

Multitasking, Multiuser, Multi-instrument Productivity Systems for GC/MS



... combining the HP 1000 RTE-6/VM data system
with HP 5988A and 5995C GC/MS's and HP 5970B
Mass Selective Detectors (MSD's).



The HP 1000 RTE-6/VM GC/MS Series— high-thruput systems that increase lab productivity and profits

The HP 1000 RTE-6/VM GC/MS Series is designed to help you put together the right combination of GC/MS computing power, automation and analytical capability to match your specific high performance, high productivity needs.

Putting the right combination together is simple. You start with the HP 1000 RTE-6/VM data system with built-in GC/MS software. You add the HP GC/MS instruments (up to four) that are best for your application—any combination of HP 5988A's, 5995C's or 5970B's. Then you fine tune your system for spe-

cific needs with an array of hardware and software options that are designed to work together.

The result—a high-thruput GC/MS system that will give your lab outstanding price/performance and put more profit in your bottom line.

Start with the best computer and the best GC/MS software

HP 1000 RTE-6/VM GC/MS Data and Automation System performance features include:

1. Multitasking Real Time Executive (RTE) operating system handles many tasks simultaneously in real time.

2. Virtual Memory (VM).

3. 132 Mbyte Winchester disk drive includes internal tape cartridge.

4. Choice of graphics printers: HP 2653, Laserjet and Thinkjet.

5. Choice of graphics terminals including the full color HP 2627A and the HP 150 Touch-screen microcomputer.

6. New self-explanatory forms software makes GC/MS easier for the beginner.

7. RPN software gives the experienced user unmatched freedom in processing and presenting data.

8. Softkeys speed data entry and GC/MS control.

9. Automatic tuning with AUTOTUNE simplifies set-up.

10. Automatic integration and calculation of ion chromatograms.



11. Superior quantitation with multiple time reference peaks, multiple internal standards and peak ratios.
12. Fast library search of 70,000 spectra data base.
13. New Aquarius software from ETC provides total automation of target compound identification and data handling.
14. Links with other HP 1000 computers and with HP 3000 computers through DS 1000 IV software and the HP150.

You can choose a high-throughput system that is right for your Lab

There are many configurations to choose from, each of which can be fine tuned to provide exactly the performance your lab needs for highest productivity.

Here are just a few examples of typical multi-instrument systems. Of course you can start with one GC/MS and one graphics terminal and add more later as required.

Add the GC/MS's that are best for your application



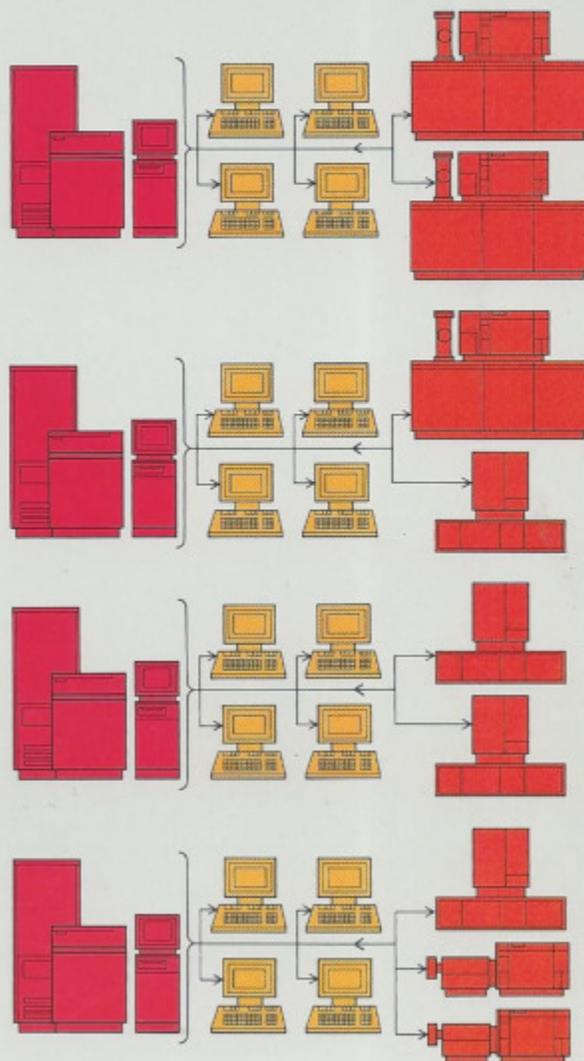
New HP 5988A GC/MS—gives you all the most useful capabilities of big-system GC/MS—EI, positive CI, negative CI, DLI LC/MS, high mass to 2000 amu, DIP, DCI, FAB and Thermospray—in a reliable system. Four HP 5988A's with autosamplers can be combined with the HP 1000 RTE-6/VM in a multitasking, multiuser system.



HP 5995C Benchtop GC/MS—a versatile benchtop GC/MS that provides many big system capabilities at a moderate price including capillary or packed column operation, direct insertion probe, and reliable sensitive mass detector with hyperbolic quadrupole. The HP 1000 RTE data system will control and handle the data from four HP 5995C's with autosamplers operating simultaneously.



HP 5970B Mass Selective Detector (MSD)—the best buy for dedicated capillary/EI applications that demand high sensitivity. Up to four HP 5970B's (with HP GC's and autosamplers) can be mated with the HP 1000 RTE-6/VM.



Automate your entire lab

If you add Hewlett-Packard Laboratory Automation System Software to your HP 1000 RTE-6/VM data system you can use it to handle the data from up to 30 gas chromatographs and liquid chromatographs in addition to two GC/MS systems.

Everyone can be more productive with the multitasking, multiuser, multi-instrument HP 1000 RTE-6/VM GC/MS data and automation system

Everyone, from the beginner to the most sophisticated user, can get more GC/MS done and get better data with the HP 1000 RTE-6/VM data and automation system.

Best computer plus best software = best GC/MS data system

This system combines Hewlett-Packard's finest laboratory automation computer with the very best GC/MS software available, bar none. New forms software makes GC/MS easier for the beginner and HP's powerful RPN software gives the experienced user unmatched creative freedom in processing and presenting data.

The computer is the HP 1000 RTE-6/VM with a Real-Time Executive (RTE) operating system to perform multiple tasks in real time, and with virtual memory (VM) to handle the enormous amount of data generated by GC/MS. A program can access all data on disc as if it were all in main memory when in fact the data are partly in main memory and partly on disc. The extended memory area is shareable by any number of active programs.

Multi-instrument operation

The HP 1000 RTE system will automatically control and handle the data from four GC/MS systems, either HP 5988's or 5995's, or HP 5970B Mass Selective Detectors, all with autosamplers in simultaneous operation.

Multitasking system helps you get more done in less time

Capable of performing dozens of different tasks simultaneously, the HP 1000 RTE system can be acquiring data, performing calculations, displaying and reporting data, communicating with other computers and doing many other things, all at the same time.

Everyone in you lab can use it

A true multiuser system, the HP 1000 RTE-6 computer can handle up to six terminals with six independent users operating simultaneously. But you're not limited to six users; everyone in your lab can

use the system (six at a time) each with tamper-proof password protection for his individual stored data, methods and programs.

Self-explanatory forms and softkeys make it easy to get the results you need

You control and monitor the system, including up to four GC/MS's, with autosamplers, through the friendly interactive graphics terminal and simple keyboard with softkeys that speed data entry.

When you create a method, a series of forms appears sequentially on the screen. Each form presents you

with a page of method information with blanks (inverse video boxes) to fill in. You just move the cursor from box to box, down the page making entries as needed.

Softkeys, which appear along the bottom of each form, make it easy to get on-line answers to your questions. For example, if you want the whole form explained, press the function key that corresponds to the "instructions" softkey and an explanation will appear on the screen. If you want help with a specific entry, place the cursor on that entry and press the "Explain Cursor" key and you get an explanation.

Review/change data in highlighted boxes MORL Autotune: ver. 040720

Autotune Run Parameters

Source Temperature: (100-300 degrees C)

Tune from Std/Previous values: (Std/Previous) Force tune: (Yes/No)

Auto copy of:
Final report: (Yes/No), list to: (Terminal LP OR
Trace report: (Yes/No), list to: (System LP

Spectrum plot: (Yes/No), list to terminal printer
Norm. spectrum: (Yes/No), list to terminal printer

Explain Explain cursor Instructions No Change 10 24 Print Print Data Print Method Print Report

To set up AUTOTUNE, you just review the data in the highlighted boxes and change it where necessary.

Review/change data in highlighted boxes

SAMPLE INFORMATION

Instrument # 1 Spectrometer Model # 5088

User name: USER8

Tuning File Name: (FILE) Cartridge: (FILE)

Data File Name: (FILE)

Sample name: (FILE) Misc: (FILE)

Method File Name: (FILE) Cartridge: (FILE) Review Input: (FILE)

Run Type: Scanning method: Linear or STD (L,S)
Column type: Capillary or Packed (C,P)
Injection mode: Splitless (S,H)
Ionization technique: EI, CI or FID (E,C,F)
Sample Introduction: GC, SDP or LC (G,D,L,H)

Explain Explain cursor Instructions No Change 10 70 Print Print Data Print Method Print Report

Simple interactive forms make method building easy. You just fill in the blanks.

Review/change data in highlighted boxes

SAMPLE INFORMATION

Data File Name: (FILE)

Name: (FILE) File Date: (FILE)

Method: (FILE) Bottle Number: (FILE) Stroke (1,2,3): (FILE)

Quant (Y or N)?
Report Format (None, Short, Full, Extended)?

Arc Report: Quant ID File, Quant Output File, Dil Fact: (FILE)

Archive: Data File: (FILE) Quant ID File: (FILE) Quant Output File: (FILE)

After Quant? Additional Program Data:
User Prog 1: (FILE)
User Prog 2: (FILE)
RPN TP File: (FILE)

Explain Explain cursor Instructions No Change 10 70 Print Print Data Print Method Print Report

To set-up the work list file for the Aquarius program review and change the data in the highlighted boxes.

You can't go wrong

When you've completed a form the system checks it and wherever your entries are incorrect the inverse video box blinks. If you want a printed copy of what is on the screen, or of your entire method, just press a soft key and your local printer will give you a hardcopy.

To use a method, enter the method's name, press a softkey and the HP 1000 downloads the method to your GC/MS where it runs automatically. During a run you can monitor it and/or you can change it in real-time—change temperature ramps, ion source parameters, run timing, etc. You can vary the display to monitor an ion chromatogram, several specific ions and/or spectral data.

Automatic tuning

To speed set-up and eliminate the need for an operator skilled in tuning mass spectrometer voltages, HP invented AUTOTUNE. At the touch of a few keys using simple forms, you can tune and calibrate the HP 5988A, 5995C or 5970B for general purpose EI operation. When reference compound PFTBA (perfluorotributylamine) is introduced, the AUTOTUNE program automatically sets the optimum parameters for the ion source, the mass filter, and detector and produces a mass spectrum with a calibrated mass scale and standard peak intensities. A record of this can be stored automatically for future reference.

Normalization to PFTBA-DFTPP target abundances

To meet the requirements of analyses that use decafluorotriphenylphosphine (DFTPP) as the tuning standard, the AUTOTUNE software will automatically perform a PFTBA to DFTPP normalization, adjusting the PFTBA ion intensities to match the DFTPP fragmentation pattern, saving time. Or, if you want to, you can tune for DFTPP manually.

Manual tuning

Manual tuning has also been simplified with forms and soft keys so one can more quickly tune for CI, nega-

tive CI, high mass, or for an application that requires user selected ions. Direct Insertion Probe (DIP) operation can be controlled in manual tune, facilitating tuning on DIP-introduced solid or viscous compounds.

Selected Ion Monitoring (SIM)

In addition to powerful identification capabilities in the scanning mode, HP 1000 RTE systems include SIM software that allows you to monitor and quantitate specific ions characteristic of a compound of interest to confirm its presence or absence.

Up to five groups of twenty ions each can be monitored and you can time-program different groups at different times during an analysis.

Superior quantitation

A chromatogram is collected for each ion. These chromatograms can be automatically integrated and calculated using standard GC methods: Area %, Norm %, ESTD and ISTD. For better peak quantitation you can use multiple time reference peaks, multiple internal standards, peak ratios and a calibration package that permits up to 10 concentration levels and three different response factor calculations: average response factor, first order linear regression, and second order linear regression.

Library search

A fast, easy-to-use, effective library search program aids in rapid identification of spectra. Using Probability Based Matching (PBM), an unknown spectrum can be compared with the most probable matches in a data base of over 70,000 entries. A print-out of the most likely hits, whatever number of hits you choose up to 20, is automatically produced. Then, if you wish, you can compare spectra of the hits, side by side with your unknown spectra, for identification.

The mass spectral data base, offered as an option, consists of over 70,000 spectra including the NIH/EPA/Mass Spectral Data Base (NBS Library) and Registry of Mass Spec-

tral Data (Wiley Library). Both condensed and full spectra are included. The data base also contains a special, 29,000 compound condensed library of spectra for use with STIRS.

STIRS (Self-training Interpretation and Retrieval System) aids in interpretation of mass spectra by determining which functional groups are indicated by the spectrum. STIRS also predicts the molecular weight of the compound and the content of bromine and chlorine in the compound from isotopic abundances.

No other GC/MS data system does so much to help you identify unknowns.

High thruput made simple

To make high-thruput automation easier and more productive, the HP 1000 RTE data system now includes Aquarius software from Environmental Testing and Certification Corporation (ETC).

This software provides total automation of target compound identification and quantitation. Sample injection, analysis, quantitation, report generation, archival storage, communication with other computers—all steps in the GC/MS process are integrated and performed automatically without operator intervention.

The software can be used to operate multiple GC/MS cores simultaneously, each with an HP autosampler that will inject up to 99 samples unattended. You can leave and come back for the printed report.

Aquarius software is designed for use in environmental applications and meets the protocol and record keeping requirements of EPA GC/MS Methods 624, 625, 1624, 1625. But it is very well suited for forensic, pharmaceutical, clinical and industrial service laboratories—wherever large numbers of samples are analyzed by GC/MS and excellent records and reports are needed.

You can be the world's greatest GC/MS data analyst and editor with RPN

Your imagination is virtually the only limit on what you can do to analyze, manipulate and display data when you use RPN, the high level GC/MS language that is included with your HP 1000 RTE-6/VM data system.

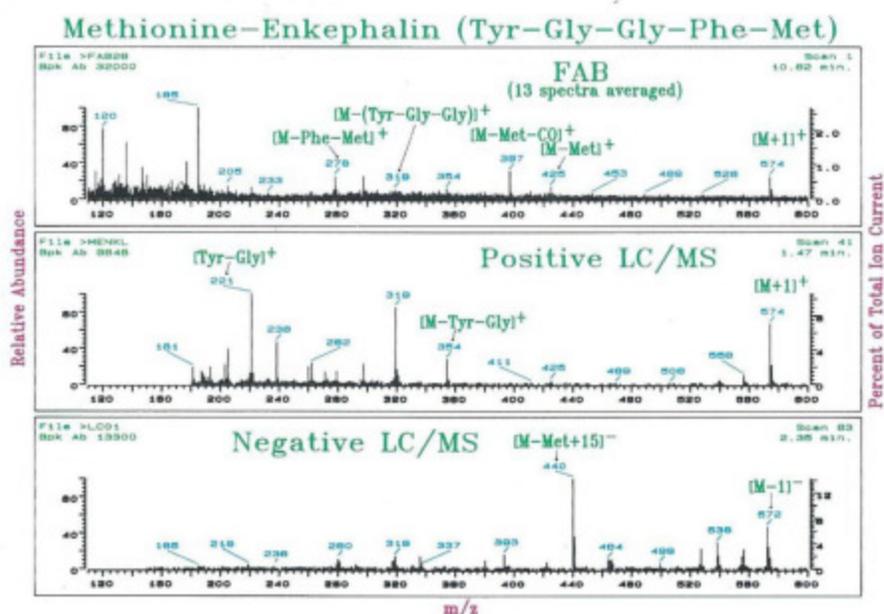
The RPN language consists of a set of short commands each of which accomplishes GC/MS data handling tasks that could take hundreds of lines of programming language. These short commands can be

strung together to form powerful compound functions to automate analysis tasks. ETC used this language in the Aquarius automation software and you can use RPN to build software programs tailored to meet the specific needs of your laboratory.

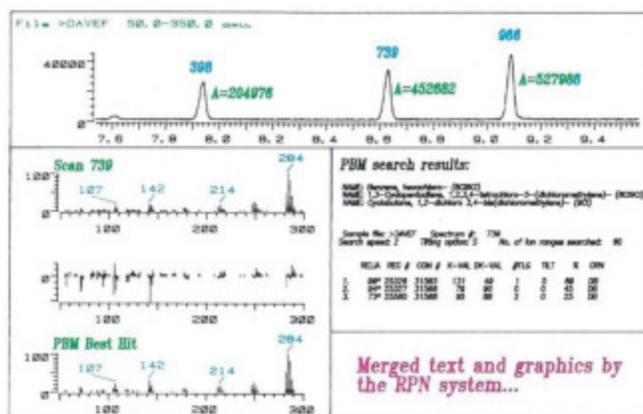
RPN gives you fantastic power to manipulate and display data. Here are examples of the kinds of things that you can do.

To add color to the RPN data on this page we used the HP 7550 plotter. It can help clarify data and make it more attractive in presentations and poster sessions.

Using RPN, we think you can do anything that anyone would ever want to do with GC/MS data. However, if you should think of something RPN can't do, or have another programming need, PASCAL, FORTRAN 77 and BASIC are available for your HP 1000 RTE-6/VM system.



Comparative analysis of methionine-enkephalin (Tyr-Gly-Gly-Phe-Met) by FAB (with spectra averaging) and LC/MS.



Merged text and graphics by the RPN system...

RPN provides you with a powerful "spread sheet" for presenting and interpreting GC/MS data.

Single-instrument GC/MS workstations

The new HP 9816S and 9836CS GC/MS workstations will automatically control and handle the data from any one of the three GC/MS cores described in this brochure—the HP 5988A, 5995C and 5970B (with the HP 5890A GC). So, if you don't need the multi-instrument, multiuser, multitasking capability of the HP 1000 RTE-6/VM data system, one of these economical GC/MS workstations could be the answer. Whatever your GC/MS requirement may be, there is probably a Hewlett-Packard solution that will give you the best price/performance available!



HP 9816S and 9836CS (color) single-instrument workstations.

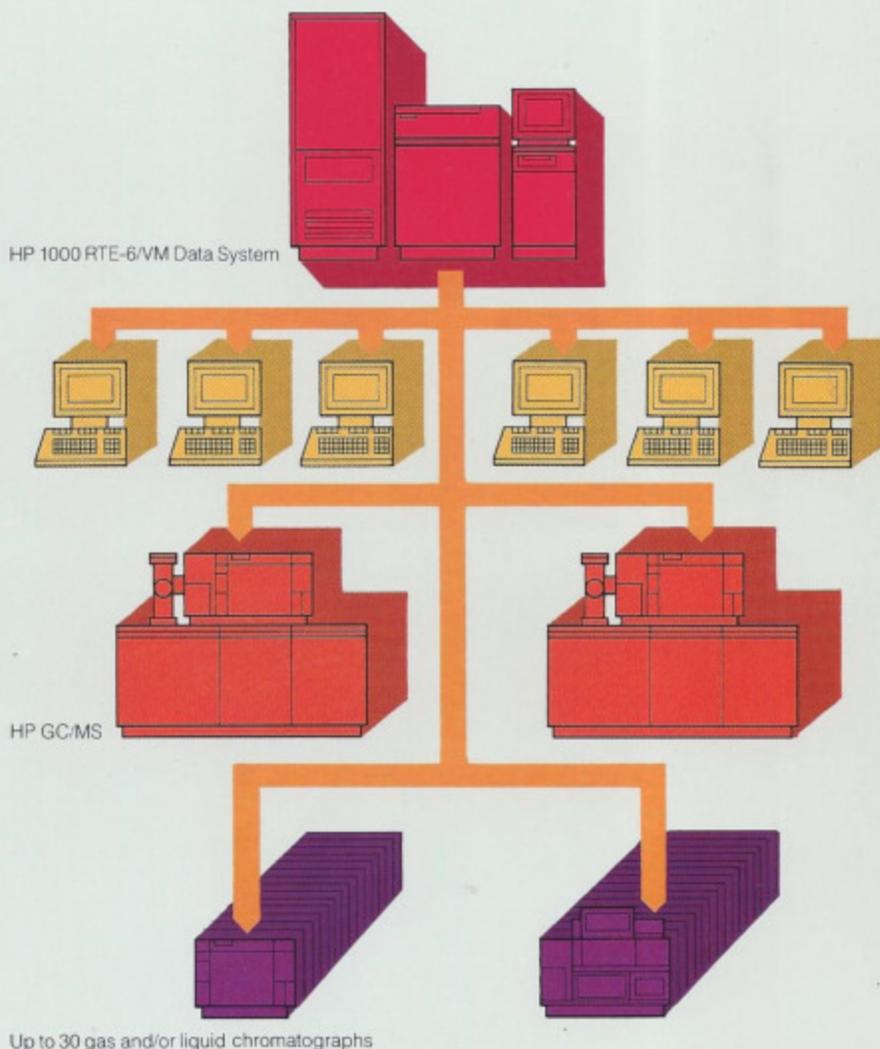
Use your HP 1000 RTE-6/VM computer to automate your lab

In addition to automating two big GC/MS systems or four MSD's, you can also use your multitasking HP 1000 RTE-6/VM to simultaneously control and handle the data from up to 30 gas chromatographs and/or liquid chromatographs. You don't need to buy another computer to automate your lab. Essentially, all you need to add to your basic GC/MS data system is some extra RAM

and disc capacity and Hewlett-Packard's proven Laboratory Automation System software.

Then, if you want to, you can use your RPN software to combine data from your GC/MS's, GC's and LC's in a common report. You achieve fully integrated laboratory automation at a very reasonable cost.

Also, the HP 1000 RTE-6/VM is expandable through DS-1000-IV software to link with other HP 1000 and HP 3000 computers.



Now there's a super GC/MS system that is easy to use and easy to buy...the versatile new HP 5988A

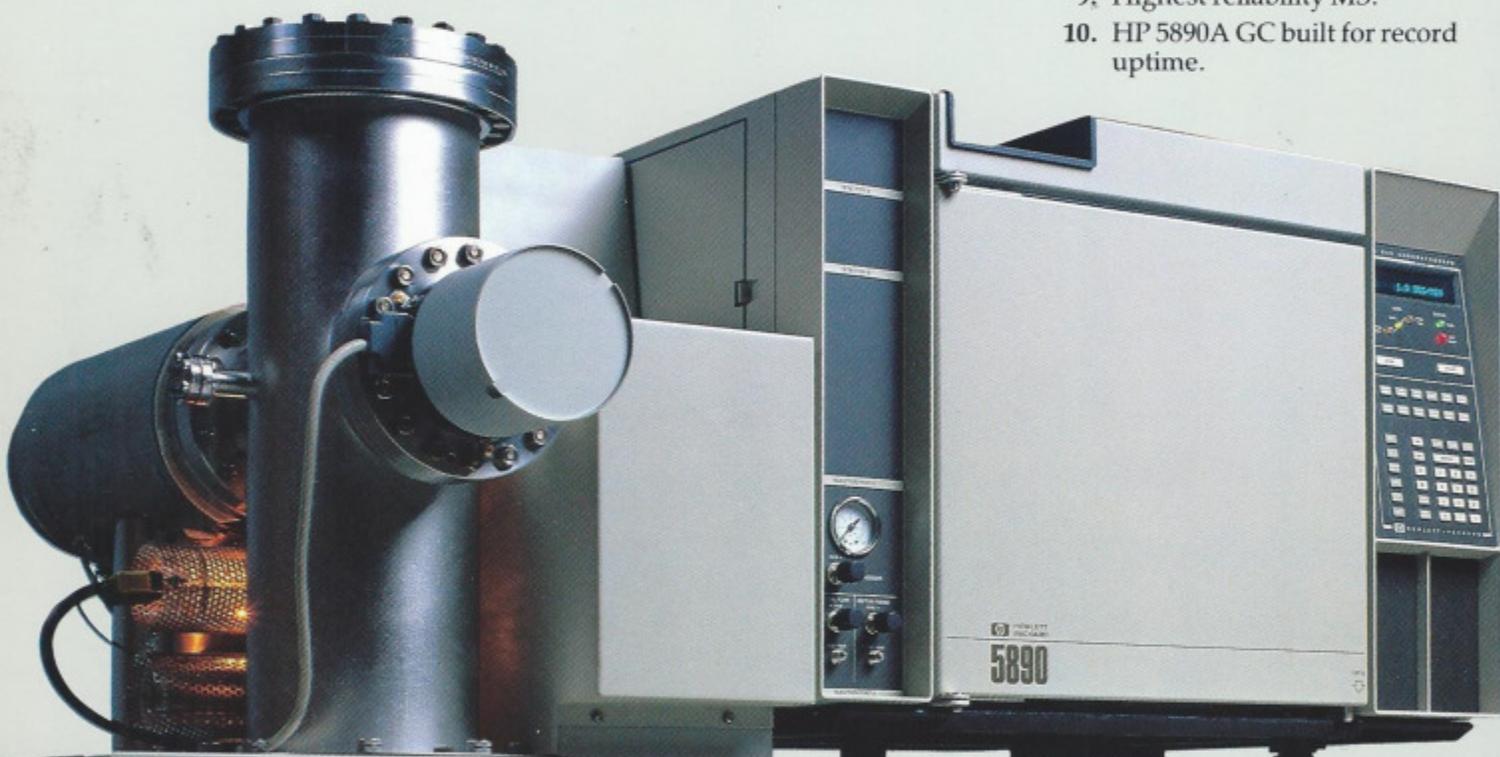
The new HP 5988A is built to make all the most useful capabilities of big GC/MS—EI, positive CI, negative CI, DLI LC/MS, high mass, DIP, DCI, FAB and Thermospray—available to research and quality labs in a reliable system that is easy to use and easy to buy. And the HP 5988A is modular, with many options, so you can choose a system that will meet your needs today and grow with you as your needs change.

HP 5988A continues HP's reputation for GC/MS reliability

The HP 5988A may be the most reliable large GC/MS we've ever built. It combines proven mass spectrometer components with the new HP 5890A gas chromatograph built to set new records for maintenance-free GC operation.

Performance features include:

1. Hyperbolic quadrupole with entrance lens to minimize rod contamination.
2. Dual EI/CI source, instantly switchable.
3. Negative CI.*
4. Direct liquid injection LC/MS.*
5. Thermospray.†
6. FAB and DCI.†
7. Direct Insertion Probe (DIP).*
8. High mass—2000 amu mass range.*
9. Highest reliability MS.
10. HP 5890A GC built for record uptime.



HEWLETT-PACKARD GC/MS SYSTEM

11. System optimized for capillary GC.
12. 2000 amu/sec scanning rate for quantitation precision.
13. Add an HP autosampler for total unattended automatic handling of up to 99 samples from injection through final printed report.
14. High-capacity, low maintenance vacuum pumping system.

*Options.

†Options available from other manufacturers.

Field-proven hyperbolic quadrupole

A major reason for HP GC/MS reliability is that Hewlett-Packard has never compromised on either the design or the fabrication of its quadrupole analyzers. Since 1976 all HP mass spectrometer systems have utilized hyperbolic rods—the theoretically ideal form. This design, in conjunction with careful attention to the entrance lens to minimize rod contamination results in high performance with low maintenance over long lifetimes. HP 5988A users will spend less time cleaning rods and more time producing results.

High-capacity, low-maintenance pumping system

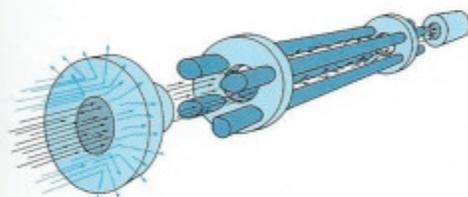
The HP 5988A high vacuum system uses two reliable Edwards diffusion pumps to provide fast pumping for both the ion source and analyzer chambers. Known for reliability and cleanliness, these pumps have integrated baffles and cold traps to prevent backstreaming. Also, as an option, isolation valves are available to vent the manifold without losing vacuum in the pumps. This greatly reduces the time it takes to change ion source filaments.

All HP 5988A MS components field proven

All of the other major HP 5988A mass spectrometer components—dual EI/CI source, capillary interface and electronics—have been field proven and continuously enhanced through previous generations of HP mass spectrometers.

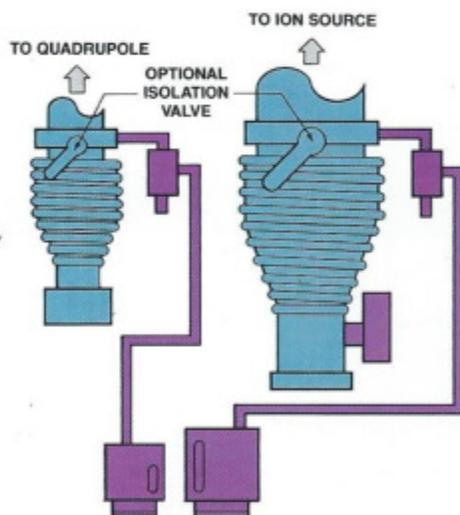
GC made for uptime

The new HP 5890A gas chromatograph chosen for the HP 5988A was designed specifically to provide maximum uptime in laboratories that handle huge sample loads and work round the clock. When maintenance is required, self diagnostics simplify identifying problems and modular replaceable components make repair quick and simple. You get more performance per dollar; more value in your HP 5988A.

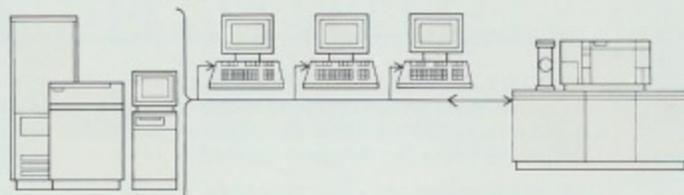


The Hewlett-Packard hyperbolic quadrupole mass filter, which is the heart of the analyzer, consists of four rods of precise hyperbolic shape aligned in a fixed mount that assures long-life performance to instrument specifications. The entrance lens focuses ions leaving the source and filters out ions that would otherwise enter the analyzer and strike and contaminate the rods.

Fast, two-pump vacuum system provides optimum ion-source and analyzer vacuums for best CI operation. Two Edwards Diffstak diffusion pumps, one for the ion source and one for the analyzer, feature new design with fewer seals requiring less maintenance.



5988A



There's almost nothing you can't do with the HP 5988A... EI, positive CI, negative CI, high mass, DLI LC/MS, Thermospray, FAB, DCI, DIP and capillary GC/MS

Dual EI/CI source

The HP 5988A dual EI/CI source is instantly switchable from one source to the other and requires no system recalibration or bakeout between modes. An advantage of CI is that it yields larger fragments and molecular weight information. The user-proven Hewlett-Packard dual EI/CI source has been continuously enhanced since it was introduced ten years ago.

Negative CI is available as an option. It provides much greater sensitivity than positive CI for detection of compounds with electronegative atoms such as fluorinated and chlorinated compounds including many pesticides.

2000 amu mass range

The HP 5988A is offered with a standard mass range of 10 to 1000 amu or with an optional high mass range of 10 to 2000 amu accessible in a single scan with unit mass accuracy.

The optional high mass range permits analysis of high molecular weight compounds such as biochemicals, organometallics and synthetic polymers. With the extended mass range you can also take greater advantage of the emerging sample introduction and ionization techniques—DLI LC/MS, FAB, DCI and Thermospray developed to handle high molecular weight compounds that are fragile, thermally labile and/or non-volatile.

LC/MS: DLI and Thermospray

Both direct liquid injection (DLI) and Thermospray (TS) are available for the HP 5988A. These "soft ionization" techniques combine the separation capabilities of liquid chromatography with the detection power of mass spectrometry.

DLI LC/MS. The LC/MS Interface option for the HP 5988A is a simple durable device that splits the LC eluent and injects a portion of it into the CI ion source. The LC solvent is used as the reactant gas to separate ions from the sample. Samples need not be derivatized, saving much time. Low nanogram sensitivity is

achieved in the selected ion monitoring mode. The LC/MS interface is compatible with microbore columns, handles gradient elution and can be used with almost any HPLC system in your lab.

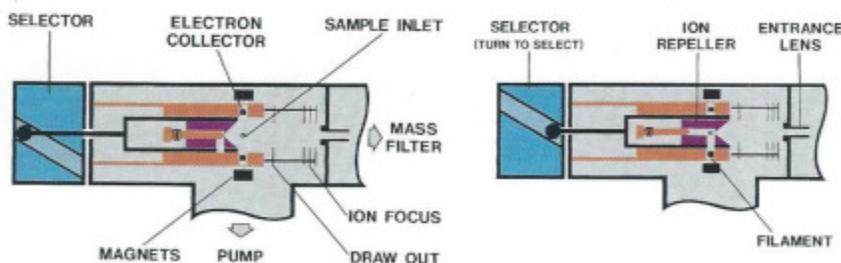
Thermospray LC/MS. The Thermospray probe vaporizes the HPLC eluent, generating a spray from which ions are sampled directly. Thermospray is well suited for polar, non volatile, thermally labile molecules. For some compounds nanogram sensitivity is achievable on full scans and picogram sensitivity on SIM.

The Thermospray accessory is easy to install and use. It requires only that the standard source assembly be replaced by the Thermospray

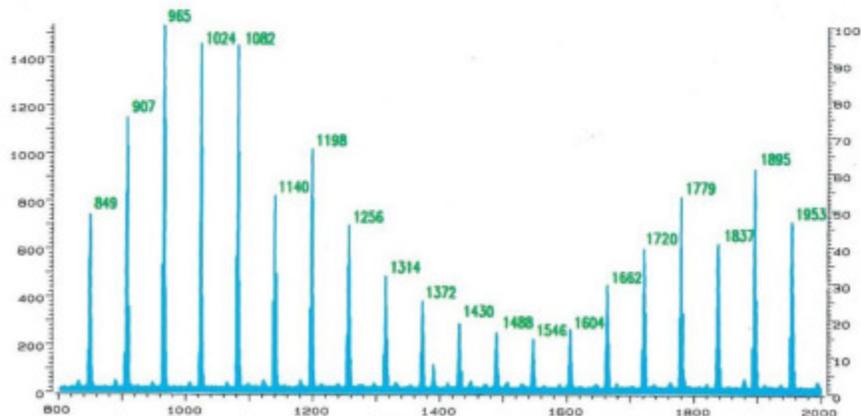
source assembly. The vaporizer probe is inserted through the direct insertion probe vacuum lock and LC/MS measurements can begin.

FAB, Fast Atom Bombardment

The HP 5988A also allows you to utilize fast atom bombardment (FAB), a direct insertion probe (DIP) technique for the analysis of compounds that are fragile, thermally labile and/or non volatile. The FAB option is almost universal in its application and is extremely easy to use. A single direct insertion probe contains both ion source and sample. This DIP gun simply inserts through the standard DIP vacuum lock and produces both ions and fast atoms. Either positive or negative ions can be made. Spectra are obtained in minutes.



The HP 5988A dual EI/CI ion source is instantly switchable from one mode to the other. Just turn the selector.



A mixture of polypropylene glycols, with average molecular weights (\overline{MW}) of approximately 1000 and 2000, scanned from 800 through 2000 amu using High Mass Option 200 with a Thermospray ion source.

DCI, Desorption Chemical Ionization

Desorption Chemical Ionization (DCI) can also be used on the HP 5988A. This option is the preferred DIP technique for analysis of extremely polar compounds. A solution of the sample is placed on a tungsten wire at the tip of the DCI probe. The probe is inserted through the DIP vacuum lock into the source chamber. A current is then passed through the wire creating protonated molecular ions and fragments of the sample.

Direct Insertion Probe

The Direct Insertion Probe (DIP) option places the sample directly in the ion source permitting the mass spectra to be obtained of relatively involatile pure compounds. The DIP may also be used for the insertion of very small (25 pmole), volatile samples because of the short path that sample vapors must travel. To induce sufficient sample vaporization, the probe can be heated up to 350 degrees and programmed at rates from 0.5 degrees C to 65 degrees C/min.

Automatic sampling

For total automation the HP 5988A can be equipped with an HP automatic sampler. Then, under the automatic control of the HP 1000

RTE-6/VM data system, the HP 5988A can handle up to 99 samples without operator intervention. You can come back when it's all done and pick a complete printed report of the results. If there are two GC/MS systems controlled by the data system, both systems can have automatic samplers and you can double your throughput.

Optimized for capillary GC

From split/splitless injector to analyzer to data system, the entire HP 5988A is optimized to take advantage of the speed, efficiency and sensitivity of capillary gas chromatography.

HP 5890A Capillary Gas Chromatograph

The HP 5890A is built for capillary. Its versatile split/splitless injector accepts both narrow and wide bore fused silica and glass capillary columns. Split and septum flow adjustments are independent of column head pressure and the splitless purge flow is time programmable.

The large column oven (12" x 12" x 6") gives you plenty of room to change capillary columns, and the multi-ramp oven temperature control can be programmed to hold the oven within 7°C of ambient. As a result, you don't need costly cryogenic cooling to use the solvent effect. Also, you can increase oven temperature at 70°C/min to elute high boiling compounds.

The capillary direct interface provides maximum sensitivity and is extremely simple to operate. It is for use with fused silica columns which are interfaced directly with the ion source. With effluent splitter this interface can be used with megabore columns.

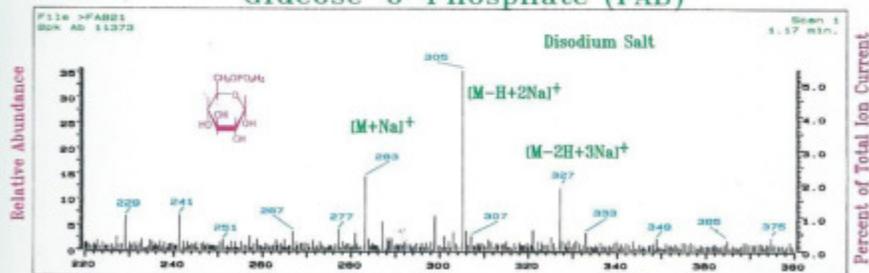
Fast scanning for capillary

The HP 5988A scans at rates greater than 2000 amu/sec, so you can make multiple scans of fast eluting capillary peaks for identification and quantitation.

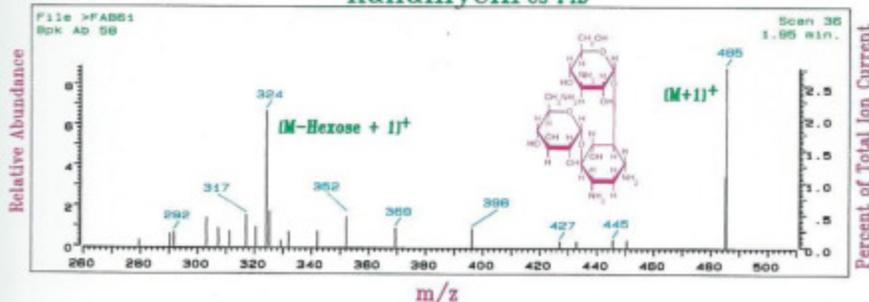


The HP 5988A can be an LC/MS. You can buy it without GC and add your own liquid chromatograph or the HP 1090 LC as shown here.

Glucose-6-Phosphate (FAB)



Kanamycin Cs PID



In this FAB analysis of glucose-6-phosphate the parent molecular ion plus two sodiums is observed. In the CS PID analysis of kanamycin the parent plus hydrogen can be seen. These analyses were run on the HP 5987A GC/MS using hardware components identical to those available with the HP 5988A.

HP 5995C—the versatile GC/MS that gives you big system benefits at a benchtop price

To begin with, the HP 5995C mates with the multitasking, multiuser, multi-instrument HP 1000/RTE data handling and automation system. This means that both neophytes and MS sophisticates can use it at the same time, and everyone can get more done. See pages 4 to 7. In multi-instrument environments one HP 1000 RTE-6/VM data system will control, automate and handle the data from up to four HP GC/MS systems. One or all can be HP 5995C's.

Performance features include:

1. Proven EI source
2. Efficient vacuum system
3. Direct Insertion Probe (DIP)
4. Highest reliability hyperbolic quadrupole
5. Integrated Hewlett-Packard GC
6. Choice of capillary or packed column operation
7. Fast scanning for capillary chromatography
8. Unattended automatic handling of up to 99 samples with an HP autosampler
9. Compact, integrated benchtop design

Optimized for capillary GC

Fast scanning. The HP 5995C will scan at rates greater than 2000 amu/sec., increasing your ability to obtain spectra of components in fast eluting capillary peaks. For high-performance capillary GC/MS the



HP 5995C has a standard capillary split/splitless injector and a choice of two interfaces between the column and the ion source.

The capillary direct interface provides maximum sensitivity and is extremely simple to operate. It is optimized for use with narrow bore (0.2mm i.d.) fused silica columns which are interfaced directly with the ion source.

The open-split capillary interface is versatile. You can use both narrow and wide bore capillary columns with inside diameters 0.3mm. This interface is designed so that the purge gas flow rate through the interface can be varied to stabilize the sample flow rate and to "split" samples that are too concentrated while maintaining a yield close to 100% for trace components.

Choice of jet or membrane separator for packed column operation

A separator is required for packed column operation to split the carrier gas from the sample before the sample enters the MS. The more universal jet separator operates over a wide temperature range and has gold mesh to trap particulate matter. The membrane separator is simple and inexpensive but is temperature and compound limited.

Proven HP hyperbolic quadrupole

The HP 5995C uses HP's proven, reliable hyperbolic quadrupole mass filter for high spectral quality and fast scanning: ≥ 2000 amu/sec over the range from 10 to 800 amu.

Efficient vacuum system

The compact analyzer—ion source, quadrupole and electron multiplier detector—measures only 375 mm long. The required vacuum is provided by an efficient diffusion pump.

It has a contoured design for extra pumping speed (about 200 l/sec for helium). It also has a water-cooled baffle which protects against backstreaming. A turbo-molecular pump is optionally available.

Monitor vacuum pressure. An optional stand-alone ion gauge controller permits monitoring pressure in the high vacuum chamber.

Independent control temperature zones

For superior separation and detection, all temperature zones along the sample path are independently controlled: injector, column oven, transfer line, ion source and quadrupole.

Direct Insertion Probe

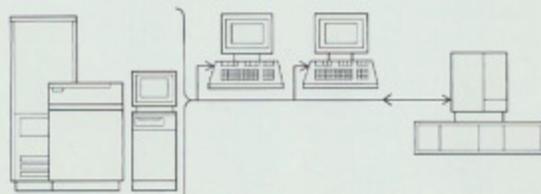
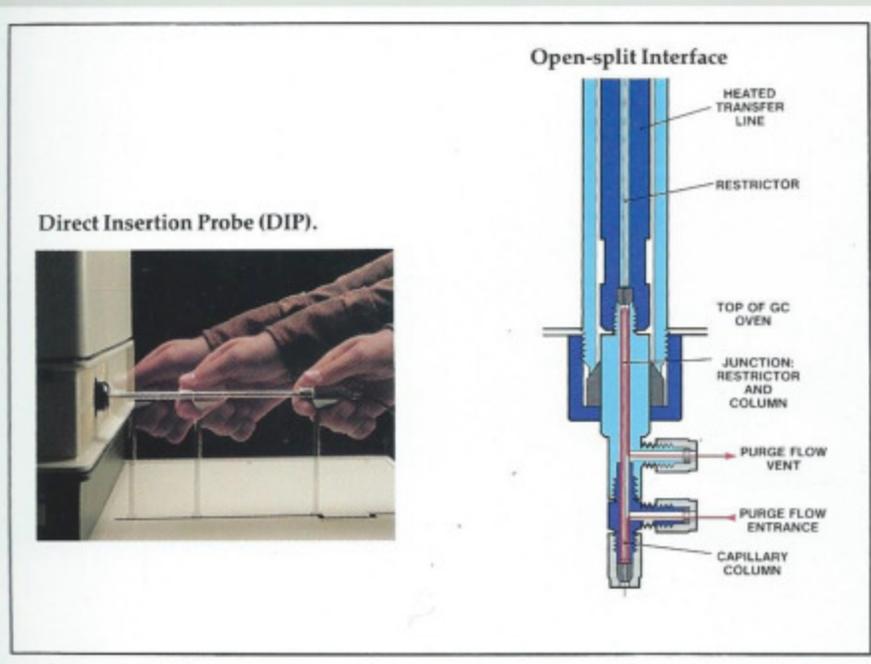
The direct insertion probe option places the sample directly in the ion source and is essential if you need to obtain mass spectra from relatively non-volatile substances that cannot be chromatographed. It is also very useful for pure substances and very small samples. The probe can be heated up to 350°C and programmed at rates between 0.5°C and 65°C/min.

Flame ionization detector

An FID detector is available with an effluent splitter to permit simultaneous FID/MS detection in packed column operation. The FID can also be used independently to establish GC conditions before a GC/MS analysis.

Integrated system

All system components, GC, MS and data system, are built by Hewlett-Packard and designed to work together. All are supported by the HP assurance of quality and by the service, sales and technical specialists of the HP Analytical Group.



HP 5970B Mass Selective Detector (MSD)... best buy for dedicated capillary/EI applications that demand high sensitivity or high thruput

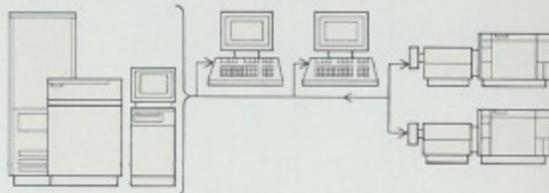
This is the second generation in the benchtop HP 5970 series that makes MSD available for almost any gas chromatograph. When used with either the HP 5880A or 5890A gas chromatograph, a low-cost GC/MSD system is created that can be automatically controlled by the HP 1000 RTE-6/VM data system.

High thruput systems

For dedicated, high thruput applications, up to four GC/MSD's with autosamplers can be mated with the HP 1000 RTE-6/VM data system for full automation from sample injection through data handling and final report. In the more usual configurations, where two GC/MS's are operated by the HP 1000 RTE-6/VM, the GC/MSD can be combined with either the versatile HP 5988A or 5995C to provide high sensitivity capillary analyses and/or for dedicated high volume analyses.

Performance features include:

1. Up to four GC/MSD's can mate with the multitasking, multi-user, multi-instrument HP1000 RTE-6/VM data system
2. Picogram sensitivity in SIM mode
3. Dedicated to capillary chromatography only
4. Reliable hyperbolic quadrupole
5. Mass filter entrance lens to minimize rod contamination
6. Fast scanning > 1500 amu per second for capillary chromatography
7. Choice of capillary GC-to-MSD interfaces: direct or open-split.
8. Compact: only 18" wide (the HP 5890 GC is 26" wide)
9. Mass range: 10 to 800 amu



Ensuring your HP GC/MS/DS investment

An HP product's quality is designed-in from the start and tested rigorously, ensuring our customers the maximum return on their investment. And our after-sale support strategy strives to keep our systems operating full time. Key elements are:

Access to well-qualified professionals—HP Customer Engineers and Systems Engineers with extensive technical training.

Local customer training—standard courses from our local training centers.

Single vendor support—you'll be dealing with one responsible resource for your computer and instrumentation needs. One telephone call can produce the assistance you require.

Hewlett-Packard documents your software with continuing manual updates and software notes. To keep your system up-to-date, we offer Software Subscription Service, which automatically compiles all software changes and enhancements and sends them to you periodically.

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GC/MS/DS Customer Training.



The covers of this brochure show many of the components available in HP GC/MS productivity systems.

On the back cover, from left to right, front row: HP 7550 Plotter and HP 9836CS GC/MS Workstation; second row: Laserjet Printer; third row: HP 5970B Mass Selective Detector (MSD) with the HP 5890A GC, and HP 9816S GC/MS Workstation; fourth row: HP 5995C.

On the front cover, from left to right, front row: Thinkjet Printer, HP 2627A Graphics Terminal, and HP 2392A System Terminal; back row: HP 5988A GC/MS, HP 7914 Winchester Disc with built-in HP 7970E Tape Storage, HP 1000 RTE-6/VM Data System, and HP 2563A Printer.

