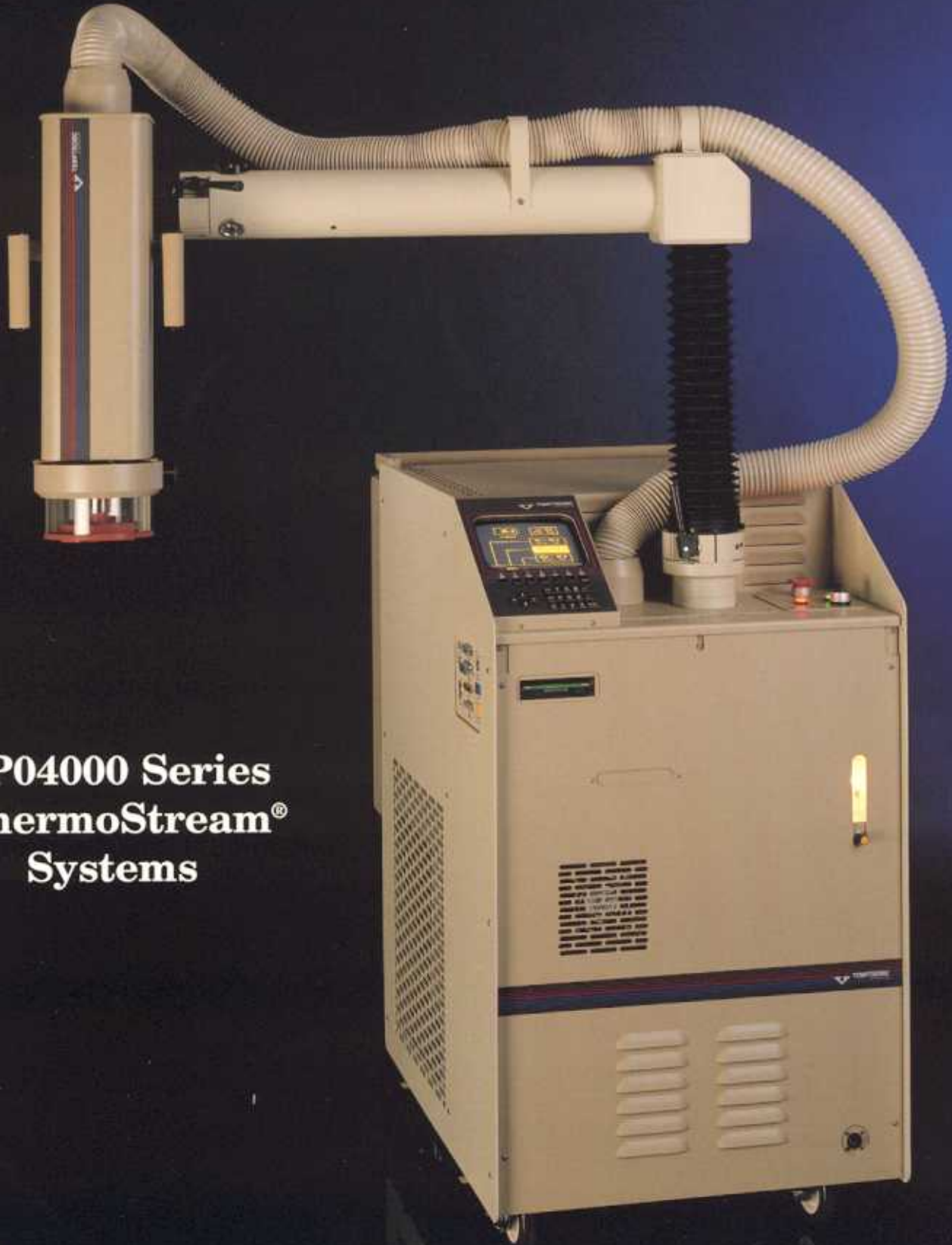




Advanced Test Equipment Rentals
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TP04000 Series
ThermoStream®
Systems



WORLD-WIDE LEADERS IN LOCALIZED TEMPERATURE CONTROL SOLUTIONS

TEMPTRONIC Complete Thermal

The TP04000 Series ThermoStream Systems combine advanced mechanical design with new developments in system control, display, programming and thermal performance for the testing of components, hybrids, modules, small assemblies and printed circuit boards *at temperature* from -75°C to $+225^{\circ}\text{C}$ with 0.1°C precision and repeatability.

The system has the flexibility to readily adapt to the requirements of both the production and engineering environments. Easy to operate and program in manual, semi-automatic or automatic mode, the TP04000 interfaces to most testers and host computers for complete ATE integration.

Long term product support includes thorough documentation, extensive application support and a worldwide customer service network providing fast

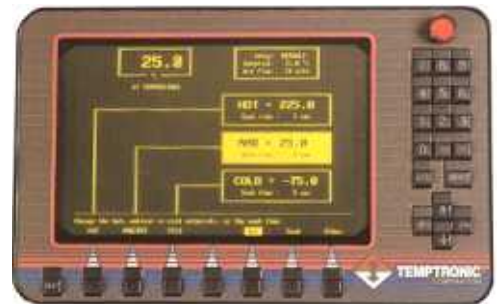
response to customer inquiries.

A complete line of thermal accessories provide the TP04000 with the versatility to meet the many localized temperature control applications in the industry today. For MilSpec qualification, production testing, reliability testing, characterization, environmental stress screening, and design verification, the TP04000 Series ThermoStream Systems provide a **complete thermal test solution**.



TP04000 system with integral CRT and Mechanical Locking Arm.

The Ultimate in User-Friendly Set-up and Control



Operate the system simply by the *Operator*

Control Module (OCM) function keys and numeric keypad. **Intuitive menus and on-line context sensitive help screens** make system control and programming easy.

The **full screen display** on the OCM provides complete, up-to-the-moment information, including air and/or DUT temperatures, all programmed values, up to 12 temperature setpoints, ramp, soak and cycle information, system operational status and error messages. All information is displayed simultaneously in alphanumeric and graphic formats.

Two modes of manual operation provide the flexibility to make the system perfectly suited for both production and engineering environments.

The *Operator's Mode* controls the system at the touch of a single button, for added efficiency in the production type environment. Password protection can be set to prevent the user from modifying programmed test set-up files for test security.

The *Engineering Mode* enables the operator to take full advantage of the system's programming capabilities. A variety of temperature test routines can be easily created, run and filed using the intuitive menus. All programming features and defaults, including data logging, hardcopy reports and "At Temperature" Windows can be specified in this mode.

Easy to use *Operator's Mode* with password protection assures test consistency.

Test Solutions

- 5 second transition time from +125° to -55°C
- 0.1°C Precision
- -75° to +225°C

Fully Compatible with any ATE or Rack and Stack Test System

IEEE-488, TTL Level Start-Test/End-of-Test and optional RS232 interfaces are compatible with any tester or host computer for complete integration into the ATE test environment. All communication I/O interfaces allow unrestricted access to all TP04000 functions from head manipulation to automatic flow control for **total programming flexibility and truly unattended operation.**

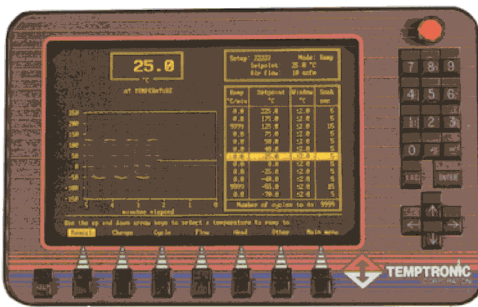
The test programmer can easily include temperature as a functional test and design variable within the test program. The System's independent programmability, multiple test set files and non-volatile memory assure that all TP04000 system capabilities can be used without burdening or reducing the processing speed of the tester CPU.

High Test Throughput

The system's speed, high heat pumping/cooling capacity and broad temperature range dramatically increase test throughput capacity. With the High Speed Thermal Head option, the system is capable of **air transition times of less than 5 seconds between +125°C and 55°C**, whether heating or cooling in continuous cycle mode.*

The **wide temperature range (-75°C to +225°C)** exceeds Mil Spec requirements.

Automatic Air Flow Control optimizes the system's high air flow rate, up to 18 SCFM, without requiring manual adjustments for the fastest device temperature transition times. Even larger devices, printed circuit boards and high power hybrids are brought to temperature with speed and precision.



Full featured *Engineering Mode* for ultimate system flexibility.

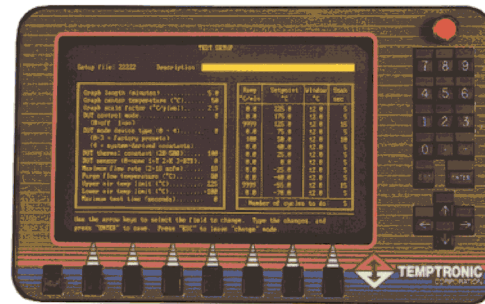
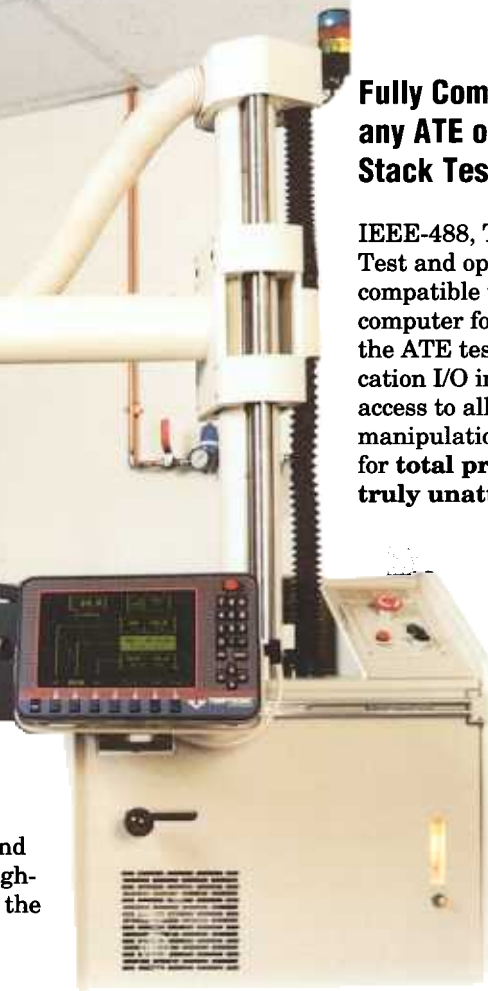
Optimized Test Accuracy

Test accuracy and throughput is assured by setting the **"At Temperature"** Windows, which can be defined from $\pm 0.5^\circ\text{C}$ to $\pm 9.9^\circ\text{C}$ around the desired test temperature.

For "real time" temperature precision, the temperature sensing of the airstream is done at the TP04000 output nozzle, within 1 cm of the test device, assuring that the air affecting the test device is typically within 1.0°C of the displayed temperature.

Temperature accuracy and stability for all device types, package styles and power levels is provided by the easy to use automated electronic calibration routine.

*System performance may vary with soak time.



Develop unlimited test set-up files manually or via IEEE-488 and RS232.

Repeatable Test Results and Reduced Set-up Time

Create custom temperature profiling routines including adjustable ramp rate, soak time and cycle sequences with up to 12 test temperatures using User-friendly menus. Unlimited set-up files and thermal profile routines can be developed, filed and retrieved instantly using the **3.5 inch floppy disk drive.**

For added flexibility in meeting specific test requirements, defaults such as "At Temperature" windows, high and low temperature limits, calibration values, IEEE-488 address, test device settling time and tunable DUT control constants can be easily adjusted by the programmer in the *Engineering Mode* using intuitive windows. **Non-volatile memory** retains all programmed defaults and information when the system is turned off or unplugged.

Test programs may be set up and run in the manual modes of operation or via IEEE-488, TTL Level ST/EOT/SFF or optional RS232 remote interfaces. Connectors are provided for a keyboard and monitor.



Convenient Coupling to the Test Fixture

The TP04000 is supplied with an easy to use **Thermal Interface Kit** containing sufficient materials for coupling to several test fixtures.

Temperature controlled purge air at the test site insures that the test socket and test fixtures are maintained at close to room temperature whether testing at extremely high or low temperatures to prevent moisture, frost or overheating of tester electronics.

Highly repeatable accuracy is accomplished by precision pneumatics raising and lowering the thermal test head to

Personal and Environmental Safety

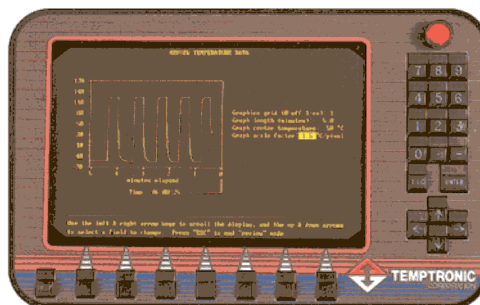
The TP04000 is an environmentally safe alternative to flouorocarbon sprays and baths and pressurized cooling gas tanks.

"Power On" indicator, Emergency "Off" button, low air pressure and flow cut-outs, redundant overheat protection and "At Temperature" and error conditions are provided. An optional red, blue/amber and green status light sits atop the unit, so that system status can be verified from across the test floor.

Large, locking casters and an integral push bar make transporting the system between test sites safe and easy. Leveling feet assure system stability even on uneven floor surfaces.



Data Logging and Convenient Hardcopy Report Generation



Review stored and logged thermal performance data on the *Review Temperature Data Screen*.

Data Logging Mode and the user-friendly *Report Generator* assist the user in saving data and creating reports quickly and easily for test verification, documentation, archives and analysis.

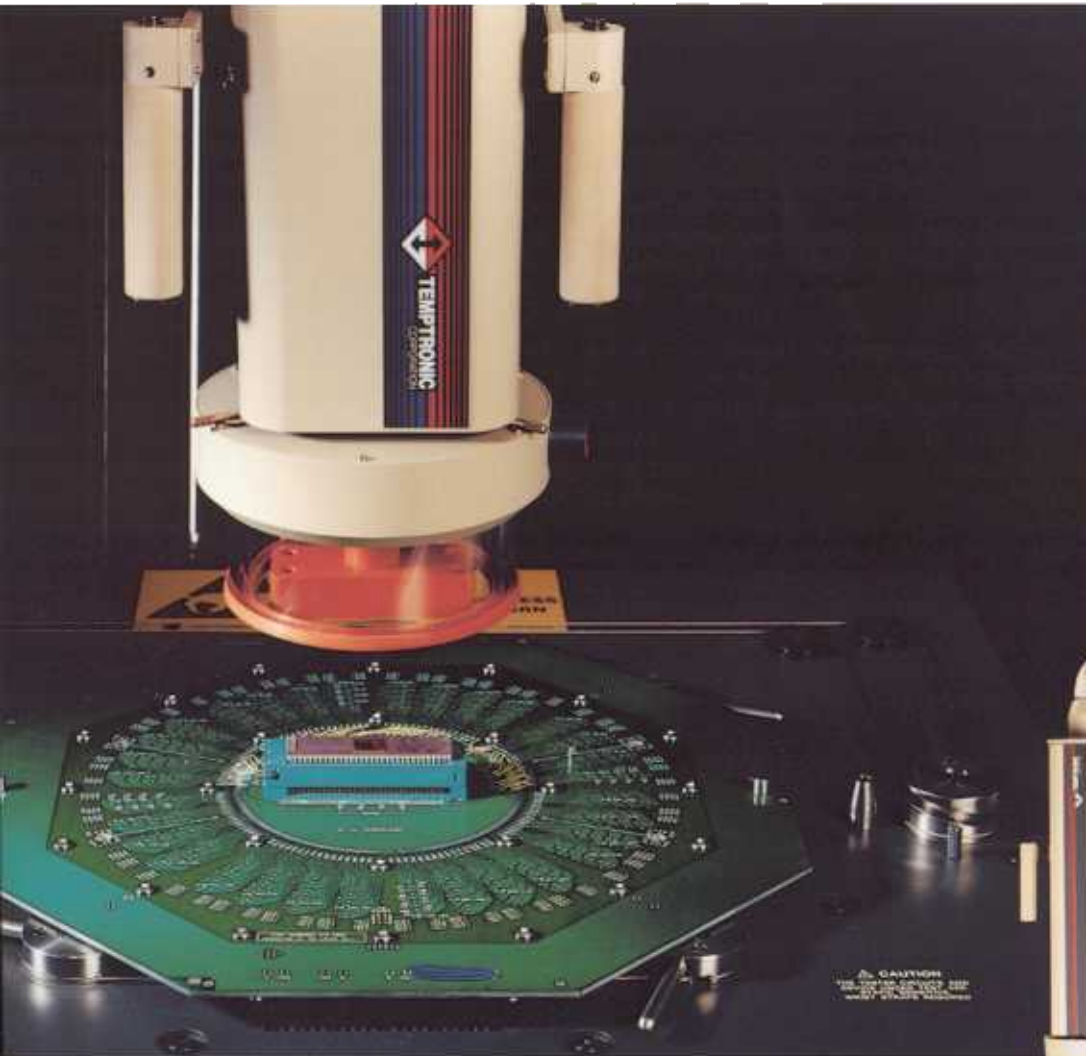
User designed reports and graphs present temperature test results based on various test parameters. "Real time" temperature performance data can be reviewed on screen and graph parameters can be adjusted to analyze any time period more closely. **The *Parallel Printer Port Option* can be used to generate hard copy reports of the test data and set-up parameters.**

Continuous data logging of several hours of thermal performance data with continuous date and time stamping can be retained in RAM. 36 or more hours of continuous information can be stored on a single 3.5" floppy disk.



and from the DUT site. The adjustable arm firmly supports the thermal head assembly at the test site assuring proper alignment.

All thermal caps may be removed and replaced without tools. An optional footswitch is available for hands-free raising and lowering of the thermal head assembly to and from the test site.

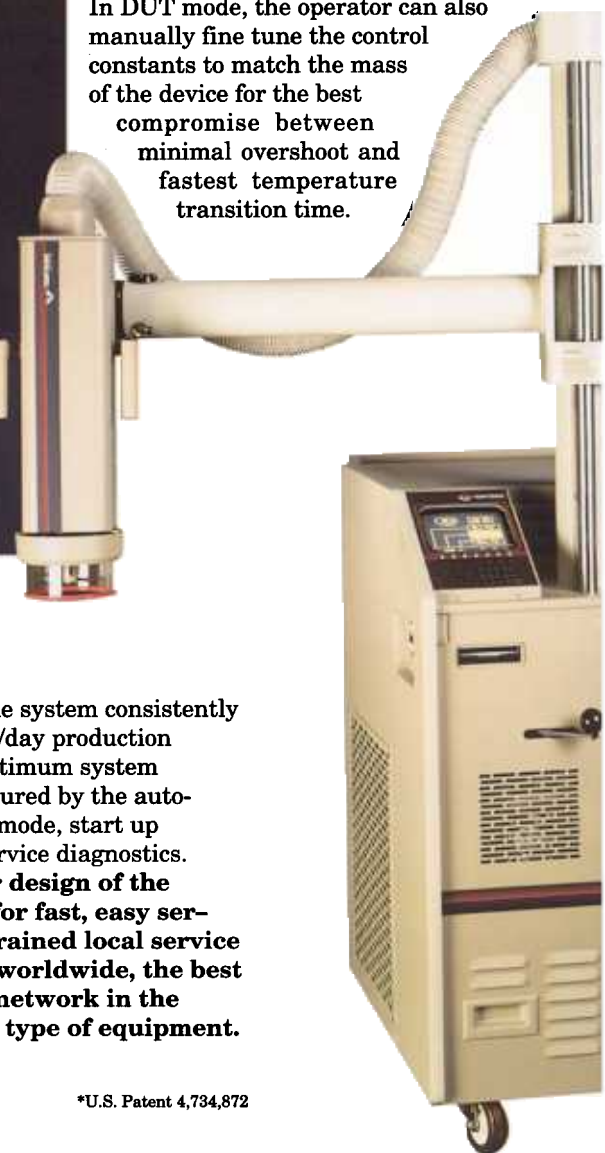


DUT Control Assures Component Temperature Accuracy

DUT (Device Under Test) patented Dual Loop Control Mode* provides direct control of the test device case temperature. The DUT control is user-tunable to optimize throughput for any package size.

The device temperature is brought as close as possible to the desired test temperature, with minimal offset, by the system using a temperature sensor located on the test socket in contact with the DUT or attached to the device case. **The TP04000 will accept type "K" and type "T" thermocouple and optional 1000 ohm RTD external DUT sensors.**

A stable DUT temperature is maintained in DUT control mode. The system will react to any change in the power dissipation level in the test device and will automatically compensate through air temperature control. In DUT mode, the operator can also manually fine tune the control constants to match the mass of the device for the best compromise between minimal overshoot and fastest temperature transition time.



ESD Protection

The TP04000 has been designed to provide ionically balanced air **free of static charge**, regardless of the test temperature. When coupled with the optional conductive shroud kit for interfacing to the tester socket, an ESD Protected environment is assured.

Maximum "Up Time"

Designed for reliability and easy service, the durable mechanical design of the

TP04000 makes the system consistently reliable in 24 hour/day production environments. Optimum system performance is assured by the automated calibration mode, start up diagnostics and service diagnostics.

The Modular design of the TP04000 allows for fast, easy service by factory trained local service representatives worldwide, the best service support network in the industry for this type of equipment.

*U.S. Patent 4,734,872

Precise Temperature Control for Printed Circuit Board, Component Arrays, and Electronic and Electro-mechanical Subassemblies

Custom thermal test enclosures for test, characterization and failure analysis of PCBs, component arrays and small subassemblies at temperature allow manual test probing of the device through patented pierce-through, fog-free windows.



The patented pierce-through window* permits physical access to the PCB or subassembly under test.

*U.S. Patent 4,426,619



Custom enclosures can be configured to meet specific test requirements for PCB and electronic and mechanical subassemblies.

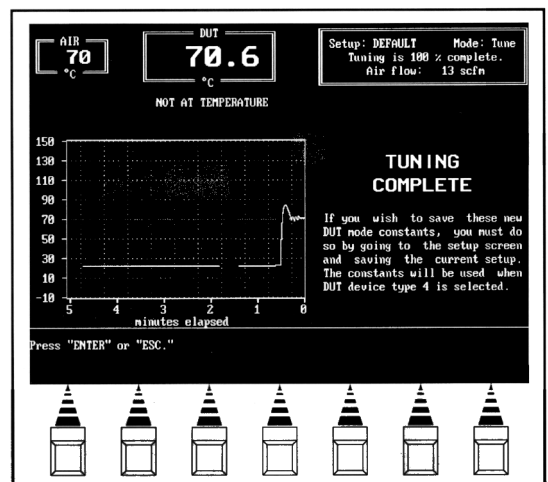
Custom PCB thermal test enclosures are available for both edge-connector and in-circuit bed-of-nails PCB test applications.



TP04000 system configuration with integral CRT

Temptronic patented Dual Loop DUT Control provides the highest throughput available and stable *At Temperature* conditions (without ringing). Autotuning quickly assesses and compensates for varying DUT thermal mass. The simple, user-adjustable Thermal Constant feature provides for error-free fine tuning of PID control characteristics. The system provides unlimited storage capacity of user/DUT programs.

Engineering DUT Screen

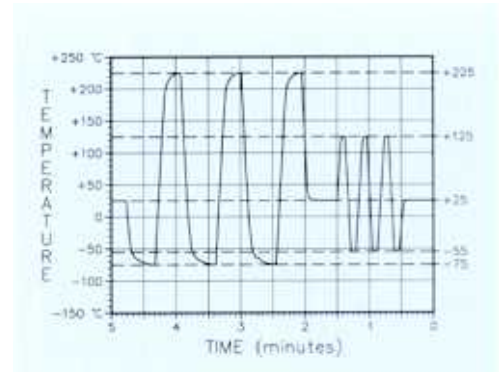


TP04000 ThermoStream System

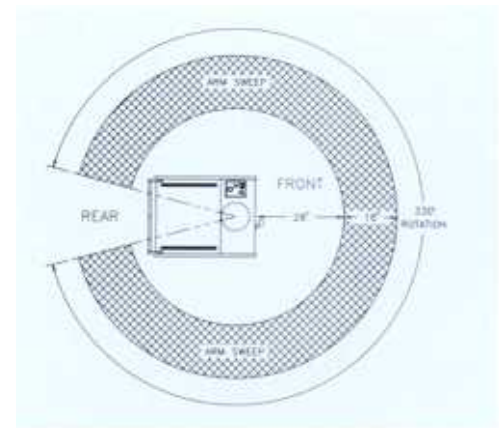
High capacity, programmable temperature control for testing and characterizing components, hybrids, modules and printed circuit boards at temperature from -75°C to +225°C.

SPECIFICATIONS

Temperature Range ¹	Mechanical Arm: -70°C to +225°C (cycling) -65°C to +225°C (steady state) ¹ CFC-free System is available - low temperature in range will degrade +5°C.	
Air Flow	Up to 18 SCFM while temperature transitioning. Microprocessor regulated for optimum system performance. Also user-settable upper limit by keypad or remote control.	
Typical Transition Rate	High Speed Head: +125°C to -55°C 5 sec Standard Head: +125°C to -55°C 22 sec	
Temperature Accuracy	±1.0°C (when calibrated against a transfer standard)	
Temperature Set and Display Resolution	0.1°C	
Non-volatile Memory	Battery back-up retention of parameters	
Controller Type	Microprocessor-based PID (Proportional, Integral, Derivative)	
Local Control	Keypad entry of parameters and selection of operating mode, setpoint	
Remote Interface Ports	RS232C Serial (option) IEEE-488 Parallel Bus	Programmer's Keyboard: AT compatible Parallel Printer: IBM or EPSON compatible (option) EGA Monitor
Handler Interface	Start Test/End of Test with Stop on First Fail (5-12 VDC Pulse; user-settable polarity)	
Remote DUT Sensors	Type T thermocouple supplied; Type K thermocouple supplied; 1000 ohm RTD optional	
Status Indication	On-screen and at-communication I/Os (separate visual indicator)	
Overheat Protection	235°C Separate circuit. (Also user-settable high and low air temperature limit)	
Dryer	Supplies -70°C dew point air from a minimum 80 PSI source at 12 SCFM flow rate	
Dimensions	System Unit - (5.2 sq. feet), 24" (61 cm) wide x 31" (79 cm) long x 41" (104 cm) high	
Weight	System Unit Arm and Thermal Head Assembly - Mechanical Arm Configuration	350 lbs. (159 kg) 75 lbs. (35 kg)



Performance graph of temperature vs time showing full system range -75°C to +225°C and mil spec range -55°C to +125°C continuous cycle transition



Rotation of Arm

FACILITIES PREPARATION

Power Requirement	220V AC, nominal, single phase, 50/60 Hz, 15 amps (standard) - Buck/Boost Transformer is provided for supply voltage outside the standard power requirement.	
Compressed Air Input Requirement	80 to 110 PSIG with air dryer (100 PSI nominal ²) 70 to 110 PSIG without air dryer (100 PSI nominal ²)	
	@ Flow Rate	8 to 24 SCFM with air dryer (16 to 24 SCFM recommended - provides optimum system performance) 5 to 21 SCFM without air dryer
	@ Dew Point	< +10°C at 80 PSI with air dryer < -75°C at 80 PSI without air dryer
	Air Input Temperature	+20°C to +28°C (+22°C nominal ²)
Operating Temperature	+20°C to +28°C (+22°C nominal ²)	
Humidity	0 to 60% (45% nominal ²)	
Noise level	62 to 63 dBA	
	² Reduced performance may be encountered at operating environments less than or greater than nominal.	

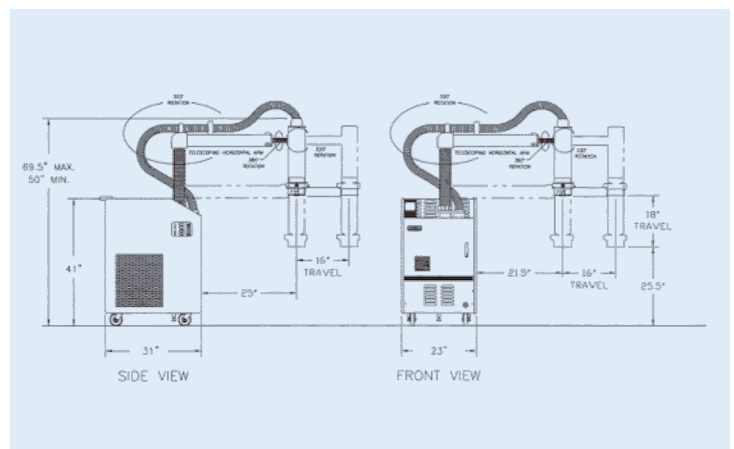
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These specifications are valid for the standard product and are subject to change without notice. Applications requiring modification of electrical, thermal, or mechanical characteristics should be discussed with the factory for possible accommodation at additional cost.

PART NO. SL10070 R/B

Printed in U.S.A.

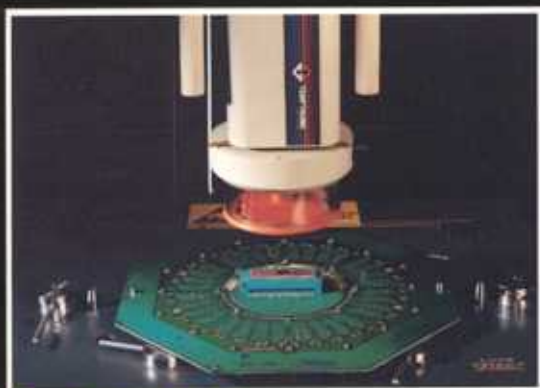
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Arm and thermal head assembly

All dimensions are approximate.

Complete Thermal Test Solutions



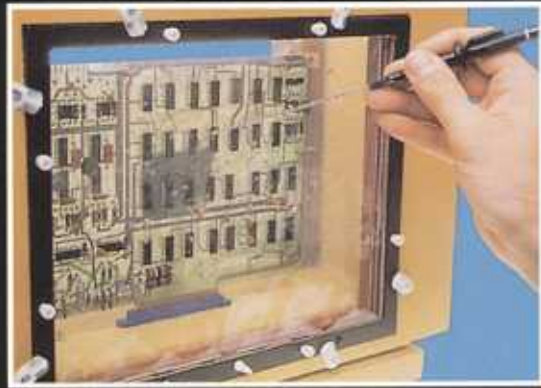
ThermoStream Systems for testing and characterizing components, modules and small printed circuit boards.



ThermoMap™ thermal imaging system for full color mapping of the temperature distribution of a device with 1 micron spatial and 0.1°C thermal resolution; for use in design, analysis and hot spot location.



ThermoFixture for testing hybrids, MCMs, modules, PCBs and other devices in a custom enclosure with fixturing for integration with ATE test systems.




ThermoZone Systems for testing, in-circuit probing and troubleshooting component arrays, burn-in boards, printed circuit boards and small electronic and electromechanical subassemblies.



ThermoChuck Systems for probing wafers, chips, hybrids and other flat devices at hot and cold temperature.



ThermoSocket Systems for testing and locating micron size defects on chips even at 30 micro-watt power levels.

TEMPERATURE ON THE  SPOT



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