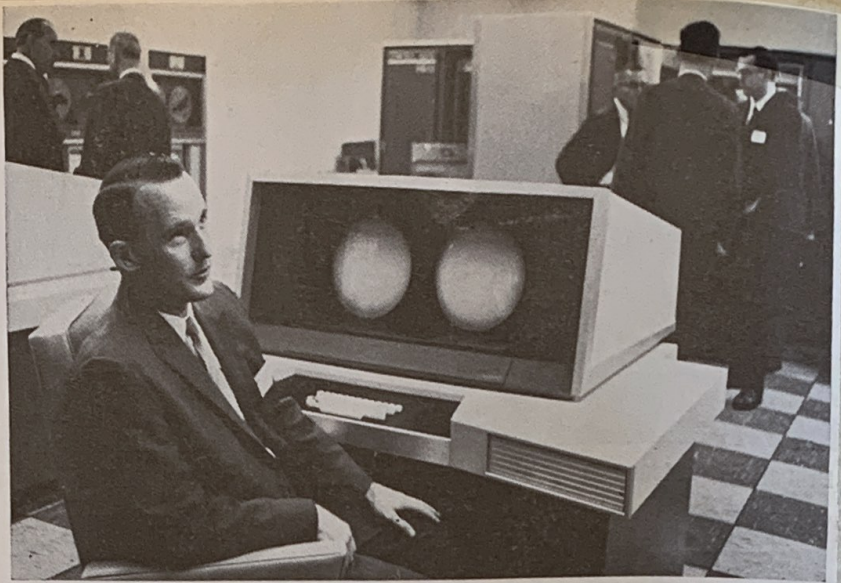


# Computers get faster than ever

Unique, high-powered 6600 comes from Control Data's lab in the Wisconsin woods



Seymour R. Cray sits at console of his computer, the fastest yet made

"Computers should obey a square law—when the price doubles, you should get at least four times as much speed," says Vice-Pres. Seymour R. Cray of Control Data Corp., which in only six years has bounced into one of the top positions in the hectic arena of data processing [BW May 25 '63, p154].

At the company's secluded Chippewa Falls Laboratory in Wisconsin, where one of the few plant luxuries is a salt lick for deer, Cray's little group of engineers last week demonstrated that law.

The showing of Control Data's 6600 computer (picture) was a triumph for the professional staff of only 14 engineers and four programmers—Cray's entire staff numbers only 34, including the night janitor. The 6600, now undergoing final checkout, is several times as fast and powerful as any other computing machine in existence. In fact, nothing quite like it has ever appeared on the market before.

**Eleven in one.** The 6600 can process 3-million instructions per second. That means some of its circuits must be able to switch back and forth in some cases at more than 30-million times a second. Moreover, the 6600 is actually made up of 10 independent computers that feed an ultra-fast central computer. The system can synchronize 11 sets of instructions at once, so it can wade through a complex problem without having to pause for each step to be completed before proceeding with the next.

Some engineers at the showing confessed they found it hard to conceive of problems complex enough to challenge the 6600, but professional mathematicians and physicists apparently don't share this mental block. They declare that the machine will open up a whole uni-

verse of scientific calculations that have been impossible to contemplate.

These include problems in nuclear and theoretical physics. Others, perhaps closer to home, might include setting up a mathematical model of the earth's atmosphere and solving the three-dimensional relationships of air flow, temperature, pressure, and humidity fast enough to keep local weather forecasts continually and accurately up to date.

**Cost per problem.** Generally speaking, the faster a machine is, the less it costs to make each calculation. The 6600 is costly—more than \$7-million for purchase or about \$175,000 a month rental—but its cost for each operation can be brought very low if it can be kept busy.

For about \$1 worth of its time, the 6600 will perform 1-million each of additions, multiplications, subtractions, and divisions. The big problem, of course, is to keep it busy.

**Small but oh my.** Compared with other machines with only a fraction of its speed and capacity, the 6600 is deceptively small and simple-looking. Its 11 computers are packed into four cabinets joined in the form of a cross. Each cabinet contains four hinged leaves crammed so tightly with transistorized circuitry that there isn't even room for air to circulate. Copper tubes of Freon refrigerant carry off the heat generated by its 600,000 silicon transistors and other components mounted on more than 10,000 double printed circuit boards.

To provide its central high-speed memory with a capacity of 131,072 words takes an array of 7,864,320 tiny magnetic cores woven together with wires as fine as human hair.

And there are 10 other memories, each with more than 40,000 cores.

To use this complexity, the operator's console is starkly simple. Two round television-like cathode ray tubes stare at the operator over his only controls—a 50-key typewriter keyboard.

Equally startling is the way Control Data's 6600 was conceived and built. It's not the product of massive teams of scientists, engineers, and technicians but is virtually the personal invention of two men: Cray, who runs the Chippewa Falls Laboratory, and James E. Thornton, his chief engineer.

Each credits the other with "most of the work" in bringing the 6600 along on schedule. Both men are models of the kind of man almost any company thinks it wants, almost never finds, and usually doesn't know what to do with if it is fortunate enough to get such a man. They have exceptionally keen minds, are practical and capable of direct action, and are almost impossibly independent.

**Off to the woods.** Cray was an original member of the Engineering Research Associates group that was bought by Remington Rand Univac, and part of the group that later left Univac to form Control Data Corp. He has dreamed up many computer innovations, including almost all basic design of the company's stable of large scientific computers. But he evidently isn't an easy man to fit into a corporate mold.

For example, about 18 months ago, he suddenly decided that too many visitors were interfering with his own and his associates' time at the main plant in Minneapolis. So he pulled up stakes and had a mod-

est one-story laboratory built on a wooded bluff near Chippewa Falls, his home town, 90 mi. from the Twin Cities. Some local residents know the lab as "Seymour's place."

After the move, Cray put a ban on visitors that all Control Data executives, including Pres. W. C. Norris, rigidly respect. No outsiders and few Control Data staff people had ever been through the place until last week when Cray decided the 6600 was ready for a semi-public bow.

**Holding the reins.** Cray would be the despair of most production executives if only because he is loath to let go of a development. He intends to produce the first dozen or so 6600s at his lab, using his present 34-man staff. Outside suppliers do

the metal work and assemble the circuit boards with their tight mass of components, but all the touchy final assembly wiring and the testing is done at the lab.

Cray says the continuing of development work during production enabled his group to triple the speed of the first machine while it was being built. Subsequent models of the 6600 are expected to contain further basic refinements.

This production procedure in the lab is quite logical, Cray says, since almost every big multimillion-dollar computer is pretty much a custom job.

"Furthermore," says Cray, "I think the cyclic change from a development to a production atmosphere

is good for the staff. It provides a variety and change of pace."

**No bureaucracy.** A simpler point may lie deeper in Cray's thinking. The Chippewa Falls lab group is very much like the struggling few who started Control Data on a shoestring and created a line of products that last year accounted for \$63-million in sales and a respectable \$3-million profit.

Cray realizes that a small group of the right people can accomplish a lot when pushed, and he doesn't want the bureaucracy of a large organization to get in the way of the pushing and the accomplishment.

"There has never been a good product designed by a committee," he declares.