

1956

FORD

car

Shop Manual

FORD DIVISION

FORD MOTOR COMPANY

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F O R D D I V I S I O N

F O R D M O T O R C O M P A N Y

FOREWORD

This manual has been prepared to provide information for the proper servicing of 1956 Ford Cars and the 1956 Ford Thunderbird. The manual should be kept where it will be readily available for reference at all times. The service procedures are accompanied by illustrations of many of the service operations. Disassembled views of some of the car units are also given.

The manual is divided into five main parts as listed in the Table of Contents on the following pages.

Part ONE—POWER PLANT—is composed of the various engines and their related systems, which are ignition, fuel, and cooling.

Part TWO—CHASSIS—includes information on the entire power train (clutch, conventional transmission, Overdrive, drive line, rear axle, etc.) and the running gear (frames, springs, suspension, brakes, wheels, tires, steering gear, steering linkages, etc.). Service procedures for the Fordomatic transmission are published in a separate manual.

Part THREE—ELECTRICAL AND ACCESSORIES—covers all of the electrical systems and units (except the ignition system) and all of the accessories (except the Overdrive and Fordomatic).

Part FOUR—BODIES—contains information on the maintenance and repair of all body components, including adjustment and alignment of doors, hoods, and fenders. Window glass adjustments are also included in this part.

Part FIVE—MAINTENANCE AND SPECIFICATIONS—includes complete maintenance and lubrication information, and contains all the specifications necessary for properly servicing Ford cars.

The page headings, throughout the manual, designate the subject matter covered. The heading on each left-hand or even-numbered page indicates the name of the chapter and the heading on each right-hand or odd-numbered page indicates the section covered.

The descriptions and specifications contained in this manual were in effect at the time the book was approved for printing. The Ford Division of Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

SERVICE DEPARTMENT
FORD DIVISION
FORD MOTOR COMPANY

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Part ONE

POWER PLANT

Chapter

I

General Engine Overhaul, Inspection, and Repair

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Trouble shooting; tune-up; the cleaning, inspection, and repair of component parts; and overhaul instructions are covered in this chapter.

The cleaning, inspection, repair, and overhaul instructions apply only after the parts have been removed from the engine, or in the case of a complete overhaul

after the engine has been disassembled.

To completely disassemble or assemble an engine, follow all the removal or installation instructions contained in the applicable engine chapter. If it is only desired to remove or install an individual part, refer to the applicable section.

1. TROUBLE SHOOTING

Trouble shooting is the application of a definite procedure, in a logical sequence, to locate and eliminate the cause of trouble in a particular system or unit. When trouble shooting, first look for the obvious causes of trouble, such as; an empty gas tank, a wet or cold engine, loose or disconnected wiring, or any other item that may cause a temporary defect.

The various factors that affect power plant operation are outlined in this section.

a. Engine.

Poor engine performance can be attributed to the engine or to forces on the car that tend to retard its motion.

For example, dragging brakes can cause the engine to work harder which will result in poor performance.

Engine performance depends on proper fuel distribution, correctly timed ignition, normal and uniform compression, and an unobstructed flow of exhaust gases.

Engine troubles, their causes, and remedies are discussed under appropriate headings.

(1) **ENGINE WILL NOT CRANK.** If the starter does not turn the engine over, or turns it over too slowly to start, the most probable causes are a defective battery or starter. Perform the following checks in the order listed, until the trouble is located.

(a) **CHECK THE BATTERY.** Try the horn or lights. If they do not operate properly, test the battery. Recharge or replace the battery as necessary.

(b) **CHECK THE BATTERY CABLES.** Check for loose or corroded connections at the starter, relay, battery, and ground. Clean, tighten or replace them as necessary.

(c) **CHECK THE STARTER RELAY CIRCUIT.** The relay contact surfaces seldom become so badly burned that they will prevent the starter from cranking the engine. However, other wiring may be at fault. Repair as necessary. Refer to Part THREE, "Electrical and Accessories."

(d) **CHECK THE STARTER OR STARTER DRIVE.** If the above components are not at fault, the trouble is probably in the starter or starter drive. If the starter is running, but not engaging the flywheel, remove the starter and make the necessary repairs to the starter drive. In rare cases, the starter drive may lock up with the flywheel. This can be corrected by loosening the starter and releasing the starter drive. If the starter does not operate, remove it and make the necessary repairs.

(2) **ENGINE CRANKS, BUT WILL NOT START.** The trouble probably lies in either the ignition system or the fuel system. The following test will determine which system is at fault:

Remove the ignition wire from one spark plug, and

insert a piece of proper sized metal rod so it protrudes from the insulator. With the ignition on and the starter turning the engine over, hold the end of the rod approximately $\frac{3}{16}$ inch from the block.

CAUTION: *On Fordomatic equipped cars, make sure the selector lever is in "N."*

If there is no spark, or if there is a weak spark, follow steps "a" or "b" whichever is applicable. If there is a good spark, proceed with step "c."

(a) **NO SPARK.** Follow the steps below to determine the cause, and make the necessary repairs or replacements.

(1) Pull the coil wire from the top of the distributor. Hold the wire $\frac{3}{16}$ inch from the cylinder head, and with the ignition on and the engine turning over, check for a spark.

CAUTION: *On Fordomatic equipped cars, make sure the selector lever is in "N."*

If a good spark is obtained, the trouble lies in either the distributor cap, rotor, or spark plug wires. Make sure these components are clean, dry, and not defective. Make repairs or replacements as necessary.

(2) If there was no spark in (1), clean the coil tower socket, or replace the high tension wire between the coil and distributor, then repeat the check. If a weak spark exists, the points are probably arcing. Test the condenser and replace it if necessary. Adjust the points. If a weak spark persists, test the coil, and replace it if necessary.

(3) If there was no spark in (2), remove the distributor cap, and see if the points are "breaking" and if an electrical spark occurs at the points. Adjust or replace the points as necessary. If there is a spark at the points; install a "jumper" between the "DIST" terminal of the coil and the distributor, then check for a spark at the points. If there is a spark, replace the coil to distributor primary wire. If there is no spark, crank the engine until the points are closed, then install a "jumper" on one of the primary coil terminals and check for a spark at the other terminal. Replace the coil if there is now a spark. If there is no spark, install a "jumper" between the battery and the battery terminal of the coil, then check for a spark at the points. If a spark exists, the ignition switch or switch to coil wiring is defective and must be repaired or replaced.

(b) **WEAK SPARK.** Perform the following checks in the order listed:

(1) The battery may be weak. Test the battery, then charge, or replace it if necessary.

(2) Remove the distributor cap, and adjust, clean, or replace the points as necessary. Severely pitted points usually indicate that the voltage regulator is improperly set or the condenser is faulty.

(3) Check the condition of the rotor, distributor cap, and plug wires. The wires must be clean, dry, and fully

seated in the terminals. Replace any damaged or corroded wires.

(4) If the weak spark persists, test the coil, and replace it if necessary.

(c) **GOOD SPARK.** If there is a good spark, perform the following fuel system checks in the order given.

(1) Check the fuel supply at the fuel tank.

(2) Check to see if fuel is reaching the carburetor. Remove the air cleaner, and look down the carburetor throat while working the throttle by hand several times. Each time the throttle is actuated, fuel should spurt from the accelerator pump discharge nozzle. If there is fuel at this point, the engine is probably flooded or there is water in the fuel system. If no fuel is observed at this point, disconnect the carburetor inlet line at the carburetor. Using a suitable container to catch the fuel, crank the engine to see if fuel is reaching the inlet fitting. If fuel is reaching the inlet fitting, the trouble is in the carburetor. Repair the carburetor as necessary. If no fuel is reaching the inlet fitting, the trouble is in the fuel pump or the fuel pump inlet line is clogged.

NOTE: *Check the flexible fuel pump inlet line for a collapsed condition.*

Remove the fuel tank filler cap, then disconnect the fuel pump inlet line at the pump. Blow air into the line to remove any obstructions. Connect the line and try to start the engine. If the engine does not start, check the fuel pump pressure, then repair or replace the pump as necessary.

(3) **ENGINE STARTS BUT FAILS TO KEEP RUNNING.** Check the fuel system first. The ignition system sometimes can cause trouble, but it is usually after the engine has run for some time and is at operating temperature.

(a) Check the fuel supply at the tank.

(b) Try to start the engine. If the engine will operate with constant foot throttle, adjust the idle speed and check the choke adjustment.

If it will not operate with constant foot throttle, check the fuel system as outlined in (2) (c).

(c) If the fuel system is operating correctly and the engine still stalls, it may be due to the coil or condenser breaking down under operating temperature. Check these components, and replace them as necessary.

(4) **ENGINE CONTINUALLY MISSES AT IDLE.** When the engine continually misses on the same cylinders, the fault generally lies in the ignition system.

(a) Isolate the miss by pulling one spark plug cable at a time from the plugs. Remove the plugs, then clean, inspect, and adjust them. Replace those that are badly fouled or burned.

(b) Check the spark plug wires for signs of deterioration and corrosion and replace them as necessary.

(c) Remove the distributor cap and rotor, then clean, inspect, and replace them as necessary.

(d) If the above steps do not correct the condition, check the compression to determine if it is satisfactory and check the intake manifold passages for obstructions.

(5) **ENGINE MISSES ERRATICALLY AT IDLE.** A miss of this type may be caused by a combination of things. Check the following in sequence:

(a) Carburetor, including choke operation, idle mixture setting, and fuel level.

(b) The ignition system, starting with the spark plugs. Make the necessary repairs.

(c) The vacuum lines and fittings for leaks. Make any necessary repairs.

(d) Valve operation. Perform a compression test if the miss persists. Repair the engine as necessary.

(6) **ENGINE MISFIRES OR HESITATES ON ACCELERATION.** This malfunction is usually a combination of faults in the ignition and fuel system, but also can be caused by the exhaust system. Check the following in sequence.

(a) Check the operation of the exhaust gas control valve. If it is sticking, free it up or replace it as necessary.

(b) Check the paint on the intake manifold heat riser passage. If the paint is not burned off, the passage may be obstructed preventing the carburetor from properly vaporizing the fuel.

(c) Remove the spark plugs. Inspect, clean, and adjust the gap. Replace any plugs that are defective or lead-fouled.

(d) Remove the distributor cap, and check the point gap, distributor shaft clearance, condition of the cam lobes, and the points. Make the necessary repairs or replacements. Check the high tension wiring for signs of deterioration, and make replacements or repairs as necessary.

(e) Check the coil and condenser. Replace them if they are defective.

(f) Check the fuel pump pressure and adjust the carburetor fuel level. Check the accelerator pump action and linkage.

(g) If the problem still persists, perform a compression test, and check the valve lash. Check the valve spring rates and assembled height. Make repairs or replacements as necessary.

(7) **ENGINE DOES NOT DEVELOP FULL POWER.** Lack of power is usually caused by poor compression. However, some preliminary checks should be made. Make sure the throttle opens all the way, and the choke remains open. After preliminary checks are made, perform the following operations if the trouble has not been located:

(a) Check the compression. This will indicate whether the internal components are operating properly.

(b) If the compression checks within limits, check the ignition system, including initial timing and distributor operation.

(c) If the compression and the ignition system are satisfactory, check the fuel system, including carburetion and fuel pump pressure.

(d) If the problem still exists, a check of mechanical components must be made. Check the valve lash, cam lobe lift, and valve timing. Make the necessary repairs.

b. Fuel System.

The fuel system consists of the fuel tank, fuel pump, carburetor, and connecting lines. Dirt and other foreign material are a major source of fuel system problems. Keep all components as clean as possible.

(1) **EXCESSIVE FUEL CONSUMPTION.** Faulty carburetion is usually responsible for excessive fuel consumption. However, the following preliminary checks should be made:

Check for fuel leaks in the system. Check choke operation and adjustment, and make certain the accelerator linkage is free. Check to see if the brakes are dragging. Adjust the carburetor.

(a) Verify the complaint with test equipment installed in the car. Show the customer how improper operation of the car will affect fuel consumption.

(b) If the test shows fuel consumption to be excessive, rebuild the carburetor. Since poor carburetion is usually a combination of internal malfunctions, it is usually not advisable to try to repair only one system in the carburetor. Time will be saved by a complete carburetor overhaul.

(2) **CARBURETOR FLOODS.** Make a visual inspection of the carburetor for leaking gaskets or casting defects. Tap the carburetor bowl. If the flooding stops, the inlet needle was held open by foreign material. If the flooding persists, follow the steps below:

(a) Remove the air cleaner and check the choke operation.

(b) Check the fuel level, the condition of the carburetor float, and the fuel inlet needle and seat. Replace any defective parts.

(c) Check fuel pump pressure. If the pressure is excessive, the pump was forcing fuel past the inlet needle and the pump should be rebuilt or replaced.

c. Cooling System.

The cooling system is thermostatically controlled to regulate engine operating temperature and provide for a short engine warm-up period.

(1) **ENGINE OVERHEATS.** Usually, engine overheating is the result of insufficient coolant supply. Check the coolant level first. Make certain that the cause of trouble is not anti-freeze evaporation.

(a) If the supply is low, check for leaks in the cooling system, then make the necessary repairs.

(b) Check the water pump belt for proper tension and adjust it if it is loose.

(c) Inspect the radiator fins for obstructions (bugs, dirt, etc.). Clean it if it is clogged.

(d) Using a thermometer in the radiator, check the gauge reading for accuracy.

NOTE: *Inaccurate readings are sometimes caused by insufficient clearance between the head casting and the temperature sending unit element. Make repairs or replacements as necessary.*

(e) Check the thermostat for proper operation and heat range. If it is defective or of the wrong heat range, replace it. Make sure the thermostat is correctly installed.

(f) Check the ignition timing and adjust it if necessary.

(g) Check the radiator for proper flow. Flush it if necessary.

(h) Remove the water pump and check for a defective impeller or a water passage obstruction. Make repairs or replacements as necessary.

(i) Check the cylinder head(s) for water passage obstructions. Clean out the passages or replace the head(s) if necessary.

(j) Check the cylinder block for water passage obstructions. Clean out the passages or replace the block if necessary.

(2) ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE. Generally this is caused by the thermostat sticking or being of the wrong heat range. Check the thermostat first. If the engine still does not reach operating temperature, check the gauge and sending unit with a thermometer installed in the radiator. Replace any defective parts.

2. TUNE-UP

Regular maintenance and inspection services are necessary for proper car operation. In addition, to maintain satisfactory performance, a periodic engine tune-up should be made.

A reliable type of engine test equipment should be used to perform the tests. As the checks and tests are made, make a visual inspection of the wiring, vacuum hoses, cooling system hoses, heater hoses, etc.

a. Minor Tune-Up.

Perform the following operations in the order given.

(1) INSPECT IGNITION WIRES, BATTERY CABLES, AND CHECK THE CONDITION OF THE BATTERY. Inspect all ignition wires for worn or damaged insulation. Make sure the wires are firmly seated in the distributor cap and that the terminals and terminal sockets are free from corrosion.

Inspect the battery case for cracks and leaks. Make a battery capacity test. If unsatisfactory, make a battery charge test. If the charge is low, recharge the battery. Inspect the battery cable connections for corrosion, and clean them if necessary. Brush the cable connectors with grease to retard further corrosion, then tighten the connectors securely.

(2) TEST CYLINDER COMPRESSION. Be sure the battery is good. Operate the engine until normal operating temperature is reached. Turn the ignition switch off. Remove all spark plugs.

Set the throttle in the wide open position and be sure the choke is wide open. Install a compression gauge in number 1 cylinder. Crank the engine until the gauge registers a maximum reading and record the reading. Note the number of compression strokes required to obtain this reading. Repeat the test on each cylinder, cranking the engine the same number of strokes as was required to obtain a maximum reading on number 1 cylinder.

A variation of ± 10 pounds from specified pressure is satisfactory. However, the compression of all cylinders should be uniform within 10 pounds.

A reading of more than 10 pounds above normal indicates carbon or lead deposits in the cylinder.

A reading of more than 10 pounds below normal indicates leakage at the head gasket, rings, or valves.

A low even compression in two adjacent cylinders indicates a head gasket leak. This should be checked before condemning the rings or valves.

To determine whether the rings or the valves are at fault, put a tablespoon of heavy oil on the piston, and repeat the compression test. The oil will temporarily seal leakage past the rings. If the same reading is obtained, the rings are satisfactory, but the valves are leaking. If the compression has increased 10 pounds or more over the original reading, it indicates there is leakage past the rings.

During a compression test, if the pressure fails to climb steadily and remains the same during the first two successive strokes, but climbs higher on the succeeding strokes, or fails to climb during the entire test, it indicates a sticky or stuck valve.

(3) CLEAN, ADJUST, AND INSTALL THE SPARK PLUGS. Sandblast the spark plugs, wipe the porcelain clean, file the electrode tips flat, and adjust the spark gap. Test the plugs in an approved spark plug tester. Inspect the plugs for broken or chipped porcelain and badly burned electrodes. Replace all defective plugs. Install the spark plugs and tighten them to the specified torque.

(4) CHECK THE DISTRIBUTOR. Remove the distributor cap and rotor. Inspect the breaker points for pitting and burning. Replace defective points. Clean and install the distributor cap and rotor.

(5) CHECK IGNITION TIMING. Disconnect the dis-

tributor vacuum line. Operate the engine at idle speed. Check the timing with a timing light and make the necessary adjustments. Connect the distributor vacuum line.

(6) CHECK MANIFOLD VACUUM AND ADJUST CARBURETOR IDLE. Check the manifold vacuum at the specified idle speed.

If the vacuum is lower than specified, check for leakage at the vacuum lines and intake manifold. Check the carburetor idle adjustment.

If the vacuum is still below normal or is erratic, it is an indication of bad rings, sticky valves, weak valve springs, or a head gasket leak.

Set the engine idle speed and the carburetor idle fuel adjustment as outlined in Chapter IV.

(7) CLEAN THE AIR CLEANER AND THE FUEL FILTER. Clean the air cleaner, and oil the element. If the air cleaner is the oil bath-type, fill to the indicated level with engine oil of the specified viscosity.

On passenger cars, remove and clean the fuel pump bowl. Install a new filter element.

On Thunderbirds, clean the fuel line filter. Install a new filter element.

(8) CHECK THE DEFLECTION OF THE DRIVE BELTS. Check the deflection of all drive belts (fan, air conditioning, and power steering). Make the necessary adjustments.

b. Major Tune-Up.

Perform the following operations in the order given.

(1) BATTERY. Remove the cables from the battery. Clean the battery terminals and cable connectors. Inspect the battery case for cracks and leaks. Make a battery capacity test. If unsatisfactory, make a battery charge test. If the charge is low, recharge the battery. Replace deteriorated connectors and cables that have worn insulation. Brush the cable connectors with grease to retard further corrosion. Connect the cables to the battery.

(2) CHECK THE GENERATOR AND REGULATOR. Follow the procedures outlined in Part THREE, "Electrical and Accessories."

(3) TEST SPARK INTENSITY. Determine if the spark from each plug wire will jump a $\frac{3}{16}$ inch gap, as follows:

Remove one spark plug wire, and install a terminal adapter in the wire terminal. Hold the end of the adapter approximately $\frac{3}{16}$ inch from the cylinder head. Run the engine at idle speed. The spark should jump the gap regularly. Repeat the test on each lead.

If the spark is unsatisfactory at all spark plugs, trouble exists in the coil, condenser, rotor or cap, internally in the distributor, or in the external primary circuit.

If the spark is unsatisfactory at some, but not all of the spark plug wires, the trouble is in the wire itself, the wire is not seated in the housing socket, or the distributor cap is corroded.

(4) TEST CYLINDER COMPRESSION. Follow the procedure under "a. Minor Tune-Up."

(5) CLEAN, ADJUST, AND INSTALL SPARK PLUGS. Sandblast the spark plugs, wipe the porcelain clean, file the electrode tips flat, and adjust the gap. Test the plugs in an approved tester. Inspect the plugs for broken or chipped porcelain and badly burned electrodes. Replace all defective plugs. Install the plugs and tighten them to the specified torque.

(6) CHECK MANIFOLD BOLT TORQUE. Tighten the intake and exhaust manifold bolts and nuts to 23-28 foot-pounds torque.

(7) TEST COIL AND CONDENSER. If the spark intensity (3) is satisfactory, it will not be necessary to test the coil and condenser. However, if the spark is not satisfactory, test these parts on a test unit to determine which one is defective. Follow the instructions of the test unit manufacturer.

(8) INSPECT BREAKER POINTS AND TEST THE DISTRIBUTOR. Inspect the distributor points for pits, excessive metal transfer, and burned spots.

Test the vacuum advance and make adjustments, repairs, or replacements as required. Set the point gap to specifications. After setting the gap, check the point dwell. If the dwell angle is not to specifications, the distributor cam is worn or the point assembly is defective. Replace all defective parts. Lubricate the distributor cam lightly with distributor cam lubricant.

(9) CLEAN AND INSPECT THE DISTRIBUTOR CAP. Inspect the cap for cracks or other damage. Remove all corrosion from the terminal housing sockets.

(10) CHECK IGNITION TIMING. Disconnect the vacuum line between the distributor and carburetor and operate the engine at idle speed. Check the timing with a timing light and make the necessary adjustments. Connect the distributor vacuum line after completing the adjustment and check ignition advance as the engine is accelerated.

(11) CHECK AND ADJUST VALVE LASH. Check and adjust the valve lash after the engine is thoroughly warmed up.

(12) TEST MANIFOLD VACUUM. Check the manifold vacuum at the specified idle speed.

If the vacuum is lower than specified, check for leakage at the vacuum lines and intake manifold. Check the carburetor idle adjustment.

If the vacuum is still below normal or is erratic, it is an indication of bad rings, sticky valves, weak valve springs, or a leaking head gasket. If this condition exists, it should be reported to the customer.

(13) **TEST FUEL PUMP PRESSURE AND CAPACITY.** The static pressure should be 3.5-5.5 p.s.i. at 500 r.p.m. The capacity should be 1 pint in 30 seconds at 500 r.p.m.

(14) **TEST BOOSTER PUMP VACUUM.** The booster pump vacuum should be 10.0 inches of mercury at 500 r.p.m. The vacuum should not drop rapidly when the engine is stopped.

(15) **INSPECT AND CLEAN THE FUEL FILTER.** On passenger cars, remove and clean the fuel pump bowl. Install a new filter element.

On Thunderbirds, clean the fuel line filter. Install a new filter element.

(16) **CLEAN THE CARBURETOR.** Disassemble and clean the carburetor. Set the fuel level, and check the accelerator pump operation.

(17) **CLEAN THE AIR CLEANER.** Clean the air cleaner and the element. If the air cleaner is the oil bath-type, fill to the indicated level with engine oil of

the specified viscosity.

(18) **ADJUST CARBURETOR IDLE.** Set the engine idle speed and the carburetor idle fuel adjustment as outlined in Chapter IV.

(19) **EXHAUST ANALYSIS.** On dual exhaust equipped cars, connect the analyzer tube to the left muffler outlet pipe.

Inasmuch as there are several types of analyzers, follow the instructions of the manufacturer.

(20) **CHECK THE DEFLECTION OF THE DRIVE BELTS.** Check the deflection of all drive belts (fan, air conditioning, and power steering). Make the necessary adjustments.

(21) **ROAD TEST.** Road test the car as a final check on the work performed. Also, notice the performance of the transmission, axle, brakes, and any optional accessories. Recommend any additional service required when the car is delivered to the owner.

3. ENGINE REMOVAL AND INSTALLATION

Separate procedures are given for the conventional passenger car and the Thunderbird.

a. Conventional Passenger Car.

The following procedures apply to all conventional passenger cars. Differences in the procedures peculiar to cars equipped with an 8 or 6-cylinder engine are noted when they exist.

The procedures given are for the engine only, without the transmission attached. Engine compartment tolerances make it impractical to remove or install the engine with the transmission attached.

(1) **REMOVAL.** If the car is equipped with a standard or overdrive transmission, follow steps (a) and (c). If the car is equipped with Fordomatic, follow steps (b) and (c).

(a) **STEPS PECULIAR TO A STANDARD OR OVERDRIVE TRANSMISSION.** Disconnect the clutch release spring. Remove the screws retaining the equalizer bar support to the flywheel housing, then remove the support and bushing. Disconnect the accelerator linkage at the manifold bell crank. Remove the two flywheel housing upper bolts. Remove the flywheel housing cover, support the transmission with a jack, then remove the remaining flywheel housing bolts.

(b) **STEPS PECULIAR TO FORDOMATIC.** Disconnect the transmission throttle linkage at the cross shaft, and tie the linkage to the dash panel. Remove the idler arm bracket. Fold back the floor mat, remove the two rubber plugs, then remove the two converter housing to engine upper bolts. Jack up the front of the car and position safety stands. Support the transmission with a jack, then remove the remaining converter housing to engine bolts.

Remove the converter housing lower access cover, then turn the flywheel till the flywheel drive plate is in position to remove the three bolts. Turn the flywheel 180°, then remove the other three bolts.

CAUTION: *After the bolts are removed from the converter drive plate, turn the drive plate 90° so the flex plates will not catch on the converter housing when the engine is removed.*

Drain the transmission. Remove the bracket that secures the transmission oil level indicator tube to the engine. Disconnect the tube at the transmission oil pan, then remove the tube assembly. Remove the transmission control linkage splash shield from the cylinder block, then remove the oil filter.

(c) **ENGINE REMOVAL.** Remove the hood. Drain the cooling system and the crankcase. Remove the heater hoses. Remove the heater inlet duct and the heater blower motor.

Remove the radiator upper and lower hoses, then remove the radiator. Remove the fan. Disconnect the battery ground cable at the cylinder block, and the flex fuel line at the fuel pump.

Disconnect the windshield wiper vacuum hose, temperature sending unit wire, and the oil pressure sending unit wire. Disconnect the primary wire at the coil. Remove the starter cable at the starter, then remove the starter. Disconnect the ground cable from the rear of the engine. Remove the air cleaner, then tape the air horn closed. Disconnect the choke cable at the carburetor. Disconnect the accelerator linkage.

Disconnect the muffler inlet pipes at the exhaust manifold.

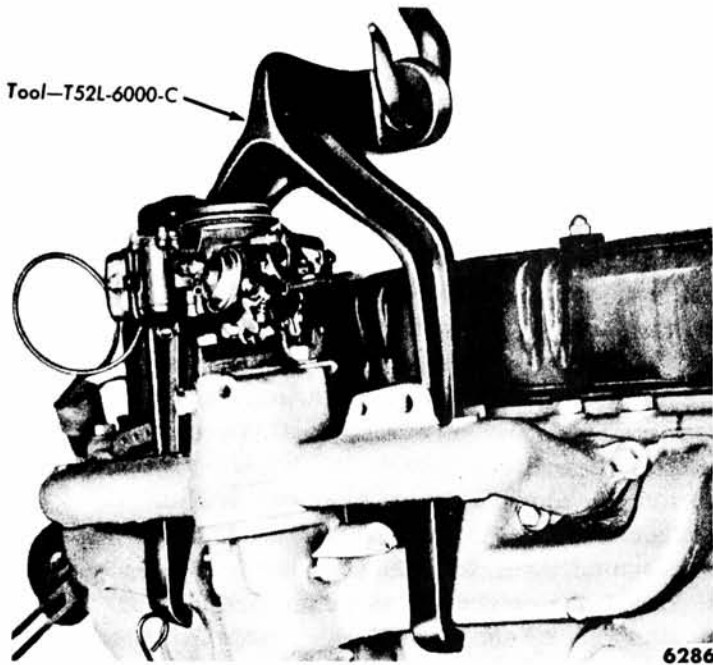


Fig. 1—Lifting Hook—6-Cylinder Engine

Attach the engine lifting hook(s) (fig. 1 or 2). Remove the right and left front splash aprons.

On 8-cylinder engines, remove the retainer and lower insulator from the engine front steady rest.

On 6-cylinder engines, loosen the two engine front steady rest to spacer bolts. Raise the car and position safety stands.

On 8-cylinder engines, remove the engine left insulator. Remove the cap screws from the engine right insulator at the engine.

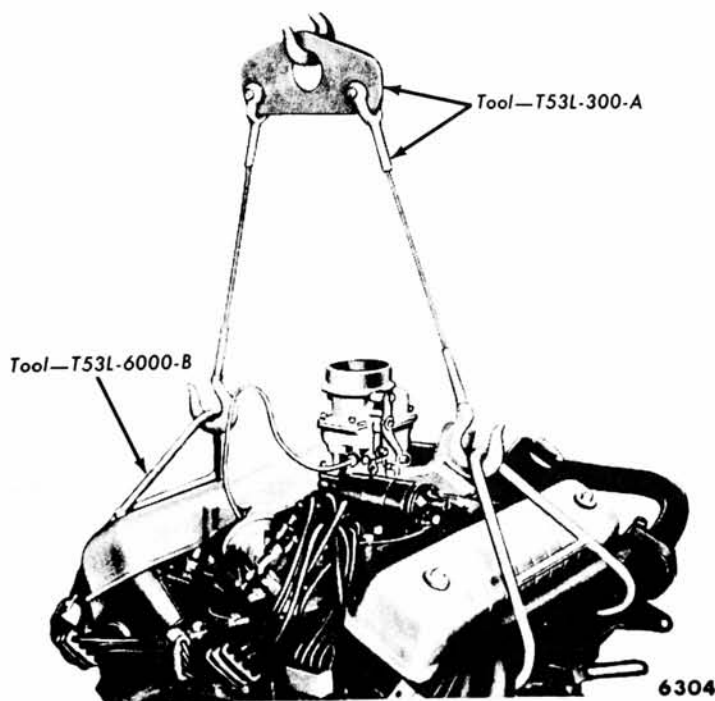


Fig. 2—Lifting Hooks and Sling—8-Cylinder Engine

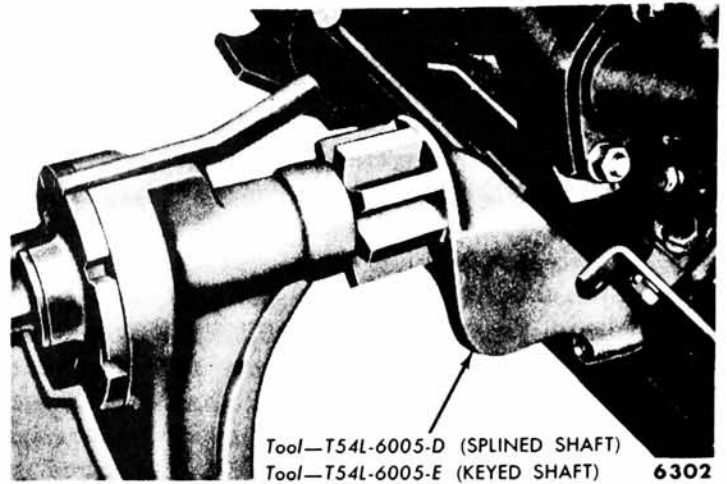


Fig. 3—Engine Mount—8-Cylinder Engine

On 6-cylinder engines, remove the left insulator to bracket bolts at the insulator, and the right bracket bolts at the engine.

Raise the engine slightly, then carefully pull it from the transmission. Carefully lift the engine out of the engine compartment. Do not let the engine swing against the grille.

Install the engine on a work stand (fig. 3 or 4).

(2) **INSTALLATION.** If the car is equipped with a standard or overdrive transmission, follow steps (a), (b), and (d). If the car is equipped with Fordomatic, follow steps (a), (c), and (d).

(a) **ENGINE INSTALLATION.** Install the appropriate engine lifting hook, then remove the engine from the work stand.

CAUTION: On Fordomatic equipped cars, make sure the flywheel drive plate is turned so the flex plate will not catch on the converter housing.

Lower the engine carefully into the engine compartment.

On 8-cylinder engines, lower the engine until the oil pump to oil pan line clears the engine left support.

Start the transmission main drive gear into the clutch

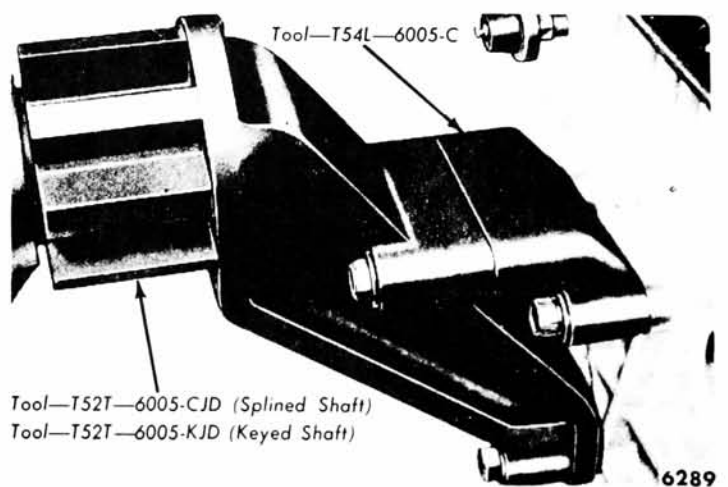


Fig. 4—Engine Mount Adapter—6-Cylinder Engine

disc. On Fordomatic units, start the converter pilot into the crankshaft.

NOTE: *On standard or overdrive units, it may be necessary to adjust the position of the transmission with relation to the engine if the transmission input shaft will not enter the clutch disc. If the engine "hangs up" after the shaft enters, turn the crankshaft slowly (with the transmission in gear) until the shaft splines mesh with the clutch disc splines.*

Make sure the studs on the manifolds of both the 6 and 8-cylinder engines are aligned with the holes in the muffler inlet pipe(s) and the dowels in the block engage the holes in the clutch housing (on Fordomatic units the block dowels must engage the holes on the converter housing).

NOTE: *Level the engine crosswise in relation to the frame before installing the mounting bolts or the steady rest.*

On the 6-cylinder engine, install the left insulator to bracket lockwashers and bolts and the right bracket to engine lockwashers and bolts. Tighten the insulator to bracket bolts to 45-50 foot-pounds torque. Tighten the engine front steady rest to spacer bolts to 30-35 foot-pounds torque.

On the 8-cylinder engine, align the holes in the engine left support insulator with the mounting holes in the block, then install the insulator to engine bolts and the frame to insulator lockwashers and nuts. Install the right insulator to engine lockwashers and bolts. Tighten the insulator to engine bolts to 45-50 foot-pounds torque and the frame to insulator nuts to 50-60 foot-pounds torque. Install the engine front steady rest lower insulator and retainer. Tighten the retainer bolt to 23-28 foot-pounds torque. Install the right and left front splash aprons.

Connect the manifold(s) to the muffler inlet pipe(s). Install the starter, then connect the starter cable (except Fordomatic). Connect the ground cable to the rear of the engine, the temperature sending unit and oil pressure sending unit wires, the generator wires, and the ignition switch wire to the coil. Connect the ignition switch wire to the engine clips. Connect the accelerator linkage and the choke wire (6-cylinder engine).

Connect the windshield wiper line and the fuel pump vacuum line. Connect the fuel pump flexible line. Install the fan assembly, then adjust the fan belt.

Install the radiator and connect the radiator hoses. Connect the battery ground cable to the engine. Remove the tape from the carburetor air horn and install the air cleaner. Install the heater blower motor and the heater inlet duct, then connect the heater hoses.

Install the hood. Fill the cooling system and the crankcase.

(b) **CONNECT STANDARD OR OVERDRIVE TRANSMISSION.** Install the bushings in the equalizer bar support,

then install the support on the flywheel housing. Install the transmission to flywheel housing bolts, and tighten them to 40-50 foot-pounds torque. Install the flywheel housing cover. Connect the clutch release spring.

Remove the jack supporting the transmission. Check the clutch pedal free travel ($1\frac{1}{8}$ - $1\frac{3}{8}$ inches) and adjust it if necessary.

(c) **CONNECT FORDOMATIC TRANSMISSION.** Install the two converter housing to engine lower bolts, and tighten them to 40-45 foot-pounds torque.

NOTE: *Tighten the bolts slowly and evenly to avoid binding on the dowel pins.*

Install the two converter housing to engine upper bolts, and tighten them to 40-45 foot-pounds torque. Install the floor pan plugs. Align the flywheel and drive plate holes with the converter, then install the six bolts, and tighten them to 25-28 foot-pounds torque.

Install the starter, and tighten the bolts to 15-20 foot-pounds torque. Install the transmission oil level indicator tube assembly. Install the idler arm and bracket. Tighten the idler arm bracket nuts to 28-43 foot-pounds torque. Install the converter housing lower access covers.

Install and connect the throttle linkage and make the necessary linkage adjustments. Remove the jack supporting the transmission. Fill the transmission with Automatic Transmission Fluid—Type A, following the recommended procedure.

(d) **CHECK ENGINE FOR OIL OR COOLANT LEAKS.** Run the engine at fast idle and check all gaskets and hose connections for leaks.

b. Thunderbird.

On Fordomatic equipped Thunderbirds, the engine may be removed with or without the transmission attached.

(1) **REMOVAL.** To remove the engine from a Thunderbird equipped with a standard or overdrive transmission, follow steps (a) and (c). To remove the engine from a Thunderbird equipped with Fordomatic, follow steps (b) and (c). To remove the engine and Fordomatic as an assembly, follow steps (c) and (d).

(a) **STEPS PECULIAR TO A STANDARD OR OVERDRIVE TRANSMISSION.** Disconnect the clutch release spring. Remove the screws retaining the equalizer bar support to the flywheel housing, then remove the support and bushing. Remove the two flywheel housing upper bolts. Remove the flywheel housing cover, support the transmission with a jack, then remove the remaining flywheel housing bolts.

(b) **STEPS PECULIAR TO FORDOMATIC.** Disconnect the transmission throttle linkage at the cross shaft, and tie the linkage to the dash panel. Remove the idler arm bracket.

Jack up the front of the car and position safety stands.

Support the transmission with a jack, then remove the converter housing to engine bolts. Remove the converter housing lower access cover, then turn the flywheel till the flywheel drive plate is in position so the three bolts can be removed. Turn the flywheel 180°, then remove the other three bolts.

CAUTION: *After the bolts are removed from the converter drive plate, turn the drive plate 90° so the flex plates will not catch on the converter housing when the engine is removed.*

Drain the transmission. Remove the bracket that secures the transmission oil level indicator tube to the engine. Disconnect the tube at the transmission oil pan and remove the tube assembly. Remove the transmission control linkage splash shield.

(c) **ENGINE REMOVAL.** Remove the hood. Drain the cooling system and the crankcase. Remove the fan, then remove the radiator and shroud as an assembly. Remove the air cleaner. Disconnect the engine ground wire at the dash panel. Disconnect the battery ground cable at the engine and the battery to starter relay cable at the battery. Disconnect the vacuum pump line, and the fuel inlet at the fuel pump. Disconnect the starter cable at the starter solenoid, then remove the cable clamp at the dash panel. Disconnect the ignition switch to coil wire at the coil. Disconnect the two heater hoses. Remove the generator wires. Remove the wires from the oil pressure sending unit and the temperature sending unit. Remove the heater blower assembly. Disconnect the tachometer cable. Disconnect the accelerator rod, then disconnect the link bracket at the block (this bracket also serves as the ignition cable bracket).

Raise the car and position safety stands. Disconnect the exhaust pipes at the exhaust manifolds. Remove the engine front mount bolt, nut, and lower insulator. Remove the engine right and left steady rest bracket bolts at the engine, then turn the brackets to one side so the engine will clear them upon removal.

Remove the safety stands and lower the car. Install the engine lifting hooks (fig. 2). Raise the engine slightly, then carefully pull the engine from the transmission. Carefully lift the engine out of the engine compartment.

Install the engine on a work stand (fig. 3).

(d) **STEPS PECULIAR TO REMOVING THE ENGINE AND FORDOMATIC AS AN ASSEMBLY.** While the car is raised in step (c), perform the following additional operations:

Drain the transmission. Disconnect the shift control linkage at the transmission and the throttle control rod. Disconnect the speedometer cable. Remove the drive shaft, and plug the transmission with an extension housing cap. Remove the converter air duct assembly. Remove the bracket that secures the transmission oil level indicator tube to the engine. Disconnect the tube at the

transmission oil pan, then remove the tube assembly. Remove the engine rear mount bolt, raise the transmission, then remove the cross member that serves as the engine rear mount.

Remove the transmission jack and lower the car. Install the engine lifting hooks. Raise the engine slightly, then carefully pull the engine and transmission forward. Carefully lift the engine and transmission from the engine compartment.

(2) **INSTALLATION.** To install the engine in a Thunderbird equipped with a standard or overdrive transmission, follow steps (a), (b), (e), and (f). To install the engine only in a Fordomatic equipped Thunderbird, follow steps (a), (c), (e), and (f). To install the engine and Fordomatic as an assembly, follow steps (a), (d), (e), and (f).

(a) **ENGINE INSTALLATION.** Install the engine lifting hooks, then remove the engine from the work stand.

CAUTION: *On Fordomatic equipped cars, make sure the flywheel drive plate is turned so the flex plates will not catch on the converter housing.*

Lower the engine carefully into the engine compartment.

Start the transmission main drive gear into the clutch disc. On Fordomatic units, start the converter pilot into the crankshaft.

NOTE: *On standard or overdrive units, it may be necessary to adjust the position of the transmission with relation to the engine, if the input shaft will not enter the clutch disc. If the engine "hangs up" after the shaft enters, turn the crankshaft slowly (with the transmission in gear) until the shaft splines mesh with the clutch disc splines.*

Make sure the studs on the manifolds are aligned with the holes in the muffler inlet pipes, and the dowels in the block engage the holes in the clutch housing (on Fordomatic units the block dowels must engage the holes on the converter housing).

Raise the car and position safety stands. Install the engine front support lower insulator, bolt, lockwasher, and nut. Tighten the insulator mounting nut to 85-95 foot-pounds torque. Install the engine right and left steady rest bracket bolts, and tighten the bolts to 45-50 foot-pounds torque.

NOTE: *If the rod assembly adjustment of either steady rest was disturbed during engine removal, adjust the rod as outlined in step (e).*

Connect the exhaust pipes to the exhaust manifolds. Remove the safety stands and lower the car.

Connect the accelerator rod, then connect the accelerator link bracket to the block. Connect the tachometer cable. Install the heater blower assembly. Install the oil pressure sending unit and the temperature sending unit wires. Connect the generator wires. Connect the two heater hoses. Connect the ignition switch to coil

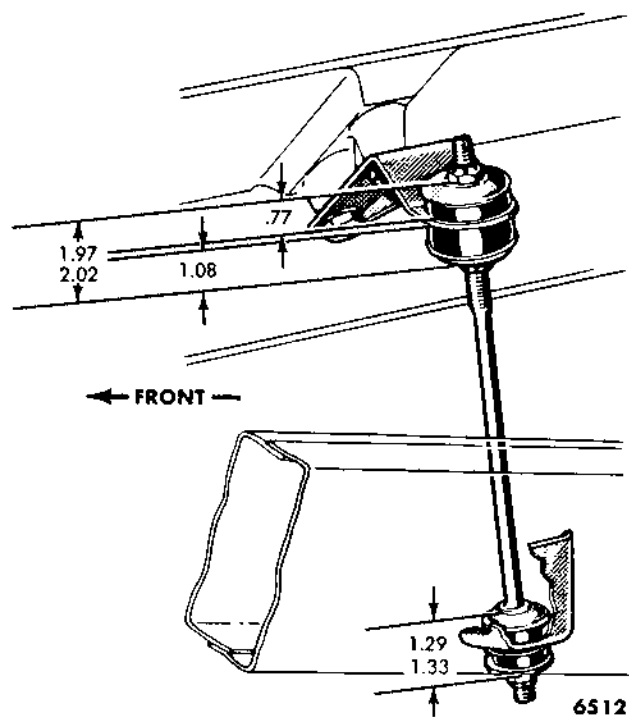


Fig. 5—Steady Rest Adjustment—Thunderbird

wire. Install the starter cable clamp on the dash panel, and connect the starter cable to the starter. Connect the windshield wiper line and the flexible fuel line. Connect the battery ground cable and the starter solenoid cable. Connect the engine ground wire. Install the air cleaner. Install the radiator and shroud, then install the fan. Install the hood. Fill the cooling system. Fill the crankcase with the correct quantity and grade of engine oil.

(b) **CONNECT STANDARD OR OVERDRIVE TRANSMISSION.** Install the bushings in the equalizer bar support, then install the support on the flywheel housing. Install the transmission to flywheel housing bolts, and tighten them to 40-50 foot-pounds torque. Install the flywheel housing cover. Connect the clutch release spring.

Remove the jack supporting the transmission. Check the clutch pedal free travel ($1\frac{1}{8}$ - $1\frac{3}{8}$ inches). Adjust the free play, if necessary.

(c) **CONNECT FORDOMATIC TRANSMISSION.** Install the two converter housing to engine lower bolts, and tighten them to 40-45 foot-pounds torque.

NOTE: Tighten the bolts slowly and evenly to avoid binding on the dowel pins.

Install the converter housing to engine bolts and tighten them to 40-45 foot-pounds torque. Align the flywheel and drive plate holes with the converter, install the six bolts, and tighten them to 25-28 foot-pounds torque.

Install the starter and tighten the bolts to 15-20 foot-pounds torque. Install the transmission oil filler tube assembly. Install the idler arm and bracket. Tighten the idler arm bracket nuts to 28-43 foot-pounds torque. Install the converter housing lower access covers.

Install and connect the throttle linkage, and make the necessary linkage adjustments. Remove the jack supporting the transmission. Fill the transmission with Automatic Transmission Fluid-Type A, following the recommended procedure.

(d) **INSTALL THE ENGINE AND FORDOMATIC AS AN ASSEMBLY.** While the car is raised in step (a), perform the following additional operations:

Jack up the transmission. Install the engine rear mount. Lower the transmission, then install the engine rear mount bolt. Install the converter air duct assembly. Install the transmission oil level indicator tube assembly. Remove the extension housing cap from the transmission, and install the drive shaft. Connect the speedometer cable. Connect the shift control linkage and the throttle control rod. Fill the transmission with Automatic Transmission Fluid-Type A, following the recommended procedure.

(e) **ENGINE STEADY REST ADJUSTMENT.** If the engine steady rests are not properly adjusted, the engine will be tilted and excessive engine vibration may result. It is good practice, therefore, to check the adjustment of the rod assemblies, at each engine installation. The dimensions are illustrated in fig. 5. If the rods are out of adjustment follow the procedure below:

With the engine steady rest support brackets in place and properly tightened (at the engine and chassis), loosen the rod lower and upper nuts on both steady rests. Let the engine seek its own level position. Turn the rod assembly lower nut, washer, and insulator of each steady rest up against the lower (chassis) support bracket. Tighten the lower nut to the dimension shown in fig. 5.

Turn the lower nut, washer, and insulator at the top of each rod assembly up against the engine support bracket. Tighten the nut to the dimension shown in fig. 5. Turn the upper nut, washer, and insulator at the top of the rod assembly down against the engine support bracket. Tighten the nut to the dimension shown in fig. 5. Check the adjustment of the top portion of the rod assembly by measuring the over-all dimension as indicated in fig. 5.

(f) **CHECK THE ENGINE FOR OIL OR COOLANT LEAKS.** Run the engine at fast idle and check all gaskets and hose connections for leaks.

4. INTAKE AND EXHAUST MANIFOLDS

a. Cleaning and Inspection.

Wash grease, oil, and dirt from the outside of the

exhaust manifolds. Clean the mating surfaces and check

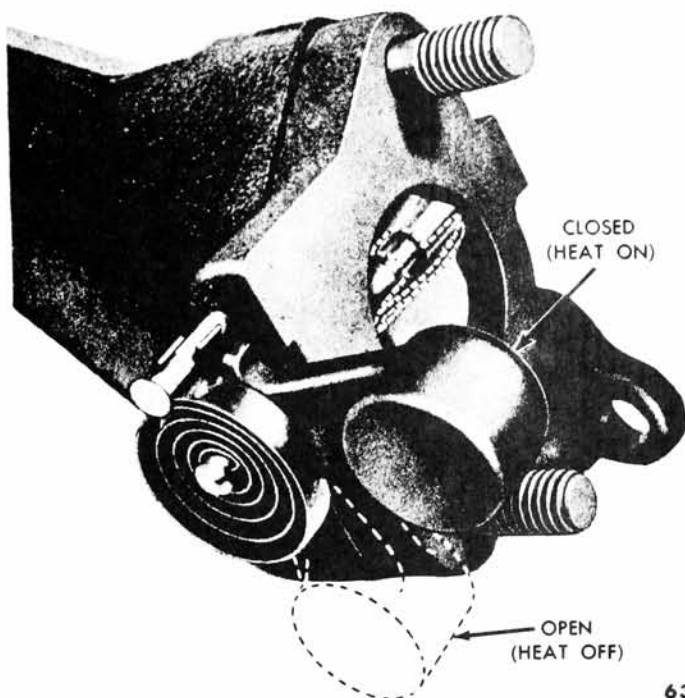


Fig. 6—Exhaust Control Valve—Single Exhaust System

them for damage. Repair or replace the manifolds as necessary.

On the intake manifold, check the fuel-air and the heat riser passages for foreign material. Inspect the surfaces for cracks or other visible defects. Repair or replace the manifolds as necessary.

CAUTION: Remove all filings and foreign matter that may have entered the manifolds as a result of repair work.

b. Exhaust Gas Control Valve.

Check the valve spring to make sure it is hooked on the stop pin. The spring stop is at the top of the valve housing when the valve is properly installed. The action of the valves is illustrated in figs. 6, 7, and 8.

Check to make sure the spring holds the valve closed when the engine is cold. Actuate the counterweight by hand to make sure it moves freely through approximately 90° of rotation without binding.

The valve is closed when the engine is at normal operating temperature and running at idle speed. How-

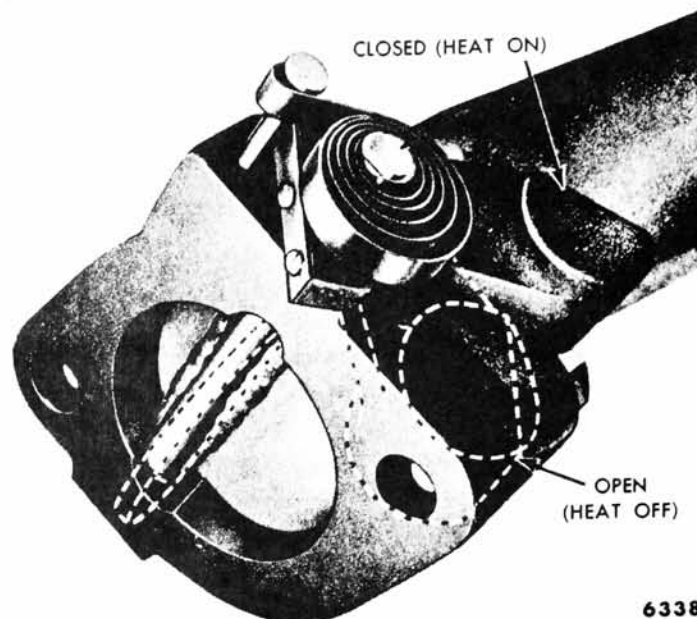


Fig. 7—Exhaust Control Valve—Dual Exhaust System

ever, a properly operating valve will open when very light finger pressure is applied to the counterweight. Rapidly accelerate the engine to make sure the valve momentarily opens. The valve is designed to open when the engine is at normal operating temperature and is operated at high r.p.m. Free stuck valves with a penetrating oil or kerosene and graphite mixture.

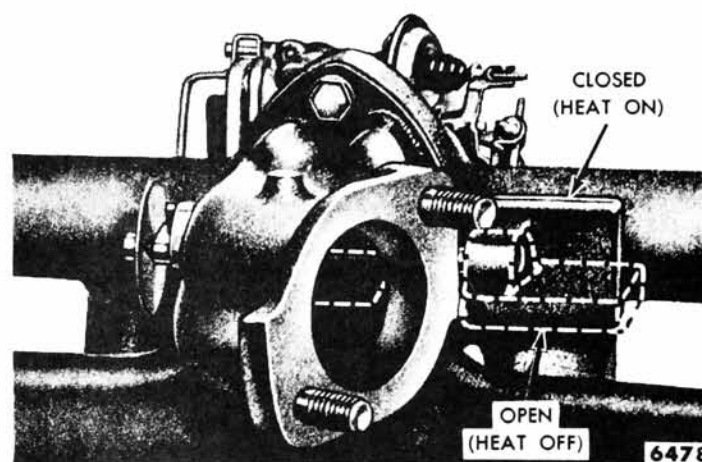


Fig. 8—Exhaust Control Valve—6-Cylinder Engine

5. ROCKER MECHANISM, CYLINDER HEAD, VALVES,^c VALVE LASH ADJUSTMENT, AND VALVE TIMING

This section covers the inspection and repair procedures applicable to the rocker mechanism, cylinder head, and valves. In addition, the methods used to adjust the valve lash and to check valve timing are given.

a. Rocker Mechanism.

The rocker mechanism parts are individually replaceable.

(1) **CLEANING AND INSPECTION.** Check the I. D. of the rocker arm bore and the O. D. of the rocker arm shaft at the location of the rocker arms. Inspect the rocker arms for grooved pads. Check the rocker adjust-

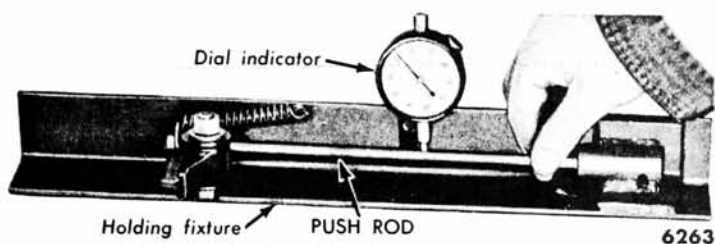


Fig. 9—Push Rod Runout Check

ing screws and lock nuts for stripped or broken threads, and the ball end of the screw for nicks and scratches or excessive wear.

Inspect the locating springs for cracks or other signs of failure.

Inspect the oil drain tube for cracks or sharp bends. Check the ball end and socket end of the push rods for nicks, grooves, roughness, or excessive wear.

A suitable check for bent push rods can be made while they are installed in the engine by rotating them (valve closed) or they can be checked between ball and cup centers with a dial indicator (fig. 9).

If the total runout of a push rod exceeds 0.020 inch, at any point, discard the rod. Do not attempt to straighten it.

(2) **REPAIRS.** If the clearance between the shaft and rocker arms is excessive, replace the shaft and/or the rocker arms. Replace all rocker arms that have severely scored or scuffed bores and/or grooved pads. Replace all scored or scuffed rocker shafts. Dress up minor nicks or scratches. Replace all damaged adjusting screws, lock nuts, and springs.

Replace the oil drain tube if it is cracked or has a sharp bend.

b. Cylinder Heads.

To protect the machined surfaces of the cylinder heads, do not remove the holding fixtures while the heads are off the engine.



Fig. 10—Checking Flatness of the Cylinder Head Gasket Surface—Typical

(1) **CLEANING AND INSPECTION.** With the valves installed to protect the valve seats, remove carbon deposits from the combustion chamber and valve heads with a scraper and a wire brush. Be careful not to scratch the gasket surface. Clean the heads with solvent to remove old gasket sealer, dirt, and grease.

Check the head for cracks. Check the gasket surface for burrs, nicks, and for flatness (fig. 10). Service specifications for flatness are 0.006 inch maximum over all, or 0.003 in any six inches. Make sure all water passages are open. Check the cylinder head core plug for evidence of leakage.

(2) **REPAIRS.** Replace the head if it cracked, or if it is damaged beyond repair.

NOTE: Do not plane or grind excessive material from the cylinder head gasket surface as the compression ratio is altered when this operation is performed.

Remove all burrs or scratches with an oil stone.

Replace any core plugs that show signs of leakage.

(3) **SPARK PLUG HOLE ADAPTERS.** If it is desired to use standard 14 millimeter spark plugs, an adapter is available which reduces the 18 millimeter hole to 14 millimeters. The adapter installation procedure is as follows:

Position a spark plug gasket on a standard 14 millimeter plug and install the plug in an adapter. Insert the spark plug and adapter assembly into the 18 millimeter hole and tighten the plug to 25-30 foot-pounds torque. This torque is sufficient to seal the adapter in place and it will not back out when the spark plug is removed. Once the adapters are installed, standard 14 millimeter spark plug gap and torque specifications apply.

c. Valve Mechanism.

Valve guides are made integral with the cylinder heads. Valves with oversized stems are available as replacements if it becomes necessary to ream the valve guides.

(1) **CLEANING AND INSPECTION.** Discard umbrella-type valve stem seals, and replace with new seals. Scrape and/or wire brush carbon from the head and stem of the valves and from the inside of the guides. Remove varnish from the valve stems. Carefully clean all carbon from the valve seat with a fine wire brush.

Check the valve for evidence of imperfect seating, heavy discoloration, burning or erosion, or warpage. Check the valve face runout (fig. 11), and also check the face for pits and grooves. Inspect the ends of the valve stem for grooves or scores.