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<td>OKAMOTO, Sigeru; NAKAMURA, Yoshiaki</td>
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Note on Software I

Operating System OS/80

Sigeru Okamoto* and Yosiaki Nakamura*

1. Introduction.

The operating system in the mini-computer needs to be short and enough in the sense that many programs can be used easily and simply, because the memory capacity of the internal and external storage usually is not so large.

The aim of this note is to describe the operating system OS/80, which is programmed relocatably for our mini-computer MACC-7/S abbreviated to MINI.

2. Specifications.

The specifications of MINI are as follows.
1. 8 kilo-words core memory (1 word = 16 bits): CM.
2. 32 kilo-words magnetic disc memory: DISC.
3. Photoelectric paper tape read unit: PTR.
4. Teletype ASR-33: TTY.

The basic routines which we develop are as follows.
1. Initial program loader: IPL.
2. ASCII pack loader: APL. (ASCII = American Standard Code for Information Interchange)
3. ASCII pack dumper: APD.
4. Hexadecimal code loader: HXL.
5. Hexadecimal code dumper: HXD.
6. Basic assembler: ON/1.

MINI has no automatic reading device and hence we construct IPL by which APL is stored in CM. APL works to store a program written in ASCII pack language in CM, and can operate in any place of CM, that is, APL is relocatable.

ON/1 is a very little assembler, main part of which except the table of operation-codes is relocatable too.

MACRO/2 (or MACRO/3) is a macro-interpreter which interprets some macro-

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instructions to the corresponding sets of machine language instructions, and serves for logical and arithmetic operations and computations of some elementary functions with 2 (or 3)-words-floating-point numbers.


OS/80 is a disc-based operating system by which eleven routines can operate. MINI is used for the education of assemblers (MAPS/1 and ON/1), E-FORTRAN, and programming in these programming languages. To do so, we construct OS/80. In OS/80 commands are as follows.

<table>
<thead>
<tr>
<th>Command</th>
<th>Program called</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MAPS/1</td>
<td>Developed by MATSUSHITA Comm. Indu. Co. Ltd.¹</td>
</tr>
<tr>
<td>21</td>
<td>MAPS/1 &amp; MACRO/2</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>MAPS/1 &amp; MACRO/3</td>
<td></td>
</tr>
<tr>
<td>AD</td>
<td>APD</td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>APL</td>
<td></td>
</tr>
<tr>
<td>HD</td>
<td>HXD</td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>HXL</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>E-FORTRAN</td>
<td>Developed by M. Takeichi and A. Yonezawa²</td>
</tr>
<tr>
<td>Y</td>
<td>ON/1</td>
<td></td>
</tr>
<tr>
<td>2Y</td>
<td>ON/1 &amp; MACRO/2</td>
<td></td>
</tr>
<tr>
<td>3Y</td>
<td>ON/1 &amp; MACRO/3</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
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</tr>
</tbody>
</table>

For example, when the punched source tape is assembled, we set the tape on PTR, push the start switch on the console panel of MINI, and type the symbol 1 on the keyboard of TTY, so the symbol 1 is printed and the source program can be assembled.

Symbols which are not list up above are printed only and neglected. For example, the series of symbols APL is equivalent to AL. We can use command W, when each program stored by APL or HXL begins to work. Let K be a program dumped by APD. K is stored by APL, and the starting address of K is stored in the address 3. When the symbol W is typed, K starts from the address indicated by the content of the address 3.

We intend to construct other softwares, for example, a disc-based assembler, Festina Lente.
1) MAPS/1 developed by MATSUSHITA Communication Industrial Co. Ltd. is an assembler which is not relocatable and composed of nearly 2300 words, but can be used easily and conveniently, and is useful for the education of programming in the assembly language. Any program which is assembled by ON/1 can be, of course, assembled by MAPS/1.

2) E-FORTRAN developed by M. Takeichi and A. Yonezawa is a good compiler composed of nearly 3200 words and similar to FORTRAN II.

4. The details of OS/80.

The following is an assembler-formed program of OS/80. "—" is a comment and neglected in assembling.

```
"ÖS/80"
EQU/0, W1;
ORG/1F65;
JA: Y1 "1FAF";
   W1 "0";
   L "1FB3";
   H "1FB4";
   F "1FB8";
   D "1FBF";
   A "1FC0";
   M3 "1FC4";
   M2 "1FC8";
   M1 "1FCC";
   M0 "1FD0";
ER: L/*+4;
   'E128;
H7F: '007F;
H1: '0100;
   '1000;
JB: '0059 "Y — ÖN/1";
   '0057 "W — WÖRK";
   '004C "L — LöADER";
   '0048 "H — HEXADECIMAL";
   '0046 "F — E-FÖRTRAN";
   '0044 "D — DUMPER";
   '0041 "A — ASCII PACK";
   '0033 "3 — MACRO/3";
```
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"0032 "2 — MACRŌ/2";
'0031 "1 — MAPS/1";
'0030 "0";

STRT: CLA/
     "STARTING ADDRESS";
 T/1;
     'E109 "READ KEYBŌARD — INITIAL";
     'E801;
 J/*/+2;
 J/*/−2;
     'E801;
 J/*/−1;
     'E001;
     'E10A;
     'E101;
     'E801;
 J/*/−1 "READ KEYBŌARD — FINAL";
 AND/H7F;
 CMP/JB#1;
 J/STRT;
 J/*/+3;
 IMS/1;
 J/*/−4;
 L/JA#1;
 T/1;

DISC: L/I/1 "READ DISC — INITIAL";
 IMS/1;
 T/W1 "(W1) — TŌP ADDRESS IN CŌRE ŎR JUMP TŌ (W1)";
 ASK/A>0/A←0/;
 J/I/W1;
 L/I/1;
 IMS/1;
 T/W2 "(W2) — TŌP BLŌCK NŌ. IN DISC";
 L/I/1;
 IMS/1;
 T/W3 "—(W3) — NUMBER ŐF BLŌCKS";
     'E82C;
 J/*/−1;
 L/W1;
     'E127;
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L/W2;
  'E128;
  'E82B;
J/ER;
L/W1;
A/H1;
T/W1;
IMS/W2;
IMS/W3;
J/ *-13;
J/DISC

"READ DISC — FINAL";

Y1:  '1B65  "TOP ADDRESS OF ÖN/1";
   '2076  "0076 — TOP BLOCK NO. OF ÖN/1 IN DISC";
   -4  "4 — NUMBER OF BLOCKS OF ÖN/1 IN DISC";
   '9C11  "1C11 — STARTING ADDRESS OF ÖN/1";
L:  '9F64  "1F64 — STARTING ADDRESS OF LOADER";

H:  '1ED6;
    '205E;
    -1;
    '9F80  "1F80 — STARTING ADDRESS OF ÖS/80";

F:  '0080;
    '2069;
    -13;
    '1E18;
    '207F;
    -1;
    '8100  "0100 — STARTING ADDRESS OF E-FÖRTRAN";

D:  '9ED6  "1ED6 — STARTING ADDRESS OF DUMPER";

A:  '1ED6;
    '205D;
    -1;
    '9F80;

M3:  '001E;
    '207A;
    -6;
'9F80;
M2: '00B6;
 '205A;
  -3;
 '9F80;
M1: '1563;
 '205F;
  -10;
 '9600 "'1600 — STARTING ADDRESS OF MAPS/1";
M0: '9F7F;
 '0000;
 '0000;
 '0000;
W2: ;
 ORG/'1FE1;
W3: ;
 END/;

References

# Memory Map of DISC

<table>
<thead>
<tr>
<th>Block No.</th>
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<th>Contents</th>
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<td>'70</td>
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</tr>
<tr>
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<td></td>
<td>'64</td>
<td>MAPS/1</td>
<td>'74</td>
<td>E-FÖRTRAN</td>
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<tr>
<td>'58</td>
<td></td>
<td>'68</td>
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<td>'78</td>
<td>Y</td>
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<tr>
<td></td>
<td>MACRÖ/2</td>
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<td></td>
<td></td>
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<tr>
<td>'5C</td>
<td></td>
<td>'6C</td>
<td>E-FÖRTRAN</td>
<td>'7C</td>
<td>MACRÖ/3</td>
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<tr>
<td></td>
<td>AP</td>
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</tr>
<tr>
<td></td>
<td>HX</td>
<td></td>
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<td></td>
</tr>
<tr>
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<td>MAPS/1</td>
<td></td>
<td></td>
<td></td>
<td>E-FÖRTRAN</td>
</tr>
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