CER-10 – The First Digital Electronic Computer in Serbia

by Dusan Hristovic

Mr.Dusan Hristovic is a computer hardware engineer (retired) and consultant at M.Pupin Institute, Belgrade, Serbia. He graduated in electrical engineering from Belgrade University in 1956 and specialized with Fed. British Industries (course on Digital system logic design with the ICL Ltd. Advanced Systems Group in London). Dusan is co-author of six books and author of some 50 scientific papers, has served as Secretary General and President of the ETRAN Society of Serbia (1980-1992) and is a founding member of the Serbian Informatics Society (DIS).

Mr. Hristovic was designer of the CER-10, CER-22, HRS-100 and TIM computer line PC systems.

CER-10 is the first digital electronic computing machine, originally designed and produced in Serbia and the former Socialist Federative Republic of Yugoslavia, in the "Vinča" Institute, during the period 1956- 1960. Due to an addition of a functional extension of the so-called Statistical Unit, the final construction took place in the "Mihailo Pupin" Institute in Belgrade at the end of 1962. CER-10 began its operational life at the TANJUG building in Belgrade in 1963. CER-10 was used for scientific and technical research for solving various mathematical problems in the SKNE "Vinča" and for statistical cryptological processing of information for the Yugoslav Federal Government (SSUP and TANJUG Agency). In fact, by structure, CER-10 is the universal, electronic, one-address, dynamic computer. Its average speed of processing was about 50,000 simple operations per second (i.e. it means, about 1,600 additions per second).

The author-team of designers and constructors of the CER-10, in the "Vinča" Institute, was: Academician Rajko Tomović PhD, Professor Tihomir Aleksić, Professor Ahmed Mandžić, Engineer Petar Vrbavac, Vukašin Masnikosa PhD, Engineer Dušan Hristović and Milojko Marić PhD. In the development of all system parts and the construction of CER-10 70 persons (engineers, programmers, technicians and specialist- workers) have taken part in the course of three years.

Only six states in Europe: England, Germany, Russia (USSR), France, Yugoslavia and Poland had their own original computing electronic digital machines developed over the period from 1949 to 1959.

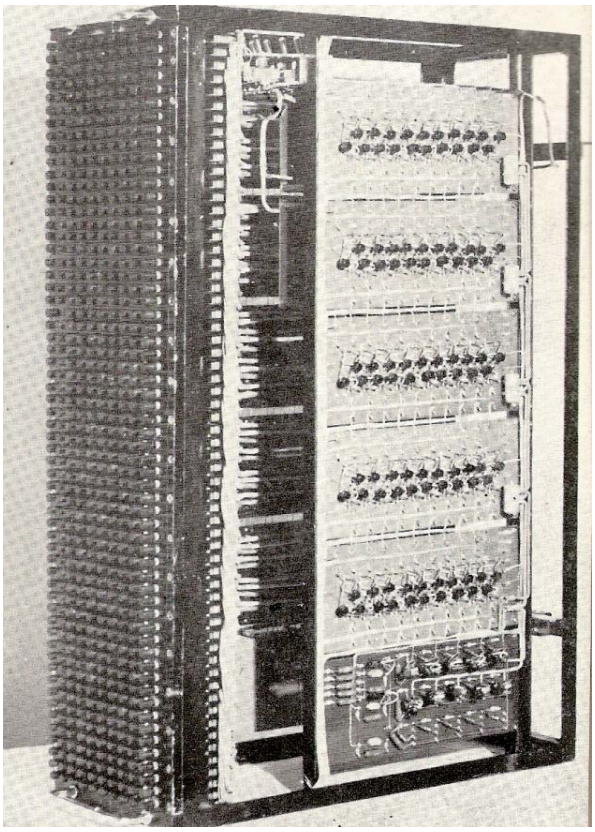
Technology and Technical characteristics of the CER-10

- Primary operational memory with a capacity of 2x12 Kbytes, 2 subsystems of matrix ferrite memory with memory cores type Philips 6D3 pfi 2mm and switching cores 6E2. Memory word is 30+1 bits, of changeable length word (max 6 characters: numbers, letters, symbols of 5 bits). Access time for the ferrite memory was 10 microseconds.
- Control Unit, named CPU (24 basic instructions in total) and Arithmetic Unit were composed from the standard logic circuitry modules made by electronic vacuum tubes, transistors, Ge-diodes and R,L,C discrete components.
- Input/Output Units: Photoelectric Reader of punched paper tapes Ferranti type TR 2B (speed 300 char/sec); Paper tape Puncher Creed type 25 (max. 100 char/sec); Tele printer - teletype Siemens model T-100 (printing speed of 8 -10 char/sec).
- Power Supply system: an independent motor-generator with nominal power 20/15,5 KVA, produced by "Rade Končar" company, Zagreb. Rectifiers with three-phase circuitry had Si-diodes types 14R2 and 10R2 (Th. Houston). There was automatic regulation, relay protection and signalisations for all power units (i.e. for 12 positive and negative voltages in CER-10).
- The computer room in the TANJUG building had 80 m2, with double flooring and air conditioning. The metal rack dimensions were 2m x 2m x 0,70 meters for each of the seven rack units.
- Technology: Philips electronic tube types ECC 81, EL 83 etc. (approx. 1.750 pieces); Transistors: 2N396, OC 76, OC 44 (1.500 pieces); Ge-diodes OA 85 Philips, for logic circuitry, (approx. 14.000 pieces); Electronic relays type Schrack (approx. 650 pieces); Pulse transformer core D25 (approx. 1.700 pieces); Delay pulse Lines (approx. 850 pieces), etc.

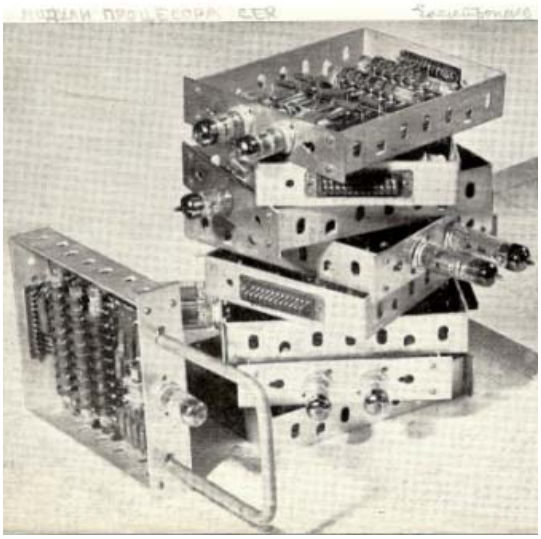
Literature (Reference publications)

1) R.Tomovic, A.Mandzic, T.Aleksic, P.Vrbavac, V.Masnikosa, D.Hristovic, M.Maric: *"Digital Electronic Computer CER10 Inst. BK-Vinca"*, Proc. of V Conf. ETAN-1960, vol.1, pp. 305-330, Belgrade Novem.18th 1960;
2) "CER-10", a booklet, separate edition (24p.), Forum-M. Pupin Institute, Belgrade 1963. (in Serbian);
3) V.Paunovic, D.Hristovic: "*Preview and Analysis of CER Computers* ", Proc. of the 44.Conf. ETRAN-2000, tom 3, pp.79-82, Sokobanja June 26th 2000. (in Serbian);
4) M.R. Williams: "A History of Computing Technology", Prentice-Hall, 1985.
5) http://en.wikipedia.org/wiki/CER_Computer; (CER-10, CER-22, CER-203, CER-12, HRS-100, TIM-100, etc.)

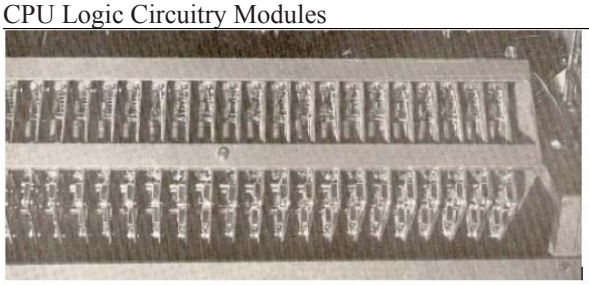
CER-10, at the Tanjug-building, 1963

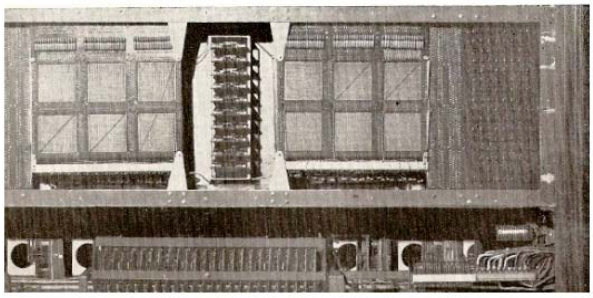


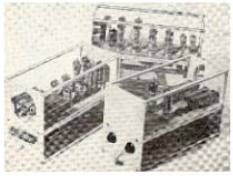
Statistical Unit ■

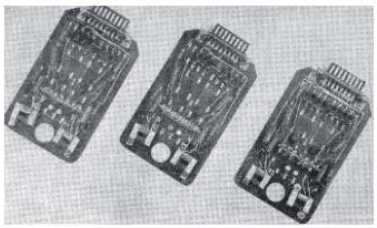


CPU Logic Circuitry Modules









Core Memory subsystems