Component News AND TECHNOLOGY

Contents

Flash Technology

By Nelson Chan
Director of Marketing, SunDisk Corporation

Flash solid-state technology has emerged as a viable mass storage solution for thousands of new products being designed and developed around the world. System designers and engineers have found that the inherent properties of flash data storage — including non volatility, ruggedness and extremely low power consumption — make it the storage solution of choice for their new products requiring capacities from 1.8 to 175 MByte.

Despite its growing popularity, there is still some confusion in the marketplace about flash technology. Potential customers sometimes are unable to clearly delineate between socket flash and mass storage flash or between non-standard flash file system (FFS) storage cards and flash storage cards that meet the PCMCIA ATA industry standard. Some misconceptions also take place when customers evaluate and compare flash storage cards and small form factor hard disk drives.

Flash mass storage is a semiconductor technology, not a disk drive technology. Flash storage pricing is relatively consistent with DRAM memory and is significantly less expensive than SRAM memory. Price comparisons between flash storage cards and small form-factor disk drives — such as 2.5″ and 1.8″ — are a moot issue. If a product designer can use a disk drive, it is a much less expensive solution per megabyte. But there are hundreds of applications, usually requiring under 100 MByte of storage, where disk drive technology cannot meet the specifications. The drives are not rugged enough, take up too much physical space, cannot withstand temperature extremes and frequent temperature changes or consume too much power. Flash storage cards consume less than five percent of the power required by 2.5″ and 1.8″ disk drives, are approximately 10 times more rugged (as measured by G force operational ratings of 1000 versus under 200), and offer extended operating temperature ranges of −25°C to +75°C — far superior to disk drive capabilities.

Flash storage cards and drives, both embedded and removable, are emerging as the storage standard for numerous mobile electronic products including hand-held computers, data collection systems, communications devices, instrumentation units and monitoring and diagnostic tools. As

Andy Seybold, the respected market analyst and writer, explains, "The whole issue of mobility is dependent upon having information where you want it, when you want it. Solid–state mass storage is the enabler for that ability."

Almost on a daily basis, product designers are finding new applications for flash data storage — see Figure 1. It is being used on board the new Boeing 777 airliner to store cabin control information. Ambulatory heart patients wear portable vests containing flash cards that record and store cardiac data. Railway conductors in Japan have flash cards in their hand held computers to quickly facilitate updates in complex fare structures. Mining companies in Canada use flash cards in drilling equipment to record vital data about precious metals and soil densities.

Flash cards are being used increasingly in telecommunication networks for data storage in harsh environmental conditions. And flash cards also are used in printers for storing fonts, emulation data, networking protocols and languages.

Many of these applications have been made possible by new higher capacity flash products. SunDisk Corporation, which introduced the world's first flash storage card that met PCMCIA (Personal Computer Memory Card International Association) standards, offers the industry's broadest range of flash data storage products. These include embedded 1.3″ and 1.8″ drives with capacities ranging between 1.8 and 80 MByte and removable storage cards with capacities between 1.8 and 175 MByte.
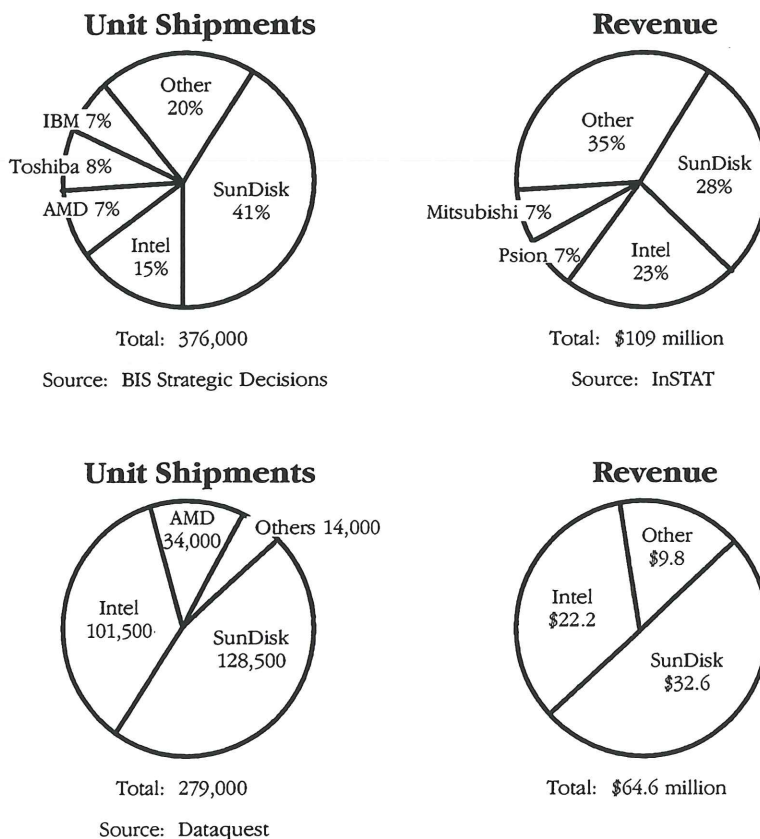
Unit Shipments

Other 20%
IBM 7%
Toshiba 8%
AMD 7%
SunDisk 41%
Intel 15%

Total: 376,000

Source: BIS Strategic Decisions

Revenue

Other 35%
SunDisk 28%
Mitsubishi 7%
Psion 7%
Intel 23%

Total: $109 million

Source: InSTAT

Unit Shipments

AMD 34,000
Others 14,000
Intel 101,500
SunDisk 128,500

Total: 279,000

Source: Dataquest

Revenue

Other $9.8
Intel $22.2
SunDisk $32.6

Total: $64.6 million

Figure 1. FlashCard Market Share – 1994

Those are "native" capacities and can be effectively doubled with Stacker compression software. A new flash form factor standard also has been introduced by SunDisk: Compact-Flash, the world's smallest (the size of a matchbook) removable mass storage system.

Flash technology has spawned two distinct markets — socket flash and flash mass storage. Socket flash, also referred to as linear flash, is delivered in the form of a memory chip embedded in the system. Socket flash typically stores data such as BIOS and operating system code, data which typically needs to be updated very infrequently. As such, socket flash is designed for mostly "read" operations. Flash mass storage cards, on the other hand, must be designed differently to perform thousands of read and write operations. Flash vendors who have ported their socket flash designs to flash

storage cards have been forced to make many product compromises — which degrade performance — in order to supply their flash cards to the market. SunDisk flash cards were designed specifically for mass storage applications.

Linear flash cards have large block-erase sizes (typically 64 KB) and, consequently, lengthy block-erase times. Flash cards that meet the ATA standard, such as those produced by SunDisk, feature a 512 byte block, the same size employed by standard IDE hard disk drives. That small block size allows for faster performance. The ATA emulation of the IDE disk drive standard provides ATA cards with 100 percent DOS and Windows compatibility. Microsoft has designed "plug and play" support for ATA cards — not linear flash cards — into the new Windows 95™ operating system.
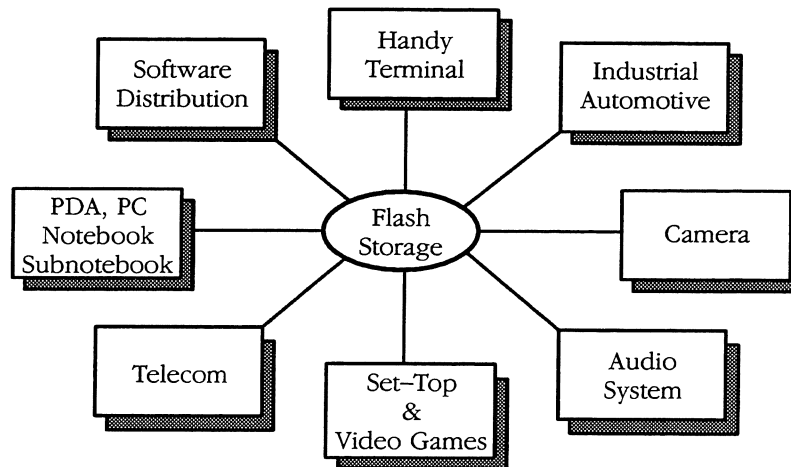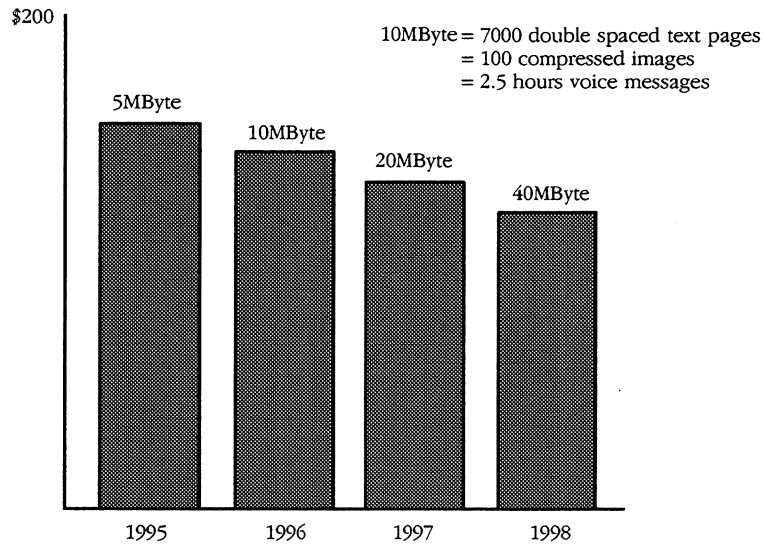

Figure 2. Pervasive Storage

$200

5MByte

10MByte

10MByte = 7000 double spaced text pages
= 100 compressed images
= 2.5 hours voice messages

20MByte

40MByte

1995   1996   1997   1998

Figure 3. FlashDisk OEM Price Trend

Linear flash cards also require one of several non-compatible flash file system software offerings to function as a mass storage device — see Figure 2. Because of that, the cards have many performance problems, including no guaranteed forward and backward compatibility, inadequate defect management and a dramatic degradation in performance as the cards start to fill up with data. SunDisk flash cards provide both forward and backward compatibility. This means that when users purchase next generation computing systems, their present flash cards will work in the new systems. And when users acquire new advanced SunDisk flash cards, they will be fully compatible with their present computer. Each SunDisk flash storage product has an onboard intelligent controller that provides true host independence. This controller removes the need for any on-board flash file software. The benefits of this design are numerous including full forward and backward compatibility, higher performance and greater reliability.

The increased worldwide design activity of flash data storage cards and production increases by vendors is driving down prices — see Figure 3. Further price reductions will be evident as vendors move to next generation, higher-density 64 and 256 MBit flash. Flash pricing at the 1 MByte and above capacity today is lower than SRAM pricing and, in high volumes, is equal to DRAM pricing. During the next two years, flash card pricing is expected to be lower than some DRAM implementations. Some market analysts expect that the flash card market will grow from its roughly $100 million in revenue in 1994 to nearly $1 billion by the end of 1997.

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New Editor For CN – New Era

By Dave Bartles

For nearly five years it has been my privilege to be the editor of the Component News & Technology newsletter. It is time for me to move on. Over the past five years I watched as the number of corporate publications dwindled to very few. CSI recognized the need for distribution of information throughout the company. Our goal was to provide in the best form possible, useful component/supplier and data information.

The quest to deliver our information in the best vehicle possible leads me to my new area of work in CSI, called Desktop Media Development — fancy words that mean I'll be working on Multimedia and Web page production. Not to worry though, the Component News newsletter surges forward under the *(very capable leadership)* of editor Peggy Bulter. Peggy is taking the newsletter and moving it into a new era of online communications. I urge you to support Peggy in her new endeavor and by all means continue the article contributions that you so graciously volunteered to me.

During my tenure as editor I received support from some folks that I would like to acknowledge:

❖ Brian Groves, CSI Director, who passionately believed in the product *and the editor* and consistently gave insight and articles.

❖ Julie Vincent, Component Engineering Manager, whose steady hand and wonderful sense of humor took the edge off of the "deadline blues."

❖ All of the Component Engineers who gave their time and energy to create articles for the newsletter and believed in sharing their knowledge with Tektronix.

❖ All of the Design Engineers in Tektronix who volunteered articles with little recognition other than a byline in the newsletter.

❖ Brian Diehm, CSI Documentation Manager, whose sense of creativity and design structure inspired me to move the newsletter to a new and hopefully better plateau.

Last but certainly not least, thanks to all of you subscribers to Component News — it was a pleasure serving you!

The future of Component News looks brighter than ever and I can't wait to see what Peggy will do with one of Tektronix' best information products! See you out there on the Web...

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Stock Boxes From Econobox

By Martin Baggs

Most of our corrugated shipping boxes are very product-specific with printed markings, and hence are inappropriate for use as stock boxes. However, there *are* a number of economy stock boxes and tuck mailers part numbered at Tektronix which *do* offer versatility. These are currently procured from Econobox, and have no labeling or marking.

The stock boxes are all 200# weight regular slotted containers, with a white exterior and a Kraft interior; the tuck mailers, too, are 200# weight. The following tables identify these part numbers, listing first the RSC boxes and then the mailers, all ordered by ID size:

Table 1 – Stock Boxes With Tek Part Numbers

Size	Econobox P/N	Tek P/N
7 × 6 × 6	EB–037	004–4134–00
10 × 6 × 4	EB–082	004–4660–00
11 × 7 × 7	EB–109	004–3875–00
12 × 4 × 4	EB–124	004–4628–00
12 × 12 × 12	EB–156	004–4107–00
14 × 4 × 5	EB–216	004–4635–00
14 × 6 × 4	EB–198	004–3876–00
14.125 × 11.75 × 6.625	EB–226	004–3883–00
17 × 9 × 9	EB–289	004–4138–00
17 × 10 × 7	EB–289B	004–4447–00
17.75 × 14.5 × 12.5	EB–301	004–3885–00
18 × 14 × 8	EB–318	004–4667–00
20 × 12 × 12	EB–360	004–3800–00
20 × 16 × 14	EB–369	004–4314–00
20 × 20 × 4	EB–370	004–4193–00
21 × 18 × 8.5	EB–388	004–3881–00
24 × 16 × 4	EB–439	004–4363–00
6 × 6 × 3	EM–49	004–3879–00
9.5 × 6.5 × 2.625	EM–09	004–3884–00
12.125 × 9.5 × 2	EM–11	004–3878–00
12.125 × 9.5 × 4	EM–12	004–3877–00
12.625 × 9.25 × 3.75	EM–13	004–3880–00
17.25 × 11.125 × 3.5	EM–17	004–3882–00

Table 2 – Tuck Mailers and Corregated Pad with Tek Part Numbers

Size	Econobox P/N	Tek P/N	Notes
8 × 5 × 3	EM–33	004–4627–00	With 3 piece urethane cushions
8 × 5 × 3	EM–33	004–4634–00	With 3 piece polypropylene cushions
14 × 14	EP–15	004–4413–00	Corrugated pad, 200#, white

In addition to these parts, we also have two padded tuck mailers and a corrugated pad from Econobox — see Table 2.

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Display Products Technology Forum

By Gary Johnson

A Display Products Technology Forum will again be held this year. It was originally scheduled for July but because of scheduling conflicts, it has been pushed out to August. The schedule will be sent to commodity team members and posted to the tek.general newsgroup as soon as dates and times are confirmed.

All employees are invited to come and view what's new in the world of Flat Panel and CRT Displays. The tentative list of suppliers includes:

❖ Delta

❖ Epson

❖ Fujitsu

❖ NEC

❖ Optrex

❖ Panasonic

❖ Planar

❖ Samsung

❖ Sharp

The suppliers are being invited to present their company's technology roadmap and provide product demo's of their latest products. These suppliers have been identified in the Material Acquisition Plan for Display Products as either Preferred Supplier Candidates or Suppliers of Alternate Technologies that are being monitored for viability.

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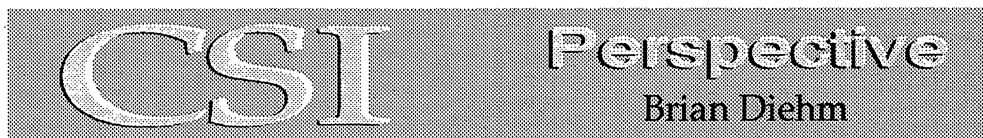
CSI Perspective — Spinning The Future

One of the complaints we hear most often is that users don't understand all the databases and tools that we provide. Many of you have expressed frustration over not knowing what tools are available, and which should be used for what purpose. The question is, "Why so many different tools?"

A large part of the mission of Component Supplier Information is the publication of data. "Information" is part of our name, and if you can't get to the information you need, it does neither you nor us any good. To this end, we've concentrated over the past several years in building a family of databases — Pangæa — that provides access to uniform data.

Every type of information we track is used by many other parts of the company. For example, supplier (vendor) data is used by purchasing, NPI, manufacturing, and engineering. All need this data for different purposes, and often the screen design or feature set that makes the tool useful for one group is less than ideal for another group.

Of course, what has been the impossible goal has been to provide uniform access across all parts of the company, across all platforms. Oracle software has brought us part way to this goal, and implementing the Pangæa tool suite in Oracle has increased the uniformity of access. Still, Parts Data Warehouse on a PC looks and feels differently than PDW on an X terminal. And, non-Oracle information sources such as Spec-

view appear radically different than the database portions of Pangæa.

With the widespread acceptance — world-wide literally — of the World Wide Web, the dream of uniform access may now be possible. CSI has developed a vision of how a Web-served component and supplier information source might appear. Using the Web (limited in distribution to Tektronix employees world-wide), we can come closer to our goal of providing the data you need, in the form you want it, right on your electronic desktop.

And, the Web allows us to provide "one-stop shopping" for all users. Instead of a family of related but overlapping tools, careful Web page design can provide a cohesive information source, one that is explorable, discoverable, and even fun to use.

One advantage of the Web is that the hardware requirements are minimal. In some areas, use of the tools has been slowed by the need to acquire increased hardware. Oracle requirements for PC memory, for example, are relatively large. This isn't the case with Web browsers such as Mosaic or Netscape. Almost any PC, Macintosh, X terminal, or UNIX workstation can run a Web browser. The browser software is even free in the case of Mosaic.

Certainly publications such as Component News will appear very soon in Web form — starting with the very next issue. But the vision is far wider, and will fundamentally

change the way information is shared at Tektronix. For example, as we explore the medium to its fullest and partner with our preferred suppliers, we hope to capture part information from the Web and incorporate the data into our databases without human re-entry. We would add only the data that Tektronix needs to run its own business: for example, safety requirements or derated parameters based on our design experience. Publication of the data can be automated from the databases and presented in Web form without further human intervention. In this vision, there is no "specification" document as we now know it; the specification can be created automatically at view time from the database.

If you want a peek at our advance planning for the Web, or just want to talk about the possibilities of Web publishing, contact Dave Bartles or Brian Diehm. We are excited about this project, and we're anxious to hear good ideas from our user community!

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Allocations And Shortages Affect Discrete Power Semiconductors
By Jim Williamson and Curt Bernal

Transistors

The commodity category of discrete power semiconductors traditionally was one of the most stable of all semis from a supply standpoint. Stable and steady growth markets, good profit margins, and quality suppliers added up to a component family with few surprises. However, in recent years with the explosive growth of automotive applications, personal computers/peripherals and portable electronics, the appetite for power semis has grown dramatically in a relatively short time.

The supplier that has had the worst problems in keeping up with demand is Motorola. As with so many other product families, they have not done a good job of forecasting future demand for product. To be fair, however, for this product area of power devices Motorola hasn't been the only one to face this problem. All of the suppliers have struggled to keep pace with the growth. Since Tektronix has traditionally relied heavily on Motorola for discrete components (almost to the exclusion of all other suppliers), when Motorola experiences difficulty we get into serious trouble.

Not all of the process/package types are affected identically. The product areas of most concern are power MOSFETs and surface mount packages. Not coincidentally, these are the areas of highest growth. By far the worst availability score goes to power MOSFETs in TO-252/DPAK surface mount packages, In fact, *anything* in a DPAK is in serious trouble. This includes Schottky and ultrafast recovery rectifiers, bipolar power transistors and even thyristors. The DPAK suppliers are adding capacity as fast as they can, but it is going to be tight for the next 12–18 months.

One alternative is the through-hole TO-220 package. It is in somewhat short supply for isolated part numbers, but the overall capacity for

this mature package style is far higher. There are many more suppliers for TO-220s than there are for DPAKs. Also, part of the growth of the DPAK demand is from designs converting from lower power TO-220 product. This has freed some TO-220 capacity.

If you need surface mount power MOSFETs, another alternate is the SO8.150 "LittleFoot" product originally introduced by Siliconix. Electrically these would be fine to use. However, pay attention to the thermal requirements of the application. DPAKs have lower thermal resistance than the SO8s, but for lower dissipation applications they are more than adequate.

Table 3 shows both the TO-220 and the SO8 electrical equivalents of the Tektronix p/n DPAKs.

Rectifiers

The parts in Table 4 are surface mount power diodes that are in the midst of an extreme industry-wide allocation. There is nothing

inherently wrong with the design of these parts, rather they are extremely hard to procure during this allocation period. The current indications are this allocation will continue through most of 1996.

Please avoid using these devices in new designs that are scheduled to be introduced sometime during the next 6–12 months. By doing so, we should manufacture the products on schedule.

Again, the DPAK, the SMB, and the SMC case styles are great packages, but due to the allocation problems we are temporarily discouraging using them in new designs.

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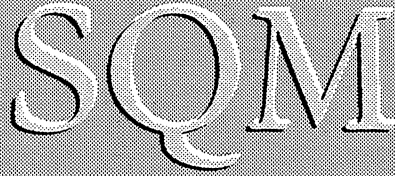
Table 3. Electrical Equivalents to the DPAK Package

DPAK		TO–220 Thru–hole Equivalent		SO8 SMT Equivalent	
Tek P/N	Motorola P/N	Tek P/N	Industry P/N	Tek P/N	Industry P/N
151–5038–01	MTD10N05E	151–1171–00	BUZ71A	151–5083–00	Si9945DY
151–5042–00	MJD117	151–0657–00	2N6041	None Yet	
151–5044–00	MJD32C	151–0482–00	TIP32C	None Yet	
151–5045–00	MTD5P06E	151–1128–00	IRF9520	No P/N	Si9407DY
151–5071–00	MTD2955E	151–1253–00	IRF9530	No P/N	Si9407DY
151–5081–00	MJD45H11	151–0625–00	D45H11	None Yet	

Table 4. Rectifier Case Styles on Allocation

Package Type	Tek P/N	Supplier P/N	Supplier
DPAK	152–5032–00	MURD320	Motorola
DPAK	152–5069–00	MBRD660CT	Motorola
SMB	152–5079–00	SMBJ15C	Gen. Instrument
SMB	152–5080–00	SMBJ40C	Gen. Instrument
SMB	152–5097–00	SMBJ6.5CA	Gen. Instrument
SMB	152–5107–00	P6SMB20A	Motorola
SMB	152–5109–00	1SMB5929B	Motorola
SMC	152–5084–00	MBRS340	Motorola

SQM

**News From
The Supplier Quality
Management Group**

SQM July Update
By Al Lavalle

Albaloy

Albaloy is a plating process that results in a solderable, corrosion resistant coating with extremely low surface resistance. It is so critical in some Tek applications that no other plating material has been found that will work. Tek has been using a unique formulation of Albaloy for many years. Recently the only qualified supplier running this plating process has decided that they weren't finding as much enjoyment with this process as they should — apparently they have lost a lot of money by scrapping out parts that failed to meet our requirements. So, they are pulling the plug on *all* Albaloy parts that Tek is currently using.

A new source has been identified and is being qualified now. They did Albaloy plating at one time in the past. At least one experienced person at the new source used to run the process here at Tek when we did our own plating. The current status of the project is:

❖ Agreement reached with new source to try Albaloy process again (wk 19).

❖ An issue over availability of Albaloy anodes resolved, anodes delivered to new source (wk 22).

❖ The new source has started up their Albaloy bath again for us (wk 24).

❖ First article samples of Albaloy plated parts from new source (critical components) delivered to Tek for evaluation (wk 25).

A transition plan in is process now, as well as a review of which part numbers we can drop from the list of parts that must have this special plating.

RCOMPM

RCOMPM is a new accounting ledger that has been set up in BBO.

It is used to track a portion of reject material that has in the past gone into a bin called "Supplier Caused" rejects — an assignment of questionable validity. Such material is often components that were designed by Tektronix. Or, it could be a situation where Tektronix instructs the manufacturer to make something in a particular way. The Tektronix-specific design could violate their normal design guidelines, therefore adversely affecting the yield.

The components are *some* of the Maxim and Maxtek parts that were designed and manufactured when we were all one company. A certain "fall out" was expected, but using these ASICs anyway is still very profitable. The new accounting ledger was created to more accurately account for the "fall outs" that are not truly "Supplier Caused" but more related to the original design.

Conductive Rubber Technology

On June 6, 1995, Supply Base Management presented Conductive Rubber Technology with a preferred supplier award. CRT — a confusing acronym for our industry — makes the rubber buttons found on front panels of many types of instruments and machinery.

Communication

Better communication with our suppliers during the NPI process might avoid future manufacturing problems. A recent example concerns periodic shutdowns in BBO caused by the diameter of a hole at the bottom of a countersink well in a metal chassis. Certain dimensions are so-called "critical dimensions," and the supplier should not have assumed which dimensions were critical based on industry practice.

While they should have built the part to our specification, our shutdowns could have been avoided if we had been clear about the application to our supplier, and showed them exactly how the material was intended to be used *before* production pieces were built.

For questions, comments or further discussion on this article please contact:

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Component News And Technology

The editor and the Component & Supplier Information group have tried to assure accuracy in the published material. We are not responsible for any errors or consequences of any errors in this publication. If you do find an error or an omission please contact the editor at the address listed below.

Component News And Technology is published six times a year by the Component & Supplier Information Group. It is free to all Tektronix Inc. employees. You are invited to submit your articles about component issues. If you feel you have information that could be helpful, how about writing about it? This publication is available for you to communicate design problems/solutions, component alerts, new product information, and application notes.

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Component Engineering Commodity Support List

The liaison support activities for the Component Engineers have been adjusted to conform with the business and project plans of the individual IBDs for FY95. The significant change will be the use of teams of 2 Component Engineers to cover each IBD.

We intend to provide an additional Component Engineer to communicate to and from the IBDs, to better serve our customers requirements and provide faster response. Each of the component engineers are prepared to coordinate the appropriate resources to answer your questions.

Some examples of the specific type of activities that the Component Engineers offers assistance are:

IBD Liaison Activities

❖ Participation with Engineering Project Teams

❖ Bill of Material Reviews

❖ Part and vendor reduction projects

Commodity Coverage Activities

❖ Generation and maintenance of Preferred Part Lists

❖ Coordination of component strategies

❖ Review of new technologies

❖ Coordination of part evaluations

❖ Assistance with part selection

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Preferred Suppliers And Preferred Supplier Candidates
By Peggy Lewis

This is the most current list of Preferred Suppliers and Preferred Supplier Candidates from Supply Base Management. Shown in the list along with the supplier name is a code indicating the current status of the supplier and the Supply Base Manager's name for each commodity.

Legend:

SBM   *Supply Base Manager*
C   *Candidate*
P   *Preferred*

Plastics:

SBM   **Harry Anderton**
C   Kaso Plastics Inc.
C   Polycast Inc.
C   Quality Plastics Co., Inc
C   Triquest Precision Plastic
C   Vision

Sheet Metal:

SBM   **Harry Anderton**
P   Accra-Fab
P   Delta Eng & Mfg
P   Neilson Mfg
P   Triax Metal Products
C   Dimensional Fabricators
C   Grass Valley Group
C   Gerome Mfg Inc.

Machined Parts:

SBM   **Harry Anderton**
P   EMI Precision, Inc.
C   Beaverton Parts, Inc.
C   Lite Specialty Mfg
C   Davis Tool Inc.

Screw Machine Parts:

SBM   **Harry Anderton**
C   Revtek, Inc.
C   Universal Precision, Inc.

Die Cast Parts:

SBM   **Harry Anderton**
C   TVT Die Casting
C   SKS Die Casting

Fourslide Parts:

SBM   **Harry Anderton**
P   Northwest Fourslide

Rotary Controls:

SBM   **Harry Anderton**
C   Bourns

Power Conversion Products:

SBM   **John Shoberg**
C   Ault
C   Coilcraft/Deyoung
C   Computer Products
C   Delta
C   TDK
C   Zman
C   Zytec

Elastomeric Keypads:

SBM   **Harry Anderton**
P   CRT

Packaging:

SBM   **Harry Anderton**
C   Packaging Resources

Printed Materials:

SBM   **Bill Florine**
C   Xerox

Optical Components:

SBM   **Larry Hiatt**

Optical Connectors:

SBM   **Larry Hiatt**
C   Rifocs

Optical Component Packaging:

SBM   **Larry Hiatt**
C   Photonic Packaging Co.

Discrete Lasers:

SBM   **Larry Hiatt**
C   NEC
C   OKI

Discrete Detectors:

SBM   **Larry Hiatt**
C   NEC
C   Photonic Packaging

Optical Modules:
(Transmitters & Receivers)

SBM   **Larry Hiatt**
C   AT&T
C   OKI

WDMs/Couplers:

SBM *Larry Hiatt*
C   AOFR (ADC)
C   Gould

Optical Fiber:

SBM *Larry Hiatt*
C   Corning

Memory Components:

SBM *Peggy Lewis*

DRAMs/VRAMS:

SBM *Peggy Lewis*
P   Toshiba
C   NEC
C   Samsung
C   T.I. (VRAMs only)

EPROMs/FLASH:

SBM *Peggy Lewis*
C   AMD
C   Cypress (PROMs only)
C   Intel
C   Xicor (EEPROM only)

SRAMs:

SBM *Peggy Lewis*
P   Dallas Semi (BB SRAMs)
P   Toshiba
C   Cypress
C   NEC
C   Samsung
C   T.I. (FIFOs only)

MROMs:

SBM *Peggy Lewis*
C   Samsung
C   Toshiba

ASICs:

SBM *Paul ten Zeldam*
C   Maxim
C   National
C   NEC
C   US2

Connectors:

SBM *Bill Florine*
(Complete connectors table on next page)

Connector Supplier Matrix

	Board to Board									Sockets							I/O				Power				
	Headers	Receptacles	<0.050	Backplane	Edgecard	Stacking	Elastomer	Screw Machine Type	Hi Rel Contact	Screw Machine	Stamped	ZIF	SIMM	PCMCIA	Lamp Sockets	CRT Sockets	Trapazoidal	Circular	Jacks & Plugs	Audio, Circular	IEC Conn Modls	Terminal Blocks	.156 Center Conn.	Other Rectnglr Disc	Circular
3M Company	1	1		L		X					L	X	L				L						X		
A/D Electronics																			2	X					2
AMP	2	2	2	1	1	1	1	1	1	1	1	1	1	1			1	1					2	1	
Berg Electronics	3	3		2	X						L		L	X										L	
ETI							2																		
Feller-Neumeyer																					2				
Fox Conn	X															2	X								
JST (Japan Solderless)	X		3	L												3	2								
McKenzie Tech	L							2		2	L														
Molex Products	X		1	L	L						X		1	L			L	X					1	2	
Mueller																			1						
Neutrik																			X	X	1				
Phoenix Co.																						1			
Samtec	3				L	L	3	3		X	L														
Schurter																						1			
Singatron																			X	1	X				1
SMK																1									
Triquest																1									
Viking Electronics	L		L	2							L							X							
Virginia Panel		3																							

Legend: 1, 2, or 3 = Preferred Supplier Candidates and their relative ranking for potential new business.
X = Fully capable in this technology   L = Limited capability in this technology

For questions, comments or more information, please contact:

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Supply Base Management
627-2302, M/S 78-507
peggyle@banyan.bv.tek.com

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