# Four Poster Road Simulators

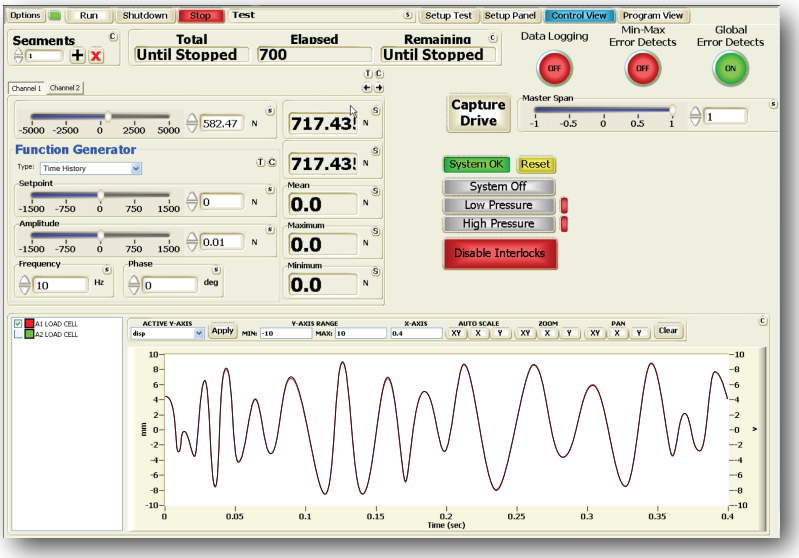
Couple our **94 Series actuators** and **high precision servo valves** with **Real Time Active Control (RTAC)** and you have the perfect ingredients for a **reliable, easy to use and accurate Four Post Road Simulator**. Push button reproduction of spindle acceleration means that **novice operators can recreate road profiles easily**, without long-winded training or specialized personnel.

## Four Post Road Simulators are the workhorse for ground vehicle development, from lawn tractors to large off-road construction equipment.

They are used for many different test applications in the automotive industry:

- Structural durability
- Squeak and Rattle assessment
- End-of-line quality control
- Ride Comfort evaluation

## Shore Western's proprietary Real Time Active Control can effortlessly replicate your events with the push of a button




RTAC is a point-by-point reproduction that ensures an entire waveform is reproduced, whether it is a periodic sinewave, or a time history. Phase and amplitude across channels are preserved, making a **multi-channel real-time simulation** possible. What makes RTAC particularly powerful, is the fact that it can run in a "**mixed mode**." This means that you can run the digital optimization with a different transducer than the analog control loop. As an example, you can run the PID loop in **displacement control, while commanding, optimizing, and reproducing spindle acceleration**.

Set up of RTAC is relatively straightforward. A step-by-step process is followed, which leads to a **full simulation in minutes**. Drive files (the files that are used to reproduce the target response) can be stored for use later. When RTAC has finished converging, its adaptation can continue as the specimen properties change (e.g. stiffness), or it can be frozen.

To perform this same task, our competitors use an arcane frequency domain based modeling technique that was invented in the 1970s. Since then, little has changed in the basic technique, which requires a difficult and time intensive set up, and takes highly experienced personnel. Also, compensation is not possible once the test has started, it is effectively open loop. **RTAC is another industry first**. It significantly reduces the required setup time, removing many of the difficulties of a time history simulation, while **improving accuracy throughout the entire course of the test**.

The Multi Axis Function Generator panel is preconfigured with the controls you need, but it can be completely **customized with your own buttons, lights, meters, sliders, and pop-up controls**. It also has Block Programming capability, so that you can define the events before and after the test, along with what happens if there is an emergency stop, controlled stop, or immediate stop. Drive files can be nested and looped to create a long-term fatigue test.

## Our Four Posters feature double acting, double-ended, fatigue rated linear actuators with hydrostatic bearings.

These Actuators feature **hydrostatic bearings** in their end-caps, which support the piston rod with very low friction, and prevent the rod from galling under high side loads. The 94 Series Actuators also feature **polymer back-up bearings** to protect the rod if the hydraulic pressure is lost for any reason.

Wheel pans and restraints keep the vehicle safely secured on the system, while minimizing extraneous side loads through the tires.

Shore Western 94 Series Actuators are fatigue rated, with a **chrome plated one piece heat treated 4140 alloy piston rod**. Hydraulic cushions in the end-caps prevent damage in the event of a runaway condition.

Our four posters can be sized to meet your specific needs, with standard stroke lengths of 6 inch (150 mm) and 10 inch (250 mm), and force ratings from 6.75 kip (25 kN) to 50 kip (230 kN). Other stroke lengths and force ratings are available on request.

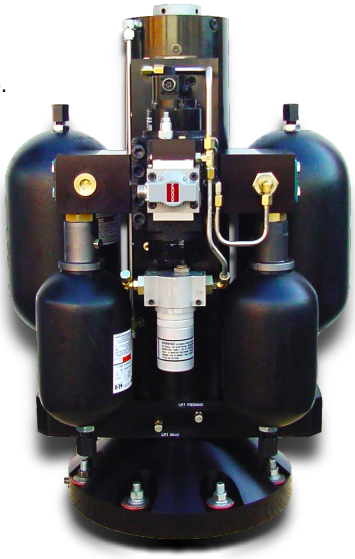
## Standard Configurations

The 943e standard configuration includes four actuators with LVDT (displacement transducer), servo valves, and pedestal base, a Hydraulic Service Manifold, a quiet Whisperpak pump and our Shore Western Control System (SWCS). Any element may be deleted and options may be added to match your application.

| Model | Vehicle GVW | | Area | | Force@3000 psi | | Overall height at mid stroke (in/cm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | lb | kg | sq in | sq cm | (lb) | kN | 6 in | 15 cm | 10 in | 25 cm |
| 943e-2.25-xx-8 | 5,500 | 2,500 | 2.25 | 14.52 | 6,750 | 30,025 | 39.95 | 101.47 | 49.95 | 126.87 |
| 943e-3.10-xx-8 | 7,700 | 3,500 | 3.1 | 20.00 | 9,300 | 41,368 | 33.95 | 86.23 | 43.95 | 111.63 |
| 943e-4.00-xx-8 | 11,000 | 5,000 | 4 | 25.81 | 12,000 | 53,379 | 33.95 | 86.23 | 43.95 | 111.63 |
| 944e-7.86-xx-8 | 22,000 | 10,000 | 7.86 | 50.71 | 23,580 | 104,889 | 35.88 | 91.12 | 45.88 | 116.52 |
| 945e-7.86-xx-8 | 44,000 (Front Axle) | 20,000 (Front Axle) | 7.86 | 50.71 | 23,580 | 104,889 | 41.88 | 106.36 | 51.88 | 131.76 |
| 946e-12.76-xx-8 | 44,000 (Rear Axle) | 20,000 (Front Axle) | 12.76 | 82.32 | 38,280 | 170,278 | 50.50 | 128.27 | 60.50 | 153.67 |
| 945.5e-12.76-xx-8 | 55,000 (Front Axle) | 25,000 (Front Axle) | 12.76 | 82.32 | 38,280 | 170,278 | 43.75 | 111.13 | 53.75 | 136.53 |
| 946.5e-17.14-xx-8 | 55,000 (Rear Axle) | 25,000 (Rear Axle) | 17.14 | 110.58 | 51,420 | 228,728 | 51.50 | 130.81 | 61.50 | 156.21 |

| Model | Vehicle GVW | | Wheel Pan Dia | | Servo Valve | | Max Velocity | |
|---|---|---|---|---|---|---|---|---|
| | lb | kg | in | cm | gpm | l/min | in/s | cm/s |
| 943e-2.25-xx-8 | 5,500 | 2,500 | 25 | 63.50 | 2x16 | 2x60 | 60 | 152 |
| 943e-3.10-xx-8 | 7,700 | 3,500 | 17 | 43.18 | 130 | 494 | 200 | 508 |
| 943e-4.00-xx-8 | 11,000 | 5,000 | 17 | 43.18 | 130 | 494 | 150 | 381 |
| 944e-7.86-xx-8 | 22,000 | 10,000 | 17 | 43.18 | 200 | 760 | 145 | 368 |
| 945e-7.86-xx-8 | 44,000 (Front Axle) | 20,000 (Front Axle) | 25 | 63.50 | 200 | 760 | 145 | 368 |
| 946e-12.76-xx-8 | 44,000 (Rear Axle) | 20,000 (Front Axle) | 40 | 101.60 | 330 | 1254 | 150 | 381 |
| 945.5e-12.76-xx-8 | 55,000 (Front Axle) | 25,000 (Front Axle) | 25 | 63.50 | 330 | 1254 | 150 | 381 |
| 946.5e-17.14-xx-8 | 55,000 (Rear Axle) | 25,000 (Rear Axle) | 40 | 101.60 | 500 | 1900 | 175 | 445 |

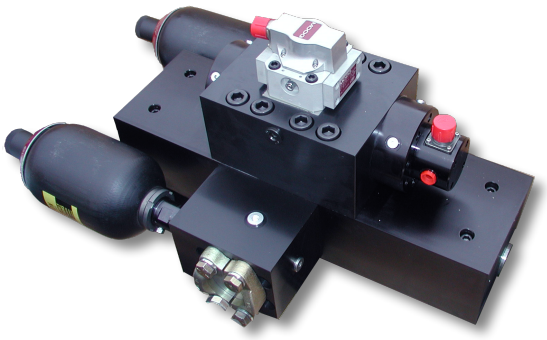
## Actuator Standard Features



- Construction: double ended with equal areas and balanced force output through zero. Fatigue rated one piece piston and rod constructed from 4140 alloy steel. Oversized rod and thick walled cylinder for bending strength. End caps include hydraulic dashpot cushions to prevent damage in runaway conditions.
- Bearings: four pocket self-aligning hydrostatic end-cap bearings for high side loads and low friction. Non-metallic back-up bearings prevent galling failures in the event of pressure loss.
- Seals: high pressure/low pressure arrangement with drain back ports. Very low friction labyrinth seals are available.
- Displacement Transducer: integral displacement transducer that provides repeatable and accurate displacement measurements. This LVDT is concentrically mounted, eliminating anti rotation restrictions. Other transducer types are available on request.

## Manifolds

- Servo valve manifolds with oversize ports for a variety of servo valves are available with the following options:
    - Dual two stage or single three stage configuration
    - Differential pressure transducer
    - Close coupled accumulators
    - Pressure on/off control
    - Switchable high and low flow servo valves



## Common Options

- Switchable valves also available for man-rated applications
- Custom stroke lengths
- Custom cylinder bore for optimized rod diameter/force output
- High pressure input up to 5000 psi (345 bar)
- Static Support to hold up the vehicle mass, and provide more dynamic force capacity
- Automated X-Y positioners for wheelbase and/or track adjustment
- Custom wheel pans and restraints

Shore Western can help you with your **facility design** too. Simulators can be placed **below floor level to provide drive-on-drive-off convenience.** They may include an **inspection pit**, and they may be housed in a **full environmental chamber** to reproduce temperature and sun load extremes.