

TITLE 'CP/M VERSION 2.2 SYSTEM RELOCATOR - 2/80'
 CPM RELOCATOR PROGRAM, INCLUDED WITH THE MODULE TO PERFORM
 THE MOVE FROM 900H TO THE DESTINATION ADDRESS

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0100          ORG      100H
0100 C32C01     JMP      PASTCOPY
0103 434F505952COPY: DB      'COPYRIGHT (C) DIGITAL RESEARCH, 1979
                                PASTCOPY:
0003 =        BIOSWK EQU      03H      ;THREE PAGES FOR BIOS WORKSPACE
0800 =        STACK EQU      800H
0801 =        MODSIZ EQU      801H      ;MODULE SIZE IS STORED HERE
0016 =        VERSION EQU     22        ;CPM VERSION NUMBER
0100 =        BOOTSIZ EQU     100H      ;SIZE OF THE COLD START LOADER
                                ; (MAY HAVE FIRST 80H BYTES = 00H)
0800 =        BDOSL  EQU     0800H      ;RELATIVE LOCATION OF BDOS
1600 =        BIOS   EQU     1600H      ;RELATIVE LOCATION OF BIOS
                                ;
0000 =        BOOT   EQU     0000H      ;REBOOT LOCATION
0005 =        BDOS   EQU     0005H
0009 =        PRNT   EQU      9        ;PRINT BUFFER FUNCTION
005C =        FCB    EQU     5CH        ;DEFAULT FCB
0900 =        MODULE EQU     900H      ;MODULE ADDRESS
                                ;
000D =        CR     EQU     0DH
000A =        LF     EQU     0AH
012C 310008     LXI      SP,STACK
                                ;
                                ; MAY BE MEMORY SIZE SPECIFIED IN COMMAND
012F 115D00     LXI      D,FCB+1
0132 1A         LDAX     D
0133 FE20       CPI
0135 CA9101     JZ        FINDTOP
0138 FE3F       CPI      '?'          ;WAS * SPECIFIED?
013A CA9101     JZ        FINDTOP
                                ;
                                ; MUST BE MEMORY SIZE SPECIFICATION
013D 210000     LXI      H,0
                                CLOOP:  ;CONVERT TO DECIMAL
0140 1A         LDAX     D
0141 13         INX      D
0142 FE20       CPI
0144 CA5F01     JZ        ECON
0147 B7         ORA      A
0148 CA5F01     JZ        ECON
                                ; MUST BE DECIMAL DIGIT
014B D630       SUI      '0'
014D FE0A       CPI      10
014F D27201     JNC      CERROR
                                ; DECIMAL DIGIT IS IN A
0152 29         DAD      H            ;*2
0153 E5         PUSH     H

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CP/M V.2.2
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0154 29      DAD      H      ;*4
0155 29      DAD      H      ;*8
0156 C1      POP      B      ;*2 IN B,C
0157 09      DAD      B      ;*10 IN H,L
0158 4F      MOV      C,A
0159 0600    MVI      B,0
015B 09      DAD      B      ;*10+X
015C C34001  JMP      CLOOP
ECON:      ;END OF CONVERSION, CHECK FOR PROPER RANGE
015F 7C      MOV      A,H
0160 B7      ORA      A
0161 C27201  JNZ      CERROR
0164 7D      MOV      A,L
0165 FE10    CPI      16
0167 DA7201  JC      CERROR
016A 2E00    MVI      L,0
016C 67      MOV      H,A
016D 29      DAD      H      ;SHL 1
016E 29      DAD      H      ;SHL 2 FOR KILOBYTES
;          H,L HAVE TOP OF MEMORY+1
016F C3A501  JMP      SETASC
;
CERROR:
0172 117B01  LXI      D,CONMSG
0175 CD7503  CALL     PRINT
0178 C30000  JMP      BOOT
017B 0B0A494E56CONMSG: DB CR,LF,'INVALID MEMORY SIZE$'
;
;
;          FIND END OF MEMORY
FINDTOP:
0191 210000  LXI      H,0
0194 24      FINDM: INR      H      ;TO NEXT PAGE
0195 CAA101  JZ      MSIZED ;CAN OVERFLOW ON 64K SYSTEMS
0198 7E      MOV      A,M
0199 2F      CMA
019A 77      MOV      M,A
019B BE      CMP      M
019C 2F      CMA
019D 77      MOV      M,A ;BITS INVERTED FOR RAM OPERATIONAL TEST
019E CA9401  JZ      FINDM
;          BITS DIDN'T CHANGE, MUST BE END OF MEMORY
;          ALIGN ON EVEN BOUNDARY
01A1 7C      MSIZED: MOV      A,H
01A2 E6FC    ANI      1111$1100B ;EVEN 1K BOUNDARY
01A4 67      MOV      H,A
SETASC: ;SET ASCII VALUE OF MEMORY SIZE
01A5 E5      PUSH     H      ;SAVE FOR LATER
;          **** SERIALIZATION ****
01A6 2A0600  LHLD     BDOS+1
01A9 227A03  SHLD     SER1
;          **** SERIALIZATION ****
01AC E1      POP      H
01AD E5      PUSH     H
01AE 7C      MOV      A,H
01AF 0F      RRC

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01B0 0F          RRC
01B1 E63F        ANI      11$1111B      ;FOR 1K COUNTS
01B3 C2B801      JNZ      NOT64         ;MAY BE 64 K MEM SIZE
01B6 3E40        MVI      A,64          ;SET TO LITERAL IF SO
01B8 47          MOV      B,A           ;READY FOR COUNT DOWN
01B9 218D03      LXI      H,AMEM
01BC 3E30        MVI      A,'0'
01BE 77          MOV      M,A
01BF 23          INX      H
01C0 77          MOVB     M,A           ;BOTH ARE SET TO ASCII 0
01C1 218E03      ASC0:    LXI      H,AMEM+1 ;ADDRESS OF ASCII EQUIVALENT
01C4 34          INR      M
01C5 7E          MOV      A,M
01C6 FE3A        CPI      '9'+1
01C8 DACF01      JC       ASC1
01CB 3630        MVI      M,'0'
01CD 2B          DCA      H
01CE 34          INR      M
01CF 05          ASC1:    DCR      B      ;COUNT DOWN BY KILOBYTES
01D0 C2C101      JNZ      ASC0
01D3 117E03      LXI      D,MEMSG
01D6 CD7503      CALL     PRINT ;MEMORY SIZE MESSAGE
;
01D9 210108      LXI      H,MODSIZ
01DC 4E          MOV      C,M
01DD 23          INX      H
01DE 46          MOV      B,M           ;B,C CONTAINS MODULE SIZE
01DF C5          PUSH     B             ;MODULE SIZE STACKED ON MEM SIZE
;
;      TRY TO FIND THE ASCII STRING 'K CP/M VER X.X' TO SET SIZE
01E0 210009      LXI      H,MODULE
;      B,C CONTAINS MODULE LENGTH
;SLOOP: ;SEARCH LOOP
01E3 118F03      LXI      D,AMSG
01E6 78          MOV      A,B
01E7 B1          ORA      C
01E8 CA2C02      JZ       ESEAR ;END OF SEARCH
01EB 0B          DCX      B             ;COUNT SEARCH LENGTH DOWN
01EC C5          PUSH     B
01ED 0E0F        MVI      C,LAMSG ;LENGTH OF SEARCH MESSAGE
01EF E5          PUSH     H             ;SAVE BASE ADDRESS OF SEARCH
CHLOOP: ;CHARACTER LOOP, MATCH ON CONTENTS OF D,E AND H,L
01F0 1A          LDAX     D
01F1 BE          CMP      M
01F2 C21A02      JNZ      NOMATCH
01F5 13          INX      D             ;TO NEXT SEARCH CHARACTER
01F6 23          INX      H             ;TO NEXT MATCH CHARACTER
01F7 0D          DCR      C             ;COUNT LENGTH DOWN
01F8 CA2002      JZ       FSEAR ;FOUND SEARCH STRING
01FB C3F001      JMP      CHLOOP
;
;      **** SERIALIZATION ****
01FE 01          DB      LXI      ;CONFUSE DISASSEMBLER
BADSER: ;BAD SERIAL NUMBER, LOOP TO CONFUSE ICE-80
01FF AF          XRA      A
BADSER0:

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```

0200 3D          DCR      A
0201 C20002      JNZ      BADSERU

;
0204 21F376      LXI      H,DI OR (HLT SHL 8)
0207 227A03      SHLD     PRHLT
020A 217703      LXI      H,PRJMP
020D 36CD        MVI      M,CALL ;CHANGE JMP BDOS TO CALL
020F 118802      LXI      D,SYNMSG-5
0212 210500      LXI      H,5
0215 19          DAD      D ;TO CONFUSE SEARCHES ON ADDRESSES
0216 EB          XCHG
0217 C37503      JMP      PRINT

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**** SERIALIZATION ****

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;
;
NOMATCH:

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;NOT FOUND AT THIS ADDRESS, LOOK AT NEXT ADDRESS

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021A E1          POP      H
021B 23          INX      H
021C C1          POP      B ;RECALL MODULE LENGTH
021D C3E301      JMP      SLOOP

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;
FSEAR:

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;FOUND STRING, SET MEMORY SIZE

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0220 E1          POP      H ;START ADDRESS OF STRING BEING MATCHED
0221 C1          POP      B ;CLEAR B,C WHICH WAS STACKED
0222 2B          DCX      H
0223 118E03      LXI      D,AMEM+1
0226 1A          LDAX     D
0227 77          MOV      M,A
0228 2B          DCX      H
0229 1B          DCX      D
022A 1A          LDAX     D
022B 77          MOV      M,A

```

```

END OF FILL

```

```

;
;
ESEAR:

```

```

;END OF SEARCH

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```

**** SERIALIZATION ****

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CHECK FOR LEAST SIGNIFICANT BYTE OF 06 IN SER1

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022C 017A03      LXI      B,SER1
022F 0A          LDAX     B
0230 FE06        CPI      6
0232 3E00        MVI      A,0
0234 C25A02      JNZ      SETJMP ;BAD SERIALIZATION IF NOT 06
0237 02          STAX     B ;STORE 00 TO LEAST SIGNIFICANT BYTE

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**** SERIALIZATION ****

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0238 C1          POP      B ;RECOVER MODULE LENGTH
0239 E1          POP      H ;H,L CONTAINS END OF MEMORY
023A C5          PUSH     B ;SAVE LENGTH FOR RELOCATION BELOW
023B 78          MOV      A,B
023C C603        ADI      BIOSWK ;ADD BIOS WORK SPACE TO MODULE LENGTH
023E 47          MOV      B,A
023F 7D          MOV      A,L
0240 91          SUB      C ;COMPUTE MEMTOP-MODULE SIZE
0241 6F          MOV      L,A
0242 7C          MOV      A,H
0243 98          SBB      B

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```

0244 67      MOV      H,A
;           H,L CONTAINS THE BASE OF THE RELOCATION AREA
0245 227C03  SHLD     RELBAS ;SAVE THE RELOCATION BASE
0248 EB      XCHG     ;MODULE BASE TO D,E
0249 210009  LXI      H,MODULE;READY FOR THE MOVE
024C C1      POP      B ;RECOVER ACTUAL MODULE LENGTH
024D C5      PUSH     B ;SAVE FOR RELOCATION
024E 3A6D00  LDA      FCB+17 ;CHECK FOR NO MOVE CONDITION
0251 FE20    CPI
0253 CA6302  JZ       MOVE
;           SECOND PARAMETER SPECIFIED, LEAVE THE DATA AT 'MODULE'
0256 09      DAD      B ;MOVE H,L TO BIT MAP POSITION
0257 C37002  JMP      RELOC
;
;           **** SERIALIZATION ****
025A 21FF01  SETJMP: LXI      H,BADSER ;BAD SERIALIZATION
025D 220703  SHLD     JMPSER+1 ;FILL JUMP INSTRUCTION
0260 C30603  JMP      JMPSER ;EVENTUAL JUMP TO MESSAGE
;           **** SERIALIZATION ****
;
;           MOVE:
0263 78      MOV      A,B ;BC=0?
0264 B1      ORA      C
0265 CA7002  JZ       RELOC
0268 0B      DCX      B ;COUNT MODULE SIZE DOWN TO ZERO
0269 7E      MOV      A,M ;GET NEXT ABSOLUTE LOCATION
026A 12      STAX     D ;PLACE IT INTO THE RELOC AREA
026B 13      INX      D
026C 23      INX      H
026D C36302  JMP      MOVE
;
;           RELOC: ;STORAGE MOVED, READY FOR RELOCATION
;           HL ADDRESSES BEGINNING OF THE BIT MAP FOR RELOCATION
0270 C1      POP      B ;RECALL MODULE LENGTH
0271 E5      PUSH     H ;SAVE BIT MAP BASE IN STACK
0272 2A7C03  LHLD     RELBAS
0275 EB      XCHG
0276 210001  LXI      H,BOOTSIZ
0279 19      DAD      D ;TO FIND BIAS VALUE
;           REGISTER H CONTAINS BIAS VALUE
;
;           RELOCATE AT 'MODULE' IF SECOND PARAMETER GIVEN
027A 3A6D00  LDA      FCB+17
027D FE20    CPI
027F CA8502  JZ       RELO
;
;           IMAGE NOT MOVED, ADJUST VALUES AT 'MODULE'
0282 110009  LXI      D,MODULE
0285 78      RELO: MOV      A,B ;BC=0?
0286 B1      ORA      C
0287 CAC002  JZ       ENDREL
;           **** SERIALIZATION ****
028A C3A402  JMP      PASTSYNC
;           SYNCMSG:
028D 0D0A53594E DB      CR,LF,'SYNCRONIZATION ERROR$'
;           PASTSYNC:

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;
;
;
02A4 0B      DCX      B      ;COUNT LENGTH DOWN
02A5 7B      MOV      A,E
02A6 E607    ANI      111B    ;0 CAUSES FETCH OF NEXT BYTE
02A8 C2B002  JNZ      REL1
;
;      FETCH BIT MAP FROM STACKED ADDRESS
02AB E3      XTHL
02AC 7E      MOV      A,M      ;NEXT 8 BITS OF MAP
02AD 23      INX      H
02AE E3      XTHL      ;BASE ADDRESS GOES BACK TO STACK
02AF 6F      MOV      L,A      ;L HOLDS THE MAP AS WE PROCESS 8 LOCATIONS
02B0 7D      REL1:    MOV      A,L
02B1 17      RAL
;CY SET TO 1 IF RELOCATION NECESSARY
02B2 6F      MOV      L,A      ;BACK TO L FOR NEXT TIME AROUND
02B3 D2BC02  JNC      REL2      ;SKIP RELOCATION IF CY=0
;
;
;      CURRENT ADDRESS REQUIRES RELOCATION
02B6 1A      LDAX     D
02B7 84      ADD      H      ;APPLY BIAS IN H
02B8 12      STAX     D
02B9 C3BC02  JMP      REL2
;
02BC 13      REL2:    INX      D      ;TO NEXT ADDRESS
02BD C38502  JMP      RELO      ;FOR ANOTHER BYTE TO RELOCATE
;
ENDREL: ;END OF RELOCATION
02C0 D1      POP      D      ;CLEAR STACKED ADDRESS
;
;      **** SERIALIZATION ****
02C1 110012  LXI      D,MODULE+BDOSL+BOOTSIZ ;ADDRESSING NEW SERIAL NUMBER
02C4 2A7A03  LHLD     SER1      ;ADDRESSING HOST SERIAL NUMBER
02C7 0E06    MVI      C,6      ;LENGTH OF SERIAL NUMBER
02C9 1A      CHKSER: LDAX     D
02CA BE      CMP      M
02CB C25A02  JNZ      SETJMP
02CE 23      INX      H
02CF 13      INX      D
02D0 0D      DCR      C
02D1 C2C902  JNZ      CHKSER
;
;      **** SERIALIZATION ****
;
02D4 3A6D00  LDA      FCB+17
02D7 FE20    CPI
02D9 CA6D03  JZ       TRANSFER
;
;      DON'T GO TO THE LOADED PROGRAM, LEAVE IN MEMORY
;      MAY HAVE TO MOVE THE PROGRAM IMAGE DOWN 1/2 PAGE
02DC 0680    MVI      B,128    ;CHECK FOR 128 ZEROES
02DE 210009  LXI      H,MODULE
02E1 7E      TRO:    MOV      A,M
02E2 B7      ORA      A
02E3 C20903  JNZ      TREND
02E6 23      INX      H
02E7 05      DCR      B
02E8 C2E102  JNZ      TRO
;

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;      ALL ZERO FIRST 1/2 PAGE, MOVE DOWN 80H BYTES
02EB EB      XCHG      ;NEXT TO GET IN D,E
02EC 2A0108   LHL      MODSIZ
02EF 0180FF   LXI      B,-128
02F2 09      DAD      B      ;NUMBER OF BYTES TO MOVE IN H,L
02F3 44      MOV      B,H
02F4 4D      MOV      C,L      ;TRANSFERRED TO B,C
02F5 210009   LXI      H,MODULE;DESTINATION IN H,L
02F8 78      TRMOV:   MOV      A,B
02F9 B1      ORA      C      ;ALL MOVED?
02FA CA0903   JZ      TREND
02FD 0B      DCX      B
02FE 1A      LDAX     D
02FF 77      MOV      M,A      ;ONE BYTE TRANSFERRED
0300 13      INX      D
0301 23      INX      H
0302 C3F802   JMP      TRMOV
;
;
;      **** SERIALIZATION ****
0305 01      DB      LXI
0306 C30603   JMPSER:  JMP      JMPSER ;ADDRESS FIELD FILLED-IN
;      **** SERIALIZATION ****
;
;TREND:      ;SET ASCII MEMORY IMAGE SIZE
0309 210108   LXI      H,MODSIZ
030C 4E      MOV      C,M
030D 23      INX      H
030E 46      MOV      B,M
030F 210009   LXI      H,MODULE;B,C MODULE SIZE, H,L BASE
0312 09      DAD      B
0313 44      MOV      B,H      ;B CONTAINS NUMBER OF PAGES TO SAVE+1
0314 215F03   LXI      H,SAVMEM;ASCII MEMORY SIZE
0317 3E30     MVI      A,'0'
0319 77      MOV      M,A
031A 23      INX      H
031B 77      MOV      M,A
;      '00' STORED INTO MESSAGE
TRCOMP:
031C 05      DCR      B
031D CA3103   JZ      TRC1
0320 216003   LXI      H,SAVMEM+1      ;ADDRESSING LEAST DIGIT
0323 34      INR      M
0324 7E      MOV      A,M
0325 FE3A     CPI      '9'+1
0327 DA1C03   JC      TRCOMP
032A 3630     MVI      M,'0'
032C 2B      DCX      H
032D 34      INR      M
032E C31C03   JMP      TRCOMP
;      FILL CPMXX.COM FROM SAVMEM
TRC1: 0331 2A8D03   LHL      AMEM
0334 226503   SHLD     SAVMO
;
;      MESSAGE SET, PRINT IT AND REBOOT
0337 114003   LXI      D,RELOK
033A CD7503   CALL     PRINT

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033D C30000      JMP      BOOT
0340 ODOA524541RELOK: DB      CR,LF,'READY FOR "SYSGEN" OR '
0357 ODOA225341  DB      CR,LF,'"SAVE '
035F 3030204350SAVMEM: DB      '00 CPM'
0365 30302E434FSAVMO: DB      '00.COM"$'

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;
TRANSFER:

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;      GO TO THE RELOCATED MEMORY IMAGE
036D 110017      LXI      D,BOOTSIZ+BIOS ;MODULE
0370 2A7C03      LHLD     RELBAS ;RECALL BASE OF RELOC AREA
0373 19          DAD      D      ;INDEX TO 'BOOT' ENTRY POINT
0374 E9          PCHL      ;GO TO RELOCATED PROGRAM

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;
;      **** SERIALIZATION ****
PRINT:

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0375 0E09      MVI      C,PRNT
0377 C30500      PRJMP:   JMP      BDOS
PRHLT:

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;      DATA      AREAS
037A          SER1:   DS      2      ;SERIAL NUMBER ADDRESS FOR HOST
037C          RELBAS: DS      2      ;RELOCATION BASE
037E ODOA434F4EMEMSG: DB      CR,LF,'CONSTRUCTING '
038D 3030      AMEM:   DB      '00'
038F 6B2043502FAMSG: DB      'k CP/M vers '
039B 322E32      DB      VERSION/10+'0','.',VERSION MOD 10 +'0'
000F =          LAMSG  EQU      $-AMSG ;LENGTH OF MESSAGE
039E 24          DB      '$'          ;TERMINATOR FOR MESSAGE
039F          END

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038D AMEM	038F AMSG	01C1 ASC0	01CF ASC1	01FF BADSER
0200 BADSERO	0800 BDOSL	0005 BDOS	1600 BIOS	0003 BIOSWK
0000 BOOT	0100 BOOTSIZ	0172 CERROR	02C9 CHKSER	01F0 CHLOOP
0140 CLOOP	017B CONMSG	0103 COPY	000D CR	015F ECON
02C0 ENDREL	022C ESEAR	005C FCB	0194 FINDM	0191 FINDTOP
0220 FSEAR	0306 JMPSER	000F LAMSG	000A LF	037E MEMSG
0801 MODSIZ	0900 MODULE	0263 MOVE	01A1 MSIZED	021A NOMATCH
01B8 NOT64	012C PASTCOPY	02A4 PASTSYNC	037A PRHLT	0375 PRINT
0377 PRJMP	0009 PRNT	0285 RELO	02B0 REL1	02BC REL2
037C RELE'S	0270 RELOC	0340 RELOK	0365 SAVMO	035F SAVMEM
037A SER1	01A5 SETASC	025A SETJMP	01E3 SLOOP	0800 STACK
028D SYNCMSG	02E1 TRO	036D TRANSFER	0331 TRC1	031C TRCOMP
0309 TREND	02F8 TRMOV	0016 VERSION		

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