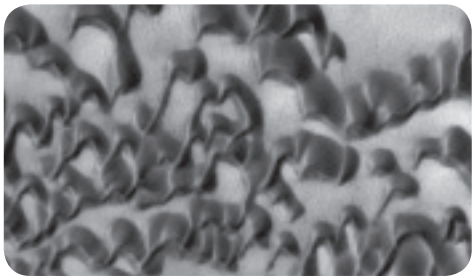
Ball Aerospace's HiRISE camera captures stunning, high resolution images of Mars with help from high performance Analog Devices converters

A worker at Ball Aerospace prepares the HiRISE camera for attachment to the Mars Reconnaissance Orbiter.

Launched into space via the Mars Reconnaissance Orbiter in August 2005, Ball Aerospace's High-Resolution Imaging Science Experiment (HiRISE) camera is the largest and highest resolution camera ever sent beyond Earth's orbit. With the ability to capture images of the Mars surface in swaths of nearly 4 × 7 miles at a resolution of approximately 800 megapixels, HiRISE is providing scientists with an unprecedented view of Mars geologic terrain and climatic processes, while enabling the identification of objects and surface features as small as a coffee table. HiRISE's ultra powerful imaging capabilities allow it to image the Martian surface at up to five times the resolution of previously utilized cameras, yielding images that are 20,000 × 40,000 pixels—it would take 1,000 typical computer screens to display just one large HiRISE image at full resolution.

Within HiRISE's image processing and memory module, twenty-eight high performance 14-bit ADI AD6645 analog-to-digital (A/D) converters are utilized across an array of fourteen charge-coupled devices (CCDs), which capture incoming light reflected off the Mars surface. These CCDs convert detected light into voltage, which is subsequently routed to the AD6645's for high speed conversion into digital data. This data is transmitted from the spacecraft to Earth via the Deep Space Network, where it will be radiometrically calibrated, organized into a mosaic image comprised of the fourteen individual CCD image strips, calibrated to account for spacecraft-to-Mars distance and positioning, and, ultimately, geometrically mapped to planetary coordinates. The resulting images are the most detailed pictures of Mars ever taken from orbit.



HiRISE image of sand dunes located at Mars polar desert.

Supporting a sampling frequency of up to 105 million samples per second (MSPS) and offering exceptional noise performance (74.5 dB signal-to-noise ratio through the first Nyquist band), the AD6645's satisfied Ball Aerospace's demanding performance and signal-to-noise noise requirements. Additionally, Ball Aerospace's stringent temperature and vibration testing demonstrated that the AD6645's were well suited for extreme environmental conditions brought on during spacecraft launch. With high performance, ultra reliable ADI data converters at the heart of the HiRISE camera, HiRISE has yielded over 17,000 high resolution images of Mars' surface over the last four Earth years—twice as long as the originally projected HiRISE mission life.

> "Analog Devices' data converters surpassed our core technical requirements and have helped to yield the stunning images of Mars that have defined HiRISE's historic mission."
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> **Thomas Ebben, HiRISE project manager, Ball Aerospace**