



## Aerospace

# Data Acquisition for a Motion Control Unit Test Bench

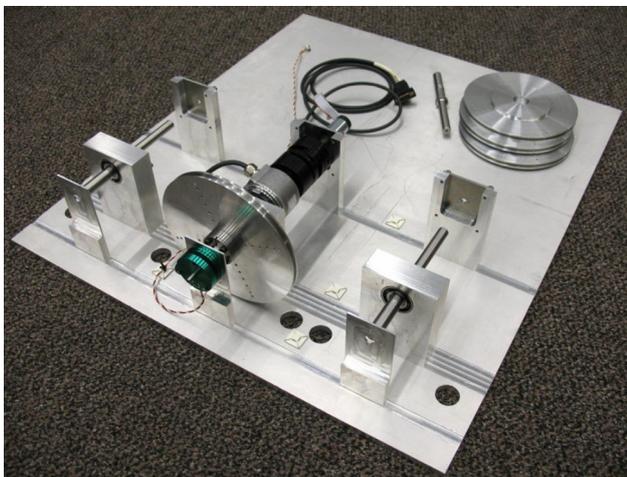
## ESA - ESTEC

ExoMars (Exobiology on Mars) is a space mission currently under development at the European Space Agency (ESA), that will send a robotic rover to the surface of Mars. The rover will carry a comprehensive suite of analytical instruments dedicated to exobiology research. The rover will make large use of electric actuators and related motion control systems. Motion controllers for space rovers and space robots in general, are one of the subjects in which the Automation and Robotics Section at ESA's Space Technology Centre (ESTEC) carries out research and development.

To support testing of new motion controllers, a generic test bench has been developed in the course of a student project at ESTEC. This test bench possesses sensors and an acquisition system allowing real-time position and velocity measurement with a computer using 20-sim 4C software.

### Test Bench Characteristics

The purpose of the test bench is to test the proper working of a motion control unit (MCU), and then characterize the most important performance parameters. In order to fully characterize the MCU, the bench allows up to three motors (brushed/brushless) to be mounted on it. Different sizes of motors and different mechanical loads are possible.



The test bench with a motor and load.

### Data Acquisition

To measure the performance the MCU and motors, a data acquisition system has been implemented. Next to reading digital outputs from the MCU, the data acquisition system had to be able to measure at least three quadrature encoders inputs and have at least 1 analog output to command a magnetic powder braking system. Three options were investigated regarding an integrated software and hardware solution: LabVIEW,

20-Sim 4C and xPC Target. Finally 20-sim 4C was chosen as being adequately fulfilling the technical needs and being dramatically lower in cost with respect to the alternative solutions.



The data acquisition system.

### 20-sim 4C

20-sim 4C is a prototyping environment that enables a user to deploy real-time C-code on hardware like PC's or ARM-9 based processor boards. For the data acquisition system the TS 7300 board was chosen. This board consists of an AMR-9 processor (real-time OS) and an FPGA (reconfigurable IO). The board has an Ethernet connection for the communication with a PC running 20-sim 4C .

The TS 7300 board was setup to enable the connection of 3 quadrature encoders, one analog output and several digital inputs. The figure at the right shows the board mounted in a box for protection.

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