the Chapter 5, *AmigOS*. A recessed volume control can be turned with a flat-bladed screwdriver to increase or reduce the sound volume.

Motors and Position Encoders

AmigoBot's drive system uses high-speed, high-torque, reversible-DC motors. Each front drive motor includes a high-resolution optical quadrature shaft encoder that provides 9,550 ticks per wheel revolution (approx. 30 ticks per millimeter) for precise position and speed sensing and advanced dead-reckoning. The tires are four inches in diameter and made of soft, but firm rubber for good traction and low compressibility.

Sonar

The AmigoBot comes standard with a single array of eight sonar. The sonar positions are fixed: one on each side, four facing forward, and two at the rear, together providing nearly 360 degrees of range sensing.

Sonar Rate and Sequence
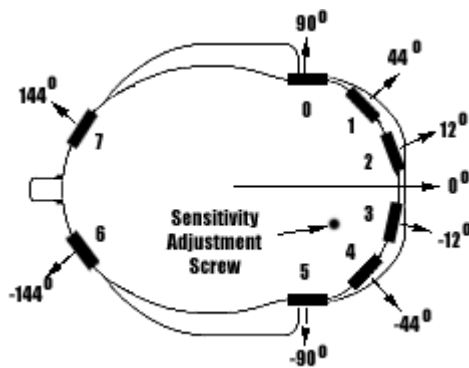
The sonar firing rate is 20 Hz (50 milliseconds per sonar) and sensitivity ranges from 10cm (6 inches) to more than 5 meters (16 feet). Objects closer than 10cm are not detected and return an out-of-range value (> 6 meters).

You may control the sonar's firing pattern through software (see Chapter 5, *AmigOS*); the default is clockwise in sequence starting with the side sonar (#0) closest to the left wheel and around to sonar #7 on the back rear panel of the robot.

Sonar Sensitivity

All eight sonar are controlled from a single board. Although calibrated at the factory, you may adjust the sonar sensitivity and range to accommodate differing AmigoBot operating environments. The sonar gain control is a one-turn screwcap accessible through a hole on the top and near the front of AmigoBot. You may have to remove an accessory to uncover the hole.

Using a flat-bladed screwdriver, turn the adjustment screw counterclockwise to make the sonar less sensitive to external noise and false echoes. Low sonar-gain settings reduce the robot's ability to see small objects. Under some circumstances, that is desirable. For instance, attenuate the sonar if you are operating in a noisy environment or on uneven or highly reflective floor—a heavy shag carpet, for example. If the sonar are too sensitive, they will "see" the carpet immediately ahead of the robot as an obstacle.

Increase the sensitivity of the sonar array by turning the gain-adjustment screw clockwise, making the sonar more likely to see small objects or objects at a greater distance. For instance, increase the sonar gain if you are operating in a relatively quiet and open environment with a smooth floor surface.