COMPUTATION CENTER
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

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To: FMS Users

From: R. Daley

Subject: Octal Correction Cards Within the FMS System

Introduction:

A feature has been added to the MIT version of FMS to accept relocatable or absolute octal correction cards.

Usage:

All octal corrections should immediately follow the binary subprogram to which they pertain. If corrections are patched onto the end of the original program, the program length is automatically updated to include the location of each correction as it is read. Care must be taken in writing each correction card so that it does not refer to an address beyond the range of the updated value of the program length.

Format:

Cols.	1-2	Must both contain 9 punches.
	3	Blank
	4-8	Nominal octal address if card is relocatable, true octal address if card is absolute correction card.
	9	Blank
	10-11	Relocation number or blank (see relocation section).
	12	Blank
	13-24	Nominal octal word if card is relocatable, true octal word if card is absolute.
	25	Blank
	26-72	Arbitrary comment field which is ignored by the loader.

Relocation:

The relocation number is obtained by considering the relocation properties of the decrement and address of the octal word in columns 13-24.

There are three possibilities for each reference (i.e., address or decrement):

1. The reference is absolute and is not to be relocated.

2. The reference is to be relocated in the "normal" fashion, meaning that

   a. If the reference is to a location outside of the subprogram, then it is to be relocated as an upper memory location. That is, it is presumed to refer to a location outside of its own subprogram.

   b. If the reference is to a location within the subprogram, then it is to be relocated as a lower memory location. That is, it is presumed to refer to a location within its own subprogram.

3. The reference is to be relocated in the "converse" fashion, meaning that

   a. If the reference is to a location outside of the subprogram, then it is to be relocated as a lower memory location.

   b. If the reference is to an address within the subprogram, then it is to be relocated as an upper memory location.

The bit configurations for these three cases are:

```
 0:  Absolute (not to be relocated).
10:  Relocate in the "normal" fashion.
11:  Relocate in the "converse" fashion.
```

A binary number of from 2 to 4 digits is formed representing the relocation indicator bits of the decrement and address of the word. A 6-digit binary number is then formed by adding low-order zeros and is translated to the equivalent two-digit octal number. The octal number is the relocation number, columns 10-11.

An absolute correction is indicated by leaving columns 10-11 blank.

Example:

If the length of a subprogram were 2001, an incorrect patch would be as follows:

```
99  01030  20  002000002001      TRA  2001
99  02001  20  050000001770      CLA  1770
99  02002  20  030000001771      FAD  1771
99  02003  20  002000001031      TRA  1031
```

The error is made in location 1030 by referring to an address outside of the subprogram which is upgraded only when the correction card 2001 is read. The error is rectified by making the relocation number 30 or beginning the patch with a dummy word that causes the program length to be upgraded far enough to include all locations and addresses referred to in the patch. A correct patch would read:

```
99  02003  00  000000000000      Dummy to extend program length.
99  01030  20  002000002001      TRA  2001
99  02001  20  050000001770      CLA  1770
99  02002  20  030000001771      FAD  1771
99  02003  20  002000001031      TRA  1031
```