

AccessionIndex: TCD-SCSS-T.20191104.001
Accession Date: 4-Nov-2019
Accession By: Ronan Scaife
Object name: DEC PDP-8/e minicomputer
Vintage: c.1970
Synopsis: Legendary 12-bit minicomputer.

Description:

This item is a DEC PDP-8/e, one of a very important early computer family, and largely responsible for DEC's early successes. The original PDP-8 was released on 22-Mar-1965, designed by Edson de Castro, who later founded Data General. It was followed by the PDP-8/S (1966), PDP-8/L (1968) then PDP-8/I (1968). All these followed a deliberate trajectory towards better value for money, which resulted in very successful products.

The PDP-8 machine's 12-bit accumulator-based architecture was modelled on the original MIT LINC machines, but their instruction set was an expansion of the PDP-5 instruction set. It has only four 12-bit registers: the accumulator, the program counter, and two hidden registers for the memory address and memory buffer, plus a 1-bit carry (*Link*) register, although these registers actually perform multiple duties during the instruction cycle. There are only eight instructions (encoded into a 3-bit field). All the arithmetic was in 2's complement, although there were eventually optional EAE (Extended Arithmetic Unit) or FPP-12 (Floating Point Processor) units.

The 12-bit data word widths were to accommodate two 6-bit characters in the era before ASCII, and were used on the MIT's LINC, DEC's PDP-5, PDP-8, PDP-12, PDP-14, and CDC 160, CDC 6600, NCR 315, SDS 92, and Ferranti Argus (one of which survives at Bletchley Park). Similarly 18-bit words were to fit three 6-bit characters, used on DEC's PDP-1, PDP-4, PDP-7, PDP-9, PDP-15, UNIVAC's 418 and IBM 7700. And 36-bit words were to fit six 6-bit characters, as used on MIT's TX-2, DEC's PDP-6, DEC-10, DEC-20, IBM's 701, 704, 709, 7090, 7094, the GE-600, and UNIVAC's 1100/2200 series.

The PDP-8/e began from a specification by Don White, who then with Lou Klotz and Remo Vogelsang designed the hardware. This model was constructed with TTL 7400-series integrated circuits, and introduced a new bus (OMNIBUS) that gave customers input/output flexibility and simplicity, and a new set of peripheral cards to suit. The CPU was split over three plug-in PCBs, and could perform about 0.5 MIPS.

The PDP-8/e in this collection was manufactured in Galway. It includes 12k words of 12-bit memory. It had a widely recognizable front panel with switches for users to enter programs and data. From [5]:

Programs were entered on the front panel using the toggle switches. A starting address was entered and the LOAD_ADDRESS switch depressed. Machine instructions were then entered one at a time and the DEPOSIT key pressed each time to enter them into memory. When the program was complete, the starting address was entered once again and the START key pressed to run the program. Many small programs were hand-assembled. Consider this small program from the Digital Equipment Corp. Small Computer Handbook, 1967:

- *Set the switches for location 00408 and press the LOAD_ADDRESS key to load the starting address for the program.*
- *Enter the machine instruction 72008 and press DEPOSIT. This is the CLA instruction which clears the accumulator*
- *Enter the machine instruction 70018 and press DEPOSIT. This is the IAC instruction which increments the accumulator*
- *Press the DEPOSIT key twice more to enter this instruction two more times*
- *Enter the machine instruction 74028 and press DEPOSIT. This is the HLT instruction which halts the machine*
- *Set the switches for location 00408 again and press the START key to run the program.*

It also has an expansion chassis, below the main chassis behind the front panel. It is in a standard six-foot-high DEC rack of that era. A TU56 DECTape was commonly used for mass storage, but sadly not on the item in this collection, which however includes a PC04 paper tape unit and an RK05 disk drive.

<<< DETAILS OF CONTENTS of CPU chassis and Extensiion chassis >>>

OMNIBUS provided for interrupts and programmed & DMA input/output. It was implemented as a large backplane, into which were plugged a maximum of 20 boards (including the CPU and input/output controllers), with no fixed slot assignments. For multi-board units (e.g. CPU and memory), any inter-board connections were via connectors on the opposite side of the board from the backplane.

<<< Software ???? >>>

Ronan: where did it come from + what was it used for (i.e. what is its provenance)?

Ronan: could you improve the paragraph re DCU below please?

Many thanks to Ronan Scaife (son of Prof. Garrett Scaife, Dept. Electrical Engineering, Trinity College Dublin) for donating this items, to Dublin City University (DCU) for allowing the preservation of the items within their campus, and also to Ronan for arranging for transport of these items to this collection.

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 are more properly part of the other categories of this catalog,
 but are listed here for convenience.

Accession Index	Object with Identification
TCD-SCSS-T.20190917.003.001	DEC PDP-8/e minicomputer. Legendary 12-bit minicomputer. c.1970.
TCD-SCSS-T.20190917.003.002	DEC PDP-8/e expansion chassis. Expander for DEC PDP-8/e minicomputer. c.1970.
TCD-SCSS-T.20190917.003.003	PC04 paper tape unit. Input/Output unit for DEC PDP-8/e minicomputer. c.1970.
TCD-SCSS-T.20190917.003.004	RK05 disk drive. Mass storage for DEC PDP-8/e minicomputer. c.1970.

References:

1. Wikipedia, *PDP-8*, see:
<https://en.wikipedia.org/wiki/PDP-8/E>
 Last browsed to on 4-Nov-2019.
2. Wikipedia, *PDP-8*, see:
<https://en.wikipedia.org/wiki/PDP-8>
 Last browsed to on 4-Nov-2019.
3. Wikipedia, *PDP-5*, see:
<https://en.wikipedia.org/wiki/PDP-5>
 Last browsed to on 4-Nov-2019.
4. Douglas W. Jones, *The Digital Equipment Corporation PDP-8, Models and Options*, see:
<http://homepage.divms.uiowa.edu/~jones/pdp8/models/>
 Last browsed to on 4-Nov-2019.
5. Mark Csele, *Vintage Digital PDP-8 Computers*, see:
<http://www.technology.niagarac.on.ca/people/mcsele/hobby/vintage-digital-pdp-8-computers/>
 Last browsed to on 4-Nov-2019.
6. PDP8/net, *Online PDP-8 Home Page, Run a PDP-8*, see:
<https://www.pdp8.net/index.shtml>
 Last browsed to on 4-Nov-2019.
7. PDP8/net, *PC04 Paper Tape Information*, see:
<https://www.pdp8.net/pc04/pc04.shtml>
 Last browsed to on 4-Nov-2019.

8. PDP8/net, *RK05 Drive Information*, see:
[RK05 Drive Information](#)
Last browsed to on 4-Nov-2019.

See the related documentation in the associated folder in this catalog.



*Figure 1: PDP-8/e and MINC-11 in DCU
Photograph courtesy Ronan Scaife*



Figure 2: PDP-8/e, in DCU, trussed up for transport



Figure 3: PDP-8/e, unloading at TCD



Figure 4: PDP-8/e, unloading at TCD



Figure 5: PDP-8/e, safely moved by Jose's removal team



Figure 6: PDP-8/e with Sr. Jose Evangelista Do Amaral Alves and Ronan Scaife

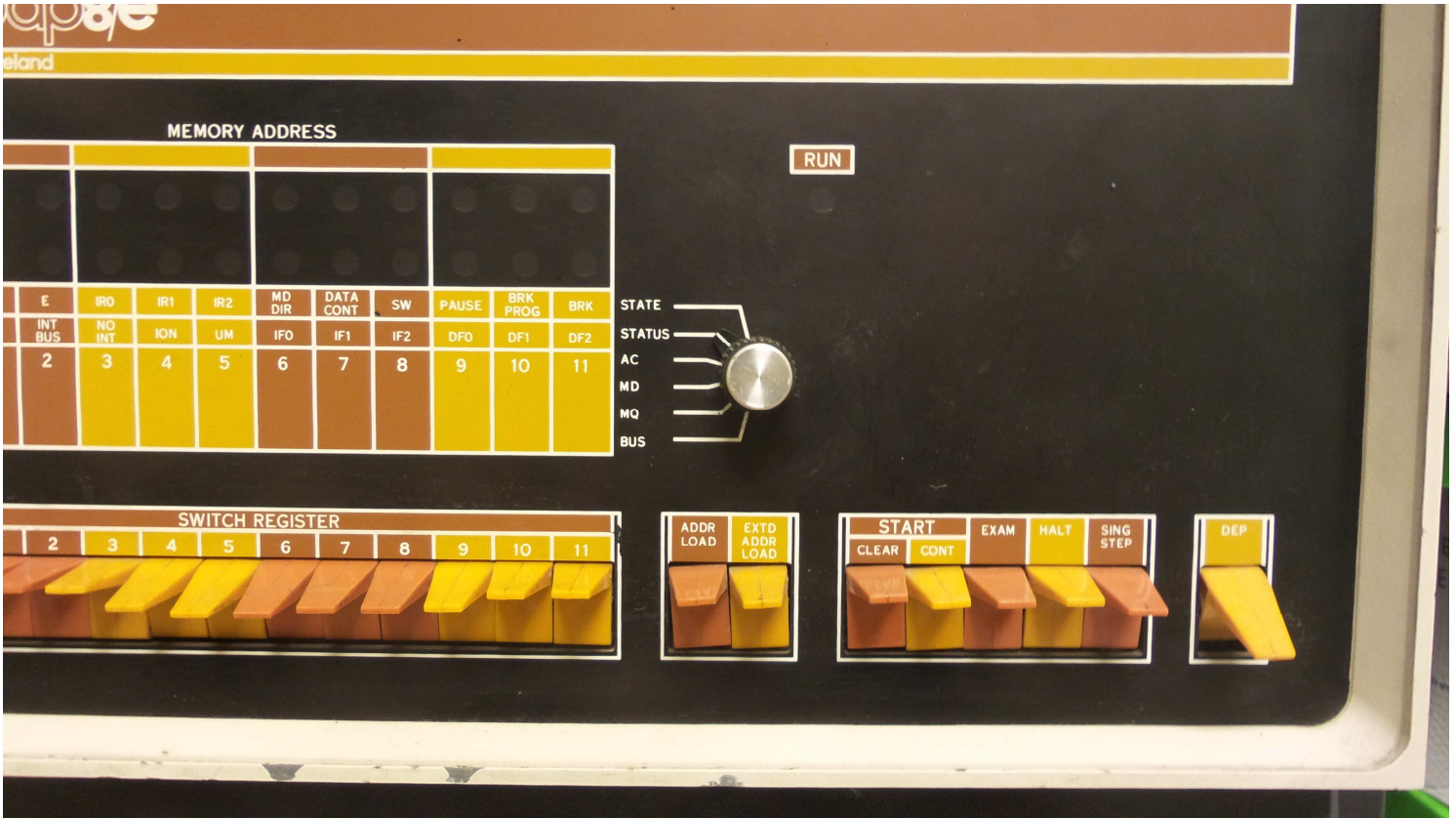


Figure 9: PDP-8/e CPU chassis front panel right side closeup



Figure 10: PDP-8/e rack left view



Figure 11: PDP-8/e rack right view

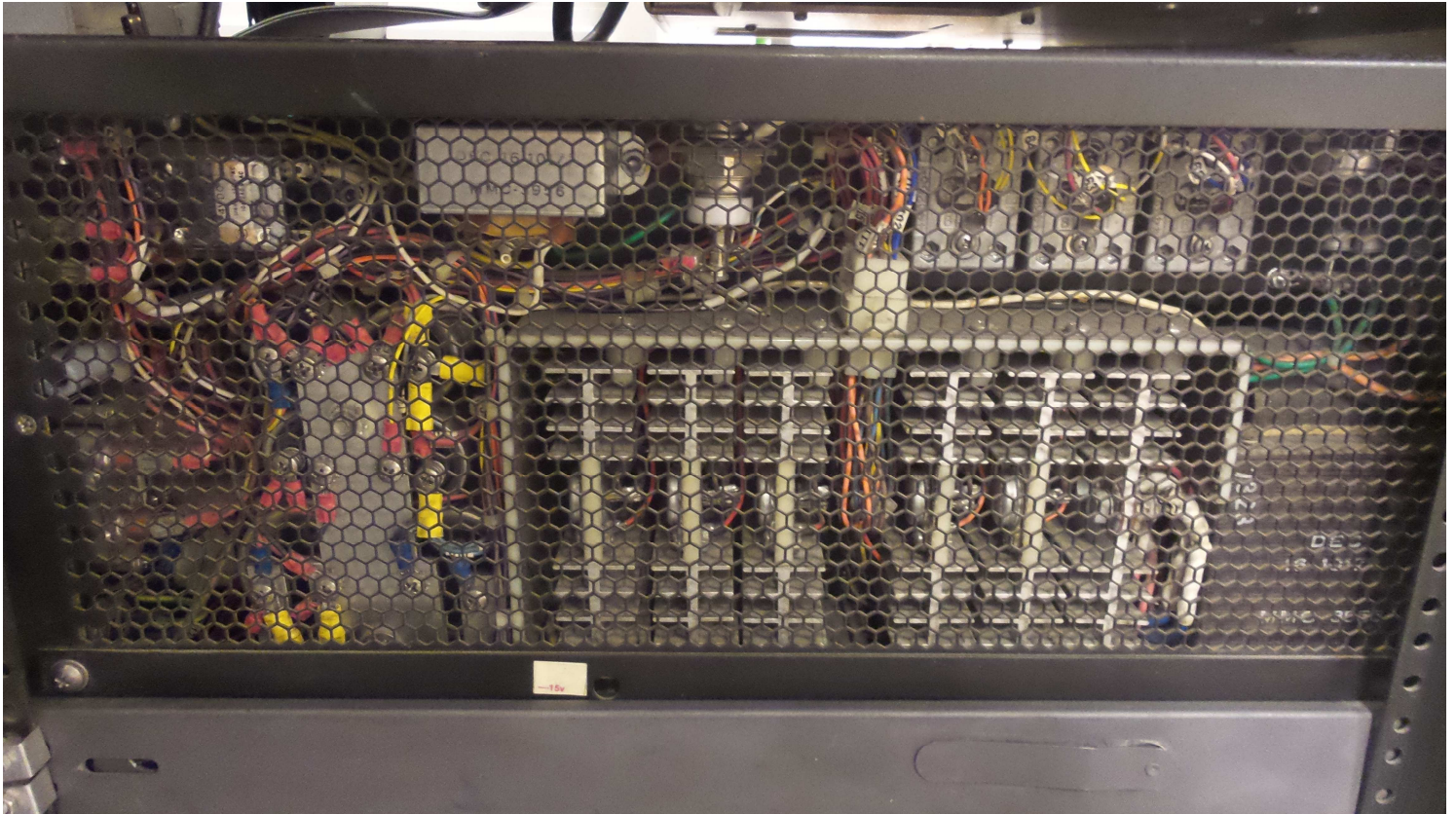


Figure 12: PDP-8/e CPU chassis left view

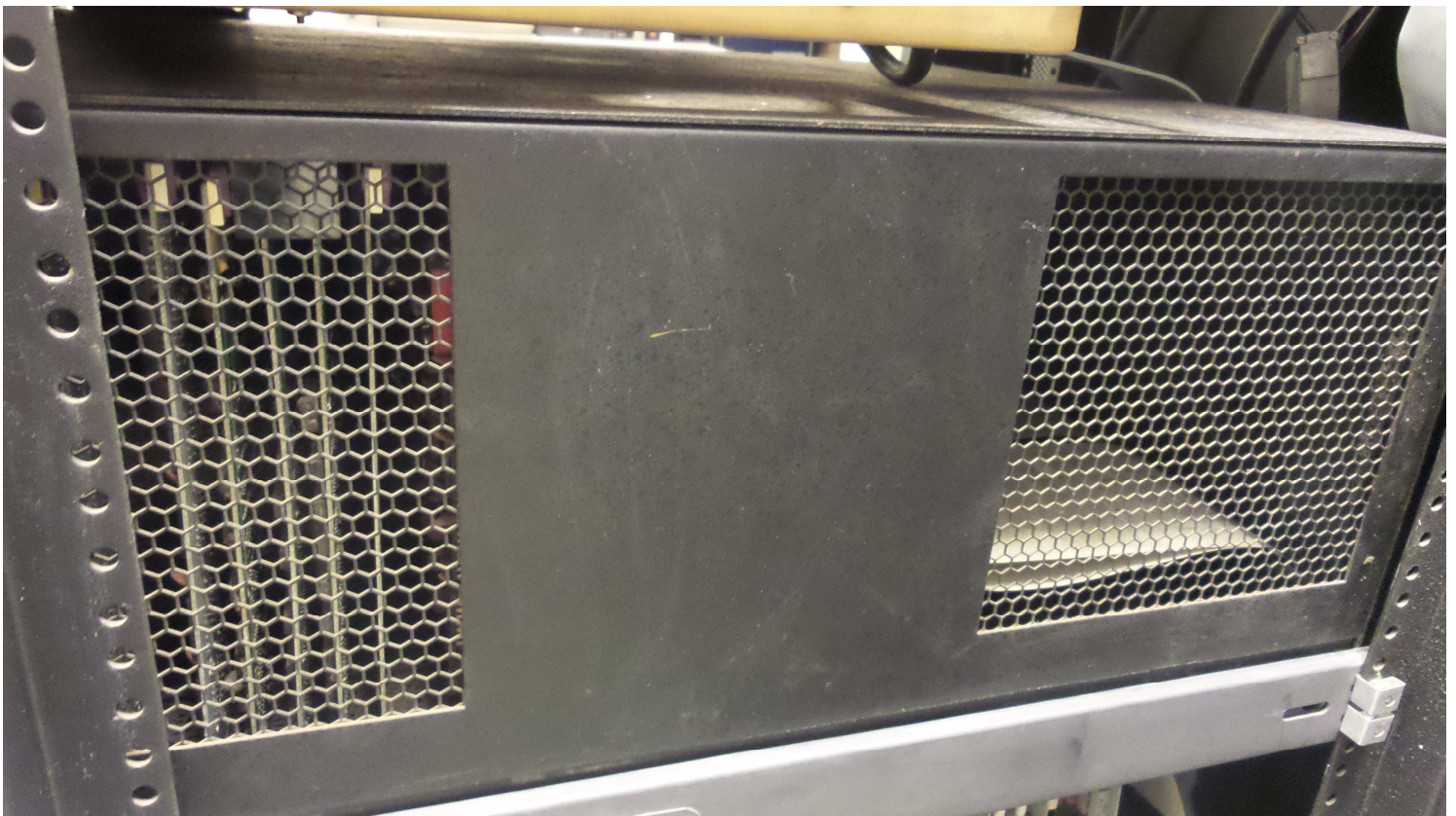


Figure 13: PDP-8/e CPU chassis right view

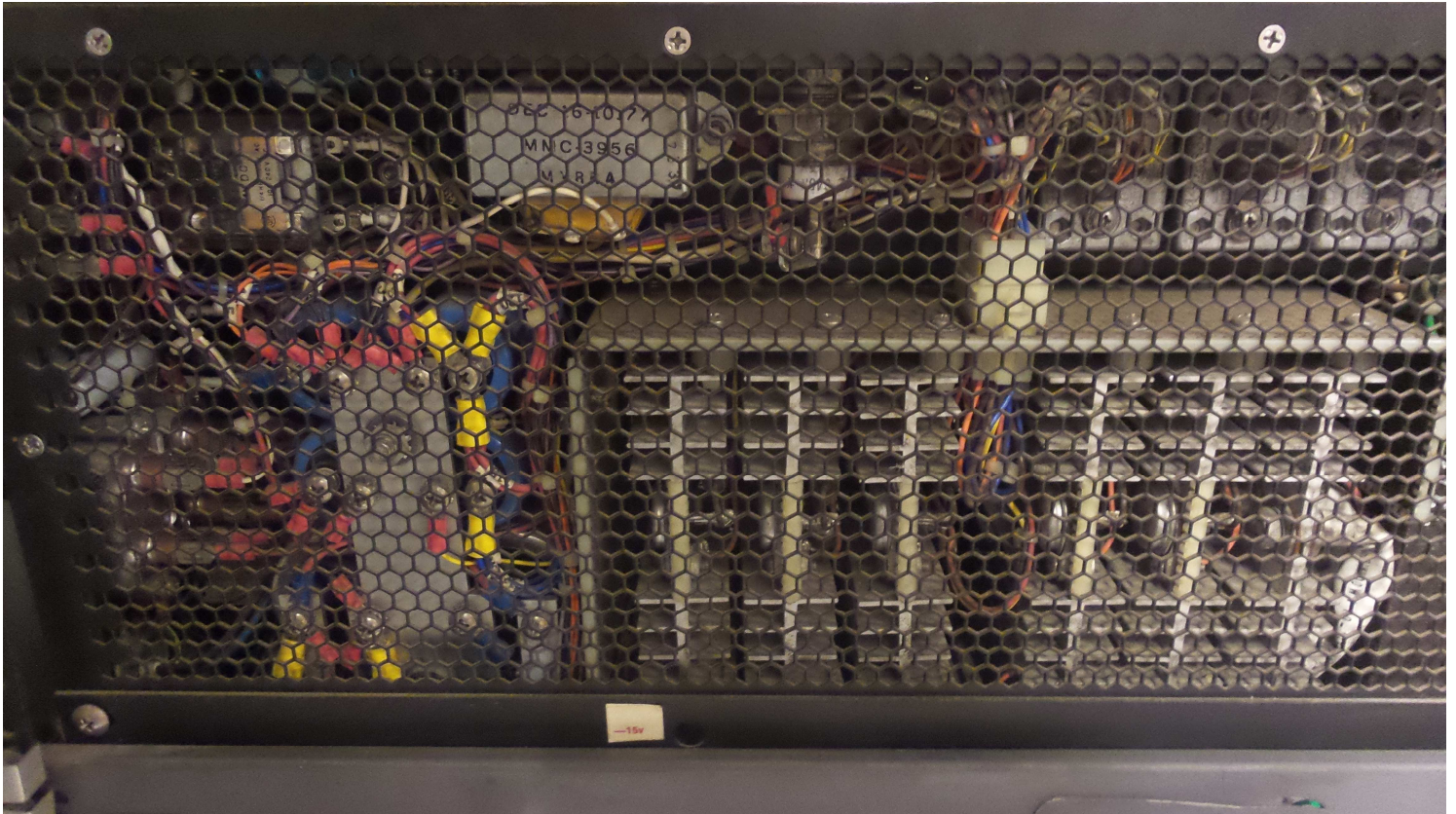


Figure 14: PDP-8/e extension chassis left view



Figure 15: PDP-8/e extension chassis right view

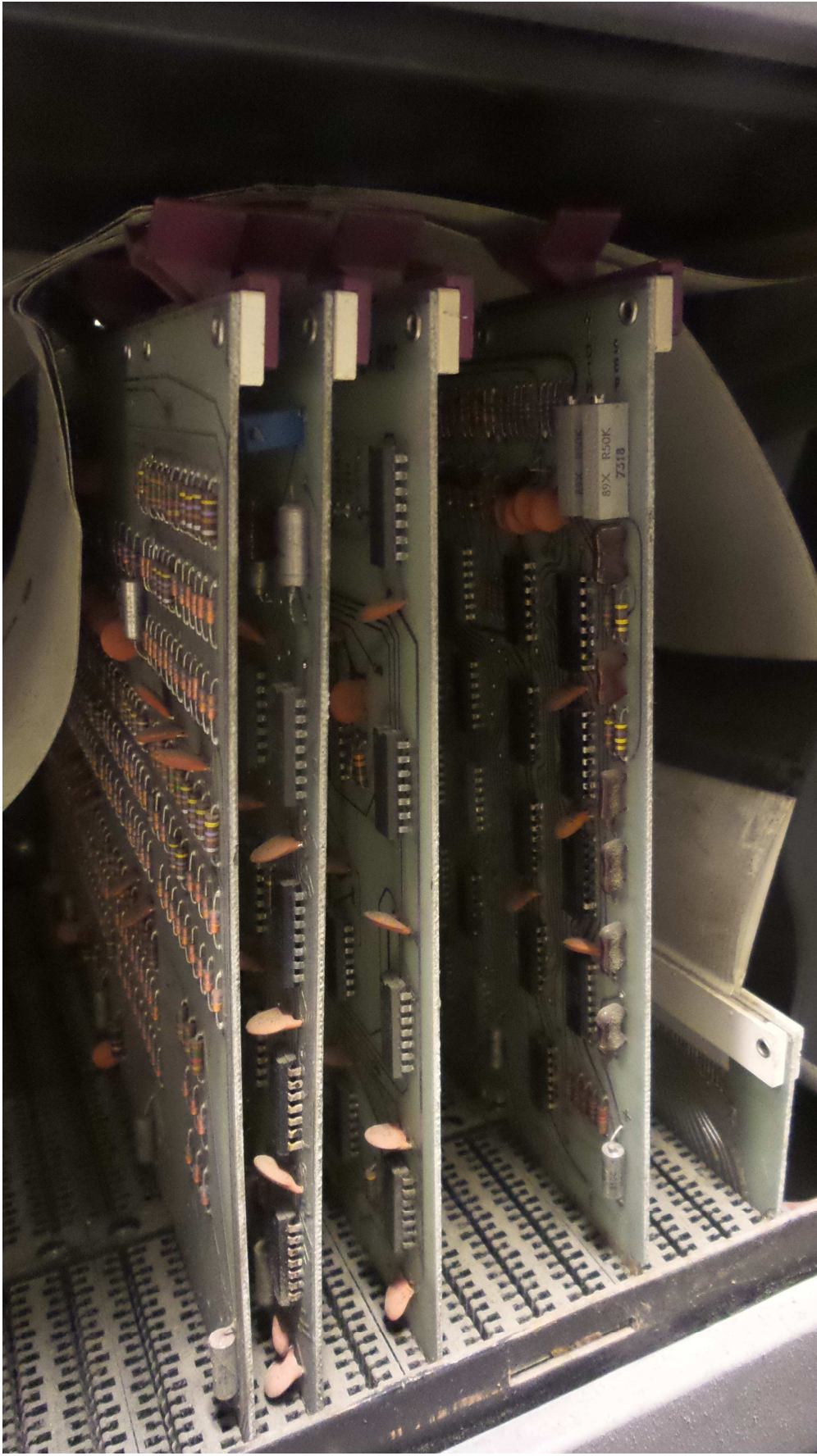


Figure 16: PDP-8/e extension chassis right view closeup

Figure 17: PDP-8/e

Figure 18: PDP-8/e

Figure 19: PDP-8/e



Figure 20: RK05 disk drive front view



Figure 21: RK05 disk drive control panel



Figure 22: RK05 disk drive logo

Figure 23: PDP-8/e

Figure 24: PDP-8/e

Figure 25: PDP-8/e

Figure 26: PDP-8/e

Figure 27: PDP-8/e

Figure 28: PDP-8/e

Figure 29: PDP-8/e



Figure 30: PC04 paper tape unit front view



Figure 31: PC04 paper tape unit read head



Figure 32: PC04 paper tape unit control panel

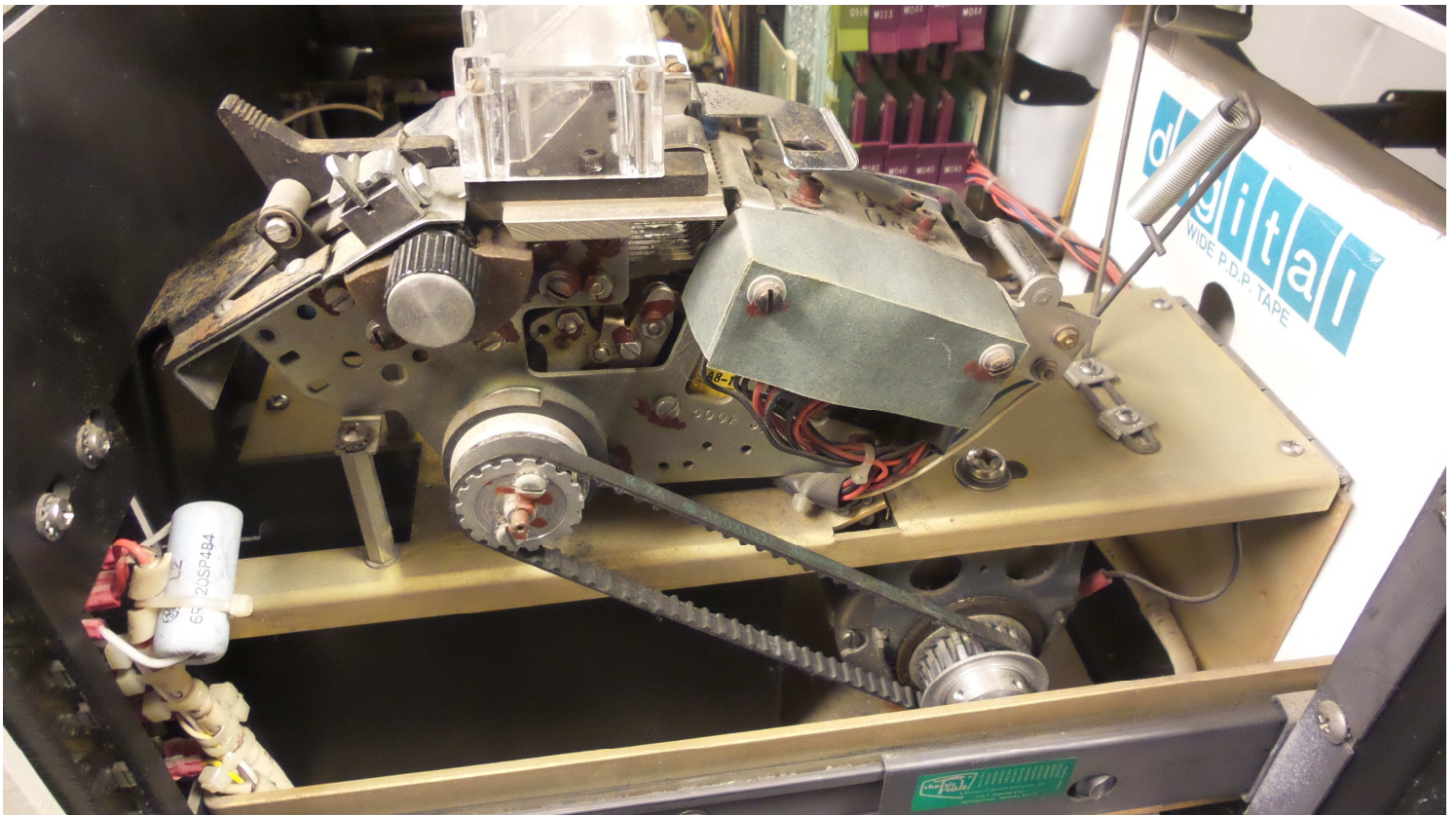


Figure 33: PC04 paper tape unit internal tape punch



Figure 34: PC04 paper tape unit internal tape punch



Figure 35: PC04 paper tape unit internal tape punch

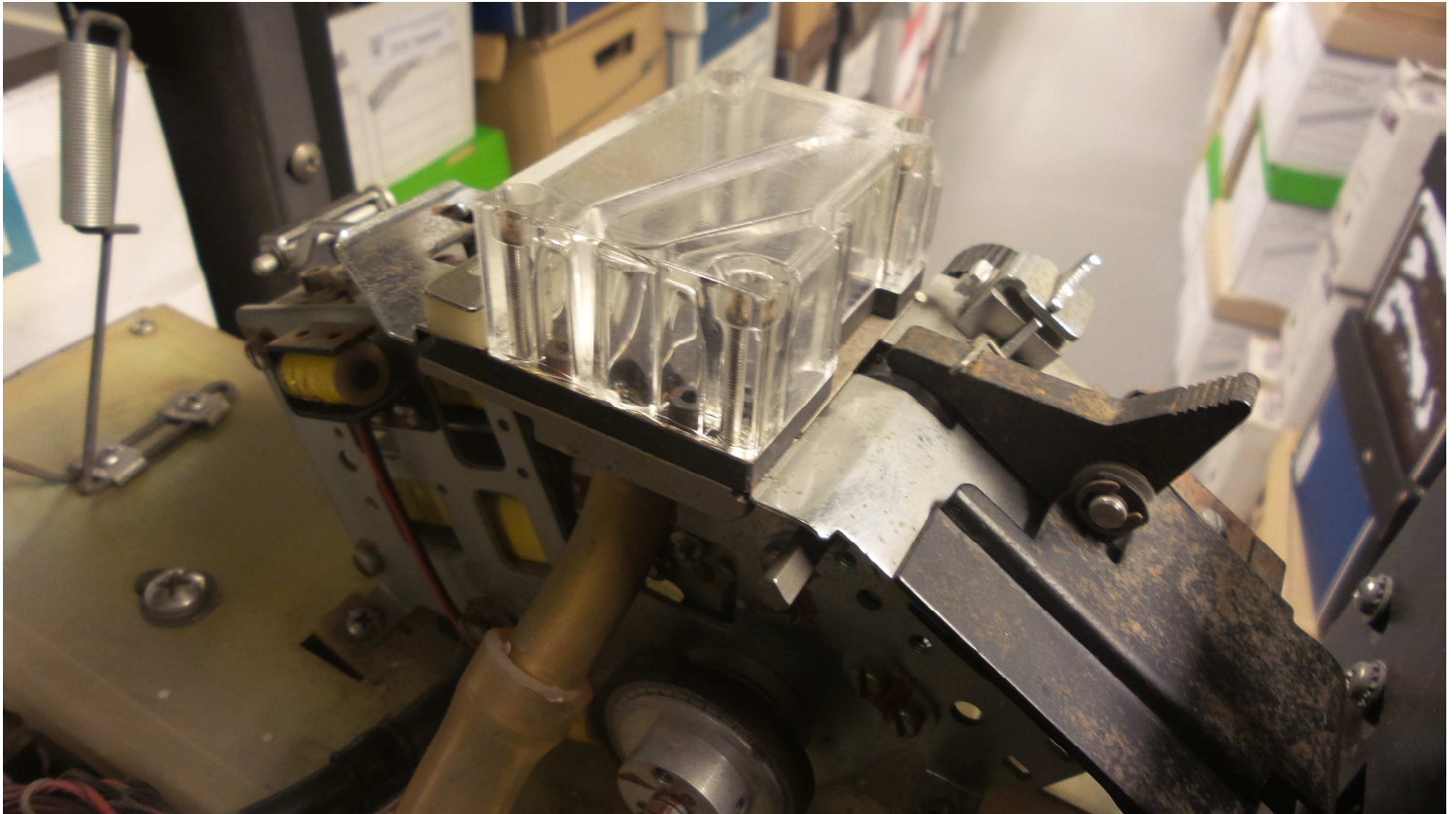


Figure 36: PC04 paper tape unit internal tape punch

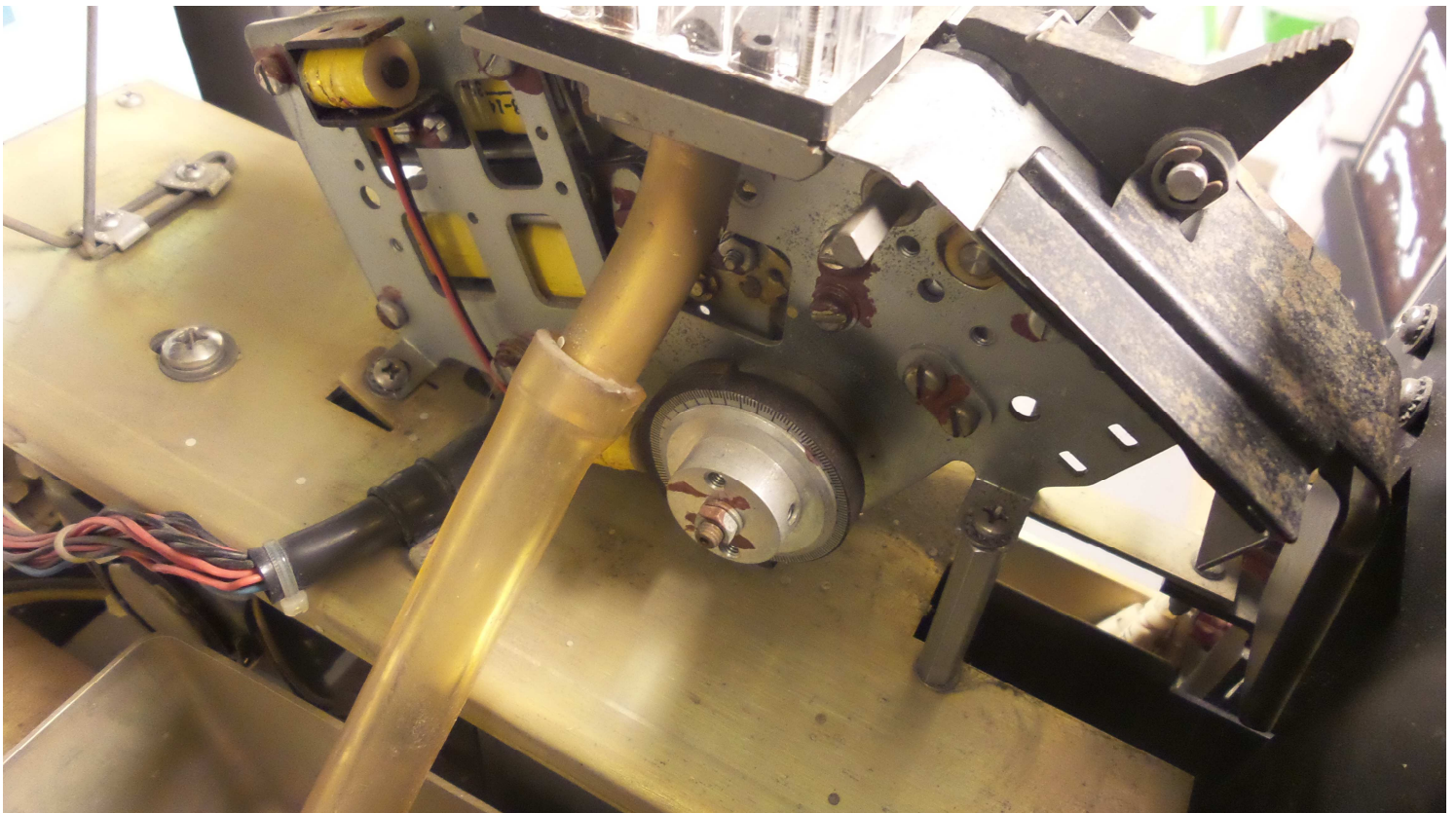


Figure 37: PC04 paper tape unit internal tape punch

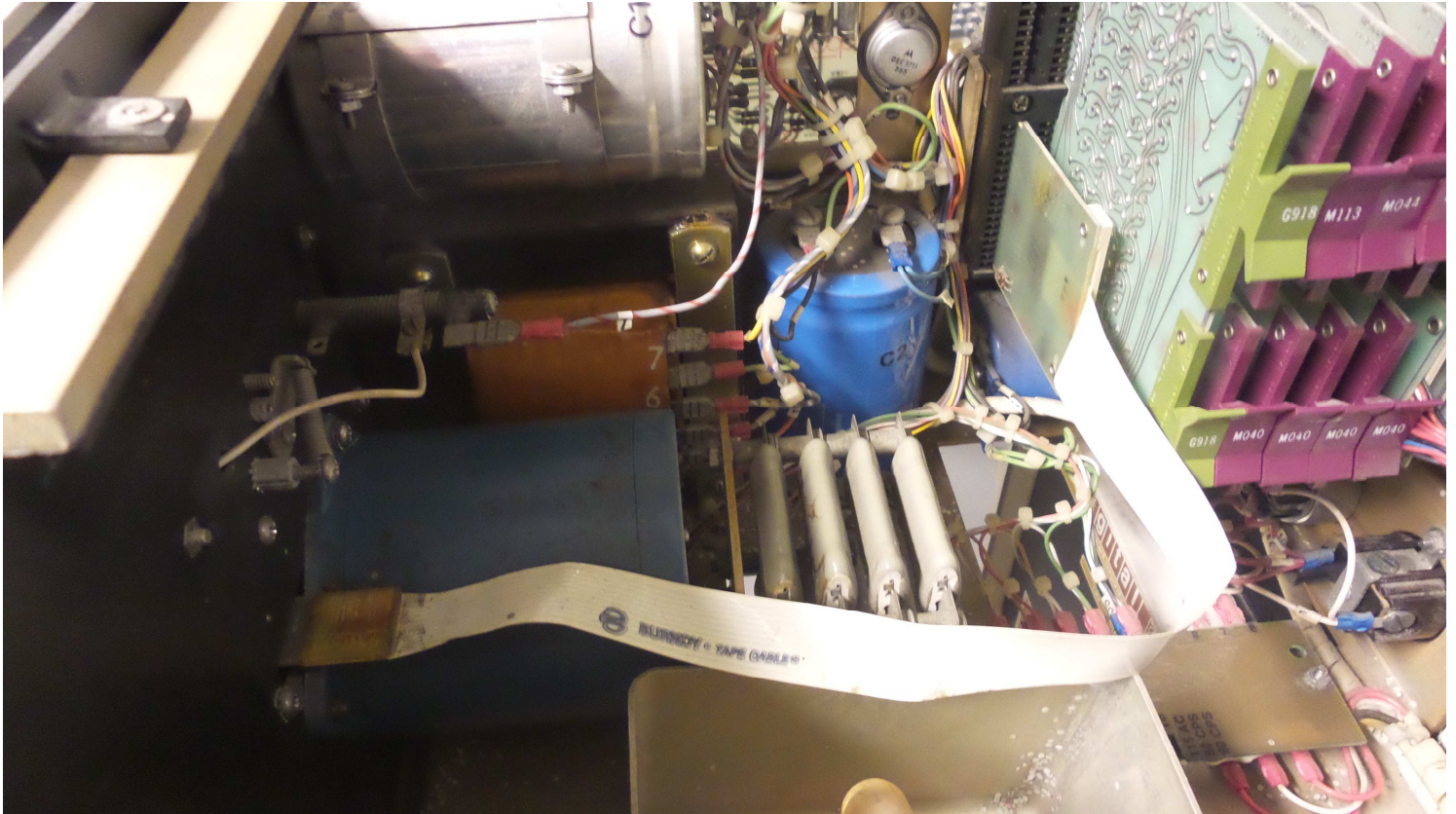


Figure 38: PC04 paper tape unit reader motor and drive electronics

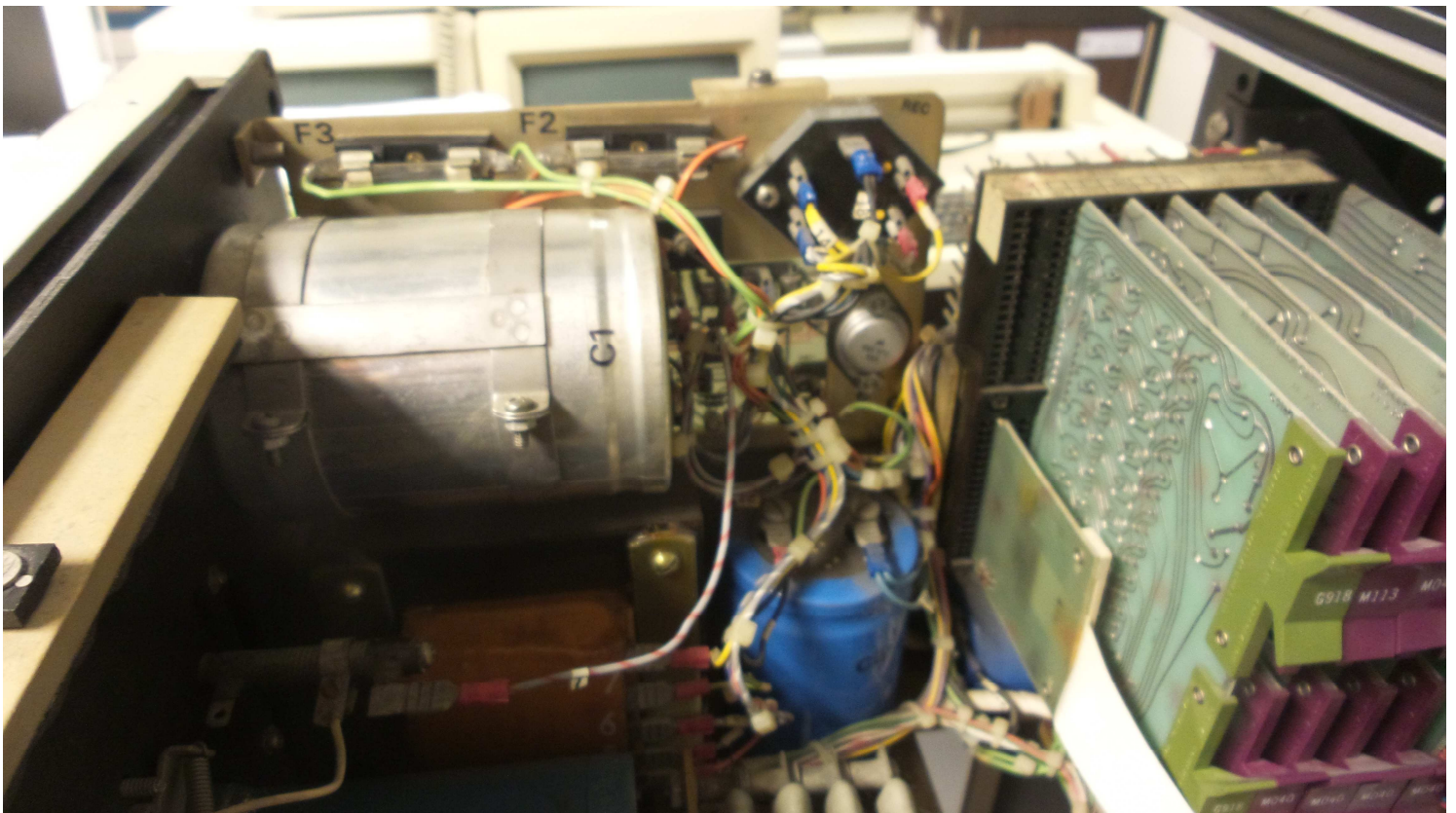


Figure 39: PC04 paper tape unit reader motor and drive electronics



Figure 40: PC04 paper tape unit logic modules

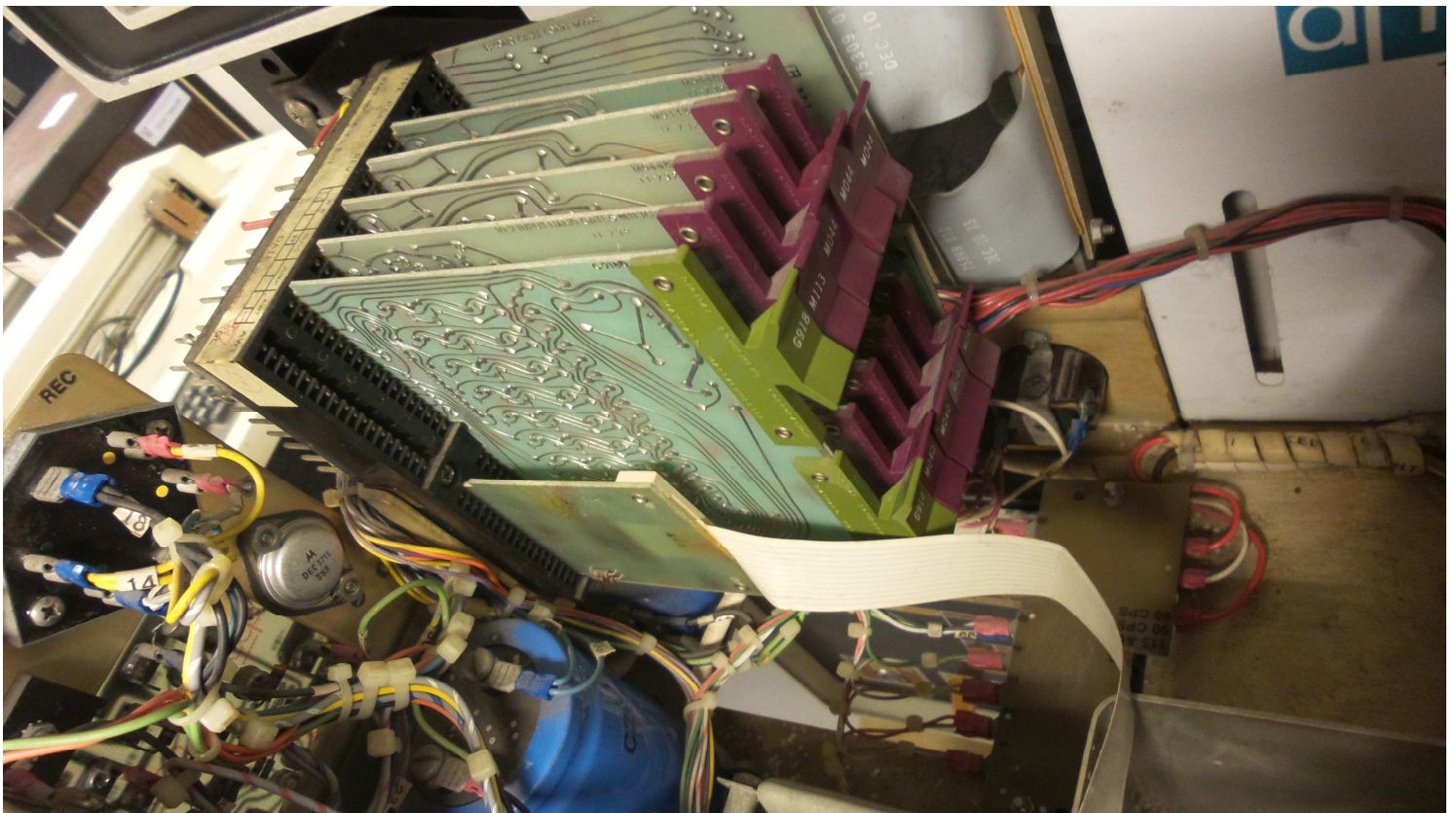


Figure 41: PC04 paper tape unit logic modules

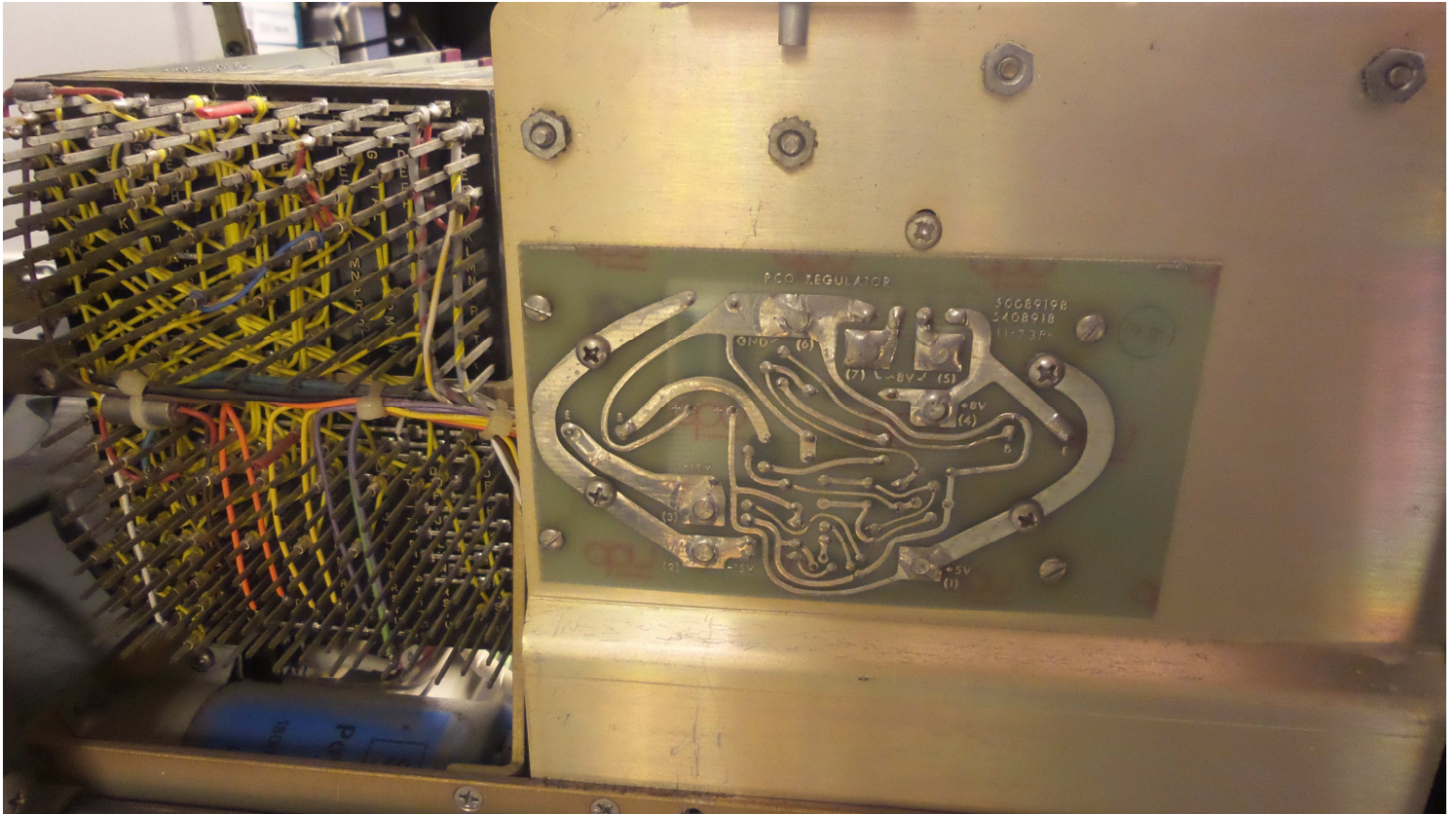


Figure 42: PCO4 paper tape unit logic module backplane

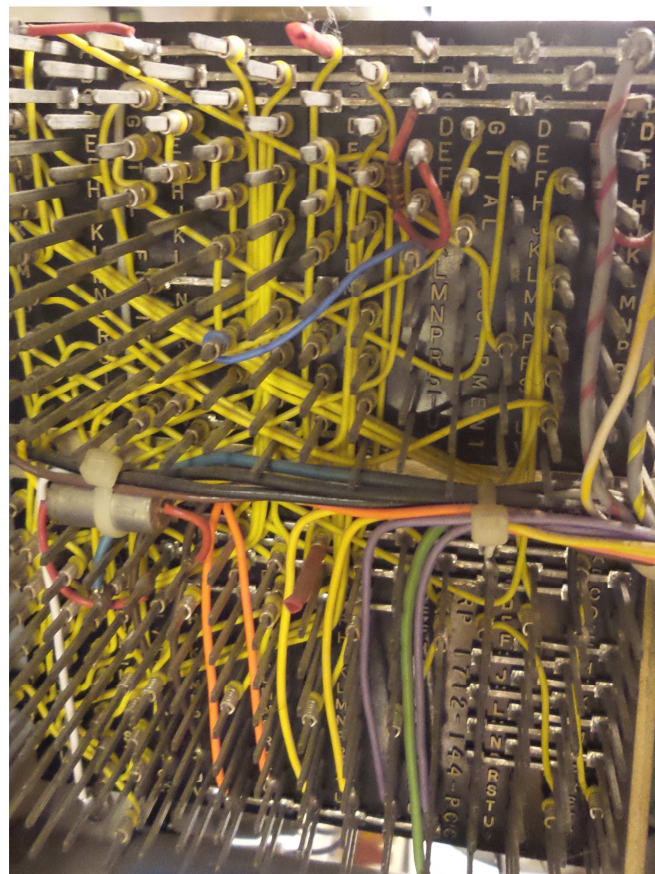


Figure 43: PCO4 paper tape unit logic module backplane closeup

Figure 44: PDP-8/e

Figure 45: PDP-8/e

Figure 46: PDP-8/e

Figure 47: PDP-8/e

Figure 48: PDP-8/e

Figure 49: PDP-8/e