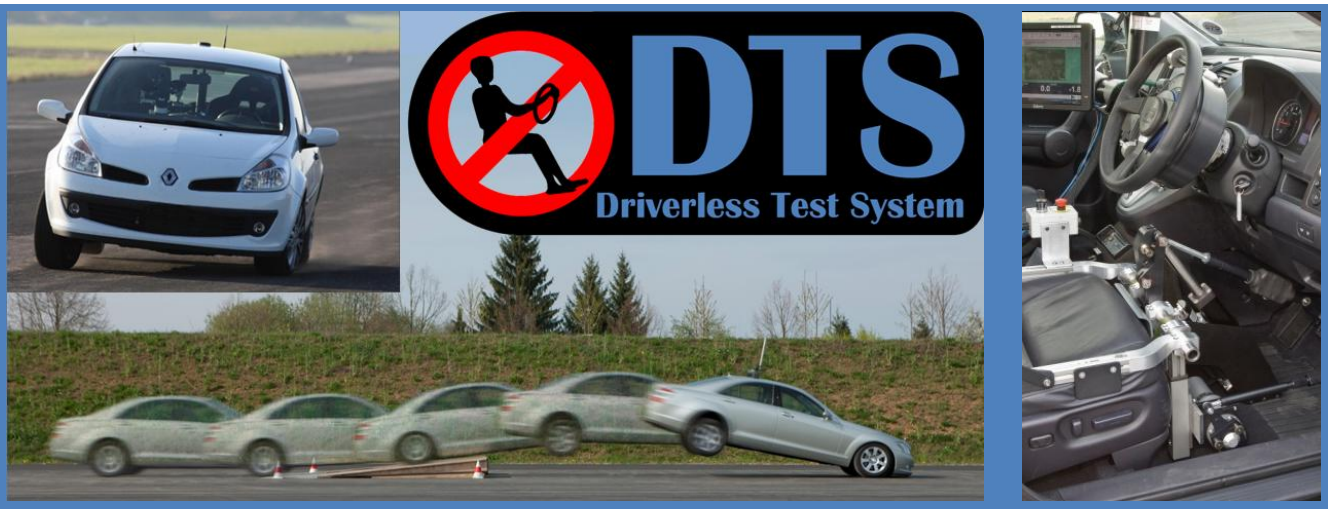
Driverless Test System

Outline specification

from Anthony Best Dynamics Ltd

Robots suitable for use in DTS: SR15 – SR30 – SR60 – Torus – SR150 – BR1000 – AR1 – CBAR – GR – CR

The Anthony Best Dynamics (ABD) range of driving robots includes steering robots, brake robots, accelerator robots and a gear-change robot with clutch actuator. ABD robots have been used by clients around world since 1997 to provide reliable and accurate control inputs to vehicles for proving-ground testing. The Driverless Test System (DTS) builds upon this proven technology to allow accurate and high-speed test driving with no human driver in the vehicle.



Driverless fish-hook test (*above left*), driverless misuse testing (*bottom*), on-seat DTS installed in a Honda (*above right*)

The Driverless Test System can be specified with any of ABD's range of steering robots, together with brake and throttle actuators - either the BR1000 and AR1, or the combined brake and accelerator robot (CBAR). The Gear Robot and Clutch Robot can be added for use in vehicles with manual gear-shift or to operate sequential automatic gearshifts.

The DTS also includes ABD's Path Following system, enabling the robots to guide the vehicle along a pre-defined path with the vehicle's position, speed and time along the path all precisely controlled. The vehicle's position feedback is provided by a 2cm-accurate GPS-corrected motion pack. ABD's Duramon software can be used to monitor the vehicle's condition. High-speed wireless telemetry enables the user to supervise the vehicle from a suitable base-station beside the track.

A safety system monitors all of the critical system elements at high frequency and can apply a secondary brake actuator rapidly in case of a problem (even a total electrical failure), to bring the vehicle safely to a stop. Users can also stop a vehicle from the base-station.

Applications:

With seven Driverless Test Systems already supplied (as of 2010), the DTS is already being used in a wide variety of applications by ABD customers around the world:

Vehicle dynamics

The full range of objective dynamics tests can be run without a human driver; reducing risk, enhancing the accuracy of the manoeuvre and improving data coherence.

Durability

Durability testing is typically arduous, physically demanding and tedious for the drivers. However, these are ideal conditions for robotised testing.

ADAS testing

ADAS: advanced driver assist systems. Testing these systems requires the precise positioning and timing of multiple vehicles – impossible for human drivers.

Misuse testing

Includes driving vehicles over ramps and sand-bank impacts to check airbags only deploy when they should. Very unpleasant for human drivers, but no problem for robots.

DTS configurations

ABD has developed a number of system configurations to suit the various applications for driverless testing. Some typical examples include:

Under-seat actuators and SR30	On-seat actuators and SR60	CBAR and SR15
The pedal actuator assembly is attached directly to the seat-bolts in place of the standard seat and a lightweight racing seat (*not shown*) is attached above.	The brake robot frame is fixed to the driver's seat, and the accelerator robot and safety brake actuator are attached. The safety brake actuator can be removed in seconds to allow normal driving.	The pedal actuators are located in front of the driver's seat, without impeding normal driving. A lower-cost option than the standard brake and accelerator robots.
The SR30 is designed to perform objective vehicle dynamics testing – the original steering robot.	The SR60 has increased torque and is ideal for performing fish-hook and sine-dwell tests.	The SR15 is the lightest and least expensive ABD steering robot with the quickest installation and removal time.
Example of usage: ADAS testing – multiple vehicles following paths in close proximity to each other. Ideal for longer-term installation in-vehicle.	Example of usage: Performing aggressive tests which may result in roll-over, without risk to a driver. On-seat pedal actuators can be installed more quickly than under-seat version.	Example of usage: Durability testing requiring ruggedness and the minimum possible equipment weight. Installation time reduced to a minimum.

DTS base-station

The base-station is normally located within line-of-sight of the test track (although this may not be possible for durability testing). The base-station can be installed in a building or even in another vehicle. The base-station software displays real-time information about the vehicle's position, speed and heading. When multiple vehicles are being tested simultaneously, their relative positions and velocities are also available.

Tests can be configured and run from the base-station and the data uploaded immediately afterwards for analysis. Video and audio data channels can also be sent from the vehicle in real-time, allowing the users to check for vehicle problems.

Remote controls (a steering wheel and pedals, *right*) may be used to drive the vehicle from the base-station. An E-stop button allows the vehicle(s) to be stopped quickly in an emergency.

By taking the human driver out of the vehicle, ABD's driverless system enables the most dangerous and arduous vehicle tests to be performed accurately, repeatably and without risk of driver injury.

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ABD has representatives throughout the world.
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17 of the top 20 most successful* vehicle manufacturers in the world **use ABD robots** to develop their vehicles.
* by global sales volume, 2009