

# Appliance Testing



## Description

Household and commercial appliances such as refrigerators, ranges, microwave ovens, dishwashers, washing machines, dryers, mixers, blenders, and toasters must be tested in both design and production phases. Both mechanical and electrical / electronic parts of the appliance must be characterized.

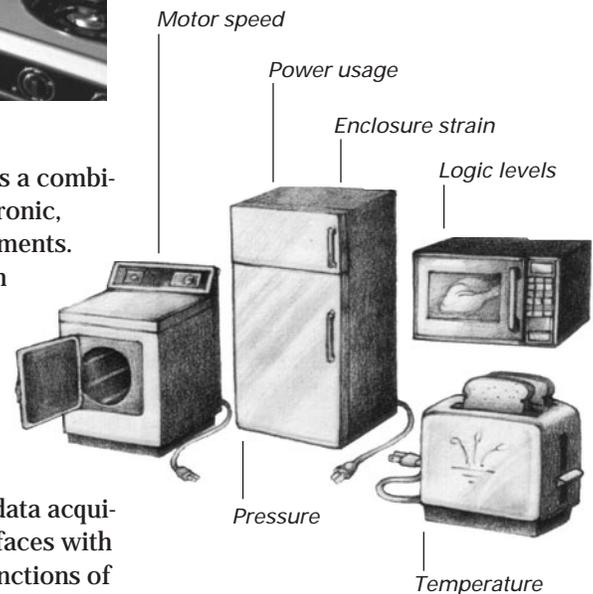
## Problem

Consumer demand for energy efficiency, reliability, and ease-of-use has turned appliance manufacturing into a high technology business. These products are complex and are manufactured in high volumes. Manufacturers must be efficient and maintain high standards of quality to remain competitive. This demands a test system that is fast, flexible, highly automated, and useful in both design and production environments.

## Solution

Appliance testing requires a combination of electrical, electronic, and mechanical measurements. A VXIbus data acquisition and control system from Hewlett-Packard is an excellent solution for this application. Capable of measuring electrical and electronic parameters directly, the data acquisition system easily interfaces with the control and power functions of an appliance. Transducers convert mechanical parameters such as temperature, pressure, and speed into electronic signals that can be measured and converted by the data acquisition system into meaningful test results. Outputs from the data acquisition system can be used to modify test conditions and automatically exercise every operational mode of the appliance. Test results are stored in the control computer's data base for subsequent quality control analysis and report generation.

## HP Data Acquisition Application Note



## Applications

- Refrigerators
- Microwave ovens
- Ranges
- Dishwashers
- Washing machines
- Dryers
- Mixers/blenders
- Toasters

## Departments

- Production
- Research
- Quality

## Implementation

### Temperature

Appliances are subjected to a variety of hot and cold conditions to test their operation under adverse conditions. In addition, ovens, toasters, dryers, and refrigerators must be tested to ensure that they are operating at the correct temperature. Thermocouples, RTDS, and thermistors are used to measure these temperatures.

### Power

Part of the appliance test is a complete characterization of the power it uses. Transducers are used to convert RMS power to either a 0-10 Vdc or 0-20 mA signal. Other power transducers convert electrical power to a pulse train that can be totaled by a counter or digital input card.

### Enclosure strain

Appliance enclosures must withstand a lot of abuse and wear. These enclosures are typically tested by stressing parts of the cabinet, doors, and handles. Strain gages mounted on these enclosures measure the amount of stress put on the parts.

### Motor speed

Speeds of fans, motors, compressors, and other moving parts are an important factor in the characterization of an appliance. The speed of these parts can affect appliance efficiency and the lifetime of its parts. Pulse output transducers are typically used to measure rotational speed.

### Logic levels

Modern appliances are controlled by microprocessors and digital electronics. Knowing the output and/or input states of the electronics can have an effect on test results. Sometimes the electronic portions of the appliance may cause what looks like a mechanical failure.

### Pressure

Some appliances like refrigerators and freezers use pressurized gases or liquids for cooling purposes. For proper operation, these fluids must be under the correct pressurization. In addition, pressure transducers may be used to characterize the pressure inside and outside the appliance during its operation, or they may characterize the pressure exerted by doors, motors, and other moving parts.

## Key System Features

- VXIbus open architecture
- Data Acquisition and Control on a single programmable VXIbus card (E1419A)
- Graphical programming language (HP VEE)
- Flexibility with deterministic control
- Wide choice of inputs/outputs
- Built-in control algorithms
- Up to 32 user-written "C" code algorithms
- 65,000 reading FIFO buffer
- 500 reading Current Value Table (CVT)
- All algorithms can write to FIFO/CVT
- Data can be time-stamped

## Typical Configuration

Data Acquisition System	Qty
HP E1421B VXI 6-Slot Card Cage	1
HP E1406B VXI Slot 0 Command Module	1
HPE1419A Multifunction Measurement & Control Card	1-2
Analog input channels	30-100
Strain gage completion channels	10-40
Counters channels	5-20
Digital input channels	20-60
<b>Computer and Software</b>	
HP Vectra Series PC with HP 82341C HP-IB Interface Card	
HP VEE for Windows 95	
HP LaserJet or InkJet printer	