

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONIC

T.M.

Servicing & Technology

February 1997

New technology update

General software



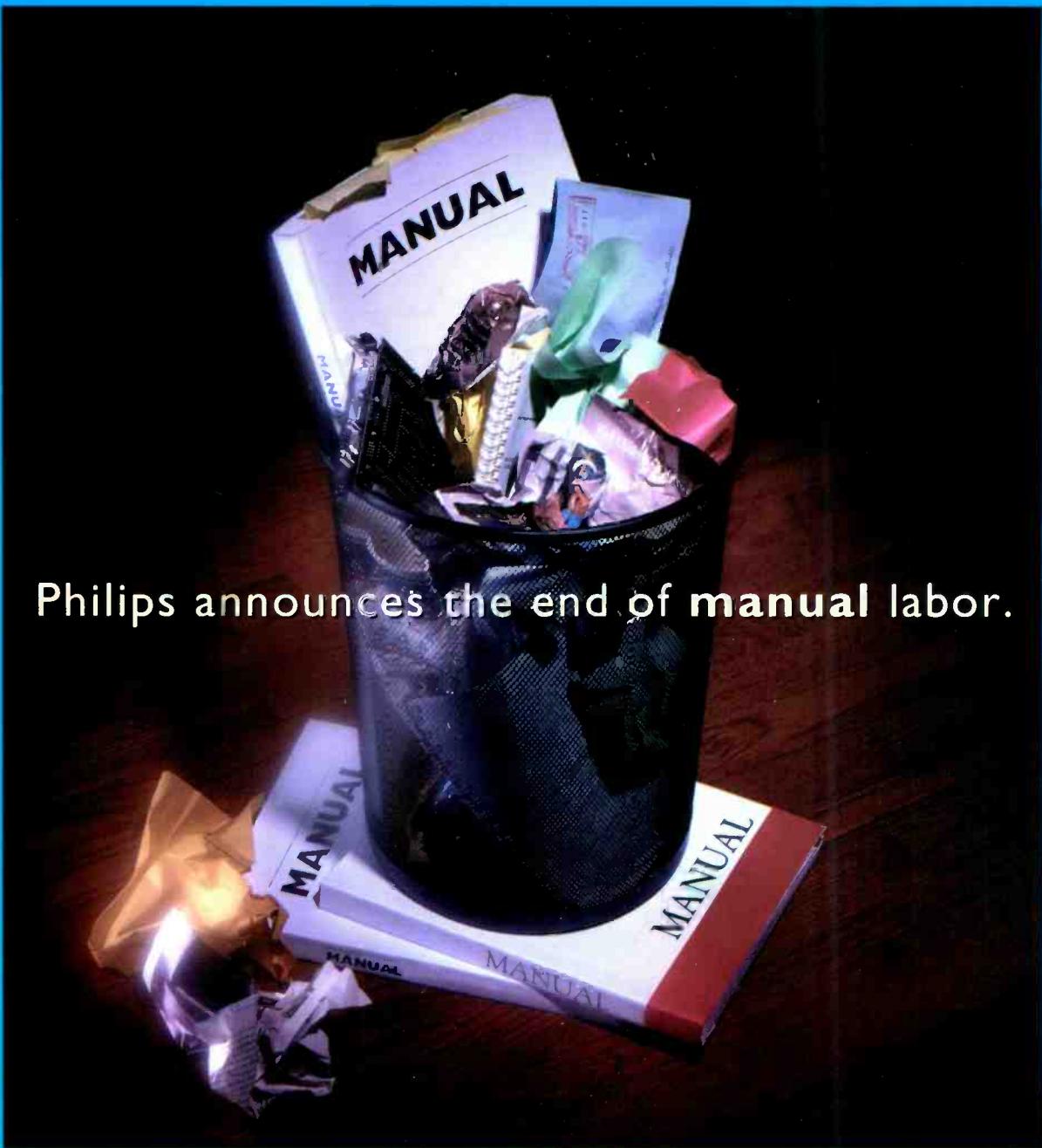
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Volume 17, No. 2 February 1997

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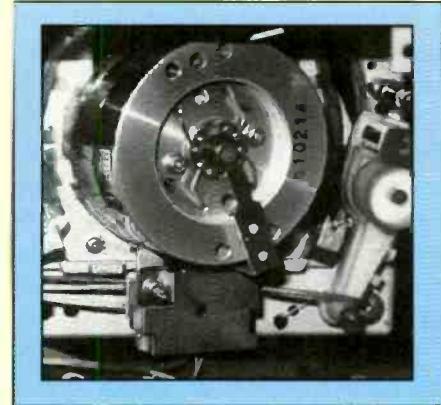
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By Philip Zorian

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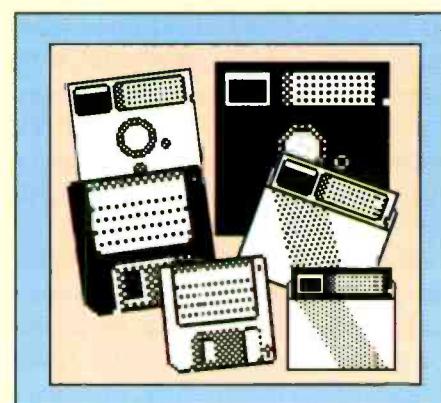
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ON THE COVER

Because VCRs are complex electromechanical devices, they are full of mechanical parts, such as tape guides, gears, tires, rollers, tape heads, and more, that can wear, or break. The proper troubleshooting technique, along with appropriate test equipment, can help make servicing of VCR mechanical problems easier and more efficient. (Photo courtesy Tentel)

Look how far electronics has come

It's interesting and useful to pause once in a while in order to gain some perspective on things. When those things happen to be electronics it's a little difficult, considering the headlong rush that electronics always seems to be in lately.

A few years ago, relatively speaking in the context of the span of human existence, the only uses of electronics were for the reproduction and broadcasting of sound. A few years later, technologists discovered how to broadcast picture information, and television was born.

Of course, it was during those early years that consumer electronics service was born. And it was pretty easy then. One man, possessing basic knowledge in radar which he learned from the military, armed with a tube tester and a caddy full of tubes could make a pretty good living.

Things settled down and changed little for many years. The television screen gradually grew larger, then solid state components were introduced, and color TV emerged. Programming, once limited to the afternoon and evening hours (remember test patterns?), gradually expanded to fill the entire day.

Somewhere in there, audio high fidelity and stereo were introduced, but for many years improvements in the TV picture were not accompanied by improvements in TV audio.

Within the past decade or two, the pace of change quickened. The consumer electronics market saw the introduction, in no particular order, of the VCR, the camcorder, compact disc, improved TV sound, video games, personal computers, the telephone answering machine, cordless telephones, cellular telephones.

But electronics changed many other things. During this same period, as engineers found ways to make electronics components and circuits smaller, more functional and more reliable, electronics were introduced into a number of prod-

ucts as control elements: automotive electronics, electronics in appliances and more.

We're standing on the threshold of electronics marvels that perhaps only the most visionary of individuals can foresee. For example, a single standard for HDTV was agreed upon at the end of November 1996. The Advanced Television Standard Committee's (ATSC) standard was agreed upon by broadcasters, computer companies and television receiver manufacturers. The FCC approved the standard on December 26, 1996.

Convergence

Now there's a new term being applied to consumer electronics: "convergence." According to a news release from the Consumer Electronics Manufacturers Association, "Convergence, once a mundane technical term meaning 'to come together,' today best describes the coming together of the full spectrum of technologies, with television companies offering interactive, digital internet capabilities and computer companies offering broadcast and entertainment venues."

Converging technologies include DVD, DSS, TV/PC, PCS, multi-media, interactive cable, smart phones, pagers, wireless products and more, all with related ancillary products and accessories.

It's all really mind boggling. Consider the internet. I'm more impressed with it every day. Not that it's without its quirks which can become annoying and frustrating. For example, waiting for the browser to change to a new site can try one's patience, and many webmasters have gotten carried away and use, IMHO (that's webspeak for "in my humble opinion"), far too many hot links. Still, using the net makes it possible to gain access to current information.

As just a single simple example, as I write this I'm getting ready for a trip to

the Consumer Electronics Show in Las Vegas. It's cold here in the Kansas City area and getting colder. What kind of clothes should I take with me? Will it be warmer in Las Vegas.

Last night I logged onto the net and looked up the weather in Las Vegas. I found out that it won't be as cold there as it's going to be in the Midwest, but I also know that I should probably take along an overcoat and I might as well leave the bathing suit and the sun screen behind. I won't be needing it.

But there's so much more information on the internet. There are directories on the net that you can use to look up that long lost friend with whom you've lost touch, or that company that moved and whose new address you can't find. Going to New York or Chicago and want to find out what's happening? You can look that up on the net. And while you're at it you can even buy your tickets there as well.

For servicers, in some cases you can look up information about suppliers of tools, test equipment, replacement components. With some, you can view their catalog and order directly via the net.

And now with the convergence of electronics, even people who don't own a computer can access all of this neat stuff.

Implications for service

What does all of this mean to consumer electronics service? For one thing, possibly an improvement in the business. Those HDTVs and other advanced products will tend to be expensive and less likely to be thrown away. Well, we can hope anyway. And as always, servicers will have to continue to work hard to learn about the technology that's driving all of these changes.

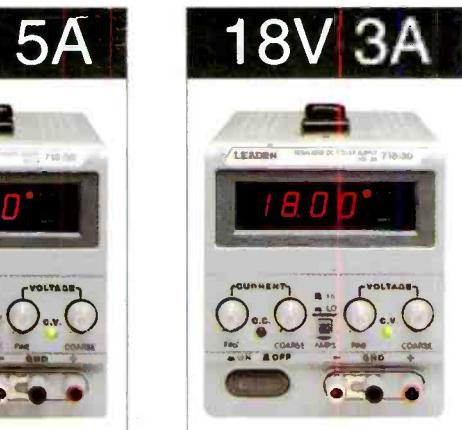
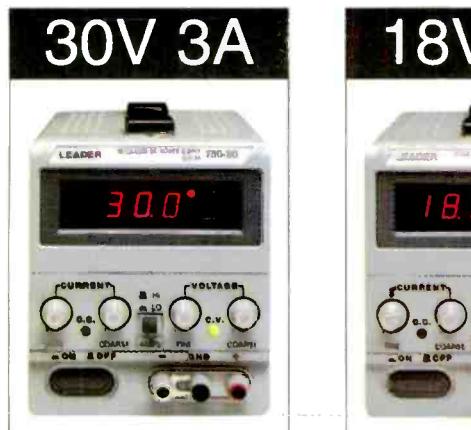
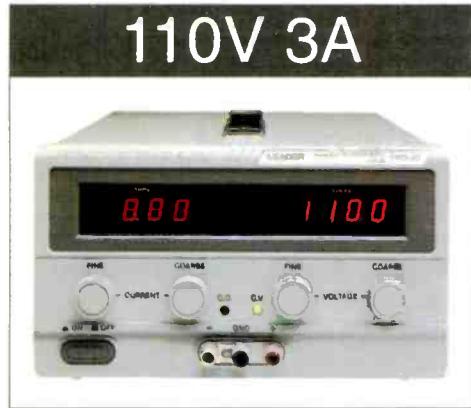
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DIGITAL
DISPLAY

Kentucky selected as site for national convention of service, installers

Berea, KY will be the location for the 1997 National Convention of the Satellite Dealers Association - SDA, and ETA, the Electronics Technicians Association, International. Location for the major educational events will be on the campus of Berea College. Location for the convention primary hotel is the Boone Tavern.

Dates for the meetings are Thursday June 12 through Sunday, June 15. The bulk of the educational demonstrations and training events will be on Friday and Saturday, June 13 and 14.

ETA and SDA will be joined by PSA, the Professional Service Association. PSA is the largest national consumer service dealer association. PSA's membership is composed of both electronics and appliance service businesses.

SDA will conduct its SAM school for all those interested in honing their skills for satellite installations, rooftop antennas and signal distribution systems.

PSA will be in charge of the two-day Business Management School sessions which will include titles like "Surviving in Shark Filled Waters" and "Managing Customer Values."

The theme of the convention is "A Time of Success," recognizing the accomplishments of the nation's technicians and the professional and business associations to which they belong.

ETA will produce its Electronics Technicians School with classes on consumer electronics products, basic electronics and new technology, including several sessions on computer programming and programs service dealers can utilize in their businesses.

Berea College will serve as more than the site for the convention as several members of the faculty will be involved in classes on Personal Development, Creativity, and Assertiveness. Doctor Harrie Buswell is the Convention Coordinator for Berea's staff.

Berea College is located 40 miles south of Lexington, KY. Berea College is unique in that students do not have to pay tuition and are unlikely to be accepted as students if they can afford to pay their way through college. Each student is required

to work at a meaningful job, earning his or her tuition.

For more information regarding the ETA-SDA-PSA Convention in Berea, KY contact: 602 N Jackson, Greencastle, IN 46135, eta@indy.tdsnet.com, 317-653-8262 (fax), 317-653-4301 (voice).

Audio sales propel home theater market

Factory sales of home theater products rose five percent in the third quarter with sales of \$2.28 billion, compared to \$2.18 billion a year ago. For the first nine months of the year, home theater equipment sales grew six percent to \$5.7 billion, according to the Consumer Electronics Manufacturers Association (CEMA). In other audio and video news, blank media sales remained fairly constant during the third quarter, up slightly in unit sales and flat in dollar sales.

"Home theater sales have been on a steady rise all year, and we expect that trend to continue during the holidays," said Gary Shapiro, CEMA president. "Our association also surveyed consumers on what they are buying for gifts this holiday season, and VCRs, home stereo components, big screen TVs and speakers were all on the list. Plus, blank tapes make great stocking stuffers."

The home theater video market managed to record a small gain of two percent in the third quarter. A very strong hi-fi stereo VCR market (sales up six percent in the quarter) helped propel the segment. Sales of TVs 25 inches and larger were also up, climbing one percent with sales of \$1.2 billion in the quarter.

Sales of home theater audio products were up sharply in the quarter rising 25 percent, maintaining a strong 24 percent rate in the year-to-date.

Product convergence is focus of 1997 spring consumer electronics show

Today we are reading e-mail on the TV, watching movies from a PC, downloading vast amounts of data from a small satellite dish, listening to stereo sound from a CD-ROM drive, and accessing the Internet from a telephone. What new converging products are on the horizon, and how will these products impact the con-

sumer and the consumer electronics marketplace? The answers to these questions will be answered with an extensive conference program and exhibits of the latest converging technologies at the Spring Consumer Electronics Show (CES), June 2-5, 1997 at the Georgia World Congress Center in Atlanta, GA.

For the first time ever, Spring CES will be co-located with COMDEX/Spring, along with WINDOWS WORLD and EXPO COMM. Combined, this event will attract a broad, international audience of decision-makers in many areas: computing, consumer electronics, telecommunications, and information technology - the backbones of the burgeoning convergence trend.

"This Spring mega-event brings together the world's most successful technology trade shows just as the lines of distinction between our industries continue to blur," said Jonathon Thompson, Vice President, CES. "For attendees, Spring CES offers an opportunity to see all of the cutting-edge consumer electronics products alongside IT and communication products. CES Exhibitors will benefit from exposure to a broad spectrum of computer and consumer electronics retail buyers, as well as new distribution channels. 1997 is the year for DVD, TV/PCs, and a host of exciting digital and converging products that are transforming our industry, and this combined Spring event will be the perfect showcase."

Already signed up to exhibit at Spring CES are some of the leading names in the convergence marketplace: Zenith, Thomson, DirecTV, JVC, Curtis Mathes, Recoton, Casio and Cobra to name a few.

Survey says

Consumer research conducted by the Consumer Electronics Manufacturers Association (CEMA) earlier this year shows that consumers are interested in - and willing to buy - converging products. A full 31 percent of survey respondents expressed a strong interest in buying a combination television and personal computer (TV/PC). Of those interested in purchasing a TV/PC, 59 percent said they would conduct word-processing on the

(Continued on page 60)

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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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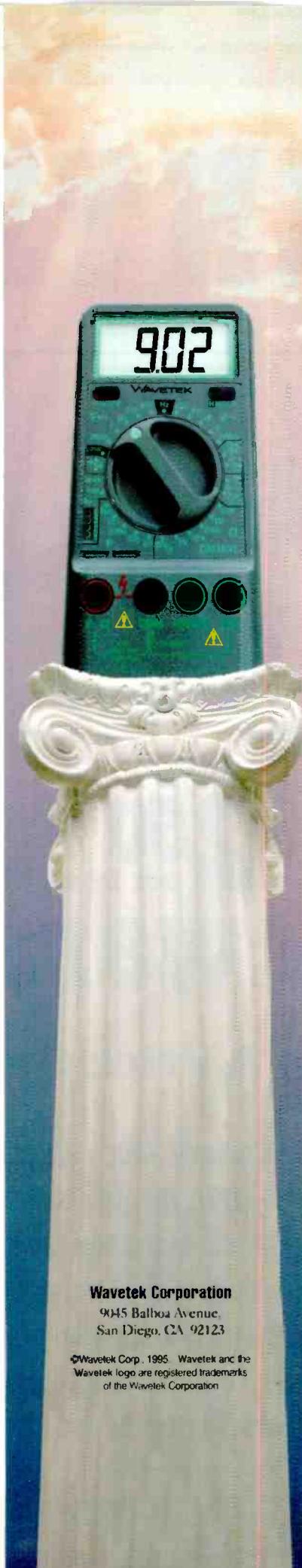
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Servicing VCR motor problems

By Homer L. Davidson

A defective VCR motor can cause a variety of problems. It may cause the VCR to shut down, load improperly, change speeds, or fail to turn on altogether. A leaky or open motor driver IC can cause intermittent, erratic, or otherwise improper speed control, resulting in unwanted changes of tape speed in the VCR. Malfunctions in components related to the motor circuits can result in many different motor problems, which may make the service technician think that the problem is a defective motor.

A defective VCR tape loading motor may stop in the middle of tape loading, cause slow operation, or it may erratically eject the tape. When the tape will not play, suspect a loading motor. Check the loading motor when the supply reel turns for a few seconds and then shuts off. Suspect a defective motor when the tape will not unload in the VCR. A broken drive belt will prevent the tape from loading into the VCR (Figure 1).

Replace the defective capstan motor when you observe a change of speed in the play mode. Suspect an open motor winding, improper supply voltage, motor fuse, or a defective motor driver IC when the capstan motor will not rotate. Usually, an unwanted change in capstan speed results from a defective servo or driver IC and speed control circuits.

It may be necessary to replace the lower drum or cylinder when the drum motor will not rotate. A VCR in which there is a defective drum or cylinder motor may load the tape and then shut down without playing. If a VCR that you are servicing has symptoms such as no drum or cylinder rotation or excessive or erratic speeds check for poor connections to the cylinder, improper voltage, or a defective main microprocessor.

Motor supply sources

The capstan motor moves the tape across the tape heads at constant speed. A defective capstan servo circuit or motor can affect both picture and sound in the

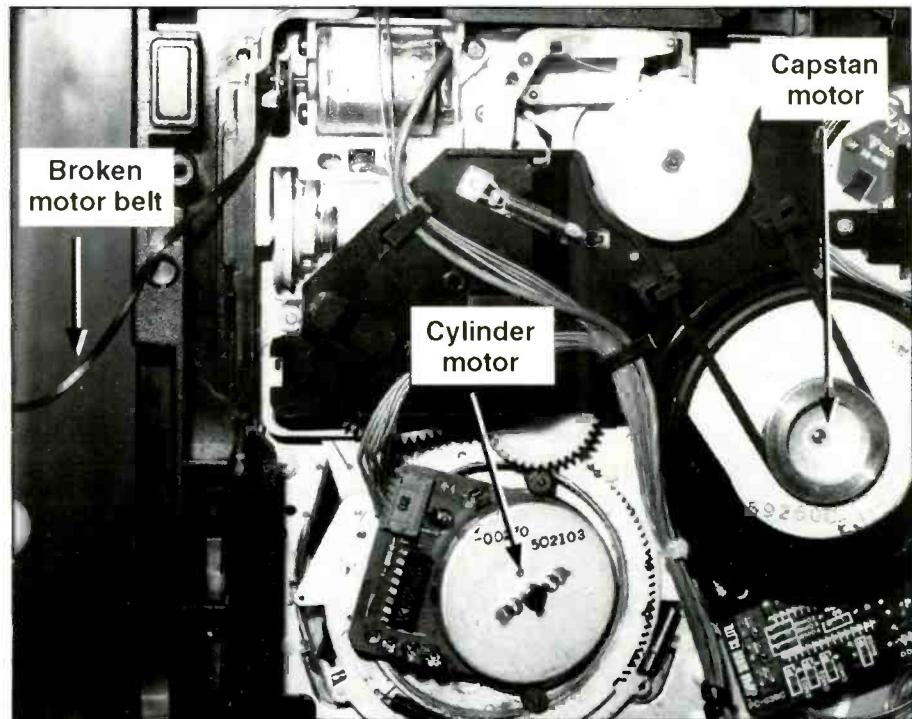


Figure 1. If the VCR won't load a tape, check for a broken motor belt.

VCR. If the sound is too fast or slow, suspect problems in the capstan circuits. Usually, the capstan speed is controlled with a speed control, phase control, and speed select circuits. Wow and flutter sounds may result from a defective capstan motor or servo circuit.

Check the voltage applied to the motor terminals. Incorrect voltage may be caused by a defective driver integrated circuit or servo section. Compare the voltage that you measure with the voltage specified on the schematic.

To determine for sure whether the problem is in the motor or in the motor supply circuits, connect an external dc voltage source to the motor terminals, to see if the motor rotates. Before connecting the external supply to the motor, disconnect at least one of the motor leads from the circuit. If the motor fails to turn with the external supply connected, measure continuity across the motor terminals to see if a motor winding or one of the terminal leads is open.

A cylinder or drum motor rotates the video heads at constant speed with respect

to the tape movement (Figure 2). If the drum motor does not rotate, check the voltage across the motor terminals. Suspect a defect in the motor drive or servo IC when the drum will not rotate. Inject external voltage to the cylinder motor terminals to see if the motor begins to turn. If the motor rotates, suspect the drum motor circuits. If not, check the motor continuity with the ohmmeter.

The loading motor loads and unloads the tape. When the tape will not load, suspect a defective loading motor, broken belt or gear assembly, and loading motor circuits. The loading motor mechanism may be belt or gear driven. Often, the loading motor is driven by a loading motor driver IC. Check the voltage applied to the motor terminals. Apply external voltage to the motor terminals (after disconnecting at least one lead) to determine if the motor rotates or if the motor drive circuits are defective.

Loading motor problems

If the tape is slow in loading, ejects tape slowly, stops in the middle of loading, or

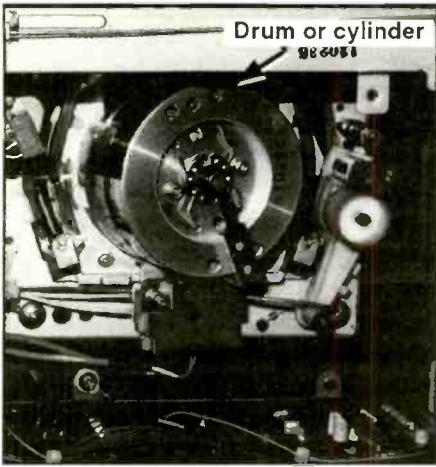


Figure 2. The cylinder or drum motor rotates the video heads at constant speed with respect to the tape movement.

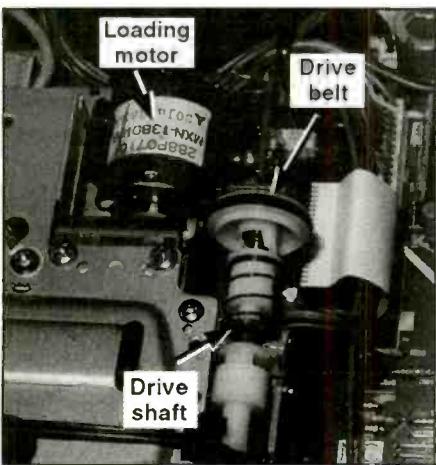


Figure 3. If the VCR makes mechanical noise, check the drive belt, gears and loading motor.

if the loading motor drive IC is extremely hot, suspect that the loading motor is defective. Of course, a leaky driver IC may run red hot and cause the motor to fail to rotate. Check for a defective loading motor if the VCR will not play or load the tape. Suspect a defective loading motor or driver IC when the supply reel turns for a few seconds and then shuts off.

Check for a defective loading motor when the VCR shuts down and will not accept tape. A defective loading motor may change speeds and produce erratic loading. Intermittent load and unload may be caused by a defective loading motor or drive belt. A foreign substance jammed in the VCR opening may prevent the unit from loading.

Loading motor related symptoms

A worn or cracked loading belt may be the cause of problems in loading of the tape. Failure of the VCR to load the tape

may be caused by a broken or worn belt or a foreign object lodged in the belt path. Check for a defective drive belt when the tape is stuck and will not move. The VCR may operate in fast forward with no reverse action, and then shutdown if the loading belt is defective. If you hear a grinding noise when you first turn the VCR on, suspect a loading motor or drive belt (Figure 3).

Intermittent or erratic loading may be caused by a broken or jammed gear assembly or cassette housing. When the VCR loads and unloads intermittently, suspect a bad timing gear or loading bracket. Replace the loading motor mode cam assembly in cases where the VCR fails to rewind, or attempts to load and then shuts off.

In cases where the tape loads partially, but does not load completely up to the heads, replace the master cam gear. If the unit will not accept the tape, or ejects the tape after the cassette is inserted, replace the link gear from the loading motor to the cassette carriage.

Check the timing gears when the VCR will not load the tape. If the tape will not load correctly, check and replace the carriage link gear assembly.

If the loading motor rotates continuously, check for a leaky or shorted loading motor drive IC. If the carriage will not load and the VCR occasionally shuts off during loading, replace the motor control IC. Suspect a defective loading motor drive IC when the tape appears stuck and will not move.

If the VCR will not load, and there is no drive voltage to the loading motor, check the motor drive IC. If the VCR will not load, rejects tape, and sometimes plays, and then goes into the rewind mode, replace the control system or servo IC. Check for a defective loading motor IC if the loading motor runs in the reverse mode but not in the forward mode.

Suspect a defective cassette control switch or defective motor when the VCR will not load or play. Check for an open fusible resistor in the motor circuits if the unit will not load. When the tape will not load, check for a defective cassette-in switch or bent cassette loading bracket.

RCA VLP900—No loading action

The cassette would not load in the RCA VLP900 VCR. In this unit the servo con-

trol IC controls both cylinder and capstan motors. The IC in this case was normal, so the most likely location of the trouble was in the loading motor drive circuits. Results of continuity tests at the motor terminals and at CN903 were normal (Figure 4). I measured the 9V and 12V sources at pins 1, 2, and 8, respectively. The voltages at pins 3 and 7 in the load and unload modes were not according to the specifications. I replaced motor driver IC901 with the manufacturer's exact part number (M45453), which restored the VCR to proper operation.

Capstan motor problems

Failure of tape functions can be caused by a defective capstan motor or circuits. The VCR may shut down if the capstan motor is inoperative. Failure of the capstan to turn may be caused by an open motor winding, bad motor socket terminals, an open fuse, or a source voltage that is not within specification. A noisy capstan motor may require lubrication or replacement. If the capstan motor does not operate but the voltage at its terminals is within specification, check for continuity of the motor windings.

A defective capstan motor may vary in speed, or produce intermittent operation. If the capstan motor is rotating too fast, check to see if the voltage applied to the motor terminals is excessively high. If rotation of the capstan motor is erratic or intermittent, it may be necessary to replace both the capstan motor and the motor driver IC. If the driver IC is leaky or shorted, you may find that the motor is defective as well. Always replace the capstan motor with the exact part number.

Capstan motor related problems

If the capstan motor does not rotate, check the motor driver IC as well as the motor itself, and replace it if it is defective. Another possible cause of failure of the capstan motor to rotate is an open fuse in the motor circuits. Measure for correct voltages at the driver and servo ICs if the capstan does not move. Replace the capstan driver IC when the capstan motor runs continuously.

If the speed of the capstan motor cannot be controlled, the problem may be a defective driver IC. Replace the motor driver IC when capstan runs for a few seconds and shuts down.

Check for open capacitors, transistors

ES&T Calendar

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April 3-4, 1997
Orlando, FL
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CES Mobile Electronics - The 12-Volt
Educational Forum
April 4-6, 1997
Atlanta, GA
703-907-7674

Support Systems Expo
May 14-15, 1997
Boston, MA
207-846-0600

Spring Comdex/CES Orlando
May 23-25, 1997
Orlando, FL
703-907-7600

Spring CES '97 co-located with
COMDEX/Spring WINDOWS
WORLD
June 2-5, 1997
Atlanta, GA
703-907-7674

CES Habitech '97 - The Home Systems
Trade & Training Show
June 24-26, 1997
Dallas, TX
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NESDA 47th/ISCET 27th/ and NIAS
5th Annual National Professional
Service Convention and Trade Show
August 4-9, 1997
Las Vegas, NV
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CTIA Breakaway '97
September 18-20, 1997
San Diego, CA
702-268-1818 ext. 310

Personal Computer & Electronics Expo
October 16-19, 1997
Uniondale, LI, NY
800-886-8000

Networks Expo Dallas/Windows
World
October 29-31, 1997
Dallas, TX
201-346-1400, ext. 145

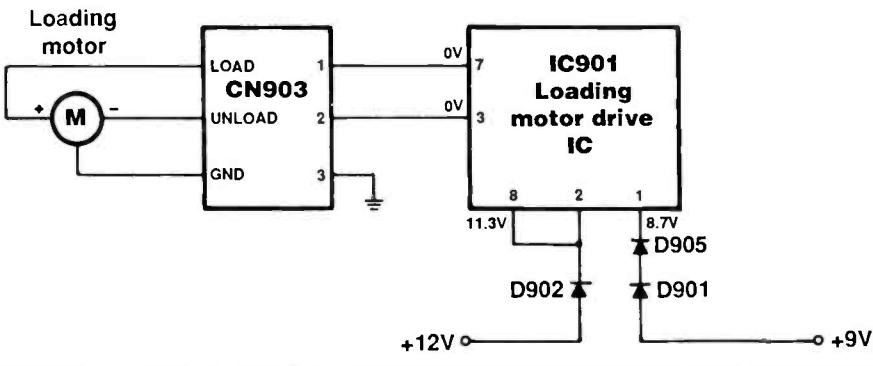


Figure 4. If the problem in a VCR is failure to load a tape, check the motor drive voltage. In this RCA VLP900 VCR, the motor drive voltage (measured at pins 3 and 7 on the motor driver IC (IC901)) was out of specification. Replacement of IC901 with an exact manufacturer's replacement part corrected the problem.

and IC in capstan motor circuits if the motor runs continually or can't be controlled. Suspect a capstan motor or the driver IC if the motor operation is intermittent, or if the motor suddenly stops rotating. Excessive capstan speed may be caused by a shorted electrolytic capacitor on the servo board. Check all components on the servo board if the capstan appears to be operating too fast.

When the VCR begins to play and suddenly stops, check for a defective mechanical position switch. You may have to replace the capstan C.B.A., when the motor will not rotate. Check for poor soldered socket connections when the motor speeds up or slows down, in either play or record modes. It may be necessary to replace a defective bracket assembly in order to correct capstan motor problems. An open capacitor in the regulated power supply can cause motor interference in the picture. Replace the defective motor with interference in the picture.

RCA VLT650HF—No cylinder or capstan movement

A customer complained that their VCR didn't operate at all. Observation of operation of the unit revealed that neither the cylinder motor nor the capstan motor was turning. Because both motors were inoperative, I suspected the servo IC (IC604). I checked the +5V and +12V sources at pins 41 and 21 respectively. There was no motor drive voltage to either motor. The voltages at the loading motor IC902 pins 9 (load) and 12 (unload) were both zero. This pretty much confirmed that the servo

IC was the cause of the problem. Replacement of this IC solved both motor rotation problems (Figure 5).

Cylinder or drum motor problems

If the tape loads and the drum rotates, and then the VCR shuts down when you place the VCR in play mode, suspect a defective drum motor. If the cylinder rotates and shuts off, check the Hall effect generator circuits and connections, before replacing the drum motor. Replace the cylinder motor if the picture jitters and you see intermittent lines at the bottom of the television screen.

In a Fisher FVH916 VCR, the VCR loads and unloads, has rewind and fast forward, but will not play. The problem is most likely an open drum cylinder P.G. coil. When the drum will not rotate, check the drum CTL voltage. If this voltage is present, troubleshoot the servo IC. You may have to replace the servo IC when the drum will not rotate.

Cylinder motor related problems

If the problem is failure of the cylinder or drum to rotate, check to see if the supply voltage is correct, and check for problems with the drum IC, or poor motor cable connections. When the cylinder motor will not start, check for poor terminal connections on driver or servo ICs. You may have to replace the driver or servo IC if there is no cylinder movement. Check for an open fuse when either the cylinder or capstan motors will not rotate. Check for open resistors in the drum circuits when the drum will not rotate. If the

head will not rotate, and you measure no drive to the lower cylinder, suspect poor soldered connections in the power circuits. Check for open electrolytic capacitors in the power circuits when the drum motor will not spin.

If the cylinder motor runs too fast, or appears intermittent, check for a defective cylinder speed adjustment or a bad spot on the speed control. For intermittent operations, check for bad connections of the motor plug and socket of the lower cylinder assembly. Replace IC motor driver or servo IC when the drum motor runs too fast. Irregular cylinder speed may require the cylinder or drum circuit board assembly replacement. Check for defective diodes and transistors when the drum motor has little torque. Replace the main microprocessor when the cylinder motor rotates too fast.

RCA VLP900—No cylinder motor rotation

The complaint about the RCA VLP900 VCR was that it sounded like it was operating, but there was no picture. Observation revealed that the cylinder motor wasn't rotating. Since both the cylinder and capstan motors operate from the system servo control IC801, and the capstan motor was operating, I assumed that IC801 was normal.

Voltage measurements were fairly normal on the cylinder drive motor IC505, except to the V, W, and U motor windings (Figure 6). Improper voltage was found

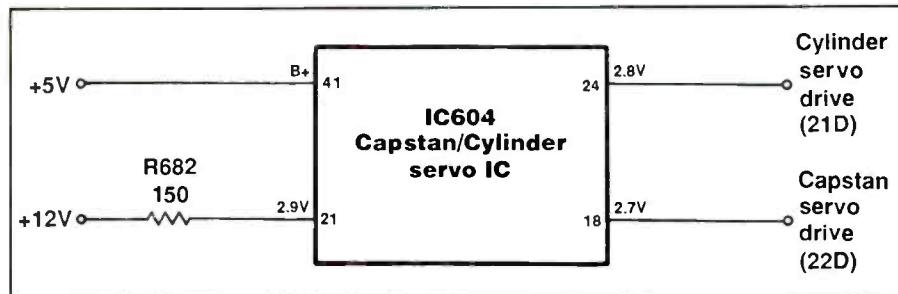


Figure 5. In this RCA VLT650HF VCR, the problem failure of rotation in both the cylinder and capstan motors. Voltage checks revealed that IC604 was defective. Replacement of this IC restored the VCR to proper operation.

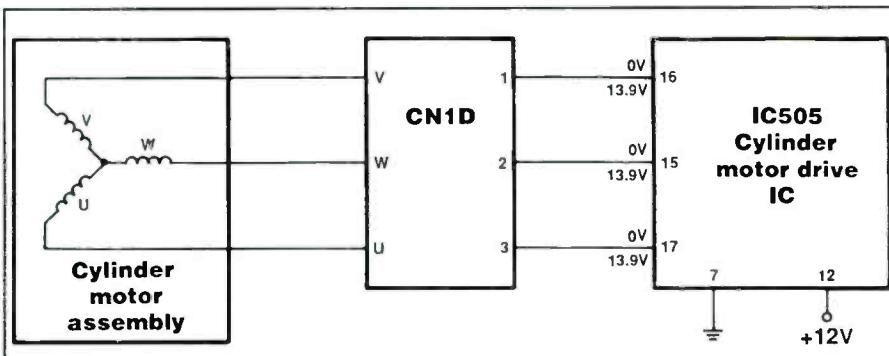


Figure 6. The cylinder in this RCA VLP900 VCR did not rotate. Replacement of IC505 solved the problem.

at pins 15, 16, and 17 of IC505. I replaced IC505 with an exact manufacturer's replacement (HA13434NT). This solved the cylinder motor rotation problem.

In another VLP900 VCR, with no capstan or cylinder rotation, the contacts of relay PL701 were bad. Cleaning the relay contacts solve the problem temporarily, but the correct fix for this problem is to replace the relay.

Conclusion

Although motors within the VCR can cause problems, do not overlook motor driver or system control ICs before replacing the motor. Defective reel motor circuits in some VCRs can be caused by defective zener diodes. Most motor problems can be solved by measuring voltages at the driver IC and motor, and checking continuity of the motor winding. ■

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New technology update

By The ES&T Staff

(Based on press materials provided by the respective companies)

Nobody ever said that servicing would be easy. On the other hand, nobody ever said it would just keep getting harder. Unfortunately, all of the advances in electronics technology and the improvements to existing electronics technology keep expanding and changing the scope of consumer electronics service, effectively providing further complications for even the most capable servicing technician.

For example, many consumer electronics servicing technicians wanted nothing more than to live out their careers servicing TVs and maybe a few VCRs. They wanted nothing to do with computers in any way, shape or form. And many were doing pretty well too, until the x*!!@%\$*\$ manufacturers started putting computers into everything.

As if to add insult to injury, the engineers at the consumer companies came up with compact disc players, which are really nothing more, or less, than sophisticated data processing machines. Then the blankety-blanks introduced digital satellite systems. And now, with certain TV sets, all adjustments are made by using a computer-based device to reset bits in an EEPROM (electrically-erasable programmable read-only memory).

It's enough to make a dyed-in-the-wool analog electronics guy cry. And I suspect it sometimes does.

There are compensations

There's no question about it; being a consumer electronics servicing technician in the technological climate that exists today requires that you acquire the equivalent of a new technical degree every decade or so. Maybe more.

On the other hand, for the consumer, all of this technological advancement has meant better, larger, sharper, brighter pictures, more accurate sound (all at prices that either remains stable or even come down), and a huge increase in available programming, and more outlets from



Figure 1. With this portable DSS system, consumers will be able to watch satellite TV programs from just about anywhere they want to.

which to acquire programs. And for the technician, it means that, in some cases, he can tweak the performance of a TV or camcorder without removing a single screw from the case.

It just keeps coming

If you're still struggling with keeping up with all the new technology that has been coming down the pike, bouncing around and screaming at you for attention, brace yourselves. Here comes some more. The text that follows describes some of the technology that is being, or soon will be incorporated into consumer electronics products to further enhance their operation, and to make the lives of consumer electronics technicians yet more interesting.

Some new components

ITT Intermetall, a leader in quality digital signal processing based integrated circuits has announced two new chip additions to its flagship DIGIT3000 IC family. The new chips, VPC3200A/3201B and DDP3300A, offer TV manufacturers a cost-effective solution by supporting all

current display geometries, such as the new 16:9 wide screen format, and prevailing global video standards that include NTSC, PAL, SECAM and SVHS.

The VPC3200A/3201B processes any analog video signal while allowing non-linear, "panorama" aspect ratio conversion. With this capability, any picture format can be displayed full-screen on any format picture tube. Therefore, TV programs transmitted using the standard 4:3 aspect ratio can be enlarged on 16:9 wide-screen televisions (the 16:9 format will also be the standard format for future HDTV transmissions). The aspect ratio conversion is also applicable in the opposite direction for displaying 16:9 programs on standard 4:3 TV sets, as well as for other format conversions. The conversion feature can be easily implemented as a software option without having to change the chassis of a TV set.

With the new chip, all video processing and clock/data generation is derived from a single 20.25MHz crystal, replacing the need to use up to four crystals with traditional IC solutions, minimizing the application costs.



Figure 2. This radio frequency communications system will allow consumers to enjoy video and audio from their home entertainment system anywhere in the house. One model even comes with the ability to change channels, adjust volume, etc., from the remote location.

Y/C separation for PAL and NTSC and all of their substandards can be performed through an optional 2-line comb filter integrated in the VPC3200A. Both versions of the VPC are plug-in compatible.

The DDP3300A contains the complete digital video back-end and D/A conversion. Additionally, the chip provides a rich set of video, post-processing features including: contrast brightness and saturation, peaking, black stretch, gamma correction and digital color transient improvement (DTI).

The DDP3300A chip's features are combined with the insertion of additional RGB signals. These signals can be used for on-screen display functions like menus, closed caption, teletext and picture-inside-a-picture.

In addition to video processing, the DDP3300A chip provides tube controls for cutoff, white drive, and beam current limiting. Its H/V deflection capability supports 90-degree and 110-degree picture tubes with E/W compensation and generates a beam scan velocity modulation output from the digital YUV and RGB input signals.

Very few external components are required for application of the VPC/DDP chip set, which is designed in CMOS technology. It operates at 5V and is controlled via an I²C bus. Both ICs are housed in 68-pin PLCC (plastic leadless chip carrier) packages.

PCTV

Toshiba America Electronic Components, Inc. (TAEC) has announced two high-performance cathode ray tubes (CRTs) specifically designed for emerging PC/TV applications. Designated the 36V and the 32V, these new tubes provide the high contrast, high brightness excellent picture sharpness that these applications demand and can be used for both PC and TV display.

As digital television becomes mainstream, TV viewing is beginning to shift from a passive to an active experience. Applications such as home shopping, home banking, video-on-demand, remote education and web browsing are becoming a reality. "Toshiba believes that PC/TV applications such as Internet browsing on the family room TV will soon become a standard home entertainment activity," said Dan Ryan, sales engineer for display products, Electron Tubes, and Devices. "Standard NTSC picture tubes do not provide the necessary quality that consumers demand. The edges appear fuzzy and the icons look distorted. PC monitor color display performance is necessary for PC/TV applications."

Advanced features of PCTV

The new CRTs provide 800 x 600 resolution and feature a number of Toshiba's

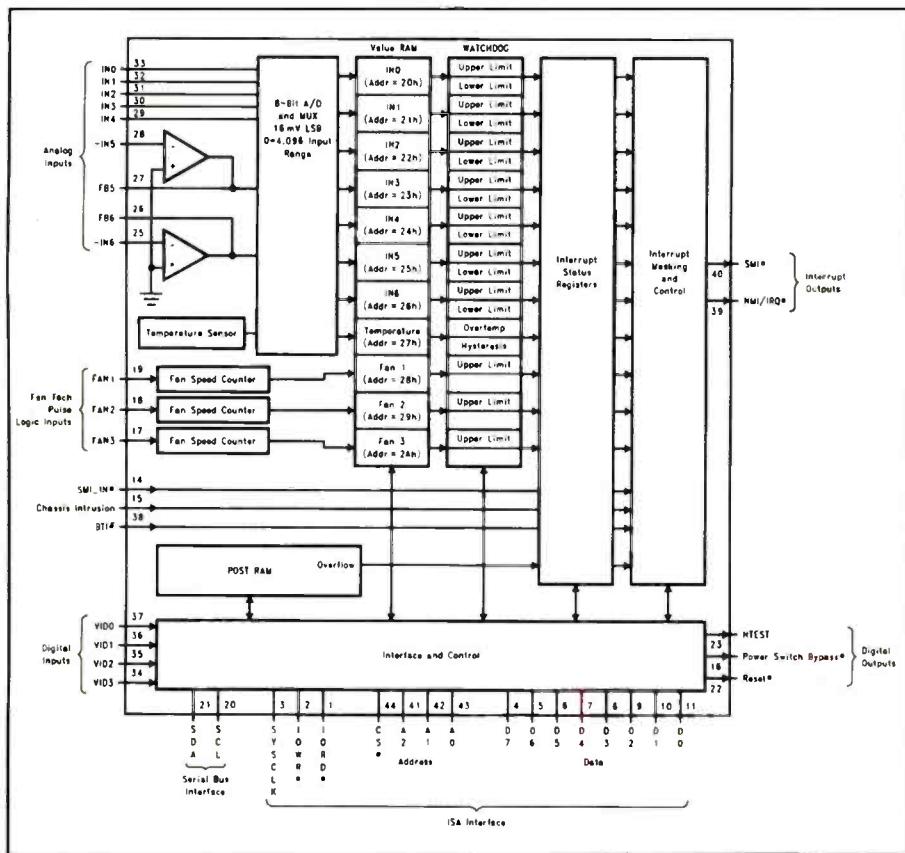


Figure 3. This IC, incorporated into a personal computer, will provide information to the information systems manager, or the personal computer service technician, that will let them know if any of the fans has ceased operation, or if the computer has overheated, or even if anyone has tampered with the case.

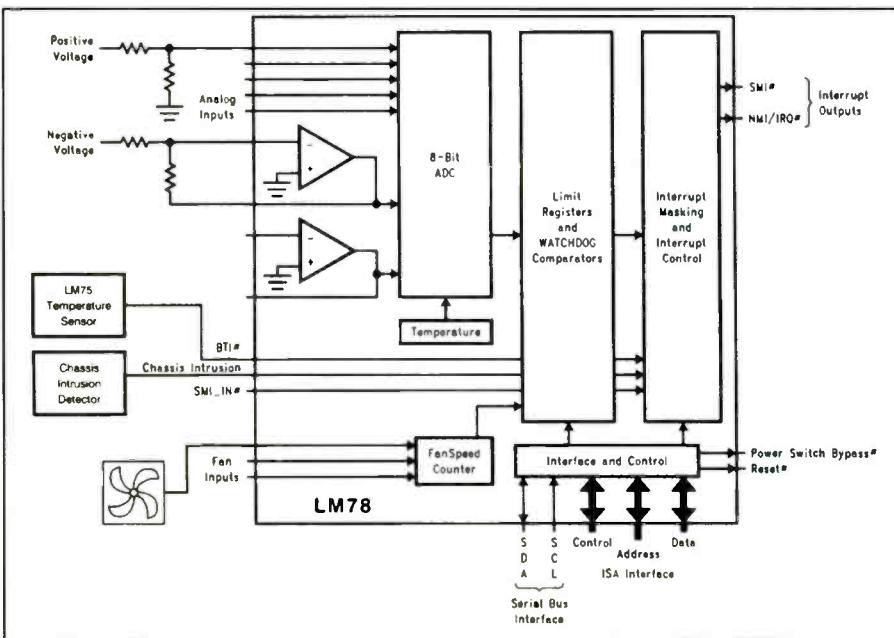


Figure 4. This is one possible configuration of the monitor IC in a personal computer.

latest technology developments, including an improved saddle/saddle-deflection yoke (S/S-DY), the DF-II dynamic focus electron gun with impregnated cathode and an INVAR mask.

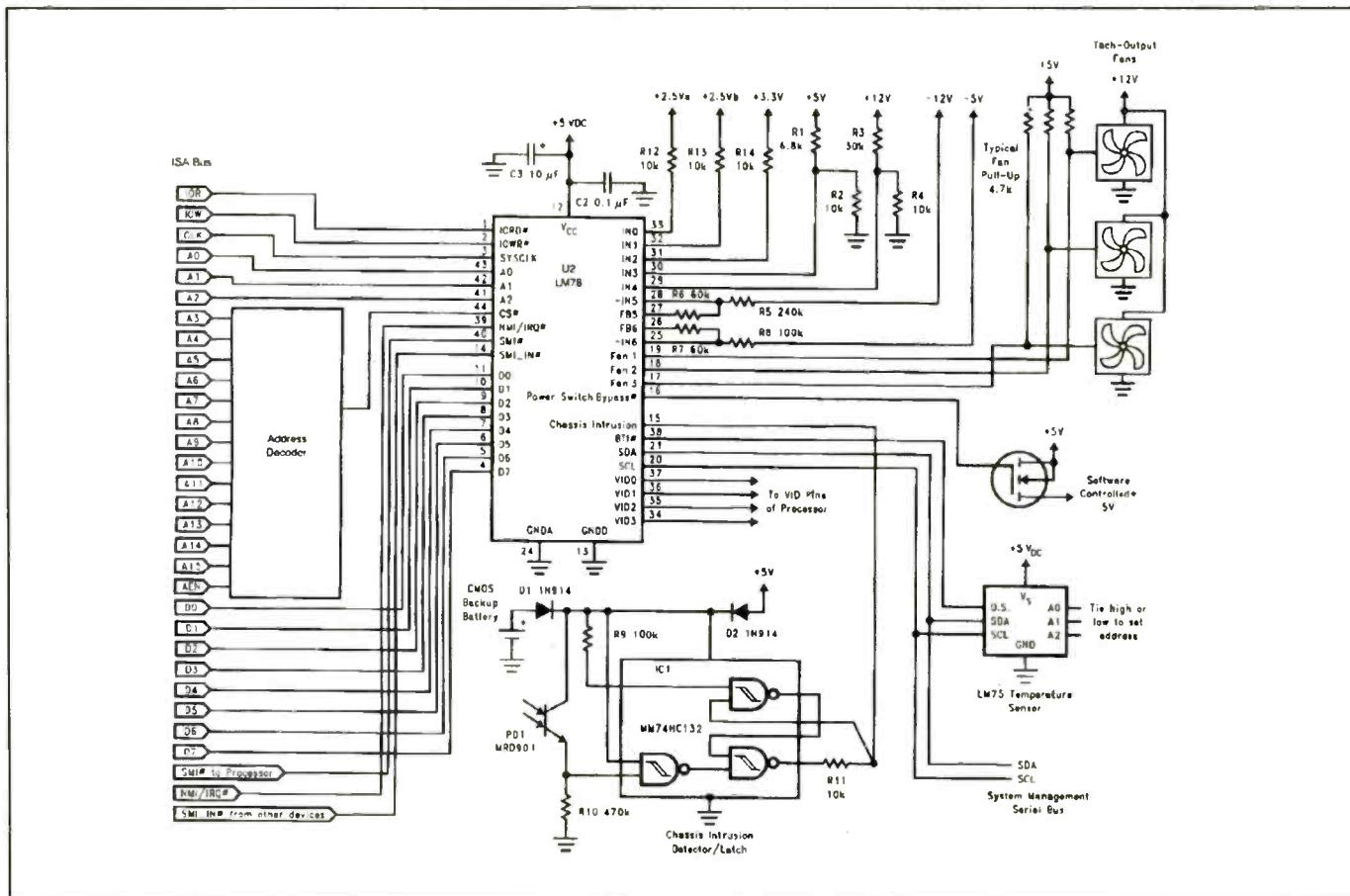
The improved saddle-type deflection yoke enables hi-scan (40kHz), suppresses rises in temperature, even at a wide deflection angle and high power operation, and achieves optimum convergence and

distortion. The dynamic focus (DF) II electron gun offers excellent sharpness, in both text and moving pictures, across the entire screen. The impregnated cathode allows high current loading and a longer life time. The INVAR mask has only one tenth of the thermal expansion coefficient of an iron mask which is essential to avoid discoloration resulting from mask doming in freezing images.

Digital video (versatile) disc components

A complete DVD logic decoder chipset is now available from Toshiba America Electronic Components, Inc. (TAEC). The six-chip set provides consumer electronics hardware manufacturers with the core circuitry for a basic DVD decoder, including the copy protection processor. A reference design is also available for a fully DVD-compliant decoder board with a PCI bus interface.

The chipset is intended for use in a decoder board that allows DVD-ready personal computers connected to a DVD-ROM drive to playback titles that take



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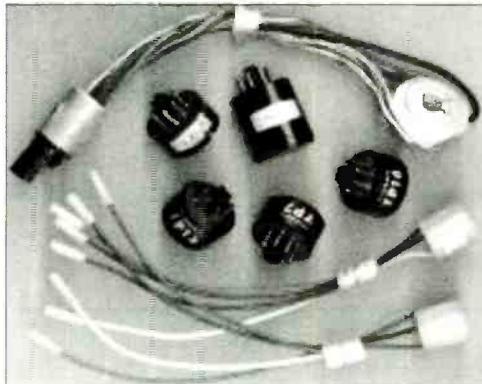
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Technical specifications of the Toshiba PCTV CRT

Product Name:	32V Multimedia CRT
Bulb (Panel and Funnel):	FS
Deflection Angle:	110 degrees
Neck Diameter (mm):	32.5
SCN PH:	0.80
Resolution (HxV):	800x600
Mask:	INVAR
Gun:	DF-II
Deflection Yolk:	S/S
fH:	48kHz
Mechanical:	useful screen diagonal: 806mm (minimum)
Overall screen area:	3118cm ²
Mass:	49kg
 Product Name:	 36V Multimedia CRT
Bulb (Panel & Funnel):	FS DT
Deflection Angle:	110 degrees
Neck Diameter (mm):	32.5
SCN PH:	0.90
Resolution (HxV):	800x600
Mask:	INVAR
Gun:	DF-II
Deflection Yolk:	S/S
fH:	40kHz
Mechanical:	useful screen diagonal: 902mm (minimum)
Overall screen area:	3905cm ²
Mass:	59kg

advantage of MPEG2 compression. Video segments that may be contained in a broad range of DVD titles ranging from movies and games to edutainment are compressed and encoded to the MPEG2 format for visual images and the Dolby Digital (AC-3) 5.1 channel format for audio signals. To allow playback of these titles on a personal computer equipped with a DVD-ROM drive, a decoder function is added to the system.

"Toshiba has taken a forward-looking approach to enabling the overall DVD market by providing a complete DVD decoder IC solution to facilitate the market launch of our DVD-ROM drives," said Amir Naghavi, senior director of multimedia marketing for TAEC. "The chips in our decoder solution are proven devices, in production for use in Toshiba's DVD players."

Functions of the DVD chipset

The chipset consists of six integrated circuits, which break down the digital sig-

nal into component elements and perform logic decoding functions for complete DVD feature support. The video image data stream is separated and decoded by the MPEG2 decoder. Sub-picture signals (such as captions) and audio signals are also separated for decoding by the video processor. The decompressed video signals are encoded as NTSC signals and output as analog signals. The chipset supports private audio stream buffering, and audio signals can be output as both analog and digital signals. Decoding of the audio signal in the Dolby AC-3 format is handled by an additional audio decoder chip available from third-party-sources. The six ICs and their major functions are listed below.

- Copy Protection Processor (TC-6807AF): Performs key authentication and descrambles encrypted data stream from copy protected materials.
- MPEG2 Video Decoder (TC81201F): This IC separates DVD program stream into video, audio and sub-picture streams;

provides MPEG1 and MPEG2 video decoding.

- Video Processor (TC90A09F): This IC performs sub-picture stream decoding and video mixing with MPEG2 decoded video.

- NTSC Encoder (TC6802AF): Accepts decoded digital video format and outputs it in NTSC digital format.

- AC-3 Audio Interface (TC6803AF): This IC provides A/V synchronization and audio stream buffering; converts data stream to format required by third party AC-3 audio decoder.

- Audio Output IC (TC9425F): Receives output from AC-3 audio decoder; provides analog and digital audio output. See sidebar, Toshiba DVD System IC Functions, for additional information.

Advanced features of the DVD chipset

Toshiba's chipset supports playback of all four DVD disk formats. These include the basic single-sided, single-layer 4.7-gigabyte (GB) DVD; the single-sided, dual-layer 8.5GB DVD; the double-sided, single-layer 9.4GB DVD; and the double-sided, dual-layer 17GB DVD which is expected to be introduced in the near future.

The chipset supports a wide range of technological innovations and features characteristic of DVD systems, which store data at seven times the capacity of a CD-ROM. Advanced features of DVDs include MPEG2 decoding of moving images with a resolution of 720x480 pixels and high-level interactivity based on seamless replay of data dispersed throughout the disk. Interactive applications will include movies with multiple endings and sports videos offering a choice of viewing angle and the ability to call up player profiles.

DVD is expected to create huge markets spanning everything from industrial use to home entertainment. The DVD decoder chipset and decoder board reference design will contribute to market development by enabling personal computers to process the large volumes of data contained in high quality video and sound.

Reference design for DVD

The reference design, developed in conjunction with Paragon Technology, Inc., provides all DVD-Video decode

Toshiba DVD logic decoder IC functions

Part Number: TC6807AF

Product: Copy Protection Processor

Function: Conforms to the latest DVD copy protection requirement; performs key authentication and descrambles encrypted data stream from copy protected materials. Pass-through mode for non-copy protected materials. Direct interface to TC81201F MPEG2 video decoder.

Package, I/O: 60-pin QFP5V I/O interface

Part Number: TC81201F

Product: MPEG2 Video Decoder

Function: Dedicated 27MHz MPEG2 video decoder for DVD provides system stream parsing and MPEG2/ MPEG1 video decoding. Accepts DVD program stream that includes MPEG2/MPEG1 video stream, MPEG audio stream, private AC-3 audio stream and sub-picture stream at 40Mb/sec. max. Supports multiple vertical and horizontal filters, including 8/9 filter for square pixel at NTSC for PC VGA monitor, and supports Pan & Scan and Letterbox filters for 16x9 or 4x3 aspect ratios. Provides YUV 4:2:2/4:2:0 and 8-bit/16-bit digital video output.

Package, I/O: 160-pin QFP3.3V, 5V tolerant I/O

Part Number: TC90A09F

Product: Video Processor

Function: Performs sub-picture stream decoding and video mixing with the MPEG2 decoded video. The sub-picture

stream is decoded according to the run-length algorithm with 16 color palettes and 16 levels of transparency support. Provides interfaces to external OSD devices and ITU-R656 digital video output to an external video encoder.

Package, I/O: 144-pin QFP3.3V and 5V I/O interface

Part Number: TC6802AF

Product: NTSC Encoder

Function: Accepts ITU-R656 format digital input and provides Y/Cb/Cr 10-bit digital output with Analog Copyguard function.

Package, I/O: 100-pin QFP3.3V, 5V tolerant

Part Number: TC6803AF

Product: AC-3 Interface

Function: Provides A/V synchronization and audio stream buffering and converts parallel data stream to serial data output needed for third party AC-3/MPEG1 audio decoder.

Package, I/O: 60-pin QFP3.3V and 5V I/O interface

Part Number: TC9425F

Product: Audio Output IC

Function: Analog audio stereo output IC, includes built-in 8-times oversampling digital filter for digital audio output and 2-channel SD modulation circuitry for analog audio output. Includes PLL and VCO circuitry to generate clock timing for 44.1kHz/48kHz audio sampling frequencies.

Package, I/O: 60-pin QFP5V I/O interface

functions on a board that meets the PCI 2.1 standard, and is 100 percent compliant with the DVD Book 1.0 specification. High quality video can be produced on the computer monitor through the digital video output (either PCI bus or Video Port Connector), and connection to a TV is also enabled through the analog video output (NTSC, S-Video). Audio output provides two analog channels which can be connected to a PC-based audio system, and a digital output for the Dolby Digital (AC-3) 5.1 channel, which requires an additional AC-3 amplifier. See sidebar for additional details on the specifications of the decoder board reference design.

Signals from the next room or outerspace

A company called RF-Link Technology offers a couple of interesting products. We haven't seen them or tried them, but if they work as the company claims, they might be of interest to service centers whose customers ask them to install extensions of their home entertainment systems, or inquire about receiving satellite signals while they're away from

home. The next two items describe these products in some detail.

A portable DBS system

This portable direct broadcast satellite (PDBS) dish (Figure 1) combines low cost, fast, easy installation, and total portability according to RF-Link. With a suggested retail price of \$229.95, the PDBS makes viewing of any direct to home (DTH) satellite channels possible almost anywhere: vacation home, recreational vehicle, tailgate party, eighteen wheeler, ski lodge, beach, camp site, or wherever the viewer wishes.

The company says that their main focus when designing wireless consumer electronics products is always on ease of use. The setup of the PDBS follows that principle. There are no loose nuts and bolts to keep track of, and no tools required for assembly. The components for the system come in a high-impact-resistant ABS casting molded to safely house the 14-inch parabolic dish, highly sensitive low-noise block feedhorn (LNB), the user's own integrated receiver decoder (IRD), and all required components. The dish has a pro-

tective powder coating with an environmentally sealed housing to provide all-weather viewing.

Set up of the system is simple, the manufacturer says. In-house tests of new users show that total time from opening the case to viewing a program is less than five minutes. Mounting is made easy by the use of a suction cup that safely attaches to the hood of a car or RV. If a flat, smooth, surface is not readily available, the dish can be mounted using a convenient C-clamp. For individuals who have more specific mounting needs, there is a universal mounting accessory kit.

Once mounted, the dish is aligned by using a level, a compass, and a proprietary guidance mechanism, which, the company says, everyone will find straightforward and simple. The satellite azimuth and elevations for this alignment can be found in the owner's manual. Though the system uses a 14-inch parabolic dish, it has performance characteristics that are virtually identical to those of an 18-inch dish, says the manufacturer, and will receive all of the hundreds of DTH channels with equal clarity.

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 20GT324JX2 3763
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 CH13M15 3774
 CH19M6 3771
 13H-M60 3774
 13H-M100 3774
 13H-M150 3774
 19H-M60 3771
 19H-M100 3771
 19H-M150 3771

SONY
 KV-13M30 3769
 KV-13M31 3769
 SCC-J84A-A 3769
 SCC-J84E-A 3769

Major specifications of the DVD decoder board reference design

Function Description

System decoder: DVD video stream, MPEG2, MPEG1
 MPEG video decoder: Video resolution level: maximum 720x480 pixel3/2
 Pulldown: (conversion from 24 frames/sec. to 30 frames/sec.)
 Audio decoder: Dolby Digital (AC-3) (mix down from 5.1 channel to 2 channels)

Sub-picture decoder: Decode of sub-pictures defined in the DVD video format
 Bus interface: PCI (PCI 2.1 compatible)

Data transfer to the DVD board by master DMA

External interface:

- Digital video output connector-
- Video format: YUV4:2:2 (ITU-R601)
- Bus width: 8 or 16 bits
- Analog video output-
- Composite video output (NTSC)
- S-Video output
- Digital audio output-
- Dolby Digital (AC-3) output
- Analog audio output-
- Stereo (2 channel: L/R) output

Display control function: Letterbox conversion (for widescreen TV software)

Digital video signal adjustment: (luminance) and UV (color) signals

Size: PCI half-size

This system is designed to be able to be used with all IRDs currently on the market, including those from RCA, Sony, GE, ProScan, Toshiba, Uniden and Echostar. Each of these IRDs will fit snugly in the carrying case.

Entertainment center in any room of the house

According to RF-Link Technology, their product, Wavecom Sr (Figure 2), approved by the FCC in August 1996, enables television viewers and music listeners to enjoy crisp, interference-free stereo audio and video reception anywhere in or around their homes or offices without having to run wires up walls or under carpets. A built-in remote control extender even allows consumers to change the channel, adjust the volume, or control their VCR, satellite IRD, laser disc player or CD player from anywhere with their existing remote control.

The system transmits the audio and video signal at a frequency of 2.4GHz, which penetrates walls, doors, ceilings and floors like magic, up to 300 feet away. According to the manufacturer, sample consumer groups have been unable to detect the difference between wired components and this system.

The Wavecom Jr provides the same function of transmitting the audio and video, but does not have the remote control capability.

The products consist of a small portable transmitter and receiver pair. They are compatible with any components that have standard audio and video input and output connections. Because they operate at 2.4GHz, these units avoid the crowded 900MHz band used by many cordless telephones and other wireless audio/video transmitters, says the manufacturer.

High-gain directional transmitting and receiving antennas instead of omnidirectional antennas are used to minimize interference from unwanted signals and eliminate the inherent problem of multipath. The remote control extender works by converting the remote control infrared signal to a radio frequency wave, and then back to infrared at the location of the equipment to be controlled.

Computer diagnostic IC

Some day in the future, a personal computer that you service may be able to tell you if it has overheated, if any of the power supply voltages have been out of spec, or if someone has tampered with the computer since you last serviced it.

The LM78 microprocessor system hardware monitor (Figure 3), a highly integrated IC capable of monitoring potentially hazardous, user-defined conditions within microprocessor based systems, is a recent addition to National Semiconductor's temperature-sensing family. The LM78 takes the product line to a new level of integration by combining key analog and digital monitoring functions, including temperature, voltage, fan speed and many key digital system signatures. It has the capability to communicate error conditions via the I²C or ISA interface, and can generate interrupts based on user-defined and programmed limits for key parameters. See Figures 4 and 5 for typical applications of this IC.

This device gives information technology managers, or service technicians, the capability to set "hazard warning limits" via watchdog registers for most key analog functions within the PC/server environment, enabling the generation of interrupts based on the performance of the computer system functions.

Key features of the diagnostic IC

Key features of the LM78 diagnostic IC include the following

- ±3C temperature accuracy, user programmable watchdog limits register for overtemperature conditions and temperature hysteresis,
- seven voltage monitoring analog inputs (0V to 4.096V full scale),
- Associated watchdog registers for each voltage input (high and low)
- Three fan inputs including two user-programmable inputs for speeds ranging from 110rpm to 8800rpm; one for fixed inputs from a standard 4400rpm tach output cooling fan,
- active-high chassis security input for detection of intrusion,
- board temperature interrupt (BTI#), for use with thermostat output temperature sensors, which may be located in strategic positions throughout the system.

The IC includes an 8-bit Delta-Sigma A/D converter with 7-input multiplex for high noise immunity in microprocessor environments. Also included are inverting op amps to accommodate measurement of negative power supplies. An on-board 32-bit POST RAM (power-on self-test RAM) allows the diagnostic IC to be among the first devices on the moth-

er board to waken and record the performance of other system parts during system boot-up.

Daunting but interesting

All of these technological advances will further enhance the consumer's experience in watching TV, using the per-

sonal computer, or listening to (or watching?) a favorite CD. They will also make the lives of consumer electronics servicing technicians somewhat more interesting. We figure that forewarned is forearmed, so we hope this information on some of this new technology will be useful, and we suspect it will be needed soon.

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CODE: ES92

Circle (68) on Reply Card

General software

By The ES&T Staff

There was a time, and it was just a few years ago, when articles in consumer magazines, and especially those that are shopping guides, recommended that potential purchasers of personal computers shop very carefully, to make sure that the software available for a particular computer was useful and relatively easy to use. Times have changed radically. The hardware choices have been pretty much narrowed down to IBM, IBM clones and Macintosh. Software available for both of these systems is truly useful, relatively inexpensive, and so varied that it fills shelf after shelf in the computer store or the discount electronics store.

Do you need to type letters, create newsletters, or even lay out a book or a magazine? Most word processors these days allow users to do all of those things and more including everyday communication chores.

Do you need to perform a lot of calculations, such as balance sheets, profit and loss statements, etc? A host of spread sheet programs will assist you in designing those forms, perform the necessary calculations, and even graph the numbers you create, and output it all in beautiful, colorful form on the CRT or printer.

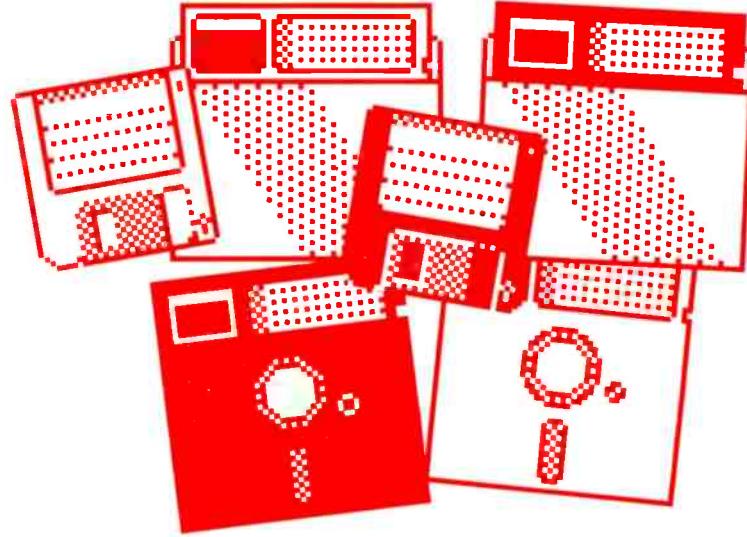
Or do you need to keep track of data: customer data, parts inventory, etc? Any of the database programs now available will allow users to store and retrieve this type of data and perform many other data handling functions.

Suites

A good way to not only get all of the big three in one package, but to get word processing, spread sheet and database software that works together so that you can easily move back and forth among them and share the same files is called using a "suite" of programs. A number of companies offer suites: Microsoft, Lotus and Claris, to name a few.

But there's more

The "big three" software types described above: word processor, spread-



sheet and database will handle a good chunk of the computer needs of the average user, but there are so many more tasks for which software manufacturers have devised software. For example, there are programs that are expressly designed to allow users to handle all of the finances in their personal lives, or in their businesses. One of these programs allows the user to keep track of all of the financial data that's part of their everyday lives.

For example, one such program, called Quicken, from Intuit, keeps track of your financial accounts: savings, checking, home mortgage, credit cards, stock portfolio, and more. Actually there's more than one program with that name: there's one for home use and another that you can use to handle business accounts.

Not only does one of these programs keep track of financial accounts, it also handles them at the same time so that at any time the user can request a statement of net worth and that information just falls out. Moreover, some banking programs, which we'll mention later, allow you to download checking or savings account data in a form that can be carried directly into a financial program.

Banking programs

If you haven't used one of these, you may be missing a good bet. My credit

union is set up so that customers can access their accounts directly via their computers. This allows customers to look up their current balances on any of their accounts, print out a statement of up to the last two months worth of transactions, or even download this data to input it to their financial software. This means that users don't have to wait for the end-of-month statement to balance their accounts. They can balance their accounts at any time.

Moreover, say that at the end of the month the checking account is being stretched a little thin in order to pay the bills you owe, but there's a surplus in savings. No problem. Just direct the computer to transfer funds from savings to checking to cover the checks you need to write. Of course, if the checking account is showing a surplus and you want to put you money somewhere where it can draw some interest, no problem. Transfers work the other way, too.

But paying bills by computer is yet another convenient capability of these software packages. The user can elect to pay any of his creditors directly by computer. Banks have a data base of companies to which customers may pay bills electronically. If one of your creditors is on the database, you simply select that company and tell the computer when you

want to pay that entity and how much. If that company is not on the bank's list, you can request that they be added.

If you have a bill that is the same every month, such as a mortgage payment, for example, you can make it a standing payment that's paid every month. That way you don't ever have to worry about making out a check, or even logging on to pay that bill. As long as there's enough cash in your checking account at the time of the month that that bill comes due, it's paid, automatically. It works kind of like one of those automatic debit authorizations, except that should you wish to cancel the automatic payment, you don't have to write to the bank 30 days in advance to cancel it. You simply go on line and delete this payment from your list.

A general purpose device

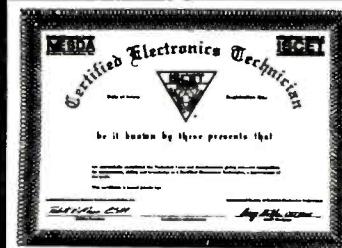
One of the wonderful things about the computer is that it is such a general-purpose information processing device. If some information-handling process is currently done manually, then most likely a program has been developed to allow the individual to perform the function using the power of a computer.

Do you need to type a letter, or many letters. The computer can help you do it faster. Do you need to perform lots of calculations. Again, the computer can speed up the work. Do you need to store, retrieve and format lots of data. The computer.

Besides all of that, computer software can store your recipes, handle your calendar of events, store all of your contacts, allow you to buy, store and use thousands of images of clip art, or create your own art, and much more.

The computer can help

Computers and their software have definitely changed the way people do their jobs and run their personal lives. They provide a number of features and functions that allow people to automate the work to be done and to look at the information they need to process in a variety of new ways. Consumer electronics service centers have such a broad variety of information processing needs that service center owners and managers should be constantly on the lookout for software such as that mentioned here. Using these programs can help make many of those difficult jobs a little easier. ■



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Sources of replacement parts

By Victor Meeldijk

Sometimes the hardest part of the repair is finding the parts needed. In this article we include sources that can help you find obsolete parts, Japanese parts, generic replacement parts and various repair parts. This updates the article that was published in December 1993.

The problem of obsolete parts is growing as the rapid pace of technology development causes even the most advanced products to become obsolete in a short period of time. The new product innovation cycle is only 3 to 4 years. The life cycle of parts is about five to six years (down from a 10 year availability).

There are many reasons that parts are discontinued, including:

- The technology used to produce the part is obsolete (a new technology is used to produce most of the product line).
- The devices are only selling in low volume (thus the fabrication facility could be better utilized to produce a part that is more profitable for the company).
- To transfer from one wafer fabrication process to another is too costly.
- There are technical incompatibilities in transferring the process to other wafer fabrication lines.

Corporate mergers cause product lines to be consolidated and redundant fabrication facilities are closed. (Equipment upgrades, and common testers for components may also cause components to become obsolete if it is considered too costly to manufacture the device with the new equipment, or to write test software for the new test systems).

If you have to replace a part, or locate a source of supply for an existing device, there are organizations that track component availability, and issue notices of parts that are being discontinued. Various military and commercial organizations track component availability and help to locate obsolete components.

Some sources of obsolete parts are listed below. Aftermarket manufacturers plan for support of obsolete products for

at least 10 years after the device is discontinued by the original manufacturer.

Organizations that track part obsolescence

The Navy manages a Microcircuit Obsolescence Management Program (MOM) that identifies devices (by types and package styles) that are being discontinued by integrated circuit manufacturers, and provides alternate sources of the devices where possible.

In 1994, MOM notices were discontinued with the information forwarded to the GIDEP program for distribution.

Naval Air Warfare Center

Aircraft Division- Indianapolis
6000 East 21st Street
Indianapolis, Indiana 46219-2189,
Ms. Courtney Howie B/435
317-353-3768, or AV 369-3768
(remote computer bulletin board 317-
351-4991, or DSN 369-4991).

The MOM program became part of the Naval Surface Warfare Center, Crand Division and the Naval Air Warfare Center, and is now known as the Diminishing Manufacturing Sources (DMS) Technology Center. They can be reached at 1-800-DMS-4886. They now help in finding solutions to obsolete part problems to keep military systems operational.

Component Obsolescence notices are distributed by GIDEP, the Government and Industry Data Exchange Program, through their DMSMS (Diminishing Manufacturing Sources and Material Shortages) notices. Many manufacturers supply discontinued notices to GIDEP on their products (Texas Instruments uses this as their main way of notifying users of parts that are going to be discontinued). Information on the GIDEP program is available from:

Government and Industry Data Exchange Program

GIDEP OPERATIONS CENTER
P.O. Box 8000
Corona, CA 91718-8000
Obsolete parts, and new sources for

components, are also tracked by Electronic Buyers' News (in the "Last Runs" column):

Electronic Buyers' News

CMP Publications, Inc.
600 Community Drive
Manhasset, NY 11030-3875
Subscriptions (address changes):
Electronic Buyers' News
P.O. Box 2020
Manhasset, NY 11030-3875
(see the listings for magazines and technical publications, below).

Another organization that tracks obsolete parts is:

TacTech

Transition Analysis of Component Technology
22700 Savi Ranch Parkway
Yorba Linda, CA 92686
714-974-7676
FAX: 714-921-2715

This company offers the Defense/Aerospace industry an electronic military microcircuit information service. The elements for the networking service consists of a: 1) comprehensive microcircuit library (which includes alternate sources for parts and whether military qualified versions of a device are available); 2) weapon system usage library; 3) comprehensive discontinuance notification; 4) customer program impact; 5) a microcircuit life cycle projector system; and 6) a parts list risk analysis.

The service can be installed on a mainframe computer or accessed via a PC and a modem. A newsletter is also issued by the company.

Sources of Obsolete Components

Here is a list of some companies that manufacture devices discontinued by the original manufacturer:

American Power Devices

7 Andover Street
Andover, MA 01810
and:

69 Bennett Street
Lynn, MA 01905
508-475-4074
Fax: 508-475-8997

Industrial and military semiconductor devices; including Stabistors and multi-chip devices that are direct replacements for discontinued General Electric, Unitrode MPD series and Motorola MZ 2360 and 2361 series.

Calogic Corporation
237 Whitney Place
Freemont, CA 95439
510-656-2900
FAX: 510-651-1076, 3025

This company has purchased some obsolete product lines from different manufacturers. Manufacture some parts discontinued by Topaz, Intersil and Siliconix. Also make equivalents to National Semiconductor devices. Standard data book products, special items and military screening are available.

Central Semiconductor Corp.
145 Adams Ave.
Hauppauge, NY 11788
516-435-1110
Fax: 516-435-1824

This company offers surface mount Schottky rectifiers that can be used to replace the MBRS120 series that is no longer available from Motorola.

David Sarnoff Research Center
Subsidiary of SRI International
CN 5300
Princeton, NJ 08543-5300
609-734-2437, 2000
Fax: 609-734-2075, 2992, 2443
(SRI International)
333 Ravenswood Ave.
Menlo Park, CA 94025
415-859-3285
Fax: 415-859-2844

The GEM program (Generalized Emulation Microcircuits) is a result of an R&D initiative by the Defense Logistics Agency and the Defense Electronics Supply Center with the guidance and support from the Weapons System Improvement Group within the Office of the Secretary of Defense.

The GEM system has the capability to produce IC devices that are form, fit and function equivalent to original devices at a quality level that satisfies testing in accordance with MIL-STD-883C.

General Transistor Corporation
216 W. Florence Ave.
Inglewood, CA 90301
310-673-8422
Fax: 310-672-2905

This company manufactures transistors discontinued by such manufacturers as RCA and Motorola, and second sources other available devices.

GTE Microelectronics
77 "A" Street
Needham Heights, MA 02194-2982
1-800-544-0052
Fax: 617-455-2088

Obsolete parts are recreated using FPGA, Gate-Array, Standard Cell technology or by the design of a plug-in module. Whole obsolete PC cards can also be recreated. Devices manufactured in obsolete technologies can also be supported.

ISI- Ideal Semiconductor Inc.
46721 Fremont Blvd.
Fremont, CA 94538
510-226-7000
FAX 510-226-1564

Manufactures obsolete parts using wafers or tooling supplied by the original manufacturer. Devices can also be reversed engineered and emulated using standard cell devices. Microcircuits and semiconductors from a variety of original manufacturers, including AMD, Harris, National Semiconductor, IDT, Signetics, Quality, Samsung and Zytrex.

ITAC Hybrid Technology
Division ITAC Systems Inc.
3121 Benton Street
Garland, TX 75042
214-494-3073
1-800-533-4822

Manufactures high temperature (200C) operational amplifiers that can replace similar products discontinued by Burr-Brown Corporation.

Lansdale Semiconductor
2929 S. 48th St., Suite #2
Tempe, AZ 85282
602-438-0123
FAX 602-438-0138

Manufactures older technology products such as RTL, DTL, TTL and memory devices. Their product line includes devices formerly manufactured at the Signetics company closed bipolar wafer fabrication on line in Orem, Utah, and Intel M82XX type bus controller and clock generator drivers.

Micrel Inc.
560 Oakmeak Parkway
Sunnyvale, CA 94086
408-245-2500
Fax: 408-245-4175

Wafers for mature and obsolete MOS technologies. Available devices include many CMOS and Metal Gate devices formerly manufactured by RCA and National Semiconductor. Micrel uses the same tooling and test programs as the original manufacturer. They can also reverse engineer parts, if necessary.

Micro Networks
324 Clark Street
Worcester, MA 01606
508-852-5400
Fax: 508-853-8296, 508-852-8456
Pin for pin compatible parts (their MN-3290 DAC's) for Burr Brown Corporation's military DAC700.

R&E International, Inc.
210 Goddard Blvd. Suite 100
King of Prussia, PA 19406
1-800-253-7007
215-992-0727
Fax: 215-992-0734

Manufacturers, and has stock of, the CMOS SCL4000 series parts formerly manufactured by Solid State Scientific (S Cubed) and Sprague Semiconductor (now Allegro Microsystems, Inc.).

Reliable Electronic Manufacturing (REM)
Division of Wyvern Technologies
1205 E. Warner Avenue
Santa Ana, CA 92705
1-800-962-1085
714-966-0710
Fax: 714-556-7014
Design and manufacture replacements for obsolete components as well as designing a variety of arrays, networks, piggyback boards and SIP and DIP packaged parts. Their specially designed parts include RC networks, field programmable modules and active modules.

Rochester Electronics, Inc.
10 Malcolm Hoyt Drive
Newburyport MA 01950-4018
508-462-9332
Fax: 508-462-9512
36 Evelyn Road
Dunstable, Beds
LU5 4NG, United Kingdom
582 603439
Fax: 582 476238

KH Electronics Corp.

Landic No. 2 Akasaka Bld. 3 flr
10-9 Adasaka 2-chome
Minato-ku, Tokyo 107, Japan
03 3587 1041
Fax: 03 3584 6394

Discontinued and Custom Packaged military and commercial semiconductors. Has the facilities to custom package semiconductor dies and also manufactures discontinued parts from die masters. This aftermarket manufacturer is the authorized distributor for obsolete products from various original manufacturers including AMD, Harris Semiconductor, Intel, Texas Instruments, Microchip Technologies, Inc. and National (and Fairchild) Semiconductor.

Semiconductors, Inc.

3680 Investment Lane
Riviera Beach, FL 33404
800-327-6183
407-842-0305
Fax: 407-845-7813
TLX: 62014516

Manufactures germanium transistors which have been discontinued by other manufacturers. Also manufacture diodes, SCRs, triacs and voltage regulators (second source to National Semiconductor).

MSI/Scorpion Semiconductor

2360 Qume Drive, Ste B
San Jose, CA 95131
408-944-6270, 6271
Fax: 408-944-6272

Produces the full line of P-Channel Silicon gate MOS technology products formerly supplied by AMD (Advanced Micro Devices). They offer products and design services in N-Channel and CMOS process technology.

Solid State Electronics Corporation

8646 Parthenia Street
Northridge, CA 91324
818-993-8257 (also used for fax)

This company sources electromechanical choppers, used in precision dc amplifiers, voltmeters and servo motors. Devices available include stock from companies that have discontinued the parts (i.e., Airpax, Bristol, Stevens Arnold, Brown Converters, etc.) or are manufactured by companies under private labeling agreements.

Sunset Silicon Products

402A Ridgefield Circle
Clinton, MA 01510
508-365-6108 (phone and fax)

Recreates the obsolete part functionality using either the original design process, or by new design tools such as gate arrays.

Components and processes available include: Analog and Digital, Integrated Circuits, Transistors, Diodes, Unijunctions, Hybrids with the following processes: High frequency, Small Signal, PMOS, NMOS, CMOS, TTL, ECL, Linear, High Voltage, Low Noise, Resistor Matching, etc.

TSI Microelectronics (formerly Transistor Specialties, Inc. Hybrid Div.)

5 Southside Road
Danvers, MA 01923
508-774-8722
Fax: 508-774-0939
TWX: 710 347-0309

Manufacture custom hybrids and custom packaged parts.

Companies that stock/locate sources of obsolete material

In mid 1992, a new directory was published by Bruxner Publishing, Inc. and distributor CNC/Stamas Inc. called the Component Exchange Directory. Excess and overstocked inventory from distributors and directory subscribers are listed in this book, making it useful not only for distributors, which the directory is geared towards, but also for purchasers needing hard to find material (although the directory is not available to OEM purchasers directly it provides their suppliers with a means of locating components that they may not have in stock).

Each participating company lists up to 500 line items with part number, available quantity, and price information. Parts are listed by manufacturer name and part number along with a code number representing the company selling the material. For further information contact Bruxner Publishing (The Component Exchange, 33 Ship Avenue, Medford, MA 02155-9813, 1-800-786-9590, Fax: 617-391-9150). Information on computer databases for parts is provided below.

When discussing part requirements with parts brokers be prepared to provide a target price, or the highest amount you would be willing to pay for the device.

(Note: Commercial components from different manufacturers may not be equivalent. These differences may range from some variances to parts with the same part number being totally different.)

A.C.P. (Advanced Computer Products), Inc.

1310 East Edinger
Santa Ana, CA 92705
714-558-8822
800-347-3423
Fax: 714-558-1603

This company can supply current and hard to find/obsolete material (including IC's, semiconductors, capacitors, crystals, and diodes).

Act Electronics

Parts Department
2345 E. Anaheim Street
Long Beach, CA 90804
214-433-0475
Service manuals and repair parts for Grundig stereo equipment.

All Electronics Corp.

P.O. Box 567
Van Nuys, CA 91408
1-800-826-5432
818-904-0524
FAX: 818-781-2653
Various surplus parts, including obsolete items.

America II Electronics

(Also known as A-1 Electronics)
13191 56th Court N. 107
Clearwater FL
A-1 Electronics:
800-736-4397
813-572-9933
Fax: 813-572-9944
America II Electronics
800-767-2637
813-573-0900
Fax: 813-572-9696

(The purchasing division of this company The IC Exchange, 2620 118th Avenue North, St. Petersburg FL 33716, 813-573-0900, Fax: 813-572-9944)

Has an inventory of over 10 million memory IC's and concentrates on second source inventories and obsolete parts. Deal with all types of parts, electrical, electromechanical, etc.

American Design IC Components

400 County Avenue
Secaucus, N.J. 07094
201-601-8999

Fax: 201-601-8991

This company has a stock of many discontinued parts.

American Microsemiconductor, Inc.

133 Kings Rd.
Madison, N.J. 07940
201-377-9566
FAX 201-377-3078

Specializes in obsolete and hard to find Japanese and US parts. Has a network of suppliers to help in locating material.

Audio Parts Company

1070 South Orange Drive
Los Angeles, CA 90019
800-999-5559
213-933-8141

This specialty parts distributor has replacement parts for some items no longer available in the U.S. including Bohsei (TV sets), Garrard (turntables) and Wolensak (tape recorders).

Bally Micro

27 Journey
Aliso Viejo, CA 92656
800-229-7690
714-362-6555
Fax: 714-362-5333

This worldwide distributor specializes in locating obsolete parts, and keeps a large inventory in stock, including parts from American (from Analog Devices to Zilog), Japanese and Korean suppliers (such as Fujitsu, Goldstar, Hitachi, Mitsubishi, Samsung and Toshiba). They also have the capability to manufacture SRAM and DRAM modules.

Burlington Microelectronics

(Division of Solid State Testing Laboratory)

56 Middlesex Turnpike
Burlington, MA 01803
617-273-5657
Fax: 617-273-4896

This company may have obsolete part die in stock.

Chaffin Electronics, Inc.

Route 1
330 Lambro Lane
Franklin Furnace, OH 45629
1-800-821-7208
614-574-4456, 6906
Fax: 614-574-2124

This company, which has been in business for 10 years specializes in a variety of parts including programmable parts.

Chip Tech, Ltd.

1952 Utica Avenue
Brooklyn, NY 11234
800-762-4536
718-451-2700
Fax: 718-451-2824

This company specializes in hard to find and obsolete components, including passive parts.

Classic Components Corp.

Los Angeles, CA
310-539-5500
Fax: 310-539-4500
Newbury Park, CA
805-499-7499
Fax: 805-498-7775
San Jose, CA
408-434-1600
Fax: 408-434-0999
Ft. Lauderdale, FL
305-771-1411
Fax: 305-771-2311
Ronkonkoma, NY
516-588-4445
Fax: 516-558-1116
Austin, TX
512-832-1222
Fax: 512-832-8444

Europe:

Krefeld, Germany
02151 399993
Fax: 02151 311181
Ramat-Gan, Israel
03613 1426
Fax: 03525-4601

This distributor has over \$40 million dollars in inventory which includes obsolete parts.

Commodity Components International

75 Newburyport Turnpike
Ipswich, MA 01938
508-356-0020
Fax: 508-356-3633

This company, with its SEMI Search network can locate sources of discontinued or hard to find IC's and semiconductors all over the world.

Datarronics

237350 Blueberry Hill #12
Conroe, TX 77385
713-367-0562
FAX: 713-292-4914

This liquidator has a large quantity of parts, circuit boards and peripherals and can locate anything from microcircuits to platen knobs.

Defense Electronic Supply Center (DESC)

Attn: DESC-EAA
1507 Wilmington Pike
Dayton, Ohio 45444-5272
DESC stockpiles discontinued military (JAN S) parts for resale to original equipment manufacturers (OEM's) that have government contracts with NASA or the Air Force space division. The parts, stored in a warehouse in Ogden, Utah, are available to qualified buyers with a two week lead time.

In addition to obsolete parts, government contractors can purchase hard to obtain "S" level parts (there are only 5 companies worldwide qualified for level "S"). The "S" level parts are available from a joint NASA/Air Force Space Systems Division (SSD) at the Los Angeles Air Force Base. This program, started in 1985, was designed to reduce scheduling delays in U.S. Air Force and NASA programs that require space certified microcircuits and semiconductors. The parts have been tested to military specifications, with DPA reports available at no charge. Parts are available to qualified buyers with a two week lead time.

DERF Electronics Corporation

1 Biehn St.
New Rochelle, N.Y. 10801
914-235-4600
FAX: 914-235-2138
2499 Old Mary Lake Road
Sanford, FL 32771
407-330-2700
FAX: 407-330-2607

In business since 1946, this company buys surplus material and may have obsolete parts in their inventory.

Dodd Electronics

P.O. Box 112
New York, N.Y.
914-739-5700
FAX: 914-739-5854
Stocking distributor of obsolete and discontinued integrated circuits.

Dynasty Electronic Supply

A Division of Pace Electronics, Inc.
800-447-8589
407-381-5908
Fax: 407-381-0785

This distributor specializes in locating passive parts including crystals (and oscillators), capacitors and inductors/transformers. They can locate parts with their World Search system. They also sell various other electronic components such as semiconductors, connectors, fuses, potentiometers, relays, tools, test equipment and computers and accessories.

EDLIE Electronics

2700 Hemstead Turnpike
Levittown, LI N.Y. 11756-1443

516-735-3330
800-645-4722

Various surplus parts including tubes and IC's.

Electronic Expeditors International

Division of Electronic Expeditors, Inc.
14828 Calvert Street
Van Nuys, CA 91411-2774
P.O. Box 9
Van Nuys, CA 91408-0009
818-781-1910
Fax: 818-782-2488

Telex: 910 495 1751 Elec Expd Van

This company has supplies of hard to find and obsolete parts, including semiconductors, IC's, military and industrial components (resistors, shock mounts, tubes, switches, circuit breakers, fans, filters, coils, connectors, cable, knobs, lamps, etc.). A catalog is available.

Electronic Salvage Parts

2706 Middle Country Road
Centereach, N.Y. 11720
Various surplus parts.

Electrospec

24 East Clinton Street
Dover, N.J. 07801
800-631-9616 201-361-6300
Fax: 201-361-7868

This company locates obsolete or hard to find products such as wire, cable, tubing and electrical connectors.

Fox Electronics

309 East Brokaw Road
San Jose, CA 95112-4208
408-437-1577
Fax: 408-437-9299

This company recycles parts from printed circuit cards and handles company excess inventories. They have obsolete and hard to find parts (parts are identified as New or Pulls).

GALCO Industrial Electronics

26010 Pinehurst Drive
Madison Heights, MI 48071
810-542-9090
Fax: 810-542-8031

In addition to providing field and depot repair services for electronic controls, this company possesses large inventory of parts (such as power semiconductors, fuses, motor controls, etc.) which contains obsolete items.

General Components

927 Calle Negocio
San Clemente, CA 92672
1-800-944-3463
714-361-8800
FAX: 714-361-0062

In business since 1983, this company has a computerized parts search system (GEN-COM) that includes surplus inventory from OEM's worldwide, as well as distributor material.

GTC

216 West Florence
Inglewood, CA 90301
310-673-8422
Fax: 310-672-2905

This company, in business since 1976, has many current devices in stock and specializes in obsolete semiconductors.

H&R Enterprises

21521 Blythe Street
Canoga Park, CA 91307
818-703-8892
Fax: 818-703-5920

This company specializes in hard to find/obsolete IC's, transistors and diodes, both military and commercial parts.

Hi-Tech Component Distributors, Inc.

320 North Nopal Street
Santa Barbara, CA 93103
805-966-5454
Fax: 805-966-2354

This distributor finds obsolete and hard to find parts, and also sells hard and floppy drives and computer peripherals.

HLK & Associates, Inc.

1305 SOM Center Road
Cleveland, Ohio 44124
1-800-222-3855
216-442-1444
Fax: 216-442-1412

This company specializes in finding hard to find or discontinued military and commercial parts.

Impact Components

(formerly JPE-Jarrah Pacific Electronics)
2300 Boswell Road
Suite 120
Chula Vista, CA 91914
800-326-5139
619-421-4808
Fax: 619-421-5704

This company specializes in hard to find semiconductors and IC's. They often sell to distributors and have sources in Southeast Asia and Europe and have a sister company in Australia.

Innovative Technology

Mailing Address:
1840 41st Avenue
Suite 102-280
Capitola, CA 95010
Shipping Address:
3045 Capitola Road, Suite #34
Santa Cruz, CA 95062
408-462-6547
Fax: 408-479-4818

This company buys excess OEM inventory and sells and locates hard to find parts such as DRAMS, SRAMS, TTL, Linear and Analog IC's and capacitors.

I.T.I. - Imminent Technologies, Inc.

22529 39th Avenue South East
Bothell, Washington 98021
in California:
619-384-5001
Fax: 619-384-5003
in Washington:
206-485-8030
Fax: 206-485-7258

This distributor specializes in locating hard to find parts including semiconductors, IC's and passive devices. They have been in business since 1990.

International Circuit Sales Corporation (ICS) 1702 East Highland Avenue

Suite 403
Phoenix, AZ 85016
800-427-7862
602-224-5322
Fax: 602-224-5014
1275 Kennestone Circle
Marietta, GA 30066
800-842-0471
404-427-9906
Fax: 404-427-9580

This company locates hard to find or obsolete parts through its worldwide supplier network.

Jacques Ebert Associates, Inc.

44 School Street
Glen Cove, N.Y. 11542
800-645-2666
516-671-6123

This company stocks and locates hard to find capacitors.

Jameco Electronics

1355 Shoreway Road
Belmont, CA 94002
415-592-8097
FAX: 415-592-2503
415-595-2664
Telex: 176043

May have some obsolete or hard to find parts in inventory, but occasionally has a flyer sale and disposes of the old material at reduced prices.

Jerome Industries, Inc.

74 West Cochran Street, #B
Simi Valley, CA 93065
805-527-5893
Fax: 805-527-6684

Specializes in Western Digital, Paradise, Faraday, and Chips and Technology IC's but can locate components from a variety of other manufacturers (from Analog Devices to Zilog) and also locate passive components from such companies as AMP, Kemet, Molex, etc.

JTM

2345 Collier Court
Simi Valley, CA 93065
805-527-9228
Fax: 805-527-2710

Specializes in current, obsolete and hard to find devices from Western Digital, Faraday (Division of Western Digital), Chips and Technology, VLSI, Brooktree, Xilinx, and Paradise.

Krueger Company

1544 West Mineral Road
Tempe, AZ 85283
800-245-2235
602-820-5330
Fax: 602-820-1707

This company has "refurbished" (reconditioned) parts that have been pulled

from circuit boards, and excess OEM inventory stock. They specialize in DRAM's, SRAM's, EPROM's, EEPROM's, EPLD/FPGA erasable logic, microprocessors and microcontrollers. They also may have interface, telecommunications, linear, logic, diodes, transistors, capacitors, resistors, connectors, sockets and oscillators.

LECTRO Components, Inc.

154 Easy Street
Carol Stream, IL 60188
708-690-0520
Fax: 708-690-0563

This distributor stocks various Kulka terminal blocks and can customize blocks for different applications.

LJ Enterprises

68 Railroad Avenue
Valley Stream, NY 11580
516-872-5000
Fax: 516-872-5081, 5082

Specializes in current and obsolete Japanese semiconductors, and passive components (for audio and video equipment). Besides their own inventory they have access to overseas components inventories.

Luke Systems, International

27827 Via Amistosa, Suite 101
Agoura Hills, CA 91301
818-991-9373
Fax: 818-991-4654

This distributor specializes in locating obsolete parts and can search over 500 worldwide companies in order to locate for hard to find components.

Micro-C Corporation

11085 Sorrento Valley Court
San Diego, CA 92121
619-552-1213
1-800-723-1357
FAX: 619-552-1219

Micro-C/I.I. Ltd.

1 Whittle Place
South Newmoor Industrial Estate
Irvine, Scotland KA11 4HR
011-44-294-221836
011-44-294-2211837
Fax: 011-294-221838

This company specializes in recycling or providing "Reconditioned" IC's, parts pulled off of circuit assemblies. They also sell, with their logo, flash EPROM's, static RAM's and some processor IC's.

Micro Wholesale International

196 Technology, Suite H
Irvine, CA 92718
714-753-0360
Fax: 714-753-0363

This company sells IBM spare parts and may have obsolete IC's in stock.

Milex Electronix Corporation

85 Engineers Road
Hauppauge, NY 11788
516-231-1500
Fax: 516-434-1333

This company buys surplus inventory and specializes in finding discontinued or hard to find items.

Mission

7 Bendix
Irvine, CA 92718
714-859-1300
Fax: 714-859-4700

This company specializes in finding memory IC's including DRAM's, SRAM's and TTL and CPU modules.

MIT Distributors

4125 Keller Springs Road
Suite 160
Dallas, TX 75244-2035
1-800-MIT-FIND (1-800-648-3463)
214-733-3322
Fax: 214-733-0048

This company, which was founded in 1991, specializes in locating hard to find and obsolete parts (including VRAM's and DRAM's). They can search the inventories of over five hundred distributors in the U.S., Canada and Europe.

Monarchy

380 Swift Avenue
Unit 21
South San Francisco, CA 94080
415-873-3055
800-922-7755

This company specializes in finding Memories, Static RAM's and EPROM's.

Nettix Electronix, Inc.

1111 Alderman Drive
Suite 280
Aphareta, GA 30202
404-751-1911
Fax: 404-751-7188

This company specializes in finding obsolete IC's (including microprocessors and SRAMs) and semiconductors.

The Network Group

31364 Via Colinas
Suite 103
Westlake Village, CA 91362
818-889-1400
Fax: 818-889-4987

This 12 year old company has a global network to search over 3,200 stocking locations for all types of electronic components including obsolete parts.

Network International Component Trading (NICT)

Box 787
18 East Main St.
Malone, NY 12953-0787
518-483-8181
Fax: 518-483-8273

This company buys and sells surplus IC's and semiconductors and specializes in obsolete and hard to find components.

New England Circuit Sales, Inc.

292 Cabot Street
Beverly MA 01915
508-927-8250
Fax: 508-922-1341

This parts broker (independent distributor), established over 10 years ago, has a trademarked "Part/Find" system, a computerized database with over 3000 worldwide part inventories (including Japan, Taiwan and China). The database contains listings of parts from other part brokers, obsolete parts, company excess inventories, etc.

NOW Electronics

50 Gerald Street
P.O. Box 829
Huntington, N.Y. 11743
516-351-8300
FAX: 516-351-8354

This company makes lifetime buys and stocks obsolete parts. If devices are not in stock they use their computerized "Semi-Search" system to locate material from a worldwide network of part brokers, distributors and OEM's. This company also stocks die and can custom manufacture devices to meet MIL-STD-883C screening and processing requirements (they are certified to MIL-I-45208).

OEM (Optical, Electronic and Mechanical) Parts, Inc.

3029 N. Hancock Ave.
Colorado Springs, CO 80907
719-635-0771
Fax: 719-475-2249

This company specializes in finding various components including integrated circuits and vacuum tubes.

Performance Memory Products

(A.K.A. Performance Electronics)
1565 Creek St., Suite 101
San Marcos, CA 92069
800-255-8607
619-471-5383
Fax: 619-471-9691
In Arizona:
Memory World
1438 Scottsdale Road
Tempe, AZ 85281
800-424-1968
Fax: 602-994-0776

(also in Australia, 118 Willoughby Rd, Suite 9, Crowsnest New Australia 2065, 011-62-9064533, Fax: 906-1871; and in the United Kingdom: 86-90 High Street, Yiewsley, West Drayton, Middx, UK. 011-44-895-420100, Fax: 895-442238)

This company has manufacturers replacements for and has discontinued and obsolete memory modules from various original manufacturers including TI, Toshiba, Hitachi, Mitsubishi, Fujitsu, OKI and NEC.

Prime Tech, Inc.

1210 Warsaw Road
Suite 900
Rosewell, GA 30076
404-594-8608
Fax: 404-594-8631

This company can supply European parts, ranging from electrical, electronic, electromechanical and mechanical items for different machines and equipment. They can also locate electronic controls/circuit boards for a variety of foreign made machines. In addition they are able to locate hard to find Japanese items through European distributors. This company also provides consultation services in translating technical information and redesigning/modifying plant equipment and systems.

Qualified Parts Laboratory (QPL), Inc.

333 Soquel Way
Sunnyvale, CA 94086
408-737-0992
Fax: 408-736-8708

This company locates obsolete parts or die. They can package the die and perform various screening tests to qualify the packaged part for military Class B or S.

RH Electronics, Inc.

4083 Oceanside Blvd., Suite G
Oceanside, CA 92056
619-724-2800
Fax: 619-724-3133

This company will go back to the original manufacturer and try to get devices manufactured (if the quantity warrants it), or will obtain enough information to get another company to manufacture the obsolete device. They can source commercial or military qualified parts, including capacitors, resistors, connectors, switches, IC's, transistors, fuses, disk drives, transformers, circuit breakers, relays, filters and lamps.

R.W. Electronics, Inc.

206 Andover Street
Andover, MA 01810
508-475-1303
Fax: 508-475-1461

This company, in business since 1981, specializes in global distribution and sourcing of such material as IC's, semiconductors, disk drives and computer peripherals,

Semitech Inc.

Cooper Run Executive Park
334 Cooper Road, Bldg A
Berlin, NJ 08009
609-768-0030
Fax: 609-768-5690

This company can locate obsolete parts including IC's, diodes and transistors. They can provide a copy of their computerized inventor run.

Stack Electronics

200 W. Main Street
Babylon, NY 11702
516-321-6086
Fax: 516-321-5662
565 Turnpike Street
N. Andover, MA 01845
508-681-9977
Fax: 508-681-9976

This company using its "Stack Track" (tm) can locate hard to find parts, specializing in surface mount components.

TELTECH Research Corporation

Technical Knowledge Service
2850 Metro Drive
Minneapolis, MN 55425-1566
612-829-9000
800-833-8330

This company offers a vendor locator service to source specialized parts, mate-

rials, equipment and services. They find emergency, or secondary sources of material and determine plant locations, order capacity, stock status and lead time. They also track technologies, and patents, and offer access to technical experts to answer technology related questions.

Trans-World Electronics

15304 E. Valley Blvd.
City of Industry, CA 91748
800-822-1236

This company has parts and servicing information for Multitech, Dyna Tech, Spectrum, and HiTech equipment.

Universal Systems and Components

1575 Westwood Blvd., Sta 204
Los Angeles, CA 90024
310-477-0322
Fax: 310-479-1447

This is a distributor, which does search for obsolete components, handles integrated circuits, diodes, transistor, capacitors and resistors.

Sources of vacuum tubes

Vacuum tube manufacturers:

California Tube laboratory, Inc.
1305 17th Avenue
Santa Cruz, CA 95062-3096
800-824-3197
408-475-2939

This company remanufactures triodes, klystrons, magnetrons, electron guns, ion pumps and other tubes for various applications. They also sell new tubes.

Richardson Electronics Ltd.

3030 N. River Road
Franklin Park, IL 60131
A manufacturer of various types of tubes and power semiconductors.

Svetlana Electron Devices, Inc.

3000 Alpine Road
Portola Valley, CA 94028
415-233-0429

This is a Russian manufacturer of power grid and modulator electron tubes.

Companies that stock, or locate vacuum tubes

Alltronics

2300 Zanker Road
San Jose, CA 95131
408-943-9773
Fax: 408-943-9776

This company has vintage radio vacuum tubes in stock.

Antique Electronic Supply

6221 South Maple Ave.
Tempe, AZ 85283
602-820-5411
FAX 602-820-4643
A source of supply for vacuum tubes.

Daily Elexs, Div. E

Box 5029
Compton, CA 90224
213-774-1255
FAX 213-603-1348
A source of vacuum tubes.

Diers

4276-SC2 North 50th Street
Milwaukee, WI 53216-1313
Old radio and TV tubes.

EDLIE Electronics

2700 Hemstead Turnpike
Levittown, LI N.Y. 11756-1443
516-735-3330
800-645-4722
Various surplus parts including tubes and integrated circuits.

Electronic Expeditors International

see above for address.

Fair Radio Sales Co.

P.O. Box 1105
1016 E. Eureka Street
Lima, Ohio 45802
419-223-2196
419-227-6573

Surplus new and used equipment, some integrated circuits, and vacuum and oscilloscope CRT tubes.

International Components Corp.

107 Maxess Rd.
Melville, N.Y. 11747
800-645-9154
516-293-1500
FAX 516-293-4983
A source of supply for vacuum tubes.

New Sensor Corporation

133 Fifth Avenue
New York, N.Y. 10011
212-529-0466
1-800-633-5477
Fax: 212-529-0486

This company has tubes from worldwide sources (Russia, China, Yugoslavia, Germany, Czechoslovakia and the U.S.) and can burn-in and match tubes.

OEM (Optical, Electronic and Mechanical) Parts, Inc.

see address above in sources for IC's.

RF Parts

435 South Pacific Street
San Marcos, CA 92069
800-RF-Parts
619-744-0500
Fax: 619-744-1943

This distributor stocks transmitting tubes (such as EIMAC) and RF power transistors, power modules, power FET's and Japanese RF parts (such as Mitsubishi, Toshiba).

Steinmetz

7519 Maplewood Avenue
R.E., Hammond, IN 46324

This organization can supply lists of old and new tubes that can be supplied.

Thor Electronics

P.O. Box 707
321 Pennsylvania Ave.
Linden, NJ 07036
1-800-666-8467

This company directly imports Japanese and Taiwanese semiconductors, and also sells electron tubes, connectors, wire/cable, etc. They also sell military qualified parts and locate hard to find obsolete devices.

Tucker Electronics

1717 Reserve Street
Garland, TX 75042
800-527-4642
Texas: 800-749-4642
214-340-0631

Has new and "pulls" (tubes removed from equipment) and surplus electronic test equipment.

Companies that manufacture obsolete computer boards

Atlantean Microsystems, Ltd.

Robjohns House
Navigation Road
Chelmsford, Essex
CM2 6HE
United Kingdom
(0245) 494292
Fax: (0245) 494184

This company manufactures circuit cards for the National Semiconductor Starplex development system, Multibus I and Cimbus boards; Motorola's Exor-

cisors, Exorsets, Exormacs, VME/10, Micromodules, Versamodules, VME I/O bus boards; and Intel's Multibus I boards.

Micro Industries

8399 Green Meadows Dr. N
Westerville, OH 43081
800-369-1086

This company manufactures discontinued PC boards for Intel and National Semiconductor systems including the National Semiconductor Starplex system.

On-Line parts locator services

Data-Connection, Inc.

15231 Alton Parkway #200
Irvine Spectrum, CA 92718
1-800-LINK-ME-1
714-753-8000
Fax: 714-753-9999

This over 14 year old networking company has offered BrokerLink, an On-Line database service since July 1993. This network lists the integrated circuits of independent distributors in one common database. The service can be searched via a part number or the database can be downloaded to your computer. This service is billable monthly.

Fastparts, Inc.

2026 West Iowa Street
Chicago, IL 60622
312-862-4553
Fax: 312-486-0547

This organization has an interactive online parts trading network. Network members anonymously list "bid" and "ask" prices for parts. Searches are made by a manufacturer and manufacturer part number. Details on quantity available, date code, part marking and part (shipping) packaging are provided. There is a yearly fee for the service.

ILS-Inventory Locator Service, Inc.,

a Ryder System Company
3965 Mendenhall Road
Memphis TN 38115
800-233-3414
901-794-4784
Fax: 901-794-1760

A data base service where worldwide suppliers list their inventories (electrical, electronic, and mechanical) and capabilities with this independent organization. Quantity and condition (new, used or overhauled) of the part is included. There is also a listing by part number of companies that overhaul parts/equipment.

Netlogic Incorporated

16 Technology Ste 107
Irvine, CA 92718
1-800-638-5644
714-453-0600
Fax: 714-453-9210

This software networking company offers "Parts Locator" a buying and selling network which lists sources of materials for sale (the seller negotiates a price). The entire database can be downloaded or you can do searches for manufacturer's part number, quantity, description and date code. Membership is either quarterly or annually.

Sources of Digital Transistors

Digital transistors are transistors with resistors incorporated within the device. There are three main manufacturers of these devices. (These devices are available through various component distributors and from the generic component companies listed below.)

Rohm Co., LTD.

ROHM Electronics Division
3034 Owen Drive
Antioch, TN 37013
615-641-2020
Fax: 615-641-2022

Motorola Semiconductor Products

3102 N. 56th Street
Phoenix, AZ 85018
Technical Resources Hotline: 1-800-521-6274

Motorola second sources some of the ROHM devices.

Panasonic Industrial Company

Matsushita Electronics Corporation of America
One Panasonic Way
Secaucus, NJ 07094
201-348-7000
Fax: 201-348-8164
The other digital transistor series were developed by Panasonic Industrial Com-

pany, Matsushita Electronics Corporation of America.

Sources of Generic Replacement Semiconductors

These companies provide cross reference guides/catalogs of their generic replacement parts.

ECG Semiconductors

(Sylvania Electronic Components)
(a North American Philips Company)
Distributor and Special Markets
Division
1001 Snappferry Road
Greenville, TN 37745
800-526-9354

ECG Canada Inc.

Electronic Components and Systems
1928 Regis Blvd.
Dorval, Quebec H9P 1H6
514-685-5800

NTE-New Tone Electronics

44 Farrand Street
Bloomfield, NJ 07003
201-748-5089
212-732-1326
1-800-631-1250
Telex 333226

(Note: Cross references are available on computer disk.)

Thompson Consumer Electronics (RCA and GE)

Distributor and Special Products
2000 Clements Bridge Road
Deptford, NJ 08096-2088
609-853-2417
SK series replacement semiconductors and Japanese JEDEC/Generic replacement semiconductors.

World Wide Component Distributors

18 Stern Avenue
Springfield, NJ 07081
201-467-6264
FAX: 201-467-8519
1-800-222-6268
Specializes in Japanese Semiconductors and generic replacement parts.

Test Your Electronics Knowledge

By Sam Wilson

Sam Wilson is currently busy with other urgent projects, and was therefore unable to prepare What Do You Know About Electronics/Test Your Electronics Knowledge for this issue. This is a reprise of articles that appeared in a previous issue.

1. Assuming the values and power ratings are the same, can a film resistor always be replaced by a carbon composition resistor in a given circuit?

- A. Yes
- B. No

2. What do the initials ASIC stand for?

3. What is the purpose of an integrated circuit called FLASH?

4. The time it takes the output of an operational amplifier to change in response to a step-voltage change at the input is called the _____.

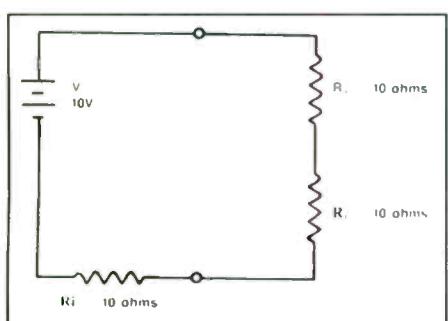


Figure 1. In this circuit, what value of R1 will result in the greatest power dissipation?

5. In the circuit of Figure 1, what value of R1 will allow it to receive maximum power from the supply?

6. What type of Morse code transmission has the low-static characteristic of frequency modulation?

7. Comparing a wideband amplifier with a narrow band amplifier, and assuming they have the same temperature, which produces more noise?

8. Why can't the outputs of UARTS be used directly on a telephone line?

- A. Improper timing

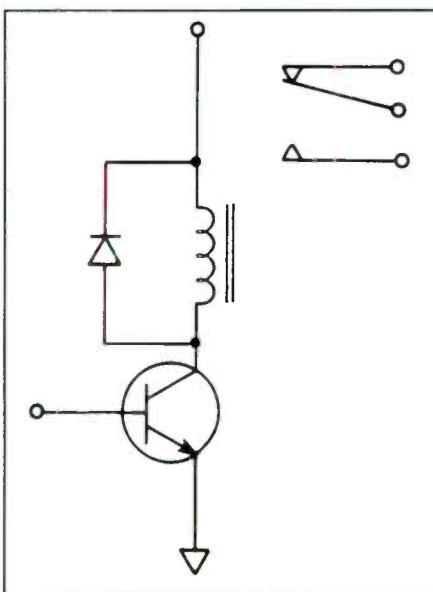


Figure 2. A diode may be used in a relay circuit in this manner to protect a transistor from inductive kickback.

- B. Cannot handle data fast enough.
- C. Against the law.

9. A diode is sometimes connected across a relay coil to protect a transistor from inductive kickback (Figure 2). Which of the following may be used instead of the diode?

- A. Triac
- B. Bead ledge
- C. Ferrite bead
- D. Varistor

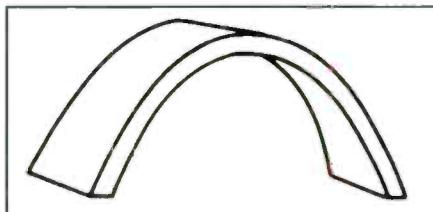


Figure 3. When a piece of flat metal is formed into a shape as shown here, is the metal stressed or strained?

10. The shape of a flat piece of metal has been changed as shown in Figure 3. In that condition the metal is

- A. stressed.
- B. strained.

(Answers on page 54)

Wilson is the electronics theory consultant for ES&T.

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FCC ID, Component Sources
and database editor.

FCC ID List.....\$19

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with full addresses.



Operators of the
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Upgrading a satellite system to Ku-Band

By Jurgen Ewert

Out in the country where there is no cable TV, satellite systems are very common. Despite the popularity of DSS and Primestar there are many 'Full View' systems in use. Usually these systems are C-Band systems. The C-Band frequencies range from 3.7GHz to 4.7GHz. There is a good variety of programming on C-Band but with the expansion to the Ku-Band there is more.

Upgrading a system to Ku-Band makes sense if your customer wants to receive 'wild feeds' such as sports, news and international broadcasts. There are currently 21 Ku-Satellites active. The signal frequencies of the Ku-Band range from 11.7GHz to 12.2Ghz.

Because of the much shorter wavelength, the behavior of the Ku-Band is different from that of C-Band. Common for both bands is that all satellites are 'parked' in the same orbit, the Clarke belt, 22,000 miles above the equator.

A typical C-Band system

The block diagram of a typical C-Band satellite system is shown in Figure 1. The signal from the satellite is focused by the dish and reflected into the feedhorn and LNB (low-noise block downconverter).

Ewert is an independent consumer electronics servicing technician.

The LNB amplifies the signal and converts it down to an IF-signal with a frequency range from 950MHz to 1450-MHz. A coax cable, usually a part of the ribbon cable, carries the dc-supply voltage from the IRD (Integrated Receiver Descrambler) to the LNB, and the IF signal to the IRD.

The IRD converts the IF signal into video and audio signals. You can connect the TV either through the antenna input on channel 3 or 4, or through the audio/video (A/V) inputs. Picture and sound quality is better using the A/V connections. The purpose of the actuator is to move the dish to different satellite locations. The IRD 'memorizes' the programmed satellite positions.

Requirements for the upgrade

For the upgrade, changes have to be made to the LNB, the feedhorn, and possibly to the cable and the IF input of the IRD. A block diagram of a typical C/Ku-Band system is shown in Figure 2.

The focal point of the dish is where the C/Ku-Band feedhorn is situated (Figure 3) with a C-Band LNB and a Ku-Band LNB (Figures 4 and 5). A waveguide (Figure 6) is supplied to attach certain C-Band LNBs to the feedhorn.

A separate coax cable is necessary to make the connection to the IR for each LNB. Some IRDs have two IF inputs, one

for C-Band and one for Ku-Band. An internal switch connects the corresponding LNB to the receiver input. If the IRD has only one IF input, a separate coax switch is necessary (Figure 7). The coax switch is controlled by a voltage from the IRD. The terminal at which this voltage appears is usually marked 'C/Ku'.

Assessing the current situation

To upgrade a satellite system to Ku-Band, take a look at how the system is currently installed.

Things to look for are:

1. Is the C-Band LNB detachable from the feedhorn?
2. Is there a spare coax cable in the ribbon cable?
3. Is a C/Ku switch built into the IRD?

The answers to these questions will determine what materials you will need to order and the price to quote, as described below.

1. If the C-Band LNB is detachable from the feedhorn, it is possible to use it with the C/Ku feedhorn. In some cases it might be better to order a new C-Band LNB anyway, if the old one has a noise temperature above 40 degrees Kelvin. If there is a LNB (a LNB combined with a feedhorn; see Figure 8) you have no other choice but to order a C-Band LNB with a noise temperature of 20K.

2. If there is a spare coax cable avail-

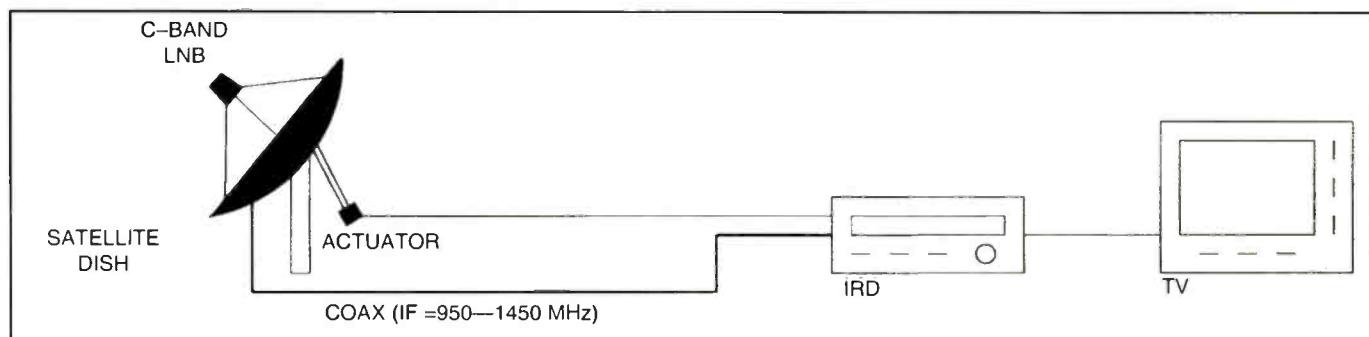


Figure 1. The elements of a typical C-Band satellite TV system are arranged as shown in this block diagram.

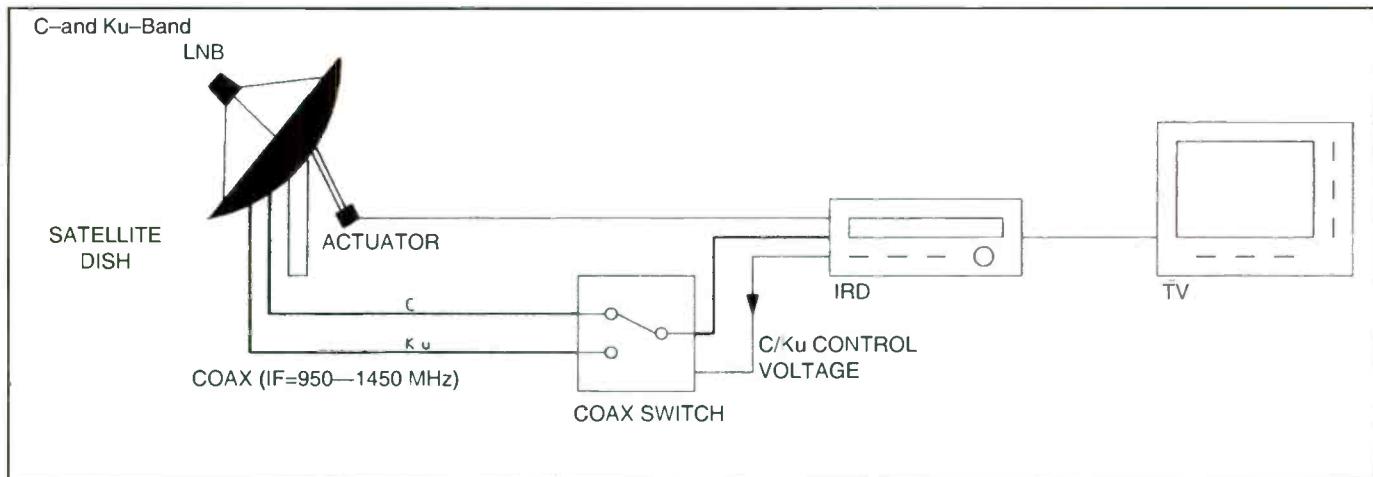


Figure 2. A typical Ku-Band satellite TV reception system are connected as shown in this block diagram.

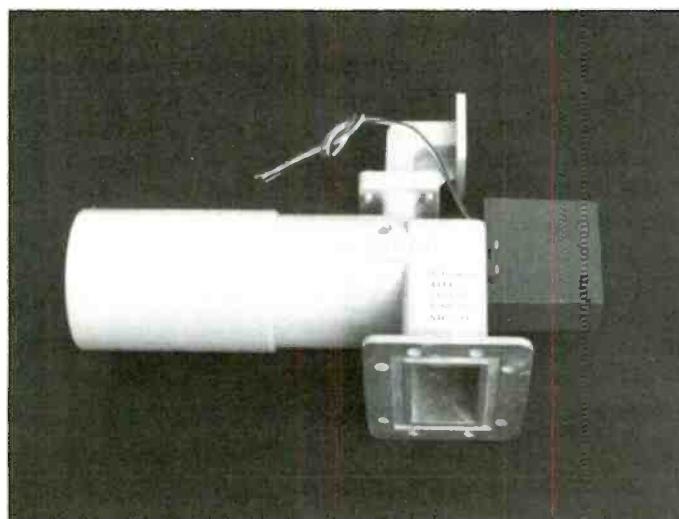
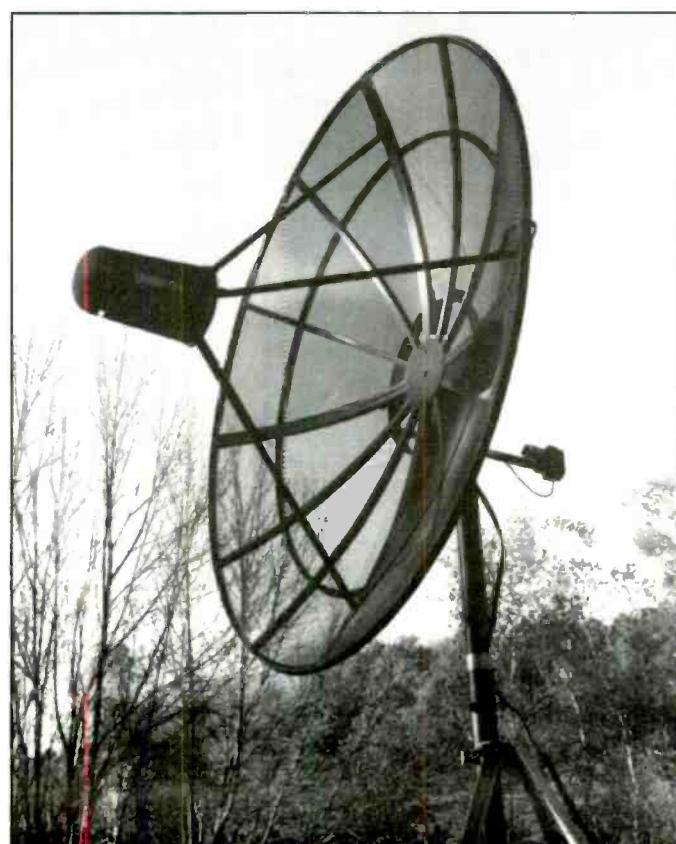


Figure 3. In a C-Band or a Ku-Band satellite TV reception system, the focal point of the dish is at the location where the feed horn's situated.



able in the ribbon cable, you need to crimp on the F-connectors and attach it to the Ku-LNB and the Ku-Input of the IRD. In some older cable you may not find the spare coax. The question is whether to replace the entire ribbon cable or add another coax cable. If you add a coax cable, do not buy the RG59 cable sold in the hardware store. For the IF signal with a frequency range from 950MHz to 1450 MHz you need RG6 cable that is sold through satellite-TV suppliers.

3. If the IRD has inputs for C- and Ku-Band there is no problem, just attach the

F-connector to the Ku input. In the event there is no Ku-input, look for a terminal marked C/Ku. That is the control voltage output for a separate C/Ku-switch. On the front panel of the IRD there should be a C/Ku-button that activates the C/Ku-control voltage. Make sure you obtain a coax switch that matches the control voltage. Measure the voltage or consult the owners manual of the IRD.

Installing the Ku-Band upgrade

It is easy to install the new upgrade to the satellite system if the job was planned

well. First you need to attach the LNBs to the feedhorn. The new feedhorn comes with adjustable scalar rings (Figure 9). Check the present feedhorn on the satellite dish. If the same kind of adjustable scalar rings are on both the present feedhorn and the new feedhorn, there is no need to replace this part.

You will find an Allen screw that holds the feedhorn in the scalar rings. Before you disassemble the feedhorn take a look at the feed throat. You will find a scale with numbers on it that tell you the f/D-ratio that was calculated by the installer

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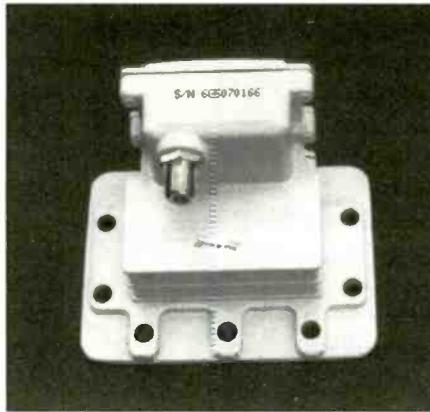


Figure 4. The LNB (this is the LNB in a C-Band system) amplifies the signal from the satellite and converts it down to an IF signal.

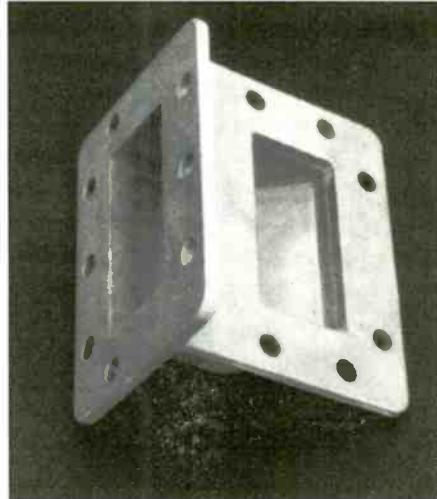


Figure 6. The signal is routed from the feedhorn to the LNB via a waveguide.



Figure 5. The frequency range of the IF from the LNB (this is an LNB in a Ku-Band system) is from 950MHz to 1450MHz.



Figure 7. If the IRD in the system you wish to convert from C-Band to Ku-Band has only one IF input, a separate coax switch is necessary.

of the original system. To make sure that the present f/D-ratio is right, you should recalculate it before installing the new feedhorn. Use the formula in Figure 10 to calculate the focal length (f) of the dish.

Calculate the f/D-ratio by dividing the focal length (f) by the diameter (D) of the satellite dish.

$$\text{f/D-ratio} = \frac{\text{f [inch]}}{\text{D [inch]}}$$

Now you are ready to assemble the feedhorn to the dish. Figure 10 shows how to set f/D ratio and Polar Axis using the template that came with the feedhorn. Set the Polar Axis when the dish is pointing straight south.

Check focal length and focal point

Check the focal length calculated earlier (Figure 11) by measuring the distance from the center of the dish to the front of



Figure 8. If the C-Band system has an LNBF (an LNB combined with a feedhorn), you will have to order a C-Band LNB with a noise temperature of 20K.

the feed throat. Subtract 1/4" from this measurement. If the measured distance is different from the calculated value at focal length, you need to adjust the focal length. Make sure you do not change the polar axis and the f/D-ratio.

Next, check to see if the feed throat is



Figure 9. The new feedhorn that you order will come with adjustable scalar rings.

in the center of the dish by measuring the distance from the edge of the dish to the feedhorn at three points around the dish. If these distances are not equal, add up all three distances and divide the sum by 3. That is the distance to which you need to adjust the focal point.

Peaking the dish

After you have made all of the connections to the new LNB, turn on the IRD and try to receive a Ku-Band satellite. The reception will probably be weak. It is even possible that there will be no reception at all, but the C-Band should work fine. The shorter wave length of the Ku-Band makes it necessary to readjust the north/south setting and the elevation of the dish.

Make these adjustments first for the C-Band. I usually have a helper who is mov-

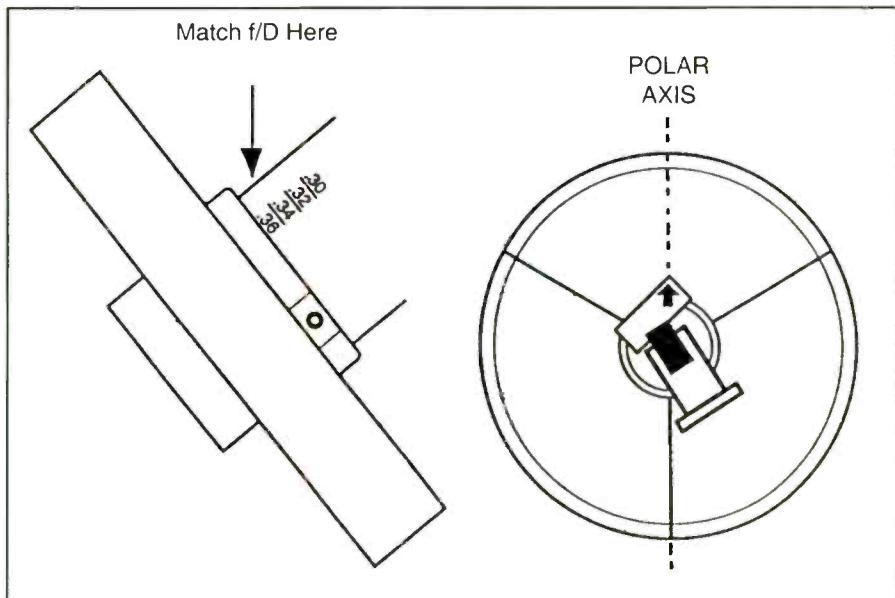


Figure 11. Check the focal length you calculated in a previous step by measuring the distance from the center of the dish to the front of the feed throat.

ing the dish and watching the picture. We use "walkie talkies" to communicate. A more accurate and faster way to adjust the satellite is by using a signal meter in the coax cable from the LNB to the IRD. First move the dish to a southern satellite and adjust the elevation bolt to the maximum signal (best picture).

Next move the dish to a satellite in the east or west and make the north/south adjustment by moving the polar mount on the mounting pole. Re-check the setting of the elevation at the southern satellite. After you have made these adjustments

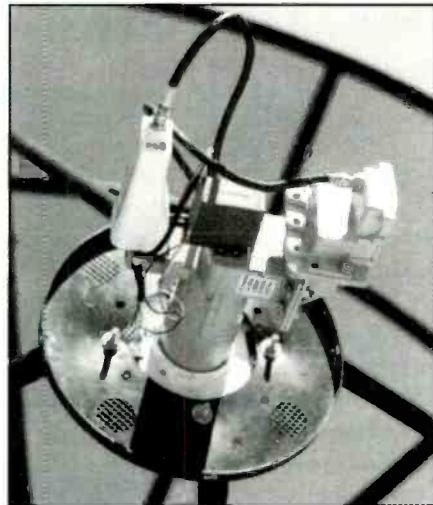


Figure 12. When you have completed the upgrade, the fully assembled feedhorn with both C-Band and Ku-Band LNBs will look like this.

on the C-Band, do the same for the Ku-Band. You will find that the reaction to adjustments on the Ku-Band is much more sensitive than on the C-Band.

After these mechanical adjustments to the dish you may need to help your customer to program the Ku-Satellites into the IRD (Figure 12).

This could be a good addition to your business

If you are not in the satellite TV business, upgrading and readjusting satellite systems is a service that could add revenue to your current business and lead to an expansion into system installation. ■

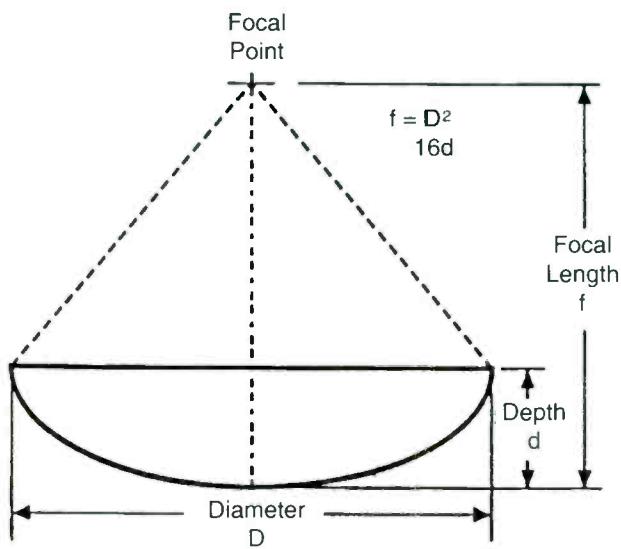


Figure 10. Calculate the focal length of the dish using this formula, and set the f/D ratio and polar axis using the template that came with the feedhorn.

VCR mechanical problems

By Philip Zorian

During a two hour movie a VCR pulls about eight hundred feet of videotape through its tape transport mechanism; twice that amount if you rewind it. Since the rubber belts, pinch roller, and idler tire are directly involved in the moving of this tape, their wear causes many of the problems about which VCR owners complain. Most of the mechanical problems are caused by worn-out rubber parts.

This article will first discuss replacement of rubber parts and then closely examine ten of the more common problems associated with these parts (the belts, pinch roller, or idler tire) wearing out.

Replacing belts; don't measure them

Once you've determined that belts need to be replaced because they are loose, slipping, worn, shiny, or broken what do you do next? Well, in order to replace any rubber part on any make or model, you'll need to know the part numbers, and you'll need a reliable distributor. Here are two rules I always follow when replacing worn belts on a VCR.

Rule 1: Don't measure the belts. There are two good reasons for this: first, measurement is a real time waster, and second, it is not an accurate way of determining the replacement part. In order to be measured, a belt must first be removed from the unit. Since removing the belts often requires the dismantling of the VCR, time is wasted in having to take them off in the first place, and now you've got a partially disassembled machine on your hands. It is much easier to look up the exact part numbers, call out with your quote, and then move on to the next defective machine. (I'll explain how easy this is in a minute.)

Trying to measure a worn-out, stretched, and possibly broken piece of rubber is not

only frustrating; but it does not produce an accurate measurement. It's hit-or-miss, especially since most specifications for belts and idler tires are given in thousandths of an inch (or millimeter). Even though some of the distributors will try to get around this by providing pictures to match your part up with, I would much rather consult a source that can tell me the exact part number needed for a belt or for the idler tire (which is even more difficult to measure accurately).

One source of information on belts is the 1996 PRB LINE Cross Guide from Premium Parts+, Whitewater, WI.

Fortunately, pinch rollers are easy to measure accurately in a matter of minutes. First, the roller must be removed, which is fairly simple in most VCRs. Then use an inexpensive plastic caliper (for example, part #21-1220, available from MCM Electronics, Centerville, OH) to match the specifications found in the PRB catalog under "VCR Pinch Rollers".

To match specifications: (1) measure the height of the pinch roller; (2) measure its outside diameter; (3) determine the inside diameter of the bearing by mea-

the roller is dried out, cracked, slick, or pitted, it will cause video problems.

Rule 2: You must find a reliable distributor for these parts. The ideal distributor will carry every belt, idler tire, and pinch roller for the most popular VCRs.

The ten most common problems

The preceding paragraphs discuss replacing the rubber parts found in any VCR. Now let's take a look at some of the more common symptoms that indicate these parts have worn out. My list of the top ten symptoms are as follows:

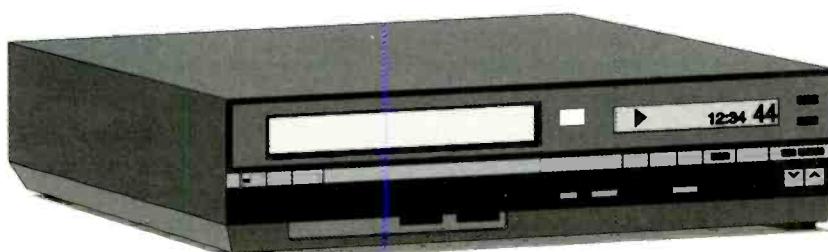
- incomplete loading;
- eating of the tape;
- tape slippage;
- no rewind;
- no fast forward;
- squealing sounds;
- take-up reel won't turn;
- intermittent shutoff;
- tape-edge damage;
- dead unit.

Incomplete loading

When the problem is incomplete tape loading, the customer will usually complain that the VCR just shuts off. Remember, all symptoms must be verified in order to properly diagnose the problem. In this situation, there is an attempt to load a tape, the unit accepts the tape and you hear the cassette drop into place, but then it shuts down.

With the "hood up" you will see the guideposts attempting to load the videotape around the video drum, but they will only get halfway before the unit shuts down. You may also hear the loading motor continue to spin.

Many VCRs have small loading belts that will begin to slip from wear and cause this symptom. Also check the guidepost tracks: if they are dry, they will need to be cleaned and lubricated.



suring the width of the shaft on which the pinch roller sits. (Don't despair, it's either 3mm or 4mm, and you can eyeball them after a while.)

Since you cannot measure the inside diameter of the bearing down inside the pinch roller, you must measure what the pinch roller sits on, in other words, the shaft. Remember, the pinch roller, working together with the capstan shaft, is responsible for pulling the videotape through the machine at a precise speed. If

Guidepost problems may have led to the slipping of the belts in the first place. If you don't lubricate the tracks, the new belt may not last long.

Eating the tape

It's fairly common to find that a VCR has eaten a tape. It is important to determine exactly what is meant by "eaten," since there are a few different problems that are described in this way. If the tape is not drawn back into the cassette completely by the supply reel when the eject button is pushed, but left hanging out, it will get crunched because the cassette flap will close on the tape as it emerges from the VCR. I have found that a clear videotape is indispensable for observing this symptom. This problem is almost always caused by a worn-out idler tire.

Tape slippage

Remember that the pinch roller and capstan shaft are responsible for pulling the videotape through the entire playback/record mechanism. They literally grab the tape by pinching it between roller and shaft. Over time, the pinch

roller will become slick and hard as the oxide coating from the videotape adheres to its surface. As the roller ages, it loses its ability to grab the videotape. A new roller has a dull black rubber surface that is firm but supple.

When the pinch roller cannot pull the tape through at a precise speed, the following symptoms will occur: (1) the take-up reel tries to pull the tape through instead, but the speed is not precise and the audio and video will intermittently speed up. (It is usually quite noticeable in the audio; you'll get a sudden "Mickey-Mouse" sound.) (2) The opposite can also occur; the movement of the tape will slow down, and you will hear a low, deep, dragging voice. (3) If the take-up reel/idler-tire combination is unable to pull the tape through, the unit will usually shut down.

The solution to this problem is simply to replace the pinch roller.

No rewind

The refusal of the VCR to rewind is one of VCR owners most common complaints. The most likely cause of rewind problems is a worn idler tire. During

rewind the idler shifts over to the left and engages the tire against the supply reel. But if the tire is too badly worn, it is unable to create enough torque and the rewind is either weak or non-existent.

If a VCR can't rewind at all, the unit will typically shut down. This can also show up as either a weak fast forward or the loss of fast forward, since this mode causes the same idler to shift to the right in order to engage with the take-up reel.

Squealing sounds

When a customer complains about squealing sounds, the squealing is most likely being caused by slipping belts. This is usually the first symptom before the VCR begins to display more serious problems. If I hear squealing sounds, I will usually assume one or all of the belts need to be replaced, but the squealing sounds are typically caused by loading belts.

Since the loading motor spins suddenly and at a high rate, slippage is a common problem with these belts. You should check the belts by looking for a shiny surface where the belt meets the pulley. Also, try turning one pulley while holding onto



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Test Your Electronics Knowledge

Answers to the quiz

(from page 45)

1. B - In some circuits noise is an important factor. Carbon composition resistors are noisier.

2. Application Specific Integrated Circuit. It is a custom-made integrated circuit and may contain both linear and digital circuits. This type of IC is designed on a computer.

3. It is a non-volatile memory that can be quickly erased.

4. Slewing rate. This is an important op amp rating.

5. 2Ω . Resistor R_1 "sees" a resistance of 2Ω looking into the source of power. In other words, it believes it is connected to a battery with an internal resistance of 20Ω .

6. Frequency shift keying. One frequency is used for dots and dashes. Another frequency is used for spaces.

7. The wideband amplifier. Noise increases with an increase in bandwidth.

8. C. ON and OFF voltages in the form of pulses are unlawful on telephone lines.

9. C. A varistor is a Voltage Variable Resistor. It has a high resistance at low voltages and a low resistance at high voltages. The high kickback voltages lower the resistance across the coil. That effectively shorts the coil during kickback.

10. B. Stress is the force that deforms the strip. Strain is the deformity produced by the stress.

the other connected to the same belt: if you are able to turn the pulley easily, then the belt is slipping. A new belt that is tight will make it difficult to turn one pulley if you are holding the other. Squealing sounds described by a customer can also be caused by a dry capstan shaft or motor shaft that simply needs lubrication.

Take-up reel won't turn

Failure of the take-up reel to turn in a VCR will usually result in automatic shutdown. When this type of shutdown occurs, the complaint from the customer will usually be that the VCR quit working. But during observation with the hood up, you will notice the movement of the take-up reel is weak or that it is not turning at all, causing tape spillage just after the pinch roller. This is almost always due to a worn idler tire.

Once the pinch roller is finished with the tape, the take-up reel pulls the videotape safely back into the cassette. If the take-up reel is unable to turn, the sensors will cause the VCR to shut down in order to avoid damage to the tape or the VCR due to the internal tape spillage.

In newer model VCRs, the idler tire has been replaced with a gear. In these newer models, unless some of the teeth on the gear are missing, when there's a shutdown problem, you can rule out the possibility that it was caused by failure of the takeup function. However, most VCRs still use an idler tire. These tires become slick, dried, and cracked along the outer surface and must be replaced.

Intermittent shutoff

Intermittent shutoff can be caused by many things, some of which are beyond the scope of this article. But, since it is an intermittent problem, you should consider the belts, idler tire, and pinch roller to be suspect. One approach is to replace these parts and then bench test the unit for three hours. This should solve the problem in most cases, especially if you observe any of these parts to be worn out.

Tape-edge damage

Tape-edge damage can be observed by opening the flap of the videocassette and noticing a curling on either the lower or upper edge of the tape. A brand new tape will appear perfectly flat and shiny.

Sending a tape with edge damage through the VCR will wreak havoc on the video, causing all kind of symptoms: picture roll, jitter, poor tracking, bending, etc. This segment will focus only on damage to the edge of the tape, but keep in mind that a videotape can be damaged anywhere along its surface.

The only rubber part that can cause tape-edge damage is the pinch roller. There are other, non-rubber, parts that can cause this problem, but an old and damaged pinch roller is my first suspicion when I see tape-edge damage.

When the roller gets so old that it is no longer perfectly flat, it applies an uneven pressure when it presses the videotape up against the perfectly flat capstan shaft. With the hood up you can easily verify exactly where the damage is occurring.

Using a tape that has no damage, run it through the unit in play mode for five seconds, and then hit pause. Using a tiny brush and white paint, put a mark on the inside non-playing surface of the tape wherever the tape contacts a part in the tape transport, then remove the videotape from the unit. The damage will always occur at some point along the path, and your mark will indicate which part is to blame. Always check to see if tape-edge damage is the cause of video problems.

Dead VCR

There are times when a belt will either break from age or simply jump off the pulley. The symptoms that result are too numerous to list and would depend on the belt and the particular machine. But a belt falling off its pulley and getting caught up in the gears will almost always result in a blown fuse as the unit struggles to overcome the obstacle by drawing more power. When the fuse blows, the customer will complain that the unit seems dead.

Conclusion

In this article I have covered the replacing of the rubber parts found on VCRs, and the ten most common problems resulting from worn-out parts. This information should equip you to deal with most problems reported by VCR owners. However, I cannot emphasize enough the importance of verifying the symptoms that customers complain about with your own eyes and ears. ■

Computer monitor servicing

By Brian Phelps

PCs are now owned by approximately 40% of U.S. households. This penetration of PCs in homes is estimated to increase to 55% to 60% by the year 2000. More important, more than one-third of home PCs are now multimedia equipped, meaning they have a 2X or faster CD-ROM drive and a sound card. Consumers are buying faster, more capable systems with improved and larger monitors as computers become a larger part of our everyday life (Figure 1).

What does this mean for the service industry? The EIA (Electronic Industries Association) says that we can expect the multimedia market, like the VCR and music CD markets before, to rapidly expand now that approximately 15% of households own the technology. This will result in more R & D dollars dedicated to the market which will raise the level of performance. The increased demand will cause an acceleration of consumer electronic and computer technology convergence. This will increase consumer awareness and expectations will continue to rise, as servicers prepare for the new wave of electronics technology.

Large monitors

Until now, 14 and 15 inch monitors have been the standard with businesses and the consumer. Purchasing systems with larger monitors dramatically increases the cost. Back in 1993, for example, a 17 inch monitor cost between \$1,000 and \$1,500. Today, you can purchase a 17-inch plug/play for about \$750.

So what's the advantage? Besides more screen area (approximately 45 to 60 percent), 17 inch monitors offer higher resolution. VGA on a 14-inch monitor is good and SVGA is satisfactory. Seventeen inch models run well at SVGA and 1024 x 768 resolution, but 14-inch mon-

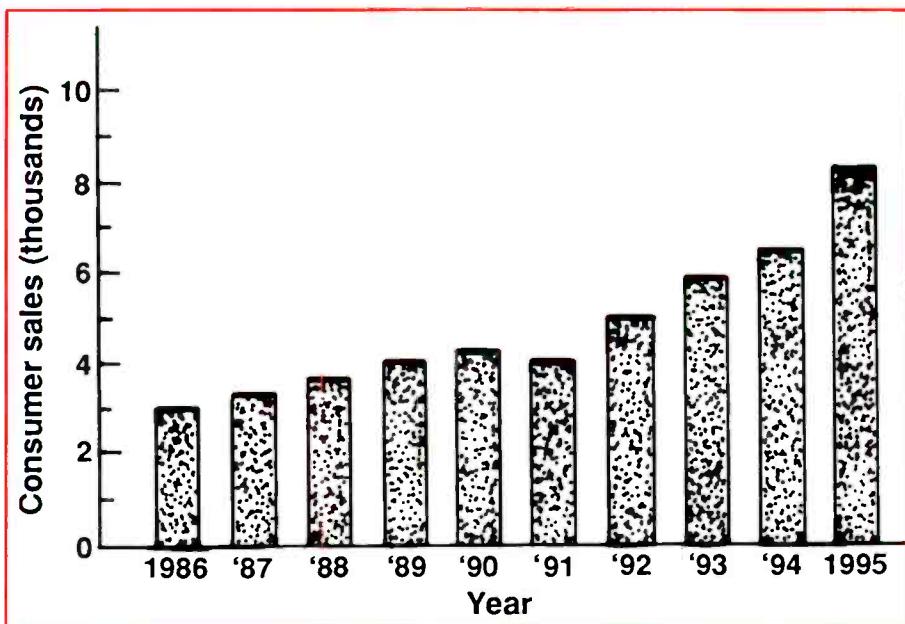


Figure 1. Last year was the first year in which dollar sales of personal computers were higher than dollar sales of televisions.

itors at 1024 x 768 display the information too small. Running at higher resolutions, the 17-inch monitor lets you display more information on the screen, not

to mention the benefit of larger size to those with poor eyesight.

The number of 17-inch monitors being shipped is increasing, too. Ask any CAD/

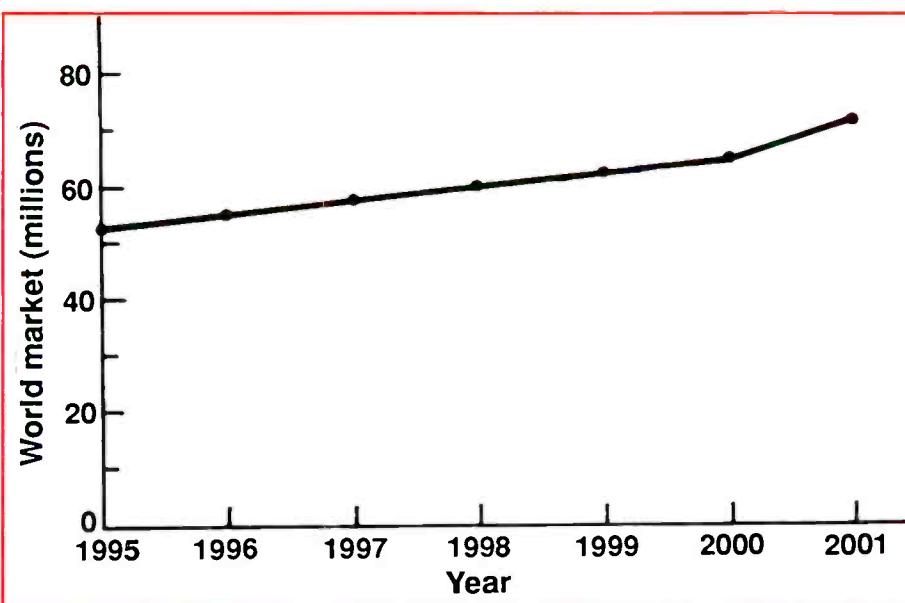


Figure 2. By the year 2001, the high-resolution segment will be 21% of the total monitor market.



CAM user where it's a requirement to have a larger screen area. Those involved with desktop publishing work with page layouts and high resolution graphics of 1280 x 1024 and beyond. Even more so, the advances in animation, mapping, and scientific visualization-designing DNA models are other examples. As these hi-tech professions rapidly expand, so will the need for high resolution monitors and their applications.

Servicing those computer monitors

By now, many servicers are taking advantage of one of the biggest servicing booms to surface in years: computer monitor service. As home computer use becomes more common and businesses update to faster, more capable computers, the need for monitor service is growing at an accelerated rate.

Within this service market, the high resolution segment will be the fastest growing in the computer monitor market for the next five years, according to Stanford Resources (a market research firm). The high resolution segment in 1995 made up 9.4% of the total. Stanford Resources projects this segment will grow

to 21% of the total market share by the year 2001 (Figure 2).

What is the driving force behind this growth? A number of factors contribute. First, Windows and Internet software applications lend themselves to having multiple windows displayed simultaneously. Viewability can become difficult on monitors smaller than 15". Second, multimedia applications push the need for high resolution displays. Viewing high-resolution photos and graphics and watching full motion video just doesn't have the same effect on a 14" VGA monitor as it does on a 17" or 21" 1280 x 1024 display.

Convergence of computers and television

The movement toward high resolution displays will continue as computer and consumer electronics manufacturers push for the consolidation of the computer and the television. Several manufacturers have already introduced products that combine a computer, digital video disc or VCR, and a television receiver. These systems use a 31" super VGA computer monitor for display.

All of this confirms excellent opportu-

nities for computer monitor service centers and depots. High-end computer monitor repair can be the most profitable segment of your monitor repair business. First, high resolution monitors do not fall into the "throwaway" or "replace" category when they fail. Users who spend \$800 on a 17" monitor or over \$1,500 on a 21" monitor probably will not junk the product and buy new when a failure occurs. Also, users of high-resolution computer monitors tend to be business and professional people such as engineers, graphics artists, medical professionals, and architects. When a monitor fails, these users can afford to pay the price to get it fixed.

The challenge

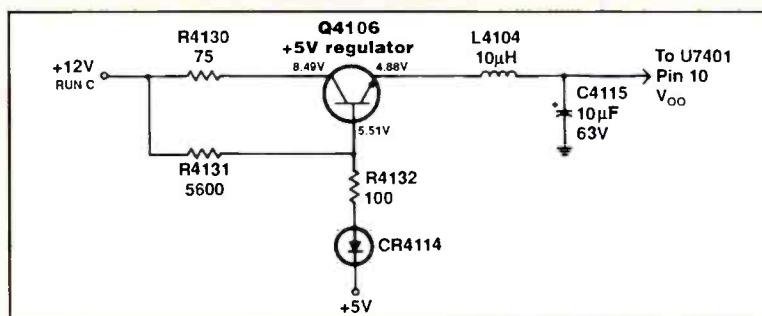
High resolution computer monitor repair comes with several challenges. High resolution computer monitors usually lock to multiple video formats, so they contain elaborate multisync and power supply regulation circuits. High resolution monitors may also have video bandwidths over 200MHz requiring extra care in frequency response and resolution testing and alignment.

High-resolution computer monitors also require precise color alignments. Medical doctors need the confidence to know the color of the image they're studying on a 21" monitor is correct before they decide to pick up a scalpel. High resolution computer monitors also have extensive alignment procedures. The service technician needs to perform these alignments to ensure that the monitor delivers the highest performance possible for maximum customer satisfaction and reduced callbacks.

So whether you're looking at getting started in computer monitors or planning to expand into the high-resolution arena, you need to be sure to check out the solutions available to help you service them - especially the test instruments. Recently introduced products are now providing solutions for video generation, color alignments, and troubleshooting processes. Check with your test instrument suppliers and see what they have available to help you cut your servicing time and add to your profits.

Troubleshooting Tips

RCA CTC 175 color TV - Part 1



An RCA CTC 175 color TV was brought into the shop. The set was completely dead. I first checked for "raw" B+, which was O.K., 150V. I then started checking standby voltage sources. Decided to check the 5V positive source first, as most Microprocessors and logic circuits will use +5V. The +5V was missing. I then went to Q4106, the +5V regulator. It is a small surface mounted

device. As I started to check it, I found that the collector lead was not soldered to the circuit board. There was no indication that it ever had been soldered. There were indications of oxide build-up on the lead and PCB pad. I used a small exacto knife and carefully scraped the collector lead and PCB and resoldered it. After doing this, normal operation of the set was restored.

PRODUCTS



Analog scope

DC to 200MHz bandwidth, 2mV/div. sensitivity and Save/Recall for 32 panel settings are available with the 3-CH, Model SS-7821 analog oscilloscope from Iwatsu America.

This eight-trace, multi-feature precision instrument has a wide range of applications including telecommunications, TV, broadcast and general industrial use. It incorporates high speed automatic setup, full TV triggering with field and line selection, a fast sweep to 2ns/div, and a 5-digit frequency counter with $\pm 0.01\%$ accuracy. Channel 3 input is switchable in three stages with sensitivities of 50mV, 100mV, and 500mV/div. making it useful for such applications as ECL, TTL, and 24V systems.

Circle (40) on Reply Card

PC programmable RGB generators

Two new RGB generators from Leader are designed to meet the needs of production, QC and service applications in that both feature compact size and stand-alone operation from pre-programmed ROMs, yet both can be fully programmed by the user through the use of a personal computer using an interface and software supplied by the manufacturer.

The LT1611 provides RGB analog outputs and maximum dot-clock frequency to 150MHz. The LT1610 outputs both



analog RGB and 8-bit parallel digital RGB for direct drive of flat panel displays. Clock frequency ranges to 150-MHz for analog outputs and 120MHz for digital feeds.

Independent operation from ROM requires only address selection from simple front panels controls and a remote controller is available for this purpose. PC control covers all aspects of raster architecture, output conditions including sync choices and pattern selection and design. Control functions are presented in the familiar "Windows" format with simple point-and-click selection of key parameters and conditions and the ability to download images greatly enhances the choice of test pictures.

Circle (41) on Reply Card

TV repair videotape

An instructional video from Electronix covers the common failures with the CTC 170/190 (RCA/GE) series TV chassis found in many brands. The chassis frequently fails, causing the picture to shrink vertically, and the tuner to become inoperative (snow/static). In more advanced stages, the TV will fail completely. This video gives a hands-on presentation of the procedures required to correct the problems, including the proper tuner-shield grounding rework, and EPROM replacement. Statistics indicate that approximately 40% of TVs, brought into the service center for repair, require the repair procedures presented.

Circle (42) on Reply Card

Low-cost testers

Wavetek introduces a new line of multimeters and multimeters - the AM8, DM7 and DM9. These three new compact, yet rugged meters are useful for basic electronic and electrical troubleshooting, test and measurement. Measurement capabilities include ac, dc, resistance and special 1.5V and 9V battery testing. All meters come standard with safety test leads and protective holsters.

The AM8, with an analog readout is the smallest and lowest cost of the three meters. It is useful for appliance repair and lighting tests around the house and shop. The DM7 is an all-trade, general



purpose digital readout meter with measuring functions that include ac/dc to 600V, four resistance ranges and diode test. The DM9 is a high performance, autoranging meter useful for field service and top-of-the-line testing. Features of the DM9 include a higher resolution 4000 count digital display, ac/dc measurement to 600V, diode test and continuity.

Circle (43) on Reply Card

Contact cleaner

Chemtronics introduces their new, improved Pow-R-Wash Contact Cleaner, the nonflammable, plastic safe solvent that safely cleans energized contacts and other electrical devices. This low odor formulation dries fast and leaves no residue, without the use of CFCs or VOCs (contains HCFCs).

This contact cleaner, formulated with HFEs from 3M, has all of the features of the original but with enhanced cleaning power to remove oily carbon, dirt, grease and other encrusted soils from contact surfaces. It has a low surface tension for flushing tight tolerance areas clean, and it is highly effective for all electronic and electro-mechanical contact maintenance including plastic embedded telephone switches, metal to metal contacts, electrical switches, breakers, relays, potentiometers, connectors, generators and motors.

Circle (44) on Reply Card



What Do You Know About Electronics? ASICs, glitches and curve tracers

By Sam Wilson

Sam Wilson is currently busy with other urgent projects, and was therefore unable to prepare What Do You Know About Electronics/Test Your Electronics Knowledge for this issue. This is a reprise of articles that appeared in a previous issue.

Is your mind boggleable? Read on. In the last issue I discussed ASICs (Application Specific Integrated Circuits). By way of introducing the subject I noted that the designer, picking from a library of standard cells, can put together a single integrated circuit that has a mixture of both digital and analog circuits into a complete system. The design process is done completely on a computer.

Now consider a single integrated circuit—an ASIC—with 200,000 gates and a clock speed of 100MHz.

These IC's are so fast that the time it takes a signal to move along a conductor between IC's is an important factor in slowing down the system.

Well, if that doesn't boggle your mind it is just possible that you have a mind that isn't boggleable.

Can you catch a glitch?

The rise time of a pulse represents a rapid change from a low voltage to a high voltage. Complicated math can be used to show that an amplifier must have a wide bandwidth to be able to amplify a pulse with a short rise time.

A glitch is an undesired, short-duration pulse with a very rapid rise time. It can

Wilson is the electronics theory consultant for ES&T.

cause problems in a logic system by falsely triggering circuits before their time.

Suppose there are glitches on a clock pulse as shown in Figure 1. Could your oscilloscope catch them? In other words, could your oscilloscope display them? One way to find out is to put together a simple circuit that produces a glitch. Use it to test your scope.

Figure 2 shows a simple circuit that you can use for producing a glitch. Without the inverter the output of the AND gate should always be logic 0. Read that 0V.

The timing diagram in Figure 3 shows how the glitch is made for evaluating your scope. The propagation delay of the inverter causes the input pulses at terminal B to arrive a short time later than the pulses at A. (The propagation delay and width of the glitch are greatly exaggerated for the purpose of illustration).

There are very short intervals of time when both inputs to the AND gate are at logic 1. Every time that occurs there is a short-duration glitch. Glitches in logic circuits are often produced accidentally by the kind of timing problem that occurs in the circuit of Figure 2.

Use an oscilloscope with a bandwidth rating of at least 20MHz. Look at the output signal on the CRT. Use the components called out in Figure 2. The power supply voltage should be 5V. At that voltage the CMOS inverter has a propagation delay of about 50ns. If your scope can't catch a glitch that short, add two more inverters in series and check again. The two additional inverters add about 100ns to the delay time. Continue to add pairs

of inverters until you can see the glitch. That will give you an estimate of the capability of your oscilloscope for catching short-duration glitches.

Repeat the experiment, but use your logic probe in place of the oscilloscope. Don't be surprised if the logic probe can out perform the scope!

A very important jump-start procedure

Kenneth Hubert of Flushing, NY says he has seen many voltage regulators ruined by jump-starting a car with the alternator running. He points out that you can avoid unnecessary expense by following this procedure:

1. After the cables are connected, run your Hypolux for approximately 10 minutes to charge the dead battery in the stranded motorist's car.
2. Shut off your Hypolux and tell the stranded motorist to start the car.
3. If the stranded motorist can't start right away, disconnect the cables before your battery is ruined.
4. Advise the stranded motorist to call a tow truck.

I know a lot of space has been used for explaining jump-starting, but, if we are going to jump-start America we had better first get this procedure down right.

The "Toss-it" syndrome

According to the people who know about such things, the World has a limited amount of energy. If we keep wasting it the way we have been we are going to run out. Give that some thought.

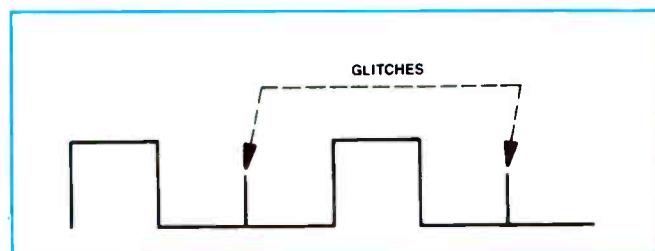


Figure 1. Is your oscilloscope fast enough to display glitches like this?

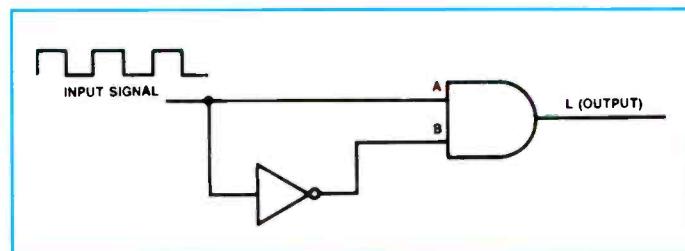


Figure 2. You can fabricate this simple circuit to create glitches to use in evaluating your oscilloscope

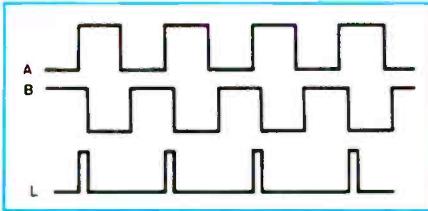


Figure 3. This timing diagram illustrates how the glitch is created.

An article "Service Costs More but Repairs Cost Less," by Charles Varble Jr., appeared in the St. Louis TESA News. Here is an excerpt from that article:

Electronic service is suffering because many people no longer have their TVs, VCRs and stereos repaired. This appears to be even more prevalent in the younger age group of twenty-five to forty. When a unit malfunctions they scan the ads and check the specifications and features and determine what functions they can obtain by purchasing a new unit instead of repairing the old unit. People find that they can have remote control, cable ready, stop action, slow motion, picture in picture and many other new features in a brand new product. Many times they do not even bother to get an estimate on the repair of the old unit, but plunge into the purchase of a new unit and frequently put it on a credit card or add it to an existing time payment account. They find it easy to justify the purchase because they will have more capabilities and with slightly greater cost in their monthly payments.

It is obvious to me from this article that instead of making great strides in saving energy, we seem to be headed in the opposite direction.

Now, think about the amount of energy used in replacing a resistor, or, integrated circuit. If we are really running out of energy—as they say—why isn't there more interest in getting things fixed instead of tossing them out and buying new ones? Also, why is this planned obsolescence permitted every year?

I asked several people and everyone I've spoken to tell me I should be able to figure it out myself. (?)

Do you remember?

When CD only meant Civil Defense? There were no compact discs.

When UPS was only an abbreviation for the United Parcel Service? There were no Uninterruptable Power Supplies.

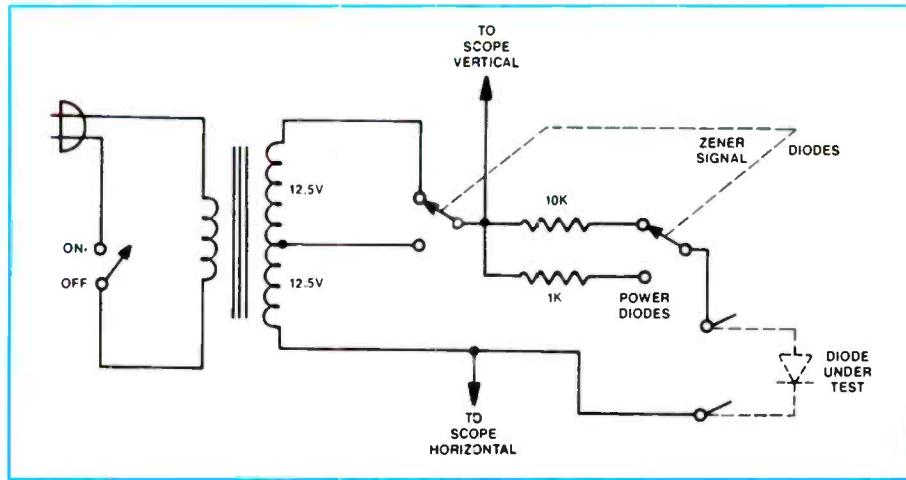


Figure 4. You can use this circuit to display the characteristic voltage vs current curve of a PN junction on your oscilloscope.

When standard cells were only laboratory voltage standards? There were no application specific ICs.

When PC always meant Printed Circuits? There were no personal computers.

Of course, I only know those older terms from the history books I have read.

The inverted diode curve

I'm sure that every ES&T reader has seen the circuit in Figure 4. It is used to display the characteristic voltage vs. current curve of a diode (or any PN junction) on an oscilloscope screen. It is also used for evaluating diodes.

Figure 5 shows a typical display using a good diode with the circuit. The problem is that the display is upside-down from the way it is usually shown in manuals. Compare the curves in Figure 5(a) and Figure 5 (b).

There is a cadre of ES&T technicians/readers known for their ability to rise to an occasion. You know, those who stand up to be counted, etc. I know of these technicians/readers because they send letters and they respond to challenges.

So, here is real challenge: modify the curve tracer so that the characteristic curves are shown right-side up.

Don't give me the bit about turning the scope upside-down to invert the curve. I'm already doing that.

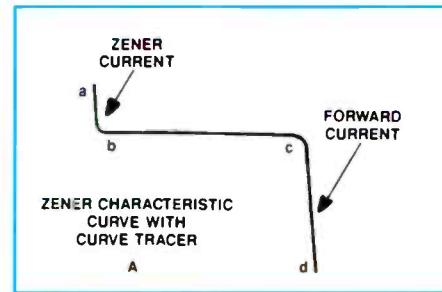


Figure 5a. A good diode or other PN junction will display a characteristic curve of this general shape when connected into the circuit of Figure 4.

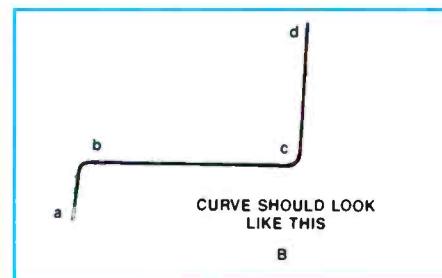


Figure 5b. The PN junction characteristic curve shown in Figure 5a is usually shown in this orientation in textbooks.

- failed in business in '33
 - had a nervous breakdown in '36
 - was defeated for nomination for congress in '43
 - was rejected for the job of land officer in '49
 - was defeated for senate in '54
 - was defeated for vice presidential nomination in '56
 - was defeated for senate in '58 and was still elected President of the United States in the year 1860.
- That politician was Abraham Lincoln.

Out of defeat

Let me tell you about a politician who:

- lost his job in '32
- was defeated when he ran for legislature in '32

product, while 50 percent said they would browse the Internet or play video games. When asked where they would purchase a TV/PC, 56 percent indicated a electronic superstore such as Best Buy or Circuit City, while 18 percent said they would buy at a computer store.

Conference program

Spring CES will offer a comprehensive program of conference sessions to educate the retailers, buyers, importers/exporters, and analysts in attendance. Among the topics to be covered are:

- New Profit Opportunities: Home Systems Enters Retail
- How to Profit from SoHo Products
- DVD: A Product Worth the Wait
- Selling DBS Services and DBS Programming
- Home Theater Meets the Internet
- Selling Telecommunications = Low Costs + Profit Potential
- TV/PC or Web TV: Will There be a Winner?
- I Want my HDTV
- Retailer & Supplier: Partnering Opportunities for Increased ROI
- Merchandising Convergent Products
- The Internet: Friend or Foe?
- Media Migration and the Retailer.

Indiana Electronic Service Association merges with ETA

Members of the Indiana Electronic Service Association, IESA, have ratified an action of the annual membership meeting attendees in April of 1996, bringing the 36 year old association under the wing of the Electronics Technicians Association, International, Inc.

IESA has been the spokesman for independent electronic service businesses and technicians in Indiana since 1960. Originally organized as a business league representing primarily television and radio service shops, the association later expanded its membership to include businesses which provided repair and installation for other segments of the electronics industry. These include communications, antennas, Master Antenna TV distribution systems, computers, VCR and audio, public address, building pre-wiring, satellite receive systems for busi-

nesses and homes, and others.

With changes in the industry, the Indiana association decided to merge with ETA. By so doing, both associations are stronger. IESA and ETA had been producing regional seminars and other association services jointly for technicians and dealers for many years.

Dick Glass, President of both the Electronics Technicians Association, International and the national Satellite Dealers Association, is the manager of the IESA division of ETA. ETA operates offices at 602 N Jackson in Greencastle, IN.

ETA was formed in 1978 as an Indiana Corporation with purposes of providing information exchange, certification of technicians, and education and training opportunities for those engaged in electronics. ETA is one of only seven

COLEMs (Commercial Operators License Examination Manager) for the Federal Communications Commission. Testing is provided through over 400 technical colleges, both public and private, and through U.S. Armed Forces education offices around the world.

Glass said that the IESA will retain its structure with its 10 state officers plus county representatives. Mr. Frank Brattain, a master CET from Cambridge City IN, and a computer-electronics instructor at Ivy Tech State College in Richmond, IN, is the 1996-97 state president. The address for IESA is the same as that of ETA and SDA: IESA, 602 N Jackson, Greencastle, IN 46136, phone: 317-653-4301, e-mail: eta@indy.tdsnet.com, http://www2.fwi.com/~n9pdt/eta.html. ■



BOOKS

Crash Course in Electronics Technology, Second Edition, By Louis Frenzel, 336 pages, paperback \$29.95

Crash Course in Electronics Technology teaches the basics of electronics, components, and circuits in an easy-to-understand format. Each chapter includes learning objectives, clear explanations and examples, and an end-of-chapter self-quizz. The drill-and-review software included with the book allows the learners to test themselves on the contents of each chapter. A final chapter teaches the basics of troubleshooting circuits.

Butterworth Heinemann, 313 Washington Street,
Newton, MA 02158

Simplified Design of IC Amplifiers, By John D. Lenk, Butterworth Heinemann, 240 pages, paperback \$29.95

No matter what your skill level, this book shows you how to design and experiment with IC amplifiers. For experimenters, students, and serious hobbyists, this book provides sufficient information to allow a reader to design and build IC amplifier circuits from "scratch." For working engineers who design amplifier circuits or select IC amplifiers, the book provides a variety of circuit configurations to make designing easier.

Butterworth Heinemann, 313 Washington Street
Newton, MA 02158

Engineers Relay Handbook, National Association of Relay Manufacturers (NARM), 395 pages, Single copy \$66.00

A revised edition of the *Engineers Relay Handbook* has been published by the National Association of Relay Manufacturers (NARM), an affiliate of the Components Group of the Electronic Industries Association (EIA). This 5th edition has been completely updated to reflect the latest relay technology and expanded to consider present day issues. The 17 chapter handbook covers:

- common uses of relays
- principles of electromechanical relay operations
- application circuits
- testing procedures and government, commercial, and international standards and specifications
- relay quality assurance and control as well as reliability
- relay types, including reed, mercury wetted and solid state

Single copies are available for \$66 within the United States and \$72 for overseas customers. Discounts are available as follows: 1-5 copies, \$60.00 each; 6-19 copies, \$55.00 each; and 20 copies or more, \$50.00 each. International prices are an additional \$12.00 per copy.

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TEST EQUIPMENT FOR SALE: Quality reconditioned Tektronix, HP, Boonton, Fluke, Wavetek, etc. Call **AST Global Marketing**, 11365 Airport Road, Meadville, PA 16335. Ph 814-336-2138. Fax 814-337-7920. E-mail astmrktg@wrench.toolcity.net.

CRT ADAPTER KIT - Hooks your CRT tester to ALL picture tubes. Win the "socket war". Obsolete proof! \$59.00. **DANDY** 2323 Gibson, Muskogee, OK 74403. 918-682-4286.

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OUT OF BUSINESS SALE: TV VCR Repair Shop. Everything must go. Priced at more than 50% off cost. Parts, Equipment, SAMs, and brand specific manuals. Super deals, guaranteed. Pro Tech, PO Box 4076, Butte, MT 59702. Phone 406-723-8922, fax 406-723-4411.

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NAP Tuner 340309 1001/2/3. Have a problem with a snowy picture? Will repair for \$25.00. **Tip Top TV & VCR**, 18441 Sherman Way, Reseda, CA 91335, 818-345-1974.

FURTHER PRICE REDUCTION. Diehl Mark III \$49, Diehl Mark V Horizontal circuit tester \$169. New. Conductive coating for remote control keypads \$9.99 ppd. **WECC**, 2411 Nob Hill Road, Madison, WI 53713. 608-238-4629, 608-273-8585.

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JVC VCR model HR-D150U. Need schematic - no longer available from JVC or any supplier. I will pay for copy and postage or will copy and return. *Contact: Bill Risko, BRS Electronics, 1329 Twining Road, Dresher, PA 19025, 215-659-2349.*

Used test equipment. *Contact: Alex Torok, AST Global Marketing, 11365 Airport Road, Meadville, PA 16335, 814-336-2138 (phone), 814-337-7920 (fax), e-mail astmektg@wrench.toolcity.net.*

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