KEITHLEY

MODEL 2700

MULTIMETER/DATA ACQUISITION SYSTEM

APPLICATION EXAMPLES

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INDUSTRY: AUTOMOTIVE

APPLICATION: Production Test of Radio Tuners and Audio Amplifiers

SUMMARY: Ensure proper electrical operation of audio systems prior to installation in the vehicle on the production line.

KEY REQUIREMENTS:

- Improve speed and accuracy of existing test system to improve yield and productivity (more good units per hour).
- Measure <25VDC, audio band ACV and frequency, resistance.
- Ruggedized connectors for maintenance purposes. Meet unionized shop floor work rules.

2700 FEATURES/BENEFITS:

- Measure/scan speeds enable 10× improvement in throughput.
- Accuracy specs enable expanding error budget from 4:1 to 50:1, thereby dramatically reducing false failures due to equipment and improving yields.
- 50-pin D-sub connectors enable quick assembly/teardown to facilitate calibration and test stand maintenance. Minimal technician training and/or tools necessary to remove system from test rack.

INDUSTRY: AUTOMOTIVE

APPLICATION: Validation Testing of Electrical Distribution Centers (Fuse/Relay Boxes)

SUMMARY: Prior to high-volume production, a series of Engineering Validation tests are done to ensure system performance. All data is documented and archived for traceability and safety purposes.

KEY REQUIREMENTS:

- Capture large amounts of data over time as product is lifecycle tested.
- Measure voltage drop across contacts/connections, resistance, and temperature via thermocouple and RTD. Test many devices in batch mode to maximize productivity.
- Send data to Excel® for statistical analysis and documentation purposes.

2700 FEATURES/BENEFITS:

- Memory buffer holds 50,000 timestamped readings and can be downloaded while being filled for continuous datalogging.
- 80 channel capacity with per-channel configurability can meet measurement requirements.
- Start-up software sends formatted, timestamped readings directly to Excel for further analysis, archiving, and reporting.

INDUSTRY: AUTOMOTIVE

APPLICATION: Production Test of Pressure Transducers

SUMMARY: Today's automobiles have a variety of sensors to monitor engine, transmission, and chassis conditions. Pressure transducers are used throughout the powertrain to convert physical conditions to electrical signals for the on-board computer to analyze.

KEY REQUIREMENTS:

- Sufficient equipment accuracy to be confident that any failures reported are the result of a DUT failure, not a test equipment failure.
- Measure supply and output voltage (mV-10V) or current (4-20mA) of each DUT. Compute ratio, and bin based on result.
- Archive test data in PC.

2700 FEATURES/BENEFITS:

- True 6½-digit (22-bit) operation and fully traceable readings give confidence in equipment.
- Ratio feature, HI/LO limits, and digital I/O enable fast pass/fail testing (while archiving test data) and interface to mechanical control systems on production line.
- 20mA range specifically designed to handle 4-20mA inputs.

INDUSTRY: OPTOELECTRONIC COMPONENTS

APPLICATION: Laser Multiplexer Testing

SUMMARY: Laser multiplexers expand the bandwidth of existing fiberoptic telecommunications lines by 4–32×. Testing involves measuring sensor output voltage, insertion loss, filter width, and rejection.

KEY REQUIREMENTS:

- High quality, low noise measurements over broad temperature and humidity ranges.
- Maximize batch size during production test.
- Maximize automation while minimizing cost.

2700 FEATURES/BENEFITS:

- 6½-digit measurement engine with integrated switching enables high quality measurement with minimum complexity.
- “Read and transmit” memory buffer enables multiplexing of PC across many test stations. 80 input channels maximize batch size.
- Totalizer and analog output improves level of automation by handshaking with and biasing DUT.

INDUSTRY: COMPUTERS AND PERIPHERALS

APPLICATION: Production Test of UPSs (Uninterruptible Power Supplies)

SUMMARY: Final acceptance test of UPSs under various line and load conditions. Test racks shipped around the world to support production facilities.

KEY REQUIREMENTS:

- Flexible testing that minimizes rack space. Test stands handle multiple DUT types.
- Measure ACV, DCV, and continuity. Switch line and load to simulate Hi/Lo operating conditions.
- Accurate, repeatable, traceable measurements, reliable connections (downtime costs hundreds of thousands of dollars per minute).

2700 FEATURES/BENEFITS:

- Per-channel configurability and 13 measurement functions enable tremendous flexibility.
- Up to 80 channels in half-rack size conserves rack space.
- True 6½-digit (22-bit) operation and rugged 50-pin D-sub connection scheme maintains yield and minimizes downtime.

INDUSTRY: COMPUTERS AND PERIPHERALS

APPLICATION: Production Test of PC and Server Power Supplies

SUMMARY: Ensure proper operation of AC/DC power supplies under various line and load conditions.

KEY REQUIREMENTS:

- System signal routing and line/load control.
- Precision DCV and ACV measurement to 250V.
- Interface to handling mechanisms on production line.

2700 FEATURES/BENEFITS:

- Up to 80 channels of precision measurement and control in one half-rack box.
- Analog output (7706) drives power supplies and load control for DUT.
- Built-in digital I/O provides automated interface.

INDUSTRY: COMPUTERS AND PERIPHERALS

APPLICATION: Production Test of Batteries

SUMMARY: Characterize the discharge curve of consumer and industrial batteries to specific customer requirements.

KEY REQUIREMENTS:

- Measure 60mVDC to 240VDC with 0.5% resolution.
- Switch power and load to batteries. Change line/load conditions (and count number of changes for correlation and lifecycle purposes).
- Read measurements without interruption while still logging data 24 × 7.

2700 FEATURES/BENEFITS:

- Wrap-around memory buffer and “read and transmit” memory enables continuous filling and download of data while taking readings.
- Battery backup, non-volatile RAM, and real-time clock enables stand-alone, around-the-clock operation.
- Counter/totalizer and isolated switching enables changing (and monitoring) line/load schemes.

INDUSTRY: COMPUTERS AND PERIPHERALS

APPLICATION: Validation/QA Testing of Copy Machines

SUMMARY: Electrical system performance and temperature is monitored during the copying process to validate proper operation.

KEY REQUIREMENTS:

- Measure multiple points of ACV, DCV, frequency, and thermocouple temperature.
- Count pages as they exit copier (a 1msec pulse every second).
- Validate system performance by correlating any failures to page count.

2700 FEATURES/BENEFITS:

- Scanning speed and measurement accuracy are at least 10× better than the Fluke Hydra for approximately half the price.
- Totalizer function counts pulses as part of multifunction scan list.
- 7706 Module handles all inputs, leaves extra slot in mainframe for future expansion.

INDUSTRY: SYSTEM INTEGRATOR (CONTRACT MANUFACTURER)

APPLICATION: Production Test of DSL Routers

SUMMARY: Demand for Internet bandwidth drives need for devices that minimize download times. Manufacturers of such devices must increase production as quickly as possible by automating all processes.

KEY REQUIREMENTS:

- Automate testing process and eliminate as much manual operation as possible.
- Test ACV, DCV, and Ohms on up to 16 DUTs in batch mode.
- Ruggedized connections to DUT to facilitate support.

2700 FEATURES/BENEFITS:

- Measurement, control, and automation capabilities reduced test time from 30 minutes to less than two minutes per unit.
- Connection scheme simplifies maintenance and calibration activities, while improving reliability.
- Front panel inputs promote simpler troubleshooting.

INDUSTRY: SYSTEM INTEGRATOR (CONTRACT MANUFACTURER)

APPLICATION: Production Test of Electrical Appliances

SUMMARY: Measure continuity, AC line voltage, current, and thermocouple temperature during sample audit.

KEY REQUIREMENTS:

- Accurate, repeatable measurement with maximum immunity to line and signal noise.
- Maximize batch size while minimizing bench space.
- Support international voltages (100V–240V)

2700 FEATURES/BENEFITS:

- Built-in signal conditioning, high noise rejection and isolation, and 6½-digit (22-bit) measurement engine ensures good measurements 10× faster than closest competitor.
- Up to 80 channels in half-rack space.
- Input modules support 300VAC/1A and thermocouples.

INDUSTRY: SYSTEM INTEGRATOR (CONTRACT MANUFACTURER)

APPLICATION: Production Test of Electronic Ballasts

SUMMARY: Test igniter voltage, lamp voltage, rectified mains voltage, short circuit output, and fuse. Test in batch mode under high line and low line and under different load conditions.

KEY REQUIREMENTS:

- Measure ACV, DCV, ACI, frequency, and temperature.
- Switch line and load conditions.
- Speed up testing as much as possible while minimizing noise and interference.

2700 FEATURES/BENEFITS:

- Built-in signal conditioning, high noise rejection and isolation, and 6½-digit (22-bit) measurement engine ensures good measurements 10× faster than closest competitor.
- "Automation-ready" with limits/channel, digital I/O, and isolated switching, while enabling mixed-signal measurements.
- Up to 80 channels in half-rack space maximizes batch size at test stations, thereby eliminating bottlenecks.

INDUSTRY: SYSTEM INTEGRATOR (CONTRACT MANUFACTURER)

APPLICATION: Validation Test of White Goods

SUMMARY: Characterize temperature inside and outside ovens per consumer fire safety standards.

KEY REQUIREMENTS:

- Thermocouple accuracy of at least ±1.0°C.
- 300 measurement points.
- 300V isolation.

2700 FEATURES/BENEFITS:

- Low-cost solution in large channel-count applications. Use different GPIB addresses.
- 300V common-mode isolation protects against any power-line associated failures. Open T/C detect for added confidence in data.
- Battery-backed setup, non-volatile RAM, and auto startup protect data that has been collected and ensures unattended operation.

INDUSTRY: SYSTEM INTEGRATOR (MACHINE BUILDER)

APPLICATION: Chemical Gas/Combustibility Analysis Systems

SUMMARY: Measure the amount of CO_2 and O_2 released when a sample is burned. Determine rate of burn, smoke, and mass flow.

KEY REQUIREMENTS:

- Measure thermocouple, 4–20mA output of pressure sensor, 0–10V output of load cells, 4–20mA output of gas analyzer, and photodiode output voltage at 30 channels/minute.
- Maximize noise immunity of measurements for more reliable data.
- Minimize cost (the customer's CGS).

2700 FEATURES/BENEFITS:

- Low-noise, high-resolution measurements (with built-in signal conditioning and noise rejection circuitry) at high speeds for fewer failures due to test equipment.
- Per-channel configurability enables any measurement on any channel for simpler setup.
- Power failure recovery resumes scanning where it stopped for stand-alone operation.

INDUSTRY: SYSTEM INTEGRATOR (MACHINE BUILDER)

APPLICATION: Traffic Control Monitoring Systems

SUMMARY: Measure various DC and AC voltages and temperatures in traffic control boxes during normal operation.

KEY REQUIREMENTS:

- Take measurements at every step in the cycle (external trigger).
- Scan 30 channels of voltage and thermocouple temperature signals approximately once every minute.
- Store up to 24 hours worth of data.

2700 FEATURES/BENEFITS:

- 50,000-point non-volatile memory meets storage requirements.
- External trigger input (digital in) enables synchronization with DUT control hardware.
- Single-box, integrated design simplifies installation.

INDUSTRY: AVIONICS/AEROSPACE

APPLICATION: In-flight Data Acquisition

SUMMARY: Monitor electronics system performance during operation to ensure safety and proper operation.

KEY REQUIREMENTS:

- 80 differential inputs of VDC, VAC, frequency, and thermocouple temperature.
- Stable, repeatable measurement with 300V isolation.
- Excellent customer service.

2700 FEATURES/BENEFITS:

- Directly handle all measurement in a half-rack box.
- True 6½-digit (22-bit) measurement with built-in signal conditioning, isolation, AC line filtering, and high input impedance.
- Backed by Keithley's sales, applications, and service groups.

INDUSTRY: AVIONICS/AEROSPACE

APPLICATION: Pre-flight Qualification Testing of Power Supplies

SUMMARY: Ensure proper operation of DC power supplies prior to integration into flight subsystems.

KEY REQUIREMENTS:

- Monitor 32 channels of DC bus voltage and current.
- Apply different mathematical scaling to each channel.
- Read contents of memory buffer during testing process (typical test of 1,000,000 cycles per month).

2700 FEATURES/BENEFITS:

- Full per-channel configurability, including mathematical scaling, handles requirement. 80-channel capacity can double existing throughput.
- 50,000-point “read and transmit” memory buffer with timestamp enables monitoring of long-term acceptance tests.
- Large connector blocks simplify wiring of multiplexer modules.

INDUSTRY: SEMICONDUCTOR

APPLICATION: Monitoring of Wafer Processing Ovens

SUMMARY: Independently verify proper operation of temperature controllers in diffusion and oxidation ovens.

KEY REQUIREMENTS:

- A traceable instrument with built-in signal conditioning, isolation, noise rejection, and filtering.
- At least 40 input channels.
- The ability to send temperature profile data to a PC.

2700 FEATURES/BENEFITS:

- Supports a wide variety of thermocouples for measuring >1000°C (with open T/C detection for safety).
- Channel monitor feature enables viewing a specific T/C without interrupting the scanning sequence.
- PC interface for archiving data and performing trend analysis.

INDUSTRY: SEMICONDUCTOR

APPLICATION: External Temperature Reference for Hot Chuck

SUMMARY: Hot chuck temperature must be controlled to within 0.2°C at probe test to ensure acceptable yields later in the process.

KEY REQUIREMENTS:

- 0.2°C accuracy using 4W RTDs.
- Hi/Lo limits with digital outputs for automated feedback loop.
- 3 measurement points per hot chuck. Support as many probe stations as possible on floor.

2700 FEATURES/BENEFITS:

- Accuracy, stability, and repeatability requirements met.
- Digital I/O and Hi/Lo limits meet automation requirements by directly interfacing to probe station.
- 4W RTD capacity of 40 channels supports 13 probe stations with a single 2700 system.

INDUSTRY: MATERIALS RESEARCH (RESEARCH LAB)

APPLICATION: Monitoring Temperature and Resistance at Many Points

SUMMARY: Measure various resistances and temperatures on a sample to determine resistance and temperature profile over a range of ambient temperature.

KEY REQUIREMENTS:

- Map resistance and temperature accurately over sample of material.
- Scan 10–30 channels of R and thermocouple temperature approximately once every minute.
- Store up to 24 hours worth of data.

2700 FEATURES/BENEFITS:

- 50,000-point non-volatile memory meets storage requirements.
- High-quality temperature and resistance measurements, rapidly.
- Single-box, integrated design and easy software reduces learning time.

KEITHLEY

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