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## Fairchild PPS-25: 4-bit CPU for 25-digit precision



It's been a long while since I have been able to post/write, having a new baby apparently does that (I missed that in the datasheet). Since I have neglected posting, or forgotten, lets continue with 'The Forgotten Ones'

This brings us to 1971, Fairchild, after losing many employees in 1968-69 who went on to start world famous semiconductor companies (Intel and AMD amongst others) has decided to make their own processor system. This was very early in the era of CPUs, you had the Intel 4004, the TI

TMS1000, and various calculator type circuits. The PPS-25 is a 400KHz (62.5uS Word cycle time, 2.5uS bitrate) PMOS processor, organized into several different chips. It is a 4-bit parallel, with 25 digit serial data, thus the name, Programmable Processor System 25. Each of those 62.5uS cycles is also divided into 25 micro instructions of 2.5uS, Now what would a 4-bit processor need 25 bit data? Precision, the PPS-25 was designed to fill the void (at the time) between high end calculator chips and actual mini-computers.

The PPS-25 systems core is the 3805 ALU and the 3806 Function/Timing chips. The 3805 (DIP18) includes the adder/subtractor as well as a 25 bit register (The accumulator). This accumulator was maskable as well, allowing different parts of it to be operated on with a 6-bit mask. This allowed a great amount of flexibility in programming. The 3806 chip (the largest of the chipset a DIP24) contains the timing and control logic, two 25-bit status registers, branch logic, the instruction address register, and various other logic functions. To support this core, is a pair of register chips, the 3808 and 3809 registers. These are basic shift registers and each contain three 4-bit BCD parallel, 25-digit serial register memories. Instructions are stored in up to 25 256x12 bit serial ROMs, the 3810. The address bus is 8-bits, and the instruction word is 12-bits so with 25 chips, you get 6400 instruction words of available instructions (or constants). 95 instructions were provided.

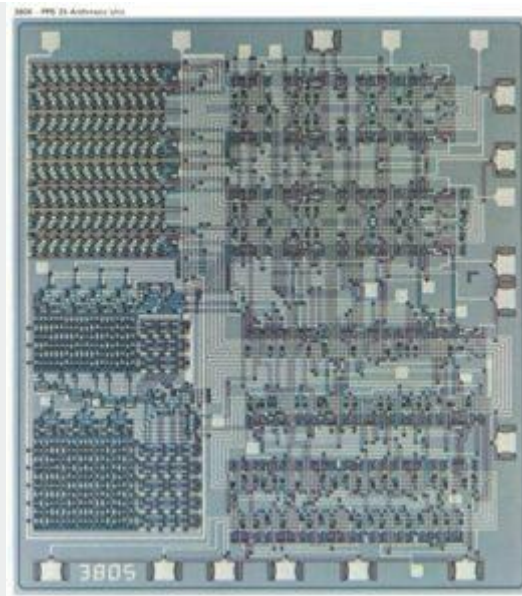


Cybernetic Mathiputer - Vintagecomputer.net

The PPS-25 also supports the 3811 for handling output, as well as the 3807/3803 input devices which support up to a 32 key keyboard (3807) or larger, 3803. Both these chips came in 40DIP packages, larger than the CPU itself.

This design was a bit complicated, and took several chips, so it did not see wide adoption, Fairchild 'de-emphasized' it by 1974 as they were working then on the F8 processor. The PPS-25 did however find its uses, and inspired other designs as well. HP considered using the PPS-25 in its calculator designs, before deciding to make their own CPU's in house (Saturn, Nut etc). The design and programming of which bare a strong resemblance to the PPS-25.

One of the more known uses of the PPS-25 was in the Cybernetic Mathputer, an early learning toy for children but its use was not limited to such trivial devices. It was also used where precise math work was needed. a Walsh Spectrum Analyser design chose it above the what would normally be considered much more powerful Intel 8080 largely due to its math capabilities.



3805 ALU – 4-bit

Its turns out making a CPU function more like an advanced calculator allowed it to do advanced math fairly well. It was also chosen for calculating SINC/COSC values for an engineering system.



Piper Cheyenne II

Another field where precise math is needed is in navigation, and the PPS-25 found a home here as well. King Radio Corp (now Honeywell) designed a Radio Navigation computer for airplanes in the 1970s based on the PPS-25. Around 500 of these were made and were found in such planes as the Piper PA-31T Cheyenne, Cessna 441 Conquest II, and Beech King Air, high end twin turbo props of the era. Interestingly King had difficulties sourcing replacements for these, so a common upgrade to these nav computers was replacing the PPS-25 with a custom ASIC and a Motorola 6802 CPU.

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<http://www.bitsavers.org/components/fairchild/pps25/>