

## **PDP-8/L Restoration**

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The PDP-8 family of computers was historically the first line of commercially successful general purpose computers. Designed by Digital Equipment Corporation (DEC) in the 1960s, they were the first computers to be sold on a retail basis in a table-top configuration. Surviving units are of academic interest due to the similarities of computer architecture and machine language programming with that of current computers.

Restoration efforts were made on a partially-functional PDP-8/L unit. Previous teams had restored the power supply, ventilation fans, front panel lights and front panel switches. All required flip-chip modules were present, with some spares. Two immediately apparent issues were the lack of standard wired connectors between the computer and the ASR-33 teletype (typewriter), and a faulty memory. As program size and complexity is limited by the availability of contiguous memory, official DEC diagnostic programs were not executable at this stage.

Standard DE-9 connectors were wired into the computer and teletype, restoring Input and Output (I/O) capability. A short contiguous block of functional memory addresses was identified and used to execute preliminary instruction test programs, with encouraging results. Manual testing identified a larger block of contiguous memory, which was used to load a custom-written memory diagnostic program. The program tests each memory location sequentially, with errors outputted to the teletype for print-out. Patterns can be observed in the memory locations with errors; octal addresses 0xxx and xx0x.

The memory address error patterns led to speculation that the respective Memory Selector boards were malfunctioning. However, swapping the positions of the boards did not change the error pattern. Two spare Memory Selector boards were refurbished by replacing their ICs and electrolytic capacitors, and subsequently swapped into the computer. One of the boards did not change the error pattern nor memory behavior, but the other board erased memory at the location it was installed in. Suspecting that the memory core stack itself was malfunctioning, it was swapped with a spare, which resulted in a change of memory behavior. The problem of the memory core stack was traced to 10 faulty diodes. Since the spare memory core stack performed worse than the original, it was sacrificed by using its functional diodes to replace the faulty diodes on the original. Core memory was fully functional after replacement of diodes. Paper tape programs can now be loaded into the computer, including official DEC diagnostic programs. Attempts are being made to load FOCAL, a high-level language similar to today's MATLAB.