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Excerpts from <https://www.multicians.org/thvv/>

<https://www.multicians.org/mgr.html>

## RUNOFF

CTSS command for text formatting written by Jerry Saltzer. A Multics BCPL version of `runoff` was written by Doug McIlroy and Bob Morris. A version of `runoff` in PL/I was written by Dennis Capps in 1974. `runoff` was eventually replaced by compose. (See also format document.) Ancestor of Unix nroff.  Info segment for runoff command

Multics documentation was transitioned from the Flexowriters to use of `runoff` when the system became self-hosting about 1968. `runoff` was used for manuals, release bulletins, internal memos and other documentation for most of the 70s. To support this use, Multics `runoff` had many features such as multi-pass execution and variable definition and expansion that went far beyond the CTSS version. Multics manuals were formatted with complex macros, included by the document source, that handled tables of contents and standard formatting, and supported the single sourcing of the commands manual and the info files for commands.

Jerry Saltzer has placed the original CTSS documentation for RUNOFF online as  Manuscript Typing and Editing (from Patricia Crisman, editor. *The Compatible Time-Sharing System, A Programmers Guide*. Second edition. M. I. T. Press, 1965, section AH.9.01, December 1966 revision) and  TYPSET and RUNOFF, memorandum editor and type-out commands, M.I.T. Computation Center Memorandum CC-244 and M.I.T. Project MAC Memorandum MAC-M-193. November 6, 1964.

<https://www.multicians.org/mgb.html#BCPL>

## BCPL

 Bootstrap Combined Programming Language. A language defined by Martin Richards of Cambridge, for bootstrapping CPL. Richards visited MIT in 1967 and brought the language design with him; BCPL was first implemented

on CTSS in 1967. Dennis Ritchie and Rudd Canaday ported CTSS BCPL to Multics. Ken Thompson wrote a version of his QED editor in BCPL, and Doug McIlroy and Bob Morris wrote Multics runoff in BCPL. BCPL is an ancestor of the C language.

<https://www.multicians.org/thvv/1401s.html>

A few years later at MIT Project MAC I was able to use my 1401 knowledge; MAC had a 4K 1401 used as reader/print for the IBM 7094, and we had a need to print our Multics EPL programs in mixed case. I wrote a program, **ASCPT**, which read 7094 Multics-format tapes containing ASCII files, and printed them on a special upper and lower case print train on the 1403 printer, using an IBM RPQ on the 1401 which used the word marks as a 7th bit in the print band. Squeezing the printer management and character translation into 4K was tough; I had constants in between the index registers. This program was described in MIT Comp Center Programming Staff Note 68, 7 Jun 1966.

While I was at Project MAC i found a program called PEST, Peripheral Equipment Symbolic Translator, on the Bell Labs BESYS tape. It was a 1401 cross-assembler that ran on the 7094. It accepted a subset of 1401 Autocoder. I wrote a minimal wrapper for it so that it could run as a CTSS command, and was able to write and compile 1401 programs online, without keypunching.

<https://www.multicians.org/mga.html#1050>

1050

First IBM terminal that used the Selectric mechanism. Used on CTSS and



Multics. Built into a desk with a desk-side box for the electronics. It had a row of switches above the keyboard for doing things like controlling the paper tape reader. Used a device dependent 6-bit character set related to BCD, but with shift codes to access the larger character set. This was the first terminal used for serious word processing, because it provided high quality upper and lower case output. Transmission speed was 134.5 baud.

2741

IBM terminal with Selectric mechanism, came after the 1050. Smaller desk, no card reader option, no control switches. Weighed about 200 pounds and cost as much as a new Buick. Used a device dependent 6-bit character set related to BCD, but with shift codes to access the larger character set. Transmission speed was 134.5 baud. Widely used on CTSS and Multics; we used the 963 typeball, which was closest to ASCII. 2741s with the 938 "correspondence" ball were supported too; when you dialed up, dialup printed a special message in both dialects: one would be gibberish and the other legible, and if you typed `login` it chose one translation and if you typed `kigub` it switched to the other translation and assumed you had typed `login`. The effect was that you typed "login" and the system detected your character code and logged you in. There were also two special pre-login commands, `963` and `938` that would set up the TTYDIM to understand your typing. The code was simpler because the numbers were the same in both encodings. Most MIT 2741s used tractor-fed paper slightly narrower than printer paper.

In order to work correctly on Multics, 2741s had to have two special features installed: 4608 Transmit Interrupt Control and 5501 Print Inhibit.

<https://multicians.org/thvv/7094.html>

## QED Editor

`QED` was a text editor contributed to the CTSS community by Ken Thompson, a Multics programmer at Bell Labs. This line-oriented editor was influenced by the character-oriented `QED` editor on the SDS-940; one of Ken's major additions was regular expression searching and substitution. `QED` was ported to Multics BCPL by Ken and Dennis Ritchie. `QED` was programmable: it supported multiple buffers, and a user could execute the contents of a buffer containing editor commands. Some remarkably arcane editor applications were written using `QED`.