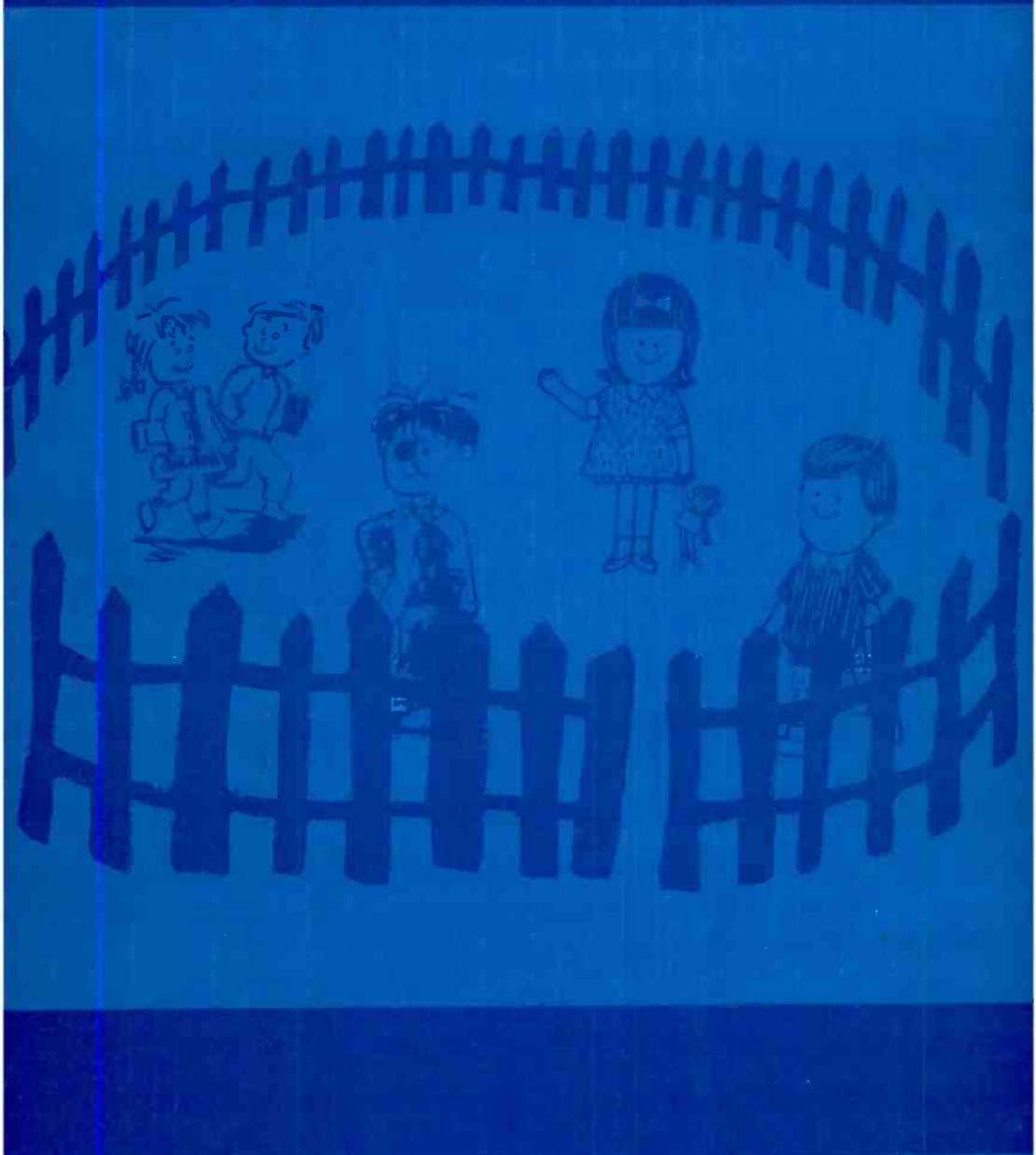
# journal

September/October 1969 35 cents



TINEBAUGH LEADS IN PRIMARY RETURNS (Page 30)

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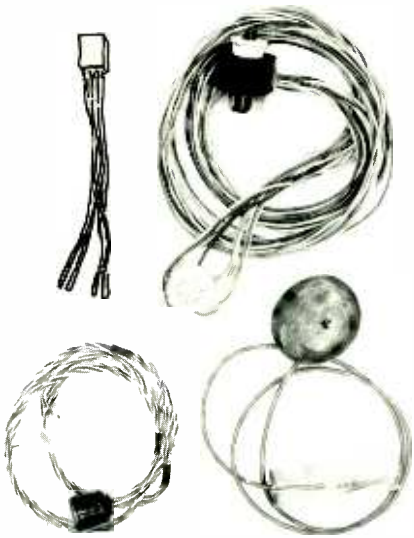

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# nri journal

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CONTENTS


YOU CAN'T FENCE KIDS IN .....2

AMATEUR RADIO NEWS .....8

COMMUNICATIONS .....11

SERVICING AUTO RADIOS .....13

EMPLOYMENT OPPORTUNITIES .....20

NEW BOOKS .....22

NRI HONORS AWARDS .....24

ALUMNI NEWS .....27



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## *On Our Cover*

Oliver Wendell Holmes once observed: "Pretty much all the honest truth-telling there is in the world is done by children." Or as Steven Elliott of St. Louis, Mo., puts it, "Kids have a delightful knack for discarding everything but what they consider to be the most essential information." As an elementary school-teacher for 14 years, he's been in a position to compile what we consider a delightful collection of observations his students have made about electronics communications, such as "Progress was from electricity to television to now..." Elliott's article begins on Page 2.

By Steven Elliott

***'Progress Was From Electricity to Television to Now'***

# KIDS; YOU CAN'T FENCE 'EM IN, AT LEAST NOT WITH WORDS

There's no doubt about it. Some of the most delightful observations about electronic communication have been scrawled on tablet paper by grade school youngsters. Having taught in public schools for fourteen years, I'm sure of it. Take these historical explanations, for example:

*QUESTION: When was the radio invented? ANSWER: On page 24.*

*"The radio was invented in the pre-me times."*

*"The Romans did not have radios. They used smoke signals in both the A.C. and D.C. times."*

*"Communication has not always been by electricity. For many ancient years ships had to send messages by flashing mirrows. But it is not good to do so now. Oncest my brother was spanked corporally for flashing a mirrow in the eyes of passerbying people."*

Kids have a knack for discarding everything but what they consider to be the most essential information. One boy brusquely wrapped up all of man's yearnings, struggles and triumphs in this eight-word package: *"Progress was from electricity to television to now."*

Here's a remark as charming as childhood itself: "I was thinking the radio was invented before the telegraph. When I learned different, all the thoughts I was going to say went in a swallow down my throat."

Marconi has certainly come in for his share of comments through the years. Here are four of my favorites:

*QUESTION: When was Marconi born? ANSWER: The other side of 1900dred.*

*"It took much hard work for Marconi to think out how to invent the radio. He had to keep thinking around-the-clock, twelve days a week."*

*"In just a few short years he became a sensation overnight."*

*"He died from 1937 to the present."*

*One incredulous little tyke wrote: "There used to not be any radios at all. Think of it!"*

A skeptical classmate of his absorbed all the statistics regarding the number of radios in America, but got his skepticism across in one crushing statement: "The amount of radios in America today is more for saying than believing."

It must run in the family. Two years later his younger sister reported: "The number of radios we have today is an adsurbly large fact of a number."

The elementary school youngster's mind seems to be a vast storehouse of miscellaneous misinformation -- half true, half false and wholly delightful. His fund of knowledge about electricity, for example, includes such fascinating items as these:

*"Electricity has been with us forever and maybe even longer."*

*"When we take the electricity and push and squeeze it up through the wires in the radio, we call it communication. What the electricity calls it is unbeknownst."*

*"Electrons carry the negative charge while protons provide the affirmative."*

*"I think I admire the electron more than anything else about electricity because it weighs only about one over 2000th. as much as a proton but can still hold its own."*

*"Would the average American be able to keep up with the news as much if it were not for electricity? The chances are 999 out of a hundred."*

**Here's one I've been trying to figure out for five years**: *"You should always capitalize the word electricity unless it is not the first word in the sentence."*

One little girl seemed to be giving it all she had when she wrote: *"Correct my being wrung but tell me true or false. Do negative charges go through electrons or through protons? I wrecked my brain trying to think which."*

But I'm afraid others are more nonchalant in their pursuit of knowledge: "Protons are bigger than electrons in case I ever want to know."

Obviously, one of the fringe benefits of being an elementary school teacher is the possibility that the next paper I read will contain a "wrong" answer that is twice as witty or thought-provoking as the right one. Sometimes they don't know and they know they don't know -- but that doesn't keep their answers from being charming:

*"Ideas about how we can use electricity have advanced to the point where they are no longer understandable."*

*"Did I pass the test about electricity and why not?"*

*"I have found radios to be easier to listen to than to tell how they work."*

Often a grownup can only envy the simplicity and beauty of a child's way of expression, as is the case of the lass who remarked: "When I learned we were going to see a movie about how the radio works, I told my feet to quiet down but they felt too Saturday to listen."

In their world of uncertainty, once they know a fact for certain they hang on to it tenaciously, e.g.: "Another name for the radio is radiotelephony, but I think I will just stick with the first word and learn it good."

Children, like mountain climbers, must always make sure that their grasp on a fact is firm, even though they want to leap far beyond. Otherwise, they may find themselves trapped on a mental ledge called a Boner. There is

usually at least an element of truth in the most absurd answer. Sometimes their answers aren't wrong at all; it's just the way they put it that's so funny:

*"Radio has a plural known as mass communication."*

*"Water-scientists have figured out how to change river currents into electric currents."*

*"The best thing live wires are good for is running away from."*

*"Quite a bit of the world's supply of electricity goes into the making of television."*

*"Many things about electronic communication that were once thought to be science fiction now actually are."*

Members of the grade school set certainly have their own opinions -- and few are hesitant to express them. Here's a logical conclusion: "All the stuff inside a radio is so twisted and coumplecated it is really not good for anything but being the stuff inside a radio."

How would you describe a vacuum? Here's one boy's answer, brief and exact: "A vacuum is an empty place with nothing in it."

Another lad wrote of his frustrating experience: "I figured out how a vacuum tube works twice but I forgot it three times."

More and more, I'm convinced that the funniest comedians in the country are all in grade school. When they turn their attention to the subject of television, youngsterisms seem to come as thick as chalkdust. Here's what I mean:

*"I like televisioning best on Saturdays, Sundays and weekdays."*

*"When a program is called a perennial television favorite, that means it is safe from canceling for the rest of the year."*

*"The Federal Communication Commission has the important-purposed job of finding out what is meant by the secret letters F and C and C."*

*"Television has taught me such things as to brush my teeth upside and down."*

*"Program-ending times are maintained very enforcedly."*

Ever heard of the word, "absolutional"? I hadn't until I came across this gem: "An absolutional opinion is what everybody should have about television."

I'm sure this next observation is perfectly true -- if I could only figure it out: "Television will not be like it should be until it gets like it was when we did not have any and appreciated such things as television offered."

Much of the fun in talking to kids comes from the startling way they can put a backspin on their answers, saying something that's ridiculous and sensible at the same time. If any of their definitions ever cause Webster to turn over in his grave, he would have to do so with a smile. Here are some that I've saved through the years:

*"When anyone says ANTENNAE, what he is saying depends on whether he is saying it to an insect or a television set."*

*"TECHNICAL DIFFICULTIES is the polite way of saying turn to some other channel."*

*"TELEVISION is a spare word for when you cannot think how to say tv."*

*"The VACUUM TUBE could just as well be called something else if we could only think of a better name for it."*

Oliver Wendell Holmes once observed: **"Pretty much all the honest truth-telling there is in the world is done by children."** Here are some personal bits of truth that the youngsters have written about what it's like watching television in their homes:

*"At our house, turning off Bonanza is a very exciting way of getting killed."*

*"One thing Daddy learned about trying to put a roof antennae up by himself was don't."*

*"They said our TV is made of mahogany but it looks like wood to me."*

*"Our television room has naughty pine walls."*

**Kids can sometimes be quite abrupt in their criticisms. When they criticize television especially, they do so with a vengeance:**

*"The worst trouble with television is even when they are told what is wrong, they keep on making the same mistakes over and over, ect., ect., ect."*

*"I have always enjoyed watching television but not very much."*

* * *

They aren't all critical, though. A girl who claimed she was one of television's "starchest supporters" had this encouraging report: "Because of improved receptions, many more television sets are now found in the outer skirts of cities."

Another moppet was going great -- until the last word: "I believe the radio is one of the most important inventions of all time. Of course my father works at a radio station, so I may be a little pregnant."

**That's one young writer who would have done fine if she had stopped while** she was ahead (which is good advice for grownup writers, too.)

* * * * * * * * * * * *

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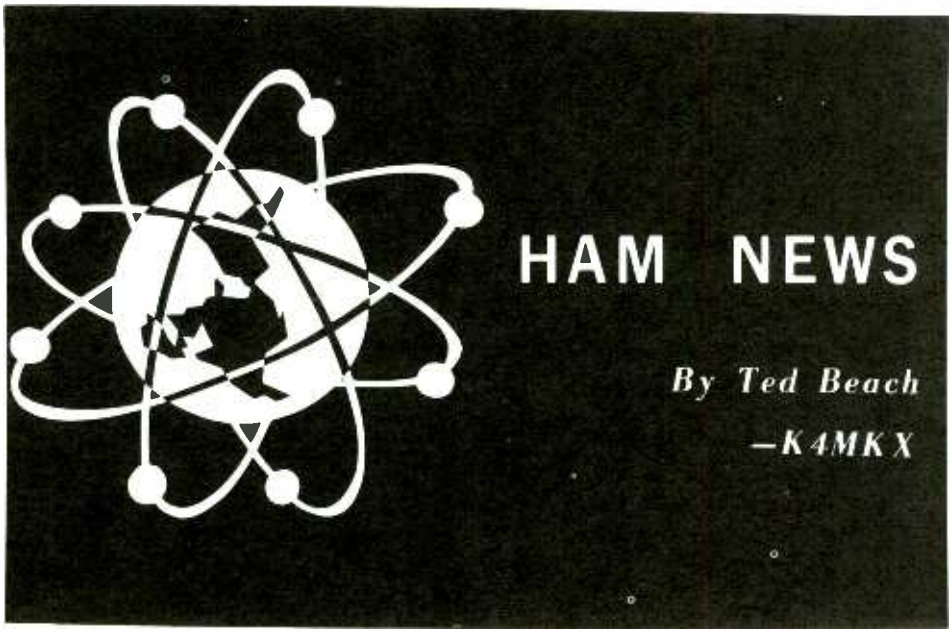



Well, since the last *Journal* we have received 27 cards, notes or letters. You sharp-eyed readers who notice that there are only 26 calls listed this time might be interested to know that the 27th letter was not from an NRI ham, but was from a graduate who was taken by our "oldest" claim a while back.

Oldtimer T. S. Norton from Hamilton, Ohio says he is *not* a ham, but was graduated from NRI in 1926 and has been (and still is!) active in the radio communications field ever since. In addition, he is a Charter Member of the Alumni Association and attended one of the early (in the 30's) get-togethers of the Alumni here in Washington. How about that?

The 26 NRI hams we have heard from recently are:

| | | |
|---|---|---|
| **WN1KPO** | **N** | **Westminster, MA** |
| **K2IPK** | **A** | **Haddon Heights, NJ** |
| **W3EZY** | **A-** | **Wilmington, DE** |
| **WA3GHE** | **G** | **W. Wyoming, PA** |
| **WN3LVU** | **N** | **Rochester Mills, PA** |
| **K3LTN** | **G** | **Clintonville, PA** |
| **W4WJJ** | **G** | **Newport News, VA** |
| **W4FDA** | **A** | **Jacksonville, FL** |
| **WA4TRS** | **E** | **Charlotte, NC** |

| | | |
|---|---|---|
| W4GJT | G | Ft. Pierce, FL |
| K4JVH | G | Maiden, NC |
| WA5PTU | T | Hurley, NM |
| WA5USU | G | Carlsbad, NM |
| W5LV | E | Metairie, LA |
| WB6QLX | G | Glendale, CA |
| K6VYJ | E | San Bruno, CA |
| WA6PKD | E | Broderick, CA |
| WA7JCQ | G | Mount Vernon, WA |
| KØDHY | G | Steward, MN |
| WØLWM | G | Iowa City, IA |
| KØFTI | G | Minneapolis, MN |
| VE5FH | - | Regina, Sask., Can. |
| VE6AGO | - | Waterton Lakes, Alberta, Can. |
| DL4IK/WA5SVR | C | |
| KG4DG/WB20IY | C | |
| KA2WM/WA6SVY | C | |

To date, we have received 324 cards, representing amateurs in all 10 districts, Alaska, Japan, Guam, England, Canada and Germany. Here's how it all breaks down by call area:

| | | | |
|---|---|---|---|
| W1 | 24 | W8 | 37 |
| W2 | 29 | W9 | 33 |
| W3 | 29 | WO | 36 |
| W4 | 40 | KL7 | 2 |
| W5 | 24 | VE | 18 |
| W6 | 22 | Others | 6 |
| W7 | 24 | | |

By actual count, there are 19 Extras, 69 Advanced, 117 General, 31 Conditional, 47 Technician and 28 Novice. We have NOT heard from anyone from Hawaii, Idaho, Nevada, South Dakota or Wyoming. Come on fellas, how can we get WAS this way?

From Canada we have heard from only VE1, VE3, VE5, VE6, VE7, VE8, and V01 (I KNOW we have some hams in Quebec, but so far only a CB QSL).

It's still too soon to give any information on the proposed CW net, as so far we have heard nothing. And before you know it Winter will be upon us, and then what? Please let us know your feelings on this, and we will see what we can do about getting something going.

Also, no news on the 14,250 SSB net. We have not had word one about any activity or followup get-togethers since our last report. Remember, this is YOUR net to do with and what as you see fit. We will act as a reporting media, but if we get no reports you get no reports. What's going on - anything?

A note from Russ, W3FSP, the other day says that in spite of our good wishes and much correspondence with Heath, that he still hasn't gotten the HW100 neutralized! Russ is also a avid 160 man but says he has closed up shop on this band because of all the QRN during the summer months (and I was all set to load up the Ranger on 160!).

Van, WA7JCQ, may be our YOUNGEST General Class license holder - he is 16. Anyone challenge this?

W4WJJ, Everett, is a Captain in the Air Force and has held quite a few calls: W3MDI, G5AAB, W5CTY, KA2CY, KA3CY, KAØCY, OE2ZVM, ON8VDM and GB2USA. Who said, "Join the Navy and see the world"?!

Ron, ex G5AMG, in spite of his new WA6 call, is going to be portable Ø as his next stateside assignment is going to be in Omaha.

Harvey, W3EZY, says he really can't compete with Jerry Miller's Oldtimer record since he was graduated January 3, 1928. Too bad, Harv!

K3LTN, Loyal, is a home brew and surplus addict and says that he has NEVER bought a piece of commercial equipment. Now that's what I call a REAL amateur. More power to you.

Irvin, WA4TRS, operates 80, 40 and 20, SSB and CW. He would like to meet with other NRI hams on weekends (3850 or 7250 ±10 KHz). He is also interested in a net. Quick, somebody grab him!

WB20IY, Walt, is presently in KA7 land without a Call (KG4DG latest) and is also interested in the net. He likes both SSB and CW and runs an SB101 barefooted.

K6VYJ, Bill, thinks a young married lady should be called just that - YML. Sounds good to me. Bill was also hoping to be the 12th Extra Class listed, but somehow four got in before him and he comes out a pretty good 16th. Sorry about that.

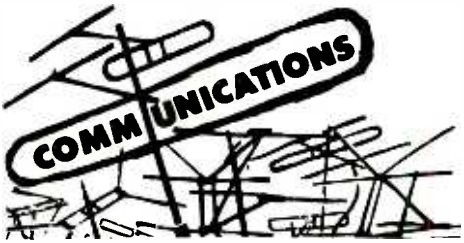
Bill, W5LV, sent in a nice letter the other day. He is only our third two-letter call and holds forth mainly as Maritime Mobile as he makes runs to South America quite frequently. He is Radio Officer on the S. S. Marine Transport and even while using his Radiotelegraph First and Radiotelephone First (BOTH with radar endorsements) aboardship, still finds time to pound it out on 7230 and 21,425 with his FT-DX-100.

Another interesting letter we received was from Bob, K4JVH, who has been hamming it up for 13 years. Bob is not only a home brew enthusiast but also enjoys QRP! He works 80 and 40 CW, using a 6AQ5 on 80 and a 6V6 on 40. That's 3.73 watts and 4.0 watts respectively. This makes my Ranger look like a kilowatt!

That's about it for this time. Remember, if you are an NRI student or graduate and are also a licensed amateur, we want to hear from you. A QSL card is fine, but be sure to indicate your license class for our files. We will acknowledge all cards and send each person a chart showing amateur frequency allocations for your troubles. Also, keep us posted if you upgrade - we'll list this in your column also.

73 es BCNU

Ted Beach - K4MKX




By David Turpin

DEAR DAVE,

**I don't understand what the alpha or alpha cutoff frequency is. What are they used for?**

The alpha of a transistor is the ratio of a change in collector current, divided by the change in emitter current which produced it, when the transistor is used in a common base circuit. Since some of the emitter current will also flow through the base, the collector current will be smaller than the emitter current and our ratio will be less than one.

The alpha of a transistor decreases as the frequency of the applied signal increases. We must be careful in choosing a transistor for a particular circuit. If the frequencies to be amplified are too high for this particular transistor our output current will be too small to produce a useable signal.

But how will we know if the transistor can be used? Each transistor has a particular frequency called the alpha cutoff frequency. At the alpha cutoff frequency, the alpha of the transistor has dropped to 70.7% of its low frequency value. At this frequency the power output of the transistor will be only 50% of what it was at low frequencies. We call this the "half power point" and say that the transistor is no longer suitable for use at higher frequencies.

DEAR DAVE,

**Can you give me some help on the power formulas? I know this sounds funny, but I hear the word power all the time and I still don't know what it means. And I can't remember the formulas at all.**

The best way to remember a formula is to know what it means. A formula is only a shorthand way of writing down facts or ideas. Let's go over the power formulas and see what they're trying to tell you.

Power is the rate at which work is done. We say that work has been done whenever a force causes motion. Both force and motion are necessary; if you lift a large stone you have done work. If you simply hold the stone in your hand you have not done any work, even though you may feel just as tired!

Power is the RATE at which work is done. If may take an hour for you to lift the stone at one time, a minute for you to lift the stone at another time. The same amount of work was done in both cases but more power was consumed in the second case because the work was done faster.

Now let's take what we know about power and apply it to electrical circuits. In this case we call our force Electromotive force, or voltage. When voltage causes current flow, power has been consumed. Notice that work is being done. Our force, voltage, causes motion,

the movement of electrons, or current flow. If we want to find how much power is consumed at any instant, we multiply the voltage at that instant times the current at that instant. Since voltage and current are both constant we can simply use the formula: $P = I \times E$.

Now suppose we want to find the power in a dc circuit when the only two factors that we know are resistance and current. We could first multiply current times resistance to find the voltage. We would then multiply current times voltage to find the power.

There's a simpler way. Since we know that $E = I \times R$ we can substitute the expression $I \times R$ for E in our formula $P = I \times E$. This gives us the formula $P = I \times I \times R$ or $P = I^2R$. This formula makes use of the facts that we already have about our circuit and we can find the power much faster.

Now suppose the two known factors are voltage and resistance. Again we can find our value for power in two steps. We can first divide resistance into voltage in order to find our circuit current. Our next step is to multiply voltage times current.

But, again, we can combine our two steps into one formula. Since $I = E/R$, we can substitute the expression E/R for I in our formula for power. Our formula becomes $P = E \times E/R$, or $P = E^2/R$.

Our three power formulas are:

$$P = EI$$
$$P = I^2R$$
$$P = \frac{E^2}{R}$$

Any one of these formulas can be used to find the power in a circuit. Use the formula which makes use of the information that you already have about a circuit.

**DEAR DAVE,**

**I'm puzzled by the letters RMS. What do they stand for? Is this the same as effective voltage? Can you help me on this?**

The letters RMS stand for "root mean square". The phrase "root mean square" refers to a mathematical process that we can use to find the effective value of an ac voltage.

If we know all of the instantaneous values of a sine wave voltage we can find the effective value by taking their square root, finding the mean, or average value, and squaring the result.

However, mathematicians have found a simpler way to compute the effective voltage. They have found that the effective value of a sine wave is always equal to 70.7% of the peak value. We can write this as a formula: $E_{eff} = .707 \times E_{peak}$.

You can see how easy this is to use. Instead of needing many values, we need only one: the peak voltage. Instead of many steps we need only one process: multiplication.

When you measure ac voltages with your voltmeter, incidentally, you measure the effective, or RMS value of the voltage. However, on most meters you will have a scale calibrated to read the peak value. You will always find that the effective value is equal $\sqrt{707}$ times the peak value.

# Servicing Solid-State Auto Radios

***There's profit to be had in servicing the auto radio, and it can be done as easily as any solid-state receiver***

By Homer L. Davidson

Many service technicians are reluctant to service the solid-state auto radio receiver. This is probably true because sometimes the auto radio must be removed and then reinstalled, which makes a little extra work. But there's repair profit in servicing the auto radio, which can be repaired in the same manner as any other solid-state receiver.

Although the eight solid-state auto radio troubles outlined here may be familiar to some technicians, they may be new to others, and in any case every technician should benefit in some measure by reviewing the problems and their solutions.

## THE PROBLEM:

Only the local broadcast stations could be received in this particular solid-state Ford Model 7TPF.

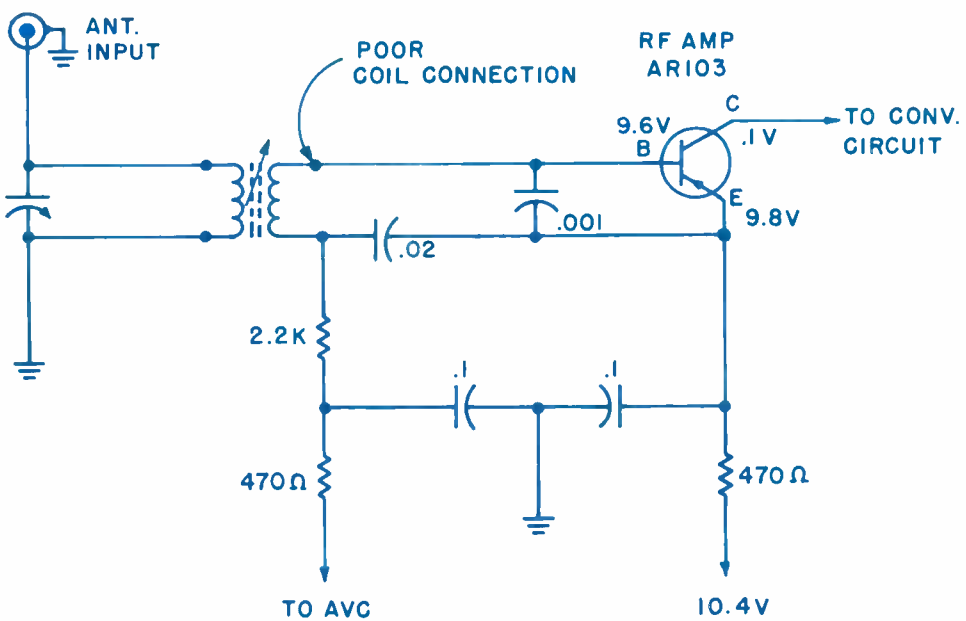



**Fig. 1. Ford Model 7TPF radio received only local stations.**

## THE SOLUTION:

A new top cowl antenna was plugged into the antenna receptacle, to check for a defective antenna system. The results were the same; only local stations were received, and only one at each end of the dial. Then the radio was pulled from the car and connected up for tests on the radio bench. The signal was traced with a noise signal generator from the audio section to the rf section. When the signal generator probe was placed on the rf transistor base terminal, the signal appeared normal. A visual check showed a broken antenna lead at the antenna trimmer terminal located behind the selector knob, but replacing the broken wire did not solve the weak reception problem.

The rf section was then checked again, and all wires traced to the tuning assembly. All tuned coils were checked with the FET-ohmmeter, and the rf coil was found open. One flexible coil lead, next to the terminal board connections, had broken off. Now we soldered a strand of flexible hookup wire to the broken piece and to the rf terminal connection (Fig. 1). Before buttoning up the radio, complete rf/i-f alignment put it back in service.

## THE PROBLEM:

A Volkswagen Model 7BUT radio was brought in to the shop with stations received only at the low end of the dial.

## THE SOLUTION:

Generally when this condition exists the converter transistor or oscillator circuits are at fault. Here we first checked the converter transistor, $Q_2$ (Fig. 2) with an in-circuit beta transistor tester. The suspected circuit showed a very high leakage reading. Next the converter transistor was removed from the circuit board and tested again with the tester. It again showed leakage, so a new universal transistor was installed. Then stations could be received over the entire broadcast band. A touchup of rf and i-f alignment was again needed.

## THE PROBLEM:

Only a trace of audio was noted on this Mopar Model 226 radio. You could hear a click in the speaker when the on/off control was switched on, and a rushing noise could be heard in the speaker when the volume control was rotated rapidly up and down.

## THE SOLUTION:

The signal was traced with the noise signal generator in the second i-f transistor

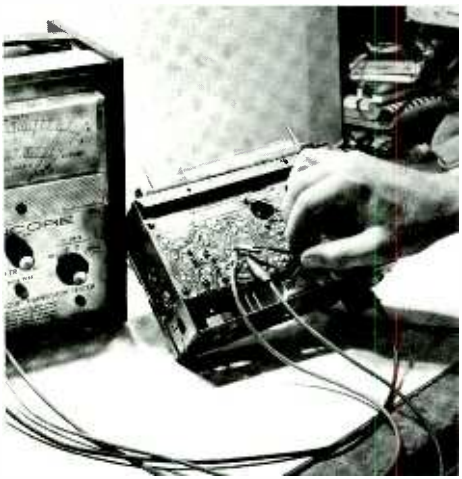


Fig. 2. An in-circuit beta transistor tester simplifies servicing.

Fig. 3. A noise signal tracer is a quick way to locate a defective stage in the auto radio.

collector terminal (Fig. 3). When the generator probe was placed on the suspected transistor base terminal, the signal was lost, and on the collector terminal the signal appeared normal. The second i-f transistor was removed from the circuit board and tested on the beta transistor tester and found open. (At times, when leakage tests are made with an in-circuit transistor tester in the i-f sections, the transistor will indicate heavy leakage. An open transistor will give an accurate reading within the circuit.)

The defective transistor was replaced and the radio was still dead. The second i-f transistor was checked for correct installation and all connections were good. Again high gain was noted when the noise generator probe was placed on the second i-f transistor base terminal. The signal was fed into the converter stage base terminal and the signal was very weak, but the signal at the collector terminal was loud and clear, which brought up the question: Is it possible to have two or more defective transistors in the same receiver?

A further check with the in-circuit beta transistor tester indicated a high leakage converter transistor, and prompted the replacement of the converter transistor. Again, the radio was connected, but only two local stations could be received. Automatically we replaced the rf transistor, and this time the radio worked. This turned out to be one of the rare cases where there were THREE defective transistors in the same radio!

When tuned to several strong local broadcast stations, the radio still appeared mushy or distorted. The overload diode was checked and found open (Fig. 4). Replacement of the open diode corrected the distortion problem, and a complete rf/i-f alignment was made after replacement of the defective transistors.

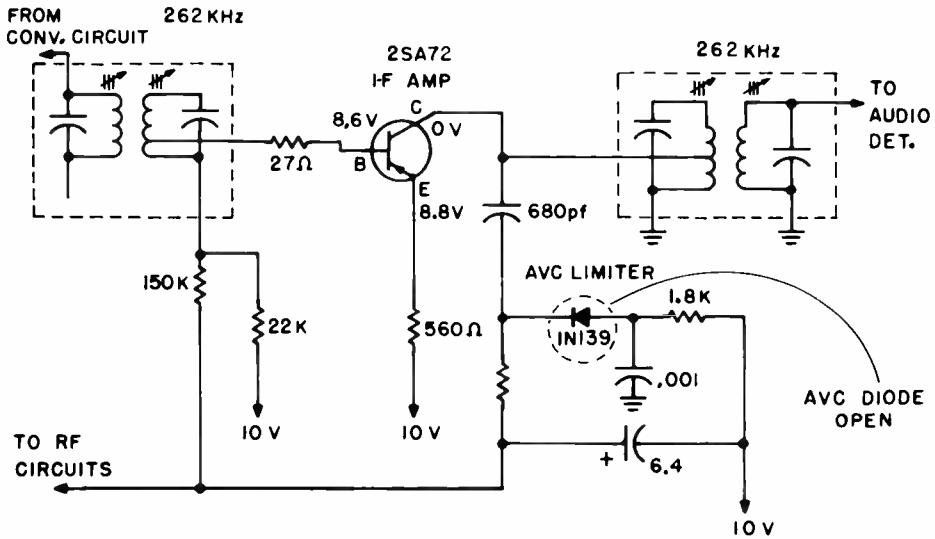



**Fig. 4. Only a trace of audio was noted in this Mopar Model 226 radio.**

## THE PROBLEM:

This Motorola Model 4TMV would operate for a few seconds and then become intermittent. When the intermittent condition existed, a low hum could be heard in the speaker, indicating the audio section might be functioning.

## THE SOLUTION:

Driving the receiver with the noise signal generator, the signal was good on the second transistor i-f collector terminal. But when the signal probe was placed on the base terminal, the radio began to operate. We let it set for half an hour while we worked on a solid-state portable. Then, going through the same test procedure, the radio still operated normally.

We removed the second i-f transistor, the suspect 2SA72, from the circuit board and tested it with a transistor tester. At first, the transistor appeared normal, and then the tester indicated an open condition. We switched the tester to the leakage position, and again the transistor tested normal. When cold spray was applied the transistor became open. Replacement of the second i-f transistor solved the intermittent condition.

## THE PROBLEM:

A solid-state Motorola Model TM297 was brought into the shop with a weak output.

## THE SOLUTION:

It played perfectly when connected to the service bench test setup. In fact, it didn't act up for two whole days. The customer was in a hurry for it, so we made another quick check; when the volume was turned up the speaker began to cut out. We suspected a defective 8-ohm PM speaker. (At times, by pushing on the voice coil while the radio is operating, an intermittent voice coil lead will act up, and the speaker will become intermittent on very high volume.)

Here we replaced the speaker, and left the radio playing for awhile. After a few minutes the output level dropped. The 12.6V supply voltage was reduced to 9 volts with a variable isolation line transformer. From 900 KHz down on the dial the radio appeared normal, but the high end of the broadcast band was completely dead. We replaced the suspect converter transistor with a universal type, and then the radio operated normally with a 9-volt supply voltage.

(That's a good point to remember when servicing auto radios: it can be wise to vary the supply voltage when extreme intermittent conditions exist. Then if the radio cuts out on any portion of the dial, you can replace the suspected converter transistor, or isolate the intermittent stage with an rf or audio signal generator.)

## THE PROBLEM:

When this Ford Model 6TBF was jarred, the stations would shift to another spot on the radio dial (Fig. 5). They would even shift when the top of the dash was thumped.

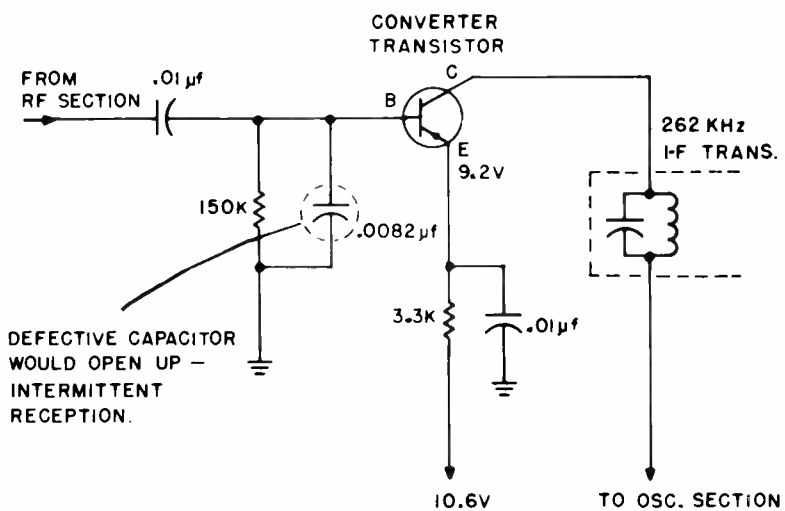



**Fig. 5. Shifting was the problem with this Ford Model 6TBF radio.**

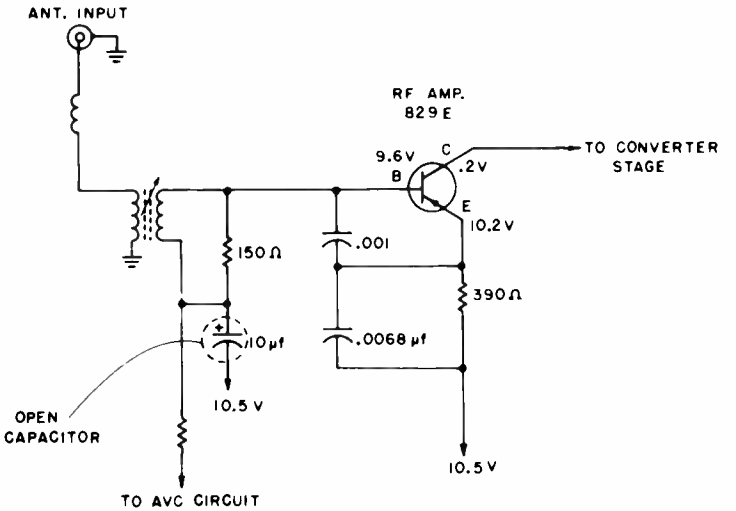



**Fig. 6. Ford Model 8TMF whistled all over the dial.**

## THE SOLUTION:

The dial drive assembly was suspected of shifting, and undoubtedly the gears or pressure plate were not meshing properly. We removed the radio and made a visual check on the service bench. After checking the dial assembly (going through the complete band), the drive assembly was tracking normally, but when the radio was tapped the stations shifted.

Now it appeared that the trouble was caused by electronic failure, or that the shifting stations could be the result of a frequency change in the oscillator section. We pushed and prodded the oscillator coil connected to the converter stage with an insulated tool, and nothing happened. But when touching the small components near the converter transistor base circuit, a .0082 μf capacitor would upen up. There seemed to be a loose connection inside the small bypass capacitor. Installing a new capacitor put the radio back to normal.

## THE PROBLEM:

A Ford Model 8TMF (Fig. 6) came into the shop with station whistling all over the dial. At the high end of the band the whistling was very loud and sometimes intermittent.

## THE SOLUTION:

Generally a tuneable or whistling condition is caused by a defective filter network. We

bridged all filter capacitors with a 500 μf electrolytic, but the whistling persisted. When the radio was bumped, the squeals would come and go. Checking the audio and filter networks pinpointed the trouble to the rf stage. A flat bypass capacitor (10 μf) turned out to be the culprit. It had a loose lead inside. Replacement was the only solution.

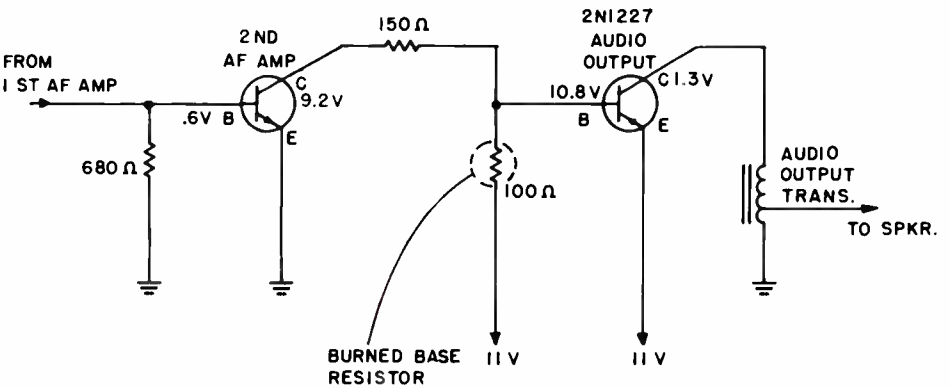



**Fig. 7. High leakage showed in check of this Bendix Model 4TBCH radio.**

## THE PROBLEM:

No audio existed on this Bendix Model 4TBCH. When the radio was switched on and the volume turned up, not a click or a sign of hum could be heard from the speaker, but the output transformer became quite warm.

## THE SOLUTION:

We removed the 2N1227 power output transistor from the heat sink, and checked for high leakage, which showed (Fig. 7). We then replaced the 100-ohm base bias resistor, and a low ohmmeter continuity check indicated the output transformer was okay. We replaced the power output transistor with a universal type.

### Other points to consider in any solid-state auto radio servicing problem:

Check the condition of the pilot light.

Tune all pushbuttons to the local broadcast stations. Make sure the stations are on the correct dial number.

Clean out dirt and grease from the dial assembly.

When installing the radio back in the car, adjust the antenna trimmer capacitor for maximum signal at 1000 KHz or 1400 KHz .

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# New Books

By Donald A. Smith, *NRI Book Editor*

**Reference Data For the Radio Engineer, 5th Edition. Howard W. Sams & Co., Indianapolis, Ind. Hardbound, $20.00.**

Here is a reference text which contains just about everything in the way of reference data. It has 45 chapters, each on a particular subject, such as: Magnetic Amplifiers, Attenuators, Microminiature Electronics, and so on.

In any particular chapter, you will find the chapter broken down into various parts. For example, Chapter 21, on Modulation, has Part 1 on Continuous Modulation. Under Part 1, you find various formulae involved in continuous modulation practice, such as Analytic Signal Representation of Modulation Waveforms, Amplitude Modulation, Double Sideband, Conventional Amplitude Modulation, Vestigial Sideband and on and on. Each of these parts of each chapter is complete information on various formulae which may be necessary to figure out some part of the chapter topic.

The book is as complete as it is large, with new subjects also being covered, such as Quantum Electronics, Nuclear Physics, Space Communications, Scattering, Matrices and so on. Each is covered COMPLETELY, and in great detail. While the book is highly mathematical, it does also provide much practical information. This book would be of most use to those advanced students and graduates interested in working as Engineering Technicians.

**How To Use Grid-Dip Oscillators, by Rufus P. Turner. Hayden Book Co., Inc. New York, N.Y. 10011. Paperbound, $2.95, 111 pp.**

I have always been one of those people who have felt that the Grid-Dip Oscillator (often referred to as the GDO), as an instrument which is extremely valuable, but few electronics people other than Radio Amateurs seem to know much about them, or how to use them. Actually the GDO is a very simple instrument. Now Rufus Turner has gone and written a book about it. Good for him! It's about time someone did.

The book is broken down into 10 chapters, with chapter one explaining the circuit of a typical Grid-Dip Oscillator and discussing its layout and operation. Various possible circuits are covered. He also discusses building a GDO, versus buying one.

In other chapters, he deals with most of the things that a GDO can be used for, showing HOW to use it as well. For example, Chapter 3 deals with Resonant Circuit Measurements. In this chapter

alone, he shows 14 different uses for it in resonant circuits.

Chapter 4 deals with Capacitance Measurements, while Chapter 5 explains many uses for the instrument in Inductance Measurements. Chapter 6 goes into Receiver Applications, while Chapter 7 covers Transmitter Applications. Antenna and Transmission-Line Tests are explained in Chapter 8. Chapter 9 discusses Miscellaneous Applications of the GDO.

The last chapter (10), deals with Commercial Grid-Dip Oscillators and covers no less than nine (9) different commercial models. Pictures, circuits and descriptions of each are given in this chapter, and the reader really gets some good, down to earth information on each one.

I think that Turner has done it again: written a book on a subject which should be covered, and done it in a way that a reader will find interesting and informative. The best endorsement I can give it is I wish I had written it myself!

**Audio Systems Handbook, by Norman H. Crowhurst. Tab Books, Blue Ridge Summit, Pa. 17214. $7.95 Hardbound, $4.95 Paperbound. 192 pp.**

As the title of this book suggests, it is all about various audio systems, how they are put together into a system, different source inputs, special type devices and so on. The book also goes into commercial aspects of sound systems.

Chapter 1 deals with amplifiers in general, explaining about db, impedance matching, various types of speakers and the amplifier output impedance, grounding, shielding and much more. In this chapter, Mr. Crowhurst has laid the foundation and basics of amplifier fundamentals in an interesting, practical way.

The following chapter discusses mixers and filters, with a good discussion on loudness compensation, equalizers, mixers and filters. The author uses diagrams, charts and other illustrations to help explain the text material.

In Chapters 4 and 5, program sources and special devices are covered. Then in Chapter 6, he talks about the "complete package." That is, things like the power margins, matching, relationship between peak and average power, mono-versus-stereo and so on.

Chapter 7 covers The Commercial Sound. This deals with other amplifier systems, other than hi-fi, that is: things such as public address systems, mikes, loudspeaker systems, PA amplifiers, and intercoms.

Chapter 8 was particularly interesting. It deals with Studios. Included are Studio Acoustics, Electronic Musical Instruments (which will interest a lot of electronic students and graduates, I'll bet), the Electronic Music (Moog) Synthesizer and other topics. Much good practical information is given here.

The last chapter (Chapter 9), deals exclusively with Speaker Systems. This chapter would be extremely helpful to those wanting to set up speakers for an auditorium, hall or what have you. There are many problems which can arise in these layouts, and they are dealt with in this chapter.

# NRI HONORS PROGRAM AWARDS

*For outstanding grades throughout their NRI course of study, the following May and June graduates received Certificates of Distinction along with their NRI Electronics Diplomas.*

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# ALUMNI NEWS

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## DETROIT RE-ELECTS SLATE OF OFFICERS

DETROIT CHAPTER elected the same slate of officers for the coming season that served them last year. After the business meeting the members enjoyed coffee, sandwiches and other goodies supplied by **Leo Blevins**, who was visiting, and **Earl Oliver.**

The chapter is planning on featuring lots of slide talks, movies and lectures this season.

## CITIZEN'S BAND JAMBOREE ATTRACTS FLINT-SAGINAW

FLINT-SAGINAW VALLEY CHAPTER members were guests of the Michigan Wolverine Radio Club at their Citizen's Band Jamboree held on June 20 - 22. This event was three full days of fun, play, and entertainment. A recording artist from London, Ont., **Peter Markestein**, and our own **Leo Blevins**, the magician, with his act, contributed to the entertainment. A parade of prizes, trophies, dancing, and hourly door prizes were also featured. Chapter members not only thoroughly enjoyed the entertainment and good fellowship but also came home with a respectable number of prizes.

## POTPOURRI OF SUBJECTS ENGROSS N. Y. MEMBERS

NEW YORK CITY CHAPTER's **Willie Foggie** demonstrated measurements, using a small portable scope to help in diagnosing problems of instability. He emphasized the use of peak-to-peak voltage measurements and the importance of

checking them against those given on the schematic.

**Jim Eaddy** spoke on the various adjustments and the reasons for them in setting up color picture tubes, and how it is possible to shift the connections between the color matrix and the tube grids to get a better picture and so avoid replacing the tube.

**Pete Carter** pointed out that in fixing car radios extreme care has to be used in handling probes or transistors could be burned out. **Stephen Kross** talked about his success with the low-voltage-transformer, scope testing of transistors and diodes, and some of his experiences with matching impedances in transistor output stages of car radios.

The Tau Epsilon Fraternity, owners of the building where the chapter meets, has definitely taken a lease on 264 East Tenth Street, so it will be the Chapter's meeting place at least the next year and hopefully it will be renovated for this fall.

## FIVE NEW MEMBERS BOLSTER JERSEY GROUP

NORTH JERSEY CHAPTER hit the jackpot in admitting five new members all at one meeting. They are **Thomas D. Callery, Bernard Friner, Elwyn E. Jones, Richard F. Lennon,** and **Ralph Sassano.** Our congratulations to you, gentlemen! All the new members are employed by Emerson TV and are very interested in transistors and their operation in TV sets.

At the next meeting **George Stoll** conducted the program, using a tape recorder and slides edited by the Howard Sams Company of its Transistor Review Series. Lecture No. 1 (of four) "Semiconductor Fundamentals", and Lecture No. 2, "Circuits and Associated Components", were the topics. Literature that accompanied these lectures was distributed to the members present. This was an interesting and rewarding meeting.

## PHILLY-CAMDEN DELIGHTS IN OWN 'SPEAKERS BUREAU'

PHILADELPHIA-CAMDEN CHAPTER is fortunate in having a number of good speakers among its membership who can be called upon to deliver the kind of talks that the chapter members like. Such a one is **Bill Davis,** who has been helping out a lot in this respect lately. You can be sure that the membership appreciates it, Bill.

Secretary **Jules Cohen** says he thinks the chapter ought to work out a schedule which calls for more on troubleshooting in color and transistor sets, and that this is one subject the members can't get enough of. Right you are, Jules.

## OCEANOGRAPHY IS TOPIC FOR PITTSBURGH CHAPTER

PITTSBURGH CHAPTER thoroughly enjoyed an unusual and fascinating program. It was conducted by **Russell Rohleder** of the Bell Telephone Company. The subject was Oceanography -- the importance of the oceans, the part they play in life on earth, the abundance of minerals and food present in sea water, and man's efforts to develop a way for

**Oceanography was the topic of Russell Rohleder's talk at Pittsburgh meeting.**

humans to live under water. Anyone who wasn't present at this meeting missed a truly absorbing program.

## SAN ANTONIO OLDTIMERS PICK UP MEMBERS, TIPS

SAN ANTONIO ALAMO CHAPTER, not to be outdone by the North Jersey Chapter (see report in this issue), also admitted five new members all at one meeting. They were **Paul Castiglione, Gilbert Scheel**, James L. **Rivet, Alfred D. Richards**, and **Paul R. Poteat. Seferino M. Ozuma** was admitted at the previous meeting. A warm welcome to you, gentlemen!

This meeting featured **Mike Kinsner**, Zenith Distributor Service Instructor, and **Ted Walker**, Zenith Distributor Service Manager, both from Joe T. Thiele Company, San Antonio **Zenith** Distributor. Normally these men conduct service schools for Zenith dealers and assist them with service problems.

The guest speakers spoke on the proper use of the oscilloscope in TV servicing. Two scopes were used. The program lasted 2-1/2 hours with no one tiring of it. Even the oldtimers admitted they learned a lot of tricks they had overlooked. One thing that intrigued Secretary **Sam Stinebaugh** was the use of external sweep from the horizontal output of the receiver when observing the horizontal waveform in the set, also the same principle for the vertical section.

This was an outstanding program. The guest speakers seemed to be much impressed by the members' response and offered to come again at an early date.

Sam Stinebaugh contacted four other major distributors. Each expressed interest in sponsoring a program. Sam thinks there will be more of this type of program.

## ROSS ALEXANDER EXPLORES SCR'S FOR SAN FRANCISCO

SAN FRANCISCO CHAPTER'S secretary, **Ross Alexander**, following **Executive Secretary Tom Nolan's** visit to the chapter on June 12, became so interested in silicon-control rectifier circuits that he reviewed Mr. Dunn's article in the January-February issue of the NRI Journal, as well as researching Michael

Faraday's life, in order to deliver a talk on it. This Ross did at the next meeting, and the talk turned out to be quite interesting by reason of his mentioning various inspiring things about Faraday's life and showing how difficult it was for Faraday to discover induction and a magnetic field surrounding a wire. Induction and magnetic flux were brought into the talk to explain the action of the yoke in forming magnetic flux.

It was decided that the talk would be given again at the next meeting and **Art Ragsdale** will deal at some length with atomic structure.


***On your calendar Oct. 31***

# Sam Stinebaugh Takes Lead in Primary

As it looks from our primary returns, Sam Stinebaugh has a very good lead to be elected National President of the NRI Alumni Association for the year 1970.

As a charter member of the San Antonio (Texas) Chapter of the NRI Alumni, Sam has been a sparkplug to fire the enthusiasm of his chapter.

Coming in second in the nominations is James Wheeler, of the Pittsburgh Chapter. Jim was the National Vice President back in 1965. He is a real worker in the Pittsburgh (Pennsylvania) Chapter, and has been an officer of that chapter several times.

Either of these two gentlemen would make an excellent president of the National Radio Institute Alumni Association.

This year we have a whole new slate of nominees for the office of Vice President. A list follows of those names nominated by the membership. Out of this list you must elect four members of the Alumni who will fill the office of Vice President of the NRIAA for the year 1970.

**NOMINEES FOR VICE PRESIDENT:**

Francis K. Smith - Atlanta, Georgia.
Graham D. Boyd - Los Angeles, California.
William Sames - Pittsburgh, Pennsylvania.
Samuel Antman - New York, New York.
Br. Bernard Frey - Springfield, Massachusetts.
George Schalk - Ridgeway, New Jersey.
Herbert Emrick - Cornwells Hgts., Pennsylvania.
Andrew Jobbagy - Flint, Michigan.

Please indicate your choice of the candidates on the ballot shown below. Then mail the ballot well before September 25, when the polls close. The list of winners will appear in the November/ December issue of the Journal.

## Alumni Election Ballot

FOR PRESIDENT (VOTE FOR ONE MAN)

☐ **SAM STINEBAUGH**, San Antonio, Texas ☐ **JAMES WHEELER**, Pittsburgh, Pa.

FOR VICE PRESIDENT (VOTE FOR FOUR)

☐ Francis K. Smith, Atlanta, Ga. ☐ Br Bernard Frey, Springfield, Mass.

☐ Graham D. Boyd, Los Angeles, Cal. ☐ George Schalk, Ridgeway, N.J.

☐ William Sames, Pittsburgh, Pa. ☐ Herbert Emrick, Cornwells Heights, Pa.

☐ Samuel Antman, New York, N.Y. ☐ Andrew Jobaggy, Flint, Mich.

YOUR NAME _____

ADDRESS _____

CITY _____ MAIL YOUR COMPLETE BALLOT TO:

STATE _____ ZIP _____ T. F. Nolan, Jr., Exec. Sec.
NRI Alumni Association
3939 Wisconsin Ave. N.W.
Washington, D.C. 20016

**POLLS CLOSE ON SEPTEMBER 25, 1969**

# DIRECTORY OF CHAPTERS

CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER meets 8:00 p.m. 2nd Tuesday of each month at Bob Erford's Radio-TV Service Shop, Chambersburg, Pa. Chairman: Gerald Strite, RR1, Chambersburg, Pa.

DETROIT CHAPTER meets 8 p.m., 2nd Friday of each month at St. Andrews Hall, 431 E. Congress St., Detroit. Chairman: James Kelley, 1140 Livernois, Detroit, Mich. VI 1-4972.

FLINT (SAGINAW VALLEY) CHAPTER meets 7:30 p.m., 2nd Wednesday of each month at Andrew Jobbaggy's shop, G-5507 S. Saginaw Rd., Flint. Chairman: Arthur Clapp, 705 Bradley Ave., Flint, Mich. 234-7923.

LOS ANGELES CHAPTER meets 8 p.m., 2nd and last Saturday of each month at Graham D. Boyd's TV Shop, 1223 N. Vermont Ave., Los Angeles, Calif., NO-2-3759.

NEW ORLEANS CHAPTER meets 8 p.m., 2nd Tuesday of each month at Galjour's TV, 809 N. Broad St., New Orleans, La. Chairman: Herman Blackford, 5301 Tchoupitoulas St., New Orleans, La.

NEW YORK CITY CHAPTER meets 8:30 p.m. 1st and 3rd Thursday of each month at 264 E. 10th St., New York City. Chairman: Samuel Antman, 1669 45th St., Brooklyn, N.Y.

NORTH JERSEY CHAPTER meets 8 p.m., last Friday of each month at Midland Hardware, 155 Midland Ave., Kearney, N.J. Chairman: William Colton, 191 Prospect Ave., North Arlington, N.J.

PHILADELPHIA-CAMDEN CHAPTER meets 8 p.m., 2nd and 4th Monday of each month at K of C Hall, Tulip and Tyson Sts., Philadelphia. Chairman: Herbert Emrich, 2826 Garden Lane, Cornwell Heights, Pa.

PITTSBURGH CHAPTER meets 8 p.m., 1st Thursday of each month at 436 Forbes Ave., Pittsburgh. Chairman: James Wheeler, 1436 Riverview Dr., Verona, Pa.

SAN ANTONIO (ALAMO) CHAPTER meets 7 p.m., 4th Friday of each month at Alamo Heights Christian Church Scout House, 350 Primrose St., 6500 block of N. New Braunfels St. (3 blocks north of Austin Hwy.), San Antonio. Chairman: R. E. Bonge, 222 Amador Lane, San Antonio, Texas.

SAN FRANCISCO CHAPTER meets 8 p.m., 2nd Wednesday of each month at the home of J. Arthur Ragsdale, 1526 27th Ave., San Francisco. Chairman: Isaiah Randolph, 60 Santa Fe Ave., San Francisco, Calif.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets 8 p.m., last Wednesday of each month at the home of John Alves, 57 Allen Blvd., Swansea, Mass. Chairman: Oliva J. Laprise, 55 Tecumseh St., Fall River, Mass.

SPRINGFIELD (MASS.) CHAPTER meets 7 p.m., last Saturday of each month at the shop of Norman Charest, 74 Redfern Dr., Springfield. Chairman: Br. Bernard Frey, 254 Bridge St., Springfield, Mass.


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**Complete with Cabinet—Nothing Else to Buy**

**SPECIFICATIONS**

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18" diagonal measure. 180 square inches of viewing area.

**Tube, Transistor and Diode Complement**
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Two stages. Uses high transconductance tubes and preset coils.

**Video Amplifier**
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**Sound Circuit**
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**High Voltage**
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**Focus**
Electrostatic with separate high voltage supply.

**Loudspeaker**
Front mounted oval type.

**Front Controls**
VHF tuner, UHF tuner, tint, color, horizontal hold, contrast, brightness, on-off and volume.

**Dimensions**
25" wide
19" deep
15¼" high

**Cabinet**
Wood grained vinyl clad steel.

**Weight**
Under 75 lbs.

**Power Requirements**
120 VAC-60 cps—275 watts

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Its functional, modular design, combined with the knowledge you gain from building, will make it simple to make any needed repairs—and we're willing to bet you'll make mighty few, for the Custom 600 is the work of a project team selected from among our own engineers, technical writers and editors who spent literally years on engineering, design and testing.

The Custom 600 uses printed circuit boards for fast, easy assembly and every component is of first quality. Its design incorporates the latest advances in the art of color receiver construction. In addition to 21 tubes, this all-channel receiver incorporates a transistor UHF tuner, transistor noise cancellation circuit and sixteen solid-state diodes. The low voltage power supply contains three silicon rectifiers. Everything, but everything, is supplied. There is absolutely nothing extra for you to buy. The attractive bronze-toned cabinet with wood tone accents will enhance any room in your home. The receiver even includes separate gun killer switches which you will build in to aid you later in making maintenance and servicing easier and more convenient, and a built-in cross hatch generator makes it easier for you to adjust convergence so that you get true-to-life color.

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