COMPANY CONFIDENTIAL

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ENGINEERING FOR DISABLED TEKS: VOLUNTEERS NEEDED

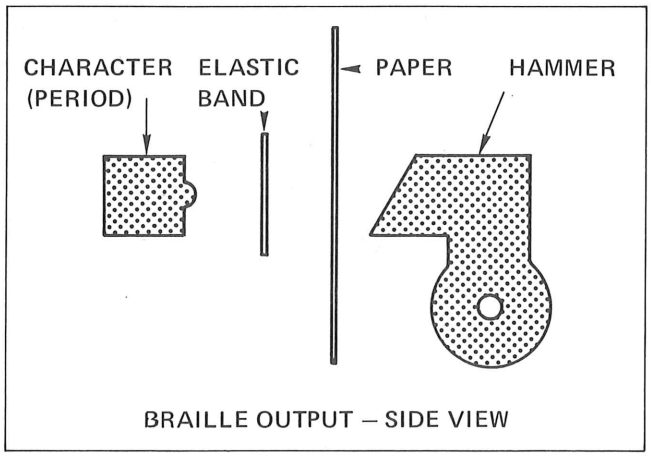


Figure 1. Line printer modification for braille output. Hammer strikes paper/cushioned by elastic band over period character.

Job Opportunities for disabled Tek employees are limited by the availability of equipment modified for their use. For some jobs, the modified equipment just doesn't exist. There's no equipment on the market because the demand is too low. Even commonly-used meters don't have displays that blind workers can use. Bob Jaquiss, in the Scientific Computer Center, is working on that problem. He's developing a system that will produce braille or simulated-speech output for the DM 501 (digital multimeter).

For other jobs, modified equipment exists, but it's too expensive or too finicky. The Scientific Computer Center has a terminal (keyboard and printer) for blind users. It's difficult to adjust and it's expensive ($14,500 from Tri-formation Systems, Inc.). An in-house version may be the answer to that problem.

Sometimes modifications can be simple and inexpensive. Scientific Computer Center's line printer can output in braille. Tek's Charlie Montgomery wrote the program that translates the output to braille. (The program uses only periods). Berkeley Labs created an elastic band that fits over the print chain (the print chain is a string of characters). The elastic band provides a cushion for the hammer that forces the paper against the characters on the chain (periods in this case). The period character pushes against the paper to make an impression on the back. That's the braille output.

A discussion group meets once a week to help solve some of the equipment problems that disable Tek employees have. Can you help with either the terminal or the DM501 project? Can you suggest other projects? Give Jerry Balk a call (ext. 7792).

Technical Information: What We Do

Basically, the Technical Information Department has two functions. One is internal: we encourage the engineering people in the company to talk to each other. That's where *Engineering News* comes in. The other function is external: we try to make it easier for you to talk to the engineering world outside of the company. That means presenting papers at conferences, and writing articles for trade journals.

Engineering News is the closest thing we have to a library of new ideas and techniques developed inside the company. *Engineering News* is the place to bring out solutions to problems that other engineers in the company may be having. It's also a good place to tell the Tek world what you're doing. Someone in another product group or another area may find an application for your work. . .or may be able to offer you the benefits of their experience.

Engineering News also announces new books, calls for papers (for upcoming conferences), and articles written by Tek people for trade magazines.

Technical information's second function needs more publicity. We're available for most any kind of help you need to present papers, slide shows, or magazine articles. We're not in the business of generating papers, shows and articles; but we can edit your paper and handle all of the mechanics for you. For example, if you plan to present a paper at a conference, we can help you with the writing and help to define the graphics that would best illustrate your ideas. We can produce all the illustrations, handle the photography and typing for you, as well as provide you with slides and coaching with your talk. We'll contact magazine editors and conference program chairmen on your behalf where it's necessary.

If you've got something that could go into *Engineering News*, or if you would like our support when you talk to the outside world (or both), give us a call. Joyce Lekas (ext. 6601), Al Carpenter (ext. 5468), Burgess Laughlin (ext. 6071).

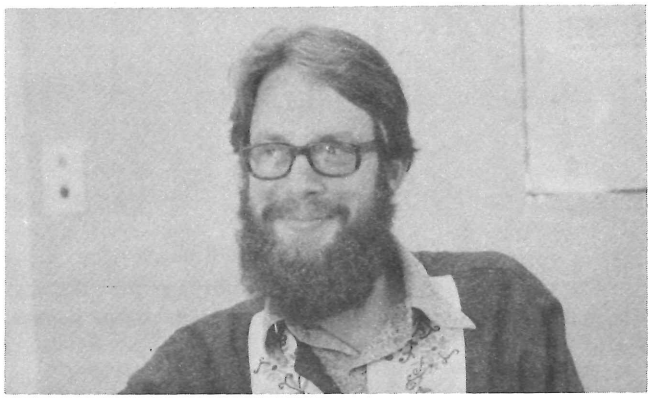
New Editors in Technical Information

Technical Information welcomes two new staff members, Al Carpenter and Burgess Laughlin, to its ranks. Both seasoned technical writers, their backgrounds are impressive. Al has been with Tektronix with a few interruptions since about 1957. He most recently headed the 7000-Series manuals group. Burgess worked for Hewlett-Packard from 1967 to 1974, when he took time out to write a book.

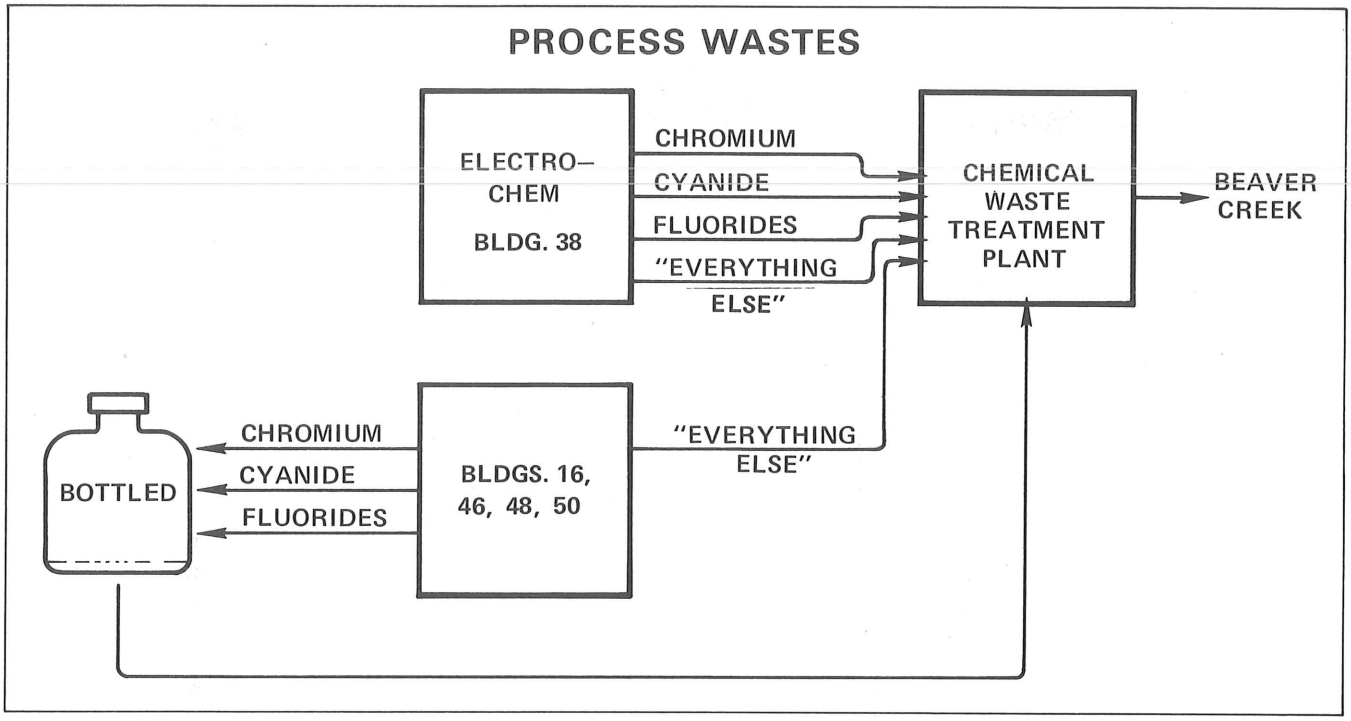
Both Al and Burgess will be seen around a lot, both gathering news for Engineering News and assisting engineers with papers and presentations. We welcome them with pleasure!

Al's extension is 5468; Burgess is at 6071. They are both at delivery station 50-462.

Al Carpenter



Burgess Laughlin



D.E.Q. Compliance... An Effort That Pays Off

For most of us, compliance with DEQ rules means a greater effort and increased costs. Of course, the long-term benefits of environmental protection justify the extra costs. But, it's always good news to find that one of Tek's compliance efforts has saved the company money instead of costing it more.

Until October 8, Electrochem (Electrochemical Engineering Department) used a pyro-phosphate copper process to electroplate pc boards. Now E-C uses an acid-copper process. Why the changeover?

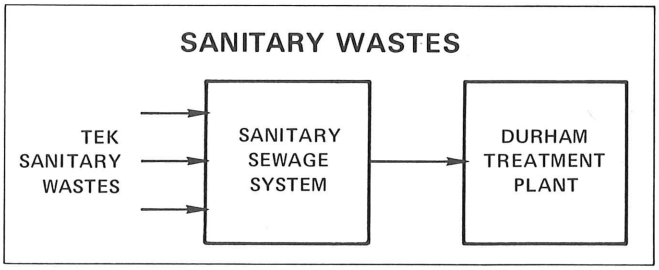
The new process produces a smaller amount of environmentally-dangerous waste. So there's less to clean out of Tek's disposal system. The changeover will have no effect on the people who use Electrochem's services.

Basically there are two waste-handling systems at Tek: one for process wastes and the other for sanitary wastes.

Tektronix operates under a DEQ permit that specifies how much of what substance we can release into Beaver Creek. The permit specifies upper limits on ammonia, cyanide, chromium, nickel, copper and fluoride. The biggest source of inorganic wastes is building 38 (Electrochem). Four disposal pipes run from the building to the Tektronix Chemical Waste Treatment Plant (part of the Facilities Department).

There's one pipe each for chromium, cyanide, fluorides, and "everything else." Most other buildings have one "everything-else" pipe. Chromium, cyanide, and fluorides are stored in bottles and then sent to the treatment plant.

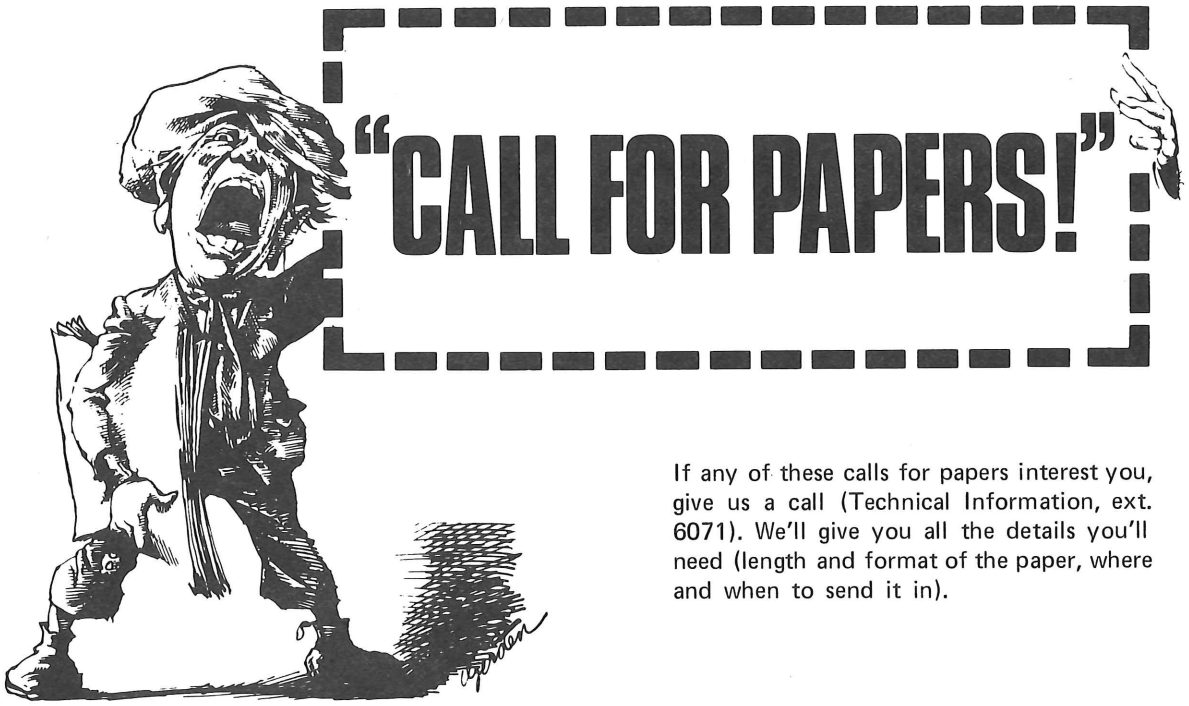
A "spill" is dumping waste in the wrong pipe. Since the cleanup process for that pipe won't handle the spill, the waste passes right into Beaver Creek. . .thus violating DEQ standards. That's the reason for all those warning signs on sinks and drinking fountains.



Organic wastes are another problem. Tek's Chemical Treatment Plant doesn't process organic materials. Where do the organic wastes come from? Mostly from washes used by semi-conductor, integrated circuit, and CRT groups. Electro-Chem also uses a lot of cleaners that contain organics. →

Tektronix will probably be paying the Durham Treatment Plant to treat these organic wastes. The treatment will cost Tek about $10,000 a month. The cost is a function of the volume of the water released. And that brings us to water conservation. The best way to conserve water is to reuse it. That way, we save money three ways: we buy less to begin with, we dump less (and have to pay lower treatment costs), and we spend less on processing wastes in the water. Processing costs are lower because the wastes are more concentrated.

Saving money is where we came in. For each dollar spent on the change to the acid-copper process, Tektronix will save 70 cents a year. That makes compliance even more attractive.



If any of these calls for papers interest you, give us a call (Technical Information, ext. 6071). We'll give you all the details you'll need (length and format of the paper, where and when to send it in).

– International Magnetics Conference is sponsoring a conference (June 6-9, 1977) in Los Angeles. They've put out a call for papers on applied magnetics, magnetic phenomena, and information storage techniques. The program chairman first wants a digest of your paper (January 5, 1977). A "digest" is a two-page summary with as much detail as you can put in.

– The IEEE Quantum Electronics Council and the Optical Society of America are sponsoring the Conference on Laser Engineering and Applications (June 1-3, 1977). They've put out a call for papers on any engineering aspect of laser devices and systems, as well as current and future applications of optical techniques. The paper is due in January, but you'll need to turn in an abstract first.

– The American Chemical Society Division of Computers in Chemistry is sponsoring the Sumposium on Minicomputers and Large Scale Computations (May 29 - June 2, 1977). They're asking for papers on the use of computers by chemists or non-chemists if the work can serve as model for chemists. The abstract is due the first day of December, 1976.

– The IEEE Computer Society Design Automation Technical Committee is sponsoring the 14th Design Automation Conference (June 20-21, 1977). They've put out a call for papers on any use of computers as aids to the design process. The "design process" includes anything from defining product specs to detailing manufacturing and test procedures.

There will also be a contest. . .for the most useful, viewable CAD output.

Transistor Library Parameter Limitations

Several years ago, a transistor parameter library was started. This library was to contain Gummel-Poon (GP) BJT model parameters for use with the SPICE circuit-simulation program. Quite a few transistor parameters, along with the software necessary for access, are now in a file on the Cyber system.

With use, it has become apparent that the parameters do not completely characterize all real-life phenomena associated with BJTs. Therefore, it may be appropriate to describe the general limitations of the library and the improvements that are being made.

Probably the biggest problem in the establishment and use of the transistor library arises from limitations of the GP model. For example, the ohmic resistances between the active regions and the transistor device terminals (R_B, R_C, and R_E) are modeled by constant-value resistors. In an actual device, these resistance values vary with the transistor operating point. Similar inconsistencies apply to other parameters. The immediate problem is to determine what constant value to assign to a variable. Possible solutions include assigning an appropriate average (however that is defined!) or using a value measured at an arbitrary operating point. In either case, the model user needs to know:

(1) That a constant is used to characterize a variable;
(2) The conditions under which that constant is appropriate to a given application; and
(3) Any available data that describes the parameter's variation with operating point.

Neal Sorensen, Ian Getreu, Graeme Boyle, and Ron Bohlman are compiling a document which will allow a designer to evaluate the usefulness of the library model parameters for a given application. This document will describe which measurements were made, the measurement techniques used, and how the parameters were obtained. For each device characterized in the library, a significant amount of raw data exists that may be useful to a designer who wishes to create his/her own model or to include parameter variations. This raw data is available directly from Neal (Ext. 5698).

It takes time and effort (mostly by Neal) to establish a transistor model library that will be adequate for most users. This is an ongoing process. Thus, the model library is in a continual state of flux as new device models are added and present models are updated or improved.

Changes to existing models arise from changes of vendor, measurement-technique improvements, and user feedback. Changes, and the dates of change, are available from Neal. A user can print out the library model parameters at any time by using the GETMODL command. (See HELP,GETMODL on the Cyber system.) The user is strongly advised to check all model parameters for appropriateness and changes prior to each use of the library.

To summarize, the user of the transistor model library must be aware that:

* Some variable parameters have been assigned constant values and must be checked for appropriateness in the user's application.
* Existing library models are periodically changed. Therefore, "blind faith" usage of the transistor model library is discouraged.

New Equipment Installation

On Thursday, September 23, our long-awaited additional 64 k of memory arrived on the loading docks. That night, within 6 hours, Control Data Corporation engineers had the new memory installed and checked out. The system was up and running with 131 k of memory by 5:30 Friday morning. Our thanks to Don Lienhart, Chester Watts, and the rest of the CDC crew! The only installation problem occurred while wrestling the 4000-pound memory bay out of the elevator on the fourth floor. The wall across the aisle from the elevator had to be pushed in slightly (about 1 inch), but that was the room needed.

So far, it seems that the additional memory has increased thruput by a factor of about two. This increase was predicted by benchmarks which were run prior to the installation.

Computer Hobbyist Club

Vic Kley of Berkeley, California, is interested in forming a 4051 Terminal user's group. Any persons interested in the idea of an independent 4051 users group should write to Vic at PO Box 2117. The ZIP code is 94702.

Introducing TEK SPS BASIC ...bit by bit

If you have a PDP-11 computer, then we have the software for you! Introducing TEK SPS BASIC, the first TEK high-level software language that lets you get down to the bits.

In-house versions of TEK SPS BASIC contain a variety of "debugging" tools in the form of special BASIC commands. These commands allow you to look at and modify any addressable location in the computer. Several PDP-11 instructions, such as BIC, BIT, BIS, etc. are emulated in BASIC commands.

A special Interrupt Vector driver lets you write, in BASIC, drivers for peripheral equipment and acquisition instruments. This driver gives you the advantages of interrupt driven input or output without the tedious and time consuming process of assembly language programming.

There's also a GPIB driver (IEEE-488) that lets you talk to anything you can plug into the interface. Development time for software and firmware can be cut dramatically by writing your maybe-if-I-try-it-this-way type of programs in BASIC.

To enhance SPS's ability to handle data at the bit level, several commands are available to input and output data in either hexa-decimal or octal format. Also, individual bits in a word can be cleared or set by the bitset commands in either hex or octal, right in the program.

Of course, TEK SPS BASIC has all the standard features of BASIC, plus lots of new ideas. Here's a sampling of what's new:

GRAPHICS: A whole new graphics package is available to ease the chore of displaying data. Not only can you move and draw to screen coordinates, but you can define your own coordinate system. This saves you the task of mapping your data into screen coordinates. You can also define any rectangular area on the screen as the display area.

STRING PROCESSING: How many times have you said "If only I had strong processing ability?" SPS has it in spades. All the string functions you could want, plus a few extra even we don't know what to do with, are there. File names can be created automatically in your programs, so you don't have to know ahead of time how many files you will be creating.

WAVEFORMS AND ZONES: Two new array features are incorporated in SPS to make waveform processing easier. The WAVEFORM statement lets you put one label on a collection of variables that define a waveform; the array itself, the data sampling interval (time between elements), and the horizontal and vertical units. Once defined, you need only reference the waveform variable name. All the rest is done automatically. Zoning allows you to select a portion of an array and operate on it independent of the rest of the array. Very useful in waveform analysis.

INTERRUPT STRUCTURE: Buried in the heart of SPS is a routine called the SCHEDULER. This guy keeps track of priorities that you assign to various routines in your program. It allows a running program to be interrupted (stacked) when a more urgent routine is needed, say to collect data from an instrument that has triggered. You have 127 levels of priority to play with, more than enough for most applications.

SIGNAL PROCESSING: When you get a signal from an instrument, you usually want to process it in some way. SPS has a set of signal processing commands providing Fourier Transforms, Correlation, Integration, and all the functions needed to let you know what happened out there. All these commands operate on either waveforms or regular arrays.

TEK SPS BASIC can be run on any DEC PDP-11 Computer. Minimum hardware requirements are at least 24K of memory and one of the following storage devices: hard disk, floppy disk, or cassette tape.

Here's a simple program designed to show how TEK SPS BASIC can be used in development work. The program prints a message on the terminal every time an interrupt from a DR11-C interface is detected. Two different vectors are used.

```
5 REM GET THE INTERRUPT VECTOR DRIVER INTO MEMORY
10 LOAD "IV"
15 REM ATTACH LUN 1 AND 2 TO VECTORS 300 AND 304(8)
20 ATTACH #1 AS IV192:
30 ATTACH #2 AS IV196:
35 REM SPECIFY THE LINE NUMBER TO GOSUB TO
40 WHEN #1 GOSUB 1000
45 REM WHEN AN INTERRUPT OCCURS
50 WHEN #2 GOSUB 2000
55 REM SET (IN OCTAL) THE ADDRESS OF THE STATUS REGISTER
60 USET A="16770"
65 REM ENABLE INTERRUPTS VIA THE STATUS REGISTER
70 PUTLOC A,"140"
75 REM RETURN TO SPS MONITOR TO AWAIT INTERRUPTS
80 RETURN
1000 PRINT "INTERRUPT FROM #1"
1005 REM THIS MESSAGE IS PRINTED WHEN #1 INTERRUPT
1010 RETURN
2000 PRINT "INTERRUPT FROM #2"
2005 REM AND THIS GOES OUT WHEN #2 SIGNALS AN INTERRUPT
2010 RETURN
```

Figure 1. Sample program using TEK SPS BASIC

If you want to know what's going on here in detail, or just want your own copy of the software to use, contact Paula Ochs, 58-157, extension 6211.

Garey Fouts
SPS Information Group

Drafting is Going Metric (Eventually)

With the acceleration of metric usage, it is well to know in advance some of the things which will affect our drafting habits. Here is a partial preview of coming events. I will cover more in a future article.

To begin, the term "metric" means the International System of Units (SI). All countries will, to a great extent, coordinate their national standards with SI.

To many people, "going metric" brings visions of giving away the USA. The truth is that a very large number of Americans are working on volunteer committees which not only interact with the International Standards Organization (ISO), but also have direct representation on ISO committees. Additionally, the ABCA (American, British, Canadian, Australian) bloc coordinates the efforts of English-speaking nations and influences international standards.

Inevitably, changes will appear on drawings. Millimeters (mm), in place of or along with the customary decimal-inch units, will be used. While other companies do not plan to use dual dimensioning, we (Tektronix) will place lists of equivalent inch dimensions on metric drawings — at least for a while.

First angle projections and commas for decimal points — systems used in Europe, will not be used here. Very probably, we will change our habits in the use of zeros. We'll put a zero ahead of a decimal point for millimetre values less than one, and we will not add insignificant zeros after the decimal just to balance a set of numbers. Also, the usual Tektronix practice of three-decimal-place accuracy will seldom be required with millimetres.

Other changes, which might affect us, include the use of a straight line to underline an out-of-scale dimension rather than the traditional "squiggle." The Greek letter ϕ (phi) will replace DIA for diameter. Phi will precede the diameter value (e.g., ϕ6.35 mm). Also, True Position Tolerancing will become Positional Tolerancing. However, the "true position" of features will remain valid usage.

A new sequence will be used in the tolerance frame, such as ⌖ | ϕ 0.02 | Ⓜ | Ⓐ We will also need to adjust to an unspecified condition (like the A in the example tolerance frame), which Regardless of Feature Size Ⓢ instead means of Maximum Material Condition Ⓜ Fortunately, we have habitually required all applicable conditions to be stated, so this change should not affect our drafting practices nor require any change to existing drawings.

These changes are not to be used yet. When metric is ready to use, a Tektronix standard will be announced.

Chuck Sullivan,
Technical Standards

A New Metric Manual

There's a new metric manual available. McDonnell Douglas Corporation compiled the manual from material provided by the American National Metric Council, the International SI Standard, the American National Standard, the DOD SI Standard, and the NASA SI Standard.

The manual is a collection of easy-to-use tables of basic and derived units, conversion guidelines, and alphabetical and classified listing of conversion units.

You can order a copy (for $5) through Technical Standards by calling Carol Schober, ext. 7976.

SPEEDING UP THE MAIL

Everybody gripes about mail service, but there is something we can all do to help. A lot of people at Tek have been moving, but don't tell the mailroom about it. Then, the Mail Service people have to spend their time doing address changes by hand each time a piece of mail reaches a "former address." We could help them get their work done and shorten the route from sender to destination by notifying the mailing lists we belong to each time we move. In the case of Engineering News, call ext. 5674 and tell us your name, old delivery station, and new delivery station. For other mailing lists you are on, find out who takes care of that list and notify them.

Microelectronics Around The World

On Friday, October 15, a panel discussion on hybrid microelectronics was held in the Tek Center Auditorium. Afterwards, some of the group toured areas of interest at ESI, PM Industries, and Tektronix.

Visitors to Tektronix included Mr. Takeshi Wada, General Manager of the Electronic Components Engineering Department of OKI Electric Industry Company in Japan. Mr. Wada told the audience about the microelectronics industry in Japan. He noted that the trend for microelectronic applications is toward consumer products; audio, calculators, and television account for well over 50% of the sales volume. Mr. Wada showed slides of some typical applications of microelectronics including power amplifier, calculator, camera, and electronic watch applications. He also had with him several sample products, including a liquid-crystal display watch.

Another visitor, Mr. Leif Larson, is the Hybrid Group Manager of the Bruel and Kjaer in Denmark. Mr. Larson talked about microelectronics in the Scandanavian countries and Finland. He, too, showed slides of microelectronic applications including radio-telephone and telephone-exchange equipment, thermal printer, microphone, preamplifier, and various display device applications.

Dick Schaumberg, Project Engineer for functional trimming techniques and apparatus at ESI, described how ESI first became involved in this type of business. He noted that ESI has sold 25 functional-trimming equipment systems in the past 3½ years. Mr. Schaumberg was accompanied by Doug Dickenson, Sales Manager for ESI.

Roydn Jones, Hybrid Circuits Engineering, described Tek's first use of hybrid circuits for thick-film high-voltage dividers, present-day applications, and trends for the future.

Other visitors to Tek were René Cotē of E.I. duPont in Niagara Falls, N.Y. and Pete Reames of TRW Systems.

IN PRINT

Lynn Carter wrote an article which appeared in the October 5, 1976 issue of EDN entitled, "Microprocessor programming trade-offs—which language is best?" Lynn says that many users think that an assembly language and a higher level language can never be used together, which is not true. The choice of a programming language must weigh the many costs and advantages to avoid the trap of overly simplified yardsticking. He then discusses the points which the user must consider when selecting a programming tool.

Lynn was with the Scientific Computer Center group at the time this article was written, and is now with the University of Colorado at Boulder. He still acts as a consultant to Tektronix.

Maureen Key 60-553