

(R) Radiator Nomenclature

1. **Scope**—This SAE Standard documents standard nomenclature in common use for various types of radiator and radiator core construction, as well as for various radiator-related accessories.
2. **References**
 - 2.1 **Applicable Publications**—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.
 - 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J151—Pressure Relief for Cooling System
SAE J164—Radiator Caps and Filler Necks
3. **Definitions—Radiator Nomenclature**
 - 3.1 **Auxiliary Tank**—A separate tank in the cooling system provided to perform one or more of the following functions:
 - a. filling,
 - b. coolant reservoir,
 - c. deaeration,
 - d. retention of coolant expelled from the radiator by expansion or afterboil, or both, and
 - e. visible fluid level indication.
 - 3.2 **Baffle**—A barrier plate used to direct fluid flow within a tank, as under a filler neck or through an in-tank oil cooler, or to divide a tank into separate chambers, as in a deaeration tank or multi-pass radiator tank. See Figure 1.

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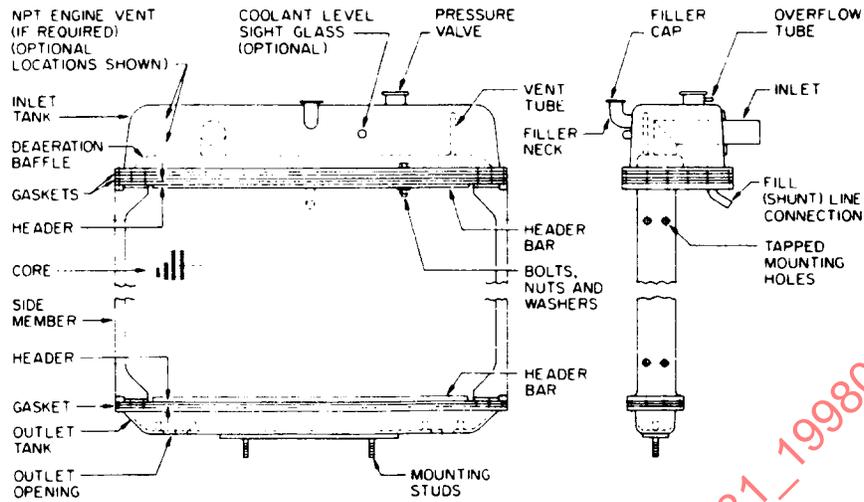


FIGURE 1—BOLTED TYPE RADIATOR, DRAWN TANKS (TYPICAL DEAERATION SYSTEM SHOWN)

3.3 Bolted Radiator—A radiator whose inlet and outlet tanks are bolted to the headers of the core, usually with a gasket seal between tank and header and bolting strips to back up the header. See Figures 1, 2, 3, and 4.

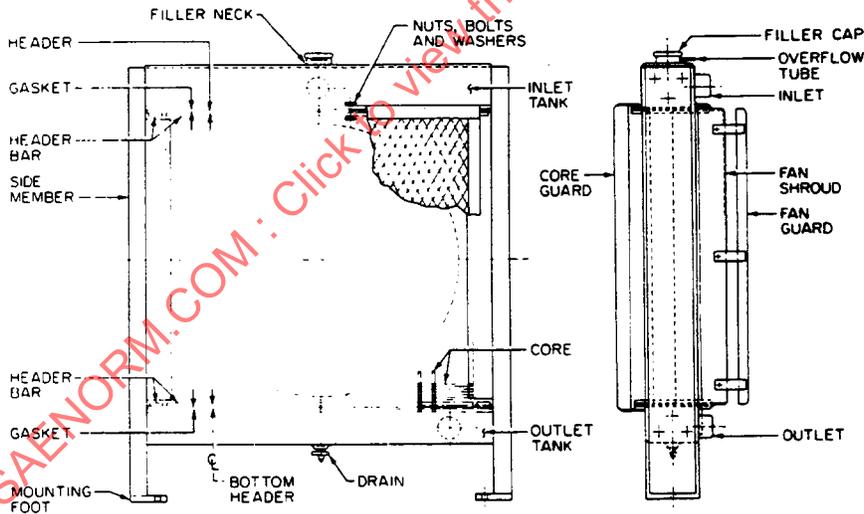


FIGURE 2—FABRICATED TYPE (ONE-PIECE CORE) RADIATOR

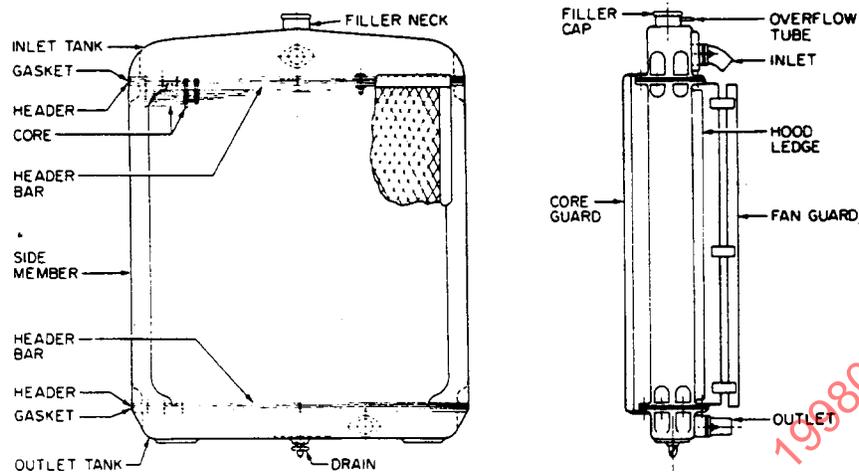


FIGURE 3—CAST TYPE (ONE-PIECE CORE) RADIATOR

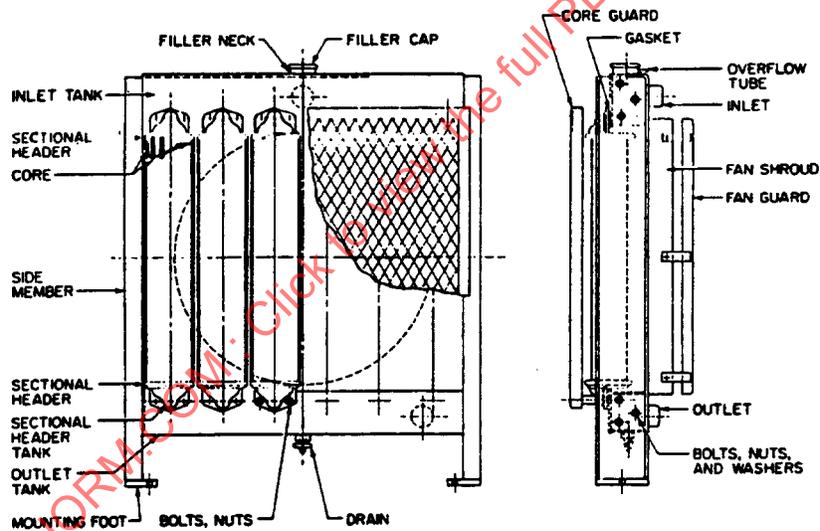


FIGURE 4—CAST OR FABRICATED TYPE (SECTIONAL CORE) RADIATOR

- 3.4 Bolting Strip**—A strip of metal having a series of holes matching the bolting hole pattern of the tanks and headers of a bolted radiator, and placed on the side of the header opposite to the tank and gasket for the purpose of clamping the joint between the tank and header by means of bolts and nuts. Also called Header Bar. Some radiators with very light gauge tanks have bolting strips on the tank flange as well. See Figures 1, 2, and 3.
- 3.5 Bottom Tank Oil Cooler**—An oil-to-coolant oil cooler mounted in the bottom tank of a radiator, usually to cool transmission or hydraulic system fluid.
- 3.6 Brazed Radiator**—A radiator in which the bond between the fins and tubes and between the tubes and headers, is accomplished by brazing. Includes vacuum brazed aluminum radiators, and controlled atmosphere brazed aluminum and copper/brass radiators.

- 3.7 **Breather Hole**—A small hole in the side of a radiator filler neck extension for the purpose of venting the air in the expansion volume of a radiator to the filler neck during engine warm-up.
- 3.8 **Cast Radiator**—A radiator having inlet and outlet tanks of cast metal, usually aluminum, sometimes cast iron. See Figure 3.
- 3.9 **Cellular Core**—A radiator core having a number of fluid passages made by joining metal ribbons at the edges and grouped to form a cellular structure. Parts of the cellular structure may be of formed or flat ribbon which is not a part of the fluid passages. See Figure 5.

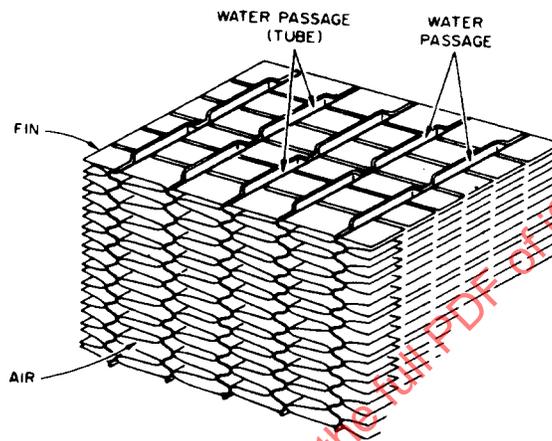


FIGURE 5—CELLULAR CORE

- 3.10 **Coolant Recovery Tank**—A non-pressurized auxiliary radiator tank designed to capture the expansion or afterboil overflow of coolant from the radiator, but not to perform a deaeration function.
- 3.11 **Cooling Package**—A group of heat exchangers mounted together in a package, such as a radiator, charge air cooler and air conditioning condenser, along with possibly an air-to-air oil cooler, fuel cooler, etc. The package may also include a fan shroud, recirculation shields, and/or shutters.
- 3.12 **Core Guard**—A screen-type device sometimes provided to protect the radiator core from damage due to dirt and debris in the cooling air stream. See Figures 2 and 3.
- 3.13 **Crimping Strip**—A metal strip, separate from the header, and usually having tabs, which may be folded or crimped around a (usually plastic) radiator tank flange and a radiator header to clamp the two together with a gasket seal between.
- 3.14 **Crossflow Radiator**—A radiator whose core tubes run horizontally when installed in the cooling system. See Figure 6.

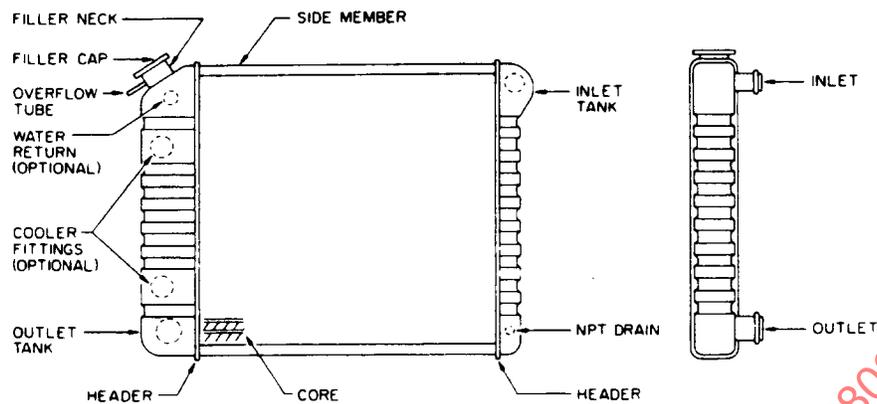


FIGURE 6—AUTOMOBILE RADIATOR (CROSS FLOW)

- 3.15 Deaeration Baffle**—A barrier used to separate chambers in a radiator top tank or auxiliary tank to form a deaeration tank. See Figure 1.
- 3.16 Deaeration Tank**—A tank designed to be capable of removing entrained air or combustion gas, or both, from the circulating coolant. The deaeration tank may be integral with the radiator inlet tank or may be mounted remotely.
- 3.17 Dished Header**—A header for a radiator in which the portion of the header through which the core tubes pass is depressed from the portion which makes up the header flanges, as in a dish. Usually used in connection with bolted radiator construction. Allows cores to be connected end-to-end with a gasket but without the use of a filler frame.
- 3.18 Downflow Radiator**—A radiator whose core tubes run vertically when installed in the cooling system. See Figure 7.

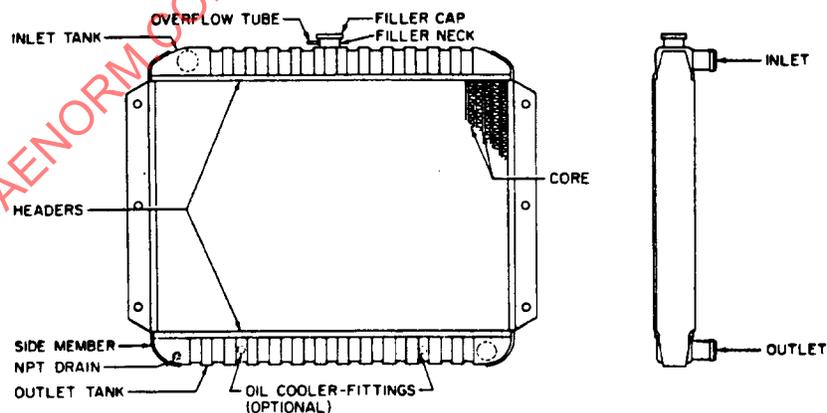


FIGURE 7—AUTOMOBILE RADIATOR (DOWN FLOW)

- 3.19 Expansion Volume**—The volume of space in a cooling system (such as in the radiator top tank or auxiliary tank) which allows for the expansion of coolant resulting from temperature rise.

- 3.20 **Fabricated Radiator**—A radiator whose inlet and outlet tanks are fabricated, as well as its side members, usually by welding of steel plates or sheets. See Figure 2.
- 3.21 **Fan Guard**—A formed wire or screen device for the purpose of preventing injury to personnel by moving fan blades. See Figures 2 and 3.
- 3.22 **Fan Shroud**—A duct to guide the cooling air between the radiator and the fan, increasing fan efficiency and reducing cooling air recirculation. See Figures 2, 8, and 9.

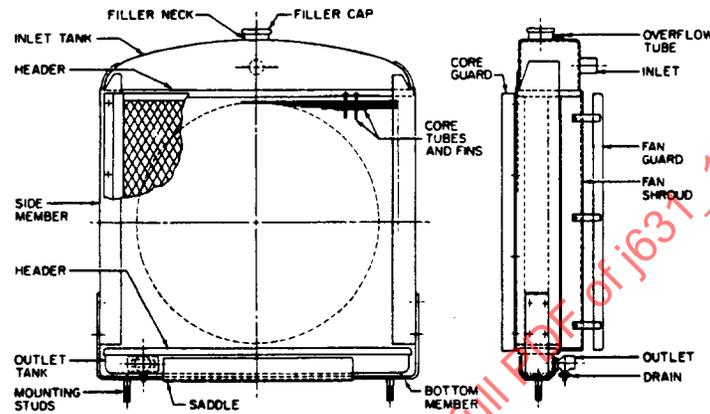


FIGURE 8—SHEET METAL RADIATOR

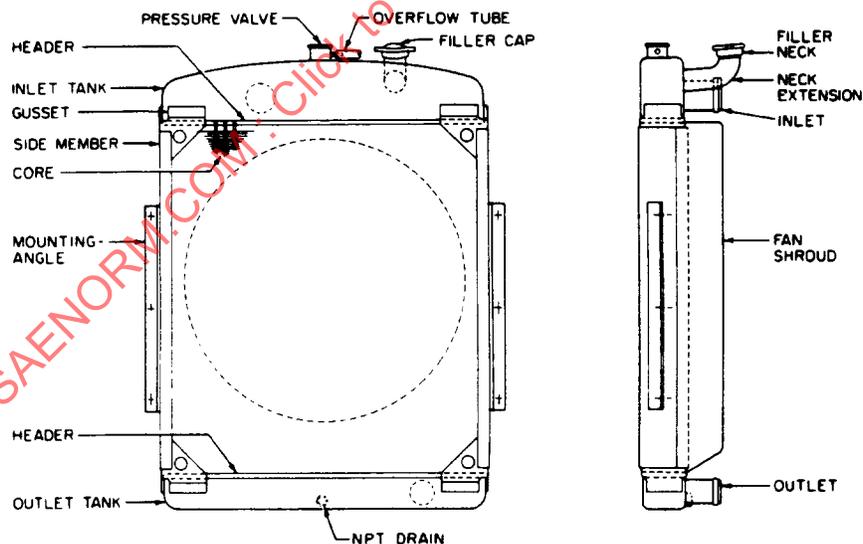


FIGURE 9—HEAVY-DUTY RADIATOR, SHEET METAL TYPE

- 3.23 **Filler Frame**—A frame, usually of metal, bolted between the headers of two cores with gaskets for the purpose of joining the cores end to end to make a larger core assembly.

- 3.24 Filler Neck**—The opening into a radiator inlet tank or surge tank through which the cooling system is filled with coolant. Usually formed of drawn sheet metal or molded as part of a plastic tank and designed to accept a cam-lock (bayonet-type) radiator filter cap, but may be a threaded type in some heavy-duty applications. See Figures 1 to 11.
- 3.25 Filler Neck Extension**—A tubular extension of the filler neck, usually extending into the radiator inlet tank or surge tank. The length of the extension and the placement of the breather hole define the expansion volume of the tank.
- 3.26 Fill Line**—A fluid conductor connecting the deaeration tank to the cooling system pump in a cooling system with deaeration capability to allow rapid filling of the system. Also called the pump return connection, or the shunt line because it bypasses coolant around the radiator core directly to the pump. See Figure 1.
- 3.27 Header**—A plate to which all of the fluid carrying tubes of the radiator core are connected. There is usually one header at each end of a core. The headers are, in turn, attached to inlet and outlet tanks for the purpose of guiding the fluid to be cooled from the inlet tank through the core tubes to the outlet tank. See Figures 1, 2, 6, 7, 8, and 9.
- 3.28 Header Bar**—See 3.4, Bolting Strip.
- 3.29 Header Reinforcement**—Pieces of metal having holes for core tubes, applied to the header in certain areas as a header doubler to increase the strength of the tube to header joints in those areas. When used, usually used on the end rows of tubes in a core.
- 3.30 In-Tank Oil Cooler**—An oil-to-coolant oil cooler mounted in a radiator tank, usually the outlet tank. See Figure 6.
- 3.31 Lockseam Tube**—A radiator core tube made from flat strip by folding the edges together into a locking seam. Usually made of brass with a solder-sealed seam. See Figures 10 and 11.

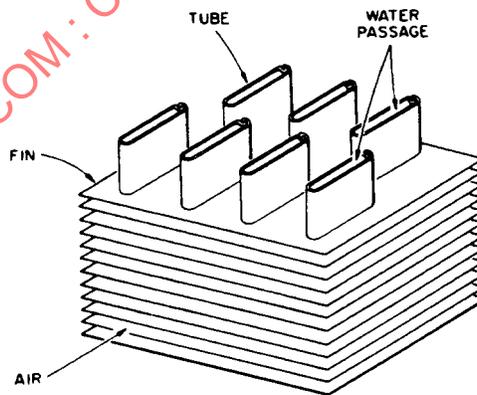


FIGURE 10—TUBE AND PLATE FIN CORE

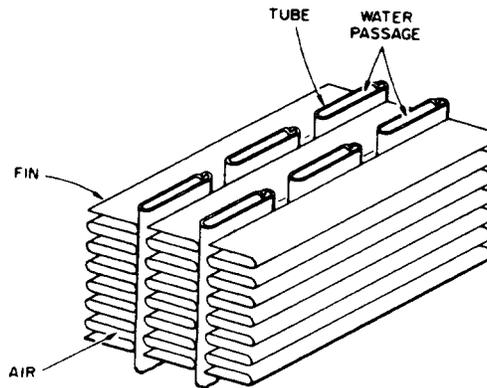


FIGURE 11—TYPICAL TUBE AND SERPENTINE FIN CORE (OFTEN REFERRED TO AS TUBE AND CENTER CORE AND CT CORE)

- 3.32 Louvered Fin**—A radiator core fin having louvers for the purpose of reducing the boundary layer thickness by turbulating the cooling air for improved heat transfer performance.
- 3.33 Low Flow Radiator**—A radiator for use in a Low Flow Cooling System, which under normal conditions operates at a coolant flow through the radiator of significantly less than full engine coolant flow rate, thus increasing the temperature drop of the coolant through the radiator. Usually used to provide low temperature coolant to a liquid cooled charge air cooler.
- 3.34 Low Flow Cooling (LFC) Valve**—A valve used to vent the radiator to the surge tank or deaeration tank of a low flow cooling radiator to allow air (gas) to escape during system fill and start-up, and to allow deaeration, but prevent or minimize coolant bypass during normal operation.
- 3.35 Multi-Pass Radiator**—A radiator configuration in which the core is divided into two or more sections through which the coolant passes, thereby increasing the velocity of the coolant and the distance it travels through the radiator.
- 3.36 Multiple Core Radiator**—A radiator assembly made up of more than one core. These may be set side-by-side and connected to a common header or tank (see 3.50, Sectional Core), or may be set end-to-end and connected to each other.
- 3.37 Non-Louvered Fin**—A radiator fin which may be a flat fin or a serpentine fin, without louvers.
- 3.38 One-Piece Core Radiator**—A radiator having a single core, as opposed to one having more than one core making up a core assembly.
- 3.39 Packaged Cooling System**—See 3.11, Cooling Package.
- 3.40 Plastic Tank Radiator (PTR)**—A radiator whose inlet and outlet tanks are made of plastic, usually glass fiber reinforced Nylon 6-6. Figures 6 and 7 can represent radiators having plastic inlet and/or outlet tanks. Inlet and outlet are integral with the appropriate tank. The filler neck and other parts and/or fittings may also be integrated with the tanks. Tanks are gasketed and secured to the headers, usually by tabs on the header, or by crimping strips, which are crimped onto or over the tank flange.

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- 3.41 Plate Fin**—A continuous flat fin having holes through which the radiator tubes pass. The holes are usually collared to make a soldered or brazed connection to the tubes. See Figure 10. The fins may be ribbed, dimpled, or louvered to improve heat transfer to the cooling air.
- 3.42 Pump Return Connection, Line**—See 3.26, Fill Line. See Figure 1.
- 3.43 Radiator Cap, Solid**—A removable device which closes the cooling system fill opening (filler neck). When installed, it permits no leakage under any cooling system operating condition. It must be used in combination with a radiator pressure relief valve. See "Filler Cap" in Figures 1 and 9.
- 3.44 Radiator Pressure Cap**—A removeable device which closes the cooling system fill opening (filler neck) and which incorporates pressure relief and sometimes vacuum relief valves. Refer to SAE J151 and SAE J164. See "Filler Cap" in Figures 2, 3, 4, 6, 7, and 8.
- 3.45 Radiator Pressure Relief Valve**—A device which provides the same features and functions as a radiator pressure cap except that it is not used for system filling. (Some hand tools are required for removal of this valve.) It must be used in combination with a radiator cap, solid. See "Pressure Valve" in Figures 1 and 9.
- 3.46 Radiator Shutters**—See 3.56, Shutters.
- 3.47 Recirculation Shields**—Flexible panels, usually of rubber, metal, and plastic, placed between the radiator or cooling package and the engine compartment walls to prevent bypass of cooling air or recirculation of hot cooling air around the outside of the radiator or cooling package.
- 3.48 Relief Valve**—See 3.45, Radiator Pressure Relief Valve.
- 3.49 Riser Tube**—A tube connecting the radiator inlet tank chamber to the deaeration tank chamber. The tube is usually designed to be higher than the normal level of coolant in the deaeration tank, and may have a bent end to direct the deaeration flow to a particular region of the deaeration tank for best deaeration action. Also called a Vent Tube. See Figure 1.
- 3.50 Sectional Core**—A core assembly made up of a number of smaller cores connected to common headers. See Figure 4.
- 3.51 Separator**—See 3.15, Deaeration Baffle. See Figure 1.
- 3.52 Serpentine Core**—A radiator core made with tubes and serpentine fins. Also called Tube and Serpentine Fin Core, Tube and Center Core, and CT core. See Figure 11.
- 3.53 Serpentine Fin**—A corrugated fin which is stacked with flat or oval fins to form a radiator core. The fins are joined to the tubes by soldering or brazing at the points where the fin convolutions touch the tubes. The fins may be ribbed or louvered to promote heat transfer to the cooling air. See Figure 11.
- 3.54 Sheet Metal Radiator**—A radiator whose inlet and outlet tanks are made of sheet metal, usually drawn brass, usually soldered to the headers. Sometimes referred to as soldered radiators. Figures 6, 7, 8, and 9 illustrate the nomenclature for sheet metal radiators.
- 3.55 Shunt Line**—See 3.26, Fill Line. See Figure 1.
- 3.56 Shutters**—Automatic or manually operated devices positioned in front or rear of a radiator to control engine coolant temperatures by regulating the air flow through the radiator.
- 3.57 Shroud**—See Figures 2, 8, and 9.