CHAPTER THREE

TROUBLESHOOTING

Troubleshooting the Mazda can be relatively easy if done in a logical, orderly manner. Although the engine and emission control system differ from year-to-year, many problems can be diagnosed and repaired by home mechanics. Other major parts of the car are diagnosed by conventional methods.

The troubleshooting procedures in this chapter analyze typical symptoms, and show logical methods of isolating causes. These are not the only methods. There may be several ways to solve a problem, but only a systematic, methodical approach can guarantee success.

TROUBLESHOOTING INSTRUMENTS

The following equipment is necessary to troubleshoot any engine properly.

a. Voltmeter, ammeter, and ohmmeter
b. Hydrometer
c. Compression tester
d. Vacuum gauge
e. Fuel pressure gauge
f. Dwell meter
g. Tachometer
h. Strobe timing light
i. Exhaust gas analyzer

Items a-f are basic for any car. Items g-i are necessary for exhaust emission control compliance. The following is a brief description of each instrument. Consult a basic auto repair manual for more detailed information.

Voltmeter, Ammeter, and Ohmmeter

A good voltmeter is needed for testing the ignition system and electrical system. A voltmeter covering 0-20 volts is satisfactory. It should have an accuracy of about ±½ volt.

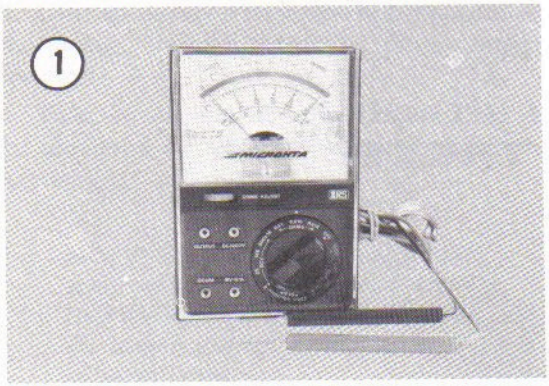
An ohmmeter measures electrical resistance. It is useful for checking continuity (open and short circuits) and testing fuses and lights.

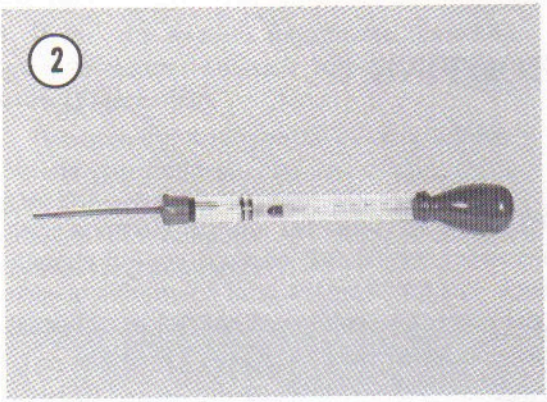
The ammeter measures electrical current. Ammeters for automotive use should cover 0-10 amperes and 0-100 amperes. These are useful for checking battery starting and charging current.

Some inexpensive VOM's (volt-ohmmeters) combine all 3 instruments into one. See **Figure 1**. The ammeter ranges are usually too small for automotive work, though.

Hydrometer

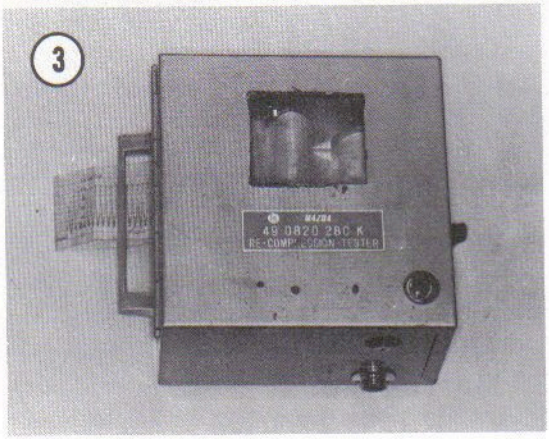
The hydrometer gives a useful indication of battery condition and charge by measuring the specific gravity of the electrolyte in each cell. See **Figure 2**. Complete details on use and interpretation of readings are given in Chapter Seven.





Compression Tester

Mazda uses a special recording compression tester for its rotary engine (**Figure 3**). Unlike reciprocating engines, rotaries have 3 combustion chambers per spark plug hole. Each chamber produces a different compression reading. The recording compression tester takes separate readings for each combustion chamber and records them on paper.



A conventional compression tester can't accurately indicate engine condition, since it would only record the highest of the 3 readings at each spark plug hole.

Recording compression testers are too expensive to be practical for the home mechanic. If compression loss is suspected, have a reading taken by a dealer or mechanic familiar with the rotary engine.

Vacuum Gauge

The vacuum gauge is used to test various emission control components. The gauge is connected into a vacuum line, usually using a T-fitting. Vacuum is then measured under specified engine conditions to determine whether a part is defective.

Fuel Pressure Gauge

This instrument is necessary for testing fuel pump performance. Fuel pressure gauges are usually combined with vacuum gauges.

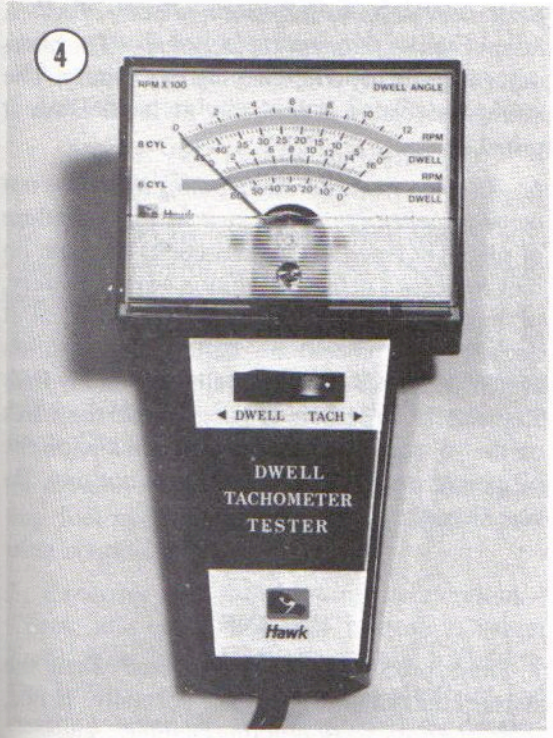
Dwell Meter

A dwell meter (**Figure 4**) measures how many degrees of cam rotation that the distributor points remain closed when the engine is running. Since this angle is determined by breaker point gap, dwell angle is an accurate indication of point gap.

Many tachometers intended for testing and tuning include a dwell meter. Follow the manufacturer's instructions to measure dwell. Use the same dwell meter as for conventional 4-cylinder engines.

Tachometer

A tachometer is necessary for setting ignition timing, adjusting the carburetor, and testing emission control parts. For Mazda rotaries, use the same tachometer and rpm scale as for conventional 4-cylinder engines. The tachometer should have a scale of 0-2,000 rpm. Tachometers with extended range (0-6,000 or 0-8,000 rpm) lack accuracy at lower speeds. The tachometer should be able to detect changes of 25 rpm.



Strobe Timing Light

This instrument is necessary for tuning and emission control adjustments, as well as for testing the ignition control system. It permits very accurate ignition timing. See **Figure 5**. The light flashes precisely at the same instant that a spark plug fires, so the position of the eccentric shaft pulley at that instant can be seen. Marks on the pulley are lined up with a timing pointer (attacned to the engine front cover) while the engine is running.

Suitable lights range from inexpensive neon bulb types to powerful Xenon strobes. Neon timing lights are difficult to see and must be used in dimly lit areas. Xenon strobe timing lights can be used outside in bright sunlight. Timing lights should be connected according to manufacturer's instructions.

Exhaust Analyzer

This instrument is necessary to check emission control adjustments accurately. It samples the exhaust gases from the tailpipe and measures the amount of carbon monoxide (percentage) and hydrocarbons (parts per million) in the exhaust. Exhaust analyzers are relatively expensive to buy, but some large rent-all dealers have them available at a modest price.

STARTER

Starter system troubles are relatively easy to isolate. The following are common symptoms and causes.

1. *Engine cranks very slowly or not at all*—Turn on the headlights. If the lights are very dim, the battery or connecting wires are probably the cause. Check the battery as described in Chapter Seven. Check the wiring for breaks, shorts, or dirty connections.

If the battery and connecting wires are not at fault, turn the headlights on and try to crank the engine. If the lights dim drastically, the starter is probably shorted to ground. Have it tested by a Mazda dealer or automotive electrical specialist.

If the lights remain bright or dim only slightly when trying to start the engine, the trouble may be in the starter, solenoid, or wiring. To isolate the trouble, short the 2 large solenoid terminals together (*NOT* to ground). If the starter cranks normally, check the solenoid and wiring up to the ignition switch. If the starter still fails to crank properly, have it tested.

2. *Starter turns, but does not engage with engine*—This problem is usually caused by a sticking solenoid. Less common causes are broken pinion and ring gear teeth, and the pinion jamming on the flywheel. On manual transmission

cars, a jammed pinion can be temporarily freed by rocking the car in high gear. With automatic transmissions, this is not possible; the starter must be removed.

3. *Loud grinding noises when starter runs*—This may mean the teeth on pinion and flywheel are not meshing properly, or it may mean the overrunning clutch is broken. In the first case, remove the starter and examine the gear teeth. In the latter case, remove the starter and have the pinion drive assembly replaced.

CHARGING SYSTEM

Charging system troubles may be in the alternator, voltage regulator, or fan belt. The following symptoms are typical.

1. *Ammeter needle does not move when ignition is switched on*—Check the ammeter wiring for current flow with the ignition key on and engine off, then with the engine running. If there is no current flow, check the wires and their connections. If there is current flow, check for bad wiring connections at the ammeter. If the connections are good, the ammeter is probably defective. Have it checked or substitute an ammeter known to be good.

2. *Ammeter shows discharge after the engine starts*—This usually indicates that no charging is taking place. First, check fan belt tension as described in Chapter Two. Then check battery condition with a hydrometer, and check all electrical connections in the charging system. If this does not locate the trouble, test the alternator as described in Chapter Seven. If the alternator is OK, have the voltage regulator tested by a Mazda dealer or automotive electrical shop.

3. *Ammeter shows intermittent discharge* — This usually indicates the charging system is working intermittently. Check the fan belt tension, and check all electrical connections in the charging system. Check the alternator.

4. *Excessive noise from alternator*—Check for loose alternator mountings. The problem may also be worn alternator bearings. If the noise comes from inside the alternator, have it checked by a dealer or automotive electrical shop.

5. *Battery requires frequent additions of water, lamps require frequent replacement*—The alternator is probably overcharging the battery. The voltage regulator is probably at fault. Have it tested.

6. *Alternator-oil pressure warning light does not come on when ignition is switched on*—Failure of this light (used on some models) to come on may indicate a defective ignition switch, battery, or light bulb. First, try to start the car. If it doesn't start, check the battery and ignition switch. If it does start, the bulb is probably bad. Replace it. If the bulb is good, check the wires on the voltage regulator "L" terminal and on the oil pressure sender in the rear end housing. Be sure they are making good contact.

ENGINE

These procedures are to be used when the starter cranks the engine over normally. If not, refer to starter section in this chapter.

1. *Engine will not start*—This problem could be caused by the ignition system or fuel system. First, find out if there is high voltage to the spark plugs. To do this, disconnect one of the leading spark plug wires. Hold the wire about ¼ to ½ inch from ground with an insulated screwdriver. Crank the engine over.

If sparks do not jump to ground, or the sparks are very weak, check the ignition system (Chapter Two) and ignition control system (Chapter Seven).

If good sparks occur, make sure fuel is getting to the carburetors. Look in the sight glass on the side of the float chamber. Fuel should be halfway up the glass. If the carburetor is dry, check for a clogged fuel filter or lines. Test the fuel pump as described later in this chapter.

2. *Difficult starting, rough idle*—Make sure the car is tuned up properly. Examine spark plugs, points, ignition timing, and carburetor adjustments as described in Chapter Two. If these are OK, remove the air cleaner and look down the carburetor throat. Make sure the secondary throttle plates close all the way. If they don't, clean and lubricate the secondary throttle linkage and shaft.

If the throttle plates close completely, check coasting and anti-afterburn valves (1971-73); deceleration control valve (1974); emission control air hoses; and idle switch. See Chapter Five.

NOTE: *1971 cars do not use an idle switch.*

On 1971-73 cars, check the No. 1 control box. Check the control unit on 1974's. See Chapter Seven.

3. *Frequent stalling when cold*—On 1971-73 cars, check the anti-afterburn and coasting valves. On 1974 cars, check the deceleration control valve. See Chapter Five.

4. *Frequent stalling at idle*—Check idle speed and fuel mixture (Chapter Two). Check spark plug condition.

5. *Excessive backfiring during deceleration*—Check idle speed and fuel mixture (Chapter Two). Too low an idle can cause backfiring. On 1971-73 cars, check the anti-afterburn and coasting valves. On 1974 cars, check the deceleration control valve. On 1972-74 cars, check the idle switch. See Chapter Five. On 1971-73 cars, check the No. 1 control box. On 1974's, check the control unit. See Chapter Seven.

6. *Low performance at all speeds, poor acceleration*—Check ignition system and carburetor adjustments (Chapter Two). Check for a clogged air cleaner element or fuel filter. Make sure all 4 spark plugs fire when the engine is warmed up. If not, check the ignition control system (Chapter Seven). Examine the carburetor. Disassemble and clean if necessary. Have compression checked by a Mazda dealer.

7. *Alternator-oil pressure light does not come on when ignition is switched on*—See *Charging System Troubleshooting* earlier in this chapter.

8. *Alternator-oil pressure light comes on when engine is running*—This light (used on some models) does jobs normally done by separate lights or gauges. It warns of a discharging battery as well as low oil pressure.

Since the light may be indicating complete loss of oil pressure, take one quick glance at the ammeter, then *shut the engine off*. Push in the clutch (manual transmission) or shift to neutral (automatic). Coast to the side of the road.

If the ammeter showed a discharge before the engine was shut off, that is probably the reason the light came on. Check for a loose or broken fan belt. Inspect alternator and regulator wires.

If the ammeter showed a normal charge, check the lamp wires at the voltage regulator "L" terminal and at the oil pressure sender on the rear end housing. If either wire has fallen off, reconnect it and start the engine. The light should go out within a few seconds. If it doesn't, shut the engine off.

If the wires are properly connected, the problem may be low oil pressure. This can be caused by low oil level or an overheating engine. Check oil level (Chapter Two) and engine temperature. A leak major enough to cause a sudden drop in oil pressure will leave a trail of oil on the ground behind the car, or large amounts of oil in the engine compartment.

If oil level and engine temperature are normal, check for a shorted oil pressure sender with an ohmmeter or other continuity tester. Remove the sender and attach a mechanical oil pressure gauge in its place. The gauge should show approximately 71 psi at 3,000 rpm. If it shows no pressure, remove the engine front cover and check for a broken oil pump drive chain (Chapter Four). If the chain is good, remove the pump and inspect it. Do not drive the car until you know why the light went on and the problem has been corrected.

9. *Excessive fuel consumption*—This can be caused by many factors seemingly unrelated to fuel consumption. Check for clutch slippage, brake drag, defective wheel bearings, and poor front end alignment. Make sure the engine is properly tuned up (Chapter Two). Check for excessive fuel pump pressure, leaky floats, or worn float needle valves.

Fuel Pump Pressure Testing

1. Install a T-fitting in the fuel line close to the carburetors.

2. Connect a fuel pressure gauge to the fitting with a short tube.

3. Start the engine and run it at varying speeds. On early cars with a contact-point fuel pump (round pump body), pressure should range from 2.8-4.3 psi (0.20-0.30 kg/cm^2). On later

cars with a solid-state pump (square pump body), pressure should range from 2.8-3.6 psi (0.20-0.25 kg/cm²). Replace the pump if not within specifications.

Fuel Pump Capacity Testing

1. Disconnect the fuel line from the carburetors.
2. Place a graduated container of about 2 quart capacity at the disconnected end of the fuel line.
3. Start the engine and let it idle. There is enough fuel in the float chamber for this.
4. Stop the engine. The fuel pump should have delivered approximately one pint (450cc) of fuel in 30 seconds or less. If no fuel, or only a very little, flows from the pump, a clogged fuel line could be the cause. Remove the gas cap and try blowing the fuel lines out with compressed air before blaming the pump.

CLUTCH

All clutch problems, except adjustments or hydraulic system repairs, require removal of the engine or transmission to identify the cause and correct it.

1. *Slippage*—This condition is most noticeable when accelerating in high gear at relatively low speeds. To check slippage, drive at a steady speed in second or third gear. Without letting up the accelerator, push in the clutch long enough to let engine speed increase (one or two seconds). Then let the clutch out rapidly. If the clutch is good, engine speed will drop quickly or the car will jump forward. If the clutch is slipping, engine speed will drop slowly and the car will not jump forward.

Slippage results from insufficient clutch pedal free-play, oil or grease on the disc, worn pressure plate, or a weak diaphragm spring. Riding the clutch pedal can cause the disc surface to become glazed, resulting in slippage. Also check the release lever to make sure it isn't binding and preventing full engagement.

2. *Drag or failure to release*—This trouble usually causes difficult shift and gear clash, especially when downshifting. The cause may be excessive clutch pedal free-play, warped or bent pressure plate or clutch disc, air in the clutch hydraulic system, or defective clutch master and operating cylinders. Also check condition of transmission main drive shaft splines.

3. *Chatter or grabbing*—There are several possible causes. Check the clutch hydraulic system for air or worn parts. Bleed, if necessary, as described in Chapter Eight. Check tightness of transmission-to-frame and engine-to-transmission mounting bolts. Check for worn or misaligned pressure plate and clutch disc.

4. *Other noises*—Noise usually indicates a dry or defective release bearing. Check the bearing and replace if necessary. Also check all parts for misalignment or uneven wear.

MANUAL TRANSMISSION

Transmission problems are indicated by one or more of the following symptoms:

a. Difficulty shifting gears
b. Gear clash when downshifting
c. Slipping out of gear
d. Excessive noise in neutral
e. Excessive noise in gear
f. Oil leaks

Transmission symptoms are sometimes hard to distinguish from clutch symptoms. Be sure the clutch is not causing the trouble before working on the transmission. Transmission procedures are described in Chapter Nine.

AUTOMATIC TRANSMISSION

Automatic transmission problems are usually indicated by rough or excessively slow shifting. Check fluid level and condition, then perform other testing procedures given in Chapter Nine.

BRAKES

1. *Brake pedal goes to floor*—There are numerous causes for this, including excessively worn linings, air in the hydraulic system, leaky brake

lines, leaky wheel cylinders and disc brake calipers, or leaky or worn master cylinder. Check for leaks and thin brake linings. Bleed the brakes. Adjust the rear brakes. If the problem still exists, rebuild the wheel cylinders and calipers and/or the master cylinder.

2. *Spongy pedal*—Normally caused by air in the system; bleed the brakes.

3. *Brakes pull*—Check for wet or greasy brake brake linings, leaky wheel cylinders and calipers, loose calipers, frozen or seized pistons, and restricted brake lines or hoses. Check front end alignment and look for suspension damage. Tires also affect braking; check tire pressures and condition.

4. *Brake squeal or chatter*—Check brake lining thickness and brake drum roundness. Check discs for excessive runout. Make sure the rear brake shoes are not loose. Clean away all dirt on shoes, pads, drums, and discs.

5. *Dragging brakes*—Check brake adjustment, including handbrake. Check for broken or weak shoe return springs (rear brakes), worn piston seals (front brakes), and swollen rubber parts due to improper or contaminated brake fluid. Clean or replace defective parts.

6. *Hard pedal*—Check brake vacuum booster (Chapter Ten). Check brake linings for contamination. Check for restricted brake lines and hoses.

7. *High speed fade*—Check for distorted or out-of-round brake drums. Check discs for excessive runout. Be sure recommended brake fluid is used. Drain entire system and refill if in doubt.

8. *Pulsating pedal*—Check for distorted or out-of-round brake drums. Check for excessive brake disc runout.

STEERING AND SUSPENSION

The following symptoms indicate steering or suspension trouble:

a. Steering is hard
b. Car pulls to one side
c. Car wanders or front wheels wobble
d. Steering has excessive play
e. Tire wear is abnormal

Unusual steering, pulling, or wandering is usually caused by bent or otherwise misaligned suspension parts. This is difficult to check without proper alignment equipment. See Chapter Twelve for repairs that you can perform, and those that must be left to a dealer or front end specialist.

If the trouble seems to be excessive play, check wheel bearing adjustment first. This is the most frequent cause. Then check steering free-play as described in Chapter Twelve. Check for loose suspension and tie rod ball-joints. Check pitman arm nut and idler arm nut for tightness. Tire wear may be caused by suspension troubles, but may have many other causes. See *Tire Wear Analysis* following.

TIRE WEAR ANALYSIS

Abnormal tire wear should always be analyzed to determine its causes. The most common causes are:

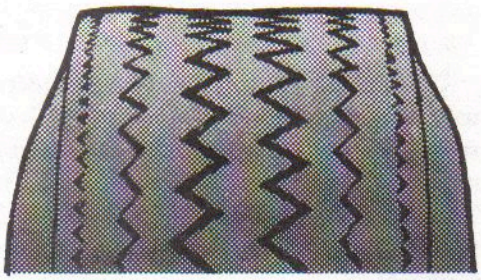
a. Incorrect tire pressure
b. Improper driving
c. Overloading
d. Bad road surfaces
e. Incorrect wheel alignment

Figure 6 identifies wear patterns and indicates the most probable causes.

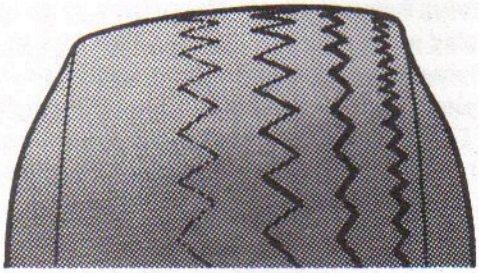
WHEEL BALANCING

All 4 wheels and tires must be in balance along 2 axes. To be in static balance (**Figure 7**), weight must be evenly distributed around the axis of rotation. (A) shows a statically unbalanced wheel. (B) shows the result—wheel tramp or hopping. (C) shows proper static balance.

To be in dynamic balance (**Figure 8**), the centerline of the weight must coincide with the centerline of the wheel. (A) shows a dynamically unbalanced wheel. (B) shows the result—wheel wobble or shimmy. (C) shows proper dynamic balance.

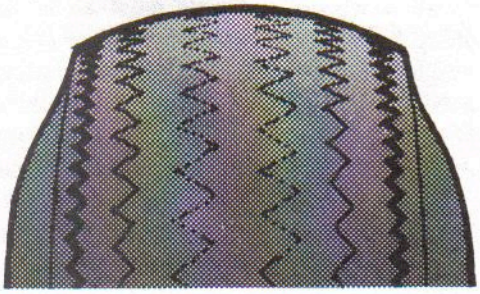


Underinflation—Worn more on sides than in center.

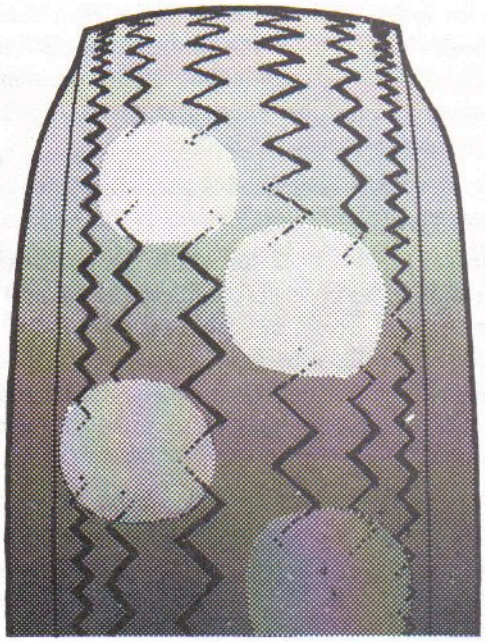


Wheel Alignment—Worn more on one side than the other. Edges of tread feathered.

Road Abrasion—Rough wear on entire tire or in patches.

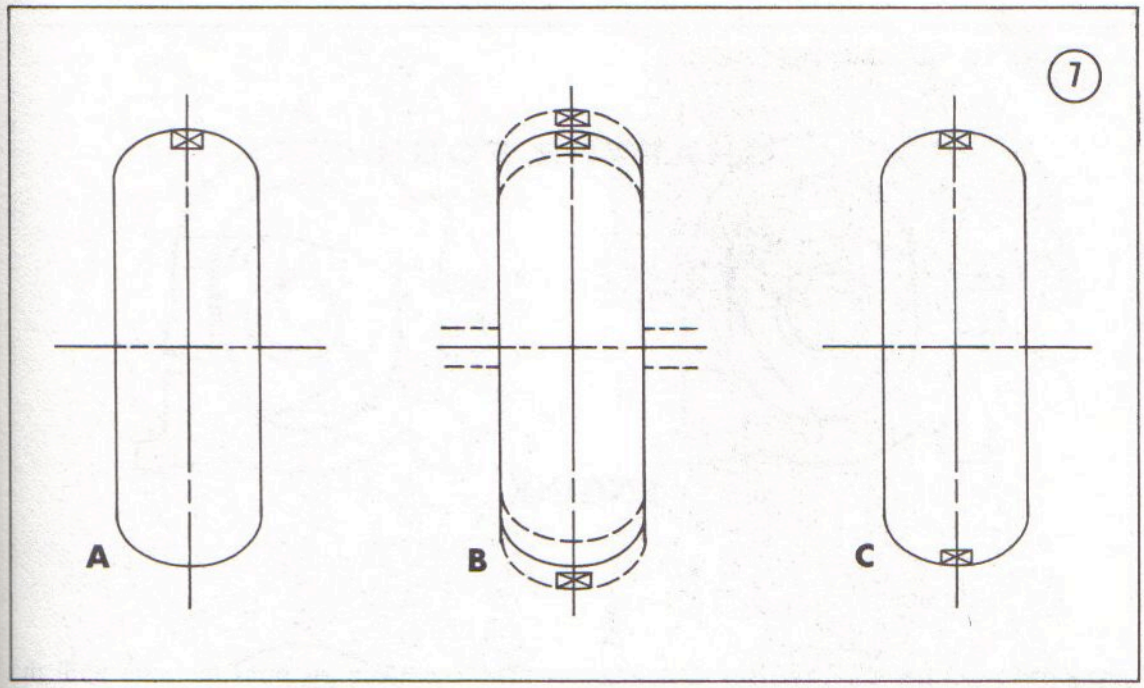


Overinflation—Worn more in center than on sides.



Wheel Balance – Scalloped edges indicate wheel wobble or tramp due to wheel unbalance.

Combination—Most tires exhibit a combination of the above. This tire was overinflated (center worn) and the toe-in was incorrect (feathering). The driver cornered hard at high speed (feathering, rounded shoulders) and braked rapidly (worn spots). The scaly roughness indicates a rough road surface.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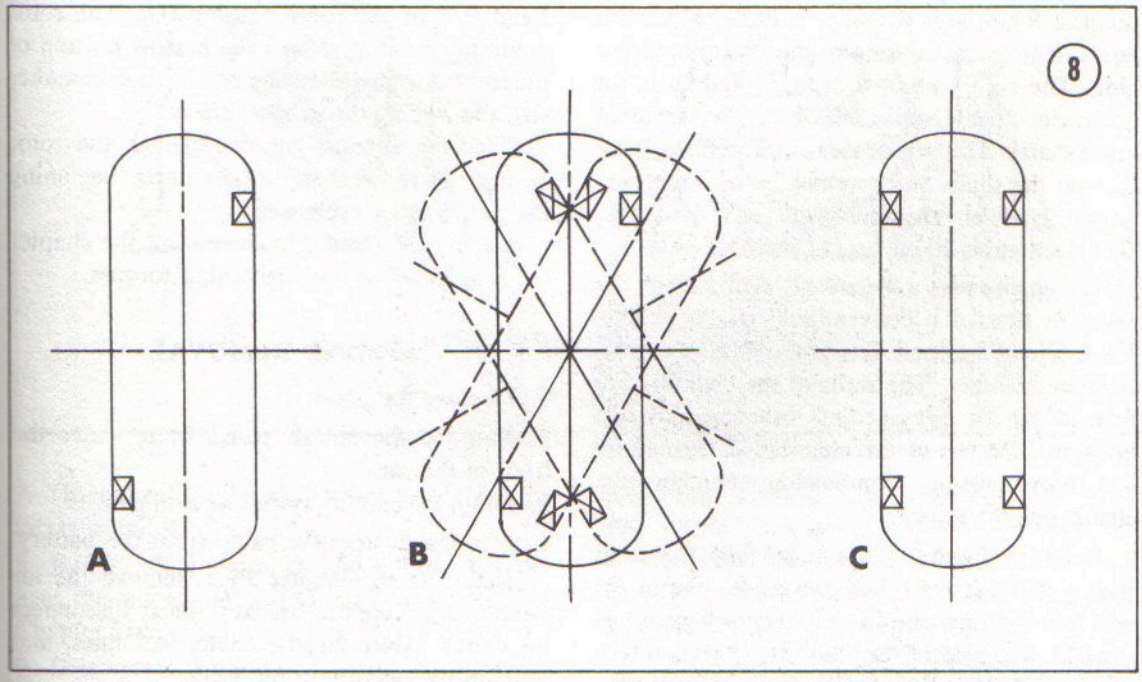
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