```
video:3C00                 ;
video:3C00                 ;
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
video:3C00                 ; °     This file is generated by The Interactive Disassembler (IDA)
°
video:3C00                 ; °                          Licensed to: Unknown User ;-)
°
video:3C00                 ; °     Copyright (c) 1999 by DataRescue sa/nv, <ida@datarescue.com>
°
video:3C00                 ;
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼
video:3C00                 ;
video:3C00
video:3C00                 ; Processor:       z80
video:3C00                 ; Target assembler: Table Driven Assembler (TASM) by Speech Technology
Inc.
video:3C00
video:3C00                 ;
ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
video:3C00
video:3C00                 ; Segment type: Regular
video:3C00                 ; segment 'video'
video:3C00                         .org 3C00h
video:3C00 ?? ?? ?? ??+video_ram:.block 400h              ; DATA XREF:
update_bullet+84┤o
video:3C00 ?? ?? ?? ??+                                   ; update_bullet+91┤o ...
video:3C00 ?? ?? ?? ??+; end of 'video'
video:3C00 ?? ?? ?? ??+
ram:4300                   ;
ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
ram:4300
ram:4300                   ; Segment type: Regular
ram:4300                   ; segment 'ram'
ram:4300                         .org 4300h
ram:4300 ??          byte_0_4300:.block 1                 ; DATA XREF: handle_fire+5┤r
ram:4300                                                  ; handle_fire+C┤w ...
ram:4301 ??          invaders_left:.block 1               ; DATA XREF: update_bullet+62┤r
ram:4301                                                  ; update_bullet+69┤w ...
ram:4302 ?? ??       row_1_invader_addr:.block 2          ; DATA XREF: sub_0_45FC+2┤r
ram:4302                                                  ; sub_0_484A+15┤r ...
ram:4304 ?? ??       row_2_invader_addr:.block 2          ; DATA XREF: sub_0_45FC+13┤r
ram:4304                                                  ; sub_0_484A+E┤r ...
ram:4306 ?? ??       row_3_invader_addr:.block 2          ; DATA XREF: sub_0_45FC+19┤r
ram:4306                                                  ; sub_0_484A+7┤r ...
ram:4308 ?? ??       row_4_invader_addr:.block 2          ; DATA XREF: sub_0_45FC+1F┤r
ram:4308                                                  ; sub_0_484A┤r ...
ram:430A*??          byte_0_430A:.block 1                 ; DATA XREF: code:49DC┤w
ram:430A*                                                 ; sub_0_4B48+3┤r ...
ram:430B*??          ufo_TTL:.block 1                     ; DATA XREF:
check_and_start_ufo+16┤w
ram:430B*                                                 ; update_ufo+35┤r ...
ram:430C*??          byte_0_430C:.block 1                 ; DATA XREF: update_bullet+C9┤w
ram:430C*                                                 ; check_and_start_ufo┤r ...
ram:430D ??          ufo_dir:.block 1                     ; DATA XREF: handle_fire+15┤r
ram:430D                                                  ; handle_fire+1A┤w ...
ram:430D                                                  ; something with UFO
(direction?)
ram:430E*??          wave_no:.block 1                     ; DATA XREF: code:49CF┤w
ram:430E*                                                 ; code:49FC┤r ...
ram:430F ??          no_lives:.block 1                    ; DATA XREF:
update_score_and_chk_bonus_life+1D┤r
ram:430F                                                  ;
update_score_and_chk_bonus_life+21┤w ...
ram:430F            ; end of 'ram'
ram:430F
code:4310*          ; File Name   : tandy.bin
code:4310*          ; Format      : Binary File
code:4310*          ; Base Address: 0000h Range: 4310h - 5000h Loaded length: 0CF0h
code:4310*          ;
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code:4310*
code:4310*          ; Segment type: Pure code
code:4310*          ; segment 'code'
code:4310*                  .org 4310h
code:4310*00        ufo_active:.db 0                      ; DATA XREF: handle_fire+F┤r
```

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code:4310*                                                     ; update_bullet+C6├w ...
code:4311*00          bullet_active:.db 0                      ; DATA XREF: handle_fire├r
code:4311*                                                     ; handle_fire+1F├w ...
code:4312*C9          byte_0_4312:.db 0C9h                     ; DATA XREF: code:49C9├w
code:4312*                                                     ; code:4AC1├w ...
code:4313*B0 45       base_centre:.dw 45B0h                    ; DATA XREF: handle_fire+23├r
code:4313*                                                     ; check_and_handle_move+17├r
...
code:4315*01          byte_0_4315:.db 1                        ; DATA XREF: code:49C6├w
code:4316 40 3C       init_row_1_invader_addr:.dw 3C40h        ; DATA XREF: code:4A1E├o
code:4318 C0 3C       init_row_2invader_addr:.dw 3CC0h
code:431A 40 3D       init_row_3_invader_addr:.dw 3D40h
code:431C C0 3D       init_row_4_invader_addr:.dw 3DC0h
code:431E*53 3E       bullet_addr:.dw 3E53h                    ; DATA XREF: handle_fire+2A├w
code:431E*                                                     ; update_bullet+1├r ...
code:4320*60          byte_0_4320:.db 60h                      ; DATA XREF: code:4F02├w
code:4320*                                                     ; code:4F26├r ...
code:4321*2B          byte_0_4321:.db 2Bh                      ; DATA XREF: code:4A98├w
code:4321*                                                     ; code:4F6C├r ...
code:4322*00          byte_0_4322:.db 0                        ; DATA XREF: code:49D8├w
code:4322*                                                     ; code:4F17├r ...
code:4323 A0 B6 BF B9+invader_30pt:.db 0A0h, 0B6h, 0BFh, 0B9h, 90h, 1Ah, 1, 20h, 86h, 20h,
89h, 20h
code:4323 90 1A 01 20+                                         ; DATA XREF: code:4570├o
code:4323 86 20 89 20+                                         ; code:4A72├o
code:4323 00                          .db 0
code:4330 9C B7 BF BB+invader_20pt:.db 9Ch, 0B7h, 0BFh, 0BBh, 0ACh, 1Ah, 1, 8Ch, 83h, 20h,
83h, 8Ch
code:4330 AC 1A 01 8C+                                         ; DATA XREF: code:457C├o
code:4330 83 20 83 8C+                                         ; code:4A7B├o
code:4330 00                          .db 0
code:433D BE BB BF B7+invader_10pt:.db 0BEh, 0BBh, 0BFh, 0B7h, 0BDh, 1Ah, 1, 8Ch, 83h, 20h,
83h, 8Ch
code:433D BD 1A 01 8C+                                         ; DATA XREF: code:4588├o
code:433D 83 20 83 8C+                                         ; code:4A84├o
code:433D 00                          .db 0
code:434A 8C B7 B7 B7+ufo:    .db 8Ch, 0B7h, 0B7h, 0B7h, 0B7h, 8Ch, 0
code:434A B7 8C 00                                             ; DATA XREF: code:4594├o
code:434A                                                      ; check_and_start_ufo+2A├o
code:4351 B8 BF BF BF+shield: .db 0B8h, 0BFh, 0BFh, 0BFh, 0BFh, 0BFh, 0B4h, 1Ah, 8, 8, 1, 8Fh
code:4351 BF BF B4 1A+                                         ; DATA XREF: code:4A4B├o
code:4351 08 08 01 8F+         .db 8Fh, 83h, 83h, 83h, 8Fh, 8Fh, 0
code:4364 B8 BC BF BC+player: .db 0B8h, 0BCh, 0BFh, 0BCh, 0B4h, 0 ; DATA XREF: code:4AA1├o
code:436A 82 84 20 88+explosion:.db 82h, 84h, 20h, 88h, 81h, 1Ah, 1, 88h, 81h, 20h, 82h, 84h,
0
code:436A 81 1A 01 88+                                         ; DATA XREF: update_bullet+53├o
code:4377 00                          .db    0 ;
code:4378 00                          .db    0 ;
code:4379 1B 01 20 20+blank_space:.db 1Bh, 1, 20h, 20h, 20h, 20h, 20h, 1Ah, 1, 20h, 20h, 20h,
20h
code:4379 20 20 20 1A+                                         ; DATA XREF: update_bullet+5C├o
code:4379 01 20 20 20+         .db 20h, 0
code:4388 50 4C 41 59 aPlay:  .text "PLAY"                     ; DATA XREF: code:4564├o
code:438C 09 D6 3C            .db 9, 0D6h, 3Ch
code:438F 54 41 4E 44+aTandyInvaders:.text "TANDY       INVADERS"
code:43A3 09 54 3D            .db 9, 54h, 3Dh
code:43A6 2A 20 53 43+aScoreAdvanceTa:.text "* SCORE ADVANCE TABLE *"
code:43A6 4F 52 45 20+        .db 0
code:43BE 2A 20 54 41+aTandyElectroni:.text "* TANDY ELECTRONICS *" ; DATA XREF: code:4558├o
code:43BE 4E 44 59 20+                                         ; code:45BB├o
code:43BE 45 4C 45 43+        .db 0
code:43D4 3C 2D 2D 2D+a30Points:.text "<----  30  POINTS"     ; DATA XREF: code:45A0├o
code:43E6 09 1E 3E            .db 9, 1Eh, 3Eh
code:43E9 3C 2D 2D 2D+a20Points:.text "<----  20  POINTS"
code:43FB 09 9E 3E            .db 9, 9Eh, 3Eh
code:43FE 3C 2D 2D 2D+a10Points:.text "<----  10  POINTS"
code:4410 09 1E 3F            .db 9, 1Eh, 3Fh
code:4413 3C 2D 2D 2D+a_Mystery:.text "<----   ?   MYSTERY"
code:4413 2D 20 20+           .db 0
code:4427 50 52 45 53+aPressZKeyToMov:.text "PRESS "          ; DATA XREF: code:45C7├o
code:4427 53 20 22 5A+        .db 22h
code:4427 22 20 4B 45+        .text "Z"
code:4427 59 20 54 4F+        .db 22h
code:4427 20 4D 4F 56+        .text " KEY TO MOVE LEFT"
code:4441 09 13 3D            .db 9, 13h, 3Dh
code:4444 50 52 45 53+aPressXKeyToMov:.text "PRESS "
code:4444 53 20 22 58+        .db 22h
```

```
code:4444 22 20 4B 45+          .text "X"
code:4444 59 20 54 4F+          .db 22h
code:4444 20 4D 4F 56+          .text " KEY TO MOVE RIGHT"
code:445F 09 93 3D              .db 9, 93h, 3Dh
code:4462 50 52 45 53+aPressKeyToFire:.text "PRESS "
code:4462 53 20 22 20+          .db 22h
code:4462 22 20 4B 45+          .text " "
code:4462 59 20 54 4F+          .db 22h
code:4462 20 46 49 52+          .text " KEY TO FIRE !"
code:4479 09 13 3E              .db 9, 13h, 3Eh
code:447C 50 52 45 53+aPressRKeyToSta:.text "PRESS "
code:447C 53 20 22 52+          .db 22h
code:447C 22 20 4B 45+          .text "R"
code:447C 59 20 54 4F+          .db 22h
code:447C 20 53 54 41+          .text " KEY TO START"
code:447C 52 54 00              .db 0
code:4493 47 20 41 20+aGAMEOVER:.text "G A M E - O V E R"      ; DATA XREF: code:494B┤o
code:4493 4D 20 45 20+          .db 0
code:44A5 20 20 53 43+aScore00000High:.text "  SCORE   00000
HIGH-SCORE"
code:44A5 4F 52 45 20+                                          ; DATA XREF: code:4544┤o
code:44A5 20 30 30 30+          .text " 00000"
code:44A5 30 30 20 20+          .db 0
code:44E5
code:44E5                ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:44E5
code:44E5
code:44E5                display_message:                ; CODE XREF: code:4547┤p
code:44E5 C5                                             ; code:455B┤p ...
code:44E5                        push    bc
code:44E6
code:44E6                loc_0_44E6:                     ; CODE XREF:
display_message+15┤j
code:44E6 7E                    ld      a, (hl)          ; get character
code:44E7 B7                    or      a                ; finished?
code:44E8 28 19                 jr      z, loc_0_4503    ; yes, exit
code:44EA FE 01                 cp      1
code:44EC 20 0E                 jr      nz, loc_0_44FC
code:44EE 06 05                 ld      b, 5             ; 5 characters to print
code:44F0 3E 08                 ld      a, 8             ; backspace
code:44F2
code:44F2                loc_0_44F2:                     ; CODE XREF:
display_message+12┤j
code:44F2 D5                    push    de
code:44F3 CD 33 00              call    33h              ; display character
code:44F6 D1                    pop     de
code:44F7 10 F9                 djnz    loc_0_44F2       ; loop
code:44F9
code:44F9                loc_0_44F9:                     ; CODE XREF:
display_message+1C┤j
code:44F9 23                    inc     hl               ; next character
code:44FA 18 EA                 jr      loc_0_44E6       ; loop
code:44FC        ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:44FC
code:44FC                loc_0_44FC:                     ; CODE XREF:
display_message+7↑j
code:44FC D5                    push    de
code:44FD CD 33 00              call    33h              ; display character
code:4500 D1                    pop     de
code:4501 18 F6                 jr      loc_0_44F9       ; loop
code:4503        ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4503
code:4503                loc_0_4503:                     ; CODE XREF:
display_message+3↑j
code:4503 C1                    pop     bc
code:4504 C9                    ret
code:4504                ; End of function display_message
code:4504
code:4505
code:4505                ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4505
code:4505
code:4505                display_message_slowly:                 ; CODE XREF:
```

```
display_message_slowly+11├j
code:4505 7E                                                        ; code:494E├p
code:4505                      ld      a, (hl)                      ; get character
code:4506 B7                   or      a                            ; done?
code:4507 C8                   ret     z                            ; yes, exit
code:4508 D5                   push    de
code:4509 C5                   push    bc
code:450A CD 33 00             call    33h                          ; display character
code:450D 01 00 23             ld      bc, 2300h                    ; ~130ms
code:4510 CD 60 00             call    60h                          ; delay
code:4513 C1                   pop     bc
code:4514 D1                   pop     de
code:4515 23                   inc     hl                           ; next character
code:4516 18 ED                jr      display_message_slowly       ; loop through message
code:4516              ; End of function display_message_slowly
code:4516
code:4518
code:4518                ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4518
code:4518
code:4518              wipe_screen_left_to_right_slow:       ; CODE XREF: code:454F├p
code:4518 D9                                                        ; code:45AF├p ...
code:4518                      exx
code:4519 21 FF 3B             ld      hl, 3BFFh                    ; start of video (-1)
code:451C 06 40               ld      b, 40h ; '@'                 ; characters/line
code:451E
code:451E              loc_0_451E:                           ; CODE XREF:
wipe_screen_left_to_right_slow+19├j
code:451E C5                   push    bc
code:451F 23                   inc     hl                           ; next column
code:4520 E5                   push    hl
code:4521 06 0F               ld      b, 0Fh                       ; 15 lines
code:4523 3E 20               ld      a, 20h ; ' '                 ; space
code:4525 11 40 00             ld      de, 40h ; '@'               ; next line address
code:4528
code:4528              loc_0_4528:                           ; CODE XREF:
wipe_screen_left_to_right_slow+12├j
code:4528 77                   ld      (hl), a                      ; display character
code:4529 19                   add     hl, de                       ; next line
code:452A 10 FC               djnz    loc_0_4528                   ; loop all lines
code:452C CD 60 4E             call    delay_1_5ms
code:452F E1                   pop     hl
code:4530 C1                   pop     bc
code:4531 10 EB               djnz    loc_0_451E                   ; loop all columns
code:4533 D9                   exx
code:4534 C9                   ret
code:4534              ; End of function wipe_screen_left_to_right_slow
code:4534
code:4535              ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4535
code:4535              START:
code:4535 F3                   di
code:4536 3E 0F               ld      a, 0Fh
code:4538 CD 33 00             call    33h                          ; display character
code:453B 31 8A 42             ld      sp, 428Ah
code:453E 21 C0 3F             ld      hl, video_ram+3C0h           ; cursor position
code:4541 22 20 40             ld      (4020h), hl
code:4544 21 A5 44             ld      hl, aScore00000High          ; "  SCORE   00000
"...
code:4547 CD E5 44             call    display_message
code:454A 3E 20               ld      a, 20h ; ' '
code:454C 32 FF 3F             ld      (video_ram+3FFh), a
code:454F
code:454F              attract_loop:                         ; CODE XREF: code:45D6├j
code:454F CD 18 45                                                 ; code:4960├j
code:454F                      call    wipe_screen_left_to_right_slow
code:4552 21 94 3F             ld      hl, video_ram+394h           ; cursor position
code:4555 22 20 40             ld      (4020h), hl
code:4558 21 BE 43             ld      hl, aTandyElectroni          ; "* TANDY ELECTRONICS *"
code:455B CD E5 44             call    display_message
code:455E 21 9E 3C             ld      hl, video_ram+9Eh            ; cursor position
code:4561 22 20 40             ld      (4020h), hl
code:4564 21 88 43             ld      hl, aPlay                    ; "PLAY"
code:4567 CD 66 4E             call    print_slow_and_check_for_R_key
code:456A 21 92 3D             ld      hl, video_ram+192h           ; cursor position
```

```
code:456D 22 20 40              ld      (4020h), hl
code:4570 21 23 43              ld      hl, invader_30pt
code:4573 CD E5 44              call    display_message
code:4576 21 12 3E              ld      hl, video_ram+212h    ; cursor position
code:4579 22 20 40              ld      (4020h), hl
code:457C 21 30 43              ld      hl, invader_20pt
code:457F CD E5 44              call    display_message
code:4582 21 92 3E              ld      hl, video_ram+292h    ; cursor poition
code:4585 22 20 40              ld      (4020h), hl
code:4588 21 3D 43              ld      hl, invader_10pt
code:458B CD E5 44              call    display_message
code:458E 21 12 3F              ld      hl, video_ram+312h    ; cursor position
code:4591 22 20 40              ld      (4020h), hl
code:4594 21 4A 43              ld      hl, ufo
code:4597 CD E5 44              call    display_message
code:459A 21 9E 3D              ld      hl, video_ram+19Eh    ; cursor position
code:459D 22 20 40              ld      (4020h), hl
code:45A0 21 D4 43              ld      hl, a30Points         ; "<----   30  POINTS"
code:45A3 CD 66 4E              call    print_slow_and_check_for_R_key
code:45A6 01 FF FF              ld      bc, 0FFFFh            ; ~1s
code:45A9 CD 60 00              call    60h                  ; delay
code:45AC CD 60 00              call    60h                  ; delay
code:45AF CD 18 45              call    wipe_screen_left_to_right_slow
code:45B2 CD D9 45              call    check_for_R_key
code:45B5 21 94 3F              ld      hl, video_ram+394h
code:45B8 22 20 40              ld      (4020h), hl
code:45BB 21 BE 43              ld      hl, aTandyElectroni   ; "* TANDY ELECTRONICS *"
code:45BE CD E5 44              call    display_message
code:45C1 21 93 3C              ld      hl, video_ram+93h
code:45C4 22 20 40              ld      (4020h), hl
code:45C7 21 27 44              ld      hl, aPressZKeyToMov   ; "PRESS \"Z\" KEY TO MOVE
LEFT"
code:45CA CD 66 4E              call    print_slow_and_check_for_R_key
code:45CD 01 FF FF              ld      bc, 0FFFFh            ; ~1s
code:45D0 CD 60 00              call    60h                  ; delay
code:45D3 CD 60 00              call    60h                  ; delay
code:45D6 C3 4F 45              jp      attract_loop
code:45D9
code:45D9                  ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:45D9
code:45D9
code:45D9              check_for_R_key:                       ; CODE XREF: code:45B2↑p
code:45D9 3A 04 38                                           ;
print_slow_and_check_for_R_key+23├p
code:45D9                      ld      a, (3804h)            ; read keyboard
code:45DC FE 04                cp      4                     ; "R"?
code:45DE CA C2 49            jp      z, start_game         ; yes, skip
code:45E1 C9                  ret
code:45E1              ; End of function check_for_R_key
code:45E1
code:45E2
code:45E2                  ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:45E2
code:45E2
code:45E2              sub_0_45E2:                            ; CODE XREF: update_bullet+26├p
code:45E2 E5                                                 ; update_bullet+36├p ...
code:45E2                      push    hl
code:45E3 D5                  push    de
code:45E4 7C                  ld      a, h
code:45E5 BA                  cp      d
code:45E6 28 06              jr      z, loc_0_45EE
code:45E8 30 0A              jr      nc, loc_0_45F4
code:45EA
code:45EA              loc_0_45EA:                            ; CODE XREF: sub_0_45E2+10├j
code:45EA AF                  xor     a
code:45EB
code:45EB              loc_0_45EB:                            ; CODE XREF: sub_0_45E2+14├j
code:45EB D1                                                 ; sub_0_45E2+18├j
code:45EB                      pop     de
code:45EC E1                  pop     hl
code:45ED C9                  ret
code:45EE              ;
ÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅÅ
code:45EE
code:45EE              loc_0_45EE:                            ; CODE XREF: sub_0_45E2+4↑j
```

```
code:45EE 7D                      ld        a, l
code:45EF BB                      cp        e
code:45F0 28 06                   jr        z, loc_0_45F8
code:45F2 38 F6                   jr        c, loc_0_45EA
code:45F4
code:45F4             loc_0_45F4:                            ; CODE XREF: sub_0_45E2+6↑j
code:45F4 3E FF                   ld        a, 0FFh
code:45F6 18 F3                   jr        loc_0_45EB
code:45F8             ;
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code:45F8
code:45F8             loc_0_45F8:                            ; CODE XREF: sub_0_45E2+E↑j
code:45F8 3E 20                   ld        a, 20h ; ' '
code:45FA 18 EF                   jr        loc_0_45EB
code:45FA             ; End of function sub_0_45E2
code:45FA
code:45FC
code:45FC             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:45FC
code:45FC
code:45FC             sub_0_45FC:                            ; CODE XREF: sub_0_4B48+2B├p
code:45FC E5                                                ; code:4B91├p
code:45FC                 push      hl
code:45FD C5                 push      bc
code:45FE 2A 02 43                ld        hl, (row_1_invader_addr)
code:4601 06 3F                   ld        b, 3Fh ; '?'
code:4603
code:4603             loc_0_4603:                            ; CODE XREF: sub_0_45FC+10├j
code:4603 7E                      ld        a, (hl)
code:4604 CB 7F                   bit       7, a
code:4606 28 03                   jr        z, loc_0_460B
code:4608 EE 0F                   xor       0Fh
code:460A 77                      ld        (hl), a
code:460B
code:460B             loc_0_460B:                            ; CODE XREF: sub_0_45FC+A↑j
code:460B 23                      inc       hl
code:460C 10 F5                   djnz      loc_0_4603
code:460E D5                      push      de
code:460F 2A 04 43                ld        hl, (row_2_invader_addr)
code:4612 CD 25 46                call      sub_0_4625
code:4615 2A 06 43                ld        hl, (row_3_invader_addr)
code:4618 CD 25 46                call      sub_0_4625
code:461B 2A 08 43                ld        hl, (row_4_invader_addr)
code:461E CD 25 46                call      sub_0_4625
code:4621 D1                      pop       de
code:4622 C1                      pop       bc
code:4623 E1                      pop       hl
code:4624 C9                      ret
code:4624             ; End of function sub_0_45FC
code:4624
code:4625
code:4625             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4625
code:4625
code:4625             sub_0_4625:                            ; CODE XREF: sub_0_45FC+16↑p
code:4625 E5                                                ; sub_0_45FC+1C↑p ...
code:4625                 push      hl
code:4626 06 40                   ld        b, 40h ; '@'
code:4628
code:4628             loc_0_4628:                            ; CODE XREF: sub_0_4625+15├j
code:4628 7E                      ld        a, (hl)
code:4629 FE 8C                   cp        8Ch ; 'Œ'
code:462B 28 09                   jr        z, loc_0_4636
code:462D FE 83                   cp        83h ; 'ƒ'
code:462F 20 08                   jr        nz, loc_0_4639
code:4631 3E 8C                   ld        a, 8Ch ; 'Œ'
code:4633 77                      ld        (hl), a
code:4634 18 03                   jr        loc_0_4639
code:4636             ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4636
code:4636             loc_0_4636:                            ; CODE XREF: sub_0_4625+6↑j
code:4636 3E 83                   ld        a, 83h ; 'ƒ'
code:4638 77                      ld        (hl), a
code:4639
```

```
code:4639                 loc_0_4639:                           ; CODE XREF: sub_0_4625+A↑j
code:4639 23                                                    ; sub_0_4625+F↑j
code:4639                         inc     hl
code:463A 10 EC                   djnz    loc_0_4628
code:463C E1                      pop     hl
code:463D C9                      ret
code:463D              ; End of function sub_0_4625
code:463D
code:463E
code:463E                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:463E
code:463E
code:463E                 move_video_line_right_HL:             ; CODE XREF:
check_and_handle_move+14╟p
code:463E E5                                                   ; update_ufo+2A╟p ...
code:463E                         push    hl
code:463F 11 3E 00                ld      de, 3Eh ; '>'         ; start at right end
code:4642 19                      add     hl, de
code:4643 E5                      push    hl
code:4644 D1                      pop     de
code:4645 13                      inc     de                    ; DE = end of row
code:4646 06 3F                   ld      b, 63                 ; number of characters/line-1
code:4648 1A                      ld      a, (de)               ; get character from end of row
code:4649 CB 7F                   bit     7, a                  ; graphic?
code:464B 28 03                   jr      z, loc_0_4650         ; no, skip
code:464D 3E 20                   ld      a, 20h ; ' '          ; space
code:464F 12                      ld      (de), a               ; display space
code:4650
code:4650                 loc_0_4650:                           ; CODE XREF:
move_video_line_right_HL+D↑j
code:4650 CB 7E                                                 ; move_video_line_right_HL+1C╟j
code:4650                         bit     7, (hl)               ; graphic character left byte?
code:4652 28 04                   jr      z, loc_0_4658         ; no, skip
code:4654 7E                      ld      a, (hl)               ; get character left byte
code:4655 12                      ld      (de), a               ; display to the right
code:4656 36 20                   ld      (hl), 20h ; ' '       ; display space at left-hand
byte
code:4658
code:4658                 loc_0_4658:                           ; CODE XREF:
move_video_line_right_HL+14↑j
code:4658 2B                      dec     hl
code:4659 1B                      dec     de
code:465A 10 F4                   djnz    loc_0_4650            ; loop through line
code:465C E1                      pop     hl
code:465D 36 20                   ld      (hl), 20h ; ' '       ; display space
code:465F C9                      ret
code:465F              ; End of function move_video_line_right_HL
code:465F
code:4660
code:4660                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4660
code:4660
code:4660                 move_video_line_left_HL:              ; CODE XREF:
check_and_handle_move+2B╟p
code:4660 E5                                                   ; update_ufo+32╟p ...
code:4660                         push    hl
code:4661 E5                      push    hl
code:4662 D1                      pop     de
code:4663 23                      inc     hl
code:4664 06 3F                   ld      b, 63                 ; characters/line-1
code:4666 1A                      ld      a, (de)               ; get character LH byte
code:4667 CB 7F                   bit     7, a                  ; graphic?
code:4669 28 03                   jr      z, loc_0_466E         ; no, skip
code:466B 3E 20                   ld      a, 20h ; ' '          ; space
code:466D 12                      ld      (de), a               ; display space LH byte
code:466E
code:466E                 loc_0_466E:                           ; CODE XREF:
move_video_line_left_HL+9↑j
code:466E CB 7E                                                 ; move_video_line_left_HL+18╟j
code:466E                         bit     7, (hl)               ; graphic RH byte?
code:4670 28 04                   jr      z, loc_0_4676         ; no, skip
code:4672 7E                      ld      a, (hl)               ; get character from video (RH
byte)
code:4673 12                      ld      (de), a               ; display LH byte
code:4674 36 20                   ld      (hl), 20h ; ' '       ; space RH byte
```

```
code:4676
code:4676              loc_0_4676:                         ; CODE XREF:
move_video_line_left_HL+10↑j
code:4676 23                   inc    hl
code:4677 13                   inc    de
code:4678 10 F4                djnz   loc_0_466E                ; loop thru row
code:467A E1                   pop    hl
code:467B 11 3F 00             ld     de, 3Fh ; '?'
code:467E 19                   add    hl, de
code:467F 36 20                ld     (hl), 20h ; ' '          ; display space on end of row
code:4681 C9                   ret
code:4681              ; End of function move_video_line_left_HL
code:4681
code:4682
code:4682              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4682
code:4682
code:4682              add_10_to_score:                        ; CODE XREF:
update_score_and_chk_bonus_life├p
code:4682 E5                   push   hl
code:4683 C5                   push   bc
code:4684 21 CC 3F             ld     hl, video_ram+3CCh        ; tens digit
code:4687 CD A4 46             call   add_1_to_score_digit
code:468A 20 15                jr     nz, loc_0_46A1            ; skip if no carry
code:468C 2B                   dec    hl                        ; hundreds digit
code:468D CD A4 46             call   add_1_to_score_digit
code:4690 20 0F                jr     nz, loc_0_46A1            ; skip if no carry
code:4692 2B                   dec    hl                        ; thousands digit
code:4693 CD A4 46             call   add_1_to_score_digit
code:4696 20 09                jr     nz, loc_0_46A1            ; skip if no carry
code:4698 2B                   dec    hl                        ; tens of thousands digit
code:4699 CD A4 46             call   add_1_to_score_digit
code:469C 20 03                jr     nz, loc_0_46A1            ; skip if no carry
code:469E CD B0 46             call   zero_score
code:46A1
code:46A1              loc_0_46A1:                             ; CODE XREF:
add_10_to_score+8↑j
code:46A1 C1                                                   ; add_10_to_score+E↑j ...
code:46A1                      pop    bc
code:46A2 E1                   pop    hl
code:46A3 C9                   ret
code:46A3              ; End of function add_10_to_score
code:46A3
code:46A4
code:46A4              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:46A4
code:46A4
code:46A4              add_1_to_score_digit:                   ; CODE XREF:
add_10_to_score+5↑p
code:46A4 7E                                                   ; add_10_to_score+B↑p ...
code:46A4                      ld     a, (hl)                   ; get score digit
code:46A5 FE 39                cp     39h ; '9'                 ; 9?
code:46A7 28 03                jr     z, loc_0_46AC             ; yes, skip
code:46A9 3C                   inc    a                         ; add 1
code:46AA 77                   ld     (hl), a                   ; store
code:46AB C9                   ret
code:46AC              ;
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code:46AC
code:46AC              loc_0_46AC:                             ; CODE XREF:
add_1_to_score_digit+3↑j
code:46AC 36 30                ld     (hl), 30h ; '0'           ; set to 0
code:46AE AF                   xor    a                         ; flag carry
code:46AF C9                   ret
code:46AF              ; End of function add_1_to_score_digit
code:46AF
code:46B0
code:46B0              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:46B0
code:46B0
code:46B0              zero_score:                             ; CODE XREF:
add_10_to_score+1C↑p
code:46B0 21 C9 3F                                             ; code:49EF├p
code:46B0                      ld     hl, video_ram+3C9h        ; score
```

```
code:46B3 06 05              ld      b, 5                    ; 5 digits to zap
code:46B5
code:46B5           loc_0_46B5:                             ; CODE XREF: zero_score+8┤j
code:46B5 36 30              ld      (hl), 30h ; '0'         ; set digit to 0
code:46B7 23                 inc     hl                      ; next digit
code:46B8 10 FB              djnz    loc_0_46B5              ; loop thru all score digits
code:46BA C9                 ret
code:46BA           ; End of function zero_score
code:46BA
code:46BB
code:46BB           ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:46BB
code:46BB
code:46BB           update_score_and_chk_bonus_life:        ; CODE XREF:
update_score_and_chk_bonus_life+27┤j
code:46BB CD 82 46                                          ; update_bullet+50┤p ...
code:46BB                    call    add_10_to_score
code:46BE 21 CC 3F           ld      hl, video_ram+3CCh      ; tens digit of score
code:46C1 7E                 ld      a, (hl)                 ; get digit
code:46C2 FE 30              cp      30h ; '0'               ; 0?
code:46C4 20 1C              jr      nz, loc_0_46E2          ; no, exit
code:46C6 2B                 dec     hl                      ; hundreds digit
code:46C7 7E                 ld      a, (hl)                 ; get digit
code:46C8 FE 35              cp      35h ; '5'               ; 5?
code:46CA 20 16              jr      nz, loc_0_46E2          ; no, skip
code:46CC 2B                 dec     hl                      ; thousands digit
code:46CD 7E                 ld      a, (hl)                 ; get digit
code:46CE FE 31              cp      31h ; '1'               ; 1?
code:46D0 20 10              jr      nz, loc_0_46E2          ; no, skip
code:46D2 2B                 dec     hl                      ; tens of thousands digit
code:46D3 7E                 ld      a, (hl)                 ; get digit
code:46D4 FE 30              cp      30h ; '0'               ; 0?
code:46D6 20 0A              jr      nz, loc_0_46E2          ; no, skip
code:46D8 3A 0F 43           ld      a, (no_lives)
code:46DB 3C                 inc     a                       ; bonus life
code:46DC 32 0F 43           ld      (no_lives), a
code:46DF CD 90 4E           call    display_lives_left
code:46E2
code:46E2           loc_0_46E2:                             ; CODE XREF:
update_score_and_chk_bonus_life+9↑j
code:46E2 10 D7                                             ;
update_score_and_chk_bonus_life+F↑j ...
code:46E2                    djnz    update_score_and_chk_bonus_life
code:46E4 C9                 ret
code:46E4           ; End of function update_score_and_chk_bonus_life
code:46E4
code:46E5
code:46E5           ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:46E5
code:46E5
code:46E5           handle_fire:                            ; CODE XREF: code:4F23┤p
code:46E5 3A 11 43           ld      a, (bullet_active)
code:46E8 B7                 or      a                       ; already fired?
code:46E9 C0                 ret     nz                      ; yes, return
code:46EA 3A 00 43           ld      a, (byte_0_4300)
code:46ED B7                 or      a
code:46EE C0                 ret     nz
code:46EF 3E 14              ld      a, 20
code:46F1 32 00 43           ld      (byte_0_4300), a
code:46F4 3A 10 43           ld      a, (ufo_active)
code:46F7 B7                 or      a
code:46F8 20 08              jr      nz, loc_0_4702
code:46FA 3A 0D 43           ld      a, (ufo_dir)
code:46FD EE 01              xor     1
code:46FF 32 0D 43           ld      (ufo_dir), a
code:4702
code:4702           loc_0_4702:                             ; CODE XREF: handle_fire+13↑j
code:4702 3E 01              ld      a, 1
code:4704 32 11 43           ld      (bullet_active), a      ; flag fired
code:4707 D9                 exx
code:4708 2A 13 43           ld      hl, (base_centre)
code:470B 11 C0 FF           ld      de, 0FFC0h              ; -64
code:470E 19                 add     hl, de                  ; video address of row above
code:470F 22 1E 43           ld      (bullet_addr), hl       ; save
code:4712 7E                 ld      a, (hl)                 ; get character from video
```

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code:4713 FE 20                  cp       20h ; ' '                ; space?
code:4715 C2 07 48               jp       nz, loc_0_4807           ; no, skip
code:4718 36 5B                  ld       (hl), 5Bh ; '['          ; display player bullet
code:471A D9                     exx
code:471B C9                     ret
code:471B               ; End of function handle_fire
code:471B
code:471C
code:471C               ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:471C
code:471C
code:471C               update_bullet:                             ; CODE XREF: update_bullet+EC┤j
code:471C D9                                                      ; code:4F39├p
code:471C                        exx
code:471D 2A 1E 43               ld       hl, (bullet_addr)
code:4720 7E                     ld       a, (hl)                 ; get character from video
code:4721 FE 5B                  cp       5Bh ; '['               ; player bullet?
code:4723 20 1A                  jr       nz, handle_bullet_hit   ; no, skip
code:4725 36 20                  ld       (hl), 20h ; ' '         ; display space
code:4727 11 C0 FF               ld       de, 0FFC0h              ; -64
code:472A 19                     add      hl, de                 ; address of row above
code:472B CB 54                  bit      2, h                   ; off the top of the screen?
code:472D 28 61                  jr       z, delete_bullet       ; yes, skip
code:472F 7E                     ld       a, (hl)                 ; get character from video
code:4730 FE 80                  cp       80h ; '€'               ; graphic space?
code:4732 28 04                  jr       z, loc_0_4738          ; yes, skip
code:4734 FE 20                  cp       20h ; ' '               ; space?
code:4736 20 07                  jr       nz, handle_bullet_hit   ; no, skip
code:4738
code:4738               loc_0_4738:                                ; CODE XREF: update_bullet+16↑j
code:4738 36 5B                                                   ; update_bullet+E0├j
code:4738                        ld       (hl), 5Bh ; '['         ; display player bullet
code:473A
code:473A               loc_0_473A:                                ; CODE XREF: update_bullet+E8├j
code:473A 22 1E 43               ld       (bullet_addr), hl       ; update bullet address
code:473D D9                     exx
code:473E C9                     ret
code:473F               ;
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code:473F
code:473F               handle_bullet_hit:                         ; CODE XREF: update_bullet+7↑j
code:473F 11 40 3C                                                ; update_bullet+1A↑j
code:473F                        ld       de, video_ram+40h
code:4742 CD E2 45               call     sub_0_45E2
code:4745 B7                     or       a
code:4746 28 54                  jr       z, loc_0_479C
code:4748 CB 7E                  bit      7, (hl)
code:474A CA EA 47               jp       z, loc_0_47EA
code:474D E5                     push     hl
code:474E CD 4A 48               call     sub_0_484A
code:4751 D1                     pop      de
code:4752 CD E2 45               call     sub_0_45E2
code:4755 B7                     or       a
code:4756 D5                     push     de
code:4757 E1                     pop      hl
code:4758 CA 0B 48               jp       z, loc_0_480B
code:475B CD 28 4D               call     sub_0_4D28
code:475E 22 20 40               ld       (4020h), hl             ; cursor position
code:4761 7E                     ld       a, (hl)                 ; get MSB
code:4762 06 03                  ld       b, 3                    ; default to 30 pts
code:4764 FE A0                  cp       0A0h ; ' '              ;
code:4766 28 04                  jr       z, loc_0_476C
code:4768 38 01                  jr       c, loc_0_476B           ; 20 pts if ???
code:476A 05                     dec      b                      ; otherwise 10 pts
code:476B
code:476B               loc_0_476B:                                ; CODE XREF: update_bullet+4C↑j
code:476B 05                     dec      b
code:476C
code:476C               loc_0_476C:                                ; CODE XREF: update_bullet+4A↑j
code:476C CD BB 46               call     update_score_and_chk_bonus_life
code:476F 21 6A 43               ld       hl, explosion
code:4772 CD E5 44               call     display_message
code:4775 CD 5A 4E               call     delay_15ms
code:4778 21 79 43               ld       hl, blank_space
code:477B CD E5 44               call     display_message
code:477E 3A 01 43               ld       a, (invaders_left)
```

```
code:4781 3D                      dec     a                           ; end of wave?
code:4782 CA 74 48                jp      z, loc_0_4874               ; yes, skip
code:4785 32 01 43                ld      (invaders_left), a
code:4788 11 00 00                ld      de, 0
code:478B CD 85 49                call    sub_0_4985
code:478E 18 06                   jr      loc_0_4796
code:4790            ;
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code:4790
code:4790            delete_bullet:                                   ; CODE XREF: update_bullet+11↑j
code:4790 11 40 00                ld      de, 40h ; '@'               ; characters/line
code:4793 19                      add     hl, de                      ; next row
code:4794 36 20                   ld      (hl), 20h ; ' '             ; display space
code:4796
code:4796            loc_0_4796:                                      ; CODE XREF: update_bullet+72↑j
code:4796 AF                                                          ; update_bullet+82├j ...
code:4796                         xor     a
code:4797 32 11 43                ld      (bullet_active), a          ; clear fired flag
code:479A D9                      exx
code:479B C9                      ret
code:479C            ;
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code:479C
code:479C            loc_0_479C:                                      ; CODE XREF: update_bullet+2A↑j
code:479C CB 7E                   bit     7, (hl)
code:479E 28 F6                   jr      z, loc_0_4796
code:47A0 21 00 3C                ld      hl, video_ram
code:47A3 06 40                   ld      b, 40h ; '@'
code:47A5
code:47A5            loc_0_47A5:                                      ; CODE XREF: update_bullet+8E├j
code:47A5 CB 7E                   bit     7, (hl)
code:47A7 20 03                   jr      nz, loc_0_47AC
code:47A9 23                      inc     hl
code:47AA 10 F9                   djnz    loc_0_47A5
code:47AC
code:47AC            loc_0_47AC:                                      ; CODE XREF: update_bullet+8B↑j
code:47AC E5                      push    hl
code:47AD 21 00 3C                ld      hl, video_ram
code:47B0 CD 7E 4C                call    clear_video_line_HL
code:47B3 21 06 00                ld      hl, 6
code:47B6 CD 1D 4D                call    sub_0_4D1D
code:47B9 45                      ld      b, l
code:47BA AF                      xor     a
code:47BB 0E 05                   ld      c, 5
code:47BD
code:47BD            loc_0_47BD:                                      ; CODE XREF: update_bullet+A2├j
code:47BD 81                      add     a, c
code:47BE 10 FD                   djnz    loc_0_47BD
code:47C0 47                      ld      b, a
code:47C1 F5                      push    af
code:47C2 CD BB 46                call    update_score_and_chk_bonus_life
code:47C5 F1                      pop     af
code:47C6 E1                      pop     hl
code:47C7 22 20 40                ld      (4020h), hl
code:47CA 06 0A                   ld      b, 0Ah
code:47CC 5F                      ld      e, a
code:47CD 21 00 00                ld      hl, 0
code:47D0 55                      ld      d, l
code:47D1
code:47D1            loc_0_47D1:                                      ; CODE XREF: update_bullet+B6├j
code:47D1 19                      add     hl, de
code:47D2 10 FD                   djnz    loc_0_47D1
code:47D4 3E 3C                   ld      a, 3Ch ; '<'
code:47D6 CD 33 00                call    33h                         ; display character
code:47D9 CD AF 0F                call    0FAFh
code:47DC 3E 3E                   ld      a, 3Eh ; '>'
code:47DE CD 33 00                call    33h                         ; display character
code:47E1 AF                      xor     a
code:47E2 32 10 43                ld      (ufo_active), a
code:47E5 32 0C 43                ld      (byte_0_430C), a
code:47E8 18 AC                   jr      loc_0_4796
code:47EA            ;
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code:47EA
code:47EA            loc_0_47EA:                                      ; CODE XREF: update_bullet+2E↑j
code:47EA E5                      push    hl
code:47EB 21 03 00                ld      hl, 3
```

```
code:47EE CD 1D 4D          call    sub_0_4D1D
code:47F1 7D                ld      a, l
code:47F2 E1                pop     hl
code:47F3 FE 03             cp      3
code:47F5 F5                push    af
code:47F6 C4 0A 4E          call    nz, sub_0_4E0A
code:47F9 F1                pop     af
code:47FA FE 02             cp      2
code:47FC DA 38 47          jp      c, loc_0_4738
code:47FF C2 96 47          jp      nz, loc_0_4796
code:4802 36 20             ld      (hl), 20h ; ' '
code:4804 C3 3A 47          jp      loc_0_473A
code:4807          ;
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code:4807
code:4807          loc_0_4807:                          ; CODE XREF: handle_fire+30↑j
code:4807 D9                exx
code:4808 C3 1C 47          jp      update_bullet
code:480B          ;
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code:480B
code:480B          loc_0_480B:                          ; CODE XREF: update_bullet+3C↑j
code:480B CD 2E 48          call    sub_0_482E
code:480E 18 86             jr      loc_0_4796
code:480E          ; End of function update_bullet
code:480E
code:4810
code:4810          ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4810
code:4810
code:4810          sub_0_4810:                          ; CODE XREF: sub_0_4C8A+90├j
code:4810 E5                                            ; sub_0_4D5F+96├p
code:4810                   push    hl
code:4811 C5                push    bc
code:4812 7E                ld      a, (hl)
code:4813 4F                ld      c, a
code:4814 3E BC             ld      a, 0BCh ; '¼'
code:4816 A1                and     c
code:4817 B9                cp      c
code:4818 20 08             jr      nz, loc_0_4822
code:481A 3E B0             ld      a, 0B0h ; '°'
code:481C A1                and     c
code:481D B9                cp      c
code:481E 20 02             jr      nz, loc_0_4822
code:4820 3E 20             ld      a, 20h ; ' '
code:4822
code:4822          loc_0_4822:                          ; CODE XREF: sub_0_4810+8↑j
code:4822 FE 80                                         ; sub_0_4810+E↑j
code:4822                   cp      80h ; '€'
code:4824 20 02             jr      nz, loc_0_4828
code:4826 3E 20             ld      a, 20h ; ' '
code:4828
code:4828          loc_0_4828:                          ; CODE XREF: sub_0_4810+14↑j
code:4828 77                ld      (hl), a
code:4829 C1                pop     bc
code:482A E1                pop     hl
code:482B C3 57 4D          jp      loc_0_4D57
code:482B          ; End of function sub_0_4810
code:482B
code:482B
code:482E
code:482E          ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:482E
code:482E
code:482E          sub_0_482E:                          ; CODE XREF: update_bullet+EF↑p
code:482E E5                push    hl
code:482F C5                push    bc
code:4830 7E                ld      a, (hl)
code:4831 4F                ld      c, a
code:4832 3E 8F             ld      a, 8Fh ; ' '
code:4834 A1                and     c
code:4835 B9                cp      c
code:4836 20 08             jr      nz, loc_0_4840
code:4838 3E 83             ld      a, 83h ; 'ƒ'
code:483A A1                and     c
code:483B B9                cp      c
```

```
code:483C 20 02                    jr      nz, loc_0_4840
code:483E 3E 20                    ld      a, 20h ; ' '
code:4840
code:4840            loc_0_4840:                        ; CODE XREF: sub_0_482E+8↑j
code:4840 FE 80                                         ; sub_0_482E+E↑j
code:4840                           cp      80h ; '€'
code:4842 20 02                     jr      nz, loc_0_4846
code:4844 3E 20                     ld      a, 20h ; ' '
code:4846
code:4846            loc_0_4846:                        ; CODE XREF: sub_0_482E+14↑j
code:4846 77                        ld      (hl), a
code:4847 C1                        pop     bc
code:4848 E1                        pop     hl
code:4849 C9                        ret
code:4849             ; End of function sub_0_482E
code:4849
code:484A
code:484A             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:484A
code:484A
code:484A            sub_0_484A:                        ; CODE XREF: update_bullet+32↑p
code:484A 2A 08 43                                      ; sub_0_4D5F+7D├p
code:484A                           ld      hl, (row_4_invader_addr)
code:484D 7C                        ld      a, h
code:484E B7                        or      a
code:484F 20 11                     jr      nz, loc_0_4862
code:4851 2A 06 43                  ld      hl, (row_3_invader_addr)
code:4854 7C                        ld      a, h
code:4855 B7                        or      a
code:4856 20 0A                     jr      nz, loc_0_4862
code:4858 2A 04 43                  ld      hl, (row_2_invader_addr)
code:485B 7C                        ld      a, h
code:485C B7                        or      a
code:485D 20 03                     jr      nz, loc_0_4862
code:485F 2A 02 43                  ld      hl, (row_1_invader_addr)
code:4862
code:4862            loc_0_4862:                        ; CODE XREF: sub_0_484A+5↑j
code:4862 D5                                            ; sub_0_484A+C↑j ...
code:4862                           push    de
code:4863 C5                        push    bc
code:4864 11 3F 00                  ld      de, 3Fh ; '?'
code:4867 19                        add     hl, de
code:4868 06 3F                     ld      b, 3Fh ; '?'
code:486A
code:486A            loc_0_486A:                        ; CODE XREF: sub_0_484A+25├j
code:486A CB 7E                     bit     7, (hl)
code:486C 20 03                     jr      nz, loc_0_4871
code:486E 2B                        dec     hl
code:486F 10 F9                     djnz    loc_0_486A
code:4871
code:4871            loc_0_4871:                        ; CODE XREF: sub_0_484A+22↑j
code:4871 C1                        pop     bc
code:4872 D1                        pop     de
code:4873 C9                        ret
code:4873             ; End of function sub_0_484A
code:4873
code:4874             ;
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code:4874
code:4874            loc_0_4874:                        ; CODE XREF: update_bullet+66↑j
code:4874 C3 F5 49                  jp      new_wave
code:4877
code:4877             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4877
code:4877
code:4877            sub_0_4877:                        ; CODE XREF: sub_0_4B48+C├p
code:4877 11 40 00                                      ; code:4B8B├p
code:4877                           ld      de, 40h ; '@'
code:487A 06 0D                     ld      b, 0Dh
code:487C
code:487C            loc_0_487C:                        ; CODE XREF: sub_0_4877+A├j
code:487C CB 7E                     bit     7, (hl)
code:487E 20 06                     jr      nz, loc_0_4886
code:4880 19                        add     hl, de
code:4881 10 F9                     djnz    loc_0_487C
```

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code:4883 3E 20                    ld      a, 20h ; ' '
code:4885 C9                       ret
code:4886                 ;
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code:4886
code:4886                 loc_0_4886:                        ; CODE XREF: sub_0_4877+7↑j
code:4886 AF                       xor     a
code:4887 C9                       ret
code:4887                 ; End of function sub_0_4877
code:4887
code:4888
code:4888                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4888
code:4888
code:4888                 check_and_handle_move:             ; CODE XREF: code:4F2B┤p
code:4888 3A 08 38                 ld      a, (3808h)         ; keyboard
code:488B E6 05                    and     5                  ; "X" or "Z" pressed?
code:488D C8                       ret     z                  ; no return
code:488E FE 04                    cp      4                  ; "Z"?
code:4890 30 16                    jr      nc, loc_0_48A8     ; yes, skip
code:4892 3A BB 3F                 ld      a, (video_ram+3BBh) ; right-most position for base
code:4895 CB 7F                    bit     7, a               ; graphic character?
code:4897 C0                       ret     nz                 ; yes, return (can't move
right)
code:4898 D9                       exx
code:4899 21 80 3F                 ld      hl, video_ram+380h ; base row
code:489C CD 3E 46                 call    move_video_line_right_HL
code:489F 2A 13 43                 ld      hl, (base_centre)
code:48A2 23                       inc     hl                 ; move player right
code:48A3 22 13 43                 ld      (base_centre), hl
code:48A6
code:48A6                 loc_0_48A6:                        ; CODE XREF:
check_and_handle_move+35┤j
code:48A6 D9                       exx
code:48A7 C9                       ret
code:48A8                 ;
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code:48A8
code:48A8                 loc_0_48A8:                        ; CODE XREF:
check_and_handle_move+8↑j
code:48A8 C0                       ret     nz
code:48A9 3A 84 3F                 ld      a, (video_ram+384h) ; left-most position for base
code:48AC CB 7F                    bit     7, a               ; graphic character?
code:48AE C0                       ret     nz                 ; yes, return (can't move left)
code:48AF D9                       exx
code:48B0 21 80 3F                 ld      hl, video_ram+380h ; base row
code:48B3 CD 60 46                 call    move_video_line_left_HL
code:48B6 2A 13 43                 ld      hl, (base_centre)
code:48B9 2B                       dec     hl                 ; move player left
code:48BA 22 13 43                 ld      (base_centre), hl
code:48BD 18 E7                    jr      loc_0_48A6
code:48BD                 ; End of function check_and_handle_move
code:48BD
code:48BF
code:48BF                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:48BF
code:48BF
code:48BF                 check_and_start_ufo:               ; CODE XREF: code:4F44┤p
code:48BF 3A 0C 43                 ld      a, (byte_0_430C)
code:48C2 3C                       inc     a
code:48C3 32 0C 43                 ld      (byte_0_430C), a
code:48C6 C0                       ret     nz
code:48C7 3A 01 43                 ld      a, (invaders_left)
code:48CA FE 08                    cp      8                  ; less than 8 invaders
remaining?
code:48CC D8                       ret     c                  ; yes, return
code:48CD 3A 10 43                 ld      a, (ufo_active)
code:48D0 B7                       or      a                  ; on-screen?
code:48D1 C0                       ret     nz                 ; yes, return
code:48D2 D9                       exx
code:48D3 3E 41                    ld      a, 65
code:48D5 32 0B 43                 ld      (ufo_TTL), a
code:48D8 3A 0D 43                 ld      a, (ufo_dir)
code:48DB B7                       or      a                  ; left?
code:48DC 28 05                    jr      z, loc_0_48E3      ; yes, skip
```

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code:48DE 21 00 3C          ld      hl, video_ram            ; start on left
code:48E1 18 03             jr      loc_0_48E6
code:48E3             ;
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code:48E3
code:48E3             loc_0_48E3:                            ; CODE XREF:
check_and_start_ufo+1D↑j
code:48E3 21 3A 3C          ld      hl, video_ram+3Ah        ; start on right
code:48E6
code:48E6             loc_0_48E6:                            ; CODE XREF:
check_and_start_ufo+22↑j
code:48E6 22 20 40          ld      (4020h), hl              ; update cursor position
code:48E9 21 4A 43          ld      hl, ufo
code:48EC CD E5 44          call    display_message
code:48EF 3E 01             ld      a, 1                     ; flag on-screen
code:48F1 32 10 43          ld      (ufo_active), a
code:48F4 D9                exx
code:48F5 C9                ret
code:48F5             ; End of function check_and_start_ufo
code:48F5
code:48F6
code:48F6             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:48F6
code:48F6
code:48F6             update_ufo:                            ; CODE XREF: code:4F41↑p
code:48F6 3A 10 43          ld      a, (ufo_active)
code:48F9 B7                or      a                        ; ufo on-screen?
code:48FA C8                ret     z                        ; no, return
code:48FB D9                exx
code:48FC 21 00 3C          ld      hl, video_ram
code:48FF 06 3F             ld      b, 63                    ; characters/line-1
code:4901
code:4901             loc_0_4901:                            ; CODE XREF: update_ufo+15↦j
code:4901 7E                ld      a, (hl)                  ; get character from video
code:4902 FE BB             cp      0BBh ; '»'
code:4904 28 09             jr      z, loc_0_490F            ; yes, alternate
code:4906 FE B7             cp      0B7h ; '·'
code:4908 28 09             jr      z, loc_0_4913
code:490A
code:490A             loc_0_490A:                            ; CODE XREF: update_ufo+1B↦j
code:490A 23                                                ; update_ufo+1F↑j
code:490A                   inc     hl                       ; next video address
code:490B 10 F4             djnz    loc_0_4901               ; loop thru line
code:490D 18 08             jr      loc_0_4917
code:490F             ;
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code:490F
code:490F             loc_0_490F:                            ; CODE XREF: update_ufo+E↑j
code:490F 36 B7             ld      (hl), 0B7h ; '·'         ; display
code:4911 18 F7             jr      loc_0_490A
code:4913             ;
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code:4913
code:4913             loc_0_4913:                            ; CODE XREF: update_ufo+12↑j
code:4913 36 BB             ld      (hl), 0BBh ; '»'         ; display
code:4915 18 F3             jr      loc_0_490A
code:4917             ;
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code:4917
code:4917             loc_0_4917:                            ; CODE XREF: update_ufo+17↑j
code:4917 3A 0D 43          ld      a, (ufo_dir)
code:491A B7                or      a                        ; left?
code:491B 28 08             jr      z, loc_0_4925           ; yes, skip
code:491D 21 00 3C          ld      hl, video_ram
code:4920 CD 3E 46          call    move_video_line_right_HL
code:4923 18 06             jr      loc_0_492B
code:4925             ;
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code:4925
code:4925             loc_0_4925:                            ; CODE XREF: update_ufo+25↑j
code:4925 21 00 3C          ld      hl, video_ram
code:4928 CD 60 46          call    move_video_line_left_HL
code:492B
code:492B             loc_0_492B:                            ; CODE XREF: update_ufo+2D↑j
code:492B 3A 0B 43          ld      a, (ufo_TTL)
code:492E 3D                dec     a                        ; ufo still active?
```

```
code:492F 32 0B 43            ld      (ufo_TTL), a
code:4932 28 02               jr      z, loc_0_4936            ; no, skip
code:4934
code:4934            loc_0_4934:                              ; CODE XREF: update_ufo+44├j
code:4934 D9                  exx
code:4935 C9                  ret
code:4936            ;
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code:4936
code:4936            loc_0_4936:                              ; CODE XREF: update_ufo+3C↑j
code:4936 AF                  xor     a                       ; flag ufo inactive
code:4937 32 10 43            ld      (ufo_active), a
code:493A 18 F8               jr      loc_0_4934
code:493A            ; End of function update_ufo
code:493A
code:493C            ;
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code:493C
code:493C            game_over:                               ; CODE XREF: code:4AB4├j
code:493C 31 8A 42                                            ; code:4B45├j
code:493C                     ld      sp, 428Ah
code:493F 21 19 3C            ld      hl, video_ram+19h       ; cursor position
code:4942 22 20 40            ld      (4020h), hl
code:4945 21 00 3C            ld      hl, video_ram           ; start of video
code:4948 CD 7E 4C            call    clear_video_line_HL
code:494B 21 93 44            ld      hl, aGAMEOVER           ; "G A M E - O V E R"
code:494E CD 05 45            call    display_message_slowly
code:4951 CD 5F 4C            call    check_for_new_high_score
code:4954 01 FF FF            ld      bc, 0FFFFh              ; ~1s
code:4957 CD 60 00            call    60h                     ; delay
code:495A CD 60 00            call    60h                     ; delay
code:495D CD 60 00            call    60h                     ; delay
code:4960 C3 4F 45            jp      attract_loop
code:4963
code:4963            ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4963
code:4963
code:4963            display_object_x10:                      ; CODE XREF: code:4A78├p
code:4963 E5                                                  ; code:4A81├p ...
code:4963                     push    hl
code:4964 D5                  push    de
code:4965 C5                  push    bc
code:4966 06 0A               ld      b, 10                   ; 10 objects to display
code:4968 D5                  push    de
code:4969 11 40 00            ld      de, 40h ; '@'
code:496C ED 52               sbc     hl, de
code:496E D1                  pop     de
code:496F 23                  inc     hl
code:4970
code:4970            loc_0_4970:                              ; CODE XREF:
display_object_x10+1C├j
code:4970 22 20 40            ld      (4020h), hl             ; cursor position
code:4973 D5                  push    de
code:4974 E5                  push    hl
code:4975 EB                  ex      de, hl
code:4976 CD E5 44            call    display_message
code:4979 E1                  pop     hl
code:497A 11 06 00            ld      de, 6
code:497D 19                  add     hl, de
code:497E D1                  pop     de
code:497F 10 EF               djnz    loc_0_4970
code:4981 C1                  pop     bc
code:4982 D1                  pop     de
code:4983 E1                  pop     hl
code:4984 C9                  ret
code:4984            ; End of function display_object_x10
code:4984
code:4985
code:4985            ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4985
code:4985
code:4985            sub_0_4985:                              ; CODE XREF: update_bullet+6F↑p
code:4985 E5                  push    hl
code:4986 D5                  push    de
code:4987 C5                  push    bc
```

```
code:4988 2A 02 43              ld       hl, (row_1_invader_addr)
code:498B CD B0 49              call     sub_0_49B0
code:498E 22 02 43              ld       (row_1_invader_addr), hl
code:4991 2A 04 43              ld       hl, (row_2_invader_addr)
code:4994 CD B0 49              call     sub_0_49B0
code:4997 22 04 43              ld       (row_2_invader_addr), hl
code:499A 2A 06 43              ld       hl, (row_3_invader_addr)
code:499D CD B0 49              call     sub_0_49B0
code:49A0 22 06 43              ld       (row_3_invader_addr), hl
code:49A3 2A 08 43              ld       hl, (row_4_invader_addr)
code:49A6 CD B0 49              call     sub_0_49B0
code:49A9 22 08 43              ld       (row_4_invader_addr), hl
code:49AC C1                    pop      bc
code:49AD D1                    pop      de
code:49AE E1                    pop      hl
code:49AF C9                    ret
code:49AF              ; End of function sub_0_4985
code:49AF
code:49B0
code:49B0                       ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:49B0
code:49B0
code:49B0              sub_0_49B0:                         ; CODE XREF: sub_0_4985+6↑p
code:49B0 E5                                              ; sub_0_4985+F↑p ...
code:49B0                       push     hl
code:49B1 06 3F                 ld       b, 3Fh ; '?'
code:49B3
code:49B3              loc_0_49B3:                         ; CODE XREF: sub_0_49B0+9↓j
code:49B3 7E                    ld       a, (hl)
code:49B4 CB 7F                 bit      7, a
code:49B6 23                    inc      hl
code:49B7 20 06                 jr       nz, loc_0_49BF
code:49B9 10 F8                 djnz     loc_0_49B3
code:49BB E1                    pop      hl
code:49BC 26 00                 ld       h, 0
code:49BE C9                    ret
code:49BF              ;
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code:49BF
code:49BF              loc_0_49BF:                         ; CODE XREF: sub_0_49B0+7↑j
code:49BF E1                    pop      hl
code:49C0 19                    add      hl, de
code:49C1 C9                    ret
code:49C1              ; End of function sub_0_49B0
code:49C1
code:49C2              ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:49C2
code:49C2              start_game:                         ; CODE XREF:
check_for_R_key+5↑j
code:49C2 AF                    xor      a
code:49C3 32 0C 43              ld       (byte_0_430C), a
code:49C6 32 15 43              ld       (byte_0_4315), a
code:49C9 32 12 43              ld       (byte_0_4312), a
code:49CC 32 0D 43              ld       (ufo_dir), a
code:49CF 32 0E 43              ld       (wave_no), a
code:49D2 32 10 43              ld       (ufo_active), a
code:49D5 32 11 43              ld       (bullet_active), a
code:49D8 32 22 43              ld       (byte_0_4322), a
code:49DB 3C                    inc      a
code:49DC 32 0A 43              ld       (byte_0_430A), a
code:49DF 3E 05                 ld       a, 5
code:49E1 32 0C 43              ld       (byte_0_430C), a
code:49E4 3E 03                 ld       a, 3
code:49E6 32 0F 43              ld       (no_lives), a
code:49E9 CD 90 4E              call     display_lives_left
code:49EC 31 8A 42              ld       sp, 428Ah
code:49EF CD B0 46              call     zero_score
code:49F2 CD 31 4E              call     display_GOOD_LUCK
code:49F5
code:49F5              new_wave:                           ; CODE XREF: code:4874↑j
code:49F5 31 8A 42              ld       sp, 428Ah
code:49F8 AF                    xor      a
code:49F9 32 11 43              ld       (bullet_active), a      ; clear fired flag
code:49FC 3A 0E 43              ld       a, (wave_no)
code:49FF 3C                    inc      a                       ; next wave number
```

```
code:4A00 FE 07                 cp      7                       ; highest?
code:4A02 20 02                 jr      nz, loc_0_4A06          ; no, skip
code:4A04 3E 01                 ld      a, 1                    ; reset to 1
code:4A06
code:4A06            loc_0_4A06:                                ; CODE XREF: code:4A02↑j
code:4A06 32 0E 43              ld      (wave_no), a
code:4A09 E6 06                 and     6                       ; 2/4/6
code:4A0B 11 40 00              ld      de, 40h ; '@'           ; characters/line
code:4A0E 62                    ld      h, d
code:4A0F 6B                    ld      l, e                    ; hl=0x0040
code:4A10 06 01                 ld      b, 1
code:4A12 FE 02                 cp      2                       ; compare wave_no with 2
code:4A14 38 06                 jr      c, loc_0_4A1C           ; wave_no=1, skip
code:4A16 28 02                 jr      z, loc_0_4A1A           ; wave_no=2, skip
code:4A18 04                    inc     b
code:4A19 19                    add     hl, de
code:4A1A
code:4A1A            loc_0_4A1A:                                ; CODE XREF: code:4A16↑j
code:4A1A 04                    inc     b
code:4A1B 19                    add     hl, de
code:4A1C
code:4A1C            loc_0_4A1C:                                ; CODE XREF: code:4A14↑j
code:4A1C EB                    ex      de, hl
code:4A1D
code:4A1D            calc_invader_row_addr:                     ; CODE XREF: code:4A40├j
code:4A1D C5                    push    bc
code:4A1E DD 21 16 43           ld      ix, init_row_1_invader_addr
code:4A22 FD 21 02 43           ld      iy, row_1_invader_addr
code:4A26 06 04                 ld      b, 4                    ; 4 rows of invaders
code:4A28
code:4A28            loc_0_4A28:                                ; CODE XREF: code:4A3D├j
code:4A28 DD 6E 00              ld      l, (ix+0)
code:4A2B DD 66 01              ld      h, (ix+1)
code:4A2E 19                    add     hl, de                  ; calc video address for
invader row
code:4A2F FD 75 00              ld      (iy+0), l
code:4A32 FD 74 01              ld      (iy+1), h               ; store
code:4A35 DD 23                 inc     ix
code:4A37 DD 23                 inc     ix                      ; next row address
code:4A39 FD 23                 inc     iy
code:4A3B FD 23                 inc     iy
code:4A3D 10 E9                 djnz    loc_0_4A28              ; loop thru all rows of
invaders
code:4A3F C1                    pop     bc
code:4A40 10 DB                 djnz    calc_invader_row_addr
code:4A42 CD 18 45              call    wipe_screen_left_to_right_slow
code:4A45 21 09 3F              ld      hl, video_ram+309h      ; cursor position
code:4A48 22 20 40              ld      (4020h), hl
code:4A4B 21 51 43              ld      hl, shield              ; shield #1
code:4A4E E5                    push    hl
code:4A4F CD E5 44              call    display_message
code:4A52 21 17 3F              ld      hl, video_ram+317h      ; cursor position
code:4A55 22 20 40              ld      (4020h), hl
code:4A58 E1                    pop     hl
code:4A59 E5                    push    hl                      ; shield #2
code:4A5A CD E5 44              call    display_message
code:4A5D 21 24 3F              ld      hl, video_ram+324h      ; cursor position
code:4A60 22 20 40              ld      (4020h), hl
code:4A63 E1                    pop     hl
code:4A64 E5                    push    hl                      ; shield #3
code:4A65 CD E5 44              call    display_message
code:4A68 21 31 3F              ld      hl, video_ram+331h      ; cursor position
code:4A6B 22 20 40              ld      (4020h), hl
code:4A6E E1                    pop     hl                      ; shield #4
code:4A6F CD E5 44              call    display_message
code:4A72 11 23 43              ld      de, invader_30pt
code:4A75 2A 02 43              ld      hl, (row_1_invader_addr)
code:4A78 CD 63 49              call    display_object_x10      ; display 1st row of invaders
code:4A7B 11 30 43              ld      de, invader_20pt
code:4A7E 2A 04 43              ld      hl, (row_2_invader_addr)
code:4A81 CD 63 49              call    display_object_x10      ; display 2nd row of invaders
code:4A84 11 3D 43              ld      de, invader_10pt
code:4A87 2A 06 43              ld      hl, (row_3_invader_addr)
code:4A8A CD 63 49              call    display_object_x10      ; display 3rd row of invaders
code:4A8D 2A 08 43              ld      hl, (row_4_invader_addr)
code:4A90 CD 63 49              call    display_object_x10      ; display 4th row of invaders
code:4A93 3E 28                 ld      a, 40                   ; number of invaders left
```

```
code:4A95 32 01 43              ld       (invaders_left), a
code:4A98 32 21 43              ld       (byte_0_4321), a
code:4A9B
code:4A9B            loc_0_4A9B:                         ; CODE XREF: code:4AD9├j
code:4A9B 21 84 3F              ld       hl, video_ram+384h   ; cursor position
code:4A9E 22 20 40              ld       (4020h), hl
code:4AA1 21 64 43              ld       hl, player
code:4AA4 CD E5 44              call     display_message     ; draw player base
code:4AA7 21 86 3F              ld       hl, video_ram+386h
code:4AAA 22 13 43              ld       (base_centre), hl   ; center of base
code:4AAD C3 FB 4E              jp       loc_0_4EFB
code:4AB0            ;
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code:4AB0
code:4AB0            loc_0_4AB0:                         ; CODE XREF: code:4B2A├j
code:4AB0 3A 0F 43              ld       a, (no_lives)
code:4AB3 3D                    dec      a                   ; any lives left?
code:4AB4 CA 3C 49              jp       z, game_over        ; no, exit
code:4AB7 32 0F 43              ld       (no_lives), a
code:4ABA CD 90 4E              call     display_lives_left
code:4ABD AF                    xor      a
code:4ABE 32 11 43              ld       (bullet_active), a  ; clear fired flag
code:4AC1 32 12 43              ld       (byte_0_4312), a
code:4AC4 CD 3B 4D              call     restore_space_characters
code:4AC7 21 80 3F              ld       hl, video_ram+380h
code:4ACA CD 7E 4C              call     clear_video_line_HL
code:4ACD 01 FF FF              ld       bc, 0FFFFh
code:4AD0 CD 60 00              call     60h
code:4AD3 CD 60 00              call     60h
code:4AD6 31 8A 42              ld       sp, 428Ah
code:4AD9 C3 9B 4A              jp       loc_0_4A9B
code:4ADC
code:4ADC            ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4ADC
code:4ADC
code:4ADC            invert_display:                     ; CODE XREF: sub_0_4B1A+4├p
code:4ADC 21 00 3C                                       ; sub_0_4B1A+B├j ...
code:4ADC                       ld       hl, video_ram
code:4ADF 01 00 04              ld       bc, 400h            ; video ram size
code:4AE2
code:4AE2            loc_0_4AE2:                         ; CODE XREF:
invert_display+1C├j
code:4AE2 7E                    ld       a, (hl)             ; get character
code:4AE3 FE 20                 cp       20h ; ' '           ; space?
code:4AE5 20 02                 jr       nz, loc_0_4AE9      ; no, skip
code:4AE7 36 80                 ld       (hl), 80h ; '€'     ; graphic space
code:4AE9
code:4AE9            loc_0_4AE9:                         ; CODE XREF: invert_display+9↑j
code:4AE9 CB 7E                 bit      7, (hl)             ; graphics character?
code:4AEB 28 07                 jr       z, loc_0_4AF4       ; no, skip
code:4AED 7E                    ld       a, (hl)             ; get character
code:4AEE 2F                    cpl                          ; invert
code:4AEF CB FF                 set      7, a                ; make graphics character
code:4AF1 CB B7                 res      6, a                ; 1st block of graphics
characters
code:4AF3 77                    ld       (hl), a             ; display
code:4AF4
code:4AF4            loc_0_4AF4:                         ; CODE XREF: invert_display+F↑j
code:4AF4 23                    inc      hl                  ; next video address
code:4AF5 0B                    dec      bc
code:4AF6 78                    ld       a, b
code:4AF7 B1                    or       c
code:4AF8 20 E8                 jr       nz, loc_0_4AE2      ; loop through screen
code:4AFA C9                    ret
code:4AFA            ; End of function invert_display
code:4AFA
code:4AFB
code:4AFB            ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4AFB
code:4AFB
code:4AFB            sub_0_4AFB:                         ; CODE XREF: sub_0_4B1A├p
code:4AFB 2A 13 43              ld       hl, (base_centre)
code:4AFE 2B                    dec      hl
code:4AFF 2B                    dec      hl
code:4B00 C9                    ret
```

```
code:4B00                 ; End of function sub_0_4AFB
code:4B00
code:4B01
code:4B01                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4B01
code:4B01
code:4B01                 sub_0_4B01:                          ; CODE XREF: sub_0_4B1A+8┤p
code:4B01 3E A6                   ld      a, 0A6h ; '¦'
code:4B03 06 00                   ld      b, 0
code:4B05
code:4B05                 loc_0_4B05:                          ; CODE XREF: sub_0_4B01+16┤j
code:4B05 C5                      push    bc
code:4B06 E5                      push    hl
code:4B07 06 05                   ld      b, 5
code:4B09 EE 3F                   xor     3Fh ; '?'
code:4B0B
code:4B0B                 loc_0_4B0B:                          ; CODE XREF: sub_0_4B01+C┤j
code:4B0B 77                      ld      (hl), a
code:4B0C 23                      inc     hl
code:4B0D 10 FC                   djnz    loc_0_4B0B
code:4B0F
code:4B0F                 loc_0_4B0F:                          ; CODE XREF: sub_0_4B01+12┤j
code:4B0F E3                      ex      (sp), hl
code:4B10 E3                      ex      (sp), hl
code:4B11 E3                      ex      (sp), hl
code:4B12 E3                      ex      (sp), hl
code:4B13 10 FA                   djnz    loc_0_4B0F
code:4B15 E1                      pop     hl
code:4B16 C1                      pop     bc
code:4B17 10 EC                   djnz    loc_0_4B05
code:4B19 C9                      ret
code:4B19                 ; End of function sub_0_4B01
code:4B19
code:4B1A
code:4B1A                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4B1A
code:4B1A
code:4B1A                 sub_0_4B1A:                          ; CODE XREF: code:4B27┤p
code:4B1A CD FB 4A                 call    sub_0_4AFB
code:4B1D E5                      push    hl
code:4B1E CD DC 4A                 call    invert_display
code:4B21 E1                      pop     hl
code:4B22 CD 01 4B                 call    sub_0_4B01
code:4B25 18 B5                   jr      invert_display
code:4B25                 ; End of function sub_0_4B1A
code:4B25
code:4B27                 ;
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code:4B27
code:4B27                 loc_0_4B27:                          ; CODE XREF: sub_0_4D5F+93┤j
code:4B27 CD 1A 4B                 call    sub_0_4B1A
code:4B2A C3 B0 4A                 jp      loc_0_4AB0
code:4B2D                 ;
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code:4B2D
code:4B2D                 loc_0_4B2D:                          ; CODE XREF: code:4C02┤j
code:4B2D 06 0A                   ld      b, 0Ah
code:4B2F
code:4B2F                 loc_0_4B2F:                          ; CODE XREF: code:4B43┤j
code:4B2F C5                      push    bc
code:4B30 CD DC 4A                 call    invert_display
code:4B33 01 10 27                 ld      bc, 2710h
code:4B36 CD 60 00                 call    60h
code:4B39 CD DC 4A                 call    invert_display
code:4B3C 01 10 27                 ld      bc, 2710h
code:4B3F CD 60 00                 call    60h
code:4B42 C1                      pop     bc
code:4B43 10 EA                   djnz    loc_0_4B2F
code:4B45 C3 3C 49                 jp      game_over
code:4B48
code:4B48                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4B48
code:4B48
code:4B48                 sub_0_4B48:                          ; CODE XREF: code:4F71┤p
```

```
code:4B48 E5                         push    hl
code:4B49 D5                         push    de
code:4B4A C5                         push    bc
code:4B4B 3A 0A 43                   ld      a, (byte_0_430A)
code:4B4E B7                         or      a
code:4B4F 28 37                      jr      z, loc_0_4B88
code:4B51 21 7F 3C                   ld      hl, video_ram+7Fh
code:4B54 CD 77 48                   call    sub_0_4877
code:4B57 B7                         or      a
code:4B58 CA BE 4B                   jp      z, loc_0_4BBE
code:4B5B 2A 08 43                   ld      hl, (row_4_invader_addr)
code:4B5E CD 7A 4B                   call    sub_0_4B7A
code:4B61 2A 06 43                   ld      hl, (row_3_invader_addr)
code:4B64 CD 7A 4B                   call    sub_0_4B7A
code:4B67 2A 04 43                   ld      hl, (row_2_invader_addr)
code:4B6A CD 7A 4B                   call    sub_0_4B7A
code:4B6D 2A 02 43                   ld      hl, (row_1_invader_addr)
code:4B70 CD 7A 4B                   call    sub_0_4B7A
code:4B73 CD FC 45                   call    sub_0_45FC
code:4B76
code:4B76              loc_0_4B76:                          ; CODE XREF: code:4BAC├j
code:4B76                                                   ; code:4C1D├j ...
code:4B76 C1                         pop     bc
code:4B77 D1                         pop     de
code:4B78 E1                         pop     hl
code:4B79 C9                         ret
code:4B79              ; End of function sub_0_4B48
code:4B79
code:4B7A
code:4B7A              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4B7A
code:4B7A
code:4B7A              sub_0_4B7A:                          ; CODE XREF: sub_0_4B48+16↑p
code:4B7A 7C                                                ; sub_0_4B48+1C↑p ...
code:4B7A                          ld      a, h
code:4B7B B7                         or      a
code:4B7C C8                         ret     z
code:4B7D CD 3E 46                   call    move_video_line_right_HL
code:4B80 11 40 00                   ld      de, 40h ; '@'
code:4B83 ED 52                      sbc     hl, de
code:4B85 C3 3E 46                   jp      move_video_line_right_HL
code:4B85              ; End of function sub_0_4B7A
code:4B85
code:4B88              ;
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code:4B88
code:4B88              loc_0_4B88:                          ; CODE XREF: sub_0_4B48+7↑j
code:4B88 21 40 3C                   ld      hl, video_ram+40h
code:4B8B CD 77 48                   call    sub_0_4877
code:4B8E B7                         or      a
code:4B8F 28 38                      jr      z, loc_0_4BC9
code:4B91 CD FC 45                   call    sub_0_45FC
code:4B94
code:4B94              loc_0_4B94:                          ; CODE XREF: code:4BC6├j
code:4B94 2A 08 43                   ld      hl, (row_4_invader_addr)
code:4B97 CD AE 4B                   call    sub_0_4BAE
code:4B9A 2A 06 43                   ld      hl, (row_3_invader_addr)
code:4B9D CD AE 4B                   call    sub_0_4BAE
code:4BA0 2A 04 43                   ld      hl, (row_2_invader_addr)
code:4BA3 CD AE 4B                   call    sub_0_4BAE
code:4BA6 2A 02 43                   ld      hl, (row_1_invader_addr)
code:4BA9 CD AE 4B                   call    sub_0_4BAE
code:4BAC 18 C8                      jr      loc_0_4B76
code:4BAE
code:4BAE              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4BAE
code:4BAE
code:4BAE              sub_0_4BAE:                          ; CODE XREF: code:4B97↑p
code:4BAE 7C                                                ; code:4B9D↑p ...
code:4BAE                          ld      a, h
code:4BAF B7                         or      a
code:4BB0 C8                         ret     z
code:4BB1 E5                         push    hl
code:4BB2 CD 60 46                   call    move_video_line_left_HL
code:4BB5 E1                         pop     hl
```

```
code:4BB6 11 40 00           ld      de, 40h ; '@'
code:4BB9 ED 52              sbc     hl, de
code:4BBB C3 60 46           jp      move_video_line_left_HL
code:4BBB               ; End of function sub_0_4BAE
code:4BBB
code:4BBE               ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4BBE
code:4BBE               loc_0_4BBE:                      ; CODE XREF: sub_0_4B48+10↑j
code:4BBE 3A 0A 43           ld      a, (byte_0_430A)
code:4BC1 EE 01              xor     1
code:4BC3 32 0A 43           ld      (byte_0_430A), a
code:4BC6 C3 94 4B           jp      loc_0_4B94
code:4BC9               ;
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code:4BC9
code:4BC9               loc_0_4BC9:                      ; CODE XREF: code:4B8F↑j
code:4BC9 3A 11 43           ld      a, (bullet_active)
code:4BCC B7                 or      a               ; fired?
code:4BCD 28 05              jr      z, loc_0_4BD4    ; no, skip
code:4BCF 2A 1E 43           ld      hl, (bullet_addr)
code:4BD2 36 20              ld      (hl), 20h ; ' '   ; display space
code:4BD4
code:4BD4               loc_0_4BD4:                      ; CODE XREF: code:4BCD↑j
code:4BD4 DD 21 08 43        ld      ix, row_4_invader_addr
code:4BD8 06 04              ld      b, 4            ; 4 rows to check
code:4BDA
code:4BDA               loc_0_4BDA:                      ; CODE XREF: code:4BE9├j
code:4BDA DD 6E 00           ld      l, (ix+0)
code:4BDD DD 66 01           ld      h, (ix+1)       ; hl = invader addr
code:4BE0 7C                 ld      a, h
code:4BE1 B7                 or      a               ; any invaders left on this
line?
code:4BE2 C4 2E 4C           call    nz, sub_0_4C2E  ; yes, call
code:4BE5 DD 2B              dec     ix
code:4BE7 DD 2B              dec     ix              ; next invader row address
code:4BE9 10 EF              djnz    loc_0_4BDA      ; loop thru 4 rows of invaders
code:4BEB DD 21 08 43        ld      ix, row_4_invader_addr
code:4BEF 06 04              ld      b, 4            ; 4 rows of invaders
code:4BF1 11 80 3F           ld      de, video_ram+380h
code:4BF4
code:4BF4               loc_0_4BF4:                      ; CODE XREF: code:4C0F├j
code:4BF4 DD 6E 00           ld      l, (ix+0)
code:4BF7 DD 66 01           ld      h, (ix+1)       ; HL = invader row addr
code:4BFA CD 55 4C           call    sub_0_4C55
code:4BFD CD E2 45           call    sub_0_45E2
code:4C00 FE 20              cp      20h ; ' '
code:4C02 CA 2D 4B           jp      z, loc_0_4B2D
code:4C05 DD 75 00           ld      (ix+0), l
code:4C08 DD 74 01           ld      (ix+1), h
code:4C0B DD 2B              dec     ix
code:4C0D DD 2B              dec     ix
code:4C0F 10 E3              djnz    loc_0_4BF4      ; loop thru 4 rows of invaders
code:4C11 3A 0A 43           ld      a, (byte_0_430A)
code:4C14 EE 01              xor     1
code:4C16 32 0A 43           ld      (byte_0_430A), a
code:4C19 3A 11 43           ld      a, (bullet_active)
code:4C1C B7                 or      a               ; fired?
code:4C1D CA 76 4B           jp      z, loc_0_4B76   ; no, skip
code:4C20 2A 1E 43           ld      hl, (bullet_addr)
code:4C23 7E                 ld      a, (hl)         ; get character from video
code:4C24 FE 20              cp      20h ; ' '         ; space?
code:4C26 C2 76 4B           jp      nz, loc_0_4B76  ; no, skip
code:4C29 36 5B              ld      (hl), 5Bh ; '['   ; display player bullet
code:4C2B C3 76 4B           jp      loc_0_4B76
code:4C2E
code:4C2E               ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4C2E
code:4C2E
code:4C2E               sub_0_4C2E:                      ; CODE XREF: code:4BE2↑p
code:4C2E C5                 push    bc
code:4C2F E5                 push    hl
code:4C30 11 3F 00           ld      de, 3Fh ; '?'
code:4C33 19                 add     hl, de
code:4C34 E5                 push    hl
code:4C35 13                 inc     de
```

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code:4C36 19                        add      hl, de
code:4C37 EB                        ex       de, hl
code:4C38 E1                        pop      hl
code:4C39 06 80                     ld       b, 80h ; '€'
code:4C3B
code:4C3B           loc_0_4C3B:                              ; CODE XREF: sub_0_4C2E+1A├j
code:4C3B 1A                        ld       a, (de)
code:4C3C FE 80                     cp       80h ; '€'
code:4C3E 7E                        ld       a, (hl)
code:4C3F 30 04                     jr       nc, loc_0_4C45
code:4C41 FE 80                     cp       80h ; '€'
code:4C43 38 01                     jr       c, loc_0_4C46
code:4C45
code:4C45           loc_0_4C45:                              ; CODE XREF: sub_0_4C2E+11↑j
code:4C45 12                        ld       (de), a
code:4C46
code:4C46           loc_0_4C46:                              ; CODE XREF: sub_0_4C2E+15↑j
code:4C46 1B                        dec      de
code:4C47 2B                        dec      hl
code:4C48 10 F1                     djnz     loc_0_4C3B
code:4C4A E1                        pop      hl
code:4C4B 11 40 00                  ld       de, 40h ; '@'
code:4C4E ED 52                     sbc      hl, de
code:4C50 CD 7E 4C                  call     clear_video_line_HL
code:4C53 C1                        pop      bc
code:4C54 C9                        ret
code:4C54           ; End of function sub_0_4C2E
code:4C54
code:4C55
code:4C55           ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4C55
code:4C55
code:4C55           sub_0_4C55:                              ; CODE XREF: code:4BFA↑p
code:4C55 7C                        ld       a, h
code:4C56 B7                        or       a
code:4C57 C8                        ret      z
code:4C58 D5                        push     de
code:4C59 11 40 00                  ld       de, 40h ; '@'
code:4C5C 19                        add      hl, de
code:4C5D D1                        pop      de
code:4C5E C9                        ret
code:4C5E           ; End of function sub_0_4C55
code:4C5E
code:4C5F
code:4C5F           ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4C5F
code:4C5F
code:4C5F           check_for_new_high_score:                ; CODE XREF: code:4951↑p
code:4C5F 21 C9 3F                  ld       hl, video_ram+3C9h  ; score
code:4C62 11 FA 3F                  ld       de, video_ram+3FAh  ; high score
code:4C65 06 04                     ld       b, 4                ; 4 digits to compare
code:4C67
code:4C67           loc_0_4C67:                              ; CODE XREF:
check_for_new_high_score+10├j
code:4C67 4E                        ld       c, (hl)             ; get score digit
code:4C68 1A                        ld       a, (de)             ; get high score digit
code:4C69 B9                        cp       c                   ; score higher?
code:4C6A 38 06                     jr       c, update_high_score ; yes, skip
code:4C6C C0                        ret      nz                  ; done if not the same
code:4C6D 23                        inc      hl
code:4C6E 13                        inc      de                  ; next digits
code:4C6F 10 F6                     djnz     loc_0_4C67          ; loop through all digits
code:4C71 C9                        ret
code:4C72           ;
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code:4C72
code:4C72           update_high_score:                       ; CODE XREF:
check_for_new_high_score+B↑j
code:4C72 21 C9 3F                  ld       hl, video_ram+3C9h  ; source = score
code:4C75 11 FA 3F                  ld       de, video_ram+3FAh  ; destination = high score
code:4C78 01 05 00                  ld       bc, 5               ; 5 digits to copy
code:4C7B ED B0                     ldir                         ; copy
code:4C7D C9                        ret
code:4C7D           ; End of function check_for_new_high_score
code:4C7D
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code:4C7E
code:4C7E                  ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4C7E
code:4C7E
code:4C7E              clear_video_line_HL:              ; CODE XREF: update_bullet+94↑p
code:4C7E C5                           push    bc        ; code:4948↑p ...
code:4C7F D5                           push    de
code:4C80 06 40                        ld      b, 40h ; '@'    ; characters/line
code:4C82
code:4C82              loc_0_4C82:                       ; CODE XREF:
clear_video_line_HL+7├j
code:4C82 36 20                        ld      (hl), 20h ; ' '    ; display space
code:4C84 23                           inc     hl              ; next video address
code:4C85 10 FB                        djnz    loc_0_4C82      ; clear a line
code:4C87 D1                           pop     de
code:4C88 C1                           pop     bc
code:4C89 C9                           ret
code:4C89              ; End of function clear_video_line_HL
code:4C89
code:4C8A
code:4C8A                  ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4C8A
code:4C8A
code:4C8A              sub_0_4C8A:                        ; CODE XREF: code:4F65├p
code:4C8A D9                           exx
code:4C8B 06 04                        ld      b, 4
code:4C8D DD 21 08 43                  ld      ix, row_4_invader_addr
code:4C91
code:4C91              loc_0_4C91:                        ; CODE XREF: sub_0_4C8A+11├j
code:4C91 DD 7E 01                     ld      a, (ix+1)
code:4C94 B7                           or      a
code:4C95 20 08                        jr      nz, loc_0_4C9F
code:4C97 DD 2B                        dec     ix
code:4C99 DD 2B                        dec     ix
code:4C9B 10 F4                        djnz    loc_0_4C91
code:4C9D
code:4C9D              loc_0_4C9D:                        ; CODE XREF: sub_0_4C8A+3B├j
code:4C9D D9                           ;        sub_0_4C8A+4E├j ...
code:4C9D                              exx
code:4C9E C9                           ret
code:4C9F              ;
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code:4C9F
code:4C9F              loc_0_4C9F:                        ; CODE XREF: sub_0_4C8A+B↑j
code:4C9F 2A 13 43                     ld      hl, (base_centre)
code:4CA2 11 80 C0                     ld      de, 0C080h
code:4CA5 19                           add     hl, de
code:4CA6 EB                           ex      de, hl
code:4CA7 DD 6E 00                     ld      l, (ix+0)
code:4CAA DD 66 01                     ld      h, (ix+1)
code:4CAD E5                           push    hl
code:4CAE 21 03 00                     ld      hl, 3
code:4CB1 CD 1D 4D                     call    sub_0_4D1D
code:4CB4 7D                           ld      a, l
code:4CB5 E1                           pop     hl
code:4CB6 FE 01                        cp      1
code:4CB8 20 4B                        jr      nz, loc_0_4D05
code:4CBA
code:4CBA              loc_0_4CBA:                        ; CODE XREF: sub_0_4C8A+84├j
code:4CBA 19                           add     hl, de
code:4CBB 11 80 FF                     ld      de, 0FF80h
code:4CBE
code:4CBE              loc_0_4CBE:                        ; CODE XREF: sub_0_4C8A+39├j
code:4CBE CB 7E                        bit     7, (hl)
code:4CC0 20 05                        jr      nz, loc_0_4CC7
code:4CC2 19                           add     hl, de
code:4CC3 10 F9                        djnz    loc_0_4CBE
code:4CC5 18 D6                        jr      loc_0_4C9D
code:4CC7              ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4CC7
code:4CC7              loc_0_4CC7:                        ; CODE XREF: sub_0_4C8A+36↑j
code:4CC7 DD 21 EA 4E                  ld      ix, 4EEAh
code:4CCB 06 04                        ld      b, 4
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code:4CCD
code:4CCD                   loc_0_4CCD:                             ; CODE XREF: sub_0_4C8A+4C├j
code:4CCD DD 7E 01                  ld      a, (ix+1)
code:4CD0 B7                        or      a
code:4CD1 28 08                     jr      z, loc_0_4CDB
code:4CD3 CD 2A 4E                  call    add_3_to_ix
code:4CD6 10 F5                     djnz    loc_0_4CCD
code:4CD8 C3 9D 4C                  jp      loc_0_4C9D
code:4CDB                   ;
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code:4CDB
code:4CDB                   loc_0_4CDB:                             ; CODE XREF: sub_0_4C8A+47↑j
code:4CDB CD 28 4D                  call    sub_0_4D28
code:4CDE 11 82 00                  ld      de, 82h ; ','
code:4CE1 19                        add     hl, de
code:4CE2 E5                        push    hl
code:4CE3 21 03 00                  ld      hl, 3
code:4CE6 CD 1D 4D                  call    sub_0_4D1D
code:4CE9 11 D2 4E                  ld      de, 4ED2h
code:4CEC 19                        add     hl, de
code:4CED D1                        pop     de
code:4CEE CB 7B                     bit     7, e
code:4CF0 28 1E                     jr      z, loc_0_4D10
code:4CF2
code:4CF2                   loc_0_4CF2:                             ; CODE XREF: sub_0_4C8A+8A├j
code:4CF2 1A                        ld      a, (de)
code:4CF3 FE 20                     cp      20h ; ' '
code:4CF5 20 A6                     jr      nz, loc_0_4C9D
code:4CF7 7E                        ld      a, (hl)
code:4CF8 12                        ld      (de), a
code:4CF9 DD 73 00                  ld      (ix+0), e
code:4CFC DD 72 01                  ld      (ix+1), d
code:4CFF DD 77 02                  ld      (ix+2), a
code:4D02 C3 9D 4C                  jp      loc_0_4C9D
code:4D05                   ;
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code:4D05
code:4D05                   loc_0_4D05:                             ; CODE XREF: sub_0_4C8A+2E↑j
code:4D05 E5                        push    hl
code:4D06 21 40 00                  ld      hl, 40h ; '@'
code:4D09 CD 1D 4D                  call    sub_0_4D1D
code:4D0C EB                        ex      de, hl
code:4D0D E1                        pop     hl
code:4D0E 18 AA                     jr      loc_0_4CBA
code:4D10                   ;
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code:4D10
code:4D10                   loc_0_4D10:                             ; CODE XREF: sub_0_4C8A+66↑j
code:4D10 EB                        ex      de, hl
code:4D11 CB 7E                     bit     7, (hl)
code:4D13 EB                        ex      de, hl
code:4D14 28 DC                     jr      z, loc_0_4CF2
code:4D16 EB                        ex      de, hl
code:4D17 E5                        push    hl
code:4D18 D9                        exx
code:4D19 E1                        pop     hl
code:4D1A C3 10 48                  jp      sub_0_4810
code:4D1A             ; End of function sub_0_4C8A
code:4D1A
code:4D1D
code:4D1D             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4D1D
code:4D1D
code:4D1D                   sub_0_4D1D:                             ; CODE XREF: update_bullet+9A↑p
code:4D1D D5                                                        ; update_bullet+D2↑p ...
code:4D1D                         push    de
code:4D1E C5                       push    bc
code:4D1F CD CC 14                 call    14CCh
code:4D22 CD 7F 0A                 call    0A7Fh
code:4D25 C1                       pop     bc
code:4D26 D1                       pop     de
code:4D27 C9                       ret
code:4D27             ; End of function sub_0_4D1D
code:4D27
code:4D28
code:4D28             ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4D28
code:4D28
code:4D28              sub_0_4D28:                        ; CODE XREF: update_bullet+3F↑p
code:4D28 D5                                             ; sub_0_4C8A+51↑p
code:4D28 D5                    push    de
code:4D29 7E                    ld      a, (hl)
code:4D2A E6 30                 and     30h ; '0'
code:4D2C 11 C0 FF              ld      de, 0FFC0h
code:4D2F 20 01                 jr      nz, loc_0_4D32
code:4D31 19                    add     hl, de
code:4D32
code:4D32              loc_0_4D32:                        ; CODE XREF: sub_0_4D28+7↑j
code:4D32 CB 7E                                          ; sub_0_4D28+D├j
code:4D32 CB 7E                 bit     7, (hl)
code:4D34 2B                    dec     hl
code:4D35 20 FB                 jr      nz, loc_0_4D32
code:4D37 23                    inc     hl
code:4D38 23                    inc     hl
code:4D39 D1                    pop     de
code:4D3A C9                    ret
code:4D3A              ; End of function sub_0_4D28
code:4D3A
code:4D3B
code:4D3B              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4D3B
code:4D3B
code:4D3B              restore_space_characters:          ; CODE XREF: code:4AC4↑p
code:4D3B 21 00 3C              ld      hl, video_ram
code:4D3E 01 C0 03              ld      bc, 3C0h           ; 15 lines (all but last)
code:4D41
code:4D41              loc_0_4D41:                        ; CODE XREF:
restore_space_characters+16├j
code:4D41 CB 7E                 bit     7, (hl)            ; graphics character?
code:4D43 28 05                 jr      z, loc_0_4D4A      ; no, skip
code:4D45 7E                    ld      a, (hl)            ; get character
code:4D46 FE 80                 cp      80h ; '€'          ; graphic space character?
code:4D48 20 02                 jr      nz, loc_0_4D4C     ; no, skip
code:4D4A
code:4D4A              loc_0_4D4A:                        ; CODE XREF:
restore_space_characters+8↑j
code:4D4A 36 20                 ld      (hl), 20h ; ' '    ; convert to space character
code:4D4C
code:4D4C              loc_0_4D4C:                        ; CODE XREF:
restore_space_characters+D↑j
code:4D4C 23                    inc     hl                 ; next video address
code:4D4D 0B                    dec     bc
code:4D4E 78                    ld      a, b
code:4D4F B1                    or      c                  ; done?
code:4D50 C8                    ret     z                  ; yes, return
code:4D51 18 EE                 jr      loc_0_4D41         ; loop through 15 lines
code:4D51              ; End of function restore_space_characters
code:4D51
code:4D53
code:4D53              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4D53
code:4D53
code:4D53              sub_0_4D53:                        ; CODE XREF: sub_0_4D5F+20├p
code:4D53 AF                                             ; sub_0_4D5F+60├p ...
code:4D53                       xor     a
code:4D54 DD 77 01              ld      (ix+1), a
code:4D57
code:4D57              loc_0_4D57:                        ; CODE XREF: sub_0_4810+1B↑j
code:4D57 3A 12 43              ld      a, (byte_0_4312)
code:4D5A 3D                    dec     a
code:4D5B 32 12 43              ld      (byte_0_4312), a
code:4D5E C9                    ret
code:4D5E              ; End of function sub_0_4D53
code:4D5E
code:4D5F
code:4D5F              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4D5F
code:4D5F
code:4D5F              sub_0_4D5F:                        ; CODE XREF: code:4F61├p
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code:4D5F D9                          exx
code:4D60 DD 21 EA 4E          ld      ix, 4EEAh
code:4D64 06 04               ld      b, 4
code:4D66
code:4D66                   loc_0_4D66:                            ; CODE XREF: sub_0_4D5F+10┤j
code:4D66 DD 7E 01            ld      a, (ix+1)
code:4D69 B7                  or      a
code:4D6A 20 07               jr      nz, loc_0_4D73
code:4D6C
code:4D6C                   loc_0_4D6C:                            ; CODE XREF: sub_0_4D5F+23┤j
code:4D6C CD 2A 4E                                                 ; sub_0_4D5F+4B┤j ...
code:4D6C CD 2A 4E            call    add_3_to_ix
code:4D6F 10 F5               djnz    loc_0_4D66
code:4D71 D9                  exx
code:4D72 C9                  ret
code:4D73              ;
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code:4D73
code:4D73                   loc_0_4D73:                            ; CODE XREF: sub_0_4D5F+B↑j
code:4D73 DD 6E 00            ld      l, (ix+0)
code:4D76 DD 66 01            ld      h, (ix+1)
code:4D79 DD 7E 02            ld      a, (ix+2)
code:4D7C BE                  cp      (hl)
code:4D7D 28 05               jr      z, loc_0_4D84
code:4D7F CD 53 4D            call    sub_0_4D53
code:4D82 18 E8               jr      loc_0_4D6C
code:4D84              ;
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code:4D84
code:4D84                   loc_0_4D84:                            ; CODE XREF: sub_0_4D5F+1E↑j
code:4D84 36 20               ld      (hl), 20h ; ' '
code:4D86 11 40 00            ld      de, 40h ; '@'
code:4D89 19                  add     hl, de
code:4D8A DD 75 00            ld      (ix+0), l
code:4D8D DD 74 01            ld      (ix+1), h
code:4D90 E5                  push    hl
code:4D91 11 C0 3F            ld      de, video_ram+3C0h
code:4D94 CD E2 45            call    sub_0_45E2
code:4D97 B7                  or      a
code:4D98 F5                  push    af
code:4D99 20 2D               jr      nz, loc_0_4DC8
code:4D9B F1                  pop     af
code:4D9C E1                  pop     hl
code:4D9D 7E                  ld      a, (hl)
code:4D9E FE 5B               cp      5Bh ; '['
code:4DA0 28 0A               jr      z, loc_0_4DAC
code:4DA2 FE 81               cp      81h ; ' '
code:4DA4 30 35               jr      nc, loc_0_4DDB
code:4DA6 DD 7E 02            ld      a, (ix+2)
code:4DA9 77                  ld      (hl), a
code:4DAA 18 C0               jr      loc_0_4D6C
code:4DAC              ;
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code:4DAC
code:4DAC                   loc_0_4DAC:                            ; CODE XREF: sub_0_4D5F+41↑j
code:4DAC E5                  push    hl
code:4DAD F5                  push    af
code:4DAE 21 03 00            ld      hl, 3
code:4DB1 CD 1D 4D            call    sub_0_4D1D
code:4DB4 7D                  ld      a, l
code:4DB5 FE 02               cp      2
code:4DB7 38 0F               jr      c, loc_0_4DC8
code:4DB9 20 14               jr      nz, loc_0_4DCF
code:4DBB AF                  xor     a
code:4DBC 32 11 43            ld      (bullet_active), a
code:4DBF CD 53 4D            call    sub_0_4D53
code:4DC2 F1                  pop     af
code:4DC3 E1                  pop     hl
code:4DC4 36 20               ld      (hl), 20h ; ' '
code:4DC6 18 A4               jr      loc_0_4D6C
code:4DC8              ;
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code:4DC8
code:4DC8                   loc_0_4DC8:                            ; CODE XREF: sub_0_4D5F+3A↑j
code:4DC8 CD 53 4D                                                 ; sub_0_4D5F+58↑j ...
code:4DC8 CD 53 4D            call    sub_0_4D53
code:4DCB F1                  pop     af
```

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code:4DCC E1                      pop      hl
code:4DCD 18 9D                   jr       loc_0_4D6C
code:4DCF              ;
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code:4DCF
code:4DCF              loc_0_4DCF:                          ; CODE XREF: sub_0_4D5F+5A↑j
code:4DCF AF                      xor      a
code:4DD0 32 11 43                ld       (bullet_active), a
code:4DD3 F1                      pop      af
code:4DD4 E1                      pop      hl
code:4DD5 DD 7E 02                ld       a, (ix+2)
code:4DD8 77                      ld       (hl), a
code:4DD9 18 91                   jr       loc_0_4D6C
code:4DDB              ;
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code:4DDB
code:4DDB              loc_0_4DDB:                          ; CODE XREF: sub_0_4D5F+45↑j
code:4DDB EB                      ex       de, hl
code:4DDC CD 4A 48                call     sub_0_484A
code:4DDF CD E2 45                call     sub_0_45E2
code:4DE2 EB                      ex       de, hl
code:4DE3 E5                      push     hl
code:4DE4 F5                      push     af
code:4DE5 FE FF                   cp       0FFh
code:4DE7 28 DF                   jr       z, loc_0_4DC8
code:4DE9 F1                      pop      af
code:4DEA E1                      pop      hl
code:4DEB 11 80 3F                ld       de, video_ram+380h
code:4DEE CD E2 45                call     sub_0_45E2
code:4DF1 B7                      or       a
code:4DF2 C2 27 4B                jp       nz, loc_0_4B27
code:4DF5 CD 10 48                call     sub_0_4810
code:4DF8 E5                      push     hl
code:4DF9 F5                      push     af
code:4DFA 18 CC                   jr       loc_0_4DC8
code:4DFA              ; End of function sub_0_4D5F
code:4DFA
code:4DFC
code:4DFC              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4DFC
code:4DFC
code:4DFC              zero_scratchpad_ram:                 ; CODE XREF: code:4EFB├p
code:4DFC 21 EA 4E                ld       hl, 4EEAh
code:4DFF 11 EB 4E                ld       de, 4EEBh
code:4E02 01 0C 00                ld       bc, 0Ch
code:4E05 36 00                   ld       (hl), 0
code:4E07 ED B0                   ldir
code:4E09 C9                      ret
code:4E09              ; End of function zero_scratchpad_ram
code:4E09
code:4E0A
code:4E0A              ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4E0A
code:4E0A
code:4E0A              sub_0_4E0A:                          ; CODE XREF: update_bullet+DA↑p
code:4E0A E5                      push     hl
code:4E0B D9                      exx
code:4E0C D1                      pop      de
code:4E0D DD 21 EA 4E             ld       ix, 4EEAh
code:4E11 06 04                   ld       b, 4
code:4E13
code:4E13              loc_0_4E13:                          ; CODE XREF: sub_0_4E0A+1A├j
code:4E13 DD 6E 00                ld       l, (ix+0)
code:4E16 DD 66 01                ld       h, (ix+1)
code:4E19 CD E2 45                call     sub_0_45E2
code:4E1C FE 20                   cp       20h ; ' '
code:4E1E CA 26 4E                jp       z, loc_0_4E26
code:4E21 CD 2A 4E                call     add_3_to_ix
code:4E24 10 ED                   djnz     loc_0_4E13
code:4E26
code:4E26              loc_0_4E26:                          ; CODE XREF: sub_0_4E0A+14↑j
code:4E26 D9                      exx
code:4E27 C3 53 4D                jp       sub_0_4D53
code:4E27              ; End of function sub_0_4E0A
code:4E27
```

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code:4E2A
code:4E2A                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4E2A
code:4E2A
code:4E2A           add_3_to_ix:                            ; CODE XREF: sub_0_4C8A+49↑p
code:4E2A DD 23                                            ; sub_0_4D5F+D↑p ...
code:4E2A                   inc     ix
code:4E2C DD 23            inc     ix
code:4E2E DD 23            inc     ix
code:4E30 C9              ret
code:4E30          ; End of function add_3_to_ix
code:4E30
code:4E31
code:4E31                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4E31
code:4E31
code:4E31           display_GOOD_LUCK:                      ; CODE XREF: code:49F2↑p
code:4E31 CD 18 45         call    wipe_screen_left_to_right_slow
code:4E34 21 19 3E         ld      hl, video_ram+219h      ; cursor position
code:4E37 06 32           ld      b, 50                   ; flash 50 times
code:4E39
code:4E39           loc_0_4E39:                             ; CODE XREF:
display_GOOD_LUCK+26├j
code:4E39 C5              push    bc
code:4E3A 22 20 40         ld      (4020h), hl             ; current cursor position
code:4E3D E5              push    hl
code:4E3E 21 D6 4E         ld      hl, aGoodLuck           ; "GOOD LUCK"
code:4E41 CD E5 44         call    display_message
code:4E44 CD 5A 4E         call    delay_15ms
code:4E47 E1              pop     hl                      ; cursor position
code:4E48 22 20 40         ld      (4020h), hl
code:4E4B E5              push    hl
code:4E4C 21 E0 4E         ld      hl, blank_x9
code:4E4F CD E5 44         call    display_message
code:4E52 CD 5A 4E         call    delay_15ms
code:4E55 E1              pop     hl
code:4E56 C1              pop     bc
code:4E57 10 E0           djnz    loc_0_4E39              ; loop though all flashes
code:4E59 C9              ret
code:4E59          ; End of function display_GOOD_LUCK
code:4E59
code:4E5A
code:4E5A                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4E5A
code:4E5A
code:4E5A           delay_15ms:                             ; CODE XREF: update_bullet+59↑p
code:4E5A 01 E8 03                                         ; display_GOOD_LUCK+13↑p ...
code:4E5A                   ld      bc, 3E8h                ; ~15ms
code:4E5D C3 60 00         jp      60h                     ; delay
code:4E5D          ; End of function delay_15ms
code:4E5D
code:4E60
code:4E60                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4E60
code:4E60
code:4E60           delay_1_5ms:                            ; CODE XREF:
wipe_screen_left_to_right_slow+14↑p
code:4E60 01 64 00                                         ; code:4F76├p
code:4E60                   ld      bc, 64h ; 'd'           ; ~1.5ms
code:4E63 C3 60 00         jp      60h                     ; delay
code:4E63          ; End of function delay_1_5ms
code:4E63
code:4E66
code:4E66                 ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
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code:4E66
code:4E66
code:4E66           print_slow_and_check_for_R_key:         ; CODE XREF: code:4567↑p
code:4E66 E5                                               ; code:45A3↑p ...
code:4E66                   push    hl                      ; ptr message
code:4E67 DD E1           pop     ix
code:4E69
code:4E69           loc_0_4E69:                             ; CODE XREF:
```

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                                                           print_slow_and_check_for_R_key+18├j
code:4E69 DD 7E 00                                         ;
                                                           print_slow_and_check_for_R_key+28├j
code:4E69                    ld      a, (ix+0)             ; get character
code:4E6C B7                 or      a                     ; done?
code:4E6D C8                 ret     z                     ; yes, exit
code:4E6E FE 09              cp      9                     ; cursor position embedded?
code:4E70 20 0E              jr      nz, loc_0_4E80        ; no, skip
code:4E72 DD 6E 01           ld      l, (ix+1)
code:4E75 DD 66 02           ld      h, (ix+2)             ; cursor position
code:4E78 22 20 40           ld      (4020h), hl           ; set ROM variable
code:4E7B CD 2A 4E           call    add_3_to_ix
code:4E7E 18 E9              jr      loc_0_4E69            ; next character
code:4E80                ;
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code:4E80
code:4E80           loc_0_4E80:                            ; CODE XREF:
                                                           print_slow_and_check_for_R_key+A↑j
code:4E80 CD 33 00           call    33h                   ; display character
code:4E83 01 00 05           ld      bc, 500h              ; ~20ms
code:4E86 CD 60 00           call    60h                   ; delay
code:4E89 CD D9 45           call    check_for_R_key
code:4E8C DD 23              inc     ix                    ; next character
code:4E8E 18 D9              jr      loc_0_4E69            ; loop
code:4E8E            ; End of function print_slow_and_check_for_R_key
code:4E8E
code:4E90
code:4E90            ; ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ S U B R O U T I N E
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
code:4E90
code:4E90
code:4E90           display_lives_left:                    ; CODE XREF:
                                                           update_score_and_chk_bonus_life+24↑p
code:4E90 E5                                               ; code:49E9↑p ...
code:4E90               push    hl
code:4E91 D5            push    de
code:4E92 C5            push    bc
code:4E93 F5            push    af
code:4E94 2A 20 40        ld      hl, (4020h)           ; current cursor position
code:4E97 E5            push    hl
code:4E98 21 D0 3F        ld      hl, video_ram+3D0h    ; cursor position
code:4E9B 22 20 40        ld      (4020h), hl
code:4E9E 3A 0F 43        ld      a, (no_lives)
code:4EA1 3D            dec     a                     ; any lives left?
code:4EA2 28 14         jr      z, wipe_all_ship_icons
code:4EA4 47            ld      b, a                  ; number of lives
code:4EA5
code:4EA5           loc_0_4EA5:                            ; CODE XREF:
                                                           display_lives_left+1B├j
code:4EA5 21 CF 4E        ld      hl, mini_player
code:4EA8 CD E5 44        call    display_message
code:4EAB 10 F8         djnz    loc_0_4EA5
code:4EAD 3A 0F 43        ld      a, (no_lives)
code:4EB0 47            ld      b, a
code:4EB1 3E 04         ld      a, 4
code:4EB3 90            sub     b                     ; no. icons to wipe
code:4EB4 28 0C         jr      z, loc_0_4EC2         ; none, skip
code:4EB6 18 02         jr      wipe_ship_icons
code:4EB8                ;
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code:4EB8
code:4EB8           wipe_all_ship_icons:                   ; CODE XREF:
                                                           display_lives_left+12↑j
code:4EB8 06 03         ld      b, 3                  ; max 3 ship icons
code:4EBA
code:4EBA           wipe_ship_icons:                       ; CODE XREF:
                                                           display_lives_left+26↑j
code:4EBA 21 CB 4E                                         ; display_lives_left+30├j
code:4EBA               ld      hl, blank_x3
code:4EBD CD E5 44        call    display_message
code:4EC0 10 F8         djnz    wipe_ship_icons
code:4EC2
code:4EC2           loc_0_4EC2:                            ; CODE XREF:
                                                           display_lives_left+24↑j
code:4EC2 E1            pop     hl
code:4EC3 22 20 40        ld      (4020h), hl           ; restore cursor position
code:4EC6 F1            pop     af
```

```
code:4EC7 C1                      pop     bc
code:4EC8 D1                      pop     de
code:4EC9 E1                      pop     hl
code:4ECA C9                      ret
code:4ECA              ; End of function display_lives_left
code:4ECA
code:4ECA            ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4ECB 20 20 20 00 blank_x3:.db 20h, 20h, 20h, 0           ; DATA XREF:
display_lives_left+2A↑o
code:4ECF 88 8E 8C 00 mini_player:.db 88h, 8Eh, 8Ch, 0        ; DATA XREF:
display_lives_left+15↑o
code:4ED3 5C                      .db   5Ch ; \
code:4ED4 56                      .db   56h ; V
code:4ED5 2A                      .db   2Ah ; *
code:4ED6 47 4F 4F 44+aGoodLuck:.text "GOOD LUCK"             ; DATA XREF:
display_GOOD_LUCK+D↑o
code:4ED6 20 4C 55 43+           .db 0
code:4EE0 20 20 20 20+blank_x9:.db 20h, 20h, 20h, 20h, 20h, 20h, 20h, 20h, 20h, 0
code:4EE0 20 20 20 20+                                        ; DATA XREF:
display_GOOD_LUCK+1B↑o
code:4EEA D1                      .db 0D1h ; Ñ
code:4EEB 3E                      .db   3Eh ; >
code:4EEC 56                      .db   56h ; V
code:4EED DF                      .db 0DFh ; ß
code:4EEE 00                      .db    0 ;
code:4EEF 56                      .db   56h ; V
code:4EF0 92                      .db   92h ; '
code:4EF1 3F                      .db   3Fh ; ?
code:4EF2 56                      .db   56h ; V
code:4EF3 00                      .db    0 ;
code:4EF4 00                      .db    0 ;
code:4EF5 00                      .db    0 ;
code:4EF6 00                      .db    0 ;
code:4EF7 00                      .db    0 ;
code:4EF8 00                      .db    0 ;
code:4EF9 00                      .db    0 ;
code:4EFA 00                      .db    0 ;
code:4EFB            ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4EFB
code:4EFB              loc_0_4EFB:                             ; CODE XREF: code:4AAD↑j
code:4EFB CD FC 4D            call    zero_scratchpad_ram
code:4EFE AF                  xor     a
code:4EFF 32 12 43            ld      (byte_0_4312), a
code:4F02 32 20 43            ld      (byte_0_4320), a
code:4F05
code:4F05              game_loop:                              ; CODE XREF: code:4F95├j
code:4F05 3A 40 38            ld      a, (3840h)              ; read keyboard
code:4F08 57                  ld      d, a
code:4F09 01 00 02            ld      bc, 200h                ; ~7.5ms
code:4F0C CD 60 00            call    60h                     ; delay
code:4F0F 3A 40 38            ld      a, (3840h)              ; read keyboard
code:4F12 AA                  xor     d
code:4F13 E6 80               and     80h ; '€'               ; space - changed state?
code:4F15 20 0F               jr      nz, loc_0_4F26          ; yes, skip
code:4F17 3A 22 43            ld      a, (byte_0_4322)        ; last saved keyboard state
code:4F1A 5F                  ld      e, a
code:4F1B AA                  xor     d                       ; changed state?
code:4F1C A2                  and     d                       ; pressed?
code:4F1D E6 80               and     80h ; '€'               ; space only
code:4F1F 7A                  ld      a, d
code:4F20 32 22 43            ld      (byte_0_4322), a        ; store keyboard state
code:4F23 C4 E5 46            call    nz, handle_fire         ; yes, call
code:4F26
code:4F26              loc_0_4F26:                             ; CODE XREF: code:4F15↑j
code:4F26 3A 20 43            ld      a, (byte_0_4320)
code:4F29 E6 03               and     3
code:4F2B CC 88 48            call    z, check_and_handle_move
code:4F2E 3A 11 43            ld      a, (bullet_active)
code:4F31 B7                  or      a                       ; fired?
code:4F32 28 08               jr      z, loc_0_4F3C           ; no, skip
code:4F34 3A 20 43            ld      a, (byte_0_4320)
code:4F37 E6 03               and     3
code:4F39 CC 1C 47            call    z, update_bullet
code:4F3C
code:4F3C              loc_0_4F3C:                             ; CODE XREF: code:4F32↑j
```

```
code:4F3C 3A 20 43              ld      a, (byte_0_4320)
code:4F3F E6 07                 and     7
code:4F41 CC F6 48              call    z, update_ufo
code:4F44 CD BF 48              call    check_and_start_ufo
code:4F47 3A 10 43              ld      a, (ufo_active)
code:4F4A B7                    or      a
code:4F4B 20 0D                 jr      nz, loc_0_4F5A
code:4F4D 3A 0C 43              ld      a, (byte_0_430C)
code:4F50 FE 80                 cp      80h ; '€'
code:4F52 20 06                 jr      nz, loc_0_4F5A
code:4F54 21 00 3C              ld      hl, video_ram
code:4F57 CD 7E 4C              call    clear_video_line_HL
code:4F5A
code:4F5A            loc_0_4F5A:                             ; CODE XREF: code:4F4B↑j
code:4F5A 00                                                ; code:4F52↑j
code:4F5A                       nop
code:4F5B 3A 20 43              ld      a, (byte_0_4320)
code:4F5E E6 0F                 and     0Fh
code:4F60 F5                    push    af
code:4F61 CC 5F 4D              call    z, sub_0_4D5F
code:4F64 F1                    pop     af
code:4F65 CC 8A 4C              call    z, sub_0_4C8A
code:4F68 21 20 43              ld      hl, 4320h
code:4F6B 34                    inc     (hl)
code:4F6C 3A 21 43              ld      a, (byte_0_4321)
code:4F6F 3D                    dec     a
code:4F70 F5                    push    af
code:4F71 CC 48 4B              call    z, sub_0_4B48
code:4F74 F1                    pop     af
code:4F75 F5                    push    af
code:4F76 C4 60 4E              call    nz, delay_1_5ms
code:4F79 F1                    pop     af
code:4F7A 20 06                 jr      nz, loc_0_4F82
code:4F7C 3A 01 43              ld      a, (invaders_left)
code:4F7F 87                    add     a, a
code:4F80 D6 01                 sub     1
code:4F82
code:4F82            loc_0_4F82:                             ; CODE XREF: code:4F7A↑j
code:4F82 32 21 43              ld      (byte_0_4321), a
code:4F85 3A 11 43              ld      a, (bullet_active)
code:4F88 B7                    or      a                   ; fired?
code:4F89 20 0A                 jr      nz, loc_0_4F95      ; yes, skip
code:4F8B 3A 00 43              ld      a, (byte_0_4300)
code:4F8E B7                    or      a
code:4F8F 28 04                 jr      z, loc_0_4F95
code:4F91 3D                    dec     a
code:4F92 32 00 43              ld      (byte_0_4300), a
code:4F95
code:4F95            loc_0_4F95:                             ; CODE XREF: code:4F89↑j
code:4F95 C3 05 4F                                          ; code:4F8F↑j
code:4F95                       jp      game_loop
code:4F95            ;
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
code:4F98 43 4F 50 59+aCopyrightC1979:.text "COPYRIGHT (C) 1979, "
code:4FAC B0 37 2F 31+          .db 0B0h, 37h, 2Fh, 31h, 33h, 42h, 59h, 20h, 54h, 52h, 53h, 2Dh
code:4FAC 33 42 59 20+          .db 42h, 4Dh, 20h, 4Bh, 4Fh, 47h, 41h, 4Eh, 45h, 49h, 0, 81h,
5Fh
code:4FAC 54 52 53 2D+          .db 7Ah, 0FEh, 30h, 28h, 2, 77h, 23h, 7Bh, 0Eh, 0Ah, 10h, 0ECh
code:4FAC 42 4D 20 4B+          .db 0C6h, 30h, 77h, 23h, 36h, 3, 0E1h, 6, 20h, 3Eh, 0, 3Dh, 20h
code:4FAC 4F 47 41 4E+          .db 4, 77h, 23h, 10h, 0FCh, 0AFh, 0C9h, 3Ah, 0C4h, 4Eh, 6Fh,
0CBh
code:4FAC 45 49 00 81+          .db 0A6h, 5Ah, 23h, 56h, 0CDh, 82h, 4Eh, 7Bh, 0Fh, 0Fh, 0Fh,
0E6h
code:4FAC 5F 7A FE 30+          .db 1Fh, 0C5h, 21h, 0C0h, 4Dh, 4Fh, 6, 0, 9, 7Bh
code:4FAC 28 02 77 23+; end of 'code'
code:4FAC 7B 0E 0A 10+
code:4FAC EC C6 30 77+
code:4FAC 23 36 03 E1+          .end
```