Engineering News

THE G.I.D.E.P. SYSTEM

GIDEP microfilm reader and files

Also in this Issue:

Impedance Problems with Multilayer Boards
Decimal Millimeters
Metric Committee
In Print
Thermal Analysis
Error Correction
Spring Classes & Courses
Water Conservation at Tek

Figure 2. Keith Sessions using the microfilm reader and GIDEP terminal.

G.I.D.E.P.

Government Industry Data Exchange Program

NOW TEKTRONIX ENGINEERS HAVE ACCESS TO:

— non-proprietary manufacturing processes, engineering reports, component reliability studies, and test methods.
— failure analysis data from such organizations as ITT, TRW, TI, NBS, and IBM.
— test equipment evaluations and calibration procedures from companies like Hewlett-Packard, General Dynamics, and Lawrence Livermore Labs.

Figure 1. GIDEP data banks

ENGINEERING	Evaluation and qualification test reports.
	Non-standard parts justification data.
	Parts and materials specifications.
	Manufacturing processes.
	Failure analysis data.
	Reports on engineering methodology and techniques.
FAILURE RATE	Failure rate/mode data.
	Replacement rate data on parts and components.
METROLOGY	Test equipment calibration procedures.
	Test system, calibration system, and metrology engineering data.
	Technical and management information on electronic test equipment.
FAILURE EXPERIENCE	Failure information on parts, components, processes, fluids, and materials.

All that information and more is available through GIDEP, the Government Industry Data Exchange Program. One purpose of the program is to make it easy for participating members to exchange information.

There are over 400 members of GIDEP. The data base available to members is huge. NBS, alone, will be adding as much as 20,000 pages of information each year.

WHAT GIDEP CAN DO FOR YOU

GIDEP members contribute information to four data banks. Figure 1 details the contents of each of the data banks. The information in the data banks is available on 16 mm microfilm. Figure 2 shows the microfilm reader and microfilm files that are available. As a full member of GIDEP, Tektronix has access to all four of the data banks.

GIDEP also offers two special services. The ALERT system sends hard copies of alerts to all GIDEP participants. The alerts tell users about problems with parts, equipment, or procedures. Here at Tektronix, Rick Bushell (Corporate Safety Director) submitted information for a SAF-ALERT on a paper shredder made by Michael Lith Sales Corporation. The shredder had an exposed conveyor belt that could pull hands into the shredder blades if the machine wasn't operating properly. Besides writing the alert directly to GIDEP, Tektronix notified the manufacturer to give them a chance to add to the alert before GIDEP transmitted it to all members.

The second special system GIDEP offers is the UDR system—the urgent data request. A GIDEP member who needs information on a part or process will first check the data banks and other possible sources. If the information isn't there, the member can write a UDR and send it to GIDEP operations center. The center distributes it to all members through the mail. Members who can answer the UDR get
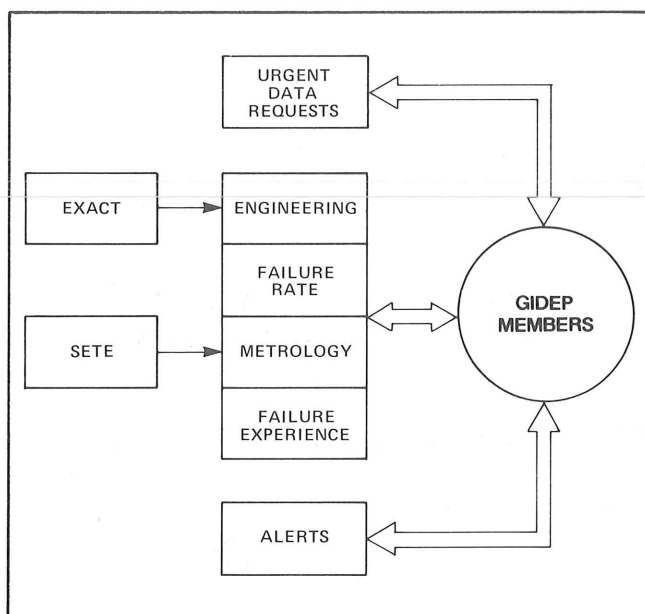
Figure 3. The GIDEP system.

in touch with the UDR writer. The UDR writer uses the information and then summarizes it for contribution to the appropriate data bank. In the future, people with the same request can then directly access the data bank. Figure 3 summarizes the services GIDEP performs.

SETE AND EXACT

GIDEP recently added access to Project SETE and to EXACT. Project SETE (Secretariat for Electronic Test Equipment) collects, reviews, coordinates, and disseminates electronic test equipment data. It's a consumer's index for electronic test equipment. Project SETE has now been merged with GIDEP, and GIDEP users have access to SETE data through the metrology data bank.

GIDEP has also made a connection to EXACT (International Exchange of Authenticated Electronic Component Performance Test Data). EXACT is the international equivalent of GIDEP. GIDEP users have access to EXACT through the engineering data bank.

USING GIDEP AT TEKTRONIX

If you need any of GIDEP's services, contact Keith Sessions at extension 7690 or drop by 58-134. Keith is the GIDEP representative for Tektronix. He works in the Engineering Services department. Keith has indices to the data banks, the data bank microfilm spools, and a microfilm reader/printer. Keith can also help you fill out ALERT and UDR forms.

ERROR CORRECTION

The October/November issue of **Engineering News** carried an announcement of a 4051 Users Group being formed at Berkeley California under the heading, "Computer Hobbyist Club." Since that time, Tektronix has learned that Vic Kley, the sponsor of that Users Group is, in fact, president of Second Source Industries, a company which competes with Tektronix. Any contacts with this group could be detrimental to Tektronix.

For those engineers interested in talking with other 4051 users, remember the **Applications Library Newsletter** published by IDS which you can obtain by requesting from A.L.N. 60-369.

ASME·SPONSORED SEMINAR

Computer Methods in Testing and in Static/Dynamic Analysis and Design

A two-day seminar, brought by Structural Dynamics Research Corporation of San Diego, will be offered on March 21 and 22 at Tek-Wilsonville. The seminar will provide an overview of the latest computer methods in testing and in static/dynamic analysis and design.

The use of interactive graphic terminals, graphic tablets for the generation of finite element models, and electronic test equipment for the measurement and analysis of vibration data will be demonstrated.

Registration for the seminar is $50, including lunch and text. Contact Mr. Jim Ehlbeck at (503) 643-1777 (home) or (503) 283-8226 (business) for further information.

Impedance Problems With Multilayer Boards

Here's a problem that should interest the people who design or lay out medium frequency (150-230 MHz) runs on multilayer boards.

As described below, variations in the fabrication procedure can make runs on inner layers vary in impedance (specifically capacitance) by up to 40%, leading to reflection, loading, and general signal degradation problems.

The designer should make sure that all fast signal lines are on one of the two outer sides of the final board.

To understand the problem, one must understand the multilayer fabrication process. A four-layer board is made from two double-sided boards. These are etched and then bonded together as shown in figure 1.

The original double-sided boards are purchased from an outside vendor. Their width (dimension2) varies ± .002 in. To keep the overall board thickness (dimension 1) at a constant value, the thickness (dimension 3) of the glue between the boards is varied during the fabrication process here at Tektronix. A typical dimension 3 is .008 in., but to make up for variations in the original board thickness, this can be as little as .005 in. If a fast printed circuit run exists on side B with a ground plane on side C, the 40% variation in the separation can have disastrous results.

The easiest solution is to make sure that the fastest runs of a device (usually over 150 MHz) are located on one of the two outer layers.

As an alternative, the designer can tell electro-chem to hold dimension 3, thus requiring dimension 1 to vary. That solution is ok unless dimension 1 is critical as when the board must plug into a connecter.

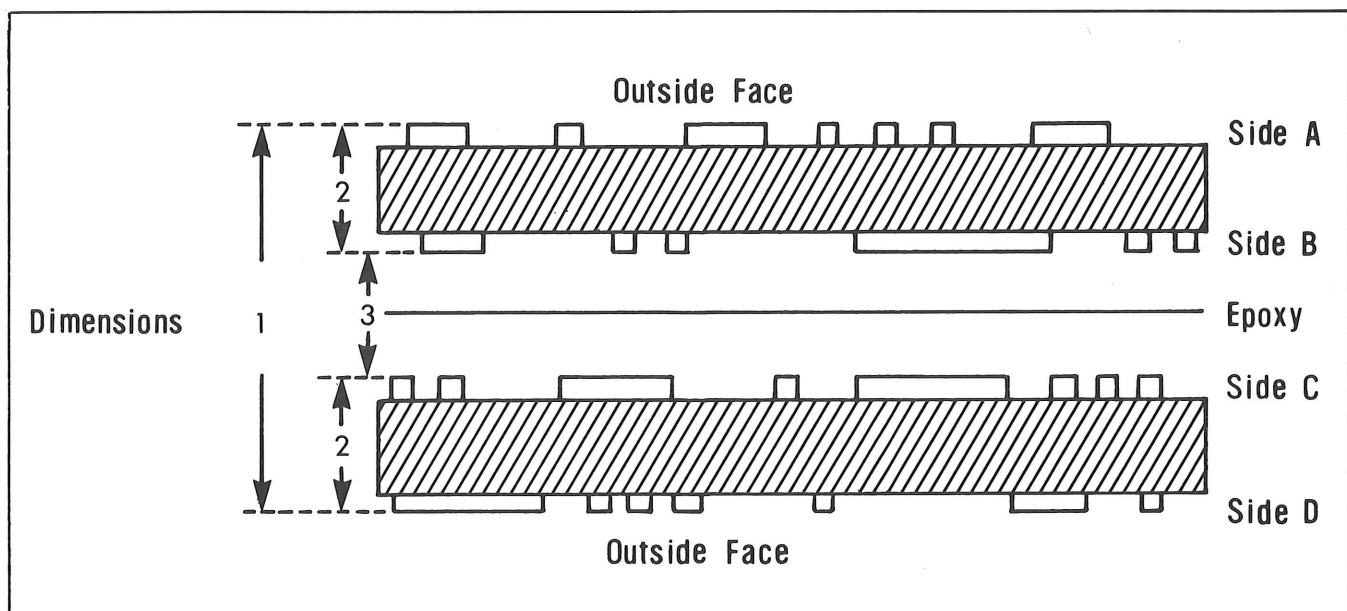If you have any questions, call Bill Wilke at extension 6066 or drop by 39-135.

Figure 1. Four-layer printed circuit board.

If any of these calls for papers interest you, give us a call (ext. 5468 or 6071). We will give you all the details you need (length and format of the paper, and where to send it). We can also help you with the writing, illustrations, typing, and mailing.

"CALL FOR PAPERS!"
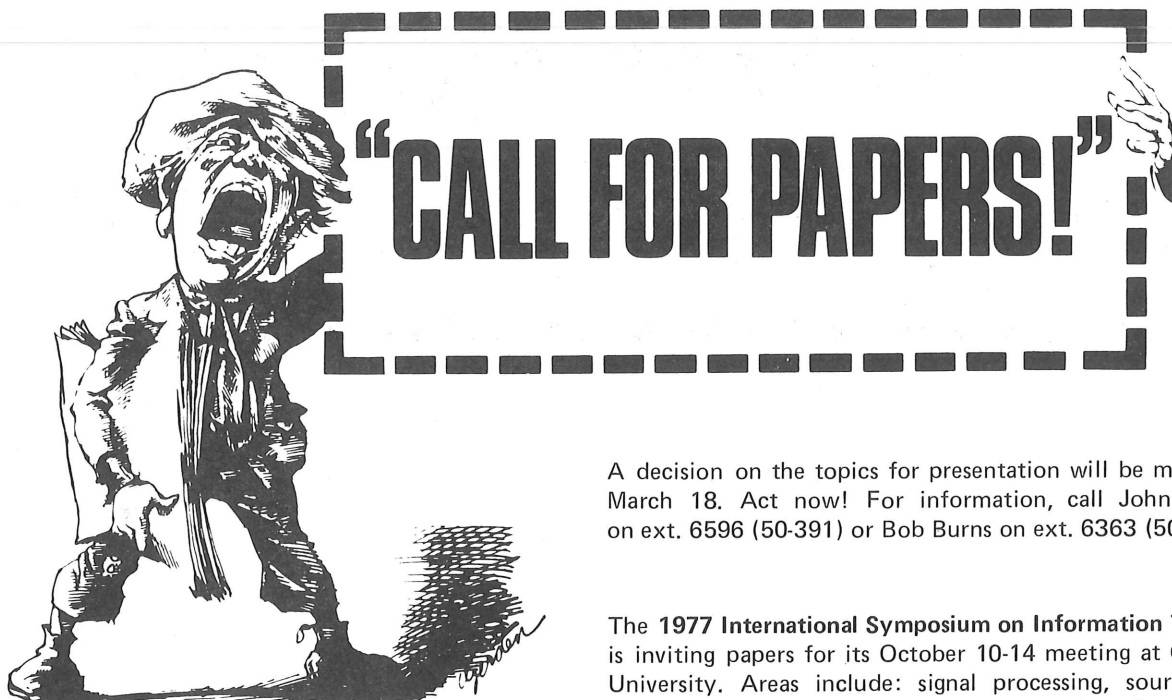
4th Engineering Forum, "New Technologies"

If you are aware of a significant new technology, whether it is presently being used at Tek or not, we would like to hear from you. The Engineering Forum on new technologies needs speakers for 8 to 15 minute presentations on a variety of subjects. These will be presented to top management on April 15.

If your new technology is not quite revolutionary, there are additional opportunities for other types of presentations. Now is your chance to become rich and famous—well, would you believe "recognized"?

A decision on the topics for presentation will be made by March 18. Act now! For information, call John Addis on ext. 6596 (50-391) or Bob Burns on ext. 6363 (50-397).

The **1977 International Symposium on Information Theory** is inviting papers for its October 10-14 meeting at Cornell University. Areas include: signal processing, source and channel coding theory, multiple terminal coding, communication networks, pattern recognition and learning, algebraic coding. Both long papers and short papers are invited. The deadline for manuscripts, abstracts and summaries is April 15, 1977.

The **1977 International Conference on Parallel Processing** has put out a call for papers for the August 23-26, 1977 conference. The sponsors, IEEE Computer Society and Wayne State University, will hold the conference in Bellaire, Michigan. You are invited to submit papers on all aspects of parallel/distributed processing. Sample topics include: modeling and simulation techniques, operating systems, languages, parallel/distributed logic circuits, architectures. Summaries and abstracts are due March 15, 1977.

Distinguished Visitor At Tektronix

Dr. Friedrich Lenz, Professor of Theoretical Electron Physics, University of Tubingen, West Germany is here at Tektronix from February 28 to April 1. Many Tektronix engineers know Dr. Lenz from previous visits. His fields of specialization are Electron Optics, Electron Microscopy, Electron Diffraction, Electron Scattering, and Computer Aided Design. He has published over 70 papers and has many professional honors to his credit.

While at Tektronix, Dr. Lenz will give a series of seminars on electron optics with emphasis on space charge problems. To learn more about the subject matter, time and location of the seminars, call Mel Balsiger at ext. 6555.
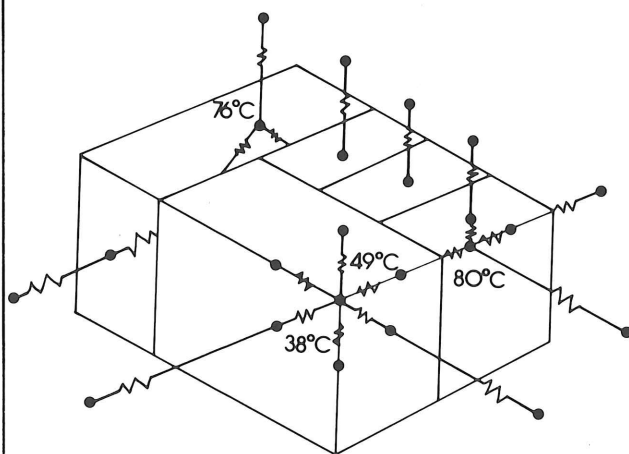
THERMAL ANALYSIS
Designing For Reliability

Figure 1   TWO WAYS OF VIEWING THE SAME INSTRUMENT
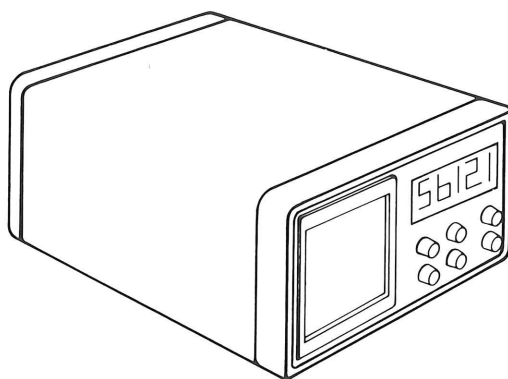
PACKAGE DESIGNER'S VISION

THERMAL DESIGNER'S VISION

What image does "thermal analysis" bring to your mind? Briefly, thermal analysis deals with the computation of heat transfer, an important consideration in electronic equipment. Early diagnosis of thermal problems is becoming increasingly important because of the trend toward smaller instruments, higher component density, and a greater emphasis on reliability. It is desirable to obtain an estimate of the temperature and heat transfer characteristics of an instrument before the box is built. Such prior "theoretical" knowledge was a factor in a recent decision that a proposed contract would be nearly impossible to meet, thus avoiding company commitment.

If you wish to increase your confidence in the thermal design of an instrument, there are numerous textbooks available, some with forbidding formulas and others with simple-to-apply but nonetheless mysterious graphs and tables to wade through. At Tek, however, you also have the opportunity to call on a specialist in the field, such as Gordon Ellison.

Gordon came to Tektronix last May from the National Cash Register Corporation. He has an impressive background in thermal research and application of thermal analysis to everything from integrated circuit chips to complete packages, including the development of computer programs for analysis of complex thermal systems. Also, he has written several papers that have been published in professional journals. (See "In Print" elsewhere in this issue.)

Gordon's primary responsibility is to improve thermal analysis and design capabilities at Tektronix to enhance overall product reliability. He does this in several ways, probably the most important of which is actually working with a project design team. Early in product development, he may only need to provide recommendations and guidance to designers who have the time and inclination to do their own thermal analysis; he may perform a quick estimate of the magnitude of the thermal problem; or he may, if the situation warrants, construct a "paper" model that represents the essential thermal elements of the electronic package. A simplified thermal model, such as Gordon might construct, is shown in figure 1. A computer solution of this

MICROPROCESSOR SOFTWARE CLASSES

The Scientific Computer Center is offering two classes in micro-computer programming through Education and Training for the spring session.

Microprocessor Software on the CDC Cyber 73 (5.304). An introduction to much of the microprocessor software supported by the Scientific Computer Center, as well as basic programming techniques for the Motorola 6800 and Zilog Z-80 microprocessors. Emphasis is being given to hands-on debugging techniques. An introduction to TESLA is included.

TESLA Programming for Microprocessors (5.306). An in-depth exposure to microprocessor programming using TESLA, Tek's high-level system programming language. TESLA offers a friendly syntax, block-structured logic, helpful diagnostics, and a high degree of machine independence yet gives the programmer access to low-level hardware when necessary. The class includes formal presentation of the TESLA language, discussion, and programming experience.

Classes begin March 28. The microprocessor software class is offered on Wednesday from 4 to 6 pm. The TESLA class will be offered on Tuesday from 4 to 6 pm and one other day. Contact Kathy Telech at ext. 5498 to register.

thermal model is used to foresee potential problems by predicting hot spots within the overall thermal profile. Also, Gordon will give advice and assistance on all sorts of thermal-related problems, from application of measurement techniques and instrumentation to computer-aided analysis, and will advise design engineers on possible solutions to heat problems in existing instruments.

During the past 10 months, Gordon has had some interesting experiences with thermal problems unique to the type of instruments designed at Tek. These have included such challenging problems as a highly-compartmentalized spectrum analyzer system, small portable test instruments, air-flow characterization of plug-in modules and packaged systems, hot spot removal from precision attenuators, and even thermal considerations in small integrated circuit chips. He has a continuing responsibility to provide Hybrid Circuits Engineering with assistance in computer modeling of IC chips and hybrid packages.

For more information, call Gordon on ext. 7887. He is located in the Environmental Laboratory on the first floor of Building 50.

Gordon N. Ellison, thermal analysis specialist at Tek.
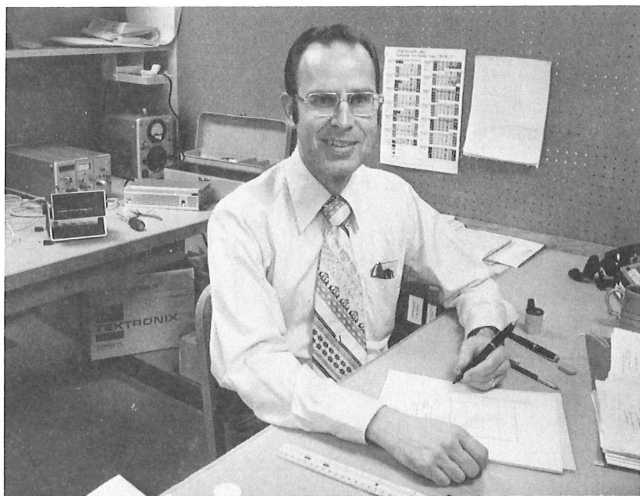
LASER COURSE

A course in **Laser Principles and Applications** will be offered during spring quarter by the Engineering and Applied Science Department at PSU. The class provides a basic introduction to lasers, with emphasis on fundamental principles of operation, the characteristics of laser light, and applications. A survey of various types of lasers will be made during which the salient features of the most important types will be briefly studied. Elements of laser theory will be presented, and various scientific and industrial applications will be examined, including holography.

This course is intended for senior level or first year graduate students in engineering and/or science and will be offered as a one quarter, 3 unit lecture course with laboratory demonstrations for either undergraduate or graduate credit (ASE 424). The first class will be March 29, 1977. For additional information, contact Dr. George Tsongas, PSU (229-4631).

METRICS

THE METRIC COMMITTEE

The Tektronix Metric committee held its first meeting in January to discuss the impact of introducing the metric system at Tektronix.

THE PROBLEMS

The committee is following a new product through the introduction process in order to anticipate the problems of metric implementation. Some of the questions that need attention are:
— how will the switch to metric affect the facilities we have now?
— how will the switch to metric affect our products?
— what are our customers doing . . . metricly?
— what will our retraining needs be?
— how will our inventories be affected?
— what will it cost to go metric?

The committee has defined several approaches to achieving metric uniformity. The first is to set up an overall implementation plan. That plan will be defined in the coming months.

To shake out the specific problems of conversion, the committee will follow one instrument from design through manufacture, and document the problems that come up at each step of the process.

METRIC SI

Differences in the use of the metric system exist between countries. Discrepancies have appeared because there was no internationally-coordinated effort to standardize.

However, recently there has been international agreement on a new standardization system, the Systeme International d'Unities . . . SI for short. With the SI, engineers and scientists of all types—mechanical, electrical, marine, civil, aeronautical, and chemical—will use a common system of calculation and expression.

PEOPLE

People from key areas of the company have been selected to help the Tektronix metric committee study metric conversion. The committee's chairperson is Howard Meehan. If you have inputs for the committee, give Howard a call on extension 5042, or drop by 58-065.

DECIMAL MILLIMETERS

This is the first of a series of articles on specific metric applications.

On Tektronix drawings we usually indicate inch dimensions by a three-place decimal (a fourth decimal is added if the stated accuracy makes it significant). Thus, a drawing says 1.000 for a one-inch length.

On drawings done in metric dimensions, common fractions are not used at all and decimal fractions are used only when absolutely necessary. This is possible because of the use of prefixes in the metric system (d, c, and m) for smaller magnitudes. That preference for whole numbers (rather than decimal fractions) will prevail on Tektronix drawings with metric dimensioning.

For consistency, all linear dimensions on mechanical drawings will be in mm. This applies to a 19 000 locomotive (19 meters long) as well as to a ϕ 0.1 wire (diameter 0.1 mm).

There are a few rules to keep in mind:
— use a leading zero on decimal fractions: 0.05.
— use no more decimals than are needed, and, definitely no terminal zeros after the decimal point: 5.000 mm = 5.
— dimensions and associated tolerances need not have the same number of decimals, only the required number in each instance: 4 $\pm$ 0.05.
— the zero is neither positive nor negative by itself, so use $16.5 \, ^{+1}_{0}$ instead of $16.50 \, ^{+1.00}_{-0.00}$.
— metric tolerance tables usually list μm, but they must be converted to mm (divide by 1000) for use on drawings: a tabular $\pm$ 50 means $\pm$ 0.05.
— for nominal dimensioning use Renard (R) series or whole mm. Use even numbers where you can, or 1 decimal place if it is absolutely needed. Especially avoid such numbers as 10.05 which could be confused with 10.5—it's difficult to make a 10.5 mm hole smaller, and anyway, there are no standard drills in such sizes.

John Reichen, ext. 5194

RENT·A·SCOPE

Instrument Control will soon begin an instrument rental program. All instruments previously available as loaners are included.

A daily rental rate has been calculated for each instrument and is noted on the checkout card; minimum daily rate is $1.00. Cost transfers to users' cost centers will be made each accounting period.

Rent-a-scope will not be in effect until AP 711. Before then, managers will be notified of what the charges would be if transferred.

For more information, call Ray Barrett, manager of Instrument Control on ext. 5653.

THE ENGINEER & FEDERAL TAXES

The IEEE, in a news release, has announced the publication of **The Engineer and Federal Taxes**. This 44-page booklet describes the mechanics of tax returns and details the tax questions engineers face. The booklet also examines deductions that engineers frequently overlook. The aim of the book is to help the engineer but without resorting to the aid of a tax specialist.

The book costs $3.00 for members of the IEEE, and $6.00 for non-members. If you would like a copy of the news release (which contains all the ordering information) give us a call on extension 5674 or drop by the Technical Information department (50-462).

PATTERN RECOGNITION

The IEEE Press recently published **Machine Recognition of Patterns**, a collection of reprinted articles on pattern recognition. This collection, edited by Ashok K. Agrawala of the University of Maryland, includes many landmark papers that are out of print and difficult to find.

A copy of this book will soon be available in the Tek Library. Desk copies can be ordered through the Library with a Library Requisition Form. Prices are:

paperbound — $14.95 (IEEE members)
clothbound — $22.45 (IEEE members)
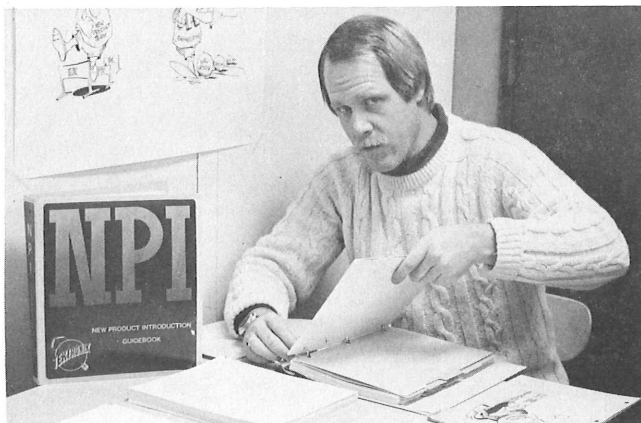clothbound — $29.95 (nonmembers)

NEW PUBLICATION

NEW PRODUCT INTRODUCTION (NPI) GUIDEBOOK

The Tektronix NPI Guidebook describes the activities and processes that typically must occur during each phase of product development to ensure successful and timely introduction to the marketplace. Most of the activities are described with respect to their relationship to the New Product Introduction Phase System, which is also described.

The guidebook is partitioned by broad areas of company activity, such as Engineering, Marketing, Manufacturing, and Product Support, and is further divided by development phase. This provides program and project managers with necessary planning and coordinating information not only for engineering activities but also for other areas of the company involved in new product introduction.

The NPI Guidebooks have already been distributed to division managers and, as they become available, will be distributed to project managers and individual departments. Each book is numbered and the distribution is limited to maintain control over updates and supplements.

If you need to see a copy, see if your manager has one yet. Also, there are two copies in the Tek Library in Bldg. 50.

Gary Graham putting together NPI Guidebooks.

IN PRINT

● THERMAL ANALYSIS

Gordon N. Ellison, Engineering Services, authored "Theoretical Calculation of the Thermal Resistance of a Conducting and Convecting Surface," that was published in the **IEEE Transactions on Parts, Hybrids, and Packaging**, Vol. PHP-12, No. 3, Sept. 1976.

Gordon's paper deals with the thermal analysis of electronic packages and components which frequently require consideration of conducting and convecting surfaces with a peripheral heat source, e.g., flat pack lids, CERDIP cavity covers, and ceramic substrate covers of the type commonly used with hybrid packages. The paper summarizes the derivation of a closed-form expression for the thermal resistance of such surfaces. The result may be used to obtain rapid quantitative answers to particular aspects of design problems. Thermal problems that require a computer may also be simplified by use of the results.

Another paper of Gordon's, "The Thermal Design of an LSI Single-Chip Package," was published in the **IEEE Transactions on Parts, Hybrids, and Packaging**, Vol. PHP-12, No. 4, Dec. 1976.

In this paper, Gordon relates the theoretical and experimental methods used to evaluate the heat conduction and convection properties of a high power dissipating LSI package with a heat-sink attachment.

If you want a copy of either of these articles, call the library on ext. 5388.

● DM44

An Engineer's Notebook article, "Low-cost dual delayed-sweep method eases measuring time," by Bill Law of Service Instruments and Abraham Taghioff of Advertising, appears in the February 3, 1977 issue of **Electronics** magazine.

This article describes the DM44 addition to the 400-series

portable oscilloscopes, including the circuitry, how to use the △ time feature, the advantages and some applications.

If you want a copy of this article, call the library on ext. 5388. The article is in Vol. 50, No. 3, pages 113-117.

● SAW-DEVICE CHARACTERISTICS

An article by Phil Snow, Hybrid Circuits Engineering, "Measure SAW-device characteristics, and pin down the performance of acoustic-wave filters and delay lines. Frequency response and impedance are the key parameters," appears in the February 15, 1977 issue of **Electronic Design**. In this article, Phil describes the equipment and measurement techniques for determining the impedance, amplitude, and phase characteristics of a SAW transducer.

If you want a copy of this article, call the library on ext. 5388. It appears in Vol. 25, No. 4, pages 112-116.

● MICROPROCESSOR TESTING

In an article in the February 17, 1977 issue of **Electronics**, Douglas H. Smith, Systems Division, explains that testing methods for MPUs have lagged behind the technology, and that most techniques fail to fully test all the functions and capabilities of μP units.

Douglas then describes a Tek-developed test method, called WISEST, that overcomes the drawbacks of older procedures. (WISEST is the acronym for Write, Interpret, Store, Execute, Save, Test.) He also reviews the deficiencies of the three older test methods to show how the criteria for WISEST were developed.

"Exercising the functional structure gives microprocessors a real workout" appears in Vol. 50, No. 4, pages 109-112. If you want a copy of this article, call the library on ext. 5388.

GPIB USERS' GROUP

A GPIB users' group has been started here at Tektronix. The purpose of the group is to discuss the problems of using programmable-instrument systems with the IEEE 488 interface bus.

If you have problems getting your system to play, or if you are simply interested in knowing what it takes to put such a system together, join the GPIB users' group every Wednesday at 8 AM in conference room A in building 58. (Conference room A is adjacent to the cafeteria.)

If you would like to attend the GPIB users' meeting, give Maris a call at extension 6234.

Water Conservation at Tek

The ECB production area in Building 38 reached a record low for water usage during January. Data has been kept for six years. Water usage has been cut in half since late 1975 and hit a low of 1.9 million gallons in January. Water usage for all of Building 38 is on the decline, with present usage about 70% of the 1976 average. January's 5.7 million gallons was close to the all-time low of 5.6 million in September of 1971, while production was increased significantly.

For more information, call Jerry Jacky on ext. 7830.

Maureen Key 60-553