

Engineering News

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Statistical Circuit Design Seminar

Scientific Computer Center

A seminar on Statistical Circuit Design (SCD) will be given by John Golembeski of Bell Telephone Laboratories (BTL) on Monday, August 16 at 10:00 AM in the Technical Center (Bldg. 50) Auditorium. John is responsible for Computer Aided Design (CAD) support for the Transmission R & D Division of BTL at Holmdel, New Jersey. A significant portion of his group's effort has been in using SCD to analyze the effects of device and component variations on circuit design. (This is similar to a SPICE job with statistical variations of components and devices included in the analysis.)

As a quick example, consider the amplifier circuit in Figure 1, which was designed to be a portion of a digital repeater. Of particular interest was the distribution of the gain at 300 MHz. The amplifiers were analyzed at 25 frequencies between 10 MHz and 1 GHz. Figure 2 illustrates the results of the analyses.

- the acceptable upper and lower limits are the boundaries of the large shaded areas.
- the nominal response, which lies inside the acceptable area, is indicated by the circles.
- histograms of the gain at each analysis frequency were generated and 6 of these are represented by the crosshatched areas.
- the computed response envelope (which corresponds to the results from a worst-case analysis) is indicated by the Xs.

Although the worst-case results (Xs) lie outside the acceptable area (near 500 MHz), the statistical analysis indicates very few circuits to be out of specification.

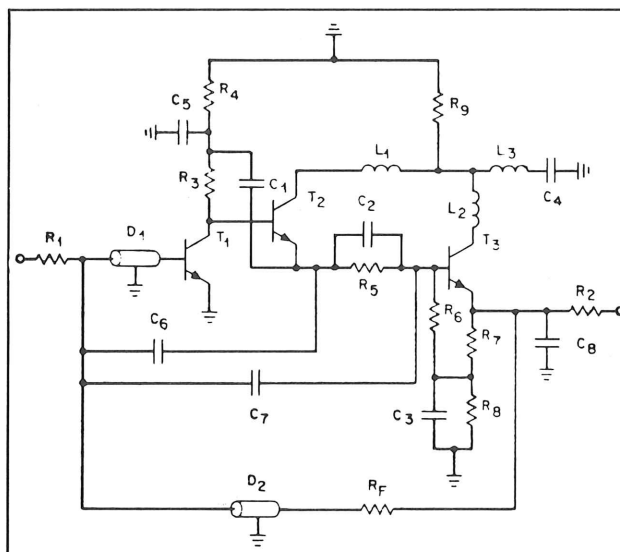


Figure 1. This amplifier circuit was analyzed using Statistical Circuit Design techniques.

Tek is working on a software exchange arrangement with BTL and it is possible that we may be able to obtain computer programs which perform these SCD analyses. The question before us is whether Tektronix can use these aids and benefit from them. This is why every person who has a stake in CAD or is interested is encouraged to attend the seminar. Follow-up sessions with John are planned for Tuesday, August 17. Your impressions and recommendations will be very important in determining the need for

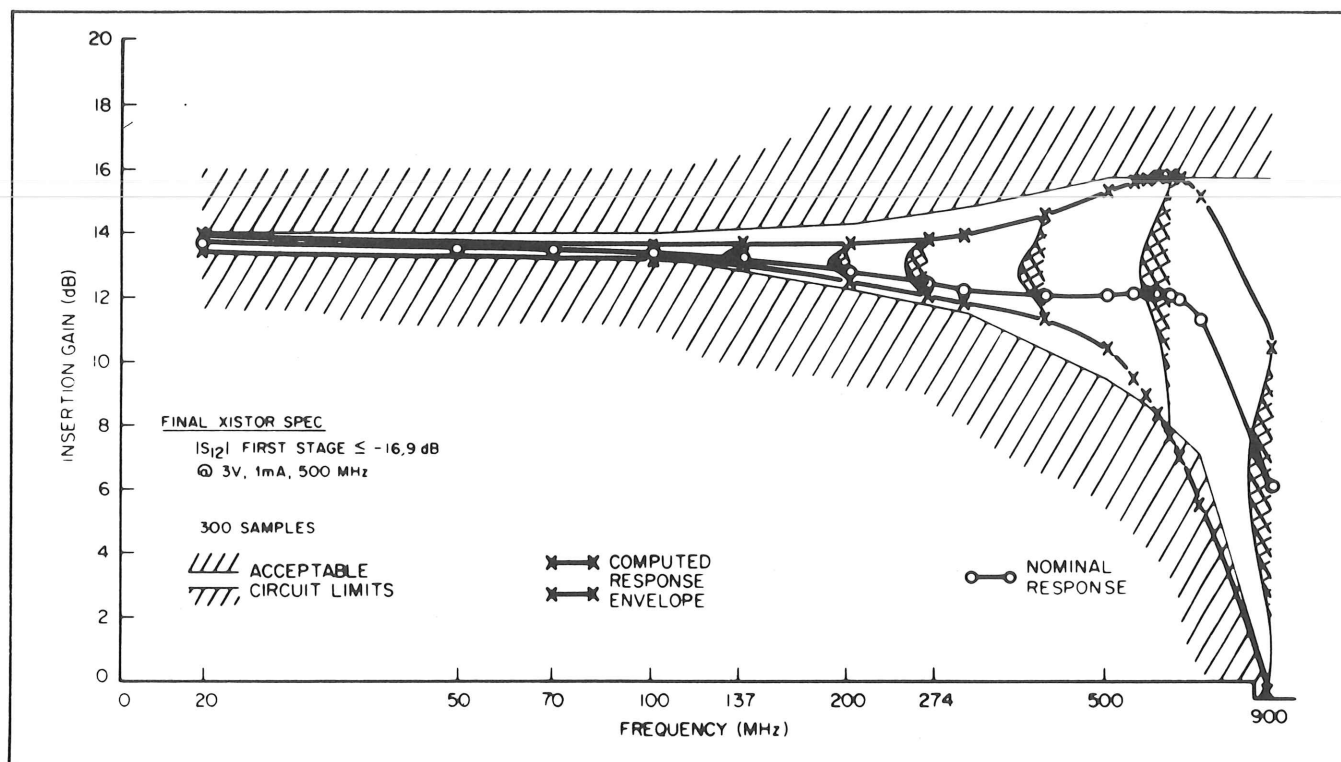


Figure 2. A composite analysis of many statistical runs performed by SCD on the amplifier circuit.

these proposed computer programs.

For more information on the Statistical Circuit Design Seminar, contact Ron Bohlman, ext. 5866.

UPDATE UPDATE

Ever wonder why your FORTRAN manual is really a whole bunch of little manuals? Well, when CDC revises or updates a manual, they don't send us a whole new manual. Just the

update, then an update to the update, etc. So the Scientific Computer Center is not trying to confuse you, we just pass on what we get.

-Imants Golts

MONTHLY MUG MEETING

The Microprocessor Users Group meeting, presided over by Bill Lowery, was held on Wednesday, August 4 at the Wilsonville Auditorium. Approximately 55 representatives from both Wilsonville and Beaverton attended.

TESLA—Don Dunstan of the Scientific Computer Center discussed the status of TESLA, Tek's higher level microprocessor programming language. He indicated that TESLA was about 95% functional for use with the Motorola 6800. For details, Don can be reached at ext. 5616. Documentation on WRITEUP, TESLA on the CYBER 73 system is currently lagging development, but should be updated by the end of August. Don also indicated that a

subset of TESLA for the CYBER is scheduled to be operational during the fourth quarter of 1976.

INTEL 8080—Ellis DuPuy and Norm Kerth of Radio Frequency Instruments discussed their application of the Intel 8080 microprocessor. The possible use of the 8080 in both IDG and Beaverton was also discussed.

Memories—Jack Grimes reported on the feasibility of AMI producing high density memories for initial Tek use.

Details of the above topics can be obtained from your Microprocessor Users Group representative. Any group manager who desires MUG representation can call Bill Lowery at ext. 5865 and appoint a MUG delegate.

UL 1244: New Draft Available

UL UPDATE

The most recent version of UL 1244, the Underwriters Laboratories Electronic Test and Measurement Equipment Standard, is currently being circulated to select members of industry for review and comment. A limited number of copies of this new draft are available from Product Safety, extensions 6649 or 7728. Critique of the document by industry members will be in the form of alternate paragraphs for insertion into UL 1244. These are due to WEMA by September 10.

In early October the WEMA committee will meet to vote on acceptance of the new draft of UL 1244, or suggest some alternatives. Following that, the draft will be assembled in final form and submitted to both UL and the American National Standards Institute (ANSI) for acceptance or comments. After acceptance by those groups, the standard will be submitted to the International Electrotechnical Commission (IEC) for adoption as an international standard (IEC 348).

Richard Nute (Product Safety and Chair of the WEMA committee to rewrite UL 1244) and the WEMA committee feel that support from ANSI is imperative to gain acceptance for the document by the IEC. At this point, however, the ANSI C39.5 committee is reluctant to consider the UL 1244 document. Presently the ANSI standard for electronic equipment is only ten pages, where UL 1244 is approximately 130 pages in length. Also Factory Mutual Engineering Group is certifying switchboard instruments to the ANSI standard and some of the members of the ANSI C39.5 committee prefer not to work with UL or a detailed standard. Adoption of UL 1244 would greatly increase requirements over the current ANSI standard.

Another problem has entered the ring. Underwriters Laboratories wants to be accredited by ANSI as a standard writing body. This would mean that when UL writes a standard it could automatically become an ANSI standard too. SAMA (Scientific Apparatus Makers' Association) has always objected to this because they feel that it would make UL too powerful, but SAMA is working to make one standard, UL 1244, an ANSI standard. Now UL has indicated that if SAMA wants UL support for making UL 1244 international, they might also support UL accreditation by ANSI.

UL 1244 has been the object of a lot of work in recent

months. Last April 13, UL and concerned members of the electronics industry met in Chicago where the rewriting of UL 1244 was handed over to representatives of industry. One of the main objectives of this rewrite was to restructure UL 1244 to correspond with the international standard IEC 348.

On May 5-6, a cross-reference index was developed in Chicago by Rich Nute (Tektronix), Marsh Johnson (H-P), Dick Howard (LFE), Don Mader (UL Melville), and Bill Hogarty (UL Santa Clara). This index simply indicates which paragraphs in UL 1244 correspond to the same requirements in IEC 348.

Based on that index, Kathy Zschoche, Joan Criswell and Lila Tabor, all of Tektronix, pasted up a complete cross reference just like the index but containing the complete text of the two standards. This was distributed to industry and copies are available from Product Safety, extension 6649 or 7728. Many people have expressed their appreciation for this document, including Andy Farquhar, Vice President and Chief Electrical Engineer of UL.

On June 8-10, a large meeting was held in Denver, Colorado. In attendance were the people in the above list plus Carl Hollingsworth (Tek), Walt Reibe (Fluke), Farquhar (UL), Pete DePaolo (Simpson Electric), Morrie Triplett (Triplett), Frank McGowan (Foxboro) and Hope Broch (WEMA).

They discussed the cross-reference document and assigned author tasks to various members to rewrite IEC 348 to include pertinent parts of UL 1244. One requirement of UL 1244 which is ignored by IEC 348, but considered important is flammability requirements.

Another problem which was discussed is that UL 1244 requires that all components used be UL recognized. It would be unreasonable to expect an international standard to require UL recognized components. This would act as a trade barrier, granting a virtual monopoly to American component manufacturers. On June 24, Carl Hollingsworth (Tek) and John Parnell (Honeywell) met with Howard Reymers (UL Melville), Farquhar, and Mader, where they developed a plan for identifying component requirements. They decided that components will not have to be UL recognized, but must meet certain specifications.



UV-Cure Machine

The Plastics Processing group in Building 16 has a new Ultraviolet (UV) cure machine to mark pushbuttons and plastic knobs. The numbers and markings are silkscreened on the knobs with UV-cure ink and the ink is dried at high speed in the UV-cure machine.

The new machine was purchased from Radiation Polymer Company about three months ago, but the first month was spent making modifications for Tek use. As delivered, the machine lacked proper mechanical and electrical safety features. Extra locks were installed for safety near high voltages; a safety bar was placed to prevent a heavy service access door from falling on the operator and service technicians; flexible water hoses from the cooling system were added so the machine could be moved; a junction box was added for main power control at the machine; and finger guards were added.

Once in operation, Chet Schink, Corporate Chemist, found that significant quantities of ozone were generated by the ionizing effect of the ultra-violet lamps. Vents were added to eliminate this problem.

The standard process for marking knobs consists of

silkscreening the pattern with ink and placing the knobs on a moving belt which passes through a warm drying oven. The parts sometimes spend as much as six minutes in the oven. The ink is thick, and after baking in the oven is not always completely cured. This process is still in use.

The new UV process uses a much thinner ink which runs through the silkscreen faster and leaves the screen less clogged. The belt in the UV-cure machine is variable speed and most markings can be cured in about ten seconds. Also, the cure is immediate and permanent. The only limit to the size of parts is the two inch opening in the loading end of the machine.

In the future the Plastics Processing group expects to use the UV-cure machine to mark side panels such as mini-scopes, some front panels, high voltage covers, and other knobs and small plastic parts. Increased use and experience with the UV cure machine may possibly include experiments with marking metal parts.

For more information about the UV-cure machine, contact Doug Cable, ext. 5066.

Elemental Analysis

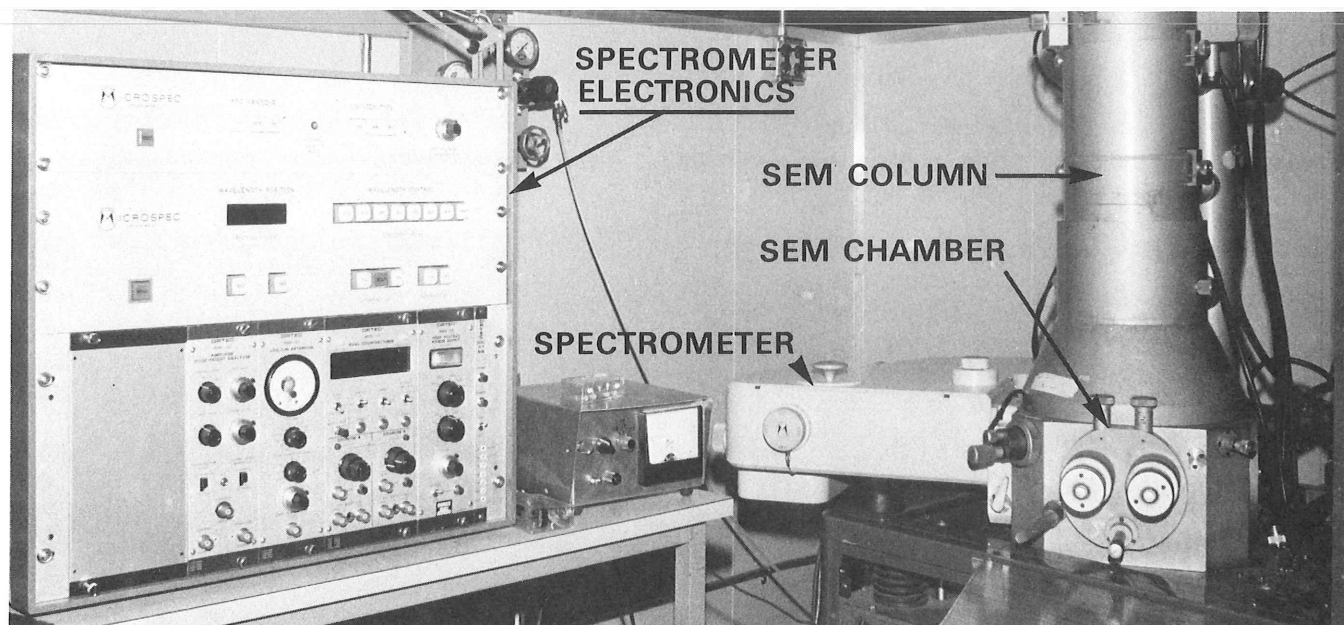


Figure 1. Scanning Electron Microscope with wavelength spectrometer for elemental analysis.

IC Manufacturing has added a Scanning Electron Microscope (SEM) with microprobe capabilities to its SEM area and can now do elemental analysis. The system can analyze any element with atomic number 5 (Boron) or greater. It will look at particles and areas as small as one cubic micron, and unlike the Auger Microprobe which analyzes from surface to 10-15 Å, the SEM/Spectrometer analyzes material to 10-20 kÅ deep.

The Spectrometer is attached to the side of the specimen chamber of the SEM, as in Figure 1. When the electron beam from the SEM gun strikes the sample in the SEM specimen chamber several signals are given off. These include: 1) back scattered electrons, 2) secondary (low energy) electrons from the surface, 3) Auger electrons and 4) characteristic X-rays. The X-rays scatter in all directions, but some pass through the aperture in the spectrometer. They are then diffracted by one of four interchangeable crystals (Lithium fluoride, Pentaerythritol, Rubidium acid phthalate, and Lead stearate), and detected by a proportional counter. As the name indicates, the counter simply counts the number of X-rays which are given off the sample.

To determine the elemental composition of a substance a spectrum scan is done and recorded on a chart recorder. Peaks at various levels indicate which elements are

present. Also, quantitative analysis can be done approaching 2% accuracy by using standards of known composition and comparing their intensities to the intensities of the sample under test, then correcting for absorption, fluorescence and atomic number.

Once the elements are identified, elemental mapping can be performed as in Figures 2-6. The system is set to the wavelength of the element to be mapped.

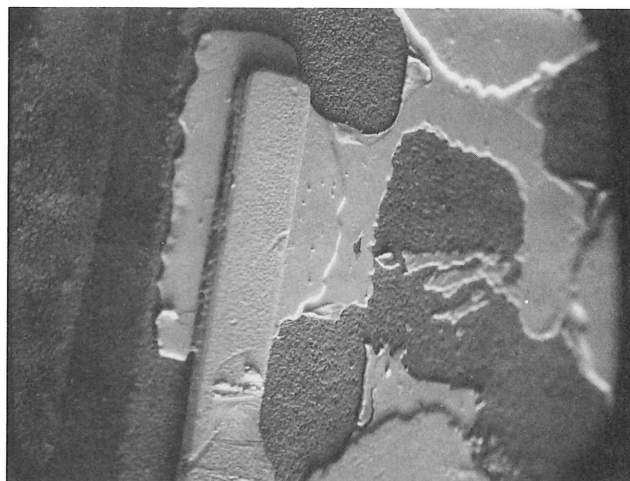
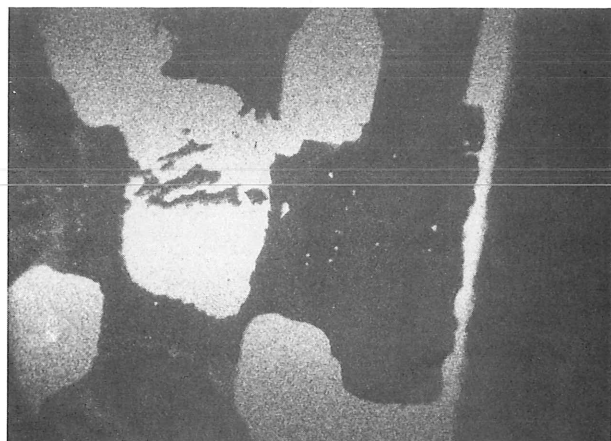
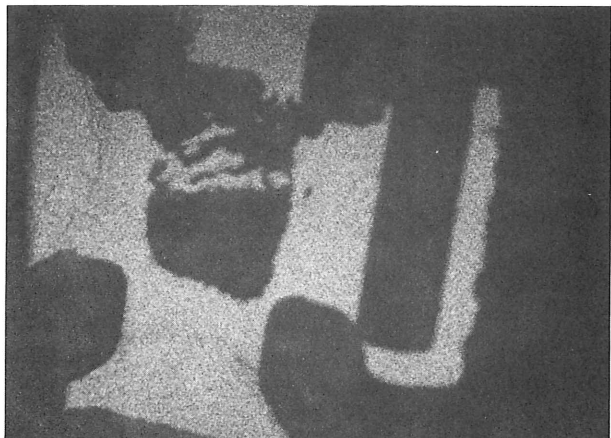


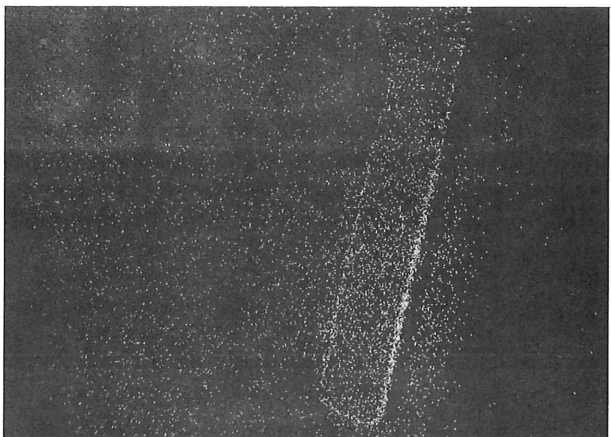
Figure 2. Scanning Electron image of a solid state device.



IRON



INDIUM



COPPER

Figure 3. Elemental mapping showing various elements and their location of the sample device.

Then only the X-rays of that wavelength are recorded and a picture forms which shows where that element is present on the sample. By repeating the process with each element shown on the spectrum scan, the location of all the elements is mapped.

For more information on using the SEM or Microprobe call Joan or Charlie Dwire, ext. 5196.

MSEE/CS Fall Term

Tektronix in cooperation with Oregon State University will offer three classes in the MSEE/CS program for Fall Term 1976-77.

EE 511 Solid-State Devices, taught by Bob Nordstrom and Ian Getreu.

EE 517 Selected Topics in Solid State, taught by John Owen from Oregon State.

One class in the Computer Science department to be announced at a later date.

New students who wish to enroll in these classes for credit must submit application forms to the E & T office by August 20, 1976.

MS Fall Term

An MS program in cooperation with the Oregon Graduate Center will have the following schedule for Fall Term 1976-77. Any class can be conducted at Tek if ten or more Tektronix employees register for a course.

Courses scheduled for Fall Term include:

Classical Mechanics

Materials

Mathematical Physics

Quantum Electronics & Modern Optics

Quantum Mechanics

Thermodynamics

New ASTM Standard

A new ASTM Standard, Vol 41, 1976, General Test Methods, Nonmetal; Statistical Methods; Space Simulation; Particle Size Measurements; General Laboratory Apparatus; Determination of Nonmetallic Materials; Metric Practice, is now in the Technical Standards area (58-187) and may be reviewed there.

Standards in Rough Draft

The following standards are in rough draft status: 062-1880-00, Interconnecting and Power Cables - Drafting; 062-2843-00, Drafting Standards, Drawing Scale; 062-2851-00, Glossary of Terms - Cable Standards; 062-2877-00, Wire and Cable Color Coding System. These will be distributed in the near future to selected lists for comment and approval.

Carcinogen Standard

Preliminary work is underway on 062-2801-00, Occupational Safety Standard (Special), Carcinogens.

SAFETY REPORT!

Footwear

Improper footwear exposes the wearer to several hazards on the job. These hazards range from chemical spills, crushed toes from falling objects, stubbed toes, cuts and punctures, and falls and slips due to unstable shoes or slippery soles.

It is difficult to develop a definitive policy on appropriate footwear for all hazards in each area at Tek. Therefore, each manager should refer to the broad, general guidelines established in the **Tek Safety and Health Reference Guide** to determine the proper protection for her/his area. They should also consider the following:

Areas of chemical spills:

Shoes should be relatively nonabsorbent with full toe and heel.

Some areas may require rubber boots. (Do not use canvas shoes.)

Areas with potential heavy falling objects, impact, molten materials, etc:

Shoe construction should include: steel toe and sufficiently heavy sole and uppers to prevent puncture by metal chips, burns from molten metal, etc.

General areas (Offices, Assembly, etc.)

All areas require footwear. Stubbing of toes, punctures by staples, broken glass, etc., may occur even in carpeted areas. (Any area with broken glass or metal chips should require shoes with closed toes and heel and a sufficiently heavy sole to prevent puncture.)

Platform soles and heels should not be worn. They are a hazard in all areas.

The following is an editorial commentary by Chuck Sullivan, Manager of Technical Standards.

UNCLE SAMUAL DEALS HIMSELF IN

When the Feds muscle in on an operation the results aren't always predictable—nor beneficial—consequently, it is difficult to foresee the impact of Senate Bill S3555.

This Bill, The Voluntary Standards and Certification Act of 1976, proposes to set up the Department of Commerce as a certifying agency for all voluntary standards organizations, with the Federal Trade Commission establishing the criteria. Under this law, any standards-producing group, such as UL, ANSI, ASTM, that wants to continue in business must meet FTC criteria and obtain an operating certificate from the Secretary of Commerce.

The government wants to utilize the voluntary labor and expertise of the private organizations, and also to exert control over their activities for the protection of individuals or companies affected by particular standards.

In a larger sense, the government also wants to exert some control over standards of an international character. There is a growing awareness that the effectiveness of international relationships can be hampered by ineffectual or nonexistent standards.

The Bill would make it mandatory for all standards-creating bodies to have within their structure an impartial appeals body to which any affected person or company, or the government, can have recourse. For instance, if a small company felt that the cost of meeting a UL standard was prohibitive or not applicable to them, they could appeal to this recourse group 1) for modification of the standard, 2) for the formulation of a less restrictive standard, or 3) for a new standard more directly applicable to their particular product.

If this Bill becomes a law it will undoubtedly increase the cost of creating standards, and thus the cost of standards to the consumer. I anticipate it will also have the effect of lengthening the time it takes to produce a standard, and there is a strong probability that the voluntary standards-making process will be considerably slowed while adjustments are made to conform to the Law.

The sponsors of the Bill are aware of these problems and costs to the voluntary standards organizations and the Bill makes provision for some degree of Federal funding. This will be the first time funds have been applied to voluntary standards effort; whether it will lead to excessive government control and devitalization of an endeavour which has served the country so well is an unanswered question.

—Chuck Sullivan

STATIC SAFE SOLDER SUCKER

Herb Zajac, Manager of the Environmental Labs performed tests on desoldering tools to determine the level of static discharges from them. Solder-Wick retains the lowest static charge of the desoldering tools tested. As a result of these tests, Solder-Wick is the preferred tool for use when desoldering circuit boards containing static sensitive devices.

Figure 1 shows the three desoldering tools tested: 1) Spring Loaded Desoldering Tool, 2) Bulb Solder Sucker, and 3) Solder-Wick. Herb removed components from a circuit board ten times with each tool to measure the static levels. The Spring Loaded Desoldering Tool left a static charge of 5 kV on the circuit board; the Bulb Solder Sucker left a static charge of 2 kV on the complete circuit board; and the Solder-Wick left a charge which varied from 0 to 100 V.

The amount of charge each tool will retain was measured by discharging 20 kV onto each tool. The Spring Loaded Desoldering Tool retained 20 kV immediately after charging and 10 kV after five minutes. The Bulb Solder Sucker retained 10 kV immediately after charging and 4 kV after five minutes. Solder-Wick retained 2 kV on the plastic reel. After one minute Solder-Wick held no charge at all.

Two additional spring-loaded desoldering tools designed to produce less static will be tested and the results will be published. If there are any questions or suggestions, please call Herb Zajac, ext. 7887.

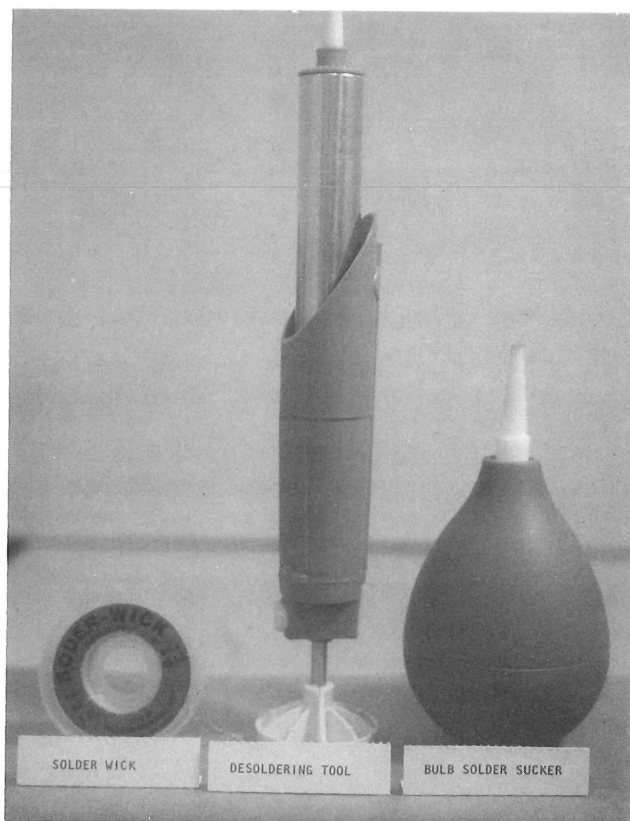


Figure 1. These three desoldering tools were tested for static charge retention.

NEW SYSTEM FOR 388- SUFFIX NUMBERS

Base Data Management has devised a new system for assigning suffix or "dash" numbers during circuit board design. Formerly an alpha coding system identified the different stages of design, but the new system will replace alpha coding with -01, -02, -03, etc. suffixes.

When a 388- number is assigned to a circuit board it reads "388-XXXX-00", where the Xs represent a four digit number. Each design group has its own code letter, for example 7000 series has the letter "K". On their circuit boards the part number appears as K-XXXX-00. In the past subsequent design changes would be KA-XXXX-00, KB-XXXX-00, KC-XXXX-00, etc. Now, the A, B, C, coding is replaced, so subsequent designs appear as K-XXXX-01, K-XXXX-02, K-XXXX-03, etc.

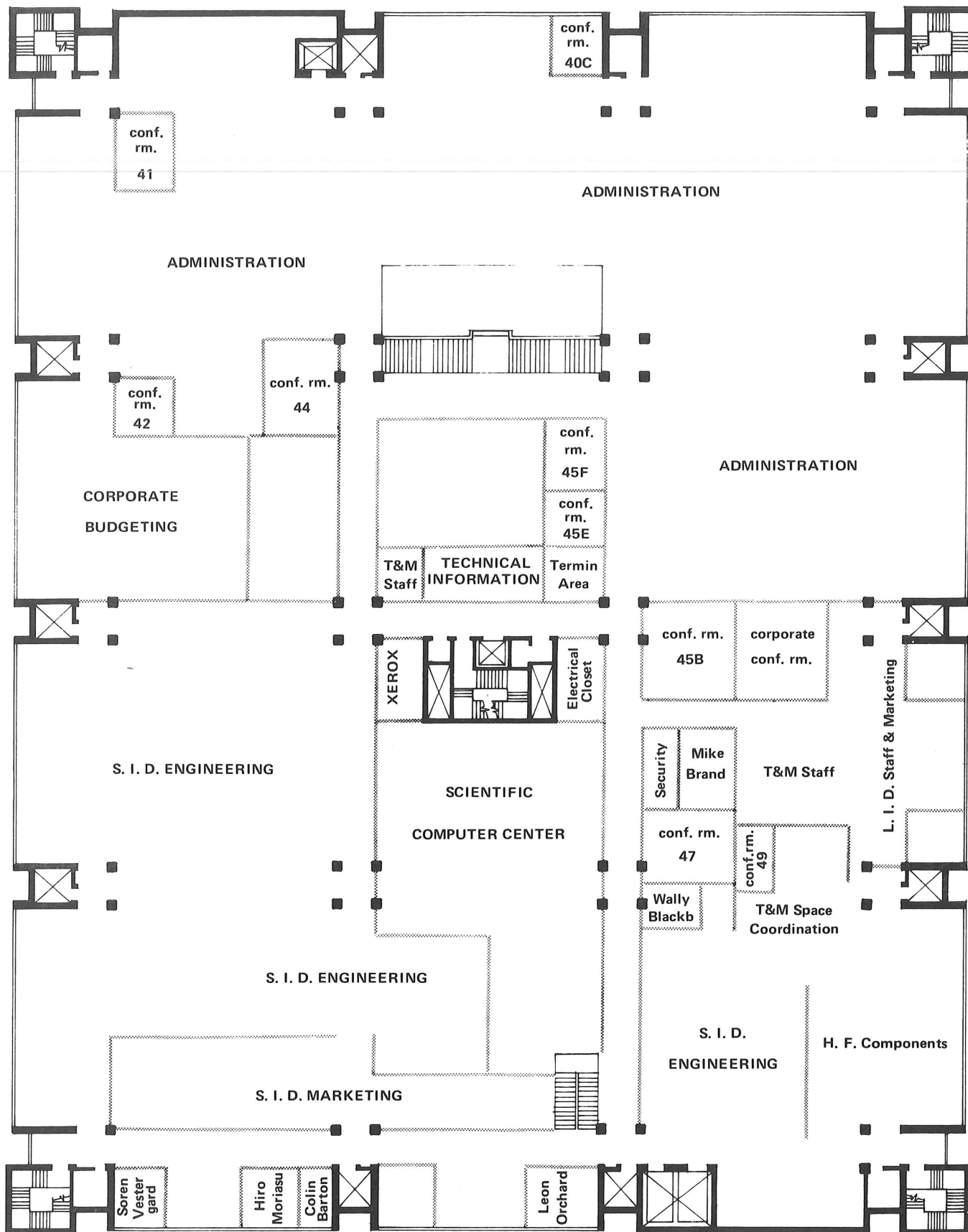
When design changes are made on engineering boards, the designer can designate changes in the suffix whenever needed without contacting Base Data Management (BDM). But as soon as the artwork is used to make an actual circuit board for use in an A-phase or B-phase instrument, the designer must contact BDM. At this time, BDM will ask the designer which numbers have been used and the status of the boards. BDM will then verify the part number and suffix and designate official board status (PP, CR, NP, etc.) From this point on, contact BDM each time a new part number is required.

A complete document describing this part number process in detail is presently being assembled by Allan Hlookoff, ext. 5781. Call Allan for more information.

IN PRINT

An article by Leon Orchard, SID Division Manager, and Bill Peek, LID Division Manager, appeared in the April, 1976 issue of IEEE SPECTRUM. The article, entitled,

"'Super' Scopes", describes many new features and capabilities that have been added to oscilloscopes. The plug-in concept increased the measurement versatility of



Bldg. 50 — Fourth Floor

oscilloscopes, but more recent concepts include digital multimeters, portables (including mini-scopes), lower frequency oscilloscopes, accessory recorders, digital oscilloscopes, delay sweep, A/D converters, counters, sample and hold amplifiers, digital delay, and brighter CRT's. Human Engineering plays an increasing role in modern oscilloscope design, making knob and switch

accessibility and ease of operation important design considerations.

"The prospect for the future is that oscilloscopes will change even faster. Programmability, ability to record and play back instructions to the user, more help from instrument intelligence—all are in the wind."

Call for papers

The 27th Electronic Components Conference will be held May 16-18, 1977, at Stouffer's National Center Inn in Arlington, Virginia.

SPONSOR: Parts, Hybrids and Packaging Group of the IEEE, and the Electronics Industries Association (EIA).

TOPICS: Papers which present new developments and knowledge in the following areas are invited:

- Hybrid Microcircuits
- Discrete Components
- Interconnection and Packaging
- Manufacturing Technology
- Reliability, Evaluation and Failure Analysis
- New or Improved Materials

ABSTRACT: Ten copies of a 500-word abstract and extended outline describing the nature, scope, content, organization, and key points of the proposed paper are due by November 8, 1976, to:

- Charles M. Tapp
- Sandia Laboratories
- Department 2150
- Albuquerque, New Mexico 87115

Maureen Key 60-553