component news

Feb. 5, 1980 COMPANY CONFIDENTIAL Issue 278

Poor Man's Disk Operating System

Microprocessor evaluation boards offered by microprocessor manufacturers allow for the creation and evaluation of programs as an aid to learning the language and evaluating the microprocessor. But, one soon recognizes the need for mass storage.

To avoid the expense of buying a disk system designed exclusively for the processor in question, or writing a disk operating system software in a new and unfamiliar language, CE developed a relatively inexpensive system that is readily adaptable for use with most microprocessor evaluation boards.

While the system was designed to aid in microprocessor evaluation, many other people have asked about it for other applications. This article will attempt to answer most of those questions. Therefore, it can be used to support this and other applications.

General description

The system uses a 6800-based "board bucket" with ROM, RAM, CPU, I/O boards and an added disk controller board. The "bucket" can interface to a terminal, to CYBER, to up to four floppy disks and, in our case, to a microprocessor evaluation board (we are presently using the Intel 8086 board, see Figure 1).

A list of hardware and firmware with procurement information is included at the end of this article.

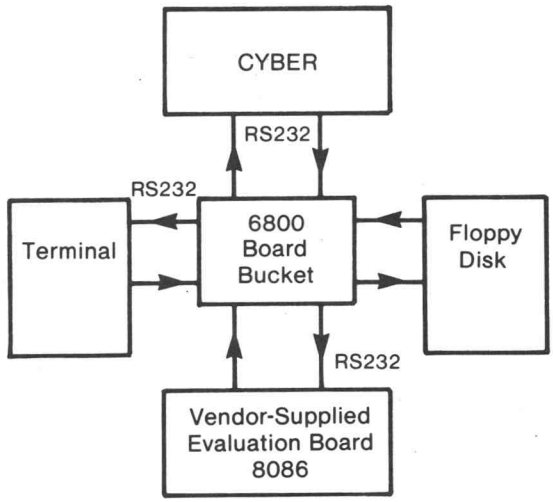


Figure 1

Hardware

The disk controller board is bus compatible, with the "bucket" and software compatible with the software from Technical Systems Consultants called FLEX 2. The system memory map is shown in Figure 2 (page 2). The ROM called DISCIO at address EØØØ is there to supply DDT compatible I/O routines.

continued on page 2

Also in this issue

continued from page 1

Each of the four possible Sugart SA400 5-inch drives requires 1.5A at 12V and 0.5A at 5V. They should be mounted in a suitable, fan-cooled box.

The disk controller requires that the 6800 CPU and RAM run at 1 MHz. Many existing CPU boards run at 650 KHz so they must be changed along with any RAM that won't work at 1 MHz.

Software

The FLEX 2 software contains a disk operating system (DOS), 6800 assembler, editor and operating utilities. Note that the software is sold with a "one end user" clause. This means that each new system must purchase a copy at about $75. It is **illegal** to copy it and the price is very, very reasonable. Other software is available, including BASIC.

The ROM DISCIO located at EØØØ was originally a small monitor which has been extensively revised to handle the DDT I/O routines. Only a small part of the 1K bytes is used in this system. The rest can be used to do things like load a Motorola formatted cassette tape. In normal operation DISCIO is transparent to the system user. The disk boot has been modified and placed in DDT. The letter Z has been reserved in DDT to boot the disk.

Application

The application for which this system was developed depends on CYBER for assembler support for all MPUs except the 6800. The source file is created in SCRIBE and run through the appropriate assembler. The binary file is then down-loaded into the 6800 memory at phone speeds of 300-1200 baud. The binary file is then saved onto the 6800 disk system. The file can then be transferred at 9600 baud to the evaluation board. The program is then tested and any changes made. The program can then be up-loaded to the 6800 and again saved.

To support a new evaluation board the only change needed is the up- and down-load programs in the 6800. Local mass storage allows many things to be done which were not possible, or were very slow before.

For more information

If you'd like more details about this disk operating system, please contact **Wilton Hart (58-125), ext. 7607.**

continued on page 3

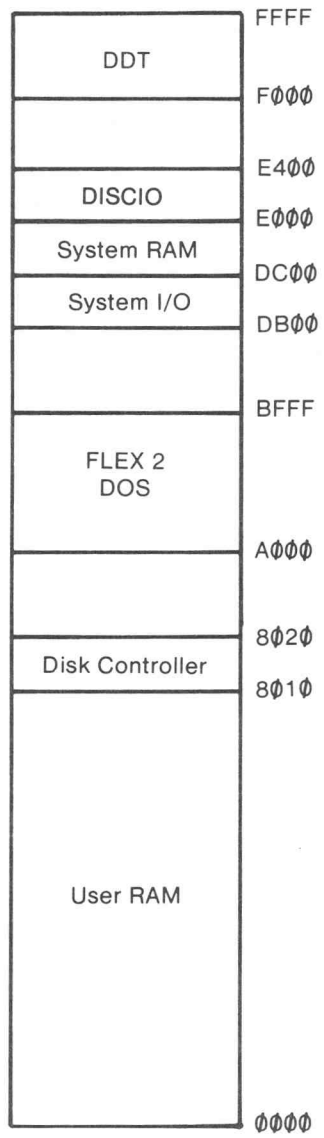


Figure 2

continued from page 2

List of Sources

Hardware

Sugart SA400 Disk Drive	Special order through Ron Brown in Wilsonville (60-757). Approx. $175 each.
Disk Controller Card	Board is purchased from Scientific Computer Center. Contact Dixie Ensinger (92-134, ext. 1925 Walker Road).
1771 Controller IC	Special order from Western Digital. Order from George Roussos (58-274, ext. 7927).
36-Conductor Cable	Stock
34-Conductor Cable Ends	Stock
DM8835	Special order from National Semiconductor.

Software

DDTV38	CYBER under ABØØMIC
DISCIO	CYBER under ABØØMIC
FLEX 2	Technical Systems Consultants Box 2574, W. Lafayette, IN 47906
BASIC	Same as above
Blank diskettes	Verbatim 5¼" diskettes, 1147 soft sector. Order from: Hobby World, 19355 Business Ctr., Dr. 687, North Ridge, CA 91324 Phone (800)423-5387. Local source: Byte Shop; Computer Land

Allen-Bradley resistor crunch

There will be a reduction in the use of Allen Bradley hot-molded carbon composition resistors, either by design or default. Our contract made during the 1979 calendar year cannot be adjusted to our 1980 needs. A-B's sales demands have increased by 40% during 1979, using all of their capacity. Our demand increased by about 16%, but the leadtimes have stretched beyond our need time. A-B has indicated that leadtimes will increase from the average 13 weeks to greater than 20 weeks.

Tek's coil manufacturing area will be maintained by A-B parts or an alternate molded resistor. Other areas using the A-B sole-sourced resistors will have to make adjustments to some other style of resistor.

Any current instrument modification should consider changing A-B resistors to another style.

Also, any new design should use other style parts. The three main part groups affected are the 317-series, 307-series and the 315-series parts with special suffixes. However, all the carbon composition resistors will have shortages.

Following is a list of the Tek part-numbered series which use these A-B resistors, plus a list of alternate sources. If you have any other questions about this supply situation, please contact **Ray Powell (58-299), ext. 6520.**

Tek part number series using A-B resistors

317-xxxx-xx	1/8 watt	5%
301-	1/2 watt	5%
302-	1/2 watt	10%
303-	1 watt	5%
304-	1 watt	10%
305-	2 watt	5%
306-	2 watt	10%
307-		Misc. sizes under 10Ω
315-	1/4 watt	5% w/special suffixes
316-	1/4 watt	10% w/special suffixes

Alternates

301- & 302-	Carbon: Rohm Mepco/ Electra Stackpole & Airco/ Speer Tin Oxide: Corning Glass
303- & 304-	Carbon: Rohm & Stackpole Metal & Tin Oxide: TRW-IRC, Dale & Corning Glass
305- & 306-	Metal & Tin Oxide: TRW-IRC & Corning Glass. Carbon: Stackpole, Dale and TRW-IRC have a 1 and 2 watt wirewound.
307- misc.	Carbon film resistors are available for most sizes.
317-	Carbon: Rohm, Airco/Speer, Mepco/Electra & Stackpole Tin Oxide: Corning Glass

Cost comparison

	A-B cost	Alternate cost (est.)
301-xxxx-xx	3.5¢	1.0¢
302-	2.0¢	1.0¢
303-	6.2¢	3.0¢
304-	3.5¢	3.0¢
305-	10.0¢	9.0¢
306-	5.8¢	6.0¢
315-	3.0¢	0.8¢
316-	2.0¢	0.8¢
317-	10.0¢	3.5¢
321 Series rated 1/4W at 70°C, ±1%		2.5¢
322 Series rated 1/2W at 70°C, ±1%		2.5¢

There is also a general purpose metal film resistor available from Mepco/Electra, Dale Electronics and TRW-IRC. It is either metal film or metal glaze in 2% value and the price is about 2.0¢. This is equal to or less than a 10% A-B part.

The plan is to buy alternates for all the xxx-xxxx-00 carbon part numbers. The special part numbers for A-B will be supported as much as possible, but Stackpole parts will be used.

Choosing and applying conductive elastomers

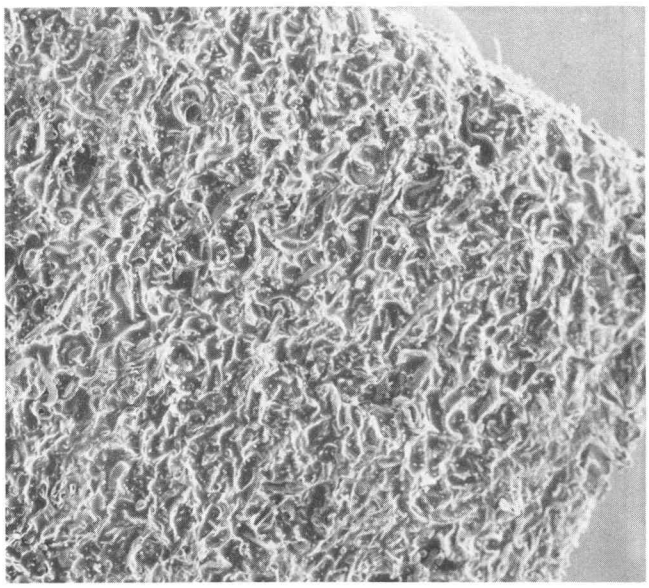
Conductive elastomers are plastic materials containing metallic additives or carbon particles. These materials have low surface resistance and very high volumetric conductance — hence eliminating or neutralizing sources of electrostatic potential in work areas. In addition, their resiliency and electrical resistance allows uniform distribution of charges without creating transients.

Plastics made conductive are of two types: those which are bulk conductive and those which are surface conductive only. Surface conductive plastics are generally referred to as "hygroscopic" materials. Hygroscopic means water-loving, and materials of this type derive their conductivity from the moisture present in the atmosphere. This absorbed moisture forms a wet layer on the substrate surface wherein current passes. This surface conductance can also be produced by coating the plastic with metallic substances.

Bulk conductivity, on the other hand, is solely dependent on the physical characteristics of the filled elastomer. "Elastomer" refers to all high polymers having the property of extensive elastic recovery (e.g., vulcanized rubber and synthetic rubber-like polymers). Materials with resistivities of 1 to 5000 Ω-cm range generally use carbon as a filler. Carbon filled elastomers are unusually strong and can easily be molded into different shapes. It is one of the less expensive conductive fillers. Metallic particles are more conductive and usually have a resistivity of no more than 10^5 Ω/sq.

Commonly used metal fillers are silver, nickel, aluminum, tin, zinc and copper. Some use tin-plated, copper clad steel; others prefer "Monel" (an alloy of nickel and copper), silver-plated brass and/or conductive oxides. The fact is, almost any metal or alloy can be used.

The use of the filler depends on the required resistance, temperature range, environmental conditions, galvanic compatibility with the mating surface and the resulting physical, electrical, or mechanical properties required of the filled elastomer.



Convoluted Sn/Cu/Fe wires in neoprene rubber. Percentage by weight: steel, 57%; copper, 40%; tin, 3%. (24X magnification)

A high polymer (or synthetic resin) with good elastic properties, high electrical conductivity, low moisture absorption, wide temperature range capabilities and high impact and tensile strength is the ideal choice for a material matrix. Among the preferred elastomers, synthetic rubber takes the lead. Not only is it cost-effective, this high polymer has a unique capability to take deformation (elongation and yield under stress), resilient, yet with allowance for easy removal and replacement of electronic parts.

There are three commonly used types of synthetic rubber — silicone, neoprene and Buna N. Conductive carriers in the form of films are usually polyethylene, polycarbonate, polyester, polyvinylchloride, polyvinylfluoride or polyimide.

Keep in mind the following recommendations for choosing and applying conductive elastomers:

1. Conductive materials are chargeable but charges are almost instantaneously bled off to ground. However, for personnel safety, when handling highly conductive materials and parts, a 1- or 2-megohm resistor and an antistatic wrist strap should be worn.

continued on page 6

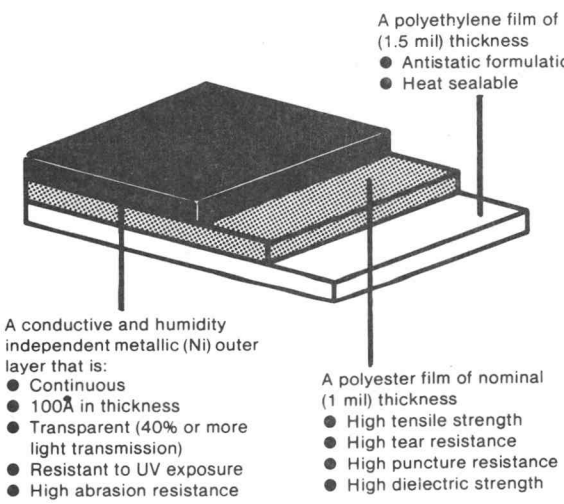
2. Incorporation of the conductive fillers should be done in the monomer mix prior to extrusion and/or molding.

3. Degassing techniques of the plastic materials (e.g., ionic bombardment, exposing to vacuum chambers, or subjection to sufficiently high temperatures and/or pressures), are usually carried out prior to metallizing or addition of metallic coatings because contamination may occur as the volatile constituents evolve.

   Note: Polyimides and silicone normally outgas small amounts of volatile materials and absorbed gases, representing less than 1% of the elastomer by weight. On the other hand, while polyvinylfluoride, fluorosilicone, and the other fluoroplastics exhibit superior resistance to environmental conditions, organic solvents, oil, stains and ozone, these compounds give off toxic fumes when heated.

4. Operating temperature range for a given elastomer should not be exceeded in either direction. At low temperature, they become brittle and may crumble under pressure; at high temperature they soften and sometimes foam, outgas or char. In the absence of temperature extremes, outgassing is a slow process of degradation by oxidation.

5. For best results, the type of filler to be chosen should meet the required parameters for which the material is intended for use.



3M's Conductive Film — Type 2100

Materials Comparison

Material	*Volume Resistivity ($1\ cm^3 = 77°\ F$)*
Carbon	1 → 5000 Ω-cm
Aluminum	2.7×10^6Ω-cm
Gold	2.2×10^6Ω-cm
Iron	9.7×10^6Ω-cm
Nickel	6.8×10^6Ω-cm
Silver	1.6×10^6Ω-cm
Magnesium	4.5×10^6Ω-cm
Copper	1.72×10^6Ω-cm
33% Sn / 67% Pb	16.0×10^6Ω-cm
70% Ag filled epoxy	0.0015Ω-cm (max) as per ASTM-257

Material	*Temperature Range (°C)*
1. Silicone —	
Sponge	−62° to 204°
Solid	−57° to 260°
2. Neoprene —	
Sponge	−34° to 65°
Solid	−43° to 104°
3. Buna-N (Nitrile rubber) —	
Sponge	−51° to 71°
Solid	−51° to 104°

The following table compares the physical properties and availability of most of the conductive elastomers used at Tek. If you have any questions, or for more information, contact **Bella Geotina (58-299), ext. 5953.**

continued on page 7

Conductive Elastomer Selection Guide

Material Description	Properties/Features	Usage/Availability	Least no. of sources
A. Conductive Elastomers (Bulk)			
1. Carbon-Silicone Elastomer	Silicone rubber with uniformly dispersed non-metallic conductive particles. Semi-conductive, resistivity is 7 to 10 ohm-cm (or up to 10^5 ohm-cm, depending on customer specifications.	Material comes in various extruded shapes and molded parts-strips, sheets, tubings, stamped parts, etc. Usage includes belts, rolls, gaskets, tubings, others.	3
2. Carbon-Polyester	Volume-conductive material has an electrical conductance of 50,000 ohms (max). Humidity independent, it has high abrasion resistance, low affinity for water and good resistance to most acids and alkalies.	Available as a bulk material in films, sheets, blocks, rods, tubings. Used to make molds, or fabricated into special shapes.	2
3. Silver Silicone & Silver fluorosilicone Elastomers	Silver combined with silicone gives an unusually high RF attenuation with remarkable moisture and pressure seal. When application involves contact with hydraulic fluids, ozone, oils and chemical solvents, silver fluorosilicone is recommended. Resistivity range for various related grades is 0.003 to 0.018 ohm-cm.	Uses: Gaskets, seals, sensing devices, static charge components, etc. Available in many shapes and stamped parts. Also custom cut to specifications. Sheets and strips with or without pressure-sensitive adhesive backing.	5
4. Aluminum with Neoprene or Silicone	Elastomer is of woven aluminum wire cloth impregnated with neoprene or silicone fluid sealing material.	Available in thin sheets from which intricate shapes may be cut.	2
5. Nickel-Silicone Elastomer	Silicone rubber with a uniform dispersion of randomly oriented nickel fibers. Operating temp: −54° to 232°C. Volume resistivity = 0.45 ohm-cm. It has an exceptional sealing property, corrosion resistance and is compatible with most metals and alloys.	Available in sheets, die-cut or stamped parts and shapes — in black or metallic gray colors. Uses: Gaskets, contacting elements, conductive belts, static-charge components, and others.	
6. Monel or Aluminum with Silicone	Similar to (3) or (4) in materials, but this elastomer is formed by critically expanding a fine metal foil and impregnating the expanded sheet with Silicone to seal.	For EMI/EMP gasketing grounding, bonding, and static discharge. Available in standard sheet sizes or larger in thin thicknesses.	3
7. Conductive Felt Metal with Silicone	Elastomer is a sintered fiber metal felt produced in sheet form. Metal used is stainless steel (may also be phosphorous bronze or mild steel). Neoprene or butyl rubber may also be used for fillers. Material is recommended for low flange temp. range.	Used as conductive gaskets, ground vibration isolators, static dissipators, etc.	3

continued on page 8

Material Description	Properties/Features	Usage/Availability	Least no. of sources
B. Particle-Filled Products			
1. Connector Buttons/ Frames	Conductive button connector can be molded in frames or rail or used individually. The resilient buttons are carbon or silver-filled silicone and this is molded in a dielectric carrier which may be glass-filled nylon or polyimide film.	Buttons are connectors for LCDs to PCBs, test and burn-in fixtures, etc. Molded in strips, connector buttons are used for interconnecting PCBs, flat cables, grounding devices, shock mounts, etc.	4
2. Switch Contacts	Material is of silicone rubber filled with carbon or silver particles. Carbon-filled contacts have a resistance of <300 ohms-cm while the silver-filled ones give <0.30 ohms-cm resistance.	Material comes molded or extruded and sliced to any length. Standard sizes and shapes available but can be ordered to meet specifications.	
3. Seal/Shield Strips	Commonly used are closed cell sponge, solid neoprene or silicone. Metals employed are Monel and Sn/Cu/Fe. Aluminum and silver plated brass are occasionally used.	Standard strips are available in 25-ft. rolls but specific lengths with square and miter cut ends can be ordered. Thickness must be specified when ordering.	4
4. Tapes/Closures	Aluminum metal foil and metal-filled acrylate (with silicone release coated paper liner) transfer tapes are available. The conductive closure comes in two parts: One, the silver-impregnated nylon tape is covered with finely woven metal filaments formed into permanent hooks; the other covered with soft loops (pile). When pressed together, the two tapes provide a tight EMI/RFI seam. Either hook or pile may be used alone as a conductive resilient gasket.	Uses include: Closure tapes for mating joints, hinge covers, gaskets and in printers, copiers and computers.	3
5. Conductive Foam	Low density types: Antistatic Kincel, Aircap, Astro-Suprabubble and Pink Poly Foam. (Normal Density is 1 lb./ft^3.) Meets ASTM D-257-66 STDS for surface resistivity. Hard density types: Carbon impregnated polyurethane or molded expanded polystyrene. (Nominal density is up to 2.5 lb./ft^3.) Meets MIL-P-26514.	Available in custom shaped, flat, die-cut or standard sheets. Light-density foams are available in rolls. Low-density foams are used for cushioning and packaging voltage sensitive devices or made into bags and pouches. High-density types are used for safe transport of MOS integrated circuits and other pinned devices.	6

continued on page 9

Material Description	Properties/Features	Usage/Availability	Least no. of sources
C. Surface-Coated Materials			
1. Conductive Films	A popular type is Pink Poly. Conductivity is brought about by a hygroscopic type of filler incorporated into a polyethylene matrix. Another type which comes opaque or transparent is a laminated polyester-polyethylene material with coating of nickel fibers on the film's surface.	Available thicknesses are 3 to 6 mils. Used for wrappings, liners, table top covers, anti-static bags, etc.	5
2. Optical Windows	Optical panel materials commonly used are glass, acrylic, polycarbonate and fluorocarbon plastics. The conductive transparent coating (may be graphite) is incorporated into the substrate's surface. Other materials available are Abcite , Mylar and Homalite. Note: The peripheries of these windows are terminated with a border of highly conductive, pure silver coated material. Use of conductive gasket is ideal for EMI/RFI shielding effectiveness.	Windows are for optical displays and shielding. Polarized filter laminates are available as well as those with frosted and/or transparent finishes. Grids calibration rulings, characters and markings can be custom ordered.	3
D. Conductive Compounds			
1. Adhesive Sealants/ Epoxies	Pure silver-loaded RTV liquid silicone rubber adhesive-sealant has a volume resistivity of 0.01 ohms-cm. It is fast drying and forms a firm, flexible resilient bond. (Some RTV adhesives use nickel carbon, aluminum, bronze, sponge iron and even gold fillers.) For high-temperature resistance with stronger and longer aging bond than the rubber adhesives (can be formulated to withstand UV rays too) the acrylate and polyurethane adhesives are good to use.	Used for bonding, joining and repairing parts and joints, conductive seam sealant, etc. Some come as a two-component epoxy or as a regular one-component adhesive sealant in a dispenser tube.	5
2. Conductive Grease	Usually silver silicone grease with no carbon or graphite fillers. Operating temperatures: −54° to 232°C, inert to ozone, radiation and most chemical compounds, and have excellent resistance to moisture and humidity.	Used to reduce friction resistance and noise. It can be applied by wiping or brushing.	3
3. Cement Caulking Systems	Copper and carbon free, it is usually made of a conductive plastic-polypropylene, polyurethane, and polyvinylacetate, or silicone in silver resin.	Caulking systems come with putty-like consistency and are readily applied with a caulking gun, spatula or syringe. Cements are similar to caulking systems except that they come in thicker paste form. Applications: Used in ferrite and pot cores, repair of PCBs, gaskets and shields, cables, tubings, others.	4

continued on page 10

Material Description	Properties/Features	Usage/Availability	Least no. of sources
E. Conductive Textiles			
	Different types of materials are available: One is of a highly conductive silver metallized knit or woven nylon fabric. Laminated kinds are also available for special applications. Included in this type of fabric is a 0.50 mil pressure-sensitive polyester fiber which comes with a 0.001 mil clean nylon; a black conductive polyethylene; a pink antistatic nylon fabric; and a blend of 65% polyester, 34% cotton and 1% stainless steel fiber. For performance when exposed to environmental conditions, vinyl coated fabrics are also available. Note: These fabrics have a surface resistance of <10 ohms-cm; have a tensile strength of up to 125 psi, tear strength of 3.5 to 8 psi and withstand temperatures of −40° to 120°C.	The silver-metallized nylon comes in standard widths and thickness, and in white or silver gray colors only. Other types come in different solid colors. These materials are laundered the same as ordinary clothing. Uses: Aprons, lab coats, protective suits for high-voltage linement, shielding curtains, body contacts and electromedical sensors, etc.	5

TECHNICAL STANDARDS

IPC Technical Review. This publication is received regularly by Technical Standards and may be borrowed by contacting Town Center ext. 241. The Review consistently contains articles of interest to circuit board designers. For instance, an article in the December issue described "Control of Dimensional Stability in Multilayer Boards."

The Product Design Standard *Modular Package System, 062-3619-00,* is now available from Technical Standards (Town Center extension 241, delivery station 41-260). This standard provides general descriptions and design parameters that should be kept in mind during the design of the mechanical package for a new product.

This standard applies to all design groups at Tektronix.

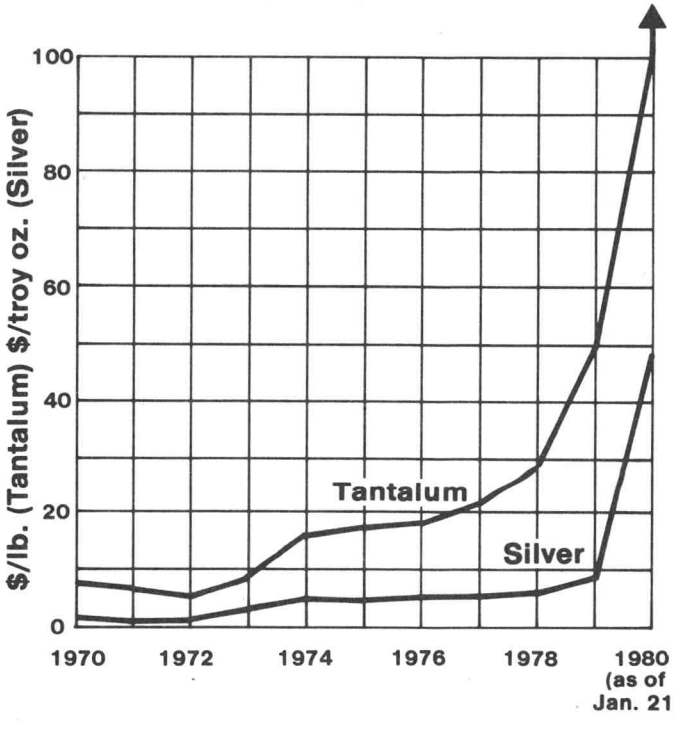
Carol Kooistra-Jones, Technical Standards
Gary Hamrick, Corporate New Product Introduction
Marlow Butler, Advanced Electro-Mechanical Design
Howard Meehan, Corporate Industrial Design

Skyrocketing prices for tantalum caps

Tantalum prices continue to rise very quickly, and the cost of a dipped tantalum capacitor now ranges from $0.18 for a small part (1μF, 50V) to ~$2.50 for a large part (100μF, 20V).

Tantalum ore prices have currently stabilized at about $100/lb., but the price of the processed tantalum powder is rapidly rising and has gone from ~$100/lb. to $200/lb. during 1979. Very recent information indicates that powder prices will rise another 30% (to $260/lb.) by October of 1980, and this will cause corresponding increases in capacitor prices. We are having problems getting enough tantalum capacitors because the manufacturers are currently allocating parts and lead times have lengthened and are now between 20 and 30 weeks.

A new Tektronix standard pricing list was released in November, 1979, to replace the March 1979 list. In this nine month interval, the price of small parts increased by 50%, and large parts by 100%. We expect more price increases in the next three months, meaning the price of a large dipped tantalum will exceed $3 by the middle of 1980. The largest axial lead hermetically sealed caps are now over $4 and will approach $5 by mid-1980.



The table below shows price increases for several tantalum cap styles. Brand X prices are what one of our largest tantalum capacitor suppliers will be charging us in March 1980. Prices from other suppliers *may* be lower.

Part	Price		
	May 79	Jun 79	Brand X Mar 80
1μF, 50V, dipped; case C	$0.15	$0.19	$0.20
6.8μF, 35V; dipped, case D	0.15	0.21	0.30
100μF, 10V, dipped, case E	0.37	0.66	1.20
47μF, 25V; dipped, case E	0.60	1.19	2.45
100μF, 20V; dipped, case F	0.83	1.19	2.45
100μF, 20V; low ESR, axial lead	1.03	1.31	4.10

Case sizes for dipped parts:
C 0.26" dia. x 0.36H
D 0.34" dia. x 0.40H
E 0.40" dia. x 0.56H
F 0.44" dia. x 0.68H

We are having serious price or availability problems with the following parts:

290-0299-00
290-0299-01
290-0425-00
290-0426-00
290-0539-00

Tantalum wet slug capacitor prices are now $1.75 to $15.00* each, and still rising due to silver and tantalum price increases. In the last half of 1979, Tektronix paid out more than *$600,000* in tantalum cap price *increases.*

We are now buying more than six million tantalum capacitors at an average price of about $0.40 each. With a realistic goal of replacing one-third of the tantalum capacitors with aluminum capacitors, we will save more than $700,000 in 1980.

continued on page 12

*Note: In mid-January these parts ranged from $1.25 to $8.00 each.

continued from page 11

In view of the current price and availability problems, we strongly recommend replacing tantalum caps with other types wherever possible, and that they not be designed into new applications unless their special characteristics are required.

Small tantalum capacitors (under 1 μF) can be replaced by plastic film or ceramic caps. In most applications, large tantalum caps can be replaced by radial lead aluminum electrolytic caps that will cost $0.05 to $0.20 each. See **Component News 273** for more information on alternatives to tantalum.

If you have any other questions, please contact **Don Anderson (58-299), ext. 5415, or Harry Tanielian (19-194), ext. 6405.**

To Users of 1K Static RAMs: Warning!

Analysis of vendors (for the following components), has indicated that these parts are obsolete and may soon be unavailable.

The parts are:

Tek P/N	Vendor P/N
156-0695-00	2606
156-0698-00	2101
156-1051-00	2101
156-1052-00	2101
156-1188-00	2111
156-0298-00	21H01
156-0291-00	2102
156-0893-00	2102

The following design and redesign alternatives are recommended:

Tek P/N	Vendor P/N
156-1278-00	2115A
156-1461-00	2114AL-4

For further information, refer to the SRAM Memory Selection Guide (page 15), or contact **Peter Reitmajer (58-121), ext. 4663.**

Keyboard redefinition

Completely programmable keyboards have many uses. We have developed a program for converting the Tektronix 4025 terminal keyboard to ASK (American Simplified Keyboard, Smith-Corona's version of Dvorak). It converts in 15 seconds, and converts back in one second. There was a minor problem getting a good equivalent of the TTY lock, but that problem has been solved.

We will be glad to help others who may want to convert to left-handed or right-handed Dvorak (the ideal keyboards for one-handed typists), or to the older form of Dvorak.

For more information on Dvorak keyboards, contact **Joe Gamble (58-299), ext. 5194.** For information on Malter and standard keyboards, contact **Halsey Royden (58-299), ext. 7711.**

Zinc plated connector shells

Due to EMI and ESD protection requirements, many metal connector shells are being used for the ground path or ground connection. Unfortunately, many manufacturers are now using zinc plating on the shells as a protective coating to avoid environmental toxicity problems associated with cadmium plating.

Zinc connector shells corrode easily in humid environments and make poor contact when used as ground paths. Cadmium or bright nickel alloy platings are recommended as finishes for connector shells that are to provide good ground connections.

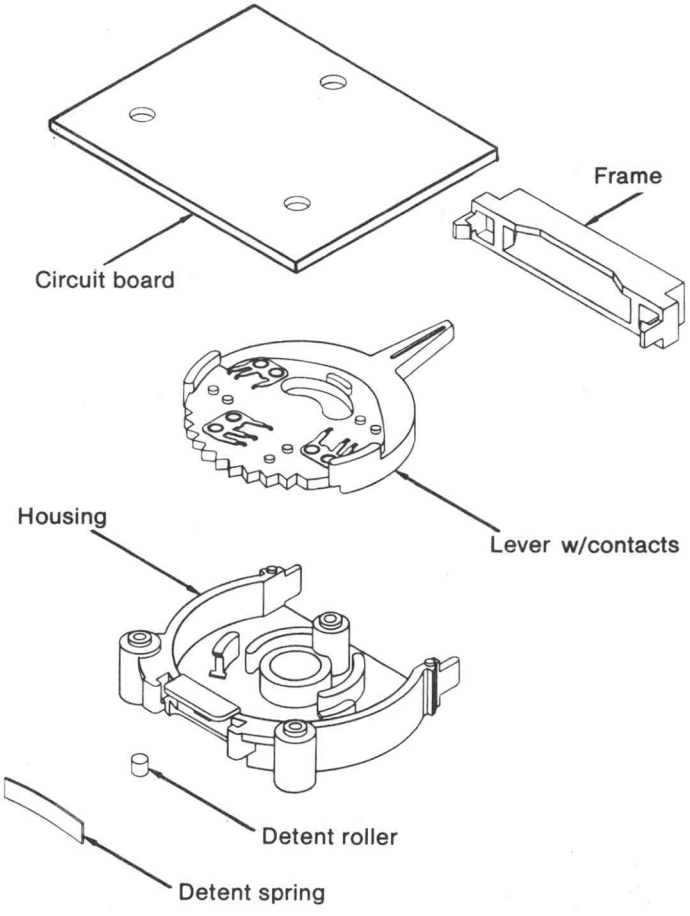
Peter Butler
58-299, ext. 5417

New 4K x 1 CMOS SRAM

Hitachi is now in full production of its 6147 static RAM. It has identical performance to Intel's 2147 at much lower power. Any engineer interested in this part should initiate a PPIF. Motorola is scheduled as a second source. Contact **Peter Reitmajer (ext. 4663)** for more information.

New Tektronix lever switch

A new, 10-position lever switch (Tek part number 263-0074-00) is presently being tooled for use in the DC503A Digital Counter. The switch utilizes existing components for the contacts, detent spring and detent roller. A snap-on frame, or bezel, projects through the front panel of the instrument for appearance and proper positioning (see drawing).



Jeanne Judah, illustrator

Cost of the switch is approximately $1.20, plus circuit board gold plating expense.

The design and tooling of the switch permit some options for future applications. These include:

1. Extending driver shafts in either direction (or both directions) from the center of the lever disk. Plastic contact holders slide onto the driver shaft for additional switching on parallel circuit boards, or on the opposite side of the main board.

2. Addition of a torsion spring to provide momentary operation at either or both end positions.

3. Changes in the number of switch positions.

If you need additional information, please contact **George Pratt, Switch Design (58-021), ext. 5531.**

8291 GPIB Chip Enhanced

The Intel GPIB Talker/Listener is in the final stages of redesign. The 8291A is expected about the second quarter of 1980. Significant changes have been made to the device to upgrade its performance and usability.

Areas where changes have been made include the Source Handshake and its interaction with the microprocessor, the method of handling Device Clear and Group Execute Trigger commands, and the transfer of Serial Poll status bytes. These and other changes have turned this device into a very desirable choice for Talker/Listener instruments.

The 8291A will not be software compatible with the 8291 in the area of Status Byte Transfer.

For a complete description of the changes anticipated for the 8291A, contact **Jim Howe (58-125), ext. 6303.**

COMPONENT CHECKLIST

The "Component Checklist" is intended to draw attention to problems or changes that affect circuit design. This listing includes: catalog and spec changes or discrepancies; availability and price changes; production problems; design recommendations; and notification of when and how problems were solved. For those problems of a continuing nature, periodic reminders with additional details will be included as needed.

	Tek P/N	Vendor	Description of part	Who to contact, ext.
✓	156-0134-00	Signetics	Comparator (μA710), 8-pin DIP	Willie Rempfer, 6700

Signetics is discontinuing production of this part, leaving us with **no sources** at this time. Several other vendors make this part, but none will package it in the 8-pin DIP except TI, which has slightly different specs.

At best, this part will be single sourced to TI, otherwise no sources will be available. Therefore, we strongly recommend against using this part (in this package).

✓	156-1153-00	National Semi.	Keyboard encoder (5740)	Bill Pfeifer, 6303

After reporting the phase-out of this keyboard encoder in **Component News 270,** I was notified that National had reversed itself and would continue making the part. Now, however, National has dropped the ax again and will definitely discontinue production. So, don't use this part in new design.

✓	156-0925-XX	Fairchild	Dual gate (4085)	Wilton Hart, 7607

Fairchild Semiconductor has notified Tek that the following parts will be discontinued:

4018	4075	40160	4532	4706
4022	4077	40162	4553	4708
4031	4078	40192	4582	4722
4043	**4085**	40194	4526	4735
4041	4072	40195	4583	4721
4068	4082	4522	4704	4736
4073	4099	4531	4705	

The only part that is Tek part-numbered is the 4085. The part numbers affected are:

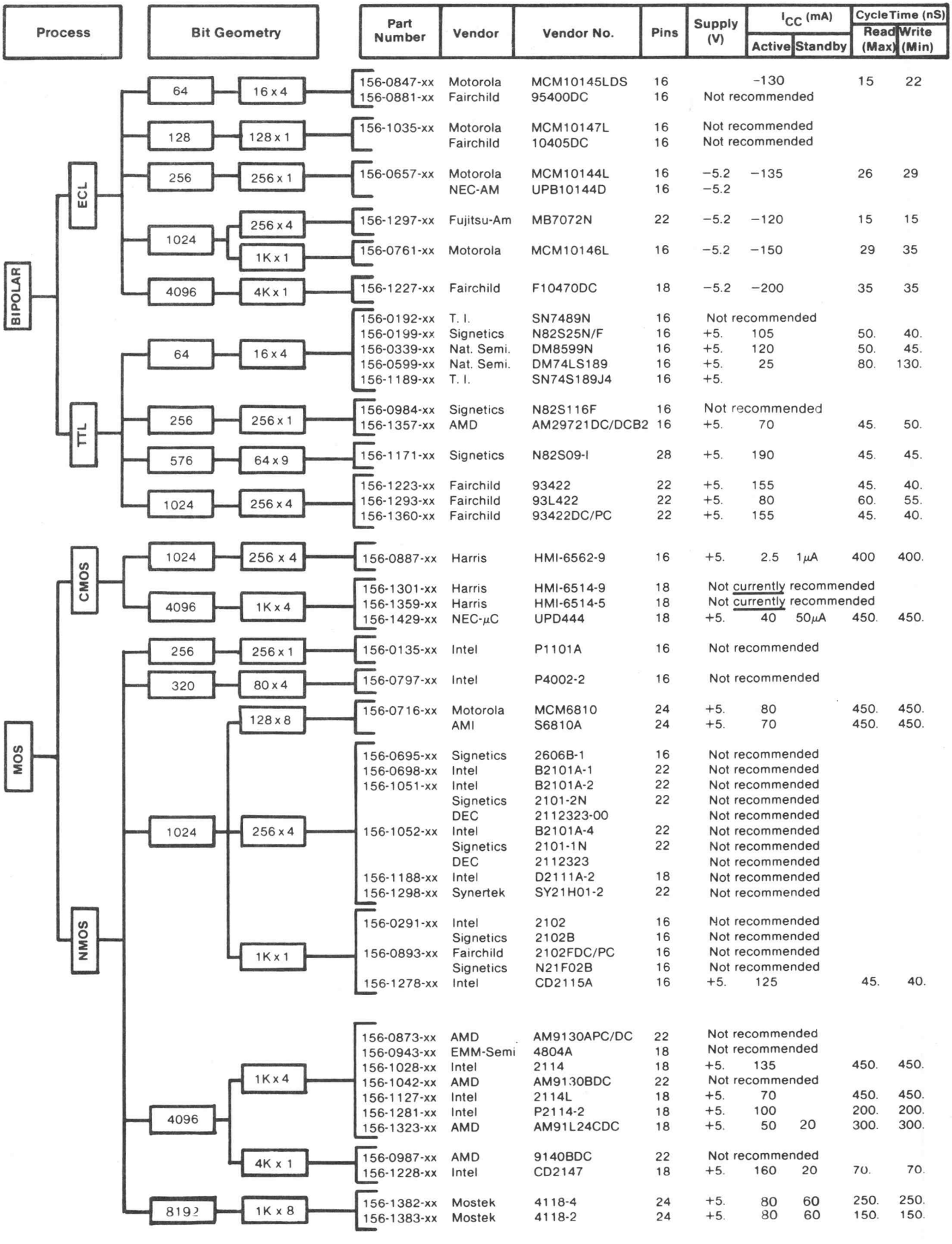
156-0925-00	Sources — Fairchild and RCA
156-0925-01	Sources — Fairchild
156-0925-02	Sources — Fairchild and RCA

The 156-0925-01 part number will no longer exist, and the other two will be single sourced.

✓	156-0984-00	Signetics	Static RAM (N82S116F)	Peter Reitmajer, 4663

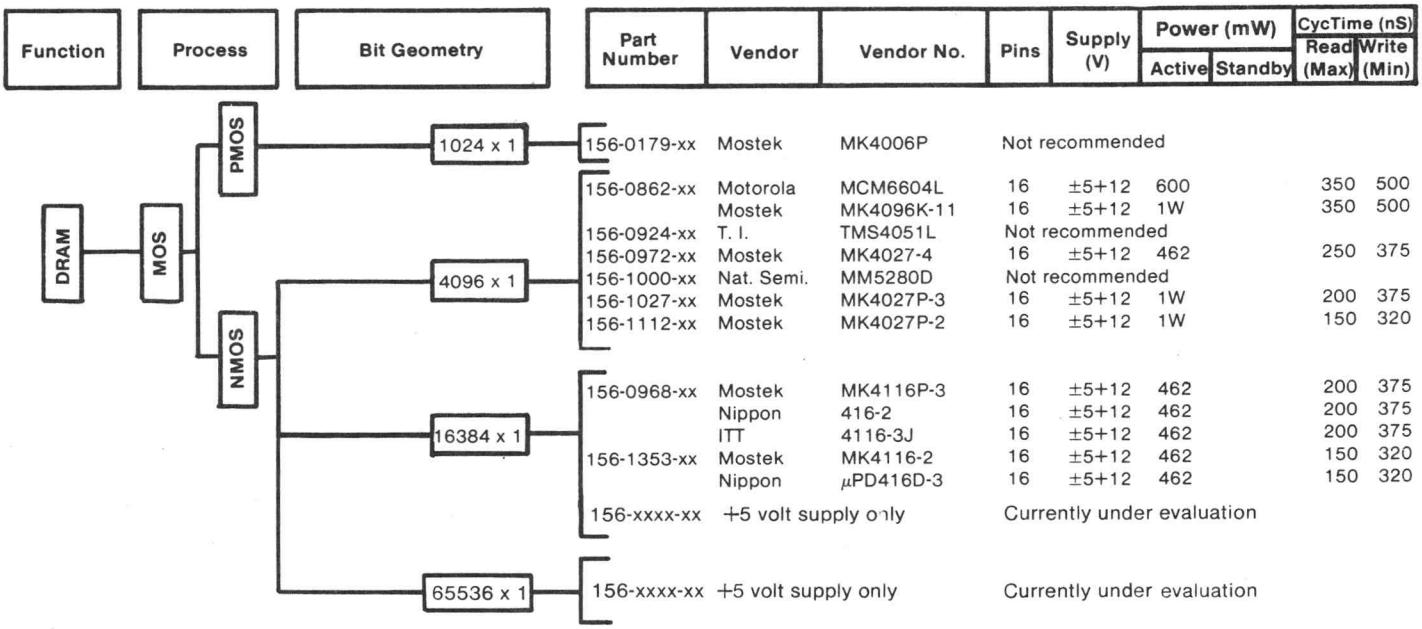
Signetics can no longer fulfill Tek's timing requirements for this part. The N82S116F is now made with a 60mS T_{AA} at Signetics. However, AMD makes an almost identical part which is pin compatible. The only difference is tristate at outputs during Write. The AMD part is currently being evaluated as a possible source. Refer to the SRAM Memory Selection Guide (page 15) for additional information.

Memory Selection Guide
Static RAMs (SRAMs)



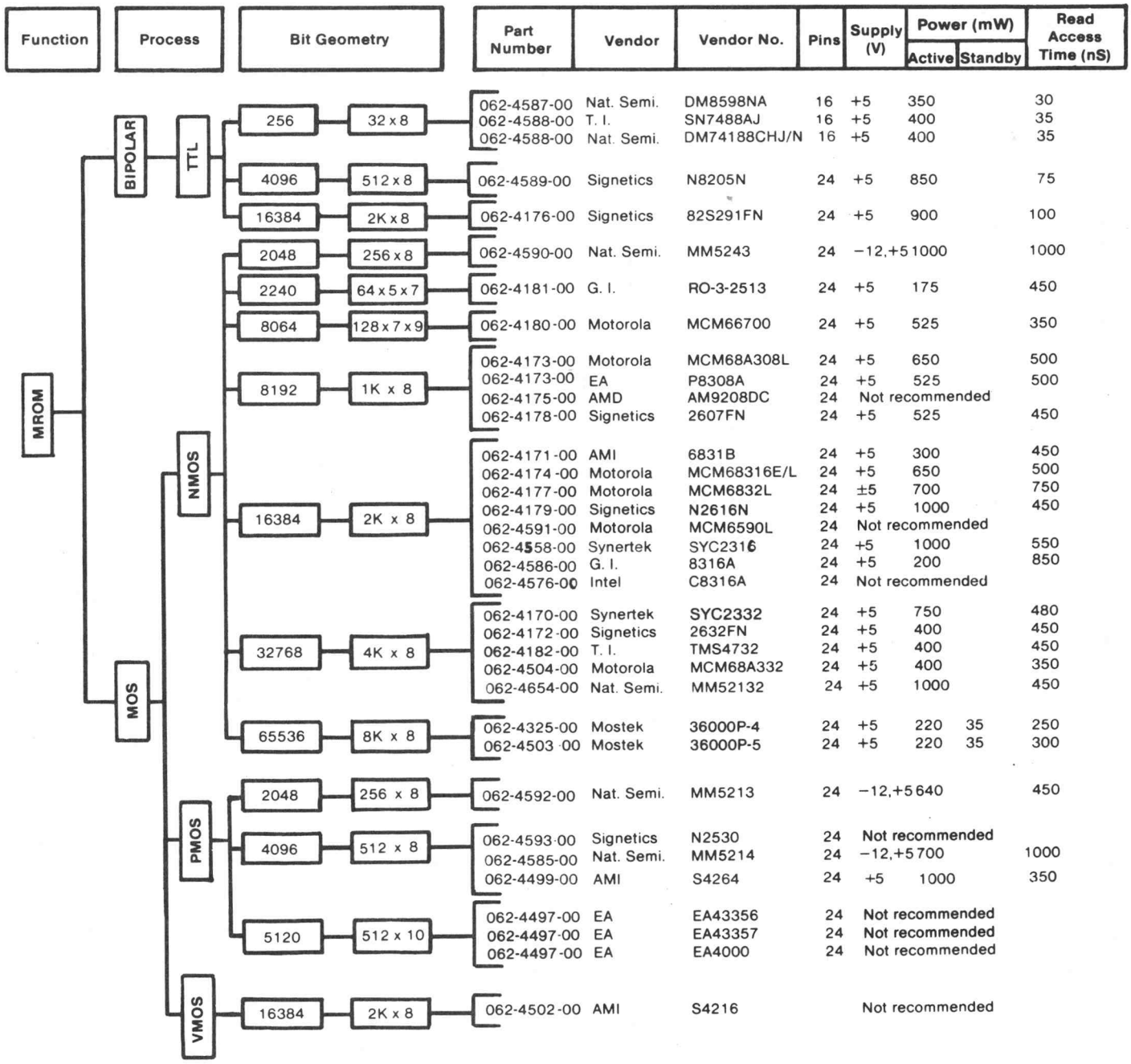
Process	Bit Geometry	Part Number	Vendor	Vendor No.	Pins	Supply (V)	I_{CC} (mA) Active	I_{CC} (mA) Standby	Cycle Time (nS) Read (Max)	Cycle Time (nS) Write (Min)
BIPOLAR / ECL	64 / 16 x 4	156-0847-xx	Motorola	MCM10145LDS	16		-130		15	22
		156-0881-xx	Fairchild	95400DC	16	Not recommended				
	128 / 128 x 1	156-1035-xx	Motorola	MCM10147L	16	Not recommended				
			Fairchild	10405DC	16	Not recommended				
	256 / 256 x 1	156-0657-xx	Motorola	MCM10144L	16	-5.2	-135		26	29
			NEC-AM	UPB10144D	16	-5.2				
	1024 / 256 x 4	156-1297-xx	Fujitsu-Am	MB7072N	22	-5.2	-120		15	15
	1024 / 1K x 1	156-0761-xx	Motorola	MCM10146L	16	-5.2	-150		29	35
	4096 / 4K x 1	156-1227-xx	Fairchild	F10470DC	18	-5.2	-200		35	35
BIPOLAR / TTL	64 / 16 x 4	156-0192-xx	T. I.	SN7489N	16	Not recommended				
		156-0199-xx	Signetics	N82S25N/F	16	+5.	105		50.	40.
		156-0339-xx	Nat. Semi.	DM8599N	16	+5.	120		50.	45.
		156-0599-xx	Nat. Semi.	DM74LS189	16	+5.	25		80.	130.
		156-1189-xx	T. I.	SN74S189J4	16	+5.				
	256 / 256 x 1	156-0984-xx	Signetics	N82S116F	16	Not recommended				
		156-1357-xx	AMD	AM29721DC/DCB2	16	+5.	70		45.	50.
	576 / 64 x 9	156-1171-xx	Signetics	N82S09-I	28	+5.	190		45.	45.
	1024 / 256 x 4	156-1223-xx	Fairchild	93422	22	+5.	155		45.	40.
		156-1293-xx	Fairchild	93L422	22	+5.	80		60.	55.
		156-1360-xx	Fairchild	93422DC/PC	22	+5.	155		45.	40.
MOS / CMOS	1024 / 256 x 4	156-0887-xx	Harris	HMI-6562-9	16	+5.	2.5	1μA	400	400.
	4096 / 1K x 4	156-1301-xx	Harris	HMI-6514-9	18	Not currently recommended				
		156-1359-xx	Harris	HMI-6514-5	18	Not currently recommended				
		156-1429-xx	NEC-μC	UPD444	18	+5.	40	50μA	450.	450.
MOS / NMOS	256 / 256 x 1	156-0135-xx	Intel	P1101A	16	Not recommended				
	320 / 80 x 4	156-0797-xx	Intel	P4002-2	16	Not recommended				
	1024 / 128 x 8	156-0716-xx	Motorola	MCM6810	24	+5.	80		450.	450.
			AMI	S6810A	24	+5.	70		450.	450.
	1024 / 256 x 4	156-0695-xx	Signetics	2606B-1	16	Not recommended				
		156-0698-xx	Intel	B2101A-1	22	Not recommended				
		156-1051-xx	Intel	B2101A-2	22	Not recommended				
			Signetics	2101-2N	22	Not recommended				
			DEC	2112323-00		Not recommended				
		156-1052-xx	Intel	B2101A-4	22	Not recommended				
			Signetics	2101-1N	22	Not recommended				
			DEC	2112323		Not recommended				
		156-1188-xx	Intel	D2111A-2	18	Not recommended				
		156-1298-xx	Synertek	SY21H01-2	22	Not recommended				
	1024 / 1K x 1	156-0291-xx	Intel	2102	16	Not recommended				
			Signetics	2102B	16	Not recommended				
		156-0893-xx	Fairchild	2102FDC/PC	16	Not recommended				
			Signetics	N21F02B	16	Not recommended				
		156-1278-xx	Intel	CD2115A	16	+5.	125		45.	40.
	4096 / 1K x 4	156-0873-xx	AMD	AM9130APC/DC	22	Not recommended				
		156-0943-xx	EMM-Semi	4804A	18	Not recommended				
		156-1028-xx	Intel	2114	18	+5.	135		450.	450.
		156-1042-xx	AMD	AM9130BDC	22	Not recommended				
		156-1127-xx	Intel	2114L	18	+5.	70		450.	450.
		156-1281-xx	Intel	P2114-2	18	+5.	100		200.	200.
		156-1323-xx	AMD	AM91L24CDC	18	+5.	50	20	300.	300.
	4096 / 4K x 1	156-0987-xx	AMD	9140BDC	22	Not recommended				
		156-1228-xx	Intel	CD2147	18	+5.	160	20	70.	70.
	8192 / 1K x 8	156-1382-xx	Mostek	4118-4	24	+5.	80	60	250.	250.
		156-1383-xx	Mostek	4118-2	24	+5.	80	60	150.	150.

Memory Selection Guide
Dynamic RAMs (DRAMs)



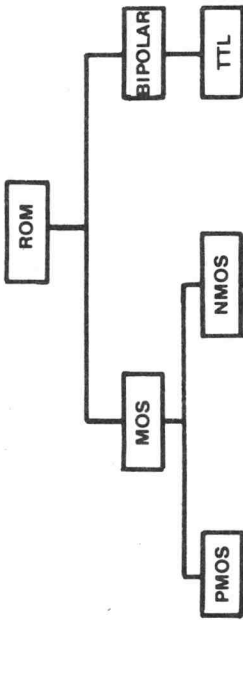
Part Number	Vendor	Vendor No.	Pins	Supply (V)	Power (mW) Active	Power (mW) Standby	CycTime (nS) Read (Max)	CycTime (nS) Write (Min)
156-0179-xx	Mostek	MK4006P	Not recommended					
156-0862-xx	Motorola	MCM6604L	16	±5+12	600		350	500
	Mostek	MK4096K-11	16	±5+12	1W		350	500
156-0924-xx	T. I.	TMS4051L	Not recommended					
156-0972-xx	Mostek	MK4027-4	16	±5+12	462		250	375
156-1000-xx	Nat. Semi.	MM5280D	Not recommended					
156-1027-xx	Mostek	MK4027P-3	16	±5+12	1W		200	375
156-1112-xx	Mostek	MK4027P-2	16	±5+12	1W		150	320
156-0968-xx	Mostek	MK4116P-3	16	±5+12	462		200	375
	Nippon	416-2	16	±5+12	462		200	375
	ITT	4116-3J	16	±5+12	462		200	375
156-1353-xx	Mostek	MK4116-2	16	±5+12	462		150	320
	Nippon	μPD416D-3	16	±5+12	462		150	320
156-xxxx-xx	+5 volt supply only		Currently under evaluation					
156-xxxx-xx	+5 volt supply only		Currently under evaluation					

Memory Selection Guide
Factory Programmable ROMs (XROMs)



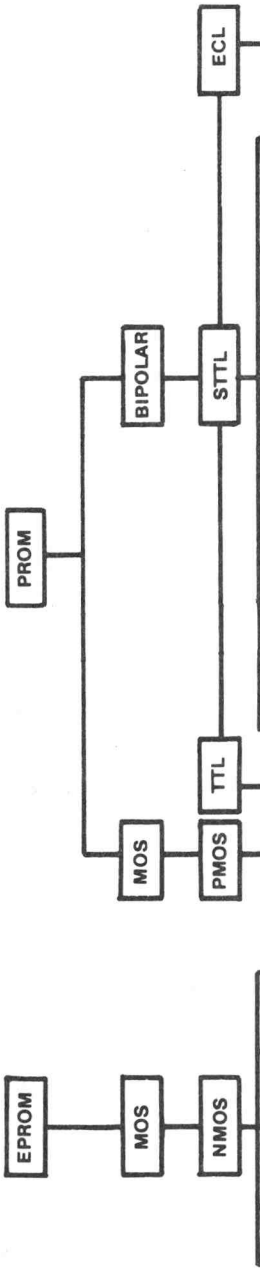
Function	Process	Bit Geometry	Part Number	Vendor	Vendor No.	Pins	Supply (V)	Power (mW) Active	Power (mW) Standby	Read Access Time (nS)
MROM	BIPOLAR	TTL	256 × 32 × 8	062-4587-00	Nat. Semi.	DM8598NA	16	+5	350		30
				062-4588-00	T. I.	SN7488AJ	16	+5	400		35
				062-4588-00	Nat. Semi.	DM74188CHJ/N	16	+5	400		35
			4096 × 512 × 8	062-4589-00	Signetics	N8205N	24	+5	850		75
			16384 × 2K × 8	062-4176-00	Signetics	82S291FN	24	+5	900		100
			2048 × 256 × 8	062-4590-00	Nat. Semi.	MM5243	24	−12,+5	1000		1000
			2240 × 64 × 5 × 7	062-4181-00	G. I.	RO-3-2513	24	+5	175		450
			8064 × 128 × 7 × 9	062-4180-00	Motorola	MCM66700	24	+5	525		350
			8192 × 1K × 8	062-4173-00	Motorola	MCM68A308L	24	+5	650		500
				062-4173-00	EA	P8308A	24	+5	525		500
				062-4175-00	AMD	AM9208DC	24	Not recommended			
				062-4178-00	Signetics	2607FN	24	+5	525		450
	MOS	NMOS	16384 × 2K × 8	062-4171-00	AMI	6831B	24	+5	300		450
				062-4174-00	Motorola	MCM68316E/L	24	+5	650		500
				062-4177-00	Motorola	MCM6832L	24	±5	700		750
				062-4179-00	Signetics	N2616N	24	+5	1000		450
				062-4591-00	Motorola	MCM6590L	24	Not recommended			
				062-4558-00	Synertek	SYC2316	24	+5	1000		550
				062-4586-00	G. I.	8316A	24	+5	200		850
				062-4576-00	Intel	C8316A	24	Not recommended			
			32768 × 4K × 8	062-4170-00	Synertek	SYC2332	24	+5	750		480
				062-4172-00	Signetics	2632FN	24	+5	400		450
				062-4182-00	T. I.	TMS4732	24	+5	400		450
				062-4504-00	Motorola	MCM68A332	24	+5	400		350
				062-4654-00	Nat. Semi.	MM52132	24	+5	1000		450
			65536 × 8K × 8	062-4325-00	Mostek	36000P-4	24	+5	220	35	250
				062-4503-00	Mostek	36000P-5	24	+5	220	35	300
		PMOS	2048 × 256 × 8	062-4592-00	Nat. Semi.	MM5213	24	−12,+5	640		450
			4096 × 512 × 8	062-4593-00	Signetics	N2530	24	Not recommended			
				062-4585-00	Nat. Semi.	MM5214	24	−12,+5	700		1000
				062-4499-00	AMI	S4264	24	+5	1000		350
			5120 × 512 × 10	062-4497-00	EA	EA43356	24	Not recommended			
				062-4497-00	EA	EA43357	24	Not recommended			
				062-4497-00	EA	EA4000	24	Not recommended			
		VMOS	16384 × 2K × 8	062-4502-00	AMI	S4216		Not recommended			

Memory Selection Guide
Factory Programmable ROMs (XROMs)



Part Number	Vendor	Vendor No.	Pins	Supply (V)	Power (mW) Active	Power (mW) Standby	Read Access Time (nS)
156-1170-00	Nat. Semi.	DM8678CABJ	16	+5	775		55
156-0236-00	AMS	C01841	40	Not recommended			
156-0237-00	AMS	C01839	40	Not recommended			
156-0337-00	MMI	6055	18	Not recommended			
156-0102-00	T. I.	TMS4100		Not recommended			
156-0103-00	T. I.	TMS4100		Not recommended			
156-0104-00	T. I.	TMS4100		Not recommended			
156-0209-00	EA	EA3021	24	Not recommended			
156-0894-00	Mostek	MCS1020	16	Not recommended			
156-0363-00	Fairchild	3258DDC	16	Not recommended			
156-0214-00	EA	EA3304	24	Not recommended			
156-0950-00	Motorola	MCM6575	24	+5	440		350
156-0952-00	Motorola	MCM6581/L	24	−3, +5	800		400
156-1168-00	Motorola	MCM6571A	24	−3 +5	800		500
156-0244-00	Intel	1301-0044	24	−9, +5	2000		1000
156-0871-00	Signetics	N2516		Not recommended			
062-4501-00	Nat. Semi	MM52415	24	-12,+5	185		900
156-0296-00	EA	EA4001	24	Not recommended			

Memory Selection Guide
Field Programmable ROMs (XROMs)



Bit Geometry		Part Number	Vendor	Vendor No.	Pins	Supply (V)	Power (mW) Active	Power (mW) Standby	Read Access Time (nS)
256	32 x 8	156-1037-xx	Signetics	10139	16	−5.2	580		15
256	32 x 8	156-0305-xx	AMD	27S18	16	+5	450		40
		156-0785-xx	Intersil	IM5610CDE	16	+5	550		40
			Nat. Semi.	DM8578N	16	+5	550		40
		156-1151-xx	Nat. Semi.	DM74S288J	16	+5	550		30
		156-1325-xx	T. I.	TBP185A030	16	+5	400		25
1024	256 x 4	156-0737-xx	Nat. Semi.	DM8574	16	+5	400		60
		156-0905-xx	Fairchild	93427DC	16	+5	550		40
		156-1343-xx	Signetics	N82S129J	16	+5	600		50
4096	512 x 8	156-0769-xx	Signetics	N82S115F	24	+5	925		90
		156-0903-xx	Intel	D3624-4	24	+5	850		60
		156-0971-xx	Intel	P/D3604L-6	24	+5	700	225	90
		156-1372-xx	T. I.	TBP18542	16	+5	675		75
		156-1392-xx	MMI	6349-1J	20	+5	775		70
4096	1K x 4	156-1213-xx	MMI	6353-1J	18	+5	875		60
8192	1K x 8	156-0960-xx	Nat. Semi.	74S471J	20	+5	750		75
			T. I.	TBP18522	20	+5	950		75
		156-0969-xx	Intel	D3608	24	+5	950		80
		156-0973-xx	Signetics	N82S2708E	24	+5	925		70
		156-0976-xx	Signetics	N82S181F	24	+5	800		70
		156-1438-xx	TI	TBP28586N	24	+5	625		45
8192	2K x 4	156-1182-xx	Signetics	N82S185F	18	+5	600		100
16384	2K x 8	156-1354-xx	Signetics	N82S191	24	+5	875		80
2048	512 x 4	156-0859-xx	MMI	6306-1J	16	+5	650		60
		156-1146-xx	Intersil	5604	16	+5	700		70
2040	256 x 8	156-0133-xx	Intel	1601	24	Not recommended			
		156-0346-xx	Intel	1602A	24	−9,+5	2000		1000
2048	256 x 8	156-0380-xx	Intel	1702A	24	Not recommended			
		156-0463-xx	Nat. Semi.	MM5203Q	24	−12,+5	730		625
4096	512 x 8	156-0528-xx	Nat. Semi.	MM5204N	24	Not recommended			
		156-0689-xx	Intel	C2704	24	Not recommended			
8192	1K x 8	156-0708-xx	Motorola	MCM2708L	24	±5,+12	800		450
			Intel	C2708	24	±5,+12	800		450
			Nat. Semi.	MM2708Q	24	±5,+12	800		450
16384	2K x 8	156-1017-xx	Intel	2716	24	+5	525	132	450
		156-1101-xx	T. I.	TMS2716JL	24	±5,+12	500		450
32768	4096 x 8	156-1403-xx	Intel	2732	24	+5	750	150	450

TECHNICAL STANDARDS

The function of Technical Standards is to identify, describe and document standard processes, procedures, and practices within the Tektronix complex, and to ensure these standards are consistent with established national and international standards. Technical Standards also provides a central repository for standards and specifications required at Tektronix. *Chuck Sullivan, manager (41-260)*

DOD-STD-100C Engineering Drawing Practices. Replaces MIL-STD-100B.
DOD-HDBK-248A Military Handbook superseding MIL HDBK-248(AS). Guide for Application and Tailoring of Requirements for Defense Material Acquisitions.
FEDERAL COMMUNICATIONS COMMISSION Transmittal Sheet No. 11, Volume III of Rules and Regulations, August 1976 Edition.
ISO 4578 Determination of Peel Resistance of High-Strength Adhesive Bonds, Floating Roller Method.
MIL-C-17E Amendment 2 Cables, Radio frequency, Flexible and Semirigid.
*MIL-C-3098G Supplement 1*Crystal Units Quartz, General Specs.
MIL-C-38999G Amendment 3 Connector, Electrical Circular, Miniature, High Density Quick Disconnect (Bayonet, Threaded and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts.
MIL-C-55036A Amendment 1 Cable, Telephone.
MIL-I-23053/2C Amendment 1 Insulation Sleeving, Electrical, Heat Shrinkable, Polyvinyl Chloride, Flexible, Crosslinked and Non-Crosslinked.
MIL-I-23053/3A Amendment 1 Insulation Sleeving, Electrical Heat Shrinkable, Polyvinyl Chloride, Semi-Rigid, Crosslinked and Non-Crosslinked.
MIL-I-23053C Amendment 2 Insulation Sleeving, Electrical, Heat Shrinkable.
MIL-M-63007 (TM) Manuals, Technical and Catalogs, Supply: Hand Receipt.
MIL-S-9395E Amendment 2 Switches, Pressure, (Absolute, Gage and Differential).
MIL-S-24236/11E Switch, Thermostatic, (Bimetallic), Subminiature, Type II, Watertight, Single Pole, Single Throw (SPST), 1 Ampere.
MIL-S-24236/17C Switches, Thermostatic, (Bimetallic), Subminiature, Type II, Watertight, Single Pole Single Throw (SPST), 2 Amperes.
MIL-S-24236/22B Switches, Thermostatic, (Bimetallic), Type II, Hermetically Sealed, Single Terminal, 0.5 Ampere.
MIL-S-24236/23B Switches, Thermostatic, (Bimetallic), Type I, Hermetically Sealed, Single Pole, Single Throw (SPST), 2 Amperes.
MIL-S-24236/25A Switches, Thermostatic, (Bimetallic), Type I, Hermetically Sealed, Single Pole, Single Throw (SPST), 2 Amperes.
MIL-S-28788A Switches, Air and Liquid Flow, Sensing.
MIL-S-81619C (USAF), Switches, Solid State Transducer, (Analog and Digital).
MIL-STD-454F Notice 3 General Requirements for Electronic Equipment.
MIL-STD-1568A Materials and Processes for Corrosion Prevention and Control in Aerospace Weapons Systems.
QQ-S-365C General Requirements for Silver Plating, Electrodeposited.
UL 62 Flexible Cord and Fixture Wire.
UL817 Seventh Edition, Revision pages for Cord Sets and Power-Supply Cords.

For more information on these publications, contact Technical Standards (41-260), ext. 241 Town Center.

component news

Published by Technical Communications
58-299, ext. 6867

Jacquie Calame, Editor
Birdie Dalrymple, Illustrator
Lola Janes, Writer

To submit an article, call Jacquie on ext. 6867, or stop by 58-299.
For mailing list changes, contact Kelly Turner at 19-123, ext. 5502.

company confidential