

A Review of the TM990/602 Computer Board System Kit

By David G. Brader

When I first heard that we were going to review the Texas Instruments TM990/602 computer board system kit, I was filled with dread. Floating around in my mind was the image of a large crate arriving at our editorial offices, and me having to spend hour upon hour sorting hundreds of resistors, capacitors, and other electronic gadgets. I recalled past experiences constructing electronic kits, and all of the headaches it caused.

“For TI, a kit is a factory assembled computer . . . made up of a standard chassis and off-the-shelf components in the form of plug-in circuit boards.”

But much to my relief, I found out that my old definition of “kit” and the definition that TI was using were indeed worlds apart. For TI, a “kit” is a factory-assembled computer that is made up of a standard chassis and “off-the-shelf” components in the form of plug-in circuit boards.

There are a large selection of TM990 boards available from Texas Instruments. The selection even includes a speech board that uses the same technology as the Home Computer. Other TI TM990 board types include Central Processing Unit (CPU), Random Access Memory (RAM), and disk drive controller.

CPU modules incorporate micro-processor, memory, and I/O on a single board. They come preassembled and pretested—ready to use. The net result is that users are spared much

time-consuming planning. For example, all the system interconnects are already determined.

Furthermore, the TM990 100-pin bus is widely recognized. Modules are available from both TI and third-party vendors to expand system features. This capability provides solutions to real-world interfacing problems with a minimum of design for users. You can, for example, purchase an IEEE-488 board to connect up to a wide variety of test equipment or a Winchester hard disk, or even purchase a bubble memory board.

As members of TI’s pace-setting 9900 “First Family,” these microcomputer modules are based on the family’s advanced memory-to-memory architecture. This innovative approach requires fewer instructions to perform a given function. This, in conjunction with a common instruction set, greatly reduces programming time and effort.

The 9900 Family has been structured to provide a mutual compatibility that preserves your software investment and avoids software “migration” expense. This means that you don’t have to worry *today* whether your software will still apply as you upgrade components or change applications *tomorrow*. Your risk of software obsolescence is negligible.

Additionally, TI is committed to the continuation and expansion of the 9900 Family. As your needs change—and as new technologies develop—you can expect to use higher performance CPU modules and more versatile memory modules while continuing to use your original software.

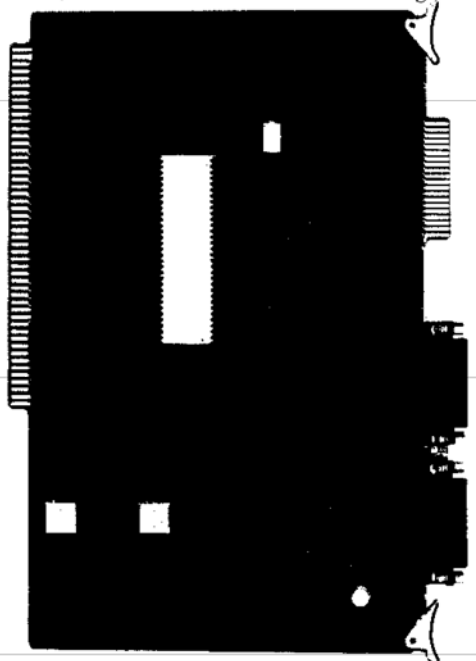
TI memory boards in this series give the designer quite a choice. If the application is in a dedicated task environment, the combination of up to 32K bytes of Erasable Programmable Read Only Memory (EPROM) and up to 16K of static RAM on one board will be of interest. If different applications must

be run at various times, the 64K dynamic RAM board gives you that flexibility. Any of the memory boards may be purchased with the minimum of memory chips installed and then expanded at a later date.

We were greatly surprised with the flexibility of the TM990/303A disk controller board. The board is so flexible, that almost any disk configuration can be used with it—up to three 5 1/4 inch drives or up to four 8 inch drives, single or double sided, single or double density, IBM or TI format. It has DMA transfer capability, and even a bootstrap load feature which can be used to initialize the computer from diskette.

Our TM990/602 kit contained three boards one of which was the disk drive controller just mentioned. With it we used two Qume Data-Trak 8” single-sided single-density disk drives.

The main board in the TM990/602 computer is the Central Processing



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Unit. In our case, the kit came with a TM990/101MA CPU board installed. There are actually four differently configured CPU boards to choose from.

The TM990/101MA CPU board uses the same microprocessor chip as the TI Home Computer (TMS9900) and has an instruction set compatible with other members of the TI990 family of computers. Other features of this board include the capacity for up to 4K-bytes of EPROM, Direct Memory Access (DMA) to both off-board and on-board memory, a programmable system interface, two serial input/output ports, three programmable internal timers, and edge-triggered interrupt with software reset.

The main memory for the 602 kit is on a TM990/203 memory expansion board. Our version contained the maximum number of dynamic RAM integrated circuits which results in 64K-bytes of memory. A nice feature of this board is the issuing of an interrupt to the CPU upon an error in the memory.

Each of the three boards came with a manual that fully described the board. Included were schematics of the circuitry, theory of operation, tutorials and guidance on usage, and even sample program segments showing the use of a board such as the disk drive controller.

Setting It Up

Unpacking the main carton, we found a neat, table-top enclosure containing a healthy power supply, a card cage with four slots, and three component boards plugged into the cage. In another box were four 8" diskettes and several manuals covering the UCSD p-System as used on the TM990/602 computer.

It should, however, be mentioned at this point that the TM990/522 table-top enclosure supplied to us is not the only one available. Like the TM990

boards, there is a selection of enclosures too. If you require more than four boards, order a larger enclosure. All of the card cages utilize the standard 100-pin TI-990 bus connectors.

We supplied our own display terminal for use with the 602 computer. It was a Televideo model 950, but almost any terminal will work.

Sorting through all the manuals, we found the TM990/602 Kit Configuration User's Guide. The first page contained a check list for installing the TM990/602 computer kit. There were only ten steps—the hardest ones were connecting the cables between the computer, disk drives, and terminal!

Here we were with a huge file of manuals and reference materials, but all we needed to get the computer working was that one page with the ten simple steps. These steps got us through the cable interconnections of the computers, dual eight inch disk drives, display terminal, and printer. The last two steps were:

*Insert the UCSD p-System disk in disk drive 1.

*Turn on the system power.

After about 40 seconds of blinking screen characters, multiple disk access, and various beeps from the terminal, the p-System greeting message appeared. All very simple.

Now that we have this TM990/602 computer, we plan to use it for testing p-System software for future reviews. The first review to come your way in the next PCM will be on TICOM's *Final Copy* software package [see the interview with Michael Hadjiioannou, President of TICOM in this issue—Ed].

We are also planning to use the UCSD p-System to transfer files between the TM990/602 and a TI-99/4A system via the RS232 interface. Watch for this and much more in forthcoming issues.