



KEITHLEY

MODEL 2700

MULTIMETER/DATA ACQUISITION SYSTEM

APPLICATION EXAMPLES

COMPANY CONFIDENTIAL

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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 $\pm 1.0^{\circ}\text{C}$.**
- **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 CO₂ and O₂ 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.**

Specifications are subject to change without notice.

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