

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONICTM

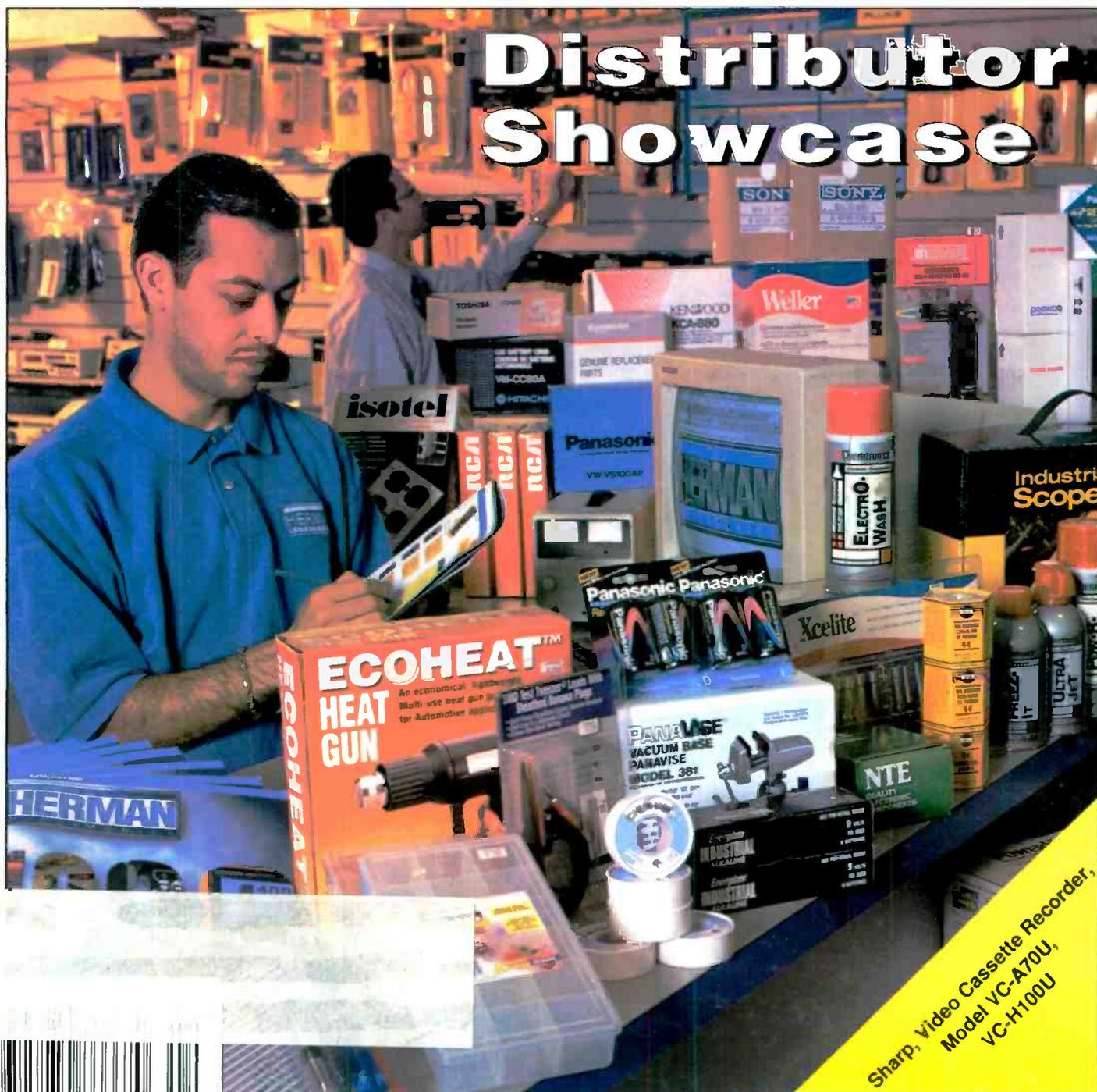
Servicing & Technology

April 1998

Computer software for service center management

Magnavox relay-free power supply

Distributor Showcase



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Servicing & Technology

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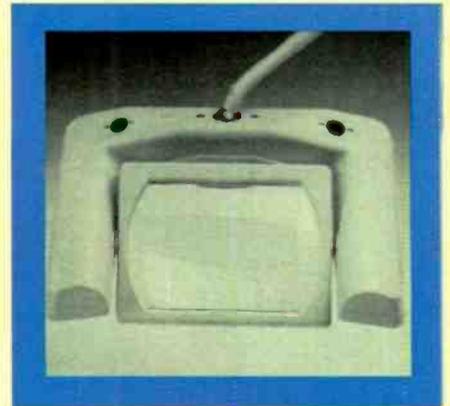
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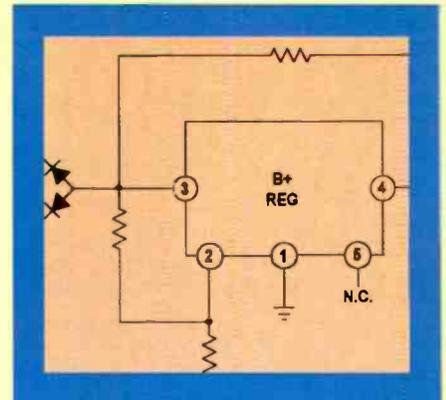
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Most replacement parts distributors are hard-working, well-organized, ethical companies, who will make every effort to help you obtain the correct replacement for a faulty component. Some are less ethical. This showcase will give you a closer look at some of the distributors through their own words; in order to help you make a sound decision about what distributor to do business with.



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Choosing a distributor is like choosing any other type of store. It's important to consider a number of factors, including but not limited to: service, location, convenience, price, hidden costs/charges. (Photo courtesy Herman Electronics.)



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THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONIC

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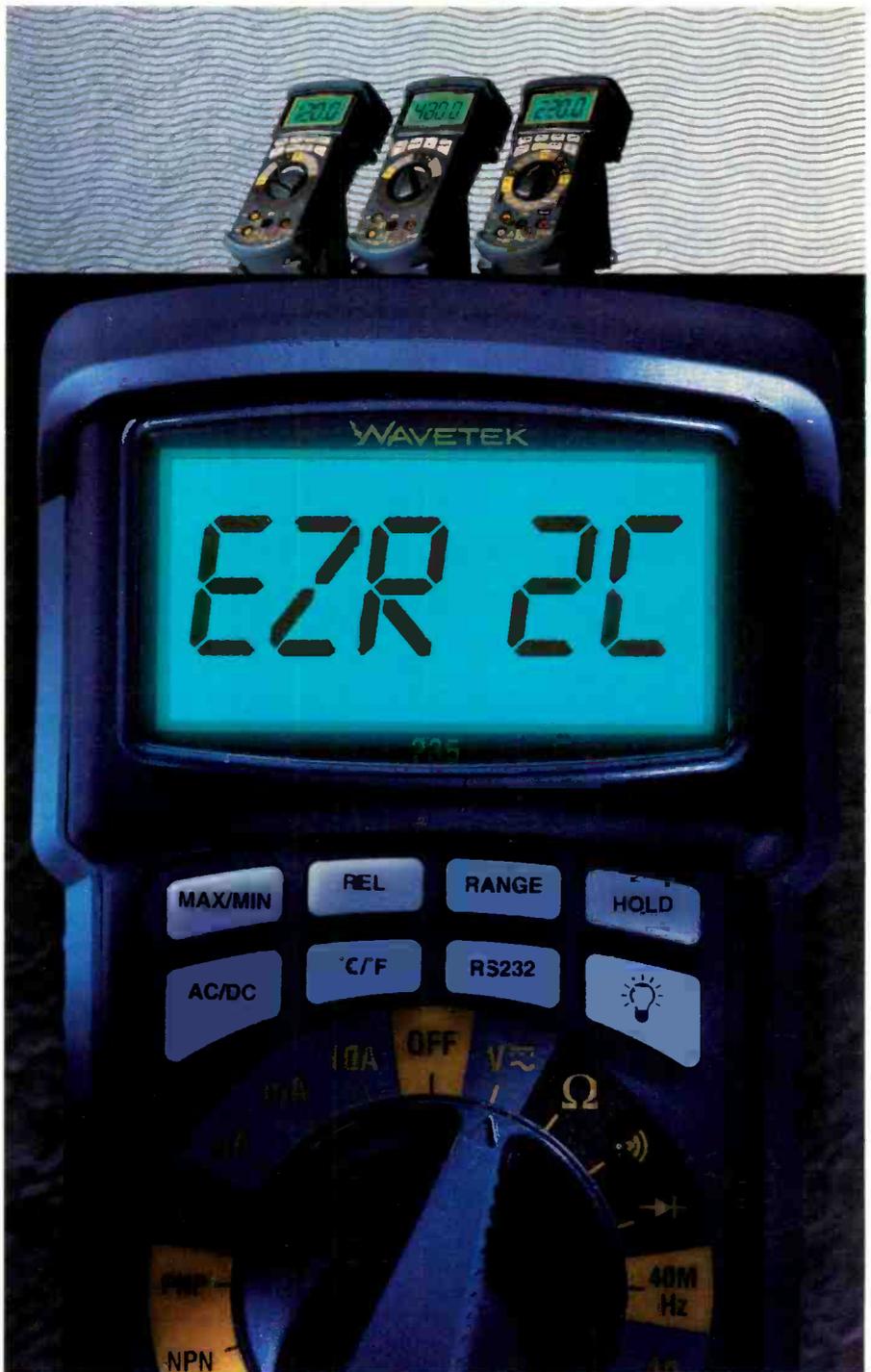
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EDITORIAL

Servicing on site

Whether we like it or not, there seems to be a certain rhythm to most things in life. Just as the seasons change from summer to fall, winter to spring then back to summer again, so other aspects of the world exhibit a rhythm as well. Even consumer electronics servicing. At least the aspect of service that has to do with the location where the product is serviced.

For those of us who are old enough to remember back to the '40s, servicing, and it was TV/radio servicing back then, was primarily performed in the home. One reason for this of course, was that the products tended to be large, bulky, and heavy. Back in those days, the chassis was really a chassis, formed out of metal, with holes in it for vacuum-tube sockets. And every set had a heavy transformer as part of the power supply. There were no "hot" chassis in those days. Moreover, when each home had only one set, it was usually a pretty large table model unit, or a console, frequently containing a radio/phonograph combination as well as the TV.

Another reason that service was usually performed in the home is that servicing the products tended to be simple. Most problems stemmed from a defective or weak vacuum tube. And most products had a relatively small number of tubes in them. Furthermore, the number of vacuum tube types was limited. A typical service technician could carry around a caddy that contained just about any tube he might have to replace.

All of this generally added up to a quick fix at the customer's home. The technician opened up the back of the set and took a look. If the heater filament of a tube wasn't producing a cheery glow, he would pull that one and put it in the tester. If the filament showed open, a new tube would generally correct the problem. Of course, those series string filaments in a few sets had a tendency to make diagnosis harder, but with only a handful of vacuum tubes to check for continuity, the problem was not terribly difficult.

If all of the tubes looked as if they were operating properly, the next step was to evaluate the symptom of the problem and check the tube that was part of the circuitry that affected that aspect of the set's function. Actually, though, given the tendency of vacuum tubes to fail in a relatively short time, it frequently made more sense to check all the tubes for emission, shorts, gas, and other problems, and replace any that seemed on the verge of failing. After all, it made more sense to spend a couple of bucks to make sure that the set would operate for a long time rather than to take a chance on being called back by an irate customer when the set broke down again in a few weeks.

The practice of service in the home began to be replaced by service in the service center as consumer electronics products began to be constructed around printed circuit boards and semiconductor devices rather than steel chassis and vacuum tubes, and as the products became smaller, lighter and less bulky. While



some semiconductors were socketed at first and might not be too difficult to replace, it didn't take long for the manufacturers to recognize that it was less expensive to use automatic equipment to solder the semiconductors in. It also made the circuits more reliable because the potential for failure due to the buildup of oxidation between the lead and the socket was eliminated.

Given this new set of circumstances, it began to make more sense to bring the set into the service center to fix it. First of all, of course, with so many TVs now of portable size and weight, it was quite easy for one man to carry it out of the house and into the service center. And with semiconductors now soldered in, it was more difficult to replace them shotgun style. That meant that the technician would have to perform diagnosis to the component level, a process that takes time and a battery of test equipment. Eventually, in-home service of consumer electronics products became as rare as house calls by the family doctor.

This situation persisted for quite some time, then something happened to change things. Television screens that had for the most part stagnated at a diagonal measure of 21 inches to 25 inches began to grow. Soon direct-view screens of 32 inches or more became common. Moreover, manufacturers began offering huge rear projection sets. These sets are heavy and bulky, and moving them presents a serious challenge for one technician. In addition to being large and therefore difficult to handle, products like projection sets have delicate parts, such as the thin projection screen, and are subject to damage if the set is moved.

Another factor that is making it more attractive to service products in the home is the trend toward home theater. In the home theater environment, especially at the high end, it is common for the components to be built in. In many cases, it's easier to service the product in place, if it can be done, than to remove the chassis and transport it to the service center.

Fortunately, some other developments have made on-site servicing somewhat more practical. For example, many of the test devices have been gradually decreasing in size and weight, while increasing in functionality and ease of use. High quality DMMs now can be held in one hand and weigh very little. Even the venerable oscilloscope has been dramatically reduced in size and weight. Soldering and desoldering tools have been made portable, either through the use of batteries or gas heated tips.

Given the growing complexity of consumer electronics products, it will always be more desirable to service them in the service center rather than on site. The service bench can always be set up more appropriately for service than the customer's home. But in many cases, given heavy, bulky, or built-in product, it makes more sense to service on site where possible. The lives of the service manager and service technician have become a little more complicated now that they occasionally have to make the decision as to how and where to most efficiently and effectively service those products.

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Computer software for service center management

by the ES&T Staff

The introduction of computers formalized the idea of the term "database," but businesses and institutions already had some form of database in place before computers came along. In a library, the database was the card catalog. It took up quite a bit of space, and in order to gain access to the information contained, a library patron had to go to the library and look up the information they needed. Nowadays, in most libraries, that same information is housed in a computer, and it can be accessed from computer terminals all over the library, or even from the personal computer of a patron from home.

Businesses have always had customer information lists: name, address, telephone number, service performed, etc. As often as not the customer information list was recorded on 3X5 cards, or a Rolodex, or something like that. This list was, in essence, a database. A database allows the business to keep track of customer activity, or to mail out flyers to their customers announcing sales or other events.

In the case of a consumer electronics service center, other data is recorded as well. When one of those customers on the database (or a new customer, newly added to the database) brings in a product for service, that information is added to a database of products in the service center. This database is frequently updated, as the product progresses through the service process, to the completion stage.

Throughout the process, various forms are produced: the customer claim form, the identification tag or sticker that is affixed to the product, the bill of materials, the invoice.

The limitations of manual databases

Manual databases are useful, of course. But, being manual, they require that the user perform the same functions over and over again. For example, every time a new form or portion thereof is generated, the information has to be manually

entered again. Of course, carbon copies can improve this situation, but carbons tend to be messy and they're not always easy to read.

Moreover, because the database is manual and on paper, the information is available only to someone who has the paper in his hand. In the case of a service center, for example, any time some procedure is completed on the product, from initial diagnosis to ordering of parts, to completion of service and performing of the operational test, or burn-in, no one in the service center will be aware of the status of the product except the technician, unless an elaborate, and perhaps cumbersome, procedure has been established such that each location reports to a central location each time there is a change in status of a product.

If such a procedure does not exist in a given service center, then any time a customer calls in to determine the status of repair of his product, the customer service person has to check with the technician, via intercom or in person, thus disrupting the flow of the work of both the technician and the customer service function.

A computer database eliminates these limitations

Many service centers still have not adopted computers. They simply feel that computers are an unnecessary product that they would have to learn about and pay good money for no reason. After all, they can continue to do things the old fashioned, manual, way. And of course they can. But a computer can certainly make all of that work of making out paperwork, retrieving data and generating reports a whole lot easier.

In fact, service management software is possibly the best argument for a service center to buy a computer. And the best thing about the software of today is that it really doesn't require that the user know anything about computers. They simply have to learn how to use the software.

But even that statement is somewhat misleading. Many, if not most, of the service center management software packages available use methods and procedures that make using them as simple as using their paper equivalent. And they make all of the paperwork chores associated with consumer electronics service so much easier than doing the same things with paper and pen.

Tracking a product

Let's consider a typical transaction using one type of service management software on a computer network. In this scenario, a customer brings in a TV set. The front desk person asks the customer if he has done business with the service center before. If the answer is no, the counter person asks for and keys in name, address and telephone number, etc. If the customer has done business there before, the customer service person asks for the customer's telephone number and keys it in. The data for that person; name, address, telephone number, etc., will appear on the screen.

At this point the information on the set: brand, model number, chassis number, screen size, complaint, etc. is then keyed in. Any other pertinent data such as amount of deposit and the promise date are also entered.

At this point, the press of a few keys causes the computer to print out a claim check and an inventory tag to be attached to the set. If the system has the capability, these documents may be bar coded for simplified data entry when the status of the set is updated.

During the service process, pertinent update information is entered into the computer; such things as the name of the technician assigned to the product, trouble found, parts that need to be ordered, location of the set if it has to be temporarily stored, etc.

If the customer calls to ask the progress of the VCR, customer service only has to

enter the individual's telephone number into the computer and the appropriate information appears on the screen.

When the repair is complete, the total labor and parts, as well as any miscellaneous materials charges are entered into the computer, the invoice is prepared, and the owner of the product is contacted.

Shared information streamlines the process

With some software, the service center may be able to do a lot of other things with the information available. Let's say that, the replacement parts inventory and service information are also on the network, which is a possibility with many service management software programs. Now when the service technician needs service information he checks the computer to determine if it is on file at the service center, and if so, where it might be. If that service literature is already in use, that information will be displayed. If the service literature is on file and available, when the technician takes it out of storage he makes the appropriate entry and

everyone in the service center knows where it is.

If the technician uses a part from inventory to perform this repair, the inventory is updated to show the new correct number of parts, and if the stocking level has reached the reorder trigger point, the part can be placed on order.

Other features

If the software is properly equipped, all of the financial information can be accessed and brought into the accounting system directly, without the need to re-enter the data. If the program has an electronic filing option, the appropriate warranty information can be transmitted electronically to the manufacturer.

Which service center management software?

Service management software programs range in price from a few hundred dollars to several thousand dollars. It's impossible without a thorough study to determine which one is the best for a particular service center. The one with the

largest price tag is not necessarily the most full-featured or useful. The only way to determine which would be the best for your purposes would be to try several that seem to be in line with your needs and find out which one, if any, will do the job for your service center.

Most service management software companies offer demo programs, some of which are actually fully featured versions, but limit the number of records that can be entered to ten or twenty. Experimenting with several of these demos will give you a chance to determine if one of them will work for your service center.

Be sure to try all of the features and make sure it will do everything you need it to do. One service center owner with whom we've spoken has a wonderfully useful program for managing his service center, but it won't interface with his accounting system, so every month his clerical personnel have to manually transport all or part of the financial data to the accounting system. That's an unfortunate waste of time.

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Look at our list

This box contains a listing of all of the companies that we know of who offer service management software. This listing is as up to date as we could make it.

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Fax: 201-529-2955

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Fax: 512-834-1137

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On-site servicing

by the ES&T Staff

Service in the service center has many advantages over servicing on site. For one thing, there's the service bench itself. If it was properly designed, it's at the right height, designed to hold the weight of any product serviced by the company, well lighted, provided with the correct power requirements, tools, test equipment and supplies. In addition, all of the correct service literature is readily at hand. If it's not right at the service bench, it's in a filing cabinet just in the next room. And if any generic replacement parts are necessary to complete the job, they may very well be in inventory at the service center.

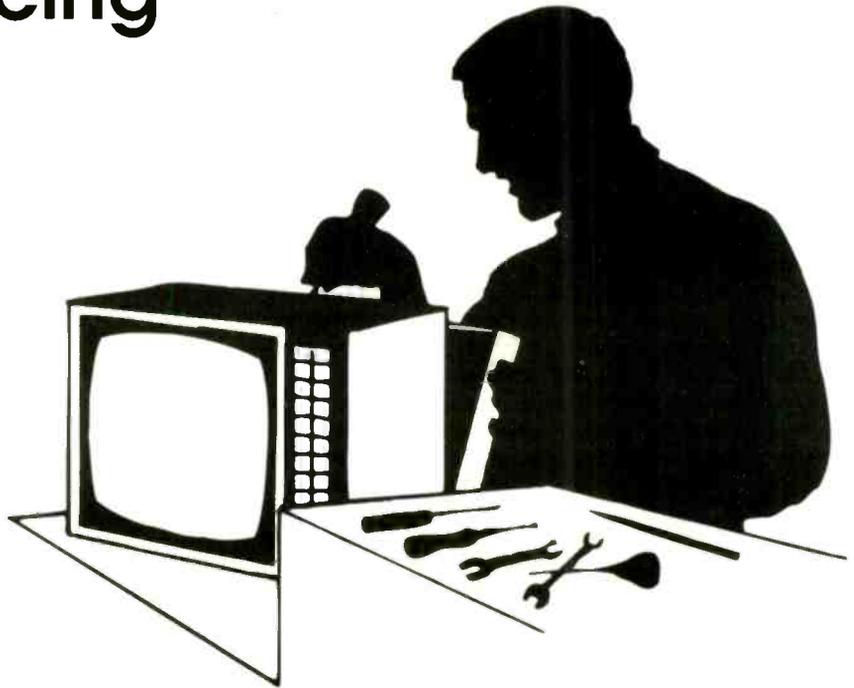
Even more important in some cases, is the presence of other technicians. If a technician is working on a product and needs to ask a question he may only have to shout to a guy over at the next bench in order to find an answer.

Service on site

There was a time when servicing of a consumer electronic product on site was the norm. When the active devices in a TV set or radio were vacuum tubes, products malfunctioned frequently, the cause of the malfunction was almost always a bad tube, and the number of different tubes that a typical set contained was limited to a relative few. Under these circumstances, it made great sense to service on site. A good technician armed with a tube tester and a caddy full of tubes could fix just about any set in a half hour or less.

Things have changed, however. Consumer electronics products of today are very reliable. Where they once might have broken down several times a year, they now generally break down only every several years. And servicing them usually requires service literature, some sophisticated test equipment and accessories, and a highly trained technician.

Under these circumstances, servicing on site is almost always something of a compromise. If the product is large or bulky, like a large direct-view television set, or a rear-projection set, it's preferable to be able to fix it right where it sits.



Removing a projection chassis for transportation to the service center can take a great deal of valuable time, and there's a pretty good possibility of damage to the product during handling or transportation. On the other hand, if the product is a personal computer, it may be desirable to service the product on site simply to return a product that the user has come to depend upon to service as quickly as possible.

As desirable as it is to service such products on site, on the first visit, there will be cases in which it will simply not be possible to service them on site. Either the tools, or the test equipment, or service literature, or replacement components will not be available. Or the diagnostic process will take an inordinate length of time, to the extent that the confidence of the customer in the ability of the tech will be seriously undermined. In such cases there is no alternative but to take the product back to the service center.

Providing the required equipment for on-site service

While no service center will probably ever be able to provide enough of the requisite tools, test equipment, etc. to complete every job on site, proper planning and making a commitment to on-site work will increase the percentage of jobs you can complete on site. The closer the environment on-site can be made to the

environment of the service bench, the more likely completions will become.

An ideal assistant would be a mini bench for the technician to take on on-site service calls. It could be nothing more than a reinforced steel box with room for all of the tools and test equipment, a plug strip so that the technician can plug in all of his electrical equipment, an isolation transformer to provide isolated power for any line operated test equipment, and room enough on top to place a large chassis. This would get the product up off the floor, and make on-site service more like bench service at the service center.

Cell phones/two-way radio communication

These days, two-way communication, whether it's via cellular telephone or a dedicated two-way system is inexpensive relative to the cost of paying a technician. It makes sense, therefore, that a techni-

“While no service center will probably ever be able to provide enough of the requisite tools, test equipment, etc. to complete every job on site, proper planning and making a commitment to on-site work will increase the percentage of jobs you can complete on site.”

can be equipped with some method of communicating with the service center to ask for assistance in servicing the product, to ask about a cross reference for a part, to request that a part be picked up and delivered to him by a lower paid assistant, or even in some cases to call for assistance in finding the location of the service call site.

Another use of a two-way radio or cellular telephone would be to keep in contact with customers. That way, if the technician has been delayed at a service call, he could call customers at locations where he's scheduled to arrive later in the day to let them know he'll be delayed. Similarly, when the technician has completed a service call, he can call and make sure that someone is actually in at the next site he is scheduled to arrive at.

Laptop computers

Laptop computers are not cheap. A state-of-the-art laptop may cost a few thousand dollars. But the salary of a good technician is several tens of thousands of dollars a year. If a laptop computer can help a technician perform service on site, perhaps in some cases allowing him to complete a service procedure quickly, and in the minimum number of trips, it might make sense to provide on-site technicians with laptop computers.

There are a number of things that a laptop can do to help the technician. For starters, many of the replacement parts cross references are now available on either floppy disk or CD ROM. If a technician is able to isolate the cause of the problem in a customer's product to a component, he may have a generic part on the service vehicle that will correct the problem, but if he doesn't have a cross reference available, he won't be able to determine that. If, however, he has a laptop computer with one of the cross references loaded on it, he might be able to quickly locate a suitable replacement and complete the service call.

As another example of the usefulness of a laptop computer in on-site service, some manufacturers are now offering service literature in the form of some kind of computer disk. If the technician has a computer with him that has the appropriate service literature loaded on it, it may be possible for him to isolate the cause of

the problem and correct it far easier than if he had to guess at the circuitry he's involved with, or if he had to leaf through bulky service manuals.

But the potential value of a laptop computer to the technician doesn't stop there. Several companies offer software that contains complete maps of every street in the U. S. And this software allows the user to enter a street name, a telephone number, a street number, or a zip code to locate an area, or even a particular address on the map. Armed with this type of software, a technician might save a considerable amount of time in finding a site to which he has been dispatched.

If the laptop computer was outfitted with an inexpensive, portable, printer, and the company's invoicing software, the technician could save several minutes per call in the generation of invoices. Moreover, the data would then be downloadable to the company's main computer, thus eliminating the need to key the information in again.

Consider the customer's home

No one wants to have their TV, VCR or personal computer fail. No one wants to have their product brought into the service center for several days or weeks to be fixed. And no one wants to have a technician pulling their product apart in their home. No matter how you look at it, having to have a product serviced is an unpleasant ordeal. The attitude and approach, as well as the competence, of the technician can have a strong effect, negative or positive, on the customer.

For starters, if the technician can get the product repaired on the first trip, and without taking the product back to the service center, the customer has the product back in service quickly and does not have to put up with having a partially disassembled product cluttering up the living room, or wondering when it will be fixed.

But there are other considerations. As the technician is disassembling the product, he may be removing dusty, grimy, parts and subassemblies. The clean rug is not a good place to put those parts. The technician should have plenty of dropcloths, containers, or other receptacles for the disassembled parts. And depending on the equipment the technician will be

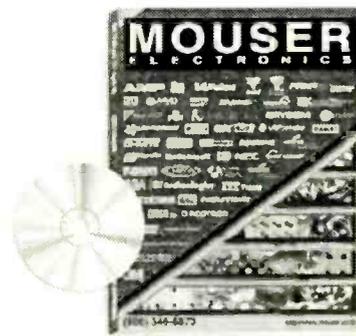
bringing in, or the product that may have to be removed from the site, it might be a good idea to put down runners to keep the floor and stairs from being soiled.

In short, the technician should be trained to make his visit as pleasant as possible for the customer.

Planning is the key

Because of the complexity and technological sophistication of consumer electronics products, it's always preferable to service them in a well equipped service center. Unfortunately, because of the size of some of today's products, and because many of today's home theater products are built in, it's not very practical to move them. To make on-site service practical, the technician who performs this type of service should be technically competent, equipped as near as possible to the way he would be equipped in the service center, and well trained in customer relations.

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Circle (71) on Reply Card

Lighting and magnification for the service center

by The ES&T Staff

Consumer electronics servicing is a difficult pursuit in a number of ways. It requires a detailed background knowledge of the principles of electronics circuit operation. It requires manual dexterity in handling the tools and the tiny components and subassemblies that a service technician encounters. It requires research skills to find the correct service information and apply it. And it requires good eyesight, either natural or assisted to be able to see the tiny components and their connections.

Because consumer electronics servicing is such a challenging visual task, it's important that the service environment have good lighting so that the technician can see the circuitry he's inspecting or repairing without the annoyance of reflections, glare or other lighting problems. Moreover, today's consumer electronics servicing environment increasingly requires the use of computers, both at the customer service desk and on the bench. It will help personnel at computer screens at either of these locations to do their jobs if they are furnished with lighting that gives adequate illumination without the sources of brightness that reflects off of the screen and makes the information difficult to see.

Providing good lighting

Good lighting for work such as servicing of consumer electronics products usually includes a number of different types of light sources. And keep in mind that if the people who are going to be working in the area are going to be kept happy and healthy, the design of the lighting system should include consideration of more than just the amount of light needed to perform the task.

For starters, if the lighting is "cold" in color, as the light put out by cool white fluorescents and some types of vapor lamps, people will feel that the environment is cold. Furthermore, the spectrum

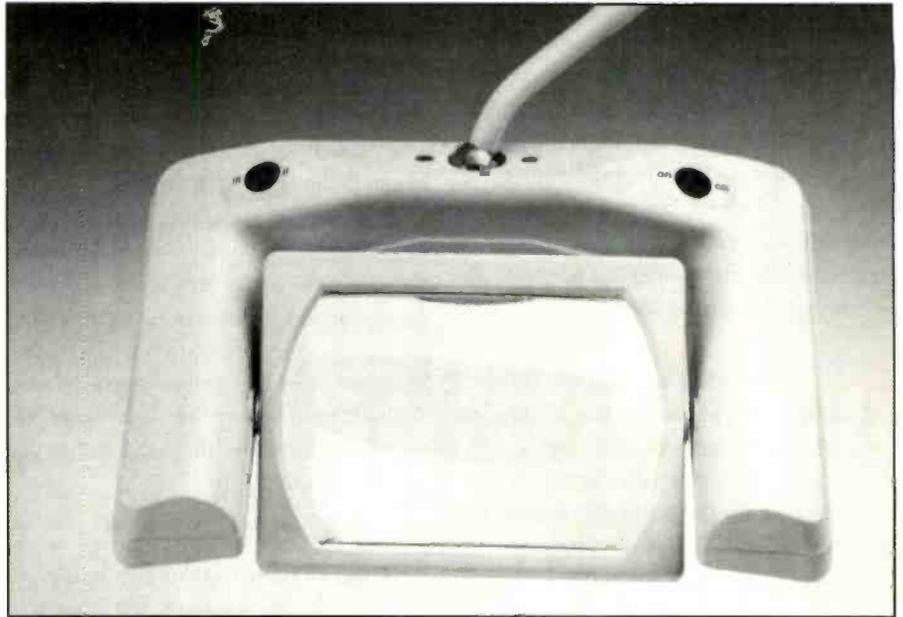


Photo courtesy Waldmann Lighting.

of cool light is limited, so that many colors will not look correct in that light.

Another consideration for lighting is to be sure that part of the lighting is used to illuminate the walls. A room in which the interior is lighted, but the walls are dark gives the people working in the room an uncomfortable feeling.

And watch out for glare. Open fluorescent fixtures provide a lot of light, but they are very bright, and so may cause eye discomfort to someone who is trying to perform a difficult visual task, and who is in the glare from one of these fixtures.

Task lighting

In a service center, task lighting frequently consists of a fluorescent, or other large lamp, mounted over the workbench. This type of lighting provides copious amounts of light, but because there are large objects on the bench, such as a television set or an oscilloscope, the area of interest to the technician may be shaded.

Because of this shading problem, and

for certain other reasons, it frequently makes sense to add another type of lighting to the service bench: adjustable arm task lighting. Adjustable arm task lighting is a work surface, wall mounted or panel mounted fixture that offers flexible arm and head joints. This flexibility allows any technician to adjust the task light to meet his own individual work requirements and visual needs.

Adjustable arm task lighting is available in several different arm styles ranging from 15 to 32 inches in length. They have a versatile variety of mounting options including table clamps, wall brackets, freestanding table bases and even panel brackets that fit many of the proprietary open office furniture systems that now are available.

Many types of task lighting offer constant illumination over a large area of the work station. This type of lighting is ideal for workers who require a large amount of task-intensive illumination. As long as ambient overhead lighting levels are low,

Common VDT Worker Symptoms

Listed in order (frequency) of occurrence

Ranking	Symptom
1	Headaches
2	Near Blurred Vision
3	Slowness in Focusing
4	Double Vision
5	Eyestrain (sore eyes or eye fatigue)
6	Glare (light sensitivity)
7	Eye Irritation (burning, dryness, redness)

Figure 1. People who work at video data terminals or computer monitor screens for long periods of time frequently complain of these symptoms.

Relationship Between Eyestrain And Time Spent At A VDT

Hours Spent at VDT	% of Users Experiencing Eyestrain
1-2	63.9%
2-4	72.7%
4-6	76.7%
6-8	80.4%

Figure 2. The length of time spent at a computer monitor screen can be directly correlated with the percentage of workers who will complain of eyestrain.

and there are no computer screens in the immediate areas, this can be a sound lighting solution for the service center.

However, sometimes little thought is placed on task-light output. Often the illumination on the work surface is too high when combined with overhead lighting.

Adjustable arm task lighting illuminates a selected area of the work station and works well in areas where workers perform multiple tasks requiring light at different areas. This task lighting also works well in computer-intensive work environments since the light can be positioned close to the computer.

Some adjustable arm task lighting also helps eliminate the problem of reflective glare by using a parabolic louver system which diffuses light and directs it only to the area that needs illuminating. This parabolic louver system limits the exit angle of the reflector which helps prevent glare on work surfaces and VDTs. Adjustable arm task lighting is used most effectively when certain areas need to be illuminated, not the entire desktop.

Mounting and positioning the lamp

Important questions should be considered when specifying lighting for an office environment. If you answer "yes" to any of the following questions, then adjustable arm lighting may be a sound lighting solution.

- Are ambient (general) light levels too high, causing glare on the computer screen and work surfaces?

- Does the worker perform many tasks in his work area that require illumination at different work station locations?

- Is there a high contrast of light and dark areas in the work station?

- Is the task lighting causing reflective glare on the VDT?

- Is glare a problem in general?

Considerations for people who work with video screens

There was a time when workers who spent time in front of a monitor were in a small minority. These days it seems that most workers spend at least part of their time in front of a screen. As you can see from Figure 1, there are a number of problems from which people who use video suffer. And as we all know, problems such as headache, eyestrain and the others listed in Figure 1 cause the efficiency of the sufferers to decrease. In the worst case, someone so afflicted might have to leave work, causing problems for management at the facility. Figure 2 shows a correlation between the amount of time spent at a monitor screen and the frequency of symptoms experienced.

Magnification basics

Using a magnifier to assist in inspecting a product for defects that may be the cause of a malfunction seems like it should be easy: you just choose a magnifier and look at the product you want to inspect. But, there's more to it than that. You need to choose a good magnifier and light source and set them up properly to perform your inspections efficiently, and with as little eye strain as possible.

Overhead lights, either fluorescent or incandescent, aren't appropriate for most inspection tasks because they produce glare that interferes with viewing small parts and details. And, you can't adjust the positions of overhead lights. If overhead lights are too bright, though, you

may be able to remove fluorescent tubes or incandescent bulbs, which will solve the problem and save energy, too.

Most service benches rely on a combination of overhead light and light from a source on the bench. The best light source is adjustable, perhaps with an articulated arm or a gooseneck, so you can position the light where you need it. You can direct the light to enhance the contrast and colors, which makes the details of components and assemblies easy to see.

Some magnifiers come with a fixed light source, such as a circular fluorescent tube that encircles a magnifying glass. This arrangement may satisfy some needs, but keep in mind that it makes it impossible to reposition the light source independent of the magnifier. And, glare from the sample you're inspecting can reflect back to your eyes through the magnifying glass. At first, you may perceive this glare as more light, but eventually it will become an annoyance and will make inspection more difficult than it should be.

The type of light bulb you choose and the bulb housing are also important. Energy-efficient fluorescent lamps last longer and provide better color rendering than older bi-pin fluorescent tubes. Also, a polished metal reflector will usually direct more light onto your work than a white-plastic or foil reflector. Another important factor is the lamp's mounting arrangement. Look for a variety of attachments or mounting arrangements, as you may want to clamp your lamp to a shelf now but attach it to a wall later.

Find your comfort zone

In addition to choosing a light source, you must also select a magnifier that suits

Lighting terminology

Ballast: An electromagnetic or electronic device used in fluorescent lights to provide the necessary starting voltage and to limit the lamp (tube) during operation.

Color rendering index: The method that indicates how colors will look under a given light source. A color rendering index (CRI) number is assigned to a light source based on its ability to make pigments look as they would under certain test sources when compared to other sources having the same color temperature. The benchmark light source is incandescent (100 CRI). Compacts grade at 82-86 (very good). Fluorescents at 62 (below average).

Color temperature: Apparent color temperature (or correlated color temperature) of a light source indicates its degree of warmth or coolness with the higher number being cool.

Compact fluorescent lamp: Small, but getting larger, fluorescent lamps used in all sorts of applications today. Its lamp life is about 10 times that of incandescent lamps and uses 70% less power. Also referred to as "PL" or "Twin Tube" lamp.

Footcandle: The unit of measurement of illuminance of a surface. One footcandle is equal to one lumen per square foot.

Glare: The effect of brightness or brightness differences within the visual field sufficiently high to cause annoyance, discomfort or loss of visual performance.

Light pollution: Light distributed in areas where light is not desired.

Luminaire: A complete lighting unit consisting of a lamp (or lamps) together with the parts designed to distribute light, to position and protect lamps, and connect them to the power supply.

Lux: The unit of illumination in the metric system, equivalent to the illumination on a surface of one square meter. $10 \text{ Lux} = 1 \text{ fc}$

Parabolic louver: Louver composed of baffles that are curved in a parabolic shape. The resultant light distribution produced by this shape gives reduced glare, better light control and is considered to have higher aesthetic appeal.

Reflector: A device inside the luminaire head which reflects lumens to the desired illuminated viewing area.

Transient adaptation: The eyes moving from the printed task, to the VDT screen.(i.e. reduced visibility after viewing different lighting levels.)

Veiling reflection: Images or reflections that appear on (reflected glare) the VDT screen from offending object (sunlight, uncovered windows) inside or outside the room. This is often called "ghosting."

Visual task: The objects and details that must be seen to perform an activity.

Watt: The unit for measuring electrical power. It defines the energy consumed by an electrical device when it is operating. The cost of operating an electrical device is determined by the watts it consumes times the hours of usage. Remember, watts is power consumed, not light output. They do not correlate.

the types of inspections you'll make. One of the most common misconceptions about working with a magnifying glass is that you have to press your nose up against it to inspect something. Actually, each person has a "comfort zone" at which he or she can view objects under a magnifier without experiencing eye strain. The comfort zone is often called the nodal or near point; for most people, the comfort zone is about 10 inches in front of their eyes. So, keeping the magnifier about 10 inches from your eyes should provide comfortable viewing.

If you've used a magnifier, you're probably familiar with the term power, expressed as nX. For example, a magnifier with 4X power means that the image you see through that magnifier is 4 times larger in both length and width. Thus, the image is 16 times the area of the original object. When reviewing magnifier specs, you may encounter the unit diopter, which refers to the ability of a lens to bend rays of light. Like power, diopter describes a lens' magnifying ability.

You may also encounter a spec for a magnifier's focal distance. This distance is the maximum distance at which you can view an object without its image being distorted. The focal distance is measured from the center of the lens to the object. Just remember a simple rule: as magnifying power increases, focal distance decreases, and the size of the lens decreases. Thus, a high-power lens is small, and you must position your work close to it. A lower-power lens can be large, and you can position your work farther from it.

Tinted glass can distort colors

The glass used in a magnifier can be important if you need to inspect colored components. Look for a magnifier that has no tint; some glass has a green tint that can distort colors. Consider the magnifier's shape, too. Circular magnifying lenses work well for small objects, but if you're inspecting a PCB, you may want a rectangular or "stadium-shaped" lens, which will let you see more of the board at one time. If you anticipate that your inspection needs will change over time, consider purchasing a magnifier that can accommodate stacked lenses. This feature will make it easy for you to increase the magnifying power of your basic magnifier.

This article was based on information provided by Waldmann Lighting. ■

Figure 3. For someone planning a lighting system, these terms should prove helpful.

Test Your Electronics Knowledge

By Sam Wilson

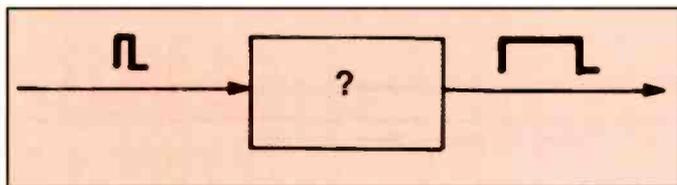


Figure 1. Another name for this pulse stretcher is a _____ multivibrator.

1. The pulse stretcher in Figure 1 is also known as a _____ multivibrator.

2. Which of the following counters is easiest on the power supply?

- A. Ripple
- B. Synchronous

3. According to DeMorgan's Law, NOT A OR B equals _____.

4. What is the output voltage of the circuit in Figure 2?

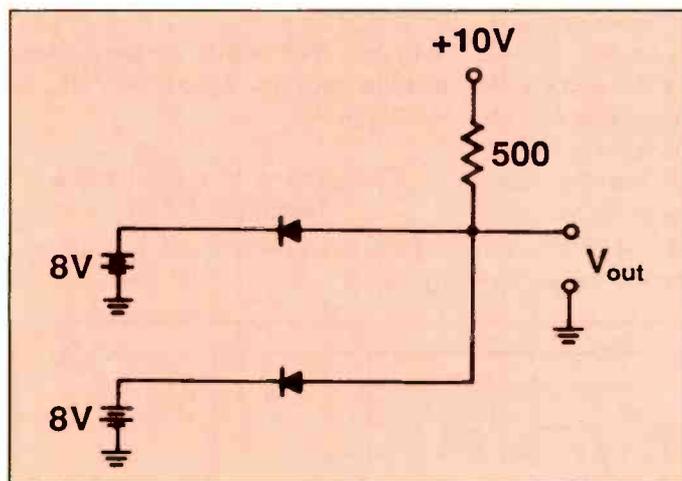


Figure 2. What is the output voltage of this circuit?

5. Figure 3 shows a _____ gate.

6. You know that 2000 pounds is equal to one ton, but, how many pounds is equal to a *long* ton?

7. Name three classifications of PROMS. _____, _____, _____.

8. Dynamic memories are made with

- A. resistors.
- B. capacitors.
- C. inductors.

Wilson is the electronics theory consultant for ES&T.

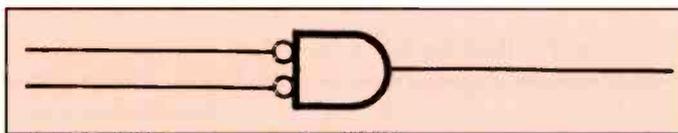


Figure 3. What type of gate is this?

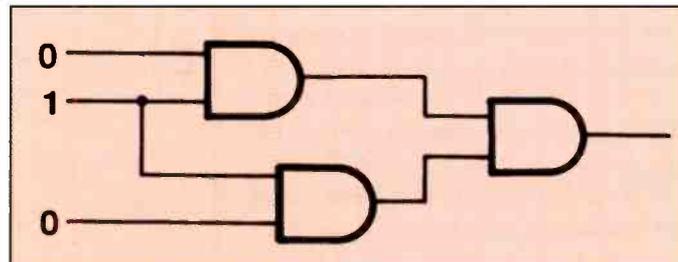


Figure 4. What will be the output of this logic circuit?

9. BCD number 0010 1001 1000 is equal to

- A. 298.
- B. 892.

10. What is the output of the circuit in Figure 4?

(Answers on page 56)



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Circle (80) on Reply Card

Magnavox relay-free power supply

by Steven Jay Babbert

In a recent design, the five-terminal regulator is being used as a part of a relatively complex circuit. At first glance it looks like an engineer was bored and decided to complicate a perfectly good design. Closer examination will reveal that the added components enable the supply to be switched on and off without the use of a relay. Since relays tend to fail after a few years, this new design may prove to be an improvement. In any event, one more mechanical device has been eliminated from the chassis.

The basic circuit

Before we get into this new design, let's review the basic circuit that the five-terminal regulator was designed for (Figure 1). The relay is situated just ahead of the bridge rectifier. The raw dc output from the bridge is routed to the input of the regulator at pin 3. The output at pin 4 supplies the horizontal output transistor (HOT) and any other sections that do not rely on a scan-derived supply. The regulator is shunted by a power resistor (typically around 200Ω at 25W) which passes a portion of the total current drawn by the chassis. This lightens the load on the regulator without affecting its operation.

The internal circuit of the regulator is shown in Figure 2. Error detector Q1 monitors the regulator's output and compares it to a zener reference. Any detected error is amplified by error amp Q2 and then applied to series-pass transistor Q3 which then conducts more or less as needed to correct the error. For example, if the base voltage of Q1 decreases due to a drop in the regulated B+, it will conduct less, allowing the voltage at the base of Q2 to rise. Q2 will now conduct more, pulling up the base of Q3 which, in turn, conducts more and increases the regulator's output voltage. An increase in the base voltage of Q1 causes the opposite action to occur.

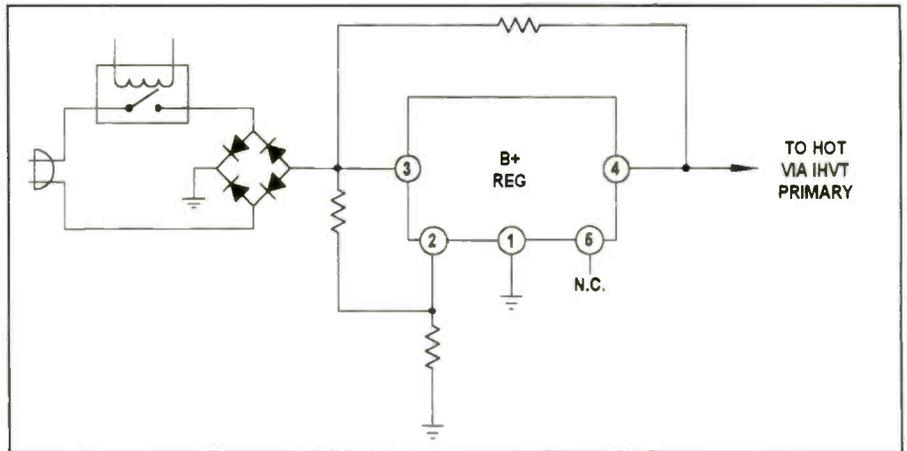


Figure 1. In the conventional design, the 5-terminal regulator is situated downstream of the on/off relay. The regulated output is routed to the HOT via the IHVT primary winding.

Note that pin 2 is connected to a voltage divider which sets the bias for Q2. This pin is normally held at about 1.2V below the voltage at the regulator's output (this is the combined drop of the e-b junctions of Q2 and Q3). The error detector only adjusts or fine tunes the bias. This type of regulator can be effectively switched off by simply removing the bias

from (or grounding) pin 2. This is essentially how the need for a relay is eliminated in some new Magnavox TV models (Figure 3).

Operation of the regulator in a Magnavox TV set

Pin 2 of regulator IC410 is controlled by on/off switch Q402 and start-up

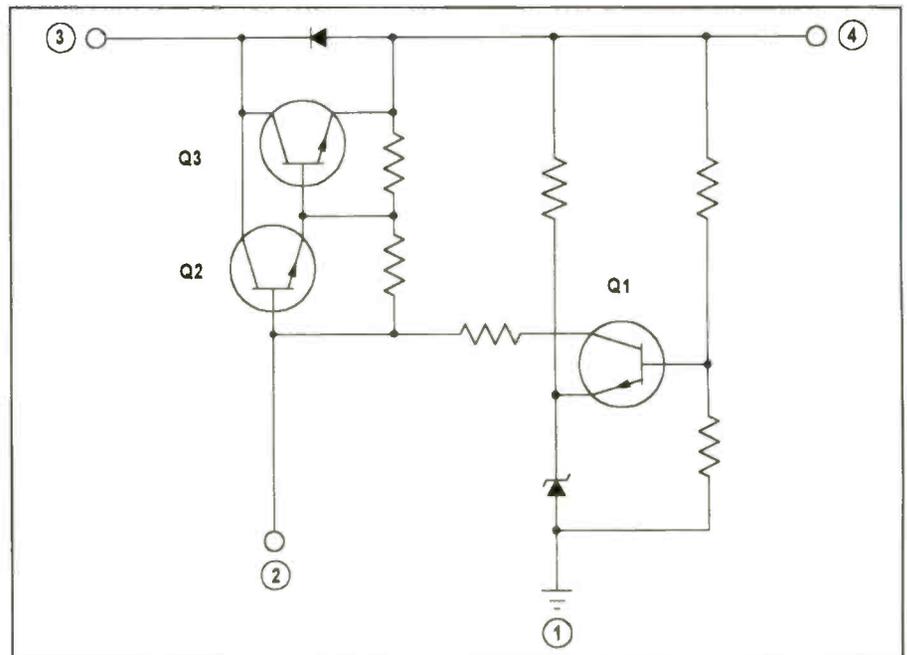


Figure 2. The five terminal regulator comprises error detector Q1, error amp Q2, and series-pass transistor Q3. Pin 5 is unused.

Babbert is an independent consumer electronics servicing technician.

Courtesy of:
 Howard W. Sams
 2647 Waterfront Parkway East Drive
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 800-428-SAMS

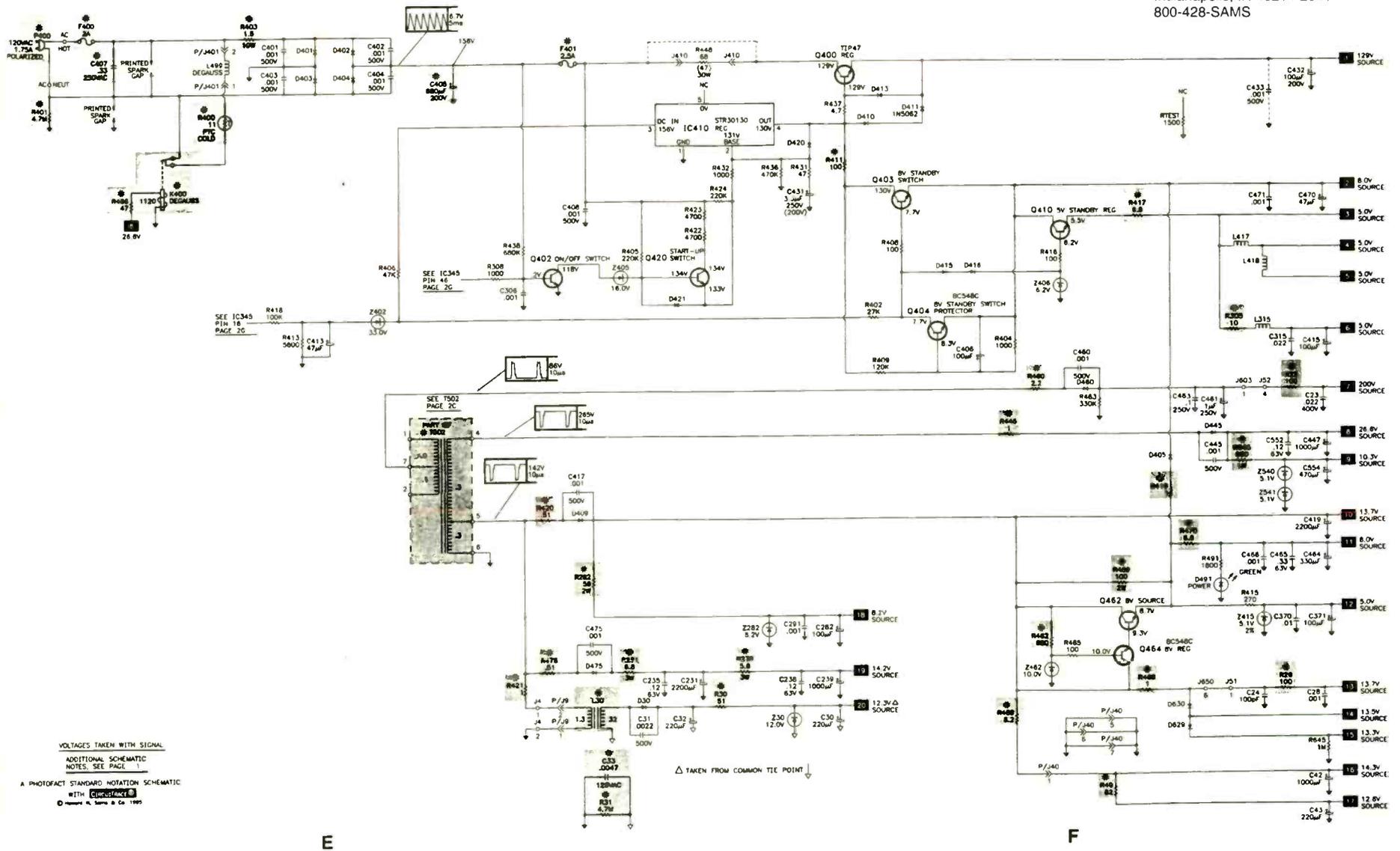


Figure 3. The Magnavox 25P506-00AA uses an unusual circuit configuration to eliminate the need for a power relay. The main B+ regulator goes into a standby mode when the set is off.

	E	B	C
Q402	0	0.7	0.03
Q420	16.2	15.7	161
Q400	14.4	15	161
Q403	6.6	7.2	11.7
Q404	6.6	6.6	7.3
Q410	5.4	6.1	6.6
	PIN 2	PIN 3	PIN 4
IC410	16	161	15

Table 1. These are the voltages that will be measured in the standby mode if the power supply is functioning normally. This will be helpful when troubleshooting or analyzing the operation of the circuit.

switch Q420. When the set is turned on, pin 46 of the system control (syscon) pulls the base of Q402 low turning it off. This allows the base of Q420 to be pulled high via R405. With Q420 on, the series combination of R422 and R423 is connected in parallel with R424. This combination forms a voltage divider with R432 and R436 (the high end of the divider is connected to the raw dc supply and the low end is tied to ground). The division factor is such that pin 2 has sufficient bias to regulate.

Supplemental regulator Q400 doubles as a switch to complete the current path through regulator shunt R448, a 68Ω 30W resistor. Note that when the chassis is running, all three elements of Q400 measure 129V on the schematic. Actually, the voltages are around 129V, 129.6V and 129.1V for e, b, and c, respectively. The main purpose of Q400 then is to open the shunt circuit when the chassis is powered down, and to act as a saturated switch when the chassis is running. R448 and Q400 normally pass about 300ma, about half of the total current drawn by the chassis.

When the chassis is running, voltage from the 8V source regulator, Q462, in the scan-derived section of the power supply takes over standby 8V source number 2 by forward biasing commutating diode D405. This voltage is also applied to the collector of 5V standby regulator Q410, taking over source number 3. The 8V is also applied to the emitter of standby switch Q403 causing it to turn off. Note that the base is clamped to less than this value by D415, D416, and Z406, hence Q403 is in cutoff.

This system is designed so that, instead

of the regulator being switched completely off at power down, the regulator goes into a low-voltage or standby mode. When the syscon receives an "off" command, pin 46 goes high allowing the base of Q402 to be pulled up by R438. Q402 then conducts, grounding the anode of 16V zener Z405. The base of Q420 then drops to near 16V causing it to turn off which removes R422 and R423 from their shunt position across R424. This frees pin 2 of IC410 allowing it to be clamped to just over 16V by D421 and Z405. Since the regulator's output voltage will always be about 2 diode drops below pin 2, it will now be around 15V.

This voltage is applied to the collector of the 8V standby switch Q403 via R411. The base of Q403 is held at about 7.2V in the standby mode hence the emitter voltage is 6.6V. Note that this is the 8V source number 2; it normally measures 6.6V in the standby mode. This is sufficient to start the chassis. 6.6V is also applied to the collector of the 5V regulator Q410. D405 is reverse biased in the standby mode preventing source number 2 from bleeding into the scan-derived supply.

Table 1 shows the approximate voltages that you may expect to measure at the pins of the IC and the transistors while this set is in the standby mode.

The standby switch protector

So far, the standby switch protector, Q404, has not been mentioned. Standby switch Q403 is on in the standby mode and off when the chassis is running. As stated earlier, it is turned off when the scan-derived 8V source comes up. It takes a moment for the output voltage of this source to rise during power-up while the 130V B+ comes up almost instantly. If Q403 were allowed to remain on during this period with 130V on its collector, it would quickly be destroyed due to excessive power dissipation.

When the output of IC410 rises to 130V, the base of Q404 begins to rise due to its connection through R409. Once it reaches about 7.2V, Q404 begins to conduct (its base voltage is still 6.6V). Since it is connected between the base and emitter of Q403, Q403 is forced into cutoff. Once the scan-derived supply comes up, the emitter voltage of Q404 rises to 8V causing it to turn off. The base voltage finally settles at 8.3V. Q403 now stays off

due to the presence of 8V on its emitter. Q404 will also protect Q403 in the event that the scan-derived supply should fail to come up for any reason; if Q403 would short, 130V would be dumped into source number 2, as well as the 5V standby regulator circuit.

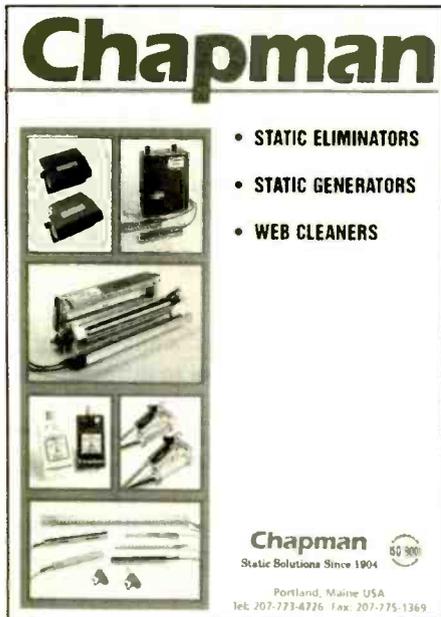
If the chassis fails to start for any reason after a power-on command (assuming that the regulated B+ is up), the emitter of Q403 will drop to about 2.9V. The emitter of standby regulator Q410 will drop to about 1.6V. Under this condition the syscon will shut down and will no longer accept a command until it is reset. To reset the syscon, unplug the chassis for about 20 seconds. The reset pulse will be generated when the set is plugged in again.

The remainder of this circuit is straightforward. Sources 7 through 20 are scan-derived from the IHVT. Most of them are shunt-regulated by zener diodes. Note that there is a transformer, L30, in 12.3V source number 20. At first glance the purpose of this transformer is unclear. It will be seen, however, that all grounds on the secondary side are floating, hence the transformer is for isolation. In fact, source 20 supplies the drivers for the external audio and video optoisolators. So, while the chassis uses a hot ground the RCA inputs are isolated.

This chassis does not employ a high-voltage shutdown circuit per se. Instead, excessive HV will result in a change of the horizontal frequency. This lowers the HV and causes tearing of the picture similar to a horizontal hold problem. If the chassis shuts down completely, the cause will be something other than an HV problem. Bear in mind that what might appear to be a horizontal related problem may in fact be a case of excessive HV. The most likely cause of this symptom is a shorted B+ regulator.

Summary

Though this chassis may seem somewhat complex compared to other chassis using a five-terminal regulator, it is really not too difficult to understand once you know what each component does and how they fit together as a unit. Hopefully, the information presented here will give you an edge if one of these chassis comes across your bench. It may also help you to analyze other "new" designs as you encounter them. ■



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Static control catalog

A new catalog of products to control static available from Chapman covers the company's full line of static eliminators, static generators, and web cleaners. In addition, includes an instructive primer on how static is created and how it can be controlled.

Users in varied industries such as plastics, converting, electronics assembly, packaging, printing, textiles, rubber, and ESD will find the catalog helpful. In addition, anyone dealing with moving non-conductive materials can benefit from static control. Static elimination products included in the catalog include industrial bars, air driven products such as air knives to focus or extend the range of static elimination, self-contained ionizers for wide area static control, conductive copper tinsel, and anti-static brushes.

Full specifications for all products and detailed ordering information is included. A new feature of the catalog is a helpful guide for choosing the right products for a variety of applications, including a comparison of the range of different types of static eliminators.

Circle (100) on Reply Card

Computer cabling/interconnection

A second version of the 1997 L-com master catalog was recently released to the public. This new catalog contains many additions and enhancements to the

version 1.0 catalog. Products listed include IEEE-488 GPIB cables and adapters, coaxial cables and accessories, universal/racks panels, telecom/modular products, Datacom/networking and service aids/cable testers.

Circle (101) on Reply Card

Technical support newsletter

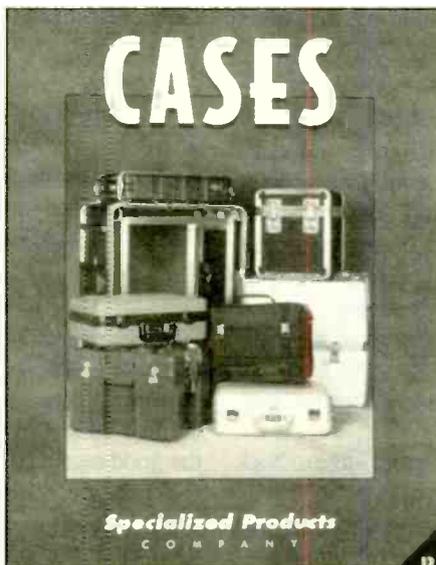
Sencore, Inc. announces that Sencore News #181 is now available. This issue features the HA2500 Universal Horizontal Analyzer specially designed for computer monitor troubleshooting. The analyzer allows the user to localize horizontal and B+ supply defects efficiently.

Circle (102) on Reply Card

Tool kit/test equipment

Specialized Products, and international supplier of tool kits and test equipment, has released its new comprehensive Case Catalog. The 32-page collection features a multitude of cases designed for virtually every application in every service-related field. The company offers a large selection of high-density, reusable shipping containers in over 100 configurations plus styles for many other uses. Available are cases for carrying, storing, protecting and shipping tools, instruments, laptop and notebook computers, sensitive and expensive equipment, circuit boards, catalogs and more.

Some cases have watertight hard shells while others are soft-sided padded styles. Others are specially designed to prevent

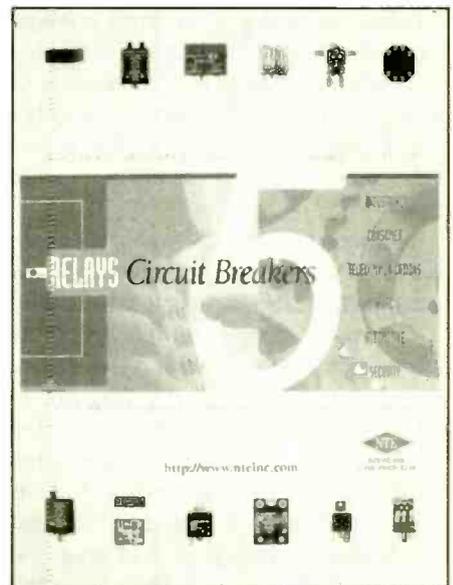


CASES

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dust contamination in cleanroom environments. For added versatility, the company includes stackable styles for space-saving storage plus reversed versions for more storage space in the lid than in the base. Many containers offer a 2-inch foam lining for a uniform interior cushion and 2-inch layers of full foam to create a custom fit for contents.

Circle (103) on Reply Card



RELAYS Circuit Breakers

<http://www.ntelinc.com>

Relays and circuit breakers catalog

NTE Electronics, Inc., has released the 5th edition of its popular Relays and Circuit Breakers Catalog, a comprehensive cross reference containing more than 534 relays and accessories matched to over 41,000 U.S., Asian, and European part numbers from as many as 212 different manufacturers.

The new catalog details the company's complete family of relays, including five recently introduced series, as well as the company's full line of circuit breakers. Included are two programmable timers, 40A PC-mountable open-frame relays in SPST and SPDT configurations, 10A subminiature PC-mount relays, and 1A DPDT low-signal relays in standard and surface-mount packaging.

Also featured in the catalog is a relay selector guide containing helpful information for specifiers in industrial, consumer, telecommunications, HVAC, automotive, and security applications.

Circle (104) on Reply Card

The entire nation had a good laugh, and got a little angry, a few years ago, when newspaper stories were published that referred to hammers bought by the military that cost \$500, or ashtrays that cost \$25, and toilet seats that cost hundreds of dollars. Of course those costs were out of line, but a little analysis of the situation might show that the costs probably weren't as far out of line as we imagine. For one thing, as consumers when we go to the store to buy one of those items, we consider the price only. So when we think about what we paid for that hammer, we see \$15.37, plus tax. So we think that \$500 is ridiculously excessive.

But we don't think about all of the other costs that should be factored in. Did you just go out and buy the hammer, or did you do some research in a consumer publication or two to see if the hammer is a good one that will last? No one paid you to do that research, but when you're an employee of a company or an organization and doing it as part of your job, that time has to be paid for. And how about the actual trip to the store. There's use of a vehicle, cost of fuel, personal time spent. What's an hour of your time worth?

The point of this is that whenever anyone buys anything, there are usually hidden costs that we don't even consider. That's one reason why it's so important to be careful where you shop when it's for your business. The right distributor may offer a consumer electronics service center services that may save time and effort. Price is only one factor in deciding where to buy tools, test equipment and replacement parts for electronic service.

Some distributors, for example, offer replacement parts for most, or all, of the major brands. Not only that, they even stock some of the hardest to obtain replacement parts for those brands. They offer a wide selection of brands and types of test equipment, consumables, etc. Their mission is to provide as much assistance as they possibly can to their clients, consumer electronics servicing professionals.

Other distributors may be newer to the business, and, until they grow, offer fewer replacement parts and other products. Other distributors may simply never wish to expand their product lines. On the other hand, they may offer better prices, or greater convenience, or other incentives. As long as the service center dealing with these distributors is aware of any limitations or shortcomings, one of these distributors may be just the one they need.

Consider these variables

When choosing a distributor, consider some of the factors listed below. Some apply only to the local distributor, and some apply only to mail order, but it would be a good idea to keep them in mind any time you're thinking about doing business with a new firm. These items are not listed in any particular order, for the simple reason that their order of priority or importance depends upon your particular wants and needs.

- Do the distributor's facilities and/or literature give the impression of competence and order?
- Do prices seem reasonable and in line with what other companies charge?
- Are most items in stock, or does the distributor have to back order many of them?
- Does the distributor offer a broad line of products, or will you have to find other sources of supply for many of your needs?

- Does the distributor specialize in any particular kinds of products that you typically order?
- What kind of payment options does the distributor offer: Open order account, credit card, COD, check, etc.?
- How soon after receipt of an order does the distributor ship?
- Does the distributor add a shipping surcharge, or a handling charge?
- Does the company list a toll-free phone/fax number?
- Are such ordering options as fax, and telex available? How about such computer ordering options as MCI Mail, CompuServe, and EasyLink?
- What is their return policy?
- Are all of the distributor's policies well documented, or do you have to guess at them? Or do they seem to differ depending on his whim?
- What kind of warranty, if any, does the distributor offer?
- Does the distributor publish a catalog? If so, is it clear and easy to understand?
- Is there a minimum order amount? If so, is it reasonable?
- What kind of shipping options are available: mail, UPS, Federal Express?
- What kind of special services, such as assembling cables, etc. does he offer?
- What research services does the distributor offer to help you to find the part you need?

Some important questions to ask

Some of these questions may not seem important, but from what we have learned from some of our readers, they may be very important. For example, we learned from one of our readers that one mail order company that he dealt with made a regular practice of charging unnecessarily high shipping charges.

Another practice that some distributors indulge in is to hold shipment of products for some time after the purchaser's check has cleared. This gives the distributor an interest-free loan between the time the check clears and the time he decides to ship the merchandise. This is not necessary. Some companies ship the product immediately after receiving an order.

One other thing to keep in mind is that some distributors charge a restocking fee even when they were responsible for shipping the incorrect product in the first place

This showcase may help

The purpose of this distributors' showcase is to provide the distributors who advertise in it with additional space to give readers information about their companies. We hope you'll take this opportunity to learn a little more about these companies so that you'll have a better idea of their capabilities and practices.

Let the buyer beware

Most replacement parts distributors are hard-working, well-organized, ethical companies, who will make every effort to help you obtain the correct replacement for a faulty component. Some are less ethical in their practices. It's not always easy to locate the good ones and avoid the ones that will give you problems.

When you're considering ordering products from a new distributor, it might be wise to start out with a small order and see what kind of treatment you get. ■

Thomson Consumer Electronics

Thomson Consumer Electronics believes that you should have a choice. We realize that you rely on our genuine replacement parts not only during the required warranty period, but also when you want the highest level of quality and performance available. We also realize that not every estimate you give can be converted to a repair using original parts. That's our difference, we give you the choice!

Original Parts

RCA and GE genuine replacement parts provide today's service professional with the reliability they need when completing in-warranty repairs. And they are delivered to you by parts distributors who provide an outstanding level of service. In fact, our most recent survey of the service industry continues to show that three out of four servicers believe that no other manufacturer provided a consistently better parts fulfillment system than the Thomson Consumer Electronics' parts distributors.

Thomson Premier Distributors can fill your warranty part orders either off their shelves on all in-stock products, or by placing a Direct Drop Shipment (DDS) order via computer directly into the TCE national parts depot. Either way, you receive the part you need to complete the repair quickly and you get the highest possible fill rate for warranty parts to service RCA, GE and ProScan products. This computer link also allows the Premier Distributor access to all the information needed to provide you with the high level of service you require in today's fast paced business.

SK Series Universal Parts

You know that lower estimates

equal more repairs and more business for you. To help you turn more of those COD estimates into repairs, Thomson continues to broaden its line of SK Series Universal Products. These quality parts let you reduce the repair estimate by lowering your replacement parts cost, and that's good news for you!

SK Series Universal Products cover a wide range of high wear, high usage parts. Whether you need video heads, flyback transformers, video replacement parts, belts, tires, pinch rollers, laser pickups, RF modulators, exact semiconductors, servicer aids, repair kits, capacitors, resistors and more, you can look to SK Series First.

TCE Literature

Thomson also provides a number of publications which makes finding the right part for the repair even easier. Our latest "SK Series Product Guide" (Catalog #301) is a quick reference tool to the SK Series Universal Product line. Photographs, text and graphic illustrations all help guide you to the right stock number very quickly and easily.

In addition to TCE's service data, the "Television Components Quick Reference Guide" contains key part numbers for recent RCA, GE and ProScan chassis. It's ideal for the technician on the road. It folds to fit in your pocket. The Quick Reference Guide also contains a section dedicated to the EPROM's associated with chassis CTC169 through CTC189.

And there is of course, our well known and widely accepted "OEM Remote Control" book. This book is printed once a year and no one that

repairs TCE products should be without one!

These publications are available from your Authorized Thomson Parts Distributor. For the "SK Series Product Guide" order publication 1J1226, for the "Quick Reference Guide" order publication 1J9548, and for the "Remote Control" book order 1F5790.

Accessories and Components Business

The Thomson Consumer Electronics, Accessories and Components Business provides service from a 358,000 square foot facility located in Deptford, New Jersey. All business functions—customer service, sales and marketing, quality assurance, product analysis, administrative departments and warehousing operate under one roof. Some parts are stocked in satellite warehouse facilities in El Paso, TX, and Indianapolis, IN.

A full line of RCA brand Consumer Electronics Accessories is marketed from this facility as well. The business is managed by Jack Nick, Vice President. Thomson Consumer Electronics corporate headquarters is in Indianapolis.

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Philips Software Development

401 East Old Andrew Johnson Highway
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The Software Development department grew out of an effort to create the best electronic service manual program possible. From this effort, we have embraced the goal to "Develop the most user friendly software products for the service industry".

The criteria we used in developing our electronic service manual program:

1. An electronic service manual program has to be FAST to allow a technician to make the most of their time. Access to diagrams and other information needs to be simple and fast.
2. It had to be COMPATIBLE with all other manufacturers. In order to prevent servicers from having to have multiple systems, our program is designed to be flexible to accommodate any manufacturers service manual data.
3. The most challenging and important is that our program had to OVERCOME EVERY COMPLAINT we could imagine concerning the use of paper manuals.

Overcoming every complaint was most difficult. There are so many problems to using paper manuals. This is a short list of problems we worked to overcome:

- Manuals get lost on one bench, under other manuals and do not get refilled.
- Tracing signals through a manual is time consuming and difficult.
- Finding any information in a manual takes too long.
- The diagrams are printed too small for most people.
- It takes too long to order and receive a manual when it is needed.
- Storing paper manuals takes up too much floor space in the shop.
- Paper manuals take up too much bench space when opened to view the diagram.
- Keeping paper manuals updated in a timely manner is difficult.
- Paper manuals lack an up to date history of known fixes and troubleshooting techniques.
- Paper manuals cost too much.
- Every company makes their manual in a different style.

We considered every one of these complaints and designed FORCE, our service manual program, to overcome these and many more complaints. FORCE makes every manual available to every technician at the same time. It includes Hot Spot signal tracing that quickly jump from one diagram to another. Location information for components circuits, diagram name, and all Known Faults are included. We can deliver our manuals via the Internet as well as update it at any time. We allow you to make notes about any fix that you find. In addition, we are soliciting consumer electronics company wishing to make manuals in this style to join us.

FORCE is user friendly and can improve productivity so much that every technician will soon have his or her own

computer. We see productivity improving by 10% to 30%, depending on the technician's use and the kind of products worked on. It costs only 1% of that productivity improvement to put a computer in the hands of every technician.

How to distribute and use electronics manuals

CD-ROMS can be used to distribute manuals but to use manuals while on a ROM has problems. ROMs slow the manual down, eliminate your ability to make notes on diagrams, limit usage to one technician at a time, and if you don't file them, they can get lost.p

We want to update your manuals daily with new fix information, corrections to part numbers, and make sure your diagrams are accurate. We can do this through the Internet most effectively.

What are the main features of FORCE?

- Diagram zooming and panning is very fast.
 - Part numbers can be linked to pricing to allow orders or fast estimates.
 - Our manuals are small, 500k for a regular TV to 3meg for a large VCR.
 - We allow distribution via CD-ROM or over the Internet.
 - Instant access to all parts of a service manual insures a speedy repair.
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 - Force was designed from the beginning to be used by all manufacturers.
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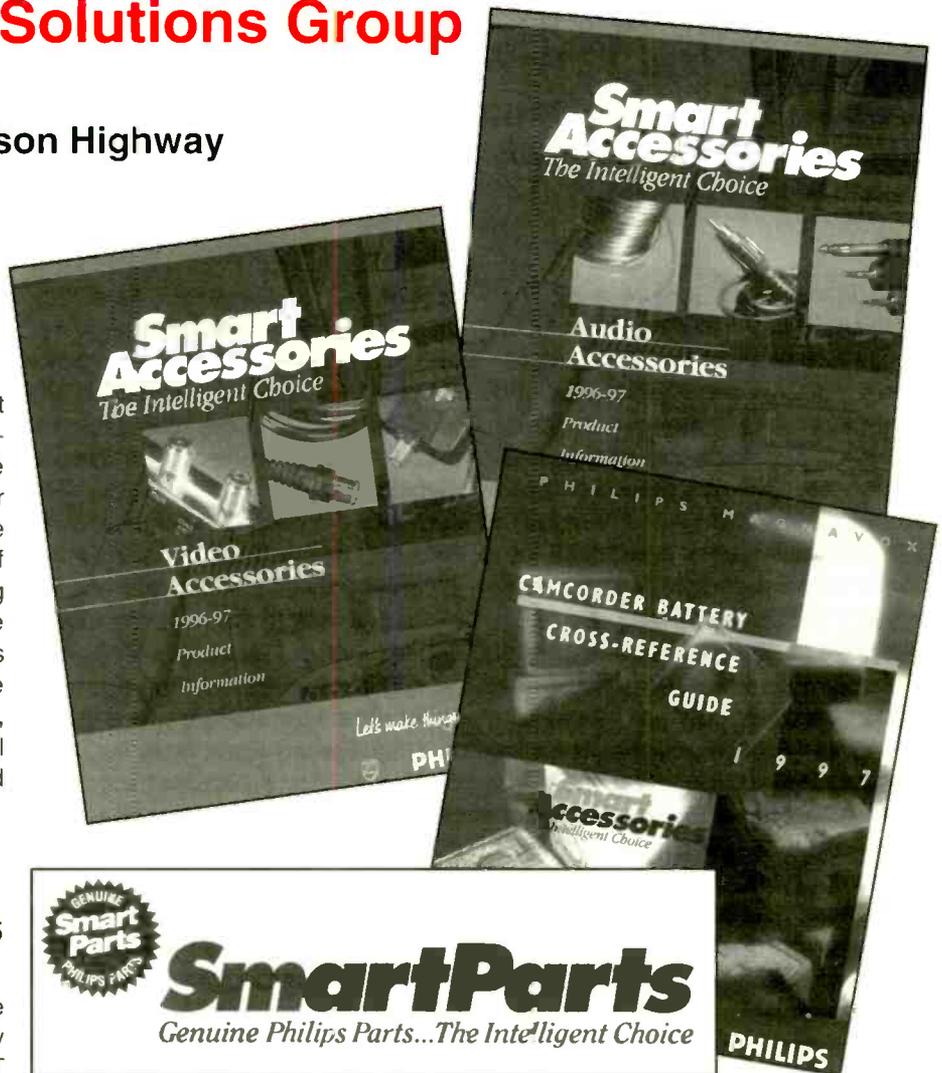
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Electro Dynamics, Inc.

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Business, by nature is a cyclical process. It requires a constant focus on the evolution of the marketplace, reevaluating current strategies and redirecting this focus for continued success. As marketplace advancements occur in technological and service capabilities your business must be ready to respond to customer needs by anticipating future demands.

Electro Dynamics, Inc., since its inception in 1984, has always kept responding to new demands in the marketplace. Each time the marketplace demanded a new solution to a problem Electro Dynamics, Inc. rose to the challenge. Whether importing OEM parts, creating a new line of semiconductors, or engineering a flyback series, Electro Dynamics, Inc. has been consistently dedicating all of its faculties to properly servicing its customer base.

Maintaining and servicing its customer base is the bedrock that has sustained Electro Dynamics, Inc.'s growth for the last 14 years. Whether through establishing global partnerships or conducting regional seminars Electro Dynamics, Inc. spends its time developing fundamentally sound relationships with its customer base and suppliers alike. Through this strength and foresight Electro Dynamics, Inc. has grown during the tenure of its corporate progress with milestones such as its introduction of an original product line, semiconductors, tires & belts and becoming the first independent distributor to directly import special regulator series (STR) from Sanken for the replacement market. In 1987 Electro Dynamics, Inc. became the first in the United States to carry a variety of replacement gears, and idlers, and a full line of replacement end sen-

sors and photo interrupters for distribution. In 1989 Electro Dynamics, Inc. and its sister company, Computer Component Source, initiated the development of its own custom manufactured flyback line and specific semiconductors. In 1990 success spawned the company's relocation to Syosset, where the company further progressed, with joint ventures involving Taiwanese factories to develop a line of replacement signal cables thus becoming the only company in the United States to feature these items. In 1992 Electro Dynamics, Inc. also became the first distributor to offer toll-free incoming fax line and direct dial in access.

Establishing further global relations Electro Dynamics, Inc. initiated importing of original parts and semiconductors, resulting in becoming the first independent distributor to directly import and offer OEM replacement parts for the consumer electronics market. In the interest of the ever expanding global marketplace Electro Dynamics, Inc. next established a joint venture with Richardson Electronics in Europe. Further broadening its base, Electro Dynamics, Inc. introduced a series of TV/VCR repair and upgrade kits. Expansion into the semiconductor business increased inventory line items from 7,200 SKU's to over 60,000 SKU's.

Once these global alliances and targeted marketing concepts were in place, Electro Dynamics, Inc. then redirected its focus internally to place its corporate emphasis on customer satisfaction. This kind of progress did not always come easily however. It required an openness to change and a willingness to evolve. When existing suppliers could not facilitate the needs

of Electro Dynamics, Inc.'s customer base, Electro Dynamics, Inc. sought out new sources of supply. This resulted in a watershed of new product availabilities and engaging the common practices of competition and free enterprise. Using its breadth of purchasing leverage Electro Dynamics, Inc. has dedicated series of procurement teams trained in new emerging technologies to constantly challenge these venues to bring about proper and competitive pricing structures.

Price may be the heartbeat of business, but the lifeblood is keeping an eye on the proper servicing of your current client's demands and needs. Although Electro Dynamics, Inc. is primarily an electronic parts company its inherent product is service. Great emphasis is placed on making sure the client is properly serviced thus ensuring that Electro Dynamics, Inc. remains ahead of industry standards. This is being accomplished through a variety of means. An example is the internal training and progress meetings that are conducted regularly between purchasing, sales, customer service and warehouse management. Our new headquarters utilizes a fully automated order picking carousel that is tied directly into inventory and product availability reports to help facilitate these decisions.

Starting from a 1,000 square foot office in East Norwich, Long Island, Electro Dynamics, Inc. has successfully progressed to the opening of its fully automated, 60,000 square foot corporate headquarters in Hauppauge, New York. Success creates progress, creating the catalyst for further success and the cycle of business broadens. ■

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WORK SMARTER

Here is the affordable software we've all been waiting for. **CyberTech** is designed exclusively to help electronic & appliance service centers and technical professionals manage information more efficiently and profitably. Many years have been spent developing and testing this software, resulting in a powerful and flexible system with easy to use, exclusive features you won't find anywhere else.

CyberTech automates routine tasks like service order entry, invoicing and diagnosing. It handles accounting, tech service & production reports, NARDA forms, invoicing, batch claim processing, inventory processing and POS, electronic purchase orders and warranty claim filing and much more!

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- ✓ Tedious routine tasks are simply and elegantly automated and paper is drastically reduced.

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- ✓ Technical service efficiency is improved and production boosted, without sacrificing quality.

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Mr. Nick Costello of Electronics Gallery (Downington, PA) - "I've been running my Service

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Mr. Richard Reinhart of Stereo Shop (Greensburg, PA) - "This system is at the forefront of Service Management Technology."

Mr. Eric Elley - Manager of B&B TV (Hightstown, NJ) - "Stylish, absolute control of operation. Customer driven, secured. I really love playing with it."

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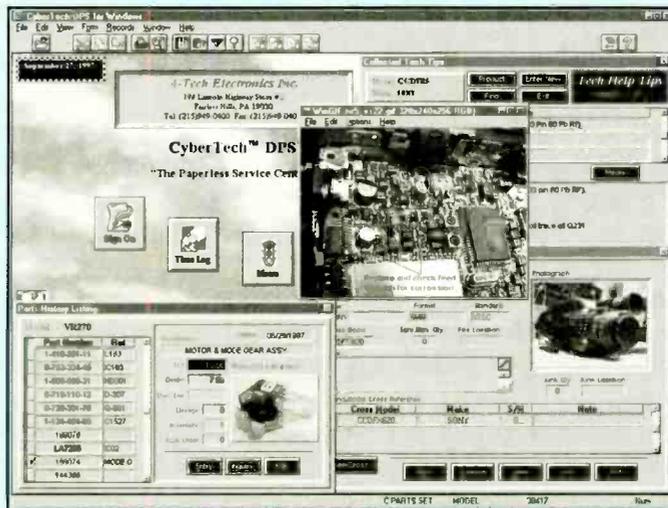
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Fax: 800-813-0087
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TechAmerica is a new, nationwide catalog operation which has its strength in core electronic components demanded by service and repair specialists, design and development engineers, other electronics professionals and a variety of commercial customers from installers to technical educators.

The cornerstone of the large catalog is the diverse components selection with thousands of items in stock. Other complementary product lines are:

- Test equipment, tools, and related technical accessories
- Wire, cable and connectors of all types
- An extensive library of technical and computer books, including service and repair subject titles.
- Chemicals and prototyping materials
- Security and automation components including video surveillance
- Computer networking products and accessories
- Audio/Video distribution components, including satellite products and systems
- Business and amateur communication products, including scanners
- Extensive selection of kits and batteries.

TechAmerica maintains aggressive inventory levels and depth. Catalog merchandise is presented in well defined sections of the book with informational specifications to assist in correct selection. Additional product information can be found by contacting the TechAmerica Technical Support group. Electronic components are sold in single or volume counts.

ADVANTAGES

TechAmerica also offers this great list of key benefits for service and repair professionals:

- NO minimum order - buy one or in volume
- NO small order surcharge
- Commercial credit available with additional volume discounts



- Quantity discounts available
- NO RMA's or restocking fees
- A More Than Fair Returns Policy
- Free catalogs
- Full shipping options from ground to overnight at very attractive rates
- Convenient ordering during non-traditional business hours (7 A.M. - 11 P.M., Central Time), and on weekends
- The overwhelming assortment of components and accessories makes this book a must on your desk or workstation - one that you'll refer to, and order from often.

THE WEBSITE

The TechAmerica website continues to be enriched almost daily. Currently, the site provides a wide variety of information, specials, and monthly flyer offers. The TechAmerica on-line catalog, with extensive search capabilities, is near completion and should be available to view very shortly. In the meantime, the site is worth regular visits to view the special offers that change frequently. Regular product line updates and new additions are also planned.

TECHAMERICA STORES

Presently, there are two TechAmerica stores located in Doraville (Atlanta), Georgia, and Denver, Colorado. At 15,000 to 20,000 square feet, they offer a complete electronics solution for electronics professionals in those markets. With more stores planned for the future, TechAmerica offers the largest selection of electronics components of any retail operation in the United States.

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Circle (116) on Reply Card

Panasonic Services Company

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For over 35 years, the Panasonic, Quasar, and Technics brand names have appeared throughout American homes and industries. In that time, our company's commitment to total customer satisfaction has manifested itself in many ways. Our approach to post sales support has evolved to include programs that encompass qualitative human resource training, as well as ones that stress the development of automated processes that allow us to offer timely, accurate solutions to our end users' service needs.

The engine behind PASC's ability to ensure timely repairs is our ability to deliver parts, accessories, and service literature to our network of factory service centers, independent servicers, and dealers in a timely manner. We are now seeing the results of over a decade of continued investment in the modernization of our facilities. The primary point of support for all replacement parts and service literature is the National Parts Center in Kent, Washington. From here, and with further support from sales & marketing staff and field staff throughout our U.S. regions, we handle a wide variety of inquiries and fill just about any request made of us.

Customer Contact

Generally, the first line of customer support is provided by our order offices located in Kent, Washington. This office handles a wide variety of customer calls ranging from simple parts orders to requests to do research on unique model numbers. Currently, the order office handles an average of 1,800 calls a day just for taking orders, as well as take an average of 250 calls from customers requesting such things as estimated shipping time, return authorizations, processing credits, and special orders. Also, the office receives over 1,000 faxes daily. In addition to all this, we offer retail customers toll-free phone and fax numbers to call and order literature, parts, or any of our comprehensive line of accessories.

In order to further improve our level of service, we've made significant investments in phone management systems to improve our efficiency. Data gathered from these systems graphically depict work load volume, peak times, and average call length on a daily basis, and give management a true picture of where additional improvements are needed.

Our staff includes representatives which reach out to the field as well. Regional parts accessory representatives call on distributors, independent servicers, dealers, and even end users, to assess their needs. With a comprehensive portfolio of sales programs and promotional items, they are able to offer profitable opportunities to small and large businesses alike. Along the way, they are able to keep in touch with the ever changing needs of all, and make the necessary recommendations to our market development personnel.

Our commitment doesn't stop with our internal efforts. We also maintain a network of over 40 authorized independent parts and accessory distributors who are well positioned to support our wide range of customers in various markets throughout the country.

Parts and Service Literature Distribution

Once we've established what our customer needs, we have to get it to them. That's the job of over 125 employees that staff our parts and service literature warehouse in Kent. The building is a quarter mile long, and encompasses 228,000 square feet, which houses over 110,000 line items and 2.8 million pieces.

The warehouse day begins at 6:00 a.m. There are over 2,000 parts orders being processed at any given time. In order to manage such an overwhelming task, procedures have been created that allow us to meet our goal of having all orders shipped within 24 hours. By the end of the day, the facility will have shipped approximately 2,700 parts and literature orders, which consist of over

7,000 line items, and over 35,000 pieces!

Through the use of bar coding, and a RF (radio frequency) based receiving system, we are able to reduce the turn around time for receiving and stocking making goods available to the customer even sooner.

We have recently completed our investment in the modernization of our warehouse operations. This includes the expanded use of RF and bar codes throughout the facility, conveyors, carousels and a new software system. Designed to create a paperless environment, this comprehensive, state of the art installation enables us to provide faster, error free service to our customers as well as positioning Matsushita for the next decade.

Finally, in our effort to be earth friendly, the warehouse has been a leader in the effort to recycle. It all started four years ago when we began to use biodegradable packing material. Today, we have a comprehensive program to recycle all paper, cardboard, aluminum cans, and pallets. We make an effort to purchase recycled product when it is available. In recognition of our efforts, we were designated a "Distinguished Business in the Green" by King County.

The Future

There will be a continued emphasis on expansion of our customers' ability to go "on line" with PASC, not just for order entry and order inquiry, but also for credit and return procedures.

Internally, with systems that our customers don't directly see, we move further into the information age. Not only do our purchasing agents continue to employ CD-ROM information systems, we are now on line with our factories in Japan for inquiry purposes, a capability we plan to expand to selected aspects of our market. The use of bar coding will continue to expand.

Our goal for the future is customer satisfaction, not just for our direct customer, but anyone who comes in contact with Panasonic, Technics, or Quasar.

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Nothing less than total satisfaction is expected by today's customers. The only way to live up to this standard is by using Matsushita Original Replacement Parts and Accessories. The source of this quality is Panasonic Services Company and your Authorized Replacement Parts Distributor. Consult the list below, or call **1-800-545-2672** for the location nearest you.

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Andrews Electronics (C/V/M/A) * 25158 Avenue Stanford, Santa Clarita 91355 * 800-289-0300 * FAX 800-289-0301
AVAC Corp. (V) * 3746 Bradview Dr., Sacramento 95827 * 916-361-7491 * FAX 916-361-5480
Cass Electronics (C/V/M/A) * 801 Seventh Ave., Oakland 94606 * 510-839-2493 or 800-289-0300 (outside 510) * FAX 510-465-5927
E. and K. Parts, Inc. (C/V/M/A) * 2115 Westwood Blvd., Los Angeles 90025 * 800-331-8263 or 310-475-6848 * FAX 800-826-0890 or 310-474-0846
Pacific Coast Parts (C/V/M/A) * 15024 Staff Court, Gardena 90248 * 800-421-5080 * FAX 800-782-5747
Star For Parts (V) * 10727 Commerce Way, Suite B, Fontana, 92335 * 909-428-1404 * FAX 909-428-3213
Blakeman Wholesale (V) * 1800 E. Walnut St., Fullerton, 92631 * 714-680-6800 * FAX 714-680-8700

COLORADO

Star For Parts (V) * 2350 Arapahoe St., Denver 80205 * 303-296-2117 * FAX 303-296-2120

CONNECTICUT

Signal Electronics Supply, Inc. (C/M/A) * 589 New Park Ave., West Hartford 06110 * 860-233-8551 * FAX 860-233-8554

FLORIDA

Herman Electronics (C/V/M/A) * 7350 N.W. 35th Terrace, Miami 33122 * 800-938-4376 * FAX 800-938-4377
Layco, Inc. (C/V/M/A) * 501 S. Main St., Crestview 32536 * 904-682-0321 * FAX 904-682-8820
Vance Baldwin (C/M/A) * 2701 W. McNab Road, Pompano Beach, 33069 * 800-432-8542 * 954-969-1811 * FAX 954-969-0226 * 800-552-1431
Vance Baldwin (C/M/A) * 1801 N.E. 2nd Ave., Miami 33132 * 305-379-4794 * FAX 305-373-8855
Vance Baldwin (C/V/M/A) * 1007 N. Himes Ave., Tampa 33607 * 800-299-1007 * FAX 813-870-1088

GEORGIA

Buckeye Vacuum Cleaner (V) * 2870 Plant Atkinson Rd., Smyrna 30080 * 404-351-730 * FAX 404-351-7307
Wholesale Industrial (C/M/A) * 5925 Peachtree Corners East, Norcross 30071 * 770-447-8436 * FAX 770-447-1078

ILLINOIS

B-B & W, Inc. (C/V/M) * 2137 S. Euclid Ave., Berwyn 60402 * 708-749-1710 * FAX 708-749-0325
Hesco, Inc. (V) * 6633 N. Milwaukee Ave., Niles 60714 * 847-647-6700 * FAX 847-647-0534
Joseph Electronics, Inc. (C/M/A) * 8830 N. Milwaukee Ave., Niles 60714 * 847-297-4208 * FAX 847-297-6923
Union Electronic Dist. (C/V/M/A) * 311 E. Corning Rd., Beecher, IL 60401 * 800-648-6657 or 708-946-9500 * FAX 800-43-UNION or 708-946-9200

INDIANA

Electronic Service Parts (C/V/M) * 2901 E. Washington St., Indianapolis 46201 * 317-269-1527 * FAX 800-899-1220

MARYLAND

Tritronics, Inc. (C/V/M/A) * 1306 Continental Dr., Abingdon 21009-2334 * 410-676-7300 * FAX 800-888-FAXD

MASSACHUSETTS

Tee Vee Supply Co. (C/V/M/A) * 407 R. Mystic Ave., PO Box 649, Medford 02155 * 617-395-9440 * FAX 617-391-8020

MICHIGAN

Allied National (V) * 13270 Capital Avenue, Oak Park 48237 * 800-730-5696 * FAX 800-999-8099
G. M. Popkey Co. (C/V/M/A) * 5000 W. Greenbrooke Dr. S.E., Grand Rapids 49512 * 800-444-3920 or 616-698-2390 * FAX 616-698-0794
Remcor Electronics (C/V/M/A) * 10670 W. Nine Mile Rd., Oak Park 48237 * 810-541-5666 * FAX 810-398-1016

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MINNESOTA

AVAC Corp. (V) * 666 University Ave., St. Paul 55104 * 612-222-0763 * FAX 612-224-2674
Ness Electronics, Inc. (C/V/M/A) * 441 Stinson Blvd. N.E., Minneapolis 55413 * 612-623-9505 * FAX 612-623-9540

MISSOURI

Cititronix, Inc. (C/V/M/A) * 1641 Dielman Rd., St. Louis 63132 * 800-846-2484 or 314-427-3420 * FAX 314-427-3360
Tacony Corp. (V) * 1760 Gilsinn Lane, Fenton 63026 * 314-349-3000 * FAX 314-349-2333

NEVADA

MCM Electronics (C/V/M/A) * 495 East Parr Blvd., Reno 89512 * 800-543-4330 * FAX 513-434-6959 (OH)

NEW JERSEY

AVAC Corp. (V) * 66 Ethel Rd., Edison 08818 * 908-287-3300 * FAX 908-287-3331
Panson Electronics (C/V/M/A) * 1-80 and New Maple Ave., PO Box 2003, Pine Brook 07058 * 800-255-5229 or 201-244-2400 * FAX 800-332-3922

NEW YORK

Dale Electronics (C/V/M/A) * 7 E. 20th St., New York City 10003 * 212-475-1124 * FAX 212-475-1963
Fox International, Inc. (C/V/M/A) * 241-A Central Ave., Farmingdale, 11735 * 800-321-6993 or 516-694-1354 * FAX 516-694-0595
Radio Equipment Corp. (C/A) * 196 Vulcan St., Buffalo 14207 * 716-874-2690 * FAX 716-874-2698
Standard Electronics (C/V/M/A) * 215 John Glenn Dr., Amherst 14228 * 800-333-1519 or 716-691-3371 * FAX 800-358-1241
Star For Parts (V) * 250 Rabro Drive E., Hauppauge 11788-0255 * 800-525-6046 * FAX 516-348-7160

OHIO

Electric Sweeper Co./ESSCO (V) * 7800 Hub Parkway, Valley View 44125-5711 * 800-321-2664 * FAX 216-524-4142
Fox International, Inc. (C/V/M/A) * 23600 Aurora Rd., Bedford Heights 44146 * 216-439-8500 * FAX 800-445-7991
MCM Electronics (C/V/M/A) * 650 Congress Park Dr., Centerville 45459-4072 * 800-543-4330 or 937-434-0031 * FAX 937-434-6959

OREGON

Diversified Parts (C/V/M/A) * 2114 S.E. 9th Ave., Portland 97214-4615 * 800-338-6342 * FAX 800-962-0602
Northwest Wholesale (V) * 426 N.E. Davis St., Portland 97232 * 800-234-8227 or 503-232-7114 * FAX 503-232-7115

PENNSYLVANIA

Steel City Vacuum Co., Inc. (V) * 919 Penn Ave., Pittsburgh 15221 * 800-822-1199 or 412-731-0300 * FAX 412-731-3205

TENNESSEE

AVAC Corp. (V) * 236-B Space Park South Dr., Nashville 37211 * 615-834-8800 * FAX 615-831-1051
Electrotex, Inc. (C/V/M/A) * 6122 Macon Rd., * Memphis 38134 * 901-383-9300 * FAX 901-388-0258
Shields Electronics Supply, Inc. (C/V/M/A) * 4722 Middlebrook Pike, Knoxville 37921 * 423-588-2421 * FAX 423-588-3431

TEXAS

Electrotex, Inc. (C/V/M/A) * 2300 Richmond Ave., Houston 77098-3299 * 713-526-3456 * FAX 713-639-6400
Electrotex, Inc. (C/V/M/A) * 1200 W. Hildebrand, San Antonio 78201 * 210-735-9271 * FAX 210-737-2642
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VCP International, Inc. (V) * 2285 Merritt Dr., Garland 75040 * 972-271-7474 * FAX 972-278-5981

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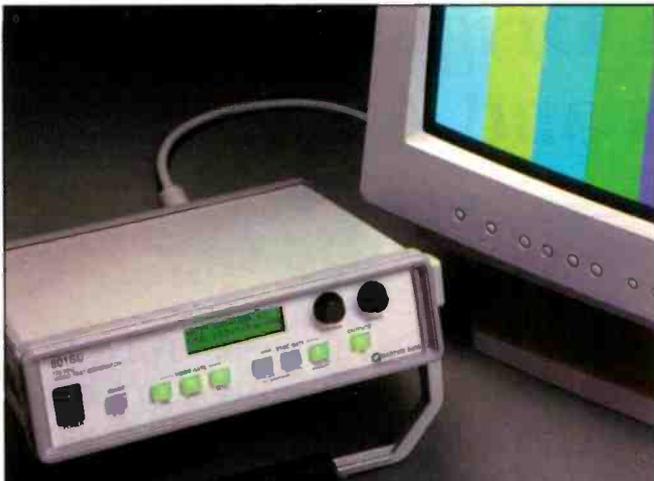
G. M. Popkey Company (C/V/M/A) * 2035 Larsen Ave., Green Bay 54307-2237 * 414-497-0400 * FAX 414-497-4894
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Richardson Electronics focuses on serving the third-party service industry with replacement data display and instrumentation cathode ray tubes and display monitors. New products added to our offering include test equipment from Quantum Data and Minolta, high-voltage flyback transformers and related electronic components for monitor and computer repair and a series of high-resolution monitors for medical imaging.

Numerous display markets rely on our off-the-shelf selection of original equipment CRTs. As the industry standard has changed from monochrome to color CRTs, Richardson has adapted its product offering. With the advent of desktop publishing systems and high-resolution CAD/CAM systems, color has become the preferred technology. Our color CRT offering includes types manufactured by Panasonic, Daewoo/Orion, Toshiba, Samsung, Goldstar.

Our cross-referencing and value-added capabilities enable Richardson to cater to a wide range of customers and applications. Whether you are an OEM, third-party maintainer, self-maintainer or even a small end user, our sales specialists are dedicated to helping you find the right CRT, high-resolution monitor or computer component for your requirement.

Service

A comprehensive cross-referencing system enables Richardson to match most any CRT requirement. Together with our extensive inventory at convenient world-wide stocking locations and ISO 9002 registered distribution centers in the United Kingdom and US, your order will most likely ship the same day you call. Richardson's value-added services include the ability to match existing mounting or implosion protection hardware and many anti-glare options. Custom packaging is another service we provide to make it easier for you to handle your order. Our value-added work is designed to meet the strict tolerances of the original equipment part and carries the approval of Underwriters Laboratories for operator safety.

Availability - Monochrome & Color CRTs

More than 200,000 monochrome and color data display tubes are available from stock. Choose from Chungwa, Clinton, Hitachi, Mitsubishi, National, Orion, Panasonic, Philips, Samsung and Toshiba CRTs in 1.5" to 23" sizes. Our extensive cross-referencing capabilities assure a match for any CRT requirement.

High-Resolution Monitors

As Richardson has expanded its markets to include medical, we've established a distribution agreement with the premier suppliers of medical imaging displays, including Philips/Fimi, Clinton Electronics, Data Ray, Barco, Image Systems and many others to offer these products off the shelf.

Test Equipment

In continuing to service the third-party repair market, Richardson has added display test equipment to its distribution offerings. Video signal generators from Quantum Data and light meters and color analyzers from Minolta are some of the new products that Richardson offers. Richardson also offers RF and microwave test and measurement accessories and components, including M/A-COM's new coaxial test cables, QMI cable assemblies, Amphenol and M/A-COM coaxial connectors, RF Gain amplifiers and many other active, passive and interconnect products used in the design or as replacements in test and measurement equipment.

Computer Components

Our selection of components used in the repairs of displays includes: flyback transformers, capacitors, coils and transformers, controls and switches, signal cables for most computer monitors and semiconductors. More than 1 million items are available from stock.

Herman Electronics

7350 Herman Way

Miami, FL 33122

Phone: 800-938-4376

Fax: 800-938-4377

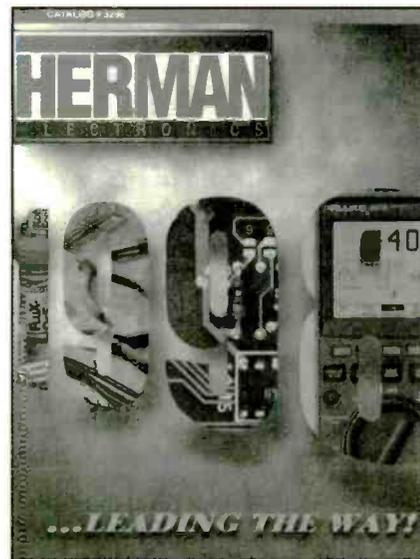
Herman Electronics is a diverse and multi-faceted full-line distributor of everything in electronics, committed to offering only the best in original replacement parts and everything in service accessories including tools, test equipment, cable, connectors, semiconductors, chemicals, and most importantly, customer service to their customers. In business for over 40 years, Herman Electronics has clearly established itself as one of the leaders in the industry by providing only quality products and superb customer service to all facets of the electronics industry.

The heartbeat of the company lies in the OEM parts department. While serving the industry for over 3 decades, Herman has many of the major OEM parts lines enabling them to provide more efficient and cost effective service to you, their valued customer. The company prides itself on being a SINGLE source to the service industry.

Herman Electronics is one of the largest original replacement parts and accessory distributors in the country and is factory authorized for SONY, PANASONIC, THOMSON-Premier (RCA-GE-PROSCAN), SAMSUNG, QUASAR, ONKYO, TECHNICS, TOSHIBA, HITACHI, DAEWOO and

KENWOOD. Stocking one of the largest and most comprehensive parts inventories in the country enables the company to fill over 80% of their orders from inventory and guarantees SAME DAY shipment of all in-stock orders placed before 5:30 P.M. (EST).

Herman Electronics provides a variety of customer support services as a result of their commitment to customer service excellence. They have several professional customer service representatives to serve all your needs from 8:30 A.M. to 6:00 P.M. (EST) Monday through Friday. The company prides itself on being accommodating to its customers in order to provide complete customer satisfaction. "We realize there are many good distributors throughout the country," says Jeffrey A. Wolf, President and son of one of the company's founders. "It is our job to EXCEED customers' expectations by taking that extra step in providing the highest level of professional, personalized service. This industry has quickly become service driven and therefore it is our focus and dedication to maintain a standard of excellence in customer service. As the year 2000 rapidly approaches we must continue to develop innovative ideas and fresh approach-



es to meet and exceed the demands that lie ahead." And the company is doing just that. On-line computer services, a 24 hour electronic ordering system, EDI, the world wide web and on-line parts research, just to name a few.

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Replacement Tuners and Mainboards. Thousands of tuners and mainboards are readily available - just call in your order. If the item you need is not currently in stock, PTS has a service support system to rebuild your non-working tuner or mainboard.

PTS also provides Computer Products such as Monitors, Printers and Motherboards. A variety of Computer Products are also available for purchase.

Our primary objectives

PTS has been supporting the independent service dealer since 1967. If you're a one man operation, multiple location service center or a manufac-

turer, PTS can help increase profits utilizing four primary objectives. **REDUCE PARTS INVENTORY.** There is no need to stock expensive, unnecessary parts for repair when you can rely on PTS for thousands of rebuilt tuners and mainboards. **PROVIDE FASTER SERVICE.** You'll minimize having to wait for back-ordered parts, schematics or technical information including high failure history of individual components. In most cases we'll process your order long before you could have obtained special ordered parts or schematics. **MINIMIZE LABOR COST.** Knowing that PTS provides an excellent source for repair assistance, your technicians will no longer have to agonize over "dog" units which results in a high labor cost per unit. Your output per man hour and work flow will improve dramatically. **INCREASE PROFITS.** Call PTS today and order your free catalog of replacement parts. ■

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Since its inception in 1981 as a full line discount distributor of electronic parts and test equipment, RNJ Electronics has committed to supply the electronics industry with state of the art products and accessories. RNJ Electronics now distributes original TV & VCR parts from Sony, RCA, Panasonic, JVC, Sharp, Hitachi and Test Equipment from B&K Precision, Global Specialties, Fluke and Emco all at very competitive prices making RNJ your one stop source for all of your parts and test equipment needs.

In addition, RNJ Electronics is a leading distributor of commercial sound products including PA amps, microphones, speakers, wire, intercoms, etc. from companies such as Bogen, University Sound, E/V, Astatic, Aiphone, CSI/Speco, Proco, Atlas/Soundolier, Telex, Nady and many more.

RNJ Electronics is also your source for home theater products such as Dolby Pro

Logic receivers, in wall/in ceiling speakers, sub woofers, center channel speakers, decora style volume controls, video projectors, electric screens, TVs & VCRs, TV & VCR wall & ceiling mounts and all types of home automation products including IR Video Distributing, etc. from manufacturers such as JVC, Channel Plus, Philips/Magnavox, Da Lite, Bretford, VMP Products, CSI and many more.

The company is also a master distributor in an industry experiencing tremendous growth: the security industry, stocking products such as cameras (regular & covert), monitors, switchers/quads/multiplexers, lenses, mounts/housing/pan & tilts/domes, wire & connectors, Cat 5 products and much more from companies such as Sony, Panasonic, Provideo, Philips, Robot, Computar, Tamron, Pelco and many more.

In addition to the above products the

company also carries in its semi-annual 144 page catalog items such as Panasonic cable converters, audio video & antenna accessories, universal remotes, camcorder batteries, semiconductors, mobile carts, tools & soldering equipment, educational kits and much more.

As you can see, RNJ Electronics prides itself on its ability to stay current with the ever changing needs of its customers. Customer service is a top priority for the company. The sales department and technical staff provide friendly & courteous service at all times. All orders are processed in a timely manner with shipping via UPS ground, red, blue, orange, Fedex or air parcel domestically and internationally. Volume discounts are available for large orders. OEM quotes and bids are welcomed.

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Indianapolis, IN 46214

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Fax: 1-800-552-3910

Web site: <http://www.hwsams.com>

Howard W. Sams & Company is proud to be celebrating 50 years as the nation's leading technical publisher. Since its inception in 1946, Sams has seen its product offerings expand and diversify, so that today, Sams boasts the most complete line-up of technical documentation, services, and publications found anywhere.

Over 50 years ago, Howard Sams was the first company to recognize that the increasing popularity of home entertainment electronics meant a corresponding demand for reliable service documentation. This insight gave birth to the first PHOTOFACT®, which presented concise technical information to help service technicians repair specific makes and models of radios. Televisions soon were added to the product line, followed by computer equipment and then VCRs, further enhancing Sams' ability to provide complete, consistent, high-quality repair information to service technicians.

Today, Howard Sams is the nation's largest provider of after-market service data for the television and VCR repair industry in the form of the PHOTOFACT® and VCRfacts® subscription services, as well as through electronics distributors. Research shows that 95 percent of the companies providing after-market repair service for color televisions use Sams technical data.

While PHOTOFACT® provided the foundation for Howard Sams' rise to the top of the technical publishing industry, it is only a portion of what the company publishes today. Sams currently offers a complete line of service products, distributor catalogs, technical books, copy service, and custom manuals for a wide range of clients.

Another major part of the Sams technical products line, PROMPT® Publications has grown to become

one of the top technical imprints in the nation and one of Sams' brightest stars. Concentrating its efforts on technical books designed both for the novice and the experienced electronics technician, PROMPT® published over 60 books in its first five years, with another 30 scheduled to go to press this year. Among the upcoming titles yet to be released are *Basic Home Theater Installation*, *Projection TV Troubleshooting and Repair*, *Power Supply Troubleshooting and Repair*, and *Audio Interfacing*.

Each and every PROMPT® book provides a clear understanding of the principles involved in the installation, maintenance, and performance of electronic devices that have become such a large part of our everyday lives. Some of PROMPT's most recent best-selling titles include *Computer Monitor Troubleshooting and Repair*, *1998 Computer Monitor Troubleshooting Tips*, and *Camcorder Troubleshooting and Repair*.

Sams' photocopy service is another element of the company's business that provides invaluable information to its customers. With a library of hundreds of manufacturers covering a wide range of product lines and thousands of models, Sams can provide service documentation on most any product, including TVs, VCRs, FAX machines, computers, microwave ovens, antique radios, plus much more.

Howard Sams experienced another historic growth year in 1995 as it was acquired by Bell Atlantic Directory Graphics, a member of the Bell Atlantic family. The acquisition was a result of a successful strategic teaming agreement that started in 1994, when BADG and Sams began working together to develop DATAHOST® an industry-leading on-line catalog delivery system.

The teaming agreement demonstrated that Directory Graphics' technological skills combined with Sams' content-rich database and technical catalog expertise would lead to next-generation business-to-business information products for both print and electronic delivery. Presently, Sams' five-million item database is being converted to a relational database platform, coined DATAHOST®. The information contained in DATAHOST® can be extracted from the database and delivered to distributor customers through not only traditional print catalogs and niche catalogs, but also CD-ROMs and electronic on-line applications.

The growth of 1995 was followed by even more expansion in 1996. Howard Sams created an on-line presence at www.hwsams.com. By visiting this site, guests are treated to complete title summaries for PROMPT® books, as well as an entirely searchable version of the Annual Index. The site also features an interactive demonstration of the DATAHOST® cataloging system. In addition to the Web site, Sams added three national sales offices in 1996. National headquarters remain in Indianapolis, IN, with sales offices now located in California, Florida, and Pennsylvania.

Since its very creation, Howard W. Sams & Company has been setting the standard by which every other technical publisher is judged. Many have tried, but few have succeeded in matching the level of quality and customer satisfaction that Sams provides with every one of its products. Sams is now taking its half-century of technical expertise into the next generation, once again forging the path that other publishers will try to follow.

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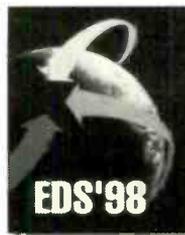
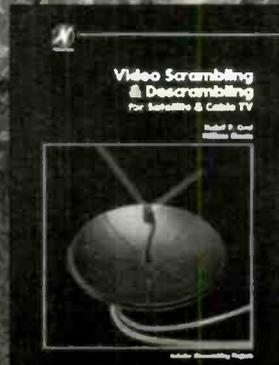
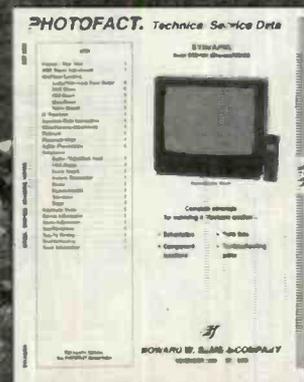
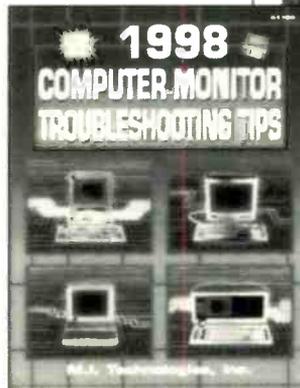
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Website: www.matelectronics.com

"The On Time Electronics Distributor" is our motto at MAT Electronics, and we have proudly served the repair industry for over 15 years. Over the past several years, MAT Electronics has striven to constantly improve our product lines, customer service and competitive pricing.

MAT Electronics has two locations to better serve our customers—our original location in Pennsylvania, and our office in Las Vegas, Nevada. The growth of MAT Electronics has been due to the following: quality product, competitive prices and fast, reliable service. The company's products are used by manufacturers, engineers, hospitals, technical training schools, hobbyists and technicians.

MAT Electronics stocks an extensive line of TV and monitor flybacks, Japanese semiconductors, capacitors and MATV accessories. Recently MAT Electronics has started to distribute original parts from Hitachi, NEC, Panasonic and Sony, at very competitive prices. The company publishes an easy-to-read, 116-page catalog filled with thousands of

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MAT Electronics is always current with market trends in the repair industry—always emphasizing what is new in electronic parts and components—for VCRs, TVs, computer monitors, stereos and microwaves. MAT Electronics sources its products from around the world as well as domestically, to offer the best merchandise at a true savings.

MAT Electronics has become a prominent distributor in the surveillance industry, and is an authorized Sony, Phillips and ProVideo distributor.

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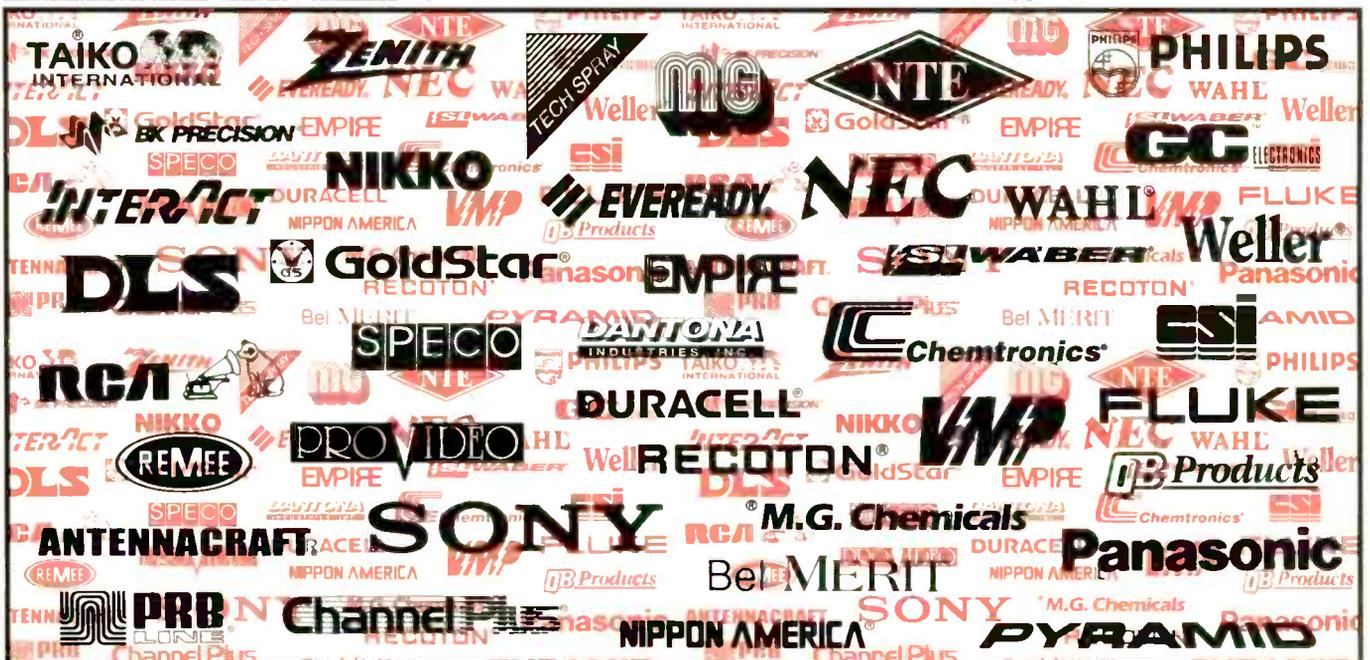
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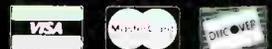


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Over the past several years, SBS Direct has built a name for itself in the Consumer Electronics industry as a leader in total store automation systems.

Its star product, Store-Trak, was developed by people who worked in the retail and service sectors of the electronics industry. They saw the need for a PC-based system that would manage most, if not all, aspects of small-to-medium sized businesses. The product they envisioned would provide easy-to-learn and easy-to-implement solutions in the ever-changing business environ-

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With more than 3,000 systems shipped to date, SBS's customers can attest to the time and money they have saved with Store-Trak, not to mention the professional image they project to their customers with the computer-printed work orders and invoices.

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SBS Direct's efforts are totally dedicated to the support and enhancement of Store-Trak. Providing, maintaining and upgrading software for managing

Electronics and Appliance stores is not a sideline at SBS; it is all that SBS does. And they do it very well, judging by what their customers have to say about them. Their fully trained and qualified staff is available during normal business hours and is always ready to assist you with any questions you may have.

In short, SBS works very hard at earning and keeping you as a satisfied customer.

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Third quarter 1997 U.S. electronics sales over \$336 billion, up 11.6% over 1996

U.S. factory sales of electronics equipment, components and related products totaled more than \$336 billion (YTD) for the third quarter of 1997, representing more than an 11% increase over last year's figures for the same time period, according to data released today by the Electronic Industries Association (EIA).

In announcing the positive third quarter sales figures, EIA President Peter F. McCloskey stated, "All of our sectors continue to demonstrate outstanding growth and now based on our third quarter results, we clearly believe our forecast for a strong 1997 will be a fact."

The following is a breakdown of the third quarter numbers according to product sector:

- Electronics Components sales rose 12.7% to \$108.8 billion, over last year's number of \$96.6 billion (YTD).
- Consumer Electronics saw an increase of 6.3% to \$7.6 billion, compared to \$7.1 billion in 1996.
- The Telecommunications sector enjoyed a significant rise to \$46.2 billion, up over 15% from last year's sales of \$39.9 billion.
- Defense Communications rose 9.5%, from last year's \$19.8 billion to \$21.7 billion.
- The Computers and Peripherals sector hit nearly \$66 billion, experiencing growth of 8.7% over the 1996 third quarter figure of \$60.5 billion.
- The sales of Electromedical Equipment enjoyed a 6.5% rise, from \$7.5 billion in 1996 to \$8 billion so far this year.
- Industrial Electronics sales increased 7.3%, with \$25.7 billion, as compared to last year's \$24 billion.
- The Other Related Products category rose from \$46.2 billion in 1996 to \$52.9 billion in the third quarter of 1997, showing a 14.5% increase.

1998 consumer electronic sales of \$75.6 billion will set all-time record

Continued strong demand for computers and other home information equipment will push U.S. sales of consumer electronics products to a record-setting \$75.6 billion in 1998, the Consumer Electronics Manufacturers Association (CEMA) has predicted. The 1998 total will be a five percent increase over last year.

CEMA, a sector of the Electronic Industries Association (EIA), issued the forecast after analyzing national sales figures for the first ten months of the year along with data from market surveys, predictions from manufacturers, information from government and other associations, as well as other research.

"While home entertainment continues to be an important segment of the consumer electronics industry, home information has become the largest and fastest growing product group," said CEMA president Gary Shapiro.

In 1993, Shapiro explained, factory sales of home entertainment products totaled \$19.9 billion compared with \$17.4 billion for home information. In 1998, home information products are expected to post \$34.5 billion in sales compared with \$20.4 billion for home entertainment.

The \$34.5 billion in home information product sales will constitute an increase of 10 percent over 1997, according to CEMA. Personal computers will lead the segment's solid growth with projected factory sales of \$17.6 billion in 1998, a \$1.7 billion jump from 1997. Other home information products expected to show gains in 1998 include computer printers, monitors, modems, software and cordless phones. Sales of corded phones, fax machines and personal word processors will decline, CEMA predicted.

"The home information product posting the highest growth rate will be digital cameras with an increase of 47 percent between 1997 and 1998," Shapiro said. "These cameras, which take pictures that can be loaded directly into computers, are one of several digital products that have been successfully introduced in recent years."

For example, the long-anticipated Digital Versatile Disk (DVD) player was introduced in the U.S. last year and is expected to generate \$170 million in factory sales in 1997 and \$326 million in 1998, according to CEMA.

A DVD, which can hold 13 times as much information as a CD-ROM, offers consumers a significantly enhanced home entertainment experience. In addition to movies and digital surround sound, the disks can include soundtracks in several languages, built-in parental control, and an array of additional material.

DVD is one of three new products in the video segment that are expected to post impressive increases in 1998, according to CEMA. The other two: TV/PC combinations which will more than double factory sales and reach \$325 million in 1998, and set-top Internet access devices which will enjoy \$180 million in factory sales in 1998.

All told, the video product segment is expected to show a modest increase from \$14.5 billion in 1997 to \$14.7 billion in 1998. The year will bring modest sales increases for stereo TV, projection TV, TV/VCR combinations, stereo VCRs, direct-to-home satellite systems and camcorders.

"The Robust sales figures for projection television, DVD and stereo VCRs are evidence of the continued consumer demand for home theater," Shapiro said. "Another example is the home theater in a box, which will lead the audio products segment in sales growth."

In all, the audio segment is expected to show a slight drop in factory sales from \$5.9 billion in 1997 to \$5.7 billion in 1998. The blank media segment will also experience a modest decline, according to CEMA.

Factory sales of mobile electronics products will increase from \$8.2 billion in 1997 to \$8.4 billion in 1998. Accessories and batteries, electronic gaming and home security will all also post modest gains.

"The consumer electronics industry continues to succeed by bringing new products to market, maintaining high levels of quality and offering increasingly affordable prices," Shapiro said. "This powerful combination will carry the industry into the next century."

Specifically, CEMA predicted that factory sales of consumer

electronics products will reach \$92 billion in 2001, an increase of 115 percent in ten years.

CEMA is a sector of the Electronic Industries Association (EIA), the 74-year-old Arlington, Virginia-based trade association representing all facets of electronics manufacturing. CEMA represents U.S. manufacturers of audio, video, accessories, mobile electronics, communication, information and multimedia products which are sold through consumer channels.

Digital photography faces bright future, according to new CEMA survey and market forecasts

The market for digital cameras is poised for significant growth in 1998 and beyond, according to two new reports from the Consumer Electronics Manufacturers Association (CEMA). The Arlington, Virginia-based trade group unveiled results from a new survey showing strong consumer interest in the capabilities of digital cameras. Also released was CEMA's forecast for future sales: 1.1 million digital cameras will be sold to retail dealers in 1998, CEMA estimates - up significantly from 700,000 units in 1997 and 300,000 in 1996.

"We saw digital cameras really mature as a consumer product in 1997, and optimism is quite high for the category as we head into the new millennium," said Gary Shapiro, president of CEMA. "An expanded retail presence for digital cameras and

the involvement of a large number of top manufacturers have helped increase the awareness among consumers of the great functionality of digital imaging. Just as we saw the products proliferate at last week's 1998 International CES®, our new survey shows similar excitement among the most likely adopters of digital cameras."

The survey, conducted through the CEMA Consumer Research Service, was administered via telephone in December 1997 to 750 households with a PC and a color printer - those currently best equipped to receive the maximum benefit from digital imaging products. Nearly eight in ten of those surveyed were at least somewhat familiar with digital cameras.

The CEMA survey shows that PC/color printer users have already been involved in activities that could benefit from the use of digital imaging products. When asked which tasks had been performed with their PC in the last six months, 67 percent said they had created invitations and/or greeting cards, 52 percent indicated they had produced designs, 41 percent said banners or posters, and 38 percent said newsletters. Additionally, forty-one percent of the respondents said they have printed digital photographic images from their PC. In many of these areas, digital cameras offer consumers a means to enhance their color printer output.

PC owners indicated the top reason they bought a color printer was to print newsletters, cards, etc. (27 percent). This was followed by "to print reports" (17 percent); "it came as part of a system" (16 percent); and "to print photos or images" (13 percent).

Interest in features of digital imaging is significant among this early adopter sample. The survey shows that instant access - printing photos right after taking them - is the most important feature (56 percent are interested). This is followed by the ability to store photos on a PC (55 percent), use photos in newsletters or Web sites (53 percent), and reduce/enlarge photos (51 percent). Interestingly, although women are less familiar with digital cameras than men, their interest level in the cameras' main features are 10 to 15 percent higher than men, according to the CEMA survey.

"We are encouraged by the high level of product interest among the 20 million U.S. households with a PC and color printer," added Shapiro. "Indications of intent-to-buy show that digital cameras - already more than a half billion dollar business [in 1998] - are ready for more of a mass market acceptance among PC users. And as the household penetration of PCs expands, sales of digital cameras are expected to come along for the ride."

Why wouldn't PC/color printer users want to purchase a digital camera? They indicated that "a regular camera meets my needs" (68 percent) and "digital cameras would be too expensive" (61 percent).

Shapiro remarked, "The greatest impediments to consumers purchasing a digital camera are actually those easiest to address. As consumers learn more about the capabilities of digital imaging, we believe many will see digital cameras as an integral part of their computing system, and a complement to their existing cameras. In addition, there are now digital models available at price ranges to fit any budget." ■



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Circle (79) on Reply Card

What Do You Know About Electronics?

By Sam Wilson

In the previous installment of this department I showed how a minimum-loss pad can be designed by using hyperbolic functions. You will remember that the mathematics showed the pad had only two resistors, and the series resistor is closer to the higher impedance being matched. Figure 1 shows the solution obtained in last month's issue using hyperbolics.

I said I would show how to do that with logs (base 10), but, I'm going to go directly to the most basic method of design using algebra. This solution was researched by Al Calderon of Miami. He was one of my best students.

According to the Maximum Power Transfer Theorem, a generator (or battery) will deliver its maximum power whenever the load resistance equals its internal resistance. That theorem assumes there are no reactive components if it is an ac circuit.

Figure 1 shows the generator and load resistor for our problem. If resistance of R_y (the load resistor) matches 100Ω , and the internal resistance of the generator matches that 100Ω , then R_y will receive the maximum possible power.

The object is to *match* the load to the generator. In other words, the generator "sees" a resistance of R_x looking out from its terminals; and, the load resistor "sees" a resistance of R_y looking out from its terminals. The matching circuit must introduce a minimum loss in our solution.

One way to match the generator to the load in an ac circuit is to use a transformer. For example, an *output transformer* matches the impedance of a power amplifier to a speaker.

For a dc circuit we use a simple L-pad such as the one shown in Figure 1. It is known as a minimum-loss pad because it wastes less power than any other resistive matching network. The circuit works very well in ac circuits where the reactance is so small that it can be disregarded. However, it will always waste more power than a well-designed matching

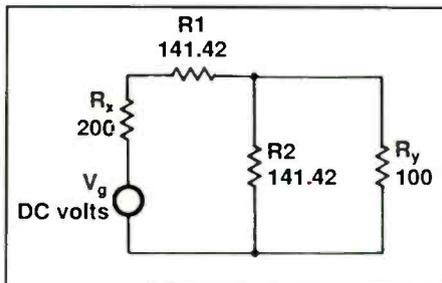


Figure 1. This is the solution to the minimum-loss pad problem obtained in last month's issue using hyperbolics.

transformer in an ac circuit. The advantage of the pad is that it is not reactive. In other words, the resistive network has a very broad frequency response.

In order to use a pad to match the generator and load of Figure 1, the following conditions must be met:

- The generator internal resistance (R_x) must be greater than the load resistance (R_y). If R_x is greater than R_y the match can be made by using the L-pad configuration shown in Figure 1.
- The generator must be capable of delivering the power required by R_y plus the power dissipated by the L-Pad.
- Resistors R_x and R_y must be non-inductive. In an ac circuit the reactance of the circuit must be negligible.

The equations for finding R_1 and R_2 are easily derived. Figure 2 shows the circuit seen by the generator and its internal resistance. The resistance of that circuit must equal the value of R_x . [Note: Some intermediate algebra steps in the following math are not shown. If you are having trouble with them send me a note (care

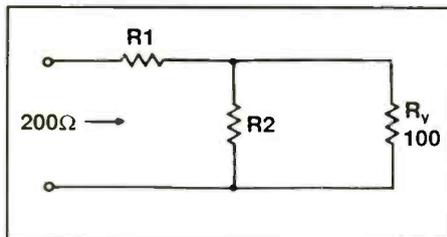


Figure 2. This is the minimum-loss pad circuit seen by the generator and its internal resistance.

of ES&T magazine) and I'll send every step. A stamp would be appreciated.]

From the generator side (Figure 2)

$$200 = R_1 + \frac{100 R_2}{100 + R_2}$$

Using algebra, multiply both sides of the equation by $(100 + R_2)$ to eliminate the denominator. Then solve for R_2 .

$$200(100 + R_2) = R_1(100 + R_2) + 100R_2$$

$$R_2 = \frac{100 R_1 - 20,000}{100 - R_1}$$

Call this Equation 1.

From the load resistance side of the circuit (Figure 3)

$$100 = \frac{(R_1 + 200)R_2}{R_1 + 200 + R_2}$$

$$R_2 = \frac{100 R_1 + 20,000}{100 R_1 + 100}$$

Call this Equation 2.

Set the R_2 values (Equation 1 and Equation 2) equal to each other.

$$R_2 = R_2$$

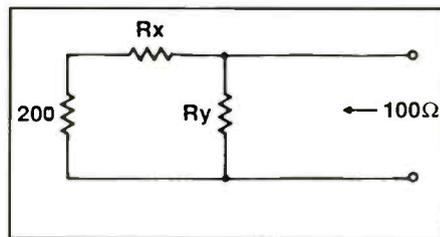


Figure 3. This is the circuit that the load resistance sees, looking back at the generator and its internal resistance.

ES&T Calendar

Electronic Distribution Show
May 12-14, 1998
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48th Electronic Components &
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May 25-28
Seattle, Washington
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SUPERCOMM '98
June 7-11
Atlanta, GA
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June 7-9, 1998
Atlanta, GA
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Fuse '98
June 19-21, 1998
Atlantic City, NJ
703-907-7643

CES Mobile Electronics
June 19-21, 1998
Atlantic City, NJ
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Test Your Electronics Knowledge

Answers to test (from page 15)

1. one-shot, or monostable
2. A
3. NOT A AND NOT B.
4. 10V
5. NAND
6. 2240 pounds, or, 1 gross (ton)
7. - EEROM (Electrically Erasable Read-Only Memory)
- EPROM (Electrically Programmable Read-Only Memory)
- EAROM (Electrically Alterable Read-Only Memory)
8. B
9. A
10. Zero

Set the product of the means equal to the product of the extremes.

$$(100R_1 - 20,000)(100 + R_1) = (100R_1 + 20,000)(100 - R_1)$$

The left side becomes -

$$100R_1^2 - 10,000R_1 - 20,000$$

The right side becomes -

$$-100R_1^2 - 10,000R_1 + 20,000$$

Set the left side equal to the right side and solve for R_1 -

$$200R_1^2 = 4,000,000$$

$$R_1 = \sqrt{20,000} = 141.42\Omega$$

Substitute R_1 into the Equation 2 (looking into the load resistance):

$$100 = \frac{(R_1 + 200)R_2}{R_1 + 200 + R_2}$$

$$34142 = 241.42 R_2$$

Solve for the value of R_2 :

$$R_2 = 141.42\Omega$$

Substitute the values for R_1 and R_2 into the original equations and show that the generator is looking into 200Ω and the load resistance is looking into 100Ω . Remember - you have not carried any value out beyond 5 places, so, there will be a very slight mismatch.

Naturally, you would choose the closest standard resistance values; or, by using trimmer resistors it is possible to get values that are much closer to R_1 and R_2 .

The reason for carrying out the decimal places so far is to show that the designed circuit gives nearly-exact values when looking in from the amplifier. Figure 1 shows the final results.

Keep in mind that the design shown here is for a minimum loss pad. If you want to introduce a specific amount of loss, as for attenuation of a strong signal, you *cannot* use this set of equations.

Measurements

Everyone wants new up-to-the-minute technology, and rightfully so. But I wonder if sometimes some valuable technology doesn't get thrown out in the process of updating our files.

For example, I noted in a telephone conversation with the editor that Florida

has had more than its share of rain and flooding. I told him I was going to start building an ark as soon as I find out what a "cubit" is. (It is mentioned as a unit of length in the story of Noah.)

It just so happens that I saved a copy of "Precision - A Measure of Progress." It is a booklet produced by General Motors in 1952. I doubt if it is still around. Here is a quotation from that book:

"Actually, the cubit of Noah's time was the length of a man's forearm. It was the distance from the tip of his elbow to the end of his middle finger. In some respects, this was a mighty handy measuring stick. It always was readily available and it couldn't be mislaid, so nobody had to waste time rummaging around trying to find it. Also, it was reasonably convenient to use, and everyone had one."

There was a problem, however, if the person working on the left (port) side of a boat was a five-foot woman and the person working on the right (starboard) side of the same boat was a seven-foot man. The result would be a boat that goes around in circles.

Speaking of the flood, did you know that if all of the moisture was taken out of the atmosphere it would cover the earth with water one inch deep?! (Taken from a series called "Interesting Facts" by Dennis Fronrath in the Melbourne newspaper called "Florida Today".)

Thinking of doing some learning?

This is more in the series of great designs, great articles, etc. that are in danger of being lost. It's not because they are no longer useful. It is because we are always looking for the newest stuff. In "What Do You Know About Electronics?" I want to reintroduce some of the lost material. Maybe you will find it useful. At least you should find it interesting.

In most cases the topics to be covered will be electronics designs. This one is an exception. Much of this material is taken from an article by E.J. Tangerman, Editor in an early copy of a magazine called Product Engineering.

Think about this:

Our most common way of conveying information, at least at ordinary levels, is by word of mouth. This is especially true when you attend association conventions. (Are you going?)

Listening is vital. You must often pick from conversation, verbal reports and spoken comments the bits of information that are pieced together into a new design or the improvement of an old one. The same sources often provide new concepts, or solutions to vexing problems. So listen - and remember what you hear.

Ninety-eight percent of all you learn comes through your eyes and ears. Seventy percent of your waking time is spent in communicating verbally, 9% of it in writing, 16% in reading, 30% in speaking, 45% - almost half - in listening. Yet most of our schools stress the teaching of writing by building-block methods, and, so-called "improvement reading" ends in the sixth grade. It is not surprising, therefore, that most of us read at the sixth-grade level, or that most of us listen at 25% efficiency.

In 1940, Dr. Harry Goldstein of Columbia discovered that it is perfectly possible to listen to a speech at three times the normal rate without a significant loss of comprehension. In other words, the normal speaking rate of 125 words a minute, which we slow to 100 words a minute so "people will understand", is far below the rate at which we think, so the mind continually darts away - or tries to - from the subject being talked about. Unless we discipline ourselves to remain attentive, the mind goes away - and stays away. That's why we "forget" - we don't really listen.

If you test listeners immediately after a lecture, their recollection or retention is only 50%; two weeks later it will have dropped to 25%.

There are three simple steps to good listening. They utilize the speed of your mind (four to five times as fast as you talk) and help to hold it in line. Here they are, according to Dr. Ralph G. Nichols of the University of Minnesota:

1. Try to anticipate what the speaker's next comment.
2. Identify elements of what the speaker is saying.
3. Make mental summaries.

Ten Ways to be a Bad Listener.

1. Calling the subject uninteresting.
2. Criticizing the delivery.
3. Becoming overstimulated (withhold evaluation until there is complete comprehension).

4. Listening only for facts. (This is the most common of bad habits among listeners, because it deludes you into thinking you have learned something. Hunt for the gist, the generalization.)

5. Outlining everything. The good listener makes little abstracts of ideas, annotates a text or outline.

6. Faking attention. You are not listening, just playing a part while your mind is elsewhere. Real listening takes energy.

7. Tolerating distractions.

8. Evading the difficult.

9. Submitting to emotional words.

10. Wasting thought power. (You think at perhaps 400 to 700 words a minute, the

speaker talks at 125, slows to 100 for emphasis. So three-fourths of your thinking capacity can be elsewhere.)

One of the hardest jobs is to convince yourself to make notes because your mind will insist, "I'll remember." Then it lets you down.

Note-taking - how and why

Notes are preferably made in your own words unless you intend to quote the speaker directly. Your own words are more useful, because they utilize your own vocabulary.

Remember to check back over your notes shortly after you have made them.

BOOKS

***Internet Industry Almanac*, by Egil Juliussen Ph.D. and Karen Petska-Juliussen, Computer Industry Almanac, Inc., 400 pages, \$400 for all directories plus S&H**

The *Internet Industry Almanac* is an annual reference book about the Internet industry: 400-pages authored by two experienced industry observers - Egil Juliussen and Karen Petska-Juliussen. The almanac has thousands of facts that summarize the industry. There are directories such as: Internet Companies - 1,500+ entries, Internet Publications - 280+, Internet Research and Testing Companies - 120+, Internet Conferences - 250+, Internet People - 5,000+, Internet Resource Directory - 300+, Internet Publishers - 75+, Internet Associations and Organizations - 90+, and Internet Conference Companies - 40+.

The Almanac is full of rankings and awards for companies, people and products. One of the most popular chapters is the salary and wealth rankings of the top Internet people as well as the average salaries for various Internet-related occupations. It has summaries of Internet market forecasts. There are also estimates of the number of Internet host computers and Internet users for over 50 individualized countries. A technology forecast focusing on 2000 and 2002 reviews the expected advances and product trends.

An introductory chapter explains the structure of the Internet industry and defines the Internet. Additionally, there is a history of the Internet, employment

data, Internet humor and more. The Internet Industry Almanac was compiled using PCs and desktop publishing and all products used are listed in the *Internet Industry Almanac*.

Computer Industry Almanac, Inc., PO Box 600, 1639 Logan Creek Drive, Glenbrook, NV 89413-0600

***Semiconductor Cross Reference Book: Fourth Edition*, by Howard W. Sams, PROMPT Publications, 671 pages, paperback \$24.95**

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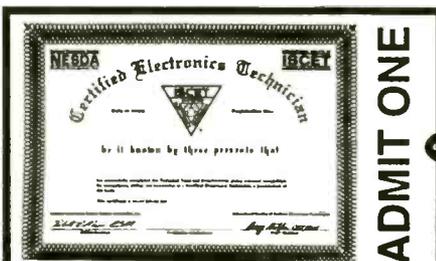
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