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Labtronic® 8400 Controller

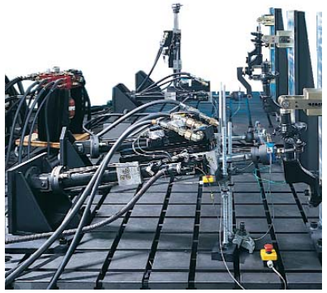
Component Test Control System

INSTRON® STRUCTURAL TESTING SYSTEMS

Affordable, Expandable Control for Component Testing

The Labtronic• 8400 controller is a state-of-the-art fully digital servohydraulic controller, designed specifically for component testing. It can accomplish simple tests with minimal investment, yet features the ability to be enhanced with additional capability to meet future needs. The integral front panel and display provide a simple, easy-to-use operator interface.

The Labtronic 8400 controller is part of the Labtronic family of controllers, incorporating technology proven over thousands of control channels and ensuring reliable results. Unlike other digitally-supervised controllers, it offers all the advantages of full digital control, including for example, excellent repeatability and accuracy, as well as the ability to store all parameters associated with a test. Signal conditioning is fully digital and integrated into the controller allowing data acquisition without the use of external A-D cards. The unit is fully portable and can easily be moved around the laboratory, or rack-mounted in a standard 19 in console.



▲
Single axis component test

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Labtronic 8400 with optional carrying handle

Future Upgrade Possibility

The Labtronic 8400 controller can grow with your testing needs. Multiple units can be quickly and easily linked together for multi-axis testing. In addition, for tests requiring sophisticated methods, advanced features such as bimodal amplitude control can be added at any time in the future. To take full advantage of the capabilities of this digital controller, a PC interface is also available. This allows either data acquisition only, or the use of all the existing IST software packages, such as WaveMaker™ or any package from the comprehensive RS LabSite• suite. The Labtronic 8400 controller uses the same hardware platform as the Labtronic 8800, which means that they can be directly linked together to expand the capabilities of an existing Labtronic 8800 controller.

Expandable for Investment Protection

Basic Controller

The Labtronic• 8400 controller is ideal for single axis durability testing of components. The unit is totally self-contained and no ancillary equipment such as a computer or external displays are required. When connected to any servohydraulic actuator, tests can be quickly and easily set-up, run and monitored from the integral front panel. Being fully digital, the controller has advantages such as high accuracy, noise rejection, bumpless control mode transfer and control of hydraulics. The display has a similar user interface to the Labtronic 8800's front panel, reducing the need for operator training.

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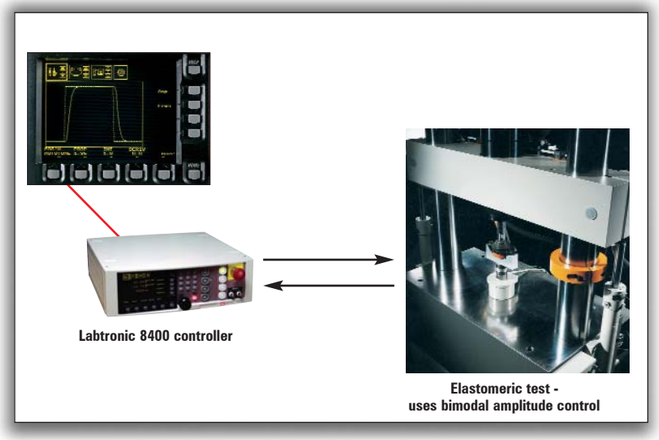
Configuration single axis component test rig

Optional Firmware Features

Choose only the features required for current testing needs. The Labtronic 8400 controller is fully expandable to meet future testing needs. Optional firmware features such as bimodal amplitude control, auto-loop shaping and enhanced waveform generation can be added at any time in the future, enhancing the capabilities of the controller and allowing it to carry out progressively more complex tests. An on-screen oscilloscope is available for test monitoring. Also available through the use of the fully digital controller, is the ability to connect a computer to allow 'User states', which define every aspect of a test to be archived and recalled for future use.



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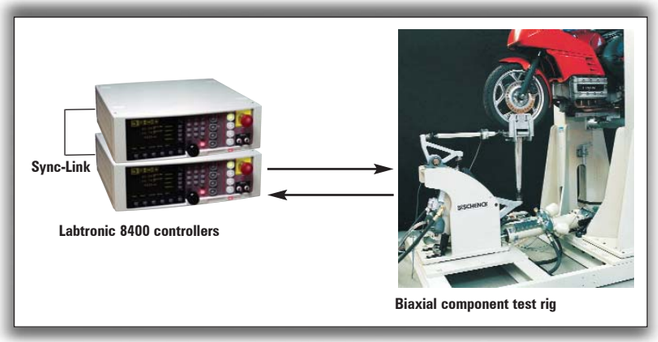
Configuration with bimodal amplitude control

Expandable for Investment Protection

Multiple Axes

Single or multi-axis test capability. Labtronic• 8400 controller systems can grow to meet expanding test needs. The controllers can be quickly and easily linked together to allow multi-axis tests to be carried out, using the multi-unit interface panel. This includes links for the first on/ last off pump controls, emergency stop chain connections and a sync-link connector to synchronize waveforms. Channels can then be set-up as master or slave axes, as appropriate.



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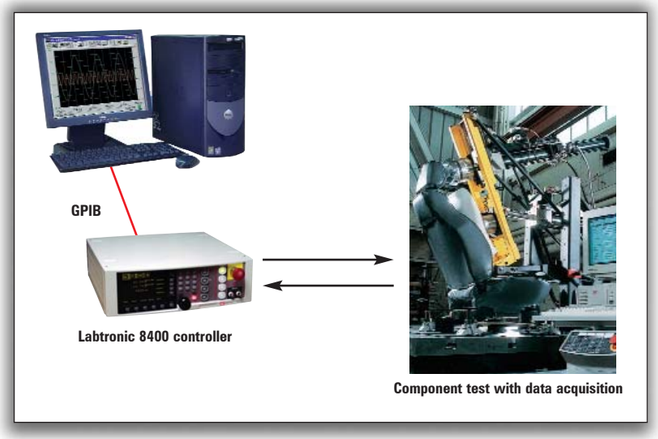
Configuration of a biaxial component test rig

Data Acquisition Capability

The Labtronic 8400 has integral data acquisition capabilities. The controller is fully digital including all signal conditioning, which forms an integral part of the system. This means that acquiring data from any of the sensors simply requires the addition of the GPIB interface. Third party A-D conversion cards are not required.
This provides greater flexibility, increased performance, and takes full advantage of the internal digital signal filters and the fact that all channels are synchronized.



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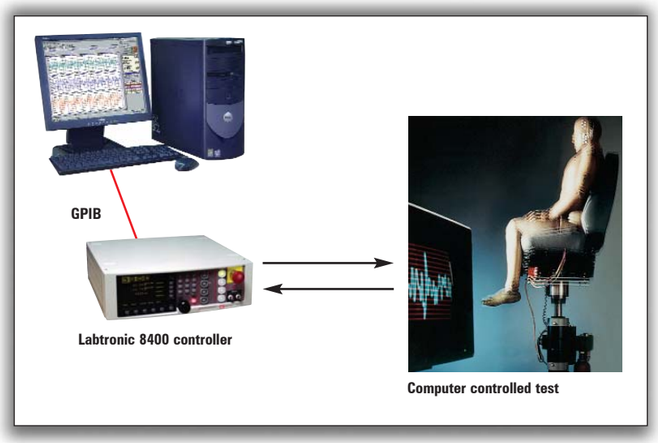
Configuration of component test with data acquisition

Software Control

The complete RS LabSite• software suite is available for use with the Labtronic• 8400 controller. This expands its capability to suit the demands of progressively more complex test requirements. Block program using cyclic data, damper test software, elastomeric testing software and vibration control software are all available. In addition, the complete RS LabSite suite can be used, allowing for example road data to be reproduced and providing comprehensive databasing capabilities with data archiving schemes. This allows full integration of a Labtronic 8400 controller-based system into a laboratory equipped with multiple Labtronic 8800 controllers.



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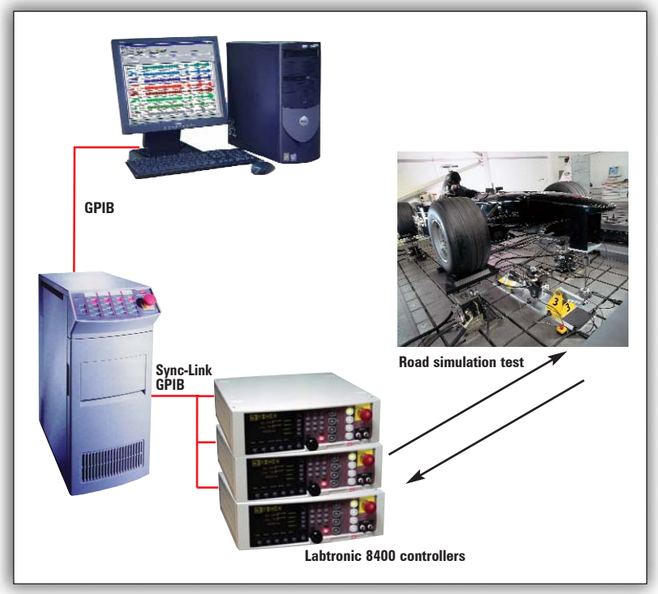
Configuration of computer controlled test

Link to Labtronic 8800 Controller

Use together with Labtronic 8800 controller for multi-axis tests. The Labtronic 8400 controller forms part of the Labtronic 8800 family. This means that not only is it possible to link Labtronic 8400 controllers together, but they can be quickly and easily linked to existing Labtronic 8800 controllers. This allows for a truly flexible use of controller resources within a laboratory. As the controller is fully compatible with the whole range of IST software, it can even be used to complement Labtronic 8800 controllers, for example, to run complex vehicle test rigs using RS LabSite simulation software. Furthermore, both products share the same hardware platform, which allows spare parts to be interchanged.



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Configuration of multi-axis test together with Labtronic 8800

Latest Digital Controller Technology

Standard Features

The Labtronic• 8400 is a stand-alone single axis controller, which belongs to the Labtronic family of controllers. Extensive control, measurement and test monitor features make it ideally-suited for component testing. Its standard features will fulfill many basic test requirements and it can easily be upgraded for increased capability.

Operator Interface

A user-friendly operator interface saves on test set-up time. The Labtronic 8400 controller's graphic display provides continuous operating status and test amplitude information. Changes in test set-up can be quickly made using an intuitive menu system with minimal scrolling.

- Graphic Display - The 120 mm x 88 mm (4.75 in x 3.5 in) display screen features comprehensive status display and logical menu tree for operator inputs
- Controls - An alphanumeric keyboard (impervious to dirt and oil) and special function keys, allow for high flexibility while maintaining user-friendly operation. A multi-function control knob provides an analog feel for operator inputs
- Oscilloscope - Loop tuning assisted by on-board oscilloscope with auto scaling
- Engineering Units - Parameters displayed in engineering units, with user selection of SI, Metric or US Customary units
- Help - Pressing the 'Help' button activates a context sensitive help message
- User-Defined Labels - Transducer signals can be custom labeled for operator convenience
- Rack Mount - As standard, unit is provided with removable brackets to enable the controller to be rack-mounted in a standard 19 in cabinet

Control

Full digital loop control allows features not usually associated with basic servo controllers. The built-in tuning oscilloscope allows the loop to be quickly optimized without the use of an external oscilloscope.

- Main Controller Board - The Integrated Axis Controller (IAC) board provides fully digital control. It incorporates two DSP processors, one for loop closure and the other for signal conditioning, allowing factors which degrade control performance such as noise and drift to be eliminated
- Control Modes - Two sensor conditioner modules (usually position and load) are provided for control feedback. With optional modules, up to four control modes are available. Digital control provides bumpless transfer between feedbacks
- Loop Tuning - PIDF (Proportional, Integral, Differential and Feed Forward) gain are provided for optimizing the control-loop. In addition, a programmable Lag term is useful when a resonance is encountered
- Function Generation - Sine, triangle, square and ramp functions are available from the internal function generator. Alternately, external command signals can be used
- Soft Start/ Stop - Programmable attack and decay times (controlled span rate of change) prevent unwanted start or stop transients
- Hydraulic Control - Panel buttons with status lights provide local hydraulic control and show operating status at a glance
- Servo Valve Driver - For two-stage servovalves
- Delta P Stabilization - Improves control with high mass loads (requires optional conditioner)

▲
Function generation

Measurement

Accurate measurement is the key to good test results. The Labtronic• 8400 controller utilizes patented measurement technology and hardware developed to ensure the integrity of data. Integrated digital data acquisition provides superior performance and accuracy over older hybrid technology, including:

- Two standard sensor conditioner modules with provision for four in total. The unique transducer recognition feature saves calibration time by automatically setting excitation levels and allowing auto-calibration for IST transducers
- Integrated data acquisition capability with digital data transfer to PC (requires PC control option)
- BNC Outputs - Four programmable BNCs for external monitoring

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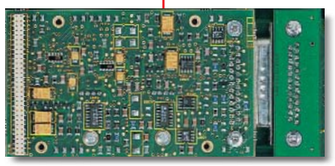
IAC board



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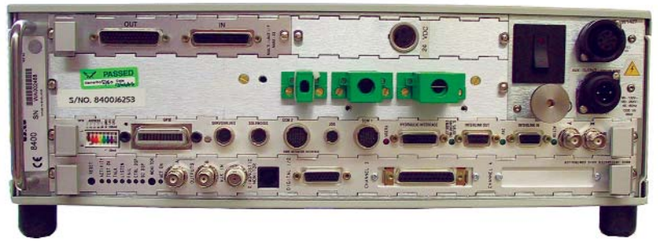
Sensor conditioner module



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Labtronic 8400 controller rear connections

Monitoring

Peak detectors provide visual confirmation of test accuracy while limit and event detectors provide background monitor of test performance.

- Peak Detectors - Programmable to read minimum and maximum peaks, or amplitude and mean of the selected parameter. The ultimate peak values are also stored
- Limit Detectors - Each transducer signal has a minimum and maximum limit detector with programmable action
- Cycle Counters - Two counters with preset event actions count interim and total test cycles
- Event Detectors - Five event detectors are programmable to detect a variety of conditions including feedback underpeak, excess servo error and digital input trigger. The event action is also programmable
- Digital I/ Os - Four inputs and four outputs provide logic communications with external devices

Data Integrity

The Labtronic 8400 controller's design features and user interface were developed with the goal of maximizing test accuracy and minimizing operational errors, thus ensuring confidence in test results.

- 'No Scrolling' User Interface - Provides immediate access to critical functions
- Single Range Transducer Conditioning - eliminates over-ranged data
- Digital Data Interface - Provides more reliable and accurate data collection than is possible with analog interfaces
- Storage of Set-ups - The Labtronic 8400 controller can store up to four set-ups (plus current set-up) for convenience and accuracy when repeating test set-ups
- Auto Transducer Recognition - Auto recognition of IST transducers saves calibration time and reduces errors by automatically establishing excitation and coarse gain

Latest Digital Controller Technology

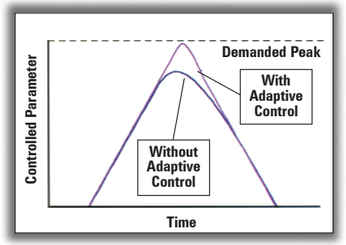
Optional Features

Available optional features and hardware expand the capability of the Labtronic• 8400 controller to match the Labtronic 8800 controller features. This assures that the user will not have to replace the controller in order to perform more sophisticated test functions.

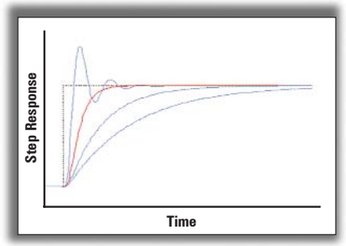
Firmware Options

The Labtronic 8400 controller can be upgraded with firmware options at any time in the future, quickly and simply by inputting a feature access code on the front panel. Available options include:

- Amplitude Control - Bimodal amplitude control maintains test amplitude and mean level
- Oscilloscope - Two channel fully-featured oscilloscope with storage capability
- GPIB Activated for PC Control – Enables the Labtronic 8400 controller to be operated remotely via a PC. The full range of applications software available from IST provides a full range of control and data acquisition capabilities
- Adaptive Control - Continually updates loop tuning parameters in real time to compensate for specimen stiffness changes (consult IST or Instron• for application advice)
- Auto-Tune - Automatically optimizes the control-loop tuning parameters (pretest)
- Extended Function Generator - Adds trapezoid and haverfunctions to standard waveforms

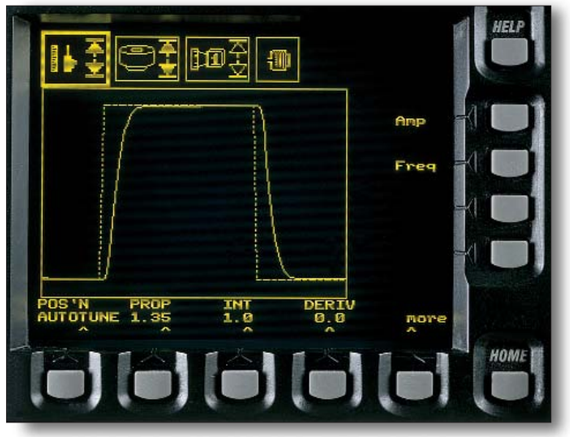


▲ Adaptive control



▲ Auto-tune

- Load Protect - Protects the test component during installation by limiting the maximum load that can be applied to a preset value, while in position control
- Unload Limit Action - Activates load protect as a limit action
- Transfer Limit and Event Action - Transfers control mode when threshold value is reached
- Break Detection - Detects when a test component has failed
- Dual Ramp Function Generation - Adds dual ramp function generation capabilities to standard waveforms
- Sensor Compensation - Provide true stress or true strain



▲ Loop tuning oscilloscope

Hardware Options

The Labtronic• 8400 controller has a wide range of hardware options which can be easily retrofitted in the test laboratory. Available options include:

- Sensor Conditioners - Conditioners three and four are available for monitoring only or with control-loop capability
- Auxiliary Connector Panel - Includes interface connectors for Delta P input, three-stage servo valves and jog handset
- Delta P Conditioner - Provides conditioning for Delta P transducer
- Three-Stage Servo Valve Driver - Provides closed-loop control for three-stage servo valves
- Jog Handset - Pendant type handset has jog controls to facilitate specimen loading
- Multi-Unit Interface Panel - Includes connections for sync-link cable, first on/ last off pump interface, and emergency stop chain connection
- Sync-Link Cable - Used to connect multiple Labtronic 8400 controllers for use on a single test. Synchronizes the function generators and start/ stop actions
- Retrofit Interface Panel - Provides drop-in replacement for selected controllers, including the MTS• 406
- Carrying Handle - Convenient carrying handle doubles as a support stand for desktop operation
- PC with GPIB Interface - Allows operation via a PC, compatible with a wide range of software, covering applications from simple data acquisition through to full vehicle simulation using IST's RS LabSite• suite of programs. Materials testing applications are also available with Instron•'s FastTrack™ 2 software suite

▲ Labtronic 8400 - combine as many as you like

Technical Specifications

General	Description
Number of Control-Loops	1
Number of Signal Conditioners	1 to 4
Number of Control Channels	1 to 4
Package Style	Desktop unit or rack mount
Integrated Axis Controller (IAC)	
Program Storage	1 MB flash memory. Firmware can be updated from a PC via the GPIB
Self Test	Automatic on power up
Diagnostics	Interactive diagnostics via diagnostic port
Closed-Loop Control	
Type	Fully digital closed-loop, PIDF + Lag
Control-Loop Parameters	Independently settable for each conditioner Proportional gain, integral gain, derivative gain, feed forward, lag
Control-Loop Update Rate	5 kHz
Auto-Loop Shaping (Optional)	Position, load and auxiliary
Adaptive Loop Shaping (Optional)	Continually updated PID terms (update rate 1 kHz)
Servo Valve Drive Limits	Independent settings for low/ high pressure to +120% FS
Servo Valve Null Adjustment	Automatically balanced
Servo Valve Dither	Variable between 200 Hz and 500 Hz settable Amplitude between 0% and 100% settable
Control Mode Transfer Accuracy	0.003% of FS of channel into which control is transferred (static transfer)
Control Mode Transfer Time	200 micro sec
Compensation Input	±10 V differential (e.g. for Delta P)
External Inputs and Outputs	
Digital Logic Inputs	4 off, programmable
Digital Logic Outputs	4 off, programmable
Analog Outputs	4 off 10 V scaleable, selectable demand, feedback(s), error
Analog Inputs	1 off 10 V scaleable and can be calibrated
Signal Conditioning	
Compatible Transducer Types	Resistive, AC and DC e.g. load cells, LVDTs, pre-conditioned devices
Transducer Recognition/ Calibration	Automatic and manual
Excitation Frequency	5 kHz
Excitation Voltage	1 V RMS to 15.5 V RMS
Input Sensitivity (Ratiometric Devices)	0.1 mV/V bis 4.7 V/V (0.25 mV/V by excitation voltage 15 V; 0.75 mV/V by excitation voltage 5 V; 0.1 mV/V by reduced resolution and excitation voltage 15 V)
Input Sensitivity (DC Output Devices)	±60 mV to ±10 V
Balance Range	100% of full scale
Over Range	100% of full scale
Data Rate	5 kHz
Resolution	19-bits (1 kHz bandwidth)
Accuracy	0.25% of reading or 0.005% of full scale (whichever is greater)
Demand Generation	
Set Point	±105% of FS
Waveforms (Basic)	Sine, square, triangle, ramp
Waveforms (Optional)	Haversine, havertriangle, haversquare, trapezoid, dual ramp
Internal Waveform	
Amplitude Resolution	32-bit
Waveform Maximum Frequency	1 kHz
Waveform Frequency Accuracy	0.01% of setting
Sample Data Playback	Via GPIB
Sample Data Playback Rates	Up to 5,000 samples per second per IAC
Sample Data Buffer Size	48 kByte

Technical Specifications

General	Description
Demand Generation	
Sample Data Filters	6 pole digital Butterworth, Chebyshev, Bessel or user defined with a fully selectable corner frequency
Data Loggin (Optional)	
Sampling Rate	Selectable up to 5 kHz
Buffer Size	160 kByte total
Filters	2, 4 or 6 pole digital Butterworth, Chebyshev, Bessel or user defined with selctable corner frequency
Resolution	19-bits (1kHz bandwidth)
Signal Range	Fully dynamic range available over ±120% of FS
Limit detectors	
Types	Min (two available per conditioner) Max (two available per conditioner)
Update Rate	1 kHz
Actions (Basic)	None (indicate only), reset, actuator off, dynamic ramp down
Actions (Optional)	Unload, mode transfer and hold
Limits Range	±100% FS
Event detectors	
Types (Basic)	Threshold, increment, count, enhanced count, digital input, error, GPIB trigger, sync link trigger
Types (Optional)	Break detection
Update Rate	1 kHz
Actions (Basic)	None (indicate only), reset, actuator off, dynamic ramp down
Actions (Optional)	Hold, finish, mode transfer, unload, stop
Peak detectors	
Types	Min, max, amplitude, mean, ultimate max, ultimate min
Update Rate	5 kHz
Computer Interface (Optional)	
Type	GPIB (IEEE HS488®)
GPIB Bandwidth	8 Mbyte per second
Hydraulic Controls	
Solenoid Drive	OFF/ PILOT/ LOW/ HIGH can be used for local hydraulic control or alternately to operate the hydraulic power supply. Provision is available for first on/ last off pump control.
Solenoid Drive Current Rating	24 V, 4 A maximum
Servo Valve Drive Current	2 off, 120 mA
Emergency Stop	High integrity emergency stop utilizing safety relays with self-checking and redundancy
Computer Control (Optional)	Computer control of hydraulics is available through GPIB command
Supply and Environmental	
Supply Voltage	90 V to 250 V (no adjustment required)
Supply Frequency	45 Hz to 60 Hz (no adjustment required)
Power Consumption	300 VA internally, plus auxiliary output for computer rated at 720 VA
Operating Temperature	10 °C to 38 °C (50 °F to 100 °F)
Storage Temperature Range	-40 °C to 66 °C (-40 °F to 151 °F)
Operating Humidity Range	10% to 90% non-condensing
Storage Humidity Range	0% to 95% non-condensing, non-frosting
Dimensions	
Desktop Unit or Rack Mounted Unit	Height 130 mm (5.25 in) Depth 432 mm Width – rack mount 483 mm (19 in) Width – desktop 432 mm (17 in) Weight 13.6 kg (30 lbs)

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