

# Shop Tips

FEBRUARY, 1964

# FROM FORD

VOL. 2, NO. 2

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

## SPECIAL FEATURE!



## COBRA KITS! NEW FROM FORD!

(See page 2)

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.

### IN THIS ISSUE

Article	Title	Page
1	New "Cobra Kits"—for 221, 260 and 289 C.I.D. Engines.....	2, 3
2	New Ford 4V 289 C.I.D. High Performance V-8 Engine—Specifications—Settings and Service Parts List.....	4, 5
3	Quick Service—Engine Diagnosis.....	6-9
4	Transistor Ignition System—Operation and Testing.....	10, 11
5	Erratic or Inoperative Electric Windshield Wipers—1963 Falcon.....	12
6	Engine Noises in Passenger Compartment—1960-63 Ford with 8 Cylinder Engine and Automatic Transmission.....	12
7	Fuel Gauge Reading Full at All Times—1963 Fairlane Station Wagon.....	12
8	Water Pump Failure—1963 Ford and Thunderbird with 352 and 390 C.I.D. Engines	12
9	Off Idle Engine Knock—1963-64 352 and 390 C.I.D. Engines.....	13
10	Accelerator Linkage—Damage When Raising or Jacking Up Engine—1963 Falcon with Eight Cylinder Engine.....	13
11	Rear Axle Noise—1962-63 Fairlane, All Models.....	13
12	New Carburetor Spacer and Gasket Assembly—1964 352-4V and 390-4V C.I.D. Engines.	13
13	Alleged Speedometer Noise—1963 Ford.....	13
14	Intermittent Parking Lamp Operation—Poor Ground—1964 Fairlane—All Models.....	13
15	Sealer For Vinyl Tops.....	13
16	Brake Pedal Height—1963 F-100-250 Trucks.	13
17	Turn Signals Not Cancelling and/or High Operating Efforts—All 1963 and 1964 Vehicles.....	14
18	Brake Pedal Bind and/or Hang-Up—1963 Ford Without Power Brakes.....	14
19	Brake Line Looseness or Rattle—Rear Axle Housing Area—1963 Ford 6 & 8 Cylinder and Falcon 8 Cylinder.....	14
20	Steering Gear Housing Replacement—Sector Shaft Bushing Failure—1961-63 Thunderbird Steering Gears.....	14
21	For You From Ford—Quick Reference Catalog and Body and Collision Parts Catalog.....	15

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BETTER PERSONAL ATTENTION  
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# 1 NEW "COBRA KITS" ...

Inspired by the spectacular success of the Ford-powered Cobra sports cars in major road races, several new "Cobra Kits" have been developed and are being offered through Ford dealers. Designed for 221, 260 and 289 C.I.D. engines, these kits offer stepped-up engine performance as well as sparkling "customized" appearance.

The Ford part numbers and brief descriptions are given below and on the following page. To obtain these kits or additional information about them, contact your local Ford dealer.

## COBRA ENGINE PERFORMANCE KITS

Available for all three blocks. These kits each contain eight pistons, a Cam Kit and a Cylinder Head and Valve Kit. All three performance kits are recommended for use with standard transmissions only.

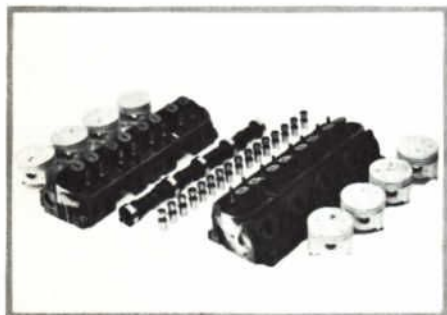
- 221 Kit.....C40Z-6A044-A
- 260 Kit.....C40Z-6A044-B
- 289 Kit.....C40Z-6A044-C



## CAM KIT

This kit consists of camshaft and 16 tappets and is the same type of unit used in the Cobra. This kit fits all three blocks and can be bought separately.

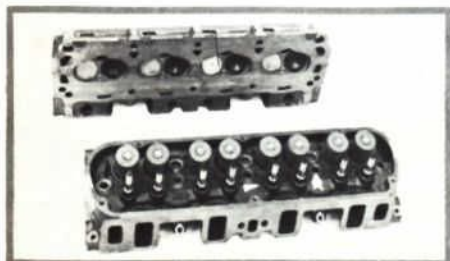
Ford Part Number.....C40Z-6A257-A



## CYLINDER HEAD AND VALVE KIT

This kit has cylinder heads, intake and exhaust valves, valve stem seals, spring assemblies, and valve spring retainers. Cylinder heads have heavy-duty rocker arm studs threaded into the head, spring seats to accommodate valve spring and damper assemblies, valve stem seals to provide improved oil control, and valve seats to accommodate larger intake valves. This kit fits all three blocks and can be bought separately.

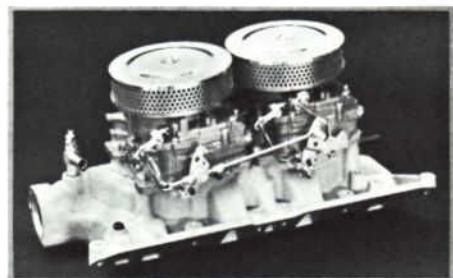
Ford Part Number.....C40Z-6C056-A



## TWO 4-V INDUCTION KIT

This kit contains two of the carburetors described above, plus a special cast aluminum intake manifold. This helps to develop maximum speed and horsepower in an engine modified for competition. This kit is now available for the 289 block only.

Ford Part Number.....C40Z-6B068-E



## THREE 2-V INDUCTION KIT

This kit features three 2-V carburetors on an aluminum intake manifold, plus air cleaner. Carburetor linkage is mechanically operated, with the front and rear carburetors acting as secondaries when maximum acceleration is desired. Under normal driving conditions only the center carburetor provides fuel to the engine.

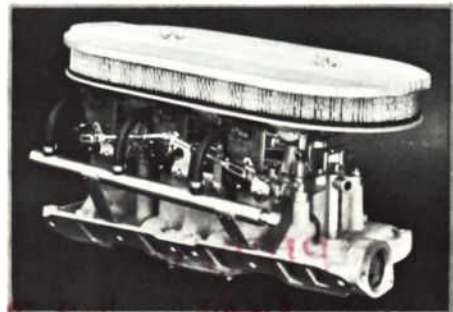
- 260 Kit.....C40Z-6B068-A
- 289 Kit.....C40Z-6B068-B
- Linkage Kit. C3DZ-9B843- A for '63 Falcon
- Linkage Kit. C4DZ-9B843-A for '64 Falcon
- Linkage Kit.....C40Z-9B843-A for '63-64 Fairlane
- Emission Reduction Kit....C40Z-6A603-A



## SINGLE 4-V INDUCTION KIT

This kit makes it possible to replace the 2-V Carburetor with a 4-V, achieving greater performance without drastic modification of the basic system. The kit includes intake manifold and gasket, air cleaner, 4-V carburetor, front and rear intake manifold gaskets, and crankcase vent gaskets plus the necessary hardware.

Ford Part Number.....C40Z-6B068-D



221 260 289  
 1257 289

# for 221, 260 and 289 C.I.D. Engines



## FOUR 2-V WEBER INDUCTION KIT

Consisting of four Weber carburetors and a special intake manifold, this system is designed for those who want to make a competition car with the 289 block. This off-the-street carburetor assembly is virtually the same model as used on the Ford-powered Lotus.

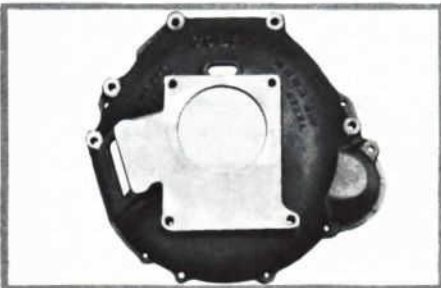
Ford Part Number.....C40Z-6B068-C



## HEAVY-DUTY CLUTCH KIT

This kit consists of disc assembly and pressure plate. Heavy-duty construction of both plate and disc assembly eliminates slipping and provides maximum performance under demanding conditions.

Ford Part Number.....C30Z-7A537-A



## SCATTER SHIELD KIT

Here is a cast steel cover for the flywheel and clutch, designed to provide greater safety when engine is at high RPM. This replaces the cast aluminum cover.

Ford Part Number.....C40Z-6394-A

## DISTRIBUTOR KIT

Consists of heavy-duty distributor and leads. Features dual-point mechanical spark advance control. It offers high speed performance characteristics especially suited for drag strip operation and other high RPM requirements.

Ford Part Number.....C4DZ-12050-A



## ENGINE DRESS-UP KITS

The kit includes aluminum valve covers; bright, long-lasting chrome dip stick, radiator cap, master cylinder cap, oil filler cap, air cleaner cover and filler. The 1963 kit fits 221, 260, and 289 C.I.D. blocks; the 1964 kit fits 260 and 289 C.I.D. engines only.

Ford Part Number...C30Z-6980-A for '63

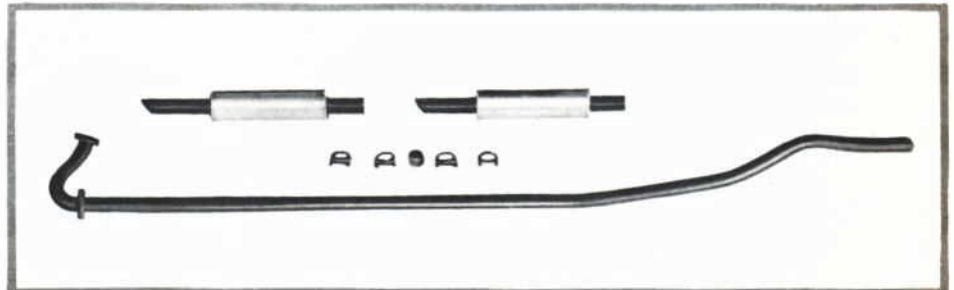
Ford Part Number...C40Z-6980-A for '64



## DUAL EXHAUST KIT

For converting standard exhaust systems to dual systems. This kit has pipe, hardware, and two straight-through 4-inch glass pack mufflers to improve performance and increase horsepower rating for 1963-64 Falcon 260 C.I.D. V-8s. (Available soon for Fairlane 260 and 289 C.I.D. V-8s.)

Ford Part Number.....C4DZ-5210-A



## VALVE COVER KITS

Consist of the distinctive aluminum valve covers only (as listed above).

Ford Part Number..C30Z-6A547-A for '63

Ford Part Number..C30Z-6A547-A for '64



## COMPETITION OIL PAN KIT

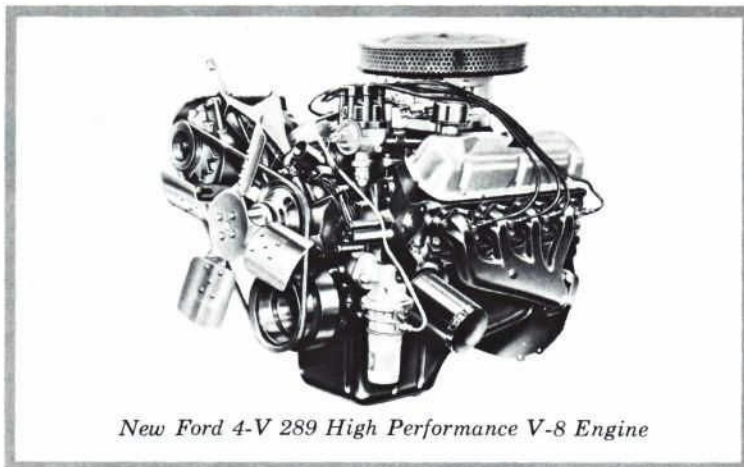
Includes oil pan assembly which is a larger capacity oil pan of lightweight finned aluminum so as to provide improved oil cooling under prolonged hot operation.

*Available Soon*

# 2 NEW FORD 4V/289 C.I.D. HIGH PERFORMANCE V-8 ENGINE

## Specifications—Settings—And Service Parts List

Ford's hottest entry in the high performance class is the snappy 289 V-8. In spite of its resemblance to the Ford 260 C.I.D. engine in physical dimensions, the 289 was revamped in almost every respect for increased horsepower and reliability. With its inherent low weight factor and diminutive size, it can be adopted to almost any chassis making it a natural for performance cars, sports cars and lightweight dragsters. Listed below and on the following page are all of the specifications, settings and service parts which apply to this middleweight champion of automotive engines.



*New Ford 4-V 289 High Performance V-8 Engine*

## SPECIFICATIONS AND SETTINGS

### NEW FORD 4V/289 HIGH PERFORMANCE V-8

Description	Specification	Description	Specification
Bore.....	4.00 in.	Contact point settings.....	.018-.022 (dwell angle 26 to 28.5)
Stroke.....	2.87 in.	Spark plug gap.....	.032-.036
Firing order.....	1-5-4-2-6-3-7-8	Ignition timing.....	10° B.T.D.C.
Maximum BHP.....	271 @ 6000 rpm	Valve lash.....	.020 Hot
Maximum torque.....	314 @ 3400 rpm	Fuel pump pressure.....	4.5-5.5 lb.
Compression ratio.....	Nominal 10.9 Maximum 11.6	RPM red line.....	7000 rpm
Camshaft, Ford part number.....	C30Z-6250-C	Carburetor jets.....	Primary #54 Secondary #64 Power .031
Intake opens.....	44° B.T.C.	Valve spring pressure.....	82-92 lb. @ (replace below 70) 1.77 length
Intake closes.....	82° ABC	Valve spring compressed to 1.320.....	235 to 260 lb.
Exhaust opens.....	92° BBC		
Exhaust closes.....	34° ATC		
Valve overlap.....	78°		

# SERVICE PARTS LIST

## NEW FORD 4V/289 HIGH PERFORMANCE V-8

Ford Part Number	Description	Ford Part Number	Description
<b>C40E-6007-E-563-A</b> . . . . .	Engine Assembly 289 CI-4V	<b>C20Z-6345-A</b> . . . . .	Bolt—Crankshaft Main Bearing Cap
Following 6 parts are required when installing		<b>C30Z-6375-C</b> . . . . .	Flywheel Assembly
C40E-6007-E-563-A engine:		<b>373223-S</b> . . . . .	Bolt—Flywheel
<b>C30Z-8600-C</b> . . . . .	Fan	<b>C30Z-6378-A</b> . . . . .	Washer—Crankshaft Damper
<b>C30Z-8620-E</b> . . . . .	Fan Belt	<b>C20Z-6384-A</b> . . . . .	Gear—Flywheel
<b>C3AZ-9350-M</b> . . . . .	Fuel Pump	<b>C30Z-6392-C</b> . . . . .	Housing Assembly—Flywheel
<b>C4AZ-9600-E</b> . . . . .	Air Cleaner	<b>C30Z-6500-A</b> . . . . .	Tappet Assy. Valve, Mechanical
<b>CITZ-10002-A</b> . . . . .	Generator	<b>C30Z-6505-A</b> . . . . .	Valve, Exhaust
<b>C20Z-11002-A</b> . . . . .	Starter	<b>C30Z-6507-A</b> . . . . .	Valve Intake Bumper Type
<b>C30Z-6009-D</b> . . . . .	Cylinder Assembly 289 CI-4V	<b>C30Z-6513-A</b> . . . . .	Spring Assy., Valve Damper
<b>C30Z-6010-D</b> . . . . .	Cylinder Block 4V (Mechanical Tappets)	<b>C30Z-6514-A</b> . . . . .	Retainer—Valve Spring
<b>C20Z-6019-D</b> . . . . .	Kit—Cylinder Front Cover	<b>7HA-6518-A</b> . . . . .	Key Valve Spring Retainer
<b>C20Z-6020-A</b> . . . . .	Gasket, Cyl., Front Cover	<b>C20Z-6524-A</b> . . . . .	Baffle, Valve Spring Oil
<b>C30Z-6049-H</b> . . . . .	Cylinder Head Assy. Marked C30E-6090-E or F	<b>C30Z-6A527-A</b> . . . . .	Stud—Rocker Arm Support
<b>C3AZ-6051-C</b> . . . . .	Cylinder Head Gasket	<b>C20Z-6564-A</b> . . . . .	Arm Assy., Valve Rocker
<b>C20Z-6065-B</b> . . . . .	Bolt—Cylinder Head (Long)	<b>C20Z-6565-B</b> . . . . .	Rod—Valve Push
<b>C30Z-6108-K</b> . . . . .	Piston, Standard	<b>C30Z-6571-A</b> . . . . .	Seal—Valve Stem
<b>B2AZ-6135-A</b> . . . . .	Pin—Piston—Standard	<b>C3DZ-6582-C</b> . . . . .	Cover Assy.—Valve Rocker Arm RH & LH (2)
<b>B2AZ-6135-B</b> . . . . .	Pin—Piston—.001 O/S Blue	<b>C20Z-6584-A</b> . . . . .	Gasket, Valve Rocker
<b>B2AZ-6135-C</b> . . . . .	Pin—Piston—.002 O/S Yellow	<b>C20Z-6600-A</b> . . . . .	Pump Assy.—Oil
<b>C3AZ-6140-B</b> . . . . .	Retainer, Piston Pin	<b>B8A-6608-A</b> . . . . .	Rotor & Shaft Assy.—Oil Pump Drive
<b>C3AZ-6148-B</b> . . . . .	Partial Ring Set	<b>B8A-6616-C</b> . . . . .	Cover, Oil Pump
<b>C30Z-6200-A</b> . . . . .	Rod Assy.—Connecting	<b>C20Z-6A618-A</b> . . . . .	Shaft Assy.—Oil Pump intermediate
<b>C30Z-6211-A</b> . . . . .	Bearing, Connecting	<b>C30Z-6622-A</b> . . . . .	Screen & Cover Assy. Oil Pump
<b>CITE-6212-A</b> . . . . .	Nut—Connecting Rod	<b>C20Z-6626-A</b> . . . . .	Gasket, Oil Pump Inlet Flange
<b>CIAE-6214-A</b> . . . . .	Bolt—Connecting Rod	<b>B8A-6629-A</b> . . . . .	Ring, Oil Pump Shaft Retainer
<b>C30Z-6250-C</b> . . . . .	Camshaft	<b>C20Z-6A630-A</b> . . . . .	Duct, Crankcase Ventilation
<b>C30Z-6256-A</b> . . . . .	Sprocket—Camshaft	<b>C20Z-6A631-A</b> . . . . .	Element, Crankcase Ventilation
<b>C20Z-6261-B</b> . . . . .	Bearing—Camshaft—Front	<b>C20Z-6A633-A</b> . . . . .	Retainer, Crankcase Ventilation
<b>C20Z-6262-B</b> . . . . .	Bearing—Camshaft—Center	<b>C20Z-6659-A</b> . . . . .	Gasket, Oil Pump to Block
<b>C20Z-6263-B</b> . . . . .	Bearing—Camshaft—Rear	<b>C3AZ-6A666-A</b> . . . . .	Valve Assy.— Crankcase Ventilation Reg.
<b>C30Z-6265-A</b> . . . . .	Spacer Cam Sprocket	<b>C20Z-6670-A</b> . . . . .	Spring—Relief Valve
<b>C20Z-6266-A</b> . . . . .	Plug	<b>C20Z-6674-A</b> . . . . .	Plunger—Relief Valve
<b>C30Z-6263-A</b> . . . . .	Chain—Timing—58 Links	<b>C30Z-6675-A</b> . . . . .	Pan Assy.—Oil
<b>C30Z-6269-A</b> . . . . .	Plate—Camshaft Thrust	<b>C2AZ-6700-A</b> . . . . .	Bearing—Crankshaft—Front Oil
<b>C20Z-6278-A</b> . . . . .	Washer—Camshaft Sprocket	<b>C20Z-6701-A</b> . . . . .	Seal—Crankshaft—Rear Oil
<b>C3AZ-6287-B</b> . . . . .	Eccentric, Cam Fuel Pump Drive	<b>C3AZ-6730-A</b> . . . . .	Plug—Engine Oil Pan
<b>C30Z-6303-B</b> . . . . .	Crankshaft	<b>C1AZ-6731-A</b> . . . . .	Element—Engine Oil Filter
<b>C30Z-6306-A</b> . . . . .	Sprocket, Crankshaft—21 Teeth Steel	<b>C20Z-6750-B</b> . . . . .	Indicator Assembly Oil Level
<b>C30Z-6310-A</b> . . . . .	Slinger—Crankshaft Oil	<b>C20Z-6734-A</b> . . . . .	Gasket—Engine Oil Pan Drain Plug
<b>C30Z-6316-A</b> . . . . .	Damper Assy.—Crankshaft	<b>C20Z-6754-A</b> . . . . .	Tube Assembly—Oil Level Indicator
<b>C3AZ-6333-B</b> . . . . .	Bearing Crankshaft Main Front, Rear, Rear Intermediate Front Intermediate	<b>C0AE-6766-E</b> . . . . .	Cap Assembly—Oil Filler With Decal
<b>C3AZ-6337-B</b> . . . . .	Bearing, Crankshaft Main Center	<b>C20Z-6781-A</b> . . . . .	Gasket Kit—Oil Pan
		<b>C20Z-6870-A</b> . . . . .	Gasket—Crankcase Ventilation

# 3 QUICK SERVICE — Engine Diagnosis

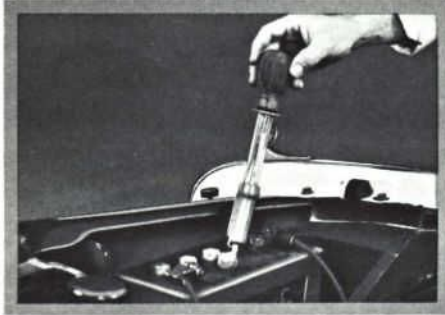
The engine diagnosis presented here and recommended for quick service operation requires the use of test instrumentation incorporating oscilloscopes such as Heyer Dyna Vision, Snap-On Master Analyser, Sun Scope Motor Tester, or their equivalent.

The use of this specialized diagnosis equipment makes possible the diagnosis of important electrical components

which must operate properly to assure satisfactory engine starting and operation. In addition, it also helps to diagnose certain mechanical conditions which might be contributing to unsatisfactory engine performance.

Following is a list of typical engine diagnosis checks which can be made with such equipment, together with a brief description of the procedure used.

The procedures cover only one of the many various methods of checking the component listed. It will be necessary to follow the recommendations of the manufacturer of the equipment used for the component being checked. The average time required for making these checks is six minutes, once the service technician has become familiar and experienced with the equipment used.



1. Check the state of the battery charge by measuring the battery electrolyte solution with a hydrometer.

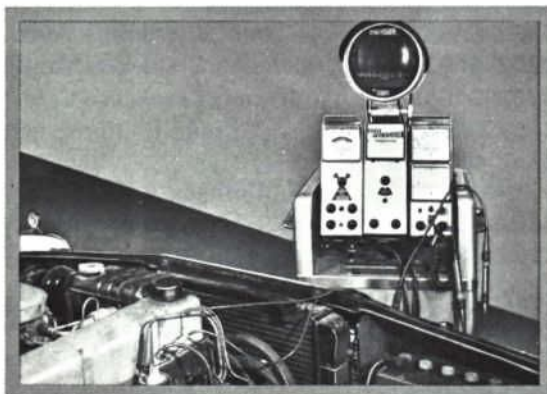


2. The battery can also be tested by measuring the voltage of the battery cells with an open circuit battery charge tester. Follow instructions of the manufacturer of the test equipment that is being used.

3. If the battery charge is low, recharge it for three minutes at 30 amps (for 12-volt batteries), or at 75 amps (for 6-volt batteries). With the fast charger still operating, test individual cell voltage of the battery and, if the cells vary more than 0.1 volt, replace the battery.



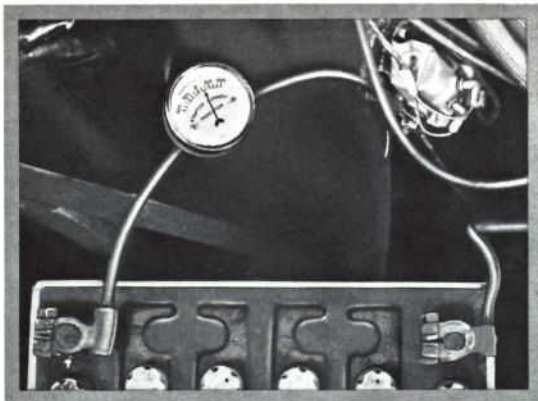
4. To check the capacity of the battery, connect the open circuit tester to the battery terminals, push the hold button on the tester and read the capacity on the meter.



## CRANKING VOLTAGE CHECK

1. Connect the oscilloscope analyzer in accordance with the instructions furnished by the equipment manufacturer.
2. Connect the voltmeter to the battery side of the coil and the ground lead to a rocker arm cover bolt.
3. Disconnect the secondary (high tension) wire at the coil.
4. Turn on the ignition and crank the engine.
5. Read the voltage on the voltmeter. Record the reading and compare it with the specifications supplied by the equipment manufacturer.

# QUICK SERVICE — Engine Diagnosis



## STARTER CURRENT CHECK

**NOTE:** If the cranking voltage check is within satisfactory limits, it will be unnecessary to perform this starter current check.

1. Disconnect the secondary (high tension) wire at the coil.
2. Check the starter draw by placing an induction-type checking gauge over the cable leading from the starter solenoid to the starter.
3. Turn on the ignition and crank the engine.
4. Read the current draw on the gauge. Record it and compare the reading with the specifications supplied by the equipment manufacturer.



## REGULATED VOLTAGE CHECK

1. Connect the voltmeter to the battery side of the coil and the ground lead to a rocker arm cover bolt. Connect the remaining lead to the battery terminal on the coil.
2. Start the engine and adjust to the rpm.
3. Read the voltage on the voltmeter. Record the reading and compare it with the specifications supplied by the equipment manufacturer.

**NOTE:** The voltage regulator must be at normal operating temperature.

## ELECTRICAL COMPONENT CHECKS

1. With the oscilloscope connected, set engine idle at the speed recommended by the equipment manufacturer.
2. Adjust the oscilloscope pattern according to manufacturer's instructions for the check being performed.
3. Compare the patterns being received on the oscilloscope with the patterns supplied by the equipment

manufacturer to determine if the electrical component is functioning properly.

4. Oscilloscopes of different manufacturers will show a variation of patterns but, in general, indicate the same conditions.



## COIL AND CONDENSER CONDITION

1. Set engine idle at 1000 rpm.
2. Turn the selector knob on the oscilloscope to the primary circuit, one cylinder, and adjust the pattern to fill the screen. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.



## POINT CONDITION

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the primary circuit, one cylinder, and adjust the pattern to fill the screen. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.

# QUICK SERVICE — Engine Diagnosis



## DWELL ADJUSTMENT

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the primary circuit, all cylinders, and adjust the pattern to slightly less than full screen. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.
3. Check dwell at 2000 and at 2500 rpm.



## COIL POLARITY

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary circuit, one cylinder. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.



## COIL WINDINGS

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary circuit, one cylinder, and adjust the pattern to slightly less than full screen. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.



## COIL TO DISTRIBUTOR HIGH TENSION WIRE

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary circuit, one cylinder. Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.



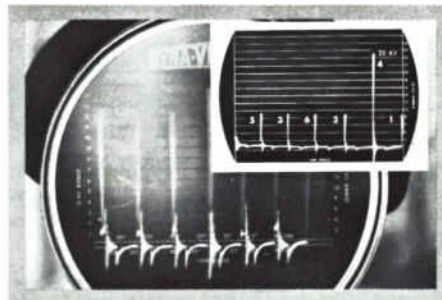
# QUICK SERVICE — Engine Diagnosis



## SPARK PLUG WIRING

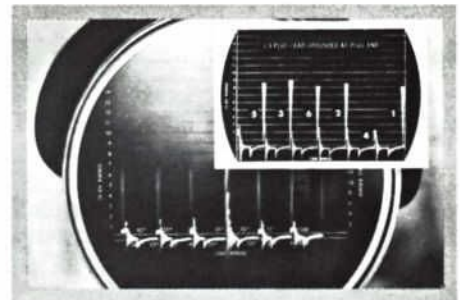
1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary circuit, all cylinders.

Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.



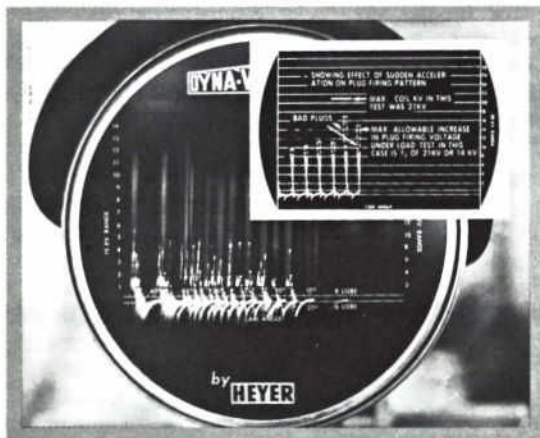
## COIL OUTPUT

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary circuit, 30 KV pattern.
3. Remove any one spark plug wire from the distributor (other than the number one wire). Read the output on the screen and compare it with the pattern and specifications supplied by the equipment manufacturer.



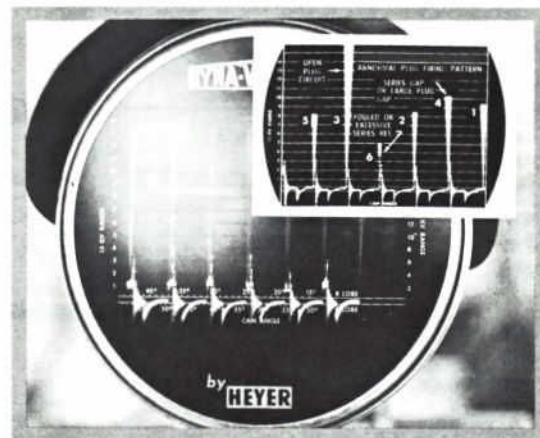
## ROTOR GAP

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the secondary, 12 KV, pattern.
3. Remove any spark plug wire except number one from the plug.
4. Ground the plug wires, one at a time, and watch the decrease in KV firing voltage. Read the pattern on the screen and compare it with the pattern and specifications supplied by the equipment manufacturer.



## SPARK PLUG FIRING VOLTAGE REQUIREMENT

1. Set engine idle at 1000 rpm.
2. Turn the selector knob to the 15 KV pattern.
3. Accelerate the engine according to recommendations. Read the patterns on the screen and compare them with the patterns and specifications supplied by the equipment manufacturer.



## SPARK PLUG FIRING CIRCUIT CONDITIONS

1. Set engine idle at 1000 rpm.
  2. Turn the selector knob to the 15 KV pattern.
- Compare the pattern on the screen with the pattern supplied by the equipment manufacturer.

# 4 TRANSISTOR IGNITION SYSTEM

## Operation and Testing

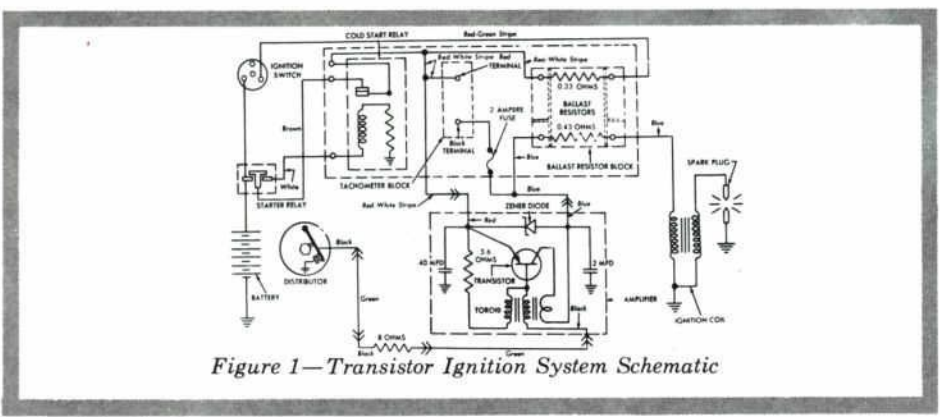


Figure 1—Transistor Ignition System Schematic

### Operation

The permatuned transistor ignition system is available on the Ford 427 C.I.D. high performance V-8 passenger car engine and on the Ford 330, 361, 391, 401 S-D, 477 S-D and 534 S-D V-8 truck engines.

Figure 1 shows a schematic of the transistor ignition system.

The ignition coil primary in the transistor system is designed to draw 12 amperes peak current, or approximately 5.5 amperes average current as indicated on a conventional ammeter, in order to provide high spark plug voltage at the higher engine speeds.

The transistor in the system acts as a heavy-duty switch or relay. It is similar in action to a horn relay, except that it has no moving parts, and thus acts with very little time lag. The transistor is connected between the battery and the coil, and is used to make and break the coil primary circuit.

The distributor controls the transistor. The 8-ohm resistor, connected between the distributor and the transistor (in the wiring harness), limits the transistor control current (and distributor point current) to 0.5 ampere. The low distributor point current

eliminates pitting and gives long distributor point life.

The distributor condenser has been increased in value to 2 mfd, and is located in the amplifier circuit. As in the standard ignition circuit, it absorbs high inductive energy during initial distributor point opening. However, it no longer has any effect on the distributor points as the transistor effectively isolates the points from the coil.

The amplifier assembly (Fig. 2) is mounted under the instrument panel to protect the parts from engine heat.

A ceramic ballast resistor block, a tachometer connector block, and a cold start relay are mounted on a plate in the engine compartment (Fig. 3). A fiber cover encloses the resistor block, tachometer block, and cold start relay.

A 2-ampere fuse in the collector to tachometer block lead prevents the transistor from being damaged by the application of external devices other

than normal testing equipment.

The cold start relay contacts are normally closed and they are connected into the circuit only during the start cycle. When the starter relay is closed, the cold start relay is actuated and opens its contacts. If, during starting, the available voltage drops below 10.5 volts, the relay contacts close, thus bypassing the 0.33-ohm resistor in the ballast resistor block, and applying full available voltage to the system.

The tachometer block is used to connect a tachometer or dwell meter into the circuit. Do not connect a tachometer or dwell meter into the circuit in any other manner, or readings will be inaccurate and damage may occur to the transistor, or change its operating characteristics.

Connect the tachometer red lead to the tachometer block red terminal (red-white striped lead) and black lead to the black terminal (blue lead).

### Testing

Do not use any other testing procedures or conventional short cuts than those listed below, or extensive damage can result to the system.

Ignition troubles are caused by a failure in the primary or secondary circuit, or incorrect ignition timing. Isolate the trouble as follows:

1. Remove the coil high tension lead from the distributor cap.
2. Hold the high tension lead approximately 1/4 inch from the cylinder head.

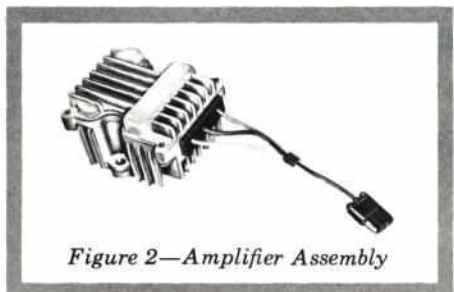


Figure 2—Amplifier Assembly

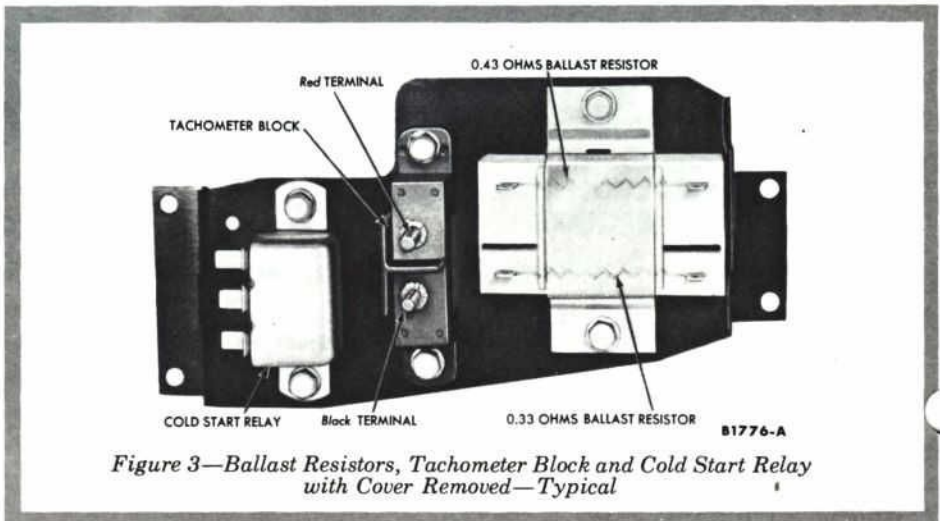


Figure 3—Ballast Resistors, Tachometer Block and Cold Start Relay with Cover Removed—Typical

# TRANSISTOR IGNITION SYSTEM

## Operation and Testing

3. With the ignition switch on, crank the engine and check for a spark. The engine may be cranked by the conventional method of running a jumper wire from the battery positive terminal to the "S" terminal of the starter relay, after disconnecting the red and blue lead at the relay.

If the spark is good, the trouble lies in the secondary (high voltage) circuit. If there is no spark or a weak spark, the trouble is in the primary (low voltage) circuit.

**Primary Circuit.** A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring.
2. Improperly adjusted, contaminated, or defective distributor points.
3. Defective amplifier assembly.

**Secondary Circuit.** A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.
2. Defective high voltage wiring.
3. High voltage leakage across the coil, distributor cap or rotor.

When diagnosis procedures isolate trouble to the primary circuit, make the following tests to locate the defective item. Do not use any other procedure, conventional short cut, or connect test equipment in any other manner than that described or extensive damage can be caused to the transistor ignition system. Figure 4 shows the transistor ignition system in outline form.

Remove the cover from the ballast-resistor relay assembly (Fig. 3), and disconnect the cold start relay. Connect a dwell meter to the tachometer block (Fig. 3). Connect the black lead to the black terminal and the red lead to the red terminal. Turn the ignition on and crank the engine. Observe the dwell meter reading.

**0° Dwell.** A dwell reading of 0° indicates:

1. The distributor points are contaminated or are not closing.

**0° to 45° Dwell.** A dwell reading 0° and 45° indicates:

1. The transistor and the primary circuit are functioning properly.
2. The trouble could be in the secondary circuit.

**45° Dwell.** A dwell reading of 45° indicates:

1. No power from ignition switch.
2. The distributor points are closed and not opening.
3. Defective amplifier assembly.

To determine which of the three items listed are causing the trouble, proceed as follows:

Disconnect the distributor lead at the bullet connector, and crank the engine. If the dwell meter indicates 0° dwell, the distributor points are not opening. If 45° dwell is indicated, the amplifier is malfunctioning or there is no power from the ignition switch.

Use a voltmeter or test light to determine if the transistor (amplifier assembly) is at fault. Connect the voltmeter to the red-green lead terminal of the ballast resistor and to ground. Crank the engine. If a steady indication on the voltmeter shows there is an

open circuit, or no power between the ignition switch and the amplifier, the ballast resistor could be defective. Replace it with a known good ballast resistor, and repeat the test.

If the test procedure indicates a defective amplifier, replace it with a known good amplifier, and proceed as follows:

Connect the distributor high tension lead at the bullet connector.

Then, with the cold start relay disconnected and the dwell meter connected to the tachometer block, crank the engine and observe the indicated dwell. A reading between 0° and 45° indicates satisfactory ignition; thus, the amplifier is at fault.

If the dwell reading is still 45°, the wiring from the amplifier through the ballast resistor to the coil is defective. Replace the defective item.

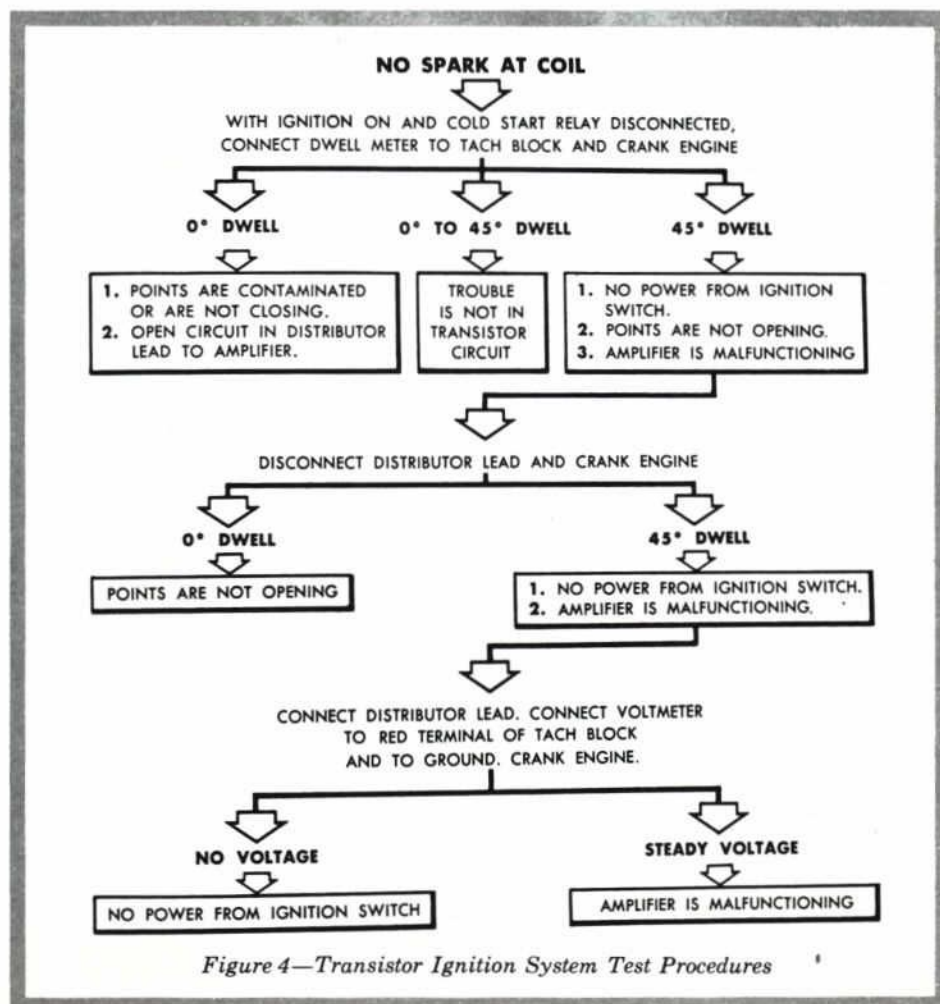


Figure 4—Transistor Ignition System Test Procedures

**5 ERRATIC OR INOPERATIVE ELECTRIC WINDSHIELD WIPERS—1963 Falcon**

In the event of a windshield wiper not shutting off or parking properly, the cause may be the switch shaft binding in the switch retaining nut. Some wiper control nuts have been noted to have the switch-shaft guide hole not concentric with the threads. This will cause the switch shaft to bind.

If this situation is encountered, the hole in the windshield wiper control switch nut should be enlarged to .250 inches. While the nut is off, remove the switch from the panel and file off any burrs at the "D" hole in the instrument panel switch mounting bracket.

**6 ENGINE NOISES IN PASSENGER COMPARTMENT—1960-63 Ford With 8 Cylinder Engine And Automatic Transmission**

Engine noises occasionally may be transmitted into the passenger compartment through the accelerator linkage. In cases of this nature, the following corrective action can be taken: To determine if engine noises are being transferred into the passenger compartment through the accelerator link, operate the engine with the link disconnected. If the noises are reduced in the passenger compartment, install the new insulated accelerator link to dampen the noise. The new link part can be readily identified by the rubber insulator incorporated (see Figure 1).

**7 FUEL GAUGE READING FULL AT ALL TIMES—1963 Fairlane Station Wagon**

If a report "the fuel gauge reads full at all times" is encountered on 1963 Fairlane Station Wagons, the probable cause is that the connecting strap of the fuel sender is grounded at the rheostat housing. This strap connects

the rheostat to the sending unit terminal, and when it is grounded will result in the gauge reading full at all times (see Figure 2).

If the strap is grounded, it can readily be corrected by bending it to clear the housing. Since this condition may also occur with replacement stock, it is imperative that a new part be inspected prior to installation.

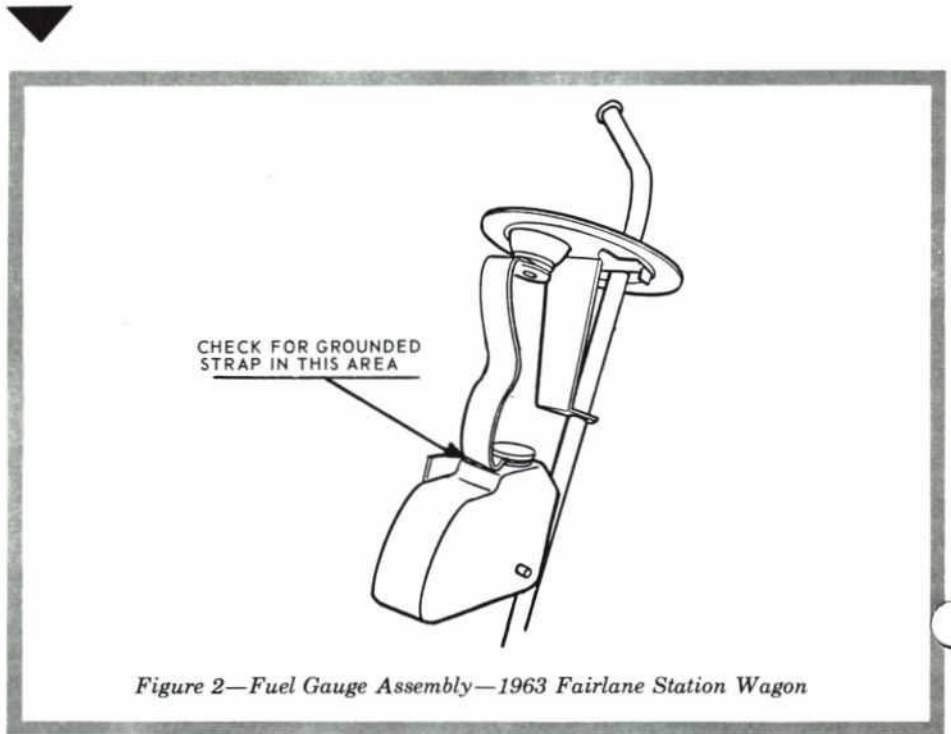


Figure 2—Fuel Gauge Assembly—1963 Fairlane Station Wagon

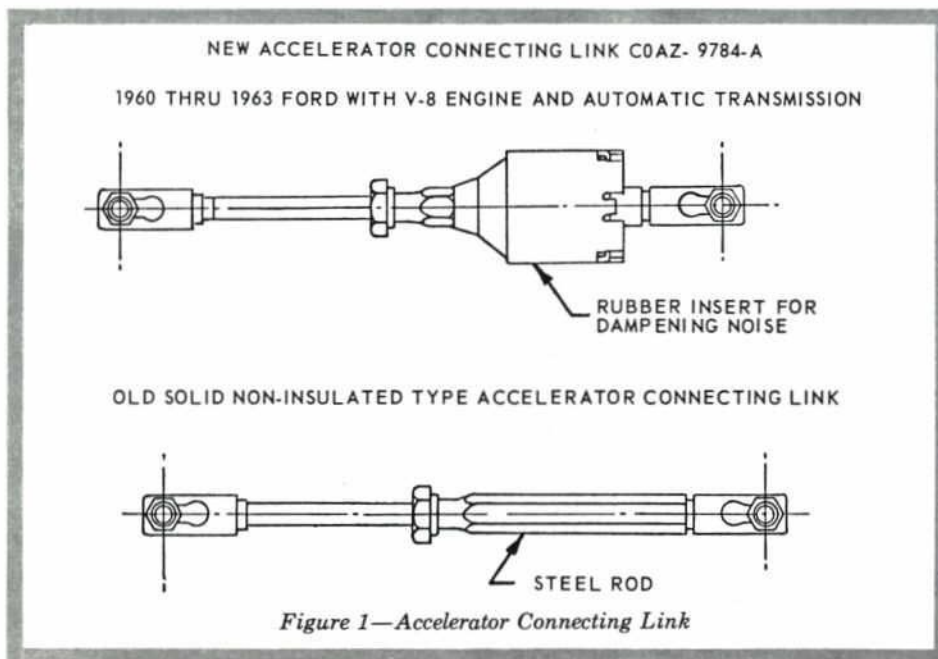


Figure 1—Accelerator Connecting Link

**8 WATER PUMP FAILURE—1963 Ford and Thunderbird with 352 and 390 C.I.D. Engines**

In some cases, examination of water pumps that have failed has shown that failure was caused by loose fan-clutch to water pump hub attaching bolts due to incorrect assembly. This has resulted in failures in the pump shaft and bearing area, and on occasion resulted in serious damage.

The loose bolt situation was corrected in production as of October 21, 1963. However, some 1963 engines built prior to that date may encounter this problem. When servicing these vehicles, it is advisable to check the fan clutch attaching bolts and torque them to 12-18 lb. ft. Following the retorquing operation, make a visual check to assure that the fan clutch hub and water pump mate properly.

**9 OFF IDLE ENGINE KNOCK—  
1963-64 352 and 390 C.I.D.  
Engines**

Fuel pump noise which occurs as an off idle (800-1500 rpm) knock on 352 and 390 C.I.D. engines may be corrected by installing a new fuel pump of the required type. The revised fuel pumps became effective in production September 26, 1963.

Part numbers of the new pumps and their applications are as follows:

Ford Part Number	Application
C3SZ-9350-E	390 C.I.D. Engine— 1963-64 Thunderbird 352 C.I.D. Engine— 1963-64 Ford;
C3AZ-9350-K	390 C.I.D. Engine— 1963-64 Ford

**10 ACCELERATOR LINKAGE—  
DAMAGE WHEN RAISING  
OR JACKING UP ENGINE—  
1963 Falcon with Eight  
Cylinder Engine**

When raising or jacking up the eight cylinder engine in the 1963 Falcon for any reason, such as engine mounts replacement, etc., disconnect the accelerator shaft arm from the accelerator pedal shaft. This must be done to avoid damage to accelerator linkage components. Should any accelerator linkage components be damaged, the damaged items should be replaced.

**11 REAR AXLE NOISE—  
1962-63 Fairlane All Models**

Objectionable rear axle noise on some of these vehicles has been determined to be transferred by the rear spring front eye bushings. This problem was corrected in production August 30, 1963, by the incorporation of new front eye bushings.

When complaints of axle noise are encountered on these vehicles built prior to the August 30 date, the new rear spring front eye bushings should be installed before replacement of the axle gears is attempted. These bushings are available in kit form under Ford Part Number C30Z-5630-D.

**12 NEW CARBURETOR SPACER  
AND GASKET ASSEMBLY  
—1964 352-4V and 390-4V  
C.I.D. Engines**

Changes have been incorporated on 1964 engines to obtain optimum fuel distribution. This is accomplished by eliminating a source of sludge build-up in the secondary venturis. A new carburetor spacer with the emission passage routed to discharge into the primary riser bores is employed instead of in the secondary bores as in the earlier design. Effective date of this change in production was November 4, 1963. Parts are now available as service replacements.

Ford Part Number	Part Name	Qty. Reqd.	Engine Model
C4AZ-9A589-A	Spacer Carb to Intake Manifold	1	352-4V;
C4AZ-9447-B	Gasket Carb to Intake Manifold	2	390-4V
88461-S8	Stud— $\frac{3}{16}$ -18-24 x 2 $\frac{1}{2}$	4	

**13 ALLEGED SPEEDOMETER  
NOISE—1963 Ford**

Noise emanating from the area of the speedometer head on some 1963 Fords can sometimes be traced to a loose speedometer cable housing finger nut, lack of speedometer cable lubrication or a sharp bend or kink in the speedometer cable housing.

Before replacing the speedometer head because of this noise problem, remove the speedometer cable from the cable housing and inspect the cable for evidence of kinks by holding an end of the cable in each hand, allowing the cable to form a gentle loop at the center, and slowly rotating the cable between the fingers. The rolling motion should be smooth and uniform. If the cable is kinked, as evidenced by a flopping motion at the kinked area, replace the cable and housing assembly. If necessary, apply a light film of Speedometer Cable Grease, Ford Part Number B5A-19581-A to the cable. Tighten the speedometer cable housing finger nut as tight as possible, using finger pressure only. Inspect the routing of the speedometer cable housing near the transmission firewall and speedometer head for sharp bends or kinks. A kinked speedometer cable or housing should be replaced.

**14 INTERMITTENT PARKING  
LAMP OPERATION—POOR  
GROUND—1964 Fairlane  
All Models**

Inadequate ground between the front parking lamp assembly and the front bumper bar on some 1964 Fairlanes may be the cause of intermittent operation of the parking lamps. This condition can be corrected by retorquing the retaining nuts that fasten the parking lamps to the bumper bar. The proper torque for these nuts is 45-60 inch-pounds.

**15 SEALER FOR VINYL TOPS**

When sealing vinyl-covered tops on passenger cars, the use of a special Silicone Rubber Sealer and Filler is recommended. In order to provide for a better appearance, this sealer is available in white (for white tops) under Ford Part Number C3AZ-19562-A, and in black (for black tops) under Ford Part Number C3AZ-19562-B. Instructions for using the sealer are included in the package.

**16 BRAKE PEDAL HEIGHT—  
1963 F-100-250 Trucks**

When excessive brake pedal height and "free travel" are encountered, it is recommended that the pedal height be measured from the floor mat perpendicularly to the top center area of the pedal pad. If this distance is more than 7 $\frac{3}{8}$ ", replace the hydraulic brake pedal assembly with Ford Part Number C3TZ-2455-D which is identified by having only one  $\frac{3}{8}$ " diameter hole for the master cylinder push rod eccentric bolt.

**17 TURN SIGNALS NOT CANCELLING AND/OR HIGH OPERATING EFFORTS—All 1963 and 1964 Vehicles**

Complaints of turn signals not cancelling and/or high operating efforts may be caused by the following conditions:

On 1963-64 Falcons and Fairlanes, the turn signal switch may be seated improperly or "cocked" in the steering column flange due to an undesirable nylon protrusion at the bottom of the switch (see Figure 1). This causes the switch wiring to become trapped between the turn signal mounting plate and the flange casting.

On all 1963-64 vehicles, threadlocking sealer which had been applied to the threaded end of the turn signal lever to prevent looseness may have been applied in excess during installation.

This excess sealer can run into the gap between the turn signal switch hub and the flange casting, increasing the turning friction and preventing normal signal cancelling.

The nylon protrusion on the switch was corrected in production in October, 1963. Also, the assembly plants were directed to apply sealer only to the lower three threads on the turn signal lever to prevent application of excessive sealer.

If these problems are encountered, remove the turn signal switch. However, do not pull the switch wires completely out of the column, as it is not necessary. Cut off the protrusion as shown in Figure 1. Scrape off the excessive sealer on the switch hub or casting with a knife (see Figure 2). Reinstall the switch and check for proper operation.

**19 BRAKE LINE LOOSENESS OR RATTLE—REAR AXLE HOUSING AREA—1963 Ford 6 & 8 Cylinder and Falcon 8 Cylinder**

A new brake line retaining clamp, Ford Part Number 378511-S, has been released for service. This clamp is used to retain the brake line to the rear axle housing. In the event of customer complaints of looseness or noise in the brake line tubes, or if the clips in the rear axle area are damaged, the new clamp should be installed. The clamp may also be used to retain the brake line in its normal position when using the 1963 housing for 1963 and past models, where applicable.

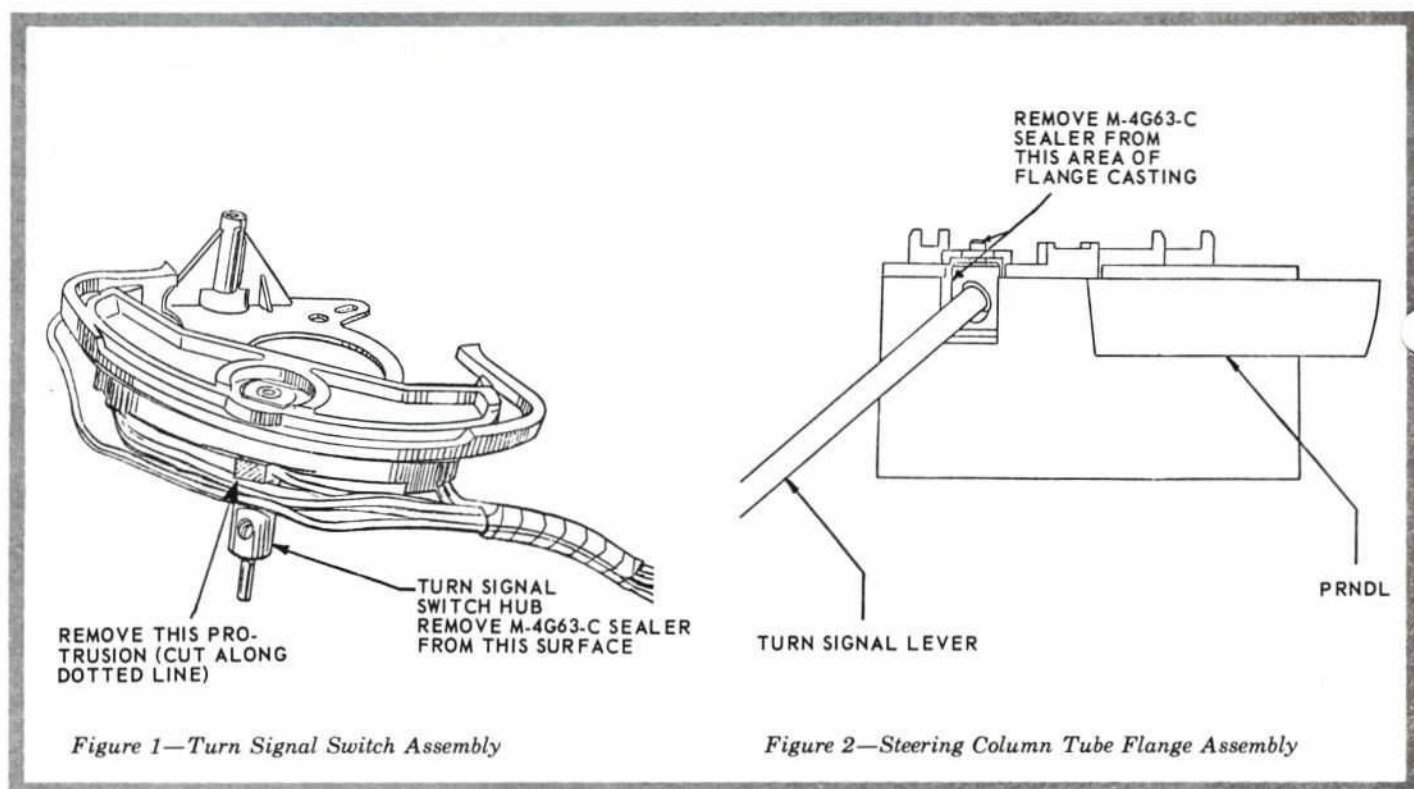


Figure 1—Turn Signal Switch Assembly

Figure 2—Steering Column Tube Flange Assembly

**18 BRAKE PEDAL BIND AND/OR HANG-UP—1963 Ford Without Power Brakes**

Recent investigations indicate that a problem of brake pedal binding or hanging up may exist on some 1963 Fords built prior to May 15, 1963. This condition is caused by the brake pedal push rod binding at the bottom side of the brake master cylinder piston. Brake dragging conditions may be caused if this binding is severe.

If encountered, this condition may be corrected in the following manner:

1. Loosen the brake pedal support bracket lower attaching nuts and upper attaching studs on the master cylinder.
2. Position the master cylinder in the farthest downward position and retorque the nuts and studs to 20-25 ft. lbs.

Note: If the brake pedal push rod is still misaligned, make sure that the push rod is not bent.

**20 STEERING GEAR HOUSING REPLACEMENT—SECTOR SHAFT BUSHING FAILURE—1961-63 Thunderbird Steering Gears**

The sector shaft bushings must be line-bored after assembly in the housing of all 1961-63 Thunderbird steering gears to assure proper alignment of the sector shaft to the piston and ball nut.

Should a bushing failure be encountered, it is necessary to replace complete steering gear housing Ford Basic Number 3548 which includes line-bored bushings.

## 21 FOR YOU FROM FORD—Quick Reference Catalog and Body And Collision Parts Catalog

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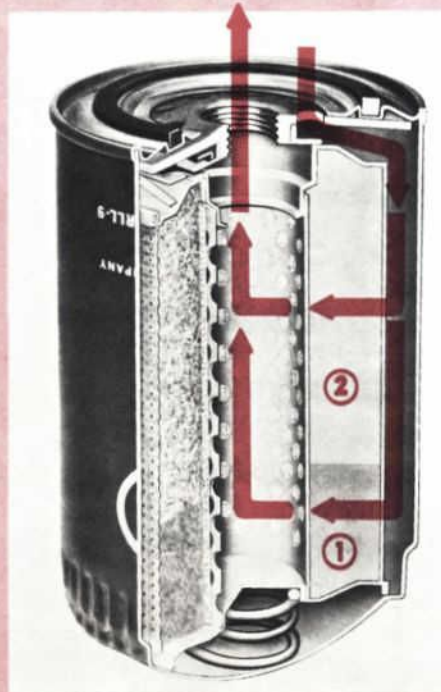
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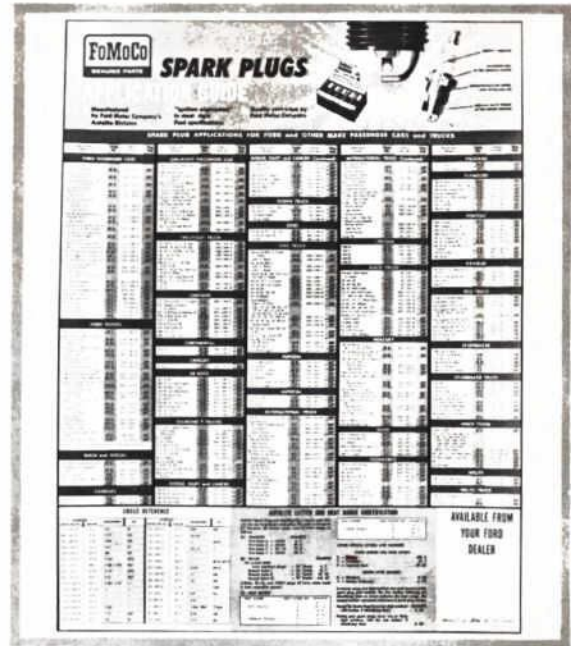


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