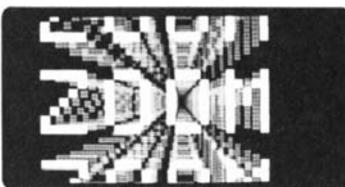


HP introduces a low-cost graphics terminal with interactive alphanumeric capabilities.

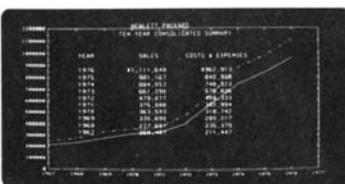
The new HP 2648 brings graphics to our growing family of intelligent terminals. It offers high performance at a low cost, and is an invaluable tool for automatic plotting, schematic diagramming, and computer-aided design. It helps you visualize your ideas from concept to execution, and its built-in microprocessor lets you perform a wide range of graphics without any CPU help at all.

The HP 2648 graphics terminal introduces a constellation of bright ideas. Here are some of them:



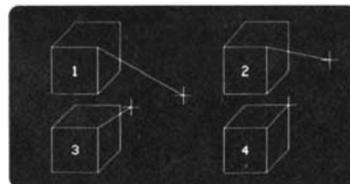
ZOOM AND PAN

Magnify any area of the display up to 16 times (16X) to investigate or modify dense or complex areas. Pan in any direction for close-up viewing of the magnified display, without affecting display memory.



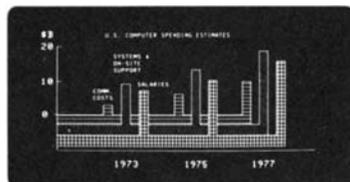
AUTOMATIC PLOTTING

Even with little or no programming knowledge, you can plot tabular data automatically. A simple menu helps you enter your data parameters on the keyboard, after which a single keystroke plots the data instantly.



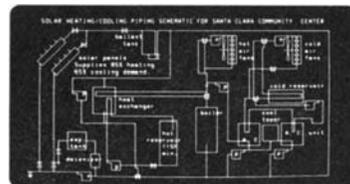
RUBBER BAND LINE

Trial graphics are a snap with the rubber band line. You can anchor a line at any point, then use the graphics cursor to move the other end of the line anywhere you wish. As you move the cursor, the line automatically conforms.



USER DEFINABLE AREA SHADING

You can specify any pattern that an 8-by-8-bit cell can generate to make clear visual definitions of separate areas with similar shapes, as in bar charts and mechanical or architectural drawings.



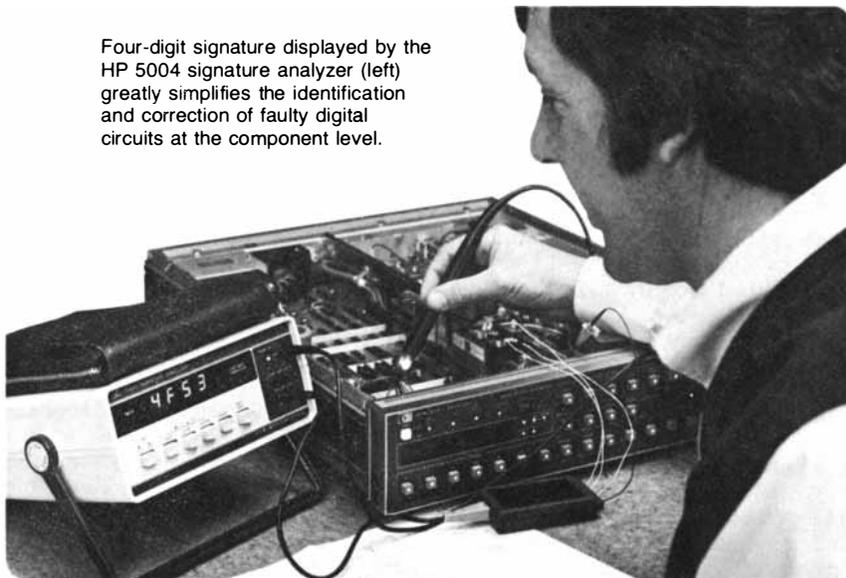
INDEPENDENT DISPLAY MEMORIES

Alphanumeric and graphic data can be shown independently or at the same time, as in this process control schematic. And because alphanumeric and graphic displays each have separate memories and cursor controls, you can change one without disturbing the other.

Other advantages of the HP 2648 include: storage of graphics and alphanumeric data on 110k byte magnetic tape cartridges; user-definable keys that can be programmed to speed repetitive jobs; and self test at the push of a button.

Price of the HP 2648 starts at \$5500*.

Four-digit signature displayed by the HP 5004 signature analyzer (left) greatly simplifies the identification and correction of faulty digital circuits at the component level.



After the honeymoon, how do you support a microprocessor?

If you're contemplating the conjugation of a microprocessor with a product you are developing, you now have an alternative to costly board-exchange programs in the event of faulty circuit components: HP's new 5004 signature analyzer.

Until now, tracing faults in a digital circuit (the type of circuit in which microprocessors reside) has been difficult. The time-honored signal tracing techniques that a field service technician can use to troubleshoot and repair *analog* circuits just don't work with digital circuits, where voltage measurements have no meaning and all waveforms look alike. Instead, manufacturers have had to base field service not on component repair but on much more expensive board exchange or replacement programs.

Signature analysis, a new measurement technique development by HP, provides component-level service capability for digital circuits. Here's how it works. When the modest requirements of signature analysis are designed into a product, the HP 5004 signature analyzer automatically characterizes the bit stream associated with a data node as a four-digit hexadecimal signature. A compressed "fingerprint" of the data present at the node, each signature is unique for a specific good node; any fault in the data stream—even one bad bit out of thousands—generates an erroneous signature. By comparing the

displayed signature with the correct one noted on the product schematic, a service technician can easily spot a faulty node, trace it back to a bad component, and repair it without replacing the board—just as with an analog circuit.

The HP 5004 generates the signature by compressing the data stream in a linear feedback shift register. With this technique, there is a 100 percent certainty that the HP 5004 will detect a single-bit error, and a 99.998 percent certainty that it will detect any error—regardless of the length of the stream or the subtlety of the fault. It even detects time-related faults such as mid-cycle displaced bits, and speed-related failures in assembled systems.

For the manufacturer, the bottom line is a substantial reduction in field service costs for microprocessor-based products and high-speed state machines. Signature analysis increases development costs by only about 1 percent, an increase that is more than offset by lower manufacturing costs due to reduction in circuit boards, interconnections, and production-line troubleshooting time.

If this sounds interesting, send in the coupon to receive HP Application Note 222, *A Designer's Guide to Signature Analysis*, which tells how to implement signature analysis in the design of a product.

Price of the HP 5004 is \$990*.



1503 Page Mill Road, Palo Alto, California 94304

For assistance call: Washington (301) 948-6370, Chicago (312) 255-9800,
Atlanta (404) 955-1500, Los Angeles (213) 877-1282.

Mail to: Hewlett-Packard, 1503 Page Mill Road, Palo Alto, CA 94304.
Please send me further information on

- HP 2648 graphics terminal
 HP 5004 signature analyzer

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*Domestic U.S. prices only.

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