necessary until the desired speed is attained. Tighten locknut on stop screw.

High-Speed Adjustment

Temporarily attach an accurate tachometer to the engine. Start the engine and run at a fast idle speed until normal operation temperature is reached. Loosen locknut on governor high-speed stop screw (Figs. 22 and 23). With the hand throttle in the maximum speed position and the load engaged, adjust stop screw in or out as necessary until the desired speed is attained. Tighten locknut on stop screw.

Sensitivity or RPM Spread Adjustment

For proper governor operation there must always be a difference between the full-load and no-load will cause governor hunting and surging, while too large an rpm will cause slow response. The normal rpm spread for this governor is 5 to 10 percent.

To stabilize governor operation and prevent hunting and surging under load, it is necessary to increase the rpm spread. Start the engine and operate at a fast idle until normal operating temperature is reached. With the load disconnected, adjust hand throttle or governor variable speed lever until maximum desired governed speed is obtained. Loosen the rpm spread adjusting nut (Figs 22 and 23), until engine speed decreases 150 rpm.

Tighten jam nut. Recheck governor under full-load and no-load conditions to determine if operation is stabilized and sensitivity is satisfactory. If necessary, repeat the adjustment procedure until correct governor operation is obtained. It may be necessary to readjust governor high-speed stop screw to maintain the correct high-speed setting under load.

To decrease the rpm spread and obtain faster governor regulation the above procedure must be reversed, running the engine under no-load at the maximum governed speed and tightening the rpm spread adjusting nut until engine speed increases 150 rpm. If hunting occurs under load, decrease the sensitivity by loosening the rpm spread adjusting nut until the hunting stops. Do Not Use The No-Load Surge Screw to Correct Hunting Under Load.

Low-Speed Adjustment (Late Design Governors)

Start the engine and operate at a fast idle speed until normal operating temperature is reached. Move hand throttle to the closed position. Loosen locknut on governor low-speed screw (Fig. 23) and turn stop screw in or out as necessary to maintain desired speed.

NOTE: If the absolute minimum idle speed is desired, adjust the governor stop screw in until no further decrease in engine speed is apparent. Then adjust the idle-speed adjustment screw on the carburetor to maintain an engine speed of 700-750 rpm.

No-Load Surge Adjustment (Late Design Governors)

The no-load surge adjustment is set at the factory and rarely, if ever, requires adjustment. If necessary, the adjustment can be used to prevent hunting and surging at no-load speeds, providing the rpm spread adjustment is

set properly. If hunting or surging at no-load is encountered loosen the surge adjustment screw locknut and turn the screw inward until speed stabilizes. Do not turn screw in any further than necessary.

CAUTION: Turning the no-load surge adjustment screw in all the way will interfere with proper governor operation and prevent the governor from returning the engine to idle speed.

DIAGNOSIS GUIDE

GASOLINE ENGINE WILL NOT START

Starter does not crank the engine

1. Battery discharged
2. Electrical lead(s) disconnected
3. Faulty starter switch
4. Faulty ignition switch
5. Faulty starter motor
6. Engine seized
7. Hydrostatic lock

Starter cranks engine slowly

1. Battery not fully charged
2. Battery cable(s) loose
3. Electrical connections corroded or dirty
4. Engine oil too heavy
5. Faulty starter motor

Starter cranks engine

MECHANICAL

1. Blocked air cleaner
2. Improper timing
3. Poor cylinder compression

IGNITION SWITCH

1. No spark to spark plugs
2. Faulty points
3. Faulty distributor
4. Faulty spark plug wires
5. Faulty spark plugs
6. Faulty timing

FUEL SYSTEM

Fuel Not Reaching Carburetor

1. Insufficient fuel in tank
2. Blocked fuel line
3. Restricted fuel filter
4. Air leaks in fuel line
5. Faulty fuel pump

Fuel Reaching Carburetor

1. Air in fuel system
2. Faulty choke operation
3. Improper fuel mixture
4. Improper float setting
5. Carburetor leaks or flooding
6. Improper fuel pump pressure

ENGINE OVERHEATS

MECHANICAL

1. Insufficient water in cooling system
2. Insufficient oil in crankcase
3. Fan belt loose or broken
4. Plugged radiator
5. Thermostat stuck
6. Timing incorrect
7. Faulty water pump
8. Radiator leaking
9. Air in cooling system
10. Radiator cap not sealing or defective
11. Internal engine leakage
12. Exhaust gas leakage into cooling system
13. Cylinder head gasket improperly installed
14. Hot spots in engine due to poor coolant circulation
15. Extended engine idling

ENGINE KNOCKS

MECHANICAL

1. Diluted or thin oil
2. Insufficient oil supply
3. Low oil pressure
4. Excessive crankshaft end play
5. Flywheel runout is excessive
6. Excessive connecting rod or main bearing clearance
7. Bent or twisted connecting rod
8. Crankshaft journals out-of-hand
9. Excessive piston-to-cylinder bore clearance
10. Excessive piston ring side clearance
11. Broken rings
12. Excessive piston pin clearance
13. Piston pin retainer loose or missing
14. Excessive camshaft end play
15. Worn timing gear teeth
16. Excessive timing gear backlash
17. Valve rocker(s) sticking
18. Valve spring(s) broken
19. Improper ignition timing

DIAGNOSIS GUIDE

ENGINE MISFIRES

MECHANICAL

1. Valve(s) sticking
2. Piston ring(s) sticking
3. Ignition timing off
4. Faulty spark plugs
5. Improper valve timing

FUEL SYSTEM

1. Air in fuel system
2. Contaminated fuel
3. Improper grade of fuel
4. Faulty fuel pump
5. Improper carburetor adjustment
6. Hot fuel system

ENGINE STARTS AND STOPS

MECHANICAL

1. Governor idle setting incorrect
2. Valve(s) sticking
3. Engine overheating
4. Restricted air cleaner

FUEL SYSTEM

1. Insufficient fuel in tank
2. Air in fuel system
3. Clogged fuel filter
4. Contaminated fuel
5. Restricted fuel suction line
6. Air leaks in fuel suction line
7. Hot fuel system
8. Non vented fuel tank cap

ENGINE DOES NOT GIVE FULL POWER — GASOLINE ENGINE

MECHANICAL

1. Clogged air cleaner
2. Improper governor linkage adjustment
3. Low coil voltage
4. Improper point dwell or gap
5. Faulty ignition timing
6. Improper valve lash adjustment
7. Worn or bent push rods
8. Faulty valve(s)
9. Improper valve timing
10. Blown or burned head gasket
11. Low cylinder compression

FUEL SYSTEM

1. Carburetor and choke out of adjustment
2. Improper fuel pump pressure
3. Contaminated fuel
4. Improper grade of fuel
5. Air in fuel
6. Air leaks in suction line

ROUGH ENGINE IDLE

MECHANICAL

1. Sticking valve(s)
2. Broken valve spring(s)
3. Governor idle setting incorrect
4. Air leak in governor system
5. Incorrect valve timing
6. Incorrect ignition timing - Gas

FUEL SYSTEM

1. Insufficient fuel in tank
2. Air in fuel system
3. Restricted fuel filter
4. Dirty carburetor
5. Improper float setting
6. Improper idle adjustment
7. Faulty fuel pump

STORAGE

The following instructions are applicable to the storage of a new or used engine.

FOR ONE MONTH

1. Run the engine at 1500 rpm and treat the upper cylinder by spraying an engine preservation oil (SEA 10) into the carburetor air intake for about two minutes. This oil should be formulated for anti-rust and anti-corrosion protection, conform to Ford Specification M-2C35 or equivalent and be a H.D. type that meets requirements for M.S. service. Open the throttle for a short burst of speed, then shut off the ignition and allow the engine to come to a stop while continuing to spray the oil into the carburetor air intake.

2. Disconnect and remove battery. Leave the spark plugs installed and cover all engine openings with dust-proof caps or shields.

3. Drain the oil, water and gasoline.

4. If the engine is less transmission, spray the flywheel and ring gear with a 1-1 mixture of an anti-rust bodied oil and Stoddard Solvent.

For Indefinate Period

1. Drain the crankcase completely and refill with an engine preservative oil (SAE 10).

2. Run the engine until it is completely out of gasoline, then restart and run it on an unleaded, undyed gasoline for at least 10 minutes. Run the engine at 1500 rpm and treat the upper cylinders by spraying an engine preservative oil (SAE 10) into the carburetor air intake for about two minutes. Open the throttle for a short burst of speed, shut off the ignition and allow the engine to come to a stop while continuing to spray the oil into the carburetor air intake.

3. Disconnect and remove battery. Drain the oil, gasoline from carburetor tank and lines. Drain the water at the bottom of the radiator and both sides of the block.

4. Remove all grease and oil from the exterior surfaces of the engine.

5. Leave the spark plugs installed.

6. Seal all engine openings and accessories with water resistant adhesive tape. Mask off all areas to be used for electrical contact.

7. Make sure all surfaces are dry, then spray all taped openings, all engine accessories including ignition wiring, and all exterior surfaces of the engine with an ignition insulation compound.

8. If the engine is equipped with a fiber-disc truck-type clutch, block the clutch in a slightly disengaged position so that the lining and pressure plate are not in contact. CAUTION: Do not completely depress the clutch lever.

LUBE OIL SPECIFICATIONS

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

It is obvious that engine manufacturers or users cannot completely evaluate the hundreds of commercial oils; therefore, the selection of a suitable lubricant in consultation with a reliable oil supplier, strict obervance of his oil change recommendations (used oil sample analysis is of great value), and proper filter maintenance will provide your best assurance of satisfactory oil performance.

Ford Motor Company lubricant recommendations are based on experience with current lubricants of various types and give consideration to the commercial lubricants presently available.

Ford industrial engines have given optimum performance and experienced the longest service with oils which meet Ford Specification ESE-M2C101-C for gasoline and ESN-M2C121-A for diesel engines. Contact a reliable oil supplier and obtain his assurance that his product has been tested and given good performance in Ford industrial engines. You may wish to request the oil supplier to show the performance results of his product in Ford industrial engines.

Operators should be urged to use the highest viscosity oil compatible with their requirement for cold starting, e.g.; when 80° F+ ambients prevail, a 10W-40 oil should not be used for severe service; instead, 20W-40 or SAE-30 minimum should be used. In applications such as irrigation operation where units are subjected to sustained operation in ambient temperatures of 80° F and above, SAE-40 oil should be used. For temperatures consistently between 32° and 80° F however, that recommendation should now be modified to exclude multi-viscosity oils and to specify the use of SAE-30 only. Units that are subjected to oil temperatures of 270° F or higher for a sustained period of time are prone to rapid oxidation of their engine lubricating oils. Oxidation from heat will eventually turn the lubricating oil into a gell-like substance. When this occurs, lubrication of components ceases--engine fails. To keep oil temperatures within a safe range (180°-210°F), it may be necessary to add an engine oil cooler to the lubrication system.

It is recommended that new engines be started with 100-hour oil change periods. The drain interval may then be gradually increased, or decreased with experience on a specific lubricant while also considering the recommendations of the oil supplier (analysis of the drained oil can be helpful here) until the most practical oil change period for the particular service has been established.

Solvents should not be used as flushing oils in running engines. Dilution of the fresh refill oil supply can occur which may be detrimental.

Heavy sludge deposits found on the oil filter elements at the time of oil change must be taken as an indication that the detergency of the oil has been exhausted. When this occurs, the oil drain interval should be shortened. Since abrasive dust, metal particles and carbon material accumulate in the lubricating oil during engine operation, the oil filter elements must be replaced each time the oil is changed. It is recommended that only oil filters that meet Ford Specification ESE-C8AF-6714-A, or C be used. Oil filters that state on the filter or container that they are acceptable for engine manufactures warranty coverage replacement are acceptable to Ford Industrial Engine and Turbine Division.

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

TROUBLE SHOOTING THE FORD SOLID STATE IGNITION

The Ford Solid State Ignition System is easy to diagnose and repair if a systematic step-by-step diagnostic approach is followed. The first step is always to verify the problem. Make sure you understand what the problem is. If you are sure that the ignition system is malfunctioning, proceed with the following analysis.

Preliminary Checks

Check for bad connections at the coil, distributor, and module.

Make sure the battery is sufficiently charged and in good condition.

Perform a Spark Intensity Test: Install an auxiliary starter switch; disconnect the coil high tension lead at the distribution cap, and hold the terminal about 1/4 inch from the cylinder head or another good ground. Crank the engine and observe the spark. If the spark is good, the problem lies in the secondary system. Proceed to check out the secondary exactly as you would with a conventional ignition system. If the spark is weak or non-existent, check the coil-to-distributor high tension lead. If this lead checks all right, the trouble lies in the primary circuitry.

If the preliminary checks have not located the problem, it will be necessary to make a series of electrical tests with a sensitive volt-ohmmeter, using probe-type test leads. For maximum effectiveness, these tests must be performed in the sequence described.

First refer to the illustrations. Figure 80 is a schematic of the overall system. Figure 81 shows the three-wire and four-wire module connectors, and identifies their terminals by socket number. Note that you are looking at the harness side of the connectors and that the terminals are female receptacles. Figure 82 is a wiring schematic showing the color coding of the wiring harness and identifying the connections at the control module. You should be thoroughly familiar with these illustrations before you start the test procedure.

As you proceed through the testing sequence, you may correct the problem at any step. Whenever the problem appears to be corrected, test the car to make sure. You will then have completed the trouble shooting procedure. However, if a problem still exists, continue to work through the testing sequence.

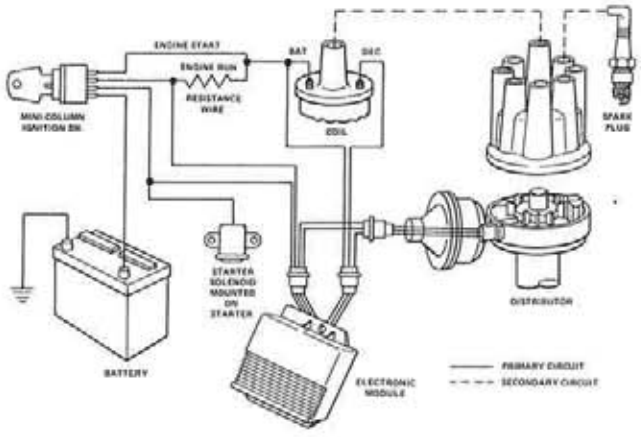


FIGURE 80. FORD SOLID STATE IGNITION SYSTEM SCHEMATIC

NOTE: When the multiple connectors at the module and at the distributor have been separated, they should be lubricated and waterproofed before reassembly. This is done by dipping the ends in Lubriplate D.S.

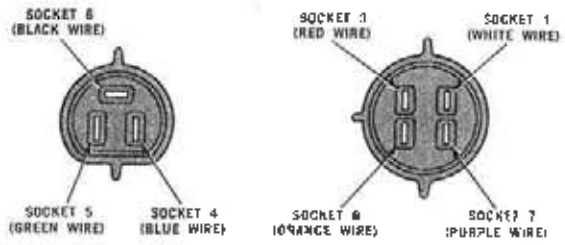


FIGURE 81. 1974 SOLID STATE MODULE CONNECTORS

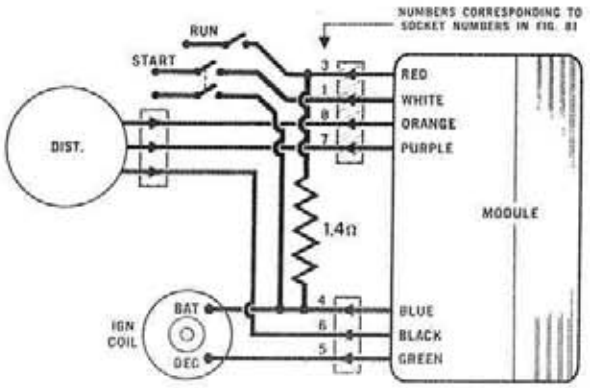


FIGURE 82. 1974 IGNITION SYSTEM WIRING DIAGRAM (SOLID STATE)

Voltmeter Tests

The purpose of the voltmeter testing is to locate excessive voltage drops which cause malfunction of the system. Turn the ignition switch ON (RUN position) and turn all lights and accessories off. Disconnect the multiple connectors at the control module, and probe with the voltmeter leads as follows: (See Figures 81 and 82 for 1974 systems, and Figure 83 for 1975 systems.)

1. Socket 3 (red wire) to ground. This indicates voltage available at the module. The reading should be battery voltage. If not, repair the feed wiring at the module for RUN condition.

2. Socket 5 (green wire) to ground. This reading should also be battery voltage. If not, perform a Battery Source Test.

Battery Source Test. Install a jumper wire from the coil DEC terminal to ground. Connect one voltmeter lead to the coil BAT terminal and the other to ground. If the reading is between 4.9 and 7.9 volts, the circuit is satisfactory. If the reading is over 7.9 volts, check the ignition resistance wire and replace if defective. If the reading is less than 4.9 volts, check the primary wiring for worn insulation, broken strands, or loose or corroded terminals.

For the following series of tests, use the auxiliary starter switch to crank the engine, and take readings as follows:

3. Socket 1 (white wire) to ground. This indicates voltage available at the module for starting. The reading should be 8 to 12 volts. If not, repair or replace the feed wiring to the module for the START condition.

4. Socket 4 (blue wire) to ground. Install a spade terminal jumper wire from Socket 5 to Socket 6. With the jumper in place, take a reading between Socket 4 and ground. The reading should be over 6 volts. If not, the bypass circuit is open or grounded from the solenoid or ignition switch to Socket 5, or there is a bad connection at the coil primary terminals.

5. Socket 7 (purple wire) to Socket 8 (orange wire). This tests the output of the magnetic pickup assembly at the module connector. There should be a D.C. volt wiggle (needle oscillation or at least 0.5 volts A.C.). No output indicates a defect in either the signal generating mechanism or the harness connection to the module. To determine the cause, make the folling Distributor Hardware Test.

Distributor Hardware Test. Disconnect the distributor pigtail connector. Crank the engine with the voltmeter leads at the two parallell blades. The meter needle should oscillate. If there is an oscillation, the harness between the distributor and the module is defective and should be repaired or replaced. If there is no oscillation, remove the distributor cap and rotor. Inspect all parts for damage. Make sure the armature is tight on the sleeve and the roll pin is in position. Crank the engine to see if

the armature rotates. If everything checks out, the magnetic pickup assembly is defective and should be replaced. If the cause of the malfunction has not been determined at this point, perform the Ohmmeter Tests.

Ohmmeter Tests

The ohmmeter tests are also made at the harness side of the module connectors. All resistance tests are made with the ignition switch OFF.

1. Socket 7 (purple wire) to Socket 8 (orange wire). The test measures the internal resistance of the pickup assembly at the module. The reading should be 400 to 800 ohms. If not, perform the following auxiliary test.

Auxiliary Test. Disconnect the distributor pigtail connector. Check the resistance between the parallel blades. The reading should be 400 to 800 ohms. If not, replace the magnetic pickup assembly. If the reading is within the specified range, the problem lies in the wiring harness between the distributor and the module; repair or replace this harness. Reconnect the pigtail connector.

2. Socket 6 (black wire) to ground. This is a check of the ground circuit resistance at the module. The ohmmeter reading should be zero. If not, make the following auxiliary test.

Auxiliary Test. Disconnect the distributor pigtail connector. Test the resistance between the third blade and the distributor bowl. The reading should be zero. If not, replace the magnetic pickup assembly. If the reading is zero, the wiring harness between the distributor and the module is defective; repair or replace the harness.

3. Socket 7 (purple wire) to ground. The ohmmeter reading should be over 70,000 ohms. If not, replace the magnetic pickup assembly.

4. Socket 8 (orange wire) to ground. This reading should also be over 70,000 ohms. If not, replace the magnetic pickup assembly.

5. Socket 3 (red wire) to coil tower. This tests the resistance of the coil secondary windings. The reading should be 7,000 to 13,000 ohms. If not, remove the coil and test it on a coil tester; replace if defective. If the coil checks out, the problem is in the wiring harness. Repair or replace the harness.

6. Socket 5 (green wire) to Socket 4 (blue wire). This tests the coil primary windings. The reading should be 1.0 to 2.0 ohms. If not, remove the coil and test with a coil tester; replace if defective. If coil tests all right, repair or replace the harness.

7. Socket 5 (green wire) to ground. The reading should be more than 4.0 ohms. If not, there is a short to ground at the coil DEC terminal or in the primary wiring to the coil.

8. Socket 3 (red wire) to Socket 4 (blue wire). This is a test of the resistance wire. The reading should be 1.0 to 2.0 ohms. If not, replace the resistance wire.

Module Replacement

If none of the preceeding tests has identified the problem area, plug in a known good module at the module harness connectors. Do not remove the original

module. Make a Spark Intensity Test with the good module. If the spark is not satisfactory, reconnect the original module and test the spark. If the spark is not satisfactory, replace the original module.

1975 IGNITION SYSTEM CHANGES

For 1975, there have been a number of revisions to the Solid State system. One change which can cause considerable confusion is in the routing of the seven wires at the control module through the three-wire and four-wire connectors. The differences between the 1974 and 1975 wire groupings and terminal identification are shown in Figure 83. This change has no effect on the service procedures previously described, since the wire color coding, continuity and socket numbers remain the same. The wiring and terminals are merely relocated in the connector for 1975. However, 1975 modules cannot be connected to 1974 wiring harnesses.

Coil

The ignition coil primary leads are now attached to a new "polarized" connector which retains them in contact with the new button terminals on the coil cap. A "Tach Test" terminal is now included to facilitate making tachometer readings.

Distributor

Distributor caps and rotors are now made from compressed alkyd plastic (blue) having higher dielectric strength than the previous phenolid material. Six-cylinder engines have a new design "mini-base" distributor having an eccentrically pivoted base place and using screws to retain the distributor cap. The three-wire "pigtail" connector now has handles to enable easier disconnection for testing purposes.

Resistance Wiring

The resistance value has been decreased from 1.4 ohms to 1.3 ohms.

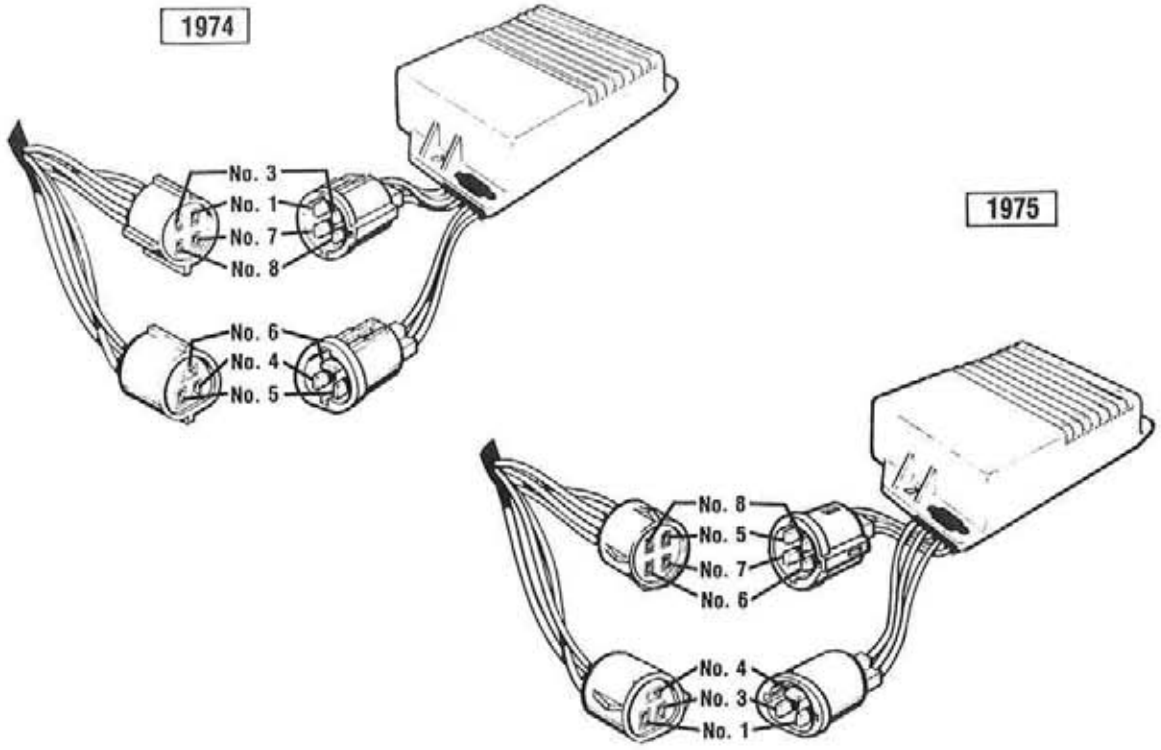


FIGURE 83. 1975 vs. 1974 MODULE CONNECTIONS

GLOSSARY OF TERMS

Advance - Spark Advance or Ignition Advance. Causing the ignition to occur earlier to compensate for faster engine operation or slower fuel combustion.

Ammeter - An electrical meter used to measure current flow in amperes.

Ampere - A unit of measurement for current. It is the quantity of current that will flow through a circuit. In terms of water analogy, this would be compared to gallons per minute.

Arcing - Electricity jumping across a gap. Arcing is not desirable in the ignition points as it causes pitting and erosion and the points soon become inoperable.

ATDC - After Top Dead Center - refers to engine timed to fire after top dead center.

Available Voltage - The open circuit voltage available from the coil. This is measured on the oscilloscope by removing one spark plug wire and measuring the voltage spike.

Breaker Points - Contact points in the distributor which open and close the ignition primary circuit.

BTDC - Before Top Dead Center - refers to engine timed to fire before top dead center.

Centrifugal Advance Mechanism - A device that advances ignition timing with relation to engine speed.

Circuit - The complete path of an electrical current, including the generating device. When the path is continuous, the circuit is closed and current flows. When the path is not continuous the circuit is open and current flow stops.

PARTS SECTION

PARTS SECTION

This Ford Industrial Engine Parts List is designed to provide for fast and easy identification of genuine Ford parts.

Most normal replacement parts for the 4-cylinder gasoline engine are available from your Ford Power Products Distributor's stock. A distributor's directory list, Form IET 194-101, enclosed in a protective envelope, is included with each engine or power unit.

Models manufactured to special customer specifications are designated S.O. (Special Option) and are identified by an S.O. number following the model number. When ordering parts, always furnish the complete model, S.O. and serial numbers. Your Power Products Distributor has complete model and S.O. information and can service substituted or peculiar components of S.O. models.

LOCATING PART NUMBERS

Note: Not all parts listed in this book are illustrated.

Illustrations consist of exploded views with parts identified by an item number.

Illustrated parts are identified in the text with the item number.

Parts not illustrated have no item number. These parts are listed under major assembly groups.

The following procedure is recommended for locating parts in the parts list:

Example: A gasket is required for the water pump cover of a 140-CID engine, and the part number is not known.

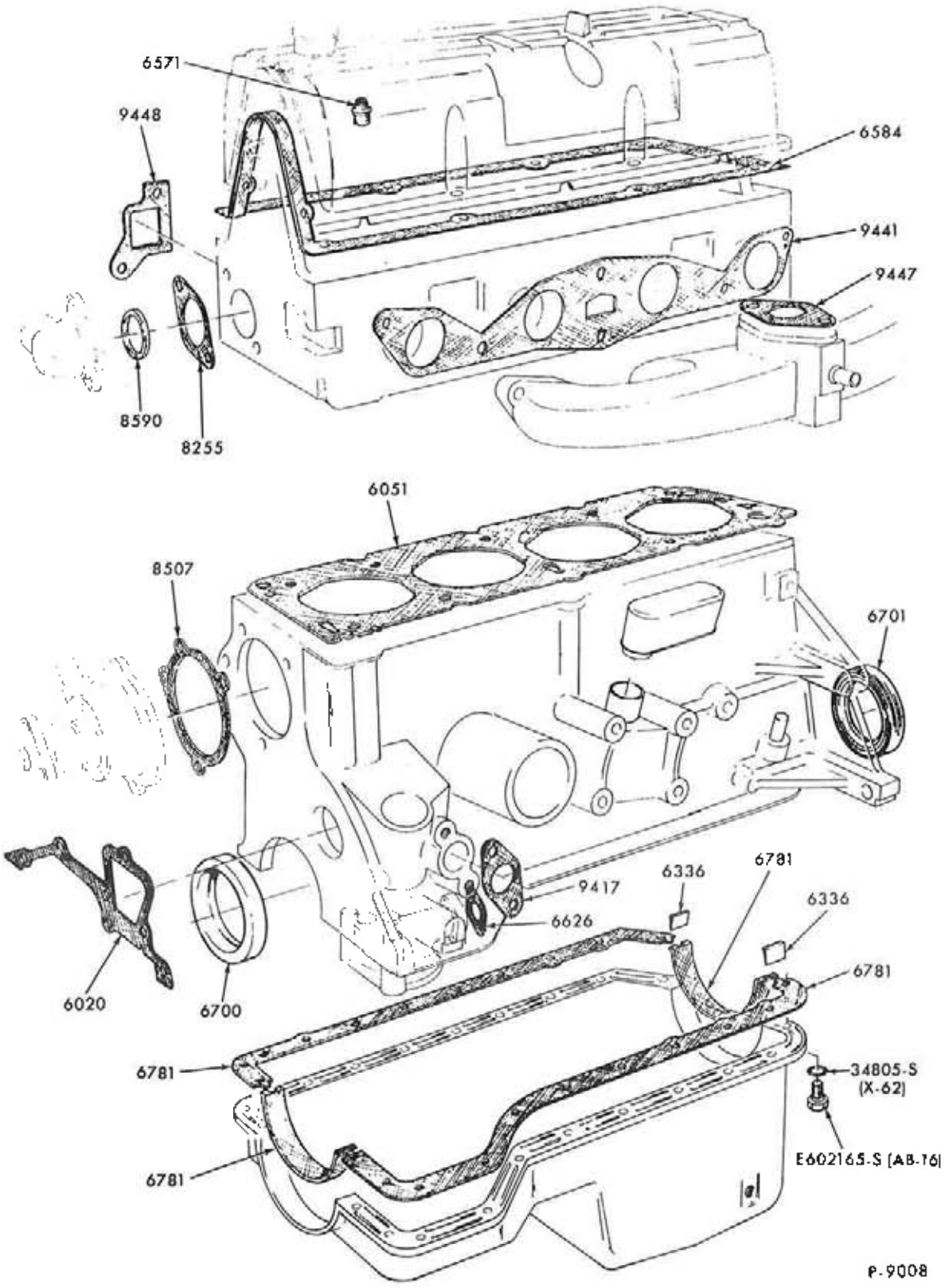
1. Refer to the Index at the front of the book for the Gasket Kits-Assembly page number.

2. Turn to the appropriate illustration page.

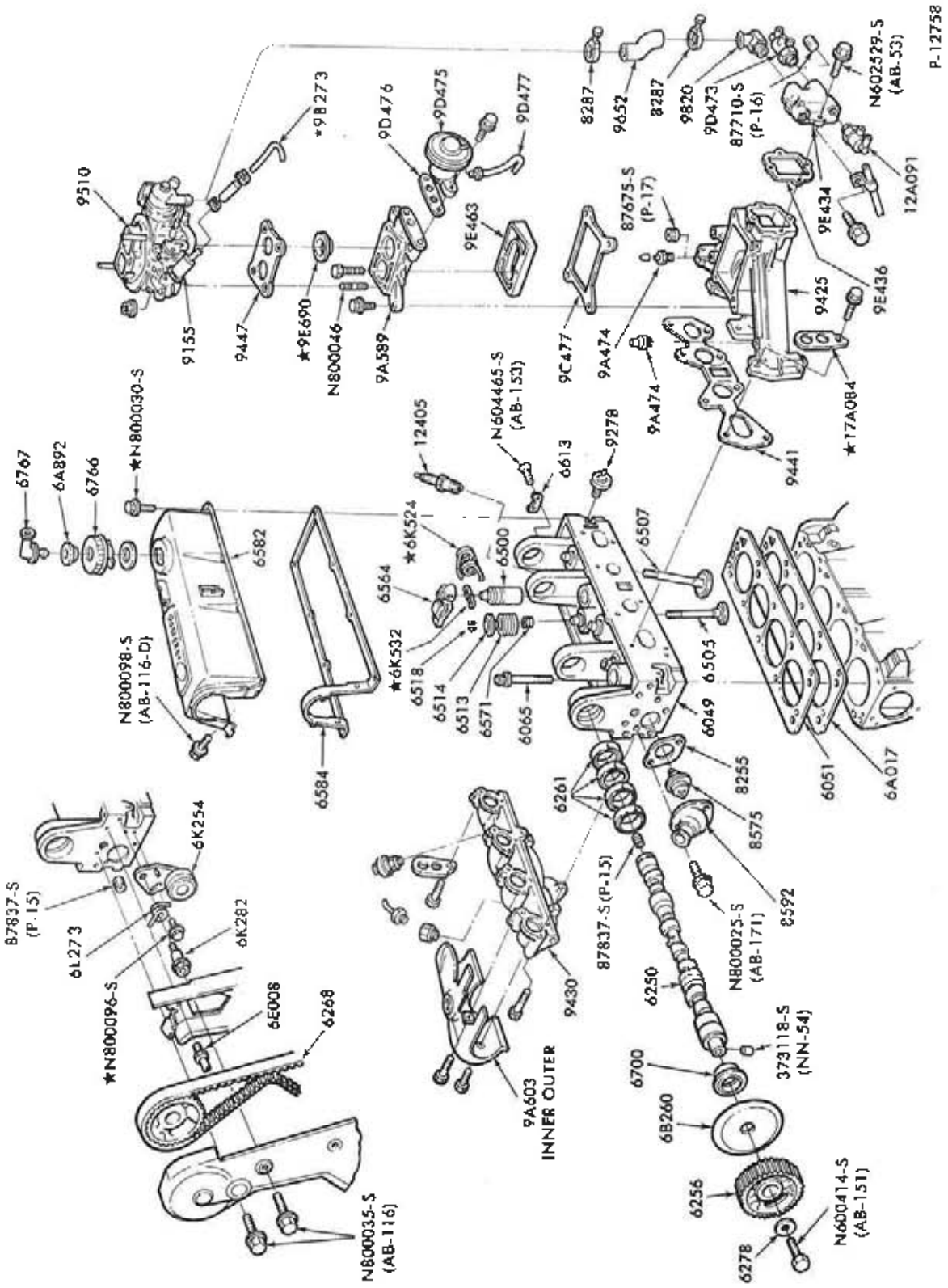
3. Refer to the appropriate text page.

When ordering parts, always indicate method of shipment; freight, air freight; express, air express; parcel post; air parcel post.

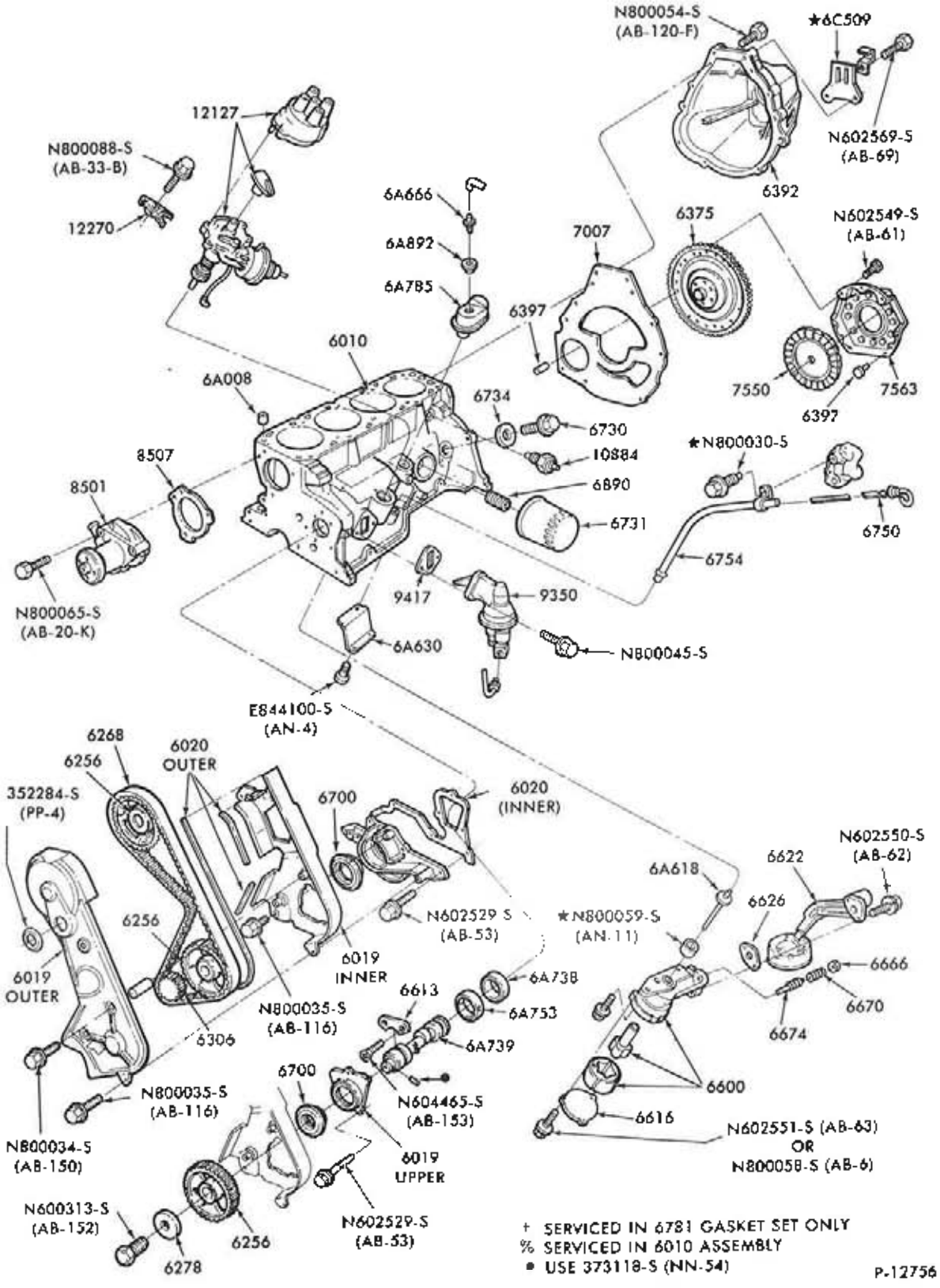
If further assistance is required by you or your local Ford Industrial Distributor contact: Hagie Manufacturing Company, Clarion, Iowa or Midwestern Power Products Company, 10100 Dennis Drive, Des Moines, Iowa.



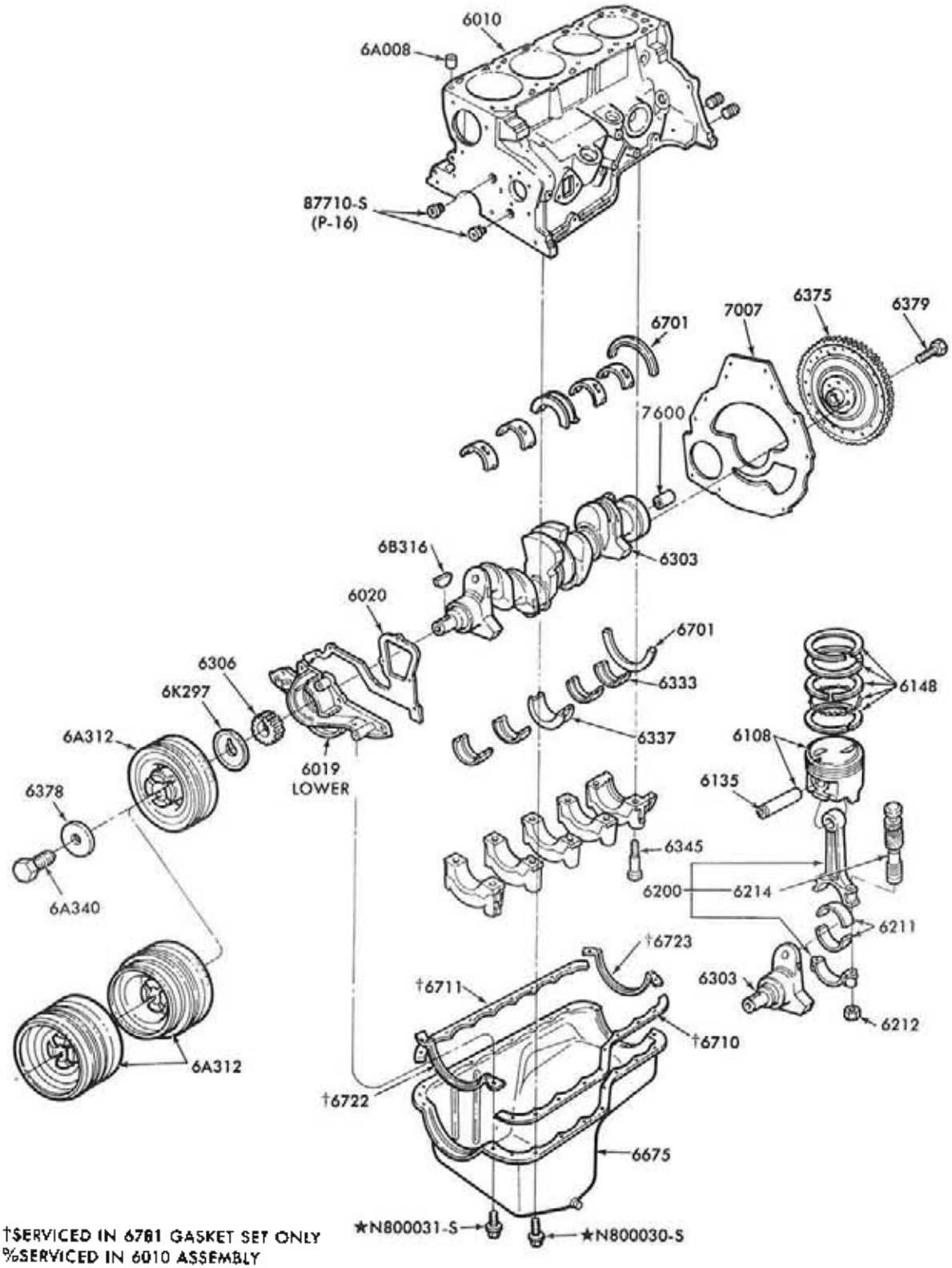
GASKETS - COMPLETE ENGINE-TYPICAL
1973/74 4 CYL. 122 (2000 cc)



ENGINE PARTS (EXTERNAL)-TYPICAL
1974/ 4 CYL. 140 (2300 cc)



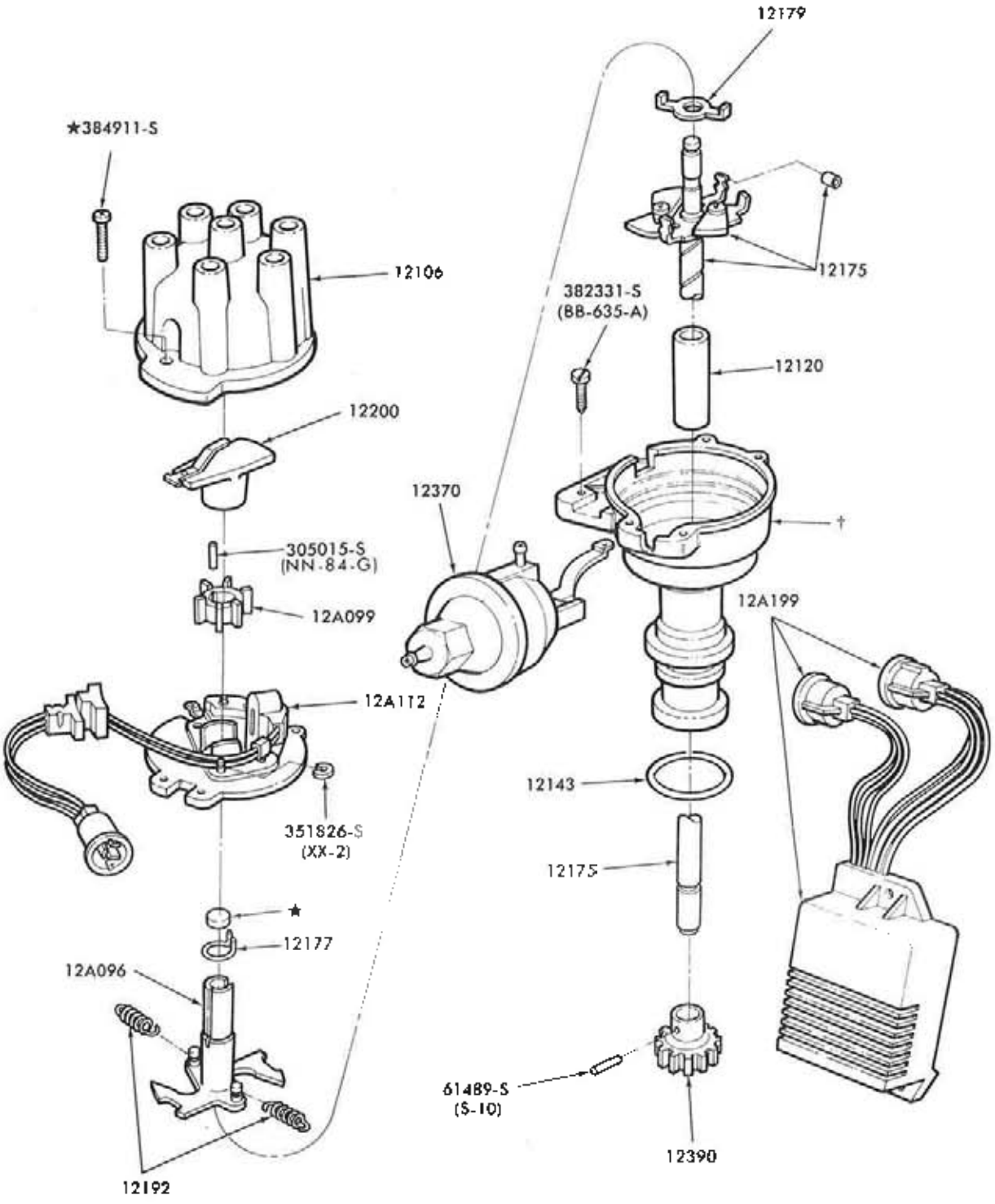
ENGINE PARTS (INTERNAL-UPPER)-TYPICAL
1974/ 4 CYL. 140 (2300 cc)



†SERVICED IN 6781 GASKET SET ONLY
%SERVICED IN 6010 ASSEMBLY
•USE 373118-S (NN-54)

P-12737

ENGINE PARTS (INTERNAL-LOWER)-TYPICAL
1974/ 4 CYL. 140 (2300 cc)



† SERVICED ONLY IN ASSY. — 12127 DISTRIBUTOR

P-12857

DISTRIBUTOR (BREAKERLESS)-TYPICAL
1975/ ALL--4 CYL. 140 (2300cc)
1975/ ALL--6 CYL. 200 and 250

Quantity	Part No.	Description
1	D5FZ 6008-A	Gasket Set (Complete Overhaul)

consists of:

2-D42E 6E009-BB	Seal (Front Cover)	1-D42E 6722-AB	Seal (Oil Pan)
1-D4FZ 6020-A	Seal (Front Cover)	1-D42E 6723-AA	Seal (Oil Pan)
1-D4FZ 6020-B	Gasket (Front Cover)	1-D4FZ 6734-A	Seal (Drain Plug)
1-D5FZ 6051-A	Gasket (Cylinder Head)	1-D4FZ 8255-A	Gasket (Water Outlet)
8-D4FZ 6571-A	Seal (Valve Stem)	1-D4FZ 8507-A	Gasket (Water Pump)
1-D5FZ 6584-A	Gasket (Rocker Cover)	1-D4FZ 9417-A	Gasket (Fuel Pump)
1-D4FZ 6626-A	Gasket (Oil Pump)	1-D4FZ 9E436-A	Gasket (Manifold Cover)
3-D4FZ 6700-A	Seal (Crankshaft Front)	1-D4FZ 9441-A	Gasket (Intake Manifold)
2-D4FZ 6701-A	Seal (Crankshaft Rear)	1-D4FZ 9447-A	Gasket (Manifold & Spacer)
1-D42E 6711-AA	Gasket (Oil Pan)	1-D4FZ 9D476-A	Gasket (EGR Valve)
1-D42E 6711-AA	Gasket (Oil Pan)	1-D4FZ 9C477-A	Gasket (Manifold & Spacer)

2	D4FZ 6A008-A	Dowell (Cylinder Head to Cylinder Block)
1	D4FZ 6E008-A	Bolt Assy. (Tensioner) - M8 x 6G (Metric Coarse)
1	D4FZ 6009-A	Cylinder Assembly
1	D4FZ 6019-A	Lower Cover Assembly (Cylinder Front)
1	D4FZ 6019-B	Upper
1	D4FZ 6019-C	Inner
1	D4FZ 6019-D	Outer
7	N602569-S76	(AB-53) Bolt (Cover to Block) - M10 x 20 (Metric Coarse)
2	N800034-S	(AB-150) - Bolt (Outer Cover to Inner Cover) Hex. Wshr. Hd - M6 x 25 (Metric Coarse)
4	N800035-S	(AB-116) - Screw & Washer - M6 x 14 (Metric Coarse)
1	D4FZ 6020-A	Outer Gasket (Cylinder Front Cover)
1	D4FZ 6020-B	Inner
	6026	Plug, Engine
AR	87710-S	(P-16) (Water Jacket Side of Block) - Pipe
1	C5AZ 6026-G	(Hole in Rear of Block) Cup Type Std. 2,072" O.D.
AR	C5AZ 6026-H	.060" O/S
4	C8AZ 6026-C	(Hole in Block and Head) Cup Type Std. 1.50" O.D.
AR	C8AZ 6026-D	.060" O/S
AR	87837-S	(P-15) Plug (Drain Holes & Oil Gallery in Block & Head) - 14' - 18
1	D4FZ 6049-D	Head Cylinder
1	D5FZ 6051-A	Head Cylinder (Gasket)
10	D4FZ 6065-A	Bolt (Cylinder Head)

Quantity	Part No.	Description
1	D4FZ 6079-A	Valve Grind Gasket Set

consists of:

1-D4FZ 6051-A	Gasket (Cyl., Head)	1-D4FZ 8507-A	Gasket (Water Pump)
8-D4FZ 6571-A	Seal (Valve Stem)	1-D4FZ 9441-A	Gasket (Intake Manifold)
1-D4FZ 6584-B	Gasket (Rocker Cover)	1-D4FZ 9447-A	Gasket (Carburetor)

Piston Assembly

4	D4FZ 6108-A	Std. (Red)
AR	D4FZ 6108-B	Std. (Blue)
AR	D4FZ 6108-C	.003" O/S
AR	D4FZ 6108-D	.020" O/S
AR	D4FZ 6108-E	.030" O/S
AR	D4FZ 6108-F	.040" O/S
4	B2AZ 6135-A	Pin Piston
2	D4FZ 6148-A	Standard
2	D4FZ 6148-B	.020" O/S
2	D4FZ 6148-C	.030" O/S
2	D4FZ 6148-D	.040" O/S
4	D4FZ 6200-A	Rod Assembly (Connecting)
	6211	Bearing Connecting Rod
8	D4FZ 6211-A	Std. (Red) - Upper and Lower
AR	D4FZ 6211-B	Std. (Blue)
AR	D4FZ 6211-C	.002" U/S
AR	D4FZ 6211-D	.010" U/S
AR	D4FZ 6211-E	.020" U/S
AR	D4FZ 6211-F	.030" U/S
AR	D4FZ 6211-G	.040" U/S
8	D4FZ 6212-A	Nut (Connecting Rod) Hex. Hd. M9 x 1 (Metric Fine)
8	D4FZ 6214-A	Oval Hd. M9 x 1 x 55 (Metric Fine)
1	D4FZ 6250-A	Camshaft
1	D4FZ 6K254-A	Pulley Assembly (Tensioner)
1	E804126-S76	(AB-112) Bolt (Holds Spring & Tension Pulley) Shoulder M8 x 46.5 (Metric Coarse)
1	E602187-S82	(AB-17) Bolt (Adjusting Bolt for Tension Pulley) Hex. Hd. M8 x 20 (Metric Coarse)
1	E630027-S71	(AX-13) Washer (Use with E602187-S82) - Flat - M8 (Metric)
2	D4FZ 6256-A	(1) Req'd Camshaft (1) Req'd Auxiliary Shaft
2	373118-S	(NN-54) Pin (Align Sprockets on Camshaft & Auxiliary Shaft)
1	N600313-S	(AB-152) Bolt (Lower Sprocket to Aux. Shaft M10 x 4 Metric Coarse)

Quantity	Part No.	Description
	6261	Camshaft (Front) Bearing
1	D4FZ 6261-A	Std. I.D. & O.D.
AR	D4FZ 6261-B	.016" U/S I.D. - Std. O.D.
	6261	Bearing (Camshaft Front Intermediate)
1	D4FZ 6261-A	Std. I.D. & O.D.
AR	D4FZ 6261-B	.016" U/S I.D. Std. O.D.
	6261	Bearing (Camshaft Rear Intermediate)
1	D4FZ 6261-A	Std. I.D. & O.D.
AR	D4FZ 6261-B	.016" U/S I.D. Std. O.D.
	6261	Bearing (Camshaft Rear)
1	D4FZ 6261-A	Std. I.D. & O.D.
AR	D4FZ 6261-B	.016" U/S - Std. O.D.
1	D4FZ 6L273-A	Spring (Tensioner)
2	D4FZ 6278-B	Washer (Camshaft Sprocket) - Flat (1) on Camshaft and (1) on Fuel Pump, Oil Pump and Dist. Drive Shaft Used on Auxiliary Drive Shaft.
1	D4FZ 6278-A	Used on Camshaft (Washer)
1	D4FZ 6K282-A	Bolt (Timing Belt Tensioner)
2	D4FZ 6K291-A	Spacer (Timing Belt Cover)
1	D4FZ 6K297-A	Guide (Crankshaft Timing Belt)
1	D4FZ 6303-A	#ID Crankshaft Assembly
1	D4FZ 6306-A	Sprocket (Crankshaft)
1	D4FZ 6A312-B	#D42E 6312-BA, BC, BD or D42E 6A312-CA (Crankshaft Pulley)

ENGINE BEARING APPLICATION CHART

	FRONT	FRONT INTERMEDIATE	CENTER	REAR INTERMEDIATE	REAR
UPPER MAIN BEARING					
Standard Std. (Red)	D4FZ 6333-A	D4FZ 6333-A	D4FZ 6337-A	D4FZ 6333-A	D4FZ 6333-A
Std. (Blue)	D4FZ 6333-B	D4FZ 6333-B	D4FZ 6337-B	D4FZ 6333-B	D4FZ 6333-B
.002" U/S	D4FZ 6333-C	D4FZ 6333-C	D4FZ 6337-C	D4FZ 6333-C	D4FZ 6333-C
.010" U/S	D4FZ 6333-D	D4FZ 6333-D	D4FZ 6337-D	D4FZ 6333-D	D4FZ 6333-D
.020" U/S	D4FZ 6333-E	D4FZ 6333-E	D4FZ 6337-E	D4FZ 6333-E	D4FZ 6333-E
.030" U/S	D4FZ 6333-F	D4FZ 6333-F	D4FZ 6337-F	D4FZ 6333-F	D4FZ 6333-F
LOWER MAIN BEARING					
Standard Std. (Red)	D4FZ 6333-A	D4FZ 6333-A	D4FZ 6337-A	D4FZ 6333-A	D4FZ 6333-A
Std. (Blue)	D4FZ 6333-B	D4FZ 6333-B	D4FZ 6337-B	D4FZ 6333-A	D4FZ 6333-B
.002" U/S	D4FZ 6333-C	D4FZ 6333-C	D4FZ 6337-C	D4FZ 6333-C	D4FZ 6333-C
.010" U/S	D4FZ 6333-D	D4FZ 6333-D	D4FZ 6337-D	D4FZ 6333-D	D4FZ 6333-D
.020" U/S	D4FZ 6333-E	D4FZ 6333-E	D4FZ 6337-E	D4FZ 6333-E	D4FZ 6333-E
.030" U/S	D4FZ 6333-F	D4FZ 6333-F	D4FZ 6337-F	D4FZ 6333-F	D4FZ 6333-F

Quantity	Part No.	Description
1	D4FZ 6A340-A	M14 x 1.5 x 40 (Metric Fine) Bolt Crank Pulley
10	D4FZ 6345-A	M12 x 1.75 x 80 (Metric Fine) Bolt Main Brg. Cap
1	D4ZZ 6A366-A	Plate (Flywheel Reinforcing)
1	D5FZ 6375-A	Flywheel Assembly
3	N800081-S51	(AB-159) Bolt (Flywheel to Conv.) M10 x 14 - (Metric Coarse)
1	D4FZ 6378-A	M15-Flat (Metric) Washer Crank Pulley
6	D4FZ 6379-B	M10 x 1 x 20 (Metric Fine) also used to att. 9D475 E.G.R. Valve.
2	D4FZ 6397-A	Flywheel Hsg. to Block Dowell
1	D2RY 6411-A	Seal (Flywheel Housing Cover Plate)
		Tappet Assy. Valve
8	D4FZ 6500-A	Hydraulic-Std.
AR	D4FZ 6500-B	.020" O/S
		Exhaust Valve
4	D4FZ 6505-A	Std.
AR	D4FZ 6505-B	.003" O/S
AR	D4FZ 6505-C	.015" O/S
AR	D4FZ 6505-D	.030" O/S
		Intake Valve
4	D4FZ 6507-A	Std.
AR	D4FZ 6507-B	.003" O/S
AR	D4FZ 6507-C	.015" O/S
AR	D4FZ 6507-D	.030" O/S
		Valve Guide
AR	D4FZ 6510-A	Intake

Quantity	Part No.	Description
8	D4FZ 6513-A	Spring (Valve)
8	DOAZ 6514-A	Retainer (Valve Spring)
16	DOAZ 6518-A	Key (Valve Spring Retainer)
8	D4FZ 6K524-A	Spring (Follower Arm)
8	D4FZ 6K532-A	Clip (Follower Arm Spring Retaining)
8	D4FZ 6564-A	Shaft (Valve Rocker Arm)
8	D4FZ 6571-A	Std. .328" I.D. Seal Valve Stem
8	D4FZ 6571-B	.015" O/S
8	D4FZ 6571-C	.030" O/S
1	D5FZ 6582-A	Cover Assy. (Valve Rocker Arm)
2	N800098-S2	(AB-116) Screw & Washer (Cover to Head) M6 x 16 (Metric Coarsed)
8	N800030-S	(AB-149-A) - Screw & Washer (Cover to Head) - M6 x 16 (Metric Coarse)
1	D5FZ 6584-A	Gasket (Valve Rocker Arm Cover)
	6600	Oil Pump
1	D5FZ 6600-A	Less Screen & Cover - Has (4) Cover Plate
1	N800059-S	(AN-11) Dowel Pin M 18.3 x 10 (Metric)
1	D5FZ 6608-A	Rotor and Shaft Assy. (Oil Pump Drive)
2	D4FZ 6613-A	(1) Used on 6250 Camshaft & (1) on 6A739 Aux. Shaft
1	D5FZ 6616-A	Has (4) Bolt Holes
4	N602551-S82	(AB-63) Bolt (Cover to Pump) M8 x 30 (Metric Coarse)
1	C2OZ 6A616-A	Refer to 6666 for "Before 1/2/75"
1	D4FZ 6A618-A	Shaft Assy. (Oil Pump Intermediate)
1	D5FZ 6622-A	Screen, Tube & Cover Assy. (Oil Pump)
2	N602550-S82	(AB-62) Screw & Washer (Screen & Cover to Pump M8 x 25 (Metric Coarse)
1	D4FZ 6626-A	Gasket (Oil Pump Inlet Tube)
1	C4TZ 6629-A	Ring (Oil Pump Intermediate Shaft Retaining)
1	D4FZ 6A630-A	Baffle (Cylinder Block Ventilation)
2	D4FZ 6638-A	Bolt and Washer
1	D4FZ 6A664-A	Lower Hose Crankcase Ventilation
1	D4FZ 6A664-B	Upper Hose Crankcase Ventilation
AR	383313-S	(YY-6) Strap (Ventilation Hose) Adj-11" Long
1	D5FZ 6A666-A	*EV-82
1	D4FZ 6670-A	Spring (Oil Pump Relief Valve)
1	D5FZ 6674-A	Plunger (Oil Pump Relief Valve)
1	D4FZ 6675-A	Pan Assy. (Oil)
18	N800030-S	(AB-149-A) Screw & Washer (Oil to Block & Cover Hex. Hd. M6 x 16 (Metric Coarse)
4	N800031-S	(AB-149-B) Screw & Wshr. (Oil Pan to Block & Cover) Hex. Hd. M8 x 20 (Metric Coarse)
	6700	Seal Cylinder (Front Cover)
3	D4FZ 6700-A	(1) Used on Crankshaft (1) on Camshaft (1) on Aux. Shaft
2	D4FZ 6701-A	Packing (Crankshaft Rear)
	* 6710-11	Serviced in 6781 Gasket Set Only
	* 6722-3	Serviced in 6781 Gasket Set Only

Quantity	Part No.	Description
2	D4FZ 6730-A	(1) Req'd for Oil Pan (1) Used on Plug Cyl. Block
1	CIAZ 6731-A	#FL-1 Oil Filter
1	D4FZ 6A738-A	Std.-1.658" I.D. Brg. Auxillary Driveshaft Rear
AR	D4FZ 6A738-B	.015" U/S
1	D4FZ 6A739-A	Shaft Assy. (Fuel Pump, Oil Pump and Dist. Drive)
1	D5FZ 6750-A	19 1/16" top of Shield to Safe-19 3/4" Shield to add 1-20 3/8" Shield to end. Dip Stick
1	D4FZ 6A753-A	Std. 1.658" I.D. Brg. Auxillary Shaft Front
1	D4FZ 6A753-B	.015" U/S
1	D4FZ 6754-A	Tube Assy. (Oil Level Indicator)
1	DIAZ 6766-A	*EC-8-A Filler Cap
1	C8AZ 6767-A	Elbow (Crankcase Ventilation Hose)
1	D4FZ 6775-A	Shield (Splash)
1	D4FZ 6781-A	Gasket Set (Oil Pan)
1	D4FZ 6A785-A	Separator Assy. (Crankcase Vent Oil)
1	D4FZ 6890-A	Insert (Oil Filter Mounting Bolt)
1	C8SZ 6A892-A	P.C.V. Valve to Oil Separator
1	C8AZ 6A892-A	Elbow to Oil Filler Cap
1	C7JZ 8005-C	Radiator
1	DOHZ 8100-B	Radiator Cap
1	7C 8125-A	Radiator Pads
1	D4PZ 8255-K	*RC-521- (Adhesive Backing)
1	D4FZ 8501-A	Pump Assy. (Water)
1	D4FZ 8509-A	Pulley Water Pump
1	D5PZ 8575-E	*RT-179-192° Temp. Thermostat
1	C9RZ 8600-A	Fan
1	D5HZ 9278-C	*SW-1297 Oil Pressure Sender
1	D4FZ 9350-A	Carter-Incl. (1) D4FZ 9417-A Gasket Fuel Pump
1	385614-S36	(11-56-K) Adapter (Intake Manifold to deceleration Valve)
1	385613-S36	(11-62-G) Nut (Adapter to Deceleration Valve) - 1"-12
1	D4FZ 9430-A	Manifold (Exhaust)
8	N800048-S	(AB-33-CE) - Bolt (Manifold to Cylinder Head) Hex M10 x 55 (Metric)
1	N800095-S72	(AW-43) Stud (Exhuast Manifold to Cylinder Head) M10 x M10 x 78MM (Metric)
1	D4FZ 9E434-A	#D42E 9E434-AB Cover Intake Manifold
4	602529-S	(AB-53) Screw & Washer Assy. (Cover to Intake Manifold) M6 x 20 (Metric)
1	D4FZ 9441-A	#D42E 9439-AA Gasket (Intake Manifold Cyl. Head)
1	D5ZZ 9447-A (*CG-434)	#75TF 9447-BA Gasket (Carb)
1	D4FZ 9B447-C	Pulley Assy. (Exhaust Air Supply Pump)
1	D5FZ 9D475-M	#D52E 9D475-D2B EGR Valve
NOTES:	Y-D5FZ 12106-A	#DH-352 Dist. Cap
1	D5FZ-12121-C	Distributor Assy.
1	D5JL 12A200-A	Wire Harness
1	D4PZ-12405-B	Plugs
1	CA-602-TA	Carb. Assy.
1	CT-223-A	Carb Kit