

AccessionIndex: TCD-SCSS-T.20250918.003

Accession Date: 18-Sep-2025

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Object name: Intel 8080 microprocessor and associated chips

Vintage: 1974

Synopsis: Intel's second and very successful early 8-bit microprocessor.

### **Description:**

This is one of the earliest microprocessors, Intel's second 8-bit microprocessor, introduced in April 1974. Whereas the 18-pin 8008 multiplexed its address and data, meaning even a simple 8008 memory interface needed about 30 external logic chips, the 8080 [1] overcame this disadvantage by using a 40-pin package, but was not binary compatible with the 8008 (but all 8008 instructions have matching 8080 instructions), while the next generation again, the 8086, was a non-strict extension of the 8080. The 8080 also benefited from moving from pMOS to nMOS, making it faster and TTL compatible.

The 8080 project was led by Federico Faggin, the physicist who had invented silicon gate technology (SGT) at Fairchild in 1968 and designed Intel's 4004 (released 1971) and 8008 (released 1972), while Masatoshi Shima, who had also worked on the 4004, did the detailed 8080 design under Faggin's direction. They expanded the instruction set and its address fields to enabled access to 64kB of memory (compared to 16kB for the 8008). It operated at 2MHz, with instructions taking 4-11 clock cycles.

The 8080 generally required the support of the 8224 two-phase clock generator and 8228 or 8238 system controller. There were other supporting chips, which were also used with Intel's next generation 8086, and so are listed with that microprocessor in this catalog:

<b>Chip</b>	<b>Function</b>
8214	Priority Interrupt Control Unit[17]
8224	Clock generator
8228	System controller and bus driver
8238	System controller and bus driver
8251	Communication controller
8253	Programmable interval timer
8255	Programmable peripheral interface
8257	DMA controller
8259	Programmable interrupt controller

Despite being fabricated in nMOS, the 8080 required +5V, -5V, and +12 V power supplies. In 1976 it was replaced by Intel's 8085, again nMOS, but only needing a single +5V power supply.

The 8085 [2] had the same register set as the 8080, and was binary compatible with it, but had a slightly different architecture, including a serial communications interface. But apart from the power supplies, the major difference was that it freed up 8 pins by multiplexing the 8-bit data bus with the lower 8-bits of the address bus. Hence it was able to use those 8 pins plus the 2 pins that had served -5V and +12V for 10 new signals. It had an internal clock generator, but its external crystal used 2 pins just as

had the 8080's two-phase clock inputs. The 10 new pins were: address latch enable (ALE), four more interrupt pins (TRAP, RST7.5, RST6.5, RST5.5), serial input and output (SID, SOD), and three dedicated bus state pins (S0, S1, IO/M; unlike the 8080 it did not multiplex state signals onto the data bus). The 8085 also replaced four signals (INTE, DBIN, SYNC, WAIT) with new signals (/INTA, RESOUT, /RD, HLDA). The 8085 also had two new instructions (SIM, RIM) to set, reset and read global and individual interrupt masks and states. In general it was simpler to design with and much faster.

There were and are many demonstration/development boards or systems for the 8080. In this Collection these are represented by a *Retrosshield* designed by Erturk Kocalar, which uses an Arduino host to emulate the original 8080 external environment, such that it can execute original 8080 software, see elsewhere in this catalog. A companion 8085 retrosshield is also included in this Collection.

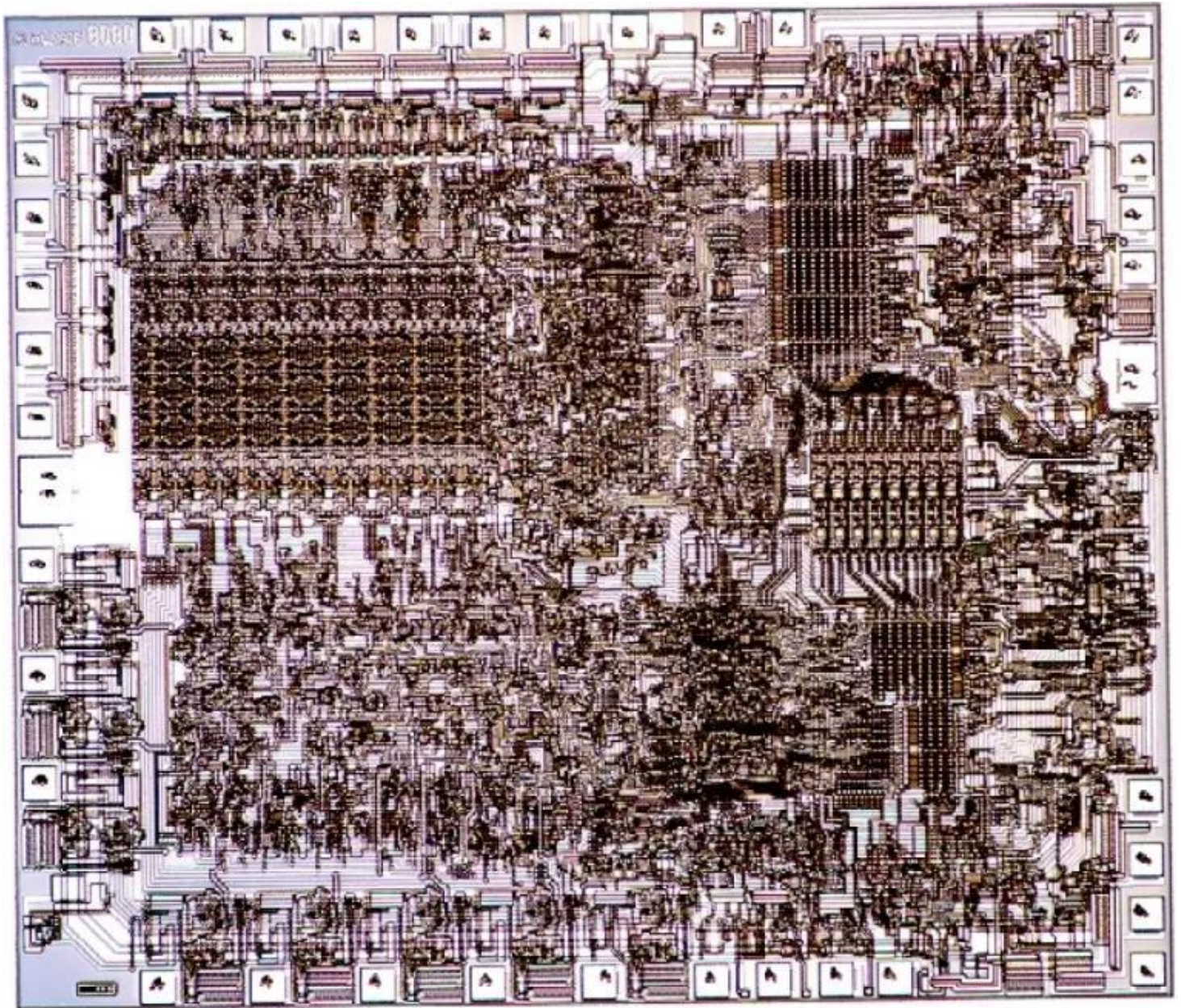
Many thanks to Brian Coghlan for donating these chips, and to Brian Coghlan and Erturk Kocalar for donating the retroshields.

The homepage for this catalog is at: <https://www.scss.tcd.ie/SCSSTreasuresCatalog/>  
Click '*Accession Index*' (1st column listed) for related folder, or '*About*' for further guidance. Some of the items below may be more properly part of other categories of this catalog, but are listed here for convenience.

Accession Index	Object with Identification
<a href="#">TCD-SCSS-T.20250918.003</a>	Intel 8080 microprocessor and associated chips. Intel's second and very successful early 8-bit microprocessor. 1974.
<a href="#">TCD-SCSS-T.20250918.003.01</a>	Intel 8080 microprocessor. 1974.
<a href="#">TCD-SCSS-T.20251216.001</a>	Arduino shield for Intel 8080. A board that enables execution of software by the 8080, Intel's second and very successful early 8-bit microprocessor, 2025.
<a href="#">TCD-SCSS-T.20251216.009</a>	Arduino shield for Intel 8085. A board that enables execution of software by the 8085, Intel's successor to their 8080 microprocessor, 2025.
<a href="#">TCD-SCSS-X.20250916.001</a>	Dr.Brian Coghlan's Collection of Early Microprocessors. An extensive and nearly complete set of unused 1970s microprocessor chips, most accompanied with documentation, some with demonstration boards. 1971.

### References:

1. Wikipedia, *Intel 8080*, see:  
[https://en.wikipedia.org/wiki/Intel\\_8080](https://en.wikipedia.org/wiki/Intel_8080)  
Last browsed to on 18-Sep-2025.
2. Wikipedia, *Intel 8085*, see:  
[https://en.wikipedia.org/wiki/Intel\\_8085](https://en.wikipedia.org/wiki/Intel_8085)  
Last browsed to on 18-Sep-2025.



*Figure 1: Intel 8080 chip die micrograph (from Wikipedia).*

Intel 8080 Architecture

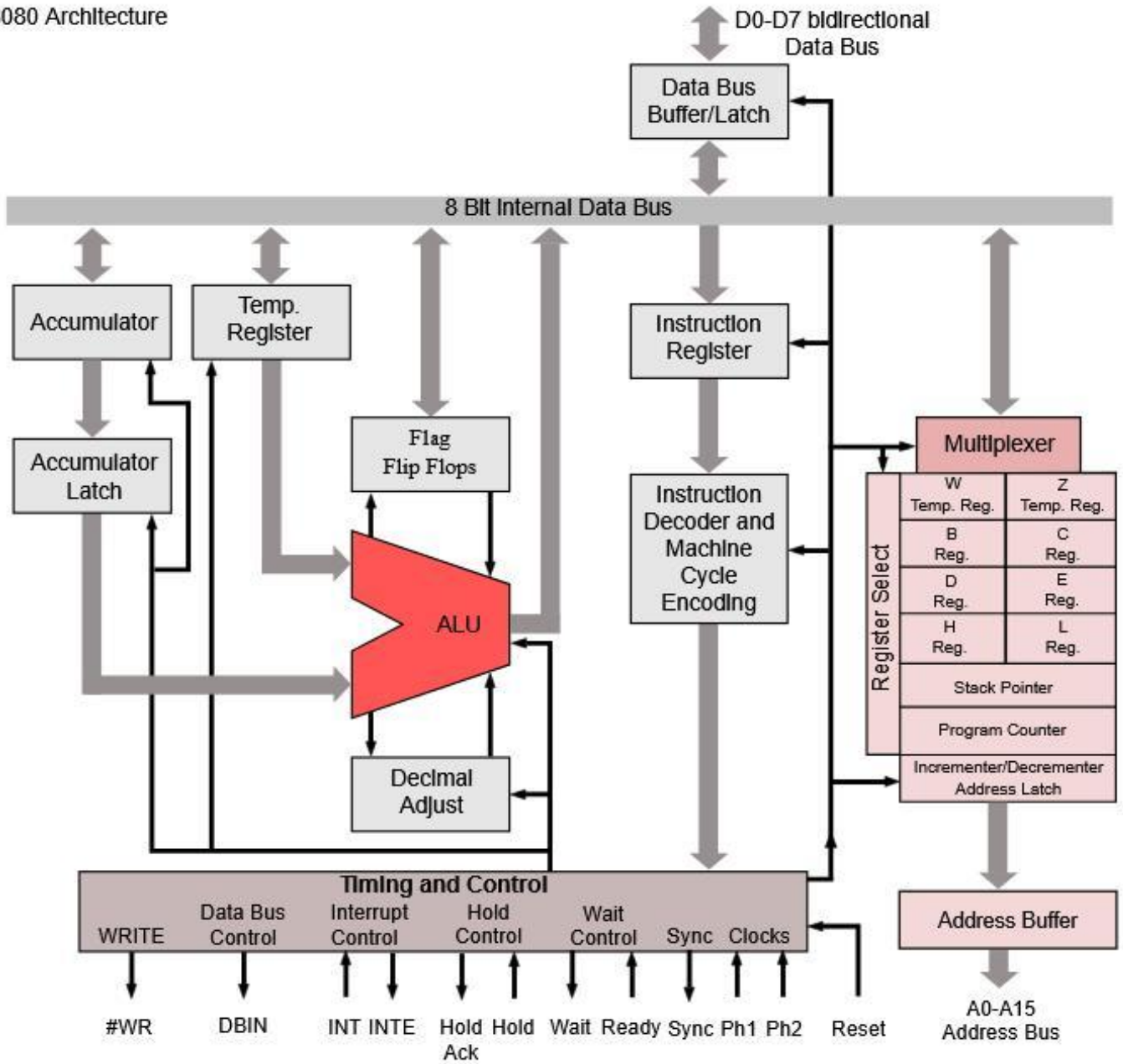


Figure 2: Intel 8080 architecture (from Wikipedia).

## Intel 8080 registers

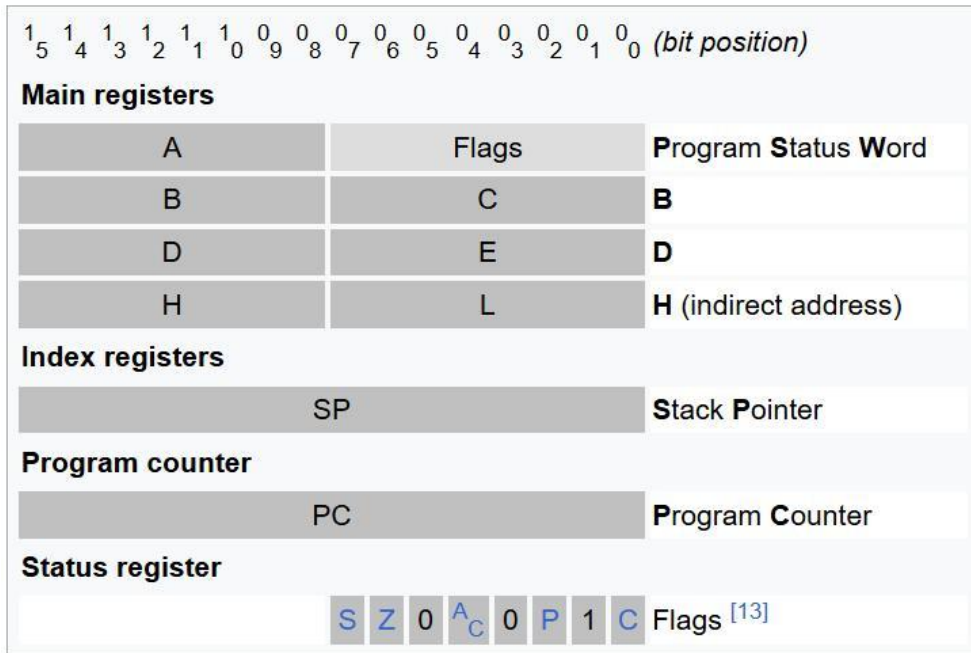


Figure 3: Intel 8080 registers (from Wikipedia).

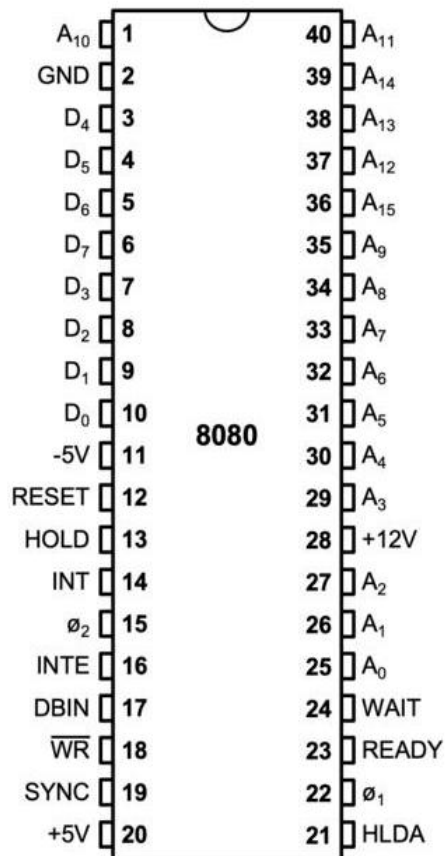


Figure 4: Intel 8080 pinout (from Wikipedia).

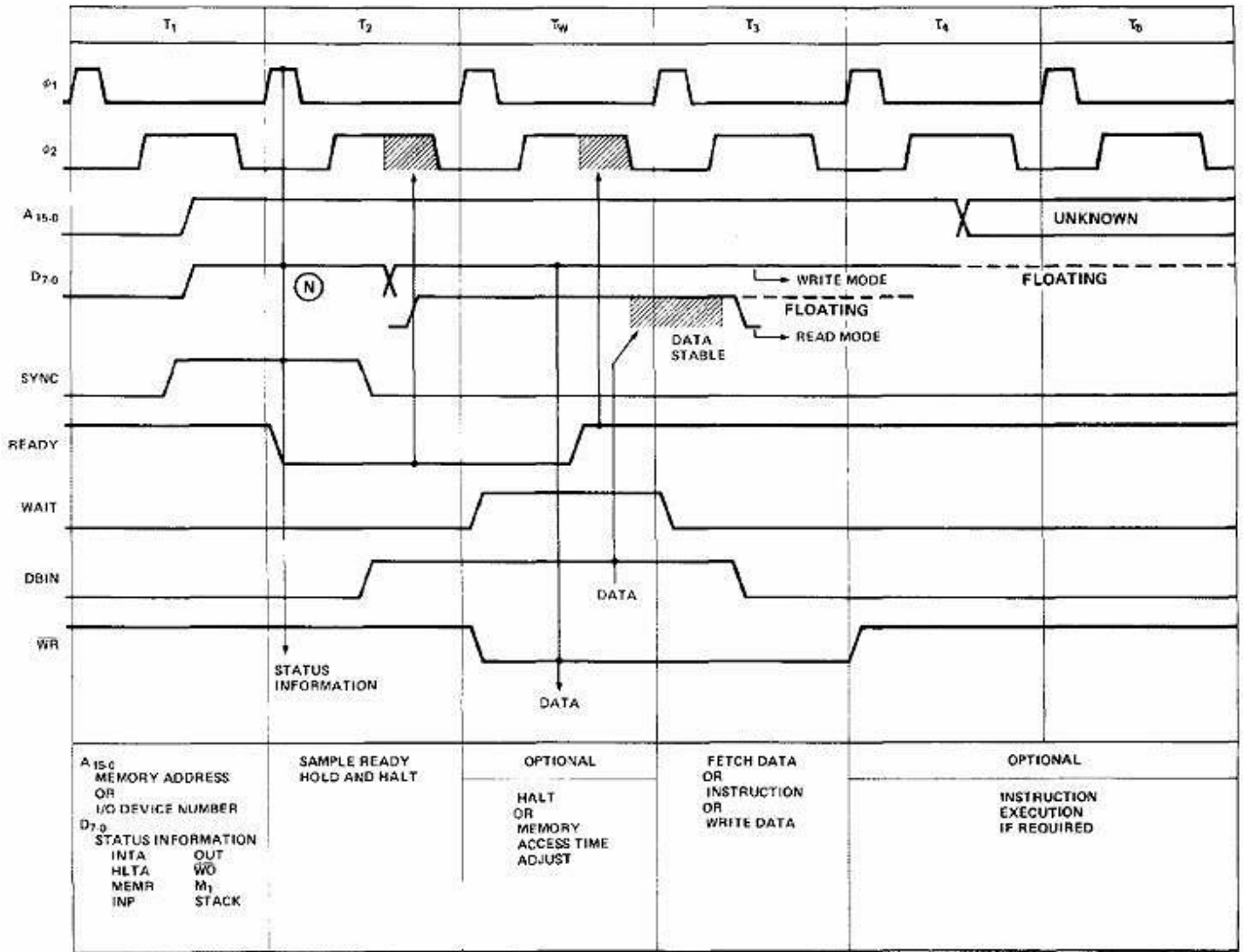
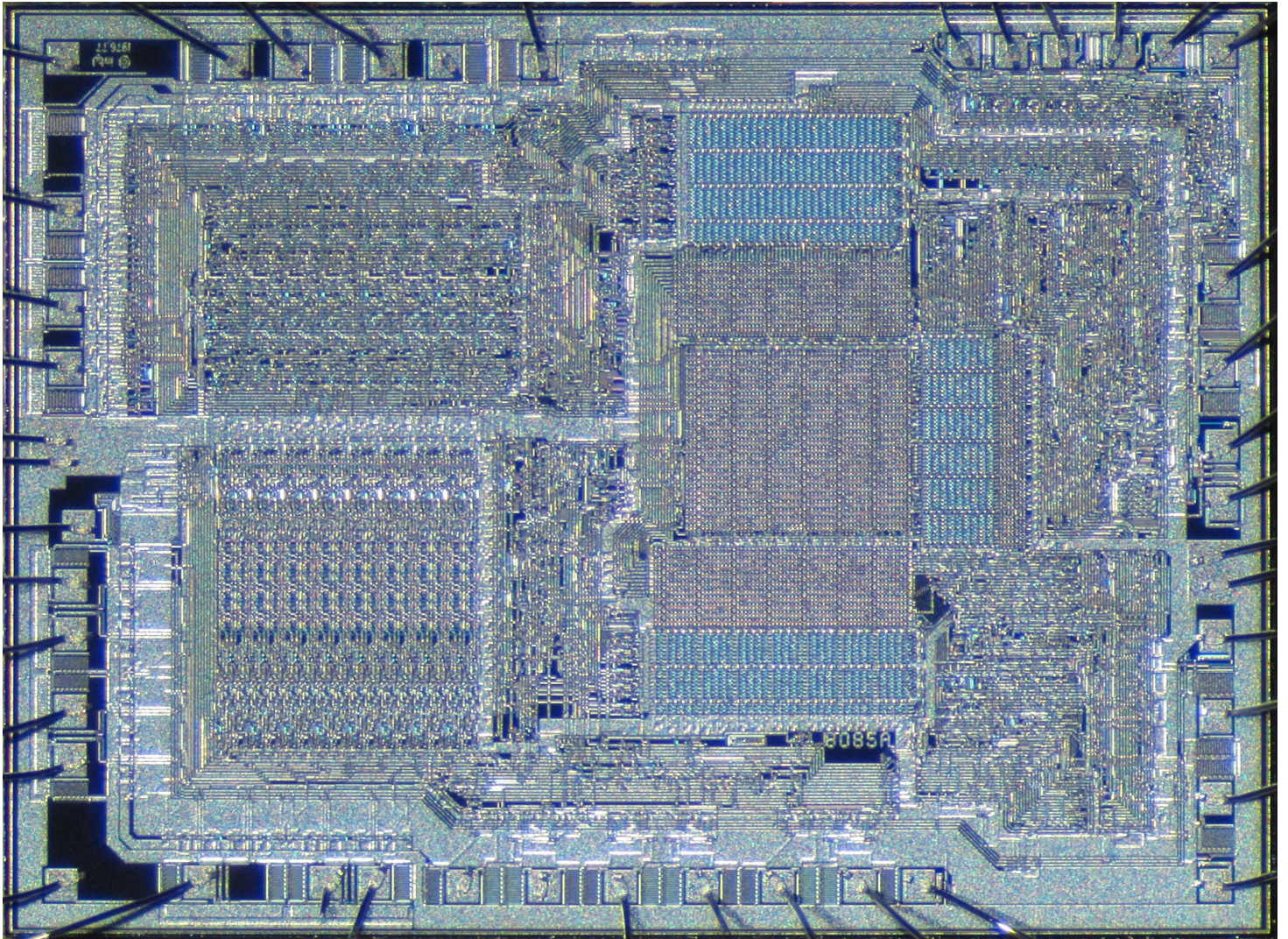


Figure 5: Intel 8080 instruction timing (from Intel datasheet).



*Figure 6: Intel 8085 chip die micrograph (from Pauli Rautakorpi).*

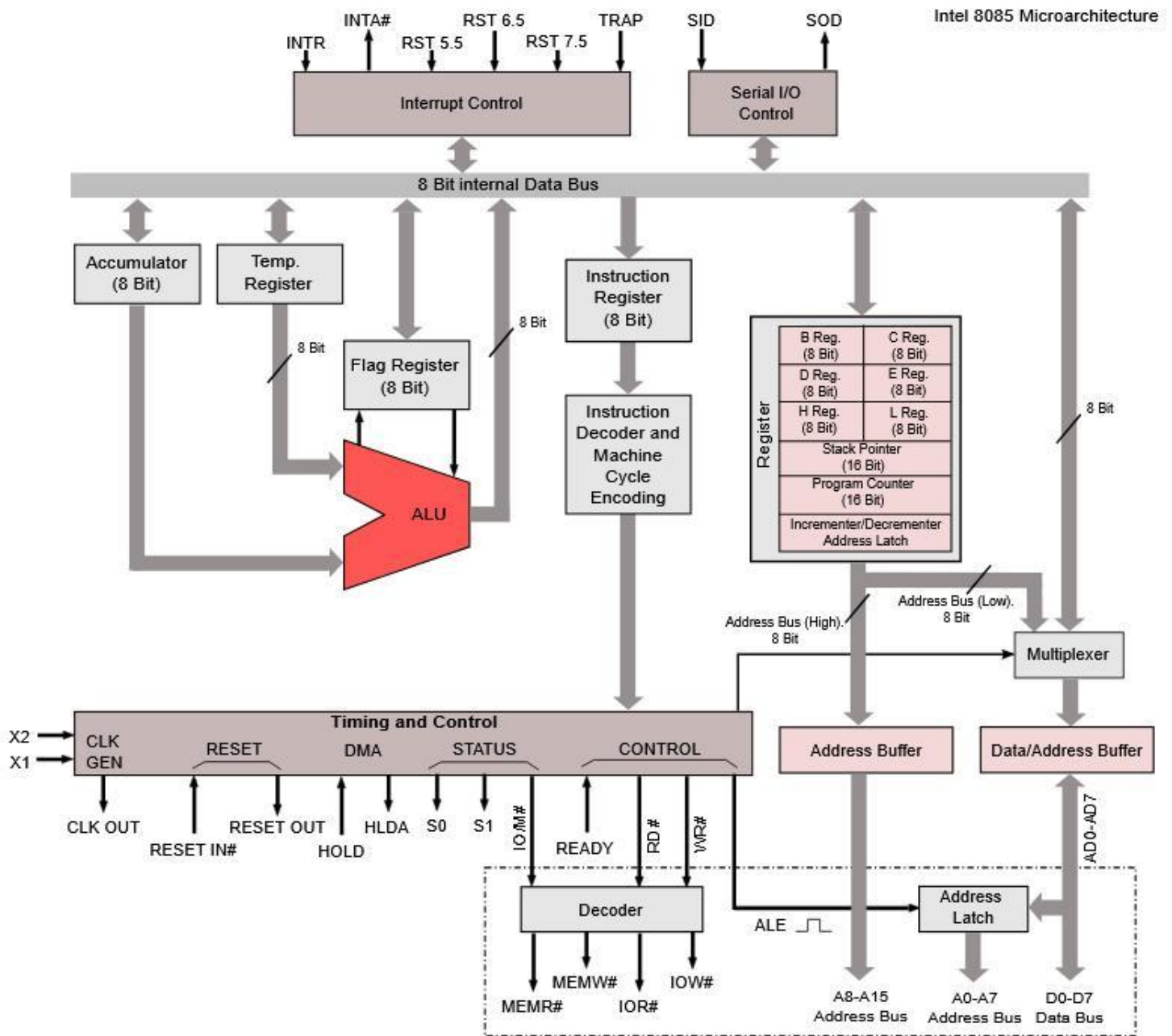


Figure 7: Intel 8085 architecture (from Wikipedia).

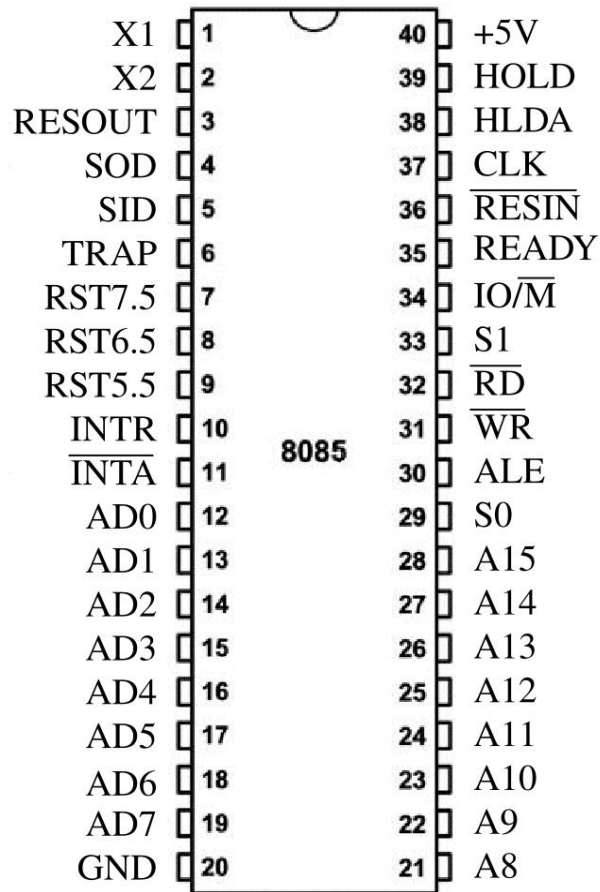


Figure 8: Intel 8085 pinout (from Wikipedia).

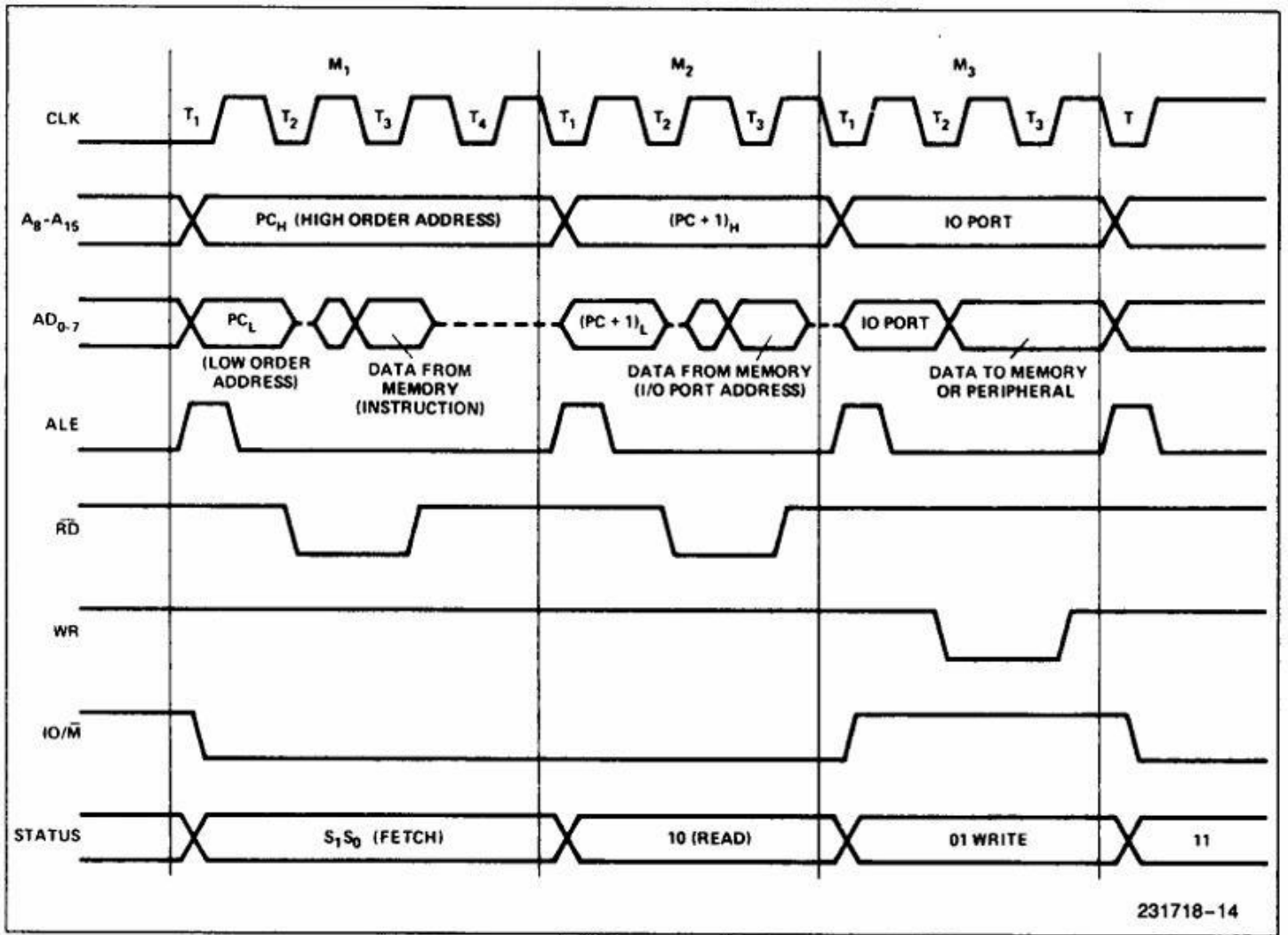


Figure 9: Intel 8085 instruction timing (from Intel datasheet).