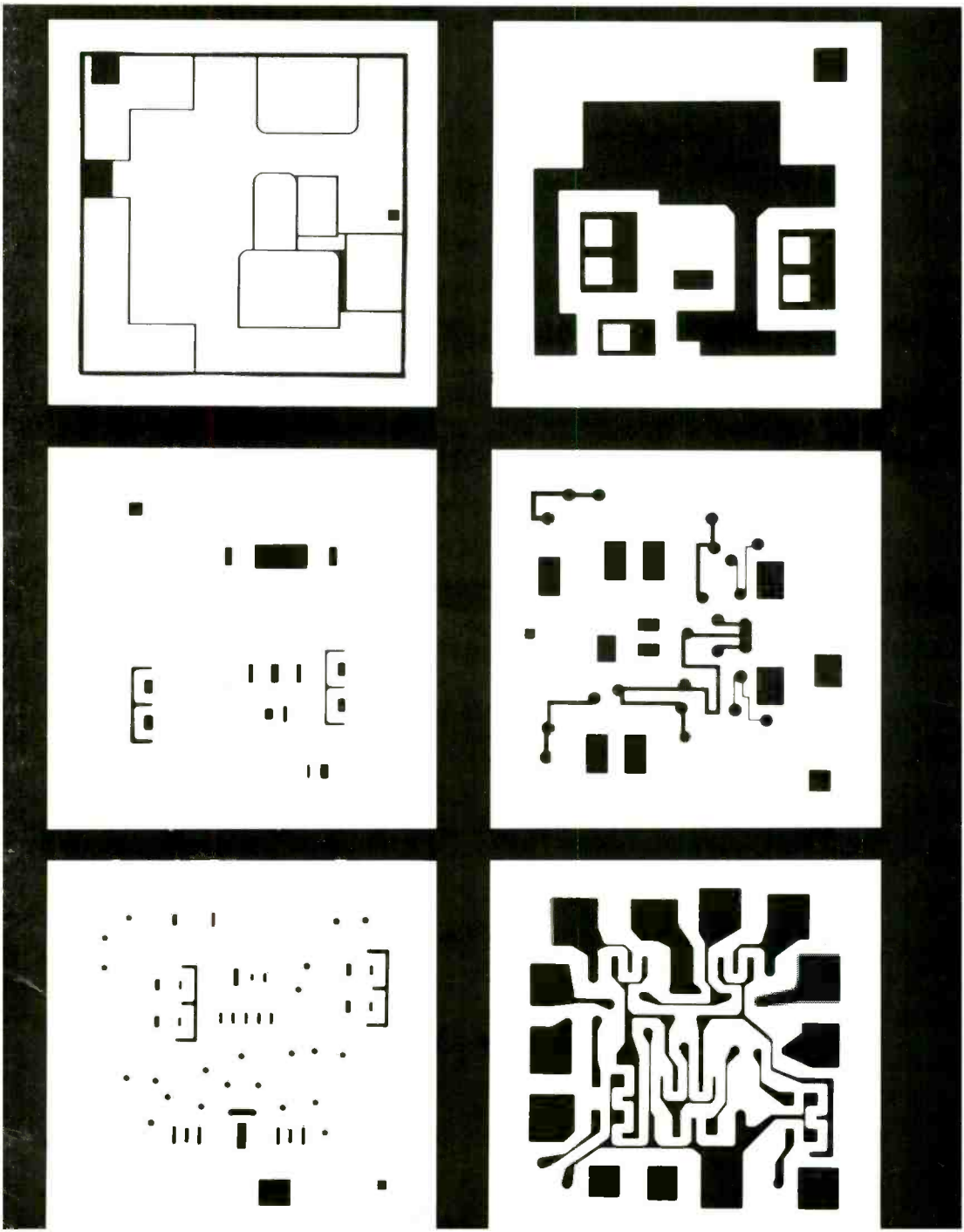
nri journal

May/June, 1969

35 Cents



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SPECIFICATIONS

CASE: Black, leather-fabric; removable, hinged lid with safety catch; PANEL: Satin finish, aluminum; PANEL LETTERING: Red; METER: Double-jeweled D'Arsonval type; accurately balanced and factory calibrated to within 2% accuracy; ROLL CHART MECHANISM: Triple-window, high speed, gear operated; illuminated; SAFETY FEATURE: Test circuits transformer isolated from power line affords utmost safety to operator and instrument; POWER REQUIREMENTS: 50-60 cycle, 110-120 volt, AC only; WARRANTY: Standard EIA warranty on all parts; DIMENSIONS: Width 15¼"; length 10½"; depth 4¾". ACTUAL WEIGHT: 10 lbs.; SHIPPING WEIGHT: 13 lbs., Parcel Post Insured.

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On the Cover

If you don't know what that is on our cover, then you should read LOUIS E. FRENZEL, JR.'s article (p. 2), "Maintaining and Upgrading Your Competence in Electronics." Lou, recently named Assistant Director of Education for NRI, is a Texas native with a background primarily as an electronics engineer in the computer field, also doing computer and circuit design and teaching. You'll be reading more of Lou's articles in upcoming issues. (P.S. The cover pictures are, in sequence, a complete set of masks for a typical monolithic integrated circuit.)

Maintaining and Upgrading Your Competence in Electronics

By Louis E. Frenzel, Jr.

Most of us know what a very broad and rapidly changing business the electronics industry is. There are so many facets to it that none of us are really able to know it all, and least of all become proficient in every area. Of course, that is why we specialize -- we work with computers or mobile communications, technical writing or TV repair, but seldom in more than one or possibly two areas.

Even though we may have only one area of specialization, it is often difficult just to keep abreast of things in this area and to maintain our competence or to improve upon it. Changes take place so rapidly that what is state-of-the-art today may be totally obsolete tomorrow. New products, components, techniques, and methods are introduced almost daily, and each and every one of them do affect our field of interest.

Keeping up with your field and maintaining your competence can really be a lot easier that you think, and there are two very simple but effective ways to do it. Let's consider them.

PROGRAMMED INSTRUCTIONS

First consider your basic technical knowledge. Since you are an NRI student or graduate, you are now getting or have had some training in electronics. In addition, you may have had other training in the service, in a resident technical school, through another correspondence course or perhaps just through a hobby or work experience.

As a graduate, you know that to further expand your technical knowledge all you have to do is to go back to school. There are many evening technical school courses and there are colleges offering courses at night leading to a degree. And there are always additional correspondence courses. These are excellent sources of training, as you know, and certainly shouldn't be overlooked, especially from a standpoint of cost and convenience. But perhaps going back to school or taking another correspondence course isn't necessary. Then, what can you do? The answer is self-study. This is somewhat different from taking a formal correspondence course that is planned and written especially for home study. This is a process where *you* select the material *you* want to learn and then, through a good deal of persistence, willpower or sheer bull-headedness, you teach yourself.

Many people try this and do learn from it, but it's a tough thing to do, and the efficiency of this method is questionable. You may go down to the bookstore and purchase a book on a subject you wish to learn. Selecting a suitable text is difficult in itself. The book may be too advanced for you, and if it is, you will give up in disgust since your background may be insufficient. Or the book may be poorly written or just plain boring. Besides all of this, it is just plain difficult to sit and read a technical book full of facts. It's not like reading *Playboy*, *Reader's Digest*, or an interesting novel. There are many facts to remember, formulas to consider, and ideas to absorb.

In short, reading a technical textbook requires much thought and a good deal of concentration. It is difficult to read such a book for any length of time without becoming bored or just losing interest. Very few persons have enough perseverance to stick to such a program of self-study. It's too easy just to sit and watch TV or read something else more interesting. But don't get discouraged. There is a solution.

Over the past several years there have been many books written for self-study. The books are an outgrowth of developments in teaching machines. Commonly called programmed instruction (P.I.) texts, they are written and organized in such a way that self-study is easier and less boring.

The material is presented to you in small, easily assimilated bits called frames. Each frame contains a sentence stating a fact or a short paragraph of explanation. A picture or figure may also be presented. The frame then contains a question for you to answer. This may require you to solve a problem, write a sentence or select the correct answer in multiple-choice form. The big benefit of programmed instruction is this immediate testing feature. After you read a fact or learn an important point, you are then immediately quizzed on it. In this way you keep check on your progress as you go and at the same time immediately reinforce the material you just read. The short frame presentation minimizes boredom and breaks the material down logically into easily presented and learned facts. And the self-testing really aids your retention. Standard texts have neither feature.

There are two basic forms of programmed instruction, one type called linear and the other branching. There are other forms, but these two are the most popular. Both types are pretty easy to work with, and it's a proven fact that they are effective. Many tests verifying their effectiveness have been made over the last several years.

An example of the linear form is shown in Fig. 1. A sentence or short paragraph presents the facts to you. Then you answer a question, usually by filling in a blank. In the next frame down you are given the correct answer (in parentheses) and some new data. Then the process is repeated. The linear form of programming is the simplest and it goes quickly.

Fig. 2 shows an example of the branching form of programmed instruction. This form is more like the teaching machine from which it was developed. Here a frame of instructional material is presented as in the linear method in the form of a sentence or short paragraph. Then follows a question or problem. Two, three or possibly four answer choices are given. You select the answer and then "branch" to the frame designated by that answer. If your answer is correct, you will be told so and then new material will be presented. If you select an incorrect answer, you will branch to a frame that will inform you of your wrong answer and then explain why. It will then send you back to the previous frame for a review and to select the correct answer.

Electronics lends itself well to presentation by programmed instruction, so well in fact that there are dozens of programmed books available. Many of the currently available texts are listed at the end of this article. The list is limited to electronic texts, but don't overlook the fact that many other related books are available -- math, physics, computer programming, etc.

Programmed books are a little tough to use for review, especially the branching type. If you want to review it's usually necessary to start the book all over again. This is OK if you have the time, but it can be annoying to have to cover some of the more familiar material again. However, this very minor disadvantage is far outweighed by the benefits it provides. The best way to review is to pick up a standard text on the same subject and use it strictly for review and reference. The standard book format is better for such work, and

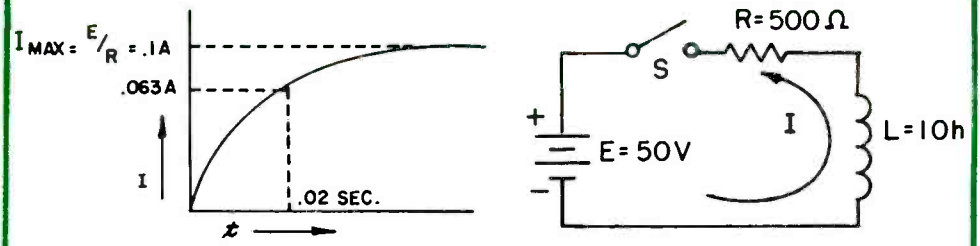
in addition the second text will give you a different slant on the same material, thus broadening your view of the subject.

If you haven't tried programmed instruction yet, you are in for a pleasant surprise. There are many books available on almost any subject. They are so easy to read that they make learning almost a pleasure. Don't neglect this simple, inexpensive method of learning electronics or improving yourself in other areas. Check your local bookstore, and give programmed instruction a try.

Fig. 1. An example of the linear form of programmed instruction.

1. The time constant T, in seconds, of an inductive-resistive circuit is equal to the inductance in henrys divided by the resistance in ohms. This is the time it takes the current in the circuit to rise to 63.7% of its maximum value. For example, with the values shown in the figure below, it will take L/R = 10/500 = .02 seconds for the current to reach .0637 amperes (63.7% of its maximum value of .1 ampere) after the switch is closed.

   With an applied voltage of 100 volts and the same L and R values above, in .02 seconds the current will reach____amperes.



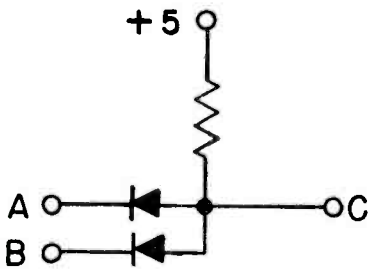
2. (.127 amperes) When the voltage is initially applied to the circuit, the rapidly expanding magnetic field in the coil generates an inverse EMF that opposes the applied voltage and keeps the current to zero. But as the field expands to its maximum, the induced voltage decreases and the current rises gradually. It takes a maximum of five time constants (5 L/R) for the current to rise to its maximum value of E/R.

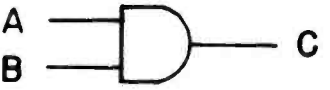
   With an applied voltage of 330 volts, an inductance of 100 millihenrys, and a resistance of 2000 ohms, it takes____milliseconds for the current to rise to its maximum value of____milliamperes.

3. (.25 milliseconds, 165 milliamperes) The time constant T is also the time in seconds that it takes the current to drop to 36.3% of its maximum value when the applied voltage is removed. Etc.

Fig. 2. An example of the branching type of programmed instruction.

1. A simple AND gate circuit and its logic symbol are shown below.





The inputs are bits that may be either binary one or zero. Just as we did with the OR gate, we can make a truth table for the AND gate that shows the output of all possible combinations of input conditions. Assume positive logic with levels of "1" = +5 volts and "0" = zero volts or ground. Using these levels and remembering that an AND gate produces a "1" output when all inputs are simultaneously "1", choose the correct truth table below.

5.

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

13.

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

24.

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

5. Your answer, the truth table here, is incorrect. This is the truth table for an OR gate. In an OR gate, if either or both of the inputs is at a logic 1, the output will be at a logic 1 as shown by this truth table. In an AND gate, the output is a logic 1 only if both inputs are at logic 1. Return to the previous frame and select the correct answer.

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

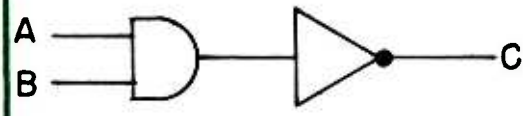
13. Your answer, the truth table here, is incorrect. This is the truth table of a NOR circuit. A NOR circuit is an OR gate followed by an inverter. We will study this circuit later. But for now, recall that an AND gate produces a logic 1 output only if both inputs are at logic 1. Return to the previous frame and select the correct answer.

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

24. Your answer, the truth table here, is correct. The AND gate produces a logic 1 output only if both inputs are at logic 1. You have now seen how all three basic logic elements, the inverter, OR gate and AND gate work. Let's go a little further.

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

Now, using the diode AND circuit followed by an inverter as shown and keeping the logic levels the same (logic 1 = +5 volts and logic 0 = zero volts) we can construct a new truth table for the entire circuit. Which truth table below correctly describes the operation of the circuit shown?



A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

A	B	C
0	0	1
0	1	0
1	1	0
1	1	0

TECHNICAL MAGAZINES

Programmed instruction itself is best at teaching basic ideas and fundamentals, and most of the available books do stress fundamentals. So we must look for an additional source of material for keeping ourselves up-to-date and technically proficient. You need not look very far, for as you read this article you are holding in your hands the basic source of all technical information -- the technical magazine.

Consider for a minute just what this magazine or others similar to it contain. First, it contains technical articles about new products and ideas, technical construction features, new design methods and other useful information. Then there are the columns -- the editorial, letters to the editor and new developments. All are important sources of up-to-date facts about our rapidly changing field. Then, last but not least, are the advertisements. Most people consider advertisements as a necessary evil. But don't look at them like this. Consider them a useful source of information about new instruments or devices that may help you in your work. Send for manufacturers' literature. This literature in itself is a fantastic untapped source of technical information. Manufacturers wishing to educate the public as to how their products can be used, publish tons of applications literature per year, and it contains much valuable information. And, best of all, it's free. There are many ads for technical literature in a great number of these magazines. Take advantage of them.

There must be several dozen different electronic oriented magazines that are excellent sources of information pertinent to your job or specialty. Some are general magazines covering all phases of electronics. Others specialize in a particular area such as computers, TV repair, circuit design or hobby electronics. From the list given at the end of this article, select several that interest you and either subscribe or buy them at the newsstand if you can. The local library probably subscribes to many of them. By reading several different magazines you get better coverage of the field and many good ideas. If you are

really gung-ho, read them all. It's a hard job but worthwhile. And a good percentage of these magazines are completely free if you are a qualified technician or engineer. Write the publisher for information about this.

Non-electronic magazines are also excellent sources of information and ideas. For example, magazines like *Product Engineering* or *Design News* are general engineering magazines that cover all fields. Reading such general publications will broaden your outlook on things and help you to pick up some useful ideas from other fields.

Also consider foreign publications. European electronic magazines are frequently available in this country. *Wireless World* and *Industrial Electronics*, both British publications, are sold on many U. S. newsstands. Both are excellent general electronic publications and will certainly give you a new slant on things.

General scientific magazines like *Scientific American, Popular Science, Popular Mechanics, Mechanics Illustrated,* and the like are also good. Most of them regularly publish electronics related articles and other good scientific information of value.

Make your technical magazine reading a habit. You will find that you can learn a lot -- not only immediately useful things but good background information that gives you confidence on your job. And don't forget the advertisements. Take advantage of them; not only because they can be of benefit, but because in most cases it is the advertisements that pay for the technical magazine that you receive free.

Self-improvement by the two methods given here is simple, inexpensive, enjoyable and ever so effective. Give it a try and notice the difference in your attitude and work.

Currently available programmed-texts and magazines listed by publisher:

Howard W. Sams, 4300 West 62nd Street, Indianapolis, Indiana 46206.

1. "Basic Electricity/Electronics", (5 volumes).

Hayden Book Company, Inc., 116 West 14th Street, New York, New York 10011.

2. "DC Circuit Principles", by Training Systems Inc. and Stanley L. Levine.
3. "Simplified Transistor Theory", by Training Systems Inc. and Stanley L. Levine.
4. "Computer Numbering Systems and Binary Arithmetic", by Training Systems Inc. and Stanley L. Levine.

Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632.

5. "AC Circuits and Measurements", by Anderson, Santanelli, Kulis.
6. "DC Circuits and Measurements", by Anderson, Santanelli, Kulis.
7. Basic Electronics: "Autotext", by Friedman, Rice and McGinty.
8. "Boolean Algebra", Federal Electric Corp.
9. "Fundamentals of Electronic Data Processing", by K. L. Inman.
10. "Electronic Data Processing Systems", by L. R. O'Neal.
11. "Electronic Troubleshooting", Philco Technical Institute.
12. "Fundamentals of Transistors", RCA Service Company.

13. "Transistors", Federal Electric Corporation.
14. "Special Purpose Transistors", Federal Electric Corporation.
15. "Mathematics for Electronics", Federal Electric Corporation.

McGraw-Hill Inc., 330 West 42nd Street, New York, New York 10036.

16. "Introduction to Boolean Algebra and Logic Design", by Hoernes and Heilwell.
17. "A Programmed Course in Basic Electricity", New York Institute of Technology.
18. "A Programmed Course in Basic Electronics", New York Institute of Technology.
19. "A Programmed Course in Basic Transistors", New York Institute of Technology.
20. "Logical Electronic Troubleshooting", by D. L. Schuster.

Doubleday and Company, Inc., Tutor Text, Garden City, New York.

21. "Introduction to Electronics", by R. J. Hughes and Peter Pipe.
22. "The Arithmetic of Computers", by N. A. Crowder.
23. "Electron Tubes at Work", by J. B. Owens and P. Sanborn.
24. "Basic Computer Programming", by T. G. Scott.
25. "Computer Programming Techniques", by T. G. Scott.

Basic Systems, Inc., 880 Third Avenue, New York, N. Y.

26. "Basic Electricity".
27. "Introduction to Transistors".
28. "Basic Transistor Circuits".

International Educational Service Inc., Scranton, Pennsylvania 18515.

29. 16 volumes on electronic subjects.

John Wiley and Sons Inc., 605 Third Avenue, New York, N. Y. 10016.

30. "Programmed Manual for Students of Fundamental Physics", by J. Orear.
31. "Quick Calculus", by D. Kleppner and N. Ramsey.
32. "Programmed Physics", by A. Joseph.
33. "Self Teaching Intermediate Algebra", by V. E. Howes and R. Dubisch.
34. "Programmed Beginning Algebra", by I. Drooyan and W. Wooton.
35. "A Programmed Introduction to Number Systems", by I. Drooyan and W. Hadel.

Amateur Radio and Citizens Band Magazines

* CQ Magazine
14 Vanderventer
Port Washington, New York 11050

* QST
American Radio Relay League
225 Main Street
Newington, Connecticut 06111

* 73 Magazine
Peterborough, New Hampshire 03458

* S9, The Citizens' Band Journal
14 Vanderventer Avenue
Port Washington, New York 11050

* Ham Radio
Greenville, New Hampshire 03048

General Magazines

† Design News
P. O. Box 6
Englewood, Colorado 80110

* Mechanics Illustrated
Fawcett Building
Greenwich, Connecticut 06830

* Popular Mechanics
575 Lexington Avenue
New York, New York 10022

* Popular Science Monthly
355 Lexington Avenue
New York, New York 10017

† Product Engineering
P. O. Box 546
Hightstown, New Jersey 08520

* Science and Mechanics
505 Park Avenue
New York, New York 10022

* Scientific American
415 Madison Avenue
New York, New York 10017

Computer Magazines

† Computer Design
P. O. Box A
Winchester, Massachusetts 01890

† Datamation
F. D. Thompson Publication
205 West Wacker Drive
Chicago, Illinois 60606

† Simulation
Simulation Councils Inc.
P. O. Box 2228
La Jolla, California 92037

Electronic Magazines

* Audio
P. O. Box 629
Mineola, New York 11501

Broadcast Engineering
4300 West 62nd
Indianapolis, Indiana 46206

† Control Engineering
466 Lexington Avenue
New York, New York 10017

† EDN
3375 South Bannock Street
Englewood, Colorado 80110

† EE, The Electronic Engineer
Chestnut and 56th Streets
Philadelphia, Pennsylvania 19139

† EEE
820 Second Avenue
New York, New York 10017

† Electronics
P. O. Box 430
Hightstown, New Jersey 08520

† Electronic Communicator
610 Washington Street
Dedham, Massachusetts 02026

† Electronic Design
850 Third Avenue
New York, New York 10022

* Electronics Illustrated
67 West 44th Street
New York, New York 10036

Electronic News
7 East 12th Street
New York, New York 10003

† Electronic Products
P. O. Box 211
Grand Central Station
New York, New York 10017

Electronic Technician
Ojibway Building
Duluth, Minnesota 55802

† Electro-Technology
205 East 42nd Street
New York, New York 10017

* Electronics World
Boulder Place
Boulder, Colorado 80302

* Elementary Electronics
505 Park Avenue
New York, New York 10022

† Frequency
167 Corey Road
Brookline, Massachusetts 02146

IEEE Spectrum
345 East 47th Street
New York, New York 10017

Industrial Electronics
Iliffe Electrical Publications
Dorset House
Stamford Street
London, S. E. 1

Instruments and Controls Systems
845 Ridge Avenue
Pittsburgh, Pennsylvania 15212

PF Reporter
4300 West 62nd Street
Indianapolis, Indiana 46206

* Popular Electronics
Portland Place
Boulder, Colorado 80302

Proceedings of the IEEE
345 East 47th Street
New York, New York 10017

* Radio-Electronics
154 West 14th Street
New York, New York 10011

* Radio-TV Experimenter
505 Park Avenue
New York, New York 10022

† Telemetry
P. O. Box 28
Bethel, Connecticut 06801

* Wireless World
111 Broadway
New York, New York 10006

† Free to qualified engineers and technicians.

*** Available at most newsstands.**

KEEP THOSE CARDS AND LETTERS COMING

When we started this series of articles in the November-December issue, we did not anticipate the great response that was to come, nor the many interesting things we would learn as a result of your comments.

For example, OM Jerry Miller, WØEJE, of Springfield, Missouri, listed his graduate student number on his QSL card, as most of you did. His number was of a different type, though, and none of us in the Instruction Department recognized what course it indicated. However, Mrs. Helen Thomas, a long-time mainstay of our Administrative Services Department, not only recognized the number, but was able to come up with the records showing that Jerry enrolled over 42 years ago, and graduated slightly more than a year later. Now that doesn't put NRI in the class with Harvard or Yale as far as age goes, but it does make us feel pretty good about being identified with an outfit that has been in business for so long, and has retained the interest of its old grads. So far as we can determine, Jerry is the earliest student among the ham group, but if any of you would like to challenge that record, please tell us about it.

The search for Jerry's records also led us to a 1927 NRI catalog. Now there is some fascinating and nostalgic reading! The course outline showed rather heavy emphasis on receiving circuits like the Cockaday, neutrodyne, and inverse reflex, in addition to the still familiar superheterodyne. The parts list for the experiments showed lots of "condensers," but no capacitors. Brand names of radios discussed included Majestic, Kolster, Grebe, and Radiola, along with some like Zenith and Philco which are still with us. We used testimonials in 1927, and in them one of the writers indicated he had earned enough as the

result of his course to buy an Essex sedan. If you remember the Essex, welcome to the club of those of use who optimistically refer to ourselves as middle-aged.

Two impressions are gained from reading the 1927 catalog. The first is that the senior Mr. Smith put out a darned good course in the days when radio was in its infancy. The second is that we have, too, modernized our courses!

Enough of philosophizing, let's update our statistics. Since the last issue, we have heard from:

W1FVQ
K1IQB
WN1IQS
K1JYO/9
K1QFD

WA2AWK
W2BXD
WB2DYH
WN2FOQ
WA2KLD*
WB2PNG
K2POI
WB2UEA
WB2UGE/6
WB2YEM

WA3CEX
WA3EXB
WA3GKF
W3IFW
WA3KFV
WN3KKG
K3RNG
W3WGY

WB4CRZ
W4CTF
WB4DPU
WB4GKV
W4JDU
WB4JOK/Ø
WA4MFZ
WA4RBE
WA4RWP
W4TMN
WA4WWA
WA4WZZ

W5AOO
K5MDG
WA5PGL
WA5SCN
WA5UAJ
WN5WRM

WA6DFJ
WB6EPT
W6KPU
W6POE
W6ROV
WB6UWX

WA7BUB
WA7EQC
WA7INR
WA7JXM
WN7KHE
K7MWN
W7PFL
K7PPZ*
K7WIM
K7WWR*

WB8BOR
K8ELH
W8EMU
WA8EQI
K8MIW
WA8PRY
WA8RHN
WA8YGF
WA8ZNO

W9BCH
WA9BDX
WA9CJQ
W9KFI
WA9LJZ
W9LRI

WA9MBM
K9MRR
WA9NII
WA9NMJ
WA9RJS
WA9SHR
WA9UIB
WA9UVW/7
K9WQY
WN9ZAF
WA9ZIW

WAØECJ
WØEJE
WØFBZ
WAØIIO
WAØNYM
WAØQNR
WAØTBU/4
WNØUET

VE1VT
VE3FAQ
VE3FCH/W1
VE5LS
VE5OO
VE7AYP
VE8MC

* Extra Class License

So that makes 243 of you whose calls have been listed in these pages. We have heard from 43 States, VE1, 2, 3, 5, 7, and 8, and England. The states we are missing are: Alabama, Hawaii, Idaho, Nevada, New Mexico, South Dakota, and Wyoming. If we have any ham readers in those States, please let us know you're out there.

By license classes (where known and appropriate), we have 11 Extra, 57 Advanced, 83 General, 20 Conditional, 34 Technician, and 21 Novice licensees listed in our file.

We have two more YLs in this issue's list--K1QFD and WA6DFJ. Both have Mrs. in front of their names. (Yes, we know about the term XYL but have never cared for it -- is a young lady no longer a young lady just because she gets married?)

Some of you may be wondering why we have not mentioned the G5AMG schedule, which was headlined in the last issue. The reason is the publication schedule, which requires that this issue, which comes out in early May, must go to the printer by April 1. Therefore, this is being written before March 29, and our crystal ball is not working too well as to what conditions will prevail on that date.

FLASH!! - - *as we go to press*

In spite of QRM from the Florida QSO party and generally poor band conditions, a number of NRI Hams participated in the G5AMG QSO test the weekend of March 29-30.

Russ, W3FSP, reports that on Saturday he heard, but was unable to work, Ron on 14,250 KHz and that as far as he could tell Ron didn't have many stateside takers. (His signals were about S4 in Maryland with an S7 noise level!)

Sunday proved to be a little better, and Russ contacted WA1FKE and WA8NJZ, both of whom had talked with G5AMG. As conditions got worse (Florida QSO party still going strong!) a young NRI Communications Course student down in Tennessee, WB4JPQ, picked up the ball and acted as impromptu Net Control to try and coordinate things a bit and relay traffic to those who, because of the apparent short skip conditions, couldn't hear Ron.

Several other NRI Hams were reported to have worked Ron. These were: WA3AFI, K3ZBK, K8KFO, KNFYM, WA9KKC and VE500. As we get more results we will let you know the full story - perhaps in the next issue.

73 - Ted, K4MKX

FLOATING ANTENNAS

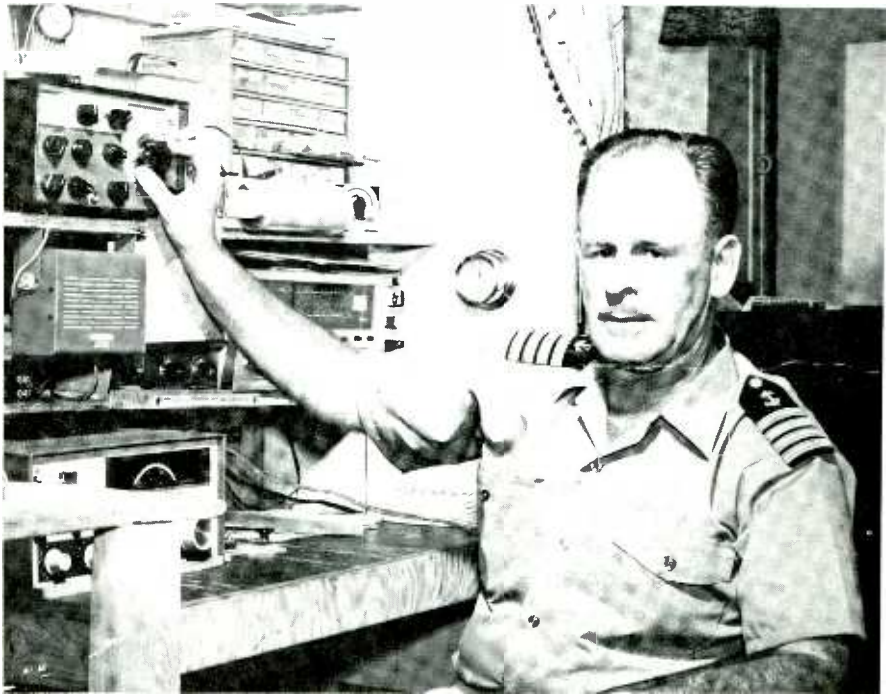
Did you ever wish you could operate your station from a floating antenna farm in the South Pacific? One of our students periodically does just that, operating as a Novice.

Captain Charles J. Carroll is employed by the Farrell Lines and makes his living sailing merchant ships back and forth between the U. S. East Coast and Australia. Charlie tells us his interest in radio goes back some 32 years, but that he never had time to take out an amateur license until 1968, because he was busy climbing the career ladder in the Merchant Marine.

Also in 1968, he enrolled in our Complete Communications Course, in order to improve his knowledge of the electronic gear which all present-day ocean-going ships carry. He studies while at sea, but finds that this has disadvantages, especially when a part in one of the experiments goes up in smoke. Coming up with a replacement part can be a bit of a problem when you are someplace in the mid-Pacific.

The picture at the bottom of the page shows Charlie in his ham shack aboard the S/S Australian Galaxy, on a voyage which lasted from September 30, 1968, to January 22, 1969. On that trip, he worked 18 States, numerous VK and ZL stations, FO8, JA, and ZK1.

When you read this, Charlie will again be operating from the South Pacific aboard the



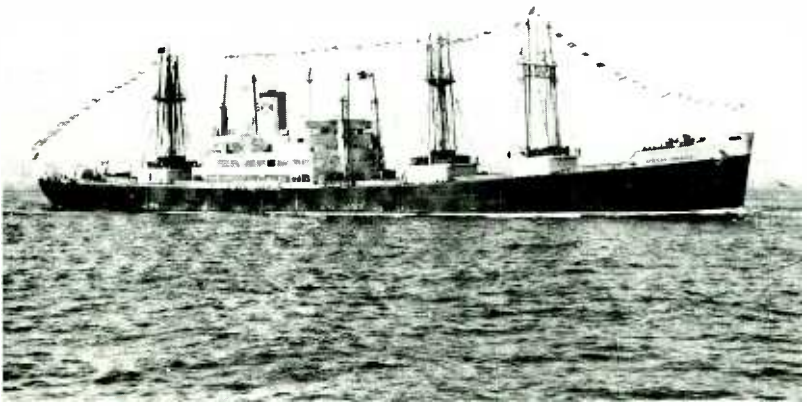
Charlie's ham shack aboard the S/S Australian Galaxy.

S/S African Star (pictured below) as WN3KKG/R3. This voyage started in March and will wind up back in the states in June, with Charlie then getting a vacation lasting three months. That shouldn't be hard to take! It will give him time to get his General or Advanced Class license.

Charlie is not the only ham in his family. His son holds an Extra Class license as K3UQU, and is an electronic technician in the Navy. His wife recently received her Novice license as WN3LPL, and his 9-year-old daughter is practicing the code. Ham radio makes it possible for him to keep in touch with his family during the long voyages, with assistance from W1BCR, K3YBN, KØYTM, and various Australian amateurs in his ports of call.

The usual calling frequency of WN3KKG when operating maritime mobile is 21170 KHz, with other crystals at 21201 and 21213. When too close to home for the 15-meter skip, he uses 7167 and 7170 KHz, but much prefers 15 meters because the QRM is less. For antennas, Charlie has been using 22-foot dipoles mounted on the ship so as to be broadside to the direction he wants to work. He also has a vertical mounted 90 feet above the water line, which should be quite an antenna when you consider the salt-water "ground" under it.

So, if you operate 15 meters, give a listen on 21170 in the early evening Eastern Time (about 2130 to 0030 GMT). If you make contact with Charlie, ask him if he still has his mustache.



The S/S African Star, aboard which Charlie is now operating.

NEW BOOKS

by Donald Smith

How To Select and Install Antennas, by Lon Cantor, Hayden Book Co., 116 West 14th St., New York, N. Y. 10011. 112 pp, $3.95 Paperbound.

This book, while not highly technical, does give much practical information on how to select, install and service antennas and antenna systems. The subject of antennas and transmission lines, as any student of electronics knows, can be complicated. This book leaves that study to others and concentrates on bringing the reader up to date on antenna types now available, how to select the best one for a given purpose and location, how to install it properly, and so on.

It does a good job of explaining to the reader the different types of lead-in wire available and the advantages and disadvantages of each. It also gives the right methods to use for various types of lead-in wires, with a good discussion on matching.

The technique of "stacking" antennas is quite common in locations far from TV broadcast stations, and this book explains how to stack antennas, plus how to properly connect them together. UHF antennas are also covered.

One chapter of the book which I was happy to see included, was a chapter on Master TV Antenna Systems. This includes systems used in homes, those used in large apartment complexes and even larger systems. Information on the equipment used in these systems and the proper way to connect and maintain them is included.

If antenna installation, repair and maintenance of the same is your cup of tea, or if you want to know more about your own antenna problems, then you will find this book worthwhile.

Electronic Reference Databook, by Norman H. Crowhurst, Tab Books, Blue Ridge Summit, Pa. 17214. 232 pp, $7.95 Hardbound, $4.95 Paperbound.

This book is a "Data Book", but really quite a different one. Instead of just listing information, Mr. Crowhurst has included background information on much of the data. This permits those who have forgotten some of the basics, to make better use of the data presented.

Those just starting out, or still in the process of studying electronics, will find the book particularly helpful. For ex-

ample, in chapter 2 the author starts with basic electronics information, beginning with I equals E/R.

He shows cancelling and how the formula may be changed around. He gives examples and shows how to solve for the unknowns. Then he continues with basic information on the slide rule and applies it to the problems he is demonstrating on Ohm's Law.

Ten chapters are included and are titled: 1. Units, 2. Basic Electronics, 3. Application of J Operator, 4. Exponential and other Tables, 5. Attenuators & Equalizers, 6. Filter Design, 7. Practical Component Design & Use, 8. Semiconductors & Tubes, 9. Feedback, and 10. Transmission Lines. This book does indeed incorporate new ways to make a reference data book more helpful to the user. I think the electronics student will be the one to most appreciate this book.

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104 Ham Radio Projects for Novice and Technician, By Bert Simon, W2UUN, Tab Books, Blue Ridge Summit, Pa. 17214. 192 pp, $6.95 Hardbound, $3.95 Paperbound.

Experimenters, builders and all who love to build! Take note, here is your book! I have just finished building several of the projects in this interesting book and most of them I built from old radio-TV parts.

This book is not a beginners book, but it does contain complete diagrams, instructions, and a good parts list, complete with part numbers when necessary. There are tube projects, transistorized equipment, receivers, transmitters, power supplies, interference suppressors and eliminators, and so on.

There are projects for all of the Radio Amateur Bands, from 80 meters to 1296 MHz! The book is written with each section containing projects of a particular type. For example, in section 1 you will find Antenna Devices; section 2, Audio Devices; section 3, CW Helps, and so on. There are no less than 13 receivers and converter projects for those who like to build these. One such receiver is a superhet for 50 MHz, which uses three tubes. This is one of the projects which I built and found to be a good stand-by receiver. I now use it in my office.

I love to build inexpensive, simple projects, particularly those for the vhf and uhf bands. If you too like to build, then I most heartily recommend this new book to you. If you like it, how about dropping me a line, in care of the NRI Journal, and let me know about it?

Challenge of Electronics Field Stimulates Minnesota Man

This article was taken from 'The Hutchinson Leader', a newspaper from Hutchinson, Minnesota. Bill Hintz, the subject of this story, successfully assembled a color TV set that he received from NRI. We send out our congratulations to him and hope he keeps up the good work.

If you've ever received a confusing puzzle or kit of some type, right about now you might well be heartened by a feat accomplished by Bill Hintz of Hutchinson, Minnesota.

Bill recently completed a 750-component-part "puzzle" which turned out to be a working color television set.

To Bill, the set represents not only the good fruit of hours of exacting toil, but also his unofficial "diploma" from a correspondence school, National Radio Institute, from whom, under the GI Bill, he studied and secured the television set kit.

Although Bill actually started the correspondence course and his set in October of 1967, the beginning of his interest in electronics goes back several years.

After graduating from Hutchinson High School in 1953, he spent four years in the accounting department at Minneapolis Moline in Hopkins. His first experience with correspondence courses was during those years when he studied electronics basics with a Cleveland, Ohio, school.

In April of 1957, Bill entered the US Army and was selected for training in electronics. While stationed at Fort Bliss, Texas, Bill went through another course in basic electronics and then was given the opportunity to work with Nike missiles. This included still another "basics" course. Later during his service career he was given a 12-week course on radar accessory equipment, dealing specifically with target simulation.

Following his Army discharge in 1960, Bill got a job in quality control with 3M Co., at Hutchinson, Minnesota. Included in his 3M training was a stint at Redwood City, California, where video tape recorders are made.

Over the years, while in the service and later at 3M Co., Bill put together

various electronic devices and kits similar to, but far less complicated than the color television set. Those devices include a scope, which shows in waveform what is happening to the circuits inside a television set; a bar-dot generator, which also tells the technician about circuits; a stereo hi-fi amplifier and an audio generator.

Because of his interest in electronics, particularly television, Bill began tinkering with sets, working and learning until he became adept at repairing them. For some time he has serviced sets for Sears in Hutchinson. Some three years ago, in 1966, he became a Philco servicer and in July of 1968 he became an authorized serviceman for General Electric in the Hutchinson-Silver Lake area. This past fall he obtained the Philco-Ford sales agency. On Sept. 28, 1968 Bill left a job he enjoyed as electronics supervisor at 3M Co. to devote full time to television service and sales.

"I think electronics is a great field and one in which there will be a shortage of workmen for a long time to come. I read recently that the electronics industry association is saying that there are not nearly enough schools to turn out trained men. If any men or boys would like to learn about correspondence courses, I'd be glad to talk with them."

Bill would also be willing to lend a hand to anyone who finds himself bogged down in kit work.

"It really is easy after you make up your mind that you have to read instructions and follow them to the letter. It's harder to follow directions, you know, if you feel you know a little bit before you start. You're so apt to think, 'Oh, I know how to do this step without reading everything.' I imagine that's true in any line.

"Another pitfall," Bill says, 'comes as you're just about through with what you're making. You get anxious to see it work and hurry through the last stages, not being too careful about following directions".

In past experiences in helping friends with various kits, he has found the problem confronting them very often has developed in the last steps.

Correspondence courses have their good points and bad, Bill feels. An advantage is that you can learn while working at another job, absorbing the course at your own speed as you can manage it.

One drawback is that if you do have a question, you have to drop everything, write to your instructor telling him about it, then wait for his answer to come back. This can sometimes be discouraging.

Bill's headquarters are at his home, about half a mile south of Hutchinson on Highway 15. Married to the former Vernetta Sieloff, Bill has a daughter, Colleen, 12, and a son, Mike, 10.

"Whenever someone wanting to talk electronics sees my blue panel truck out front, they can expect to find me there. I'd sure like to see someone else build a color set."

BY DAVID TURPIN

DEAR DAVE,

I'm confused about "swinging" chokes. I don't understand how they work or why we need them.

Let's quickly review some of the problems. A swinging choke uses an iron core with a small air gap in the core. Air cannot be saturated so changes in the coil current will produce corresponding changes in flux lines around the coil and current regulation is improved.

We can greatly increase the inductance of the coil by using an iron core. However, this presents certain problems. If an iron core coil becomes saturated, increasing current through the coil will not produce a corresponding change in the number of lines of flux formed around the coil. Regulation is poor and the choke may actually be damaged. For this reason, most chokes are rated for specific values of current, which must not be exceeded.

DEAR DAVE,

I just built my CONAR Model 211 VTVM and I'm very pleased with it. Only one thing bothers me. What's the difference between this and a VOM?

The initials VOM stand for Volt-Ohm Milliammeter. When used as a voltmeter, this type of instrument has the meter coil connected directly across the voltage to be measured. Resistors are added in series with the meter to extend its range.

Let's take an example of a meter coil that we want to use in a meter circuit for measuring voltages up to 50 volts. The meter we want to use will give us a full scale reading when a current of 1 ma flows through it. In our example, the resistance of the meter coil is only 100 ohms. Obviously we cannot connect the coil itself across 50 volts or a very high current would flow through the coil and damage it.

However, since we know the voltage that we want to measure, and we know the maximum permissible current, we can calculate exactly how much additional resistance will be required. Using Ohm's Law, we divide the resistance into the voltage to find that we need a total of 50,000 ohms in our meter circuit. Subtracting the resistance of the meter coil we find that we must add exactly 49,900 ohms in series with the meter.

Suppose we want to measure smaller voltages and wish a more accurate reading than we could get on a 0-50 volt scale? We would simply reduce the amount of resistance in series with the meter. If we wanted to measure voltages between 0 volts and 5 volts we would use our maximum voltage and maximum current to find that we must have exactly 5,000 ohms in our meter circuit.

For higher voltages we increase the amount of resistance. Try to work out examples of your own.

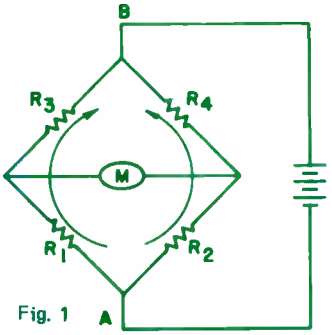


Fig. 1

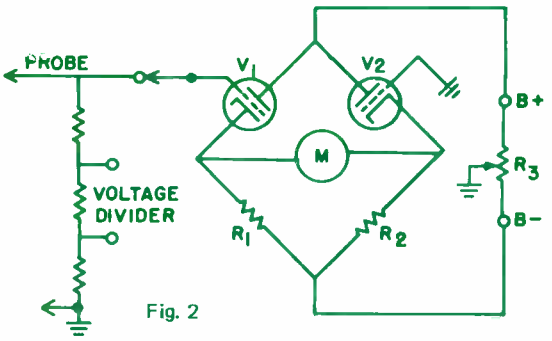


Fig. 2

Notice that for each additional volt that we want to measure with this particular meter we must add an additional 1,000 ohms of resistance. This figure is called the sensitivity of the meter and is always given in ohms per volt; in our example the sensitivity of the meter is 1,000 ohms per volt.

The letters VTVM stand for Vacuum Tube Volt Meter. With this instrument we make use of a bridge circuit.

Look at Fig. 1. We have a difference of potential from point A to point B, making A negative with respect to B. Electrons will flow through the circuit in the direction indicated by the arrows.

Notice that there are two possible paths for current. Provided that the product of R_1 and R_4 is equal to the product of R_2 and R_3, current through both halves of the circuit will be equal, and no current will flow through the meter.

Now look at Fig. 2. Notice that we have replaced R_3 and R_4 with two triodes. The grid of V_2 is grounded, but we can connect the grid of V_1 to a probe and voltage divider network and use this circuit for measuring voltages.

If we connect the VTVM across a voltage, we change the bias of V_1. This is just the same as changing the resistance of the tube. If we measure a positive voltage, the resistance of the tube will be decreased and some of the electrons flowing through R_2 will flow through the meter and through V_1 rather than through V_2. If we measure a negative voltage we increase the resistance of V_1 and some of the current through R_1 will now flow through the meter and through V_2.

In practice we connect the meter into the VTVM circuit through a reversing switch. We adjust the meter to indicate 0 volts with R_3. When we change the polarity of the voltage we are measuring, we reverse the meter connections so that we will always get an upscale reading.

We use the voltage divider network to tap off the amount we want of the voltage we are measuring. Naturally, we cannot place 50 volts directly on the grid of V_1. We adjust our range switch so that only a small portion of this voltage will be used, say 1.5 volts.

Notice that the resistance of the VTVM does not change when you change the range. We rate this type of meter by its input impedance. The input impedance of your VTVM is 12.2 megohms.

NRI HONORS PROGRAM AWARDS

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

WITH HIGHEST HONORS

Ramon Acevedo, Shirley, N. Y.
David E. Anderson, Cleveland, Ohio
Robert C. Black, Falls Church, Va.
John P. Cowden, Colonial Heights, Va.
John R. Critchfield, Pearl City, Hawaii
William Gossenberger, Brooklyn, N. Y.
Walter Harwell, Jr., Greenville, Texas
William H. Holstine, APO San Francisco
Jack H. Horner, Carlos, Ind.
Edward F. Kammar, Jr., Baltimore, Md.
Joseph M. Koller, Coram, N. Y.
Lawrence W. Lugar, Johnstown, Pa.
Laurel H. Maxwell, Kensington, Md.
Clifford C. McKinstry, Hampton, Va.
Stevens S. Petry, McLean, Va.
Ronnie Alan Servies, Knoxville, Tenn.
John W. Slabbers, Salinas, Calif.
Clarence Tyson, Berwick, Pa.

WITH HIGH HONORS

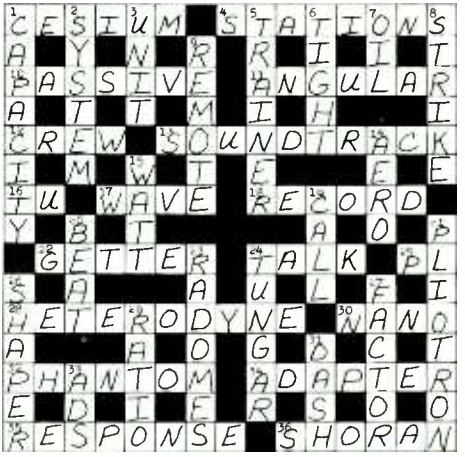
Lorenzo Edwin Acevedo, Huntsville, Ala.
Harold D. Anderson, P. Q., Canada
Charles A. Balmat, Englewood, Fla.
Kenneth F. Barr, Mt. Pleasant, Iowa
Leland H. Bates, Springfield, Ill.
Ronald H. Bradshaw, West Columbia, S. C.
Leon Curtis Callaway, Colorado City, Texas
Thomas D. Callery, Jersey City, N.J.
Stanley L. Chester, Burlingame, Calif.
Edwin M. Clapp, Jr., Wilmington, Del.
Thomas R. Crow, Ellsworth AFB, S.D.
Richard A. Davidson, North Jackson, Ohio
Robert A. Dietz, Calatia, Kans.
Donald D. Eddy, Bristol, Conn.
Myrle T. English, Miami, Fla.
Michael F. Esposito, Wantagh, N.Y.
Howard F. Fanning, Montgomery, Ala.
Wilbert W. Feest, West Allis, Wis.
Lawrence F. Fralix, Reevesville, S.C.
James J. Gallagher, Stockton, Calif.
Douglas H. Gregg, Aberdeen, Md.
H. Wilbur Havens, Hope, Mich.
Billy L. Hill, Overland Park, Kansas
Blanchard Hurd, Jr., Baltimore, Md.
Rex C. James, Leicester, N.C.
Stanley M. Johnson, Littleton, N.C.
Fred Jordan, Jr., Mansfield, Ohio
Allen J. Lewandowski, Lorain, Ohio
J. Robert Mellis, Latham, N.Y.
Dennis R. Morgan, Norwalk, Calif.
Eugene W. Morrison, Bismarck, N.D.
John Nemeth, Fort Gordon, Ga.
Wally H. S. Ng, Vancouver, B.C., Canada
Alejandro Ramirez, Mayaguez, Puerto Rico
John R. Rivoire, Slidell, La.
Ronald A. Rosawski, Kansas City, Mo.
Joseph D. Roux, Baton Rouge, La.
Arch F. Roy, Jr., Satellite Beach, Fla.
Larry R. Shawler, FPO New York
Thomas H. Taylor, Terryville, Conn.
Robert M. Tuomela, Babbitt, Minn.
Ronald F. Von Breeden, Malden, Mass.
Donald P. Walton, Laurel, Md.
Walter A. Watmuff, Smithtown, N.Y.
James West, Kirkland Lake, Ont., Canada
Donald G. Whiteman, Peru, Ind.
Barry J. Wilson, Greenland, N. H.
Robert L. Zettlemoyer, Omaha, Nebr.

WITH HONORS

Wm. James Adams, Hull, Ga.
Robert M. Allen, Springfield, Mass.
Virgil Almeida, Arlington, Va.
Daniel L. Balog, Woodbridge, N. J.
Boyce M. Banks, Jr., Greenwood, S. C.
Thomas J. Bush, Lockport, N. Y.
Terrence L. Butman, Mobile, Ala.
Gerald O. Byars, Detroit, Mich.
Grant Campbell, Lexington, Ky.
Jack L. Chaffee, Auburn, Wash.
Donald S. Chickson, Scranton, Pa.
George W. Chilman, Roanoke, Va.
Gene A. Coberly, Baltimore, Md.
M. Z. Collins, Jr., Winston-Salem, N. C.
Burl Combest, Moody, Texas
Shreve Connelly, Spokane, Wash.

A. D. Cooper, Falls Church, Va.
Richard L. Critchlow, Niles, Mich.
Howard B. Davis, Pontiac, Mich.
James R. Denault, Fort Clayton, Canal Zone
Gordon L. Dice, Alpena, Mich.
George L. Driesbach, Palmerton, Pa.
W. E. Driggers, Jr., Longview, Texas
Floyd V. Dry, Jefferson City, Mo.
Richard Dudley, Elkhart, Ind.
Johnnie Leon Flannagan, Eloise, Fla.
Charles L. Fowler, Louisville, Ky.
Georges Georgoudes, Montreal, P. Q., Canada
Charles W. Gibbons, Wilmington, Ohio
Charles R. Gilbert, Houston, Texas
Thomas H. Glick, Dayton, Ohio
Jack B. Gordon, Madison, Wis.
Robert I. Griffin, Parkersburg, W. Va.
Samuel J. P. Grills, Westerly, R. I.
Abraham B. Harris, Warrenton, Va.
Ivie B. Hathaway, Turin, N. Y.
Kenneth G. Hostnick, Largo, Fla.
Alfred Hughes, Jr., Marlow Heights, Md.
Arthur Iglesias, Fremont, Calif.
Willard R. Jordan, Crestview, Fla.
Armen Karagosian, Trenton, N. J.
George H. Karner, Jr., Lafayette, Calif.
Floyd Kirksey, Jr., Rodessa, La.
John W. Knoll, Pacific Palisades, Calif.
V. Kulakovs, Hyannis, Mass.
Theodore R. Kosch, Springfield, N. J.
Boyd L. Leech, Hughesville, Pa.
Roger D. Lehman, Tehachapi, Calif.
Robert J. Leo, Loma Linda, Calif.
Jacques Levac, Montreal-North, P.Q., Canada
John Elmer Lovell, Saskatoon, Sask., Canada
Mervin C. Luallen, Jr., Forrest City, Ark.
Willie Malone, Buffalo, N. Y.
Adrian F. Massey, Dover, Delaware
Donald D. Mathieux, Winchester, Va.
Cecil Max McAlister, Jr., Pomona, Calif.
Gerald L. Mercier, Grove City, Ohio
Ronald M. Merkel, Milwaukee, Wis.
Harrison E. Merritt, APO New York
Michael J. Mesco, Connellsville, Pa.
Jim K. Milligan, Austin, Texas
Harold E. Moody, Finley, Tenn.
Fred W. New, Kansas City, Mo.
Clifford E. Newton, Wathena, Kansas
Joseph Leo Nicholas, Dinuba, Calif.
Alvarado G. Noyles, Columbus, Ohio
John R. Osborne, Jr. Elkhart, Ind.
Joseph J. Pawlowski, Philadelphia, Pa.

John L. Perry, Eau Gallie, Fla.
Carl R. Power, Claymont, Delaware
Harold G. Pryor, Independence, Mo.
Allen R. Pugh, Lake Ariel, Pa.
Robert Pyznar, Hazlet, N. J.
C. L. Raper, Steens, Miss.
Donald A. Rigg, Groton, Conn.
Gareld D. Riggs, Bossier City, La.
Bill Rigsby, Ponca City, Oklahoma
Boyce N. Robinson, Green Bay, Nfld., Canada
A. E. Rostler, Fall River, Mass.
Richard E. Russell, North Highlands, Calif.
Everett St. Clair, Zanesville, Ohio
Andre St. Germain, Grand Mere, P.Q., Canada
James Ray Sanders, Sepulveda, Calif.
Ray Slatton, Greer, S. C.
John P. Smathers, Canton, N. C.
William Charles Smith, Elkhart, Indiana
Louis R. Stanley, Albuquerque, New Mexico
Raymond W. Stark, Quincy, Ill.
Donald Steward, Coronado, Calif.
Harry G. Stoddard, Jr., Mentor, Ohio
Karl H. Stojic, Cadillac, Mich.
Vincent E. Vick, Lafayette, Indiana
Yu Sau Wah, San Francisco, Calif.
Harold C. Waltrip, Jr., Greenfield, Ill.
William A. Wheeler, Converse, Texas
John D. Williams, Lynn, Mass.
Rolland D. Wilson, Suitland, Md.
Stanley J. Zbegan, San Jose, Calif.
J. J. Zonca, Chula Vista, Calif.



SOLUTION TO CROSSWORD PUZZLE

CONAR EASY PAYMENT PLAN

J6

Note: Easy payment contracts cannot be accepted from persons under 21 years of age. If you are under 21, have this sheet filled in by a person of legal age and regularly employed.

Enclosed is a down payment of $_____ on the equipment I have listed on the reverse side. Beginning 30 days from the date of shipment I will pay you $_____ each month until the total payment price is paid. You will retain title of this equipment until this amount is fully paid. If I do not make the payments as agreed, you may declare the entire unpaid balance immediately due and payable, or at your option, repossess the equipment. Your acceptance of this will be effected by your shipment to me of the equipment I have listed.

Date _____ Your written signature _____

CREDIT APPLICATION

Print Full Name _____ Age _____

Home Address _____

City & State _____ How long at this address? _____

Previous Address _____

City & State _____ How long at this address? _____

Present Employer _____ Position _____ Monthly Income _____

Business Address _____ How Long Employed? _____

If in business for self, what business? _____ How Long? _____

Bank Account with _____ Savings ☐ Checking ☐

CREDIT REFERENCE (Give 2 Merchants, Firms or Finance Companies with whom you have or have had accounts.

Credit Acct. with _____ Highest Credit _____
(Name) (Address)

Credit Acct. with _____ Highest Credit _____
(Name) (Address)

job-ops

---HELP WANTED---

SEARS HAS MANY CAREER OPPORTUNITIES FOR EXPERIENCED TV TECHNICIANS OR RECENT GRADS OF ELECTRONIC SCHOOLS. TOP BENEFITS - LOCATIONS THROUGHOUT THE U.S. CONTACT:

WILLIAM J. LYNOTT
DEPARTMENT 731A-E
SEARS, ROEBUCK AND CO.
P. O. BOX 6742
PHILA., PA. 19132

Wheate's TV is looking for a NRI student or graduate for a Radio-TV servicing trainee. Applicants, preferably from Washington, D. C., must have experience with current electronic equipment.

Wheate's TV
151 Rollins Ave.
Rockville, Md.
20852

Plains Electronics Co., 4419 50th St., Box 6577, Lubbock, Texas, needs Technicians for TV and Two-Way Radios. Salary Commensurate with ability. Must be graduate.

NAYLOR TYPE & MATS is a trade plant that needs maintenance men for electronic typesetting equipment. Will send to school.

NAYLOR TYPE & MATS
505 M & M Building
Houston, Texas 77002
CA 7-8171

Positions available dealing with heavy duty industrial equipment, 2-way radios, closed circuit TV and paging systems. Requires at least 2nd class FCC license.

CONTACT: Mr. W.D. Howard
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Contact Mrs Feldman
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11 Spring Street
Herndon, Virginia

Electronics technician needed to assist electronics engineer with college AV service. System includes closed circuit television, dial access retrieval, language and science laboratories, and AV equipment. Position, under state civil service, is to be filled this summer. Salary is competitive. For further information, contact NRI.

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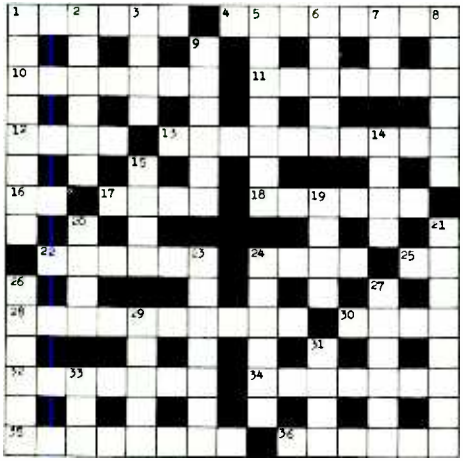

By Michael Kresila

Solution on Page 24

Across

1. *A chemical element having a low work function.*
4. *An assembly of radio transmitting equipment and its transmitting antenna. PL.*
10. *An inert component which may control, but does not create or amplify energy.*
11. *The rate of change of bearing.*
12. *A group of working people.*
13. *The narrow band which carries the audio in a movie film. 2 wds.*
16. *Transmission unit. Abbr.*
17. *A physical activity that rises and falls periodically as it travels through a medium.*
18. *To preserve for later reproduction.*
22. *Material included in a vacuum tube for absorbing residual gas.*
24. *Conversation.*
25. *More than one. Abbr.*
28. *Also called beat.*
30. *Prefix meaning one-billionth (10^{-9}).*
32. *A type of circuit superimposed on two other circuits.*
34. *A device used for changing temporarily or permanently the terminal connections of a circuit.*
35. *The amplification of a device at a particular frequency.*
36. *Acronym for Short-range Air Navigation.*

Down

1. *The current-output capability of a cell or battery over a period of time.*
2. *Consecutive operations and procedures required to accomplish a specific objective.*
3. *A reference quantity for measuring purposes.*
5. *The representation of an operating system by computers and personnel.*
6. *The closest possible coupling between two circuits under given conditions.*
7. *Lubricate.*
8. *To deliver or aim a blow.*
9. *Control of a device from a distance.*
14. *Prefix meaning air.*
15. *Unit of electrical power.*
19. *Radio station identification.*
20. *Periodic variations that result from the superimposition of waves having different frequencies.*
21. *A high-vacuum thermionic tube.*
23. *Term for turrets which enclose antenna assemblies.*
24. *A rectifier tube used chiefly in battery chargers.*
26. *A type of electrical network designed to be inserted into a circuit to improve its transmission.*
27. *An algebraic operation.*
29. *A type of detector.*
31. *Code element used in radiotelegraphy.*
33. *Advertisements. Abbr.*

ALUMNI NEWS

Walter Adamiec	President
Franklin Lucas	Vice-Pres.
James J. Kelly	Vice-Pres.
Reynolds Nickless	Vice-Pres.
E. J. Meyer	Vice-Pres.
T. F. Nolan, Jr.	Exec. Sec.

SAGINAW VALLEY CHAPTER ARE GUESTS OF TAYLOR ELECTRONICS

FLINT (SAGINAW VALLEY) CHAPTER members were guests of Taylor Electronics for a program conducted by Mr. Anthony Razonthon and Mr. Lee Drebore, both Sencore Engineers. They spoke on vector servicing and FET testing. Specifically, the subjects dealt with were chroma problems, chroma adjustment, bandpass alignment, servicing RCA, Zenith, and Motorola Quasar with the vector scope.

There was a 40-minute film on saving time in servicing transistors, a one-hour film on sweep alignment of color TV and rf-if alignment, and troubleshooting with a sweep and marker generator. Another 20-minute film was devoted to solid-state servicing and a lecture on how to service hybrid TV and auto radios. Of great interest was how to make money in TV-Radio servicing with and without the extension of credit to the customer.

Steve Avetta gave a talk on static convergence. His method of concentrating on the center of the screen, is to cut a hole in a newspaper and paste the newspaper on the front of the picture tube with the hole in the center so the center dots can be seen.

HAGERSTOWN CHAPTER HAS NEW NAME

CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER was formerly known as the Hagerstown Chapter. It has been renamed because practically all the members now come from the Chambersburg area rather than Hagerstown. Also the Chapter now meets on Tuesdays instead of Thursdays. See the Directory of Chapters.

DETROIT MEMBERS PRACTICE TROUBLESHOOTING

DETROIT CHAPTER's Gill Sager furnished his portable TV at one meeting so the members could use a schematic and voltmeter to learn how to check the test points and also how to locate them.

Earl Oliver used the meter and explained what he was doing while he was checking the set.

Raymond Berus donated an extra TV set that he had to the chapter so it could be kept at the meeting place for use by the members in learning TV troubleshooting.

The chapter has been devoting some of its time to solid-state servicing and plans to continue this program. Mr. Berus' transistor board is used quite a lot with lectures on this subject.

NEW TOPICS DRAW LARGE CROWD

LOS ANGELES CHAPTER had a rather large meeting recently. Four topics of discussion were taken up by three members of the chapter. Gene DeCaussin delivered a talk and demonstration on the wafer type tuner and then on checking faulty oscilloscopes. N. Durbin selected TV Antennas as his subject, then the entire audience discussed tuner problems.

It was decided at this meeting that future meetings would feature problems and solutions of Color TV repair.

NEW YORK CITY CHAPTER MOVES TO NEW QUARTERS

Since 1937, NEW YORK CITY CHAPTER has been meeting at the St. Marks Community Center, 12 St. Marks Place, New York City. However, the new owner of the building recently evicted the chapter from these quarters.

After some difficulty in finding a new meeting place, the chapter now has semi-permanent quarters at 264 East 10th St., New York City.

One meeting was held at a one-night stand at the Warren St. Community Center in Brooklyn due to the effort of Pete Carter. He also gave a very comprehensive talk on convergence adjustments in Color TV Receivers at this same meeting.

Jim Eaddy gave a talk on bandpass and color oscillator adjustments at the first meeting in the new 10th Street quarters. The information on the new meeting place arrived after press time for the March-April issue of the Journal so the directory is now changed accordingly.

NORTH JERSEY CHAPTER HAS ROUND TABLE DISCUSSION

NORTH JERSEY CHAPTER allotted practically an entire meeting to a round table discussion by the members present. Among the many things discussed were the articles in the NRI Journal on the oscilloscope, which were written by J. B. Straughn. The members felt that these articles were very educational and very good. They had been referred to at previous meetings but this night the articles led the way to practical uses of the instrument. Members who have oscilloscopes were urged to bring them into the next meeting for calibration and then, progressively learn how to use the scope.

Members had fun with an antique combo

radio & phono amplifier that had intermittent cut out and distortion troubles. Frank Lucas completed the repair with the replacement of the i-f transformers. Also new tubes and a coupling condenser were installed. The first series of "The Use of the Oscilloscope" got under way. Proper procedures to set up operations of the scope and different probes were discussed. A few waveforms were shown. This will be continued next month.

PHILLY-CAMDEN MEETS WITH GE

PHILADELPHIA-CAMDEN CHAPTER was much pleased with a talk by Bill Davis on troubleshooting black and white and color TV sets in the home. There's always something to be learned on this subject, especially from Bill Davis.

The meeting was scheduled with General Electric in their Philadelphia auditorium. The members look forward to these GE meetings, as indeed they should, because they always pick up new, useful ideas and also enjoy a delicious buffet supper provided by their generous hosts.

Norman Roton, Vice Chairman of the Chapter, delivered another of his excellent talks on color TV.

Some months ago the Chapter acquired a color TV for Chapter use in experimenting and training uses. It was a good decision; they have been giving the set a thorough workout.

COMMUNICATION IS TOPIC FOR PITTSBURGH

PITTSBURGH CHAPTER gave a warm welcome to Mr. Rohleder of the Bell Telephone Company as a guest speaker. His subject was the past, present and future of methods of communications.

Bob McDonald, General Electric Service Technician, demonstrating a video recorder and camera to Pittsburgh Chapter members.

This was truly an enjoyable lecture due to Mr. Rohleder's wide knowledge of his subject and to his skill as a speaker.

The lecture and demonstration was conducted at the very next meeting by Mr. Bob McDonald of G.E. on Video Recorders and Cameras. Being one of the area's few technicians able to service recorders, he was able to answer many of the questions asked about the equipment.

Mr. Rohleder of Bell Telephone Co., delivers his lecture on communication at a Pittsburgh meeting.

San Antonio members listen attentively to Executive Secretary, Tom Nolan, as he gives a talk on solid state color TV.

SAN ANTONIO CHAPTER VISITED BY EXECUTIVE SECRETARY

At a meeting held on the twentieth of March 1969, Mr. Tom Nolan, Executive Secretary of the Alumni Association, gave a talk on solid-state Color TV Receivers.

The meeting was held at the Alamo Heights Christian Church Scout House in San Antonio, Texas; the turnout was excellent.

The NRI Color Receiver was used to demonstrate convergence, purity adjustments, and demonstrate answers to questions from the audience.

The Executive Secretary would like to comment on the great amount of work done by the chapter members in creating interest in this meeting, and contributing so much to the excellent attendance.

Also the Southern hospitality was without peer. A special thanks to Mrs. Bonge and Mrs. Stinebaugh for their graciousness in entertaining us in their homes. Our trip will be long remembered.

OLD MEMBER RETURNS TO SAN FRANCISCO

SAN FRANCISCO CHAPTER members gave a warm welcome to Ross Alexander, a member of the chapter who had been away for quite a long while. Ross marked his return by leading a discussion on a wireless microphone broadcaster kit to be assembled. The members agreed to assemble it at the next meeting.

SOUTHEASTERN MASS. CHAPTER WELCOMES NEW MEMBERS

SOUTHEASTERN (MASS.) CHAPTER was pleased to receive three guests at a recent meeting. They were; Ray Mulland, Somerset, Mass., Al Sardinha, North Westport, Mass., and Jim Deese, Bristol, R.I. All three expressed their desire to be admitted to the chapter and they were warmly welcomed.

Dick Allaire of Holbrook, Mass., an NRI student, brought his Conar Color TV Kit to the meeting to get a helping hand in interpreting his scope patterns so he could complete his NRI Advanced Color TV Servicing Course. This led to a very interesting and instructive evening.

NEW COLOR TV IMPROVES ATTENDANCE

SPRINGFIELD (MASS.) CHAPTER demonstrated convergence, both static and dynamic, with the chapter's color TV set. The members themselves participated in this program. Brother Bernard showed a film strip from the RCA Service Company.

Acquisition of its own color TV set to use for demonstrations has created more interest and much improved attendance at the meetings.

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 Chairman Eugene DeCaussin's Radio-TV Shop, 4912 Fountain Ave., L. A., Calif., NO 4-3455.

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, 523 Ivy St., 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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KIT 230UK	$49.95
WIRED 230WT	$69.95

	NRI STUDENT & ALUMNI PRICE
KIT 230UK	$39.80
WIRED 230WT	$56.70

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	CATALOG PRICE
KIT 280UK	$29.95
WIRED 280WT	$43.95

	NRI STUDENT & ALUMNI PRICE
KIT 280UK	$26.35
WIRED 280WT	$39.55

MODEL 311

$5 MONTH

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The Model 311 gives fast, accurate, reliable test on all resistors and capacitors. Measures capacity of mica, ceramic, paper, oil-filled and electrolytics from 10 mmfd. to 1500 mfd., 0-450 volts. Checks for leakage, measures power factor and useful life. Shows exact value of resistors from 1 ohm to 150 megohms. Clearly indicates opens and shorts. Has "floating chassis" design to greatly reduce shock hazards. The Model 311 will also apply actual DC test voltage to capacitors to reveal break-down under normal circuit conditions, a feature far superior to many R-C testers which give low voltage "continuity" tests. Can be used for in-circuit tests in many applications and circuits.

	CATALOG PRICE
KIT 311UK	$29.95
WIRED 311WT	$42.50

	NRI STUDENT & ALUMNI PRICE
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