ET/D

SEPTEMBER 1981 • $1.50

ELECTRONIC TECHNICIAN/DEALER
LEADING THE ELECTRONIC
SERVICE MARKETS

KOWR4038013-P2-
4823AD1R -379-
RAY KOWECK
27734 DENMAR
WARREN MI 48093
AB APR82 -AS

RESIDENTIAL SECURITY

Video for the 80's

HBJ A HARCOURT BRACE JOVANOVICH PUBLICATION

Four Good Reasons

to sell "CONTROLLOR SYSTEMS" T.M.

CSC has the answer to all wireless security needs.

1. Our 630 Control Cabinet (A) is the heart of the Sound Discrimination System. It provides up to 2,500 square feet of protection. Easy to install, one simply plugs this attractive unit into any 115V AC outlet and adjusts the sensitivity knob.

A

2. The 631 Sound Discriminator Module (B) works in combination with the 630 to broaden the coverage area. Like the 630, one only has to plug it into a 115V AC outlet and set the sensitivity knob. It sends a line carrier signal from one building to another as long as the buildings share the same electrical transformer.

B

3. The new 612 Sound Discriminator (C) is self contained, battery operated (9 volts) and has its own radio frequency transmitter. Easy to install, it mounts to wall or ceiling with one screw in a keyhole slot. Only a recessed pot sensitivity adjustment is required.

C

D

E

F

G

4. Our wireless 510 system (D) can include any number of door/window (E), vibrator (G) and personal emergency (F) transmitters. The new 612 (C) is also compatible to the model 510.

Our magic numbers . . . 630, 631, 612 and 510 . . . will provide the answers to your wireless security needs. Let us send you full information.

"CONTROLLOR SYSTEMS" T.M. CORPORATION

21363 GRATIOT, EAST DETROIT, MI 48021

CALL TOLL FREE 800·521·6220

T.M. IN MICHIGAN CALL 313·772·6100 COLLECT

CALL TOLL FREE

Circle No. 102 on Reader Inquiry Card

READER SURVEY

Here as promised in last month's "From the Editors Desk" is the first part of ET/D's readership survey. We would like a few facts about you as a technician and you have a chance to let us know what you want to see in ET/D. Please read the survey questions carefully and answer them thoughtfully; you can help us greatly in determining ET/D's future direction. Please note that no name, signature, etc., is asked for on the postage-paid return card. You need not be concerned with being identified with your answers. The greater the return of cards the more accurate the survey results and the greater weight we can give your preferences.

Walter H. Schwartz
Editor

1. Type of electronic business which you own or in which you are employed:
1) service business, no retailing 2) retail business, no servicing 3) combination service/retail business 4) distributor 5) none of above
2. Which one of the following best describes the position presently held by you:
1) owner or partner who is also a technician 2) owner or partner who is not a technician 3) technician employee 4) service manager 5) none of above
3. Is your electronics servicing and/or retailing business or vocation:
1) full time [principal source of income] 2) part time [not principal source of income]
4. If you circled (2) in question 3, which one of the following best describes your full time occupation:
1) electronics-related technical position 2) non-technical position in electronics industry 3) teacher of electronics-related course 4) student in electronics-related course 5) none of above
5. Which one of the following was the principal method by which you received formal electronic training. (If you are not an electronic technician, circle the number 5 on the card.)
1) civilian resident course 2) civilian correspondence course 3) military school 4) other than above 5) not technician
6. Which one of the following types of electronic courses, if any, are you presently most interested in:
1) resident electronic course (basic) 2) resident electronic course (advanced or refresher) 3) correspondence electronic course (basic) 4) correspondence electronic course (advanced or refresher) 5) none of above
7. 1) Are you an ET/D subscriber? 2) ET/D non-subscriber?
8. *To which of the following magazines do you presently subscribe:
1) Electronic Servicing 2) Radio Electronics 3) Popular Electronics
9. *What security magazines do you read:
1) Alarm Signal 2) SDM 3) AID 4) Security World

Amount of coverage desires

Indicate the amount of coverage in ET/D you prefer for each of the items listed in 10-39. Circle either 1, 2 or 3 opposite the item number on the answer card.

	None	OK	More
10. TV circuit theory	1	2	3
11. TV troubleshooting	1	2	3
12. Test instrument operation and applications	1	2	3
13. Electronic security systems theory and installation techniques	1	2	3
14. Tape player/recorder theory/ troubleshooting	1	2	3
15. Communications equipment theory and troubleshooting	1	2	3
16. Antenna systems theory and installation techniques	1	2	3
17. Audio circuit theory and troubleshooting	1	2	3
18. Medical electronics theory/ troubleshooting	1	2	3
19. Industrial control electronics theory and troubleshooting	1	2	3
20. Basic theory of solid-state devices	1	2	3
21. Record changer servicing	1	2	3
22. Auto radio troubleshooting	1	2	3
23. Business management	1	2	3
24. Service shop operation	1	2	3
25. Manufacturers' service tips	1	2	3
26. News of the industry	1	2	3
27. Association news	1	2	3
28. New products	1	2	3
29. Merchandising and sales techniques	1	2	3
30. TEKFAX schematics	1	2	3
31. Test instrument report	1	2	3
32. Appliance servicing	1	2	3
33. Mini computer	1	2	3
34. Video disc/tape	1	2	3
35. Satellite TV	1	2	3
36. Teletext	1	2	3
37. Video games	1	2	3
38. Articles about other service shops	1	2	3
39. Articles about other electronic dealers	1	2	3
40. I use TEKFAX 1) Regularly 2) Occasionally 3) Seldom 4) Never	1	2	3

COMPARE OUR LOW PRICES

(EXR) SAME EXACT PARTS AS PHILIPS ECG* LINE.

AT 50% to 80% OFF PHILIPS PRICES

PHILIPS ECG* TYPE NO.	PHILIPS SUGG. RESALE	OUR PRICE
ECG 165	13.50	2.95
ECG 238	15.75	2.95
ECG 276	10.95	5.95
ECG 500A	20.00	11.95
ECG 523	22.80	14.50

SPECIAL (MIN. 5 PCS.)

SG 613*	6.50
2SC867A	4.15
2SC1308K	2.45
SE 5020	0.65
ECG 793	2.80
ECG 794	2.60
AN 214Q	1.90

COD ORDERS WELCOME (Min. Order $25)

CALL TOLL FREE 800-526-4928

3 YEARS WARRANTY ON ALL PARTS.

DIGITRON ELECTRONIC Corporation

110 Hillside Ave. • Springfield, N.J. 07081

*ECG IS A TRADE MARK OF PHILIPS

Circle No. 103 on Reader Inquiry Card

ET/D

ELECTRONIC TECHNICIAN/DEALER
LEADING THE ELECTRONIC
SERVICE MARKETS

September 1981, Vol. 103, No. 7

FEATURES

WALTER H. SCHWARTZ
Editor

PETER B. CREDIT
Assistant Editor

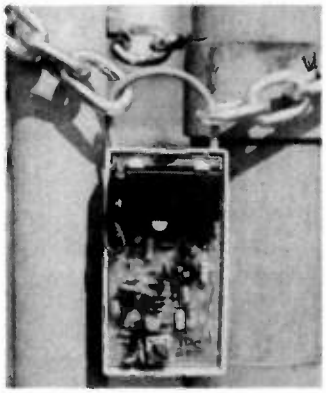
RAY ALLEGREZZA
Contributing Editor

TOM GRENEY
Publishing Director

DON FRASER
Graphic Design

BARB JOHNSON
Production Manager

LILLIE PEARSON
Circulation Fulfillment



On the Cover: This month's cover symbolizes the increasing reliance on electronic security equipment to supplement and complement physical security methods.

DEPARTMENTS

HBJ A HARCOURT BRACE JOVANOVICH PUBLICATION ABP ABC EIA

ELECTRONIC TECHNICIAN/DEALER (ISSN 0192-7175) is published monthly by Harcourt Brace Jovanovich Publications. Corporate offices: 757 Third Avenue, New York, New York 10017. Advertising offices: 757 Third Avenue, New York, New York 10017 and 111 East Wacker Drive, Chicago, Illinois 60601. Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: one year, $12; two years, $20; three years, $26 in the United States and Canada; all other countries: $40. Single copies: $1.50 in the United States and Canada; all other countries: $4.50. Second class postage paid at Duluth, Minnesota 55806 and additional mailing offices. Copyright © 1981 by Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the publisher. ELECTRONIC TECHNICIAN/DEALER is a registered trademark of Harcourt Brace Jovanovich, Inc.

POSTMASTER: Send address changes to ELECTRONIC TECHNICIAN/DEALER, P.O. Box 6016, Duluth, Minnesota 55806.

INDUSTRY REPORT

A correction and an apology

ET/D incorrectly reported in "Newsline" in the June 1981 issue that RCA was phasing out production of discrete power rectifiers and RF power transistors. The information was quoted from *Television Digest* of May 25, 1981, but it has been learned since that the information was in error and that these lines continue in production.

CASA to sue Mazda Motors

The Custom Automotive Sound Association (CASA) will resume action on the legal battleground to eradicate tie-in sales of automotive sound equipment to new cars by sponsoring a lawsuit against Mazda Motors. "By its refusal to halt the installation of unordered sound equipment at the ports and standardization of radios in many of its models, Mazda is denying dealers and consumers the freedom to purchase sound equipment of their choice; consequently, CASA has no other recourse but to initiate a lawsuit against Mazda," said CASA President Philip Christopher.

In announcing CASA's reentry into the legal arena Christopher said that injunctions and other relief would be sought against Mazda because of its "arrogant disregard of antitrust laws." Christopher said that CASA cannot accept the present level of factory installations of automotive sound equipment which, he added, has risen despite CASA's agreements with several automobile manufacturers and importers that affect nearly 4,000,000 vehicles which should be available for sale without standard equipment radios. "The radio delete option agreements which CASA has forced or influenced several automobile manufacturers and importers to adopt are being circumvented because of unlawful practices by some field personnel who coerce dealers into purchasing factory radios," Christopher commented.

"We want a court ruling on this suit," said Christopher. "We've got the support of the industry to go all the way if necessary to set a precedent. CASA will not tolerate the erosion of the industry's rightful share of the market because of unlawful practices which deny dealers and consumers the freedom to purchase sound system of their choice," he said.

CASA's member manufacturers, distributors, installers and retailers are enthusiastically supporting the legal battle with Mazda. Substantial contributors to CASA's legal fund were pledged by Jensen Sound Laboratories, Audiovox Corporation, Metra Electronics, Pioneer Electronics of America and Southern Auto Sound during CASA's membership meeting where Christopher announced CASA's intent "to sue Mazda and any other vehicle manufacturer or importer who flagrantly violates the antitrust laws against tie-in sales." CASA's litigation fund has been used to finance legal battles against General Motors, Toyota and Volkswagen, each of which thereafter changed their practices with regard to vehicles previously sold with standard equipment radios.

U.S. Market Video Products Sales Up In First Half Of 1981

Total U.S. market sales to retailers of major consumer video products—color and monochrome television receivers and video cassette recorders—increased substantially in the first half of 1981, compared to the same period last year. According to industry figures compiled by the Marketing Services Department of the Electronic Industries Association's Consumer Electronics Group, sales to retailers of color TV sets in the 26 weeks, year-to-date, rose to 5,143,615 units, up 20.3 percent over 4,275,463 units sold in the first half last year. Monochrome television receiver sales in the first half of 1981 were 2,762,503 units, an increase of 13.4 percent over 2,436,732 units sold in the comparable six months of 1980. Video Cassette recorders (VCR) sales in the first half of 1981 climbed to 543,473 units, an increase of 89.6 percent over 286,601 units sold in the first half of 1980.

Security Marketing Program

Davis Marketing Group, and its subsidiary corporation, the Security Industry Education Group has recently announced the development of a new "mini consulting" service. Called the Management Assistance Program, the program is intended to enable small and medium sized alarm companies to develop a more professional approach to marketing, administration, service and installation of alarm systems.

Although the program was created primarily for companies in the burglar and fire alarm industry, it has potential application for companies that are contemplating getting into that industry.

The Management Assistance Program was designed to enable a company to develop a systems and procedures approach to product equipment selection, design, installation and service, sales and marketing, administration and operation, and overall management controls. A variety of written material is given to the MAP subscriber, along with four quarterly visits by a Davis Marketing Group Executive.

For further information, contact Davis Marketing Group, 1550 N. Northwest Highway, Suite 409, Park Ridge, Illinois 60068.

GIVE TO THE
UNITED NEGRO COLLEGE FUND.
A MIND IS A TERRIBLE THING
TO WASTE.

RCA Files With FCC For Direct Broadcast Satellite Authorization

RCA American Communications, Inc. filed July 16th with the FCC for authority to construct, launch, position and operate an experimental system of direct broadcast satellites and ground support facilities capable of providing television, audio and other services to individual and community receiving stations in the United States.

The complete DBS system would consist of four operational satellites, plus an in-orbit spare and an on-ground spare, according to Eugene F. Murphy, President and Chief Executive Officer of RCA Communications, Inc.

A period of not less than four years will pass between the date of approval and the date of commencing transmission. The initial investment to orbit and operate the first satellite and the spare, along with the ground investment, is estimated at some $400 million. The complete system as proposed will require a total investment of $760 million.

Each RCA American DBS spacecraft would carry a total of six 230-watt K-band transponders, two of which would be capable of being switched to carry broadband, high definition television signals. Each channel would have its own backup, on-board space for 100 percent redundancy.

An RCA study reportedly shows that a DBS system could be economically feasible in areas where cable television is unavailable at an installation cost of less than $500 per home. Specifications call for a minimum signal of 58 dBw from each regular transponder at the edge of its coverage area. This is some 400 times more powerful a signal than delivered by today's conventional communications satellites.

Spacecraft electrical power will be provided by a total of 200 square feet of solar array that together supply an initial 4,770 watts, and a minimum of 3,600 watts at the end of the seven-year design life.

As stated in the application, RCA American intends to provide only the space segment of the DBS system, including tracking, telemetry and command functions via its own earth stations. Uplink facilities for programming will be provided at the customers' request, but it is anticipated that most of the uplink facilities will be customer-owned.

FROM THE EDITOR'S DESK

Small computers—by almost anyone's predictions they would seem to be a consumer electronics item for the '80s. The EIA (Electronic Industries Association) quotes estimates that indicate a $9 billion market in 1984 for small business computers and estimates that personal computer sales increased 60 percent in 1980. Many of these go into offices, but estimates have been made that computers in the home will be a $7 billion a year market by 1985.

Beyond this, control systems that rival small computers in complexity will appear in security systems, heating and cooling systems, appliances, automobiles, almost anything around the home that can use more than a simple off-on switch.

You are going to have a computer in your shop, if you do not now have one, and it isn't going to do only your accounting. It is going to be a troubleshooting tool. Sylvania some time ago, at its 1980 national service meeting, announced a program which would put field repair experiences, factory changes, all sorts of service and troubleshooting information into a computer memory. Portions of the program are being held back by the pending move of Sylvania and Philco headquarters to Knoxville, TN, but ultimately you should be able to call, hopefully a 800 number, and talk to Sylvania's computer with your microcomputer, and have access to all the information the factory has. Such a program, if instituted by each manufacturer, could be very valuable.

I mention this to show what I (and many others) believe will occur in the next five years or less. Microcomputers will be so all pervasive in the home, in commerce, in industry that I cannot see how the manufacturer can set up service to take care of all of them. When they become as common as color television receivers—someone will have to take care of them—and perhaps sell them—and it might as well be you.

ET/D is working hard to develop, first, a short series of elementary programming articles, to be followed by a series of articles on mini/microcomputer troubleshooting. These will all be written for the technician who has no real computer background but needs to develop one. The editors will unfortunately be good judges of this approach. In any case these articles will be for the technician not the programming hobbyist.

Sincerely,

Walter H. Schwartz

ET/D

Walter H. Schwartz, *Editor (Duluth)*

Peter B. Credit,
Assistant Editor (Duluth)

Tom Greney, *Group Vice President*
Publishing Director (Chicago)

Don Fraser, *Graphic Design*

Barb Johnson, *Production Manager*

Diane Blesener, *Production Supervisor*

Lillie Pearson, *Circulation Supervisor*

Gene Bailey, *Reader Service*

Julie Laitin, *Promotion Director*

Dawn Anderson, *Classified Ad Mgr.*

Please submit editorial manuscripts to:
Editor ET/D, 1 East First Street,
Duluth, Minn., 55802.

ADVERTISING SALES

Please send all advertising material to:
ET/D, Production Mgr.
120 West Second Street
Duluth, Minn. 55802
(218) 727-8511

East Region
Steve Del Duca
757 Third Avenue
New York, N.Y. 10017
(212) 888-4382

Midwest Region
Keith Lewis
111 East Wacker Drive
Chicago, Ill. 60601
(312) 938-2325

Southern Region
Chuck Cummings
613 N. O'Connor
Irving, TX 75061
(214) 253-8678

Western Region
Joyce Amiri
10741 Moorpark St., Suite #21
North Hollywood, CA 91602
(213) 980-7750 or (213) 760-1684

HBJ

HARCOURT BRACE JOVANOVICH PUBLICATIONS

Robert L. Edgell, *Chairman*
Richard Moeller, *President*
Lars Fladmark, *Executive Vice President*
Arland Hirman, *Treasurer*
Thomas Greney, *Group Vice President*
Ezra Pincus, *Group Vice President*
Lawrence Witchel, *Group Vice President*
Joe Bilderbach, *Vice President*
James T. Ghema, *Vice President*
George A. Glenn, *Vice President*
Harry D. Ramaley, *Vice President*

LETTERS

STATE OF THE INDUSTRY:

I have been reading about the need for electronic technicians and engineers for many years now. It is time that the general public knew the truth about the misrepresentations made in this regard.

What really happens is this: The various companies employing electronic technicians and engineers make an annual report to The Federal Government, estimating their needs for engineers and technicians. They always overestimate. This information is summarized, and used by the U. S. Government labor agencies as a basis for permitting foreign technicians and engineers to come to the U.S., certified as being needed. It is also used as the basis for grants and other encouragements for training more engineers and technicians in schools.

Obviously it is to the advantage of electronic employers to have more technicians and engineers trained, and imported, because wages paid in an industry depend upon supply and demand. When there is an oversupply of labor, the wages drop.

And of course our educational industry, trades schools and colleges, both private and public, encourage such overestimation because it results in jobs in the educational sector, and more educational grants, etc. Thus we have industry and educators using the services of the U. S. Government to cruelly deceive would-be technicians and engineers about job opportunities. As a matter of fact there have been horrendous losses in electronic jobs due to automation, and exporting of jobs overseas.

Look at what has happened to our T.V., High Fidelity, and other industry areas in recent years, with Japan taking the lion's share. Even new products like CB and video tape recorders have been snatched away from us. In integrated circuits, Japanese are coming on very strong now . . . all with the blessing of the U.S. Government, which gets upset when imported motor cars take 25% of the market, but is not at all concerned when imported electronics take 75% of the market!

As a matter of fact, one of the major electronic engineering societies has been concerned over the heavy importation of foreign electronics personnel. These people are permitted to stay in the U. S. only while employed. As a result they are very dependent upon their employers, and work longer hours for less money. They have been said to have resulted in depressing the wages in the U. S. electronics industry, and there seems to be reason for believing this is true since an electronics engineering graduate earns substantially less than an engineer in civil, chemical, or other engineering branches, and for no good discernible reason.

It has been alleged that the electronics industry has had a very powerful lobby in Washington, while the working technicians and engineers are not represented very adaquately, and this appears to be the case. Why else would we see a graduate of an electronic trade school starting at about the same wage as an unskilled construction trade laborer, in the consumer electronics field? There is no doubt that the consumer electronics technician faces very complex equipment in color TV and video recording equipment, yet he has been underpaid for many years now.

The simple fact is that there is an oversupply of technicians, and this is not an accident. It is part of a deliberate policy on the part of big business, the

U. S. Government, and the educators. Even in the worst years, when electronics had massive layoffs, the Government called for training more engineers and technicians "for the future!"

When Volkswagon gets fifty seven dollars an hour for mechanics charges, while T.V. repair shops get half that rate, you know that something is very wrong in the electronics industry.

Compare the salary of a T. V. technician with an electrician, plumber, or skilled auto mechanic and the picture is even more obvious. Remember, many technicians must be licensed by the F.C.C. when working on two way radios, broadcast equipment, etc., so licensing is not the difference.

It is time that the word got out. There are too many reports encouraging students to attend trade schools and two years colleges. Many of them never really get into the electronics business. Others simply wind up working as self employed shop owners at a lower rate per hour than they would get working for some one else in industry . . . preferably in some other line of work.

A reduction in the number of technicians and engineers would have a very beneficial effect on earnings in this business. Our hourly rates should be at least 50% higher than at present, to be in line with other skilled technical labor compensation. It is time we did something about it. Write your State Senator and Representative. More effectively, join a state or national organization and insist that they lobby state and national governments about stopping the U. S. Government role in insuring that electronics workers work cheap! Electronics people have the reputation of being "loners." In this case a "loner" is a "goner."

Unfortunately, past actions of the people of this industry have bordered on the suicidal! Shop owners have cooperated with local trade schools, hoping for cheap entry level labor, then turned around and complained about the low rates prevalent in the industry!

Well, cheap labor and cheap rates go hand in hand. If you make 50% profit on cheap labor, it isn't much, and you can't pay many bills with it. A healthy industry does good work, pays good wages, and makes good profits. Cheap labor, with skimpy profits also guarantees a sickly business community in your home town, since cheap labor cannot buy much.

Perhaps the most effective way to improve things in this business is to tell the story as it really is, "If you are thinking of getting into electronics to make a good living, forget it. You will do better driving a truck, working in construction, being an electrician or a plumber, or getting into a chemical lab, etc. So tell the vocational counsellors in the schools, the fathers who want to help their children, and the young people themselves . . . the two years you will spend preparing for an electronics career would be better spent learning another career!"

One last fact: The military trains lots of personnel in electronics. Ex military people are competing with civilians fo the available jobs. The military schools are good. Most other jobs are not impacted in this way, by the good old U. S. of A. We need at least a 50% reduction in the number of electronics courses offered in private and public schools, and more "truth in industry."

William W. Hatcher
Glendale, AZ

SECURITY: JAMES ROSS AND STEVEN BROWNE

I would like to take this opportunity to commend you on your very informative article in the June issue of ETID. However, there is one point I would like to draw your attention to and it deals with the section on wireless panic activation. The wireless receiver would be much more effective if its connected into the Emergency circuit (which is always on) so if the system was disarmed you could still have a panic (Emergency) activation. I look forward to Part 2.
Bob Hoffman
Nutone Housing Group. Scovill Inc.
3305 Lurting Ave.
Bronx, NY 10469

LIABILITY AND INSURANCE:

In reading through your magazine, I was most upset when reading the article entitled, "Commercial Electronics, Inc.," which commences on page 16 of that June issue. The concept of a contract limiting the alarm company's liability has always been very important to the alarm industry, as well as for my insurance program. Because of this, I was somewhat upset to see the proposal which Commercial Electronics uses which was reprinted on page 17. This contract is by no means acceptable in the alarm industry or for any insurance program to date. The language is rather antiquated and misses quite a few important points. While I do not wish to waste your time or mine in telling you exactly what is wrong with the contract, my concern is that other alarm companies reading this magazine will assume that the language is adequate and copy it.
George Tanty
AVRECO, Inc.
200 W. Monroe St.
Chicago, IL 60606

I have been assured that legal advice was sought when the Commercial Electronics, Inc. contract form was drawn up. However, being no legal expert I concede that it might be incomplete. Each security installing company should get proper legal advice for its contracts and liability insurance advice from one of the firms specializing in this field. Editor.

HELP NEEDED:

I need some help in locating a schematic for an HQ-110 Hammarlund radio. I wrote to Hammarlund but it was an old add. So if you can help me I sure would be grateful.
Mike Martinez
414 S. Beech
Cortez, CO 81321

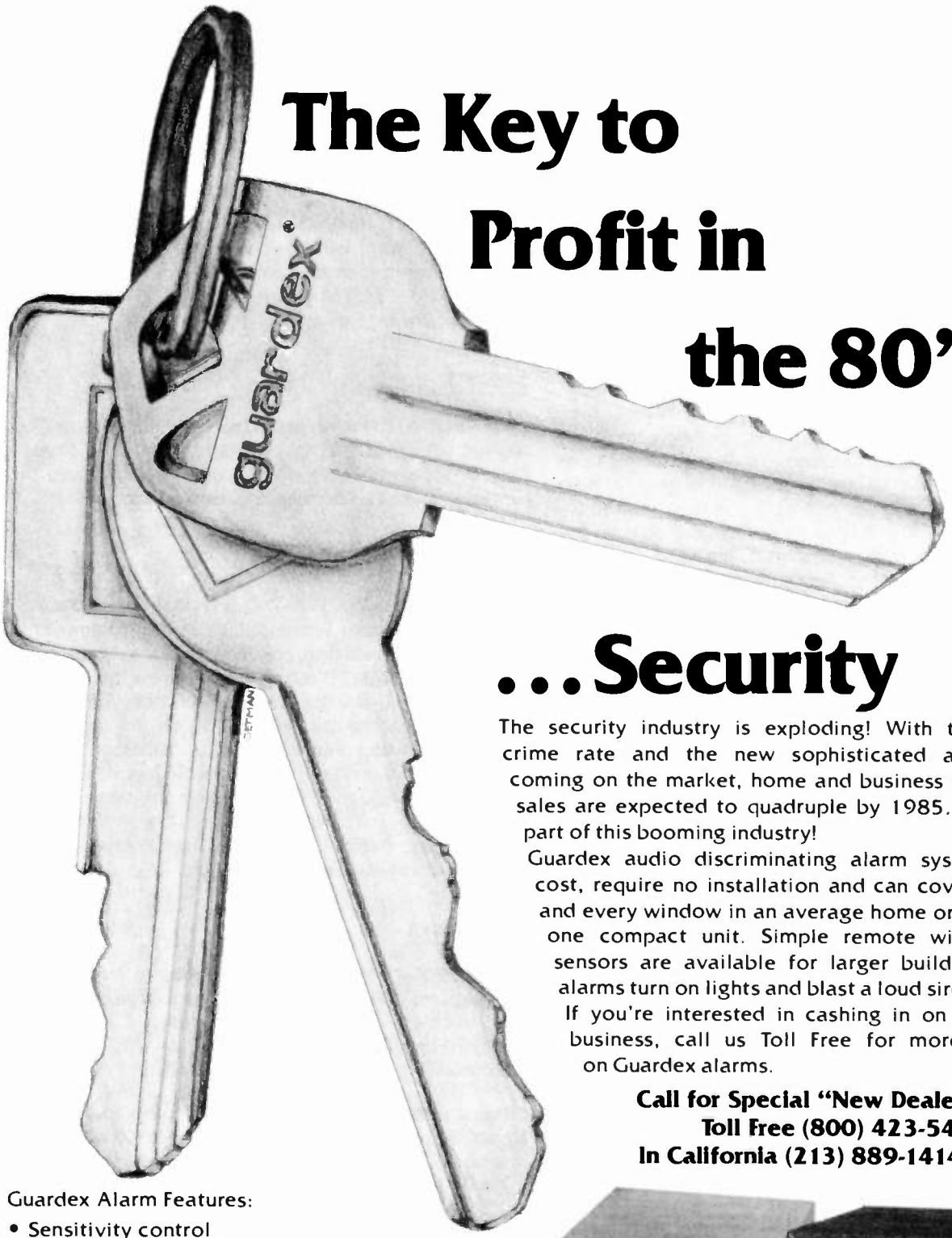
Please publish the following letter; "I need a HAMMARLUND radio schematic model HQ—180—AZ. I am willing to copy it or buy copy of it or original? Thank you.
Marios Hatziprokopiou
151 A Langfield Drive
Buffalo, N.Y. 14215

Need a flyback transformer for a Panasonic color TV #CT-62P. Part number is TLF5007. Panasonic does not stock this part anymore. If anyone has this fly call or write me. Thank you.
Roberts T.V. Co., Inc.
8861 Biscayne Blvd.
Miami, Fl 33138
759-5794

I need your help. Mercury Model #1100 A tube tester. I need tube set up chart; schematic. Precise Model #909 VTVM, schematic. Transi-Master Model #TR110, transistor tester, signal generator. I need transistor set up chart.
Daniel Martinez
310 E. 115 St. #11-D
New York, NY 10029

Need schematic for an EDL Instruments Model 230 scope. Will pay for copy and postage. Need flyback transformer PN 334PO3402 for a Bradford Model 1143B31 Color TV. Have not been able to locate substitute. Any ideas?
Larry Stigney
5466 Toltec Dr.
Santa Barbara, CA 93111

The Key to Profit in the 80's...



...Security

The security industry is exploding! With the increasing crime rate and the new sophisticated alarm systems coming on the market, home and business security alarm sales are expected to quadruple by 1985. You can be a part of this booming industry!

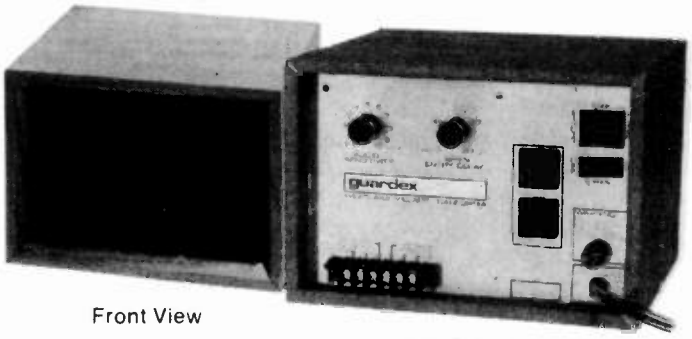
Guardex audio discriminating alarm systems are low cost, require no installation and can cover every door and every window in an average home or business with one compact unit. Simple remote wireless plug-in sensors are available for larger buildings. Guardex alarms turn on lights and blast a loud siren.

If you're interested in cashing in on this booming business, call us Toll Free for more information on Guardex alarms.

Call for Special "New Dealer" Offer!
Toll Free (800) 423-5490
In California (213) 889-1414 Collect

Guardex Alarm Features:

- Sensitivity control
- 0-30 second adjustable entry delay on siren
- Pulse Counter – one sound turns on lights, etc. Second sound activates siren
- Remote horn output – Driver built-in
- Key Switch input – low voltage
- Back-up battery input
- External trigger input – open circuit
- Automatic reset
- Internal siren shut-off



Front View

Rear View

GUARDIAN ELECTRONICS, INC.

31117 W. Via Colinas,
Westlake Village, CA 91362
Toll Free (800) 423-5490
In California (213) 889-1414 Collect

Circle No. 108 on Reader Inquiry Card

SERVICE SEMINAR

Servicing Microprocessor Products, Part 2. (Continued from July). In troubleshooting the input and output ports of the MPU, if the right information enters the MPU, it may cause another set of instructions to start executing, some of which may cause pulses to appear at the output ports.

These pulses could then be used to turn an LED or motor ON or OFF. So, the computer can only follow the instructions programmed into it during manufacture and will produce certain outputs according to the input information it gets. If it gets the wrong input, it will do either nothing or some very strange things indeed.

If you try and trace the input/output ports on the schematic of a typical product, you will be very confused in a short time. A connection from an input or output port may travel all over the diagram and connect to several seemingly unrelated switches, sensors, LEDs or motors. The reason for this technician's nightmare is the fact that most MPUs multiplex their I/O lines. That is, one line of an I/O port may be used for several different and unrelated things. This can be done because of the timing relationships inside the MPU.

For example: The computer knows when it is outputting pulses at certain ports and by controlling when certain pulses coincide, the computer can select what device gets turned on even though several are connected to the same port. The same is true of input ports. Though several switches are connected to the same port, the computer can tell which one is activated by enabling each switch one at a time and then reading the input port during a particular switch's alloted time period to look for a change of data. This scanning of switches is done very rapidly and appears instantaneously to humans.

Obviously there is a lot going on here at once, and to troubleshoot this area you are going to need a little help. Well, help is not far away—it's inside the Service Manual. Most manufacturers have been including "simplified" diagrams of the more complex circuits, and these make understanding how the circuit works considerably easier. For example, they will show you the signal path for all the switches and motors for all the modes of the machine. You can easily trace which output port enables which switch and what input port that switch is connected to. Connect one channel of your scope to the output port in question and the other channel to the corresponding input port. Push the switch and the pulses should correspond. If you don't get a pulse at the input port when the switch is activated, find out why. Trace through the circuit until you find the point where the pulse stops. It could be a bad switch, connector or IC transfer gate. A note on checking pulses at the ports; make sure you not only have a pulse but that it is of the correct level. Something else connected to the same data line may be pulling it down and the MPU may not be able to distinguish whether it's a high or a low. Similarly, when checking output ports—if you don't get a pulse when you should, try to disconnect the port from the circuitry it is driving and check again. A short in a drive transistor could be holding down the output port.

By using these troubleshooting methods, I'm sure you will find that 99% of the problems are not caused by the computer chip. Remember, use logical step-by-step troubleshooting techniques and you will beat the microprocessor at its own game. Now you didn't really want to unsolder that 40 pin chip, did you? Happy Servicing! Courtesy, Panasonic Technical Newsletter, Mike Lega, Video Product Inspector, Panasonic Quality Assurance Group.

MAGNAVOX

Chassis T950, raster bounces vertically, excessive height and problem may appear intermittently. To correct: Replace R514, .82K 2 watt resistor. (Changed in value to extremely high resistance). Bob Baker, CET, Billings, MT.

RCA

Chassis CTC-31, picture blanks out on top & bottom when brightness control varied, vertical pulse on grid of video output measures 40 volts in amplitude. To correct: Replace resistor R-754, 755, 756 and/or coil L-706. William T. Wall, CET, Jacksonville, Fla.

SANYO

Chassis DD-91C76N. No raster (remote function only). No filament voltage at CRT or transformer T-901. To correct: Clear or replace relay RL-1801 (located inside remote receiver). Kenneth D. Simmons, SR, Gravel Ridge, AR.

SONY

All models using 2SC1127 R-G-B (video) output transistors—There are many versions of the 2SC1127 transistor in circulation, of those shown, only those similar to types C and D are suitable for R-G-B output use. Never use types similar to A or B for R-G-B output service since their VCEO is too low as indicated by the number "1" on the case. Only 2SC1127 transistors with the number "2" marked on the case in the lower right-hand corner are suitable for use as R-G-B output transistors. Sony Parts is shipping only those with the number 2 marked on the case. However, other semiconductor suppliers may be shipping rank 0 or 1 transistors which must not be used as R-G-B output transistors.

SYLVANIA

Chassis E06-2 VHF channels above 6 are weak with a beat pattern, VHF and channels 2 through 6 operate normal. To correct: Replace neutralizing capacitor C27, connect across RF amplifier transistor. Jack Green, CET, Oneanta, Alabama.

Chassis E21, no sync, oscilloscope displays loss of sync signal. To correct: Replace defective coil L-408 (located off of sync IC). Scott Leibrand, CET, Des Moines, Iowa.

ZENITH

Chassis 25JC49, (Tekfax 1740). No HV, sound ok. Replacing horizontal module does not correct the problem. To correct: Replace T204 (open primary winding). Bud Phelps, Phelp's TV Service, Scammon, Kansas.

Chassis 16Z8C50. Vertical won't hold. Excessive voltage on C88 capacitor (integrator side). To correct: Replace C88, .01mfd capacitor (apparently shorted). Chester Maus, West Columbia, Texas.

Chassis 20XIC38, picture dark, picture appears negative. To correct: Replace defective coil L-7. Located off of pin no. 7 of 6KT8 cathode follower. Manual DeLaRosa, CET, Monro Bay, CA.

SECURITY VIEWPOINT

By Ray Allegrezza

One area that is often overlooked by the security dealer/installer is the practice of pre-wiring. Basically, what the term means is that the dealer goes to a development or building currently under construction and installs the security equipment, or at least the wiring, before the building is completed.

There are a number of sound reasons why this practice is becoming more prevalent in the security business.

- The client is more likely to agree to the purchase of security equipment at this time. (How many people do you know who buy a new car from the dealer then have accessories such as air conditioning installed a month after they take delivery?).
- Pre-wiring is much easier than installing security systems in existing homes or offices. When you install security systems in existing homes, you usually have to contend with damp basements, or crawlspaces which are usually insulated with fiberglass and hot inaccessible attics, etc. Also keep in mind that many a potential sale has gone down the drain because the lady of the house would not tolerate an army of installers swarming through her house tearing up carpets and drilling holes in her living room walls!
- Pre-wiring can save you dollars in terms of installation time. Since the walls are open when pre-wiring, and everything is laid out before you, the time it should take you to do the job can drastically be reduced.
- Should any problems with the actual security system you are installing manifest themselves, you can determine and correct them more quickly since everything is so much more accessible.

Many developers have indicated that they agree with the concept of pre-wiring, since it is an extra selling feature of the homes they are trying to sell. This is especially true in the suburbs where many of those new homeowners are transplants from big cities. Home security to them is as important a selling factor as central air, and wall-to-wall appliances.

Although as with any type of home security device some product demonstration is required, most alarm dealers involved in pre-wiring claim that most of their sales are made at direct presentations to the developer.

But keep in mind any presentation, no matter how good, may not in itself make the sale, You had better be prepared to back up the presentation with some hard facts—facts that show how by adding these home security systems, the developer can increase the sale of homes.

When deciding on the equipment to install, a good rule of thumb is as follows—keep it simple. Naturally you will want to use high quality equipment, but remember that even top-quality systems can and do malfunction. The last thing you want is to leave the new homeowner with an operation manual that reads like some textbook explaining the laws of relativity.

No matter what, once you decide that pre-wiring can be a viable addition to the services you offer, don't be discouraged! Initial acceptance will not happen overnight.

When your bid for a job is accepted, work *with* not against the developer. Plan time schedules so that your respective tasks don't interfere with each other. Handled properly, pre-wiring can reap you those additional sales dollars needed to keep your business healthy. And don't forget that MATV and possibly a sound system can also be pre-wired.

The ONLY professional liability policy DESIGNED for the ALARM INDUSTRY

General Liability, Products, Completed Operations, Errors & Omissions

Ask your agent to call or write GEORGE TANTY.

Avreco, Inc.

SPECIAL RISK MARKETING

200 West Monroe Street
Chicago, Illinois 60606
312/663-1500 • Telex 25-3553

OPTIMA VALUE SALE

TO ORDER CALL TOLL FREE 1-800-327-0224

G.E. SYLVANIA, ZENITH 75% Off LIST NEW-BOXED

☐ 3A3	5 for $11.88	☐ 6HV5	5 for $26.19
☐ 6BK4	5 for $22.06	☐ 6JE6	5 for $24.75
☐ 6CJ3	5 for $11.06	☐ 6LB6	5 for $23.81
☐ 6FQ7	5 for $ 9.19	☐ 6LF6	5 for $24.75
☐ 6GF7	5 for $16.06	☐ 17JZ8	5 for $12.94
☐ 6GH8	5 for $ 9.38	☐ 38HE7	5 for $22.69

All Tubes Not Advertised, Write in at 75% off list. Sleeves Only. Singles 72% off list.

TRANSISTORS & I.C.'s . . . MIN.5 3 Year Guarantee

☐ 2SC1172 Toshiba	$2.95	☐ 1166BA521	$1.25
☐ 2SC867A Sony	$3.95	☐ 2SC1172B	$1.95
☐ SG613 Sony	$6.95	☐ 2SC1308K	$1.95
☐ TA7222 Toshiba	$1.50	☐ 2SC1358A	$1.95
☐ TA7204P Toshiba	$1.00	☐ 165	$1.95
☐ TA7205P Toshiba	$1.25	☐ 238	$1.95

REPLACEMENT FOR ECG

☐ 130	$ .75	☐ 196	$ .59	☐ 791	$1.50
☐ 152	$ .49	☐ 197	$ .59	☐ 792	$1.50
☐ 153	$ .49	☐ 230	$2.84	☐ 793	$2.00
☐ 171	$ .59	☐ 291	$ .95	☐ 808	$1.50
☐ 182	$1.50	☐ 292	$ .95	☐ 819	$1.50
☐ 183	$1.50	☐ 329	$1.60	☐ 822	$2.00
☐ 186	$ .55	☐ 712	$1.00	☐ 820	$2.00
☐ 195A	$ .75	☐ 731	$1.00	☐ 1167	$1.95

ZENITH, RCA & SYLVANIA MODULES

☐ 9-79	$ 2.95	☐ 145256	$11.56
☐ 9-92	$ 8.95	☐ 145262	$18.95
☐ 9-147	$10.50	☐ Rep. ECG500A	$ 9.95
☐ 150-190	$12.95	☐ Rep. ECG523	$13.95
☐ 138697	$13.23	☐ Rep. ECG526	$14.95
☐ 139546	$17.36	☐ 32-39202-3	$14.95
☐ 141154	$19.60	☐ 32-43068-1	$14.95
☐ 141427	$19.33	☐ 32-41658-3	$14.95

GENERAL

☐ VEH070 & 076 VIDEO HEAD	$49.95@		
☐ 2½ Amp 1000 PIV	100 for $ 8.00		
☐ 3 Amp 1000 PIV	100 for $15.00		
☐ STEREO Y ADAPTER ¼"	10 for $ 4.90		
☐ 9 ft. 59U F-F 99¢	☐ 10ft 59U F-F $ 1.09		

Quantity Prices Available

Letters of credit and all checks placed on deposit with Bank of Hallandale, FL. VISA/Bank Americard & Master Charge accepted. Min. order $75. FOB Dania, FL. Catalog $3, refundable upon order.

SEND CHECK OR MONEY ORDER TO:

OPTIMA ELECTRONICS
2022 Tigertail Blvd., Dania, FL 33004
Phone (305) 920-3550
TOLL FREE 1-800-327-0224

Circle No. 117 on Reader Inquiry Card

NEWSLINE

ATARI SERVICE NETWORK IN FORMATION. Atari announced in early August the formation of a nationwide service network to include by the end of 1981, 500 independent service centers trained and authorized to service the Atari Video Computer System (VCS™).

AM BROADCAST STATION TO REMAIN AT 10KHZ. The Federal Communications Commission reversed itself and voted 4 to 2 to drop its policy favoring a shift to 9KHz spacing for AM broadcast stations.

IBM IN PERSONAL COMPUTER MARKET. IBM officially entered the personal computer market in early August with an 8088 based unit assembled at Boca Raton, Florida. The new IBM personal computer, reportedly assembled to a major extent from components supplied by various vendors, has a base price of nearly $1600.

ELECTRONICS GROWTH IN THE '80's. The electronics industry will experience great growth throughout the '80's according to Predicasts, Inc., Cleveland. Some of the products experiencing this growth will be semiconductor device shipments, which should double to over $10 billion in 1983; viewdata equipment is predicted to be a $5.7 billion market by 1990; and automotive electronics will increase by a factor of 5 by 1985.

ELECTRONIC INDUSTRY LEADERS. Fairchild Magazines' listing of the top 50 companies of 1980 in electronics shows IBM on top with electronic sales of $21.54 billion. Only four TV manufacturers are among the top 50: General Electric, RCA, North American Philips and Zenith. GE had approximately $3.75 billion in electronics sales, only about 15% of its total business; RCA had nearly $3.5 billion in electronics sales, about 42% of its business; N.A. Philips did about $2.2 billion worth of electronics business and Zenith about $1.2 billion, 100% of it in electronics.

RCA ASKS TO LAUNCH A FIFTH SATELLITE. RCA recently requested authority to launch a fifth satellite at 66 degrees west in 1983. At present RCA American services use 55 transponders, 43 of which are on Satcom I and II and twelve which are leased. Anticipated needs require 120 transponders. RCA American, at present, has authority to construct six satellites and launch four. Satcom III-R and IV will be launched by the end of 1981. A third satellite will be launched in October '82 and Satcom I-R will be launched to replace Satcom I in the spring of '83.

Special

2SC1308K
Horizontal Output Transistor

2.60
Minimum order of 10

MCM, one of the nation's top Japanese semiconductor importers also has a warehouse full of popular TV & Stereo replacement items ready to ship UPS anywhere in the U.S. Just call either toll-free hotline for immediate delivery.

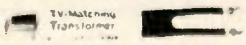
PART #:	10-29	PART #:	10-29	PART #:	10-29
2SA747A	$ 5.40	2SC1116	$ 3.80	HA1342	$ 2.70
A909	8.60	C1172B	3.60	LA1365	2.00
A1075	4.95	C1306	1.45	LM4558	1.90
A1106	4.00	C2581	4.00	M51515	4.00
B555	4.20	D386A	1.40	MRF455	17.80
B618	2.30	D425	3.20	SG613	7.40
B688	2.60	D478	.90	STK0050	7.40
B706A	6.40	AN214Q	2.10	TA7205	1.80
C458	.30	BUY69A	4.40	TIP31C	.90
C867A	4.80	DM98	7.40	UPC1025	2.10
C1114	4.40	GH3F	1.40	2N3055	1.20
				2SK30A	.50

CATV Parts and Accessories —at low, low MCM Prices.

F59 Connector
- For use with 59-U Cable
- Ferrule included

15¢ each (100 or more) 18¢ each (10-99)

TVT-1 Matching Transformer
- UHF/VHF/FM 75-300 Ohm matching transformer
- "F" Type input, 300 Ohm twinlead output

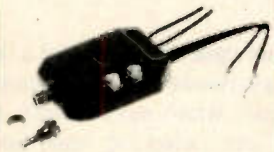


55¢ each (10-up) 65¢ each (1-9)

TVI Interference Filter
- Reduces interference caused by auto ignition, CB's, neon signs, etc.
- Connects between set & antenna

65¢ each (10-up) 80¢ each (1-9)

SPL-702 UHF/VHF/FM Splitter
- 75 Ohm
- Three way splitter w/F59 connector



$1.35 (10-up) $1.55 (1-9)

JB-2 Deluxe Coaxial Switch
- A/B switch for CATV, MATV, MDS, STV & VCR applications
- Double backed tape included for easy installation

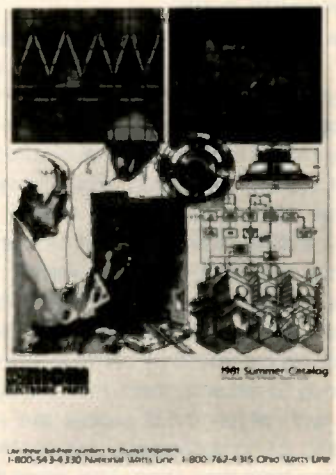
$7.40 (10-up) $8.90 (1-9)

JB-300 Coaxial Switch
- Quick selection from TV antenna & cable to VCR or other sources
- 2-Input, slide type A/B switch for CATV, MATV, MDS, STV & VCR applications

$2.70 (10-up) $2.95 (1-9)

Get the whole MCM Parts-Saving Story.

Order today and get our 64 page catalog free!



CALL OUR TOLL-FREE LINES *TODAY* FOR *IMMEDIATE DELIVERY!*

1•800•762•4315
Ohio Watts Line

mcm ELECTRONIC PARTS

1•800•543•4330
National Watts Line

858 Congress Park Drive, Centerville, Ohio 45459

Circle No. 114 on Reader Inquiry Card

Residential security

Sophisticated yet simple

Each residential security system has its own design and instalative problems depending on the house or apartment to be protected and the needs of the owner. Here's another typical yet unique system design. *

By John Sanger

Designing and installing a sophisticated alarm system need not be a complicated process. Taken in small stages, the design process is a manageable task. Assuming that we have surveyed the house, made some notes and a few sketches, and asked the homeowner some basic questions (*ET/D*, March, 1981), then we can proceed with designing a system that will best suit the homeowner's needs.

The adage, "The customer is always right," does not apply to the alarm industry. It is a rare occurrance when a prospective customer has—at best—a vague idea of the principles of electronic alarm system protection. For this reason we should remember, above all else, to sell the customer what he *needs* and not necessarily what he *wants*.

It is estimated that only three to five percent of the homes in the United States are protected by alarm systems. It stands to reason, then, that the systems with which most people are acquainted are in businesses—where they work or where they shop. And, while the similarities between commercial and residential alarm systems are many, there are some significant differences.

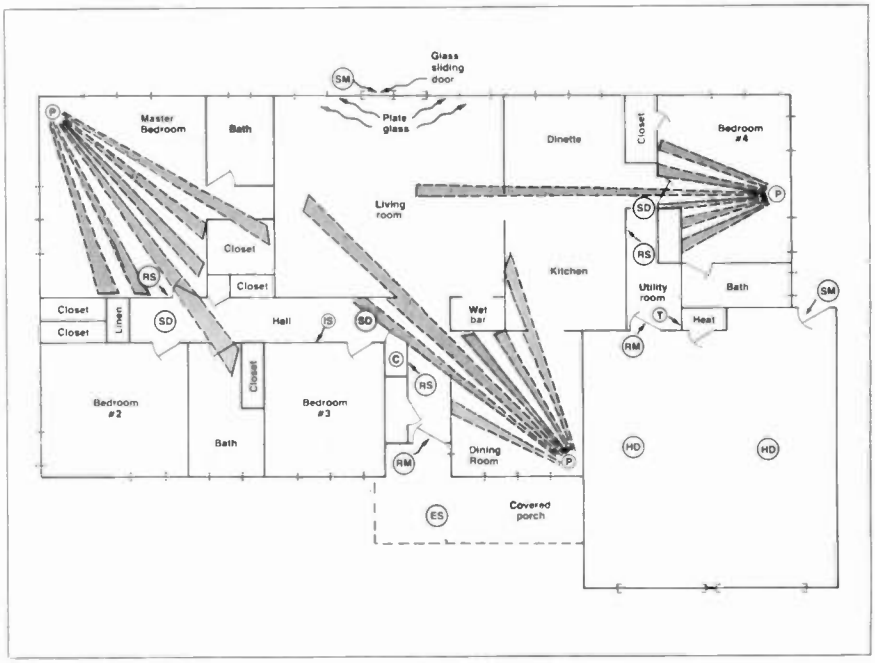


Figure 1: Floorplan of house showing location of alarm equipment.

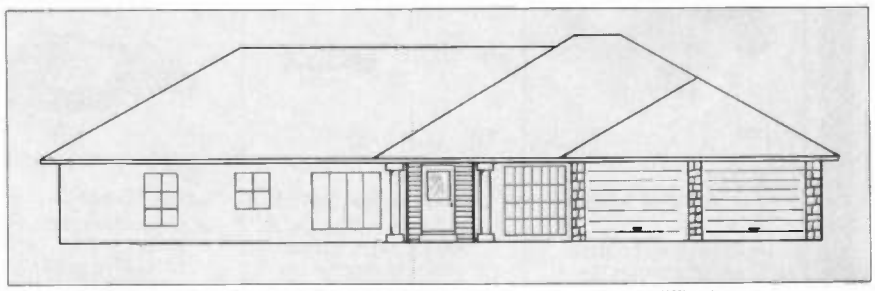


Figure 2: A hip roof makes reaching exterior walls from the attic a difficult task.

For one thing, commercial systems are usually highly visible; residential systems are not, in an attempt to blend in with the decor of the home. Installation methods, therefore, are different.

With this in mind, we can sit down with our notes and sketches and design a proposed system and prepare a bid. The floorplan shown in Figure 1 is more detailed than one that would be used by most system designers. (The floorplan illustrated here is for the purpose of explaining the rationale behind the selection and placement of equipment, and is not meant to imply that a detailed drawing is needed for design purposes. Of course, when more details are included, our designing task becomes simpler).

The total "alarm" system, as shown in Figure 1, consists of three separate systems utilizing a single control box: (1) burglary—with a perimeter and an interior zone, (2) emergency (fire/panic), and (3) medical alert system.

Exlcuding the overhead garage doors, there are four exterior doors (three wood, one sliding glass). Since the

** Equipment and services featured in ET/D's articles are selected by authors as typical for each application, and implies no necessary endorsement by ET/D. A variety of equivalent equipment and services are generally available.*

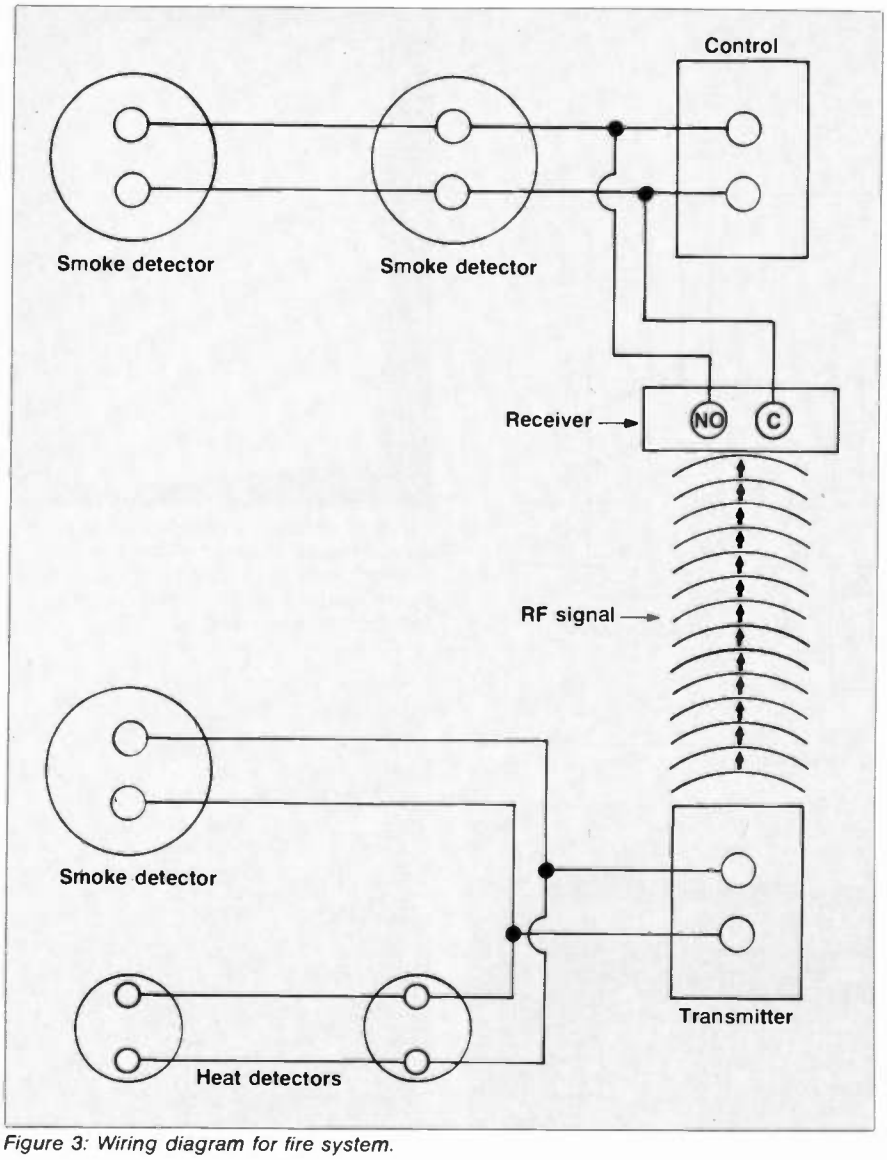


Figure 3: Wiring diagram for fire system.

overhead garage doors will not be protected, the utility room door is considered to be an exterior door.

In lieu of protecting each of the sixteen moveable and seven non-moveable windows, interior space protection devices would reduce the man-hours required to install the system. Since the house has a hip roof (Figure 2), reaching the area in the attic above each of the windows would be difficult.

The only door that will be difficult to reach from the attic will be the back sliding glass door. The front door is inset because of the covered porch, and there should be plenty of room in the attic above the utility room door. Each of these doors will be protected by magnetic contact switches: a surface mounted magnet and switch on the sliding door and a recess mounted magnet and switch in the other two doors. A ½" × 30" drill bit makes drilling up through the header into the attic an easy job).

The back garage door can be protected with a surface mounted switch and magnet, with the wiring run across the wall and ceiling to a point where it can be easily reached from the attic. The perimeter circuit (or loop), therefore, consists of four doors protected by magnetic contact switches.

For an interior (trap) zone, Colorado Electro-Optics' Model 9035 passive infared (PIR) intrusion detection devices are recommended for two reasons. First, because of the finger-like protective pattern of the PIR, careful placement will yield multiple-area coverage. Second, because the 9035 is an RF (i.e., "wireless") device, installation is extremely simple.

By mounting the CEO 9035's as shown in Figure 1 (symbol "P"), and carefully adjusting the lens of each unit, more than one room can be protected with a single unit. The PIR mounted in the dining room, for example, will protect the dining room and the protection pattern will extend into the entry area, hallway, kitchen and living room. Again, careful adjustment of the lens is imperative to achieve maximum coverage.

Installation of the three CEO 9035's will take approximately 0.75 man-hours compared to twelve to fifteen man-hours to protect the windows with foil tape, glass breakage devices and/or contact switches. While the equipment cost is more for the PIR's, it is offset by the savings in installation labor. The interior (trap) zone will effectively replace a more elaborate perimeter loop.

The second part of the total system is the fire system. Three smoke detectors and two heat detectors (200 degree thermostats) will provide good fire protection. The two smoke detectors located at the main hallway can be wired directly into the control panel, which is located in a nearby closet. The third smoke detector and the two heat detectors can be connected to a single RF transmitter to eliminate a long wire run back to the control box. Since the smoke detectors are normally open

Figure 4: Linear's D8C eight-channel receiver adds more versatility to the system. It is similar in appearance to the D4C four-channel receiver. (Photo courtesy Linear Corporation)

(N.O.) devices, they may be connected in parallel or "home-run" to the transmitter. Figure 3 shows a recommended method of wiring the detectors.

The transmitter for the heat and smoke detectors should be mounted on the wall in the utility room so that it can be reached to change the battery and to prevent tampering.

Closing the circuit (i.e., shorting) on any of the heat or smoke detectors or entering the panic code into any of the control's remote keypads will effect an emergency alarm. These devices will trigger an alarm twenty-four hours a day—whether the burglar alarm portion of the system is armed or not.

The medical alert system, the third part of the overall system, consists of two portable RF (wireless) transmitters. Reception of the medical alert signal immediately triggers an alarm—twenty-four hours a day.

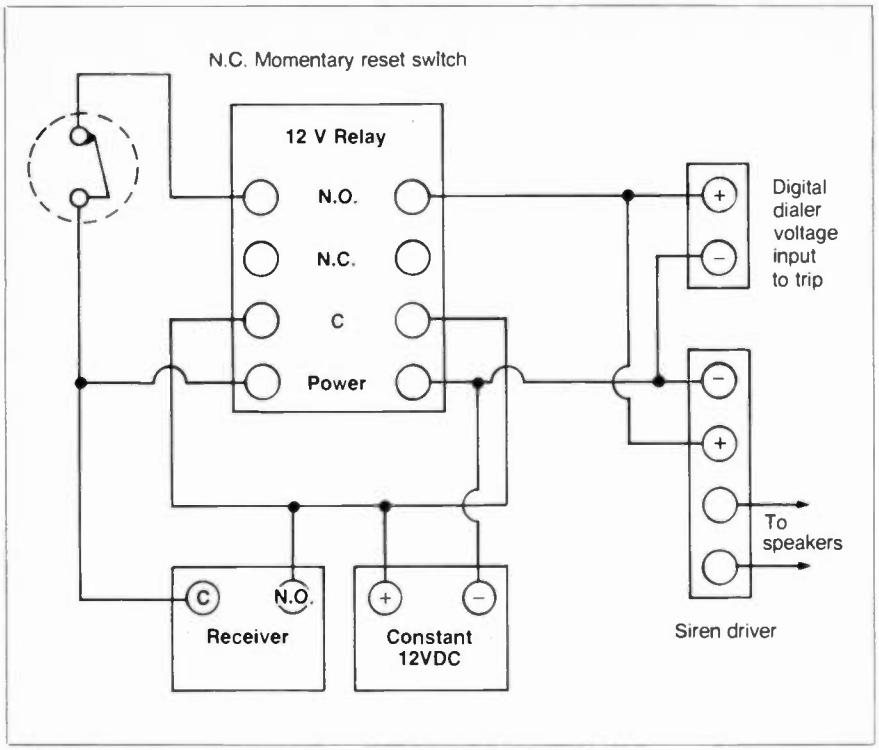


Figure 5: Wiring diagram for a latching relay with reset switch.

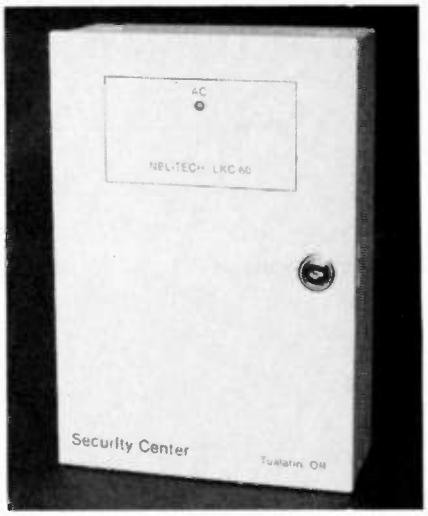


Figure 6: Nel-Tech's LKC-60 control panel can be placed in an out-of-the-way location since all functions are controlled by the remote keypads. (Photo courtesy Nel-Tech Development, Inc).

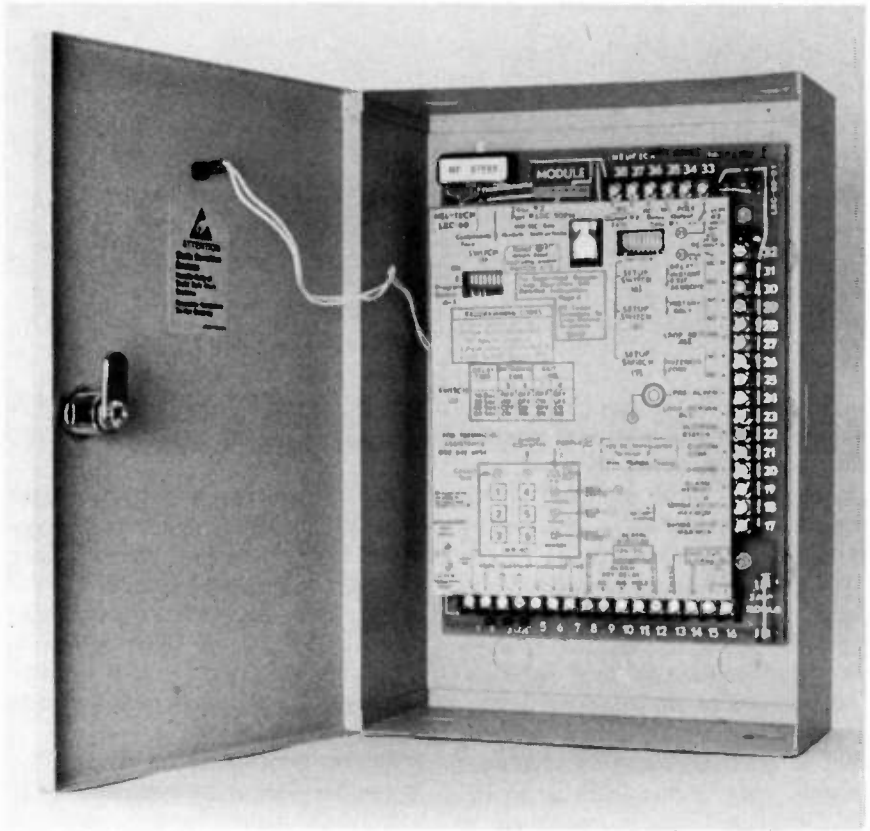


Figure 7: The LKC-60 control box is roomy enough to accommodate a battery and digital dialer. (Photo courtesy Nel-Tech Development, Inc).

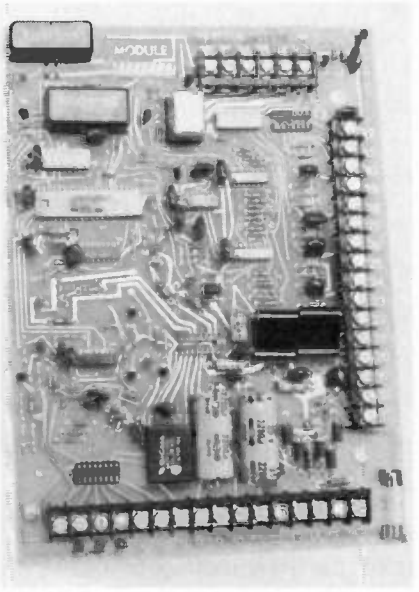


Figure 8: The LKC-60's printed circuit board is simple to connect—detailed instructions come with the control. (Photo courtesy Nel-Tech Development, Inc).

Figure 9: The 6R60 digital keypad controls all functions of the system. The keypad is available in several colors (stainless, brass, bronze) and with customized lettering. (Photo courtesy Nel-Tech Development, Inc).

The signals sent by the equipment containing Linear RF transmitters (CEO 9035 PIR, D-21 transmitter connected to smoke and heat detectors, and the D-22 portable transmitters) are received and processed by a Linear D4C four-channel receiver and Linear R4C four-channel relay module. If additional channels were needed, a linear D8C eight-channel receiver could be used (Figure 4).

The output from the Linear R4C on the channel selected for the medical alert system is fed into a latching relay (Figure 5). The purpose of the latching relay, which requires being manually

Symbol/ Location[1]	Item	Quantity	Total cost	Man-hours
	CONTROL EQUIPMENT AND ACCESSORIES			
C	Nel-Tech LKC-60 Control	1	$ 185.00	1.75
RS	Nel-Tech 6R60 Remote Keypad	3	120.00	4.50
C	Adcor SD-2 Siren Driver	1	12.50	.20
C	Powersonic PS1226 Gel Cell	1	22.00	.20
C	Basler 12VAC-40VA Transformer	1	8.00	.25
C	Linear D4C 4-Channel Receiver	1	45.00	.25
C	Linear R4C 4-Channel Relay Interface	1	35.00	.25
C	Acron DD-2 4-Channel Digital Dialer[2]	1	75.00	.75
C	RJ31X Connector Cord	1	5.00	.20
C	12V Relay and Board	1	10.00	.20
C	Normally Closed Momentary Switch	1	5.00	.25
	BURGLARY (PERIMETER ZONE)			
RM	Sentrol 1055 Recessed Magnetic Contact	2	7.00	1.50
SM	Sentrol 1025 Surface Magnetic Contact	2	5.00	1.00
	BURGLARY (INTERIOR ZONE)			
P	Colorado Electro-Optics 9035	3	345.00	.75
	FIRE			
T	Linear D-21 Transmitter[3]	1	18.00	.25
HD	Fire-Lite 42 Heat Defector-200 degree	2	10.00	1.00
SD	SmokeMaster BIR Smoke Detector	3	75.00	1.50
	MEDICAL EMERGENCY			
	Linear D-22 Portable Transmitter[4]	2	40.00	N/A
	AUDIBLE ANNUNCIATORS			
IS	Moose MPI-16 Interior Speaker (Brown)	1	12.50	.50
ES	Moose MPI-30 Exterior Speaker	1	30.00	.75
	WIRE			
	10 Conductor/22 gauge—solid	100'	13.00	N/A
	2 Conductor/22 gauge—stranded	150'	3.00	N/A
	2 Conductor/18 gauge—stranded	25'	2.00	N/A
	SUBTOTAL		$1,083.00	16.00
	MISCELLANEOUS HARDWARE (3% Of Equipment Costs)		32.50	
	TOTAL EQUIPMENT COST		$1,115.50	
	Monitoring Service Connection Fee		14.00	
	TOTAL EQUIPMENT AND RELATED COSTS		$1,129.50	
	LABOR COST FOR BIDDING[5]		240.00	
	SUBTOTAL		$1,369.50	
	PROFIT MARGIN (40%)[6]		548.00	
	SYSTEM PRICE TO CUSTOMER		$1,917.50	
	LESS DIRECT EXPENSES			
	Total Costs		– 1,129.50	
	Installer's Wages (8 hrs. × $10/hr.)		– 80.00	
	Helper's Wages (8 hrs. × 7.50/hr.)		– 60.00	
	GROSS PROFIT		$ 648.00	

Notes: [1]Refer to Figure 1 for location of items.
[2]Requires a Telco installed RJ31X jack.
[3]See Figure 12.
[4]See Figure 13.

[6](Actual profit 28.58%. A 40% profit would raise the cost to 2282.50 and many shops would at least double the direct labor costs bringing the customer price yet higher; Editor).

Figure 11: Equipment and man-hour list simplifies the bidding process.

Figure 10: Computerization speeds the processing of alarm signals through the monitoring facility to the authorities; it usually takes less than 90 seconds for authorities to be notified of a problem. (Photo courtesy Emergency 24).

Figure 12: Linear's D-21 transmitter, housed in an attractive plastic case, is easy to install. (Photo courtesy of Linear Corporation).

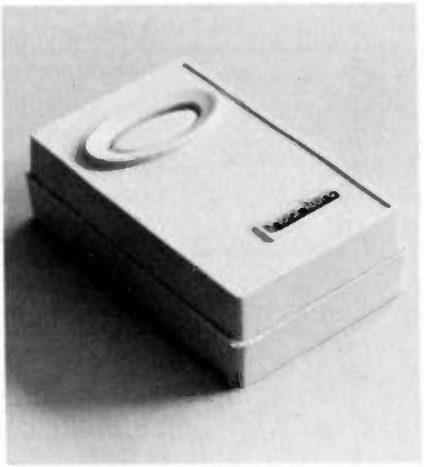


Figure 13: Linear's D-22 transmitter, a portable transmitter, has a range of approximately 200 feet and is widely used as a portable panic button for panic and medical alert systems. (Photo courtesy Linear Corporation).

reset, is to insure that someone responds to the medical emergency. The voltage output from the latching relay trips the digital dialer and activates the sirens. The sirens can be shut off *only* by pressing the normally close (N.C.) momentary reset switch. (The fire and burglary circuits have an automatic cut-off feature to silence the sirens). While the reset switch may be installed anywhere in the house, it is simpler to mount it on or near the control panel.

While there are numerous control units on the market that could be used for this system, Nel-Tech's LKC-60 has been selected because of its reliability and versatility. (See Figures 6, 7, and 8).

The LKC-60 panel is a six-function microprocessor controlled unit that will allow up to ten remote digital keypads (Figure 9) to be used. Three keypads (symbol "RS" in Figure 1) will be used in the proposed system.

All of the coding for the LKC-60 is done in the field by the installer (or the homeowner)—a real convenience for quick, simple code changes. Codes can range from one to seven digits and are user selected. The remote keypads control all six of the control panel's functions—that is, each function is controlled by a code:

1. Arm/disarm (entire burglary system)
2. Interior burglary zone on/off
3. Panic (built-in keypad panic)
4. Custom zone (add a relay and some imagination)
5. Alarm memory reset (LED tells if alarm has tripped)
6. Entry and exit delays on/off (allowing the selection of delayed entry and exit or an instant alarm)

Features of the LKC-60 include 6 and 12vdc regulated 500ma voltage outputs, prealarm warning, selectable entry and exit delays, selectable keypad coding to control functions, alarm memory, two twenty-four hour loops, siren cut-off and reset of remaining loops, battery charger, relay and voltage outputs during a burglar alarm, built-in interior zone, and "set-up" switches (for testing the control panel). The loop inputs of the LKC-60 panel are instant only (N.O. and N.C.), delay/instant interior zone (N.O. and N.C.), and delay/instant nonzoned (N.O. and N.C.). The type and number of loop inputs, the custom zone flexibility, and the number of outputs combine to make the LKC-60 a very versatile control panel.

The proposed system, in addition to sounding an exterior and an interior siren, will annunciate the burglary, emergency (fire/keypad panic), or medical emergency via an Acron DD-2 digital dialer to a receiver located at a monitoring facility—which, upon receipt of an alarm signal, immediately notifies the appropriate authorities (Figure 10). The monitoring cost to the alarm dealer, for three channels, is approximately $8.50 per month; monthly monitoring to the customer: $25.00. Granted, $16.50 per month profit does not sound like much—until it is multiplied by 100 (or 1000) customers.

The selling price of the system (as shown in Figure 1) would be $1,917.50 (taxes not included). After deducting direct expenses (labor and equipment), the dealer's gross profit would be $648.00—which is not bad for a one-day job. Details on equipment and labor are included in Figure 11. ET/D

Residential security system design, III

Filling in the Details

In the first two parts of this series on residential security system design, a representative residential system was presented. This part of the series will provide more details on some of the features of the system and will describe several alternate methods of connecting intrusion detection circuits to standard panels.

By James A. Ross *

The digital keyboard (or keypads) which are used in this system allow the homeowner to turn "ON" or "OFF" the various circuits at convenient locations within the premises; and, by means of lights, they provide circuit status information as well. Control of the circuits through operation of the keypad is quite simple and straightforward.

If you wish to activate the perimeter circuit, you would enter the code for this circuit. For example, let's assume that you had chosen "567" as the perimeter circuit code. Looking at the panel you see that the power light is "ON" and the other two lights are "OFF." Pressing 5, 6, and 7 in sequence will turn the perimeter circuit "ON," and its light will also come "ON." To turn the interior circuit "ON," you merely enter its code. Let's enter "5567" in to the system and its signal light will come "ON" indicating that the interior circuit is armed. To turn a circuit "OFF", the same code is used. In other words, entering a code will cause the appropriate circuit to change status, "OFF" to "ON" or "ON" to "OFF."

Suppose you make an error, or someone tries to guess at your code and enters an incorrect code. In that event the system refuses to accept any additional instructions until a reset code has been entered. Let's use "31" as a reset code, and assume that you had tried to disarm the interior circuit by entering "5667" instead of "5567." The instant the first incorrect digit is entered the system "froze," and you will have to enter the sequence "3, 1, 5, 5, 6, 7" to disarm the interior circuit.

As mentioned in the last article, this system also has a panic feature. If more than one key is pressed at one time, an alarm is generated instantly. I am personally aware of at least one case where this feature probably saved a life, and I always recommend it.

Available circuit options

Residential systems usually include fire/smoke, perimeter, and interior circuits, and may include an exterior circuit in a very sophisticated system. However, contrary to the impression that may have been created by the words in a previous article, these are by no means the only options available in residential security systems.

In fact, there is really no limit to the number of circuits which can be incorporated into a system. Some examples which come to mind are maintenance circuits (water in basement, low temperature in a greenhouse, high temperature in a refrigerator or freezer, low

* *Capital Security and Surveillance Systems, Inc. Rockville, MD*

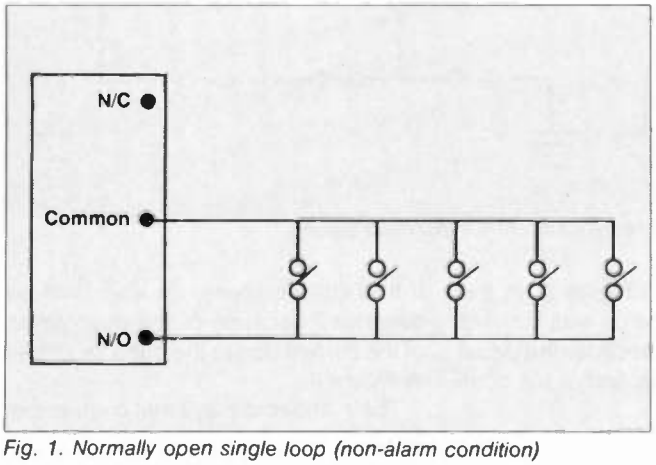


Fig. 1. Normally open single loop (non-alarm condition)

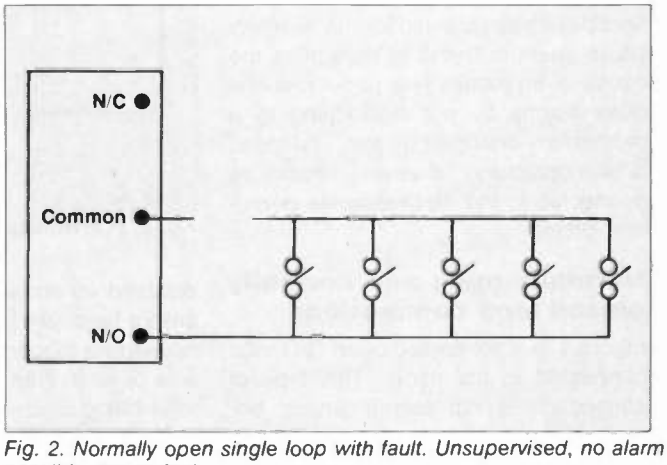


Fig. 2. Normally open single loop with fault. Unsupervised, no alarm possible due to fault.

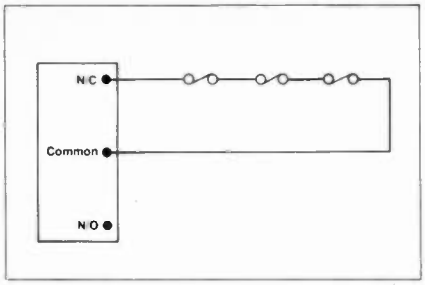


Fig. 3. Normally closed single loop (non-alarm condition).

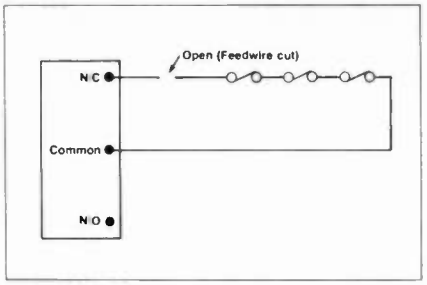


Fig. 4. Normally closed single loop with fault. Alarm condition due to open—self supervising.

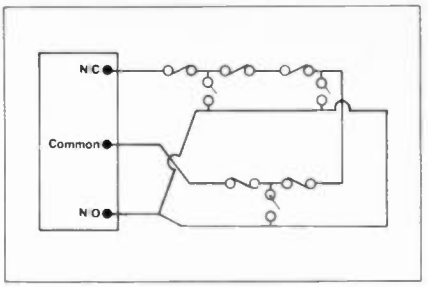


Fig. 5A. Open and closed loop combines wiring, non-alarm condition.

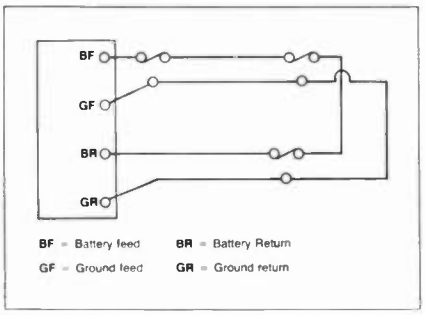


Fig. 5B. Break and cross loop, non-alarm condition. Note SPDT switches.

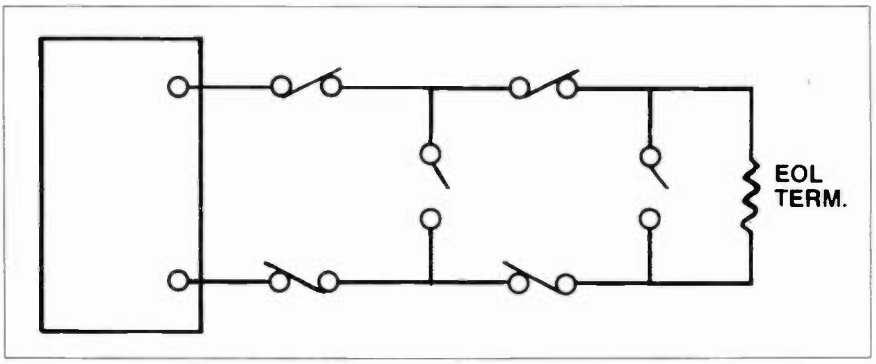


Fig. 6. End-of-line (EOL) termination using a resistor.

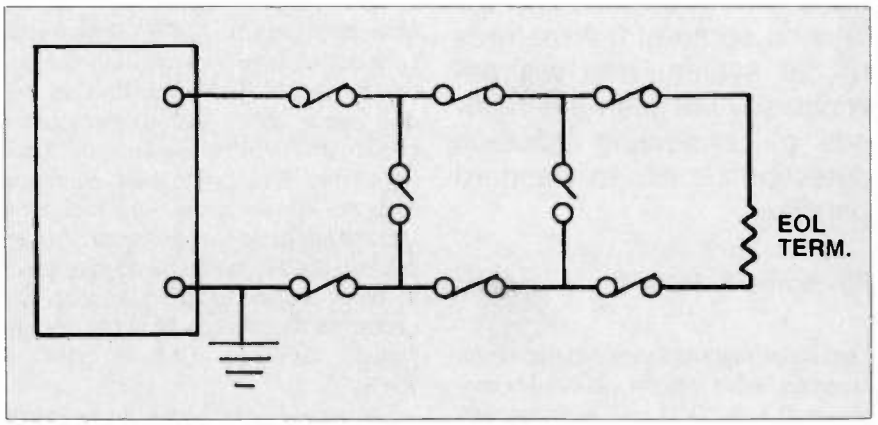


Fig. 7. EOL termination resistor loop with ground at panel.

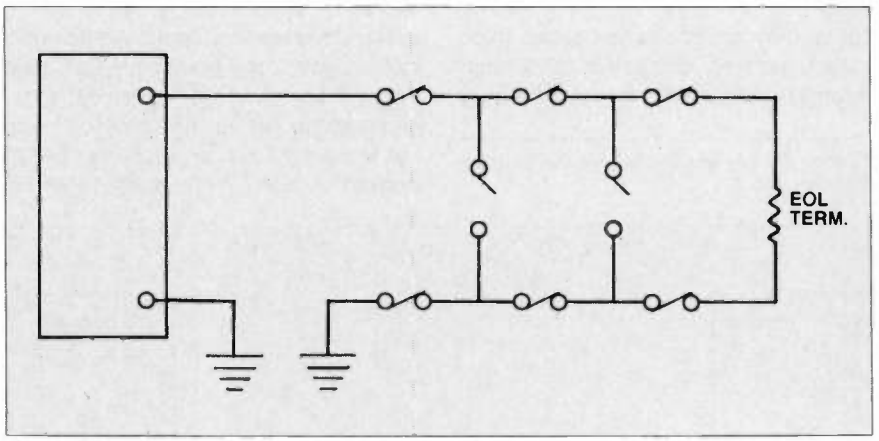


Fig. 8. EOL termination resistor loop with supervised ground.

water pressure, etc.), panic circuits for intrusion, holdup, health, etc., and theft circuits on valuables or vehicles. You could even design a system with several circuits of the same type, such as health emergency, if necessary.

The digital communicators can handle as many messages as you like, transmitting a different digital code for every different emergency.

Normal and fast response circuits

Using the Nutone 2252 panel gave us the option of using two different perimeter circuits, normal response and fast response. The normal response circuit is an attempt to reduce the problems caused by "swingers," which is the security industry's word for a circuit which occasionally changes state for a moment. That's right, it's the old intermittant problem, the troubleshooter's bugaboo. Reed switches, foil circuits, pressure contacts, and vibration sensors have been blamed for many, many hours spent in trying to determine the cause of an alarm. This panel reduces false alarms by not responding to a momentary change of state. The glass break detectors, however, should be connected to the fast response perimeter circuit.

Normally open and normally closed loop connections

Figure 1 is a schematic of an N/O loop connected to the panel. This type of connection is not recommended because it is not supervised, which means it would not create an alarm if it was disabled as shown in Figure 2. In this case a feed wire broke (or was cut), but no alarm is triggered because the circuit was open to start with and is still open after being disabled.

Figure 3, on the other hand, shows the N/C circuit which is self-supervising. If it is cut anywhere, an alarm will be generated because of the interruption of the current due to the open as shown in Figure 4.

The number of ways that circuits can be wired is infinite, but two variations are shown in Figure 5. The first of these,

open and closed loop, combined wiring, shown in Figure 5A is simply a combination of the open loop and closed loop of Figure 1 and Figure 3. It requires less wire but otherwise offers no advantages over two separate circuits. If you analyze the circuit, you'll see that the open loop circuit is still unsupervised.

In Figure 5B, however, we see a new arrangement which requires SPDT switches (or relays) for its operation. In this case an open anywhere will cause an alarm; the circuit is self supervising.

End of line terminations and supervised ground

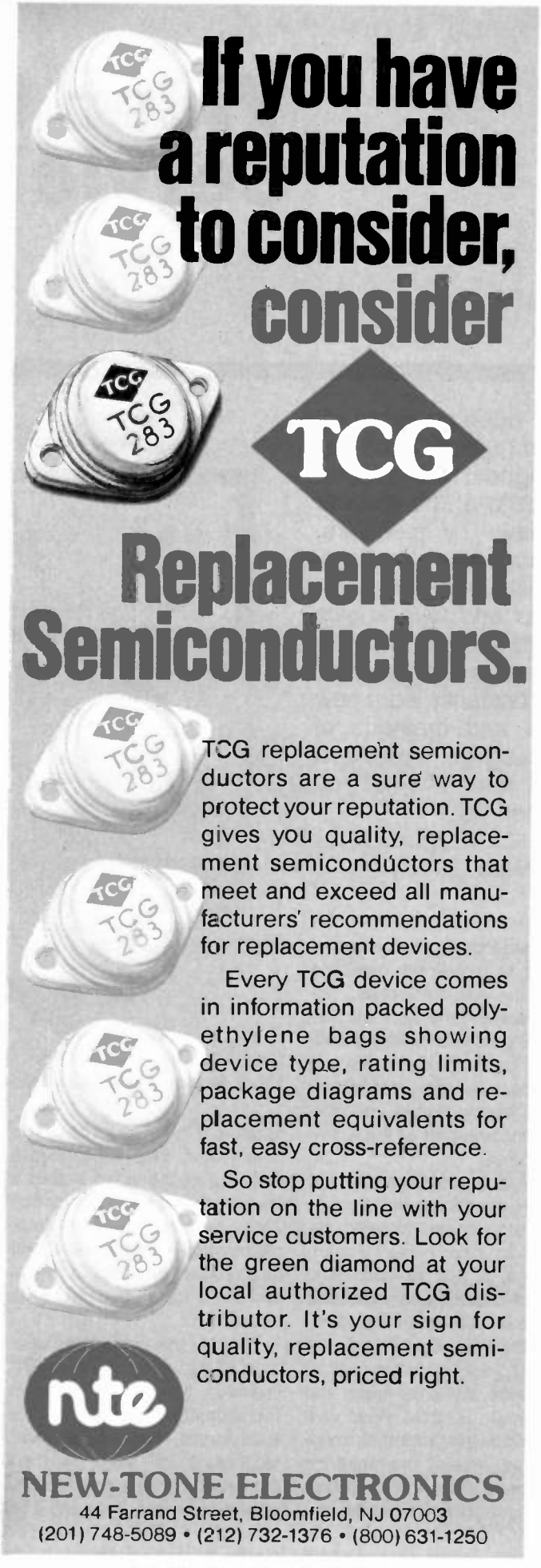
Total reliance on open circuits and short circuits was all right in the beginning but modern panels allow the use of end-of-line terminations and distributed resistance because these panels are able to sense small changes in loop resistance (current) and generate an alarm if the current change is out of tolerance. Figure 6 shows an end-of-line resistance terminated loop. You can see that opening any of the series switches (relays) will cause the loop current to drop to zero, and closing any of the open shunt switches will cause the loop current to increase.

Use of EOL terminations can result in a big reduction in false alarms because the panel will not react to small current changes caused by loose connections, corrosion, etc.

Now let's take a look at a supervised ground. (Underwriters Laboratory has standards for approved systems, and a U.L. approved system can result in lower insurance premiums). In Figure 7 we see a loop with EOL termination resistor to which a ground has been added at the panel. What happens to the operation of the loop if the ground is lost? The answer is that nothing happens; the panel is sensing changes in loop current and the loss of the ground does not affect loop current. In Figure 8, however, we see that the loop has been broken and the two ends are connected to ground. (Side-by-side on the same water pipe is fine). In this case, loss of either ground will cause loop current to drop to zero and will generate an alarm, and, therefore, we have created a supervised ground.

Summary

These three articles have outlined the steps in design of a residential intrusion, panic, and fire/smoke detection and alarm system. Remember, the two most important things to keep in mind in any design are: 1) the objective and, 2) KISS (keep it simple, stupid). Good luck. ET/D



Circle No. 121 on Reader Inquiry Card

Video Product Servicing

For the '80s

Consumer video products will increase in numbers and variety throughout the 1980's. By the middle of the decade you will have TV receivers, VCR's, disc players, cameras, satellite receivers, projection sets and who knows what, to contend with. You are going to have to sharpen your skills and constantly learn new techniques and methods of effective service. Here's a preview of some of what you may see and do.

By Stan Prentiss

Fig. 1. Sencore's VA48 video analyzer and tuner signal source.

INDEPENDENT and CORPORATE SERVICERS are looking at a totally new product world to technically massage and repair in the coming decade. Television receivers and monitors will certainly remain stable and reliable standbys, but huge sales of video discs and cameras, perhaps including a sprinkling of automotive engine timing and controls, will all become part of the active electronics scene.

At the same time, frequency synthesis and phase-locked loops in the newer varactor television tuners, midband, superband and hyperband cable TV channels, satellite 4, 6, and 12 GHz band reception, 1-chip black and white and 3 or 4-chip color sets with infrared remote transmitters in direct view and large-screen projection systems will all make a difference. While the newer and considerably more complex video cassette recorder/players, with their modulators, whose annual maintenance should average in the neighborhood of $150, plus the on-going disc battle, can easily move all profitable servicing to technical levels not even imagined heretofore in the electronics service industry. And were we to step momentarily out of the video aspect and into the burgeoning surge of automotive and 2-way radio electronics—amateur and professional—the outlook for both goods and services amounts to an astronomical dollar for all better U.S. technical tradesmen.

To enter this market and take advantage of these opportunities will require intensive training for many in digital techniques, electro-mechanical servo subsystems, comb filters, basic laser technology, dc motor familiarity, fundamentals of modern projection TV, satellite signal reception, cable television operations, and heterodyning techniques common to both buried chroma subcarriers in discs and cassettes as well as 2-way radio. And should some aspects of automotive electronics titillate the pocketbook, a crash course in these fundamentals is needed also. If such prospects are appealing, then nights and weekends must be at least partially devoted to hot pursuit of technical excellence for economic survival. Prime manufacturers ought to provide specific technical information, while test equipment applications should come from other sources, among them instrument makers and the better technical magazines.

TV receivers

With the steady emergence of virtually 100 percent integrated circuit color re-

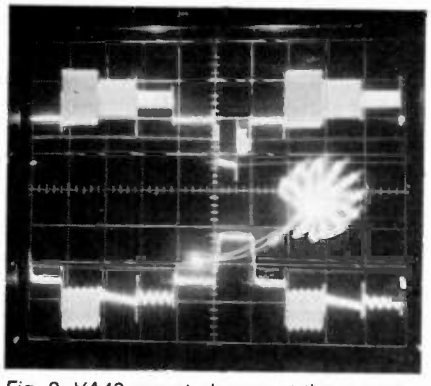


Fig. 2. VA48 swept chroma at the output of the video detector and at the CRT with sidelock vector added. Note low 4.08MHz amplitude.

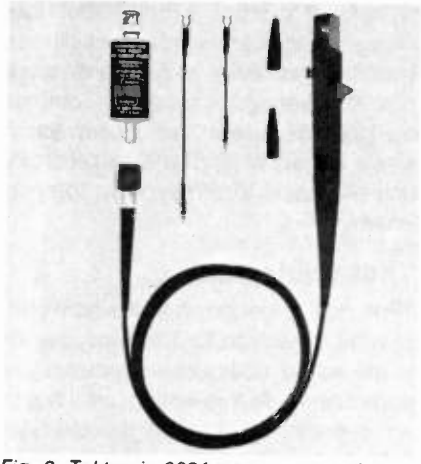


Fig. 3. Tektronix 6021 ac current probe with 2 ma/mv and 10 ma/mv standard termination.

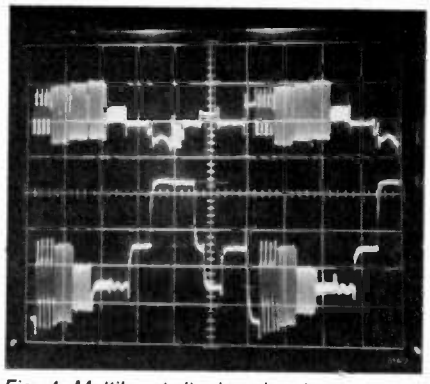


Fig. 4. Multiburst display showing response above 4MHz in the upper trace and little more than 3MHz in the lower trace (at CRT).

ceivers, and substantially throw-away inexpensive black and whites, you'll spend a long day probing ICs with a voltmeter and reading dc voltages. One digital multimeter connected to the prime power supply and another, through a suitable probe to the high voltage, should at least point to any marginal or obvious hi/lo supply failures promptly and settle this question at once. Next, a video analyzer with multiburst—such as Sencore's VA48 modified (Fig. 1) can both confirm and permit i-f sweep alignment of envelope and synchronous detector video systems, and allow examination of luminance information directly to the cathodes of the picture tube. Then a vector and/or swept chroma pattern from a clean, gated rainbow color bar generator (CG169 Sencore, RCA tube type, or possibly Leader), will confirm color bandpass (Fig. 2) 3.58 MHz subcarrier, and RGB amplifier luminance-chroma operation as all signals enter the CRT. Finally, ac current probes (Fig. 3) even without special low frequency current amplifiers can offer a very good indication of what the receiver's sweep sections are or are not doing as signal currents rise and fall. Note, if you please, that we have made system oscilloscope probe connections at the cathodes of the picture tube only, digital multimeter checks for basic dc voltages, and vertical/horizontal sweep circuit inspections with wrap-around ac probes on standard color coded leads into the deflection yoke. If there are pure tuner or i-f problems apparent, the VA48 will supply substitution or drive signals for both.

Observe further that we've not broken or disturbed a single electrical connection, yet have actually analyzed the entire, sweep, video and most dc voltages in the receiver. If you want to do sound, connect a video disc, cassette, or any handy external modulator such as B & K's Model 1250 NTSC generator, which has both external audio and video inputs/outputs. Signal injection or tracing should then adequately handle the rest.

Video cassettes

Unfortunately they are not so straightforwardly serviced because of their complex electro-mechanical makeups. Motors often fail, servo loops become defective, second rate or over-used tapes produce oxide flakeoff and dirt, amateur or poorly designed automatic head cleaners characteristically damage recording heads, tape guides become misaligned, while head switching times often manage misadjustment. Once again, you'll find your VA48 indispensable in making multiburst and chroma patterns on fresh tape to test the player/recorder equipment. And although many symptoms and their cures are often evident by actions of the machine itself, final tests must be carried out in write/read modes for satisfactory fault finding and adjustment.

Multiburst, (Fig. 4) of course, shows the bandpass of the cassette through both its baseband output as well as its modulator. You should see a little better frequency response at composite video since high frequencies are often lost passing through the modulator and TV receiver, especially if the latter is narrow-band. Gated rainbow (preferred) or NTSC color bars will both excite their respective color circuits, with gated rainbows generating a definitive 10 bars (final output) from yellow through orange, red, magenta, blue, cyan, and green at regular 30-degree gated intervals. NTSC patterns are more suitable for broad chroma viewing of yellow, green, blue, and red hues and a quick examination for color crosstalk. Unless you can manage a very special and expensive NTSC vectorscope, the various voltage levels throughout the recorder and at the chroma detector output of the receiver aren't that overwhelming. Good grayscale patterns are, however, and will immediately show the linearity of any receiver/monitor's output.

Once again, equipment familiarity and serviceability tests become the only 100-percent cures for video cassette blues. For if the microprocessor clock and function controls are satisfactory, u/v tuners operating normally, and the power supplies putting out essential voltages, eyeballs, digital multimeters, and a good 20- to 50-MHz dual trace oscilloscope are the final crutches of eventual salvation. Just follow the service manual and sweat, but try and diagnose the problem section first by general symptoms.

Video discs

Once more, servo loops, switches, motors, and crystal-controlled oscillators are the norms, with tracking arms, stylus kickers, styli, optics, lasers, capacitive pickups of several varieties, tracking and tangental mirrors, Daxi control, and microprocessors are all part of the state-of-the-art technology. Here you have test discs offered by Magnavox/Pioneer and RCA/Zenith for their respective laser and CED systems, with very high density (VHD) Matsushita/JVC/General Electric on the way. At the moment, there are no test instruments with satisfactory input impulses available to inject signals through the tracking arms. Consequently, test recordings that produce sync, gray scale, color fields and bars, high frequency pre-emphasis correction checks, track pitches between 1.4 and 2 microns for crosstalk, as well as dropout identification, and color luminance response, are part of what's collectively available. Couple these aids with a very good 30 to 50 MHz oscilloscope, and most routine adjustments and ordinary problems can be accommodated in reasonable time. Where

there are subsystem breakdowns, digital voltmeters, accurate counters, and scopes must come to the rescue as always in any modern analog or digital electronics.

One advantage the laser record disc has over CED, is the presence of both vertical interval test (VITS) and vertical interval (color) reference (VIRS) signals implanted during the vertical blanking intervals on all discs we've seen so far produced. With these, of course, system bandpass and color circuit operation can easily be checked with any scope at the video detector of any broadband, comb filter-equipped receiver. Conversely, many consumer-type laser discs are noisy, but their video-stereo outputs are virtually indestructable because of each record's tough plastic covering. Industrially, commercial manufacturers use lasers exclusively for digital and analog recording and playback. You may want to specialize.

Test equipment

Time now to get down to the nitty-gritty of what's required for this fancy testing in the way of both test instruments and applications. At this writing, we'll not try an in-depth explanation to cover the field, just an "awareness" indicator to show what can be done and how. All suggested equipment is owned and currently, being used by the author.

Spectrum analyzers (Fig. 5) are hardly routine service tools for audio and video analysis yet, but the day is fast approaching when sidebands, spurious responses, crosstalk, video and audio carriers (Fig. 6), signal-to-noise ratios, and bandpass analysis will all become part and parcel of the trade.

As compared to an ordinary oscilloscope which offers peak or peak-to-peak values of voltage versus time, the spectrum analyzer displays the absolute value of Fourier components in any incoming waveform, whether cw, pulsed, f-m, or a-m and offers a highly useful measure of both response and spectral purity. Voltage amplitude is shown either logarithmically or linearly with respect to frequency, and all this makes the analyzer cost between $10 and $40 thousand—a big buck for anyone, especially when $10 thousand won't really purchase an extended, broadband instrument. Our particular equipment is a Tektronix 7L12 and 6713 storage mainframe, with a range of from 100kHz to 1.8GHz and resolutions between 300 Hz and 3 MHz. Because all cassette and disc modulators come under the FCC classfication of Class 1 devices, you could be responsible for their accurate operation whenever servicing such commercial or home entertainment equipments; and their outputs are only visible with a spectrum analyzer. The FCC doesn't like either spurious emissions that interfere with other equipments or modulator modifications. Licensed and unlicensed technicians beware! Spectrum analyzers will eventually fill some of your shop space as product complexities grow.

Oscilloscopes used in servicing should have vertical amplifier attenuators that permit voltage inputs between at least 5 millivolts to 10 volts per division and up to a 50MHz bandpass. For with a 10X probe and an 8 division graticule, this becomes 400 millivolts to 800 volts full scale, and that leaves little room to spare as you will see shortly in deflection yoke examinations, not to mention i-f amplifiers and vertical output swings. Your single or dual time bases, too, should operate somewhere between 0.5 sec. to 200 nsec/or better for full resolution of the faster chroma signals, with a preferable accuracy of 3% overall. Recommended are Tektronix scopes in the new 2200 series, some of the better B & K-Precision models just released, or instruments of similar capability and quality. Cost: between $1500 and $2000, depending on such features

Circle No. 129 on Reader Inquiry Card

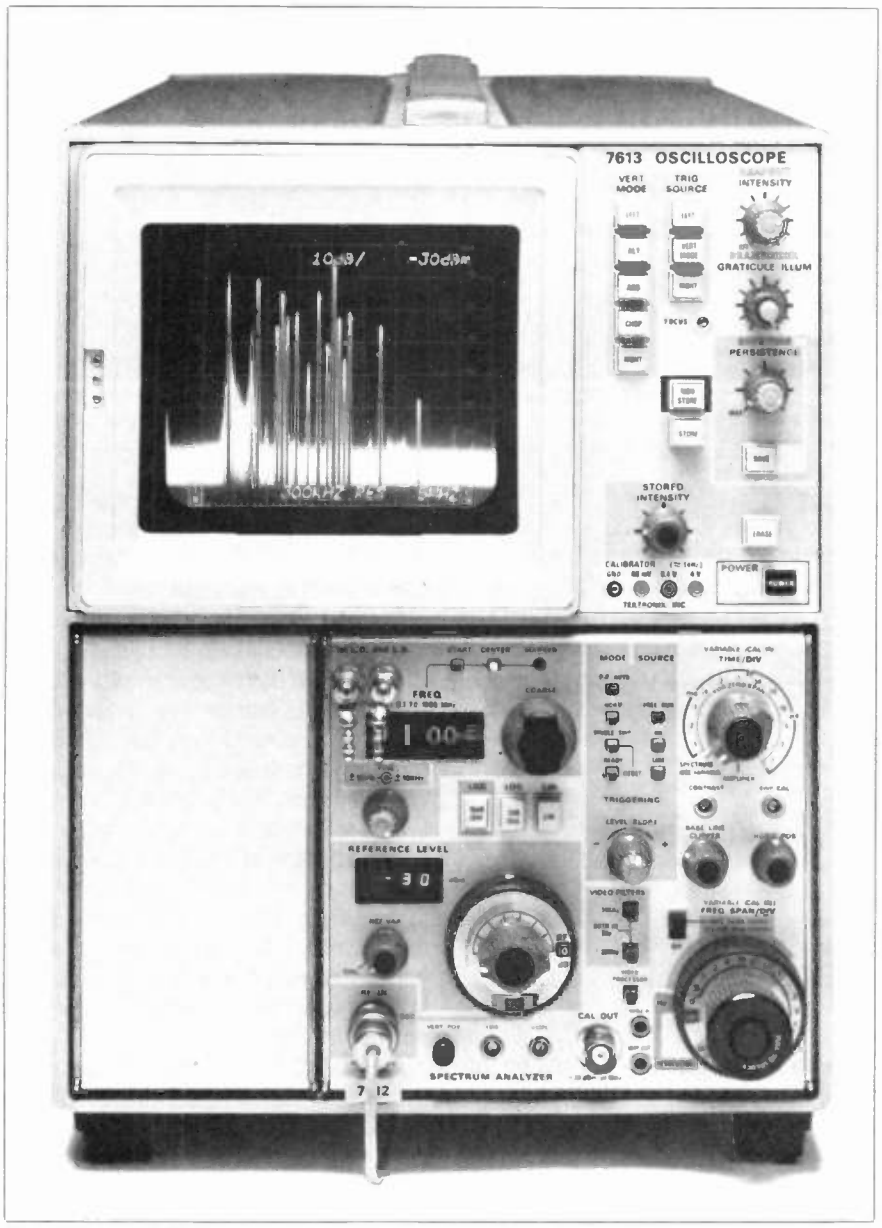


Fig. 5. Tektronix 7L12 spectrum analyzer plug-in a 7000 mainframe.

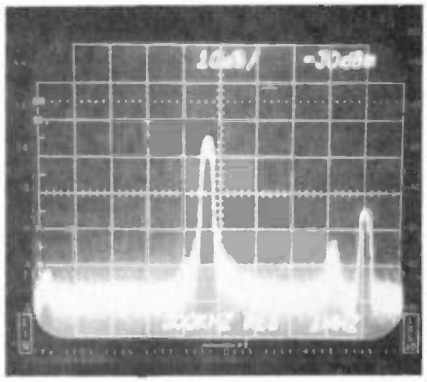


Fig. 6. A spectrum display of video, 3.58MHz chroma and audio carriers. What is the signal-to-noise ratios for video and audio?

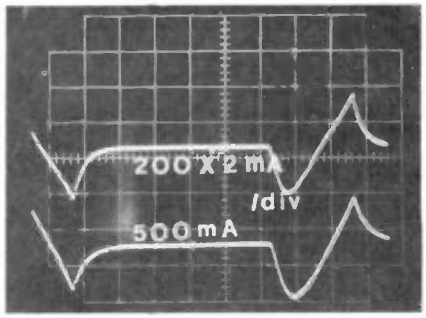


Fig. 7. A comparison between standard ac current probe termination and the expensive current amplifier. The difference is a fudge factor of 1.25:1.

as delay lines, dual time bases and multitraces. You can buy cheaper, of course, but durability, utility, and quality aren't usually built in.

Digital voltmeters and counters are on the market from virtually every source imaginable. Beware of slow responding instruments with dc accuracies of much less than 0.05%, or counter specifications guaranteeing less than ±5 parts/million/year and input sensitivities of greater than 10 millivolts. Tight initial specs. become desirable for best accuracy and extended mean time between calibrations. You should also look for between 50 and 100% overranging in the digital meters and complete electronic overvoltage protection. In addition, the most useful instruments operate on NiCad rechargeable batteries so their cases float free of fixed commons and avoid the twin perils of ground loops and hot chassis. Recommended are Data Precision and John Fluke at prices between $270 and $500 (other manufacturers do make comparable instruments, Ed.). LED and not liquid crystal readouts for 4½ digits in multimeters and 8 digits in counters are preferred. Counters should have both 50Ω and 1 megohm inputs.

Video signal generators. The only one near the kilobuck price range we've found that does tuners, i-fs, traps, multiburst, swept chroma, color bars, ringing tests, and accurate signal substitutions is Sencore's VA48. For our uses it's been incomparable, and with a couple of modifications has served just as well as much more expensive units with actually less service suitability, but more design-oriented features. Unfortunately its highly praiseworthy color bar output isn't suitable for vectors, but in all other respects you'll find it a live little uhf/vhf TV broadcasting station with all sorts of drive signals to spare, even in dual polarity.

Should you discover a pressing need to extend the VA48's multiburst range to 4.08 MHz and also add color burst on the back porch of the horizontal sync pulse *during* multiburst, write to Sencore for the information. We have given Sencore the changes, which they may or may not pass on to you, since it's a risky business making field modifications unless you're extremely experienced and are willing to risk voiding your warranty.

AC current probes. By no means the ordinary variety built strictly for analog and digital multimeters, these oscilloscope P6021 Tektronix ac current probes are constructed with a u-shaped ferrite core and thumb-activated sliding lid that allows closing the core around any smaller size wire conductor being measured. The conductor under test constitutes a 1-turn primary winding, while windings around the core internal to the shielded probe form the secondary—the turns ratio amounting to 125:1. The P6021 unit also has a 62.5-ohm passive termination with slide switch for 2mA and 10mA per millivolt reading on the scope.

Calibrated to produce fast response readings at accuracies of ±3%, between 120Hz and 60MHz, the probes

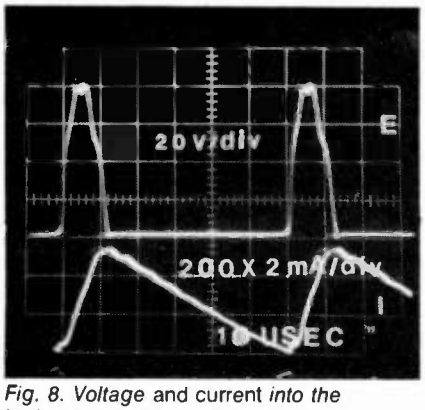


Fig. 8. Voltage and current into the horizontal windings of a deflection yoke.

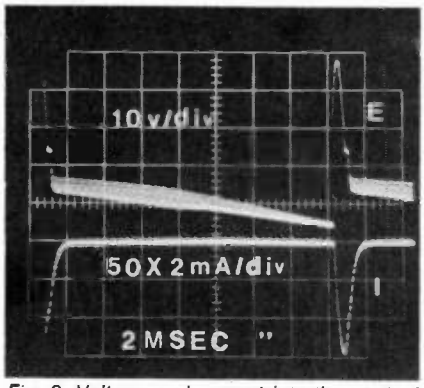


Fig. 9. Voltage and current into the vertical windings of a deflection yoke.

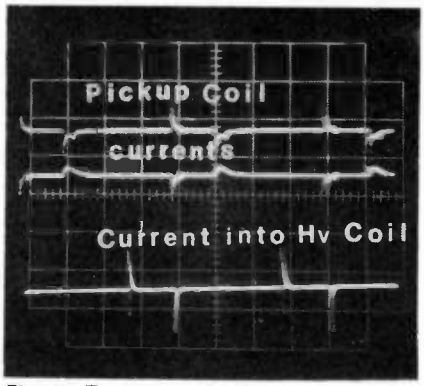


Fig. 11. Two out of phase currents in and a single differentiated current out (double exposure to obtain the three traces).

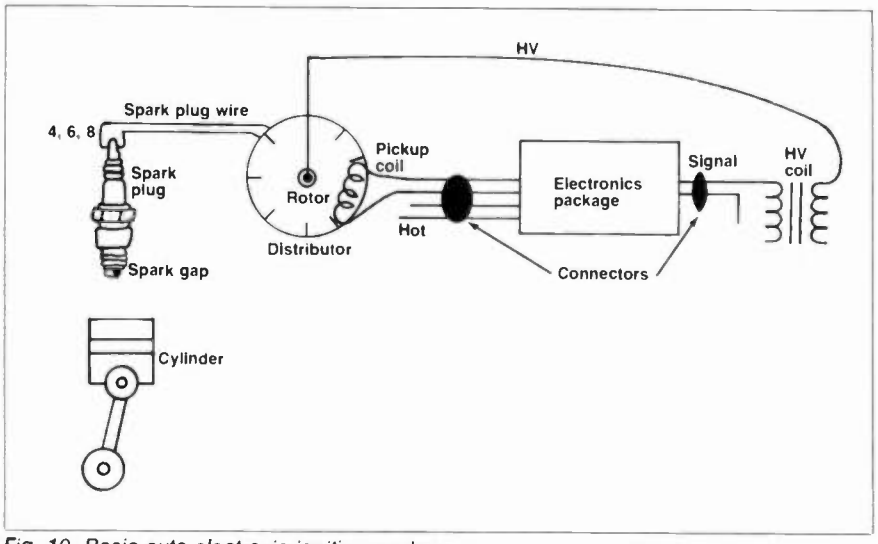


Fig. 10. Basic auto electronic ignition package.

will handle 15 amperes of current. Frequencies below 120 Hz sometimes require a rather expensive Model 134 amplifier that extends the probe range to 12 Hz at 15 A. We can calculate a "fudge factor" that will prevent the necessity of having to buy the additional 134 at least for 30 Hz (900 rpm) and 60 Hz in vertical TV frequencies.

Used as ac input measuring instruments and vertical/horizontal deflection yoke current analyzers, these probes should prove exceptionally useful. Tested on new models of RCA, Zenith, and General Electric receivers, all equivalent waveforms are quite similar in configuration (and exact in frequency, of course) and differ only in power amplitudes between 19- and 25-inch cathode ray tubes. Thereafter, all you have to do to make these measurements is to slide the probe's head around a wire conductor such as a power input, or find the red/brown horizontal and yellow/green vertical leads to the deflection yoke, switch oscilloscope time bases between 10 usec or 2 and 5 msec, and you can both see the inputs and immediately determine current and power as well.

If, for instance your probe termination is set for 2 ma/mv, a peak reading of 50 mv would amount to 2 × 50 mv, or 100 milliamperes, which should then be reduced to rms by dividing by 1.414 or multiplied by 0.707. Following this, simply read the ac voltage with an ordinary 10X probe (reduced to rms) and you have total input power—just like that!

In the illustration (Fig. 7), the usual 2ma or 10ma/mv, is compared with a direct reading from the 134 amplifier. With the top trace and terminated current probe set for 2 ma/mv, you will multiply 2.8 × .200 × 2, since the scope's vertical amplifiers are set for 0.2v/div. The answer is 1.12 amps. In the lower trace, we have 500 ma × 2.8 divisions, amounting to 1.4 amperes. Therefore, at 60 Hz, 1.12 divided into 1.4 equals 1.25, and that's the "fudge factor" at 60 Hz, should you wish to attempt precision. But using an rms voltmeter of very considerable accuracy, if you multiply 0.707 times the 1.12 amps given you will closely approximate the 755 rms ma current measured by this ±0.75% accurate multimeter on its ac current range. So let's say the terminated current probe is on the button for our purposes at an rms reading of 1.12 × 0.707 equals a value of 792 ma at 60 Hz. Ac power, with an rms input voltage of 114, would then amount to .792 × 114, or 90.288w, and that's the power consumption of an RCA CTC-108 with no signal input.

Now, let's look at this same receiver's deflection circuits with simultaneous applications of both voltage and current probes and illustrate the considerable advantages of said technique. Find the red-brown horizontal and yellow-green vertical leads to the deflection yoke, switch oscilloscopes time bases between 10 μsec or 1 to 5 msec, and you can clearly see the ac current waveforms. Then attach a 10X probe from the second oscilloscope channel to the horizontal or vertical signal point of entry into the yoke and it reads its voltage in peak units directly.

An RCA CTC 108, for instance, produces a horizontal yoke sawtooth of 520 mv/div × 2 for current, in addition to a peak voltage display of 800 volts (Fig. 8). In terms of rms resistive power this amounts substantially to Emax × Imax × 0.707, or 1040 ma × 800 v × 0.707 equals 588 w, since we really don't know the actual value of the usually low yoke inductance. But if this was necessary, then Irms-Erms/L, which when transposed becomes $2\pi fl$ = Erms/Irms; and the inductance at 15,734Hz is calculated as L = Erms/Irms × 6.28 × 15,734Hz, or 565.6/72674.4 = 7.78 mHys. Thereafter, Impedance (Z) rms = 800/1.04 = 769 × 0.707 = 543.68 ohms.

The same sort of measurements apply to the vertical sections of the deflection yoke also. Without using any fudge factor, let's see how these numbers turn out from the currents and voltages displayed in Fig. 9. At 10v/div., the amplitude of the upper trace amounts to 45 volts, while current becomes 150 mV × 2 mA, or 300 milliamperes. Then Emax × Imax × 0.707 equals 45 × 0.3 × 0.707, or 9.54 watts of power expended. Subsequently, 1 = Erms/

continued on page 48

OP Amps III

Applications

Operational amplifiers are of wide application, but some of their design considerations are not clearly spelled out in the textbooks. Here a few mysteries are explained.

By Bernard B. Daien

In Part II we gave the formulae for the voltage gain of an op amp in both the inverting, and the non-inverting configurations. Since we are going to build on these basic formulae, they are repeated in Figure 1, along with tables showing how the gain varies with different ratios of resistors in the feedback loop.

If you compare the gains of the inverting, and the non-inverting amplifiers, for the same values of feedback resistors, you will notice that the non-inverting gain is always 1 more than the inverting gain. Therefore we can rewrite the gain for the non-inverting amplifier as, "Rf/Rin + 1", and, if you compare this gain, to the gain obtained using the same ratio of resistors, in the negative feedback formula in Part I of this article, you will notice that they are the same.

Adding and Subtracting . . .

Stated simply, the general feedback formula for negative feedback, works with single input amplifiers, such as audio amplifiers, and also with the non-inverting input op amp. The inverting op-amp has a gain of one less than the general formula. Since the inverting and the non-inverting inputs have different gains, if we attempt to use *both inputs simultaneously,* as a differential amplifier, the op amp will not work properly. It will give us an output, despite common mode rejection built into the op amp!

In order for the op amp to function as a differential amplifier, a voltage divider has to be connected between the non-inverting input and the signal generator, *in order to reduce the gain of the non-inverting input down to the gain of the inverting input.* When this is done, the gain of the inverting and the non-inverting inputs is identical, and the op amp can be used as a true differential input amplifier. This is shown in Figure 2, along with the calculations used for the resistors required.

Notice that in the case illustrated, the gain of the inverting input is 9, but the gain of the non-inverting input is 10, as described earlier. In order to reduce the gain of the non-inverting input to 9, from 10, we need a voltage divider that provides an output of 0.9 times the input. Then the gain, multiplied by the divider loss, is, "10 × 0.9," which of course, equals 9. With both sides of the op amp providing a gain of nine, the inputs are "balanced" and common mode rejection is restored. This tells us that if plus one volt is applied to both inputs, the output will behave as if there is no signal at the inputs at all. This happens because the gains are EQUAL AND OPPOSITE. (The inputs are out of phase). But, there is more . . .

Let us consider what happens if we apply plus one volt to one input, and

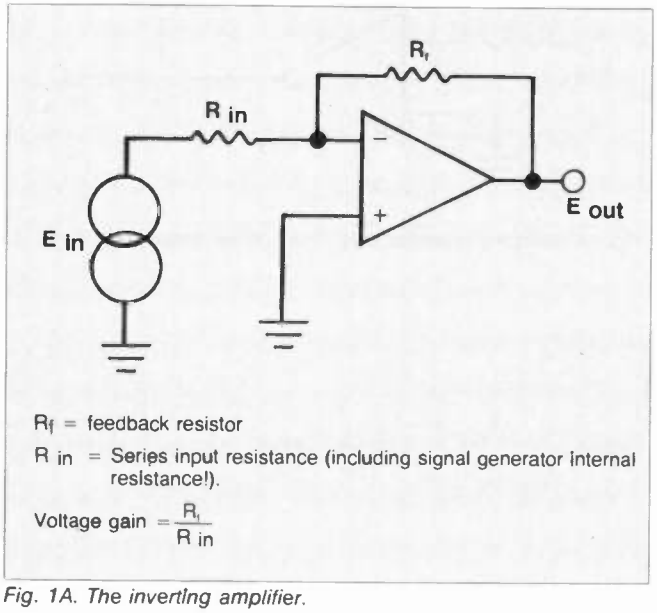


Fig. 1A. The invertlng amplifier.

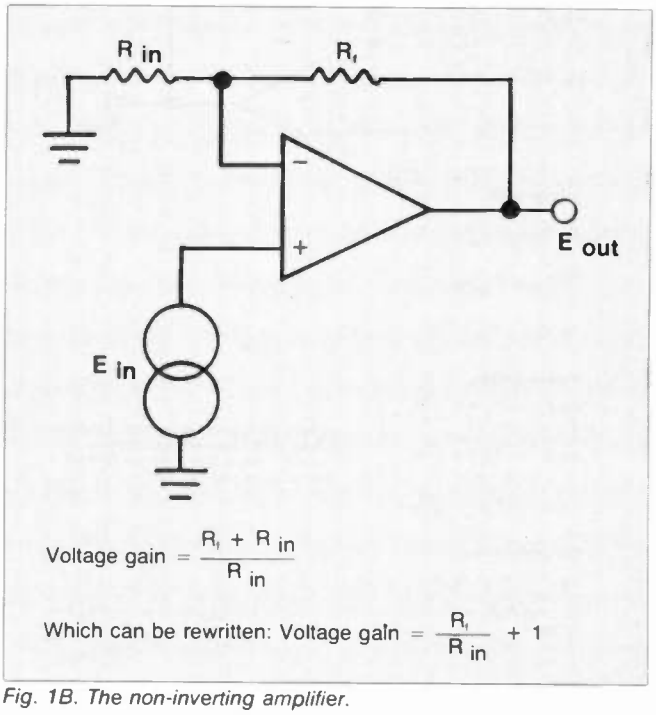
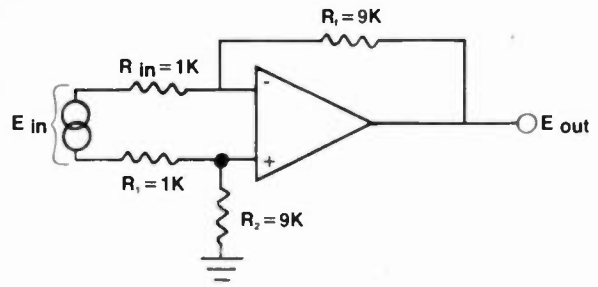


Fig. 1B. The non-inverting amplifier.



Voltage gain inverting side $= \frac{R_f}{R_{in}} = \frac{9K}{1K} = 9$

Voltage gain Non-Inverting side $= \frac{R_f}{R_{in}} + 1 = 10$

But, there is a voltage divider in the non-inverting side, R_1 and R_2, which provides a loss, so that the output of the divider = 9/10 of the input. Then the non-inverting gain of 10 is reduced to 9/10 × 10 = 9, and both the investing and the non-inverting sides of the amplifier have the same gain. In actual design therefore, the ratio of R_f/R_{in}, is always the same as the ratio R_2/R_1. To insure this, 1% resistors are used, and then $R_{in} = R_1$ and $R_f = R_2$ for simple and effective design calculations.

Fig. 2. The differential amplifier.

Output versus inputs for a differential amplifier with a voltage gain of 1

INVERTING INPUT	NON-INVERTING INPUT	OUTPUT
+1	+1	0
−1	−1	0
+1	−1	−2
−1	+1	+2
0	+2	+2
0	−2	−2
+2	0	−2
−2	0	+2

Note: If the op amp closed loop gain had been set for 5, then the outputs shown would be multiplied by a factor of 5. This is an algebraic subtractor with gain as desired.

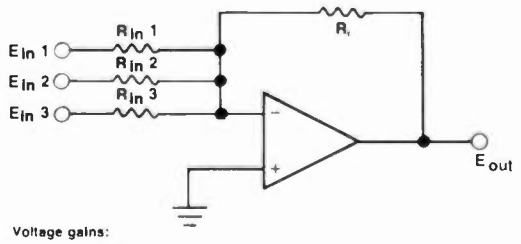
Fig. 3. Differential amplifier, input vs. output.

minus one volt to the other input. In that case the output will behave as if there was two volts applied to one input, and zero volts applied to the other. Thus the differential amplifier configuration responds only to the difference between the two input terminals, and in the process performs THE SUBTRACTION OF TWO SIGNALS. Let's test this by trying some input signals, in table form in Figure 3. Note that when both inputs are the same, the output is zero. With a closed loop gain of 1, if the inverting input is minus 1 volt, and the non-inverting input is plus one volt, the output is *plus two volts.* If you continue down the table you will quickly see that the output is always the algebraic difference (algebraic subtraction) of the two inputs. It is easy to increase the output by using a closed loop gain greater than one, if desired.

(For those of you who have forgotten the procedure, to subtract in algebra, you merely change the sign of the lower number, then add in algebra. In this case, change the sign of the inverting input, and add the two inputs).

Now that we have pointed out that the differential amplifier can be used for algebraic subtraction, we should also note that we can do algebraic addition using the "summing amplifier," (which we already know as the inverting amplifier). This brings us to the need for some practical applications information . . .

Examine Figure 2, and the accompanying information carefully, and you will notice that the ratio of the two resistors in the feedback loop in the inverting side, is always the same as the ratio of the divider resistors in the non-inverting side! This makes building a practical differential amplifier (or "sub-



Voltage gains:

For E_{in} 1 $= \frac{R_f}{R_{in}\,1}$

For E_{in} 2 $= \frac{R_f}{R_{in}\,2}$

For E_{in} 3 $= \frac{R_f}{R_{in}\,3}$

Voltage outputs:

For $E_1 = -E_{in}\,1 \times \frac{R_f}{R_{in}\,1}$

For $E_2 = -E_{in}\,2 \times \frac{R_f}{R_{in}\,2}$

For $E_3 = -E_{in}\,3 \times \frac{R_f}{R_{in}\,3}$

Note: A positive input will become a negative output, while a negative input becomes a positive output. Both positive and negative inputs can be used together.

Composite output:

$E_{out} = -[E_{in}1(R_f/R_{in}1) + E_{in}2(R_f/R_{in}2) + E_{in}3(R_f/R_{in}3)]$

Note that Rf controls the gain of all the inputs, and that *the outputs are inverted and summed.*

Fig. 4. The summing amplifier. (inverting)

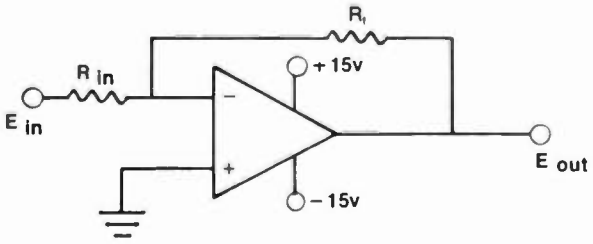


Fig. 5A. Inverting amplifier using dual power supplies.

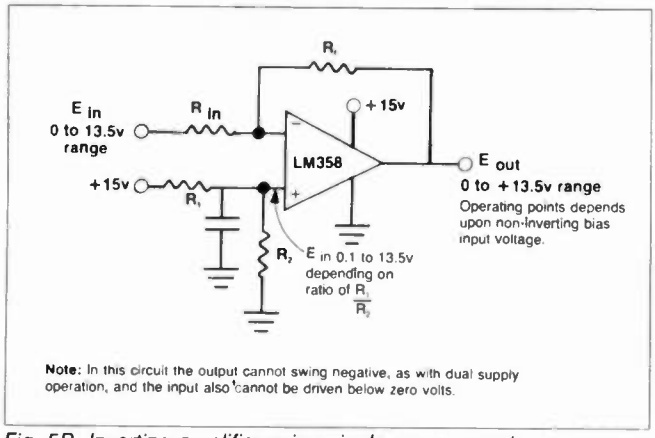


Fig. 5B. Inverting amplifier using single power supply.

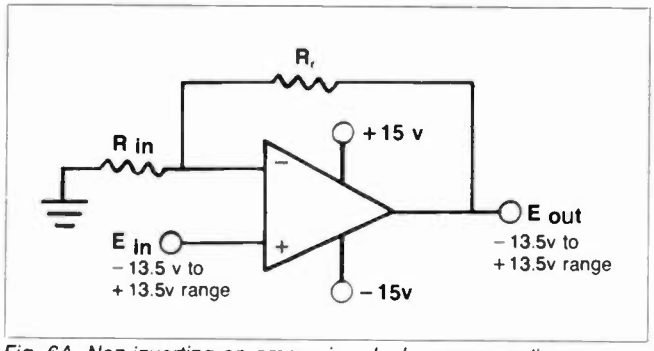


Fig. 6A. Non-inverting op-amp using dual power supplies.

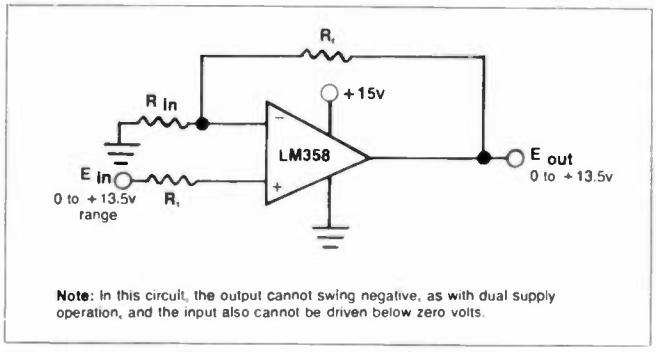


Fig. 6B. Non-inverting op-amp using single power supply.

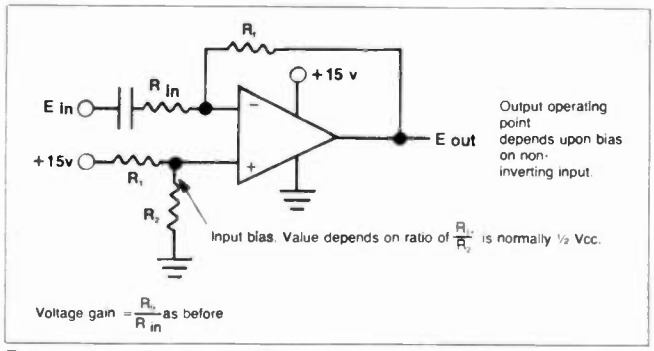


Fig. 7A. Inverting ac amplifier, single power supply.

tractor," if you will), very simple. These resistors must be very carefully matched however, i.e., the ratio of the resistors must be very carefully matched however, i.e., the ratio of the resistors in each input must be the same. The use of 1% metal film resistors is usual, but performance can be improved by matching with a digital meter. Remember, performance is not very dependent upon the op amp, with the feedback loop closed . . . but is very dependent upon the resistors in the feedback loop.

Now let's look at the schematic for an inverter (or "summing" amplifier). Several different inputs can be fed into the inverting side of the op amp, and the output of the op amp will be the algebraic sum of the inputs, *but inverted,* since we are using the inverting input. The schematic and calculations are shown in Figure 4. Notice that we can also change the gain of each individual input, if that is desired. This is taken into account in the calculations, which show each input multiplied by the resistor ratio for that input. This makes the summing circuit a very flexible one, since it can not only add, but also multiply each input by a different factor, simultaneously! This circuit has a very useful feature . . . despite the number of inputs used, there is no cross-talk between them. Thus, in audio mixing use, the various signals can be recovered in the output without cross talk. This is true because of the very low input impedance existing at the inverting input, which is the common point for all input signals, and is a virtual ground.

Single supply operation

Before we go further, it should be emphasized that most op amp literature describes the basic two-power-supplies circuitry, employing a positive and a negative power supply. Recently op amps have been developed which work well with a single power supply, but there is a fundamental difference in operation with these, which is not really made clear in most literature . . .

When using dual supplies, both the input and the output can be at ground

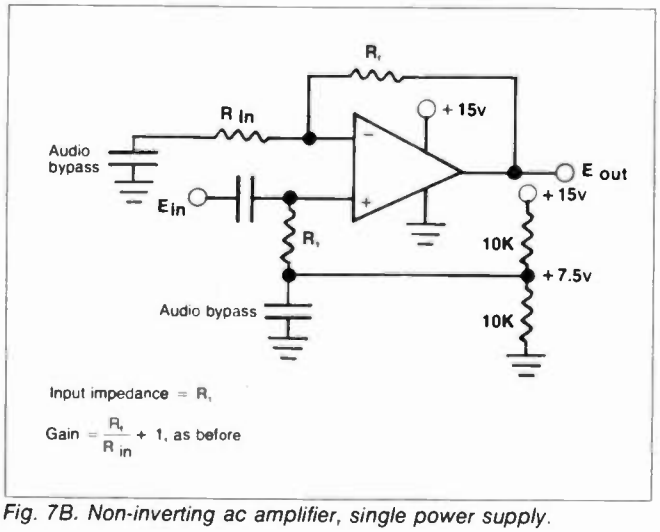


Fig. 7B. Non-inverting ac amplifier, single power supply.

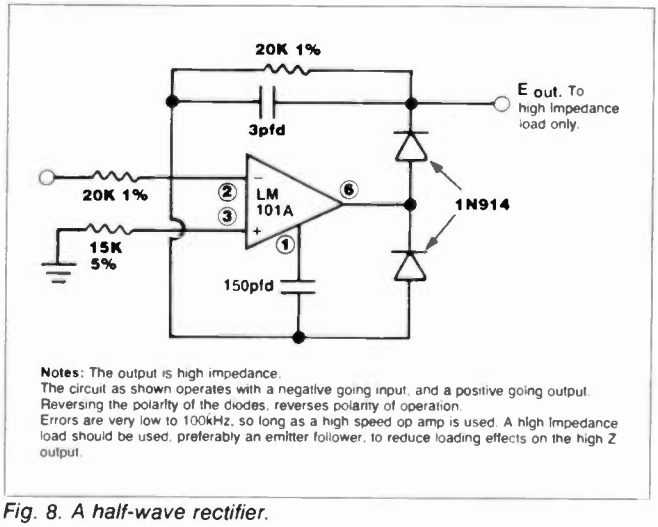


Fig. 8. A half-wave rectifier.

potential, since the output can swing either positive or negative. When using a single supply, however, the input should be biased so that the output operating point (the quiescent level) is somewhere between ground and the available supply voltage. The output voltage can then swing up to the supply voltage and down to zero, just as is the case with discrete transistor amplifiers.

Figure 5A shows the schematic of an inverting amplifier, as used with dual power supplies. Note that the non-inverting input is at dc ground, and the output can swing either positive or negative. In Figure 5B, the same inverting amplifier is set up for use with a single power supply, and the non-inverting input is biased from the single power supply. The output can swing down to zero, or up to the power supply voltage, and normally stays about midway between the two. Figure 6A shows a dual supply non-inverting amplifier, while Figure 6B is the single supply configuration.

Most circuits for single supply operation *are published as ac amplifiers* (audio, etc.) and therefore have blocking capacitors at the input, as in Figure 7. This makes things very simple for authors, . . . since the ac input signal does not create a conflict with the dc biasing. When op amps are used with a single power supply, and dc input signals, the situation becomes a little more complicated, since there is no way to avoid interaction between the dc bias, and the dc input signal.

Let's look at that another way. With a single power supply we need to bias the op amp so that the output is in the linear region . . . i.e. neither saturated nor cut off. A dc input signal will then vary the dc output *around the desired operating point.* With dual supplies this is no problem, since the output is normally at ground (zero volts), and the input signal, positive or negative, merely causes the output to swing + or − in accordance with the level of the input signal, the polarity of the input signal, and the gain of the amplifier.

Notice that in both the inverting and non-inverting ac coupled, single supply circuits the biasing is fed into the non-inverting input, and the inverting input develops the same dc bias voltage via the feedback network. This is because of what we learned in the earlier parts of this series . . . that in an op amp operating closed loop, the voltage difference between the two inputs is always close to zero. (That applies to dc as well as ac!) So if you bias the non-inverting input, the inverting input will be driven by the feedback loop to the same po-

javelin electronics

Creator of the revolutionary Spectar camera and one of the leading suppliers of CCTV equipment.

NOW AVAILABLE THROUGH SECRES

DISTRIBUTORS

Your source for all alarm, security, and CCTV equipment and accessories, representing over 50 manufacturers. Fast, dependable service, 24-hour shipping, full back-up technical assistance.

SPECIAL OFFER

FREE

16mm LENS WITH ANY SPECTAR CAMERA

CALL TOLL FREE (800) 243-6498

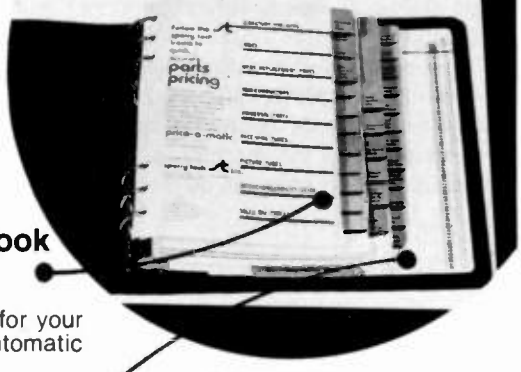
SECRES DISTRIBUTORS
101 Franklin Street
Westport, Conn. 06880
In Conn. call 226-7371

Circle No. 123 on Reader Inquiry Card

When you price by "The Book" everyone benefits!

Eliminates under-charging...controls over-pricing...treats both customer and shop owner fairly!

tv & radio tech's guide to pricing



The Parts Pricing Book
200 pages of fast moving parts...with a selection of mark-up you feel is correct for your shop...computerized with automatic up-dating service....$69.50

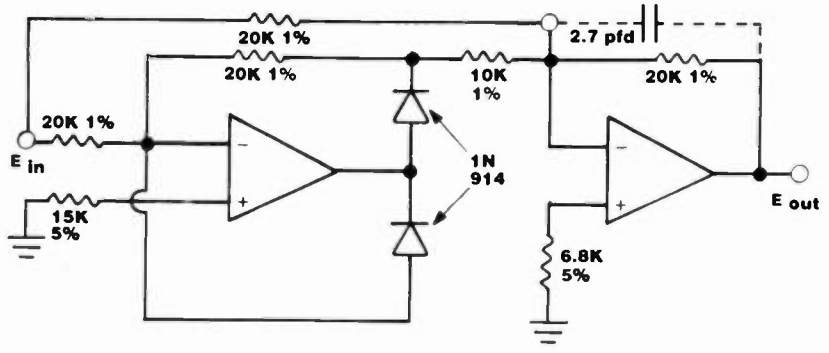
The Labor Pricing Book
Tech's Guide to Pricing will not only change your customer's attitude and perception...It will change yours as well....$29.50

When you appear on the job with organized pricing material ...you create an image of both technical and business skills!

CALL TOLL FREE: 800-228-4338
8/5 C.S.T. MONDAY/FRIDAY

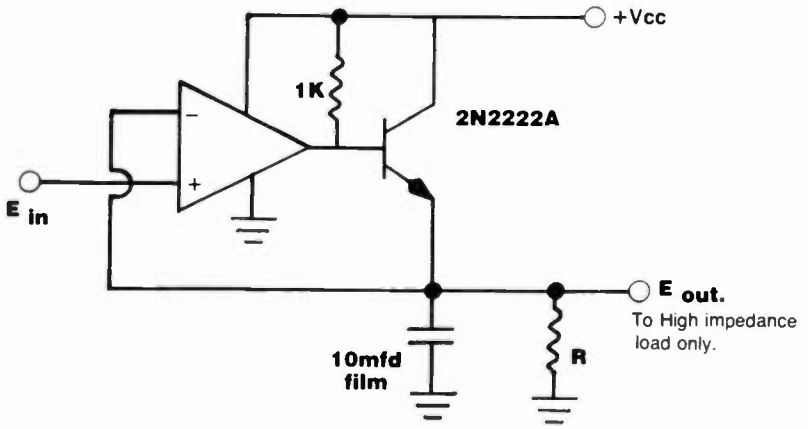
sperry tech inc. P.O. Box 5234 Lincoln, Nebraska 68505

Circle No. 109 on Reader Inquiry Card



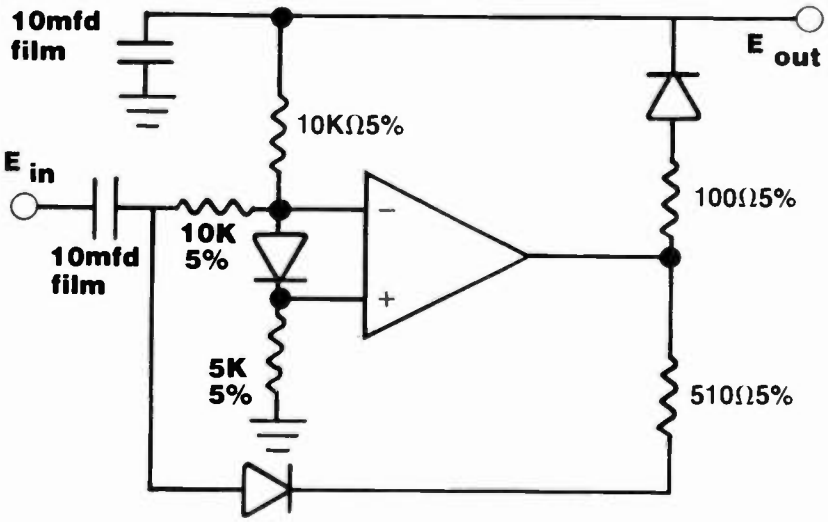
Note: For low speed operation, use 741, or 747 op amps. For faster operation, use 1556 op amps. Output is negative. For positive output, reverse the diodes.

Fig. 9. A full-wave rectifier.



Note: The output must see a very high resistance to avoid loading the capacitor, which holds the peak charge. It is advisable to drive into an emitter follower. Resistor "R" then determines the capacitor discharge time. A starting value for R is about 1 megohm.

Fig. 10A. A positive peak detector.



Note: All diodes Fairchild FD 600.
Input must be driven from a low impedance source, otherwise an internally compensated op-amp must be used to prevent oscillation. The output is a positive dc voltage proportional to the peak-to-peak voltage of the input waveform.

Fig. 11. A peak-to-peak detector.

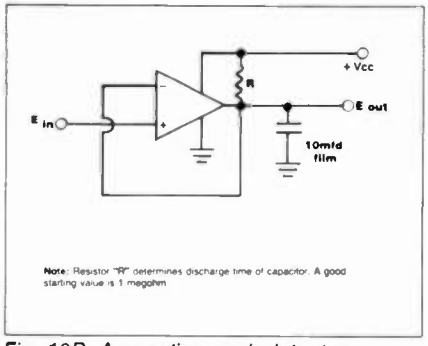


Fig. 10B. A negative peak detector.

tential as the non-inverting input, and both inputs of the op amp will be properly biased.

Non-linear applications

Up to this point we have been considering only applications in which the op amp is used as a linear amplifier. There are many uses for non-linear circuits, therefore we are going to consider some of these now.

As you undoubtedly already know, a diode rectifier (or detector) has a forward voltage drop of over a half a volt for silicon diodes, and over a tenth of a volt for germanium. At times this may be far too great for the use intended. Figure 8 shows the schematic for a half wave rectifier that works *at millivolts* of input! (This half wave rectifier will operate to a hundred kilohertz and therefore may be used as a detector in many instances).

Figure 9 is a full wave rectifier. By reversing the diodes as noted in the figure, the output of the full wave rectifier is easily reversed to produce a positive output.

Figure 10 is a peak detector, while Figure 11 is a PEAK-TO-PEAK DETECTOR. Resistor "R" determines the discharge time of the peak voltage held by the capacitor. Changing the value of "R" changes the discharge time as desired.

There is no way to discuss op amps without including "active filters." In the next article in this series we will talk about active filters, IC op amp failure inducing conditions, and troubleshooting IC op amps.

It should be stated, that by convention, when the power supply for an op amp is omitted in the schematic, it is assumed that dual power supplies are required. That convention is used in this series. Therefore, when power supplies are not shown in the schematic diagrams, dual supplies are required. (Most circuits require dual supplies. Single supply op amps are a recent development, and they require more circuit complexity). ETD

BULLETIN BOARD

Video-Forum, a division of *Jeffrey Norton Publishers, Inc.*, recently announced publication of the revised 1981 Business and Technology Videolog, reportedly the only video program directory for business professionals. **The Business and Technology Videolog,** first published in 1979, is a reference guide to videotape and cassette programs available from producers and distributors throughout the United States. The book provides detailed descriptive entries on each program, including prices and ordering information. Each program is indexed for quick professional access, in up to three different subject categories. A separate section lists the addresses, phone numbers, and contact persons for all producers/distributors. The 1981 edition of the Business and Technology Videolog contains entries for over 4,500 programs from a total of 135 producers/distributors. The programs listed are intended for: Businesses and corporations; schools/colleges of business and technology; training directors; supervisors, and professional business associations. The directory includes programs that cover a wide range of economic, technical, social and psychological areas.
Circle No. 140 on Reader Inquiry Card

Over 2500 semiconductor devices used in mass market products have now been organized and cross-referenced for easy comparison in one new book, *D.A.T.A., Inc.'s* **Consumer IC D.A.T.A. Book.** The guidebook provides detailed electrical, functional and pictorial information on TV circuits, audio amplifiers, clocks, calculators, rhythm devices, video games and numerous other consumer devices. Incorporating D.A.T.A.'s unique standardized format, with products cross-referenced to generic number, technical data, logic and block drawings and manufacturers' names and addresses, it makes searching out and comparing consumer-type semiconductors easy. The Consumer IC D.A.T.A. Book will be published twice yearly in January and June with the first edition due June, 1981. The subscription rate is $55 per-year (2 editions). Customers are invited to test the book on-the-job on a 30-day trial basis by writing D.A.T.A., Inc., P.O. Box 26875-PR, San Diego, CA 92126 or call the toll free number, 800-854-7030.
Circle No. 141 on Reader Inquiry Card

Spectronics, a division of Honeywell, has just introduced a new product line catalog. **The catalog describes over 250 opto products** including opto isolators (coupler), interrupter modules, gallium arsenide and gallium aluminum arsenide LEDs, silicon photodetectors, and light sensitive integrated detectors. For a free catalog write to Tom Jones, Spectronics, a division of Honeywell, 830 E. Arapaho Rd., Richardson, Texas, 75081 or call (214) 234-4271.
Circle No. 142 on Reader Inquiry Card

GTE has made available two new publications—**an eight-page brochure** listing all RAMs and ROMs manufactured by GTE Microcircuits, and a **six-page brochure** cross-referencing the division's 2114 RAMs with 4K RAMs from other electronics firms. The guide lists part numbers for all versions of the 2K, 4K and 8K RAMs, and 16K, 32K and 64K ROMs. Also provided is the organization of each device, its access time and the number of pins to each package. The cross-reference brochure lists

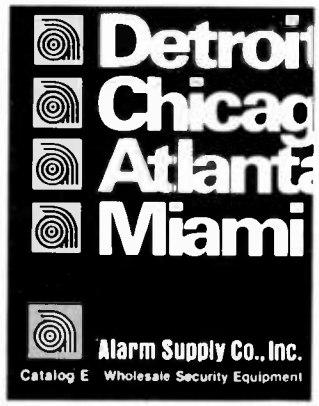
Circle No. 106 on Reader Inquiry Card

Circle No. 126 on Reader Inquiry Card

Alarm Supply means business!

for you!

Your
Full Service
Distributor



3000 Products

Wholesale Burglar Alarms, Fire Alarms, Closed Circuit Television, Access Controls, Anti-Shoplifting, Automotive and Wireless Residential Equipment

Toll Free Wats Lines

For your ordering convenience listed below.

Dealer Showrooms

You're invited — watch for seminar announcements.

Nation's Largest Independent

Alarm Supply has been serving the Alarm Industry for over 10 years ...our only business.

Alarm Supply Co., Inc.

Wholesale Security Equipment

10th Anniversary

Detroit
12551 Globe Road
Livonia, Michigan 48150

National	800 521-6100
Michigan	800 572-5790
Local	313-591-9100
T W X	810 242-2982

Chicago
1033 State Parkway
Schaumburg, IL 60195

Midwest	800 323-4990
Illinois	800 942-8155
Local	312 843-8800

Atlanta
3912 Shirley Dr., S.W.
Atlanta, Georgia 30336

Southeast	800 241-7722
Georgia	800 282-7066
Local	404 691-4844

Miami
7819 N.W. 15th Street
(extension of N.W. 78th Ave.)
Miami, Florida 33126

Florida	800 432-3231
Broward	305 523-0004
Local	305 593-0004

Circle No. 101 on Reader Inquiry Card

all 23 versions of the 2114 produced by GTE Microcircuits, including low-power and high-reliability versions, and gives the corresponding parts produced by 15 other semiconductor manufacturers. Some of the firms listed are AMI, Fairchild, Intel, National Semiconductor and Signetics. A listing of local sales offices also is provided. The brochures are available from GTE Microcircuits, 2000 West 14th St., Tempe, AZ 85281.
Circle No. 143 on Reader Inquiry Card

Security electronics is the subject of a catalog recently published by *Wm. B. Allen Supply Company, Inc.* Listed are over fifteen various types of security electronics products which include space protection devices, closed circuit television, vehicle alarms and many others. Well written background information is contained in the catalog which covers such subjects as principles of microwave and photoelectronics.
Circle No. 144 on Reader Inquiry Card

Mouser Electronics offers its **1981 catalog** containing 112 pages of electronic components. A comprehensive free guide for engineers, purchasing agents, or anyone who specifies or recommends electronic components, equipment or tools. The catalog contains full product specifications, illustrations, and pricing for more than 10,000 items that includes potentiometers, jacks, plugs, speakers, knobs, coils, battery holders, clips, fuses, lamps, LED's and many other products manufactured by or distributed by Mouser Electronics.
Circle No. 145 on Reader Inquiry Card

The Illustrated Encyclopedia Dictionary of Electronics by John Douglas-Young and published by *Parker Publishing Co.* is a ready reference manual containing technical information and definitions of electronic terms and circuits. The text is alphabetically organized for quick use and includes charts, tables, schematic diagrams, formulas, graphic symbols, and conversion factors for the technician, experimenter or engineer.
Circle No. 146 on Reader Inquiry Card

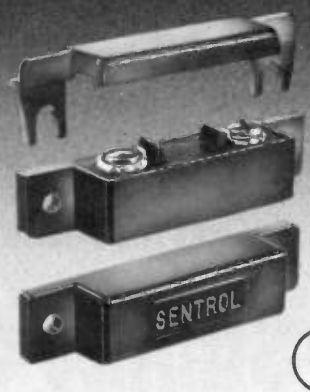
Microprocessor and Digital Computer Technology by Jerome E. Oleksy and George B. Rutkowski and published by *Prentice-Hall* describes how computers and MPU's work along with giving the reader instructions on how to read and write simple routines and how to test for proper execution of MPU programs. No previous knowledge of digital or solid state electronics is necessary, the only prerequisite is a familiarity with dc and ac circuits. Special emphasis is placed on the step by step way a computer or MPU is told what to do by a program.

Most interesting is the coverage of microprocessor applications. Digital-to-analog and analog-to-digital converters are explained in simple terms as is interfacing with the MPU and an industrial controller is explained in detail. Also explained is interfacing to a typical video terminal.

Midtex's **complete standard relay product line in a comprehensive 125 page catalog** is now available. New product features include sealed relays for PCB immersion, economy power relays, and (1 hour) programmable time delay relays and cycle timers. Updated sections describe relay applications, contact selections, and details of miniature, power, latching, mercury-wetted, solid state, and time delay relays and timers. Another feature of the catalog is the easy-to-identify significant part numbering system designed to assist the end-user in the proper device selection. For a free copy of this relay presenation, contact Midland-Ross Corp.,

PERFORMANCE PROVED
MAGNETIC CONTACTS

Sentrol's 1085T Surface Mount magnetic switches are performance proved. They eliminate costly service calls and disrupting false alarms. Not subject to sticking or freezing and ruggedly designed for a life expectancy of 10,000,000 cycles. Easily and quickly installed and come complete with all mounting hardware including spacer and cover.



UL LISTED

Available in 4 gap distance ranges from ¾" to 2" and in 3 colors to match any decor.
Low current switching superiority make them ideal for solid state systems.
Biased high security model available.
Send for Sentrol "Product Information Bulletin" or call Toll Free 1-800-547-2556.

SENTROL®

10831 S.W. Cascade Blvd. Portland, OR 97223 Phone 503/620-8540

BUILDING THROUGH EXCELLENCE

Circle No. 125 on Reader Inquiry Card

Midtex Div. 1650 Tower Blvd., North Mankato, MN USA 56001.
Circle No. 148 on Reader Inquiry Card

The Practical Handbook of Solid State Troubleshooting by Robert C. Glenn, Jr. and published by *Parker Publishing Co.* is a fully illustrated guide that gives practical troubleshooting tips and procedures dealing with some of the latest electronic circuitry such as pulse width modulated dc power supplies, differential and operational amplifiers, solid state TV circuitry, phase lock receiver oscillators and digital IC's.
Circle No. 149 on Reader Inquiry Card

Catalog #124 is a concise and **informative reference manual of over 2,400 products** available from *Klein Tools, Inc.* The 112-page catalog covers a wide selection of pliers, screwdrivers, hammers, measuring tapes, knives, levels, tool pouches, wrenches, chisels, saws, cable cutters, fish tapes, work gloves, padlocks, tool boxes, tool chests, roller cabinets, contractor's storage boxes, truck boxes, plus a full line of occupational protective equipment. Pertinent OSHA and ANSI editorial treatment on the use of tools and protective equipment such as belts and harnesses also is included.
Circle No. 127 on Reader Inquiry Card

A new 24-page "short form" catalog of its major products has recently been published by *Waldom Electronics, Inc.* Designed by the Chicago-based firm for the MRO, prototype and short-run OEM markets, the catalog is available from Waldom distributors throughout the USA and Canada. Among the products featured are: solderless terminals and connectors manufactured by Hollingsworth, nylon connectors and pin terminals by Molex, PCB accessories by Bivar and Waldom's own cable tie brand, Speedy-Ty. In addition, the new catalog includes spacers and electronic hardware and fasteners. Also featured are two pages of Waldom's own kit assortments for electronic hardware, terminals and nylon connectors.
Circle No. 151 on Reader Inquiry Card

Microwave components & equipment listed in a new 64 page catalog, sales bulletin "111" from *Lectronic Research Laboratories, Inc.*, contains a diversified and comprehensive presentation of new or reconditioned microwave components & equipment, electronic test instruments and specialized components. Product lines are featured such as microlab/fxr, Hewlett-Packard, Narda, DeMornay-Bonardi, PRD, TRG, Microwave Assoc. & Waveline, in addition to function groups of waveguide & flanges, fixed & variable coaxial attenuators, coaxial terminations, filters, ferrite circulators & isolators, horn antennas, slotted lines, dummy loads, coaxial & waveguide switches and others.
Circle No. 152 on Reader Inquiry Card

Computer Programs in BASIC by Paul Friedman and published by *Prentice-Hall* is a fully indexed guide to over 1,600 BASIC computer programs recently published in personal computer magazines for microcomputers, minicomputers, and the large "mainframe" computers. Covering six major catagories—Business/Finance, Games, Math, Science/Education, Personal Interest, and Utility—the book provides program reviews in over 173 catagories and briefly describes what each program does, tells where it can be found, and lists the equipment needed to make the program run.
Circle No. 153 on Reader Inquiry Card

A twenty-four page product guide providing tabulated data and outine configurations for RCA's line of Solid State Emitters has been released by *RCA Electro-Optics and Devices.* The line includes the following types of IR emitters and injection lasers: infrared emitting diodes, pulse and CW operated injection lasers, stacked diode lasers, and laser systems. The product guide, SSE-100, features an applications section depicting schematics of typical drive circuits for IR emitting diodes and injections lasers. Selection guides are also included. Copies of the SSE-100 product guide may be obtained by writing to RCA, Box 3200, Somerville, NJ 08876.
Circle No. 154 on Reader Inquiry Card

Lear Siegler's Bogen Division has recently announced its **new catalog of sound equipment.** In sixteen pages, the catalog covers all the firm's public address products, leading off with Bogen's line of amplifiers. They range from 10/20/35/60/100-watt integral models to 60/125/250-watt power amplifiers and include telephone paging amplifiers, paging/talkback amplifiers, in-wall and mobile units. The catalog contains complete information on Bogen's mixer-preamplifiers, tuners, receivers and equalizers, as well as speakers, microphones stands, and accessories. The catalog, #210-K, is available from Bogen.
Circle No. 155 on Reader Inquiry Card

A new, eight-page, four-color brochure from *Hewlett-Packard* summarizes characteristics of the company's electronic counter product line to help the user select the best instrument and accessories for his application. Eleven counter families are covered, constituting what Hewlett-Packard claims to be the broadest selection in the industry. Instruments range from basic, "frequency-only" models to high performace universal and microwave counters. In addition to the data given on each electronic counter family, an extensive selection chart summarizes key characteristics and options of each model to aid in rapid comparison and selection of products. The "Electronic Counter Brochure" is available from Hewlett-Packard without charge.
Circle No. 156 on Reader Inquiry Card

A free brochure details the *Harris Corporation's* DLS-1 ProtoCall PBX small business telephone system. The 10-page color illustrated brochure explains features and benefits of advanced PBXs in smaller offices with from 8 to 55 telephones. It discusses, how automatic redial, automatic callback, conferencing, call forwarding, automatic call distribution, and many other features save time and expense for smaller organizations. Entitled "In the Business World a Telephone System Should Mean Business," the brochure is available by writing Harris Corporation, Digital Telephone Systems Division, Publications Dept., PO Box 1188, Novato, CA 94947.
Circle No. 157 on Reader Inquiry Card

Republic Electronics Corp., announces availability of its new 1981 Catalog S-1 (12 pages), **describing its complete line of MUCON Subminiature Ceramic Capacitors,** which includes a complete range of temperature coefficients from NPO through N5600 with capacitance values as low as ½pf. QPL approved CCR05 through CCR09 and CCR75 through CCR79 and QPL approved CDR11 thru CDR14 and CDR21 thru CDR25 are listed. Also available is a complete line of Ultra-Stable MU-CAPS from 1pf through 0.22mf and HIGH Q capacitors from 0.1pf through 1000pf.
Circle No. 158 on Reader Inquiry Card

Two books on operational amplifiers have recently been published by *Prentice-Hall.* **Operational Amplifier, Characteristics and Applications** by Robert G. Irvine and the **OP Amp Handbook** by Fredrick W. Hughes describe in detail the operation and utilization of the

operational amplifier. Hughes' book provides an easy to read, basic understanding of the op amp while Irvine's text covers the operation of the op amp in greater detail. Both texts are well written and more than adequately cover the subject.
Circle No. 159 on Reader Inquiry Card

International Recitifier announces **its latest Product Digest Catalog** featuring International Recitifier's complete line of power semiconductor devices, including power MOSFET transistors, bipolar power transistors and darlingtons, power Schottky recitifiers, transistors, silicon rectifiers, protective devices, diode bridges and molded power circuits. A comprehensive product data sheet is also available for each device covered in the catalog by contacting your local IR field representative.
Circle No. 160 on Reader Inquiry Card

Albia Electronics, Inc., introduces its Spring/Summer 1981 **Catalog for electronic test and design equipment** and supplies. Featured in the catalog are Albia's newest design modules, along with frequency counters, oscilloscopes, function generators, capacitance meters and breadboarding kits. Write to them at 24 Albia St., P.O. Box 1833, New Haven, Conn. 06508.
Circle No. 161 on Reader Inquiry Card

New-Tone Electronics has recently published its **Technician Component's Replacement Master Guide** of semiconductors for industrial, entertainment, commercial, and MRO applications. The guide contains 452 pages of drawings and data for transistors, SCR's, Zeners, IC's, CMOS and TTL logic. Complete drawings and case outlines are included.
Circle No. 162 on Reader Inquiry Card

A new 18 page catalog from *Flair Electronics* is now available. It describes 188 items, indexed by category of application and part number, including Glass-Break Detectors, Multi-Zone Annunciators and Magnetic Contacts. Prices up to 1000 pieces are included. Write to P. O. Box 543, Glendora, CA 91740 for a free catalog.
Circle No. 163 on Reader Inquiry Card

A 16 page reference brochure available from *Data Precision* describes a broad range of digital instrumentation including: 5½ digit and 4½ digit lab and systems multimeters; 4½ digit portable/bench DMM's; 3½ digit hand held portable DMM's; dc voltage/current standards; analog multiplexer; 488 interface; frequency counters; capacitance meters and thermometers. Also included is a complete range of options and accessories.
Circle No. 164 on Reader Inquiry Card

Germanium Power Devices Corp. introduces its **19 page catalog** containing germanium small signal transistors, and germanium power transistors (up to 100 amps). Included in the catalog are charts showing typical common emitter characteristics of the power transistors along with case outline drawings and dimensions. Write to them at Shetland Industrial Center, Bldg. 4, York St., P.O. Box 65, Shawsheen Village Station, Andover, Mass. 01810.
Circle No. 165 on Reader Inquiry Card

TRW Power Semiconductors has recently published a **comprehensive cross reference list of industry and TRW part numbers.** The eight-page, two-color publication contains more than 1,900 entries, showing EIA numbers in conventional order and the corresponding TRW number.
Circle No. 166 on Reader Inquiry Card

Price Without Sacrifice.

HITACHI V-302B & V-152B

Put a proven Hitachi dual-trace oscilloscope on your bench for as little as $735. Our V-152B 15MHz model includes unprecedented sensitivity (1 mV/div.)...10X sweep magnification...front panel XY operation...trace rotation...Z-axis input...and more. Need greater bandwidth? Our V-302B model is the only 30MHz dual-trace scope with signal delay line priced under $1000, with all the above features, to make your testing operations fast, easy, and accurate. Reliability is exceptional, too. (As you'd expect from a manufacturer with over 20 years of experience "outscoping" the competition.) So exceptional, in fact, that Hitachi quality is backed by a 2-year warranty...the longest in the industry. Whether you use it for teaching or repairs, for video, audio, or computer testing, you can't find more scope for your dollar than at Hitachi. Write for more details.

Hitachi...The measure of quality.

- V-152B 15 MHz Dual Trace . . . $735*
- V-302B 30 MHz Dual Trace . . . $995*

*Probes included.

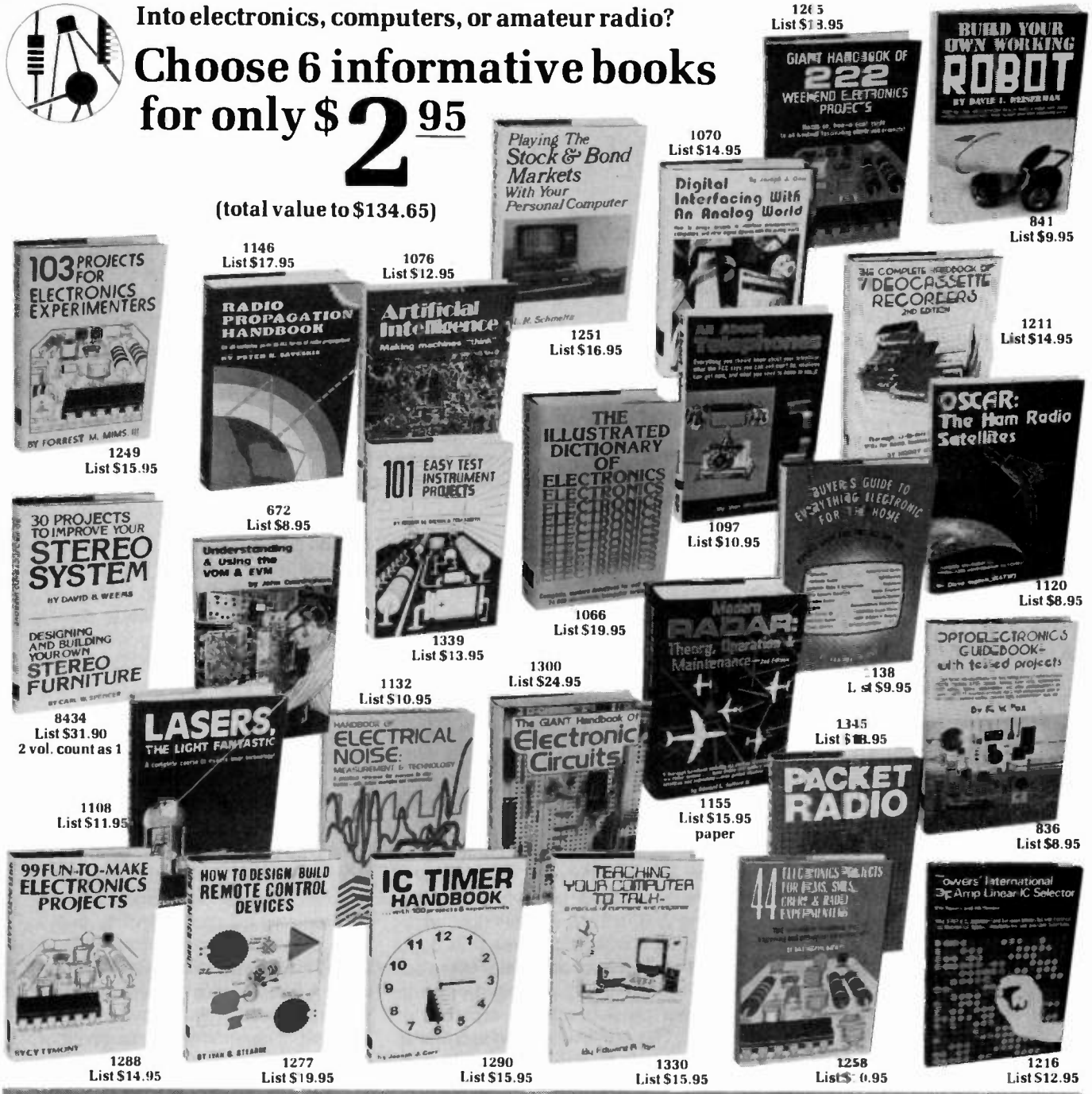
HITACHI
Hitachi Denshi America, Ltd.
175 Crossways Park West
Woodbury, NY 11797
(516) 921-7200

Circle No. 104 on Reader Inquiry Card

Into electronics, computers, or amateur radio?

Choose 6 informative books for only $2.95

(total value to $134.65)



7 very good reasons to try Electronics Book Club . . .

- **Reduced Member Prices.** Save up to 75% on books sure to increase your know-how
- **Satisfaction Guaranteed.** All books returnable within 10 days without obligation
- **Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 14 times a year with dozens of up-to-the-minute titles you can pick from
- **"Automatic Order".** Do nothing, and the Main selection will be shipped to you automatically! But . . . if you want an Alternate selection—or no books at all—we'll follow the instructions you give on the reply form provided with every News Bulletin
- **Continuing Benefits.** Get a Dividend Certificate with every book purchased after fulfilling Membership obligation and qualify for discounts on many other volumes
- **Bonus Specials.** Take advantage of sales, events, and added-value promotions
- **Exceptional Quality.** All books are first-rate publisher's editions, filled with useful, up-to-the-minute info

Electronics Book Club

Blue Ridge Summit, PA 17214

Please accept my Membership in Electronics Book Club and send the 6 volumes circled below. I understand the cost of the books selected is $2.95 (plus shipping/handling). If not satisfied, I may return the books within ten days without obligation and have my Membership cancelled. I agree to purchase 4 or more books at reduced Club prices during the next 12 months, and may resign any time thereafter.

672 836 841 1066 1070 1076 1097 1108 1120
1132 1138 1146 1155 1211 1216 1249 1251 1258
1277 1288 1290 1300 1330 1339 1345 8434

Name _____ Phone _____

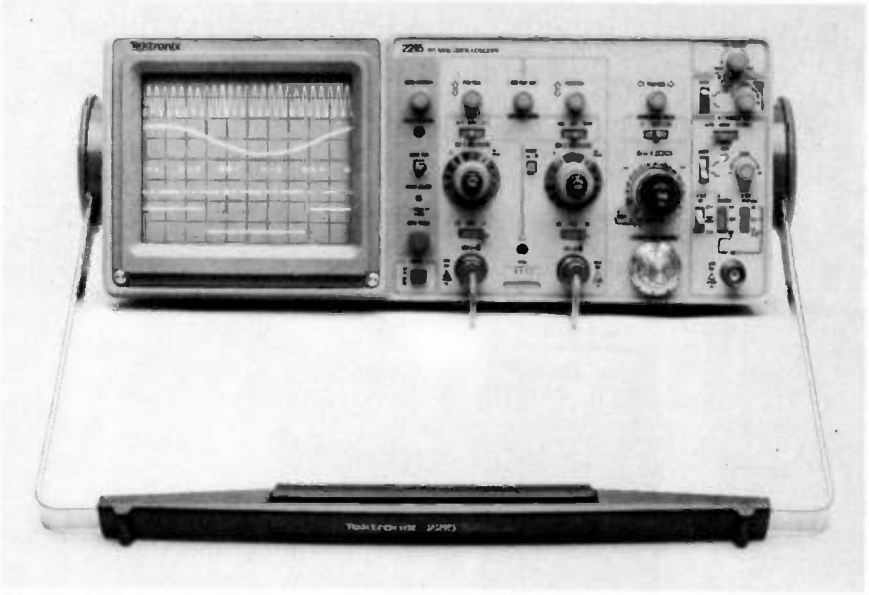
Address _____

City _____

State _____ Zip _____

(Valid for new members only. Foreign and Canada add 20%.) ETD-981

TEST INSTRUMENT REPORT



The Tektronix 2215 oscilloscope. Circle Number 150 on the Reader Service Card for more information.

Tektronix 2215 Oscilloscope

60 MHz at moderate cost

By Walter H. Schwartz & Peter B. Credit

Tektronix has apparently decided to meet and to attempt to better both the domestic and import competition in the wideband general purpose portable oscilloscope market. The 2213 and 2215 are 60 MHz (50 MHz at the 2-5-10 mv attenuator settings) dual trace single and dual time base scopes, respectively. They offer a full range of basic features attractively packaged in traditional Tek blue and reportedly use the CRT originally used in the much more expensive 465 series.

We found the bandwidth of the 2215 to be approximately −6 dB at 75 MHz at the 20 mv to 10v per division settings, at the 2, 5, and 10 mμ settings manufacturers specifications rate it at dc to 50 MHz. The input attenuator offers deflection factors of 2 mμ per division to 10v per division with an accuracy of ±3%. The rise time is rated at 5.8ns or less, maximum safe input voltage is specified to be 400v (dc + peak ac) or 800v p-p ac to 1kHz or less.

With the vertical mode switches set to BOTH and ADD, the waveform displayed is the algebraic sum of the signals applied to both channel 1 and 2 inputs. If the channel 2 INVERT push button is pressed in, the waveform displayed is the difference between the signals applied to the channel 1 and channel 2 inputs.

Pushing the BEAM FIND pushbutton will cause the display to reappear on the screen if it has moved off thus allowing for quick location of a missing waveform.

Triggering modes are auto, norm, and TV field and function normally for a scope of this type.

The sweep rate for A sweep is 0.5 second per division to 0.05μs per divison in a 1-2-5 sequence, the B sweep rate is 50ms per divison to 0.05μs per division. Delay time applies to sweep speed settings of 0.5μs per division and slower, the B delay time position control range is less than 0.5s per division to more than 10 divisions.

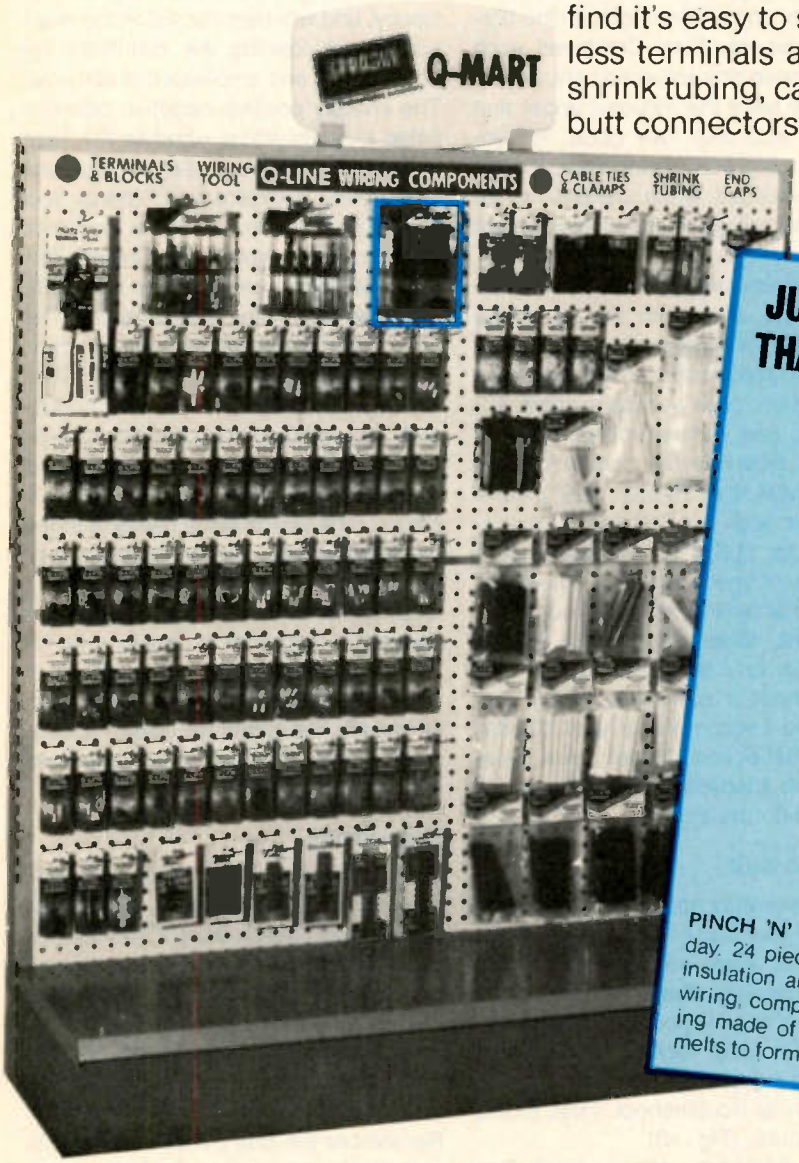
Delayed sweeps are always fun though sometimes confusing, (they require reading of the instruction manual), since delayed sweep features vary from scope model to scope model—I always have liked the mixed mode some of the more expensive Tektronix and Telequipment scopes have—and the 2215 also requires full understanding. In the 2215, the A sweep displays the desired signal; the B sweep displays that portion of the A sweep which is intensified. The B sweep speed in the delay time position control determines this segment. It works very nicely.

The 2215 has all the features one would expect of a portable/bench scope. The controls are convenient—even the concentric functions; the human engineering was done properly. The only complaint we had was that the automatic intensity control circuit allowed the trace to run out of intensity on very fast pulses, 0.05 μsec, at low repetition rates, 100 Hz or so. However, I do not know how often this situation would arise in other than lab tests. At repetition rates of 500 Hz or so there is more than adequate intensity.

The 2213 sells for $1100 and the dual time base 2215 sells for $1400. They weigh approximately 17 lbs, are of sturdy construction—we examined the 2215 closely—and meet fairly rigorous environmental requirements. ETD

You'll find MORE in wiring components at a Sprague Q-LINE™ Distributor

The next time you visit your Sprague distributor, look for the Q-LINE wiring component display. Here, you'll find it's easy to select exactly what you want in solderless terminals and wiring component accessories . . . shrink tubing, cable ties, cable clamps, terminal blocks, butt connectors, bullet connectors, quick-splices, end-caps, soldering aids, wiring tools, and component assortments. Everything is logically arranged for quick location.



JUST ONE OF DOZENS OF PRODUCTS THAT CAN SAVE YOU TIME EVERY DAY.

PINCH 'N' SEAL™ TUBING ASSORTMENT: Useful every day. 24 pieces in 4 frequently-needed sizes. Provide ideal insulation and strain relief for end cap terminations, worn wiring, component breakouts, fragile components, etc. Tubing made of dual-wall polyolefin. When heated, inner wall melts to form seal while outer wall shrinks to skin tight fit.

For detailed information on all Q-LINE products (capacitors, switches, chassis boxes, optoelectronic devices, DIP/SIP components, resistors, wiring components, etc.) write for 40-page Catalog C-652 to Sprague Products Co., Distributors' Division of the Sprague Electric Co., 65 Marshall St., North Adams, Mass. 01247.

Where MORE is more than a promise.

6S-0123

SPRAGUE®
THE MARK OF RELIABILITY

a subsidiary of **GK Technologies** Incorporated

Circle No. 116 on Reader Inquiry Card

OPTIMA VALUE SALE

TO ORDER CALL TOLL FREE 1-800-327-0224

C. B. HARWARE & WIRE

10 FT. RCA to SPADE LUG COAX 59U		$ .99
20 FT. RCA to SPADE LUG COAX 59U		$ 1.39
50 Ft. 58U PL to PL		$ 2.95
100 Ft. 58U PL to PL		$ 4.95
M359 Elbow	Min. 5	$ .69
M358 T	Min. 5	$ .79
DUMMY LOAD	Min. 5	$ .29
DELUXE CB MOUNT		$ 1.95
REGULAR CB MOUNT		$ 1.25
100 Ft. Hook Up Wire	Min. 10	$ .59
CO-PHASING HARNESS 6 Ft.		$ .99
CB LIGHTNING ARRESTER	Min. 5	$ .49
100 Ft. 11U PL to PL		$ 9.95
250 Ft. Spool 11U @8¢ per ft		$20.00

MATV 59U & 6U CABLES
F-59 to F-59

2 Ft.	$ .75
3 Ft.	$ .79
6 Ft.	$ .89
8 Ft.	$ .89
9 Ft.	$ .99
10 Ft.	$ .99
12 Ft.	$ 1.09
15 Ft.	$ 1.19
20 Ft.	$ 1.29
25 Ft.	$ 1.69
50 Ft.	$ 3.09
75 Ft.	$ 4.19
100 Ft.	$ 5.29
VHF/UHF SEPARATOR MODEL 106 Min. 10	$ .55
VHF MATCHING TRANSFORMER MODEL 300 Frequency Range 5-300 MHz Min. 10	$ .39

Quantity Prices Available

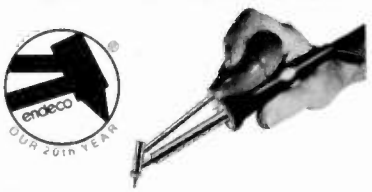
Letters of credit and all checks placed on deposit with Bank of Hallandale, FL. VISA/Bank Americard & Mastercharge accepted. Min. order $75. F.O.B. Dania, FL. Catalog $3, refundable upon order.

SEND CHECK OR MONEY ORDER TO:

OPTIMA ELECTRONICS
2022 Tigertail Blvd., Dania, FL 33004
Phone (305) 920-3550
TOLL FREE 1-800-327-0224

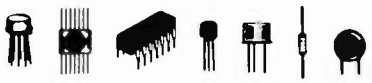
Circle No. 118 on Reader Inquiry Card

Vital protection for PC Boards



Be safe. Desolder PC components with Endeco irons. Get *proper* HEAT TO MELT and *strong* VACUUM ACTION TO LIFT solder and *cool* both PC board and component without damage.

These PC components replaced fast with Endeco desoldering or soldering tools.



Endeco professional features include safety light that denotes *high, low* and *off* on switch models, SS construction for long life, light weight and balance for easy use.

Contact your distributor for Endeco desoldering and soldering irons, kits and equipment—or write us today.

Enterprise Development Corp.
5127 East 65th Street
Indianapolis, IN 46220
Phone: (317) 251-1231

Circle No. 107 on Reader Inquiry Card

VIDEO SERVICING

continued from page 26

Irms = 45/.3 × 0.707 = 106.05/6.28 × 59.94 Hz = 106.05/376.42 = 28.17 mHys. Finally, Z = E/I, or 45/.3 × 0.707 = 106.05 ohms.

Interestingly enough, there are no polarity changes through either horizontal or vertical coils, and current is always decreasing (or decaying) as voltage increases, just as the textbooks say. This means, as usual, that an open or partially opened circuit will produce a greater voltage with less current, while circuit leakage or shorts ordinarily produce much more current with diminishing voltage. Also, sharp eyes will discover a small step glitch in the vertical cutoff waveform, and a little ringing in the horizontal drive waveform. Combined, such waveforms in any coil action should immediately tell if the inductor under test is good, and also how good. No so-called ringing test under static conditions is needed when dynamic drive waveforms tell you everything you want to know.

For 25-inch sets, the waveforms are very similar, and even the horizontal yoke voltage is approximately the same. But peak horizontal current becomes 5.2 amperes, peak vertical current, 1.2 amperes, and vertical voltage rises to 116 volts. Now this may or may not hold true for most or all 25-inch, 100° picture tube color sets, but it is factual measurement for G.E.'s EM chassis that is also part of the 1982 line. Naturally, once you're familiar with the four given waveforms, there will be little trouble identifying any deflection yoke lead even without a schematic. But if you don't have a scope with at least 10v/div. vertical deflection, forget such measurements altogether, since a mere 5v/div. can't do the trick.

Automotive

Automobiles may not necessarily be included in your bag of tricks, but it might be a rather easy way to make a fast buck—expecially where the electronics ignition package is not buried in the distributor. On Ford, Jaguar, Toyota, etc., you'll find it separate and available and quite easy to troubleshoot. First, locate the distributor (Fig. 10).

Inside this high voltage distribution unit is a pickup coil that produces two out-of-phase current waveforms for the electronics package, which you'll usually find sealed tightly with impossible-to-remove gunk. This package consists of little more than a group of progressively higher current amplifiers, delivering a single differentiated current out (Fig. 11). This single-ended output cuts on and off the high voltage transformer-type coil, providing 30- or 40-kilovolt pulses to jump sparkplug gaps and fire each cylinder in order of design rotation. This occurs as cylinders and the gas-air mixture internally combust sequentially, a crankshaft turns the distributor rotor, transferring coil-generated high voltage to each cylinder via a rotor just before it reaches its travel apex. In any well-tuned engine, this process continues with the vehicle either in gear or at idle until battery ignition is turned off. Battery cranking current supplies start-up potential when ignition turns on.

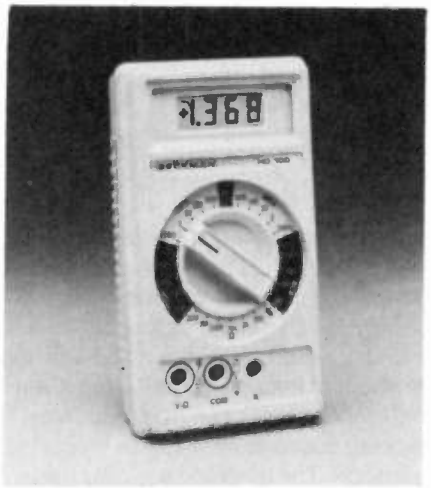
The two input waveforms indicate distributor firing action, pickup coil efficiency, and whether transistorized electronics are loading the distributor by both shapes and amplitudes of currents. The sharply positive negative differentiated outputs show whether the high voltage primary/secondary output coil is receiving sufficient firing energy and its on/off duration. On Ford products there are four wires into the electronics package—one common, one hot—with the other two being signal inputs. The output has but two wires, one of which carries the signal. The nice part of it all is that ac current probes will immediately tell, without wiring diagrams, what the operating status amounts to and who is at fault. You might just want a piece of the action since heavy handed mechanics break or separate more connecting wires than there are electronic failures. When electronic breakdowns occur, the auto engine usually runs for 15 or 20 minutes then cuts off. As it does, the waveshapes distort and readily identify the culprit for quick replacement. Obviously, engine heat becomes the prime offender.

Summary

Troubleshooting in the '80s decidedly requires a highly selective, trained, rational touch. Shotgunning ICs on sealed or open and very tender pc boards isn't one of them. Signal in, signal out gets the job done every time. You've just got to have equipment to do the job, or retire and let only the big independents and national service organizations take over. Remember the Boy Scout's motto: "Be prepared!" ETD

SUPPORT
MARCH OF DIMES

NEW PRODUCTS



Portable DMM

Circle No. 130 on Reader Inquiry Card

The HD-100 is a new portable DMM from *Beckman Instruments, Inc.*, and is made waterproof and dustproof to resist the elements. It reportedly can withstand the physical impact of accidental drops and has the kind of built-in input protections never before found in other DMMs. Voltage inputs are protected to 1500vdc or 1000vrms. Current ranges are protected to 2a/250v while resistance ranges are protected to 500vdc. The O-ring sealed ABS plastic case is fire retardant with ribbed side walls that are said to be twice as thick as other meters. The bright "NATO" yellow case is highly visible—easy to spot in a tool box or on a ledge before leaving a job. Inside, the electronics, including the "large area" LCD and battery, are shock-mounted to resist damage from impact. A common 9v alkaline battery is said to provide up to 2000 hours of continuous operation and up to two years of life under typical conditions. The single rotary switch, patented by Beckman, allows you to quickly switch to the function and range you are seeking. A quick visual continuity test function, called Insta-Ohms®, enables you to check electrical continuity with the speed and ease of an analog type multimeter. In any resistance range, an ohms symbol (Ω) appears instantly in the LCD when continuity is detected. Each HD-100 comes with a one-year limited warranty. A complete line of Beckman accessories are also available for use with the HD-100. They include a clip-on vinyl case, 2 ac current clamps, deluxe test lead kit, RF probe and a high voltage probe.

Satellite TV Products

Circle No. 131 on Reader Inquiry Card

Blonder-Tongue Laboratories, Inc. has recently introduced a new line of satellite TVRO earth station products for the MATV market. This new product line, specifically designed to interface with existing MATV systems, consists of: three antenna systems (3.0, 3.65 and 4.6 meters); three new Low Noise Converters; a low cost Earth Station Receiver and mounting tray; two foundation pier kits, and a 4.6 meter pressurization kit. The 3.0 meter antenna system (Model 6001) consists of six stamped aluminum panels, bolted together to form a parabolic surface of revolution, dual polarization focal point feed and mount. This design provides a very low shipping volume and easy handling during installation. The mount provides coverage of geosynchronous satellites located along the orbital arc from 91° to 136° west longitude from anywhere in the contiguous United States. The Model 6002 antenna system combines the 3.0 meter antenna with a 0.65 meter extender ring for increased gain. The 4.6 meter antenna system (Model 6003) utilizes a high efficiency Cassegrain design substantially reducing satellite terminal costs by providing performance comparable to larger antennas. The 12 panel main reflector is paraboloidal and uses a shaped subreflector to focus the incoming signal to a receive-only feed horn. The design provides high gain while meeting

FCC sidelobe requirements. Blonder-Tongue's new Model 6008 Earth Station Receiver and Models 6004, 6005, and 6006 low-noise converters (LNC) are used in combination to enable satellite signals to be carried from the earth station antenna to the receiver over low cost, UHF-type coaxial cable. A low noise converter (a combination of a low-noise amplifier and block downconverter) is mounted at the antenna. Satellite signals from the LNC are low noise amplified and the entire 500 MHz band is block converted down from frequencies in the 3.7-4.2 GHz range to frequencies in 270-770 MHz range for input into the receiver. The Model 6008 twenty-four channel Earth Station Receiver uses threshold extension demodulation (TED) to enhance video and audio quality at low signal levels. Techniques employed in designing TED for the Model 6008 have substantially improved receiver performance, even in the presence of multiple subcarriers. Impulse noise in the video signal is reduced near the threshold level, and high picture quality is extended to considerably lower operating signal levels than with conventional demodulation. Channel changing is remotely programmable thru BCD code or switch closure. The Model 6008 receiver units are configured so that they may be mounted side-by-side in a 19 inch rack for use in existing headends.

4½ Digit Multimeter

Circle No. 132 on Reader Inquiry Card

The Model 945 from *Data Precision* is said to be the first full-function, 4½-digit, hand-held multimeter in a "calculator-style case." The Model 945 measures both dc and ac voltages with a resolution of 10μv up to 1000vdc and up to 700vac in 5 ranges. Both plus and minus are displayed in dc measurements eliminating any possible ambiguity. Resistance is measured from 200Ω at 10mΩ resolution to 20MΩ in 6 ranges. There are 5 ranges of dc and ac current measuring from 10na to 2a. Basic accuracy is ±0.05%. The unique and very useful feature of the instrument is its ability to characterize diodes as well as to test them. Since the resistance measurement is made by constant current sources, the multimeter directly displays the voltage drop across a diode each decade current step from 100na to 1ma, yielding a 5-point curve. Other loads, both active and passive, may also be characterized using this feature. Powered by a 9v battery, the Model 945 features a large 0.43" high liquid crystal

display of the high contrast type, easily viewed under most lighting conditions. AC voltage, average sensing with rms calibration, has a basic accuracy of 0.5% over the full power frequency range to 500Hz. At reduced accuracy the instrument will measure from 30Hz to 1kHz. The input impedance for all voltage measurements both ac and dc is 10MΩ in parallel with approximately 100pf. Basic resistance measuring accuracy is 0.08% of input. While maximum open circuit voltage is 3.5v, due to the constant current-source feature the voltage drop across the load is directly measured in the display. This allows the operator to immediately determine whether the voltage is high enough to break down diode potentials, and to arrange his measurement multiplier range appropriately to permit accurate in-circuit measurements. All resistance measurements are protected up to 250v rms with no damage to the instrument and no change in calibration. DC current measurement basic accuracy is 0.15% while ac is 0.5%. The current measuring circuits are protected with a 2a 250v fuse, easily changed without tools. Temperature coefficient of all measuring functions is consistent with the specifications and accuracy under normal room temperature. In most cases the temperature coefficient is better than 10% of the specifications so that ambient temperature change would have to exceed 10°C in order to upset the instrument beyond the basic spec limitation. The 945 is designed for truly portable use. The battery is designed to last 100 hours of use before requiring replacement. A low-battery indicator displays before end of battery life. The Model 945 has been designed for industrial use and carries a full two year warranty against all normal use hazards.

Programmable Function Generator

Circle No. 133 on Reader Inquiry Card

Exact Electronics, Inc. recently announced its Model 607 programmable function generator. The Model 607 is a fully programmable function generator via the GPIB (IEEE 488) bus with address switches on the rear panel to allow easy changes of the GPIB address for maximum flexibility in program design. Outputs are sine, square, triangle, ramp and pulse and may be programmed from 1mv to 16.6v p-p into 50Ω, 2 mv to 33.2v p-p unloaded. Amplitude resolution is 3 digits in 4 decade ranges. Accuracy is said to be ±1% of programmed value. The waveforms can be symmetrical about ground or with programmable dc offset. Offset can be programmed from 0v to ±15.6v with 3 digit resolution in 4 decade ranges. Accuracy is said to be ±1% of programmed offset. Programmed frequency range is 0.001 Hz to 1.66MHz with 3 digit resolution in 9 ranges. Accuracy is ±1% of programmed frequency. A VCF (Voltage Controlled Frequency) input allows the generator to be swept or frequency modulated. Gate and trigger modes can be programmed allowing bust and single cycle triggered operation. The triggered or gated waveforms can be programmed to start negative or positive going at 0 degrees, ±90 degrees or −90 degrees. Trigger inputs are DTL and TTL compatible. A phase lock input will lock the Model 607

IMPERIAL ALARM SCREENS

- ***Provide full window opening protection***
- ***Custom made to fit any window***
- ***Versatile - can be used with hard wire and RF installations***
- ***Insulated circuit wire at 4" intervals sound alarm when cut & reed switch in frame provides additional protection.***

"Quality Alarm Screens since 1957"
U.L. Approved

IMPERIAL SCREEN COMPANY, INC.
5336 W. 145th STREET
LAWNDALE, CALIF. 90260 • (213) 772-7465

Circle No. 113 on Reader Inquiry Card

WE COVER THE
SECURITY MARKET!

AIPHONE	SAXTON
BRETFORD	SCHLAGE
CAMBRIDGE	SENSORCARD
CMC	SECRES
KOYO	STELLAR
MOHAWK	SRI
PANASONIC	SYRE
PENTAX	TOA
RCA	VICON

PLUS OVER 50 MORE SECURITY PRODUCT MANUFACTURERS.

SR
SECURITY RESOURCES
21 Castle Avenue
Fairfield, Conn. 06430

CALL TOLL FREE
(800) 243-2878

In Conn. call 334-3233

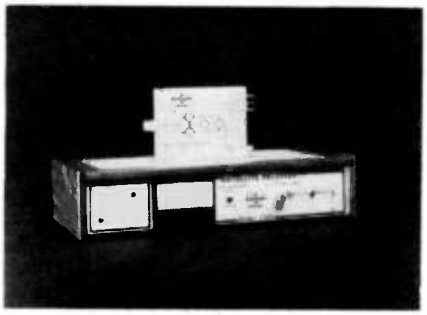
Circle No. 124 on Reader Inquiry Card

to an external clock or frequency that is within 1% of the programmed frequency. An external dc offset input allows the dc levels of the output to be modified with an analog voltage allowing closed loop work or amplitude modulation. Frequency, waveform, amplitude, trigger, gate and DC offset are all GPIB programmable and signal commons are isolated for system flexibility.

Satellite TV Receiver

Circle No. 135 on Reader Inquiry Card

Gillaspie and Associates has recently introduced its Model 7500 satellite television receiver which features an Image Reject Mixer/Down-converter. The downconversion is at the antenna which allows for extended antenna-receiver runs with RG59 cable. The receiver portion features power supply for the LNA, downconverter and tuning voltages, signal strength meter, transponder selector, dual audio and audio-video outputs. It is finished in a brushed aluminum housing with walnut decorator case. The image reject mixer/downconverter features an output frequency of 70MHz at 75 ohms, with a noise figure of 13 dB. The Gillaspie IRM is said to deliver a conversion gain of 17 dB with image



rejection of 10dB. Power requirement is 18vdc at 100mA. It has a built in LNA bias choke and dc block. Tuning requirements are +7 to +18vdc. The input connector is a type-N female while the output features a type-F female. Although designed primarily for 3.7-4.2 GHz Band for satellite televison reception, it can be adapted for use in other areas.

Dynatracer

Circle No. 134 on Reader Inquiry Card

The Dynatracer from *Non-Linear Systems* is a signature pattern producer for the troubleshooting of solid state circuits and components, both in and out of circuit, with no external power applied. It is designed for use with any oscilloscope capable of X-Y mode of operation; has 3 impedance ranges low, med, high and also provides for normal scope operation or DT-1 scope input operation by switching arrangement. The DT-1 dynatracer tests and visually detects faulty IC's, diodes, bridge rectifiers, zeners, FET's, darlingtons, LED's, voltage regulators, transistors, capacitors, unijunctions, SCR's and triacs as well as opens and shorts. The DT-1 comes complete with BNC to BNC cables for attachment to scope plus test lead assembly and component test adapter.

Microcomputer

Circle No. 136 on Reader Inquiry Card

Q1 Corporation has recently introduced its Microlite II microcomputer. This standalone self-contained office/business system contains the microprocessor as

OMNITRON: The Source for Quality at Low Cost

Silicon H.V. Triplers
HIGH VOLTAGE MULTIPLIERS

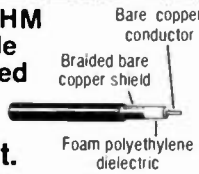
SYLVANIA Triplers

ECG-500A	ECG-523	ECG-526A
212-139	212-141	212-141-02
212-139-01	212-141-01	212-141-03
212-139-02		212-141-04
$12.95 ea.	$15.00 ea.	$16.99 ea.

REMEMBER! Sylvania Tubes 70% + 10% OFF LIST

Sylvania ECG Replacement Semiconductors and Components Full line in stock. The best quality semiconductor.

RG-59/U 75 OHM Co-Axial Cable Copper Braided Shield
White or Black
$44.50/1000 ft.



F-59 Connector with Separate Ferrule 10¢/100 lot

Matching Transformer 75-300 Ohm
MT-1 59¢ ea. $49.00/100

2 Way - 75 Ohm Coupler
MT-2 $1.49

2 SC1172B
$1.99

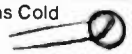
VERY POPULAR

80 MFD x 450 Volts... .99
100 MFD x 450 Volts...1.09

SOLDER (60/40 Rosin Core) 1 lb. - .062 dia. (regular size) $6.99 SOL-1

SILICON RECTIFIER 2.5 Amp/1000 PIV 100/$9.95 SL-100

GLOBAR DISC · 120 Ohms Cold 107191 RCA 99¢



SOLDER WICK 99¢
Solder Removal SW-5
⅛" Wide (Thick Type)-5 feet

10 ASSORTED CIRCUIT BREAKERS 10/$6.50 Good Assortment CB-10

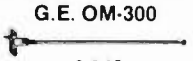
CHEATER CORDS
Polarized C Clip Price: 39¢ 24620

Standard C Clip Price: 39¢ 24623

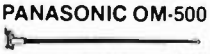
REPLACEMENT RODS

4 Section LAR-4 69¢
5 Section LAR-5 89¢
6 Section LAR-6 99¢
7 Section LAR-7 99¢

G.E. OM-300 $1.49



PANASONIC OM-500 $1.59



OMNITRON ELECTRONICS
770 Amsterdam Ave., New York, NY 10025
RCA • ZENITH • PANASONIC • G.E. • SONY

Send Purchase Order, Check or Money Order
or Call Toll Free 800-223-0826
in NY STATE (212) 865-5580
All ORDERS SHIPPED UPS/COD F.O.B., N.Y.C.
MASTER CARD • VISA

Circle No. 115 on Reader Inquiry Card

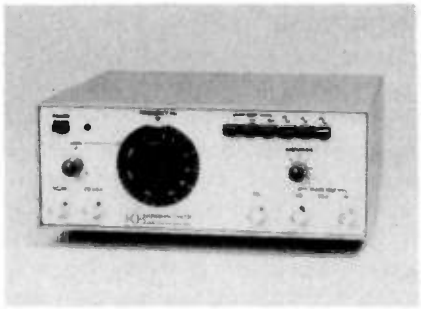
well as all other essential components in a single console that is no larger than an electric typewriter. The unit thus easily fits onto a secretary's return. The typewriter keyboard has 100 key stations, a numeric pad, and 32 function keys. A 24-line by 80-character plasma display is an important factor in making the entire system compact. The Microlite II also houses two 5¼ inch floppy disk drives that can store up to 350,000 characters per disk. An optional dot matrix printer can also be housed in the

console. Other options include floppy disk drives with a 500-kilobyte 8-inch capacity. Up to four of these drives can be supported. Rigid disk drives with 27/54/208 megabyte removable or 24/40 megabyte Winchester fixed media are available for data base applications where high speed and larger capacity are needed. Magnetic tape drives are also available. Letter-quality printing for word processing applications is provided by a separate daisywheel printer, and a 300-line-per-minute line printer provides high volume printing. Provision has also been made for serial communications.

Function Generator

Circle No. 137 on Reader Inquiry Card

Krohn-Hite announces an improved version of its Model 1000 function generator, the Model 1000A. The special feature of the 1000A is the inclusion of the Waveguard output protection circuit, at no extra cost, which was formerly available only as an added option. The Model 1000A provides 20Vp-p sine, square and triangular waveforms from 0.2Hz to 3MHz and provides 1500:1 frequency tuning range on each of its 3 multiplier bands. Additional features of the Model 1000A include External Voltage Control (VC) of frequency, a calibrated control voltage (CV) output, proportional to frequency, and an auxiliary TTL output.



Logic Timer Detector

Circle No. 138 on Reader Inquiry Card

Practical Technology recently announced another entry into the Logic Analysis market with the introduction of a general purpose Logic Trigger Detector. The new unit, named LTD-1, is a versatile instrument that simplifies logic troubleshooting by expanding the triggering capabilities of existing test instruments. The LTD-1 generates a trigger signal that can be used to trigger Scopes, Logic Analyzers, Counters and other instruments. The LTD-1 samples and recognizes 2 pre-set combinations of 9 input channels to produce a Trigger Output signal. For further isolation of unique trigger events, the LTD-1 has an A, B, and A delay B Function and Delay selection; also, auxillary Input and Outputs permit units to be connected in parallel (or serial) for wider (or deeper) trigger combinations. Applications of the LTD-1 include supplementing Practical Technology's Logic Analysis Display Formatter (LADY) (or any other logic analyzer) with additional trigger capabilities, and the use of the output signal to de-multiplex time multiplexed signals on a micro bus or elsewhere.

Noise Analyzer

Circle No. 139 on Reader Inquiry Card

Pacific Accessory Corporation has recently introduced its Model NA-1 Noise Analyzer Signal Tracer, an instrument used in locating and identifying vehicle noise interference sources. The Noise Analyzer enables the operator to hear noise currents; picks up and identifies radiating noise fields; and, traces signals, tests speakers and checks circuit continuity. Specifications of the PAC Noise Analyzer Signal Tracer include: maximum input sensitivity of 20 microvolts; maximum input voltage to 32 vdc; picks up noise currents to 2 microamps without hum; has pin type conductive probes and a directional inductive probe.

IT PAYS TO COMPARE
SPECIAL
IN ORDER TO GET THIS SPECIAL YOU MUST TELL US YOU SAW THIS AD.

REPLACEMENT FOR ECG — MIN. 10/TYPE

ECG TYPE	ECG PRICE	SALE PRICE	ECG TYPE	ECG PRICE	SALE PRICE
123A	1.32	0.45	187A	2.50	1.10
128	1.75	0.70	192	1.60	0.60
129	1.85	0.80	193	1.96	0.60
130	3.00	1.20	196	2.70	0.90
152	2.20	1.00	198	2.45	1.25
153	2.00	0.80	238	14.75	4.00
159	1.53	0.55	280	6.30	3.00
163A	10.75	4.20	291	2.45	1.30
165	13.50	3.15	292	2.85	1.40
186A	1.25	1.00	310	9.55	5.00

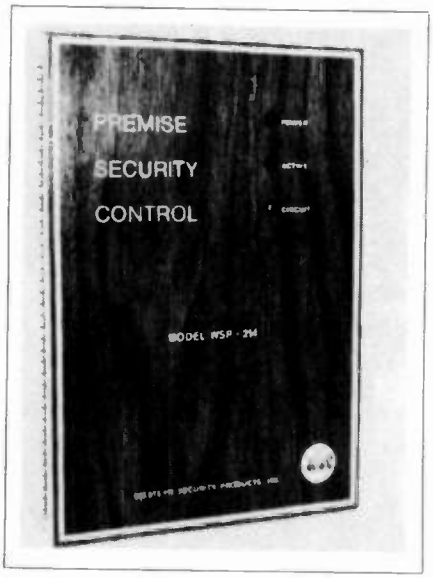
ORIGINAL JAPANESE — MIN 10/TYPE

TYPE	SALE	TYPE	SALE
2SA699A	0.60	AN214Q	1.60
2SA771	2.90	BA521	1.80
2SB507	0.95	BA532	1.80
2SB633	1.10	LA4051	1.60
2SC1306	1.10	LA4420	1.70
2SC1308	2.50	LA4430	1.80
2SC1986	1.80	M51513L	2.20
2SD313	0.70	STK0050	7.00
2SD613	0.80	TA7203P	1.60
TA7222	2.80	UPC1181	2.20
UPC1182	2.20	UPC1185	3.90

— WRITE FOR COMPLETE CATALOG —
✓ 1500 types original Jap. IC's & TRS
✓ 1000 types exact ECG replacement
✓ Other parts for TV, stereo, etc.
ELECTRONIC PARTS SUPPLY
P.O. BOX 5356 BERKELEY, CA 94705
TOLL FREE: 800 227-0104
IN CA. AK.HI. 415 532-2711
COD. PREPAID. M/O. VISA. M/C
BASIC SHIPPING CHARGES $2.50
Circle No. 111 on Reader Inquiry Card

Be a miracle worker.
GIVE TO THE AMERICAN CANCER SOCIETY.

SECURITY PRODUCTS



Premise Control

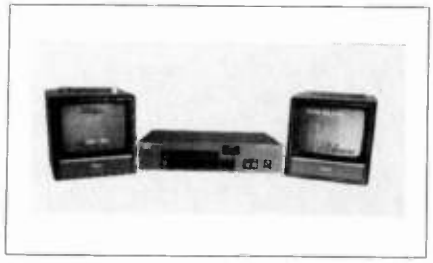
Circle No. 167 on Reader Inquiry Card

A new Premise Control, Model WSP-214, is now available from *Western Security Products*. The WSP-214 will ring a bell loudly, and it will operate an 18v siren driver and 30w speaker. The audible signal will cut off after a predetermined time and reset. A regulated power supply will keep a gel cell ready for standby use and supply a clean 12v (1 amp) for use with dc motion detectors. Up to four remote (momentary) key switches with LED lights may be used in the new panel. A 24-hour supervised emergency circuit is reset by the same key switch, with no separate reset slide switch to confuse the user. Two isolated communicator outputs (12v at 50ma) are provided, one for the 24-hour circuit, one for the protection circuit. The gel cell positive lead is fused as is the audible signal (2 fuses). In the 18 gauge beige cabinet are three LED'S. One is for ac "on" indication, one for "armed" indication, and the third for circuit condition. When both protection circuits are complete, the circuit status LED is on so it doubles as a "ready" light.

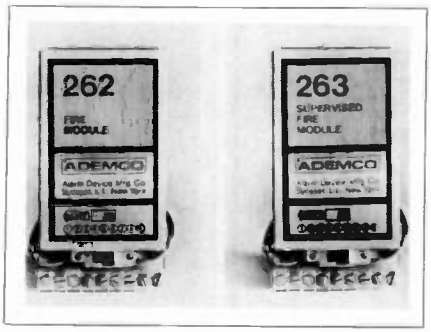
Video Security System

Circle No. 168 on Reader Inquiry Card

A microprocessor-controlled CCTV security system that monitors and controls up to 8 cameras and 16 alarm contact pairs has recently been introduced by *ECHOlab, Inc.* The new Model VSN "Video Sentry" is a compact system designed to permit continuous central station monitoring of critical points and areas throughout a building or complex. The VSN is a versatile system that allows both real-time operator viewing and automatic videotape recording of



sensitive areas, and that instantly displays pre-programmed video instructions to the guard on activation in any alarm contact. Completely contained in a cabinet 3½ in. high × 19 in. wide by 13¼ in. in diameter, the VSN includes a number of operating features including a motion detector that monitors all camera outputs and a time/date generator for annotating video tape records. The alarm-response capability of the system can be programmed by means of an accessory keyboard. A series of interactive menus (not accessible to the guard/operator) permit supervisory personnel to set and position time and date information, generate and position alarm instructions for each contact pair, define each contact pair as N/O or N/C, functionally test each part of the system, and preset many other control and alarm functions.



Fire Modules

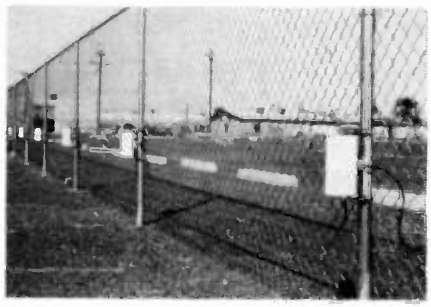
Circle No. 169 on Reader Inquiry Card

Ademco has recently added the No. 263 Supervised Fire Module and No. 262 Unsupervised Fire Module to their line of clip-on modules. Both modules, available in 6 and 12vdc versions, can turn many of Ademco's Alarm Processing Centers into combination Burglary/Fire Controls at a nominal cost. The No. 263 Supervised Fire Module provides supervised fire detection capability to Ademco Alarm Processing Center Nos. 1203, 1023-12 and 1024. Once installed, openings in the fire loop can be detected and can even be audibly sounded if connected to a sounding device. Supervision of dc power to smoke and combustion detectors can be provided by an end-of-line module (No. 633). Fire loop supervision is provided by an end-of-line resistor. The No. 262 Unsupervised Fire Module provides fire protection capability to Ademco Alarm Processing Center Nos. 1023, 1023-12, 1024, BC1026 and BC1028. The No. 262 does everything the No. 263 does, but lacks end-of-line resistor supervision. Devices such as thermostats or smoke detectors, when connected to either the No. 262's or No. 263's two-wire fire loop, will initiate a fire alarm when their contacts close across the two loop wires. When an alarm is triggered, a built-in alarm relay latches, providing a voltage to operate a sounding device and closing a set of dry contacts which may be connected to a communicator or dialer. Both modules have built-in manual reset switches. When operated, they reset the fire circuit if all devices have returned to a normal condition. Both modules also provide for an additional reset switch to be installed to allow resetting from another location.

Terrain Sensor

Circle No. 170 on Reader Inquiry Card

Omni Spectra has recently introduced a Volumetric Terrain Following Sensor (V.T.F.S.) System, The Model 700 Omni-Guard™. Through the use of multiple antenna heads, the system is able to follow changing contours in landscape, providing volumetric protection along the interior of perimeter fence lines, with high immunity to nuisance alarms caused by fence movement. When mounted to



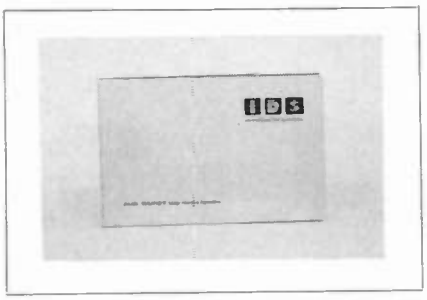
the support posts of a chain link fence, the Omni-Guard™ system will provide area protection inside the fence for a distance of up to 330 feet (100 m) in length and 20 feet (6 m) in depth. Unlike other devices mounted to the fence, it does not depend on the vibration of the fence to initiate an alarm. This eliminates many of the nuisance alarms in-

herent with fence mounted devices. By using multiple antennas, the pattern will follow changes in the contour of the site, eliminating the need for level ground, as in beam breaking devices, such as; microwave or photoelectric beams. The Model 700 operates from low voltage plug-in transformers and includes standby batteries to provide a minimum of four (4) hours protection from power outages. An automatic gain control circuit is provided to minimize set up time and to compensate for varying site conditions. The transmitter, receiver, and standby batteries are enclosed in 14 gauge steel enclosures. Antenna assemblies are constructed of extruded aluminum and ABS plastic.

Audio Interface Transmitter

Circle No. 171 on Reader Inquiry Card

Intrusion Detection Systems, Inc., has recently announced its new line of audio listen-in transmitters used with outdoor buried seismic systems. The 1-8 zone transmitters are designed to interface with a remote receiver, or display panel receiver, using voice-grade telephone lines to carry the signal. The transmitter can operate with any digital dialer equipped with an audio listen-in feature. The transmitter takes the place of the audio listen-in microphone and pre-amplifiers in the dialer. The companion receiver converts the signals to the low-frequency seismic signals. The transmitter is automatically reset when used



in the central station. The AUD-04/08 or CST-04/08 will generate a multitone burst when triggered. This tone burst is used to identify the discrete zone that is in alarm. Following the one-second burst, the seismic data is frequency-modulated and amplified. Frequency modulation is necessary to transmit seismic data over voice-grade telephone lines. The transmitter is restored by sending a reset signal from the display. The central station transmitter is equipped with a reset timer which restores the unit automatically after a 3 minute period.

Security Alarm System

Circle No. 172 on Reader Inquiry Card

A new security device to protect homes has recently been introduced by *Polaroid Corporation*. Called Night Watch bolt alarm, the system combines a carbon-steel bolt lock and alarm. Designed to fit on the inside of inward-opening

doors, Night Watch bolt alarm is recommended for use with a primary door lock. The alarm comes complete with

WORKMAN & UTR

PROUDLY ANNOUNCE
THAT UTR ELECTRONICS IS NOW A DIVISION
OF WORKMAN ELECTRONIC PRODUCTS, INC.,
SARASOTA, FLORIDA

WEP UTR

TV MODULES and TUNERS

UTR Electronics is one of the largest rebuilders of modules and tuners in the world.

FAMOUS FOR:

- Quality Parts
- Quality Workmanship
- Same Day Service
- 1 Year Warranty

TUNER REPAIR AND REPLACEMENT

UTR Electronics

Division Of: WORKMAN ELECTRONIC PRODUCTS, INC.
801 ROSE CIRCLE, S.W. • ATLANTA, GA. 30310
Phone 404 753-5311

Circle No. 128 on Reader Inquiry Card

POWERSONIC

RECHARGEABLE GEL-TYPE BATTERIES
NICKEL-CADMIUM BATTERIES
BATTERY CHARGERS

POWER-SONIC CORPORATION
P.O. Box 5242, Redwood City, CA 94063
Phone: (415) 364-5001 Telex: 348400

Circle No. 119 on Reader Inquiry Card

screws and instructions for home installment. The system becomes activated when the bolt is slid into the locked position. When an intruder tries to open a door fitted with the device, pressure on the bolt triggers the alarm, giving protection to homeowners and apartment dwellers. Powering the 85-decibel alarm is Polaroid's Polapulse P100 six-volt battery (not included with the alarm), an improved version of the unique wafer-thin power source originally designed and manufactured for Polaroid's SX-70 photographic film packs. A narrow slot in the alarm's durable casing holds the Polapulse battery, which can be replaced without removing the unit from the door.

Telephone Entry System

Circle No. 173 on Reader Inquiry Card

American Tele-Entry Security Systems has recently introduced its resident controlled security entry system, Amtel. Amtel can accommodate up to 512 occupant numbers using a single standard telephone line. Features include an emergency number, personal key code, talk time limit, intruder alarm, telephone number privacy, digital display, modular memory and choice of touch tone or rotary dial. Provisions for a postal lock are made to allow postmen to enter premises. Amtel carries a full 1 year warranty and a 5 year limited warranty.

Impact Detection System

Circle No. 174 on Reader Inquiry Card

A new Impact Detection System used to aid in the detection of forced intrusion through glass or other building materials has recently been made available from *Napco Security Systems, Inc.* The Impact I consists of the IP-900 Glass-Break Processor, the IP-910 Shock/Event Processor and central axial supported sensors. Each processor accepts 75 or more sensors. The impact sensitivity is adjustable and the processor can be set for various numbers of shocks before an alarm occurs, thus reducing false alarms. There are two separate LEDs, one reports each shock and the other is for alarm. An optional audible indicator can be attached to the processor to test for proper operation. The unit has normally open, normally closed and latched outputs and operates from 4.8 to 17 volts dc. For added perimeter protection, an optional weather resistant sensor is available for chain-link and other types of fences.

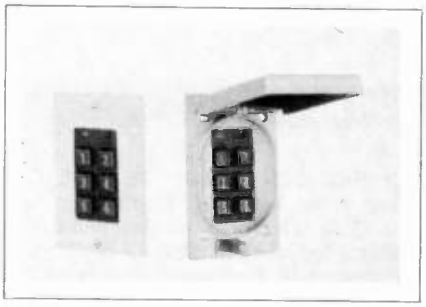
Fire Alarm Control Panel

Circle No. 176 on Reader Inquiry Card

Fire-Lite Alarms has recently introduced the Miniscan 112, a "No-Option" single zone fire alarm control panel that is said to have all the usual extras engineered into the product as standard. The only add-on is a three zone expander module. This UL listed 12 volt control panel offers the capability of utilizing 12 volt two-wire smoke detectors, reportedly an industry first. The MS-112 will operate up to 30 two-wire ionization or photoelectric detectors per zone, and still has the power to sound approximately 25 audible devices. Many features included in the MS-112 come from the Sensiscan 1000 and Miniscan 424 controls.

Access Control System

Circle No. 175 on Reader Inquiry Card



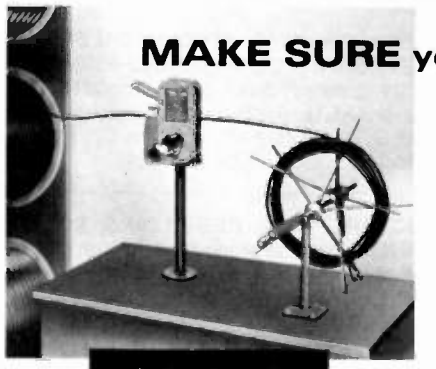
The KODE KEY 620 is a digital access control system from *Alarm Controls Corp.* and is composed of a decoder module and indoor and/or outdoor key pads. KODE KEY's computerized decoder module operates with any 12vdc system. A selection of any 4-digit (non-repeating) code can be set or changed at the decoder module. Memory clears if combination isn't completed within reset time limit. This system reportedly cannot be defeated by short-circuiting wiring to key pad. This system also features: Built-in power supply; 2-channel output (momentary or latching); SPDT relays, contacts, rated 2 amps; 4-wire connection to key pad; and 2 independently wired LED'S. It is powered from a 12v (Class II) tranformer, and will operate from any 12vdc power source.

Surveillance Monitor

Circle No. 177 on Reader Inquiry Card

A new 9 inch monochrome monitor designed for CCTV surveillance applications has recently been announced by *RCA Closed-Circuit Video Equipment.* The desk top TC1110 features 700 line

resolution, AFC, solid state circuits, and a regulated power supply. The TC1110 monitor also features switchable dc restoration and a video selector switch. It also includes 12vdc operating capability for mobile or remote applications.



MAKE SURE you get paid for every inch of wire sold

EXACT MEASURING is a must when you retail coaxial cables, audio cables, and electronic/electrical wires. You can work confidently and quickly . . . yet keep close control . . . with HYKON WIRE METERS and REELS set up on a counter or as a portable combo. Wire up to 1" diameter pulls from stock through the meter onto take-up reel for neater delivery. Write for details or call us at AREA 216 821-2320

Hykon

MANUFACTURING CO.
ET-161 East State Street ALLIANCE, OH 44601

Circle No. 112 on Reader Inquiry Card

CLASSIFIED

RATES: 60 cents per word (minimum charge, $20). Bold face word or words in all capital letters charged at 85 cents per word. Boxed or display ads charged at $75 per column inch (one inch minimum). Agency commissions will be given only when camera-ready art is provided by agency. For ads using blind box number, add $5 to total cost of ad. Send ad copy with payment to Dawn Anderson, ELECTRONIC TECHNICIAN/DEALER, 1 East First Street, Duluth, MN 55802.

BOX NUMBER REPLIES: Mail box number replies to: ELECTRONIC TECHNICIAN/DEALER, Classified Ad Department, 120 W. 2nd St., Duluth, MN 55802. Please include box number in address.

WANTED

MIRROR IN-THE-LID, SPINNING DISK, AND OTHER PRE-1946 TELEVISION SETS, parts, literature wanted for substantial cash. Also need 12AP4, 9AP4, MW-31-3 picture tubes, and any information on projection sets made by **TELICON CORP.** of N.Y. in 1947. Arnold Chase, 9 Rushleigh Rd., West Hartford, CT 06117.(203) 521-5280. 3/82

WANTED: PICTURE TUBE REBUILDING EQUIPMENT working or not. Write or call Atoll Television, 6425 Irving Park, Chicago, Illinois 60634. Phone 312-545-6667. 9/81

BUSINESS OPPORTUNITIES

RAMPART SECURITY SYSTEMS DEALERS' sales are booming. The Rampart Dealer Program offers **ENORMOUS PROFIT POTENTIAL PLUS EXCITING RESIDUAL INCOME.** Our success and reputation are a result of a total business format approach for the residential, small commercial market. Product, marketing and management training with complete backup has made success a reality for over 50 dealers. If you qualify, it can do the same for you. Investment only $12,500, backed by inventory. No experience necessary, just a strong desire to succeed. Call Franchise Director collect (215) 752-2210 or write **RAMPART INDUSTRIES, INC.,** 1 Oxford Valley, Suite 317, Langhorne, PA 19047.

SATELLITE television...Howard/Coleman boards to build your own receiver. For more information write: **ROBERT COLEMAN,** Rt. 3, Box 58 ETD, Travelers Rest, SC 29690.

FOR SALE: TV SALES & SERVICE SHOP located in Mayville, Wisc. a growing industrial community in central Wisc. A prime Sportsmen's area as well. Includes bldg, Living quarters, truck, test equip., parts, and new merchandise. Call 1-414-387-3757 or 387-2438 for information or appointment. **TRIPLE CROWN REALTY,** 14 Tower Dr., Mayville, Wisc. 53050 9/81

MECHANICALLY INCLINED INDIVIDUALS Assemble electronic devices in your home. Knowledge or experience not necessary. Get started in spare time. Turn your spare or full time into cash. No investment-Write for free details. ELECTRONIC DEVELOPMENT LAB, Box 1560B, Pinellas Park, FL 33565. TF

T.V. TECH'S
EXPAND YOUR EARNING POTENTIAL

Microprocessor technology is the way. New repair horizons open up to you when you know how to work on micro's, such as coin operated video games, pinball machines and many others. At E.I.B. we offer courses in microprocessor repairs at all levels. We can open up new earning potentials for you or your shop. Our courses are complete and comprehensive and will give you the practical know-how to get started. It will also provide a solid background to enable you to keep up with this fast changing business. Day and evening courses are available. For further information and an application Call **212-377-0369** (call collect). *Write:* **Electronic Institute of Brooklyn,** 4823 Ave. N., Brooklyn, N.Y. 11234.

GROUND floor opportunity with new company! Best marketing plan available in the United States today. A superior product line, better incentives and excellent bonus programs combined, offer the most success-oriented plan yet to be announced. Write or call for free information. **ENHANCE MARKETING GROUP,** (E), P.O. BOX 26563, Salt Lake City, UT 84126. (801) 467-0473. 9/81

TV Sales Service-Est. 18 yrs. Factory Authorized Service. Owner retiring-Complete shop with equipt. parts, etc. $15,000.00. Call 516-588-4855 or write to Louis Sventora, 321 Portion Rd., Lake Ronkonkoma, L.I., N.Y. 11779. 9/81

For Sale: Zenith Sales and Service shop near major highway, complete with truck. 5 minutes to beach in Los Angeles area. $25,000 plus inventory. Call Jim, 213-375-2233. 10/81

TV Sales and Service Shop - 16 yrs. same location - No. Calif. mountain town. Good Living. 916-628-5513.

FOR RENT

SCHEMATICS - LIBRARY SERVICE. One month rental fee $2.25. Membership card $10.00. **ALL RIDERS** manuals and **SAMS** available for your use. **THE TV SHOP,** 530 Minnesota Ave., Fallbrook, California 92028. (Telephone 1-714-723-1302). 1/82

FOR SALE

OSCILLOSCOPES SPECIAL SALE-HP & TEK, 50MHZ DUAL TRACE, $595. reg. $695. Limited Quantities. Reconditioned, Calibrated, Guaranteed. Free Catalog. A-OK ELECTRONICS, 1445 NW. 9th St., Homestead, FL. 33030. (305)247-6349 11/81

PICTURE TUBE REBUILDING EQUIPMENT capable of producing four high quality tubes per day **(WILL TRAIN TO OPERATE)** Call or Write Atoll Television, 6425 Irving Park, Chicago, Illinois 60634, ph. 312-545-6667. 9/81

SUPREME Television - Radio Diagram manuals discounted 60%. Free information. SASE. Supreme, 1760 Balsam, Highland Park, IL 60035. 9/81

NEED A 470 MFD AT 75 WV (RCA #134179)? Norfolk got a replacement 470 mfd at 80 wv, pc at the right price—$2.00 each/10 for $19.00—f.o.b. Garnerville, NY 10923. 10/81

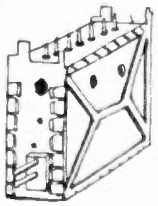
Collect your over-due bills for a nominal service charge. NO collection fees. Satisfaction guaranteed. Free information. Charles S. Johnson Box 78 Colo City Ariz. 86021. 11/81

TV ANTENNAS and accessories. Special coax designs solve problems, eliminate twin-lead and baluns. Buy direct. Write for list. Tele-Comm, Box 2910, Station A, Champaign, IL 61820. 10/81

T.V. AND APPLIANCE, Sales and Service—Business for sale in small South Central Montana Community. Owner retiring and will sell building, equipment, and inventory. Call **MANDEVILLE AGENCY** (406) 322-5361.

TECHNICAL reports: Keep pace with technology. Stay current beyond immediate job requirements. Engineers, technicians, computer science personnel. **Free** brochure. **ADVANCED TECHNOLOGY EDUCATIONAL SYSTEMS,** 4615 North Park Avenue, Suite 1519, Chevy Chase, Maryland 20015. 9/81

SIMPLE SIMON
7 + 11 PART KITS



MITSUMI UHF TUNER

PRICE $34.95

Freq. Range UHF 470 ,889 mHz
Channels 14-83 Output Chan 3

1	VT1-SW	Varactor UHF Tuner Model UES-A55F	$34.95
2	CB1-SW	Printed Circuit Board Pre-Drilled	$18.95
3	TP7-SW	P.C.B. Potentiometers 1-20K, 1-1K & 5-10K OHMS, 7-pieces	$5.95
4	FR35-SW	Resistor Kit ¼ W, 5% Carbon Film, 32-pieces	$4.95
5	PT1-SW	Power Transformer PRI-117VAC, SEC-24VAC, 250MA	$6.95
6	PP2-SW	Panel Mount Potentiomers & Knobs 1-1KBT & 1-5KAT W/SW	$5.95
7	SS14-SW	IC's-7 ea., Diodes 4 ea., Regulators 2 ea., Heat Sink 1 ea.	$29.95
8	CE9-SW	Electrolytic Capacitor Kit 9 ea.	$5.95
9	CC33-SW	Ceramic Disk Capacitor Kit 50 W.V. 33 ea.	$7.95
10	CT-SW	Variable Ceramic Trimmer Capacitors 5-65PFD 6 ea.	$5.95
11	L4-SW	Coil Kit 2 ea., 18 MHS, 1 ea. 22 MHS Inductances prewound and 1 ea. T37-12 Ferrite Toriod Core with 3 ft. of #26 Wire	$5.00
12	ICS-SW	I.C. Sockets Tin Inlay 5 ea. 8 Pin, 2 ea. 14 Pin	$1.95
13	SR-SW	Speaker Oval 4x6" & Prepunched Wood Enclosure	$14.95
14	MISC-SW	Misc. Parts Kit Includes Hardware, 6/32 & 8/32 Nuts & Bolts, H.U. Wire, Ant. Terms, DPDT ANT. SW., Fuse Fuseholder etc.	$9.95
		*When Ordering All Items 1 Thru 14 Total Price	$139.95

ANTENNA & ACCESSORIES

STVA-1-STV	Yagi Antenna 13.5 DB, 75 OHM, CHN 42 Thru 54	$9.95
STVA-2-STV	Yagi Antenna 13.5 DB, 75 OHM, CHN 20 Thru 28	$9.95
	CX-75 Coaxial 75 OHMS Low Loss	$.12 P/FT.
	F-59 Coxial Connectors ea.	$.39
	MT-1 Special UHF 75-300 OHM Matching Transformer ea.	$1.45
	A-1 indoor VHF-UHF Antenna Amplifier with Power Supply 300 OHM IN & Out. ABT 13Db gain	$19.95

Min. Order Amount is $19.95. Add 10% Shipping and Handling. Over $40.00 Add 5%. Catalog $1.00.
Mail Orders Only.

SIMPLE SIMON ELECTRONIC KITS
Calif. orders mail to:
3871 S. Valley View, Suite 12
Las Vegas, NV 89103
(702) 322-5273

Other orders mail to:
11850 S. Hawthorne Blvd., Hawthorne,
California 90250, Tel: (213) 675-3347

VISA — MASTERCHARGE ACCEPTABLE

SCRAMBLED-TV WHAT IT IS-HOW IT WORKS. New publication explains how the two encoding/decoding systems used today work. Theory, circuits, etc. Send $9.95 to: Workshop, Box 393ETN Bethpage NY 11714. TF

TV AND RADIO TUBES 49¢ EA!! Send for free color parts catalog. Your order free if not shipped in 24 hours. Cornell Electronics 4215-17 University San Diego California 92105 TF

NEED A 4700 MFD AT 50 WV? NORFOLK'S got it at the right price—$3.95 each—f.o.b. Garnerville, NY 10923. 10/81

LOWEST prices electronic parts. Confidential catalog free. **KNAPP,** 4750 96th St. N., St. Petersburg, FL 33708. 9/81

SONY-PANASONIC-RCA-ZENITH-EXACT REPLACEMENT PARTS-LARGE INVENTORIES-SEND PART OR MODEL NUMBERS-WILL UPS OR COD-GREEN TELE RADIO DISTRIBUTORS, 172 SUNRISE HIGHWAY, ROCKVILLE CENTRE, N.Y. 11570. TF

Automobile radio and tape replacement parts: Delco, Chrysler, Philco-Ford, Motorola, Panasonic and many others. Large inventory. **Laran Electronics Inc.** 3768 Boston Road, Bronx, NY 10469 (212) 881-9600 out of New York state (800) 223-8314 TF

TUBES—Receiving, Industrial and Semiconductors, factory boxed. Free price list. Low, low prices. **TRANSLETERONIC INC.,** 1365-39th Street, Brooklyn, N.Y. 11218E 800-221-5802, 212-633-2800.

Lowcost needles wholesale 12 up, Pickering V-15 $2.75/ea., XV-15 $3.50/ea., original magnetic cartridges V15/AT2 $6.00/ea., Empire Mark IV $8.00/ea., Shure M81MC $5.95/ea., many more, free catalog, 212-897-0509. D & W, 66-19 Booth St., Rego Park, NY 11374. 9/81

MINIATURE ELECTROLYTICS. Assortment No. 57 **10 ALL DIFFERENT 100 VOLT AND UP.** 15 MFD @ 100 AX—20 MFD @ 100 AX—22 MFD @ 100 RAD—100 MFD @ 100 AX—4 MFD @ 150 AX—8 MFD @ 150 AX—22 @ 160 RAD—47 @ 160 AX—3.3 @ 200 PC—20 @ 250 AX—$7.95 each/2 for $15. Norfolk Electronics, P.O. Box 91, 55 Railroad Avenue, Garnerville, NY 10923. 9/81

AUDIO SPECIALS, RCA PLASTIC PLUG-25¢ EA., RCA SHIELDED METAL PLUG-35¢ EA., PLASTIC MINI PHONE PLUG-25¢ EA., DUAL AUDIO CABLE WITH RCA PLUGS EACH END., 3 FT.-$1.19 EA. 4 FT.-$1.25 EA. 6 FT-$1.39 EA. CZ LABS 55 RAILROAD AVE. GARNERVILLE, N.Y. 10923 (914)947-1554. 9/81

"QUALITY ELECTRONIC PARTS AT WHOLESALE PRICES." ELECTRONIC DEALERS AND HOBBYISTS! Send your name and address for **"free catalog"** and be placed on mailing list for monthly specials. **Free** technical assistance available with order! R. L. Miller, Box 391 Bay Station, Dept ETD 3 Brooklyn, NY 11235 TF

SEPT. SPECIALS, RG-59/U COAX CABLE-7¢ PER FT., F-59 CONNECTORS WITH SEPARATE RINGS-15¢ EA. F-59A WITH RING ATTACHED 20¢ EA., 75-300 OHM MATCHING TRANSFORMERS 59¢ EA., F-81 SPLICE CONNECTORS 39¢ EA., CZ LABS 55 RAILROAD AVE GARNERVILLE, N.Y. 10923 (914)947-1554/5. 9/81

SEE HOME MOVIES. SPORTS, LAS VEGAS SHOWS ETC. MICROWAVE ANTENNA COMES COMPLETE INCL. BOX, DOWN CONVERTER, CABLE, HARDWARE, ETC. 1 YR. GUARANTEE. ONLY $147.00 QUANTITY PRICES AVAIL. SEEVIEW ELECTRONICS 4616 FLATLANDS AVE. BROOKLYN, N.Y. 11234 (212) 951-6505 9/81

SUNNY CALIFORNIA—TV SALES AND SERVICE FOR SALE. SMALL ESTABLISHED SHOP WITH HIGH POTENTIAL IN VENTURA COUNTY—SOUTHERN CALIFORNIA. 805-649-1566. 9/81

New Flyback transformer checker. Test's power, vertical, audio chokes, small Sony chokes, RCA start-up and driver transformer. All Flybacks send only $14.95 to Jack Ross, 6415 N. Richmond, Chicago, Illinois 60645. 9/81

New Motorola VHF Tuners - in original boxes - replace OPTT399A and others, $17.00 plus $5.00 handling and postage. Send Quasar needs and SASE. Maurer TV, 29 S. 4th St., Lebanon, PA 17042.

ELECTRONIC catalog. Over 4,500 items. Parts & components. Everything needed by the hobbyist or technician. $2.00 postage & handling, refundable with first $15.00 order. (Foreign $4.00 U.S. funds). **T&M ELECTRONICS,** 474 East Main Street, Patchogue, NY 11772. (516) 289-2520. 10/81

FREE speaker catalog! Woofers, mids, tweeters, hardware, crossovers, grille cloth, plans, kits, information, much more. Discount prices. **UNIVERSAL SOUND,** Dept. ET, 2253 Ringling Blvd., Sarasota, FL 33577, (813) 953-5363. 1/82

PRINTED circuit boards with running water! Technical breakthrough. Precise reproduction. Ideal for beginners. Free info. **COVAL,** Dept. ET8, 2706 Kirby, Champaign, IL 61820. 9/81

Satellite Television: Information on building or buying your own earth station. Six pages of what's needed, where to get it, costs, etc. $4.00 to Satellite Television, RD #3, Box 140, Oxford, NY 13830. TF

SATELLITE parabolic antenna, including polar mount. Fiberglass and steel construction f/d—.45, 12'—41 dB—$1,100. **SATRONICS COMMUNICATIONS,** P.O. Box 2924, St. A, Champaign, IL 61820 (217)398-2873. 9/81

1 BPI, 3000C, distortion analyzer. Excellent condition. **FINKLEA'S** 223 S. McQueen St., Florence, SC 29501. (803) 662-2526. 9/81

SAMS PHOTOFACTS 33-796, 30% complete. Sell all or part. List available. R. L. Wollam, 1 Woods Ct., Huntington, NY 11743.

PALOMAR—pride—exclusive repair facility. Factory trained technicians—all work guaranteed. **PALOMAR/PRIDE ELECTRONICS,** 1320 Grand, San Marcos, CA 92069 **(714) 744-0720.** 9/81

SAVE BIG BUCKS!! MOST POPULAR B&W YOKE (Y105)—$9.95 each/3 for $27. Terms C.O.D.; UPS. NORFOLK ELECTRONICS, P.O. Box 91, Garnerville, NY 10923. 914-947-1501/1502. 10/81

CABLE TV converter, low cost, easy to build, plans $5. **L. NAHHAS,** 112 Williams Ave., Old Tappan, NJ 07675. 9/81

Logical Deduction.

Are bills turning your life story into "The Case of the Disappearing Paycheck"? Does all your hard-earned money seem to vanish without a trace left to save?

Then perhaps you should investigate United States Savings Bonds.

Because saving with Bonds is so simple, it's elementary. Especially if you join the Payroll Savings Plan.

Once you sign up, you see, a small part of each paycheck is automatically set aside to buy Bonds.

Which means as soon as you're paid, you save. Before you're left trying to deduce where it all went.

Buy U.S. Savings Bonds through the Payroll Savings Plan. And take the mystery out of saving.

Take stock in America.

Double or nothing?

Saving money these days is difficult for most everyone. But there is a plan guaranteed to build your savings. Even for those who can't seem to ever save a cent. Buying U.S. Savings Bonds through the Payroll Savings Plan.

The amount you'd like to save is taken out automatically. When you accumulate the purchase price, you get a Bond. A $50 Bond costs only $25. Or a $100 Bond costs only $50. Whatever the amount, you'll double your money if you hold the Bond to maturity.

Remember, you can double your money for sure or put off saving and do nothing. Double or nothing.

Take stock in America.

UNITED STATES SAVINGS BONDS

When you put part of your savings into U.S. Savings Bonds you're helping to build a brighter future for your country and for yourself.

Ad Council A public service of this publication and The Advertising Council.

AD INDEX

NEW PRODUCTS

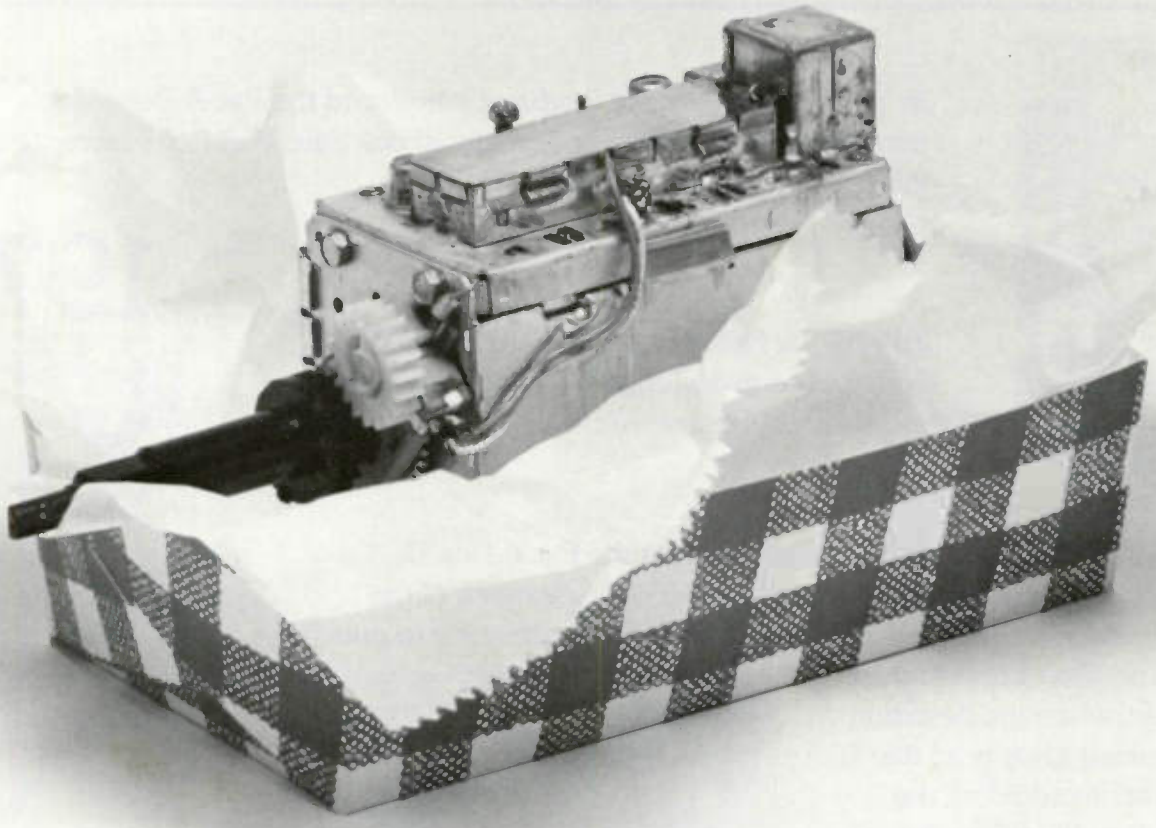
BULLETIN BOARD

SECURITY PROD.

TEST INSTR. RPT.

This index is furnished for the readers' convenience. However, the publisher can not guarantee its accuracy due to circumstances beyond our control.

Tuners To Go



Now you don't even need to wait a single day
for delivery of quality rebuilt PTS tuners.
They're ready and waiting for you!
Pick up a carry-out wherever you see
the **EXPRESS TUNER EXCHANGE** sign.

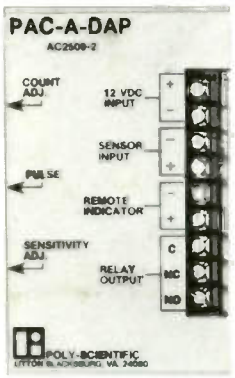
Sure beats waiting.

Circle No. 120 on Reader Inquiry Card

Express Tuner Exchange

PTS ELECTRONICS, INC.
General Headquarters: P.O. Box 272
Bloomington, IN 47402

Pac-A-Dap III® by Terminus®
The 1st of a New Generation

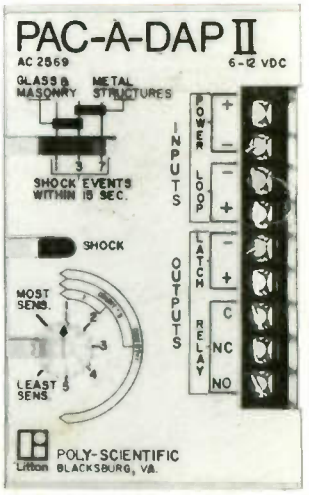


1977

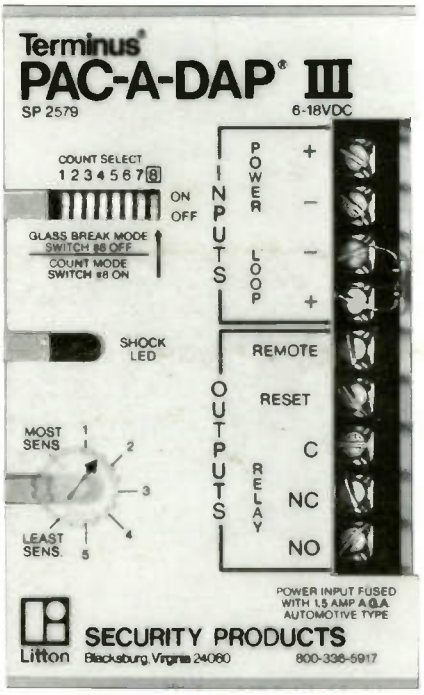
In 1977, Litton Security Products introduced the Pac-A-Dap, which permitted the concept of perimeter shock detection to be incorporated into existing security systems.

1979

In1979, the Pac-A-Dap II was announced. Improvements included 6-12v operation and more accessible controls.



For 1981, Litton Security Products presents the Pac-A-Dap III. The Pac-A-Dap III (SP 2579) combines all of the features of the widely used Pac-A-Dap II and the Glass-Break processor into one unit. The glass-break feature is useful when the detection of breaking glass is all that is required. In addition, the Pac-A-Dap III utilizes the new Terminus Custom Chip which will be incorporated into the new generation of Litton Security Products signal processors, controls, and Demo Tester. The Terminus Demo Tester (SP 2508) is a versatile sales installation tool that enables a sales person to easily demonstrate the benefits and features of Terminus or helps the installer set up a Terminus Shock Detection System.



1981

For more information about these new products, contact your authorized Litton Security Products distributor.

LITTON SECURITY PRODUCTS

1213 North Main Street Blacksburg, Va. 24060 703-552-3011 800-336-5917

Circle No. 110 on Reader Inquiry Card