

The HSDA System, for High-Speed and High-Stability Balance Measurements

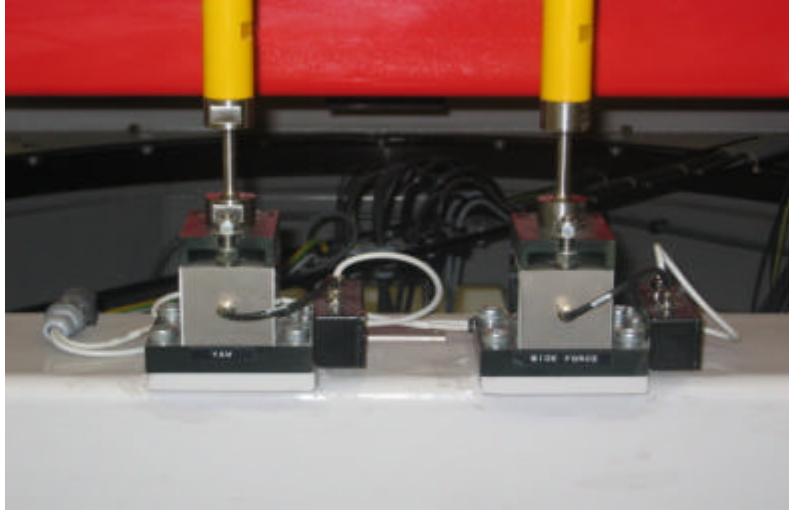


Aerotech's HSDA system builds on the latest version of Aerotech's Digital Signal Conditioning Units (DSCUs), and adds a Management unit (DSCM) to drive these devices (using specialised communication hardware) at their maximum speed, which is well beyond the capability of standard PC-based equipment. The resulting data is sent as a continuous data stream to the controlling PC-based system over a dedicated Ethernet link. The DSCM also enables the tuning of the DSCU filters to be controlled in detail.

HSDA is available for retro-fitting to existing balances, and is now the primary system offered with any new Aerotech balance.

The following paragraphs give further details of the operation of the DSCUs and the DSCM.

Technical description (DSCUs)



Data is acquired from each load-cell by a dedicated Digital Signal Conditioning Unit, located very close to the loadcell. Bridge readings are taken (ratiometrically) by the DSCU at a rate of 4.8 kHz, with 24 bit resolution. Two subsequent stages of processing are applied, the second stage being optional.

The 4.8 kHz data is firstly averaged in blocks at a selectable rate of 1 to 300Hz. This is termed the "output rate". For example, with an output rate of 100 Hz, the incoming data will be divided up into blocks of 48 readings, and the average of these readings will be calculated and passed on to the next stage.

The second stage is an "intelligent" filter. This is designed to operate in a similar fashion to an R-C electronic filter, in that any change to the incoming value will only gradually be reflected in the outgoing result. This enforces a degree of stability, with a user-selectable time constant.

In order to ensure that this filter only smooths the signal to remove noise, and does not prevent the device from responding rapidly to major changes at the input, a threshold level can be set (in terms of mV/V), such that any change greater than this level will be immediately reflected at the output, and filtering will re-commence from the new level. Where data is highly unstable, but represents a repeatable condition (for example, an aircraft in stall, or a vehicle with aerodynamically poor attachments), this threshold can be raised to such a degree that all data will be fully filtered, thus eliminating the dynamics, but quickly producing a measurement that can be accurately repeated.

Aerotech's data acquisition system is able to set the three controlling parameters for these two stages of filtering: Output rate (in ten steps from 1 Hz to 300 Hz); Filter Threshold level (mV/V); and Filter Steps (which determines the time constant). If desired, the Filter Steps value can be set to zero, and the block-averaged data will be transmitted with no further filtering applied.

Technical description (DSCM)

The DSCUs are very powerful and flexible units, capable of a wide range of applications, including high-speed data acquisition. However, a conventional PC with MS Windows suffers from limitations in Serial Communications which prevent it from fully exploiting these capabilities. Aerotech have therefore developed the Digital Signal Conditioning Manager (DSCM) to overcome the limitations, and make it very easy to connect a set of loadcells to a PC, using Ethernet communication. The most basic function of the DSCM is to convert the DSCUs into Ethernet devices, but it also makes it very easy to control all the filtering and speed settings, and manages the units, doing all the polling, protocol management, and error-checking; and simply producing a reliable, continuous stream of data over an Ethernet connection.



The unit is a small (197 x 125 x 43 mm) self-contained box. Plug in up to 6 DSCUs on one side, Ethernet cable and power connector on the other, and thirty seconds later it's ready to stream data to you.

Each DSCU can deliver up to 300 samples per second, and the DSCM can stream 6-channel data packets at the full 300 Hz.

The DSCUs can be connected individually, each to its own port, in order to obtain the absolute maximum speed, or can be connected on one or more shared busses to minimise cabling.

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