Using soapy water from a spray bottle is an easy method to find the location of an air leak.

This chart shows the relationship between tire inflation pressure and load capacity of the tire.
FIGURE 47.2 This chart shows that a drop in inflation pressure has a major effect on fuel economy.

FIGURE 47.4 Notice that if a tire is underinflated by 10 PSI, the life expectancy is reduced by 40%.

FIGURE 47.5 A temporary inflation pump that uses 12 volts from the cigarette lighter to inflate the tire.
FIGURE 47.6 Many vehicle manufacturers include an aerosol can of sealer on vehicles that are not equipped with a conventional spare tire.

FIGURE 47.7 Most shops that use nitrogen inflation install a green tire valve cap to let others know that nitrogen, rather than air, has been used to inflate the tire.

FIGURE 47.8 Note the difference in the shape of the rim contour of the 16 inch and 16 1/2 inch diameter wheels. While it is possible to mount a 16 inch tire on a 16 1/2 inch rim, it cannot be inflated enough to seat against the rim flange. If an attempt is made to weld the tire bead onto a 16 1/2 inch rim, the tire bead can break, resulting in an explosion that could cause serious injury or death.
When installing a tire-pressure monitoring system sensor, be sure that the flat part of the sensor is parallel to the center section of the rim.

This tire on a new vehicle has been matched mounted at the factory. The yellow sticker is placed at the largest diameter of the tire. The valve core hole in the wheel is usually drilled at the smallest diameter of the wheel. The best way to make sure the assembly is as round as possible and to reduce the number of wheel weights needed to balance the tire is to align the sticker with the valve core.

Cleaning the bead area of an aluminum (alloy) wheel using a handheld wire brush. The technician is using the tire changer foot to rotate the wheel as the brush is used to remove any remnants of the old tire. Using an electric or air-powered wire brush speeds the process, but care should be exercised not to remove any of the aluminum bead. (Remember, steel is harder than aluminum and a steel wire brush could cause recesses to be worn into the aluminum wheel, which could prevent the tire from proper seating in the bead area.) The bead seat area on steel wheels should also be cleaned to prevent air leaks at the rim.

FIGURE 47.9
When installing a tire-pressure monitoring system sensor, be sure that the flat part of the sensor is parallel to the center section of the rim.

FIGURE 47.10
This tire on a new vehicle has been matched mounted at the factory. The yellow sticker is placed at the largest diameter of the tire. The valve core hole in the wheel is usually drilled at the smallest diameter of the wheel. The best way to make sure the assembly is as round as possible and to reduce the number of wheel weights needed to balance the tire is to align the sticker with the valve core.

FIGURE 47.11
(a) Cleaning the bead area of an aluminum (alloy) wheel using a handheld wire brush. The technician is using the tire changer foot to rotate the wheel as the brush is used to remove any remnants of the old tire. Using an electric or air-powered wire brush speeds the process, but care should be exercised not to remove any of the aluminum bead. (Remember, steel is harder than aluminum and a steel wire brush could cause recesses to be worn into the aluminum wheel, which could prevent the tire from proper seating in the bead area.) The bead seat area on steel wheels should also be cleaned to prevent air leaks at the rim.

(b) Using an electric or air-powered wire brush speeds the process, but care should be exercised not to remove any of the aluminum bead. (Remember, steel is harder than aluminum and a steel wire brush could cause recesses to be worn into the aluminum wheel, which could prevent the tire from proper seating in the bead area.) The bead seat area on steel wheels should also be cleaned to prevent air leaks at the rim.
Rendered (odorless) animal fat is recommended by some manufacturers of tire changing equipment for use as a rubber lubricant.

Always tighten wheel lug nuts (or studs) in a star pattern to ensure even pressure on the axle flange, brake rotors or drums, and the wheel itself.

Most manufacturers recommend using hand tools rather than an air impact wrench to remove and install lock-type lug nuts to prevent damage. If either the key or the nut is damaged, the nut may be very difficult to remove.
FIGURE 47.15 A torque-limiting adapter for use with an air impact wrench still requires care to prevent overtightening. The air pressure to the air impact should be limited to 125 PSI (860 kPa) in most cases, and the proper adapter must be selected for the vehicle being serviced. The torque adapter absorbs any torque beyond its designed rating. Most adapters are color coded for easy identification as to the size of lug nut and torque value.

FIGURE 47.16 This wheel was damaged because the lug nuts were not properly torqued.

FIGURE 47.17 The method most often recommended is the modified X method. In this method, each tire eventually is used at each of the four wheel locations. An easy way to remember the sequence, whether front-wheel drive or rear-wheel drive, is to say to yourself, "Drive wheels straight, cross the nondrive wheels."
FIGURE 47.18 A bulge in a tire as a result of either an injury to the sidewall such as contact with a curb or an internal fault in the tire. This tire requires replacement.

FIGURE 47.19 Excessively worn tire showing the belt material showing on the inside edge. This tire requires replacement.

FIGURE 47.20 Wear on the outside shoulders only is an indication of an alignment problem. If the tire was worn evenly on both the inside and outside edges then it was likely caused by under inflation.
FIGURE 47.21 A tire runout gauge being used to measure the radial runout of a tire.

FIGURE 47.22 To check wheel radial runout, the dial indicator plunger tip rides on a horizontal surface of the wheel, such as the bead seat.

FIGURE 47.23 To check lateral runout, the dial indicator plunger tip rides on a vertical surface of the wheel, such as the wheel flange.
The most accurate method of measuring wheel runout is to dismantle the tire and take dial indicator readings on the inside of the wheel rim.

A wheel balancer detects heavy spots on the wheel and tire, and indicates where to place weight to offset both static and dynamic imbalance.

An assortment of wheel weights designed to fit different shaped rims.
FIGURE 47.27: A liquid tire-stop leak was found in all four tires. This liquid caused the tires to be out of balance.

FIGURE 47.28: Stick-on weights are used from the factory to balance the alloy wheels of this vehicle.

FIGURE 47.29: Wheel weight pliers are specially designed to remove and install wheel weights.
FIGURE 47.30 A tire balancer that can also detect radial and lateral force variation and instruct the operator where to rotate the tire to achieve the best ride, or indicate a bent wheel.

FIGURE 47.31 Most brake drums do not have the attached weight.

FIGURE 47.32 Notice that the tie rod touches the fixture end.
FIGURE 47.33 (a) A hubcentric plastic ring partially removed from an aftermarket wheel. (b) A hubcentric plastic ring left on the hub when removing a wheel.

FIGURE 47.34 The area of the repair should be buffed slightly larger than the patch to be applied.

FIGURE 47.35 A stitching tool being used to force any trapped air out from under the patch.
FIGURE 47.36 A rubber plug being pulled through a hole in the tire. The stem is then cut off flush with the surface of the tire tread.

FIGURE 47.1 A typical tire-changing machine showing the revolving table and movable arm used to remove a tire from the wheel.

FIGURE 47.2 The foot-pedal controls allow the service technician to break the tire bead, damp the wheel (rim) to the machine, rotate the tire/wheel assembly, and still have both hands free.
Using a tire valve removal tool, unscrew the valve core using extreme caution because the valve is under pressure and can be forced outward and cause personal injury.

The valve core removed from the tire valve. Allow all of the air in the tire to escape.

A bead breaker is being used to separate the tire from the bead seat of the wheel. Repeat as needed to break the bead on both sides of the wheel.
After breaking the beads from both sides of the tire, install the wheel/tire assembly flat onto the machine and, using the foot-pedal control, lock the wheel to the changer.

To remove the tire from the wheel, position the arm of the changer against the rim of the wheel and lock in position.

The tire tool (flat bar) is placed between the bead of the tire and the wheel. Using tire lubricant can help prevent damage to the tire.
UNFIGURE 47.9 The foot pedal that causes the table to rotate is depressed and the tire is removed from the wheel.

UNFIGURE 47.10 Reposition the tire tool to remove the lower bead of the tire from the wheel.

UNFIGURE 47.11 As the table of the tire changer is rotated, the tire is released from the wheel and can be lifted off the wheel.
Before installing a tire, inspect and clean the bead seat.

Before installing a new tire, most experts recommend replacing the tire valve, being installed here, using a tool that pulls the valve through the hole in the wheel.

Apply tire soap or rubber lubricant to both beads of the tire.
Chapter 47

Tire and Wheel Service

UNFIGURE 47.15 Rotate the tire on the wheel and position the arm so that the tire will be guided onto the rim as the wheel is rotated.

Inflate the tire, being careful not to exceed 40 PSI. Experts suggest that a tire be in a cage during the initial bead seating inflation to help prevent personal injury if the wheel or tire fails.

Repeat for the upper bead.
Install the tire valve core and inflate the tire to specifications.

The source of the leak was detected by spraying soapy water on the inflated tire. Needle-nose pliers are being used to remove the object that caused the flat tire.

A part of a razor blade was found to be the cause of the flat tire.
UNFIGURE 47.21: A reamer is being used to clean the puncture hole.

UNFIGURE 47.22: This technician is using two open-end wrenches to hold the tire bead apart if a tire bead spreader is not available.

UNFIGURE 47.23: The surrounding area is being buffed using an air-powered die grinder equipped with a special buffing tool specifically designed for this process.
After using a vacuum on all debris after buffing, apply rubber cement to the area. The brush included with the rubber cement makes the job easy. Be sure to cover the entire area around the puncture. Peel off the paper from the adhesive on the patch. Insert the tip of the patch through the puncture from the inside of the tire.
UNFIGURE 47.27 Use a pair of pliers to pull the plug of the patch through the puncture.

UNFIGURE 47.28 This view of the patch is from the inside of the tire.

UNFIGURE 47.29 To be assured of an airtight patch, the adhesive of the patch should be "stitched" to the inside of the tire using a serrated roller called a stitching tool.
UNFIGURE 47.20: A view of the plug from the outside of the tire after metal covering used to cover the puncture is removed from the patch plug. The plug can be trimmed to the level of the tread using side cutters or knife.