

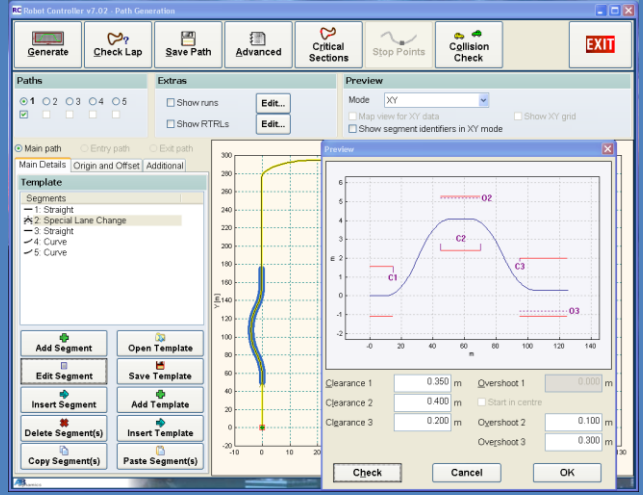


An upgrade for ABD steering robots; also used in ABD's Driverless Testing System

The path following system from Anthony Best Dynamics (ABD) offers a major enhancement to the capabilities of driving robots, enabling the robot system to guide a vehicle along a path at any speed, with exceptional accuracy and repeatability. Path following uses feedback from a 2cm GPS-corrected inertial motion pack to make real-time corrections to the vehicle's steering, keeping the vehicle on the path.



Driverless testing using path-following software

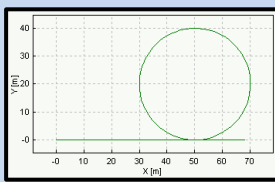


Path-generation utility: short ISO lane-change

Path following can be used with any current ABD steering robot (together with pedal robots if available) and also forms an integral part of ABD's **Driverless Test System** and the **Soft Crash Target Vehicle**. It can be used for short duration tests, such as the ISO lane-change, and also for long tests such as multiple laps of a durability circuit. It offers significant improvements in vehicle testing accuracy and repeatability, leading in turn to cost and time savings.

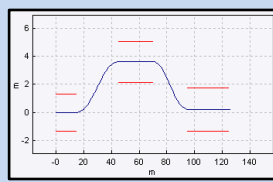
Path following can be used on any suitable test track without need for any modification to the track surface. A path (command file) can be **generated using data** recorded while driving, or alternatively may be **created in geometric segments**, as shown *above right*. Paths can have associated speed profiles enabling ABD pedal robots to control the vehicle's speed.

Some examples of tests that can be performed with path following:



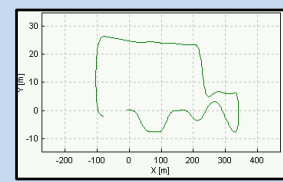
Steady state cornering

Traditionally driven manually around a painted circle; with path following this test can be done at any location on a VDA and path overlay repeatability is guaranteed. Speed control can be manual or using ABD pedal robots.



Double lane-change

The ISO lane change manoeuvres and the American Consumer Report lane-change profiles can be automatically programmed and then precisely optimised through the cones for maximum speed, maximum smoothness or other objectives.



Complete laps of a circuit

A path can be recorded around a circuit and replayed for as many laps as needed. No human test driver can drive multiple laps as repeatably as a path following system, allowing the engineer to evaluate the variables he's really interested in!

- Used safely and reliably by customers at **over 200kph**
- Can be automatically tuned for a **huge range of vehicles**
- In use for more than **10 years** around the world
- Recognises and responds automatically to **over-steer or under-steer**
- Multiple vehicles can be **synchronised** using GPS time



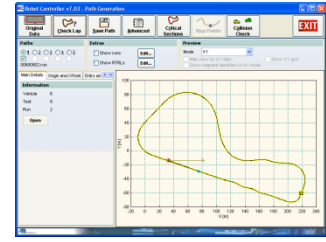
The minimum required system elements for path following are:



**ABD steering robot**  
(SR15, SR30, SR60, Torus, SR150)



**2cm GPS-inertial motion pack**  
(currently OxTS, GeneSys or iMAR)



**Path following software**  
(see below)

Additional ABD robots can also be used for the control of vehicle speed, controlled pedal inputs and gear-change.

**Path following software**

As of 2011, path following software can be purchased in modules, each tailored for a particular type of testing. This means that **upgrading to path following is now more affordable than ever**. There are path-following modules for vehicle dynamics, ADAS testing and durability testing, each carefully designed to offer the features needed by engineers specialised in those fields:



**SR Opt 12a**  
**PF starter pack**

- PF standard test
- Generate paths from geometric segments
- Generate paths using recorded data
- Steady-state cornering (constant radius circles)
- Critical sections – for improved safety in high-risk path sections
- Speed control (when used with AR): constant velocity; throttle on/off



**SR Opt 12b**  
**Dynamics module<sup>1</sup>**

- Optimised lane-change manoeuvres (ISO and Consumer Report)
- On-centre steering feel test
- PF lead-in to an open-loop test – used to perform any other steering robot test at a specific point on the track



**SR Opt 12c**  
**Durability module<sup>1</sup>**

- Speed control (when used with AR): varying speed profile along the path
- Stopping on a point (precise control of the stopping position)
- PF lap test: multiple laps of the same circuit path, with optional entry and exit paths



**SR Opt 12d**  
**ADAS module<sup>1,2</sup>**

- Start test using GPS time (for synchronised testing)
- Time-synchronised control of position along the path (needed for multiple vehicle interaction)
- PF straight-line triggered path test, used for cut-in manoeuvres
- Virtual guide rails to relax or disable PF control in specific sections of the path
- Path following in reverse

<sup>1</sup> requires SR Opt 12a, <sup>2</sup> requires SR Opt 12c

For more detailed information on this and other related products contact:

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ABD has representatives throughout the world.  
For details please refer to our website:  
[www.abd.uk.com](http://www.abd.uk.com)

**The top 5 most successful\* vehicle manufacturers in the world all use ABD Path Following to develop their vehicles.**

\* by global sales volume, 2009