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RESEARCH & INSTRUMENTATION

High-Speed Multi-Sensor Data Acquisition System

Custom Hardware Design | Embedded Firmware | Sensor Signal Conditioning | Network Connectivity

CLIENT

A government-affiliated research institution requiring precise, time-stamped sensor data capture.

THE PROBLEM

The research team needed to capture readings from several different sensors at defined intervals, but each sensor put out a different kind of electrical signal — different voltage ranges, different current characteristics — that couldn't just be wired straight into a digitiser without distortion or noise. On top of that, every reading needed an accurate timestamp, and the data had to land on a PC for analysis without someone manually transcribing it.

WHAT WE BUILT

The core engineering challenge here was the front end: getting each sensor's raw signal into a clean, consistent form before it was ever digitised. We designed dedicated signal-conditioning circuitry for each sensor type, so that by the time a signal reached the analog-to-digital converter, it was in a predictable range the converter could capture accurately. We paired that with a high-resolution converter and added a small onboard display so technicians on-site could see current readings with date and time — useful for sanity-checking the setup before walking away. For getting data to the PC, we built in network streaming with configurable addressing on both ends, so the system could be pointed at whichever PC was running the analysis for a given experiment.

WHAT IT DOES

- ✓ Conditions signals from multiple sensors with different electrical characteristics into a consistent, accurate input for digitisation
- ✓ Captures readings at high resolution using a precision analog-to-digital converter
- ✓ Displays live readings with date and time on an onboard screen for on-site verification
- ✓ Streams timestamped readings to a PC over the network at regular intervals, with no manual transcription
- ✓ Supports configurable network addressing on both the device and the receiving PC, so the system can be pointed at different analysis setups as needed

OUTCOME

The research team got a single system that handled the full chain from raw sensor signal to timestamped data on their PC, removing both the signal-quality problems of direct sensor wiring and the manual effort of logging readings by hand.

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