ENGINEERING NEWS

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COMPANY CONFIDENTIAL

MICROPROCESSOR SUPPORT AVAILABLE

As a new service to design engineers, a user-responsive Microprocessor Support Group was created within the S.C.C. to support microprocessor development at Tek in both software and hardware.

Software aids include packages supplied by microprocessor manufacturers as well as programs written in-house. These software packages allow the microprocessor user to do software development on our CDC timeshare system. When the programs are compiled or assembled into machine language, they can be loaded into the user's microprocessor system over ordinary phone lines for testing, or written into programmable ROM.

Hardware aids currently being studied are standardized test systems, in-circuit emulators, and user PROM facilities. Hardware support will include development of aids for design engineers, as well as acquisition and distribution of aids developed by product groups.

Bill Lowery, head of the newly formed Microprocessor Support Group would like to create a Microprocessor Users' Group. This group, comprised of hardware/software engineers will meet once a month to discuss developments within the Tek product groups, current and projected support offered by the Microprocessor Support Group, and methods by which the Microprocessor Support Group might better provide aids to the Tek engineering community. An additional function of the group will be to disseminate information relating to new products and new forms of support offered to Tek by microprocessor manufacturers. They will also provide a unified body to voice Tek's needs to industry.

The group will be composed of one engineer or software designer from each group desiring representation.

Group managers who wish to send delegates to the Microprocessor Users' Group are requested to contact Bill Lowery, del. sta. 50-454, extension 5865.

A.M.I. TO DO TEK WAFER FABRICATION

In recent months Tek Labs has been negotiating a MOS wafer prototype and production agreement with American Microsystems Inc. (AMI). The intent of Tektronix has been to procure a long term contract which specifies acceptable turnaround times and reasonable prices for wafer fabrication, even though the volume may be low.

AMI is one of the oldest and most reliable suppliers of custom MOS circuits in the world today. It was this reputation which prompted us to go with them. AMI's home office, engineering facility and R&D labs are located in Santa Clara, California. Their manufacturing lines are in Pocatella, Idaho.

The agreement contracts AMI to do wafer fabrication only. Circuit design, mask making, testing and packaging will be done here. This working relationship will preserve the proprietary nature of our designs and the ownership of the tooling. AMI is making available to the Tektronix MOS IC designer all the processes that are available to their own designers. This includes a P-channel Si Gate process that is compatible with our inhouse process. In addition, we will now have access to N-channel Si Gate with or without a depletion load, and CMOS. These extra processes greatly expand the variety of circuits we can do in custom MOS. AMI has supplied us with all the necessary documentation to design with these processes. They will act as paid consultants when necessary.

When AMI delivers wafers to us, they will test them to be sure that the electrical characteristics (threshold voltage, breakdown voltages, etc.) are within tolerance. They will also replace any wafers lost due to poor workmanship on their part. They will not guarantee functional probe yield. However, there is no reason to believe the yield on our circuits will be different from AMI's normal circuits.

Mike Connell

GLASS SHOP SMASHING SUCCESS

There are little old glassmakers at Tektronix and they'll make just about anything you can think of out of glass. Located on the second level of Building 50, Keith Deardorff, John Swartzfager, and Gary McRobert live in a roomful of equipment and they bend, bond, cut, form and blow glass into many different shapes.

Often someone simply needs spouts or nozzles added to standard Pyrex beakers, or the shape of a glass item modified to perform a certain function. Condensation tubes are popular and consist of irregular glass shapes within larger glass envelopes, usually accompanied by a confusing array of nozzles, spouts, flanges, caps, and tubes. This special glass shop also bonds glass to ceramics and some metals; tungsten, molybdenum, Kovar and others.

IC Support

For the IC groups, the glassworkers build gas flow apparatus, construct boats (wafer carriers), do repair work on damaged equipment, put handles on beakers, and do precision glass cutting jobs on mirrored reticules for the mask department.

Equipment

The glass lathe is primary equipment in this shop. It is a large rotating vise with two aligned chucks which operate at variable speed, heat sources in the form of various burners, controls for the many gases they use, a pilot light for igniting the burners, and an apparatus for blowing glass.

There are two different types of chuck to choose from, depending on the material to be held. Some chucks are modified for holding large pieces of glass, beakers, and metals. Others are similar to drill press chucks, for holding small pieces.

The most frequently used torch is similar to an oxy-acetylene hand-held welding torch. Other hand-held torches produce large encompassing flames for annealing glass after it is worked. Some burners are mounted in a semi-circle and produce flame below a horizontally mounted glass piece.

The type of flame varies with the work. Fine, tightly controlled and very hot work is done with a Hydrogen-Oxygen mixture. More general heating uses a Natural Gas-Oxygen mixture. There is a control panel on the lathe with assorted valves from which the various gas combinations can be selected.

Carton-tipped hand tools and carbon rods help in shaping and forming the hot glass.

Occasionally repair jobs contain traces of lethal chemicals. Because air pressure is sometimes necessary in forming large diameter glass tubing, and careful control of the air flow is vital, a breath controlled blowing apparatus was devised. The operator's breath, through a diaphragm type regulator, controls the flow of compressed nitrogen to the work piece.

Annealing

When a piece of glass has been heated and worked, whether joined, shaped or bent, stresses form that might cause a break. Glass should be annealed at high temperatures to remove the stress areas. This can be done either with the gas/air torch or one of the annealing ovens in the area. One large oven for annealing quartz operates at 1150 degrees C.

Safety

Recently Keith showed members of the Northwest Chapter of the American Scientific Glassblowers Society the safety features of the Tek Glass Shop.

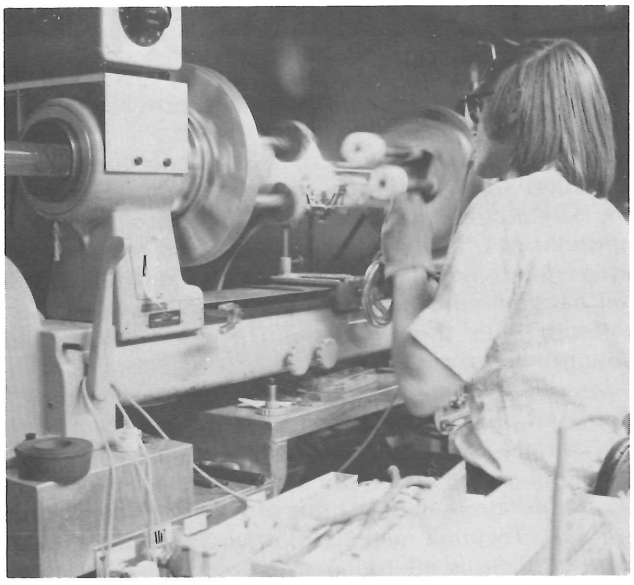


Figure 1. Gary uses the Glass Lathe to make a glass-to-metal seal.

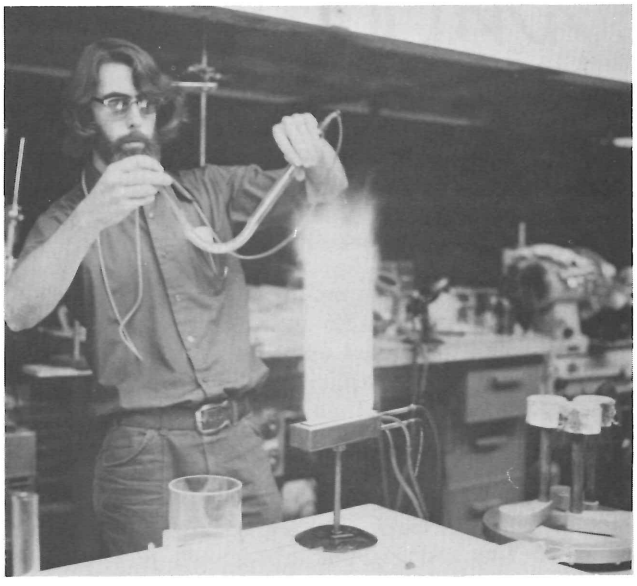


Figure 2. Keith uses a ribbon burner to bend a piece of tubing.

Figure 3. Keith (left) and John examining a beaker handle for strain patterns with a polariscope.

Because Hydrogen is flammable, a Hydrogen detector has been installed which will close the gas lines below the floor if the Hydrogen in the air approaches an unsafe level.

Hoses and connectors have been changed to comply with all applicable safety codes. Tek's full compliance with safety codes in the Glass Shop will probably establish a precedent in other Oregon Glass Shops.

Part of Engineering Tube Lab

The Glass Shop shares a common area, facilities, and manager with the Seal and Exhaust operation. Many of the glass operations involved in Lab glass fabrication and CRT glass fabrication/sealing require essentially the same facilities. The products may differ, but the skills required are similar. When possible, these similar skills are cross utilized as required.

For further information about the Laboratory Apparatus Glass Shop, call Keith Deardorff, John Swartzfager, or Gary McRobert, ext. 7645.

JOHN OWEN DISCUSSES GOALS

John Owen has a foot in both camps and likes it that way. As the first occupant of the Tektronix chair of Electrical Engineering at Oregon State University he says that it is so important to him to combine a liaison with industry with his academic activities that he prefers not taking a straight teaching job. Right now, he is lecturing full time at Oregon State. During the winter term he will also be lecturing in the M.S.E.E. graduate program at Tektronix. His special topics include solid state semiconductor materials. He is most interested in "heterojunctions"—those junctions that occur when two semiconductor materials are combined. These juctions have properties that are useful in lasers and in solar cells. He cited the Gallium Arsenide—Gallium Aluminum Arsenide heterojunction as an example.

In addition to heterojunctions, John says he would like to concentrate on electroluminescent devices and phosphors.

A personable and pleasant man, John may already be familiar to many engineers at Tek. He is spending one or two days a week here, primarily in the labs. He is impressed with the cooperation he has already encountered. He hopes to listen, talk and possibly give advice, whenever possible.

John comes to Tektronix from the University of Nottingham where he has lectured and conducted research for the past ten to twelve years. Among the many topics he has lectured upon are: material properties, electrical theory, electromagnetism, networks, communications, solid state electronics, direct energy conversion, and semiconductor theory.

He holds both a B.S. and Ph.D. in physical electronics from Nottingham. He has done research on the absorption and stimulated emission of radiation at microwave frequencies. Other work has included epitaxial growth of semiconductors, photocathodes, nucleation studies and the reflection of low energy electrons from surfaces.

During 1968-1969 he was in the United States teaching at the University of Alabama and NASA. He taught quantum electronics, solid state electronics and semiconductor theory and devices.

He coauthored a book with J.E. Parton entitled "Applied Electromagnetics" published by MacMillan, 1975.

John can be reached at OSU at 754-3617, or through Harley Perkins at Tektronix. Harley's extension is 6186.

CALCULATOR INSURANCE 1976

Tektronix is again offering calculator insurance to Tek employees. The annual premium of $2.00 per hundred dollars of value covers a calculator from January 1, 1976 to January 1, 1977 through the Travelers Indemnity Company. Enrollment period ends December 24. There is a $25 deductible applied to each claim.

For complete information and a schedule of premium charges, contact Nancy Mowlds, ext. 7679.

Modular Button Switch (M.B.S.) Contact Insertion Machine

In the M.B.S., metal contacts must be inserted in the proper positions in the 10mm and 7.5mm contact holders. The 4 position, 10mm contact holder has 15 possible combinations, and the 2 position, 7.5mm holder has 3 possible combinations.

An M.B.S. Contact Insertion Machine was designed and built to do this job without wasting contacts in the void positions. Dale Rath, Mechanical Engineering Support, was responsible for mechanical and overall machine design, and Bill Renfro, CRT Electrical Design, designed the electronic controller.

The machine consists of four main parts; the metal contact feeding and positioning system, the plastic contact holder feeding and positioning system, the metal contact cutting and insertion system, and the electronic controller.

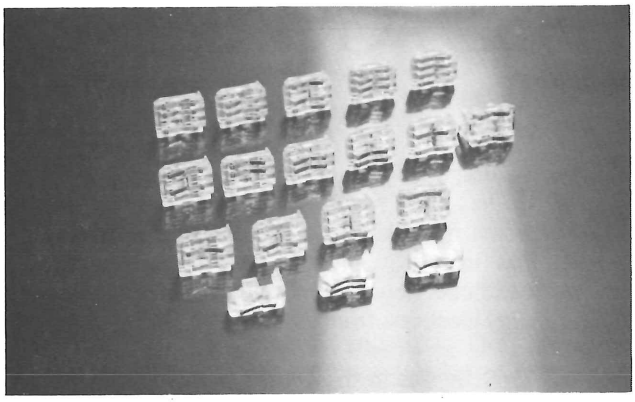


Figure 1. There are many possible combinations with the M.B.S. plastic contact holders.

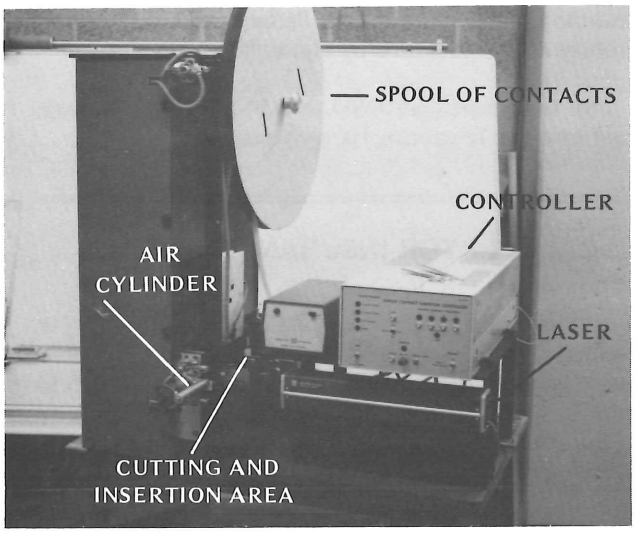


Figure 2. The M.B.S. switch contact insertion machine.

Machine Operation

The operator inserts one end of a spool mounted contact strip into the feed roller sprocket. The contacts are fed into the cutting area until the strip automatically stops. This is the zero index position. When the metal strip interrupts the light from a low power laser, it prevents the light from passing through a flat ribbon light pipe (.0015 inches in diameter), and thus turns off a photo transistor. The loss of this signal tells the controller to stop the stepping motor from driving the strip.

The operator then programs the controller to select the proper contacts for a specific switch by turning on the toggle switches in any combination. To activate the correct cutter, the operator turns on the run switch. The controller then starts the stepping motor and drives the contact strip forward to the lowest position.

Empty plastic holders must be fed into the clamp mounted on the air cylinder. A cartridge full of holders feeds the holders to the clamp. The cartridges are presently filled with holders by hand, taking approximately two-thirds of the operator's working time. The rate of loading cartridges determines the rate of insertion which is currently 750-850 per hour. As requirements increase, an automatic loading system will be developed. With a ready supply of filled holder cartridges, the machine can insert contacts in about

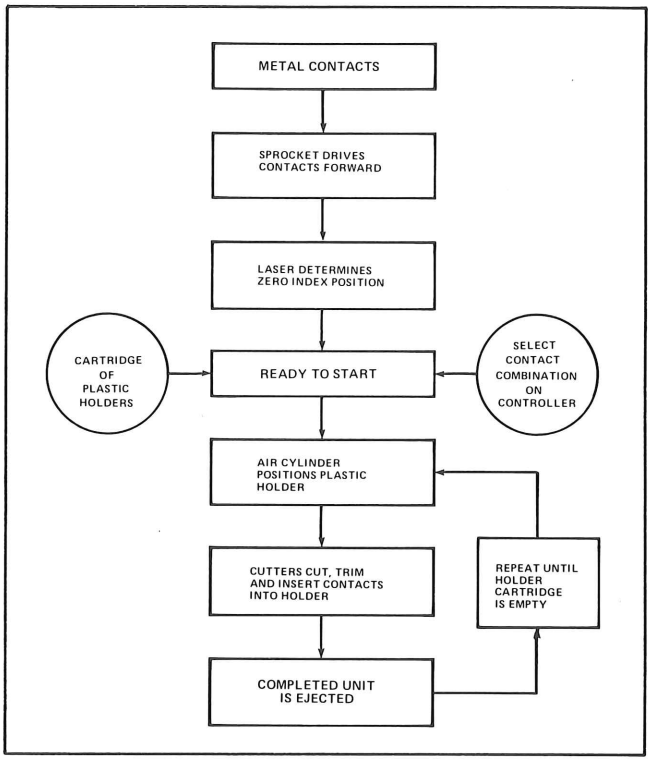


Figure 3. Flow chart of the operation of the insertion machine.

1700 plastic holders an hour. That figure will vary with contact configuration and quantity per holder.

When a plastic holder is in place, the controller actuates an air cylinder that clamps the holder against a metal surface where the contacts will be inserted.

One hundred microseconds after the air valve closes, the controller fires the proper cutter and a metal contact is cut from the strip and fed into the plastic holder. If the machine jams, a photo transistor will signal the controller to turn the machine off.

When the cutter completes its stroke, the light signal to the photo transistor causes the air cylinder to retract and return to its original position.

After the cutters have retracted and signaled the controller that the cutting operation is complete, the controller repressurizes the cartridge, a new plastic part is fed to the clamp and the operation is repeated.

When a switch configuration requires that a space be left empty, the machine will cut the lowest position first and then back up past the space and cut the top position. In this manner the machine is always cutting the end contact from the strip and there is no waste.

Dale Rath

What Price Value

Born in a humble Alpenhut in Switzerland, John Reichen has come a long way to his present position in Switch Engineering. Retired from the Swiss Navy, John recently received his 20-year pin at Tektronix.

In 1963 he became interested in Value Engineering at a series of workshops on the subject. In October of 1973 he became a Certified Value Specialist (CVS) with the Society of American Value Engineers (SAVE) and is currently active in SAVE and Value Engineering.

VALUE ENGINEERING

Faced with material shortages at the end of WWII, the world needed to make better use of available resources. The development of Value Engineering (VE) was partly a result of this need. VE is recognized in the U.S. and abroad as a means of finding the best compromise between necessary functions and optimum cost. It is usually applied to customer goods hardware, but can be applied equally well to any area that generates cost, such as processes, services, education, construction, or electronics.

Function and Value

Like a doctor's stethescope or an Electrical Engineer's pocket calculator, the Value Engineering Specialist has Work-Sheets, Task Teams, the Job Plan, and Techniques. What distinguishes VE from other cost methodologies is that VE relates FUNCTION and VALUE rather than using a straight items-to-cost analysis.

FUNCTION makes a product work or sell.

VALUE, in VE, is different from cost. It is a relationship between cost and attainment of desired function. Of the many kinds of value, the two most important in VE, here applied to a knife, are:

Use Value – that which makes something perform a function.

The blade of the knife.

Esteem Value – that which makes us want to own it.

A carved ivory handle.

The relationship between function and value in a particular item is determined by the answers to the Five Key Questions:

1. What is it?

   A knife.

2. What does it do?

   Fit hand, cut material, it is sharp, looks nice.

3. What must it do?

   Cut material (Primary function).

4. What does it cost?

   $8.00 (Because of the ivory handle).

5. What is it worth?

   $1.00 (The blade is the primary function).

Job Plan

A VE study progresses from these questions through a systematic five-phase Job Plan:

A. Acquisition of Information – a fact finding phase where the functions, costs, and values of the study item are thoroughly defined.

The knife has a sharp, durable blade. The carved ivory handle is expensive. Although the ivory blade sells knives, increasing ivory costs make the knife less profitable.

B. Brainstorming – finding other means of performing the primary function.

Plastic handle; plain ivory handle; plain wooden handle; no handle; etc.

C. Creative Analysis – evaluate each means found and select the most worthwhile ones.

Plastic handle is inexpensive but looks cheap. Plain ivory handle lasts long and is attractive, but is very expensive. Plain wooden handle is functional, attractive, and inexpensive.

D. Development – selected means are refined and readied for the change proposal.

Plain wooden handle performs required function at acceptable cost.

E. Execution – a proposal is presented to management. Proposal status and results are periodically reviewed. The new realizations are disseminated.

Advantages of plain wooden handle are reported to those who will implement the change. Records of production costs and sales figures are kept.

Techniques

VE studies are most effective when carried out by task teams composed of representatives of different areas in a company. Vendors should be consulted and options considered. VE teams usually use worksheets and checklists for each phase. There are many techniques used by VE specialists to evaluate functions. Let's apply some of these techniques to our example.

Analyze the functions.

Answer the Five Key Questions.

Work on specifics, not generalities.

Get complete information about specific plastics and methods of making them into a handle; casting, vacuum forming, extruding?

Use good business judgement.

Will savings pay for the cost of the change?

Get all available costs.

Materials, labor, burden, tooling.

Put a $ value on constraints.

Consider OSHA, UL.

Get information from reliable sources.

Purchasing, Cost Accounting, Manufacturing, Marketing.

Determine the value of the primary function.

What is the cutting function worth?

Evaluate by comparison.

Ivory vs. wood vs. plastic vs. metal. Alternate means of cutting?

Many of these techniques are not entirely new. They were and still are used by people outside of Value Engineering. However, the organized methods of VE systematizes their application to achieve the wanted function with the essential features at optimum cost.

J.E.C. INFORMATION

In the November issue of Engineering News we printed a story on the progress of the Job Evaluation Committee (J.E.C.) and how it will affect pay ranges. Unfortunately, we were supplied with accurate but misleading information from the Compensation Department. It was stated that of the ten members of the Chairperson's J.E.C., three were engineers. While this statement is true, it should be noted that none of these three is now a practicing engineer, and all three hold better than first level managerial positions.

COMMITTEE MEMBERSHIP

A list of who is on what committee would be useful for anyone who wanted to address problems or comments to a specific group. For example, who do you contact if you want to say something to the American National Standards Y14.5 Committee?

How would you like to make your membership on a committee a more useful tool for Tektronix? By filling in the following blanks and sending the information to ENGINEERING NEWS at 50-462, you can help us compile and publish a list of committee membership among Tek personnel. Thank you.

NAME: _____

DEPT: _____

YOUR COMMITTEES: _____

_____

_____

_____

_____

RETURN TO: 50-462

POWER CONVERTER CIRCUIT

Are you interested in power converters on the low end of the power range (around 15 w or less) with high efficiency, simple circuitry, overload protection, and very wide variations in line voltage and load current? You might be interested in a general concept which I've found appealing.

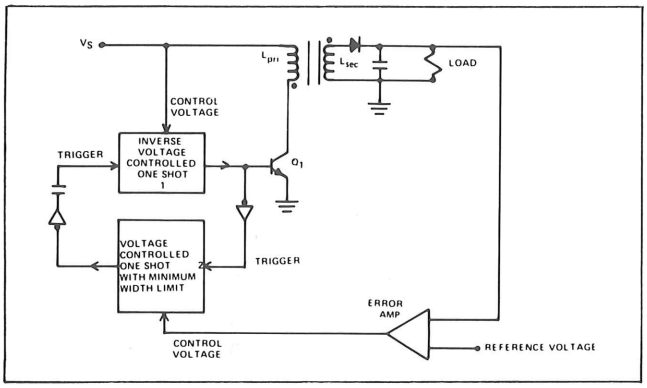


Figure 1. Block diagram of a blocking converter.

Refer to the block diagram of the blocking converter shown in figure 1. Power is transferred from the line to the power transformer core when Q_1 is on, and from the core to the load when Q_1 is off. In more detail, the transformer is "charged" as an inductor with current ramping linearly upward from a zero level when Q_1 is on, and "discharges" as an inductor with current ramping linearly downward to zero when Q_1 is off. The amount of energy transferred through the transformer in one cycle, which I will call an energy packet, is controlled by V_s, $t_{Q\,on}$, and L_{pri}, by the relationship:

$$E = \frac{(V_s t_{Q\,on})^2}{2L_{pri}} \quad \left(\text{Derived from } V = L\frac{di}{dt} \text{ and } E = \frac{LI^2}{2}\right).$$

If the $V_s t_{Q\,on}$ product is kept constant E will be a constant and open loop line regulation will be achieved. This is the purpose of block 1. It maintains roughly equal sized energy packets regardless of line variations. To achieve closed loop load regulation one must control how often energy packets are transferred. That is the purpose of block 2. This one shot must have a minimum width to ensure that each energy packet is completely transferred from the transformer secondary to the load before another packet is assembled on the transformer primary. This will also provide a power transfer limit for overload protection.

To implement the circuit you'll need to calculate valves for L_{pri} and L_{sec}, the transformer's primary and secondary inductances. For a symmetrical waveform:

$$L_{pri} = \frac{\eta V_s^2}{8P_o f} \qquad L_{sec} = \frac{V^2_{sec}}{8P_o f}$$

where: η = the transformer efficiency

$V_s \approx$ the voltage impressed upon the transformer primary

V_{sec} = the voltage impressed by the transformer secondary on the load

P_o = the maximum output power

f = the maximum frequency of operation.

Figure 2 shows a partially evaluated implementation. This uses a 555 timer IC, which makes things pretty simple. The 11k resistor and 1nF cap form the t_{Q_1} on timing elements. The photo transistor and 1nF cap form the t_{Q_1} off timing elements. The 5.1k resistor sets the minimum t_{Q_1} off time, and the 510k resistor provides for startup capability. Incidentally, Q_1, Q_2, the diode, the 1k resistor and the 100nF cap can all be replaced by the VCM-1 VMOS device, which will result in switching speeds of near 5 ns.

Getting back to generalities, the circuit concept's main advantage is wide line voltage and load current capability. Disadvantages include: (1) High primary and secondary peak currents (4 times I_{ave}) and (2) Residual current oscillation during the dead zone time between the completion of the secondary discharge and the beginning of the primary change. Bruce Campbell, extension 6740.

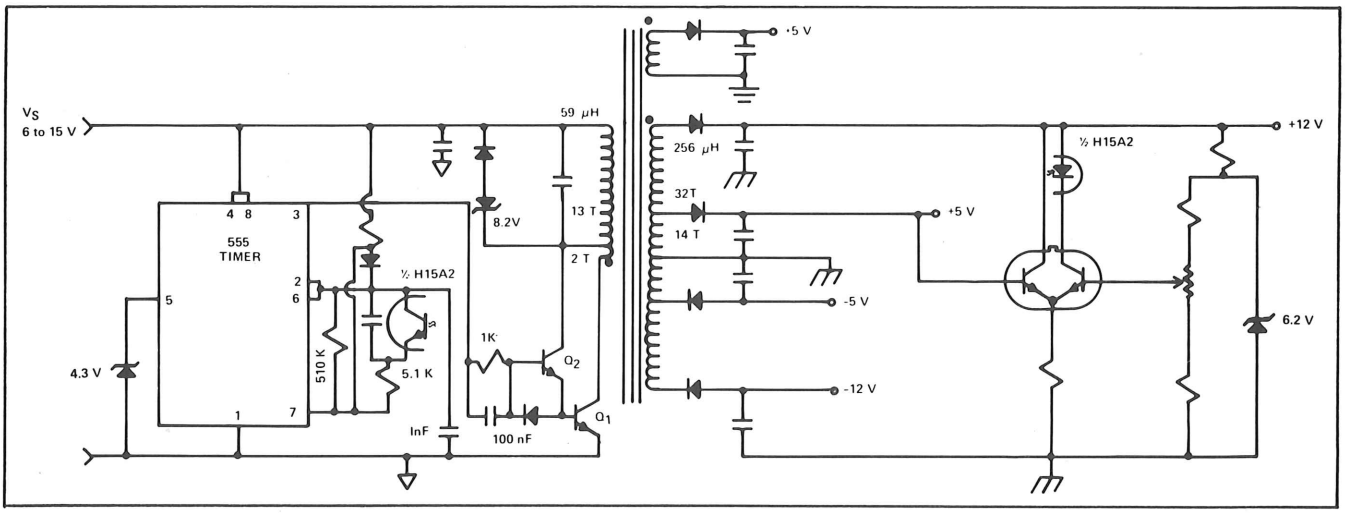


Figure 2. A preliminary circuit using a 555 timer for independent line and load regulation.

Typeless Operand in CDC FTN Fortran

A typeless operand is not type REAL, type INTEGER, type COMPLEX, or type DOUBLE, yet it can exist within arithmetic expression. CDC has invented a typeless operand which is not documented. A description has been assembled. To get a copy for yourself type: **-WRITEUP,TYPLESS.**

After the execution of the following Fortran statements, one might expect the values of X and Y to be the same.

```
REAL X,Y

10   X = 20B

20   Y = 10B + 10B
```

However, Y will have the real value 16.0, while X will have the integer value 16. The cuase of this irregularity is the fact that octal constants are typeless. Typeless operands are not unusual. In addition to octal constants, typeless operands include Hollerith constants and certain inline functions such as SHIFT.

The following four rules govern the behavior of typeless operands within arithmetic and relational expressions. They do not apply to logical or masking expressions.

1. Typeless operands are never subjected to type conversion, even in simple replacement statements. (As in statement number 10 above.)

2. When evaluating an expression, a typeless operand is used as if it has the type of the dominant operand within that expression. The order of dominance of operand types from highest to lowest is COMPLEX, DOUBLE, REAL, INTEGER, and LOGICAL.

3. When evaluating an expression in which all of the operands are typeless, the expression is evaluated as if all of the operands are of type INTEGER, and the expression becomes type INTEGER. (Statement 20 above.)

4. An evaluated mixed-mode arithmetic expression always has a type. That type is the type of the dominant operand. (Statement 20 above.)

An arithmetic expression is a set of arithmetic operands combined by arithmetic operators and parentheses which, when evaluated, produce a single-valued result. Arithmetic operands are constants, variables, and functions which may be typed or typeless.

Some more examples. . . .

```
30   X = Y + 10B
```

In statement 30 above, the octal constant 10B takes the type of the dominant operand Y (Rule 2), and is treated as if it is type REAL. The octal constant is not converted. A floating-point add is done and the sum is stored into X. The octal constant has a floating-point value of zero (because its exponent is zero), thus leaving X equal to Y after the statement has been executed.

```
INTEGER

40   X = Y + I + 10B
```

In statement 40 above, the integer I is floated before the addition, but the octal constant 10B assumes the mode of the dominant operand Y (Rule 2). As in statement 30, the octal constant takes a floating-point value of zero.

```
50   X = I + 10B
```

In statement 50 above, the dominant operand type in the arithmetic expression is INTEGER. An integer add is performed (Rule 2) and the result is floated and stored into X.

```
60   X = Y + (10B + 20B)
```

In statement 60 above, the arithmetic expression within the parenthesis is treated as type INTEGER and an integer add is performed (Rule 3). The resultant operand is floated, a floating-point add to Y is performed, and the sum is stored into X.

```
REAL Z(99)

70   X = Z(I) * 64

80   Y = Z(I) * 100B
```

In statements 70 and 80 above, we see two apparently similar operations. In statement 70, a typical mixed-mode arithmetic expression, the constant 64 is floated and the floating-point product is stored into X. In statement 80, the octal constant 100B assumes the mode of the dominant operand Z (Rule 2), and the floating-point product is stored into Y. The resultant Y will always be zero because the octal constant 100B has a floating-point value of zero.

The four rules for typeless operands also apply to relational expressions. A relational expression is a combination of two operands with a relational operator. Either of the operands may be an arithmetic expression of a typeless operand. The following are the relational operators.... .EQ., .NE., .GT., .GE., .LT., and .LE..

```
90    X = 20B

100   IF (X .EQ. 10B) CALL ABORT
```

In statement 100 above, the call to ABORT will be executed. In statement 90, no type conversion is done (Rule 1), and X is left with a floating-point value of zero. In statement 100, a typical relational expression, the octal constant 10B assumes the type of the dominant operand X (Rule 2), a floating-point subtract is done, and a test for a zero result is made to determine equality. In this case, both X and the octal constant 10B have a floating-point value of zero and the expression is true.

HELP,XXXX (Reprinted from last month)

The following is a list of utility programs developed by the Scientific Computer Center group. For in-depth information on any of the following, type HELP,XXXXX (where XXXXX is the name of the particular program).

If you type HELP,INDEX, you'll receive a list of everything that has an explanation listed under HELP.

Utility Programs

CHARGES - This program will tell you how much money you've spent during the current period.

NEWTAPE - Will assign you a new, blank library tape. For complete information, type HELP,TAPELIB.

TF - A tape file system which may be used to save and restore files using either the 7 or 9 track drive.

BACKUP - Saves all indirect access files in your catalog on either the 7 or 9 track drive in a TF format.

SCRIBE - An interactive character-based text editor with much more power than EDIT.

BARB - A batch program for producing formatted write-ups. Type -WRITEUP,BARB for a complete BARB document.

XFER - A fancy copy program with multi-file and merging capability. Type -WRITEUP,XFER for a complete XFER document.

USERS - This often explains why the system is running slow.

EX - An easy way to execute FORTRAN programs. Writeups are available in the computer room.

LUCY - A medium to register praise or complaints.

PRINT - A procedure for printing a file which has no carriage control characters. Type HELP,PRINT.

BUTTER - A set of FORTRAN subroutines to read or write some (but not all) non-standard tapes. Type HELP,BUTTER.

HEADING - Puts a page of block lettering on the front of a file. Type HELP,HEADING.

SAMTOP - A procedure for sending a message to the operator and receiving a response.

MACHINE - The MACHINE command provides a graphic way of looking at how the Cyber 70 computer system's resources are being used. A Tek 4010 family terminal is required.

TIDY - A program to clean up code and re-sequence statement numbers in a FORTRAN program.

NEWS - Should be typed first thing every day. It lists items important to users.

TAPES - This program will list all magnetic tapes currently assigned to your user number. For information, type HELP,TAPELIB.

STRUCTURAL ANALYSIS PROGRAM SAP IV

SAP IV is a computer program which uses the State of the art analysis of finite elements. (Finite elements are the individual sections of a whole structure broken down into simple parts.) Near solutions are generated for complex structures which are defined by a linear equation ($m X + K X + C X = 0$, where m = mass, K = damping constant, and C = spring constant). Analysis of a structure with finite elements provides a solution (forces and displacements) anywhere in that structure. It also permits external forces (heat, load, etc.) to be applied to any element in the structure.

Analysis of finite elements for Mechanical Engineers is similar to the program SPICE for Electrical Engineers. Progress in high technology design becomes a function of the latest in analytical methods.

Before finite element analysis, numerical methods and lumped systems (general parameters and simplified assumptions) were the structural analysis methods available to the M.E. The end result was related to time, testing facilities, and the degree of "good enough." SAP IV can lower the time, and replace "good enough" with specific limits.

SAP IV has an element library of flat plates, 3 dimensional beams, boundary elements, trusses, pipe sections, etc. Using basic elements from the above library, one can examine very complex structures. SAP IV is a Fortran compiled program, but uses its own program language. Identification numbers are assigned to material, load case, cross section, etc. The program analyzes the structure element by element and then uses superposition to achieve a solution for the total structure.

Barry Ratihn, Extension 6565

WEEKLY KRONOS CLASS

The Scientific Computer Center conducts a class on every Wednesday 10 AM-noon in Building 50 conference room 49. The class is essentially a bull session to deal with any computer-related topics. We particularly stress the KRONOS control language and KRONOS system architecture.

Roy Carlson 7668

Attention Inventors

Simply put, all inventions which **relate to Tektronix business activities** must be assigned to the company. This is true even if the invention is made on the employee's own time and without the use of Tek facilities or material. If Tektronix is not interested in protecting or making use of an invention, however, it will ordinarily be released to the inventor with Tek retaining a nonexclusive, royalty free license.

Tektronix is also entitled to "shop rights" to inventions which are **not** related to the company's business activities, but which are made using Tek facilities, material, or on Tek time. That means that Tektronix has the rights to use the invention in its business without paying royalty to the inventor.

Finally, Tek has no legal interest in inventions which are made by an employee using his own time, money and materials, and which do **not** relate to Tektronix business activities.

If you have a question about whether an invention "relates to Tektronix business activities," or if you want to get a release on something you've invented, contact the Patents and Licensing Group, del. sta. 50-419.

John Winkelman

shocking situation

Users of the Optimation AC 126 Calibrator are warned that it is possible to make physical contact with the set screws on the front panel knob. This exposes the operator to a potential shock hazard. Under some normal operating modes and in certain failure modes the set screws on the front panel knob may be elevated from ground (and the front panel) by more than 100 volts at a current capacity in excess of 50 mA. If there are any questions, contact Gene E. Brox, ext. 5397. Delivery station 58-188.

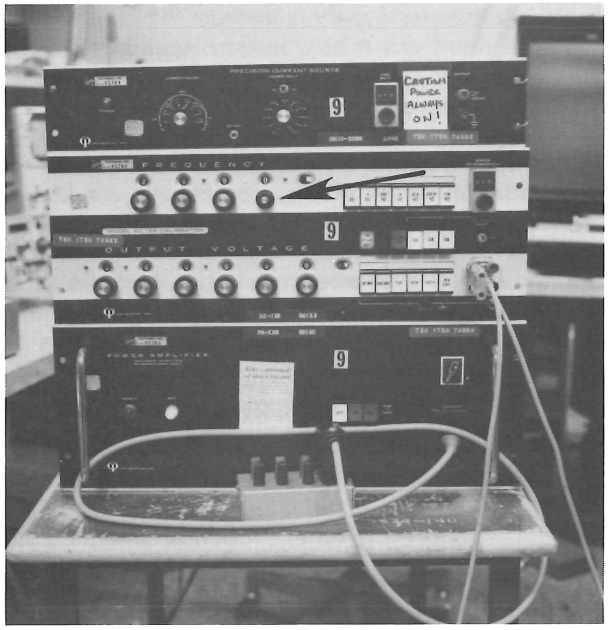


Figure 1. Arrow indicates knob with protruding setscrew which carries potentially lethal voltage.

Engineers at Kodak Seminar

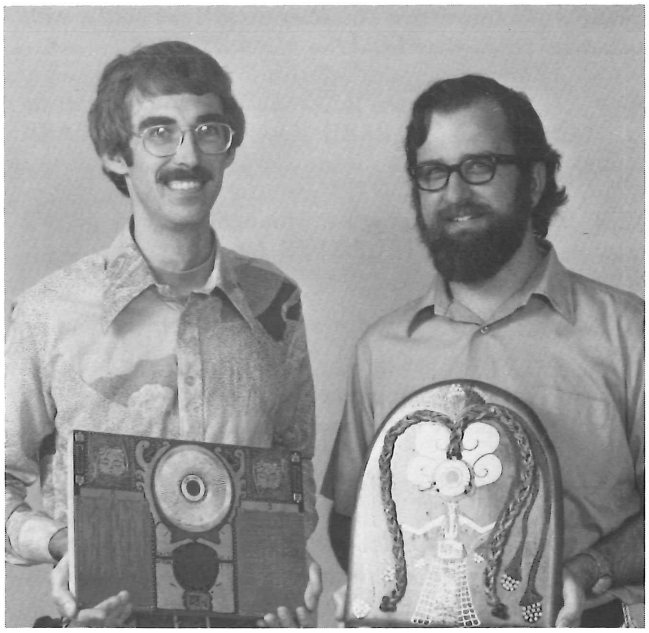
Larry Land, M.C. Engineering, and Phil Schierer, Analytical Instruments, presented papers at the KODAK MICRO-ELECTRONICS SEMINAR, October 20-21, 1975 in Monterey, California.

Larry's paper entitled "Projection Versus Contact Printing in Hardware Photomasks" is an evaluation of a 1:1 projection photomask printing camera as compared with the present contact printing technique. He included performance in the areas of resolution, defect generation and mask runout. The effects of various hard surface photomask materials such as chrome, iron oxide, and chrome/chrome oxide on the results obtained were presented in his evaluation.

The title of Phil's paper is "Photoresist Exposure Cameras Measured with a Rapid Scanning Spectrometer." The optical characteristics of various photoresist cameras were measured with a rapid scanning spectrometer to determine the optical parameters adversely affecting camera performance. While test results were applicable to the Photoresist exposure cameras, the potential of the rapid scan spectrometer in measurement problems was also considered.

Authors giving papers were presented with plaques made by Holly Sweeney of Mt. Holly Springs, Pennsylvania. Each plaque is a carved and painted wood background with EC boards, IC chips, wiring harnesses and other electrical components used to form the design.

Ms. Sweeney has published a collection of her works, both pictures and text, called "Sixteen on the Silicon Age," printed by Capitol Press, Harrisburg, Pennsylvania.



Phil Schierer (left) and Larry Land with the plaques they received for speaking at the Kodak seminar in Monterey.

IN PRINT

Ben Buisman, Marketing Portables, wrote an article which appeared in the November issue of PERSONNEL JOURNAL entitled, "4-Day, 40-Hour Workweek: Its Effect on Management and Labor." It tells of the accomplishments of labor unions in making the 5-day, 40-hour week standard in the U.S. It then describes the different forms of the 4-day week, and gives the arguments of labor and management for and against changing the working structure. Results of attempts by many companies are given, as well as a look at the future.

Norman Franzen, Real Time CRT, and Ross Speciale, High Frequency Lab Scopes, co-authored a paper at the Fifth European Microwave Conference entitled, "A New Procedure for System Calibration and Error Removal in Automated S-Parameter Measurements." The basic procedure is described, reference standards defined, and a set of equations is discussed in detail.

Raymond Hayes, Signal Processing Devices, wrote a paper which appeared in the October, 1975 IEEE Transactions on Electron Devices entitled, "A Silicon Diode Array Scan Converter for High-Speed Transient Recording."

High-Speed Transients and low-repetition-rate signals are often difficult or impossible to capture with conventional processing and display circuits. A scan converter tube was developed which uses a silicon diode array to capture the signal at high speed. A reading gun reads the information at speeds compatible with conventional processing and display circuits. The information can also be digitized for computer storage and analysis.

The Scan Converter is used in the R7912 Transient Digitizer.

Ross Speciale, High Frequency Lab Scopes, authored a paper in November, 1975 IEEE Transactions on Microwave Theory entitled, "Even- and Odd-Mode Waves for Nonsymmetrical Coupled Lines in Nonhomogeneous Media." With a simple analysis of the eigenvectors, representing the fundamental uncoupled wave modes of a pair of nonsymmetrical coupled lines in nonhomogeneous medium, he proves that these two modes reduce, under a given condition, to an even mode with equal voltage magnitudes and an odd mode with equal current magnitudes and opposite polarities.

Note: All articles **IN PRINT** are available in the Tek Library, ext. 5388.

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

The 1976 IEEE Power Electronics Specialists Conference will be held June 8-10, 1976 at the NASA-Lewis Research Center, Cleveland, Ohio.

SPONSOR: Aerospace and Electronic Systems.

TOPICS: Areas of particular interest, dealing with component/circuit interactions, include but are not limited to:

Power Devices and Components
Power Circuits
Innovative Applications.

ABSTRACT: Submit 6 copies of a 300-500 word summary and 2 copies of a 35 word abstract by December 5, 1975.

OTHER: Submit papers to:

Program Chairman Forest Golden
General Electric Corporation
Box 30, West Genesee Street
Auburn, New York 13021
(315) 253-7321 Extension 227.

The 1976 Power Tube Specialist Conference will be held on March 16-18, 1976 at the Naval Post Graduate School, Monterey, California.

SPONSOR: The Electron Devices Group of the IEEE and the Advisory Group on Electron Devices of the U.S. Department of Defense.

TOPICS: Original papers are invited describing original technical work or summaries of the existing state-of-the-art. Areas of interest include:

All Classes of Power Tubes
Traveling-Wave Amplifiers & Oscillators
Crossed-Field Devices
Power Grid Tubes
Electron Bombarded Semiconductors
Special Techniques (Computer Simulation & Critical Material Development).

ABSTRACT: The abstract must not exeeed one side of a double-spaced type-written page, including title, author(s), telephone number, mailing address, company affiliation, city and state of company location. Abstracts are due by January 15, 1976.

OTHER: Ten (10) copies of all material should be sent to:

Dr. J. V. Lebacqz
Technical Program Chairman
Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, California.

Call for papers...

The 1976 IEEE Power Engineering Society Summer Meeting will be held July 18-23, 1976 in Portland, Oregon.

SPONSOR: IEEE Power Engineering Group.

TOPICS: Authors who have significant contributions in the power field are invited to submit papers.

ABSTRACT: Prospective authors are urged to request a Power Author's Kit from:

IEEE, Technical Conference
Service Office
345 East 47th Street
New York, N.Y. 10017.

OTHER: Deadline for receipt of original manuscripts at IEEE Headquarters is February 1, 1976. Page limits, typing requirements, and other necessary information are specified in the Power Author's Guide.

The first IEEE/OSA Conference on Laser and Electro-Optical Systems will be held at the Town and Country Hotel in San Diego, California on May 25-27, 1976.

SPONSOR: Quantum Electronics Council of the IEEE and the Technical Council of OSA (The Optical Society of America).

TOPICS: Original papers are solicited that describe new technical contributions to such areas as:

Laser Engineering & Manufacturing
Measurement & Alignment Systems
Optical Signal & Data Processing Systems
Optical Display Systems
Electro-Optical Systems for Microelectronics Production
Electro-Optical Component Technology
Space & Military Electro-Optical Systems
Laser Fusion & Laser Isotope-Separation Systems
Adaptive Optical Techniques.

ABSTRACT: Two copies each of a 35 word abstract and a 200-500 word summary (three pages maximum) should be submitted by January 23, 1976 to:

M. E. Rabedeau
IBM – F55/015
Monterey and Cottle Roads
San Jose, California 95193.

OTHER: All questions and inquiries should be directed to:

Ms. Leslie Hill
Hughes Aircraft Company
Electron Dynamics Division
3100 West Lomita Boulevard
Torrance, California 90509.
