TELONICS QUARTERLY™

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Microprocessors

Learning to live with better products ... or how things become obsolete before their time.

Almost every scientist in today's world uses various "small" computers as part of their day-today work. Many researchers use desktop computers in their offices and portable systems in the field. These products have evolved rapidly over the past 10 years and it seems every couple of months a brand new product comes out which is faster, more powerful, and capable of applications which were previously only dreamed about.

This rapid evolution in computer technology is being fueled by the development of new microprocessors which are used inside these machines. The newest rage in desktop and portable computing is the Pentium and the Power PC technology. The competition is fierce and the price of these technologies comes down dramatically as competition continues to increase.

As most all of you are aware, the consumer electronics industry utilizes various microcontrollers (i.e. microprocessor PLUS memory and peripherals like input/output devices, timers and clocks). Microcontrollers are found in automobiles, toys, stereo equipment, communications equipment, and a whole slew of other applications which support the consumer electronics industry.

At Telonics, we have used similar technologies in the development of our PTTs (ARGOS satellite transmitters) and receiving systems (both conventional VHF Receivers and Satellite Uplink Receivers). Back in the early 1980s, we were one of the first manufacturers to utilize microprocessor technology in the digital control section of our satellite transmitter electronics. Microcontrollers afforded an unheard of flexibility in programming units to do specific tasks in the field. They also offered a low power solution to extensive discreet integrated circuit networks. That's the good side.

As technology marched forward, the older microcontrollers became obsolete and eventually unsupported by their manufacturers. The new became old.

This phenomenon is now rippling through the telemetry field. Although we have purchased extensive stock of many of the microcontrollers we use in our applications, several are becoming obsolete. The manufacturer is no longer producing the silicon, and ultimately the microcontrollers used in some applications will have to be replaced with new technology. That's great for the customer who plans to apply the new technology as it becomes available, but it does create certain problems for individuals who wish to refurbish existing units. Note: Some researchers refurbish units again and again for as long as 15 years. In today's world, this is an incredible product lifetime.

One example of extended product life is the ST-3, a PTT that has been used in many configurations over several years. On board the ST-3 is the microcontroller which includes ROM, or Read Only Memory, in which the main application program is place. This ROM is a nonvolatile residence for many important programming parameters such as dutycycle, ID codes, and data sampling protocols which users help define for specific applications.

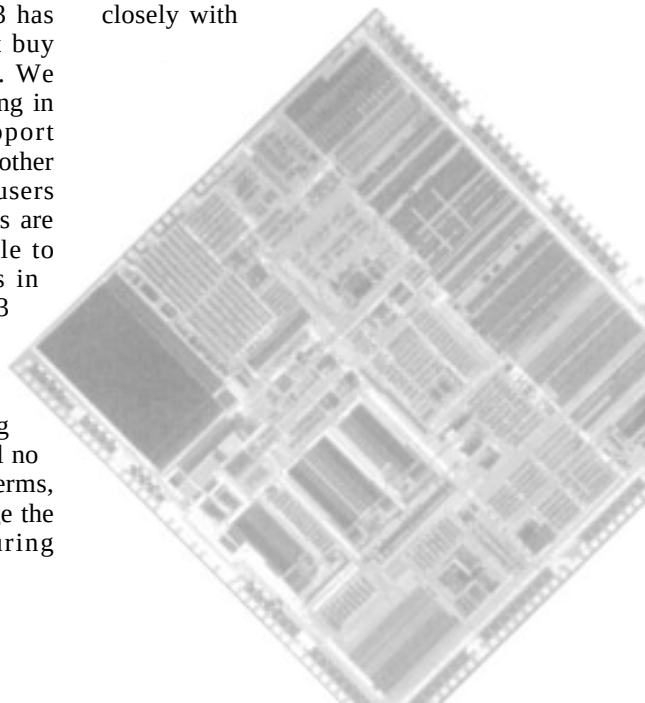
In order to change those parameters, it is necessary to replace the microcontroller installed on the ST-3 with a new microcontroller with updated parameters. Unfortunately, the microcontroller on board the ST-3 has now become obsolete; we cannot buy any more from the manufacturer. We have fewer than a hundred remaining in stock and will continue to support changes in duty-cycle and various other programming alterations which users require. When these few controllers are gone, it will no longer be possible to change programming parameters in existing ST-3 PTTs. While the ST-3 can still be used as long as employs exactly the same programmlng parameters which were originally installed, the existing microcontroller and its software will no longer be replaceable. In simple terms, you will no longer be able to change the duty-cycle of an ST-3 during refurbishment.

As you might expect, a new PTT has already been developed to replace the ST-3. It has many new features which will be described in a future newsletter and will be available in fall 1994. This next generation satellite transmitter, the ST-14, is supported by new microcontroller technology and will have an even lower quiescent power consumption than our existing ST-3. Many of the features will be excellent improvements over existing technology.

memory (e.g. ID code, duty-cycle, sampling rates and other features) without having to send the unit back to the factory for reprogramming. With the obsolescence of the microcontroller which carries onboard E2, this approach will be lost in the ST- 13. We are currently testing another alternative that will allow users to program their own units in the lab or in the field. In the interim, programming will need to be completed at our factory.

A similar problem exists with the TR-4 Conventional VHF Telemetry Receiver. Researchers will be able to utilize the same options they have been using all along, but programming the specific frequencies covered by the receiver will have to be accomplished at our factory until we have an alternative solution to the user programming issue for this unit.

At present our software and hardware engineers are working closely with



microprocessor manufacturers to select technologies which will replace older microcontrollers, provide additional capabilities to users, and which we can only hope will be available for a period of years. We are doing everything we possibly can in order to ensure that we maintain the features which you, as users, have come to depend upon.

Microcontrollers have provided us with "smart" transmitters and "smart" receivers and "smart" interactive technologies. They have allowed us to recover data and select a duty-cycle for operating units in the lowest power modes. In general, they have provided a level of control over units deployed in remote applications which was not even conceived of back in the early days of telemetry. For this we're thankful. For those of you doing research in biology, meteorology, or oceanography, clearly it's not the technology that is most interesting—it's answering the scientific questions. Therefore, we're making every attempt to make the transition from one technology to another as simple and painless to users as possible while retaining the benefits that this technology presents. *Stan Tomkiewicz*

Zimbabwe

Our thanks to everyone who participated in the workshop.

In early March we were fortunate to represent Telonics at a telemetry workshop in Zimbabwe. The event was organized and co-sponsored by Zimbabwe Department of National Parks and Wild Life Management and International Wildlife Veterinary Services. Professionals from seven countries attended, and we were able to share valuable info mation and ideas.

We spent 10 days in Zimbabwe, teaching as well as learning in the classroom, working in the field, visiting game parks and traveling the countryside. During our short time, both of us were very impressed by the beautiful country, its wildlife and people.

Zimbabwe afforded the opportunity for all of us to view many animal species in the wild. Large animals such as elephants, rhino and giraffes are certainly more impressive in groups and moving freely in their environments than they are behind a rail and moat in a zoo. The diverse bird life was a challenge in identification and speeles such as the Lilac Breasted Rollers are beautiful and exotic birds to the North American visitor. We also saw a few herps, including a black mamba that we almost stepped on while hurrying along a small path near Victoria Falls.

Without exception the people we met throughout our visit were friendly and polite. At no time did we feel insecure or ill at ease about our safety.

We discussed this with a smile as we sat on a Heathrow runway in London on the trip home, not able to get to Terminal 4 because the IRA had just launched several more mortars onto the runway.

Early March was the end of the rainy season in Zimbabwe, so the vegetation was green and the grass high. This added to the beauty of the country, but it made viewing game in the field difficult at times. It also illustrated why telemetry is an important tool in areas where an animal the size of an elephant can cross the road and then disappear in the vegetation just meters ahead of you.

The workshop was presented over four days. The first session opened with a valuable keynote address by Mr. Rowan Martin of Zimbabwe Department of National Parks and Wild Life Management. Rowan set the stage for the workshop by discussing African wildlife conservation and by sharing his vast experience utilizing telemetry Three days of "classroom" discussions and a field day followed.

Conventional VHF telemetry is the primary telemetry technique being used in southern Africa, so discussions of this technology were most extensive. Discussions included field techniques, as well as technical information regarding antennas, tions, data acquisition systems, coaxial cables, etc. The participating biologists were very active in discussions, and we probably learned as much as we taught. The objective was to replace some of the "black box" or "black magic" concepts of telemetry equipment and operations with

information that enables users to understand how the equipment and systems operate, and thereby improve their data gathering abilities. In addition to VHF telemetry, other topics included ARGOS satellite linked systems, advances in using Global Positioning Systems to track wildlife, and other specialized applications and technologies.

A valuable and very interesting portion of the program was a series of presentations by participants describing their field projects. Presentations included several methods for attachment of transmitters to rhinos, use of telemetry in a study of elephants on communal lands, activity sensors on wild dogs, motion and temperature sensing transmitters on pangolins, and use of implantable transmitters in wolverines (no, the wolverines were not local).

The field day for the seminar took place at Sinametela in Hwange National Park. Participants tracked wild dogs and rhino from aircraft, and a rhino on foot. The field day also enabled us to review and comment on the way in which equipment was deployed on several aircraft, and the aerial tracking techniques currently in use by participants.

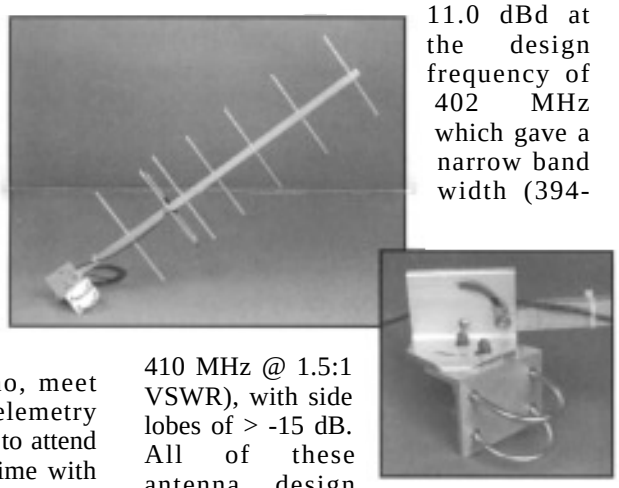
We also were able to spend two days at Fothergill Island (which is not currently an island) on Lake Kariba. There we were able to do some ground and aerial telemetry work with cheetah and rhino, meet several people involved in telemetry projects who had not been able to attend the seminar, and spend more time with others we had met previously. We also did our most extensive game viewing at Fothergill. It was impressive!

In summary, the workshop and trip were interesting, educational and enjoyable. We sincerely thank our hosts in Zimbabwe and all those people who shared their time and experience with us. We hope you also felt the workshop and field time were worthwhile and, from your comments, we think you did. Thanks again to everyone who organized and participated in the workshop.

Blll Burger & Stan Tomkiewicz

TGA-100 7 Element Linearly Polarized GOES Antenna

The Telonics GOES antenna (which has whimsically been described as looking like a ladder) is the result of several requests from the field. This antenna was specifically designed to operate with the Telonics TGT-l and TGT-2 GOES Data Collection Platforms (DCPs). The design goals were higher gain, narrower band width, optimization of frequency for the end user, and easier installation, adjustment and maintenance than those antennas currently available. The TGA- 100 is a rugged design, incorporating solid aluminum rod and thick walled aluminum tube wherever possible to reduce the possibility of the antenna being crushed or bent by wind or snow loading. (This does not make it impervious to tank tracks or truck tires !)



The gain of the TGA-100 was maximized at 11.0 dBd at the design frequency of 402 MHz which gave a narrow band width (394-410 MHz @ 1.5:1 VSWR), with side lobes of > -15 dB. All of these antenna design considerations are good, but problems can occur with connectors and cabling. If the signal doesn't hit the satellite, they are often the culprits. To avoid these problems, we have chosen female Type N 50 ohm bulkheau connector. A 50 ohm coax cable must be procured separately to connect the antenna to the GOES DCP. This cable can vary in length but must have a Type N male connector on one end and a BNC male connector on the other end.

These high standards and physical features allow the field user the assurance that the antenna is optimized for longevity and performance in his/her particular GOES application.

The installation of the TGA-100 is a simple process due to a unique azimuth and elevation mounting system. The azimuth portion of the mount allows for full coverage (360°) of any point on the horizon. The elevation portion of the mount allows for coverage from 0° to 90° elevation (marked in 10° increments), thus allowing coverage of any point in the sky. All components in the AZ/EL mount are either stainless steel or corrosion resistant aluminum. This allows the mount to be out in the weather for extended periods without incurring corrosion problems if the azimuth or elevation should need to be changed from the current position, or the transmitter and antenna moved to another site. Adjustment of the mounting system is easily performed by one 7/16" wrench. No other tools are needed !

Gone are the days where you need three different size wrenches and a flat blade screw driver to install your antenna (and don't forget the hammer!). Now all that is needed is one wrench, one roll of self-vulcanizing tape, cable ties, and the antenna to have your own "step ladder" to the satellite so that you can send your data with confidence. *Gary Jones*

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TELEMETRY-ELECTRONICS CONSULTANTS
932 E. IMPALA AVE. • MESA, ARIZONA 85204-6699 U.S.A.
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