Communications

Curiosity has three antennas that serve as both its "voice" and its "ears." They are located on the rover equipment deck (its "back"). Having multiple antennas provides back-up options just in case they are needed.

- Ultra-High Frequency Antenna
- X-band High-Gain Antenna
- X-band Low-Gain Antenna

Ultra-High Frequency Antenna

Most often, Curiosity sends radio waves through its ultra-high frequency (UHF) antenna (about 400 Megahertz) to communicate with Earth through NASA's Mars Odyssey and Mars Reconnaissance Orbiters. Because the rover's and orbiters' antennas are close-range, they act a little like walkie-talkies compared to the long range of the low-gain and high-gain antennas. Using orbiters to relay messages is beneficial because they are closer to the rover than the Deep Space Network (DSN) antennas on Earth and they have Earth in their field of view for much longer time periods than the rover does on the ground. That allows them to send more data back to Earth at faster rates. Mars Reconnaissance Orbiter relays most of the data between the rover and Earth.

Main Function	Transmitting Data to Earth through Mars Orbiters
Radio Frequency	Ultra-High Frequency (UHF) band (about 400 megahertz)
Transmission Rates	Up to 2 megabits per second on the rover-to-orbiter relay link.

The X-Band High-Gain Antenna

Curiosity uses its high-gain antenna to receive commands for the mission team back on Earth. The high-gain antenna can send a "beam" of information in a specific direction, and it is steerable, so the antenna can move to point itself

directly to any antenna on Earth. The benefit of having a steerable antenna is that the entire rover doesn't necessarily have to change positions to talk to Earth. Like turning your neck to talk to someone beside you rather than turning your entire body, the rover can save energy by moving only the antenna.

Main Function	Transmitting or Receiving Data
Location	Mounted mid-aft-port-side of Curiosity's deck ("back")
Size	Hexagonally shaped 1 foot (0.3 meters) in diameter
Transmission Rates	160 bits per second or faster to the Deep Space Network's 112-foot-diameter (34-meter-diameter) antennas or at 800 bits per second or faster to the Deep Space Network's 230-foot-diameter (70-meter diameter)

The X-Band Low-Gain Antenna

Curiosity uses its low-gain antenna primarily for receiving signals. This antenna can send and receive information in every direction; that is, it is "omni-directional." The antenna transmits radio waves at a low rate to the Deep Space Network antennas on Earth.

Main Function	Receiving Data
Radio Frequency	X band (7 to 8 gigahertz)

Source: https://mars.nasa.gov/msl/mission/rover/communication/