L O G I C S O F T

R E L O C A T E R V 1 . 6

Z-80 RELOCATER PROGRAM FOR MACHINE CODE, ON NASCOM MICROCOMPUTERS

The program is supplied on a self-generating tape cassette recorded on one side at 300 BAUD and the other at 1200 BAUD.

Once loaded to its normal locations (1000-15D0) it can then be relocated itself to any free memory block 0500H long.(Note:it will be necess -ary to change array pointers in the main prog. if loaded into ROM).

On execution the program will ask nine questions to which it will require a user input;

1) ORIGIN -The start address of the prog -ram to be relocated.The address to which the program was meant to start from but not neseccarily its actual position.

2) NEW ORIGIN -The start address to where the program is to be relocate -d to.

3) LOWER LIMIT -The address below which code in the program,to be relocate -d,is not altered. E.g. if a limit of 1000H was set and during execution the relocater finds a CALL to an address below 1000H then it will not relocate that code.

4) UPPER LIMIT -The opposite of the lower limit. Addressing above the limit is not altered.

5) END ADDRESS -The end address of the progra -m that is to be relocated. Note:this is the physical end address of the program where it is actually located in RAM

6) 1 BYTE TEST -Answer this question either 'YES' or 'NO' failure to do

so will result in an assumed NO.'YES' will set up a mode such that if the relocater finds a 'LD' instruction for a single byte operand (Eg. 3E ,0E,06 etc.) then the relocat -er will stop and the prompt 'C?' will be shown.This is asking if you wish to change the code.Typing 'N' will cause the relocater to resume relocating where as 'Y' will position the cursor over the operand and allow it to be changed using the keyboard. Once satisfied press ENTER to continue relocation.

7) ACTUAL ORIGIN -The actual first address of the program,to be relocated, in RAM.Note:If the program is in its correct position relative to the origin then make ACTUAL ORIGIN = ORIGIN.

8) OPTIONS -(C D L M O Q W)

C: Copy relocated code to new origin.

D: Delay (about .75s @4Mhz)

L: List relocated code to a Centronics printer (uses ports 4,5,6,7).

M: Manual mode-Waits for a key to be pressed before proceeding. (Note:don't use ENTER key).

O: Over Copy-copies relocated code over the original program.

Q: Query-If code is within the upper and lower limits then it will halt the program and the prompt '(YNC) ?' will be displaye -d.
'C' allows the code to be altered as described in the BYTE TEST mode.

'Y' allows the relocater to relocate the code. 'N' tells the computer not to relocate the code. Enter one of these letters

W: Write-sends the VDU contents to the UART.

9) DATA Areas? -This allows the operator to define areas within the prog ram which are to be ignored by the relocater but still to be copied in under the C and O commands.To exit from the mode simply press ENTER without inputting any address -ess.
As many defined areas may be inputted as the operator wishes as there are no restri -ctions on the array length. The first input (LOW) points to the first byte to be treat -ed as data and the sceond input (HI) points to the byte to be treated as an instructi -on.(Note:make sure that a space between inputs).

On inputting options up to 10 letters may be entered at any one time.This means that you may input as many delays or lists as you wish (Up to !0 of course!),ie for a delay of 1.5s input 'DD'.
It is important that the order of inputs is noted as the relocater operates on them as they have been inputted.Eg inputting QC is not the -r will List before copying etc.

RELATIVE RELOCATION.

In this version (V1.6) the relative relocation facility has been fully supported.Eg If,for example,you have a program which starts at 0D00 and you want to relocate it to 0F00 but the program can only be loaded into 0C00 then the relocater can relocate this to 0F00 if you input the following parameters:

```
ORIGIN          = 0D00H
NEW ORIGIN      = 0F00H
ACTUAL ORIGIN = 0C00H
```

Then on running the program will relocate to code to 0F00 though it usually starts at 0D00 and is situated at 0C00H

PROGRAM STRUCTURE.

To enable the relocater to be located in ROM it will be neseccary to point array locations to addresses outside the relocater in RAM.
Two arrays are needed;

1) WORD ;10 bytes long ; org 10B5H
2) DATA ;XX bytes long ; org 15D0H

The above addresses point to their current locations.XX means that the length is dependant on the number of inputs.

LENGTH = NUMBER OF INPUTS * 4 + 2 bytes

To re-write the pointers alter locations :

11D9 : 1390 : 1332 : for WORD array and
14B4 : 152D : for DATA array.

```
L0000 EQU  £0000
L000A EQU  £000A
L000B EQU  £000B
L002A EQU  £002A
L0800 EQU  £0800
L0801 EQU  £0801
L0802 EQU  £0802
L0803 EQU  £0803
L0804 EQU  £0804
L0806 EQU  £0806
L0808 EQU  £0808
L0B4A EQU  £0B4A
L0B5A EQU  £0B5A
L0B5C EQU  £0B5C
L0B60 EQU  £0B60
L0B8A EQU  £0B8A
L0B8C EQU  £0B8C
L0B90 EQU  £0B90
L0B94 EQU  £0B94
L0B98 EQU  £0B98
L0BCB EQU  £0BCB
L0BCF EQU  £0BCF
L0BF1 EQU  £0BF1
L0BFA EQU  £0BFA
L0BFD EQU  £0BFD
L0BFE EQU  £0BFE
L0C21 EQU  £0C21
L0C29 EQU  £0C29
```

```
1000  C3 C0 10   L1000 JP   L10C0          ;C@.
1003  4F 72 69   L1003 DEFB £4F,£72,£69 ;Ori
1006  67 69 6E         DEFB £67,£69,£6E ;gin
1009  20 20 20         DEFB £20,£20,£20 ;
100C  20 20 4E         DEFB £20,£20,£4E ;  N
100F  65 77 20         DEFB £65,£77,£20 ;ew
1012  4F 72 69         DEFB £4F,£72,£69 ;Ori
1015  67 69 6E         DEFB £67,£69,£6E ;gin
1018  20 4C 6F         DEFB £20,£4C,£6F ; Lo
101B  77 65 72         DEFB £77,£65,£72 ;wer
101E  20 4C 69         DEFB £20,£4C,£69 ; Li
1021  6D 69 74         DEFB £6D,£69,£74 ;mit
1024  45 6E 64         DEFB £45,£6E,£64 ;End
1027  20 41 64         DEFB £20,£41,£64 ; Ad
102A  64 72 65         DEFB £64,£72,£65 ;dre
102D  73 73 55         DEFB £73,£73,£55 ;ssU
1030  70 70 65         DEFB £70,£70,£65 ;ppe
1033  72 20 4C         DEFB £72,£20,£4C ;r L
1036  69 6D 69         DEFB £69,£6D,£69 ;imi
1039  74 31 20         DEFB £74,£31,£20 ;t1
103C  42 79 74         DEFB £42,£79,£74 ;Byt
103F  65 20 74         DEFB £65,£20,£74 ;e t
1042  65 73 74         DEFB £65,£73,£74 ;est
1045  01 11 31   L1045 DEFB £01,£11,£31 ;..1
1048  32 3A C2         DEFB £32,£3A,£C2 ;2:B
104B  C3 C4 CA         DEFB £C3,£C4,£CA ;CDJ
104E  CC CD D2         DEFB £CC,£CD,£D2 ;LMR
1051  D4 DA DC         DEFB £D4,£DA,£DC ;TZ\
1054  E2 E4 EA         DEFB £E2,£E4,£EA ;bdj
1057  EC F2 F4         DEFB £EC,£F2,£F4 ;lrt
```

```
105A  FA FC 21                DEFB £FA,£FC,£21 ;z|!
                        L105C EQU  $-1
105D  22 2A 36                DEFB £22,£2A,£36 ;"*6
                        L105F EQU  $-1
1060  CB 06 0E                DEFB £CB,£06,£0E ;K..
1063  10 16 18                DEFB £10,£16,£18 ;...
1066  1E 20 26                DEFB £1E,£20,£26 ;. &
1069  28 2E 30                DEFB £28,£2E,£30 ;(.0
106C  38 3E C6                DEFB £38,£3E,£C6 ;8>F
106F  CE D3 D6                DEFB £CE,£D3,£D6 ;NSV
1072  DB DE E6                DEFB £DB,£DE,£E6 ;[^f
1075  EE F6 FE                DEFB £EE,£F6,£FE ;nv~
1078  DF D7 43                DEFB £DF,£D7,£43 ;_WC
                        L107A EQU  $-1
107B  4B 53 5B                DEFB £4B,£53,£5B ;KS[
107E  73 7B 09                DEFB £73,£7B,£09 ;s{.
                        L1080 EQU  $-1
1081  19 23 29                DEFB £19,£23,£29 ;.#)
1084  2B 39 E1                DEFB £2B,£39,£E1 ;+9a
1087  E3 E5 E9                DEFB £E3,£E5,£E9 ;cei
108A  F9 4F 72                DEFB £F9,£4F,£72 ;yOr
                        L108B EQU  $-2
108D  67 20 30                DEFB £67,£20,£30 ;g 0
1090  30 30 30                DEFB £30,£30,£30 ;000
1093  20 20 5A                DEFB £20,£20,£5A ;  Z
1096  38 30 20                DEFB £38,£30,£20 ;80
1099  52 45 4C                DEFB £52,£45,£4C ;REL
109C  4F 43 41                DEFB £4F,£43,£41 ;OCA
109F  54 45 52                DEFB £54,£45,£52 ;TER
10A2  20 56 31                DEFB £20,£56,£31 ; V1
10A5  2E 36 20                DEFB £2E,£36,£20 ;.6
10A8  20 4E 65                DEFB £20,£4E,£65 ; Ne
10AB  77 20 4F                DEFB £77,£20,£4F ;w O
10AE  72 67 20                DEFB £72,£67,£20 ;rg
10B1  30 30 30                DEFB £30,£30,£30 ;000
10B4  30 43 20                DEFB £30,£43,£20 ;0C
                        L10B5 EQU  $-2
10B7  20 20 20                DEFB £20,£20,£20 ;
10BA  20 20 20                DEFB £20,£20,£20 ;
10BD  20 20 00                DEFB £20,£20,£00 ;  .
10C0  EF                      RST  £28         ;o
10C1  0C 00                   DEFB £0C,£00     ;..
10C3  21 94 0B                LD   HL,L0B94    ;!..
10C6  22 29 0C                LD   (L0C29),HL  ;").
10C9  EF                      RST  £28         ;o
10CA  28 43 29 20             DEFM /(C) /      ;(C)
10CE  4C 4F 47 49             DEFM /LOGI/      ;LOGI
10D2  43 20 53 4F             DEFM /C SO/      ;C SO
10D6  46 54 20 31             DEFM /FT 1/      ;FT 1
10DA  39 38 31                DEFM /981/       ;981
10DD  0D 00                   DEFB £0D,£00     ;..
10DF  21 98 0B                LD   HL,L0B98    ;!..
10E2  22 29 0C                LD   (L0C29),HL  ;").
10E5  EF                      RST  £28         ;o
10E6  4E 41 53 2D             DEFM /NAS-/      ;NAS-
10EA  53 59 53 20             DEFM /SYS /      ;SYS
10EE  56 31 2E 36             DEFM /V1.6/      ;V1.6
10F2  00                      DEFB £00         ;.
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10F3  DF                        RST  £18          ;_
10F4  5D                        DEFB £5D          ;]
10F5  06 10                     LD   B,£10        ;..
10F7  EF                L10F7   RST  £28          ;o
10F8  0D 00                     DEFB £0D,£00      ;..
10FA  10 FB                     DJNZ L10F7        ;.{
10FC  31 00 10                  LD   SP,L1000     ;1..
10FF  EF                        RST  £28          ;o
1100  0C 00                     DEFB £0C,£00      ;..
1102  11 CB 0B                  LD   DE,L0BCB     ;.K.
1105  21 8B 10                  LD   HL,L108B     ;!..
1108  01 2A 00                  LD   BC,L002A     ;.*.
110B  ED B0                     LDIR              ;m0
110D  DD 21 00 08               LD   IX,L0800     ;]!..
1111  21 03 10                  LD   HL,L1003     ;!..
1114  06 04                     LD   B,£04        ;..
1116  C5               L1116   PUSH BC           ;E
1117  3E 20                     LD   A,£20        ;>
1119  32 8A 0B                  LD   (L0B8A),A    ;2..
111C  11 8C 0B                  LD   DE,L0B8C     ;...
111F  01 0B 00                  LD   BC,L000B     ;...
1122  ED B0                     LDIR              ;m0
1124  E5                       PUSH HL           ;e
1125  ED 53 29 0C               LD   (L0C29),DE   ;mS).
1129  EF                       RST  £28          ;o
112A  20 3F 20                  DEFM / ? /        ; ?
112D  00                        DEFB £00          ;.
112E  DF                        RST  £18          ;_
112F  63                        DEFB £63          ;c
1130  11 5A 0B                  LD   DE,L0B5A     ;.Z.
1133  DF                        RST  £18          ;_
1134  64                        DEFB £64          ;d
1135  2A 21 0C                  LD   HL,(L0C21)   ;*!.
1138  DD 75 00                  LD   (IX),L       ;]u.
113B  DD 23                     INC  IX           ;]#
113D  DD 74 00                  LD   (IX),H       ;]t.
1140  DD 23                     INC  IX           ;]#
1142  E1                       POP  HL           ;a
1143  C1                       POP  BC           ;A
1144  10 D0                     DJNZ L1116        ;.P
1146  3E 20                     LD   A,£20        ;>
1148  32 8A 0B                  LD   (L0B8A),A    ;2..
114B  11 8C 0B                  LD   DE,L0B8C     ;...
114E  01 0B 00                  LD   BC,L000B     ;...
1151  ED B0                     LDIR              ;m0
1153  ED 53 29 0C               LD   (L0C29),DE   ;mS).
1157  E5                       PUSH HL           ;e
1158  EF                       RST  £28          ;o
1159  20 3F 20                  DEFM / ? /        ; ?
115C  00                        DEFB £00          ;.
115D  DF                        RST  £18          ;_
115E  63                        DEFB £63          ;c
115F  11 5A 0B                  LD   DE,L0B5A     ;.Z.
1162  DF                        RST  £18          ;_
1163  64                        DEFB £64          ;d
1164  2A 21 0C                  LD   HL,(L0C21)   ;*!.
1167  22 FE 0B                  LD   (L0BFE),HL   ;"~.
116A  E1                        POP  HL           ;a
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```
116B  3E 20          LD    A,£20          ;>
116D  32 8A 0B       LD    (L0B8A),A      ;2..
1170  11 8C 0B       LD    DE,L0B8C       ;...
1173  01 0B 00       LD    BC,L000B       ;...
1176  ED B0          LDIR                 ;m0
1178  ED 53 29 0C    LD    (L0C29),DE     ;mS).
117C  EF             RST   £28            ;o
117D  20 3F 20       DEFM  / ? /          ; ?
1180  00             DEFB  £00            ;.
1181  DF             RST   £18            ;_
1182  63             DEFB  £63            ;c
1183  3A 5A 0B       LD    A,(L0B5A)      ;:Z.
1186  32 FD 0B       LD    (L0BFD),A      ;23.
1189  21 CF 0B       LD    HL,L0BCF       ;!O.
118C  22 29 0C       LD    (L0C29),HL     ;").
118F  3A 01 08       LD    A,(L0801)      ;:..
1192  DF             RST   £18            ;_
1193  68             DEFB  £68            ;h
1194  3A 00 08       LD    A,(L0800)      ;:..
1197  DF             RST   £18            ;_
1198  68             DEFB  £68            ;h
1199  2A 29 0C       LD    HL,(L0C29)     ;*).
119C  36 20          LD    (HL),£20       ;6
119E  21 F1 0B       LD    HL,L0BF1       ;!q.
11A1  22 29 0C       LD    (L0C29),HL     ;").
11A4  3A 03 08       LD    A,(L0803)      ;:..
11A7  DF             RST   £18            ;_
11A8  68             DEFB  £68            ;h
11A9  3A 02 08       LD    A,(L0802)      ;:..
11AC  DF             RST   £18            ;_
11AD  68             DEFB  £68            ;h
11AE  2A 29 0C       LD    HL,(L0C29)     ;*).
11B1  36 20          LD    (HL),£20       ;6
11B3  CD 98 15       CALL  L1598          ;M..
11B6  00             NOP                  ;.
11B7  00             NOP                  ;.
11B8  00             NOP                  ;.
11B9  00             NOP                  ;.
11BA  00             NOP                  ;.
11BB  00             NOP                  ;.
11BC  EF             RST   £28            ;o
11BD  20 20 4F 70    DEFM  /  Op/         ;  Op
11C1  74 69 6F 6E    DEFM  /tion/         ;tion
11C5  73 20 3F 20    DEFM  /s ? /         ;s ?
11C9  28 43 44 4C    DEFM  /(CDL/         ;(CDL
11CD  4D 4F 51 57    DEFM  /MOQW/         ;MOQW
11D1  29 20          DEFM  /) /           ;)
11D3  00             DEFB  £00            ;.
11D4  DF             RST   £18            ;_
11D5  63             DEFB  £63            ;c
11D6  21 60 0B       LD    HL,L0B60       ;!`.
11D9  11 B5 10       LD    DE,L10B5       ;.5.
11DC  01 0A 00       LD    BC,L000A       ;...
11DF  ED B0          LDIR                 ;m0
11E1  2A 02 08       LD    HL,(L0802)     ;*.h
11E4  ED 5B 00 08    LD    DE,(L0800)     ;mK..
11E8  AF             XOR   A              ;/
11E9  ED 52          SBC   HL,DE          ;mR
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```
11EB  22 08 08          LD    (L0808),HL  ;".. 
11EE  C3 12 15          JP    L1512       ;C.. 
11F1  00                NOP               ;. 
11F2  2A 00 08    L11F2 LD    HL,(L0800)  ;*.. 
11F5  E5                PUSH  HL          ;e 
11F6  ED 5B 08 08       LD    DE,(L0808)  ;mE.. 
11FA  19                ADD   HL,DE       ;. 
11FB  CD F2 12          CALL  L12F2       ;Mr. 
11FE  E1                POP   HL          ;a 
11FF  C3 65 15          JP    L1565       ;Ce. 
1202  CA BA 12    L1202 JP    Z,L12BA     ;J:. 
1205  FE DD               CP    £DD         ;^] 
1207  CA 7D 12          JP    Z,L127D     ;J}. 
120A  FE FD               CP    £FD         ;^} 
120C  CA 7D 12          JP    Z,L127D     ;J}. 
120F  FE ED               CP    £ED         ;^m 
1211  CA 5E 12          JP    Z,L125E     ;J^. 
1214  06 1B               LD    B,£1B       ;.. 
1216  11 5F 10          LD    DE,L105F    ;._. 
1219  1A          L1219 LD    A,(DE)      ;. 
121A  BE                CP    (HL)        ;> 
121B  28 2F             JR    Z,L124C     ;(/ 
121D  13                INC   DE          ;. 
121E  10 F9             DJNZ  L1219       ;.y 
1220  CD 84 14          CALL  L1484       ;M.. 
1223  00                NOP               ;. 
1224  1A          L1224 LD    A,(DE)      ;. 
1225  BE                CP    (HL)        ;> 
1226  28 2B             JR    Z,L1253     ;(+ 
1228  13                INC   DE          ;. 
1229  10 F9             DJNZ  L1224       ;.y 
122B  0E 01             LD    C,£01       ;.. 
122D  CD E6 12          CALL  L12E6       ;Mf. 
1230  22 00 08    L1230 LD    (L0800),HL  ;".. 
1233  CD 90 13    L1233 CALL  L1390       ;M.. 
1236  00                NOP               ;. 
1237  00                NOP               ;. 
1238  00                NOP               ;. 
1239  2A 00 08          LD    HL,(L0800)  ;*.. 
123C  ED 5B 06 08       LD    DE,(L0806)  ;mE.. 
1240  ED 52             SBC   HL,DE       ;mR 
1242  DA F2 11          JP    C,L11F2     ;Zr. 
1245  EF                RST   £28         ;o 
1246  0D 0D 00          DEFB  £0D,£0D,£00 ;... 
1249  DF                RST   £18         ;_ 
124A  5B                DEFB  £5B         ;[ 
124B  00                NOP               ;. 
124C  06 02         L124C LD    B,£02       ;.. 
124E  00                NOP               ;. 
124F  00                NOP               ;. 
1250  C3 30 14          JP    L1430       ;C0. 
1253  0E 03         L1253 LD    C,£03       ;.. 
1255  CD E6 12          CALL  L12E6       ;Mf. 
1258  CD 06 13          CALL  L1306       ;M.. 
125B  C3 33 12          JP    L1233       ;C3. 
125E  11 7A 10    L125E LD    DE,L107A    ;.z. 
1261  06 06             LD    B,£06       ;.. 
1263  23                INC   HL          ;# 
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```
1264  1A           L1264 LD    A,(DE)       ;.
1265  BE                 CP    (HL)         ;>
1266  28 07              JR     Z,L126F     ;(.
1268  13                 INC   DE           ;.
1269  10 F9              DJNZ  L1264        ;.y
126B  2B           L126B DEC   HL           ;+
126C  C3 A6 14             JP    L14A6      ;C&.
126F  2B           L126F DEC   HL           ;+
1270  0E 04               LD    C,£04        ;..
1272  06 02               LD    B,£02        ;..
1274  CD E8 12             CALL  L12E8        ;Mh.
1277  CD 06 13             CALL  L1306        ;M..
127A  C3 33 12             JP    L1233        ;C3.
127D  11 80 10     L127D   LD    DE,L1080     ;...
1280  06 0B               LD    B,£0B        ;..
1282  23                  INC   HL           ;£
1283  1A           L1283 LD    A,(DE)       ;.
1284  BE                 CP    (HL)         ;>
1285  28 E4              JR     Z,L126B     ;(d
1287  13                 INC   DE           ;.
1288  10 F9              DJNZ  L1283        ;.y
128A  2B                   DEC   HL         ;+
128B  CD E6 12             CALL  L12E6      ;Mf.
128E  7E                   LD    A,(HL)     ;~
128F  FE 36                CP    £36        ;~6
1291  28 15                JR     Z,L12A8   ;(.
1293  FE CB                CP    £CB        ;~K
1295  28 11                JR     Z,L12A8   ;(.
1297  11 5C 10             LD    DE,L105C     ;.\.
129A  06 03               LD    B,£03        ;..
129C  1A           L129C LD    A,(DE)       ;.
129D  BE                 CP    (HL)         ;>
129E  28 0F              JR     Z,L12AF     ;(.
12A0  13                 INC   DE           ;.
12A1  10 F9              DJNZ  L129C        ;.y
12A3  0E 03               LD    C,£03        ;..
12A5  C3 69 15     L12A5   JP    L1569        ;Ci.
12A8  CD E6 12     L12A8   CALL  L12E6        ;Mf.
12AB  0E 04               LD    C,£04        ;..
12AD  18 F6               JR    L12A5        ;.v
12AF  CD E6 12     L12AF   CALL  L12E6        ;Mf.
12B2  CD 06 13             CALL  L1306        ;M..
12B5  0E 04               LD    C,£04        ;..
12B7  C3 33 12             JP    L1233        ;C3.
12BA  0E 00        L12BA   LD    C,£00        ;..
12BC  06 04               LD    B,£04        ;..
12BE  7E           L12BE   LD    A,(HL)       ;~
12BF  DF                   RST   £18          ;_
12C0  68                   DEFB  £68          ;h
12C1  00                   NOP                ;.
12C2  EF                   RST   £28          ;o
12C3  20                   DEFM  / /          ;
12C4  00                   DEFB  £00          ;.
12C5  7E                   LD    A,(HL)       ;~
12C6  23                   INC   HL           ;£
12C7  0C                   INC   C            ;.
12C8  FE 00                CP    £00          ;~.
12CA  CA 30 12             JP     Z,L1230     ;J0.
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```
12CD  10 EF              DJNZ L12BE          ;.o
12CF  22 00 08           LD   (L0800),HL     ;".
12D2  CD 90 13           CALL L1390          ;M..
12D5  2A 00 08           LD   HL,(L0800)     ;*..
12D8  ED 5B 08 08        LD   DE,(L0808)     ;mE..
12DC  19                 ADD  HL,DE          ;.
12DD  CD F2 12           CALL L12F2          ;Mr.
12E0  2A 00 08           LD   HL,(L0800)     ;*..
12E3  C3 BA 12           JP   L12BA          ;C:.
12E6  06 01        L12E6 LD   B,£01          ;..
12E8  7E           L12E8 LD   A,(HL)         ;~
12E9  DF                 RST  £18            ;_
12EA  68                 DEFB £68            ;h
12EB  EF                 RST  £28            ;o
12EC  20                 DEFM / /            ;
12ED  00                 DEFB £00            ;.
12EE  23                 INC  HL             ;#
12EF  10 F7              DJNZ L12E8          ;.w
12F1  C9                 RET                 ;I
12F2  EF           L12F2 RST  £28            ;o
12F3  20 20              DEFM /  /           ;
12F5  00                 DEFB £00            ;.
12F6  7C                 LD   A,H            ;|
12F7  DF                 RST  £18            ;_
12F8  68                 DEFB £68            ;h
12F9  00                 NOP                 ;.
12FA  7D                 LD   A,L            ;}
12FB  DF                 RST  £18            ;_
12FC  68                 DEFB £68            ;h
12FD  00                 NOP                 ;.
12FE  EF                 RST  £28            ;o
12FF  20 20              DEFM /  /           ;
1301  00                 DEFB £00            ;.
1302  C9                 RET                 ;I
1303  00                 NOP                 ;.
1304  00                 NOP                 ;.
1305  00                 NOP                 ;.
1306  5E           L1306 LD   E,(HL)         ;^
1307  23                 INC  HL             ;#
1308  56                 LD   D,(HL)         ;V
1309  23                 INC  HL             ;#
130A  E5                 PUSH HL             ;e
130B  AF                 XOR  A              ;/
130C  2A FE 0B           LD   HL,(L0BFE)     ;*~.
130F  ED 52              SBC  HL,DE          ;mR
1311  DA 24 13           JP   C,L1324        ;Z$.
1314  2A 04 08           LD   HL,(L0804)     ;*..
1317  AF                 XOR  A              ;/
1318  ED 52              SBC  HL,DE          ;mR
131A  30 08              JR   NC,L1324       ;0.
131C  C3 32 13           JP   L1332          ;C2.
131F  2A FA 0B     L131F LD   HL,(L0BFA)     ;*z.
1322  19                 ADD  HL,DE          ;.
1323  EB                 EX   DE,HL          ;k
1324  7B           L1324 LD   A,E            ;{
1325  DF                 RST  £18            ;_
1326  68                 DEFB £68            ;h
1327  EF                 RST  £28            ;o
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1328  20                    
1329  00                    
132A  7A                    
132B  DF                    
132C  68                    
132D  E1                    
132E  22 00 08              
1331  C9                    
1332  21 B5 10              
1335  06 0A                 
1337  7E                    
1338  FE 51                 
133A  28 06                 
133C  23                    
133D  10 F8                 
133F  C3 1F 13              
1342  E1                    
1343  E5                    
1344  2B                    
1345  2B                    
1346  06 02                 
1348  CD E8 12              
134B  EF                    
134C  20 28 59 4E           
1350  43 29 20 3F           
1354  20                    
1355  00                    
1356  CF                    
1357  FE 59                 
1359  20 0C                 
135B  F5                    
135C  06 0F                 
135E  EF                    
135F  08 00                 
1361  10 FB                 
1363  F1                    
1364  C3 1F 13              
1367  FE 4E                 
1369  20 0A                 
136B  06 09                 
136D  EF                    
136E  08 00                 
1370  10 FB                 
1372  C3 2D 13              
1375  FE 43                 
1377  28 05                 
1379  F7                    
137A  00                    
137B  00                    
137C  18 D8                 
137E  06 0F                 
1380  EF                    
1381  11 00                 
1383  10 FB                 
1385  DF                    
1386  7B                    
1387  FE 0D                 
1389  CA 2D 13              

      DEFM / /              ;
      DEFB £00              ;.
      LD   A,D              ;z
      RST  £18              ;_
      DEFB £68              ;h
L132D POP  HL               ;a
      LD   (L0800),HL       ;"..
      RET                   ;I
L1332 LD   HL,L10B5         ;!5.
      LD   B,£0A            ;..
L1337 LD   A,(HL)           ;^
      CP   £51              ;^Q
      JR    Z,L1342         ;(.
      INC  HL               ;£
      DJNZ L1337            ;.x
      JP   L131F            ;C..
L1342 POP  HL               ;a
      PUSH HL               ;e
      DEC  HL               ;+
      DEC  HL               ;+
      LD   B,£02            ;..
      CALL L12E8            ;Mh.
      RST  £28              ;o
      DEFM / (YN/           ; (YN
      DEFM /C) ?/           ;C) ?
      DEFM / /              ;
      DEFB £00              ;.
L1356 RST  £08              ;0
      CP   £59              ;^Y
      JR   NZ,L1367         ; g
      PUSH AF               ;u
      LD   B,£0F            ;..
L135E RST  £28              ;o
      DEFB £08,£00          ;..
      DJNZ L135E            ;.C
      POP  AF               ;q
      JP   L131F            ;C..
L1367 CP   £4E              ;^N
      JR   NZ,L1375         ; .
      LD   B,£09            ;..
L136D RST  £28              ;o
      DEFB £08,£00          ;..
      DJNZ L136D            ;.C
      JP   L132D            ;C-.
L1375 CP   £43              ;^C
      JR    Z,L137E         ;(.
      RST  £30              ;w
      NOP                   ;.
      NOP                   ;.
      JR   L1356            ;.X
L137E LD   B,£0F            ;..
L1380 RST  £28              ;o
      DEFB £11,£00          ;..
      DJNZ L1380            ;.C
L1385 RST  £18              ;_
      DEFB £7B              ;{
      CP   £0D              ;^M
      JP    Z,L132D         ;J-.
```

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138C  F7                      RST   £30          ;w
138D  18 F6                   JR    L1385        ;.v
138F  00                      NOP                ;.
1390  11 B5 10          L1390 LD    DE,L10B5     ;.5.
1393  06 0A                   LD    B,£0A        ;..
1395  C5                L1395 PUSH  BC           ;E
1396  D5                      PUSH  DE           ;U
1397  1A                      LD    A,(DE)       ;.
1398  FE 4D                   CP    £4D          ;^M
139A  CA BF 13                JP     Z,L13BF     ;J?.
139D  FE 57                   CP    £57          ;^W
139F  CA C2 13                JP     Z,L13C2     ;JB.
13A2  FE 44                   CP    £44          ;^D
13A4  CA CB 13                JP     Z,L13CB     ;JK.
13A7  FE 43                   CP    £43          ;^C
13A9  CA 06 14                JP     Z,L1406     ;J..
13AC  FE 4F                   CP    £4F          ;^O
13AE  CA 00 14                JP     Z,L1400     ;J..
13B1  FE 4C                   CP    £4C          ;^L
13B3  CA D4 13                JP     Z,L13D4     ;JT.
13B6  D1                L13B6 POP   DE           ;Q
13B7  C1                      POP   BC           ;A
13B8  13                      INC   DE           ;.
13B9  10 DA                   DJNZ  L1395        ;.Z
13BB  EF                      RST   £28          ;o
13BC  0D 00                   DEFB  £0D,£00      ;..
13BE  C9                      RET                ;I
13BF  CF                L13BF RST   £08          ;O
13C0  18 F4             L13C0 JR    L13B6        ;.t
13C2  21 8A 0B          L13C2 LD    HL,L0B8A     ;!..
13C5  06 30                   LD    B,£30        ;.0
13C7  DF                      RST   £18          ;_
13C8  6D                      DEFB  £6D          ;m
13C9  18 F5             L13C9 JR    L13C0        ;.u
13CB  06 30             L13CB LD    B,£30        ;.0
13CD  FF                L13CD RST   £38          ;.
13CE  FF                      RST   £38          ;.
13CF  FF                      RST   £38          ;.
13D0  10 FB                   DJNZ  L13CD        ;.{
13D2  18 F5                   JR    L13C9        ;.u
13D4  3E 00             L13D4 LD    A,£00        ;>.
13D6  D3 06                   OUT   (£06),A      ;S.
13D8  3E 0F                   LD    A,£0F        ;>.
13DA  D3 07                   OUT   (£07),A      ;S.
13DC  06 06                   LD    B,£06        ;..
13DE  3E 20             L13DE LD    A,£20        ;>
13E0  CD 8F 14                CALL  L148F        ;M..
13E3  10 F9                   DJNZ  L13DE        ;.y
13E5  21 8A 0B                LD    HL,L0B8A     ;!..
13E8  06 30                   LD    B,£30        ;.0
13EA  7E                L13EA LD    A,(HL)       ;~
13EB  CD 8F 14                CALL  L148F        ;M..
13EE  23                      INC   HL           ;£
13EF  10 F9                   DJNZ  L13EA        ;.y
13F1  3E 0D                   LD    A,£0D        ;>.
13F3  CD 8F 14                CALL  L148F        ;M..
13F6  00                      NOP                ;.
13F7  00                      NOP                ;.
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13F8  00                  NOP             ;.
13F9  C3 C0 13            JP    L13C0     ;C@.
13FC  00                  NOP             ;.
13FD  00                  NOP             ;.
13FE  00                  NOP             ;.
13FF  00                  NOP             ;.
1400  ED 5B 08 08  L1400  LD    DE,(L0808)  ;m[..
1404  18 03               JR    L1409     ;..
1406  11 00 00       L1406  LD    DE,L0000  ;...
1409  C5             L1409  PUSH  BC        ;E
140A  D5                    PUSH  DE        ;U
140B  11 8A 0B              LD    DE,L0B8A  ;...
140E  DF                    RST   £18       ;_
140F  64                    DEFB  £64       ;d
1410  00                    NOP             ;.
1411  2A 21 0C              LD    HL,(L0C21)  ;*!.
1414  AF                    XOR   A         ;/
1415  D1                    POP   DE        ;Q
1416  ED 52                 SBC   HL,DE     ;mR
1418  C1                    POP   BC        ;A
1419  41                    LD    B,C       ;A
141A  3F                    CCF             ;?
141B  11 90 0B              LD    DE,L0B90  ;...
141E  E5             L141E  PUSH  HL        ;e
141F  DF                    RST   £18       ;_
1420  64                    DEFB  £64       ;d
1421  00                    NOP             ;.
1422  E1                    POP   HL        ;a
1423  3A 21 0C              LD    A,(L0C21)  ;:!.
1426  77                    LD    (HL),A    ;w
1427  23                    INC   HL        ;#
1428  10 F4                 DJNZ  L141E     ;.t
142A  C3 C0 13              JP    L13C0     ;C@.
142D  00                    NOP             ;.
142E  00                    NOP             ;.
142F  00                    NOP             ;.
1430  06 02            L1430  LD    B,£02     ;..
1432  C3 70 14               JP    L1470     ;Cp.
1435  EF               L1435  RST   £28       ;o
1436  20 43 3F                 DEFM  / C?/     ;  C?
1439  00                       DEFB  £00       ;.
143A  CF               L143A  RST   £08       ;O
143B  F7                      RST   £30       ;w
143C  FE 59                   CP    £59       ;~Y
143E  20 1C                   JR    NZ,L145C  ;  .
1440  06 0A                   LD    B,£0A     ;..
1442  EF               L1442  RST   £28       ;o
1443  11 00                   DEFB  £11,£00   ;..
1445  10 FB                   DJNZ  L1442     ;.{
1447  DF               L1447  RST   £18       ;_
1448  7B                      DEFB  £7B       ;{
1449  FE 0D                   CP    £0D       ;~.
144B  28 03                   JR     Z,L1450  ;(.
144D  F7                      RST   £30       ;w
144E  18 F7                   JR    L1447     ;.w
1450  21 98 0B           L1450  LD    HL,L0B98  ;!..
1453  06 06                   LD    B,£06     ;..
1455  36 20               L1455  LD    (HL),£20  ;6
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1457  23                  INC  HL          ;#
1458  10 FB               DJNZ L1455       ;.{
145A  18 22               JR   L147E       ;."
145C  FE 4E         L145C CP   £4E         ;^N
145E  28 06               JR    Z,L1466    ;(.
1460  EF                  RST  £28         ;o
1461  08 00               DEFB £08,£00     ;..
1463  C3 3A 14            JP   L143A       ;C:.
1466  06 05         L1466 LD   B,£05       ;..
1468  EF            L1468 RST  £28         ;o
1469  08 00               DEFB £08,£00     ;..
146B  10 FB               DJNZ L1468       ;.{
146D  C3 AB 14            JP   L14AB       ;C+.
1470  CD E8 12     L1470 CALL L12E8        ;Mh.
1473  3A FD 0B            LD   A,(L0BFD)   ;:}.
1476  FE 59               CP   £59         ;^Y
1478  CA 71 15            JP    Z,L1571    ;Jq.
147B  C3 AB 14            JP   L14AB       ;C+.
147E  2A 00 08     L147E LD   HL,(L0800)  ;*..
1481  C3 AB 14            JP   L14AB       ;C+.
1484  11 45 10     L1484 LD   DE,L1045    ;.E.
1487  06 1A               LD   B,£1A       ;..
1489  C9                  RET              ;I
148A  00                  NOP              ;.
148B  00                  NOP              ;.
148C  00                  NOP              ;.
148D  00                  NOP              ;.
148E  00                  NOP              ;.
148F  F5            L148F PUSH AF          ;u
1490  DB 04         L1490 IN   A,(£04)     ;[.
1492  CB 47               BIT  0,A         ;KG
1494  20 FA               JR   NZ,L1490    ; z
1496  F1                  POP  AF          ;q
1497  F5                  PUSH AF          ;u
1498  CB FF               SET  7,A         ;K.
149A  D3 05               OUT  (£05),A     ;S.
149C  CB BF               RES  7,A         ;K?
149E  D3 05               OUT  (£05),A     ;S.
14A0  CB FF               SET  7,A         ;K.
14A2  D3 05               OUT  (£05),A     ;S.
14A4  F1                  POP  AF          ;q
14A5  C9                  RET              ;I
14A6  06 02         L14A6 LD   B,£02       ;..
14A8  CD E8 12            CALL L12E8       ;Mh.
14AB  0E 02         L14AB LD   C,£02       ;..
14AD  C3 30 12            JP   L1230       ;C0.
14B0  ED 5B 00 08   L14B0 LD   DE,(L0800)  ;mE..
14B4  DD 21 D0 15         LD   IX,L15D0    ;]!P.
14B8  DD 7E 01      L14B8 LD   A,(IX+£01)  ;]~.
14BB  FE FF               CP   £FF         ;~.
14BD  CA 0B 15            JP    Z,L150B    ;J..
14C0  DD 6E 00            LD   L,(IX)      ;]n.
14C3  DD 66 01            LD   H,(IX+£01)  ;]f.
14C6  DD 23               INC  IX          ;]#
14C8  DD 23               INC  IX          ;]#
14CA  AF                  XOR  A           ;/
14CB  ED 52               SBC  HL,DE       ;mR
14CD  28 06               JR    Z,L14D5    ;(.
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14CF  DD 23              INC  IX          ;]£
14D1  DD 23              INC  IX          ;]£
14D3  18 E3              JR   L14B8       ;.c
14D5  E1           L14D5 POP  HL          ;a
14D6  0E 00        L14D6 LD   C,£00       ;..
14D8  06 04              LD   B,£04       ;..
14DA  DD 6E 00     L14DA LD   L,(IX)      ;]n.
14DD  DD 66 01           LD   H,(IX+£01)  ;]f.
14E0  AF                 XOR  A           ;/
14E1  ED 52              SBC  HL,DE       ;mR
14E3  CA 05 15           JP    Z,L1505    ;J..
14E6  1A                 LD   A,(DE)      ;.
14E7  DF                 RST  £18         ;_
14E8  68                 DEFB £68         ;h
14E9  EF                 RST  £28         ;o
14EA  20                 DEFM / /         ;
14EB  00                 DEFB £00         ;.
14EC  13                 INC  DE          ;.
14ED  0C                 INC  C           ;.
14EE  10 EA              DJNZ L14DA       ;.j
14F0  ED 53 00 08        LD   (L0800),DE  ;mS..
14F4  CD 90 13           CALL L1390       ;M..
14F7  ED 5B 00 08        LD   DE,(L0800)  ;mE..
14FB  2A 08 08           LD   HL,(L0808)  ;*..
14FE  19                 ADD  HL,DE       ;.
14FF  CD F2 12           CALL L12F2       ;Mr.
1502  C3 D6 14           JP   L14D6       ;CV.
1505  EB           L1505 EX   DE,HL       ;k
1506  00                 NOP              ;.
1507  C3 30 12           JP   L1230       ;C0.
150A  00                 NOP              ;.
150B  E1           L150B POP  HL          ;a
150C  7E                 LD   A,(HL)      ;^
150D  FE EF              CP   £EF         ;^o
150F  C3 02 12           JP   L1202       ;C..
1512  EF           L1512 RST  £28         ;o
1513  20 44 41 54       DEFM / DAT/      ; DAT
1517  41 20 41 72       DEFM /A Ar/      ;A Ar
151B  65 61 73 20       DEFM /eas /      ;eas
151F  3F                 DEFM /?/         ;?
1520  0D                 DEFB £0D         ;.
1521  20 20 20 4C       DEFM /   L/      ;   L
1525  4F 57 20 20       DEFM /OW  /      ;OW
1529  48 49              DEFM /HI/        ;HI
152B  0D 00              DEFB £0D,£00     ;..
152D  DD 21 D0 15        LD   IX,L15D0    ;]!P.
1531  00                 NOP              ;.
1532  EF           L1532 RST  £28         ;o
1533  20 20              DEFM /  /        ;
1535  00                 DEFB £00         ;.
1536  DF                 RST  £18         ;_
1537  63                 DEFB £63         ;c
1538  06 02              LD   B,£02       ;..
153A  11 4A 0B           LD   DE,L0B4A    ;.J.
153D  DF           L153D RST  £18         ;_
153E  64                 DEFB £64         ;d
153F  2A 21 0C           LD   HL,(L0C21)  ;*!.
1542  7D                 LD   A,L         ;}
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```
1543  B4                      OR   H              ;4
1544  FE 00                   CP   £00            ;^.
1546  28 0F                   JR    Z,L1557       ;(.
1548  DD 75 00                LD   (IX),L         ;]u.
154B  DD 23                   INC  IX             ;]£
154D  DD 74 00                LD   (IX),H         ;]t.
1550  DD 23                   INC  IX             ;]£
1552  10 E9                   DJNZ L153D          ;.i
1554  C3 32 15                JP   L1532          ;C2.
1557  DD 36 00 FF  L1557      LD   (IX),£FF       ;]6..
155B  DD 36 01 FF             LD   (IX+£01),£FF   ;]6..
155F  EF                      RST  £28            ;o
1560  0D 00                   DEFB £0D,£00        ;..
1562  C3 F1 11                JP   L11F1          ;Cq.
1565  E5                L1565 PUSH HL             ;e
1566  C3 B0 14                JP   L14B0          ;C0.
1569  06 02             L1569 LD   B,£02          ;..
156B  CD E8 12                CALL L12E8          ;Mh.
156E  C3 30 12                JP   L1230          ;C0.
1571  22 00 08          L1571 LD   (L0800),HL     ;"..
1574  06 07                   LD   B,£07          ;..
1576  2B                     DEC  HL             ;+
1577  2B                     DEC  HL             ;+
1578  7E                     LD   A,(HL)         ;^
1579  21 90 15                LD   HL,L1590       ;!..
157C  BE                L157C CP   (HL)           ;>
157D  28 09                   JR    Z,L1588       ;(.
157F  23                      INC  HL             ;£
1580  10 FA                   DJNZ L157C          ;.z
1582  2A 00 08                LD   HL,(L0800)     ;*..
1585  C3 AB 14                JP   L14AB          ;C+.
1588  2A 00 08          L1588 LD   HL,(L0800)     ;*..
158B  C3 35 14                JP   L1435          ;C5..
158E  00                      NOP                 ;.
158F  00                      NOP                 ;.
1590  0E 06 1E          L1590 DEFB £0E,£06,£1E    ;...
1593  16 26 2E                DEFB £16,£26,£2E    ;.&.
1596  3E 00                   DEFB £3E,£00        ;>.
1598  21 8C 0B          L1598 LD   HL,L0B8C       ;!..
159B  22 29 0C                LD   (L0C29),HL     ;").
159E  00                      NOP                 ;.
159F  00                      NOP                 ;.
15A0  EF                      RST  £28            ;o
15A1  41 63 74 75             DEFM /Actu/         ;Actu
15A5  61 6C 20 4F             DEFM /al O/         ;al O
15A9  72 69 67 69             DEFM /rigi/         ;rigi
15AD  6E 20 3F 20             DEFM /n ? /         ;n ?
15B1  00                      DEFB £00            ;.
15B2  DF                      RST  £18            ;_
15B3  63                      DEFB £63            ;c
15B4  11 5C 0B                LD   DE,L0B5C       ;.\.
15B7  DF                      RST  £18            ;_
15B8  64                      DEFB £64            ;d
15B9  2A 02 08                LD   HL,(L0802)     ;*..
15BC  AF                      XOR  A              ;/
15BD  ED 5B 00 08             LD   DE,(L0800)     ;mE..
15C1  ED 52                   SBC  HL,DE          ;mR
15C3  22 FA 0B                LD   (L0BFA),HL     ;"z.
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15C6  2A 21 0C            LD   HL,(L0C21)   ;*!.
15C9  22 00 08            LD   (L0800),HL   ;"..
15CC  00                  NOP               ;.
15CD  00                  NOP               ;.
15CE  00                  NOP               ;.
15CF  C9                  RET               ;I
15D0  90            L15D0 SUB  B            ;.
-- NAS-SYS 3 --
```