Software Design for a 38.4 kbaud Data Terminal

National Semiconductor
Application Note 270
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February 1982

INTRODUCTION

This Application Note describes a CRT terminal designed around the DP8350 CRT controller and the INS8080 microprocessor. The hardware is a modified version of the circuit described in Application Note AN-199. The software was redesigned and optimized for terminal speed and function. In its present form it is upwards compatible with the Hazeltine 1500 video terminal and has a limited graphics capability. Furthermore, it is able to communicate with a host computer via an RS-232 port, at 38.4 kbaud, without using fill-in characters or handshaking. One 2k by 8 EPROM contains all the software required to implement the terminal. An optional EPROM can be used to add features such as menu display or to transform the terminal into a calculator (in the local mode). The absence of the second EPROM does not affect the operation of the terminal as the software checks for its presence.

DATA TERMINAL FEATURES

- Modes: remote/local
- Limited graphics
- Window scrolling
- Line transmitting and local editing
- Hazeltine 1500 compatible*
- Video display: two pages, 24 x 80 characters/page
- Upper/lower case
- Scrolling plus screen roll up/roll down
- Cursor: blinking (two rates)
- Line, character insert/delete
- Attributes: dual intensity/inverse video
- Full duplex RS-232 port; 110-38400 baud
- Keyboard input: 7-bit parallel
- Full cursor control and addressing
- Cursor enable/disable
- Single board (BLC/SBC) compatible design

*The majority of the software written for the Hazeltine 1500 will run with no modification. However, there are differences.

UNIQUE FEATURES

Graphics Capability: The graphics capability of this terminal, although limited by the number of symbols (34), proves to be very helpful. Typical uses include digital waveform generation (e.g., logic analyzer display), and graph oriented displays such as histograms. A graphics menu is available in the local mode. Entering ↑Q† from the keyboard will result in a two line menu display. Line 23 displays upper and lower case characters, while line 24 displays the corresponding graphics symbols (see *Figure 3*). In local, entering ↑B will switch the terminal to the graphics mode; the ESC key can be used to exit. In remote mode, the format requirements for graphics display generation are summarized by the flowchart shown at the bottom of this page.

The same flowchart can be used in local, if the "lead-in"‡ block is omitted.

Typical transmission sequences are:

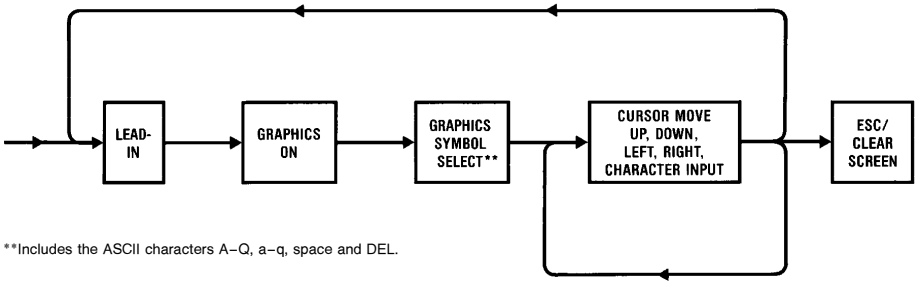
7E, 02, 42, 10, 1B
7E, 02, 63, 10, 10, 10, . . . ,10, 1B
7E, 02, 42, 8, 8, 8, 4A, 7E, 0C, 7E, 0C, 1B

All the graphics symbols, along with the upper and lower case characters, are coded into one 2716 EPROM. As a result, both the character set and the graphics symbols may be customized. The total number of available fonts is 128. The field on each displayed character is 7 rows by 10 columns. The alphanumeric symbols occupy a 5 by 7 subfield typically, except for those requiring descenders; they occupy a 5 by 9 section, while the graphics symbols utilize the whole 7 by 10 field.

Transmit: The data terminal can transmit one line of text upon receipt of the 14H code from the keyboard in local mode. Alternately, the host CPU can request transmission by sending 14H prefixed by the 7E lead-in code.

†Note that ↑ indicates a control key entry.

‡Lead-in code: 7E.



**Includes the ASCII characters A–Q, a–q, space and DEL.

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The same function can be used in a relatively unconventional way when programming in BASIC. The majority of BASIC interpreters used in small business systems or home computers incorporate a line-oriented editor, almost adequate for most of the tasks they have to perform. The basic problem with such editors is that they cannot change the flow of the program easily. In other words they cannot change line numbers. This is a shortcoming, as it is both annoying and tedious having to retype segments of text in order to change the program flow, just because the editor cannot handle altering line numbers only.

This terminal offers an efficient solution to this problem. Simply stated, it allows changing line numbers only. Here is a brief description of a typical sequence leading to text and/or line number modification. Let us assume that a BASIC interpreter is used and that the program that needs to be changed is in memory. Using the list command, the program lines to be modified can be displayed. Now, while in the Command Mode of BASIC, the terminal is switched to local. The user has effectively at his disposal a screen-oriented editor. The cursor can be moved about and text changed as desired; that, of course, includes line numbers. When the editing is completed, the user positions the cursor on the line that was altered and types ↑T. In response, the cursor scans the line, inverting the attributes. At the same time the line is transmitted to the host CPU in the same order as it was scanned, from left to right. Attribute inversion serves as feedback to the user. After the last character of each line has been transmitted, the cursor returns to the beginning of the following line. As a result, consecutive ↑T keyboard entries transmit successive lines. Thus, altering the flow of a BASIC program involves entering the local mode, changing line numbers, transmitting the modified program lines, and switching back to on-line operation. All this can be accomplished at a fraction of the time usually required otherwise. Finally, entering similar lines of text such as the ones found in ''PRINT'' statements, can be accomplished easily by switching to local, typing the first line and transmitting it; then moving the cursor up one line, changing the line number along with parts of the text that are different, retransmitting the line, and so on. In this way the user can create a long program segment while operating repetitively on one line.

Insert/Delete with Range: This is a rather unusual function that can assist in generating pseudo ''screen window'' effects. Specifically, a pre-selected number of display lines can scroll while the rest of the display remains fixed. Each ''window'' is defined as N lines by 80 characters, where: $1 < N < 48$, counting from the current cursor location to the end of page. The brief BASIC program that follows demonstrates the use of this function. In this example the display lines 1 through 4, and 19 through 24 remain ''frozen''. The message (100 lines long) is displayed on lines 5 through 18, demonstrating the scrolling of a section of the display.

```
100 PRINT CHR$(&H7E) + CHR$(&H11) + "d";
110 FOR I = 1 TO 100
120 PRINT CHR$(&H7E) + CHR$(&H1D)
    + CHR$(&H49)  + CHR$(12);
130 PRINT, "WINDOW SCROLLING LINE:",I,
    CHR$(&HOD)
140 NEXT I
```

80 Character Software FIFO: This is one of the key items that allows terminal communication at 38.4 kbaud without handshaking. An 80 character first-in, first-out software buffer is used. The incoming characters are stored temporarily in this buffer, while the microprocessor is servicing interrupts. As time becomes available, the characters are retrieved from the FIFO and processed. That includes performing a terminal function or moving an ASCII character to the video memory. The software allows for a large number of concurrent service requests such as row start, keyboard, as well as multiple ACE interrupts.

Fast Service Routine for Row Start Interrupt: Conventional row start address look-up and loading are not done during the row start interrupt time; instead, a simple row counting routine is used. The terminal count (a software counter) generates a triggering signal for video RAM wrap-around address loading. The use of this technique improves the system throughput substantially. Cursor and Top of the Page address loading (i.e., writing to the appropriate DP8350's registers) is done during the vertical retrace interval.

Keyboard Controlled Mode Selection: The operating mode of the terminal can be selected from the keyboard. To aid the user in identifying which mode the terminal is in, two cursor blinking rates are used. The low rate indicates remote mode; a high rate indicates local.

Other functions that can be selected from the keyboard are:

1) Upper/lower case. The default mode upon power up is determined by reading the SW3 switch setting.
2) Next page. A software switch that selects for display page one or two.

Read Cursor: In the local mode the present cursor location can be displayed on line 24, columns 79–80. For example, if the cursor is located on line 8, column 66, entering ↑E from the keyboard will result in a display of ''Ag'' at the bottom right hand corner of the screen. This can save time in looking up the ASCII equivalent codes of the X, Y cursor coordinates to be used in cursor addressing. (Note that, ↑E = ENQ = 05H.)

The following is an example of how this could be used in a BASIC program.

```
PRINT CHR$ (&H7E) + CHR$ (&H11) + "Ag"
```

Upon execution of the above statement, the cursor will move to line 8, column 66.

Menu Display: In the local mode the user has access to a menu display that summarizes the terminal's functions, along with the corresponding control codes (see *Figure 1*). This feature is optional and resides in EPROM #2. The important thing to note is that various kinds of menu/HELP displays can be implemented easily in this fashion. This function can be accessed from the keyboard. Alternately, a dedicated HELP key (that generates the 1D code) can be used.

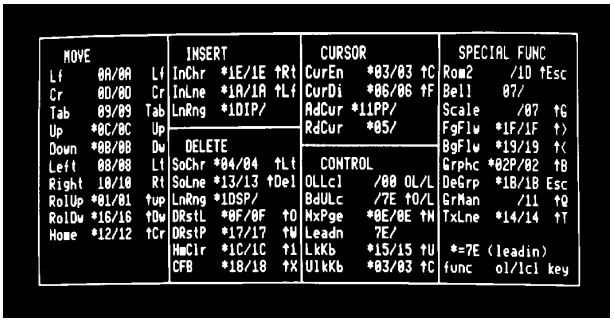

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FIGURE 1. Sample Menu Display

Character Generator Fonts

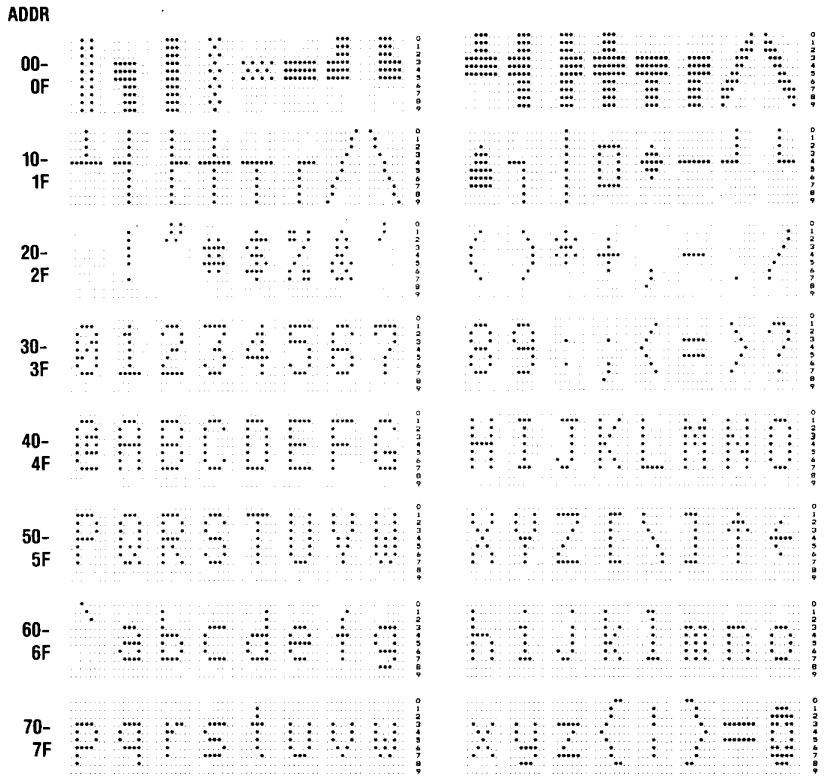

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FIGURE 2. Sample Character Font

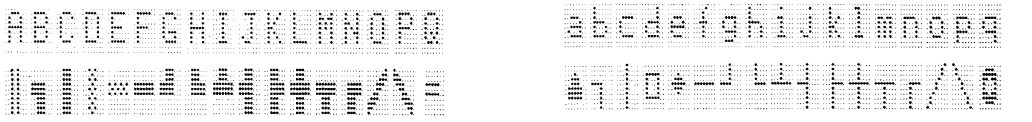

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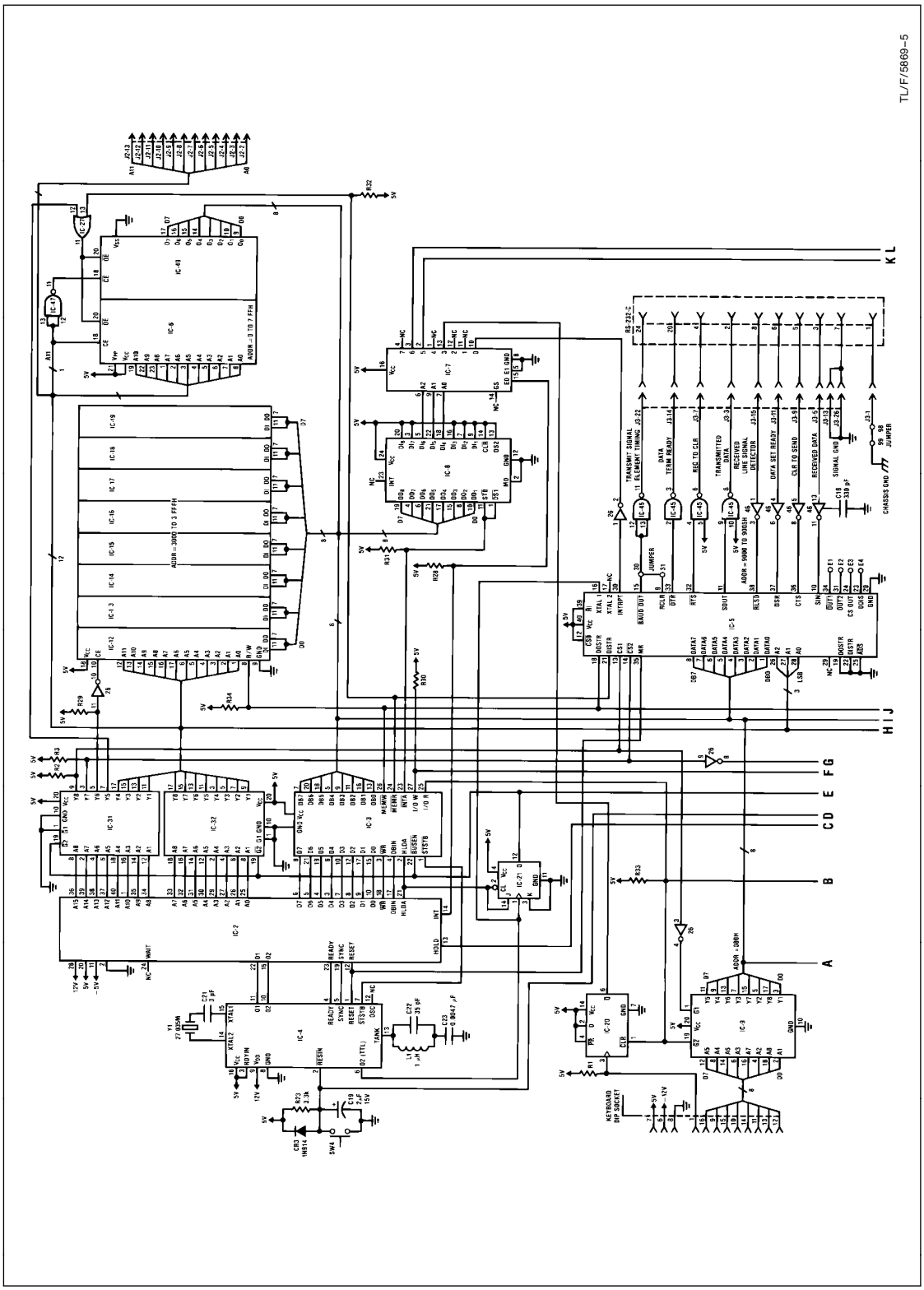
FIGURE 3. Graphics Menu Shown at the Bottom of the Screen



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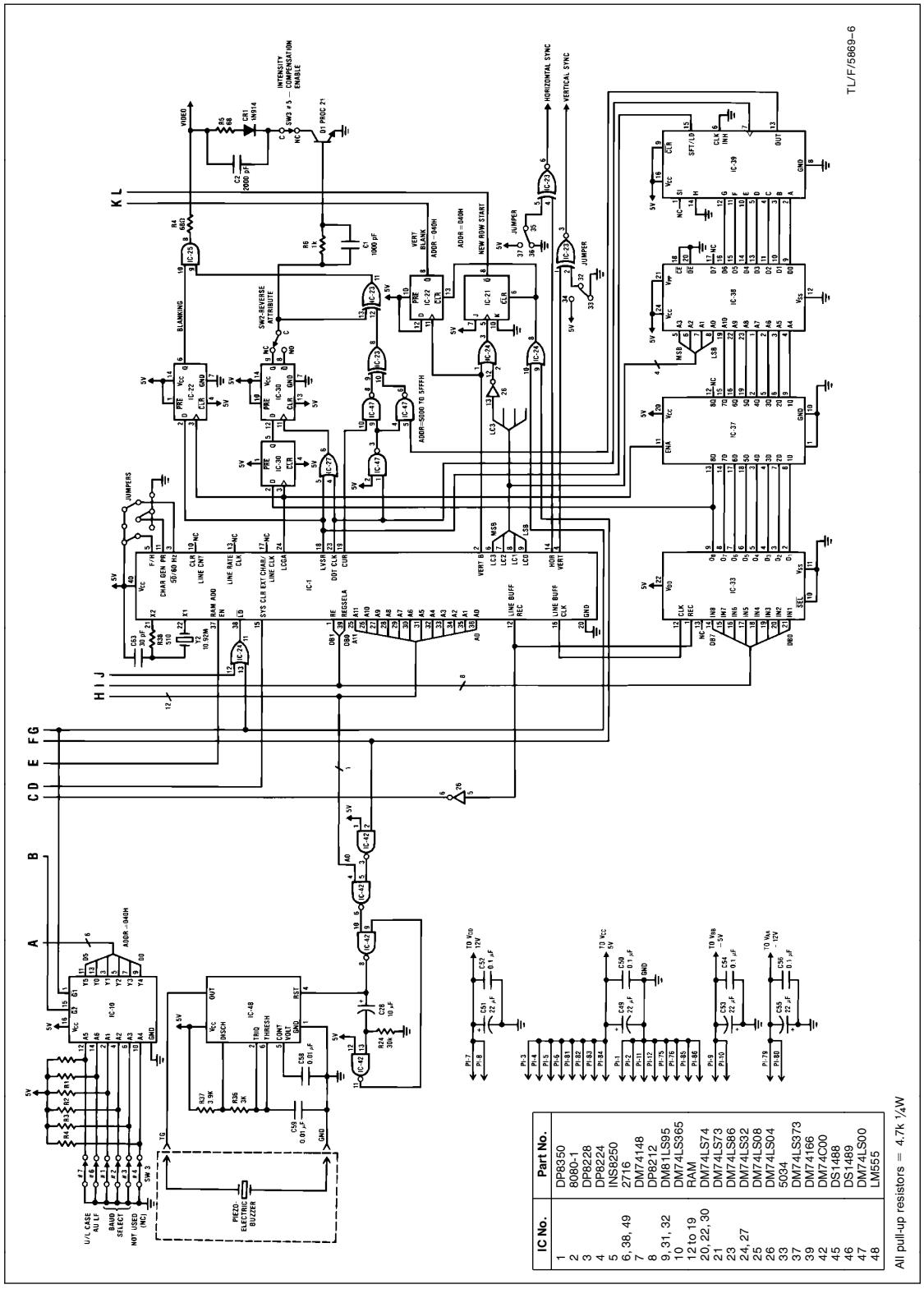

IC No.	Part No.
1	DP8350
2	8080-1
3	DP8228
4	DP8224
5	INS8250
6, 38, 49	2716
7	DM74148
8	DP8212
9, 31, 32	DM81LS95
10	DM74LS365
12 to 19	RAM
20, 22, 30	DM74LS74
21	DM74LS73
23	DM74LS86
24, 27	DM74LS32
25	DM74LS08
26	DM74LS04
33	5034
39	DM74LS373
42	DM74166
45	DM74C00
46	DS1488
47	DS1489
48	DM74LS00
	LM555

All pull-up resistors = 4.7k ¼W

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Control Functions Summary

Functions	On-Line / Local	Remarks
Cursor Move/Control		
Line Feed	0A / 0A	
Carriage Return	0D / 0D	
Tab	09 / 09	
Cursor Up	7E, 0C / 0C	
Cursor Down	7E, 0B / 0B	
Cursor Left	08 / 08	
Cursor Right	10 / 10	
Home	7E, 12 / 12	
Home and Clear	7E, 1C / 1C	
Enable Cursor	7E, 03 / 03	
Disable Cursor	7E, 06 / 06	
Address Cursor	7E, 11, X, Y /	Remote Only
Read Cursor	7E, 05 / 05	
Insert		
Character Insert	7E, 1E / 1E	
Line Insert	7E, 1A / 1A	
Line Insert with Range	7E, 1D, 49, Y	Remote Only
Delete		
Character Strip	7E, 04 / 04	
Character Delete	7F / 7F	
Line Delete	7E, 13 / 13	
Line Delete with Range	7E, 1D, 53, Y /	Remote Only
Clear to End of Line	7E, 0F / 0F	
Clear to End of Page	7E, 17 / 17	
Miscellaneous		
Local/Remote	/ 00	Local Only
Upper/Lower Case	/ 7E	Local Only
Next Page	7E, 0E / 0E	
Keyboard Lock	7E, 15 / 15	
Keyboard Unlock	7E, 03 / 03	
Bell	07 /	Remote Only
Special Functions		
Function Menu	/ 1D	A summary of available functions and their corresponding codes (local mode only).
Graphics On	7E, 02 / 02	Enter graphics mode.
Graphics Off	7E, 1B / 1B	Exit graphics mode.
Graphics Menu	/ 11	Line 23 displays upper and lower case characters and line 24 the corresponding graphics symbols (local).
Line Transmit	7E, 14 / 14	Transmits the cursor line and inverts its attributes.
Foreground Follows	7E, 1F / 1F	
Background Follows	7E, 19 / 19	
Clear Foreground	7E, 18 / 18	
Scale	/ 07	The line above the cursor becomes a scale (1–80). This is an aid for graphics and text alignment (local).
Roll Up	7E, 01 / 01	
Roll Down	7E, 16 / 16	

Character Generator Hex Dump

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	14	14	14	14	14	14	14	14	14	14	0	0	0	0	0	0
10	0	0	0	7C	7C	7C	1C	1C	1C	1C	0	0	0	0	0	0
20	1C	1C	1C	1C	1C	1C	1C	1C	1C	1C	0	0	0	0	0	0
30	14	8	14	8	14	8	14	8	14	8	0	0	0	0	0	0
40	0	0	0	55	2A	55	0	0	0	0	0	0	0	0	0	0
50	0	0	0	7F	7F	7F	0	0	0	0	0	0	0	0	0	0
60	1C	1C	1C	7C	7C	7C	0	0	0	0	0	0	0	0	0	0
70	1C	1C	1C	1F	1F	1F	0	0	0	0	0	0	0	0	0	0
80	1C	1C	1C	7F	7F	7F	0	0	0	0	0	0	0	0	0	0
90	1C	1C	1C	7C	7C	7C	1C	1C	1C	1C	0	0	0	0	0	0
A0	1C	1C	1C	1F	1F	1F	1C	1C	1C	1C	0	0	0	0	0	0
B0	1C	1C	1C	7F	7F	7F	1C	1C	1C	1C	0	0	0	0	0	0
C0	0	0	0	7F	7F	7F	1C	1C	1C	1C	0	0	0	0	0	0
D0	0	0	0	1F	1F	1F	1C	1C	1C	1C	0	0	0	0	0	0
E0	1	3	7	E	C	18	38	70	60	40	0	0	0	0	0	0
F0	40	60	70	38	18	C	E	7	3	1	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
100	0	0	8	1C	1C	3E	3E	3E	0	0	0	0	0	0	0	0
110	0	0	0	0	78	8	8	8	8	8	0	0	0	0	0	0
120	8	8	8	8	8	8	8	8	8	8	0	0	0	0	0	0
130	0	0	3E	22	22	22	22	3E	0	0	0	0	0	0	0	0
140	0	0	8	1C	3E	1C	8	0	0	0	0	0	0	0	0	0
150	0	0	0	0	7F	0	0	0	0	0	0	0	0	0	0	0
160	8	8	8	8	78	0	0	0	0	0	0	0	0	0	0	0
170	8	8	8	8	F	0	0	0	0	0	0	0	0	0	0	0
180	8	8	8	8	7F	0	0	0	0	0	0	0	0	0	0	0
190	8	8	8	8	78	8	8	8	8	8	0	0	0	0	0	0
1A0	8	8	8	8	F	8	8	8	8	8	0	0	0	0	0	0
1B0	8	8	8	8	7F	8	8	8	8	8	0	0	0	0	0	0
1C0	0	0	0	0	7F	8	8	8	8	8	0	0	0	0	0	0
1D0	0	0	0	0	F	8	8	8	8	8	0	0	0	0	0	0
1E0	1	2	2	4	8	8	10	20	20	40	0	0	0	0	0	0
1F0	40	20	20	10	8	8	4	2	2	1	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	0	8	8	8	8	8	0	8	0	0	0	0	0	0	0	0
220	A	A	14	0	0	0	0	0	0	0	0	0	0	0	0	0
230	0	0	14	3E	14	3E	14	0	0	0	0	0	0	0	0	0
240	0	8	1E	28	1C	A	3C	8	0	0	0	0	0	0	0	0
250	0	32	32	4	8	10	26	26	0	0	0	0	0	0	0	0
260	0	8	14	14	18	2A	24	1A	0	0	0	0	0	0	0	0
270	8	8	10	0	0	0	0	0	0	0	0	0	0	0	0	0
280	0	8	10	20	20	20	10	8	0	0	0	0	0	0	0	0
290	0	8	4	2	2	2	4	8	0	0	0	0	0	0	0	0
2A0	0	8	2A	1C	2A	8	0	0	0	0	0	0	0	0	0	0
2B0	0	0	8	8	3E	8	8	0	0	0	0	0	0	0	0	0
2C0	0	0	0	0	0	0	8	8	10	0	0	0	0	0	0	0
2D0	0	0	0	0	3E	0	0	0	0	0	0	0	0	0	0	0
2E0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0
2F0	0	2	2	4	8	10	20	20	0	0	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
300	0	1C	22	26	2A	32	22	1C	0	0	0	0	0	0	0	0
310	0	8	18	8	8	8	8	3E	0	0	0	0	0	0	0	0
320	0	1C	22	2	C	10	20	3E	0	0	0	0	0	0	0	0
330	0	3E	2	4	C	2	22	1C	0	0	0	0	0	0	0	0
340	0	4	C	14	24	3E	4	4	0	0	0	0	0	0	0	0
350	0	3E	20	3C	2	2	22	1C	0	0	0	0	0	0	0	0
360	0	1C	22	20	3C	22	22	1C	0	0	0	0	0	0	0	0
370	0	3E	22	2	4	8	8	8	0	0	0	0	0	0	0	0
380	0	1C	22	22	1C	22	22	1C	0	0	0	0	0	0	0	0
390	0	1C	22	22	1E	2	2	1C	0	0	0	0	0	0	0	0
3A0	0	0	0	8	0	0	8	0	0	0	0	0	0	0	0	0
3B0	0	0	0	8	0	0	8	8	10	0	0	0	0	0	0	0
3C0	0	4	8	10	20	10	8	4	0	0	0	0	0	0	0	0
3D0	0	0	0	3E	0	3E	0	0	0	0	0	0	0	0	0	0
3E0	0	10	8	4	2	4	8	10	0	0	0	0	0	0	0	0
3F0	0	1C	22	2	4	8	0	8	0	0	0	0	0	0	0	0

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Character Generator Hex Dump (Continued)

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
400	0	1C	22	2E	2A	2E	20	1E	0	0	0	0	0	0	0	0
410	0	1C	22	22	3E	22	22	22	0	0	0	0	0	0	0	0
420	0	3C	22	22	3C	22	22	3C	0	0	0	0	0	0	0	0
430	0	1C	22	20	20	20	22	1C	0	0	0	0	0	0	0	0
440	0	3C	22	22	22	22	22	3C	0	0	0	0	0	0	0	0
450	0	3E	20	20	3C	20	20	3E	0	0	0	0	0	0	0	0
460	0	3E	20	20	3C	20	20	20	0	0	0	0	0	0	0	0
470	0	1C	22	20	20	2E	22	1E	0	0	0	0	0	0	0	0
480	0	22	22	22	3E	22	22	22	0	0	0	0	0	0	0	0
490	0	1C	8	8	8	8	8	1C	0	0	0	0	0	0	0	0
4A0	0	1E	4	4	4	4	24	18	0	0	0	0	0	0	0	0
4B0	0	22	24	28	30	28	24	22	0	0	0	0	0	0	0	0
4C0	0	20	20	20	20	20	20	3E	0	0	0	0	0	0	0	0
4D0	0	22	36	2A	2A	22	22	22	0	0	0	0	0	0	0	0
4E0	0	22	22	32	2A	26	22	22	0	0	0	0	0	0	0	0
4F0	0	1C	22	22	22	22	22	1C	0	0	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
500	0	3C	22	22	3C	20	20	20	0	0	0	0	0	0	0	0
510	0	1C	22	22	22	2A	24	1A	0	0	0	0	0	0	0	0
520	0	3C	22	22	3C	28	24	22	0	0	0	0	0	0	0	0
530	0	1C	22	20	1C	2	22	1C	0	0	0	0	0	0	0	0
540	0	3E	8	8	8	8	8	8	0	0	0	0	0	0	0	0
550	0	22	22	22	22	22	22	1C	0	0	0	0	0	0	0	0
560	0	22	22	22	14	14	8	8	0	0	0	0	0	0	0	0
570	0	22	22	22	2A	2A	2A	14	0	0	0	0	0	0	0	0
580	0	22	22	14	8	14	22	22	0	0	0	0	0	0	0	0
590	0	22	22	22	1C	8	8	8	0	0	0	0	0	0	0	0
5A0	0	3E	2	4	8	10	20	3E	0	0	0	0	0	0	0	0
5B0	0	E	8	8	8	8	8	E	0	0	0	0	0	0	0	0
5C0	0	20	20	10	8	4	2	2	0	0	0	0	0	0	0	0
5D0	0	38	8	8	8	8	8	38	0	0	0	0	0	0	0	0
5E0	0	8	1C	2A	8	8	8	8	0	0	0	0	0	0	0	0
5F0	0	0	8	10	3E	10	8	0	0	0	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
600	10	8	4	0	0	0	0	0	0	0	0	0	0	0	0	0
610	0	0	0	1C	2	1E	22	1E	0	0	0	0	0	0	0	0
620	0	20	20	20	3C	22	22	3C	0	0	0	0	0	0	0	0
630	0	0	0	1E	20	20	20	1E	0	0	0	0	0	0	0	0
640	0	2	2	2	1E	22	22	1E	0	0	0	0	0	0	0	0
650	0	0	0	1C	22	3E	20	1C	0	0	0	0	0	0	0	0
660	0	4	8	8	1C	8	8	8	0	0	0	0	0	0	0	0
670	0	0	0	1E	22	22	1E	2	1C	0	0	0	0	0	0	0
680	0	20	20	20	3C	22	22	22	0	0	0	0	0	0	0	0
690	0	8	0	18	8	8	8	1C	0	0	0	0	0	0	0	0
6A0	0	4	0	4	4	4	24	18	0	0	0	0	0	0	0	0
6B0	0	10	10	12	14	18	14	12	0	0	0	0	0	0	0	0
6C0	0	18	8	8	8	8	8	1C	0	0	0	0	0	0	0	0
6D0	0	0	0	36	2A	2A	2A	2A	0	0	0	0	0	0	0	0
6E0	0	0	0	3C	22	22	22	22	0	0	0	0	0	0	0	0
6F0	0	0	0	1C	22	22	22	1C	0	0	0	0	0	0	0	0

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
700	0	0	0	3C	22	22	3C	20	20	0	0	0	0	0	0	0
710	0	0	0	1E	22	22	1E	2	2	0	0	0	0	0	0	0
720	0	0	0	16	18	10	10	10	0	0	0	0	0	0	0	0
730	0	0	0	1E	20	1C	2	3C	0	0	0	0	0	0	0	0
740	0	8	8	1C	8	8	8	4	0	0	0	0	0	0	0	0
750	0	0	0	22	22	22	22	1C	0	0	0	0	0	0	0	0
760	0	0	0	22	22	22	14	8	0	0	0	0	0	0	0	0
770	0	0	0	22	22	2A	2A	14	0	0	0	0	0	0	0	0
780	0	0	0	22	14	8	14	22	0	0	0	0	0	0	0	0
790	0	0	0	22	22	22	1E	2	1C	0	0	0	0	0	0	0
7A0	0	0	0	3E	4	8	10	3E	0	0	0	0	0	0	0	0
7B0	6	8	8	10	20	10	8	8	6	0	0	0	0	0	0	0
7C0	0	8	8	8	0	8	8	8	0	0	0	0	0	0	0	0
7D0	30	8	8	4	2	4	8	8	30	0	0	0	0	0	0	0
7E0	0	0	0	7F	0	7F	0	0	0	0	0	0	0	0	0	0
7F0	0	1C	3E	36	22	22	36	3E	1C	0	0	0	0	0	0	0

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```
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    1
CRT801

                              TITLE CRT801
                        ;May 1980
  0000'                 ASEG
                        ORG     00000h
                        ;constants
  000A                  LF      equ     0Ah
  000D                  CR      equ     0Dh
  0020                  SPC     equ     020h
  007E                  LINC    equ     07Eh    ;leadin code
  0060                  RWRG    equ     low RR48-low RR1+2
  0003                  KULCDE  equ     03h     ;kbd unlock code
                        ;I/O ports
  0080                  KBDPRT  equ     080h    ;keyboard
  0040                  ROWPRT  equ     040h    ;row interrupt
  0040                  VERPRT  equ     040h    ;vertical interrupt
  0040                  SETSW   equ     040h    ;baud sel,autolf,u/lcase
  0002                  LCLIND  equ     2       ;local indicator
  0001                  BELPRT  equ     1       ;bell
                        ;ace
  9000                  ACEDTA  equ     09000h  ;data
  9001                  ACEITR  equ     ACEDTA+1;interrupt mask
  9003                  ACECTL  equ     ACEDTA+3;control
  9005                  ACESTU  equ     ACEDTA+5;transmit status

                        ;ram assignment
  3FFF                  FROWH   equ     03FFFh  ;first row reg pair
  3FFE                  FROW    equ     FROWh-1 ;
  3FFD                  LROWH   equ     FROWh-2 ;last row reg pair
  3FFC                  LROW    equ     FROWh-3 ;
  3FFB                  CROWH   equ     FROWh-4 ;cursor row reg pair
  3FFA                  CROW    equ     FROWh-5 ;
  3FF9                  CURH    equ     CROW-1  ;cursor reg pair
  3FF8                  CUR     equ     CROW-2  ;
  3FF7                  TOPH    equ     CUR-1   ;top of page reg pair
  3FF6                  TOP     equ     CUR-2   ;
  3FF5                  NRW     equ     TOP-1   ;row counter
  3FF4                  VCALEN  equ     TOP-2   ;vert calc routine enable
  3FF3                  GSYMBL  equ     VCALEN-1;graphics symbol
  3FF2                  AULF    equ     GSYMBL-1;auto linefeed,0=auto lf
  3FF1                  LOCLM   equ     AULF-1  ;local mode,0=remote
  3FF0                  ULCASE  equ     AULF-2  ;upper/lower case,0=lower
  3FEF                  GECNTL  equ     AULF-3  ;graphic enable,0=disable
  3FEE                  KBDLCK  equ     AULF-4  ;keyboard lock,0=unlock
  3FED                  RTECTL  equ     KBDLCK-1;cursor blink rate cntl
  3FEC                  CUREN   equ     KBDLCK-2;cursor enable,0=off
  3FEB                  CURTMR  equ     KBDLCK-3;cursor blinking timer
  3FEA                  FFWCT   equ     KBDLCK-4;ace fifo word count
  3FE9                  LEADIN  equ     KBDLCK-5;leadin mode,0=no leadin

  3FE8                  ICMD    equ     KBDLCK-6;insert char mode,0=insert
  3FE7                  CPYCTL  equ     ICMD-1  ;row copy direction cntl
  3FE6                  FFWRT   equ     CPYCTL-1;fifo write pointer
  3FE5                  FFRD    equ     CPYCTL-2;fifo read pointer
  3FE5                  STK     equ     FFRD    ;stack      3FE4h down
  3FA3                  LINP    equ     FFEND+4 ;leadin parameter storage
  3FA2                  LINWCT  equ     FFEND+3 ;leadin word count

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    2
CRT801
  3FA1                  LINFH   equ     FFEND+2 ;leadin func jmp addr high
  3FA0                  LINF    equ     FFEND+1 ;leadin func jmp addr low
  3F9F                  FFEND   equ     03F9Fh  ;ace fifo end
  3F50                  FFSTRT  equ     03F50h  ;ace fifo start 3F50/3F9Fh
  3F20                  FBG     equ     03F20h  ;fore/background cntl
  3F00                  DMYROW  equ     03F00h  ;dummy row  3F00/3F4Fh
  3780                  FCHR2   equ     03780h  ;page 2, 1st char

                        ;INTERRUPTS
                        ;***********************************************
  0000  F3              START:  DI                      ;restart 0
  0001  21 3F00                 LXI     H,DMYROW        ;clr non video ram
  0004  F9                      SPHL
  0005  C3 00E2                 JMP     INIT
                        ;---------------------------------------
                        ;row interrupt
  0008  F5              ROW:    PUSH    PSW             ;restart 1
  0009  0C                      INR     C
  000A  C2 0066                 JNZ     NOWRAP          ;no wrap arroud
  000D  C3 0061                 JMP     VRWRAP          ;do wrap arround
                        ;---------------------------------------
                        ;vertical interrupt
  0010  E5              VERT:   PUSH    H               ;restart 2
  0011  21 3FF5                 LXI     H,NRW
  0014  4E                      MOV     C,M             ;load NRW
  0015  C3 07AE                 JMP     VTSUB
                        ;---------------------------------------
```

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```
                        ;ace duplicate interrupt
0018    C3 0038         ACEDUP: JMP     ACE             ;restart 3
                        ;{FUNCTION} disable cursor
001B    21 3FEC         DICUR:  LXI     H,CUREN         ;disable cursor
001E    77                      MOV     M,A             ;a=0
001F    C9                      RET
                        ;---------------------------------------
                        ;keyboard interrupt
0020    E5              KBD:    PUSH    H               ;restart 4
0021    F5                      PUSH    PSW
0022    21 3FEE                 LXI     H,KBDLCK        ;keyboard lock cntl
0025    C3 02C9                 JMP     KBDINT
                        ;---------------------------------------
                        ;row duplicate interrupt
0028    F5              ROWDP:  PUSH    PSW             ;restart 5
0029    0C                      INR     C
002A    C2 0066                 JNZ     NOWRAP
002D    C3 0061                 JMP     VRWRAP
                        ;---------------------------------------
                        ;vertical duplicate interrupt
0030    C3 0010         VERTDP: JMP     VERT            ;restart 6
0033    EB              TABSTP: XCHG                    ;hl=crow
0034    D1                      POP     D               ;remove call
0035    D1                      POP     D
0036    73                      MOV     M,E             ;return org crow
0037    C9                      RET
                        ;---------------------------------------
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    3
CRT801
  0038
                        ;ACE INTERRUPT
                        ;***********************************************
0038    E5              ACE:    PUSH    H
0039    F5                      PUSH    PSW
003A    21 3FEB                 LXI     H,CURTMR
003D    D5                      PUSH    D
003E    AF                      XRA     A
003F    77                      MOV     M,A     ;reset cursor timer
0040    2B                      DCX     H       ;FFWCT
0041    34                      INR     M       ;fifo empty?
0042    C2 0244                 JNZ     STFIFO  ;no, store to fifo

0045    2B                      DCX     H       ;leadin
0046    B6                      ORA     M
0047    3A 9000                 LDA     ACEDTA  ;read ace
004A    FB                      EI
004B    C2 0283                 JNZ     LINMDE  ;leadin mode

004E    E6 7F           FIFACE: ANI     07Fh
0050    11 0267                 LXI     D,FFCHK
0053    D5                      PUSH    D       ;pseudo call
0054    FE 0A                   CPI     LF
0056    CA 03B1                 JZ      LFEED
0059    CD 015C                 CALL    CALJMP
005C    E6 87                   ANI     087h    ;leadin+jmp addr high
005E    F8                      RM              ;leadin required, return
005F    67              LCLFUN: MOV     H,A     ;jmp addr high
0060    E9                      PCHL            ;do function


                        ;row interrupt continue
                        ;***********************************************
0061    3E 01           VRWRAP: MVI     A,1
0063    32 5000                 STA     05000h  ;wrap arround addr
0066    D3 40           NOWRAP: OUT     ROWPRT  ;clr row flip/flop
0068    F1                      POP     PSW
0069    FB                      EI
006A    C9                      RET


                        ;WRITE TO ACE
                        ;***********************************************
006B    3E 0D           SNDCR:  MVI     A,CR
006D    57              WTACEA: MOV     D,A

006E    3A 9005         WTACED: LDA     ACESTU  ;check status
0071    FE 60                   CPI     060h    ;hold/tx register
0073    DA 006E                 JC      WTACED  ;not ready
0076    CD 075E                 CALL    $DLY    ;delay

0079    7A              OUTACE: MOV     A,D
007A    32 9000                 STA     ACEDTA  ;write to ace
007D    C9                      RET
                        PAGE
```

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```
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    4
CRT801
  007E
                        ;ROW START LOOKUP TABLE     (start addr=7Eh)
                        ;*********************************************
  007E    3EB0          ROW47D: dw      03EB0h
  0080    3000          ROW48D: dw      03000h
  0082    3050          ROW1:   dw      03050h
  0084    30A0          ROW2:   dw      030A0h
  0086    30F0          ROW3:   dw      030F0h
  0088    3140          ROW4:   dw      03140h
  008A    3190          ROW5:   dw      03190h
  008C    31E0          ROW6:   dw      031E0h
  008E    3230          ROW7:   dw      03230h
  0090    3280          ROW8:   dw      03280h
  0092    32D0          ROW9:   dw      032D0h
  0094    3320          ROW10:  dw      03320h
  0096    3370          ROW11:  dw      03370h
  0098    33C0          ROW12:  dw      033C0h
  009A    3410          ROW13:  dw      03410h
  009C    3460          ROW14:  dw      03460h
  009E    34B0          ROW15:  dw      034B0h
  00A0    3500          ROW16:  dw      03500h
  00A2    3550          ROW17:  dw      03550h
  00A4    35A0          ROW18:  dw      035A0h
  00A6    35F0          ROW19:  dw      035F0h
  00A8    3640          ROW20:  dw      03640h
  00AA    3690          ROW21:  dw      03690h
  00AC    36E0          ROW22:  dw      036E0h
  00AE    3730          ROW23:  dw      03730h
  00B0    3780          ROW24:  dw      03780h
  00B2    37D0          ROW25:  dw      037D0h
  00B4    3820          ROW26:  dw      03820h
  00B6    3870          ROW27:  dw      03870h
  00B8    38C0          ROW28:  dw      038C0h
  00BA    3910          ROW29:  dw      03910h
  00BC    3960          ROW30:  dw      03960h
  00BE    39B0          ROW31:  dw      039B0h
  00C0    3A00          ROW32:  dw      03A00h
  00C2    3A50          ROW33:  dw      03A50h
  00C4    3AA0          ROW34:  dw      03AA0h
  00C6    3AF0          ROW35:  dw      03AF0h
  00C8    3B40          ROW36:  dw      03B40h
  00CA    3B90          ROW37:  dw      03B90h
  00CC    3BE0          ROW38:  dw      03BE0h
  00CE    3C30          ROW39:  dw      03C30h
  00D0    3C80          ROW40:  dw      03C80h
  00D2    3CD0          ROW41:  dw      03CD0h
  00D4    3D20          ROW42:  dw      03D20h
  00D6    3D70          ROW43:  dw      03D70h
  00D8    3DC0          ROW44:  dw      03DC0h
  00DA    3E10          ROW45:  dw      03E10h
  00DC    3E60          ROW46:  dw      03E60h
  00DE    3EB0          ROW47:  dw      03EB0h
  00E0    3F00          ROW48:  dw      03F00h
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    5
CRT801
  00E2
                        ;INITIALIZE
                        ;*********************************************
  00E2    3E 20         INIT:   MVI     A,SPC   ;space
  00E4    16 E9                 MVI     D,low LEADIN;byte count
  00E6    CD 04C7               CALL    DRLLP   ;store spaces
  00E9    AF                    XRA     A
  00EA    32 3FA2               STA     LINWCT  ;zero leadin word count
  00ED    16 17                 MVI     D,256-low LEADIN;byte count
  00EF    CD 04C7               CALL    DRLLP   ;store zeros
  00F2    31 3FE7               LXI     SP,STK+2
  00F5    21 5050               LXI     H,05050h
  00F8    E5                    PUSH    H       ;set up fifo rd/wrt ptrs
  00F9    CD 04AE               CALL    CURULK  ;enable cursor,unlock kbd
  00FC    32 3FEA               STA     FFWCT   ;zero fifo word count(FFh)
  00FF    23                    INX     H       ;RTECTL
  0100    36 1C                 MVI     M,01Ch  ;cursor blink cntl
  0102    2E FC                 MVI     L,low LROW;last row
  0104    36 B0                 MVI     M,low RR24
  0106    2E FE                 MVI     L,low FROW;first row
  0108    36 82                 MVI     M,low RR1
  010A    DB 80                 IN      KBDPRT  ;clear keyboard intr
  010C    CD 04CE               CALL    CLRSCN  ;clear screen
  010F    CD 07BF               CALL    ACESW   ;init ace, read setsw
  0112    3E 3F         PATTN:  MVI     A,03Fh
  0114    21 3780               LXI     H,FCHR2 ;1st byte of page 2
  0117    75            PTNLP:  MOV     M,L     ;write pattern
  0118    23                    INX     H
  0119    BC                    CMP     H
```

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```
011A    C2 0117             JNZ     PTNLP
011D    D3 01               OUT     BELPRT  ;ring bell for ready

                    ;CALCULATE SCREEN ADDR AFTER VERTICAL INTERRUPT
011F    2E EB       VCAL:   MVI     L,low CURTMR
0121    7E                  MOV     A,M
0122    2F                  CMA
0123    34                  INR     M       ;cursor timer
0124    23                  INX     H       ;cursor enable
0125    A6                  ANA     M
0126    23                  INX     H       ;rate cntl
0127    A6                  ANA     M       ;blink rate mask
0128    C4 0174             CNZ     CURLOC  ;cursor on
012B    3E 20               MVI     A,020h  ;8350 offset
012D    84                  ADD     H       ;offset addr high
012E    67                  MOV     H,A     ;=5Fh if cursor off
012F    E5                  PUSH    H       ;save cursor
0130    2A 3FFE             LHLD    FROW
0133    2B                  DCX     H       ;fetch row start
0134    7E                  MOV     A,M
0135    C6 20               ADI     020h    ;offset addr high
0137    57                  MOV     D,A
0138    2B                  DCX     H
                    PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    6
CRT801
  0139
0139    5E                  MOV     E,M     ;de=top of page
013A    7D                  MOV     A,L     ;calc row wrap constant
013B    0F                  RRC             ;divide by 2
013C    C6 8F               ADI     08Fh    ;add offset
013E    E1                  POP     H       ;cursor location
013F    F3                  DI
0140    22 3FF8             SHLD    CUR     ;update cursor
0143    EB                  XCHG
0144    22 3FF6             SHLD    TOP     ;update top of page
0147    21 3FF5             LXI     H,NRW
014A    77                  MOV     M,A     ;row wrap constant
014B    2B                  DCX     H       ;VCALEN
014C    36 00               MVI     M,0     ;disable VCAL routine
014E    FB          WAIT:   EI
014F    76                  HLT
0150    7E                  MOV     A,M     ;VCALEN
0151    B7                  ORA     A       ;check from vert intr
0152    CA 014E             JZ      WAIT    ;no
0155    C3 011F             JMP     VCAL    ;do screen calculations

                    ;CALCULATE JMP ADDR
0158    2E E9       CJMP:   MVI     L,low LEADIN
015A    E6 7F               ANI     07Fh    ;mask 1st bit
015C    FE 20       CALJMP: CPI     SPC
015E    DA 0168             JC      FUNC    ;0-1Fh, func
0161    FE 7E               CPI     07Eh
0163    DA 0372             JC      CHAR    ;20-7Dh, char input
0166    D6 5E               SUI     05Eh    ;7E/7Fh to 20/21h
0168    2B          FUNC:   DCX     H       ;insert mode
0169    74                  MOV     M,H     ;h<>0,defeat insert mode
016A    07          JMPADD: RLC             ;*2, msb=0
016B    5F                  MOV     E,A     ;d=02h (jmp tbl)
016C    1A                  LDAX    D       ;fetch jmp addr low
016D    6F                  MOV     L,A
016E    13                  INX     D
016F    1A                  LDAX    D       ;fetch jmp addr high
0170    C9                  RET

                    ;CALCULATE CUR LOC AND CUR TO END DIFF
0171    3E 50       DFCLOC: MVI     A,80
0173    90                  SUB     B       ;cursor to end difference

                    ;CALCULATE CURSOR LOCATION
0174    2A 3FFA     CURLOC: LHLD    CROW
0177    2B                  DCX     H
0178    56                  MOV     D,M
0179    2B                  DCX     H
017A    5E                  MOV     E,M
017B    68                  MOV     L,B
017C    19                  DAD     D       ;hl=cursor address
017D    C9                  RET
                    PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    7
CRT801
  017E
                    ;ROW WRAP AROUND LOOKUP TABLE   (start addr=17Eh)
                    ;*****************************************
017E    00E0        RR47D:  dw      00E0h
0180    0082        RR48D:  dw      0082h
0182    0084        RR1:    dw      0084h
```

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```
0184    0086          RR2:    dw      0086h
0186    0088          RR3:    dw      0088h
0188    008A          RR4:    dw      008Ah
018A    008C          RR5:    dw      008Ch
018C    008E          RR6:    dw      008Eh
018E    0090          RR7:    dw      0090h
0190    0092          RR8:    dw      0092h
0192    0094          RR9:    dw      0094h
0194    0096          RR10:   dw      0096h
0196    0098          RR11:   dw      0098h
0198    009A          RR12:   dw      009Ah
019A    009C          RR13:   dw      009Ch
019C    009E          RR14:   dw      009Eh
019E    00A0          RR15:   dw      00A0h
01A0    00A2          RR16:   dw      00A2h
01A2    00A4          RR17:   dw      00A4h
01A4    00A6          RR18:   dw      00A6h
01A6    00A8          RR19:   dw      00A8h
01A8    00AA          RR20:   dw      00AAh
01AA    00AC          RR21:   dw      00ACh
01AC    00AE          RR22:   dw      00AEh
01AE    00B0          RR23:   dw      00B0h
01B0    00B2          RR24:   dw      00B2h
01B2    00B4          RR25:   dw      00B4h
01B4    00B6          RR26:   dw      00B6h
01B6    00B8          RR27:   dw      00B8h
01B8    00BA          RR28:   dw      00BAh
01BA    00BC          RR29:   dw      00BCh
01BC    00BE          RR30:   dw      00BEh
01BE    00C0          RR31:   dw      00C0h
01C0    00C2          RR32:   dw      00C2h
01C2    00C4          RR33:   dw      00C4h
01C4    00C6          RR34:   dw      00C6h
01C6    00C8          RR35:   dw      00C8h
01C8    00CA          RR36:   dw      00CAh
01CA    00CC          RR37:   dw      00CCh
01CC    00CE          RR38:   dw      00CEh
01CE    00D0          RR39:   dw      00D0h
01D0    00D2          RR40:   dw      00D2h
01D2    00D4          RR41:   dw      00D4h
01D4    00D6          RR42:   dw      00D6h
01D6    00D8          RR43:   dw      00D8h
01D8    00DA          RR44:   dw      00DAh
01DA    00DC          RR45:   dw      00DCh
01DC    00DE          RR46:   dw      00DEh
01DE    00E0          RR47:   dw      00E0h
01E0    0082          RR48:   dw      0082h
01E2    0084          RR1D:   dw      0084h

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    8
CRT801

                      ;JUMP ADDRESS CONSTANTS
                      ;*****************************************
                      ;A15    :- 0=no leadin required
                      ;A14/A12:- parameter count
                      ;A11    :- 0=local function
 1000                 W1      equ     01000h  ;one para adder
 2000                 W2      equ     02000h  ;two para adder
 8000                 LIN     equ     08000h  ;leadin adder
 0800                 NLC     equ     00800h  ;not local adder

 0A5F                 F1      equ     RTN+NLC
 03B9                 F2      equ     CARRTN
 03B1                 F3      equ     LFEED
 0C34                 F4      equ     BELL+NLC
 060A                 F5      equ     TAB
 0437                 F6      equ     FS
 041F                 F7      equ     BS

 844E                 F8      equ     UPCUR+LIN
 8460                 F9      equ     DWNCUR+LIN
 84D8                 F10     equ     HOMCUR+LIN
 85F3                 F11     equ     NPAGE+LIN
 8472                 F12     equ     ROLUP+LIN
 848C                 F13     equ     ROLDWN+LIN

 84AE                 F14     equ     CURULK+LIN
 8DD1                 F15     equ     RDCUR+LIN+NLC
 ADA2                 F16     equ     ADDCUR+LIN+NLC+W2

 84F1                 F17     equ     FGNDF+LIN
 84F7                 F18     equ     BGNDF+LIN

 8368                 F19     equ     INSCHAR+LIN
 8358                 F20     equ     STOFCH+LIN
 8505                 F21     equ     INSLNE+LIN
 8512                 F22     equ     STOFLNE+LIN
 AD26                 F23     equ     ISLRG+LIN+NLC+W2
 9E8A                 F24     equ     GRAPH+LIN+NLC+W1
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```
 0419                   F25     equ     DEL
 83DB                   F26     equ     DCROW+LIN
 84C0                   F27     equ     DRTLN+LIN
 84BA                   F28     equ     DRTPG+LIN
 8642                   F29     equ     CFB+LIN
 84CE                   F30     equ     CLRSCN+LIN

 8CB6                   F31     equ     KBLK+LIN+NLC
 801B                   F32     equ     DICUR+LIN
 871D                   F33     equ     SNDLNE+LIN
 87BF                   F34     equ     ACESW+LIN
 0AC5                   F35     equ     LINSET+NLC
 86BC                   F36     equ     DEGRPH+LIN
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    9
CRT801
 01E4
                        ;PUT A WORD TO ACE
 01E4   57              KBDACE: MOV     D,A
 01E5   3A 9005                 LDA     ACESTU
 01E8   E6 20                   ANI     020h
 01EA   CA 01E5                 JZ      KBDACE+1;not ready
 01ED   C3 0079                 JMP     OUTACE

                        ;ACE BAUD RATE CONSTANTS
 01F0   06AB            B110:   dw      1707    ;       0
 01F2   0139            B600:   dw      313     ;       1
 01F4   009C            B1200:  dw      156     ;0.3%   2
 01F6   004E            B2400:  dw      78      ;0.3%   3
 01F8   0027            B4800:  dw      39      ;0.3%   4
 01FA   0014            B9600:  dw      20      ;2.3%   5
 01FC   000A            B19200: dw      10      ;2.3%   6
 01FE   0005            B38400: dw      5       ;2.3%   7

                        ;FUNCTION JUMP TABLE    (start addr=200h)
                        ;***********************************************
 0200   0A5F            TBLJMP: dw      F1      ;null/toggle local
 0202   8472                    dw      F12     ;A:roll up
 0204   9E8A            CB:     dw      F24     ;B:graphics mode
 0206   84AE                    dw      F14     ;C:on cursor/unlock kbd
 0208   8358                    dw      F20     ;D:strip off character
 020A   8DD1            CE:     dw      F15     ;E:read cursor
 020C   801B                    dw      F32     ;F:disable cursor
 020E   0C34            CG:     dw      F4      ;G:bell/scale
 0210   041F                    dw      F7      ;H:cursor left
 0212   060A                    dw      F5      ;I:tab
 0214   03B1                    dw      F3      ;J:line feed
 0216   8460                    dw      F9      ;K:cursor down
 0218   844E                    dw      F8      ;L:cursor up
 021A   03B9                    dw      F2      ;M:carriage return
 021C   85F3                    dw      F11     ;N:next page
 021E   84C0                    dw      F27     ;O:delete rest of line
 0220   0437                    dw      F6      ;P:cursor right
 0222   ADA2            CQ:     dw      F16     ;Q:address cursor/menu
 0224   84D8                    dw      F10     ;R:home cursor
 0226   8512                    dw      F22     ;S:strip off a line
 0228   871D                    dw      F33     ;T:transmit a line
 022A   8CB6            CU:     dw      F31     ;U:lock keyboard
 022C   848C                    dw      F13     ;V:roll down
 022E   84BA                    dw      F28     ;W:delete rest of page
 0230   8642                    dw      F29     ;X:clear fore/background
 0232   84F7                    dw      F18     ;Y:background follows
 0234   8505                    dw      F21     ;Z:insert line
 0236   86BC                    dw      F36     ;1B:esc/defeat graphics
 0238   84CE                    dw      F30     ;1C:home and clear screen
 023A   AD26            C1D:    dw      F23     ;1D:insert/strip lne/rng
 023C   836B                    dw      F19     ;1E:insert character
 023E   84F1                    dw      F17     ;1F:foreground follows
 0240   0AC5            C7E:    dw      F35     ;7E:leadin/ace,u/l-case
 0242   0419                    dw      F25     ;7F:delete

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    10
CRT801
                        ;STORE A WORD TO ACE FIFO
 0244   3E 50           STFIFO: MVI     A,80
 0246   BE                     CMP     M       ;exceeding 80 words?
 0247   3A 9000                 LDA     ACEDTA  ;read ace
 024A   DA 032C                 JC      OVRNG   ;more than 80 words
 024D   2E E6                   MVI     L,low FFWRT
 024F   54                      MOV     D,H     ;set up write pointer high
 0250   5E                      MOV     E,M     ;set up write pointer low
 0251   12                      STAX    D       ;store to fifo
 0252   7B                      MOV     A,E
 0253   3C                      INR     A       ;advance pointer
 0254   FE A0                   CPI     low FFEND+1;exceeding 80 words?
 0256   DA 025A                 JC      WFFRNG  ;less than 80 words
 0259   1F                      RAR             ;fifo start again
```

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```
025A    77          WFFRNG: MOV     M,A     ;advance write pointer
025B    FB                  EI

025C    D1          CMRTN:  POP     D
025D    F1                  POP     PSW
025E    E1                  POP     H

                    ;{FUNCTION} unused keys
025F    C9          RTN:    RET


                    ;KEY BOARD RETURN, addr high=2h
0260    AF          KLCRTN: XRA     A       ;enable keyboard
0261    32 3FEE             STA     KBDLCK
0264    C3 025C             JMP     CMRTN

                    ;CHECK FIFO AND RETURN, addr high=2h
0267    21 3FEA     FFCHK:  LXI     H,FFWCT ;fifo word count
026A    35                  DCR     M       ;fifo empty?
026B    FA 025C             JM      CMRTN   ;empty


                    ;READ A WORD FROM ACE FIFO
026E    2E E5       RDFIFO: MVI     L,low FFRD
0270    54                  MOV     D,H     ;set up read pointer high
0271    5E                  MOV     E,M     ;set up read pointer low
0272    7B                  MOV     A,E
0273    3C                  INR     A       ;advance read pointer
0274    FE A0               CPI     low FFEND+1;exceeding 80 words?
0276    DA 027A             JC      RFFRNG  ;less than 80 words
0279    1F                  RAR             ;fifo start again
027A    77          RFFRNG: MOV     M,A     ;store read pointer
027B    2E E9               MVI     L,low LEADIN
027D    7E                  MOV     A,M
027E    B7                  ORA     A       ;leadin mode=0?
027F    1A                  LDAX    D       ;read fifo word
0280    CA 004E             JZ      FIFACE  ;not leadin, normal entry
                    PAGE
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    11
CRT801
  0283
                    ;LEADIN MODE
0283    E6 7F       LINMDE: ANI     07Fh    ;mask input
0285    11 0267             LXI     D,FFCHK
0288    D5                  PUSH    D       ;pseudo call
0289    2E A2               MVI     L,low LINWCT
028B    5E                  MOV     E,M     ;leadin word count
028C    1D                  DCR     E       ;word count=0?
028D    F2 02B3             JP      LINPRA  ;parameter entries
0290    FE 20               CPI     SPC     ;control codes?
0292    D2 02C2             JNC     ILELIN  ;not cntl code, error
0295    CD 016A             CALL    JMPADD  ;fetch jmp address
0298    B7                  ORA     A
0299    F2 02C2             JP      ILELIN  ;code requires no leadin
029C    E6 77               ANI     077h    ;word count/jmp addr high
029E    67                  MOV     H,A     ;save
029F    E6 70               ANI     070h    ;mask word count
02A1    CA 02BE             JZ      LINEXE  ;do function

02A4    0F          LINPFN: RRC             ;right justify word count
02A5    0F                  RRC
02A6    0F                  RRC
02A7    0F                  RRC
02A8    32 3FA2             STA     LINWCT  ;store to word count reg
02AB    3E 07               MVI     A,07h
02AD    A4                  ANA     H       ;get jmp addr high
02AE    67                  MOV     H,A
02AF    22 3FA0             SHLD    LINF    ;save function jmp addr
02B2    C9                  RET

02B3    73          LINPRA: MOV     M,E     ;leadin word count-1
02B4    16 00               MVI     D,0     ;d=0,e=word count-1
02B6    23                  INX     H       ;LINP
02B7    19                  DAD     D       ;hl=para pointer
02B8    77                  MOV     M,A     ;store word
02B9    C0                  RNZ             ;word count<>0, next word
02BA    2A 3FA0             LHLD    LINF    ;load leadin jmp address
02BD    AF                  XRA     A

02BE    32 3FE9     LINEXE: STA     LEADIN  ;defeat leadin
02C1    E9                  PCHL            ;do function

02C2    D3 01       ILELIN: OUT     BELPRT  ;illegal code after leadin
02C4    AF                  XRA     A       ;a=0, reset leadin
```

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```
                        ;(FUNCTION) set leadin mode
  02C5    32 3FE9       LINSET: STA     LEADIN  ;a<>0, set leadin
  02C8    C9                    RET


                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    12
CRTB01
  02C9
                        ;keyboard interrupt continue
  02C9    AF            KBDINT: XRA     A
  02CA    32 3FEB               STA     CURTMR  ;reset cursor blink timer
  02CD    B6                    ORA     M       ;keyboard locked?
  02CE    DB 80                 IN      KBDPRT  ;read keyboard
  02D0    FB                    EI
  02D1    D5                    PUSH    D
  02D2    C2 0327               JNZ     KNACTV  ;keyboard not active

  02D5    B7                    ORA     A
  02D6    CA 0333               JZ      TGLCL   ;toggle local
                                                ;defeat graphics
  02D9    77                    MOV     M,A     ;lock keyboard
  02DA    11 0260               LXI     D,KLCRTN
  02DD    D5                    PUSH    D       ;generate pseudo call

  02DE    23                    INX     H       ;GECNTL
  02DF    B6                    ORA     M
  02E0    23                    INX     H       ;ULCASE
  02E1    FE 61                 CPI     061h
  02E3    DA 02EC               JC      NLCSE   ;not lower case
  02E6    FE 7B                 CPI     07Bh
  02E8    D2 02EC               JNC     NLCSE   ;not lower case
  02EB    96                    SUB     M       ;u/l case cntl,m=20h/0

  02EC    23            NLCSE:  INX     H       ;local
  02ED    5E                    MOV     E,M
  02EE    1C                    INR     E       ;local mode?
  02EF    C2 01E4               JNZ     KBDACE  ;write to ace

  02F2    FE A0         LCL:    CPI     0A0h    ;parameter entry?
  02F4    D2 068D               JNC     LGPARA  ;yes

  02F7    CD 0158               CALL    CJMP    ;get jmp addr
  02FA    E6 0F                 ANI     0Fh
  02FC    FE 08                 CPI     08h     ;local?
  02FE    DA 005F               JC      LCLFUN  ;do local function
  0301    7B                    MOV     A,E     ;read lookup tbl ptr
  0302    FE 05                 CPI     low CB+1;cntl B?
  0304    CA 06B7               JZ      ENGRPH  ;enable graphics mode
  0307    FE 0B                 CPI     low CE+1;cntl E?
  0309    CA 0773               JZ      LRDCUR  ;display cursor location
  030C    FE 0F                 CPI     low CG+1;cntl G?
  030E    CA 0784               JZ      SCALE   ;put scale
  0311    FE 23                 CPI     low CQ+1;cntl Q?
  0313    CA 06D5               JZ      PGM     ;put graphics menu
  0316    FE 41                 CPI     low C7E+1
  0318    CA 07CD               JZ      ATQUL   ;init ace,toggle u/l case
  031B    FE 3B                 CPI     low C1D+1
  031D    CA 034F               JZ      ROM2    ;do rom2 functions
  0320    FE 2B                 CPI     low CU+1;cntl U?
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    13
CRTB01
  0322
  0322    C0                    RNZ             ;unused keys
  0323    D1                    POP     D       ;pseudo rtn+lock kbd
  0324    C3 0261               JMP     KLCRTN+1


  0327    EE 03         KNACTV: XRI     KULCDE  ;lock/unlock kbd?
  0329    CA 025A               JZ      CMRTN-2 ;unlock keyboard
  032C    3E 50         OVRNG:  MVI     A,80    ;for FFWCT
  032E    D3 01                 OUT     BELPRT
  0330    C3 025A               JMP     CMRTN-2 ;lock kbd

  0333    23            TGLCL:  INX     H       ;GECNTL
  0334    77                    MOV     M,A     ;disable graphics mode
  0335    32 3FE9               STA     LEADIN  ;reset leadin
  0338    2E F1                 MVI     L,low LOCLM
  033A    7E                    MOV     A,M
  033B    2F                    CMA             ;toggle local
  033C    77                    MOV     M,A
  033D    CD 07E8               CALL    EDACE   ;en/disable ace
  0340    C2 0345               JNZ     ONLINE
  0343    3E 1E                 MVI     A,03h XOR 01Dh
  0345    EE 1D         ONLINE: XRI     01Dh
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```
0347    00                      nop             ;out lclprt
0348    00                      nop
0349    32 3FED                 STA     RTECTL  ;select blink rate
034C    C3 025C                 JMP     CMRTN

                        ;JMP TO ROM2
034F    3A 0800         ROM2:   LDA     0800h   ;check presence of rom2
0352    FE 55                   CPI     055h    ;=55h?
0354    C0                      RNZ             ;not exist
0355    C3 0801                 JMP     0801h   ;ok, do jmp



                        ;{FUNCTION} stripe off a character
0358    CD 0171         STOFCH: CALL    DFCLOC  ;get cur loc and diff
035B    3D                      DCR     A
035C    CA 0434                 JZ      BELL    ;last column, error
035F    23              STOFLP: INX     H
0360    56                      MOV     D,M
0361    2B                      DCX     H
0362    72                      MOV     M,D     ;do copy
0363    23                      INX     H
0364    3D                      DCR     A
0365    C2 035F                 JNZ     STOFLP
0368    C3 03A4                 JMP     PSPC    ;put a space

                        ;{FUNCTION} insert character
036B    AF              INSCHAR:XRA     A
036C    32 3FE8                 STA     ICMD    ;enable insert mode
036F    C3 038D                 JMP     INSCHR
                        PAGE
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    14
CRT801
0372
                        ;CHARACTER INPUT
0372    D1              CHAR:   POP     D       ;pseudo return
0373    2E 20                   MVI     L,low FBG
0375    AE                      XRA     M       ;add attribute
0376    AD                      XRA     L       ;remove space code

0377    2A 3FFA                 LHLD    CROW    ;calculate cursor loc
037A    2B                      DCX     H
037B    56                      MOV     D,M
037C    2B                      DCX     H
037D    5E                      MOV     E,M
037E    68                      MOV     L,B     ;row start+cursor
037F    19                      DAD     D       ;hl=cursor address
0380    77                      MOV     M,A     ;write to screen

0381    3E 4F                   MVI     A,79
0383    A8                      XRA     B       ;last column?
0384    CA 03C0                 JZ      LSTCHR  ;last, do scroll
0387    04              MIDCHR: INR     B       ;else advance cursor
0388    3A 3FE8                 LDA     ICMD    ;insert mode?
038B    B7                      ORA     A
038C    C0                      RNZ             ;not insert mode

038D    3E 4F           INSCHR: MVI     A,79
038F    90                      SUB     B       ;byte counter
0390    CA 03AB                 JZ      ILCHAR  ;cursor at last column

0393    2A 3FFA                 LHLD    CROW
0396    5E                      MOV     E,M
0397    23                      INX     H
0398    56                      MOV     D,M     ;d=row end+1
0399    1B                      DCX     D       ;row end
039A    EB                      XCHG
039B    2B              INSLP:  DCX     H
039C    56                      MOV     D,M
039D    23                      INX     H
039E    72                      MOV     M,D     ;do copy
039F    2B                      DCX     H
03A0    3D                      DCR     A
03A1    C2 039B                 JNZ     INSLP

03A4    3E 80           PSPC:   MVI     A,080h
03A6    A2                      ANA     D       ;get character attribute
03A7    F6 20                   ORI     SPC     ;add space
03A9    77                      MOV     M,A
03AA    C9                      RET

03AB    3C              ILCHAR: INR     A       ;make a<>0
03AC    D3 01                   OUT     BELPRT
03AE    C3 03CE                 JMP     DICMD   ;defeat insert char mode
                        PAGE
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```
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    15
CRT801
  03B1
                        ;{FUNCTION} line feed
  03B1    3A 3FF2       LFEED:  LDA     AULF    ;auto line feed?
  03B4    B7                    ORA     A
  03B5    C2 03C1               JNZ     LFD     ;do line feed
  03B8    C9                    RET

                        ;{FUNCTION} carriage return
  03B9    3A 3FF2       CARRTN: LDA     AULF    ;auto line feed?
  03BC    B7                    ORA     A
  03BD    C2 04DE               JNZ     ZROCUR  ;do cr only


  03C0    47            LSTCHR: MOV     B,A     ;set cursor to 1st col

  03C1    11 3FFC       LFD:    LXI     D,LROW
  03C4    2A 3FFA               LHLD    CROW
  03C7    24                    INR     H
  03C8    1A                    LDAX    D
  03C9    BD                    CMP     L       ;crow=lrow?
  03CA    7E                    MOV     A,M     ;next row
  03CB    32 3FFA               STA     CROW    ;crow+1
  03CE    32 3FE8       DICMD:  STA     ICMD    ;defeat insert char mode
  03D1    C0                    RNZ             ;not last row

  03D2    EB            LFSCR:  XCHG            ;last row, do scroll
  03D3    F3                    DI
  03D4    77                    MOV     M,A     ;lrow+1
  03D5    2E FE                 MVI     L,low FROW
  03D7    5E                    MOV     E,M     ;de=row wrap arround tbl
  03D8    1A                    LDAX    D
  03D9    77                    MOV     M,A     ;frow+1
  03DA    FB                    EI


                        ;{FUNCTION} clear cursor row
  03DB    2A 3FFA       DCROW:  LHLD    CROW

  03DE    EB            CLRROW: XCHG
  03DF    21 0000               LXI     H,0
  03E2    39                    DAD     SP
  03E3    EB                    XCHG
  03E4    F3                    DI
  03E5    F9                    SPHL
  03E6    E1                    POP     H       ;lookup row start
  03E7    F9                    SPHL            ;sp=row start
  03E8    FB                    EI
  03E9    2A 3F20               LHLD    FBG     ;space + attribute
                        PAGE
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    16
CRT801
  03EC
  03EC    E5            PUSHSP: PUSH    H       ;do clear row
  03ED    E5                    PUSH    H
  03EE    E5                    PUSH    H
  03EF    E5                    PUSH    H
  03F0    E5                    PUSH    H
  03F1    E5                    PUSH    H
  03F2    E5                    PUSH    H
  03F3    E5                    PUSH    H
  03F4    E5                    PUSH    H
  03F5    E5                    PUSH    H       ;10
  03F6    E5                    PUSH    H
  03F7    E5                    PUSH    H
  03F8    E5                    PUSH    H
  03F9    E5                    PUSH    H
  03FA    E5                    PUSH    H
  03FB    E5                    PUSH    H
  03FC    E5                    PUSH    H
  03FD    E5                    PUSH    H
  03FE    E5                    PUSH    H
  03FF    E5                    PUSH    H       ;20
  0400    E5                    PUSH    H
  0401    E5                    PUSH    H
  0402    E5                    PUSH    H
  0403    E5                    PUSH    H
  0404    E5                    PUSH    H
  0405    E5                    PUSH    H
  0406    E5                    PUSH    H
  0407    E5                    PUSH    H
  0408    E5                    PUSH    H
  0409    E5                    PUSH    H       ;30
  040A    E5                    PUSH    H
  040B    E5                    PUSH    H
  040C    F3                    DI
```

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```
 040D    E5                     PUSH    H
 040E    E5                     PUSH    H
 040F    E5                     PUSH    H
 0410    E5                     PUSH    H
 0411    E5                     PUSH    H
 0412    E5                     PUSH    H
 0413    E5                     PUSH    H
 0414    E5                     PUSH    H       ;40
 0415    EB                     XCHG
 0416    F9                     SPHL
 0417    FB             BSRTN:  EI
 0418    C9                     RET


                        ;{FUNCTION} delete
 0419    3E 20          DEL:    MVI     A,SPC
 041B    CD 06CB                CALL    STSP    ;store space
 041E    AF                     XRA     A       ;do back space
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    17
CRT801
 041F
                        ;{FUNCTION} back space
 041F    C4 06C1        BS:     CNZ     CHKGM   ;check graphics mode
 0422    F3             BS1:    DI
 0423    05                     DCR     B       ;cursor-1
 0424    F2 0417                JP      BSRTN   ;not 1st column
 0427    04                     INR     B
 0428    FB                     EI
 0429    3A 3FEF                LDA     GECNTL
 042C    B7                     ORA     A       ;graphics mode?
 042D    C0                     RNZ             ;defeat wrap arround
 042E    CD 0451                CALL    UCUR1   ;up cursor one row
 0431    C8                     RZ              ;crow=frow?
 0432    06 4F                  MVI     B,79    ;set cursor to last col
 0434    D3 01          BELL:   OUT     BELPRT
 0436    C9                     RET

                        ;{FUNCTION} forward cursor
 0437    CD 06C1        FS:     CALL    CHKGM   ;check graphics mode
 043A    3E 4F                  MVI     A,79
 043C    B8                     CMP     B       ;last column?
 043D    C2 0387                JNZ     MIDCHR  ;not last column
 0440    3A 3FEF                LDA     GECNTL
 0443    B7                     ORA     A       ;graphics mode?
 0444    C0                     RNZ             ;defeat wrap arround
 0445    CD 0463                CALL    DCUR1   ;down cursor one row
 0448    C8                     RZ              ;crow=lrow?
 0449    06 00                  MVI     B,0     ;set cursor to 1st col
 044B    D3 01                  OUT     BELPRT
 044D    C9                     RET

                        ;{FUNCTION} up cursor one row
 044E    CD 06C1        UPCUR:  CALL    CHKGM   ;check graphics mode
 0451    11 3FFA        UCUR1:  LXI     D,CROW
 0454    2A 3FFE                LHLD    FROW
 0457    1A                     LDAX    D       ;crow
 0458    24                     INR     H       ;hl=row wrap arround tbl
 0459    BD                     CMP     L       ;crow=frow?
 045A    C2 04A7                JNZ     $4
 045D    D3 01                  OUT     BELPRT  ;crow=frow, ring bell
 045F    C9                     RET

                        ;{FUNCTION} down cursor one row
 0460    CD 06C1        DWNCUR: CALL    CHKGM   ;check graphics mode
 0463    11 3FFA        DCUR1:  LXI     D,CROW
 0466    2A 3FFC                LHLD    LROW
 0469    1A                     LDAX    D       ;crow
 046A    24                     INR     H       ;hl=row wrap arroud tbl
 046B    BD                     CMP     L       ;crow=lrow?
 046C    C2 04A9                JNZ     $5
 046F    D3 01                  OUT     BELPRT  ;crow=lrow, ring bell
 0471    C9                     RET
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    18
CRT801
 0472
                        ;{FUNCTION} roll up
 0472    11 3FFA        ROLUP:  LXI     D,CROW
 0475    2A 3FFE                LHLD    FROW
 0478    1A                     LDAX    D
 0479    24                     INR     H       ;hl=row wrap arround tbl
 047A    BD                     CMP     L       ;crow=frow?
 047B    7E                     MOV     A,M     ;next row
 047C    F3                     DI
 047D    32 3FFE                STA     FROW    ;frow+1
 0480    C2 0484                JNZ     RUNEQ
```

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```
0483    12                      STAX    D       ;crow+1
0484    EB              RUNEQ:  XCHG            ;d=1,h=3Fh
0485    2E FC                   MVI     L,low LROW
0487    5E                      MOV     E,M     ;de=row wrap arround tbl
0488    1A                      LDAX    D       ;next row
0489    77                      MOV     M,A     ;lrow+1
048A    FB                      EI
048B    C9                      RET

                        ;{FUNCTION} roll down
048C    11 3FFA         ROLDWN: LXI     D,CROW
048F    3A 3FFC                 LDA     LROW
0492    D6 04                   SUI     4       ;up one row
0494    6F                      MOV     L,A
0495    26 01                   MVI     H,1     ;hl=row wrap arround tbl
0497    1A                      LDAX    D       ;crow
0498    D6 04                   SUI     4
049A    BD                      CMP     L       ;crow=lrow?
049B    7E                      MOV     A,M     ;up one row
049C    F3                      DI
049D    32 3FFC                 STA     LROW    ;lrow-1
04A0    C2 04A4                 JNZ     RDNEG
04A3    12                      STAX    D       ;crow-1
04A4    1E FE           RDNEG:  MVI     E,low FROW
04A6    1A                      LDAX    D
04A7    D6 04           $4:     SUI     4
04A9    6F              $5:     MOV     L,A     ;hl=row wrap arround tbl
04AA    7E                      MOV     A,M
04AB    12                      STAX    D       ;frow-1
04AC    FB                      EI
04AD    C9                      RET

                        ;{FUNCTION} enable cursor, unlock keyboard
04AE    AF              CURULK: XRA     A
04AF    32 3FEE                 STA     KBDLCK  ;unlock keyboard
04B2    2F                      CMA             ;enable cursor
04B3    C3 001B                 JMP     DICUR

                        ;{FUNCTION} lock keyboard
04B6    32 3FEE         KBLK:   STA     KBDLCK  ;lock keyboard
04B9    C9                      RET
                        PAGE
 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    19
CRT801
 04BA
                        ;{FUNCTION} delete rest of page
04BA    3A 3FFA         DRTPG:  LDA     CROW
04BD    CD 04E9                 CALL    CTLRW2  ;clear crow+1 to lrow

                        ;{FUNCTION} delete rest of line
04C0    CD 0171         DRTLN:  CALL    DFCLOC  ;get cursor loc and diff
04C3    57                      MOV     D,A     ;save
04C4    3A 3F20                 LDA     FBG
04C7    77              DRLLP:  MOV     M,A     ;store space/attribute
04C8    23                      INX     H
04C9    15                      DCR     D
04CA    C2 04C7                 JNZ     DRLLP   ;until end of line
04CD    C9                      RET

                        ;{FUNCTION} clear screen
04CE    CD 06BC         CLRSCN: CALL    DEGRPH  ;defeat graphics mode
04D1    2A 3FFE                 LHLD    FROW
04D4    7D                      MOV     A,L
04D5    CD 04E6                 CALL    CTLRW1  ;clear frow to lrow

                        ;{FUNCTION} home cursor
04D8    3A 3FFE         HOMCUR: LDA     FROW
04DB    32 3FFA                 STA     CROW    ;crow=frow
04DE    06 00           ZROCUR: MVI     B,0     ;set cursor to 1st col
04E0    C9                      RET

                        ;CLEAR TO LAST ROW
04E1    16 01           CLRWLP: MVI     D,1
04E3    5F                      MOV     E,A     ;de=row wrap arround tbl
04E4    1A                      LDAX    D       ;next row
04E5    6F                      MOV     L,A
04E6    CD 03DE         CTLRW1: CALL    CLRROW  ;clear whole row
04E9    2A 3FFC         CTLRW2: LHLD    LROW
04EC    BD                      CMP     L       ;row=lrow?
04ED    C2 04E1                 JNZ     CLRWLP  ;until last row
04F0    C9                      RET


                        ;{FUNCTION} foreground follows
04F1    11 2020         FGNDF:  LXI     D,02020h;foreground spaces
04F4    C3 04FA                 JMP     LDFGD
```

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```
                        ;{FUNCTION} background follows
  04F7    11 A0A0       BGNDF:  LXI     D,0A0A0h;background spaces
  04FA    21 0000       LDFGD:  LXI     H,0
  04FD    39                    DAD     SP
  04FE    EB                    XCHG
  04FF    31 3F50               LXI     SP,DMYROW+80
  0502    C3 03EC               JMP     PUSHSP  ;store in dummy row
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    20
CRT801
  0505
                        ;{FUNCTION} insert a line
  0505    CD 0590       INSLNE: CALL    CRLR    ;calc crow/lrow diff
  0508    21 3FFA               LXI     H,CROW
  050B    73                    MOV     M,E     ;set crow=lrow
  050C    C2 054B               JNZ     MOVDWN  ;move row contents
  050F    C3 058C               JMP     DRWZCU  ;else, del lrow/zero cur

                        ;{FUNCTION} strip off a line
  0512    CD 0590       STOFLNE:CALL    CRLR    ;get crow/lrow diff
  0515    CA 058C               JZ      DRWZCU  ;del lrow/zero cursor
  0518    E5            SLNERG: PUSH    H       ;else do move
  0519    21 3FE7               LXI     H,CPYCTL
  051C    36 00                 MVI     M,0     ;copy upward
  051E    CD 0550               CALL    MOVROW  ;move row contents
  0521    E1                    POP     H       ;get original crow
  0522    22 3FFA               SHLD    CROW    ;back to crow
  0525    C9                    RET

                        ;{FUNCTION} insert/strip off line with range
  0526    2A 3FFA       ISLRG:  LHLD    CROW
  0529    3A 3FA3               LDA     LINP    ;read 2nd parameter
  052C    3D                    DCR     A
  052D    E6 3F                 ANI     03Fh    ;40/7Fh offset to 0/3Fh
  052F    FE 38                 CPI     038h
  0531    D0                    RNC             ;error
  0532    FE 17                 CPI     017h
  0534    DA 053C               JC      ISNPA
  0537    FE 20                 CPI     020h
  0539    D8                    RC              ;error
  053A    D6 09                 SUI     9
  053C    3C            ISNPA:  INR     A
  053D    57                    MOV     D,A
  053E    3A 3FA4               LDA     LINP+1  ;read 1st parameter
  0541    FE 53                 CPI     "S"     ;strip off?
  0543    7A                    MOV     A,D
  0544    CA 051B               JZ      SLNERG  ;do strip off line
  0547    CD 05C1       ILNERG: CALL    IRWOS   ;offset row by para
  054A    7A                    MOV     A,D     ;return para
  054B    21 3FE7       MOVDWN: LXI     H,CPYCTL
  054E    36 04                 MVI     M,4     ;copy downward

                        ;MOVE ROW CONTENTS,UP/DOWN CNTL BY CPYCTL
  0550    F5            MOVROW: PUSH    PSW     ;save row count
  0551    2A 3FFA               LHLD    CROW
  0554    5E                    MOV     E,M
  0555    23                    INX     H
  0556    56                    MOV     D,M
  0557    1B                    DCX     D       ;crow end
  0558    D5                    PUSH    D       ;save
  0559    21 3FE7               LXI     H,CPYCTL;direction control
  055C    11 3FFA               LXI     D,CROW
  055F    1A                    LDAX    D       ;read crow
  0560    96                    SUB     M       ;direction cntl
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    21
CRT801
  0561
  0561    6F                    MOV     L,A
  0562    26 01                 MVI     H,1     ;hl=row wrap arround tbl
  0564    7E                    MOV     A,M     ;lookup +/- one row
  0565    12                    STAX    D       ;update crow
  0566    6F                    MOV     L,A
  0567    25                    DCR     H       ;hl=row start table
  0568    5E                    MOV     E,M
  0569    23                    INX     H
  056A    56                    MOV     D,M
  056B    1B                    DCX     D       ;+/- row end
  056C    E1                    POP     H       ;rtn current row last loc
  056D    06 10                 MVI     B,80/5  ;copy 80 characters
  056F    1A            CPLP:   LDAX    D       ;read
  0570    77                    MOV     M,A     ;copy
  0571    2B                    DCX     H       ;next byte
  0572    1B                    DCX     D       ;next byte
  0573    1A                    LDAX    D       ;do 5 times for speed
  0574    77                    MOV     M,A
```

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```
0575    2B                      DCX     H
0576    1B                      DCX     D
0577    1A                      LDAX    D       ;3
0578    77                      MOV     M,A
0579    2B                      DCX     H
057A    1B                      DCX     D
057B    1A                      LDAX    D       ;4
057C    77                      MOV     M,A
057D    2B                      DCX     H
057E    1B                      DCX     D
057F    1A                      LDAX    D       ;5
0580    77                      MOV     M,A
0581    2B                      DCX     H
0582    1B                      DCX     D
0583    05                      DCR     B
0584    C2 056F                 JNZ     CPLP    ;finish 80 bytes?
0587    F1                      POP     PSW     ;row count
0588    3D                      DCR     A
0589    C2 0550                 JNZ     MOVROW  ;next row
058C    47              DRWZCU: MOV     B,A     ;zero cursor
058D    C3 03DB                 JMP     DCROW   ;and delete cursor row

                        ;CALCULATE ROW DIFFERENCE
0590    2A 3FFA         CRLR:   LHLD    CROW    ;calc crow to lrow
0593    3A 3FFC                 LDA     LROW
0596    5F              FRCR:   MOV     E,A
0597    95                      SUB     L       ;get the difference
0598    D2 05A0                 JNC     $2      ;within range
059B    3E 60           $D2:    MVI     A,RWRG  ;over range
059D    83                      ADD     E
059E    95                      SUB     L
059F    B7                      ORA     A       ;clear carry
05A0    1F              $2:     RAR             ;row diff /2
05A1    C9                      RET
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    22
CRT801
 05A2

                        ;{FUNCTION} address cursor
05A2    2A 3FA3         ADDCUR: LHLD    LINP    ;read leadin parameter
05A5    7C                      MOV     A,H

05A6    11 5010         CALCX:  LXI     D,05010h;calc x coordinate
05A9    BA                      CMP     D
05AA    DA 05B3                 JC      CX4FD   ;00/4Fh=loc 0/79
05AD    92                      SUB     D       ;50/7Fh offset to 0/2F
05AE    BB                      CMP     E
05AF    DA 05B3                 JC      CX4FD   ;50/5Fh offset to 0/15
05B2    93                      SUB     E       ;60/7Fh offset to 0/31
05B3    47              CX4FD:  MOV     B,A     ;then set cursor

05B4    3E 1F           CALCY:  MVI     A,01Fh
05B6    A5                      ANA     L       ;0/1F,20/3F,40/5F,60/7Fh
05B7    FE 18                   CPI     018h    ;offset to 00/1Fh
05B9    DA 05BE                 JC      CY17D   ;00/17h=row 0/23
05BC    D6 18                   SUI     018h    ;18/1Fh=row 0/7
05BE    2A 3FFE         CY17D:  LHLD    FROW    ;offset first row

05C1    07              IRWOS:  RLC             ;diff*2,msb=0
05C2    85                      ADD     L       ;frow+offset
05C3    DA 05CB                 JC      ROSFFU  ;>FFh
05C6    FE E1                   CPI     low RR48+1
05C8    DA 05CD                 JC      ROSEOD  ;less than E0h,ok
05CB    D6 60           ROSFFU: SUI     RWRG    ;row range
05CD    32 3FFA         ROSEOD: STA     CROW    ;then update crow
05D0    C9                      RET


                        ;{FUNCTION} read cursor
05D1    CD 05E0         RDCUR:  CALL    RDX     ;read cursor x coord
05D4    CD 006D                 CALL    WTACEA  ;write to ace

05D7    CD 05E7                 CALL    RDY     ;read cursor y coord
05DA    CD 006D                 CALL    WTACEA  ;write to ace

05DD    C3 074A                 JMP     CRACE   ;cr for termination

05E0    78              RDX:    MOV     A,B
05E1    FE 20                   CPI     020h    ;if 0/1Fh add offset
05E3    D0                      RNC             ;20/4Fh=cursor loc 32/79
05E4    C6 60                   ADI     060h    ;60/7Fh=cursor loc 0/31
05E6    C9                      RET
```

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```
  05E7    2A 3FFE        RDY:    LHLD    FROW
  05EA    3A 3FFA                LDA     CROW
  05ED    CD 0596                CALL    FRCR    ;calc frow/crow diff
  05F0    C6 60                  ADI     060h    ;60/77h=row 0/23
  05F2    C9                     RET
                         PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    23
CRT801
  05F3
                         ;{FUNCTION} next page
  05F3    16 30          NPAGE:  MVI     D,030h  ;page offset
  05F5    21 3FFA                LXI     H,CROW
  05F8    F3                     DI
  05F9    7E             NPLP:   MOV     A,M
  05FA    FE B1                  CPI     0B1h
  05FC    DA 0601                JC      NPLT    ;a< B1,82-B0h
  05FF    92                     SUB     D       ;a>=B1,B2-E0h
  0600    92                     SUB     D
  0601    82             NPLT:   ADD     D
  0602    77                     MOV     M,A
  0603    2C                     INR     L       ;do crow/lrow/frow
  0604    2C                     INR     L
  0605    FA 05F9                JM      NPLP    ;if pass frow, end
  0608    FB                     EI
  0609    C9                     RET

                         ;{FUNCTION} tab
  060A    2A 3FFA        TAB:    LHLD    CROW
  060D    E5                     PUSH    H       ;save crow
  060E    CD 0667                CALL    SCATT

  0611    13             TDAOSP: INX     D       ;next character
  0612    2D                     DCR     L       ;end of row?
  0613    CC 067A                CZ      DRCFL   ;down one row, get 1st loc
  0616    1A                     LDAX    D       ;read character
  0617    84                     ADD     H       ;check attribute
  0618    FA 0635                JM      TSATT   ;diff, find same attrib
  061B    FE 20                  CPI     SPC     ;space?
  061D    C2 0611                JNZ     TDAOSP  ;loop until space
  0620    13             TSANSP: INX     D       ;next character
  0621    2D                     DCR     L       ;end of row?
  0622    CC 067A                CZ      DRCFL   ;down one row, get 1st loc
  0625    1A                     LDAX    D       ;read character
  0626    84                     ADD     H       ;check attribute
  0627    FA 0635                JM      TSATT   ;diff, find same attrib
  062A    FE 20                  CPI     SPC     ;non space?
  062C    CA 0620                JZ      TSANSP  ;loop until non space
  062F    D1             TMCUR:  POP     D       ;remove saved crow
  0630    3E 50                  MVI     A,80
  0632    95                     SUB     L       ;calc cursor location
  0633    47                     MOV     B,A     ;move cursor
  0634    C9                     RET
  0635    13             TSATT:  INX     D       ;next character
  0636    2D                     DCR     L       ;end of row?
  0637    CC 067A                CZ      DRCFL   ;down one row,get 1st loc
  063A    1A                     LDAX    D       ;read character
  063B    84                     ADD     H       ;check attribute
  063C    FA 0635                JM      TSATT   ;loop until same attrib
  063F    C3 062F                JMP     TMCUR   ;move cursor
                         PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    24
CRT801
  0642
                         ;{FUNCTION} clear fore/background to space
  0642    2A 3FFA        CFB:    LHLD    CROW
  0645    24                     INR     H
  0646    E5                     PUSH    H       ;save
  0647    CD 0667                CALL    SCATT
  064A    1A             CFBLP:  LDAX    D       ;read character
  064B    84                     ADD     H       ;test attribute
  064C    FA 0653                JM      CFBDIF  ;diff attrib
  064F    3E 20                  MVI     A,SPC   ;if same attrib,
  0651    B4                     ORA     H       ;put a space
  0652    12                     STAX    D
  0653    13             CFBDIF: INX     D       ;next character
  0654    2D                     DCR     L       ;character counter-1
  0655    C2 064A                JNZ     CFBLP   ;until finish 80 char
  0658    E1                     POP     H       ;saved crow
  0659    3A 3FFC                LDA     LROW
  065C    BD                     CMP     L       ;row=lrow?
  065D    C8                     RZ              ;no more
  065E    6E                     MOV     L,M     ;else next row
  065F    E5                     PUSH    H       ;save
  0660    CD 06B1                CALL    $3
  0663    C3 064A                JMP     CFBLP
  0666    C9                     RET
```

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```
                        ;SET UP CHAR COUNTER AND ATTRIB
  0667    CD 0174       SCATT:  CALL    CURLOC  ;get cursor location
  066A    EB                    XCHG            ;put in de
  066B    21 8050               LXI     H,0B050h;mask/char count
  066E    3A 3F20               LDA     FBG
  0671    A4                    ANA     H
  0672    67                    MOV     H,A
  0673    22 3FA5               SHLD    LINP+2  ;save count,attrib
  0676    7D                    MOV     A,L
  0677    90                    SUB     B       ;get cur to end diff
  0678    6F                    MOV     L,A     ;put in l
  0679    C9                    RET


                        ;DOWN ONE ROW AND GET ADDR ON 1ST COLUMN
  067A    CD 0463       DRCFL:  CALL    DCUR1   ;down cursor one row
  067D    CA 0033               JZ      TABSTP  ;crow=lrow, no tab
  0680    6E                    MOV     L,M     ;next row
  0681    25            $3:     DCR     H
  0682    2B            $1:     DCX     H
  0683    56                    MOV     D,M     ;addr high
  0684    2B                    DCX     H
  0685    5E                    MOV     E,M     ;addr low
  0686    2A 3FA5               LHLD    LINP+2  ;count and attrib
  0689    C9                    RET
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    25
CRT801
  068A
                        ;{FUNCTION} graphics
  068A    3A 3FA3       GRAPH:  LDA     LINP    ;read leadin parameter
  068D    21 107E       LGPARA: LXI     H,0107Eh
  0690    3D                    DCR     A
  0691    E6 3F                 ANI     03Fh
  0693    BC                    CMP     H       ;h=010h
  0694    DA 06AD               JC      $G1     ;"A" to "P"
  0697    FE 3E                 CPI     03Eh    ;delete
  0699    CA 06B2               JZ      $G3
  069C    94                    SUB     H       ;h=010h
  069D    FE 0F                 CPI     0Fh     ;space?
  069F    CA 06B2               JZ      $G3     ;space
  06A2    BC                    CMP     H       ;h=010h
  06A3    DA 06AC               JC      $G2     ;> "Q"
  06A6    FE 20                 CPI     020h
  06A8    DA 06AD               JC      $G1     ;"a" to "p"
  06AB    2C                    INR     L       ;set l to 7Fh
  06AC    7D            $G2:    MOV     A,L     ;L=7Eh or 7Fh
  06AD    CD 06D0       $G1:    CALL    STSCN   ;put symbol to screen
  06B0    C6 1E                 ADI     01Eh
  06B2    D6 1E         $G3:    SUI     01Eh
  06B4    32 3FF3               STA     GSYMBL  ;for non/destructive move

  06B7    3E 80         ENGRPH: MVI     A,080h
  06B9    C3 06BD               JMP     DEGRPH+1

                        ;{FUNCTION} defeat graphics
  06BC    AF            DEGRPH: XRA     A
  06BD    32 3FEF               STA     GECNTL
  06C0    C9                    RET



                        ;CHECK GRAPHICS MODE AND PUT SYMBOL TO SCREEN
  06C1    3A 3FEF       CHKGM:  LDA     GECNTL
  06C4    B7                    ORA     A       ;graphics mode?
  06C5    C8                    RZ              ;no, rtn to func
  06C6    3A 3FF3               LDA     GSYMBL
  06C9    B7                    ORA     A       ;non destructive move?
  06CA    F8                    RM              ;yes
  06CB    21 3F20       STSP:   LXI     H,FBG
  06CE    AE                    XRA     M       ;get attribute
  06CF    AD                    XRA     L       ;remove space code
  06D0    CD 0174       STSCN:  CALL    CURLOC
  06D3    77                    MOV     M,A     ;write to screen
  06D4    C9                    RET
                        PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    26
CRT801
  06D5
                        ;PUT GRAPHIC MENU TO SCREEN (LOCAL)
  06D5    CD 070C       PGM:    CALL    RUADD

  06D8    CD 06F3               CALL    P38SYM  ;print ascii A/Q
  06DB    CD 06F3               CALL    P38SYM  ;print ascii a/q
```

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```
06DE    CD 070C             CALL    RUADD

06E1    CD 0700             CALL    P32SYM  ;print ascii 0h/Fh
06E4    F6 7E               ORI     07Eh    ;print ascii 7Eh
06E6    CD 06F7             CALL    P6SYM   ;4 spaces
06E9    EE 30               XRI     030h    ;print ascii 10/1Fh
06EB    CD 0700             CALL    P32SYM
06EE    F6 7F               ORI     07Fh    ;print ascii 7Fh
06F0    C3 06F7             JMP     P6SYM   ;4 spaces

06F3    F6 41       P38SYM: ORI     041h    ;change symbol
06F5    16 10               MVI     D,16    ;counter
06F7    14          P6SYM:  INR     D
06F8    CD 0702             CALL    PGMLP
06FB    16 04       P4SP:   MVI     D,4
06FD    C3 04C4             JMP     DRLLP-3 ;put 4 spaces

0700    16 10       P32SYM: MVI     D,16    ;print 32 symbols

0702    77          PGMLP:  MOV     M,A
0703    23                  INX     H
0704    73                  MOV     M,E     ;FBG
0705    23                  INX     H
0706    3C                  INR     A       ;next symbol
0707    15                  DCR     D
0708    C2 0702             JNZ     PGMLP
070B    C9                  RET


070C    CD 0472     RUADD:  CALL    ROLUP   ;up one row
070F    26 00               MVI     H,0
0711    6F                  MOV     L,A     ;hl=lrow
0712    CD 0682             CALL    $1      ;lrow 1st loc
0715    EB                  XCHG
0716    CD 06FB             CALL    P4SP    ;put 4 spaces
0719    5F                  MOV     E,A     ;FBG
071A    E6 80               ANI     080h    ;get attribute
071C    C9                  RET
                    PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    27
CRTB01
071D
                    ;{FUNCTION} transmit a line
071D    06 00       SNDLNE: MVI     B,0     ;set cursor to 1st loc
071F    CD 0174             CALL    CURLOC  ;get row start
0722    E5                  PUSH    H       ;save row start
0723    11 004F             LXI     D,79    ;find row end
0726    19                  DAD     D       ;hl=row end, clear carry
0727    16 40               MVI     D,040h  ;rotated space
0729    7E          LENDLP: MOV     A,M     ;read char
072A    17                  RAL             ;mask out msb
072B    AA                  XRA     D       ;space? , clear carry
072C    C2 0734             JNZ     LNSP    ;until find a non-space
072F    2B                  DCX     H
0730    1D                  DCR     E
0731    C2 0729             JNZ     LENDLP  ;repeat loop
0734    E1          LNSP:   POP     H       ;hl=row start again
0735    56          SNDLP:  MOV     D,M     ;read character
0736    3E 60               MVI     A,060h  ;screen all cntl codes
0738    A2                  ANA     D
0739    C2 073E             JNZ     SNCNTL  ;not control code
073C    16 2A               MVI     D,"*"   ;cntl code,send "*" instead
073E    CD 006E     SNCNTL: CALL    WTACED  ;write to ace
0741    7E                  MOV     A,M     ;read char again
0742    EE 80               XRI     080h    ;invert attribute
0744    77                  MOV     M,A     ;store back
0745    23                  INX     H       ;next character
0746    1D                  DCR     E
0747    F2 0735             JP      SNDLP   ;until end of line

074A    CD 006B     CRACE:  CALL    SNDCR   ;send cr for termination
074D    3A 3FF1             LDA     LOCLM
0750    B7                  ORA     A       ;local?
0751    C8                  RZ              ;remote,no time delay

0752    CD 075E     $D3:    CALL    $DLY    ;do delay
0755    15                  DCR     D       ;d was 0Dh
0756    C2 0752             JNZ     $D3
0759    D3 01               OUT     BELPRT  ;delay done,ring bell
075B    C3 0463             JMP     DCUR1   ;move cursor to next row
075E    E5          $DLY:   PUSH    H
075F    D5                  PUSH    D
```

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```
 0760    CD 07F0              CALL    LUBD    ;lookup baud constant
 0763    3E 1F                MVI     A,01Fh  ;chg delay at high bauds
 0765    B3                   ORA     E
 0766    5F                   MOV     E,A
 0767    CD 059B      $D1:    CALL    $D2
 076A    1B                   DCX     D
 076B    15                   DCR     D
 076C    14                   INR     D
 076D    F2 0767              JP      $D1
 0770    D1                   POP     D
 0771    E1                   POP     H
 0772    C9                   RET
                      PAGE

 STARPLEX MACRO-ASSEMBLER V2.0          PAGE    28
CRT801
 0773
                      ;DISPLAY CURSOR LOCATION (LOCAL)
 0773    CD 05E7      LRDCUR: CALL    RDY     ;y coordinate
 0776    2A 3FFC              LHLD    LROW    ;get print out loc
 0779    5E                   MOV     E,M
 077A    23                   INX     H
 077B    56                   MOV     D,M
 077C    1B                   DCX     D       ;lrow last location
 077D    12                   STAX    D       ;put to screen
 077E    CD 05E0              CALL    RDX     ;x coordinate
 0781    1B                   DCX     D
 0782    12                   STAX    D       ;put to screen
 0783    C9                   RET

                      ;SCALE (LOCAL)
 0784    21 3FFE      SCALE:  LXI     H,FROW
 0787    3A 3FFA              LDA     CROW
 078A    BE                   CMP     M       ;frow=crow
 078B    CC 048C              CZ      ROLDWN  ;if equ,roll down
 078E    2A 3FFA              LHLD    CROW    ;get print out loc
 0791    2B                   DCX     H
 0792    2B                   DCX     H
 0793    CD 0682              CALL    $1
 0796    EB                   XCHG            ;hl=loc
 0797    1E 31                MVI     E,"1"

 0799    16 B1        SCLLP1: MVI     D,"1"+080h
 079B    3E BA                MVI     A,"9"+081h
 079D    72           SCLLP2: MOV     M,D
 079E    14                   INR     D       ;"1" to "9"
 079F    23                   INX     H       ;next location
 07A0    BA                   CMP     D       ;exceeding "9"?
 07A1    C2 079D              JNZ     SCLLP2
 07A4    3E 39                MVI     A,"9"
 07A6    73                   MOV     M,E
 07A7    1C                   INR     E       ;"1" to "8"
 07A8    23                   INX     H       ;next location
 07A9    BB                   CMP     E       ;exceeding "8"?
 07AA    C2 0799              JNZ     SCLLP1
 07AD    C9                   RET

                      ;VERTICAL INTERRUPT CONTINUE
                      ;***********************************************
 07AE    2B           VTSUB:  DCX     H       ;VCALEN
 07AF    74                   MOV     M,H     ;h<>0, enable VCAL routine
 07B0    2A 3FF8              LHLD    CUR     ;get cursor
 07B3    36 03                MVI     M,3     ;write to DP8350
 07B5    2A 3FF6              LHLD    TOP     ;top of page
 07B8    36 02                MVI     M,2     ;write to DP8350
 07BA    D3 40                OUT     VERPRT  ;clr vert intr flip/flop
 07BC    E1                   POP     H
 07BD    FB                   EI
 07BE    C9                   RET
                      PAGE

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CRT801
 07BF
                      ;{FUNCTION} ace, auto line feed, upper/lower case
 07BF    DB 40        ACESW:  IN      SETSW   ;read switch settings
 07C1    E6 10                ANI     010h
 07C3    32 3FF2              STA     AULF    ;set auto lf flag

 07C6    DB 40                IN      SETSW   ;read switch again
 07C8    E6 20                ANI     020h
 07CA    C3 07D2              JMP     STUL    ;set u/l case flag
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                        ;INIT ACE, TOGGLE ULCASE (LOCAL)
07CD    3A 3FF0     ATGUL:  LDA     ULCASE
07D0    EE 20               XRI     020h    ;toggle u/l case
07D2    32 3FF0     STUL:   STA     ULCASE

07D5    CD 07F0             CALL    LUBD    ;lookup baud constant

07D8    21 9003             LXI     H,ACECTL
07DB    74                  MOV     M,H     ;set DLAB

07DC    2E 01               MVI     L,1
07DE    72                  MOV     M,D     ;set baud high
07DF    2B                  DCX     H
07E0    73                  MOV     M,E     ;set baud low

07E1    2E 03               MVI     L,3
07E3    36 02               MVI     M,2     ;7 bit,1 stop bit

07E5    3A 3FF1             LDA     LOCLM   ;local?
07E8    3C          EDACE:  INR     A
07E9    21 9000             LXI     H,ACEDTA
07EC    5E                  MOV     E,M     ;remove ace input
07ED    23                  INX     H       ;ACEITR mask
07EE    77                  MOV     M,A     ;en/disable ace intr
07EF    C9                  RET

07F0    DB 40       LUBD:   IN      SETSW   ;lookup baud constant
07F2    E6 0E               ANI     0Eh
07F4    C6 F0       BADDR:  ADI     low B110;add base addr
07F6    6F                  MOV     L,A
07F7    26 01               MVI     H,1
07F9    5E                  MOV     E,M     ;get baud low
07FA    23                  INX     H
07FB    56                  MOV     D,M     ;get baud high
07FC    C9                  RET
                            END     START
```

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CRT801
Macros:

Symbols:
$1      0682    $2      05A0    $3      0681    $4      04A7
$5      04A9    $D1     0767    $D2     059B    $D3     0752
$DLY    075E    $G1     06AD    $G2     06AC    $G3     06B2
ACE     0038    ACECTL  9003    ACEDTA  9000    ACEDUP  0018
ACEITR  9001    ACESTU  9005    ACESW   07BF    ADDCUR  05A2
ATGUL   07CD    AULF    3FF2    B110    01F0    B1200   01F4
B19200  01FC    B2400   01F6    B38400  01FE    B4800   01F8
B600    01F2    B9600   01FA    BADDR   07F4    BELL    0434
BELPRT  0001    BGNDF   04F7    BS      041F    BS1     0422
BSRTN   0417    C1D     023A    C7E     0240    CALCX   05A6
CALCY   05B4    CALJMP  015C    CARRTN  03B9    CB      0204
CE      020A    CFB     0642    CFBDIF  0653    CFBLP   064A
CG      020E    CHAR    0372    CHKGM   06C1    CJMP    0158
CLRROW  03DE    CLRSCN  04CE    CLRWLP  04E1    CMRTN   025C
CPLP    056F    CPYCTL  3FE7    CQ      0222    CR      000D
CRACE   074A    CRLR    0590    CROW    3FFA    CROWH   3FFB
CTLRW1  04E6    CTLRW2  04E9    CU      022A    CUR     3FF8
CUREN   3FEC    CURH    3FF9    CURLOC  0174    CURTMR  3FEB
CURULK  04AE    CX4FD   05B3    CY17D   05BE    DCROW   03DB
DCUR1   0463    DEGRPH  06BC    DEL     0419    DFCLOC  0171
DICMD   03CE    DICUR   001B    DMYROW  3F00    DRCFL   067A
DRLLP   04C7    DRTLN   04C0    DRTPG   04BA    DRWZCU  058C
DWNCUR  0460    EDACE   07E8    ENGRPH  06B7    F1      0A5F
F10     84D8    F11     85F3    F12     8472    F13     848C
F14     84AE    F15     8DD1    F16     ADA2    F17     84F1
F18     84F7    F19     836B    F2      03B9    F20     8358
F21     8505    F22     8512    F23     AD26    F24     9E8A
F25     0419    F26     83DB    F27     84C0    F28     848A
F29     8642    F3      03B1    F30     84CE    F31     8CB6
F32     801B    F33     871D    F34     87BF    F35     0AC5
F36     86BC    F4      0C34    F5      060A    F6      0437
F7      041F    F8      844E    F9      8460    FBG     3F20
FCHR2   37B0    FFCHK   0267    FFEND   3F9F    FFRD    3FE5
FFSTRT  3F50    FFWCT   3FEA    FFWRT   3FE6    FGNDF   04F1
FIFACE  004E    FRCR    0596    FROW    3FFE    FROWH   3FFF
FS      0437    FUNC    016B    GECNTL  3FEF    GRAPH   068A
GSYMBL  3FF3    HOMCUR  04D8    ICMD    3FE8    ILCHAR  03AB
ILELIN  02C2    ILNERG  0547    INIT    00E2    INSCHA  036B
INSCHR  038D    INSLNE  0505    INSLP   039B    IRWOS   05C1
ISLRG   0526    ISNPA   053C    JMPADD  016A    KBD     0020
KBDACE  01E4    KBDINT  02C9    KBDLCK  3FEE    KBDPRT  0080
KBLK    04B6    KLCRTN  0260    KNACTV  0327    KULCDE  0003
LCL     02F2    LCLFUN  005F    LCLIND  0002    LDFGD   04FA
LEADIN  3FE9    LENDLP  0729    LF      000A    LFD     03C1
LFEED   03B1    LFSCR   03D2    LGPARA  068D    LIN     8000
LINC    007E    LINEXE  02BE    LINF    3FA0    LINFH   3FA1
LINMDE  0283    LINP    3FA3    LINPFN  02A4    LINPRA  02B3
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LINSET  02C5    LINWCT  3FA2    LNSP    0734    LOCLM   3FF1
LRDCUR  0773    LROW    3FFC    LROWH   3FFD    LSTCHR  03C0
LUBD    07F0    MIDCHR  0387    MOVDWN  054B    MOVROW  0550
NLC     0800    NLCSE   02EC    NOWRAP  0066    NPAGE   05F3
NPLP    05F9    NPLT    0601    NRW     3FF5    ONLINE  0345

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CRTB01
OUTACE  0079    OVRNG   032C    P32SYM  0700    P38SYM  06F3
P4SP    06FB    P6SYM   06F7    PATTN   0112    PGM     06D5
PGMLP   0702    PSPC    03A4    PTNLP   0117    PUSHSP  03EC
RDCUR   05D1    RDFIFO  026E    RDNEQ   04A4    RDX     05E0
RDY     05E7    RFFRNG  027A    ROLDWN  048C    ROLUP   0472
ROM2    034F    ROSEOD  05CD    ROSFFU  05CB    ROW     0008
ROW1    0082    ROW10   0094    ROW11   0096    ROW12   0098
ROW13   009A    ROW14   009C    ROW15   009E    ROW16   00A0
ROW17   00A2    ROW18   00A4    ROW19   00A6    ROW2    0084
ROW20   00A8    ROW21   00AA    ROW22   00AC    ROW23   00AE
ROW24   00B0    ROW25   00B2    ROW26   00B4    ROW27   00B6
ROW28   00B8    ROW29   00BA    ROW3    00B6    ROW30   00BC
ROW31   00BE    ROW32   00C0    ROW33   00C2    ROW34   00C4
ROW35   00C6    ROW36   00C8    ROW37   00CA    ROW38   00CC
ROW39   00CE    ROW4    0088    ROW40   00D0    ROW41   00D2
ROW42   00D4    ROW43   00D6    ROW44   00D8    ROW45   00DA
ROW46   00DC    ROW47   00DE    ROW47D  007E    ROW48   00E0
ROW48D  0080    ROW5    008A    ROW6    008C    ROW7    008E
ROW8    0090    ROW9    0092    ROWDP   0028    ROWPRT  0040
RR1     0182    RR10    0194    RR11    0196    RR12    0198
RR13    019A    RR14    019C    RR15    019E    RR16    01A0
RR17    01A2    RR18    01A4    RR19    01A6    RR1D    01E2
RR2     0184    RR20    01A8    RR21    01AA    RR22    01AC
RR23    01AE    RR24    01B0    RR25    01B2    RR26    01B4
RR27    01B6    RR28    01B8    RR29    01BA    RR3     01B6
RR30    01BC    RR31    01BE    RR32    01C0    RR33    01C2
RR34    01C4    RR35    01C6    RR36    01C8    RR37    01CA
RR38    01CC    RR39    01CE    RR4     0188    RR40    01D0
RR41    01D2    RR42    01D4    RR43    01D6    RR44    01D8
RR45    01DA    RR46    01DC    RR47    01DE    RR47D   017E
RR48    01E0    RR48D   01B0    RR5     018A    RR6     018C
RR7     018E    RR8     0190    RR9     0192    RTECTL  3FED
RTN     025F    RUADD   070C    RUNEQ   0484    RWRG    0060
SCALE   0784    SCATT   0667    SCLLP1  0799    SCLLP2  079D
SETSW   0040    SLNERG  0518    SNCNTL  073E    SNDCR   006B
SNDLNE  071D    SNDLP   0735    SPC     0020    START   0000
STFIFO  0244    STK     3FE5    STOFCH  0358    STOFLN  0512
STOFLP  035F    STSCN   06D0    STSP    06CB    STUL    07D2
TAB     060A    TABSTP  0033    TBLJMP  0200    TDAOSP  0611
TGLCL   0333    TMCUR   062F    TOP     3FF6    TOPH    3FF7
TSANSP  0620    TSATT   0635    UCUR1   0451    ULCASE  3FF0
UPCUR   044E    VCAL    011F    VCALEN  3FF4    VERPRT  0040
VERT    0010    VERTDP  0030    VRWRAP  0061    VTSUB   07AE
W1      1000    W2      2000    WAIT    014E    WFFRNG  025A
WTACEA  006D    WTACED  006E    ZROCUR  04DE

No  Fatal error(s)
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