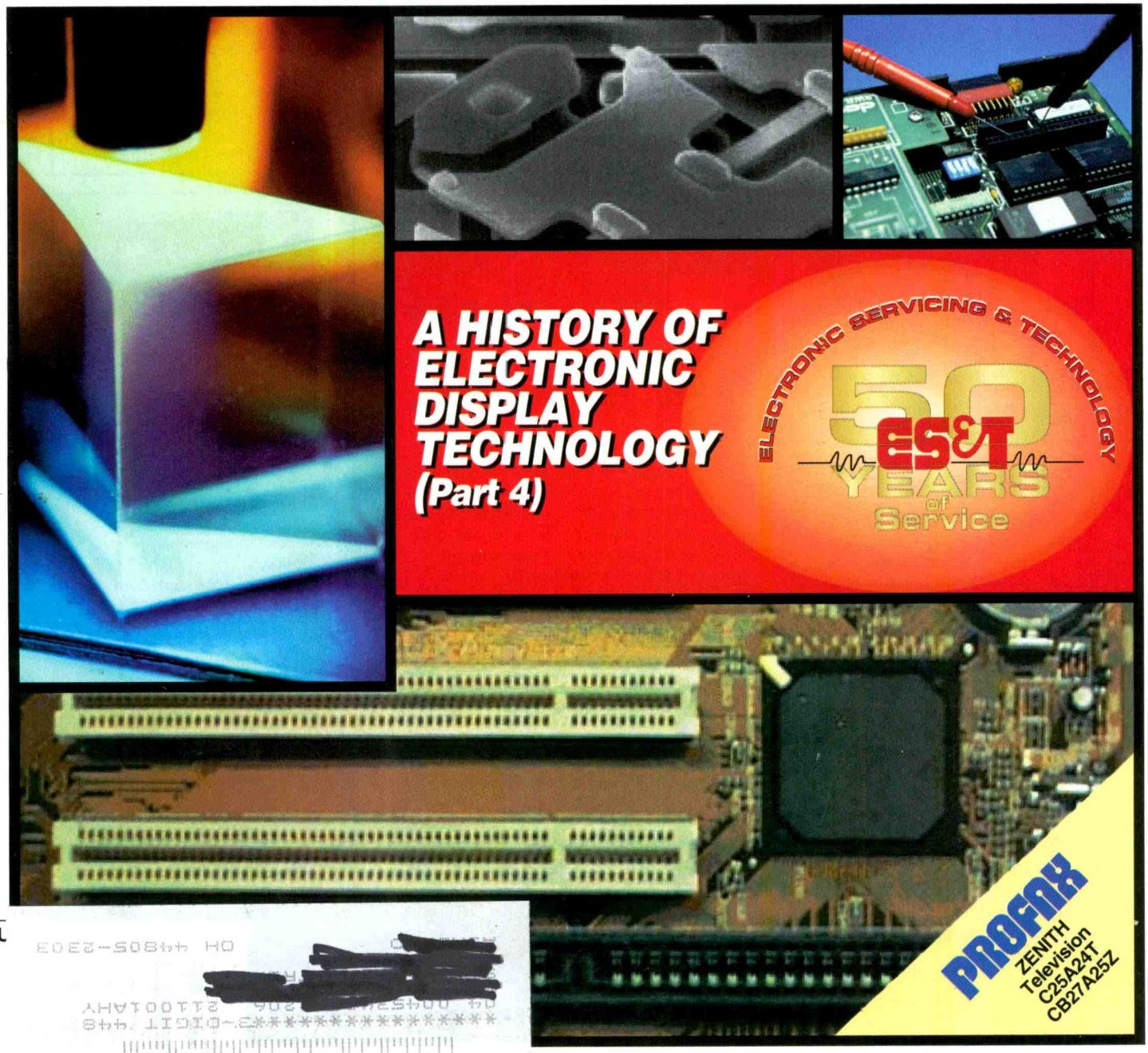
THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC™ Servicing & Technology

October 2001

PC TESTING TIPS • BEST IDEAS

SERVICING NEW GENERATION TELEVISIONS



A HISTORY OF ELECTRONIC DISPLAY TECHNOLOGY (Part 4)

ELECTRONIC SERVICING & TECHNOLOGY
50 YEARS of Service
ES&T

PROFAX
ZENITH
Television
C25A24T
CB27A25Z

Model 1744

0-35V, 0-10A DC Power Supply

- Fully overload protected
- Output on/off button
- CV/CC operation

Circle (1) on Reply Card

Test Bench High Performance DMM

Heavy duty design with double injection molding for better grip and shock protection.

- True RMS
- Resistance measurement
- RS-232 - PC link interface for data acquisition
- Logic probe
- Data hold

Model 390A

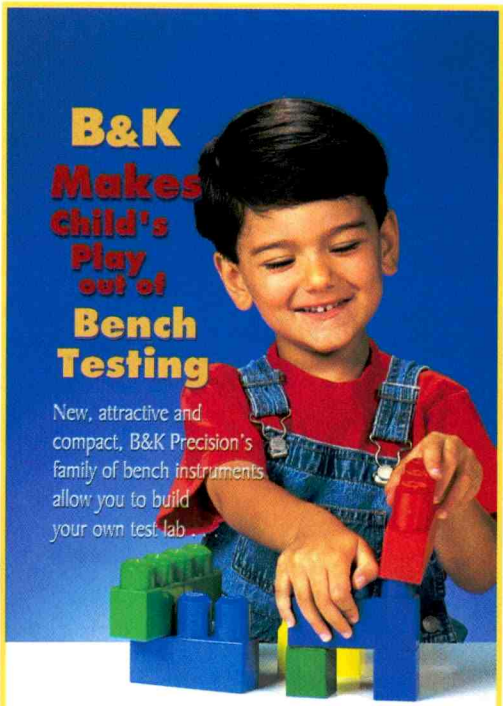
Circle (5) on Reply Card

Model 1635

1.05GHz Spectrum Analyzer

- 100KHz Frequency display resolution
- Frequency and level markers
- RS-232 interface

Circle (2) on Reply Card



No Kidding.

B+K Precision's line of Bench Test Equipment has a new modern look with all of the same great features such as large, bright, easy-to-read displays and simple easy-to-use controls. The new power supplies provide the versatility and reliability required for a broad spectrum of laboratory and service applications.

B+K Precision offers an extensive line of high performance signal generators including function, sweep/function, RF, audio, and arbitrary waveform generators. And the versatile Bench Digital Multimeters (DMM) offer a variety of important features at attractive prices.

For more information on how you can change bench testing from a chore into child's play

BK PRECISION
SETTING NEW STANDARDS IN PERFORMANCE & VALUE

1031 Segovia Circle, Placentia, CA 92870
(714) 237-9220 Fax: (714) 237-9214
www.bkprecision.com

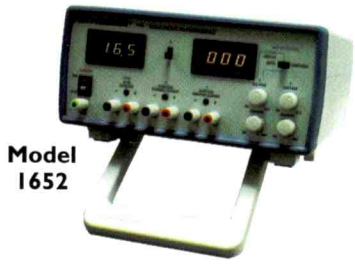
Circle (9) on Reply Card

Model 1790

High Current DC Power Supply

- Constant Voltage/Constant Current Operation
- Facility for Presetting the Output Voltage and Max. Load Current Limits
- Separate DC Output ON/OFF Switch
- Remote Sensing Facility
- High Stability and Close Regulation ±0.01%
- Meet CE Specifications

Circle (6) on Reply Card



Model 1652

Triple Output DC Power Supply

- Two 0VDC to 24VDC outputs
- Fixed 5V output
- Adjustable current limiting
- Short circuit protection
- Connect outputs in series for higher voltage or in parallel for higher current

Circle (3) on Reply Card

Model 4070A

Function/Arbitrary Waveform Generator

- 0.01Hz Frequency resolution
- RS-232 interface
- Visit www.bkprecision.com for more details

Circle (7) on Reply Card

Model 4040A

20 MHz Sweep/Function Generator

- 0.2Hz to 20MHz
- AM and FM modulation
- Burst operation
- External frequency counter to 30MHz

Circle (4) on Reply Card

Battery Capacity Analyzer

Model 600

- Measures both no Load Voltage and Battery Capacity
- Great tool for testing back up batteries for UPS, Security, Emergency Flood Light systems
- Ideal for automotive, UPS Maintenance, and Telecommunication applications

Circle (8) on Reply Card

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS
ELECTRONIC™
Servicing & Technology

An Open Letter to ES&T Subscribers, Advertisers and Other Friends

2001...A MOST DIFFICULT YEAR

To say that the year 2001 was an eventful one almost sounds redundant, but it certainly was eventful for everyone, including us.

As many of you know, we purchased ES&T at the end of 2000 and looked forward to accomplishing a number of goals with the magazine during 2001.

However, two particularly trying long-term illnesses within our family, both ending in very sad deaths, took away our focus, and put us behind in production.

Playing "catch up" has been equally difficult, especially as we have attempted to upgrade the look and content of ES&T to match the changes in the world of professional electronic servicing. These changes include a significantly more comprehensive Buyers' Guide, new emphasis on Cost of Doing Business issues, Association and Industry News, Home Theater, Smart Homes, Smart Appliances and the continuing struggle for manufacturer support and cooperation.

GETTING BACK ON TRACK

As this October issue is finally going to press, we have made the decision to jump directly to the January, 2002 issue...and that will be the next issue you will receive. It should follow this issue by about 2-3 weeks.

We expect this will put us back on a regular publishing schedule for you to receive your issues as you expect and deserve.

MEETING OUR OBLIGATIONS...PLUS A BONUS

So that no subscriber is penalized for our difficulties, we are extending subscriptions for three months; two months for the 'missing' issues and another for your patience and loyalty. All subscriptions and subscribers who were entitled to the November or December, 2001 issues will be automatically extended for three months.

This change will be reflected on your subscription label just as soon as we can make the transition in the computer systems.

THANK YOU FOR YOUR SUPPORT

We hope this meets with your approval. Again, we express our gratitude for the input, support and loyalty each of you have expressed during our short duration with this grand old publication, and we promise to help bring it and the role of the Professional Servicer up to the levels both deserve.

Dave Allen
Marie Marcellino
And the Staff of Electronic Servicing & Technology Magazine

Note to Advertisers: Advertisers have the option of continuing their current programs into the January and February issues or to cease with the October issue at no short rate. Obviously we would like to continue with your business and will renew all advertisers without a rate increase.

Electronic Servicing & Technology Magazine, Modern Media Communications Inc.
403 Main Street, 2nd Floor • Port Washington, New York 11050
Phone: 516.883.3382 • Fax: 516.883.2162 • mmei@mainlymarketing.com

Editorial

by Nils Conrad Persson

THE MORE THINGS CHANGE...

It's been fun, and enlightening to take a trip down memory lane in the series "A History of Electronic Display Technology," that we've published during this, the 50th anniversary year of Electronic Servicing & Technology. You'll find the conclusion of the series, Part 4, in this issue. Also interesting, although frequently forgotten is the human drama that accompanies any great leap forward in technology, such as the development of television. Moreover, it's also interesting to note that sometimes technology comes full circle.

As every consumer electronics service technician is no doubt aware, the first "television" set was a mechanical affair. A Scottish engineer and entrepreneur, John Logie Baird built a television system based on rotating disks. At the transmitting end, a disk with holes arranged in a spiral pattern around the edge spun. The subject was illuminated with a bright light that shone through the spinning disk, thus effectively "scanning" the subject. The light from the subject illuminated sensors that converted the light into an electrical signal. The electrical signal was amplified, then transmitted to a receiving device where the picture was reproduced.

At the receiving end, the electrical signal was converted back into light, that was viewed through the holes in another spinning disk that was constructed in a similar fashion to the disk at the transmitting end, and that was spinning in synchronization with that disk.

The pictures that this system produced were very small, something like two inches by four inches, and were of very low resolution, so that at first the picture transmitted was nothing more than a silhouette. But television had been born. Interestingly, because the picture signals were of such low resolution, some of them were recorded on recording material that was used for audio recording. Some of those recordings exist to this day. So, I guess you could say that video transmission and recording were invented almost simultaneously.

A German researcher Paul Nipkow proposed a mechanical television system, which he called an "electric telescope" in 1883, and developed a patent for it. At the time he was a student in Berlin, an unknown 23 year old. Most early television systems were based on this idea.

Similar to the system demonstrated by Baird, Nipkow's system was based on a disc with holes made in it arranged in a spiral near the outer edge. A bright light was shone through the disk. Because the holes were at the outer edge of the disc, and only about two inches of the vertical travel of the edge of the disc was used to form the picture, the motion of the holes as they scanned the subject was essentially linear.

As the disc revolved, the light through each hole vertically scanned the image, creating one vertical line of the picture. The light reflected from the subject was reflected to a selenium cell. First the light from hole scanned a "line" of the picture, then light passed through the next hole in sequence creating the next vertical line, until the subject had been completely scanned. The selenium cell converted the light variations into an electronic signal, which was then amplified and transmitted to the receiver where they were reproduced. Pictures were reconstituted at the receiver by a similar disc which was synchronized with the transmitter.

A young man in the United States, Philo Farnsworth, the son of a farmer in Idaho, had become fascinated with the technology of the day. It is said that when the family had moved there from Utah, as they came over the final rise and descended to the new farm, he exclaimed something like "it has electricity," as he saw the electric wires leading to the buildings.

Philo quickly became the expert on electrical technology on the farm, and made repairs to anything electrical that failed, and even invented and constructed new electrical labor saving devices. He read voraciously about technology, and became fascinated with the idea of television that he read about in the science and technology magazines of the time.

The story goes that one day, at the tender age of 14, while Farnsworth was (take your pick) either cutting a hayfield, or plowing a potato field, the rows he had made suggested an idea for creating a television picture on a cathode ray tube by scanning an electron beam in a series of horizontal rows over the phosphor on the screen of the tube. Shortly thereafter, he explained his idea to his teacher, who encouraged the boy to pursue it. Basically, Farnsworth's approach to television as he expressed it was "nothing mechanical."

Farnsworth continued to work on his television system, including the camera tube, which he called the "image dissector," and as he grew older, he found some people who would invest in his television system and began to work on it full time.

We won't go into all the gory details here, but while he was finding a lot of technological success, Farnsworth was having some, but not a lot, of financial success with television, which caused the shareholders in the company to be discontent. David Sarnoff, head of RCA, and a visionary in the commercial potential of television, learned of Farnsworth's progress in television technology and a deal was made to incorporate Farnsworth's ideas into commercial television. To be fair, it must be mentioned that another scientist employed by RCA, Vladimir Zworykin, was also instrumental in the development of television as we know it.

In the recent past a number of improvements have been made to TV displays. CRTs have been made bigger and brighter, and in some cases made with flat screens. A number of non-CRT displays have been introduced: LCD, plasma, and now the digital light projector (DLP) from Texas Instruments. Ironic, don't you think, that in the early days of TV moving away from mechanical devices led to a system that could provide better and better pictures, but the most recent technology, which provides breathtaking pictures, is, in part, mechanical in nature.

As they say in France, "Plus ca change, plus que ca meme chose," which translates to "The more things change, the more they stay the same."

Conrad Persson

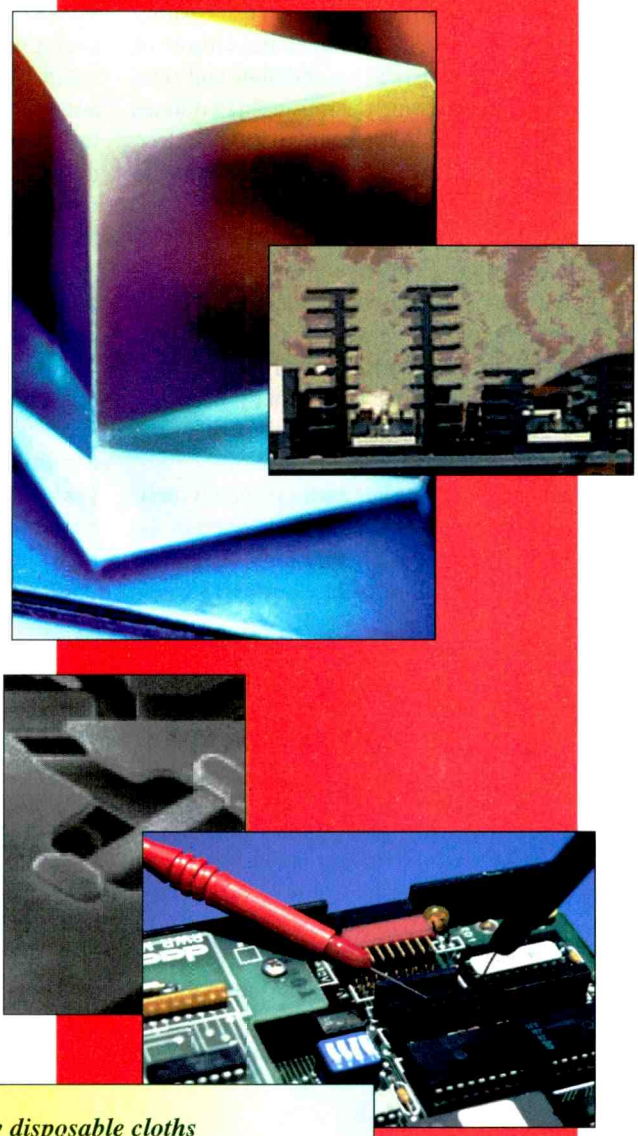
THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS
ELECTRONIC Servicing & Technology

Volume 21, No. 9 October 2001

CONTENTS

FEATURES

50 ES&T YEARS of Service



"Use the new disposable cloths called 'Swiffer' for difficult clean-up jobs. This product is fantastic for trapping dirt. It picks up spilled toner and thick dust on the first wipe. (This idea was submitted by the legendary 'El Cheap-o,' so it must be good – and economical)."

DEPARTMENTS

News

Klipsch Breaks Ground on Midwest's Consumer Audio Research Facility

Indiana and Arkansas to Get 200 Newly Created Jobs

Indianapolis — In spite of many companies reporting layoffs and earnings warnings and analysts predicting a sagging economy, Klipsch Audio Technologies, a global manufacturer of premium loudspeakers and high-end electronics, is growing operations in two states and plans to hire more than 200 people.

Fred Klipsch, CEO of Klipsch Audio Technologies, recently announced that most of the company's Hope, Arkansas-based engineering operations will be relocated to Klipsch worldwide headquarters in Indianapolis and will occupy a new 27,000 square foot, state-of-the-art laboratory. According to company officials, Klipsch's new audio engineering and technology center will be one of the most advanced consumer audio research facilities in the Midwest, possibly even in the U.S. Klipsch has already hired 45 people as part of a plan to hire up to 132 new employees in Indianapolis.

Mr. Klipsch also announces that Klipsch has begun construction on a new 46,000 sq.ft. warehouse and distribution center near its main manufacturing facility in Hope, Ark. According to Klipsch, construction of the new distribution center is a multi-million dollar capital investment that also includes significant renovation of the manufacturing facility, and will create 80 new jobs.

According to an analysis by market-consulting firm Frost and Sullivan, home entertainment is the fastest growing area of the consumer-electronics industry, thanks mainly to sales of surround sound speaker systems. Almost three-quarters of a billion dollars was spent in the U.S. last year on speakers. That number is expected to top $1 billion by 2007. Klipsch hopes to capture the lion's share of this market increase through their new construction and expansion projects.

Klipsch has formed strategic business alliances with Hard Rock Cafe, Regal Cinemas, Monster Cable® and the four Tweeter Center outdoor amphitheaters in Atlanta, Boston, Chicago and Philadelphia.

State of Maine Recycle Decision

ElectroniCycle, Inc. has been selected as the vendor to furnish statewide service to collect and recycle for computers and other CRT devices.

This is similar to the Massachusetts contract as it's a five-year arrangement to process the electronic wastestream from all sources within the state.

DU Alum Receives 2001 Kyoto Prize

Award Honors Work for Laser Development That Made Internet Possible

DENVER — On Nov. 10, Panish received the prestigious 2001 Kyoto Prize in the "Advanced Technology in the field of Electronics" category in Kyoto, Japan. Everyday electronic devices including supermarket scanners, CD players and computer laser printers would not be possible without the groundbreaking research of University of Denver alumnus Dr. Morton B. Panish.

Panish and two other laureates in the category, Dr. Izuo Hayashi and Dr. Zhores Ivanovich Alferov, at the Kyoto Conference Hall. Each received a diploma, a Kyoto Prize Medal of 20-karat gold, and share a cash gift of 50 million yen (about $136,000 each).

The Inamori Foundation of Kyoto, Japan, has annually presented the Kyoto Prizes — one of the world's most esteemed privately sponsored awards — since 1985. The awards honor extraordinary life achievement in the fields of advanced technology, basic sciences, and creative arts and moral sciences.

Since receiving his bachelor of science degree from the University of Denver in 1950, Panish has made pioneering contributions to the telecommunications field while working for Bell Laboratories. The Kyoto Prize honors his developments with semiconductor lasers, also known as injection lasers. Early injections could only operate at extremely low temperatures. Panish's research allowed lasers to be used at room temperature. The researched paved the way for multiple uses of optical fiber communications systems, which makes the Internet possible.

Working at Bell Labs in 1970, Panish and Hayashi developed a single crystal semiconductor sandwich of GaAs between two layers of AlGaAs that they named a double heterostructure. In the development and demonstration of the double heterostructure, Hayashi spearheaded the theory and Panish developed a method of crystal growth (to grow the single crystal heterostructure).

"Way back in 1970, we knew [the injection laser] was a significant development for the phone company, but we had no idea how tremendous it would become," Panish says. "It's a tremendous satisfaction to have your work recognized as work which has contributed to society and the world."

Panish credits the University of Denver for sparking his interest in physical chemistry. "Professor Allen Vander Weyden encouraged me," he recalls. Panish went o n to receive his doctorate in physical chemistry from Michigan State University and began working for Bell Laboratories (now Lucent Technologies' Bell Laboratories) in 1964. He retired in 1992.

For more information about Kyoto Prize, visit the Inamor Foundation at www.inamori-f.or.jp.

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC
Servicing & Technology

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

ELECTRONIC SERVICING & TECHNOLOGY Magazine
403 Main Street, 2nd Floor
Port Washington, NY 11050 USA
516-883-3382 Fax 516-883-2162
mmei@mainlymarketing.com

EDITORIAL
Editor: NILS CONRAD PERSSON
P.O. Box 12487, Overland Park, KS 66212
913-492-4857
cpersedit@aol.com

CONSULTING EDITORS
TV Servicing Consultant: BOB ROSE
TV Servicing Consultant: HOMER L. DAVIDSON
Components Consultant: VICTOR MEELDIJK
Audio Consultant: ALVIN G. SYDNOR

BUSINESS
Publisher: MARIE MARCELLINO
mmarcellino@mainlymarketing.com

President: DAVID L. ALLEN
dallen@mainlymarketing.com

CIRCULATION
Circulation Coordinator
Tel: 516-883-3382 admin@mainlymarketing.com

PRODUCTION
Production Manager: MARIANNE MEADOWS
mmeadows@mainlymarketing.com

SALES STAFF
Sales Director: DAVID L. ALLEN
dallen@mainlymarketing.com

Sales: JONI JONES
P.O. Box 346, Port Washington, NY 11050
Tel: 516-944-8068 Fax: 516-944-2739
jmjones@ix.netcom.com

Sales: BARBARA ARNOLD
60 Thoreau Street, Concord, MA 01742
Tel: 781-259-9207 Fax: 781-259-9883
bhacat@tiac.net

International: JAY FEBRER
jfebrer@mail.com

Classified/Display Classified: LYNDIANE PAOLETTI
Tel: 516-883-3382 admin@mainlymarketing.com

Sales Coordinator: LYNDIANE PAOLETTI
admin@mainlymarketing.com

***FOR SUBSCRIPTIONS** — new or renewal — use our subscription website:* **www.electronic-servicing.com**

Electronic Servicing & Technology (ISSN 0278-9922) is published monthly by Mainly Marketing, 403 Main Street, Port Washington, NY, 11050. Telephone 516-883-3382. Periodical class postage paid at Port Washington, NY and additional offices. Canada: Postage agreement number 1885766. Subscription prices (payable in US dollars only): Domestic—one year $26.95, two years $49.95. Canadian—one year $36.95, two years $69.95. Foreign Air Post—one year $44.95, two years $85.95. Allow six weeks for delivery of first issue and for change of address.

Printed in the United States of America.

Postmaster: Please send change of address notice to Electronic Servicing & Technology, 403 Main Street, NY 11050.

Directv Adds New Self-Service Features to DIRECTV.com Web Site

Customers Can Now Manage Their Account Online

El Sengundo, CA,-DIRECTV Inc., provider of digital satellite television service, announces the addition of several new online self-service applications to the DIRECTV.com Web site (www.DIRECTV.com). The new self-service features allow DIRECTV customers to have access to their accounts 24 hours a day.

The new self-service function launched in October, is an addition to the online billing DIRECTV began offering earlier this year. The new features allow customers to:

- Order pay per view programming and sports subscriptions
- Change their programming package in real time
- View account transactions made since their last billing statement
- Make credit card or check card payments that will immediately post to accounts
- Access a more robust, customizable online program guide
- Activate additional DIRECTV Receivers for existing account

In addition, DIRECTV customers will be able to establish automatic recurring payment by credit card or check card, pay bills using a one-time check draft and order popular events online ahead of time without having to go through DIRECTV call centers. These new features will also allow DIRECTV customers to purchase pay per view movies from the online program guide remotely, which would enable parents who are still at the office to order and authorize a pay per view movie for their kids. Customers can register for these self-service features by visiting DIRECTV.com/signin.

DMX/AEI Music Names Des Walsh Senior Vice President of Commercial Division

Los Angeles — DMX/AEI Music announced that Des Walsh has joined the company as Senior Vice President, Commercial Division, North American operations. Walsh brings DMX/AEI Music 20 years of experience in developing and enhancing growth-oriented businesses in Ireland, England, South Korea, the Netherlands and North America. At DMX/AEI Music, Walsh will be responsible for managing the North American commercial business, including: national, local and affiliate sales; field marketing; operations; sales development and the Business Media and Advertising departments. He will report to Gregory Probert, CEO, DMX/AEI Music.

Communications Research Centre Canada and BTG Sign Agreement to Commercialize Advanced Communications Technologies

Ottawa, Canada and West Conshohocken, PA (The Communications Research Centre Canada (CRC), one of the leading telecommunications research labs in the world, and BTG (LSE:BGC), the global technology commercialization company, have signed an agreement enabling BTG to assist CRC in generating revenue from it's communications, broadcasting and information technologies. Through this agreement, the first for a publicly-funded Canadian lab, CRC will offer BTG will have exclusive rights to market the technologies to companies, first in Canada, and then worldwide. CRC and BTG will share royalty revenues generated from sublicenses.

DIRECTV Successfully Launches Spot Beam Satellite

El Segundo, CA — DIRECTV 4S, a powerful new spot beam satellite that will enable DIRECTV to provide hundreds of additional local channels to television households across the country, was launched successfully from the Guiana Space Center in Kourou, French Guiana.

The spacecraft will enable DIRECTV to add more than 300 local channels to its existing local channel programming in 41 markets and meet the federal "must carry" requirement of the satellite Home Viewer Improvement Act by its effective date of Jan. 1, 2002. Boeing Space and Communications, a business of The Boeing Company (NYSE:BA), built the satellite.

"This is another significant milestone in the seven-year history of DIRECTV and we applaud the joint efforts of the Ariane space and Boeing teams to ensure the smooth and successful launch of this powerful new satellite," said Roxanne Austin, president and COO, DIRECTV, Inc. "Upon its successful deployment at 101 degrees West Longitude (WL), we can swiftly begin to expand our offering of local channel programming to viewers in 41 markets, representing more than 61 percent of all television households in the United States.

DIRECTV 4S, a Boeing 601HP that is the first in the DIRECTV fleet to use spot beam technology, was launched aboard an Ariane 4 launch vehicle at 4:35p.m. PST. After 21 minutes, the rocket left the spacecraft ina geosynchronous transfer orbit with a high point of 22,300 miles (36,000 km) above the equator. Controllers at the Hartebeestthoek ground station in South Africa made contact with the satellite and confirmed that all systems are functioning properly.

DIRECTV expects to begin offering services from DIRECTV 4S by the end of December.

FLUKE®

New

Introducing the 110 Series of digital multimeters. Totally new. Totally Fluke.

Want to compare sizes? These little meters pack more features than some DMMs twice their size. True-rms ac voltage and current readings, for example. 6000 count resolution. Min/Max/Average. And frequency and capacitance capabilities. Plus they give you an easy-open battery access door. They're all CAT III rated for 600V and are protected by a three-year warranty. The 112 model has a backlight and delivers 0.7% basic dc accuracy. The price? They're less than you think. Yes, smaller is better. Definitely. Pick one up at your nearest distributor or call **(888) 722-0763**. Or click into **www.fluke.com/110**.

Fluke. *Keeping your world up and running.*

Work faster with hang-ups.

Get our ToolPak™ strap and magnet for hanging your meter from almost anything while you work.

IEC 1010-1 600V CAT III

TÜV PRODUCT SERVICE GS

VDE Pending

CE N10140 CSA UL

Sometimes smaller is better.

Circle (11) on Reply Card

Servicing New Generation Televisions

by Bob Rose

This article was originally to have the title "Servicing $10,000 + television sets," but because those sets present the same kinds of problems that are presented by similar, less expensive, sets, the current title seemed as though it would be more generally applicable. Television sets have become bigger, heavier, and more expensive. About two years ago I saw a Hitachi product, manufactured in conjunction with Thomson Multimedia, at a training seminar in St. Louis that cost just about $15,000.00. Philips manufactures a gizmo that hangs on a wall (putting it on a ceiling is a little much, don't you think?) for a little more than $15,000.00. This article bears the title "Servicing New Generation Televisions," a category that includes plasma and flat screen products as well as digital products which in turn includes standard definition televisions (SDTV) and high definition televisions (HDTV). Because more and more homes include large, heavy, expensive, television sets, we servicers now face the task, the frustration, and the challenge of repairing very expensive products that are on the whole designed to be serviced in the home.

Servicing Them is a Task.

Well, servicing such products in the home has always been a task, but it was more manageable in the "good old" days. I never really minded Zenith and RCA projection TVs because I could tell Brian, who does our pick up and delivery, to pull the box and bring it in for service. He brought the light box into the shop, leaving the rest of the unit in the customer's house. I set the light box on a bench, made the repairs, and asked Brian to deliver the repaired box, install it, and make whatever final adjustments the repaired unit needed. It was quick; it was easy; it was profitable. However, Zenith stopped making the box as a pullout unit a couple of years ago, and I understand Thomson will shortly follow suit.

Speaking of the light box, I'll pass along some information I recently picked up while perusing email from NESDA's electronics list. One shop owner has developed a procedure for pulling both the tube array and chassis and installing them into a box he built. I don't have the particulars and can't comment on difficulties he had to overcome, but it does seem to work for him.

Other brands have either never used a removable light box or stopped making it a few years ago. We could make certain repairs on those TVs in the home but usually pulled the unit and brought the whole thing into the shop. That's pretty much what we still do. The reasons are simple. First, some repairs are extremely difficult to complete in the home. Second, I'm 58 years old, wear bifocals, have creaky knees, a problem with a cervical disc (I have a pain in the neck), and a back that gets an ache as soon as I bend over. Brian and his helper bring them into the shop where we put them onto a table that is 30 inches high.

Servicing in the home isn't out of the question, however. Thomas, who does some outside work for us, repairs a few in the home if the repair is relatively easy. Even though he is in his early thirties, he frequently brings them to the shop because he has trouble working at floor level and in poorly lighted conditions.

In-Home Repairs are Getting More Difficult

In-home repair is getting more and more difficult as the new generation products come of age. First, we don't want to haul them because they are not only big, often huge, but also expensive. If you haul it, you're responsible for it. A telephone technician in our area was in the process of putting a telephone line behind a sixty-inch Toshiba when he accidentally drilled a hole through the left rear corner of the TV. Don't ask me how he managed such a feat because even he couldn't tell me how he pulled it off. Though the quarter inch hole wasn't noticeable and certainly didn't damage the TV, the customer demanded a new cabinet. We refused to get involved in the tussle that ensued even though we were asked by the company, "Can you install a new cabinet?" I do know that the telephone company settled the issue by buying the gentleman a new TV. Things like that do happen.

Because we do haul them, we have invested in a larger van, more expensive handling equipment, and hired extra help to facilitate loading and unloading them. Thomas just spent about $2,000.00 for something called a "stairwalker," a device that literally walks up and down steps with a projection TV strapped to it. The stairwalker is a marvelous invention, but it is frightfully expensive. There it is, you see, we had no choice. We had to have a larger van and additional equipment just to stay in business, and those investments have cut into the shop profit. We take in more money, but we get to keep less of it than we did.

Second, consumers are building houses that are more and more elaborate. We do service work for a couple who built a monster TV (ninety inches, I think) into a kind of closet. It's a separate room that has built in shelves for a DVD player, a VCR, a complete home audio system, and a surround sound system for the TV. His setup makes service easy because we can get to the back of everything by opening a door and walking behind the equipment. Fortunately, he kept the rollers on the TV, and we can roll it around as needed. However, some are dumb enough (that's the only word that fits) to build their equipment right into the house and fuss when we charge extra to tear things apart so we can get to the failing unit or units. Well, we don't tear things apart anymore, but they do sometimes have to get a carpenter to disassemble the maze so we can service the offending unit.

Third, in-home service means having to lug a computer, literature in some form, hand tools, soldering/desoldering equip-

ment, an oscilloscope, an isolation transformer, a DMM, and such things to the service site. Moreover, we don't dare set those things onto a carpet that cost a small fortune per square foot. We use a very clean drop cloth onto which we set things and on which we work. Since the HDTV products have come into the hands of consumers, such a scenario has become more and more common.

Fourth, servicing products in the home requires us to work in difficult surroundings. All things being equal, we have to sit or kneel on the floor while we probe the circuit board in poor light and sometimes in a poorly ventilated corner of a room. I have had to change clothes after a service call because the clothes I was wearing had become saturated with perspiration. Should I also mention dealing with inquisitive children, customers whose questions break your concentration, and pets that ought to be outside instead of in your face?

Fifth, the construction of DTV products, particularly HDTV units, makes troubleshooting especially difficult, particularly if you try to repair to the component level. When you take the back off one of those TV's, you are confronted by lots of double-sided circuit boards that are loaded with surface mount components. Moreover, the motherboard is usually packed with daughter boards stacked so closely together that getting a probe to a suspected component is a major undertaking if it isn't virtually impossible.

Sixth, replacing modules and whole circuit boards is about the only option open to us. That not only increases the price of the repair for the consumer but also bites into our profit margin. Thomas just recently repaired a HDTV unit and presented the customer with a thousand-dollar repair bill. His profit was a less than it would have been if the TV had been a run-of-the-mill projection unit.

There are other issues involved in home service, but these are the ones with which we wrestle as the new, larger, and expensive televisions become more and more common. I see no need to gripe about it even though griping makes me feel better. I guess it's just a matter of making peace with the situation as it is-or going out of business.

I'm a few years away from retirement and may not have to wrestle with it much longer. If I decide to stay in the business, I will have to invest more heavily in "in-home" service because I don't see any other alternative. Well, there is one. Manufacturers could uniformly go back to the practice of putting the goodies in a light box to make in-home service an easier and more palatable task. However, I don't sense a trend in that direction. If service facilities continue to go out of business at their current rate, manufacturers may have to take steps to make servicing easier in order to get their products serviced. I do know that some shops are

doing what my partner and I decided to do a few of years ago. We absolutely refuse to provide warranty service for certain brands and certain products because of low pay, difficulty getting service-related issues resolved, rejected warranty claims, and the like. But this is another issue.

Manufacturers Don't Always Make Things Easier

The equipment and the environment in which it is located are two issues with which we have to contend as we service the new generation products. We also have to struggle, and often struggle almost daily, with manufacturers. I won't use names in print, but I will certainly use the names in private conversation.

One manufacturer wants us to get a "PTV Authorization Number" before going out on a service call. Having gotten the number, we are to proceed to the site, give them a call, and follow their instructions as we proceed with the repair. Sounds nice, doesn't it? Wait till you have to wade through a voice mail box to get to the point where you are told you have "x number of calls ahead of you" and that your "hold time" will be twenty minutes. Some customers don't want their phones tied up that long. I don't want our time tied up that way either.

Others want us to call once we get on site and talk to technical assistance before and as we proceed with diagnosis. Same problem, you see. We have to wait for someone to respond to the phone call, and the wait can be interminable.

Now, if you are reading between the lines, you have picked up on the fact that we frequently have to make two trips to complete a repair. The first is a diagnostic call; the second is the "fix it" call, praying as we go that we don't have to make yet a third call.

The cost of parts is also an issue. It's nothing to order a module for the new stuff and be billed for $500.00 to $1,000.00. We order the part and have our account billed, pull and ship the old part, file the appropriate paper work, and wait to get paid. Chances are the warranty payment and credit for the part won't be forthcoming. In the meantime, we might order just another part and are refused shipment because the account is "more than thirty days overdue." Some manufacturers don't sell parts direct, requiring us to order them via a third party. In such an instance, we tie up our money while we wait for a manufacturer to pay us for parts and service rendered on their behalf. Let it be known that in almost all instances we don't get a mark-up on the parts. We just get credit or payment for the exact cost of the part.

Here's a case in point. We recently replaced all three CRT's in a two-month-

old monster PTV. Before installing the new tubes, we had to make certain that two modifications had been completed and check a third condition. Having completed the necessary checks, we installed the new tubes, performed a complete convergence, and filed the necessary paper work. The manufacturer notified us about ten days later that the claim had been rejected because we had filed a labor rate that was $2.00 higher than our negotiated rate. The business manager resubmitted the claim. That was in July. It is now October, and we still haven't been paid. Since a third-party vendor furnished the tubes, we are liable for the cost of the parts. The same manufacturer had in the past and under similar circumstances simply noted that we would be receiving "x number of dollars" instead of the amount requested. Nobody knows why the manufacturer simply didn't pay the claim by lowering the labor rate by $2.00. The rejected claim has created a problem on which we are still working. But then we frequently have problems with this "name brand" manufacturer. Would you be willing to undertake other, similar jobs for them? We aren't, but we must service their products in order to keep our dealer customers.

This episode reminds me of the time the same manufacturer held up warranty payment on an $800.00 picture tube because we failed to put the customer's zip code on the warranty claim. When they located the offending claim, they found that the zip code had been on the claim all along. We still didn't get paid for almost a month and certainly didn't get an apology.

Of course payment for services rendered is also an issue. The unit in which we installed three picture tubes had other problems. It came into the shop as a dead unit. We found and installed a defective part in one of its four power supplies. When the set came on line, we found phosphor burns on each of the tubes. Now when phosphor burns occur on the tubes in that unit, the manufacturer requires the servicer to make certain modifications if they haven't already been done. We repaired a power supply, checked for the modifications, installed and set up three CRT's, performed a complete convergence, and delivered the PTV to the customer. The latter feat meant putting a vehicle on the road for a total of three hundred miles. For our efforts we were paid $138.00. Raising cain didn't get additional money, but it evidentially embarrassed the field service rep because in just a few days we got an across-the-board rate increase.

Fortunately, some manufacturers are more kindly disposed to us than the ones I just talked about. They automatically raise their rates without our having to ask and are quite willing to help us resolve whatever problems we have. They even pay mileage when we have to drive a distance greater than 30 miles from the shop. We

look forward to servicing their products.

Getting Parts Can Be a Problem.

The way parts orders are handled these days occasionally creates a problem. Some manufacturers still handle parts orders using the telephone. Others, however, have gone online. The hype is on line ordering saves time and money. Well, the computer is here-and-now, and I don't have a problem with it, but I do occasionally have a problem with on line ordering. It doesn't always save time and may in fact take up to three times longer than the old-fashioned phone ordering system. Moreover, there are times when we need help finding a part number. Online ordering requires precise information, meaning we have to go to technical assistance (if we can get through) to get the information. It's not a big problem, but it does get tedious from time to time.

The parts orderings problems I've just mentioned really aren't serious though they are irritating. However, other problems relating to on line ordering are serious. For example, I tried to order a part online earlier in the summer and was told it was no longer available even though the TV was four years old. I got it from MCM less than a week later. The same company has bugs in its software that may not only report "NLA" (no longer available) status but also give out an incorrect part number or refuse tofill the order because your account is past due when it isn't.

To be fair I must report that at least one other company has a super on line parts store. It takes less time to access, is at least as reliable as the old way of ordering, and ships the part in less time. That's really neat!

I have at least temporarily solved the problem by ordering parts from those suppliers who have a known track record. For example, why deal with a major manufacturer who give poor service when I can order the very same part from an independent vendor who ships promptly and reliably. I won't go back to the major manufacturer until it cleans up its act.

Working With the Literature Can Be a Challenge

Then there's the little issue of service literature in CDROM format. It has its advantages, to be sure. But it doesn't always make servicing easier. Just yesterday I spent more than thirty minutes trying to find a part number. The CDROM for the unit had "the differences" between it and previous models and referred me to five other manuals for parts. I had to look through all of them to find what I needed.

I personally find paper manuals to be quicker, easier, and more efficient to use in the home. Because that is true, we make an effort to take paper with us whenever we can even if we have to print it out before we leave to make the call. Does this mark me as "inflexible," "old fashioned," and "resistant to change"?

Conclusion

Here, now, are a few of the issues related to servicing new generation televisions.

Some of the issues have been with us from the beginning because those issues involve learning new technology, feeling our way around new products, using unfamiliar test equipment (like DTV signal generators), finding the best and most profitable way to do business, and building a data base to facilitate repairs.

Other issues cluster around manufacturers who make the job of repairing their products difficult because they won't listen when we ask them to do certain things to make our job easier. What's the matter with spending a few extra dollars for the wood that goes into building a light box? Why produce literature that isn't "user friendly" in the best of circumstances? Why maintain a technical assistance hotline that is both difficult and time consuming to access? Why make parts ordering difficult? Why not work with us when we have a problem with a warranty claim? Why skimp on technical training?

Some of these issues may work themselves out in the future; some will probably get worse. In the meantime, I wait and hope. ■

Information for purchasing a stairwalker:
Escalera, Inc. PO Box 1359
Yuba City, CA., 95992, USA
Phone: 530-673-6318 Fax: 530-673-6376
e-mail to: info@escalera.com
www.stairclimber.com

PC Testing Tips

by PC911
www.PCNineOneOne.com

Servicing personal computers can easily be an exercise in humility, or futility, or both. That's not so much true of the hardware side of things, as it is of the software side of things. When it comes to the hardware, generally if a board is faulty, you replace it, you don't troubleshoot to the component level. After all, boards are generally pretty inexpensive, and it just isn't worth it to spend any time troubleshooting and replacing components. There may be exceptions to that rule, but for the most part that's how things are done.

And this is not to say that you won't ever find a hardware problem that will test your skills as a highly-trained service technician. That will no doubt happen from time to time. But as often as not, the knotty problems will be software related.

This article will cover several aspects of personal computer service. The first segment will give you some suggestions on how to identify the mainboard in a computer. The second segment will discuss some of the problems that can occur as a result of programs that run in the background, and will offer some suggestions on how to troubleshoot and correct such problems. The third segment will give you some tips on testing CD-ROMs.

This information was graciously provided by the good folks at www.pcnineoneone.com. A place where you'll find "Friendly Expert Computer Help - In Plain English." This web site has how to's, tips and tweaks, reviews and more to help people who are mystified about one aspect or another of personal computers. There's a lot of information at this site, and if they don't have what you're looking for, they have a forum where you can exchange ideas and questions and answers with others, and links to many other sites

We chose to make as few edits and changes as possible to the text of these articles, so it will sound just the way it will sound when you visit their site.

PC mainboard identification

Every now and then, we see questions in the PC911 Forum regarding identification of the mainboard installed in a PC.

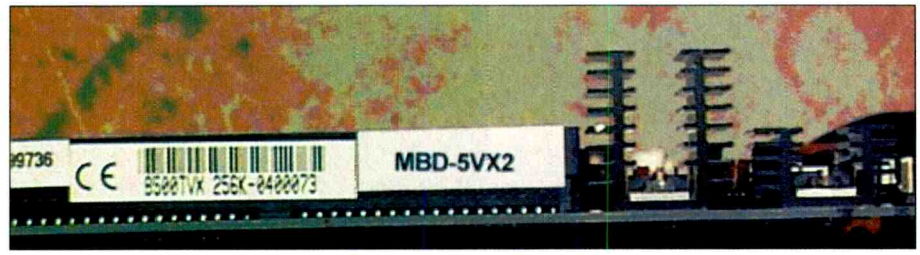


Figure 1A. Two model numbers on same board, on side of ISA slot.

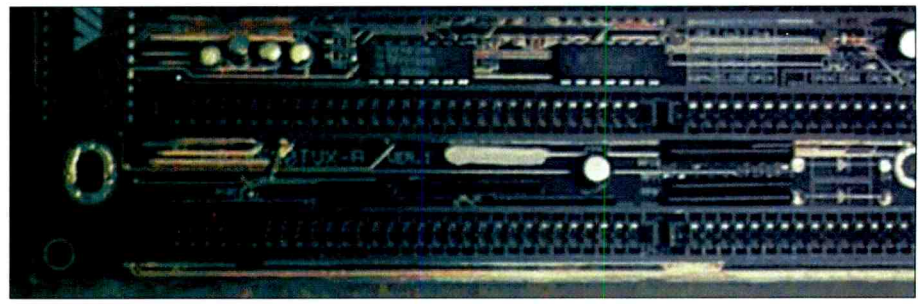


Figure 1B. MB8500TVX — A surface marking.

Many users simply don't know the make and model of the mainboard (motherboard or mobo) that their systems are built around. Does this really matter? No ... not unless and until something goes wrong where you need that info to effect a repair. Or, until you decide to perform some DIY system upgrade and suddenly you need to know something specific about the board.

If all was done according to Hoyle when you purchased your system, you received some sort of documentation with it. Many times, that documentation will include at least a spec sheet itemizing the individual components, and at best it will include a User's Guide or manual for the mobo.

Several types of system upgrades might require the user to have this documentation. Sometimes, you will need to change jumper or DIP switch settings when installing a processor of a different type or speed. Some memory changes will also require such changes. Then there are such tasks as enabling or disabling integrated sound, modem, and video features. Or, maybe you're just plain curious! If you find yourself in the position of needing to identify an unknown mainboard, fret not - there are several workable alternatives to throwing darts at a list of mobo makers.

In this article, I will concentrate on the American Megatrends and Award BIOS'es, as they are by far the ones most commonly used by modern desktop systems. I will address three basic methods for use in determining your mainboard manufacturer.

The "Lookatit" Method

The first thing to do, and probably the last thing that many folks think of, is to simply "look at it". Many mobo makers will screen-print their ID right on the board. Ideally this ID will be on the upper (visible) surface of the board, but this is often not the case with "generic" mobo's. With some of these boards, if they are ID'ed at all, it is on the lower surface, which is normally not visible on an installed board.

Look carefully at the entire surface of the board, including those areas that may be hidden behind drives, cables, or the power supply. Many boards are labeled between their expansion slots. Another common location on newer boards is in the area of the CPU slot or socket. Also, be aware that while the board may not have its maker's name showing, it just may have its model name or number printed there for all the world to see.

While you are searching the board for

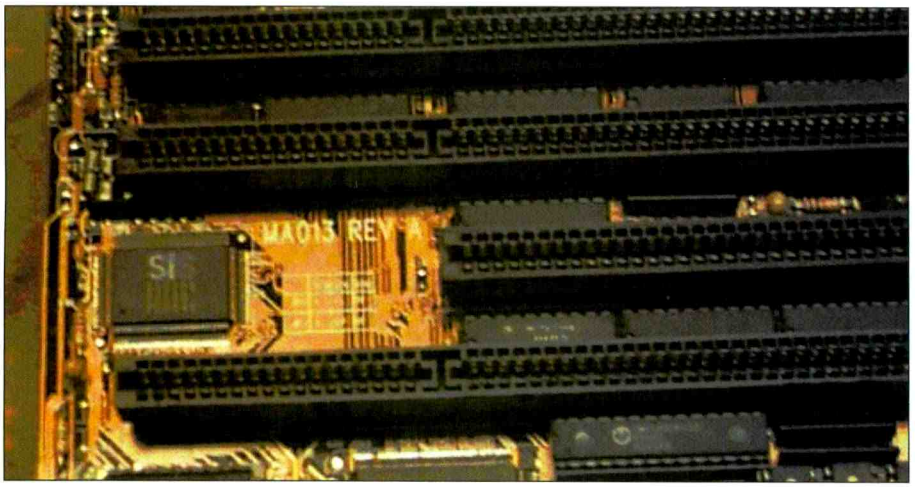


Figure 1C. Board ID between ISA slots.

Figure 1D. Board ID on edge of board, near cache slot.

make and model info, take a minute to note the location of any jumpers or DIP switches on the board. If you are doing an upgrade requiring resetting any of these devices, it will help to know where they are located. Figures 1A through 1E illustrate the mainboard identification schemes used on four different mainboards

In Figure 1A, we can see the markings applied to a generic model. The markings here are somewhat unusual in that it would appear that there are two different model numbers identified - 8500TVX and MBD-5VX2. This is sometimes the case when a basic board from one manufacturer is sold under another brand name. There are several mainboards on the market, under widely varying names, all made by one company. This situation is a real problem when the manufacturing company is just that - an operation that builds and sells generic boards for other (marketing) firms without providing any real end-user support. The support responsibilities fall on the seller, and often there is little or no support to be had as a result. A web search for these models via http://www.google.com/ returned enough hits on the 8500-TVX to make it obvious that the board is a Biostar board. A similar search for the MBD-5VX2 designation returned no hits. A quick hop to Biostar's website http://www.biostar-usa.com/ and a little bit of detective-type browsing through their museum showed the board to be a model MB8500TVX-A version 1 board. For the record, this board is also screened with that information on its surface, as shown in Figure 1B below.

In Figure 1C, we can see the markings on an older 386 mainboard. Here, the model number and revision level are clearly evident, but the manufacturer is again not shown. Get used to that. As a general rule, the top name-brand boards will usually headline their brand name, but the lesser-known boards are going require some digging. This particular board can be identified as a product of Edom International, but not with a simple web search. Once identified via an advanced search, using MA013 and 386DX as the search strings, it becomes evident that the board was an Edom product.

In Figure 1D, we see another model number, AP5C/P. This time, a simple web search on that string returned numerous (102) hits. Among the top ten hits, six were for pages on Acer or AOpen sites. A couple of clicks later and we're at http://english.aopen.com.tw/, the English-language home page for this manufacturer. Pretty sweet, huh? Let's take a look at the last picture, Figure 1E.

Here again we can see a model number and revision level only. First step, which by now should pretty apparent, is a web search. In this case, the web search leads us to http://www.dcscomputer.com.tw/, the home page for the board maker DCS Computer Systems.

So what does all of this mean - why did I go through all of this if it is so obvious? Well ... because it is only obvious once you've done it a time or two. Sometimes the most obvious alternative gets overlooked simply because we think that it can't be that easy! Moral of this story - start out with what you can see - "Lookatit".

The BIOS Method

Under normal conditions each and every mainboard model or model family uses a unique BIOS. This is a geeky way of saying that the BIOS used on most mainboards was written or modified specifically for that board type. It is for this reason that you will notice so many different BIOS update files on most manufacturers' websites. If a company produces 15 different mainboard families, there will generally be at least 15 different BIOS versions used across that mix. Sometimes, different BIOS versions will be used within a mainboard family as well. Consider two boards within a given design family, one with two DIMM slots and supporting up to 512MB of SDRAM, while the other has three DIMM slots and supports 768MB of SDRAM. A likely consequence of this design change is that these two boards, while in the same design family, will probably use different BIOS versions.

Don't be confused by the terminology here, either. The terms version and release have two distinct meanings as applied to PC mainboard BIOS. Version is generally taken to mean a BIOS that is designed for a specific combination of processor, RAM, chipset, peripheral support, OS support,

New Family of B+K Precision® Device Programmers

B+K Precision programmers have been designed for ease-of-use and reliable performance. These programmers are a must for anyone that Tests, Repairs, or Programs any electronic device that uses a memory IC.

- 48 pin ZIF socket, no adapter required for any DIP device up to 48 pins (32 pin model 848)
- Fast and accurate programming
- Parallel printer port interface
- Windows 95/98/Me/NT/2000 compatible

(Contact us for help in selecting the right programmer for your application)

Model	848	864	865
Devices Supported	"EPROM, EEPROM/Flash, Serial EPROM, Microcontroller, PLD and BPROM (BPROMs 864 & 865)"		
Device Library	2500 (Optional Modules maybe required)	4322	4391
Interface	Standard Printer Parallel Port		
"Programming Socket .300-.600 pin spacing"	32 pin DIP ZIF	48 pin DIP ZIF	48 pin DIP ZIF
Operating System	Windows® 95/98/Me/NT/2000 compatible		
Buffer Features	Erase, Random Data Fill, Fill Block, Copy Block, Move Block, Swap Block, Buffer Print, Find Text, Replace Text, Go To Address, Checksum Calculator, 8 bit & 16 bit View Modes"		

Enter 17

NEW PRODUCT UPDATES FROM B+K PRECISION®

125VAC, 125W Output DC Inverter

The model 1605 DC Inverter can convert a standard 12 volt cigarette outlet into 115VAC, 60Hz signal that can be used to provide power for just about any kind of appliance. It can be used to provide power to notebook computers, televisions or just about any electronic device that draws less than125W. This unit can provide its maximum current output continuously hour after hour without overheating.

Enter 18

Tone Generator & Cable Tracer Kit

The model 262 Tone Generator and Cable Tracer Kit contains a hand-held Tone Generator and a hand-held Cable Tracer. The Tone Generator can impose a tone on a wire or cable and test for wire continuity. The Cable Tracer can trace Tone Generator signals through dry wall, wood and many other non-metal surfaces (under ideal conditions). The Tone Generator has a standard RJ11 plug and two alligator clips that allow easy connections between the unit and stripped wires, terminal panels, wall plates, or modular single line jacks.

Enter 19

Battery Capacity Analyzer

For UPS's, Telecommunications & Automotive

The need for battery maintenance tools is growing for use in Automotive, Field Service and Maintenance, Telecommunications, and UPS Manufacturing/Maintenance applications.
Model 600 measures the storage capacity of 12V Lead Acid Batteries and displays the capacity as a percentage. This can help identify batteries which may be defective or deteriorated. With California electricity crisis, model 600 is the perfect tool to prevent sudden UPS failures.
Model 600 is priced at $299 and available now.

Enter 20

New Designs for BK Power Supplies

Triple Output DC Power Supply

Model 1670A
- One variable 0-30 VDC, 3 A section
- One 12 VDC fixed section
- One 5 VDC fixed section
- Ideal for general electronic servicing, school electronics labs, and powering up hobbyists projects

Enter 21

Programmable DC Power Supplies

Model 1786A
- Nine user-programmable preset outputs
- Ten step user-programmable output routine
- In-case calibration
- Serial interface cable and software included
- Download upgraded software from www.bkprecision.com

Enter 22

BK PRECISION 1031 Segovia Circle, Placentia, CA 92870 (714)237-9220, Fax: (714)237-9214 www.bkprecision.com

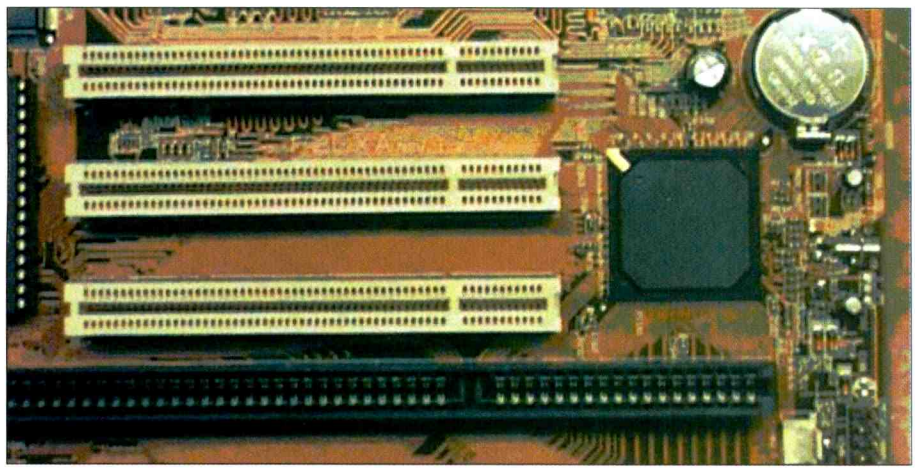


Figure 1E. Board ID between PCI slots.

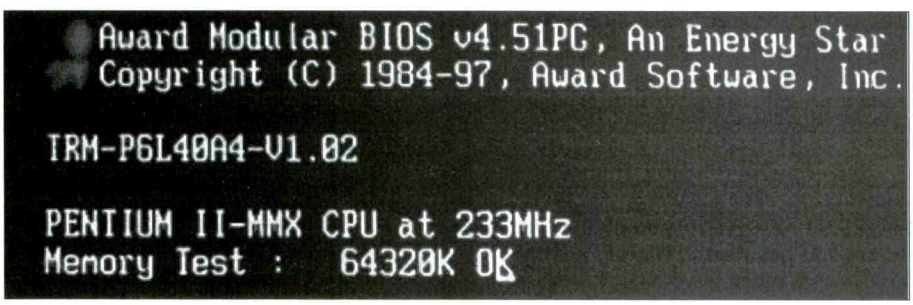


Figure 2. Mainboard ID information displayed on startup.

Figure 3. BIOS ID string displayed on startup.

and performance level. Release is generally taken to mean a specific iteration of a specific BIOS version. Various BIOS versions are offered in various releases as bug fixes or additional system enhancements become available. Some websites will refer to their BIOS update offerings by mainboard model and BIOS version. In this case, the mainboard model correlates to the actual BIOS version, while the update version correlates to the BIOS version release.

Now that that is out of the way, why is it important to begin with? It's like this - if each different mobo uses a unique BIOS, it stands to reason that the mobo can then be identified simply by identifying the BIOS that it uses. Some manufacturers make this very easy for us by displaying the BIOS version and release on system startup. Others will display a BIOS identifier string on startup, while still others will offer no on-screen clues. Lets consider an easy one first.

Figure 2 shows the information displayed at the upper left corner of the monitor on system startup, during the RAM count. Figure 3 shows the BIOS ID string (for the same mainboard) that is displayed at the same time. To keep this information displayed long enough to write it down, simply press the Pause key on your keyboard when the information appears. Write down the desired information, and then press any key to continue the boot cycle.

In Figure 2, the board is identified with the string TRM-P6L40A4-V1.02, and the BIOS used is some iteration of Award's 4.51PG BIOS - probably the most popular PNP BIOS in use today. Using the board ID string as a basis, a simple web search takes us to http://support.tekramusa.com/, the support site provided by the board maker, Tekram Technology.

The board ID string also tells us that the current BIOS release is v1.02. Is this information relevant? The answer to that depends upon the reason you are trying to ID the board in the first place. Suppose you are having a problem getting a real-mode CD-ROM device driver (for your BTC CD-ROM reader) to load successfully. Somewhere along the line, somebody says, "Yeah - that was a problem with that mobo with early BIOS releases. They fixed that in release 1.03." Now it's obvious, right?

That's all the information that we need to identify this particular board. It actually identified itself and its BIOS release for us. Now suppose that we are dealing with a board that doesn't display the board ID info, but does display the BIOS ID string across the lower portion of the monitor, as shown in Figure 3 below. Can we use this information to work backwards to the board model? Sometimes ... as we are about to see.

A quick look at the BIOS ID string gives us some helpful info right off the top. We can see that the BIOS date here is 10/29/97, and that the BIOS provides support for the Intel 440LX/Winbond W877AF chipset. The BIOS string also gives us some other useful info if you know where to look for it. I have found Wim's BIOS Site - http://www.ping.be/bios - to be an excellent resource for identifying the board from its BIOS ID string. This site has extensive listings for both AMI (American Megatrends) and Award BIOS'es, and there is also a wealth of other BIOS-related information available there as well.

As is thoroughly explained at Wim's BIOS Site, the significant portion of the string is the 2A69JTG9C portion, which includes a basic chipset code, a manufacturer code, and a model/family code. The following illustrations show how these codes relate in the tables provided at the site. As is evident in Figure 5, where available, there are also links provided to the board maker's website.

A similar scheme of ID codes is used by AMI in their BIOS'es. I have a 533MHz test box in my shop that reports a BIOS ID string of 62-0922-009999-00101111-071595-000000-M756LMR-H and a dis-

played date of 09/22/2000. In most cases, the last four digits in the third group are the manufacturer code. Note that I said "in most cases". This particular board is a PC-Chips board, and their assigned ID is 1437. There is no apparent pattern to the use of 9999 in the ID string, and I have seen it on several different makers' boards. This ID string does, however, include the board model, M756LMR, in its last group of digits. AMI calls this a Project Tag. Again there is no fixed rule to this. Some mobo's display their chipset type as the sixth group of digits, where this string shows all zeroes. What I have seen is that when the manufacturer ID is shown as 9999, the ID string will often contain the model as a project tag, and when the ID string has a valid maker ID, it then usually has a chipset type rather than a model displayed. In the case of this mobo, a web search for the Project Tag data yielded the manufacturer's name.

The Software Method

Sometimes, there is no help to be found either on the board or in the startup dis-

2A69H	Intel 440FX chipset (Pentium II/Pentium Pro based chipset)
2A69J	Intel 440LX/EX chipset (Pentium II based chipset)
2A69K	Intel 440BX/ZX chipset (Pentium II/III based chipset)
2A69L	Intel 'Camino' 820 Chipset

Figure 4. BIOS chipset code in ID string 2A69JTG9C.

TB	Taeil ???
TG	Tekram
TJ	Totem

Figure 5. Manufacturer coces as referenced in ID strings.

- 2A69JT19C: Trang Bow TB-6LX
- 2A69JTG9: Tekram P6L40-A4
- 2A69JV3DC-00: VTech HIS-P6EX4-A3

Figure 6. Manufacturer and board family or model codes in ID string 2A69JTG9C.

```
AMIBIOS Motherboard Manufacturer Identification
Version 1.2 (02/07/2001) Copyright 2000 American Megatrends, Inc.

 This file has recorded information useful in identifying the manufacturer
 of this motherboard. The information is listed below:

An AMIBIOS ID String Was Detected:
       62-0922-009999-00101111-071595-000000
       -- ---- ------                ------
        |  |    |                      |
        |  |    |                      Chipset/BIOS Info
        |  |    Manufacturer ID
        |  Version Information
        Processor & BIOS ROM Information

The Manufacturer Code Detected (9999) Does Not Have A Database Entry.

The Following AMIBIOS Project Tag Was Found: _TG_M756LMR
```

Figure 7. AMIMBID results as written to disk.

```
        BIOS-Info, c't/Andreas Stiller, 10/97

Computer ID             : PC, Type : AT
BIOS Date               : 08/23/99
Award BIOS found        : Award Modular BIOS v4.51PG
Award ID-String         : 08/23/1999-693-596-SMC-2A6LG<3JC-00
Board/BIOS-Version      : 6VIA81-PC133 Ver: B

OEM                     : unknown
URL                     : ??
Chipset                 : 693-596-SMC //VIA
```

Figure 8. CTBIOS v1.3 results as displayed.

play. If that is your situation, don't despair yet! We still have one more trick to try - we can "ask" the mainboard who it is, and who made it.

AMI offers a freeware mainboard (BIOS) identification utility that, although written specifically for the AMI BIOS'es, is only able to extract a very limited range of information. This utility is available for download at AMI's Bios support site. The following page, http://www.ami.com/support/bios.html, offers AMI's manufacturer code list as well as links for the ID utility and post- and beep-code references. The ID utility (AMIMBID.EXE) is a compact (94Kb) file that must be run from a pure DOS session. It will read the data stored on the BIOS chip and display the relevant portion of that data on-screen. It will also write a text file (RESULTS.TXT) that contains most of the information displayed. Figure 7 below illustrates the data written to the text file for the mainboard discussed in the previous section. Note that the BIOS ID string extracted is not quite the same as what was displayed on system startup. The boot display included the Project Tag, which is shown separately in the text file. Note also that this utility does not provide a manufacturer's name if the Manufacturer Code does not match a database entry. As was the case in earlier examples, a web search is in order for final determination of the board maker.

Needless to say, these results are less than ideal, and not helpful at all if the board uses Award BIOS. In that case, I suggest the use of CTBIOS, another mobo ID utility. This one is the (freeware) product of c't, the leading PC enthusiast's magazine in Germany, and can be found at their website, http://www.heise.de/ct/english/. Of course, most of the site's pages are in German, so I'll give another link for this utility, http://bootdisk.com/. This site is chock-full of useful tools besides CTBIOS, so check it out carefully.

This utility will extract useful data from both AMI and Award BIOS'es, and it does a fairly good job of providing the board maker's name and web address. Compare Figures 8 and 9 below. Figure 8 show the output of CTBIOS v1.3, while Figure 9 shows the same system when examined by CTBIOS v1.5. In either case, it is evident that the board does not carry its maker's name in its BIOS chip. CTBIOS v1.5 reveals much more information than its earlier version did, but it cannot find something that is not there. Once again, we resort to the web search for the board model 6VIA81 or to Wim's BIOS Site for a lookup on the manufacturer ID X3. Wim identifies the X3 code as belonging to A-Corp, and this finding is easily verified by the web search.

In Conclusion

With all of the high-level system diagnostic utilities I have at my disposal, I still end up returning to these tried-and-true routines when I need to know whose product is in the machine. The utilities that I have recommended here are all freeware, readily available for download, and are easily run by executing their filenames at a command prompt. They will all return the desired information as on-screen displays. These factors combine to make them my utilities of choice for mainboard identification.

One of the obvious questions that may have occurred to you by now is "Why not skip all of this and go right to the BIOS producer's site for information?" Well, the short and sweet answer is that both AMI and Award will simply direct you to go to the mainboard maker for any BIOS support issues. Remember, the whole intent of this exercise was to identify the board maker. If we don't know who the board maker is... well, you get the idea.

I certainly hope that some of this will make your next mainboard identification task just a little bit simpler.

Programs Running in the Background

Sometimes you will run into the problem where two programs that are installed on your PC conflict with each other and refuse to run at the same time. Or you have a memory leak (a program that uses memory when in use but does not return it after it is done) but are not sure which program is causing it. It can be tricky to find the culprit, because you think that no other programs were running, so what could possibly be the problem? You'd be surprised at how many programs are running on your PC right now. Take a look right now and be amazed. Push Ctrl-Alt-Del on your keyboard right now. You should now see a dialog box labeled Close Programs. In there is a list of some pretty funny looking names. Each one of those is a program running right now in the background. Didn't expect to see that many, did you? Two of the items listed here are always there, that is Explorer and Systray. Those are Windows compo-

nents and they are supposed to be there. But everything else is a program running right now that could be a possible culprit for your problem. They get loaded automatically every time you start Windows.

How Do They Get Loaded?

There are several places where you can find out. Let's first look at your startup files. Go to Start/Run, and type Sysedit. In the resulting window you'll see many cascading Windows. In the Autoexec.bat window you might find a few lines to start a program. Or in the Win.ini file, look at the load= and run= lines. Anything in those lines after the = sign is a program to be loaded.

Windows also has a startup folder where it checks every time Windows starts. If there are any programs listed, it will start them automatically. You can find the contents of the startup folder by going to Start/Programs/Startup. Didn't realize you had those items in there, did you?

Then there is another not so obvious place: the Windows Registry. The registry key HKEY_LOCAL_MACHINE \ Software \ Microsoft \ Windows \ CurrentVersion \ Run holds a list of programs to be loaded on Windows startup as well.

You probably think "how did they get in there?" since you didn't put them there. Some of them need to be running in the background to function properly, such as a virus scanner. They put themselves into a startup menu automatically when you install them. Others might not need to be there, but they load anyway to be available when you need them.

Now that you know how to find out what programs you have running in the background and how they got there, let's talk about how to do some troubleshooting to find the culprit.

Be Systematic

To find out which application is the problem, you need to take a systematic approach. There are two ways to do this: You can shut down all other programs, make sure the problem does not happen anymore, then turn them back on one by one, until it happens again. Most likely the last program you turned on before the problem reappeared is the culprit.

Figure 9. CTBIOS v1.5 results as displayed for same system as shown in Figure 8.

The other option is to shut down one program at a time, until the problem disappears. Most likely, the one program you just shut down is the culprit.

Prevent Them From Loading

The best approach is to make sure a possible suspect doesn't even load on startup. Windows 98 comes with a built-in utility that lets you control what loads when Windows starts. Start this utility by going to Start/Run, typing msconfig and clicking OK. You'll see a dialog with several tabs across the top. The last tab is labeled Startup. In here is a complete list of items that Windows loads automatically. Note the checkbox next to each item. Uncheck the first item, reboot, see if the problem persists. If so, go back to msconfig, re-check that item, uncheck the next item and reboot. Repeat this procedure until you've found the culprit.

For more information straight from the horses mouth on how to use the MSConfig utility, check out this article from the MS Knowledge Base.

Shut Them Down

There is also a way to shut down a program that runs in the background of your current Windows session which does not require a reboot. You can push Ctrl-Alt-Del to bring up the Close Program window. Now highlight the program you want to disable for now and click End Task. The Close Program window should disappear. Sometimes it can take a few seconds for the program to unload, so be patient. Other times, you might get another window informing you that the program is not responding. That window will have its own End Task button that you should push to close it for good. Repeat this process for every program that you want to shut down.

Be careful: Do not push Ctrl-Alt-Del while the Close Program window is still on the screen, it will reboot your PC, reload Windows and all those programs you were just trying to shut down, and you'll have to start all over again.

Also, remember not to shut down Explorer. That's Windows running and it's supposed to be there.

The main advantage of the first procedure is that it will completely prevent that item from loading, and will not load that item again until you re-check its box. The disadvantages of the second procedure are that it will load all programs again as soon as you reboot and that it's not as thorough because it might not completely get rid of the program or unload all parts of it.

Either way, you should be able to isolate the program that's causing your problem. With that knowledge, you can take the necessary steps to correct it, e.g. uninstalling the program if it is no longer needed, upgrade it if there is an update, upgrade or patch available from the manufacturer, or at least temporarily disable it to avoid the problem when applicable.

To take this one step further, you can download a neat little program called Startup Cop. It not only lets you prevent

programs from loading when booting, it also lets you create separate profiles so you can boot with only pre-defined applications running. This tool is especially helpful if you have Windows 95 which does not come with the msconfig tool.

Testing CD-ROMs

There are many different uses for CD-ROM drives: You use it to install software, listen to music CDs, play games, etc. Because of its versatility, it can be tricky to troubleshoot CD-ROM problems, so we made a list of common problems and their solutions for you.

Is the Drive Properly Connected?

When you have problems accessing the drive and it either shows as not available, or does not show up at all, the first thing you should check are the physical connections of the drive. Take off the cover and take a look at the back of the CD-ROM drive. You should see something like this: Figure 1.

Make sure the drive has power. Then check that the data cable is connected properly. If it is an IDE drive, you are probably using a 40-pin ribbon cable. This cable has a red line along one side of the cable. This indicates location of pin 1 and needs to line up with the pin 1 marking on the back of the drive. An easy way to remember this is that the side with the red line usually goes next to the power connector. Then make sure that the other end of the data cable is plugged into the appropriate controller on the motherboard and also has pin 1 lined up correctly.

Another important thing to check is the jumper(s) on the back of the drive. Just like any other IDE device, you can either set it to Master, Slave, or Cable Select (CS - rarely used). If you have only one device on this IDE channel, then the drive should be set to Master. If you have two devices on this IDE channel, then one needs to be set as Master, the other as Slave.

If this is a SCSI device, first check the cable, then make sure that the drive has a unique ID number assigned to it, and that the SCSI chain is terminated properly. For more information on configuring SCSI devices please take a look at our SCSI tutorial.

And while you have the cover off, you might as well take a look at the sticker on the drive and write down the make and model in case you need it later to obtain the correct driver.

Does Your PC Recognize the Drive?

Now that you know that the drive is properly connected, put the cover back on and power the PC on. Watch carefully on the first screen that appears when you do. You should see several lines where the BIOS detects IDE devices and displays the devices it found. Is your IDE CD-ROM drive listed here? If not, hit the key indicated on the screen to enter the BIOS setup menu. The most common keys for this are Del, F1, or F2, depending on the BIOS manufacturer. Once you see the setup screen, look for a listing of the primary and secondary IDE devices. Again, it varies where this menu is located, but it should be easy to find. When you see it, check what each one is set to. Each one should be set to Auto, or Auto Detect, which tells the BIOS to check for a device on each position on each channel during bootup, and try to identify the device automatically. But if it is set to None, The BIOS won't even look and therefore cannot find the drive.

After correcting the setting here, save the changes and exit the BIOS. This will automatically reboot the machine. Watch the screen again carefully to make sure the drive is now being recognized. If the CD-ROM drive still doesn't show up, then you might be dealing with faulty hardware. Replace the cable to the drive with another one and see if the problem persists. The next logical step would be to swap the CD-ROM drive with another one that you know works. This process will help you eliminate the possibility of bad hardware.

If the CD-ROM now shows up in the BIOS, great. The PC knows about it. Let the boot process continue to load Windows. Once you're in Windows, open Windows Explorer, and see if the CD-ROM drive is now listed and accessible. If it doesn't show up, then it's time to look at the device manager. Go to Start/Settings/Control Panel/System/Device Manager, and look for an item labeled CDROM. If it's there, click on the "+" symbol next to it to expand this category. You should now see the drive listed like this for example: Figure 2.

If there is an exclamation mark or red x next to the drive, it indicates that Windows has a problem with the drive. Double-click on the description for the drive to get to its properties and read the device status for an explanation of the problem. For example, Windows might not have a driver available for the drive, or the wrong driver was installed. Windows is very good about recognizing CD-ROM drives and installing the correct drivers for it, but sometimes you need to install the driver manually.

To resolve such a conflict, first check to see whether the drive was identified correctly. Compare the make and model listed in the Device Manager with the make and model of the actual drive that you wrote down earlier. To update the driver - it either came on a floppy with the drive or can be downloaded from the manufacturer's web site - click the Driver tab in this Properties window and select Update Driver. Click Next, select Display a list of drivers in a specific location ..., click Have Disk, then use the Browse button to direct it to the drive and folder where the driver is located. Once this is finished, you will be prompted to reboot. When Windows is up again, go back to the Device Manager and confirm that the problem is now resolved.

No Sound

Another common problem with CD-ROM drives is that the drive seems to work fine when installing software, yet when playing a music CD there is no sound. If you have checked the obvious, such as speakers powered on, volume up, etc., without success, then you should check the connection between the CD-ROM drive and your sound card. Music is not transferred through the regular IDE or SCSI data cable, but through a separate cable that connects the drive directly to your sound card. If you look at this picture, you'll notice this cable on the left. Make sure that your drive does indeed have this cable and that it is securely connected to the appropriate port on your sound card. If your sound chip is not on a separate sound card in a PCI or ISA slot but integrated into your motherboard, then there will be an appropriate plug on the motherboard.

CD-ROM Drive Letter Changed

Windows usually assigns the first available drive letter after the last hard drive partition drive letter. For example, if you have two hard drives with two partitions each, the hard drives will be C:, D:, E: and F:, and the CD-ROM drive will default to G:. This system is nothing unusual and usually works just fine. The problem you can run into later on is when you start adding or removing hard drives or partitions. This might cause the drive letter assignment for the CD-ROM drive to shift up or down. This can cause a problem when you try to use a program that requires its CD in the drive while using it. For example, if you want to play a game like Quake or Unreal Tournament, you always need to insert the CD first. If the CD is not in the drive, you will be prompted. When you install the game (or other software), often the application will make a note of the drive letter that it was installed from and expect the CD to be available at that drive letter in future use. When the drive letter has changed, this won't be the case. Some programs will complain about it and ask you to point it to the correct location, while others might flat out refuse to work. The tedious but safe solution to this problem would be to reinstall any application that behaves like that right over itself after a CD-ROM drive letter change. This will update the application with the current drive letter. The quick but not always successful or safe solution is to use a third-party application such as Drive Mapper or Change of Address to search the registry and INI files on your hard drive for references to the CD-ROM drive letter and update it with the new letter.

CD-ROM Won't Read Certain Disks

Another common symptoms with older CD-ROM drives is that they seem to be extremely picky about what CDs they like. Some CDs it reads just fine, while others it has to try several times before it gets it, and yet others it refuses to read at all. This is nothing unusual, CDs are not always equal, the quality of even store-bought, professionally manufactured CDs can vary immensely. Each CD production facility could be using a different type or brand of blank CD to manufacture the software, different machinery, different tolerance levels, QA procedures, etc. In addition, you can run into problems when you try reading a CD-R (recordable, a CD that was created with a CD burner), as older CD-ROM drives cannot read them.

Tweaking CD-ROM Drives

There are a few things you can do to tweak your CD-ROM and its behavior that might speed things up a little and get rid of some little annoyances.

Turn on DMA

Newer CD-ROM drives support DMA (Direct Memory Access) mode which takes a little load off of your CPU. To enable this, go to Start/Settings/Control Panel/System/Device Manager, click the "+" symbol next to the CDROM category, double-click the entry for the CD-ROm drive and select the Settings tab. Check the box for DMA, click OK, and reboot your computer. When Windows is back, go back to this dialog and see if the setting stuck. If so, the drive supports DMA, and if you don't see any problems, leave it enabled. If it unchecked itself again, or you have problems after this change, disable this feature again.

Put the CD-ROM Drive on a Separate IDE Channel

If you have a regular IDE CD-ROM drive, then you can increase performance in certain situation a bit by putting the CD-ROM drive on a separate IDE channel. If you were to put both your hard drive and your CD-ROM drive on the same primary IDE channel, then you might take a small performance hit when doing something that requires both devices to be accessed, such as playing a game from CD, playing music CDs while working, or installing software. The reason for this is that IDE cannot multitask, it can only address one device at a time, meaning that data can be transferred either from or to the hard drive or the CD-ROM drive, but not both at the same time. By placing the CD-ROM drive on the secondary IDE channel, hard drives on the primary IDE channel can be accessed at the same time as the CD-ROM drive on the secondary IDE channel.

Turn On/Off Auto Insert Notification

You've probably noticed that whenever you insert a software CD, the installation program on the CD will fire up automatically within a few seconds. The same happens when you insert a music CD. Within a few seconds the CD player will come up and start playback. This feature is called Auto Insert Notification and is enabled by default in Windows. If you want to change this behavior, you can do this in two ways. To disable this feature on a per-case basis, simply hold down the Shift key on your keyboard when closing the CD tray for about 10 seconds. This will prevent automatic startup for this one instance. To disable this feature permanently, go to Start/Settings/Control Panel/System/Device Manager, click the "+" symbol next to the CDROM category, double-click the entry for the CD-ROm drive and select the Settings tab. Uncheck the box for Auto Insert Notification, click OK, and reboot your machine. For more information on this feature check out our article on Auto Insert Notification at our website.

Modify the Windows CD Source Path

If your CD-ROM drive letter has changed as explained earlier, one annoyance you might run into is that anytime you need to access the Windows installation CD to add or remove Windows components or to install a driver, Windows will still assume that the CD can be found at the old drive letter and you have to change it manually - every single time. This can be easily remedied with a little registry tweak. Go to Start/Run, type Regedit and hit OK. Drill down to the following registry key: HKEY_LOCAL_MACHINE \ Software \ Microsoft \ Windows \ CurrentVersion \ Setup. Highlight the Setup key by clicking on it once, then look in the right-hand pane for a string called SourcePath. Right-click this string and select Modify. Change it to the correct path and exit the registry editor. For example, if your CD-ROM drive originally was G:, then the source path probably reads G:\win98. If your CD-ROM drive letter has changed to H:, then simply change the source path to H:\win98. ■

ELECTRONIC SERVICING & TECHNOLOGY
50 ES&T YEARS of Service

A History of Electronic Display Technology (Part 4)

Light Valve Technology From Pixelated Light Valves to Piezoelectric Mirror Light Valves

In the January, April and July issues, we published the first three parts in a four-part series of articles that would describe the history of electronic projection display technology. The series is based on the article cited at right. This segment will cover the digital micromirror device.. Please note: figure numbers are continued from the previous segments in order to preserve continuity.

Adapted with the permission of Texas Instruments, from an article by Dr. Larry J. Hornbeck, which originally appeared in the Texas Instruments Technical Journal of July-September 1998. Dr. Hornbeck was the inventor of the Digital Micromirror Device™ optical switch, which is at the heart of Digital Light Processing™ technology.

The Digital Micromirror Device

In November 1977 a small U.S. Government-funded program was initiated in the Central Research Laboratories (CRL) of Texas Instruments to build a CCD-addressed, membrane-based spatial light modulator for optical processing applications. Later called the Deformable Mirror Device (DMD), this technology was to be the forerunner of the current Digital Micromirror Device (also DMD) invented ten years later in 1987. Only by its initials does the original technology bear any resemblance to the current DMD technology that forms the basis for Texas Instruments Digital Light Processing (DLP) projection display business.

The Deformable Mirror Device

The deformable mirror device was analog, required high-voltage addressing and was fabricated with a hybrid process. The Digital Micromirror Device is digital, uses standard 5V addressing and is fabricated with a monolithic, CMOS-compatible process.

The following is a brief account of how Texas Instruments took advantage of the digital electronics revolution to develop the world's first high-performance light valve on single-crystal silicon. TI's entrepreneurial spirit and long-term financial commitment, the innovative skills, dedication and perseverance of its employees, a little luck, timing, ...all con-tributed to the development and commercial success of this technology.

The Analog Decade (1977-1987)

In November 1977, the author and two other researchers in CRL began work on a U.S. Government-funded program to develop a spatial light modulator for optical signal processing applications, such as pattern recognition. TI bid on the program on the basis of its strength in CCD technology, particularly its CCD technology used for night vision applications. In that application, the CCD substrate was thinned and imaged from the backside (opposite the charge transfer electrodes) with electrons emitted from an infrared-sensitive photocathode.

It had been proposed that a membrane-based spatial light modulator be fabricated on the backside of a thinned CCD address circuit. The CCD would work in reverse. Instead of reading out a charge pattern corresponding to an image, a charge pattern would be read into the device and then be transferred across the thinned silicon substrate to the backside. The charge would modulate the potential across the air gaps of the membrane pixels and thereby deflect them. But it soon became apparent that a more manufacturable approach would be required.

The approach that was developed is shown in Figure 35. The metallized membrane was based on the technology used by Preston at Perkin-Elmer. It was fabricated from nitrocellulose and metallized with antimony (later to be improved by alloying with bismuth). The membrane was cast in its liquid state onto the surface of clean water and picked up with a casting ring, dried and metallized before being placed onto the address circuit. The address circuit consisted of an array of n-channel transistors with one transistor for each pixel. Its function was similar to the way liquid-crystal devices are addressed today by single-crystal silicon address circuits. Polysilicon material served a dual purpose, as the gate of the transistor and as a sacrificial spacer.

By 1979 a 16 x 16 pixel array was demonstrated. Although this device was to be used in optical signal processing applications, for test purposes it was desirable to show the mirror deformation. Schlieren projection optics were developed to convert mirror deformation into brightness variations. Early on, the DMD was associated with displays, and many viewed the DMD program as an effort to produce a "display on a chip." By 1981 a 128 x 128 pixel array had been demon-

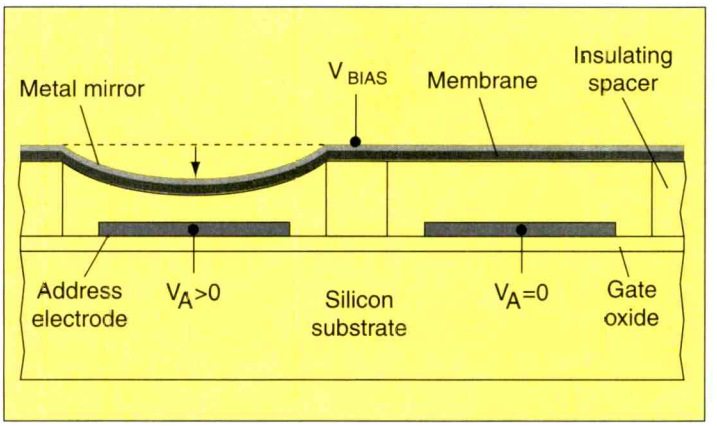


Figure 35. Membrane Deformable Mirror Device (simplified cross section).

strated. An image from an early device is shown in Figure 36. By 1983 lower defect counts were achieved, sufficient for optical processing applications.

In 1980 W. Ed Nelson of Texas Instruments proposed that the DMD be used as a "light bar" to replace the laser polygon scanner in an electrophotographic (or "xerographic") application. Although it would soon become apparent that the membrane-based DMD was unsuitable for the high aspect ratio, linear pixel arrays required in printing, the investigation launched a part of the DMD effort in a new direction. This new approach sought a way to build a monolithic cantilever-beam DMD over a single-crystal silicon address circuit. This internally funded focused effort was to consume the next four years and would result in the dispiriting conclusion that an analog DMD (monolithic or not) would never be suitable for the printing application.

In 1983 a new, low-temperature fabrication process was developed. For the first time, the fabrication of a micromechanical structure directly over a completed metal-oxide-silicon (MOS) address circuit, including its aluminum interconnects, was possible. At the time, there were two technologies for building micro-mechanical cantilever beam structures on single-crystal silicon as shown in Figure 37. The first approach (a) used SiO 2 for the mechanical element and a p-type epitaxial silicon layer as the "sacrificial" layer, grown over a p+ buried layer that acted as an etch stop. The epitaxial layer was anisotropically wet etched in ethylenediamine and pyrocatechol (EDA). The second approach (b) used polysilicon as the mechanical element and an SiO 2 layer for the sacrificial layer or spacer. The spacer was removed by wet etching in HF acid to form the air gap.

Both approaches involved process temperatures greater than what could be tolerated by aluminum, which is used as the

Figure 36. 128 x 128 membrane DMS (first projected image, 1981). Blemishes are examples of "tenting."

interconnect material in the silicon address circuit. The first approach also removed the single-crystal silicon, precluding the fabrication of transistors directly under the mechanical element.

To overcome these significant limitations, the low-temperature DMD fabrication process shown in Figure 38 was conceived. A planarizing photoresist layer (spacer) is spun over the MOS address circuit including its aluminum interconnects. The photoresist acts as the sacrificial layer. It is patterned with holes for what will become support posts and hardened to prevent it from melting later during the process. Aluminum for the micromechanical elements is sputter deposited and patterned using a plasma or "dry" etch. It covers the sidewalls of the holes to form support posts and electrical contacts to the underlying metallization layer. To complete the process, the organic photoresist sacrificial layer is stripped in a special plasma chemistry containing oxygen and fluorine which minimizes the process temperature (so-called undercut process).

This extremely simple low-temperature DMD process is accomplished at less than 200 ∞C and preserves the integrity of the underlying address circuit. Its advantage over existing process technologies was to enable the fabrication of a close-packed array of aluminum mirrors and hinges directly over a completed MOS address circuit, including the aluminum interconnects. This breakthrough processing concept enabled both analog and digital DMD architectures and was a major factor leading to the industry's first commercially successful "display on a chip" technology.

In 1984 a linear DMD test array was designed for the printing application. It was based on the new low-temperature process technology and consisted of 2400 cantilever beams in a staggered line array as shown in Figure 39. Each square aluminum cantilever had a hinge in the corner that allowed bending to occur at 45 degrees relative to the edges of the cantilever for improved contrast ratio. This was basically the same approach as in the Westinghouse Mirror Matrix Tube described earlier.

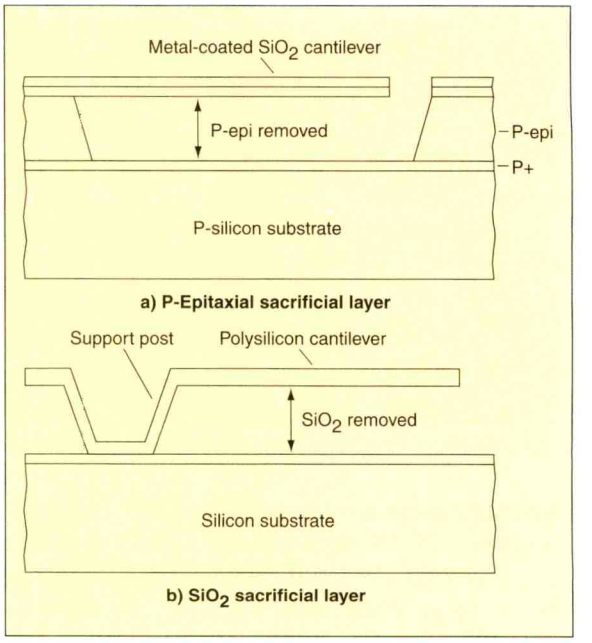


Figure 37. High-temperature micromechanical process technologies (circa 1983).

An aluminum address electrode under each cantilever acted to electrostatically attract the cantilever mirror. The address electrodes were hard wired in patterns so that the test chip would require no transistors. The stable deflection range was up to four degrees at 30V. Beyond four degrees, the tips of the beams would spontaneously touch down and usually stick to the surface. The first printing using the new 2400 x 1 DMD was done by scanning film past the projected image of the pixels. Print samples are shown in Figure 39 including an appeal to a TI executive for more money to support the technology. Later, print samples were made on plain paper using an electrophotographic process, in which the DMD array acted to expose a photoreceptor drum.

Soon it became apparent that the hinges of the original cantilever design were too stiff. What was required was a thin hinge for compliance and a thicker cantilever beam to yield a flat mirror. In an ordinary multilevel metal process, the hinge metal would be patterned and plasma etched first, followed by the beam metal. But plasma chemistry is often not very kind. The byproducts of the plasma etching contaminate and roughen the photoresist spacer, making it unsuitable for further metal deposition. The challenge became how to "pattern" the hinge but not really

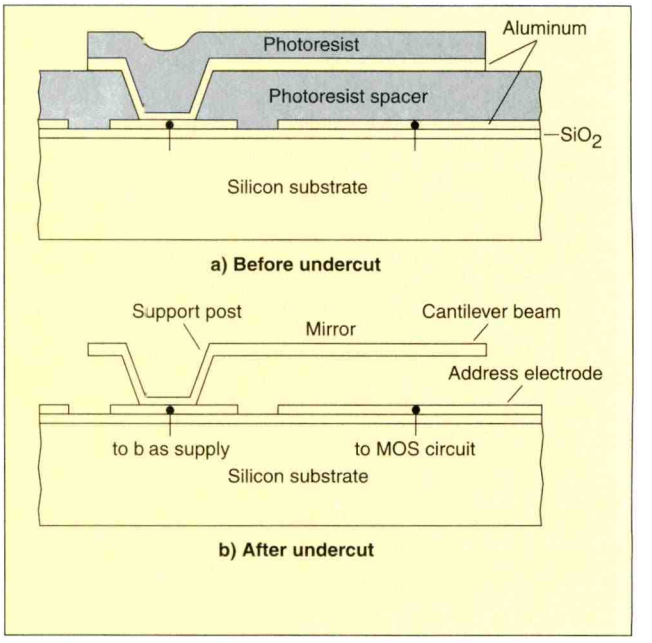


Figure 38. Low-temperature DMD process.

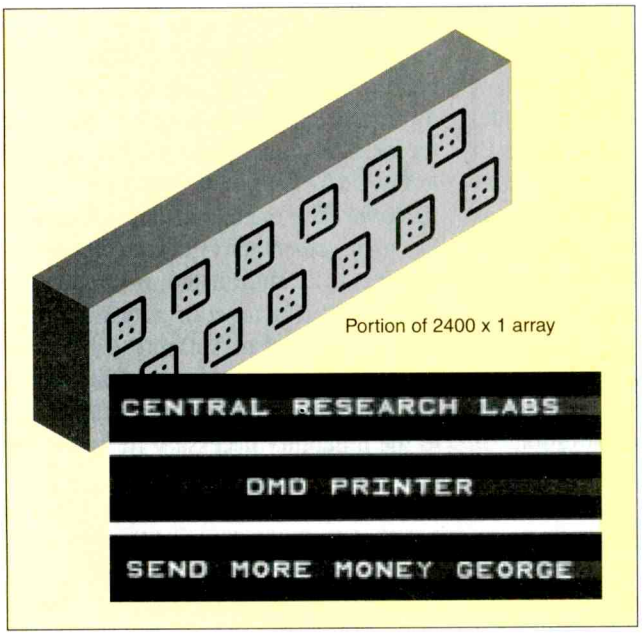


Figure 39. Cantilever-beam DMD print samples on film.

etch it until later, after the beam metal is etched. A new "buried-hinge" process was developed in 1985 that met the challenge, and it has been used ever since for the hinge/beam process.

The buried-hinge process shown in Figure 40 begins with the deposition of hinge metal over the photoresist spacer, followed by a plasma deposition of SiO 2 . The SiO 2 is then patterned in the shape of the hinge, with appropriate overlaps to the subsequent cantilever-beam pattern. Then the beam metal is deposited, thereby burying the SiO 2 hinge pattern. A photoresist pattern in the shape of the beam is formed over the beam metal. Finally a single plasma aluminum etch is used for both the beam metal and hinge metal. The photoresist masks the beam metal and prevents it from etching. The SiO 2 does the same for the hinge, acting as a buried etch stop. The SiO 2 is plasma-stripped from the hinges prior to the photoresist spacer strip that creates the air gap.

In 1986 it was hoped that the combination of the low-temperature DMD and buried-hinge processes would yield DMD pixel arrays that met requirements for the electrophotographic printer application, including angular deflection uniformity of the beams across the array. But after a significant effort, the angular uniformity requirement could not be met. Process-induced surface stresses and residues on the hinges were causing them to deviate from flatness in the non-energized state leading, to nonuniform angular deflections when energized. The hinge stress also exhibited an "aging" effect that caused the angular deflections to be unstable with time and temperature. |After many frustrations and failures, it became apparent that the analog nature of the DMD's mechanical structure would preclude it from ever becoming a commercially viable technology for printer applications.

The Digital Decade (1987-1997)

By early 1987 the time had come to make a decision: abandon the DMD as a viable approach for electrophotographic printing or develop a new architecture that was not sensitive to hinge surface stresses and the aging effect. As often happens, desperation breeds innovation. By the end of 1987 a breakthrough device concept was conceived and demonstrated called the bistable deformable mirror device or bistable DMD.

The bistable DMD concept is shown in Figure 41. Instead of cantilever hinges, the beam is supported by a pair of torsion hinges. The torsion beam rotates until its "landing" tip touches a landing electrode pad that is at the same potential as the beam. Instead of analog deflection angles determined by a balance of forces, the bistable DMD has digital deflection angles because the beam lands. The angle is determined by the spacer air gap and the length of the torsion beam from it axis of rotation to its landing tip. The direction of rotation is selected by a pair of address electrodes on either side of the rotation axis. Complementary voltage waveforms, (?Phiaddress , Phiaddress) are applied to these electrodes by an underlying memory cell. A bias voltage applied to the beam makes the beam energetically bistable. The result is lower address voltages, permitting larger deflection angles.

In comparison to the old analog DMD technology, the bistable DMD's advantages are (1) larger rotation angles (± 10 degrees), (2) precise rotation angles unaffected by environment or age, and (3) lower address voltages compatible with standard 5V MOS transistor technologies.

For the first time, larger rotation angles enabled the use of "darkfield" projection optics as opposed to the Schlieren optics used in the oil-film projectors and other light

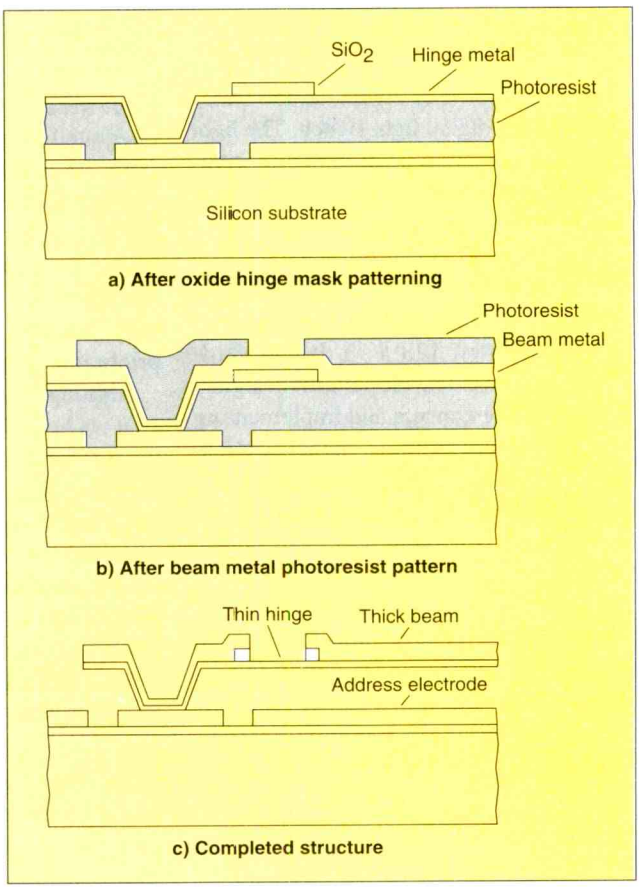


Figure 40. The buried-hinge process for DMD.

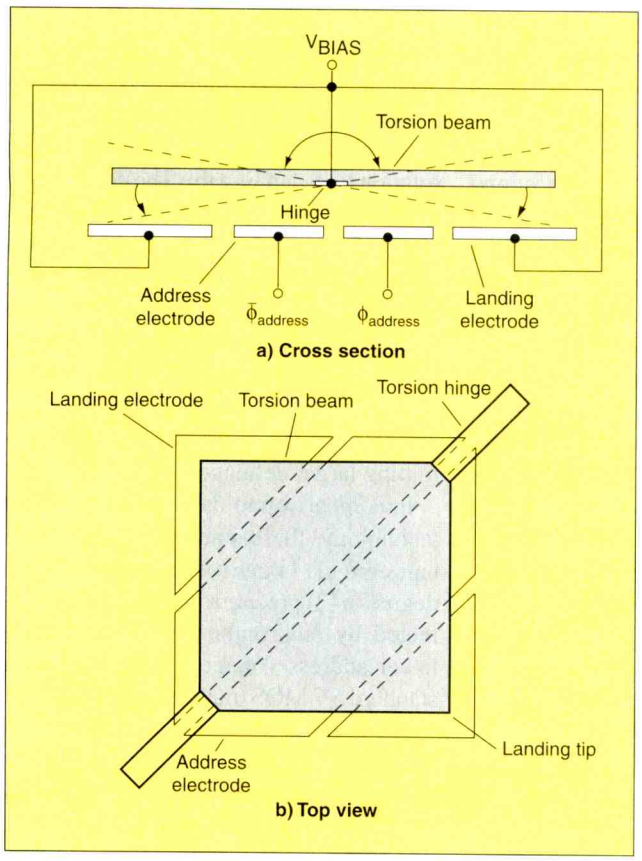


Figure 41. The bistable DMD concept.

valves. As shown in Figure 42, the DMD acts as a fast digital light switch. The light from the projection lamp is rotated completely out of the pupil of the projection lens so that no Schlieren stop is required.

The first test chip based on the bistable DMD (or just DMD as we shall call it from now on) was a 512 x 1 linear array (four staggered rows, 128 x 4). It had hardwired address electrode patterns designed for testing the concept and implementing the first digital printing demonstration. Testing commenced in November 1987, and all of the DMD's digital benefits were realized. The first photos of device operation under a darkfield and brightfield microscope are shown in Figure 43, along with an early print sample. Soon, an expenditure of 30 cents was made to purchase red and blue tinted transparent plastic that was placed in the annular illumination ring of a darkfield microscope objective. This provided a way of distinguishing the positive and negative rotation directions (plus = red, minus = blue) and was the first demonstration of colored images.

As testing continued, the initial excitement over the first results began to fade. Although not unexpected, after only a few million landings, the landing tips began to stick to the landing pads. This phenomenon was later identified as adhesion caused by a combination of the capillary condensation of water and van der Waals forces (surface forces). After many long hours in the lab by the author, a solution to this problem was implemented called electronic "reset." In this technique, a voltage pulse is applied to the beam bias that deforms the beam, stores energy and then releases it to "spring" the landing tip away from the surface.

With this reset technique in hand, the 512 x 1 test device was integrated into a printer test bed, and in 1988 the first digital print samples were generated. The results were encouraging, but more difficulties had to be overcome before the new digital light-valve technology could be considered worthy of consideration for incorporation into a printing product.

Although electronic reset had provided a way of releasing the beam tips from the surface, it still did not provide the reliability necessary for a product. It was not until early 1990 that a breakthrough occurred, a way of providing lubrication (or passivation) to lower the adhesive levels and the amount of mechanical wear that was occurring during reset.

The method that was adopted was based on a discovery made in the last century, that certain whale oils are autophobic. When an autophobic oil is placed on a bearing surface, an impurity in the oil forms a surface film that the oil will not wet, reducing its likelihood of creeping away from the bearing. The impurity was determined to be a fatty acid that was forming an oriented monolayer on the bearing surface, resulting in a low-energy surface (or one having low adhesive forces). This same principle was applied to the DMD with a few important modifications. The method of deposition was by vapor, rather than liquid, and the material was fully fluorinated to provide the lowest possible level of adhesion, only one-quarter that of Teflon(tm)-like surfaces. Combining the passivation process and improved packaging techniques led to the reliability necessary for using the DMD in a printing product.

In late 1988 product development was initiated to build the world's first electrophotographic, high-speed airline ticket printer. It would be based on a DMD "exposure module." The team to develop the exposure module was led by Ed Nelson, who eight years earlier had first proposed a DMD printer, and who had since championed and led the development activities for the DMD printing application. An 840 x 1 DMD array was designed to print 240 dots per inch on a 3.5-inch wide ticket coupon at 40 coupons per minute. Introduction of this product in late 1990 represented the first com-

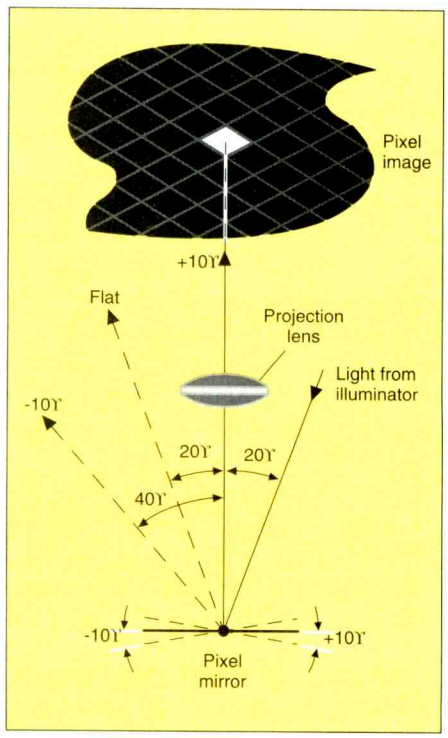


Figure 42. TDMD optical switching principle.

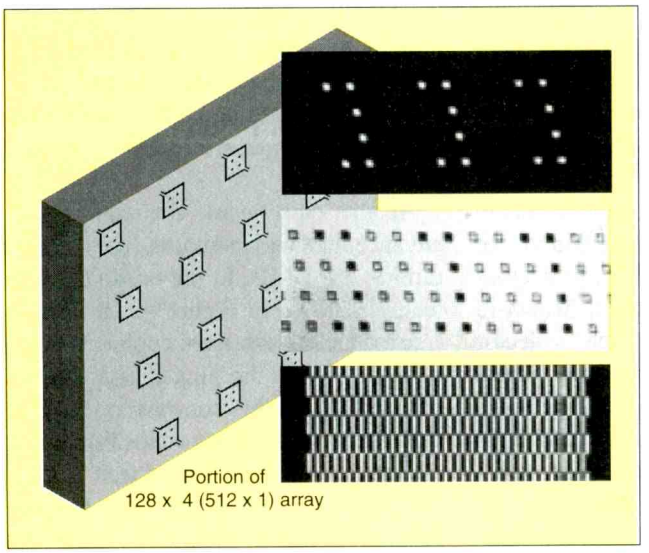


Figure 43. First bistable DMD (darkfield and brightfield photomicrographs and electrophotographic print sample).

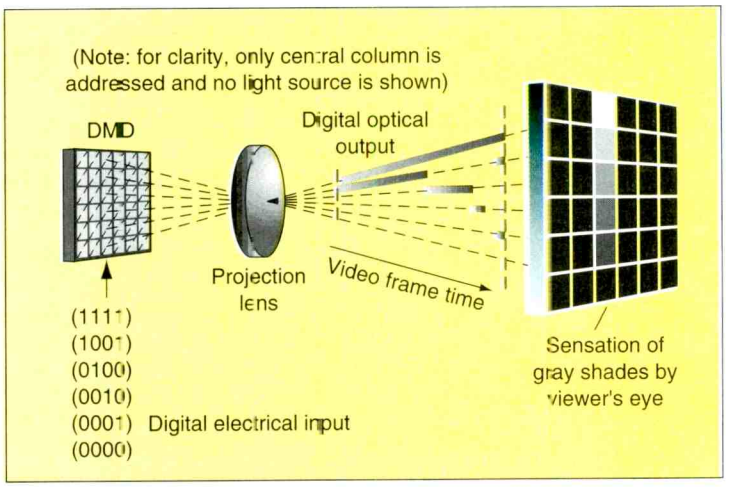


Figure 44. DMD binary-weighted pulsewidth modulation (4-bit, 16 gray-level example).

mercialization of a micromechanical light-valve technology in history.

During this period of intense product development, Jeffrey Sampsell of TI's Central Research Laboratories led a small team to explore the possibility of using the DMD for projection display applications. Interest in the DMD spread outside of Texas Instruments. In 1989 a joint development program with Rank-Brimar Limited (currently Digital Projection International) and a high-definition display contract with DARPA (Defense Advanced Research Projects Agency) were initiated. These programs formed the beginnings of what would later be a massive, internally funded effort by TI to bring DMD projection display technology to the market.

DMD projection display technology started from humble beginnings with a two-line demonstration in 1990. A pair of DMD printer chips were mounted in the same package to represent two lines in a digital display. Demonstration optics were assembled that included a spinning color disc that enabled the time-multiplexing of red, green and blue light onto a single DMD chip. Gray scale was achieved using a tech-nique called binary-weighted pulsewidth light modulation, illustrated in Figure 44. Because the DMD is a digital light switch, its only capability is to turn light on or off. But because of the high switching speed, it was possible (during each video frame time) to produce a burst of digital light pulses of varying durations that led to the sensation of gray scale as per-ceived by the viewer.

Current DMD architectures have a mechanical switching time of ~15 µs and an optical switchingtime of ~2 µs. Based on these times, 24-bit color(8 bits or 256 gray levels per primary color) is supported in a single-chip projector while 30-bit color (10bits or 1024 gray levels per primary color) is supported in a three-chip projector. Twenty-four-bit color depth yields 16.7 million color combinations while 30-bit color depth yields more than 1 billion color combinations. Even higher bit depths can be achieved by multiplexing techniques.

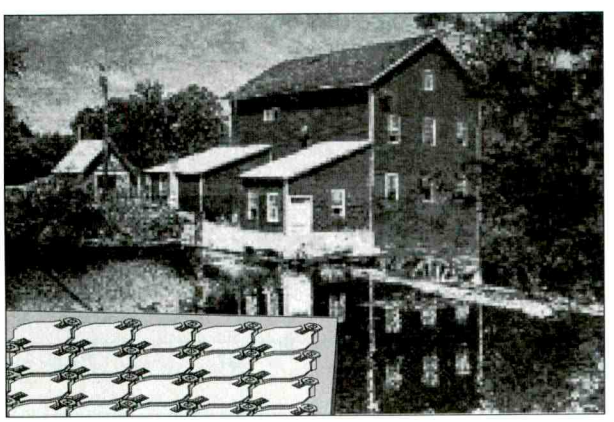


Figure 45. First fill-color DMD images, May 1992.

Unlike LCD technology, in which the switchingtimes are ~10ms, the DMD has no image lag from one frame to the next and therefore moving objectsare not blurred. Because the gray scale of the DMDis determined by time division, it is accurate and stable. By comparison, gray scale in an LCD-based projector is determined by the analog voltage level delivered by the address transistor and the analog characteristics of the liquid crystal material.Temperature and photo degradation can therefore have an adverse effect on LCD image stability.

While two-line DMD displays were being viewedwith great curiosity, the first true DMD display chips were being developed. The first was a 768 x 576 (PAL format) resolution chip with full transistor addressing. The second was a high-definition 2048 x 1152 demonstration chip having a fixed-image capability "wired" into its substrate. It seemed during 1991 there was a surge in the number of "true believers" who could make the leap of faith from two-line to 1152-line DMD displays. Excitement over the DMD was contagious and extended to the upper levels of TI management.

Acting on this excitement, Texas Instruments formed the Digital Imaging Venture Project (DIVP) in December 1991 and transferred the DMD from the Central Research Laboratories into this new organization. An infusion of talent and capital into DIVP led to many

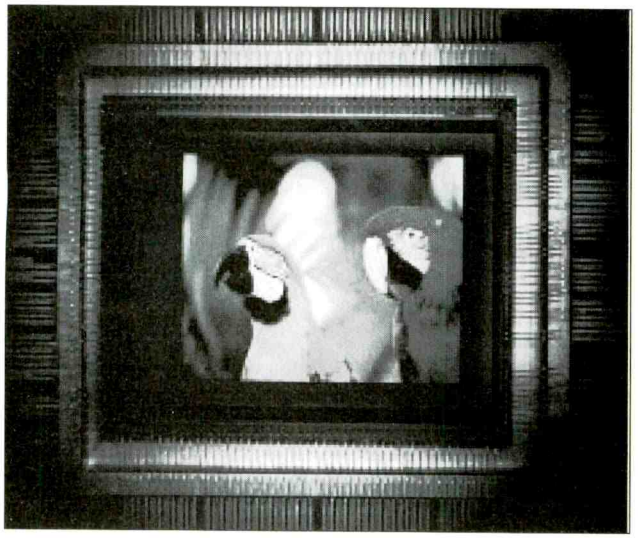


Figure 46. DMD front projection display showing entire chip area (768 x 576 array, 640 x 480 image).

improvements in the DMD chip architecture, fabrication, packaging and testing, system architecture and optics. The name of the device was changed from Deformable Mirror Device to Digital Micromirror Device to more accurately describe its function compared to the original membrane-based analog DMD.

During the first year of DIVP's existence, both chip and system level advancements were being made. A prototype 768 x 576 resolution DMD projection system was demonstrated in May 1992, projecting static images, shown in Figure 45. The projector was based on a single DMD chip and time-multiplexed color.This marked a major milestone in the history of projection display technology, the first full-resolution color demonstration of a "display on a chip." Figure46 shows a projected image of an improved DMDarchitecture demonstrated in 1993. The light shield has been removed and the field of view of the projection lens has been increased to show the chip perimeter, including the bond pads and wires. This image dramatically illustrates the display-on-a-chip nature of DMD technology. In spite of the historical significance of the May 1992 demonstration, much remained to be improved in terms of pixel defects, contrast ratio and reliability.

At the chip level, the first major advancement was to improve the contrast ratio of the DMD. In the original architecture, shown in Figure 45, the beam (mirror)and hinges were coplanar. Light scattering from the hinges and support posts lowered the contrast ratio. The active area ratio and hence the brightnessof the display also was reduced. A new structure was developed that hid the micromechanical structures under the mirror. It was given the name "hidden hinge." This was the first in a series of architectural improvements shown in Figure 47. In this concept, the beam or ("yoke") supports an overlying 17 µm x 17 µm mirror.

The Hidden Hinge Concept

In 1993 the hidden hinge concept was demonstrated in a 768 x 576 resolution

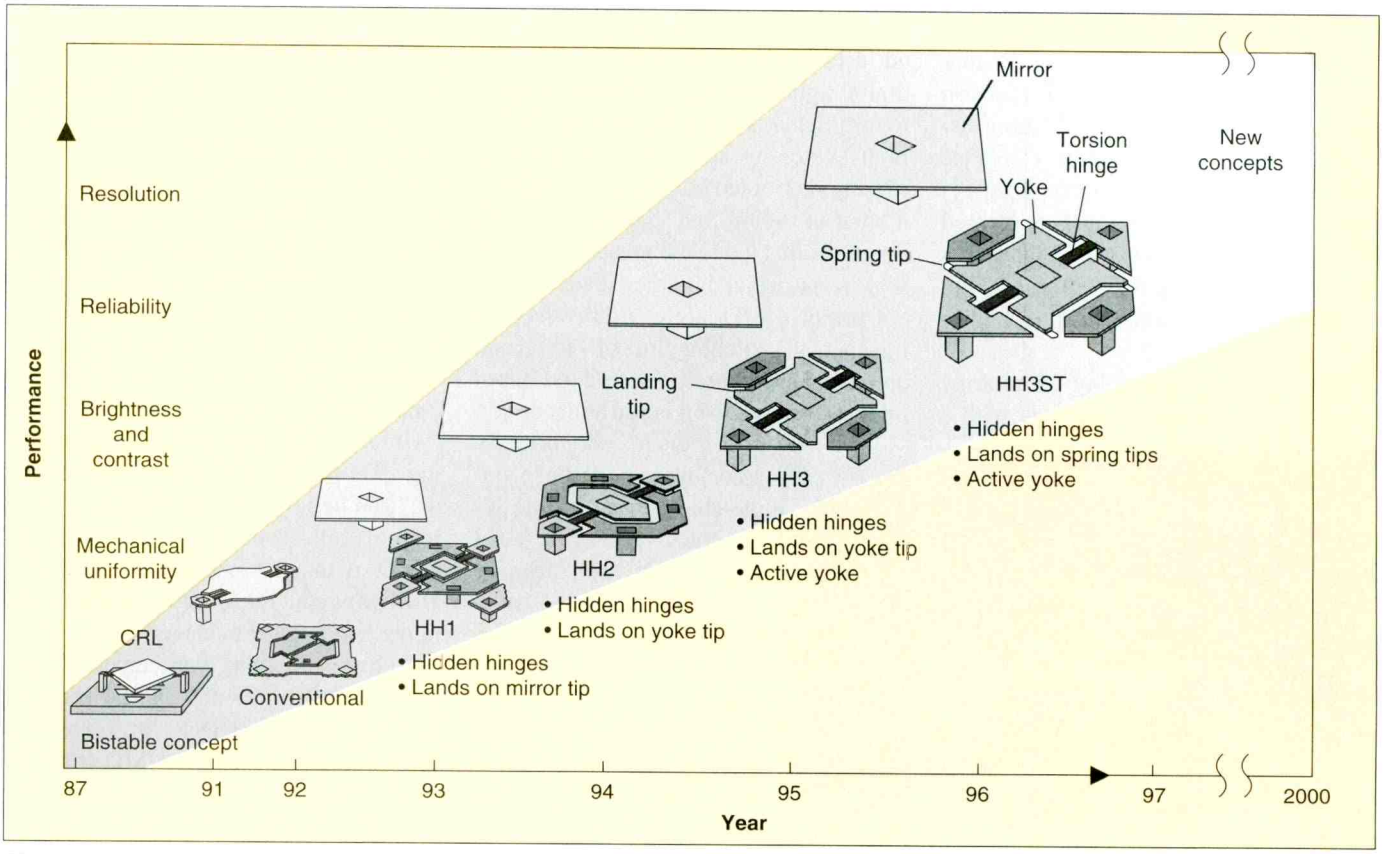


Figure 47. Evolution of DMD pixel architecture.

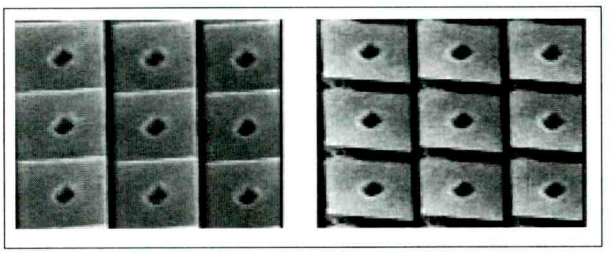


Figure 48. SEM video images of operating DMD (early version).

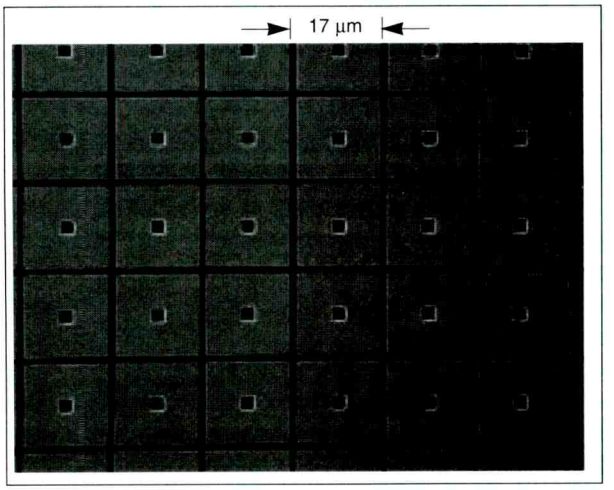


Figure 49. SEM photomicrograph of urrent DMD mirrors.

DMD projectionsystem that showed significant improvements incontrast ratio and light efficiency over earlier sys-tems. Figure 48 shows a close-up view of early hidden hinge DMD mirrors operating in a scanningelectron microscope. Figure 49 shows the mirror surface of the current DMD. Because the gaps between the mirrors are so narrow, the projected image of aDMD appears "seamless" or almost filmlike, i.e. the pixel structure is almost invisible. The seamless appearance of DMD images has become a hallmark of DMD-based projection displays and stands in contrast to transmissive LCD display technology where the pixel structure is readily apparent.

Also in 1993, as an outgrowth of the original DARPA contract, a high-definition, fixed-image 2048 x 1152 resolution, three-chip display was demonstrated.The DMD chip contained no address transistors,only hard-wired patterns of address electrodes that permitted fixed images to be projected. This proof-of-concept demonstration showed the feasibility of manufacturing large-area DMD superstructures, tested the optical design and provided a glimpse of high-definition DMD images. The lessons learned wouldbe applied to the demonstration in 1994 of a 2048 x1152 resolution, three-chip DMD-based projection system that incorporated full transistor addressing and projected static images.

In 1994 DIVP engineers demonstrated the world's first all-digital projection display from source to eye. The digital source material was derived from a telecine transfer of movie film to digital tape. This demonstration showed that DMD-based projection systems had unique capabilities for digital fidelity and stability found in no other projection display technology. It was apparent that this all-digital display technology needed a name that described it at the highest level of its functionality. The name chosen was Digital Light Processing or DLP.

Architectural Modifications of the DMD

Architectural modifications of the DMD pixel continued and not only improved the performance butalso enhanced reliability. As shown in Figure 47,additional versions of the basic hidden hinge structure(HH1) were developed. The first of these (HH2)extended the yoke structure so that the yoke rather than the mirror landed. In 1994 an improved version (HH3) widened the yoke so that it not only was the landing structure, but it also was electrically active to provide greater electrostatic efficiency.

In 1995 "spring tips" were added to the landing tips of the yoke. These were made from the hinge material and provided additional energy storage for improved reset reliability. Figure 50 shows architectural details of the HH3 spring tip architecture for two pixels, one with the mirror tipped +10 degrees and the other -10 degrees. In Figure 51 a scanning electron microscope image of the yoke and hinge levels is shown before the mirrors are processed. The first spacer has been removed to reveal the underlying metal level (metal 3) just above the CMOS transistor circuitry.

Concurrent with these architectural improvements were those in the areas of wafer process improvements and particle controls, packaging, hinge materials, lubrication, drive waveforms and high-speed automated testing. Together, these improvements led to the demonstration of the performance and reliability necessary to commercialize the DMD. On the systems side, there were pioneering improvements in the image processing algorithms and optical architectures necessary to ensure the maximum performance advantage of the Digital Light Processing system shown in Figure 52.

Three types of DLP projection systems had beendeveloped by 1996, differentiated by the number ofDMD chips-one, two, or three (Figure 53). The choice depends on the intended market application and is based on a tradeoff between light utilization efficiency, brightness, power dissipation, lamp technology,weight, volume, and cost. The single-chip and two-chip systems rely on the time multiplexing of color, a unique feature of DMD technology arising from the

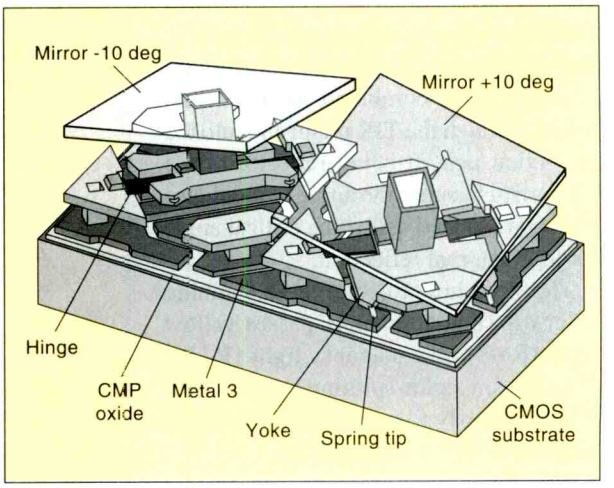


Figure 50. Two DMD pixels (mirrors are shown as transparent).

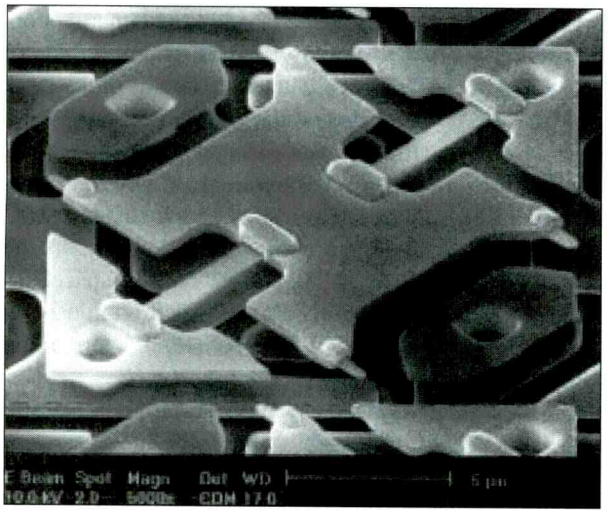


Figure 51. SEM photomicrograph of yoke and hinge levels (before mirror processing). First spacer has been removed.

fast switching time of the mirrors. The slower response time of analog-based LCDs precludes all but a three panel architecture.

The three-chip projector has one chip for each of the primary colors, red (R), green (G), and blue (B). Light from an arc lamp is focussed onto an integrator rod, that acts to homogenize the light beam and change its cross-sectional area to match the shape of the DMD. The white light (W) then passes through a total internal reflection (TIR) prism. The prism adjusts the incidence angle of the light beam onto theDMD so the beam can be properly switched into and out of the pupil of the projection lens by the rotating action of the DMD mirrors (refer to Figure 42). A set of dichroic color-splitting prisms splits the light by reflection into the primary colors and directs them to the appropriate DMD. The modulated light from each DMD traverses back through the prisms, that now act as a combiner for the primary colors. The combined light (R,G,B) passes through the TIR prism and into the projection lens. It is not reflected at the TIR prism because the angle of incidence has been reduced below the critical angle for total internal reflection.

The two-chip projector has a spinning color disc that alternately passes yellow light (R+G) and magenta light (R+B). The dichroic color-splitting prisms direct R continuously to one chip and G and B alternately to the second chip.

The single-chip projector has a color disc that alternately passes R, G, B to the DMD chip. Although the singe-chip diagram in Figure 53 includes an integrator rod and TIR prism, these may be omitted in lower cost designs. Without a TIR prism, the projection and illuminating lens will mechanically interfere unless the projection lens is offset from the center of the DMD.

Each projector has its own benefits and tradeoffs. The single-chip projector is self-converged, lower in cost and permits the very lightest portable designs.

The two-chip projector provides greater light efficiency and is well suited in applications requiring the very longest life time lamps that may be spectrally deficient in the red. The three-chip projector has the highest optical efficiency and is required in the brightest large-venue applications such as tradeshows and public information displays.

By early 1996 DLP technology was ready for commercialization. The Digital Imaging Venture Project, no longer a venture, was renamed Digital Imaging. A number of market leaders in the projection display industry had been working with Digital Imaging on DLP-based projection display products for several years. At first, display "engines" were sold to these market leader OEMs (original equipment manufacturers) for incorporation into their final products. Later, Digital Imaging would also sell DMD chip sets together with DLP digital image processing and formatting boards.

The first DLP-based projection display productswere introduced to the market in April 1996. Theseproducts were VGA (640 x 480) resolution, portable projection displays based on a single chip and time-multiplexed color. Soon SVGA (800 x 600) resolution products were brought to the market. In late fourth quarter 1996 two-chip products were introduced forhome theater. In early 1997 two-chip systems for videowall applications and three-chip, high brightness systems for home theater and large-venue applications (Figure 54) were brought to the market.

The DMD Today

Just two and one-half years after the first product introduction of DLP-based projection displays, more than 100,000 DLP subsystems had been shipped to customers. DMD reliability has been demonstrated to

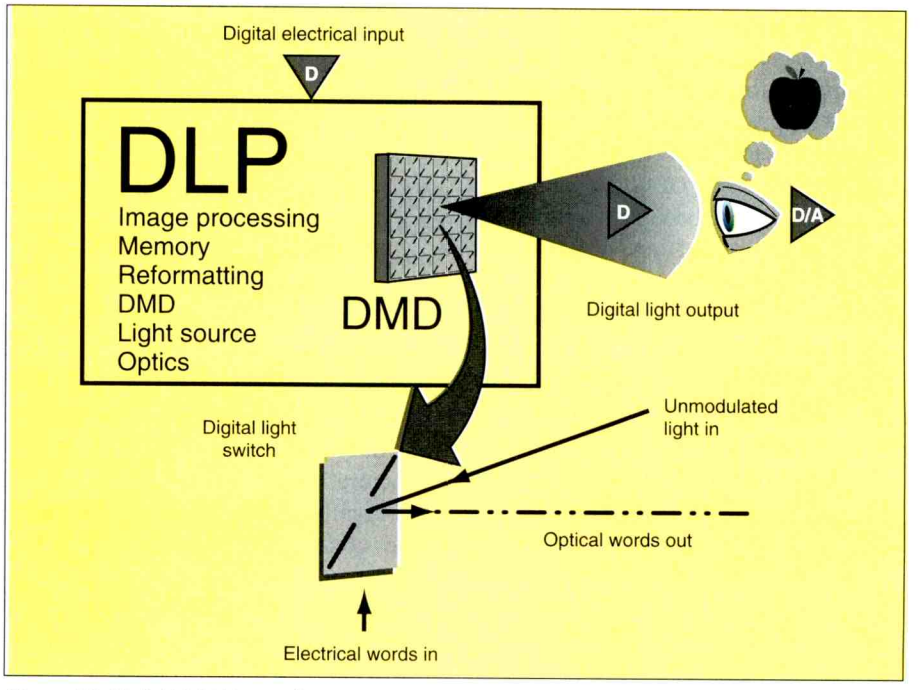


Figure 52. Digital Light Processing system.

The Official Event of the Home Automation & Networking Association

HANA
Home Automation & Networking Association

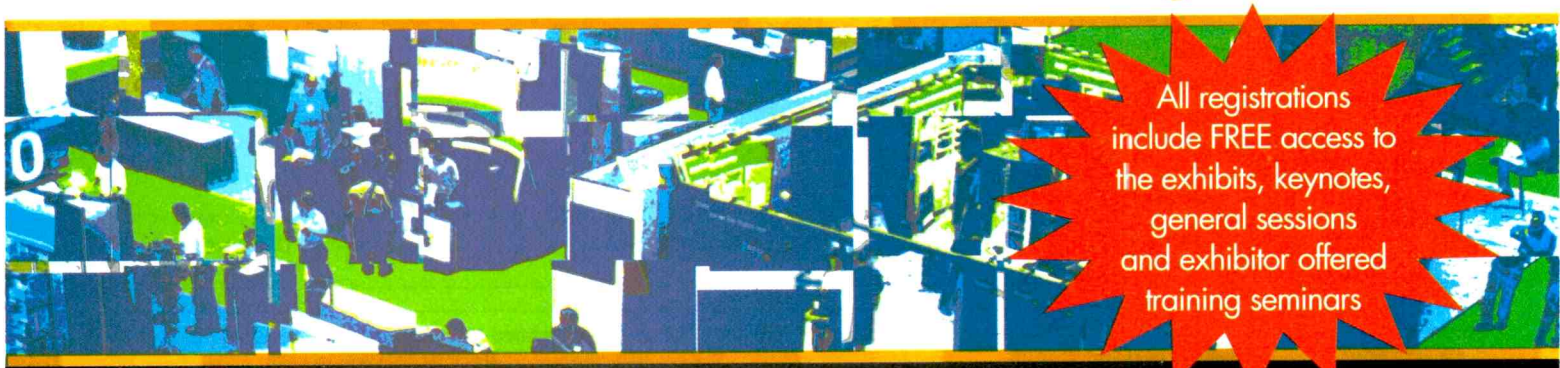
EHX
ELECTRONIC HOUSE EXPO
FALL 2001

Free Exhibits Only Registration!

Plus, save $300+ off Conference Packages when registering by October 3!

Registration and information at
www.ehexpo.com
Questions? 800.375.8015

Conference October 24–27 ■ **Exhibits** October 25–27 ■ **Long Beach** California



All registrations include FREE access to the exhibits, keynotes, general sessions and exhibitor offered training seminars

Helping You Deliver the Connected Home

networking whole house
automation security distributed audio
home theater energy management
internet/broadband
lighting control structured wiring
no-new-wires CCTV control
sales & marketing...more!

Intensive learning 100+ seminars, workshops, keynotes, general sessions and exhibitor offered training—mix and match your ideal training schedule

Free Keynotes and General Sessions From Microsoft, Premise Systems, Best Buy, Internet Home Alliance, HNN and WBFAA

NEW! EHX Orientations Free sessions for Builders, Electrical Contractors and Computer VARs

100+ Exhibitors The industry's top manufacturers, distributors and service providers on the expo floor

Official Event of HANA Home Automation & Networking Association
Sponsored by CEPro
Platinum Sponsor Microsoft
Gold Sponsor premise systems
Bronze Sponsor Home Director
Endorser InternetHomeAlliance
Endorser para
Produced by EH EVENTS & EDUCATION

Circle (25) on Reply Card

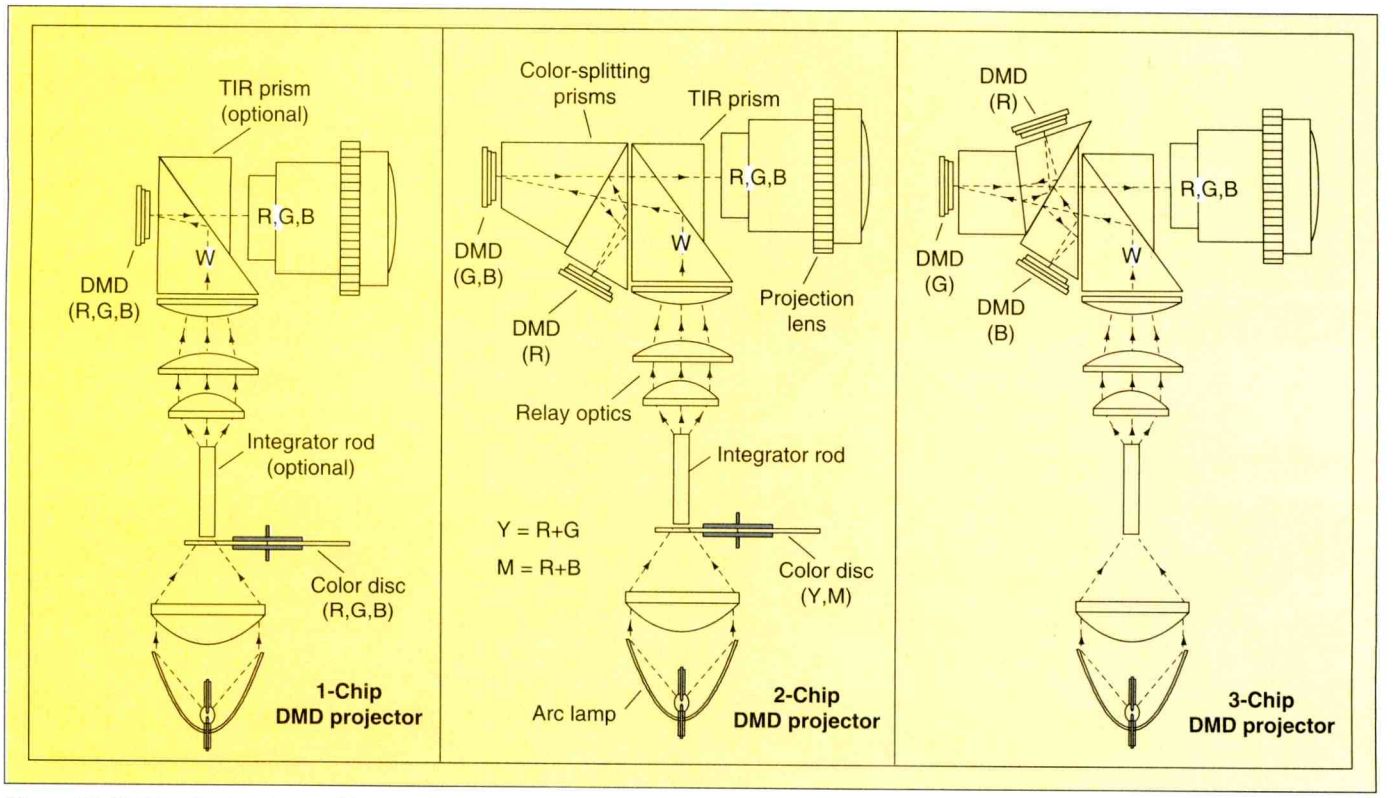


Figure 53. DLP family of projectors (Note: to clearly illustrate the complete light path, TIR prisms are rotated 45 or 90 degrees with respect to color-splitting prisms, copared to actual systems.

be in excess of 100,000 operating hours (more than one trillion mirror cycles).

More than 20 Digital Imaging customers, virtually all of the industry's most respected names, are selling DLP-based products in various electronic projection display markets including mobile, stationary conference room, home theater, videowall and large venue. Systems with resolutions of SVGA (800 x600) and XGA (1024 x 768) are available. Prototype SXGA (1280 x 1024) resolution systems have been demonstrated and were introduced to the market in 1999.

The unparalleled versatility of DMD technology has led to differentiated products ranging from one-chip ultraportable to three-chip ultrabright projectors. Two-chip projectors with ultra-long lifetime lamps are found in between. In the mobile market, a one-chip DLP-based ultraportable projector with 500 ANSI lumens of brightness and weighing 7 pounds is currently the best-selling product in its class. Two-chip DLP-based video cubes for the videowall market are setting new standards for edge-to-edge uni-formity and stability in an application where color and gray scale matching from cube to cube is critical. Two- and three-chip DLP-based home theater systems are found in both front and rear projection configurations. They bring clear, film-like images to the home and even double as large-screen PC monitors. In the ultra-bright, large-venue market, three-chip DLP-based projectors with up to 6500 ANSI lumens of brightness and XGA resolution are widely accepted as the industry standard for digital fidelity, stability and ease of setup.

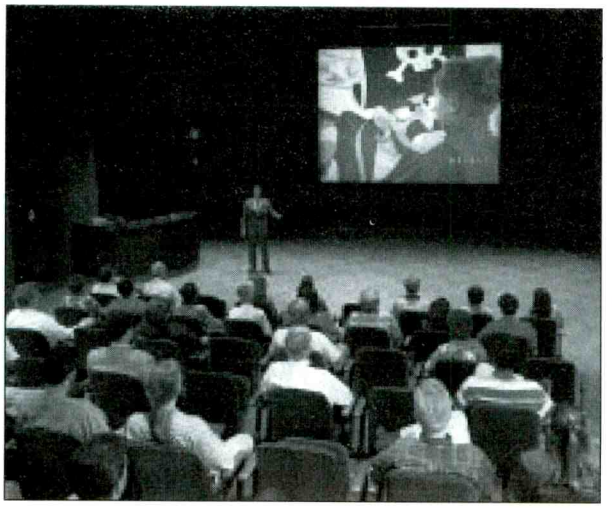


Figure 54. Large-venue DLP-based projector.

Texas Instruments and its manufacturing partners have received numerous technology and productawards for the DMD and DLP-based projectors. The Academy of Television Arts & Sciences has awarded Emmys for Outstanding Achievement in Engineering Development to Digital Projection International (longest-standing customer for DLPsubsystems), Brian Critchley of Digital Projection, Texas Instruments, and the author. These Emmys are the first ever awarded for a projection display technology.

Summary

The first large-screen electronic projection displays were developed in the early 1940s. The CRT, oil-film projector and the forerunner of the modern laser projector

were the ancestors of today's improved CRTs, light-valve projectors and the laser projector. Light-valve projectors were developed to overcome the basic limitation of the CRT, its lack of brightness.

Light valves address this fundamental limitation by separating the light source and the means of controllingthe light. Light valves are categorized by the address technology, the light valve or control layer, andthe use of any intermediate conversion technology between the addressing scheme and the control layer.

For more than 40 years, research on alternatives to the original oil-film light valve has led to a remarkable diversity of approaches including those based on acousto-optics, elastomers, micromechanical gratings,electro-optics, magneto-optics, liquid crystals, membranes, cantilever beams, piezoelectric mirrors and torsion beams. These technologies have attempte dnot only to overcome the brightness limitation of the CRT but also, the limitations of size, weight, stability, and cost of the oil-film projector.

Integrated Circuits and the DLP

With the advent of high-density integrated circuits,the idea of putting a display on a chip became very attractive, but no display technology could be seamlessly integrated onto the chip to take full advantage of this new method of electronic circuit mass production. The semiconductor industry has moved into the digital age, achieving success with advanced consumer services and products such as digital satellite TV, digital cell phones and digital video discs. Now it is even more attractive to learn how to mass produce displays on silicon and to utilize the fidelity and stability inherent in digital technology.

The DMD is the first display on a chip to be commercialized for projection applications. It is the only all-digital (source to eye) projection display technology on the market. Although LCDs have recently been integrated onto silicon address chips, they are still based on analog technology and subject to its limitations. The modern DMD is nothing less than a spatial light modulator taken to its ideal limit of performance. Functioning as a fast, efficient digital light switch, rather than an analog output valve, it combines the image fidelity and the stability and noise immunity that are inherent and so compelling in other digital technologies.

Early in the 20th century, the CRT provided the first electronic window for seeing beyond the horizon.At the close of the 20th century, Digital LightProcessing and the DMD provide the perfect electronic window for seeing into the digital world of education, business, and entertainment (including motion pictures) as well as yet-to-be-charted new forms of multimedia entertainment. Digital LightProcessing may well be the ultimate projection display technology for the emerging digital age of the 21st century. ■

2001 Best Ideas Contest from NPSC

Each year at the National Professional Service Convention (NPSC), put on by NESDA (the National Electronic Service Dealers Association), one of the highlights is the "Best Ideas Contest," moderated by Jerry McCann, Owner of McCann's Electronics Service in Metarie, LA. During this contest, attendees offer ideas that have worked for them to improve operations, improve customer service, save money, or otherwise make their service business better. Jerry, and the members of NESDA have generously allowed us to share the "Best" ideas generated at the 2001 NPSC with ES&T readers. Here they are.

1. Save the Styrofoam and cardboard packing sheets from replacement PTVScreens to cover and protect sets being delivered or stored while in the service center. These are cut to size and light to store. Secure the protective sheet using tape or large (really large) rubber bands.

2. Use a mapping program to establish the estimated travel time and milage required when requesting "out of area" expenses for in warranty authorizations. A few such programs were mentioned: such as Yahoo and Map-Point 2001.These programs are generic so you must apply local road condition modifications for construction or for major traffic areas when estimating travel time plus milage. One servicer mentioned that in his area they have mud slides, so road conditions must often be updated from what the mapping software describes. Another participant provided some interesting food for thought: if the billable hourly rate was $60.00 per, and if the truck could ideally and constantly travel in a straight line at 60mph, a $1.00 per mile travel charge would cover the technician time but not any of the truck expenses.

3. Use government economic development money if available to help defray the cost of making improvements to structures. One service center owner provided photos that showed his store front before and after remodeling. The appearance of the fifties-era building was brought into 2000 by the owner seeking and taking advantage of local government economic development area money. Partial government funding covered one third of the capital improvement. The before and after remodeling pictures showed an awesome improvement.

4. Purchase rolls of various sized small "zip close" clear plastic bagsto control parts inventory. Labeling and bagging individual small parts reduces shrinkage and eases inventory control.

5. One participant offerd this as a decision making tool: Always ask yourself: "Is what I am about to decide going to give me short-term pleasure but long-term pain, or will it result in short-term pain but long-term pleasure?"

6. Use the new disposable cloths called 'Swiffer' for difficult clean-up jobs. This product is fantastic for trapping dirt. It picks up spilled toner and thick dust on the first wipe. (This idea was submitted by the legendary 'El Cheap-o,' so it must be good - and economical).

7. Use coffee filters for cleaning and polishing slick surfaces. In the lab, carefully hand-smoothing a soft area of the filter paper over video heads was mentioned as very successful in cleaning and polishing video heads.

8. Discipline yourself to always use the full word 'Television' instead of 'TV' in speaking, advertisements and promotional materials. Along with corresponding activities, the English language can be a great instrument in establishing professionalism.

9. The Cue-Cat Scanners being given away by Wired magazine, DeltaAirlines, Radio Shack and many others can be converted to a useful general purpose bar-code scanner by searching the Internet and getting the simple instructions about cutting out four wires. One servicer found his local Radio Shack overloaded with the promotional items.

10. If you have an automated "OnHold" phone system, include your companyWeb Site and E-mail address in the greeting. Often the caller is sitting at his desk with fast I-Net access and will look up directions, prices, hours or which brand they seek by visiting your web site. This will and save your customer time he would otherwise spend on hold, and will free up one of your incoming lines. A large number of modern clients now use the web more often than the phone. Be certain to check your incoming company E-mail regularly during the day so that you can respond in a timely fashion.

11. On the occasion of a special company anniversary, one service center sent a gift certificate to retail salesman and key business supporters who constantly referred business to the service center. The special gift was in the form of a $50.00 gift certificate to a steakhouse. It was very well received and openly appreciated.

12. One participant recommended a small book that contained good advice on increasing business for any enterprise. The book: "Growing Your Business," by MarkLeBlanc, (ISBN # 1-890676-38-1) was passed around for inspection be attendees. This book examines the relationships that businesses have with their customers and clients. The author describes a normal person who does business with us as a client.

The client who sends us business from their family or work is called a supporter. The supporter that keepsour company on their mind and constantly refers and promotes and enhances our business is declared the status of being one of our company advocates. Few business actually have, or can be even aware of, more than 25 advocates. If you know of anyone who is an advocate for your business, never be out of contact with them for more than 90 days - by phone, E-mail, brochure in the regular mail - any method, but after you identify them, stay in touch with your

company advocates.

13. Sell good quality line surge/spike protectors with every job. Have a disclaimer on the repair invoice that must be initialed if the client wishes not to purchase it at the time. The decision not to buy then carries a consequence. This activity sells more line spike protectors and also protects more users. Especially good suggestion for servicers in heavy lightning areas.

14. Sell 'Screen Clean" on all PTV Service calls. Distributors sell a packaged cleaner product with a cloth that retails for about $12.00. Additionally the VCR head cleaning tapes continue to be useful products and good sellers at the service counter.

15. Ask for referral when doing quick (no charge) counter favors such asa simple removal of a stuck tape or CD, wiring explanation or a quick hook-up diagram. Handing a small stack of three business cards to a grateful counter customer and asking them to pass on the cards to three friends has proven to be an acceptable request and continues the respect of the professional favor. The servicer who made this suggestion was honored when a local newspaper reporter was coincidentally the recipient of a courtesy service and requested to hand out the three business cards. A very complimentary local interest newspaper article followed the unsuspecting but professional handling of the reporter.

16. Tired of lifting PTV's and 36 inch picture tubes? One servicer reports of investigating the commercial suction cup - power hoist products costing above $5,000.00 and designing his own for about $1,000.00. The equipment list has a few options and is available from randy@servicew.com.

17. Use the sticky side of inexpensive packing tape to clean workbench rugs of loose solder and small screws. Also good to remove hard to reach light bulbs.

18. Processing some service products when the assigned tech gets into technical problems requires a plan. The Plan, called "Five Steps to Closure," involves the following steps. 1. Get help - another tech or call the tech line at the manufacturer. 2. Re-Inspect with all senses - Look - Feel - Listen to the product - again. 3. Consider if a major assembly or board might be available. 4. Consider the time involved with age and replacement cost. A re-estimate may be allowed. 5. Return the product un-repaired if it is too intermittent or beyond a reasonable amount of dedicated technical time.

19. Have a 'Hold Harmless Agreement' form ready when removing a major product such as a large PTV from a client's home. Let the owner know that the delivery people will be as careful as possible. The product has to be on the first floor unless an elevator is readily available. The product is fragile and the circumstances of moving the electronics, bulbs, mirror and plastic lens is always a risk.

20. One servicer has found a synergy with other area businesses. He has a front office area capable of selling accessories and support items for these other companies and has increased his own front counter traffic bysetting up specific counters for these other speciality appliances. Some adjacent service businesses (ceiling fans, antennas) are now primarily mobile and are moving from bricks and mortar to metal and rubber.

21. Make it clear up front that you will not take back for refund parts that you have sold to a customer to make his own repair. Post a sign at the front counter "If the part you installed was not the problem, you now have a spare." When selling parts over the counter and the customer wishes to return their "nice try" part that you had recently sold them because of their own mis-diagnosis, explain that you cannot "rent" parts for them to try but they now have a "spare" for their home stock.

22. One participant offered a solution for pulling in a PTVchassis that has no light box, and passed around pictures of his method. The servicer had designed a multi-purpose carrier out of plywood that allowed the removed but loose chassis and light array to be mounted and carried safely throughout the transportation and service process. Tubes faced upward to provide a safe travel. In the service center, the test screen is ceiling mounted almost horizontally to provide a serviceable target for the tubes.

After all the ideas were presented, the participants were asked to vote on the one that they thought would be the most userul. The most votes went to suggestion number 6; The "Swiffer" cleaning cloth. No prizes were awarded for any of the suggestions, but everyone wins in the sharing of ideas. ■

Comdex Review

Comdex is historically the trade show where manufacturers of computer products and related equipment show their products and services to computer resellers. This year Comdex was held at the Las Vegas Convention Center and the Las Vegas Hilton Hotel November 10 through November 16, 2001. Comdex consists of a number of events: a trade show where the manufacturers show their products, a series of seminars, conferences and tutorials, and keynote speeches by top level managers in the computer industry.

The Conferences and Tutorials

This year, Comdex offered eight conferences and 39 tutorials:

High-Velocity Computing
Selecting, Implementing and Managing New Technologies (includes InfoSecurity University and Managing IT Service and Support Programs)

Extreme Knowledge
Hard-Core Technical Education (includes Windows Technical and Sun Microsystems' Java UniversitySM Programs)

comdex.biz
Aligning Business Strategy and Technology

IT Executive Symposium
Capturing Business Value from New Technologies

EMobility
Wireless and Mobile Solutions

WebWorks
Cutting-Edge Tools, Technologies and Techniques

New World Service Provider Summit
Strategies for the Service Provider and Broadband Marketplace

Fortune Small Business Forum
Technology for growing businesses

Tutorials
Valuable skills, strategies, and solutions you can use right away.

Details on these presentations follow.

High Velocity Computing

Information Technology (IT) managers know how fast the pace of technology changes. There is always another IT challenge on the horizon requiring a newer, better, faster and more responsive technology solution. The High-Velocity Computing Conference is for IT professionals who are ready to shift into high-gear. Learn about the high-impact technologies you need to know about today, and the IT strategies that will enable you to maximize their value within your organization.

Comdex management recommended this segment for Strategic IT Management, including CIOs/CTOs; technical support managers, information security experts, MIS directors, IT/IS managers and directors, network managers/administrators, technology resellers and solution providers, technology analysts, telecommunication managers

Attendees at these sessions were expected to walk away with the following:

- Recommendations on the practicality of moving to a data center
- A blueprint for maximizing the integrity of data and systems
- Perspective on how technology will affect our social, political and economic lives in the upcoming year
- A plan for building the IT organization and infrastructure to support the Company's' business initiatives
- Insight on the new technology that they need to plan for now
- Strategies for managing the IT Service and Support Center
- The opportunity to Network.

Extreme Knowledge: Hard-core Technical Information

The rapid pace of technological change has created unprecedented opportunities for new development methods, techniques and skills. But conquering the development challenges brought about by a new generation of hardware and software platforms, tools and applications means it's time for extreme measures

Comdex people recommended that these people attend these sessions: technologists, programmers, software developers and engineers, architects, web professionals, designers, IT professionals, technical staff, networking professionals, NT administrators, network architects, infrastructure engineering staff.

Attendees were expected to acquire the following:

- Technical solutions to the challenges surrounding bandwidth, data integration, storage and support
- The ability to develop wireless applications
- Knowledge needed to make decisions about Windows 2000, XP and 2002 and its active directory
- Skills required to develop and implement Linux
- Code-level training to make them a better Java developer
- Peer tried and tested solutions
- The opportunity to network.

Comdex.biz: Aligning Business Strategy and Technology

These sessions were presented to help attendees explore recent developments in the application of technology and learn how to leverage them for business success. Within these programs, attendees were expected to discover how new technologies combined with winning business strategies will increase productivity, bring them closer to customers and help them to respond to new market opportunities. Sessions on knowledge management, CRM and business transformation were presented to help attendees take business to new levels of success.

These sessions were recommended for senior executives and business professionals and project managers charged with directing and leading their organizations into the future.

Promised benefits of these sessions were:

- A roadmap for launching knowledge management initiatives
- Organizational and ROI strategies for building/implementing a CRM ecosystem
- Perspective on how to successfully integrate the Internet into a mid-to enterprise-sized business
- Ideas and strategies on laying the foundation for business' transformation to the new economy
- A plan for aligning any company's vision, goals, value, structure, process, leadership and people

IT Executive Symposium — After the Bubble: What's next? Capturing Business Value from New Technologies

Disruptive innovation. New business

models. The promise-and the reality-of wireless communications. Over the past five years, the business world has been obsessed with technology companies and advancements in technology. Silicon Valley was our de facto Atlantis. But when the bubble burst in 2000, industry analysts, executives, and management gurus alike began to speak about technology in hushed tones. While inflated market valuations may be a thing of the past, make no mistake-the high-tech sector is not dead, or even lost. It is simply getting ready for the next wave.

Developments in new technologies, such as broadband, wireless communications and enterprise storage, are continuing at a rapid pace. Whether you are conducting a business that develops and sells technology or one in which operations critically rely on technology, you will continue to be faced with a central challenge: how to capture business value from emerging new technologies.

For senior executives, the IT Executive Symposium offered a strategic look at the various technology issues and platforms that are critical to them and their businesses. The session explored future implications and the continued importance of technology as a key driver of the global economy.

Expected benefits of this session to attendees were:

- A vision of upcoming technology-sector changes that will impact strategic decisions
- An understanding of where information technology is creating real value...and where it is not
- New contacts, new ideas, and new approaches to building leading-edge technology strategies

This session was recommended for CIOs, COOs, CEOs, senior line managers, IT executives and other business professionals charged with directing and leading their organizations into the future.

EMobility

During the past ten years, wireless communications has grown beyond raw technology, beyond traditional applications, beyond business and beyond consumers. It has become, to almost everyone who benefits from it, essential. Mobility means the freedom to go where we need to be, and yet remain connected to the people and information that enrich our lives and make us more productive, effective and satisfied with what we do. The eMobility Conference was an opportunity to find out what the wireless phenomenon is really about, without the hype, the misinformation and the.

This program was recommended for Service Providers, IT Managers, Business Managers, Channel/Resellers and Solution Providers

Benefits promised to attendees were

- The pros and cons of key wireless applications
- A blueprint for integrating wireless technology into business
- Solutions to wireless technical issues, including security, application integration and building the ideal mobile communicator
- An understanding about the opportunities and issues business of mobile communication
- Insights into which direction the wireless industry will take in the future

Webworks — Cutting Edge Tools, Technologies and Techniques

The WebWorks Conference provided an opportunity to discover creative solutions to daunting Web challenges. Attendees were expected to learn about the hottest Web-enhancing technologies and tools.

This session was recommended for Web Designers, Web Administrators, Web Developers, Webmasters, Information Architects, Content Managers, Web Marketing Professionals, CIOs/CTOs, IT Managers and Web Project Managers

Promised benefits were:

- A "how-to" guide for getting your business up on the Web
- A workable knowledge of XML
- The what's, why and where's of deploying WAP (Wireless Application Protocol)
- The skills needed to design and maintain an effective Web site
- The tools you need to perform a quantitative Web site evaluation

New World Service Provider Summit

The New World Service Provider Summit promised to bring service providers (xSPs), broadband carriers, IT service professionals, ISVs, and end-users together to meet, discuss, and learn about the opportunities and developments surrounding premium service delivery.

This session was recommended to:

Industry Attendees: Service Providers (xSPs), broadband carriers, IT service providers, Content Delivery Providers, Integration and Hosting Services, Technical Software Providers, Vertical Market Service Providers, and ISVs.

Buying Communities: Business Managers, IT Managers, Small Business Executives

Attendees were promised the following benefits:

- An understanding of the key services being demanded by XSP customers to help you personalize your product offerings
- Solutions for engineering broadband networks for successful service delivery

- A roadmap for evaluating, adopting and maintaining a service provider model
- The opportunity to Network, Network, Network

Fortune Small Business Forum

The fortune small business Forum offered a full day of innovative sessions, networking opportunities, a motivating keynote and relevant technology workshops — geared to provide attendees with the techniques that will empower them to make their businesses grow.

Comdex staff recommended this program for CEO's, Presidents, Top Executives, Information Managers, Principals, Owners of Small, Non-IT Businesses.

Promised benefits from this program were:

- An understanding of how to use technology to distinguish the company's customer service from the competition
- A plan for using the Internet to help the small business compete against much larger competitors
- Knowledge of current technology trends for broadband to enterprise software to wireless
- Ideas for attaining the company's sales and marketing potential through the use of the latest software programs
- Solutions for dramatically cutting costs by automating billing, human resources and order systems

The Trade Show

In addition to the tutorials and conferences, Comdex offered a trade show at which manufacturers of computer hardware, software and services showcased the newest and hottest of their products. Senior editors from the IT industry's leading publications judged and honored the most innovative and noteworthy IT products introduced during COMDEX Fall 2001 in 17 categories plus "Best of Show". The award-winners were announced in a ceremony at COMDEX Fall 2001.

Eighteen awards were announced at the ceremony. The coveted "Best of Show" was awarded to Fujitsu PC Corporation for their product, the Fujitsu LifeBook P Series. The LifeBook P Series is an ultra light, ultra portable notebook computer that utilizes an innovative, low voltage Transmeta chip, which allows an unheard of six hours of life. Seventeen awards were given out in individual categories and one product was designated as Best of Show. Editors from the participating publications were each responsible for judging three or more of the categories. ■

THE WINNERS OF THE COMDEX FALL 2001 BEST OF COMDEX AWARDS ARE:

WINNER	PRODUCT
Best Enterprise Software	
Novell	ZENworks for Desktops 3.2
Cardiff Software	Liquid Office eForm Management System V2.0
Cisco Systems	Cisco Unity 3.0
Best Networking Sofware	
Brocade Communications Systems, Inc.	Brocade Silkworm 380 Enterprise Fabric Switch
Celestix Networks	Tarus Server Appliance
NetScaler, Inc.	NetScaler Request Switch 6000 Series
Best Notebook	
Fujitsu PC Corporation	Fujitsu LifeBook P Series
Toshiba America Information Systems	Toshiba Portege 4000 Series
Toshiba America Information Systems	Toshiba Satelite 5005-S504
Best Services	
Distinctive Technologies	PC Pinpoint Pro
CNM Network	Voice Assistant
Collective Good	CARE Mobile Phone Recycling Program
Best Desktop PC	
Compaq Computer Corp.	D500 Ultra-Slim Desktop
Sony Electronics	PCV-MXS 10
Hewlett Packard	E-PC 42
Best Enterprise Storage	
Nexsan Technologies	InfiniSAN D2D
Texas Memory Systems	NAS-250
Dot Hill	SANNET Axis
Best Mobile/Handheld System	
Toshiba America	Pocket PC3570
Handspring, Inc.	Treo 180
PC-Ephone, Inc.	PC-Ephone 2.0
Best Wireless Networking System	
Agere System	AP-2000 Access Point
Proxim	Harmony 802.11a
Intel Corporation	Intel Pro/Wireless 5000 LAN Family of Products

WINNER	PRODUCT
Best User Storage	
CMS Peripherals	Desktop ABS w/USZB 2.0
Panasonic Industrial Co.	(DVD Burner) LF-D311
Imation Corp.	Ripgo
Best Mobile/Handheld Software	
Rand McNally + Palm, Inc.	PalmPak Travel Card: Rand McNally Road Atlas
Cutting Edge Software	Quickoffice Conference 6.0
Conduits Technologies, Inc.	Pocket Slides 1.1
Best Networking Software	
TechTracker, Inc.	TechTracker ITX v.1.0
Novell	NetWare 6
CrossTec Corp.	NetOp Remote Control Version 7.0
Best Internet Software	
Eyeball Networks, Inc.	Eyeball Chat 2.0
Browse3D Corporation	Browse3D Browser Beta 1.0
Rivar Technologies	CODE: NEO Version 1
Best New Technology	
Marathon Technologies	Split Site
Virtutech, Inc.	Virtutech Simics
Senseboard Technologies AB	Virtual Keyboard
Best New Concept Product	
Patria Ailon OY	Ailonet
IPDEX Technologies	Red Eye 7
TII Network Technologies	Digital Closet
Best Server	
Egenera, Inc.	Egenera Blade Frame 1.1
NEC	NEC Espress5800/320La
Toshiba America Information Systems	Magnia 2300
Best Security	
G+A Electromedia	Access Armor v.1.0
Trust Digital	PDA Secure (for both CE+Palm)
Pocket Multi Media	PMM Pockit Remote
Best eBusiness Product	
Marathon Technologies	Exchange Server 3000
Cyberspace HQ	Service Traq
Netmining	Hits-into-Leads

New Products

Telephone Line Analyzer

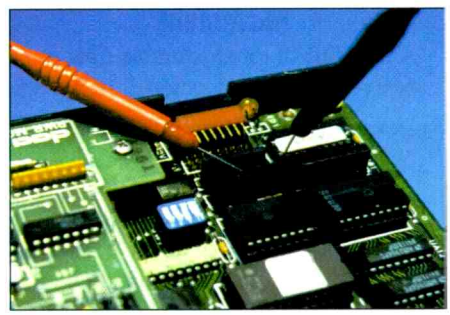
This basic tester features two cables and two modular plugs for standard RJ-11 phone jacks and RJ-45 phone jacks which are becoming more common as homeowners and home-based businesses bring more lines into a site. The product carries a lifetime warranty and has a LED lights so the user can identify correct wiring, reverse polarity, and shorted or open pairs quickly and accurately.

The unit quickly identifies problems simply by plugging into a wall jack. Allows homeowners or other users to determine if a phone problem is in the incoming line or handset. The lead from the tester is simply plugged into a phone jack and if the jack tests OK, the user knows that the problems is in the handset, so a service call to the phone company is unnecessary. Helpful to homeowners but also useful to installers, contractors or electricians working in a home or small business where a number of phone lines are being tested.

Cooper Tools
Circle (29) On Reply Card

Test Probe for Tight Space

The Electronics Acupuncture Probe (EAP) from Automotive Electronics Services is a unique solution to many of the common problems associated with connecting test equipment to electronic circuits. The EAP features a small, sharp needle that is ideal for back-pinning small, crowded connectors. It can also serve as an ultra-small pin tip probe for general purpose testing on today's small, tightly packed circuit boards. Most importantly, the EAP pin can be replaced if it becomes dull, bent or broken. A variety of inexpensive pins from sewing and discount stores can be used in the EAP. This means that you can customize the EAP with pins in a wide variety of shapes and sizes to suit your individual testing needs. The probes attach to standard 4mm banana plug test leads. Each Electronics Acupuncture Probe kit includes five EAP's, extra pins, spare setscrews and outer insulator jackets all ina rugged storage case.



Some possible applications of the EAP

- Back-pinning small, high density connectors
- Inserting into small component sockets
- Probing small circuit boards and components
- And more...

(Continued on next page)

Photofact® Index

SAMS TECHNICAL PUBLISHING HAS JUST RELEASED THE FOLLOWING PHOTOFACT® SETS

PANASONIC
AEDP322....4512
AP342....4515
BP342....4515
CT-36D20B....4515
CT-36D20UB....4515
CT-36D30B....4515
CT-36D30CB....4515
CT-36D30UB....4515
CT-36SF35W....4512
CT-36XF35CW....4512

PHILIPS MAGNAVOX
MS2730....4514
MS2730C221....4514
TP3285C....4509
TP3285C121....4509

RCA
CTC203T....4516
CTC203T4....4516
CTC203T5....4516
CTC203U5....4516
F19422TX1....4516
F19422TX41....4516
F19422TX51....4516
F19422TX52....4516
F19424TX1....4516
F19424TX41....4516
F19424TX51....4516
F19424TX52....4516

SAMSUNG
KS2A(N)....4506
TXJ2066....4506
TXK2066....4506
TXK2066X/XAA....4506

SANYO
AVM-3258C....4507
AVM-3258G....4507
AVM-3258S....4507
AVM-3651G....4510
DS35510....4510
G5Y-3258C0....4507
G5Y-3258G0....4507
G5Y-3258S0....4507
G7R-3651G0....4510
35510-00....4510

SHARP
CN27S18....4511
SN-91....4511
27N-S180....4511

SONY
KP-48V85....PF GOLD 5
KP-53V85....PF GOLD 5
KP-61V85....PF GOLD 5
KV-32TW25....4508
SCC-J71N-A....4508
SCC-P43FA....PF GOLD 5
SCC-P43GA....PF GOLD 5
SCC-P43HA....PF GOLD 5

TOSHIBA
TAC0006....4513
TAC0009....4505
TAC0013....4505
TAC0017....4505
27A30....4513
29AS30....4513
32A30....4505
32A40....4505
32A50....4505

Photofact® and Photofact® Gold are available from NESDA Corporate Members: B&D Enterprises, HBF Electronics, MCM Electronics and Pacific Coast Parts. Additionally, Photofact® and Photofact® Gold can be purchased from your local SAMS distributor or directly from Sams Technical Publishing

Unique Design

- It's smaller than most probes
- The pin is ultra-sharp
- The pin is replaceable if it becomes dull, bent or broken...no more throwing away probes! Pins are inexpensive and readily available — it's a probe you can use!
- If you have a special probing situation, bend, cut or alter the pin however you need to since it's replaceable.
- You can use a wide variety of pin shapes and sizes to suit your particular needs.
- They attach right to most test leads so there is no need to devise awkward makeshift probing methods.
- Each EAP kit includes spare parts so that your EAP's are always ready, in working condition

AES (Automotive Electronics Services)
Circle (30) On Reply Card

RF Connectors Introduces a New Low Loss 7-16 Din Connector

RF Connectors, a division of RF Industries, announces the release of another new 7-16 DIN series coaxial connector

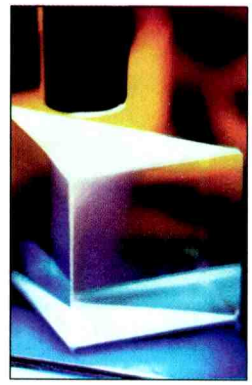
designed for use with LMR-600® low-loss cable from Times Microwave and WBC-600 low-loss cable from CommScope. The RFD-1604-2L2 is a 7-16 DIN male crimp connector featuring silver plated body and contact for optimum inter-modulation distortion reduction and Teflon® insulation for its preferred dielectric performance. The RFD-1631-2L2 is the 7-16 DIN female crimp termination designed use with LMR-600 and WBC-600 cables. To facilitate installation of all RF Connector crimp connectors for 0.600" diameter cable, the RFA-4009-20 piston crimp handle and RFA-4009-01 die set should be used. Many other coaxial crimp and clamp connectors have been added to the BNC, TNC, N, SMA, 7-16 DIN, MCX, MMCX, and SMB lines to be used with full series of low-loss cables ranging from 0.1" to 0.6" diameter and manufactured by Belden, CommScope and Times Microwave.

Available from RF Connector Distributors throughout the US, Canada and Mexico.

RF Connectors
Circle (31) On Reply Card

A New Line of Low Stress Adhesives for Fiber Optic Assembly Eliminated Parts Movement

A new line of tough, durable fiber optic adhesives has been developed to prevent movement of critical components during curing and subsequent thermal cycling. The line includes three new fixturing and positioning adhesives (not designed for use in the optical path) and ten adhesives with refractive indices from 1.42 to 1.58, for use in the optical pathway.



Low Shrink™ adhesives feature shrinkage as low as 0.1% and exceptional cure speed, these fiber optic adhesives offer low total movement, superior moisture resistance, very low outgassing and excellent adhesion to a variety of substrates. Formulated to cure in seconds outgassing and excellent adhesion to a variety of substrates. Formulated to cure in seconds upon exposure to UV or visible blue light, they exhibit excellent depth and speed of cure, allowing their use in many critical and demanding applications. Those applications include fiber opti "V' groove bonding, positioning of laser diodes, fiber pigtailing, transceiver potting, mounting active devices or passive couplers and prism and other optical device assemblies.

All three precision bonding products have a one-year shelf life when stored at room temperature. Refrigerated storage is not necessary and pot life is unlimited. Unlike two and three part materials, waste and scrap are eliminated.

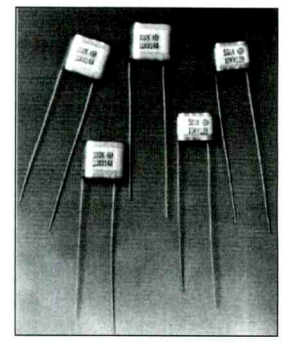
DYMAX fiber optic adhesives provide users with "cure on demand," meaning the adhesive does not fixture until exposed to longwave UV or visible light. This feature permits adjustment of parts after the adhesive is dispensed to obtain precise alignment. Curing in seconds facilities J.I.T. manufacturing, providing the opportunity to reduce production costs. Obtaining a complete cure in seconds offers the ability to perform in-line quality control of the finished product, eliminates the need for storage space and costly work-in-process and enables fast, high volume automated processing.

DYMAX has a complete line of UV/visible light curing systems that are compatible to the curing chemistry of UV adhesives. High intensity spot lamps provide fast cures for small drops of adhesive, while stationary flood lamps and lamps mounted over conveyors provide cures of DYMAX precision assembly resins in large are applications.

DYMAX Corporation
Circle (32) on Reply Card

Inexpensive High Voltage Capacitors

Westwood, NJ — The MVDR, a lower cost, very high voltage inductive capacitor, especially designed for use with CRT displays and video monitors, high voltage power supplies and multiplier circuits is now available from Seacor, Inc. a major supplier of standard and custom capacitor products.



With prices ranging as low as $0.35 each for bulk quantities, these small footprint devices feature a capacitance range of 500PF and 1000PF with in-between ratings available on special order. Voltage range is from 10 to 15KV with capaci-

tance tolerance at ±10%(K). Dissipation factor is ≤1.0% at 1KHz and 20°C. Insulation resistance between terminals is ≥ 100 x 10^3 MΩ.

Self-healing and equipped with tinned copper clad steel axial leads, the MVDR types may be combined in parallel and/or series assemblies to achieve various capacitances-voltages.

Construction features include internal multi-series connection windings with polyester metallized film and epoxy resin impregnation.

Directly competitive with high voltage ceramic capacitors, these new units are available from stock to 6 weeks, depending upon quantities ordered.

Seacor
Circle (33) on Reply Card

B+K Precision® Adds Low Cost PC Compatible Device Programmer

Placentia, CA — B+K Precision Corporation, announces the addition of the Model 848, low cost PC Compatible

Device programmer. The device has been designed for ease-of-use, fast, reliable performance, and features an extensive library of 2,500 devices (600 devices require optional modules). The 848's device library is constantly being updated.

B+K Precision also offers a line of socket adapters to interface with most IC packages including: PLCC, SOIC, TSOP, DIP, TQFP, SSOP, PSOP, or QFP. Prices at $249, B+K Precision's newest Device Programmer is a must for anyone that tests, repairs, programs or re-programs any electronic device using a memory IC, according to the company.

"Fast, Dependable, and Reliable, the Model 848 is the latest addition to our new family of Device Programmers," said Victor Tolan, President of B+K Precision Corporation. "The device is completely PC compatible, and we only use vendor approved Windows™ based software to assure successful programming. Our extensive libraries, which are constantly being updated to reflect the latest in technology, are easily accessed from our web site. The Model 848's outstanding accuracy, flexibility and price performance makes it an ideal choice for programming EPROM, EEPROM/Flash, Serial EPROM, Microcontroller, and PLD devices."

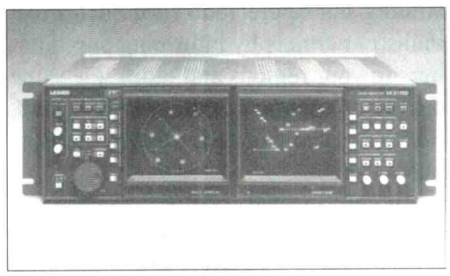
The Model 848 Device programmer comes with a 32-pin ZIP socket that eliminates the need of an adapter for any DIP device up to 32 pins. However, B+K Precision does maintain an extensive line of socket adapters to interface with many IC packages, if required. The Model 848 offers Buffer features including Erase, Random Data Fill, Fill Block, Copy Block, Move block, Swap Block, Buffer print, Find Text, Replace text, 8-Bit and 16-Bit View Modes, Go To Address, and Checksum Calculator. The unit is windows 95/98/Me/NT/2000™ compatible and comes equipped with a standard parallel printer port interface.

Priced at $249, The Model 848, comes complete with a library of 2,500 devices, software (with the user manual in digital format), power supply, and parallel cable. It is available for immediate delivery.

B+K Precision Corporation
Circle (34) on Reply Card

Full Rack HD-SDI Waveform Monitor

Cypress, CA, Leader instruments Corporation has introduced the LV 5170D a multiformat HD/SDI



Waveform/Vectorscope Monitor with dual CRTs. Operating features include the ability to handle 14 HDTV formats as well as optional SD-SDI and 480p analog. Format selection is automatic, with auto adoption of colorimetry to match the selected system Detection and logging of video, audio, ancillary & color gamut errors plus selectable alarms ensure awareness of operating conditions. AES/EBU digital audio is disembedded from the signal being processed, and output as four pairs of digital audio for eight channels total. Finally, a readout in hex of all data points on any selected raster line is provided with the choice of manual line selection or line capture as the result of a detected TRS error.

Extensive monitoring functions include waveform (YCcCr orGBR), vector (choice of electronic or external graticule), picture and stereo monitoring. All observations are presented with the unbroken clarity that only instrument grade CRT displays can provide. Line-select, precision cursors, menu control of digital and analog setups and storage of ten front-panel setups round out operating features. The LV 5170D accepts two SDI inputs switchable from the front panel and provides a buffered SDI output from the feed selected. Input selection includes one 3-wire analog input. Decoded pix-monitor outputs may be set to either YPbPr or GBR.

Monitoring facilities include data capture that is triggered by selected line number or detected error and reads out hex data for the selected line addresses. A reading of serial data signal level, given in terms of equivalent cable length from an ideal source, aids in evaluating SDI conditions. Of particular value is the error detection system that spots CRC errors in video (Y and C), audio and ANC data. The time of first error shown along with total error count and time elapsed from the first error to facilitate BER calculations. White phosphor CRT is provided as standard.

Options include HD eye pattern or SD-SDI including SD eye pattern and 480p analog.

Availability is through Leader's regional sales offices and nationwide distributor network.

Leader Instruments
Circle (35) on Reply Card

Association News

NESDA Holiday Update

To stay in touch and update our membership in the middle of this busy Holiday Season, there are a few things in progress I want to bring to your attention because they are sure to have some future effect upon us all.

Please Join me in officially welcoming Mack Blakely to our Association staff as he is now an official staff member and will assume the helm as the next NESDA Executive Director at the end of this month. He has been very busy relocating and preparing for this task. Welcome aboard Mack.

Another reason to be thankful is all the help we continue to receive from our Industry Peers. I have just received a copy of the new full color PTS flier that David Melwid produced that also promotes our NESDA Membership along with our upcoming Convention. He has allotted half of this flier to promoting our association while using the other half to promote PTS. So please join me in thanking David and PTS for this well timed support and help.

I also want you to join me in thanking Thomson Multimedia for allowing NESDA members the opportunity to access their website. Please take note of the fact that they have only offered this to "NESDA Members" outside their authorized service network and that brings more value to becoming and remaining a member in this association. We are also thankful for their active participation and every other like commitment for this forum.

I don't want to forget to thank each NESDA/Satisfusion member for renewing their NESDA membership and welcome that confidence.

We are further indebted to Fay Wood and the outstanding job she is doing with our marketing and membership committees, receiving commitments from Industry Partners to add 37 peer sponsored NESDA memberships in the coming year. We will officially thank all of these special industry partners for their generous commitment in a soon to be released NESDA message. I pledge my personal appreciation and cooperation to each of these special partners and look forward to assisting them at every opportunity throughout my tenure.

I have been ask and accepted an invitation from Mr.Walt Herrin of Hitachi to attend the Hitachi Executive Conference in San Diego on December 5th through 8th to bring any issues we wish directly to their top level Hitachi Executives. If you have an input that you think should be presented at this conference please send it to me by Tuesday, December 4th so that I may include it in my presentation. We thank Walt and Hitachi for their confidence and this opportunity. Other NESDA members attending are Clancy Harms, Region 7 Director, Wayne Markman, NESDA Industry Relations Committee Chairman and NESDA Past President and Billy Sims, TEA President should you rather provide your input to them.

We need NESDA and/or ISCET members to serve on our Certified Service Center committee to work with CEA to develop and update many important requirements for this emerging Industry wide program. If you wish to serve please contact me for more information.

May I conclude by wishing each of you the most joyful and happy Holiday Season ever and ask that you join with me in prayer for our Industry, our Association and our Country including all those we have sent into harms way.

Sincere Appreciation with Best Wishes,
John Eubanks CET
NESDA President
Phone 904-772-1420
fesa@fdn.com

NESDA Thanksgiving With Good News

Board and Others,

As many of you know, our newly formed "Marketing Committee" has been hard at work on new concepts and initiatives to promote this association and improve our membership numbers. We are now beginning to see some very positive results from their efforts. A short while ago, we were ask by a Past President the legitimate question inquiring of our ongoing plans to hold and keep NESDA membership while expressing concern for a high perceived loss rate. We had great hopes for these new programs but as you know hopes do not pay dues and all that could be truthfully said at that point was,"We are working on that."

Well, now we have a little more information. Since receiving the recent information from Clyde of Toshiba's outstanding commitment to sponsor 10 new NESDA memberships in the coming year, resulting from this new approach we have received notification from Kenwood they will sponsor 3 more new NESDA memberships and Tritronics has since committed to sponsoring 4 more new NESDA memberships in a post to this board. I hope all of you will join me in demonstrating our appreciation for such great industry partners by informing our members in your regions and return the same degree of support for them in like kind, for these proven and trusted industry allies.

An additional source of good news is the arrival of access application forms sent to non Thomson ASC- NESDA member's businesses to be filled out and returned to Thomson so these NESDA members can be granted the limited access promised at NPSC 2001 to the Thomson service website. This is a welcomed benefit provided to NESDA members by yet another of our industry partners.

So please join me at every opportunity to thank each of these friends for such a display of their generous support and confidence in our association . Just like the first bird off the roost in the early morning, it gives us something to "crow" over. And please make sure to let our Marketing Committee know just how much we appreciate all this work they are doing for our entire NESDA family.

Cock a doodle doo!! In fowl language that means "Greatfully Appreciated".

A Happy Thanksgiving With Sincere Thanks to All Who Made This Possible,
John Eubanks CET
NESDA President
fesa@fdn.com

1st Week on the Job for Mack Blakeley

After my first week on the job at the NESDA office, I am pleased to report that I am very excited about the future of NESDA.

I have spent the first week learning where everything is, getting to better know the office staff, implementing a few time saving computer operations, and working very hard on the 2002 NESDA and NPSI budgets.

I am very pleased to report that we will be presenting a positive budget at the January meeting. Expenses will be down in the coming year and due to the retention of a good percentage of the Satisfusion promotion members, membership is up from two years ago. With the new Manufacturer/Distributor membership sponsorship program and with some of the new member benefit programs that I plan to implement, I think we have a good chance of an increase in net membership in the coming year.

I have explained to staff that is my goal to present completed November 30th financial statements and preliminary financial statements as of December 31, 2001 at the January Board meeting. I will be sending the NESDA and NPSI budgets to you for your review, two weeks prior to the meeting.

As Clyde reported to you, he put me in his office and turned the daily operations of NESDA/ISCET over to me immediately upon my arrival. Before I arrived, he had his computer and paper files extremely well organized to make it easy for me to find what I have needed to make decisions and to work on the budgets. He has provided me with assistance as needed and explained the procedures currently in place. It is real pleasure to work with Clyde during this transition.

A week or so ago, I sent you my personal email address. Well, it seems the provider I chose, home.com, went bankrupt and shut down their service about a week later. What luck! Please use my NESDA address mack@nesda.com. to communicate with me. I have a temporary personal email address of mackblake@yahoo.com. I will provide my new home permanent email address as soon as I am able to establish it with my new provider charter.net. I do have Internet access at home and I am able to log into my computer at the NESDA office and work from home. In fact, I am using my computer in the office via the internet from home to send this email.

Thank you again for the opportunity and honor to serve as Executive Director of NESDA/ISCET. I will do my very best to provide you with the leadership you expect.

Respectfully,

Mack Blakely mack@nesda.com

Michael Fischer Elected NARDA President

Lombard, IL — Michael Fischer, president, Nielsen's, Inc., Spencer, Iowa, was elected president of the North American Retail Dealers Association (NARDA) during a Board of Directors meeting held at the 46th annual Institute of Business Management, October 12-15 at the Xerox Training and Conference Center, Leesburg, VA.

In accepting the gavel, Fischer noted, "NARDA faces the same challenges and uncertainties of the current marketplace as the retailers it represents and industry's suppliers. How will we deal with the upheaval? We have an energetic and focused Board of Directors and a solid and experienced professional association staff. It's really a simple answer. We're going to look for the new opportunities in those challenges that help our members succeed. That's exactly what we plan to do."

Robert Cremer, Aronson Furniture, Appliances and Electronics, Chicago, Illinois, who served three terms as president, remains on the board as chairman.

Also elected were: first vice president, Randy Whitehead, Service West, Salt Lake City, Utah; second vice president, Michael Corder, Hod's Home Electronics Center, Waterford, Michigan; secretary Leon Barbachano, Allen & Peterson Home Decor, Anchorage, Alaska; and treasurer, Timothy Seavey, Seavey's Furniture and Appliance, Windham, Maine.

Remaining on the board as directors are: Garey Alimia, A-1 Home Appliance, Harvey, Louisiana; Bill Benson, Benson's Appliance, Bloomington, Illinois; Larry Clark, The Music Store, Inc., Greenfield, Massachusetts, Oliver Dyer, Oliver Dyer's Appliance, Fort Worth, Texas; Ivins "Itchy" Popkin, Furniture Fair, Jacksonville, North Carolina; and Kent Renier, Renier Co., Dubuque, Iowa.

NARDA is a not-for-profit association whose members are retailers of kitchen and laundry appliances, consumer home electronics, furniture and other hard goods consumer products. NARDA[s mission is to enhance the ability of independent dealers t build progressive, profitable businesses.

Walt Seymour Leaves CEA

After a 28 year career in the electronics and technical services industries, Walt Seymour has decided to leave CEA, effective November 16. Walt joined the Consumer Electronics Group of EIA in 1985, an since then he has devoted much time and energy into the development and execution of CEA's technical education and services programs. He currently serves as National Chair for the electronic applications portion of the SkillsUSA championship competition. He has also managed programs designed to upgrade the service and support part of the consumer electronics industry, and he has had a variety of assignments in the technical education arena, including the development of curriculums, a national skills standard, a certification program and accreditation program for schools which teach electronics.

Prior to joining CEA, Walt was employed for 12 years by General Electric, in their Major Appliance Business Group and later with their Integrated Communications Service Organization.

Walt is a native of Baltimore, and is a big Orioles and Ravens fan. He lives with his wife Hea, a Montgomery County high school teach. They have two daughters, Helena, an attorney in Massachusetts and, Karen, an occupational therapist in North Carolina.

NEDA Honors Seven Industry Leaders at 2001 Executive Conference

Atlanta GA — NEDA honored seven electronic distribution industry leaders at its annual awards ceremony during the 2001 NEDA Executive Conference, held October 28-30 at the Renaissance Chicago Hotel.

Carroll Receives Gail S. Carter Award

NEDA bestowed its highest honor, The Gail S. Carter Award, to Bob Carroll, Senior VP and CFO of Powell Electronics. The award acknowledges electronic distributor principals who have made significant contributions to the distribution industry, have taken an active role in NEDA and civic affairs and are recognized by the industry as leaders.

Powell Electronics has a long-standing history with NEDA and it was Harold Powell himself who encouraged Carroll to participate in NEDA. Carroll has been an active member of NEDA for over a decade. He has held several positions on the NEDA Board of Directors including Secretary, Vice President, President and Chairman of the Board. He also has served on the Executive Conference Planning Committee.

"Bob approached his place on the NEDA Board with commitment, enthusiasm and a sense of humor," said NEDA Executive Vice President Robin B. Gray, Jr. "He is a longtime, dedicated supporter of NEDA and has encouraged others in his organization to participate in NEDA by attending NEDA events and participating on NEDA Task Forces."

Panduit, Philips Semiconductor Receive NEDA Manufacturer Award

NEDA presented Panduit Corp. and Philips Semiconductor with the NEDA Manufacturer Award. The award was created in 1990 to recognize the manufacturer-supplier that best exemplifies the spirit of partnership in the electronic distribution industry. It was expanded in 1999 to honor two manufacturers per year: one from the passives side and one from the active side. The Manufacturer Award recipients are nominated by the NEDA Board of Directors and selected by ballot by NEDA distributor members.

This year, the NEDA Board added two new criteria to the award qualifications: support of authorized distribution and support of NEDA and its industry guidelines. The highest priority goal of the chosen organizations is the development of closer partnerships that enable both manufacturers and authorized distributors to better serve the customer.

Jack Shewman, Panduit Corporation, and John Tuley, Philips Semiconductor, accepted the awards on behalf of their respective firms.

Campbell, Tobin, Turay and Zierk Receive Distinguished Service Awards

NEDA honored Scott Campbell; Mike Touray, NEC Electronics; Walter Tobin, Pioneer-Standard and Robert Zierk, Avnet, Inc. with its Distinguished Service Award. The award is given to those individuals who make significant contributions to NEDA.

"These individuals have given their time and talent for the betterment of the industry by their involvement in NEDA," said Craig Conrad, NEDA President. "Without them, NEDA would not be a world-class association."

Scott Campbell has been a dedicated member of the NEDA Board of Directors for three years. He has also been instrumental in helping to obtain sponsorships for the NEDA Executive Conference.

Walter Tobin has served on the Executive Conference Planning Committee for the past two years. He has been active in making the conference a success by eagerly recruiting speakers and giving his all to participating in planning the program.

Mike Turay spearheaded the NEDA Design Win Registration Task Force which published the widely-used NEDA Design Forecast/Registration Reporting Form. He served on this year's Executive Conference Planning Committee and has been active in the E-Commerce Roundtable both as a participant and as a resource for agenda and speaker recommendations. Mike's active involvement in RosettaNet has helped him to expand its deployment within the electronics supply chain, benefiting both NEDA distributor and manufacturer members with development of interoperable business-to-business process transactions.

Robert Zierk is a leader of NEDA's Human Resources Roundtable and has been instrumental in making it one of NEDA's most active and valuable committees. He has also been a featured speaker at the NEDA Test Measurement and Electronics Supply Conference.

The 2002 NEDA Executive Conference will be held October 27-29, 2002 at the Renaissance Chicago Hotel.

ATTENTION LOCAL, NATIONAL AND REGIONAL ASSOCIATIONS:

For inclusion in ES&T Assocation News pages, please forward your press announcement and newsletter to:

Electronic Servicing & Technology
403 Main Street, 2nd Floor
Port Washington, NY 11050

ES&T Readers Speakout

READER OPINION SURVEY/COMMENTS

Thank you for listing V-M Audio Enthusiasts in the January issue as we discussed. It was perfect, I wouldn't change a thing about what was printed. I have sent in my subscription and look forward to more issues that cover both old and new technologies. If I can help with bringing the technical resources of the V-M Corporation to bear, please let me know as I have much technical information and files.
Thanks again, and I hope that we can converse again in the future.

Sincerely, Gary Stork

Thank you again for supporting my research project this past year. "Sex & Radiation: ELF/EMF and the Birth Ratios of Electronics Repair".
Technicians again achieved High Honors (2nd Place) at the Long Island Science Congress, and was a state semi-finalist for the Intel Science & Engineering, with a special recognition award from the United States Army.
Enclosed is a complete copy of my paper for your review.
Again, sincere thanks,

Louis Giuffrida

All service centers should charge an up front, non-refundable diagnostic fee; no free estimates. This practice may contribute to any unity of purpose and a higher professional persona as perceived by the consumer / customer coming in our front door.

T.V.F.

What to do with junk TVs & others is a still a problem. Also lack of good available service info & troubleshooting guides.

D. L. Mansfield, MO

I think one way to help the professional servicer in providing fast quality repairs and maintenance work is by obtaining expeditious and affordable service & repair literature, manuals, & parts. I still remember when the larger outlets like Sears, JC Penny, etc. included schematic diagrams & technical notes with their consumer electronics equipment.

G.H. Bayamon, PR

I agree with C. Wests e-mail. Manufactures shun the independent servicer. They want the consumer to toss the product and buy another one. I have many customers that just want their unit fixed at a reasonable cost.

R. M. Yarnell, AZ

What happened to quality or reliability in a product? We need to have some kind of standards on TV & VCR's - so that people know what they are getting. For example TV-VCR combos have cheap or low quality VCR parts.

J. G, Dallas, TX

My opinion for lowering the cost of repair service to customers and service technicians. Starting with TV sets — The manufacturer could sell, at a reasonable cost, the complete boards, to replace the troubled ones and that will minimize time and money.

J.E. Round-Rock, TX

Give up and find other areas to use your knowledge and trouble shooting skills.

N.E.G. West Palm, FL

I'm located in a rural area about an hour drive from larger centers. (Population 120k+) So if I charge too much, customers would rather travel to the city.
I'm doing business from home, so unless its an emergency, most customers bring the item to me.
Consequently, big screen TV's 27 inches or more are not done.
I have warranty repair for fence controllers and do other similar work like electric motorboat motors, pinball machines etc. For variety I do , older car diagnostic systems and so on..
Most items, donated to me for some reason or another I recondition, if I can, and donate to a local Catholic charity.
I use to charge a flat rate of $32.00. Than I went to $36,00 per hour and found my customer base disappearing. So, I dropped it to $25.00 but that didn't work either.
The last year or so I charge a service rate of $16.00 per hour ($4.00 for 15 minutes) plus expenses which vary depending on item.
Operating expenses are itemized on work order and vary from $8.00 to $22.00, this is added on once per job, so instead of 3 hrs. @ $25.00 = $75.00 for labor, it's now $16.00 per hr. plus the varying expense charge depending on the job.

J.C.E. Elgin, Ontario, Canada

I like to read articles on solving EEPROM problems like the one written by Bob Rose in '97 for RCA TV's, but now for other TV brands like Sony. I have a Sony TV on my workbench with this kind of problem and I don't know how to gain access to adjustments. (This is a model KV-29XL42M/5, chassis BA-4D, by the way.)
I'm surprised to see that Sony is at the top or your list on service. Years ago they were excellent at providing information, and now they don't even answer faxes or e-mail's, at least to people in Mexico. Your magazine is one of the few resources I have for information.

Mexico

ES&T Readers are invited to respond to any of the above or make additional comments. Wherever possible, we will put interested parties together. Send to:

ES&T Readers Speakout
403 Main Street, 2nd Floor
Port Washington, NY 11050
Fax: 516-883-2162
Email: dallen@mainlymarketing.com.

READERS' EXCHANGE

Readers' Exchange is a free service for ES&T paid subscribers only. Please include a copy of a recent address label with your Readers' Exchange Copy. The following restrictions apply to Readers' Exchange:

• Only individual readers may use Readers' Exchange, and items must be restricted to those that are ordinarily associated with consumer electronics as a business or hobby. If you're in business to sell the item(s) you want to offer for sale, the appropriate place for your message is in a paid advertisement, not Readers' Exchange.

• Readers' Exchange items must be restricted to no more than three items each for wanted and for sale.

• All submissions must be typed or printed clearly!

Send your Readers' Exchange submissions to:
Readers' Exchange • Electronic Servicing & Technology • 403 Main Street, 2nd Floor, Port Washington, NY 11050
Tel: 516-883-3382 Fax: 516-883-2162

FOR SALE

Sencore VC93 Video Analyzer, like new, all probes, maual, Video tapes, $450.00. Tektronix Dual Trace Oscilloscope model 2247A with accessories, $350.00. Tentelometer and Huntron tracker. Everything for a total of $900.00 Conatct James Wajid 914-831-5981.

B&K Model 1460 Solid state, Triggered Sweep Scope. D.C. to 10 MHz bandwidth with mv/cm sensitivity, year 1970. All manuals and in original shipping box, 10:1 and direct probe. $50 plus shipping, price new $400. B&K High Voltage probe, Pix Tube anode, 0 to 30 Kilovolts, with manual, $10 plus shipping. Sencore TF26 Cricket, Transisitor and FET tester w/manual, $25 plus shipping. Sencore TF40 Pocket Cricket, Transisitor and FET tester w/manual, $25 plus shipping. Eico Model 324 RF Signal Generator w/manual, year 1970. $25 plus shipping. Model BG10 electrotech mini-bar digital color generator w/manual, $20 plus shipping. Telematic Universal Test Rig, 19" color pix tube, for tube and solid state servicing, with manuals and all kind of adapters for Many, Many pix tubes, year 1977. $100, can't ship, too big. All items have manuals. Wallace W. Huffman, 2579E 550N, Warsaw, IN. 46582-1783,call 219-453-4811.

NEC projection TV 45" 1990 model (was Colortyme model PJ 4310 W14A chassis) 3 CRTs complete assembly, has #74922017 (026) on lens $ 75.00 or best offer. Also boards etc, best offer, had PWC2924 motherboard. Call 615-563-5634.

As tech/owner of a MA/PA shop, I was the only user of my test equipment and they are in excellent condition. Precision Apparatus Series 920 Tube Tester with Centronics hardware and data updates to test all vacuum tubes, $250.00. B&K Model 467 Picture Tube Restorer/Analyzer with updating, including universal clip-on adapter, $200.00. Jerrold Model A.I.M. 719A VHF/UHF Signal Level Meter, needs batteries, $175.00. A-OK TV, AOKAY@prodigy.net, 203-847-9254.

Diehl Mark IV Diagnostic computer – $75.00, 648s Jackson Tube tester – $35.00, Eico VTVM 249 – $35.00, Sencore PS127 Oscilloscope – $35.00, Eico 324 RF Signal Generator – $20.00, ESR meter in-circuit cap checker – $35.00. all with manuals. B&K 445 CRT – $35.00, High Voltage (30KV) probe – $10.00. 550 tubes boxed – make offer. Ed Bello 614-451-9248, ebello1@msn.com. Five Zenith 9-160-05,-60 modules. Repaired and tested by A-OK TV. $60.00 each, all five for $250.00. A-OK TV, AOKAY@prodigy.net, 203-847-9254.

Attention librarians and techs. Magazines for sale: ES&T 1974 to present date, Radio Electronics 1950 to present date. Minimum order for either, in one-year blocks, $250.00. A-OK TV, AOKAY@prodigy.net, 203-847-9254.

Sencore SC3100, $1,200.00. Sencore PR570, $600.00. Both items in excellent condition, hardly used. Call Sam Stephens, 916-655-3365.

SENCORE SG80 AM, FM STEREO ANALYZER, TENMA 72-895 Wow & Flutter meter, both less than 4 years old. As new in original box with all std. accessories. Also B&K 1035 Wow & Flutter meter. The B&K is an older unit but in near mint condition. TENNY JR environmental test chamber with heavy castered stand. Reconditioned by LR Environmental Equipment. (pick up only the test chamber) Units were requirements of a Ford Motor Co. contract but have practically no use. All excellent condition. I also have an older SENCORE SG165 Stereo Analyzer. Manuals are included with all equipment. All equipment was bought new by me with the exception of the B&K 1035 and the Tenny Jr. Contact: Henry at Milner Aviation Electronics 1-800-645-9455 or milav@vol.com.

WANTED

Need Mitsubishi flyback transformer part #334p167080 or EVG/Russell suggested part number FBT-212. Will pay fair price. Please contact Bing Huie, P.O. Box 2634, Alameda, California 94501. 510-523-9087

Tektronics Scope Type 647A. We need CRT. Part T6470-31-1. New or a good used CRT. Corrado Electronics Repairs. 603-774-7864. Will pay going price.

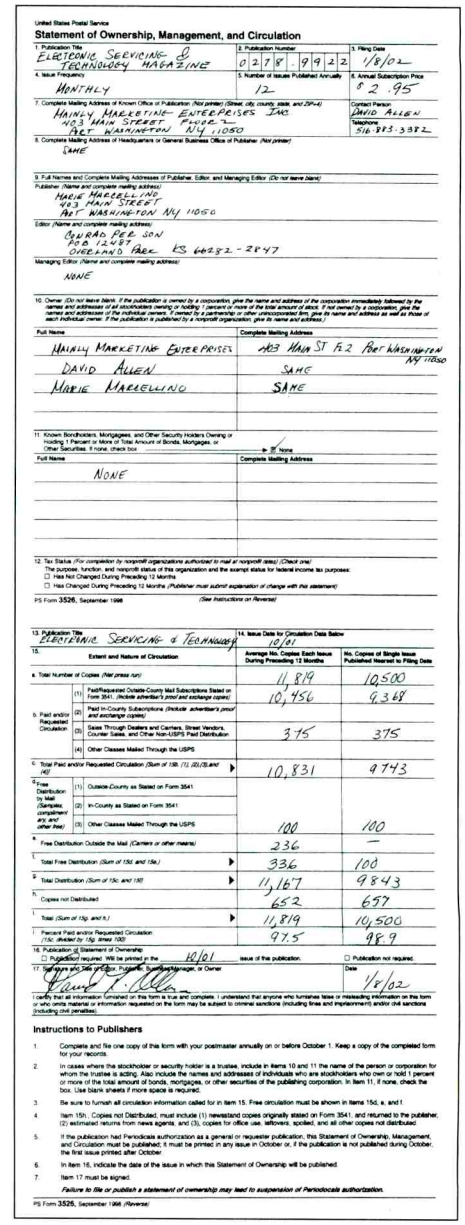
Looking for schematic for a Curtis Mathis color TV model A-2656-R6. Chassis C-849 will buy at reasonable price. Willie's TV P.O. Box 252 Planada, CA 95365.

Front plastic buttons assembly for Magnavox Model TS2560B101. Part #483541037219 new or used NLA from Magnavox. Call Pete at 724-941-5358 or write ABCM, 124 Thompsonville Road, McMurray, PA 15317.

Panasonic IC for VCR/TV-VCR #VCRS0164. NLA from Panasonic. Call Pete at 724-941-5358 or write ABCM 124 Thompsonville Road, McMurray, PA 15317.

Service Literature for Hitachi Model HTA 3000 Rcvr. Amp. Richard Gilman P.O. Box 633 King City, CA, 93930. 831-385-9248.

Service data and VHF tuner assembly for TMK model 1933RC color TV. Will be happy to pay photocopy/mailing costs for data, and, of course, for part. Tel.: 301-963-9751 or email: 73063.524@compuserve.com



United States Postal Service
Statement of Ownership, Management, and Circulation

1. Publication Title	2. Publication Number	3. Filing Date
ELECTRONIC SERVICING & TECHNOLOGY MAGAZINE	0278-9922	1/8/02
4. Issue Frequency: MONTHLY	5. Number of Issues Published Annually: 12	6. Annual Subscription Price: $2.95

7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4): MAINLY MARKETING ENTERPRISES INC. 403 MAIN STREET FL2 PORT WASHINGTON NY 11050 — Contact Person: DAVID ALLEN; Telephone: 516-883-3382

8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer): SAME

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)

Publisher (Name and complete mailing address): MARIE MARELLINO 403 MAIN STREET PORT WASHINGTON NY 11050

Editor (Name and complete mailing address): CONRAD PERSON PO BOX 12487 OVERLAND PARK KS 66282-2487

Managing Editor (Name and complete mailing address): NONE

10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)

Full Name	Complete Mailing Address
MAINLY MARKETING ENTERPRISES	403 MAIN ST FL2 PORT WASHINGTON NY 11050
DAVID ALLEN	SAME
MARIE MARELLINO	SAME

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → ☑ None

Full Name	Complete Mailing Address
NONE	

12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☐ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)

PS Form 3526, September 1998 (See Instructions on Reverse)

13. Publication Title: ELECTRONIC SERVICING & TECHNOLOGY	14. Issue Date for Circulation Data Below: 10/01	
15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)	11,819	10,500
b. Paid and/or Requested Circulation (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. (Include advertiser's proof and exchange copies)	10,456	9,368
(2) Paid In-County Subscriptions (Include advertiser's proof and exchange copies)		
(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution	375	375
(4) Other Classes Mailed Through the USPS		
c. Total Paid and/or Requested Circulation (Sum of 15b. (1), (2),(3),and (4))	10,831	9743
d. Free Distribution by Mail (Samples, complimentary, and other free) (1) Outside-County as Stated on Form 3541		
(2) In-County as Stated on Form 3541		
(3) Other Classes Mailed Through the USPS	100	100
e. Free Distribution Outside the Mail (Carriers or other means)	336	—
f. Total Free Distribution (Sum of 15d. and 15e.)	336	100
g. Total Distribution (Sum of 15c. and 15f)	11,167	9843
h. Copies not Distributed	652	657
i. Total (Sum of 15g. and h.)	11,819	10,500
j. Percent Paid and/or Requested Circulation (15c. divided by 15g. times 100)	97.5	98.9

16. Publication of Statement of Ownership
☐ Publication required. Will be printed in the 10/01 issue of this publication. ☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner — Date: 1/8/02

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

Instructions to Publishers

1. Complete and file one copy of this form with your postmaster annually on or before October 1. Keep a copy of the completed form for your records.
2. In cases where the stockholder or security holder is a trustee, include in items 10 and 11 the name of the person or corporation for whom the trustee is acting. Also include the names and addresses of individuals who are stockholders who own or hold 1 percent or more of the total amount of bonds, mortgages, or other securities of the publishing corporation. In item 11, if none, check the box. Use blank sheets if more space is required.
3. Be sure to furnish all circulation information called for in item 15. Free circulation must be shown in items 15d, e, and f.
4. Item 15h., Copies not Distributed, must include (1) newsstand copies originally stated on Form 3541, and returned to the publisher, (2) estimated returns from news agents, and (3), copies for office use, leftovers, spoiled, and all other copies not distributed.
5. If the publication had Periodicals authorization as a general or requester publication, this Statement of Ownership, Management, and Circulation must be published; it must be printed in any issue in October or, if the publication is not published during October, the first issue printed after October.
6. In item 16, indicate the date of the issue in which this Statement of Ownership will be published.
7. Item 17 must be signed.

Failure to file or publish a statement of ownership may lead to suspension of Periodicals authorization.

PS Form 3526, September 1998 (Reverse)

CLASSIFIED

CLASSIFIED ADVERTISING By the word. $1.65 per word, per insertion, pre-paid. Minimum charge is $35 per insertion. Initials and abbreviations count as full words. Indicate free category heading (For Sale, Business Opportunities, Miscellaneous, Wanted). Blind ads (replies sent to ES&T for forwarding) are $40 additional. No agency discounts are allowed for classified advertising. For further information, or to place your order, contact:

Lyndiane Paoletti, Electronic Servicing & Technology
403 Main Street, 2nd Floor, Port Washington, NY 11050
Tel: 516-883-3382 Fax: 516-883-2162

FOR SALE

ANY Tuner we rebuild is $25, YES $25, YES $25, YES $25, YES $25! Includes FREE Shipping and Handling. *BUY - SELL - TRADE* **Tip Top TV**, 18441 Sherman Way, Reseda, CA 91335. **818-345-1974.**

SENCORE, TEKTRONIX, HEWLETT PACKARD (all models). **We SELL REFURBISHED EQUIPMENT. Please call "CHOICE ELECTRONICS"** for all of your test equipment needs. Complete financing options available. Call 1-800-609-0677, 605-361-6386 ask for Lance Topple.

IN-CIRCUIT CAPACITOR TESTER – Find bad caps FAST and RELIABLY with the Capacitor Wizard in-circuit ESR Tester! Great for monitors, switching power supplies, TV, etc. Still only $179.95. MC/VISA. **Independence Electronics Inc. 800-833-1094. www.awiz.com.**

CRT ADAPTER and Setup Book — Hooks "YOUR" CRT Tester to "ANY" crt. Projection, Monitor, Color. Patented. $79.95. DandyDapter 918-682-4286, 2323 Gibson, Muskogee, OK 74403.

TV CASE HISTORIES: Volume 9 with 3,500+ histories. Satisfaction assured. Only $63.00 (plus $3.95 shipping). Over 12,600 books and supplements sold with only 1 returned for a refund! **Mike's Repair Service**, P.O. Box 217, Aberdeen Proving Ground, MD 21005. Same mailing address 37+ years. Send SASE for samples. 410-272-4984,1-800-2-FIX-TVS 11a.m.-9 p.m. (http://mikesrs.no-frills.net).

EMPLOYMENT

ELECTRONIC TECHNICIAN Florida Keys: Live and work in paradise! Component level repair. Send resume and copies of schooling certificates. Apply to Tvdocs@aol.com or call: 305-451-1951 Or: (cell) 305-394-1532.

EXPERIENCED TV TECHNICIANS, Combination in home service and bench repair. Performance incentives. **Apply at www.unitedradio.com or call Nick 315-445-3315.**

WANTED

IMPEDENCE MATCHER for Telematic Test Jig. Part #10J-4000. Call Jim at 724-539-8697.

BUSINESS OPPORTUNITIES

TV/VCR Repair Shop in Las Vegas, NV. Nets $75,000/year. Current owner active, but does no repairs himself. Asking $80,000 or best offer. 702-869-0622.

EDUCATIONAL COURSES AVAILABLE

FREE COURSES. For free electronic courses via email, register at www.emailschool.com.

DISPLAY CLASSIFIED MARKETPLACE

DISPLAY CLASSIFIED MARKETPLACE Display Classified Marketplace $260.00 per column inch per insertion. Frequency rates available. 2 columns per page, 3 1/2" column width. Minimum size accepted: 1 column inch. Additional sizes billed in 1/4" increments. Maximum height per ad is 4", maximum width per ad is 1 column (3 1/2"). Agency discounts paid to recognized agencies if finished materials are provided. We accept AMEX, MasterCard, VISA and Discover. Optional color (determined by ES&T) $150.00 per insertion. For more information, or to place your order, contact:

Lyndiane Paoletti
Electronic Servicing & Technology
403 Main Street, 2nd Floor, Port Washington, NY 11050
Tel: 516-883-3382 Fax: 516-883-2162

ADVERTISERS INDEX

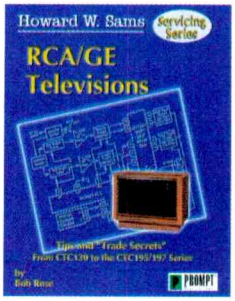
COMPANY	PAGE NUMBER	READER SERVICE NUMBER	ADVERTISER HOTLINE
ANDREWS ELECTRONICS	11	15	(800) 289-0300
B&D	5	10	(888) 815-0508
B&K PRECISION	IFC	1-9	(800) 462-9832
B&K PRECISION	15	17-22	(800) 462-9832
ELECTRONIC DESIGN SPECIALISTS	17	23	(561) 487-6103
ELECTRONIC HOUSE EXPO	39	25	(800) 375-8015
ELECTRONIC SERVICING & TECHNOLOGY:			
BOOK SHOP	IBC		(800) 462-4659
SUBSCRIPTIONS	53	36	(800) 462-4659
ELECTRONIC TECHNICIANS ASSOCIATION	10	14	(800) 288-3824
ELECTRONIX CORP.	56	38	(937) 878-9878
ESCALERA, STAIRCLIMBER	56	39	(800) 622-1359
FLUKE CORP.	7	11	(800) 44-FLUKE
HERMAN PANSON ELECTRONICS	56	40	(800) 938-4376
INTERNATIONAL COMPONENTS	56	41	(800) 645-9154
ISCET	45	28	(817) 921-9101
NEUTRIK	12	16	(732) 901-9488
PROBEMASTER	43	27	(800) 772-1519
SAMS TECHNICAL PUBLISHING	41	26	(800) 428-SAMS
SENCORE	9	12	(800) SENCORE
T.A. EMERALD INDUSTRIES	10	13	(800) 280-0020
TEST SUPPLY INC.	23	24	(301) 317-4718
THOMSON MULTIMEDIA INC.	BC	42	(800) 336-1900

WE'D LIKE TO SEE YOUR COMPANY LISTED HERE TOO!
CALL: Joni Jones, 516-944-8068, e-mail: jmjones@ix.netcom.com,
Barbara Arnold, 781-259-9207, e-mail: bhacat@tiac.net
or
David Allen, *Sales Director*, 516-883-3382,
e-mail: dallen@mainlymarketing.com

TO WORK OUT AN ADVERTISING PROGRAM TAILORED TO SUIT YOUR NEEDS.

ES&T BOOK SHOP

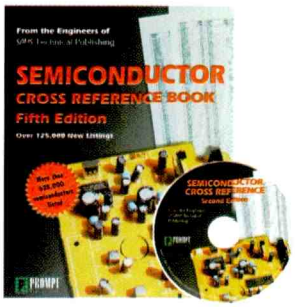
To Order Call Toll Free 800-462-4659



RCA/GE Televisions
(Howard W. Sams)

Expanding on the Sams Servicing Series, author Bob Rose takes an in-depth look at RCA/GE TVs, with coverage of manufacturer hr shop in Fort Dodge, IA for 38 years. He is the author of more than 43 books and more than 1,000 articles printed in 48 different magazines. He currently is the TV servicing consultant for *Electronic Servicing & Technology* magazine.

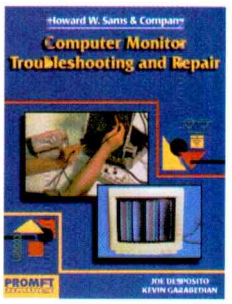
Paperback • 320 pages
ISBN 0790612240 • Sams # 61171
$34.95 US



Semiconductor Cross Reference Book
Paperback or CD-ROM
by Sams Technical Publishing

The perfect companion for anyone involved in electronics! Sams has compiled years of information to help you make the most of your stock of semiconductors. Both paper and CD-ROM versions of this tool contain an additional 128,000 parts listings over the previous editions.

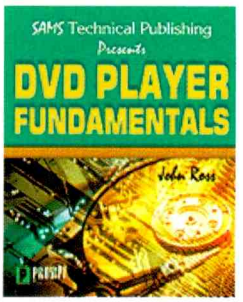
Paperback, 5/E • 876 pages
ISBN 0790611392 • Sams 61139
$39.95 US
CD-ROM, 2/E
ISBN 0790612313 • Sams # 61231
$39.95 US



Computer Monitor Troubleshooting and Repair
By Joe Desposito
Prompt Series from Sams

This can save time and money in monitor repair. Technicians will benefit from this book as it takes the reader through the basics and on to trouble shooting circuits.

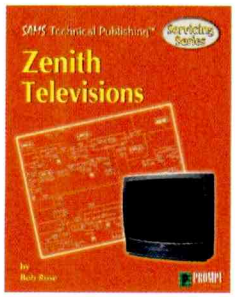
Paperback • 308 pages
ISBN 07906011007 • Sams # 61100
$34.95 US



DVD Player Fundamentals
by John Ross

DVD Player Fundamentals covers every aspect of the Digital Versatile Disc starting with features, specifications, hookup, operation, user error, and more. For the professional, specific technical information includes: DVD track structure and disc construction, optical head and lens features and specifications, video signal processing, MPEG-2 technology, audio signal processing, decoding, audio path and reference signals, switch-mode power supply, tracking servo, transverse servo, system control circuits, etc.

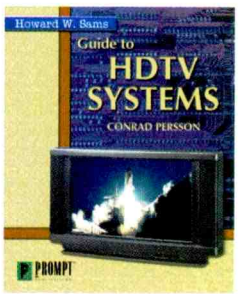
Paperback • 304 pages
ISBN 0790611945 • Sams# 61194
$29.95 US



Servicing Zenith Televisions
(Sams Servicing Series)
by Bob Rose

Expanding on the Sams Servicing Series, author Bob Rose takes an in-depth look at Zenith TVs, with coverage of manufacturer OEM parts versus generic parts.

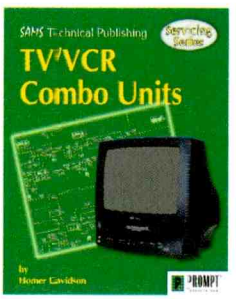
Paperback • 352 pages
ISBN 0790611716 • Sams# 61216
$34.95 US



Guide to HDTV Systems
by Conrad Persson

As HDTV is developed, refined and becomes more available to the masses, technicians will be required to service them. Up until now, precious little information has been available on the subject. This book provides a detailed background on what HDTV is, the technical standards involved, how HDTV signals are generated and transmitted, and a generalized description of the circuitry an HDTV set consists of.

Paperback • 323 pages
ISBN 079061166X • Sams# 61166
$34.95 US



Servicing TV/VCR Combo Units
(Sams Servicing Series)
by Homer Davidson

Part of Sams Servicing Series, Servicing TV/VCR Combo Units covers the servicing issues surrounding this popular electronic device. TV/VCR combo units have become smaller, more affordable, and functional. They are now used in new ways, including applications in autos, campers, kitchens, and other non-traditional locations. Homer Davidson uses his vast knowledge to cover this subject in a way no one else can.

Paperback • 320 pages
ISBN 0790612240 • Sams # 61224
$34.95 US

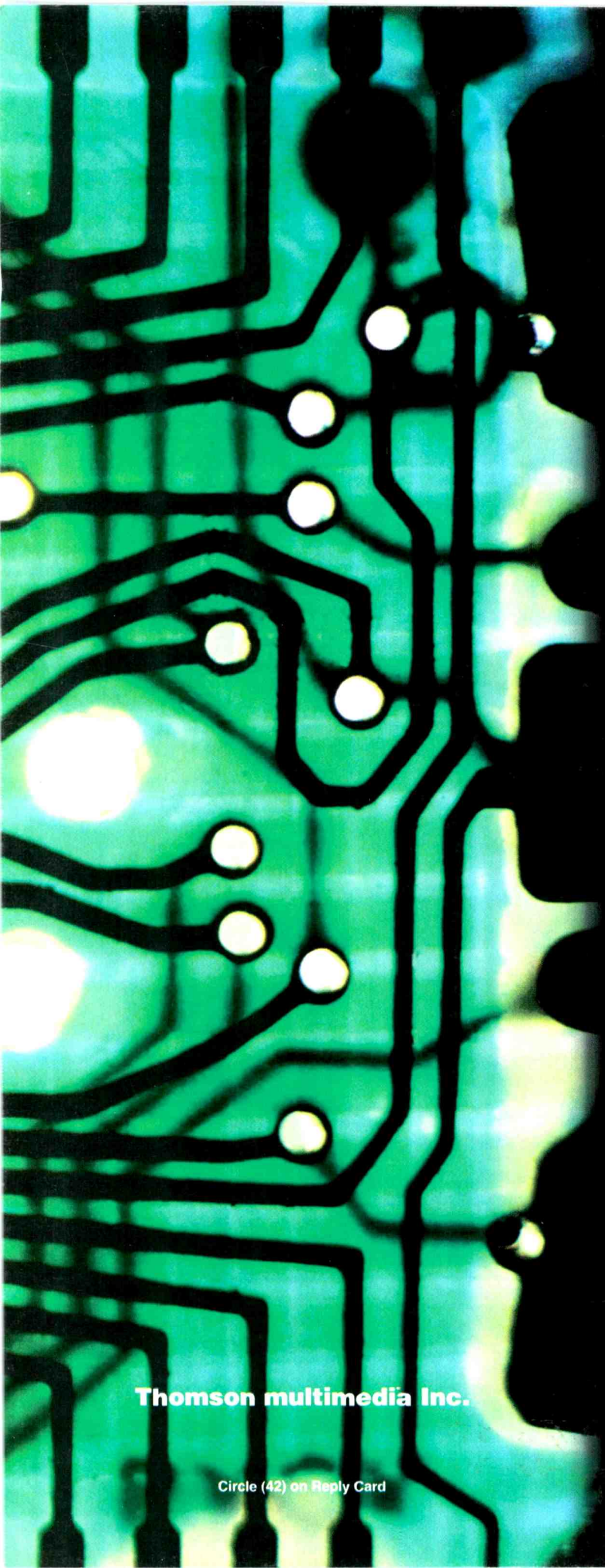
ORDER TOLL FREE
1-800-462-4659

Make your selections and include your name, address and telephone with order.

Check, Money Order, MC, VISA, AMEX and Discover accepted. Include CC# and Expiration with order.
Make checks payable to: ***Electronic Servicing and Technology***.

Shipping: FREE on US orders over $50.
Smaller orders = $6.00.
Foreign shipping charged at actual cost (less $6.00 for orders over $50).

Call or mail order to:
Customer Service
ES&T
P.O. Box 748
Port Washington, NY 11050
Fax: 516-883-2162
Tel: 800-462-4659



Exact Semiconductors

The Right Parts For The Job

"Trust Me!"

How many times have you heard that!

You built your reputation on hard work and quality repairs. Why change now?

Put your reputation on the line with two names you *can* trust.

SK *Series* and Thomson multimedia Inc.

With over 1,700 exacts in stock, you won't have to look anywhere else. And when you're in need of any video heads, belts, tires, flyback transformers or video replacement parts, we have them too.

But we don't stop there.

Our continuing quality assurance and accuracy goes into every SK *Series* product.

For more information on SK *Series* products, contact your nearest Thomson Distributor.

SK *Series*...The parts you need to do the job. "Trust me!"

Thomson multimedia Inc.

SK *Series*

Circle (42) on Reply Card