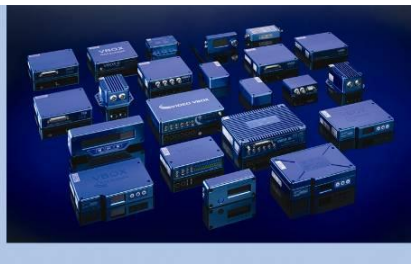
How we verify the brake test accuracy of VBOX



Verifying the brake test distance accuracy of VBOX

To allow us to verify the brake test measurements obtained by the VBOX unit, we teamed up with some major car and tyre manufacturers to develop an accurate and independent validation.

We start by using a fixed known starting point for the braking event. We then use a marked line on the test track which has been drawn perpendicular to the direction of travel. This line has to be at precisely 90 degrees to the direction of travel, as it is difficult to drive the car over exactly the same place every time and we need an accurate start point.

VBOX 3i accurate to within ±2cm

We fix a reflective strip along this line, and attach a laser trigger to the side of the vehicle, pointing straight down, to pick up when the car has crossed the line (right). This laser trigger has to be mounted low on the vehicle to reduce any effects from the car pitching as it crosses the line. It is important not to start the braking period until after the vehicle has passed over this line, as the car will begin to yaw under braking, which can cause a lever arm effect on the measurement point.

Fixed starter point with laser range finder

The laser trigger we use has a very low latency of 0.2ms. This is important because we don't want to introduce any delays at this critical stage, as the vehicle is travelling at 28 metres per second. The output from the laser trigger is fed into the brake trigger input on the VBOX and replicates the triggering of the pedal sensor, but from a precise known starting line. The vehicle is then driven at 100km/h up to the line and then the brakes are applied straight afterwards until the vehicle comes to a stop.

It is then a case of measuring the distance that the vehicle has travelled since crossing the line and comparing this with the VBOX measured distance.

It is very important to measure from the same point on the vehicle, as the vehicle will not always come to a halt pointing in a perfectly straight line. Therefore we place the GPS antenna over the top of the laser sensor, and measure from this point.

Fixed laser range finder

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July 2011

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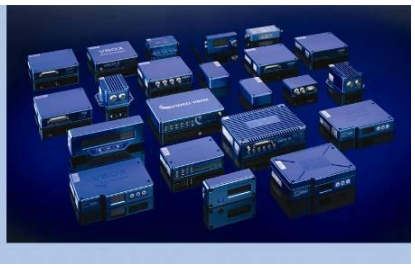
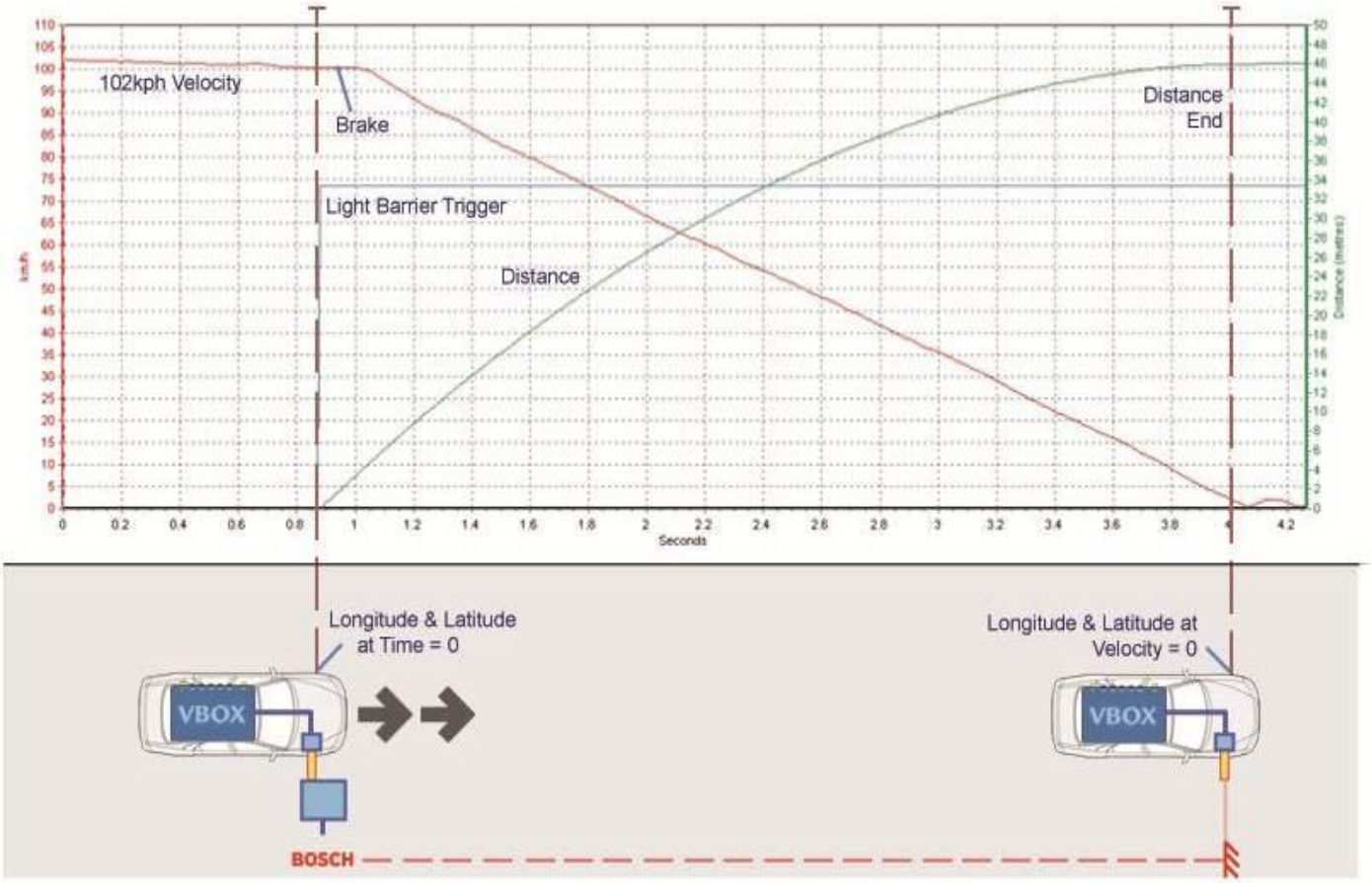


Outlined below is the system used to validate the accuracy of VBOX when measuring braking distances:



Validate the accuracy of VBOX for measuring braking distances

Using the light barrier provides a reference point to verify the distance measurement using a laser. This enables us to confirm the brake distance accuracy of VBOX at ±2cm.

Laser Range Finder

To physically measure the stopping distance, we use a Bosch Laser rangefinder (left) placed on the starting line. This is aimed at a plate which is then placed on the vehicle mounted laser sensor.

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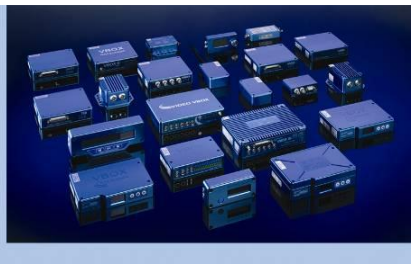
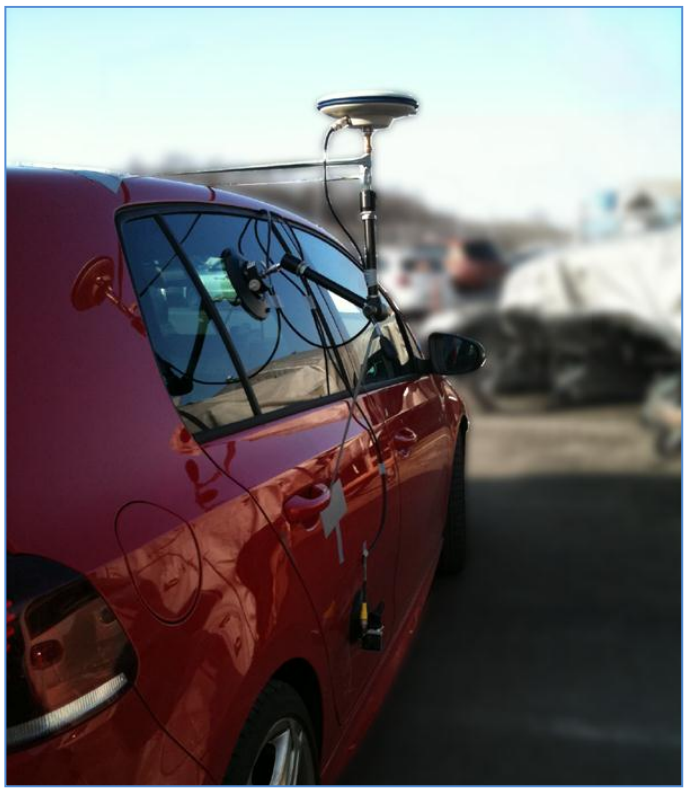


As a third method we use our RTK GPS & GLONASS VBOX system and share the same antenna as the primary brake testing VBOX. We send corrections to this unit from a base station placed next to the track, enabling precise distance measurements from the fixed start line to the stationary vehicle.

As all three methods are measuring the same distance, a direct comparison can be made. This enables us to validate the braking distance determined by the VBOX.



DNSS Base Station
By programming the known GPS position, a Base Station can accurately monitor any variations between the position obtained and its own programmed position.

When combined with a VBOX GPS system such as the VBOX 3i, the base station can provide positional accuracy of 95% CEP.

VBOX 3i RTK
By combining a VBOX 3i with a Base Station using Real Time Kinematic (RTK) techniques, it enables users to gain repeatable, stable results to within 2cm accuracy.

How accurate is VBOX for brake testing?

In a recent test with a major motor manufacturer, we checked the accuracy of VBOX against a light barrier, laser, and RTK DGPS setup with BaseStation, all of which confirmed under 2cm accuracy.

We also captured the tests on our LabSat GPS simulator, which records the raw GPS signals and the brake trigger input, and allows us to replay these tests through any VBOX on the bench. This allows us to have a repeatable reference to check against any new firmware or hardware updates, and maintains a high standard of brake testing accuracy.

For more information on VBOX and to find the right VBOX GPS data logger for you, go to www.velocitybox.co.uk or contact us at vbox@racelogic.co.uk