

Thomson computers

The history of Thomson 8-bit computers in France

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Forever Party 2015 - Defender of the 8-bits

Plan

- 1 History
- 2 Timeline of Thomson computers
- 3 Programming on Thomson
- 4 Software failure
- 5 Join us!

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Thomson company

The birth of Thomson

- 1879: Thomson-Houston company created in the USA
- 1892: Compagnie Française Thomson-Houston
- 1892: Merges with General Electric

The French company (CFTH) turns out to be not so useful to General Electric. It gradually becomes independent.



Thomson company

During the XXth century, Thomson buys other companies, gets too big, is split into several sub companies, some of which merge again.

- 1966: Thomson is split in Thomson-Brandt and Thomson-CSF
- 1981: Thomson-Brandt and Thomson-CSF are nationalized and merged again.

The nationalization happens because Thomson is a major supplier of weapons and high-tech devices for the French army (including semiconductors and other electronics related products). The French government doesn't want to rely on supplies of those coming from other countries, and wants to secure the local production.

Activities in various sectors over the XXth century:

- Electricity transport and production
- Tramways and Railways (will become ALSTOM)
- Batteries and Lightbulbs (Mazda)
- Weapons (Hotchkiss)
- Home appliances (Brandt)
- Semiconductors (EFCIS, will become ST microelectronics)
- Cathodic ray tubes and monitors
- ... and more (Technicolor, Thales, ...)

Thomson is involved in research about Radars, Magnetron, Videodiscs, the first "Eurovision" TV transmission, and much more.

Economics in France

France is worried that the USA will take over the country

- This dates from WWII, mostly
- Politics and Economics are designed to avoid this
- Avoiding the use of English as much as possible

Economics in France

The big US companies (Commodore, Apple, Atari and others) don't get to the French market as easily as elsewhere in Europe.

- High import taxes
- No easy way to setup a French subcompany (like Commodore Germany)
- French specific standards: SECAM, AZERTY, SCART (computers have to be modified to work with this)

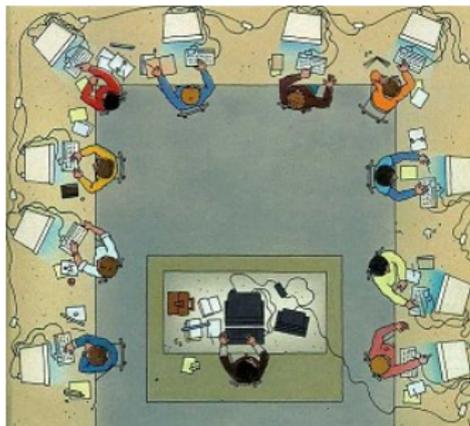
Computers in France

This makes it easier for French companies to do their own computers

- Matra licences the MC10 design from Tandy and makes a French version of it
- Exelvision designs a computer using TI hardware
- Thomson builds theirs using Motorola 68xx family
- And much more (SMT, Léanord, LogAbax, Bull, ...)

Plan Informatique Pour Tous

"Informatique Pour Tous" - Computers for everyone!



- French government plan to install computers in classrooms (6-15 year old children)
- Technical constraints enforcing a French manufacturer (SCART connector, LSEG language)
- Thomson will make most of the machines for this

Plan Informatique Pour Tous

Thomson solution



- "Student" computers: MO5 with RAM expansion and network interface
- The network is Léanord's Nanoréseau (RS485 based)
- "Teacher" computer (file server): Bull, LogAbax or SMT machines.

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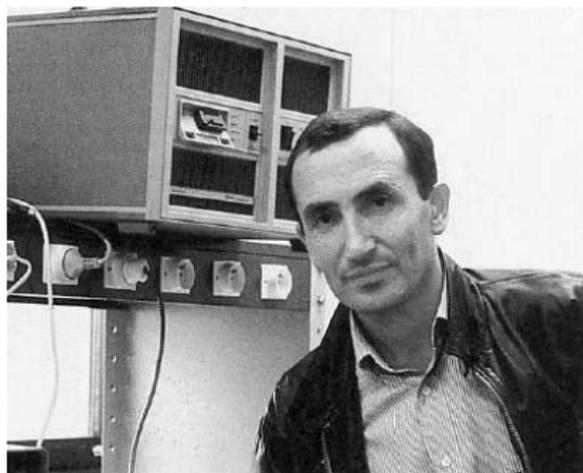
- All machines built around the 6809E CPU at 1MHz
- Video memory is made of two 8K pages
- No compatibility with anything else!

The 6809E (and other Motorola chips) was already manufactured by Thomson-EFCIS for the French army, under license from Motorola. The 68xx chipset will be a popular one for French computers because of this (including Matra Alice, Tavernier, Apollo 7 Squalle shown below).



└ Early design: the T9000 prototype

Most of the design for the first machine is the work of José Henrard. Researcher in sociology and economy, he built his own computer in his spare time and was then hired by Thomson to get the company started with computers.



This leads to the prototype T9000 computer demonstrated in 1979, a design very close to the T07. Works then begin on industrializing the design.

Almost 24K of RAM:

- 8K system RAM (8 bits wide, expansion available to add 32K more),
- 8K video RAM (14 bits wide)

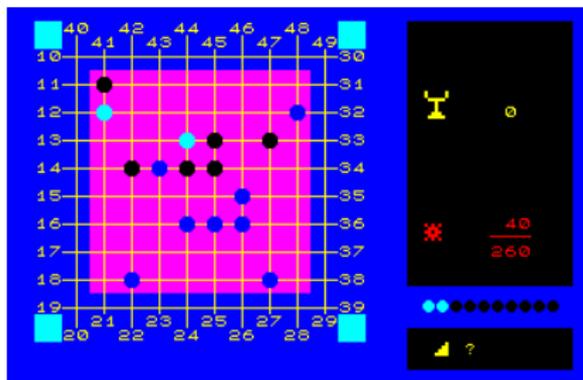
6K of ROM (built into the 6846 PIA):

- monitor code and "welcome" boot screen
- (BASIC comes in a cartridge, sold separately)

Static RAM is used, allowing a simple video generation system using standard 74LS logic chips.

The computer is designed to be used mostly with the integrated lightpen. The keyboard is considered secondary and made flat in an attempt to make it less visible.

320x200, 8 color, with 8x1 color blocks, 2 colors per block.



Atomium, 1982



Elvis Lives! Slideshow, 2014

Sound: 1-bit buzzer.

TO7/70

Introduced in 1984, this competes against the Amstrad CPC 464 and Commodore 64.



64K RAM (48K system + 16K video), extensible to 128K.
Dynamic RAM and integrated Gate Array for video logic.
Slightly better "chicklet" keyboard.

The color palette has the 8 base colors, and brighter versions (not darker as on Spectrum).

"bright white" is replaced with orange.



La mine aux diamants, 1984

M05

The M05 was launched at the same time as the T07/70. It is a simpler design and competes against the ZX Spectrum and Oric Atmos.



6846 PIA removed

Simpler memory map with 16K ROM and 48K RAM

Better tape data encoding.

Built-in BASIC, masked by cartridges.

No memory expansion initially, but fixed later to allow a 64K expansion on the cartridge port.



Life and death of Dinosaurs, 1986



Poiscaïe by Exocet, 2015

TO9



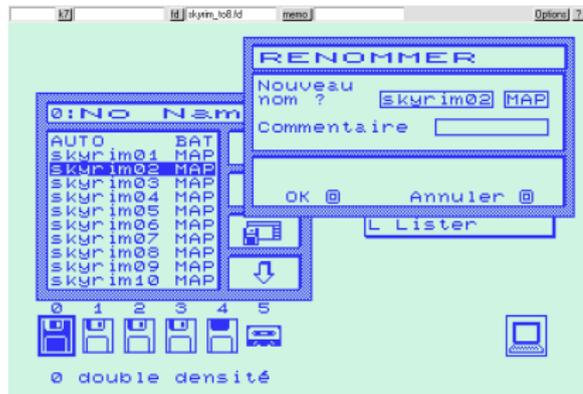
Introduced in 1985, the TO9 targets the professional market (competing against the Macintosh, according to Thomson marketing dept.)

TO9

128K RAM, 136K ROM with built-in BASIC, Word processor, database, and "icon DOS" file manager.

Built-in disk drive, PC like desktop case with detached keyboard
6-bit DAC for sound output, Joystick/mouse ports, parallel port.
(these are all available as expansion for other models).

The same year, the TO7/70 and MO5 are upgraded to get a mechanical keyboard.



New video modes without block constraints
 (320x200 4 colors, 160x200 16 colors,
 640x200 2 colors)
 4096 color configurable palette.



The Druid by Brink, 2014



Bob Morane Science Fiction



Asterix Chez Rahazade

New gate array integrating more of the computer on a single chip to reduce costs.

All the new features from the TO9 are made available on all machines.

The ROM is 64K on MO6 and 80K on TO machines. The built-in software is now moved to floppies to allow easier upgrades (the first 10000 TO9 shipped had to be replaced because of software bugs).

└ The 1986 machines

The TO7/70 is replaced with the TO8 (now fighting against Amstrad CPC 6128, Amiga 500 and Atari ST),



www.wda-fr.org

It gets an internal floppy controller and 256K RAM, but still no built-in floppy drive.

└ The 1986 machines

The MO5 is replaced with the MO6 (fighting against Amstrad CPC 464), which has 128K RAM and a built-in tape deck.



End of the story

In 1987, the TO8 is replaced with the TO8D and finally gets a built-in floppy drive.



Thomson teamed up with Olivetti (Italia) and Acorn (UK) to design an european standard computer. This was based on 68000 CPU and multitasking OS/9. The project is cancelled.

Thomson will sell a PC compatible machine (the TO16) until 1989, then quit the microcomputer market.

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- Binary-incompatible redesign of the earlier 680x CPU
- Similar to the 6502, but more powerful
- 2 accumulators (A and B) useable as a 16-bit one (D)
- 2 index registers (X,Y)
- 2 stack pointers (S,U)
- Direct-page allows fast access to a 256-byte memory zone (like Zero-page, but can use any 256-byte memory zone with DP register)
- Hardware multiply instruction
- advanced addressing modes (indirect with predecrement/postincrement)
- LEA instruction (like on 68000)

Original design (1982-1985)

- The video hardware access the memory using a 16-bit bus
- This is split in two "banks", the CPU can only map one at a time
- One bank sets 2 colors for a block (3 or 4bit each)
- The other bank defines the 8 pixels (0=use first color, 1=use second color)
- The resolution is fixed to 320x200, leaving a small free space in each bank
- Video memory is linear.

Starting from the TO9, and in the 1986 gate array, some changes are made:

- The 4-bit colors are fed to a programmable lookup palette, allowing 4096 colors
- The pixel clock can be changed to generate 160x200 or 640x200 modes
- The "attribute block" system can be replaced by a planar or semi-planar mode (each pixel is defined using some bits from each bank)
- The system allows for "overprint" modes where one bank masks the other.

In 1986, further changes are made:

- The memory access is done using the system 8-bit bus
- The two banks are interleaved in physical memory to allow "same-page" fast access
- This makes it possible to use a single bank of 8 256K chips for the whole memory
- As the Gate Array is also used on the MO6, an extra swapping step is added for compatibility.

Up to the MO5, only a buzzer is available.

Starting from the TO9, a 6-bit DAC is used. It has no DMA, so playing sound wastes a lot of CPU time, and some bits are shared with mouse input, which create interferences.

Additionally, the tape drive has a stereo head. One track is used for data, and the other is sent to the audio amplifier. This can be used for CPU-free high-quality audio.

The ROM is always mapped in. This is why interrupts are hardwired to it.

On the MO5 and plain TO7, only the video RAM is banked (2 banks). But RAM expansions may add more.

The TO9 adds even more banking support,

The 1986 gate array is compatible with all of the above, and has yet another new mode to allow up to 512K of banks. It also allows relocating the video RAM to different memory banks instead of a single fixed one.

Use of the different modes can be confusing. It's possible to map the same RAM page to the CPU at multiple places at a time.

On TO machines, the 6846 PIA provides a programmable timer

Unfortunately, the interrupt routine jumps into ROM, and does a lot of things there.

You can still use the timer with polling, or the SYNC instruction to wait for timer events without using interrupts (but this of course locks the CPU waiting).

The 1986 gate array has 60Hz video support. This was never used, as attempts to export the machines have all failed (to URSS, India, Argentina, Spain, ...).

This could be used to kill the bottom border of the screen like on Atari ST.

The video modes are programmed using a 7-bit register. A lot of combinations are marked "useless" in the official documentation. What happens if you use them?

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└ Why did it fail?

As you probably have noticed, Thomson machines were never too popular out of France. Why is that?

- Too high prices: Thomson insisted on building the computers completely in France, and had somewhat complex hardware (lots of RAM and ROM, ...), leading to high prices.
- Too high compatibility: all machines use the same 1MHz CPU in an attempt to make them all compatible. In 1986, this was not acceptable anymore
- Too low compatibility: despite the attempts, there were still a lot of problems and misunderstandings (why keeping both the MO and TO series? Why replacing the Gate Array with a new and slightly different design in the MO5 later revisions?)
- Too many machines: and I only shown the ones with actual hardware differences, ignoring the various recasings (MO5NR, MO5 Platini, mechanical keyboard upgrades)

└ Why did it fail?

- Unusual CPU choice: Thomson and Tandy CoCo are the only ones using the 6809, forcing devs to use different tools and rewrite all their code. Z80 and 6502 were a lot more popular.
- Low quality software: most software is adapted from Spectrum or CPC, and not using Thomson machines capabilities to their full potential. Moreover, they kept compatibility with older models, and never used the advanced features of the new ones to the full power.
- "educative" orientation. Thomson is remembered for being the "school computer". It never managed to become a popular game machine, nor a business one.

└ Thomson demoscene

In the 80s and 90s, there was an active Thomson community in France, but not much demomaking activities. People focused mostly on writing "serious" software, and some hardware projects.

In the 1990s, the only group was HCL. They did some intros as well as the HCL megademo.

In the 2000s, the group PULS finally brings some serious demos to Thomson with Chinese Stack and Space Project.

In 2011, for the first time a Thomson demo enters a democompo (at Forever!)

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I hope to see more people have a try at Thomson. You don't have one at home? No problem, we have emulators!

Get MESS or TEO, both come with a built-in debugger and other useful features for development.

Some of the hardware documentation is only available in French. (have a look at the dcmoto website for some). I'm working on a "demomaker guide" to get you started.

<http://shinra.cpcscene.com>