COMPONENT NEWS
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New display panels evaluated

Tektronix engineers frequently inquire about new displays that are currently on the market. We evaluate displays as they become available, and occasionally re-evaluate older ones. Following is a brief update on many of the new offerings from display device manufacturers.

multi-digit "stick" displays

We recently tested the National NSB series of "stick" displays. Unfortunately, the failure rate in the humidity tests was very high.

Generally, displays that have the die mounted on a circuit board substrate and use hollow light pipes have very poor environmental withstand capability (see figure 1). In contrast, those that have the die mounted on a lead frame, and then potted in clear epoxy, are much more reliable (see figure 2).

Monsanto has not yet offered a multi-digit display (except duals), but plans to introduce a "reliable stick" by the end of 1978. They are aware of the problems with "sticks" now on the market, and will use the lead frame construction to avoid them.

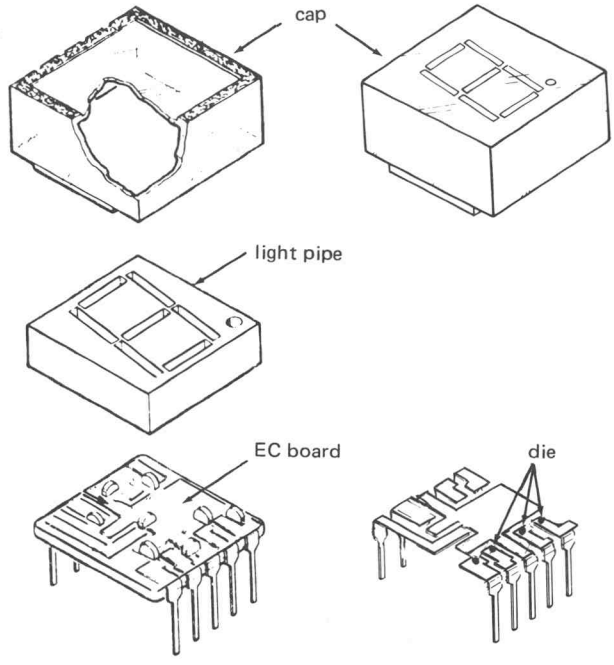

figure 1

figure 2

½-inch displays

One of the least reliable displays now in use at Tektronix is P/N 150-1046-00, Fairchild's FND507. Texas Instruments has redesigned their TIL321 display to be mechanically compatible with the Fairchild part, and the "A" version uses the lead-frame construction mentioned above. These displays are currently under evaluation.

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LED digits, ±1

Monsanto has changed the design of their MAN3610 (P/N 150-1038-00) to use lead-frame instead of circuit board construction. Along with this change, a pin has been added at position 9.

Tektronix instruments using this part have been modified, as required, to accommodate pin 9. New instruments should also allow for it.

In the past, ±1 digits have not been available in common-cathode configuration. Because the 14-pin package has plenty of pins available, HP and Monsanto now offer units with both ends of all LEDs brought out to separate pins (see figure 3). These units can be used in common-anode or common-cathode configurations.

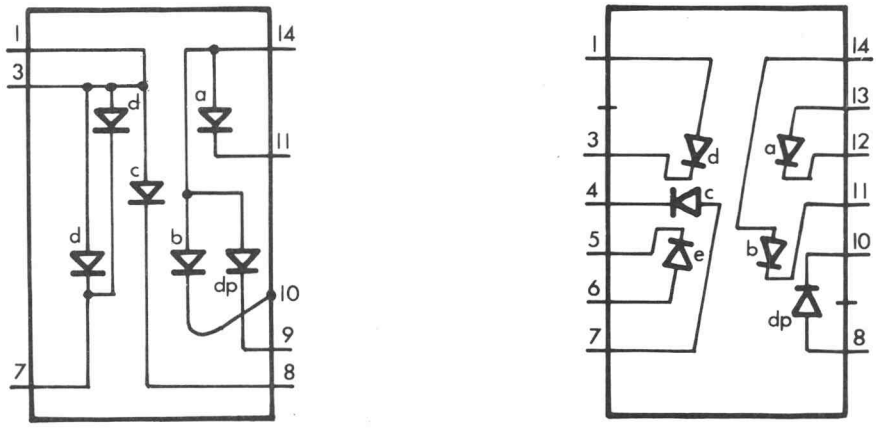

figure 3 **common anode** **universal**

fluorescent display panels

Fluorescent displays have well-sealed glass packages. We have had no problems with this package in humidity and temperature extremes (see **Component News** 254).

In addition, we recently ran vibration tests on fluorescent displays from NEC and Itron at low (10-55 Hz) and high frequency (50-500 Hz). No problems were apparent after these tests.

We have had questions about the life expectancy of fluorescent displays. Itron estimates it will take about 140,000 hours for the light output to degrade by 50%.

Filament burn-out should not be a concern with these displays, because the filament is operated at a relatively low temperature (700°C). There is no visible glow at this temperature.

The chief disadvantage of these panels is the relatively bulky package. The space occupied behind the panel is about three times that required by comparable LED displays.

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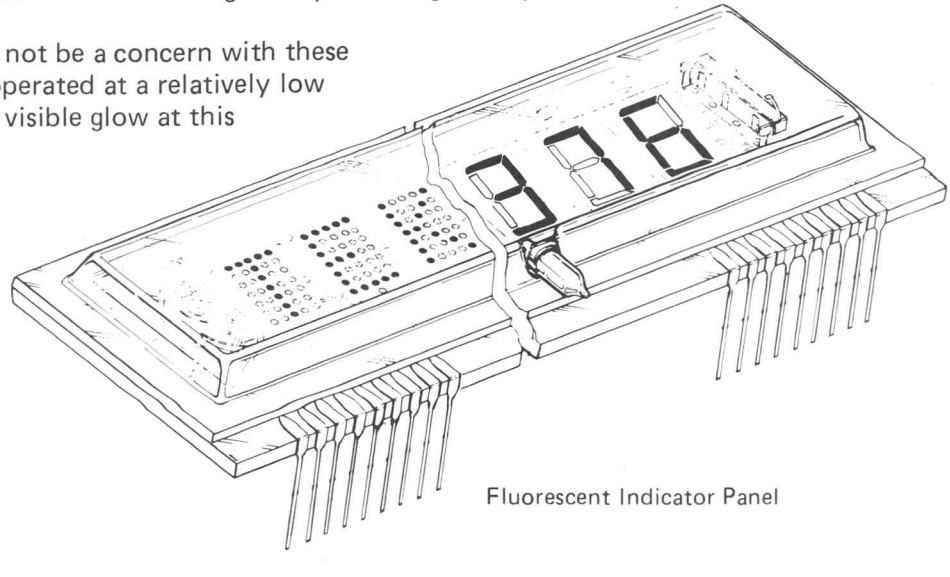

Fluorescent Indicator Panel

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alphanumeric displays

The Hewlett-Packard HDSP-6508 alpha display is in Tek stock, P/N 150-1060-00. This 8-character, 16-segment display has performed well in Tek's environmental tests.

Texas Instruments has been slow in getting an alpha display on the market. They are now planning to second-source the HP display instead of developing their own.

"intelligent" displays

"Intelligent" displays have support electronics, usually latch, decoder and driver, built into the display package. They accept ASCII code.

One of the earliest intelligent displays is the Litronix DL1416 (P/N 150-1047-00). HP plans to make an intelligent version of their HDSP-6508, but has not yet introduced a product.

Another version of the intelligent terminal uses a standard display mounted on a PC board with decoder, latch, etc., integrated circuits. A fluorescent unit of this type is offered by Digital Electronics.

flashing LED

Litronix has introduced a flashing LED. It is in a standard T-1¾ package, and has a built-in IC that switches the light at about 3 Hz. It operates off a 5-volt supply.

On samples we have seen, the flashing rate is affected by ambient light. Bright lights will cause the flashing to stop. This characteristic may not be a concern for some applications, but Litronix is trying to correct it.

gas-discharge displays

Beckman Instruments is beginning production of HB330 series gas displays. This is identical to the SP330 series, except that it has krypton gas mixed with the neon. The krypton helps to ionize the gas, resulting in faster turn-on. The new units will require higher operating current (300 mA recommended, versus 70 mA for present parts). The price will be about 20% higher.

The improved turn-on of the krypton units is still not fast enough for multiplex operation, so they will have a keep-alive electrode (as in the non-krypton units). The mechanical configuration will be identical to the present SP330 series.

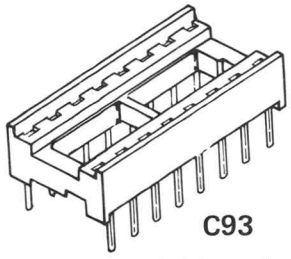
sample panels available

Component Engineering has sample panels containing a variety of discrete, digital and alpha-numeric displays. These include LED, liquid crystal, and fluorescent; a panel for gas displays is being prepared. These may be seen at 58-299, or in your area on request.

For further information, contact **Betty Anderson or Louis Mahn, ext. 6389.**

Low-profile IC socket modified

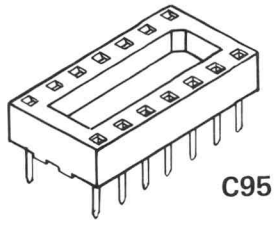
IC sockets are a source of severe quality problems to production areas. Crushed contacts, broached entries and bent or broken leads are commonly encountered problems.



C93
(old version)

Recently, the C93 series of low-profile sockets (manufactured by Texas Instruments) was replaced by the C95 series. This was done to alleviate flux entrapment problems, common in the C93 series. The newer, C95 sockets have no anti-wicking wafers (see illustrations), but have demonstrated other inadequacies.

C95 series sockets are extremely susceptible to damage when inserting an IC. Therefore, we were finding many parts with broached entries and/or collapsed contacts.

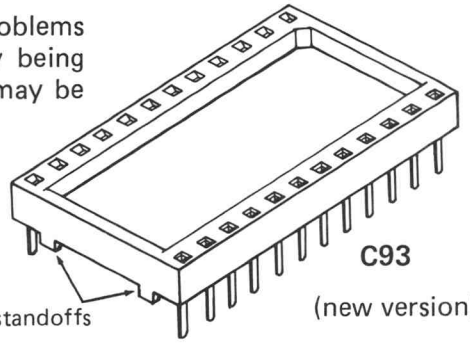


C95

In this case, the cure was worse than the cold!

After much testing, a different version of the original C93 series socket has been developed by TI. This part has standoffs which are 0.025" taller than the old C93 standoffs (see drawing). In addition, the new part **does not** have the anti-wicking wafer.

These two modifications should help solve many lingering problems associated with low-profile IC sockets. The new parts are currently being phased into production areas, and some height clearance problems may be encountered.



C93
(new version)

higher standoffs

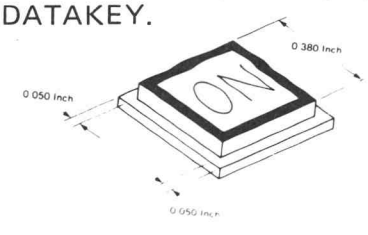
There are other factors to consider when utilizing any socket:

1. Sockets are a convenience factor, only.
2. They are fragile devices, and should not be misapplied.
3. A socket is cheaper to remove than repair. To remove it, pry off the plastic insulator and remove the pins from the circuit board one by one. Remember—a new socket/IC interface is failure-prone, a repaired socket is doomed.

If you have any questions concerning these devices contact **Peter Butler, ext. 5417.**

Fairchild offers LCD keycap

Incandescent and LED-lighted keycaps have been available for quite some time. Now, Fairchild has introduced a liquid crystal display (LCD) keycap called DATAKEY.



The keycap operates on nanoamps of current. When not energized, the cap face is blank. When energized, the message is displayed by reflected light, indicating that the key is in a live option.

For technical data and information on demonstration units, contact **Jim Deer (58-299), ext. 7711.**

Tek-made cables UL recognized

The culmination of over two years work by Accessories Engineering and Product Safety has resulted in UL recognition for 22 Tek-made cables. This UL safety recognition is a criterion for gaining whole instrument certification of our products.

In order to produce UL-recognized cables, our production facilities were modified and new machinery acquired. The result was a cable production facility certified to produce Unlisted Component — Recognized Appliance Wiring Material for *in-house* use only (not for sale to customers in bulk).

New cables will be recognized as they progress from prototype to regular status. Also, the present list will be enlarged.

Instrument designers should define their cable needs as early as possible, because it takes 15 to 20 weeks to gain UL recognition on a cable, even after the part is in the production phase. Whenever possible, utilize recognized Tek-made cables for new designs.

For more details on the cable production facilities, contact **Dick Guarnero (19-092), ext. 5787.** For information on gaining UL recognition, contact **Wally House (58-123), ext. 7192.**

The following cables, used primarily in IDG products, are UL-recognized:

Tek P/N	UL style number
175-0152-01	2937
175-0304-01	2937
175-0305-01	2937
175-0306-01	2937
175-0433-00	2937
175-0497-01	2935
175-1050-01	2937
175-1157-00	2937
175-1185-00	2937
175-1196-00	2936
175-1202-00	1760
175-1203-00	2935
175-1255-00	1760
175-1419-00	2934
175-1544-00	2935
175-1556-00	2936
175-1694-00	2934
175-1695-00	2936
175-1731-00	2934
175-1747-00	2937
175-1748-00	2935
175-1749-00	2934

Voltage selectors meet safety requirements

After two years of negotiations, Switchcraft has released four line voltage selectors designed to meet UL, CSA and VDE requirements. This aids our effort to meet domestic and European standards for these devices.

The line voltage selectors operate at 2A, 250V or 4A, 125V with a 2000 VAC dielectric withstand capability. The following four styles have been Tek part-numbered and are now in stock:

Tek P/N	mounting style/markings
260-1933-00	mounting tabs for panel mount; right angle PC terminals; marked 115/230
260-1934-00	mounting tabs for panel mount; straight PC terminals; marked 115/230
260-1935-00	no mounting tabs; straight PC terminals; marked Hi/Low
260-1935-01	no mounting tabs; straight PC terminals; marked 115/230

These parts are single-sourced, however we are currently evaluating an emergency source. UL, CSA and VDE approvals are pending.

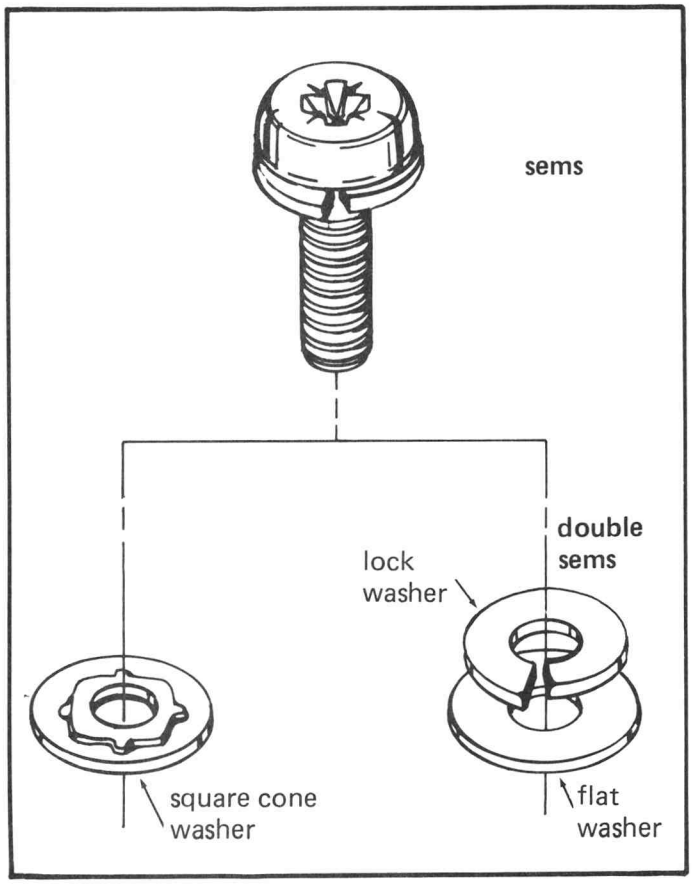
If you want more information, or sample parts, contact **Joe Joncas (58-299), ext. 6365.**

Screw-washer assembly plan outlined

history

To shorten assembly times, fastener producers developed a screw-washer assembly called a **sems.** In Tektronix applications, we use a flat washer in addition to the lock washer to protect the circuit board surface. This assembly (see drawing) is called **double sems.**

Sources are limited and prices are high for these parts because the assembly is patented and requires special production equipment. To overcome the disadvantages of limited availability and high costs, we are investigating alternatives to the double sems.



Shakeproof designed a compatible assembly available at a lower cost using a **square cone** washer (see drawing). The square cone provides lock washer capability, while the flat rim meets the requirements for protection from damaging the circuit board. All parameters are the same as for the double sems except for a difference of about 0.020" in screw penetration because of the lesser washer height for the square cone washers.

present situation

At present, seven of the 17 part numbers for screw-washer assemblies are square cone parts. A problem exists with one part, a 4-40 x 0.315" steel, cadmium-plated assembly available in both double sems and square cone versions:

Tek P/N	assembly type	approx. usage	part cost
211-0207-00	double sems	1.25 million	2.1¢
211-0244-00	square cone	0.5 million	1.4¢

proposal

Test results and present usage prove that both kinds of assemblies are compatible, so I'd like to use one part number, 211-0207-00, for both parts. The spec will be revised to show both alternatives and the 211-0244-00 part number will eventually be phased out.

This proposal not only has the advantage of lower priced parts but also gives us the flexibility of a second source for the double sems.

for comments or more information

If you'd like to have more details, or comment on this proposal, contact me in Manufacturing Engineering (19-668) or call ext. 6404.

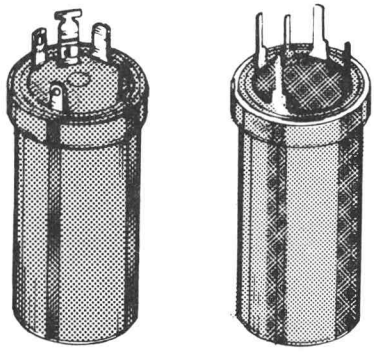
Horst Zittlau

size	length	material/ finish	part number	double sems or sq. cone washer
2-56	0.250	Brass, Ni	211-0180-00	double
2-56	0.312	Sil.Bz.,Ni	211-0182-00	double
2-56	0.437	Steel, Cd	211-0259-00	square
2-56	0.625	Steel, Cd	211-0260-00	square
4-40	0.250	Steel, Cd	211-0661-00	square
4-40	0.312	Steel, Cd	211-0207-00	double
4-40	0.312	Steel, Cd	211-0244-00	square
4-40	0.312	Brass, Ni	211-0116-00	double
4-40	0.438	Brass, Ni	211-0121-00	double
4-40	0.562	Brass, Ni	211-0154-00	double
4-40	0.625	Steel, Cd	211-0246-00	square
4-40	0.625	Brass, Ni	211-0152-00	double
4-40	0.688	Steel, Cd	211-0240-00	square
4-40	1.000	Brass, Ni	211-0145-00	double
6-32	0.312	Brass, Ni	211-0601-00	double
6-32	0.312	Steel, Cd	211-0658-00	square
6-32	0.438	Brass, Ni	211-0602-00	double
6-32	0.625	Steel, Cd	211-0648-00	double

Capacitors inspected for leaky seals

Some manufacturing areas are experiencing problems with aluminum electrolytic capacitors leaking electrolyte.

The parts in question are the twist-mount and printed circuit-mount electrolytics manufactured by General Electric (the 87F series). These parts are aluminum can versions, usually about one inch in diameter and one to three inches in height. They are typically applied as filter capacitors in power supply circuits.



twist mount **ECB mount**

All aluminum electrolytics of this type manufactured by GE are suspect, regardless of lot date. GE has been removed from the approved source list for all affected parts due to this problem, and the inadequacy of their quality control effort and end seal materials.

There are still some GE parts remaining in the warehouse and in manufacturing areas which **should not** be used. Incoming Inspection is 100% testing the parts on hand for defective seals, and marking them with a red dot on the top of the can. If you have any of these parts without the red dot, send them to Bob Thorp in Incoming Inspection (70-588).

For more information, contact **Larry Meneghin (58-176) ext. 7268, Harry Tanielian 19-668) ext. 6405, or Harry Ford (58-299) ext. 6520.**

Variable capacitor availability

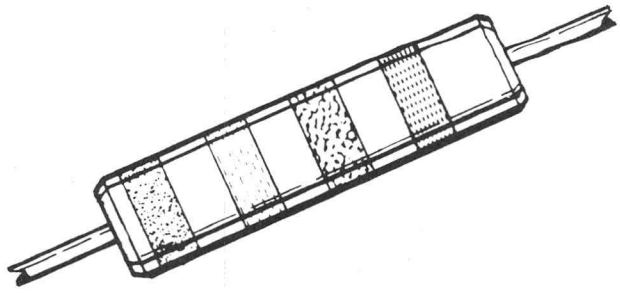
If you have any questions concerning the availability of variable capacitors which are not presently stock items (particularly new design requirements) please let me know. I will be discussing our needs with factory engineers in an August 1 meeting.

Alan LaValle (ext. 5415)

CE stocks ceramic cap samples

Component Engineering is stocking samples of ceramic axial lead capacitors for engineering use. A few samples of each value capacitor listed below are available from **Harry Ford (58-299) ext. 6520.**

3.9 pF
4.3 pF
9.3 pF
33.0 pF
39.0 pF
120.0 pF
180.0 pF
220.0 pF
330.0 pF
390.0 pF
560.0 pF
680.0 pF

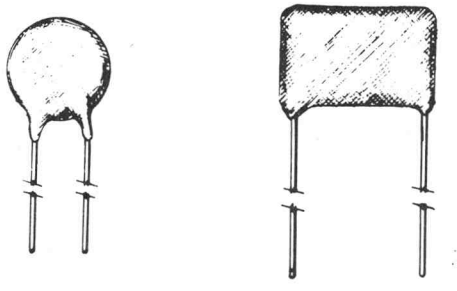


820.0 pF
1200.0 pF
1500.0 pF
1800.0 pF
2700.0 pF
3300.0 pF
8200.0 pF
0.012 μF
0.018 μF
0.022 μF
0.039 μF
0.047 μF
0.082 μF

Cap reliability: disc vs rectangle

Experience and field theory considerations tell us that a disc is a better shape for a high-voltage ceramic capacitor than a rectangle. We try to avoid sharp corners and edges on any high-voltage device where possible, to circumvent concentrating fields at those points. However, it is sometimes desirable to use a square part where space is at a premium.

The question then becomes — are we sacrificing reliability for space considerations by using a rectangular part as opposed to a disc?



In an effort to find out, Component Reliability Engineering surveyed available field and plant removal data on all high-voltage ceramic plate capacitors. The sample consisted of 19 different part numbers of the disc style caps, with a total annual usage of 490,302 parts; and seven different part numbers of the rectangular style with a total annual usage of 231,566 parts. The results were:

	disc type	**rectangular type**
Average plant removals	0.025%	0.021%
Average field removals	0.070%	0.183%

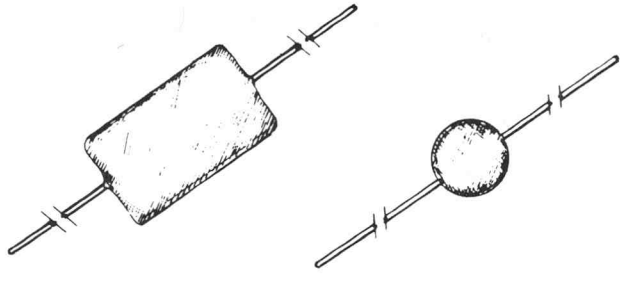
Although plant removals stay about the same, the statistics for field removals show that using a rectangular part generally means a decrease in reliability by a factor of 2.6.

There are some notable exceptions to these results:

283-0261-00 disc capacitor with a field removal rate of 0.175%.

283-0300-00 disc capacitor with a field removal rate of 0.108%

283-0101-00 rectangular, 0.0047 μF, capacitor with a field removal rate of 0.621%. This part represents our biggest problem in high-voltage capacitor reliability, and **should not be used for new design** under any circumstances.



If we remove these three parts from the calculations, the field removal rates become 0.0229% for round parts and 0.110% for rectangular, or a difference of a factor of 5.

For any further information contact **Larry Meneghin (58-176), ext. 7268.**

Digital CE group relocates to 58-125

Digital Component Engineering has relocated to delivery station 58-125. Along with this move, we have divided our operation into two groups.

A memory group, managed by Eric Peterson, will evaluate semiconductor, tape and floppy disc storage systems. Bob Goetz and Ron Burghard will work with Eric. The remainder of the organization will be a logic group, which I will continue to manage.

In addition, Wilton Hart will now be handling microprocessor evaluation.

Ted Olivarez, manager
Digital Component Engineering

TTL RELIABILITY

Burn-in? Ceramic packages? What's best?

Component Reliability Engineering (CRE) has completed reliability tests designed to assess benefits of burn-in, or use of ceramic packages, for TTL, Schottky TTL and low-power Schottky TTL devices. These tests were aimed at answering the following questions:

1. What are the reliability benefits of 100% burn-in for TTL microcircuits?

2. Are ceramic-packaged TTL parts more reliable than plastic-packaged parts?

Based on life tests of over 1200 TTL (298 STTL, 269 TTL, and 648 LSTTL) devices at 150°C junction temperature (a total of over 120,000 device-hours), we have the following data to answer the above questions:

1. Projected failure rates (at 70°C junction temperature)

Raw parts, untested (-00)	0.05%/1000 hrs.
100% tested parts	0.03%/1000 hrs.
100% tested parts w/100% burn-in	0.006%/1000 hrs.

2. Ceramic-packaged TTL microcircuits appear to offer no significant reliability advantage over plastic, with two possible exceptions:

   a. Very low power dissipation LS parts (< 10 mW). Accelerated humidity tests will be conducted on some LS parts to determine if adequate humidity protection exists.

   b. Very high power dissipation parts (>250 mW). In these cases, the junction temperature of plastic encapsulated parts can be 15° to 20° C higher than cerdip-packaged units.

      The increased failure rate due to higher junction temperature in plastics must be compared to the cost, availability and projected failure rate of cerdip-packaged devices.

cost & availability of 100% screened microcircuits

Part vendors are providing test services including temperature cycling, burn-in high temperature functional tests and 25°C tests at extra cost. These test programs add about 6 to 10¢ to the cost of the raw part. Table 1 shows the vendors' extra cost test program details. Figure 1 shows the typical specification format we are using to procure devices with this added testing.

incoming inspection of vendor-screened parts

One concern frequently voiced is: "How can we make sure the part manufacturers are adequately performing this extra-cost testing?" One way is to station on-site inspectors at semiconductor manufacturer's plants. While this may be feasible for the U. S. Government, it is probably not feasible for Tek.

Another way to evaluate these extra-cost test plans is to periodically sample incoming parts both for quality and reliability conformance. This is the alternative which we intend to pursue. Required quality and reliability levels for these vendor-screened parts are naturally more stringent than those expected for raw (xxx-xxxx-**00**) parts. Additional equipment at Incoming Inspection will be required to handle added sample test requirements.

lower TTL failure rates impact system reliability

A parts count MTBF calculation was performed for a complex system (similar to 8002) with over 800 digital microcircuits, along with various other electrical components. (See Table 2 for actual part distribution.) Results were:

MTBF with raw parts (untested)	900 hrs.
MTBF with elec. tested parts	1200 hrs.
MTBF with 100% burn-in and elec. test	1600 hrs.

This indicates a reliability improvement of over 70% is possible through use of 100% screened parts.

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figure 1, LSTTL high-reliability testing specification

inspection criteria (100% screening requirements)

1. Temperature cycling, per MIL-STD-883, method 1010, 10 cycles, 0° to 100°C, minimum.
2. Burn-in screen, per MIL-STD-883 method 1015, condition A, 125°C ambient for 160 hours.
3. Electrical test per requirements herein at 25°C.
4. Electrical test (functional only) at 100°C ambient.

quality levels:

Parts supplied to this specification shall meet the following quality levels when tested at Tektronix, Inc.

	LTPD	acceptance number
100°C functional	2	1
25°C DC parameter tests	3	1
25°C AC parameters	7	1

reliability sample tests:

Parts supplied to this specification shall be capable of passing the following reliability sample test:

Operating Life Test per MIL-STD-883, method 1005, condition A, 125°C, 1000 hours, LTPD = 5, acc. no. = 1.

This reliability sample test shall be used when qualifying new vendors, requalifying existing vendors, or as a reliability acceptance test to determine lot acceptability.

Marking:

Vendor special processing mark on top surface of acceptable devices.

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table 1, vendor test programs

comparison of competitive programs for plastic packaged digital product

screening methods and AQL levels	Fairchild "Matrix IV" level 5	National Semiconductor "A+"	Signetics 'Supr II" level B	Texas Instruments "Pep 3"	Motorola "better" level III
100% overvoltage stress	no	no	no	yes	yes
type 100% thermal stress	thermal shock	temp. cycling	thermal shock	temp. cycling	temp. cycling
thermal stress condition	883A/1011A 0°-100°C	883A/1010A 0°-100°C	883A/1011A 0°-100°C	883A/1010A 0°-100°C	883A/1010 special −25° - +150°C
thermal stress cycles	15	5	15	10	10
type 100% burn-in	883A/1015C HTRB	883A/1015 HTRB	883A/1015F HTRB	883A/1015F HTRB	883A/1015 A or C HTRB
burn-in conditions	168 hrs/125°C	168 hrs/125°C	equivalent to 168/125°C	168 hrs/125°C or equivalent	160 hrs/125°C or 1.0 eV equiv.
type 100% hi temp screen	100°C functional	100°C functional	100°C functional	*100°C "continuity"	100°C functional
guaranteed AQL levels					
100°C functional	0.15%	**0.14%	**0.10%	**0.10%	0.10%
25°C DC	0.28%	0.28%	0.65%	0.40%	0.28%
hi-temp DC	1.0%	—	0.65%	0.40%	0.40%
lo-temp DC	1.0%	—	0.65%	0.40%	0.40%
25°C AC	1.0%	—	1.0%	***1.65%	0.65%
external visual and mechanical					
major (critical)	—	0.25%	0.25%	0.25%	0.11%
minor (cosmetic)	—	1.0%	1.0%	2.5%	2.5%
approximate extra cost	**10¢**	**8.5¢**	**5¢**	**8¢**	**10¢**

* Performed prior to burn-in only. Functional is okayed 100% at 25°C after burn-in.
** 25°C only
*** .25% on critical AC parameters

Note: While Fairchild and Signetics are listed in this table, use of their extra cost testing is not recommended due to their use of thermal shock screening. This test subjects devices to liquids at 0 and 100°C whereas the temperature cycling, used by the others, is an air-to-air test. The thermal shock test can introduce latent failures (entrapped moisture) due to the liquid-to-liquid immersion.

impact of vendor extra-cost testing

Table 1 shows the acceptable quality level (AQL) for various part characteristics. If we consider the 0.1% AQL for functionality or DC parameters, we can estimate the probability of having a non-functioning board, assembly or instrument due to a bad microcircuit. Probability of success can be estimated by $(1 - AQL)^N$ where AQL is expressed as a decimal fraction and N is the number of microcircuits per assembly. Figure 2 is a graphic expression of this probability.

continued on page 12

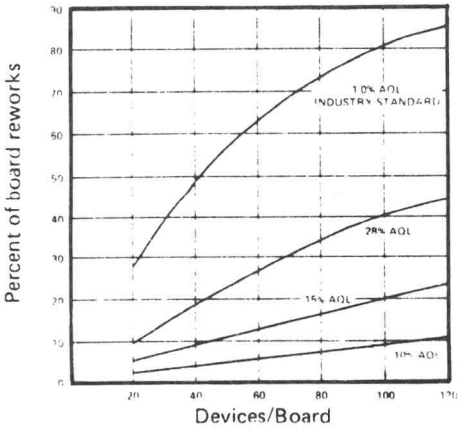


figure 2, effect of AQL on board rework rate

continued from page 11

The low level of board rework required justifies the elimination of sockets for all SSI and MSI TTL, LSTTL and STTL devices.

background

Some Tektronix new instrument projects have already decided that instrument reliability goals dictate higher part reliability. For example, a new spectrum analyzer project has chosen to use 100% screened (temp. cycle burn-in and test) LSTTL parts. Other projects such as a new "smart" scope in LID, are also planning to use 100% screened digital microcircuits.

Studies by other firms have provided good statistical evidence supporting the need for 100% screening. Extensive work done at Bell Telephone Labs showed infant mortality in TTL or other bipolar logic microcircuits in average proportions of 0.2 to 0.4% of incoming lots. The lifetime or longevity of this infant mortality was about 100 hours at elevated junction temperature (150°C).

Based on the temperature acceleration factors derived by Bell Labs, it would take about 1400 hours of instrument burn-in at 50°C ambient to get rid of these weak parts. For this reason, part burn-in is preferred.

table 2
parts complement on sample instrument

Microcircuits	880
Transistors	70
Diodes	110
Motors/Fans	4
Resistors	572
Capacitors	740
Transformers	4
Connectors	93
Switches	46

recommendations

New instrument projects requiring highest levels of TTL, STTL or LSTTL microcircuit reliability should use the 100% screened parts.

Some part numbers have already been established for these microcircuits; contact Component Reliability Engineering for an up-to-date list. If the part you want to use has not already been set up, a Purchased Part Initiation Form (PPIF) would be required. Contact **Ron Schwartz (58-176), ext. 6511,** for further information.

Staff announcement

I am happy to announce the addition of **Betty Lise Anderson** to the R. C. Optoelectronic Component Engineering staff.

Betty earned her BSEE at Syracuse University, Syracuse, NY. She was formerly an engineering apprentice at General Electric Company Optoelectronics, Liverpool, NY, and also worked as laboratory assistant at Syracuse University Microelectronics Laboratory.

She will be working on visible optoelectronic components, including discrete LEDs, alphanumeric displays, drivers and related devices. If you need information on any of these, you may call her at ext. 6389.

Bob Chen, manager

new inductors available

Pulse Engineering has introduced a new line of inductors designed for use in 20 KHz switching power supplies.

The inductors range from 8 to 65μHz in effective inductance, with rated DC currents ranging from 12.5 to 100A.

For more information on these devices contact **Harry Ford (58-299), ext. 6520.**

CRE analyzes, stores returned components

Over the past 18 months Component Reliability Engineering has been collecting data and components (other than Tek-made components) which have failed in the field and been returned to Tek by our service centers.

The actual components returned to CRE are being stored in a readily retrievable manner and will be held for a period of 24 months from the date received. At the end of that period, if no interest is shown, they will be discarded.

Simultaneously, all data concerning these devices is entered into a computerized data bank. We presently have about 18,000 failed components in storage, which means a data bank already holding over 18,000 entries. This data is **not** purged on a 24-month interval, however.

The computer print-out, updated bi-monthly, is sorted by part number, then sub-sorted by instrument type. Also included in this print-out is the circuit symbol, instrument serial number, the manufacturer and date-code of the failed device, whether or not the instrument was in warranty at the time of the failure or if the instrument was DOA.

Also included are notes on whether other simultaneous failures occurred, the reported failure mode, the date the device failure occurred, which field office reported the failure, whether the device was plugged-in or soldered-in, the type of package (plastic, ceramic, glass, metal, etc.) and a general remarks column. (See example of a typical print-out, below.)

CRE has conducted testing on over 4,000 of the returned devices and the results of this testing are also available.

If you're looking for information on the failures of any specific part numbers or instruments in terms of circuit location, manufacturer, type of failures, etc., contact Bonnie Borders, ext. 7268.

Ron Schwartz

RELIABILITY FILE LISTING FOR SORT1 DATE=07-01-78 PAGE< 313>

LOCATE	PART NUMBER	INST	SERIAL NUMBER	CRKT SYMBOL	MFGR.	W A R	D O A	DATE CODE	S I M	RPT FAL CDE	FAIL DATE	FLD. OFCE	WK/ YR NTR	SP IK DG	REMARKS
C002213	156-0230-00	TG501	B010210	U 310	MOTOR	N	N	7312	X	165	082676	1275	197		
C006443	156-0230-00	TG501	B033351	U 315	FAIR	Y	N	7703	X	163	102177	1240	457	P	
C009574	156-0230-00	7D01	B020295	U 268	SIG	Y	N	7634	X	163	082677	1231	268	C	
C009939	156-0230-00	7D01	B051404	U 615	FAIR	Y	N	7729	X	155	000000	1285	188	P	
D003575	156-0230-00	7D01	B020715	U 615	MOTOR	Y	N	7647	X	174	041177	1225	207	P1.41HR	
C005922	156-0230-00	7D01	B020681	U 621	FAIR	Y	N	7652	X	163	000000	0000	427	PREPORTED AS 156003000	
C006354	156-0230-00	7D01	B051841	U 621	SIG	Y	N	7707	X	165	123077	1231	128	C	
D002945	156-0230-00	7D01	B	U0619	SIG	Y	U	7602		165	000000	0000	257		
D002921	156-0230-00	7D15	B082256	Q0314	MOTOR	Y	U	7330		161	000000	0000	257		
D003695	156-0230-00	7D15	B082314	U 413	SIG	Y	N	7602		163	052476	0000	257		
C004160	156-0230-01	S3260	B010119	U 39	MOTOR	N	N	7324	X	000	051777	1218	297	P	
D002637	156-0230-01	S3260	B010104	U0039	MOTOR	U	U	7245	X	000	022377	0000	257		
C003161	156-0232-00	S3260	B	U 28	TI	N	N	7218		000	010677	0000	167	SHORTED PIN 24 AND 25	
C000563	156-0232-00	4631	B041319	U 126	SIG	Y	N	7422	X	166	040576	1238	247	P	
D002947	156-0234-00	TEK 31	B052761	U0083	AMI	Y	U	7423		120	011277	0000	257	CAP WAS OFF	
C004527	156-0248-00	1470	B010144	U 275	SIG	Y	N	7622	X	155	021877	1265	327	XP	
D001968	156-0248-00	1470	B010194	U 275	TI	Y	N	7549		168	111876	1252	257		
D001965	156-0248-00	1470	B010281	U 275	TI	Y	N	7549		168	010377	1252	257		
C006002	156-0249-00	S3260	B	U 44	SIG	N	N	7409		000	100577	0000	437	PWHITE DOT	
C008144	156-0252-00	WR501	B010199	U 412	MOTOR	Y	N	7639		162	000000	0000	108	C	
C004214	156-0253-00	S3260	B	0000	MOTOR	N	N	7412	X	000	062777	0000	307	P	
D000680	156-0253-00	S3260	B010132	U 24	MOTOR	U	N	7441		165	090976	0000	257		
C009507	156-0254-00	S3260	B	U 360	SIG	Y	N	0000	X	000	060778	0000	268	P	
C007335	156-0254-00	S3260	B140607	U 375	SIG	Y	N	7316	X	000	112977	0000	018	P	
D001547	156-0254-00	S3260	B010113	U 375	SIG	U	N	7426	X	165	021876	1285	257		
D001954	156-0255-00	S3260	B	U 10	SIG	N	N	7241	X	000	010777	0000	257	REPORTED AS 156022500	
D000701	156-0255-00	TEK31	B042316	0000	MOTOR	Y	N	7431		168	050676	1265	257		
D002748	156-0259-00	7D10	B010191	U0974	RCA	Y	U	0149		165	013177	1251	257		
C007126	156-0259-00	7844	B111056	0000	RCA	Y	N	0649	X	174	112277	1261	517	P	
C007125	156-0259-00	7844	B111056	0000	RCA	Y	N	0649	X	174	112277	1261	517	P	
C007720	156-0259-00	7844	B111062	U 50	RCA	Y	N	0649		163	112977	1257	058	P	
C002953	156-0260-00	7D13	B010345	Q 415 03	MOTOR	U	N	0552		162	000000	0000	167		
D003638	156-0266-00		B	U 67	MOTOR	Y	N	7308		000	042977	0000	217	P	

TECHNICAL STANDARDS

The function of Technical Standards is to identify, describe, and document standard processes, procedures, and practices within the Tektronix complex, and to insure 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 (58-187)*

new and revised standards available from Technical Standards

EIA Standards Proposal No. 1306 is available to look at. The comment period has expired. If approved, this standard will be published as RS-455.

UL 44 Rubber-Insulated Wires and Cables ($4.50) which was approved (Aug. 1977) as an ANSI/UL standard, contains some mandatory changes effective 3 Dec 78. If you are using an old issue of this standard, order the ANSI/UL now.

QQ-A-225D (June 1971) Aluminum and Aluminum Alloy Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished

QQ-C-530C (Nov. 1971) Copper-Beryllium Alloy Bar, Rod and Wire (Copper Alloy Numbers 172 & 173)

MIL-A-6752A(ASG) Notice 2 (Mar. 1978) Reinstates this military specification — Ammeters, Voltmeters and Loadmeters; Direct Current

MIL-S-2319OD (Mar. 1973) Straps, Clamps, and Mounting Hardware, Plastic for Cable Harness Tying and Support

MIL-S-43336C (Mar. 1978) Sealing Irons and Sealing Plates, Electric, Manually Operated

MIL-STD-1188A (Jan. 1978) Commercial Packaging of Supplies and Equipment

MIL-STD-1665 (Jan. 1978) Test Equipment for the Standard Electronic Modules Program

MS-3367E (Jan. 75) Strap, Tie Down, Electrical Components, Adjustable, Self-Clinching, Plastic, Type 1, Class 1

MIL-HDBK-238(NAVY) Notice 1 (Feb. 1978) Electromagnetic Radiation Hazards - there are five deletions in this handbook

MIL-HDBK-63038-1(TM) (May 1977) Technical Manual Writing Handbook

MIL-HDBK-63038-2(TM) (May 1977) Technical Writing Style Guide

available from our lending library

NBSIR 74-946 (April 1978) The National Measurement System for Ionizing Radiations

new and revised 062 part number standards (now available from Reprographics, ext. 5577)

062-3099-00 Drafting Standards - Engineering Change Order (ECO) has been reformatted and revised. All sheets are now revision A. The changes are: sheet 3, paragraph 5.e added; sheet 4, paragraph 7.2e reworded; and paragraph 7.3 changed.

062-1874-00 Drafting Standards - Line Conventions and Letters has been revised effective 24 May 1978.

for information on the above publications, please call Carol Whitmore, Technical Standards, ext. 7976.

Technical Standards staff change notice

Technical Standards is pleased to announce the addition of Carol Whitmore as our group secretary. She will be replacing Carol Schober, who has taken a position with a group moving to Vancouver.

Chuck Sullivan, Technical Standards

Technical Standards, continued

new publication received

Technical Standards now has a copy of X3/TR-1-77, **American National Dictionary for Information Processing,** published by the Computer and Business Equipment Manufacturers Association committee X3. It is based on an American National Standards Institute publication X3.12-1970 and contains an extensive listing of terms adopted by the International Organization for Standardization. The copy is available for reference in the Technical Standards area or copies may be ordered. Cost is $8.00.

Chuck Sullivan, Technical Standards

NASA Tech Briefs, Vol. 3, No. 1 now available

NASA Tech Briefs, Vol. 3, No. 1 is now available for perusal in the Technical Standards area, 58-187. Among the many articles are: "New Tool for Preparing Aluminum for Welding," "Using Nylon Screws for Coil Forms" and "A Bench-Top Soldering Jig for EC Boards."

Chuck Sullivan, Technical Standards

Tektronix Standard 062-1701-00

This standard was issued June 1, 1978, and covers the proper use of trademarks, trade names, copyright notices, disclaimers and proprietary content statements for Tektronix, Inc.

Questions regarding the application of trademarks to Tektronix products should be referred to the appropriate Industrial Design Group. Questions regarding the legal application of interpretation of trademarks, copyrights and other proprietary matters should be referred to Patents and Licensing. The responsibility for decisions regarding the overall use of trademarks is the function of the Graphic Guideline Committee.

Carol Jones, Technical Standards

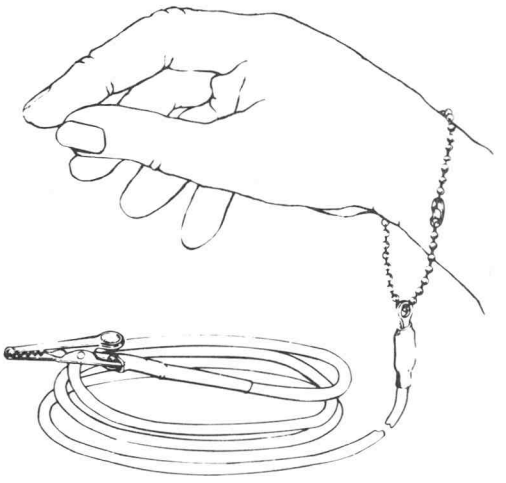
New anti-static wrist strap available

A more comfortable and durable anti-static wrist strap is now available (Tek P/N 006-2404-01).

The wrist strap is worn by the operator, and attached by an alligator clip to an anti-static work surface (see illustration). A 280 KΩ resistor protects sensitive components from electro-static discharge (ESD).

The wrist chain is adjustable, and should be worn loosely around the wrist. To be effective, it must be worn in contact with the skin, but not touching any clothing. Price for the wrist strap is $4.50 each.

For more information, contact **Sil Arata (ext. 6585) or Glen Johnson (ext. 7128).**



ComponentNewsNewComponents

This column is designed to provide timely information regarding new components, vendors, availability and price. "New Components" can also be used as an informal update to the Common Design Parts Catalogs. Samples may or may not be available in Engineering Stock.

Vendor	No.	Description	When available	Tek P/N	Approx. Cost	Engineer to contact
		analog devices				
National, Signetics	LM393N	Low power, dual voltage comparator (½ of LM339)	June (stock)	156-1225-00	$ 0.50	John Hereford, 6700
AMD, National, Signetics	LM319D	High speed, dual voltage comparator, ceramic package	June (stock)	156-1226-00	2.00	John Hereford, 6700
TI	TL087C	JFET-input op amp, 0.5mV offset voltage maximum	now (samples)	no P/N	negotiable	John Hereford, 6700
TI	TL066	Power programmable JFET op amp	now (samples)	no P/N	——	John Hereford, 6700
Hybrid Systems	DAC392C-12	Very fast hybrid 12-bit voltage output D/A	4-6 wk.	no P/N	129.00/ thousands	Don Gladden, 6700
Motorola	MC10318L	8-bit 10nS D/A	4-6 wk.	no P/N	26.00/ hundreds	Don Gladden, 6700
Raytheon	4200	High accuracy multiplier	now	no P/N	2.75	Don Gladden, 6700
AMD	AM6070	Compounding 8-bit DAC	now	no P/N	9.50	Don Gladden, 6700
AMD	LF398	High accuracy sample and hold	June	no P/N	3.50	Don Gladden, 6700
AMD	AM6080	High-speed μP compatible 8-bit D/A	Sept.	no P/N	5.00	Don Gladden, 6700
Beckman	7545	CMOS μP compatible 12-bit D/A	now	no P/N	20.00	Don Gladden, 6700
		digital devices				
Motorola	6821	Peripheral Interface Adaptor	now	156-0427-03	——	Bill Pfeifer, 6303
Harris	HM6514	1Kx4 CMOS RAM	now	no P/N	16.00	Wilton Hart, 7607
Intel	2147	4Kx1 high-speed HMOS RAM (t_{ACC} = 70 nS)	now	156-1228-00	——	Eric Peterson, 6302
		electromechanical devices				
EAC	RX-1-5-Y	SPST reed relay	soon	148-0122-00	3.44	Paul Johnson, 6365
Die Tech	5023	.034" gap x .340" L hybrid terminal lead	now	131-2283-00	0.05	Peter Butler, 5417
Ferroxcube	991-430-00	Terminal for bobbin	now	131-2297-00	0.01	Peter Butler, 5417
Ferroxcube	991-170-00	PC terminal for bobbin	now	131-2302-00	0.01	Peter Butler, 5417
Ferroxcube	——	EC-70 bobbin	now	276-0249-00	——	Byron Witt, 5417
ITT Cannon	DA-15P-F179A	25-pin male subminiature wirewrap	now	131-1744-01	3.56	Peter Butler, 5417
T&B	22L006	Insulation pierce magnetic wire crimp connector	now	131-2299-00	0.08	Peter Butler, 5417
Berg	65039-36	1x1 minilatch housing	now	352-0545-00	0.12	Peter Butler, 5417
Berg	65039-32	1x5 .100" ctrs minilatch housing	now	352-0548-00	0.22	Peter Butler, 5417
Berg	65039-31	1x6 .100" ctrs minilatch housing	now	352-0546-00	0.23	Peter Butler, 5417
Berg	65039-29	1x8 .100" ctrs minilatch housing	now	352-0544-00	0.27	Peter Butler, 5417
Berg	——	2x7 .100" ctrs minilatch housing	now	352-0537-00	0.52	Peter Butler, 5417
AMP	1-87175-4	1x6 .100" ctrs locking clip housing	now	352-0547-00	0.41	Peter Butler, 5417
AMP	——	2x7 right angle open header	now	131-2306-00	0.57	Peter Butler, 5417
Switchcraft	D4M	Male, panel mount, 4-pin audio connector	now	131-2310-00	1.08	Peter Butler, 5417
Switchcraft	L4MN	Male, panel mount, 4-pin audio to mike adaptor	now	131-2308-00	1.58	Peter Butler, 5417
Switchcraft	B4M	Male, panel mount, 4-pin, round audio connector	now	131-2309-00	1.58	Peter Butler, 5417
Textool	220-0336-51-0605	21F 22-pin IC socket, 7" handle	now	136-0713-00	9.40	Peter Butler, 5417

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
✓	no Tek P/N	Texas Instruments	9902 UAR/T	Bill Pfeifer, 6303

John Lewis discovered that the TI 9902 Universal Asynchronous Receiver/Transmitter (UAR/T) seems to have a problem with cross-talk between the CRUCLK and the CE inputs, when the high level of the CRUCLK signal is 4V or greater.

TI is investigating the problem, and until it is resolved, we recommend limiting the high level of the CRUCLK signal to 3.5V.

✓	no Tek P/N	Motorola	General Purpose Interface Adaptor	Jim Howe, 6303

Two application notes regarding the MC68488 GPIA and some of its problems are available from me at 58-125, ext. 6303.

Microwave system proposed

Tektronix, Inc., is considering acquiring a private microwave radio system to provide voice and data communications between TIP, WRIP, Wilsonville and Vancouver.

A portion of the channel capacity will be dedicated to digital data service. Eight wide-band channels from TIP to each of the three other locations is planned. Each channel will accommodate 64 kb/s asynchronous data rates directly, or accept the input/output of data multiplexers.

In order to configure the system efficiently, your assistance is requested in determining current and anticipated data transmission requirements. Please review your needs and respond to Gary Croff (55-283), ext. 5045.

Norm Babcock
Microwave Project Manager

Technical editors appointed

Technical Communications exists to help you communicate with manufacturing and engineering areas at Tektronix. To facilitate our response to your needs, I have restructured our editorial responsibilities to provide a central contact for each publication.

Component News and the **Engineering Sourcebook** will be edited by Jacquie Calame. Mike Quigley, formerly industrial editor with Bingham Willamette Company, will edit **ManuFACTuring.** Contact Lola Janes for **SEMINARS** and vendor data book distribution. Jacquie, Mike and Lola can all be contacted on ext. 6867 or 5350.

We are also in the process of revising and developing various component and reliability application handbooks. If you have a special project or need some editorial assistance, please feel free to call me on ext. 6867 or stop by 58-299.

Carolyn Schloetel, manager
Technical Communications

94-344

~~39-311~~ I Dick Dunipace

COMPONENT NEWS

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Birdie Dalrymple, component illustrations

For article ideas on subjects which affect either purchased or Tek-made components, feel free to call on us on ext. 6867.

Deliver to:

For additions or corrections to the mailing list, call Lola Janes, ext. 6867.