

COMPUTER CORNER

Yesterday's personal computers

KEEPING YOUR COMPUTER UP-TO-DATE with the latest peripherals often results in a pile of unnecessary equipment building up around the house. For example, just recently, while cleaning up the basement, I happen to run across all kinds of old personal-computer equipment that had been accumulated over the years—most of which still has some life left in it. But while sorting through all that stuff, I wondered whether any of it would ever again be of any use. There are probably others out there who like myself have been fooling around with microcomputers since the very beginning and have also accumulated a variety of odds-and-ends that today are more nostalgic than practical. The only problem with that is figuring out what to do with all of it.

The old timers

One piece of equipment found in that mountain of antiquity was the first microcomputer that I was ever involved with, the NRI model 832. The unit was designed back in the early '70s when I was working for the National Radio Institute—a home-study school. That computer, designed before microprocessor IC's became available, came in kit form and was included as part of NRI's computer-technology course. The unit, housed in a large metal cabinet, used 7400-series TTL (Transistor-Transistor-Logic) IC's mounted on ten printed-circuit boards. The whole idea behind the kit was to give students hands-on experience in working with TTL integrated circuits. The kit was also used to demonstrate the principles of

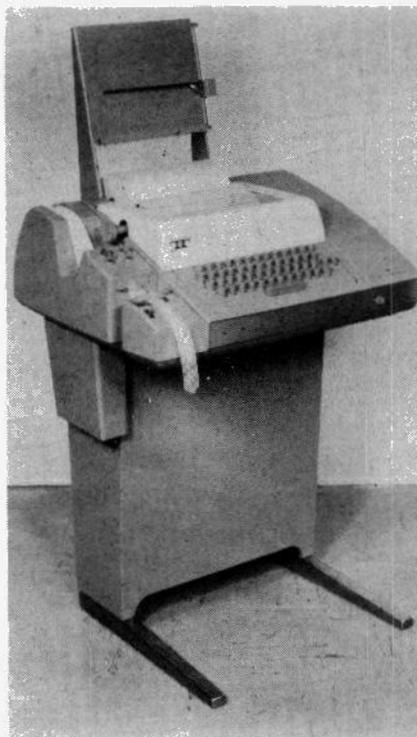


FIG. 1

computer operation and programming, and to teach the student good troubleshooting techniques. It featured an 8-bit-word, serial processing, and an instruction set of 15 operational codes. The memory consisted of a large slide-switch-diode matrix that formed a programmable-read-only-memory or PROM. Its memory capacity was 16 eight-bit words.

The computer also contained sixteen bytes of random-access-memory (RAM) built around the old TTL 7489 16-bit RAM. That machine worked pretty well and could be programmed to do almost anything. But today it just



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wouldn't be practical because it has no I/O instructions, and its memory-expansion capabilities are limited. Nevertheless, since its introduction, in 1972, several thousand of those units have been shipped to students, and it has aided them in learning about digital logic and computer fundamentals. In fact, the unit is still included with NRI's home-study digital-electronics course. Though it's nice to have one of those units around as a reminder of the past, it's doubtful that it will ever be of use again. It's been sitting in a box in the basement for about twelve years now and will probably go on sitting there.

Another unit, found in that nostalgic heap in the basement, was my Teletype ASR-33 hard-copy terminal (see Fig. 1). That terminal was once the most popular I/O device available for those early personal computers and sold for \$1200 back in 1976. It featured a 10-CPS (Character-Per-Second) printer with keyboard and a 10-CPS paper-tape reader and punch. The first time that the unit was ever used was when I first started playing around with microprocessors. Later, one of the early Motorola D2 boards with a 6800 microprocessor was added, which used a serial interface to talk to the ASR-33. That combination was used to learn how to program the 6800 in hex machine-code. Unfortunately, the D2 board was loaned out some years ago and was never returned. The ASR-33 was used as the primary I/O device for my first real personal computer, which was an IMSAI 8080.

The IMSAI 8080 was built from a

kit and was used for a number of years. Quite a bit of machine-language programming was done on it. An 8K BASIC was also available in paper-tape form, but it took about 20 minutes to load it on the 10-CPS ASR-33. At times the program didn't load properly on the first try, so the procedure had to be repeated. Today, waiting for 20 minutes to load a program is unacceptable and having to repeat the sequence is totally out of the question. But, we've come a long way since then.

Overall, the ASR-33 is still in pretty good shape and though it did get damaged slightly during the recent move, there's nothing wrong with it that can't be fixed. But I have no idea of what in the world I'd ever use that machine for, and doubt that the time that it would take to repair it would be justified. Anyway, it's large, takes up lots of space, and anyone who ventures into my basement is usually impressed and asks about it.

One of the more useful machines found lying around down

there, was one of the old Commodore PET 2001 computers. You may recall that machine with its built-in 9-inch CRT, audio-cassette player/recorder, and the tiny calculator-like keyboard. That unit was acquired in 1976 and has been in use most of the time since then. Several years ago, there was a failure in the RAM, which was promptly repaired. The most difficult problem encountered during that repair was trying to locate a supplier for one of the old odd-ball MOS-technology 22-pin 4K static RAM's. And beside that, it cost a fortune! The unit's BASIC and graphics capability are still pretty good by today's standards; however it doesn't feature color, and the audio-cassette mass storage is slow. Still my 13-year-old son continues to use the unit for practicing his programming homework, and he has even written a number of his own applications programs for his *Dungeons & Dragons* game. However, the games for the PET are nothing compared to *Flight Simulator*,

Decathlon, *Temple of Apshai*, and a host of other neat games for the newer IBM PC.

Another item discovered in that computer treasure trove was an H8-5 accessory board, which is a serial-port and cassette-interface card for Heathkit's original model H8 computer. The serial port and cassette interface board was removed from the unit when the floppy-disk controller became available and was never used again. In fact, my older son took the H8 computer, an H9 terminal, and the H17 floppy-disk unit off to college with him and I haven't seen it since. I suppose the IC's on the accessory board might be useful for experiments, but I haven't the foggiest idea of what I could build with them.

Continuing the search, I also discovered an old RCA *VIP Cosmac* computer. That unit was purchased sometime in 1977, but the proposed application escapes me now. That computer features RCA's unusual 1802 micro-
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processor, a hex keyboard, and video output. It also has 2K of RAM and an audio-cassette interface. The unit has never been used and is still packed in its original box. I suppose it might be good for learning about microprocessors or as a special controller for some project. But the 1802 is not exactly what you'd call a mainstream CPU.

Also among my basement collection was a Heathkit *ET-320*, a 6800-based microprocessor trainer. The unit works fine and is outstanding for learning microprocessor operation and applications. Heath still sells that unit, but I suspect that mine will reside in a cardboard box in my basement along with some of the other goodies that I hate to give up.

Just recently, a pair of Tandon *100-1* floppy-disk drives were added to my basement junkbox. Those single-sided double-density 160K byte drives came out of an IBM *PC*, which was purchased when that computer first became available late in 1981. Since most of the newer software for the *PC* uses double-sided drives, I was forced to upgrade to a couple of Control Data double-sided drives. Now the question is what to do with the Tandon units? They are probably worth a couple of hundred dollars apiece if purchased separately, but who wants single-sided drives when double-sided drives seem to be the most popular thing?

Computer components

Finally, we come to my component junkbox. Beside all the old TTL devices, a number of 256-bit bipolar RAM IC's, some 4K NMOS RAM IC's, a 1702A PROM, and some LED displays were found. Also in that junkbox were a couple of microprocessors that had been acquired somewhere along the way. One type was Intel's original 8088 8-bit microprocessor and the other a Signetics 2650 8-bit microprocessor.

So far, I haven't really decided what to do with all that stuff; most of it has been around for years, so there's no great rush to get rid of it. Perhaps some of it will be sold,

particularly those items that may still be useful. Other items will remain in the basement for old times sake, and then there may be a few items that will just be thrown away or cannibalized.

In any case, most of the stuff is in pretty good shape and could be used for experimenting or learning. Other than using it for experimental and learning applications, the best thing to do may be to give the stuff away to somebody who can use it. Anyway, the basement is straighter now—or at least some of it is!

My next chore will be to sort through the old magazines: There must be every issue of every personal computer and electronics magazine since the early '70's down there. Most of them should be thrown away, since they take up so much space. But I just can't bring myself to do that, because those magazines contain the history of personal computing—again, nostalgia! Anyway, going through all of those magazines is more than a week's project (especially since I'll probably try to read every issue). I wonder if I'll ever get around to it.

R-E