Shop Tips FROM FORD

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Technical parts and service information published by Ford Division to assist servicemen in Service Stations, Independent Garages and Fleets.

SPECIAL FEATURE!

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Be sure to file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication please write to: Ford Division of Ford Motor Company, Parts and Service Promotion and Training Dept., P.O. Box 658, Dearborn, Michigan, 48121.

FoMoCo GENUINE PARTS

AUTOLITE

ROTUNDA

From Your Ford Dealer

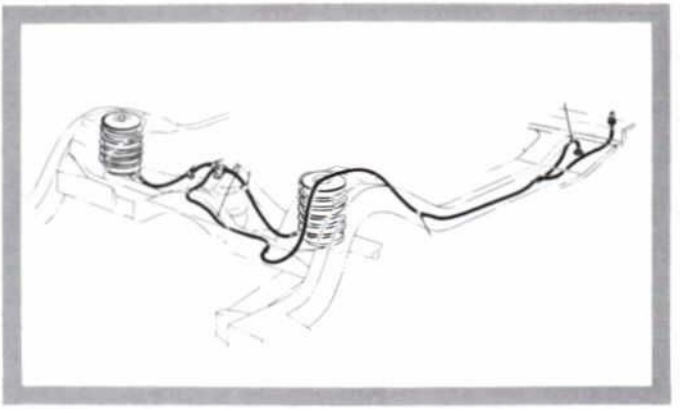
INSTALLATION OF FORD'S

Ford has just released a new Auxiliary Air Spring Kit available as an accessory for installation in 1965 Ford and Mercury passenger cars and station wagons.

The purpose of this kit is to give extra support to the springing system of the car when needed, as in the case of drivers who pull trailers or frequently carry a full complement of passengers and load up their trunk.

The kit consists of tough, butyl rubber cylinders (nominal side wall thickness ¼", end caps ⅜") which are installed within the rear coils. Air-filled, they are completely adjustable for any load or road condition. They are equipped with a conventional tire valve and can be inflated with a standard air hose. When weight is added, the owner simply adds air to adjust to the load. When the added weight is removed, air can be released as necessary, to level the car.

The Auxiliary Air Spring Kit is available through your local Ford Dealer's Parts Department under Ford Part Number C5AZ-5A589-A.



INSTALLATION

Installation of the Auxiliary Air Springs is a relatively easy operation; however, it is necessary to follow the outlined procedure carefully, to assure quick, trouble-free installation. NOTE: Do not remove the valve cap from the air cell until installation is complete.

1. Lower the axle or raise the body to completely open the coils. (If necessary, disconnect the right hand shock absorber to provide additional coil opening.) Only one shock should be dropped to prevent any possibility of tearing off the brake line.

2. Rotate the coil springs until the left-hand bottom coil points forward and the right hand bottom coil points rearward. It is necessary to do this to prevent exposure of the valve stem to a moving coil which could lead to premature wear or breaking off of the valve stem.

3. Tighten the bolt and add protector caps to the upper bolts.

4. Compress the air cylinder and form it into a boat shape, and with the valve stem at the bottom, insert it into the coil springs. See Figure 1.

5. Push the cylinder up within the coil. A blunt instrument such as a tire iron may be used to guide the flattened cylinder to the top of the coil. Note: Do not use a screwdriver or other sharp instrument for this purpose, as the butyl cylinder can be damaged by sharp objects.

6. When the cylinders are completely within the coils, remove the valve caps to allow the unit to assume its "as molded" shape. Do not inflate the air cylinders.

7. Raise the axle or lower the body until the air cylinders lightly touch the upper and lower spring clamp plates. Do not inflate the air cylinders.

8. With the air cylinders lightly touching the upper and lower spring clamps, rotate the cylinders until the valve stems face inboard (toward the centerline of the vehicle). Do not inflate the air cylinders.

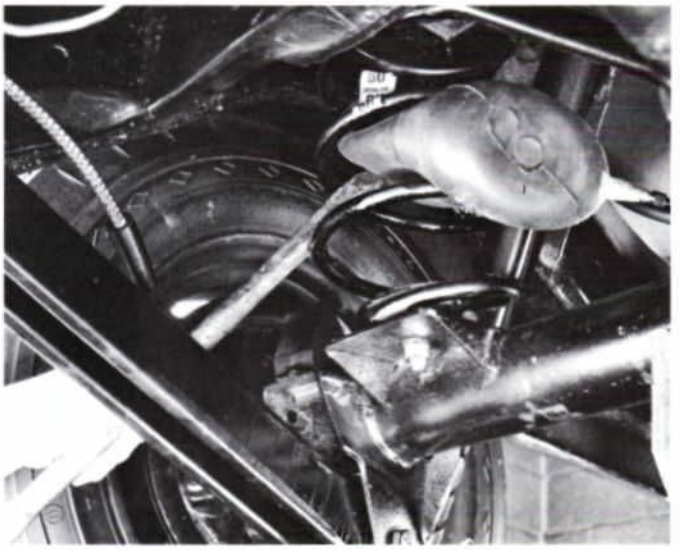


Figure 1—Compress the air cylinder and form into a boat shape.

9. Attach the hose ends to the valve stems of the cylinders and secure the hose assembly to the differential housing studs with two clips. See Figure 2. Be sure to put the clips in the proper location to allow for proper slack in the air hose.

10. Route the hose along the left hand side of the vehicle. Note the location of the white mark on the hose and route it so that the mark is located as shown in the installation instructions.

11. For passenger cars: Drill a .344-diameter hole on the trunk floor, locating the hole on the step up of the trunk, 5¼" to the left of the body bolt, and 1½" to the rear of the body bolt. See Figure 3. Route the valve stem through the hole and secure with two .302-32 nuts, two 5/16 washers and one 5/16 washer.

For station wagons: Secure the valve stem to the frame at the rear crossmember with two .302-32 nuts and two 5/16 washers.

AUXILIARY AIR SPRING KIT

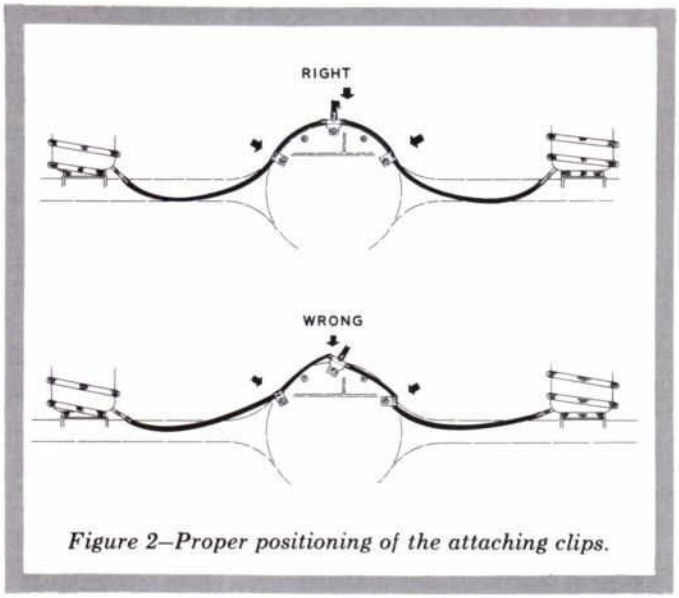


Figure 2–Proper positioning of the attaching clips.

12. Do not inflate the air cylinders while the car is on the frame hoist. The weight of the car must be supported by its suspension. Inflate the cylinder to 15 pounds.

13. Test for air leaks by applying a soap and water solution to all valve cores, fittings and connections.

14. Deflate the air cylinders to a minimum of 2 pounds per square inch.

15. Apply the instruction decal to the deck lid on passenger cars and to the glove box on station wagons. This decal contains instructions for proper inflation of the air springs.

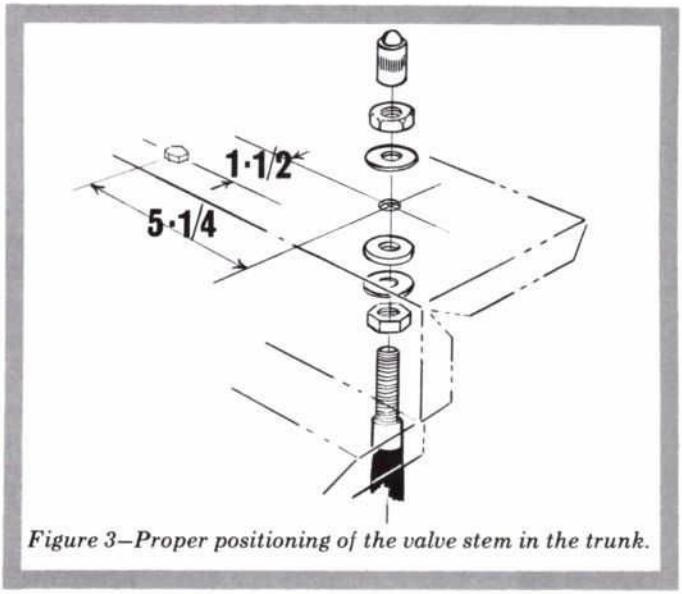


Figure 3–Proper positioning of the valve stem in the trunk.

SERVICE TIPS

The Auxiliary Air Spring Kit is designed to give added support of up to 500 lbs. over the maximum designated axle load. There should never be less than 2 pounds of air in the air cylinders. This is to maintain the cylinders in contact with the coil springs and thus hold chafing to a minimum. The air cylinders should not be inflated to over 15 p.s.i. Very excessive air pressures could cause extreme bulging between the coils and cause the cylinders to rub against a chassis member or burn out against a very hot tail pipe.

Rotating one or both of the rear coil springs prior to installing the air cylinders as described in Step 2, can be simplified by applying external pressure to the coils with a Stilson wrench after loosening the upper and lower clamp bolts. Care should be taken not to gouge the coil by placing a shop rag or strip of sheet metal between the coil and the jaws of the wrench. See Figure 4.

Installation of the air cylinders within the rear coil spring can be easily accomplished by compressing the end of the air cell by hand to fit into the coil spring opening. Once the end of the air cell is within the coil, it may be pushed up into the coil with a "blunt" tire iron.

Proper placement and tightening of the hose clips is essential in the installation of the air springs. If the clips are allowed to rotate while tightening the nut on the banjo, the hose will place excessive strain on the valve stems. It is important that the clips be positioned and tightened as shown in Figure 2 for maximum slack at the air spring valve stem.

When tightening the hose nuts to the threaded valves of the air cylinders, it is advisable to wrap a piece of cloth around the valve stems before grasping them with a pair of pliers. This will prevent any possibility of tearing the rubber when the nuts are tightened securely for a good air seal.

Note the exact location of the valve stem in the trunk and proper routing of the air hose down the left side of the vehicle so as to prevent the air hose from rubbing against the exhaust pipe.

Proper air pressure may be checked with an ordinary tire low pressure air gauge.

Prior to loading the vehicle, inflate the air springs to 15 pounds. Then load the vehicle and deflate the springs until the vehicle is level.

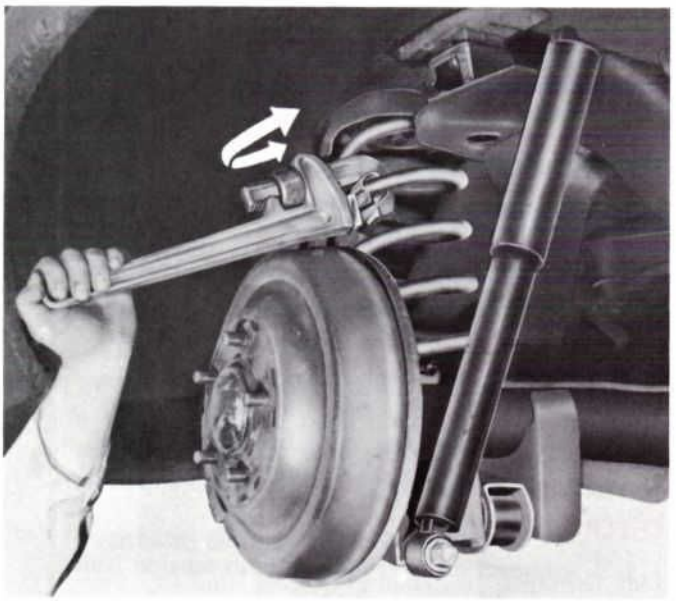


Figure 4–Proper rotation of the coil springs.

ENGINE TROUBLE SHOOTING

DIAGNOSIS AND TESTING

This article is intended to assist service personnel in the proper diagnosis and testing of common engine problems. Usually the best guide to a problem is the customer's description of his trouble. Proper diagnosis and testing can be extremely valuable in that time lost in checking improbable causes and using hit and miss methods can be eliminated, and customer complaints can be reduced. Through good service comes customer satisfaction and loyalty.

Typical customer descriptions are presented here. Under each is listed the sequence to be followed in arriving at the true cause of the specific problem. They are also listed in the order of their probable occurrence. Always follow the principle: first things first, and be sure to use the most modern test equipment to save time.

For diagnosis of the transistor ignition system, see page 10 of the December, 1964 Issue of Shop Tips.

ENGINE WILL NOT CRANK

The cause of this trouble is usually in the Starting System.

If the starting system is not at fault, it may be a hydrostatic lock or a seized engine.

Remove the spark plugs; then attempt to crank the engine with the starter. If the engine cranks, it indicates that water is leaking into the cylinders. Remove the cylinder head(s) and inspect the gasket(s) and/or head(s) for cracks. Examine the cylinder block for cracks.

ENGINE WILL NOT CRANK AND STARTER RELAY DOES NOT CLICK

1. The battery may be discharged.
2. The ignition switch, starter neutral switch or starter relay may be inoperative.
3. The relay control circuit may be open or contain high resistance.

CHECK BATTERY

Perform a Battery Capacity Test. If the battery does not test as having good capacity, make a Battery Test Charge. Replace the battery if the test indicates that it is worn out or under capacity.

CHECK STARTER RELAY

1. Disconnect and ground the high tension lead from the spark coil so that the engine cannot start. On cars with a transistor ignition, also disconnect the brown wire from the starter relay I terminal. Place the transmission lever in the N or P position.

2. With a fully charged battery, operate the ignition switch to crank the engine. If the engine will not crank and the relay does not click, connect a jumper lead from the battery terminal of the relay to the starter switch terminal of the relay. If the engine does not crank, and the relay does not click, the starter relay is probably defective.

3. If the engine cranks in Step 2, remove the quick disconnect from the starter neutral switch, which is located on the steering column under the instrument panel. Connect a jumper wire between the quick disconnect terminals that are connected to the two red-blue stripe wires. Operate the ignition switch to crank the engine.

4. If the engine cranks in Step 3, the starter neutral switch is defective or out of adjustment.

5. If the engine does not crank in Step 3, there are three possible defects:

The hot wire from the battery terminal of the starter relay to the battery terminal of the ignition switch is loose or broken.

The ignition switch is defective.

The wire from the ignition switch to the automatic transmission neutral switch or from the neutral switch to the S terminal of the starter relay is loose or broken.

ENGINE WILL NOT CRANK BUT STARTER RELAY CLICKS

If the relay clicks when the ignition switch is operated, and the engine does not crank, connect a heavy jumper from the relay battery terminal to the relay starter terminal. If the engine cranks, replace the relay. If the engine does not crank, observe the spark when connecting and disconnecting the jumper. If there is a heavy spark, see Check Engine and Starter Drive below. If the spark is weak or if there is no spark at all, proceed as follows:

CHECK CABLES AND CONNECTORS

If the spark at the relay is weak when the jumper is connected, inspect the battery starter cables for corrosion and broken conductors. Check the ground cable to see if it is broken, badly corroded, or loose at the connecting points. Inspect all cable connections. Clean and tighten them if necessary. Replace any broken or frayed cables. If the engine still will not crank, the trouble is in the starter, and it must be repaired or replaced.

CHECK ENGINE AND STARTER DRIVE

If a heavy spark is obtained when the jumper wire is connected, loosen the starter mounting bolts to free the starter pinion.

If the starter drive is locked, remove the starter from the engine and examine the starter drive pinion for burred or worn teeth. Examine the teeth on the flywheel ring gear for burrs and wear. Replace the pinion or the flywheel ring gear if they are badly worn or damaged.

If the starter drive is not locked, remove the starter from the engine and perform the no-load current test. The starter should run freely.

If the current reading at no-load speed is below specifications, the starter has high resistance and should be repaired.

If the current reading is above normal, and the starter is running slower than it should at no-load, it is probably due to tight or defective bearings, a bent shaft, or the armature rubbing the field poles. A shorted coil in the starter also causes the current reading to be high. Disassemble the starter and determine the cause. Repair it if possible, or replace the starter.

If the no-load current reading of the starter is normal, install the starter, remove all the spark plugs, and attempt to crank the engine with the starter.

If the engine cranks with the spark plugs removed, water has probably leaked into the cylinders causing a hydrostatic lock. The cylinder heads must be removed, and the cause of internal coolant leakage eliminated.

If the engine still will not crank, the engine is seized and cannot be turned by the starter. Disassemble the engine and repair or replace the defective parts.

STARTER SPINS BUT DOES NOT CRANK ENGINE

If the starter spins but will not crank the engine, the starter drive is worn out, broken, seized to the shaft or has a broken armature by-pass switch or actuating lever. Repair or replace parts as necessary.

ENGINE CRANKS SLOWLY

Several causes may result in this symptom:

1. The battery may be low in charge.
2. There may be excessive resistance in the starter circuit.
3. The starter may be faulty.
4. The engine may have excessive friction.

CHECK BATTERY

Test the state of charge of the battery. If the battery is discharged, recharge the battery, and check the starter relay for possible internal shorts to ground that may have caused the battery to discharge. Perform a Battery Capacity Test. If the battery does not test as having good capacity, make a Battery Test Charge.

Replace the battery if the test indicates it to be worn out or under capacity.

CHECK EXTERNAL CIRCUIT VOLTAGE DROP

If the battery was fully charged in the previous test, test the starter cranking circuit voltage drop. The voltage drop will be either excessive or normal.

VOLTAGE DROP (RESISTANCE) EXCESSIVE

Locate the exact part of the circuit with the excessive resistance.

To correct excessive resistance in the battery to starter relay cable, starter relay to starter cable or battery to ground cable, clean and tighten the cable connections. Recheck the voltage drop. If it is still excessive, replace the cables.

To correct excessive resistance of the starter relay contacts, replace the starter relay.

VOLTAGE DROP (RESISTANCE) NORMAL

If the voltage drop (resistance) is normal, make

ENGINE TROUBLE SHOOTING

DIAGNOSIS AND TESTING

a starter load test. If the starter load current is not to specifications, proceed as follows:

Cranking Current Low. Remove the starter from the engine, and repair and replace it.

Cranking Current Normal or High. Remove the starter from the engine, and test the starter current draw at no-load. If the no-load current draw is above or below specifications, repair or replace the starter.

If the current draw at no-load is normal, the starter is not at fault. The engine has excesive friction, and the cause must be determined. Repair or replace faulty parts.

ENGINE CRANKS NORMALLY BUT WILL NOT START

Check the fuel supply. If there is sufficient fuel in the tank and the proper starting procedure is used, the cause of the trouble probably lies in either the ignition or the fuel system.

To determine which system is at fault, perform the following test:

Disconnect a spark plug wire. Check the spark intensity at the end of the wire by installing a terminal adapter in the end of the wire. Then hold the adapter approximately $\frac{3}{16}$ inch from the exhaust manifold and crank the engine.

IF THERE IS NO SPARK OR A WEAK SPARK AT THE SPARK PLUGS

The cause of the trouble is in the ignition system.

Disconnect the brown lead ("I" terminal) and the red and blue lead ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay.

To determine if the cause of the trouble is in the primary or the secondary circuit, remove the coil high tension lead from the top of the distributor, **and hold it approximately $\frac{3}{16}$ inch from the cylinder head.** With the ignition on, crank the engine and check for a spark.

If the spark at the coil high tension lead is good, the cause of the trouble is probably in the distributor cap, rotor or spark plug wires.

If there is no spark or a weak spark at the coil high tension lead, the cause of the trouble is probably in the primary circuit, coil to distributor high tension lead, or the coil.

IF THERE IS A GOOD SPARK AT THE SPARK PLUGS

Check the spark plugs. If the spark plugs are not at fault, check the following items:

If fuel is not discharged by the accelerating pump, disconnect the carburetor fuel inlet line at the carburetor. Use a suitable container to catch the fuel. Crank the engine to see if fuel is reaching the carburetor.

If fuel is not reaching the carburetor, check:

The fuel filter.

The fuel pump.

The carburetor fuel inlet line for obstructions.

The fuel pump flexible inlet line for a collapsed condition.

The fuel tank line for obstructions.

MANUAL CHOKE

Check the choke linkage for binding or damage. Make certain the choke plate closes when the choke knob on the instrument panel is pulled out and that the plate opens when the knob is pushed in.

AUTOMATIC CHOKE

Check the position of the choke plate. If the engine is hot, the plate should be open. If the plate is not open, the engine will load up due to the excessively rich mixture and will not start. If the engine is cold, the plate should be closed. If the plate is not operating properly, check the following items:

The choke plate and linkage for binding.

The fast idle cam linkage for binding.

The thermostatic spring housing adjustment.

FUEL SUPPLY AT THE CARBURETOR

Work the throttle by hand several times. Each time the throttle is actuated, fuel should spurt from the accelerating pump discharge port (6-cylinder) or nozzles (V-8).

If fuel is discharged by the accelerating pump, the engine is probably flooded, or there is water in the fuel system, or an engine mechanical item is at fault.

Fuel tank vent restricted.

If fuel is reaching the carburetor, check:

The fuel inlet system including the fuel inlet needle and seat assembly and the float assembly.

ENGINE

Mechanical failure in camshaft drive.

ENGINE STARTS BUT FAILS TO KEEP RUNNING

FUEL SYSTEM

Idle fuel mixture needle(s) not properly adjusted.

Engine idle speed set too low.

The choke not operating properly.

Float setting incorrect.

Fuel inlet system not operating properly.

Dirt or water in the fuel lines or in the fuel filter.

Carburetor icing.

Fuel pump defective.

Check for dirt in the carburetor not allowing fuel to enter or be discharged from the idle system.

IGNITION SYSTEM

Defective spark plugs.

Leakage in the high tension wiring.

Open circuit in the primary resistance wire.

Breaker points not properly adjusted.

ENGINE RUNS BUT MISSES

Determine if the miss is steady or erratic and at what speed the miss occurs by operating the engine at various speeds under load.

MISSES STEADILY AT ALL SPEEDS

Isolate the miss by operating the engine with one cylinder not firing. This is done by operating the engine with the ignition wire removed from one spark plug at a time, until all cylinders have been checked. Ground the spark plug wire removed.

If the engine speed changes when a particular cylinder is shorted out, that cylinder was delivering power before being shorted out. If no change in the engine operation is evident, the miss was caused by that cylinder not delivering power before being shorted out. In this case, check the:

IGNITION SYSTEM

If the miss is isolated in a particular cylinder, perform a spark test on the ignition lead of that cylinder.

If a good spark does not occur, the trouble is in the secondary circuit of the system. Check the spark plug wire and the distributor cap.

If a good spark occurs, check the spark plug. If the spark plug is not at fault, a mechanical component of the engine is probably at fault.

ENGINE

Intake manifold gasket leak.

Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

MISSES ERRATICALLY AT ALL SPEEDS

EXHAUST SYSTEM

Exhaust system restricted.

IGNITION SYSTEM

Breaker points not properly adjusted.

Defective breaker points, condenser, secondary wiring, coil, or spark plugs.

High tension leakage across the coil, rotor or distributor cap.

Defective ignition switch.

FUEL SYSTEM

Float setting incorrect.

Fuel inlet system not operating properly.

Dirt or water in the fuel lines or carburetor.

Restricted fuel filter.

Loose booster venturi (V-8).

COOLING SYSTEM

Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature.

ENGINE

Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

MISSES AT IDLE ONLY

FUEL SYSTEM

Idle fuel mixture needle(s) not properly adjusted.

Restriction in idle fuel system.

ENGINE TROUBLE SHOOTING

DIAGNOSIS AND TESTING

IGNITION SYSTEM

Excessive play in the distributor shaft.
Worn distributor cam.
Defective coil, rotor, condenser, breaker points, ignition wiring or spark plugs.

ENGINE

Valve lash (engine with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters set too tight. Worn camshaft lobe(s).
Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

MISSES AT HIGH SPEED ONLY

FUEL SYSTEM

Power valve or passages clogged or damaged.
Low or erratic fuel pump pressure.
Fuel inlet system not operating properly.
Restricted fuel filter.
Restricted main fuel system.
Positive crankcase ventilation system restricted or not operating properly.

IGNITION SYSTEM

Defective spark plugs.

COOLING SYSTEM

Engine overheating.

ENGINE

Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

ROUGH ENGINE IDLE

FUEL SYSTEM

Engine idle speed set too low.
Idle fuel mixture needle(s) not properly adjusted.
Float setting incorrect.
Air leaks between the carburetor, spacer, and the manifold and/or fittings.
Intake manifold gasket leak (V-8). Power valve leaking fuel.
Idle fuel system air bleeds or fuel passages restricted.
Fuel bleeding from the accelerating pump discharge nozzle(s).
Secondary throttle plate(s) not closing (4-barrel carburetor).
Improper secondary throttle plate stop adjustment (4-barrel carburetor).
Incorrect idle speed setting of the secondary carburetor (427 V-8).
Leaking fuel pump, lines or fittings.

IGNITION SYSTEM

Improper adjusted or defective breaker points.
Fouled or improperly adjusted spark plugs.
Incorrect ignition timing.
Spark plug misfiring.

EXHAUST SYSTEM

Exhaust control valve inoperative or sticking (240 Six and 427 V-8).

ENGINE

Loose engine mounting bolts or worn engine support insulator.
Cylinder head bolts not properly torqued.
Valve lash or valve clearance set too tight.
Crankcase ventilation regulator valve defective or a restricted vent tube.
Worn camshaft lobes.
Perform a manifold vacuum or compression test to determine which mechanical component is at fault.

POOR ACCELERATION

IGNITION SYSTEM

Incorrect ignition timing.
Fouled or improperly adjusted spark plugs.
Imporperly adjusted or defective breaker points.
Distributor not advancing properly.
Loose or defective spark control valve (6-cylinder).

FUEL SYSTEM

Accelerating pump malfunction.
Float setting incorrect.
Throttle linkage not properly adjusted.
Accelerating pump stroke not properly adjusted.
Leaky power valve, gasket or accelerating pump diaphragm.
Power valve piston stuck in the up position (6-cylinder).
Dirt or corrosion in accelerating system.
Distributor vacuum passages in the carburetor blocked.
Restricted fuel filter.
Defective fuel pump.

BRAKES

Improper adjustment—too tight.

TRANSMISSION

Clutch slippage (manual-shift transmissions).
Improper band adjustment (automatic transmissions).
Converter One-Way Clutch (automatic transmissions).

ENGINE

Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

ENGINE DOES NOT DEVELOP FULL POWER OR HAS POOR HIGH SPEED PERFORMANCE

FUEL SYSTEM

Restricted air cleaner.
Restricted fuel filter.
Clogged or undersize main or secondary jets and/or low float setting.
Power valve or passages clogged or damaged.
Fuel pump pressure incorrect.
Distributor vacuum passage in the carburetor blocked.
Secondary throttle plates not opening (V-8).
Automatic choke malfunctioning or improperly adjusted.

IGNITION SYSTEM

Ignition timing not properly adjusted.
Defective coil, condenser or rotor.
Distributor not advancing properly.
Excessive play in the distributor shaft.
Distributor cam worn.
Fouled or improperly adjusted spark plugs or spark plugs of incorrect heat range.
Improperly adjusted or defective breaker points.

EXHAUST SYSTEM

Exhaust control valve inoperative or sticking (240 Six or 427 V-8).
Restriction in system.

COOLING SYSTEM

Thermostat inoperative or of incorrect heat range.
Thermostat installed incorrectly.
Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature.

ENGINE

Positive crankcase ventilation system not operating properly.
Perform a manifold vacuum or engine compression test to determine which mechanical component of the engine is at fault.
One or more camshaft lobes worn beyond wear limit.
Worn valve guides.

TRANSMISSION

Improper band adjustment (automatic transmissions).

EXCESSIVE FUEL CONSUMPTION

Determine the actual fuel consumption with test equipment installed in the car.
If the test indicates that the fuel consumption is not excessive, demonstrate to the owner how improper driving habits will affect fuel consumption.
If the test indicates that the fuel consumption is excessive, make a preliminary check of the following items before proceeding to the fuel and ignition systems.

PRELIMINARY CHECKS

CHASSIS ITEMS

Check:
Tires for proper pressure.

ENGINE TROUBLE SHOOTING

DIAGNOSIS AND TESTING

Front wheel alignment.
Brake adjustment.

EXHAUST SYSTEM

Check the exhaust control valve operation (240 Six and 427 V-8).
System restricted.

ODOMETER

Check calibration.

IGNITION SYSTEM

Check:
Distributor breaker points.
Ignition timing.

ENGINE

Crankcase ventilation regulator valve defective or restricted tubes (Positive Crankcase Ventilation System).

FINAL CHECKS

FUEL SYSTEM

Check:
Fuel pump pressure.
Engine idle speed.
Idle fuel mixture needle(s) for proper adjustment.
Automatic choke for proper operation.
Fast idle speed screw for proper adjustment.
Accelerating pump stroke adjustment.
Anti-stall dashpot for proper adjustment.
Air cleaner for restrictions.
Float setting for fuel level.
Jets for wear and/or damage.
Power valve operation.
Air bleeds for obstructions.
Accelerating pump discharge port (6-cylinder) or nozzles (V-8) for siphoning.
Accelerator linkage for binds.
Choke adjustment.

IGNITION SYSTEM

Check:
Ignition timing.
Spark plug condition and adjustment.
Distributor spark advance operation.
Spark control valve for proper seating (6-cylinder).

ENGINE

Perform a manifold vacuum or engine compression test to determine which mechanical component of the engine is at fault.
Check valve clearance (hydraulic lifters) or valve lash (mechanical tappets).

COOLING SYSTEM

Check thermostat operation and heat range.

TRANSMISSION

Check band adjustment (automatic transmissions).

ENGINE OVERHEATS

TEMPERATURE SENDING UNITS AND GAUGE

Unit or gauge defective (not indicating correct temperature) or constant voltage regulator defective.

ENGINE

Cylinder head bolts not properly torqued.
Incorrect valve lash (engine with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters).

Low oil level or incorrect viscosity oil used.

COOLING SYSTEM

Insufficient coolant.
Cooling system leaks.
Drive belt tension incorrect.
Radiator fins obstructed.
Thermostat defective.
Thermostat improperly installed.

Cooling system passages blocked.
Water pump inoperative.
Faulty fan drive.

IGNITION SYSTEM

Incorrect ignition timing.
Incorrect distributor advance.

EXHAUST SYSTEM

Restrictions in system.

BRAKES

Improper adjustment—too tight.

LOSS OF COOLANT

COOLING SYSTEM

Leaking radiator or water pump.
Loose or damaged hose connections.
Radiator cap defective.
Overheating.

ENGINE

Cylinder head gasket defective.
Intake manifold to cylinder head gasket defective (V-8).
Cylinder head or intake manifold bolts (V-8) not properly torqued.
Cylinder block core plugs leaking.
Temperature sending unit leaking.
Cracked cylinder head or block, or warped cylinder head or block gasket surface.

ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE

TEMPERATURE SENDING UNIT AND GAUGE

Unit or gauge defective (not indicating correct temperature) or constant voltage regulator defective.

COOLING SYSTEM

Thermostat inoperative or of incorrect heat range.

NOISY HYDRAULIC VALVE LIFTER

A noisy hydraulic valve lifter can be located by operating the engine at idle speed and placing a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a shock will be felt when the valve seats.

Another method of identifying a noisy lifter is by the use of a piece of hose. With the engine operating at idle speed, place one end of the hose near the end of the valve stem and the other end to the ear and listen for a metallic noise. Repeat the procedure on each intake and exhaust valve until the noisy lifter(s) has been located.

The most common causes of hydraulic valve lifter troubles are dirt, gum, varnish, carbon deposits and air bubbles.

Dirt in the lifter assembly can prevent the disc valve from seating, or it may become lodged between the plunger and body surfaces. In either case, the lifter becomes inoperative due to failure to "pump-up" or because the internal parts are no longer free to function properly. When dirt is found to be responsible for lifter malfunction, remove the lifter assembly and thoroughly clean it. Recommended engine oil and filter change intervals should be followed to minimize lifter problems caused by dirt.

Deposits of gum and varnish cause similar conditions to exist which may result in lifter malfunction. If these conditions are found to be present, the lifter should be disassembled and cleaned in solvent to remove all traces of deposits.

Air bubbles in the lubricating oil, caused by an excessively high or low oil level, may likewise cause lifter malfunction. A damaged oil pick-up tube may allow air to be drawn into the lubricating system.

Check for engine oil aeration as follows:

Check the engine oil level to be sure it is within specification and correct as required. **Be sure the correct engine oil dipstick is being used.**

Operate the engine at approximately 1200 rpm until normal operating temperature is reached. Stop the engine and remove the oil pressure sending unit. Install a fitting in this opening with a petcock-type valve that will permit attachment of a ¼ to ⅜ inch diameter hose of sufficient length to direct the oil discharge into the oil filler pipe. Close the valve.

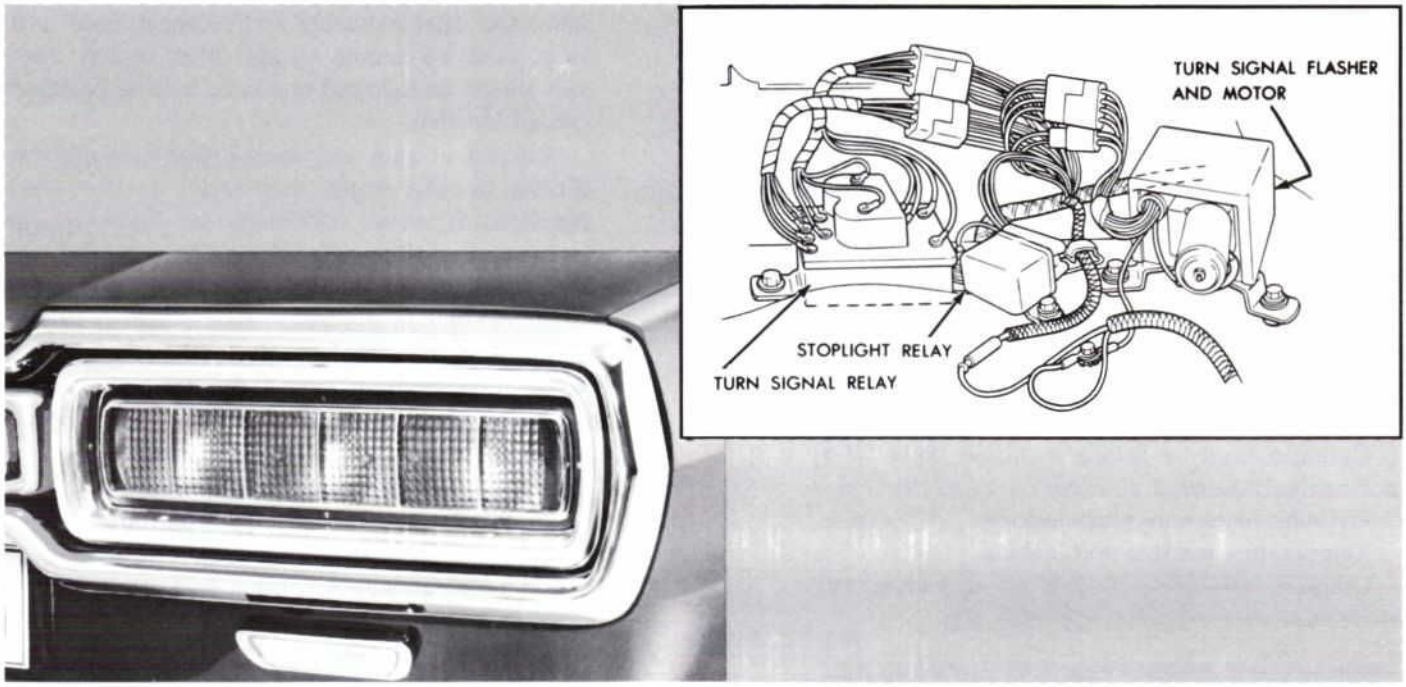
Start the engine and operate it at approximately 500 rpm for a minimum of five minutes; then, open the valve slightly to permit a steady discharge of oil. Check the oil flow for air bubbles.

Increase the engine speed to approximatly 1000 rpm and check for air bubbles in the oil. **To facilitate checking for air bubbles, direct the oil flow over white paper or through a piece of transparent tube. The engine should not be operated at excessive speeds or for extended periods with the oil bleed attached.**

If oil aeration is evident, remove the oil pan for further test and/or inspection of the oil pump intake system. Perform corrective action as required to remove air from the lubricating oil.

SERVICING THE 1965 THUNDERBIRD SEQUENTIAL TURN SIGNALS

All 1965 Thunderbird models now incorporate rear turn signals that impart a directional effect. When a turn is signaled, the three bulbs behind the lens operate in sequence starting with the inside bulb, and continue lighting in sequence until the turn is completed and the signal lever is canceled.



The sequential turn signal indicator system is composed of the following component parts: A turn signal switch which is located in the steering column; a current relay mounted on the brake pedal support to operate the indicator pilot lights and a relay and a flasher assembly which are located in the luggage compartment behind the rear seat.

The flasher assembly consists of a motor and 4 cams. One cam returns the motor to the start position after the turn signal indicators are canceled. The remaining 3 cams are staggered and each set of contacts is connected to one of the three rear light bulbs.

When the turn signal indicator switch is moved to indicate a right or left hand turn, the circuit is completed to the flasher motor and to the flasher cam contacts. This starts the motor in operation and the cams begin to rotate. As the cams rotate, the inboard rear light bulb is illuminated first and remains on until the cycle is completed. The center light bulb is then illuminated and it remains on while the outboard rear light bulb is illuminated. All three lights go out at the same time and the cycle is repeated, as long as the turn signal indicator switch is closed to indicate a turn. The front parking light bulb flashes in sequence with the center rear light bulb.

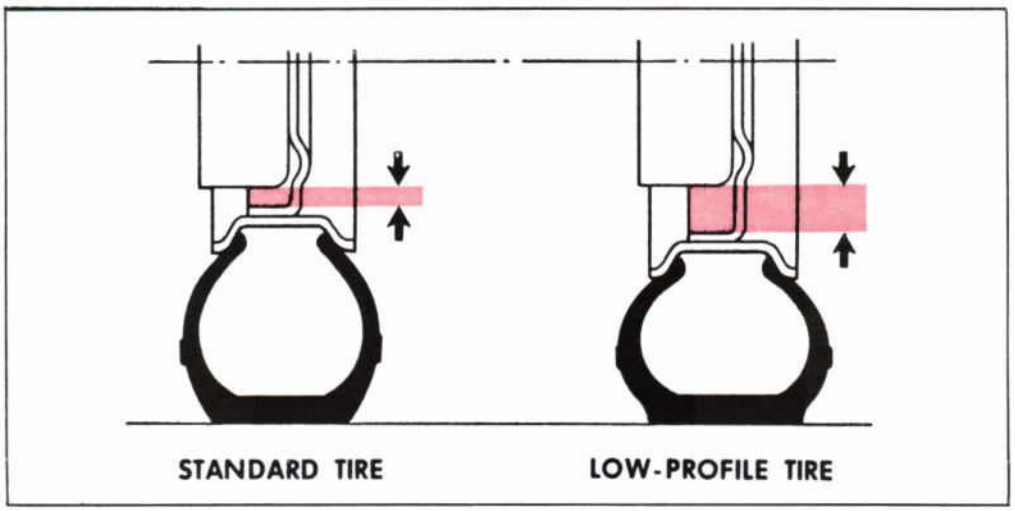
When the turn signal indicator switch is canceled, the light bulbs go out immediately. The motor cam allows the motor to travel to the park position so that the sequence always starts with the inboard rear light.

The turn signal pilot light, located on each front fender, is controlled by a current relay. The relay is adjusted so that it will open a set of contacts whenever the 4 signal light bulbs are on. The relay remains closed and the pilot light is illuminated until the 4 exterior light bulbs are all on. The relay contacts then open and the pilot light goes off until all 4 exterior lights are off. The relay contacts then close to illuminate the pilot light. If one or more of the exterior light bulbs are not functioning, the relay contacts will remain closed and the pilot light will remain on.

NEW LOW-PROFILE TIRES FOR 1965 FORD CARS

In 1965, many cars in the Ford Line feature new low-profile tires which help the car retain a low-silhouette styling that is so desirable. In addition to the styling advantage, the low-profile tires reduce rolling resistance for improved fuel economy. Among its other advantages are: greater amount of tread on the road for increased life, more stopping power and higher load capacity, less rolling when cornering for better stability and handling and increased flexibility for a smoother ride. These are results of the wider cross-section and reduced dimension between the road and rim.

These new low-profile tires are standard equipment on most models in the 1965 Ford line of passenger cars and station wagons. The chart below gives a listing and comparison of the new low-profile tires as compared to the old style tire. Service personnel may want to stock up on these new low-profile tires in order to be able to meet customer demand, and also be able to recognize them for servicing.



LOW-PROFILE SIZE COMPARISON CHART

13 INCH WHEEL		14 INCH WHEEL		15 INCH WHEEL	
REGULAR SIZE	EQUIVALENT LOW PROFILE SIZE	REGULAR SIZE	EQUIVALENT LOW PROFILE SIZE	REGULAR SIZE	EQUIVALENT LOW PROFILE SIZE
6.00 x 13	6.00 x 13	6.00 x 14	6.45 x 14	6.00 x 15	6.85 x 15
6.50 x 13	6.50 x 13	6.50 x 14	6.95 x 14	6.50 x 15	7.35 x 15
7.00 x 13	7.00 x 13	7.00 x 14	7.35 x 14	6.70 x 15	7.75 x 15
		7.50 x 14	7.75 x 14	7.10 x 15	8.15 x 15
		8.00 x 14	8.25 x 14	7.60 x 15	8.45 x 15
		8.50 x 14	8.55 x 14	8.00 x 15	8.85 x 15
		9.00 x 14	8.85 x 14	8.20 x 15	9.00 x 15
		9.50 x 14	8.85 x 14	NONE	9.15 x 15

NEW PRODUCTS FROM FORD

Here are just a few Rotunda Quality Automotive Products available to you from your local Ford Dealer's Parts Counter. These are products designed to make your service and maintenance jobs easier and less time consuming.

DISTRIBUTOR CAM LUBRICANT . . . This new lubricant is recommended for use when installing ignition points. Application requires only about as much lubricant as the size of a match head distributed evenly over the entire cam surface. When the points are installed and the cam rotates, the lubricant forms into a small bead on the rubbing block and serves to keep the cam lubricated. This product is available under Ford Part Number C4AZ-19D530-A.

SOLVENT AND PENETRATING FLUID . . . Available in a 12-ounce spray container as well as in an 8-ounce can with spout. This chemical accessory is a combination penetrating agent solvent and colloidal lubricant designed to penetrate close fittings, clean and lubricate tight bearing surfaces, and free push fit bearings and all types of threaded connections. It is also recommended for freeing up and lubricating exhaust gas control valves for better engine performance. The 12-oz. can is available under Ford Part Number C4AZ-19A501-A. The 8-oz. can with spout is available under Ford Part Number COAZ-19A501-A.

POLYETHYLENE GREASE . . . A superior lubricant for lowering operating effort in areas like hinges, locks, catches, gear boxes and many other shop and home uses. It comes in an 8-oz. plastic tube with spout under Ford Part Number C4AZ-19584-A; or in a 16-oz. spray can with an extension nozzle for reaching hard to get at places under Ford Part Number C4AZ-19584-B.

DYNAMICALLY BALANCING WHEEL AND TIRE ASSEMBLIES ON VEHICLES WITH DISC BRAKES

(All Vehicles with Disc Brakes)

Any attempt to balance the wheel and tire assembly dynamically on the vehicle without first pulling back the shoe and lining assemblies from the disc rotor may result in an additional drag effort to rotate the wheel and tire which in turn, may develop a drag too large for the balancing equipment to accommodate.

This drag effect can be removed by the following procedure:

1. Remove the wheel and tire assembly from the hub and rotor assembly.

2. Remove the two bolts retaining the caliper splash shield and remove the shield.

3. Push the pistons into the cylinder bores by applying steady pressure for at least a minute on the shoe and lining assembly toward the respective caliper housing on each side of rotor. If difficulty is experienced in retracting the pistons, water pump pliers should be used.

4. After the pistons have been retracted, install the caliper splash shield with the two retaining bolts.

5. Install the wheel and tire assembly on the hub and rotor assembly.

6. Dynamically balance the wheel and tire assembly with same equipment as used on drum brake assemblies.

7. Important! After balancing the wheel and tire, pump the brake several times until a firm pedal is obtained and the shoe and lining assemblies are properly seated.

DISTRIBUTOR SPECIFICATIONS

(1965 Falcon, Fairlane and Mustang—200 CID Six Cylinder Engine with Automatic Transmission)

200 CID Engine (Distributor No. C5DF-12127-K used with Automatic Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
800	¾—1¾	0.79
1200	3¾—4¾	1.90
1600	5¾—7	3.00
2000	7 —8¼	3.80
Maximum Advance Limit		12¾°

DISTRIBUTOR SPECIFICATIONS

(1965 Ford 240 CID Six Cylinder Police and Taxi Engine with Automatic Transmission)

240 Police and Taxi Six (Distributor No. C5AF-12127-AM used with Automatic Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
700	1½—2½	0
1000	4 —5	0
1500	6¼—7½	0
2000	8½—10	0
Maximum Advance Limit		11°

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1—4	8
1000	3—6	10
1000	4—7	12—20
Maximum Advance Limit		7°

BULLET TERMINAL REMOVAL FROM TURN SIGNAL SWITCH MULTIPLE CONNECTOR

Some difficulty may be encountered in removing the bullet terminals from the turn signal switch multiple connector at the lower end of the steering column. As an aid in removing these bullet terminals, two ways of fabricating a tool are shown in Figure 5.

The tool, as illustrated, is T-shaped for easy gripping in the palm of the hand and can be fabricated with 3/16 in. drill rod stock or 3/16 in. copper tubing. The end of the tool when inserted over the individual bullet terminal to be removed, compresses the locking latch at the end of the bullet and allows the bullet terminal to be pulled away from the multiple connector.

The locking latch at the end of the bullet may become overly compressed in some cases and will not allow the bullet terminal to lock in the connector upon re-installing. When this problem is encountered a knife edge may be used to pry the locking latch outward which will alleviate this condition.

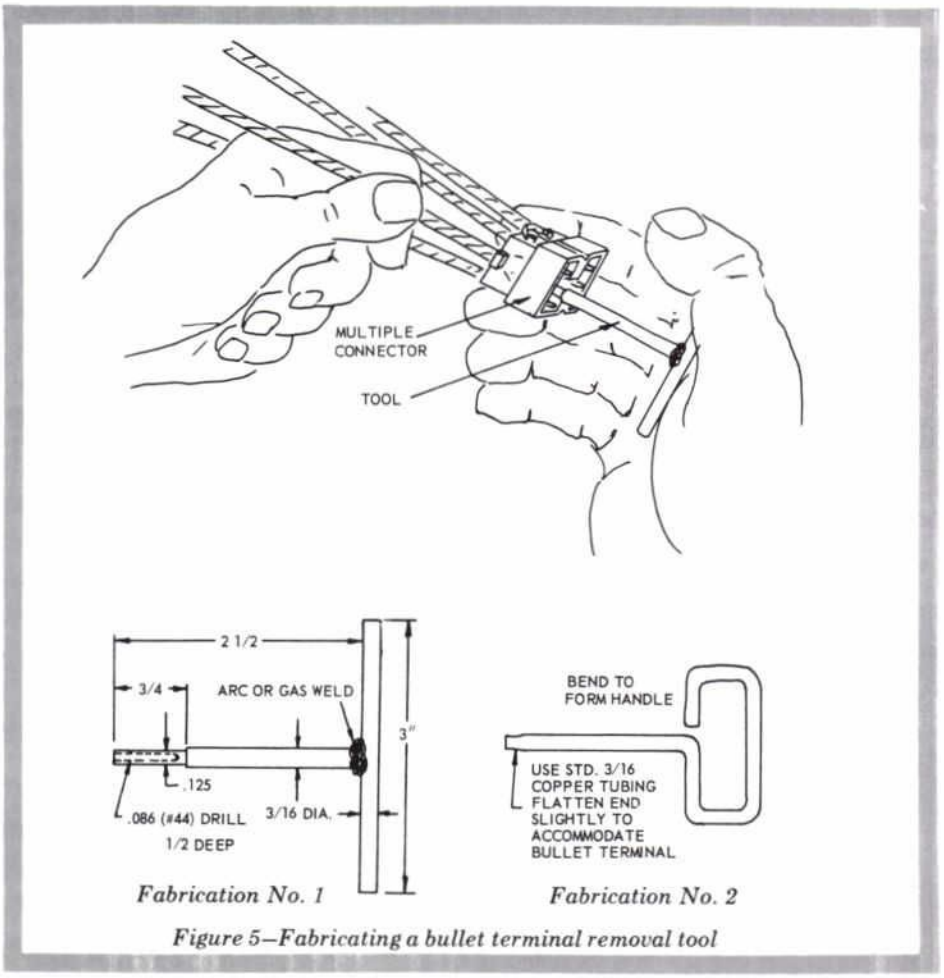


Figure 5—Fabricating a bullet terminal removal tool

FORD'S JANUARY—FEBRUARY SPOTLIGHT OFFER SENDS EXTRA PROFITS ROLLING YOUR WAY

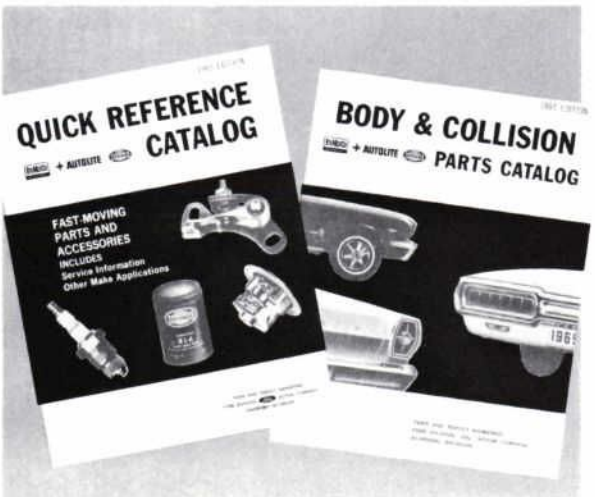
February is the final month for you to cash in on the extra profits that can be yours with your local Ford Dealer's Parts Department special on new FoMoCo Generator Regulators.

During the months of January and February, participating Ford Dealers are offering an extra $.50 off their regular price on every new FoMoCo Generator Regulator purchased by eligible wholesale accounts. This is in addition to the regular generous discount offered to regular wholesale customers and adds up to big savings for you.

Your reputation as a good mechanic brings customers to you for service. This reputation is strengthened when you show a Ford owner that you installed a FoMoCo Generator Regulator, the part designed to work best with the Ford electrical system. And it's easier to sell FoMoCo Genuine Parts at full profit.

Don't forget that cash savings like these are available every month at your local participating Ford Dealer's Parts Counter. They can add up to more than $50 of extra profit a year. It will profit you to buy your parts from him.

KEEP CURRENT ON FORD SERVICE



The 1965 issues of Ford's Quick Reference and Body & Collision Catalogs are now available to you FREE at your local Ford Dealer.

Quick Reference Catalog . . . A must for anyone who services or repairs cars. It features over 100 pages of valuable service tips from Ford's service experts. A comprehensive index simplifies identification of parts. This valuable reference piece features concise parts information on all Ford cars and light-duty trucks with a listing of over 4,000 fast-moving parts.

Body & Collision Parts Catalog . . . Up-dated for 1965. This catalog is ideal for anyone doing body work. It has 50 pages of body service tips and over 200 exploded-view illustrations to help identify collision parts and speed repair work.