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THE ENGLISH ELECTRIC CO., LTD.

Tel. 700 NELSON RESEARCH LABORATORIES STAFFORD

TECHNICAL MEMORANDUM: NS u 246

Date 18.9.57.

Instructions for Using Automatic Instruction Modifier and 64 Column Read and Punch.

Reference

Order No.

Report by A. Gilmour.

Data - Sheets 1-3.

1. SUMMARY.

This report contains instructions to programmers on the methods of using the automatic instruction modifier and the 64 column read and punch on DEUCE.

2. AUTOMATIC INSTRUCTION MODIFICATION ON DEUCE.

The following modifications have been made to Machine No. 3 at N.R.L., and all users should check that it will not upset any existing programmes which they propose to use on the machine.

The carrying out of a transfer 17-0 or 18-0 causes a modification of the contents of the appropriate quadruple store in the first minor cycle of transfer. If the characteristic and timing numbers of the D.O. instruction are suitably chosen then it can be arranged that the modified word enters control, leaving in the QS a copy of itself.

The type of modification effected depends on the coding of the D.O. instruction, according to the following scheme.

Digits present in D.O. instruction.	Digit added to word in QS.
NO P_1, NO P_2 $(=0 \times P_1)$	P_5
P_1, NO P_2 $(=1 \times P_1)$	P_{10}
NO P_1, P_2 $(=2 \times P_1)$	P_{17}
P_1, P_2 $(=3 \times P_1)$	P_{18}

If a P_{15} is present, then the presence of a P_3 will cause an addition P_{22} to be added and the presence of a P_4 will cause the digits determined by P_1, P_2 and P_3 to be subtracted instead of added.

If a P_{15} is not present, the P_3 and P_4 have no effect. (This case is normally used for automatic counting. The use of the P_2 here clearly imposes a slight restriction on the choice of Next Instruction Source).

The above coding holds for 17-0 instructions.

For 18-0 instructions, a similar scheme holds but subtractions replace additions and vice versa.

It is dangerous to allow any counting operations to carry to the P32 position of the minor cycle concerned, as a spill-over into the first few digits of the next minor cycle will usually occur.

3. 64 COLUMN READ AND PUNCH.

3.1 Card Layout.

The 64 relevant columns are considered in two fields

(i) α field - Hollerith columns 17-48.
(ii) β field - Hollerith columns 49-80.

3.2 Reading.

When any row of a card is being read, the α field is read first, using a normal stopped instruction, and then the β field is read, using an unstopped instruction.

The intervals of availability of the fields are:

(i) the α field is available from the start of the execution of the stopped instr. and remains available for a further 6 m.c. after the completion of the transfer specified by the stopped instr.

(ii) the β field becomes available 20 m.c. after the completion of the stopped instr. and remains so until 2 m.s. after the single shot for this row.

So the required programming is simply

```
0 - AX     reads α field
...        suitable time delay
0 - B Co.  reads β field.
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where the time delay may be used for other useful programming.

3.3 Punching.

The α field is sent to destination 29 using a stopped instr. and the 8-24, 1, obeyed next as soon as possible, which allows the β field to be sent to D.29, using an unstopped instruction. The β field is available for 5 m.s. after the single shot for this row.

The required programming is then:

```
A-29 X
8-24 1
B-29
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3.4 Notes.

Double triads of instructions may be read into the drum or the D.L.'s by these means.

Sixty four columns of decimal information may similarly be read or punched.

A Gilmour.

MATHEMATICS DEPARTMENT.

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