Digital Computer Laboratory
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SUBJECT: 556 DRUM INPUT PROGRAM, MAY, 1953

To: S&EC Group, Group 61, Systems Group

From: F.C. Helwig

Date: 26 May 1953

Abstract: A 556 input program to be used in conjunction with a modified version of the test storage input program described in E-537 has been stored on group 11 of the magnetic drum. Group 11 has been locked out and is now unavailable to programs.

1. The Test Storage Input Program

A test storage input program was described in E-537. This program has been modified so that flip-flop 3 will remain in its present location (test storage register 3) and so that drum group 9 or 11 is block-read into ES by the program instead of drum group 5 or 7. The new test storage input program is as follows:

```
0   +0 x 2^-15
1   +1 x 2^-15
2   Flip-flop register #2      sp y
3   Flip-flop register #3      sp 1 or sp 2


25  mh30
→26 ca26   }  Record the contents of ES on group 0 (register 32 of ES being
27  si455  }       recorded on register 32 of group 0, etc.)
28  bo26   }
29  ad25   }  Read the contents of group 11 into ES (register 31 of group 11
30  si451  }       being read into register 32 of ES, etc.)
31  bi30   }
```

The entry point for the read in of 556 tape is at register 26. An entry point at register 29 will be used by Group 61.

2. The 556 Drum Input Program

The 556 drum input program has been stored on group 11 and group 11 has been locked out. The input program can be block-read into ES by sending control to the test storage input program at register 26 (32 octal). The test storage input program first block-records the contents of ES on group 0 of the magnetic drum (register 32 of ES being recorded in register 32 of group 0, etc.) and then block-reads the contents of group 11 into ES (register 31 of group 11 being read into register 32 of ES, etc.). The input program has been recorded on group 11 in such a way that its initial word is read into register 32 of ES. After the block read control proceeds directly from

the test storage input program to the 556 drum input program.

The 556 drum input program reads in existing 556 paper tape via the photoelectric tape reader. This kind of tape has been described in E-473. It was, however, necessary to define a new kind of block which must be punched in existing tapes whose physical length exceeds about 5760 characters (48 feet). This new kind of block is called a ca block and is described in section 3.

It was also considered desirable to define a second new block (an si block) which facilitates the storing of words in drum groups 1 to 11. This block is described in section 4.

3. The ca Block

Because of time requirements it is necessary for the 556 drum input program to first read all of the words on a 556 tape into consecutive registers of a temporary storage block in ES and then to deselect the photoelectric tape reader and record the contents of the storage block in the proper locations on group 0. This takes place whenever an sp block occurs on the 556 tape. There can, however, exist programs on 556 tape which are short enough to fit into ES but which in 556 form are too long to fit into the storage block used by the 556 drum input program (e.g., a large number of modifications can occur in a program). Such tapes can be read by the 556 drum input program only if they contain a ca block (which consists of the single word ca 0 followed by 3 inches of feed out). Upon detecting a ca block the 556 drum input program deselects the photoelectric tape reader, records the contents of the ES storage block on group 0 and then selects the photoelectric tape reader again to read in more 556 tape.

If two banks of ES are used these blocks need occur only on tapes whose lengths exceed 48 feet (for one bank, the maximum length is 22.5 feet). If ca blocks are inserted it is recommended that they be placed no more than 40 feet apart to allow for a planned change in the drum input program in October, 1953.

4. The si Block

The S & EC group does not contemplate producing, before October, 1953, a conversion program which will prepare 556 tape for direct read to drum groups 1 to 11. However the facility has been built into the drum input program for allowing direct read in to these groups from 556 tape prepared by a simple manual modification (or by a special conversion program). This is accomplished by means of another newly defined block -- an si block.

The si block is a one-word block consisting of the word si g, where g is the number of a desired group, g = 0, 1, ..., 11 (decimal). The si block may occur between any other blocks on 556 tape and has the effect of directing all succeeding words into group g until another si block occurs to change it or until the drum input program is read in again by starting over at 26. Thus words to be recorded in group 4, for example, can be converted to 556 by the standard basic or CS conversion as if they were to go directly into ES and the resulting 556 tape can then be manually modified by punching si 4 at the start of the tape. The words on the 556 tape will then go into their assigned locations between 0 and 2047, but in group 4 instead of group 0 as they would have if no si block had occurred.

More than one si block may of course be used on one tape, and si 0 may be used to precede groups of words which are to go into ES via group 0.

5. Changes in the Read In Procedure

The 556 drum input program is designed to read in any 556 tape that could be read in by the old test storage input program (with the exception that the addition of ca blocks may be required). At present, read in cannot be initiated by pressing the "read in button" but must be initiated by starting over at 26 (32 octal). The read in button will be changed shortly to permit its use here.

Those programs which automatically read in the next tape in a sequence by means of the instruction sp 21 (sp 25 octal) must be modified by replacing this instruction by the instruction sp 26 (sp 32 octal).

The ck instruction which checks the sum mod 1 occurs in register 75 (octal) of the 556 drum input program.

6. Alarms during Read In

When alarms which are not caused by incorrect tapes occur during the actual read in of a paper tape into the ES storage block (this can be detected by the fact that the photo electric tape reader will be selected) it is usually possible to continue the read in procedure by pulling the tape back to a point immediately following the last sp block and starting over at 40 (octal). Note that starting over at 26 (32 octal) will destroy those parts of the program already on group 0 since this records the contents of ES on group 0 and ES contains the input program at this time.

Signed: Frank C. Helwig
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Approved: JDP
Jack D. Porter

FCH:jdp:tl

Attached:
DL-705

556 Drum Input Program, May, 1953 (OCTAL)

```
 40  si 213     Select PETR
  1  ca 162
  2  td 126     Set up to initially record in ES storage block
  3  td 163
  4  cs   0     Set word counter to -0
  5  ts 164
  6  rd   0     Read in and store control word in flip flop 3
  7  ts   3
 50  cp 117     Detect negative control words
  1  clh  2     Detect sp block
  2  cp  77
  3  clhl       Detect ck block
  4  sp 155
  5  ca   3     Initially set sum mod 1
  6  ts 165
  7  td 166     Form drum address of initial word in block
 60  ca 164     Record number of words in ES storage block
  1  sp 125
  2  ca 166     Record drum address of initial word in ES storage block
  3  sp 125
  4  rd   0
  5  ex 165
  6  sa 165
  7  ex 165     Read block of words into ES storage block and form sum mod 1
 70  sp 125
  1  ao 164
  2  cp  64
  3  sp  44
  4  rd   0
  5  ck 165     Check sum mod 1
  6  sp  44
  7  rd   0     Read in and store spy in flip flop 2
100  ts   2
  1  ca   3
  2  su 116     Detect sp1 and sp2
  3  cp 105
  4  sp  44     Ignore sp block for sp n, n>2
  5  sp 132     Record the contents of the ES storage block on group 0
  6  ca 167     Select drum to record sp y
  7  si 707
110  ca 170     Store bi 40 in flip flop 2
  1  ex   2
  2  rc   0     Record sp y in register 2 of group 0
  3  ca 171
  4  si 703     Read group 0 into ES
  5  ca 172
  6  sp   2
  7  clhl       Detect -n + 1
```

```
120  cp 123
  1  sp 132     Record the contents of the ES storage block on group 0
  2  sp  40
  3  ca   3     Set the number of words counter to -n + 1
  4  sp  45
  5  ta 131
  6  ts ---     Store single word in first available register of ES storage block
  7  ao 126
130  td 163
  1  sp -
  2  ta 141
  3  ca 162
  4  td 146     Set up to record ES storage block on the drum
  5  ad   1
  6  td 142
  7  su 163     Is any recording necessary
140  cp 142
  1  sp -
  2  ca ---     Select drum to record block of words
  3  si 707
  4  ao 142     Set up address of bo instruction
  5  td 151
  6  ca ---
  7  su   1     Form -n
150  ts 164
  1  bo -       Record block of words on group 0
  2  ca 151
  3  su 164
  4  sp 134     Set up to record next block of words
  5  cp  74
  6  clh 36     Detect ts block
  7  cp  55
160  clc 12     Select drum group on which to record words
  1  sp 173
  2  bo 200     Initial address of ES storage block
  3  bo ---     Final address of ES storage block
  4  + 0        Number of words counted
  5  + 0        Sum mod 1
  6  + 0        Digit storage
  7  + 2
170  bi 40      Constants
  1  si 40
  2  + 2019
  3  ts 166     Set up to record words on drum group selected
  4  sp  44
```