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ENGINEERING NEWS

SHOCK MODEL FOR THE 492 CRT

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David A. Bell

Formerly with FDI Engineering, Dave is now working with Peterson Associated Engineers in Portland, but for more information about the model, call Carlos Beeck on ext. 7996. A full report is available.

The portable 492 Spectrum Analyzer, first released to customers in April, 1978, was designed to be rugged enough to meet the rigid military specification MIL-T-28800B ... an ambitious goal reached by few instrument designs. One part of the specification requires the instrument to successfully endure 12-inch drops on all sides and corners.

In instruments such as spectrum analyzers, the crt is perhaps the component most vulnerable to shock damage. Within the crt, the electron gun is most subject to failure. The

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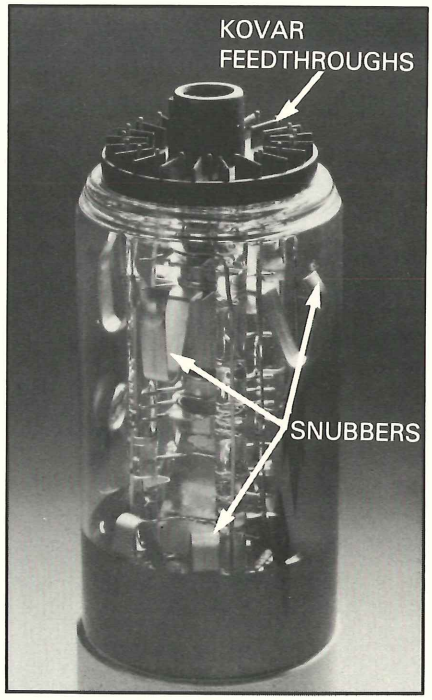


The cap end of the crt.

GLOSSARY

Kovar feedthroughs - devices that allow electrical connections to pass through glass tubes without losing the vacuum in the tube. "Kovar" is a brand name for an iron alloy that has the same coefficient of expansion as glass. So, if the temperature changes, the glass and the Kovar wire expand or contract at the same rate. Different rates of expansion would cause them to separate thereby destroying the vacuum in the tube.

Natural frequency—the frequency at which an object oscillates after it has been struck.

Spring constant—a measure of the stiffness of a spring.

Snubber - a mechanical damper which also positions and supports the crt gun structure.

SYMBOLS

$\ddot{\theta}$	angular acceleration
θ	angular displacement
CM	center of mass
I	moment of inertia
$K_{1, 2, 3}$	spring constants
$K_{S1, S2, S3, T1, T2}$	spring constants. ("S" indicates compression spring constants, and "T" indicates torsion spring constants).
$L_{1, 2, 3}$	distances
R	radial distance from point A
R_{CM}	radial distance to center of the electron gun's mass from point A
ω_n	natural frequency
f	frictional dissipation factor
F	force
M	moment (force x distance)
X	distance displaced
A_{max}	maximum acceleration of CM without causing the electron gun to strike the glass tube.
δ_{cm}	deflection of center of mass.
δ_{max}	maximum deflection without causing the electron to strike the glass tube.
m	mass
M_A	moments about point A
n	number of snubbers. The symbol n_1 represents the number of snubbers at the display end of the electron gun, and n_2 represents the number of snubbers at the cap end. (This "n" is not related to the subscript n used with omega).
A	point about which gun rotates when gun is shocked. The gun does not deflect in the X direction, but does rotate around A.

The Model

A diagrammatic model of the electron gun for the 492 Spectrum Analyzer is shown in *Figure 1.*

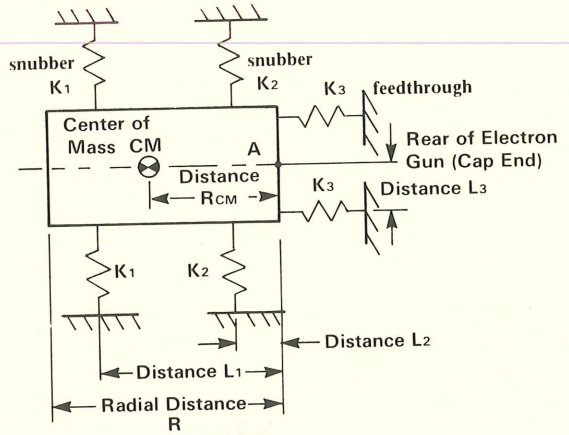


Figure 1. A model of the electron gun.

Accurate mathematical description of the vibrational model requires two independent coordinates, the distance displaced X and angular displacement θ. These two coordinates lead to two governing equations:

$$F = m\ddot{X} \text{ (force equation)}$$

$$I\ddot{\theta} = \Sigma M \text{ (torque equation)}$$

Fortunately, we can greatly simplify the model by making these empirically-verified assumptions: (1) vibrational rotation occurs about point A; (2) symmetrical snubbers may be modeled on one side of the gun (eliminating the need to keep track of coordinates and other information about the upper-side snubbers); (3) reactions at the rear of the electron gun at the Kovar feed-throughs may be modeled as spring constant K_3; and (4) vertical snubbers react in compression, while horizontal snubbers sets react in torsion, to shock loading or planar vibration (vibration in the plane of the page). *Figure 2* shows the simplified model.

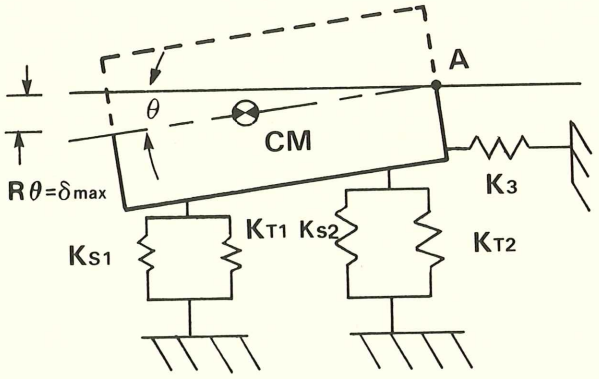


Figure 2. A simplified version of the electron gun model shown in figure 1.

With the simplified model, the governing equation becomes the torque equation.

$$I\ddot{\theta} = \Sigma M_A$$

This equation greatly reduces the math involved. However, mathematical expansion requires information on the moment of inertia M_A about point A, snubber behaviour and geometric considerations such as mass and critical dimensions of the guns' glass rods, as well as location of gun components.

A resonance search identified the natural frequency ω_n of a gun not having snubber damping. We made force/deflection tests on the feed-through wires to determine K_3.

The moment of inertia I was then determined from the frequency equation associated with the governing equation.

governing equation: $$\ddot{\theta} + \frac{K_3 L_3^2}{I}\theta = 0$$

frequency equation: $$\omega_n = \frac{1}{2\pi}\sqrt{\frac{K_3 L_3^2}{I}}$$

Empirical as well as conceptual analysis identified the constants associated with small deflections of various snubber types. Identification of unknowns K_{S1}, K_{S2}, K_3 (compression); K_{T1}, K_{T2} (torsion); and I as well as identification of the energy dissipation term f (which accounts for frictional and nonplanar rotational losses) enabled us to assemble the governing equation of gun vibration.

$$\ddot{\theta} + [(K_{S_1} + K_{T_1})\, 2n_1 L^2{}_1 + (K_{S_2} + K_{T_2})\, 2n_2 L^2{}_2 - K_3 L^2{}_3]\,\frac{\theta f}{I} = 0$$

$$\ddot{\theta} + \frac{f\beta\theta}{I} = 0 \qquad \beta = \text{quantity in brackets.}$$

where K_{S2} and K_{T2} are spring constants at position 2 for compression and torsion respectively, and where n_2 is the number of snubbers at position 2 for one side only.

Therefore from vibration theory, the frequency equation is

$$\omega_n = \frac{1}{2\pi}\sqrt{\frac{f\beta}{I}} \text{ radians/sec.}$$

The frequency equation accurately predicted the natural frequency of several engineering models. The following relationship of the deflection of the center of mass δ_{CM} and ω_n relates the frequency equation to the maximum acceleration of the gun and the maximum allowable deflection δ_{MAX}.

$$\delta_{cm} = R_{cm}\,\theta \text{ and } \theta = \frac{\delta_{max}}{R}$$

$$a_{max} = \omega_n^2\ \delta_{cm} = \omega_n^2\ \delta_{max}\left(\frac{R_{cm}}{R}\right)$$

APPLYING THE FREQUENCY EQUATION

Lab analysis revealed that the original crt (with a natural frequency of 81 Hz) could withstand a shock of approximately 40 G's. From the acceleration relationship above, it became clear that a higher natural frequency was needed. That is, for a maximum acceleration greater than 100 G's.

$$\omega_n \geq \frac{1}{2\pi} \left(\frac{a_{max} R}{\delta_{max} R_{cm}} \right)^{1/2} \geq 132 \text{ Hz}$$

The frequency equation variables that are easiest to change are the snubbers' spring constants, the number of snubbers, and the location of the center of mass relative to the cap end of the crt. *Figure 3* describes the effect on the maximum acceleration of shifting the center of mass (CM) and varying the number, size and type of snubbers front and rear for a 492 crt gun with the mass of the gun assumed constant.

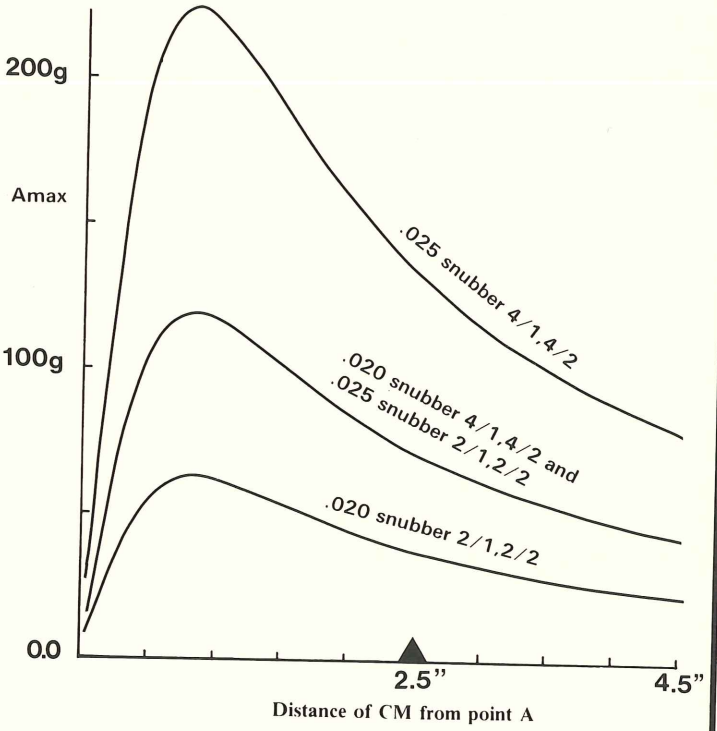


Figure 3. This graph shows the effects of shifting the gun's CM and the effects of various snubber types and positions.

Several snubber combinations were tested. For example, 4/1 means four snubbers were placed at the screen end (1) of the gun, and 2/1, 2/2 means two snubbers were placed at the front end and two at the cap end (2).

Continued from page 2

electron gun failure level, then, may determine how much shock the instrument can take before malfunctioning. An implication of the specification is that the instrument has to withstand accelerations of more than 100 G's. But the best performance for the tube used with the 492 was approximately 40 G's.

The traditional solution to vibrational problems is to build engineering models, subject the models to shock loading and then suggest construction improvements from the test data. A less costly and time consuming method is mathematical vibrational modeling which also has the advantage of greater accuracy than traditional methods when coupled with minimal empirical testing.

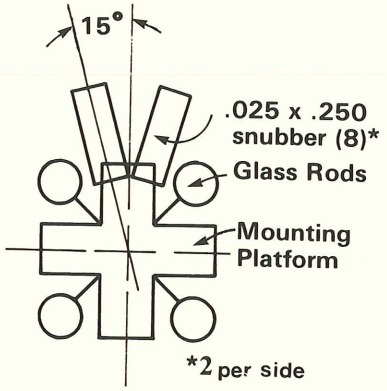


Figure 4. Based on the model, designers placed the snubbers as shown here.

APPLYING THE MODEL TO THE 492

As a solution to the vibration problem, moving the center of mass was less attractive than modifying snubber type and arrangement. *Figure 4* shows how the .025-by-.250 snubbers were finally used.

The snubbers are shown slightly spread apart and offset over the edge of the rods. This reduces rotational nonplanar vibration of the gun in shock conditions, and also provides protection in diagonal shock (which is what happens to the instrument if it is dropped).

We tested an engineering model crt in steps of 25 G's from 25 to 150 G's. We detected no electrical or mechanical deviations up to 150 G's. At 150 G's, a slight centering deviation within tolerance was detected. Also at 150 G's a very slight wrinkle on the edge of one of the guns' larger deflection plates showed that the gun may have touched the glass walls. □

FINDING RIPPLE VALLEY VOLTAGE WITH AN HP-25.

If you are a power converter designer you can probably use this program. It determines how deeply a storage capacitor discharges between peaks of a sine wave while supplying energy to a constant power load. Most high-efficiency power converters closely resemble this kind of load and depend on a storage capacitor.

The program (*figure 1*) is based on the cosine wave equation and a formula describing the discharge of a capacitor into a constant power load (*figure 2*). The discharge equation is the product of, first, integrating a basic capacitor equation under the conditions of a constant power discharge and, second, modifying the integration result with an appropriate offset and initial condition.

```
gRAD
fSTK
RCL4
5
÷
STO5
RCL4
2
X
RCL1
X
RCL0
÷
CHS
RCL2
g x²
+
f √x
STO6
RCL4
RCL3
X
gπ
X
2
X
fcos
RCL2
X
STO7
RCL6
–
gABS
•
1
f x ≥ y
GTO49
RCL6
RCL7
f x < y
GTO46
RCL5
STO – 4
5
STO ÷ 5
RCL5
STO + 4
GTO07
RCL6
```

USER SETUP:

f ENG 1
sto C in R0
sto P in R1
sto V_P in R2
sto f in R3
sto .75/f in R4
f PRGM
R/S

THE PROGRAM WILL STORE:

t in R4
T_{inc} in R5
v_c in R6
v_s in R7

WHEN COMPLETE:

T_I will be in R4
$v_c \approx V_v$ will be in R6 and will be displayed

EXAMPLE:

Given: C = 900 μF
P = 119.5 W
V_p = 120 V
f = 48 Hz.

Results: T_I = 18.75 mS
$v_c = 97.06 \approx v_s = 97.08 \approx V_v$

Execution time ≈ 6 seconds

Figure 1. This ripple valley voltage program determines how deeply a storage capacitor discharges into a constant power load.

The program is iterative and stops when the answer is within 100mV of the solution. You will have to account for real-world losses in diodes, thermistors, fuses, filters and other circuit components. You will also have to account for sine wave flat-topping by reducing the peak voltage V_P from the ideal value.

SYMBOLS

v_c = voltage across capacitor C
V_p = peak voltage of v_s
P = load power (a constant)
t = time
c = storage capacitance
v_s = supply voltage
f = frequency of v_s

Figure 3 shows the circuit assumed for the program, and presents the waveform of the voltage across capacitor C.

For more information, call Bruce Campbell on ext. 7827.

Discharge formula

$$v_c = \sqrt{V_p^2 - \frac{2Pt}{C}}$$

Cosine equation

$$v_s = V_p \cos 2\pi ft$$

Figure 2. These two equations are the basis of the program.

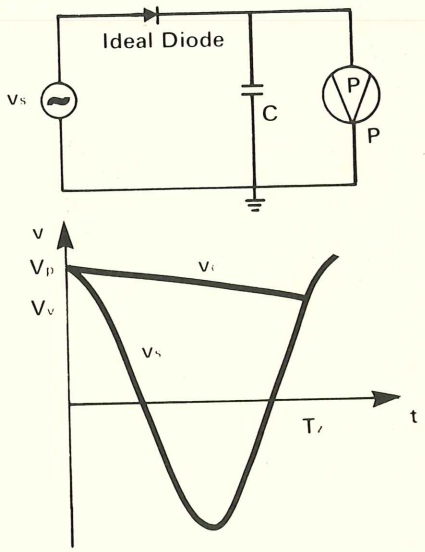
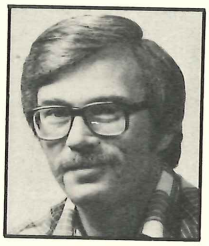


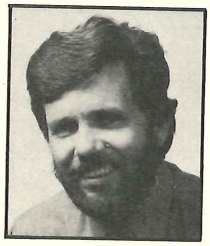
Figure 3. Shown here is the circuit assumed for the ripple valley voltage program, and the waveform of the voltage across capacitor C. □

PATENTS RECEIVED

INSTRUMENT CART

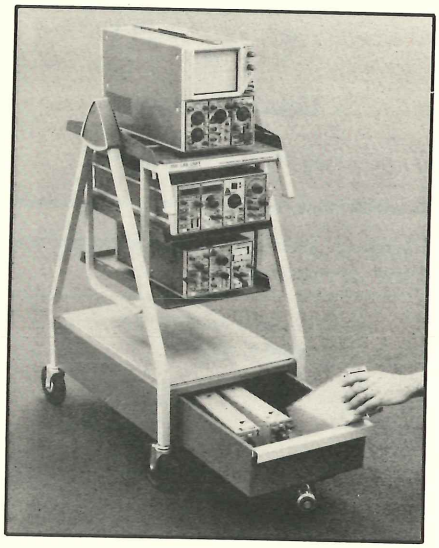


Phillip W. Sheely, LDP Engineering, ext. 6741.



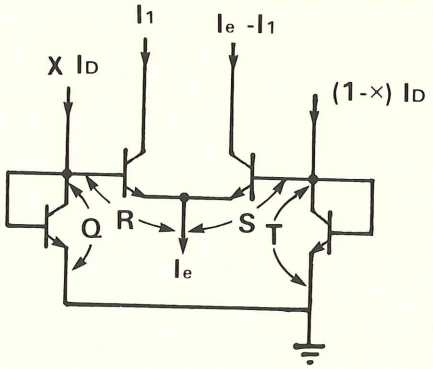
Howard M. Meehan, Industrial Design (T&M), ext. 5042.

This patent is for the instrument cart shown in the figure. □



WIDEBAND DIFFERENTIAL AMPLIFIER

Barrie Gilbert, Monolithic Circuits Engineering, ext. 6283.



This patent is for a wideband differential amplifier made from a pair of differentially-connected control devices (such as transistors). The control devices have a pair of semiconductor junction input devices coupled to them for receiving complementary input currents.

The input devices operate logarithmically to compensate for the inverse-logarithmic response of the control devices. As a result, a linear rather than a non-linear transfer response results.

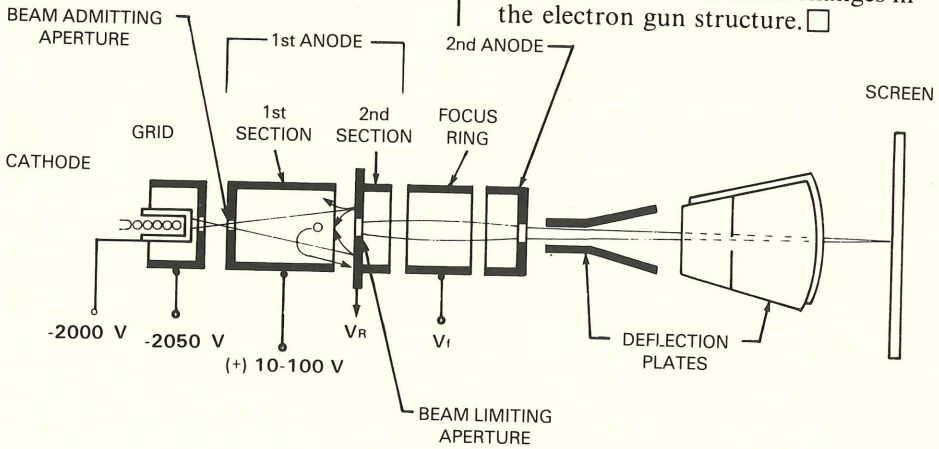
The patent also describes multipliers, cascade amplifiers and other circuits. □

AN ELECTRON BEAM FORMING STRUCTURE

Bo Janko, Electron Device Engineering, ext. 6651

This patent is for an electron-beam forming structure that includes an anode made up of two sections separated by a small space. The first section is closest to the cathode and has a beam-admitting aperture and is connected to a positive potential. The second section has a beam-limiting aperture and is connected to ground relative to the first section.

The first section repels positive ions created in the area adjacent to the beam-limiting aperture and deflects them from the electron beam source so that they can be collected in the second section, thus avoiding the drift towards the cathode which would be damaged by their impact. This type of cathode protection can be provided with minimal changes in the electron gun structure. □



MICROPROCESSOR AID FOR PARALYSIS VICTIM?

Matt Johnson, a Florida high school student, suffered a gymnastics accident three years ago that left him paralyzed from the neck down. He is able to breath with the help of nerve stimulators and can talk while exhaling. His accident was unusual in that there was no brain damage, enabling him to enroll in Florida's Merritt Island Community College to continue his studies. Several projects have been started that will make living easier for Matt Johnson. A breath-controlled, electric powered wheelchair provides some mobility, ramps built in his bedroom allow access to the room, and a powered bed swings continously in a 62-degree arc to aid blood circulation.

His neighbors and friends have searched for a system that will allow him to write and edit text. Head and mouth movements and speech are the only tools available to him. There may be systems already available that are controllable even with such limited movement. If you know of such a system or if you are interested in helping develop one, contact Bill Walker by calling ext. 7008 or writing 50-475.□

ENGINEERING NOTEBOOK RESPONSIBILITIES

While Engineering notebooks are valuable primarily as a record of the development of patentable ideas, they are also useful as a reference for engineers other than the ones who originally worked on the project. To enhance the value of the notebooks to the company, users need to recognize their responsibilities.

RECEIVING

The Patents and Licensing Department issues the notebooks. To obtain one, call the department secretary (ext. 5385) and give the name and delivery station of the person to receive the notebook. Each notebook is numbered and assigned to one person, but you may have more than one notebook at a time.

CARE

A damaged or unreadable notebook is useless, and a notebook's value is diminished by improper record keeping. Each page should include a title or very brief description of the subject matter, as well as the project number, if any. The book should be dated and signed (not initialed) by the engineer every five to ten pages. Those pages should also be witnessed and dated by two associates who understand the recorded material. The witnesses must specifically identify the pages they are witnessing.

Once you are issued an engineering notebook, it is your responsibility to make sure that no one else uses it. And when you finish a project or when you leave your department, you must return the notebook to Patents and Licensing (D.S. 50-419) or leave it with your manager if the project is still active.

Notebooks returned to Patents and Licensing are warehoused, but can be retrieved on request by calling ext. 5385.□

ELECTRON SCATTERING STUDY

In March, 1978, Catherine Lin-Hendel (Applied Research) presented with D. H. Lowndes and R. H. Hendel (University of Oregon), "Electron Scattering Rate Anisotrophy and Conduction Electron—4f Moment Interactions in Au (Rare-Earth) Dilute Alloys," to the American Physical Society meeting in Washington. The paper describes a de Hass-van Alphen effect study in three Au(Rare-Earth) dilute Alloy systems: Au (Gd), Au (Ho) and Au (Yb).

For a copy, call Cathy at ext. 6388. □

INFORMATION THEORY SYMPOSIUM CALL FOR PAPERS

The 1979 International Symposium on Information Theory (sponsored by the IEEE) is calling for papers. The symposium will be held June 25-29, 1979 in Grignano, Italy.

The sponsors ask that an abstract, a 500-word summary, and the complete paper be submitted by 1 December, 1978. For more information and for assistance in producing your paper, call T&M Publicity on ext. 5674.

T&M Publicity helps Tektronix employees write, edit and present technical papers. All papers and articles published outside Tektronix *must* pass through the Publicity department for confidentiality review. Further, the department interfaces with Patents and Licensing to make sure patent applications have been filed for all patentable designs discussed in the paper or article.□

MECHANICS OF WRITING TECHNICAL ARTICLES

Bill Furlow, T&M Publicity, ext. 6601.

This is the second part of a two-part article. The first part, in April's **Engineering News** *discussed the benefits of writing technical articles. For a copy of that article, call ext. 6792.*

WHERE TO GET IDEAS

Let's first dispel a myth that even most engineers think is true. "Everybody knows that engineers can't write, right?" Wrong! Who could be better qualified than a design engineer to write articles? The disciplined thought patterns required in your everyday work—the ability to see the problem, think it through and come up with a valid solution—will enable you to write good, solid articles that communicate your thoughts to others and stimulate their own thought processes as well.

If you don't already have a topic in mind, though, don't go looking for one. You'll know you're on the right track when the thought "someone should write an article about that" occurs naturally to you. Keep in mind the major categories for technical articles:

—New technology
—Design problems and solutions
—Applications
—Design considerations

Remembering that these are the areas that most magazines are interested in, you will find yourself evaluating many topics for their article potential. Eventually you will settle upon one or two that seem to be the more interesting topics for you. Then you are on your way.

Whatever your subject, you must have some new or interesting material to add to the general knowledge of the magazine's readers, or the editors won't give you the chance to publish the material. All the more reason to take your time in picking the topic, especially for your first article.

You may not realize it, but reams of good material for tech articles pass through your hands in a year's time.

Technical reports on projects you have completed are one source. Perhaps the entire project is so interesting that a systems overview article would find good reader response. Perhaps the impact of your system is so great that newspapers and general interest magazines would like a report on it. Perhaps there are five or ten subsystem or circuit designs that would be of interest to other design engineers. Don't sell yourself short ... problems that you have overcome may not have been encountered yet by designers at other companies.

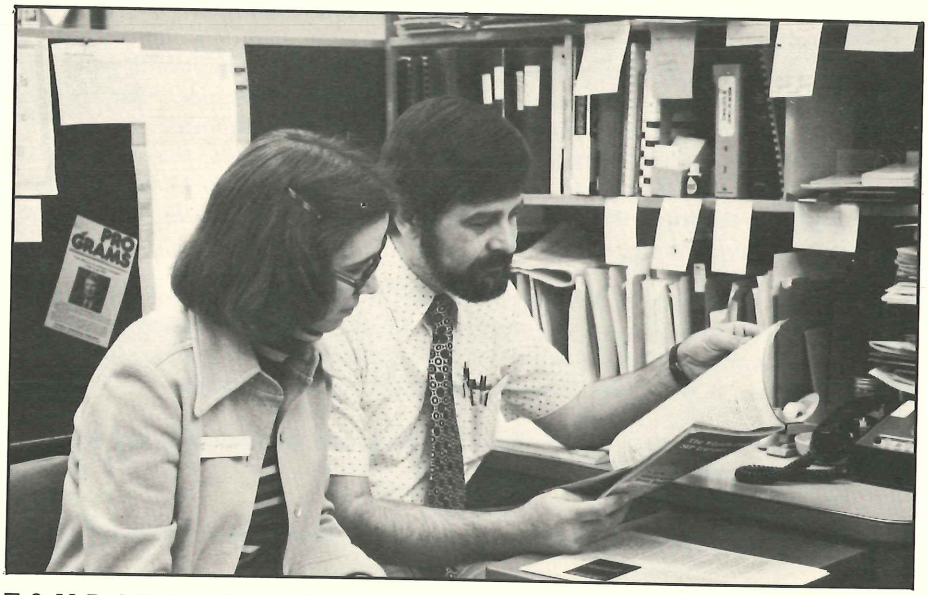
Product and market surveys are another source. Do you see a segment of medical electronics that is being ignored? Did you survey all components and manufacturers of a given product area? Did you do a systems analysis of two competing technologies? Magazine editors and readers will be interested in these topics, if you are able to release the material.

Some magazines may be interested in running portions of applications notes before Tektronix prints and distributes them. Check with the T&M Publicity Department first. We'll contact the magazine you think is most likely to be interested. But after app-notes are printed, few magazines are interested.

Lab notes from your design work are another source of article ideas. If you found a solution to a problem that's been bothering you for a long time, chances are other engineers would like to know about it too. Data plots and empirical data from breadboards and production tests will provide good support material for your article.

WHERE CAN YOU PUBLISH IT?

First, you should take a few minutes to write an outline. It serves the same purpose as a block diagram or flow



T & M Publicity editors Wyn Giluck and Bill Furlow are two of the publicity specialists whose responsibilities include editing journal and professional society articles, and preparing articles for trade magazines.

chart. It will help you to get an overall impression of the article and arrange it in an orderly manner. You should also assemble all the illustrations, photographs, schematics and tables that you want to use in the article before you begin to write.

At this point it is best to survey your article and the potential markets for it. When evaluating magazines for your article, you will need to answer a few questions. For example, do they seem to be aimed at the audience you want to reach? The T&M Publicity Department can help you with such questions.

Once you've decided on one or two magazines, have the publicity department call them and ask if they're interested in your article. There is no formal procedure in the trade press. You can call or write, or send a copy of your outline, or send the completed article. If you call, you can at least find out if the magazine is receptive to your idea before you invest too much time in preparing it. No one is going to commit themselves to buying an article until they've seen the whole package, but at least you'll know whether you have a reasonable chance of having your article accepted.

The editors may suggest a different approach to your article that will make it more interesting to their readers. This will greatly improve your chances of selling the article, so the phone call is probably the best approach at this stage, and submitting an outline is the second most effective.

Submitting a complete article is the most hazardous route because it may take weeks or even months to know whether the article has been accepted. Since ethics dictate that you submit your article to only one magazine at a time, you may spend six months looking for some place to have it published. And since timeliness is all important in electronics design articles, your technique may become obsolete before you can publish it.

DOWN TO THE NITTY GRITTY

Once you have aroused the interest of an editor, your next task will be to write the article. You've probably read enough tech articles and written enough reports that you can handle this without too much assistance. Keep this one point in mind: written and spoken information are distinctly different, yet conversational writing is more interesting to read. Try to write more like you talk. But not exactly as you would talk, because writing affords you the time for a more precise selection of words. Take that extra time to find the right words. That doesn't mean that you should "multisyllabicate" wherever possible; in fact, you should try to use shorter words when you can. Don't say "utilize" when you mean "use". On the other hand, tech articles are read by a well educated audience, so don't be afraid of large words when they are really necessary.

Write in an active not a passive tone. "I found" or "you will find" is much livelier than "it was found" or "it will be found".

Finally, after the first draft is complete, set it aside for a week. After this "cooling-off" period, pick it up, make the changes you think are needed and contact the T&M Publicity Department. We will help you in anyway we can.

HOW LONG DOES IT TAKE?

Most magazines acknowledge manuscripts as soon as they receive them. If you haven't heard from the magazine within four weeks, you are quite correct in reminding us to tell the editor of the oversight. After your article is received, it is assigned to an editor for review. He will accept or reject the article. Normally this will take two to six weeks, and editing may take another two to four weeks At this point, most magazines return the edited version to you to review for technical accuracy. Don't argue with the editor about titles, punctuation or grammar unless they are totally unacceptable to you. Editors aren't perfect in those areas, but they do have some feel for reader acceptance and preference. When you receive this approval copy, your article will usually be about eight weeks (or less) from publication and time is of the essence. Check it, correct it, and return it without delay.

continued on page 10

continued from page 9

In closing, let's examine why some of the editing changes that will be made are important, because they sometimes do seem to depart from the good practices of both engineering reports and journalism. The standard practice for engineering report titles, for example, is to specify as accurately as possible what is covered in the report. The aim of general-interest magazines, on the other hand, is to drag as many readers as possible into the story. Those are the two extremes between which trade magazine editors try to steer their magazines. They attempt to make the article sound interesting to everyone to whom it may be useful. On the other hand, they try not to trick anyone to whom the article would be a waste of time into reading it.

Who, what, when, where, why, and how—those indispensible tools of journalism—are boiled down to what, why and how at most trade magazines. This is another area where engineering and journalism diverge, but most editors think it best to steer a course between the two, to give the reader as much useful material as possible in the space available.

That, in a rather large and rambling nutshell, is it. We hope that this will give you some insight into writing technical articles, and that it will also arouse the Hemingway that lies dormant within you. Because, selfishly enough, we here in Publicity want to help you show the world how technically superior Tektronix really is.

Tektronix has two publicity departments: one for T&M and one for IDG. Each department handles ***product*** *publicity for its own group. T&M , however, handles technical papers and articles for all of Tektronix.* □

GPIB EVALUATIONS MADE FOR NON-TEK INSTRUMENTS

A TM 500 task force has evaluated 13 programmable instruments made by other companies. A report is available for each of the instruments listed in *table 1.* Each report includes six types of material:

- a one page summary of the instrument's features.
- questions and answers about the specifications and hardware design.
- a list of all the instrument's parts and what the labor costs would be if Tektronix built the instrument.
- a comparison of the instrument to the present and projected TM 500 line.
- a discussion of how well the instrument works on the GPIB and of how easy it is to program.
- a series of photos showing the construction of the instrument, and the data from which the specifications were deduced

If you would like to see this information, call the appropriate person listed in Table 1. In addition, Bob Beville has written a 50-page evaluation of the instruments' operation on the GPIB.

Dana 9015 Counter Timer HP 5328A Counter Timer	Bill Wilke	8-1521	94-513
Fluke 1953A Counter Timer	Roland Crop	6105	50-380
HP 3455A 6-1/2 Digit DMM HP 3438A 3-1/2 Digit DMM Fluke 8500A 6-1/2 Digit DMM	Eldon Berg	8-1523	94-513
HP 6002A Power Supply HP 59501A Power Supply Programmer	Bob Beville	8-1557	94-513
HP 3335A 80 MHz synthesizer Fluke 6001A 11 MHz synthesizer Wavetek 172A 13 MHz Function Generator	Don Hall	8-1559	94-513
HP 8165A 50 MHz Function Generator	Roger Stenbock	8-1557	94-513
HP 2240A Measurement & Control Processor	Bob Verrinder	8-1555	94-513
General GPIB questions	Steve Rice	8-1556	94-513
	Jim Geddes	8-1530	94-513

Table 1. Listed here are engineers to call if you are interested in Tektronix evaluations of non-Tek GPIB instruments.

□

NEW LEAD SETS FOR P6451 PROBES

The Accessories Marketing department of the Service Instruments Division has announced two lead sets for quickly connecting a P6451 Probe to multiple test points in compact logic circuits.

In one lead set, an harmonica-adapter cable plugs into sets of ten .025-inch square pins built into the board. Using this set allows quick connection for production testing and field servicing with 7D01 and LA 501 Logic Analyzers. The part number is 012-0800-00.

In the other lead set, easy connection with circuit test points is made with miniature retractable hook-tips that plug onto RETMA color-coded leads. The leads match the signal channel numbers on P6451 probes. This lead set (012-0747-00) was designed for engineers needing versatile and quick signal-access for a logic analyzer.

Call Ron Lang (ext. 5133) for a copy of the Marketing Sales Release for these leads. The sales release provides details for each of the leads. □

SOCIETY OF RELIABILITY ENGINEERS FORMING PORTLAND CHAPTER

A Portland-area chapter of the Society of Reliability Engineers is being formed. The SRE is an independent professional organization founded in 1966. The major objectives of the SRE are developing, communicating and advancing reliability techniques, and making the application of those techniques more effective.

For more information about the SRE, contact John McCoy (ext. 2832) or Om Gupta (ext. 2372). Both work for IDG Reliability. □

TRADE MAGAZINES LOOKING FOR DESIGN IDEAS ... AND THEY PAY, TOO!

Several electronic trade magazines are looking for short articles describing new design ideas. All will pay if they publish the ideas, but the amount varies.

Electronics is looking for previously unpublished circuit designs and for solutions to design problems that electronic engineers are facing or might face in the near future. The article should describe the operation and purpose of the circuit. Payment for published ideas is $50 for each design. For the magazine's "Engineering Notebook," $50 will be paid for short articles that describe design shortcuts, calculation aids, measurement and test techniques, and any other ideas that save engineering labor or materials.

Electronic Design is seeking (for its "Ideas for Design" column) new or not widely known design techniques, clever uses of new components or test equipment, packaging tips, and cost saving ideas. The pay starts at $20 for published ideas, an additional $30 for the idea voted best-of-issue by readers, and $1000 for the Idea of the Year.

EDN is asking for short articles for its "Design Awards" section. The cash remuneration is $20 for each published idea, a $50 U.S. bond for the best idea of the issue, and $1000 for the annual Grand Prize Circuit winner. The entries should be short descriptions of circuits that have already been built and tested.

If you have an idea that might be publishable, call T&M Publicity on ext. 6601. (T&M Publicity handles technical articles for Tektronix). □

HIGH-SPEED GEOMETRIC TRANSFORMS

Mike Rieger (Instrument Research, Tektronix Laboratories) presented a paper entitled "High-Speed Geometric Transformations with a Low-Cost Matrix Multiplier" at the Society for Information Display conference in Los Angeles in April, 1978. For a copy of the paper call Mike on ext. 6907. □

PROGRAM FOR PREDICTING NOISE IN DIGITAL SYSTEMS

The March 1, 1978 **Electron Design** carried an article entitled "Predict Noise in Digital Systems" which describes a program written for a Texas Instruments SR52 calculator. Gene Cowan (Portables Engineering) has adapted that program for the HP35 calculator. For a copy of the program call T&M Publicity (ext. 6792) and ask for a copy of Special Design File No. 26. A copy will be mailed to you within a few days. □

MORE ON BYPASS AND DECOUPLING

Laudie J. Doubrava (SPS Engineering) is author of "High Frequency Bypass and Decoupling Design," an article in **Proceedings of Powercon 5,** May, 1978. This 11-page article describes the application of bypassing and decoupling techniques to achieve acceptable performance of "real-life" power supply design. The article is a more detailed version of Laudie's article in the April **Engineering News.**

Call Laudie at ext. 1119 (Walker Road) for a copy. □

TRADE SHOWS AND CONFERENCES

To make it easier for Tektronix engineers to participate in trade shows and technical conferences, Engineering News will publish a list of upcoming shows and conferences.

If you would like to present a technical paper or participate in a panel discussion, call T & M Publicity on ext. 6601. (T & M Publicity handles technical papers for the whole company. If you would like to present an exhibit at a trade show, call Norm Abelson (Marketing Communications) on ext. 6232.

Sept. 11-13	AANA	(American Association of Nurse Anesthetists)
Sept. 6-15	IMTS	(International Machine Tool Show)
Sept. 12-14	WESCON	(Western Electronic Show & Convention)
Sept. 19-21	EOS	(Electro Optics/Laser Conference & Exposition)
Oct. 15-18	EASCON	(Electronic and Aerospace Systems Convention)
Oct. 16-19	ISA	(Instrument Society of America)
Oct. 21-25	ASA	(American Society of Anesthesiologists)
Oct. 21-26	AAP	(American Academy of Pediatrics)
Oct. 22-25	ACEMB	(Annual Conference on Engineering in Medicine & Biology)
Oct. 31-Nov. 2	Cherry Hill	(Test Symposium)
Nov. 13-16	AHA	(American Heart Association)
Nov. 14-16	Military Electronics Exposition	
Nov. 26-30	RSNA	(Radiological Society of North America)
Dec. 4-6	International Electron Devices	
Dec. 12-14	MIDCON	

COMPANY CONFIDENTIAL

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Why EN?

Engineering News serves two purposes. Long-range, it promotes the flow of technical information among the diverse segments of the Tektronix engineering and scientific community. Short-range, it publicizes current events (new services available and notice of achievements by members of the technical community).

For mailing list changes, call ext 6792.

Contributing to EN

Do you have an article or paper to contribute or an announcement to make? Contact the editor on ext, 6792.

How long does it take to see an article appear in print? That is a function of many things (the completeness of the input, the review cycle and the timeliness of the content). But the *minimum* is five weeks for simple announcements and about eight weeks for major articles.

The most important step for the contributor is to put his message on paper so that the editor will have something to work with. Don't worry about organization, spelling and grammar. The editor will take care of those when he puts the article into shape for you.