

**a  
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# **A Microminiature Computer**

**Designed**

**Developed**

**Tested by Texas Instruments**

**for the US Air Force**

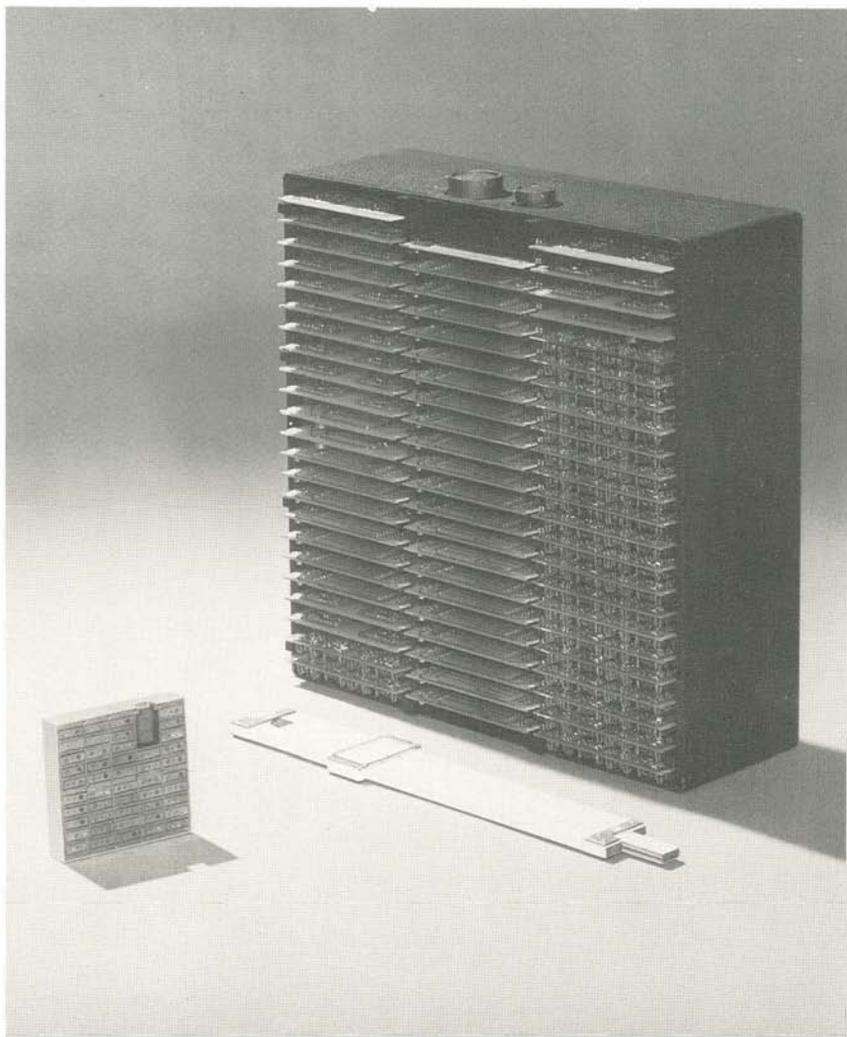
A significant contribution to miniaturization of electronic equipment in missile and space applications is now realized with the development of an experimental digital computer. Demonstrating a practical application of Solid Circuit\* semiconductor networks, Texas Instruments developed the computer for the Aeronautical Systems Division of the US Air Force in connection with ASD's Molecular Electronics Program.

The tiny computer has a total volume of only 6.3 cubic inches and weighs only 10 ounces. It performs exactly the same functions as a conventional computer but is 150 times smaller and 48 times lighter. The total power dissipation of the semiconductor network computer is 16 watts.

The dramatic size reduction of the new computer was made possible by forming each of its 587 digital circuits within a minute silicon bar. These circuits replace the 8500 transistors, diodes, resistors, and capacitors required to perform the identical electrical functions of the conventional computer.

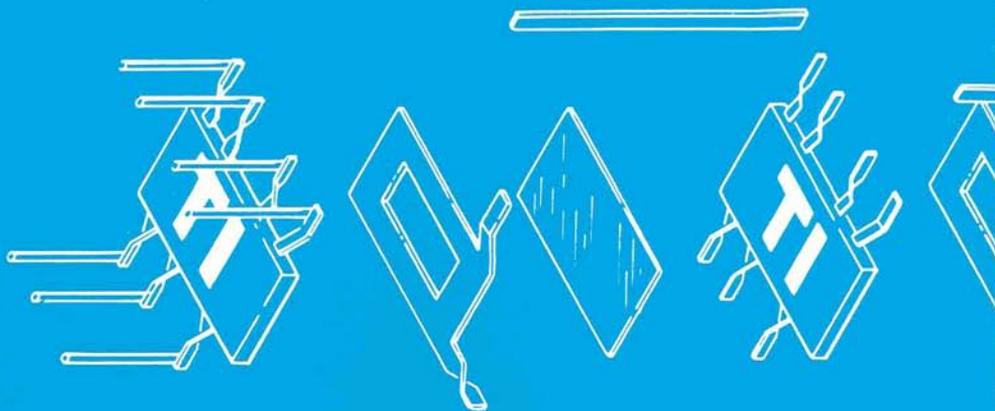
\*Trademark of Texas Instruments Incorporated





The tiny molecular electronic computer is dwarfed by the transistorized conventional computer which has identical electronic function.





The new computer is a serial binary fixed-point machine with an operand word length of 10 bits, plus sign. It uses synchronous logic and is divided into two parts — the operand memory and instruction memory.

The new network computer is a general purpose computer. For demonstration purposes it has been programmed to simulate a digital computer to perform addition, subtraction, multiplication, division, and other arithmetic problems.

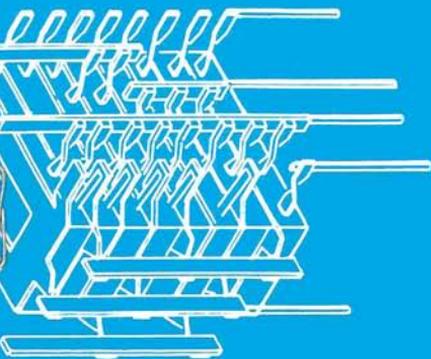
The importance of the new computer is that it is sufficient to demonstrate solutions to the problems of interconnections, computation, electrical interaction, and maintenance of high density using semiconductor networks.

A manual control unit was also designed and developed. Instruments to provide a means for monitoring and control of the computer and to allow manual programming. The keys and the display of the manual control unit permit the operator to communicate with the computer.

A bilateral converter is also included in the manual control unit. Decimal input and output information can be used with the binary computer. Power supplies for manual unit and the computer are a part of the manual control unit.

For demonstration purposes the manual control unit can be used to control either the semiconductor network computer or the conventional component computer to illustrate identical operation.





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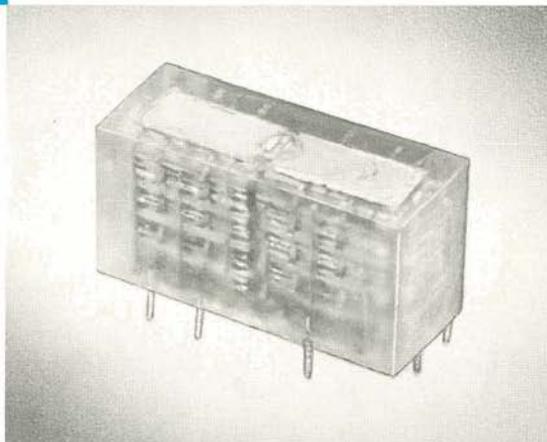
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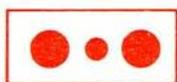
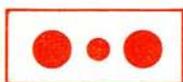
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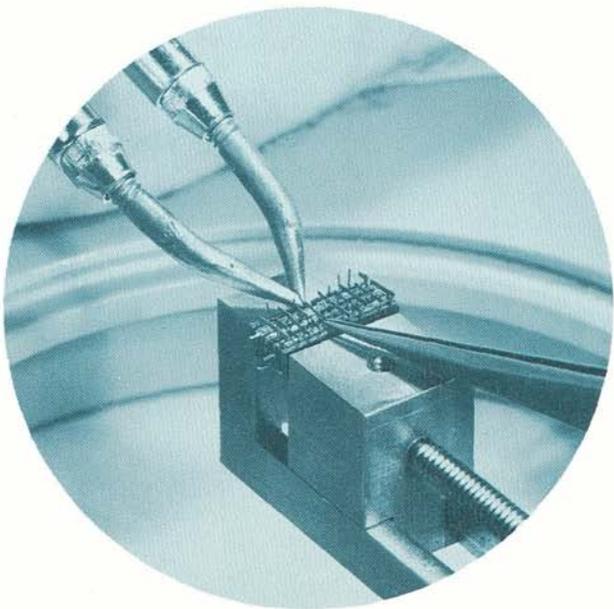
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Fabrication of the molecular electronic computer begins with the Solid Circuit\* semiconductor network. Several networks are assembled and welded, then encapsulated to form a rigid module.

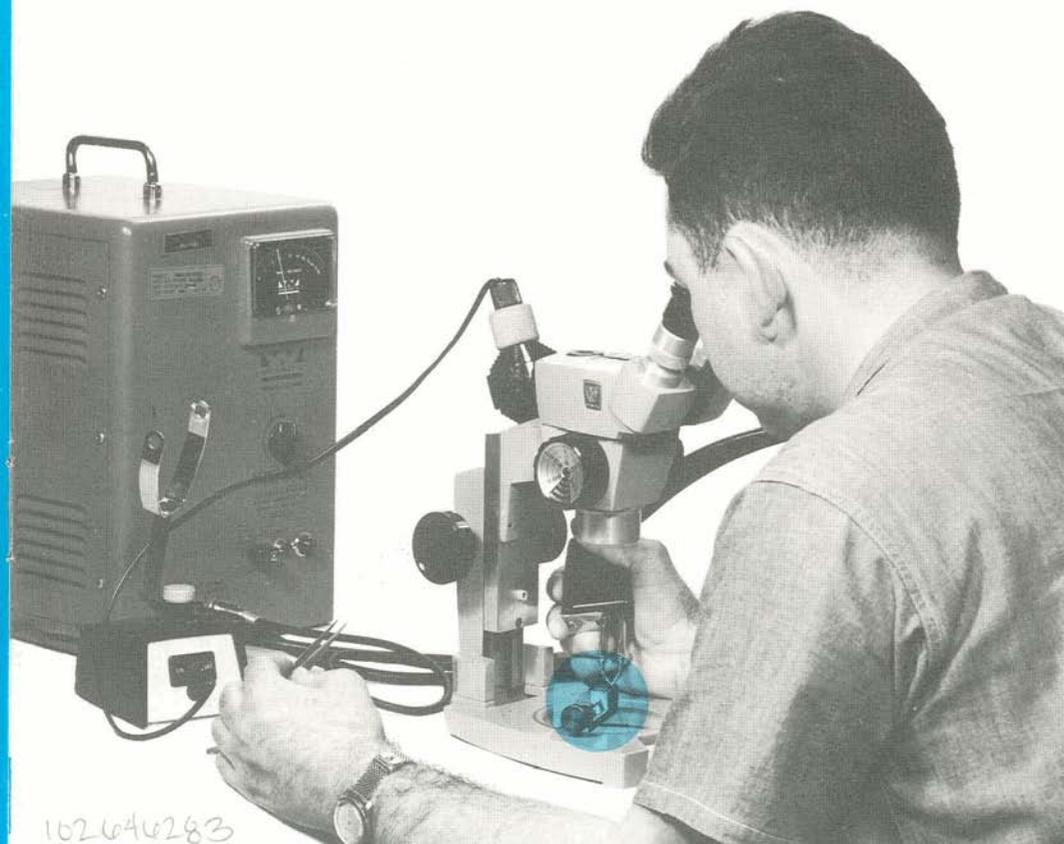




After the computer was designed by Texas Instruments engineers, the assembly of encapsulated modules was done by production-line workers in the company's Apparatus Division. All connections on this and other semiconductor network equipments are capacitor-discharge welded for reliability and to avoid heat damage. Assembly work is done under a 10-power microscope without using special tools.



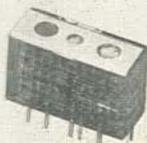
Three types of semiconductor networks are used in the tiny computers RS flip-flop, NOR gates, and logic drivers. The individually hermetic-sealed semiconductor networks, measuring .250 inch x .125 inch x .030 inch, were assembled into rigid modules by welding 8 to 16 networks together in a stack and then encapsulating the stack. The computer is made up of 47 of these modules containing 587 semiconductor networks.



The semiconductor network performs the function of 10 to 29 conventional components.



This computer module contains 8 to 16 semiconductor networks, performing the function of about 150 individual components.



The computer is made up of 47 modules containing 587 semiconductor networks—the equivalent of 8500 individual components.

