

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

# ELECTRONIC<sup>T.M.</sup>

## Servicing & Technology

April 1996

Computer software for service center management

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# ELECTRONIC

Servicing &amp; Technology

Volume 16, No. 4 April 1996

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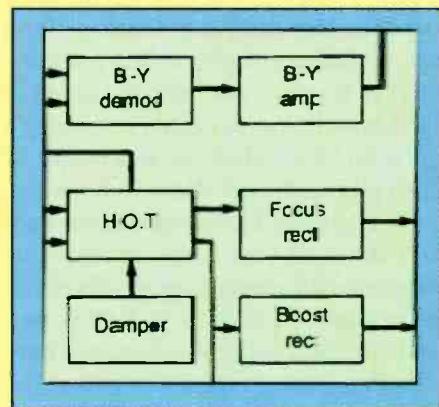
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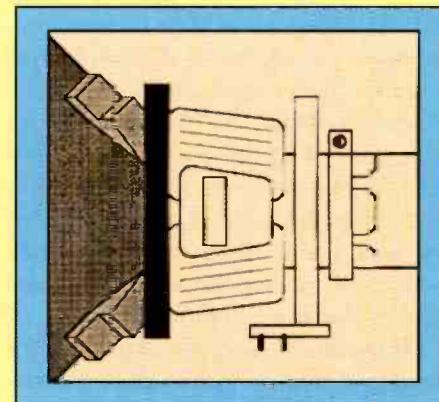
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Distributors are very important to consumer electronics service centers. Once the diagnosis has been made on a product that has malfunctioned, it remains until the replacement parts have arrived and are installed. The sooner the replacement arrives, the sooner the service procedure can be completed and turned into profit for the service center. Our Distributors' Showcase gives distributors a chance to provide details about their products and performance for the information of readers. (Photo courtesy Philips ECG)



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# The internet

There's a lot of hype today about the internet. Everyone in the media is talking about it as though it's the greatest information resource ever to come along. It's a little overdone, of course. On the other hand, the internet is pretty amazing. If you have a computer with a modem and some kind of access to the 'net' and aren't at least exploring it, you could be missing a good bet. The following are a couple of examples of the usefulness of the 'net'.

Just the other day I received a call from an individual who works at the home office of CQ Communications. She wanted to know if I knew of a drafting program for the Macintosh computer. I have a drafting program for IBM compatibles, so I called the company that makes it. They don't do software for the Mac, and don't know anyone who does.

Next I logged onto America OnLine (AOL) and selected their internet connection. I used their web browser and searched for the key words "Macintosh drafting software." The browser returned the names of 38 sites on the internet that had all three of those words in them. Most of the sites didn't sound very useful. One of them, in fact, was the site of an individual who has his resume on the web and knows Macintosh drafting software.

However, two sites turned out to be the home pages of companies that manufacture drafting software for the Mac. I was able to contact one of the companies via telephone, and the other via their internet address. In both cases, I got the names of outlets that sell their software. In one of the two cases, I could have placed an order directly by telephone if I had wanted to.

Using the internet, in five minutes, and with almost no effort, I found information that otherwise might have taken hours of looking through magazine ads, books on computers, and other resources.

Another case I recently heard about through my connection to NESDA via NESDANET, was about a consumer who was looking on the internet for someone to service a product and ran across the NESDA web site. He left a message with

the site and the business was referred to a servicer in his geographical area.

For someone just getting started, or thinking about becoming involved with the internet it can seem a little forbidding. There's all that jargon about http, www, @, html, gophers, ftp, and other stuff. And sometimes it all just seems like self-indulgent people playing around with new terms just for the sake of doing so.

Actually, it doesn't take very long to begin to get a feel for those terms. Just as someone's mailing address consists of their name, the house number, name of the street, city, state and zip code (imagine what that might look like to someone from an underdeveloped country who has no concept of any of those things), their internet address consists of their internet name and the name of the internet server they're connected to and whether the site is commercial (.com), educational, or something else.

But depending on what you're trying to do, and how your internet provider is set up, you may not have to be concerned with any of that. To reiterate what I did when I was looking for a manufacturer for that software, I simply logged onto AOL, then clicked on the Internet Connection panel on the main menu. After a brief pause, the web browser page appeared and I simply clicked my mouse on the box that indicates where to enter the search information, entered my three search words, then clicked on the 'Search' button.

The web browser did the rest, providing me with the information that it had found 38 sites and listed the first 25. I simply had to move the mouse pointer to any of the listings that seemed promising and click. That then connected me to that particular web site where I was able to explore the information presented. After browsing the first 25 sites listed, I simply clicked on the button that said "More" and retrieved the list of the remaining 13. Depending on the information you're looking for, the web browser might list hundreds of sites that contain the word or words you entered to search on.

There is a huge amount of useful information out there on the web on just about any subject. Want to look up information on one of the major consumer electronics manufacturers. Just enter the name as a search string on your browser and you'll find a connection to their home page. As I understand it, at least one major manufacturer has a listing of its authorized service centers for any consumer who logs onto the net looking for that information.

But there's so much other information: detailed information on business or vacation destinations, restaurant listings and reviews, weather data for any location in the world, details on the products and services offered by just about any manufacturer or service provider in the world.

And, of course, you can contact the folks at **ES&T** via the internet. We don't have a web site, but all of us have internet addresses where you can reach us. I'm at cpersedit@aol.com. Kirstie Wickham, **ES&T**'s Associate Editor is at kirstieest@aol.com. And for those of you who might wish to advertise, Diane Klusner, Associate Publisher (formerly Advertising Director) is at dianekest@aol.com.

Here's another thing to keep in mind about the web. It's huge, so much so that there's a lot of information that you might not ever want or need. But that shouldn't keep you from giving it a try. After all, most newspapers, magazines, etc., contain a lot of information that most of us skip over because it's not interesting or useful. Television offers a lot of programming that's not in the least interesting to many of us, but we have a TV for the stuff that interests us. And I frequent the public library, but am only interested in a fraction of what it offers.

There's a lot of stuff on the web that won't interest you, but for most people, there's a virtually limitless amount of stuff that will.

*Nile Conrad Penom*

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

# ELECTRONIC

Servicing & Technology

**Electronic Servicing & Technology** is edited for servicing professionals who service consumer electronics equipment. This includes service technicians, field service personnel and avid servicing enthusiasts who repair and maintain audio, video, computer and other consumer electronics equipment.

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Statement of Ownership, Management and Circulation  
12-1-95. Electronic Servicing & Technology, 76 North  
Broadway, Hicksville, NY 11801.  
Publication # 02789922. Issued 13 times a year, subscription  
price \$24.75 per year. Publisher: Richard A. Ross, Editor  
Nils Conrad Persson, owned by CQ Communications Inc.  
Stockholders: Richard A. Ross, Alan M. Dorhofer, Thomas  
Kniotel, Arthur S. Salsberg. Circulation (Average of 12  
Preceding Months): Net Press Run 23,241 Sales Through  
Dealers and News Agents 925, Mail Subscriptions 19,757  
Total Paid 20,682 Free Distribution 541, Total Distribution  
21,333 Copies not Distributed 1,787. Returns from News  
Agents 231, Total 23,241. Circulation (Single Issue Nearest  
Filing): Net Press Run 22,022 Sales Through Dealers and  
News Agents 1,075 Mail Subscriptions 19,145 Total Paid  
20,220, Free Distribution 538. Total Distribution 20,738,  
Copies not Distributed 895, Returns from News Agents 569,  
Total 22,202.  
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# NEWS

## Servicers now have an on ramp to the electronics information highway

NESDA, NIAS, and ISCET members and boards are sharing information and ideas - daily - through fast and affordable e-mail on the internet. The associations also have a "home page" on the worldwide web. What's more, it's open to anyone in the service industry.

If a service dealer or technician wants to locate a hard-to-find part, get ideas about repairing a tough "dog" chassis, congratulate or chastise a manufacturer, or determine the payment patterns of a particular service contract company, where do they go? They can go to a convention once a year. They can write a letter for later publication in a magazine or newsletter. They can call up a dealer or two right away. Or, they can get on the NESDAnet and converse with hundreds of dealers, manufacturers, parts distributors, and other services suppliers—all of them at one time—instantly.

Recognizing that electronic communication is the wave of the future, the NESDA board of directors recently gave approval to a far-reaching plan to increase NESDA's presence on the internet.

### Strictly for servicers

Currently, NESDA's Internet Services Committee, under chairperson Susan Frick (Independence MO), is operating seven group e-mail addresses on the internet. These groups are described as follows:

**Appliance Servicers Only:** The e-mail station is used for discussing subjects of interest primarily to appliance servicing professionals, such as: parts availability, pricing, and interchangeability; warranty procedures; customer relations; freon availability and pricing; factory repair hints or modification bulletins; etc.

**Electronics Servicers Only:** Used for many of the same topics as the appliance servicers, but specific to computers, audio, video, and other consumer-related servicing. This would include: news about packaging methods; return of investment on manufacturer-required test equipment and service aids; a rental or loan program for video camera harnesses; etc.

**Appliance and Electronics Technicians:** Limited to certified technicians

who are also members of ISCET, topics here could include: repair fixes; circuit descriptions; factory-suggested circuit modification; manufacturers' new product descriptions, upcoming technical training opportunities; etc.

**All Service Information:** Includes all of the people on the preceding three lists and generally covers more generic topics, such as: service operation questions and advice; management decisions; dealing with customers; finding and training technicians; the future of the service industry; the relative value of warranty service; dealing with the low warranty labor reimbursement rates and the high cost of replacement parts; etc. Many manufacturer, distributor, and service contract company personnel also maintain "listening" posts on the NESDAnet to help answer specific questions and aid with hard-to-find parts requests.

There are three other lists specifically reserved for communications to or between members of each of the boards of NESDA, NIAS, and ISCET.

The networks are self-supporting. Though instigated and approved by NESDA/ISCET, internet participant dues pay for all operating and maintenance costs. Individual operational fees (NESDAnet "dues") are only \$10 per month, payable annually. (For NESDA, NIAS, and ISCET members, the fee is half, \$5 mo.) The fees fund the services of an outside provider who receives the e-mail messages and re-sends them to the list participants. The provider handles the computers, and maintains and services the list.

The networks are self-supporting in other ways, too. Since there is no official agenda, the topics to be discussed is determined solely by the participants, themselves. Some members are content to just read, others write messages frequently. Most chip in only when they need some help or advice—or have something to offer. As a promotional flyer states, "NESDAnet is best when it's not a spectator sport." It encourages the exchange of ideas and suggests that the voices of NESDAnet participants "will help shape the future of our industry."

For more information about NESDAnet, contact Susan Frick at 10912 Winner

Rd., Independence MO 64052; e-mail susan@frick.com; Phone 816-461-6230; Fax 816.833.3919.

## Open to the world

NESDA has also opened itself to the world on the worldwide web. The web pages present news about NESDA, including its purposes. It lists NESDA and NIAS officers, staff, and committees. It contains consumer information and assistance, a founders page, links to other web sites, tells about the NESDAnet, outlines the PRIDE and CSM programs, repeats best business ideas from the annual convention, and lists special business aids available through NESDA.

New features (available now or soon) include: ways consumers may locate NESDA/NIAS members by zip code; a form for registering for the annual conventions of NESDA and/or its Associate member organizations; a way to confidentially determine yours costs-of-doing-business, and then compare them to the national average; and how members can order special parts-deals or test-equipment, etc., on-line.

Much of the work of setting up this network was performed by NESDA Vice President Randy Whitehead CSM of Service West in Salt Lake City UT 84115; e-mail randynesda@aol.com; Phone 801-269-1800; Fax 801.268.4755.

For more information about - or to join - NESDA, NIAS, or ISCET, write to the respective association at 2708 W. Berry Street, Fort Worth TX 76109-2397; e-mail iscetFW@aol.com; Phone 817-921-9061/9101; Fax 817.921.3741.

## NESDA/NIAS/ISCET and state associates help petition the Supreme Court in Southeastern/Peak Computer Antitrust Case on behalf of the independent service industry

NESDA, NIAS, and ISCET helped win the Kodak case when the U.S. Supreme Court ruled that a manufacturer may not monopolize the servicing of its brands of products. The service industry representatives are again going to the High Court to battle a lower court decision that could undermine the Kodak victory. NESDA, along with NIAS and ISCET and its state



Associate organizations, are reconfirming the rights of consumers to a choice of servicers—and the rights of independent servicers to compete equally with all competitors.

A lawsuit, now reaching the Supreme Court level, will have a serious impact on the future of the product service industry. The service industry's representatives—trade associations at the local, state, and national levels—have joined the fray.

In 1992, a computer manufacturer which also provides service for its computers, Triad Systems Corp., sued a competitor for copyright infringement. The competitor, Southeastern Express Co., also offered service on Triad computers. The "infringement," according to Triad, occurred when Southeastern technicians turned on the computer and made use of the operating system that Triad had imbedded in the machine. Triad, which sells the computers but leases the software to run them, wants to prevent Southeastern from even turning on the computers.

When the case reached the Ninth Circuit Court of appeals, that court agreed with Triad. The justices ruled that making even a temporary copy of the operating software in the computer's random access memory (RAM) is a violation of the U.S. Copyright Act. The Court said that the services performed by Southeastern provided no public benefit and that Southeastern was improperly using software, which was developed by Triad to enable its customers and its own technicians to service Triad computers.

Southeastern countersued for antitrust violations and appealed the Triad decision to the U.S. Supreme Court. Southeastern's lead attorney, Ron Katz of Coudert Bros. in San Francisco (who represented NESDA in its Kodak brief), says "the decision is contrary to the public policies underlying the Copyright Act," and "is also contrary to common sense because the electronic copy in RAM disappears when the computer is turned off." Mr. Katz further argues that, "if the Ninth Circuit's interpretation of the copyright law is permitted to stand, all independent servicers who use, consult on, or repair computers will risk liability as software 'thieves' simply by using software for its

intended purpose on behalf of those who lawfully possess the software."

The friend-of-the-court brief filed by NESDA/NIAS/ISSET and the Associates state the associations' interests in the case is in behalf of their professional servicer members. The NESDA brief charges that the Ninth Circuit's misinterpretation of copyright law should be reviewed because it defies logic and, unchanged, will pre-

vent independent service operators (ISOs) from competing with manufacturers. NESDA states that companies and individuals who develop software should be able to realize a return on their investment. However, the brief adds, "manufacturers should not be entitled to prevent ISOs from competing with them by bundling operating system software with

(Continued on page 69)

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# Computer software for service center management

By The ES&T Staff

One of the interesting things about using a computer to handle information is that the user often finds that the benefits seem to multiply. For example, here at **ES&T** we put all of our contact information into a computer database. It made things such as calling people much easier. Instead of trying to find that business card, or a listing in a book somewhere, a few keystrokes brought the essential information about that individual, including their telephone number, to the screen.

Then with all of that information in the database, it became easy to bring the production of the annual buyers' guide,

which had been processed by an outside company, in house. Moreover, when it's time to take a trip, with a few keystrokes we can prepare a list of contacts who are located in that state or are in the zip codes near where our trip will take us.

Once the information is in the data base, it's usually easy to manipulate in any of a number of ways that make it easier to keep track of contacts or accounts, prepare reports, etc.

## Service management software

That's one of the things that makes service management software so valuable to

most service centers. One of these software packages allows service center personnel to key in the pertinent data on a transaction that takes place in the service center, and then use that data in a number of ways as will be described in the following text.

### Tracking a set

Let's consider a typical transaction using one type of software on a networked system. A customer brings in a small-screen set. The counter person first asks if the customer has done business with the service center before. If the answer is no,

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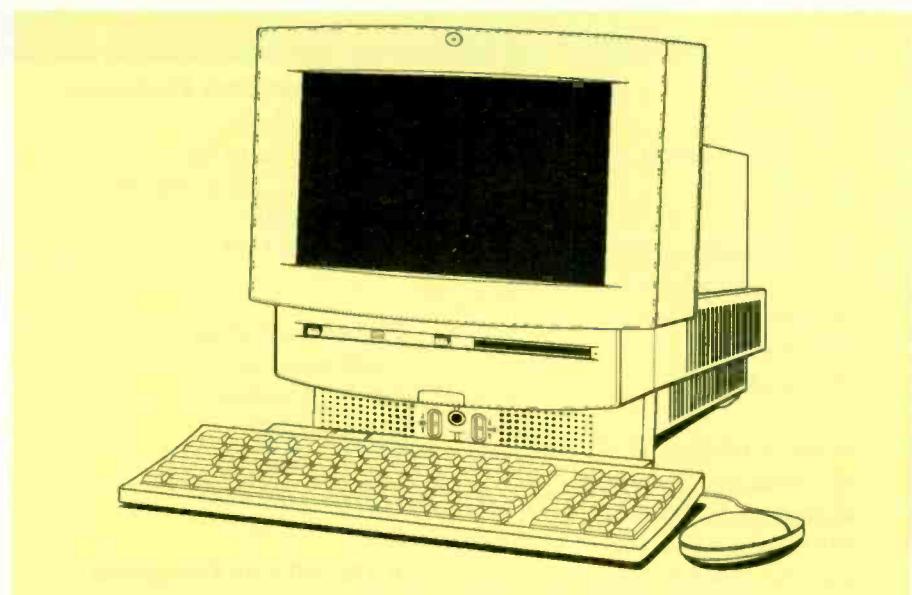
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the counter person keys in whatever information is required and proceeds. If the answer is yes, the counter person asks for the person's telephone number, keys it in, and if everything is working properly, the data for that person; name, address, telephone number, etc., appears on the screen.

Either way, the information on the set: brand, model number, chassis number, screen size, complaint, etc. is then keyed in. If a deposit is required, the amount of deposit is keyed in, and the promise date, if one is given, is also entered. At this point, the computer prints out a claim check and an inventory tag to be attached to the set. Depending on the computer hardware and software, these documents may be bar coded.

As the set goes through the service process, the pertinent information is entered into the computer. This information may include such things as the technician to whom the set is assigned for service, trouble found, parts that need to be ordered, location of the set if it has to be temporarily stored, etc.

With all of this information in the computer, if the service center sends out status cards on sets that have been delayed



for parts, the information is right at hand. If the customer calls to ask the progress of the set, it isn't necessary for the counter personnel to put the party on hold in order for them to run back into the service center to check on it, he only has to key the individual's telephone number into the computer and the appropriate information appears on the screen, as if by magic.

When the time comes, the total of labor

and parts, as well as any miscellaneous materials charges are entered into the computer and the invoice is prepared. The owner of the product is called and the process is complete.

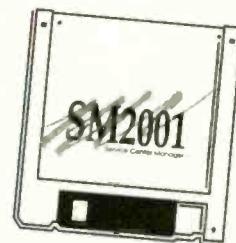
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a lot of other things with the information available. For example, let's say that the replacement parts inventory and service information inventory are also computerized and on the network, then when the service technician needs to select the service information he queries the computer to see where it is. If another technician is already using it, that information should be in the computer. If the service literature is on file, when the technician takes it out of storage he makes the appropriate entry and every one in the service center knows where it is.

If there is a service tips program, the technician can enter the brand and model of the set he's just begun working on and the symptoms, and if there is any information on file for this trouble, he can apply it to this situation.

If the technician selects 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 directly, electronically to the manufacturer.

### Which one is for you?

There are service management software programs ranging from a few hundred dollars to several thousand dollars. It's impossible without a thorough study to determine which one is the best for your operation. As with other types of software, 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.

Fortunately, most providers of this type of software offer demo programs some of

which are actually fully featured versions, but limit the number of records that you can enter 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. I spoke with one service center owner recently who has a wonderfully useful program, with one exception. The program 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 when it really should be possible to achieve that interface with another program.

### Look at our list

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

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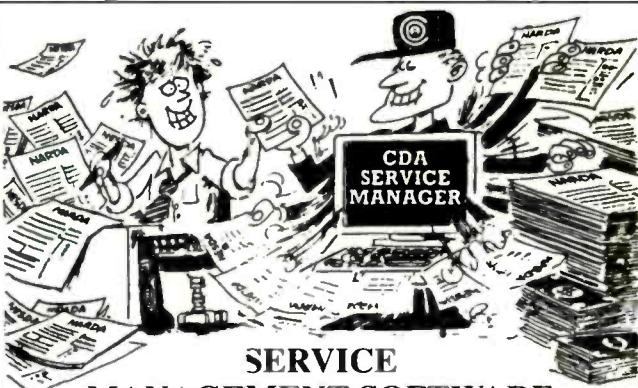


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# Color television receiver circuits

By Lamar Ritchie

A color TV receiver contains all of the circuitry of the monochrome receiver, plus the added circuits needed to demodulate and display the color portion of the picture. To display the picture in color, three video signals are derived; the original red, green and blue video signals.

The color CRT has three color phosphors, each of which glows with one of the three primary colors when bombarded by electrons. These phosphors are placed on the inner surface of the CRT as either triangular groups of the three colors (mostly in older receivers), alternating rectangles of the three colors, or alternating stripes of the three colors.

Regardless of the version, all color CRTs require three separate electron beams, each modulated with the video of one of the primary colors. Each also has a shadow mask placed behind the phosphors. This mask has a series of openings that allows each electron beam to strike only the correct color phosphor.

The three beams must be precisely aligned to enable them to enter the opening in the mask at the correct angle and strike the correct phosphor. Stray magnetic fields could create enough error to cause the incorrect color to be displayed in parts of the picture. For this reason color CRT's require an automatic degaussing circuit to keep the CRT and mounting components demagnetized. The automatic degaussing coil is mounted around the CRT just inside the cabinet.

Figure 1 is a general block diagram of the circuits found in a color TV receiver. There may be other circuits, and some may differ, but this block diagram is a good starting point when it comes to developing an understanding of what the circuits in a color TV set do and how they are interconnected.

Ritchie is an electronics instructor at Kentucky Tech, Hazard Campus.

## Color TV main stages

Here is a brief description of the main stages found in a color TV receiver. This article will often make references to "older receivers" or "modern receivers". More often than not, a consumer electronics technician will be servicing a set that's several years old, rather than more recent models.

**UHF tuner**—Converts the UHF channel selected down to the video IF frequencies. Older tuners were arranged as shown on the block with the UHF tuner feeding into the VHF tuner. When UHF stations were selected, the VHF tuner's mixer (and on some, the RF amp also) became video IF amps for extra gain.

**VHF tuner**—Converts the VHF channel selected down to the common IF frequencies. At the tuner output, the picture carrier is at 45.75MHz and the sound carrier is at 41.25MHz. Note that in later model receivers, UHF and VHF tuner circuits are combined into a single unit that is also capable of tuning to the additional channels for cable TV.

**Video IF amplifiers**—These amplify the video and audio frequencies within the video IF pass band to the levels sufficient to drive the video detector and sound converter. There are typically three or four video IF amplifier stages, sometimes referred to as PICTURE IF AMPS or simply PIX IF AMPS.

**Sound converter**—This stage converts the sound frequency in the video IF pass band (41.25MHz) down to the sound IF frequency of 4.5MHz by heterodyning the picture and sound frequencies together and tuning to the difference frequency. This circuit could be simply a diode and 4.5MHz tuned circuit.

**Sound IF amp**—Also referred to as au-

dio IF amp. This stage is responsible for amplifying the 4.5MHz sound IF signal to a level sufficiently high to be detected by the sound detector.

**Sound detector**—Also known as an audio detector. This portion of the circuit converts the FM modulated 4.5MHz sound IF frequency to baseband audio.

**Audio amplifier**—This circuit will amplify the audio frequencies from the detector to power levels sufficient to drive the speaker. If the TV is MTS equipped, there may be two audio amplifiers (stereo) and the MTS decoding circuits will precede the audio amps.

**Video detector**—An AM detector, usually a diode detector, that converts the picture frequencies within the video IF passband down to baseband video. Immediately following the detector will be a 4.5-MHz sound trap to remove the frequency that will result from the heterodyning of the picture and sound frequencies of the video IF circuits.

**Video amplifiers**—These amplify the video from the detector to levels sufficient to drive other circuits.

**Delay line**—This is a device that delays the Y signal (monochrome video), or luminance about 0.8μsec to match the delay in the chroma circuits. The color signal is delayed more than the luminance because more circuitry is involved in recovering the color components of the signal.

**Y output amp**—Also known as the video output amp. For the color TV versions that use it, this stage amplifies the Y signal (black/white or brightness component) to the level sufficient to drive the CRT. Most color receivers use R, G, and B video output amps with the

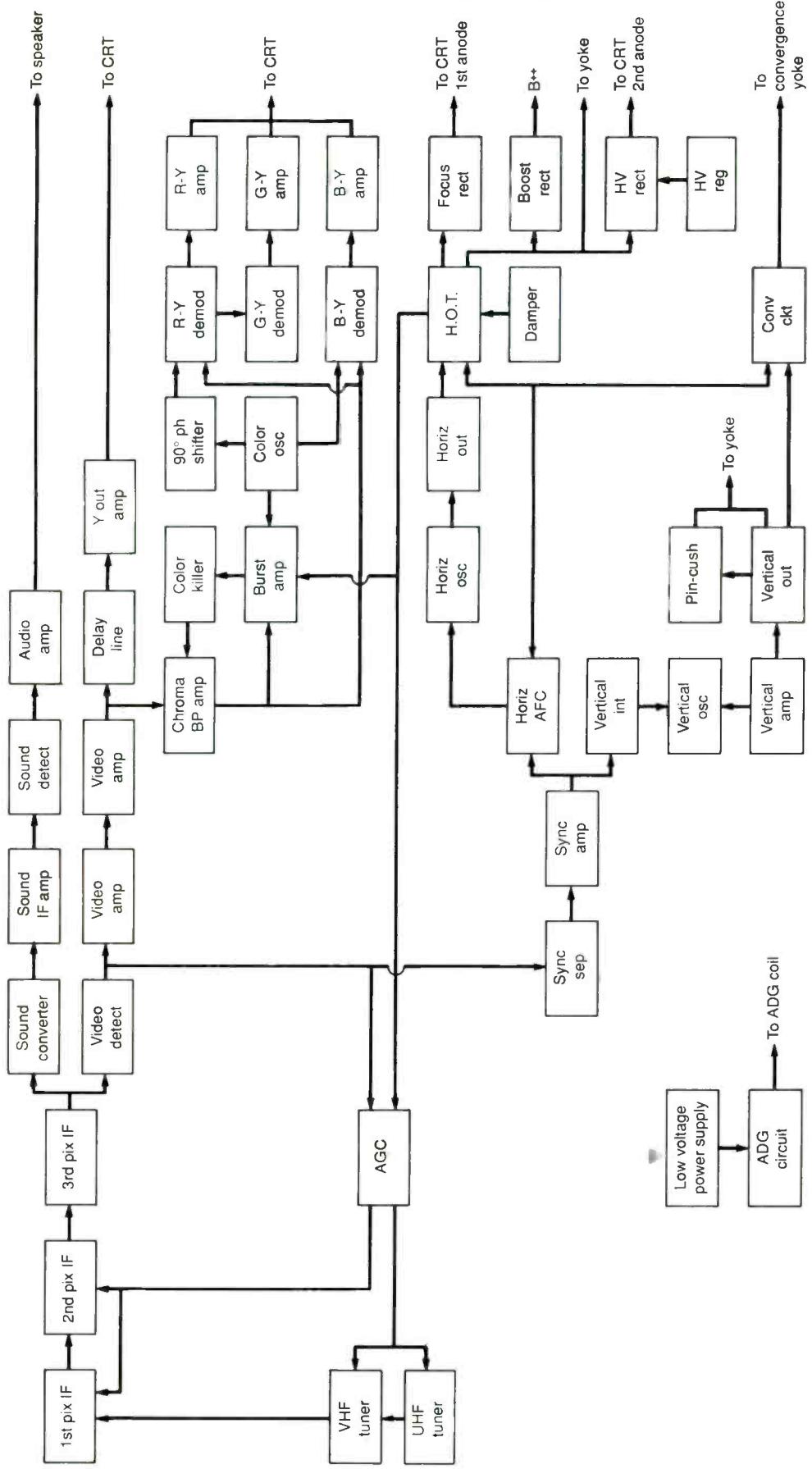


Figure 1. The circuitry of most modern television receivers is similar to that shown in this block diagram.

Y signal already mixed back in with the three color-difference signals.

*Chroma bandpass amp*—This stage separates the color components from the video signal and amplifies them to a level sufficient to drive the demodulators and burst amplifier. There may be two or three chroma bandpass amps.

*Burst amplifier*—The purpose of this block is to separate the color burst (color sync) from the chroma signal and amplify the burst. This signal will be used to phase lock the color oscillator.

*Color oscillator*—A crystal oscillator at 3.58MHz (actually 3.579545MHz) that supplies the reference signal for demodulating the color. This frequency was suppressed during the modulation process.

*Color demodulators*—The B-Y demodulator recovers the B-Y signal using the chroma and oscillator CW at 0 degrees. The R-Y demodulator recovers the R-Y signal using the chroma signal and

the oscillator CW at 90 degrees. The 90 degree phase shifter in the block diagram shifts the oscillator phase for use by the R-Y demod. Most newer TV receivers also use a G-Y demodulator, but some use a G-Y adder circuit that derives the G-Y signal by adding together the proper amounts of the R-Y and B-Y signals. This is the type shown on the preceding block diagram. Another type, called X-Z demodulators, will be described later.

*Color difference amplifiers*—These amplify the R-Y, G-Y and B-Y signals to a level sufficient to drive the CRT. These are used only if there is a separate Y video output amp, as described above.

*Automatic gain control, or AGC*—This stage keeps a constant video level at the detector by closely controlling the gain of the tuner's RF amp and the video IF amps.

*Sync separator*—Separates the sync pulses from the composite video signal for use by the deflection circuits.

*Sync amplifier*—The sync amp amplifies the sync pulses to a level sufficient to be used by the deflection circuits. In modern receivers it may also provide pulses for the AGC circuit and digital circuits, such as channel/time display, etc.

*Horizontal oscillator*—This will develop the 15.75Khz (15,734.26Hz to be exact) horizontal scanning frequency.

*Horizontal AFC*—Automatic frequency control circuit for the horizontal oscillator. Its purpose is to keep the horizontal oscillator locked to the horizontal sync pulses from the composite signal.

*Horizontal output amp*—Amplifies the 15.75Khz pulses from the horizontal oscillator to a level sufficient to drive the horizontal deflection windings in the deflection yoke. It may also have to provide power for other circuits as there may be secondary windings of the horizontal output transformer that are rectified and used as dc power supplies.

*Horizontal output transformer*—This is more commonly called the flyback

transformer. It may also be known as an integrated flyback transformer (IFT) or integrated high voltage transformer (IHVT) if the high voltage rectifier is built in to the transformer. Its primary purpose is to match the horizontal output stage to the horizontal deflection yoke winding, but it has many other functions. It develops the high voltage ac pulse at 15.75Khz, which is rectified and used for the CRT's second anode. It is also used to develop keying voltage pulses and dc supply voltages for other circuits.

*Damper*—The yoke and flyback transformer have high inductance and stray capacitance between their windings that can cause ringing when shock excited by the abrupt change in scanning current during flyback time. The damper is simply a diode, usually connected across the horizontal output amp, that conducts during retrace (flyback) time and acts as a low impedance to damp out this ringing.

*High voltage rectifier*—Rectifies the high voltage ac pulse from the flyback transformer to produce the high voltage dc needed by the CRT. A filter capacitor is not needed because the Aquadag coating on the inside and outside of the CRT act as a high voltage capacitor.

*High voltage regulator*—Keeps the high voltage constant in spite of varying beam currents (varying brightness of the picture) and line voltage changes. This is necessary because changes in the high voltage will cause misconvergence of the three beams.

*Convergence circuit*—Specifically, this means the circuitry for the dynamic convergence of the three electron beams. This circuit generates the waveforms that feed the convergence yoke. It makes minor corrections to the main scanning voltage to insure that each of the three beams strike the correct place on the CRT screen at all points in the scanning process. Only the older delta type CRT's require a complex dynamic convergence circuit. Newer in-line and Trinitron CRT's require only adjustable permanent magnets placed around the neck of the tube.



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**Boost rectifier**—When the horizontal output begins to supply power to the flyback, between pulses, the collapsing field of the primary winding produces a counter-counter EMF that aids, and is approximately equal to, the dc supply voltage. This may be rectified and used in places that need a voltage that is greater than the normal dc supply voltage, such as for the CRT screen voltages. Most modern receivers do not use the boosted B+ voltage, instead using multiple secondary taps on the flyback transformer.

**Focus rectifier**—Rectifies the voltage at a flyback transformer tap to produce the moderately high dc voltage for the first anode, used to focus and accelerate the electron beam. Most modern receivers do not use a focus rectifier, instead using a network of high voltage resistors to reduce the main high voltage to the correct level. Many also use a tap in a *voltage tripler* that is employed after a lower voltage flyback transformer.

**Vertical integrator**—The vertical integrator is usually considered as part of the

vertical oscillator. It is a low pass filter that removes the vertical sync pulses from the composite sync to be used to synchronize the vertical oscillator.

**Vertical oscillator**—This circuit generates the 60Hz (actually 59.94Hz) vertical scanning frequency.

**Vertical amps and output amp**—These amplify the vertical scanning signal produced by the vertical oscillator to a level sufficient to drive the vertical windings of the deflection yoke. In older receivers a vertical output transformer was used to match the vertical output amp to the yoke. Most modern receivers do not require it because transistor amps, such as the complementary symmetry, have an impedance low enough to drive the yoke directly.

**Pincushion circuit (PIN)**—Develops a parabolic waveform that compensates for the "pincushion" effect caused because the electron beams must travel a greater distance to reach the edges of the screen than they do to reach the center area of the screen. Depending on the size and

deflection angle of the CRT, there may be side and top/bottom pincushion circuits. For modern receivers this might not be a discrete circuit but an integral part of the scanning circuits, if used at all.

**Low voltage power supply**—Supplies operating dc voltages for the various circuits. Most modern receivers do not really have a low voltage power supply that is operated from the ac power line instead using a scan derived power supply. Only the voltages needed to start the horizontal circuits are derived from the ac line. Most of the other voltages would be derived from the flyback transformer, once the horizontal circuits are operating. This is the most cost effective way to generate these voltages because fewer components are needed and the higher frequency pulses are easier to filter, thus requiring smaller filter capacitors.

**Automatic degaussing circuit, or ADG**—Demagnetizes the CRT screen and metal holders each time the TV is turned on to prevent stray magnetic fields from interfering with color purity. ■

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# Lighting and magnification

By The ES&T Staff



**E**lectronics servicing encompasses a lot of things. It is about understanding electronics theory and the operation of consumer electronics products. It is about having the right tools and test equipment and knowing how to use them. It is about knowing where to obtain the replacement components that you need to complete the repair of a TV, VCR or personal computer. But just as important as any other aspect of consumer electronics servicing, it is about seeing.

Lighting engineers determine the required lighting for a given task by its visual difficulty. Many ordinary daily tasks don't require very high light intensity, but most of the tasks required of a consumer electronics technician do. For example, just trying to read a poorly reproduced schematic diagram may require a great deal of light.

## Assessing the problem

Consumer electronics technicians of today have many far more demanding visual tasks than just reading service literature. Printed circuit boards in today's consumer products, with their tiny surface-mounted devices, and their vanishingly thin circuit traces make it virtually impossible for a technician to desolder a fine-pitch IC and solder in a new one without not only a good source of light, but some form of magnification as well.

Moreover, even such helpful products as oscilloscopes and other test equipment may present difficult seeing tasks. You don't want too much light on the oscilloscope screen, so that you don't get glare, making the signal traces difficult to see, and yet you need to have the controls properly lighted.

And even if you have good task lighting, you may be inadvertently causing seeing difficulties. If the contrast between the task area lighting and the general area

lighting is too great, in other words, if the light on the work is extremely bright and the service center work area is otherwise relatively dark, it can cause eyestrain and even a feeling of uneasiness.

In short, every consumer electronics service center needs good lighting, both general and task lighting, and also needs some kind of magnification for those especially difficult seeing tasks.

## How much light do you need?

Unfortunately, determining the amount of light needed in any facility is as much art as it is a science, and there are many answers to the question, depending on who you ask. One rule of thumb is that the general lighting ought to provide the illumination of 100 foot candles, and that task lighting should provide as much as several hundred foot candles. A first step in determining how much light you need in your facility is to borrow or rent a light meter and see what level exists now.

An even better approach would be to have a look in the yellow pages under "Lighting Consultants" and call a few to see how much they would charge to perform a lighting survey. These consultants know what light levels are required, and how to best achieve those levels.

## Making it esthetically pleasing

Whether you decide to make improvements to your lighting by yourself, or to hire a consultant, there are several things that should be kept in mind. For example, while it's important to have an adequate lighting level, it's also important to avoid glare. Glare is a constant problem for service technicians these days. The TV screen itself is reflective and any glare will find its way to the technician's eye. The oscilloscope screens are also highly reflective and glare interferes with read-

ing and interpreting what's on the screen. And now, in these days when technicians may be equipped with computer terminals at their benches, they have still another source of glare.

Fortunately, lighting fixture manufacturers have designed a number of fixtures that reduce glare. For example, fluorescent lamps are now available with parabolic reflectors: (they look like egg crates) that shine the light directly down, with very little light reflected to the sides. These fixtures provide a lot of light on the surface where it's needed, but are not bright to look at and do not cause glare on reflective surfaces, like screens.

Another factor in lighting design for visual comfort as well as adequate amounts of light is to make sure that the walls of the room receive some illumination. If the interior of the room is well lit, but the walls are dark, it feels uncomfortable to the occupants. Lighting the walls defines the space.

#### Your store lighting is important, too

The lighting in the customer reception area is also important. The visual comfort of any area depends in large part on how it is lighted. If the reception area is visually comfortable, people will feel welcome and will be more inclined to come back next time they have a problem with their product.

#### Light fixture maintenance and relamping

Once you have made any improvements to the lighting in your service center, keep in mind that just as with any other important business system, it should be maintained. An area in which several lamps are burned out, or, even worse, blinking, is visually uncomfortable. Moreover, lighting fixtures and lenses get dirty over time and the light output can decrease greatly.

Fixtures should be cleaned regularly, and dim or burned out bulbs should be replaced. In fact, there's a school of thought that rather than replace bulbs as they become bad, called "spot relamping," all of the bulbs should be replaced at the same time. This is called "group relamping." The thinking is that if all of the lamps were installed at the same time, and have operated about the same length of time in the same conditions, then they

can all be expected to become worn out at about the same time.

#### Proper lighting can provide many benefits

Anyone who works in an area that is poorly lighted will have problems performing visual tasks. In addition, such an area can give the feeling of being in a dungeon. Good, bright lighting makes it easier to see to do the job, and can make a person working in the area feel better.

The expense of installing an adequate and esthetically pleasing lighting system may be recouped many times over by increased productivity, reduced employee turnover and increased customer traffic.

#### Other enhancements to seeing

As we get older, our vision tends to deteriorate. However, this happens so gradually that we really don't notice it. Things just don't appear as sharp as they used to. Another good idea for consumer electronics servicing technicians is to have their eyes checked regularly to determine if they need glasses.

But even the sharpest eyed technicians are challenged by today's consumer electronics products, and in addition to good lighting, many visual tasks in the service center require some form of magnification. There are many forms of magnification available. Here are a few you might try: handheld magnifier, magnifier lamp, jeweler's loupe, microscope, camera imaging system, visor magnifier, and magnifying spectacles attached to glasses. Some service technicians have even been known to use a video camera trained on the area of interest, with the picture on a fairly large screen TV.

#### Seeing tasks will become more difficult

With every passing year the consumer electronics manufacturers make their products smaller and pack more and more features into them. This means that component size and spacing and printed circuit board wiring size and spacing continue to become smaller and tighter. Each such advancement makes the visual task of servicing the product more challenging. It's important that service centers keep in mind the importance of providing adequate illumination and magnification for the completion of these tasks. ■

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# CRT setup adjustments

By Arthur N. Flavell

A CRT setup is required whenever the CRT or deflection yoke is replaced, and sometimes when adjustments have drifted because of circuit aging. A full CRT setup includes a number of both electrical and physical adjustments.

Service literature provides information on the adjustments to be made and specifications for their completion. Unfortunately, the instructions are brief and often cryptic, with little in the way of explanation of individual controls or their functions. No mention is made of interactions between adjustments or of the order in which adjustments should be made to minimize re-doing steps. As trained technicians, we are expected to know.

Attempting a CRT setup without understanding the steps involved can be a frustrating experience. This is especially true of complex setups such as projection televisions. This article describes the procedure for setting up a CRT, the controls and adjustments used, and the purpose and effect of each adjustment. Typical methods are described, but the manufac-

Flavell is owner of an independent consumer electronics service center in Alaska.

turer's service literature should be followed for exact procedures.

## Getting started

Before beginning, the set should be allowed to warm up thoroughly. If the CRT has been changed, a "burn-in" period of several hours may be required. Follow the CRT manufacturer's recommendations. Otherwise, 30 minutes is adequate to allow the circuits to stabilize.

## B+ Adjustment

In modern television receivers, the B+ supply powers the horizontal, CRT high voltage and various other circuits. If the value of the B+ voltage is wrong, the horizontal circuits may function improperly or not at all. CRT high voltage may be excessive, creating a radiation hazard. Before attempting any CRT setup, check the B+ voltage and adjust it if necessary.

## Degaussing

Residual magnetism in the CRT or chassis distorts color reproduction on screen. This shows up as areas with a purple or greenish tint in the picture.

Degaussing is done by moving the degaussing coil in a circular motion about three to four inches away from the set with the broad side of the coil parallel to the surface. Degauss the CRT face as well as the top and sides of the cabinet.

The coil should be moved at least six feet away from the set and turned so the broad side of the coil is at right angles to the CRT face before turning it off. This minimizes magnetization induced by the degaussing coil. If areas of color distortion remain after degaussing, a purity adjustment is needed.

## Purity adjustment

If a full screen of single color is displayed, it should have the same intensity and hue characteristics over the entire screen. As the electron beam from the gun cathode travels toward the face of the CRT, it passes through an aperture screen. Tiny holes in the screen allow the beam to fall only on the phosphor dots associated with that gun. If the beam's scan is distorted, it falls on the holes for another color, causing areas of impurity.

To adjust purity, a white raster signal

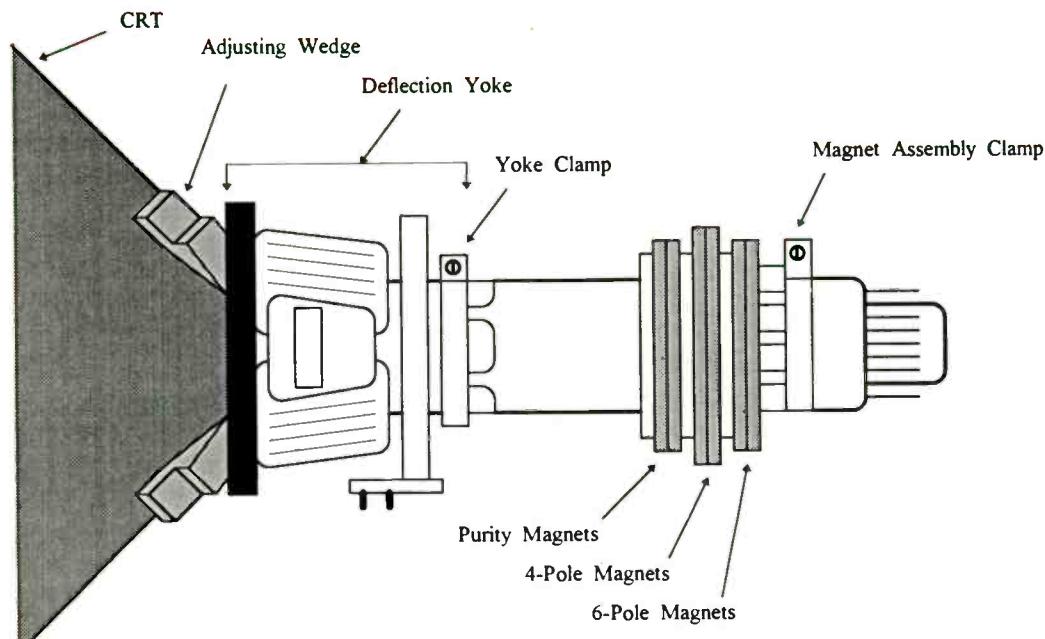
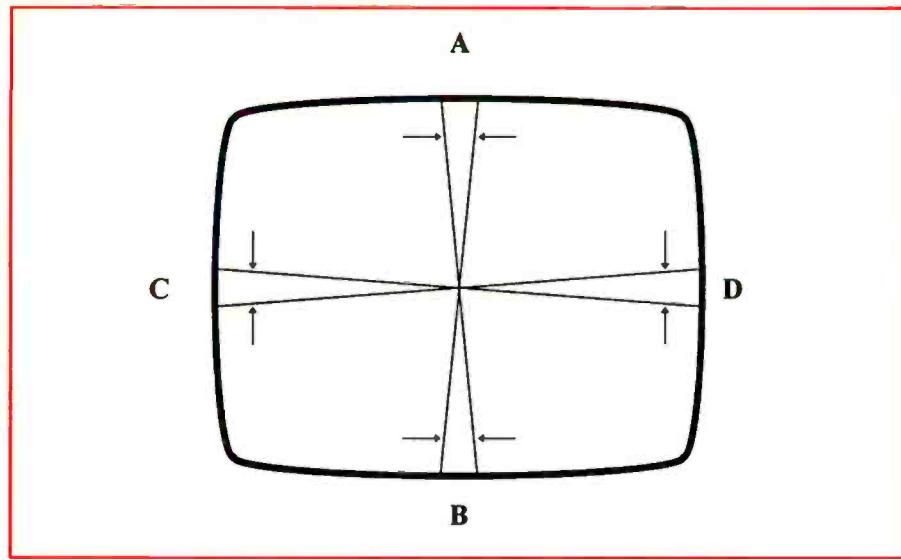


Figure 1. These are the components that must be manipulated to perform CRT setup adjustments on a television set.



**Figure 2.** As part of the convergence, tilt the yoke up or down to converge the vertical lines at points A and B and the horizontal lines at points C and D as shown here.

is used. If a generator signal is not available, a white screen may be produced by unplugging the IF signal cable from the tuner. With the white signal present, two of the CRT beams are cut off, leaving a single-color raster. Some manufacturers specify green for the purity adjustment, while others use red.

To perform the purity adjustment, set the controls as specified in the service literature. Loosen the deflection yoke clamp and slide the yoke assembly as far toward

the magnet assembly as possible. See Figure 1 for component locations.

Assuming green as the purity setup color, you will see a vertical band of green in the middle portion of the screen. Adjust the purity magnets to center the green band. Slide the yoke assembly forward until the screen is a uniform green. The purity magnets may have to be adjusted again to achieve good results.

**CAUTION!** The deflection wire connections on the yoke present a shock haz-

ard. It is a good idea to cover these connections with electrician's tape before handling a live yoke.

### Focus

The focus adjustment should be made before attempting convergence. Adjust the control so individual raster lines are clearly visible. On smaller screens, it may be easier to use a cross-hatch pattern to make the adjustment.

### Convergence

Convergence is a process that causes the traces from the red, green and blue guns to "converge," or meet at the same points on the screen. A complete convergence adjustment consists of two parts - static convergence and dynamic convergence. Because the static convergence affects the entire area of the screen, it is performed before the dynamic convergence, which affects only the periphery.

### Static convergence

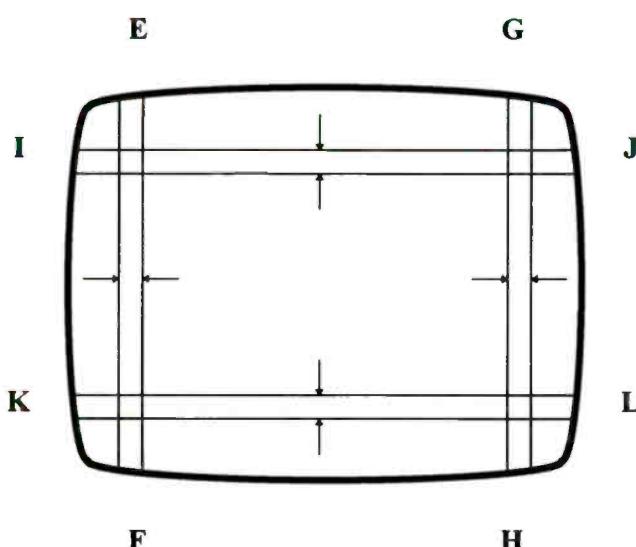
Static convergence is performed using a dot pattern. Adjust the four-pole magnets to converge the red and blue dots at the center of the screen. The magnets may be rotated in either direction individually, or rotated together. Adjust the 6-pole magnets in the same manner to converge the red/blue dots with the green dots. When done properly, the center dot should appear as a single dot, with no individual colors visible. It may be necessary to repeat the procedure to get a good convergence. When the purity and static convergence adjustments are completed, secure the magnet assemblies with a dab of nail polish or paint on their edges.

### Dynamic convergence

Dynamic convergence is performed with a crosshatch pattern. Remove the three rubber wedges between the yoke and the CRT and loosen the yoke clamp enough to allow it to be tilted up and down and side to side.

Refer to Figure 2 for this step. Tilt the yoke up or down to converge the vertical lines at points A and B and the horizontal lines at points C and D.

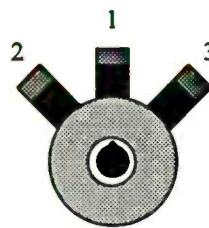
Refer to Figure 3 for this step. Tilt the yoke left and right to converge the vertical lines at the sides of the screen (E - F and G - H) and the horizontal lines at the top and bottom of the screen (I - J and K - L). It may be necessary to repeat the dynamic steps in order to achieve the best convergence.



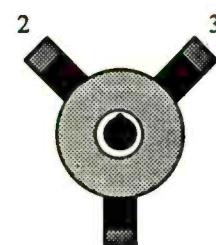
**Figure 3.** As part of the convergence, tilt the yoke left and right to converge the vertical lines at the sides of the screen (E - F and G - H) and the horizontal lines at the top and bottom of the screen (I - J and K - L). It may be necessary to repeat the dynamic steps in order to achieve the best convergence.



(a)



(b)

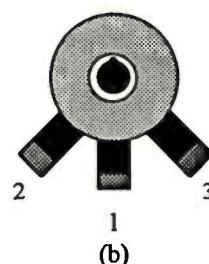


(c)

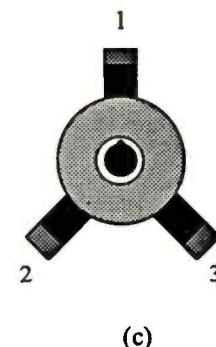
### A) Yoke Tilted Up



(a)



(b)



(c)

### B) Yoke Tilted Down

**Figure 4.** If the yoke is tilted up after the up-down adjustment, perform the procedure in the text using these drawings as a guide.

- L). It may be necessary to repeat the dynamic steps to get the best convergence.

Because the yoke is loose for both parts of the dynamic convergence, it is sometimes difficult to make the lateral adjustment without disturbing the up-down position following this procedure minimizes the aggravation.

If the yoke is tilted up after the up-down adjustment, perform this procedure:

1. Insert a rubber wedge at the top of the yoke assembly (Figure 4-A [a]). This is a temporary position which acts as a pivot point for making lateral adjustments while maintaining the proper vertical tilt.

2. Make the lateral adjustment and insert wedges 2 and 3 about 60 degrees to either side of wedge 1 (Figure 4-A [b]). Secure wedges in position 2 and 3 with a small amount of rubber cement or silicone adhesive.

3. Move wedge 1 to its final position at the bottom of the yoke (Figure 4-A [c]) and secure it with adhesive.

4. Tighten the yoke clamp.

If the yoke is tilted down after the up-

down alignment you have completed, follow the same procedure using the wedge positions shown in Figure 4-B.

#### Color temperature

The color temperature adjustment accomplishes two tasks. It sets the screen grid voltage of the CRT and it balances the outputs of the red, green and blue guns. The balancing is done at both a low brightness level and a high brightness level so both black and white and color scenes are reproduced accurately. These steps may be referred to as black balance and white balance.

The setup begins with setting certain controls at specified levels. Typically, the red, green and blue cutoffs (low light controls) and screen control are set to minimum. The red and blue drive controls are set to mechanical midrange, the automatic color control is turned off and the color control set to minimum.

The low level balance is made with the vertical sweep disabled. Some televisions have a "setup" switch for this purpose.

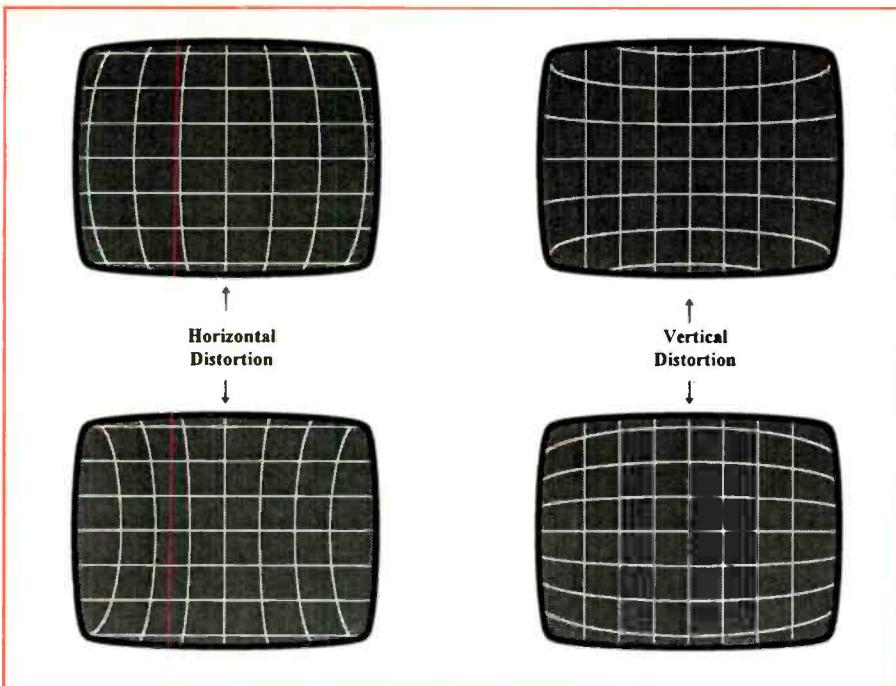
Others may require the vertical yoke winding to be disconnected or a jumper placed which will disable the sweep circuit. With the vertical sweep turned off, the screen control is increased just to the point where a faint horizontal scan line is visible across the center of the screen. Take note of the color of the line.

Adjust the low-light controls for the two colors that are not visible to produce a white line. For example, if the line visible from the screen adjustment is green, advance the red and blue low-light controls while the green is left at its minimum setting. After completing the low-level balance, restore the vertical sweep.

With the screen at normal brightness, adjust the red and blue drive controls to achieve a pure white raster. Vary the brightness control from maximum to minimum to ensure that the display is balanced throughout the brightness range.

#### Horizontal centering

As the name implies, this procedure centers the picture laterally. The adjust-



**Figure 5.** Pincushion distortion arises when the top and bottom or sides of the picture are bowed, as revealed here by a crosshatch generator. Smaller TVs may not have adjustments for pincushion correction, but many larger screens and projection types will include them. Adjust the vertical or horizontal pincushion controls until the grid lines are straight.

ment may be made with a potentiometer control, a jumper that can be attached to one of three terminals, or a multiple position switch. Some sets may not have a means for horizontal centering.

It is easiest to center the display with a crosshatch generator. If a generator is not available, move the control both ways with a picture on screen. Note the positions of the control when the horizontal blanking interval is visible at the edges of the screen. Set the control midway between these two points.

#### Horizontal size

The NTSC system uses "overscan" in the picture display. This means that a small portion of the actual picture is off the screen, both horizontally and vertically. Overscan prevents the blanking interval from being visible to the viewer. Adjust the horizontal size so the picture is just off the edges of the screen. Setting the control too high may cause some picture elements, such as text to be cut off.

#### Vertical size

Vertical size is set in much the same way as horizontal size. The picture should overscan slightly so the vertical blanking

interval is not visible. In newer sets, one vertical size control adjusts both the top and bottom of the picture. In older sets, you may encounter two controls labeled "vertical height" and "vertical linearity."

Oddly enough, vertical height adjusts the bottom edge of the picture while linearity control varies the top. These controls interact somewhat and it may be necessary to work back and forth between them to get the proper proportions. This adjustment is best made with a crosshatch generator. Adjust the controls set for even spacing between the horizontal lines. If the generator has a circle function, the circle is useful for setting both vertical and horizontal size controls. Adjust the controls for a perfectly round circle.

#### Vertical centering

After setting the vertical size, center the picture between the top and bottom of the screen. The centering control may be a potentiometer, switch or jumper and terminal arrangement.

#### Pincushion adjustment

Pincushion distortion arises when the top and bottom or sides of the picture are bowed. Figure 5 illustrates pincushion



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distortion as revealed by the picture created by a crosshatch generator.

Smaller TVs may not have adjustments for pincushion correction, but many larger screens and projection types will include them. Adjust the vertical or horizontal pincushion controls until the grid lines are straight.

### Sub-bright control

The "sub" controls work together with the user controls on the front of the set. The corresponding sub control is essentially a coarse adjustment and the user control is a fine adjustment.

The sub-bright control may be set visually or by specific voltages at test points on the chassis, depending on the manufacturer. The visual setup is made by turning the user brightness and contrast controls to their minimum setting and turning off the "auto" picture circuits. The sub-bright control is then adjusted so bright white areas of the picture are just visible.

Care should be taken with this adjustment, as setting the sub-bright too high can result in excessive beam current and reduced life of the CRT.

### Sub-contrast control

The sub-contrast is set with the user brightness and contrast controls set at normal viewing levels. The sub-contrast control is then set for a picture with good contrast. It should not be set so high that turning the user contrast control up will cause video overloading or pulling.

### Sub-tint control

Set the sub-tint control with the color control at a normal operating level, the user tint control centered and "auto" circuits off. Adjust the sub-tint for normal hue. This is most easily set with human subjects on screen, because hue errors are readily apparent in skin tones. Check the user tint control to assure an adequate range of red to green tint is available.

### It can make the set look like new

Performing a complete CRT setup is a complex and demanding task. Understanding the purpose of individual adjustments and controls makes the job easier, quicker and more profitable. And a quick touch-up of color temperature, brightness and contrast on a tired older set may have your customers believing you are a wizard. ■

# Test Your Electronics Knowledge

## Subjects at random

By J.A. Sam Wilson

1. A certain company uses 6-32 screws for assembling its product. What do the numbers mean?
2. You do not have an American Wire Gauge available, but, you know for sure that the circular mil area of #20 wire is 1022 circular mils. From that information, determine the approximate circular mil of #26 wire.
3. A certain VOM uses the so-called D'Arsonval meter movement. The deflection of the pointer is proportional to the
  - A. average value of an input sinewave current.
  - B. RMS value of an input sinewave current.
4. What is the propagation effect called when phase differences between radio wave components of the same transmission are experienced at the receiving station?
5. What do the letters in the acronym "KISS" stand for?
6. A microprocessor that is put together with individual integrated circuits is called a \_\_\_\_\_.
7. A circle with a diameter of one inch has an area of  $\pi/4$  square inches. A circle with a diameter of 2 inches has an area of \_\_\_\_\_ square inches.
8. The current through a given resistor is written as:  $I = 4A$ . What does the letter 'I' stand for? (YES, I know it is the current, but, what does the letter 'I' stand for?)
9. The solder usually used for soldering in general circuits is called 60/40. That means it is
  - A. 60% lead and 40% tin.
  - B. 60% tin and 40% lead.
10. A solder called 63/37 is used for soldering \_\_\_\_\_ components.

Wilson is the electronics theory consultant for ES&T.

(Answers on page 64)

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# What Do You Know About Electronics?

## Random thoughts

By J. A. Sam Wilson

We had announced that I was going to discuss the graphical solution of Integral Calculus in this issue. For compelling reasons those plans have been changed. I'll start this WDYKAE? with a few random thoughts instead.

### More about lightning

In a letter from Peter M. Wisniewski of Cambridge, MA he writes:

"Hello Sam, A car with wet tires can get struck by lightning (Dec 1995 ES&T). A car with dry tires can get struck by lightning. A car with dry tires which are 100 feet tall can get struck by lightning. A car suspended 1000 ft. in the air can get struck by lightning (as do airplanes). A person sitting inside that car will probably survive the hit unless maybe the car is a Corvette or a convertible with the top down (or up). That person is lucky that there is a phenomenon known as a Faraday cage. I'm sure you know all of that so what is the deal with the wet tires?"

Sam Says—The popular misconception is that you are safe in a car in a storm. If you are sitting in a storm your tires are likely to be wet. Your statistical chance of the car being hit by lightning are higher than if you are sitting in a car with dry tires on sandy soil and there is no storm. You may or may not be safe depending upon a number of factors but that was not the issue under discussion.

You went from cars on the ground to 100-ft tall tires to cars suspended 1000 ft in the air to airplanes to Corvettes to convertibles to Faraday cages. The thrust of the article was that the misconception that you are safe in a thunderstorm by staying in your car is not true.

Incidentally, the fact that the Graf Zeppelin and Hindenburg were filled with hydrogen and they were struck by lightning many times with no damage when crossing the ocean, is more interesting (to

me) than a car with 100-ft. tires (well, maybe at least as interesting). The passengers in the air ships were not aware of the lightning strikes.

Many thanks for taking the time to write. I wish I could do a complete article on lightning. I have a file cabinet full of good stuff. I'll try to slip in a few strikes every so often.

### Book corrections

Don Brown of Moberly, MO wrote asking for copies of the corrections of errors for the two Communications Books by Wilson and Risse. (Plug: The two books are titled "Communications Licensing and Certification Examinations - The Complete Tab Reference", and, "Practice Tests for Communications Licensing and Certification Examinations - The Complete Tab Reference".) You can buy them from TAB or from your high-class bookstore.

I don't think you will be able to get them in the library. The titles (we didn't write the titles) will not fit on library reference cards.

If you want a copy of the corrections—do like Don Brown did—write to me. Of course, the corrections won't make any sense if you don't have the books.

### Learning from the past

Recently I was watching a show on Public TV. It was a tour through Williamsburg, VA. The narrator said that you can learn a lot about what is happening today by studying how things were done in the past. I really believe that. It is sometimes true in your study of electronics.

I have a Physics book that dates back to the late 1800s and experimenter magazines that date back to the 1920s. I have built some of the experimental equipment and found it interesting. I am not sure I learned very much, but it is a lot of fun.

One experiment you should never try is the one Ben Franklin did with a kite in a thunderstorm. People have been killed

trying that one. It is still a mystery how he survived. As time goes along I'll share some of those experiments with you.

### More about the Fahrenheit scale

I received a letter from David K. Peck of Austin, Texas. In it he clears up the question I asked about how the Fahrenheit temperature scale was invented. Here is the complete letter:

"This is written with reference to your article What Do You Know About Electronics? which appeared in the July 95 issue of ES&T magazine on page 60, under the heading "Conversion Factors for Temperature" you wondered where Gabriel Fahrenheit obtained the temperature of 32 degrees for the temperature at which water freezes. When I took Physics in college the instructor actually explained that little puzzle. I must admit that I have not been able to find the reference that the professor, Dean Becker at Austin Community College, used, but the explanation seemed quite satisfying to me.

It seems that Mr. Fahrenheit didn't start at 32 degrees at all. To start with, Isaac Newton had arbitrarily called body temperature 12 degrees and the temperature at which water freezes zero degrees.

Gabriel Fahrenheit started by generating the coldest temperature that he could get—by mixing ice and salt—to obtain the temperature at which salt water freezes. This was measured using a rigid container with mercury in it. He calibrated this "coldest" temperature obtainable as zero degrees. Then he measured his body temperature from his armpit. To obtain a reasonable temperature range on his thermometer he arbitrarily multiplied Newton's number (12 degrees for body temperature) by 8 and thus calibrated the second point on his thermometer at 96 degrees. All other temperatures were allowed to fall as they would. Thus, on his thermometer distilled water would freeze at 32 degrees and it would boil at 212 degrees.

If you are interested in searching for Dean's reference he said that it was 'Engines, Energy and Entropy: A Thermodynamics Primer' by John B. Senn, Copyright 1882, Published by W. H. Freeman. ISBN 0-7167-1282-2. Sincerely Yours, David K. Peck".

Let me put in my two cents worth here. Fahrenheit achieved fame in two ways;

- He made a temperature scale that has been widely used, and,
- He had a world-standard armpit.

He got more than the 15-minutes of fame that everyone is said to be entitled to have. Although his scale is widely accepted there are two possible flaws in his method.

The temperature at which water boils depends upon the altitude. If he had a fever his armpit temperature would be affected. This does not in any way detract from his very clever procedure. Many thanks to David K. Peck of Austin, TX.

#### **The meter**

The procedure described by reader Peck reminds me of another universally-accepted unit of measurement—the me-

ter. It was supposed to be *one ten-millionth* of the distance between the north pole and the equator on a meridian that passes through Paris. The calculation was based upon the idea that the world is a sphere. As you know, the world is not a sphere, it is shaped like an apple. Notwithstanding that fact, the standard meter in Paris is based on a round world.

#### **A Wilson standard**

A fellow student in my college physics class was greatly displeased that I got 100% on every quiz. That set a standard on the class curve that he couldn't match. One day in the cafeteria—where most of my useful education was really obtained—he decided to discredit me. "If you are so smart Wilson, can you tell me exactly how far you can throw a stone?"

My answer: "Units of distance measurement are based upon arbitrary standards. I accept a unit of length equal to one Wilson-stone which is exactly how far I can throw a two-pound stone." I also pointed out that he was trying to get into a battle of wits and he was completely unarmed. (I never claimed to be nice.)

#### **Easy Conversions**

Suppose someone jumps out of a fast taxi and asks you to convert so many fathoms into feet. Being a reader of WDYKAE? you know that you simply multiply the number of fathoms by 6.0. (Converting fathoms to meters is not as simple. You must multiply the number of fathoms by the factor 1.828804.)

Hardly a day goes by without someone asking you to convert knots to nautical miles per hour. Simply multiply the number of knots by 1.0.

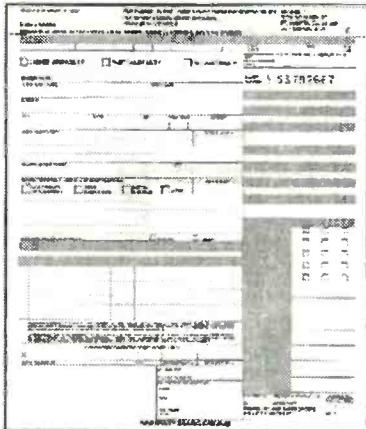
Speaking of misconceptions....It is generally thought that you cannot cure a common cold. Not true. All you have to do is use the Sam Wilson cold cure: At a temperature below freezing you stand in your bare feet and underwear on the grass in your back yard until you get a chill. It helps if you wrap a wet towel around your neck. That procedure turns the cold into pneumonia. They can cure that.

To close it off, some people think that the first V8 engine was in a Ford. Actually, there was a V8 engine in Chevrolets before the Ford version. (There were other cars with V8 engines too.) ■

## **Improve Your Form.**

### **3/5 Part**

A continuous feed form used for customer COD service, parts/accessory sales receipts, and warranty billing. Includes technician hard copy and set tag. Available in 3-part (N3CS) and 5-part (N5CS) format.



### **5 Part**

A continuous feed 5-part (N5CN) form for warranty billing that does not include a set tag.

**Discounts** Carbonless NESDA Forms are available to NESDA members at additional savings. For pricing information and samples, contact Moore Business Products at the number below.

### **The NESDA Form**

Moore Business Products  
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Circle (59) on Reply Card

# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

Distributors can tend to look alike when you're looking at their catalogs, or their ads. It doesn't matter whether a distributor is a one-person organization operating on a shoestring budget out of a garage or a well established organization employing dozens of highly trained people in a sophisticated modern facility, the ink on paper can make them both look pretty similar.

But there usually is a big difference in how they're able to deal with your needs. The established distributor will probably be able to handle most or all of your orders for components, tools, test equipment and the like and get them on their way to you the same day the order is received, or the next day. The less sophisticated distributor may take longer, or may not be able to fulfill all of your requirements.

Buying from a distributor is much like dealing with any other kind of business. Whether you buy most of your products from a local distributor or do most of your business via mail order, or use some combination of the two, it's a good idea to use care in choosing the distributor(s) with whom you do business.

Just as with any other kind of selling organization, you'll find many similarities and many differences among distributors. Most distributors are well organized and well stocked, can help you with special requirements, and have a research department to help you find the part you need; some are not. Some mail-order distributors can accept your orders in a variety of ways including mail, telephone (some with 800 numbers), fax, etc.; some can not. Some distributors charge a reasonable fee for shipping and handling; some will charge you what you will conclude is an exorbitant amount. Some distributors will send your order right away even before your check clears, some will wait until your check clears, and some will keep your money well beyond the point when they should have shipped your order.

## Some variables to consider

Here are some of the factors you should consider when settling on a distributor. 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. Put them in order of importance for yourself.

- 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 number?
- Are such ordering options as fax, and telex available? How about such computer ordering options as MCI Mail, CompuServe, and EasyLink?
- What is the distributor's 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, etc.?
- 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?

## These questions can be important

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 on the products he sells.

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 a nice little 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.

## Check this showcase

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

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. If the service is good, you might gradually increase the size of your order and gradually build up a close working relationship.

If the service you receive is not what you'd like, try someone else. It's your business that will suffer if you don't get what you order when you need it, or if you're hit with exorbitant freight charges that you have to pass along to your customer. ■

# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## MCM Electronics

650 Congress Park Drive  
Centerville, OH 45459  
Phone: 800-543-4330  
Fax: 513-434-6959

MCM is dedicated to serving the Consumer Electronics Repair Industry. Thousands of original OEM and generic replacement parts are in stock and available for immediate delivery. In addition, MCM offers a wide variety of tools, test equipment and service aids from the best known names in the industry. Names like Tenma, Fluke, Hitachi, B&K, Chemtronics, Caig, Rite-Off, Cooper Tools and more. New lines include International Data Sciences, Superprobe, Uniden, Whistler and Pro-Fit International. In addition, MCM is a Premier RCA/GE Distributor and an authorized Panasonic/Quasar/Technics Parts Distributor.

### Discover The MCM Electronics Difference

MCM publishes two full-sized catalogs annually. It is packed with over 21,000 of the most commonly used repair parts, components, semiconductors and tools in the electronics industry. The latest issue boasts over 3000 additions. Sales flyers are mailed regularly featuring specially priced items and new product additions keeping the customers up-to-date on the latest available products.

### Superior Customer Service

The MCM staff is trained to answer all calls fast, friendly and efficiently. All sales representatives are professionals who are available on toll-free lines to provide immediate information on stock availability and pricing. They are available Monday through Friday 7:00 A.M. to 9:00 P.M. EST, and Saturday 9:00 A.M. to 6:00 P.M. EST. Faxed orders are also accepted 24 hours a day, seven days a week. MCM also provides highly trained electronics technicians to answer customers' product questions. With a separate toll-free "Tech Line," customers receive prompt answers to their questions by calling 1-800-824-TECH (8324).

### Fast Delivery From Two Distribution Facilities

MCM is committed to providing superior customer service. Distribution centers

are strategically located near Reno, NV and Dayton, OH. This enables fast delivery at ground rates throughout the U.S. In addition, with our 21,000 items stocked,

99% of all orders are shipped within 24 hours. For more information and a free catalog, call 1-800-543-4330, in Dayton, OH, call 513-434-0031.

# Promises, Promises

MCM Electronics® Delivers

In today's competitive service market, you need suppliers you can rely on. Claims of discount prices or wide selection are of little help when items are not in stock or have long lead times.

Look to MCM to have what you need, when you need it, at the right price. Our deep inventory, broad selection of over 21,000 items and competitive prices have made us a leading supplier to the service industry for 20 years. When you need to rely on your parts supplier, look to MCM Electronics. Call today for your free catalog.

### Save on select Original Sony Optical Pick-Ups

Popular pick-ups are used in many CD players from JVC, Denon, Kenwood and more. Prices are good only to ES&T readers. To receive your discount you must supply this code: **ES87**

SAVE UP TO  
**36%**



Sony#	KSS#	MCM Order#	Reg.	Sale
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8-848-137-11	KSS-210B	35-435	65.75	52.60
8-848-144-11	KSS-240A	35-440	96.50	66.00
8-848-224-11	KSS-320BBP	32-5975	83.95	75.00
8-848-246-11/22	KSS-360A	32-5985	60.50	48.40
8-848-283-11	KSS-313A	32-5990	109.00	65.00
8-848-289-21/31	KSS-331ARP	32-6000	63.95	51.15
F-8481-371-01	KSS-201B	35-435	65.75	52.60

Prices effective until May 15, 1996

To order or get your free catalog, call...

**1-800-543-4330**



Authorized  
**Panasonic**  
**Quasar/Technics**  
Original Parts Distributor

MCM is a  
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Get fast delivery from our distribution facilities near Dayton, OH and Reno, NV!

**CODE: ES87**

Circle (63) on Reply Card

## Matsushita Services Company

20421 84th Avenue South  
Kent, Washington 98021  
Phone: 800-833-9626  
Fax: 800-237-9080

For 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 MSC'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 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 1,400 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 500 faxes daily. In addition to all of 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.

One of our recent changes was the consolidations of our Kent, WA and Suwanee,

GA order offices. The single order office allows us to process customer orders more quickly and efficiently. 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 will 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 keep in touch with the ever changing needs of all, and make the necessary recommendations to our market developmental 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 80 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 125,000 line items and 3½ million pieces.

The warehouse day begins at 6:00 A.M. There are nearly 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 3,000 parts and literature orders, which consist of over 10,000 line items,

and over 40,000 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.

In August of this year, we will have completed our investment in the modernization of our warehouse operations. This will include 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 will enable 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 MSC, 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 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. ■

# Matsushita Original Replacement Parts and Accessories

A Guarantee of Quality

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 The Matsushita Services Company and your Authorized Replacement Parts Distributor. Consult the list below, or call **1-800-545-2672** for the location nearest you.

## CALIFORNIA

Andrews Electronics (C/V/M/A) \* 25158 Avenue Stanford, Valencia 91355 \* 800-289-0300  
\* FAX 800-289-0301

Cass Electronics (C/V/M/A) \* 801 Seventh Ave., Oakland 94606 \* 510-839-2277 \* FAX 510-465-5927  
E and K Parts (C/V/M/A) \* 2115 Westwood Blvd., Los Angeles 90025 \* 310-475-6848 \* FAX 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/Tacony (V) \* 1800 E. Walnut St., Fullerton 92631 \* 714-680-6800 \* FAX 714-680-8700

## COLORADO

Denver Walker Wintronics (C/M) \* 1001 W. Arizona Ave., Denver 80223 \* 303-744-9505  
\* FAX 303-777-9357

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 \* 203-233-8551  
\* FAX 203-233-8554

## FLORIDA

Herman Electronics (C/V/M/A) \* 7350 N.W. 35th Terrace, Miami 33122 \* 800-938-4376 \* 305-477-0063  
\* FAX 800-938-4377 \* 305-477-8087

Layco, Inc. (C/V/M/A) \* 501 South Main St., Crestview 32536 \* 904-682-0321 \* FAX 904-682-8820

Vance Baldwin (C/A/M) \* 2701 West McNab Road, Pompano Beach, 33069 \* 800-432-8542 or  
305-969-1811 \* FAX 800-552-1431 or 305-969-0226

Vance Baldwin (C/M/A) \* 1801 NE 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 \* 404-351-7300 \* FAX 404-351-7307  
Wholesale Industrial (C/M/A) \* 5925 Peachtree Corners East, Norcross 30071 \* 404-447-8436  
\* FAX 404-447-1078

## 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 North Milwaukee Ave., Niles 60714 \* 708-647-6700 \* FAX 708-647-0534

Joseph Electronics (C/M/A) \* 8830 N. Milwaukee Ave., Niles 60648 \* 708-297-4208 \* FAX 708-297-6923

Union Electronic Dist. (C/V/M/A) \* 311 E. Corning Road, 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

## KANSAS

G & A Distributors, Inc. (C/V/M/A) \* 635 N. Hydraulic St., Wichita 67214 \* 316-262-3707

\* FAX 316-262-6494

Manhattan Electronics, Inc. (C/V/M) \* 9086 Bond St., Overland Park 66214 \* 800-821-3114 or 913-888-1115  
\* FAX 800-255-6239

## MARYLAND

Fairway Electronics (C/V/M/A) \* 4210 Howard Ave., Kensington 20895 \* 301-564-1440 \* FAX 800-955-1358

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

## MASSACHUSETTS

Signal Electronics Supply, Inc. (C) \* 484 Worthington St., Springfield 01105 \* 413-739-3893  
\* FAX 203-233-8554

Tee Vec Supply Co. (C/V/M/A) \* 407 R Mystic Avenue, P.O. Box 649, Medford 02155 \* 617-395-9440  
\* FAX 617-391-8020

## MICHIGAN

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 Nine Mile Rd., Oak Park 48237 \* 810-541-5666 \* FAX 810-398-1016

## MINNESOTA

Ness Electronics, Inc. (C/V/M/A) \* 441 Stinson Blvd. NE, Minneapolis 55413 \* 612-623-9505  
\* FAX 612-623-9540

Mid America Vacuum Cleaner Supply Co. (V) \* 666 University Ave., St. Paul 55104 \* 612-222-0763  
\* FAX 612-224-2674

## MISSOURI

Cititronix, Inc. (C/V/M/A) \* 1641 Dielman Rd., St. Louis 63132 \* 314-427-3420 or 800-846-2484  
\* 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) \* 205 Vista Blvd., Suite 103, Sparks 89434 \* 702-355-1000  
\* FAX 702-355-1092

## NEW JERSEY

Panson Electronics (C/V/M/A) \* I-80 and New Maple Ave., Pine Brook 07058 \* 800-255-5229  
\* FAX 800-332-3922

## NEW YORK

Date 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 \* 516-694-1354 or  
800-321-6993 \* FAX 516-694-0595

Radio Equipment Corp. (C/A) \* 196 Vuican St., Buffalo 14207 \* 716-874-2690 \* FAX 716-874-2698

Star For Parts (V) \* 250 Rabro Drive East, Hauppauge 11788-0255 \* 800-525-6046 \* FAX 516-348-7160

## OHIO

Fox International, Inc. (C/V/M/A) \* 2360 Aurora Rd., Bedford Heights 44146 \* 216-439-8500  
\* FAX 800-445-7991

MCM Electronics (C/V/M/A) \* 650 Congress Park Drive, Centerville 45459-4072 \* 513-434-0031 or  
800-543-4330 \* FAX 513-434-6959

Nirav Corporation (A) \* 2723 Wolf Rd., Bay Village 44140 \* 800-982-8273 or 216-835-8130  
\* FAX 216-835-3122

## 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 NE Davis St., Portland 97232 \* 800-234-8227 or 503-232-7114  
\* FAX 503-232-7115

The Moore Co. (C/V/M) \* 333 SE 2nd, Portland 97214 \* 800-487-0500 or 503-731-0100  
\* FAX 503-731-0105

## PENNSYLVANIA

CRS Electronics (C/M) \* 818 Brownsville Rd., Pittsburgh 15210 \* 412-431-7700 \* FAX 412-431-5666

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

## SOUTH CAROLINA

Wholesale Industrial (C/V/M) \* 515 E. Bay St., Charleston 29403 \* 803-722-2634 \* FAX 803-723-8182

## TENNESSEE

Shields Electronics Supply, Inc. (C/V/M/A) \* 4722 Middlebrook Pike, Knoxville 37921 \* 615-588-2421  
\* FAX 615-588-3431

## TEXAS

Fox International (C/V/M) \* 752 So. Sherman, Richardson 75081 \* 800-321-6993 \* FAX 800-445-7991

Interstate Electric Co. (C/V/M/A) \* 11292 Leo Lane, Dallas 75229 \* 214-247-1567 or 800-527-4029  
\* FAX 214-247-2137

M-Tronics (C/V/M/A) \* 3201 West Ave., San Antonio 78213 \* 210-340-4069 \* FAX 210-340-4569

VCP International, Inc. (V) \* 2285 Merritt Dr., Garland 75040 \* 214-271-7474 \* FAX 214-278-5981

## VIRGINIA

Avec Electronics Corp. (C/M) \* 711 Granby St., Norfolk 23510 \* 804-627-3502

\* FAX 414-627-1710

Avec Electronics Corp. (C/M) \* 2002 Staples Mill Rd., Richmond 23230 \* 804-359-6071  
\* FAX 804-359-5609

Avec Electronics Corp. (C/M) \* 2009 Williamson Rd., Roanoke 24012 \* 703-344-6288  
\* FAX 703-344-0081

## WISCONSIN

G. M. Popkey Company (C/V/M/A) \* 2035 Larsen Ave., Green Bay 54307-2237 \* 414-497-0400  
\* FAX 414-497-4894

G. M. Popkey Company (C/V/M/A) \* 2355 S. Calhoun Rd., New Berlin 53151 \* 414-786-5887  
\* FAX 414-786-9031

(C) Consumer Electronic Parts. (V) Vacuum Cleaner Parts Distributor. (M) Major Appliance Parts. (A) Accessories (as of 11-95)

**Matsushita Services Company**  
50 Meadowlands Parkway, Secaucus, NJ 07094

**Panasonic**

**Technics**

**Quasar**

# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## Herman Electronics

7350 N.W. 35th Terrace  
Miami, FL 33122

Phone: 800-938-4376 Fax: 800-938-4377

Herman Electronics is a diverse, full-line distributor of everything in electronics, committed to offering only the best in original replacement parts, tools, test equipment, 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.

1995 was a very special year for Herman Electronics. After 35 years, they have just completed relocating to their new state of the art distribution facility in order to prepare to meet the demands of the 21st century. Herman Electronics is also proud to announce that they have just published the **FIRST edition of the Herman Catalog**. This 350 page buyers guide has everything to fill your every need. Call for your free copy today.

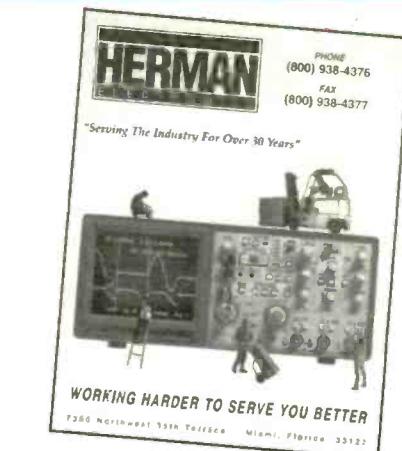
Herman Electronics' product base varies from original replacement parts and accessories to test equipment and everything in between including tools, soldering & desoldering equipment, chemicals, cable, connectors, microphones, line conditioners and virtually everything to fulfill a servicer/technician's needs.

The heartbeat of the company lies in the OEM parts department. While servicing the industry for over three decades, Herman Electronics has many

of the major OEM parts lines, enabling them to provide more efficient and cost effective service to you, their valued customers. Herman is one of the largest original replacement parts and accessory distributors in the country and is factory authorized for SONY, PANASONIC, RCA (premier), SAMSUNG, QUASAR, KENWOOD, GE, TECHNICS, ONKYO, and TOSHIBA. Stocking one of the largest and most comprehensive inventories enables the company to fill over 80% of their orders from their 40,000 stocking items and guarantees TWO-DAY service (at no additional charge) to you on all in stock orders placed before 2:30 P.M. (EST).

Herman Electronics is able to provide a variety of customer support services as a result of the company's commitment to customer service excellence. They have several customer service representatives to serve all of your needs from 8:30 A.M. to 5:30 P.M. Monday thru Friday.

The company prides itself on being accommodating to its customers in order to deliver total customer satisfaction. "We realize there are many good distributors throughout the country" says Jeffrey A. Wolf, Vice-President and son of one of the company's founders. "It is our job to be better by taking that extra step in giving our customers professional personalized service. This industry has quickly become service driven. Therefore, we



are dedicated to maintaining a standard of excellence in customer service."

Herman Electronics makes ordering easy and provides several benefits to insure customer satisfaction. All out-of-state orders are shipped **UPS 2nd Day Air** at no **additional charge**. Several methods of payment are available including a net 30 day open account, COD, Mastercard/Visa or American Express. To accommodate the west coast and after hours requests and orders, Herman Electronics has an electronic telephone and fax ordering system to insure service 24 hours a day, seven days a week.

If you haven't given Herman Electronics a try, please do so now - you'll be glad you did! Herman Electronics the **ONE source for ALL your service needs**.

# IF YOU NEED IT... WE HAVE IT!

# HERMAN

ELECTRONICS

Phone: 800•938•4376

### THE HERMAN ADVANTAGE

- All In-Stock Orders Placed Before 2:00 PM EST Are Shipped the Same Day.
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- RAPID RESPONSE to All Research Requests.
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- NO MINIMUM ORDER.

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CALL NOW FOR YOUR FREE COPY OF THE NEW HERMAN CATALOG!

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# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## PTS Corporation

5233 Highway 37 South • PO Box 272  
Bloomington, IN 47402-0272  
Phone: 800-844-7871  
Fax: 800-844-3291

For over thirty years PTS has been providing television replacement tuners and mainboards to the electronic service industry. PTS is the nation's largest single source for all major brands of replacement Television Tuners, Mainboards, Projection Set Modules and Complete Chassis. Brands such as RCA, Zenith, Philips and GE are available at substantial savings when compared to manufacturers pricing. PTS employs over 275 technical and support staff with a 85,000 square foot facility and branch locations in California, Texas and Colorado.

### Thousands in stock

PTS maintains an extensive inven-

tory on most major brands of Television 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.

In recent years, PTS has expanded its available service to include Computer Products such as Monitors, Printers and Motherboards.

### 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 backordered 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. ■

# PTS Electronics

Supplying the World of Electronics

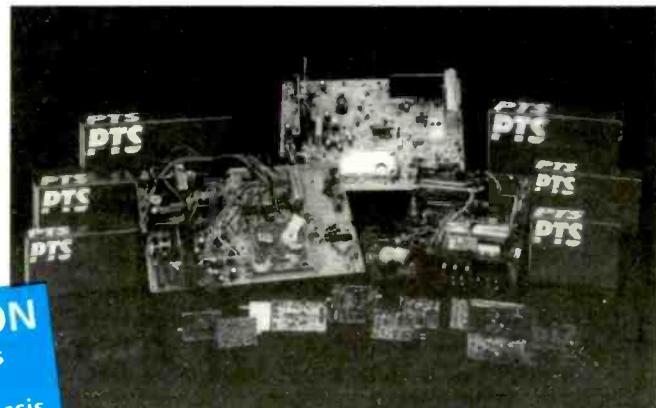
## PTS Service

PTS knows what it takes to make it in today's rapidly changing electronics industry. Over the years PTS has gained the confidence of service professionals and manufacturers by providing a level of service unsurpassed in the industry. PTS provides quality replacement TV Tuners, Chassis, Mainboards, and Modules for most major manufacturers.

Brands such as Zenith, RCA and Philips are in stock for immediate shipment.

**The Nation's Largest Inventory of TV Tuners and Mainboards**

**TELEVISION**  
Mainboards  
Tuners  
Complete Chassis



### CORPORATE HEADQUARTERS

**INDIANA**  
BLOOMINGTON  
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TOLL FREE  
800-844-3291  
FAX

**COLORADO**  
ARVADA  
800-331-3219  
TOLL FREE  
303-422-5268  
FAX

**TEXAS**  
LONGVIEW  
800-264-5082  
TOLL FREE  
903-234-0441  
FAX

**CALIFORNIA**  
TUSTIN  
800-380-2521  
TOLL FREE  
714-258-0315  
FAX

## Philips ECG

P. O. Box 967  
Greeneville, TN 37744-0967

### Leading the Industry to Success

Philips ECG has stood the test of time building upon a tradition of providing the highest quality, most reliable, customer service in the industry. We took the lead in pioneering semiconductor replacement devices to better serve the needs of the local servicer. This long-term focus on quality and service first has made the ECG brand a standard by which others are compared.

### 30 Years of Universal Replacements

In 1966 the ECG Semiconductor Replacement Line was introduced, and a year later the company introduced its first replacement guide with 23 types cross referencing to 2,700 industrial part numbers. Thirty years and 17 editions later, the ECG Master Replacement Guide has grown to cross reference nearly 4,000 devices to over 294,000 industry part numbers. Throughout this time, ECG has consistently offered the broadest available line of universal replacement semiconductors to the commercial, industrial OEM/MRO, computer, entertainment, and communications industries. Philips ECG's concept of universal replacement has enabled us to establish a broad range of semiconductors that replaces more industrial part numbers than any other line.

### Philips ECG—Our Product Lines

#### Keep Growing

Today, Philips ECG offers a wide range of universal replacement semiconductors such as transistors, ICs, rectifiers, diodes and opto devices, just to name a few. The ECG brand has become the recognized industry leader and has earned a reputation of superb quality, service, and technical support. In addition to the semiconductor line, other Philips ECG product lines include test equipment, relays, I/O modules, cube timers, surge suppressors, A/V parts and accessories, FPRs, flybacks, chemicals, and other electronic products. These



lines are continuously monitored and updated to ensure that Philips ECG customers receive the latest in state-of-the-art technology.

### Save Money with Less Parts

Philips ECG is dedicated to helping our customers improve their bottom line. Our products save distributors and service technicians money by helping them enjoy the benefits of a broader parts coverage with less inventory and at a substantial savings. When our customers succeed, we succeed.

### Servicing the Servicer

How do we assure the customer is satisfied? By listening. As we listen and respond to the needs of distributors and servicers, our quality improves, and we are able to offer better products. One way we have responded to industry needs, is by consolidating our depart-

ments into one modern facility located in Greeneville, TN. This move improves our efficiency, and ultimately helps us offer high level customer service. The staff associates in production, warehouse, quality control, customer service, engineering, marketing, date processing, and administration are equipped and focused to provide ECG customers prompt efficient service.

### The First Name in Replacement

From its inception in 1966 to its leadership role in the semiconductor replacement industry, the ECG brand has continued to stand the test of time by providing the highest quality, reliability, and customer service.

Ask your ECG distributor today or call 1-800-526-9354 for the name of the distributor nearest you.

# RELIABILITY.

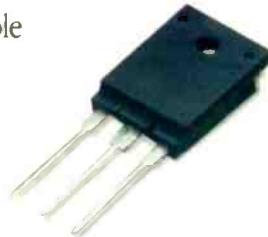


## ECG® Standing the test of time.

Thank you for trusting ECG all these years. Your success has always been our bottom line. We are built upon a tradition of providing you with the highest quality, reliability, and customer service plus the widest cross-reference selections in the industry.

Our extensive parts lines make hard-to-find replacements easy-to-find. Featuring over 4,000 devices which replace 294,000 part numbers, the ECG Semiconductors Master Replacement Guide is the time-tested industry standard.

However, semiconductors are not all we carry, we also offer antenna rotators, cable convertors, chemicals, circuit breakers, circuit designers, cube timers, flameproof resistors, flyback transformers, input/output modules, multimeters, proximity switches, rechargeable batteries, relay & relay accessories, surge suppressors, test equipment, TV accessories, VCR tools/parts, and wiring accessories.



**For your servicing needs, you can rely on ECG.**

Ask your ECG distributor today or call 1-800-526-9354 for the name of the distributor nearest you.

See us at the '96 EDS Show at Booth 6102-D

Philips ECG is ISO-9002 registered.

Circle (115) on Reply Card



# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## Dalbani Corporation

4225 N.W. 72nd Avenue

Phone: 1-800-325-2264

Fax: 305-594-6588

Dalbani Corporation is a national and international distributor of high quality electronics components and parts servicing the wholesale, retail and manufacturing industry.

Since finding the parts you need should not be a major task, Dalbani Corporation maintains a huge stock of the most popular parts as well as those parts that are hard to find. Our extensive inventory of over 22,000 different items reflects our commitment to our customers anticipating their needs and offering the lowest prices available for the best quality merchandise.

Dalbani Corporation keeps customers informed of the latest introductions of new items by publishing two full line catalogs per year including catalog supplements, seasonal brochures, and notifications of sales promotions and specials. The mul-

tilingual Sales Department coupled with the state-of-the-art computerized order processing, enables Dalbani Corporation to offer prompt and efficient service to benefit the customers: Monday through Friday 9:00 A.M. to 7:00 P.M. Eastern Time. A toll-free number (1-800-DALBANI/1-800-325-2264) for the U.S.A. is available, in addition to a 24-hour fax line (305-594-6588).

Dalbani Corporation offers many shipping options (UPS Red, Blue, Orange & Ground, Fed Ex, etc.). Orders received by 2:00 P.M. Eastern Time will be shipped the same day, and most other orders are shipped within 24-hours. CODs, company checks and cash, and most major credit cards (Visa, Mastercard, Amex, & Discover) are accepted. There is a \$20.00 minimum order.



Free Catalog (232 Pages)  
With your First Order.

Our Customer Service Department is available to help answer customer's product related questions during normal business hours.

Dalbani Corporation will meet your company's needs: wholesale, retail and manufacturing. ■

# DALBANI

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GOLDSTAR®

DIGITAL METER (3-1/2" DIGITS)

ORDER N° 50-795 "DMM 311"

- Detector is built in with buzzer sound(Amp mode) • 3-1/2 digits, LCD; max. reading of 1999
- Automatic Polarity indication appears on LCD
- DC Volt, 200mV-1000VDC • AC Volt, 200mV-750VAC • DC : 200µA - 20mA • AC Current: 200µA-200mA • Resist.: 200Ω-20MΩ; Continuity, transistor & diode check • Unit comes with a snap-on holster, safety-designed test lead set and 9VBattery • Dim : 7.75"(H) x 3.75"(W) x 2.25"(D)

PROBES  HOLSTER



\$34.95

ONE YEAR  
Made in Japan  
VCR HEADS  
Replacements

24-0150	GOLDSTAR	413050A	\$11.50
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24-0800	PANASONIC	VEHS-0115	10.95
24-0900	PANASONIC	VEHS-0385/0191	11.95
24-1200	PANASONIC	VEHS-0077	23.50
24-1375	PANASONIC	VEHS-0146	21.90
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24-2625	SHARP	DDRMU0004E10	26.00

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• (305) 716-1016 • Fax : (305) 594-6588

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Order N° 50-888

- 7 Assorted head & guide aligners
- VCR Head puller
- Retaining ring remover
- Spring hook
- Micro screwdriver
- Hex key set
- Fitted vinyl
- Soft zippered case
- 3 Reversible screwdrivers (Small-Flat-Philips) • Dimensions: 9 1/2"(W) X 12 1/4"(L)



\$24.95

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Low Frequency Power Transistors

(AF driver, VCBO : 180V, 1.5A, 100 hFE)

BD-135 (NPN-Si)	Repl. ECG : 373
BD-136 (PNP-Si)	Repl. ECG : 374

29¢

Minimum 10 pieces per item

(Voltage Regulators)  
Item No.

7805 (Pos VR, 5V, 1A)	960
7806 (Pos VR, 6V, 1A)	962
7809 (Pos VR, 9V, 1A)	1910
7812 (Pos VR, 12V, 1A)	966
7818 (Pos VR, 18V, 1A)	958
7824 (Pos VR, 24V, 1A)	972
7905 (Neg VR, 5V, 1A)	961
7906 (Neg VR, 6V, 1A)	963
7912 (Neg VR, 12V, 1A)	967
7915 (Neg VR, 15V, 1A)	969
7918 (Neg VR, 18V, 1A)	959
7924 (Neg VR, 24V, 1A)	971

Repl. ECG N°



SHIP UP TO 5 lb. FOR ONLY \$3.95 / 2nd DAY

Excluding Hawaii, Alaska, and Puerto Rico

\$20.00 MINIMUM ORDER

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We carry over 14,000 original IC and Transistor in stock



Up to 60% Off  
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63-0286	EMERSON	04-321-4003	12.50
63-0189	GOLDSTAR	154-074R	12.50
63-460	GOLDSTAR	154-122E	11.99
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63-0475	RCA (original)	1455864-501	19.95
63-0203	SAMSUNG	FCK-1415AL	11.50
63-810	SHARP	RTRNF-0003PEZZ	12.50
63-0126	SHARP	RTRNF-0011PED	12.50
63-840	SHARP	RTRNF-0015PEZZ	14.95
63-850	SHARP	RTRNF-0016PEZZ	14.95
63-0106	SHARP	RTRNF-1588CEZZ	19.95
63-0112	SONY	1-439-254-13	12.50
63-0170	SONY	1-439-254-00	12.50
63-0113	SONY	1-439-273-00	15.99

## HOT PRICES ON POPULAR SEMI'S

Order N°	Brand	Min.	Price	Order N°	Brand	Min.	Price
BU-208	TESLA	10	\$1.49	STRD-1005	SANKEN	--	4.15
BU-208/O	TOSHIBA	--	4.50	STR-30130	SANKEN	--	2.66
2N-3055	TESLA	10	0.60	STRS-6301	SANKEN	--	8.50
2N-3773	TESLA	5	1.20	TA-7777N	TOSHIBA	--	6.99
2SD-1398	SANYO	10	\$1.49	TDA-2005	SGS	5	1.49
2SD-1650	SANYO	5	1.69				

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# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## RNJ Electronics, Inc.

805 Albany, Ave., PO Box 528  
Lindenhurst, NY 11757  
Phone: 800-645-5833  
Fax: 800-RNJ-FAX1

RNJ Electronics, Inc. is now entering its 16th year as a full-line discount distributor, servicing the TV, VCR, computer, stereo, and microwave repair industries. In addition, RNJ Electronics is a leading supplier of background sound products including PA amplifiers, microphones, speakers, wire, etc. RNJ is also your source for all home theater products including Dolby Pro-logic receivers, in wall speakers, subwoofers, center channel speakers, as well as Decora volume controls. RNJ electronics can now fill your DSS satellite needs including both the basic and deluxe systems. The company has also become a leading distributor in an industry experiencing tremendous growth: the security industry, stocking products such as cameras, monitors, sequential switchers, quad splitters, multiplexers, lenses, modulators, etc.

The company publishes a semi-annual,

136-page catalog containing thousands of items all at discounted prices. Product categories in our catalog include test equipment by B&K Precision, EMCO, Global Specialties, Fluke, Wavetek, and AVCOM. In addition, the company also stocks a full line of audio video and antenna accessories, universal remotes, TV and VCR wall mounts, mobile carts, service chemicals, an extensive line of VCR parts, camcorder accessories, TV and monitor fly-backs, Japanese semi-conductors, microwave oven parts, educational kits, tools and soldering equipment and computer accessories. RNJ is also one of the largest stocking distributors of Panasonic cable converters.

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. All orders are processed in a timely manner with



shipping via UPS. The company has added additional phone lines as well as an 800 fax line.

The company offers volume discounts for large orders. It also ships all over the world. RNJ Electronics, Inc. can meet all of your needs. Call toll free and see. ■

## YOUR DISCOUNT SOURCE FOR:

DSS SATELLITE SYSTEMS  
TEST EQUIPMENT  
AUDIO/VIDEO ACCESSORIES  
VCR PARTS & ACCESSORIES  
CAMCORDER BATTERIES &  
ACCESSORIES  
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VIDEO HEADS  
TV & VCR MOUNTS  
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TV PARTS & ACCESSORIES

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SERVICE CHEMICALS  
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ELECTRONICS, INC.

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16th  
YEAR



805 ALBANY AVENUE • PO BOX 528  
LINDENHURST, NEW YORK 11757-0528

# Thomson Consumer Electronics, Inc.

1-800-336-1900

(Call for the distributor nearest you!)



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. We also realize that not every estimate 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 you need when completing 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 shows 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 has broadened its line of SK Series products to include Universal Replacement parts. 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 Parts cover a wide range of high wear, high usage parts.

Whether you need video heads, idlers, gears, pulleys, tires, belts, pinch rollers, laser pickups, RF modulators, exact semiconductors, tool kits or other servicer aids you can look to SK Series.

#### TCE Literature

Thomson also provides a number of publications which makes finding the right part for the repair even easier. In addition to TCE 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 CTC-168 through CTC187.

Another hard copy publication is the TCE "Source Book" which contains a wide variety of information. The extensive main section contains VCR/Camcorder Key Items, with a look-up by brand and model. Another section contains an OEM manufacturer number look-up for SK Universal Parts, belts and other wear items along with photos, as well as a complete Camcorder Battery cross reference. The "Source Book" also contains information on TCE Tools and Fixtures by model number, Flameproof Resistors, IC Protectors, and Axial Lead Zener Diodes.

These publications are available from your Authorized Thomson Parts Distributor. For the *Quick Reference Guide* order publication 1J9548, for the *VCR/Camcorder Source Book* order publication number 1J9780.

#### The Thomson "Tech Aid" Family

The first three members of Thomson's "Tech Aid" family have recently been introduced. This involvement of new technology in the Consumer Electronics service business represents a trend which will help improve Quality, Productivity, and Customer Satisfaction in our business as well as yours.

A PC software package called Chipper Check™ will be used to perform diagnostics and alignments on models containing chassis CTC178, 179, 188, and 189. With

a click of a mouse button the Servicenter's Personal Computer will "talk to" TCE models containing the CTC178, 179, 188, and 189 chassis via a communications interface. In addition to the service features, the Help Screens and point-and-click references serve as excellent training supplements, and provide troubleshooting assistance for your technicians.

Thomson also offers other software subscriptions in the "Tech Aid" software family. PartsFinder™ serves as a fast look-up tool for needed replacement parts and Service data information. Nipper Net™ is an on-line system that allows subscribers to download important, up-to-date information like Service Bulletins to their PC's rather than wait for periodic mailings of diskettes or printed materials.

These "Tech Aid" family members are all available from Thomson Consumer Electronics Publications. Call (502) 491-8110 for more information.

#### 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, Asheville NC, and Indianapolis IN.

A full line of RCA brand Consumer Electronics Accessories is marketed from this facility as well. The business is managed by Larry R. McKinney, General Manager. Thomson Consumer Electronics corporate headquarters is in Indianapolis.

#### One Call is All You Need to Make

Whether you need original RCA and GE parts or SK Series products, your Thomson distributor is your one stop source. A single call to a Thomson Distributor gives you the choice you deserve, making your business more profitable. To locate a nearby Thomson Authorized Distributor simply call (800) 336-1900 today. ■

# *Sometimes* There's No Substitute For The Genuine Article...

As a member of today's professional electronics repair industry, 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.

Thomson Consumer Electronics' Authorized Parts Distributors can provide you with the replacement part which meets original specifications for RCA, GE and ProScan brand products.

Not only is Thomson a leader in producing quality Home Consumer Electronic products, but our most recent survey of the service industry shows the majority of you believe that **no other manufacturer** provided a consistently better parts fulfillment system than Thomson. We thank you very much.

As a result, quality parts and quality service combine to protect your reputation with your customers. Is anything more important to you?

# *Sometimes* There is **SK** Series UNIVERSAL Parts

We also realize that not every estimate can be converted to a repair using original parts, especially VCRs. Our growing line of low cost, high quality SK Series universal parts can help you convert more of those jobs and increase your profits. Whether you need video heads, idlers, gears, pulleys, tires, belts, pinch rollers, laser pickups, tool kits or exact semiconductors, you can look to SK Series.

We have parts for Panasonic, JVC, Sony, Zenith, Magnavox and most other brands...and you can get all these parts with one call to your Authorized Thomson SK Series Parts Distributor. What could be easier or more convenient?

For more information on the SK Series line of universal parts contact your Thomson Parts Distributor.



**THOMSON CONSUMER ELECTRONICS**

2000 Clements Bridge Road Deptford, NJ 08096-2088

Circle (116) on Reply Card

**RCA**

**PROSCAN**



**Genuine  
Replacement  
Parts**

## Andrews Electronics

PO Box 914  
Santa Clarita, CA 91380-9014  
Phone: 800-289-0300  
Fax: 800-289-0301

Andrews Electronics is housed in 50,000 square feet of warehousing and office space. Miles of shelving are arranged for immediate identification and easy accessibility for over

250,000 different parts that we carry. Andrews is the largest supplier in America for the majority of the manufacturers we represent. Our average fill rate is over 90%, and our

dealer order desk has 30 available sales representatives available to take care of all your ordering needs.

We've built our reputation on a very simple philosophy.....service. Not very fancy, but very effective. Our constant growth attests to it. You see, all of our policies that have been developed over the years have been based on that one simple thought: "How may we better serve the industry?" How about:

- 16 major brands to save you time, frustration, and money with "one-stop shopping."
- Orders placed before 2:30 PST are routinely shipped the same day.
- A freight program that offers free or discounted shipping.
- No minimum orders or handling charges.
- Automatic backorder reports with ETA's mailed bi-weekly.
- A fast, highly-efficient research department, second to none.
- A program that converts make/model-descriptions to part numbers instantly for the majority of research requests.
- 24-hour toll-free phone and fax order lines.
- Over 80 full-time employees waiting to serve your needs.

Our newest feature is an online system that allows select customers to directly access our computer! This program offers the widest possible range of servicing including:

Placing orders that are automatically prioritized and will accept multiple purchase order numbers, research, etc., viewing previous orders, access to our model file, will enable customers to perform the majority of their research immediately.

You'll be able to view backorders with ETA's, part inquiry for pricing and availability on a system that also provides information on substitutes and allows partial part numbers to be entered.

This is just one more reason to make us your "one-stop shopping" distributor.

At Andrews we only bill you for the actual UPS charges, not a penny more! Or under our freight program, you'll pay less than that or nothing at all!

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## Philips Technical Training

401 East Old Andrew Johnson Hwy.  
Jefferson City, TN 37760  
Phone: 423-475-0044  
Fax: 423-475-0221

### Partnering With Servicers

What is the secret to long-term success? Customer Service. Effective customer service is the key to long-term, income-producing relationships with customers. Recognizing this critical element, Philips Technical Training partners with you, our servicer, to provide all Philips' customers the best service possible. When our customers are happy, we win, you win, and the customer wins. Therefore, Philips Technical Training is dedicated to helping you with the training and resources to improve your service and your bottom line.

### Listening To The Servicer

Our commitment to excellence is total customer satisfaction. How do we assure the customer is satisfied? By listening. Utilizing surveys, we ask the servicers to check the quality of our products and make suggestions for improvement. As we listen and respond, our quality improves, and we are able to offer a better product. This habit of listening has also earned us the respect of servicers throughout the industry—they have voted us the number one supplier of technical training materials since 1984.

### Computer Software

Servicers told us repeatedly that they could do their jobs better with computer software which provides instant access to parts replacement information. We listened. The Parts Pricing and Cross-Reference program is the result. It includes over 260,000 part numbers for generic and Philips parts, substitute numbers, dealer costs, dud prices, descriptions, and availability.

Then we created PartSeeker, which can access the service manual parts list for all Philips-brand Direct-View TV and PTV chassis since 1985. To use, you simply choose a specific model and then view the parts list along with warranty information, parts pricing, and substitutions (in conjunction with Parts Pricing and Cross-Reference). In addition, we developed SmarTips which provides random access to tips on Philips, Magnavox, Sylvania, and Philco products.

The most important software purchase you make this year could be our latest re-



lease, SmartMan. This Windows-based program allows storage and random access to more than standard service manual information. Instant location and display of schematics, circuits, parts, faults, and training information is at your fingertips! Data is accessible by model or chassis number. Enter the circuit, part, fault, or schematic you want to see, and it pops up on the screen. In addition, you can access Parts Pricing & Cross-Reference, Part-Seeker, and SmarTips without leaving the program. For example, if you are studying a chassis design in SmartMan, you can, at any time, select a part from that diagram and pull up information from one of the other programs.

### Videotapes

One of the fastest-growing training resources we have is videotape training. Videos simplify complex procedures through step-by-step instruction. Servicers improve their skills and abilities to repair more and more problems. In addition, videos allow the servicers to replay a segment or entire video as often as needed. Our video training tapes cover TVs, PTVs, VCRs, Camcorders, CDs, Power Supplies, Monitors, and other servicing topics. In addition, we offer TechNews, a

quarterly video presented in an upbeat video magazine format.

The popularity of our training videos has led us to release a Spanish-soundtrack training video on Power Supplies. We plan to continue releasing more Spanish-soundtrack training tapes in the coming years.

Due to servicer demand, our video production facilities keep growing. We've more than tripled our facilities to keep up with your requests.

### Service Aids

We provide a variety of resources to help make your job easier. Wall schematics, in-home service guides, and a PTV Convergence template kit are some of the many ways we are trying to make your job easier. In addition, we provide a Techline (1-900-896-8324) designed to help all of our non-authorized servicers solve any servicing difficulties.

### Free Catalog

At your request, Philips Technical Training will mail a comprehensive training catalog which explains all of our available products and training materials. You can get a catalog by calling the Technical Training department at 423-475-0044 or faxing us at 423-475-0221. ■

# ★★★ DISTRIBUTORS' SHOWCASE ★★★

## Howard W. Sams

2647 Waterfront Parkway East Drive  
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Phone: 1-800-482-7267  
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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 lineup 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 such retail outlets as Radio Shack. 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.

Created in 1991, 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 40 books in its first five years, with another 20 scheduled to go to press this year. Among the upcoming titles yet to be released are the *In-Home VCR Mechanical Repair and Cleaning Guide*, *Real World Interfacing with your PC*, *Alternative Energy*, and the *PHOTOFACt® TV Troubleshooting and Repair Guide*.

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 *Digital Electronics*, *Surface-Mount Technology for PC Boards*, and *Advanced Speaker Designs*.

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.

Last year marked another historic period for Howard Sams as it was acquired by Bell Atlantic Directory Graphics, a member of the Bell Atlantic family. Based in Valley Forge, PA., Directory Graphics provides complete graphics services, database design, typesetting, pagination and state-of-the-art electronic database publishing, multimedia, and CD-ROM applications for Bell Atlantic and other Yellow Pages

and catalog publishers. The acquisition was a result of a successful strategic teaming agreement that started in 1994, when Directory Graphics and Sams began working together to develop DATAVIEW®, an industry-leading on-line catalog delivery system.

The teaming agreement demonstrated the 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. While the acquisition has had the most profound effect on Sams' catalog division, it brings increased potential and expansion opportunities to all elements of the business. This includes preliminary plans to make PHOTOFACt® service documentation and PROMPT® books available on-line via the Internet.

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. To receive more information on any of Sams' products or services, please call 1-800-428-7267. ■

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PRB Line (PRB) wants you to celebrate our 40th Anniversary with us. Since 1956 PRB has been innovative, while always making our customers needs top priority. With the introduction of the "PRB System" PRB revolutionized the belt industry!

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tions to you, our valued customer.

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backs, you will be able to be priced competitively with other vendors.

The HR line of flybacks includes a cross reference and access to the internet for technical information and support of any questions you may have.

PRB Line is also introducing their new Chip Quik® SMD Bench Rework System to meet the ever changing demands of electronic technologies. The "system" is designed to assist the technician in removing and replacing SMDs. Present methods of removing SMDs are expensive, unreliable and can be damaging to the PC board.....But with the PRB Line SMD Bench Rework System your job has been made easier as well as less expensive. Included are instructions for the removal and replacement of the SMD in 9 easy steps.

PRB Line is very excited about these innovative new products. Keeping our customers first while providing high quality products and superior service is what we're all about.

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## MAT Electronics

**(East Coast)**  
**400 Pike Road**  
**Huntingdon, PA 19006-1118**  
**Phone: 800-628-1118**  
**Fax: 800-628-1005**

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

MAT Electronics has two locations to better serve our customers—our original location in Pennsylvania and our newest location 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 flybacks (TV and monitor), Japanese semi-conductors, capacitor and MATV accessories. Recently, MAT Electronics

**(West Coast)**  
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**Fax: 702-434-7509**

has started to distribute original parts from Hitachi, NEC, Panasonic and Sony at very competitive pricing. The company publishes an easy-to-read 92-page catalog filled with thousands of inventoried items, which can be accessed immediately on their state-of-the-art computer system.

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

MAT Electronics is proud to be a prominent distributor in the surveillance industry and is an authorized Sony, Philips, Provideo distributor.

MAT Electronics takes great pride in its ability to accommodate the various needs

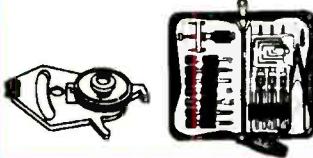
of all their valued customers—both in the US and worldwide. The company normally ships orders within 24-hours of receipt of your order, but UPS red and blue label service is also available to ensure even faster delivery service if necessary.

The company takes pride in our friendly and knowledgeable telephone operators on both coasts, who are waiting to take your phone call and deal courteously with any questions you may have about any electronic part. If you don't see it in the catalogue—just ask for it.

MAT Electronics takes the risk out of ordering from a catalog, offering a 90-day 100% guarantee on all purchases. Large volume discounts are also available. The company's toll-free lines are open weekdays 8:30 A.M. to 7 P.M. EST, and Saturdays from 8:30 A.M. EST until 2:00 P.M. The toll-free FAX number available 24 hours a day. ■

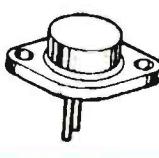
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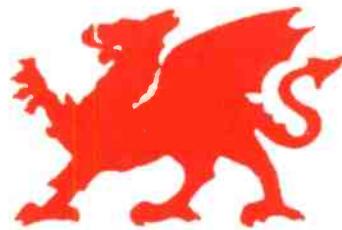
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## Tritronics Incorporated

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Phone: 1-800-638-3328, Fax: 1-800-888-3293 (MD)  
Phone: 1-800-365-8030, Fax: 1-800-999-3293 (FL)



Tritronics, Inc. has faced the same challenges as you during the last several years. If you are reading this article, CONGRATULATIONS! You survived the recession of the early 90's and are probably a stronger service center than you were five years ago.

Our family owned and operated business survived by providing fast, professional service to the independent service industry. For example, orders received by 4:00 P.M. EST are shipped the same day; we average an overall 85% fill on initial shipments; we offer an on-line ordering system (DRAGNET).

EFFICIENCY is great, but how can we save our customers' time and money? Tritronics offers toll-free pricing and availability for common parts by description and by part number. Our headquarters can be

reached at (800) 638-3328 and our Florida branch at (800) 365-8030. The order desk is staffed by an experienced sales force. We also offer toll-free fax numbers for price and availability; headquarters (800) 888-FAXD and Florida (800) 999-FAXD. Faxed in research is usually returned in four hours.

The rising cost of replacement parts brought Tritronics to the conclusion that high-quality, low cost replacement parts are needed by our customers. We recently introduced our sixth catalog, which is full of such items.

The catalog has more pages of products and cross-references, and now includes test and soldering equipment, optical pickups and many new products. Please call (800) 638-3328 if you have not received our

latest edition. If you are located in Florida, please call (800) 365-8030.

Tritronics has fully staffed parts research and sales departments that are knowledgeable and efficient. In an effort to improve our level of service, Tritronics has employed Doug Maris, CSM, formally the service manager of Home Electronics of Englewood, Colorado, to run the Miami branch. Doug has been in the service industry for eleven years and his goal is to bring the servicer's perspective to Tritronics, Inc.

In our travels to the various industry meetings, Tritronics officers often have the pleasure of meeting other people who work their business with family members. The Tritronics family looks forward to serving your business now and in the future. ■

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# ★ ★ ★ DISTRIBUTORS' SHOWCASE ★ ★ ★

## Parts Express

**340 E. First Street  
Dayton, OH 45402-1257  
Phone: 800-338-0531  
Fax: 513-222-4644**

Parts Express is a full line distributor of electronic parts and accessories geared toward the consumer electronics industry and the technical hobbyist. In business since 1986, Parts Express has quickly established itself as a leader in the industry by consistently providing quality products, first rate customer service, low prices, and toll-free technical support.

Parts Express stocks an impressive array of CATV and VCR repair parts, semiconductors, test equipment, chemicals, computer accessories, adhesives, telephone products, educational materials, pro sound equipment, raw loudspeaker drivers for home, car, and home theater

applications, crossover parts, specialized connectors, batteries, cellular accessories, and a huge selection of wire and cable. Parts Express stocks over 15,000 items and strives to continually expand its product line to offer the customer a wide and diverse selection of sometimes hard to find products and accessories. Some of the items stocked are from names like 3M, Fluke, Tripplett, Littelfuse, Klein, Goldstar, Mueller, Electro-Voice, Catamount, NTE, Motorola, Pioneer, Eminence, Pyle, Pyramid, Celestion, Audax, Vifa, Morel, Monster Cable, Sherwood, Dynamat, Ultimate, Kester, Neutrik, Augat, Cambridge, GC Electronics, Tech Spray,

Rite Off, Caig, GB, Lisle, Phoenix Gold, Easypower, Mag-Lite, Weller/Ungar, Panavise, Carol, Ferrofluidics, and many more. All of these products are stocked and ready for immediate shipment (most orders shipped within 24 hours).

The sales department at Parts Express prides itself on offering fast, friendly, dependable service and complete customer satisfaction. The phone representatives can provide information about current pricing and availability and the technical support staff is happy to provide answers on a wide variety of questions. Orders can be placed 8:00 A.M. - 8:00 P.M. ET Monday through Friday, and 9:00 A.M. - 5:00 P.M. ET on Saturday.

Each year Parts Express produces a full line catalog, showcasing the complete product offering plus detailed descriptions and specifications. This catalog is supplemented with numerous sales flyers during the year, offering special bargains and hot deals. For more information or to request a free 228 page full line catalog, please call 1-800-338-0531. ■

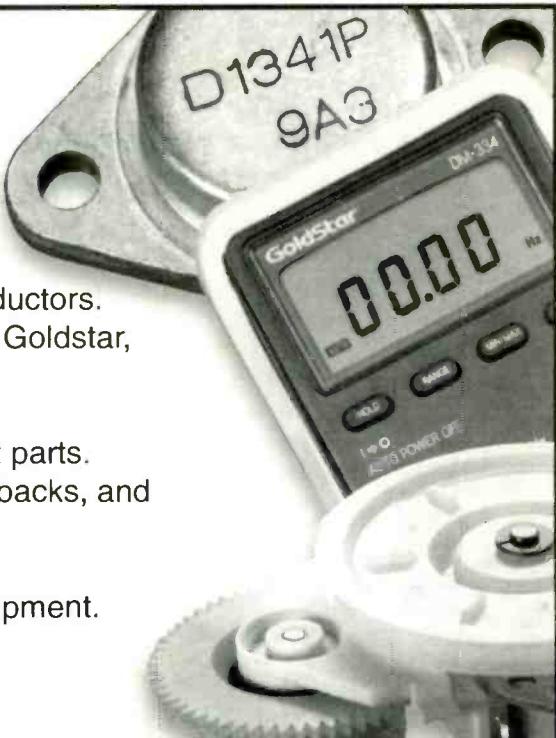
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# BUSINESS CORNER

## Cut your technicians' salaries and let them earn more

By Charles Varble, Jr.

Technicians' compensation is one of the biggest problems facing the managers of electronic service centers today. You as the manager have to determine what each technician is worth and how much to pay him, while at the same time you realize that in today's business climate you probably do not make an adequate profit. This makes it difficult to pay the technicians more out of the current budget.

You are probably paying your technicians a straight salary. If business is good you could afford to pay more, but when business is bad you are stretched tight just to pay salaries. This might be the time to look at alternative pay methods.

### Hourly pay

Hourly pay is perhaps the most commonly used method of determining pay.

Varble is a retired consumer electronics service business owner.

It is a simple method; you only have to determine the hours worked and multiply that by the hourly rate and also compute the overtime rate, which is usually one and one half times the normal rate. This computation determines the gross pay.

While this system is simple, it does have some major disadvantages. Everyone receives the same pay even though some workers do much more work during the same time period. Some workers sell more by suggestions, or attitude, and thus create a greater income for the company. The advantage of this method to the technician is that he knows that he will receive the same pay each pay period, and can budget his expenses accordingly.

The principal disadvantage is that workers do not receive more pay for better performance or for increasing the sales of the business. It is especially difficult to fit technicians into an hourly wage category because their productivity and value to the

company vary greatly. If you are manufacturing parts you can readily compare workers productivity, but it is much more difficult with electronic service.

### Paying on commission

Straight commission is a form of pay that is based only on the sale of a product or service. Most automobile salespeople, door to door salespersons, and a lot of telephone sales persons work on this system. The advantage of this method is that the employee is not limited by the number of hours he works, and some successful sales people make more than the head of the company. When they are paid more, it is because they deserve more because they have produced more income for the company. Frequently, however, when commissions of sales people reach these stratospheric levels the company adjusts the commission rate to less than the amount earned.

Week # 01		Worksheet for Jim			Week started 01/02/95	
#	Date	Ticket	Customer	Status	Reservice	Amount
1	02	3957	Moore, K			46.00
2	02	3963	Vincili, Rose			72.50
3	02	3959	Johnson, A	H-P		89.75
4	02	3981	Marko, J	E-Ser		115.50
5	02	3943	Puckett, J			58.50
6	03	3967	Mason, Q			74.75
7	03	3983	Arrow, J		XX	N/C
8	03	3949	Marcus, W			55.00
9	03	3964	Juliustein, Marcia			79.75
10	03	3987	Morris, A	E-Ser		80.00
30						
Totals:		16 Units		1 Hold	1 Reservice	935.40 Labor

Figure 1. This is an example of a weekly worksheet used for gathering data.



The major disadvantage of compensation on straight commission is that the employee earns much less when sales are slow, and they might not receive any pay when they are sick or on vacation.

Some service companies use a variation of this method. They pay a person a set amount on each repair and they frequently do not pay social security, unemployment or other taxes. They state that the person is "self-employed".

If you currently use this system, don't be surprised if someday someone from the IRS knocks on your door and informs you that you owe a large amount of money because you have not paid the taxes that are due on employees. The IRS has made some very firm definitions regarding what constitutes a "self-employed" person and many employers will find that they are not in compliance with the methods that they are using.

### Salary

Salaried workers receive a fixed amount each pay period. The advantage is that they can count on the same amount each pay period. They do not receive less if they take off a few hours or days, and they receive the same pay when they are sick. The disadvantage is that they do not normally receive extra pay when they work extra hours or overtime. They are expected to be there early and frequently they leave after the hourly people have already gone home. Some of these people receive partial pay for overtime or for "scheduled overtime". This method does not include productivity as a factor, and may not be appropriate for the electronics servicing technician.

### Incentive plans

A bonus incentive is paid by some companies, usually after a quarter or a year, and is based either on the profit of the company, or on exceeding a goal that was defined previously. The advantage is that everyone shares in an extra payment if the business earns extra income. The disadvantage of this is that generally everyone shares equally even though some have contributed more to it than others by producing more in the way of productivity and sales. Another disadvantage is that

because it is not paid often, the employee loses sight of the fact that his extra effort is really rewarded.

### Salary plus bonus

A salary and bonus is the best arrangement for a great many businesses. The employee gets paid a regular hourly wage and then also receives a bonus at the end of each period based on his individual contribution. In the case of a service business, the bonus is usually based on the labor income produced, and reduced by the amount of re-service that is required.

In this scheme, you establish a goal, or "bogey," and after this amount is met then the employee receives a percentage of the excess; usually 25 to 50 percent of this amount. In my opinion, if this is computed and paid monthly it serves the best interest of all concerned.

The advantage of an incentive plan such as this is that the employee who produces the most income for the company receives the largest bonus. Everyone tends to think that they make the greater contribution to the company and if they do they are rewarded on the same basis. Employees can earn more without asking for a raise, and frequently they will make suggestions that will increase the income and benefit everyone.

A disadvantage of a salary plus bonus plan is that it is usually necessary to reduce the hourly rate, even though the technicians will make more total gross income. Another disadvantage is that earnings will be reduced when business is slow. However, it allows a business to pay out more when business is good and does not penalize them during the slower portion of the business cycle.

A scheme such as this requires more time to log and compute every employee's income, but this is also a good business practice. Companies that have changed to this form of pay for technicians have been pleasantly surprised because the technicians earn more and so does the company.

### Compensation for non-productive time

A "super technician" who is assigned

to assist other technicians must be given the same bogey as the other technicians, but he must be given credit for non-productive time while he is helping others. The technician who gets all of the "dogs" must also be given a credit against his goal so that he can fully participate in the bonus system.

### Reservice

Reservice on a unit that has failed during the warranty period for the initial repair is normally completed by the same technician who serviced it in the first place, and he is not given credit for it. If, on the other hand, another technician is assigned the repair, he should earn the full normal credit. This amount would then be deducted from the pay of the technician who originally completed the repair.

### Establishing the goal

To determine the goal for your company, start by taking an annual period and figure all of the labor income produced by all of your employees. First, determine your current bogey by dividing labor income by technicians' payroll; this is your Labor-to-Salary ratio. Multiply this figure by each technician's current production salary. This will tell you how much each technician needs to produce each week. If you have your technicians wait on the counter and answer phones that portion of their salary must be assigned to non-productive salary.

As an example, if a technician works 10% of the time waiting on customers then you have to multiply his actual salary by 90% (100% - 10%) to figure the production salary. The resulting number is usually between 2.5 and 4. Some people call this the "burden factor." You can then check out each individual technician by finding the L/S ratio for each by dividing the labor income they produce by their productive salary and then compare this to the overall ratio as produced by the entire business.

Any technician with a ratio above the average is producing more income and anyone with a ratio that is below the average is producing less income than the average. This method works fairly for



01/14/96		Bonus						Page 4		
Bonus For Month:		Jan 1996		Jim		Carried Forward				
Week	Hours	Goal	Income	Non-Prod	Recalls	Net	Units	Recalls	Bonus	
Week 01	32.00	880.00	1035.40	88.00		1123.40	16	1	85.19	
Week 02	40.00	1100.00	1369.20	110.00		1479.20	22	1	132.72	
Week 03	40.00	1100.00	1327.50	110.00		1437.50	23	1	118.13	
Week 04	40.00	1100.00	1598.50	110.00		1708.50	27	2	212.98	
		.00	.00						.00	
<b>Totals:</b>		152.00	4180.00	5330.60	418.00	@Hour	5748.60	88	5	549.02
Bonus>		\$549.01	Minutes>	103.64	\$35.07	Average = \$60.58			Recalls>	5.38%

The above example for technician Jim is based on an hourly wage of \$10.00 and a L/S ratio of 2.75. If you multiply the hours times \$10.00 and then times 2.75 (the bogey) you will see that the goal is exactly correct for the hours worked. You will note that week 01 is for only 32 hours because of the holiday on New Year's day but his salary for that week was for forty hours because he is paid for holidays. The same computation applies if he is sick. The \$418.00 non-prod was credited to him because he waits on the counter 10% of his time. On the first row at the bottom labeled Totals, the figures are the sum of the columns above. He completed 88 repairs that were charged for and 5 recalls. The row under it lists the bonus as \$549.01 and he received this as an extra check on Friday, January 19th, the first pay period after the 15th of the month. The next item was 103.64 minutes per item. The \$35.07 an hour was computed by dividing the income \$5,330.60 by the 152 hours actually worked. the average labor cost was \$60.58 and was arrived at by dividing the total income of \$5,330.60 by 88. The recall rate was 5.38% and was computed by dividing 5 by 93 (88 units repaired plus the 5 reserve).

Figure 2. Here is a copy of the worksheet given to the employees with their bonus check.

everyone because the highly paid technician is required to produce more income than the lower paid person. Every technician will think that they are contributing more than their share of the work but this simple exercise will give you proof of who is the most valuable to the company.

The L/S ratio for an outside technician will be about half as high as that of an inside technician because of the additional expense of the service vehicle. In our experience, it is just as easy for the outside tech to make a good bonus as it is for an inside tech, because if a given service job is difficult he will bring the set in for a bench technician to service. The inside tech must work on a set, no matter how difficult, until it is properly repaired.

#### Gathering the data

In order to determine the production of each technician, you'll have to accumulate the appropriate data. A weekly worksheet that the technicians fill out daily

works best. You may already have a sheet like this. If you do not currently use this type of form, you may copy or alter the sample sheet shown in Figure 1. The top of the sheet has lines for information such as week number, the week of the year, technician name and week beginning.

The technician fills in the date and the ticket number, the customer's name, the status only if it is not completed, such as hold for parts or intermittent. The reservice notation is checked if this job is a reservice. The amount is filled in later by the office when the unit is billed.

The bottom portion is also completed in the office. "Units" is the total completed units, "hold" is the units held, "reservice" is the total number of units that were reservised and "labor" is the total of all of the amounts for the week. This sheet hangs on a clipboard on each technicians bench and it is easy to tell the status by just glancing at the worksheet. These totals are transferred to the bonus

sheet each month and the incentive bonus is paid by an extra check on the first pay-day after the 15th of the month.

#### Control is of paramount importance

Control is absolutely necessary in the running of a profitable business today. Even if you do not have an active bonus program, or do not intend to start one, you should have each technician fill out a worksheet as described above. When a technician fills out this weekly sheet and sees that he has completed a low number of units, it will give him an incentive to improve his productivity. You should explain to all of your technicians that greater productivity is the primary factor that allows you to increase their total earnings.

Technicians will compare their productivity with each other and most of them will try to increase the output to show that they are the best. This will increase their productivity as well as the bonus that they receive.

# Test Your Electronics Knowledge

## Answers To The Quiz on page 23

1. The screw is made from standard screw stock #6 and it has 32 threads per inch.

2. The circular mil area drops by one half for every three wire sizes. So, #23 wire has an approximate area of  $1022/2 = 511$  circular mils. Number 26 wire has an approximate circular mil area of  $511/2 = 255$  circular mils. (The value from the wire gauge is 254.1.)

3. (A) The *deflection* of the pointer is proportional to the average value. The scale is usually calibrated to indicate the RMS value.

4. Selective Fading. At certain distances it is nearly impossible to receive the signal unless a special antenna system (called a "diversity antenna system") is used.

5. You may have answered "Keep It Simple Stupid". The correct answer is "Keep It Short and Simple".

6. Bit Slice. It is much faster than a microprocessor but more difficult to design. It is *not* made so that every section of a microprocessor is a separate integrated circuit. Instead, a number of sections are grouped together in one block.

7. The area of a circle in square inches is given as:

$$A = (\pi \times D^2)/4.$$

For a circle having a 1-inch diameter the area is:

$$A = (\pi \times 1^2/4 = \pi/4 \text{ square inches})$$

When the diameter is 2 inches the area is:

$$A = (\pi \times 2^2)/4 = (\pi \times 4)/4.$$

The 4s cancel, leaving  $A = \pi$  (square inches).

8. Intensity (The original French name for the amount of current.)

9. B (by definition)

10. surface mount



## Improving productivity is better than raising rates

If you choose to raise your labor rates, you will find that this will reduce the number of repairs that your customers will authorize you to perform, which will most likely reduce your total income. The replacement cost of the unit is in direct competition with your service business. If you increase productivity in your service center, you will be able to pay your technicians more while at the same time insuring a profit for your company.

## Provide documentation with the bonus

Figure 2 is a copy of the worksheet that you would give to the technicians along with their bonus checks one each month. The sample sheet shows the week number, hours worked, the goal, service income produced, non-productive time, the recall amount (if credited to another tech), the adjusted amount, the total units processed excluding recalls, and the number of recalls and the amount of bonus that the tech will receive for that week.

The totals at the bottom sum all of these up and also give the minutes per repair, average income produced per hour, average dollar amount per repair, and the recall percentage of the total. These figures are computed, not to criticize, but to give a realistic picture of the service completed.

## No risk

There is no risk involved for the business if you choose to try the bonus system for you and your employees. Have a meeting and tell your technicians that for the next four months you are going to pay them a bonus in addition to their salary, based on 50% of the excess they produce in labor income over the target amount. You will see a column on the bonus sheet that lists Non-Prod and this is to give them credit for the time spent waiting on customers and other non-productive time. Compute and pay their bonus, along with a copy for them, on the first pay period after the 15th of the following month.

The technician is not taking any risk either because the bonus is in addition to his normal salary. He will actually make

more if you reduce the base salary, and this will lower his goal and it will be easier for him to make more total income with both the salary and bonus. I have used this format for many years and it is good for everyone. The technician who does more earns more, and as they see the direct cause and effect you will find that the productivity increases considerably. Do not be surprised if they make suggestions that allow them to be more efficient and complete more repairs.

## Overcoming resistance to change

Changes are usually met with some resistance because people are comfortable with the way they are doing things now. Discuss this with your people and tell them it will be for a trial period, maybe four months, and you will discuss it with them after this time to see how they like it and if they want to continue it. Unless you are satisfied with your profit and the trends in your business you must make changes to survive in today's harsh and difficult business climate.

## Productivity is the key

Productivity will be the difference in the companies that are successful in the future. You are very limited in the amount that you can raise prices and still get the customers to authorize the repairs. The increased efficiency will be a benefit to everyone, the technician will earn more, the company will make a profit and the customer will have the unit repaired. The electronic manufacturers have learned that they must be more efficient if they are going to survive and the electronic service facility must do the same thing.

The bonus should be paid monthly and you will be surprised at how the technicians will "hustle" at the end of the month to make a good bonus. Because you are computing the bonus for each technician no one feels as he is individually "carrying the other techs".

Every business has to make a profit to survive, and for employees to keep their jobs. It is in the best interest of everyone to have a compensation program that treats everyone fairly.



# Implementing and Maintaining a Power-Saving Video System

By Stephen J. Bigelow

A personal computer demands relatively little power—about as much as a family-sized television. As a consequence, many PC users and employers have chosen to leave their PCs turned on all day long (and often overnight). Ten years ago, this would hardly have been an issue, but today there are tens of millions of PCs in service around the world.

In the US, PCs are believed to account for over 5% of all commercial electricity consumption! That figure is expected to rise to over 10% by the year 2000. Now 10% may not sound like much, but the numbers work out to be about 22 billion kilowatt-hours of electricity each year. The cost of that much power provides a strong incentive for conservation, and the PC industry has been working hard to respond.

Technicians who service computers and peripherals should be aware of existing power conservation schemes, as they affect the operation of the computer and other system components.

## It's not easy being green

The principles behind PC power conservation are remarkably straightforward: simply shut off or disable any areas of the PC that are not being used. Of course, the actual implementation of that principle can be a bit stickier.

Laptop and other mobile PC designs have been refining power monitoring and conservation techniques for years in an effort to extend battery life. You might think that desktop systems would be a natural recipient of those developments, but

desktop systems have lagged behind.

For power conservation to work on the desktop PC, the motherboard, power supply, and expansion boards must all be capable of reporting their idle condition to a control circuit (typically on the "green" motherboard) which will then order the device to enter a power-conservation state, and re-start the device without interruption when it is needed. The process of spinning-down a hard drive and then spinning it back up again is one typical example of power conservation.

The nagging problem for desktop systems has been getting all the green components and green BIOS (all made by different, often competing, manufacturers) into the same system. Even today, few true conservation-aware desktop personal computers are in service.

## The video breakthrough

The one notable part of the PC to cut through the delays and confusion of power conservation has been the video system. This is particularly important when you realize that the monitor itself usually consumes far more power than the desktop system to which it is attached, and the conservation can be accomplished without any other green components in the system.

The success (and overall ease) of video power conservation is largely due to the fact that monitors and video boards are a relatively remote and independent part of the PC. After all, you can swap a monitor or video board in a matter of minutes with almost no worry of compatibility; unlike updating a motherboard or power supply. This article shows you the concepts behind video power conservation,

and explains how to implement a "green" video system.

## Energy Star compliance

If you choose to work with energy-saving video equipment, you are invariably going to encounter Energy Star; a program sponsored by the US Environmental Protection Agency (EPA). Energy Star is not a standard or specification; rather it is a series of minimum requirements outlined for PC and peripheral power consumption. When a device meets the minimum requirements, it is "Energy Star Compliant", and then has the right to bear the EPA's Energy Star logo.

Very simply, Energy Star compliance requires that PCs, monitors, and printers must be able to enter a power-saving mode (also referred to as a low-power, sleep, or standby mode) when idle for some period of time, then recover from that state when needed without interrupting the machine's state or work left in progress. PCs and monitors must power down to 30 watts or less (each). Printers that normally run fewer than 15 pages per minute must power down to 30 watts or less, while printers that run at more than 15 pages per minute can power down to 45 watts or less. All high-end color printers must power-down to 45 watts or less.

By all accounts, these requirements are pretty loose. You should realize that the Energy Star program does not dictate how a device achieves its energy-saving state, nor does it define any kind of signaling protocol to control energy-saving features. All of that is left up to the individual manufacturers.

As a result, all Energy Star actually says is that a device must use less than

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"such-and-such" an amount of power while in its "power-saving" state. It is also important to remember that the Energy Star program is strictly voluntary within the PC industry, so manufacturers are not legally obligated to design or produce energy-saving products.

#### Conservation techniques

Now that you understand the objectives of video power conservation, it's time to see how the conservation is implemented on a practical basis. While various peripheral manufacturers work to develop their own power-saving schemes, two signaling standards have come to the forefront of video technology; DPMS and Nutek. As power-saving video equipment becomes more readily available, you will probably encounter both.

#### DPMS

The Display Power Management System (or DPMS) was originally developed by the Video Electronic Standards Association

(known as VESA) to specifically address power conservation in computer monitors. The DPMS protocol uses the horizontal and vertical synchronization signals generated from a video board to set the monitor's power saving mode.

Ordinarily, horizontal and vertical sync signals are generated continuously from a video board. These signals produce the raster. DPMS defines four monitor states; *on*, *standby*, *suspend*, and *off*. By selectively cutting off one or both signals at the video board, the DPMS monitor can be placed in one of those modes as shown in Table 1.

Unfortunately, DPMS compatibility does not define the power levels at each state. Therefore, there is no guarantee that a DPMS-compliant monitor is actually Energy Star compliant. VESA specifically avoided defining power levels with DPMS signaling so that the DPMS approach could be adopted for use in different countries with varying power conservation strategies. This is a wrinkle often overlooked during equipment selection, so you will have to make sure that your monitor uses the proper signaling (i.e. DPMS) as well as meets the desired energy conservation requirements (i.e. Energy Star).

The advantage to DPMS signaling is that it can be accomplished with relatively simple programming; such as being integrated into a screen saver. This eliminates the need for specialized video boards, and physical changes to the video port. As an alternative to screen savers, DPMS-compliant video drivers and video BIOS are now appearing.

Even Windows 95 screen saver properties have been designed to support DPMS video signaling. However, the video device driver must use either the Advanced Power Management (APM) 1.1 BIOS interface (with support for device 01FFh), or employ the VESA BIOS Extensions for Power Management. You will need to check with the maker of your video board to see if their Windows 95 video drivers support either of these.

Modes are selected based on system

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inactivity. For example, a system idle for 5 minutes may set the monitor to its Standby mode. After an additional 10 minutes of inactivity, the monitor will be switched to its Suspend mode. After 60 minutes in Suspend mode, the monitor will turn Off (where only the monitor's microcontroller is running). A keystroke or mouse movement at any point will set the monitor back to its On state (though recovering from a Suspend or Off state may take 30 to 60 seconds). In many cases, the actual timing values for each state can be set through the DPMS software.

### Nutek

One of the great arguments against DPMS signaling is the need for DPMS-compliant software to properly manipulate the video board's synchronization signals. Sweden has introduced an alternative signaling standard, called Nutek, which is much simpler and more straightforward than DPMS.

Rather than affect horizontal and vertical signals, Nutek-compliant monitors simply look for an absence of Blue video signal. Virtually all modern monitors use three independent analog color signals (Red, Green, and Blue) to generate colors.

When the Blue signal is absent, a Nutek-compliant monitor starts an internal timing cycle that will gradually step the monitor down to one or more power-saving modes. The moment a screen saver blanks the screen, the Nutek monitor will drop to about 80% of its full-power consumption—roughly equivalent to the DPMS Standby mode.

If the blank screen persists for several more minutes, the monitor will drop to its major power-save mode (often down to 10% of its full power) where only the CRT heater and microcontroller circuit are active. If the monitor remains in this Suspend condition for a prolonged period, the CRT heater will shut down, leaving only the monitor's internal microcontroller active. This Off state is typical during idle overnight operation.

Once again, the actual amount of power saved at each step will depend on the particular monitor design, so there is no guarantee that a Nutek-compliant monitor is actually Energy Star compliant—that's something you'll have to investi-

VESA DPMS	Horizontal Sync	Vertical Sync	Video
On normal	Normal	Normal	
Standby	Cutoff	Normal	Blanked
Suspend	Normal	Cutoff	Blanked
Off	Cutoff	Cutoff	Blanked

Table 1 - DPMS state vs. video signals

gate when shopping for monitors. The timing for each power-down state is programmable within the monitor itself.

As you might expect, the Nutek-compliant monitor requires no specialized software; any off-the-shelf blank screen saver (or screen image with an absence of Blue signal) will work. Where a DPMS state is maintained by the DPMS software, the Nutek state is kept track of in the monitor. Since it is the blank screen saver that activated a power-down in the first place, any keystroke or mouse movement will cut out the screen saver. When the Blue signal resumes, the Nutek-compliant monitor will return to its full-power mode (though there may be a bit of warm-up time for the CRT).

### Proprietary techniques

The vast majority of energy-saving monitors in today's marketplace use either DPMS or Nutek signaling, but you may also encounter a variety of proprietary signaling schemes. We strongly advise you to avoid such proprietary monitor approaches simply because technical support, equipment repair, and replacement devices are likely to be difficult or impossible to obtain. Also, there is no promise that proprietary video power conservation software or drivers will work properly under complex operating systems such as Windows 95.

### Configuration and maintenance issues

As with most advances in the PC industry, there are a series of configuration and maintenance issues that have to be considered. The following points may help you when planning a power-saving video system for a computer.

### DPMS issues

DPMS has proven to be a popular signaling approach in the PC industry, but it relies on specialized driver software that

will manipulate the horizontal and vertical signals of a video board. Consequently, video drivers and BIOS become key elements of video power conservation.

•*Software compatibility and timing:* Just as with any other device driver, poorly-written DPMS-compliant video drivers can interfere with other system software resulting in system crashes or hang-ups. Check in with the manufacturer of the video adapter for driver updates and patches. If you rely on DPMS-enabling applications such as AfterDark screen savers, disabling or removing the software will disable your power conservation. Time delay settings for each power state are typically entered into the DPMS screen saver configuration or video driver properties.

•*Swapping video boards and drivers:* Today, it is virtually impossible to install a new video board without installing a new video driver as well. If another video board does not have a DPMS-compatible driver, you will lose the feature. When shopping for a replacement board, look for the proper drivers too. If you switch to a generic video driver (such as starting Windows 95 in its "safe" mode), you are also likely to lose DPMS capability.

•*Swapping monitors:* Using a non-DPMS monitor in place of a DPMS monitor should not damage anything, and there should be no visual image distortion since the video signals are blanked. However, you will receive little (if any) power savings with a non-DPMS monitor.

### Nutek issues

Nutek also relies on software for proper operation, but the demands are not nearly as stringent.

•*Screen savers:* The Nutek approach works best with a blanking screen saver. It does not matter which screen saver you choose as long as there is no Blue video signal. However, a regular screen display



which contains no Blue (a very rare occurrence) will cause a Nutek monitor to power-down as well. Removing the screen blower will disable your power conservation. The delay before your screen saver takes control determines when power conservation will begin.

**Monitor timing and programming:** The time delay settings for each Nutek power state are programmed into the monitor itself. You will need to refer to the monitor's documentation for default timing and programming options.

### The ultimate power conservation

In spite of the advances in power conservation, the age-old question still remains; "Should I turn it off or leave it on?" Proponents claim that modern systems and peripherals can be turned off safely, while opponents argue that the repeated heating and cooling of system components leads to premature system failure. Ultimately, there is no logical reason why you should not turn off your PC at the end of a working day. To understand the answer, you should understand where the debate came from.

### NEWS (from page 5)

utilities and other diagnostic software." NESDA notes that, under such a ruling, "even the profession of servicing television sets, VCRs, vehicle electronics, audio components, and other products will be at risk, since these contain computer chips that are activated when the machines are turned on." NESDA further contends that more manufacturers will be emboldened to try similar tactics which would make consumers captive to those manufacturers for repair and maintenance. "Such actions," NESDA says, "would destroy the independent service industry as we know it" and would "strip the public of its present option to receive better service at lower prices from independent servicers."

NESDA reminds the Supreme Court of its decisions in the Kodak case: that the briefs filed by NESDA and other service associations "attest the magnitude of the service business"; and that "the development of the entire high technology service industry is evidence of the efficiency of a separate market for service."

NESDA/NIAS/ISCET and the Associa-

When components operate, they dissipate power as heat. The heat causes expansion which puts stress on the interconnections within an IC, CPU, and other components. Repeatedly turning a system on and off causes repeated heating and cooling of the parts which eventually fatigues the internal connections, causing parts to fail.

It was argued that by leaving the system on, the parts would reach a stable operating temperature and repeated "thermal fatigue" would be eliminated. This was largely true for older PCs and peripherals which ran hot.

Today, low-power operation and efficient IC assembly techniques have dramatically reduced the heat generated in ICs and other components. Just about all of the heat you feel rising from a monitor is from the CRT; the last remaining throwback to vacuum tubes. While we would not recommend turning a monitor or PC on and off repeatedly during the day, there is little reason to let the system run all night or weekend long. Power-conservation modes are great during the working day, but don't be afraid to turn

ates conclude that, if the Court does not review the Triad decision, the tactics of bundling software into one package will likely be implemented by many if not all manufacturers. "This Court," it suggests, "should reaffirm its previous decision in Kodak that the ISOs do, indeed, serve a valuable public benefit."

Service dealers or technicians may obtain more information about the case or about NESDA, NIAS, or ISCET, by contacting the respective associations at 2708 W. Berry Street, Fort Worth, TX 76109-2397; Fax 817.921.3741; NESDA/NIAS phone 817-921-9061; ISCET phone 817-921-9101.

### 1996 Convention Announcement

The Satellite Dealers Association—SDA—has chosen Faribault, MN for its 1996 Annual Conference. The dates are June 13-14-15.

The location for the Educational Events is the Minnesota Riverland Technical College, 1225 SW 3rd Street in Faribault. Host hotel and location for the Satellite Dealers Awards and Recognition Banquet is the Best Western Galaxie Lodge.

the system off each night: that's the best power conservation there is.

Sources of information for this article:

#### Energy Star Computers

US EPA (6202J)  
Washington, DC 20480  
Tel: 202-233-9114  
Fax: 202-233-9578

#### Nanao USA Corp.\*

23535 Telo Ave.  
Torrance, CA 90505  
Tel: 310-325-5202  
Fax: 310-530-1679

#### VESA

2150 North First St.,  
Suite 440  
San Jose, CA 95131-2029  
Tel: 408-435-0333  
Fax: 408-435-8225

\* The author gratefully acknowledges the cooperation of Nanao USA in the development of this article.

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Dick Glass, President of SDA said: "Satellite Dealer friendly and economical Faribault is less than an hour away from the Twin Cities where attendees will visit the Mall of America, Indian casinos and other attractions with their families. Faribault is a small historic community in the heart of some of the most beautiful rivers and lakes in the country, all having public fishing and camping access."

In addition to SDA's famous SAM School for satellite dealers, the not-for-profit SDA will host a special Rooftop Antenna Installation Seminar as well as a Private Cable Estimation and Installation Course during the 3-day conference.

The Pat Porter "Friend of the Satellite Dealer" award will be presented at the Grand Banquet on Friday, June 14.

Riverland Technical College has been a testing site for the CSI (Certified Satellite Installer) and the CET (Certified Electronics Technician) exam program for several years. RTC offers technician training at 4 campuses: Austin, Faribault, Owatonna, and Rochester, MN. For conference updates and registration information: 800-288-3824.

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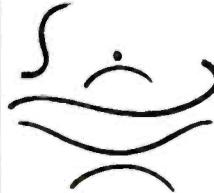
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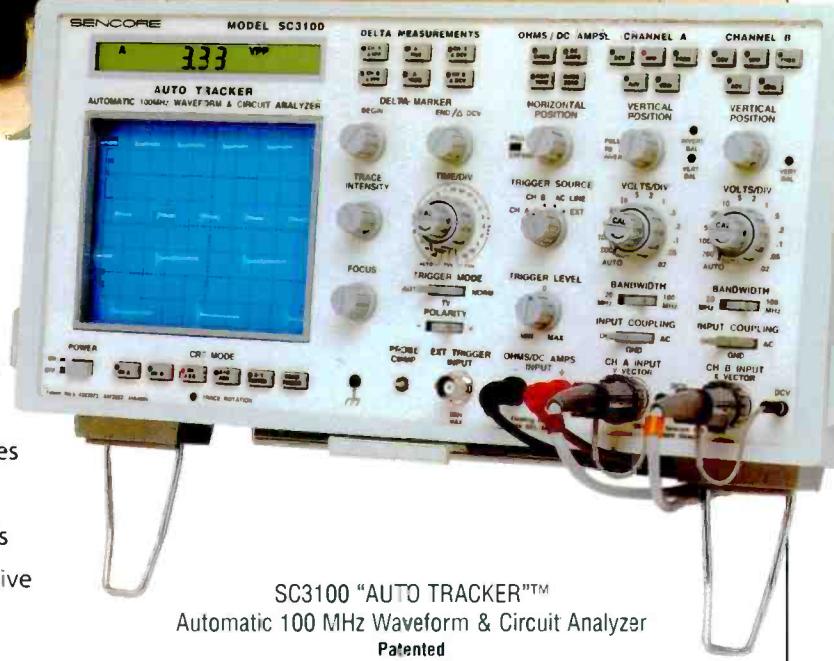
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(1) Approvals/Listing pending

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