ET/D

MARCH 1982 • $1.50

ELECTRONIC TECHNICIAN/DEALER

LEADING THE ELECTRONIC
SERVICE MARKETS

Security System Installation

Satellite TV

Computer Programming

CCTV

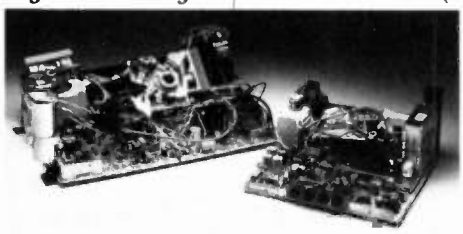
HBJ A HARCOURT BRACE JOVANOVICH PUBLICATION

Eye-opening news from NESDA/ISCET. RCA's serviceability rated:

'Excellent' again!

"Serviceability continues to receive recognition from RCA as a very worthwhile project. Two of RCA's new chassis, CTC 111C and CTC 115A, have again earned the highest possible serviceability rating category...EXCELLENT... by incorporating serviceability features required by the NESDA/ISCET serviceability rating criteria."

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



CTC 111C chassis serviceability: Excellent.

CTC 115A chassis serviceability: Excellent.

ISCET's 92.16% (CTC 111C) and 90.70% (CTC 115A) ratings were good news to us. They mean that some of the most demanding critics in the industry agree that we've succeeded in designing chassis that are easy to troubleshoot. Here are some reasons why they think so:

All subassemblies plug into chassis. No tools are needed to remove the CTC 115A chassis (main circuit board). After you've removed the cabinet back, unplug subassemblies and the chassis is ready for removal.

Roadmapping on both sides of the board. Although the ColorTrak chassis use single-sided circuit boards, double roadmapping 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.

All that means is that when you do have to repair our new ColorTrak chassis, in most cases you can fix them quickly and easily.

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

RCA

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For your free subscription to RCA COMMUNICATOR, our magazine of news and advice for service technicians, write: RCA, Dept. 1-455, 600 North Sherman Drive, Indianapolis, IN 46201.

INDUSTRY REPORT

Home Video and Cable Top $3.7 Billion in U.S.

According to the *Home Video Yearbook* just published by Knowledge Industry Publications, Inc., consumer home video expenditures for principal segments of the U.S. market are estimated at $3.76 billion for 1980, a figure which is expected to more than triple to reach $12.5 billion by 1985. And the U.S. market is only part of the worldwide boom in cable TV, video hardware, and programming. *The Home Video Yearbook* points out, for example, that German consumers spent $440 million on video in 1980, while Japanese consumers are buying video cassette recorders at the rate of 1.3 million per year.

Among the facts chronicled in the 1981-82 edition of *The Home Video Yearbook* are the following:

- Of the 80.9 million U.S. TV homes, 21.7 million are basic cable television subscribers, serviced by 4300 systems; 10.5 million homes subscribe to pay services.
- Cable and pay TV account for more than half of U.S. home video expenditures.
- Seven major companies—ABC, CBS, RCA, Time Inc., Times Mirror, Warner Communications, and Westinghouse—have extensive home video activities in at least five distinct areas, with RCA involved in no less than 14 separate segment ventures.
- As of July 1981 there were approximately 1 million subscription television (STV) subscribers, representing a 150% increase from the 400,000 January 1980 figure.
- Japanese manufacturers will produce over 8 million VCR's in 1981, double the production rate of the previous year.
- For 1981, VCR unit sales are expected to reach the 1.5 million mark in the U.S.; approximately two-thirds of these are VHS-format systems, with the remaining one-third made up of machines of the Beta variety.
- By mid-1981, European households owned 2 million video cassette recorders—nearly one-third of these are in British homes.
- Videotext services or viewdata experiments that use the TV set as a display terminal are underway in 18 countries around the world.

VCR Use Copyright Infringement

The Ninth Circuit Court of Appeals October 19th, overturned a lower court decision and unanimously held that home use of video recorders constituted copyright infringement, and that while it had no way to enforce royalty payments against users, the VCR manufacturers are in some way accountable. The end result of this decision is totally unknown,and bills were almost immediately introduced in Congress to exempt home VCR use.

The Electronics Industries Association immediately issued a statement. Speaking on behalf of the Electronic Industries Association's Consumer Electronics Group, Jack Wayman, Senior Vice President, stated, "Today's decision of the Ninth Circuit Court of Appeals regarding prohibition of the use of the video cassette recorder to tape programming off the air for home use is unfortunate and disturbing for a number of reasons.

"It is our belief that the decision violates the public interest by prohibiting the American consumer from utilizing and enjoying a product which significantly improves the quality of their lives.

"We also believe that the intent of Congress was clearly stated in 1971 when it permitted private persons to record sound-only off the air for home use."

"The video cassett recorder is one of the most popular and the fastest growing products sold in the consumer market. There are currently more than 3 million in use. It has numerous uses, such as 'time shifting' of broadcast programs which the viewer otherwise might have missed. This type of 'time shift' recording thus increases the audience available to broadcasters who pay royalties to the owners of the copyrighted material. The popularity of the VCR also results from its use for the production of home movies and for the showing of prerecorded video tape on which royalties have already been paid.

"The issue in question has been in the courts for a number of years and we expect that this decision will not conclude the matter. We fully support any requests for rehearing in the Ninth Circuit Court, en banc, and finally at the Supreme Court level if necessary, in order to see this decision reversed."

N.A.P. Consumer Electronics Consolidates Product Service Operations

North American Philips Consumer Electronics Corporation's technical services, field services, consumer affairs, factory services, finance, and business development and planning departments are now all housed in new quarters in Jefferson City, Tennessee. The new facilities contain lecture and training rooms and offices for approximately 75 product service employees involved with Magnavox, Sylvania, Philco, and Odyssey products. N.A.P. product services operations employ approximately 800 people.

CASA Members Sue Mazda

Launching what could be a new series of lawsuits against automobile manufacturers and importers of foreign made cars, the Custom Automotive Sound Association (CASA) announced that its members filed suit for injunctive relief against Mazda Motors to abolish the practice of making radios standard equipment on new cars. The majority of Mazdas presently are sold in the United States with factory or port-installed standard equipment radios.

Defendants named in the suit are: Mazda Motors of America (Central), Mazda Distributors Northwest, Inc., and Toyo Kogyo Company, Ltd. The suit was filed on January 4 in Seattle, Washington, in the U.S. District Court for the Western District of Washington. Another suit specifically dealing with the eastern regions of the United States may also be filed.

The suit claims that Mazda should be found in violation of Section 3 of the Clayton Act and Section 1 of the Sherman Act for its "refusal to sell automobiles to Mazda dealers except on the condition that they also purchase a pre-installed radio with such automobiles." The plaintiffs state that Mazda monopolizes the autosound market by making radios standard equipment and includes the price in a single indivisible "base price" of the car. The suit claims that supposedly optional radios are often installed at port regardless of whether dealers or consumers wish to purchase such radios.

Plaintiffs names in the suit are "Sounds" on Wheels and Salem Sound Center, both of Seattle, Washington. The two firms operate businesses in Washington and Oregon.

Plaintiffs state that Mazda's "automobile radio sales practices have had, and increasingly have, the effect of appreciably restraining and substantially lessening free competition in the market for sound equipment." These practices are unlawful because they tie the sale of radios to new cars, the suit states.

In announcing the new litigation, CASA President Philip Christopher said that sales of aftermarket automotive sound equipment to Mazda dealers have notably declined because of Mazda's deliberate attempts to monopolize the new car autosound market. Christopher rebuked Mazda for denying consumers the freedom to select the sound equipment of their choice through radio standardization.

"Other importers and automobile manufacturers," said Christopher, "should view this suit as a warning against continued factory and port installation of standard equipment radios on new cars. This suit marks CASA's renewed determination to stamp out radio standardization as a means of monopolizing the automotive sound equipment market in the United States and Canada," Christopher said.

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LEADING THE ELECTRONIC SERVICE MARKETS
March 1982 Vol. 104, No. 3

FEATURES

On the Cover: Closed circuit television is an important part of commercial security and is a natural for anyone involved in video. Look into it. (Courtesy Northwestern Bell Telephone and Midwest Patrol)

DEPARTMENTS

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FROM THE EDITOR'S DESK

We've tabulated the results of ET/D's October readership survey. The results are fascinating. First, there are many small one- and two-technician shops in the consumer electronics service business—and for most of them, business is good. (For more than 90%, business has at least remained stable; for most, it has increased in the last year.) Everyone does TV work. Most do some stereo service, although a significant number apparently do none. Some small radios are still being repaired, but it is not a major business for anyone. Auto-sound is a significant part of the business for about half of you, and about half of you do TV antenna work. (I think you who aren't are missing a bet; most of the TV installations I see, rural or urban, would benefit from a good antenna.) Most of you do not service CB radio. It is not particularly difficult work; CB apparently is just about dead in most areas. It is good to see an ever-increasing, though slowly, number of our readers involved in medical electronics, industrial electronics, microcomputers and video games. While TV service in total will continue to decrease; the sales of electronic games is expected to grow tremendously—by 1000% for some companies in a single year— and insufficient thought is being given to service. It will be a struggle, but there may be an excellent opportunity for those who wish to service video/electronic games. The same holds true for microcomputers, although the manufacturers of microcomputers may be much more cognizant of service than are the game manufacturers.

Back to the survey—About half of you are engaged in both sales and service, the sales usually being TV sales. VCR and video disc sales are not as large a factor. This is a mistake—don't let the video specialists take over—don't be afraid of VCR sales and *service.* Nearly 10% of you are selling microcomputers—great! As we keep telling you, there is an obvious future here.

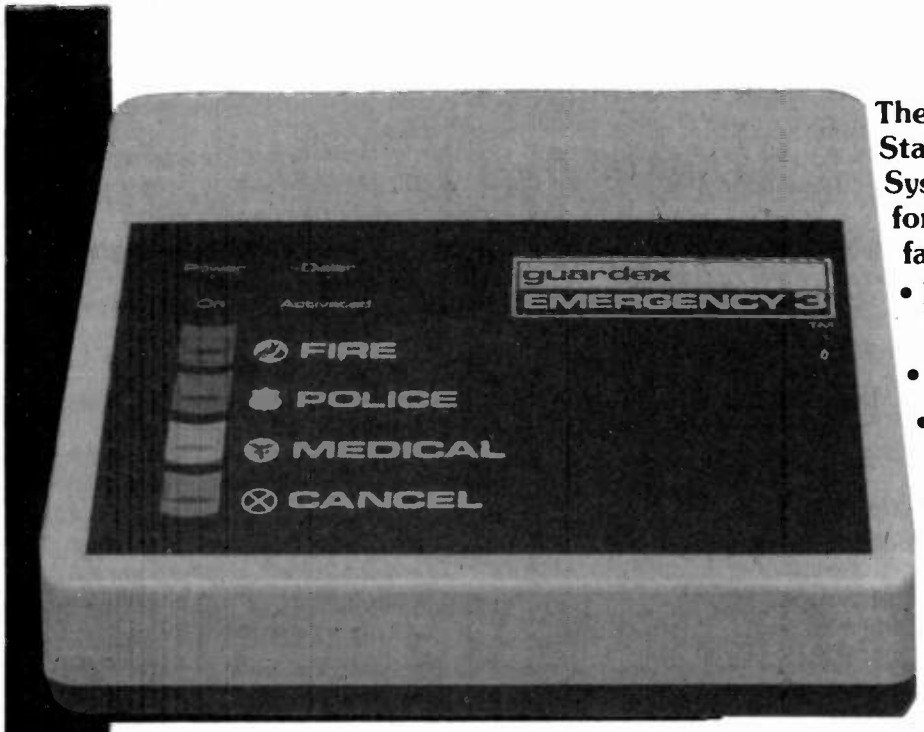
Replacement parts contribute significantly to the income of most shops. I hope this means that you are charging realistic prices for them, not that your labor charges are too low.

One last thing this month—your response on TEKFAX coverage indicates that ET/D should cover a broad spectrum of popular chassis *and* of less common brands. As we would expect, the smaller shops want popular brand coverage, the larger shops want us to emphasize the less common. We will cover some of both.

Sincerely,

Walter H. Schwartz
Editor

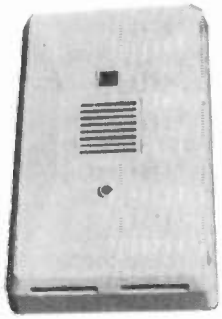
A Direct line to Help...



The Emergency 3™ Central Station Monitored Call Aid System is Here! Designed for people who need help fast...

- People with medical problems
- People who live alone
- People who want to protect their family
- Business executives - hostage targets
- Bank managers
- Liquor Stores, Gas Stations
- Any business with cash or valuables

and PROFIT



SIMPLE INSTALLATION

The Emergency 3 is a digital wireless system that comes standard with 2 channel panic button and photo-electric smoke detector transmitter. An optional cash drawer transmitter for silent hold-up is available. The Emergency 3's four channel digital communicator comes pre-programmed for T.E.M.S. computerized central monitoring station. This allows simple plug installation, with no field programming necessary.

Take advantage of this expanding emergency aid market. For more information call:

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LETTERS

RATES:

I took special note of your magazine's article by Dick Glass. Even though a reprint, it does indicate a need that a lot of TV shops around here need to realize.

A lot of shops around here, TV and stereo shops tend to run down another shop, for what they think is too high of a rate for repair work. Yet they are getting an average of 25.00/hr for shop labor.

I may operate for a Commercial outfit or those I know only, but I still figure an average $40.00/hr. rate on shop jobs. I do flat rate stereos (amps receivers, tuners) flat rates amps $40.00, tuners 35.00, and receivers 45.00. On TVs I find it hard to really flat rate them, so the hourly rate applies there.

Even with the above rates I can get a lot of work on sets that date back a few years. Of course I mostly work on stereos.

I do not get too many complaints, however I did get one Electronics tech. that thought that anyone with that kind of prices should be turned over to the better business bureau. I found out he is real smart on electronics, but he never ran a repair business. With this exception most of my customers are real happy with what I charge them.

I operate out of my basement and don't have high overhead, but I think a TV-electronics tech should make what he's worth.

I do want to add that there are some real good shops around here. It is the ones that are cut-throat that make it bad.

On two way radio, for a shop to make it here he has to remember that the only legal business from Motorola and possibly GE is sold on a service contract with their factory service. I think they have a set up where all their radios sold are registered at the factory for theft-prevention purposes.

I do assist a man who is a large commercial sound dealer. That is a good field for electronics techs. Keep up the good work fellow techs.

Bill Gilbert
4412 Waterbury Ln.,
Lincoln, NE 68516

TEKFAX:

The Nov. letter to editor by R-KTV of Philadelphia stated my position almost completely. The smattering of different models you used to cover got me by quite well altho I do subscribe to Zenith & RCA regularly. The coverage used to get me by on the occasional set I did not usually service.

Since I am in an area where a limited number of Jap sets are sold—I doubt very much that I will renew since the schematics were the reason I subscribed to start with. I would also like to see you list major part numbers. I would pay more if necessary for the above.

Willian G. Carter
Carter TV Service
Crawfordsville, Ind.

We intend to have from now on a mix of popular brands and less common brands. I hope we can satisfy everyone. Editor.

I'D LIKE TO SEE . . .

Would like to see more of start-up & shut-down circuits in your publication if at all possible.

Gabe Banvelos
12230 Klingerman St.
El Monte, California

I'D LIKE TO KNOW . . .

The testing and repairing of Pix tubes seems to be more of a problem than to all technicians, regardless of equipment they have.

I do have a model #465 and a good many adapters.

One of my friends has a #467 with all the adapters but it is not able to do the job. In two cases it has failed.

I would like to know if any of your readers have found a fool proof way.

John M. MacGowan
MacGowan Radio & TV
5040 Thomas Ave. So.
Minneapolis, Minn. 55410

Most of the better CRT checkers do a good job. There are also those now which do an almost miraculous job of emission restoration. Check them out. Editor.

GOING OUT OF BUSINESS:

I have for sale my entire tube stock for 75% off 1979 list price. They can be purchased in lots of 25 or more tubes or the entire inventory. Complete list sent if requested.

Robert D. Spachman
109 S. 5th St.
Souderton, Penna. 18964

You might enclose a SASE if you request his list. Editor.

HELP NEEDED:

Wanted: Heathkit MM-1 VOM. Send condition and price. Also Finco VM-100K meter movement or complete VOM with good movement. Send condition and price to J. Max Koone, Rt. 5, Box 32, Rutherfordton, NC 28139.

Thank you for your assistance on this.

J. Max Koone
Route 5, Box 457
Rutherfordton, NC 28139

WOW!

I am not a subscriber to your magazine "ET/D", but I work shops in the Boston area and read the owner's copies. Most owners are not technicians, and do not read the technical "stuff", only that which is pertainant to "sales" and perhaps to learn the "buzzwords" of electronics to maintain the illusion of competence with their customers. I am not knocking your publication, but I find most of the technical articles are directed to those who never question "authority" and have had any curiosity about life brainwashed out of them by the institutions of learning.

Questions like this, does anyone ask? "When using a digital pulser, does one disable the system clock or oscillator to first begin to 'squirt' the pulse into the 'suspected' chip?" The articles seem to be written by people who KNOW these procedures, but don't communicate with the "teaching" attitude with which they must have to convey their knowledge of troubleshooting. Perhaps they don't want to help others, and only want their name in print with "C.E.T." after it, and really convey to others that THEY know what they are talking about!

I am not a "joiner", so I don't belong to the various guilds and organizations. They simply refuse to deal with the real problems of this industry and only serve to be political stages for those in power to serve themselves. I have seen many techs who "passed" the CET "test" who are poor and sloppy beyond description. Organizations like these only serve those who control them, and maintain the illusions of the public.

But the "public" is smarter than all the techs and all the "trade" organizations put together. Why do bus drivers, plumbers, ditch diggers, and other "unskilled" people make more money than electronics people? Well, it's not the government, nor the school systems, nor the churches, but the greedy, and self-centered salesmen who sell the electronics goods and the skills to keep them maintained. There are also the "service reps" who "authorize" the shops to do warranty work with low rates, but allow phony claims for a kickback. In the meantime, the technician who is the backbone of this industry, receives less pay than a board-swapper in a computer factory, must have more skills,

Continued on page 50

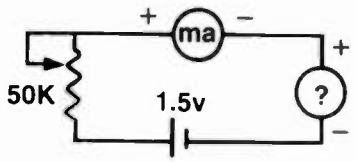
TECHNICAL SHORTS

By Frank Egner

Determining Meter Characteristics

Have you ever had a meter that you'd like to use as a dc voltage or current monitor—but didn't know the meter characteristics? Two values must be known: the full scale current, I-fs, and the meter movement resistance, Rm.

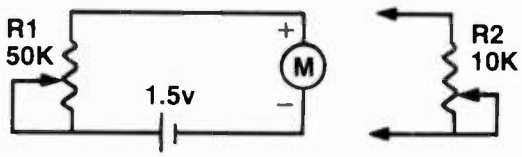
I-fs is easy to find, as shown here:



Adjust R for full-scale deflection and read I-fs from the milliammeter. Or use a 1000 ohm resistor in series, measure the voltage drop, and convert to current using Ohm's law.

Meter sensitivity is the reciprocal of I-fs. If I-fs is 1ma, 1/1ma = 1000 ohms-per-volt. If I-fs is 50 μa, the meter sensitivity is 20,000 ohms-per-volt, etc.

Measuring Rm with an ohmmeter prepares the meter for the trash can! Rm must be measured indirectly as shown here.



Adjust R1 for exactly full scale on M. Then connect R2 across M and adjust R2 for exactly half scale on M. Remove R2 and measure its resistance and you have Rm. Ohm's law proves it.

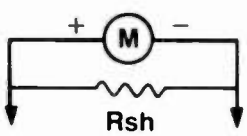
A series multiplier resistor can be added to make the full scale value of your choice:

R_{mult} = E-fs /I-fs minus R_m.

The closer R_{mult} is to the calculated value, the more accurate the meter indication will be.

If you want to use the meter as a dc current monitor, you'll have to connect a meter shunt, R_{sh}. You'll need both I-fs and R_m.

$E_m = ER_{sh}$ so $I_mR_m = I_{sh}\ R_{sh}$ and, transposing, $R_{sh} = I_mR_m / I_{sh}$.



If you want to measure up to 50ma full scale, and I-fs = 1ma and R_m = 400 ohms, then I_{sh} will be 49ma and I_mR_m / I_{sh} = .001 × 400 /.049 = 8.2 ohms.

You can series-parallel small-value resistors to make R_{sh}. The higher the full-scale current, the smaller R_{sh} must be.

If the present meter scale doesn't agree with your desired value, it's not much trouble to re-label the scale values. The scale will be linear from 0 to the desired full-scale voltage or milliamps.

Meter Loading Effects

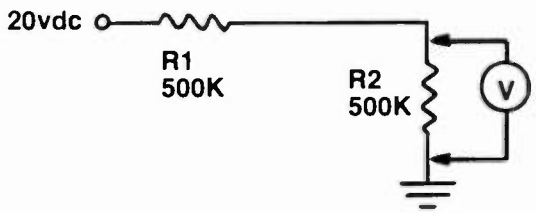
When we make voltage measurements in electronic circuits, we usually accept the meter indication as fact. But some of those measurements may contain considerable error—caused by the meter itself. We should be aware of these conditions.

The kind of meter being used and the circuit impedance at the point of measurement must be considered when accuracy is important. Even the latest and best measuring devices introduce loading errors in many situations.

Most transistor circuits are low-impedance circuits and voltage measurements are usually reliable. But field-effect transistors and vacuum tube circuits are high-impedance circuits—where voltage measurement errors caused by meter loading may increase substantially.

When a voltmeter is connected across a component, the internal resistance of the meter forms a parallel circuit with the component being measured. When the measurement is made in a high-impedance circuit across a high resistance, equivalent resistance can be reduced drastically. When resistance decreases, voltage and current must also change and the measurement will not reflect the true circuit conditions.

First, let's use a 1000 ohms-per-volt VOM on both the 10v and 50v ranges. On the 10v range the internal resistance of the meter is only 10,000 ohms. With 10k connected in parallel with R2, the equivalent resistance is only about 9.8k and the



meter indicates about 0.4v. That's a worst-case error that cannot be disregarded. On the 50v range, internal resistance is 50k and the results aren't much better.

The 20,000 ohms-per-volt VOM is usually considered to be reasonably accurate. On the 10v range, meter resistance is 200k. Equivalent resistance is about 143k and the meter indicates nearly 4.5v. On the 50v range, meter resistance increases to 1 Megohm. Equivalent resistance is about 333k and the meter indicates about 8v. It's evident that higher ranges are more accurate (less loading), but if too high a range is used, the deflection is too small to interpolate accurately.

On dc input, most oscilloscopes have 1 megohm internal resistance and provide accuracy about comparable to the 20,000 ohms-per-volt VOM for this particular measurement.

Many FET meters and nearly all digital voltmeters have a constant input resistance of 10 Megohms on all ranges. When connected across R2, the equivalent resistance is about 476k and the meter indicates about 9.75v. That's a considerable reduction in the error of the other meters. VTVMs typically have an input resistance of 11 Megohms on all ranges. Measurements with VTVMs are only slightly more accurate than with FET meters or DMMs.

The degree of error introduced by a meter depends on the circuit resistance, where and how the meter is connected, the voltage range, and the particular meter used for the measurement. In some circuits (some oscillators, for example), connecting a low impedance meter into the circuit to measure voltage will cause the circuit to malfunction and produce misleading symptoms.

A technician should know his test equipment and be aware of its capabilities and limitations. It can save him time and frustration.

AT THE BENCH

with Barry D'Iott

Giving Estimates

I'd like to suggest an approach to giving estimates that will inspire customer confidence and at the same time expedite the process.

First step: Ask, "What problems are you having?" You don't have to phrase it exactly that way, but don't ask, "What's wrong with your set?" This could lead a customer to think or say out loud, "I don't know, that's why I brought it to you." So always ask for the *symptoms*, not a diagnosis.

Say the customer says, "It has no picture." The next step is to turn the set on. This serves two purposes. You confirm the symptoms, and you are starting the repair process. The customer sees action! The set isn't being carried off to a shelf, it's being *looked* at!

It isn't necessary that the person taking in the set be a technician, only that he be able to spot the symptoms.

Step three can be a big timesaver. Say the set has raster but no video. There's no way of finding the bad parts without troubleshooting it, right?

But how concerned are customers about exactly which parts are bad? Aren't they mainly concerned about how much it will cost and how long it will take? Most shops will say, "We have to find out what parts are bad and then we'll call you with an estimate." Here, in my opinion, is a better way to do it. Tell the customer, "Most of the time trouble like this is caused by bad parts in the video amp circuit. Usually, we can repair it for under $95. If it runs under $95 can we just go ahead and fix it?" I find most customers say, "As long as it's not more than that, go ahead."

Tell the customer that if the repair should have to run over $95 you'll call them, but most of the time it runs under $95. (I use the figure $95 only as an example. What figure *you* use depends on your rate structure. Check you records and find the average amount you've been charging for repairing a dead set. Say it's $75. I think you'll find that a majority of your repairs will be within $20 plus or minus of your average.) So if you can get an OK up to $95, then chances are you'll be able to fix the set without having to stop work in the middle to contact the customer.

Exceptions: If the set is a tube type or a hybrid, it's better to give two figures. For example: It's $25 plus tubes if it's a tube trouble, and if it's circuitry work it's usually under $95.

Naturally, in this real world we live in, some customers will be insistent on an *exact* estimate; give them one in that case. What if the customer asks, "Is it worth fixing?" This is a tough question. If you say postitively "Yes," the customer may hold it against you the next time the set breaks down. If you say, "That's strictly up to you," you are asking the customer to make a decision he or she does not feel qualified to make.

A good thing to say in this circumstance is, "It would cost about $400 to replace it" (or whatever a comparable new set would cost in your area). This focuses the consumer's realization on the fact that if the set *isn't* repaired it will cost much more to replace it.

Exceptions: If a set is over 10 years old you might say, "Maybe you should think of a new set pretty soon, but you could fix this one up as a spare set or as a backup set. Even the new sets give trouble sometimes." Naturally, there are some sets which, from an economic point of view, aren't worth fixing—for example, a 15-year-old mongrel brand with a weak picture tube. But don't be too quick to turn thumbs down on it. Find out if the set has a sentimental value. Perhaps it was a gift. Also, people become attached to their old TVs the way you and I are attached to our teddy bears. Would you want someone to tell you to throw away your teddy bear because it's getting old and mangy?

It's good to remember that even though an old set might look like a hunk of junk, it has brought many hours of happiness to its owner. It should not be hastily condemned.

When will it be ready?

A bad answer: "It could take 5 days or 5 months."

Another bad answer: "It will take a week."

A better answer: We'll be starting on it within 5 days. Sometimes we get held up waiting for parts, but we set a target of within one week on a repair." This is a reasonable answer which should satisfy the customer and will not box you into a promise you might not be able to keep.

Streamlining your estimating process is going to save you a significant amount of time. Should you pass the savings on to the customer—or give yourself a well-deserved raise? Why not do both. It's a nice feeling to do something where everybody benefits.

SERVICE SEMINAR

PHONE NUMBERS

Here are a number of telephone numbers for parts departments of various manufacturers. (Courtesy of NESDA, NATESA and other sources.)

Admiral parts	1-800-447-8361
Frigidaire parts	1-800-282-0637
General Electric parts	1-800-241-0250
Hitachi parts & service	1-800-421-1040
Lectronic Inc.	1-800-325-3348
Litton microwave	1-800-328-7777
Magnavox parts	1-800-241-7790
MGA/Mitsubishi	
Customer relations	1-800-421-1132
Parts	1-800-421-1099
	1-800-262-1341 (CA)
Technical problems	1-800-421-1583
	1-800-262-4165 (CA)
Morse electrophonic	1-800-527-6422
Sencore	1-800-843-3338
Teknika parts	1-800-221-2106
Thordardson-Meissner	1-800-851-3583
Whirlpool parts	1-800-432-1604

Now, if all manufacturers would offer such services . . . .

PARTS DIRECTORY

EIA Replacement Parts Directory—A new edition of the annual Consumer Electronics Service Technician Replacement Parts Handbook has been published by the Parts Subcommittee of the Electronic Industries Association's Consumer Electronics Group Service Committee.

Prepared for the use of the servicer, the 65-page booklet offers a comprehensive inventory control and ordering system, including necessary forms and order sheets, according to Mel Gilson of Zenith Radio Corporation, Chairman of the Parts Subcommittee. It also provides a list of locations where parts are available for the consumer electronics products of EIA/

CEG member companies. For a free copy write: EIA, Consumer Electronics Group, 2001 EYE St. N.W., Washington, D.C. 20006, Attn: Gene Koschella.

RCA

CTC 58—Narrow raster, HV measures only 8-10 kv. Check, by subbing, all sections of filter C 104. (Ron's Service, Kimmel, IN)

CTC 85—Erratic picture jumping and loss of horiz. frequency (X-ray protection circuit activated—may shut down). Related to brightness and/or line volts. Check, by subbing, L 402.

CTC 87—Four blanking bars show at max brightness. OK at normal br. Check for open R 3044 in brightness limiter/blanker circuitry. (Ogletree's TV, Phenix City, AL)
Intermittent hour glass picture (Pulled in at center)—Check for open C 3077 cap (15 mfd 15v) across primary of pincushion transformer.

CTC 92—Very intermittent shutdown—Check for loose terminal strip mounting screw—supplies "hot" ground from aluminum heat sink ring to pin 2 of MDR module.

CTC 97—Intermittent shutdown. Appears to be over-current shutdown because Q 602 base goes high—but base remains high with CR 601 disconnected. Check for open R 620 (27k).

CTC 101—Excessive brightness, retrace lines. In "service" position, line increases in intensity until shutdown occurs. Color and focus controls vary brightness. Check for open connection on PW 5000 at pin 5 of the kine socket.
Insufficient width. Check Q 401 pin driver.

CTC 108—No picture or sound, no "ticking" noise from regulator circuit. Check for open Q 104 (B to E) regulator oscillator.

KCS 207—No raster. Check for open or shorted T 502 driver transformer. Courtesy of *The Vanguard* of the Electronic Service Dealers Assn. of N.J., Inc.

SYLVANIA

E12-01, 02—No horizontal sync, scalloped edges, pix moves to left or right. All components check OK. To correct: Check Zener diode SC 320 by substitution. GD Handy, Jr., Palm Springs, FL.

E21 Chassis. Severe snivet on right side of raster, diminishes as channel frequency is increased. Q400 horizontal driver transistor No. 13-39098-1.

E 48, 5,6,7—Tripler arcing.—No brightness following tripler replacement, HV OK. C448, .01 2 kV shorted, on deflection module. B. Hockman, Rockaway Radio, Rockaway Beach, N.Y.

NEXT MONTH IN ET/D

- VCR Maintenance
- Wireless Telephones
- Satellite TV

SECURITY VIEWPOINT

By John Sanger

I do not know about the rest of the business people, especially those who operate small businesses, but I suspect that there are many who become involved with the technical aspects of their products and services, shoving aside the simple, basic procedures. Unfortunately, I find myself reinventing the wheel occasionally—that is, I overlook the basics and assume that a problem is complex. Some easily overlooked aspects of alarm sales, installation, and service are mentioned here—hoping that they will serve as a reminder of the *types* of simple problems that are overlooked.

With the trend for many commercial establishments to move away from urban areas and into industrial parks, consider encouraging them to have more than just a loud alarm. If they are even slightly isolated in a commercial park, no one will hear a siren or bell. The bulk of your alarm sales may be local systems with just an outside noisemaker, but consider the need for more than noise.

Design a simple system. Make it easy for the customer to operate and *test*. The fewer calls the customer makes to you because he can not operate or test his system, the lower your expenses will be since you will not have to dispatch a service person.

Visit your commercial customers occasionally. If they have added to the building or rearranged the office or work areas, additional protection may be required. Besides, the goodwill created will more than pay for your visit.

If subcontractors are used for installations, be sure to maintain control over the quality of workmanship. The subcontractor is representing *you* to the customer. Inspect his work.

From a more technical standpoint, I strongly encourage installers to *zone* as many systems as possible. It makes troubleshooting simpler.

Try to locate zone indicators outside the protected area whenever possible. Before a service person or the customer enters the protected area he can observe the indicators and determine whether the system has been tripped and which zone(s) will require checking.

When zoning a system, do not put too much equipment on a zone. Arrange the zones in a logical sequence so that it will be readily apparent where the problem is.

Bench test all equipment for a day or so before installing it. Hook it up in the shop and observe how it is functioning. If problems exist, they can be solved more easily in the shop than in the field. Besides, having a customer peer over your shoulder and find out that the equipment is not functioning does not do much to help your image and credibility as an alarm system specialist.

Be comforable with the equipment that you use. Equipment with which you are familiar and on which you can rely will give you peace of mind and a feeling of satisfaction about the installation. Your customer will appreciate it, too.

THE BUSINESS SIDE OF THINGS

By William Joseph

You can't see it, hear it, or touch it—but it plays a very important role in your business. Its presence (or the lack of it) is a big factor in the bottom line of your P&L.

As important as it is, many service dealers never give much thought to it; some aren't even aware of it. What is it? Why, productivity, of course.

The importance of productivity in your business can be illustrated by thinking of a service department as a factory. In this case, the finished product being "manufactured" is a completed service call—in the customer's home or in the shop. Like the product being manufactured in a real factory, every completed job in your service department is being produced at a specific cost. Not only must that exact cost be known, but each item of expense making up the total must be known. This is a positive requirement if you are to have any hope of controlling the expense of operating your business.

Bear in mind, though, that there is one very important difference between a factory and your service department. Your raw material is not steel or wood or plastic; it is skilled labor. That labor—your own as well as that of your employees—is by far the largest share of expense going into your product.

In fact, it probably exceeds all other expenses combined.

As a service dealer, then, you are a merchant. Your product is skilled labor that you buy at one price and sell at another—hopefully at a profit. Thus, the cost of labor is a nucleus around which all other considerations revolve. Bear in mind, though, that the cost of the labor you buy is determined to a much greater degree by the amount of properly done work completed by your technicians each day than by the basic rate of wages you pay. Consider this example:

The ABC Company employs four road technicians. Its records indicate that average productivity is six completed calls per-man, per-day.

Over on the other side of town is the XYZ Company. It doesn't keep productivity records. If it did, it would be discovered that its four technicians average only four calls per-man, per-day. Because of this difference in productivity, the cost of labor at XYZ is 50% higher than its competitor's *even though both companies pay the same basic wage rate.*

To put it another way, the service manager at XYZ could, in effect, add two technicians to his force at no cost. They would arrive fully trained; would work for no salary at all; would ask for no vacations or benefits; and would need no additional tools, trucks, or test equipment. How can he earn himself a cozy spot in service manager's paradise? By raising his present productivity from four to the six being done by ABC's technicians! Chances are that he can do it, too, because experience clearly shows that productivity is influenced by skilled management attention.

This is not to suggest that the job is a lead pipe cinch. It isn't. The fact is, productivity is a bad word to a lot of people today.

To many technicians, it suggests that the boss is trying to exploit them—to cheat them in some way. To the boss, it's often a nightmare of a subject because employees seem to get uptight whenever he mentions it.

All of this is a shame, really, because productivity isn't a bad word at all. In fact, improvements in productivity will almost always benefit

Continued on page 49

CALENDAR

NARDA SCHOOL OF SERVICE MANAGEMENT
March 28-31, 1982
Notre Dame University, South Bend, IN
John Gooley: (312) 454-0944

ANNUAL NEW ENGLAND ALARM CONVENTION
April 2-4, 1982
Sheraton Inn, Sturbridge, Massachusetts, sponsored by the New England Alarm Associations Council.

PROFESSIONAL AUDIO RETAILERS ASSN. ANNUAL CONFERENCE
April 17-20, 1982
Scottsdale, AZ
Jerry Fogel: (816) 444-3500

NATIONAL BURGLAR & FIRE ALARM ASSOCIATION 35th ANNUAL CONVENTION & EXHIBITION
April 18-21, 1982
Sheraton Bal Harbour Hotel, Bal Harbour, FL. Contact NBFAA, 1101 Connecticut Ave., Washington, D.C. 20036: (202) 857-1130

ELECTRONICS DISTRIBUTION SHOW AND CONFERENCES
April 29, 30 and May 1, 1982
New Orleans Hilton
David Fisher: (312) 648-1140

NATIONAL SOUND AND COMMUNICATIONS CONFERENCE
April 29, 30 and May 1, 1982
New Orleans Marriott Hotel
Gerald Newman: (312) 648-1140

TELSA (CT) STATE CONVENTION
May 1-2, 1982
Quality Inn, Vernon, CT
Vincent Lanter: (203) 766-4931

WESA STATE CONVENTION
June 4-6, 1982
Lake Lawn Lodge, Delavan, WI

ASEA (AZ) STATE CONVENTION
June 4-6, 1982
Tucson Marriott, Tucson, AZ
Martin Gleming: (602) 888-0707

VEA (VA) STATE CONVENTION
June 26-28, 1982
Springfield, VA
Jim Williams: (703) 533-9595

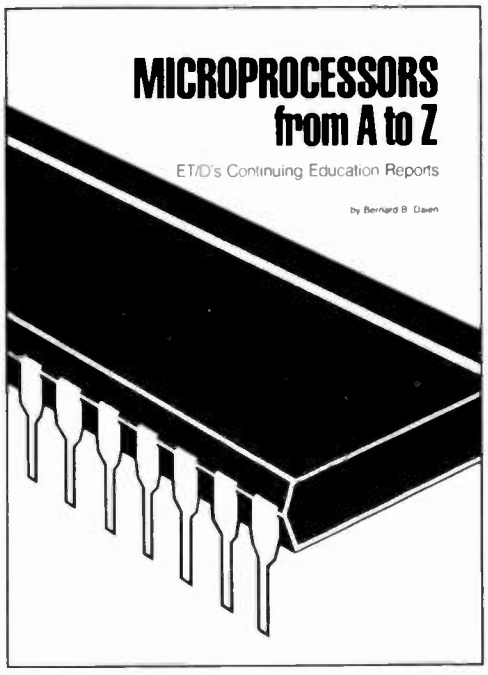
MESDA/ISCET/ETA-GNO(LA)/TSA(AR)/T-E-A(TX) ANNUAL NATIONAL ELECTRONICS SERVICE CONVENTION AND TRADE SHOW
August 2-7 1982
New Orleans, LA
J.W. Williams: (817) 921-9061

NATESA ANNUAL CONVENTION
August 25-29, 1982
Indian Lakes Resort, Bloomingdale, IL
Frank Moch: (312) 582-6350

ET/D welcomes announcements of state and regional annual conventions, meetings, and conferences.

MICROPROCESSORS from A to Z

by Bernard B. Daien



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Installation Techniques

Potpourri

There is much to be said for knowledge gained through experience. There is also much to be said for learning from others—and avoiding costly errors.

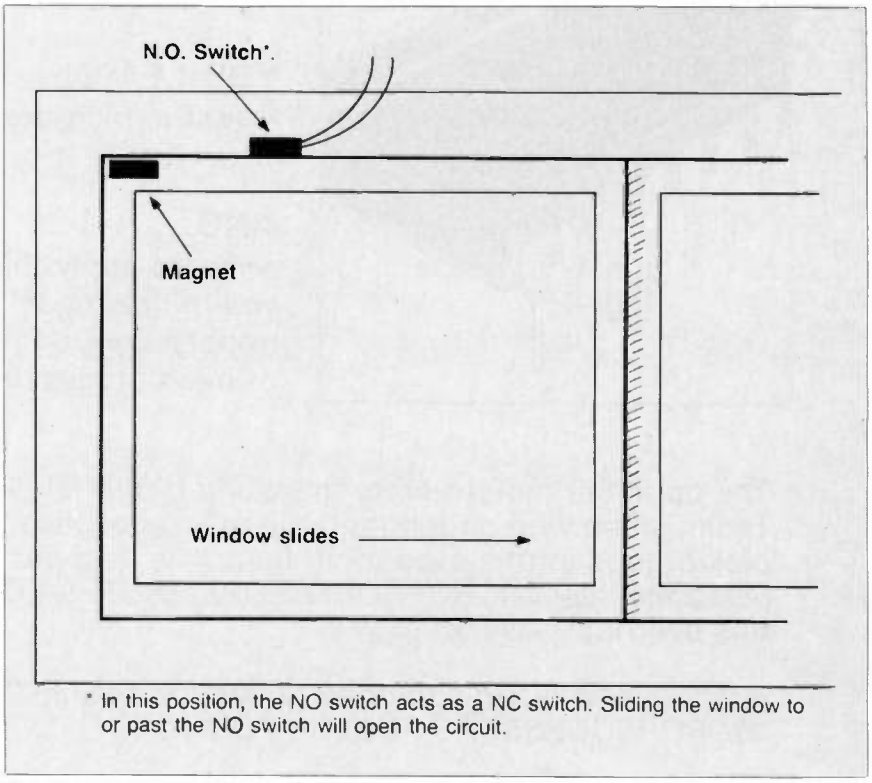
By John Sanger

The comments and suggestions discussed here are the result of personal experience and of talking with many security and alarm installation professionals. Hopefully, you will find many of them useful.

Magnetic Contact Switches

Sliding (aluminum and glass) patio doors are probably the weakest link in the chain of protection. While surface-mounted magnetic contact switches will protect the opening, they are visible and the homeowner may prefer that the protective devices be hidden. Concealing a magnetic contact switch will take a little longer, but it is not a difficult task—and it certainly makes a neater installation.

Removing the door from the frame by lifting it up and pulling the bottom of the door away from the track will make the job easier. Drill a ¼" or ⅜" hole (depending on the size of recessed switch used) in the top track, up through the header plate and into the attic. Run the wires and insert the switch. Then, mount the magnet in the top channel of the door so that it will be directly below the switch. A small amount of silicone rubber sealant will securely hold the magnet in the channel. Replace the door in the track and the job is done.



* In this position, the NO switch acts as a NC switch. Sliding the window to or past the NO switch will open the circuit.

Fig. 1 Positioning a window switch to allow opening the window for ventilation.

A similar procedure can be used with sliding windows if the track and channel are large enough to accommodate the switch and magnet.

Occasionally, a customer will want to open one or more windows for ventilation—and still use the alarm system. This can be accomplished by using a normally open magnetic contact switch in the normally closed protective loop. (When the magnet is away from the switch, the contacts are closed.)

Mount the switch on the window frame (see Figure 1) and offset the magnet on the frame holding the glass by about six inches. The window can be opened approximately five inches for ventilation. If opened any farther, it will open the contacts in the switch and activate the alarm.

While this is a simple method to protect a window without using a shunt switch, it has two potential problems. First, if the window is left open (past the switch) when the system is armed, it will be unprotected and there will be no indication on the control's loop status light. Second, if the user opens the window for more

ventilation while the system is armed, he will trip the alarm. The customer should be given instructions regarding the "stop" point to avoid problems.

If the gap between a switch and magnet is too large to hold the switch contacts closed (or open, depending on whether you are using NC or NO switches), add another magnet. By using two magnets, with like poles together, pulling power will be increased. Of course, you can always change to a wide-gap magnet, too.

An often overlooked point of entry is the drop-down stairway into the attic. While the door from the garage into the residence is usually protected, many times the overhead garage door is not. A determined burglar could enter the garage, cut a hole in the ceiling to gain access to the attic, and walk down into the house via the stairway. (If there is no space protection device, he has gained entry without tripping the alarm.)

A simple, surface-mounted magnetic contact switch will eliminate the problem. Attach the switch to the stairway frame and the magnet to the ladder. To prevent tampering, be sure that both are installed so that they are concealed when the stairway is closed.

Remote Key Stations

Exterior key controls, while very useful and necessary to certain types of installations, pose a potential problem. A knowledgeable burglar would know where the tamper switch is located and could drill or melt the plate to gain access to it. The result: a compromised alarm system.

The addition of a magnetic contact switch on the plate, in addition to the regular tamper switch, would greatly increase the security of the exposed remote station.

Another possibility is to conceal an arm/disarm switch and connect the *momentary* key switch to the tamper circuit on the control panel along with the regular tamper switch.

Figure 2 shows how a normally closed magnetic contact switch can be concealed to arm and disarm a panel requiring a momentary contact closure. Instead of using a key to arm and disarm the system, the customer merely passes a magnet across the hidden switch.

Thus, if a would-be intruder removed the remote station plate and attempted to short the key switch terminals to disarm the system, he would actually trip the alarm. Moreover, by connecting the key switch to the panic circuit on the control panel, the customer has an extra (key-operated) panic button.

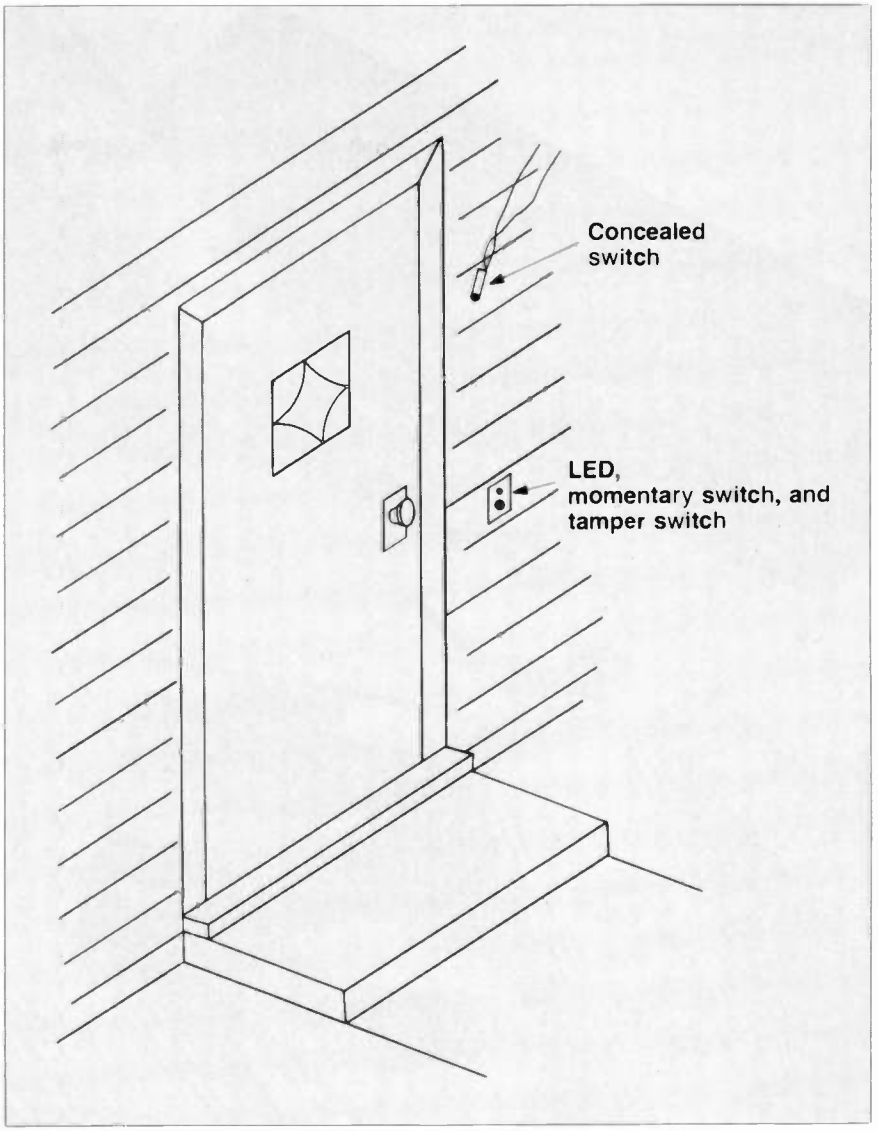


Fig. 2. A concealed remote key switch protects the regular key switch from tampering.

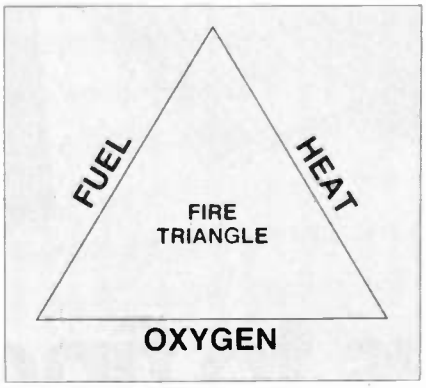


Fig. 3. The Fire Triangle.

Wiring

Wiring, if not done properly, can take on nightmarish proportions for a trouble-shooter who is checking an alarm system. Basically, a common sense approach to wiring is all that is needed; keep it out of harm's way.

When running wires above a suspended ceiling or in an attic, place them in an out-of-the-way location whenever possible. A repair person who is working or a homeowner rearranging items in an attic should be able to move around without snagging and breaking alarm circuit wires. Stapling wires to overhead rafters will usually keep them safe. Looping the wire periodically along the wire run will provide enough slack to withstand a small tug without breaking; it also provides a tie-in point if needed at a later date.

Running a wire along the floor between the baseboard and carpet tacking strip should be done carefully. If the wire shifts over the tacking strip, it may be punctured, broken, or shorted.

Generally, running wires under carpet is not a good idea—especially in high traffic areas. Walking on the carpet, with the wire underneath, will eventually wear out the wire.

Rodents and wires do not mix well. Given the opportunity, the little critters will chew through the insulation on the wire.

Zoning a system has a definite advantage over a simple continuous series-

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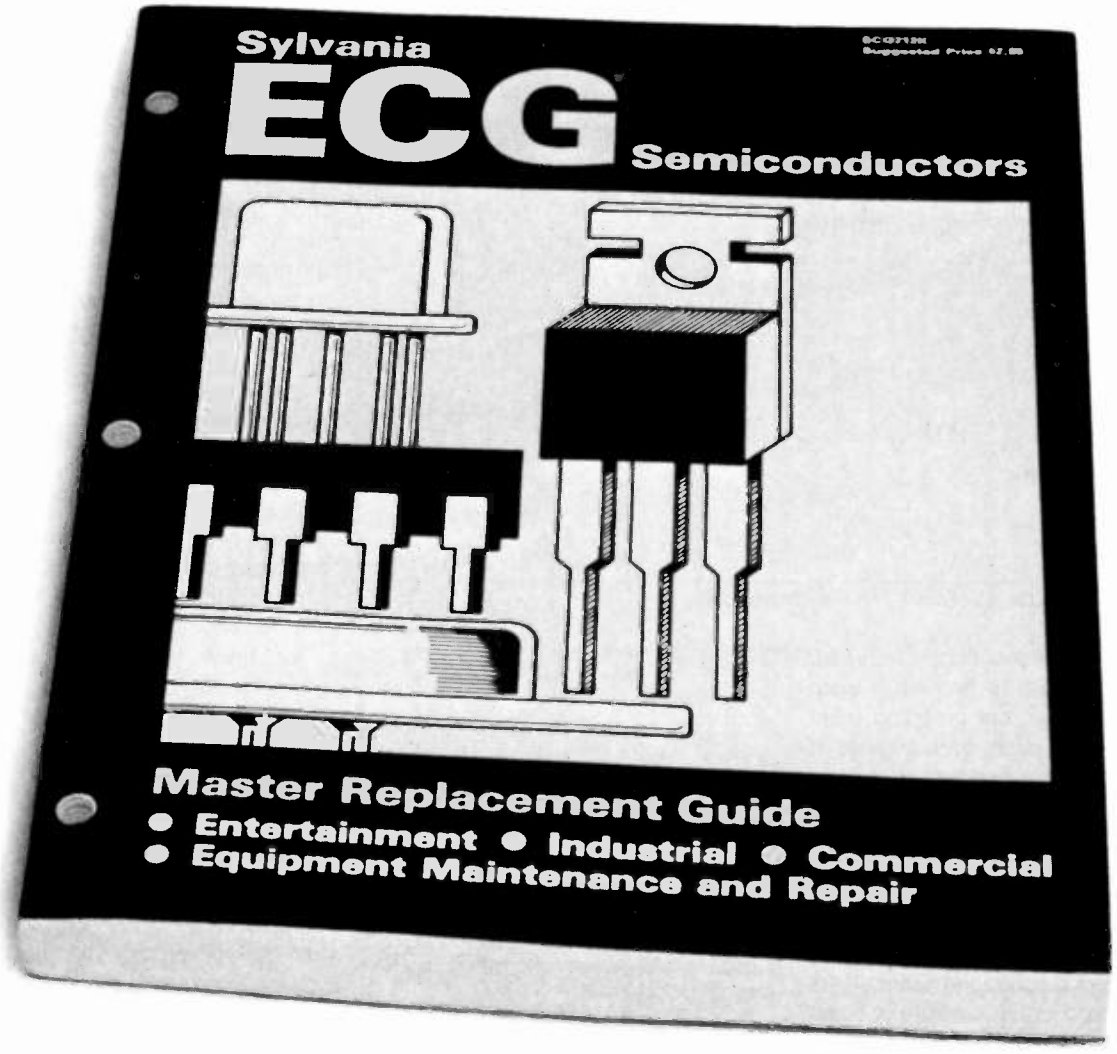

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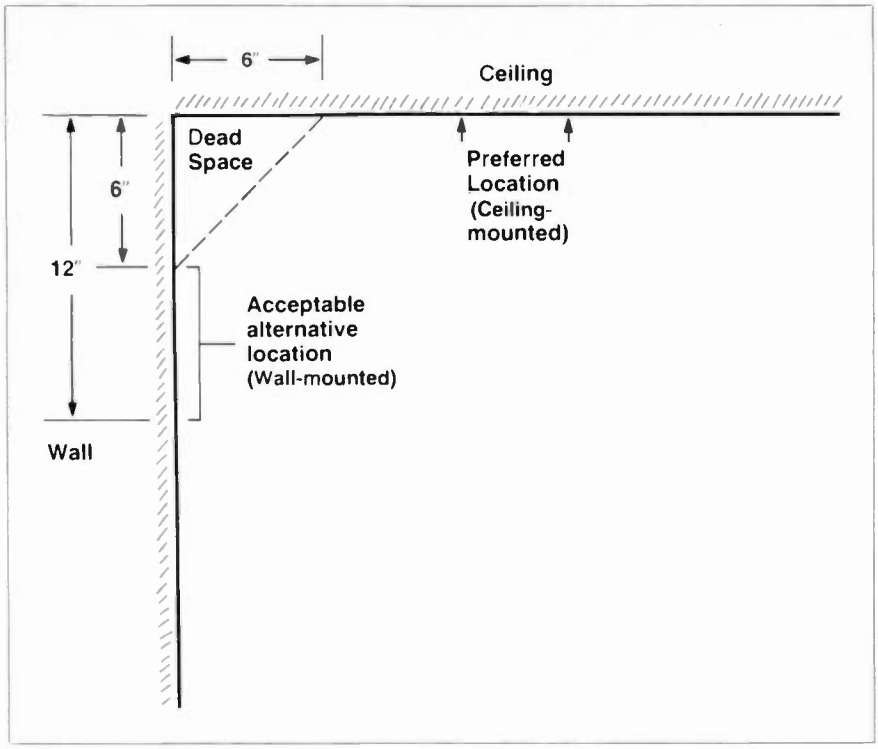


Fig. 4. Smoke detector placement in a flat ceiling room.

loop when troubleshooting is required. It is not necessary to *home-run* each individual detector, but grouping them by room or area might be advisable. If a wiring problem is suspected, each zone could be checked. Once the problem zone is identified, locating the problem within the zone is much simpler than facing the the problem of inspecting the entire loop.

A terminal strip and/or a few toggle switches make a good zone board. Place the zone board inside the control box if there is room, or in an easily accessible spot in the attic.

Try to avoid running alarm circuit wires next to ac wires. (Cross ac wires at right angles.) Running alarm loop wires parallel to ac wires may cause interference in the loop.

All this attention to such a simple task may seem unnecessary. After you have spent several hours looking for a broken or shorted wire, you may change your mind. A little extra time spent initially may prevent a lot of extra time spent troubleshooting.

A Weak Link—Strobes

Strobe lights or, for that matter, bells and some sirens that are not tamper protected can be the weak link in an alarm system. An enterprising intruder can pry off the strobe light's cover and short the wires—*short*, not cut.

When the control panel goes into an alarm condition, its voltage output will be a dead short. At best, the voltage output circuit will probably be destroyed;

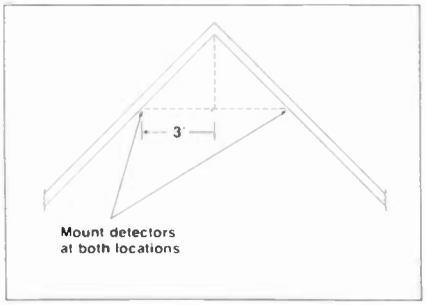


Fig. 5. Smoke detector placement in a sloped ceiling room.

at worst, the entire panel will smoke. Either way, there will be no alarm.

An in-line fuse of 2 or 3 amps (depending on how many amps the strobe draws) will prevent damage to the control. Of course, when the fuse blows the strobe will not work, but the rest of the system will.

Prealarm Feature

Many of the newer control panels have a prealarm, or entry warning, feature. During the entry delay on an entry/exit delay system, a voltage output is available to power a beeper or buzzer. It's a nice feature to remind the customer to disarm their system—thereby reducing false alarms.

If the beeper is not loud enough when mounted inside the control box, try mounting it on the outside (no problem if the control is hidden in a closet). Still not loud enough? Mount it in a central air vent and it can be heard all over the house.

If you want to be different, try Microtone's Melo-Alert. Upon entry, the device plays "Home Sweet Home."

Hold-Up Devices

Hold-up alarms are usually very simple, easy-to-install systems. Cash drawer money clips are popular items for these systems—they are also prone to many false alarms if a clerk accidentally removes the last bill (the one inserted in the money clip).

A way to reduce the possibility of unwanted false alarms is to use *two* cash drawer money clips in each register. If the normally open devices are connected in series, they *both* must have the last bill removed to trip the alarm.

Smoke Detectors

An understanding of fire chemistry will help the alarm dealer and his installation crew when called upon to design and install a fire system. While there are several types of flame and smoke detectors on the market, the ionization and photoelectric type smoke detectors are the most common.

Ionization-type detectors respond more quickly to a flaming fire; photoelectrics, to a smoldering fire. *Quickly* is a relative term because both types of detectors will respond to either type of fire (flaming or smoldering) within a few seconds of each other.

Fire is a chemical reaction. For a fire to begin, three things are necessary: heat (temperature high enough for ignition), fuel (something that will burn), and oxygen (as present in the air). These three components are usually referred to as the *fire triangle* (Figure 3). If any one of the three elements of the fire triangle is missing, a fire cannot be started; remove any of them and the fire will be extinguished.

Smoke detectors should be mounted on a horizontal ceiling, as close to the center as possible—and *never* closer than six inches to a wall or vertical partition that touches the ceiling. If ceiling mounting is not possible, the detector can be mounted on a vertical wall—between six and twelve inches below the ceiling. (Figure 4)

Sloped ceilings require multiple detectors. They should be mounted within three feet of the peak, measured horizontally. (Figure 5)

In residential installations, the detector should be located near the sleeping areas; several detectors may be required if sleeping areas are separated. Moreover, in multi-level residential structures there should be at least one detector per level—with a preferred location being at the top of the stairway. ETD

Microcomputer Programming, III

A real program

About this time we hope you can see that elementary computer programming is not too mysterious and that it can be useful when troubleshooting. You certainly can see just how stupid the microcomputer is without correct instructions

By Bernard B. Daien

During our earlier discussion of the use of the word LIST we omitted another way it can be very helpful. The word REM (for "REMarks") is used very frequently since it permits us to insert comments in the program. These comments enable the programmer to remind himself (at some future date) of what he had in mind . . . to clarify his goals . . . explain to others who may use the program what he is doing, etc. We want these remarks to be visible when needed, but we do not want them to appear when the program is run since they are intended for human programmers' use—and not the computer's use. There is a simple way to do this . . . as the partial program in Fig. 1 shows.

REM is followed by a space, then the remark (and as usual, no period). Line 90 *will not appear* when the program is RUN. (REMarks are not executed.) If you type LIST, however, the remark will appear as the program is listed in its entirety, for the benefit of the programmer. As you can see, LIST is a very handy word.

The LET Statement . . .

The LET statement stores letters or numbers in memory and identifies the memory location with a label so that the programmer or the computer can return to it when desired. For example, the program statement

10 LET A = 6

stores the number 6 in memory, at the location we have labeled A. Stated another way, the content of memory location A is the number 6. The labels used for memory locations are called "variables". The contents of the memory are known as "the value of the variable". So much for simple definitions ("buzz words").

During your study of algebra in high school the letter "X" was commonly used to indicate an unknown, and you simply put down the letter X each time you referred to that unknown. The LET statement enables us to do the very same thing in BASIC. Now we are going to find out which labels we are permitted to use in BASIC. Most BASIC dialects and computers permit the use of a single letter, such as A; or, we can use the combination of a *letter followed by a number*, such as A1, B3, etc. Please note that the first character is the letter. *We cannot use a number* followed by a letter (3B) on many machines for label purposes, so it is best to avoid them, at least for now.

Whether the label consists of a letter, or a letter plus a number, is immaterial. But, *only one label can be used on the left side of the equals sign.* For example:

20 LET A = 2 + 3

is permissible, but

20 LET A + B = 5

is not permissible because there are two labels on the left side of the equation, i.e. to the left of the equals sign. This is better understood when you recall that the program statement

20 LET A = 2 + 3

is telling the computer to put the value 2 + 3, or 5, into memory location labeled "A". There is no location labeled A + B, since A and B are separate memory locations. This would be a programmer's error.

We can do several different things with the LET statement, as best demonstrated by the following simple program:

```
10 LET A = 2
20 LET B = 3
30 LET C = A + B
40 PRINT C
50 END
RUN
```

The computer executes the program:

```
5
DONE
```

Notice that first we have entered into the computer's memory the value 2 at location A and the value 3 at location B; now we can use these for further calculations by simply writing A or B, as needed. In fact, we did just that on line 30 when we wrote LET C = A + B. Secondly, that statement, LET C = A + B, caused the computer to enter the sum of A and B in the location labeled C . . . so from now on we also have C available.

Fig. 1.

```
90 REM THE FOLLOWING IS TO COMPUTE COMPOUND INTEREST
```

PRINT C, on line 40, caused the computer to print out the contents of location C, which was 5. (It would be useful for the reader to review the use of the PRINT statement, discussed earlier.)

You may wonder why we did not write the program as below:

```
10 PRINT 2+3
20 END
RUN
```

The answer would be exactly the same as in the previous program. But suppose the numbers were long ones—involving, say, 2.065374 and 3.112622 . . . and suppose that we needed to use these numbers several times in equations. Once entered, a simple A or B could be a great time and labor saver—and reduce errors. You have been doing this sort of thing for years . . . for example: when you use "pi" (π) in place of the very lengthy math term (3.14159 to only six places!).

There is still another advantage in using LET. You have been using electronic formulae for years, ranging from the simple E = I R to lengthy and complex ones with many terms. The computer can be programmed to do such equations quickly and effortlessly. All you need to do is assign a value to each variable in the formula (put in the numbers) using LET . . . then type in the equation; follow the rules of BASIC (which we will discuss) . . . and the equation is executed in the twinkling of an eye! So you see, LET offers some very nice advantages.

Now go back and look at the program in which we wrote line 30 as follows:

```
30 LET C=A+B
```

You might mistakenly think we assigned two letters, A and B, as the value of C, but this is not the case, because *we had previously assigned the numerical value of 2 to A, and 3 to B*, and the computer recorded *that* in its memory. Therefore, the computer assigned the value of 5 to C. This leads us to an important rule of BASIC: "You can assign algebraic expressions, including letters, on the right hand side of the equal sign in equations . . . *but only if values have already been assigned to them.*" In the above case we had already assigned values to A and B; therefore we were able to use A and B on the right hand side of the equation. If we had not previously assigned values to A and B, obviously the program would not have worked anyway. Therefore if we write:

```
50 LET A=B+C-D
```

we have assigned three letters in the formula on the right hand side of the = sign, but in the program we must have previously given values to B, C, and D, using the LET statement.

Stopping Program Execution

Normally, we indicate the last statement in a program by using END. The END statement halts further program execution. To illustrate this, try this program:

```
10 PRINT "ONE"
20 PRINT "TWO"
30 END
40 PRINT "THREE"
RUN
```

The computer replies:

```
ONE
TWO
DONE
```

Notice that line 40 in the program was not executed because it followed the END statement. Remember, *the END statement stops further program execution!*

This brings us to a little problem. Suppose we want to stop executing the program *momentarily*, before we reach the last statement in the program. How can we do it? In such cases, we have another statement, STOP. If you are debugging a program *and wish to stop somewhere other than at the end*, use the STOP statement.

When you use the STOP statement, most computers provide an "extra" feature . . . they print out the line number where the stop occurred. To show this, repeat the last program, but substitute the word STOP for END in line 30. The computer now replies:

```
ONE
TWO
BREAK IN 30
DONE
```

The words BREAK IN 30 mean that program execution broke off at line 30 in the program; or, stated another way, the computer stopped executing the program at line number 30.

The STOP statement in normally used to stop program execution when we are not at the end of a program.

This inevitably leads us to the question, "How do we get the computer to resume program execution again, after the use of END or STOP?"

The abbreviation CONT (for "CONTINUE") causes program execution to resume following the use of END or STOP. The program execution resumes with the statement immediately following the break, without any changes in the program or the program execution.

There are other ways to stop, interrupt, and resume program execution, each with advantages for certain uses. As you become more expert in programming, you will learn them . . . but for the purpose of this article on entry-level programming, the above information will suffice. Programmers soon acquire a bagful of favorite "tricks" that enable them to program faster and with less effort. Such methods are properly reserved for more advanced text.

The Matter of Spacing . . .

The spacing of the computer's printout can be significant. We may wish to put several related answers on the same line, for example. This may be to keep the answers grouped—or to save space in a lengthy program.

Here are some simple ways to get the computer to do some spacing for us. As we noted earlier, a line in BASIC is 72 characters long, but we never use the last two spaces—which gives us a total

Fig. 2.

```
10 PRINT 5+1, 12/3, 7-2, 4+4, 6-3
20 END
RUN
```

The computer answers:

```
6             4             5             8             3
DONE
```

of 70 useable spaces. The computer will divide these 70 spaces into 5 blocks of 14 spaces each and permit us to space our program execution into these five blocks. Thus, we can put *five separate answers of less than 14 characters each* on one line. We do this by utilizing the comma (,) as shown in Fig. 2.

The use of a comma followed by a space after each problem caused the five answers to appear on the same line. If we had put more than five problems on a program line, the computer would have used more than one line to answer, with five answers per line. Using the comma, no more than five answers will appear on a line.

We not only save space with commas, we also save labor since we can enter several problems on a single program line. This in turn reduces errors and time spent in programming. We avoided entering five separate line numbers and five separate PRINT statements in this simple case.

Let's look more carefully at just what the commas did. *Each comma caused the computer to move one "block" to the right.* Therefore, if you put two commas together (,,) the computer will space that answer two blocks to the right, etc. Try it.

We are not just limited to numbers when using commas; for example, the program in Fig. 3 combines commas for spacing, along with the PRINT statement and quotation marks.

Now that you know what a comma is used for in BASIC, you must also understand that the comma can never be used for separating numbers into groups of three as is conventionally done . . . for example, one million is usually written 1,000,000 . . . and one millionth is written .000,001. The computer reads commas as being "block spacers", *and the use of the comma is forbidden for other purposes.* If you wish to write 1,000,000 in BASIC, you simply write 1000000—(no commas).

Just as the comma is used for spacing, so is the semicolon (;) —but the semicolon has the opposite sort of action. The semicolon is used to push things together. Let's rewrite our program to demonstrate the use of the semicolon in Fig. 4.

No spacing at all!

Now we have two extremes . . . rather large spacing into five blocks using commas . . . or no spacing at all with semicolons. Obviously, we need better control than that, and it is easily done if we rewrite our program as shown in Fig. 5.

Of course, you can use one, two, three—or as many spaces as desired . . . this avoids jamming words (or numbers) together . . . and permits separating expressions.

By now you must have noticed that there was no period at the end of a programming line. *We do not conclude lines with a period.* To the computer, the period is reserved for use as a decimal point, like 3.14 or similar use. The decimal point (period) can be used in program statements in English, or with letters when within quotes, and with the PRINT statement. In such a case, we are merely ordering the computer to reproduce whatever is within the quotation marks . . . i.e., the computer is being used much like a duplicating machine for that one use.

In many other uses, the computer will confuse the period with a decimal point and proceed to mess up your calculations.

There is a bit more to this business of spacing. How about vertical spacing? Suppose we wish to skip an entire line . . . or two lines? That is, we wish the computer to leave a space or two between the lines it prints out.

Try this:

```
10 PRINT "ONE"
20 PRINT
30 PRINT "TWO"
40 END
RUN
```

The response is . . .

```
ONE

TWO
DONE
```

Notice that there is now an empty space between the ONE and the TWO. This is because on line 20 we made a PRINT statement with nothing following it. Therefore, we ordered the computer to print nothing, and it did so. When we hit the carriage return key the computer simply moved down one line. Of course, you can skip several lines by repeating the process as many times as you wish. To have a three line space you would type:

```
20 PRINT
30 PRINT
40 PRINT
```

It's very simple.

Using the Word TAB . . .

If you have ever used a typewriter, you are familiar with the TAB key. (Tab is an abbreviation for the word "tabulator".) This key is used for indenting margins and for lining up the text in vertical columns—as in adding up figures in bills, etc. The word TAB is used in much the same way in BASIC. To illustrate, try this program:

```
10 PRINT "BOY"
20 PRINT TAB(5) "GIRL"
30 END
RUN
```

Note that on line 20 the PRINT statement was followed by a space, then TAB followed by the numeral 5 in parenthesis, *with no space between the parenthesis and TAB.*

The computer prints out

```
BOY
     GIRL
DONE
```

The word GIRL has been moved five spaces to the right as the result of the TAB(5) statement preceding it on line 20. Of course, we can indent any number

Fig. 3.

```
10 PRINT "ANT", "BOY", "CAT", "DOG", "EAR"
20 END
RUN
```

The computer answers:

```
ANT            BOY            CAT            DOG            EAR
DONE
```

Fig. 4.

```
10 PRINT "ANT"; "BOY"; "CAT"; "DOG"; "EAR"
20 END
RUN
```

The computer answers:

```
ANTBOYCATDOGEAR
DONE
```

Fig. 5.

```
10 PRINT "   ANT"; "   BOY"; "   CAT"; "   DOG"; "   EAR"
20 END
RUN
```

Notice that we left three spaces just before each word, but inside the quotation marks. Since everything inside the quotation marks is reproduced by the PRINT statement, the three spaces will also appear when the computer executes the program:

```
ANT   BOY   CAT   DOG   EAR
DONE
```


of spaces between one, and an entire line, depending upon the number we put in parenthesis.

In the next part of this discussion we will continue with spacing. If we can space the way we wish, we can move things around, placing them exactly where we wish them to go . . . and this is the very beginnings of "graphics". We will then be able to make graphs and even pictures with our computer!

Notice how many ways we can combine the PRINT command with commas, spaces, and semicolons, etc. The word to remember is "combine". All through this introductory programming you must keep in mind that the little "pieces" of programming you learn here *can be combined into the great many different combinations*. Thus, ten different items can be combined into a hundred different combinations, as you already intuitively know. It is now up to you to *try* these different combinations if you are going to become a skilled programmer. "Trying" things is another way of saying "practice"! You cannot become proficient at programming without practicing, anymore than you can become a musician without practicing. This discussion can only open the door and clear away some of the confusion. **ETD**

Selling CCTV

Professionalism

Closed circuit TV is a completely logical area of security for the TV/video dealer/servicer to sell and maintain. Your established position in business should make you a credible vendor to potential security customers. Here's why!

By Richard J. Schrenker

A recent National Association of Retail Dealers of American communication alluded to the fact that in 1970 there were over 81,000 television service businesses in the United States. Today, the NARDA missive continues, there remains only slightly over 27,500 of these same businesses to serve a larger, still-growing demand. NARDA described this group as "survivors," people who hang tenaciously on through "good management" and "planned pricing." This is hard to deny; *tenacious* describes most survivors, while good management and proper pricing are essential ingredients to eking out even a minimal existence. However, television repair is a competitive business. It is apparent one must have the courage of his convictions and confidence; both of these mental assets must be bolstered with a strong combination of technical knowledge and an ability to adapt in an ever-changing field. All of these seem to be the necessary criterion for survival—all of which says one thing: PROFESSIONALISM.

A Short History of TV

How does home television service relate to where closed circuit television is headed? History has a tendency to repeat itself—in business as well as in daily life. A knowledge of the history of a business or a parallel business can be beneficial to an investor. What is happening now in closed circuit television installation and repair is somewhat similar to what happened in home television service and repair. First, there were a select few in the business: usually a spillover from an allied field. The hobbyist or an ex-service technician were some of the first people in television. Then came the individuals trained in one of the many technical schools springing up around the country. In both cases—television and closed circuit television—those firms entering the new areas had the field to themselves. Few people knew or understood this new discipline. Cost of the equipment was high in the case of CCTV. Therefore, at first there were only a few firms in the business, and as with television, people who had equipment needing repair were forced to turn to these businesses. Costly repairs and repeat failure of equipment made service a lucrative endeavor and drew new venturers like the cry of gold. If there ever was a reason for the maligning of the television industry, it was because of some of the first entrants into the business. Wherever there's a dollar to be made there are those "quick-dollar" operators who move in on an industry and bleed the unsuspecting. It has been no different in television than it was with food, air conditioning, home repairs, home appliances, and you-name-it. Again, there were those who ventured into the field without sufficient background—people who strive to do well but do not have the knowledge to make a success of a technical business. Some did try and learned; they were among the survivors. But, for the most part, these people and the quick-dollar operators were among the departed on the last count. Why?

Advancing Technology

Repair and service of television is a technical field. Understanding the theory of equipment is necessary to analyze problems. Once, not too long ago, all television sets were the same, with tubes as principal components. It was relatively easy to train a person to search out burned-out tubes and recognize other common problems. Now, all sets are different and a technician may be skilled in repairing one brand television, yet somewhat bewildered by the circuitry of another make.

No longer is it possible for other than simple repairs and minor adjustments to be performed in the home. It requires special equipment to isolate problems. Test equipment and time are usually necessary to seek out the simplest of breakdowns. Special instrumentation, including the commonly-found oscilloscope and digital multimeters—both expensive—are a requirement for fast, efficient, inexpensive repairs of today's complex electronic systems. Experience is a factor closely related to ability in television repair. Understanding the equipment and the conditions under which the equipment operates facilitates repairs. A technician has to know what he is working with and on, for in some cases merely touching the equipment with your hands can damage components. The stored static electricity in a person's body can create havoc with a CMOS chip. The time-conditioned technician knows heat and cold in small but potent doses may have to be applied to certain problem panels to simulate environmental conditions experienced in day-to-day operation of a television set. Application of heat can bring about a malfunction that normally would occur only after a set were operating for an hour or more; similarly, cold brings the panel's temperature back to a state comparable to conditions when the set was first turned on.

It sounds easy . . . a couple of tricks. Yet, schooling and re-schooling are necessary to keep a technician abreast of what is happening in his field. These tools provide him with understanding to attack the changing technology in a field where improvements and miniaturization

are a daily occurrence. PROFESSIONALISM!!!

CCTV's Parallel

So—what happened in the home television service is now being repeated in the closed circuit television industry. Like every industry in its infancy, CCTV drew the "quick-dollar" merchant. He was a hardware salesman who sold only pieces of equipment, delivered the goods, perhaps even installed them; then he divorced himself from the equipment on whatever grounds were appropriate for bowing out. When the normal service problems inherent in all electronic equipment reared what he thought was their ugly head, he no longer wanted any part of the ailing equipment.

It was different at the time of the sale. The salesman was a congenial gentleman who agreed with anything his client said, dutifully saying only those things a potential purchaser wants to hear. One camera was sufficient where four were needed. He sold the idea that the equipment was almost infallible as a deterrent to crime and seldom, if ever, needed repair. Later, when his equipment *did* need repair it was difficult, if not impossible, to get him to respond to the telephone. His sales pitch, "one really doesn't have to watch CCTV once it's installed; it practically works by itself," was partially true. In fact, his sales pitch included the money-saving drone camera, which he touted as being as effective as actual working cameras. The price for this service he rendered was exorbitant. But—closed circuit television *does* have to be watched, and drones presuppose all thieves are dumb—a myth many companies are finding is far from the truth. As with almost every other industry, that was the atmosphere in which the groundwork for a now-burgeoning industry was laid. To illustrate, this same industry showed an eleven percent growth in 1978. Vicon Industries, a supplier of support products for CCTV systems, reported in March 1979 an increase in the second fiscal quarter of 54.4 percent over the same quarter the previous year. Surely, this is indicative of a growing, viable industry, ready for the PROFESSIONAL approach.

CCTV's Dilemma

Closed circuit television is still in the "growing" stage—still beset by the problems of infancy. It seems anyone formerly associated with security hardware has jumped on the CCTV bandwagon. Suddenly, those original firms who had once controlled the CCTV field were thrown into the fray of competition. The potential earnings in the CCTV field took on the aspects of new oil. Anyone with the slightest knowledge of electronics and a little capital leaped into the churning water to ride what looked like an inviting current. It brought about two opposing camps in the closed circuit television industry: one group, price oriented, offers bargain buys. This group seeks to do a volume business without any of the costs necessary to conduct a long-term commitment: no service technicians to pay, limited office space, and no service area. The second group, service oriented, is seeking a long-term relationship mutually beneficial to both the client and themselves. It employs skilled people, which limits net profits, but since security is not a one-day affair, those with this long-range approach have a distinct advantage. To the client, this assures quick, reliable service, stability, and longevity. One doesn't make the large investments in equipment and in people unless it is for a long-term commitment.

Firms featuring closed circuit television sales are engaged in a stiff competitive battle. The skirmishes for business are frequent. It is apparent CCTV is needed as a security tool, for its use is growing rapidly. However, there is no question as to who will survive this battle. The

next survivors will be those firms capable of providing the support for security with quality service. Those who cannot meet the demands industry and retail businesses impose upon them as pilferage and other problems increase will gradually fade from the picture. To survive, they must keep abreast of new and more sophisticated equipment. It's the battle of the 27,500 all over again. Fair prices, service, and craftsmanship are what purchasers will soon be looking for—as do the individual television set owners. Those who cannot meet this criterion will join the 53,000, their fast-dollar brethren who once abounded in the service business. Then will come the "PROFESSIONALS" who will take over and dominate the CCTV industry.

What Is Professionalism?

It is also true that all who entered the CCTV industry in its early stages, and who are now entering, are not out to bilk the unsuspecting client. Running a few wires and plugging in a camera and a monitor does not make a CCTV system. Nor does the ability to run those wires and turn on the equipment make a capable technician.

What *does* make a competent technician? Dick Galloway, president of Panaservice, Inc., and vice president of Security Television Systems, Inc., Baltimore, Maryland, draws repair work at his Baltimore shop from as far away as Pennsylvania and Virginia. Dick has been in electronics for over 30 years and is considered by many as an expert in television electronics. His theory of competence is exemplified by the technicians in his shop. All technicians are trained at weekly meetings, all have attended seminars and schools, all have current reading material available on the latest advances in their fields.

An excellent example is one technician, Robert Koykendall, who has been working for Dick for about five years. Bob graduated from a local technical school and began his career repairing car radios in the back of Dick's television shop. Books on electronics, training materials, and magazines were available through the shop. Whenever a manufacturer offered seminars or training schools, the young technician was sent. In these five years he has spent some eight to ten weeks in specialized training, not counting some of the single-day seminars attended. When this is considered in wages paid, man hours lost to production, plus transportation, lodging, meals, and even entertainment money, it is indeed an expensive proposition. However, if it weren't necessary and beneficial, small shops like this would not spend hard-earned profits on this training. What has happened is that this young man has become a seasoned technician capable of analyzing problems in complex electronic equipment—and he is still learning.

What's Happening . . .

There are many examples of problems generated in a technical field invaded by semi- or non-technical adventurers. Recently, a large office building experienced what can happen when service is needed after a non-service-oriented company installed its security cameras. A security force is often dependent upon the tools it has to work with to be totally effective. When the equipment it has to work with is not functioning at all—or functioning poorly—it limits effectiveness, while placing an additional burden on the security force. This was the case at this building. Over a period of five years the cameras had functioned poorly—or not at all. One CCTV camera was replaced after only two years and then both cameras were down. One camera showed gray figures and the other had no picture at all. There was no one to repair or adjust the cameras or monitors. Normal life expectancy of most CCTV equipment is about five years (a monitor

may last longer), and care and service are important in the longevity of any equipment. When the building manager contacted the company which had installed the cameras he was informed the cameras were installed only as a favor because they were involved in the construction of the building. Other companies were contacted, all with negative results. Most of the CCTV installers contacted wouldn't bother to look at the equipment. This same situation was encountered by a national company who purchased CCTV equipment about the same time this office building did.

The reason? With certain brands of equipment there are no authorized local repair centers. All the equipment has to be shipped back to the factory for repair. No schematics are given out—warranty work must be shipped back. In this case, the cameras were one brand and the monitors were an obscure brand with the manufacturer's name obliterated. Even a well-educated guess at what was wrong gave only a fifty-fifty chance of accurately estimating the cost of repair. There is the cost of removing the equipment, packing it for shipment back to the factory, and then reinstalling it. Once the equipment is shipped back to the factory it is not under the control of the repair shop but is controlled by the manufacturer's service division. Repair costs for old cameras can reach nearly the cost of a new camera. If a service shop has this situation, it usually gives its client an estimate, explains that if the camera is repaired there is still a chance of further problems, and then lets the client make the decision about repair or replacement. In the case of the building manager, the equipment was replaced with *service* this time being a significant part of the new installation program. Security has to be capable and continuous to be effective.

There are many cases of poor service and near-misrepresentation in the selling of closed circuit television systems. One installer, finding himself in a competitive selling situation, extolled his service expertise by bragging to his prospect, "There's nothing that can go wrong with a video tape recorder I can't fix in fifteen minutes." Accompany that statement with an abnormally low price, and it has to be extremely tempting to a prospective buyer. Add to that another frequent statement heard by prospective buyers, "There's nothing that ever really goes wrong with this equipment. How long have you had your television set at home?" How is it possible for a professional organization to follow these statements with an explanation of what problems can occur and what the cost of

these problems is?

Promises! Promises!

Then there was the retailer who explained his good fortune when he acquired, at a cost of a little under $5,000, a closed circuit television system which normally would have cost him considerably more. After a year one camera didn't function at all. When eighteen months had rolled by, two of four cameras had failed, another camera had a picture slowly fading to shades of light grey, the monitor rolled incessantly, and his expensive video tape recorder neither recorded nor played back. His telephone calls to the installing company went unanswered, his calls to other repair services received the same negative responses that the previously mentioned building manager described. There he sat with his non-functioning bargain purchase which was absolutely incapable of providing any assurance that his store was not being pilfered daily. This same installer left video cables and power cords dangling from the shelves and ceiling haphazardly. A good novelist would have described the scene as, "cables hanging from the ceiling and shelves of the establishment like wild vines, reaching down and strangling the crates below." To say the least, a craftsmanship-like appearance was entirely lacking. No wonder the installer's telephone went unanswered.

There are any number of locations where cameras have just been turned off by owners. One store, approximately 100 feet by 75 feet with aisles piled high with merchandise, has a camera rotating in the front of the store. The store manager called CCTV ineffective and turned his expensive tool off. He suggested it was turned off because no one watched it, anyway. How can one control losses on a meat counter 80 feet from a camera when the camera spends only two seconds covering the area in an approximate twelve-second rotation? In most businesses, particularly small businesses with less than ten employees, it is almost impossible to employ a full-time camera watcher. Here, knowing the psychology of how to watch the monitor makes closed circuit television an effective deterrent tool. Also, movement on a washed-out monitor is not an effective attention-getter; movement on a sharp, crisp picture naturally attracts the eye. (As a police officer with twelve years of experience observing various activities, I can attest to how much more a trained and aware person sees than a non-trained individual.)

A summation of all the information boils down to three words. The security aspect of closed circuit television should be REAL, CAPABLE, and CONTINUOUS. To offer these qualities requires a professional attitude and technical knowledge.

Security Has to Be Real

One has only to acquaint himself with the facts surrounding pilferage to realize why security should be real. In the case of the drone cameras, in any store, warehouse, or building it takes only seconds for a skilled thief to know if cameras are real or phoney. Within one week after the installation of drone cameras, all employees in a business know the "cameras" can't see their actions. The theory about thieves being dumb isn't appropriate. Thieves are smart; not one of them would steal if they thought the odds of being caught were stacked against them. The thief in a business will want to know exactly what the camera sees. He'll be looking for a monitor. What! No monitor! Since experts agree sixty percent of theft in a retail operation is the result of employee pilferage, once it's determined the cameras are fake, it's open season for those inclined to steal. Usually, the store owner is fully confident the drones are protecting his

merchandise, so he confidently relaxes his vigilance. It's then the hammer falls. While the merchant feels secure in his belief everyone is being fooled by the phoney cameras, the thief or thieves have free reign to plunder. It isn't until the inventory shows increased shrinkage that the businessman realizes the fallacy of reliance on "dummy" cameras. Keep them guessing—put in *real* equipment.

. . . and Capable

It is obvious even to a layman looking over a business establishment when closed circuit television cameras are not capable of covering vulnerable areas. One camera, covering 7,500 square feet of storage area in a store crowded with merchandise, certainly can't intimidate even a part-time thief. Any camera installed should be covering a specific vulnerable area. The camera should not be put in under general circumstances merely to scare. Like any good tool, the CCTV camera is designed to do a specific job, a job it performs effectively if installed properly. The equipment installed must be considered a tool that is part of a system consisting of the equipment, the personnel monitoring the equipment, the service available to keep the equipment in operation, and a method by which management utilizes the deterrent capabilities of the equipment.

The hardware for the CCTV system has to be chosen for its effectiveness in relationship to the total system. Everyone knows a camera and a monitor. What size monitor will be the most effective with the system being installed? Is it best to have individual monitors or one monitor and a switcher to view several camera locations? Is the camera panning—or perhaps is there a video tape recorder? Does the client want to see small details or does he want a view of a large area? A small monitor may be less expensive initially but more costly in the long run because it does not produce the desired results.

The credibility of CCTV has been lost to many potential users because the wrong equipment was offered at less cost. Or—inadequate equipment was improperly placed. The equipment must be a system capable of producing the desired results. Security devices, regardless of what type security they are, must be capable.

. . . and Continuous

Security equipment and safety equipment must function if they are to be useful. This is evident when the recent Los Vegas fire tragedies are reviewed relative to equipment not functioning. The loss of life accompanied with huge financial losses are indicative of what can happen when equipment is inadequate, fails, or is entirely lacking. Equipment not properly installed, shoddy maintenance procedures, lack of knowledge of the equipment, inadequate equipment, or irresponsible installers or technicians are often instrumental where a catastrophy results from non-functioning or malfunctioning equipment. In the aftermath of such tragedies, there is usually a resurgence of interest in, quote, "the right equipment," which more often than not diminishes as time passes between the impact of the news accompanying the tragedy and the reality of the cost of proper equipment and professional service.

"All security installations are, is pulling a few wires and hooking up some equipment," is the attitude of some companies installing such systems. They are not. An installer can be taught to find a break in a wire, determine if a camera or monitor is malfunctioning, or take out the equipment and bring it back into the shop. Equipment to these organizations is hardware, and system means putting the hardware together. The idea of the man who installed a couple of cameras and monitors successfully, turned them on and they worked, then said, "I always wanted to get into electronics and now I'm in it," will be passé when enough companies have unfortunate experiences similar to those already mentioned. Most companies like to see some credentials regarding ability. Those who look only at price, well—that's a pay-me-now-or-pay-me-later game.

It's often difficult to convince people a CCTV system installed in a working situation is different from a television set sitting in the living room of a home. This is particularly true when one salesman tells them they have nothing to worry about and repairs are minimal and low in cost. They never mention your home video set is on usually from about four in the afternoon until midnight. That's eight hours a day or 11,648 hours over a four-year period. Many closed circuit television systems are in service 24 hours a day, seven days a week. This means 35,040 hours over that same four-year period. Three times as long—and often under adverse environmental conditions.

Let's compare the conditions between home and industry. The home TV set is protected from extremes in cold and heat. Dust, dirt and corrosives are fairly limited in the home. (Look in the rear of a home set. It is usually in relatively good condition.) Dust and dirt do not normally affect integrated circuits, yet accumulations of dirt and dust in an industrial setting over long periods of time can hold moisture or corrosive substances, which can cause damage. In business settings there are doors opening, people moving in and out, trucks and carts, heating and cooling equipment, all of which generate more dust in one day than would be generated in a month at home.

Do you need service to prevent wear and tear on equipment? Every manufacturer of equipment, regardless of type, issues a manual on equipment care. Instructions are usually issued to prolong the life of the equipment. And—even when preventative maintenance is supplied, there are some failures you can't control. There are normal failures where parts just give out—something no one can predict or explain. These situations are the norm with even the best electronic devices. Computers are generally installed in controlled environments for those reasons . . . to prevent dust accumulation and moisture from taking its toll on the equipment. No one knows what is going to fail or when it will fail. What could be more evident than the failure of a computer on the space shuttle? What if service was not there? What if there was no back-up maintenance? No technicians? The space shuttle would still be sitting on the launch pad while the computer was shipped back to the factory for repair.

To keep security equipment functioning, it is necessary to have trained personnel available for repairs. Therefore, technically oriented firms are the best equipped to service and maintain equipment for continuous security. **ETD**

"I don't give up easily . . . I'll fix it if costs you five hundred dollars."

Satellite TV, Part II

About Satellites

The interest in TVRO systems is high. Here, quickly, is how the satellite receives and re-transmits the signals we want to receive with our systems

By Jesse Delgado

In part I of this series we covered the beginnings of satellite TV reception, its advantages (such as communications expansion), and the possible social and business implications that will come about because of satellite communications.

Now we will discuss the satellite proper, its operations with respect to the transmission and reception of satellite signals from and to earth.

The satellite's main function of transmitting and receiving signals is very straight forward when we exclude the support systems that are involved in the satellite's operation and which create a complex system.

The satellite's position is continuously monitored by computers. Through the use of a continuous signal from the earth, ground computers can modify the position of the satellite so that the satellite can maintain its position within the four-degree spacing assigned to each satellite used by the U.S. In addition, a computer on the satellite directs internal housekeeping—such as the direction of the inertial guidance system which involves positioning rockets.

Solar energy plays an important role in the satellite's functions. Solar energy panels are the electrical power source for the satellite's various systems. Present satellite technology gives us the capability to transmit thousands of audio and data channels and several TV channels on a satellite, and this requires a constant supply of electricity.

When considering the support systems involved in the satellite's operation, we

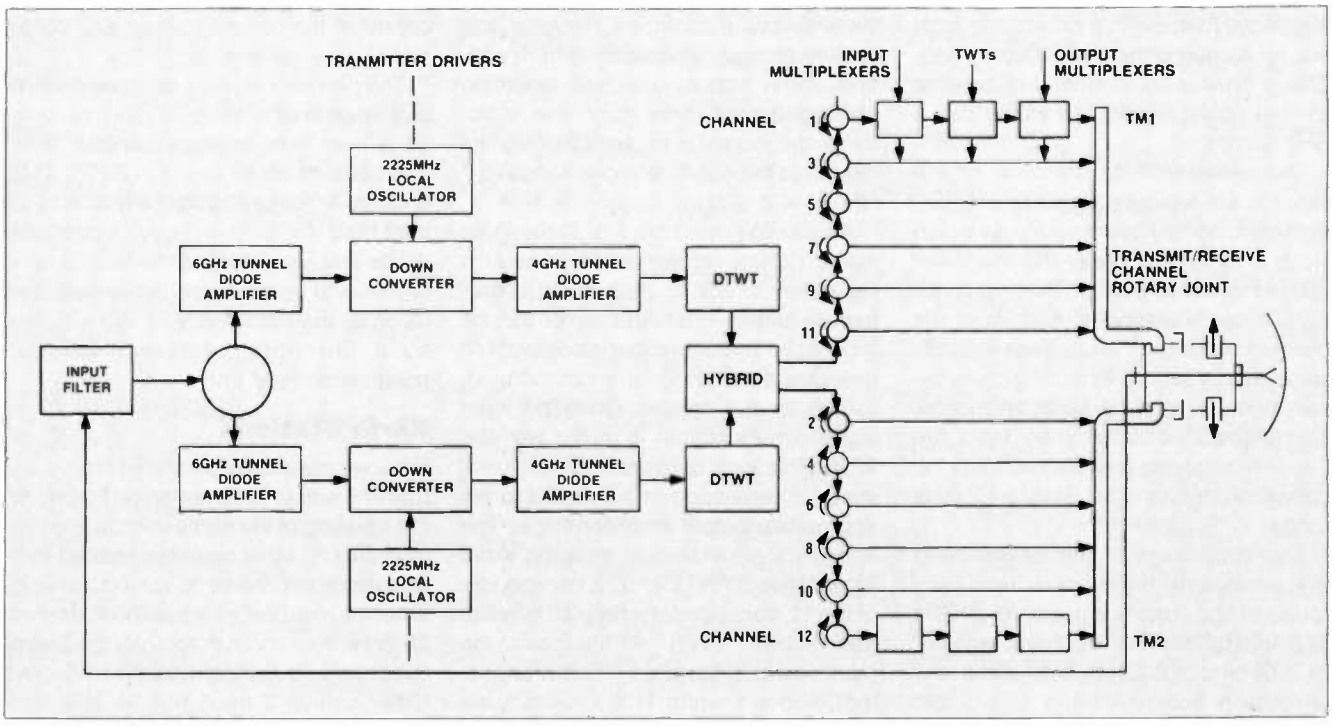


Fig. 1 A 12-channel satellite from Hughes.

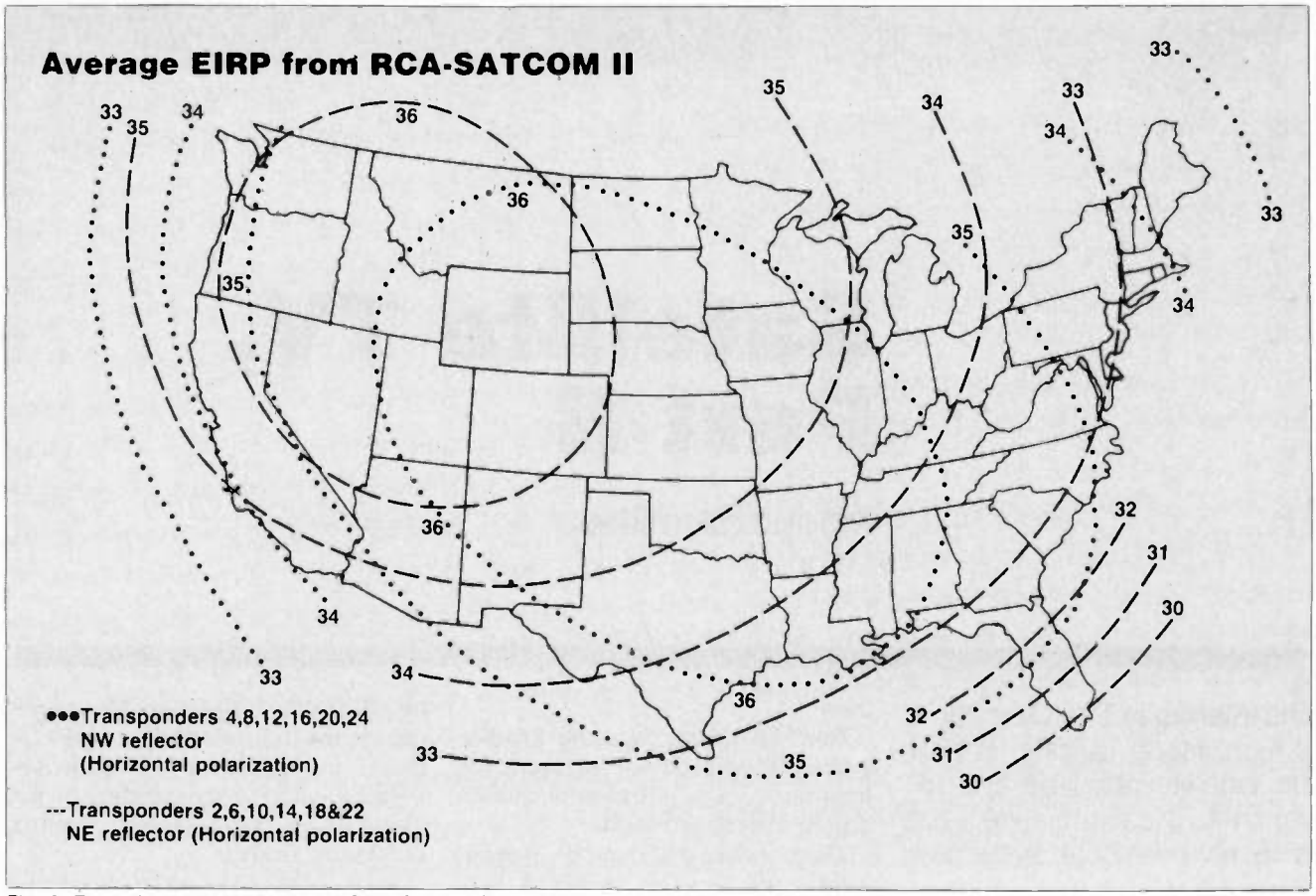


Fig. 2. Typical satellite footprints (RCA's Satcom II).

must keep in mind that basically the satellite is nothing more than an unattended microwave relay station, if we disregard the support systems.

The satellite, basically, has one set of antennas to receive the signals originating from the earth. The receiving antennas are usually a wide-beam sculptured antenna that covers the required frequency range with a broadband front end for receiving the signals from earth. These signals are normally referred to as the "uplink signals" (5.9 GHz to 6.4 GHz range).

The re-transmitting antennas of the satellite are typically highly directional, high gain, narrow beam antennas which focus on a narrow area—like the lower half of the United States. The reason for narrow beam antennas is to avoid the problem of wasting the satellite's valuable solar energy source by radiating unuseable signal beyond the earth, into space. The signals re-transmitted from the transmit antennas are referred to as the "downlink signals" (3.7 GHz to 4.2 GHz range).

The importance of the difference in the previously mentioned frequency range of the "uplink signals" (5.9 GHz to 6.4 GHz) and the "downlink signals" (3.7 GHz to 4.2 GHz) is to avoid any interaction between them when both signals are being processed at the same time by the satellite.

The Satellite

Fig. 1 shows a typical block diagram of a 12-transponder (or channel) satellite designed by the Hughes Aircraft Corporation. Hopefully, this will help show the operation of the typical satellite.

As the uplink signals are received by the wide beam antennas, they are processed through a broadband front end. The uplink signals are then amplified and fed to a converter stage that hetrodynes the incoming frequency or signals directly to the downlink signal range (3.7 GHz to 4.2 GHz).

As you can see from Fig. 1, the input signal (uplink signal) is fed through a redundant circuit to help avoid a premature failure. The input signal can be processed through either circuit, which provides a certain amount of extra reliability for the system. Once the input signal (uplink signal) is mixed with the 2225 MHz local oscillator, the downlink signal is developed and then fed to the appropriate output amplifier stage. The amplifiers are individual traveling wave tube stages ("TWTs"). Each transponder of the 12-transponder (channel) satellite has its own "TWT." At this point, the peak power is 5 watts (+7dBw, or decibels above 1 watt). This 5 watts is fed to the appropriate downlink re-transmit antenna. As mentioned before, the re-transmit antennas are very directional. Their gain, added to the output level of the TWT amplifier stages, gives a much higher effective isotropic radiated power (EIRP) to the downlink signal system. Since the re-transmit antennas are directional, they have a definite radiation pattern; maximum gain occurs at the center of the pattern, called the "boresight."

The downlink signal's radiation pattern is referred to as a "footprint" and is shown on a map with intensity contour lines that connect equal levels of EIRP. This is called a "footprint map;" a typical footprint map is shown in Fig. 2. You might notice that Fig. 2 makes mention of horizontal and vertical polarization with relation to the transponders. We will discuss the horizontal and vertical polarization later on.

Earth Stations

First, we must consider the earth station transmit power requirements. To permit the re-using of the same microwave frequencies on other satellites spaced four degrees apart, the earth station transmit antenna must be of a parabolic design to create the very high gain, narrow beam necessary to transmit to the satellite. Other satellites must not be affected. This is why 10 meters (33 ft.) or larger

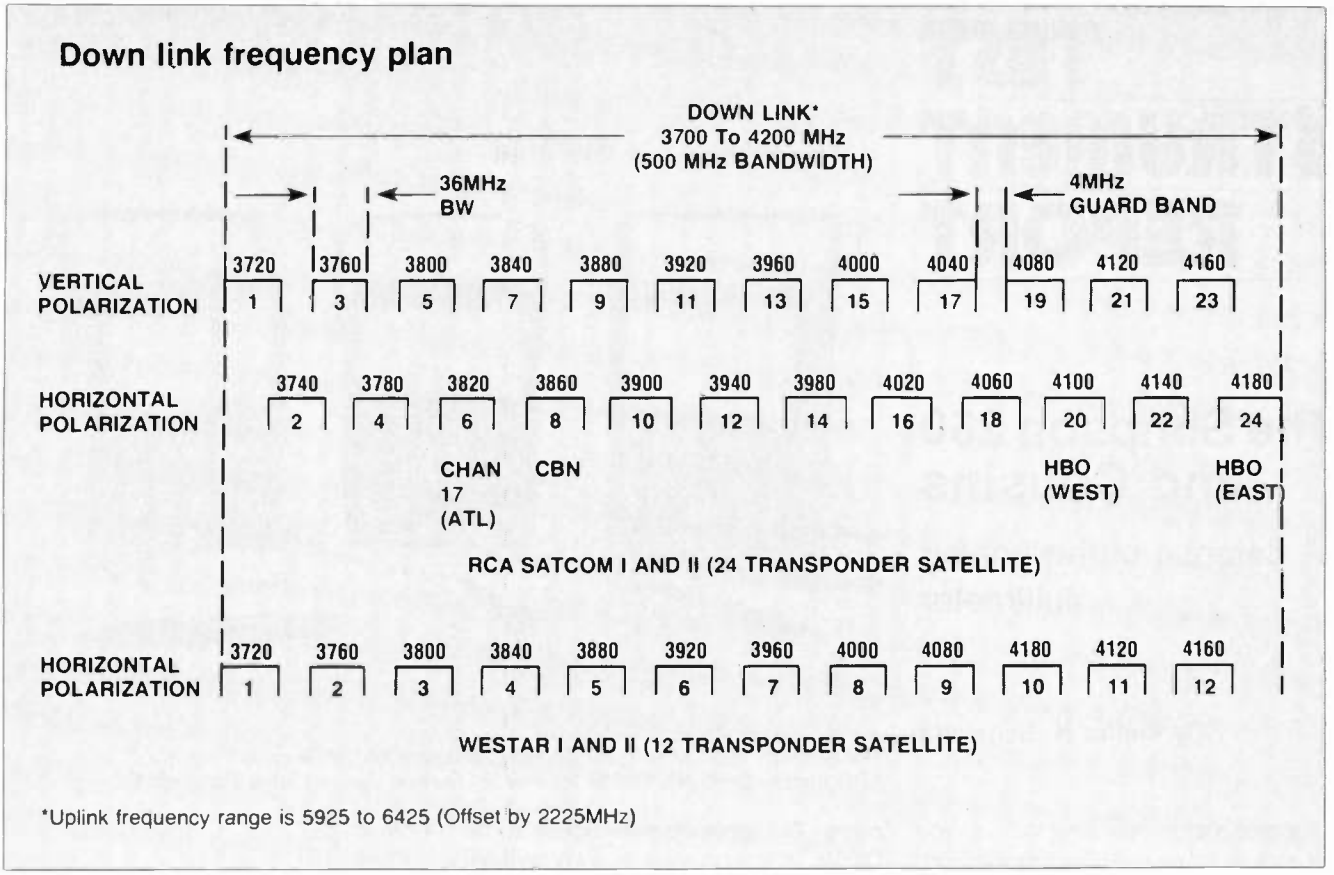


Fig. 3. The satellite downlink spectrum showing both horizontally and vertically polarized signals.

parabolic reflectors are generally used. As a consequence, considerably less transmit power is needed, as opposed to an isotropic antenna, radiating in all directions. Also, the beam-width of such a parabolic antenna is less than one degree, which insures proper uplink signals to the satellite being aimed at—without affecting another satellite spaced only four degrees away and operating on the same frequencies.

Additionally, such a parabolic antenna can receive the signal from the satellite; it can have a gain of nearly 100,000 times that of a non-directional antenna.

We now should have an idea of the earth station power requirements. There are two types of gain involved in the earth station power requirements. The first is *passive gain*, which comes from the design of the parabolic antenna and should be a minimum of 50 to 60dB. This requires a minimum of a 10 meter (33 ft.) parabolic antenna with a close surface tolerance over its entire area. Second, there is *active gain*, which comes from the uplink transmitter, which must have a minimum of 1 to 3 kilowatts of transmit power. Coupling these two (passive and active) gains will give a noise-free studio-quality signal. This is considerably better than the signal that degenerates with each passing from microwave relay station ground to ground station in a major network. It is all the more important that the signal coming from the earth station is a good quality signal because the *satellite* has no significant gain; it only relays whatever signal it receives back down to earth.

The total satellite bandwidth is approximately 500MHz. Figure the difference in the uplink signal—6.4GHz minus 5.9GHz equals a 500MHz bandwidth. (1GHz is equal to 1,000MHz.) The same applies to the downlink signal; 4.2GHz minus 3.7GHz equals 500MHz bandwidth. Referring to Fig. 3, we can see this 500MHz bandwidth forms the basis for the downlink band. The 500MHz band is divided into 12.5 channels both up and down; this gives us a 40MHz bandwidth for each channel. Each channel also has a 4MHz guard band to give further isolation from adjacent channels, with additional room for ground-to-satellite command signals, satellite-to-ground verification signals, and beacon signals for ground control alignments. The obvious bandwidth requirement of 40MHz needed for each TV channel will show the necessity of using the microwave frequencies as opposed to the standard HF radio spectrum.

Horizontal and Vertical Polarization

As mentioned earlier, we will now discuss the horizontal and vertical polarization—shown in Fig. 2, the footprint map—and also mentioned in Fig. 3, the downlink 500MHz bandwidth frequency plan.

Initially, a satellite can be expected to process one TV channel per transponder, which gives us a total of 12 channels within the 500MHz band. In the beginning, satellite communications with 12 channels of TV was considered the standard, but later on several satellites doubled the number of TV channels they could handle by a technique known as "opposite-sense polarization." What this means is to be able to use the same 40MHz wide band for *2 separate TV channels* by processing one channel with *horizontal* antenna polarization and the other TV channel with a *vertical* polarization. This type of re-use of a frequency is now becoming the standard for the newer satellites now in space—and for the ones that will be launched in the near future. (For a better explanation of vertical and horizontal polarization and circular polarization, see ET/D November '81, page 18.)

Also, if you will notice on Fig. 2 of the footprint map, not all of the transponders show the same footprint. The reason for this is that the amplifier stages of the satellites are not exactly equal in power output.

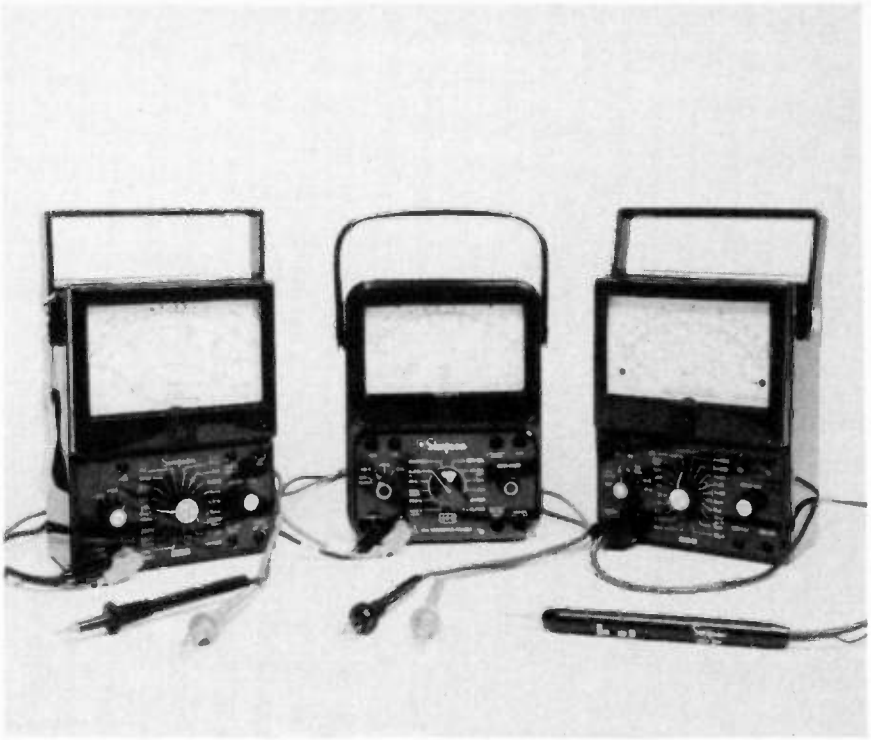
Part III of this series will discuss satellite receiver systems, since this is what all of you will want to become familiar with. ET/D

TEST INSTRUMENT REPORT

The Simpson 260 and Cousins

A defense of the analog multimeter

By Walter H. Schwartz



The Simpson 260 Series 7, the 260-6XL, and their FET VOM cousin the 303-3XL on the ET/D bench. Circle No. 150 on the Reader Service Card for more information.

I imagine that by this time most of you have been thoroughly brainwashed with the supposed superiority of the digital multimeter, of its accuracy, resolution, and ease of reading. But do these advantages actually exist in all DMMs? In general, you do not need the accuracy (even if it does exist—and it often does not). The two or three percent accuracy of a good analog meter is usually more than adequate; consequently, the high resolution of the DMM, is superfluous. What difference does it make — usually, at least — if the collector voltage of a transistor is 12.3 volts or 12.2? 12 to 12.5 is close enough. Admittedly, there is one exception—it is nice to be able to measure emitter-base voltages referenced to ground with two or three digit resolution. That exception aside, the analog multimeter is quite adequate and has many virtues.

An analog multimeter like the Simpson 260 is a passive device, and as such is very consistent and dependable. Ohmmeter batteries must be replaced every year or two, otherwise there is no power needed for operation. The analog meter is also pretty hard to damage. The 260's taut band movement itself is very sturdy and is varistor protected. Most overloads, even gross overloads, damage only one multiplier or shunt, if anything. The 260 is also almost completely immune to outside influences—except for, perhaps, strong magnetic fields. Have you ever worked near a source of RF and had your digital meter go crazy? Even the horizontal sweep system in many TV receivers will upset some DMMs. A little corona in a HV system will really upset most electronic voltmeters—digital or analog. The analog multimeter just isn't bothered by these things. The analog meter to me is—at least if you understand its limitations—very reliable; it rarely misleads you.

So what do you get with a Simpson 260 and some of its relatives? You get a meter with very useful basic ranges and a wide variety of accessories to extend them. And most of these accessories are available at modest cost. The standard 260 Series 7 has ranges of 0-2.5, 0-10, 0-50, 0-250, 0-500, and 0-1000 volts, ac and dc. It also has 250 mv and 1v dc ranges. It has 1, 10, 100, and 500 ma full scale dc current ranges and a 10 amp range. It has ohms scales with 12Ω, 1200Ω, and 120kΩ center scale. This really does cover most of what you need to measure. The accuracy is 2% on dc, 3% on ac, and about 2% of arc on ohms. This sort of accuracy holds for most of the 260 family, the 250, the 255 (which has a temperature scale), and the 260XL (more about this later). The 270-4 has a mirror scale and a 1.25% dc and 2% ac accuracy. The compact Model 160 is similar in features to the 260, the Model 265 industrial VOM is very similar but has capabilities intended for industrial plant maintenance, including both dc and ac current ranges. And if you want super sensitivity, there is the Model 269, a 100,000 per volt instrument with a low current range of 16 µa, a six-inch scale length, and an accuracy of 1.5% on dc.

The Model I liked best is the relatively new 260-6XL. It has, in addition to standard 260 features, 0-25 and 0-100 volt ranges (ac and dc), 5 and 50 ma ranges, and four standard ohms scales (6Ω, 600Ω, 6,000Ω and 60kΩ center scale) plus two low power ohms scales of 20 and 200Ω center scale and a maximum of 100mv open circuit voltage.

Accessories available for the 260 family include a temperature probe for the 255 only, an Amp-Clamp ac ammeter adapter, 5 and 10kv ac and dc probes, and a 40kv dc probe and a low power ohms probe for the 250/255/260s without low power ohms. The low power ohms probe is an active device with an ohms voltage of only 30mv and scale factors of X1 and X100 on the 260's ohmmeter. A variety of cases for the 260s are also available.

The analog multimeter is ideal for nulling or peaking adjustments. It is great for quick continuity checks without waiting for a display to settle down. RF doesn't bother it and it generates none itself. The 260 is double fused, the movement is varistor protected, and an overload relay is available in the P versions of the 260 series; it is extremely difficult to damage electrically, and the taut band movement will take a lot mechanically. Every shop needs both a VOM and a DMM. The VOM for much routine work; the DMM where resolution is necessary (and make sure its accuracy is commensurate with its resolution). The two instruments complement each other.

BOOK REVIEWS

A book that may prove useful not only to those doing a lot of major component sales, but to those selling service, as well, is *How to Master the Art of Selling*. The 350-page sales trainer suggests numerous keys to successful selling. Written by Tom Hopkins, one of America's leading sales trainers whose seminars have reportedly attracted over half a million persons, the book offers comprehensive instructions on what to do and how to do it. Included are tips on arousing emotions, controlling fear, and turning failure and rejection into a positive learning experience. Many of the author's suggestions may also be applicable in daily living, including a chapter on influencing one's family and circle of friends entitled, "How to Sell the Most Important People You Know." Hopkins also outlines what he feels are the fourteen most important words in the art of selling: "Whenever you ask a closing question, shut up. The first person to speak loses." He elaborates, "If you say anything, you relieve the pressure on the prospect to speak first, answer the close, and commit himself to buy. If you . . . even make much of a gesture, you'll relieve the pressure and blow your chances of closing." Also included in the book are techniques on using the telephone in selling, the twelve sources of success, and rules for effective goal-setting. Other areas of interest in the book are chapters entitled "Creating the Selling Climate" (much of this chapter has to do with how *not* to scare away a prospective buyer), "Twelve Power Closes", and "How to Sell Your Way Out of Slumps". *How to Master the Art of Selling* by Tom Hopkins, Champion Press, hard-cover, $19.95. ISBN: 0-93836.

I'm sure you have occasionally found yourself sitting at your bench, staring at a chassis thinking: "I thought I knew how this thing works, and how to troubleshoot it. What am I overlooking? Maybe I don't really understand it as well as I thought." Robert Goodman has recently written a little book, *How to Troubleshoot and Repair Electronic Circuits*, that should help you get a fresh start in many such instances. A better title perhaps would be, *How to Understand and Troubleshoot Electronic Circuits*, for Mr. Goodman explains both circuit operation and develops a troubleshooting procedure for a selection of sometimes-troublesome circuits in TV receivers (including remote control and electronic tuners), color and black and white, AM/FM stereo tuners and amplifiers, tape decks, electronic games, clocks, VCR's and scanning receivers, and finishes by giving a few hints on microprocessor and microcomputer troubleshooting.

Mr. Goodman's approach to understanding each of the circuits is very practical, developed from his personal experiences and is heavy on Zenith, Quasar, and RCA TV troubleshooting tips and RCA and Sony VCR's. Specifically covered in detail, for example, are: RCA's CTC 99/101 horizontal oscillator/vertical countdown system, hybrid vertical sweep systems, Zenith Sync/AGC IC's, late-model RCA video and chroma circuitry and comb filter circuit, Zenith horizontal sweep circuits, assorted Quasar black and white, sync, video, and other circuitry. Most of this information is on fairly modern and current chassis. *How to Troubleshoot and Repair Electronic Circuits*, Robert L. Goodman, hardbound, 377 pages, TAB BOOKS, Inc., Blue Ridge Summit, PA 17214. Recommended; W.H.S

SECURITY PRODUCTS

CCTV Accessories

Circle No. 130 on Reader Inquiry Card

Pelco Sales, Inc., manufacturers of CCTV accessories for over twenty-five years, offers its newly expanded product line for 1982. Pelco's selection includes pan & tilts and scanners, enclosures, mounts, controls (short to long distance), video switchers, video signal equipment, lenses (fixed focal to motorized zoom and internal auto-iris), and a host of mis-

cellaneous equipment such as remote delay boxes and desktop consoles. New and enhanced products include COAXITRON™, the coax control system which allows system equipment (i.e. pan & tilts, motorized zoom lens) to be operated over the same coax presently used for video transmission only. Also, COMPUSWITCH™, a new generation of microcomputer-based sequential switchers developed by Pelco, allows many video inputs to be automatically sequenced through one monitor.

Entry Sentry

Circle No. 131 on Reader Inquiry Card

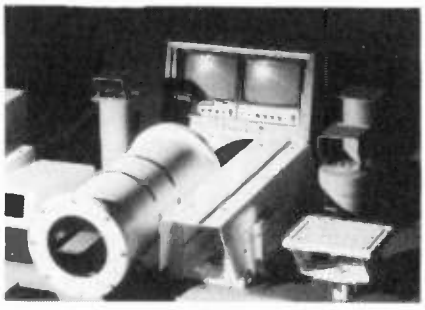
The recently introduced *Trigon Electronics* Model 36 was designed for building owners who need protection for a few units — or as many as 36. With the new Trigon 36, buyers don't have to pay for more security protection than is needed. The unit measures 12" × 4" × 1½", meaning it can probably be squeezed into places larger security units might not fit. Installation of the Trigon Model 36 reportedly can be completed easily since it connects directly into existing telephone lines. A visitor simply dials the resident's two-digit code (listed next to the unit on a directory board) and the unit automatically dials the resident's regular 7-digit phone number. After identification of the visitor, the resident can then touch or dial "5" on his

phone to release the secured entrance, allowing the guest to enter. A "beep" on the phone line tells the resident and visitor that the entrance has been opened. Other features include microprocessor control, external programming, standby power, FCC registration, rent collection assistance, "Time's Up" feature (beeps twenty seconds before a three-minute automatic cutoff of conversation occurs), pushbutton lock (allows residents to enter without key by use of an entry code), and emergency number programming (fire and police numbers can be placed in the automatic dialer's memory). Larger units are also available.

CCTV Hardware

Circle No. 132 on Reader Inquiry Card

Vicon Industries, Inc., offers CCTV equipment from the simplest in design to the most complex microprocessor-based programmable control/routing switcher security installation. Although the company does not manufacture cameras, monitors, or VCRs, they *do* make available pan & tilt units, "omni-

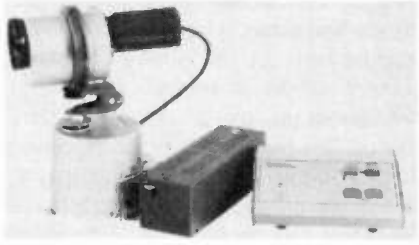


scan" (discreet spherical camera enclosures that make it impossible to see where the camera is pointing), scanners, switchers (both manual and automatic), camera housings, mountings, controls (single and multiple—plus digital and microprocessor-based), video signal equipment (amplifiers, motion detectors, time/date generators, screen splitters, camera identifiers, etc.), consoles, lenses (fixed and zoom), as well as other miscellaneous equipment. Additionally, Vicon claims to offer design assistance and technical backup in the layout and structuring of virtually any system the designer might have in mind. The special order department is able to custom-engineer, fabricate, and program new equipment to the specifications a designer/installer might have.

CCTV Equipment

Circle No. 133 on Reader Inquiry Card

Panasonic Video Systems offers a complete line of CCTV electronics for security applications. Available are both black and white and color cameras utilizing a single-chip image sensor (CPD) based on a concept that combines the advantages of both the MOS and CCD image sensor systems. The units are reportedly



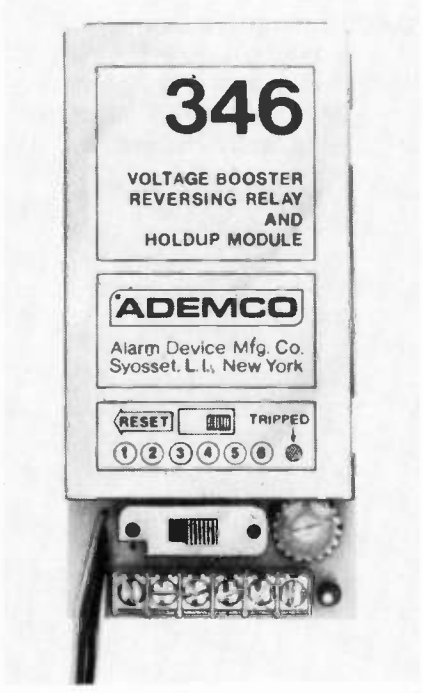
free of bloom and burn-in, with little lag in the color camera and none in the black and white. Fixed pattern noise is said to be significantly less than in traditional MOS image sensors—and narrow dynamic range is not as significant as in ordinary CCD image sensors, the manufacturer claims. The company also features an advanced time-lapse recorder/player, able to record, in color, up to 240 hours of surveillance on one ½" cassette. It can also record in real time when more detail is required . . . or one of five in-between speeds. Automatic switching to real time (if the unit is in time lapse) can be accomplished during an intrusion by wiring the VCR directly into the normally-open switch of an alarm system. The company also offers a line of sequential video source switchers, the deluxe model of which contains ten inputs for alarm sensors on doors, mats, windows, etc. Each sensor controls one camera and, when activated, the sequential output to the monitor automatically switches to that camera. If more than one alarm is sounded, the unit switches between the cameras involved. In addition, Panasonic manufactures a time/date generator for use in CCTV security systems. In addition to the time

and date, the generator has a 99-hour stopwatch function, displaying time in hours, minutes, seconds, and hundredths of a second.

Multi-Feature Accessory

Circle No. 134 on Reader Inquiry Card

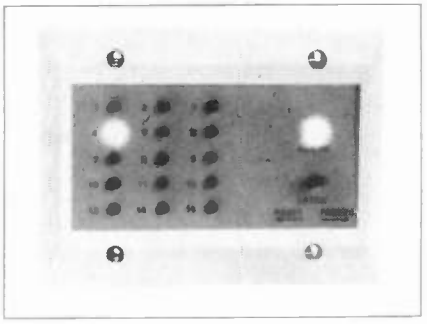
Ademco recently introduced the No. 346 Reversing Relay, Voltage Booster, and Hold-Up Module—a multi-feature accessory which allows many alarm processing centers to be connected to minimodularms, modularms, and other central station installations. The NO. 346 Module is designed to take nominal 6vdc input and provide the proper current level needed to drive the leased phone line. The Voltage Booster provides the necessary power to send signals over leased phone lines to the central station, reportedly making additional power sources unnecessary. The 24-hour holdup circuit can be set up as either silent or audible and can take wiring from both latching and non-latching devices. The reversing relay can be set to either instant or twenty-second delay response, allowing for alarm sound testing without relay activation. An instant LED indicates when an alarm has triggered the relay. The No. 346 Module provides all this in a package which is designed to fit inside alarm processing center cabinets.



Remote Zone Annunciators

Circle No. 135 on Reader Inquiry Card

Aritech's ZIP-7, ZIP-15, and ZIP-20 zone annunciation plates contain both a mode selector switch (latch, freeze, reset) and 7, 15, or 20 remote zone indicating LED's.



Having only one plate to install reportedly ends alignment problems and cuts installation time. The Aritech 230 and Advisor VIII multi-sensor intrusion detection systems can now be supplied with the new ZIP plates. An LED light on each sensor and on the remote annunciator indicates which sensor is in alarm. According to the manufacturer, this permits easy walktesting, allows quick troubleshooting, and maximizes subscriber confidence. The new ZIP plates can also be used with Aritech 101 stand-alone ultrasonic detectors and with Aritech 550 stand-alone PIR detectors. These plates are mounted in a 3-gang 2.75 inch deep box outside the protected area.

NEW PRODUCTS

Truck Enclosure

Circle No. 140 on Reader Inquiry Card

The Ready-Cap, an all-steel pick-up enclosure will full-opening doors that provide access to every part of the pick-up cargo bed, has been announced by *Reading Body Works, Inc.* Designed for easy installation on standard and compact pick-ups, the Ready-Cap is said to protect parts, tools, and equipment behind weathertight double-panel doors. Heavy-duty door locks have cylinders guaranteed to the original owner for the life of the unit, according to the manufacturer. The full-width, full-height door

on each side is made to operate automatically on spring-loaded door props that flip the door up to the full open position when the door latch is disengaged. Then, when the door is partially lowered, the spring-loaded mechanism returns it to a fully closed and locked position. The full rear door opens sideways. All doors are designed to open smoothly in all climates on Reading's patented concealed pin hinges, which rotate on stainless steel bearings. The full-opening doors make it practical to equip the Ready-Cap with interior shelf racks and bins for parts and supplies accessible from all sides.

Ferrite Kit

Circle No. 141 on Reader Inquiry Card

The Bead, Balun & Broad Band Kit from *Fair-Rite Products Corp.*, consists of some thirty different types of ferrite shield beads, multi-aperture Balun cores, and cores for broad band inductors and transformers in a variety of different shapes and sizes for the design engineer and/or builder. All parts in the kit are completely dimensioned along with being color coded denoting the type of material being used. The kit provides the designer with a wide selection of materials for $20.00 postpaid. Application notes are provided with the kit. A complete manual with extensive technical data is also available. Both the kit and the manual are available from Fair-Rite Products Corp., Wallkill, New York 12589.

Truck Body

Circle No. 142 on Reader Inquiry Card

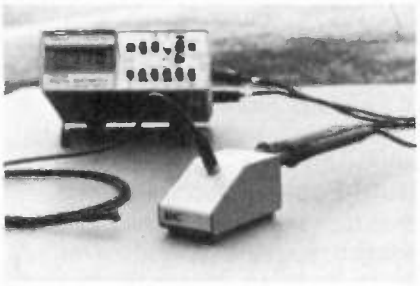
Steelweld Equipment Co., Inc., has introduced a new line of bodies for the electronic servicing industry that have been developed specifically for instal-

lation on the new, more fuel-efficient ¾-ton, 8600 GVWR chassis now being offered by major truck manufacturers. According to the manufacturer, these new bodies are in keeping with the industry-wide trend to down-size fleets, but they are engineered to perform their jobs even better than the older, larger bodies they will replace. Better use of space has been made possible by new, more efficient compartmentation. The bodies are offered with a number of standard features as well as a variety of optional features that permit adapting them to meet a wide range of work methods and fleet requirements. The bodies are said to feature double-paneled and reinforced doors, channel reinforced floors, compartments and roofs. All exterior panels reportedly are of a special steel processed so that molten zinc becomes an actual part of the metal, rather than just a surface coating—for long-lasting protection against rust and corrosion.

Temperature probe

Circle No. 143 on Reader Inquiry Card

Electronic thermometry has recently become available to anyone with a digital multimeter. The Tempa Tool by *Alpha Magnum Corporation* allows a DMM to simply plug into its standard prod tip jacks for a measurement of 1 millivolt per degree. The sensor lead plugs into the unit as well, permitting extension of the 48" 2-wire sensor lead to 2 miles with absolutely no error in reading, the manufacturer claims. This miniature phone plug also doubles as a power switch,

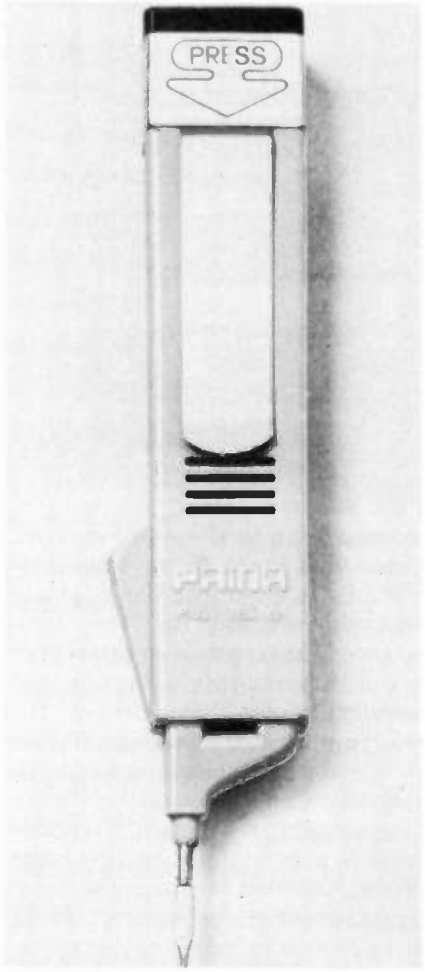


preventing accidental power drain during storage. The Tempa Tool reportedly measures temperatures over a range of −55°C to +150°C and is factory calibrated to ±0.3°C. A 15-turn externally-accessible trimmer permits user calibration of the Tempa Tool or correction of DMM error to 0.1° accuracy.

Multipurpose Tester

Circle No. 144 on Reader Inquiry Card

A new product from *Galil Electronics* is the PAMA POLY-TESTER, a new multifunctional tester for continuity and dis-



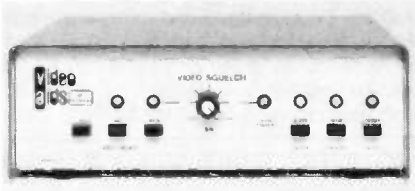
continuity testing, checking neutral and ground terminals in power outlets, checking semiconductors, and voltage testing. POLY-TESTER has no test leads—only one integral test probe. The instrument is said to be unaffected by induction, and test indications are reported by light and sound. POLY-

TESTER operates on extremely long-life batteries, with minimal drain, and solid-state reliability, the manufacturer claims. The POLY-TESTER tests fuses, in box or out, bulb filaments in and out of sockets, electrical appliances, transformer and relay coils, contacts, and switches. It also checks ground and neutral terminals in power outlets for discontinuity.

Video Quality Monitor

Circle No. 145 on Reader Inquiry Card

The Video Squelch, an automatic video fault monitor and signal switch, has been introduced by *Video Aids of Colorado*. The unit monitors a main video feed for signal-to-noise ratio degradation below a customer-set level—or complete loss



of valid video signal. If either fault occurs, an alternative video source is selected and built-in visual and audible alarms operated. An automatic 110-volt switched power source is available to remove power from auxiliary equipment when a fault occurs. Time delays from ½-second to 30-seconds for either defect are customer adjustable The unit resets automatically when acceptable video transmission resumes on the main channel. This unit is intended for unattended control of remote repeaters, automatic alternate best feed selection in cable and satellite distribution systems, and continuous signal monitoring in industrial and broadcast applications. A free-standing unit and a rack mount adaptor are available.

Portable Insulation Resistance Tester

Circle No. 146 on Reader Inquiry Card

Universal Enterprise's IRT1000 is a versatile, three range (2 Megohm ranges: 0-100 Megohms and 0-1000 Megohms; 1 Ohm range: 0-100 Ohms, 4 Ohm mid scale) insulation resistance tester for shop and field use. The IRT1000 can be used for testing electrical machinery, hermetic compressors, transformers, switch blocks, electronic components, and cables. Features of the IRT1000 include: battery operation for complete portability, solid state circuitry, automatic zero adjust, internal electronic voltage regulator (no-drift reading), color coded meter face, battery check feature, and

automatic circuit discharge; fuse protection is provided on all ranges. The IRT1000 comes complete with tilt stand carrying case, batteries, data cards, test leads, instructions, and a one year warranty.

LCD Digital Multimeter

Circle No. 147 on Reader Inquiry Card

The DM25 is a 3½ digit DMM from *Universal Enterprises, Inc.* with a basic dc accuracy specified at ±0.2% of full scale. It will measure dc volts from 0.1v to 1,000v, dc current from 0.1ma to 200ma, ac volts from 1v to 600v, and resistance from 1 ohm to 2 megohms. The DM25 measures 5.4 in. × 3.4 in. × 1.4 in., weighs 10.5 oz, and has a 0.4 in. display. Reported features include overload protection on all ranges, fuse protected current and resistance ranges (to protect against excessive overload), automatic zeroing and polarity, and over-range and low battery indication. An automatic lim-

iter circuit is said to allow up to 140vac to be applied on all OHMS ranges without blowing the fuse. The DM25 is powered by a standard 9v battery. Both battery and fuse are located in an accessible compartment and there are no screws to remove or lose. Safety-type test leads, carrying case, and instructions are included.

CLASSIFIED

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

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

HELP WANTED

Fort Lauderdale, Florida area, **INSIDE TV BENCH TECHNICIAN.** Full-time-permanent job. Good Benefits, salary open. Contact K TV, 6410 North University Drive, Tamarac, Florida, 33321, (305) 722-0230.

WANTED

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

Wanted for Cash: 7N7, 7F7, 53, 6L6 metal, 6AF6, 6HU8, 304TL, 4CX1000A, all transmitting, special purpose and Eimac tubes, etc. DCO Inc., 10 Schuyler Avenue, North Arlington, NJ 07032. Toll Free (800) 526-1270.

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

WANTED: RCA, ZENITH, etc. TV MODULES NEW OR USED. HEATHKIT IG-5240 GENERATOR. ED HERBERT, 410 N. THIRD ST., MINERSVILLE, PA 17954.

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TV/APPLIANCE Est. 15 years in Lisbon, Maine (13 miles S. E. of Lewiston). Owner taking home over $35,000 yr. Priced reasonably with long term financing. Call Collect VR Business Brokers, 207-774-7715.

SATELLITE TV DEALERS Min. Investment, high profits. Market expanding 24% year. 80 channel home earth station, commercial, apartments, motels. EASTRIDGE SATELLITE (collect) 601/647-3406, Box 0, Charleston, MS 38921. 3/82

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

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

FOR SALE

FREE flyer. Electronic parts. IC's, semiconductors, hardware. **BOYD ELECTRONICS,** 10 Center Street, Douglas, MI 49406.

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

FOR SALE: TV-VCR shop equipment and inventory, RCA, Zenith, GE, Philco modules and parts. Bargain price. Send S.A.S.E. for complete list. Don DeMarco, 5687 Billmyer Hwy., Tecumseh, MI 49286.

UHF VARACTOR TUNERS with Internal AGC $17.95 Dealer Net plus Shipping and C.O.D. Charges. Brand new units. Schematic drawing with each order, Channels 14 through 83, Output channels 2 and 3. Dimensions: 2.28" × 3.78" × 1.05" and 75 ohm. United Tuner Service, 1201 West Second Street, Bloomington, IN 47401, 812-339-2179.

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

TUBES: Receiving, Industrial and Semi-conductors, factory boxed. Free price list. Low, low prices. **TRANSLETERONIC INC.,** 1365 39th Street, Brooklyn, NY 11218. 800-221-5802, 212-633-2800.

DISTORTION ANALYZER, HEATHKIT. IMD IM-5248, $95. New in original carton. Ray Larsen, 126 Mill Rd., Tonkawa, OK 74653. 405-628-3695 or 405-762-6341.

B & K mod. 467, $220.00. Admiral modules 70% off. Write for list. Harold Cressler, Box 232A, RD. 6, Carlisle, PA 17013.

At last simple speaker phasing tester. Determines if your speakers are not 180 out of phase. Don't cancel out your high and low's. Determines true polarity for best audio reproduction. Stereo speakers must have voice coil travel same directions. Send $8.95 to Jack Ross, 6415 N. Richmond, Chicago, IL 60645.

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

Burglar Alarms - Cassette tape programs on How To Expand Or Start Your Alarm Business
Send for FREE tape and lists to: Alarm Data, Dept. ET 1825 George Ave., Annapolis, MD, 21401, or call (301) 269-6000. 3/82

USED COLOR TV. Yoke removed from working TV chassis. Send complete information, including part numbers with certified check or money order for $24.50 plus $7.00 postage and handling. Maurer TV, 29 South 4th Street, Lebanon, PA 17042 717-272-2481.

Complete TV and stereo shop equipment for sale. Everything needed to go into business; includes latest test equipment; complete Sams; Sony, RCA, Zenith modules and parts. Over $45,000, at dealer cost for only $15,000. 303-641-4678.

WINTER SPECIALS - 2SC 1172B-20 lot $1.79; 2SC 1308K-20 lot $1.79; SGG13 SONY-10 lot $5.90; 5 FT SOLDER WICK-79¢. MINIMUM ORDER $50. REDCOAT ELECTRONICS, 66 - 15 Thornton Place, Forest Hills, NY 11374, (212) 261-9479. 3/82

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

SATELLITE receivers. Sat-Tec R2BR $795.00. Also Avantek 120° LNA's $650.00 Call **DICK SUBA**, (315) 357-3481.

PCB 2:1 negatives to 11 × 14 $20.00. For positives add $10.00. Add your artwork postage. **REIS ELECTRONICS, INC.**, 1043 S. York #10, Bensenville, IL 60106.

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

SAMS Complete set 1-2039 plus 7 heavy duty 4 drawer cabinets excellent condition $3,250.00 Also used test equipment. 5480 S. Waco, Aurora, CO 80015 (303) 690-3393.

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

MICROWAVE receiver system. Write: "Dealers Wanted", P. O. Box 4181 Dept. ED, Scottsdale, AZ 85258. (602) 941-9395.

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BUSINESS SIDE OF THINGS

Continued from page 14

all parties involved. Nowhere is this more true than in the service business.

Not to despair, though. While it may be a tough problem, a careful effort can be counted on to bring about valuable improvements; and I don't know of any area of management responsibility that holds the promise of a bigger reward than does the challenge of improving technician productivity.

So, where do we begin? Just how does a service dealer or manager go about the business of improving the productivity of technicians (or himself, for that matter)?

Well, there may be a lot of tough questions to answer on the subject of productivity, but that's not one of them. The answer can be found in a phrase I once heard at a management seminar: You can't manage it if you can't measure it.

A fancy way, perhaps, to express a simple idea. Namely, if you expect to bring about improvements, you must know the precise point from which you are starting. You must, in other words, have simple records to record the work of each technician and of the group as a whole. There is no practical way to determine where your efforts are taking you if you don't know where you started from.

Take too much of your valuable time? Not at all. Your records need not be elaborate or cumbersome—and the little time required to maintain them could be one of your best investments ever.

What is needed is the number of eight-hour days worked by each tech. (A ten-hour day would be recorded as 1.25 days, a twelve-hour workday as 1.5 days, etc.) At the end of the period being measured, usually one month, the number of completed calls is divided by the number of eight-hour days to arrive at completed-calls-per-day. That's your average productivity.

More complete records would also compute such things as lack-parts calls and not-home percentages as a way to highlight opportunities for improvement.

Once you have accumulated records for at least a month or two, you're ready to apply the basics of productivity management to your business. Next month we'll talk about specific ways that you can improve productivity in your organization. **ET/D**

AD INDEX

TEST INSTR. RPT.

SECURITY PROD.

NEW PRODUCTS

LETTERS

Continued from page 8

and get less benefits.

And how is your magazine addressing this problem? Not very well, I would say! You express opinions of others, but will not do any investigating on your own! Perhaps you are a part of the system to keep the tech as low as possible, glorify the salesmen, and maintain all the illusions the public wishes to hear! If this is true, you are not being wise, as the continuance of the service business is also YOUR problem, and the communicating of the TRUTH is the only way it's going to continue!
Jack MacGrath

You present an interesting and not uncommon viewpoint. *BUT* before passing judgement on ET/D, read the whole magazine. Read each editorial in its entirety. And remember many of the owners are technicians—often more so than businessmen—which is part of the problem. The technician's pay should be higher, the owner's return on investment should be higher. Service should not, in effect, subsidize the manufacturers or the customers. And ET/D says so regularly. Editor.

Special

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POPULAR HORIZONTAL OUTPUT TRANSISTOR

$2.60 (10-99)

$2.29 (100-up)

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	ERS 165 . . . . . $2.40	

ERS **The Professionals Choice.** Why pay more for others when you can get *QUALITY* replacement semiconductors *DIRECTLY* from MCM? Each ERS semiconductor is backed by a *TWO* year warranty.

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"I'll tell you what it takes to succeed in VTR repair service."

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Leader gives you test signal sources for every conceivable video and audio application—reliable and easy-to-use instrumentation that keeps you right on track. Audio sine/square wave generators cover 10 Hz to 1 MHz with low distortion.

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Photograph of test bench taken at Orlen-Tech, Inc. a factory authorized service center.