NCR
ENGINEERING &
MANUFACTURING-WICHITA

PRINTOUT

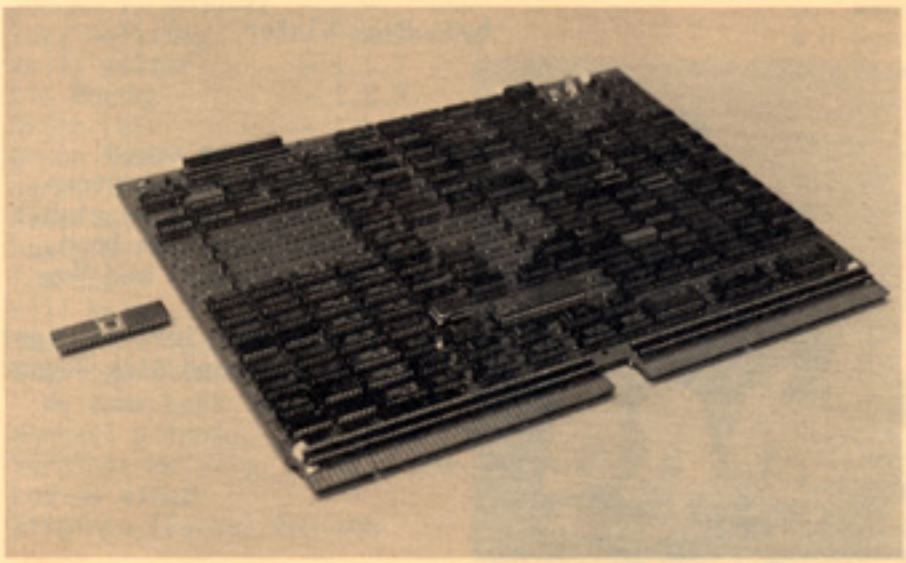
Volume 12 | April 29, 1983 | No. 3

LOOK MA . . . . . IT'S A CHIP!!!

Engineering accomplishments are nothing new for this division and sometimes innovative achievements occur which go unnoticed except for a few people involved. Not so this time. A small group of NCR-Wichita Engineers have just completed what General Manager Dan Pigott has called "One of the most significant technological achievements in the area of VLSI engineering in the entire corporation".

What is this marvel? Well, it's smaller than a breadbox---in fact it's about the size of a fingernail, and it contains 15,000 (that's right-thousand) transistors in addition to a lot of other complex circuitry. It could potentially save the corporation $40,000,000.00 in manufacturing costs, besides all of the residual advantages of such a technology.

What is it? It is the SCSI Chip, a printed circuit board (PCB) replacement which will eventually be in virtually every product this division makes, as well as products made at other NCR divisions. What the chip does is allow main computer processors to talk to all kinds of peripheral devices (disks, mag tapes, etc.) and even other processors without being concerned that they might only understand another "language" or protocal.



A comparison in size between a normal printed circuit board and the SCSI Chip (on the left). The chip is located in the center of the ceramic carrier with connector pins on the bottom.

Why is this a notable achievement? Three reasons: First, because it is being done on a chip instead of a full-sized PCB (the PCB in the picture, in fact, does the same job as the chip). The cost of manufacturing the chip is roughly 1/16 that of building a PCB. So---since this chip is a very high volume item, that 16 times savings is realized every time a chip is used in a product.

Second, it is a notable achievement because of the sheer complexity and magnitude of getting all that circuitry and logic onto a device that small. The process is called VLSI (Very Large Scale Integration) as opposed to LSI (Large Scale Integration) which is what we use in our normal PCB's. It is a very new process and this was our largest undertaking in this area.

The third and probably the most significant reason is that because of the process involved, once the chip is "built" it must work correctly the first time or several weeks (or months) are involved in making design changes and all new chips have to be made.

We are proud to say that the SCSI Chip worked correctly the first time!! As Dan Pigott said: "These things just aren't supposed to be completely correct on the first pass chips, but ours was!" This is a tribute to the expertise and diligence of the people in the VLSI design group headed up by Dick Bogner who works for Dave Bangle in the Processor Products department. Many, many people have been involved in this project in some facet, but Dick's main development group consisted of Don Doud and Tom Harp (principal logic designers), Wayne Stewart (auto-routing), Bill Ecton (logic simulation), and Ray Loar (chip layout). This group of dedicated engineers has been working on this chip for nine months and have worked through Christmas and New Year, many weekends, sometimes second shifts, and in some cases 20 hours straight to meet their intermediate deadlines. These are the people who work on the logic diagrams and chip layouts you see stretched from the floor to the ceiling in the Red conference room. They and other support personnel have spent days and months checking, checking, and re-checking their logic design and layout. The reason for this is that the VLSI process is acutally a photo process wherein a "mask" made from a logic layout is essentially "etched" on the surface of a silicon wafer. This is unlike the printed circuit boards which can have a "cut and jumper wire" used to repair a logic error. This chip is obviously too small to modify once it is created, so the logic has to be right the first time.

You might ask "Why not put everything on chips"? Maybe that will happen some day, but at the present time the cost of designing the chip is high enough that very high production volumes have to be needed in order to recover that cost. PCB's will still be around for a long, long time; but until then, as we become more skilled in producing these chips, a lot of people will always remember that FIRST BIG ONE, the SCSI CHIP!

by: Rick Slater

They can be proud!
The VLSI design group:
(seated, left to right)
Bill Ecton, Don Doud,
Wayne Stewart and Tom
Harp.
(standing, left to right)
Ray Loar and Dick Bogner.