COMPANY CONFIDENTIAL

Engineering News

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SAFETY REPORT!

As Corporate Safety director, it is my responsibility to keep Tek employees informed of safety hazards at Tek, as well as to promote corrective measures when required. Many fine words and admonitions have been written and spoken regarding occupational safety and health. These words seem to make admirable sense, yet accidents, injuries, and loss of property continue.

The Corporate Group recognized the problem some time back when they formed the Corporate Safety Council. This responsibility has expanded with the formation of the Corporate Safety and Health Department.

The safety objectives of corporate management state that the Safety Department will "create and maintain a safe and healthful environment where people may work and where property and products are kept reasonably free from damage or destruction."

These words mean very little in themselves. They must be supported by line management. What a person does about safety depends on what his boss wants him to do, not on statements from above. It is important to remember that you have the best understanding of your operations and area. You have a knowledge of the potential hazards and should identify those hazards. Safety efforts are more effective when initiated and applied within the area concerned.

Lasers

One of the many areas where we have directed our attention is Laser Safety. A laser committee has been formed. The members are: Brad King, Hybrid Circuits Engineering; Phil Schierer, Analytical Instruments; Herb Zajac, Environmental Labs; Chet Schink, Chemical Support Manager; Jim Keski, Ceramic Engineering; and Helen Thomas, Manager of Health Services. Their charter is to develop a set of Safety and Health standards for the installation, operation and maintenance of lasers at Tek. Enforcement by the safety department will be based upon these standards.

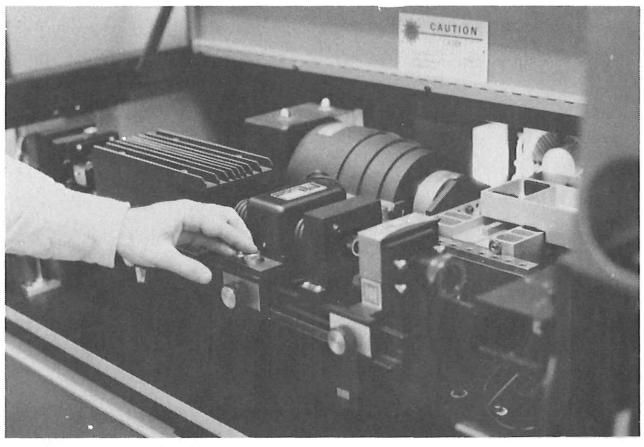
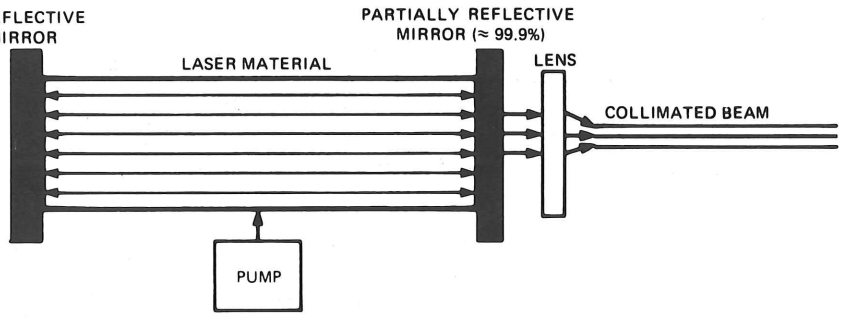


Figure 1. A Nd-Yag laser is the core of this laser trim system. The collimated beam is focused through the series of lenses on the right. Note the "caution" label on the cover.

To understand the problems presented by lasers, let's have a look at how a laser works. The following is reprinted with permission from **Electronics in Industry** magazine, April 1975 issue.

What is a laser?



The term "laser" is an acronym for Light Amplification by Stimulated Emission and Radiation. In other words, the laser is a device that produces and amplifies light. Unlike ordinary light, laser light is unique in that it is monochromatic (all light waves in the beam are of the same frequency); it is coherent (all light waves in the beam are in phase with each other); and it is collimated (the beam remains very narrow over long distances). Because of these characteristics, laser light has a very much higher energy concentration than ordinary light and is much brighter.

A laser consists of three components: (1) a lasing medium; (2) a "pump" (input energy source); and (3) an optical cavity. The lasing medium is the material that is actually responsible for the laser's action. Four common materials are presently used: solid state, gas, semiconductors, and liquids.

The pump, or energy source, provides the energy to produce laser light in the lasing material. Several methods of pumping are commonly used. For example, optical pumping, i.e., a bright source of light, is employed in solid state lasers. Other types of lasers may "pump" a high electric current through the lasing material to produce laser light.

Once the lasing medium has been pumped, lasing action begins. The direction of laser beam propagation is controlled by placing the lasing medium in an optical cavity formed by two reflectors (mirrors) facing each other along a central axis. Photon beams produced along the cavity axis are reflected 180 degrees at each reflection and travel once more through the lasing medium causing stimulated emission of other photons. Thus, the beam grows in magnitude with each traverse of the lasing medium.

One of the mirrors in the system is slightly transparent, so that a small portion of the light passes through that mirror and becomes the laser output. The lens focuses the light into a collimated beam of high intensity.

To find out a little about laser use at Tek, we talked to Brad King, Tek's Laser Safety Officer. In his area, Hybrid Circuits Engineering, there is a laser based hybrid resistor trimming system. The core of the system is the Nd-YAG laser (Fig. 1). The collimated laser beam is at 1.06 microns wavelength (near infrared) and the diameter of the beam is about 1 cm.

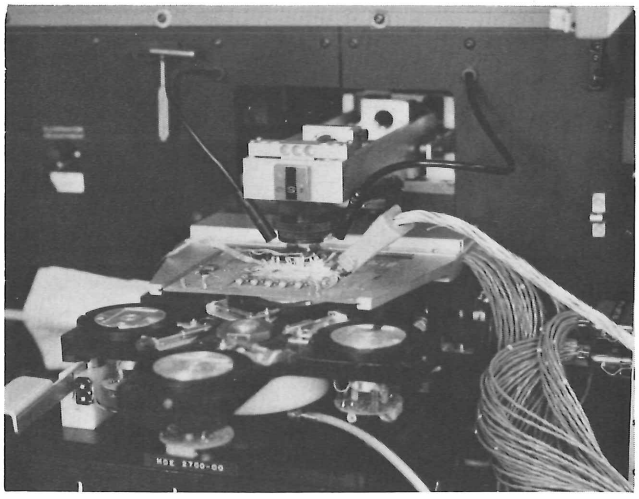


Figure 2. The collimated laser beam is refocused at the work station. The device to be trimmed is mounted on the carousel and automatically trimmed by a computer controlled system.

At the work station (Fig. 2) the beam is focused down to a 25 micron diameter. At typical operating power levels, the energy level at the substrate is approximately 10^6 watts/cm^2. This is the power level required to vaporize the resistor material on hybrid devices.

When thick film or thin film resistors are required on hybrid devices, the resistive material is applied to the surface. Processing variations make trimming necessary to obtain desired tolerances. With laser trim, accuracy as high as 0.005% can be obtained.

The device to be trimmed is mounted in the carousel and turned to position beneath the laser. A probe system measures the resistances. The computer controlled system automatically trims the resistors to the prespecified tolerance. This system is also capable of trimming for voltage, current and transient response.

Lasers can cause possible biological damage to eyes or skin. The extent of the damage depends on exposure time and laser output and wavelength.

Skin damage is rare and similar to burning yourself on a stove or cigarette. Damage is not cumulative, unlike x-rays or carcinogenics.

Eye damage is also extremely rare. There have been only

five industrial accidents nationwide which have resulted in permanent eye damage. This damage is usually caused by looking directly into the laser beam, but can also result from beam reflections off alignment equipment, tools, windows, or any other reflective surface.

At Tek, as with most industrial laser users, the systems are interlocked so that the beam is terminated when the covers or other shielding is removed. When the laser is being aligned, the technicians are required to wear laser safety goggles. Warning signs and labels are required to inform persons working in close proximity to lasers of existing dangers and applicable precautionary measures (goggles, limited access).

In Brad's area, there was the additional possibility of the beam escaping through a window. A suitable shielding material has been tested and approved to prevent stray beams from escaping.

3-Wire Cords

Another area which has been of some concern is the three-wire extension cords which have both a male and female connector. After an employee received an electrical shock from an instrument, a manager discovered that many of the cords in his area were not properly grounded.

The problem was that little or not contact was being made between the grouding pin and receptacle. For the past ten to twelve years, people at Tektronix have been testing replacement three-wire cords for conductor continuity, polarity and short circuits. At the completion of the testing a spring, part no. 214-0698-00, is installed in the female ground receptable (see Fig. 3).

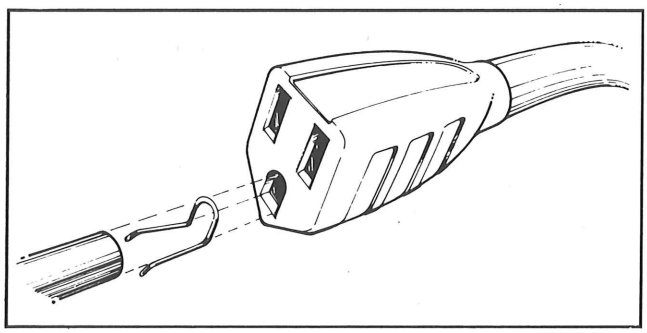


Figure 3. The grounding clip is inserted in the ground receptacle of a power cord with a special tool (P/N 003-0744-00).

There are still many hundreds, possibly thousands of power cords that have not been tested. To ensure employee safety and to reduce the possibility of instrument and property damage, you are asked to take the following steps:

1. Test all electrical three-wire cords for ground continuity and correct polarity with a voltmeter. Work the cord around in the socket to check for intermittent contact.

2. Check the grounding pins of motor bases on instruments using detachable cords.

3. Insert a grounding spring in each female ground receptacle as in Fig. 3. These springs were not meant for use in ground receptacles of bench and wall outlets, and should not be installed in them. Faulty plugs on benches or wall outlets should be replaced.

The grounding spring 214-0698-00, the insertion tool 003-0744-00, and the extracting tool 003-0743-00, are available through Material Stores. For more information on how to use them, contact Earl Anderson, ext. 5490.

In conclusion, my staff and I will need all the help we can get to get the job done. The payoff is tremendous both in reduction of human suffering and in dollars and cents. It is worth the effort.

Be patient with us if at times we seem to be interfering with getting your job done. Safety and Health recognition is important to the functioning of a large company. If you have any suggestions or see an area that requires our attention, tell us about it. An effective safety program depends on the cooperation of everyone concerned.

—Rick Bushell

IN PRINT

An article in Electronic Design entitled "Logic Analyzers: A New Force in Digital Troubleshooting" quotes **Rick Watkins,** project manager for Tek's LA501 Logic Analyzer. The article outlines the main features of a logic analyzer and describes how these features differ in the various analyzers built by different companies. The possibility of logic analyzers capturing some of the oscilloscope market is considered. Rick Watkins and managers from H-P and other logic analyzer manufacturers discuss intelligence in future logic analyzers.

Jim Wagner, 5000 Series, authored an article which appeared in the February 1976 issue of COMPUTER DESIGN magazine entitled, "Tools for Logic Analysis." He compares the strengths and weaknesses of logic analyzers and oscilloscopes in troubleshooting logic problems. He shows that logic analyzers will not completely replace the oscilloscope in logic analysis, but will provide an additional tool for obtaining major and significant answers to logic problems.

U.L. AFFECTS TEKS

TEK FACES UL

Tektronix first became aware of the need to design around Underwriters Laboratories requirements with our Medical Products in about 1971. We submitted the 412 Medical Monitor for UL listing and had it returned a few months later with a letter explaining that it didn't meet their requirements. Among other things, it lacked a Hospital grade plug and cord, and failed to meet outside marketing requirements. We have corrected some of the problems, but the 412 has never been listed.

Figure 1. Markings for the fuse and some of the auxiliary outputs on the 412 Medical Monitor do not meet UL standards.

Our next relationship with UL was with our calculators. We realized fairly soon after we started building calculators that office machinery must have UL listing, so we would have to deal with UL again. When city and state codes require UL listing in bid requirements, a manufacturer without UL listing is automatically out of the bidding.

The State of Oregon includes UL listing in its bid requirements. Since the state orders a lot of office equipment, we began changing our calculators and computer terminals so they comply and are now getting UL listing. Data processing equipment and office equipment are now listed with relative ease.

The following is a list of Tek products submitted by Tek and listed by UL. This list **does not** mean that the production versions of all these instruments are UL listed. What it means is that we now know which modifications are necessary to meet UL requirements. The only way to determine whether or not a specific instrument is UL listed is to find the UL label on the instrument. **If there is no label, the instrument is not UL listed.**

Model	Type Listing
4012	UL478
4013	UL478
4012	UL478 HD Power Supply
4013	UL478 HD Power Supply
T21	UL114
T31	UL114
4023	UL478
4051	UL114/478
4631	UL114
4632	UL114
4923	UL114
4923—Option 1	UL114
4006	UL478
4006—Option 1	UL478
4661	UL114
4662	UL114
603	UL544 Medical
4641	UL478

If UL 1244, the Test and Measurement equipment standard becomes final this year, we will have only one or two years in which to comply. Leon Orchard, Service Instruments Division manager, has already announced that all instruments in his group having DC in 1976 or later shall be built to UL standards.

Lew Kasch, U.S. Marketing, says "The lack of UL listing is an impediment to the sale of a product." UL listing will not guarantee a sale, but the lack of it will hurt and in some cases prohibit sales.

In the monitor business, we lost a contract with the government for the 603 Storage Display unit because it took 2½ years to get UL listing. We had submitted it to UL and it did not meet their requirements. We did not respond quickly nor with enough effort. We built and submitted two models which didn't pass. Finally, we applied some cooperative effort, set a target date and are now listed by UL. Once we really started working on it, UL helped us all the way. There were weekly phone calls between Tek and the UL Santa Clara office to clarify points about the standard. UL usually anticipates it will take three months to list a product, if everything goes right. The problem with the 603 was our own response.

Government Service Administration (GSA), a large purchasing organization for the U.S. government, has proposed that in the future, any equipment they buy must be UL listed, if an applicable standard exists.

On April 18, 1974 Jim Sandberg, TV Product Marketing, and Cliff Schrock, FDI Marketing, attended a meeting

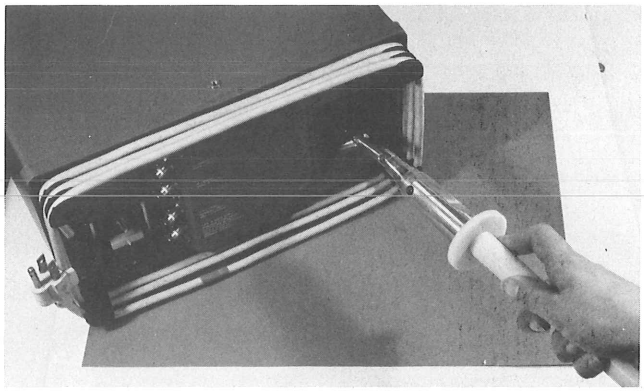


Figure 2. To determine the accessibility of any hazardous parts, (moving fan blades, sharp edges, or shock hazards) UL devised an accessibility probe, modeled after the human finger.

concerning the use of UL listed equipment in the Chicago area. Ben Budeil, City of Chicago Electrical Inspector, was present, as were representatives from UL, members of the Contractors Association of Chicago and manufacturers of sound and closed circuit TV equipment. The problem is basic—anything with a line cord on it used in the city of Chicago must be UL approved. A recent call to Chicago verified this. The exceptions are schools, airports and other areas which are under state or federal jurisdiction. Test and Measurement is presently enjoying a "grace" period while UL 1244 is under development. But as soon as 1244 becomes effective, this law will apply to most Tektronix products. Other cities are adopting similar laws.

The reason why more and more groups are requiring UL listing is that UL listing implies that an instrument is less likely to catch fire or carry an injurious shock. Instruments with UL listing can help lower accident insurance rates because there is less chance of injury. Also, adopting a rule requiring UL listing relieves the city inspector of the burden of deciding what is acceptable and what is not.

Richard Nute, Product Safety, is in the process of preparing a statement of policy for Tektronix which will go something like this: "Included in a product proposal will be a requirement for product safety. This will include applicable standards to which the product will be designed. Depending on the standards, some testing will have to be done to ascertain compliance. Following that we may have to go to third party testing like UL or City of Los Angeles."

Product Safety has moved from 50-454 to 58-262. The people in Product Safety at the Beaverton plant are Rich Nute, Eddie Richmond, Henry Jones, Joan Criswell and Kathy Zschoche. Bob Randall and Linda Ward, the Product Safety people at the Wilsonville plant, are at 60-666.

FILE FOR SPECIAL DESIGNS

To the Editor:

There are many devices and circuits built at Tektronix which are only used once. They are the test systems, interface logic, driver circuits, etc., built by various groups for their own use. Once they are no longer needed, they are usually set aside and forgotten. We could save a lot of time, energy, and money if these designs were "recycled."

One practical way to tap this resource might be to set up a library of drawing packages and documentation for special designs, and an index of the library contents. When a special design is completed, an extra copy of the documentation with a title, the designer's name, a one paragraph description, and the drawing package would be assigned a number and filed. Engineering News would publish a brief description of the design, and an index.

The next time someone needs to design a special system, a quick glance at the index might save weeks of work. If some part of it has already been built, why do it again? An additional advantage is that the searcher may find time-consuming mistakes described in the documentation that he can then avoid.

I think there are two important things that can make the library work. 1) Keep it informal; nobody wants to hassle with lengthy formal procedure. 2) Be considerate of other people's time. If the project requires consultation with the original designer, offer a project number for the designer to charge the time shared with you. It keeps the bean-counters happy and is an excellent investment of project dollars.

-Keith W. Parker

We think Keith has a good idea and have set up a file drawer for this purpose. Send in drawing packages and brief circuit descriptions of any special designs that you think should be shared. We will file them, assign numbers, and print a brief description in Engineering News. Here are a few descriptions Keith sent in to get us started.

- EN Staff.

File No. 0001

E.C. BOARD, TEK 31 UNIVERSAL INTERFACE

This circuit contains all the necessary logic to get BCD (Binary Coded Decimal) data in or out of a Tek 31. It handles all address selection and handshake protocol. BCD data is exchanged in positive and/or negative logic. Features include full status indication, address compare, ready, floating point/fixed point data, etc. Vector board area is 4.250 x 2.625 for custom circuits and is adequate for DVM, scanner, stepping motor, etc., interfaces. Hardware kits are also included for TM500 module or behind panel mounting. - Keith Parker

File No. 0002

E.C. BOARD, STEPPING MOTOR CONTROL LOGIC, E4301X

This is a 3.625 x 4.250 circuit board with the following features:

1) Control logic for one (1) stepping motor.

2) TTL in and out.

3) Direction control.

4) Two one-shots give two programmable stepping rates.

5) Limit switch logic.

6) Full status outputs such as "Limits O.K.", "Time outs O.K.", "Step clock accepted/not accepted", etc.

7) 22/44 0.156 center E.C. connector. - Keith Parker

File No. 0003

E.C. BOARD, STEPPING MOTOR DRIVER, E4813XA

This circuit is built from four 151-0405-00 npn power Darlingtons with 214-1914-00 heatsinks in open collector configuration. It will drive stepping motors, solenoids, etc. Features include full diode protection, current limiting resistors, and pull up resistors for checkout without motors. It is a 3.625 x 4.250 E.C. board with 22/44 0.156 center E.C. connector. - Keith Parker

File No. 0004

E.C. EXTENDER BOARD, 22/44 contacts on 0.156 centers, 7 in. long, E4810X

This extender board uses 136-0156-00 connector and has 44 labelled test points. It was built for use with 3.625 x 4.250 vector board (E66XB). - Keith Parker

IN PRINT

An article in the February issue of BUSINESS WEEK featured Tektronix' attempts at "Shedding a one-product image." **Earl Wantland, Larry Mayhew, Bill Walker and Jerry Ramey** are quoted in the article that centers around how Tek approached the new market areas opened by our graphics terminals. With the introduction of our first bi-stable storage based CRT terminals in 1969, we also faced new marketing problems. Larry Mayhew said, "We found we had to sell a benefit to the customer, not a set of engineering features. Market development was a new term for us. Our strength had always been in product innovation, and we felt comfortable with a product-oriented organization. Organizing around customer groups was 'unstabilizing.'"

TWO REVISED STANDARDS AVAILABLE FROM IEEE

IEEE has published two revised standards which are important to Electronic Draftsmen involved with graphic symbols.

IEEE Std. 200-1975 is called **Reference Designations for Electrical and Electronics Parts and Equipments.** It gives reference designations for identifying and locating discrete items on diagrams and in a set; for graphic symbols on diagrams; and for items in parts lists, circuit descriptions and instructions. It also includes methods for forming and applying reference designations. This has been adopted into Tektronix Standard A-105.

IEEE Std. 315-1975 is called **Graphic Symbols for Electrical and Electronics Diagrams.** It is a list of graphic symbols and class designation letters for use on electrical and electronics diagrams. Items are arranged sectionally in family groups by general type. Typical applications are shown and drafting practices concerning the graphic symbols are described. This has been adopted into Tektronix Standard A-106.

Copies of these standards and also ANSI 32.14-1973 which establishes graphic symbols for logic diagrams may be obtained through Technical Standards, ext. 7976.

"CAMERAM"

Dramatic advances in solid state image sensing devices have been pioneered by such groups as RCA, Reticon, Fairchild and GE. Their technologies have yielded sensor arrays up to 312 x 500 elements at costs up to $3000. However, many other semiconductor houses have entered the market. How? By removing the package lid from a $3.00 dynamic Random Access Memory (RAM). The exposed semiconductor chip is the basis for a simple, cost effective imaging device.

Data in dynamic RAMs spontaneously decays because of charge leakage. Many forms of energy will hasten the process: heat, x-rays—even light. In the Mostek 4006 1K RAM the stable state for memory cells is the logic level 0. Without refreshing, all bits will decay to 0 within a fraction of a second. The higher the temperature of the device, the faster the decay.

One might expect, then, that cells which are exposed to a higher flux of incident radiation (e.g., light) would lose data faster than their darker neighbors, and such is the case.

The Mostek 4006 is composed of a 32 x 32 array of addressable memory cells. Projection of an image onto the array will hasten the decay of data in the illuminated cells. Those cells exposed to a higher light level will decay faster. After determining the correct electrical address pattern for the physical cells (the cell in row 1, column 1 isn't necessarily address 1-1), it is possible to sequentially address the cells and reference the image.

The decay of the cell is dependent on the product of incident power and time. This permits the detection of halftones in an image because higher illumination causes faster decay. Eight read operations on a cell produce up to eight levels of halftone. Early decay indicates that the cell was highly illuminated. Late decay indicates a low level of illumination.

Although specified at 2 msec, the minimum refresh period for the memory is in the neighborhood of 200 msec with no decay under no illumination.

Specifics

For the Mostek 4006 some interesting discoveries were made. Exceptionally wide spectral response from the ultraviolet to infrared is easily detected. Even using glass optics, heat flux in a 700°F soldering iron was observed.

Since the output of the chip is digital, digital data reduction to interface with a computer is possible. For visual image

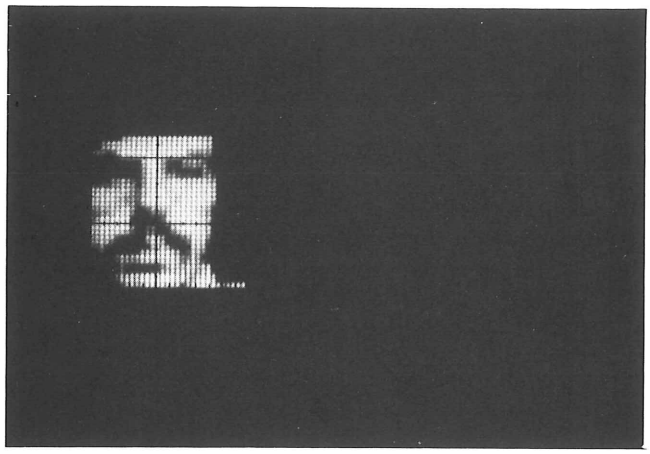


Figure 1. A low resolution photo of the author, taken by the CAMERAM and reproduced on a 465 scope.

reproduction, an x-y monitor is driven with a pair of D/A converters. This causes the beam to follow the position of the accessed memory cell, and the output of the chip drives the z axis of the scope. This procedure produced the photograph in figure 1.

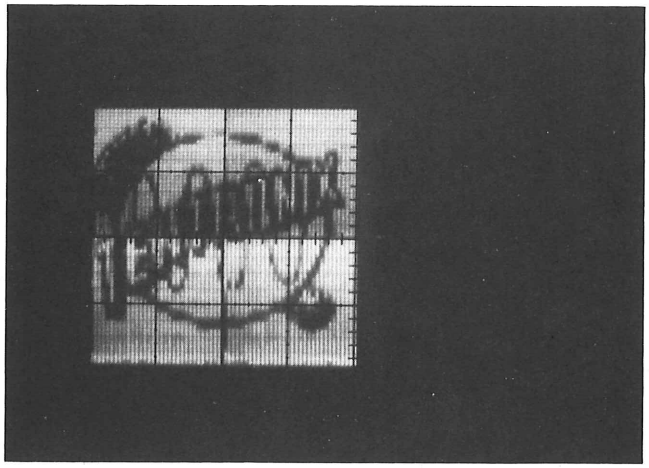


Figure 2. A series of exposures reveals the Tek logo.

Figure 2 is a series of exposures which were made by shifting the image for each exposure. This illustrates, in a basic fashion, the character recognition potential of a RAM based image sensing device.

While the quality of images is not nearly as good as RCA's SID (Silicon Imaging Device), a 1000:1 price difference certainly should mean that an "Image RAM" deserves further investigation.

C.S. Osbourne, X6551

Protect Your Property

PROPRIETARY INFORMATION

Most employees become so familiar and comfortable in their working environment that industrial espionage seems a distant and unlikely thing. A Department of Commerce survey in 1974 indicated that industrial espionage is not uncommon. It does not always take the form of stealing whole instruments or documents. One common practice is for visiting vendors to keep their eyes open. In an open company, like Tektronix, vendors have access to nearly every area. If they are allowed to see drawings and prototype instruments for new projects and news of these new projects gets out, we could lose the competitive edge that unique instruments would give us.

We can't lock up everything. Control of proprietary information is the responsibility of each individual employee. When you are working on a project where publicity could harm Tektronix, keep your work out of sight. This doesn't mean you have to lock everything up, but at least put it in a drawer or cabinet when you go home at night.

Some simple problems can be solved with common sense. For example, one group, when moving to a new building, was assigned a location next to large windows, facing a parking lot. Since their drawings are constantly on display, they requested a new location where their work could not be seen by everyone passing the building. They were moved towards the center of the building. This is an obvious and simple solution. While not totally secure, it eliminates the constant exposure to visitors.

Most industrial espionage is not cloak and dagger. It can be simply taking advantage of an open situation. Remove the temptation and you remove most of the problem.

PARKING LOTS

Many items have been stolen from cars in the parking lots. The most common theft is CB radios, but the list also includes tape decks, car radios, packages, and car parts. The security patrol in our parking lots discourages theft, but cannot do the whole job. An unlocked car can be burglarized in a few seconds.

Mark items like CB radios and tape decks with the car license number or other identifying mark with an engraving tool. Lock your car. Take removable tape decks and packages with you when you leave your car. Reports thefts to Myron Warren, ext. 5337.

Stolen Equipment

Following is a list of instruments and calculators that have been reported missing from Tek in the past month. If you know the whereabouts of any of these items, contact **Myron Warren,** ext. 5337. If you feel uncomfortable because of circumstances, anonymous letters will be accepted. His delivery station is 50-250. Include particulars (serial number, etc., if possible); the equipment may just be on loan.

ITEM	SERIAL NUMBER	BLDG.	VALUE
Dial Indicator - - 2 in. dia.	- - -	48	$ 260.00
4010 Terminal	- - -	50	4,000.00
455	B012267	Portland F.O.	1,695.00
T922	B010244	Portland F.O.	850.00
81 Instruments	- - -	Salt Lake F.O.	103,775.00
T I SR50 Calculator	488642	58	50.00
HP 25 Calculator	1510A11282	50	195.00
Standard Pneumatic Air Driver	- - -	19	238.00
3-M Overhead Projector	- - -	50	100.00

CHANGES IN CYBER-73 OPERATING SYSTEM

On Monday, February 9, the operating system on the CYBER-73 became Tek-3 (Kronos 2.1.2 level 411). Several changes came with this new operating system.

1. Maximum field length for any job is now 124K.

2. The "STATUS" command has changed. For details, type HELP,STATUS.

3. The "NODROP" command has been removed. To get the same effect you must anticipate a no-drop situation and include it on your "OLD," "NEW" or "LIB" command. For example, OLD,SNERD/ND.

4. Nine track (NT) is now the default on the "LABEL" and "REQUEST" commands. This won't affect "TF" users.

5. FORTRAN programs that bomb during execution will now get their write buffers flushed.

6. Batch card users should note that 5 special characters have new punch sets:

[is 12-2-8 (cents sign)

] is 11-2-8 (!)

^ is 11-7-8 (not symbol)

Underscore is 0-5-8 (underscore)

@ is 0-4-8 (@)

7. Batch users have two new commands (control cards):

NORERUN.	Clear rerun status.
RERUN.	Set rerun status.

All jobs in the input queue are assigned rerun status. In case of a system crash they will survive and be rerun. This rerun could be a disaster for a job that had just updated a critical data base before the crash. This user should use the NORERUN command.

8. Accounting is now in SRU (system resource units) instead of CPU (central processor units). A job will use more SRU than CPU because the SRU will include an amount for CPU, CMU (central memory units), I/O, permanent file activities, and magnetic tape activity. There will no longer be a separate charge for CMU and CPU, as they are included in the new SRU. The effect to the average user will be an overall increase in total charges of 5% and 10%. There will be a new charge of $.50 per mount for having the operator mount magnetic tapes. In addition, there will be a charge on Saturdays for printed paper and punched cards only.

For more information, contact Dick Machlan, ext. 5714 or Roy Carlson, ext. 7668.

MICROPROCESSORS DISCUSSED AT COMPCON/76

John Telford attended Compcon/76 in San Francisco the last week in February. Topics frequently discussed were the impact of microprocessors on the electronics industry and the need for a systems programming language to aid in the development of microprocessor based systems. A group of microprocessor and minicomputer software users presented a panel discussion which covered the need for a systems programming language.

John says most people seem to agree on the need for such a language, although no specific language was offered. They felt that no current programming language will suit the purpose. What is needed is transportability, ease of programming (a block structured language would do), and codes optimized for space and execution time. There was some discussion of language directed computer architecture.

John discussed Compcon with Bill Lowery, director of the Microprocessor User's Group. They came to the following conclusions: 1) that the TESLA system which is being built by the Scientific Computer Center (see Engineering News, February issue, SCC) seems to be one solution to the systems programming language problem. As far as John could tell, no other company is developing a microprocessor-independent programming system. TESLA is less constrained by tradition than other current programming languages. 2) The better the microprocessor system (the software and hardware used to develop a microprocessor based instrument), the less it costs to use microprocessors in products.

John also learned at the conference that Programmed Logic Arrays (PLA) are logic component sleepers. They have great potential but are not being used much. The problem is not the hardware, but more the lack of understanding how and where to use them. In some designs it is practical to replace a sea of logic with a single component. At present the costs are high ($10-$30), but vendors assure us that the price will be coming down. The outstanding feature offered is programmability. By replacing random logic, PLAs promise to bring down component count, lower power requirements, and therefore lower costs.

MUG shown TIDBIT

The February Microprocessor User's Group (MUG) meeting was held at the Wilsonville Auditorium on February 25. The purpose of the meeting was to discuss the TIDBIT (Tek Information Display Bus) which is currently under development in IDG. They presented a document which contains preliminary definitions of bus protocol.

Tom Cheek, IDP Engineering, began the presentation by outlining the concepts which influenced the development of this new bus architecture. The most important point was to design a bus which is not limited to one instrument and can be used to efficiently support a wide variety of digital components over the next three to five years.

Major characteristics of the bus will be:

1) Modified asynchronous, full handshaking data transfer protocol. Full handshaking is used except under specified conditions. A bus clock is used to aid in providing signal deskewing.

2) Shared Address and Data Lines. Lines are shared to reduce the number of signal lines required, and consequently reduce the number of terminators (and terminator power).

3) Multiple Bus Masters and Bus Devices.

4) Bus Controller. There will be a Bus Controller associated with each bus and located in the "top-most" card slot.

5) Single Level Interrupt.

6) Daisy-Chain Prioritization.

7) Overlapped Bus Master Transfers. To maximize the bus transfer rate, it is possible to transfer bus control from one Bus Master to another at the same time a data transfer is occurring. This nearly eliminates an "bus overhead" from slowing the data rate.

Another topic of discussion at the MUG meeting was the difficulty Dan Sheley, IDP Engineering, had in obtaining preliminary data from Western Digital regarding their Data General ECLIPSE-emulating microprocessor. A call by MUG chairman, Bill Lowery, to Jim Lorigan at Western Digital resulted in alteration of a scheduled visit from March 31 to Monday, March 1. The inter-group coordination provided by MUG can be seen to be helpful in obtaining the cooperation of Microprocessor manufacturers.

The next MUG meeting is scheduled for Monday, March 31, in the Council Room on the fourth floor of Building 50. The Microprocessor User's Group is composed of one representative from any group which desires representation. Managers who have not appointed a rep to the MUG and wish to do so can call Bill Lowery at 5865.

MEASUREMENT CAPABILITIES

The Measurement Standards group has published a document, "Measurement Capabilities," which describes their calibration capabilities and the accuracy they can achieve. Standards has two different facilities at Tektronix: the Electrical Standards Lab adjacent to Instrument Control in Building 58 (Del. Sta. 58-188), and the Physical Standards Lab in the west end of Building 19 (Del. Sta. 19-275).

"Measurement Capabilities" is divided into four major sections covering Low Frequency, High Frequency, Radiometric, and Physical Measurements. Information is presented by parameter to be measured and includes data on measurement techniques and traceability.

In order that Tektronix' T&M products agree with the rest of the scientific community, we must continually monitor our inspection equipment and measuring techniques. To accurately certify a measuring instrument, the inspection tool or instrument must have at least four times the capability of the device it calibrates in order to have a 97% chance of being correct.

As our lines become more diversified, measurement parameters are extended, and specifications are tightened. Our ability to verify advertised specifications must keep pace.

It is possible that some of our present capabilities may not cover existing or future requirements. This could jeopardize sales. The Measurement Standards group welcomes comments and feedback about calibration needs from others involved.

For a copy of "Measurement Capabilities," contact Chuck Corbridge, ext. 7880, Del. Sta. 58-188.

M152: GEOMETRY AND FOCUS CORRECTION IC

The M152 is a monolithic IC that has been fabricated and tested in IC Engineering and Manufacturing. It was designed by engineers from IC Design and IDG. Standard (200Ω) bipolar processing is used and the 72x93 mil die will be available in a 16 pin dual-in-line package.

Applications: CRTs with electromagnetic deflection systems and any deflection angle (angles greater than 90° are possible). The face plate may be flat, spherical, or cylindrical.

Accuracy: Positional accuracy better than 1% relative to distance from the center of the screen.

Writing Speed: Corner-to-corner diagonal jump and settle to 1% in better than 10 μsec.

Signal Levels: ±5V max on all inputs and outputs. (Both x and y inputs may have the same extremums with aspect ratio taken care of by a resistor value change.)

Power Supplies and Dissipation:

(+15, -12) preferred. - 400 mW typical.

(+15, -15) acceptable. - 450 mW typical.

Package: 16 pin DIP with Kovar-clad copper leadframe.

External Elements: 1% fixed resistors (6) and 2 trim pots (optional).

Figure 1. Characteristics and performance of the M152.

The M152 is designed to appropriately pre-distort the signals from a vector generator (or other device) before they are applied to the electromagnetic deflection coils of a CRT, in such a way that the resultant display is not distorted. It also provides a signal to correct for the de-focusing that occurs at the edges of the screen. The nonlinear correction functions that are electronically generated are the precise ones required from geometrical considerations.

The characteristics and performance of the M152 are summarized in figure 1. Figure 2 is a block diagram of the IC. The circuit may be used in CRTs of various sizes by adjusting the values of the external resistors R_X and R_Y. It has been successfully operated in the 4006 (60° tube with 10 inch flat face) and the 4014 (90° tube with 19 inch spherical face-plate).

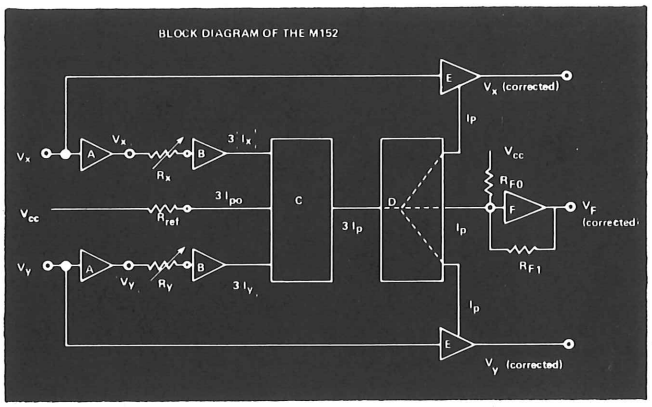


Figure 2. Block diagram of the M152.

For more information on the M152, contact Binoy Rosario, ext. 6362 or Harvey Golladay, ext. 2643.

MORE MOVES

Monitor Marketing, Stan Foss and Jack Benton, have moved from 50-362 to the fourth floor of Building 50, 50-491.

Lab Scope Reliability, Bob Wallace, has moved from 50-365 to 50-491.

APPROVAL FOR ARTICLES

Larry Biggs, IDP Engineering, has drafted an approval form which will be used in IDP for authors of technical articles. It is sometimes necessary that an article be reviewed to prevent publication of proprietary or company confidential information. The form provides for approval and comments by immediate managers, engineering managers, division managers and the patents and licensing group. This is not a formal document, but more a voluntary attempt to protect Tek from accidental release of information which could damage marketing plans and competitive advantage gained from years of research.

For a copy of the form for your own use, contact Larry Biggs, del. sta. 60-219.

papers. . .Call for papers. . .Call for papers

Wescon/76 will be held at the Los Angeles Convention Center on September 14-17. As in past Wescons, this is a Call for Sessions rather than for individual papers. Proposals should be for two-and-one-half hour sessions of not more than four individual presentations. The presentations within any one session should be complementary.

SPONSOR: Los Angeles and San Francisco Councils, IEEE, and Southern and Northern California Chapters, ERA.

TOPICS: Areas of interest include but are not limited to:
- Instrumentation and Measurement
- Medical Electronics
- Test Equipment
- Communications Technology
- Microprocessors
- Education
- Consumer Impact
- Reliability
- Memories
- Components
- Government
- Manufacturing
- System Technology
- Business and Management
- Packaging/Interconnection
- Computers/Peripherals.

LETTER OF INTENT: A short statement that includes subject, topic, scope of the material, significance of the topic, and names and affiliations of four proposed speakers or panelists (not more than two from organization) are due by March 15, 1976.

OTHER: Address letters to:
Wescon Professional Program Committee
999 North Sepulveda Blvd., Suite 410
El Segundo, California 90245

The National Telecommunications Conference will be held at the Fairmont Hotel in Dallas on November 29 through December 1, 1976.

SPONSOR: Dallas Section and the Communications Society of the IEEE.

TOPICS: Area of interest include but are not limited to:
- Wire Transmission
- Radio Transmission
- Digital Carrier Systems
- Communication Theory
- Signal Processing
- Voice and Image Processing
- Communication Electronics
- Data and Computer Communications

Specific session topics under consideration include:
- Computer Network Security
- Effects of Regulation/Technology on Radio Spectrum
- Professionalism and Trends in Engineering Education
- Environmental Effects on Telephone Systems.

ABSTRACTS: Five copies of the proposed paper plus a one-page summary are due by June 1, 1976.

OTHER: Send papers to:
Gerald D. Haynie, Chairman
Technical Program Committee
NTC-76, Room 3E-231
Bell Telephone Laboratories
Holmdel, New Jersey 07733

On February 4, Mike Freeman of the Vocal Interface Division of Federal Screw Works demonstrated Votrax ML-1 at the Technical Center (50) auditorium. He contacted a G.E. computer over the telephone which supplied, through a terminal, data input to the Votrax. The electronically synthesized voice then explained its operation, sang a simple musical scale, and demonstrated its versatility. Mike typed a few words into the keyboard and explained briefly how a word must be separated into phonemes and that inflection and rate must be specified.

Votrax is the only speech synthesizer on the market. An alternate approach is digitizing human speech and storing it on ROM. This is an inexpensive means of achieving a small vocabulary. For example, the talking calculator (Photo and story on back page of January 30 TEKWEEK) has a vocabulary of twenty-four words with a packing density of about 64 bytes per word. The speech is a little unnatural, but can be easily understood after a few minutes. There is speech processing involved, since brute force digitizing requires about 1024 bytes per word.

Voice recognition by a machine is more difficult to achieve. A machine can be programmed to interpret input from one person, but problems arise with the different speech patterns from different people. Stray sounds must also be filtered out. If you are interested in electronic speech synthesis or voice control of electronic devices, contact Robert Chew, Instrument Research at ext. 7020.

IDG TECHNICAL REPORT

Jack Grimes, IDP Engineering, authored an IDG Technical Report entitled, "Memory Technology 1." It is part one of a two part article on memories. The first part is about Read/write RAM and MOS CCD memories. The next part will discuss magnetic media.

In this report Jack compares R/W RAM against CCD memories. He supports R/W RAM with a series of favorable statistics, while comments on CCDs as memory devices are more cautionary.

The R/W RAM rate of technology progression curve is nearly straight, domainated by IBM and Intel. The 16K Intel device has the highest bit density so far, but predictions indicate future 64K, 128K and 256K devices. The uppermost limits in memory density is 10^7 on a 400 x 400 mil chip, but this density is not expected until 1981 at the earliest. Cell density is limited by the wavelength of light used in the mask exposure and the space taken up by support circuitry on the chip, but high density must be balanced against the yield rate to produce economically desirable devices. Cost of R/W RAM is predicted to reach .005 per bit by 1980.

Next, Jack reports on digital applications of CCD memory. By pointing out that maximum density of the CCD is no better than for transistor R/W RAM, and that current processes are at least as complex as for R/W MOS RAM, he concludes that CCDs offer insufficient advantage over R/W MOS RAM.

Analog CCD memory is viewed more favorably, with transient digitizing, time delay, and filtering cited as "especially neat."

Jack observes that as long as CCDs share much of their process technology with MOS RAM, they will offer no significant advantages as memory devices.

This report is Company Confidential.

Copies of IDG Technical Reports are available at the Tek Library, 50-210.

Maureen Key 60-553