All Channels Under Control

Switchable USB hub Brings Order to Test Activities of Multimedia Devices

In the meantime, the choice of a car depends less on the HP, than on the infotainment offer. Opel f.ex. already advertises its iconic compact car „Adam“ as a „smartphone on wheels“. It is expected that memory sticks/cards, smartphones or PDA´s can be connected and operated in modern vehicles. The USB standard serves as an interface in the vehicle and the mutlimedia hubs ensure the management and connection of those devices. Through the focus on infotainment systems, consumer electronics and IT finally made their entrance into the vehicle.

The testing of infotainment systems was new territory for those who are responsible for End-of-Line tests and other tests such as RunIn, stress tests and endurance tests. Therefore, the unfamiliar devices according to the vehicle environment and their USB interfaces were causing worries. Bruno Hörter, CEO of measurement specialist MCD in Germany, remembers the time this topic caused many sleepless nights. The reasons for this were sloppy switching operations and system crashes caused by USB controlled devices. Incorrectly connected and disconnected USB devices were the reason for chaotic conditions. Some of the devices already caused problems during the boot process, while others crashed and had to be reset.

The operators bitterly missed the possibility to switch specific USB ports on and off. The worldwide market was researched feverishly without any results and alternatives to solve this problems. A USB hub with the possibility to remote-control specific ports and connect or disconnect them just did not exist. MCDs engineers felt the necessity to develop such a device and began to realize it on their own. All possibilities which were missing during device testing were combined into a new concept. The result was simple in its outward appearance, but full of quality within. Bruno Hörter says the whole

measurement technology world has been waiting for this development to finally cure these problems from the past.

This USB hub has eight downstream ports, which can be turned on and off individually via USB. When switching it off, the supply voltage (+5 V) and the data lines on the semiconductor switches are separated. The control is via the USB hub Toolmonitor (PC software), which is included in the delivery in form of an USB memory stick. Each USB port can be used as standard port (SDP), load-in line (CDP) or as a charger connection (DCP) and provides the connected device up to 1.5 A. Whether or not and which ports are to be active after switching on the hubs (for example, access to the mouse or key-board to have) can be stored in non-volatile memory. Via a button on the device, one can either temporarily shut down all ports or restore the previous switching state of all ports.

The hub enables emulation of battery chargeable ports according to USB-IF BC1.2 CDP with up to 1.5A on each port or emulation of dedicated chargers according to USB-IF BC1.2 DCP, YD/T-1591 (2009) and other manufacturer-specific charger protocols with a charging current of up to 2.5A (without USB data communication). Additionally to the USB ports, the USB hub still has a 8-channel relay multiplexer, with an individual, centrally supplied voltage on each port (max. 48 V) and independently switchable, e.g. device supply with a voltage other than 5 V enabling extensive stress tests. The shut down takes place for both probes, making sure that the wires are potential-free.

The first implemenation of the USB hub was an EOL test of a multimedia hub for luxury vehicles. The test activities now ran in an organised manner be-cause the USB channels could be switched on and off specifically according to the test plan, including automatic connection and disconnection of USB devices. Without the control via MCD´s USB hub during repeated starts and restarts, problems occurred causing inevitable disruptions of testing proce-dures after running a few test sequences. Outputs of the mutimedia hub can

be supplied with different units by a computer-controlled USB channel switch-over (f.ex. switching of USB sticks and cards, smartphones, PDAs and many more on the USB connection to be tested). Due to the electrically intelligent control, switching operations can be ran without disruptions and are constantly reproducible, which is very essential for serial production. U-sing the additional switching channels, loads on the USB voltage sources can be simulated and measured. The distribution of various test voltages on DUTs are possible by using different hubs with changing voltages.

RunIn, Stress Test, Endurance Test:

During RunIn tests, many DUTs are measured and stimulated simultaneous-ly. Using a couple of MCDs USB hubs the DUTs are provided with different supply voltages. The source/sink connected to the relay matrix can load po-tential and exposure profiles using its integrated control. By these means, extreme situations which happen to occur in a vehicle wiring system from time to time, can be simulated very well. Using the USB outputs, control channels of DUTs are switched onto a couple of USB computer interfaces and the communication is checked under extreme conditions.

During the test program, MCD´s USB hubs switch the channels onto the test PC and therefore make sure that the right measured values can be assigned to the measured DUT. A central test station software not only controls the USB hubs, but also the external voltage supplies and climate chambers. During temperature checks from -40 to +80°C, tests are running repeatedly and the measured values are stored in a database. The command-driven simulation of the various USB operating modes including the charging func-tions ensure an unique starting position for flexible testing of different units with USB communication. The flexibility while switching the USB devices via the MCD USB hub as well as the possibility to furthermore switch voltages or loads lead to the finding that MCDs hub is an indispensable component of a reliable test system. „Since we use the devices in our test systems, we don´t have to worry about the application of necessary progamming devices, data

sources, USB hard drives, modems or other devices anymore," says Bruno Hörter.

The control of MCD´s USB hub is via ASCII commands or the USB hub Toolmonitor (PC software), which is included in delivery in the form of an USB memory stick for comfortable usage. For third-party software, the USB hub Toolmonitor can be completely remote controlled. COM/DCOM or .Net – Assembly is used as an interface. This allows the USB hub Toolmonitor to be integrated in a large number of applications (MCD TestManager CE, LabView®, Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), OpenOffice®). The USB hub can also be implemented for Linux operating systems, if required. The MCD USB hub Toolmonitor serves as an operator interface for the MCD USB hubs.

Bruno Hörter also points to the energy saving component due to shut down of not required USB devices and the usage of the hub as a charging station for battery ran USB devices (also standalone without USB host).

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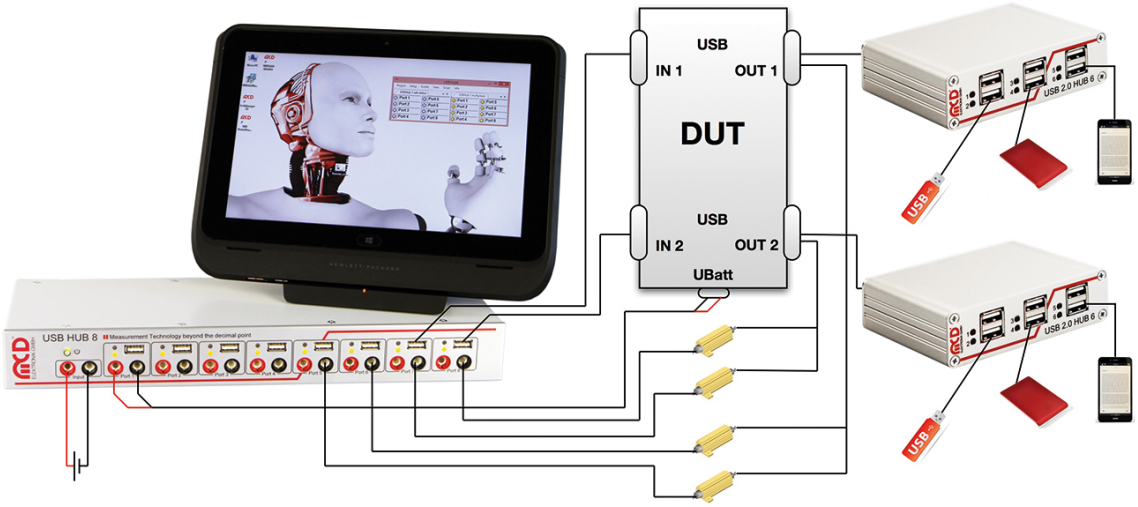
Pictures:

Picture 1: Robust and elegant metal housing for workplace or 19“ rack mounting.



Picture 2: The mixture of USB interfaces and configurable power supply ensures tests in every operating mode. In this example, the USB hub 6-Port is also used.

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Picture 3: Example of integration of the USB hub 8-Port in modular and height adjustable standard test systems (MCD VTS 2030).

About MCD Elektronik GmbH:

MCD Elektronik GmbH was founded in 1983 and currently employs 80 people. The owner-managed company is headquartered in Birkenfeld, near Pforzheim, Germany. MCD Elektronik is active in Germany, Hungary, and China, and delivers to 48 countries around the world.

MCD Elektronik GmbH manufactures measurement and test systems for electronic production for their customers, who include OEMs and their suppliers in the automotive sector, companies in machine and systems design, medical technology, energy-electronics, quality technology, sensor

manufacturing, and aerospace. The company relies on innovative customer-specific complete solutions - developed and realized by a team of highly qualified specialists.

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