# *Measurement systems offer answers to complex problems*

area rep employees report

**Bob LeBrun, Manager**
**Measurement Systems**

*Bob gave a brief slide presentation showing different systems configurations, and the instruments used for them, then opened the meeting for questions.*

An example of what a system does was shown as a picture of a trace on an oscilloscope and another picture of what the trace looks like after it's processed through a computer. The Digital Processing Oscilloscope that we use for this is a kind of system. Part of the Digital Processing Oscilloscope is a 7704A scope with a digitizer added in the middle. It uses a mag tape cassette that works with the computer.

Add a hard copy unit from Tek's own IDD product line and you have another systems package. The hard copy unit is more practical than a computer line printer and can do graphs which the line printer can't.

A system can be set up to use a Tek programmable calculator instead of a computer; we can also get graphic output from this system.

Tek's transient digitizer offers capability unique to Tektronix. Bandwidth is similar to a 7904 scope, and the instrument can sample as close as every 10 picoseconds in real time, then convert to binary bits—up to 512 without stopping. A digital display controller turns the information back to an analog signal that can be shown on a

Automated testing of ICs involves relatively complex systems. Sector cards are often used, one or more for each pin on the IC. One sector card can cost about the same as a complete oscilloscope.

We said in some of the questions-and-answers that the larger systems such as the S3260 typically might run around $250,000, but these can cost as much as half a million. It depends on what the customer needs.

It's our intention to provide solutions to customers' problems. The customer might, for instance, be trying to produce a brand-new device just designed—he then wouldn't even know yet what his problems are, when we first start talking with


*ABOUT 350,000 components make up this S3260 system, valued up to half-million dollars.*

We apply a lot of effort to analyzing problems.

Systems looks at the Tek catalog, and those of other equipment manufacturers, as containing building blocks for what we put together.

A computer might be called the dumbest clerk in the world. Computers would make good soldiers; they follow what you tell them exactly and don't worry about whether or not it's what they really should do, or what you really want them to do. It's a big problem telling the computer exactly what you want so there's no misunderstanding. That's why we put a lot of engineering effort into software.

*BOB LEBRUN*
*Guest Speaker*

## Questions for Guest Speaker

*How many people are there in Measurement Systems? Do you have many field people, or are most of your employees in Beaverton?*

There are approximately 300 employees in marketing, manufacturing and engineering combined. Only a couple dozen of these are located in the field.

*What exactly is a measurement system?*

In a very general sense, a measurement system can be viewed as a collection of several individual pieces of electronic equipment plus software. These are connected together to perform measurements that could not be made by any of the pieces alone (or even by smaller collections). The equipment involved, typically, includes some test and measurement items such as oscilloscopes and digital voltmeters. It also includes either a minicomputer or programmable calculator together with peripherals such as a computer display terminal and magnetic tape cassette or disk.

Not all systems are 'measurement' systems. Even within Tektronix we have another kind; information systems. These are handled by our Information Display Division.

Perhaps a brief description of the different kinds of measurement systems we are presently involved with would clarify:

The Digital Processing Oscilloscope supplements normal oscilloscope performance by adding computations to change the raw data acquired into information that is easy to interpret. Before a computer or calculator can perform computations, the waveform must be digitized. The TEKTRONIX P7001 Processor, a part of the Digital Processing Oscilloscope, was designed to accomplish this function.

The S-Series of Automated Test Systems is best characterized as fully automatic equipment for testing integrated circuits (ICs). LSI CPU chips and semiconductor memories are examples of rapidly growing applications. These systems include fixtures to connect the devices being tested to the electronics which stimulates them and the electronics making the measurements. There are several families within the S-Series ranging from the S-3100 Series of benchtop testers to the S-3260 Series for complex ICs.

The Waveform Digitizing Instrument Series is based on the TEKTRONIX R7912 Transient Digitizer. This very state-of-the-art instrument makes it possible to digitize a point on a waveform every 10 picoseconds; 1000 times faster than any competitive instrument.

Overall, measurement systems views the entire Tektronix catalog, and to some extent other companies' catalogs, as a supermarket full of electronic equipment available as building blocks. We use these blocks to design and build solutions to customer's measurement problems.

*When you more or less custom-design a system, will it still be useful for a certain number of customers with similar needs? If so, about how many might be typical?*

The potential market for a particular system configuration is one of major consideration when we decide whether or not to bid on a custom-design. Another is how much custom-design is involved. A small amount of one-shot engineering may be worthwhile for a single sale. A large amount would not be a good investment. Because of these variables, it's really impossible to generalize how many sales of a configuration are typical.

*Since you use instruments from all over Tek to combine into a system, do you have your own QC and reliability checks in addition to the usual ones?*

We perform a thorough QC and reliability of each individual system built. In a sense, this is in addition to the checks done by the original manufacturing area for each instrument. However, that's not the reason we do it. The system also includes electronic interfacing circuitry, interconnections, software and perhaps instrument modifications. These items would receive no QC and reliability under operating conditions if we failed to check the total package.

*How much money is involved in a typical system?*

System prices range from $20,000 to over $500,000. The average price for a Digital Processing Oscilloscope and for a Waveform Digitizing Instrument system is about $50,000. For S-Series, the average is considerably higher because of the complexity of S-3260s. $250,000 might be typical.

*Do we use our own Tek-made systems in Tek production and engineering activities? Do you ever design a system specifically for Tek use?*

*LARRY BRINKLY*
*Conference Chairman*

Tek's IC Engineering area uses an S-3260. IC Manufacturing has several S-3150s. Digital Processing Oscilloscopes are used by several engineering groups. The S-3260 and S-3150s did involve a small amount of design specifically for them.

*If you need to mod an instrument that's already installed in a system, or modify the system itself, would you send someone out to do it in the field?*

If a fairly large system that's out of warranty needs modification, would you send someone out to do it? Technically, and perhaps even financially, isn't it more practical to repair a system on-site?

It normally is more practical, both technically and financially, to repair a system on-site. Most of this service is performed by service engineers who live in the field and are members of Tek's regular field service organization. Occasionally, we find it necessary to send a specialist from Beaverton to repair a system that incorporates a substantial amount of new design.

Modifications are usually handled by the field service engineers. Particularly complex ones sometimes require travel from Beaverton. Another technique is to return just the part of the system needing modification to the factory. This is practical if the amount of hardware involved is small and if we can find a way, such as loaning some equipment, to keep the customer's system operating.

*Having a separate sales force, how does Systems Marketing coordinate with other Tek marketing people? How do you handle it if a systems customer wants help on an oscilloscope problem?*

There is an excellent spirit of cooperation between all of the separate sales forces at Tektronix. This ensures that the customer's inquiry or problem—whatever the product concerned—is rapidly responded to by the appropriate field personnel.

In addition, the individual sales groups work together in demonstrating the full range of products to customers both in group presentations and to individual users.

Almost without exception, 'System' customers are also 'oscilloscope' customers. With the considerable use of oscilloscope technology in Measurement Systems, our sales engineers can answer many of the 'oscilloscope' questions. The customer's inquiry is then passed on to the appropriate Measurement Products field engineer for his specialized help.

*In a small single instrument, say a scope that sells for around $1800, you have a certain profit margin that's probably typical of most oscilloscopes; does a big-ticket item like a system have a similar margin?*

Yes, average systems do have profit margins comparable to oscilloscopes. However, the spread is probably greater among systems than among scopes. I'd attribute this mostly to the amount of customizing in any particular system and sometimes to competitive factors.

*How many years before a system sold today would become obsolete in terms of current technology?*

Probably about 10 years in terms of how long a particular system shipped today would be useful to its owner. However, the exact content of a system, say a TEKTRONIX S-3260, is continually evolving.

This results from improvements made to solve customer problems and from newer models of equipment used within an S-3260. This evolutionary improvement process causes the model of a few years ago to be obsolescent relative to today's newly manufactured model.

*Do we have environmental problems with systems sent overseas to countries with extreme climates? What are the problems of shipping a complete system overseas?*

It doesn't really make much difference whether a system is shipped to the East Coast or across the water. In either case, careful (and expensive) crating and on-site installation by people from Beaverton are necessary. Naturally, shipping time and expense are greater overseas, as are the procedural requirements associated with importing. So far, none of our international installations is in more severe environments than our U.S. ones.

*Do we ever use a portable scope in a system? Do we mainly use 7000-series scopes in systems?*

To date, the scopes we have installed in systems have all been 7000-series with one major exception, the R568. The R568 is frequently used because it accepts Tek's programmable plug-ins, the 3S6/3T6.

*Do we buy cassettes for the software from other companies? If so, why aren't we making our own?*

Some of the magnetic tape cassettes used in Tek systems are purchased from other companies, and some, such as that used in the Tek's programmable calculator, are built in-house. The make-or-buy decision is made specifically for each model based on economic analysis. When our projected volume is small, it is usually less expensive to purchase outside.

*Are systems sales on an increasing curve?*

Yes.

*Do customers who cancel orders pay a penalty?*

We haven't had any systems cancellations recently. If we do, the penalty will depend on how much work we'd already invested at the time of the cancellation.

*Will Tek ever make its own computers?*

I don't know; we consider it periodically. Our programmable calculator is much like a computer.

*About how many measurement systems has Tek sold?*

I'll have to just say more than a few hundred—getting more explicit for publication would be very interesting to the competition.

*Do we go back to the customer in six months or so and ask for opinions and suggestions after they've used their Tek system a while?*

Yes, but it's in less than six months. We're in touch continually for several months after installing a system.

*How good is the reliability of Tek systems?*

Fair. The problems are big and complex compared with servicing, say, a scope. Our S3260 has some 350,000 components. The laws of statistics suggest that you definitely will have some failure problems. We go to great lengths to pre-screen components and re-assess design, but some failures are unavoidable. We have a board exchange system to keep the customer's equipment up and running without delay; the customer sends a defective board back to the plant and we supply a good one without waiting to repair his.

*Are there a few basic models that we modify for most customers, or are all systems customized?*

We can't sell only standard configurations, but we're working toward as much standardization as possible. The practicality of it all depends on how much engineering is needed to customize a certain way, and on the likelihood of future demand for that feature.

*Isn't the waveform digitizer we make incomplete—an instrument that can't do anything by itself?*

The R7912 won't do anything all by itself, just as an oscilloscope plug-in won't. Some customers have existing equipment that they plan to use it with.

*Do we purchase equipment such as computers for customers who need that kind of help, or just direct them to manufacturers?*

We do it either way, depending on the specific problems involved.

*We use DEC computers with our system; DEC doesn't OEM our terminals even though they don't build their own, and I hear they don't give us a very good deal on their computers—so why do we keep buying from them?*

It sounds as if you've heard some false information. I believe we get good value from DEC in service as well as in products. DEC does make its own terminals.

*What does OEM mean?*

Original equipment manufacturer; it's a special kind of contract with a customer who buys your product and builds it into the product he manufactures. Tektronix offers some OEM contracts and takes advantage of some from other manufacturers.

*Who are some of our major customers?*

DEC is one, by coincidence. The phone company is another; there are several IC manufacturers and aerospace companies like Hughes and TRW.

*Does Rockwell show any interest?*

They have a Tek system.

*Does Tek make a robot for display purposes?*

That depends on what you'd describe as a robot; some of the equipment we make could be defined as robot in that it automates tasks that you'd otherwise expect people to do.

*How many competitors do we have?*

That's easy to answer for specific applications like IC testing; I read somewhere recently that we're number four in size in that particular business. It's very difficult to compare some of the others, like the transient digitizer, because there's no directly comparable competition. H-P has an automatic Network Analyzer, but neither the DPO nor the 7912 is directly competitive.

*Are there any installations large enough that we have to station someone there full time to nursemaid the Tek equipment?*

No, but we do have full-time persons stationed in several U.S. locations where various customers combined have enough equipment to justify it.