COMPONENT NEWS
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FOR — Sampler ? Pulser ?
A/D — ?

A 500 ps strobe uses 4¢ diode

The circuit below was developed as a possible low-cost alternative to using an avalanche transistor in medium-high speed strobe applications.

A snap-off diode appears to be the next best alternative to avalanche transistors, but they can be expensive. We currently have a $4 snap-off diode part numbered with the possibility of a $2 part in the mill. So, because of expense I looked into one other avenue of approach.

What are the snap characteristics of a signal diode? I found what appears to be a stable characteristic in fast signal diodes. By generating enough stored charge and switching the diode off rapidly, snap times approaching 300 picoseconds could be generated using a 152-0141-02 diode.

For best snap-off performance, the pulse driving the snap diode must have a transition time less than the storage time of the snap-off diode. Typical snap-off diodes have a longer storage time than switching diodes and so do not require as fast a pulse to drive them.

The circuit below was developed using the 152-0141-02 as a snap-off diode. Your response might be: "So a few -0141's did what you wanted. Snapping them relies on undefined parameters in a very general-purpose diode."

The 152-0141-02 is not the only diode that will work in this circuit. The 152-0333-00, 152-0245-00, 152-0233-00 and 152-0574-00 all work with near identical results. These diodes are from several different manufacturers, different families, and different processes.

One might conclude that almost any small signal silicon junction diode in the two to four nanosecond reverse recovery time range would work in this circuit. So far they have.

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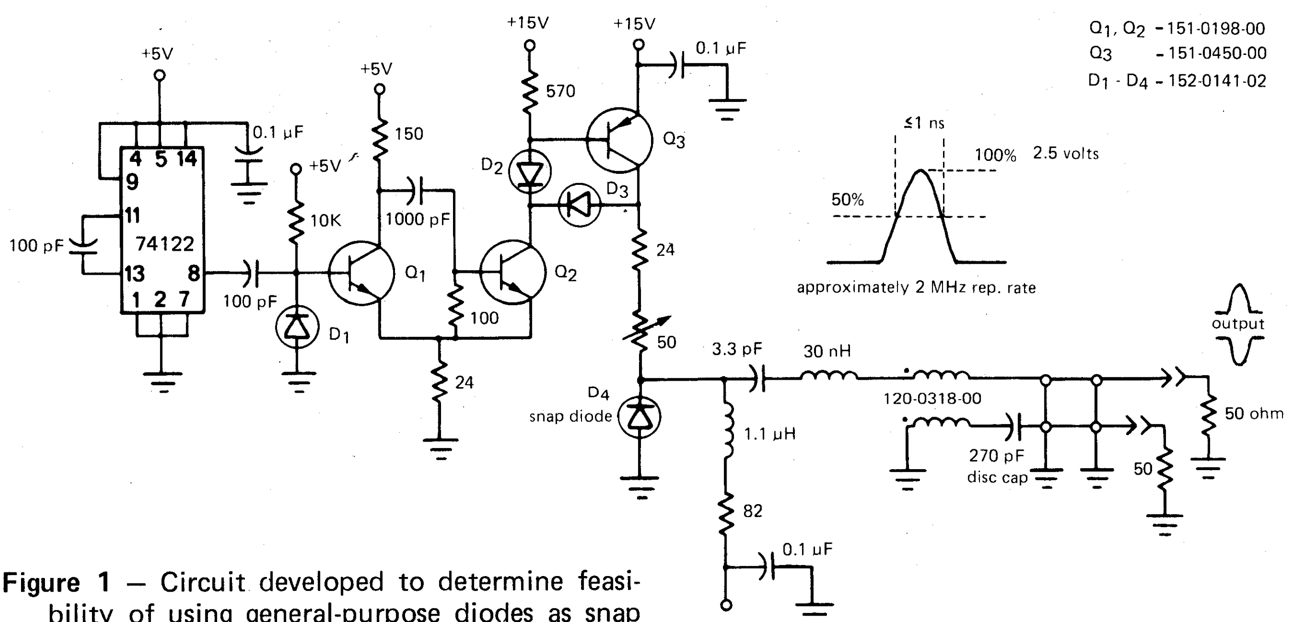

Figure 1 — Circuit developed to determine feasibility of using general-purpose diodes as snap diodes for strobing sample and holds.

Parts cost around $3 (excluding oscillator).

continued from page one

The test circuit uses a 74122 one-shot in a free running mode to generate the strobe pulse. The repetition rate is approximately 2 MHz.

This signal drives a couple of 151-0198-00 transistors in a Schmitt trigger. The schmitt is AC coupled so that it really acts as a fast one-shot.

The output is current driven into a 151-0450-00 which acts as a buffer to drive the snap diode. The diodes on the collector and base of the -0450 keep the transistor from saturating and wasting power in slow recovery.

While the -0450 is cut off, the snap diode is forward biased with about 50 mA. When the -0450 is turned on, it rapidly pulls the stored charge out of the diode, causing it to snap at the end of the storage time (around two nanoseconds).

The edge is then coupled through a "semi-tuned" differentiator to a balun. The balun acts as a phase splitter, giving complementary outputs. Due to the capacitive coupling, these outputs are floating for dc biasing purposes.

The amplitude can be adjusted from two to three volts with 2.5 volts as the design center (50 ohm loads).

If necessary, symmetry can be adjusted by slightly mis-matching loads.

The pulse width at 50% of amplitude is 1 ns. With a four volt bias across the outputs giving a one volt overlap of the pulses (see scope trace), the cross-over is 500 picoseconds.

If you are interested in playing with this test circuit, there is film work available for an EC board. Questions and comments are welcome.

Robin Larson, ext. 6511
Component Applications

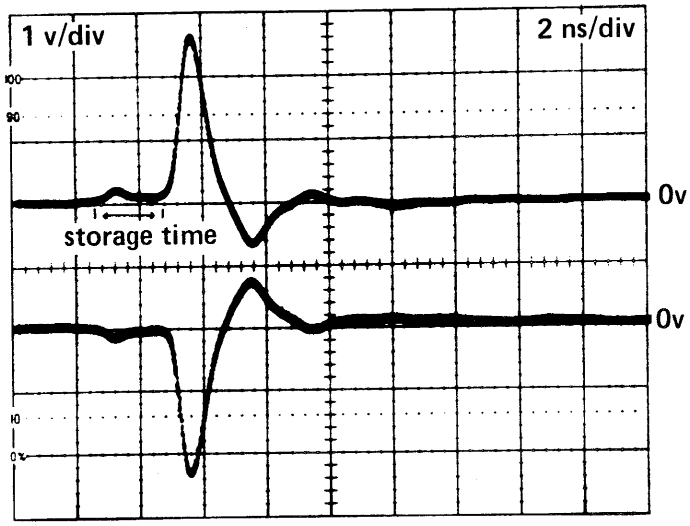

Figure 2 -- Complementary outputs

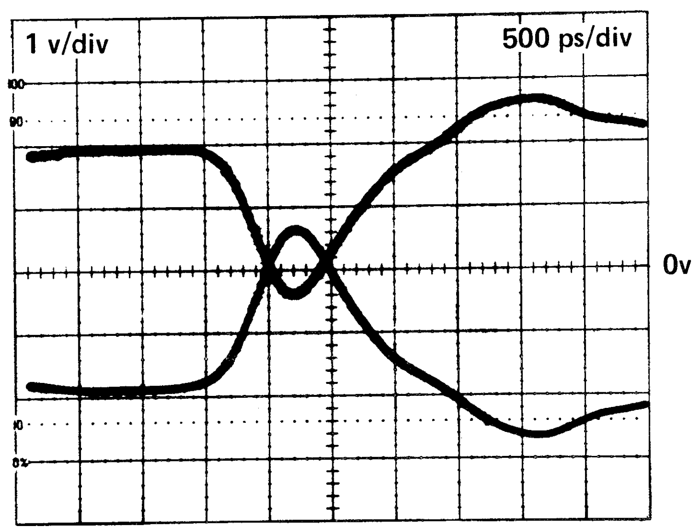

Figure 3 — Strobe output biased for 1 volt overlap

Note: For information on purchased diodes, contact Gary Sargeant, ext. 5345, in Component Evaluation.

DISTRIBUTION OF SPECIFICATIONS

At one time our department produced and issued specification drawings for purchased parts. At the same time, "Tekmade" parts specifications were issued by the central reprographics department for all other Tek drawing groups.

Rather than having two groups doing the distributing, it has been our goal to have all drawings filed and distributed by the same department. This change is nearly completed.

Copies of purchased item drawings (specs) are now available from Central Reprographics Dept. at 58-038, ext. 5577. Any requests for copies of specs should be directed to Reprographics.

Aperature cards have also been made on these specifications and can be viewed in the satellite film drawing file locations.

Fred Schade, ext. 7374
Documentation

New line of fuses, fuseholders introduced

A European manufacturer, Schurter, is now introducing in the United States a complete line of fuse holders, line selectors, and fuses.

This line is built to meet the European Safety Standards of VDE, SEMKO, and IEC so it is timely for our overseas sales.

Some of Schurter's products include a convertible fuseholder from 3AG, UL-approved fuses, to 5 x 20 mm DIN approved fuses. The fuseholder will mount in the standard ½" hole we punch for American fuseholders. The convertible part is the fuse cap so one extra part is necessary to make the change.

Schurter is also UL approved on this fuseholder. In the past, the 5 x 20 mm DIN fuses have not met UL approval. But, Schurter is now making the changes so that their 5 x 20 mm fuses will meet the standards of UL for time blowing characteristics.

To meet the stringent requirements for office equipment (layman operated) Schurter has a "touchless" type of fuseholder, also convertible from 3AG size to DIN size. This fuseholder has a larger diameter than standard so it is recommended only for new instruments.

Schurter also has a line of splash-proof, immersible fuseholders for military requirements.

Their line selectors will have six positions marked for three voltages at 115 VAC and three voltages at 240 volts AC. One of the line selectors has a built-in fuseholder.

Catalog data and some samples are available. More samples are on the way.

Verne McAdams, ext. 6365

upcoming technical seminars

General Instruments — Microprocessor

The Micro-Electronics Division of General Instrument Corporation will present a technical seminar covering their new single chip, 16-bit microprocessor (N-Channel, ion implant, MOS, LSI) on Wed, **October 8th** at 1:15 pm in the auditorium of Building 50.

Jim Halligan, manager of the microprocessor application/engineering department will provide engineering and application details.

For further information, call George Roussos in Engineering Purchasing, ext. 7927.

Texas Instruments — Microprocessor

Texas Instruments will give an in-depth presentation on their 16-bit N-channel MOS microprocessor (TMS9900) Monday, **October 13th** from 2 to 5 pm in Bldg. 50 auditorium. Jerry Moffett, marketing and Dean Ogden, design engineer, will represent TI.

Bill Lowery, ext. 5865

Fairchild — CCD Arrays

Dr. Gil Amelio of Fairchild Semiconductor will present a seminar at Tektronix, Monday **Oct. 20th** from 1 to 4 pm in Bldg. 50 auditorium. Dr. Amelio will discuss Fairchild's effort in linear and digital CCD arrays.

Ron Huntington, ext. 7262

New part numbers have been assigned for UL approved circuit board material. After processing, the flame rating of this material will be UL 94 V-2 or better. For more information, call Richard Nute, ext. 6649, or Wally Doeling, ext. 6581.

MULTILAYERED MATERIAL		
254-0608-00	.0025 x 12 x 20	.5/0
254-0609-00	.004 x 12 x 20	1/1
254-0609-01	.004 x 12 x 20	1/0
254-0610-00	.006 x 23 x 20	1/1
254-0610-01	.006 x 12 x 20	1/0
254-0611-00	.008 x 12 x 20	1/1
254-0611-01	.008 x 12 x 20	1/0
254-0611-02	.008 x 12 x 20	4/4
254-0612-00	.010 x 12 x 20	1/1
254-0613-00	.012 x 12 x 20	1/1
254-0613-01	.012 x 12 x 20	1/0
254-0614-00	.015 x 12 x 20	1/1
254-0614-01	.015 x 12 x 20	1/0
254-0615-00	.025 x 12 x 20	.5/0
254-0615-01	.025 x 12 x 20	1/1
254-0615-02	.025 x 12 x 20	1/0
254-0615-03	.025 + 0.002 x 12 x 20	1/1
254-0616-00	.031 x 12 x 20	1/1
254-0617-00	.056 x 12 x 20	.5/0
TWO-SIDED MATERIAL		
254-0620-00	.025 x 13 x 20	1/1
254-0621-00	.031 x 13 x 20	1/1
254-0621-01	.031 x 13 x 20	0/0
254-0622-00	.056 x 13 x 20	1/1
254-0623-00	.062 x 13 x 20	1/1
254-0623-02	.062 x 13 x 20	0/0
254-0624-00	.093 x 13 x 20	1/1
254-0624-01	.093 x 13 x 20	0/0
254-0625-00	.125 x 13 x 20	1/1
PRE-PREGS		
254-0618-00	.0025 x 12 x 20	0/0
254-0619-00	.0045 x 12 x 20	0/0

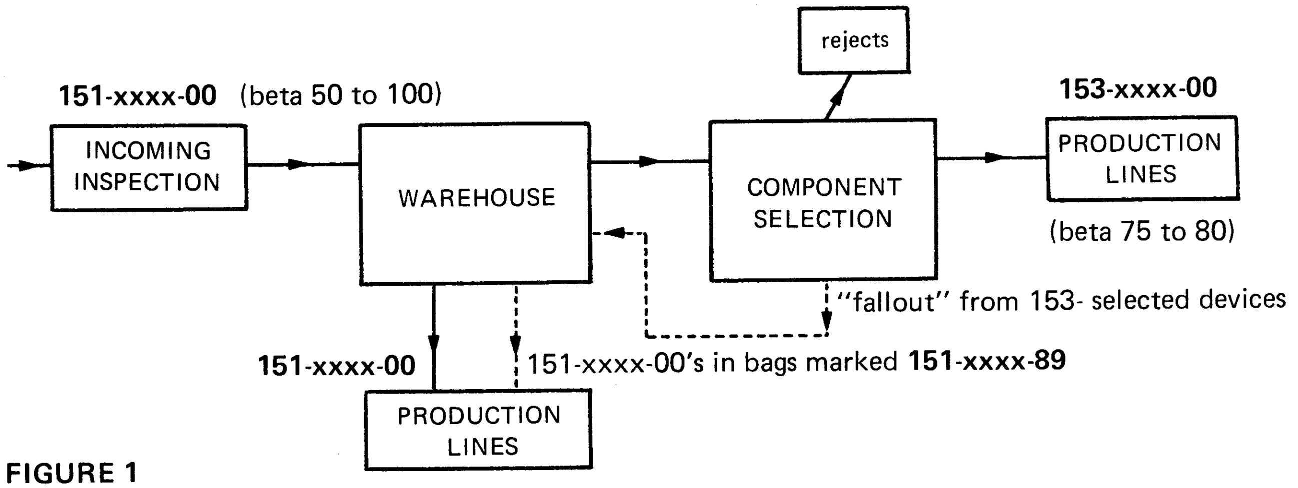

FIGURE 1

Avoid using selected components if possible

Using existing part-numbered components for new design has obvious advantages. These include:

1. generally lower cost due to increased volume
2. availability
3. known component history (failure rates, vendor quality, etc.)

When circuit design calls for components with parameter values different than those available, one alternative has been for Component Preconditioning and Test at Tektronix to select an existing part-numbered component for a particular parameter value. A typical example is the selection of a 151-xxxx-00 transistor for a beta between 75 and 80.

As shown in **Figure 1**, some 151-xxxx-00 transistors are sent to Component Selection and the rest go directly to production areas using the part. The number of transistors sent to Component Selection depends on:

1. the number of selected parts needed, and
2. the projected yield (i.e. how many devices will have a beta between 75 and 80).

Transistors with the desired beta are given a **153**-xxxx-00 part number and shipped to the appropriate production lines.

All other transistors are sent to 151-xxxx-00 using areas via the warehouse in bags marked 151-xxxx-**89**. The -89 suffix is marked on the containers to avoid screening those devices for beta again and again.

These 151-xxxx-00 transistors in -89 bags are NOT rejects but are in fact of higher quality than the parts sent directly to production areas. This is because the opens, shorts and other defective parts are automatically removed during the selection process.

Some production areas have returned devices in bags marked -89 to the warehouse as rejects, failing to understand this selection process. However, by far the worst misconception about selected parts has to do with the associated cost.

Figure 2 includes relevant usage and price figures for a typical component. Specific prices and part numbers are withheld to protect the innocent.

Suppose that 1k 153-xxxx-00 selected transistors are needed per period and the expected selection yield is 50%. Therefore, 2k devices must be screened by Component Selection to meet the demand.

In screening the 2k 151-xxxx-00's, Component Selection entails a labor charge of around 3¢ per 153-xxxx-00 device. (Labor charges run anywhere from 2 to 5¢ for each selected device.) The total cost of the selected part in this example is 28¢.

If all goes well, the "fallout" devices are routed back to the warehouse as -89's and used in production lines at 25¢ each. But you guessed it — "If" is a big word.

Figure 3 shows what generally happens two or three years after the selection process for a component was initiated. Notice the following changes:

1. The selected part has become popular and its usage has increased from 1k devices per period to 5k devices/period.

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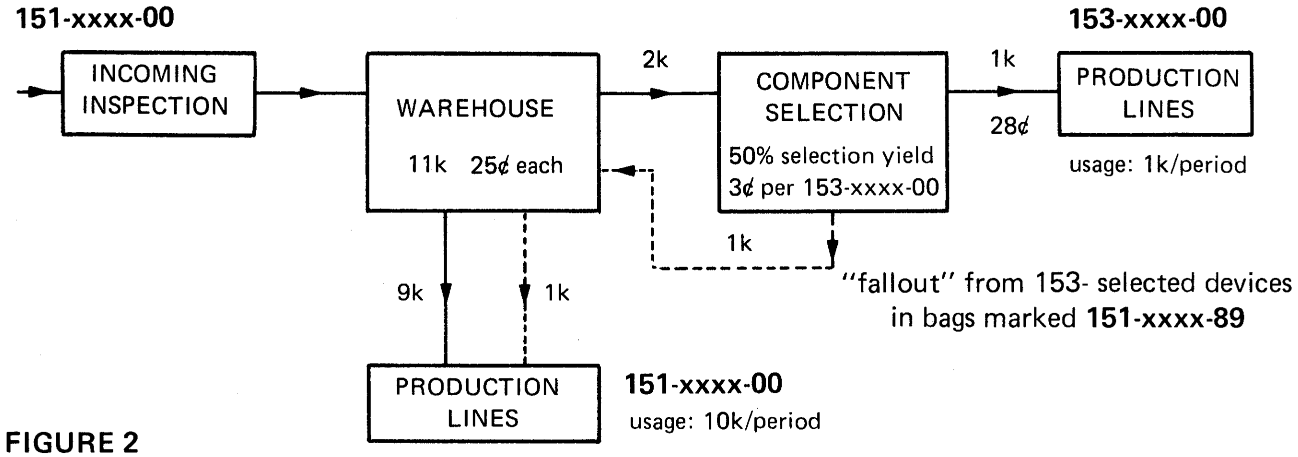

FIGURE 2

2. The selection yield has dropped from 50% to 10% because of minor process changes. The vendor's part nonetheless still meets our original min. and max. beta specs.
3. The demand and usage of the original 151-xxxx-00 device we select from has declined from 10k devices/period to 1k/period.
4. The cost of the raw part and the labor charge have both increased.

In this example, Tektronix is accumulating 151-xxxx-00 transistors at the rate of 44k devices per period. Though not all cases are as drastic, the trend certainly exists. We currently have around $160k worth of discrete devices in surplus stock.

In light of this information, Tektronix has taken several steps to ensure that this problem will not reoccur. Effective immediately:

1. Any new selected component request will not be processed unless authorized by a Component Evaluation manager. This is to ensure that the actual cost of the selected part is known and that all other alternatives have been investigated.
2. Expected yield rates and all other hidden costs will be included in the cost of the selected component. For the example given, the actual cost, C_a, is:

$$C_a = (\text{raw cost} + \text{labor charge}) + \frac{(\text{surplus stock})(\text{raw cost})}{\text{no. of selected devices}}$$

$$C_a = 30¢ + 5¢ + \frac{44{,}000 \times 30¢}{5000}$$

$$= 35¢ + \$2.64 = \$2.99 \text{ per selected device}$$

3. Vendors will be queried to see if they can select components. Tek will select any parts where it is economically feasible to do so, but all costs will be computed and weighed before deciding to select in-house.

For further information, contact Dennis Crop, manager of the discrete semiconductor group in Component Evaluation, ext. 7268; Bernie Dwigans in Component Preconditioning and Test, ext. 7648; or Loyal Strom and Dick Borts in Purchasing, ext. 6196.

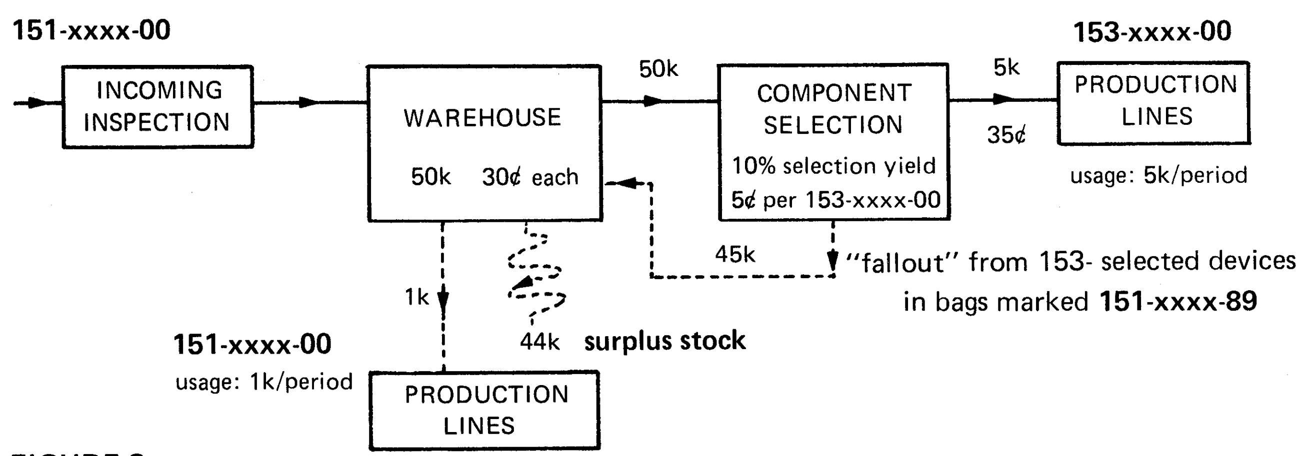

FIGURE 3

260-1709-00 switch problems encountered

Some failures of the 260-1709-00 power switch used in the 7834 have been reported. These failures were attributed to water absorption of the nylon actuator and corrosion of the latch spring.

The failure mode has been stickiness of the actuator and latch spring during the high humidity, high temperature tests (MIL E 16400F or Tek Standard 3).

This problem was noted in the original evaluation of the switch and the vendor was contacted to eliminate these problems. And, our specification was written to cover these problems.

A reliability inquest uncovered two factors contributing to the recent failures:

1. The vendor never received the specification.
2. The vendor discovered the problem with the nylon actuator and was in the process of tooling up for a different plastic. (Valox is being considered.)

Component Evaluation has done the following in response to these problems:

1. Instigated inquiries into an alternate source
2. Reviewed and updated specifications
3. Notified vendor of the nylon actuator and latch spring problem. Sent samples of rejects.
4. Checked for field failures in the 7613, 7623, and 7633 (only two failures in past year).
5. Insured that forthcoming components will have plating on the latch spring. Negotiations are still pending on the change of the plastic actuator.

The final solution for these problems will be to change the latch spring to stainless steel, or equivalent, and to change the plastic actuator to a non-hygroscopic, non-flammable plastic.

For further information, contact me in Component Evaluation, ext. 6365.

Verne McAdams

BME machine-insertable caps now cost even less

We anticipate a new interest in "base-metal-electrode" monolithic ceramic capacitors due to a substitution of a cheaper, proprietary metal in place of the precious metal (palladium or platinum).

In fact, U.S. Capacitor Corp. recently announced immediate availability of a new line of monolithic capacitors made without the precious metal. This development makes it more feasible than ever to use the machine-insertable capacitor in place of the "discap" and the "dogbone" in new circuit design.

Price comparisons are shown in the chart below:

Many other manufacturers are now testing their own versions of the "BME" made with the less expensive metal. Though price changes are favorable we are not sure of performance and quality. Some companies have reported problems to us, such as de-lamination and oxidation of the electrode. These problems are serious.

We are evaluating these monolithic capacitors and expect to make application and/or usage recommendations in November.

For more information, contact Joe Yuen in Component Evaluation, ext. 7264.

Rating	Machine Insertable Standard	Machine Insertable BME	Cheapest hand-inserted capacitor
10 pF +5%, NPO	10 ¢	7 ¢	5 ¢
0.01 μF +20%, X7R	15 ¢	6 ¢	5 ¢
0.1 μF −20% +80%, Z5U	15 ¢	9 ¢	5 ¢

PLEASE NOTE

The Leeds & Northrup temperature pot has been missing from Component Evaluation for some time. The serial number is 170476, cal number 1205.

If you know or learn of its whereabouts, we'd appreciate its return. Please call Virg Tomlin, ext. 7709 or Carol Zlab, ext. 5413.