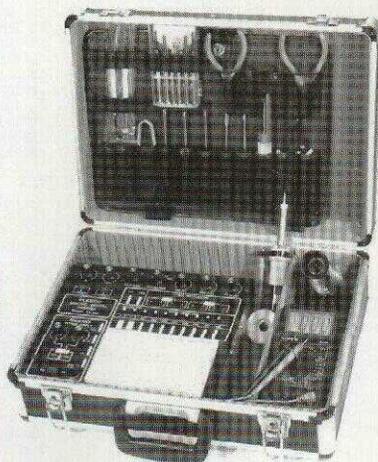


# DIGITAL / ANALOG TRAINER

ITEA  
Booth 823

NEW



## Model XK-700

Elenco's Digital / Analog Trainer is specially designed for school projects. With five built-in power supplies, the XK-700 also features a complete function generator, data switches, logic indicators, a large breadboard area and more. The trainer is mounted in a professional technician tool case with a removable tool pallet to hold a broad line of tools. Available assembled or in kit form. Tools and meter shown optional.

### SPECIFICATIONS

Power Supplies: +1.25V - 20VDC @ 1A  
 --1.25V - --20VDC @ 1A  
 +12VDC @ 1A  
 --12VDC @ 1A  
 +5VDC @ 1A  
 +30VAC CT @ 1A

Function Generator: Sine, Saw, Square Waveforms  
 Freq. Adj. 1 - 100KHz  
 Fine Freq Adj.  
 Amplitude Adj. DC Offset

Digital Section: \* Eight data switches  
 \* Two no-bounce logic switches  
 \* Eight LED readouts, buffered  
 \* Clock frequency 1 to 100KHz  
 \* Clock amplitude 5Vpp square wave

Breadboards: \* 2 breadboards, each containing  
 830 tie points (total 1,660)

Elenco Electronics, Inc.

150 W. Carpenter Ave.  
 Wheeling, IL 60090

(847) 541-3800 • Fax: (847) 520-0085  
 (800) 533-2441 • www.elenco.com  
 e-mail: elenco@elenco.com

Circle No. 12

# Technology Today

Alan J. Pierce



## Feeling with Artificial Limbs

Most people don't realize that those who use artificial arms or legs have lost much more than just the physical dexterity that would be provided by the missing limb. Physically challenged individuals have also lost the senses of touch, pressure, and temperature that their arms and legs once had.

In recent years, many prosthesis users have found that physical therapy and advances in prosthetic technology have allowed them to walk, lift objects, and even run. Yet, in the area of the physical senses, prosthetic limbs have lacked functionality. Until now! The Sabolich Research and Development Center, in Oklahoma City, recently made major breakthroughs in transmitting touch and temperature.

In September 1997, the National Institute of Health completed a nationwide trial that validated Sabolich's achievements. The new technology should be fully available early in 1998.

To create an awareness of pressure, Sabolich places pressure transducers in the toes and heels of artificial feet. The greater the surface pressure against them, the larger the signal sent on to electrodes that touch the existing part of a person's foot. Signals from the front and back of the foot go to the front and back of the person's leg, respectively. Researchers report that the user can learn to interpret the varying intensity of signals on the leg as messages that convey the full range of pressure along the foot.

The performance of the new prostheses is so effective that users report that they experience sensation in entire limbs again—even in their missing portions. Doctors call this phenomenon *cerebral projection*. Its existence plays a key role in the natural performance of an artificial leg. Because of cerebral projection, a person using a prosthesis can apply the gas or brake pedal of a car with the same accuracy as a person who has a real leg.

To create a sense of touch in an artificial hand, Sabolich's Sense of Feel System uses a cuff that wraps around the existing portion of a person's arm. As the

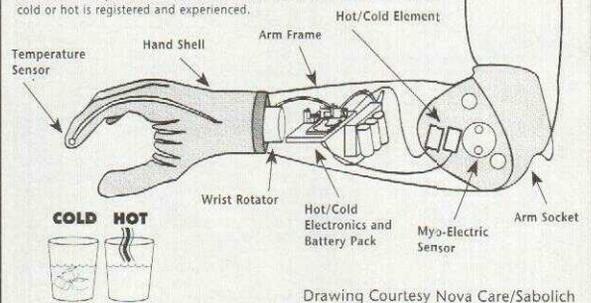
fingers of the artificial hand press together around an object, the cuff applies equal pressure to the arm. With this device, a person can hold a delicate glass, a child's hand, or a steel container, with just the right amount of pressure.

By implanting special temperature probes in each of the hand's fingers, the

### Myo-Electric Prosthesis with Hot & Cold Sensory System

#### HOW IT WORKS

1. Temperature sensors placed in the fingers of the myo-electric arm react to the hot or cold environment, such as ice or hot water.
2. Computerized advanced circuitry system which interprets these signals.
3. The appropriate signals are sent to the electrodes on the skin of the residual limb.
4. The skin receptors send information to the brain, where the sensation of cold or hot is registered and experienced.



system also addresses the need to sense temperature. Here the electronics involved use a number of thermopile electrodes that rest against the existing part of a person's arm. The thermopile device allows perception of the full range of temperatures, from hot to cold, experienced at the fingers.

These improvements in sensing come only partly from the ingenuity of the doctors, engineers, and technologists who have developed them. One of the most significant—and interesting—contributions to their potential success is the human brain's ability to adapt signals through cerebral projection.

### Recalling the Facts

1. What kinds of sensory information do people receive from their arms and legs?
2. What is "cerebral projection"?
3. Describe how an artificial hand can transmit temperature or pressure information.

Alan J. Pierce is professor, Department of Technology, Elizabeth City State University, Elizabeth City, NC 27909.

