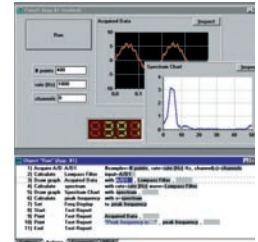


KEITHLEY



Solutions for Data Acquisition

Instrument Control • Analysis • Presentation

TEST POINT

A	B	C
1	0	0
2	1.982706	4.922111
3	2.3424879	2.0224879
4	3.4405777	4.709999
5	4.4695955	4.895699
6	5.4272401	4.62251
7	6.3221533	4.550504
8	7.1720342	4.479919
9	8.0007028	4.409933
10	9.-1.65409	3.341144
11	10.-3.01581	4.27352
12	11.-3.88318	4.20695
13	12.-4.14141	4.141417
14	13.-3.77059	4.076904
15	14.-2.8458	4.013397
16	15.-1.52283	3.950879
17	16.-0.01299	3.889334
18	17.1453216	3.828748
19	18.265591	3.769106



From concept to completion, nothing is easier than TestPoint

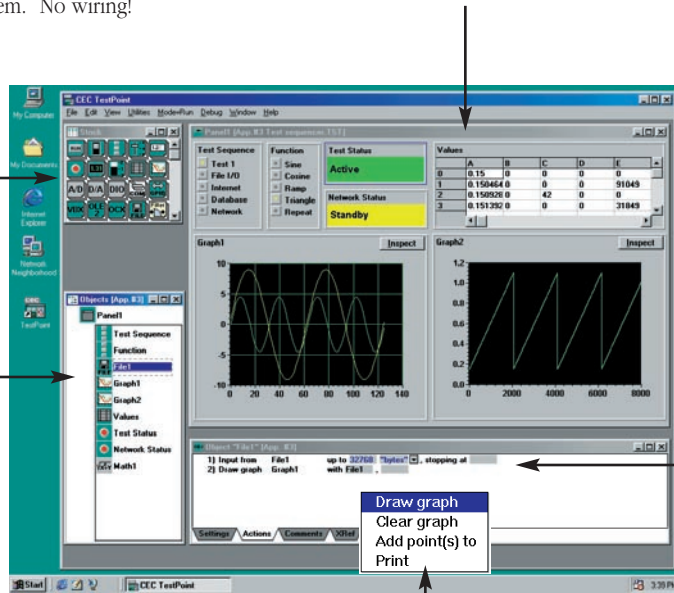
TestPoint™ uses object-oriented, drag-and-drop technology to bring both power and simplicity to data acquisition and test & measurement. That's why TestPoint is the choice for tens of thousands of applications worldwide.

Stock Window

Custom or standard objects like displays, graphs, switches, and interface hardware are available in the Stock Window. Select items as you need them. Place them where you want them. No wiring!

User Window

Applications can have one or more panels to display buttons, graphs and other items. These panels are the user interface.



DRAG-AND-DROP TECHNOLOGY

Object Panel

All objects that are used in an application appear in the Object Panel. This is where the Stock objects take on custom information for use in your application. The same object can be used multiple times in an Action List.

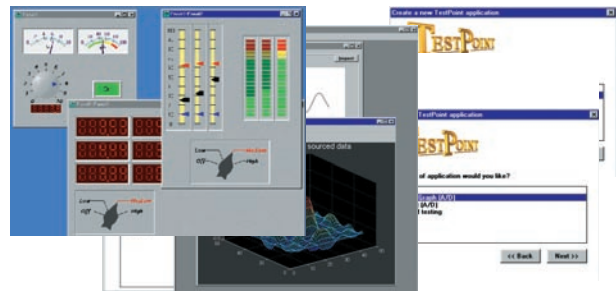
Drop-down lists provide action choices and eliminate typing.

Action List

You create a list of the things your test will do by dragging objects to an Action List. TestPoint does the typing. These lines are provided to describe the test to you. While you drag and drop, TestPoint creates a compiled program.

New in TestPoint version 4!

- Ten new controls, including Knob, Gauge, LED bar, LED display
- 32-bit ActiveX support for add-in controls
- MATLAB® interface
- TestWizards™ and TestStyles™

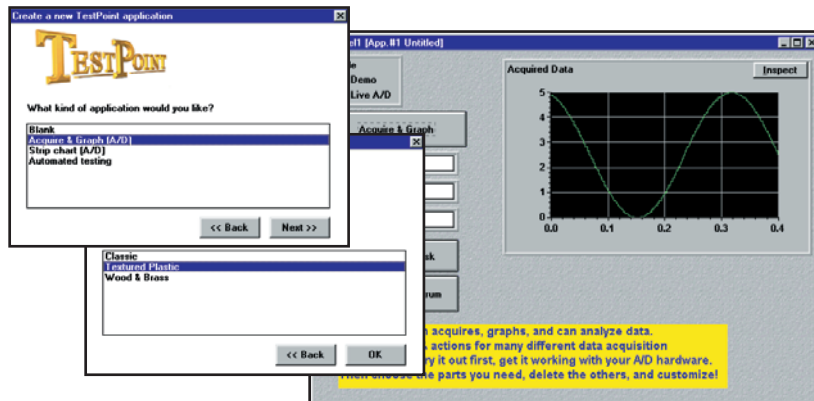


TestPoint is a trademark of Capital Equipment Corporation.

"I've built several test racks using TestPoint and I've always been impressed with its ease, versatility and power. One application I wrote pages the engineer when one of the 168 channels it monitors goes out of spec and inputs which channel to the pager as well." – N. Holland



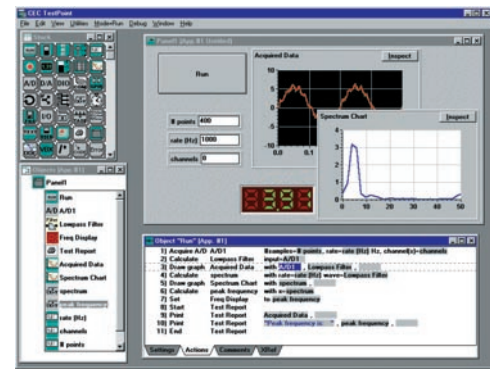
Simple



TestWizards get you started with pre-written application templates in a choice of graphical styles. With just a few mouse clicks, you can create a complete running data acquisition program. Then just modify or drag in other objects to add your own custom enhancements.

Powerful

Drag and drop just a few action lines and TestPoint's powerful objects create a fast, advanced application to your specs quickly and easily. The example shown here acquires data, does digital filtering, spectrum analysis, and produces a full printed report with graphs and text – using only 12 objects and 11 actions. It was created in a matter of minutes by starting with a TestWizard template and adding a graph, report, and a few math objects.



Unlimited

There are no limits to what you can do with TestPoint! Full support for all the latest software standards ensures that you can extend the built-in features we provide through the use of third-party software components and links to other programs, or even write your own enhancements and new TestPoint objects.

ActiveX
C++/DLL
VISA
OLE2
DDE
ODBC
OPC

"In our application we are acquiring light intensity signals at two different wavelengths... Simultaneously, the ECG and a pressure signal are acquired and analyzed... The application was written in less than a week by a novice to TestPoint." – E. Kouvalainen

SIMPLE • POWERFUL • UNLIMITED

Data Acquisition

Analog to Digital Conversion

TestPoint provides high-level A/D functions to simplify data acquisition. When the A/D object is placed in an Action List, a pop-up menu appears. A simple click on the function of choice adds that function to the Action List and TestPoint is ready to acquire data samples. A/D data can be scaled to engineering units, logged to disk files, and plotted on a graph or strip chart, all with just a few simple choices and no more than two action lines. High-level functions let you start, stop, set gains, trigger, pretrigger, and other hardware options quickly and easily.

Automatic A/D Configuration

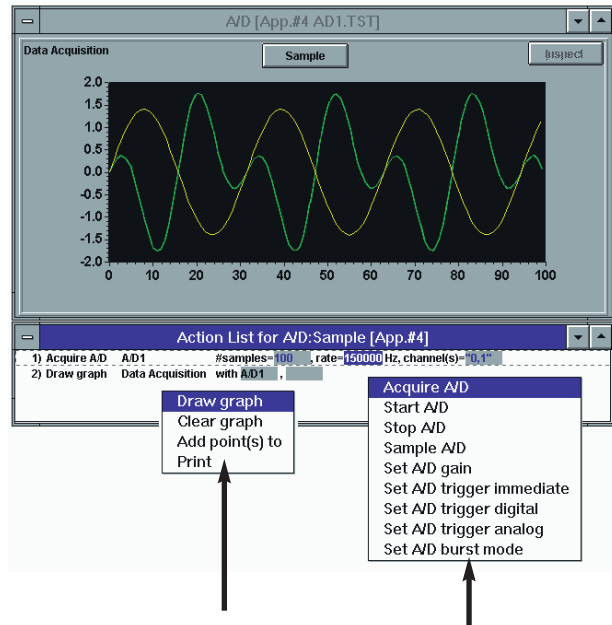
TestPoint supports a wide variety of A/D, D/A, digital I/O, and counter/timer hardware from all the major manufacturers. Its unique **auto-search** feature finds installed boards automatically. In fact, because TestPoint's high-level data acquisition objects are vendor-independent, you can change boards or move to another computer and hardware configuration without changes to your TestPoint application. When you run, auto-search fills in the available hardware, and you're all set to go.

Speed

A/D cards operate at their full rated hardware speeds under TestPoint. TestPoint's multitasking capability allows simultaneous acquisition, waveform output, and other processing.

Digital to Analog Conversion

TestPoint provides high-speed control of D/A cards for control systems and generation and editing of arbitrary waveforms.



Drop-down lists provide action choices and eliminate typing.

Any test or test sequence you do now in a conventional programming language can be done in TestPoint.

Remote DAQ, Smart Sensors, and PLCs

TestPoint's OPC client object connects to any measurement device that comes with an OPC (OLE for Process Control) server. This includes devices from Allen-Bradley, Siemens, Modicon and many others.

OPC - OLE for Process Control: OPC is an industry software standard for communicating with factory measurement and process control equipment, supported by the more than 150 members of the OPC consortium. OPC server software comes either from the manufacturer of the device or a third-party supplier such as www.kepware.com. TestPoint can read or write any data item "published" by an OPC server.

Instrument Control



Control any IEEE-488, GPIB, RS232, RS485, or VXI instrument. TestPoint converts difficult instrument data formats like reversed byte binary or combinations of numbers, strings, vectors, and arrays with simple menu options.

This application reads a value from a meter and acquires a waveform from an oscilloscope.

The scope is controlled using the standard GPIB object and the universal library functions.

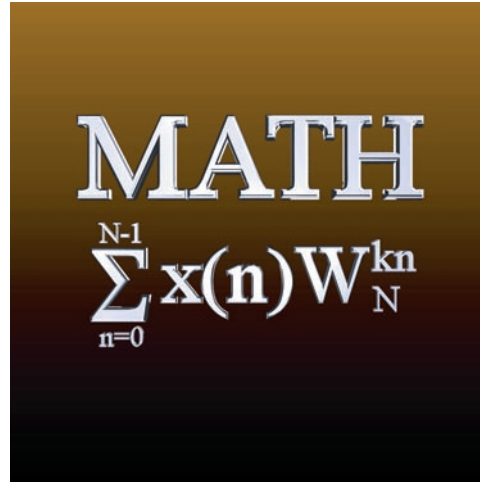
The meter is controlled using the TestPoint's instrument library for that specific device.

Universal Instrument Library

The GPIB, VISA, and RS232 instrument objects in TestPoint support **all instruments, all functions, and all commands**. These general purpose objects can be used directly or they can be customized and combined with other objects. The details of custom objects can be hidden or "locked" for designers, OEMs and VARs who want to sell custom add-ons to TestPoint. In addition to the general purpose objects, TestPoint provides hundreds of instrument-specific objects (DMMs, oscilloscopes, function generators, etc.) for your convenience.

Math & Analysis

TestPoint's Math Object lets you calculate simple or complex formulas with any number of variables. Arithmetic, logic operators, vector and array, string, trigonometric, and log functions are all available. FFTs and inverse FFTs, filters and other advanced functions provide fast data analysis and the list of math functions is constantly growing. The TestPoint math interface has been carefully researched to provide maximum benefit for minimum time investment. You can drag and drop variables without retyping: it takes just two lines to graph an FFT and TestPoint handles string variables as easily as numbers. TestPoint never requires tedious connection and placement of math icons and TestPoint does most type conversions automatically so that what you want is what you get, regardless of input format. When you select the math icon from the Stock Panel, TestPoint prompts you for a formula and name. Simple or complex formulas are built quickly with clear understandable names and without selecting, connecting or drawing additional icons.



Vector/array functions

zero(), one(), ramp(), idn(), dim(), vector replacement, index, subarray, reverse, rotate, determinant, inverse, transpose, decimate, matMultiply, appendVector, generateSin/Cos/ Triangle/Ramp generate/Square/Steps generateRepeat.

Analysis Functions

integration, differentiation, FFT() and IFFT(), frequency, magnitude and phase Hamming, Hanning, Blackman, Blackman-Harris3, Blackman-Harris4, histogram, convolve, solve, sort. Linear least squares, Polynomial regression.

Filter functions

lowpass, highpass, bandpass, notch, FIRFilter, IIRFilter, smoothavg/avgcentered/median.

Control functions

proportional, PID, PD, PI, ID, and user defined functions.

Digital Filtering

Butterworth, Chebyshev and Bessel.

All math functions can be combined and nested to any level. Math functions accept multiple data types (polymorphic) and are computed to 15 significant digits.

Basic Functions

+, -, *, /, exponentiation mod, not, and, or, xor, sqr(), sgn, factorial, <, <=, =, >, >, comparison operators for numbers or vectors, floor, ceil, round, int, abs, sgn, rnd, rndNormal.

Trig and Log Functions

sin, cos, tan, asin, acos, atan2, atan, sinh, cosh, tanh, sqrt, log10, log, exp, pow2, pow10, factorial.

String functions

asc, substr(), instr(), chr(), string concatenation, strtrim, strcomp upcase(str), lowercase(str).

Conversion functions

hex(), valhex(), binary(), valbin() str(), Convert to Number/ String/ Vector or List.

Statistics functions

avg(), sum(), mean(), median(), mode(), stddev(), min(), minindex(), max(), maxindex().

List functions

list, sublist, select.

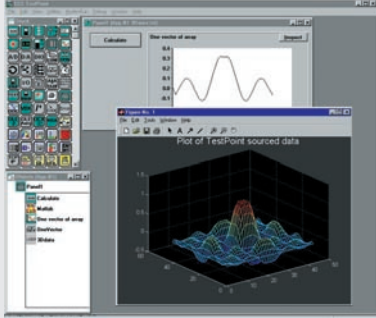
Curve fit functions

linear, exponential, polynomial, logarithmic, interpolation.

Miscellaneous functions

cliplower, clipupper, cliprange, if, type, pi, e, length, previous, interpolation, random number generator (8 methods), counter. Numbers can be formatted in engineering, or scientific notation.

MATLAB® Interface



TestPoint now includes a complete interface to MATLAB, the world's leading math and analysis software package from The MathWorks, Inc.

- Send data to MATLAB from TestPoint
- Call on MATLAB's advanced math, signal processing, and other toolkits
- Execute MATLAB commands from TestPoint
- Use MATLAB's graphing features from TestPoint
- Call TestPoint from MATLAB to operate A/D hardware or instruments

MATLAB is a registered trademark of The MathWorks, Inc.

Presentation



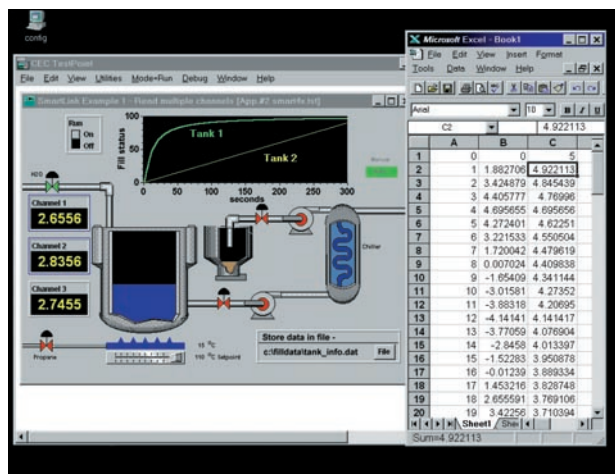
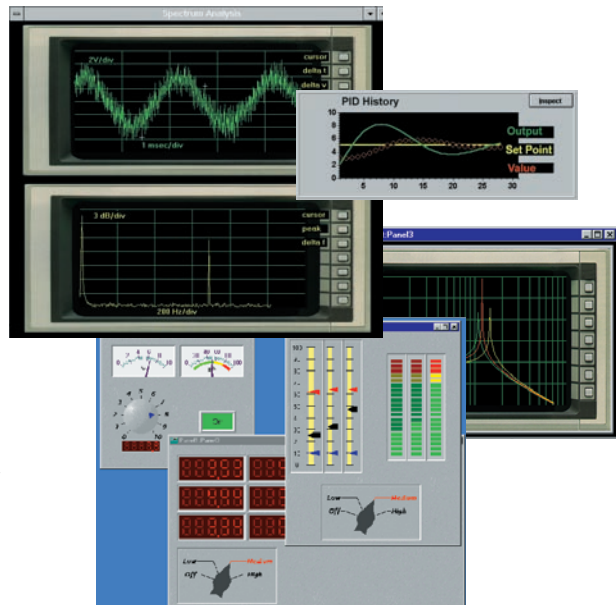
Graphs and Displays

TestPoint's graph features include Y/t, X-Y, and scatter plots, with linear or log axes and settings to control trace colors, line types, symbols, grids, and labels. The Inspect button allows a user to open a window into the graphical data, zoom, pan, and change the appearance, as well as print or copy the data.

Text or numeric data can also be displayed in any of the wide variety of interface objects included with TestPoint, such as graphical gauges, linear bars, 7-segment readouts, stacked LED bars, and much more. The 10 new controls added in version 4 allow a choice of fonts, colors, and dozens of other display aspects.

Printed Reports

The Report Object creates formatted documents with headings, page numbers, and any text or graphical content you decide to include from your TestPoint data. You have full control over fonts and page orientation. Output can go to any supported Windows printing device.



Links to Microsoft Office and other applications

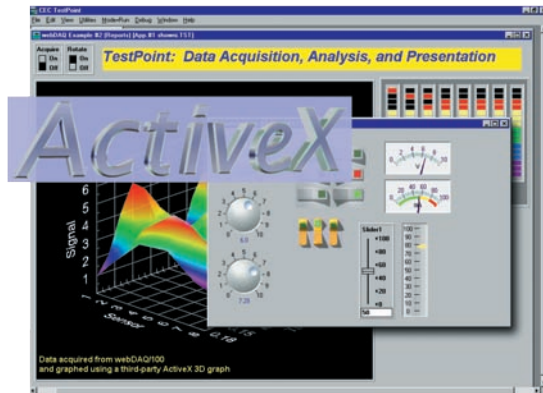
Take advantage of the familiar tools in Office and other popular programs by linking TestPoint data directly into your documents. Use the page layout features of Word or Excel to create stunning reports.

“Ease of use usually implies sacrificing possibilities. I have found that not to be the case with TestPoint. A TestPoint application will most likely be limited by a lack of the programmer’s design creativity rather than by TestPoint’s development tools.” – Brad Schulte, NWS Technologies

Open and Extendible

No Limits!

Unlike some proprietary or closed data acquisition programs, TestPoint never limits what you can do. If you need to add a new type of hardware, a new graphical display, or go beyond TestPoint's thousands of built-in features in any way, we've provided everything you need. By supporting all the latest standards, true plug-in component software is a reality. You can add ActiveX controls, use Object Linking and Embedding, or call external code or device drivers. What's more, with our **user-defined objects** feature, anything you add on to TestPoint can be packaged as a native object and placed right in your Stock window for re-use, or distributed to other developers.

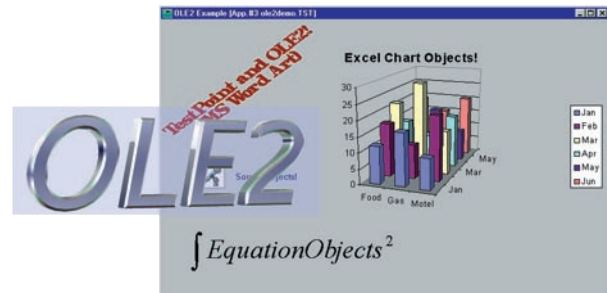


ActiveX Controls

ActiveX controls are an industry-standard form of software component that can be purchased and plugged right into TestPoint, just like any built-in object. Because TestPoint uses event-driven object-oriented technology, these components fit right in. Hundreds of different ActiveX controls are available, providing features ranging from dials, meters, and sliders, to notebook tabs, spreadsheet grids, graphing and database tools. In fact, many hardware vendors now provide driver interfaces in the form of ActiveX objects.

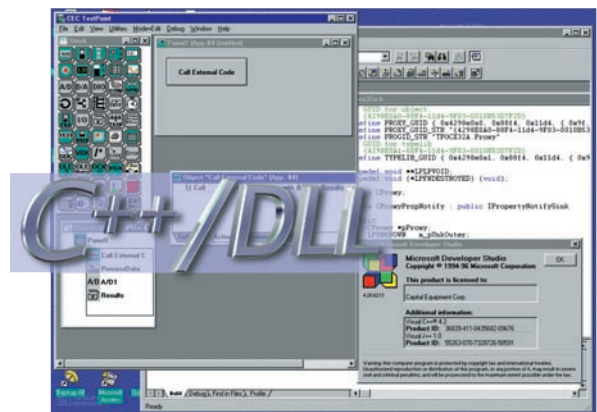
External Code or Drivers

If you want to access any features of the Windows operating system, call on third-party hardware drivers, or even develop your own custom processing routines in another language, TestPoint's Code Object lets you directly call on external subroutines in any Windows DLL (dynamic link library) file. Examples included with TestPoint show you how you can draw your own screen graphics, do custom math processing, minimize and change window placement and more. You can even start other programs, including legacy DOS applications, to leverage work you've already done.

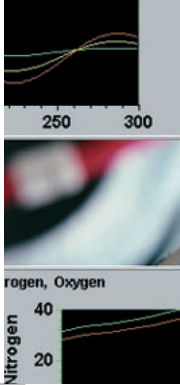


Object Linking and Embedding

Want to integrate TestPoint's abilities in data acquisition and instrument control with familiar analysis or presentation tools like Word, Excel, Access, or other programs? TestPoint includes an OLE2 feature that lets you directly embed an object provided by another program right in your TestPoint panel, like the Excel chart shown here. TestPoint's OLE Automation object gives you full control over all the features of any OLE server application – you can manipulate data, colors, etc. – any feature provided by the other program.



"With TestPoint, we didn't have to hire a professional programmer to get the exact application program we wanted. TestPoint allows us to do our own programming and that's one of the reasons it's an economical – as well as effective – data acquisition program." – Dave Filbrun, Infant Pulmonary Lab, Children's Hospital, Columbus, Ohio



Distributing Your Applications

There are no license fees associated with the applications you create using TestPoint. A runtime packaging utility, built into TestPoint, puts your test and all related files into one neat package for distribution.

The packaging utility also includes a Windows installation program that installs your application. Runtime source code can even be password protected. **When a customer receives your TestPoint runtime disk, all they need to do is select File Run and enter a:setup.** TestPoint sets up a new group and installs the software and icon for your application. Double click on the icon and your application is running under Windows. It's fast, easy, and professional.

Packaging your runtime is as easy as 1-2-3.

1. Select the application you want to package.
2. Choose the installation files and groups.
3. Choose the destination.



Free Runtimes • No license fees • No hassles

TestPoint Specifications

Objects - TestPoint includes 50 standard objects that perform the functions listed on these pages. Any number of objects can be used in any order, individually or combined with other objects to create user defined objects. In addition to the functions listed, objects for instruments, closed loop control (PID), thermocouple measurements and engineering unit conversions are also included. TestPoint objects have settings which control their physical and operational characteristics. Object settings position and size are programmable. The properties of ActiveX objects added to TestPoint are programmable. All math functions can be nested and where applicable, all math functions operate on scalars, vectors, and arrays.

A/D functions - acquire n samples, start A/D and signal event after n samples, single sample, pretrigger, trigger immediate, digital, analog, channel, level, polarity(+/-), mode (edge, level), gain, hysteresis, A/D burst mode (on,off) 1 to 2E+09 or continuous samples per channel. Supports multiple boards, unlimited channels, thermocouples, strain gauges, and manufacturer specific commands.

D/A functions - start rate, channels, value, mode (continuous or once) arbitrary function generator, and editing from equation, data entry, or file. Supports multiple simultaneous D/A output.

IEEE-488 - all IEEE-488 (HP-IB, GPIB) functions, commands and instruments are supported. Hundreds of instrument libraries included with an automated test and custom library tutorial.

VISA - supports any VXI or GPIB-VXI controllers and all VXI instruments, as well as GPIB boards from multiple vendors

RS232 - up to 9 ports. Timeout, I/O delimiter, queue size, event signaling, mode, baud rate, DTR, RTS, break, handshake mode.

Digital I/O - output, input, set bits, configure, multiple board support, comprehensive examples included.

General Purpose I/O - memory or I/O mapped, word or byte, bit test.

Mathematics and Analysis Functions - see Math & Analysis page of this brochure

Data formatting - numeric, string, array,vector or list, 488.2, high/low byte first, arrays of numbers or strings, any delimiter(s) and any sequence.

Graphics - draw, clear, and add points to line, strip or bar charts. Linear, semilog, or log scaling, X vs Y, autoscaling X and/or Y, multiple Y axes, settable axis intercept, major/minor grids and tics. Choice of background, grid and waveform colors, indicators, and annotation. Inspect, zoom, pan and tabular data.

Report Generation - programmable fonts, size, tabs, margins, headers, page #'s, time, date, text positioning, pagination, etc.

Grouping - Any number of objects can be grouped and groups can be grouped to achieve hierarchy.

Multitasking/Multithreading

GUI Controls: Pushbutton, Switch, Selector, Slider, Text, Data-Entry, Indicator, Display, Bar, Grid, Graph, Knob, Gauge, LED Bar, LED Display, Percent, Pie Chart, Odometer, Toggle, User-defined switch/selector.

ActiveX controls and OLE AutomationPanels - settable size, position and background color.

Picture - BMP, GIF, JPG, TIF, PCX, TGA, EPS, WMF, PCT import/display to 16.7M colors., options for bezel, tile, stretch, etc.

Files - open, close, input, output, erase, set/get filename, filters, warnings, check existence, initial value, network access, and other features.

Loops - linear, geometric, decade, do while, repeat until. Unlimited nesting. **Conditionals** - if/then, if/then/else, case on all math and logical operations. Unlimited nesting.

Code object - supports all external code DLL's and Windows API functions and parameter passing.

Debug mode - single step, multistep, breakpoints, data view, enable/disable action lines.

Demo mode - all objects that access hardware or instruments will run with simulated data if the hardware or instrument is not present.

Error handler - any error or group of errors can be assigned to an error object

OLE2 - embedded data, one way and two way links. **Timer** - provides access to current time and date with 50msec resolution.

Runtime - complete runtime packaging utility for test applications and related DLLs, INIs, pictures, and executables. Runtimes support multitasking and any number of runtimes can execute simultaneously.

Full Client/Server Dynamic Data Exchange (DDE) - copy, paste, paste/cancel link for use with Lotus, Microsoft, Borland and other products.

Help - complete context sensitive help with search, examples, copy and paste and print capability.

User defined objects - any set of objects, including code objects and other user defined objects can be packaged as a user defined object. Objects can have hierarchy and be locked (password protected) or unlocked for distribution.

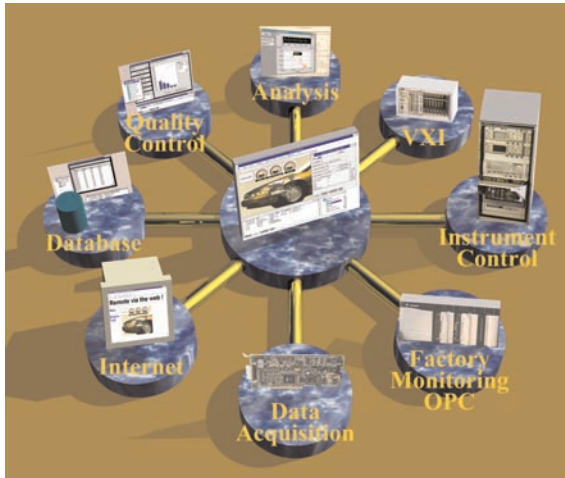
Acquisition and Transfer Rates - acquisition speeds and data rates are determined by the hardware rates of the installed interface cards and computer/disk throughput. TestPoint does not limit the maximum data acquisition rate of A/D or output of D/A cards. IEEE-488 max. data rate using CEC IEEE-488 cards is 1.5Mbytes per second continuous.

Editing - cut, copy, paste, paste/cancel link, windows tabs, Z-ordering, object alignment, snap to grid.

Maximums - The number of objects, panels, and applications is limited only by memory. Maximum numeric vector dimension > 2E+6.

TestPoint can be used with Windows 95/98/ME and Windows NT or 2000.

Enterprise Version



To apply the full power of TestPoint to your applications, choose the Enterprise Version, which includes everything in the TestPoint Professional Base Version, plus the three Toolkits shown here. The **Internet Toolkit** distributes your results anywhere on your network. The **Database Toolkit** integrates TestPoint into corporate servers for reporting and data mining. The **Statistical Process Control Toolkit** brings powerful analysis to your production processes to keep them in tune.

Internet Toolkit



The Internet Toolkit provides the ability to view and control remote applications using an internet browser or TestPoint application. Remote sites can send email based on test status, or can communicate directly with any TCP/IP network client.

The **TestPoint Web Server** lets you view screens and data from TestPoint applications on any web browser from anywhere on your company intranet, or, if you choose, anywhere on the World Wide Web. There is no need to modify your applications or to know anything about creating web pages or HTML. Just run the Web Server on the computer with your TestPoint application, then go to your internet browser and enter the address of that computer.

The **E-mail object** drops into applications and adds the ability to send a message to anyone, by either internet mail (SMTP), or Microsoft Mail (MAPI) protocols. The content of the message can contain data from your application – for example, showing measured values that are in an alarm range.

The **TCP/IP object** provides powerful direct communications with any network-connected client program. This can be another TestPoint application at a remote location, an Ethernet-based measurement instrument, or a custom program or Internet script running on a server.

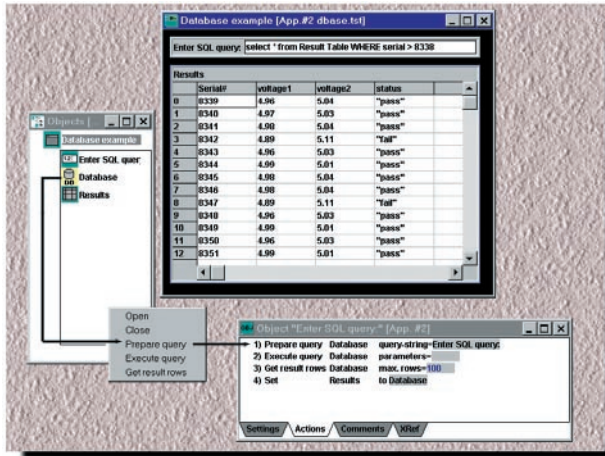
How does it work? When you add the TCP/IP object to your TestPoint application, you can choose whether your program will act as a server or client. Then you use the built-in actions simply to send messages (text or data), and to react to the events of incoming data from the remote location.

The Internet Toolkit includes examples for: client/server applications, e-mail, interactive (chat-style) communications, broadcasting to multiple clients, and web viewing of graphs and data.

The Internet, Database, and SPC Toolkits are included in the TestPoint Enterprise version, or available separately



Database Toolkit

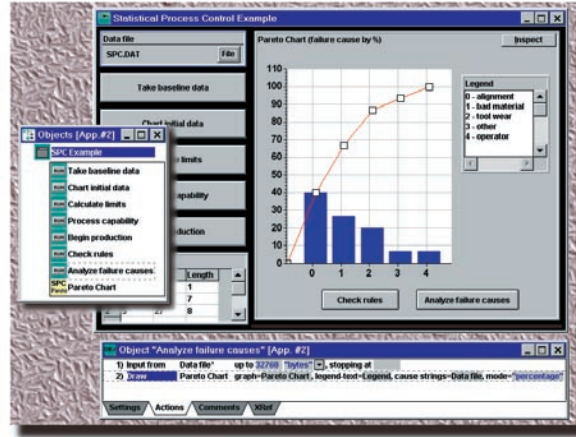


The Database Toolkit allows direct access to all popular database packages right from TestPoint, with no low-level coding, or exporting and importing of disk files. This lets you store measurement and test results or retrieve configuration information.

Your database can be built with Microsoft Access, Oracle, Sybase, SQL Server, or any other package compatible with the industry-standard ODBC driver specification. It can even be on a remote server.

How does it work? The database object has a drag-and-drop menu to handle database access. Simply select the database object, drag it to an Action List, and select the action required. The "Prepare query" action takes any command you provide in SQL (Structured Query Language), the common language of all database programs, and compiles it for use. Then the "Execute Query" and "Get result rows" actions carry out your command and get the data you've asked to be retrieved. You can retrieve data based on any desired search characteristics, insert new records into your database, update or delete records. In fact, any command supported by your database through the SQL language is available with the database object. The Database Toolkit includes examples for: using SQL and using your database program to help you write SQL commands, retrieving and inserting records, and using multiple data sources.

SPC Toolkit



The Statistical Process Control (SPC) Toolkit charts process data in real time, automatically derives control limits from your data, monitors process quality, tests for limit violations or trends, and produces standard SPC charts.

For any production process where quality is crucial, the SPC Toolkit's features will give you what is needed to identify and correct problems. SPC methods are now a standard part of many quality and ISO 9000 initiatives. The SPC Toolkit not only provides TestPoint objects that calculate SPC values, graph them, and compare them against patterns and rules, but the accompanying manual provides a clear and readable introduction to SPC techniques, as well as references to useful textbooks.

Charts:

- X-bar/R, X-bar/s, X/mR, mX-bar/mR
- p (fraction nonconforming), c (defect count)

Analysis:

- Control limits, Zones and run rules, Process shift detection
- Pareto charts (failure cause analysis)

Statistics:

- Histograms, Process capability (Cp, Cpk), mean, median, std. dev., skew, kurtosis

Ordering information

TestPoint Professional Development System
(Base version) TESTPOINT

TestPoint Enterprise Version
(includes base version plus Internet,
Database, and SPC) TP-SUITE

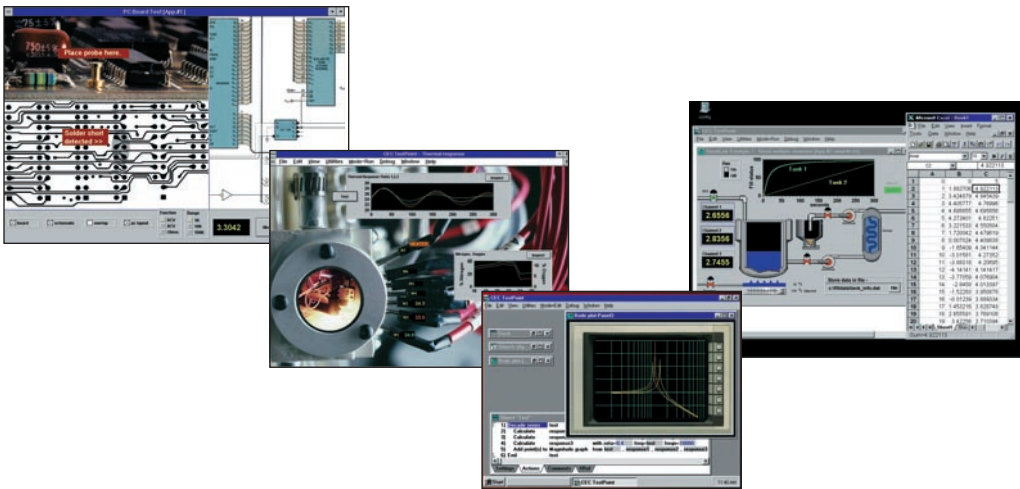
Toolkits - can be added to base version

Internet Toolkit	TP-INTERNET-TLKIT
Database Toolkit	TP-DBASE-TLKIT
SPC Toolkit	TP-SPC-TLKIT

Version Upgrades

Major version update from any earlier version to the latest code

Academic pricing and 5-pack quantity discounts are available.



Specifications are subject to change without notice.

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Keithley Instruments, Inc.

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FRANCE:	Keithley Instruments Sarl
GERMANY:	Keithley Instruments GmbH
GREAT BRITAIN:	Keithley Instruments Ltd.
INDIA:	Keithley Instruments GmbH
ITALY:	Keithley Instruments s.r.l.
KOREA:	Keithley Instruments Korea
NETHERLANDS:	Keithley Instruments B.V.
SWITZERLAND:	Keithley Instruments SA
TAIWAN:	Keithley Instruments Taiwan

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Yuan Chen Xin Building, Room 705 • 12 Yumin Road, Dewai, Madian • Beijing 100029 • 8610-6202-2886 • Fax: 8610-6202-2892
3, allée des Garays • 91127 Palaiseau Cédex • 01-64 53 20 20 • Fax: 01-60 11 77 26
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