FIGURE 21.1 If the thermostat has a jiggle valve, it should be placed toward the top to allow air to escape. If a thermostat were stuck open or open too soon, this can set a diagnostic trouble code P0128 (coolant temperature below thermostat regulating temperature).

FIGURE 21.2 Use caution if using a steel scraper to remove a gasket from aluminum parts. It is best to use a wood or plastic scraper.
FIGURE 21.3 An intake manifold gasket that failed and allowed coolant to be drawn into the cylinder(s).

FIGURE 21.4 The lower intake manifold attaches to the cylinder heads.

FIGURE 21.5 The upper intake manifold, often called a plenum, attaches to the lower intake manifold.
FIGURE 21.6 Some plastic intake manifolds are equipped with a pressure relief valve that would open in the event of an backfire condition to prevent the higher internal pressures from causing damage to the manifold.

FIGURE 21.7 A single overhead camshaft engine with a timing belt that also rotates the water pump.

FIGURE 21.8 A Toyota/Lexus hybrid electric vehicle has a ready light. If the ready light is on, the engine can start at anytime without warning.
Always use the viscosity of oil as specified on the oil fill cap.

Before starting the process of adjusting the valves, look up the specifications and exact procedures. The technician is checking this information from a computer CD-ROM-based information system.

The tools necessary to adjust the valves on an engine with adjustable rocker arms include basic hand tools, feeler gauge, and a torque wrench.
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UNFIGURE 21.3: An overall view of the four-cylinder engine that is due for a scheduled valve adjustment according to the vehicle manufacturer's recommendations.

Start the valve adjustment procedure by first disconnecting and labeling, if necessary, all vacuum lines that will be removed to gain access to the valve cover.

UNFIGURE 21.4: The air intake tube is being removed from the throttle body.

UNFIGURE 21.5: The intake manifold is being disconnected from the throttle body.
UNIT 21.6 With all vacuum lines and the intake tube removed, the valve cover can be removed after removing all retaining bolts.

UNIT 21.7 Notice how clean the engine appears. This is a testament to proper maintenance, regular oil changes by the owner.

UNIT 21.8 To help locate how far the engine is being rotated, the technician is removing the distributor cap to be able to observe the position of the rotor.
UNFIGURE 21.9 The engine is rotated until the timing marks on the front of the crankshaft line up with zero degrees—top dead center (TDC) with both valves closed on #1 cylinder.

UNFIGURE 21.10 With the rocker arms contacting the base circle of the cam, insert a feeler gauge of the specified thickness between the camshaft and the rocker arm. There should be a slight drag on the feeler gauge.

UNFIGURE 21.11 If the valve clearance is not correct, loosen the retaining nut and turn the valve adjusting screw with a screwdriver to achieve the proper clearance.
After adjusting the valves that are closed, rotate the engine one full rotation until the engine timing marks again align.

The engine is rotated until the timing marks again align indicating that the companion cylinder will now be in position for valve clearance measurement.

On some engines, it is necessary to watch the direction the rotor is pointing to help determine how far to rotate the engine. Always follow the vehicle manufacturer’s recommended procedure.
UNFIGURE 21.15 The technician is using a feeler gauge that is one thousandth of an inch thinner and another one thousandth of an inch thicker than the specified clearance as a double check that the clearance is correct.

UNFIGURE 21.16 Adjusting a valve takes both hands—one to hold the wrench to loosen and tighten the lock nut and one to turn the adjusting screw. Always doublecheck the clearance after an adjustment is made.

UNFIGURE 21.17 After all valves have been properly measured and adjusted as necessary, start the reassembly process by replacing all gaskets and seals as specified by the vehicle manufacturer.
Reinstall the valve cover being careful to not pinch a wire or vacuum hose between the cover and the cylinder head.

Use a torque wrench and torque the valve cover retaining bolts to factory specifications.

Reinstall the distributor cap.
UNFIGURE 21.21: Reinstall the spark plug wires and all brackets that were removed to gain access to the valve cover.

UNFIGURE 21.22: Reconnect all vacuum and air hoses and tubes. Replace any vacuum hoses that are brittle or swollen with new ones.

UNFIGURE 21.23: Be sure that all clips are properly installed. Start the engine and check for proper operation.
UNFIGURE 21.24: Double check for any oil or vacuum leaks after starting the engine.