HCM: East-European Home-Computer ...

| Bulgaria | Czechoslovakia | GDR (DDR) | Hungary | Poland | **Romania** | USSR | Yugoslavia |

Romanian Home-Computer:

| HC85 | HC88 | HC90 | HC91 | HC2000 | aMIC, PRAE | CIP | JET | TIM-S | microTIM | microTIM+ | Cobra |

Special thanks to: Arkadius, Andrei Dancau, Garba Mihai, Claudiu Costin, Daniela Ionitoiu, Bogdan Bordea, Aleodor Daniel IOAN, Grecu Cristi.

Please contact me if you have any **additional information** (e.g. pictures / articles), find an error or want to **sell/trade/donate** a machines to the HCM.

Ice Felix: HC85 / HC90 / HC91 / HC2000

Ice Felix Logo

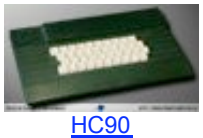

HC85 (classic)


HC85 (keybaord)


HC85 (bottom)


HC85 (back)


HC85 (modern)


HC90

The HC series of computer were built at a company called "Ice Felix" founded in 1970, located in Bukarest (Bucuresti). The Company still exists and even has a (web page with some valuable information (HC85=1985/HC2000=1993). As far as I know all HC machines were Sinclair Spectrum clones, built arround the Zilog Z-80 processor. I am not sure if it was a original Z-80 or a east-european clone.

HC85
Introduced in 1985 the HC85 was the first machine of the HC line. It has to load its basic interpreter from tape - there was no floppy disk available. The keyboard is said to be quite bad.
From [Old-Computers.com] I learned that there were two versions of the HC-85 - the older one in the "classic"-syle an a "modern"-version that looks like the HC-90. The "classic"-version seems to be the rarer one. According to **Stefan Marinescu** it had the BASIC interpreter in the ROM, so it did not load anything like that from casette - perhaps this is different for the old and the new version? We have to find out ....

HC88
According to **Bogdan Bordea** there also was a HC-88 (same case as the HC-85) with CP/M support.

HC90
Unlike the HC85 the HC90 has a built in Basic-Interpreter.

HC91
Built arroud 1991 the HC91 was just a facelife for the HC90. From [Old-Computers.com] I learned that there were two versions of the HC-91 - one with a 40-key version with a HC-90 flat-keyboard an a newer 50-key version with a better (more typwriter like) keyboard. The circuit diagramm is also different.

HC2000
In 1993 the HC 2000 was launched - the last and the best of the HC machines. It came with a built in disk-drive (double density, 720kB) - there was also a version of the HC2000 with a built in


HC91 (40key)


HC91 (50key)


HC2000

tape recorder. The floppy-disk version of the HC2000 was able to load a CP/M operating system (you had to type PRINT USR 14446 command at the BASIC prompt).

Aleodor Daniel IOAN a computer engineer from Romania added some more details:

- CPU: Z80A (from Zilog!!) or MMN80CPU (Romanian Z80!!);
- CLOCK: 3.5469 MHz from 17.7345 MHz osc, asymetrical duty cycle (get max. from a 4 MHz CPU !!);
- ROM: 32Ko (I27C256), with: 16Ko BASIC, 16Ko CP/M BIOS;
- RAM: 64Ko (2x4464 DRAMS); 48Ko BASIC, but 64Ko banked for CP/M!!
- VIDEO: PAL encoder drived from 17.7345 MHz system clock;
- VIDEO MEMORY ADDRESS: 4000h/C000h, comutable !!
- OS: Spectrum, CP/M (with external disk controller);
- EXTENSION: Special extension with serial, network and floppy disk interfaces, 5"1/4 + 3"1/2, 360Ko/720Ko (I8272 controller). An additional 16Ko EPROM for BASIC serial/network/disk BIOS.
- KEYBOARD: Mechanical, very BAD !! (the single weakness!!).

Technical Overview:

Year: 198?	**CPU:** Zilog Z80 or MMN80CPU
RAM/ROM: 48k / 16k + 8k Video	**Clone:** Sinclair Spectrum
Colors: 8 (16 counting "BRIGHT")	**Resolution:** 175x255, 24x30 in text mode

Timisoara: TIM-S / microTIM / microTIM+


TIM-S


Microtim


Microtim (Keyboard)


Microtim (Bottom)


Microtim (Back)

Zilog Z-80 processor, Memories Factory Timisoara, Romanian clone of the famous Sinclair Spectrum computer, 1987 (or earlier) today the Company is called "InfoTim" and there is even a page about the microTim [here].

Daniela Ionitoiu from IONICOL provided additional information an pictures about the history of Romanian Sinclair Clones:

"Three unlicenced Romanian clones were developped almost independently. These were developped in three main university centres Timisoara, called initially microTim, and then TimS (from TIMisoara and Spectrum), Cluj-Napoca called Prae (which means "beginning" in latin) and Bucharest called aMIC (translated as "aSMALL"). These were developped using a combination of the "black box" principle and illegally obtained desings. The "Black Box " approach was widely developped and used in Eastern Block for developping electronic devices. The same principle was used in Eastern Germany to make the best PC in the east called "Robotron". Unformally, "Black Box" means replacing a chip or a groups of chips that I do not know (or do not have) with another group that has same input and output signals.

Coming back to Romania, the Cluj group dissapeared quite quickly. But Timisoara and Bucharest continued making spectrum based computers until early 1990s. Timisoara choose to further integrate and extend the model (as Sinclar did). The main designer behind TimS is eng. Dumitru Panescu who reached quite a mastery skill in


Microtim+ (early version)


Microtim+ (keyboard)


Microtim+ (Back)


Microtim+


Microtim+ (keyboard)


Microtim+ (Back)


microTIM+ (PCB)


aMIC

integrating spectrum designs. His last prototype of TimS (it was never produced) integrated all spectrum firmware into one computer including a CP/M option. At start-up the user would select by pressing a key what does he or she wants to use. Bucharest, dropped aMIC (which in fact had its software ported also in Timisoara) and build a new model called HC (Home Computer). First HC appeared in 1985. These computers are becoming very rare even in Romania, as not many were built in the first place, and most of them have been destroyed."

aMIC and PRAE
According to **Bogdan Bordea** the aMIC and PRAE were not spectrum clones but original designs with build in basic interpreters. The both had a graphical monochrome display with 256x256 pixel, ROM 2-16kB, RAM 16-48kB. aMIC (developed at the "Politechnischen Hochschule" in Bucuresti and ITCI Timisoara) was build in 1983-84 in Timisoara at the memory factory (that build the Ferrite-Cores for the FELIX mainframe and later the TIM-S).

TIM-S
According to **Adrian Dragodan** TIM-S was the first ZX Spectrum compatible produced in Timisoara. It had an Z80B cpu, and two speeds, 3.5 and 6 Mhz, selectable via a backside switch, RS232 and Centronics Amstrad-style. Earlier TIM-S also had a flat (sensorial) keyboard, and a numeric keypad. Later models came with a "real" kbd, and were inscribed "DataTIM" BTW, most DataTIM models had no keypad. It had a flat, sensorial keyboard (In the later models it was a normal kbd, all the ones produced and labeled DataTIM were TIM-S's with normal keyboard). The TIM-S had 80 Kb RAM whereas the microTIM's had only one 64K bank.

microTIM
According to **Adrian Dragodan** the MicroTIM was the later, cost-reduced version of the TIM-S without the turbo mode and RS232, and with a "real", but very flaky keybaord. First versions had a numeric keypad, but the keyboard was really lousy, hardly usable for editing. The latest issues of Microtim included a better keyboard. Differences between TIM-S and MicroTIM:

- Reduced number of IC's: TIM-S: about 80, MicroTIM: about 50
- TIM-S: 6 Mhz mode, 80 KB RAM, 16 KB ROM
- Microtim: only 3.5 Mhz, 64 KB RAM, 16 KB ROM
- In both models the ROM was copied into RAM, so it was possible to load other ROM from tape
- In TIM-S, the video memory was doubled.

About the cases, there were MicroTIM's with numerical keypad. All used that same case, except some versions of M-TIM+, that had a separated keyboard and internal PSU.

microTIM+
The microTIM+ is also an unlicenced Spectrum clone with a detachable keyboard and is perhaps the rarest machine of the TIM-Line.

According to **Adrian Dragodan** MicroTIM+ had a much better kbd, but w/o the keypad. Several versions were produced, with different kbd look, and even a version with separated kbd, incorporated PSU and Sinclair joy intf. All the models had 80 Kb RAM - video RAM was doubled, to permit the CPU to acces the video RAM even during the scren refresh, 16 Kb ROM which was copied (shadowed)

in RAM at the adress 0000h. This solution allowed the loading of the original Spectrum ROM. I know of several games that were incompatible with the MicroTIM ROM, so it was necessary to load the original Spectrum ROM. All the models had a RESET sw., and about the size, it was like a Acorn BBC, both in shape and in size.

Functionally, TIM-S and MicroTIM(+) were identical, 99% Spectrum compatibles, but M's had a lot less IC's than TIM-S, so they were produced a lot longer(cheaper=better).

According to **Daniela Ionitoiu** only a few hundred were made.

According to **Bogdan Bordea** there was a book in 1990 by Mr. Panescu about the TIM-S Plus (with 3x64kB RAM, 16/64kB VideoRAM, and 2kB or 16kB EPROM) that was Spectrum 48 bis +3 compatible and had CP/M support. Some models of the TIM-S(+) with Z80B had two speeds: traditiona 3.5MHz and 6MHz turbo switchable (soft- and hardware). The Photos of the microTim(+)'s seem to be an early version of the TIM-S - they had no agreed on a name yet (datatim, microTIM or whatever). The circuit board of the microTim+ looks rather like a classic TIM-S (with 64kB SystemRAM - 8kb of these VideoRAM - the 16kB pysical / 8kB used VideoRAM were only written - and 8x2kB Eprom). Commercially only the Name TIM-S was used. Prices from Mr. PanescuÂ´s Â´90 TIM-S+ book:

- Variante 201 (with 2x5,25" diskdrive, tapedrive, S/W-Monitor und DokuÂ´s) 135.800 lei
- Variante 202 (mit 2x5,25" diskdrive, tapedrive, RGB-Monitor und DokuÂ´s) 171.500 lei
- Variante 211 (mit 2x5,25" diskdrive, tapedrive, S/W-monitor, 80Char printer and doku) 171.500 lei
- Variante 202 (mit 2x5,25" diskdrive, tapedrive, RGB-Monitor, 80Char printer and doku) 223.500 lei
- Variante 211 (mit 2x5,25" diskdrive, tapedrive, S/W-Monitor, 132Char printer and doku) 287.000 lei
- Variante 202 (mit 2x5,25" diskdrive, tapedrive, RGB-Monitor, 132Char printer and doku) price is missing

Technical Overview:

Year: 1983	**CPU:** U808 (Z-80 clone)
RAM/ROM: 16,32,48kB / 16kB	**Clone:** Sinclair Spectrum
Colors: b/w	**Resolution:** 192x256

Electro Magnetica: Jet


JET (white)

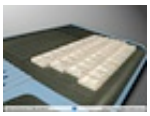

JET (Bottom)

According to **Zeno Mateescu** found at [www.old-computer.com]: The Jet was a Romanian Spectrum clone computer built in a telephone case! You can see the handset housing and the numeric keyboard replaced with black plastic masks.

The keyboard was made of printed pieces of paper inserted in transparent key-caps.

The whole computer was more a HC-85 clone, designed more specificaly for computer games. That's where the name came from:


JET (blue)


JET (Keyboard)

JET-EM Aparat pentru jocuri pe ecran TV - machine for games on TV screen - if I remember well.

It is indeed a Sinclair ZX Spectrum compatible computer. It didn't had any joystick connector (kempston or any other joystick) so I had to modify it to use a joystick. Another interesting thing about JET was that you couldn't hear the program that was loading from the tape. On HC85, for example, you could hear that, let's call it noise, when loading the program.

Technical Overview:

Year: 1990

CPU: MME 880D Zilog Z80 Russian clone

RAM/ROM: 16 or 48kB / ?kB

Clone: Spectrum

Colors: 8

Resolution: 256 x 192

Electronica: CIP, CIP-02, CIP-03, CIP-04


CIP


CIP 03


CIP 03 (blue)


CIP 03 (keyboard)


CIP 03 (back)


CIP 04


CIP 04 (keyboard)


CIP 04 (Floppy)

During the last months some infos about the CIP machine arrived. Here are the facts:

CIP, CIP-02:
These are said to exist but I don't know anything about the specs. CIP: EPROM 2Ko, RAM 64Ko, loads BASIC-S from tape (cassete)

CIP-03:
The CIP-03 is (at least today) the most machine from the CIP series. Like most east-european systems it is an unlicenced spectrum clone. At least from visual point of view there are two different versions of the CIP-03: one with a red lable and one with a blue label. The red-label CIP-03 seems to be the more common version. If there are any technical differences - I don't know!

CIP-04:
The CIP-04 has a built in floppy disk drive so it looks like it was a Spectrum +3 clone. But the floppy was 3.5" and the (no uncommon) not 3" format. It has a whopping 256Kb of RAM. According to [www.old-computer.com] "The 64 KB of ROM probably hold the 48K Spectrum BASIC, 128K Spectrum ZX+3 BASIC and CP/M operating system"

Have a look at [www.old-computer.com] for a nice picture of the PCB!

According to **Daniela Ionitoiu** the CIPs were made in the same factory in Bucharest that made the HC-Series called "Ice Felix". The fabrication period were the late 1980s.

According to **Grecu Cristi** "The CIPs (Calculator pentru Instruire Personala - computer for personal instruction), were made by Electronica, not by I.C.E. Ofcourse, these two factories are one near the other, so I think this was the confusion. They are both on the Pipera Platform, in the South of Bucharest."

Technical Overview:

Year: 1988

CPU: MMN-80

RAM/ROM: 64kB or 256kB /

Clone: Spectrum Clone

16kB

Clone: Spectrum Clone


CIP 04 (Back)

Colors: 8

Resolution: 256 x 192

ITCI: Cobra


Cobra (Black)


Cobra (keyboard)


Cobra (back)


Cobra (White)


Cobra (Screen)

Bogdan Bordea wrote a very long and informative mail about the Cobra. Here a short translated version: (the original and much better german text from Bogdan can be found here)

"I can provide some detailed information about the CoBra (COmputer BRAsov). It was designed in my hometown Brasov (Kronstadt) at the ITCI and I build a few myself. In fact it was a teacher at the Informatik-Lyzeum, Vasile Prodan, who build the first spectrum clone (around 1984 if I remember correctly). After that it was taken over by the ITCI with Vasile Prodan and so the cobra was born. In 1988 it was already a mature product - it had a build in floppy port and CP/M was ported to the CoBra. The only weakness was the power supply and the 4116 (RU3) memory chips because the needed three different voltages. The power-on sequenece (-5V first, then +5V and +12V at last) did not work every every time and in this case the 4116 died. Later it was replaced by 4516 (RU6). After the 4164 (RU5G9) was released the three 4116/4516 standart-memory banks were replaced by one 4164 bank and the RAM adressing was modified.

With another modification I had shadowed 8k for video-ram to avoid adding wait-states for reading - unfortunately the copatibility to the original spectrum was lost because timing was not similair any longer - this was caused errors with some time-critical games. The ROM was build with 9 2716 (RF2 or RF5) EPROMs. One contains the boot-code an the other 8 the SpectrumBASIC. Later 27128, 27256 or even 27512 were used if possible. I myself burned CP/M a 27512 (2kB BOOT + CP/M in a 16kB Section, original SpectrumBASIC, modified BASIC with Floppy-support and OPUS) with a special EPROM burner that connects to the Expansion-port of the CoBra (designed by the ITCI an build in small numbers) to avoid booting from floppy.

The original Cobra CP/M Boot-Disk was copy-protected with 4kB sectors on tracks 1+2 (double sided). So it could not be copied with the standart copy programm (DIP). Due to the poor quality of the original disk they were damaged very soon and hard to replace. So get the debugger, modify the Bootprom to read "standart" 512 byte sectors and copy the 4k Boot-sector to a regularly formated disk. Unfortunatly the software-guys build in additional copy protection mechanisms in CP/M that expected a 4kB sector on the disk - after solving this last chalange with the debugger the cobra booted from regular disk - no begging for special disks any more.

Disks with 8 or 10 sectors per tracks 320/400kB (40Tracks) and 800kB (80Tracks) for DS/DD - but only for 5,25" diskdrives. Other formats were 157kB (35Tracks) and 180kB (40Tracks) for older SS/DD 5,25" diskdrives. I did not find any 3,5" diskdrives before 1990 - in this time the 5,25" diskdrives were already hard to get. With 8" the capacities were totaly different - in fact only 250kB (77Tracks Ã¡ 26Sektors Ã¡ 128Bytes) SS/SD in CP/M was suported for all diskdrives. Only one friend of mine was able to get such a diskdrive - he had problems with the sync-motor because it works with line voltage and the frequency varied a lot. We joked that need

needs different disks for morning, noon and evening to read/write his data.

As far as I remember the Cobra was build in small quantities at the Elektronenrechnerfabrik (ICE) in Bucuresti (were also the HC series was build). Ordinary people had to get it from the black-market because communists did not allow individuals to buy it. After 1989 the CIPs and the JETs were build but they were of minor quality. From all designs the Cobra was certainly the most flexible and easiest Clone in reproduction and the circuit and the board was quite optimized and elegant for the time given. Unfortunatly it was not commercialy available after 1989. It was produced by a research institute with a small production of its own (only with parts from Romania - if necessary from the east-block). But the competition from cheap HC90+, CIP and JET was too big - these machines were already build with much less components form the west.

Usualy one bought the board and the components from one of the dormitories (Regie) around Bukarest (thats why one could think of a DIY-Kit). One needs to have "the right connections" to get the parts because they were stolen at the factory and sometimes the militia made raids. Usualy the Cobra board was fitted into a HC-85 Case because the original cases were rare and hard to get. It was joked around (and I am not sure if it was relay false) that more Cobras were made at the dormitories than in the factory."

Andrei Dancau told me some details about the Cobra:

The Cobra was as far as I know 100% compatible with the Sinclair Spectrum. Basically a clone. Since it was a do it yourself kit, the CPU could be different. The mainboard I have has a Russian CPU, but I'm pretty positive that you could get a Zilog Z80 by the beginning of the 90's. Catalin Mihaila provided quite a lot of infos about the Cobra:

- Producer: ITCI Brasov Romania
- Year: 1988
- CPU: Zilog Z80CPU (or clone: UB880D - old east german clone, MMN80CPU - romanian clone) at 3.5 MHz
- ROM: 2K - boot eprom + 32K eprom for OS: 16K - standard zx sinclair basic; 16K for OPUS (OPerating User System)
- RAM: 64K or 80K(for versions with CP/M)
- OS:
    - standard zx spectrum basic
    - OPUS
    - CP/M 2.2+

Features:

- with floppy interface mounted can access until 4 units of floppy of 720K, 360K or 180K(!!) in all formats (8'', 5.25'', 3.5'')
- at startup computer show on screen a nice draw with cobra and after few momments the draw is moving from right to left (code is in 2K eprom) from startup mode one can:
    - press "B" for access to zx spectrum basic
    - press "W" to access OPUS
    - press "D" to boot CP/M from FDD
    - press "C" to load any other OS from tape (it wait to load two files without header and length #2000 each and after that execute JP #0000)

- OPUS features:
  - include assembler and desassembler
  - include memory monitor
  - include tape copy program
- Memory map is variable depend by which OS is loaded.

Technical Overview:

Year: 1988	**CPU:** Z-80 or clone
RAM/ROM: 64kB / 32+2kB	**Clone:** Spectrum
Colors: 16	**Resolution:** 256x192

Links: to other web-sites ...

Romanian Computer History (English)
Romanian Computer History at Ionicol (English)