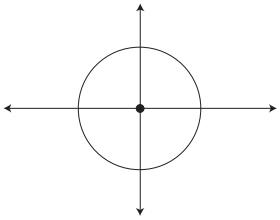
Where Should I Place the AMR Antenna on My Vehicle?

By Dan Merritt, Badger Meter, Inc.

One important but often overlooked part of a drive-by Automatic Meter Reading (AMR) System is the antenna on the vehicle. AMR systems typically utilize frequencies that permit a small (less than three feet in length), lightweight antenna with a magnetic mount to be placed on a metal surface of the vehicle. Magnetic mounts permit the entire antenna system to be easily removed from one vehicle and moved to another. The antenna is connected to a small, lightweight receiver/computer that can also be moved from one vehicle to another, eliminating the need for a dedicated vehicle for meter reading. As a result, the flexibility for a utility is greatly enhanced for both regular monthly meter reading and special off-cycle reading.

While this flexibility is beneficial to the user, it can sometimes lead to confusion and poor practices that may actually degrade the data collection process and the effectiveness of the AMR system.

The AMR antenna actually is only half of the antenna system; the other half is the ground plane, which is usually some portion of the vehicle's metal body in close proximity to the antenna. The typical AMR antenna is omnidirectional, that is, it receives and transmits (if used in wake-up mode) a radio-frequency (RF) signal equally well in all horizontal directions around the antenna.



Radiation pattern of a vertical antenna; top-down view

For this to occur in actual practice, the antenna needs to be properly positioned on the vehicle to achieve a proper ground plane and clearance from nearby obstructions. Solid items that are in the near field of radiation can absorb or reflect some of the RF energy, both transmitted and received, and hinder the antenna performance by interfering with the radiation pattern.

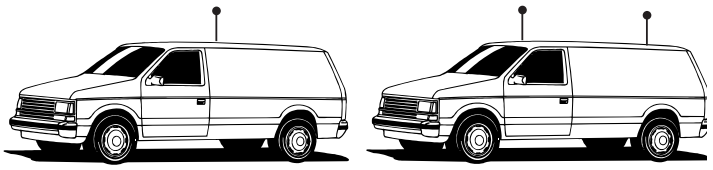
The ideal location for the antenna is on the vehicle roof, provided it is metal, located dead center. This location provides a ground plane of the entire metal roof around the antenna, and the antenna is mounted high enough over the top of the vehicle, precluding RF obstructions.

In some instances, using this location may not be possible. Alternative locations include the corners or side of the roof, trunk deck, or one of the four corners of the vehicle. Whichever location is chosen, it should be a metal surface to achieve a ground plane as well as provide a suitable mounting surface for the magnetic antenna base. Note that any location in which metal does not extend around the antenna base equally will cause a less than ideal radiation pattern.

Safety considerations may preclude the use of the roof if the height of the mounted antenna will come into contact with low-hanging tree limbs and structures such as garage doors. Existing antennas already mounted on the vehicle may also force a less optimum mounting location. Antennas located within one wavelength of each other may cause some mutual interference. (One wavelength at 450 MHz is about 2.2 feet, while one wavelength at 900 MHz is about 1.1 feet.) To minimize interference, keep the two antennas separated as much as possible, for example, by using opposite sides of the roof. This separation is especially important if one antenna is used for high-power, two-way radio communications.

Also, regularly check antenna and cable components for damage and corrosion. The antenna cable is particularly susceptible to damage. Avoid sharp bends in the cable. Protect the cable from door slamming by running the cable through a slightly opened window. If the antenna is regularly removed, always grab the magnetic base, not the antenna cable.

If you have questions about antenna placement, contact Badger Meter Technical Support by phone at 800-456-5023, or via email at techsupport@badgermeter.com. ■



For optimal AMR system performance, place the antenna as high as possible in the center of the metal roof, free and clear of obstructions. Multiple antennas need to be separated as much as possible.