RAL

DESIGN & DISCOVERY

Open Days July 1990

RUTHERFORD APPLETON LABORATORY

SCIENCE AND ENGINEERING RESEARCH COUNCIL

SYSTEM DESIGN

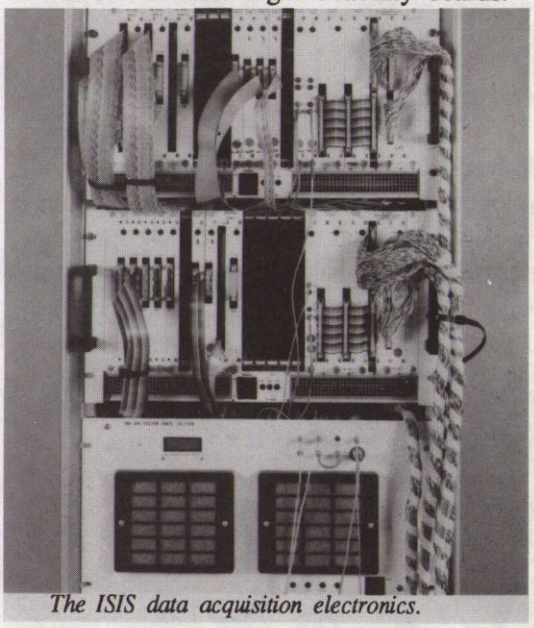
Electronics Division at RAL designs and builds electronic systems for the SERC funded nuclear physics, science and space science communities, and for organisations outside RAL through Rutherford Research Services. The division undertakes the whole design process from the generation of specifications through to design, prototyping, production and maintenance and has the full range of chip and board manufacturing technologies available to the designers.

Some examples of current projects are :

The data acquisition and trigger system for the Zeus central tracking detector at the DESY laboratory in Hamburg - The electronics features 4608 channels of 100 MHz 8 bit flash ADCs and ECL pipelines implemented in hybrids, DSP front end processing, 700 channels of 200 ps resolution timing circuits, Transputer based data acquisition and a trigger system based on Xilinx programmable gate arrays.

The data acquisition systems for the ISIS spallation neutron source at RAL - The modular design allows systems to be built from a standard set of components to meet the different requirements of the various instruments. Fourteen systems are now operational and maintained by Electronics Division. In addition the Division provides a full electronics service to the instruments.

Electronics for the ATSR experiment on the ERS1 satellite - The Division was responsible for the design and manufacture of the preamps, signal processing, and associated control and clock circuits for the infra red detectors on the experiment. Space approved components and assembly techniques were used in the manufacture of these high reliability boards.



The ISIS data acquisition electronics.

The Design Process.

Specifications and requirements.

Through close collaboration with the users requirement and specification documents for the proposed system are generated. This iterative process takes the design to the level of partitioning the functions between modules and the module specifications themselves. Project plans, costings and spend profiles are developed using computer based tools.

Design.

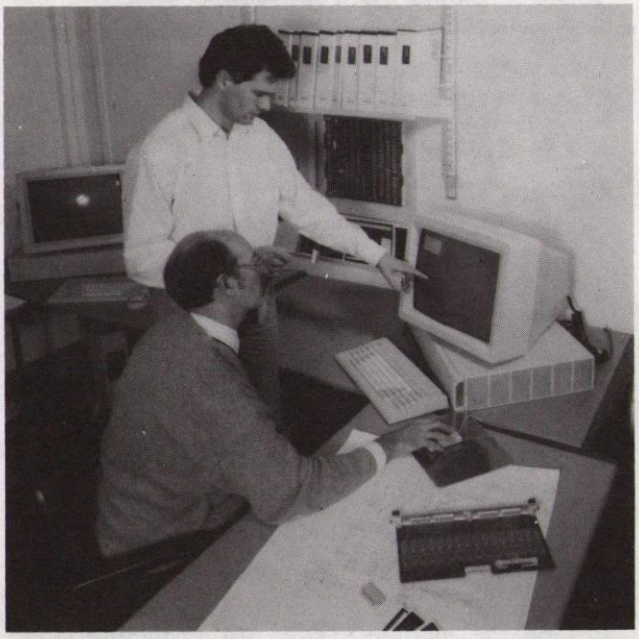
The top down design process includes the use of high level simulation packages to check the overall system performance and interactions between sub systems. Choices of chip and manufacturing technologies are made followed by the detailed design. Circuit schematic capture is carried out on the division's CAD system which also provides routes to wire wrap and printed circuit board manufacturing. Designs can be simulated at the gate level, using packages that interface to the CAD, to check their performance against the high level model. Programming information is produced for programmable gate arrays and software is written for embedded processors.

Production.

Bulk ordering of components is organised and production assembly, carried out by commercial companies, is set up. Completed boards are returned to RAL for testing and building into the final systems. Automatic in circuit testing is available from outside companies who run systems that can be programmed using data from the CAD facility. After tests at RAL the systems are installed and commissioned at their final destination. Full documentation is provided and Electronics Division continues to support the systems in the field for long periods.

Prototyping.

Prototype hardware is built and then tested and developed using a wide range of test equipment such as digital storage oscilloscopes and logic analysers. Test software is written for functional testing of the boards and modules and the design is iterated to its final version.



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