



buy the parts cheaply, as well as scheduling and synchronising the delivery dates. All computer makers are aware of the disastrous effects of the late delivery of a single component. Idle production lines cost money and late deliveries will lose customers. Getting the best price for each component is also vital; a couple of pence on a connector can amount to a substantial sum of money in the high volumes that today's home micro makers are dealing with.

The assembly of the computer, whether by automation or by many human hands, is also an area that is prone to error. Components can easily be inserted upside down or back to front, or omitted altogether, completely ruining the final board. Flow-soldering can also miss one pin of a chip package. Similarly, some of the components in a batch may not meet their technical specification.

These problems explain the need for testing, both of the components and the finished boards. Many micro assemblers run spot tests on incoming components, and all of them run board tests of various levels of sophistication. Board testing is expensive, needing powerful computer hardware. But the investment has to be made: a sub-contractor won't keep his contract for long if

machines fail to work on delivery.

It is also common practice for the client to have a representative on the spot to test for faults in incoming parts and in the final product.

The sub-contractor that manufactures the Oric has devised an ingenious further test. The finished machines are individually weighed. If the machine is below the specified weight, then some components must be missing from the assembly. This is why each Oric box has a blue label quoting the machine's weight.

The final test of a computer is to plug the finished machine into a power supply and a television set. Makers of business machines often leave them running for a day or two 'soak testing', or 'burning in'. This simply involves leaving the machine running its built-in routines or accompanying software to ensure that everything is working properly.

With this number of variables, it is not hard to appreciate why home micros can be late or unreliable. The final assembler is dependent on chip and component suppliers to deliver on schedule and to the right specification. The design and marketing companies will depend on the final assembler to deliver the product in working order, and without keeping the customers waiting.

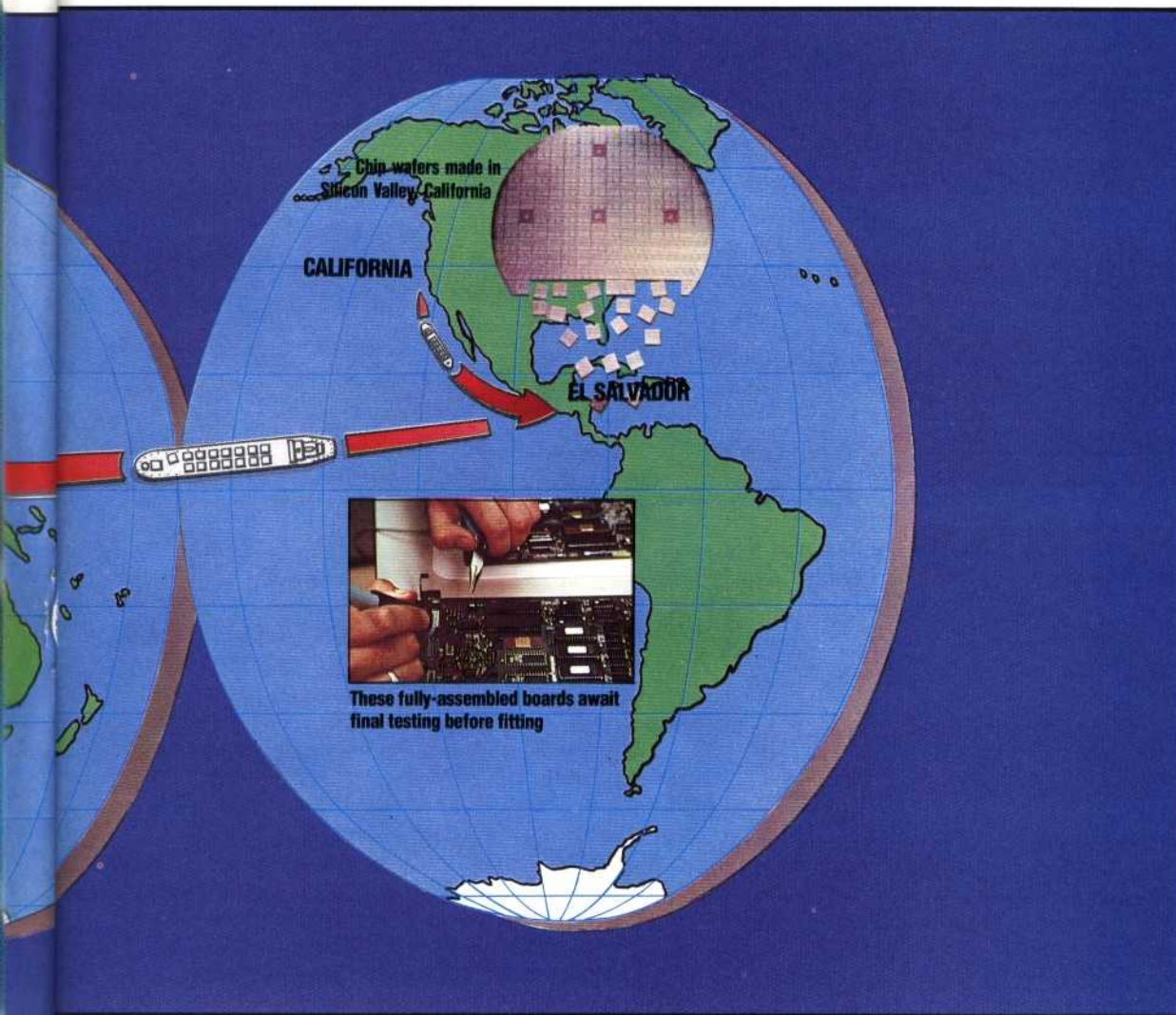


#### Cost Cutting

The purpose of transporting computer parts around the world is to save the manufacturer money and keep retail prices down. By using inexpensive labour resources in other countries, manufacturers have been able to reduce their costs significantly. But recent advances in automated production have made it possible to produce entire computers in Britain as inexpensively. The Oric Atmos, for example, is produced entirely in Britain, although Oric maintain production facilities in Singapore for their foreign markets

#### Flying Components

This map of the world illustrates the movement of microcomputer components in the assembly process



KEVIN JONES