



The programmable MR-1A-XRV2 is a fully Magnetic Resonance Imaging (MRI) compatible linear motion stage for use inside the bore of an MRI scanner. The stage is made of precisely machined MRI-compatible materials and replicates, in real time, user defined dynamic and periodic motion profiles. Phantoms of different shapes can be positioned on top of the moving carriage. Alternatively an extension arm is connected to the carriage to push-pull objects (i.e. tumours) or to exert force on an elastic phantom.

Product Description

The programmable controller features user-defined and dynamic trajectory-following capabilities as well as accurate positioning control of the stage. The user-defined trajectories can be created in a spreadsheet template on any computer then loaded on the control system through a micro SD card. Data communication and positioning control is also achieved through a USB port. The stage and motor are controlled via a control unit that is positioned outside the scanner room. An LCD on the control unit provides the user with real-time updates of the exact position of the stage and mode of operation.

Versatility beyond 1 axis ...

Simultaneous superior-inferior (SI) & left-right (LR) linear motion can be achieved by rotating the stage to varying known degrees, similarly simultaneous superior-inferior (SI) & anterior-posterior (AP) linear motion can be achieved if the device is secured to angular wedges of varying and known degrees. The MR-1A-XRV2 motion stage offers a sinusoidal implementation. A second default motion can be added.

Designed and developed for use in an MRI environment, the MR-1A-XRV2 is compatible with other imaging modalities such as; CT, PET, SPECT, and Ultrasound.

**Custom modifications can be made upon request.*



Applications

This programmable linear motion controller and stage can be used for a wide range of applications in imaging, validation, and development studies:

- Evaluation of systems designed for MRI guided treatment
- Radiation therapy related research, motion assessment & validation
- Evaluation of motion correction algorithms
- Comparison, co-registration & validation of MRI, PET, SPECT & CT motion correction algorithms
- MR Elastography
- MRI guided robotics applications
- Evaluation of MRI guided HIFU treatment

System Specifications

Motion Stage

- Accuracy in reaching a fixed position: 0.1 mm
- Maximum NRMSE for dynamic motion with frequency < 1 Hz: 6.0%
- Max speed: > 30 mm/sec
- Max force: -> 20 N
- Max phantom weight/load: 6 kg
- Dimensions: 134 mm W X 72 mm H (90 mm with phantom adapter) X 287 mm L
- Carriage: 102 mm W X 95 mm L
- Range of motion: 50 mm (2.0")

Control System

- Communication USB
- Memory: Micro SD card
- Input Voltage: 12 Volts DC
- Input Supply Current: 3 Amperes

Modes of Operation

- Manual position control using step and direction keys
- Position control through computer by sending commands through USB port
- Execute sinusoidal trajectory with options of varying motion amplitude or frequency using keys
- Execute user defined dynamic and periodic trajectories with options of varying motion amplitude or frequency in real-time using specific interface keys

Additional Specifications

- Maximum scanner field strength: 3 T
- Memory: >32 MB for storing trajectories
- Temporal resolution: > 1 KHz
- LCD position Display: Yes
- Safety limit switch: Yes

Accessories

- Two cables with two DB9 connectors for connecting to the scanner room's penetration panel (length – up to 20 m)
- Cables from penetration panel to control unit
- Penetration panel adaptor plates upon request
- Micro SD card
- Power supply adapter
- Horizontal actuator arm with vertical plate for push/pull or deformation motion applications

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Patent Pending

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