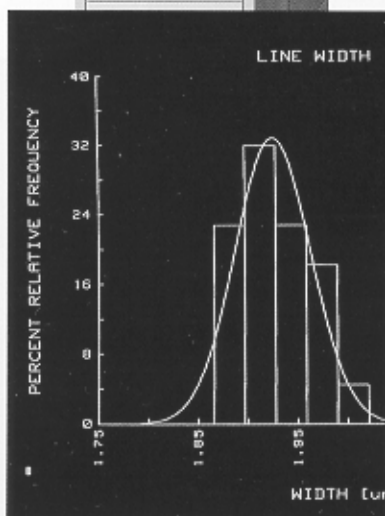


HP 4062UX Semiconductor Process Control System

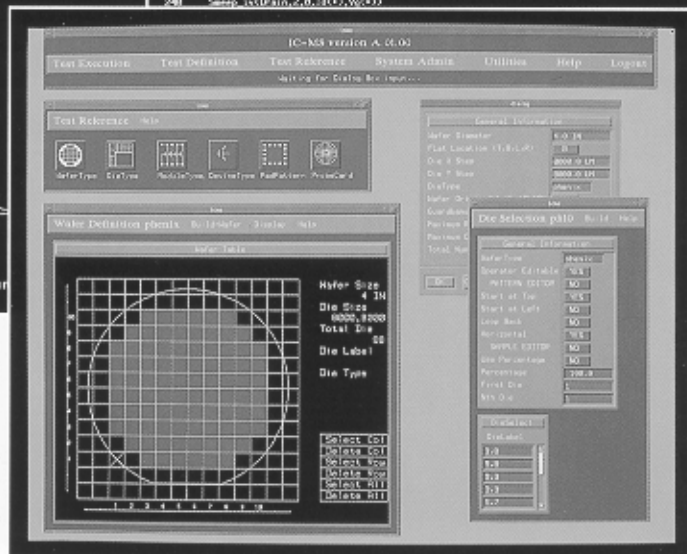
Improve time to
market and process
quality while reducing
your test costs.



```

10 OPTION PAGE 1
20 INTER Source,Gate,Drain,Substrate
30 BIN 10001,10001
40
50 Init_system
60 Set_smu(3)
70
80 Source=34
90 Gate=36
100 Drain=62
110 Substrate=64
120
130 Connect(GND,Source)
140 Connect(GND,Gate)
150 Connect(GND,Drain)
160 Connect(GND,Substrate)
170
180 Loggraph(1,-2.5,1,E-14,1,E-1,"GATE VOLTAGE (V)", "SWITCH CURRENT (A)", "ID-VG CURVE OF MOS FE1",1,8,0)
190
200 FOR Vsub=0 TO -2 STEP -.5
210   Force_v(Gate,2.0,-.5)
220   Force_v(Substrate,Vsub,.8)
230   Set_v(Gate,1.2,-2.5,31,1,8)
240   Temp_v(Drain,2.0,-.5,5,10,0)

```



The HP 4062UX Process Control System

The System

The HP 4062UX Process Control System is the first DC parametric test system that combines the world's most powerful instrument control language, HP BASIC, with all the facilities of HP-UX, HP's implementation of the AT&T System V UNIX* operating system.

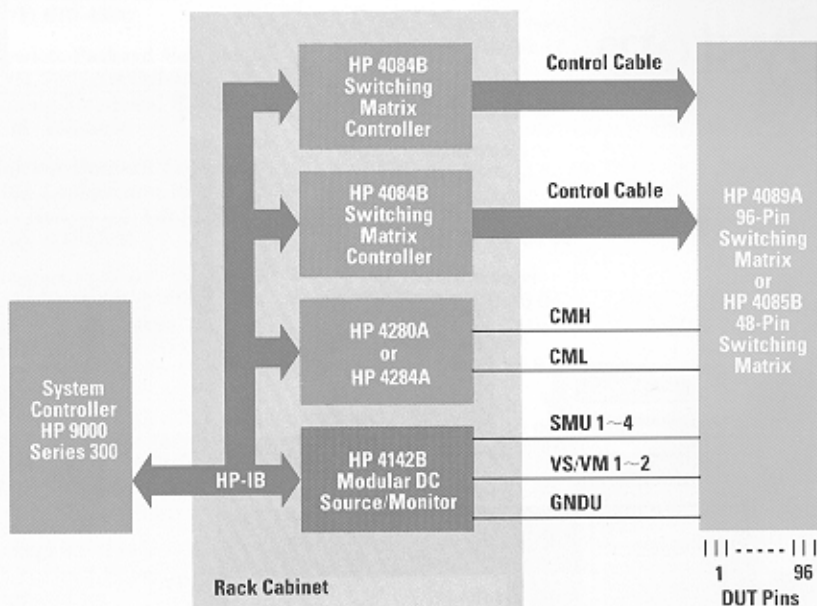
This new operating environment, HP BASIC/UX, provides an unbeatable combination of features ideally suited for large test systems. You get all the power of the HP-UX operating system combined with the easy-to-use features of HP BASIC.

Of course the real heart of any test system is its measurement hardware. The HP 4062UX's hardware is the most sophisticated available. Each measurement subsystem has been specially designed for use in test systems. High speed testing is the primary objective, of course, without sacrificing HP's renowned test capabilities.

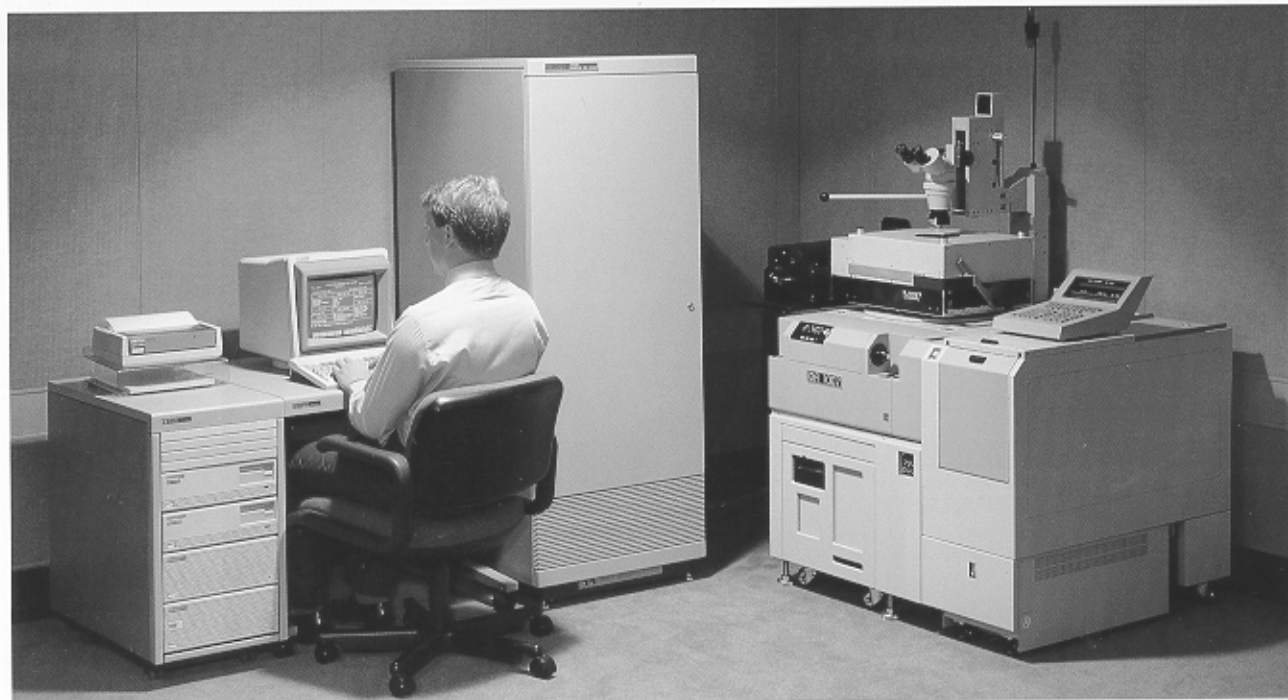
*UNIX is a U.S. registered trademark of AT&T in U.S.A. and in other countries

The system controller is a state-of-the-art HP engineering workstation. Its enormous computing power can be used for data handling and analy-

sis in addition to instrument control. Multi-tasking and windowing capabilities allow you to fully utilize this computing power.



HP 4062UX System Configuration



System Features

High Throughput

The HP 4062UX uses the same high-speed test hardware found in our HP 4062C parametric tester. Each test module is designed especially for systems use and is optimized for high-speed testing. A spot measurement can typically be made in about 6 ms while a more complex measurement, such as V_{th} , requires only about 25 ms when using the Analog Feedback Unit (AFU). And measurement resolution and accuracy aren't sacrificed to obtain these high speeds.

The DC subsystem contains its own MC68000 microprocessor so the majority of measurement control can be done locally, greatly increasing test speeds. Measurement commands and data are transferred over the HP-IB bus using a binary format, greatly increasing bus communication speeds.

Couple this high-speed measurement hardware with HP's high-performance workstations and you get a truly high throughput test system.

Wide Measurement Range

The versatility of the HP 4062UX is apparent when you look at its measurement capabilities:

- Current Measurements from 20 fA to 1 A,
- Voltage Measurements from 4 μ V to 200 V and
- Capacitance Measurements from 10 fF to 1.2 nF.

And these measurements can be made through any of the system's 96 pins.

The HP 4062UX is also capable of making pulsed measurements to help eliminate thermal drift when testing at high power levels.

High Accuracy and Resolution

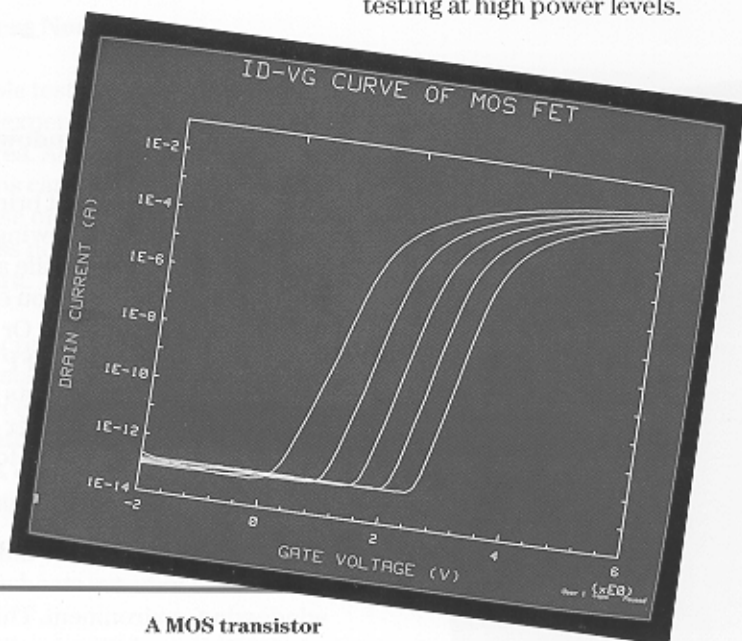
The HP 4062UX has the type of measurement accuracy and resolution you have come to expect from HP. This high accuracy and resolution make the HP 4062UX the ideal tool for today's complex semiconductor processes. Measurements in the sub-picoamp range are often needed for the development and control of these advanced processes. Measurement resolution of 4 μ V (differential mode) and 20 fA is realized with 17-bit measurement accuracy.

HP Support and Service

To help you get up and running as quickly as possible your HP 4062UX will be installed and its performance will be verified by HP personnel. HP also offers training for the test hardware as well as the system controller and operating system. Application support is also available through HP's extensive customer support network. Software subscription service is available to assure that you always have the most up-to-date software revisions.

The reliability of the large number of HP 4062s now in service has shown that HP's reputation for high quality is well deserved. But, in the event that a problem does occur you can relax knowing that HP's worldwide service network is there to help. In addition, because all the components, including the system controller, are from HP, you can be sure that HP service can handle the job.

The modularity of the HP 4062UX design assures that repairs can usually be made by replacing the suspect component, keeping downtime to a minimum.



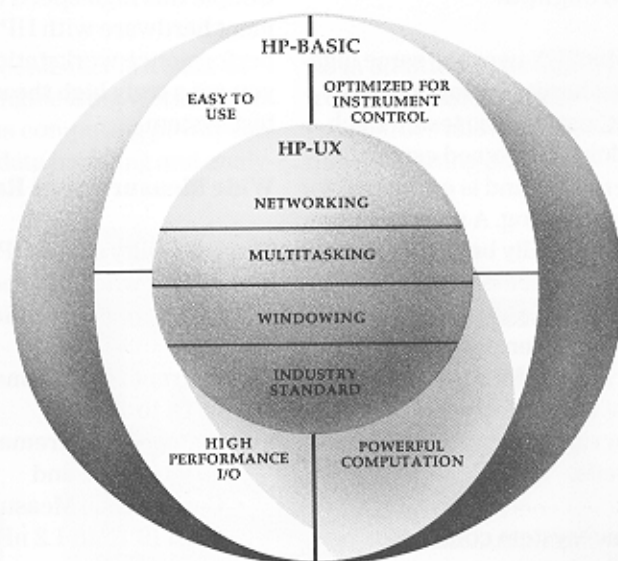
A MOS transistor sub-threshold measurement demonstrates the wide measurement range and high resolution of the HP 4062UX system.

HP-UX Operating Environment

HP BASIC/UX

HP BASIC/UX combines the ease-of-use of HP BASIC, the world's most popular language for instrument control, with the powerful facilities of HP-UX, HP's implementation of the AT&T System V UNIX* operating system.

The HP BASIC/UX environment retains the friendliness and high-performance instrument control capabilities of HP BASIC (sometimes known as "Rocky Mountain BASIC"). But the marriage of HP BASIC with HP-UX provides exciting new features such as networking, multitasking and windowing which you can put to work to make your parametric testing more efficient.



**HP BASIC/UX---
The best of both
worlds for instru-
ment control.**



**Develop and run
tests concurrently
with powerful
X-Window
capabilities**

Multi-tasking and Windowing

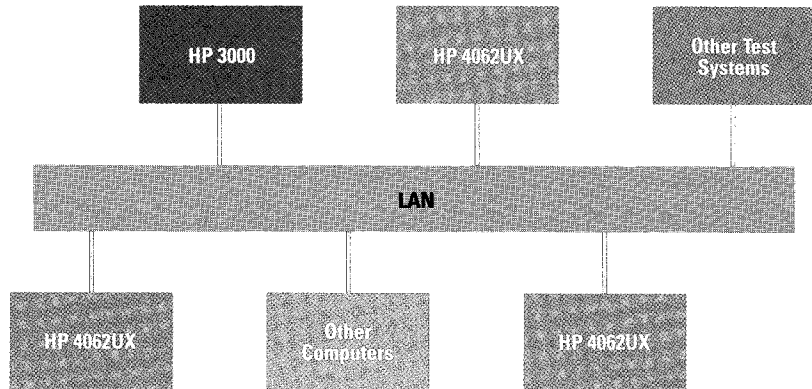
The HP-UX environment brings multi-tasking and windowing to process control. Now while a test is running in one window you can be analyzing data in another. Or use the Virtual Front Panel (VFP) in one window to monitor the tests running in a second. Or transfer data to your mainframe while developing new test programs.

The HP 4062UX uses X-Windows, the de-facto industry standard windowing environment. This windowing capability simplifies test program debugging and data analysis.

Networking

The HP-UX operating system opens up the world of computer networking to you. The HP 4062UX can easily be interconnected, over industry standard LANs, to other HP 4062UXs, other test systems and main-frame computers. Access to IEEE 802.3/Ethernet networks using ARPA/Berkeley services, DECnet using NS/VAX, SUN networks using NFS services, or SNA networks using an SNA gateway can easily be accomplished.

Your test data becomes truly mobile, going anywhere it is needed. The HP 4062UX system controller can be easily integrated into test-area or factory-level management systems helping you increase your test area productivity.

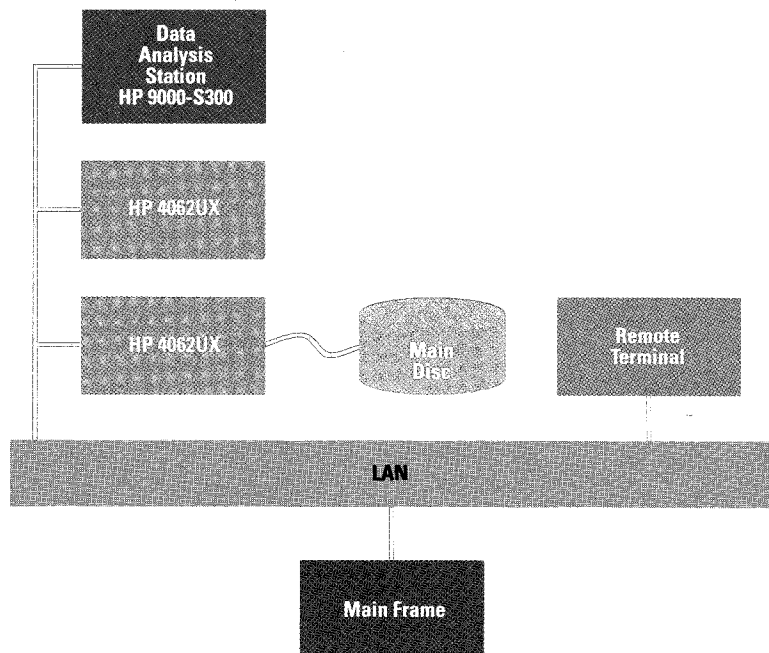


The HP 4062UX can be easily connected to industry-standard LANs.

Discless Nodes

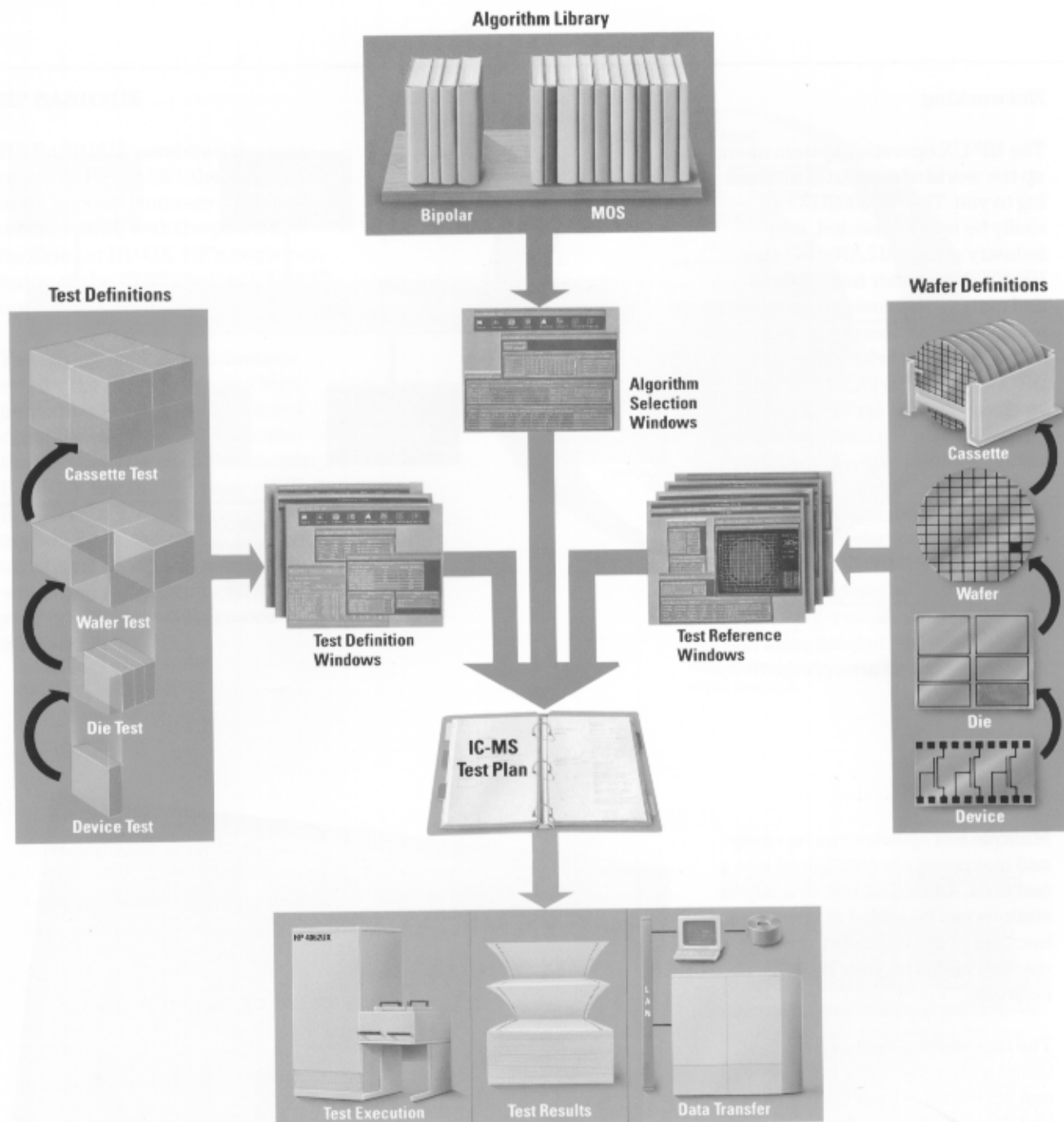
Multiple test systems can be easily and inexpensively configured into a test area. Additional test or analysis stations can be added at lower cost because of the capability of using discless nodes on your HP-UX network.

The incremental cost of these additional stations is lower because you can access all of your test programs and data residing on the main HP-UX disc. There is no need for local storage devices.



Several HP 4062UX systems configured in a discless cluster—all accessing one main disc.

IC-MS Parametric Test Software



IC-MS organizes the electrical and physical specifications of a test plan into a hierarchical set of easily understood windows.

Reduce Parametric Test Costs

- Reduce time to market
- Protect software investment
- Minimize software support and documentation cost

IC-MS (Integrated Circuit—Measurement System) is a software executive for the HP 4062UX which

greatly reduces the time and effort needed to generate and execute parametric tests. You can now create complex tests which execute rapidly in R/D or production without ever having to write or debug code. Tests are created by filling in easy-to-understand windows which call on algorithms and device struc-

ture libraries. IC-MS runs under X11 Windows and the industry standard OSF/Motif™ user interface. Developing and executing tests, as well as analyzing run-time data or communicating with other UNIX programs has never been easier.

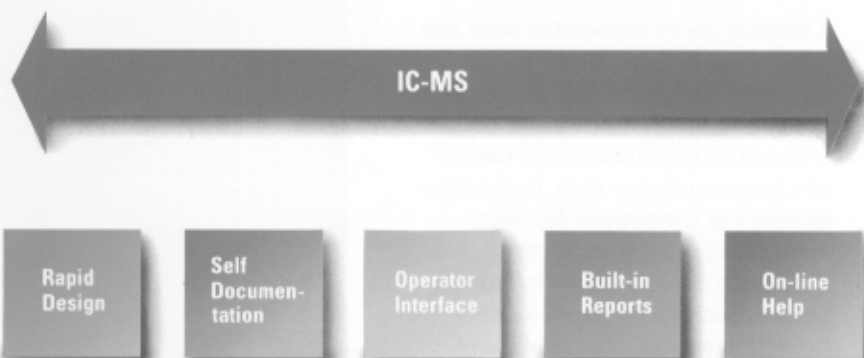
Quickly Create New Tests

Without writing any code, you can use IC-MS to:

- Define tests to be performed
- Define devices, die, and wafers to be tested
- Execute tests on automatic wafer probers
- Analyze the test data
- Ship the data to a database for further analysis

All operations are performed using tabular or graphical windows which are highly re-usable. IC-MS facilitates rapid editing of device and test definitions to increase your productivity by up to x10 over editing custom programs. New test plans can literally be created in minutes, allowing timely monitoring of new fab processes or production wafer test.

Reduce Your Software Development Time/Cost



Use in Both R/D and Production

IC-MS provides the flexibility that is needed during IC development to routinely modify test plans during the R/D phase. Yet it offers robust operation, multiple security levels, ease of use and high test speed which make it ideal for production testing as well. On-line data reports and wafer summaries add the necessary visibility to make timely production engineering decisions. If necessary, production testing can proceed in an engineering mode. With the ease of a mouse click, suddenly a much more detailed view of the test process is available for the engineer responsible for controlling the fab process.

User Algorithm Library

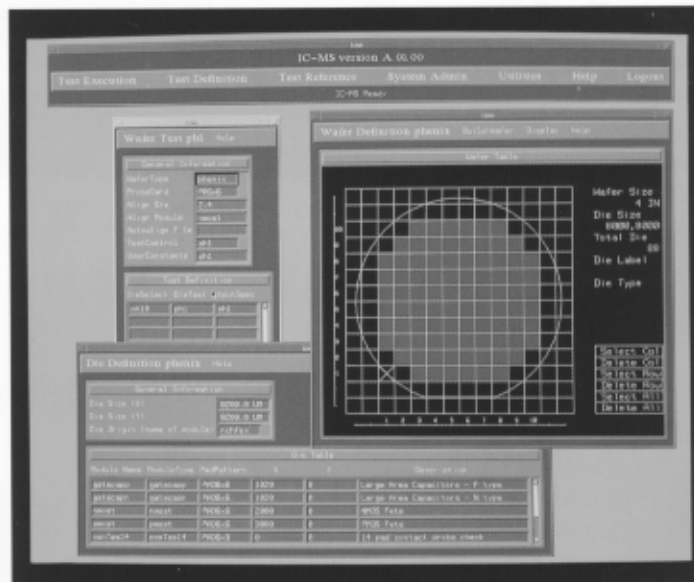
While IC-MS provides sets of ready-to-use algorithms, the open interface allows users to easily add algorithms written in HP BASIC/UX or C. Specifications are passed to algorithms using the interactive windows of IC-MS. Thus, algorithms can be easily customized for a wide range of applications without additional programming.



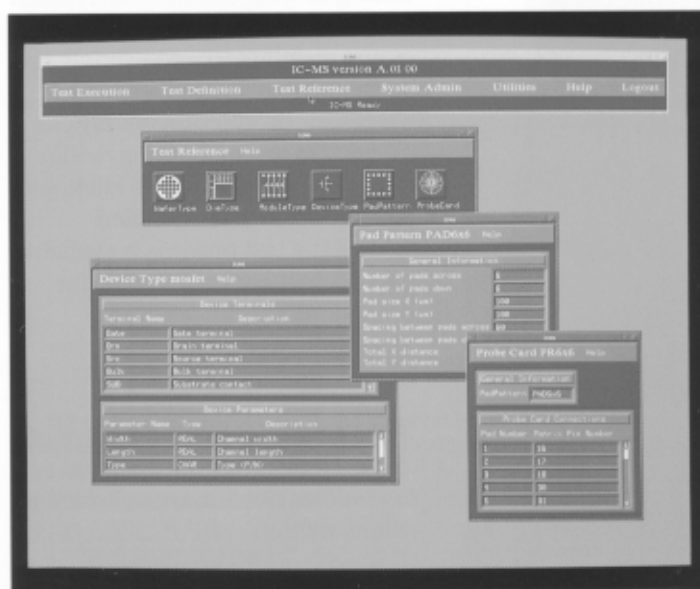
IC-MS simplifies the task of creating and documenting a test program.

Self-documenting

A tedious chore associated with any parametric test is adequately documenting all physical and electrical specifications. The design of IC-MS is based on the hierarchical nature of a semiconductor chip. It provides an efficient framework for documenting all aspects of a test, including device names, device locations, probing patterns, fixture connections, test specifications, binning limits, and report formats. Pull down window commands facilitate printing selected specifications or complete test definitions in terminology familiar to the process engineer.



IC-MS turns the task of writing a test program into a simple sequencing of devices, algorithms, and test definitions.



Verification and help features keep all data entry on track for reliable and easy test development.

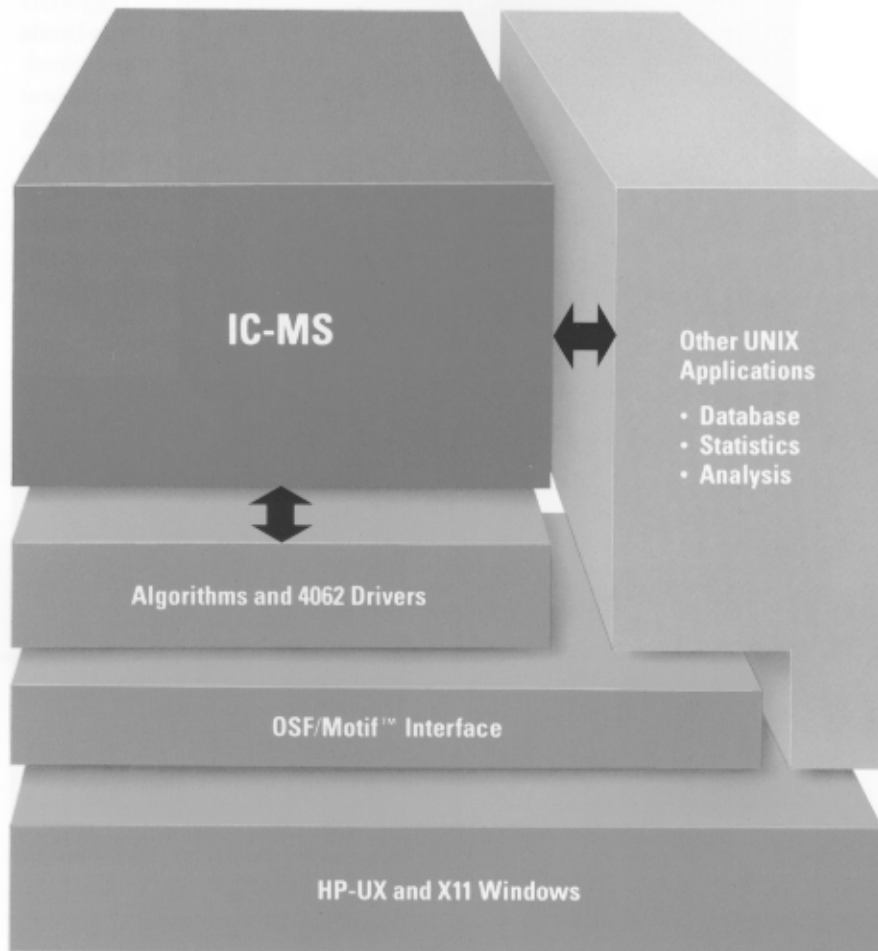
On-line Help

To be effective, a software system must be easy to use. IC-MS offers a multi-level system of on-line help. System level help provides help on general topics including a tutorial on IC-MS for the novice user. Window level help describes what each window is for and what kind of data is expected. Even context dependent help is available for each field. An IC-MS test plan is built from a hierarchy of re-usable files. IC-MS organizes these files and provides rapid movement between them. IC-MS verifies consistency of all files and when you can't remember, IC-MS will even suggest legal field entries to help speed up file editing.

Open Interface

In addition to offering turnkey solutions, IC-MS provides an open environment with the flexibility needed to customize your particular test needs. You may write your own test algorithms, your own output reports, and your own data formats

for outputting to existing databases. You may even write your own data entry checkers for lot names and wafer-ids to match existing standards. This kind of flexibility is mandatory for the multi-vendor and multi-system world of today's IC manufacturing.

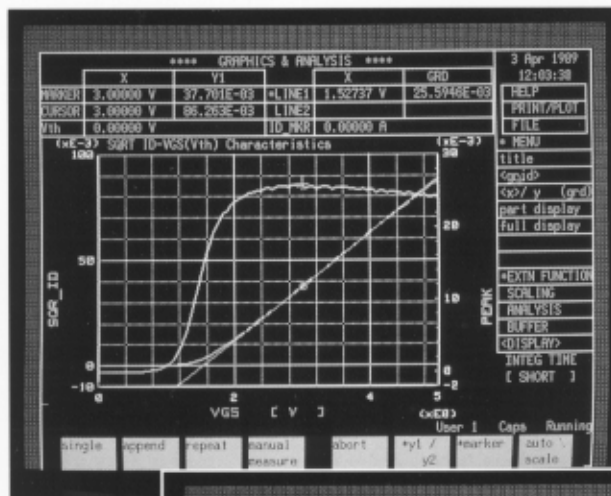


The open architecture of IC-MS allows flexible data flow between the HP 4062UX and standard UNIX applications.

Full Feature Parameter Analyzer

Interactive Measurement and Analysis

Interactive Measurement and Analysis (HP IMA/UX) is an optional software package which turns the HP 4062UX into an interactive semiconductor parameter analyzer. You can set up complex measurements and graphically analyze test results in seconds, using simple windows patterned after the industry standard HP 4145B parameter analyzer user interface. Use simple mouse-driven windows to study a device while it is connected to the HP 4062UX switching matrix. Or enhance device analysis under programmatic control by accessing HP IMA/UX features from a HP BASIC/UX test program.



*** UNIT DEFINITION ***

3 Apr 1989 12:11:58

SLOT NO	UNIT ID	V NAME	I NAME	MODE	FUNCTION
---	GN00		[----]	[V]	[CON]
2	SM01(HP)	VO	ID	V	CONST
3	SM02(HP)	VGS	IC	V	VARI
4	SM03(HP)	VGS	IDG	V	CONST
5	SM04(HP)			[V]	
6	VS01			[V]	
6	VS02			[V]	
6	VM01			[----]	[----]

USER FUNCTION

NO NAME (UNIT) = EXPRESSION

1 SQR_ID () = SQR(ABS(ID))

2 PEAK () = DELTA(SQR(ABS(ID))) / DELTA(VGS)

Buttons: MENU, UNIT DEF, SOURCE SET UP, DISP SET UP, GRAPH & ANALYSIS, User 1, Caps, Running, more 1/2

*** SOURCE SET UP ***

3 Apr 1989 12:11:58

*** VARIABLE ***

NAME	[VGS]	[----]
SLEEP MODE	SINGLE	[----]
LIN / LOG	LINEAR	[----]
START	0.00000 V	[----]
STOP	5.00000 V	[----]
STEP	50.0000mV	[----]
NO OF STEP	101	[----]
COMPLIANCE	1.00000mA	[----]
POWER COMP	[----]	[----]

*** CONSTANT ***

NAME	[VGS]	[VGS]	[----]	[----]
MODE	[V]	[V]	[----]	[----]
VALUE	3.00000 V	0.00000 V	[----]	[----]
COMPLIANCE	20.0000mA	100.000mA	[----]	[----]

Buttons: MENU, UNIT DEF, SOURCE SET UP, DISP SET UP, GRAPH & ANALYSIS, User 1, Caps, Running, more 1/2

Use HP IMA/UX to make complex semiconductor measurements in seconds.

Additional Software Utilities

Programming Productivity

The HP 4062UX is supplied with a powerful set of software tools which allow you to create test environments tailored to your exact needs. Tools such as the Test Instruction Set (TIS), Virtual Front Panel (VFP), and the Off-line Debugger can be used to develop stand alone test programs or to develop algorithms which run under the IC-MS test executive. Programs previously designed to run on the HP 4062B/C will run without modification on the HP 4062UX under HP BASIC/UX, thus protecting any software investment you may have already made.

An example of a typical measurement sequence using TIS commands.

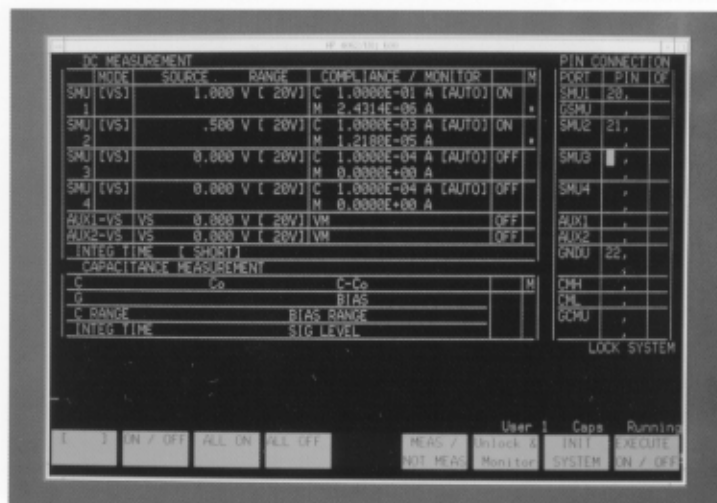
Test Instruction Set

The Test Instruction Set (TIS) is the main programmatic interface to the HP 4062UX test hardware. TIS provides high-level system commands for hardware control. With TIS you can easily force, measure, sweep or pulse currents and voltages. Control of the switching matrix is also through TIS.

```
10 OPTION BASE 1
20 INTEGER Source,Gate,Drain,Substrate
30 DIM Id(81),Vg(81)
40 I
50 Init_system
60 Set_mnu(3)
70 I
80 Source=34
90 Gate=36
100 Drain=62
110 Substrate=64
120 I
130 Connect(FN_Gnd,Source)
140 Connect(FN_Gau(4),Gate)
150 Connect(FN_Gau(1),Drain)
160 Connect(FN_Gau(3),Substrate)
170 I
180 Loggraph1(-2.5,1.E-14,1.E-1,"GATE VOLTAGE (V)","DRAIN CURRENT (A)","ID-VG CURVE OF MOS FET",1,0,0)
190 I
200 FOR Vgub=0 TO -2 STEP -.5
210   Force_v(Drain,3,20,1)
220   Force_v(Substrate,Vgub,20)
230   Set_iv(Gate,1,20,-2.5,81,1,0)
240   Sweep_iv(Drain,2,0,Id(*),Vg(*))
250   MOVE Vg(1),LGT(Id(1))
260   FOR J=2 TO 81
270     IF Id(J)<=0 THEN 290
280     DRAW Vg(J),LGT(Id(J))
290   NEXT J
300 NEXT Vgub
310 I
320 Disable_port
330 Connect
340 END
```

Plotting and graphics commands make displaying your results easy too.

Each TIS command is an optimized, compiled subprogram (HP BASIC CSUB). This gives you the fastest, most efficient way to access the hardware. You don't have to worry about instrument communication. Each command also contains extensive error checking and trapping, relieving you from this tedious task.



The Virtual Front Panel can be used for monitoring and controlling the HP 4062UX system.

Virtual Front Panel

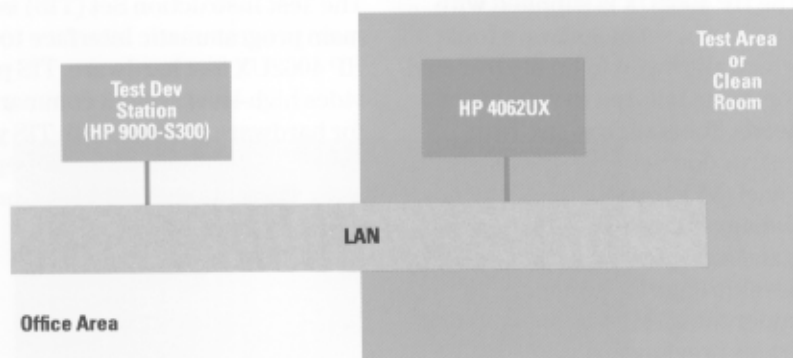
The Virtual Front Panel (VFP) of the HP 4062UX provides you with an easy way to access the measurement hardware. By calling the VFP you can control the measurement hardware interactively allowing you to make quick device measurements.

The VFP is also a great tool for checking the status of the measurement hardware. This makes it ideal for program development and debugging. Use the VFP in one HP-UX window while your test program is running in another and you can monitor the progress of your test.

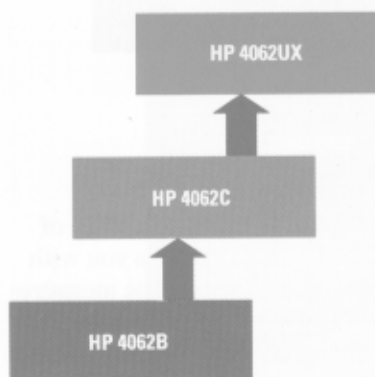
Off-Line Debugger

The HP 4062UX contains a new Off-line Debugger. With this feature you can easily write and debug your test programs without requiring access to the measurement hardware. With the multi-user capabilities you can be debugging a test program at your desk while the HP 4062UX is testing wafers over in the test area.

With the Off-line Debugger you can "run" a test program and the Debugger will return "measurement results" obtained from actual test data or simulated data. You can get your test program in order without the need for hardware access. This frees up the hardware for the purpose it was intended—testing wafers.



With the off-line debugger, test development can be done remotely.



HP 4062B/C systems can be easily upgraded to the HP 4062UX configuration.

Upward Compatibility

HP is fully committed to keeping compatibility among the HP 4062 system family. This protects your investment and provides lasting system value. Current owners of HP 4062B/C systems can easily upgrade their systems to the HP 4062UX configuration. HP 4062B/C test programs are upward compatible with the HP 4062UX system. Test programs written for the HP 4062B/C can be run on the HP 4062UX with little or no modification. This system's compatibility gives you great flexibility when designing test areas for both R&D and production testing.

Prober Drivers

Prober driver software is provided for most major wafer prober models. Probers are connected to the HP 4062UX through the HP-IB (IEEE-488) interface. HP can also work with you to solve any interfacing problems unique to your situation.

The Hardware

DC Measurement Subsystem

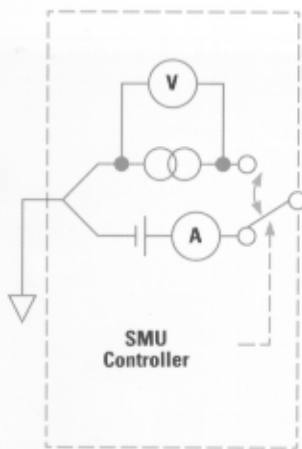
The DC subsystem used in the HP 4062UX is the HP 4142B. The HP 4142B uses HP's innovative Source Monitor Units (SMU). These SMUs can be operated in two different modes:

- Simultaneous Voltage Source + Current Monitor
- Simultaneous Current Source + Voltage Monitor

Two different SMUs are available for use with the HP 4062UX:

- Standard Power: $\pm 100\text{V}$; $\pm 100\text{mA}$ (2W max.)
- High Power: $\pm 200\text{V}$; $\pm 1\text{A}$ (14W max.)

The SMUs can be programmed to perform either linear sweeps or log sweeps, pulsed spot, pulsed sweep, or simultaneous sweep and pulsed measurements, over their entire operating range.



SMU block diagram

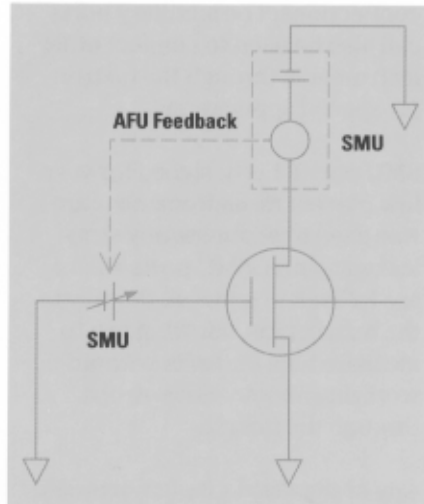
The HP 4142B uses an active ground unit (GNDU) which can sink up to 1.6 A of current. A VS/VM unit can be added which contains two voltage sources (VS) and two voltage monitor (VM) ports. The voltage monitors can be used in a differential mode to obtain up to $4\mu\text{V}$ of voltage resolution.

An important feature of the HP 4142B is the Analog Feedback Unit (AFU). The AFU allows you to use the measured value from one SMU to control the output from a second. This speeds up operating point measurements such as V_{th} and h_{fe} . A V_{th} measurement can typically be made in as little as 25 ms when using the AFU.

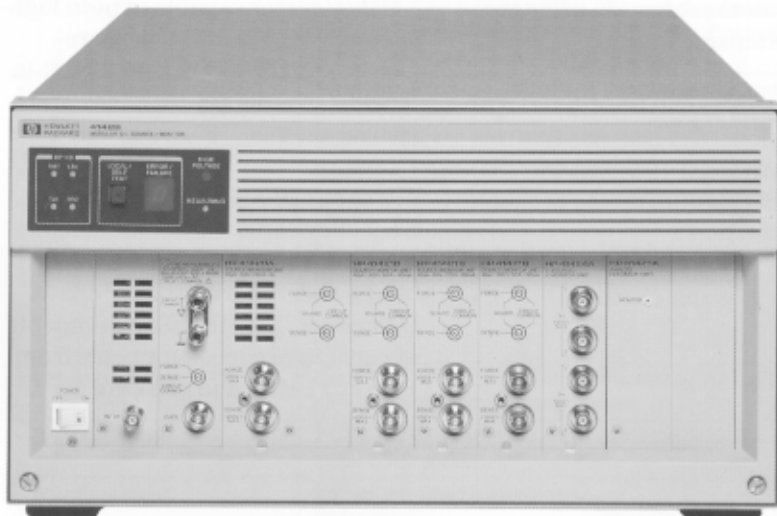
The HP 4142B uses a modular design which allows you to configure the unit to meet your particular testing needs.

The typical configuration would contain:

- 1 High Power SMU
- 3 Standard SMUs
- 1 VS/VM Unit
- 1 AFU



Typical AFU application—Controlling the gate bias of a MOS transistor using the drain current.



The HP 4142B modular DC source/monitor unit.

Switching Subsystem

For device switching the HP 4062UX can use either the HP 4089A 96-pin matrix or the HP 4085B 48-pin matrix. Both matrices are controlled by the HP 4084B matrix controller. (The HP 4089A uses two HP 4084B controllers.)

The HP 4062UX uses an overhead test-head design so system performance can be specified at the matrix pin tips. This design eliminates the factors which can cause accuracy and stability problems often associated with excess cabling.

Both matrices have 8 input ports plus a port for the ground unit. 4 ports are intended for SMU connections and 4 ports are auxiliary for VS/VM or capacitance meter connections. The auxiliary ports can also be used to connect other instruments through the matrix for special applications.

SMU port #1 is designed for very low current measurements, care was used to eliminate any stray leakage paths. SMU ports #2,3,4 are full kelvin paths all the way to the matrix pins, allowing you to measure high currents without worrying about voltage drops through the matrix.

Any of the matrix input ports can be connected to any of the test pins, giving you flexibility when designing test structures and probe cards.



The HP 4089A 96-pin switching matrix mounted on a wafer prober.

The HP 4089A and HP 4085B switching matrices are designed to be mounted on any prober designed to accept the small SENTRY test head. Connections to other prober styles can also be made using the cable extension fixture.

Both matrices can be ordered with a number of standard test fixtures for measuring packaged parts. A "universal" fixture is also provided for special parts.

Capacitance Subsystem

The HP 4062UX uses the HP 4280A C-meter for its capacitance measurements. The HP 4280A is a 1 MHz C-meter capable of both high-speed C-V/G-V and C-t measurements. The HP 4280A uses a built-in ± 100 V bias supply for C-V/G-V measurements.

For applications where multi-frequency capacitance measurements are desired the HP 4062UX can be ordered with the HP 4284A LCR meter. The HP 4284A is capable of capacitance measurements from 1 KHz to 1 MHz and biases of up to ± 40 V.

Specifications

Hardware Overview

• Measurement Functions	Spot and Swept I, V, I-V, C, G, C&G-V, C&G-t, Pulsed I-V, Pulsed Sweeps, Analog Search	
• Number of DUT Pins	12 to 96 Pins	
• Current/Voltage	SMUs (4): High Resolution SMU Port: V: $\pm 40 \mu\text{V}$ to $\pm 200 \text{ V}$, I: $\pm 20 \text{ fA}$ to $\pm 100 \mu\text{A}$ High Current SMU Port: V: $\pm 40 \mu\text{V}$ to $\pm 200 \text{ V}$, I: $\pm 2 \text{ pA}$ to $\pm 1 \text{ A}$ Standard SMU Ports (2): V: $\pm 40 \mu\text{V}$ to $\pm 200 \text{ V}$, I: $\pm 2 \text{ pA}$ to $\pm 100 \text{ mA}$ Basic Measurement Accuracy (all SMU ports): V: $\pm 0.05\%$, I: $\pm 0.2\%$ Maximum Differential Voltage: 400 V V force Resolution: $100 \mu\text{V}$ I force Resolution: 50 fA (High Res. Port) 5 pA (Other Ports) Ground Unit: $\pm 1.6 \text{ A}$ VS/VM Unit: Voltage Source (2): V: $\pm 1 \text{ mV}$ to $\pm 40 \text{ V}$, I monitor: $\pm 20 \mu\text{A}$ to $\pm 100 \text{ mA}$ Basic Accuracy: $\pm 0.1\%$ Voltage Monitor (2): V: $\pm 40 \mu\text{V}$ to $\pm 40 \text{ V}$ Basic Accuracy: $\pm 0.05\%$ Differential Mode Resolution: $4 \mu\text{V}$	
• Capacitance Measurement	HP 4280A Modes: C, G, C-t, G-t, C.G-t, C-V, G-V Frequency: 1MHz C range: 10 fF to 1.2 nF G range: .01 μS to 12 mS Basic Accuracy: $\pm .5\% \text{ C}$, $\pm 1.5\% \text{ G}$ Max DC Bias: $\pm 100\text{V}$	HP4284A C, G, C-V, G-V 1kHz, 10kHz, 100kHz, and 1MHz 10 fF to 1.2 nF .01 μS to 7.5 mS $\pm .8\% \text{ C/G}$ $\pm 40 \text{ V}$
• System Controllers	HP 9000 Series 300 Models: 345, 370, 375	

Software Overview

• IC-MS	Integrated Circuit Measurement System . Windowed environment for defining, testing, and analyzing wafer parametric tests without programming. Calls HP or user defined measurement algorithms in HP BASIC/UX and C.	
• Algorithm Library	Set of algorithms compatible with IC-MS written in both C and BASIC. Provides fundamental algorithms needed to monitor bipolar, MOS, and other semiconductor processes.	
• IMA/UX	Interactive Measurement and Analysis. For quick measurement and graphical analysis with mouse-driven or programmatic control.	
• Parameter Measurements	Routines supplied to measure: Resistance (2/4 Pt.) Breakdown Voltage (3 methods) hFE	Threshold Voltage (5 methods) Drain Current Delta L, Delta W
• Virtual Front Panel (VFP)	Interactive Hardware Control and Monitoring. For device connection and measurement control.	
• Probing Control	Probing Pattern Generator (PPG). Software drivers for most major wafer probers.	
• Data Processing	Software routines included for: Wafer Maps Histograms Scatter Plots	Trend Charts X-Y Graphs
• Verification Software	Performance Verification (PV) Diagnostics (DIAG)	
• Operating Environment	HP BASIC/UX 5.52 (HP-UX 7.0) or later revisions	
• Test Instruction Set (TIS)	High level instrument control commands. (Compiled CSUBS)	

Specifications are guaranteed at the DUT interface.

For more information on the HP 4062UX please contact your HP sales representative for these other publications:

HP 4062UX System Description
(Lit. No. 5952-7977)

HP 4062UX System Configuration Guide
(Lit. No. 5950-2972)

Information about HP controllers and networking services is also available from your HP sales representative.

For more information, call your local HP sales office listed in your telephone directory or an HP regional office listed below for the location of your nearest sales office.

United States:

Hewlett-Packard Company
4 Choke Cherry Road
Rockville, MD 20850
(301) 670-4300

Hewlett-Packard Company
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 255-9800

Hewlett-Packard Company
5161 Lankershim Blvd.
No. Hollywood, CA 91601
(818) 505-5600

Hewlett-Packard Company
2015 South Park Place
Atlanta, GA 30339
(404) 955-1500

Canada:

Hewlett-Packard Ltd.
6877 Goreway Drive
Mississauga, Ontario L4V 1M8
(416) 678-9430

Japan:

Yokogawa-Hewlett-Packard Ltd.
15-7, Nishi Shinjuku 4 Chome
Shinjuku-ku
Tokyo 160, Japan
(03) 5371-1351

Latin America:

Hewlett-Packard
Latin America Region Headquarters
Monte Pelvoux No. 111
Lomas de Chapultepec
11000 Mexico, D.F. Mexico
(525) 202-0155

Australia/New Zealand:

Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Melbourne, Australia
(03) 895-2895

Far East:

Hewlett-Packard Asia Ltd.
22/F Bond Centre
West Tower
89 Queensway
Central, Hong Kong
8487777

European Headquarters

Hewlett-Packard S.A.
150, Route du Nant d'Avril
1217 Meyrin 2
Geneva-Switzerland
41/22 780 8111

In Europe, please call your local HP sales office or representative:

Austria:

(0222) 2500-0

East Central Europe, USSR, and Yugoslavia:

Vienna - Austria
(0222) 2500-0

Belgium and Luxembourg:

(02) 761 31 11

Denmark:

(42) 81 66 40

Finland:

(0) 88 721

France:

(1) 69 82 60 60

Germany:

(06172) 16 0

Greece:

(01) 68 28 811

Iceland:

(91) 67 10 00

Ireland:

(01) 88 33 99

Italy:

(02) 92 19 91

Netherlands:

(020) 547 6669

Norway:

(02) 24 60 90

Spain:

900 123 123

Sweden:

(08) 750 20 00

Switzerland:

(057) 31 21 11 (Head office)
(022) 780 41 11 (Suisse Romande)
(046) 05 15 05 (Customer Information Center)

South Africa:

HiPerformance Systems
(011) 802 5111

Turkey:

175 29 70

U.K.:

(0344) 369 369

Middle East and Africa:

Geneva-Switzerland
41/22 780 7111