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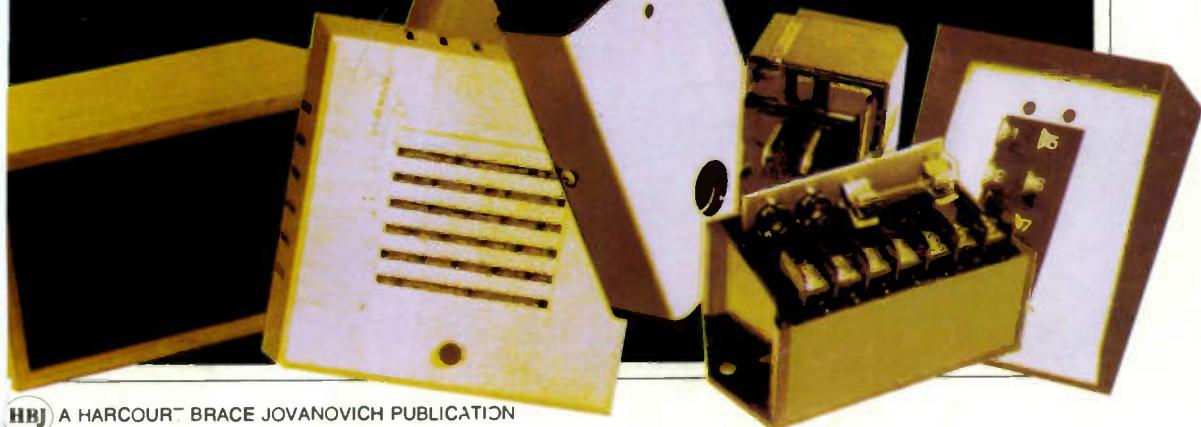
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B

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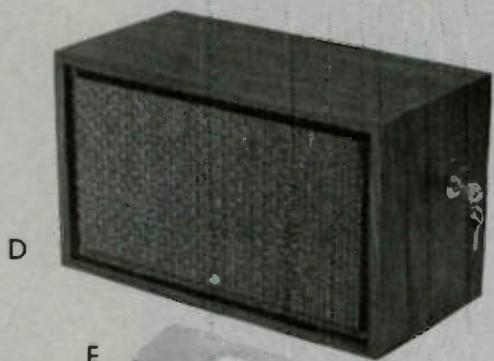
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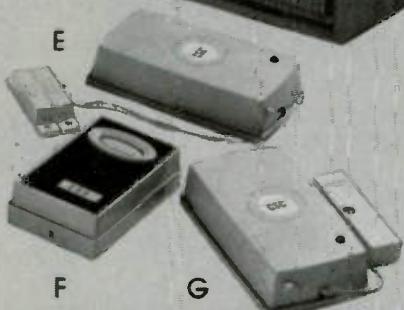
C

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INDUSTRY REPORT

British Teletext Group Files Rules Proposals With FCC

The United Kingdom Teletext Industry Group has asked the Federal Communications Commission (FCC) to begin a proceeding to adopt rules to allow use of the British "defined format" teletext system in the United States. Compatibility with the Canadian Telidon system and with line 21 captioning for the deaf; full color picture and tele-software capabilities; cost effectiveness and ruggedness, are among the features of the multi-level system proposed. The filing represents a major step in the rapidly accelerating promotion of British teletext technology in this country, following closely on the formation of the US marketing organization, British Videotex and Teletext (BVT).

The filing proposes five levels of British teletext operation for use in the United States. These include, in addition to level 1 which is now used in the United Kingdom and other countries around the world, levels 2 through 5 which have increasingly sophisticated display capacities, including, among other things, non-spacing attributes, multi-language coding, full screen fine-line graphics and full color pictures. Also proposed is "telesoftware" or the transmission of computer programs for reception by British decoders and processing in home or business computers. The filing states that the hierarchy of decoder levels will permit the immediate development of teletext in the United States, since all the necessary equipment is now in volume production and readily available for distribution, followed by the gradual incorporation of increasingly sophisticated display capacities as they become practical.

Electricity Produced From Fireless Coal-Generator System

An RCA scientist has received a patent for an efficient method of using coal to produce electricity without burning the coal, thereby eliminating the air-pollutants normally associated with coal-powered generators.

Dr. Richard Williams, a Fellow of the Technical Staff of RCA Laboratories, Princeton, NJ, has been granted a patent for his development that converts coal to gas that can be utilized in fuel cells for the direct generation of electricity.

The process starts with passing steam over hot coal, which produces carbon monoxide and hydrogen. This reaction has been used since the 19th century

to produce so-called "water gas" in many cities. Normally the gas is burned directly or used for chemical raw materials.

Dr. Williams' patent, however calls for the carbon monoxide to be reacted with hot sodium hydroxide to form sodium formate, which can be utilized in a fuel cell to generate electricity directly. The remaining hydrogen can also be used in a fuel cell to produce electricity.

The fuel cell, originally conceived about 150 years ago, is an electric cell in which the chemical energy from the oxidation of a gaseous fuel is converted directly to electrical energy in a continuous process.

In recent years, fuel cells have been used to provide electricity for various types of spacecraft. Now, because of the energy shortage, terrestrial applications for fuel cells are being developed.

Dr. Williams points out that coal-fired steam turbine generating plants convert about 30 percent of the coal's energy into electric power, with nitrogen and sulfur air pollutants as undesirable by-products.

Fuel cells, however, can convert as much as 50 percent of the coal's energy into electricity, and pollutants can be removed during processing.

The RCA process for converting the coal to gas can be relatively efficient, Dr. Williams explained, because the reaction that produces the sodium formate releases energy, compensating in part for the energy required to produce the water gas.

RCA will grant non-exclusive licenses to the Williams patent.

Average Pay Varies Widely By Geographic Area

Where does one find the highest and lowest pay rates? That depends strongly upon the job, according to Dr. Steven Langer, Managing Consultant of Abbott, Langer & Associates. Having analyzed and compared pay data for over 90 jobs in almost 200 geographic areas in the U.S. and possessions, his firm has just published a 116-page report entitled *Inter-City Wage & Salary Differentials—1981* which reports his findings in detail. Copies of this publication are available for \$75.00 from Abbott, Langer & Associates, P. O. Box 275, Park Forest, IL 60466. According to the report, Secretaries are paid 34% above the national average in Peoria, IL, but 33% below the average in New Bern/Jacksonville, NC. Las Vegas switchboard operators do 40% better than the average, whereas those in Laredo, TX are 32% below the national average. Key-punch operators do best in Gary, IN (39% above) and worst in the McAllen, TX area (24% below).

The same sort of disparities hold true for technical jobs. For example, com-

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From Television to Security	16
<i>On The Other Side of the Fence</i>	
CET Quiz VI	19
<i>Networks</i>	
Residential Security System Design	20
<i>KISS</i>	
Operational Amplifiers, Part I	32
<i>Care and Feeding</i>	
Electronic Security	37
<i>A Distributors Viewpoint</i>	

DEPARTMENTS



On The Cover: This month ET/D again emphasizes security electronics as a logical extension of the consumer electronics sales and service business as it now stands. Our cover symbolizes the contraction of television service work and the potentially great expansion of security electronics as a supplement to your business.

Industry Report	3
Letters	6
From the Editor's Desk	8
Security Viewpoint	10
Newsline	12
Service Seminar	14
TEKFAX	23
Test Instrument Report	38
Bulletin Board	39
New Products	40
Security Products	44
Classified Advertisements	48
Advertiser's Index	50
Reader Service	51



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puter programmers (business) do best in El Paso/Alamogordo, TX/NM (17% above) and worst in Providence, RI (19% below). Electronic technicians are paid 33% above the average in Gary, IN and 27% below the average in San Antonio, TX. Blue-collar workers are certainly not exempt from geographic pay differentials. Maintenance mechanics are paid best in Gary, IN (19% above average) and worst in Fort Smith, AR, Puerto Rico, and McAllen, TX (26% below). Truck drivers in Chicago are paid 28% higher than the national average but 58% below in Puerto Rico. Forklift operators are paid 28% above average in Gary, IN and least in Puerto Rico (52% below the national average).

Naturally, wages and salaries in Alaska are almost always higher than anywhere else in the U.S. For example, secretaries in Alaska are paid 43% more than the national average; key-punch operators 51% more; computer programmers 49%; truck drivers 43%; and forklift operators 51%. However, the cost of living in Alaska is also significantly higher than any place in the continental U.S.

Sprague To Close Plant, Drop Disk Caps

Sprague Electric will drop its commodity disk capacitors and close its 100,000 square foot ceramic disk plant in Grafton, Wisconsin. Sprague confirmed the shutdown would be completed by the end of the year with about 300 hourly workers being affected by the phase out. Only high voltage disks and slugs, dual disks and precision capacitors made in Grafton will be relocated to Sprague's Wichita Falls, Texas plant.

Products being dropped by Sprague include general-purpose, Hypercon, and temperature compensating disks. Sprague remains committed to and intends to expand its monolithic ceramic capacitor operation in its five domestic and its offshore plants.

NAB Petitions FCC In Approval of Direct Broadcast Satellites

The National Association of Broadcasters told the Federal Communications Commission recently that it had two new studies which "strongly suggest that immediate approval of DBS (direct broadcast satellites) services would have seriously adverse public interest consequences." The NAB petitioned the FCC for leave to file (1) "Direct Broadcast Satellites: Service, Economic and Market Factors," prepared by Browne, Bortz & Coddington, Denver, Colorado and (2) "Broadcast Satellite Study," prepared by Satellite Systems Engineering, Inc., Washington, D.C. The NAB petition also said that the reports indicated "the Commission has not yet adequately measured either the need for adding more TV signals throughout the country, or the impact of

premature DBS authorizations on other satellite services."

NAB said one report showed that even without broadcast satellites, regular television, subscription television, multipoint distribution systems and low power television stations would provide about 75 percent of the U.S. homes with access to 30 or more channels in television in 1990. NAB also said the Browne, Bortz & Coddington study indicates that hasty Commission approval of DBS systems employing current satellite video techniques could seriously impede the development of high definition television services. A quick approval of DBS systems using present technology, the study points out, could delay for many years a new generation of video transmission methods which could replace current television techniques with significantly improved picture quality, more suitable for large-screen viewing. It also strongly urges the need for a careful analysis of alternatives, and comprehensive prior planning, before any FCC commitments are made to particular DBS systems.

Because of the studies' importance in developing DBS policies, NAB requested that the FCC seek public com-

ment on the studies before deciding whether to entertain DBS proposals at this time. NAB pointed to the Commission's having taken such steps when Comsat's December, 1980, application was filed, and argued that its studies—the first detailed analysis of DBS services since that time—deserve equal consideration.

The NAB serves a membership of over 4,700 radio and 660 television stations, including all the major networks.

Telematic Acquires RCA Division

Telematic, manufacturer of TV service components, and a pioneer in the development and manufacture of test jigs and adapters, announced the acquisition of the RCA Test Jig and Adapter division. Telematic will continue the RCA Test Jig and Adapter Program as an independent line. It will also continue to manufacture its own popular test jig and adapters. The combination will enable Telematic to service virtually every television set in use today. In addition, Telematic will continue to manufacture its regular line of brighteners, subtuners, hi voltage probes and replacements.

All products will be supplied by Telematic from their plant at 108-02 Otis Avenue, Corona, N.Y. 11368, telephone 212/271-5200. **ETD**

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LETTERS

To Frank Egner:

I enjoyed reading your article that appeared in the January 1981 issue of "Electronic Technician Dealer." I am a newcomer to the electronics industry and I have been studying every spare moment trying to master the basic concepts of electronics.

If possible, I would like to ask your help in supplying more information concerning the Certified Electronic Technician (CET) associate or journeyman exams.

I would like to know more about the qualifications needed to pass these tests, the nature of the tests, and also where the tests can be taken.

Any information that you could supply would be greatly appreciated.

Derrick T. Wilson
118 Burley Drive
Mt. Sterling, KY 40353

Editor: Here once again is information on CET Testing and Technician's organizations: ETA-I, 7046 Doris Drive, Indianapolis, IN 46224; ISCT, 2708 W. Berry St., Fort Worth TX 76109 and also for a specialized consumer electronics test write to NATESA, 5930 S. Polaski Road, Chicago, IL 60629.

Wanted: Rabbit Ear Antenna for a Weltron (now out of business) AM/FM, Stereo 8 Track, model #2001.

M.B. Danish
P.O. Box 217
Aberdeen Proving Ground, MD 21005

I am in need of manuals or schematics for both an RCA WB97A VTVM and a FAIRCHILD 702 O-SCOPE. Any help would greatly be appreciated. Very willing to pay for copies or better yet, send the manuals and they will be returned to you.

ET/D, thanks for the articles on running a service department.

Mike Oggene
9433 Caddy Lane
Caledonia, WI 53108

HELP!

I need assistance in locating parts for two TRIPPLETT model 850 Electronic Volt-Ohmmeters.

The parts I am in need of are, two

Switch Function assembly part no. 22-436, or instead of these parts, switch Function part no. 22-391.

This 850 meter was discontinued of manufacture, and they have indicated no parts are stocked. Any help you and your readers can supply me in obtaining the above listed part(s), will be greatly appreciated. Thank you!

Roberto Diaz Jorge
554 Laviana Street
Urb. Matienzo Cintron
Rio Piedras, P.R. 00923

I need a front cabinet for Zenith TV model D3721/E37. Part number is S93092 or S98721. The part is no longer available. Does not have to be brand new part.

Karl Rybak
29641 Marshall
Southfield, MI 48076

I've been trying to get a schematic for the Amana touchmatic module for a couple of years now.

They are being manufactured by the Essex Corp., Box 9455, Fort Wayne, Indiana 46899 and by Motorola Corp., Car Radio Div.

I wonder if you or any of you readers could obtain a schematic and source of parts.

Thank you.
Raymond Miller
Raymond's TV
Zenith Sales & Service
Monroeville, OH 44847
(419) 465-2711

Perhaps one of your readers can help me. I am in need of a copy of the "Operation Manual" or "Operation instruction" for "capacitor analyzer model CE", manufactured by Solar Mfg. Corp. Bayonne, N.J.

Will pay for copy and postage, any help your readers can supply will be greatly appreciated!

Bing K. Huie
2153D Alameda Ave.
Alameda, CA 94501

TEKFAX:

The ET/D TEKFAX #1876 in the November 1980 issue was missing, I would like to get this one so my file will be complete.

John E. Grimes
422 Barbersville Road
Laurel, MD 20810

Editor: TEKFAX 1876 was eliminated in editing—there is none. Sorry for the confusion.

A BOUQUET:

I received Schematic 1780 and wish to express my appreciation to you. The set is working fine and I have a happy customer.

You have a great magazine and a great service.

My sincere thanks.
John Pannuzzo
1210 S.W. 65 Avenue
Hollywood, FL 33023

Editor: Thank you!

BOUQUETS AND BRICKBATS:

I thought your article "Analyzing Functional Techniques" in the February 1981 issue of Electronic Technician/Dealer was excellent. The functional chart on Page 41 adds a lot to the article. It, however, had to be so small to fit the magazine page that I am unable to follow the chart without going to my magnifier light. This is very difficult to handle at the work bench. Blow-up and reproduction here would be too costly.

Do you have larger copies? One of the size of 2 magazine pages, I believe, would be a good size. Could you send me a copy. I would be willing to pay a reasonable charge plus postage.

I am a regular subscriber. Keep up the good work. Thank you.
Howard E. Eissner
7714 Bristow Drive
Annandale, Virginia 22003

Editor: We are very pleased at the response this article has received. Author Bob Goodman has our thanks and congratulations. About the flow chart: this chart was courtesy of Sencore, Inc., which has developed this troubleshooting technique to high degree of sophistication for use with the VA48 Video Analyzer (the principles apply of course to many other quality signal sources) and I'm sure they would be glad to send you information.

This is in response to your alarm design article in the March '81 ET/D Mag. I picked this issue up at the Las Vegas National Burglar and Fire Alarm Association Convention this March. Until now I hadn't had enough time to even open the cover, though I'm glad I did.

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FROM THE EDITOR'S DESK

By this time you've noticed, I hope, ET/D's continuing coverage of security systems and I think it is about time again to talk about it. Why are we emphasizing security electronics? Because it is the first of several natural avenues of expansion for the established consumer electronics sales and service operation. Particularly if you have been selling and installing MATV or intercom/sound systems for residential use, security should fit your business pattern. If you have been prewiring new houses for MATV adding the wiring for a security system is a snap. If you have been adding MATV systems to existing buildings you know the problems involved and security system wiring is no worse. When it comes to designing the systems common sense, your electronics background, ET/D and the help of security manufacturers should make it easy.

As far as understanding and troubleshooting the system is concerned a good electronics technician should adapt immediately. In fact, *he is overqualified*. The security manufacturers in general are not used to working with technically qualified installers and have geared their troubleshooting accordingly. You may find the situation actually rather frustrating; the manufacturers don't want you to repair anything complex; they are not in the habit of supplying service information on their control panels, etc. Luckily the equipment is quite reliable; most problems involve interconnections, and wiring.

To satisfy your curiosity ET/D is going to try to explain in a generalized way the inner workings of many of the various sensors and their interactions with the control panel. In the last analysis, most of the sensors simply function as a normally open or normally closed switch as far as the control panel is concerned. This simplifies troubleshooting.

So anyway, I'm telling you there is a market here which you are probably poised to hit, and of which you need have no fears, at least technically. The residential security market is wide open; market penetration is negligible, not one house in a hundred is protected, so develop a sales strategy—here some of the manufacturers will help you—watch ET/D ads, and go to work.

Sincerely

Good news for you and your customers. NESDA/ISCET rates RCA serviceability:

'Excellent'

"The RCA CTC 108 and CTC 109 chassis have earned the highest possible serviceability rating category... Excellent... by incorporating serviceability features required in the ISCET Serviceability Rating Form.

"RCA's many years of cooperation with ISCET's Serviceability Committee has helped produce excellent results."

—Dean R. Mock, Chairman, NESDA/ISCET Serviceability Committee

ISCET's 92% (CTC 108) and 93% (CTC 109) ratings were good news to us. Because they mean that some of the most demanding critics in the industry agree that we've succeeded in de-

signing chassis that not only give your customers a first rate picture, but are easy to repair too. Here are some reasons why they think so:

All subassemblies plug into chassis. No tools are needed to remove chassis (main circuit board). Just remove the cabinet back, unplug subassemblies and the chassis is ready for removal.

Roadmapping on both sides of the board. Although the XL-100 chassis use single-sided circuit boards, double road-mapping means you can easily trace circuits from either side.

Circuits and voltages directly identified. Major circuit areas as well as power supply source and key pulse voltages are labeled by name on the board. So you can find them fast.

That all means that when you do have to repair our new XL-100 chassis, in most cases you can fix them quickly and easily.

And you won't have to waste your valuable time trying to find out where to go to fix what you already know is wrong.

Because to us that's what really counts. Making your job easier and your customers happier.

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SECURITY VIEWPOINT

By Ray Allegrezza

This month, I'd like to depart from my 'normal format' of a one-theme article and share with you some interesting bits and pieces of information that have come across my desk in the last few weeks.

Some of the observations I've made concerning this industry are not always pleasant.

In the past, I've mentioned that selling residential security can often times be a frustrating way to make a living. Consumers are a tough sell. They are often times uninformed and more often than not, *misinformed* about security equipment and capabilities.

Definite changes in consumer attitudes are now on the scene. Citizen organizations and neighborhood watch groups are springing up all across the country.

The 'average-American' is becoming security minded. He has made his statement, loud and clear. Techniques, methods and equipment that have the capability to discourage an intruder before the criminal gains access to the premises is what the consumer wants to know about.

There are a number of these devices currently on the market. (How many are you aware of? If none come to mind, this indicates to me that you may not be doing your homework regarding new product availability).

One of these newcomers on the scene is called the Porch Lite. This device, manufactured by Colorado Electro Optics is basically an infrared detector (passive) that senses changes in the energy of the protection pattern. Should a change occur, the unit will activate lighting (which can remain on for up to four minutes). The unit also has a built in photo transistor which deactivates the Porch Lite during the day. According to the people at Colorado Electro Optics, the system can be manually overridden.

The system is an effective deterrent to crime since the burglar will see lights, or a stereo etc. come on as he approaches the home.

Another device on the market is the Omni-Space Switch from Consumer Electronics, Inc. of California.

The switch is an omni-directional sensor (field disturbance type) that will transmit a signal to any combination of AC devices that are connected into remote receiver modules located in the home. Again, as with the Porch Lite, the selling point of this system is that it turns on lights, radios, etc, before the intruder enters the premises.

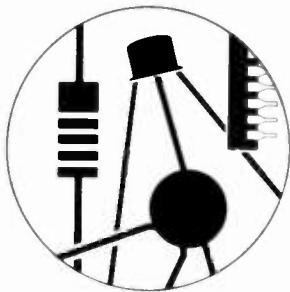
Home television security systems are also becoming more and more popular these days. You can profit from these systems by (a) selling the system to consumers and (b) selling a surprisingly wide selection of add-on accessories available with these systems.

Basically, these systems consist of camera and lens, cable, and a standard 12" television receiver. When someone rings the door bell, an alarm switch sounds over the television, and the camera mounted over the front or back door transmits the image of the caller to the TV screen. Communications can be achieved through the sound mount. If the TV set happens to be off, a bell is activated and the user can turn on the TV.

To sum up, these products are out there and more importantly, they are selling. Evaluate their potential as it applies to your business.

Especially the TV security systems (since you or your technician are already in your customer's homes servicing their present sets). Makes sense doesn't it?

ELECTRONICS



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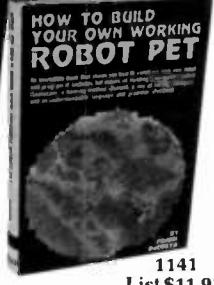
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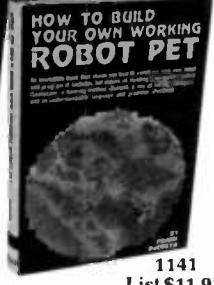
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ETD-681

NEWSLINE

RECORD TV & AUDIO SALES IN 1980. Factory sales of traditional TV & audio products hit record \$10.6 billion last year, would have topped \$16 billion with inclusion of video equipment (VCRs, discs, games, software, etc.), home computers, personal electronics, according to estimates in 1981 Annual Consumer Electronics Annual Review, just issued by EIA Consumer Electronics Group. Color TV was biggest sales item in 1980, rising 7%, followed by audio recorders & players, up 10%, sales of hi-fi components rose 20.9%, other audio systems were up 7.1%, B/W TV rose 4.8%, and radios increased 7.1%.

EARLY DISC SALES DISAPPOINT RCA DEALERS. RCA videodisc player (VDP) dealers overwhelmingly believe sales in first couple of weeks were below expectations, according to Television Digest mail survey. However, sales were up to RCA's expectations, according to Group Vice President Jack Sauter, who said company "never indicated there would be a landslide reaction." According to Television Digest Early Warning Report dealer panel indicated that nearly 82 percent are offering RCA players and discs. Of those, only 11 percent said that sales in first week or two were up to their expectations; nearly 78 percent said they were below expectations (another 11 percent didn't know or didn't reply to question). Among general comments: "Sales disappointing, very conspicuous by their absence." "None sold--5 inquiries (4 were already on our Laserdisc prospect list). Will need extensive one-on-one consumer education. Could be a viable product by fall, but profit margins will erode, especially when floor plans approach due date." "Poor time of year to introduce. Newspaper advertising lacking imagination." "Though we are big in video, we have not yet sold a single disc player." "The disc will not be as strong in metro areas--as it will be in rural or more sparsely populated areas (where there is no pay TV)."

FIRST QUARTER TELEVISION, VCR SALES ABOVE 1980 LEVELS. Total U.S. market sales to retailers of television receivers and video cassette recorders registered sharp increases over last year in the first quarter of 1981, according to statistics compiled by the Marketing Services Department, Electronic Industries Association. Video cassette recorder sales to retailers in the first three months of 1981 increased by 69.8 percent over the same period last year while the color television set sales were up 16.9 percent and monochrome TV set sales rose 16.5 percent over the first quarter of 1980.

STUDY SHOWS 64.3 MILLION STEREO HOMES. A 25,000-home consumer mail survey commissioned by EIA Consumer Electronics Group, indicates 81.3 percent of U.S. households--or 64.3 million--own home music systems, and 17 percent have two or more. A one-year study, which had a 69.8 percent response rate, was conducted in 1980 and showed 28.8 percent of U.S. households (which totaled 79.1 million last year) owned console audio (working out to 22.8 million homes), 40.7 percent owned compacts (32.2 million), and 20.9 percent owned component systems (24.7 million). Consoles had median age of 11.3 years, compacts 4.8 years, components varied from 2.2 years for phono cartridges and 4.5 years for receivers to 8.4 years for reel-to-reel tape decks.

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GENERAL ELECTRIC

Color Chassis 19YA. No video, sound okay. Loss of 14.83v source. To correct: Replace Y646 diode—must be exact replacement fast recovery diode. P.R. Carranged CET, and Emmett O'Brien, Ansonic, CT.

Color Chassis 25MA. Intermittent loss of vertical. When vertical collapses, 12vdc at P5 of vertical module drops to zero. To correct: Replace defective power transformer (intermittent) GE part number EP88X6. Manual DeLaRosa, CET, Morro Bay, CA.

PHILCO

B Line Chassis Model 26C41WA. No high voltage regulator and horizontal frequency out of range on both horizontal hold and service control. To correct: Replace (DIW) silicon rectifier part no. 348054-7 or use ECG 525 which has a higher voltage and current rating. Allow enough lead for a heat sink, solder onto slips for better contact. P. H. Besler, St. Norbert, Manitoba.

RCA

CTC74H. Insufficient vertical sweep and vertical roll. Replacing vertical module and vertical output transistors does

not help. To correct: Solder loose connections on R503 (3.9 ohm 2w resistor) at pincushion phase coil, L501. Lowell Britt, Boise, Idaho.

RCA

Replacement of diodes and capacitors in 150v bridge rectifier. In the November 1979 series of Goldenrods, the subject of the 150v bridge rectifier, as related to various RCA television chassis, outlined specific steps that must be taken in the event a shorted diode is encountered in the rectifier. Steps include the replacement of all four diodes and, in most chassis, the addition of a specially selected capacitor. RCA Distributor and Special Products Division has developed a kit to simplify ordering the specified diode/capacitor combination. Whenever stock number 147579 is ordered you will receive a kit consisting of four approved diodes and one of the specially selected capacitors. Previously only the four diodes were supplied under this stock number. Failure to replace all four diodes and the capacitor may severely compromise the reliability of the instrument—generating a non-productive callback for you.

For Chassis CTC 85, 86, 89, 90, 91, and 92. In the event a diode failure is encountered in the 150v power supply bridge (CR 201, CR202, CR203, CR 204), to assure continuing reliability:

1. Replace all four diodes—use only stock number 147579. Avoid stressing the body of the diodes when forming the leads.

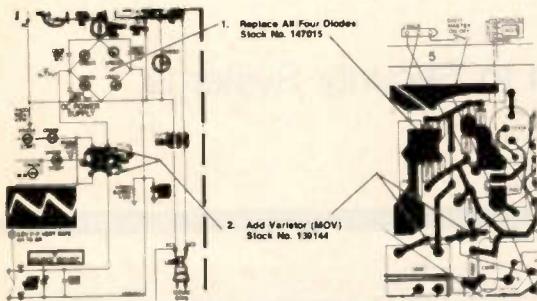
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2. Add a capacitor—use only stock number 147563, specially selected for this application—see schematic and diagram. Capacitor and leads must be dressed clear of other components and connections. Do not disturb lead dress of other components in the area. At completion of service, perform standard leakage test as outlined in "Safety Precautions" section of Service Data.



For CR 3701, 3702, 3703, 3704, follow same replacement procedure for diodes and capacitors and see schematic diagram.

For CR 600, 601, 602, 603:

1. Replace all four diodes—use only stock number 7015. Avoid stressing the body of the diodes when forming the leads.
2. Check for the presence of a varistor (MOV) across the primary (terminals 1 and 3) of the start transformer, T600. If the varistor is not in the circuit, add one (stock No. 139144).

Wrap and solder one lead directly to T600 terminal 1, wrap and solder the other lead to test point AH. The varistor and its leads must be dressed clear of other components and connections. Do not disturb lead dress of other components in the area. At the completion of service, perform standard leakage test as outlined in "Safety Precautions" section of Service Data.

SYLVANIA

Color Chassis E-10. No picture, circuit breaker kicks after 20-30 seconds. HV appears momentarily before circuit breaker kicks—B+ measures +300v at collector of B+ regulator—should be +170v. To correct: Replace defective SC-506 (212v boost), shorted. Part number 13-17174-1. Note: Check adjacent components in the regulator circuit. Allen Danbendiek, CET, Beatrice NB.

Color Chassis D-12-9. No vertical or horizontal sync. Transistors in sync circuit test normal. To correct: Replace defective SC-304 diode, Sylvania part number 596-5. Walt Holin, CET, Poway, CA.

TRUEZONE

Chassis 2DC2063. No raster, sound okay. No high voltage, capacitor connected to 6KD6 tube defective. To correct: Replace defective circuit breaker (note: resistor inside of circuit breaker which connects to cathode of 6KD6 open) also check for possible open horizontal centering control. Replace if defective. Pete Mikita, Strutters, OH.

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Commercial Electronics, Inc.

From Television to Security Systems.

Commercial Electronics, Inc. was originally a television service firm that over the last several years has moved to become primarily a security sales and installation operation. Here are some details on the why and how

By Walter H. Schwartz

John Wisely began Commercial Electronics the way many of us began similar businesses, with little capital, after several years of working for somebody else. He had lined up several hotel television service contracts as a cushion before he quit his former job and in January 1974 opened a storefront operation on Metairie Road. Here he serviced television and other consumer electronics and fulfilled his hotel service contracts. John did not wish to limit his business activities, hence the



Fig. 1. John Wisely, the owner of Commercial Electronics finds work at his desk, proposing and planning systems, more profitable than technician's bench work.

1 - Control Panel	\$160
1 - Dialer	\$135
1 - Battery	\$ 40
1 - Smoke detector	\$ 60
1 - Mini-Howler	\$ 15
10 - Window bugs	\$ 45
1 - Pulse extender	\$ 15
10 - Contacts (door switches)	\$ 29
2 - Remote Controls	\$ 30
1 - Siren	\$ 40
1 - Emergency Button wire	\$ 30
	\$604
Materials markup	\$500
1½ days labor (2 men) \$150 × 3	\$450
	\$1554
Costs \$604 + \$150	\$754
Gross profit	\$800

Fig. 2. This is a breakdown of a typical Commercial Electronics residential security system.

name Commercial Electronics, and did antenna and intercom work also.

He was approached after Commercial Electronics had been established for some time, to install and service closed circuit television equipment. This got to be a significant part of his business and eventually he decided to sell CCTV himself.

After a time, still in the consumer electronics service business except for his CCTV work, a couple of years ago John allowed himself to be talked into attending one of Wm. B. Allen Supply Co.'s seminars on the security business for consumer electronics technicians. He found himself convinced and went whole-heartedly

into the security business. At present his business is about 20% television, 40% residential security, and 40% commercial security (including CCTV). He now hires two installers and one technician and spends most of his time handling the security business, selling, and planning and designing systems and only takes care of a few select television customers personally.

A typical residential security system installed by Commercial Electronics is sold for from \$1500 to \$1800 including installation labor. This would involve about \$600 (cost) worth of materials and a labor cost of about \$150 (two men for 1½ days at about \$6.00 per hour each). John feels to properly



Commercial Electronics, Inc.
2620 MARIETTA AVENUE • KENNER, LOUISIANA 70062
(504) 469-5404

PROPOSAL

TO: _____

DATE: _____, 19 _____

Commercial Electronics, Inc. proposes to perform/install the following:

1. Commercial Electronics, Inc. will install the above equipment and/or perform the above services in and on the premises located

at _____
for the price stated above.

2. Commercial Electronics, Inc. will supply all parts and labor to maintain the above equipment for one (1) year after date of installation, except for any damage, malfunction, or malfunction caused by intentional or malicious damage.

3. Purchaser(s) warrants he owns the above premises or, if he does not, he has the permission of the owner of the premises to have the above equipment installed and services performed.

4. Commercial Electronics, Inc. will maintain the above equipment (excluding batteries, torn tape, or equipment intentionally or maliciously damaged) under the same conditions stated herein for an additional twelve month period for the sum of \$ _____, payable in full at the beginning of said period. Commercial Electronics, Inc. will make service contracts available for subsequent years at a price to be quoted when each such contract is requested.

5. If Purchaser(s) does not renew the maintenance agreement after the first twelve month period, all services will be performed for a charge to include parts and labor, which charge will be paid at the time such services are performed.

6. Purchaser(s) agrees that in the event of failure, non-function, malfunction, or malfunction of the equipment and services mentioned above, liability, if any, of Commercial Electronics, Inc. for loss or damage to person or property thereby sustained shall not exceed the lesser of \$250.00 or the insurance deductible which Purchaser(s) may be required to pay, and this limitation of Commercial Electronics, Inc.'s liability shall apply if any loss or damage to person or property, irrespective of its cause or origin, results directly or indirectly from performance or non-performance of any obligation arising from this document or from any active or passive fault or negligence of Commercial Electronics, Inc., its employees, agents, or anyone acting or purporting to act in its behalf. This paragraph shall apply and be binding on Purchaser(s) even if Purchaser(s) does not have insurance in effect at the time of any loss or damage as described herein, and in the absence of insurance Commercial Electronics, Inc.'s liability, if any, shall not exceed \$250.00.

7. Purchaser(s) acknowledges furnishing the above equipment and/or services may result in holes and other minor alterations in or to the premises.

8. Should Purchaser(s) move his home or business establishment from the premises to another location within a radius of fifty (50) miles from Commercial Electronics, Inc.'s business establishment, Commercial Electronics, Inc. will relocate any equipment which can be removed without substantial damage to the above premises for a reasonable charge to be agreed upon by the parties.

9. This document represents the entire proposed agreement between Commercial Electronics, Inc. and Purchaser(s), and it may be changed only by written document signed by all parties.

10. Purchaser(s) agrees that the signature of Purchaser(s) hereon shall constitute an offer to purchase only, which shall not be binding upon Commercial Electronics, Inc. until accepted in writing by its President or Vice President.

Purchaser _____

Accepted this _____ day of _____, 19 _____
COMMERCIAL ELECTRONICS, INC.

Purchaser _____

by _____
(President) _____
(Vice President) _____

Fig. 3. Commercial Electronics proposal/contract form includes a carefully written liability clause.

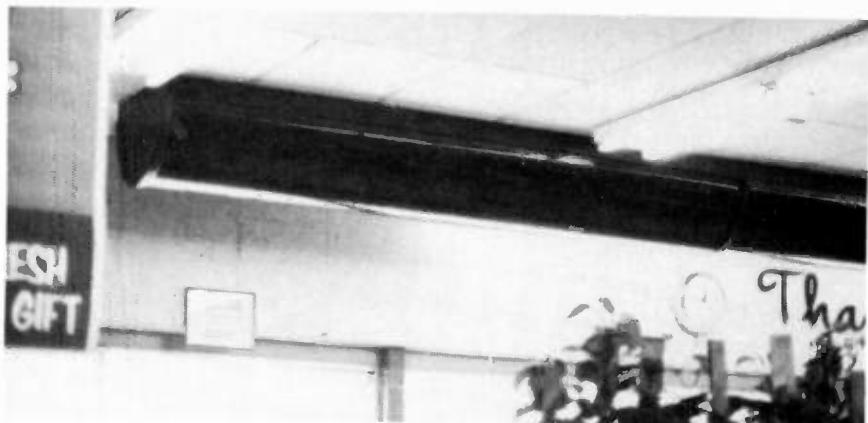


Fig. 4. A CCTV rail system housing mounted on the ceiling of a supermarket.

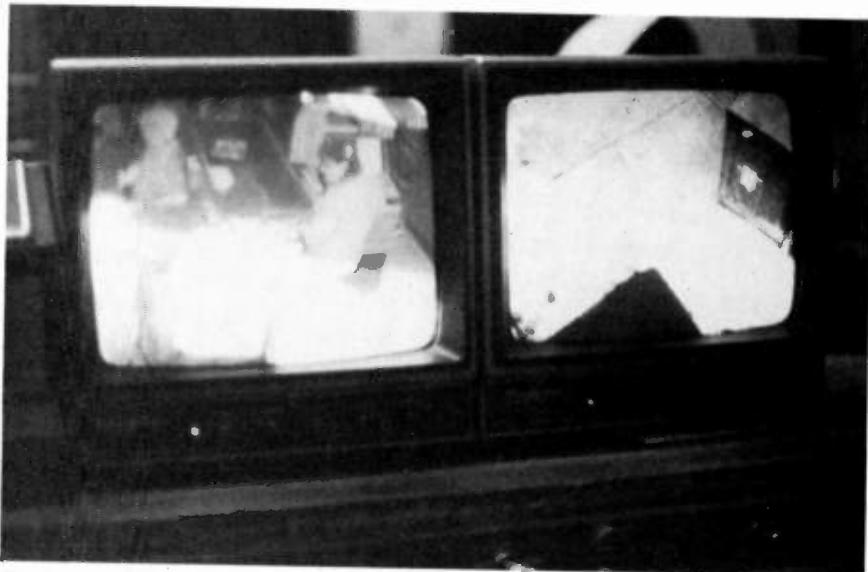


Fig. 5. Supermarket monitors showing a checkout counter and the loading dock.



Fig. 6. A simple camera positioning covers the meat counter.

cover costs (overhead) he must charge three times an installer's hourly rate for labor; the labor charge for 1½ days is about \$450. A markup of about 45% of the selling price is added to the materials cost, on this typical installation \$500, and if a salesman sells the job for him he pays a 10% commission (or \$150-\$180). A breakdown in tabular form is given in Figure 2. This is a basic system with

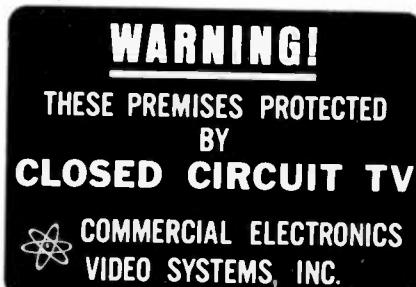


Fig. 7. Commercial Electronics posts these stickers conspicuously around protected premises. A similar sticker is used for a standard security system.

no extras. Note the gross profit of \$800 which is much better than the average television job.

Commercial Electronics uses its own proposal/contract forms for all security installations (Figure 2.). Note particularly section 6 which protects Commercial Electronics from equipment failure liabilities. This sort of protection is most important to the installer. Have your own forms made up; get competent legal advice.

Closed circuit television has always

been a significant part of Commercial Electronics security business. It has a wide range of commercial applications. Fast food outlets and supermarkets are typical of these. The supermarket needs to watch both its customers and employees. Some features of a typical supermarket system are illustrated in Figures 4, 5, and 6. The dark housing hanging from the ceiling (Fig. 4) contains a camera with a zoom lens and a scanner (pan and tilt) mechanism, both controllable from the monitor position. The monitors can watch any cash register and most of the aisle space from this one camera which can be moved the width of the store silently and effectively concealed in the dark plexiglas housing. The camera position is never apparent to customers or cashiers. The monitors can also be switched to cameras at the meat counter (Fig. 6) and the loading dock area.

electronics has made several other changes in John Wisely's business and personal life. He feels that it is a profitable business and he is doing much better financially. There is little or no weekend or after hours work and few telephone calls, etc. to his home. He has moved his business location into an office and warehouse in an industrial park where he can maintain a low profile which will not attract burglaries or break-ins; (of course, he does have an alarm system). He has been able to reduce his shop facilities to those necessary to maintain CCTV and service his reduced television business. He finds his technician/installer productivity to be much higher than that of a technician in television servicing, making planning much easier.

Another point, something that may not be a factor to everyone is the personal satisfaction John says he gets from the work he does. "I feel like a businessman, I find I can make much more money at my desk designing and proposing systems than I can doing the installation work. After all these years as a technician I often feel I should be working on installations, but everytime I do so I find I lose money. My job now is to manage. It is hard to both work as a technician and do an effective job as a manager. I spend my mornings in the office and my afternoons out seeing people, selling. And I'm doing better than I could have imagined ever doing in the television only business." **ETD**

CET Quiz VI

Simple Networks

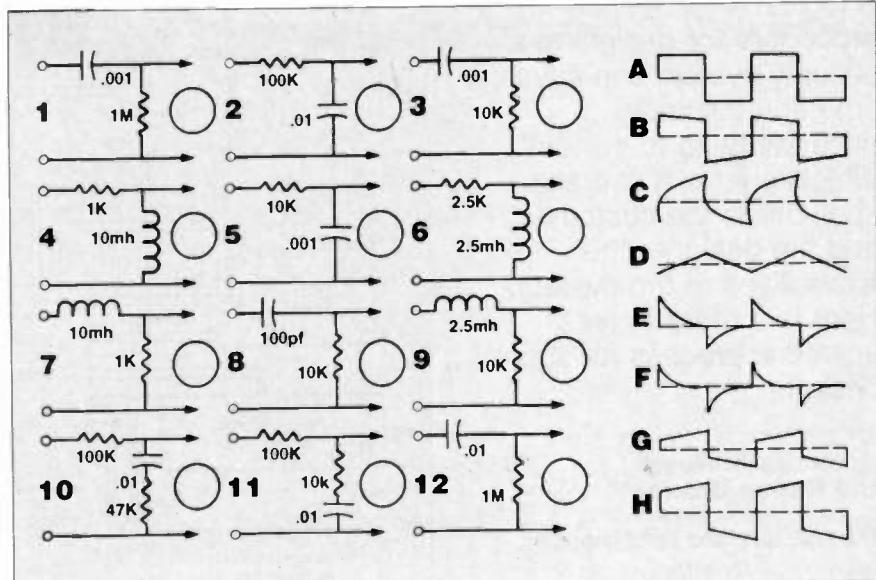
If you read and understood Bernard Daien's article on RC and RL time constants in May ET/D this quiz should be easy.

By Frank R. Egner, CET

RC (Resistance-capacitance) networks are probably the most commonly used component combination in electronics. The simple series RC circuit is used for coupling, differentiating, integrating, waveshaping, and timing to name a few. RL (Resistance-inductance) networks, although not as common as RC networks, are used for differentiating and waveshaping, plus other applications. How RC and RL networks react depends primarily on their time constants and the frequency and waveshape of the applied signal.

A time constant can be defined as the time required for current or voltage in the circuit to change by 63.2% (usually rounded to 63%) of the maximum possible change. In each subsequent time constant, the current or voltage changes by 63% of the remaining possible change. Therefore, the change follows an exponential curve. After five time constants have elapsed, the change is considered to be completed. The changes in voltage or current in RC and RL circuits always follows the Universal Time Constant Curves (available in most electronic texts).

The time constant of an RC network is calculated by the relationship t (in seconds) is equal to the product of R (in ohms) times C (in farads), or $t = RC$. For example, a one megohm resistor and a one microfarad capacitor have a time constant of one



second. In one second 63% of the maximum possible change will occur, and after five seconds the change will be completed.

The time constant of an RL network is calculated by the relationship t (in seconds) is equal to the inductance (in henries) divided by the resistance (in ohms), or $t = L/R$. Again, 63% of the maximum possible change occurs in one time constant and is completed in five time constants. RL time constants are usually measured in small increments of time when compared to RC time constants, which may range from nanoseconds to many seconds, depending on the application.

To determine how a waveform will be affected by an RC or RL circuit, the shape and period of the waveform must be analyzed with the network time constant. In general, if the time constant is ten or more times the period of the waveform, negligible change in the signal phase, shape, or amplitude will occur. Conversely, if the

time constant is one-tenth the waveform period or less, the waveform will undergo a change in phase, shape, and/or amplitude.

The basic operation of both RC and RL time constant effects is best demonstrated by the application of squarewaves to the networks. By calculating the signal period ($P = 1/F$) and the time constant ($t = RC$ or L/R), the output waveform can be predicted.

RC and RL network quiz

The following circuits are examples of RC and RL networks. In all cases, the applied waveform is a 10KHz squarewave with 10v p-p amplitude. By applying your knowledge of time constants, match the output waveforms to the networks that will produce them.

13. In all circuits above, if the input waveform is a sinewave, the output waveform is also a sinewave.
(True) (False)

You can check your answers on page 39.

Residential Security System Design, Part I

Basic Principles

A logical step-by-step procedure for designing a security system can save time and eliminate uncertainty as to system effectiveness. It can also spell out to the customer and the designer the capabilities of the system. Here is a more or less universal process for such design.

by James A. Ross*
and Steven Browne**

The first, last, and most important guiding rule for effective design is: "KISS" Keep It Simple, Stupid.

Always keeping "KISS" in mind the design process logically proceeds through four steps:

- 1) Determination of what you intend to accomplish,
- 2) Evaluation of any special considerations which might cause modification of 1),
- 3) Assessment of the capabilities of your enemy, and
- 4) Assessment of the resources that you can bring to bear on the problem.

In a practical situation, you might work through these four steps several times because steps 2), 3), and 4) may well modify the initial statement of step 1). For instance, to point to something recently in the news, the Three Mile Island nuclear power generating plant was intended to convert nuclear energy to electrical energy. However, the overriding special consideration of step 2) should have been: the operation of the plant

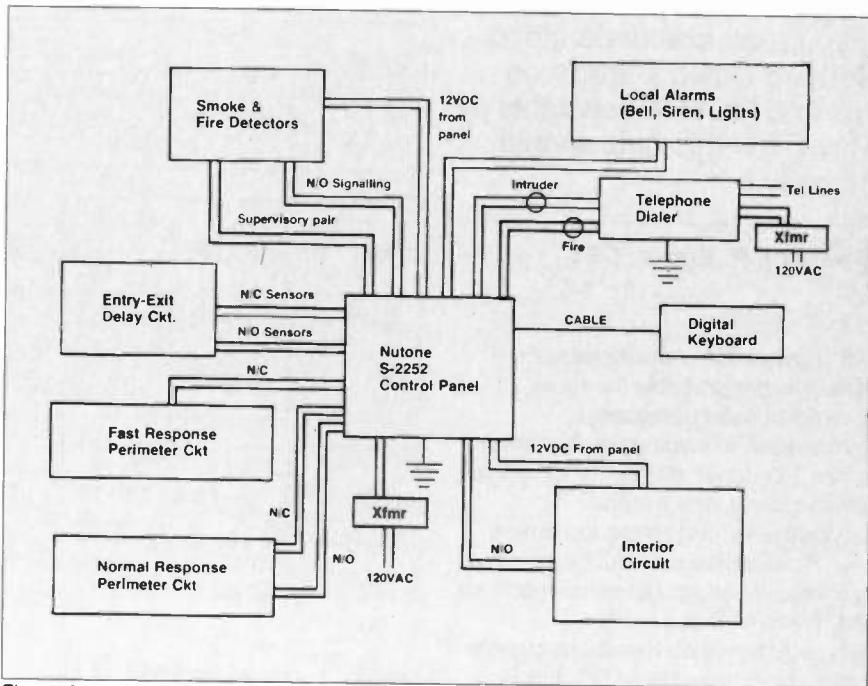


Fig. 1. Interconnections of controls, sensors and alarm circuits to the control panel.

must never endanger life. If this had been properly evaluated, the plant would not have been built as it was. In our situation, designing a home security system, step 2) will probably be the admonition of the homeowner to design a system that he can live with, e.g., no switch mats where a pet or a midnight-snacking human can trip the interior circuit, etc.

In step 3) you must assess what it is you are protecting, and against whom. If the prize is worth the attention of a professional, then you must create a system which will protect against a knowledgeable attack. If the potential enemy is an impulsive amateur, your design will be much simpler.

Step 4, though, is the one which regularly sends you back to step 1). In this step you advise the homeowner how much it will cost to do everything, and that's when you begin to simplify

the system, because most people in the real world have limited resources.

The design which this article will describe is based on many real residential fire/intrusion detection and alarm systems which the authors have designed and installed, without of course, providing any information which could compromise a specific system. For the purposes of this article we'll assume the homeowner has insisted on the most protection with the least inconvenience to family and servants.

Overall home security system

There are an infinite number of ways that a home security system can be configured, but, in a practical sense, all systems consist of four separable circuits: exterior, perimeter, interior, and fire/smoke, connected to one or more control panels. As noted in a

* Capital Security and Surveillance Systems, Inc., Washington, DC
** Solid State Electronics, Rockville, MD

previous article in this series, the individual circuits may be broken into zones to provide additional flexibility.

Control panel

The control panel is the heart of any system. It includes the switches for turning elements of the system "ON" and "OFF," the logic circuits which respond to inputs from sensors, panic buttons, key switches or digital keyboards, and the outputs to signalling systems. For this representative residential design we have chosen the Nutone S-2252 panel because it has many features which we wish to incorporate in our design. Figure 1 is a block diagram of the interconnection of controls, sensors, and alarm circuits with this Nutone panel.

Exterior circuit

Most home systems have no exterior circuit at all, because the threat is not severe enough to justify the heavy expense. If needed, an exterior circuit would probably use a proximity or vibration sensor system associated with a wire fence around the property. Another excellent exterior sensing system consists of an array of buried microphones. These seismic systems sense the vibrations caused by a person walking and automatically trigger an alarm. At least one type, made by Intrusion Detection Systems (IDS) of San Leandro, California, has a verification mode in which you can listen to the amplified sounds of motion.

Recently Colorado Electro-Optics introduced a product called "Security Light Control" which is intended to be used in conjunction with your front (or back) porch light. The unit would not normally be connected to the security panel, but would operate independently once activated. The unit will sense a person approaching the door in darkness, by the infrared radiation from the person, and turn the porch light "ON". If the person is a friend, he will appreciate your thoughtfulness. If he is a burglar, he will most likely skedaddle.

In our representative design for this article, we are not using a seismic system, but will use a security light control at each of three doors.

Perimeter circuit

This is the circuit which covers all doors and windows, and which would be left "ON" even when the family is home and up and about. In designing

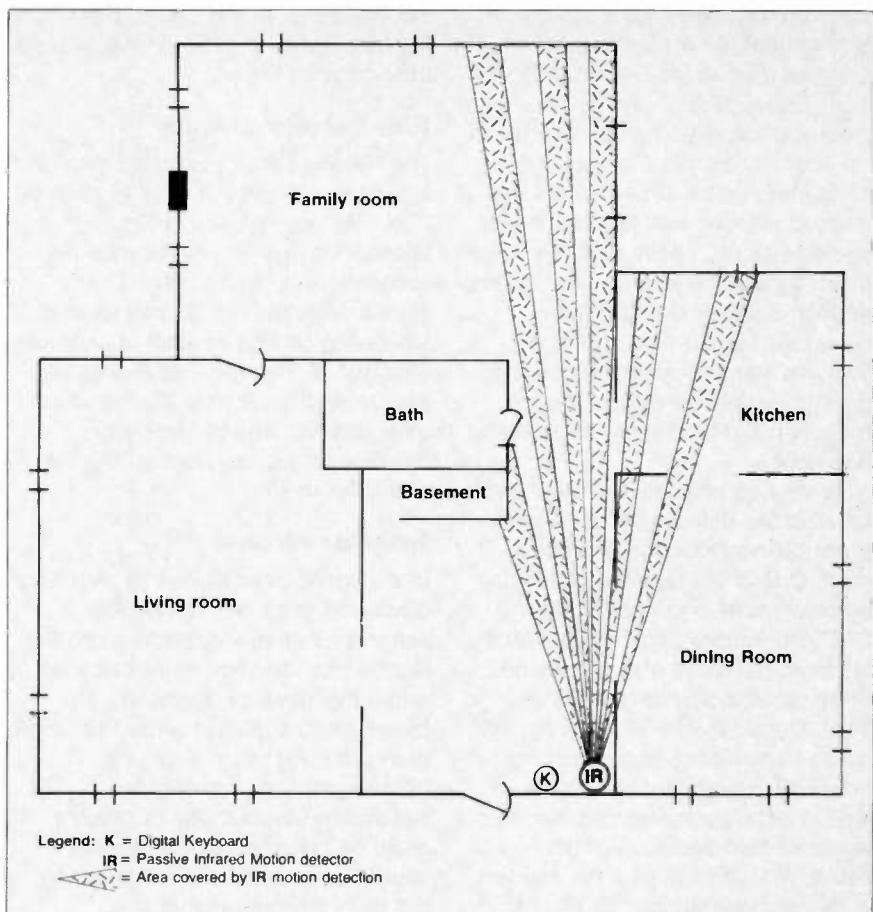


Fig. 2. Partial floor plan showing location of digital keyboard and IR coverage pattern.

the system, however, at least one door will be designated as an "Exit-Entry" door. The normally closed switch from this door (or these doors) is wired separately to terminals on the panel which are connected to a time delay circuit, so that the user can enter and leave his home without generating an alarm. The Nutone panel, for one, has an interesting feature in its exit-entry circuitry. The time delay is adjustable for any period up to 45 seconds which means you have that length of time after entering to turn the system "OFF" to prevent sounding the alarm. The Nutone panel helps you to remember this by emitting a gentle buzz from the time the door is opened until the system is deactivated.

Note in Figure 1 that the entry-exit delay circuit contains both normally open and normally closed detectors. This allows flexibility and simplicity in designing this circuit. For instance, a N/O floor mat could be used inside the front door in the simplest installation. In our design we will use both a floor mat and a recessed plunger switch in this circuit.

The fast response perimeter circuit is used with glass break detectors, which are fastened to each window

not otherwise protected. This circuit will provide instant response if any protected window is broken.

The normal response perimeter circuit has been designed by Nutone to help to prevent the annoyance caused by false alarms due to momentary unintentional contact in sensitive detectors. The remainder of our detectors will be connected to this circuit. Note that this circuit also has provision for either N/C or N/O detectors.

Here we come to the design feature which provides for superior perimeter protection while reducing inconvenience to the minimum, namely alarm screens. If we had used plunger switches or magnetic switches to protect windows, we would have had to also put a shunt switch next to the window so that the window can be opened for ventilation without activating the alarms. That means that the window opening is not protected while the window is open, and, certainly you would not leave home with the window open. Our design uses a special screen which has a conductor unobtrusively woven through it which is connected in series with the N/C perimeter circuit. If the screen is cut, the alarm activates. The

screen also includes a magnet which holds a recessed magnetic switch closed as long as the screen is in place. Therefore, removal of the screen will also generate an alarm.

In addition, all doors including the sliding glass doors are protected with recessed plunger switches in the N/C perimeter circuit. These switches protect against the intruder who opens the door, but they don't protect against the burglar who breaks the glass and steps through the opening, so we use audio detectors (glass break detectors) in every room with a glass door.

It is very important to keep in mind that all of the detectors described so far are connected in the perimeter circuit. One of the features of this particular panel is the ability to turn "OFF" the interior circuit so that family members can move about freely but still be protected by the perimeter circuit. Considering this, if it is felt that a radio transmitter panic button is necessary, its receiver should be wired into the perimeter circuit so that the transmitted panic signal will activate the alarm even if the interior circuit has been turned "OFF". Also, any other sensor intended to activate

the system while the interior circuit is not activated should be connected into the perimeter circuit.

Fire/Smoke circuit

The Nutone panel has no provision for turning this circuit "OFF"; it is always "ON". As you can see in Figure 1, supervision is included because the sensors are normally open. The smoke detectors should be mounted (on ceiling or high on wall) in bedroom area and at the top of each staircase. Also available are heat (temperature) detectors and rate-of-rise heat detectors, used to detect a flash fire with little smoke.

Interior circuit

In the previous article in this series we discussed some of the available sensors for interior protection and the reasons for their use. In a residence with a high level of perimeter protection, the interior sensor system does not need to be elaborate. (Conversely, in a commercial installation where a wall or skylight could be breached or the intruder could hide somewhere inside during the day - interior sensors are extremely important).

Figure 2 shows a part of the floor plan of our representative residence, with the location of the controlling digital keyboard and the pattern covered by the passive infrared motion detector. We'll cover the digital keyboard in more detail in the next article, but, for now, it is only necessary to point out that the coverage pattern of the IR sensor has been directed so that the homeowner can activate the interior system by keyboard and then move to the front door without causing an alarm. Similarly, after returning, he can deactivate the interior system without entering the IR coverage area. Note, though, that the passive IR covers the basement door, and the sliding glass door in the family room. It even provides some protection in the kitchen!

Summary

In this article we presented the general rules of design, and some specifics regarding the design of a residential security system. In the next article we'll discuss the control circuits and signalling systems. As always, questions and comments are welcome. Send them to us c/o ET/D



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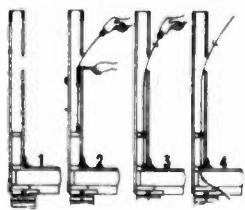
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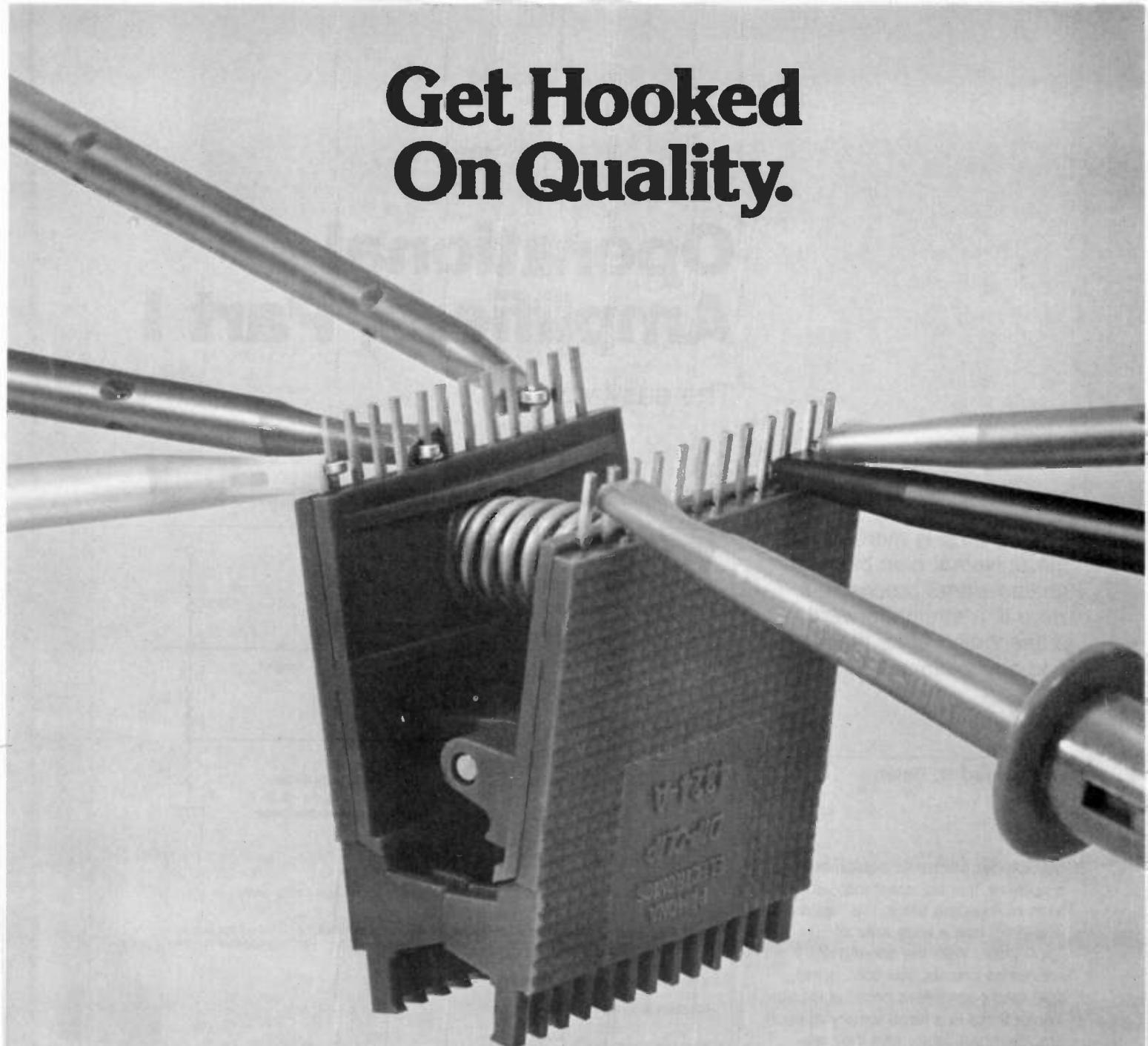
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Operational Amplifiers, Part I

The easy way.

The op amp is more or less the universal gain block of analog signal processing. Here is a straightforward presentation of its theory and application.

By Bernard B. Daien

Since most electronic equipment uses amplifiers, it is apparent that some form of "building block," or "universal amplifier" has a wide area of application. With the coming of integrated circuits, low cost, small, lightweight amplifiers became feasible. Today there is a large variety of such amplifiers available, and they are called "Operational Amplifiers" (Op amps).

Op amps almost always use some form of negative feedback, thus this article covers the basics of negative feedback theory, in a simple and direct way, without complicated mathematics. Since the op amp is based on its predecessor, the "differential amplifier" (diff amp), differential amplifiers are also discussed.

Since variations of the op amp are used today in instrumentation, and industrial and consumer electronics, technicians need practical information concerning the methods of troubleshooting IC op amps . . . also included in this article.

If you wish to sharpen your skills in the area of op amps, this article will

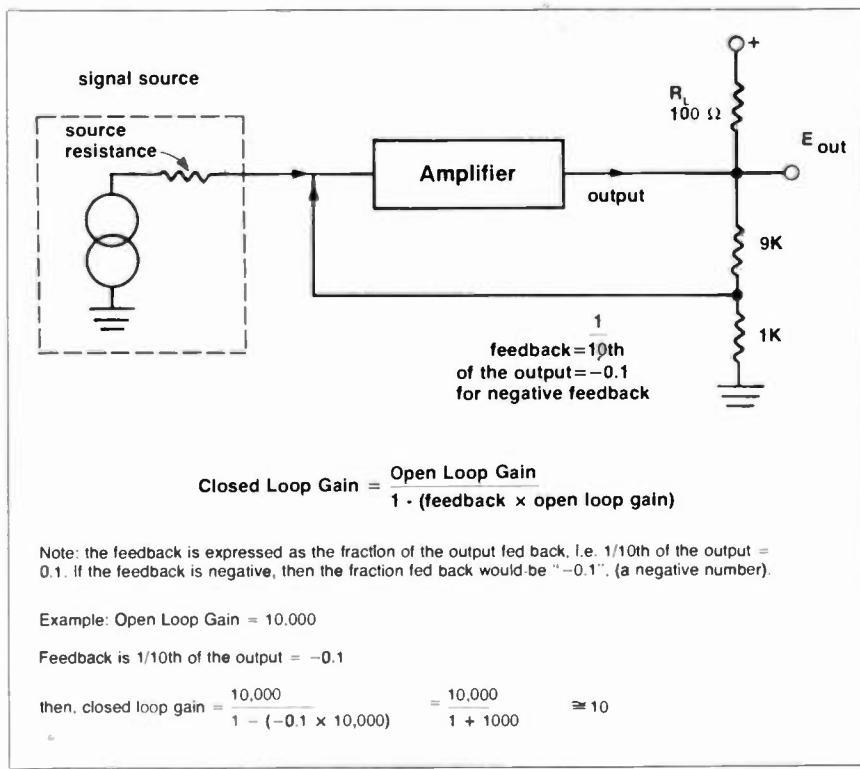


Fig. 1 The principles of inverse feedback.

get you off to a good start . . . painlessly.

Advantages of the op amp

Most modern instrumentation incorporates amplifiers. If the gain of an amplifier drops only five percent, the instrument is out of specified accuracy limits. (On the other hand, if an amplifier is in a simple broadcast receiver, a loss of five percent in gain merely means that the volume control must be readjusted.) In another instance, the loss of gain in a color television "color killer" circuit may mean loss of color (a common occurrence). Stability is often very

essential.

With an op amp the gain is determined by inverse feedback, and is almost completely independent of the gain of the integrated circuit itself. If the op amp open loop gain changes 25%, the closed loop gain will show virtually no change! Thus changes due to aging, temperature, supply voltage, etc., have very little effect on the operation of circuits using op amps with feedback. This is the chief advantage of the op amp.

But, there are other advantages. Op amps are less expensive than discrete amplifiers . . . and they are much smaller and lighter. Over the years a

Effect of changing open loop gain, with 10% negative feedback

Open Loop Gain	Closed Loop Gain
10,000	9.99
1000	9.90
100	9.09

So long as the closed loop gain is much less than the open loop gain, changes in the open loop gain have negligible effect on the closed loop gain.

Fig. 2 The effect of open loop gain on closed loop gain.

great number of practical circuits based on op amps have been developed, covering almost every conceivable area of application. Some of these op amp applications were not really practical before the advent of op amps due to cost, size, etc. One such application is the "active filter," which enables us to build low pass, high pass, bandpass, and bandstop (notch) filters, down to frequencies as low as .01 Hertz! (Try doing that with LC filters).

New thoughts about old circuits

Anyone who has used voltage regulators knows that the output voltage changes very little when the output current changes appreciably. If you think about it, the only way this can happen is if the voltage regulator has a very low internal resistance (source resistance). We therefore say, "A constant voltage source has a low internal impedance." (This concept will be important to you later on in this article).

Similarly, a constant current regulator's output current changes very little, when the load resistance changes appreciably. The only way this can happen is if the internal resistance of the current regulator is very large. With a high internal resistance (source resistance), the source resistance will be much larger than the load resistance. The source resistance then limits the current, and the smaller load resistance has little effect on the output current.

Stated another way, in a series circuit consisting of one very large fixed resistor, and a much smaller variable resistor, the value of the smaller resistor will have very little effect on the current. The larger resistor is in effect, a "limiting" resistor. Thus a 1000 ohm variable resistor, in series with a one megohm fixed resistor, can change the current

only one tenth of one percent! We can sum this up by saying, "A constant current supply has a very high internal resistance." (This will be important later in this article).

Anything that tends to make the output of an amplifier a constant current source, raises the output impedance. Anything that tends to make the output of the amplifier a constant voltage source, lowers the output impedance. Keep this in mind.

Inverse feedback basics

Inverse (negative) feedback tends to make an amplifier's gain independent of the amplifier's characteristics, such as aging, drift with temperature, or changes with applied voltage. In addition, the feedback can be used to make the amplifier's output a constant voltage, or constant current. Negative feedback also changes the amplifier's bandwidth, distortion, and enables the gain of the amplifier to be precisely calculated in advance.

Remember that by making the output constant voltage, the output impedance is lowered . . . but if we make the output constant current, the output impedance is raised! This is in contradiction to what you have read in many simplistic articles which almost always state, "negative feedback lowers the output impedance." Or, "An op amp has an output impedance close to zero." Both of those statements are incorrect. The output impedance of an op amp is determined by whether the feedback tends to make the output look like a constant current source, or a constant voltage source. (Similarly, input impedance depends upon feedback being in the form of a voltage, or a current). Thus the way the feedback is implemented determines both the input and the output characteristics of the amplifier. If you think about that last sentence a bit, it will become quite obvious, since the feedback loop

Amplifier Open Loop Gain is 10,000

Fraction of Output Fed Back Into Input	Closed Loop Gain
.01	99.0
.05	19.9
.10	9.99

Note that the closed loop gain approximates the reciprocal of the fraction fed back. Thus if we feed back 1/100th of the output, the gain is 100. If we feed back 1/10th of the output, the gain is 10, etc.

Fig. 3 The effect of changing the amount of negative feedback.

is taken from the amplifier's output, and fed back into the input.

Although we are discussing op amps, the feedback theory presented will be useful wherever feedback is used. It is unfortunate that so little attention has been given to the theory and practice of feedback. Usually, one or two feedback formulas are given, without explanation . . . as a result technicians must use them "blind" (without understanding). Feedback is a very powerful and basic tool, and should be well understood by technicians.

There is one point that must be made with regard to feedback . . . feedback implies a "closed loop." The loop consists of the amplifier from input through to output, then back again from output to input through the feedback path, thus closing the loop. If anything breaks this loop, the feedback system collapses. The reason for the word "anything" is not immediately obvious, so let's discuss it. Of course if we open the loop by means of a switch connected in series, you know that the loop will collapse . . . but there are other things besides a switch or a broken connection that can do exactly the same thing. If we overdrive a stage, to cutoff or saturation, the loop can no longer follow, and the same thing happens. Thus, in order for the feedback system to be operative, (as in any other analog system) you must be sure that none of the active devices in the loop are overdriven.

Figure 1 is the block diagram of an amplifier with negative feedback. Beneath it is the formula for the gain with feedback. To use it you need to know two things . . . the gain without feedback (open loop gain), and the fraction of the output signal fed back to the input. The closed loop gain will be less than the open loop gain, since negative feedback can only decrease the gain.

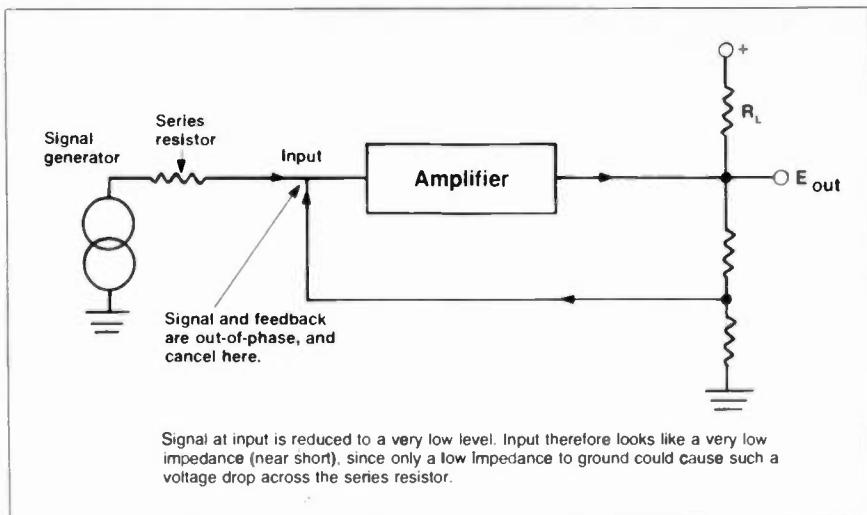


Fig. 4 Gain is reduced by signal cancellation at input of amplifier. This often results in low input impedance.

You must understand that the feedback does not change the gain of the amplifier itself. What happens is that the signal fed back into the input, from the feedback loop, is out of phase with the input signal, and the two signals tend to cancel . . . therefore the input signal is reduced.

With an open loop gain of 100,000 (which is not unusual for op amps), a 200 microvolt input signal will result in a 20 volt output swing. This would be sufficient to drive the amplifier into saturation, using a 20 volt power supply! But, using negative feedback, we can drop the closed loop gain to 1000, and a ten millivolt signal will then result in 10 volts of low distortion output.

Notice that the input signal required is at a low level due to the high gain of the amplifier we are using. The actual signal at the input to the amplifier, is the output signal divided by the open loop gain! Remember, the feedback reduces the level of the input signal . . . it does not reduce the

gain of the amplifier.

In the case just mentioned, with a closed loop gain of 1000, and 10 volts of output, the input signal of ten millivolts is actually reduced to 100 microvolts by the feedback, illustrating the fact that the input signal with feedback must always be very small. With this fact in mind let us examine the table in Figure 2, which has been made up with aid of the formula in Figure 1. Note that the gain of the amplifier with feedback is independent of the open loop gain of the amplifier, so long as the closed loop gain is much less than the open loop gain. (A big gain reduction).

Figure 3 is a table which illustrates the fact that the closed loop gain depends only upon the amount of inverse feedback, and shows how the gain changes when the amount of feedback is changed.

Since the input signal is reduced by the feedback, you may be asking yourself how this can happen. For example, if we apply a signal of

several volts from a previous stage, how does it become reduced to microvolts? Figure 4 shows a generator, connected to an amplifier with feedback. Note the use of a series resistor between the two. (If the generator has a high series internal resistance, the added resistor may be unnecessary.)

If the signal is reduced to close to zero volts at the input to the amplifier, there must be a very low impedance at the input to the amplifier. This low impedance comes about because of the negative feedback into the input . . . a fact which we mentioned earlier in this article. Pursuing this point further, the output of the amplifier is also a low impedance, because we are sampling the output voltage by means of the voltage divider . . . and a change in output voltage causes a change in feedback voltage in such direction as to tend to restore the output voltage. Thus a change in loading has little effect on the output voltage, which is a constant voltage source, and therefore must be a low impedance! If we had taken the feedback voltage from a resistor in series with the load (a current sampling resistor) as in Figure 5, the feedback would tend to hold the output constant (a constant source) which is a high impedance output. By now you must be appreciating what was discussed earlier in this article about impedance changing!

As a matter of fact, the ordinary emitter follower is a single stage amplifier, with close to 100% feedback. As a result, the gain is very low (close to one). Since the feedback is 100% of the voltage across the emitter load, which is directly fed back into the emitter, the output impedance is very low. You now are

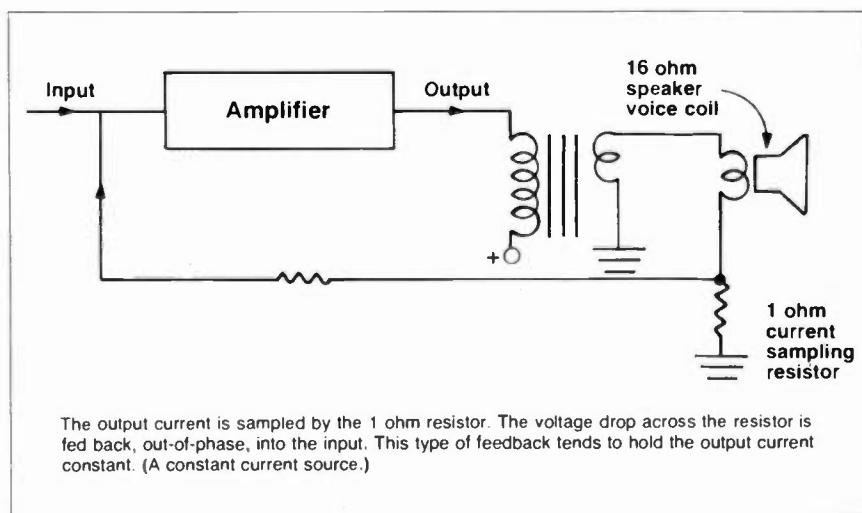


Fig. 5 Current proportional feedback.

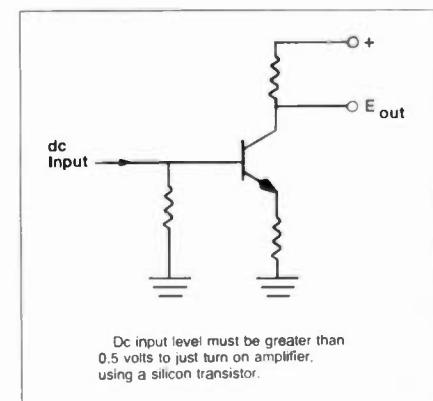


Fig. 6 A conventional transistor amplifier.

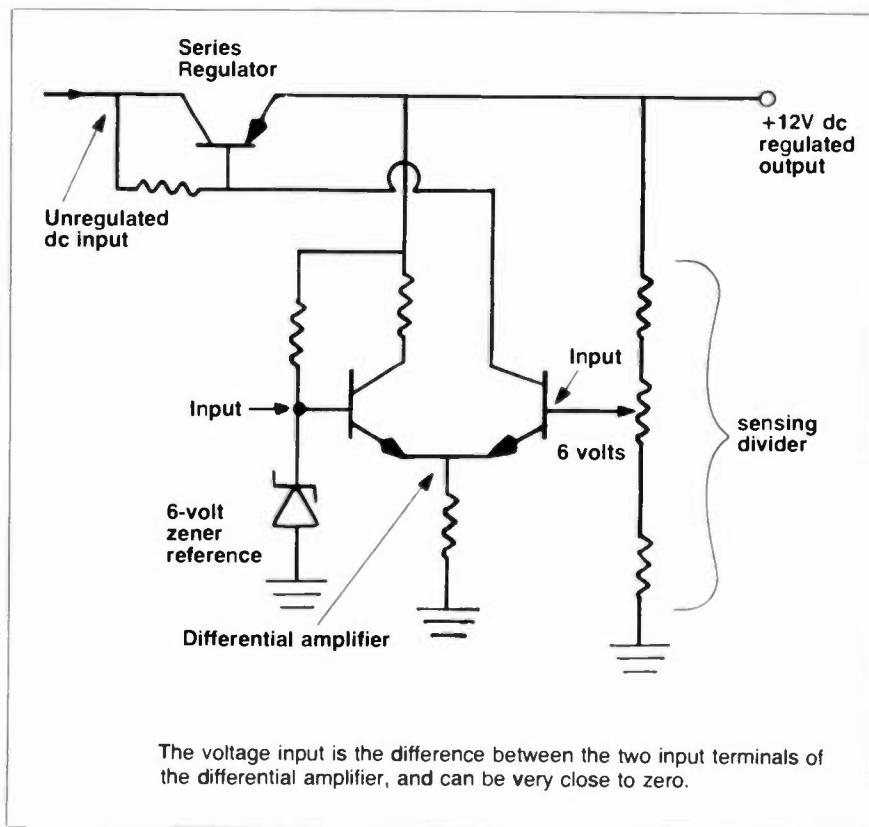
looking at the common emitter follower from the inverse feedback point of view!

Now, back to Figure 4. It is often inconvenient to have an amplifier with a very low input impedance. To get around this, most op amps use a differential amplifier, which has two inputs, out of phase with each other. We can now use one input for inverse feedback, and the other input for the signal. Or we can tie one input to an unvarying source (ground, or a reference voltage) and feed both the inverse feedback and the signal into the other input. So far as the differential amplifier is concerned, THE INPUT IS THE DIFFERENCE BETWEEN THE TWO INPUT TERMINALS.

This arrangement has some advantages. With an ordinary amplifier such as in Figure 6, the input voltage must be more than 0.6 volts dc if we are to go down to direct current (zero frequency). Many amplifiers must be capable of dc operation. With the differential amplifier shown in Figure 7, in a voltage regulator, there is very little difference between the two inputs, but the amplifier can handle a dc voltage differential input close to zero volts . . . which is essential in a voltage regulator.

Stated another way, the single input amplifier always has about a half volt offset (dc) at the input, since the input is between the emitter and the base, and the transistor requires a half volt of dc in order to turn on. (The differential amplifier input is between the two bases, and therefore can be close to zero). Further, the emitter/base voltage changes with temperature, close to two millivolts per degree centigrade. If the transistor starts cold, and ends up hot . . . or if the environment changes (as in automotive service) . . . the base/emitter voltage can easily shift two tenths of a volt. This is a very large change (40 percent).

The differential amplifier does not have this problem, since both sides of the amplifier change at closely the same rate, and therefore track each other, maintaining close to zero difference. Thus the differential amplifier is stable with temperature. As a matter of fact the differential amplifier does not respond to anything that affects both sides of the amplifier equally. This is called "common mode rejection" . . . therefore changes in power supply voltage have very little effect on the output. Since modern



The voltage input is the difference between the two input terminals of the differential amplifier, and can be very close to zero.

Fig. 7 A differential amplifier.

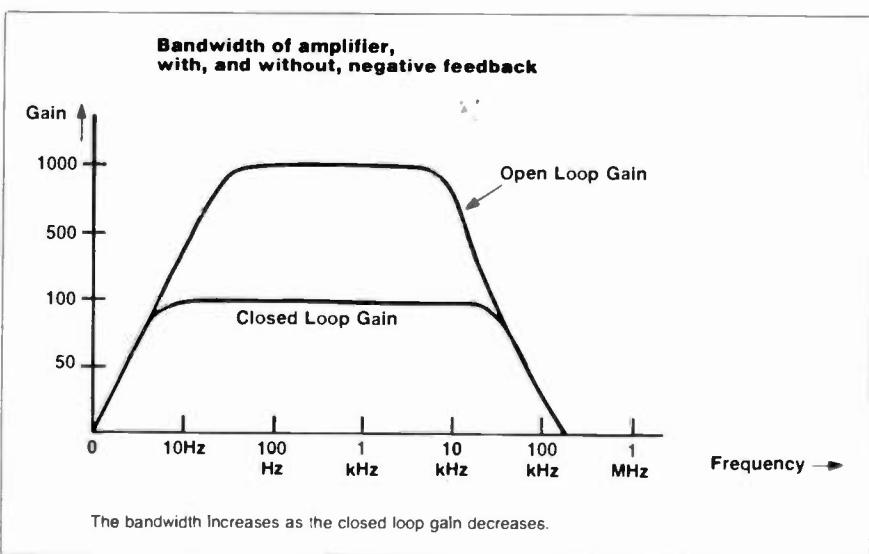


Fig. 8 The relationship of negative feedback and bandwidth.

differential amplifiers are integrated circuits, in which both sides of the amplifier are made on the same chip, at the same time, of the same materials, in the same way, they are so closely alike that such op amps and diff amps have great common mode rejection (CMR). Before the advent of ICs it was necessary to assemble these amplifiers from discrete components, which, of course, were not so well matched. As a result the IC op amps and diff amps are superior to amps made of discrete components. In pre-IC years, good op amps were quite expensive, due to

the careful component matching required . . . but matching is a natural result of IC fabrication, and the IC amps are not only good, but are also quite inexpensive.

We mentioned earlier that negative feedback *changes* the bandwidth and the distortion in an amplifier. (Note that the word was "changes" and not "reduces"). Most texts merely state that negative feedback reduces distortion, and increases bandwidth, but this is not correct. It depends upon how the feedback is implemented, and what the feedback is intended to accomplish. For example, if we are

using a frequency selective network in the feedback loop, in order to make an "active filter," we will actually increase the distortion, if we define distortion as a change in the shape of the waveform at the output of the amplifier, as compared to the waveform at the input of the amplifier. If we feed a square wave into an active filter input, we may wind up with a sine wave at the output. This happens because a square wave is a fundamental plus odd harmonics, while a sine wave has no harmonics. If the active filter is a good one, and is set to eliminate all frequencies higher than the fundamental (low pass), then a sine wave at the fundamental frequency will be the result. So you see that negative feedback does not necessarily "reduce distortion." It all depends on how we implement the feedback, and how we define "distortion."

Similarly, negative feedback may actually reduce bandwidth, as in the case of an active filter. A better statement is, "If you apply feedback around an amplifier in such a way that the feedback loop maintains an 180 degree (out-of-phase) relationship with the input signal, and if the feedback loop has a flat frequency response,

the feedback will increase the effective bandwidth of the amplifier, and reduce the distortion." Stated another way, "no phase shift, and a flat frequency characteristic." This tells us that the characteristics of the amplifier depend upon the characteristics of the feedback loop, so we have changed from an amplifier dependent upon the op amp's characteristics to one that depends upon the feedback loop's characteristics!

We are now independent of the amplifier's drift, etc., but we need very stable components in the feedback loop. Do not expect low drift if you use composition resistors in the feedback loop . . . they drift with time, temperature, humidity, etc. (especially in high values over 100,000 ohms). You must now use metal film resistors. Similarly you can't use ordinary disk capacitors intended for bypass applications. You will need to use high stability polystyrene or mica capacitors. And so it goes . . .

This will all be very evident if you look at the tables in Figure 2 and Figure 3, which show that the gain of the amplifier is independent of the gain variation of the amplifier, and directly dependent upon the values of

the resistors in the feedback loop.

For the moment, let us assume that you are using stable components in the feedback loop, and that the loop has good phase and frequency response. Then, and only then, is it true that the feedback will increase the bandwidth, and reduce the distortion. In the case of bandwidth, you can see how much the bandwidth is increased by referring to Figure 8, which shows the open loop frequency response curve of an amplifier with a gain of 1000. Superimposed upon it is the closed loop gain of 100. Notice that when we reduce the gain the bandwidth automatically increases! You can make your own graphical solutions in the same way.

Now, on to distortion. That turns out to be quite simple, since the effect of changes inside the amplifier are reduced by the same amount as the gain is reduced. Thus if an amplifier with 10 percent distortion has its gain reduced by a factor of ten, the distortion will also be reduced ten times, and becomes only 1 percent distortion! Simple, isn't it?

The reason the distortion is reduced is that the input signal and the feedback are out of phase at the input to the amplifier, and thus tend to "cancel" each other. *Distortion in the output* is fed back out of phase to the input, but there is no signal component to reduce it (cancellation), thus the distortion fed back is quite large, and after going through the inverse feedback loop, literally is forced to "commit suicide" through the process of "non-cancellation."

In a TV set, the video amplifier must handle not only the ac signal present, but also the dc (brightness level). If the dc level is lost, we need a dc restorer to restore it again. Similarly, in voltage regulators, the dc level must be amplified. In process control instrumentation, one volt may indicate a quarter of a tank full of chemicals, etc. Thus we often need an amplifier that goes down to dc. The op amp, or the diff amp, provide an easy way to handle these situations.

To come

In part II of this article, to follow, we will look at some practical differential amplifiers, and operational amplifiers . . . how the feedback loop is implemented . . . applications . . . and troubleshooting procedures. In addition, an overview of the different types of operational amplifiers will be provided. **STD**



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Circle No. 110 on Reader Inquiry Card

Electronic Security

A Natural diversification for the Electronics Technician

Your electronics distributor has a different perspective, an overview of the consumer electronics sales and service business that most shop owners don't have. Here is how one of them views the security business.

by George Kanelos*

Recent advances in electronic technology have resulted in consumer and commercial products that infrequently, if ever, require service or repair. Consequently, the market upon which many electronic technicians depend for professional survival is rapidly eroding while the costs of living and doing business continue to rise. Increasing numbers of technicians are thus confronted with the classic problems of maintaining income and business growth in a depressed market. The simplest solutions, however, are often overlooked - the opportunities available through diversification. Diversification, of course, is not unknown to electronic technicians. Historically, it has been confined to three areas:

- (1) Sales of consumer audio-video products
- (2) Installation of sound, intercom and communications systems
- (3) Installation of CCTV and MATV systems

Although all three remain potential vehicles for diversification, they generally require substantial capital investments in space, personnel and inventory. Their viability is therefore limited to those technicians with the necessary resources. A fourth alternative, offering exceptional income opportunity yet requiring minimal investment, is the sale,

installation and service of electronic burglar and fire alarm systems. With a more than sufficient technical foundation, an existing customer base and the invaluable experience gained from managing his own business, the electronic technician may find electronic security the most natural diversification. To effectively evaluate the practicality of diversifying into electronic security, a fundamental understanding of the industry is necessary. Briefly, the electronic security industry serves three major market areas: residential, commercial and industrial/institutional. Over 10,000 companies, ranging in size from one or two man proprietorships to giant national corporations, provide its many services to end users in every city and town in the nation. Its products are supplied by hundreds of manufacturers through a network of independent, regional and national distributors. The constantly increasing demand for its services has resulted in an industry wide growth rate exceeding 20% annually and a virtually limitless market. Additionally, public awareness, heightened by the media's emphasis on crime reporting and the first hand experiences shared by the majority of Americans, contributes significantly to the desire for electronic security protection.

Further analysis of the electronic security industry's profile reveals that all the criteria necessary to support successful diversification are present.

First, the industry's markets are multiple and dynamic. As the risk of loss and cost of replacement increase, electronic security protection becomes a more attractive investment. Indeed, in many commercial, industrial and institutional applications, the need for electronic security is reinforced by insurance carriers who demand its installation prior to underwriting coverage, legislatures which require its installation and penalize for lack of adequate protection, and law enforcement

agencies which recommend its installation since they are no longer able to maintain an effective preventive role unaided. In the residential sector, both homeowners and apartment dwellers are encouraged to install electronic security systems by insurance carriers who provide premium discounts for even minimal protection. In many municipalities, building codes, governing all types of structures, are requiring installation of electronic fire protection systems before occupancy can be granted.

Second, along with multiple markets, the electronic security industry provides both short and long term income options. Systems may be sold outright for greater immediate return or leased over a period of years. Although immediate revenue is reduced, the lease provides significantly greater return over its term than the outright sale and with the excellent probability of renewal, may perpetuate itself indefinitely.

Another long term income option is the addition of leased or contracted services to either the sold or leased system. The two most commonly added services are maintenance and monitoring.

After the system warranty has expired, maintenance or service may be provided on an as needed basis with appropriate billing for time, parts and labor. The desired alternative is a service contract covering time, parts, labor and periodic inspections.

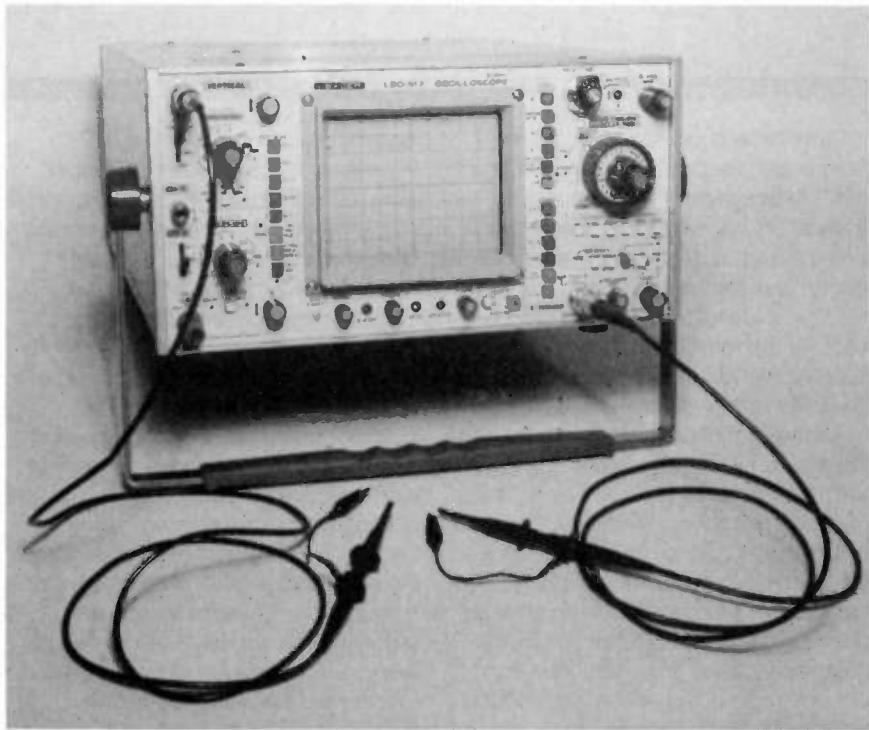
Conceptually similar to the initial system lease, the service contract provides long term recurring revenue and the probability of renewal.

Monitoring is the foundation upon which success in the electronic security industry is based. It is a round the clock service of overseeing a customer's security system from a remote location via a telephone line. Status signals from the customer's premises are

continued on page 39

*Wm. B. Allen Supply Co., New Orleans.

TEST INSTRUMENT REPORT



The Leader LBO-517 50MHz oscilloscope.
For more information circle No. 120 on the Reader Service Card.

Leader's LBO-517 50MHz Oscilloscope

Quality and Features

By Peter B. Credit

and an alternate triggering mode that permits measurement and comparison of two signals that are unrelated in frequency.

In addition, the signal providing trigger to the main timebase can be instantly identified and displayed by pressing a pushbutton. Other features include a rectangular CRT with graticule illumination, a calibrated delayed timebase which allows for accurate measurements and observations of complex waveforms or long pulse trains, and the capability of displaying the main and delayed timebases simultaneously, resulting in displaying both the complete waveform and the expanded section at the same time.

The specified bandwidth of the LBO-517 is 50MHz at -3db (it exceeded this in testing) with a rise time of 7ns.

The vertical deflection factor is 5mv/cm to 5v/cm in 10 calibrated steps. A $\times 5$ multiplier adds 1mv/cm and 2mv/cm steps for frequencies below 10MHz.

The accuracy is $\pm 3\%$ and $\pm 5\%$ with the $\times 5$ magnification. The input impedance is $1M\omega \pm 2\%$, ($35pf \pm 3pf$) with a

maximum input voltage of 600v (dc plus ac peak).

The different modes for the timebase generator are, main time base only (TB), main time base intensified by delayed time base, delayed time base, and main time base alternated with delayed time base. The main (A) time base sweep speed is calibrated in 22 steps from $0.05\mu s/cm$ to $0.5s/cm$ in a 1-2-5 sequence. The B time base is calibrated in 20 steps from $0.05\mu s/cm$ to $0.1s/cm$.

There is a $\times 10$ magnifier that extends at any timebase setting the sweep speeds of the main and delayed time bases to $5ns/cm$. The accuracy of the time base is $\pm 3\%$ unmagnified, and $\pm 5\%$ magnified. The delay time is continuously variable, a multiplier with 1000 divisions.

The different modes of the main time base triggering are auto, normal, and single shot using ac, dc, LF reject (removes signal components lower than 5KHz), HF reject (removes signal components higher than 20KHz), TV vertical (a shaping filter whose low frequency output is used for triggering) and TV horizontal.

The delayed time-base triggering sources are internal and external, with an immediate mode (B sweep begins immediately after delay time) and a triggered mode, (B sweep begins after first trigger occurring after delay time).

Both the main time base and the delayed time base triggering have a maximum input voltage of 600v (dc plus ac peak). On the rear panel of the LBO-517 there is the CH-1 output control which provides an amplified output of the channel 1 signal which can drive a frequency counter, the CH-3 control which positions the channel 3 (main time base trigger) trace on the CRT, the CH-4 pull quad control which when pulled displays as channels 3 and 4 the signals being used to trigger the main (A) and delayed (B) time bases, provided the alternate or chop push button is also in. Also on the rear panel is the Z-axis input connector which is used to apply signal to intensity modulate the CRT, and the CH-4 external input which is used in applying an external signal to the oscilloscope for delayed (B) time base triggering and display as the channel 4 trace; and the B sweep triggering level control which is used to select the amplitude level at which the sweep is triggered, and the B sweep triggering source switch which selects either internal or external CH-4 trigger signal for the delayed (B) time base.

I thought the quality of construction
continued on page 39

BULLETIN BOARD

Described as a "crash course" in digital electronics, **Handbook Of Digital Electronics** by John D. Lenk and published by *Prentice-Hall* has just been introduced. The book was written with five classes of readers in mind. The engineer who must design with (and program) digital devices, the technician who must service digital electronic equipment, the programmer/analyst who wants to relate programs and software to digital hardware and finally, to students and hobbyists who want an introduction to digital electronics. The various classes of readers start from different learning points but the book brings them all up to the same point of understanding by descriptions that are technically complete, yet written in simple nontechnical terms wherever possible. An excellent book for anyone desiring a knowledge of digital electronics.

Circle No. 121 on Reader Inquiry Card

Service dealers can now buy Sony parts direct from *Consumer Products Distributing, Inc. (CPD)*, at money saving prices. CPD, the largest Sony distributor in the Mid-West, has extended its regional direct marketing of Sony parts to include service dealers throughout the United States. National advertising by the company began in March. In commenting about this market expansion, Dan Harp, CPD General Manager said, "Direct marketing is cost efficient because service dealers save time, money and can reduce their inventory. CPD has been doing direct marketing of electronic parts since 1969, and has the experience, efficiency and the inventory required to make buying direct from us profitable for our customers. Volume purchases of parts by CPD keeps prices down. Our inventory of 7,028 Sony video, audio and Betamax parts is stocked in depth. Parts are shipped within 24 hours of receipt of order." For specific Sony parts price information and/or a CPD credit application contact: Dan Harp, General Manager, CPD, Inc., 330 Pagosa Court, Indianapolis, IN 46226. Phone: (317) 897-4602.

Circle No. 122 on Reader Inquiry Card

A 32-page product guide, **COS/MOS Digital Integrated Circuits**, COS-278H, describing RCA's extensive CMOS

product line, is now available from *RCA Solid State Division*. The product guide is intended as an aid to designers in the selection of optimum device types for specific applications. It provides maximum ratings, recommended operating conditions, static electrical characteristics, classifications and selection charts, and functional diagrams for the complete line of 121 B-Series (20v absolute maximum rating) and 70 A-Series (15v absolute maximum rating) CMOS digital integrated circuits. The material is organized in sections on B-Series ICs, A-Series ICs, packages, ordering information, product classification, function selection, and functional diagrams, with supplemental listings on microprocessor, memory and timekeeping circuits. The product description covers a broad range of small, medium and large scale integrated circuit functions from simple gates to complex counters, registers and arithmetic circuits. The products cover both standard circuit types for commercial and industrial applications and high-reliability slash (/) series types for aerospace, military and critical industrial applications. Copies of the product guide, COS-278H, may be obtained from *RCA Solid State sales offices* or by writing to *RCA Solid State Division, Box 3200, Somerville, NJ 08876*.

Circle No. 123 on Reader Inquiry Card

Answers to quiz

- | | | |
|-------|-------|---------|
| 1. b. | 5. c. | 10. h. |
| 2. d. | 6. f. | 11. g. |
| 3. e. | 7. c. | 12. a. |
| 4. f. | 8. f. | 13 True |
| 9. a. | | |

TEST INSTRUMENT REPORT

continued from page 38

of the LBO-517 was above average for most imported oscilloscopes of similar type due to its all steel case (which should help in shielding RFI), an aluminum front panel which is bolted to an aluminum sub panel, glass epoxy printed circuit boards and IC's that plug in. The internal layout and construction is very

neat and compact also.

Another feature that I like is the abundant use of lighted indicators that indicate "out of calibration," "magnification on," "main time base triggered," "single shot ready," and power on.

Since the maximum input with a X10 probe is 50v/cm (400Vp-p for a full height trace) the X100 probe would be useful and would extend the input capability to 1600V as well as offering an input impedance of 100 megohms in parallel with about 8pf.

The size of the LBO-517 is 11 1/4 x 6 1/4 x 14 3/4 inches and weighs 25 1/2 lbs. It comes with a full two year warranty and is supplied with two probes and a very complete manual.

ELECTRONIC SECURITY

continued from page 37

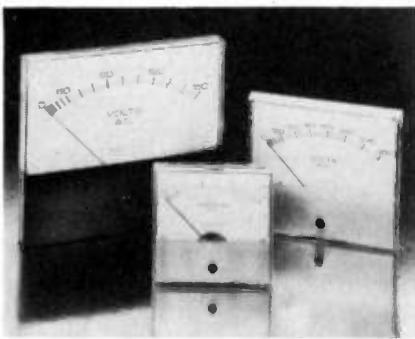
continuously transmitted to the remote receiving station over either an existing or dedicated telephone line. It is the responsibility of the receiving station to immediately report any change in status requiring a response.

The police department would be notified in the event of a burglary or hold-up, the fire department in the event of a fire, paramedics in the event of a medical emergency and the installing company's service personnel in the event of a down system. Heating, air conditioning and refrigeration systems may be similarly monitored. Monthly fees for monitoring services range from an average minimum of \$20.00 for a residence to hundreds of dollars for a commercial or industrial installation.

Third, the electronic security industry offers an abundance of competitively priced, readily available, easily installed and reliable equipment. Most major manufacturers and distributors provide extensive support services including free application installation and troubleshooting guidance. Reference material such as the Wm. B. Allen Supply Company's Security Products Catalog can be an invaluable source of introductory information for the serious neophyte as well as the experienced professional. National, state and local trade associations can also provide information and considerable assistance to the sincere beginner.

Finally and most importantly, the electronic security industry presents the opportunity for the electronic technician to utilize his knowledge and skills while building a rewarding and profitable business.

NEW PRODUCTS



Panel Meters

Circle No. 130 on Reader Inquiry Card

Weston Instruments announces the availability of a new family of analog ac panel meters, in their Mustang® line of precision ac and dc instruments. This new 7500 Series employs a pivot-and-jewel-suspension iron-vane movement, reportedly providing direct, true-RMS measurement of ac voltage and current despite wide frequency changes or severe waveform distortion. (The other ac meters in the Mustang line use rectifier circuits combined with a taut-band dc movement, and are inherently average-responsive, although calibrated RMS). The 7500 Series specifications indicate a $\pm 2\%$ f.s. accuracy at 60Hz, with an operating frequency range of 25 to 500Hz for the ammeters, and 25 to 125Hz for the voltmeters. A choice of eight standard ranges is available: 0-10 or 100 milliamperes, 0-1, 2, or 5 amperes, and 0-50, 150, or 300 volts. All are available in $2\frac{1}{2}$ ", $3\frac{1}{2}$ ", and $4\frac{1}{2}$ " sizes. Ranges up to 500 volts are available on special order.



10MHz Oscilloscope

Circle No. 131 on Reader Inquiry Card

Scopex Instruments Ltd. introduces a dual-trace, solid-state oscilloscope that is said to be particularly easy to use. The model 14D-10, provides a switched-

mode power supply, a reported sensitivity over its full bandwidth at 10MHz of 2mV, an add and invert facility and X-Y operation. Additional features include a display area of $3.9" \times 3.1"$ (100 mm \times 80 mm) and full probe compensation. Designed for industrial, telecommunication and educational applications, the instrument is said to be accurate to $\pm 3\%$. The add and invert facility enables computer service engineers to align floppy disk drives and other peripherals. The pushbutton X-Y function, suitable for Lissajous figure experiments, may be coupled to logic analyzers for microprocessor applications. The vertical system's (channels A and B) sensitivity can be adjusted from 2mv/division to 10v/division in 12 calibrated ranges. Channels can be operated jointly, alternately, chopped, in the XMODE (channel A switched to the horizontal or X deflection system while channel B remains the vertical or Y amplifier) or the add and invert facility can be called into play. Sweep speeds can be adjusted from 1 msec/division to 100 msec/division in 16 calibrated ranges. A pull-knob enables sweep speed to be increased by a factor of 5 to raise speed to 200 nsec/division. Channel A may serve as the trigger circuit or an external trigger may be applied. The instrument is $6.1" (155 \text{ mm}) \text{ high} \times 12.2" (310 \text{ mm}) \text{ wide} \times 17.1" (435 \text{ mm}) \text{ deep}$ and weighs 11 lb (5 kg). It can be operated from 210/250 v or 105/125 v, 48/60Hz ac supplies. High-impedance probes, a protective muff and a light hood are optional. Inquiries from potential customers and agents in the United States are welcomed by the company or may be sent to BIS.

Power Surge Device

Circle No. 132 on Reader Inquiry Card

A new 220 volt, power surge control device that protects computers, communications, medical and other electronic equipment from destructive voltage transients, has been introduced by *RKS Enterprises, Inc.* The new product, called Surge Sentry Model SS-220-H, simply plugs into any standard 220 volt outlet to provide immediate protection from transients. In operation, the SS-220-H detects short duration voltage surges, and immediately shunts all unwanted or potentially dangerous voltages. The new device is said to be able to respond in picoseconds and has a reported dissipation of 600,000 watts at 100 microseconds. Rapid response is especially important because high voltage transients, even of durations shorter

than 1 millisecond, can cause misregistration, false logic, misindexed programs, false triggering of circuits, premature component failure, hazardous shorts, and even electrical fire due to arc-over. Another feature of the SS-220-H is a neon light that lets the user know, at a glance, that the device is functioning properly. In addition, because the device works in parallel with the power line, the SS-220-H will reportedly not interrupt equipment operation in the unlikely event it malfunctions. The SS-220-H measures 4.7 in. high, 2.5 in. wide, 1.5 in. deep and weighs approximately 5.8 ounces (163 gm). Surge Sentry is also available in 120 volt and OEM versions, with several other versions in development.



Compact Truck Body

Circle No. 133 on Reader Inquiry Card

A new fiberglass body designed for use with compact and mini pickup trucks is being introduced by the *Handy Mandy Trailer Mfg. Co.* The model MV-90 is directly mounted to the pickup frame, and has 180 cubic feet of interior space. Body weight is said to be the lightest in the industry at 17 oz. per square foot. Additional specifications include a body length of 90 inches, an overall height of 72- $\frac{3}{4}$ inches and an overall width of 72 inches. The overall weight, mounted, less interior equipment is 325 lbs. The MV-90 can be ordered individually, or supplied with a compact pickup.

Aluminum Electronic Packages

Circle No. 134 on Reader Inquiry Card

Nordal Electronics Company introduces its new line of aluminum boxes for electronic packaging that can be made in any size with no tooling or set up charges. The box and removable cover are made of .032 aluminum. These boxes can be used to package RF circuits, amplifiers, filters, oscillators, magnetics and other electronic circuits. The boxes can be used alone or

mounted on a PC board to provide a shielded package with a removable cover. Special packages can be made with holes for connectors, feed-throughs, standoffs or mounting brackets. Delivery is two weeks.



LCD Hand-Held Multimeter

Circle No. 135 on Reader Inquiry Card

The TM354 from *Thandar* is a compact 3½ digit, hand-held, pocket multimeter featuring a large ½ in. liquid crystal display, 0.75% basic accuracy, and is said to provide 2000 hours battery life from one 9v alkaline battery. The meter provides five functions in 14 ranges permitting measurement of dc volts (from 1mV-1000V) ac volts (from 1v-500v) dc current (from 1µA-200mA) resistance (from 1Ω-2MΩ) plus diode check. Supplied with test probes and protective vinyl pouch, the TM354 is designed and manufactured in England, and carries a full 1 year warranty.

35MHz Scope

Circle No. 136 on Reader Inquiry Card

A new 35MHz, dual channel portable KIK-Scope with a delayed sweep and automatic switching of alternate and chop mode, has been introduced by *Kikusui International Corporation*, a subsidiary of *Kikusui Electronics*, Japan. Called the Model 5531, the new scope is similar to the familiar T935A but offers several additional capabilities. For example: the 5531 features auto focus for sharp pictures and a metal housing that minimizes external RFI interference. The ADD mode coupled with a channel 2 invert allows both A + B and A - B measurements. It reportedly has a 1mV sensitivity at 15MHz and the ability to operate the

Our new model 128 has a beeper and a whole lot more. After you've seen it we think you'll agree that this is the best all around field service DMM available. It beeps on all three functions—V, Ω and A—and on all ranges

for each function. Applications are virtually unlimited. It "displays" a standard digital readout, an audible tone for rapid over/under checks and an over/under arrow.

The sound choice. Unique 128 design enables you to verify forward conduction and reverse blocking of semiconductor junctions, test LEDs and check multiple junction components. Even with the beeper on, the 128 maintains 10MΩ input resistance. You can calibrate both the beeper threshold and the A/D without disassembling the instrument.

The 128 is human engineered with a large, 0.6" display, rugged ABS case and display window, 350-hr battery life and overload protection.

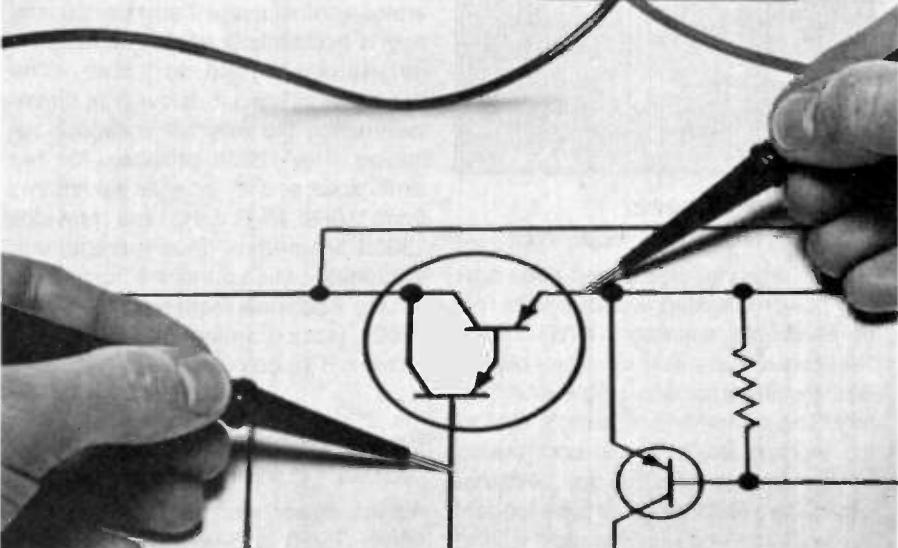
Much less versatility can cost much more than \$139.

The 128 is the sound choice because it's the smart buy. Contact your local Keithley representative or distributor.

Nothing less than the best.

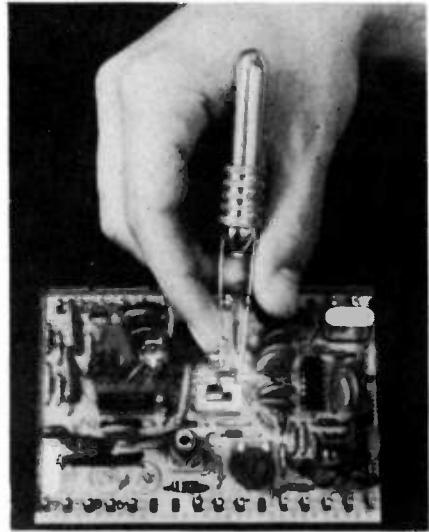
KEITHLEY

Keithley Instruments, Inc.
28775 Aurora Road / Cleveland, OH 44139
(216) 248-0400 / Telex: 98-5469



Circle No. 111 on Reader Inquiry Card

delayed sweep in a triggered mode. Small and compact, the Model 5531 measures 370mm × 165mm × 470mm and weighs approximately 10kg. The 5.5. inch rectangular, internal graticule CRT has 8 × 10 divisions, each measuring 9.5mm. The Model 5531 is completely modular. All internal construction is on plug-in boards and, in the event of trouble, a board swap-out program assures fast maintenance turn-around and minimum down-time. It comes with a 2-year warranty (CRT, one year). Sales are made on a 30-day "satisfaction-or-your-money-back" basis. The horizontal axis (sweep time) for Channel A (main sweep) is said to be 0.5 μ sec/div in 20 steps. Sweep time for Channel B is the same, but in 11 steps. A 5X magnification can accelerate the sweep time to 0.1 μ sec/div. The 5531 is said to be conservatively rated at dc to 35MHz (-3dB). Normal sensitivity (deflection factor) is 5mv to 5v/div in 10 ranges. Operational modes are Channel 1, Channel 2, Dual (automatic switching Alternate and Chop), Add and X-Y. There are four trigger sources for Source A signals (internal, external, External + 10 and Line), plus internal trigger modes for Signal source B (Ch 1, Ch 2 and Norm). Trigger coupling includes ac, HF rejection and dc.



Precision Tweezer

Circle No. 137 on Reader Inquiry Card

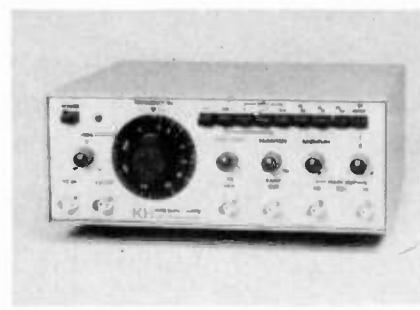
Desco Industries has added three battery powered lighted tweezers to its line of electronic assembly aids. These tweezers all have stainless steel blades and are powered by a single AAA battery. The powerful lamp directs light to the working point. A low cost plastic case model is available for field tool cases. Two stainless steel case models are available, one with a straight tip and

one with an angle tip. The stainless steel cases reportedly will last many years on the industrial assembly bench.

Voltage Regulators

Circle No. 138 on Reader Inquiry Card

Motorola has introduced a series of 3-terminal positive voltage regulators capable of supplying in excess of 30 amps over an output voltage range adjustable from 1.2v to 33v. These voltage regulators—the LM150/250/350—require only two external resistors to set the output voltage. Internal current limiting, thermal shutdown and safe area compensation are employed, reportedly making these devices virtually failure-proof. The LM150 series serve a wide variety of applications, including local on-card regulation, adjustable switching regulation, a programmable output regulator, or as a precision current regulator. Motorola offers this 3-terminal adjustable-positive voltage regulator in a TO-3 metal case and in an industry standard TO-223 plastic case.



Function Generator

Circle No. 139 on Reader Inquiry Card

Krohn-Hite introduces its new function generator, the model 1200A. The 1200A features the Krohn-Hite Waveguard™ output protection circuitry, which reportedly prevents damage to the generator's output stage if an external voltage is accidentally applied across the generator's output terminals. The Waveguard™ circuit recovers automatically when the external voltage is removed. The 1200A provides 20v p-p sine, square and triangle waveforms from 0.2Hz to 3 MHz and provides 1500:1 linear up or down sweeps, with adjustable sweep durations from 1000s to 1ms. Additional features of the Model 1200A include variable dc offset and auxiliary TTL output.

Power Supply

Circle No. 140 on Reader Inquiry Card

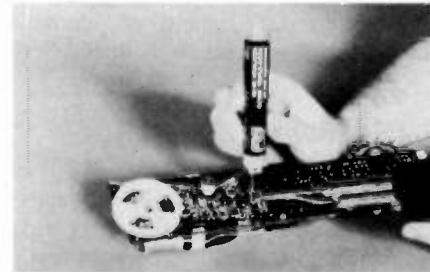
Adtech Power, Inc. has introduced the Model S5-20, a 5-volt, 20-amp open-

frame switching power supply. Designed around Adtech's patented Univerter™ design, the new unit is the first of a family of 100w Adtech switching power supplies. It is suitable for a line range of 90 to 135 vac or 180 to 270 vac selectable, and a line frequency of between 47 and 440 Hz. Efficiency is said to be more than 72% at full load, 115 or 230 vac at 25° C. Other output specifications include: compensation for up to 0.5v line drop; output overvoltage protection crowbar fixed at 6.25 ± 0.75 v; and output current limitation to 150 percent or less. The Model S5-20 is constructed on a single PC board. The input and output is through a 10-terminal barrier strip mounted on the PC board. Dimensions are 2-1/4 × 5 × 9 inches. Options include a power fail warning signal, dc input and a pre-load device.

Test Pattern Generator

Circle No. 141 on Reader Inquiry Card

The Signal Source 1209 from *Visual Information Institute, Inc.*, is a new selectable scan rate test pattern generator that is capable of testing all types of closed-circuit television displays, computer terminals, medical equipment, security systems, etc. It includes an internal sync generator that provides H drive, V drive, blanking and sync outputs, plus a test pattern generator which has a complete set of functions—gray scale, window, flat field, crosshatch, dots, resolution and color bars. The Signal Source 1209 is enclosed in a leather briefcase for portability and field use and is 7" high × 21" wide × 13" deep.

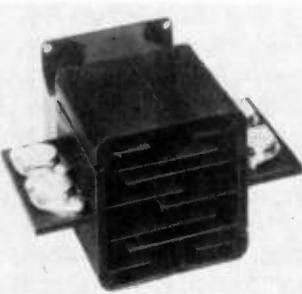


Solder Repair Kits

Circle No. 142 on Reader Inquiry Card

A line of solder repair kits for making fast, easy repairs on a variety of electrical and electronic connections in the home or workshop is being introduced by *Fry Metals, Inc.* Fry Solder Repair Kits feature triple core solder dispensers that assure continuous flux flow while soldering fine wires and other connections. Offered in both 60% tin/40% lead, and 40/60 combination rosin dispensers. Also included is a handy pre-

mixed solder cream dispenser tube. Used with a soldering iron or gun, Fry Solder Repair Kits come with application information and are ideal for electrical wiring, antennas, speaker leads, appliances, TV's, and radios. Packaged on full-color 6" x 6" blister cards, a complete rotating carousel rack is available. Literature is available on request.



Heat Sinks

Circle No. 143 on Reader Inquiry Card

Heat Sinks Plus has announced its 6031 Series forced air cooling package which is a two piece modular constructed unit designed for mounting and cooling electronic components. The 6031 Series is constructed from Heat Sinks Plus' 6031 extrusion with a unique fin design that offers less air flow resistance resulting in maximum heat transfer and optimum thermal performance. The 6031 Series is specifically designed to be used with a mini boxer type fan (3.2 in. square) and the three inch quadrant shown will accept two TO-3 style devices for a total of four resulting in a maximum input with minimum temperature rise. The 6031 Series is available with steel or glass filled nylon end plates. The two piece quadrant construction is available in any given length and can be ordered without shelf for stud mounted devices.

Audio Meters

Circle No. 144 on Reader Inquiry Card

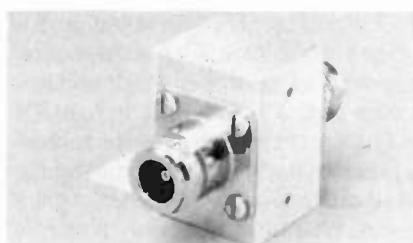
A new type of audio meter that indicates actual loudspeaker power dissipation is now available from *Hutco, Inc.* Designated the PWP-80 Peak Power Meter, this instrument reportedly has a dynamic measuring range of 30dB and a standard indication range of 0.1w to 100w. The PWP-80 meter is said to have a frequency response range of 20Hz to 20KHz and is flat over that range to \pm 0.5dB. It reportedly can tolerate a full power peak overload of 1000w, with a recovery time from a maximum overload of 1.2 seconds. All driving circuitry for the PWP-80 is self-contained within the meter case. A 15v

power supply is required with a maximum drain of 25ma. The meter is designed to be connected in parallel with the loudspeaker line, directly across the coil. Manufactured by Nippon Keiki Works of Japan, the PWP-80 is a product of a company with 600 employees and annual sales of about \$25 million. Nippon Keiki has a worldwide reputation for quality and sold about \$1 million worth of products to United States customers last year.

Portable Desoldering System

Circle No. 145 on Reader Inquiry Card

The new Hot Vac 4000 Desoldering System from *Ungar* contains a built-in vacuum pump allowing it to be used at any location in a factory, repair center or field location where normal ac electric power is available. The solder is melted by the heated tip, and the vacuum is actuated by a switch located on the biomechanically designed handle. The solder which is removed is retained in the built-in solder reservoir which may be easily emptied, even when the heater is hot. Tip temperature is adjustable from approx. 500 to 1000 degrees F., allowing the Hot Vac 4000 to be used on a wide variety of applications. The temperature sensing heater is said to provide instantaneous temperature recovery, and transient spikes are fully suppressed making it safe for desoldering MOS and other voltage sensitive components. The Hot Vac 4000 includes a built-in handle holder and a convenient handle for easy carrying. A variety of different size tips for various applications is also included.



Lightning Suppressor

Circle No. 146 on Reader Inquiry Card

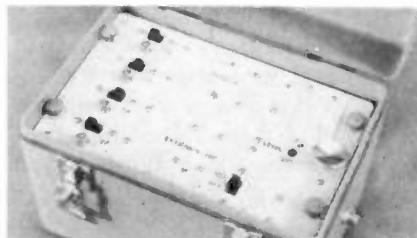
Poly Phaser Corporation introduces its new lightning suppressor, the Zap Trapper[®]. Specifications include a bandwidth of 0.1MHz to 1000MHz, an insertion loss of 0.1 db max at 00MHz, a VSWR of 1.15:1 at 1000MHz, an impedance of 50 ohms, RF power of up to 750 watts, turn on time of approximately 1 μ sec, turn on voltage of 280 vdc and a typical surge rating of 10,000 amps. The Zap Trapper can be installed directly

into the transmission feedline and is available with either N or UHF type connectors.

Portable Capacitance Selector

Circle No. 147 on Reader Inquiry Card

Ohmite introduces its new portable capacitance selector, the Cap-Ranger. The Cap-Ranger allows over 10,000 values of capacitance to be selected, ranging in value from 100pF to 11.111 μ F. Slide switches permit the selection of values in steps of 100pF. The Cap-Ranger is suitable for both ac and dc circuits due to the absence of electrolytic capacitors in its circuitry. Cap-Ranger terminals will accept stripped leads, space lugs or banana plugs. Two safety features are included in the Cap-Ranger: a case grounding terminal is provided in addition to two measurement terminals, and internal resistors discharge capacitors when switches are in "off" position. When used in conjunction with Ohmite's companion Ohm-Ranger, the Cap-Ranger allows easy determination of RC time constants. The size of the Cap-Ranger is 4" x 6" x 1".



CATV Signal Generator

Circle No. 148 on Reader Inquiry Card

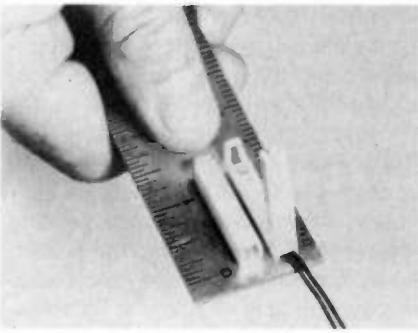
A new signal generator, designed expressly for aligning the subchannel equalizers in two-way CATV systems, has been introduced by *Extronix, Inc.* The new unit generates picture carriers for channels T7, T8, T9 and T10, separately switchable and adjustable. The output may be inserted into the system at any convenient tap and adjusted to any level up to +45 dbmv in 75 ohms. The signals can then be used for adjusting the equalizers at each successive return amplifier along the cable. The unit is small (6x8x9 in.), light in weight (6 lbs.) and battery operated. It may be used outdoors with the gasketed housing closed against the weather. Model SCAG-4-D requires eight D-size dry cells which is said to last 120 hours. Model SCAG-4-N includes eight C-size nickel-cadmium cells with charger, pilot light and detachable power cord.

SECURITY PRODUCTS



Voice Driver

Circle No. 149 on Reader Inquiry Card
Bestek International Corporation announces its new voice synthesis system, the Voice Driver. Utilizing a microprocessor voice synthesizer for fire and burglar warning, the Voice Driver can replace siren drivers or bells and can be installed using existing wiring. Both systems are user programmable to announce "fire" and "burglar" in five major languages. Features include two channels (burglar & fire), 6 or 12 vdc and an output that is said to be 110 db at 12 vdc.



Magnetic Switch

Circle No. 150 on Reader Inquiry Card

An ultra small surface mount magnetic switch that fits in hard to install places and features a unique mount disguising method is being introduced by *Sentrol, Inc.* Both the magnetic switch unit and the actuating magnet are encapsulated in plastic that includes a mounting flange that accommodates screw, nail, sticky tape or epoxy mounting. Once attached,

the switch and/or magnet unit snaps in place hiding the mounting method. In addition to the size and installation advantages, the new Sentrol contact provides wider gap distance tolerance and thus helps provide more false alarm protection due to loose-fitting doors or windows. The unit is available in both off-white and mahogany brown color and in normally open, normally closed and single pole double throw configurations. The switch is encapsulated in epoxy to resist dirt, moisture and corrosion as well as having rhodium plated contacts that reportedly do not cold weld. The units are said to have a life expectancy of 10,000,000 cycles.



Home Surveillance System

Circle No. 151 on Reader Inquiry Card
Zenith Radio Corporation has introduced its "Video Sentinel System," a television viewing, home surveillance and door-answering system, all-in-one. The Video Sentinel System consists of a new 12-inch diagonal black-and-white television set which incorporates special circuitry for the system's video monitor and intercom functions, a closed circuit video camera with stand, and a doorbell intercom unit. A three-button control panel on top of the television/monitor puts a homeowner in total TV viewing and home surveillance control. By pressing the "TV" button, the regular television programming appears on the screen. When the "Camera" button is pushed, the TV picture comes from the location of the camera (front porch, nursery, garage, backyard, etc.), and, anytime the "Talk" button is pressed, one may listen and talk to a front door caller. If the homeowner wishes no program interruptions from the automatic Video Sentinel System while watching TV, a "Camera Defeat" button on the bottom front of the set will automatically shut off the video portion of the system. In the event a visitor rings the doorbell intercom box and no one is home, the Video Sentinel System automatically

shuts off after four to five minutes. The closed circuit video camera, with stand, may be mounted to wall or ceiling in rooms within, or outdoors on porch, or under roof overhang. The doorbell intercom box is intended to replace a homeowner's current doorbell button. When pressed, it activates the doorbell as well as both the intercom and video portions of the entire Video Sentinel System. The television/monitor (model M129P) features complete VHF and UHF channel reception; solid state chassis and picture tube design; signal processing circuitry, and a solid state audio detector system. The video camera features solid state design; standard C-mount; 16 millimeter F 1.6 lens; quartz-crystal-controlled circuitry; fully interlaced scan for clear picture; automatic light level control; $\frac{3}{4}$ -inch Vidicon camera tube for sharp focusing and low power consumption; and a special wide angle lens adapter is available as an option. The Video Sentinel System comes with a 60-foot camera/TV cable to connect the camera to the TV/monitor and a 25-foot audio cable to connect the intercom box to the camera.



Electronic Demonstrator

Circle No. 152 on Reader Inquiry Card

"Demo 90," a new electronic demonstrator from *Fire Burglary Instruments Inc.* is now available to dealers as a tool to educate consumers in electronic security. "Demo 90" combines graphics and audio to demonstrate the principles of today's electronic security systems for homes and businesses. The "Demo 90" will also give prospective buyers hands-on experience with a working system plus demonstrating virtually all the refinements available. The "Demo 90" comes in an attache-style case measuring 22" x 17" x 3 $\frac{1}{2}$ " and weighing 9 lbs. It is provided with interchangeable graphics illustrating typical residential or commercial installations. It plugs into any ordinary wall outlet. The

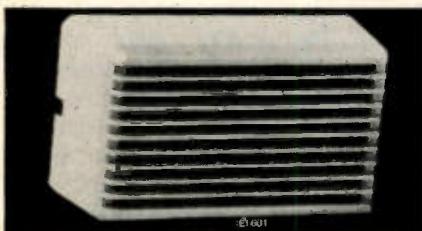
"Demo 90" illustrates a simple perimeter loop, key-operated switching and digital key switching, as well as delay zones, zone bypassing, panic/fire, telephone cut line and zone memory. A digital readout shows the message transmitted to a central station by a direct wire, McCulloch or dialer. And the unit accepts plug-in sensors, either passive infrared or ultrasonic, to demonstrate interior traps. To accompany the unit, Fire Burglary has produced a new consumer brochure, with room for imprint, to leave behind after demonstrations. Full information on the "Demo 90" and the companion brochure can be obtained from authorized Fire Burglary "stocking" distributors nationwide.



Dealer Demonstration Kit

Circle No. 153 on Reader Inquiry Card

DTI Security introduces its new security dealer demonstration kit consisting of nine different items to help illustrate a security system to a homeowner. The DTI demonstration case consists of: DSS-52 UL and Fire Marshall approved control panel, DCU-12 digital remote arming station, DFM-50 fire module, DSR-50 siren driver, pre-alarm buzzer, speaker siren with loud-soft adjustment, battery and transformer, simulated floor plan with switches, and a removable file folder with presentation portfolios. All are manufactured by DTI Security.



Miniature Motion Detector

Circle No. 154 on Reader Inquiry Card

International Electronics, Inc. introduces its new miniature ultrasonic motion detector, the IEI-601. Features of the IEI-601 include an integrated circuit design, FM signal processing, LED walk light, and a 24 hour independent tamper

circuit. The range of the IEI-601 is said to be adjustable up to 30 feet depending on acoustics and objects in the room. The pattern is elliptical (football-shaped) approximately 30 feet deep × 20 feet × 20 feet. Pattern varies with acoustics, temperature, humidity and slope of room.

Two Way Radio Lock

Circle No. 155 on Reader Inquiry Card

A new two way radio lock has been introduced by *Equipment Theft Information Program, Inc.* to help prevent the theft of Motorola mobile two-way radios from trucks, buses, autos, off-road

equipment, boats, etc. The Fort Radio Lock uses a tubular key lock and file hard steel bars formed into a single weldment to help prevent the unauthorized removal of the radio equipment. The lock allows the selection of any of eight key positions by inserting a "change key" and turning it to the new key position, indicated by a click. (The "change key" does no locking or unlocking). Only the key that fits the new position will open the lock. Security can be continuously maintained if a key is lost or stolen by simply dialing to a different key. It is not necessary to change tumblers or the lock. The lost key will

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Circle No. 116 on Reader Inquiry Card

not open the lock. In operation, turning the key releases the lock bolt, then is withdrawn. The radio is fully operational inside the Fort Radio Lock. The method of installation is just as important to the security of the radio as the Fort Radio Lock itself. A mounting package is available consisting of hardened bolts with special heads, oversize washers and special locking nuts that are matched to the Fort Radio Lock. The radio lock can be mounted on the wall, ceiling or floor. Specify the length of the mounting bolts needed. The radio locks are available now for Motorola models: Micor, Syntor, Maxar, Moxy, Mitrek, Mocom and Industrial Dispatcher. Specify radio name, model number and wattage. Allow six to eight weeks for delivery.

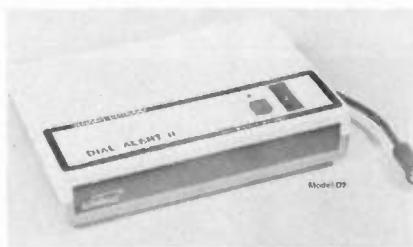


Motion Detector

Circle No. 156 on Reader Inquiry Card

A unique new motion detector that is said to be almost totally immune to environmental conditions and changes is now available from *Unisec, Inc.* Known as the DU-ED Dimensional Unified-Energy Detector, Model D-1, this new system provides total volumetric protection in areas of from 50 to 1000 square feet ($5m^2$ to $100m^2$). Each detector is self-contained and the number which may be paralleled on a single four-conductor unshielded cable is limited only by the dc capability of the optional power supply or the power supply in the alarm control unit. One detector requires 30 to 35 ma at 11 or 14 volts dc. Available in both surface and flush mounted models, the DU-ED may be painted or taped over without affecting performance. The area of protection is reportedly not affected by furniture or other obstructions, whether permanently installed or frequently changed

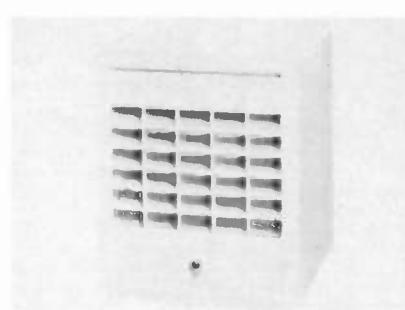
in size or location, making the DU-ED particularly effective in protecting warehouses or storage areas where contents frequently change. The Unisec DU-ED is also reportedly not affected by sunlight, mirrors, radio frequency interference, bells or other sounds, or normal air turbulence. No sensitivity adjustments are required, even with changing room conditions. In addition, the DU-ED self-compensates for extreme changes in temperature and humidity.



Telephone Alarm System

Circle No. 157 on Reader Inquiry Card

The Dial-Alert automatic telephone alarm system is a new security product from *Seaboard Electronics Co.* The Dial-Alert system warns of fires, burglaries, low or high temperatures, toxic gases and other hazards in areas that are frequently or occasionally left unguarded. There is a choice of two models, the D1 and D2. The D1 can be equipped with any or all of 12 sensors offered by Seaboard. The D2 can be used to report alarms from multiple locations and utilizes a sensitive microphone to pick up every sound in the protected area, such as a buzzing smoke alarm, or trespassers moving about or talking to each other. Another important application of either model is its use with a wireless panic alarm to summon help.



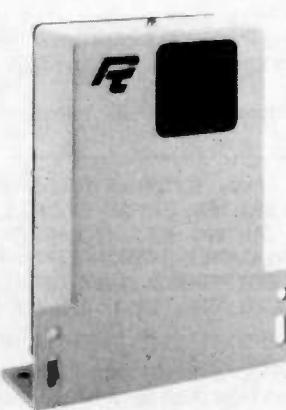
Photoelectric Intrusion Detector

Circle No. 159 on Reader Inquiry Card

Raytek introduces its new photoelectric intrusion detector system the Model 3150. The system consists of a transmitter and receiver. The transmitter emits a beam of invisible infrared energy to the receiver up to distances of 500 feet (152m). The receiver's alarm relay is actuated when an intruder crosses the beam interrupting the transmission of infrared energy. The 3150 is designed to operate with any alarm system. The receiver contains a SPDT supervised alarm relay. Both receiver and transmitter may be powered from plug-in transformers and optional stand-by batteries, or a control panel/power supply capable of supplying a minimum of 15ma per unit. The units are protected from tampering (system armed only) by a tamper switch arrangement which breaks the beam upon removing either cover. All connections to the units are

false alarms because of its logic circuitry. This logic discriminates against natural background variations and optimizes detection of real intrusions. The detector provides wide area protection. A single sensor is reportedly capable of guarding an area or room to a range of approximately 50 feet (17 meters). Since the PIRS 75 is passive, multiple sensors can be installed in proximity to each other without interference. The large field of view makes alignment of the sensors uncritical. The sensor is designed to mount directly to the wall. Horizontal and vertical adjustments are made internally to the optic. Being passive, the power requirements of the sensor are minimal which results in high reliability and long life. RFI feed-through filters insure high protection from false alarms caused by most radio frequency interference.

made via barrier strips with clamp type terminals. Keyhole mounting makes installation fast and easy. Holes are also provided to mount the units on standard single gang electrical boxes. Cable ports for concealed wiring are integral to the base. Fingertip adjustable optics, LED alarm indicator and a readily available clip-on alignment light provide easy alignment to cut installation time to a minimum. All processing, alarm and charging circuitry is located inside a protective inner housing. Features of the 3150 include: pulsed active infrared beam, 500 foot (152m) range, and 12v ac or dc operation.

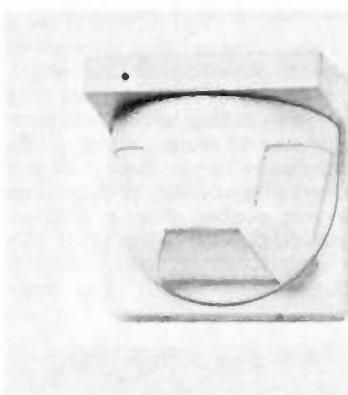


Photoelectric Control

Circle No. 160 on Reader Inquiry Card

A new long range self-contained pulsed infra-red photoelectric control has been announced by *Reflection Technology*. The series 4000 controls are available for proximity, retro-target, or through-scan applications. The range in the through-scan mode is 700 feet and retro-target range is 45 feet with no proximity effect. The range in proximity mode is 10-20 feet depending upon the target reflectivity. The sensitivity adjustment controls the range from zero to the stated maximum. Typical applications include counting, intrusion sensing, position detecting, routing detection, traffic control, web guiding or brake detection, automatic door control and many others where noncontact sensing of any material object or liquid is required. The control requires only a few minutes to align as two LED indicators are provided as a standard feature. The first LED indicates the status of the output, and the second LED indicator is a variable brightness LED, with the intensity proportional to the received signal strength. Once aligned and the receiver sensitivity set, further adjustments are reportedly not necessary, regardless of changing ambient conditions. No focus-

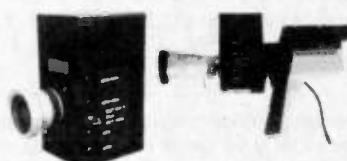
ing is said to be required and no special tools are required for installation or alignment. The control is enclosed in a die-case aluminum enclosure and is rated for NEMA 1, 3, 4, 5, and 12. A large selection of control and interface options are available for interfacing to industrial control systems, relay logic, motor control centers and computers. The operating voltage is 117 vac, 230 vac, or 12-30 volts ac or dc.



Intrusion Detector

Circle No. 161 on Reader Inquiry Card

The Advisor 480 is a high security passive infrared intrusion detector from *Aritech Corp.* The sensor protects 17 zones in a 180° field of view. One sensor can provide coverage of a 30 x 40 foot room. Dual thermopile operation reportedly provides high detector sensitivity while canceling background clutter. The detector can alarm at background to target differentials of only 1°C and targets moving as slow as 1.2 inches per second. The Advisor 480 has adjustable sensitivity and balanced detection logic making it highly immune to false alarms. There are built in test points that allow the installer to monitor the background environment. The Advisor 480 can be used as a stand alone detector or as a sensor in an Aritech 230 or Advisor VIII multi sensor system.



Time and Date Generator

Circle No. 162 on Reader Inquiry Card

A time and date generator from *Visual Methods, Inc.*, is now available for 16mm film cameras and video porta pack television cameras. The VMI TD-143 unit attaches to any "C" mount

camera and optically annotates the edge of the film or vidicon camera. The information is located on either side, the top, or the bottom of the film frame. After an initial set-up the TD-143 keeps accurate time and date for four years and does not have to be reset until leap year. Time and date are set-up via four push button switches and one toggle switch. The set time and date are viewed via LED indicators through a window. The TD-143 is powered by 117 vac with 8-hour battery stand-by available during power failure, or 12vdc from the porta pack batteries. The TD-143 screws onto the front of the camera and adds only 3½ inches to its length. It is 6 inches high by 3¾ inches wide and finished in black anodized aluminum. A unique feature of the TD-143 is that any "C" mount lens may be used—including wide angle 4.8mm or 6mm lenses without the rear element of the lens hitting the film camera shutter blade. Applications for the TD-143 include automatic teller machines (ATM) in banking, pollution monitoring cameras, and other industrial applications requiring time and date annotation.



Ignition Lock

Circle No. 163 on Reader Inquiry Card

Wolo, the automotive security systems manufacturer, is marketing its new Auto Watchman, Model 2000, Ignition Lock Protector. The Auto Watchman is said to protect all American and Foreign vehicles with the ignition lock on the steering post. The Auto Watchman reportedly installs in seconds; prevents the use of lock pullers, master or duplicate keys from freeing the steering wheel, transmission, and starting the engine. Made of stamped steel 1/8 in. thick, double linked hardened chain (4000 lbs. tensile strength) and plastic covered so as not to scratch the steering column. The Auto Watchman locks with a high security double-bitted key. Finish is a chip-resistant crinkle paint. The Auto Watchman is skin packed on a four color display card.

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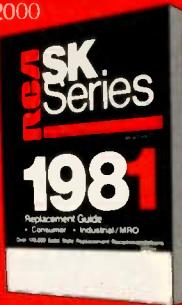


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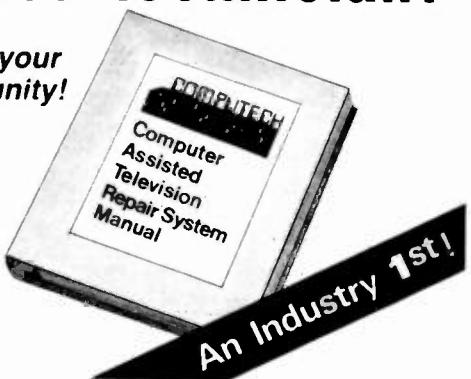


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AD INDEX

Circle No.	Page No.	
101 Alarm Supply Co	5	133 Handy Mandy Trailer
Avreco, Inc	3	Mfg Co. 40
102 B & K Precision	10	134 Nordal Electronics
103 Computech	50	Company 40
104 Consumer Products		135 Thandar 41
Distributing, Inc	7	136 Kikusui Intl Corp 41
105 Controller Systems		137 Desco Industries 42
Corp	CV 2	138 Motorola 42
106 Cooper Group	CV 4	139 Krohn-Hite 42
107 Diversified Mfg. & Mktg	22	Institute Inc 42
108 Electronic Book Club	11	140 Fry Metals, Inc 42
109 Fluke Mfg. Co, John	CV 3	141 Visual Information
110 Imperial Screen Co	30	142 Heat Sinks Plus 43
111 Keithley Instruments		143 Hutco, Inc 43
Inc	41	144 Ungar 43
North American Phillips	13	145 Poly Phaser Corporation 43
112 Optima Electronics	3	146 Extronix, Inc 43
113 Pomona Electronics	31	147 Ohmite 43
114 Power Sonic Corp	22	148 RCA 49
RCA		149 Reliable Fire
		Equipment Co 45
116 Zenith Radio Corp	14,15	150 Sentrol, Inc 44
		151 Zenith Radio Corp 44
		152 Fire Burglary
		Instruments Inc 44

SECURITY PROD.

Circle No.	Page No.	
116 Reliable Fire		
Equipment Co	45	149 Bestek Intl. Corp 44
117 Zenith Radio Corp	14,15	150 Sentrol, Inc 44
		151 Zenith Radio Corp 44
		152 Fire Burglary
		Instruments Inc 44
153 D T I Security	45	153 D T I Security
120 Leader Instruments	38	154 International Electronics
		Inc 45
		155 Equipment Theft
		Information 45

TEST INSTR. RPT.

Circle No.	Page No.	
120 Leader Instruments	38	156 Unisec, Inc 46
		157 Seaboard Electronics
121 Prentice-Hall	39	158 Fire-Lite Alarms, Inc 46
I22 Consumer Prods.		159 Raytek 46
Distr., Inc.	39	160 Reflection Technology 47
123 RCA Solid State		161 Anitech Corp 47
Division	39	162 Visual Methods Inc 47
		163 Wolo 47

NEW PRODUCTS

Circle No.	Page No.	
130 Weston Instruments	40	This index is furnished for the readers' convenience.
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