

driver's aid



A smooth ride

A new ergonomically designed driver's aid system can lead to less time pounding the roads

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A part from standard drive cycle runs on chassis dynamometers, the ErgoDrive 2002 driver's aid provides new means for optimizing times and costs when testing vehicles. In addition to other functions, the 3D animation makes simulation of test drives for passenger cars, trucks and racing vehicles on the chassis dynamometer possible. Driver's aid software runs on a standard PC or on a special hardware platform allowing operation at temperatures from -30 to +55°C, and the simulated road can be generated using the GPS data of the real road. ErgoDrive 2002 is thus ideally

suited for use in climatic chambers and climatic wind tunnels.

The driver's aid is an important human-machine interface for simulating test drives on chassis dynamometers. Similar to a test drive on a real road, the driver controls the car using the driver's aid animation as a visual feedback. ErgoDrive 2002 has been optimally adapted to the test task and the test driver with regard to ergonomics and spatial perception to meet not only the demands of standard applications such as emission certification, but also the new areas of application such as fuel consumption tests, brake power and cooling

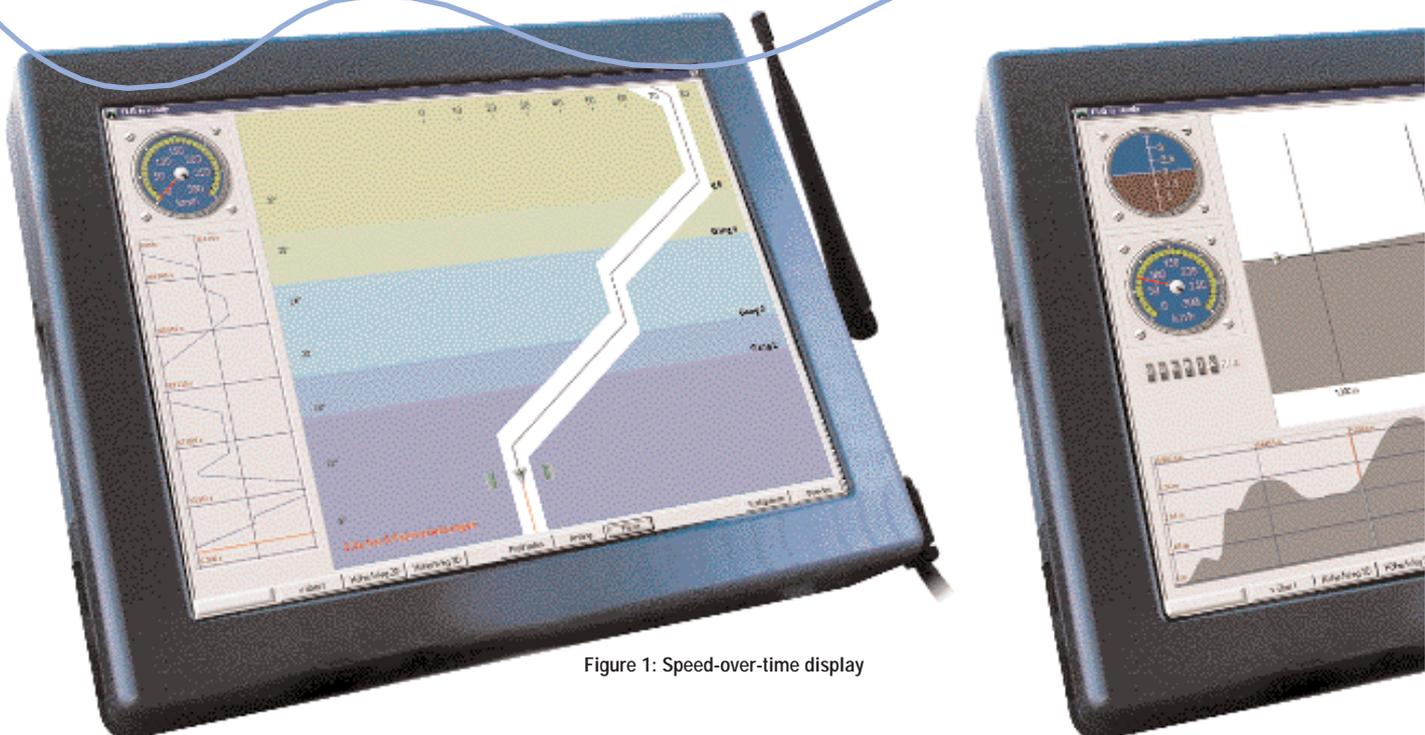


Figure 1: Speed-over-time display

capacity tests, and driveability evaluation. The driver can fully concentrate on his tasks and still relax over an extended period of time, resulting in a low rate of driving errors being incurred by out-of-tolerance hits. The driver's aid has extended operating and visualization functionalities in addition to those of conventional driver's aids.

ErgoDrive 2002 can function as a stand-alone unit with the corresponding functions such as remote operation and control of measuring processes, and also as part of a complex automation system with a chassis dynamometer host computer. ErgoDrive 2002 provides various operating modes including: speed-over-time display (for exhaust emission certification (Figure 1)); 2D road gradient profile with overall views of the route (Figure 2); and 3D animation (powered by an advanced GPS-interface and a user-friendly landscape editor (Figure 3)). A combination of speed-over-time display with 3D animation is also possible for special applications. All visualization modes operate under Windows 98, Windows NT and Windows 2000, while the user interface emulates the Windows look and feel. Customizable support is provided, and apart from the most important basic settings, the visualization layout can be freely configured by the operator. Furthermore, it is possible for the user to create new, and edit existing drive cycles including gear shift tables, digital outputs, etc.

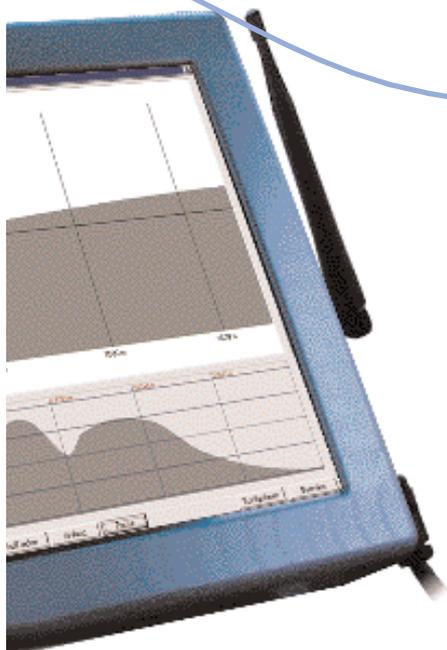


Figure 2: 2D road gradient profile and view of the route

Climatic chamber with radio-Ethernet: Figure 4 shows a possible system structure. Radio-Ethernet is used for communication between a special hardware platform suitable for a climatic chamber (a mobile outdoor PC for example) and the host computer.

In a climatic chamber application, the driver's aid (DA) integrated with a chassis dynamometer host computer (CDHC), with synchronous visualization of the driver's aid carried out on two computers. One (computer two, outdoor PC) is situated in the vehicle in a climatic chamber, while another (computer one) is in the operator room. The system consists of three computers:

- Computer 1: the driver's aid computer in the operator room that monitors the test run;
- Computer 2: a mobile outdoor PC that instructs the test driver during a test run in the vehicle;
- Computer 3: chassis dynamometer host computer (CDHC), with man-machine interface (MMI) that operates/monitors the chassis dynamometer from the operator room;

The computers run the following software: DA 2D and 3D for visualization modes; 2D for speed over time or 2D road gradient profile; and 3D animation of ErgoDrive 2002; DA client for operation of the driver's aid (test-run start, pause, end, load drive cycle, edit configuration, etc); LabMap as a shared data interface; LabNet as

a network data interface over TCP/IP, allowing sharing of global data such as status, fault messages, state of I/O channels, etc over the LAN; LabTmc10 as an interface to the TMC10 digital I/O card; and MMI for operating and monitoring the chassis dynamometer.

The outdoor PC features connection to the cigarette lighter/onboard socket; an accumulator battery to bridge power cuts; radio-Ethernet; and operation in temperatures ranging from -30 to +55°C.

These special features facilitate a wide range of applications in vehicle test technology such as climatic chambers and wind channels. Thanks to the use of radio-Ethernet and connection to the cigarette lighter/onboard socket, mounting effort is minimal, and the mobile outdoor-PC can be operated exclusively via a touch-screen.

Areas of application with DaimlerChrysler: DaimlerChrysler in Stuttgart-Untertürkheim currently uses the 2D or 3D animation of ErgoDrive 2002 on a chassis dynamometer for trucks as a visualization tool for truck drivers.

The chassis dynamometer is used for testing the entire drive assembly of heavy trucks with an overall weight of over 7.5 tons, and can continuously absorb or generate powers of ±600kW. To provide adequate cooling for the vehicle during a test



Figure 3: 3D animation

Robot development

run, a cooling fan has been installed to set the temperature of the relative wind, and to define a maximum ambient temperature of +40°C. Apart from the usual performance and brake tests, the main activities on the chassis dynamometer are tests of cooling system performance, exhaust emission, and fuel consumption. In the past, these tests were mainly performed under stationary conditions at partial or full load, but progress in chas-

sis dynamometer and control technology now offers dynamic alternatives to the conventional road test by simulating resistances and vehicle-mass inertia simulations during driving. This operating mode is usually referred to as 'drive simulation'.

Drive simulations on the chassis dynamometer have economic advantages over road tests, and also provide test results that can be clearly interpreted.

During a road test, the test parameters may vary greatly due to ambient conditions (temperature, precipitation, friction between road surface and tires, etc) and traffic situation, and thus negatively affect the test results, while the chassis dynamometer always provides constant peripheral parameters. Since dynamic fuel consumption tests are especially prone to interference, they were the first category to be transferred to the chassis dynamometer.

To perform fuel consumption tests as realistically as possible in comparison to real road-tests, a drive robot must be used on the chassis dynamometer, or a visualization tool must be employed to provide the human driver with precise information on the test route. The latter option would have required a drive robot to be adapted to the highly diverse configuration of trucks to be tested, and an algorithm developed for shifting and drive behavior. Taking into account largely divergent load and performance parameters, a decision was made in favor of human drivers on the chassis dynamometer.

Since late 1999, the driver's aid has been supporting the successful performance of fuel consumption tests on the chassis dynamometer. To maintain the high degree of acceptance shown by the drivers, cbb-software continued developing the functions of the 3D animation. The driver's aid allows simulation and visualization of freely defined test routes on the chassis dynamometer in addition to real routes previously recorded with a GPS receiver during a reference drive. An expansion of the drive simulation to cover brake performance measurements with non-wear brake systems (engine brake, retarder) on downhill routes is scheduled for the future. ●

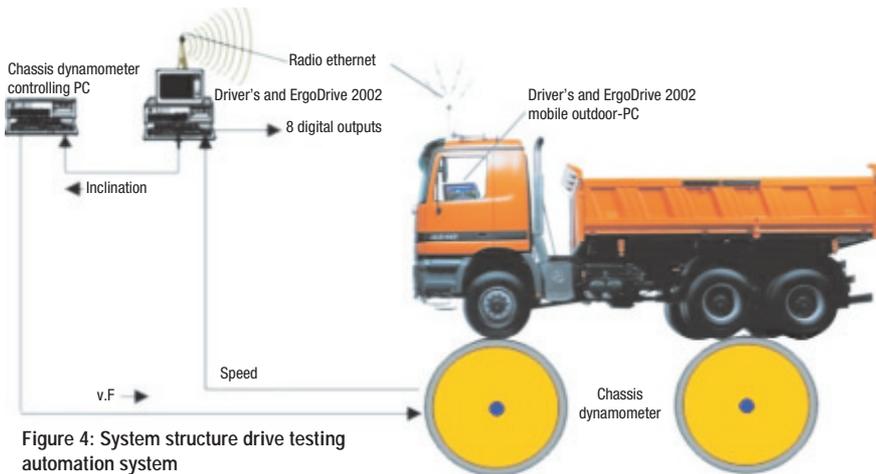


Figure 4: System structure drive testing automation system

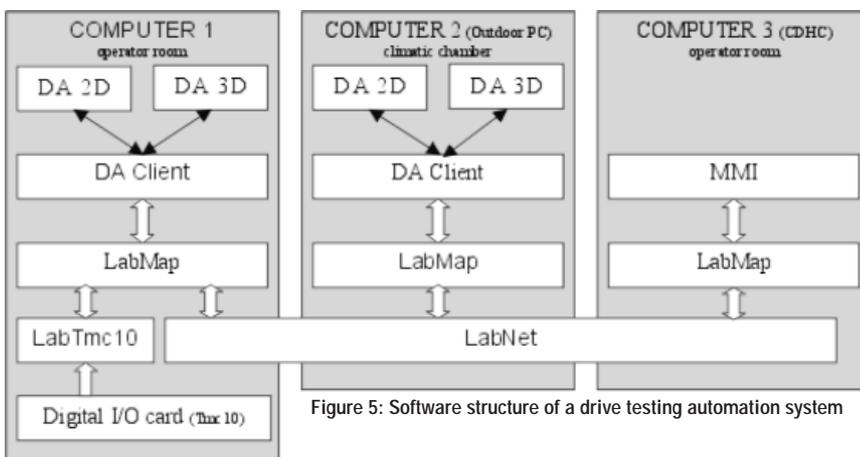


Figure 5: Software structure of a drive testing automation system



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