Diseño de un sistema operativo de disco

(Por Primitivo de Francisco y Jesús Alonso)

Capítulo .....Pag.

DOS 2.3..... 2

Hardware..... 23

Disc 2.3 28

DOS 3.0..... 31

Disc 3.0 53

Backup..... 56

Format..... 62

Scopy 70

Disc-cat..... 84

Western Digital..... 86

Tandom 101

DOS V 2.3

DIRECCION REAL PAGINADA → 0000

(23755) 5CCB ↓ (23867) 5D3B } 112 BYTES

ZONA DESPLAZADA DE PROG

```
A000 F3          DI
A001 11FFFF      LD   DE,FFFF
A004 3E07        LD   A,07
A006 1801        JR   A009
A008 00          NOP
A009 D3FE        OUT  (FE),A
A00B 3E3F        LD   A,3F
A00D 1804        JR   A013
A00F 00          NOP
A010 C3013D      JP   3D01      ← IMPRESION
A013 ED47        LD   I,A
A015 00          NOP
A016 1803        JR   A018
A018 C30F3D      JP   3D0F      ← IMPRESION TEXTO
A01B 00          NOP
A01C 00          NOP
A01D 00          NOP
A01E 62          LD   H,D
A01F 6B          LD   L,E
A020 3602        LD   (HL),02
A022 2B          DEC  HL
A023 BC          CP   H
A024 20FA        JR   NZ,A020
A026 B7          OR   A
A027 ED52        SBC  HL,DE
A029 19          ADD  HL,DE
A02A 23          INC  HL
A02B 3008        JR   NC,A033
A02D 35          DEC  (HL)
A02E 2803        JR   Z,A033
A030 35          DEC  (HL)
A031 28F3        JR   Z,A026
A033 2B          DEC  HL
A034 22B45C      LD   (5CB4),HL   PRAMT
A037 11AF3E      LD   DE,3EAF
A03A 01A800      LD   BC,00A8
A03D 7B          LD   A,E
A03E EB          EX   DE,HL
A03F 310050      LD   SP,5000
A042 CDF13C      CALL 3CF1 →
A045 EB          EX   DE,HL
A046 23          INC  HL
A047 227B5C      LD   (5C7B),HL   UDG
A04A 2B          DEC  HL
A04B 01401E      LD   BC,1E40
A04E ED4338B5C   LD   (5C38),BC   RASP
A052 22B25C      LD   (5CB2),HL   RAMTOP
A055 21003C      LD   HL,3C00
A058 22365C      LD   (5C36),HL   CHARS
A05B 2AB25C      LD   HL,(5CB2)
A05E 363E        LD   (HL),3E
A060 2B          DEC  HL
A061 F9          LD   SP,HL
A062 2B          DEC  HL
A063 25          DEC  HL
A064 223D5C      LD   (5C3D),HL   ERR-SP
A067 110313      LD   DE,1303
A06A D5          PUSH DE
A06B ED56        IM   1
A06D FD213A5C    LD   IY,5C3A     ERR-NR
A071 21B65C      LD   HL,5CB6     FUERA
A074 224F5C      LD   (5C4F),HL   CHANS
A077 11AF15      LD   DE,15AF
A07A 011500      LD   BC,0015
A07D EB          EX   DE,HL
A07E CDF83C      CALL 3CF8 →
A081 EB          EX   DE,HL
A082 2B          DEC  HL
A083 22575C      LD   (5C57),HL   DATADD
A086 23          INC  HL
A087 22535C      LD   (5C53),HL   PROG
A08A 224B5C      LD   (5C4B),HL   VARS
A08D 3680        LD   (HL),80
A08F 23          INC  HL
A090 22595C      LD   (5C59),HL   ELINE
A093 CDB702      CALL 02B7
A096 23          INC  HL
A097 22615C      LD   (5C61),HL   WORKSP
A09A 22635C      LD   (5C63),HL   STKBOT
A09D 22655C      LD   (5C65),HL   STKEND
A0A0 3E38        LD   A,38
A0A2 328D5C      LD   (5C8D),A    ATTRP
A0A5 328F5C      LD   (5C8F),A    ATTRT
A0A8 32485C      LD   (5C48),A    BORDCR
A0AB 212303      LD   HL,0323
A0AE 22095C      LD   (5C09),HL   REPDEL
A0B1 FD35C6      DEC  (IY+C6)
A0B4 FD35CA      DEC  (IY+CA)
A0B7 211615      LD   HL,1516
A0BA 11105C      LD   DE,5C10     STRMS
A0BD 010E00      LD   BC,000E
A0C0 CDF83C      CALL 3CF8
A0C3 FDCB01CE    SET  1,(IY+01)
A0C7 21DF0E      LD   HL,0EDF
A0CA CDBE0A      CALL 0ABE
A0CD 21655C      LD   HL,5C6B     DEFSZ
A0D0 3602        LD   (HL),02
A0D2 218B12      LD   HL,128B
A0D5 E5          PUSH HL
A0D6 C3793D      JP   3D79
```

BORDE BLANCO

```
A0D9 CD213D     CALL 3D21
A0DC CDBD01     CALL 01BD
A0DF CDBB0A     CALL 0ABB
A0E2 2A595C     LD   HL,(5C59)   ELINE
A0E5 7E         LD   A,(HL)
A0E6 FEAA       CP   AA
A0E8 2007       JR   NZ,A0F1
A0EA 23         INC  HL
A0EB 5E         LD   E,(HL)
A0EC 23         INC  HL
A0ED 56         LD   D,(HL)
A0EE EB         EX   DE,HL
A0EF 1803       JR   A0F4
A0F1 210100     LD   HL,0001
A0F4 22425C     LD   (5C42),HL   NEWPPC
A0F7 AF         XOR  A
A0F8 32445C     LD   (5C44),A    NSPPC
A0FB 216016     LD   HL,1660
A0FE CDE50A     CALL 0AE5
A101 2A535C     LD   HL,(5C53)   PROG
A104 25         DEC  HL
A105 22575C     LD   (5C57),HL   DATADD
A108 211B3C     LD   HL,3C1B
A10B CDE50A     CALL 0AE5
→A10E CD213D    CALL 3D21
A111 3EFF       LD   A,FF
A113 32155D     LD   (5D15),A    STRMS
A116 AF         XOR  A
A117 32F75C     LD   (5CF7),A    —
A11A CDA63D     CALL 3DA6
A11D 3EAA       LD   A,AA
A11F 32175D     LD   (5D17),A    —
A122 217E01     LD   HL,017E
A125 221A5D     LD   (5D1A),HL   —
A128 210000     LD   HL,0000
A12B 39         ADD  HL,SP
A12C 221C5D     LD   (5D1C),HL   —
A12F 2B         DEC  HL
A130 2B         DEC  HL
A131 F9         LD   SP,HL
A132 CDA801     CALL 01A8
A135 2A5D5C     LD   HL,(5C5D)   CHADD
A138 CD5501     CALL 0155
A13B CA3E01     JP   Z,013E
A13E FEEA       CP   EA
A140 23         INC  HL
A141 20F5       JR   NZ,A138
A143 CD5501     CALL 0155
A146 28F3       JR   Z,A13B
A148 FE3A       CP   3A
A14A C25E01     JP   NZ,015E
A14D 23         INC  HL
A14E 7E         LD   A,(HL)
A14F 22115D     LD   (5D11),HL
A152 C31F02     JP   021F

A155 7E         LD   A,(HL)
A156 FE0D       CP   0D
A158 C8         RET  Z
A159 FE80       CP   80
A15B C8         RET  Z
A15C B7         OR   A
A15D C9         RET
→A15E CD213D    CALL 3D21 →
A161 3A175D     LD   A,(5D17)
A164 B7         OR   A
A165 2003       JR   NZ,A16A
A167 CDF53E     CALL 3EF5 →      CALCULA
A16A CD5908     CALL 0859        BYTES LIBRES ?
A16D CD9D01     CALL 019D
A170 ED7B1C5D   LD   SP,(5D1C)
A174 2A1A5D     LD   HL,(5D1A)
A177 ED4B0F5D   LD   BC,(5D0F)
A17B 0600       LD   B,00
A17D E9         JP   HL
A17E CDBD01     CALL 01BD
A181 FDCB007E   BIT  7,(IY+00)
A185 C0         RET  NZ
A186 2A635C     LD   HL,(5C63)   STKBOT
A189 22655C     LD   (5C65),HL   STKEND
A18C E5         PUSH HL
A18D 21925C     LD   HL,5C92     MEMBOT
A190 22685C     LD   (5C68),HL
A193 E1         POP  HL
A194 11BE3C     LD   DE,3CBE     —
A197 ED7B3D5C   LD   SP,(5C3D)   ERRSP
A19B D5         PUSH DE
A19C C9         RET
A19D CDAE0A     CALL 0AAE
A1A0 FE0D       CP   0D
A1A2 C8         RET  Z
A1A3 CD6F0B     CALL 0B6F
A1A6 18F5       JR   A19D
A1A8 2A3D5C     LD   HL,(5C3D)   ERRSP
A1AB 22135D     LD   (5D13),HL
A1AE 2A1C5D     LD   HL,(5D1C)   STRMS
A1B1 2B         DEC  HL
A1B2 2B         DEC  HL
A1B3 223D5C     LD   (5C3D),HL
A1B6 110F3C     LD   DE,3C0F
A1B9 73         LD   (HL),E
A1BA 23         INC  HL
A1BB 72         LD   (HL),D
A1BC C9         RET
```

(3)

```
  A1BD 2A135D   LD   HL,(5D13)
  A1C0 223D5C   LD   (5C3D),HL
  A1C3 C9       RET
→ A1C4 210000   LD   HL,0000
  A1C7 22F75C   LD   (5CF7),HL
  A1CA 39       ADD  HL,SP
  A1CB 22105D   LD   (5D10),HL
  A1CE 2B       DEC  HL
  A1CF 2B       DEC  HL
  A1D0 F9       LD   SP,HL
  A1D1 CDA801   CALL 01A8
  A1D4 21175D   LD   HL,5D17
  A1D7 7E       LD   A,(HL)
  A1D8 CAF101   JP   Z,01F1
  A1DB 36AA     LD   (HL),AA
  A1DD CDB80A   CALL 0AB8
  A1E0 CDAA0A   CALL 0AAA
  A1E3 217702   LD   HL,0277 → FICHERO MENSAJE INICIAL
  A1E6 DF       RST  18          0289
  A1E7 21D13F   LD   HL,3FD1 → RESTO DEL MENSAJE (QUITAR 2ª PARTE DEL MENSAJE)
  A1EA DF 9902  RST  18
  A1EB CDA93D   CALL 3DA9 → PREPARA CONTROLADOR
  A1EE CDCF02   CALL 02CF → PREGUNTA CLAVE
  A1F1 2A105D   LD   HL,(5D10)
  A1F4 2B       DEC  HL
  A1F5 2B       DEC  HL
  A1F6 F9       LD   SP,HL
  A1F7 CD213D   CALL 3D21 →
  A1FA CDA40A   CALL 0AA4 → CANAL Ø
  A1FD CDC03E   CALL 3EC0 → RUTINA ANTIMODIFICACION
  A200 AF       XOR  A
  A201 32155D   LD   (5D15),A
  A204 21F101   LD   HL,01F1
  A207 221A5D   LD   (5D1A),HL
  A20A CDA63D   CALL 3DA6 →
  A20D CD4C3D   CALL 3D4C →
  A210 AF       XOR  A
  A211 320F5D   LD   (5D0F),A
  A214 2A595C   LD   HL,(5C59)
  A217 22115D   LD   (5D11),HL
  A21A 7E       LD   A,(HL)
  A21B FE0D     CP   0D
  A21D 28EE     JR   Z,A20D
  A21F 2A1F5D   LD   HL,(5D1F)
  A222 2B       DEC  HL
  A223 0E00     LD   C,00
  A225 0C       INC  C
  A226 57       LD   D,A
  A227 3A235D   LD   A,(5D23)
  A22A B9       CP   C
  A22B DA5E01   JP   C,015E
  A22E 7A       LD   A,D
  A22F 23       INC  HL
  A230 BE       CP   (HL)
  A231 20F2     JR   NZ,A225
  A233 AF       XOR  A
  A234 320F5D   LD   (5D0F),A
  A237 32D65C   LD   (5CD6),A
  A23A 32105D   LD   (5D10),A
  A23D 213B5C   LD   HL,5C3B
  A240 CBBE     RES  7,(HL)
  A242 0600     LD   B,00
  A244 2A215D   LD   HL,(5D21)
  A247 0D       DEC  C
  A248 CB21     SLA  C
  A24A 09       ADD  HL,BC
  A24B 5E       LD   E,(HL)
  A24C 23       INC  HL
  A24D 56       LD   D,(HL)
  A24E EB       EX   DE,HL
  A24F E5       PUSH HL
  A250 115502   LD   DE,0255
  A253 D5       PUSH DE
  A254 E9       JP   HL
  A255 213B5C   LD   HL,5C3B
  A258 CBFE     SET  7,(HL)
  A25A E1       POP  HL
  A25B E9       JP   HL
  A25C CD960A   CALL 0A96
  A25F CD4D03   CALL 034D
  A262 21C33F   LD   HL,3FC3 → "NUEVA CLAVE"
  A265 DF D3    RST  18
  A266 CDCF02   CALL 02CF
  A269 11EA5B   LD   DE,5BEA → DESTINO  ┐
  A26C 21065D   LD   HL,5D06 → ORIGEN   │ RECOLOCA EL NUEVO NOMBRE DE CLAVE
  A26F 010900   LD   BC,0009 → Nº       ┘
  A272 EDB0     LDIR
  A274 C31B3D   JP   3D1B
```

16 01 0B 1401 -- L.D.I. ... ØL 1480

... DF

* TR-DOS Ver 2.3 *

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↑ TEXTO DE CABECERA

```
A277  16 01 05 2A* 20 54 52 2D
A27F  44D 4FO 50S 20  56V 65e 72r 20
A287  322 2E. 333 20  2A* 0D  0D  7F©
A28F  20  311 399 388 344 20  54T 65e
A297  63c 68h 6En 6Fo 6CL 6Fo 67J 79Y
A29F  20  52R 65e 73s 65e 61a 72r 63c
A2A7  68h 20  4CL 74t 64d 2E· 16  05
A2AF  0B  28( 55U 2E. 4BK 2E. 29) 00
```

TABLA CON EL TEXTO

```
A2B7  2A595D    LD   HL,(5D59)   E LINE
A2BA  3622      LD   (HL),22
A2BC  23        INC  HL
A2BD  225B5D    LD   (5D5B),HL   K CUR
A2C0  3622      LD   (HL),22
A2C2  23        INC  HL
A2C3  360D      LD   (HL),0D
A2C5  23        INC  HL
A2C6  3680      LD   (HL),80
A2C8  C9        RET
A2C9  CDB702    CALL 02B7
A2CC  C3B30A    JP   0AB3 → TECLADO
A2CF  CDA40A    CALL 0AA4 → CANAL K
A2D2  213C3F    LD   HL,3F3C
A2D5  DF 18     RST  18
A2D6  CDC302    CALL 02C3
A2D9  CDC80A    CALL 0AC8
A2DC  2A595D    LD   HL,(5D59)   END LINE
A2DF  23        INC  HL
A2E0  0609      LD   B,09 → CARACTERES DEL NOMBRE
A2E2  0E00      LD   C,00          DE LA CLAVE
A2E4  11055D    LD   DE,5D06
A2E7  7E        LD   A,(HL)
A2E8  FE22      CP   22 → "
A2EA  2001      JR   NZ,A2ED
A2EC  1F        LD   C,A
A2ED  F5        PUSH AF
A2EE  79        LD   A,C
A2EF  FE22      CP   22 → "
A2F1  2005      JR   NZ,A2F8
A2F3  F1        POP  AF
A2F4  3E20      LD   A,20
A2F6  1801      JR   A2F9
A2F8  F1        POP  AF
A2F9  12        LD   (DE),A
A2FA  23        INC  HL
A2FB  13        INC  DE
A2FC  10E9      DJNZ A2E7
A2FE  C9        RET
A2FF  CD4803    CALL 0348
A302  CDFF3C    CALL 3CFF → PRINT "0D"
A305  CDFF3C    CALL 3CFF → PRINT "0D"
A308  ED4BE55B  LD   BC,(5BE5)
A30C  CDCD0A    CALL 0ACD
A30F  21893F    LD   HL,3F89
A312  DF 8A     RST  18
A313  C35E01    JP   015E
A316  320F5D    LD   (5D0F),A
A319  3A155D    LD   A,(5D15)
A31C  B7        OR   A
A31D  CC0F3D    CALL Z,3D0F →
A320  C9        RET
      8F
A321  214D3F    LD   HL,3F4D
A324  3E01      LD   A,01
A326  C3A809    JP   09A8
A329  AF        XOR  A
A32A  32CC5C    LD   (5CCC),A
A32D  ED5BCC5C  LD   DE,(5CCC)
A331  1600      LD   D,00
A333  21175D →  LD   HL,5D17
A336  AF        XOR  A
A337  BE        CP   (HL)
A338  77        LD   (HL),A
A339  2805      JR   Z,A340
A33B  D5        PUSH DE
A33C  CDFD3E    CALL 3EFD →
A33F  D1        POP  DE
A340  21005B    LD   HL,5B00
A343  0601      LD   B,01
A345  C38D0B    JP   0B8D
A348  110800    LD   DE,0008
A34B  18E6      JR   A333
```

2B
22 3D 5C
11 03 13
C3 64 ØØ

RESTITUYE LO MODIFICADO EN 0066 RESTO DE CODIGO PARA LA MODIFICACION (NMI)

22 ---- 22 0D 80

SIMULA LINEA BASIC PARA EDITAR NOMBRE CLAVE

CALL 3DA9 → DISCO + TEMPORIZ
POP HL
POP BC
RET

CLAVE ?

EVITA CLAVE

CLAVE

5D06 ⋮ 5D0E — NOMBRE DE LA CLAVE

GUARDA LA CLAVE TECLEADA

"FREE"

CALCULA BYTES LIBRES TRAS CAT

"NO FILE (S)"

```
A34D CD4803   CALL 0348
A350 3AE75B   LD   A,(5BE7)
A353 FE07     CP   07
A355 280A     JR   Z,A361
A357 FE0A     CP   0A
A359 2806     JR   Z,A361
A35B 21BB3F   LD   HL,3F9E
A35E DF       RST  18
A35F 18B2     JR   A313
A361 ED4BF65C LD   BC,(5CF6)
A365 21C45C   LD   HL,5CC4
A368 09       ADD  HL,BC
A369 77       LD   (HL),A
A36A 3AE35B   LD   A,(5BE3)
A36D 23       INC  HL
A36E 23       INC  HL
A36F 23       INC  HL
A370 23       INC  HL
A371 77       LD   (HL),A
A372 21065D   LD   HL,5D06
A375 11EA5B   LD   DE,5BEA
A378 0609     LD   B,09
A37A CD6E3D   CALL 3D6E
A37D C8       RET  Z
A37E CDCF02   CALL 02CF
A381 18CA     JR   A34D
A383 2A115D   LD   HL,(5D11)
A386 23       INC  HL
A387 7E       LD   A,(HL)
A388 FE0D     CP   0D
A38A CA9A03   JP   Z,039A
A38D CD000B   CALL 0B00
A390 CD960A   CALL 0A96
A393 CDD20A   CALL 0AD2
A396 EB       EX   DE,HL
A397 CDDE09   CALL 09DE
A39A CD960A   CALL 0A96
A39D CD4D03   CALL 034D
A3A0 CDBB0A   CALL 0ABB
A3A3 CDAA0A   CALL 0AAA
A3A6 21EB3F   LD   HL,3FBB
A3A9 DF       RST  18
A3AA 21F55B   LD   HL,5BF5
A3AD DF       RST  18
A3AE CDFF3C   CALL 3CFF
A3B1 3AE45B   LD   A,(5BE4)
A3B4 21F45B   LD   HL,5BF4
A3B7 96       SUB  (HL)
A3B8 E5       PUSH HL
A3B9 CDBA3E   CALL 3EBA
A3BC 21503F   LD   HL,3F50
A3BF DF       RST  18
A3C0 E1       POP  HL
A3C1 4E       LD   C,(HL)
A3C2 CDBB3E   CALL 3EBB
A3C5 21593F   LD   HL,3F59
A3C8 DF       RST  18
A3C9 CD2903   CALL 0329
A3CC 21005B   LD   HL,5B00
A3CF CDE53E   CALL 3EE5
A3D2 CDFF3C   CALL 3CFF
A3D5 3AF65C   LD   A,(5CF6)
A3D8 C641     ADD  A,41
A3DA D7       RST  10
A3DB 0602     LD   B,02
A3DD CDE53E   CALL 3EE5
A3E0 C5       PUSH BC
A3E1 3E3A     LD   A,3A
A3E3 D7       RST  10
A3E4 E5       PUSH HL
A3E5 CD763D   CALL 3D76
A3E8 010D00   LD   BC,000D
A3EB E1       POP  HL
A3EC E5       PUSH HL
A3ED 09       ADD  HL,BC
A3EE 4E       LD   C,(HL)
A3EF C5       PUSH BC
A3F0 79       LD   A,C
A3F1 0602     LD   B,02
A3F3 FE0A     CP   0A
A3F5 3801     JR   C,A3F8
A3F7 05       DEC  B
A3F8 FE64     CP   64
A3FA 3005     JR   NC,A401
A3FC 3E20     LD   A,20
A3FE D7       RST  10
A3FF 10FB     DJNZ A3FC
A401 C1       POP  BC
A402 CDCD0A   CALL 0ACD
A405 E1       POP  HL
A406 C1       POP  BC
A407 111000   LD   DE,0010
A40A 19       ADD  HL,DE
A40B 10D0     DJNZ A3DD
A40D 18C0     JR   A3CF
A40F 111000   LD   DE,0010
A412 19       ADD  HL,DE
A413 C9       RET
```

- CALL 0348 → SALTA AL DISCO
- LD A,(5BE7) → CODIGO ERROR
- LD HL,3F9E / RST 18 → "DISK ERROR"
- JR A313 → JP Ø15E
- LD HL,5D06 / LD DE,5BEA → PUNTEROS CLAVE DISCO
- 5D06 = CLAVE TECLEADO
- 5BEA = CLAVE DISCO

```
LD A,(DE)
CP (HL)
RET NZ
INC DE
INC HL
DJNZ
RET
```

- TITULO / FICHEROS / BORRADOS
- LD HL,3FBB / RST 18 → "TITULO" (DEL TITULO)
- LD HL,5BF5 / RST 18 → "NOMBRE"
- CALL 3CFF → IMPRIME OD

```
A3B1 — 21593F  LD HL,"FICHEROS"
       DF      RST 18
       3AE45B  LD A,(5BE4)
       21F45B  LD HL,5BF4
       96      SUB (HL)
       E5      PUSH HL
       CDBA3E  CALL 3EBA → IMPRIME Nº
       21633F  LD HL,"BORRADOS"
       DF      RST 18
       E1      POP HL
       4E      LD C,(HL)
       CDBB3E  CALL 3EBB → IMPRIME Nº
```

- LD HL,3F50 / RST 18 → "FILE(S)" OD
- LD HL,3F59 / RST 18 → "DEL. FILES" OD
- C9 RET → BYTE DE RETORNO POR LA RUTINA ANTERIOR
- 3EB1 C5 PUSH BC
- 3E70 LD A,70H
- D7 RST 10H
- C1 POP BC
- 79 LD A,C
- FE0E CP 0E
- C8 RET Z
- 3E70 LD A,70H
- D7 RST 10H
- 3E70
- C9 RET
- CALL 3CFF → PRINT "OD"
- ADD A,41 / RST 10 → PRINT "A"
- LD A,3A / RST 10 → PRINT ":" (CD E13E)
- CALL 3D76 → "NOMBRE [B]"
- OR A / RET Z / C6 41 / D7 / C9 — IMPRIME SOLO [B:]
- 3ED7 CD FE3C / C3 2903
- LD B,02 → MAXIMO DOS ESPACIOS
- LD A,20 / RST 10 → ESPACIO

```
A414 E5        PUSH HL
A415 C5        PUSH BC
A416 0100A4    LD   BC,A400
A419 09        ADD  HL,BC
A41A 7C        LD   A,H
A41B B5        OR   L
A41C 2803      JR   Z,A421
A41E C1        POP  BC
A41F E1        POP  HL
A420 C9        RET
A421 21005D    LD   HL,5D00
A424 34        INC  (HL)
A425 CD2D03    CALL 032D
A428 C1        POP  BC
A429 E1        POP  HL
A42A 21005B    LD   HL,5B00
A42D C9        RET
A42E CD000B    CALL 0B00
A431 CD960A    CALL 0A96
A434 CDD20A    CALL 0AD2
A437 79        LD   A,C
A438 B8        CP   B
A439 CA600A    JP   Z,0A60
A43C 1A        LD   A,(DE)
A43D E6DF      AND  DF
A43F DE41      SBC  A,41
A441 DA600A    JP   C,0A60
A444 FE04      CP   04
A446 D2600A    JP   NC,0A60
A449 32195D    LD   (5D19),A
A44C CDA93D    CALL 3DA9 ──→
A44F C35E01    JP   015E
A452 CDEE0A    CALL 0AEE
A455 CD960A    CALL 0A96
A458 CD8C04    CALL 048C
A45B CD160A    CALL 0A16
A45E 3AF65C    LD   A,(5CF6)
A461 32F85C    LD   (5CF8),A
A464 C22103    JP   NZ,0321
A467 C5        PUSH BC
A468 CD1205    CALL 0512
A46B CD160A    CALL 0A16
A46E F5        PUSH AF
A46F 3AF85C    LD   A,(5CF8)
A472 21F85C    LD   HL,5CF8
A475 BE        CP   (HL)
A476 C2600A    JP   NZ,0A60
A479 CD4D03    CALL 034D ──→ Error Disco
A47C F1        POP  AF
A47D CAAE09    JP   Z,09AE
A480 C1        POP  BC
A481 CD1905    CALL 0519
A484 C31B3D    JP   3D1B ──→
A487 3A105D    LD   A,(5D10)
A48A B7        OR   A
A48B C9        RET
A48C 0643      LD   B,43
A48E 3AD65C    LD   A,(5CD6)
A491 B7        OR   A
A492 2016      JR   NZ,A4AA
A494 CD8704    CALL 0487
A497 2011      JR   NZ,A4AA
A499 CDAE0A    CALL 0AAE
A49C FEAF      CP   AF
A49E 0643      LD   B,43
A4A0 2808      JR   Z,A4AA
A4A2 FEE4      CP   E4
A4A4 0644      LD   B,44
A4A6 2802      JR   Z,A4AA
A4A8 0642      LD   B,42
A4AA 21E55C    LD   HL,5CE5
A4AD 70        LD   (HL),B
A4AE C9        RET
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A4AF CD0005    CALL 0B00
A4B2 CD960A    CALL 0A96
A4B5 CD8C04    CALL 048C
A4B8 CD883D    CALL 3D88 ──►
A4BB C22103    JP   NZ,0321
A4BE C5        PUSH BC
A4BF CD4803    CALL 0348
A4C2 3AE45B    LD   A,(5BE4)
A4C5 C1        POP  BC
A4C6 0C        INC  C
A4C7 B9        CP   C
A4C8 2005    ┌─JR   NZ,A4CF
A4CA 3D      │ DEC  A
A4CB 32E45B  │ LD   (5BE4),A
A4CE AF      │ XOR  A
A4CF F5      └►PUSH AF
A4D0 2804    ┌─JR   Z,A4D6
A4D2 21F45B  │ LD   HL,5BF4
A4D5 34      │ INC  (HL)
A4D6 C5      └►PUSH BC
A4D7 CD930B    CALL 0B93
A4DA C1        POP  BC
A4DB 0D        DEC  C
A4DC CD1205    CALL 0512
A4DF F1        POP  AF
A4E0 CAE504  ┌─JP   Z,04E5
A4E3 3E01    │ LD   A,01
A4E5 32DD5C  └►LD   (5CDD),A
A4E8 F5        PUSH AF
A4E9 CD900B    CALL 0B90
A4EC F1        POP  AF
A4ED C25E01    JP   NZ,015E
A4F0 CD4803    CALL 0348
A4F3 2AEB5C    LD   HL,(5CEB)
A4F6 22E15B    LD   (5BE1),HL
A4F9 ED5BEA5C  LD   DE,(5CEA)
A4FD 2AE55B    LD   HL,(5BE5)
A500 1600      LD   D,00
A502 19        ADD  HL,DE
A503 22E555    LD   (5BE5),HL
A506 C31B3D    JP   3D1B ──►
A509 CD1205    CALL 0512
A50C 3ADD5C    LD   A,(5CDD)
A50F FE01      CP   01
A511 C9        RET
A512 AF        XOR  A
A513 C5      ┌►PUSH BC
A514 CD5B06  │ CALL 065B
A517 C1      │ POP  BC
A518 C9      │ RET
A519 3EFF    │ LD   A,FF
A51B 18F6    └─JR   A513
A51D 2AE15C    LD   HL,(5C61)  WORKSP
A520 22CF5C    LD   (5CCF),HL
A523 011001    LD   BC,1000
A526 C3640B    JP   0B64
A529 22D75C    LD   (5CD7),HL
A52C 22DB5C    LD   (5CDB),HL
A52F ED5BEA5C  LD   DE,(5CEA)
A533 2AD95C    LD   HL,(5CD9)
A536 1600      LD   D,00
A538 19        ADD  HL,DE
A539 22D95C    LD   (5CD9),HL
A53C C9        RET
A53D CD960A    CALL 0A96
A540 CD1D05    CALL 051D
A543 CD4D03    CALL 034D ──► ERROR DISP
A546 3AF45B    LD   A,(5BF4)
A549 B7        OR   A
A54A CA5E01    JP   Z,015E
A54D 210000    LD   HL,0000
A550 22D95C    LD   (5CD9),HL
A553 0EFF    ┌►LD   C,FF
A555 0C      │ INC  C
A556 CD0905  │ CALL 0509
A559 20FA    └─JR   NZ,A555
A55B 79        LD   A,C
A55C 32D45C    LD   (5CD4),A
A55F 2AEB5C    LD   HL,(5CEB)
A562 22D55C    LD   (5CD5),HL
A565 CD2905    CALL 0529
A568 0C      ┌►INC  C
A569 CD0905  │ CALL 0509
A56C 28FA    └─JR   Z,A568
A56E FE00      CP   00
A570 2018    ┌─JR   NZ,A58A
A572 3AD45C  │ LD   A,(5CD4)
A575 4F      │ LD   C,A
A576 0C      │ INC  C
A577 CD0905  │ CALL 0509
A57A FE00    │ CP   00
A57C 2868    │ JR   Z,A5E6
A57E AF      │ XOR  A
A57F 32DD5C  │ LD   (5CDD),A
A582 CD900B  │ CALL 0B90
A585 CD2905  │ CALL 0529
A588 18EC    │ JR   A576
A58A 3AEA5C  └►LD   A,(5CEA)
A58D 32D35C    LD   (5CD3),A
A590 32D15C    LD   (5CD1),A
A593 2AEB5C    LD   HL,(5CEB)
A596 22D55C    LD   (5CD5),HL
A599 C5        PUSH BC
A59A CD1F06    CALL 061F
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A59D C1          POP   BC
A59E 2AF45C      LD    HL,(5CF4)
A5A1 22D55C      LD    (5CD5),HL
A5A4 22EB5C      LD    (5CEB),HL
A5A7 AF          XOR   A
A5A8 32EA5C      LD    (5CEA),A
A5AB 3ADD5C      LD    A,(5CDD)
A5AE F5          PUSH  AF
A5AF 3E01        LD    A,01
A5B1 32DD5C      LD    (5CDD),A
A5B4 CD900B      CALL  0B90
A5B7 F1          POP   AF
A5B8 32DD5C      LD    (5CDD),A
A5BB 3AD45C      LD    A,(5CD4)
A5BE 4F          LD    C,A
A5BF 2AD85C      LD    HL,(5CD8)
A5C2 22EB5C      LD    (5CEB),HL
A5C5 3AD15C      LD    A,(5CD1)
A5C8 32EA5C      LD    (5CEA),A
A5CB CD900B      CALL  0B90
A5CE 3AD45C      LD    A,(5CD4)
A5D1 3C          INC   A
A5D2 4F          LD    C,A
A5D3 CD1205      CALL  0512
A5D6 2AD55C      LD    HL,(5CD5)
A5D9 22EB5C      LD    (5CEB),HL
A5DC CD900B      CALL  0B90
A5DF 3AD45C      LD    A,(5CD4)
A5E2 4F          LD    C,A
A5E3 C35505      JP    0555

A5E6 2ACF5C      LD    HL,(5CCF)
A5E9 010010      LD    BC,1000
A5EC CD7D0B      CALL  0B7D
A5EF CD4803      CALL  0348
A5F2 2AE55B      LD    HL,(5BE5)
A5F5 ED5BD95C    LD    DE,(5CD9)
A5F9 19          ADD   HL,DE
A5FA 22E55B      LD    (5BE5),HL
A5FD 3AE45B      LD    A,(5BE4)
A600 21F45B      LD    HL,5BF4
A603 96          SUB   (HL)
A604 32E45B      LD    (5BE4),A
A607 3600        LD    (HL),00
A609 2AD55C      LD    HL,(5CD5)
A60C 22E15B      LD    (5BE1),HL
A60F F5          PUSH  AF
A610 CD930B      CALL  0B93
A613 F1          POP   AF
A614 4F          LD    C,A
A615 CD1205      CALL  0512
A618 AF          XOR   A
A619 32DD5C      LD    (5CDD),A
A61C C38104      JP    0481
A61F 3AD35C      LD    A,(5CD3)
A622 B7          OR    A
A623 C8          RET   Z
A624 D610        SUB   10
A626 3025        JR    NC,A653
A628 3AD35C      LD    A,(5CD3)
A62B 47          LD    B,A
A62C AF          XOR   A
A62D 32D35C      LD    (5CD3),A
A630 C5          PUSH  BC
A631 2ACF5C      LD    HL,(5CCF)
A634 E5          PUSH  HL
A635 ED5BD55C    LD    DE,(5CD5)
A639 CD8D0B      CALL  0B8D
A63C 2AF45C      LD    HL,(5CF4)
A63F 22D55C      LD    (5CD5),HL
A642 E1          POP   HL
A643 C1          POP   BC
A644 ED5BD75C    LD    DE,(5CD7)
A648 CD9D0B      CALL  0B9D
A64B 2AF45C      LD    HL,(5CF4)
A64E 22D75C      LD    (5CD7),HL
A651 18CC        JR    A61F
A653 32D35C      LD    (5CD3),A
A656 0610        LD    B,10
A658 AF          XOR   A
A659 18D5        JR    A630
A65B F5          PUSH  AF
A65C 21CC5C      LD    HL,5CCC
A65F 3600        LD    (HL),00
A661 79          LD    A,C
A662 D610        SUB   10
A664 3803        JR    C,A669
A666 34          INC   (HL)
A667 18F9        JR    A662
A669 C610        ADD   A,10
A66B 4F          LD    C,A
A66C C5          PUSH  BC
A66D CD2D03      CALL  032D
A670 C1          POP   BC
A671 F1          POP   AF
A672 CD0A0A      CALL  0A0A
A675 11DD5C      LD    DE,5CDD
A678 011000      LD    BC,0010
A67B B7          OR    A
A67C 2801        JR    Z,A67F
A67E EB          EX    DE,HL
A67F EDB0        LDIR
A681 C9          RET
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A682 CDC206    CALL 06C2
A685 CD9B06    CALL 069B
A688 CD960A    CALL 0A96
A68B 3EFF      LD   A,FF
A68D 32105D    LD   (5D10),A
A690 3AE55C    LD   A,(5CE5)
A693 FE42      CP   42 ------> "B"
A695 CAD900    JP   Z,00D9
A698 C35E01    JP   015E

A69B CDC706    CALL 06C7
A69E CD960A    CALL 0A96
A6A1 CDF206    CALL 06F2
A6A4 C32407    JP   0724
A6A7 CD6F0B    CALL 0B6F
A6AA CDAE0A    CALL 0AAE
A6AD FE0D      CP   0D
A6AF 2A5D5C    LD   HL,(5C5D)
A6B2 2B        DEC  HL
A6B3 225D5C    LD   (5C5D),HL
A6B6 C8        RET  Z
A6B7 32105D    LD   (5D10),A
A6BA 3E01      LD   A,01
A6BC 32D65C    LD   (5CD6),A
A6BF CD200B    CALL 0B20
A6C2 AF        XOR  A
A6C3 32105D    LD   (5D10),A
A6C6 C9        RET
A6C7 CD000B    CALL 0B00
A6CA CD8704    CALL 0487
A6CD C4050B    CALL NZ,0B05
A6D0 CDAE0A    CALL 0AAE
A6D3 FEAF      CP   AF ------> CODE
A6D5 CCA706    CALL Z,06A7
A6D8 FEE4      CP   E4 ------> DATA
A6DA F5        PUSH AF
A6DB CD8C04    CALL 048C
A6DE F1        POP  AF
A6DF CC6E09    CALL Z,096E
A6E2 CD960A    CALL 0A96
A6E5 CD883D    CALL 3D88 ------>
A6E8 C22103    JP   NZ,0321
A6EB CD1205    CALL 0512
A6EE CDF53E    CALL 3EF5 ------>
A6F1 C9        RET
A6F2 3AD65C    LD   A,(5CD6)
A6F5 B7        OR   A
A6F6 2AE65C    LD   HL,(5CE6)
A6F9 2803      JR   Z,A6FE
A6FB 2AD95C    LD   HL,(5CD9)
A6FE ED5BEB5C  LD   DE,(5CEB)
A702 FE03      CP   03
A704 3AEA5C    LD   A,(5CEA)
A707 D5        PUSH DE
A708 2007      JR   NZ,A711
A70A ED5BDB5C  LD   DE,(5CDB)
A70E CDE60B    CALL 0BE6
A711 F5        PUSH AF
A712 3AE55C    LD   A,(5CE5)
A715 FE42      CP   42 ------> "B"
A717 F5        PUSH AF
A718 CCA507    CALL Z,07A5
A71B F1        POP  AF
A71C FE44      CP   44 ------> "D"
A71E CCD707    CALL Z,07D7
A721 F1        POP  AF
A722 D1        POP  DE
A723 C9        RET
A724 47        LD   B,A
A725 CD8704    CALL 0487
A728 2807      JR   Z,A731
A72A F5        PUSH AF
A72B CD1208    CALL 0812
A72E F1        POP  AF
A72F FEFF      CP   FF
A731 F5        PUSH AF
A732 CC6D0B    CALL Z,0B6D
A735 3AD65C    LD   A,(5CD6)
A738 FE03      CP   03
A73A CC0D3F    CALL Z,3F0D ------>
A73D F1        POP  AF
A73E C49D0B    CALL NZ,0B9D
A741 2A595C    LD   HL,(5C59)
A744 2B        DEC  HL
A745 3680      LD   (HL),80
A747 C9        RET
A748 3EFF      LD   A,FF
A74A 1802      JR   A74E
A74C 3EEE      LD   A,EE
A74E 32105D    LD   (5D10),A
A751 C38506    JP   0685
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A754 CDC706    CALL 06C7
A757 CD960A    CALL 0A96
A75A 3AE55C    LD   A,(5CE5)
A75D FE42      CP   42 ----------> "B"
A75F C2600A    JP   NZ,0A60
A762 ED4BE65C  LD   BC,(5CE6)
A766 C5        PUSH BC
A767 03        INC  BC
A768 213000    LD   HL,0030
A76B CDBE0A    CALL 0ABE
A76E 3680      LD   (HL),80
A770 EB        EX   DE,HL
A771 D1        POP  DE
A772 E5        PUSH HL
A773 ED5BEB5C  LD   DE,(5CEB)
A777 3AEA5C    LD   A,(5CEA)
A77A 47        LD   B,A
A77B CDC206    CALL 06C2
A77E 78        LD   A,B
A77F CD2407    CALL 0724
A782 E1        POP  HL
A783 22025D    LD   (5D02),HL
A786 ED5B535C  LD   DE,(5C53)
A78A 21D208    LD   HL,08D2
A78D CD750B    CALL 0B75
A790 C38B06    JP   068B
A793 EB        EX   DE,HL
A794 37        SCF
A795 ED52      SBC  HL,DE
A797 D8        RET  C
A798 110A00    LD   DE,000A
A79B 19        ADD  HL,DE
A79C 44        LD   B,H
A79D 4D        LD   C,L
A79E 21051F    LD   HL,1F05
A7A1 CDBE0A    CALL 0ABE
A7A4 C9        RET
A7A5 ED5B535C  LD   DE,(5C53)
A7A9 2A595C    LD   HL,(5C59)
A7AC 2B        DEC  HL
A7AD E5        PUSH HL
A7AE D5        PUSH DE
A7AF ED52      SBC  HL,DE
A7B1 ED5BE65C  LD   DE,(5CE6)
A7B5 D5        PUSH DE
A7B6 CD9307    CALL 0793
A7B9 C1        POP  BC
A7BA D1        POP  DE
A7BB E1        POP  HL
A7BC C5        PUSH BC
A7BD 22025D    LD   (5D02),HL
A7C0 21E519    LD   HL,19E5
A7C3 CD750B    CALL 0B75
A7C6 C1        POP  BC
A7C7 CD850B    CALL 0B85
A7CA 23        INC  HL
A7CB ED4BE85C  LD   BC,(5CE8)
A7CF 09        ADD  HL,BC
A7D0 224B5C    LD   (5C4B),HL
A7D3 2A535C    LD   HL,(5C53)
A7D6 C9        RET
A7D7 ED5BE85C  LD   DE,(5CE8)
A7DB 2ADB5C    LD   HL,(5CDB)
A7DE E5        PUSH HL
A7DF CD9307    CALL 0793
A7E2 E1        POP  HL
A7E3 7C        LD   A,H
A7E4 B5        OR   L
A7E5 2810      JR   Z,A7F7
A7E7 2AD75C    LD   HL,(5CD7)
A7EA 2B        DEC  HL
A7EB 2B        DEC  HL
A7EC 2B        DEC  HL
A7ED ED4BDB5C  LD   BC,(5CDB)
A7F1 03        INC  BC
A7F2 03        INC  BC
A7F3 03        INC  BC
A7F4 CD7D0B    CALL 0B7D
A7F7 2A595C    LD   HL,(5C59)
A7FA 2B        DEC  HL
A7FB ED4BE85C  LD   BC,(5CE8)
A7FF C5        PUSH BC
A800 03        INC  BC
A801 03        INC  BC
A802 03        INC  BC
A803 CD850B    CALL 0B85
A806 23        INC  HL
A807 3AD25C    LD   A,(5CD2)
A80A 77        LD   (HL),A
A80B 23        INC  HL
A80C D1        POP  DE
A80D 73        LD   (HL),E
A80E 23        INC  HL
A80F 72        LD   (HL),D
A810 23        INC  HL
A811 C9        RET
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A812 3AD95C    LD    A,(5CD9)
A815 48        LD    C,B
A816 47        LD    B,A
A817 79        LD    A,C
A818 B8        CP    B
A819 3821      JR    C,A83C
A81B 78        LD    A,B
A81C B7        OR    A
A81D CA600A    JP    Z,0A60
A820 05        DEC   B
A821 2813      JR    Z,A836
A823 D5        PUSH  DE
A824 11C45C    LD    DE,5CC4
A827 2AF65C    LD    HL,(5CF6)
A82A 19        ADD   HL,DE
A82B D1        POP   DE
A82C 7E        LD    A,(HL)
A82D 1C        INC   E
A82E BB        CP    E
A82F 2003      JR    NZ,A834
A831 1E00      LD    E,00
A833 14        INC   D
A834 10F7      DJNZ  A82D
A836 0601      LD    B,01
A838 2AD75C    LD    HL,(5CD7)
A83B C9        RET
A83C 21AE3F    LD    HL,3FAE -      "REC. NO."
A83F 3E05      LD    A,05
A841 C3A809    JP    09A8
A844 CD883D    CALL  3D88 ------>
A847 CAAE09    JP    Z,09AE
A84A CD4803    CALL  0348
A84D 3AE455    LD    A,(5BE4)
A850 FE80      CP    80
A852 CAA309    JP    Z,09A3
A855 C9        RET
A856 CDC206    CALL  06C2
A859 210100    LD    HL,0001
A85C 22D15C    LD    (5CD1),HL
A85F CD000B    CALL  0B00
A862 CDAE0A    CALL  0AAE
A865 FEAF      CP    AF ------> CODE
A867 2852      JR    Z,A8BB
A869 FECA      CP    CA ------> LINE
A86B 2011      JR    NZ,A87E
A86D CD480B    CALL  0B48
A870 CD960A    CALL  0A96
A873 2ADB5C    LD    HL,(5CDB)
A876 22D15C    LD    (5CD1),HL
A879 21E55C    LD    HL,5CE5
A87C 1824      JR    A8A2
A87E FEAA      CP    AA ------> SCREEN
A880 200E      JR    NZ,A890
A882 210040    LD    HL,4000
A885 22D75C    LD    (5CD7),HL
A888 21005B    LD    HL,5B00
A88B 22D95C    LD    (5CD9),HL
A88E 182E      JR    A8BE
A890 CD960A    CALL  0A96
A893 CDAE0A    CALL  0AAE
A896 21E55C    LD    HL,5CE5
A899 FEE4      CP    E4 ------> DATA
A89B 2812      JR    Z,A8AF
A89D FE0D      CP    0D
A89F C2600A    JP    NZ,0A60
A8A2 3642      LD    (HL),42
A8A4 CD4408    CALL  0844
A8A7 CD590B    CALL  0B59
A8AA CD5209    CALL  0952
A8AD 181A      JR    A8C9
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A8AF 3644       LD   (HL),44
A8B1 CD4408     CALL 0844
A8B4 CD7909     CALL 0979
A8B7 3010       JR   NC,A8C9
A8B9 381B       JR   C,A8D6
A8BB CD060B     CALL 0B06
A8BE CD960A     CALL 0A96
A8C1 3E43       LD   A,43
A8C3 32E55C     LD   (5CE5),A
A8C6 CD4408     CALL 0844
A8C9 2AD75C     LD   HL,(5CD7)
A8CC 22E65C     LD   (5CE6),HL
A8CF EB         EX   DE,HL
A8D0 2AD95C     LD   HL,(5CD9)
A8D3 B7         OR   A
A8D4 ED52       SBC  HL,DE
A8D6 DA600A     JP   C,0A60
A8D9 7D         LD   A,L
A8DA B7         OR   A
A8DB 2801       JR   Z,A8DE
A8DD 24         INC  H
A8DE 7C         LD   A,H
A8DF 32EA5C     LD   (5CEA),A
A8E2 5F         LD   E,A
A8E3 1600       LD   D,00
A8E5 2AE55B     LD   HL,(5BE5)
A8E8 ED52       SBC  HL,DE
A8EA DAA309     JP   C,09A3
A8ED E5         PUSH HL
A8EE 2A595C     LD   HL,(5C59)
A8F1 36AA       LD   (HL),AA
A8F3 23         INC  HL
A8F4 ED5BD15C   LD   DE,(5CD1)
A8F8 73         LD   (HL),E
A8F9 23         INC  HL
A8FA 72         LD   (HL),D
A8FB 2ADB5C     LD   HL,(5CDB)
A8FE 22E85C     LD   (5CE8),HL
A901 2AE15B     LD   HL,(5BE1)
A904 22EB5C     LD   (5CEB),HL
A907 E5         PUSH HL
A908 CDFA3E     CALL 3EFA ──→
A90B E1         POP  HL
A90C EB         EX   DE,HL
A90D 2AE65C     LD   HL,(5CE6)
A910 3AEA5C     LD   A,(5CEA)
A913 47         LD   B,A
A914 CD9D0B     CALL 0B9D
A917 2AF45C     LD   HL,(5CF4)
A91A E5         PUSH HL
A91B CD4803     CALL 0348
A91E E1         POP  HL
A91F 22E15B     LD   (5BE1),HL
A922 E1         POP  HL
A923 22E55B     LD   (5BE5),HL
A926 21E45B     LD   HL,5BE4
A929 34         INC  (HL)
A92A E5         PUSH HL
A92B CD930B     CALL 0B93
A92E E1         POP  HL
A92F 4E         LD   C,(HL)
A930 0D         DEC  C
A931 3AE55C     LD   A,(5CE5)
A934 FE42       CP   42 ──→ "B"
A936 CC3C09     CALL Z,093C
A939 C38104     JP   0481
A93C 2A595C     LD   HL,(5C59)
A93F ED5B535C   LD   DE,(5C53)
A943 37         SCF
A944 ED52       SBC  HL,DE
A946 22E65C     LD   (5CE6),HL
A949 2A4B5C     LD   HL,(5C4B)
A94C ED52       SBC  HL,DE
A94E 22E85C     LD   (5CE8),HL
A951 C9         RET
A952 2A4B5C     LD   HL,(5C4B)
A955 ED5B535C   LD   DE,(5C53)
A959 ED52       SBC  HL,DE
A95B 22DB5C     LD   (5CDB),HL
A95E 2A535C     LD   HL,(5C53)
A961 22D75C     LD   (5CD7),HL
A964 2A595C     LD   HL,(5C59)
A967 23         INC  HL
A968 23         INC  HL
A969 23         INC  HL
A96A 22D95C     LD   (5CD9),HL
A96D C9         RET

A96E CD7909     CALL 0979
A971 D0         RET  NC
A972 210000     LD   HL,0000
A975 22DB5C     LD   (5CDB),HL
A978 C9         RET
```

```
A979 CD6F0B    CALL 0B6F
A97C CDC30A    CALL 0AC3
A97F CBF9      SET  7,C
A981 79        LD   A,C
A982 32D25C    LD   (5CD2),A
A985 3002      JR   NC,A989
A987 37        SCF
A988 C9        RET
A989 20FC      JR   NZ,A987
A98B 23        INC  HL
A98C 5E        LD   E,(HL)
A98D 23        INC  HL
A98E 56        LD   D,(HL)
A98F 23        INC  HL
A990 22D75C    LD   (5CD7),HL
A993 ED53DB5C  LD   (5CDB),DE
A997 19        ADD  HL,DE
A998 22D95C    LD   (5CD9),HL
A99B CD6F0B    CALL 0B6F
A99E FE29      CP   29
A9A0 20E7      JR   NZ,A989
A9A2 C9        RET
A9A3 21703F    LD   HL,3F70    "NO SPACE"
A9A6 3E03      LD   A,03
A9A8 CD1603    CALL 0316
A9AB C35E01    JP   015E
A9AE 21783F    LD   HL,3F78    "FILE EXISTS"
A9B1 3E0284    LD   A,02
A9B3 18F3      JR   A9A8
A9B5 21DD5C    LD   HL,5CDD
A9B8 0608      LD   B,08
A9BA 3620      LD   (HL),20
A9BC 23        INC  HL
A9BD 10FB      DJNZ A9BA
A9BF CDD20A    CALL 0AD2
A9C2 78        LD   A,B
A9C3 B1        OR   C
A9C4 CA600A    JP   Z,0A60
A9C7 EB        EX   DE,HL
A9C8 CDDE09    CALL 09DE
A9CB 79        LD   A,C
A9CC FE09      CP   09
A9CE 3802      JR   C,A9D2
A9D0 0E08      LD   C,08
A9D2 7E        LD   A,(HL)
A9D3 FE20      CP   20
A9D5 DA600A    JP   C,0A60
A9D8 11DD5C    LD   DE,5CDD
A9DB EDB0      LDIR
A9DD C9        RET
A9DE 23        INC  HL          <- IMPRESION REAL
A9DF 7E        LD   A,(HL)
A9E0 FE3A      CP   3A
A9E2 201A      JR   NZ,A9FE
A9E4 2B        DEC  HL
A9E5 7E        LD   A,(HL)
A9E6 E6DF      AND  DF          -> 1101 1111
A9E8 DE41      SBC  A,41
A9EA DA600A    JP   C,0A60
A9ED FE04      CP   04
A9EF D2600A    JP   NC,0A60
A9F2 C5        PUSH BC
A9F3 E5        PUSH HL
A9F4 CDA93D    CALL 3DA9
A9F7 E1        POP  HL
A9F8 C1        POP  BC
A9F9 0B        DEC  BC
A9FA 0B        DEC  BC
A9FB 23        INC  HL
A9FC 23        INC  HL
A9FD C9        RET
A9FE 2B        DEC  HL
A9FF 3A195D    LD   A,(5D19)
AA02 C5        PUSH BC
AA03 E5        PUSH HL
AA04 CDA93D    CALL 3DA9        ->
AA07 E1        POP  HL
AA08 C1        POP  BC
AA09 C9        RET

AA0A 69        LD   L,C
AA0B 2600      LD   H,00
AA0D 29        ADD  HL,HL
AA0E 29        ADD  HL,HL
AA0F 29        ADD  HL,HL
AA10 29        ADD  HL,HL
AA11 01005B    LD   BC,5B00
AA14 09        ADD  HL,BC
AA15 C9        RET
```

```
AA16 CDB509    CALL 09B5
AA19 CD2903    CALL 0329
AA1C 0680      LD   B,80
AA1E 0E00      LD   C,00
AA20 C5        PUSH BC
AA21 CD0A0A    CALL 0A0A
AA24 CD1404    CALL 0414
AA27 C1        POP  BC
AA28 C5        PUSH BC
AA29 79        LD   A,C
AA2A FE10      CP   10
AA2C 2005      JR   NZ,AA33
AA2E C1        POP  BC
AA2F 0E00      LD   C,00
AA31 18ED      JR   AA20
AA33 11DD5C    LD   DE,5CDD
AA36 0609      LD   B,09
AA38 AF        XOR  A
AA39 BE        CP   (HL)
AA3A 2003      JR   NZ,AA3F
AA3C C1        POP  BC
AA3D 1809      JR   AA48
AA3F CD6E3D    CALL 3D6E
AA42 C1        POP  BC
AA43 2805      JR   Z,AA4B
AA45 0C        INC  C
AA46 10D8      DJNZ AA20
AA48 F6FF      OR   FF
AA4A C9        RET
AA4B 3E80      LD   A,80
AA4D 90        SUB  B
AA4E 4F        LD   C,A
AA4F AF        XOR  A
AA50 C8        RET  Z
AA51 CD213D    CALL 3D21
AA54 FDCB019E  RES  3,(IY+01)
AA58 CDBD01    CALL 01BD
AA5B ED7B1C5D  LD   SP,(5D1C)
AA5F C9        RET
AA60 FDCB007E  BIT  7,(IY+00)
AA64 2805      JR   Z,AA6B
AA66 3E05      LD   A,0B
AA68 323A5C    LD   (5C3A),A
AA6B 3C        INC  A
AA6C 213F3F    LD   HL,3F67
AA6F CD1603    CALL 0316
AA72 C35E01    JP   015E
AA75 CDC206    CALL 06C2
AA78 CD9B06    CALL 069B
AA7B CD960A    CALL 0A95
AA7E 2AE55C    LD   HL,(5CE8)
AA81 3AE55C    LD   A,(5CE5)
AA84 FE42      CP   42
AA86 CAD900    JP   Z,00D9
AA89 E5        PUSH HL
AA8A 215E01    LD   HL,015E
AA8D E5        PUSH HL
AA8E C3903C    JP   3C90
AA91 FDCB017E  BIT  7,(IY+01)
AA95 C9        RET
AA96 CD910A    CALL 0A91
AA99 C0        RET  NZ
AA9A E1        POP  HL
AA9B C9        RET
AA9C CD5F0B    CALL 0B6F
AA9F CDE10A    CALL 0AE1
AAA2 18ED      JR   AA91
AAA4 AF        XOR  A
AAA5 210116    LD   HL,1601
AAA8 1814      JR   AABE
AAAA 3E02      LD   A,02
AAAC 18F7      JR   AAA5
AAAE 211800    LD   HL,0018
AAB1 1808      JR   AABE
AAB3 CDA40A    CALL 0AA4
AAB6 212C0F    LD   HL,0F2C
AAB9 1803      JR   AABE
AABB 216B0D    LD   HL,0D6B
AABE E5        PUSH HL
AABF CD903C    CALL 3C90
AAC2 C9        RET
AAC3 21B228    LD   HL,28B2
AAC6 18F6      JR   AABE
AAC8 216E0D    LD   HL,0D6E
AACB 18F1      JR   AABE
AACD 211B1A    LD   HL,1A1B
AAD0 18EC      JR   AABE
AAD2 21F12B    LD   HL,2BF1
AAD5 18E7      JR   AABE
AAD7 21991E    LD   HL,1E99
AADA 18E2      JR   AABE
AADC 218C1C    LD   HL,1C8C
AADF 18DD      JR   AABE
AAE1 218210    LD   HL,1082
AAE4 18D8      JR   AABE
AAE6 2A115D    LD   HL,(5D11)
AAE9 23        INC  HL
AAEA 225D5C    LD   (5C5D),HL
AAED C9        RET
```

"ERROR"

CANAL "0"

CANAL "2"

CANAL

CLS

CONTROL PUERTOS

LOOK-VARS

CLS-LAW

LINE NUMBER

SEPARA NUM Y STRING

FIND INTEGERS

EVALUA EXPRESION

EVALUA - NEXT

SALTOS AL SISTEMA

```
AAEE CD000B    CALL 0B00
AAF1 CDAE0A    CALL 0AAE
AAF4 FE2C      CP   2C ──► ","
AAF6 C2600A    JP   NZ,0A60
AAF9 CD5F0B    CALL 0B6F
AAFC CDDC0A    CALL 0ADC
AAFF C9        RET
AB00 CDE60A    CALL 0AE6
AB03 C3DC0A    JP   0ADC
AB06 CDAE0A    CALL 0AAE
AB09 FEAF      CP   AF ──► CODE
AB0B C0        RET  NZ
AB0C CD9C0A    CALL 0A9C
AB0F 2807      JR   Z,AB18
AB11 CDD70A    CALL 0AD7
AB14 ED43D75C  LD   (5CD7),BC
AB18 CDAE0A    CALL 0AAE
AB1B FE2C      CP   2C ──► ","
AB1D C2600A    JP   NZ,0A60
AB20 CD9C0A    CALL 0A9C
AB23 2813      JR   Z,AB38
AB25 CDD70A    CALL 0AD7
AB28 CD8704    CALL 0487
AB2B ED43D95C  LD   (5CD9),BC
AB2F 2007      JR   NZ,AB38
AB31 2AD75C    LD   HL,(5CD7)
AB34 09        ADD  HL,BC
AB35 22D95C    LD   (5CD9),HL
AB38 CDAE0A    CALL 0AAE
AB3B FE2C      CP   2C ──► ","
AB3D 2809      JR   Z,AB48
AB3F FE0D      CP   0D
AB41 C2600A    JP   NZ,0A60
AB44 CD960A    CALL 0A96
AB47 C9        RET
AB48 CD9C0A    CALL 0A9C
AB4B C8        RET  Z
AB4C CDD70A    CALL 0AD7
AB4F ED43DB5C  LD   (5CDB),BC
AB53 3E03      LD   A,03
AB55 32D65C    LD   (5CD6),A
AB58 C9        RET
AB59 2A115D    LD   HL,(5D11)
AB5C 22025D    LD   (5D02),HL
AB5F 21A711    LD   HL,11A7 ──► REMOVE FLOAT POINT
AB62 1811      JR   AB7E
AB64 2A615C    LD   HL,(5C61)
AB67 22025D    LD   (5D02),HL
AB6A 213000    LD   HL,0030 ──► MAKE BC SPACES
AB6D 1806      JR   AB75
AB6F 22025D    LD   (5D02),HL
AB72 212000    LD   HL,0020 ──► COLECT NEXT CHAR
AB75 E5        PUSH HL
AB76 2A025D    LD   HL,(5D02)
AB79 CD9030    CALL 3090 ──►
AB7C C9        RET
AB7D 22025D    LD   (5D02),HL
AB80 21E819    LD   HL,19E8 ──► RECLAIMING
AB83 18F0      JR   AB75
AB85 22025D    LD   (5D02),HL
AB88 215516    LD   HL,1655 ──► MAKE ROOM
AB8B 18E8      JR   AB75
AB8D AF        XOR  A
AB8E 180F      JR   AB9F
AB90 CD1905    CALL 0519
AB93 ED5BF45C  LD   DE,(5CF4)
AB97 1B        DEC  DE
AB98 0601      LD   B,01
AB9A 21005B    LD   HL,5B00
AB9D 3EFF      LD   A,FF
AB9F 32CE5C    LD   (5CCE),A
ABA2 ED53F45C  LD   (5CF4),DE
ABA6 AF        XOR  A
ABA7 B0        OR   B
ABA8 C8        RET  Z
ABA9 C5        PUSH BC
ABAA E5        PUSH HL
ABAB CD2E3E    CALL 3E2E
ABAE 3AF45C    LD   A,(5CF4)
ABB1 CD2A3E    CALL 3E2A
ABB4 3AF55C    LD   A,(5CF5)
ABB7 CDCB3D    CALL 3DCB
ABBA 3ACE5C    LD   A,(5CCE)
ABBD B7        OR   A
ABBE F5        PUSH AF
ABBF CC383E    CALL Z,3E38
ABC2 F1        POP  AF
ABC3 C4323E    CALL NZ,3E32
ABC6 E1        POP  HL
ABC7 110001    LD   DE,0100
ABCA 19        ADD  HL,DE
ABCB E5        PUSH HL
ABCC 11C45C    LD   DE,5CC4
ABCF 2AF65C    LD   HL,(5CF6)
ABD2 19        ADD  HL,DE
ABD3 7E        LD   A,(HL)
ABD4 21F45C    LD   HL,5CF4
ABD7 34        INC  (HL)
ABD8 BE        CP   (HL)
ABD9 2006      JR   NZ,ABE1
ABDB 3600      LD   (HL),00
ABDD 21F55C    LD   HL,5CF5
ABE0 34        INC  (HL)
ABE1 E1        POP  HL
ABE2 C1        POP  BC
ABE3 10C4      DJNZ ABA9
ABE5 C9        RET
```

```
ABE6 E5          PUSH HL
ABE7 67          LD   H,A
ABE8 2E00        LD   L,00
ABEA E5          PUSH HL
ABEB ED52        SBC  HL,DE
ABED E1          POP  HL
ABEE DCF8BF      CALL C,0BF8
ABF1 7C          LD   A,H
ABF2 E1          POP  HL
ABF3 D8          RET  C
ABF4 7A          LD   A,D
ABF5 C9          RET
ABF6 AF          XOR  A
ABF7 32D65C      LD   (5CD6),A
ABFA 37          SCF
ABFB C9          RET
ABFC FF
ABFD FF          LIBRES
ABFE FF
ABFF FF
```

(17)

3C00 → Entrada desde BASIC

```
AC00 C3813C    JP    3C81      -> PRESENTA CABECERA ETC
AC03 C3293C    JP    3C29      -> ADMITE : REM:
AC06 C3A93D    JP    3DA9
AC09 C38D0B    JP    0B8D
AC0C C39D0B    JP    0B9D
AC0F 2A105D    LD    HL,(5D10)     <- ENTRADA DESDE DISCO (ESPANZU)
AC12 2B        DEC   HL
AC13 2B        DEC   HL
AC14 F9        LD    SP,HL
AC15 CDAA3C    CALL  3CAA
AC18 C3600A    JP    0A60
AC1B ED7B3D5C  LD    SP,(5C3D)
AC1F 3A105D    LD    A,(5D10)
AC22 B7        OR    A
AC23 CA761B    JP    Z,1B76    -> ROM
AC26 C3CF12    JP    12CF      -> ROM
AC29 3A175D    LD    A,(5D17)
AC2C FEAA      CP    AA
AC2E C4383C    CALL  NZ,3C38
AC31 CDAA3C    CALL  3CAA
AC34 E5        PUSH  HL
AC35 C30E01    JP    010E
AC38 DBF7      IN    A,(F7)    TRIESTADO  1111 0111  B3     <- IN CAT
AC3A FE1E      CP    1E
AC3C 2002      JR    NZ,AC40   -> 2002 JR NC / CF ? / 31 ? / 21B556 LD HL,5CB5
AC3E CF        RST   8
AC3F 3121B5    LD    SP,B521
AC42 5C        LD    E,H
AC43 017000    LD    BC,0070
AC46 CD5516    CALL  1655      -> ROM MAKE ROOM
AC49 3E0B      LD    A,0B
AC4B 321E5D    LD    (5D1E),A
AC4E AF        XOR   A
AC4F 32185D    LD    (5D18),A  ]
AC52 320F5D    LD    (5D0F),A  ] PONE A 0
AC55 32195D    LD    (5D19),A  ]
AC58 3EFF      LD    A,FF      ]
AC5A 323A5C    LD    (5C3A),A  ] PONE A FF
AC5D 32165D    LD    (5D16),A  ]
AC60 21243F    LD    HL,3F24
AC63 221F5D    LD    (5D1F),HL
AC66 21313F    LD    HL,3F31
AC69 22215D    LD    (5D21),HL
AC6C 3E0D      LD    A,0D
AC6E 32235D    LD    (5D23),A
AC71 CDD23C    CALL  3CD2
AC74 3ED0      LD    A,D0      ] 0001 1111 -> SEL
AC76 D31F      OUT   (1F),A    ] DRIVE 0 ETC
AC78 C9        RET
AC79 3EFF      LD    A,FF
AC7B 32165D    LD    (5D16),A
AC7E CDBE3C    CALL  3CBE
AC81 3A175D    LD    A,(5D17)  ] PRIMERA ENTR.
AC84 FEAA      CP    AA
AC86 C4383C    CALL  NZ,3C38
AC89 CDAA3C    CALL  3CAA
AC8C E5        PUSH  HL
AC8D C3C401    JP    01C4      -> ?
AC90 22025D    LD    (5D02),HL ] SCRATCH
AC93 ED53045D  LD    (5D04),DE ]
AC97 D1        POP   DE
AC98 E1        POP   HL
AC99 D5        PUSH  DE
AC9A CDBE3C    CALL  3CBE
AC9D 11AD3C    LD    DE,3CAD
ACA0 D5        PUSH  DE
ACA1 E5        PUSH  HL
ACA2 ED5B045D  LD    DE,(5D04) ] SCRATCH
ACA6 2A025D    LD    HL,(5D02) ]
ACA9 C9        RET
ACAA 21BE3C    LD    HL,3CBE
ACAD F3        DI
ACAE F5        PUSH  AF
ACAF CDD23C    CALL  3CD2
ACB2 3A165D    LD    A,(5D16)  -> 0111 1111 -> SOFTWARE DISCO = SI
ACB5 E67F      AND   7F
ACB7 32165D    LD    (5D16),A
ACBA D3FF      OUT   (FF),A    -> CARGA REGIS. [LATCH]
ACBC F1        POP   AF
ACBD C9        RET
ACBE F5        PUSH  AF
ACBF CDD23C    CALL  3CD2
ACC2 3A165D    LD    A,(5D16)
ACC5 F680      OR    80        -> MANTIENE BLOQUEADO PAG CERO
ACC7 32165D    LD    (5D16),A  [LATCH]
ACCA D3FF      OUT   (FF),A
ACCC CDD83C    CALL  3CD8
ACCF F1        POP   AF
ACD0 FB        EI
ACD1 C9        RET
ACD2 CDE03C    CALL  3CE0
ACD5 D3FC      OUT   (FC),A    -> 1111 1101 [BIEST]  PERMISO DOS  ACCESO CONTROLAD.
ACD7 C9        RET
ACD8 CDE03C    CALL  3CE0
ACDB F680      OR    80
ACDD D3FC      OUT   (FC),A    -> A0 Y A1 [BIEST]  NO PERMISO DOS
ACDF C9        RET
ACE0 3A485C    LD    A,(5C48)
ACE3 E638      AND   38        -> 00111000
ACE5 0F        RRCA
ACE6 0F        RRCA
ACE7 0F        RRCA
ACE8 C9        RET
```

```
ACE9 CDD23D    CALL 3DD2
ACEC 3EFF      LD   A,FF
ACEE D3FF      OUT  (FF),A
ACF0 C9        RET
ACF1 CDE93D    CALL 3DE9
ACF4 EDB8      LDDR
ACF6 18B5      JR   ACAD
ACF8 CDE93D    CALL 3DE9
ACFB EDB0      LDIR
ACFD 18AE      JR   ACAD
ACFF 3E05      LD   A,05
AD01 E5        PUSH HL
AD02 C5        PUSH BC
AD03 CD093D    CALL 3D09
AD06 C1        POP  BC
AD07 E1        POP  HL
AD08 C9        RET
AD09 211000    LD   HL,0010
AD0C C3BE0A    JP   0ABE
AD0F 7E        LD   A,(HL)
AD10 B7        OR   A
AD11 C8        RET  Z
AD12 E67F      AND  7F
AD14 D7        RST  10
AD15 CB7E      BIT  7,(HL)
AD17 C0        RET  NZ
AD18 23        INC  HL
AD19 18F4      JR   AD0F
AD1B CD930B    CALL 0B93
AD1E C35E01    JP   015E
AD21 3AB65C    LD   A,(5CB6)
AD24 FEF4      CP   F4
AD26 C8        RET  Z
AD27 21185D    LD   HL,5D18
AD2A B6        OR   (HL)
AD2B 36FF      LD   (HL),FF
AD2D C8        RET  Z
AD2E 21B65C    LD   HL,5CB6
AD31 11265D    LD   DE,5D26
AD34 063A      LD   B,3A
AD36 4E        LD   C,(HL)
AD37 1A        LD   A,(DE)
AD38 77        LD   (HL),A
AD39 79        LD   A,C
AD3A 12        LD   (DE),A
AD3B 23        INC  HL
AD3C 13        INC  DE
AD3D 10F7      DJNZ AD36
AD3F C9        RET
AD40 2A595C    LD   HL,(5C59)
AD43 360D      LD   (HL),0D
AD45 225B5C    LD   (5C5B),HL
AD48 23        INC  HL
AD49 3680      LD   (HL),80
AD4B C9        RET
AD4C 3A0F5D    LD   A,(5D0F)
AD4F B7        OR   A
AD50 CC403D    CALL Z,3D40
AD53 2A595C    LD   HL,(5C59)
AD56 CDFF3C    CALL 3CFF
AD59 3A195D    LD   A,(5D19)
AD5C C641      ADD  A,41
AD5E D7        RST  10
AD5F 3E3E      LD   A,3E
AD61 D7        RST  10
AD62 213A5C    LD   HL,5C3A
AD65 36FF      LD   (HL),FF
AD67 CDB30A    CALL 0AB3
AD6A CDC80A    CALL 0AC8
AD6D C9        RET
AD6E 1A        LD   A,(DE)
AD6F BE        CP   (HL)
AD70 C0        RET  NZ
AD71 13        INC  DE
AD72 23        INC  HL
AD73 10F9      DJNZ AD6E
AD75 C9        RET
AD76 C5        PUSH BC
AD77 0608      LD   B,08
AD79 7E        LD   A,(HL)
AD7A D7        RST  10
AD7B 23        INC  HL
AD7C 10FB      DJNZ AD79
AD7E 3E3C      LD   A,3C
AD80 D7        RST  10
AD81 7E        LD   A,(HL)
AD82 D7        RST  10
AD83 3E3E      LD   A,3E
AD85 D7        RST  10
AD86 C1        POP  BC
AD87 C9        RET
AD88 CDB509    CALL 09B5
AD8B CD4D03    CALL 034D
AD8E C3190A    JP   0A19
AD91 11FA5C    LD   DE,5CFA
AD94 2AF65C    LD   HL,(5CF6)
AD97 19        ADD  HL,DE
AD98 AF        XOR  A
AD99 77        LD   (HL),A
AD9A 3A1E5D    LD   A,(5D1E)
AD9D D31F      OUT  (1F),A
AD9F DBFF      IN   A,(FF)
ADA1 E680      AND  80
ADA3 28FA      JR   Z,AD9F
ADA5 C9        RET
```

3CFF

RST 10H

3DDD

IMPRIME MENSAJE

ULTIMO DATO = Ø ? FF

IMPRIME TEXTO S/ HL

IN CAT

CANTIDAD DE CARACTERES ?

COMPARA LA CLAVE

HL = 5B10

IMPRIME NOMBRE

IMPRIME: NOMBRE <B>

IN CAT

IN CAT

```
ADA6 3A195D     LD    A,(5D19)
ADA9 32F65C     LD    (5CF6),A
ADAC 21165D     LD    HL,5D16
ADAF 4F         LD    C,A
ADB0 3E7C       LD    A,7C
ADB2 B1         OR    C
ADB3 D3FF       OUT   (FF),A
ADB5 77         LD    (HL),A
ADB6 11FA5C     LD    DE,5CFA
ADB9 2AF65C     LD    HL,(5CF6)
ADBC 19         ADD   HL,DE
ADBD 7E         LD    A,(HL)
ADBE D33F       OUT   (3F),A
ADC0 3E0F       LD    A,0F
ADC2 0EFF       LD    C,FF
ADC4 0D         DEC   C
ADC5 20FD       JR    NZ,ADC4
ADC7 3D         DEC   A
ADC8 20F8       JR    NZ,ADC2
ADCA C9         RET
ADCB 4F         LD    C,A
ADCC DB1F       IN    A,(1F)
ADCE E680       AND   80
ADD0 32CD5C     LD    (5CCD),A
ADD3 ED5BF65C   LD    DE,(5CF6)
ADD7 21FA5C     LD    HL,5CFA
ADDA 19         ADD   HL,DE
ADDB 3A165D     LD    A,(5D16)
ADDE F67C       OR    7C
ADE0 32165D     LD    (5D16),A
ADE3 D3FF       OUT   (FF),A
ADE5 71         LD    (HL),C
ADE6 E5         PUSH  HL
ADE7 21C35C     LD    HL,5CC8
ADEA 19         ADD   HL,DE
ADEB 7E         LD    A,(HL)
ADEC E1         POP   HL
ADED FE17       CP    17
ADEF CC183E     CALL  Z,3E18
ADF2 FE16       CP    16
ADF4 CC183E     CALL  Z,3E18
ADF7 79         LD    A,C
ADF8 D37F       OUT   (7F),A
ADFA 3A1E5D     LD    A,(5D1E)
ADFD F610       OR    10
ADFF D31F       OUT   (1F),A
AE01 3ACD5C     LD    A,(5CCD)
AE04 B7         OR    A
AE05 2809       JR    Z,AE10
AE07 0602       LD    B,02
AE09 3EE0       LD    A,E0
AE0B CDC23D     CALL  3DC2
AE0E 10F9       DJNZ  AE09
AE10 CD9F3D     CALL  3D9F
AE13 3E10       LD    A,10
AE15 C3C23D     JP    3DC2
AE18 47         LD    B,A
AE19 79         LD    A,C
AE1A B7         OR    A
AE1B 1F         RRA
AE1C 4F         LD    C,A
AE1D 78         LD    A,B
AE1E D0         RET   NC
AE1F 3A165D     LD    A,(5D16)
AE22 E66F       AND   6F
AE24 D3FF       OUT   (FF),A
AE26 32165D     LD    (5D16),A
AE29 C9         RET
AE2A 32FF5C     LD    (5CFF),A
AE2D C9         RET
AE2E 22005D     LD    (5D00),HL
AE31 C9         RET

AE32 3EA0       LD    A,A0
AE34 1802       JR    AE38
```

TEMPORIZ

```
AE36 3E80      LD   A,80
AE38 32FE5C    LD   (5CFE),A
AE3B 160A      LD   D,0A
AE3D D5        PUSH DE
AE3E 3AFF5C    LD   A,(5CFF)
AE41 3C        INC  A
AE42 D35F      OUT  (5F),A
AE44 2A005D    LD   HL,(5D00)
AE47 3AFE5C    LD   A,(5CFE)
AE4A FEA0      CP   A0 ------------>
AE4C C2A73E    JP   NZ,3EA7
AE4F D31F      OUT  (1F),A
AE51 DBFF   ->IN   A,(FF)
AE53 E6C0      AND  C0
AE55 28FA      JR   Z,AE51
AE57 17        RLA
AE58 3818      JR   C,AE72
AE5A 7E        LD   A,(HL)
AE5B 2F        CPL
AE5C D37F      OUT  (7F),A
AE5E 23        INC  HL
AE5F 18F0      JR   AE51
AE61 15     ->DEC  D
AE62 CA803E    JP   Z,3E80
AE65 D5        PUSH DE
AE66 CD913D    CALL 3D91
AE69 3AF55C    LD   A,(5CF5)
AE6C CDCB3D    CALL 3DCB
AE6F D1        POP  DE
AE70 18CB      JR   AE3D ----------
AE72 DB1F   ->IN   A,(1F)
AE74 D1        POP  DE
AE75 47        LD   B,A
AE76 E6FC      AND  FC
AE78 C8        RET  Z
AE79 E610      AND  10
AE7B 20E4      JR   NZ,AE61
AE7D 15        DEC  D
AE7E 20BD      JR   NZ,AE3D
AE80 78        LD   A,B
AE81 E640      AND  40
AE83 210C3F    LD   HL,3F90   "WRITE PROTECT"
AE86 2003      JR   NZ,AE8B
AE88 211D3F    LD   HL,3F9E   "DISC ERROR"
AE8B DB3F   ->IN   A,(3F)
AE8D B7        OR   A
AE8E 2005      JR   NZ,AE95
AE90 DB5F      IN   A,(5F)
AE92 FE0A      CP   0A
AE94 C8        RET  Z
AE95 DF     ->RST  18
AE96 213E3F    LD   HL,3FA8   "FREE"   "TRACK"
AE99 DF        RST  18
AE9A DB3F      IN   A,(3F)
AE9C CDBA3E    CALL 3EBA
AE9F 3E07      LD   A,07
AEA1 320F5D    LD   (5D0F),A
AEA4 C35E01    JP   015E ----------
AEA7 D31F      OUT  (1F),A
AEA9 DBFF   ->IN   A,(FF)
AEAB E6C0      AND  C0
AEAD 28FA      JR   Z,AEA9
AEAF 17        RLA
AEB0 DA723E    JP   C,3E72
AEB3 DB7F      IN   A,(7F)
AEB5 2F        CPL
AEB6 77        LD   (HL),A
AEB7 23        INC  HL
AEB8 18EF      JR   AEA9
AEBA 4F        LD   C,A
AEBB 0600      LD   B,00
AEBD C3CD0A    JP   0ACD ----------
AEC0 210000    LD   HL,0000
AEC3 110000    LD   DE,0000
AEC6 0600      LD   B,00
AEC8 E5        PUSH HL
AEC9 4E        LD   C,(HL)
AECA EB        EX   DE,HL
AECB 09        ADD  HL,BC
AECC EB        EX   DE,HL
AECD E1        POP  HL
AECE 23        INC  HL
AECF 7C        LD   A,H
AED0 FE0C      CP   0C
AED2 20F4      JR   NZ,AEC8
AED4 3A4B3F    LD   A,(3F4B)
AED7 BB        CP   E
AED8 C2E03E    JP   NZ,3EE0
AEDB 3A4C3F    LD   A,(3F4C)
AEDE BA        CP   D
AEDF C8        RET  Z
AEE0 219E3F    LD   HL,3F9E   "DISC ERROR"
AEE3 DF        RST  18
AEE4 76        HALT ----------
AEE5 CD1404 ->CALL 0414
AEE8 7E        LD   A,(HL)
AEE9 B7        OR   A
AEEA CAFF02    JP   Z,02FF ---> IMPRIME SI HA LISTADO CAT EL Nº BYTES LIBRES
AEED FE01      CP   01
AEEF CC0F04    CALL Z,040F ---> LD DE, 0010
AEF2 C0        RET  NZ          ADD HL,DE
AEF3 18F0      JR   AEE5        RET
```

IMPRIME Nº FICHEROS Y BORRADOS

PROTECCION ANTI PIRATEO DEL D.O.S.

ELIMINAR

```
AEF5 3EAA      LD   A,AA
AEF7 32175D    LD   (5D17),A
AEFA AF        XOR  A
AEFB 1802      JR   AEFF
AEFD 3EFF      LD   A,FF
AEFF 32CE5C    LD   (5CCE),A
AF02 110900    LD   DE,0009
AF05 0601      LD   B,01
AF07 21005B    LD   HL,5B00
AF0A C3A20B    JP   0BA2
AF0D E5        PUSH HL
AF0E ED5BF45C  LD   DE,(5CF4)
AF12 CD053F    CALL 3F05
AF15 3ADB5C    LD   A,(5CDB)
AF18 D1        POP  DE
AF19 B7        OR   A
AF1A 28D9      JR   Z,AEF5
AF1C 4F        LD   C,A
AF1D 21005B    LD   HL,5B00
AF20 EDB0      LDIR
AF22 18D1      JR   AEF5
```

3F22 → DIRECCION REAL

```
AF23 CF → CAT
     2A → *
     D1 → MOVE
     E6 → NEW
     D2 → ERASE
     EF → LOAD
     F8 → SAVE
     FE → RETURN
     C0 → USR
     BE → PEEK
     F4 → POKE
     D5 → MERGE
     F7 → RUN
AF31 83
```

REPERTORIO DE COMANDOS DE DISCO

```
AF32 03 2E "."
     04 3D "="
     05 52 "R"
     04 AF → CODE
     04 82
     06 56 "V"
     08 51 "Q"
AF40 0A 5C "\"
```

```
AF42 02 48 "H"
     07 4C "L"
     07 54 "T"
     07 75 "U"
     0A 10
     02
```

RESTO DE LA DECODIFICACION DE COMANDOS

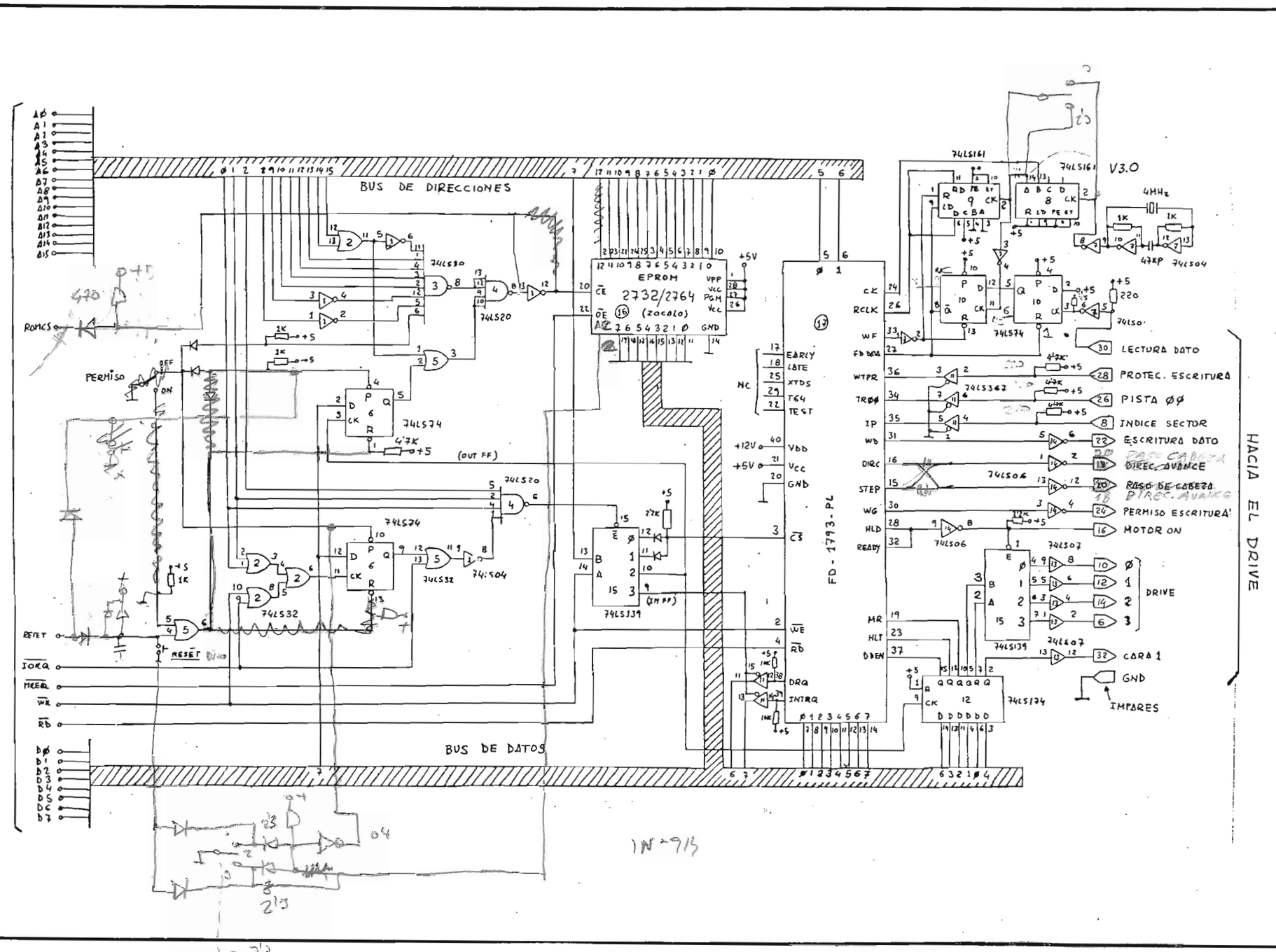
MENSAJES

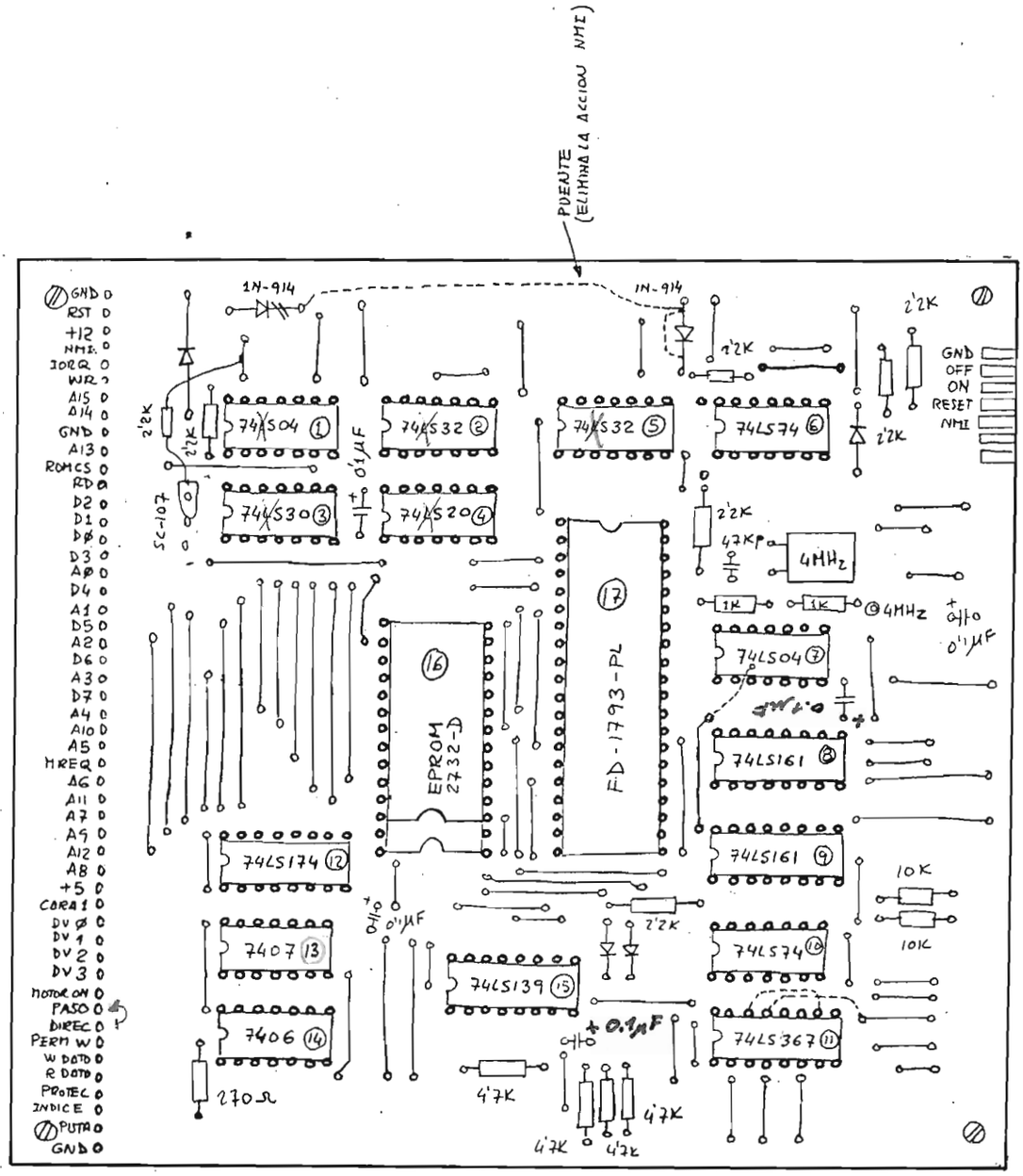
```
AF4B [illegible] 0D 4E 6F 20 46 69
AF53 6C 65 28 73 29 [illegible] 20 44
AF5B 65 6C 2E. 20 46 69 6C 65
AF63 28 73 29 [illegible] 2A 45 52
AF6B 52 4F 52 2A [illegible] 4E 6F
AF73 20 73 70 61 63 65 2E. [illegible]
AF7B [illegible] 46 69 6C 65 20 65 78
AF83 69 73 74 73 2E. [illegible] 20 46
AF8B 72 65 65 2E. [illegible] 57 72
AF93 69 74 65 20 70 72 6F 74
AF9B 65 63 F4 [illegible] 44 69 73 63
AFA3 20 45 72 72 6F F2 [illegible] 54
AFAB 72 6B A0 [illegible] 52 65 63 2E.
AFB3 20 4E 6F 2E. 20 4F 2F 46
AFBB 54 69 74 75 6C 6F 3A A0
AFC3 4E 75 65 76 6F A0 43 6C
AFCB 61 76 65 20 3A A0 15 07
AFD3 03 41 69 73 74 72 69 62
AFDB 75 69 64 6F 20 45 6E 20
AFE3 45 78 63 6C 75 73 69 76
AFEB 61 20 70 6F 72 16 03 0A
AFF3 53 49 4C 4F 47 20 28 45
AFFB 29 00 FF FF 00 00 00 00
```

```
0D No file(s) 8D
   Del. File(s) 8D
0D * ERROR * 8D
0D No space. 8D
0D File exists. 8D
   Free. 8D
0D Write protect
0D Disc Error
0D Trk
0D Rec. No. O/E
Titulo :
Nuevo clave :
```

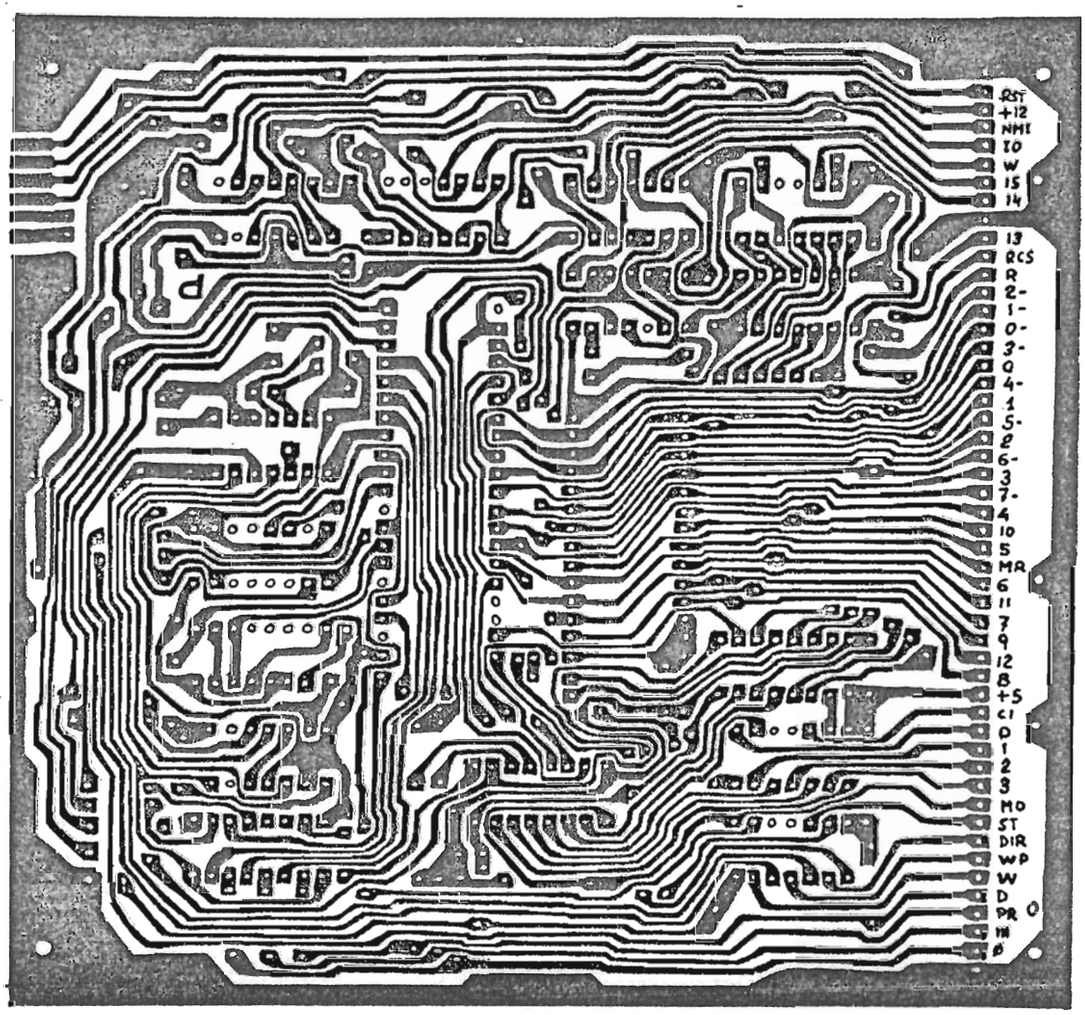
```
3FEF
3F4D — 1401 TITULO ☒ : 1480
3F59 — ☒FICHEROS 8D
3F63 — ☒☒BORRADOS 8D
3F6E — 0D 1201 ☒ERROR ☒ 0D 1280
3F7B — 0D NO ☒CABE 8D
3F84 — 0D YA ☒EXISTE 8D
3F8F — 0D NO ☒EXISTE 8D
3F9A — ☒SECTORES☒LIBRES 8D
3FAB — 0D DISCO ☒ PROTEGIDO
3FBB — 0D ERROR ☒ DE ☒ DISCO
3FCA — 0D — PISTA :A0
3FD3 — NUEVA☒CLAVE :☒
3FD9 — 0D DESBORDAMIENTO
3FE0
3FEF ☒ 1401 TITULO ☒ : 1480
```

```
— TITULO — 0
FICHEROS = ☒
0D BORRADOS = ☒
```


HACIA EL ORDENADOR
BUS DE DIRECCIONES
BUS DE DATOS
EPROM 2732/2764 (zocalo)
74LS30
74LS20
74LS74
74LS32
74LS04
74LS139
74LS161
74LS574
74LS507
74LS174
FD-1793-PL
ROMCS
PERMISO
RESET
IORQ
MREQ
WR
RD
(OUT FF)
(IN FF)
DRQ
INTRQ
V3.0
4MHz
LECTURA DATO
PROTEC. ESCRITURA
PISTA ØØ
INDICE SECTOR
ESCRITURA DATO
DIREC. AVANCE
PASO DE CABEZA
PERMISO ESCRITURA
MOTOR ON
DRIVE
CARA 1
GND
IMPARES
HACIA EL DRIVE

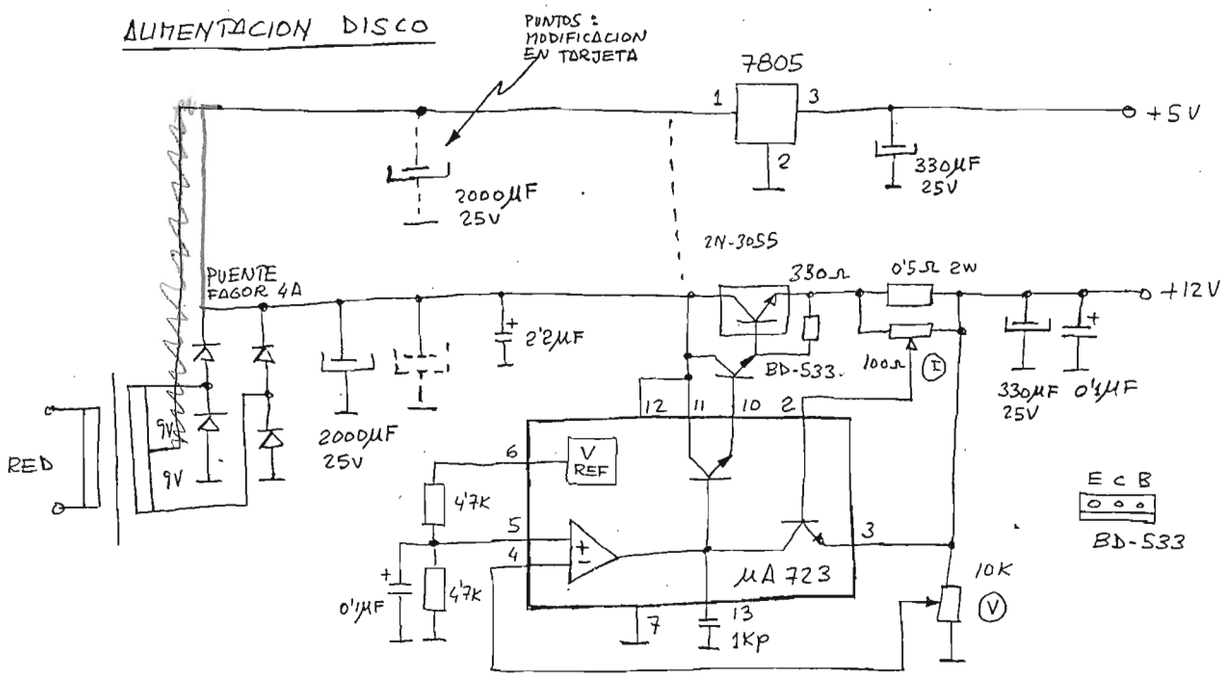


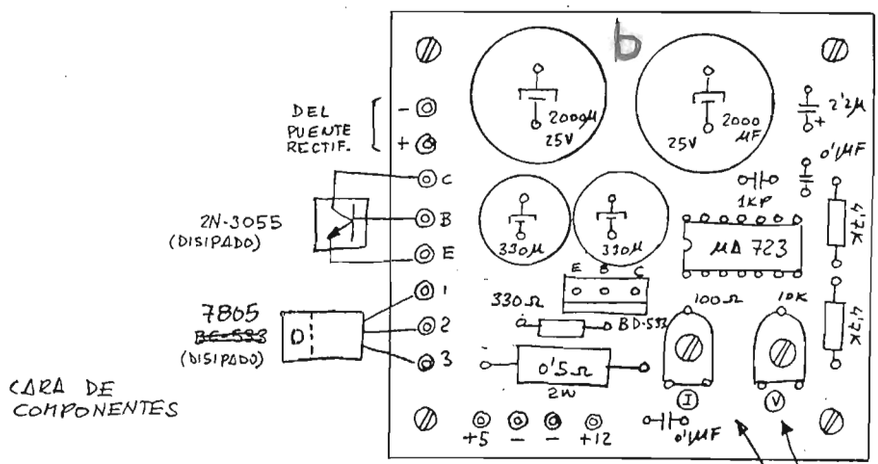
CARA DE COMPONENTES

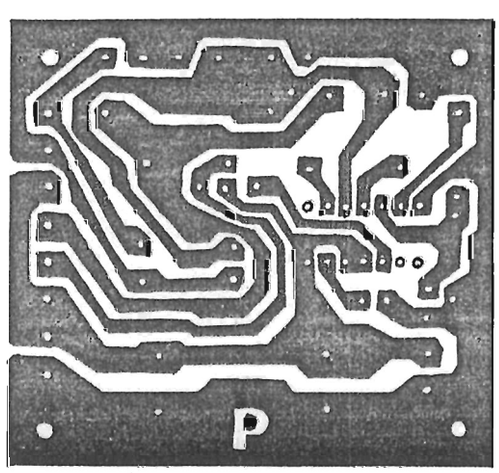


CARA DE PISTAS (TAMAÑO REAL)

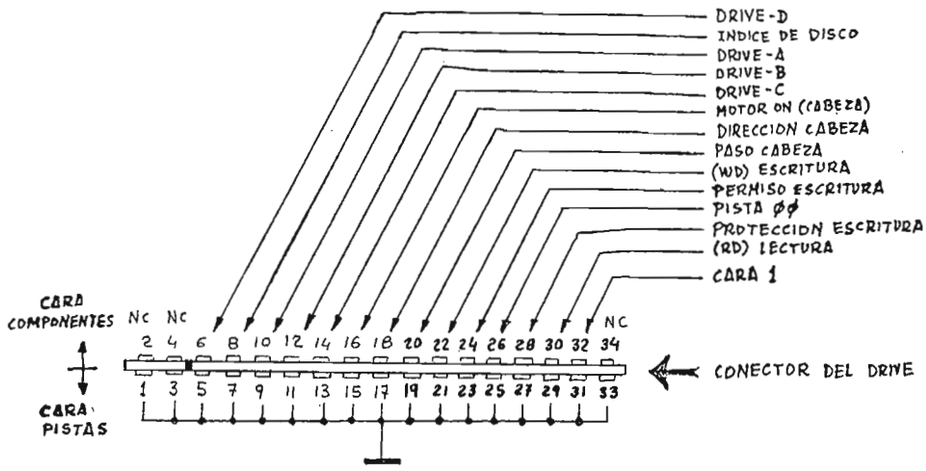
ALIMENTACION DISCO

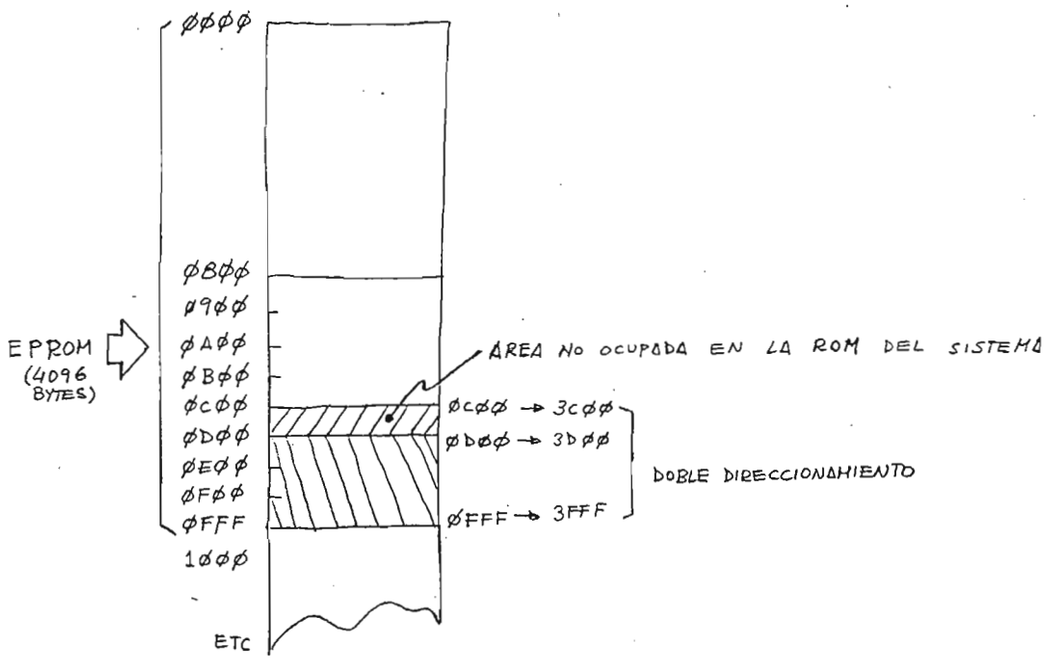






CARA DE PISTAS





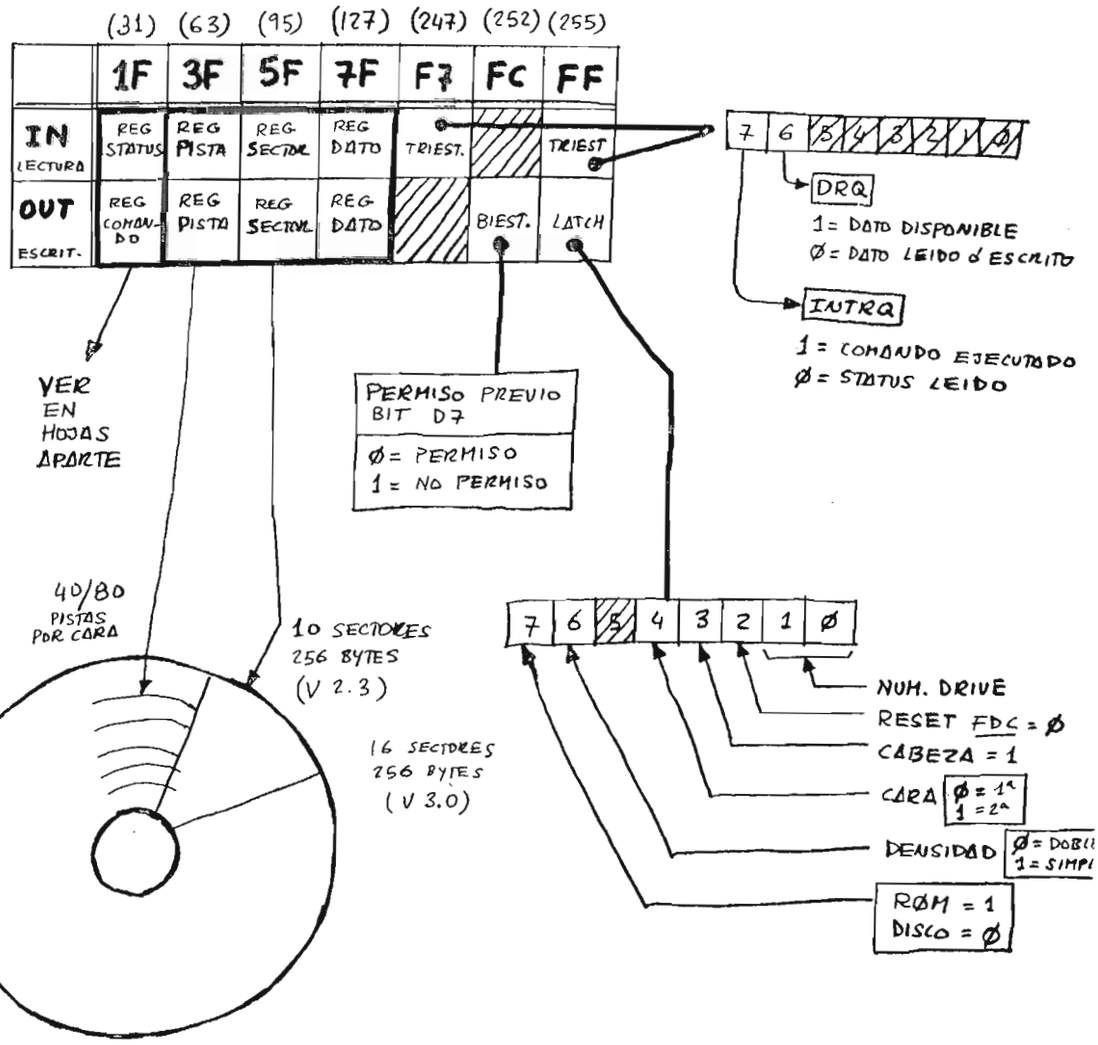
PAGINACION DEL D.O.S. LA PAGINACION OCUPA TODO LOS PRIMEROS 4 K BYTES DE LA ROM + 1 K BYTE DEL FINAL EN FORMA DE DOBLE DIRECCIONAMIENTO

D

1

A1	A0	READ (RE)	WRITE (WE)
0	0	Status Register	Command Register
0	1	Track Register	Track Register
1	0	Sector Register	Sector Register
1	1	Data Register	Data Register

FILOSOFIA DE ACCESO A LOS REGISTROS

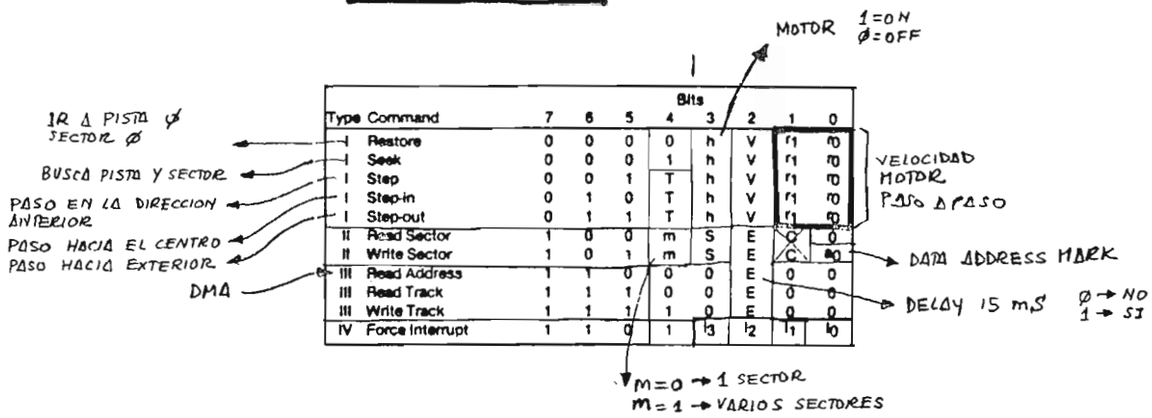


CAPACIDAD TOTAL = 409600 BYTES (V 2.3)

CAPACIDAD TOTAL = 655360 BYTES (V 3.0)

5D16 → GUARDA ESTADO LATCH

COMANDOS



Type	Command	7	6	5	4	3	2	1	0
		Bits							
I	Restore	0	0	0	0	h	V	r_1	r_0
I	Seek	0	0	0	1	h	V	r_1	r_0
I	Step	0	0	1	T	h	V	r_1	r_0
I	Step-in	0	1	0	T	h	V	r_1	r_0
I	Step-out	0	1	1	T	h	V	r_1	r_0
II	Read Sector	1	0	0	m	S	E	C	0
II	Write Sector	1	0	1	m	S	E	C	a_0
III	Read Address	1	1	0	0	0	E	0	0
III	Read Track	1	1	1	0	0	E	0	0
III	Write Track	1	1	1	1	0	E	0	0
IV	Force Interrupt	1	1	0	1	I_3	I_2	I_1	I_0

FLAG SUMMARY

Command Type	Bit No(s)		Description
I	0, 1	r_1 r_0 = Stepping Motor Rate See Table 3 for Rate Summary	
I	2	V = Track Number Verify Flag	V = 0, No verify V = 1, Verify on destination track
I	3	h = Head Load Flag	h = 1, Load head at beginning h = 0, Unload head at beginning
I	4	T = Track Update Flag	T = 0, No update T = 1, Update track register
II	0	a_0 = Data Address Mark	a_0 = 0, FB (DAM) a_0 = 1, FB (deleted DAM)
II	1	C = Side Compare Flag	C = 0, Disable side compare C = 1, Enable side compare
II & III	1	U = Update SSO	U = 0, Update SSO to 0 U = 1, Update SSO to 1
II & III	2	E = 15 MS Delay	E = 0, No 15 MS delay E = 1, 15 MS delay
II	3	S = Side Compare Flag	S = 0, Compare for side 0 S = 1, Compare for side 1
II	3	~~L = Sector Length Flag~~	~~LEB's Sector Length in ID Field~~ ~~00 01 10 11~~ ~~L = 0 256 512 1024 128~~ ~~L = 1 128 256 512 1024~~
II	4	m = Multiple Record Flag	m = 0, Single record m = 1, Multiple records
IV	0-3	I_x = Interrupt Condition Flags I_0 = 1 Not Ready To Ready Transition I_1 = 1 Ready To Not Ready Transition I_2 = 1 Index Pulse I_3 = 1 Immediate Interrupt, Requires A Reset I_3-I_0 = 0 Terminate With No Interrupt (INTRQ)	

CLK	2 MHz	2 MHz	1 MHz	1 MHz	2 MHz	1 MHz
ODEN	0	1	0	1	x	x
R1 R0	TEST=1	TEST=1	TEST=1	TEST=1	TEST=0	TEST=0
0 0	3 ms	3 ms	6 ms	6 ms	164µs	368µs
0 1	6 ms	6 ms	12 ms	12 ms	190µs	380µs
1 0	10 ms	10 ms	20 ms	20 ms	196µs	396µs
1 1	15 ms	15 ms	30 ms	30 ms	208µs	416µs

RESTORE → Ø 8 MOTOR ON
Ø Ø MOTOR OFF

SEEK → 1 8 MON
1 Ø MOFF

STEP → 2 8
2 Ø

STEP IN → 4 8
4 Ø

STEP OUT → 6 8
6 Ø

R. SECT → 8 Ø
W. SECT → A Ø

R. TRACK → E Ø
W. TRACK → F Ø

INTERRUPT → D Ø = NO INTERRUPCION

RESUMEN

COMANDOS

STATUS

BIT	ALL TYPE I COMMANDS	READ ADDRESS	READ SECTOR	READ TRACK	WRITE SECTOR	WRITE TRACK
S7	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY
S6	WRITE PROTECT	0	0	0	WRITE PROTECT	WRITE PROTECT
S5	HEAD LOADED	0	RECORD TYPE	0	WRITE FAULT	WRITE FAULT
S4	SEEK ERROR	RNF	RNF	0	RNF	0
S3	CRC ERROR	CRC ERROR	CRC ERROR	0	CRC ERROR	0
S2	TRACK 0	LOST DATA	LOST DATA	LOST DATA	LOST DATA	LOST DATA
S1	INDEX PULSE	DRQ	DRQ	DRQ	DRQ	DRQ
S0	BUSY	BUSY	BUSY	BUSY	BUSY	BUSY

STATUS FOR TYPE I COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset it indicates that the drive is ready. This bit is an inverted copy of the Ready input and logically 'ored' with MR.
S6 PROTECTED	When set, indicates Write Protect is activated. This bit is an inverted copy of $\overline{WRPT}$ input.
S5 HEAD LOADED	When set, it indicates the head is loaded and engaged. This bit is a logical "and" of HLD and HLT signals.
S4 SEEK ERROR	When set, the desired track was not verified. This bit is reset to 0 when updated.
S3 CRC ERROR	CRC encountered in ID field.
S2 TRACK 00	When set, indicates Read/Write head is positioned to Track 0. This bit is an inverted copy of the $\overline{TR00}$ input.
S1 INDEX	When set, indicates index mark detected from drive. This bit is an inverted copy of the $\overline{IP}$ input.
S0 BUSY	When set command is in progress. When reset no command is in progress.

STATUS FOR TYPE II AND III COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset, it indicates that the drive is ready. This bit is an inverted copy of the Ready input and 'ored' with MR. The Type II and III Commands will not execute unless the drive is ready.
S6 WRITE PROTECT	On Read Record: Not Used. On Read Track: Not Used. On any Write: It indicates a Write Protect. This bit is reset when updated.
S5 RECORD TYPE/ WRITE FAULT	On Read Record: It indicates the record-type code from data field address mark. 1 = Deleted Data Mark, 0 = Data Mark. On any Write: It indicates a Write Fault. This bit is reset when updated.
S4 RECORD NOT FOUND (RNF)	When set, it indicates that the desired track, sector, or side were not found. This bit is reset when updated.
S3 CRC ERROR	If S4 is set, an error is found in one or more ID fields; otherwise it indicates error in data field. This bit is reset when updated.
S2 LOST DATA	When set, it indicates the computer did not respond to DRQ in one byte time. This bit is reset to zero when updated.
S1 DATA REQUEST	This bit is a copy of the DRQ output. When set, it indicates the DR is full on a Read Operation or the DR is empty on a Write operation. This bit is reset to zero when updated.
S0 BUSY	When set, command is under execution. When reset, no command is under execution.

DOS V 3.Ø

(1)

```
A000 F3          DI
A001 11FFFF      LD    DE,FFFF
A004 3E07        LD    A,07
A006 1801        JR    A009
A008 00          NOP
A009 D3FE        OUT   (FE),A
A00B 3E3F        LD    A,3F
A00D 1804        JR    A013
A00F 00          NOP
A010 C3013D      JP    3D01
A013 ED47        LD    I,A
A015 C31B20      JP    201B
A018 C32F3D      JP    3D2F
A01B 00          NOP
A01C 00          NOP
A01D 00          NOP
A01E 62          LD    H,D
A01F 6B          LD    L,E
A020 3602        LD    (HL),02
A022 2B          DEC   HL
A023 BC          CP    H
A024 20FA        JR    NZ,A020
A026 B7          OR    A
A027 ED52        SBC   HL,DE
A029 19          ADD   HL,DE
A02A 23          INC   HL
A02B 3006        JR    NC,A033
A02D 35          DEC   (HL)
A02E 2803        JR    Z,A033
A030 35          DEC   (HL)
A031 28F3        JR    Z,A026
A033 2B          DEC   HL
A034 22B45C      LD    (5CB4),HL
A037 11AF3E      LD    DE,3EAF
A03A 01A800      LD    BC,00A8
A03D 7B          LD    A,E
A03E EB          EX    DE,HL
A03F 310060      LD    SP,6000
A042 CDF13C      CALL  3CF1
A045 EB          EX    DE,HL
A046 23          INC   HL
A047 227B5C      LD    (5C7B),HL
A04A 2B          DEC   HL
A04B 01401E      LD    BC,1E40
A04E ED43385C    LD    (5C38),BC
A052 228250      LD    (5C82),HL
A055 210030      LD    HL,3000
A058 22365C      LD    (5C36),HL
A05B 2A825C      LD    HL,(5C82)
A05E 363E        LD    (HL),3E
A060 2B          DEC   HL
A061 F9          LD    SP,HL
A062 2B          DEC   HL
A063 2B          DEC   HL
A064 223D5C      LD    (5C3D),HL
A067 110313      LD    DE,1303
A06A D5          PUSH  DE
A06B ED56        IM    1
A06D FD213A5C    LD    IY,5C3A
A071 21B65C      LD    HL,5CB6
A074 224F5C      LD    (5C4F),HL
A077 11AF15      LD    DE,15AF
A07A 011500      LD    BC,0015
A07D EB          EX    DE,HL
A07E CDF83C      CALL  3CF8
A081 EB          EX    DE,HL
A082 2B          DEC   HL
A083 22575C      LD    (5C57),HL
A086 23          INC   HL
A087 22535C      LD    (5C53),HL
A08A 224B5C      LD    (5C4B),HL
A08D 3680        LD    (HL),80
A08F 23          INC   HL
A090 22595C      LD    (5C59),HL
A093 CD8722      CALL  2287
A096 23          INC   HL
A097 22615C      LD    (5C61),HL
A09A 22635C      LD    (5C63),HL
A09D 22655C      LD    (5C65),HL
A0A0 3E38        LD    A,38
A0A2 328D5C      LD    (5C8D),A
A0A5 328F5C      LD    (5C8F),A
A0A8 32485C      LD    (5C48),A
A0AB 212305      LD    HL,0523
A0AE 22095C      LD    (5C09),HL
A0B1 FD35C6      DEC   (IY+C6)
A0B4 FD35CA      DEC   (IY+CA)
A0B7 21C615      LD    HL,15C6
A0BA 11105C      LD    DE,5C10
A0BD 010E00      LD    BC,000E
A0C0 CDF83C      CALL  3CF8
```

```
A0C3 FDCB01CE SET  1,(IY+01)
A0C7 211DF0E  LD   HL,0EDF
A0CA CDBE2A   CALL 2ABE
A0CD 216B5C   LD   HL,5C6B
A0D0 3602     LD   (HL),02
A0D2 218B12   LD   HL,128B
A0D5 E5       PUSH HL
A0D6 C3793C   JP   3C79
A0D9 CD413D   CALL 3D41
A0DC CDBD21   CALL 21BD
A0DF CDBB2A   CALL 2ABB
A0E2 2A595C   LD   HL,(5C59)
A0E5 7E       LD   A,(HL)
A0E6 FEAA     CP   AA
A0E8 2007     JR   NZ,A0F1
A0EA 23       INC  HL
A0EB 5E       LD   E,(HL)
A0EC 23       INC  HL
A0ED 56       LD   D,(HL)
A0EE EB       EX   DE,HL
A0EF 1803     JR   A0F4
A0F1 210100   LD   HL,0001
A0F4 22425C   LD   (5C42),HL
A0F7 AF       XOR  A
A0F8 32445C   LD   (5C44),A
A0FB 21B016   LD   HL,16B0
A0FE CDBE2A   CALL 2ABE
A101 2A535C   LD   HL,(5C53)
A104 2B       DEC  HL
A105 22575C   LD   (5C57),HL
A108 211B3C   LD   HL,3C1B
A10B CDBE2A   CALL 2ABE
A10E CD413D   CALL 3D41
A111 3EFF     LD   A,FF
A113 32155D   LD   (5D15),A
A116 AF       XOR  A
A117 32F75C   LD   (5CF7),A
A11A CDC63D   CALL 3DC6
A11D 3EAA     LD   A,AA
A11F 32175D   LD   (5D17),A
A122 217E21   LD   HL,217E
A125 221A5D   LD   (5D1A),HL
A128 210000   LD   HL,0000
A12B 39       ADD  HL,SP
A12C 221C5D   LD   (5D1C),HL
A12F 2B       DEC  HL
A130 2B       DEC  HL
A131 F9       LD   SP,HL
A132 CDA821   CALL 21A8
A135 2A5D5C   LD   HL,(5C5D)
A138 CD5521   CALL 2155
A13B CA5E21   JP   Z,215E
A13E FEEA     CP   EA
A140 23       INC  HL
A141 20F5     JR   NZ,A138
A143 CD5521   CALL 2155
A146 28F3     JR   Z,A138
A148 FE3A     CP   3A
A14A C25E21   JP   NZ,215E
A14D 23       INC  HL
A14E 7E       LD   A,(HL)
A14F 22115D   LD   (5D11),HL
A152 C31F22   JP   221F
A155 7E       LD   A,(HL)
A156 FE0D     CP   0D
A158 C8       RET  Z
A159 FE80     CP   80
A15B C8       RET  Z
A15C B7       OR   A
A15D C9       RET
A15E CD413D   CALL 3D41
A161 3A175D   LD   A,(5D17)
A164 B7       OR   A
A165 2003     JR   NZ,A16A
A167 CD143F   CALL 3F14
A16A CD5D2B   CALL 2B5D
A16D CD9D21   CALL 219D
A170 ED7B1C5D LD   SP,(5D1C)
A174 2A1A5D   LD   HL,(5D1A)
A177 ED480F5D LD   BC,(5D0F)
A17B 0600     LD   B,00
A17D E9       JP   HL
```

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```
A17E CDBD21   CALL 21BD
A181 FDCB007E BIT  7,(IY+00)
A185 C0       RET  NZ
A186 2A635C   LD   HL,(5C63)
A189 22655C   LD   (5C65),HL
A18C E5       PUSH HL
A18D 21925C   LD   HL,5C92
A190 22685C   LD   (5C68),HL
A193 E1       POP  HL
A194 11BE3C   LD   DE,3CBE
A197 ED7B3D5C LD   SP,(5C3D)
A19B D5       PUSH DE
A19C C9       RET
A19D CDAE2A   CALL 2AAE
A1A0 FE0D     CP   0D
A1A2 C8       RET  Z
A1A3 CD732B   CALL 2B73
A1A6 18F5     JR   A19D
A1A8 2A3D5C   LD   HL,(5C3D)
A1AB 22135D   LD   (5D13),HL
A1AE 2A1C5D   LD   HL,(5D1C)
A1B1 2B       DEC  HL
A1B2 2B       DEC  HL
A1B3 223D5C   LD   (5C3D),HL
A1B6 110F3C   LD   DE,3C0F
A1B9 73       LD   (HL),E
A1BA 23       INC  HL
A1BB 72       LD   (HL),D
A1BC C9       RET
A1BD 2A135D   LD   HL,(5D13)
A1C0 223D5C   LD   (5C3D),HL
A1C3 C9       RET
A1C4 210000   LD   HL,0000
A1C7 22F75C   LD   (5CF7),HL
A1CA 39       ADD  HL,SP
A1CB 221C5D   LD   (5D1C),HL
A1CE 2B       DEC  HL
A1CF 2B       DEC  HL
A1D0 F9       LD   SP,HL
A1D1 CDA821   CALL 21A8
A1D4 21175D   LD   HL,5D17
A1D7 7E       LD   A,(HL)
A1D8 CAF121   JP   Z,21F1
A1DB 36AA     LD   (HL),AA
A1DD CDBB2A   CALL 2ABB
A1E0 CDAA2A   CALL 2AAA
A1E3 217722   LD   HL,2277
A1E6 DF       RST  18
A1E7 21EF3F   LD   HL,3FEF
A1EA DF       RST  18
A1EB CDC93D   CALL 3DC9
A1EE ~~CDCF22~~ CALL ~~22CF~~ ──► CLAVE
A1F1 2A1C5D   LD   HL,(5D1C)
A1F4 2B       DEC  HL
A1F5 2B       DEC  HL
A1F6 F9       LD   SP,HL
A1F7 CD413D   CALL 3D41
A1FA CDA42A   CALL 2AA4
A1FD ~~CDCF3E~~ CALL ~~3ECF~~ ELIMINAR (~~CLAVE~~) TEJTEA
A200 AF       XOR  A
A201 32155D   LD   (5D15),A
A204 21F101   LD   HL,21F1
A207 221A5D   LD   (5D1A),HL
A20A CDC63D   CALL 3DC6
A20D CD6C3D   CALL 3D6C
A210 AF       XOR  A
A211 320F5D   LD   (5D0F),A
A214 2A595C   LD   HL,(5C59)
A217 22115D   LD   (5D11),HL
A21A 7E       LD   A,(HL)
A21B FE0D     CP   0D
A21D 28EE     JR   Z,A20D
A21F 2A1F5D   LD   HL,(5D1F)
A222 2B       DEC  HL
A223 0E00     LD   C,00
A225 0C       INC  C
A226 57       LD   D,A
A227 3A235D   LD   A,(5D23)
A22A B9       CP   C
A22B DA5E21   JP   C,215E
A22E 7A       LD   A,D
A22F 23       INC  HL
A230 BE       CP   (HL)
A231 20F2     JR   NZ,A225
```

```
A233 AF        XOR  A
A234 320F5D    LD   (5D0F),A
A237 32D65C    LD   (5CD6),A
A23A 32105D    LD   (5D10),A
A23D 213B5C    LD   HL,5C3B
A240 CBBE      RES  7,(HL)
A242 0600      LD   B,00
A244 2A215D    LD   HL,(5D21)
A247 0D        DEC  C
A248 CB21      SLA  C
A24A 09        ADD  HL,BC
A24B 5E        LD   E,(HL)
A24C 23        INC  HL
A24D 56        LD   D,(HL)
A24E EB        EX   DE,HL
A24F E5        PUSH HL
A250 115522    LD   DE,2255
A253 D5        PUSH DE
A254 E9        JP   HL
A255 213B5C    LD   HL,5C3B
A258 CBFE      SET  7,(HL)
A25A E1        POP  HL
A25B E9        JP   HL
A25C CD962A    CALL 2A96
A25F CD4D23    CALL 234D
A262 21E13F    LD   HL,3FE1   "NUEVA CLAVE"
A265 DF        RST  18
A266 CDCF22    CALL 22CF
A269 11EA5B    LD   DE,5BEA
A26C 21065D    LD   HL,5D06
A26F 010900    LD   BC,0009
A272 EDB0      LDIR
A274 C33B3D    JP   3D3B
```

```
A2B7 2A595C    LD   HL,(5C59)
A2BA 3622      LD   (HL),22
A2BC 23        INC  HL
A2BD 225B5C    LD   (5C5B),HL
A2C0 3622      LD   (HL),22
A2C2 23        INC  HL
A2C3 360D      LD   (HL),0D
A2C5 23        INC  HL
A2C6 3680      LD   (HL),80
A2C8 C9        RET
A2C9 CDB722    CALL 22B7
A2CC C3B32A    JP   2AB3
A2CF CDA42A    CALL 2AA4
A2D2 21E53F    LD   HL,3FE5   "CLAVE"
A2D5 DF        RST  18
A2D6 CDC922    CALL 22B7
A2D9 CDC82A    CALL 2AC8
A2DC 2A595C    LD   HL,(5C59)
A2DF 23        INC  HL
A2E0 0609      LD   B,09
A2E2 0E00      LD   C,00
A2E4 11065D    LD   DE,5D06
A2E7 7E        LD   A,(HL)
A2E8 FE22      CP   22
A2EA 2001      JR   NZ,A2ED
A2EC 4F        LD   C,A
A2ED F5        PUSH AF
A2EE 79        LD   A,C
A2EF FE22      CP   22
A2F1 2005      JR   NZ,A2F8
A2F3 F1        POP  AF
A2F4 3E20      LD   A,20
A2F6 1801      JR   A2F9
A2F8 F1        POP  AF
A2F9 12        LD   (DE),A
A2FA 23        INC  HL
A2FB 13        INC  DE
A2FC 10E9      DJNZ A2E7
A2FE C9        RET
A2FF CD4823    CALL 2348
A302 CDFF3C    CALL 3CFF → "OD"
A305 CDFF3C    CALL 3CFF   "
A308 ED4B5E5B  LD   BC,(5B5E)
A30C CDCD2A    CALL 2ACD
A30F 21A83F    LD   HL,3FA8 → "FREE"
A312 DF        RST  18
A313 C35E21    JP   215E
```

```
A316 320F5D    LD    (5D0F),A
A319 3A155D    LD    A,(5D15)
A31C B7        OR    A
A31D CC2F3D    CALL  Z,3D2F
A320 C9        RET
A321 213C3F    LD    HL,3F3C      "NO FILE"
A324 3E01      LD    A,01         → 3FEF
A326 C3A829    JP    29A8
A329 AF        XOR   A
A32A 32CC5C    LD    (5CCC),A
A32D ED5BCC5C  LD    DE,(5CCC)
A331 1600      LD    D,00
A333 21175D    LD    HL,5D17
A336 AF        XOR   A
A337 BE        CP    (HL)
A338 77        LD    (HL),A
A339 2805      JR    Z,A340
A33B D5        PUSH  DE
A33C CD1C3F    CALL  3F1C
A33F D1        POP   DE
A340 21005B    LD    HL,5B00
A343 0601      LD    B,01
A345 C3912B    JP    2B91
A348 110800    LD    DE,0008
A34B 18E6      JR    A333
A34D CD4823    CALL  2348
A350 3AE75B    LD    A,(5BE7)
A353 FE06      CP    06
A355 3804      JR    C,A35B
A357 FE11      CP    11
A359 3806      JR    C,A361
A35B 21BD3F    LD    HL,3FBD   ] "DISK ERROR"
A35E DF        RST   18        ]
A35F 1882      JR    A313
A361 ED4BF65C  LD    BC,(5CF6)
A365 21C45C    LD    HL,5CC4
A368 09        ADD   HL,BC
A369 77        LD    (HL),A
A36A 3AE35B    LD    A,(5BE3)
A36D 23        INC   HL
A36E 23        INC   HL
A36F 23        INC   HL
A370 23        INC   HL
A371 77        LD    (HL),A
A372 21065D    LD    HL,5D06
A375 11EA5B    LD    DE,5BEA
A378 0609      LD    B,09
A37A CD8E3D    CALL  3D8E
A37D C8        RET   Z
A37E CDCF22    CALL  22CF  → C9 00 00
A381 18CA      JR    A34D
A383 2A115D    LD    HL,(5D11)
A386 23        INC   HL
A387 7E        LD    A,(HL)
A388 FE0D      CP    0D
A38A CA9A23    JP    Z,239A
A38D CD042B    CALL  2B04
A390 CD962A    CALL  2A96
A393 CDD62A    CALL  2AD6
A396 EB        EX    DE,HL
A397 CDDE29    CALL  29DE
A39A CD962A    CALL  2A96
A39D CD4D23    CALL  234D
A3A0 CDB82A    CALL  2AB8
A3A3 CDAA2A    CALL  2AAA
A3A6 21DA3F    LD    HL,3FDA   ] "TITULO"
A3A9 DF        RST   18        ]
A3AA 21F55B    LD    HL,5BF5   ] "NOMBRE"
A3AD DF        RST   18        ]
A3AE CDFF3C    CALL  3CFF  → IMPRIME "0D"
A3B1 3AE45B    LD    A,(5BE4)
A3B4 21F45B    LD    HL,5BF4
A3B7 96        SUB   (HL)
A3B8 E5        PUSH  HL
A3B9 CDD33E    CALL  3ED3
A3BC 216F3F    LD    HL,3F6F   ] "FILES"
A3BF DF        RST   18        ]
A3C0 E1        POP   HL
A3C1 4E        LD    C,(HL)    3F79
A3C2 CDD43E    CALL  3ED4
A3C5 21783F    LD    HL,3F78   ] "DEL FILES"
A3C8 DF        RST   18        ]
A3C9 CD2923    CALL  2329  → 3EF6 (NO PONER PRIMERO)
A3CC 21005B    LD    HL,5B00
A3CF CD043F    CALL  3F04
A3D2 CDFF3C    CALL  3CFF
A3D5 3AF65C    LD    A,(5CF6)
A3D8 C641      ADD   A,41      ] "A"
A3DA D7        RST   10        ]
A3DB 0602      LD    B,02
A3DD CD043F    CALL  3F04
```

SUSTITUIR PARA ORDENAR EL ORDEN DE TITULO = NOMBRE =

```
A3E0 C5        PUSH BC
A3E1 3E3A      LD   A,3A   } ":" → CD E05E
A3E3 D7        RST  10     }
A3E4 E5        PUSH HL
A3E5 CD963D    CALL 3D96
A3E8 010D00    LD   BC,000D
A3EB E1        POP  HL
A3EC E5        PUSH HL
A3ED 09        ADD  HL,BC
A3EE 4E        LD   C,(HL)
A3EF C5        PUSH BC
A3F0 79        LD   A,C
A3F1 0602      LD   B,02
A3F3 FE0A      CP   0A
A3F5 3801      JR   C,A3F8
A3F7 05        DEC  B
A3F8 FE64      CP   64
A3FA 3005      JR   NC,A401
A3FC 3E20      LD   A,20
A3FE D7        RST  10
A3FF 10FB      DJNZ A3FC
A401 C1        POP  BC
A402 CDCD2A    CALL 2ACD
A405 E1        POP  HL
A406 C1        POP  BC
A407 111000    LD   DE,0010
A40A 19        ADD  HL,DE
A40B 10D0      DJNZ A3DD
A40D 18C0      JR   A3CF
A40F 111000    LD   DE,0010
A412 19        ADD  HL,DE
A413 C9        RET
A414 E5        PUSH HL
A415 C5        PUSH BC
A416 0100A4    LD   BC,A400
A419 09        ADD  HL,BC
A41A 7C        LD   A,H
A41B B5        OR   L
A41C 2803      JR   Z,A421
A41E C1        POP  BC
A41F E1        POP  HL
A420 C9        RET
A421 21CC5C    LD   HL,5CCC
A424 34        INC  (HL)
A425 CD2D23    CALL 232D
A428 C1        POP  BC
A429 E1        POP  HL
A42A 21005B    LD   HL,5B00
A42D C9        RET
A42E CD042B    CALL 2B04
A431 CD962A    CALL 2A96
A434 CDD62A    CALL 2AD6
A437 79        LD   A,C
A438 B8        CP   B
A439 CA602A    JP   Z,2A60
A43C 1A        LD   A,(DE)
A43D E60F      AND  0F
A43F DE41      SBC  A,41
A441 DA602A    JP   C,2A60
A444 FE04      CP   04
A446 D2602A    JP   NC,2A60
A449 32195D    LD   (5D19),A
A44C CDC93D    CALL 3DC9
A44F C35E21    JP   215E
A452 CDF22A    CALL 2AF2
A455 CD962A    CALL 2A96
A458 CD8C24    CALL 248C
A45B CD162A    CALL 2A16
A45E 3AF85C    LD   A,(5CF8)
A461 32F85C    LD   (5CF8),A
A464 C22123    JP   NZ,2321
A467 C5        PUSH BC
A468 CD1225    CALL 2512
A46B CD162A    CALL 2A16
A46E F5        PUSH AF
A46F 3AF85C    LD   A,(5CF8)
A472 21F85C    LD   HL,5CF8
A475 BE        CP   (HL)
A476 C2602A    JP   NZ,2A60
A479 CD4D23    CALL 234D
A47C F1        POP  AF
A47D CAAE29    JP   Z,29AE
A480 C1        POP  BC
A481 CD1925    CALL 2519
A484 C33B3D    JP   3D3B
A487 3A105D    LD   A,(5D10)
A48A B7        OR   A
A48B C9        RET
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A48C 0643      LD   B,43
A48E 3AD65C    LD   A,(5CD6)
A491 B7        OR   A
A492 2016      JR   NZ,A4AA
A494 CD8724    CALL 2487
A497 2011      JR   NZ,A4AA
A499 CDAE2A    CALL 2AAE
A49C FEAF      CP   AF
A49E 0643      LD   B,43
A4A0 2808      JR   Z,A4AA
A4A2 FEE4      CP   E4
A4A4 0644      LD   B,44
A4A6 2802      JR   Z,A4AA
A4A8 0642      LD   B,42
A4AA 21E55C    LD   HL,5CE5
A4AD 70        LD   (HL),B
A4AE C9        RET
A4AF CD042B    CALL 2B04
A4B2 CD962A    CALL 2A96
A4B5 CD8C24    CALL 248C
A4B8 CDA83D    CALL 3DA8
A4BB C22123    JP   NZ,2321
A4BE C5        PUSH BC
A4BF CD4823    CALL 2348
A4C2 3AE45B    LD   A,(5BE4)
A4C5 C1        POP  BC
A4C6 0C        INC  C
A4C7 B9        CP   C
A4C8 2005      JR   NZ,A4CF
A4CA 3D        DEC  A
A4CB 32E45B    LD   (5BE4),A
A4CE AF        XOR  A
A4CF F5        PUSH AF
A4D0 2804      JR   Z,A4D6
A4D2 21F45B    LD   HL,5BF4
A4D5 34        INC  (HL)
A4D6 C5        PUSH BC
A4D7 CD972B    CALL 2B97
A4DA C1        POP  BC
A4DB 0D        DEC  C
A4DC CD1225    CALL 2512
A4DF F1        POP  AF
A4E0 CAE524    JP   Z,24E5
A4E3 3E01      LD   A,01
A4E5 32DD5C    LD   (5CDD),A
A4E8 F5        PUSH AF
A4E9 CD942B    CALL 2B94
A4EC F1        POP  AF
A4ED C25E21    JP   NZ,215E
A4F0 CD4823    CALL 2348
A4F3 2AEB5C    LD   HL,(5CEB)
A4F6 22E15B    LD   (5BE1),HL
A4F9 ED5BEA5C  LD   DE,(5CEA)
A4FD 2AE55B    LD   HL,(5BE5)
A500 1600      LD   D,00
A502 19        ADD  HL,DE
A503 22E55B    LD   (5BE5),HL
A506 C33B3D    JP   3D3B
A509 CD1225    CALL 2512
A50C 3ADD5C    LD   A,(5CDD)
A50F FE01      CP   01
A511 C9        RET
A512 AF        XOR  A
A513 C5        PUSH BC
A514 CD5B26    CALL 265B
A517 C1        POP  BC
A518 C9        RET
A519 3EFF      LD   A,FF
A51B 18F6      JR   A513
A51D 2A615C    LD   HL,(5C61)
A520 22CF5C    LD   (5CCF),HL
A523 010010    LD   BC,1000
A526 C3682B    JP   2B68
A529 22D75C    LD   (5CD7),HL
A52C 22DB5C    LD   (5CDB),HL
A52F ED5BEA5C  LD   DE,(5CEA)
A533 2AD95C    LD   HL,(5CD9)
A536 1600      LD   D,00
A538 19        ADD  HL,DE
A539 22D95C    LD   (5CD9),HL
A53C C9        RET
A53D CD962A    CALL 2A96
A540 CD1D25    CALL 251D
A543 CD4D23    CALL 234D
A546 3AF45B    LD   A,(5BF4)
A549 B7        OR   A
A54A CA5E21    JP   Z,215E
A54D 210000    LD   HL,0000
A550 22D95C    LD   (5CD9),HL
A553 0EFF      LD   C,FF
A555 0C        INC  C
A556 CD0925    CALL 2509
A559 20FA      JR   NZ,A555
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A55B 79          LD   A,C
A55C 32D45C      LD   (5CD4),A
A55F 2AE85C      LD   HL,(5CE8)
A562 22D55C      LD   (5CD5),HL
A565 CD2925      CALL 2529
A568 0C          INC  C
A569 CD0925      CALL 2509
A56C 28FA        JR   Z,A568
A56E FE00        CP   00
A570 2018        JR   NZ,A58A
A572 3AD45C      LD   A,(5CD4)
A575 4F          LD   C,A
A576 0C          INC  C
A577 CD0925      CALL 2509
A57A FE00        CP   00
A57C 2868        JR   Z,A5E6
A57E AF          XOR  A
A57F 32DD5C      LD   (5CDD),A
A582 CD942B      CALL 2B94
A585 CD2925      CALL 2529
A588 18EC        JR   A576
A58A 3AEA5C      LD   A,(5CEA)
A58D 32D35C      LD   (5CD3),A
A590 32D15C      LD   (5CD1),A
A593 2AE85C      LD   HL,(5CE8)
A596 22D55C      LD   (5CD5),HL
A599 C5          PUSH BC
A59A CD1F26      CALL 261F
A59D C1          POP  BC
A59E 2AF45C      LD   HL,(5CF4)
A5A1 22D55C      LD   (5CD5),HL
A5A4 22E85C      LD   (5CE8),HL
A5A7 AF          XOR  A
A5A8 32EA5C      LD   (5CEA),A
A5AB 3ADD5C      LD   A,(5CDD)
A5AE F5          PUSH AF
A5AF 3E01        LD   A,01
A5B1 32DD5C      LD   (5CDD),A
A5B4 CD942B      CALL 2B94
A5B7 F1          POP  AF
A5B8 32DD5C      LD   (5CDD),A
A5BB 3AD45C      LD   A,(5CD4)
A5BE 4F          LD   C,A
A5BF 2AD85C      LD   HL,(5CD8)
A5C2 22E85C      LD   (5CE8),HL
A5C5 3AD15C      LD   A,(5CD1)
A5C8 32EA5C      LD   (5CEA),A
A5CB CD942B      CALL 2B94
A5CE 3AD45C      LD   A,(5CD4)
A5D1 3C          INC  A
A5D2 4F          LD   C,A
A5D3 CD1225      CALL 2512
A5D6 2AD55C      LD   HL,(5CD5)
A5D9 22E85C      LD   (5CE8),HL
A5DC CD942B      CALL 2B94
A5DF 3AD45C      LD   A,(5CD4)
A5E2 4F          LD   C,A
A5E3 C35525      JP   2555
A5E6 2ACF5C      LD   HL,(5CCF)
A5E9 010010      LD   BC,1000
A5EC CD812B      CALL 2B81
A5EF CD4823      CALL 2348
A5F2 2AE55B      LD   HL,(5BE5)
A5F5 ED5BD95C    LD   DE,(5CD9)
A5F9 19          ADD  HL,DE
A5FA 22E55B      LD   (5BE5),HL
A5FD 3AE45B      LD   A,(5BE4)
A600 21F45B      LD   HL,5BF4
A603 96          SUB  (HL)
A604 32E45B      LD   (5BE4),A
A607 3600        LD   (HL),00
A609 2AD55C      LD   HL,(5CD5)
A60C 22E15B      LD   (5BE1),HL
A60F F5          PUSH AF
A610 CD972B      CALL 2B97
A613 F1          POP  AF
A614 4F          LD   C,A
A615 CD1225      CALL 2512
A618 AF          XOR  A
A619 32DD5C      LD   (5CDD),A
A61C C38124      JP   2481
A61F 3AD35C      LD   A,(5CD3)
A622 B7          OR   A
A623 C8          RET  Z
A624 D610        SUB  10
A626 3028        JR   NC,A653
A628 3AD35C      LD   A,(5CD3)
A62B 47          LD   B,A
A62C AF          XOR  A
A62D 32D35C      LD   (5CD3),A
A630 C5          PUSH BC
A631 2ACF5C      LD   HL,(5CCF)
A634 E5          PUSH HL
A635 ED5BD55C    LD   DE,(5CD5)
A639 CD912B      CALL 2B91
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A63C 2AF45C    LD    HL,(5CF4)
A63F 22D55C    LD    (5CD5),HL
A642 E1        POP   HL
A643 C1        POP   BC
A644 ED5BD75C  LD    DE,(5CD7)
A648 CDA128    CALL  28A1
A64B 2AF45C    LD    HL,(5CF4)
A64E 22D75C    LD    (5CD7),HL
A651 18CC      JR    A61F
A653 32D35C    LD    (5CD3),A
A656 0610      LD    B,10
A658 AF        XOR   A
A659 18D5      JR    A630
A65B F5        PUSH  AF
A65C 21CC5C    LD    HL,5CCC
A65F 3600      LD    (HL),00
A661 79        LD    A,C
A662 D610      SUB   10
A664 3803      JR    C,A669
A666 34        INC   (HL)
A667 18F9      JR    A662
A669 C610      ADD   A,10
A66B 4F        LD    C,A
A66C C5        PUSH  BC
A66D CD2D23    CALL  232D
A670 C1        POP   BC
A671 F1        POP   AF
A672 CD0A2A    CALL  2A0A
A675 11DD5C    LD    DE,5CDD
A678 011000    LD    BC,0010
A67B B7        OR    A
A67C 2801      JR    Z,A67F
A67E EB        EX    DE,HL
A67F EDB0      LDIR
A681 C9        RET
A682 CDC226    CALL  26C2
A685 CD9828    CALL  2898
A688 CD962A    CALL  2A96
A68B 3EFF      LD    A,FF
A68D 32105D    LD    (5D10),A
A690 3AE55C    LD    A,(5CE5)
A693 FE42      CP    42
A695 CAD920    JP    Z,20D9
A698 C35E21    JP    215E
A69B CDC726    CALL  26C7
A69E CD962A    CALL  2A96
A6A1 CDF226    CALL  26F2
A6A4 C32427    JP    2724
A6A7 CD7328    CALL  2873
A6AA CDAE2A    CALL  2AAE
A6AD FE0D      CP    0D
A6AF 2A5D5C    LD    HL,(5C5D)
A6B2 2B        DEC   HL
A6B3 225D5C    LD    (5C5D),HL
A6B6 C8        RET   Z
A6B7 32105D    LD    (5D10),A
A6BA 3E01      LD    A,01
A6BC 32D65C    LD    (5CD6),A
A6BF CD242B    CALL  2B24
A6C2 AF        XOR   A
A6C3 32105D    LD    (5D10),A
A6C6 C9        RET
A6C7 CD042B    CALL  2B04
A6CA CD8724    CALL  2487
A6CD C40A2B    CALL  NZ,2B0A
A6D0 CDAE2A    CALL  2AAE
A6D3 FEAF      CP    AF
A6D5 CCA726    CALL  Z,26A7
A6D8 FEE4      CP    E4
A6DA F5        PUSH  AF
A6DB CD8C24    CALL  248C
A6DE F1        POP   AF
A6DF CC6E29    CALL  Z,296E
A6E2 CD962A    CALL  2A96
A6E5 CDA83D    CALL  3DA8
A6E8 C22123    JP    NZ,2321
A6EB CD1225    CALL  2512
A6EE CD143F    CALL  3F14
A6F1 C9        RET
A6F2 3AD65C    LD    A,(5CD6)
A6F5 B7        OR    A
A6F6 2AE65C    LD    HL,(5CE6)
A6F9 2803      JR    Z,A6FE
A6FB 2AD95C    LD    HL,(5CD9)
A6FE ED5BEB5C  LD    DE,(5CEB)
A702 FE03      CP    03
A704 3AEA5C    LD    A,(5CEA)
A707 D5        PUSH  DE
A708 2007      JR    NZ,A711
A70A ED5BD85C  LD    DE,(5CD8)
A70E CDEA2B    CALL  2BEA
A711 F5        PUSH  AF
A712 3AE55C    LD    A,(5CE5)
A715 FE42      CP    42
A717 F5        PUSH  AF
A718 CCA527    CALL  Z,27A5
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A718 F1        POP  AF
A719 FE44      CP   44
A71B CCD727    CALL Z,27D7
A71E F1        POP  AF
A71F D1        POP  DE
A720 C9        RET
A721 47        LD   B,A
A722 CD8724    CALL 2487
A725 2807      JR   Z,A72E
A727 F5        PUSH AF
A728 CD1228    CALL 2812
A72B F1        POP  AF
A72C FEFF      CP   FF
A72E F5        PUSH AF
A72F CC9128    CALL Z,2891
A732 3AD65C    LD   A,(5CD6)
A735 FE03      CP   03
A737 CC2C3F    CALL Z,3F2C
A73A F1        POP  AF
A73B C4A12B    CALL NZ,2BA1
A73E 2A595C    LD   HL,(5C59)
A741 2B        DEC  HL
A742 3680      LD   (HL),80
A744 C9        RET
A745 3EFF      LD   A,FF
A747 1802      JR   A74B
A749 3EEE      LD   A,EE
A74B 32105D    LD   (5D10),A
A74E C38526    JP   2685
A751 CDC726    CALL 26C7
A754 CD962A    CALL 2A96
A757 3AE55C    LD   A,(5CE5)
A75A FE42      CP   42
A75C C2602A    JP   NZ,2A60
A75F ED4BE65C  LD   BC,(5CE6)
A763 C5        PUSH BC
A764 03        INC  BC
A765 213000    LD   HL,0030
A768 CD8E2A    CALL 2A8E
A76B 3680      LD   (HL),80
A76D EB        EX   DE,HL
A76E D1        POP  DE
A76F E5        PUSH HL
A770 ED5BE65C  LD   DE,(5CE6)
A774 3AEA5C    LD   A,(5CEA)
A777 47        LD   B,A
A778 CDC226    CALL 26C2
A77B 78        LD   A,B
A77C CD2427    CALL 2724
A77F E1        POP  HL
A780 22025D    LD   (5D02),HL
A783 ED5B535C  LD   DE,(5C53)
A787 21D208    LD   HL,08D2
A78A CD7928    CALL 2879
A78D C38B26    JP   268B
A790 EB        EX   DE,HL
A791 37        SCF
A792 ED52      SBC  HL,DE
A794 D8        RET  C
A795 110A00    LD   DE,000A
A798 19        ADD  HL,DE
A799 44        LD   B,H
A79A 4D        LD   C,L
A79B 21051F    LD   HL,1F05
A79E CD8E2A    CALL 2A8E
A7A1 C9        RET
A7A2 ED5B535C  LD   DE,(5C53)
A7A6 2A595C    LD   HL,(5C59)
A7A9 2B        DEC  HL
A7AA E5        PUSH HL
A7AB D5        PUSH DE
A7AC ED52      SBC  HL,DE
A7AE ED5BE65C  LD   DE,(5CE6)
A7B2 D5        PUSH DE
A7B3 CD9327    CALL 2793
A7B6 C1        POP  BC
A7B7 D1        POP  DE
A7B8 E1        POP  HL
A7B9 C5        PUSH BC
A7BA 22025D    LD   (5D02),HL
A7BD 21E519    LD   HL,19E5
A7C0 CD7928    CALL 2879
A7C3 C1        POP  BC
A7C4 CD8928    CALL 2889
A7C7 23        INC  HL
A7C8 ED4BE65C  LD   BC,(5CE6)
A7CC 09        ADD  HL,BC
A7CD 22485C    LD   (5C48),HL
A7D0 2A535C    LD   HL,(5C53)
A7D3 C9        RET
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A7D7 ED5BE85C  LD    DE,(5CE8)
A7DB 2ADB5C    LD    HL,(5CDB)
A7DE E5        PUSH  HL
A7DF CD9327    CALL  2793
A7E2 E1        POP   HL
A7E3 7C        LD    A,H
A7E4 B5        OR    L
A7E5 2810      JR    Z,A7F7
A7E7 2AD75C    LD    HL,(5CD7)
A7EA 2B        DEC   HL
A7EB 2B        DEC   HL
A7EC 2B        DEC   HL
A7ED ED4BDB5C  LD    BC,(5CDB)
A7F1 03        INC   BC
A7F2 03        INC   BC
A7F3 03        INC   BC
A7F4 CD8128    CALL  2881
A7F7 2A595C    LD    HL,(5C59)
A7FA 2B        DEC   HL
A7FB ED4BE85C  LD    BC,(5CE8)
A7FF C5        PUSH  BC
A800 03        INC   BC
A801 03        INC   BC
A802 03        INC   BC
A803 CD892B    CALL  2B89
A806 23        INC   HL
A807 3AD25C    LD    A,(5CD2)
A80A 77        LD    (HL),A
A80B 23        INC   HL
A80C D1        POP   DE
A80D 73        LD    (HL),E
A80E 23        INC   HL
A80F 72        LD    (HL),D
A810 23        INC   HL
A811 C9        RET
A812 3AD95C    LD    A,(5CD9)
A815 48        LD    C,B
A816 47        LD    B,A
A817 79        LD    A,C
A818 B8        CP    B
A819 3821      JR    C,A83C
A81B 78        LD    A,B
A81C B7        OR    A
A81D CA602A    JP    Z,2A60
A820 05        DEC   B
A821 2813      JR    Z,A836
A823 D5        PUSH  DE
A824 11C45C    LD    DE,5CC4
A827 2AF65C    LD    HL,(5CF6)
A82A 19        ADD   HL,DE
A82B D1        POP   DE
A82C 7E        LD    A,(HL)
A82D 1C        INC   E
A82E B8        CP    E
A82F 2003      JR    NZ,A834
A831 1E00      LD    E,00
A833 14        INC   D
A834 10F7      DJNZ  A82D
A836 0601      LD    B,01
A838 2AD75C    LD    HL,(5CD7)
A83B C9        RET
A83C 21CD3F    LD    HL,3FCD  ----> "REC NO."
A83F 3E05      LD    A,05
A841 C3A829    JP    29A8
A844 CDA83D    CALL  3DA8
A847 CAAE29    JP    Z,29AE
A84A CD4823    CALL  2348
A84D 3AE45B    LD    A,(5BE4)
A850 FE80      CP    80
A852 CAA329    JP    Z,29A3
A855 C9        RET
A856 CDC226    CALL  26C2
A859 210100    LD    HL,0001
A85C 22D15C    LD    (5CD1),HL
A85F CD042B    CALL  2B04
A862 CDAE2A    CALL  2AAE
A865 FEAF      CP    AF
A867 2852      JR    Z,A8BB
A869 FECA      CP    CA
A86B 2011      JR    NZ,A87E
A86D CD4C2B    CALL  2B4C
A870 CD962A    CALL  2A96
A873 2ADB5C    LD    HL,(5CDB)
A876 22D15C    LD    (5CD1),HL
A879 21E55C    LD    HL,5CE5
A87C 1824      JR    A8A2
A87E FEAA      CP    AA
A880 200E      JR    NZ,A890
A882 210040    LD    HL,4000
A885 22D75C    LD    (5CD7),HL
A888 21005B    LD    HL,5B00
A88B 22D95C    LD    (5CD9),HL
A88E 182E      JR    A8BE
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A890 CD962A    CALL 2A96
A893 CDAE2A    CALL 2AAE
A896 21E55C    LD   HL,5CE5
A899 FEE4      CP   E4
A89B 2812      JR   Z,A8AF
A89D FE0D      CP   0D
A89F C2602A    JP   NZ,2A60
A8A2 3642      LD   (HL),42
A8A4 CD4428    CALL 2844
A8A7 CD5D2B    CALL 2B5D
A8AA CD5229    CALL 2952
A8AD 181A      JR   A8C9
A8AF 3644      LD   (HL),44
A8B1 CD4428    CALL 2844
A8B4 CD7929    CALL 2979
A8B7 3010      JR   NC,A8C9
A8B9 3818      JR   C,A8D3
A8BB CD0A2B    CALL 2B0A
A8BE CD962A    CALL 2A96
A8C1 3E43      LD   A,43
A8C3 32E55C    LD   (5CE5),A
A8C6 CD4428    CALL 2844
A8C9 2AD75C    LD   HL,(5CD7)
A8CC 22E65C    LD   (5CE6),HL
A8CF EB        EX   DE,HL
A8D0 2AD95C    LD   HL,(5CD9)
A8D3 B7        OR   A
A8D4 ED52      SBC  HL,DE
A8D5 DA602A    JP   C,2A60
A8D9 7D        LD   A,L
A8DA B7        OR   A
A8DB 2801      JR   Z,A8DE
A8DD 24        INC  H
A8DE 7C        LD   A,H
A8DF 32EA5C    LD   (5CEA),A
A8E2 5F        LD   E,A
A8E3 1600      LD   D,00
A8E5 2AE55B    LD   HL,(5BE5)
A8E8 ED52      SBC  HL,DE
A8EA DAA329    JP   C,29A3
A8ED E5        PUSH HL
A8EE 2A595C    LD   HL,(5C59)
A8F1 36AA      LD   (HL),AA
A8F3 23        INC  HL
A8F4 ED5BD15C  LD   DE,(5CD1)
A8F8 73        LD   (HL),E
A8F9 23        INC  HL
A8FA 72        LD   (HL),D
A8FB 2AD85C    LD   HL,(5CD8)
A8FE 22E85C    LD   (5CE8),HL
A901 2AE15B    LD   HL,(5BE1)
A904 22EB5C    LD   (5CEB),HL
A907 E5        PUSH HL
A908 CD193F    CALL 3F19
A90B E1        POP  HL
A90C EB        EX   DE,HL
A90D 2AE65C    LD   HL,(5CE6)
A910 3AEA5C    LD   A,(5CEA)
A913 47        LD   B,A
A914 CDA128    CALL 28A1
A917 2AF45C    LD   HL,(5CF4)
A91A E5        PUSH HL
A91B CD4823    CALL 2348
A91E E1        POP  HL
A91F 22E15B    LD   (5BE1),HL
A922 E1        POP  HL
A923 22E55B    LD   (5BE5),HL
A926 21E45B    LD   HL,5BE4
A929 34        INC  (HL)
A92A E5        PUSH HL
A92B CD9728    CALL 2897
A92E E1        POP  HL
A92F 4E        LD   C,(HL)
A930 0D        DEC  C
A931 3AE55C    LD   A,(5CE5)
A934 FE42      CP   42
A936 CC3C29    CALL Z,293C
A939 C38124    JP   2481
A93C 2A595C    LD   HL,(5C59)
A93F ED5B535C  LD   DE,(5C53)
A943 37        SCF
A944 ED52      SBC  HL,DE
A946 22E65C    LD   (5CE6),HL
A949 2A485C    LD   HL,(5C48)
A94C ED52      SBC  HL,DE
A94E 22E85C    LD   (5CE8),HL
A951 C9        RET
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A979 CD6F0B    CALL 0B6F
A97C CDC30A    CALL 0AC3
A97F CBF9      SET  7,C
A981 79        LD   A,C
A982 32D25C    LD   (5CD2),A
A985 3002      JR   NC,A989
A987 37        SCF
A988 C9        RET
A989 20FC      JR   NZ,A987
A98B 23        INC  HL
A98C 5E        LD   E,(HL)
A98D 23        INC  HL
A98E 56        LD   D,(HL)
A98F 23        INC  HL
A990 22D75C    LD   (5CD7),HL
A993 ED53DB5C  LD   (5CDB),DE
A997 19        ADD  HL,DE
A998 22D95C    LD   (5CD9),HL
A99B CD6F0B    CALL 0B6F
A99E FE29      CP   29
A9A0 20E7      JR   NZ,A989
A9A2 C9        RET
A9A3 21703F    LD   HL,3F70    "NO SPACE"
A9A6 3E03      LD   A,03
A9A8 CD1603    CALL 0316
A9AB C35E01    JP   015E
A9AE 217B3F    LD   HL,3F7B    "FILE EXISTS"
A9B1 3E02      LD   A,02
A9B3 18F3      JR   A9A8
A9B5 21DD5C    LD   HL,5CDD
A9B8 0608      LD   B,08
A9BA 3620      LD   (HL),20
A9BC 23        INC  HL
A9BD 10FB      DJNZ A9BA
A9BF CDD20A    CALL 0AD2
A9C2 78        LD   A,B
A9C3 B1        OR   C
A9C4 CA600A    JP   Z,0A60
A9C7 EB        EX   DE,HL
A9C8 CDDE09    CALL 09DE
A9CB 79        LD   A,C
A9CC FE09      CP   09
A9CE 3802      JR   C,A9D2
A9D0 0E08      LD   C,08
A9D2 7E        LD   A,(HL)
A9D3 FE20      CP   20
A9D5 DA600A    JP   C,0A60
A9D8 11DD5C    LD   DE,5CDD
A9DB EDB0      LDIR
A9DD C9        RET
A9DE 23        INC  HL          <- IMPRESION REGL
A9DF 7E        LD   A,(HL)
A9E0 FE3A      CP   3A
A9E2 201A      JR   NZ,A9FE
A9E4 2B        DEC  HL
A9E5 7E        LD   A,(HL)
A9E6 E6DF      AND  DF          -> 1101 1111
A9E8 DE41      SBC  A,41
A9EA DA600A    JP   C,0A60
A9ED FE04      CP   04
A9EF D2600A    JP   NC,0A60
A9F2 C5        PUSH BC
A9F3 E5        PUSH HL
A9F4 CDA93D    CALL 3DA9
A9F7 E1        POP  HL
A9F8 C1        POP  BC
A9F9 0B        DEC  BC
A9FA 0B        DEC  BC
A9FB 23        INC  HL
A9FC 23        INC  HL
A9FD C9        RET
A9FE 2B        DEC  HL
A9FF 3A195D    LD   A,(5D19)
AA02 C5        PUSH BC
AA03 E5        PUSH HL
AA04 CDA93D    CALL 3DA9        <-
AA07 E1        POP  HL
AA08 C1        POP  BC
AA09 C9        RET

AA0A 69        LD   L,C
AA0B 2600      LD   H,00
AA0D 29        ADD  HL,HL
AA0E 29        ADD  HL,HL
AA0F 29        ADD  HL,HL
AA10 29        ADD  HL,HL
AA11 01005B    LD   BC,5B00
AA14 09        ADD  HL,BC
AA15 C9        RET
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AA0A 69          LD    L,C
AA0B 2600        LD    H,00
AA0D 29          ADD   HL,HL
AA0E 29          ADD   HL,HL
AA0F 29          ADD   HL,HL
AA10 29          ADD   HL,HL
AA11 01005B      LD    BC,5800
AA14 09          ADD   HL,BC
AA15 C9          RET
AA16 CDB529      CALL  29B5
AA19 CD2923      CALL  2329
AA1C 0680        LD    B,80
AA1E 0E00        LD    C,00
AA20 C5          PUSH  BC
AA21 CD0A2A      CALL  2A0A
AA24 CD1424      CALL  2414
AA27 C1          POP   BC
AA28 C5          PUSH  BC
AA29 79          LD    A,C
AA2A FE10        CP    10
AA2C 2005        JR    NZ,AA33
AA2E C1          POP   BC
AA2F 0E00        LD    C,00
AA31 18ED        JR    AA20
AA33 11DD5C      LD    DE,5CDD
AA36 0609        LD    B,09
AA38 AF          XOR   A
AA39 BE          CP    (HL)
AA3A 2003        JR    NZ,AA3F
AA3C C1          POP   BC
AA3D 1809        JR    AA48
AA3F CD8E3D      CALL  3D8E
AA42 C1          POP   BC
AA43 2806        JR    Z,AA4B
AA45 0C          INC   C
AA46 10D8        DJNZ  AA20
AA48 F6FF        OR    FF
AA4A C9          RET
AA4B 3E80        LD    A,80
AA4D 90          SUB   B
AA4E 4F          LD    C,A
AA4F AF          XOR   A
AA50 C8          RET   Z
AA51 CD413D      CALL  3D41
AA54 FDCB019E    RES   3,(IY+01)
AA58 CDBD21      CALL  21BD
AA58 ED7B1C5D    LD    SP,(5D1C)
AA5F C9          RET
AA60 FDCB007E    BIT   7,(IY+00)
AA64 2805        JR    Z,AA6B
AA66 3E08        LD    A,08
AA68 323A5C      LD    (5C3A),A
AA6B 3C          INC   A
AA6C 21863F      LD    HL,3F86 → * Error *
AA6F CD1623      CALL  2316
AA72 C35E21      JP    215E
AA75 CDC226      CALL  26C2
AA78 CD9B26      CALL  269B
AA7B CD962A      CALL  2A96
AA7E 2AE85C      LD    HL,(5CE8)
AA81 3AE55C      LD    A,(5CE5)
AA84 FE42        CP    42
AA86 CAD920      JP    Z,20D9
AA89 E5          PUSH  HL
AA8A 215E21      LD    HL,215E
AA8D E5          PUSH  HL
AA8E C3903C      JP    3C90
AA91 FDCB017E    BIT   7,(IY+01)
AA95 C9          RET
AA96 CD912A      CALL  2A91
AA99 C0          RET   NZ
AA9A E1          POP   HL
AA9B C9          RET
AA9C CD7328      CALL  2873
AA9F CDE52A      CALL  2AE5
AAA2 18ED        JR    AA91
AAA4 AF          XOR   A
AAA5 210116      LD    HL,1601
AAA8 1814        JR    AABE
AAAA 3E02        LD    A,02
AAAC 18F7        JR    AAA5
AAAE 211800      LD    HL,0018
AAB1 1808        JR    AABE
AAB3 CDA42A      CALL  2AA4
AAB6 212C0F      LD    HL,0F2C
AAB9 1803        JR    AABE
AABB 21680D      LD    HL,0D68
AABE E5          PUSH  HL
AABF CD903C      CALL  3C90
AAC2 C9          RET
```

```
AAC3 21B228   LD   HL,28B2
AAC6 18F6     JR   AABE
AAC8 216E0D   LD   HL,0D6E
AACB 18F1     JR   AABE
AACD CD153D   CALL 3D15
AAD0 211B1A   LD   HL,1A1B
AAD3 C3D93E   JP   3ED9
AAD6 21F128   LD   HL,28F1
AAD9 18E3     JR   AABE
AADB 21991E   LD   HL,1E99
AADE 18DE     JR   AABE
AAE0 218C1C   LD   HL,1C8C
AAE3 18D9     JR   AABE
AAE5 218210   LD   HL,1082
AAE8 18D4     JR   AABE
AAEA 2A115D   LD   HL,(5D11)
AAED 23       INC  HL
AAEE 225D5C   LD   (5C5D),HL
AAF1 C9       RET
AAF2 CD042B   CALL 2B04
AAF5 CDAE2A   CALL 2AAE
AAF8 FE2C     CP   2C
AAFA C2602A   JP   NZ,2A60
AAFD CD732B   CALL 2B73
AB00 CDE02A   CALL 2AE0
AB03 C9       RET
AB04 CDEA2A   CALL 2AEA
AB07 C3E02A   JP   2AE0
AB0A CDAE2A   CALL 2AAE
AB0D FEAF     CP   AF
AB0F C0       RET  NZ
AB10 CD9C2A   CALL 2A9C
AB13 2807     JR   Z,AB1C
AB15 CDDB2A   CALL 2ADB
AB18 ED43D75C LD   (5CD7),BC
AB1C CDAE2A   CALL 2AAE
AB1F FE2C     CP   2C
AB21 C2602A   JP   NZ,2A60
AB24 CD9C2A   CALL 2A9C
AB27 2813     JR   Z,AB3C
AB29 CDDB2A   CALL 2ADB
AB2C CD8724   CALL 2487
AB2F ED43D95C LD   (5CD9),BC
AB33 2007     JR   NZ,AB3C
AB35 2AD75C   LD   HL,(5CD7)
AB38 09       ADD  HL,BC
AB39 22D95C   LD   (5CD9),HL
AB3C CDAE2A   CALL 2AAE
AB3F FE2C     CP   2C
AB41 2809     JR   Z,AB4C
AB43 FE0D     CP   0D
AB45 C2602A   JP   NZ,2A60
AB48 CD962A   CALL 2A96
AB4B C9       RET
AB4C CD9C2A   CALL 2A9C
AB4F C8       RET  Z
AB50 CDDB2A   CALL 2ADB
AB53 ED43DB5C LD   (5CDB),BC
AB57 3E03     LD   A,03
AB59 32D65C   LD   (5CD6),A
AB5C C9       RET
AB5D 2A115D   LD   HL,(5D11)
AB60 22025D   LD   (5D02),HL
AB63 21A711   LD   HL,11A7
AB66 1811     JR   AB79
AB68 2A615C   LD   HL,(5C61)
AB6B 22025D   LD   (5D02),HL
AB6E 213000   LD   HL,0030
AB71 1806     JR   AB79
AB73 22025D   LD   (5D02),HL
AB76 212000   LD   HL,0020
AB79 E5       PUSH HL
AB7A 2A025D   LD   HL,(5D02)
AB7D CD903C   CALL 3C90
AB80 C9       RET
AB81 22025D   LD   (5D02),HL
AB84 21E819   LD   HL,19E8
AB87 18F0     JR   AB79
```

```
AB89 22025D    LD    (5D02),HL
AB8C 215516    LD    HL,1655
AB8F 18E8      JR    AB79
AB91 AF        XOR   A
AB92 180F      JR    ABA3
AB94 CD1925    CALL  2519
AB97 ED5BF45C  LD    DE,(5CF4)
AB9B 1B        DEC   DE
AB9C 0601      LD    B,01
AB9E 21005B    LD    HL,5B00
ABA1 3EFF      LD    A,FF
ABA3 32CE5C    LD    (5CCE),A
ABA6 ED53F45C  LD    (5CF4),DE
ABAA AF        XOR   A
ABAB B0        OR    B
ABAC C8        RET   Z
ABAD C5        PUSH  BC
ABAE E5        PUSH  HL
ABAF CD4E3E    CALL  3E4E
ABB2 3AF45C    LD    A,(5CF4)
ABB5 CD4A3E    CALL  3E4A
ABB8 3AF55C    LD    A,(5CF5)
ABBB CDEB3D    CALL  3DEB
ABBE 3ACE5C    LD    A,(5CCE)
ABC1 B7        OR    A
ABC2 F5        PUSH  AF
ABC3 CC563E    CALL  Z,3E56
ABC6 F1        POP   AF
ABC7 C4523E    CALL  NZ,3E52
ABCA E1        POP   HL
ABCB 110001    LD    DE,0100
ABCE 19        ADD   HL,DE
ABCF E5        PUSH  HL
ABD0 11C45C    LD    DE,5CC4
ABD3 2AF65C    LD    HL,(5CF6)
ABD6 19        ADD   HL,DE
ABD7 7E        LD    A,(HL)
ABD8 21F45C    LD    HL,5CF4
ABDB 34        INC   (HL)
ABDC BE        CP    (HL)
ABDD 2006      JR    NZ,ABE5
ABDF 3600      LD    (HL),00
ABE1 21F55C    LD    HL,5CF5
ABE4 34        INC   (HL)
ABE5 E1        POP   HL
ABE6 C1        POP   BC
ABE7 10C4      DJNZ  ABAD
ABE9 C9        RET
ABEA E5        PUSH  HL
ABEB 67        LD    H,A
ABEC 2E00      LD    L,00
ABEE E5        PUSH  HL
ABEF ED52      SBC   HL,DE
ABF1 DCFA2B    CALL  C,2BFA
ABF4 E1        POP   HL
ABF5 7C        LD\   A,H
ABF6 E1        POP   HL
ABF7 D8        RET   C
ABF8 7A        LD    A,D
ABF9 C9        RET
ABFA AF        XOR   A
ABFB 32D65C    LD    (5CD6),A
ABFE 37        SCF
ABFF C9        RET
```

```
AC00 C3813C    JP    3C81
AC03 C3293C    JP    3C29
AC06 C3C93D    JP    3DC9
AC09 C3912B    JP    2B91
AC0C C3A12B    JP    2BA1
AC0F 2A1C5D    LD    HL,(5D1C)
AC12 2B        DEC   HL
AC13 2B        DEC   HL
AC14 F9        LD    SP,HL
AC15 CDAA3C    CALL  3CAA
AC18 C3602A    JP    2A60
AC1B ED7B3D5C  LD    SP,(5C3D)
AC1F 3A105D    LD    A,(5D10)
AC22 B7        OR    A
AC23 CA761B    JP    Z,1B76
AC26 C3CF12    JP    12CF
AC29 3A175D    LD    A,(5D17)
AC2C FEAA      CP    AA
AC2E C4383C    CALL  NZ,3C38
AC31 CDAA3C    CALL  3CAA
AC34 E5        PUSH  HL
AC35 C30E21    JP    210E
AC38 DBF7      IN    A,(F7)
AC3A FE1E      CP    1E
AC3C 2002      JR    NZ,AC40
AC3E CF        RST   8
AC3F 3121B5    LD    SP,B521
AC42 5C        LD    E,H
AC43 017000    LD    BC,0070
AC46 CD5516    CALL  1655
AC49 3E08      LD    A,08
AC4B 321E5D    LD    (5D1E),A
AC4E AF        XOR   A
AC4F 32195D    LD    (5D19),A
AC52 32185D    LD    (5D18),A
AC55 320F5D    LD    (5D0F),A
AC58 3EFF      LD    A,FF
AC5A 323A5C    LD    (5C3A),A
AC5D 32165D    LD    (5D16),A
AC60 21433F    LD    HL,3F43
AC63 221F5D    LD    (5D1F),HL
AC66 21503F    LD    HL,3F50
AC69 222150    LD    (5D21),HL
AC6C 3E0D      LD    A,0D
AC6E 32235D    LD    (5D23),A
AC71 CDD23C    CALL  3CD2
AC74 3ED0      LD    A,D0
AC76 D31F      OUT   (1F),A
AC78 C9        RET
AC79 3EFF      LD    A,FF
AC7B 32165D    LD    (5D16),A
AC7E CDBE3C    CALL  3CBE
AC81 3A175D    LD    A,(5D17)
AC84 FEAA      CP    AA
AC86 C4383C    CALL  NZ,3C38
AC89 CDAA3C    CALL  3CAA
AC8C E5        PUSH  HL
AC8D C3C421    JP    21C4
AC90 22025D    LD    (5D02),HL
AC93 ED53045D  LD    (5D04),DE
AC97 D1        POP   DE
AC98 E1        POP   HL
AC99 D5        PUSH  DE
AC9A CDBE3C    CALL  3CBE
AC9D 11AD3C    LD    DE,3CAD
ACA0 D5        PUSH  DE
ACA1 E5        PUSH  HL
ACA2 ED5B045D  LD    DE,(5D04)
ACA6 2A025D    LD    HL,(5D02)
ACA9 C9        RET
ACAA 21BE3C    LD    HL,3CBE
ACAD F3        DI
ACAE F5        PUSH  AF
ACAF CDD23C    CALL  3CD2
ACB2 3A165D    LD    A,(5D16)
ACB5 E67F      AND   7F
ACB7 32165D    LD    (5D16),A
ACBA D3FF      OUT   (FF),A
ACBC F1        POP   AF
ACBD C9        RET
ACBE F5        PUSH  AF
ACBF CDD23C    CALL  3CD2
ACC2 3A165D    LD    A,(5D16)
ACC5 F680      OR    80
ACC7 32165D    LD    (5D16),A
ACCA D3FF      OUT   (FF),A
ACCC CDD83C    CALL  3CD8
ACCF F1        POP   AF
ACD0 FB        EI
ACD1 C9        RET
ACD2 CDE03C    CALL  3CE0
ACD5 D3FC      OUT   (FC),A
ACD7 C9        RET
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ACD8 CDE03C    CALL 3CE0
ACDB F680      OR   80
ACDD D3FC      OUT  (FC),A
ACDF C9        RET
ACE0 3A485C    LD   A,(5C48)
ACE3 E638      AND  38
ACE5 0F        RRCA
ACE6 0F        RRCA
ACE7 0F        RRCA
ACE8 C9        RET
ACE9 CDD23C    CALL 3CD2
ACEC 3EFF      LD   A,FF
ACEE D3FF      OUT  (FF),A
ACF0 C9        RET
ACF1 CDE93C    CALL 3CE9
ACF4 EDB8      LDDR
ACF6 1885      JR   ACAD
ACF8 CDE93C    CALL 3CE9
ACFB EDB0      LDIR
ACFD 18AE      JR   ACAD
ACFF 3E0D      LD   A,0D
AD01 E5        PUSH HL
AD02 C5        PUSH BC
AD03 CD153D    CALL 3D15
AD06 CD0F3D    CALL 3D0F
AD09 CD233D    CALL 3D23
AD0C C1        POP  BC
AD0D E1        POP  HL
AD0E C9        RET
AD0F 211000    LD   HL,0010
AD12 C3BE2A    JP   2ABE
AD15 C5        PUSH BC
AD16 21E05B    LD   HL,5BE0
AD19 012000    LD   BC,0020
AD1C 11D15C    LD   DE,5CD1
AD1F EDB0      LDIR
AD21 C1        POP  BC
AD22 C9        RET
AD23 21D15C    LD   HL,5CD1
AD26 11E05B    LD   DE,5BE0
AD29 012000    LD   BC,0020
AD2C EDB0      LDIR
AD2E C9        RET
AD2F 7E        LD   A,(HL)
AD30 B7        OR   A
AD31 C8        RET  Z
AD32 E67F      AND  7F
AD34 D7        RST  10
AD35 CB7E      BIT  7,(HL)
AD37 C0        RET  NZ
AD38 23        INC  HL
AD39 18F4      JR   AD2F
AD3B CD972B    CALL 2B97
AD3E C35E21    JP   215E
AD41 3AB65C    LD   A,(5CB6)
AD44 FEF4      CP   F4
AD46 C8        RET  Z
AD47 21185D    LD   HL,5D18
AD4A B6        OR   (HL)
AD4B 36FF      LD   (HL),FF
AD4D C8        RET  Z
AD4E 21B65C    LD   HL,5CB6
AD51 11265D    LD   DE,5D26
AD54 063A      LD   B,3A
AD56 4E        LD   C,(HL)
AD57 1A        LD   A,(DE)
AD58 77        LD   (HL),A
AD59 79        LD   A,C
AD5A 12        LD   (DE),A
AD5B 23        INC  HL
AD5C 13        INC  DE
AD5D 10F7      DJNZ AD56
AD5F C9        RET
AD60 2A595C    LD   HL,(5C59)
AD63 360D      LD   (HL),0D
AD65 225B5C    LD   (5C5B),HL
AD68 23        INC  HL
AD69 3680      LD   (HL),80
AD6B C9        RET
AD6C 3A0F5D    LD   A,(5D0F)
AD6F B7        OR   A
AD70 CC503D    CALL Z,3D50
AD73 2A595C    LD   HL,(5C59)
AD76 CDFF3C    CALL 3CFF
AD79 3A195D    LD   A,(5D19)
AD7C 0641      ADD  A,41      -> "A"
AD7E D7        RST  10        -> ">"   } CD 103E
AD7F 3E3E      LD   A,3E
AD81 D7        RST  10
AD82 213A5C    LD   HL,5C3A
AD85 35FF      LD   (HL),FF
AD87 CDB32A    CALL 2AB3
AD8A CDC82A    CALL 2AC8
AD8D C9        RET
```

```
AD8E 1A          LD   A,(DE)
AD8F BE          CP   (HL)
AD90 C0          RET  NZ
AD91 13          INC  DE
AD92 23          INC  HL
AD93 10F9        DJNZ AD8E
AD95 C9          RET
AD96 C5          PUSH BC
AD97 0608        LD   B,08
AD99 7E          LD   A,(HL)
AD9A D7          RST  10
AD9B 23          INC  HL
AD9C 10FB        DJNZ AD99
AD9E 3E3C        LD   A,3C   "<"   5B
ADA0 D7          RST  10
ADA1 7E          LD   A,(HL)
ADA2 D7          RST  10
ADA3 3E3E        LD   A,3E   ">"   5D
ADA5 D7          RST  10
ADA6 C1          POP  BC
ADA7 C9          RET
ADA8 CDB529      CALL 29B5
ADAB CD4D23      CALL 234D
ADAE C3192A      JP   2A19
ADB1 11FA5C      LD   DE,5CFA
ADB4 2AF65C      LD   HL,(5CF6)
ADB7 19          ADD  HL,DE
ADB8 AF          XOR  A
ADB9 77          LD   (HL),A
ADBA 3A1E5D      LD   A,(5D1E)
ADBD D31F        OUT  (1F),A
ADBF DBFF        IN   A,(FF)
ADC1 E680        AND  80
ADC3 28FA        JR   Z,ADBF
ADC5 C9          RET
ADC6 3A195D      LD   A,(5D19)
ADC9 32F65C      LD   (5CF6),A
ADCC 21165D      LD   HL,5D16
ADCF 4F          LD   C,A
ADD0 3E3C        LD   A,3C
ADD2 B1          OR   C
ADD3 D3FF        OUT  (FF),A
ADD5 77          LD   (HL),A
ADD6 11FA5C      LD   DE,5CFA
ADD9 2AF65C      LD   HL,(5CF6)
ADDC 19          ADD  HL,DE
ADDD 7E          LD   A,(HL)
ADDE D33F        OUT  (3F),A
ADE0 3E0F        LD   A,0F
ADE2 0EFF        LD   C,FF
ADE4 0D          DEC  C
ADE5 20FD        JR   NZ,ADE4
ADE7 3D          DEC  A
ADE8 20F8        JR   NZ,ADE2
ADEA C9          RET
ADEB 4F          LD   C,A
ADEC DB1F        IN   A,(1F)
ADEE E680        AND  80
ADF0 32CD5C      LD   (5CCD),A
ADF3 ED5BF65C    LD   DE,(5CF6)
ADF7 21FA5C      LD   HL,5CFA
ADFA 19          ADD  HL,DE
ADFB 3A165D      LD   A,(5D16)
ADFE F63C        OR   3C
AE00 32165D      LD   (5D16),A
AE03 D3FF        OUT  (FF),A
AE05 71          LD   (HL),C
AE06 E5          PUSH HL
AE07 21C85C      LD   HL,5CC8
AE0A 19          ADD  HL,DE
AE0B 7E          LD   A,(HL)
AE0C E1          POP  HL
AE0D FE17        CP   17
AE0F CC383E      CALL Z,3E38
AE12 FE16        CP   16
AE14 CC383E      CALL Z,3E38
AE17 79          LD   A,C
AE18 D37F        OUT  (7F),A
AE1A 3A1E5D      LD   A,(5D1E)
AE1D F610        OR   10
AE1F D31F        OUT  (1F),A
AE21 3ACD5C      LD   A,(5CCD)
AE24 B7          OR   A
AE25 2809        JR   Z,AE30
AE27 0602        LD   B,02
AE29 3EE0        LD   A,E0
AE2B CDE23D      CALL 3DE2
AE2E 10F9        DJNZ AE29
AE30 CDBF3D      CALL 3DBF
AE33 3E10        LD   A,10
AE35 C3E23D      JP   3DE2
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AE38 47       LD   B,A
AE39 79       LD   A,C
AE3A B7       OR   A
AE3B 1F       RRA
AE3C 4F       LD   C,A
AE3D 78       LD   A,B
AE3E D0       RET  NC
AE3F 3A165D   LD   A,(5D16)
AE42 E66F     AND  6F
AE44 D3FF     OUT  (FF),A
AE46 32165D   LD   (5D16),A
AE49 C9       RET
AE4A 32FF5C   LD   (5CFF),A
AE4D C9       RET
AE4E 22005D   LD   (5D00),HL
AE51 C9       RET
AE52 3EA0     LD   A,A0
AE54 1802     JR   AE58
AE56 3E80     LD   A,80
AE58 32FE5C   LD   (5CFE),A
AE5B 160A     LD   D,0A
AE5D D5       PUSH DE
AE5E 3AFF5C   LD   A,(5CFF)
AE61 3C       INC  A
AE62 D35F     OUT  (5F),A
AE64 2A005D   LD   HL,(5D00)
AE67 0E7F     LD   C,7F
AE69 3AFE5C   LD   A,(5CFE)
AE6C D31F     OUT  (1F),A
AE6E FEA0     CP   A0
AE70 C2C53E   JP   NZ,3EC5
AE73 DBFF     IN   A,(FF)
AE75 E6C0     AND  C0
AE77 28FA     JR   Z,AE73
AE79 FA913E   JP   M,3E91
AE7C EDA3     OUTI
AE7E 18F3     JR   AE73
AE80 15       DEC  D
AE81 CA9F3E   JP   Z,3E9F
AE84 D5       PUSH DE
AE85 CDB13D   CALL 3DB1
AE88 3AF55C   LD   A,(5CF5)
AE8B CDEB3D   CALL 3DEB
AE8E D1       POP  DE
AE8F 18CC     JR   AE5D
AE91 DB1F     IN   A,(1F)
AE93 D1       POP  DE
AE94 47       LD   B,A
AE95 E6FC     AND  FC
AE97 C8       RET  Z
AE98 E610     AND  10
AE9A 20E4     JR   NZ,AE80
AE9C 15       DEC  D
AE9D 20BE     JR   NZ,AE5D
AE9F 78       LD   A,B
AEA0 E640     AND  40
AEA2 21AF3F   LD   HL,3FAF
AEA5 2003     JR   NZ,AEAA
AEA7 21BD3F   LD   HL,3FBD
AEAA DB3F     IN   A,(3F)
AEAC B7       OR   A
AEAD 2005     JR   NZ,AEB4
AEAF DB5F     IN   A,(5F)
AEB1 FE0A     CP   0A
AEB3 C8       RET  Z
AEB4 DF       RST  18
AEB5 21C83F   LD   HL,3FC8
AEB8 DF       RST  18
AEB9 DB3F     IN   A,(3F)
AEBB CDD33E   CALL 3ED3
AEBE 3E07     LD   A,07
AEC0 320F5D   LD   (5D0F),A
AEC3 C35E21   JP   215E
AEC6 DBFF     IN   A,(FF)
AEC8 E6C0     AND  C0
AECA 28FA     JR   Z,AEC6
AECC FA913E   JP   M,3E91
AECF EDA2     INI
AED1 18F3     JR   AEC6
AED3 4F       LD   C,A
AED4 0600     LD   B,00
AED6 C3CD2A   JP   2ACD
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AED9  CDBE2A    CALL  2ABE
AEDC  C3233D    JP    3D23
AEDF  210020    LD    HL,2000
AEE2  110000    LD    DE,0000
AEE5  0600      LD    B,00
AEE7  E5        PUSH  HL
AEE8  4E        LD    C,(HL)
AEE9  EB        EX    DE,HL
AEEA  09        ADD   HL,BC
AEEB  EB        EX    DE,HL
AEEC  E1        POP   HL
AEED  23        INC   HL
AEEE  7C        LD    A,H
AEEF  FE2C      CP    2C
AEF1  20F4      JR    NZ,AEE7
AEF3  3A6A3F    LD    A,(3F6A)
AEF6  BB        CP    E
AEF7  C2FF3E    JP    NZ,3EFF
AEFA  3A6B3F    LD    A,(3F6B)
AEFD  BA        CP    D
AEFE  C8        RET   Z
AEFF  21BD3F    LD    HL,3FBD
AF02  DF        RST   18
AF03  76        HALT
AF04  CD1424    CALL  2414
AF07  7E        LD    A,(HL)
AF08  B7        OR    A
AF09  CAFF22    JP    Z,22FF
AF0C  FE01      CP    01
AF0E  CC0F24    CALL  Z,240F
AF11  C0        RET   NZ
AF12  18F0      JR    AF04
AF14  3EAA      LD    A,AA
AF16  32175D    LD    (5D17),A
AF19  AF        XOR   A
AF1A  1802      JR    AF1E
AF1C  3EFF      LD    A,FF
AF1E  32CE5C    LD    (5CCE),A
AF21  110900    LD    DE,0009
AF24  0601      LD    B,01
AF26  21005B    LD    HL,5B00
AF29  C3A62B    JP    2BA6
AF2C  E5        PUSH  HL
AF2D  ED5BF45C  LD    DE,(5CF4)
AF31  CD243F    CALL  3F24
AF34  3ADB5C    LD    A,(5CDB)
AF37  D1        POP   DE
AF38  B7        OR    A
AF39  28D9      JR    Z,AF14
AF3B  4F        LD    C,A
AF3C  21005B    LD    HL,5B00
AF3F  EDB0      LDIR
AF41  18D1      JR    AF14
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ELIMINAR AUTOPROTECCION

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3EDF  C9
3EEØ  C5
      3E20
      D7
      C1
      78
      FE02
      C8
      3E20
      D7
      3E20
      D7
      C9

3EFO  B7
      C8
      C641
      D7
      C9

3EF6  CD FF3C → "OD"
      C32923
```

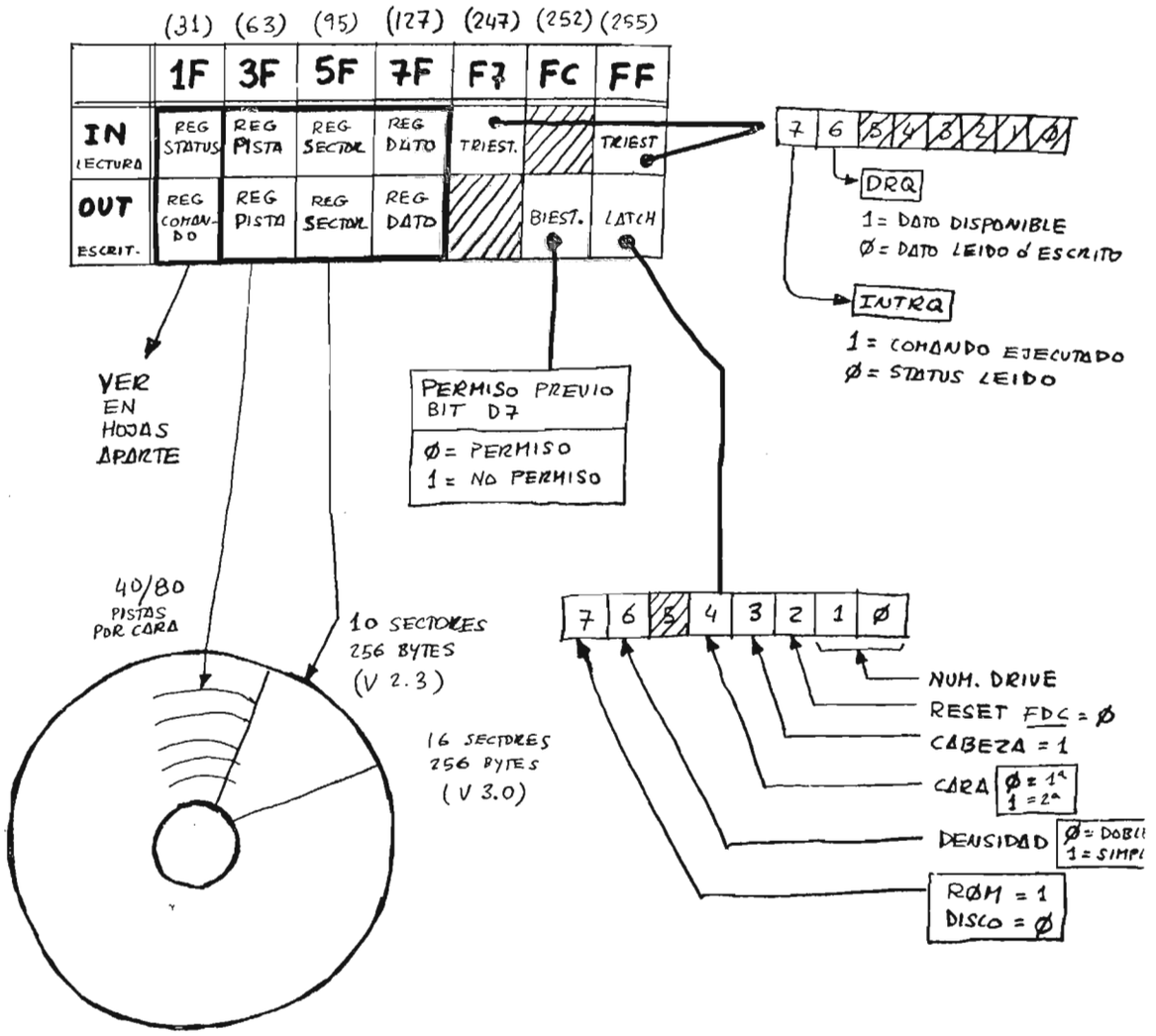
```
AF43 CF
AF44 2AD1E6
AF47 D2EFF8
AF4A FEC0
AF4C BE
AF4D F4D5F7
AF50 83
AF51 83
AF52 2E24
AF54 3D
AF55 05
AF56 52
AF57 24
AF58 AF
AF59 24
AF5A 82
AF5B 2656
AF5D 2851
AF5F 2A5C22
AF62 48
AF63 27
AF64 4C
AF65 27
AF66 54
AF67 27
AF68 75
AF69 2AA81F
```

```
AF6C  0D 4E 6F 20 45 69 6C 65
AF74  28 73 29 8D 20 44 65 6C
AF7C  2E 20 46 69 6C 65 20 73
AF84  29 8D 0D 2A 45 52 52 4F
AF8C  52 2A 8D 0D 4E 6F 20 73
AF94  70 61 63 65 2E 8D 0D 46
AF9C  69 6C 65 20 69 78 69 73
AFA4  74 73 2E 8D 20 46 72 65
AFAC  65 2E 8D 0D 57 72 69 74
AFB4  65 20 70 72 6F 74 65 63
AFBC  F4 0D 44 69 73 63 20 45
AFC4  72 72 6F F2 0D 54 72 6B
AFCC  A0 0D 53 65 63 2E 20 4E
AFD4  6F 2E 20 4F 2F C6 54 69
AFDC  74 6C 65 3A A0 4E 65 77
AFE4  A0 50 61 73 73 77 6F 72
AFEC  64 3A A0 00 FF FF FF FF
AFF4  FF FF FF FF FF FF FF FF
AFFC  FF FF FF 00 00 00 00 00
```

AF6C | 0D No-File(s) 8D
— DEL.

A1	A0	READ (RE)	WRITE (WE)
0	0	Status Register	Command Register
0	1	Track Register	Track Register
1	0	Sector Register	Sector Register
1	1	Data Register	Data Register

FILOSOFIA DE ACCESO A LOS REGISTROS



CAPACIDAD TOTAL = 409600 BYTES (V 2.3)

CAPACIDAD TOTAL = 655360 BYTES (V 3.0)

COMANDOS

MOTOR 1=ON Ø=OFF

IR A PISTA Ø SECTOR Ø

BUSCA PISTA Y SECTOR

PASO EN LA DIRECCION ANTERIOR

PASO HACIA EL CENTRO

PASO HACIA EXTERIOR

DMA

VELOCIDAD MOTOR PASO A PASO

DATA ADDRESS MARK

DELAY 15 mS Ø → NO 1 → SI

m=0 → 1 SECTOR
m=1 → VARIOS SECTORES

Type	Command	7	6	5	4	3	2	1	0
		Bits							
I	Restore	0	0	0	0	h	V	r_1	r_0
I	Seek	0	0	0	1	h	V	r_1	r_0
I	Step	0	0	1	T	h	V	r_1	r_0
I	Step-in	0	1	0	T	h	V	r_1	r_0
I	Step-out	0	1	1	T	h	V	r_1	r_0
II	Read Sector	1	0	0	m	S	E	C	0
II	Write Sector	1	0	1	m	S	E	C	a_0
III	Read Address	1	1	0	0	0	E	0	0
III	Read Track	1	1	1	0	0	E	0	0
III	Write Track	1	1	1	1	0	E	0	0
IV	Force Interrupt	1	1	0	1	I_3	I_2	I_1	I_0

FLAG SUMMARY

Command Type	Bit No(s)		Description
I	0, 1	$r_1 r_0$ = Stepping Motor Rate See Table 3 for Rate Summary	
I	2	V = Track Number Verify Flag	V = 0, No verify V = 1, Verify on destination track
I	3	h = Head Load Flag	h = 1, Load head at beginning h = 0, Unload head at beginning
I	4	T = Track Update Flag	T = 0, No update T = 1, Update track register
II	0	a_0 = Data Address Mark	a_0 = 0, FB (DAM) a_0 = 1, F8 (deleted DAM)
II	1	C = Side Compare Flag	C = 0, Disable side compare C = 1, Enable side compare
II & III	1	U = Update SSO	U = 0, Update SSO to 0 U = 1, Update SSO to 1
II & III	2	E = 15 MS Delay	E = 0, No 15 MS delay E = 1, 15 MS delay
II	3	S = Side Compare Flag	S = 0, Compare for side 0 S = 1, Compare for side 1
II	3	~~L = Sector Length Flag~~	~~LSB's Sector Length in ID Field: 00 01 10 11; L = 0: 256 512 1024 128; L = 1: 128 256 512 1024~~
II	4	m = Multiple Record Flag	m = 0, Single record m = 1, Multiple records
IV	0-3	I_x = Interrupt Condition Flags I_0 = 1 Not Ready To Ready Transition I_1 = 1 Ready To Not Ready Transition I_2 = 1 Index Pulse I_3 = 1 Immediate Interrupt, Requires A Reset I_3-I_0 = 0 Terminate With No Interrupt (INTRQ)	

CLK	2 MHz	2 MHz	1 MHz	1 MHz	2 MHz	1 MHz
DDEN	0	1	0	1	x	x
R1 R0	TEST=1	TEST=1	TEST=1	TEST=1	TEST=0	TEST=0
0 0	3 ms	3 ms	6 ms	6 ms	184µs	368µs
0 1	8 ms	8 ms	12 ms	12 ms	190µs	380µs
1 0	10 ms	10 ms	20 ms	20 ms	196µs	396µs
1 1	15 ms	15 ms	30 ms	30 ms	206µs	416µs

RESTORE → Ø 8 MOTOR ON
Ø Ø MOTOR OFF

SEEK → 1 8 MON
1 Ø MOFF

STEP → 2 8
2 Ø

STEP IN → 4 8
4 Ø

STEP OUT → 6 8
6 Ø

R. SECT → 8 Ø
W. SECT → A Ø

R. TRACK → E Ø
W. TRACK → F Ø

INTERRUPT → D Ø = NO INTERRUPCION

RESUMEN

COMANDOS

STATUS

BIT	ALL TYPE I COMMANDS	READ ADDRESS	READ SECTOR	READ TRACK	WRITE SECTOR	WRITE TRACK
S7	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY
S6	WRITE PROTECT	0	0	0	WRITE PROTECT	WRITE PROTECT
S5	HEAD LOADED	0	RECORD TYPE	0	WRITE FAULT	WRITE FAULT
S4	SEEK ERROR	RNF	RNF	0	RNF	0
S3	CRC ERROR	CRC ERROR	CRC ERROR	0	CRC ERROR	0
S2	TRACK 0	LOST DATA	LOST DATA	LOST DATA	LOST DATA	LOST DATA
S1	INDEX PULSE	DRQ	DRQ	DRQ	DRQ	DRQ
S0	BUSY	BUSY	BUSY	BUSY	BUSY	BUSY

STATUS FOR TYPE I COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset it indicates that the drive is ready. This bit is an inverted copy of the Ready input and logically 'ored' with MR.
S6 PROTECTED	When set, indicates Write Protect is activated. This bit is an inverted copy of $\overline{WRPT}$ input.
S5 HEAD LOADED	When set, it indicates the head is loaded and engaged. This bit is a logical "and" of HLD and HLT signals.
S4 SEEK ERROR	When set, the desired track was not verified. This bit is reset to 0 when updated.
S3 CRC ERROR	CRC encountered in ID field.
S2 TRACK 00	When set, indicates Read/Write head is positioned to Track 0. This bit is an inverted copy of the $\overline{TR00}$ input.
S1 INDEX	When set, indicates index mark detected from drive. This bit is an inverted copy of the $\overline{IP}$ input.
S0 BUSY	When set command is in progress. When reset no command is in progress.

STATUS FOR TYPE II AND III COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset, it indicates that the drive is ready. This bit is an inverted copy of the Ready input and 'ored' with MR. The Type II and III Commands will not execute unless the drive is ready.
S6 WRITE PROTECT	On Read Record: Not Used. On Read Track: Not Used. On any Write: It indicates a Write Protect. This bit is reset when updated.
S5 RECORD TYPE/ WRITE FAULT	On Read Record: It indicates the record-type code from data field address mark. 1 = Deleted Data Mark. 0 = Data Mark. On any Write: It indicates a Write Fault. This bit is reset when updated.
S4 RECORD NOT FOUND (RNF)	When set, it indicates that the desired track, sector, or side were not found. This bit is reset when updated.
S3 CRC ERROR	If S4 is set, an error is found in one or more ID fields; otherwise it indicates error in data field. This bit is reset when updated.
S2 LOST DATA	When set, it indicates the computer did not respond to DRQ in one byte time. This bit is reset to zero when updated.
S1 DATA REQUEST	This bit is a copy of the DRQ output. When set, it indicates the DR is full on a Read Operation or the DR is empty on a Write operation. This bit is reset to zero when updated.
S0 BUSY	When set, command is under execution. When reset, no command is under execution.

BACK UP

(1)

```
8000 C32B81    JP    812B
8003 C31880    JP    8018
8006 C3CE80    JP    80CE
8009 C33183    JP    8331
800C CD2B80    CALL  802B
800F FE07      CP    07
8011 CA0E81    JP    Z,810E
8014 C9        RET
8015 C5        PUSH  BC
8016 D5        PUSH  DE
8017 E5        PUSH  HL
8018 3A385C    LD    A,(5C38)
801B E620      AND   20
801D E1        POP   HL
801E D1        POP   DE
801F C1        POP   BC
8020 2002      JR    NZ,8024
8022 AF        XOR   A
8023 C9        RET
8024 3EFF      LD    A,FF
8026 B7        OR    A
8027 C9        RET
8028 00        NOP
8029 00        NOP
802A 00        NOP
802B C5        PUSH  BC
802C D5        PUSH  DE
802D E5        PUSH  HL
802E 3A2880    LD    A,(8028)
8031 E601      AND   01
8033 3E4C      LD    A,4C
8035 2802      JR    Z,8039
8037 3E43      LD    A,43
8039 D7        RST   10
803A 3E08      LD    A,08
803C D7        RST   10
803D 21885C    LD    HL,5C88
8040 4E        LD    C,(HL)
8041 3E21      LD    A,21
8043 91        SUB   C
8044 322980    LD    (8029),A
8047 23        INC   HL
8048 4E        LD    C,(HL)
8049 3E18      LD    A,18
804B 91        SUB   C
804C 2600      LD    H,00
804E 17        RLA
804F 17        RLA
8050 17        RLA
8051 17        RLA
8052 3002      JR    NC,8056
8054 24        INC   H
8055 B7        OR    A
8056 17        RLA
8057 6F        LD    L,A
8058 7C        LD    A,H
8059 17        RLA
805A 67        LD    H,A
805B 3A2980    LD    A,(8029)
805E 85        ADD   A,L
805F 6F        LD    L,A
8060 010058    LD    BC,5800
8063 09        ADD   HL,BC
8064 222980    LD    (8029),HL
8067 3E80      LD    A,80
8069 AE        XOR   (HL)
806A 77        LD    (HL),A
806B 213B5C    LD    HL,5C3B
806E 7E        LD    A,(HL)
806F E620      AND   20
8071 28FB      JR    Z,806E
8073 3E20      LD    A,20
8075 AE        XOR   (HL)
8076 77        LD    (HL),A
8077 3E80      LD    A,80
8079 2A2980    LD    HL,(8029)
807C AE        XOR   (HL)
807D 77        LD    (HL),A
807E 3A085C    LD    A,(5C08)
8081 FE06      CP    06
8083 212880    LD    HL,8028
8086 2006      JR    NZ,808E
8088 3E01      LD    A,01
808A AE        XOR   (HL)
808B 77        LD    (HL),A
808C 18A0      JR    802E
```

(2)

```
808E 4F          LD    C,A
808F 7E          LD    A,(HL)
8090 B7          OR    A
8091 79          LD    A,C
8092 C4B880      CALL  NZ,80B8
8095 FEC5        CP    C5
8097 2004        JR    NZ,809D
8099 3E5D        LD    A,5D
809B 1806        JR    80A3
809D FEC6        CP    C6
809F 2002        JR    NZ,80A3
80A1 3E5B        LD    A,5B
80A3 F5          PUSH  AF
80A4 212C01      LD    HL,012C
80A7 111400      LD    DE,0014
80AA CDB503      CALL  03B5
80AD F1          POP   AF
80AE FE0C        CP    0C
80B0 2002        JR    NZ,80B4
80B2 3E08        LD    A,08
80B4 E1          POP   HL
80B5 D1          POP   DE
80B6 C1          POP   BC
80B7 C9          RET
80B8 FE61        CP    61
80BA D8          RET   C
80BB FE7B        CP    7B
80BD D0          RET   NC
80BE E6DF        AND   DF
80C0 C9          RET
80C1 212C01      LD    HL,012C
80C4 113C00      LD    DE,003C
80C7 CDB503      CALL  03B5
80CA C1          POP   BC
80CB D1          POP   DE
80CC E1          POP   HL
80CD C9          RET
80CE E5          PUSH  HL
80CF D5          PUSH  DE
80D0 4F          LD    C,A
80D1 C5          PUSH  BC
80D2 FE07        CP    07
80D4 28EB        JR    Z,80C1
80D6 3E02        LD    A,02
80D8 CD0116      CALL  1601
80DB C1          POP   BC
80DC C5          PUSH  BC
80DD 3E09        LD    A,09
80DF 328C5C      LD    (5C8C),A
80E2 79          LD    A,C
80E3 E67F        AND   7F
80E5 FE08        CP    08
80E7 2008        JR    NZ,80F1
80E9 3E20        LD    A,20
80EB D7          RST   10
80EC 3E08        LD    A,08
80EE D7          RST   10
80EF 3E08        LD    A,08
80F1 D7          RST   10
80F2 C1          POP   BC
80F3 D1          POP   DE
80F4 E1          POP   HL
80F5 C9          RET
80F6 3AB65C      LD    A,(5CB6)
80F9 FEF4        CP    F4
80FB C8          RET   Z
80FC 21B65C      LD    HL,5CB6
80FF 11265D      LD    DE,5D26
8102 063A        LD    B,3A
8104 4E          LD    C,(HL)
8105 1A          LD    A,(DE)
8106 77          LD    (HL),A
8107 79          LD    A,C
8108 12          LD    (DE),A
8109 23          INC   HL
810A 13          INC   DE
810B 10F7        DJNZ  8104
810D C9          RET
810E CDF680      CALL  80F6
8111 ED7B1C85    LD    SP,(851C)
8115 2A1E85      LD    HL,(851E)
8118 ED4B0F5D    LD    BC,(5D0F)
811C E9          JP    HL
811D 212085      LD    HL,8520   → INICIO SCRATCH?
8120 3E20        LD    A,20
8122 0620        LD    B,20
8124 77          LD    (HL),A        BORRA 32 BYTES
8125 23          INC   HL
8126 10FC        DJNZ  8124
8128 3600        LD    (HL),00
812A C9          RET
```

③

```
812B E1          POP  HL
812C 221E85      LD   (851E),HL
812F 210000      LD   HL,0000
8132 39          ADD  HL,SP
8133 221C85      LD   (851C),HL
8136 317887      LD   SP,8778
8139 CDF680      CALL 80F6
813C 21FFFF      LD   HL,FFFF
813F 22FA5C      LD   (5CFA),HL
8142 3E00        LD   A,00
8144 CD5C83      CALL 835C
8147 CD063C      CALL 3C06
814A CD6D83      CALL 836D
814D 3E02        LD   A,02
814F CD1016      CALL 1610
8152 CD6B0D      CALL 0D6B
8155 219883      LD   HL,8398 "
8158 CD5183      CALL 8351
815B 211584      LD   HL,8415 "
815E CD5183      CALL 8351
8161 CD5382      CALL 8253
8164 CD6B0D      CALL 0D6B
8167 21CE83      LD   HL,83CE "
816A CD5183      CALL 8351
816D CD0C80      CALL 800C
8170 FE79        CP   79
8172 20F9        JR   NZ,816D
8174 3E20        LD   A,20
8176 CD0680      CALL 8006
8179 3EFF        LD   A,FF
817B 321885      LD   (8518),A
817E CD7B82      CALL 827B
8181 3A2787      LD   A,(8727)
8184 FE19        CP   19
8186 219001      LD   HL,0190
8189 2815        JR   Z,81A0
818B 212003      LD   HL,0320
818E FE18        CP   18
8190 280E        JR   Z,81A0
8192 FE17        CP   17
8194 280A        JR   Z,81A0
8196 214006      LD   HL,0540
8199 FE16        CP   16
819B 2803        JR   Z,81A0
819D C3B982      JP   82B9
81A0 ED4B2987    LD   BC,(8729)
81A4 ED42        SBC  HL,BC
81A6 224085      LD   (8540),HL
81A9 210000      LD   HL,0000
81AC 22F25C      LD   (5CF2),HL
81AF 22EB5C      LD   (5CEB),HL
81B2 CD8E81      CALL 818E
81B5 C30E81      JP   810E
81B8 2A4085      LD   HL,(8540)
81BB 7C          LD   A,H
81BC B5          OR   L
81BD C9          RET
81BE CD8881      CALL 8188
81C1 C8          RET  Z
81C2 3A1885      LD   A,(8518)
81C5 B7          OR   A
81C6 3E00        LD   A,00
81C8 321885      LD   (8518),A
81CB 2015        JR   NZ,81E2
81CD CD6B0D      CALL 0D6B
81D0 21CE83      LD   HL,83CE "
81D3 CD5183      CALL 8351
81D6 CD0C80      CALL 800C
81D9 FE79        CP   79
81DB 20F9        JR   NZ,81D6
81DD 3E20        LD   A,20
81DF CD0680      CALL 8006
81E2 CD8881      CALL 8188
81E5 C8          RET  Z
81E6 C5          PUSH BC
81E7 016000      LD   BC,0060
81EA ED42        SBC  HL,BC
81EC C1          POP  BC
81ED 3058        JR   NC,824A
81EF 2A4085      LD   HL,(8540)
81F2 44          LD   B,H
81F3 4D          LD   C,L
81F4 210000      LD   HL,0000
81F7 224085      LD   (8540),HL
81FA C5          PUSH BC
81FB AF          XOR  A
81FC 32CE5C      LD   (5CCE),A
81FF 218387      LD   HL,8783 "
8202 E5          PUSH HL
8203 ED5BF25C    LD   DE,(5CF2)
8207 41          LD   B,C
8208 CD5C83      CALL 835C
820B CD093C      CALL 3C09
820E CD6D83      CALL 836D
```

```
8211 2AF45C    LD    HL,(5CF4)
8214 22F25C    LD    (5CF2),HL
8217 CD6B0D    CALL  0D6B
821A 21EF83    LD    HL,83EF
821D CD5183    CALL  8351
8220 CD0C80    CALL  800C
8223 FE79      CP    79
8225 20F9      JR    NZ,8220
8227 3E20      LD    A,20
8229 CD0680    CALL  8006
822C E1        POP   HL
822D C1        POP   BC
822E ED5BEB5C  LD    DE,(5CEB)
8232 3EFF      LD    A,FF
8234 32CE5C    LD    (5CCE),A
8237 41        LD    B,C
8238 CD5C83    CALL  835C
823B CD0C3C    CALL  3C0C
823E CD6D83    CALL  836D
8241 2AF45C    LD    HL,(5CF4)
8244 22EB5C    LD    (5CEB),HL
8247 C3BE81    JP    81BE
824A 224085    LD    (8540),HL
824D 016000    LD    BC,0060
8250 AF        XOR   A
8251 18A7      JR    81FA
8253 CD1D81    CALL  811D
8256 CDD182    CALL  82D1
8259 212085    LD    HL,8520
825C 11065D    LD    DE,5D06
825F 010900    LD    BC,0009
8262 EDB0      LDIR
8264 C9        RET
8265 214485    LD    HL,8544 "
8268 0602      LD    B,02
826A 110700    LD    DE,0007
826D AF        XOR   A
826E 32CE5C    LD    (5CCE),A
8271 CD5C83    CALL  835C
8274 CD093C    CALL  3C09
8277 CD6D83    CALL  836D
827A C9        RET
827B CD6582    CALL  8265
827E 21065D    LD    HL,5D06
8281 112E87    LD    DE,872E
8284 0609      LD    B,09
8286 CD2A83    CALL  832A
8289 C8        RET   Z
828A 218584    LD    HL,8485 "
828D CD5183    CALL  8351
8290 CD5382    CALL  8253
8293 18E6      JR    827B
8295 215684    LD    HL,8456
8298 CD5183    CALL  8351
829B C30E81    JP    810E
829E ED7B1C85  LD    SP,(851C)
82A2 C9        RET
82A3 7E        LD    A,(HL)
82A4 B7        OR    A
82A5 C8        RET   Z
82A6 23        INC   HL
82A7 FE21      CP    21
82A9 38F8      JR    C,82A3
82AB 2B        DEC   HL
82AC E5        PUSH  HL
82AD 0600      LD    B,00
82AF 3E21      LD    A,21
82B1 04        INC   B
82B2 BE        CP    (HL)
82B3 23        INC   HL
82B4 38FB      JR    C,82B1
82B6 05        DEC   B
82B7 E1        POP   HL
82B8 C9        RET
82B9 D1        POP   DE
82BA CDC082    CALL  82C0
82BD C30E81    JP    810E
82C0 213084    LD    HL,8430 "
82C3 CD5183    CALL  8351
82C6 37        SCF
82C7 C9        RET
82C8 3E0D      LD    A,0D
82CA CD0680    CALL  8006
82CD C9        RET
82CE CDC882    CALL  82C8
82D1 212085    LD    HL,8520 "
82D4 AF        XOR   A
82D5 321A85    LD    (851A),A
82D8 E5        PUSH  HL
82D9 CD0C80    CALL  800C
82DC FE20      CP    20
82DE 28F9      JR    Z,82D9
82E0 1804      JR    82E6
```

```
82E2 E5        PUSH HL
82E3 CD0C80    CALL 800C
82E6 E1        POP  HL
82E7 FE08      CP   08
82E9 281E      JR   Z,8309
82EB FE0D      CP   0D
82ED CA2583    JP   Z,8325
82F0 4F        LD   C,A
82F1 3A1A85    LD   A,(851A)
82F4 FE1D      CP   1D
82F6 28EA      JR   Z,82E2
82F8 79        LD   A,C
82F9 77        LD   (HL),A
82FA 23        INC  HL
82FB E5        PUSH HL
82FC CD0680    CALL 8006
82FF E1        POP  HL
8300 3A1A85    LD   A,(851A)
8303 3C        INC  A
8304 321A85    LD   (851A),A
8307 18D9      JR   82E2
8309 3A1A85    LD   A,(851A)
830C B7        OR   A
830D 28C2      JR   Z,82D1
830F 3D        DEC  A
8310 321A85    LD   (851A),A
8313 2B        DEC  HL
8314 3E20      LD   A,20
8316 77        LD   (HL),A
8317 E5        PUSH HL
8318 212183    LD   HL,8321 "
831B CD5183    CALL 8351
831E E1        POP  HL
831F 18C1      JR   82E2
8321 08        EX   AF,AF
8322 2008      JR   NZ,832C
8324 00        NOP
8325 3E20      LD   A,20
8327 C30680    JP   8006
832A 1A        LD   A,(DE)
832B BE        CP   (HL)
832C 2006      JR   NZ,8334
832E 13        INC  DE
832F 23        INC  HL
8330 10F8      DJNZ 832A
8332 AF        XOR  A
8333 C9        RET
8334 3EFF      LD   A,FF
8336 B7        OR   A
8337 C9        RET
8338 110000    LD   DE,0000
833B 0602      LD   B,02
833D 214485    LD   HL,8544 "
8340 3EFF      LD   A,FF
8342 32CE5C    LD   (5CCE),A
8345 CD5C83    CALL 835C
8348 CD0C3C    CALL 3C0C
834B CD6D83    CALL 836D
834E C30E81    JP   810E
```

(6)

```
8351 7E          LD    A,(HL)
8352 B7          OR    A
8353 C8          RET   Z
8354 E5          PUSH  HL
8355 CD0680      CALL  8006
8358 E1          POP   HL
8359 23          INC   HL
835A 18F5        JR    8351
835C F3          DI
835D F5          PUSH  AF
835E CD8183      CALL  8381
8361 3A165D      LD    A,(5D16)
8364 E67F        AND   7F
8366 32165D      LD    (5D16),A
8369 D3FF        OUT   (FF),A
836B F1          POP   AF
836C C9          RET
836D F5          PUSH  AF
836E CD8183      CALL  8381
8371 3A165D      LD    A,(5D16)
8374 F680        OR    80
8376 32165D      LD    (5D16),A
8379 D3FF        OUT   (FF),A
837B CD8783      CALL  8387
837E F1          POP   AF
837F FB          EI
8380 C9          RET
8381 CD8F83      CALL  838F
8384 D3FC        OUT   (FC),A
8386 C9          RET
8387 CD8F83      CALL  838F
838A F680        OR    80
838C D3FC        OUT   (FC),A
838E C9          RET
838F 3A485C      LD    A,(5C48)
8392 E638        AND   38
8394 0F          RRCA
8395 0F          RRCA
8396 0F          RRCA
8397 C9          RET
```

```
8398  0D 16 01 05 2A 20 42 41
83A0  43 48 55 50 20 56 65 72
83A8  20 32 2E 33 20 2A 0D 00
83B0  20 20 7F 20 54 65 63 68
83B8  6E 6F 6C 6F 67 79 20 53
83C0  65 73 65 61 72 63 68 20
83C8  4C 74 64 2E 0D 00 0D 49
83D0  6E 73 65 72 74 20 53 6F
83D8  75 72 63 65 20 64 69 73
83E0  63 20 74 68 65 6E 20 70
83E8  72 65 73 73 20 59 00 0D
83F0  49 6E 73 65 72 74 20 44
83F8  65 73 74 69 6E 61 74 69
8400  6F 6E 20 64 69 73 63 0D
8408  74 68 65 6E 20 70 72 65
8410  73 73 20 59 00 0D 50 61
8418  73 73 77 6F 72 64 20 66
8420  6F 72 20 53 6F 75 72 63
8428  65 20 64 69 73 63 0D 00
8430  0D 07 2A 20 57 72 6F 6E
8438  67 20 64 69 73 6B 20 66
8440  6F 72 6D 61 74 21 20 2A
8448  00 0D 07 4E 6F 20 73 70
8450  61 63 65 2E 0D 00 0D 07
8458  46 69 6C 65 20 65 78 69
8460  73 74 73 2E 0D 00 20 46
8468  72 65 65 2E 0D 00 0D 07
8470  52 65 63 6F 72 64 20 4E
8478  6F 2E 20 6F 76 65 72 2D
8480  66 6C 6F 77 00 0D 57 72
8488  6F 6E 67 20 50 61 73 73
8490  77 6F 72 64 0D 50 61 73
8498  73 77 6F 72 64 20 3A 20
84A0  00 0D 57 72 69 74 65 00
84A8  70 72 6F 74 65 63 74 00
84B0  0D 52 4E 46 20 45 72 72
84B8  6F 72 00 0D 43 52 43 20
84C0  45 72 72 6F 72 00 0D 44
84C8  61 74 61 20 4C 6F 73 74
84D0  00 0D 41 28 62 6F 72 74
84D8  29 2C 52 28 65 74 72 79
84E0  29 2C 49 28 67 6E 6F 72
84E8  65 29 00 0D 54 72 61 63
84F0  68 20 00 20 53 65 63 74
84F8  6F 72 20 00 0D 50 72 6F
8500  74 65 63 74 69 6F 6E 3F
8508  20 00 20 20 20 20 20 20
8510  20 20 20 20 20 00 00 00
```

FORMAT

```
A000 C3F6A0     JP    A0F6
A003 C315A0     JP    A015
A006 C32BA0     JP    A02B
A009 C3CEA0     JP    A0CE
A00C C364A5     JP    A564
A00F C378A5     JP    A578
A012 C398A5     JP    A598
A015 C5         PUSH  BC
A016 D5         PUSH  DE
A017 E5         PUSH  HL
A018 3A3B5C     LD    A,(5C3B)
A01B E620       AND   20
A01D E1         POP   HL
A01E D1         POP   DE
A01F C1         POP   BC
A020 2002       JR    NZ,A024
A022 AF         XOR   A
A023 C9         RET
A024 3EFF       LD    A,FF
A026 B7         OR    A
A027 C9         RET
A028 00         NOP
A029 00         NOP
A02A 00         NOP
A02B C5         PUSH  BC
A02C D5         PUSH  DE
A02D E5         PUSH  HL
A02E 3A2AA0     LD    A,(A02A)
A031 E601       AND   01
A033 3E4C       LD    A,4C
A035 2802       JR    Z,A039
A037 3E43       LD    A,43
A039 D7         RST   10
A03A 3E08       LD    A,08
A03C D7         RST   10
A03D 21885C     LD    HL,5C88
A040 4E         LD    C,(HL)
A041 3E21       LD    A,21
A043 91         SUB   C
A044 3228A0     LD    (A028),A
A047 23         INC   HL
A048 4E         LD    C,(HL)
A049 3E18       LD    A,18
A04B 91         SUB   C
A04C 2600       LD    H,00
A04E 17         RLA
A04F 17         RLA
A050 17         RLA
A051 17         RLA
A052 3002       JR    NC,A056
A054 24         INC   H
A055 B7         OR    A
A056 17         RLA
A057 6F         LD    L,A
A058 7C         LD    A,H
A059 17         RLA
A05A 67         LD    H,A
A05B 3A28A0     LD    A,(A028)
A05E 85         ADD   A,L
A05F 6F         LD    L,A
A060 010058     LD    BC,5800
A063 09         ADD   HL,BC
A064 2228A0     LD    (A028),HL
A067 3E80       LD    A,80
A069 AE         XOR   (HL)
A06A 77         LD    (HL),A
A06B 213B5C     LD    HL,5C3B
A06E 7E         LD    A,(HL)
A06F E620       AND   20
A071 28FB       JR    Z,A06E
A073 3E20       LD    A,20
A075 AE         XOR   (HL)
A076 77         LD    (HL),A
A077 3E80       LD    A,80
A079 2A28A0     LD    HL,(A028)
A07C AE         XOR   (HL)
A07D 77         LD    (HL),A
A07E 3A085C     LD    A,(5C08)
A081 FE06       CP    06
A083 212AA0     LD    HL,A02A
A086 2006       JR    NZ,A08E
A088 3E01       LD    A,01
A08A AE         XOR   (HL)
A08B 77         LD    (HL),A
A08C 18A0       JR    A02E
```

```
A08E 4F        LD   C,A
A08F 7E        LD   A,(HL)
A090 B7        OR   A
A091 79        LD   A,C
A092 C488A0    CALL NZ,A088
A095 FEC5      CP   C5
A097 2004      JR   NZ,A09D
A099 3E5D      LD   A,5D
A09B 1806      JR   A0A3
A09D FEC6      CP   C6
A09F 2002      JR   NZ,A0A3
A0A1 3E5B      LD   A,5B
A0A3 F5        PUSH AF
A0A4 212C01    LD   HL,012C
A0A7 111400    LD   DE,0014
A0AA CDB503    CALL 03B5
A0AD F1        POP  AF
A0AE FE0C      CP   0C
A0B0 2002      JR   NZ,A0B4
A0B2 3E08      LD   A,08
A0B4 E1        POP  HL
A0B5 D1        POP  DE
A0B6 C1        POP  BC
A0B7 C9        RET
A0B8 FE61      CP   61
A0BA D8        RET  C
A0BB FE7B      CP   7B
A0BD D0        RET  NC
A0BE E6DF      AND  DF
A0C0 C9        RET
A0C1 212C01    LD   HL,012C
A0C4 113C00    LD   DE,003C
A0C7 CDB503    CALL 03B5
A0CA C1        POP  BC
A0CB D1        POP  DE
A0CC E1        POP  HL
A0CD C9        RET
A0CE E5        PUSH HL
A0CF D5        PUSH DE
A0D0 4F        LD   C,A
A0D1 C5        PUSH BC
A0D2 FE07      CP   07
A0D4 28EB      JR   Z,A0C1
A0D6 3E02      LD   A,02
A0D8 CD0116    CALL 1601
A0DB C1        POP  BC
A0DC C5        PUSH BC
A0DD 3E09      LD   A,09
A0DF 328C5C    LD   (5C8C),A
A0E2 79        LD   A,C
A0E3 E67F      AND  7F
A0E5 FE08      CP   08
A0E7 2008      JR   NZ,A0F1
A0E9 3E20      LD   A,20
A0EB D7        RST  10
A0EC 3E08      LD   A,08
A0EE D7        RST  10
A0EF 3E08      LD   A,08
A0F1 D7        RST  10
A0F2 C1        POP  BC
A0F3 D1        POP  DE
A0F4 E1        POP  HL
A0F5 C9        RET
A0F6 210000    LD   HL,0000
A0F9 39        ADD  HL,SP
A0FA 2285A8    LD   (A885),HL
A0FD 31FAA9    LD   SP,A9FA
A100 21FFFF    LD   HL,FFFF
A103 227FA8    LD   (A87F),HL
A106 3A1E5D    LD   A,(5D1E)
A109 E680      AND  80
A10B 280C      JR   Z,A119
A10D 2134A8    LD   HL,A834
A110 CD78A4    CALL A478
A113 CD06A0    CALL A006
A116 C351A4    JP   A451
```

```
A119 3E7F      LD   A,7F
A11B D3FC      OUT  (FC),A
A11D AF        XOR  A
A11E 327AA8    LD   (A87A),A
A121 3E02      LD   A,02
A123 CD1016    CALL 1610
A126 CD6B0D    CALL 0D6B
A129 21BAA5    LD   HL,A5BA
A12C CD7BA4    CALL A47B
A12F CD06A0    CALL A006
A132 3278A8    LD   (A878),A
A135 FE71      CP   71          } q
A137 CA51A4    JP   Z,A451      }
A13A FE51      CP   51          } Q
A13C CA51A4    JP   Z,A451      }
A13F FE31      CP   31          } 1
A141 38EC      JR   C,A12F      }
A143 FE35      CP   35          } 5
A145 30E8      JR   NC,A12F     }
A147 CD6B0D    CALL 0D6B
A14A 3A78A8    LD   A,(A878)
A14D 218FA6    LD   HL,A68F
A150 FE31      CP   31          } 1
A152 2811      JR   Z,A165      }
A154 21AEA6    LD   HL,A6AE
A157 FE32      CP   32          } 2
A159 280A      JR   Z,A165      }
A15B 21CDA6    LD   HL,A6CD
A15E FE33      CP   33          } 3
A160 2803      JR   Z,A165      }
A162 21ECA6    LD   HL,A6EC
A165 CD7BA4    CALL A47B
A168 3A78A8    LD   A,(A878)
A16B 2177A8    LD   HL,A877
A16E 3628      LD   (HL),28
A170 FE31      CP   31          } 1
A172 2806      JR   Z,A17A      }
A174 FE33      CP   33          } 3
A176 2802      JR   Z,A17A      }
A178 3650      LD   (HL),50
A17A 210BA7    LD   HL,A70B
A17D CD7BA4    CALL A47B
A180 3A7AA8    LD   A,(A87A)
A183 4F        LD   C,A
A184 CD0FA0    CALL A00F
A187 3E02      LD   A,02
A189 CD63A4    CALL A463
A18C 210DA7    LD   HL,A70D
A18F CD7BA4    CALL A47B
A192 CD06A0    CALL A006
A195 E6DF      AND  DF
A197 FE4D      CP   4D          } M
A199 CA21A1    JP   Z,A121      }
A19C FE41      CP   41          } A
A19E 2004      JR   NZ,A1A4     }
A1A0 3E00      LD   A,00
A1A2 1816      JR   A1BA
A1A4 FE42      CP   42          } B
A1A6 2004      JR   NZ,A1AC     }
A1A8 3E01      LD   A,01
A1AA 180E      JR   A1BA
A1AC FE43      CP   43          } C
A1AE 2004      JR   NZ,A1B4     }
A1B0 3E02      LD   A,02
A1B2 1806      JR   A1BA
A1B4 FE44      CP   44          } D
A1B6 20DA      JR   NZ,A192     }
A1B8 3E03      LD   A,03
A1BA 327AA8    LD   (A87A),A
A1BD 4F        LD   C,A
A1BE CD0FA0    CALL A00F
A1C1 3E02      LD   A,02
A1C3 CD63A4    CALL A463
A1C6 214EA7    LD   HL,A74E
A1C9 CD7BA4    CALL A47B
A1CC 3A7AA8    LD   A,(A87A)
A1CF C641      ADD  A,41
A1D1 CD09A0    CALL A009
A1D4 3E04      LD   A,04
A1D6 CD63A4    CALL A463
A1D9 3E05      LD   A,05
A1DB CD63A4    CALL A463
A1DE 212FA7    LD   HL,A72F
A1E1 CD7BA4    CALL A47B
A1E4 CD06A0    CALL A006
A1E7 E6DF      AND  DF
A1E9 3276A8    LD   (A876),A
A1EC FE46      CP   46          } F
A1EE 280E      JR   Z,A1FE      }
A1F0 FE56      CP   56          } V
A1F2 280F      JR   Z,A203      }
A1F4 FE4D      CP   4D          } M
A1F6 20EC      JR   NZ,A1E4     }
A1F8 CD09A0    CALL A009
A1FB C321A1    JP   A121
```

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A1FE CDE9A4    CALL A4E9
A201 3E20      LD   A,20
A203 CD09A0    CALL A009
A206 2167A7    LD   HL,A767
A209 CD7BA4    CALL A47B
A20C 3E30      LD   A,30
A20E CD09A0    CALL A009
A211 3A75A8    LD   A,(A875)
A214 F610      OR   10
A216 D3FF      OUT  (FF),A
A218 3275A8    LD   (A875),A
A218 AF        XOR  A
A21C 3279A8    LD   (A879),A
A21F CD4AA2    CALL A24A
A222 3A78A8    LD   A,(A878)
A225 FE31      CP   31
A227 CA39A4    JP   Z,A439
A22A FE32      CP   32
A22C CA39A4    JP   Z,A439
A22F 2167A7    LD   HL,A767
A232 CD7BA4    CALL A47B
A235 3E31      LD   A,31
A237 CD09A0    CALL A009
A23A 3A75A8    LD   A,(A875)
A23D E6EF      AND  EF
A23F 3275A8    LD   (A875),A
A242 D3FF      OUT  (FF),A
A244 CD4AA2    CALL A24A
A247 C339A4    JP   A439
A24A CD0CA0    CALL A00C
A24D AF        XOR  A
A24E 327CA8    LD   (A87C),A
A251 3E09      LD   A,09
A253 F5        PUSH AF
A254 CD63A4    CALL A463
A257 F1        POP  AF
A258 3C        INC  A
A259 FE0F      CP   0F
A25B 20F6      JR   NZ,A253
A25D 1600      LD   D,00
A25F 3A76A8    LD   A,(A876)
A262 FE56      CP   56
A264 CA84A3    JP   Z,A384
A267 3A75A8    LD   A,(A875)
A26A E6F7      AND  F7
A26C D3FF      OUT  (FF),A
A26E 3EFF      LD   A,FF
A270 3274A8    LD   (A874),A
A273 3A76A8    LD   A,(A876)
A276 FE56      CP   56
A278 CA84A3    JP   Z,A384
A27B 1E01      LD   E,01
A27D D5        PUSH DE
A27E 2172A7    LD   HL,A772
A281 CD7BA4    CALL A47B
A284 D1        POP  DE
A285 D5        PUSH DE
A286 4A        LD   C,D
A287 0600      LD   B,00
A289 CD1B1A    CALL 1A1B
A28C 3E20      LD   A,20
A28E CD09A0    CALL A009
A291 D1        POP  DE
A292 21FCA9    LD   HL,A9FC
A295 060E      LD   B,0E
A297 36FF    ┌►LD   (HL),FF
A299 23      │ INC  HL
A29A 10FB    └─DJNZ A297
A29C 0606      LD   B,06
A29E 3600    ┌►LD   (HL),00
A2A0 23      │ INC  HL
A2A1 10FB    └─DJNZ A29E
A2A3 36FE      LD   (HL),FE
A2A5 23        INC  HL
A2A6 72        LD   (HL),D
A2A7 23        INC  HL
A2A8 3600      LD   (HL),00
A2AA 23        INC  HL
A2AB D5        PUSH DE
A2AC E5        PUSH HL
A2AD 1600      LD   D,00
A2AF 2168A8    LD   HL,A868
A2B2 19        ADD  HL,DE
A2B3 5E        LD   E,(HL)
A2B4 E1        POP  HL
A2B5 73        LD   (HL),E
A2B6 D1        POP  DE
A2B7 23        INC  HL
A2B8 3601      LD   (HL),01
A2BA 23        INC  HL
A2BB 36F7      LD   (HL),F7
A2BD 23        INC  HL
A2BE 060B      LD   B,0B
A2C0 36FF    ┌►LD   (HL),FF
A2C2 23      │ INC  HL
A2C3 10FB    └─DJNZ A2C0
```

```
A2C5 0606      LD   B,06
A2C7 3600    ►LD   (HL),00
A2C9 23      ┌ INC  HL
A2CA 10FB    └ DJNZ A2C7
A2CC 36FB      LD   (HL),FB
A2CE 23        INC  HL
A2CF 06FF      LD   B,FF
A2D1 D5        PUSH DE
A2D2 7A        LD   A,D
A2D3 B7        OR   A
A2D4 2809      JR   Z,A2DF
A2D6 36E6    ►LD   (HL),E6
A2D8 23      ┌ INC  HL
A2D9 10FB    └ DJNZ A2D6
A2DB 36E6      LD   (HL),E6
A2DD 1808      JR   A2E7
A2DF 7B        LD   A,E
A2E0 36FF    ►LD   (HL),FF
A2E2 23      ┌ INC  HL
A2E3 10FB    └ DJNZ A2E0
A2E5 36FF      LD   (HL),FF
A2E7 D1        POP  DE
A2E8 23        INC  HL
A2E9 36F7      LD   (HL),F7
A2EB 23        INC  HL
A2EC 060B      LD   B,0B
A2EE 36FF    ►LD   (HL),FF
A2F0 23      ┌ INC  HL
A2F1 10FB    └ DJNZ A2EE
A2F3 1C        INC  E
A2F4 7B        LD   A,E
A2F5 FE0B      CP   0B
A2F7 C29CA2    JP   NZ,A29C
A2FA 06FF      LD   B,FF
A2FC 36FF    ►LD   (HL),FF
A2FE 23      ┌ INC  HL
A2FF 10FB    └ DJNZ A2FC
A301 F3        DI
A302 D5        PUSH DE
A303 160A      LD   D,0A
A305 21FCA9    LD   HL,A9FC
A308 3EF4      LD   A,F4
A30A D31F      OUT  (1F),A
A30C 3A74A8    LD   A,(A874)
A30F B7        OR   A
A310 2814      JR   Z,A326
A312 AF        XOR  A
A313 3274A8    LD   (A874),A
A316 0605      LD   B,05
A318 3EFF    ►LD   A,FF
A31A CD92A5  ┌ CALL A592
A31D 10F9    └ DJNZ A318
A31F 3A75A8    LD   A,(A875)
A322 F608      OR   08
A324 D3FF      OUT  (FF),A
A326 DBFF      IN   A,(FF)
A328 E6C0      AND  C0
A32A 28FA      JR   Z,A326
A32C FA36A3    JP   M,A336
A32F 7E        LD   A,(HL)
A330 D37F      OUT  (7F),A
A332 23        INC  HL
A333 C326A3    JP   A326
A336 DB1F      IN   A,(1F)
A338 E664      AND  64
A33A 2811      JR   Z,A34D
A33C E660      AND  60
A33E 280A      JR   Z,A34A
A340 21D2A7    LD   HL,A7D2
A343 CD7BA4    CALL A47B
A346 FB        EI
A347 C3D4A1    JP   A1D4
A34A 15        DEC  D
A34B 20B8      JR   NZ,A305
A34D D1        POP  DE
A34E DB3F      IN   A,(3F)
A350 B7        OR   A
A351 D5        PUSH DE
A352 202F      JR   NZ,A383
A354 1E0A      LD   E,0A
A356 3E09      LD   A,09
A358 D35F      OUT  (5F),A
A35A 3EA0      LD   A,A0
A35C 2197A6    LD   HL,A697
A35F F3        DI
A360 D5        PUSH DE
A361 CDB6A5    CALL A5B6
A364 D1        POP  DE
A365 D31F      OUT  (1F),A
A367 DBFF      IN   A,(FF)
A369 E6C0      AND  C0
A36B 28FA      JR   Z,A367
A36D FA78A3    JP   M,A378
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A370 7E       LD   A,(HL)
A371 2F       CPL
A372 23       INC  HL
A373 D37F     OUT  (7F),A
A375 C367A3   JP   A367
A378 FB       EI
A379 DB1F     IN   A,(1F)
A37B E63C     AND  3C
A37D 2804     JR   Z,A383
A37F 1D       DEC  E
A380 C25AA3   JP   NZ,A35A
A383 D1       POP  DE
A384 1E01     LD   E,01
A386 D5       PUSH DE
A387 2184A7   LD   HL,A784
A38A CD7BA4   CALL A47B
A38D D1       POP  DE
A38E D5       PUSH DE
A38F 4A       LD   C,D
A390 0600     LD   B,00
A392 CD1B1A   CALL 1A1B
A395 3E20     LD   A,20
A397 CD09A0   CALL A009
A39A 1601     LD   D,01
A39C 7A       LD   A,D
A39D 1E0A     LD   E,0A
A39F D35F     OUT  (5F),A
A3A1 3E80     LD   A,80
A3A3 F3       DI
A3A4 D5       PUSH DE
A3A5 CDB6A5   CALL A5B6
A3A8 D1       POP  DE
A3A9 D31F     OUT  (1F),A
A3AB DBFF     IN   A,(FF)
A3AD E6C0     AND  C0
A3AF 28FA     JR   Z,A3AB
A3B1 FAB9A3   JP   M,A3B9
A3B4 DB7F     IN   A,(7F)
A3B6 C3ABA3   JP   A3AB
A3B9 FB       EI
A3BA DB1F     IN   A,(1F)
A3BC E63C     AND  3C
A3BE 2854     JR   Z,A414
A3C0 1D       DEC  E
A3C1 C2A1A3   JP   NZ,A3A1
A3C4 E610     AND  10
A3C6 2196A7   LD   HL,A796
A3C9 200C     JR   NZ,A3D7
A3CB E608     AND  08
A3CD 21AAA7   LD   HL,A7AA
A3D0 2005     JR   NZ,A3D7
A3D2 E604     AND  04
A3D4 21BEA7   LD   HL,A7BE
A3D7 CD7BA4   CALL A47B
A3DA 2179A8   LD   HL,A879
A3DD 34       INC  (HL)
A3DE 21EEA7   LD   HL,A7EE
A3E1 CD7BA4   CALL A47B
A3E4 DB3F     IN   A,(3F)
A3E6 0600     LD   B,00
A3E8 4F       LD   C,A
A3E9 CD181A   CALL 1A18
A3EC 3E20     LD   A,20
A3EE CD09A0   CALL A009
A3F1 21FFA7   LD   HL,A7FF
A3F4 CD7BA4   CALL A47B
A3F7 DB5F     IN   A,(5F)
A3F9 0600     LD   B,00
A3FB 4F       LD   C,A
A3FC CD181A   CALL 1A18
A3FF 3E20     LD   A,20
A401 CD09A0   CALL A009
A404 3E0D     LD   A,0D
A406 CD09A0   CALL A009
A409 3E20     LD   A,20
A40B CD92A5   CALL A592
A40E CD03A0   CALL A003
A411 C2D4A1   JP   NZ,A1D4
A414 14       INC  D
A415 7A       LD   A,D
A416 FE0B     CP   0B
A418 C29CA3   JP   NZ,A39C
A41B D1       POP  DE
A41C 14       INC  D
A41D 3A77A8   LD   A,(A877)
A420 92       SUB  D
A421 C8       RET  Z
A422 3E14     LD   A,14
A424 CD92A5   CALL A592
A427 7A       LD   A,D
A428 D37F     OUT  (7F),A
A42A 3E1B     LD   A,1B
A42C D31F     OUT  (1F),A
A42E CD71A5   CALL A571
A431 3E10     LD   A,10
A433 CD92A5   CALL A592
A436 C373A2   JP   A273
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A439 2107A8    LD   HL,A807
A43C CD7BA4    CALL A47B
A43F 3A79A8    LD   A,(A879)
A442 0600      LD   B,00
A444 4F        LD   C,A
A445 CD1B1A    CALL 1A1B
A448 210BA8    LD   HL,A80B
A44B CD7BA4    CALL A47B
A44E C3D4A1    JP   A1D4
A451 FB        EI
A452 3EFF      LD   A,FF
A454 D3FC      OUT  (FC),A
A456 3E02      LD   A,02
A458 CD1016    CALL 1610
A45B CD6B0D    CALL 0D6B
A45E ED7B85A8  LD   SP,(A885)
A462 C9        RET
A463 F5        PUSH AF
A464 3E16      LD   A,16
A466 CD09A0    CALL A009
A469 F1        POP  AF
A46A CD09A0    CALL A009
A46D AF        XOR  A
A46E CD09A0    CALL A009
A471 0620      LD   B,20
A473 3E20      LD   A,20
A475 CD09A0    CALL A009
A478 10F9      DJNZ A473
A47A C9        RET
A47B 7E        LD   A,(HL)
A47C B7        OR   A
A47D C8        RET  Z
A47E E5        PUSH HL
A47F CD09A0    CALL A009
A482 E1        POP  HL
A483 23        INC  HL
A484 18F5      JR   A47B
A486 2188A8    LD   HL,A888
A489 060A      LD   B,0A
A48B 3620      LD   (HL),20
A48D 23        INC  HL
A48E 10FB      DJNZ A48B
A490 2188A8    LD   HL,A888
A493 AF        XOR  A
A494 3287A8    LD   (A887),A
A497 E5        PUSH HL
A498 CD06A0    CALL A006
A49B FE20      CP   20
A49D 28F9      JR   Z,A498
A49F 1804      JR   A4A5
A4A1 E5        PUSH HL
A4A2 CD06A0    CALL A006
A4A5 E1        POP  HL
A4A6 FE08      CP   08
A4A8 281E      JR   Z,A4C8
A4AA FE0D      CP   0D
A4AC CAE4A4    JP   Z,A4E4
A4AF 4F        LD   C,A
A4B0 3A87A8    LD   A,(A887)
A4B3 FE09      CP   09
A4B5 28EA      JR   Z,A4A1
A4B7 79        LD   A,C
A4B8 77        LD   (HL),A
A4B9 23        INC  HL
A4BA E5        PUSH HL
A4BB CD09A0    CALL A009
A4BE E1        POP  HL
A4BF 3A87A8    LD   A,(A887)
A4C2 3C        INC  A
A4C3 3287A8    LD   (A887),A
A4C6 18D9      JR   A4A1
A4C8 3A87A8    LD   A,(A887)
A4CB B7        OR   A
A4CC 28C2      JR   Z,A490
A4CE 3D        DEC  A
A4CF 3287A8    LD   (A887),A
A4D2 2B        DEC  HL
A4D3 3E20      LD   A,20
A4D5 77        LD   (HL),A
A4D6 E5        PUSH HL
A4D7 21E0A4    LD   HL,A4E0
A4DA CD7BA4    CALL A47B
A4DD E1        POP  HL
A4DE 18C1      JR   A4A1
A4E0 08        EX   AF,AF
A4E1 2008      JR   NZ,A4EB
A4E3 00        NOP
A4E4 3E20      LD   A,20
A4E6 C309A0    JP   A009
A4E9 2197A8    LD   HL,A897
A4EC 010001    LD   BC,0100
A4EF 3600      LD   (HL),00
A4F1 23        INC  HL
A4F2 0B        DEC  BC
A4F3 79        LD   A,C
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A4F4 B0        OR   B
A4F5 20F8      JR   NZ,A4EF
A4F7 3E0A      LD   A,0A
A4F9 327EA9    LD   (A97E),A
A4FC 3E01      LD   A,01
A4FE 3279A9    LD   (A979),A
A501 218601    LD   HL,0186
A504 3A78A8    LD   A,(A878)
A507 FE31      CP   31
A509 280E      JR   Z,A519
A50B 211603    LD   HL,0316
A50E FE32      CP   32
A510 2807      JR   Z,A519
A512 FE33      CP   33
A514 2803      JR   Z,A519
A516 213606    LD   HL,0636
A519 227CA9    LD   (A97C),HL
A51C 217AA9    LD   HL,A97A
A51F 3619      LD   (HL),19
A521 FE31      CP   31
A523 280E      JR   Z,A533
A525 3618      LD   (HL),18
A527 FE32      CP   32
A529 2808      JR   Z,A533
A52B 3617      LD   (HL),17
A52D FE33      CP   33
A52F 2802      JR   Z,A533
A531 3615      LD   (HL),16
A533 CD3AA5    CALL A53A
A536 CD4FA5    CALL A54F
A539 C9        RET
A53A 2115A8    LD   HL,A815
A53D CD7BA4    CALL A47B
A540 CD86A4    CALL A486
A543 2188A8    LD   HL,A888
A546 1181A9    LD   DE,A981
A549 010900    LD   BC,0009
A54C EDB0      LDIR
A54E C9        RET
A54F 2124A8    LD   HL,A824
A552 CD7BA4    CALL A47B
A555 CD86A4    CALL A486
A558 2188A8    LD   HL,A888
A55B 118CA9    LD   DE,A98C
A55E 010900    LD   BC,0009
A561 EDB0      LDIR
A563 C9        RET
A564 117FA8    LD   DE,A87F
A567 2A7DA8    LD   HL,(A87D)
A56A 19        ADD  HL,DE
A56B AF        XOR  A
A56C 77        LD   (HL),A
A56D 3E0B      LD   A,0B
A56F D31F      OUT  (1F),A
A571 DBFF      IN   A,(FF)
A573 E680      AND  80
A575 28FA      JR   Z,A571
A577 C9        RET
A578 79        LD   A,C
A579 327DA8    LD   (A87D),A
A57C 3EFC      LD   A,FC
A57E B1        OR   C
A57F 4F        LD   C,A
A580 117FA8    LD   DE,A87F
A583 2A7DA8    LD   HL,(A87D)
A586 19        ADD  HL,DE
A587 7E        LD   A,(HL)
A588 D33F      OUT  (3F),A
A58A 79        LD   A,C
A58B D3FF      OUT  (FF),A
A58D 3275A8    LD   (A875),A
A590 3E23      LD   A,23
A592 0EFF      LD   C,FF
A594 0D        DEC  C
A595 20FD      JR   NZ,A594
A597 3D        DEC  A
A598 20F8      JR   NZ,A592
A59A C9        RET
A59B 4F        LD   C,A
A59C 117FA8    LD   DE,A87F
A59F 2A7DA8    LD   HL,(A87D)
A5A2 19        ADD  HL,DE
A5A3 7E        LD   A,(HL)
A5A4 B9        CP   C
A5A5 C8        RET  Z
A5A6 71        LD   (HL),C
A5A7 79        LD   A,C
A5A8 D37F      OUT  (7F),A
A5AA 3E1B      LD   A,1B
A5AC D31F      OUT  (1F),A
A5AE CD71A5    CALL A571
A5B1 3E10      LD   A,10
A5B3 C392A5    JP   A592
A5B6 57        LD   D,A
A5B7 AF        XOR  A
A5B8 7A        LD   A,D
A5B9 C9        RET
```

I

SCOPY

(1)

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8000 C3D589    JP   89D5
8003 C3AD89    JP   89AD
8006 3AB65C    LD   A,(5CB6)
8009 FEF4      CP   F4
800B C8        RET  Z
800C 21B65C    LD   HL,5CB6
800F 11265D    LD   DE,5D26
8012 063A      LD   B,3A
8014 4E        LD   C,(HL)
8015 1A        LD   A,(DE)
8016 77        LD   (HL),A
8017 79        LD   A,C
8018 12        LD   (DE),A
8019 23        INC  HL
801A 13        INC  DE
801B 10F7      DJNZ 8014
801D C9        RET
801E 3EFF      LD   A,FF
8020 32155D    LD   (5D15),A
8023 AF        XOR  A
8024 32F75C    LD   (5CF7),A
8027 CDDB80    CALL 80DB
802A 3EAA      LD   A,AA
802C 32175D    LD   (5D17),A
802F 219780    LD   HL,8097
8032 221A5D    LD   (5D1A),HL
8035 210000    LD   HL,0000
8038 39        ADD  HL,SP
8039 22FE8A    LD   (8AFE),HL
803C 2B        DEC  HL
803D 2B        DEC  HL
803E F9        LD   SP,HL
803F CD0680    CALL 8006
8042 CDC180    CALL 80C1
8045 2A5D5C    LD   HL,(5C5D)
8048 CD6580    CALL 8065
804B CA8080    JP   Z,8080
804E FEEA      CP   EA
8050 23        INC  HL
8051 20F5      JR   NZ,8048
8053 CD6580    CALL 8065
8056 28F3      JR   Z,804B
8058 FE3A      CP   3A
805A C28080    JP   NZ,8080
805D 23        INC  HL
805E 7E        LD   A,(HL)
805F 22115D    LD   (5D11),HL
8062 C33D81    JP   813D
8065 7E        LD   A,(HL)
8066 FE0D      CP   0D
8068 C8        RET  Z
8069 FE80      CP   80
806B C8        RET  Z
806C B7        OR   A
806D C9        RET
806E C5        PUSH BC
806F D5        PUSH DE
8070 E5        PUSH HL
8071 21358A    LD   HL,8A35
8074 CDAF88    CALL 88AF
8077 3A085C    LD   A,(5C08)
807A E6DF      AND  DF
807C E1        POP  HL
807D D1        POP  DE
807E C1        POP  BC
807F C9        RET
8080 CD0680    CALL 8006
8083 CD4F89    CALL 894F
8086 CD6580    CALL 8065
8089 ED7BFE8A  LD   SP,(8AFE)
808D 2A1A5D    LD   HL,(5D1A)
8090 ED4B0F5D  LD   BC,(5D0F)
8094 0600      LD   B,00
8096 E9        JP   HL
8097 CDD480    CALL 80D4
809A FDCB007E  BIT  7,(IY+00)
809E C0        RET  NZ
809F 2A635C    LD   HL,(5C63)
80A2 22655C    LD   (5C65),HL
80A5 E5        PUSH HL
80A6 21925C    LD   HL,5C92
80A9 22685C    LD   (5C68),HL
80AC E1        POP  HL
80AD 11138A    LD   DE,8A13
80B0 ED7B3D5C  LD   SP,(5C3D)
80B4 D5        PUSH DE
80B5 C9        RET
80B6 CD9F88    CALL 889F
80B9 FE0D      CP   0D
80BB C8        RET  Z
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80BC CD6589    CALL 8965
80BF 18F5      JR   80B6
80C1 2A3D5C    LD   HL,(5C3D)
80C4 22135D    LD   (5D13),HL
80C7 21198C    LD   HL,8C19
80CA 223D5C    LD   (5C3D),HL
80CD 219C89    LD   HL,899C
80D0 22198C    LD   (8C19),HL
80D3 C9        RET
80D4 2A135D    LD   HL,(5D13)
80D7 223D5C    LD   (5C3D),HL
80DA C9        RET
80DB 3A195D    LD   A,(5D19)
80DE C3063C    JP   3C06
80E1 AF        XOR  A
80E2 32F75C    LD   (5CF7),A
80E5 320F5D    LD   (5D0F),A
80E8 210000    LD   HL,0000
80EB 39        ADD  HL,SP
80EC 22FE8A    LD   (8AFE),HL
80EF 2B        DEC  HL
80F0 2B        DEC  HL
80F1 F9        LD   SP,HL
80F2 CDC180    CALL 80C1
80F5 21175D    LD   HL,5D17
80F8 36AA      LD   (HL),AA
80FA 21FFFF    LD   HL,FFFF
80FD 22FA5C    LD   (5CFA),HL
8100 22FB5C    LD   (5CFB),HL
8103 CDAC88 →  CALL 88AC
8106 CD9B88    CALL 889B
8109 219581    LD   HL,8195
810C CD738A    CALL 8A73
810F CD063C    CALL 3C06
8112 2AFE8A    LD   HL,(8AFE)
8115 2B        DEC  HL
8116 2B        DEC  HL
8117 F9        LD   SP,HL
8118 CD0680    CALL 8006
811B CD9588    CALL 8895
811E AF        XOR  A
811F 32155D    LD   (5D15),A
8122 211281    LD   HL,8112
8125 221A5D    LD   (5D1A),HL
8128 CDDB80    CALL 80DB
812B CD8B8A    CALL 8A8B
812E AF        XOR  A
812F 320F5D    LD   (5D0F),A
8132 2A595C    LD   HL,(5C59)
8135 22115D    LD   (5D11),HL
8138 7E        LD   A,(HL)
8139 FE0D      CP   0D
813B 28C6      JR   Z,8103
813D 21E38A    LD   HL,8AE3
8140 0E00      LD   C,00
8142 0C    →   INC  C
8143 57        LD   D,A
8144 79        LD   A,C
8145 FE09      CP   09
8147 D28080    JP   NC,8080
814A 7A        LD   A,D
814B 23        INC  HL
814C BE        CP   (HL)
814D 20F3      JR   NZ,8142
814F AF        XOR  A
8150 320F5D    LD   (5D0F),A
8153 32D65C    LD   (5CD6),A
8156 32105D    LD   (5D10),A
8159 213B5C    LD   HL,5C3B
815C CBBE      RES  7,(HL)
815E 0600      LD   B,00
8160 21EC8A    LD   HL,8AEC
8163 0D        DEC  C
8164 CB21      SLA  C
8166 09        ADD  HL,BC
8167 5E        LD   E,(HL)
8168 23        INC  HL
8169 56        LD   D,(HL)
816A EB        EX   DE,HL
816B E5        PUSH HL
816C 117181    LD   DE,8171
816F D5        PUSH DE
8170 E9        JP   HL
8171 213B5C    LD   HL,5C3B
8174 CBFE      SET  7,(HL)
8176 E1        POP  HL
8177 E9        JP   HL
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8178 CD8787    CALL 8887
817B CDF682    CALL 82F6
817E 21436B    LD   HL,8B43
8181 CD738A    CALL 8A73
8184 CD5F82    CALL 825F
8187 11058D    LD   DE,8D05
818A 21065D    LD   HL,5D06
818D 010900    LD   BC,0009
8190 EDB0      LDIR
8192 C39089    JP   8990
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8195  16 01 05 2A 20 53 43 4F
819D  50 59 20 20 56 65 72 20
81A5  32 2E 33 20 2A 0D 0D 7F
81AD  20 31 39 38 34 20 54 65
81B5  63 68 6E 6F 6C 6F 67 79
81BD  20 52 65 73 65 61 72 63
81C5  68 20 4C 74 64 2E 16 07
81CD  07 43 6F 6D 6D 61 6E 64
81D5  73 20 61 72 65 3A 16 09
81DD  07 11 06 43 41 54 16 0B
81E5  07 11 06 4E 45 57 11 07
81ED  20 22 6E 65 77 66 69 6C
81F5  65 22 2C 22 6F 6C 64 66
81FD  69 6C 65 22 16 0D 07 11
8205  06 45 52 41 53 45 11 07
820D  20 22 66 69 6C 65 6E 61
8215  6D 65 22 16 0F 07 11 06
821D  4D 4F 56 45 11 07 16 11
8225  07 11 06 43 4F 50 59 11
822D  07 20 22 66 69 6C 65 6E
8235  61 6D 65 22 16 13 07 11
823D  06 52 45 54 55 52 4E 11
8245  07 00 2A 59 5C 36 22 23
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8247 2A595C    LD   HL,(5C59)
824A 3622      LD   (HL),22
824C 23        INC  HL
824D 225B5C    LD   (5C5B),HL
8250 3622      LD   (HL),22
8252 23        INC  HL
8253 360D      LD   (HL),0D
8255 23        INC  HL
8256 3680      LD   (HL),80
8258 C9        RET
8259 CD4782    CALL 8247
825C C3A488    JP   88A4
825F CD9588    CALL 8895
8262 21478B    LD   HL,8B47
8265 CD738A    CALL 8A73
8268 3AF65C    LD   A,(5CF6)
826B C641      ADD  A,41
826D CD618A    CALL 8A61
8270 3E3A      LD   A,3A
8272 CD618A    CALL 8A61
8275 3E20      LD   A,20
8277 CD618A    CALL 8A61
827A CD5982    CALL 8259
827D CDB988    CALL 88B9
8280 2A595C    LD   HL,(5C59)
8283 23        INC  HL
8284 0609      LD   B,09
8286 0E00      LD   C,00
8288 11065D    LD   DE,5D06
828B 7E        LD   A,(HL)
828C FE22      CP   22
828E 2001      JR   NZ,8291
8290 4F        LD   C,A
8291 F5        PUSH AF
8292 79        LD   A,C
8293 FE22      CP   22
8295 2005      JR   NZ,829C
8297 F1        POP  AF
8298 3E20      LD   A,20
829A 1801      JR   829D
829C F1        POP  AF
829D 12        LD   (DE),A
829E 23        INC  HL
829F 13        INC  DE
82A0 10E9      DJNZ 828B
82A2 C9        RET
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82A3 CDF182    CALL 82F1
82A6 CDB18A    CALL 8AB1
82A9 CDB18A    CALL 8AB1
82AC ED4B003D  LD   BC,(3D00)
82B0 CDBE88    CALL 88BE
82B3 213C8B    LD   HL,8B3C
82B6 CD738A    CALL 8A73
82B9 C3B080    JP   80B0
82BC 320F5D    LD   (5D0F),A
82BF 3A155D    LD   A,(5D15)
82C2 B7        OR   A
82C3 CC738A    CALL Z,8A73
82C6 C9        RET
82C7 21008B    LD   HL,8B00
82CA 3E01      LD   A,01
82CC C3AB87    JP   87AB
82CF CDCD83    CALL 83CD
82D2 7E        LD   A,(HL)
82D3 B7        OR   A
82D4 CAA382    JP   Z,82A3
82D7 FE01      CP   01
82D9 CCC883    CALL Z,83C8
82DC C0        RET  NZ
82DD 18F0      JR   82CF
82DF AF        XOR  A
82E0 325C5C    LD   (5C5C),A
82E3 ED5B5C5C  LD   DE,(5C5C)
82E7 1600      LD   D,00
82E9 211B8C    LD   HL,8C1B
82EC 0601      LD   B,01
82EE C3093C    JP   3C09
82F1 110800    LD   DE,0008
82F4 18F3      JR   82E9
82F6 CDF182    CALL 82F1
82F9 3A028D    LD   A,(8D02)
82FC FE07      CP   07
82FE 280C      JR   Z,830C
8300 FE0A      CP   0A
8302 2808      JR   Z,830C
8304 21F78B    LD   HL,8BF7
8307 CD738A    CALL 8A73
830A 18AD      JR   82B9
830C ED4BF65C  LD   BC,(5CF6)
8310 21C45C    LD   HL,5CC4
8313 09        ADD  HL,BC
8314 77        LD   (HL),A
8315 3AFE8C    LD   A,(8CFE)
8318 23        INC  HL
8319 23        INC  HL
831A 23        INC  HL
831B 23        INC  HL
831C 77        LD   (HL),A
831D 21065D    LD   HL,5D06
8320 11058D    LD   DE,8D05
8323 0609      LD   B,09
8325 CDB68A    CALL 8AB6
8328 C8        RET  Z
8329 CD5F82    CALL 825F
832C 18EF      JR   831D
832E 2A115D    LD   HL,(5D11)
8331 23        INC  HL
8332 7E        LD   A,(HL)
8333 FE0D      CP   0D
8335 CA4583    JP   Z,8345
8338 CDF486    CALL 86F4
833B CD8786    CALL 8687
833E CDC386    CALL 86C3
8341 EB        EX   DE,HL
8342 CDED87    CALL 87ED
8345 CD8786    CALL 8687
8348 CDF682    CALL 82F6
834B CDAC88    CALL 88AC
834E CD9B88    CALL 889B
8351 21068C    LD   HL,8C06
8354 CD738A    CALL 8A73
8357 21108D    LD   HL,8D10
835A CD738A    CALL 8A73
835D CDB18A    CALL 8AB1
8360 3AFF8C    LD   A,(8CFF)
8363 210F8D    LD   HL,8D0F
8366 96        SUB  (HL)
8367 E5        PUSH HL
8368 CDDE8A    CALL 8ADE
836B 21038B    LD   HL,8B03
836E CD738A    CALL 8A73
8371 E1        POP  HL
8372 4E        LD   C,(HL)
8373 CDDF8A    CALL 8ADF
8376 210C8B    LD   HL,8B0C
8379 CD738A    CALL 8A73
837C CDDF82    CALL 82DF
837F 211B8C    LD   HL,8C1B
8382 CDCF82    CALL 82CF
8385 CDB18A    CALL 8AB1
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8388 3AF65C    LD    A,(5CF6)
838B C641      ADD   A,41
838D CD618A    CALL  8A61
8390 0602      LD    B,02
8392 CDCF82    CALL  82CF
8395 C5        PUSH  BC
8396 3E3A      LD    A,3A
8398 CD618A    CALL  8A61
839B E5        PUSH  HL
839C CDC38A    CALL  8AC3
839F 010D00    LD    BC,000D
83A2 E1        POP   HL
83A3 E5        PUSH  HL
83A4 09        ADD   HL,BC
83A5 4E        LD    C,(HL)
83A6 C5        PUSH  BC
83A7 79        LD    A,C
83A8 0602      LD    B,02
83AA FE0A      CP    0A
83AC 3801      JR    C,83AF
83AE 05        DEC   B
83AF FE64      CP    64
83B1 3007      JR    NC,83BA
83B3 3E20      LD    A,20
83B5 CD618A    CALL  8A61
83B8 10F9      DJNZ  83B3
83BA C1        POP   BC
83BB CDBE88    CALL  88BE
83BE E1        POP   HL
83BF C1        POP   BC
83C0 111000    LD    DE,0010
83C3 19        ADD   HL,DE
83C4 10CC      DJNZ  8392
83C6 18BA      JR    8382
83C8 111000    LD    DE,0010
83CB 19        ADD   HL,DE
83CC C9        RET
83CD E5        PUSH  HL
83CE C5        PUSH  BC
83CF 01E572    LD    BC,72E5
83D2 09        ADD   HL,BC
83D3 7C        LD    A,H
83D4 B5        OR    L
83D5 2803      JR    Z,83DA
83D7 C1        POP   BC
83D8 E1        POP   HL
83D9 C9        RET
83DA 21CC5C    LD    HL,5CCC
83DD 34        INC   (HL)
83DE CDE382    CALL  82E3
83E1 C1        POP   BC
83E2 E1        POP   HL
83E3 211B8C    LD    HL,8C1B
83E6 C9        RET
83E7 CDF488    CALL  88F4
83EA CD8788    CALL  8887
83ED CDC388    CALL  88C3
83F0 79        LD    A,C
83F1 B8        CP    B
83F2 CA6D88    JP    Z,886D
83F5 1A        LD    A,(DE)
83F6 E6DF      AND   DF
83F8 FE41      CP    41
83FA DA6D88    JP    C,886D
83FD DE41      SBC   A,41
83FF FE04      CP    04
8401 D26D88    JP    NC,886D
8404 32195D    LD    (5D19),A
8407 CD063C    CALL  3C06
840A C38080    JP    8080
840D CDDF88    CALL  88DF
8410 CD8788    CALL  8887
8413 CD8C85    CALL  858C
8416 CDB887    CALL  87B8
8419 3AF65C    LD    A,(5CF6)
841C 32F85C    LD    (5CF8),A
841F C2C782    JP    NZ,82C7
8422 C5        PUSH  BC
8423 CD1486    CALL  8614
8426 CDB887    CALL  87B8
8429 F5        PUSH  AF
842A 3AF85C    LD    A,(5CF8)
842D 21F65C    LD    HL,5CF6
8430 BE        CP    (HL)
8431 C26D88    JP    NZ,886D
8434 CDF682    CALL  82F6
8437 F1        POP   AF
8438 CAB187    JP    Z,87B1
843B C1        POP   BC
843C CD1B86    CALL  861B
843F C39089    JP    8990
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8442 CDF486    CALL 86F4
8445 CD8788    CALL 8887
8448 CD9B86    CALL 869B
844B CDAC86    CALL 86AC
844E 21686B    LD   HL,8B68
8451 CD738A    CALL 8A73
8454 CD6E80    CALL 806E
8457 FE59      CP   59
8459 20F9      JR   NZ,8454
845B CD8C85    CALL 858C
845E CDB887    CALL 87B8
8461 3AF65C    LD   A,(5CF6)
8464 32F85C    LD   (5CF8),A
8467 32F95C    LD   (5CF9),A
846A C2C782    JP   NZ,82C7
846D CD1486    CALL 8614
8470 21E65C    LD   HL,5CE6
8473 11ED5C    LD   DE,5CED
8476 010700    LD   BC,0007
8479 EDB0      LDIR
847B 3AF15C    LD   A,(5CF1)
847E 320F8C    LD   (8C0F),A
8481 3AF85C    LD   A,(5CF8)
8484 CD063C    CALL 3C06
8487 CDF682    CALL 82F6
848A 3AF65C    LD   A,(5CF6)
848D 32F95C    LD   (5CF9),A
8490 3EFF      LD   A,FF
8492 32108C    LD   (8C10),A
8495 CD0F85    CALL 850F
8498 2A118C    LD   HL,(8C11)
849B 22EB5C    LD   (5CEB),HL
849E 2AF45C    LD   HL,(5CF4)
84A1 22FC8C    LD   (8CFC),HL
84A4 21FF8C    LD   HL,8CFF
84A7 34        INC  (HL)
84A8 4E        LD   C,(HL)
84A9 0D        DEC  C
84AA 0600      LD   B,00
84AC C5        PUSH BC
84AD 110900    LD   DE,0009
84B0 ED53F45C  LD   (5CF4),DE
84B4 CD8389    CALL 8983
84B7 C1        POP  BC
84B8 CD1B86    CALL 861B
84BB CD9089    CALL 8990
84BE C38080    JP   8080
84C1 AF        XOR  A
84C2 32108C    LD   (8C10),A
84C5 3AF95C    LD   A,(5CF9)
84C8 CD063C    CALL 3C06
84CB CDF682    CALL 82F6
84CE CD2788    CALL 8827
84D1 CAB187    JP   Z,87B1
84D4 CDF182    CALL 82F1
84D7 3AFF8C    LD   A,(8CFF)
84DA FE80      CP   80
84DC CAA687    JP   Z,87A6
84DF 21ED5C    LD   HL,5CED
84E2 11E65C    LD   DE,5CE6
84E5 010700    LD   BC,0007
84E8 EDB0      LDIR
84EA CDF182    CALL 82F1
84ED 3A0F8C    LD   A,(8C0F)
84F0 32EA5C    LD   (5CEA),A
84F3 ED5BEA5C  LD   DE,(5CEA)
84F7 1600      LD   D,00
84F9 B7        OR   A
84FA 2A008D    LD   HL,(8D00)
84FD ED52      SBC  HL,DE
84FF DAA687    JP   C,87A6
8502 22008D    LD   (8D00),HL
8505 2AFC8C    LD   HL,(8CFC)
8508 22EB5C    LD   (5CEB),HL
850B 22118C    LD   (8C11),HL
850E C9        RET
850F 3AF15C    LD   A,(5CF1)
8512 B7        OR   A
8513 C8        RET  Z
8514 3A108C    LD   A,(8C10)
8517 B7        OR   A
8518 2010      JR   NZ,852A
851A CDAC86    CALL 86AC
851D 21686B    LD   HL,8B68
8520 CD738A    CALL 8A73
8523 CD6E80    CALL 806E
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8526 FE59      CP   59
8528 20F9      JR   NZ,8523
852A 3AF15C    LD   A,(5CF1)
852D B7        OR   A
852E C8        RET  Z
852F D660      SUB  60
8531 3051      JR   NC,8584
8533 3AF15C    LD   A,(5CF1)
8536 47        LD   B,A
8537 AF        XOR  A
8538 32F15C    LD   (5CF1),A
853B C5        PUSH BC
853C 32CE5C    LD   (5CCE),A
853F 3AF85C    LD   A,(5CF8)
8542 4F        LD   C,A
8543 CD063C    CALL 3C06
8546 212E8D    LD   HL,8D2E
8549 E5        PUSH HL
854A ED5BF25C  LD   DE,(5CF2)
854E CD093C    CALL 3C09
8551 2AF45C    LD   HL,(5CF4)
8554 22F25C    LD   (5CF2),HL
8557 CDAC88    CALL 88AC
855A 21898B    LD   HL,8B89
855D CD738A    CALL 8A73
8560 CD6E80    CALL 806E
8563 FE59      CP   59
8565 20F9      JR   NZ,8560
8567 3A108C    LD   A,(8C10)
856A B7        OR   A
856B C4C184    CALL NZ,84C1
856E E1        POP  HL
856F C1        POP  BC
8570 ED5BEB5C  LD   DE,(5CEB)
8574 3EFF      LD   A,FF
8576 32CE5C    LD   (5CCE),A
8579 CD0C3C    CALL 3C0C
857C 2AF45C    LD   HL,(5CF4)
857F 22EB5C    LD   (5CEB),HL
8582 188B      JR   850F
8584 32F15C    LD   (5CF1),A
8587 0660      LD   B,60
8589 AF        XOR  A
858A 18AF      JR   853B
858C 0643      LD   B,43
858E 3AD65C    LD   A,(5CD6)
8591 FE01      CP   01
8593 2817      JR   Z,85AC
8595 3A105D    LD   A,(5D10)
8598 B7        OR   A
8599 2011      JR   NZ,85AC
859B CD9F88    CALL 889F
859E FEAF      CP   AF
85A0 0643      LD   B,43
85A2 2808      JR   Z,85AC
85A4 FEE4      CP   E4
85A6 0644      LD   B,44
85A8 2802      JR   Z,85AC
85AA 0642      LD   B,42
85AC 21E55C    LD   HL,5CE5
85AF 70        LD   (HL),B
85B0 C9        RET
85B1 CDF488    CALL 88F4
85B4 CD8788    CALL 8887
85B7 CD8C85    CALL 858C
85BA CDE287    CALL 87E2
85BD C2C782    JP   NZ,82C7
85C0 C5        PUSH BC
85C1 CDF182    CALL 82F1
85C4 3AFF8C    LD   A,(8CFF)
85C7 C1        POP  BC
85C8 0C        INC  C
85C9 B9        CP   C
85CA 2005      JR   NZ,85D1
85CC 3D        DEC  A
85CD 32FF8C    LD   (8CFF),A
85D0 AF        XOR  A
85D1 F5        PUSH AF
85D2 2804      JR   Z,85D8
85D4 210F8D    LD   HL,8D0F
85D7 34        INC  (HL)
85D8 C5        PUSH BC
85D9 CD8389    CALL 8983
85DC C1        POP  BC
85DD 0D        DEC  C
85DE CD1486    CALL 8614
85E1 F1        POP  AF
85E2 CAE785    JP   Z,85E7
85E5 3E01      LD   A,01
85E7 32DD5C    LD   (5CDD),A
85EA F5        PUSH AF
85EB CD2C86    CALL 862C
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85EE F1          POP   AF
85EF C28080      JP    NZ,8080
85F2 CDF182      CALL  82F1
85F5 2AEB5C      LD    HL,(5CEB)
85F8 22FC8C      LD    (8CFC),HL
85FB ED5BEA5C    LD    DE,(5CEA)
85FF 2A008D      LD    HL,(8D00)
8602 1600        LD    D,00
8604 19          ADD   HL,DE
8605 22008D      LD    (8D00),HL
8608 C39089      JP    8990
860B CD1486      CALL  8614
860E 3ADD5C      LD    A,(5CDD)
8611 FE01        CP    01
8613 C9          RET
8614 AF          XOR   A
8615 C5          PUSH  BC
8616 CD5B87      CALL  875B
8619 C1          POP   BC
861A C9          RET
861B 3EFF        LD    A,FF
861D 18F6        JR    8615
861F 2A615C      LD    HL,(5C61)
8622 22CF5C      LD    (5CCF),HL
8625 010010      LD    BC,1000
8628 CD5A89      CALL  895A
862B C9          RET
862C CD1B86      CALL  861B
862F C38389      JP    8983
8632 22D75C      LD    (5CD7),HL
8635 22DB5C      LD    (5CDB),HL
8638 ED5BEA5C    LD    DE,(5CEA)
863C 2AD95C      LD    HL,(5CD9)
863F 1600        LD    D,00
8641 19          ADD   HL,DE
8642 22D95C      LD    (5CD9),HL
8645 C9          RET
8646 CD8788      CALL  8887
8649 CDF682      CALL  82F6
864C 3A0F8D      LD    A,(8D0F)
864F B7          OR    A
8650 CA8080      JP    Z,8080
8653 210000      LD    HL,0000
8656 22D95C      LD    (5CD9),HL
8659 0EFF        LD    C,FF
865B 0C          INC   C
865C CD0B86      CALL  860B
865F 20FA        JR    NZ,865B
8661 79          LD    A,C
8662 32D45C      LD    (5CD4),A
8665 2AEB5C      LD    HL,(5CEB)
8668 CD3286      CALL  8632
866B 0C          INC   C
866C CD0B86      CALL  860B
866F 28FA        JR    Z,866B
8671 FE00        CP    00
8673 2018        JR    NZ,868D
8675 3AD45C      LD    A,(5CD4)
8678 4F          LD    C,A
8679 0C          INC   C
867A CD0B86      CALL  860B
867D FE00        CP    00
867F 2868        JR    Z,86E9
8681 AF          XOR   A
8682 32DD5C      LD    (5CDD),A
8685 CD2C86      CALL  862C
8688 CD3286      CALL  8632
868B 18EC        JR    8679
868D 3AEA5C      LD    A,(5CEA)
8690 32D35C      LD    (5CD3),A
8693 32D15C      LD    (5CD1),A
8696 2AEB5C      LD    HL,(5CEB)
8699 22D55C      LD    (5CD5),HL
869C C5          PUSH  BC
869D CD1C87      CALL  871C
86A0 C1          POP   BC
86A1 2AF45C      LD    HL,(5CF4)
86A4 22D55C      LD    (5CD5),HL
86A7 22EB5C      LD    (5CEB),HL
86AA AF          XOR   A
86AB 32EA5C      LD    (5CEA),A
86AE 3ADD5C      LD    A,(5CDD)
86B1 F5          PUSH  AF
86B2 3E01        LD    A,01
86B4 32DD5C      LD    (5CDD),A
86B7 CD2C86      CALL  862C
86BA F1          POP   AF
86BB 32DD5C      LD    (5CDD),A
86BE 3AD45C      LD    A,(5CD4)
86C1 4F          LD    C,A
86C2 2ADB5C      LD    HL,(5CDB)
86C5 22EB5C      LD    (5CEB),HL
86C8 3AD15C      LD    A,(5CD1)
86CB 32EA5C      LD    (5CEA),A
86CE CD2C86      CALL  862C
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86D1 3AD45C    LD   A,(5CD4)
86D4 3C        INC  A
86D5 4F        LD   C,A
86D6 CD1486    CALL 8614
86D9 2AD55C    LD   HL,(5CD5)
86DC 22EB5C    LD   (5CEB),HL
86DF CD2C86    CALL 862C
86E2 3AD45C    LD   A,(5CD4)
86E5 4F        LD   C,A
86E6 C35B86    JP   865B
86E9 2ACF5C    LD   HL,(5CCF)
86EC CDF182    CALL 82F1
86EF 2A008D    LD   HL,(8D00)
86F2 ED5BD95C  LD   DE,(5CD9)
86F6 19        ADD  HL,DE
86F7 22008D    LD   (8D00),HL
86FA 3AFF8C    LD   A,(8CFF)
86FD 210F8D    LD   HL,8D0F
8700 96        SUB  (HL)
8701 32FF8C    LD   (8CFF),A
8704 3600      LD   (HL),00
8706 2AD55C    LD   HL,(5CD5)
8709 22FC8C    LD   (8CFC),HL
870C F5        PUSH AF
870D CD8389    CALL 8983
8710 F1        POP  AF
8711 4F        LD   C,A
8712 CD1486    CALL 8614
8715 AF        XOR  A
8716 32DD5C    LD   (5CDD),A
8719 C33C84    JP   843C
871C 3AD35C    LD   A,(5CD3)
871F B7        OR   A
8720 C8        RET  Z
8721 D660      SUB  60
8723 302E      JR   NC,8753
8725 3AD35C    LD   A,(5CD3)
8728 47        LD   B,A
8729 AF        XOR  A
872A 32D35C    LD   (5CD3),A
872D C5        PUSH BC
872E 32CE5C    LD   (5CCE),A
8731 212E8D    LD   HL,8D2E
8734 E5        PUSH HL
8735 ED5BD55C  LD   DE,(5CD5)
8739 CD093C    CALL 3C09
873C 2AF45C    LD   HL,(5CF4)
873F 22D55C    LD   (5CD5),HL
8742 E1        POP  HL
8743 C1        POP  BC
8744 ED5BD75C  LD   DE,(5CD7)
8748 CD0C3C    CALL 3C0C
874B 2AF45C    LD   HL,(5CF4)
874E 22D75C    LD   (5CD7),HL
8751 18C9      JR   871C
8753 32D35C    LD   (5CD3),A
8756 0660      LD   B,60
8758 AF        XOR  A
8759 18D2      JR   872D
875B F5        PUSH AF
875C 21CC5C    LD   HL,5CCC
875F 3600      LD   (HL),00
8761 79        LD   A,C
8762 D610      SUB  10
8764 3803      JR   C,8769
8766 34        INC  (HL)
8767 18F9      JR   8762
8769 C610      ADD  A,10
876B 4F        LD   C,A
876C C5        PUSH BC
876D CDE382    CALL 82E3
8770 C1        POP  BC
8771 F1        POP  AF
8772 CD1B88    CALL 881B
8775 11DD5C    LD   DE,5CDD
8778 011000    LD   BC,0010
877B B7        OR   A
877C 2801      JR   Z,877F
877E EB        EX   DE,HL
877F EDB0      LDIR
8781 C9        RET
8782 EB        EX   DE,HL
8783 37        SCF
8784 ED52      SBC  HL,DE
8786 D8        RET  C
8787 110A00    LD   DE,000A
878A 19        ADD  HL,DE
878B 44        LD   B,H
878C 4D        LD   C,L
878D 21051F    LD   HL,1F05
8790 CDAF88    CALL 88AF
8793 C9        RET
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8794 CDE287    CALL 87E2
8797 CAB187    JP   Z,87B1
879A CDF182    CALL 82F1
879D 3AFF8C    LD   A,(8CFF)
87A0 FE80      CP   80
87A2 CAA687    JP   Z,87A6
87A5 C9        RET
87A6 212388    LD   HL,8823
87A9 3E03      LD   A,03
87AB CDBC82    CALL 82BC
87AE C33080    JP   8030
87B1 212E8B    LD   HL,8B2E
87B4 3E02      LD   A,02
87B6 18F3      JR   87AB
87B8 21DD5C    LD   HL,5CDD
87BB 0608      LD   B,08
87BD 3620      LD   (HL),20
87BF 23        INC  HL
87C0 10FB      DJNZ 87BD
87C2 CDC388    CALL 88C3
87C5 78        LD   A,B
87C6 B1        OR   C
87C7 CA6D88    JP   Z,886D
87CA EB        EX   DE,HL
87CB CDED87    CALL 87ED
87CE 79        LD   A,C
87CF FE09      CP   09
87D1 3802      JR   C,87D5
87D3 0E08      LD   C,08
87D5 D5        PUSH DE
87D6 E5        PUSH HL
87D7 11DD5C    LD   DE,5CDD
87DA EDB0      LDIR
87DC CD2788    CALL 8827
87DF E1        POP  HL
87E0 D1        POP  DE
87E1 C9        RET
87E2 CDB887    CALL 87B8
87E5 F5        PUSH AF
87E6 C5        PUSH BC
87E7 CDF682    CALL 82F6
87EA C1        POP  BC
87EB F1        POP  AF
87EC C9        RET
87ED 23        INC  HL
87EE 7E        LD   A,(HL)
87EF FE3A      CP   3A
87F1 201C      JR   NZ,880F
87F3 2B        DEC  HL
87F4 7E        LD   A,(HL)
87F5 E6DF      AND  DF
87F7 FE41      CP   41
87F9 DA6D88    JP   C,886D
87FC DE41      SBC  A,41
87FE FE04      CP   04
8800 D26D88    JP   NC,886D
8803 C5        PUSH BC
8804 E5        PUSH HL
8805 CD063C    CALL 3C06
8808 E1        POP  HL
8809 C1        POP  BC
880A 0B        DEC  BC
880B 0B        DEC  BC
880C 23        INC  HL
880D 23        INC  HL
880E C9        RET
880F 2B        DEC  HL
8810 3A195D    LD   A,(5D19)
8813 C5        PUSH BC
8814 E5        PUSH HL
8815 CD063C    CALL 3C06
8818 E1        POP  HL
8819 C1        POP  BC
881A C9        RET
881B 69        LD   L,C
881C 2600      LD   H,00
881E 29        ADD  HL,HL
881F 29        ADD  HL,HL
8820 29        ADD  HL,HL
8821 29        ADD  HL,HL
8822 011B8C    LD   BC,8C1B
8825 09        ADD  HL,BC
8826 C9        RET
8827 CDDF82    CALL 82DF
882A 0680      LD   B,80
882C 0E00      LD   C,00
882E C5        PUSH BC
882F CD1B88    CALL 881B
8832 CDCD83    CALL 83CD
8835 C1        POP  BC
8836 C5        PUSH BC
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8837 79         LD   A,C
8838 FE10       CP   10
883A 2005       JR   NZ,8841
883C C1         POP  BC
883D 0E00       LD   C,00
883F 18ED       JR   882E
8841 11DD5C     LD   DE,5CDD
8844 0609       LD   B,09
8846 AF         XOR  A
8847 BE         CP   (HL)
8848 2003       JR   NZ,884D
884A C1         POP  BC
884B 1809       JR   8856
884D CD868A     CALL 8A86
8850 C1         POP  BC
8851 2806       JR   Z,8859
8853 0C         INC  C
8854 10D8       DJNZ 882E
8856 F6FF       OR   FF
8858 C9         RET
8859 3E80       LD   A,80
885B 90         SUB  B
885C 4F         LD   C,A
885D AF         XOR  A
885E C8         RET  Z
885F CD8788     CALL 8887
8862 CD0680     CALL 8006
8865 CDD480     CALL 80D4
8868 ED7BFE8A   LD   SP,(8AFE)
886C C9         RET
886D FDCB007E   BIT  7,(IY+00)
8871 2805       JR   Z,8878
8873 3E0B       LD   A,0B
8875 323A5C     LD   (5C3A),A
8878 3C         INC  A
8879 211A8B     LD   HL,8B1A
887C CDBC82     CALL 82BC
887F C38080     JP   8080
8882 FDCB017E   BIT  7,(IY+01)
8886 C9         RET
8887 CD8288     CALL 8882
888A C0         RET  NZ
888B E1         POP  HL
888C C9         RET
888D CD6589     CALL 8965
8890 CDD288     CALL 88D2
8893 18ED       JR   8882
8895 AF         XOR  A
8896 210116     LD   HL,1601
8899 1814       JR   88AF
889B 3E02       LD   A,02
889D 18F7       JR   8896
889F 211800     LD   HL,0018
88A2 180B       JR   88AF
88A4 CD9588     CALL 8895
88A7 212C0F     LD   HL,0F2C
88AA 1803       JR   88AF
88AC 216B0D     LD   HL,0D6B
88AF E5         PUSH HL
88B0 CDE589     CALL 89E5
88B3 C9         RET
88B4 21B228     LD   HL,28B2
88B7 18F6       JR   88AF
88B9 216E0D     LD   HL,0D6E
88BC 18F1       JR   88AF
88BE 211B1A     LD   HL,1A1B
88C1 18EC       JR   88AF
88C3 21F12B     LD   HL,2BF1
88C6 18E7       JR   88AF
88C8 21991E     LD   HL,1E99
88CB 18E2       JR   88AF
88CD 218C1C     LD   HL,1C8C
88D0 18DD       JR   88AF
88D2 21821C     LD   HL,1C82
88D5 18D8       JR   88AF
88D7 2A115D     LD   HL,(5D11)
88DA 23         INC  HL
88DB 225D5C     LD   (5C5D),HL
88DE C9         RET
88DF CDD788     CALL 88D7
88E2 CDCD88     CALL 88CD
88E5 CD9F88     CALL 889F
88E8 FE2C       CP   2C
88EA C26D88     JP   NZ,886D
88ED CD6589     CALL 8965
88F0 CDCD88     CALL 88CD
88F3 C9         RET
88F4 CDD788     CALL 88D7
88F7 C3CD88     JP   88CD
88FA CD9F88     CALL 889F
88FD FEAF       CP   AF
88FF C0         RET  NZ
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8900 CD8D88    CALL 888D
8903 2807      JR   Z,890C
8905 CDC888    CALL 88C8
8908 ED43D75C  LD   (5CD7),BC
890C CD9F88    CALL 889F
890F FE2C      CP   2C
8911 C26D88    JP   NZ,886D
8914 CD8D88    CALL 888D
8917 2814      JR   Z,892D
8919 CDC888    CALL 88C8
891C 3A105D    LD   A,(5D10)
891F B7        OR   A
8920 ED43D95C  LD   (5CD9),BC
8924 2007      JR   NZ,892D
8926 2AD75C    LD   HL,(5CD7)
8929 09        ADD  HL,BC
892A 22D95C    LD   (5CD9),HL
892D CD9F88    CALL 889F
8930 FE2C      CP   2C
8932 2810      JR   Z,8944
8934 FE0D      CP   0D
8936 C26D88    JP   NZ,886D
8939 CD8788    CALL 8887
893C 210000    LD   HL,0000
893F 22DB5C    LD   (5CDB),HL
8942 1808      JR   894F
8944 CD8D88    CALL 888D
8947 C8        RET  Z
8948 CDC888    CALL 88C8
894B ED43DB5C  LD   (5CDB),BC
894F 2A115D    LD   HL,(5D11)
8952 22025D    LD   (5D02),HL
8955 21A711    LD   HL,11A7
8958 1811      JR   896B
895A 2A615C    LD   HL,(5C61)
895D 22025D    LD   (5D02),HL
8960 213000    LD   HL,0030
8963 1806      JR   896B
8965 22025D    LD   (5D02),HL
8968 212000    LD   HL,0020
896B E5        PUSH HL
896C 2A025D    LD   HL,(5D02)
896F CDE589    CALL 89E5
8972 C9        RET
8973 22025D    LD   (5D02),HL
8976 21E819    LD   HL,19E8
8979 18F0      JR   896B
897B 22025D    LD   (5D02),HL
897E 215516    LD   HL,1655
8981 18E8      JR   896B
8983 ED5BF45C  LD   DE,(5CF4)
8987 1B        DEC  DE
8988 0601      LD   B,01
898A 211B8C    LD   HL,8C1B
898D C30C3C    JP   3C0C
8990 CD8389    CALL 8983
8993 C38080    JP   8080
8996 C3D889    JP   89DB
8999 C3AD89    JP   89AD
899C 2AFE8A    LD   HL,(8AFE)
899F 2B        DEC  HL
89A0 2B        DEC  HL
89A1 F9        LD   SP,HL
89A2 CDFF89    CALL 89FF
89A5 C36D88    JP   886D
89A8 E1        POP  HL
89A9 E1        POP  HL
89AA C3CF12    JP   12CF
89AD 3A175D    LD   A,(5D17)
89B0 FEAA      CP   AA
89B2 C4BC89    CALL NZ,89BC
89B5 CDFF89    CALL 89FF
89B8 E5        PUSH HL
89B9 C31E80    JP   801E
89BC 21CA5C    LD   HL,5CCA
89BF 016B00    LD   BC,006B
89C2 CD5516    CALL 1655
89C5 3EF4      LD   A,F4
89C7 321E5D    LD   (5D1E),A
89CA 3E00      LD   A,00
89CC 32195D    LD   (5D19),A
89CF 3EFF      LD   A,FF
89D1 323A5C    LD   (5C3A),A
89D4 C9        RET
89D5 CD138A    CALL 8A13
89D8 CD278A    CALL 8A27
89DB 3A175D    LD   A,(5D17)
89DE CDFF89    CALL 89FF
89E1 E5        PUSH HL
89E2 C3E180    JP   80E1
```

```
89E5 220250    LD    (5D02),HL
89E8 ED530450  LD    (5D04),DE
89EC D1        POP   DE
89ED E1        POP   HL
89EE D5        PUSH  DE
89EF CD138A    CALL  8A13
89F2 11028A    LD    DE,8A02
89F5 D5        PUSH  DE
89F6 E5        PUSH  HL
89F7 ED5B045D  LD    DE,(5D04)
89FB 2A025D    LD    HL,(5D02)
89FE C9        RET
89FF 21138A    LD    HL,8A13
8A02 F3        DI
8A03 F5        PUSH  AF
8A04 CD278A    CALL  8A27
8A07 3A165D    LD    A,(5D16)
8A0A E67F      AND   7F
8A0C 32165D    LD    (5D16),A
8A0F D3FF      OUT   (FF),A
8A11 F1        POP   AF
8A12 C9        RET
8A13 F5        PUSH  AF
8A14 CD278A    CALL  8A27
8A17 3A165D    LD    A,(5D16)
8A1A F680      OR    80
8A1C 32165D    LD    (5D16),A
8A1F D3FF      OUT   (FF),A
8A21 CD2D8A    CALL  8A2D
8A24 F1        POP   AF
8A25 FB        EI
8A26 C9        RET
8A27 CD428A    CALL  8A42
8A2A D3FC      OUT   (FC),A
8A2C C9        RET
8A2D CD428A    CALL  8A42
8A30 F680      OR    80
8A32 D3FC      OUT   (FC),A
8A34 C9        RET
8A35 213B5C    LD    HL,5C3B
8A38 7E        LD    A,(HL)
8A39 E620      AND   20
8A3B 28FB      JR    Z,8A38
8A3D 3E20      LD    A,20
8A3F AE        XOR   (HL)
8A40 77        LD    (HL),A
8A41 C9        RET
8A42 3A485C    LD    A,(5C48)
8A45 E638      AND   38
8A47 0F        RRCA
8A48 0F        RRCA
8A49 0F        RRCA
8A4A C9        RET
8A4B CD278A    CALL  8A27
8A4E 3EFF      LD    A,FF
8A50 D3FF      OUT   (FF),A
8A52 C9        RET
8A53 CD488A    CALL  8A4B
8A56 EDB8      LDDR
8A58 18A8      JR    8A02
8A5A CD488A    CALL  8A4B
8A5D EDB0      LDIR
8A5F 18A1      JR    8A02
8A61 E5        PUSH  HL
8A62 D5        PUSH  DE
8A63 C5        PUSH  BC
8A64 E67F      AND   7F
8A66 CD6D8A    CALL  8A6D
8A69 C1        POP   BC
8A6A D1        POP   DE
8A6B E1        POP   HL
8A6C C9        RET
8A6D 211000    LD    HL,0010
8A70 C3AF88    JP    88AF
8A73 7E        LD    A,(HL)
8A74 B7        OR    A
8A75 C8        RET   Z
8A76 CD618A    CALL  8A61
8A79 CB7E      BIT   7,(HL)
8A7B C0        RET   NZ
8A7C 23        INC   HL
8A7D 18F4      JR    8A73
8A7F 2A595C    LD    HL,(5C59)
8A82 360D      LD    (HL),0D
8A84 225B5C    LD    (5C5B),HL
8A87 23        INC   HL
8A88 3680      LD    (HL),80
8A8A C9        RET
```

```
8A8B  3A0F5D    LD    A,(5D0F)
8A8E  B7        OR    A
8A8F  CC7F8A    CALL  Z,8A7F
8A92  2A595C    LD    HL,(5C59)
8A95  CDB18A    CALL  8AB1
8A98  3A195D    LD    A,(5D19)
8A9B  C641      ADD   A,41
8A9D  CD618A    CALL  8A61
8AA0  3E23      LD    A,23
8AA2  CD618A    CALL  8A61
8AA5  213A5C    LD    HL,5C3A
8AA8  36FF      LD    (HL),FF
8AAA  CDA488    CALL  88A4
8AAD  CDB988    CALL  88B9
8AB0  C9        RET
8AB1  3E0D      LD    A,0D
8AB3  C3618A    JP    8A61
8AB6  1A        LD    A,(DE)
8AB7  BE        CP    (HL)
8AB8  2006      JR    NZ,8AC0
8ABA  13        INC   DE
8ABB  23        INC   HL
8ABC  10F8      DJNZ  8AB6
8ABE  AF        XOR   A
8ABF  C9        RET
8AC0  F6FF      OR    FF
8AC2  C9        RET
8AC3  C5        PUSH  BC
8AC4  0608      LD    B,08
8AC6  7E        LD    A,(HL)
8AC7  CD618A    CALL  8A61
8ACA  23        INC   HL
8ACB  10F9      DJNZ  8AC6
8ACD  3E3C      LD    A,3C
8ACF  CD618A    CALL  8A61
8AD2  7E        LD    A,(HL)
8AD3  CD618A    CALL  8A61
8AD6  3E3E      LD    A,3E
8AD8  CD618A    CALL  8A61
8ADB  C1        POP   BC
8ADC  C9        RET
8ADD  2F        CPL
8ADE  4F        LD    C,A
8ADF  0600      LD    B,00
8AE1  C3BE88    JP    88BE
```

```
8AE4  CF 2A D1 E6 D2 FE C0 FF
8AEC  2E 83 E7 83 46 85 0D 84
8AF4  B1 85 5F 83 78 81 42 84
8AFC  00 00 00 00 0D 4E 6F 20
8B04  46 69 6C 65 28 73 29 0D
8B0C  20 44 65 6C 2E 20 46 69
8B14  6C 65 28 73 29 0D 0D 2A
8B1C  45 52 52 4F 52 2A 0D 0D
8B24  4E 6F 20 73 70 61 63 65
8B2C  2E 0D 0D 46 69 6C 65 20
8B34  65 78 69 73 74 73 2E 0D
8B3C  20 46 72 65 65 2E 0D 4E
8B44  65 77 A0 50 61 73 73 77
8B4C  6F 72 64 20 66 6F 72 20
8B54  44 52 49 56 45 A0 0D 57
8B5C  72 69 74 65 20 70 72 6F
8B64  74 65 63 F4 0D 49 6E 73
8B6C  65 72 74 20 53 6F 75 72
8B74  63 65 20 64 69 73 6B 20
8B7C  74 68 65 6E 20 70 72 65
8B84  73 73 20 59 00 0D 49 6E
8B8C  73 65 72 74 20 44 65 73
8B94  74 69 6E 61 74 69 6F 6E
8B9C  20 64 69 73 6B 0D 74 68
8BA4  65 6E 20 70 72 65 73 73
8BAC  20 59 00 0D 44 69 73 63
8BB4  20 45 72 72 6F F2 0D 41
8BBC  28 62 6F 72 74 29 2C 52
8BC4  28 65 74 72 79 29 2C 49
8BCC  28 67 6E 6F 72 65 A9 0D
8BD4  54 72 61 63 6B A0 20 53
8BDC  65 63 74 6F 72 A0 0D 52
8BE4  65 63 6F 72 64 20 4E 6F
8BEC  2E 20 6F 75 65 72 2D 65
8BF4  6C 6F F7 55 6E 6B 6E 6F
8BFC  77 6E 20 66 6F 72 6D 61
8C04  74 AE 54 69 74 6C 65 3A
8C0C  A0 00 00 00 00 00 00 00
8C14  00 00 00 00 00 9C 89 00
```

J

(1)

DISC-CAT

```
  10 CLEAR 59999
  20 RANDOMIZE USR 15363: REM :
LOAD "disc-cat"CODE 6e4,512
  30 INPUT "Nombre del fichero "
;n$
  40 RANDOMIZE USR 6e4
```

```
EA60 2A4B5C    LD    HL,(5C4B)
EA63 7E        LD    A,(HL)
EA64 FE4E      CP    4E
EA66 2810      JR    Z,EA78
EA68 CD6819    CALL  1968
EA6B EB        EX    DE,HL
EA6C ED5B595C  LD    DE,(5C59)
EA70 A7        AND   A
EA71 ED52      SBC   HL,DE
EA73 EB        EX    DE,HL
EA74 38ED      JR    C,EA63
EA76 CF        RST   8
EA77 01234E    LD    BC,4E23
EA7A 23        INC   HL
EA7B 7E        LD    A,(HL)
EA7C B1        OR    C
EA7D C8        RET   Z
EA7E 23        INC   HL
EA7F CDA1EB    CALL  EBA1
EA82 CD1AEB    CALL  EB1A
EA85 78        LD    A,B
EA86 B1        OR    C
EA87 281B      JR    Z,EAA4
EA89 CF        RST   8
EA8A 00        DEFB  0
               NOP

EAA3 00        NOP
EAA4 FDCB0286  RES   0,(IY+02)
EAA8 1198EB    LD    DE,EB98
EAAB CDE1EA    CALL  EAE1
EAAE 11E9EA    LD    DE,EAE9
EAB1 CDE1EA    CALL  EAE1
EAB4 ED4B93EB  LD    BC,(EB93)
EAB8 CD2B2D    CALL  2D2B
EABB CDE32D    CALL  2DE3
EABE 11FAEA    LD    DE,EAFA
EAC1 CDE1EA    CALL  EAE1
EAC4 ED4B95EB  LD    BC,(EB95)
EAC8 CD2B2D    CALL  2D2B
EACB CDE32D    CALL  2DE3
EACE 110AEB    LD    DE,EB0A
EAD1 CDE1EA    CALL  EAE1
EAD4 ED4B97EB  LD    BC,(EB97)
EAD8 0600      LD    B,00
EADA CD1B1A    CALL  1A1B
EADD 3E0D      LD    A,0D
EADF D7        RST   10
EAE0 C9        RET
EAE1 1A        LD    A,(DE)
EAE2 13        INC   DE
EAE3 FEFF      CP    FF
EAE5 C8        RET   Z
EAE6 D7        RST   10
EAE7 18F8      JR    EAE1

EAE9 0D 0D 44 49 52 45 43 43
EAF1 49 4F 4E 20 20 20 20 20
EAF9 FF 0D 44 49 2E 20 45 4A
EB01 45 43 55 43 49 4F 4E 20
EB09 FF 0D 4E 2E 20 53 45 43
EB11 54 4F 52 45 53 20 20 20
EB19 FF 3A 17 5D FE AA C4 38
```

EA77 01 DEFB 01
EA78 23 INC HL
EA79 4E LD C,(HL)

②

```
EB1A 3A175D    LD    A,(5D17)
EB1D FEAA      CP    AA
EB1F C4383C    CALL  NZ,3C38
EB22 CDAA3C    CALL  3CAA
EB25 E5        PUSH  HL
EB26 CD213D    CALL  3D21
EB29 3EFF      LD    A,FF
EB2B 32155D    LD    (5D15),A
EB2E AF        XOR   A
EB2F 32F75C    LD    (5CF7),A
EB32 CDA63D    CALL  3DA6
EB35 3EAA      LD    A,AA
EB37 32175D    LD    (5D17),A
EB3A 217E01    LD    HL,017E
EB3D 221A5D    LD    (5D1A),HL
EB40 210000    LD    HL,0000
EB43 39        ADD   HL,SP
EB44 221C5D    LD    (5D1C),HL
EB47 2B        DEC   HL
EB48 2B        DEC   HL
EB49 F9        LD    SP,HL
EB4A CDA801    CALL  01A8
EB4D CDC206    CALL  06C2
EB50 CD4803    CALL  0348
EB53 11065D    LD    DE,5D06
EB56 21EA5B    LD    HL,5BEA
EB59 010900    LD    BC,0009
EB5C EDB0      LDIR
EB5E CD5003    CALL  0350
EB61 AF        XOR   A
EB62 32D65C    LD    (5CD6),A
EB65 3E43      LD    A,43
EB67 32E55C    LD    (5CE5),A
EB6A CDC206    CALL  06C2
EB6D 11DD5C    LD    DE,5CDD
EB70 2198EB    LD    HL,EB98
EB73 010800    LD    BC,0008
EB76 EDB0      LDIR
EB78 CD3B3D    CALL  3D3B
EB7B CDE806    CALL  06E8
EB7E 2AE65C    LD    HL,(5CE6)
EB81 2293EB    LD    (EB93),HL
EB84 2AE85C    LD    HL,(5CE8)
EB87 2295EB    LD    (EB95),HL
EB8A 3AEA5C    LD    A,(5CEA)
EB8D 3297EB    LD    (EB97),A
EB90 C35E01    JP    015E

EB93 60 EA 00 00 02 63 61 74
EB98 61 64 6F 72 20 FF 06 08

EBA1 0608      LD    B,08
EBA3 1198EB    LD    DE,EB98
EBA6 EB        EX    DE,HL
EBA7 1A        LD    A,(DE)
EBA8 77        LD    (HL),A
EBA9 23        INC   HL
EBAA 13        INC   DE
EBAB 0D        DEC   C
EBAC 2806      JR    Z,EBB4
EBAE 10F7      DJNZ  EBA7
EBB0 C9        RET
EBB1 3620      LD    (HL),20
EBB3 23        INC   HL
EBB4 10FB      DJNZ  EBB1
EBB6 C9        RET
```

(K)

WESTERN DIGITAL
CORPORATION

FD179X-02
Floppy Disk Formatter/Controller Family

FEATURES

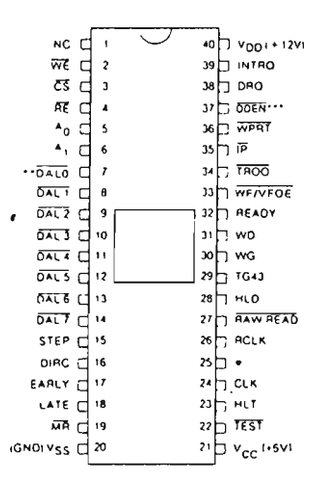
- TWO VFO CONTROL SIGNALS — RG & VFOE
- SOFT SECTOR FORMAT COMPATIBILITY
- AUTOMATIC TRACK SEEK WITH VERIFICATION
- ACCOMMODATES SINGLE AND DOUBLE DENSITY FORMATS
  - IBM 3740 Single Density (FM)
  - IBM System 34 Double Density (MFM)
  - Non IBM Format for Increased Capacity
- READ MODE
  - Single/Multiple Sector Read with Automatic Search or Entire Track Read
  - Selectable 128, 256, 512 or 1024 Byte Sector Lengths
- WRITE MODE
  - Single/Multiple Sector Write with Automatic Sector Search
  - Entire Track Write for Diskette Formatting
- SYSTEM COMPATIBILITY
  - Double Buffering of Data 8 Bit Bi-Directional Bus for Data, Control and Status
  - DMA or Programmed Data Transfers
  - All Inputs and Outputs are TTL Compatible
  - On-Chip Track and Sector Registers/Comprehensive Status Information
- PROGRAMMABLE CONTROLS
  - Selectable Track to Track Stepping Time
  - Side Select Compare
- INTERFACES TO WD1691 DATA SEPARATOR
- WINDOW EXTENSION
- INCORPORATES ENCODING/DECODING AND ADDRESS MARK CIRCUITRY
- FD1792/4 IS SINGLE DENSITY ONLY
- FD1795/7 HAS A SIDE SELECT OUTPUT

179X-02 FAMILY CHARACTERISTICS

FEATURES	1791	1792	1793	1794	1795	1797
Single Density (FM)	X	X	X	X	X	X
Double Density (MFM)	X		X		X	X
True Data Bus			X	X		X
Inverted Data Bus	X	X			X	
Write Precomp	X	X	X	X	X	X
Side Selection Output					X	X

APPLICATIONS

8" FLOPPY AND 5¼" MINI FLOPPY CONTROLLER
SINGLE OR DOUBLE DENSITY
CONTROLLER/FORMATTER



*1791/3 = RG 1795/7 = SSO
**1793/7 TRUE BUS
***1792/4 OPEN

PIN DESIGNATION

FD179X SYSTEM BLOCK DIAGRAM

PIN OUTS

PIN NUMBER	PIN NAME	SYMBOL	FUNCTION
1	NO CONNECTION	NC	Pin 1 is internally connected to a back bias generator and must be left open by the user.
19	$\overline{\text{MASTER RESET}}$	$\overline{\text{MR}}$	A logic low (50 microseconds min.) on this input resets the device and loads HEX 03 into the command register. The Not Ready (Status Bit 7) is reset during $\overline{\text{MR}}$ ACTIVE. When $\overline{\text{MR}}$ is brought to a logic high a RESTORE Command is executed, regardless of the state of the Ready signal from the drive. Also, HEX 01 is loaded into sector register.
20	POWER SUPPLIES	Vss	Ground
21		Vcc	+5V ±5%
40		Vdd	+12V ±5%
COMPUTER INTERFACE:			
2	$\overline{\text{WRITE ENABLE}}$	$\overline{\text{WE}}$	A logic low on this input gates data on the DAL into the selected register when $\overline{\text{CS}}$ is low.
3	$\overline{\text{CHIP SELECT}}$	$\overline{\text{CS}}$	A logic low on this input selects the chip and enables computer communication with the device.
4	$\overline{\text{READ ENABLE}}$	$\overline{\text{RE}}$	A logic low on this input controls the placement of data from a selected register on the DAL when $\overline{\text{CS}}$ is low.
5,6	REGISTER SELECT LINES	A0, A1	These inputs select the register to receive/transfer data on the DAL lines under $\overline{\text{RE}}$ and $\overline{\text{WE}}$ control: $\overline{\text{CS}}$ A1 A0 $\overline{\text{RE}}$ $\overline{\text{WE}}$ 0 0 0 Status Reg Command Reg 0 0 1 Track Reg Track Reg 0 1 0 Sector Reg Sector Reg 0 1 1 Data Reg Data Reg
7-14	$\overline{\text{DATA ACCESS LINES}}$	$\overline{\text{DAL0-DAL7}}$	Eight bit Bidirectional bus used for transfer of data, control, and status. This bus is receiver enabled by $\overline{\text{WE}}$ or transmitter enabled by $\overline{\text{RE}}$. Each line will drive 1 standard TTL load.
24	CLOCK	CLK	This input requires a free-running 50% duty cycle square wave clock for internal timing reference, 2 MHz ± 1% for 8" drives, 1 MHz ± 1% for mini-floppies.
38	DATA REQUEST	DRQ	This open drain output indicates that the DR contains assembled data in Read operations, or the DR is empty in Write operations. This signal is reset when serviced by the computer through reading or loading the DR in Read or Write operations, respectively. Use 10K pull-up resistor to +5.
39	INTERRUPT REQUEST	INTRQ	This open drain output is set at the completion of any command and is reset when the STATUS register is read or the command register is written to. Use 10K pull-up resistor to +5.
FLOPPY DISK INTERFACE:			
15	STEP	STEP	The step output contains a pulse for each step.
16	DIRECTION	DIRC	Direction Output is active high when stepping in, active low when stepping out.
17	EARLY	EARLY	Indicates that the WRITE DATA pulse occuring while Early is active (high) should be shifted early for write precompensation.
18	LATE	LATE	Indicates that the write data pulse occurring while Late is active (high) should be shifted late for write precompensation.
22	$\overline{\text{TEST}}$	$\overline{\text{TEST}}$	This input is used for testing purposes only and should be tied to +5V or left open by the user unless interfacing to voice coil actuated steppers.
23	HEAD LOAD TIMING	HLT	When a logic high is found on the HLT input the head is assumed to be engaged. It is typically derived from a 1 shot triggered by HLD.
25	READ GATE (1791, 1792, 1793, 1794)	RG	This output is used for synchronization of external data separators. The output goes high after two Bytes of zeros in single density, or 4 Bytes of either zeros or ones in double density operation.
25	SIDE SELECT OUTPUT (1795, 1797)	SSO	The logic level of the Side Select Output is directly controlled by the 'S' flag in Type II or III commands. When U = 1, SSO is set to a logic 1. When U = 0, SSO is set to a logic 0. The SSO is compared with the side information in the Sector I.D. Field. If they do not compare Status Bit 4 (RNF) is set. The Side Select Output is only updated at the beginning of a Type II or III command. It is forced to a logic 0 upon a MASTER RESET condition.
26	READ CLOCK	RCLK	A nominal square-wave clock signal derived from the data stream must be provided to this input. Phasing (i.e. RCLK transitions) relative to RAW READ is important but polarity (RCLK high or low) is not.
27	$\overline{\text{RAW READ}}$	$\overline{\text{RAW READ}}$	The data input signal directly from the drive. This input shall be a negative pulse for each recorded flux transition.
28	HEAD LOAD	HLD	The HLD output controls the loading of the Read-Write head against the media.
29	TRACK GREATER THAN 43	TG43	This output informs the drive that the Read/Write head is positioned between tracks 44-76. This output is valid only during Read and Write Commands.
30	WRITE GATE	WG	This output is made valid before writing is to be performed on the diskette.
31	WRITE DATA	WD	A 200 ns (MFM) or 500 ns (FM) output pulse per flux transition. WD contains the unique Address marks as well as data and clock in both FM and MFM formats.
32	READY	READY	This input indicates disk readiness and is sampled for a logic high before Read or Write commands are performed. If Ready is low the Read or Write operation is not performed and an interrupt is generated. Type I operations are performed regardless of the state of Ready. The Ready input appears in inverted format as Status Register bit 7.

PIN NUMBER	PIN NAME	SYMBOL	FUNCTION
33	WRITE FAULT / VFO ENABLE	WF/VFOE	This is a bi-directional signal used to signify writing faults at the drive, and to enable the external PLO data separator. When WG = 1, Pin 33 functions as a WF input. If WF = 0, any write command will immediately be terminated. When WG = 0, Pin 33 functions as a VFOE output. VFOE will go low during a read operation after the head has loaded and settled (HLT = 1). On the 1795/7, it will remain low until the last bit of the second CRC byte in the ID field. VFOE will then go high until 8 bytes (MFM) or 4 bytes (FM) before the Address Mark. It will then go active until the last bit of the second CRC byte of the Data Field. On the 1791/3, VFOE will remain low until the end of the Data Field. This pin has an internal 100K Ohm pull-up resistor.
34	TRACK 00	TR00	This input informs the FD179X that the Read/Write head is positioned over Track 00.
35	INDEX PULSE	IP	This input informs the FD179X when the index hole is encountered on the diskette.
36	WRITE PROTECT	WPRT	This input is sampled whenever a Write Command is received. A logic low terminates the command and sets the Write Protect Status bit.
37	DOUBLE DENSITY	DDEN	This input pin selects either single or double density operation. When DDEN = 0, double density is selected. When DDEN = 1, single density is selected. This line must be left open on the 1792/4.

GENERAL DESCRIPTION

The FD179X are N-Channel Silicon Gate MOS LSI devices which perform the functions of a Floppy Disk Formatter/Controller in a single chip implementation. The FD179X, which can be considered the end result of both the FD1771 and FD1781 designs, is IBM 3740 compatible in single density mode (FM) and System 34 compatible in Double Density Mode (MFM). The FD179X contains all the features of its predecessor the FD1771, plus the added features necessary to read/write and format a double density diskette. These include address mark detection, FM and MFM encode and decode logic, window extension, and write precompensation. In order to maintain compatibility, the FD1771, FD1781, and FD179X designs were made as close as possible with the computer interface, instruction set, and I/O registers being identical. Also, head load control is identical. In each case, the actual pin assignments vary by only a few pins from any one to another.

The processor interface consists of an 8-bit bi-directional bus for data, status, and control word transfers. The FD179X is set up to operate on a multiplexed bus with other bus-oriented devices.

The FD179X is TTL compatible on all inputs and outputs. The outputs will drive ONE TTL load or three LS loads. The 1793 is identical to the 1791 except the DAL lines are TRUE for systems that utilize true data busses.

The 1795/7 has a side select output for controlling double sided drives, and the 1792 and 1794 are "Single Density Only" versions of the 1791 and 1793 respectively. On these devices, DDEN must be left open.

ORGANIZATION

The Floppy Disk Formatter block diagram is illustrated on page 5. The primary sections include the parallel processor interface and the Floppy Disk interface.

Data Shift Register — This 8-bit register assembles serial data from the Read Data input (RAW READ) during Read operations and transfers serial data to the Write Data output during Write operations.

Data Register — This 8-bit register is used as a holding register during Disk Read and Write operations. In Disk Read operations the assembled data byte is transferred in parallel to the Data Register from the Data Shift Register. In Disk Write operations information is transferred in parallel from the Data Register to the Data Shift Register.

When executing the Seek command the Data Register holds the address of the desired Track position. This register is loaded from the DAL and gated onto the DAL under processor control.

Track Register — This 8-bit register holds the track number of the current Read/Write head position. It is incremented by one every time the head is stepped in (towards track 76) and decremented by one when the head is stepped out (towards track 00). The contents of the register are compared with the recorded track number in the ID field during disk Read, Write, and Verify operations. The Track Register can be loaded from or transferred to the DAL. This Register should not be loaded when the device is busy.

Sector Register (SR) — This 8-bit register holds the address of the desired sector position. The contents of the register are compared with the recorded sector number in the ID field during disk Read or Write operations. The Sector Register contents can be loaded from or transferred to the DAL. This register should not be loaded when the device is busy.

Command Register (CR) — This 8-bit register holds the command presently being executed. This register should not be loaded when the device is busy unless the new command is a force interrupt. The command register can be loaded from the DAL, but not read onto the DAL.

Status Register (STR) — This 8-bit register holds device Status information. The meaning of the Status bits is a function of the type of command previously executed. This register can be read onto the DAL, but not loaded from the DAL.

CRC Logic — This logic is used to check or to generate the 16-bit Cyclic Redundancy Check (CRC). The polynomial is: $G(x) = x^{16} + x^{12} + x^5 + 1$.

The CRC includes all information starting with the address mark and up to the CRC characters. The CRC register is preset to ones prior to data being shifted through the circuit.

Arithmetic/Logic Unit (ALU) — The ALU is a serial comparator, incrementer, and decrementer and is used for register modification and comparisons with the disk recorded ID field.

Timing and Control — All computer and Floppy Disk interface controls are generated through this logic. The internal device timing is generated from an external crystal clock.

The FD179X has two different modes of operation according to the state of DDEN. When DDEN = 0 double density (MFM) is assumed. When DDEN = 1, single density (FM) is assumed. 1792 & 1794 are single density only.

AM Detector — The address mark detector detects ID, data and index address marks during read and write operations.

PROCESSOR INTERFACE

The interface to the processor is accomplished through the eight Data Access Lines (DAL) and associated control signals. The DAL are used to transfer Data, Status, and Control words out of, or into the FD179X. The DAL are three state buffers that are enabled as output drivers when Chip Select (CS) and Read Enable (RE) are active (low logic state) or act as input receivers when CS and Write Enable (WE) are active.

When transfer of data with the Floppy Disk Controller is required by the host processor, the device address is decoded and CS is made low. The address bits A1 and A0, combined with the signals RE during a Read operation or WE during a Write operation are interpreted as selecting the following registers:

A1	A0	READ (RE)	WRITE (WE)
0	0	Status Register	Command Register
0	1	Track Register	Track Register
1	0	Sector Register	Sector Register
1	1	Data Register	Data Register

During Direct Memory Access (DMA) types of data transfers between the Data Register of the FD179X and the processor, the Data Request (DRQ) output is used in Data Transfer control. This signal also appears as status bit 1 during Read and Write operations.

On Disk Read operations the Data Request is activated (set high) when an assembled serial input byte is transferred in parallel to the Data Register. This bit is cleared when the Data Register is read by the processor. If the Data Register is read after one or more characters are lost, by having new data transferred into the register prior to processor readout, the Lost Data bit is set in the Status Register. The Read operation continues until the end of sector is reached.

On Disk Write operations the data Request is activated when the Data Register transfers its contents to the Data

Shift Register, and requires a new data byte. It is reset when the Data Register is loaded with new data by the processor. If new data is not loaded at the time the next serial byte is required by the Floppy Disk, a byte of zeroes is written on the diskette and the Lost Data bit is set in the Status Register.

At the completion of every command an INTRQ is generated. INTRQ is reset by either reading the status register or by loading the command register with a new command. In addition, INTRQ is generated if a Force Interrupt command condition is met.

The 179X has two modes of operation according to the state of $\overline{DDEN}$ (Pin 37). When $\overline{DDEN}$ = 1, single density is selected. In either case, the CLK input (Pin 24) is at 2 MHz. However, when interfacing with the mini-floppy, the CLK input is set at 1 MHz for both single density and double density.

GENERAL DISK READ OPERATIONS

Sector lengths of 128, 256, 512 or 1024 are obtainable in either FM or MFM formats. For FM, $\overline{DDEN}$ should be placed to logical "1." For MFM formats, $\overline{DDEN}$ should be placed to a logical "0." Sector lengths are determined at format time by the fourth byte in the "ID" field.

Sector Length Table*

Sector Length Field (hex)	Number of Bytes in Sector (decimal)
00	128
01	256
02	512
03	1024

*1795/97 may vary — see command summary.

The number of sectors per track as far as the FD179X is concerned can be from 1 to 255 sectors. The number of tracks as far as the FD179X is concerned is from 0 to 255 tracks. For IBM 3740 compatibility, sector lengths are 128 bytes with 26 sectors per track. For System 34 compatibility (MFM), sector lengths are 256 bytes/sector with 26 sectors/track; or lengths of 1024 bytes/sector with 8 sectors/track. (See Sector Length Table)

For read operations in 8" double density the FD179X requires $\overline{RAW\ READ}$ Data (Pin 27) signal which is a 200 ns pulse per flux transition and a Read clock (RCLK) signal to indicate flux transition spacings. The RCLK (Pin 26) signal is provided by some drives but if not it may be derived externally by Phase lock loops, one shots, or counter techniques. In addition, a Read Gate Signal is provided as an output (Pin 25) on 1791/92/93/94 which can be used to inform phase lock loops when to acquire synchronization. When reading from the media in FM, RG is made true when 2 bytes of zeroes are detected. The FD179X must find an address mark within the next 10 bytes; otherwise RG is reset and the search for 2 bytes of zeroes begins all over again. If an address mark is found within 10 bytes, RG remains true as long as the FD179X is deriving any useful information from the data stream. Similarly for MFM, RG is made active when 4 bytes of "00" or "FF" are detected. The FD179X must find an address mark within the next 16 bytes, otherwise RG is reset and search resumes.

During read operations (WG = 0), the $\overline{VFOE}$ (Pin 33) is provided for phase lock loop synchronization. $\overline{VFOE}$ will go active low when:

a) Both HLT and HLD are True
b) Settling Time, if programmed, has expired
c) The 179X is inspecting data off the disk

If $\overline{WF}/\overline{VFOE}$ is not used, leave open or tie to a 10K resistor to + 5.

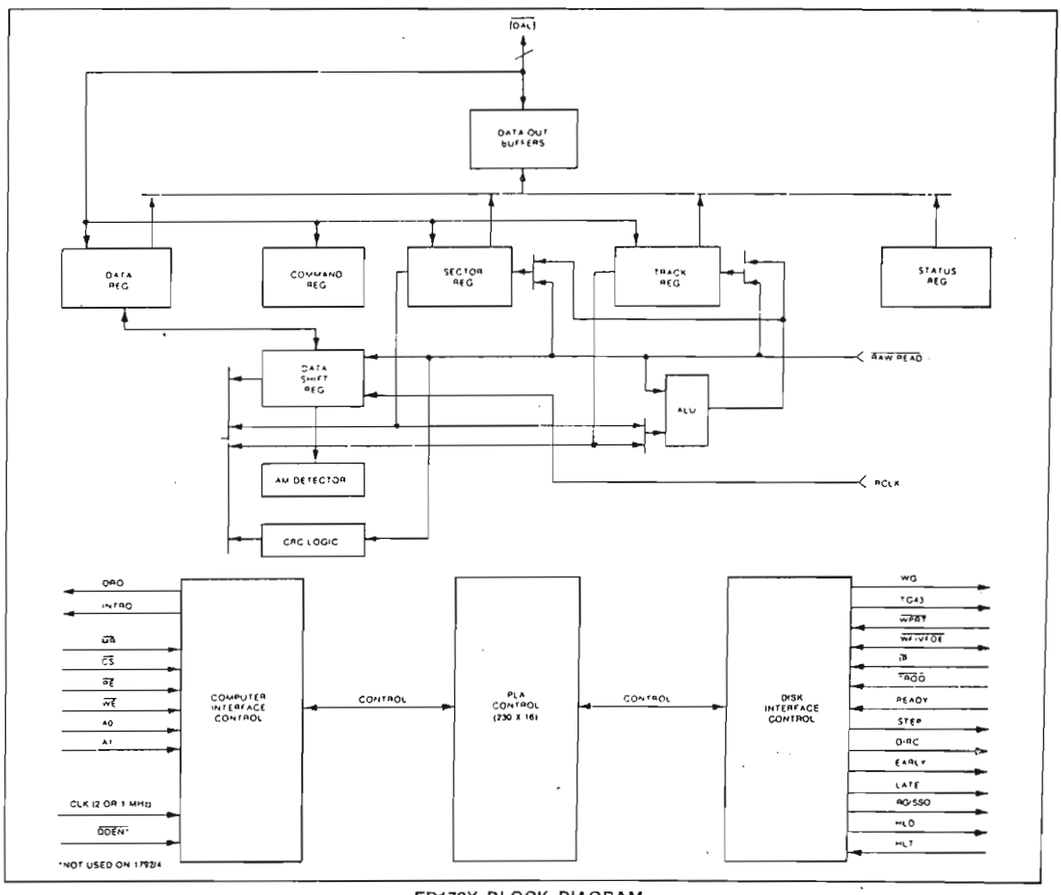
GENERAL DISK WRITE OPERATION

When writing is to take place on the diskette the Write Gate (WG) output is activated, allowing current to flow into the Read/Write head. As a precaution to erroneous writing the first data byte must be loaded into the Data Register in response to a Data Request from the FD179X before the Write Gate signal can be activated.

Writing is inhibited when the $\overline{Write\ Protect}$ input is a logic low, in which case any Write command is immediately terminated, an interrupt is generated and the Write Protect status bit is set. The Write Fault input, when activated, signifies a writing fault condition detected in disk drive electronics such as failure to detect write current flow when the Write Gate is activated. On detection of this fault the FD179X terminates the current command, and sets the Write Fault bit (bit 5) in the Status Word. The $\overline{Write\ Fault}$ input should be made inactive when the Write Gate output becomes inactive.

For write operations, the FD179X provides Write Gate (Pin 30) and Write Data (Pin 31) outputs. Write data consists of a series of 500 ns pulses in FM ($\overline{DDEN}$ = 1) and 200 ns pulses in MFM ($\overline{DDEN}$ = 0). Write Data provides the unique address marks in both formats.

Also during write, two additional signals are provided for write precompensation. These are EARLY (Pin 17) and LATE (Pin 18). EARLY is active true when the WD pulse appearing on (Pin 30) is to be written EARLY. LATE is active true when the WD pulse is to be written LATE. If both EARLY and LATE are low when the WD pulse is present, the WD pulse is to be written at nominal. Since write precompensation values vary from disk manufacturer to disk manufacturer, the actual value is determined by several one shots or delay lines which are located external to the FD179X. The write precompensation signals EARLY and LATE are valid for the duration of WD in both FM and MFM formats.



FD179X BLOCK DIAGRAM

READY

Whenever a Read or Write command (Type II or III) is received the FD179X samples the Ready input. If this input is logic low the command is not executed and an interrupt is generated. All Type I commands are performed regardless of the state of the Ready input. Also, whenever a Type II or III command is received, the TG43 signal output is updated.

COMMAND DESCRIPTION

The FD179X will accept eleven commands. Command words should only be loaded in the Command Register when the Busy status bit is off (Status bit 0). The one exception is the Force Interrupt command. Whenever a command is being executed, the Busy status bit is set. When a command is completed, an interrupt is generated and the Busy status bit is reset. The Status Register indicates whether the completed command encountered an error or was fault free. For ease of discussion, commands are divided into four types. Commands and types are summarized in Table 1.

TABLE 1. COMMAND SUMMARY

A. Commands for Models: 1791, 1792, 1793, 1794 B. Commands for Models: 1795, 1797

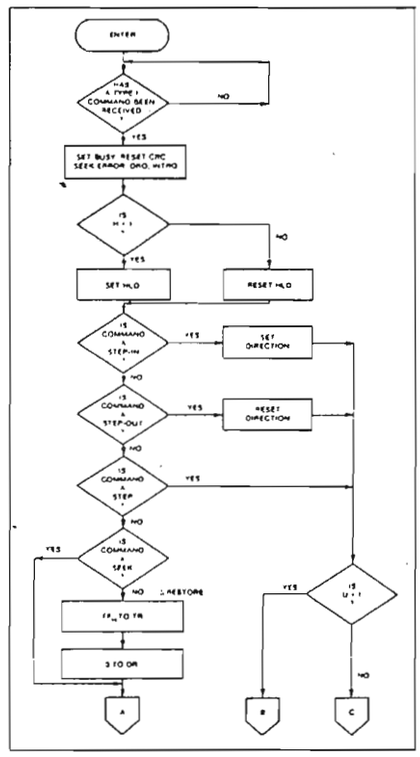
		Bits								Bits							
Type	Command	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
I	Restore	0	0	0	0	h	V	r_1	r_0	0	0	0	0	h	V	r_1	r_0
I	Seek	0	0	0	1	h	V	r_1	r_0	0	0	0	1	h	V	r_1	r_0
I	Step	0	0	1	T	h	V	r_1	r_0	0	0	1	T	h	V	r_1	r_0
I	Step-in	0	1	0	T	h	V	r_1	r_0	0	1	0	T	h	V	r_1	r_0
I	Step-out	0	1	1	T	h	V	r_1	r_0	0	1	1	T	h	V	r_1	r_0
II	Read Sector	1	0	0	m	S	E	C	0	1	0	0	m	L	E	U	0
II	Write Sector	1	0	1	m	S	E	C	a_0	1	0	1	m	L	E	U	a_0
III	Read Address	1	1	0	0	0	E	0	0	1	1	0	0	0	E	U	0
III	Read Track	1	1	1	0	0	E	0	0	1	1	1	0	0	E	U	0
III	Write Track	1	1	1	1	0	E	0	0	1	1	1	1	0	E	U	0
IV	Force Interrupt	1	1	0	1	I_3	I_2	I_1	I_0	1	1	0	1	I_3	I_2	I_1	I_0

FLAG SUMMARY

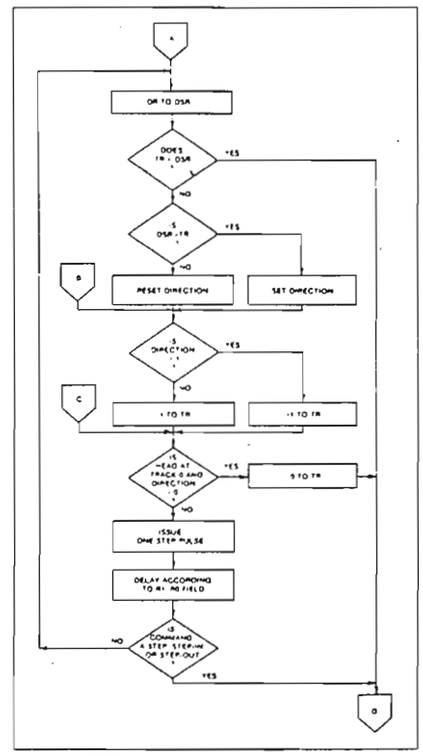
TABLE 2. FLAG SUMMARY

Command Type	Bit No(s)		Description
I	0, 1	r_1 r_0 = Stepping Motor Rate See Table 3 for Rate Summary	
I	2	V = Track Number Verify Flag	V = 0, No verify V = 1, Verify on destination track
I	3	h = Head Load Flag	h = 1, Load head at beginning h = 0, Unload head at beginning
I	4	T = Track Update Flag	T = 0, No update T = 1, Update track register
II	0	a_0 = Data Address Mark	a_0 = 0, FB (DAM) a_0 = 1, F8 (deleted DAM)
II	1	C = Side Compare Flag	C = 0, Disable side compare C = 1, Enable side compare
II & III	1	U = Update SSO	U = 0, Update SSO to 0 U = 1, Update SSO to 1
II & III	2	E = 15 MS Delay	E = 0, No 15 MS delay E = 1, 15 MS delay
II	3	S = Side Compare Flag	S = 0, Compare for side 0 S = 1, Compare for side 1
II	3	L = Sector Length Flag	LSB's Sector Length in ID Field: 00 / 01 / 10 / 11 L = 0: 256 / 512 / 1024 / 128 L = 1: 128 / 256 / 512 / 1024
II	4	m = Multiple Record Flag	m = 0, Single record m = 1, Multiple records
IV	0-3	I_x = Interrupt Condition Flags I_0 = 1 Not Ready To Ready Transition I_1 = 1 Ready To Not Ready Transition I_2 = 1 Index Pulse I_3 = 1 Immediate Interrupt, Requires A Reset I_3-I_0 = 0 Terminate With No Interrupt (INTRQ)	

*NOTE: See Type IV Command Description for further information.



TYPE I COMMAND FLOW



TYPE I COMMAND FLOW

TYPE I COMMANDS

The Type I Commands include the Restore, Seek, Step, Step-In, and Step-Out commands. Each of the Type I Commands contains a rate field (r0 r1), which determines the stepping motor rate as defined in Table 3.

A 2 μs (MFM) or 4 μs (FM) pulse is provided as an output to the drive. For every step pulse issued, the drive moves one track location in a direction determined by the direction output. The chip will step the drive in the same direction it last stepped unless the command changes the direction.

The Direction signal is active high when stepping in and low when stepping out. The Direction signal is valid 12 μs before the first stepping pulse is generated.

The rates (shown in Table 3) can be applied to a Step-Direction Motor through the device interface.

TABLE 3. STEPPING RATES

CLK	2 MHz	2 MHz	1 MHz	1 MHz	2 MHz	1 MHz
$\overline{DDEN}$	0	1	0	1	x	x
R1 R0	$\overline{TEST}$=1	$\overline{TEST}$=1	$\overline{TEST}$=1	$\overline{TEST}$=1	$\overline{TEST}$=0	$\overline{TEST}$=0
0 0	3 ms	3 ms	6 ms	6 ms	184μs	368μs
0 1	6 ms	6 ms	12 ms	12 ms	190μs	380μs
1 0	10 ms	10 ms	20 ms	20 ms	198μs	396μs
1 1	15 ms	15 ms	30 ms	30 ms	208μs	416μs

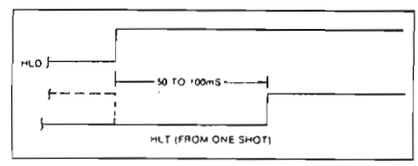
After the last directional step an additional 15 milliseconds of head settling time takes place if the Verify flag is set in Type I commands. Note that this time doubles to 30 ms for a 1 MHz clock. If $\overline{TEST}$ = 0, there is zero settling time. There is also a 15 ms head settling time if the E flag is set in any Type II or III command.

When a Seek, Step or Restore command is executed an optional verification of Read-Write head position can be performed by settling bit 2 (V = 1) in the command word to a logic 1. The verification operation begins at the end of the 15 millisecond settling time after the head is loaded against the media. The track number from the first encountered ID Field is compared against the contents of the Track Register. If the track numbers compare and the ID Field Cyclic Redundancy Check (CRC) is correct, the verify operation is complete and an INTRQ is generated with no errors. If there is a match but not a valid CRC, the CRC error status bit is set (Status bit 3), and the next encountered ID field is read from the disk for the verification operation.

The FD179X must find an ID field with correct track number and correct CRC within 5 revolutions of the media; otherwise the seek error is set and an INTRQ is generated. If V = 0, no verification is performed.

The Head Load (HLD) output controls the movement of the read/write head against the media. HLD is activated at the beginning of a Type I command if the h flag is set (h = 1), at the end of the Type I command if the verify flag (V = 1), or upon receipt of any Type II or III command. Once HLD is active it remains active until either a Type I command is received with (h = 0 and V = 0); or if the FD179X is in an idle state (non-busy) and 15 index pulses have occurred.

Head Load timing (HLT) is an input to the FD179X which is used for the head engage time. When HLT = 1, the FD179X assumes the head is completely engaged. The head engage time is typically 30 to 100 ms depending on drive. The low to high transition on HLD is typically used to fire a one shot. The output of the one shot is then used for HLT and supplied as an input to the FD179X.



HEAD LOAD TIMING

When both HLD and HLT are true, the FD179X will then read from or write to the media. The "and" of HLD and HLT appears as status Bit 5 in Type I status.

In summary for the Type I commands: if h = 0 and V = 0, HLD is reset. If h = 1 and V = 0, HLD is set at the beginning of the command and HLT is not sampled nor is there an internal 15 ms delay. If h = 0 and V = 1, HLD is set near the end of the command, an internal 15 ms occurs, and the FD179X waits for HLT to be true. If h = 1 and V = 1, HLD is set at the beginning of the command. Near the end of the command, after all the steps have been issued, an internal 15 ms delay occurs and the FD179X then waits for HLT to occur.

For Type II and III commands with E flag off, HLD is made active and HLT is sampled until true. With E flag on, HLD is made active, an internal 15 ms delay occurs and then HLT is sampled until true.

RESTORE (SEEK TRACK 0)

Upon receipt of this command the Track 00 ($\overline{TR00}$) input is sampled. If $\overline{TR00}$ is active low indicating the Read-Write head is positioned over track 0, the Track Register is loaded with zeroes and an interrupt is generated. If $\overline{TR00}$ is not active low, stepping pulses (pins 15 to 16) at a rate specified by the r1 r0 field are issued until the $\overline{TR00}$ input is activated. At this time the Track Register is loaded with zeroes and an interrupt is generated. If the $\overline{TR00}$ input does not go active low after 255 stepping pulses, the FD179X terminates operation, interrupts, and sets the Seek error status bit, providing the V flag is set. A verification operation also takes place if the V flag is set. The h bit allows the head to be loaded at the start of command. Note that the Restore command is executed when $\overline{MR}$ goes from an active to an inactive state and that the DRQ pin stays low.

SEEK

This command assumes that the Track Register contains the track number of the current position of the Read-Write head and the Data Register contains the desired track number. The FD179X will update the Track register and issue stepping pulses in the appropriate direction until the contents of the Track register are equal to the contents of the Data Register (the desired track location). A verification operation takes place if the V flag is on. The h bit allows the head to be loaded at the start of the command. An interrupt is generated at the completion of the command. Note: When using multiple drives, the track register must be updated for the drive selected before seeks are issued.

STEP

Upon receipt of this command, the FD179X issues one stepping pulse to the disk drive. The stepping motor direction is the same as in the previous step command. After a delay determined by the r1r0 field, a verification takes place if the V flag is on. If the U flag is on, the Track Register is updated. The h bit allows the head to be loaded at the start of the command. An interrupt is generated at the completion of the command.

STEP-IN

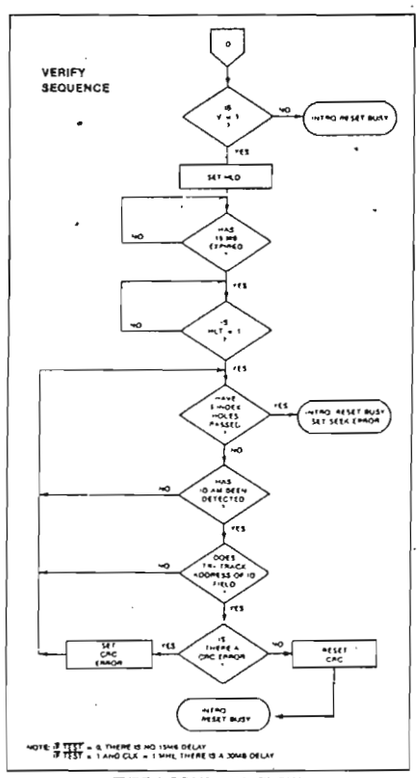
Upon receipt of this command, the FD179X issues one stepping pulse in the direction towards track 76. If the U flag is on, the Track Register is incremented by one. After a delay determined by the r1r0 field, a verification takes place if the V flag is on. The h bit allows the head to be loaded at the start of the command. An interrupt is generated at the completion of the command.

STEP-OUT

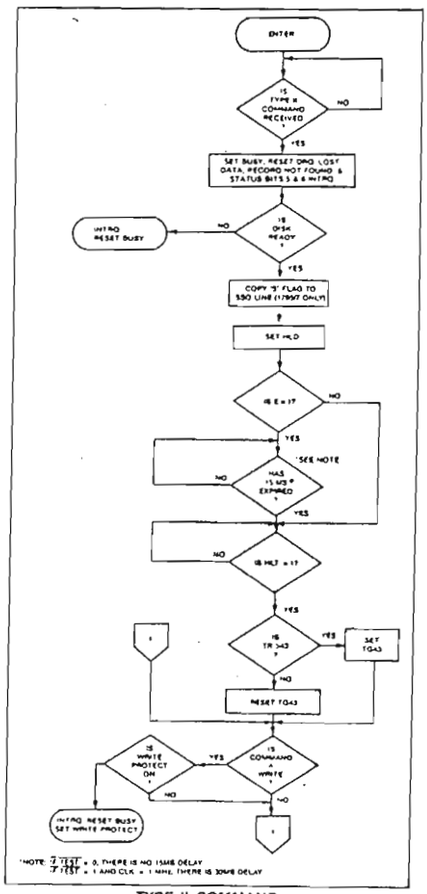
Upon receipt of this command, the FD179X issues one stepping pulse in the direction towards track 0. If the U flag is on, the Track Register is decremented by one. After a delay determined by the r1r0 field, a verification takes place if the V flag is on. The h bit allows the head to be loaded at the start of the command. An interrupt is generated at the completion of the command.

EXCEPTIONS

On the 1795/7 devices, the SSO output is not affected during Type 1 commands, and an internal side compare does not take place when the (V) Verify Flag is on.



TYPE I COMMAND FLOW



TYPE II COMMAND

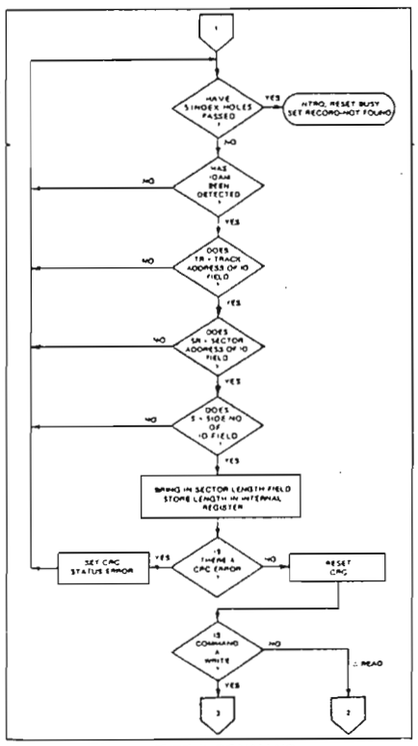
TYPE II COMMANDS

The Type II Commands are the Read Sector and Write Sector commands. Prior to loading the Type II Command into the Command Register, the computer must load the Sector Register with the desired sector number. Upon receipt of the Type II command, the busy status Bit is set. If the E flag = 1 (this is the normal case) HLD is made active and HLT is sampled after a 15 msec delay. If the E flag is 0, the head is loaded and HLT sampled with no 15 msec delay. The ID field and Data Field format are shown on page 13.

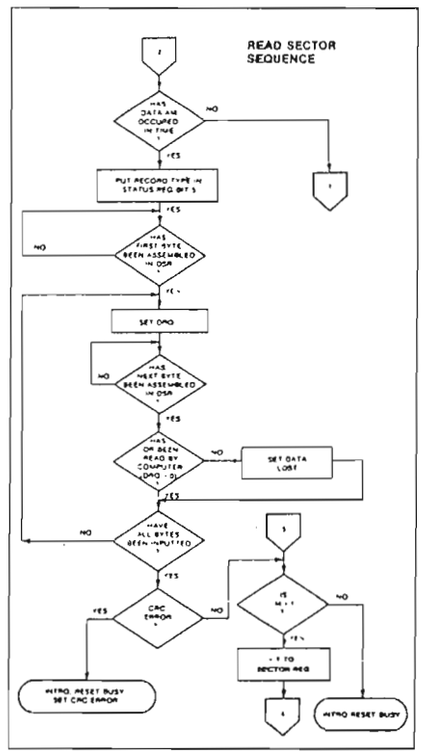
When an ID field is located on the disk, the FD179X compares the Track Number on the ID field with the Track Register. If there is not a match, the next encountered ID field is read and a comparison is again made. If there was a match, the Sector Number of the ID field is compared with the Sector Register. If there is not a Sector match, the next encountered ID field is read off the disk and comparisons again made. If the ID field CRC is correct, the data field is then located and will be either written into, or read from depending upon the command. The FD179X must find an ID field with a Track number, Sector number, side number, and CRC within four revolutions of the disk; otherwise, the Record not found status bit is set (Status bit 3) and the command is terminated with an interrupt.

Each of the Type II Commands contains an (m) flag which determines if multiple records (sectors) are to be read or written, depending upon the command. If m = 0, a single sector is read or written and an interrupt is generated at the completion of the command. If m = 1, multiple records are read or written with the sector register internally updated so that an address verification can occur on the next record. The FD179X will continue to read or write multiple records and update the sector register in numerical ascending sequence until the sector register exceeds the number of sectors on the track or until the Force Interrupt command is loaded into the Command Register, which terminates the command and generates an interrupt.

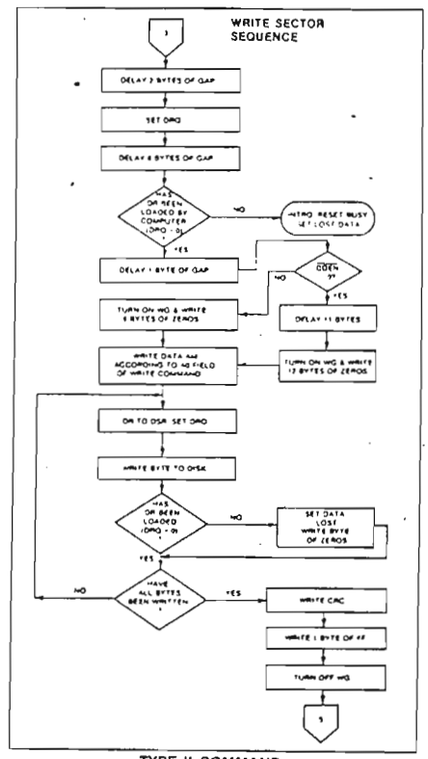
For example: If the FD179X is instructed to read sector 27 and there are only 26 on the track, the sector register exceeds the number available. The FD179X will search for 5 disk revolutions, interrupt out, reset busy, and set the record not found status bit.



TYPE II COMMAND



TYPE II COMMAND



TYPE II COMMAND

The Type II commands for 1791-94 also contain side select compare flags. When C = 0 (Bit 1) no side comparison is made. When C = 1, the LSB of the side number is read off the ID Field of the disk and compared with the contents of the (S) flag (Bit 3). If the S flag compares with the side number recorded in the ID field, the FD179X continues with the ID search. If a comparison is not made within 5 index pulses, the interrupt line is made active and the Record-Not-Found status bit is set.

The Type II and III commands for the 1795-97 contain a side select flag (Bit 1). When U = 0, SSO is updated to 0. Similarly, U = 1 updates SSO to 1. The chip compares the SSO to the ID field. If they do not compare within 5 revolutions the interrupt line is made active and the RNF status bit is set.

The 1795/7 READ SECTOR and WRITE SECTOR commands include a 'L' flag. The 'L' flag, in conjunction with the sector length byte of the ID Field, allows different byte lengths to be implemented in each sector. For IBM compatability, the 'L' flag should be set to a one.

READ SECTOR

Upon receipt of the Read Sector command, the head is loaded, the Busy status bit set, and when an ID field is encountered that has the correct track number, correct sector number, correct side number, and correct CRC, the data field is presented to the computer. The Data Address Mark of the data field must be found within 30 bytes in single density and 43 bytes in double density of the last ID field CRC byte; if not, the ID field is searched for and verified again followed by the Data Address Mark search. If after 5 revolutions the DAM cannot be found, the Record Not Found status bit is set and the operation is terminated.

When the first character or byte of the data field has been shifted through the DSR, it is transferred to the DR, and DRQ is generated. When the next byte is accumulated in the DSR, it is transferred to the DR and another DRQ is generated. If the Computer has not read the previous contents of the DR before a new character is transferred that character is lost and the Lost Data Status bit is set. This sequence continues until the complete data field has been inputted to the computer. If there is a CRC error at the end of the data field, the CRC error status bit is set, and the command is terminated (even if it is a multiple record command).

At the end of the Read operation, the type of Data Address Mark encountered in the data field is recorded in the Status Register (Bit 5) as shown:

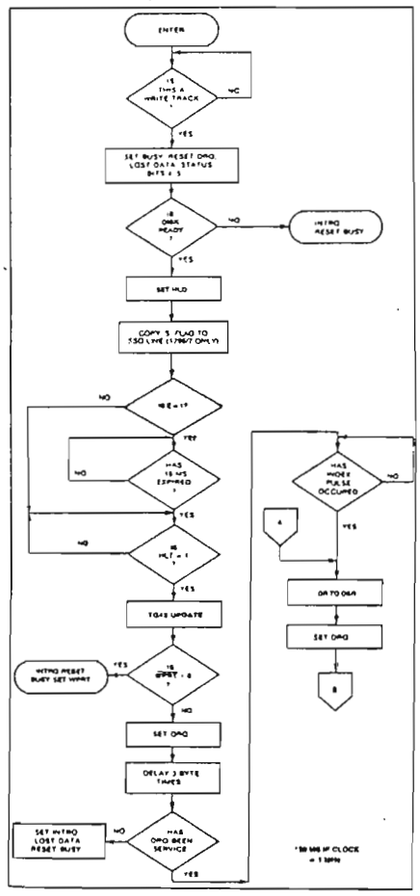
STATUS BIT 5	
1	Deleted Data Mark
0	Data Mark

WRITE SECTOR

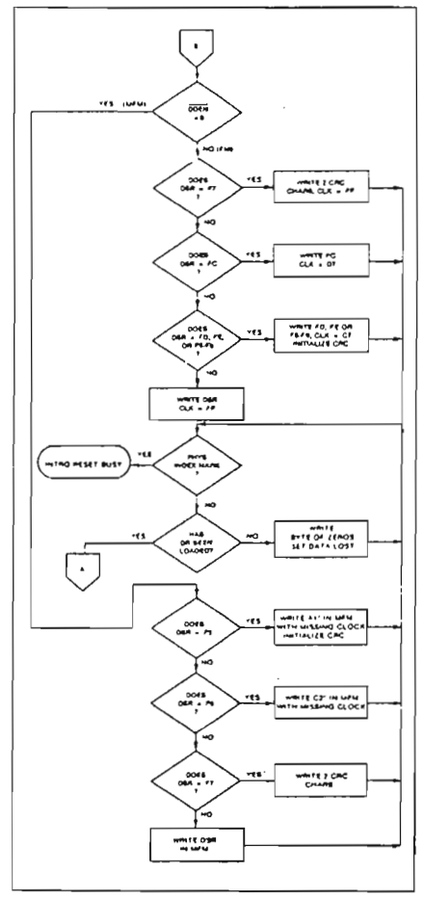
Upon receipt of the Write Sector command, the head is loaded (HLD active) and the Busy status bit is set. When an ID field is encountered that has the correct track number, correct sector number, correct side number, and correct CRC, a DRQ is generated. The FD179X counts off 11 bytes in single density and 22 bytes in double density from the CRC field and the Write Gate (WG) output is made active if the DRQ is serviced (i.e., the DR has been loaded by the computer). If DRQ has not been serviced, the command is terminated and the Lost Data status bit is set. If the DRQ has been serviced, the WG is made active and six bytes of zeroes in single density and 12 bytes in double density are then written on the disk. At this time the Data Address Mark is then written on the disk as determined by the a_0 field of the command as shown below:

a_0	Data Address Mark (Bit 0)
1	Deleted Data Mark
0	Data Mark

The FD179X then writes the data field and generates DRQ's to the computer. If the DRQ is not serviced in time for continuous writing the Lost Data Status Bit is set and a byte of zeroes is written on the disk. The command is not terminated. After the last data byte has been written on the disk, the two-byte CRC is computed internally and written on the disk followed by one byte of logic ones in FM or in MFM. The WG output is then deactivated. For a 2 MHz clock the INTRQ will set 8 to 12 μsec after the last CRC byte is written. For partial sector writing, the proper method is to write the data and fill the balance with zeroes. By letting the chip fill the zeroes, errors may be masked by the lost data status and improper CRC Bytes.



TYPE III COMMAND WRITE TRACK



TYPE III COMMAND WRITE TRACK

TYPE III COMMANDS

READ ADDRESS

Upon receipt of the Read Address command, the head is loaded and the Busy Status Bit is set. The next encountered ID field is then read in from the disk, and the six data bytes of the ID field are assembled and transferred to the DR, and a DRQ is generated for each byte. The six bytes of the ID field are shown below:

TRACK ADDR	SIDE NUMBER	SECTOR ADDRESS	SECTOR LENGTH	CRC 1	CRC 2
1	2	3	4	5	6

Although the CRC characters are transferred to the computer, the FD179X checks for validity and the CRC error status bit is set if there is a CRC error. The Track Address of the ID field is written into the sector register so that a comparison can be made by the user. At the end of the operation an interrupt is generated and the Busy Status is reset.

READ TRACK

Upon receipt of the READ track command, the head is loaded, and the Busy Status bit is set. Reading starts with the leading edge of the first encountered index pulse and continues until the next index pulse. All Gap, Header, and data bytes are assembled and transferred to the data register and DRQ's are generated for each byte. The accumulation of bytes is synchronized to each address mark encountered. An interrupt is generated at the completion of the command.

This command has several characteristics which make it suitable for diagnostic purposes. They are: the Read Gate is not activated during the command; no CRC checking is performed; gap information is included in the data stream; the internal side compare is not performed; and the address mark detector is on for the duration of the command. Because the A.M. detector is always on, write splices or noise may cause the chip to look for an A.M. If an address mark does not appear on schedule the Lost Data status flag is set.

The ID A.M., ID field, ID CRC bytes, DAM, Data, and Data CRC Bytes for each sector will be correct. The Gap Bytes may be read incorrectly during write-splice time because of synchronization.

CONTROL BYTES FOR INITIALIZATION

DATA PATTERN IN DR (HEX)	FD179X INTERPRETATION IN FM ($\overline{DDEN}$ = 1)	FD1791/3 INTERPRETATION IN MFM ($\overline{DDEN}$ = 0)
00 thru F4	Write 00 thru F4 with CLK = FF	Write 00 thru F4, in MFM
F5	Not Allowed	Write A1* in MFM, Preset CRC
F6	Not Allowed	Write C2** in MFM
F7	Generate 2 CRC bytes	Generate 2 CRC bytes
F8 thru FB	Write F8 thru FB, Clk = C7, Preset CRC	Write F8 thru FB, in MFM
FC	Write FC with Clk = D7	Write FC in MFM
FD	Write FD with Clk = FF	Write FD in MFM
FE	Write FE, Clk = C7, Preset CRC	Write FE in MFM
FF	Write FF with Clk = FF	Write FF in MFM

*Missing clock transition between bits 4 and 5

**Missing clock transition between bits 3 & 4

WRITE TRACK FORMATTING THE DISK

(Refer to section on Type III commands for flow diagrams.)

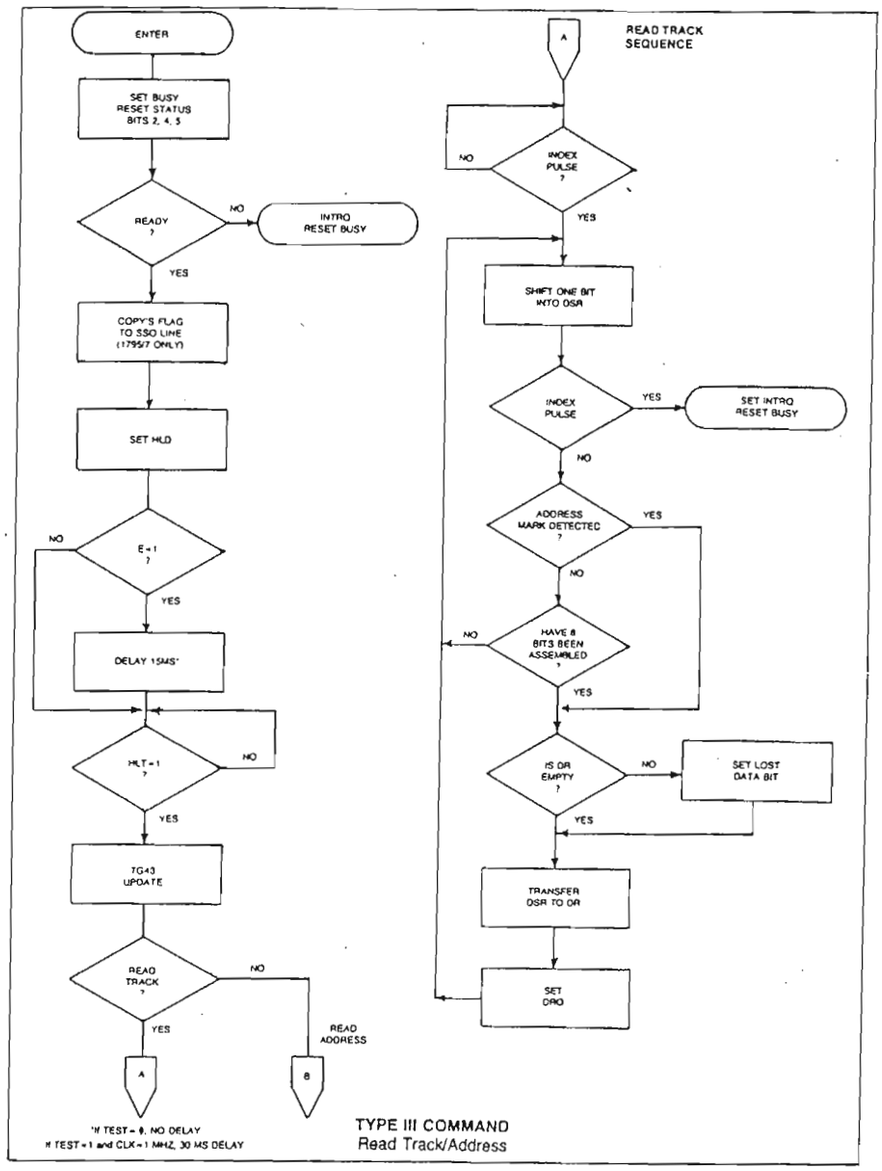
Formatting the disk is a relatively simple task when operating programmed I/O or when operating under DMA with a large amount of memory. Data and gap information must be provided at the computer interface. Formatting the disk is accomplished by positioning the R/W head over the desired track number and issuing the Write Track command.

Upon receipt of the Write Track command, the head is loaded and the Busy Status bit is set. Writing starts with the leading edge of the first encountered index pulse and continues until the next index pulse, at which time the interrupt is activated. The Data Request is activated immediately upon receiving the command, but writing will not start until after the first byte has been loaded into the Data Register. If the DR has not been loaded by the time the index pulse is encountered the operation is terminated making the device Not Busy, the Lost Data Status Bit is set, and the Interrupt is activated. If a byte is not present in the DR when needed, a byte of zeroes is substituted.

This sequence continues from one index mark to the next index mark. Normally, whatever data pattern appears in the data register is written on the disk with a normal clock pattern. However, if the FD179X detects a data pattern of F5 thru FE in the data register, this is interpreted as data address marks with missing clocks or CRC generation.

The CRC generator is initialized when any data byte from F8 to FE is about to be transferred from the DR to the DSR in FM or by receipt of F5 in MFM. An F7 pattern will generate two CRC characters in FM or MFM. As a consequence, the patterns F5 thru FE must not appear in the gaps, data fields, or ID fields. Also, CRC's must be generated by an F7 pattern.

Disks may be formatted in IBM 3740 or System 34 formats with sector lengths of 128, 256, 512, or 1024 bytes.



TYPE III COMMAND
Read Track/Address

TYPE IV COMMANDS

The Forced Interrupt command is generally used to terminate a multiple sector read or write command or to insure Type I status in the status register. This command can be loaded into the command register at any time. If there is a current command under execution (busy status bit set), the command will be terminated and the busy status bit reset.

The lower four bits of the command determine the conditional interrupt as follows:

I_0 = Not-Ready to Ready Transition
I_1 = Ready to Not-Ready Transition
I_2 = Every Index Pulse
I_3 = Immediate Interrupt

The conditional interrupt is enabled when the corresponding bit positions of the command ($I_3 \cdot I_0$) are set to a 1. Then, when the condition for interrupt is met, the INTRQ line will go high signifying that the condition specified has occurred. If $I_3 \cdot I_0$ are all set to zero (HEX D0), no interrupt will occur but any command presently under execution will be immediately terminated. When using the immediate interrupt condition (I_3 = 1) an interrupt will be immediately generated and the current command terminated. Reading the status or writing to the command register will not automatically clear the interrupt. The HEX D0 is the only command that will enable the immediate interrupt (HEX D8) to clear on a subsequent load command register or read status register operation. Follow a HEX D8 with D0 command.

Wait 8 micro sec (double density) or 16 micro sec (single density before issuing a new command after issuing a forced interrupt (times double when clock = 1 MHz). Loading a new command sooner than this will nullify the forced interrupt.

Forced interrupt stops any command at the end of an internal micro-instruction and generates INTRQ when the specified condition is met. Forced interrupt will wait until ALU operations in progress are complete (CRC calculations, compares, etc.).

More than one condition may be set at a time. If for example, the READY TO NOT-READY condition (I_1 = 1) and the Every Index Pulse (I_2 = 1) are both set, the resultant command would be HEX "DA". The "OR" function is performed so that either a READY TO NOT- READY or the next Index Pulse will cause an interrupt condition.

STATUS REGISTER

Upon receipt of any command, except the Force Interrupt command, the Busy Status bit is set and the rest of the status bits are updated or cleared for the new command. If the Force Interrupt Command is received when there is a current command under execution, the Busy status bit is reset, and the rest of the status bits are unchanged. If the Force Interrupt command is received when there is not a current command under execution, the Busy Status bit is reset and the rest of the status bits are updated or cleared. In this case, Status reflects the Type I commands.

The user has the option of reading the status register through program control or using the DRQ line with DMA or interrupt methods. When the Data register is read the DRQ bit in the status register and the DRQ line are automatically reset. A write to the Data register also causes both DRQ's to reset.

The busy bit in the status may be monitored with a user program to determine when a command is complete, in lieu of using the INTRQ line. When using the INTRQ, a busy status check is not recommended because a read of the status register to determine the condition of busy will reset the INTRQ line.

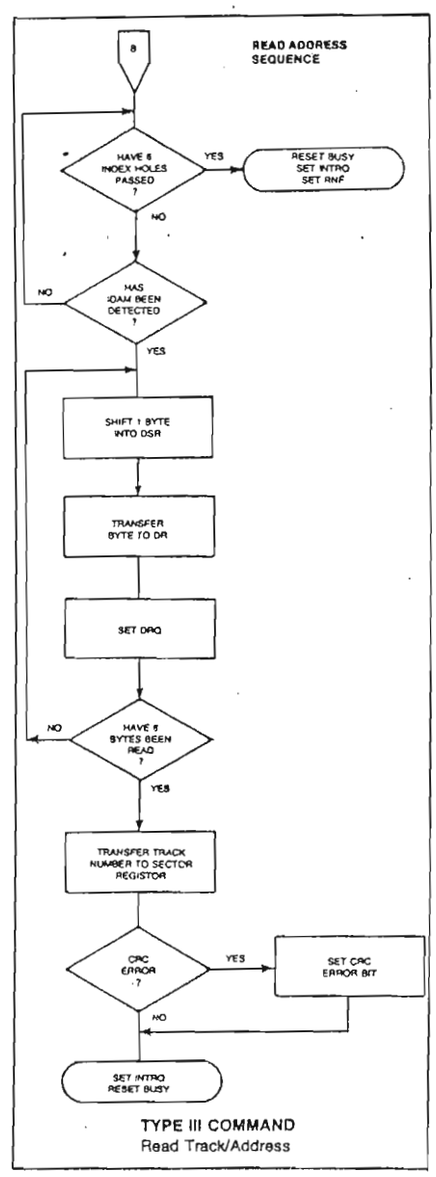
The format of the Status Register is shown below:

(BITS)							
7	6	5	4	3	2	1	0
S7	S6	S5	S4	S3	S2	S1	S0

Status varies according to the type of command executed as shown in Table 4.

Because of internal sync cycles, certain time delays must be observed when operating under programmed I/O. They are: (times double when clock = 1 MHz)

Operation	Next Operation	Delay Req'd. FM	MFM
Write to Command Reg.	Read Busy Bit (Status Bit 0)	12 µs	6 µs
Write to Command Reg.	Read Status Bits 1-7	28 µs	14 µs
Write Any Register	Read From Diff. Register	0	0



TYPE III COMMAND
Read Track/Address

IBM 3740 FORMAT — 128 BYTES/SECTOR

Shown below is the IBM single-density format with 128 bytes/sector. In order to format a diskette, the user must issue the Write Track command, and load the data register with the following values. For every byte to be written, there is one Data Request.

IBM 3740 FORMAT — 128 BYTES/SECTOR

Shown below is the IBM single-density format with 128 bytes/sector. In order to format a diskette, the user must issue the Write Track command, and load the data register with the following values. For every byte to be written, there is one Data Request.

NUMBER OF BYTES	HEX VALUE OF BYTE WRITTEN
40	FF (or 00)*
6	00
1	FC (Index Mark)
26	FF (or 00)*
6	00
1	FE (ID Address Mark)
1	Track Number
1	Side Number (00 or 01)
1	Sector Number (1 thru 1A)
1	00 (Sector Length)
1	F7 (2 CRC's written)
11	FF (or 00)*
6	00
1	FB (Data Address Mark)
128	Data (IBM uses E5)
1	F7 (2 CRC's written)
27	FF (or 00)*
247**	FF (or 00)*

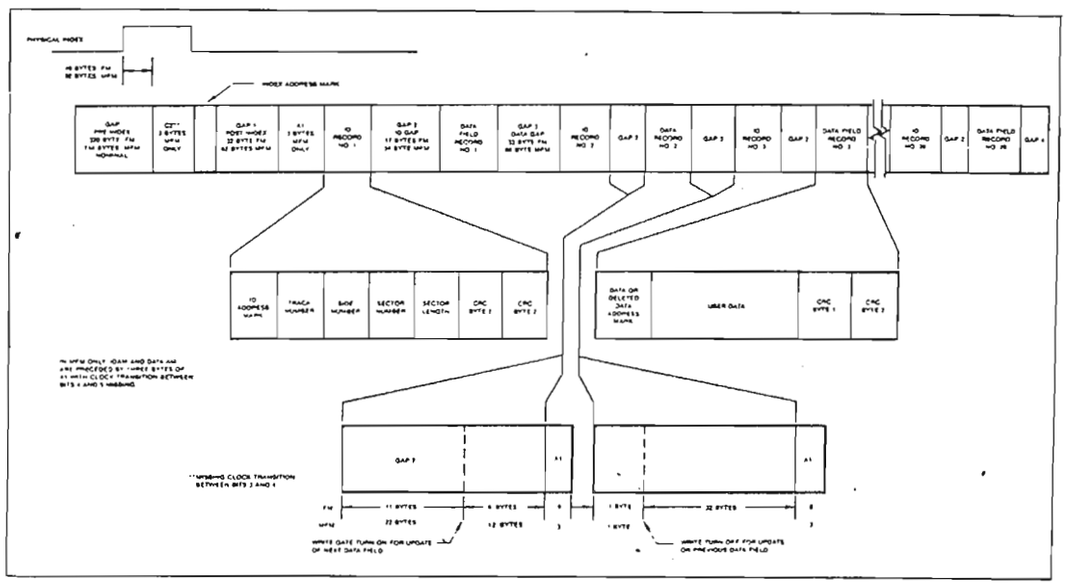
*Write bracketed field 26 times
**Continue writing until FD179X interrupts out. Approx. 247 bytes.
1-Optional '00' on 1795/7 only.

IBM SYSTEM 34 FORMAT- 256 BYTES/SECTOR

Shown below is the IBM dual-density format with 256 bytes/sector. In order to format a diskette the user must issue the Write Track command and load the data register with the following values. For every byte to be written, there is one data request.

NUMBER OF BYTES	HEX VALUE OF BYTE WRITTEN
80	4E
12	00
3	F6 (Writes C2)
1	FC (Index Mark)
* 50	4E
12	00
3	F5 (Writes A1)
1	FE (ID Address Mark)
1	Track Number (0 thru 4C)
1	Side Number (0 or 1)
1	Sector Number (1 thru 1A)
1	01 (Sector Length)
1	F7 (2 CRCs written)
22	4E
12	00
3	F5 (Writes A1)
1	FB (Data Address Mark)
256	DATA
1	F7 (2 CRCs written)
54	4E
598**	4E

*Write bracketed field 26 times
**Continue writing until FD179X interrupts out. Approx. 598 bytes.



IBM TRACK FORMAT

1. NON-IBM FORMATS

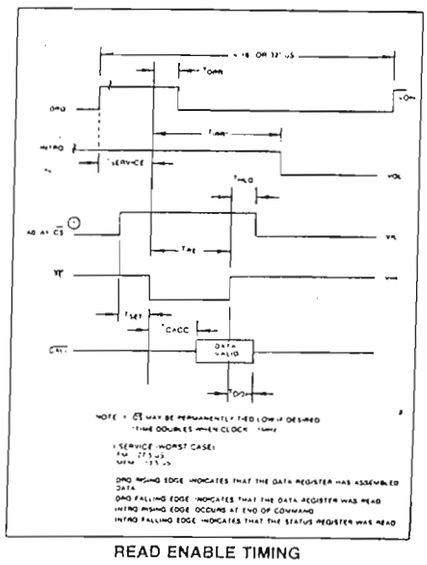
Variations in the IBM formats are possible to a limited extent if the following requirements are met:

1) Sector size must be 128, 256, 512 or 1024 bytes.
2) Gap 2 cannot be varied from the IBM format.
3) 3 bytes of A1 must be used in MFM.

In addition, the Index Address Mark is not required for operation by the FD179X. Gap 1, 3, and 4 lengths can be as short as 2 bytes for FD179X operation, however PLL lock up time, motor speed variation, write-splice area, etc. will add more bytes to each gap to achieve proper operation. It is recommended that the IBM format be used for highest system reliability.

	FM	MFM
Gap I	16 bytes FF	32 bytes 4E
Gap II	11 bytes FF	22 bytes 4E
*	6 bytes 00	12 bytes 00
*		3 bytes A1
Gap III**	10 bytes FF	24 bytes 4E
	4 bytes 00	8 bytes 00
		3 bytes A1
Gap IV	16 bytes FF	16 bytes 4E

*Byte counts must be exact.
**Byte counts are minimum, except exactly 3 bytes of A1 must be written.



READ ENABLE TIMING

TIMING CHARACTERISTICS

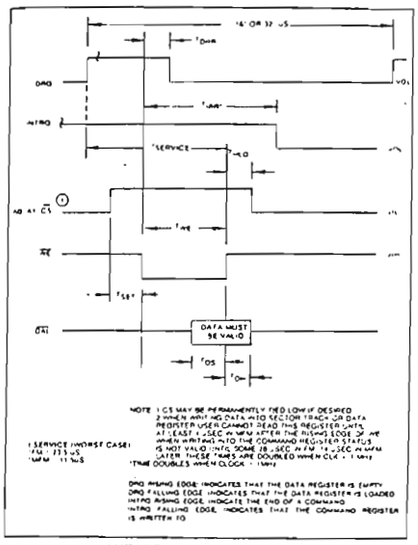
T_A = 0°C to 70°C, V_{DD} = + 12V ± .6V, V_{SS} = 0V, V_{CC} = +5V ± .25V

READ ENABLE TIMING (See Note 6, Page 21)

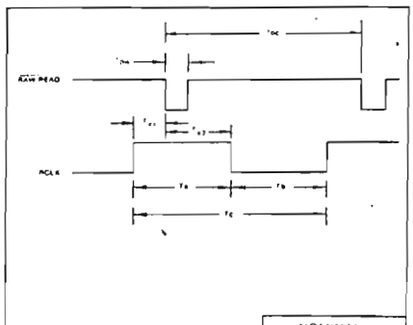
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	CONDITIONS
TSET	Setup ADDR & CS to $\overline{RE}$	50			nsec	
THLD	Hold ADDR & CS from $\overline{RE}$	10			nsec	
TRE	$\overline{RE}$ Pulse Width	400			nsec	C_L = 50 pf
TDRR	DRQ Reset from $\overline{RE}$		400	500	nsec	
TIRR	INTRQ Reset from $\overline{RE}$		500	3000	nsec	See Note 5
TDACC	Data Access from $\overline{RE}$			350	nsec	C_L = 50 pf
TDOH	Data Hold From $\overline{RE}$	50		150	nsec	C_L = 50 pf

WRITE ENABLE TIMING (See Note 6, Page 21)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	CONDITIONS
TSET	Setup ADDR & CS to $\overline{WE}$	50			nsec	
THLD	Hold ADDR & CS from $\overline{WE}$	10			nsec	
TWE	$\overline{WE}$ Pulse Width	350			nsec	
TDRR	DRQ Reset from $\overline{WE}$		400	500	nsec	
TIRR	INTRQ Reset from $\overline{WE}$		500	3000	nsec	See Note 5
TDS	Data Setup to $\overline{WE}$	250			nsec	
TDH	Data Hold from $\overline{WE}$	70			nsec	



WRITE ENABLE TIMING



DISKETTE	MODE	$\overline{DDEN}$	CLK	NOMINAL T_1	NOMINAL T_2	NOMINAL T_3
8"	MFM	0	2 MHz	1 µs	1 µs	2 µs
8"	FM	1	2 MHz	2 µs	2µs	4 µs
5"	MFM	0	1 MHz	2 µs	2µs	4 µs
5"	FM	1	1 MHz	4 µs	4 µs	8 µs

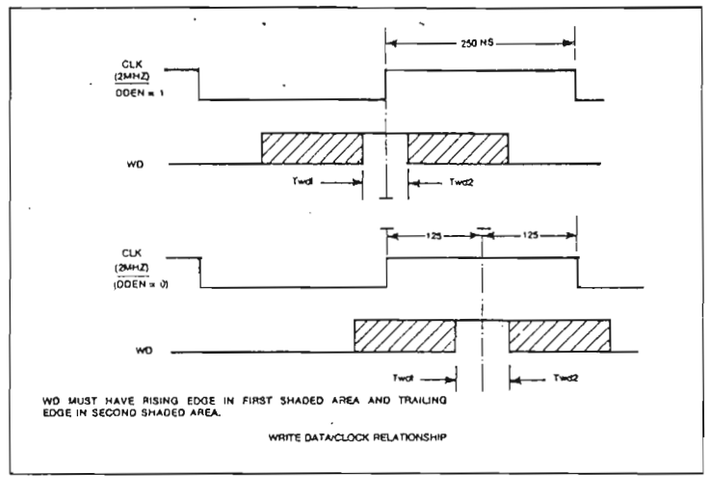
INPUT DATA TIMING

INPUT DATA TIMING:

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Tpw	$\overline{Raw\ Read}$ Pulse Width	100	200		nsec	See Note 1
tbc	$\overline{Raw\ Read}$ Cycle Time	1500	2000		nsec	1800 ns @ 70°C
Tc	RCLK Cycle Time	1500	2000		nsec	1800 ns @ 70°C
T_{x1}	RCLK hold to $\overline{Raw\ Read}$	40			nsec	See Note 1
T_{x2}	$\overline{Raw\ Read}$ hold to RCLK	40			nsec	See Note 1

WRITE DATA TIMING: (ALL TIMES DOUBLE WHEN CLK = 1 MHz) (See Note 6, Page 21)

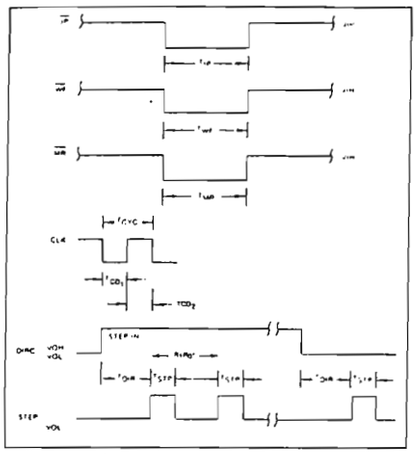
SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Twp	Write Data Pulse Width		500	650	nsec	FM
			200	350	nsec	MFM
Twg	Write Gate to Write Data		2		µsec	FM
			1		µsec	MFM
Tbc	Write data cycle Time		2,3, or 4		µsec	±CLK Error
Ts	Early (Late) to Write Data	125			nsec	MFM
Th	Early (Late) From Write Data	125			nsec	MFM
Twf	Write Gate off from WD		2		µsec	FM
			1		µsec	MFM
Twd1	WD Valid to Clk	100			nsec	CLK = 1 MHZ
		50			nsec	CLK = 2 MHZ
Twd2	WD Valid after CLK	100			nsec	CLK = 1 MHZ
		30			nsec	CLK = 2 MHZ



WRITE DATA TIMING

MISCELLANEOUS TIMING: (Times Double When Clock = 1 MHz) (See Note 6, Page 21)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	CONDITIONS
TCD_1	Clock Duty (low)	230	250	20000	nsec	
TCD_2	Clock Duty (high)	200	250	20000	nsec	
TSTP	Step Pulse Output	2 or 4			μsec	See Note 5 ± CLK ERROR
TDIR	Dir Setup to Step		12		μsec	
TMR	Master Reset Pulse Width	50			μsec	
TIP	Index Pulse Width	10			μsec	See Note 5
TWF	Write Fault Pulse Width	10			μsec	



MISCELLANEOUS TIMING

*FROM STEP RATE TABLE

NOTES:
1. Pulse width on RAW READ (Pin 27) is normally 100-300 ns. However, pulse may be any width if pulse is entirely within window. If pulse occurs in both windows, then pulse width must be less than 300 ns for MFM at CLK = 2 MHz and 600 ns for FM at 2 MHz. Times double for 1 MHz.
2. A PPL Data Separator is recommended for 8" MFM.
3. tbc should be 2 μs, nominal in MFM and 4 μs nominal in FM. Times double when CLK = 1 MHz.
4. RCLK may be high or low during $\overline{\text{RAW READ}}$ (Polarity is unimportant).
5. Times double when clock = 1 MHz.
6. Output timing readings are at V_{OL} = 0.8v and V_{OH} = 2.0v.

Table 4. STATUS REGISTER SUMMARY

BIT	ALL TYPE I COMMANDS	READ ADDRESS	READ SECTOR	READ TRACK	WRITE SECTOR	WRITE TRACK
S7	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY	NOT READY
S6	WRITE PROTECT	0	0	0	WRITE PROTECT	WRITE PROTECT
S5	HEAD LOADED	0	RECORD TYPE	0	WRITE FAULT	WRITE FAULT
S4	SEEK ERROR	RNF	RNF	0	RNF	0
S3	CRC ERROR	CRC ERROR	CRC ERROR	0	CRC ERROR	0
S2	TRACK 0	LOST DATA	LOST DATA	LOST DATA	LOST DATA	LOST DATA
S1	INDEX PULSE	DRQ	DRQ	DRQ	DRQ	DRQ
S0	BUSY	BUSY	BUSY	BUSY	BUSY	BUSY

STATUS FOR TYPE I COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset it indicates that the drive is ready. This bit is an inverted copy of the Ready input and logically 'ored' with MR.
S6 PROTECTED	When set, indicates Write Protect is activated. This bit is an inverted copy of $\overline{\text{WRPT}}$ input.
S5 HEAD LOADED	When set, it indicates the head is loaded and engaged. This bit is a logical "and" of HLD and HLT signals.
S4 SEEK ERROR	When set, the desired track was not verified. This bit is reset to 0 when updated.
S3 CRC ERROR	CRC encountered in ID field.
S2 TRACK 00	When set, indicates Read/Write head is positioned to Track 0. This bit is an inverted copy of the $\overline{\text{TR00}}$ input.
S1 INDEX	When set, indicates index mark detected from drive. This bit is an inverted copy of the $\overline{\text{IP}}$ input.
S0 BUSY	When set command is in progress. When reset no command is in progress.

STATUS FOR TYPE II AND III COMMANDS

BIT NAME	MEANING
S7 NOT READY	This bit when set indicates the drive is not ready. When reset, it indicates that the drive is ready. This bit is an inverted copy of the Ready input and 'ored' with MR. The Type II and III Commands will not execute unless the drive is ready.
S6 WRITE PROTECT	On Read Record: Not Used. On Read Track: Not Used. On any Write: It indicates a Write Protect. This bit is reset when updated.
S5 RECORD TYPE/ WRITE FAULT	On Read Record: It indicates the record-type code from data field address mark. 1 = Deleted Data Mark. 0 = Data Mark. On any Write: It indicates a Write Fault. This bit is reset when updated.
S4 RECORD NOT FOUND (RNF)	When set, it indicates that the desired track, sector, or side were not found. This bit is reset when updated.
S3 CRC ERROR	If S4 is set, an error is found in one or more ID fields; otherwise it indicates error in data field. This bit is reset when updated.
S2 LOST DATA	When set, it indicates the computer did not respond to DRQ in one byte time. This bit is reset to zero when updated.
S1 DATA REQUEST	This bit is a copy of the DRQ output. When set, it indicates the DR is full on a Read Operation or the DR is empty on a Write operation. This bit is reset to zero when updated.
S0 BUSY	When set, command is under execution. When reset, no command is under execution.

ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings
- V_{DD} with repect to V_{SS} (ground): + 15 to − 0.3V
- Voltage to any input with respect to V_{SS} = + 15 to − 0.3V
- I_{CC} = 60 MA (35 MA nominal)
- I_{DD} = 15 MA (10 MA nominal)

C_{IN} & C_{OUT} = 15 pF max with all pins grounded except one under test.
Operating temperature = 0°C to 70°C
Storage temperature = − 55°C to + 125°C

OPERATING CHARACTERISTICS (DC)

TA = 0°C to 70°C, V_{DD} = + 12V ± .6V, V_{SS} = 0V, V_{CC} = + 5V ± .25V

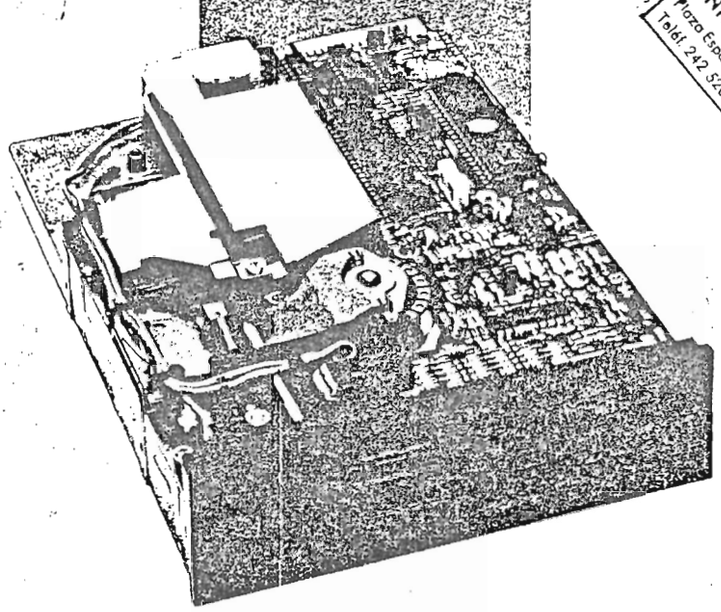
SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	CONDITIONS
I_{IL}	Input Leakage		10	μA	V_{IN} = V_{DD}**
I_{OL}	Output Leakage		10	μA	V_{OUT} = V_{DD}
V_{IH}	Input High Voltage	2.6		V	
V_{IL}	Input Low Voltage		0.8	V	
V_{OH}	Output High Voltage	2.8		V	I_O = − 100 μA
V_{OL}	Output Low Voltage		0.45	V	I_O = 1.6 mA*
P_D	Power Dissipation		0.6	W	

*1792 and 1794 I_O = 1.0 mA
**Leakage conditions are for input pins without internal pull-up resistors. Pins 22, 23, 33, 36, and 37 have pull-up resistors. See Tech Memo #115 for testing procedures.

TM65 SERIES THINLINE™

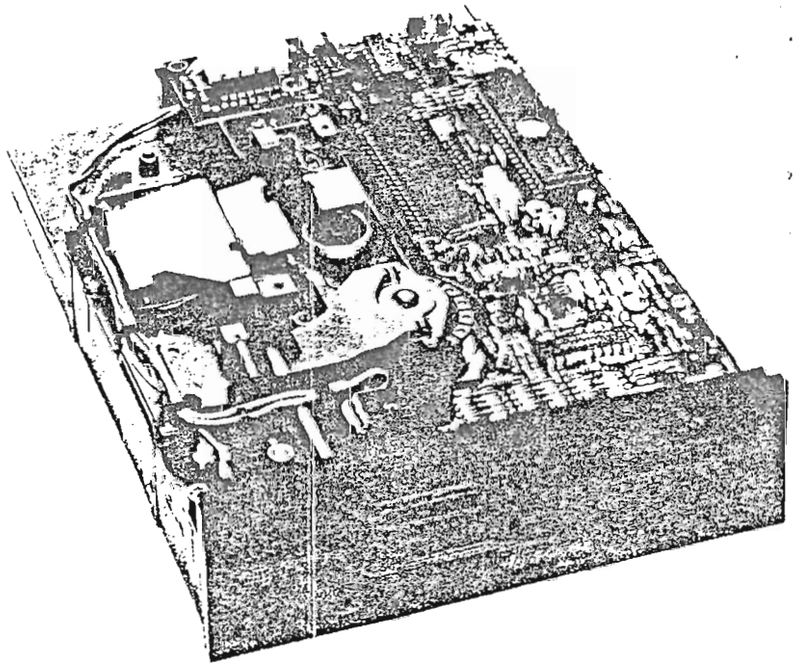
FLEXIBLE DISK DRIVES

PRODUCT SPECIFICATION AND USER'S MANUAL



TM65 SERIES THINLINE™
5-1/4-INCH, SINGLE AND DOUBLE-SIDED, FLEXIBLE DISK DRIVES
48 AND 96 TRACKS PER INCH
PRODUCT SPECIFICATION AND USER'S MANUAL

TM65-4



Tandon CORPORATION
20320 PRAIRIE STREET
CHATSWORTH, CALIFORNIA 91311

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

This manual provides useful information in order to evaluate and incorporate Tandon's disk drive into a system.

Tandon Corporation's TM65 series of drives are full feature, one-half height, 5-1/4-inch ThinLine™ flexible disk drives. The drives are compact data storage devices that use an ANSI-compatible, Industry Standard 5-1/4-inch diskette.

Model Number TM65-1L is a single-sided, 48 tracks per inch, recording device. The TM65-2L is a double-sided, 48 tracks per inch, recording device. Model Number TM65-4 is a double-sided, 96 tracks per inch, recording device.

The drives are capable of reading and writing digital data using FM, MFM, or MMFM techniques. Encoding and decoding of the data is done by the user's controller.

1.1 SCOPE OF THE DOCUMENT

This document contains a description of the major features, physical and functional specifications, mounting and power requirements, the interface, and typical timing characteristics of the TM65 series of drives.

1.2 PURPOSE OF THE DRIVE

These drives are rotating disk memories designed for random access data entry, storage, and retrieval applications. Typical applications include intelligent terminal controllers, microcomputers, word processing systems, data communication systems, error logging, microprogram loading, and point-of-sale terminals.

INTERNAL TRIM ERASE

The drive provides the control signals necessary for proper trim erasure of data.

INDUSTRY STANDARD INTERFACE COMPATIBILITY

The drive is compatible with controllers that use an industry standard interface.

ACTIVITY INDICATOR

An activity indicator, located on the front panel, is automatically illuminated when the drive is selected.

COMPACT SIZE

The reduced height of the drive enables it to occupy only one-half the mounting space required for a conventional drive.

1.3 MAJOR FEATURES

MICROPROCESSOR CONTROL

The TM65-4 drive features an onboard microprocessor, providing four major features:

1. Momentary motor start for improved media centering.
2. Improved head positioning accuracy with reduced hysteresis.
3. Write current switching for optimal recording quality.
4. Programmable Ready signal.

NOTE

Through the use of LSI circuitry, the microprocessor has been eliminated on the TM65-1L and TM65-2L.

WRITE PROTECT

When a write protected diskette is inserted in the drive, the write electronics are disabled.

DAISY CHAIN CAPABILITY

The drive provides the address selection and gating functions necessary to daisy chain a maximum of four units at the user's option. The last drive on the daisy chain terminates the interface. The terminations are accomplished by a resistor array plugged into a DIP socket.

1.4 FUNCTIONAL DESCRIPTION

The drives are fully self-contained, and require no operator intervention during normal operation. Each drive consists of a direct drive spindle motor, a head positioning system, and a read/write system.

When the front latch is opened, access is provided for insertion of a diskette. The diskette is held in place by aluminum guide rails. Its location is ensured when the diskette is inserted until a back stop is encountered and the ejection mechanism latches.

Closing the front latch on the TM65-4 activates the motor start circuit momentarily, resulting in accurate centering and clamping of the diskette. The drive hub on all versions is held at a constant speed of 300 RPM by a servo-controlled, direct drive, brushless D. C. motor. The heads remain in contact with the recording media until the front latch is opened. If media is not present and the front latch is closed, the heads will remain separated from each other on double-sided drives.

The heads are positioned over the desired track by means of a four-phase stepper/band assembly and its associated electronics. This positioner uses a one-step rotation for 96 TPI to cause a one track linear movement, and a two-step rotation for 48 TPI to cause a one track linear movement.

Data recovery electronics includes an integrated read amplifier, differentiator, zero crossover detector, and digitizing circuit. No data decoding capabilities are provided.

The drive has the following sensors:

1. An optical index sensor generates a digital signal when the index hole on the diskette is detected.

2. An optical write protect sensor disables the write electronics when a write protect tab is applied to the diskette.

3. A motor start switch provides momentary motor spin-up to help center the diskette when the front latch is closed (TM65-4 only).

4. An optical Track 0 sensor detects when the head/carriage assembly is positioned at Track 0.

1.5 PHYSICAL DESCRIPTION

A representative drive is shown in Figure 1-1. The drive can be mounted in a vertical or horizontal plane. However, the logic circuit board must be on the uppermost side when the drive is mounted horizontally.

The read/write head assembly is positioned by a split band positioner mounted to a stepper motor. The read/write heads are glass-bonded, ferrite/ceramic structures with a life expectancy of 20,000 operating hours.

Operator access for diskette loading is provided via a horizontal slot located at the front of the drive.

The electronic components of the drive are mounted on two printed circuit boards. The logic circuit board is mounted above the chassis. The motor control circuit board is mounted directly to the spindle motor. Power and interface signals are routed through connectors plugging directly into the logic circuit board.

The spindle is driven by a direct drive, brushless D. C. spindle motor with integral tachometer and speed control circuit. All of the electronics associated with the spindle motor are mounted on the motor itself. A 50 and 60 Hertz strobe pattern is printed directly on the motor, allowing visual verification of the motor's speed.

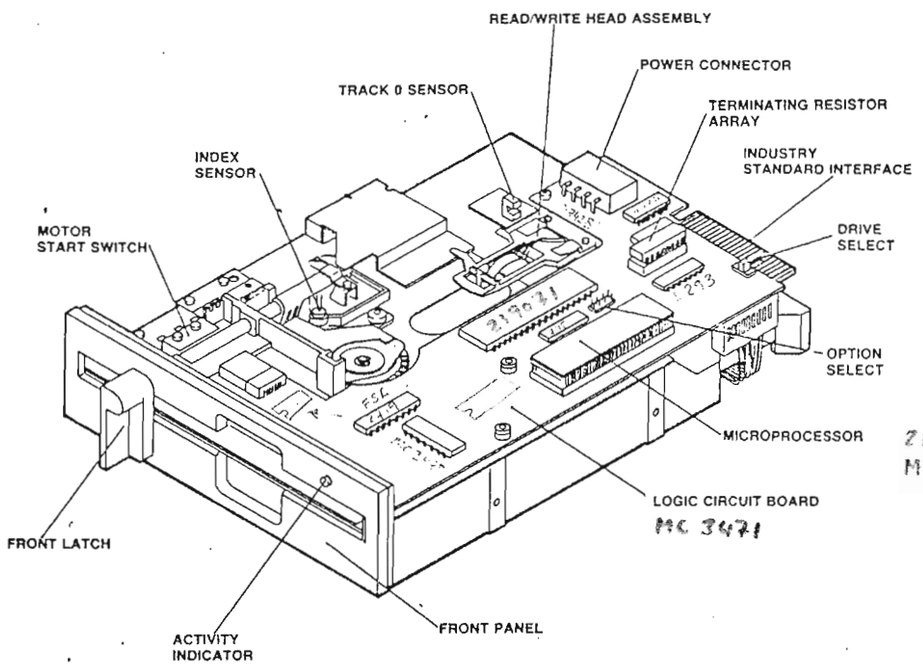


FIGURE 1-1
TM 65-4 DISK DRIVE WITH HEAD SHIELD REMOVED

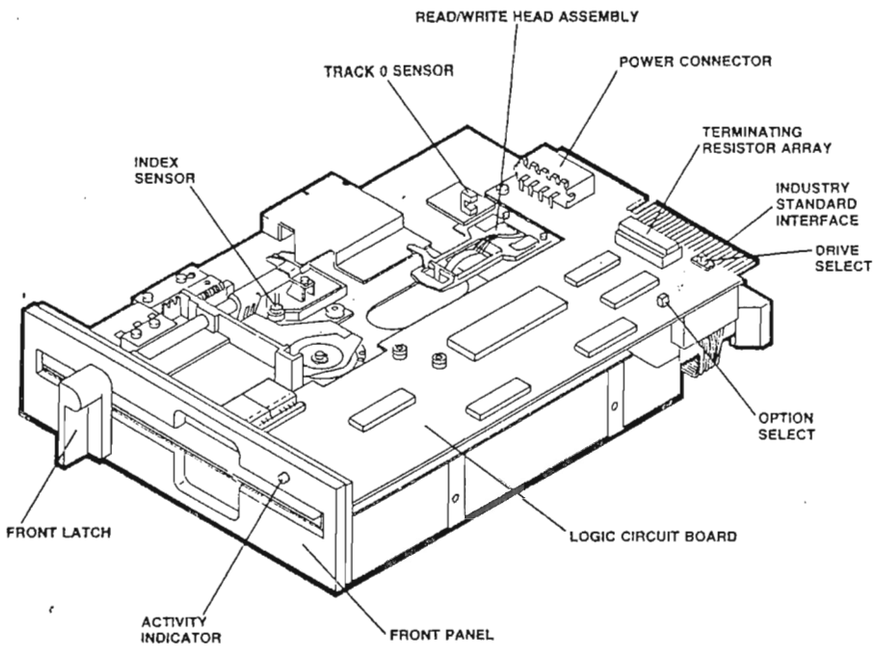


FIGURE 1-2

TM 65-2L DISK DRIVE WITH HEAD SHIELD REMOVED

SECTION 2

PRODUCT SPECIFICATIONS

INTRODUCTION

This section contains the mechanical, electrical and operational, reliability, and environmental specifications for the TM65 series of disk drives.

2.1 MECHANICAL SPECIFICATIONS

The physical dimensions of the drive are located in Figure 2-1.

2.2 ELECTRICAL AND OPERATIONAL SPECIFICATIONS

The electrical and operational specifications are located in Table 2-1

2.3 RELIABILITY SPECIFICATIONS

The reliability specifications are located in Table 2-2.

2.4 ENVIRONMENTAL SPECIFICATIONS

The environmental specifications are located in Table 2-3.

This product is recognized under U.L. EMRT2, Component-Data Processing Equipment, Electronic.

Certified

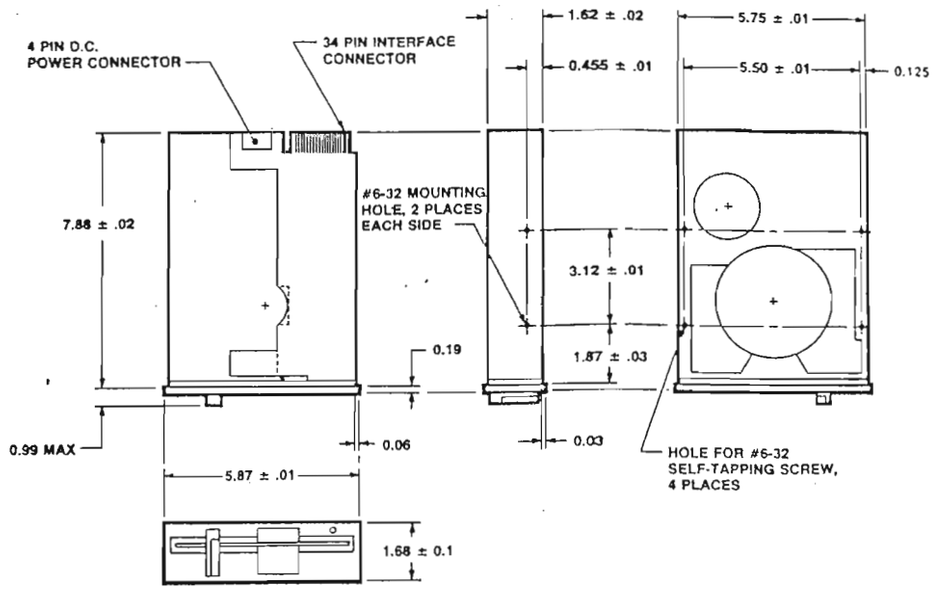


FIGURE 2-1
DISK DRIVE OUTLINE DRAWING

NOTES: ALL DIMENSIONS ARE IN INCHES
WEIGHT IS 2.62 POUNDS, 1.18 KILOGRAMS
DOTTED LINE INDICATES LSI
CIRCUIT BOARD OUTLINE

TABLE 2-1
ELECTRICAL AND OPERATIONAL SPECIFICATIONS

Media	ANSI-compatible, 5-1/4-inch diskette
Media Life (For Reference Only)	4 x 10^6 passes per track
Tracks Per Inch	
TM65-1L	48 TPI
TM65-2L	48 TPI
→ TM65-4	96 TPI
Tracks Per Drive	
TM65-1L	40 tracks
TM65-2L	80 tracks
→ TM65-4	160 tracks
Track Spacing	
TM65-1L	0.529 millimeters, 20.8 milinches
TM65-2L	0.529 millimeters, 20.8 milinches
→ TM65-4	0.265 millimeters, 10.4 milinches
Head Life	20,000 media contact hours
Disk Rotational Speed	300 RPM ±1.5 percent
Average Rotational Latency	100 milliseconds
Instantaneous Speed Variation (ISV)	±2 percent
Motor Start Time	250 milliseconds, maximum
Seek Time, track to track	
TM65-1L	6 milliseconds minimum
TM65-2L	6 milliseconds minimum
→ TM65-4	3 milliseconds minimum

TABLE 2-1 (CONTINUED)
ELECTRICAL AND OPERATIONAL SPECIFICATIONS

Data Transfer Rate	250,000 bits per second, double density
Flux Reversals Per Inch (FRPI), inside track	
All Models, Side 0	5,535 FRPI
TM65-2L and TM65-4, Side 1	5,877 FRPI
Unformatted Recording Capacity, double density	
TM65-1L	250 kilobytes per disk
TM65-2L	500 kilobytes per disk
TM65-4	1 megabyte per disk
Shipment	When prepared for shipment by Tandon, the drive meets the requirements of NSTA pre-shipment test procedure Project 1A.
Head Settling Time	15 milliseconds
Average Track Access Time, including head settling time	90 milliseconds
Typical Recording Modes	FM, MFM, MMFM

D. C. Voltage and Current Requirements

TM65-1L, TM65-2L	TM65-4
+12 volts ± 0.6 volt at 500 milliamperes average, 1.0 amperes maximum, with less than 100 millivolts peak-to-peak ripple.	+12 volts ±0.6 volt at 900 milliamperes average, with less than 100 millivolts peak-to-peak ripple. 850 milliamperes maximum surge current if seek is not performed. If a seek is performed during the motor start interval, surge current is 1.15 amperes maximum for 150 milliseconds.
+5 volts ± 0.25 volt at 300 milliamperes average, 400 milliamperes maximum, with less than 50 millivolts peak-to-peak ripple.	+5 volts ±0.25 volt at 450 milliamperes average with less than 50 millivolts peak-to-peak ripple.

TABLE 2-2
RELIABILITY SPECIFICATIONS

Error Rates, maximum, exclusive of external sources, e.g.: electronics, defective, and contaminated diskettes	
Soft Errors (Recoverable)	One in 10^9 bits
Hard Errors (Nonrecoverable)	One in 10^{12} bits
Seek Errors	One in 10^6 seeks
Mean Time Between Failures	11,000 hours, 100 percent duty cycle
Mean Time To Repair	30 minutes

TABLE 2-3
ENVIRONMENTAL SPECIFICATIONS

Temperature	
Operating, Media Dependent	10°C to 46°C, 50°F to 115°F
Nonoperating	−40°C to 71°C, −40°F to 160°F
Relative Humidity	
Operating, noncondensing, Media Dependent	20-to-80 percent
Nonoperating, noncondensing	5-to-95 percent
Altitude	
Operating or Nonoperating	152.4 meters, 500 feet, below sea level, to 15,240 meters, 50,000 feet, above sea level

SECTION 3

OPERATION

INTRODUCTION

This section contains information on how to unpack, check out, install, and operate the TM65 series of drives.

3.1 UNPACKING THE DRIVE

The drives are shipped in protective containers to minimize the possibility of damage during shipment. The following list is the recommended procedure for unpacking the drive.

1. Place the container on a flat work surface, top side up.
2. Cut the tape that holds the tab in the slot on the front side of the container.

   CAUTION

   Container may spring open when the tape is cut.
3. Remove drive from plastic bag.
4. Inspect the drive for possible damage.
5. Notify the carrier immediately if any damage is found.
6. Save the shipping container for future use.

3.2 PREINSTALLATION CHECKOUT

Before applying power to the drive, the following inspection should be conducted:

1. Remove the cardboard shipping insert, and retain for future shipment.

   CAUTION

   Turning the front latch to the open position will cause the shipping insert to eject. Remove the insert slowly to prevent damage to the upper slider.
2. Check to ensure that the front latch rotates easily. It should remain in the open position when rotated fully counterclockwise (horizontal to front panel).
3. When the latch is moved to an open position, the head arm raises.
4. Ensure the front panel is secure.
5. Manually rotate the drive hub. It should rotate freely.
6. Ensure both circuit boards are secure.
7. Ensure the connectors are firmly seated.

3.3 MOUNTING THE DRIVE

The drive has been designed to be mounted horizontally or vertically. When mounted horizontally, the logic circuit board side of the drive must be the top side.

Two 6-32 tapped mounting holes are provided on each side and four holes for self tapping screws are provided on the bottom of the drive for attachment to user-supplied mounting brackets. When installed in either plane, horizontal or vertical, only two mounting screws are required to securely hold the drive in place. Under no circumstances should four or more mounting screws be used.

Two drives may be mounted in a single, full-size drive enclosure, 3.25-inches high. A two-hole mounting scheme per drive is recommended for mounting in a two drive configuration.

Any mounting scheme in which the drive is part of the structural integrity of the enclosure is not permitted. Mounting schemes should allow for adjustable brackets or incorporate resilient members to accommodate tolerances. In addition, it is recommended that mounting schemes include no more than two mounting surfaces.

The drive is manufactured and tested with some critical internal alignments that must be maintained. Hence, it is important that the mounting hardware not introduce significant stress on the chassis.

DUST COVER

The design of an enclosure should incorporate a means to prevent contamination from loose items, e.g., dust, lint, and paper chad since the drive does not have a dust cover.

COOLING

Heat dissipation from a single drive is normally 9 watts, 31 BTU per hour for the LSI version and 13 watts, 44 BTU per hour for the microprocessor version under high load conditions. When the drive is mounted so the components have access to a free flow of air, normal convection cooling allows operation within the specified temperature range.

When forced air is used, air flow must be directed outward from the drive. Do not intake air through the drive or heads and diskettes.

The use of forced air flow is recommended when two drives are mounted within a single enclosure.

3.4 INTERFACE CONNECTIONS

Interface connections for the TM65 series drives are made via a user-supplied, thirty four-pin, flat ribbon connector, 3M Part Number 3463-0001 or AMP Part Number 583717-5, using contact Part Number 1-583616-1 for twisted pair or its equivalent. This connector mates directly with the circuit board connector at the rear of the drive.

The D. C. power connector is a four-pin connector located at the rear of the drive. The interface description of the connectors, and the location of each one, is contained in this section. Interface lines are located in Table 3-1. D. C. power connector pin assignments are located in Table 3-2, Page 3-7.

The signal wire harness should be of the flat ribbon or twisted pair type, 26-to-28 gauge conductor, compatible with the connector to be used. The recommended cable length is ten feet maximum.

TABLE 3-1
DRIVE INTERFACE LINES
AND PIN ASSIGNMENTS

Input Control Lines:
Controller-To-Disk Drive

Ground	Pin	Signal
1	2	Spare
3	4	Spare
5	6	Drive Select 3
9	10	Drive Select 0
11	12	Drive Select 1
13	14	Drive Select 2
15	16	Motor On
17	18	Direction Select
19	20	Step
21	22	Composite Write Data
23	24	Write Enable
31	32	Side Select

Output Control Lines:
Disk Drive-To-Controller

Ground	Pin	Signal
7	8	Index/Sector
25	26	Track 0
27	28	Write Protect
29	30	Composite Read Data
33	34	Ready*

*TM65-4 Standard, see Table 3-3.
TM65-2L Optional. Contact your Tandon representative.

INPUT CONTROL LINES

DRIVE SELECT LINES

The Drive Select lines provide a means of selecting and deselecting a drive. These four lines select one of the four drives attached to the controller.

When the signal logic level is true (low), the drive electronics are activated, then the drive is conditioned to respond to Step or Read/Write commands. A Drive Select line must remain stable in the true (low) state until a Step or Read/Write command is completed. When the signal line logic level is false (high), the input control lines and output status lines are disabled.

The drive address is determined by a jumper select on the logic circuit board. Drive select lines 0 through 3 provide a means of daisy chaining a maximum of four drives to a controller. Only one can be true (low) at a time. An undefined operation results if two or more drives are assigned the same address or if two or more Drive Select lines are in the true (low) state simultaneously.

MOTOR ON

When this signal is true (low), the drive motor accelerates to its nominal speed of 300 RPM, and stabilizes at this speed in less than 250 milliseconds. When the signal line logic level goes false (high), the drive decelerates to a stop. This signal may be gated with Drive Select as an option.

On the TM65-4, the motor activates momentarily when the front latch is closed. This motor start function remains active for approximately three seconds, unless Motor On is in the true (low) condition.

DIRECTION SELECT AND STEP LINES (TWO LINES)

When the drive is selected, a true (low) pulse on the Step line, with a time duration greater than 200 nanoseconds, initiates the access motion. The direction of motion is determined by the logic state of the Direction Select line when a step pulse is issued. The motion is toward the center of the disk if the Direction Select line is in the true (low) state. The direction of motion is away from the center of the disk if the Direction Select line is in the false (high) state.

To ensure proper positioning, the Direction Select line should be stable at least 100 nanoseconds prior to issuing a corresponding step pulse, and remain true (low) 100 nanoseconds after it.

The access motion is initiated on the trailing edge of the step pulse. The time period between consecutive trailing edges of step pulses should be three milliseconds for the TM65-4 and six milliseconds for the TM65-1L and TM65-2L.

The drive must be stepped at either three or six milliseconds, depending upon the jumper options. If selection of other step rates is desired, consult your local Tandon representative.

The drive electronics ignore step pulses when one of the following conditions exists:

1. The write enable is true (low).
2. The direction select is false (high), and the head is positioned at Track 0.
3. The drive is not selected.
4. When trying to seek beyond Track 79 on the TM65-4.
5. When the door latch is opened on the TM 65-4.

COMPOSITE WRITE DATA

When the drive is selected, this interface line provides the bit serial composite write data pulses that control the switching of the write current in the selected head. The write electronics must be conditioned for writing by the Write Enable line.

For each high-to-low transition on the Composite Write Data line, a flux change is produced at the write head gap. This causes a flux change to be recorded on the media.

The microprocessor on the TM65-4 automatically decreases write current by 25 percent, when writing on the inner tracks, for optimal recording quality. Write current is switched at Track 40.

When a single-density (FM) type encoding technique is used in which data and clock form the combined Write Data signal, it is recommended that the repetition of the high-to-low transitions, while writing all zeros, be equal to one-half the maximum data rate, 125 kilohertz ±0.1 percent, and the repetition of the high-to-low transitions, when writing all ones, be equal to the maximum data rate, 250 kilohertz ±0.1 percent.

Host controllers may implement write precompensation circuits that recognize worst case patterns and adjust the write data waveform. Although a value cannot be specified for write precompensation, Tandon suggests a value of 250 nanoseconds for systems using MFM double density recording format.

WRITE ENABLE

When this signal is true (low), the write electronics are prepared for writing data and the read electronics are disabled. This signal turns on write current in the selected read/write head. Data is written under the control of the Composite Write Data and Side Select input lines. When the Write Enable line is false (high), all write electronics are disabled.

When a write protected diskette is installed in a drive, the write electronics are disabled, irrespective of the state of the Write Enable or Side Select lines.

SIDE SELECT, TM65-2L AND TM65-4

The Side Select interface line defines which side of a two-sided diskette is used for information transfer.

A false (high) level on this line selects the read/write head on side zero, the lower head, of the drive. A true (low) level on this line selects the read/write head on side one, the upper head, of the drive. Side Select is ignored by the TM65-1L.

OUTPUT CONTROL LINES

INDEX/SECTOR

The index/sector signal is a composite of the index pulse and sector signals.

An index pulse is provided once every revolution, 200 milliseconds nominal, to indicate the beginning of a track to the controller. The leading edge of this signal must always be used to ensure timing accuracy. The index/sector line remains in the true (low) state for the duration of the index pulse, which is nominally four milliseconds.

The sector signal portion appears only when using hard sectored diskettes.

TRACK 0

When the drive is selected, the Track 0 interface signal, when true (low), indicates to the controller that the read/write heads are positioned on Track 0. This signal remains true (low) until the heads are moved from Track 0.

WRITE PROTECT

When the Write Protect line goes true (low), the diskette is write protected and the write electronics are disabled. It is recommended the controller not issue a Write command when the Write Protect signal is true (low).

When the Write Protect line is false (high), the write electronics are enabled.

COMPOSITE READ DATA

This interface line transmits the readback data to the controller when the drive is selected. It provides a pulse for each flux transition detected from the diskette. The Composite Read Data output line goes true (low) for a duration of 1 ±0.25 microsecond for each flux change detected from the diskette.

The leading edge of the Composite Read Data output pulse represents the true position of the flux transitions on the diskette's surface.

READY, TM65-4 ONLY

The Ready signal indicates the operational status of the drive. There are two ready signal conditions selectable by use of programming jumper connectors (see Section 3.6).

Ready is defined as drive selected and door closed only, or drive selected, door closed, diskette inserted and up to speed. Diskette inserted means that at least one index pulse has been detected. Up to speed means that 250 milliseconds have elapsed since the motor has been turned on. Ready goes false when the motor is turned off or the door is opened.

TYPICAL INTERFACE CHARACTERISTICS

Lines between the controller and the drive have the following characteristics:

V_{out} True = +0.4 volt maximum at I_{out} = 48 milliamperes, maximum

V_{out} False = +2.4 volts minimum open collector at I_{out} = 250 microamperes, maximum

Figure 3-1 contains the characteristics of the electrical interface. Figure 3-2 contains the control and data timing requirements.

3.5 D. C. POWER

D. C. power is supplied to this drive via a four-pin AMP connector, J2, mounted on the logic circuit board. The mating connector, not supplied, is AMP Part Number 1-480424-0, using AMP contact Part Number 60619-1. Pin assignments are found in Table 3-2.

The chassis should be connected to earth ground to ensure proper operation. The conductor should be 16-to-18 AWG, minimum.

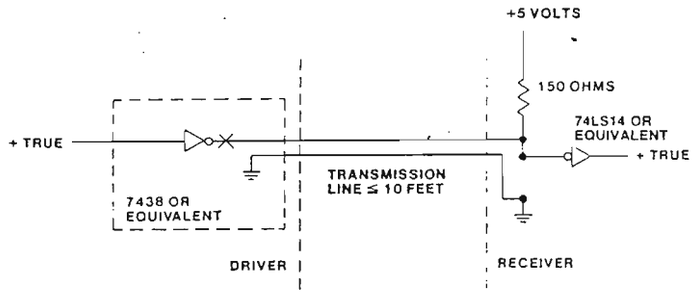
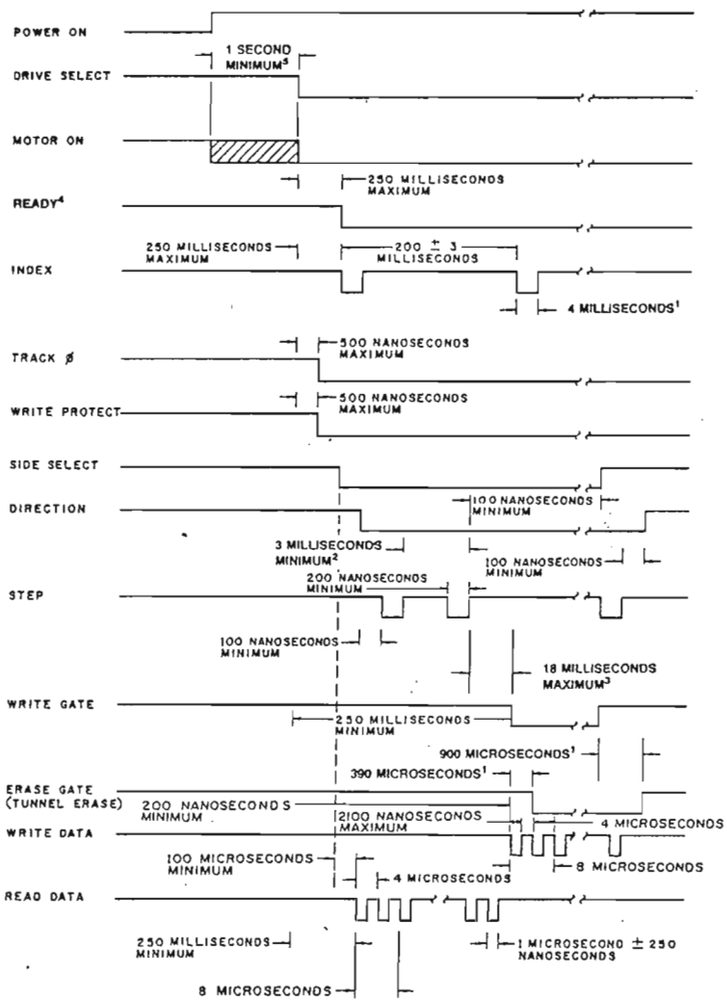


FIGURE 3-1
ELECTRICAL INTERFACE CHARACTERISTICS

TABLE 3-2
D. C. POWER CONNECTOR PIN ASSIGNMENTS

Pin	Supply Voltage
1	+12 volts D. C.
2	Common D. C. return
3	Common D. C. return
4	+ 5 volts D. C.

Pin	Signal
Ground lug 3/16-inch quick disconnect	Chassis ground from controller



NOTES: [1]FOR REFERENCE ONLY
[2]SIX MILLISECONDS FOR TM65-1L AND TM65-2L
[3]TWENTY-ONE MILLISECONDS FOR TM65-1L AND TM65-2L
[4]TM65-4 STANDARD/TM65-2L OPTIONAL, CONTACT YOUR TANDON REPRESENTATIVE
[5]TM65-4 ONLY

FIGURE 3-2
CONTROL AND DATA TIMING REQUIREMENTS

STEPPER MOTOR POWER SAVE (TM65-4)

The +12 volts is applied to the stepper motor only while stepping. This voltage is reduced to +5 volts, 50 milliseconds after the last step has been completed.

In order to conserve peak power in the system, the stepper motor power is delayed when the spindle motor is first turned on unless a seek operation is requested at this time.

RESTORE

The Restore operation on the TM65-4 returns the heads to Track 0 during the power up sequence. Restore operation on the TM65-1L and TM65-2L is accomplished by the host controller.

3.6 DRIVE ADDRESS AND OPTION PATCHING

The drive address and option patching is determined by the different jumper configurations required for specific system applications. If jumper configurations are changed on the TM65-4, power should be cycled off and on so the microprocessor can recognize the new configuration.

DS0 THROUGH DS3 JUMPERS (ALL DRIVES)

This option allows the user to daisy chain up to four drives, and to enable one drive at a time. Drive Select is implemented by shorting one of the four connections, using a shorting plug.

The terminator resistor pack, RP1, located on the logic circuit board should be installed in the last drive of the daisy chain (Figure 3-3, 3-4). All other devices on the interface must have the resistor pack removed.

S1 THROUGH S4 OPTION JUMPERS (TM65-4)

Disk drive configurations are available via jumper options S1, S2, S3, and S4. A specific combination of 16 bits define a configuration. If an unused configuration is jumpered, the Front Panel L.E.D. blinks until the power is turned off and a defined configuration is jumpered (Figure 3-3).

All options do automatic centering while the latch is being closed.

Table 3-3 shows the options available. An X denotes jumper installation, and a dash (–) denotes jumper removed.

NOTE

The ready signal, with the door closed and one index pulse detected, is delayed 250 milliseconds after power on (after 1 second delay).

If jumper configurations are changed, power should be cycled off and on so the microprocessor can recognize the next configuration.

TABLE 3-3
TM65-4 OPTIONS

S1	S2	S3	S4	Ready Is A Function Of:	Drive Motor On Is A Function Of:	Motor Off Delay
—	—	—	X	Door Closed, up to speed and drive selected	Drive Select or Motor On	None
—	—	X	—	Door Closed, up to speed and drive selected	Drive Select and Motor On	None
—	X	—	—	Door Closed, up to speed and drive selected	Motor On	3 seconds
—	X	X	—	Door Closed, up to speed and drive selected	Motor On	None
X	—	—	—	Door Closed and drive selected	Drive Select and Motor On	None
X	—	—	X	Door Closed up to speed and drive selected	Drive Select or Motor On	3 seconds
X	—	X	X	Door Closed and drive selected	Motor On	3 seconds
X	—	X	—	SELF SEEK CYCLE, 3 Millisecond Step Rate		

NOTE: Motor stops when door is opened:

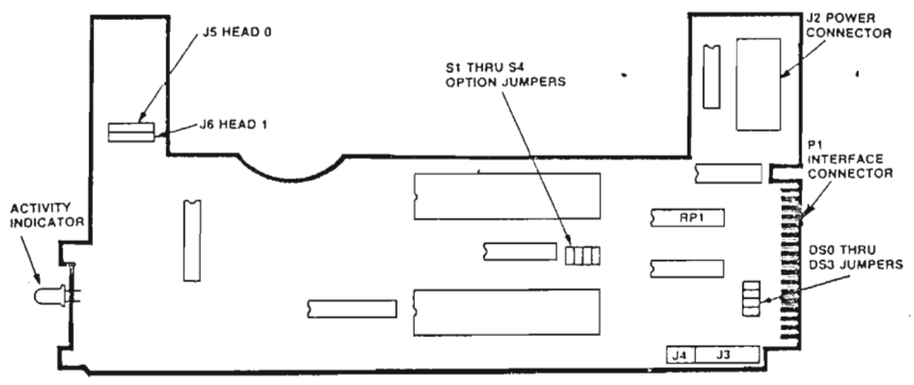


FIGURE 3-3
LOGIC CIRCUIT BOARD OPTION LOCATIONS, TM65-4

JP2 AND JP7 OPTION JUMPERS (TM65-1L, TM65-2L)

Disk drive configuration options are provided by JP2 and JP7 (Figure 3-4).

DRIVE SELECT CONTROL (JP2)

The JP2 jumper is used only in single drive systems when the user requires the drive logic to be enabled at all times. The DS0 through DS3 Drive Select lines are disabled with JP2 installed, eliminating need for the host controller to issue a Drive Select signal.

JP2	DRIVE SELECT CONTROL
X	Drive Selected at all times.
—	Drive Select controlled by DS0 through DS3.

MOTOR ON CONTROL (JP7)

Connecting JP7, A to C, allows spindle motor control via J1, pin 16. If the B to C jumper is installed, the spindle motor is controlled by Drive Select.

C-A	C-B	MOTOR CONTROL
X	–	Spindle motor controlled by Motor On signal
–	X	Spindle motor controlled by Drive Select.

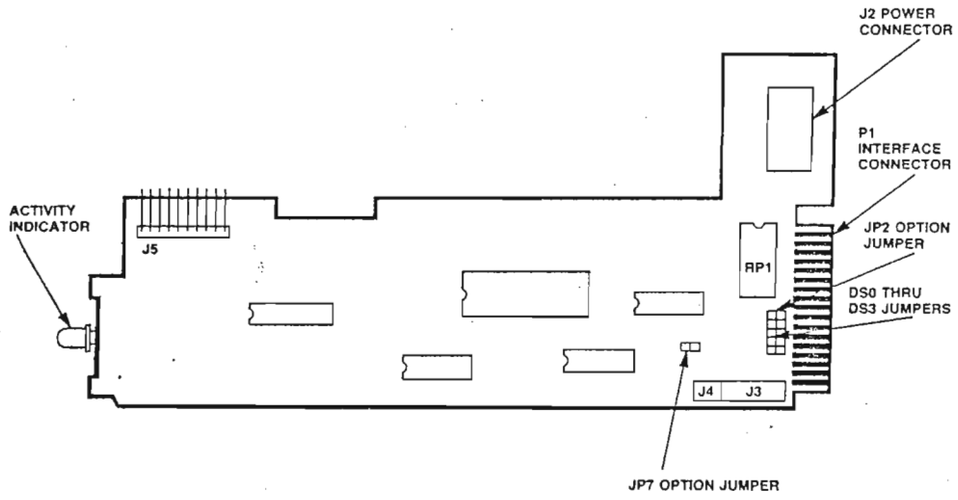


FIGURE 3-4
LOGIC CIRCUIT BOARD OPTION LOCATIONS
TM65-1L, TM65-2L

3.7 DISKETTES

The TM65 series of drives use an ANSI-compatible 5-1/4-inch diskette. Diskettes are available with a single index hole or with multiple (index and sector) holes. The TM65-4 drive requires the use of 96 TPI certified media. Use of other media results in poor data reliability.

Diskettes with a single hole are used when soft sector format is required. Multiple hole diskettes provide sector information through the use of an index sensor and electronics.

Figure 3-5 illustrates the diskette used with the drive. This recording media is a flexible diskette enclosed in a protective jacket. The protected diskette, free to rotate within the jacket, is continuously cleaned by its soft fabric lining during normal operation.

LOADING THE DISKETTE

The drive is loaded by inserting the diskette, head aperture forward, into the front slot of the drive. Access to the diskette loading slot is obtained by opening the front latch.

The diskette should be carefully inserted until it is solidly against the back stop.

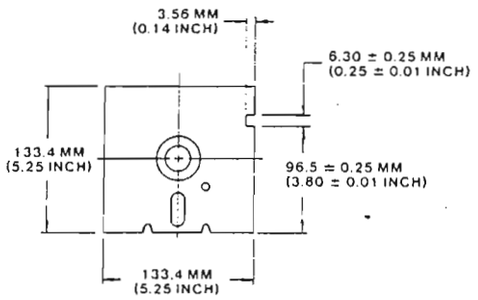
CAUTION

Damage to the center of the diskette may result if the door is closed when the diskette is not properly inserted. This prevents reliable recovery of the recorded data.

WRITE PROTECT TAB

The drive is equipped with a Write Protect Sensor Assembly. This sensor operates in conjunction with a diskette that has a slot cut in the protective jacket. Figure 3-5 contains the location of the slot.

When the slot is covered with an optically opaque self-adhesive tab, the diskette is write protected. The tab must be removed to write on the diskette. Figure 3-6 contains information on how to install a tab to cover the slot.



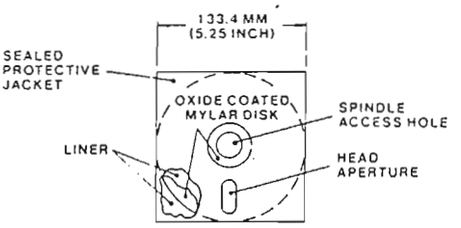


FIGURE 3-5
RECORDING MEDIA

DISKETTE HANDLING AND STORAGE

It is important the diskette be handled and stored correctly so the integrity of the recorded data is maintained. A damaged or contaminated diskette can impair or prevent recovery of data, and can result in damage to the read/write heads.

Figure 3-6 contains an illustration of the physical configuration of the diskette. The 5-1/4-inch diskette is oxide-coated, flexible mylar. It is enclosed in a 5-1/4-inch square protective jacket. Read/write head access is made through an aperture in the jacket. In addition, openings for the drive hub and diskette index hole are provided.

Figure 3-7 provides some helpful hints on the care and handling of the drive and diskettes. In addition, to ensure trouble-free operation and to enhance the service life of the diskette, the following handling procedure should be observed.

1. Return the diskette to the protective jacket when not in use.
2. Avoid exposing the diskette to any magnetizing force in excess of 50 oersted.

NOTE

The 50-oersted level magnetizing force is reached at a distance of approximately three inches from a typical source, e.g., motors, generators, or transformers.

3. To avoid warping, do not store the diskette in direct sunlight.
4. Do not use a lead pencil or a ballpoint pen to write on the label. Use a felt tipped pen, and mark lightly on the label.

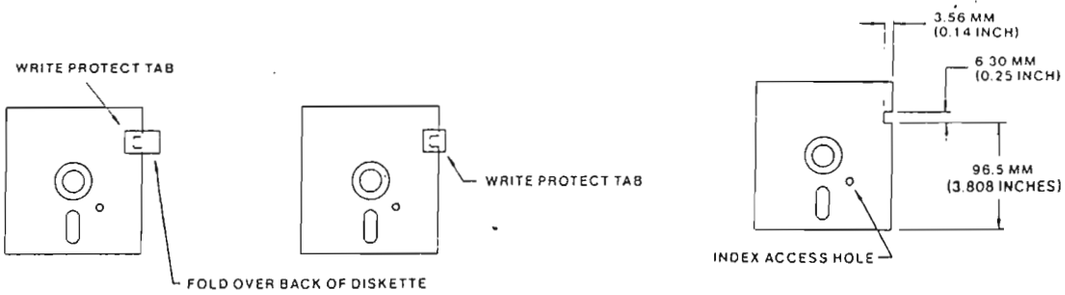
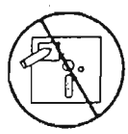
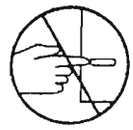


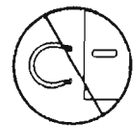
FIGURE 3-6
WRITE PROTECT TAB



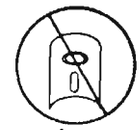
DO NOT WRITE ON THE JACKET WITH PEN OR PENCIL. USE A FELT TIPPED PEN.



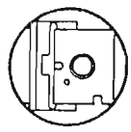
DO NOT TOUCH PRECISION SURFACE WITH YOUR FINGERS.



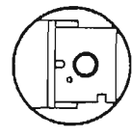
KEEP THE DISKETTE AWAY FROM MAGNETIC FIELDS.



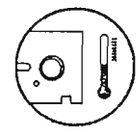
HANDLE WITH CARE; BENDING AND FOLDING MAY DAMAGE DISKETTE.



TO AVOID DAMAGE TO THE DISKETTE AND TO YOUR DRIVE, INSERT DISKETTE CAREFULLY UNTIL THE BACKSTOP IS ENCOUNTERED.



RETURN THE DISKETTE TO ITS JACKET WHEN NOT IN USE.



DISKETTES SHOULD BE STORED AT 10°C TO 52°C 50°F TO 125°F

FIGURE 3-7
DISKETTE CARE AND HANDLING