

R-191: Low Cost Educational Shake Table

The ANCO Model R-191 earthquake shake table is a 1 DOF (horizontal) economical teaching tool for earthquake engineering, vibration, system dynamics, control systems, and data acquisition and processing studies and demonstrations.

- Portable, total weight <35 kg, no anchorage required
 - Table top: 30 x 30 cm with tapped hole grid for test item attachment
 - Achieves 1 g acceleration with a 20 kg payload
 - Peak displacement of +/- 15 cm
 - Peak velocity of 40 cm/s
 - Frequency range of operation is 0 to 20 Hz
 - Can be used as a large structure vibrator with 250 N force
 - Uses all-electric ball screw actuator
 - Requires single phase 300 Watt power
 - Includes ANCO's SPECTIME program for user-generated spectrum that is compatible with earthquake time histories
 - Provided with ANCO's FOXTROT hand held digital controller with library of preprogrammed and allows for user-supplied or user computed earthquake drive signals
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R-191



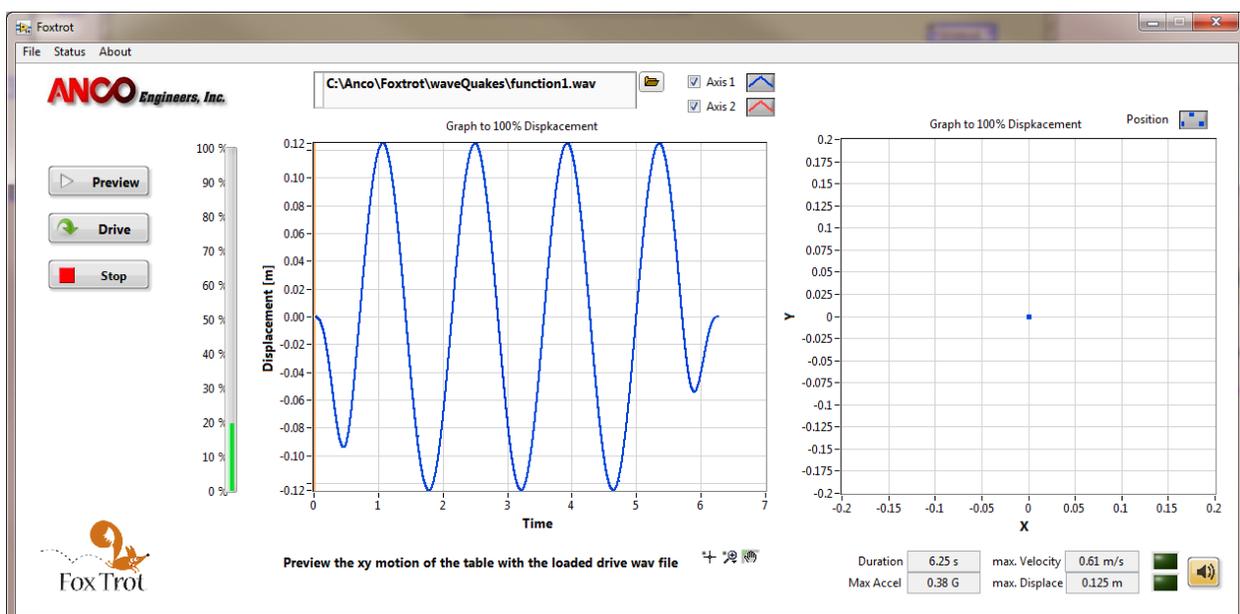
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BALL SCREW DRIVE accepts a +/- 1 V drive signal corresponding to +/- 100% displacement. This drive signal can be provided by FOX TROT or a user-supplied signal source. Ball screws use an electric servo motor with internal encoder and digital PID servo loop to drive the ball screw under displacement command. The frequency response exceeds 20 Hz depending on the table mass loading.

FOX TROT is a hand held digital controller that provides one channel of displacement drive signal to the ball screw drive. This controller uses an MP3 format file and a PC program is included that allows the user to convert external real or generated earthquake drive motions (or other wave forms) into the MP3 format and download them into FOX TROT. The program can also double integrate the user drive signals to calculate a displacement drive from acceleration data. A manual adjustment potentiometer of the output signal amplitude allows the user to scale the table drive from 0 to 100%. FOX TROT does not use a table feedback accelerometer but uses the displacement encoder to provide table feedback.

SPECTIME is a program that allows the user to enter the break points of a Required Response Spectrum (RRS) and then computes a time history with a similar RRS. This time history is imported to FOXTROT to drive the shake table.

FOXTROT GUI



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A User's Manual is provided that includes five suggested educational experiments and drawings of several educational test structures that possess a variety of dynamic properties.

OPTIONAL EQUIPMENT can be provided that includes sample models for study including a multi-story building, piping system, water tank, and base isolated simulated electronic cabinet.

The ANCO Model R-191 provides the following educational options to teachers and students:

- Demonstrates the concept that all structures have several modes and resonant frequencies.
- Shows how different types of earthquake motion cause different structural responses, such as, soil conditions or earthquake size and distance.
- Illustrates the nature of structural damping.
- Allows students to compete to build the most earthquake resistant structure according to various design principles and material constraints.
- Demonstrates the effectiveness of proper design versus inadequate design and how small changes can result in large safety margins.
- Demonstrates proper anchorage and safety measures of nonstructural equipment in a home or office.
- Enhances the students' understanding of energy distribution in an earthquake motion and how the energy distribution affects a structure's earthquake response.
- Allows the table to be used as a vibrator to excite a lab structure and demonstrate that real structures have resonant frequencies.
- Enables students to experience signal generation and processing in a servo control system.
- Enables students to perform structural control experiments.
- All of these topics are covered by the experiments described in the user manual which also includes quizzes to assess student comprehension.