

-LOC OBJECT H STAT E LINE SOURCE LINE

```

1      TITLE 'EINSTEIN DISC M.O.S.'
2 *
3 *
4 *****
5 *
6 *
7 *      DISC ROUTINES      UPDATED 18/9/84
8 *      (MOS113)
9 *
10 *****
11 *
12      EXTRN  RWFLAG,ERCNT,DSCPRT,TRKPRT,HSTTRK,DATPRT,HSTSEC,SECTPRT
13      EXTRN  SCTSIZ,HSTDMA,CMDPRT,RDMEM,ZHMDSC,ZFDRST,STATUS,NSECT
14      EXTRN  SIDFLG,HSTDSC,BITS,STEPR,RSTPRT,ZPINIT,TRKTBL,DISC
15      EXTRN  DPBPTR,TRAK,SECT,DBUF,HSTBUF,UNACNT,RSFLAG,WRTYPE,UNADSC
16      EXTRN  UNASEC,HSTACT,SEKHST,HSTWRT,ZWSECT,ZRSECT,READOP,ZRCPYU
17 *
18 *
19      ENTRY  R0SECT,WRSECT,COMMND,H0MDSC,SETTRK,SETSEC
20      ENTRY  SETBUF,R0REC,WRREC,FDRST,FLUSH,GNSECT,SELOSC
21 *
22 *
23 *
24 *
25 DSCMOS RSECT RAM
26 *
27 *
28 MCAL      MACRO
29      RST      H'08'      MOS FUNCTION CALL ROUTINE
30      DATA    $1$      FUNCTION NUMBER
31      ENDM
32 *
33 *
34 *
35 *****
36 *
37 *      FLOPPY-DISC SECTOR R/W ROUTINES
38 *
39 *****
40 *
41 R0SECT XOR      A
42      JR      RW1      ACTUAL SECTOR READ ROUTINE
43 *
44 *
45 WRSECT LD      A,H'01'      ACTUAL SECTOR WRITE ROUTINE
46 RW1      LD      (RWFLAG),A
47      LD      A,H'0A'      10 RETRIES ON ERROR
48      LD      (ERCNT),A
49 RW2      CALL    CALDSC      CALCULATE DISC ENABLE LINE
50      OUT     (DSCPRT),A
51      CALL    MOTON      CHECK IF MOTOR ON
52      JP      NZ,RWERR
53      CALL    DEFTRK      ARE WE KEEPING TO OLD TRACK
54      LD      A,(HL)
55      OUT     (TRKPRT),A      PLUG IN CURRENT TRACK VALUE
56      LD      A,(HSTTRK)

```

000000 AF
000001 1802

1
2

000003 3E01
000005 320000 E
000008 3E0A
00000A 320000 E
00000D CDC200 R
000010 D300 E
000012 CDEC00 R
000015 C29F00 R
000018 C09701 R
00001B 7E
00001C D300 E
00001E 3A0000 E

3
4
5
6
7
8
9
10
11
12
13
14

45 WRSECT LD A,H'01'
46 RW1 LD (RWFLAG),A
47 LD A,H'0A'
48 LD (ERCNT),A
49 RW2 CALL CALDSC
50 OUT (DSCPRT),A
51 CALL MOTON
52 JP NZ,RWERR
53 CALL DEFTRK
54 LD A,(HL)
55 OUT (TRKPRT),A
56 LD A,(HSTTRK)

ACTUAL SECTOR WRITE ROUTINE
10 RETRIES ON ERROR
CALCULATE DISC ENABLE LINE
CHECK IF MOTOR ON
ARE WE KEEPING TO OLD TRACK
PLUG IN CURRENT TRACK VALUE

LOC OBJECT M STATE LINE SOURCE LINE

000021	BE		15	57	CP	(HL)	
000022	2813		16	58	JR	Z,RW3	YES - SKIP TRACK SET UP
000024	77		17	59	LD	(HL),A	
000025	0300	E	18	60	OUT	(DATPRT),A	NEW TRACK
000027	3E10		19	61	LD	A,H'10'	
000029	002A01	R	20	62	CALL	STPCMD	SEEK NEW TRACK
00002C	CC4301	R	21	63	CALL	Z,CHKST	CHECK FOR COMMAND COMPLETED
00002F	1189A0		22	64	LD	DE,H'A089'	
000032	CC5E01	R	23	65	CALL	Z,DELST	WAIT FOR HEAD TO SETTLE, AND TEST FOR;
000035	2068		24	66	JR	NZ,RWERR	MO(1), SPIN-UP(1), RNF(0), CRC(0), & BUSY(0)
000037	3A0000	E	25	67	RW3 LD	A,(HSTSEC)	
00003A	0300	E	26	68	OUT	(SCTPRT),A	
00003C	3A0000	E	27	69	LD	A,(SCTSIZ)	
00003F	57		28	70	LD	D,A	SET UP No. SECTORS
000040	0E00	E	29	71	LD	C,DATPRT	AND C GIVES PORT TO ACCESS
000042	2A0000	E	30	72	LD	HL,(HSTDMA)	
000045	3A0000	E	31	73	LD	A,(RWFLAG)	
000048	87		32	74	OR	A	
000049	F3		33	75	DI		NO INTERRUPTS WHILE DISCS IN USE
00004A	2026		34	76	JR	NZ,DWRSCF	
				77 *			
				78 *			
00004C	3E80		35	79	DWRSCF LD	A,H'80'	READ SINGLE RECORD COMMAND TO FDC
00004E	0600		36	80	LD	B,0	
000050	003001	R	37	81	CALL	COMMAND	
000053	2014		38	82	JR	NZ,RB3	
000055	0800	E	39	83	RB1 IN	A,(CMDPRT)	GET STATUS
000057	0F		40	84	RRCA		
000058	300C		41	85	JR	NC,RB2	BUSY?, ERROR IF NOT!
00005A	0F		42	86	RRCA		
00005B	30F8		43	87	JR	NC,RB1	DRQ?
00005D	EDA2		44	88	INI		INPUT FROM DATA PORT
00005F	C25500	R	45	89	JP	NZ,RB1	
000062	15		46	90	DEC	D	
000063	C25500	R	47	91	JP	NZ,RB1	
000066	004301	R	48	92	RB2 CALL	CHKST	
000069	FB		49	93	RB3 EI		
00006A	2033		50	94	JR	NZ,RWERR	
00006C	0800	E	51	95	IN	A,(CMDPRT)	
00006E	E6BF		52	96	AND	H'8F'	MASK UNUSED BITS ON READ
000070	182A		53	97	JR	RWDUN	
				98 *			
				99 *			
000072	3E80		54	100	DWRSCF LD	A,H'80'	WRITE SINGLE RECORD COMMAND TO FDC
000074	0600		55	101	LD	B,0	
000076	003001	R	56	102	CALL	COMMAND	
000079	201C		57	103	JR	NZ,RB3	
00007B	000000	E	58	104	CALL	RDMEM	
00007E	5F		59	105	LD	E,A	
00007F	0800	E	60	106	WB1 IN	A,(CMDPRT)	GET STATUS
000081	0F		61	107	RRCA		
000082	3010		62	108	JR	NC,WB2	
000084	0F		63	109	RRCA		
000085	30F8		64	110	JR	NC,WB1	
000087	ED59		65	111	OUT	(C),E	OUTPUT TO DISC DATA-PORT
000089	23		66	112	INC	HL	

LOC OBJECT M STAT E LINE SOURCE LINE

00008A	C00000	E	67	113	CALL	RDHNM	
00008D	5F		68	114	LD	E,A	
00008E	10EF		69	115	DJNZ	WB1	
000090	15		70	116	DEC	D	
000091	C27F00	R	71	117	JP	NZ,WB1	
000094	C04301	R	72	118	CALL	CHKST	
000097	F8		73	119	EB		
000098	2005		74	120	JR	NZ,RWERR	
00009A	D800	E	75	121	IN	A,(CNDPRT)	
				122 *			
				123 *			
00009C	FE80		76	124	RWDUN	CP	H'80'
00009E	C8		77	125	RET	Z	ONLY MOTOR ON SHOULD BE SET DROP THROUGH IF ERROR
				126 *			
				127 *			
				128 *			
				129 *			
				130 *			
				131 *			
				132 *			
00009F	C00C01	R	78	133	RWERR	CALL	STCNV
0000A2	210000	E	79	134	LD	HL,ERCNT	
0000A5	FE04		80	135	CP	4	NOT READY ?
0000A7	3004		81	136	JR	NC,RWERO	
0000A9	FE02		82	137	CP	2	WRITE PROTECTED
0000AB	2002		83	138	JR	NZ,RWER1	
0000AD	3601		84	139	RWERO	LD	(HL),1
0000AF	3E00		85	140	RWER1	LD	A,H'D0'
0000B1	D300	E	86	141	OUT	(CNDPRT),A	TERMINATE FDC COMMAND
0000B3	35		87	142	DEC	(HL)	
0000B4	2805		88	143	JR	Z,RWER3	SEE IF RETRIED ENOUGH
				144	NCAL	ZHNDSC	HOME TO TRACK ZERO AND RETRY
0000B6	CF		89	+	RST	H'08'	MOS FUNCTION CALL ROUTINE
0000B7	00	E		+	DATA	ZHNDSC	FUNCTION NUMBER
				+	ENDM		
0000B8	CA0000	R	90	145	JP	Z,RW2	
				146	RWER3	NCAL	ZFORST
0000B8	CF		91	+	RST	H'08'	RESET FDC - ERROR
0000BC	00	E		+	DATA	ZFORST	MOS FUNCTION CALL ROUTINE
				+	ENDM		FUNCTION NUMBER
0000BD	3A0000	E	92	147	LD	A,(STATUS)	
0000C0	B7		93	148	OR	A	
0000C1	C9		94	149	RET		
				150 *			
				151 *			
				152 *			
				153 *			
				154 *			
0000C2	E5		95	155	CALDSC	PUSH	HL
0000C3	C0E100	R	96	156	CALL	DSCBIT	
0000C6	6E		97	157	LD	L,(HL)	NOW HAVE REQUIRED DISC LINE
0000C7	3A0000	E	98	158	LD	A,(HSTSEC)	GET SECTOR NUMBER REQUIRED
0000CA	D600	E	99	159	SUB	HSECT	SEE IF SECTOR ON OTHER SIDE SPECIFIED!
0000CC	3802		100	160	JR	C,CLD1	
0000CE	C8E5		101	161	SET	4,L	MARK-SIDE SELECT BIT
0000D0	7D		102	162	CLD1	LD	A,L

CALDSC - WORK OUT WHICH DRIVE-SELECT TO ENABLE

LDC OBJECT M STAT E LINE SOURCE LINE

```

000001 E1      103  163    POP    HL
000002 C9      104  164    RET
                  165 *
                  166 *
                  167 *      GNSECT - CHECK SIDFLG TO SEE IF 10- OR 20-SECTOR (SS/DS) DISC
                  168 *
                  169 *
000003 E5      105  170 GNSECT PUSH    HL
000004 CDE100  R  106  171    CALL   DSCBIT
000007 3A0000  E  107  172    LD      A,(SIDFLG)    SEE IF DRIVE MARKED DOUBLE-SIDED
00000A A6      108  173    AND     (HL)
00000B E1      109  174    POP     HL
00000C 3E00    E  110  175    LD      A,GNSECT
00000E C8      111  176    RET     Z
00000F 87      112  177    ADD     A,A      DOUBLE SECTOR COUNT IF DRIVE MARKED
0000E0 C9      113  178    RET
                  179 *
                  180 *
                  181 *      DSCBIT - GET (HL) AT DISC BIT MARKER
                  182 *
                  183 *
0000E1 3A0000  E  114  184 DSCBIT LD      A,(HSTDSC)
0000E4 210000  E  115  185    LD      HL,BITS    GET BIT TO SET ON PORT
0000E7 E603    116  186    AND     3
0000E9 85      117  187    ADD     A,L
0000EA 6F      118  188    LD      L,A
0000EB C9      119  189    RET
                  190 *
                  191 *
                  192 *      MOTON - SEE IF MOTOR ON, IF NOT THEN HOME DISC
                  193 *
                  194 *
0000EC AF      120  195 MOTON XOR     A      SET Z FLAG
0000ED D800    E  121  196    IN      A,(CHDPR)
0000EF 17      122  197    RLA
0000F0 D8      123  198    RET     C      TEST MOTOR-ON BIT
                                DROP THROUGH TO HOMDSC IF OFF
                  199 *
                  200 *
                  201 *      HOMDSC - HOME TO TRACK 0 ON DISC
                  202 *
                  203 *
0000F1 3E04    124  204 HOMDSC LD      A,H'04'    VERIFY AFTER HOME TO TRACK 0
0000F3 CD2A01  R  125  205    CALL   STPCMD
0000F6 CC6001  R  126  206    CALL   Z,CHKINX    CHECK FOR INDEX PULSES
0000F9 CC4301  R  127  207    CALL   Z,CHKST    CHECK FOR COMMAND COMPLETED
0000FC 11B0A4  128  208    LD      DE,H'A4B0'
0000FF CC5E01  R  129  209    CALL   Z,DELST    ALLOW HEAD TO SETTLE, TEST FOR TRACK 0
000102 2008    130  210    JR      NZ,STCNV
000104 CD9701  R  131  211    CALL   DEFTRK
000107 AF      132  212    XOR     A
000108 D300    E  133  213    OUT     (TRKPR),A
00010A 77      134  214    LD      (HL),A
00010B C9      135  215    RET
                  216 *
                  217 *
                  218 *      STCNV - CONVERT STATUS CODE FOR DISC ERRORS

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PMDS CROSS ASSEMBLER Z80

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LOC OBJECT N STAT E LINE SOURCE LINE

```

219 *
220 *
221 *
222 *
223 *
224 *
225 *
00010C 05      136 226 STCHV PUSH DE
00010D FEFE    137 227 CP H'FE'
00010F 1E05    138 228 LD E,5
000111 2810    139 229 JR Z,STC1
000113 1D      140 230 DEC E
000114 FEFF    141 231 CP H'FF'
000116 2808    142 232 JR Z,STC1
000118 1D      143 233 DEC E
000119 C867    144 234 BIT 4,A
00011B 2006    145 235 JR NZ,STC1
00011D 1D      146 236 DEC E
00011E C877    147 237 BIT 6,A
000120 2001    148 238 JR NZ,STC1
000122 1D      149 239 DEC E
000123 78      150 240 STC1 LD A,E
000124 D1      151 241 POP DE
000125 320000  E 152 242 LD (STATUS),A
000128 B7      153 243 OR A
000129 C9      154 244 RET
245 *
246 *
247 *
248 *
249 *
250 *
00012A E5      155 251 STPCMD PUSH HL
00012B 210000  E 156 252 LD HL,STEPR
00012E B6      157 253 OR (HL)
00012F E1      158 254 POP HL
255 *
256 *
000130 D300    E 159 257 CMDMD OUT (CMDPRT),A
000132 C5      160 258 PUSH BC
000133 0680    161 259 LD B,H'80'
000135 D800    E 162 260 CMD1 IN A,(CMDPRT)
000137 0F      163 261 RRCA
000138 3306    164 262 JR C,CMD3
00013A 10F9    165 263 DJNZ CMD1
00013C C1      166 264 CMD2 POP BC
00013D AF      167 265 XOR A
00013E 3D      168 266 DEC A
00013F C9      169 267 RET
000140 C1      170 268 CMD3 POP BC
000141 AF      171 269 XOR A
000142 C9      172 270 RET
271 *
272 *
273 *
274 *

```

01 - BAD DATA/CHECKSUM
02 - WRITE PROTECTED DISC
03 - TRACK/SECTOR NOT FOUND
04 - DRIVE NOT READY
05 - NO DRIVE

NO DRIVE ?

NOT READY ?

SECTOR NOT FOUND ?

WRITE PROTECTED ?

OTHERWISE BAD DATA ERROR!

COMMND - OUTPUT COMMAND TO FDC
STPCMD - TYPE '1' COMMAND TO FDC (RESTORE OR SEEK)

"DR" STEPPING RATE

DROP THROUGH TO COMMAND

GET STATUS

RETURN A=FF IF ERROR

O.K. - NOW BUSY

CHKST - CHECK FDC STATUS FOR "TIMEOUT"

LOC OBJECT M STAT E LINE SOURCE LINE

```

275 *
000143 C5      173 276 CHKST PUSH 9C
000144 D5      174 277      PUSH DE
000145 1603     175 278      LD 0,3
000147 010000   176 279      LD BC,H'0000'
00014A D800     E 177 280 CKS1 IN A,(CNDPRT) WAIT UNTIL NO LONGER BUSY
00014C 0F      178 281      RRCA
00014D 3008     179 282      JR NC,CKS3
00014F 08      180 283      DEC 9C
000150 78      181 284      LD A,B
000151 B1      182 285      OR C
000152 20F6     183 286      JR NZ,CKS1
000154 15      184 287      DEC D
000155 20F3     185 288      JR NZ,CKS1
000157 D1      186 289 CKS2 POP DE *TIME-OUT*
000158 18E2     187 290      JR CND2
00015A D1      188 291 CKS3 POP DE D.K.
00015B C1      189 292      POP BC
00015C AF      190 293      XOR A
00015D C9      191 294      RET
295 *
296 *
297 * DELTST - ALLOW HEAD SETTLING TIME, THEN CHECK STATUS
298 *
299 *
00015E 05      192 300 DELTST PUSH DE
00015F 110011   193 301      LD DE,H'1100'
000162 18      194 302 DEL1 DEC DE
000163 7A      195 303      LD A,D
000164 83      196 304      OR E
000165 20FB     197 305      JR NZ,DEL1
000167 D1      198 306      POP DE
000168 DB00     E 199 307 IN A,(CNDPRT) TEST STATUS AFTER DELAY
00016A A3      200 308 AND E MASK BITS NOT REQUIRED
00016B BA      201 309 CP D
00016C C9      202 310 RET
311 *
312 *
313 * CHKINX - CHECK FOR INDEX PULSES
314 *
315 *
00016D C5      203 316 CHKINX PUSH BC
00016E 010000   204 317      LD BC,0 DO TIME-OUT ON INDEX PULSES
000171 08      205 318 CX1 DEC BC SHOULD GET ONE EVERY 200ms OR SO
000172 78      206 319      LD A,B
000173 81      207 320      OR C
000174 2808     208 321      JR Z,CX2
000176 D800     E 209 322 IN A,(CNDPRT)
000178 C84F     210 323 BIT 1,A
00017A 28F5     211 324      JR Z,CX1
00017C 18C2     212 325      JR CND3
00017E D800     E 213 326 CX2 IN A,(CNDPRT) NO DISC, SO SEE IF WRITE-PROTECT
000180 17      214 327 RLA
000181 17      215 328 RLA
000182 3F      216 329 CCF
000183 9F      217 330 SBC A,A IF NO WRITE-PROTECT, CAN'T HAVE A DRIVE

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PMOS CROSS ASSEMBLER Z80

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LOC OBJECT M STAT E LINE SOURCE LINE

```

000184 3D      218 331    DEC    A
000185 C1      219 332    POP    BC
000186 C9      220 333    RET
                334 *
                335 *
                336 *      FORST - RESET FDC AFTER ERROR, SO MOTOR NOT ALWAYS ON !
                337 *      ALSO RESETS PSG
                338 *
                339 *
000187 AF      221 340 FORST XOR A
000188 0300    E 222 341    OUT    (DISCRT),A
00018A C5      223 342    PUSH   BC
00018B 0620    224 343    LD      B,H'20'
00018D 0300    E 225 344 FDR1  OUT    (RSTPRT),A      RESET FDC (& PSG)
00018F E3      226 345    EX      (SP),HL
000190 E3      227 346    EX      (SP),HL
000191 10FA    228 347    DJNZ   FDR1      H.B. 50 uS PULSE NEEDED FOR FDC
                348    MCAI   ZPINIT    SET UP PSG FOR KEYBOARD AND NO SOUND
000193 CF      229    +      RST    H'08'      MOS FUNCTION CALL ROUTINE
000194 00      E    +      DATA  ZPINIT      FUNCTION NUMBER
                +      ENDM
000195 C1      230 349    POP    BC
000196 C9      231 350    RET
                351 *
                352 *
                353 *      DEFTRK - GET DEFAULT TRACK LOCATION FOR DESIRED DISC
                354 *
                355 *
000197 3A0000  E 232 356 DEFTRK LD      A,(HSTDSC)
00019A 210000  E 233 357    LD      HL,TRKTBL
00019D 05      234 358    ADD     A,L
00019E 6F      235 359    LD      L,A
00019F 00      236 360    RET     NC
0001A0 24      237 361    INC     H
0001A1 C9      238 362    RET
                363 *
                364 *
                365 *****
                366 *
                367 *      XT&100S DISC SELECTION ROUTINES
                368 *      KEPT IN MOS FOR CONVENIENCE
                369 *
                370 *****
                371 *
                372 *
0001A2 210000  239 373 SELDSC LD      HL,0
0001A5 79      240 374    LD      A,C
0001A6 320000  E 241 375    LD      (DISC),A
0001A9 FE04    242 376    CP      4
0001AB 00      243 377    RET     NC      ONLY 4 DISCS ALLOWED
0001AC 6F      244 378    LD      L,A
0001AD ED480000 E 245 379    LD      BC,(DPBPTR)
0001B1 29      246 380    ADD     HL,HL
0001B2 29      247 381    ADD     HL,HL
0001B3 29      248 382    ADD     HL,HL
0001B4 29      249 383    ADD     HL,HL

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LOC OBJECT M STAT E LINE SOURCE LINE

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000185 09      250 384      ADD    HL,BC      GET START OF OUR DISC DEFN. TABLE IN HL
000186 C9      251 385      RET
                386 *
                387 *
000187 79      252 388 SETTRK LD      A,C
000188 320000   E 253 389      LD      (TRAK),A
00018B C9      254 390      RET
                391 *
                392 *
00018C 79      255 393 SETSEC LD      A,C
00018D 320000   E 256 394      LD      (SECT),A
0001C0 C9      257 395      RET
                396 *
                397 *
0001C1 ED430000 E 258 398 SETBUF LD      (DBUF),BC
0001C5 C9      259 399      RET
                400 *
                401 *
                402 *****
                403 *
                404 *          SECTOR DE-BLOCKING ROUTINES, FOR 512-BYTE SECTORS
                405 *
                406 *****
                407 *
                408 *
0001C6 210000   E 260 409 RDEC   LD      HL,HSTBUF
0001C9 220000   E 261 410      LD      (HSTDMA),HL
0001CC AF      262 411      XOR      A
0001CD 320000   E 263 412      LD      (UNACHT),A
0001D0 3C      264 413      INC      A
0001D1 320000   E 265 414      LD      (RSFLAG),A
0001D4 3C      266 415      INC      A
0001D5 320000   E 267 416      LD      (WRTYPE),A      TREAT AS UNALLOCATED
0001D8 CDC902   R 268 417      CALL    SCTCAL
0001DB 79      269 418      LD      A,C
0001DC FE01     270 419      CP      1          SEE IF DIRECTORY READ
0001DE 2866     271 420      JR      Z,RWC2
0001E0 1850     272 421      JR      RWC1
                422 *
                423 *
0001E2 210000   E 273 424 WRREC   LD      HL,HSTBUF
0001E5 220000   E 274 425      LD      (HSTDMA),HL
0001E8 AF      275 426      XOR      A
0001E9 CDC902   R 276 427      CALL    SCTCAL
0001EC 79      277 428      LD      A,C
0001ED 320000   E 278 429      LD      (WRTYPE),A      TYPE OF WRITE OPERATION GIVEN IN C
                                0=WRITE TO ALLOC, 1=WRITE TO DIR
                                2=WRITE TO UNALLOC.
0001F0 FE02     279 430      CP      2
0001F2 2011     280 431      JR      NZ,WRRI
0001F4 3E10     281 432      LD      A,H'10'
0001F6 320000   E 282 433      LD      (UNACHT),A
0001F9 2A0000   E 283 434      LD      HL,(DISC)
0001FC 220000   E 284 435      LD      (UNADSC),HL      SET UP UNADSC & UNATRK
0001FF 3A0000   E 285 436      LD      A,(SECT)
000202 320000   E 286 437      LD      (UNASEC),A
                438 *
                439 *

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LOC OBJECT M STAT E LINE SOURCE LINE

```

440 *          CHECK FOR WRITE TO UNALLOCATED SECTOR
441 *
442 *
000205 3A0000 E 287 443 WRR1 LD A,(UNACNT)
000208 B7 288 444 OR A
000209 281F 289 445 JR Z,WRR3
00020B 3D 290 446 DEC A
00020C 320000 E 291 447 LD (UNACNT),A
00020F 3A0000 E 292 448 LD A,(SECT)
000212 210000 E 293 449 LD HL,UNADSC
000215 CDD702 R 294 450 CALL DSCOMP
000218 2010 295 451 JR NZ,WRR3
00021A 34 296 452 INC (HL)          END OF TRACK ?
00021B CDD300 R 297 453 CALL GNSECT
00021E 87 298 454 ADD A,A
00021F 87 299 455 ADD A,A
000220 BE 300 456 CP (HL)
000221 2004 301 457 JR NZ,WRR2
000223 3600 302 458 LD (HL),0          YES SO MOVE TO START OF NEXT TRACK
000225 28 303 459 DEC HL
000226 34 304 460 INC (HL)
000227 AF 305 461 WRR2 XOR A
000228 1805 306 462 JR WRR4
00022A AF 307 463 WRR3 XOR A
00022B 320000 E 308 464 LD (UNACNT),A
00022E 3C 309 465 INC A
00022F 320000 E 310 466 WRR4 LD (RSFLAG),A
467 *
468 *
469 *          COMMON CODE FOR READ & WRITE FOLLOWS
470 *
471 *
000232 210000 E 311 472 RWC1 LD HL,HSTACT          COMMON CODE FOR READ & WRITE
000235 7E 312 473 LD A,(HL)
000236 3601 313 474 LD (HL),1
000238 87 314 475 OR A
000239 2815 315 476 JR Z,RWC3
00023B 3A0000 E 316 477 LD A,(SEKHST)
00023E 210000 E 317 478 LD HL,HSTDSC
000241 CDD702 R 318 479 CALL DSCOMP
000244 2833 319 480 JR Z,RWC5
000246 3A0000 E 320 481 RWC2 LD A,(HSTWRT)
000249 87 321 482 OR A
00024A 2804 322 483 JR Z,RWC3
484 MCAL ZWSECT
00024C CF 323 + RST H'08'          MOS FUNCTION CALL ROUTINE
00024D 00 E + DATA ZWSECT          FUNCTION NUMBER
+ ENDM
00024E 206F 324 485 JR NZ,RDWERR
000250 2A0000 E 325 486 RWC3 LD HL,(DISC)          MAY HAVE TO FILL HOST (512-BYTE) BUFFER
000253 3A0000 E 326 487 LD A,(HSTDSC)
000256 BD 327 488 CP L
000257 220000 E 328 489 LD (HSTDSC),HL          SET UP HSTDSC & HSTTRK
00025A 2809 329 490 JR Z,RWC31
00025C CDC200 R 330 491 CALL CALDSC
00025F D300 E 331 492 OUT (DSCPRT),A

```

LOC OBJECT A STAT E LINE SOURCE LINE

			493	MCAL	ZHMOSC	DD RESTORE IF CHANGING DRIVE
000261	CF		332	+	RST	H'08'
000262	00	E		+	DATA	ZHMOSC
				+	ENDM	FUNCTION NUMBER
000263	205A		333	494	JR	NZ,RDWERR
000265	3A0000	E	334	495 RMC31	LD	A,(SEKHST)
000268	320000	E	335	496	LD	(HSTSEC),A
000268	3A0000	E	336	497	LD	A,(RSFLAG)
00026E	87		337	498	OR	A
00026F	2804		338	499	JR	Z,RMC4
				500	MCAL	ZRSECT
000271	CF		339	+	RST	H'08'
000272	00	E		+	DATA	ZRSECT
				+	ENDM	FUNCTION NUMBER
000273	204A		340	501	JR	NZ,RDWERR
000275	AF		341	502 RMC4	XOR	A
000276	320000	E	342	503	LD	(HSTWRT),A
000279	3A0000	E	343	504 RMC5	LD	A,(SECT)
00027C	0E00		344	505	LD	C,0
00027E	E603		345	506	AND	3
000280	1F		346	507	RRR	
000281	CB19		347	508	RR	C
000283	47		348	509	LD	B,A
000284	210000	E	349	510	LD	HL,HSTBUF
000287	09		350	511	ADD	HL,BC
000288	018000		351	512	LD	BC,H'80'
000288	ED580000	E	352	513	LD	DE,(DBUF)
00028F	3A0000	E	353	514	LD	A,(READOP)
000292	87		354	515	OR	A
000293	2006		355	516	JR	NZ,RMC6
000295	EB		356	517	EX	DE,HL
000296	3E01		357	518	LD	A,1
000298	320000	E	358	519	LD	(HSTWRT),A
				520 RMC6	MCAL	ZRCPYU
000298	CF		359	+	RST	H'08'
00029C	00	E		+	DATA	ZRCPYU
				+	ENDM	FUNCTION NUMBER
00029D	3A0000	E	360	521	LD	A,(WRTYPE)
0002A0	FE01		361	522	CP	1
0002A2	2008		362	523	JR	NZ,RMC7
0002A4	AF		363	524	XOR	A
0002A5	320000	E	364	525	LD	(HSTWRT),A
				526	MCAL	ZWSECT
0002A8	CF		365	+	RST	H'08'
0002A9	00	E		+	DATA	ZWSECT
				+	ENDM	FUNCTION NUMBER
0002AA	2013		366	527	JR	NZ,RDWERR
0002AC	AF		367	528 RMC7	XOR	A
0002AD	C9		368	529	RET	
				530 *		
				531 *		
0002AE	3A0000	E	369	532 FLUSH	LD	A,(HSTWRT)
0002B1	87		370	533	OR	A
0002B2	C8		371	534	RET	Z
0002B3	AF		372	535	XOR	A
0002B4	320000	E	373	536	LD	(HSTWRT),A

COPY DATA TO OR FROM 512-BYTE BUFFER

WRITE OPERATION SO MARK & SWITCH DIRECTION

COPY READ/WRTTEN BLOCK
MOS FUNCTION CALL ROUTINE
FUNCTION NUMBER

ALWAYS WRITE TO DIRECTORY

MOS FUNCTION CALL ROUTINE
FUNCTION NUMBER

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LOC OBJECT M STAT E LINE SOURCE LINE

000287	210000	E	374	537	LD	HL,HSTBUF	
00028A	220000	E	375	538	LD	(HSTDMA),HL	
				539	NCAL	ZWSECT	DROP INTO ROWERR
00028D	CF		376	+	RST	H'08'	MOS FUNCTION CALL ROUTINE
00028E	00	E		+	DATA	ZWSECT	FUNCTION NUMBER
				+	ENDM		
				540 *			
				541 *			
00028F	F5		377	542	ROWERR PUSH	AF	
0002C0	AF		378	543	XOR	A	MARK DISC INACTIVE
0002C1	320000	E	379	544	LD	(HSTACT),A	
0002C4	320000	E	380	545	LD	(UNACT),A	
0002C7	F1		381	546	POP	AF	
0002C8	C9		382	547	RET		
				548 *			
				549 *			
0002C9	320000	E	383	550	SCTCAL LD	(READOP),A	SET READ OPERATION
0002CC	3A0000	E	384	551	LD	A,(SECT)	CALCULATE ACTUAL SECTOR REQUIRED BY
0002CF	C83F		385	552	SRL	A	SHIFTING DOWN SPECIFIED SECTOR
0002D1	C83F		386	553	SRL	A	
0002D3	320000	E	387	554	LD	(SEKHST),A	
0002D6	C9		388	555	RET		
				556 *			
				557 *			
0002D7	4F		389	558	DSCOMP LD	C,A	COMPARE DISC, TRACK, AND SECTOR SPECS
0002D8	3A0000	E	390	559	LD	A,(DISC)	
0002DB	8E		391	560	CP	(HL)	
0002DC	C0		392	561	RET	NZ	
0002DD	3A0000	E	393	562	LD	A,(TRAK)	
0002E0	23		394	563	INC	HL	
0002E1	8E		395	564	CP	(HL)	
0002E2	C0		396	565	RET	NZ	
0002E3	79		397	566	LD	A,C	
0002E4	23		398	567	INC	HL	
0002E5	8E		399	568	CP	(HL)	
0002E6	C9		400	569	RET		END OF DISC ROUTINES
0002E7				570	END		

NO ERRORS DETECTED

LOC OBJECT M STAT E LINE SOURCE LINE

```

1 *****
2 *
3 *      GRAPHIC - SUPPORT ROUTINES
4 *      =====
5 *
6 *****
7 *
8 *
9 GRHSPT RSECT  RAM
10      EXTRN  SCRCNT,ORGY,ORGX,DOTON,DOTCNT,CX,CY,RADY,X1,Y1,X2
11      EXTRN  CINC,IMULT,FSTACK,STP,FILSP,GCCLR,FILMOD,HSTBUF
12      EXTRN  FLUSH
13 *
14      ENTRY  PLOT,PLTXY,POINT,PNTXY,DRAWTO,POLYG,ORGO,CLADR,SETCLR
15      ENTRY  FILL
16 *
17 *
18 VRIN  MACRO
19      RST    H'28'          VIDEO RAM READ
20      ENDM
21 *
22 *
23 VROUT MACRO
24      RST    H'30'          VIDEO RAM WRITE
25      ENDM
26 *
27 *
28 *****
29 *
30 *
31 *      PLOT - ROUTINE TO PLOT (OR UNPLOT) A POINT
32 *
33 *
34 *
35 *
36 *      PLTXY - PLOT POINT AT IX,IY
37 *
38 *
39 PLTXY PUSH  HL          APPLY DOT MODE, FOR DRAW, ETC.
40 PXYO  LD    HL,DOTON
41      LD    A,(DOTCNT)
42      INC  A
43      LD    (DOTCNT),A
44      CP    (HL)
45      JR    C,PXY1
46      INC  HL
47      CP    (HL)
48      JR    C,PXY2
49      INC  HL
50      CP    (HL)
51      JR    C,PXY1
52      INC  HL
53      CP    (HL)
54      JR    C,PXY2
55      XOR  A
56      LD    (DOTCNT),A

```

```

000000 E5      1
000001 210000 E 2
000004 3A0000 E 3
000007 3C      4
000008 320000 E 5
00000B BE      6
00000C 3812    7
00000E 23      8
00000F BE      9
000010 3812   10
000012 23     11
000013 BE     12
000014 380A   13
000016 23     14
000017 BE     15
000018 380A   16
00001A AF     17
00001B 320000 E 18

```

LOC OBJECT M STATE LINE SOURCE LINE

00001E 18E1	19	57	JR	PXY0	
000020 3E01	20	58 PXY1	LD	A,1	
000022 1803	21	59	JR	PLT1	
000024 AF	22	60 PXY2	XOR	A	
000025 20		61	DATA	H'20'	TRICK TO SKIP (JR NZ,)
		62 *			
		63 *			
000026 E5	23	64 PLDT	PUSH	HL	ROUTINES TO PLOT (OR UNPLOT) A POINT
000027 D5	24	65 PLT1	PUSH	DE	
000028 C5	25	66	PUSH	BC	
000029 F5	26	67	PUSH	AF	
00002A CD4000	R 27	68	CALL	CALADR	CALCULATE PLOTTING ADDRESS
00002D 3817	28	69	JR	C,PLT4	
00002F E1	29	70	POP	HL	
000030 C88F	30	71	RES	7,A	RESET BIT ?
000032 1C	31	72	INC	E	
000033 25	32	73	DEC	H	
000034 2002	33	74	JR	NZ,PLT2	NO, SET BIT !
000036 C8FF	34	75	SET	7,A	ROTATE BACK TO CORRECT SPOT
000038 1D	35	76 PLT2	DEC	E	
000039 2803	36	77	JR	Z,PLT3	
00003B 0F	37	78	RRCA		
00003C 18FA	38	79	JR	PLT2	
00003E CDD801	R 39	80 PLT3	CALL	SETCLR	SET VDP LOCATION
000041 C1	40	81	POP	BC	
000042 D1	41	82	POP	DE	
000043 E1	42	83	POP	HL	
000044 AF	43	84	XOR	A	
000045 C9	44	85	RET		
000046 F1	45	86 PLT4	POP	AF	
000047 C1	46	87	POP	BC	
000048 D1	47	88	POP	DE	
000049 E1	48	89	POP	HL	
00004A AF	49	90	XOR	A	CO-ORDINATES OFF SCREEN, RETURN NZ
00004B 3D	50	91	DEC	A	
00004C C9	51	92	RET		
		93 *			
		94 *			
		95 *			
		96 *			
		97 *			
		98 *			
		99 *			
00004D DDE5	52	100 CALADR	PUSH	IX	
00004F C1	53	101	POP	BC	
000050 FDE5	54	102	PUSH	IY	
000052 D1	55	103	POP	DE	
000053 CD8900	R 56	104 CALAD1	CALL	ORGC0	GET ONTO SCREEN
000056 D8	57	105	RET	C	
000057 218F00	58	106	LD	HL,H'8F'	
00005A ED52	59	107	SBC	HL,DE	
00005C D8	60	108	RET	C	EXIT IF Y>H'CO' (192)
00005D 3E07	61	109	LD	A,7	
00005F 91	62	110	SUB	C	
000060 E607	63	111	AND	7	
000062 3C	64	112	INC	A	HAVE DOT 1-8

CALADR - CALCULATE GRAPHICS ADDRESS, GIVEN BY X,Y IN IX, IY
(BC, DE FOR CALAD1). RETURN BC AT VRAM ADDRESS,
A WITH DOT MASK TO APPLY LATER.

LOC OBJECT M STAT E LINE SOURCE LINE

```

000063 57      65 113    LD    D,A      SAVE DOT COUNT IN D
000064 79      66 114    LD    A,C
000065 E6F8    67 115    AND   H'F8'
000067 4F      68 116    LD    C,A
000068 7D      69 117    LD    A,L
000069 E607    70 118    AND   7
00006B B1      71 119    OR    C
00006C 4F      72 120    LD    C,A      LOW BYTE OF ADDRESS IN C
00006D 7D      73 121    LD    A,L
00006E 0F      74 122    RRCA
00006F 0F      75 123    RRCA
000070 0F      76 124    RRCA
000071 E61F    77 125    AND   H'1F'      SET UP HIGH BYTE OF ADDRESS
000073 47      78 126    LD    B,A      IN B
000074 E6F8    79 127    AND   H'F8'
000076 5F      80 128    LD    E,A
000077 3A0000  E 81 129    LD    A,(SCRCHT)  CALCULATE SCROLL OFFSET
00007A 80      82 130    ADD   A,B
00007B E607    83 131    AND   7
00007D 83      84 132    OR    E
00007E 47      85 133    LD    B,A
                   134    VRIN
00007F EF      86    +    RST   H'28'      VIDEO RAM READ
                   +    ENDM
000080 1E08    87 135    LD    E,B      HAVE DOT COUNT IN D
000082 0F      88 136 CALAD2 RRCA
000083 1D      89 137    DEC   E
000084 15      90 138    DEC   D
000085 20FB    91 139    JR    NZ,CALAD2
000087 B7      92 140    OR    A
000088 C9      93 141    RET
                   142 *
                   143 *
000089 2A0000  E 94 144 ORGCO LD    HL,(ORGY)  ADD ORIGIN VALUE FOR CORRECT SCREEN POSITION
00008C 19      95 145    ADD   HL,DE
00008D EB      96 146    EX    DE,HL
00008E 2A0000  E 97 147    LD    HL,(ORGX)
000091 09      98 148    ADD   HL,BC
000092 44      99 149    LD    B,H
000093 4D     100 150    LD    C,L
000094 AF     101 151    XOR    A
000095 B8     102 152    CP    B      EXIT IF X=H'100' (256)
000096 C9     103 153    RET
                   154 *
                   155 *
                   156 *      PNTXY - RETURN POINT AT IX, IY (BC, DE FOR POINT)
                   157 *
                   158 *
000097 DDE5    104 159 PNTXY PUSH  IX
000099 C1     105 160    POP   BC
00009A FDE5    106 161    PUSH  IY
00009C D1     107 162    POP   DE
00009D CD5300  R 108 163 POINT CALL  CALAD1      FIND BYTE IN VRAM HOLDING POINT
0000A0 3807    109 164    JR    C,PTOFF  JUMP IF OFF SCREEN
0000A2 C87F    110 165    BIT   7,A
0000A4 3E00    111 166    LD    A,0      RETURN 0 IF BACKGROUND

```


LOC	OBJECT	M	STAT	E	LINE	SOURCE	LINE
0000A6	C8		112	167	RET	Z	
0000A7	3C		113	168	INC	A	
0000A8	C9		114	169	RET		RETURN 1 IF FOREGROUND
0000A9	AF		115	170	PTOFF	XOR	A
0000AA	3D		116	171	DEC	A	RETURN 255 IF OFF SCREEN
0000AB	C9		117	172	RET		
				173 *			
				174 *			
				175 *			
				176 *			
				177 *			
0000AC	CD0000	R	118	178	DRAWTO CALL	PLTX	
0000AF	E5		119	179	PUSH	HL	
0000B0	C5		120	180	PUSH	BC	
0000B1	ED480000	E	121	181	LD	BC,(X1)	HAVE END POINT
0000B5	ED580000	E	122	182	LD	DE,(Y1)	IN BC,DE
0000B9	FDE5		123	183	PUSH	IX	
0000BB	E1		124	184	POP	HL	
0000BC	CD3701	R	125	185	CALL	CHKEND	
0000BF	D9		126	186	EXX		
0000C0	5F		127	187	LD	E,A	
0000C1	C601		128	188	ADD	A,1	
0000C3	9F		129	189	SBC	A,A	
0000C4	57		130	190	LD	D,A	YS IN DE
0000C5	D9		131	191	EXX		
0000C6	DDE5		132	192	PUSH	IX	
0000C8	E3		133	193	EX	(SP),HL	SAVE DY
0000C9	50		134	194	LD	D,B	
0000CA	59		135	195	LD	E,C	
0000CB	CD3701	R	136	196	CALL	CHKEND	
0000CE	D9		137	197	EXX		
0000CF	4F		138	198	LD	C,A	
0000D0	C601		139	199	ADD	A,1	
0000D2	9F		140	200	SBC	A,A	
0000D3	47		141	201	LD	B,A	XS IN BC
0000D4	D9		142	202	EXX		
0000D5	D1		143	203	POP	DE	RETRIEVE DY IN DE
0000D6	87		144	204	OR	A	
0000D7	ED52		145	205	SBC	HL,DE	
0000D9	19		146	206	ADD	HL,DE	
0000DA	44		147	207	LD	B,H	
0000DB	4D		148	208	LD	C,L	DX IN BC, DY IN DE
0000DC	210000		149	209	LD	HL,0	R IN HL
0000DF	FA0801	R	150	210	JP	M,DRAW5	
				211 *			
				212 *			
0000E2	D5		151	213	DRAW2 PUSH	DE	
0000E3	DDE5		152	214	PUSH	IX	
0000E5	E3		153	215	EX	(SP),HL	
0000E6	ED580000	E	154	216	LD	DE,(X1)	SEE IF X=X1
0000EA	87		155	217	OR	A	
0000EB	ED52		156	218	SBC	HL,DE	
0000ED	E1		157	219	POP	HL	
0000EE	D1		158	220	POP	DE	
0000EF	2843		159	221	JR	Z,DRAW8	
0000F1	D9		160	222	EXX		

LOC OBJECT M STAT E LINE SOURCE LINE

0000F2	0009		161	223	ADD	IX,BC	ADD X5 TO X
0000F4	09		162	224	EXX		
0000F5	19		163	225	ADD	HL,DE	ADD DY TO R
0000F6	E5		164	226	PUSH	HL	
0000F7	29		165	227	ADD	HL,HL	
0000F8	3802		166	228	JR	C, DRAW3	
0000FA	ED42		167	229	SBC	HL,BC	SEE IF R+R)=DX
0000FC	E1		168	230	POP	HL	
0000FD	3807		169	231	JR	C, DRAW4	
0000FF	09		170	232	EXX		
000100	FD19		171	233	ADD	IV,DE	ADD Y5 TO Y
000102	09		172	234	EXX		
000103	87		173	235	OR	A	
000104	ED42		174	236	SBC	HL,BC	SUBTRACT DX FROM R
000106	CD0000	R	175	237	CALL	PLTXY	
000109	1807		176	238	JR	DRAW2	
				239 *			
				240 *			
000108	05		177	241	PUSH	DE	
00010C	FD05		178	242	PUSH	IV	
00010E	E3		179	243	EX	(SP),HL	
00010F	ED580000	E	180	244	LD	DE,(Y1)	SEE IF V=Y1
000113	87		181	245	OR	A	
000114	ED52		182	246	SBC	HL,DE	
000116	E1		183	247	POP	HL	
000117	01		184	248	POP	DE	
000118	281A		185	249	JR	Z, DRAW8	
00011A	09		186	250	EXX		
00011B	FD19		187	251	ADD	IV,DE	ADD Y5 TO Y
00011D	09		188	252	EXX		
00011E	09		189	253	ADD	HL,BC	ADD DX TO R
00011F	E5		190	254	PUSH	HL	
000120	29		191	255	ADD	HL,HL	
000121	3802		192	256	JR	C, DRAW6	
000123	ED52		193	257	SBC	HL,DE	SEE IF R+R)=DY
000125	E1		194	258	POP	HL	
000126	3807		195	259	JR	C, DRAW7	
000128	09		196	260	EXX		
000129	0009		197	261	ADD	IX,BC	
00012B	09		198	262	EXX		
00012C	87		199	263	OR	A	
00012D	ED52		200	264	SBC	HL,DE	SUBTRACT DY FROM R
00012F	CD0000	R	201	265	CALL	PLTXY	
000132	1807		202	266	JR	DRAW5	
000134	C1		203	267	POP	BC	RESTORE BC,HL
000135	E1		204	268	POP	HL	
000136	C9		205	269	RET		
				270 *			
				271 *			
				272 *			CHKEND - RETURN SIGN (DE-HL) IN A, MAGNITUDE (DE-HL) IN HL
				273 *			
				274 *			
000137	EB		206	275	CHKEND	EX	DE,HL
000138	AF		207	276	XOR	A	
000139	ED52		208	277	SBC	HL,DE	CALCULATE DIFFERENCES & SIGNS FOR
00013B	C8		209	278	RET	Z	X- AND Y- MOVES

LOC OBJECT M STAT E LINE SOURCE LINE

00013C	19		210	279	ADD	HL,DE	
00013D	F24401	R	211	280	JP	P,CK1	
000140	EB		212	281	EX	DE,HL	
000141	3D		213	282	DEC	A	-VE
000142	1801		214	283	JR	CK2	
000144	3C		215	284	CK1 INC	A	+VE
000145	B7		216	285	CK2 OR	A	
000146	ED52		217	286	SBC	HL,DE	
000148	C9		218	287	RET		
				288 *			
				289 *			
				290 *			
				291 *			
				292 *			
				293 *			
				294 *			
							FILL - FILL ENCLOSED SHAPE, GIVEN START POINT IN IX, IY, MODE IN "FILMOD". N.B. THIS ROUTINE DOES NOT WORK IF CALLED FROM MONITOR !
000149	210000	E	219	295	FILL LD	HL,FSTACK	INITIALISE FILL STACK
00014C	220000	E	220	296	LD	(STP),HL	
00014F	C00000	E	221	297	CALL	FLUSH	ENSURE DISC BUFFER EMPTY
000152	C08202	R	222	298	FILL CALL	FREND	MAIN PART OF FILL
000155	D0220000	E	223	299	LD	(X2),IX	SAVE RIGHT END
000159	C08801	R	224	300	CALL	HORAW	FIND LEFT END X1 & DRAW X1,Y TO X2,Y
00015C	F023		225	301	INC	IY	
00015E	D0E5		226	302	PUSH	IX	
000160	C0EC01	R	227	303	CALL	FSEKCH	FIND LINE ABOVE
000163	D0E1		228	304	POP	IX	
000165	D8		229	305	RET	C	
000166	F028		230	306	DEC	IY	
000168	F028		231	307	DEC	IY	
00016A	C0EC01	R	232	308	CALL	FSEKCH	FIND LINE BELOW
00016D	D8		233	309	RET	C	
00016E	ED730000	E	234	310	LD	(FILSP),SP	
000172	2A0000	E	235	311	LD	HL,(STP)	
000175	F9		236	312	LD	SP,HL	
000176	D0E1		237	313	POP	IX	POP OLD LINE INFORMATION
000178	F0E1		238	314	POP	IY	
00017A	ED730000	E	239	315	LD	(STP),SP	
00017E	ED780000	E	240	316	LD	SP,(FILSP)	
000182	110000	E	241	317	LD	DE,FSTACK	
000185	B7		242	318	OR	A	
000186	ED52		243	319	SBC	HL,DE	
000188	20C3		244	320	JR	NZ,FILL	DONE WHEN STP=STACK
00018A	C9		245	321	RET		
				322 *			
				323 *			
				324 *			
				325 *			
				326 *			
				327 *			
							HORAW - SPECIAL MODE OF "DRAW" FOR FILL, WHEN WE KNOW THAT ONLY HORIZONTAL LINES ARE NEEDED.
000188	CD4000	R	246	328	HORAW CALL	CALADR	SEE WHERE WE ARE !
00018E	C0E301	R	247	329	CALL	CHKFMD	
000191	C8FF		248	330	SET	7,A	PLOT FIRST POINT
000193	1C		249	331	INC	E	
000194	1D		250	332	HOR3 DEC	E	
000195	280E		251	333	JR	Z,HOR5	
000197	0F		252	334	RRCA		

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LOC OBJECT M STAT E LINE SOURCE LINE

000198	C8FF		253	335	SET	7,A	PLOT POINT
00019A	DD2B		254	336	DEC	IX	
00019C	30F6		255	337	JR	NC,HDR3	LOOP WHILE STILL SOME TO DO
00019E	37		256	338 HDR4	SCF		
00019F	1D		257	339	DEC	E	
0001A0	2803		258	340	JR	Z,HDR5	
0001A2	0F		259	341	RRCA		
0001A3	18F9		260	342	JR	HDR4	
0001A5	F5		261	343 HDR5	PUSH	AF	
0001A6	CDD501	R	262	344	CALL	FILCOL	
0001A9	F1		263	345	POP	AF	
0001AA	3003		264	346	JR	NC,HDR6	DONE IF END POINT FOUND
0001AC	DD23		265	347	INC	IX	
0001AE	C9		266	348	RET		
0001AF	11F8FF		267	349 HDR6	LD	DE,H'FFF8'	
0001B2	79		268	350	LD	A,C	
0001B3	93		269	351	ADD	A,E	MOVE TO NEXT LOCATION
0001B4	4F		270	352	LD	C,A	
0001B5	D0		271	353	RET	NC	DONE IF MOVING OFF SCREEN
0001B6	CDE201	R	272	354	CALL	VINFIL	
0001B9	2008		273	355	JR	NZ,HDR7	SEE IF 8-DOT SEGMENT EMPTY
0001BB	DD19		274	356	ADD	IX,DE	MOVE LEFT 8 POINTS
0001BD	2F		275	357	CPL		NEGATE SEGMENT
0001BE	CDD501	R	276	358	CALL	FILCOL	FILL 8-DOT SEGMENT
0001C1	18EC		277	359	JR	HDR6	
0001C3	C847		278	360 HDR7	BIT	0,A	RETURN IF DOT ON EDGE
0001C5	C0		279	361	RET	NZ	
0001C6	1600		280	362	LD	D,0	
0001C8	DD23		281	363	INC	IX	
0001CA	14		282	364 HDR8	INC	D	
0001CB	37		283	365	SCF		PLOT POINT
0001CC	1F		284	366	RRR		
0001CD	DD2B		285	367	DEC	IX	
0001CF	30F9		286	368	JR	NC,HDR3	FILL UNTIL END POINT FOUND
0001D1	07		287	369 HDR9	RLCA		
0001D2	15		288	370	DEC	D	
0001D3	20FC		289	371	JR	NZ,HDR9	
				372 *			
				373 *			
0001D5	CDE301	R	290	374 FILCOL CALL	CHKFMD		FILL VDP LOCATION ACCORDING TO FILL MODE
				375 SETCLR VR0UT			SET VDP LOCATION AND COLOUR IT
0001D8	F7		291	+	RST	H'30'	VIDEO RAM WRITE
				+	ENDM		
0001D9	C8E8		292	376	SET	5,B	
0001DB	3A0000	E	293	377	LD	A,(GCCLR)	
				378	VR0UT		
0001DE	F7		294	+	RST	H'30'	VIDEO RAM WRITE
				+	ENDM		
0001DF	C8A8		295	379	RES	5,B	
0001E1	C9		296	380	RET		
				381 *			
				382 *			
				383 *			
				384 *			
				385 *			
				386 VINFIL VRIN			GET FROM VDP FIRST

CHKFMD - CHECK FILL MODE, NEGATE VALUE IN A IF NECESSARY

LOC OBJECT M STAT E LINE SOURCE LINE

```

0001E2 EF      297      +      RST      H'28'      VIDEO RAM READ      *
                        +      ENDM                                *
0001E3 E5      298      387 CHKFM0 PUSH      HL
0001E4 210000  E      299      388      LD      HL,FILMOD      FILMOD=FF FOR NORMAL FILL
0001E7 AE      300      389      XOR      (HL)
0001E8 EEFF    301      390      XOR      H'FF'      DO INSTEAD OF CPL, SO Z FLAG IS UNAFFECTED
0001EA E1      302      391      POP      HL
0001EB C9      303      392      RET

```

393 *

394 *

395 *

396 *

397 *

FSERCH - SEE IF MORE TO FILL IN ABOVE/BELOW CURRENT LINE

```

0001EC C09700  R      304      398 FSERCH CALL      PNTXY
0001EF FEFF    305      399      CP      H'FF'
0001F1 C8      306      400      RET      Z      DONE IF GOING OFF SCREEN
0001F2 3D      307      401      DEC      A
0001F3 C0E301  R      308      402      CALL     CHKFM0
0001F6 2805    309      403      JR      Z,F51
0001F8 C08202  R      310      404      CALL     FREND
0001FB 1803    311      405      JR      F52
0001FD C05902  R      312      406 F51      CALL     FRENDZ
000200 ED580000 E      313      407 F52      LD      DE,(X2)
000204 00E5    314      408      PUSH     IX
000206 E1      315      409      POP      HL
000207 B7      316      410      OR      A
000208 ED52    317      411      SBC      HL,DE
00020A F21802  R      318      412      JP      P,F53
00020D C02902  R      319      413      CALL     XYP5H
000210 D8      320      414      RET      C      RETURN IF STACK OVERFLOW
000211 D023    321      415      INC      IX
000213 C05902  R      322      416      CALL     FRENDZ
000216 18E8    323      417      JR      F52
000218 D5      324      418 F53      PUSH     DE      X=X2
000219 D0E1    325      419      POP      IX
00021B C09700  R      326      420      CALL     PNTXY
00021E FEFF    327      421      CP      H'FF'
000220 C3      328      422      RET      Z
000221 3D      329      423      DEC      A
000222 C0E301  R      330      424      CALL     CHKFM0
000225 C8      331      425      RET      Z
000226 C08202  R      332      426      CALL     FREND      DROP THROUGH TO XYP5H

```

427 *

428 *

429 *

430 *

431 *

XYP5H - PUSH X & Y ONTO STACK AND CHECK FOR OVERFLOW

```

000229 00E5    333      432 XYP5H PUSH     IX
00022B D1      334      433      POP      DE      NEW X IN DE
00022C F0E5    335      434      PUSH     IY
00022E C1      336      435      POP      BC      NEW Y IN BC
00022F ED730000 E      337      436      LD      (FILSP),SP
000233 ED780000 E      338      437      LD      SP,(STP)
000237 E1      339      438      POP      HL
000238 E5      340      439      PUSH     HL
000239 87      341      440      OR      A

```

LOC OBJECT M STAT E LINE SOURCE LINE

00023A	ED52		342	441	SBC	HL,DE	
00023C	2009		343	442	JR	NZ,XP1	
00023E	E1		344	443	POP	HL	OLD X (=NEW X) IN DE
00023F	E1		345	444	POP	HL	GET OLD Y
000240	ED42		346	445	SBC	HL,BC	
000242	09		347	446	ADD	HL,BC	
000243	2802		348	447	JR	Z,XP1	
000245	E5		349	448	PUSH	HL	PUSH BACK OLD Y
000246	D5		350	449	PUSH	DE	AND OLD X
000247	C5		351	450	PUSH	BC	PUSH NEW Y
000248	D5		352	451	PUSH	DE	AND NEW X
000249	210800	E	353	452	LD	HL,HSTBUF+8	CHECK BOTTOM OF FILL STACK AREA
00024C	B7		354	453	OR	A	
00024D	ED72		355	454	SBC	HL,SP	ENSURE STACK DOES'NT OVERFLOW
00024F	3F		356	455	CCF		
000250	ED730000	E	357	456	LD	(STP),SP	
000254	ED780000	E	358	457	LD	SP,(FILSP)	
000258	C9		359	458	RET		
				459 *			
				460 *			
				461 *			FREN0Z - FIND NEW RIGHT END OF INTERRUPTED LINE
				462 *			FREND - FIND RIGHT END OF UNINTERRUPTED LINE
				463 *			
				464 *			
000259	CD4000	R	360	465	FREN0Z	CALL	CALADR
00025C	D023		361	466	FR1	INC	IX
00025E	C5		362	467	FR11	PUSH	BC
00025F	CD9700	R	363	468		CALL	PNTXY
000262	E1		364	469		POP	HL
000263	110800		365	470		LD	DE,8
000266	FEFF		366	471		CP	H'FF'
000268	2840		367	472		JR	Z,FR6
00026A	3D		368	473		DEC	A
00026B	CDE301	R	369	474		CALL	CHKFMD
00026E	2012		370	475		JR	NZ,FREND
000270	ED42		371	476		SBC	HL,BC
000272	09		372	477		ADD	HL,BC
000273	28E7		373	478		JR	Z,FR1
000275	CDE201	R	374	479	FR2	CALL	VINFIL
000278	3C		375	480		INC	A
000279	20E3		376	481		JR	NZ,FR11
00027B	D019		377	482		ADD	IX,DE
00027D	79		378	483		LD	A,C
00027E	83		379	484		ADD	A,E
00027F	4F		380	485		LD	C,A
000280	30F3		381	486		JR	NC,FR2
000282	CD4000	R	382	487	FREND	CALL	CALADR
000285	D023		383	488	FR3	INC	IX
000287	C5		384	489	FR4	PUSH	BC
000288	CD9700	R	385	490		CALL	PNTXY
00028B	E1		386	491		POP	HL
00028C	110800		387	492		LD	DE,8
00028F	FEFF		388	493		CP	H'FF'
000291	2817		389	494		JR	Z,FR6
000293	3D		390	495		DEC	A
000294	CDE301	R	391	496		CALL	CHKFMD

LOC OBJECT M STAT E LINE SOURCE LINE

```

000297 2811      392  497    JR    Z,FR6
000299 ED42      393  498    SBC   HL,BC
00029B 09        394  499    ADD   HL,BC
00029C 28E7      395  500    JR    Z,FR3
00029E CDE201    R  396  501 FR5  CALL VINFIL
0002A1 20E4      397  502    JR    NZ,FR4
0002A3 0D19      398  503    ADD   IX,DE
0002A5 79        399  504    LD    A,C
0002A6 83        400  505    ADD   A,E
0002A7 4F        401  506    LD    C,A
0002A8 30F4      402  507    JR    NC,FR5
0002AA 0D28      403  508 FR6  DEC   IX
0002AC C9        404  509    RET

```

510 *

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POLG - DO ELLIPSE/POLYGON

VALUES AS FOLLOWS:-

CX,CY - CENTRE COORDINATES

RADX,RADY - X,Y RADII

CINC - STEP FOR DRAWING

BC,DE - START & END ANGLES (0, 1024 FOR 1 REV.

CARRY FLAG - SET FOR DRAWING FROM ENDS TO MIDDLE

```

0002AD 0B        405  521 POLYC DEC   BC      DECREMENT END ANGLE FOR COMPARE
0002AE 0B        406  522    DEC   BC
0002AF F5        407  523    PUSH  AF
0002B0 CDE602    R  408  524    CALL  CHKARC    CHECK START & END ANGLES
0002B3 AF        409  525    XOR   A
0002B4 320000    E  410  526    LD    (DOTCNT),A    INITIALISE DOT COUNT
0002B7 EB        411  527    EX     DE,HL
0002B8 CD0603    R  412  528    CALL  CALPT     WORK OUT FIRST POINT
0002BB F1        413  529    POP   AF
0002BC F5        414  530    PUSH  AF
0002BD DC0802    R  415  531    CALL  C,DRWEND
0002C0 DD2A0000  E  416  532 ELL3  LD    IX,(X1)    SET OLD END AS NEW START POINT
0002C4 FD2A0000  E  417  533    LD    IX,(Y1)
0002C8 ED580000  E  418  534    LD    DE,(CINC)  ADD INCREMENT TO COUNT
0002CC 19        419  535    ADD   HL,DE
0002CD CD0603    R  420  536    CALL  CALPT
0002D0 CDAC00    R  421  537    CALL  DRAWTO    DRAW LINE FROM PREVIOUS POINT
0002D3 B7        422  538    OR    A
0002D4 ED42      423  539    SBC   HL,BC      SEE IF REACHED END
0002D6 09        424  540    ADD   HL,BC
0002D7 38E7      425  541    JR    C,ELL3
0002D9 F1        426  542    POP   AF
0002DA D0        427  543    RET    NC
0002DB DD2A0000  E  428  544 DRWEND LD    IX,(CX)    DRAW FROM CENTRE TO ENDS IF NEEDED
0002DF FD2A0000  E  429  545    LD    IX,(CY)
0002E3 C3AC00    R  430  546    JP     DRAWTO

```

547 *

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551 *

CHKARC - ENSURE ANGLES POSITIVE, INCREASE END ANGLE IF START>END

0002E6 CB7A 431 552 CHKARC BIT 7,D

SEE IF NEGATIVE START ANGLE

PMDS CROSS ASSEMBLER Z80

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LOC OBJECT M STATE LINE SOURCE LINE

```

0002E8 2806      432  553      JR      Z,CKA1
0002EA 14        433  554      INC      0
0002EB 14        434  555      INC      0
0002EC 14        435  556      INC      0
0002ED 14        436  557      INC      0
0002EE 18F6      437  558      JR      CHKARC
0002F0 C878      438  559 CKA1  BIT      7,8
0002F2 2806      439  560      JR      Z,CKA2
0002F4 04        440  561      INC      8
0002F5 04        441  562      INC      8
0002F6 04        442  563      INC      8
0002F7 04        443  564      INC      8
0002F8 18F6      444  565      JR      CKA1
0002FA 60        445  566 CKA2  LD      H,B
0002FB 69        446  567      LD      L,C
0002FC 87        447  568      OR      A
0002FD ED52      448  569      SBC     HL,DE
0002FF 00        449  570      RET     NC
000300 04        450  571      INC      8
000301 04        451  572      INC      8
000302 04        452  573      INC      8
000303 04        453  574      INC      8
000304 18F4      454  575      JR      CKA2

```

ADD REVOLUTIONS UNTIL POSITIVE

SEE IF NEGATIVE END ANGLE

ADD REVOLUTIONS UNTIL POSITIVE

GET END ANGLE INTO HL

BIGGER - JUST RETURN

ADD REVOLUTIONS UNTIL GREATER

CALPT - CALCULATE POINT ON CIRCUMFERENCE, GIVEN ANGLE IN HL

```

000306 E5        455  581 CALPT  PUSH    HL
000307 C5        456  582      PUSH    BC
000308 110004     457  583      LD      DE,1024
000308 87        458  584      OR      A
00030C ED52      459  585 CLP1  SBC     HL,DE
00030E 30FC      460  586      JR      NC,CLP1
000310 19        461  587      ADD     HL,DE
000311 110002     462  588      LD      DE,512
000314 CD3701    R  463  589      CALL    CHKEND
000317 F5        464  590      PUSH    AF
000318 EB        465  591      EX      DE,HL
000319 210001     466  592      LD      HL,256
00031C CD3701    R  467  593      CALL    CHKEND
00031F C1        468  594      POP     BC
000320 4F        469  595      LD      C,A
000321 EB        470  596      EX      DE,HL
000322 210001     471  597      LD      HL,256
000325 87        472  598      OR      A
000326 ED52      473  599      SBC     HL,DE
000328 EB        474  600      EX      DE,HL
000329 05        475  601      PUSH    DE
00032A C5        476  602      PUSH    BC
00032B 79        477  603      LD      A,C
00032C ED580000  E  478  604      LD      DE,(CX)
000330 ED480000  E  479  605      LD      BC,(RDX)
000334 CD4E03    R  480  606      CALL    CALCIR
000337 220000    E  481  607      LD      (X1),HL
00033A C1        482  608      POP     BC

```

GET HL INTO RANGE 0-1023 (0 TO 2*PI)

HAVE TY IN HL

SAVE YS

HAVE TX IN HL

HAVE YS IN B, XS IN C

HAVE TY IN DE

SAVE TY

XS IN A

DO X-COORD

LOC OBJECT M STAT E LINE SOURCE LINE

```

000338 E1      483  609  POP  HL      RETREIVE TY
00033C 78      484  610  LD   A,B     YS IN A
00033D ED560000 E 485  611  LD   DE,(CY)
000341 ED480000 E 486  612  LD   BC,(RADY)
000345 CD4E03   R 487  613  CALL CALCIR      DO Y-COORD
000348 220000   E 488  614  LD   (Y1),HL
00034B C1      489  615  POP  BC
00034C E1      490  616  POP  HL      RESTORE COUNT
00034D C9      491  617  RET

        618 *
        619 *
00034E D5      492  620 CALCIR PUSH DE
00034F F5      493  621  PUSH AF      DO X+XS*(RX*SN(TX))/256
000350 24      494  622  INC  H
000351 25      495  623  DEC  H
000352 2026    496  624  JR   NZ,CCR3
000354 2C      497  625  INC  L
000355 2D      498  626  DEC  L
000356 110000  499  627  LD   DE,0      RETURN 0 IF SIN(TX)=0
000359 2B14    500  628  JR   Z,CCR1
00035B EB      501  629  EX   DE,HL
00035C 217E03   R 502  630  LD   HL,SNTBL      CALCULATE SINE BY LOOK-UP
00035F 19      503  631  ADD  HL,DE
000360 1E00     504  632  LD   E,0
000362 56      505  633  LD   D,(HL)
000363 14      506  634  INC  C      IF D=0 THEN ASSUME 1
000364 15      507  635  DEC  D
000365 2B13    508  636  JR   Z,CCR3
000367 CD0000   E 509  637  CALL IMULT      CALCULATE RX*SN(TX)
00036A C87C     510  638  BIT  7,H
00036C 2801     511  639  JR   Z,CCR1      ROUND RESULT
00036E 13      512  640  INC  DE
00036F F1      513  641 CCR1 POP  AF      HAVE RESULT IN DE
000370 87      514  642  OR   A      TEST XS
000371 E1      515  643  POP  HL      GET START COORDINATE
000372 FA7703   R 516  644  JP   M,CCR2
000375 19      517  645  ADD  HL,DE      XS>0 : ADD
000376 C9      518  646  RET
000377 ED52     519  647 CCR2 SBC  HL,DE      XS<0 : SUBTRACT
000379 C9      520  648  RET
00037A 50      521  649 CCR3 LD   D,B      SPECIAL CASE FOR SIN(TX)=1
00037B 59      522  650  LD   E,C
00037C 18F1     523  651  JR   CCR1
        652 *
        653 *
        654 *      SNTBL - TABLE OF SINES, TO 1 PART IN 256
        655 *
        656 *
00037E 00020305 527 SNTBL DATA H'00',H'02',H'03',H'05',H'06',H'08',H'09',H'0B'
        06080908
000386 000E1011 528 DATA H'00',H'0E',H'10',H'11',H'13',H'14',H'16',H'18'
        13141618
00038E 191B1C1E 529 DATA H'19',H'1B',H'1C',H'1E',H'1F',H'21',H'22',H'24'
        1F212224
000396 2627292A 530 DATA H'26',H'27',H'29',H'2A',H'2C',H'2D',H'2F',H'30'
        2C2D2F30

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LOC OBJECT M STAT E LINE SOURCE LINE

00039E	32333537 333A383D	561	DATA	H'32',H'33',H'35',H'37',H'38',H'3A',H'3B',H'3D'
0003A6	3E404143 44464749	662	DATA	H'3E',H'40',H'41',H'43',H'44',H'46',H'47',H'49'
0003AE	4A4C4D4F 50525355	663	DATA	H'4A',H'4C',H'4D',H'4F',H'50',H'52',H'53',H'55'
0003B6	5658595B 5C5E5F61	664	DATA	H'56',H'58',H'59',H'5B',H'5C',H'5E',H'5F',H'61'
0003BE	62636566 68696B6C	665	DATA	H'62',H'63',H'65',H'66',H'68',H'69',H'6B',H'6C'
0003C6	6D6F7072 73757677	666	DATA	H'6D',H'6F',H'70',H'72',H'73',H'75',H'76',H'77'
0003CE	797A7B7D 7E808182	667	DATA	H'79',H'7A',H'7B',H'7D',H'7E',H'80',H'81',H'82'
0003D6	84858688 898A8C8D	668	DATA	H'84',H'85',H'86',H'88',H'89',H'8A',H'8C',H'8D'
0003DE	8E909192 93959697	669	DATA	H'8E',H'90',H'91',H'92',H'93',H'95',H'96',H'97'
0003E6	989A9B9C 9D9FA0A1	670	DATA	H'98',H'9A',H'9B',H'9C',H'9D',H'9F',H'A0',H'A1'
0003EE	A2A4A5A6 A7A8A9AB	671	DATA	H'A2',H'A4',H'A5',H'A6',H'A7',H'A8',H'AA',H'AB'
0003F6	ACADAEAF B1B2B3B4	672	DATA	H'AC',H'AD',H'AE',H'AF',H'B1',H'B2',H'B3',H'B4'
0003FE	B5B6B7B8 B9BABCBD	673	DATA	H'B5',H'B6',H'B7',H'B8',H'B9',H'BA',H'BC',H'BD'
000406	BEBCBDC1 C2C3C4C5	674	DATA	H'BE',H'BF',H'CO',H'C1',H'C2',H'C3',H'C4',H'C5'
00040E	C6C7C8C9 CABCCECD	675	DATA	H'C6',H'C7',H'C8',H'C9',H'CA',H'CB',H'CC',H'CD'
000416	CECFCD00 D1D2D3D4	676	DATA	H'CE',H'CF',H'CF',H'D0',H'D1',H'D2',H'D3',H'D4'
00041E	D5D6D7D7 D8D9DAD8	677	DATA	H'D5',H'D6',H'D7',H'D7',H'D8',H'D9',H'DA',H'DB'
000426	DCDCDDDE DFE0E0E1	678	DATA	H'DC',H'DC',H'DD',H'DE',H'DF',H'E0',H'E0',H'E1'
00042E	E2E3E3E4 E5E5E6E7	679	DATA	H'E2',H'E3',H'E3',H'E4',H'E5',H'E5',H'E6',H'E7'
000436	E7E8E9E9 EAE8EBEC	680	DATA	H'E7',H'E8',H'E9',H'E9',H'EA',H'EB',H'EC',H'EC'
00043E	EDEDEEEE EFEFF0F1	681	DATA	H'ED',H'ED',H'EE',H'EE',H'EF',H'EF',H'F0',H'F1'
000446	F1F2F2F3 F3F4F4F5	682	DATA	H'F1',H'F2',H'F2',H'F3',H'F3',H'F4',H'F4',H'F5'
00044E	F5F5F6F6 F7F7F8F8	683	DATA	H'F5',H'F5',H'F6',H'F6',H'F7',H'F7',H'F8',H'F8'
000456	F8F9F9F9 FAFAFAFB	684	DATA	H'F8',H'F9',H'F9',H'F9',H'FA',H'FA',H'FA',H'FB'
00045E	F8F8FCFC FCFCFD0D	685	DATA	H'F8',H'F8',H'FC',H'FC',H'FC',H'FC',H'FD',H'FD'
000466	F0F0FEFE FEFEFEFF	686	DATA	H'F0',H'F0',H'FE',H'FE',H'FE',H'FE',H'FE',H'FF'
00046E	FFFFFFF7 FFFF0000	687	DATA	H'FF',H'FF',H'FF',H'FF',H'FF',H'FF',H'00',H'00'
000476	00000000 00000000	688	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'

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LOC OBJECT M STAT E LINE SOURCE LINE

00047E 689 END

NO ERRORS DETECTED

LOC OBJECT M STATE LINE SOURCE LINE

```

1 CHRSET RSECT RAM
2 ENTRY KTAB,PCTAB
3 *****
4 *
5 *
6 *      KEYBOARD LOOK-UP TABLE
7 *
8 *
9 *****
10 KTAB DATA H'69',H'6F',H'70',H'5B' *I,Q,P,LFT ARROW ROW 1
11 DATA H'5F',H'0A',H'7C',H'30' *- ,LF,II,0 ROW 1
12 DATA H'49',H'4F',H'50',H'7B' *I,Q,P,1/4 SHIFT ROW 1
13 DATA H'60',H'0B',H'5C',H'40' *POUND,Vt,1/2,2 SHIFT ROW 1
14 DATA H'09',H'0F',H'10',H'1B' *HT,SI,DLE,ESC CTRL ROW 1
15 DATA H'1F',H'0A',H'1C',H'30' *IS1(US),LF,IS4(F5),0 CTRL ROW 1
16 DATA H'6B',H'6C',H'38',H'3A' *K,L,,, ROW 2
17 DATA H'5D',H'04',H'39',H'85' *RGHT ARROW,HT,9,f5 ROW 2
18 DATA H'4B',H'4C',H'2B',H'2A' *K,L,+,* SHIFT ROW 2
19 DATA H'7D',H'08',H'29',H'85' *3/4,B5,.,f5 SHIFT ROW 2
20 DATA H'08',H'0C',H'3B',H'3A' *VT,FF,,, CTRL ROW 2
21 DATA H'10',H'04',H'39',H'85' *IS3(G5),HT,9,f5 CTRL ROW 2
22 DATA H'2C',H'2E',H'2F',H'38' *,,,/,8 ROW 3
23 DATA H'19',H'30',H'5E',H'84' *INSERT,=,UP ARROW,f4 ROW 3
24 DATA H'3C',H'3E',H'3F',H'28' *C,.,?,( SHIFT ROW 3
25 DATA H'1A',H'20',H'7E',H'84' *DELETE,.,DIVIDE,f4 SHIFT ROW
26 DATA H'2C',H'2E',H'2F',H'38' *,,,/,8 CTRL ROW 3
27 DATA H'06',H'30',H'1E',H'84' *INSERT,=,IS2(RS),f4 CTRL ROW 3
28 DATA H'37',H'38',H'35',H'34' *7,6,5,4 ROW 4
29 DATA H'33',H'32',H'31',H'83' *3,2,1,f3 ROW 4
30 DATA H'27',H'26',H'25',H'24' *',&,%,f5 SHIFT ROW 4
31 DATA H'23',H'22',H'21',H'83' *#,*,!,f3 SHIFT ROW 4
32 DATA H'37',H'36',H'35',H'34' *7,6,5,4 CTRL ROW 4
33 DATA H'33',H'32',H'31',H'83' *3,2,1,f3 CTRL ROW 4
34 DATA H'75',H'79',H'74',H'72' *U,Y,T,R ROW 5
35 DATA H'65',H'77',H'71',H'82' *E,H,Q,f2 ROW 5
36 DATA H'55',H'59',H'54',H'52' *U,Y,T,R SHIFT ROW 5
37 DATA H'45',H'57',H'51',H'82' *E,H,Q,f2 SHIFT ROW 5
38 DATA H'15',H'19',H'14',H'12' *NAK,EN,DC4,DC2 CTRL ROW 5
39 DATA H'05',H'17',H'11',H'82' *ENQ,ETB,DC1,f2 CTRL ROW 5
40 DATA H'6A',H'6B',H'67',H'66' *J,H,G,F ROW 6
41 DATA H'64',H'73',H'61',H'81' *D,S,A,f1 ROW 6
42 DATA H'4A',H'4B',H'47',H'46' *J,H,G,F SHIFT ROW 6
43 DATA H'44',H'53',H'41',H'81' *D,S,A,f1 SHIFT ROW 6
44 DATA H'0A',H'0B',H'07',H'06' *LF,B5,BEL,ACK CTRL ROW 6
45 DATA H'04',H'13',H'01',H'81' *EOT,DC3,SOH,f1 CTRL ROW 6
46 DATA H'6D',H'6E',H'62',H'76' *M,N,B,V ROW 7
47 DATA H'63',H'78',H'7A',H'86' *C,X,Z,f6 ROW 7
48 DATA H'4D',H'4E',H'42',H'56' *M,N,B,V SHIFT ROW 7
49 DATA H'43',H'58',H'5A',H'86' *C,X,Z,f6 SHIFT ROW 7
50 DATA H'0D',H'0E',H'02',H'16' *CR,SO,STX,SYN CTRL ROW 7
51 DATA H'03',H'18',H'1A',H'86' *ETX,CAN,SUB,f6 CTRL ROW 7
52 *
53 *
54 *
55 *
56 *****

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LOC OBJECT M STAT E LINE SOURCE LINE

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57 * CHARACTER SET PATTERN GENERATOR LOOK UP TABLE
58 *****
59 *
60 *
61 PG TAB DATA H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00' ; SPACE
62 DATA H'00',H'10',H'10',H'10',H'10',H'00',H'10',H'00' ; !
63 DATA H'00',H'28',H'28',H'28',H'00',H'00',H'00',H'00' ; "
64 DATA H'00',H'28',H'7C',H'28',H'28',H'7C',H'28',H'00' ; HASH
65 DATA H'00',H'10',H'3C',H'50',H'38',H'14',H'78',H'10' ; $
66 DATA H'00',H'60',H'64',H'08',H'10',H'2C',H'4C',H'00' ; %
67 DATA H'00',H'20',H'50',H'20',H'54',H'48',H'34',H'00' ; &
68 DATA H'00',H'10',H'10',H'10',H'00',H'00',H'00',H'00' ; '
69 DATA H'00',H'08',H'10',H'10',H'10',H'10',H'08',H'00' ; (
70 DATA H'00',H'20',H'10',H'10',H'10',H'10',H'20',H'00' ; )
71 DATA H'00',H'10',H'54',H'38',H'10',H'38',H'54',H'10' ; *
72 DATA H'00',H'00',H'10',H'10',H'7C',H'10',H'10',H'00' ; +
73 DATA H'00',H'00',H'00',H'00',H'00',H'10',H'10',H'20' ; ,
74 DATA H'00',H'00',H'00',H'00',H'38',H'00',H'00',H'00' ; -
75 DATA H'00',H'00',H'00',H'00',H'00',H'00',H'10',H'00' ; .
76 DATA H'00',H'00',H'04',H'08',H'10',H'20',H'40',H'00' ; /
77 DATA H'00',H'10',H'28',H'44',H'44',H'28',H'10',H'00' ; 0
78 DATA H'00',H'10',H'30',H'10',H'10',H'10',H'38',H'00' ; 1
79 DATA H'00',H'38',H'44',H'04',H'38',H'40',H'7C',H'00' ; 2
80 DATA H'00',H'38',H'44',H'18',H'04',H'44',H'38',H'00' ; 3
81 DATA H'00',H'18',H'28',H'48',H'7C',H'08',H'08',H'00' ; 4
82 DATA H'00',H'7C',H'40',H'78',H'04',H'44',H'38',H'00' ; 5
83 DATA H'00',H'38',H'40',H'78',H'44',H'44',H'38',H'00' ; 6
84 DATA H'00',H'7C',H'04',H'08',H'10',H'20',H'20',H'00' ; 7
85 DATA H'00',H'38',H'44',H'38',H'44',H'44',H'38',H'00' ; 8
86 DATA H'00',H'38',H'44',H'38',H'04',H'08',H'10',H'00' ; 9

0000A8 00000000
00000000
0000B0 00101010
10001000
0000B8 00282828
00000000
0000C0 00287C28
287C2800
0000C8 00103C50
38147810
0000D0 00606408
102C4C00
0000D8 00205020
54483400
0000E0 00101010
00000000
0000E8 00081010
10100800
0000F0 00201010
10102000
0000F8 00105438
10385410
000100 00001010
7C101000
000108 00000000
00101020
000110 00000000
38000000
000118 00000000
00001000
000120 00000408
10204000
000128 00102844
44281000
000130 00103010
10103800
000138 00384404
38407C00
000140 00384418
04443800
000148 00182848
7C080800
000150 007C4078
04443800
000158 00384078
44443800
000160 007C0408
10202000
000168 00384438
44443800
000170 00384438
04081000

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LOC	OBJECT	M	STAT	E LINE	SOURCE LINE
000178	00000010 00100000	37	DATA	H'00',H'00',H'00',H'10',H'00',H'10',H'00',H'00'	
000180	00000010 00101020	38	DATA	H'00',H'00',H'00',H'10',H'00',H'10',H'10',H'20'	
000183	00001020 40201000	39	DATA	H'00',H'00',H'10',H'20',H'40',H'20',H'10',H'00'	
000190	0000007C 007C0000	90	DATA	H'00',H'00',H'00',H'7C',H'00',H'7C',H'00',H'00'	=
000198	00001008 04081000	91	DATA	H'00',H'00',H'10',H'08',H'04',H'08',H'10',H'00'	>
0001A0	00384408 10100010	92	DATA	H'00',H'38',H'44',H'08',H'10',H'10',H'00',H'10'	?
0001A8	00384454 5C403C00	93	DATA	H'00',H'38',H'44',H'54',H'5C',H'40',H'3C',H'00'	3
0001B0	00102844 7C444403	94	DATA	H'00',H'10',H'28',H'44',H'7C',H'44',H'44',H'00'	8
0001B3	00784478 44447800	95	DATA	H'00',H'78',H'44',H'78',H'44',H'44',H'78',H'00'	6
0001C0	00384440 40443800	96	DATA	H'00',H'38',H'44',H'40',H'40',H'44',H'38',H'00'	C
0001C3	00784444 44447800	97	DATA	H'00',H'78',H'44',H'44',H'44',H'44',H'78',H'00'	D
0001D0	007C4078 40407C00	98	DATA	H'00',H'7C',H'40',H'78',H'40',H'40',H'7C',H'00'	E
0001D3	007C4078 40404000	99	DATA	H'00',H'7C',H'40',H'78',H'40',H'40',H'40',H'00'	F
0001E0	00384440 4C443800	100	DATA	H'00',H'38',H'44',H'40',H'4C',H'44',H'38',H'00'	G
0001E3	0044447C 44444400	101	DATA	H'00',H'44',H'44',H'7C',H'44',H'44',H'44',H'00'	H
0001F0	007C1010 10107C00	102	DATA	H'00',H'7C',H'10',H'10',H'10',H'10',H'7C',H'00'	I
0001F3	003C0808 08483000	103	DATA	H'00',H'3C',H'08',H'08',H'08',H'48',H'30',H'00'	J
000200	00444850 70484400	104	DATA	H'00',H'44',H'48',H'50',H'70',H'48',H'44',H'00'	
000203	00404040 40407C00	105	DATA	H'00',H'40',H'40',H'40',H'40',H'40',H'7C',H'00'	
000210	00446C54 54444400	106	DATA	H'00',H'44',H'6C',H'54',H'54',H'44',H'44',H'00'	
000213	00446454 4C444400	107	DATA	H'00',H'44',H'64',H'54',H'4C',H'44',H'44',H'00'	N
000220	00384444 44443800	108	DATA	H'00',H'38',H'44',H'44',H'44',H'44',H'38',H'00'	
000223	00784478 40404000	109	DATA	H'00',H'78',H'44',H'78',H'40',H'40',H'40',H'00'	
000230	00384444 54483400	110	DATA	H'00',H'38',H'44',H'44',H'54',H'48',H'34',H'00'	Q
000233	00784478 50484400	111	DATA	H'00',H'78',H'44',H'78',H'50',H'48',H'44',H'00'	Q
000240	00384038 04043800	112	DATA	H'00',H'38',H'40',H'38',H'04',H'04',H'38',H'00'	S
000243	007C1010 10101000	113	DATA	H'00',H'7C',H'10',H'10',H'10',H'10',H'10',H'00'	
000250	00444444 44443800	114	DATA	H'00',H'44',H'44',H'44',H'44',H'44',H'38',H'00'	U

LOC OBJECT STAT E LINE SOURCE LINE

LOC	OBJECT	STAT	E	LINE	SOURCE LINE
000258	00444444 28281000			115	DATA H'00',H'44',H'44',H'44',H'28',H'28',H'10',H'30' y
000260	00444454 54542300			116	DATA H'00',H'44',H'44',H'54',H'54',H'54',H'28',H'00' w
000268	00442810 10284400			117	DATA H'00',H'44',H'28',H'10',H'10',H'28',H'44',H'00' x
000270	00444428 10101000			118	DATA H'00',H'44',H'44',H'28',H'10',H'10',H'10',H'00' y
000278	007C0810 20407C00			119	DATA H'00',H'7C',H'08',H'10',H'20',H'40',H'7C',H'00' z
000280	00001020 7C201000			120	DATA H'00',H'00',H'10',H'20',H'7C',H'20',H'10',H'00' LEFT ARROW
000288	00404058 04181C00			121	DATA H'00',H'40',H'40',H'58',H'04',H'18',H'1C',H'00' 1/2
000290	00001008 7C081000			122	DATA H'00',H'00',H'10',H'08',H'7C',H'08',H'10',H'00' RIGHT ARROW
000298	00103854 10101000			123	DATA H'00',H'10',H'38',H'54',H'10',H'10',H'10',H'00' ^
0002A0	00000000 0000007C			124	DATA H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'7C' _
0002A8	00182420 70207C00			125	DATA H'00',H'18',H'24',H'20',H'70',H'20',H'7C',H'00' POUND
0002B0	00003008 38483400			126	DATA H'00',H'00',H'30',H'08',H'38',H'48',H'34',H'00' a
0002B8	00404070 48487000			127	DATA H'00',H'40',H'40',H'70',H'48',H'48',H'70',H'00' b
0002C0	00003048 40483000			128	DATA H'00',H'00',H'30',H'48',H'40',H'48',H'30',H'00' c
0002C8	00080838 48483800			129	DATA H'00',H'08',H'08',H'38',H'48',H'48',H'38',H'00' d
0002D0	00003048 70403800			130	DATA H'00',H'00',H'30',H'48',H'70',H'40',H'38',H'00' e
0002D8	00102820 78202000			131	DATA H'00',H'10',H'28',H'20',H'78',H'20',H'20',H'00' f
0002E0	00003048 38084830			132	DATA H'00',H'00',H'30',H'48',H'38',H'08',H'48',H'30' g
0002E8	00404070 48484800			133	DATA H'00',H'40',H'40',H'70',H'48',H'48',H'48',H'00' h
0002F0	00100030 10103800			134	DATA H'00',H'10',H'00',H'30',H'10',H'10',H'38',H'00' i
0002F8	00080008 08084830			135	DATA H'00',H'08',H'00',H'08',H'08',H'08',H'48',H'30' j
000300	00404850 60504800			136	DATA H'00',H'40',H'48',H'50',H'60',H'50',H'48',H'00' k
000308	00301010 10103800			137	DATA H'00',H'30',H'10',H'10',H'10',H'10',H'38',H'00' l
000310	00006854 54545400			138	DATA H'00',H'00',H'68',H'54',H'54',H'54',H'54',H'00' m
000318	00005068 48484800			139	DATA H'00',H'00',H'50',H'68',H'48',H'48',H'48',H'00' n
000320	00003048 48483000			140	DATA H'00',H'00',H'30',H'48',H'48',H'48',H'30',H'00' o
000328	00003048 48704040			141	DATA H'00',H'00',H'30',H'48',H'48',H'70',H'40',H'40' p
000330	00003048 48380C08			142	DATA H'00',H'00',H'30',H'48',H'48',H'38',H'0C',H'08' q

LOC OBJECT M STATE LINE SOURCE LINE

000338	00005068	143	DATA	H'00',H'00',H'50',H'68',H'40',H'40',H'40',H'00'	
	40404000				
000340	00003840	144	DATA	H'00',H'00',H'38',H'40',H'30',H'08',H'70',H'00'	5
	30087000				
000348	00207020	145	DATA	H'00',H'20',H'70',H'20',H'20',H'28',H'10',H'00'	1
	20281000				
000350	00004848	146	DATA	H'00',H'00',H'48',H'48',H'48',H'58',H'28',H'00'	4
	48582800				
000358	00004848	147	DATA	H'00',H'00',H'48',H'48',H'48',H'30',H'30',H'00'	6
	48303000				
000360	00005454	148	DATA	H'00',H'00',H'54',H'54',H'54',H'54',H'28',H'00'	4
	54542800				
000368	00004428	149	DATA	H'00',H'00',H'44',H'28',H'10',H'28',H'44',H'00'	2
	10284400				
000370	00004848	150	DATA	H'00',H'00',H'48',H'48',H'38',H'08',H'48',H'30'	4
	38084830				
000378	00007810	151	DATA	H'00',H'00',H'78',H'10',H'20',H'40',H'78',H'00'	2
	20407800				
000380	00404048	152	DATA	H'00',H'40',H'40',H'48',H'18',H'30',H'08',H'00'	1/4
	18308000				
000388	00282828	153	DATA	H'00',H'28',H'28',H'28',H'28',H'28',H'28',H'00'	PARALLEL BARS
	28282800				
000390	00702010	154	DATA	H'00',H'70',H'20',H'10',H'68',H'18',H'30',H'08'	3/4
	68183008				
000398	00001000	155	DATA	H'00',H'00',H'10',H'00',H'70',H'00',H'10',H'00'	DIVIDE
	70001000				
0003A0	7C7C7C7C	156	DATA	H'7C',H'7C',H'7C',H'7C',H'7C',H'7C',H'7C',H'7C'	DEL
	7C7C7C7C				
		157 *			
		158 *			
		159 *		GRAPHICS CHARACTER SET	
		160 *			
		161 *			
0003A8	00000000	162	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	128
	00000000				
0003B0	60804020	163	DATA	H'60',H'80',H'40',H'20',H'08',H'14',H'14',H'18'	129
	08141418				
0003B8	00000000	164	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
	00000000				
0003C0	00000000	165	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
	00000000				
0003C8	0010F804	166	DATA	H'00',H'10',H'F8',H'04',H'F8',H'10',H'00',H'00'	132
	F8100000				
0003D0	00000000	167	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
	00000000				
0003D8	004424F4	168	DATA	H'00',H'44',H'24',H'F4',H'24',H'44',H'00',H'00'	134
	24440000				
0003E0	80E0A0E0	169	DATA	H'80',H'E0',H'A0',H'E0',H'10',H'10',H'10',H'10'	135
	10101010				
0003E8	00207C30	170	DATA	H'00',H'20',H'7C',H'80',H'7C',H'20',H'00',H'00'	136
	7C200000				
0003F0	80C0A0A0	171	DATA	H'80',H'C0',H'A0',H'A0',H'10',H'08',H'08',H'08'	137
	10080808				
0003F8	50505008	172	DATA	H'50',H'50',H'50',H'08',H'50',H'20',H'00',H'00'	138
	50200000				
000400	2050D850	173	DATA	H'20',H'50',H'08',H'50',H'50',H'50',H'00',H'00'	139

LOC OBJECT M STAT E LINE SOURCE LINE

LOC	OBJECT	M	STAT	E	LINE	SOURCE LINE
000408	50500000 E080C080 38203020		174	DATA	H'E0',H'80',H'CO',H'80',H'38',H'20',H'20',H'20'	140
000410	E08080E0 1C141814		175	DATA	H'E0',H'80',H'80',H'E0',H'1C',H'14',H'18',H'14'	141
000418	80C0E040 1C14141C		176	DATA	H'80',H'CO',H'E0',H'40',H'1C',H'14',H'14',H'1C'	142
000420	E0204020 EC04080C		177	DATA	H'E0',H'20',H'40',H'20',H'EC',H'04',H'08',H'0C'	143
000428	00000000 00000000		178	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
000430	E08080E0 1C14141C		179	DATA	H'E0',H'80',H'80',H'E0',H'1C',H'14',H'14',H'1C'	145
000438	E0A0E080 9C14141C		180	DATA	H'E0',H'A0',H'E0',H'80',H'9C',H'14',H'14',H'1C'	146
000440	E0A0E080 9C101810		181	DATA	H'E0',H'A0',H'E0',H'80',H'9C',H'10',H'18',H'10'	147
000448	E08080E0 1C101810		182	DATA	H'E0',H'80',H'80',H'E0',H'1C',H'10',H'18',H'10'	148
000450	C0A0A0C0 1010101C		183	DATA	H'CO',H'A0',H'A0',H'CO',H'10',H'10',H'10',H'1C'	149
000458	C0A0A0CC 10080418		184	DATA	H'CO',H'A0',H'A0',H'CC',H'10',H'08',H'04',H'18'	150
000460	00000000 00000000		185	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
000468	C0A0A0C0 1C141814		186	DATA	H'CO',H'A0',H'A0',H'CO',H'1C',H'14',H'18',H'14'	152
000470	0088908C 90330000		187	DATA	H'00',H'88',H'90',H'8C',H'90',H'88',H'00',H'00'	153
000478	20A87020 00080800		188	DATA	H'20',H'A8',H'70',H'20',H'00',H'08',H'08',H'00'	154
000480	E080C080 EC08080C		189	DATA	H'E0',H'80',H'CO',H'80',H'EC',H'08',H'08',H'0C'	155
000488	00000000 00000000		190	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
000490	00000000 00000000		191	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
000498	00F0C0A0 90080400		192	DATA	H'00',H'F0',H'CO',H'A0',H'90',H'08',H'04',H'00'	158
0004A0	00000000 00000000		193	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	
0004A8	FFFFFFFF FFFFFFFF		194	DATA	H'FF',H'FF',H'FF',H'FF',H'FF',H'FF',H'FF',H'FF'	160
0004B0	00000000 000000FF		195	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'00',H'FF'	161
0004B8	00000000 0000FF00		196	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'FF',H'00'	162
0004C0	00000000 00FF0000		197	DATA	H'00',H'00',H'00',H'00',H'00',H'FF',H'00',H'00'	163
0004C8	00000000 FF000000		198	DATA	H'00',H'00',H'00',H'00',H'FF',H'00',H'00',H'00'	164
0004D0	01010101 01010101		199	DATA	H'01',H'01',H'01',H'01',H'01',H'01',H'01',H'01'	165
0004D8	02020202 02020202		200	DATA	H'02',H'02',H'02',H'02',H'02',H'02',H'02',H'02'	166
0004E0	04040404		201	DATA	H'04',H'04',H'04',H'04',H'04',H'04',H'04',H'04'	167

LOC OBJECT N STATE LINE SOURCE LINE

LOC	OBJECT	N	STATE	LINE	SOURCE LINE
0004E8	04040404 08080808 08020808	202	DATA	H'08',H'08',H'08',H'08',H'08',H'08',H'08',H'08'	168
0004F0	000000F0 10101010	203	DATA	H'00',H'00',H'00',H'F0',H'10',H'10',H'10',H'10'	169
0004F8	0103040C 13334CCC	204	DATA	H'01',H'03',H'04',H'0C',H'13',H'33',H'4C',H'CC'	170
000500	00000000 3333CCCC	205	DATA	H'00',H'00',H'00',H'00',H'33',H'33',H'CC',H'CC'	171
000508	00000003 04081010	206	DATA	H'00',H'00',H'00',H'03',H'04',H'08',H'10',H'10'	172
000510	FF808080 80808080	207	DATA	H'FF',H'80',H'80',H'80',H'80',H'80',H'80',H'80'	173
000518	101020C0 00000000	208	DATA	H'10',H'10',H'20',H'C0',H'00',H'00',H'00',H'00'	174
000520	08080403 00000000	209	DATA	H'08',H'08',H'04',H'03',H'00',H'00',H'00',H'00'	175
000528	0808080F 00000000	210	DATA	H'08',H'08',H'08',H'0F',H'00',H'00',H'00',H'00'	176
000530	FF000000 00000000	211	DATA	H'FF',H'00',H'00',H'00',H'00',H'00',H'00',H'00'	177
000538	00FF0000 00000000	212	DATA	H'00',H'FF',H'00',H'00',H'00',H'00',H'00',H'00'	178
000540	0000FF00 00000000	213	DATA	H'00',H'00',H'FF',H'00',H'00',H'00',H'00',H'00'	179
000548	000000FF 00000000	214	DATA	H'00',H'00',H'00',H'FF',H'00',H'00',H'00',H'00'	180
000550	80808080 80808080	215	DATA	H'80',H'80',H'80',H'80',H'80',H'80',H'80',H'80'	181
000558	40404040 40404040	216	DATA	H'40',H'40',H'40',H'40',H'40',H'40',H'40',H'40'	182
000560	20202020 20202020	217	DATA	H'20',H'20',H'20',H'20',H'20',H'20',H'20',H'20'	183
000568	10101010 10101010	218	DATA	H'10',H'10',H'10',H'10',H'10',H'10',H'10',H'10'	184
000570	101010F0 00000000	219	DATA	H'10',H'10',H'10',H'F0',H'00',H'00',H'00',H'00'	185
000578	3332CCCC 3020C080	220	DATA	H'33',H'32',H'CC',H'C8',H'30',H'20',H'00',H'80'	186
000580	3333CCCC 00000000	221	DATA	H'33',H'33',H'CC',H'CC',H'00',H'00',H'00',H'00'	187
000588	10100804 03000000	222	DATA	H'10',H'10',H'08',H'04',H'03',H'00',H'00',H'00'	188
000590	80808080 808080FF	223	DATA	H'80',H'80',H'80',H'80',H'80',H'80',H'80',H'FF'	189
000598	00000006 C0201010	224	DATA	H'00',H'00',H'00',H'00',H'00',H'20',H'10',H'10'	190
0005A0	00000000 03040808	225	DATA	H'00',H'00',H'00',H'00',H'03',H'04',H'08',H'08'	191
0005A8	00000000 0F080808	226	DATA	H'00',H'00',H'00',H'00',H'0F',H'08',H'08',H'08'	192
0005B0	03030303 03030303	227	DATA	H'03',H'03',H'03',H'03',H'03',H'03',H'03',H'03'	193
0005B8	80804040 20100803	228	DATA	H'80',H'80',H'40',H'40',H'20',H'10',H'0C',H'03'	194
0005C0	01010202	229	DATA	H'01',H'01',H'02',H'02',H'02',H'04',H'04',H'08'	195

LOC OBJECT M STAT E LINE SOURCE LINE

02040408					
0005C8 0F0F0F0F	230	DATA	H'0F',H'0F',H'0F',H'0F',H'0F',H'0F',H'0F',H'0F'	196	
0F0F0F0F					
0005D0 02020202	231	DATA	H'02',H'02',H'02',H'02',H'02',H'02',H'07',H'02'	197	
02020702					
0005D8 00000000	232	DATA	H'00',H'00',H'00',H'00',H'00',H'00',H'FF',H'FF'	198	
0000FFFF					
0005E0 00000000	233	DATA	H'00',H'00',H'00',H'00',H'00',H'FF',H'FF',H'FF'	199	
00FFFFF					
0005E8 00000000	234	DATA	H'00',H'00',H'00',H'00',H'FF',H'FF',H'FF',H'FF'	200	
FFFFFFF					
0005F0 C0300C03	235	DATA	H'0C',H'30',H'0C',H'03',H'00',H'00',H'00',H'00'	201	
00000000					
0005F8 0F0F0F0F	236	DATA	H'0F',H'0F',H'0F',H'0F',H'F0',H'F0',H'F0',H'F0'	202	
F0F0F0F0					
000600 3333CCCC	237	DATA	H'33',H'33',H'CC',H'CC',H'33',H'33',H'CC',H'CC'	203	
3333CCCC					
000608 03030C0C	238	DATA	H'03',H'03',H'0C',H'0C',H'03',H'03',H'0C',H'0C'	204	
03030C0C					
000610 08081020	239	DATA	H'08',H'08',H'10',H'20',H'0C',H'00',H'00',H'00'	205	
C0000000					
000618 01010202	240	DATA	H'01',H'01',H'02',H'02',H'04',H'08',H'30',H'0C'	206	
040830CC					
000620 00666618	241	DATA	H'00',H'66',H'66',H'18',H'18',H'66',H'66',H'00'	207	
18666600					
000628 44444444	242	DATA	H'44',H'44',H'44',H'44',H'44',H'44',H'44',H'44'	208	
44444444					
000630 101010F0	243	DATA	H'10',H'10',H'10',H'F0',H'10',H'10',H'10',H'10'	209	
10101010					
000638 02020202	244	DATA	H'02',H'02',H'02',H'02',H'02',H'02',H'FF',H'02'	210	
0202FF02					
000640 07070707	245	DATA	H'07',H'07',H'07',H'07',H'07',H'07',H'07',H'07'	211	
07070707					
000648 80804040	246	DATA	H'80',H'80',H'40',H'40',H'20',H'20',H'10',H'10'	212	
20201010					
000650 00000000	247	DATA	H'00',H'00',H'00',H'00',H'03',H'0C',H'30',H'0C'	213	
030C30C0					
000658 08080404	248	DATA	H'08',H'08',H'04',H'04',H'02',H'02',H'01',H'01'	214	
02020101					
000660 101010FF	249	DATA	H'10',H'10',H'10',H'FF',H'00',H'00',H'00',H'00'	215	
00000000					
000668 C0300601	250	DATA	H'0C',H'38',H'06',H'01',H'00',H'00',H'00',H'00'	216	
00000000					
000670 01010202	251	DATA	H'01',H'01',H'02',H'02',H'04',H'04',H'08',H'08'	217	
04040808					
000678 031C6080	252	DATA	H'03',H'1C',H'60',H'80',H'00',H'00',H'00',H'00'	218	
00000000					
000680 44FF4444	253	DATA	H'44',H'FF',H'44',H'44',H'44',H'FF',H'44',H'44'	219	
44FF4444					
000688 80402010	254	DATA	H'80',H'40',H'20',H'10',H'08',H'04',H'02',H'01'	220	
08040201					
000690 33330C0C	255	DATA	H'33',H'33',H'0C',H'0C',H'03',H'03',H'00',H'00'	221	
03030000					
000698 01010101	256	DATA	H'01',H'01',H'01',H'01',H'01',H'01',H'01',H'FF'	222	
010101FF					
0006A0 11224488	257	DATA	H'11',H'22',H'44',H'88',H'11',H'22',H'44',H'88'	223	

LOC OBJECT M STATE LINE SOURCE LINE

11224488					
0006A8 88442211	258	DATA	H'88',H'44',H'22',H'11',H'88',H'44',H'22',H'11'	224	
88442211					
0006B0 C0C0C0C0	259	DATA	H'CO',H'CO',H'CO',H'CO',H'CO',H'CO',H'CO',H'CO'	225	
C0C0C0C0					
0006B8 030C1020	260	DATA	H'03',H'0C',H'10',H'20',H'40',H'40',H'80',H'80'	226	
40408080					
0006C0 80804040	261	DATA	H'80',H'80',H'40',H'40',H'40',H'20',H'20',H'10'	227	
40202010					
0006C8 F0F0F0F0	262	DATA	H'FO',H'FO',H'FO',H'FO',H'FO',H'FO',H'FO',H'FO'	228	
F0F0F0F0					
0006D0 00000000	263	DATA	H'00',H'00',H'00',H'00',H'00',H'02',H'FF',H'02'	229	
0002FF02					
0006D8 FFFF0000	264	DATA	H'FF',H'FF',H'00',H'00',H'00',H'00',H'00',H'00'	230	
00000000					
0006E0 FFFFFFF00	265	DATA	H'FF',H'FF',H'FF',H'00',H'00',H'00',H'00',H'00'	231	
00000000					
0006E8 FFFFFFFF	266	DATA	H'FF',H'FF',H'FF',H'FF',H'00',H'00',H'00',H'00'	232	
00000000					
0006F0 030C30C0	267	DATA	H'03',H'0C',H'30',H'CO',H'00',H'00',H'00',H'00'	233	
00000000					
0006F8 F0F0F0F0	268	DATA	H'FO',H'FO',H'FO',H'FO',H'0F',H'0F',H'0F',H'0F'	234	
0F0F0F0F					
000700 CCCC3333	269	DATA	H'CC',H'CC',H'33',H'33',H'CC',H'CC',H'33',H'33'	235	
CCCC3333					
000708 3030C0C0	270	DATA	H'30',H'30',H'CO',H'CO',H'30',H'30',H'CO',H'CO'	236	
3030C0C0					
000710 000000C0	271	DATA	H'00',H'00',H'08',H'CO',H'20',H'10',H'08',H'08'	237	
20100308					
000718 C0300804	272	DATA	H'CO',H'30',H'08',H'04',H'02',H'02',H'01',H'01'	238	
02020101					
000720 81422418	273	DATA	H'81',H'42',H'24',H'18',H'18',H'24',H'42',H'81'	239	
18244281					
000728 00FF0000	274	DATA	H'00',H'FF',H'00',H'00',H'00',H'FF',H'00',H'00'	240	
00FF0000					
000730 1010101F	275	DATA	H'10',H'10',H'10',H'1F',H'10',H'10',H'10',H'10'	241	
10101010					
000738 101010FF	276	DATA	H'10',H'10',H'10',H'FF',H'10',H'10',H'10',H'10'	242	
10101010					
000740 E0E0E0E0	277	DATA	H'E0',H'E0',H'E0',H'E0',H'E0',H'E0',H'E0',H'E0'	243	
E0E0E0E0					
000748 10102020	278	DATA	H'10',H'10',H'20',H'20',H'40',H'40',H'80',H'80'	244	
40408080					
000750 00000000	279	DATA	H'00',H'00',H'00',H'00',H'CO',H'30',H'08',H'03'	245	
C0300C03					
000758 10202040	280	DATA	H'10',H'20',H'20',H'40',H'40',H'40',H'80',H'80'	246	
40408080					
000760 000000FF	281	DATA	H'00',H'00',H'00',H'FF',H'10',H'10',H'10',H'10'	247	
10101010					
000768 00000000	282	DATA	H'00',H'00',H'00',H'00',H'01',H'06',H'38',H'CO'	248	
010638C0					
000770 08080404	283	DATA	H'08',H'08',H'04',H'04',H'02',H'02',H'01',H'01'	249	
02020101					
000778 00000000	284	DATA	H'00',H'00',H'00',H'00',H'80',H'60',H'10',H'03'	250	
80601C03					
000780 99666639	285	DATA	H'99',H'66',H'66',H'99',H'99',H'66',H'66',H'99'	251	

LOC OBJECT N STATE LINE SOURCE LINE

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          99666699
000788 01020408      286    DATA  H'01',H'02',H'04',H'08',H'10',H'20',H'40',H'80' 252
          10204080
000790 0000C0C0      287    DATA  H'00',H'00',H'00',H'00',H'30',H'30',H'CC',H'CC' 253
          3030CCCC
000798 FF010101      288    DATA  H'FF',H'01',H'01',H'01',H'01',H'01',H'01',H'01' 254
          01010101
0007A0 FFFFFFFF      289    DATA  H'FF',H'FF',H'FF',H'FF',H'FF',H'FF',H'FF',H'FF' 255
          FFFFFFFF
          290 *
          291 *
0007A8      292    END
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NO ERRORS DETECTED