Program J (Inverse in place)

N IS 6 Number of elements in the permutation

$ IS 255 Temporary storage

i IS 2 Variables of the algorithm

ii IS i Two characters indicate that the

jj IS 3 variable is multiplied by 8

k IS jj

mm IS 4

LOC Data_Segment

X GREG @

OCTA 0

OCTA 6,2,1,5,4,3

LOC #100

* Inverse a permutation in place

01 Invert SET t,N 1 J1. Negate all. $t ← n.$

02 SL mm,t,3 1 $m ← n.$

03 1H LDO k,X,mm N

04 NEG k,k N

05 STO k,X,mm N $X[k] ← −X[k].$

06 SUB mm,mm,8 N $m ← m − 1.$

07 PBP mm,1B N Branch if $m > 0.$

08 SL mm,t,3 1 $m ← n.$

09 2H SR i,mm,3 N J2. Initialize. $i ← m.$

10 3H SL jj,i,3 A J3. Find negative entry. $j ← i.$

11 LDO i,X,jj A $i ← X[j].$

12 PBP i,3B A To J3 if $i > 0.$

13 4H NEG i,i N J4. Invert.

14 SL ii,i,3 N

15 LDO t,X,ii N $t ← X[−i]$

16 STO t,X,jj N and $X[j] ← X[−i].$

17 SR t,mm,3 N $t ← m$

18 STO t,X,ii N and $X[−i] ← m.$

19 5H SUB mm,mm,8 N J5. Loop on $m. m ← m − 1.$

20 PBP mm,2B N Branch if $m > 0.$

* inspect memory locations of array X for the result

TRAP 0,Halt,0

Main IS Invert

Analysis

In this program some registers have two names. For example, the labels i and ii stand for one register. The program uses i to represent a value of the array X and ii for an index to this array.

The program needs $(5N + A)\mu + (16N + 3A + 7)\upsilon. For the test data the procedure has the statistics: 117 instructions, 40 mems, 133 oops; 14 good guesses, 8 bad. As in this case $N = 6$ and $A = 10$ the formula gives $30 + 10 = 40\mu$ and $96 + 30 + 7 = 133\upsilon.$