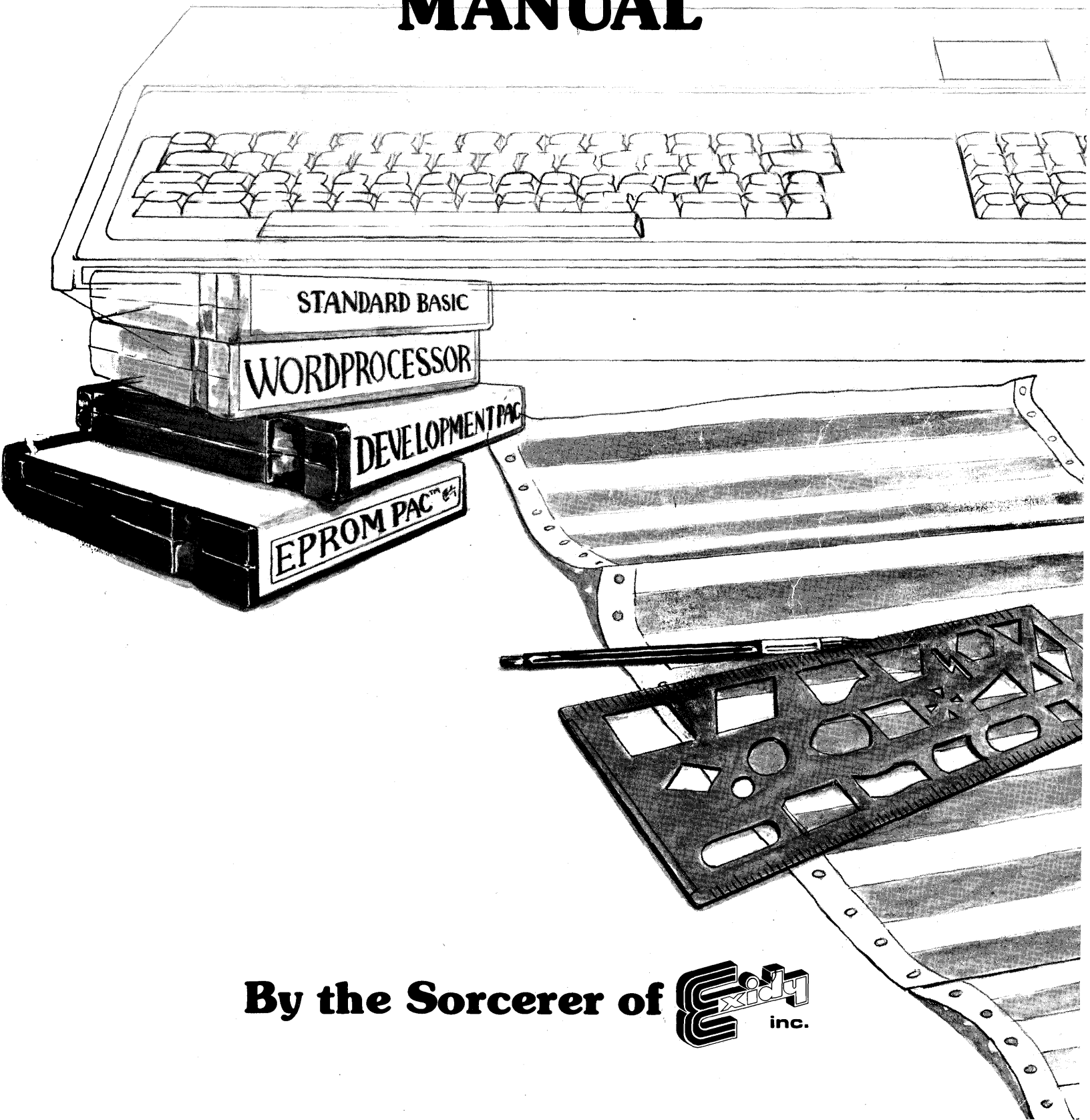
SORCERER SOFTWARE MANUAL



By the Sorcerer of Exidy inc.

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PREFACE

This document is designed to aid the Exidy programmer in ***easily*** utilizing the myriad of wonderful facilities of the machine. There are many Monitor subroutines, uses of cassette tapes, BASIC programming techniques, and uses of the Input/Output ports which require a detailed explanation to be used to the fullest extent.

To obtain all the benefits from this manual, please read the two books that come with the Exidy "A Guided Tour of Personal Computing" and "A Short Tour of Basic." This internal manual is a supplement to these.

The manual is divided into several sections. Each is intended to be an independent "mini-manual" describing fully the topic under discussion.

INTRODUCTION TO THE Z80 MICROCOMPUTER

INTRODUCTION TO THE Z80

Before you can understand how the Exidy really works, a few fundamentals have to be covered about the architecture of the Z80 MPU (**M**icro**P**rocessing **U**nit). First of all, let's discuss the concept of "hex."

Hex, Binary, and Decimal

"Hex" is short for hexadecimal. This is a number system based on sixteen, not 10 as we are used to (decimal). In decimal, we have ten possible digits, 0, 1, 2, . . ., 8, and 9. In hex, we have sixteen. Of course the first ten are 0 through 9 as with decimal. But there are six more, A, B, C, D, E, and F. "A" means 10, "B" means 11, "C" 12, "D" 13, "E" 14, and "F" 15. So a number like 1CB3 makes sense in hex. In decimal numbers each digit represents a "power" of 10, namely "ones," "tens," "hundreds," and "thousands." For example, the decimal number 1895 means 1 thousands plus 8 hundreds plus 9 tens plus 5 ones, or

$$\begin{aligned}1895 &= 1\text{x}1000 + 8\text{x}100 + 9\text{x}10 + 5\\ &= 1000 + 800 + 90 + 5\end{aligned}$$

In hex however, each digit (0 through F) represents a power of 16, "ones," "sixteens," "two hundred fifty sixes," and "four thousand ninety sixes." For example, the ***hex*** number 1895 can be written as in the example above

$$\begin{aligned}1895 &= 1\text{x}4096 + 8\text{x}256 + 9\text{x}16 + 5\\ &= 4096 + 2048 + 144 + 5\\ &= 6293 \quad \text{(decimal)}\end{aligned}$$

Another hex number 3CF1 can be seen as

$$\begin{aligned}3\text{CF}1 &= 3\text{x}4096 + \mathbf{12}\text{x}256 + \mathbf{15}\text{x}16 + 1\\ &= 12288 + 3072 + 240 + 1\\ &= 15601 \quad \text{(decimal)}\end{aligned}$$

The reason why understanding the hex number system is so important is because the majority of computers today, big, mini, and micro, are based entirely on hex. This includes the Z80 MPU, which is the basis of the Exidy Sorcerer. Its machine language instructions are in hex; its arithmetic is done in hex; characters typed on the keyboard, displayed on the screen, placed on cassette tape and printed on a printer are all in hex.

If you understand hex, then "binary" (the number system based on **2**) should present no problems. There are only 2 digits possible to make any binary number, 0 and 1. These **bi**nary digi**t**s are called "bits." A bit can be 0 or 1. Each of these digits represents a power of 2 (1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, and 32768). So a number in binary like 0011110011110001 is

$$\begin{aligned}0011110011110001 &= 0\text{x}32768 + 0\text{x}16384 + 1\text{x}8192 + 1\text{x}4096 +\\ &\quad 1\text{x}2048 + 1\text{x}1024 + 0\text{x}512 + 0\text{x}256 +\\ &\quad 1\text{x}128 + 1\text{x}64 + 1\text{x}32 + 1\text{x}16 +\\ &\quad 0\text{x}8 + 0\text{x}4 + 0\text{x}2 + 1\\ &= 8192 + 4096 + 2048 + 1024 +\\ &\quad 128 + 64 + 32 + 16 + 1\\ &= 15601 \text{ (decimal)}\end{aligned}$$

But that means, according to the previous example, that since 15601 decimal is also 3CF1 hex, then

0011110011110001 (binary) = 3CF1 (hex).

This is no mere coincidence. Let's see why. If we look at a "4-bit binary number" (i.e., a number in binary made up of only four digits of 0's and 1's), then the smallest it could be is 0000 (0 decimal), and the largest it could be is 1111 (15 decimal or F hex). Thus every digit in hex, 0-F, can be expressed exactly as a 4-bit binary number:

Binary	Decimal	Hex
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

In other words, a hex digit is really just another way of writing 4 bits, or, every 4 bits of a binary number can be grouped as 1 hex digit. Let's see how that works with the numbers we just did. 0011110011110001 can be broken into groups of 4 bits (right to left) as follows:

0011 1100 1111 0001

If each 4-bit group is viewed individually, they calculate to

0011 = 3 decimal (3 hex)
1100 = 12 decimal (C hex)
1111 = 15 decimal (F hex)
0001 = 1 decimal (1 hex)

So it can be written

0011	1100	1111	0001	binary
3	C	F	1	hex

So hex and binary are actually the same thing, with different groupings. Another example, to write 0F8D hex in binary

0	F	8	D	hex
0000	1111	1000	1101	binary

which, when pieced back together, becomes

0000111110001101 = 0F8D.

Bits, Bytes, Addresses, and "K"

Enough about decimal, hex, and binary. We now know how numbers are written on the Z80. Let us take a look at how memory is organized.

The smallest unit of information that can be placed in the memory of just about any computer made, including the Z80, is a bit, the same bit we saw earlier. This only holds a 0 or a 1 however, and is too small for normal numerical use. So a larger unit was created, called a "byte." A byte is just eight bits or two hex digits grouped together.

So a byte can contain a number from 00000000 binary (00 hex, 0 decimal) to 11111111 binary (FF hex, 255 decimal). Each unique byte in the Exidy's memory space is assigned a four-hex digit (two-byte) number called an "address." This address identifies the particular byte and its contents. Addresses start at 0000 hex and end at FFFF hex (65535). Thus, the Exidy (Z80) can have up to 65536 bytes of memory. Another way programmers like to put this is to use the term "K." A "K" is just another way of saying the number 1024 decimal (400 hex). So 65536 boils down to 64K (64x1024 = 65536).

RAM versus ROM

Since we are on the subject of memory, there are two types. In one type the contents can never be changed. Information can only be "read" from it. This is called **R**ead **O**nly **M**emory or ROM (computerists love abbreviations or acronyms). ROM is usually used to contain programs or data which is to be present in the same state all the time. For example, the Exidy Monitor program is in ROM (starting at memory byte address E000) and Exidy BASIC is in ROM (the ROM-PAC starting at address C000). ROM can have its contents "burned in" permanently at the factory, or can be burned in once by the programmer (called PROM or Programmable ROM), or can be erased by strong ultraviolet light and burned in over and over again (called EPROM or Eraseable PROM).

However, for programmers to write and run programs, we need memory which we can change or modify the contents. This is called **R**andom **A**ccess **M**emory or RAM. When the size of an Exidy's memory is given (e.g., 8K, 16K, 32K), this number applies only to RAM, or user-modifiable memory. All Exidys have the same ROM area potential. So a 16K Exidy has 16x1024 or 16384 bytes of RAM.

Static versus Dynamic

The above two terms are usually only applied to RAM. Static RAM has the ability to hold its contents indefinitely as long as electrical power is applied. Dynamic RAM, on the other hand (in milliseconds usually), loses or leaks its contents, and the data must be re-written or refreshed to the RAM often enough to keep the data from disappearing altogether. Typically static RAM requires more power, is more expensive, but is faster. The Exidy and many other Z80 based systems use dynamic RAM because of power and cost considerations, and also because the Z80 MPU is well-suited to interface to dynamic RAM (e.g., it can be made to do the RAM refreshing).

Z80 ARCHITECTURE

The Z80 microprocessor is an 8-bit based machine. In other words, its data flow and arithmetic is usually on a 1-byte basis. It can address up to 64K bytes of memory. On the Exidy, a maximum of 32K bytes of this can be placed onboard (in the keyboard unit), while another 16K can be located as ROM for the Monitor and various ROM cartridges.

In addition to having 64K of possible memory, the Z80 has twenty-two registers. These are special high speed memories which reside on the MPU chip, and are used for arithmetic and program logic functions. These are all 1 byte in size unless otherwise noted:

Table 1. Z80 Registers

A	— the accumulator. This is the central register
F	— the flags register. Each bit represents a CPU status; e.g., the "Z" bit is on if the A register contains 0; the "S" bit is on if A is negative
B	— general use register
C	— general use register
D	— general use register
E	— general use register
H	— general use register
L	— general use register
SP	— 2-byte register containing the current stack address
PC	— 2-byte program counter containing the address of the next instruction to be executed.
IX	— 2-byte index register. Usually will contain an address to be used with a constant offset or displacement.
IY	— 2-byte index register with the same type of use as IX.
I	— register used to allow processing of external interrupts to the Z80 from the S-100 bus
R	— refresh register which can be used to provide dynamic RAM refreshing operations.

Registers A, F, B, C, D, E, H, and L have an alternate register called A', F', B', C', D', E', H', and L'. Only one set can be used at a time, while the other set allows space to save important program information. The EXX and EX Z80 instructions are used to flip back and forth between them. Also some registers can be connected together to create 2-byte, 16-bit register pairs. These are AF, BC, DE, and HL.

For more detailed information on the Z80 MPU I the reader is referred to the Zilog publication "Z80 CPU, Z80A CPU Technical Manual," product number 03-0029-01.

EXIDY SORCERER COMPUTER ARCHITECTURE

Exidy Devices and Ports

The Sorcerer has the following I/O devices or ports. Listed also is the Monitor command(s) to activate each:

Table 2. Sorcerer I/O Port Assignment

a. the keyboard	SET I=K
b. the video screen	SET O=V
c. cassette tape #1	SET I=S, SET O=S
d. cassette tape #2	SET I=S, SET O=S
e. serial RS-232 interface	SET I=S, SET O=S
f. parallel interface	SET I=P, SET O=P
g. Centronics printer interface	SET O=L

Note that these are onboard ports. This list does not include any devices added to the Exidy via the S-100 bus expansion facility.

The keyboard is implemented as part of the Z80 I/O port number FE hex (254), input bits 0-4, output bits 0-3. The video screen needs no port but uses the 1920-byte RAM area at address F080 as a 64 by 30 screen. There is a port FE bit (input 5) indirectly related to video processing which signals when vertical retrace is in progress on the TV screen. The two cassette interfaces are part of the serial interface and provide an audio translation of the digital data suitable for recording on tape quite reliably.

Exidy Serial Port

The serial port allows data transfer to occur between the Exidy and external devices (such as printers, modems, cassette tape, and the like). Data travels one bit at a time in a predefined conventional sequence called asynchronous transmission protocol.

The protocol defines how the data is to look, and the speeds at which it is to travel. For example, each 8-bit byte of data is actually sent as a 10- or 11-bit stream, sometimes even longer. The 8 bits must be preceded by a bit called a start bit, and must be followed by one or usually two or more stop bits. These bits also must be sent and received at a particular speed, predetermined by the sender and receiver. The speed is given in bits per second, or commonly called "baud" (derived from Baudot, the name of one of the forerunners of terminal communications). Thus, 300 baud means 300 bits per second. Since it takes about 10-11 bits to transmit a byte or character, this means about 30 characters per second. The Exidy serial interface "speaks" this common language, and operates at one of the two speeds, either 1200 baud (120 cps) or 300 baud (30 cps).

The serial port is actually two devices, an RS-232C interface and the dual cassette interface. RS-232C is the name given to a widely accepted standard of signal voltage and logic levels and the pinouts of the 25-pin plug or connector used for cabling between the sender and receiver. The asynchronous protocols signals are usually sent via this RS-232C standard. Another part of Z80 port FE (output bit 7) determines whether the serial port is RS-232C (bit on) or dual cassette (bit off). Cassette is the default. Output bit 6 controls the baud rate (1=1200, default, 0=300). Port status is placed on port FD while data transfer occurs on FC. For example, to connect a 300 or 1200 baud RS-232C serial printer to the Exidy, follow instructions given with the printer and from Exidy. However, the following guidelines may be used:

1. Connect pin 7 of the serial DB25 connector to printer ground pin 7.
2. Connect pin 3 to printer pin 2.
3. Connect pin 2 to printer pin 3.

Reset the Exidy, enter the Monitor (BYE in BASIC), enter the command SET O=S, and all output which would have gone to the screen will go to the printer, until Reset or SET O=x is entered (x is usually V to return to video). There is also software available from Exidy providing a serial driver, and the ability to use the serial interface to turn the Sorcerer into a dumb terminal connected to another computer. Typically a modem and possibly an acoustic coupler may be required here. Reverse pins 2 and 3 in the above guidelines for this use.

The cassette interfaces may also be used with motor control. Pins 12 and 24, 13 and 25 can be used to turn cassette number 1 and 2 off and on for SAVEs, LOADs, FILEs and BATCHs commands. Pins 15, 5 and 20, 16, 18, and 21 are the mike input, auxiliary input, and earphone output connections. Note that cassette number 1 has these mike and ear connections duplicated as RCA plugs on the back of the Sorcerer.

Exidy Parallel Port

The parallel port differs from the serial port mainly in that data is transferred an entire byte at a time. This is ideal for fast printers and sometimes even some floppy disk units. The Sorcerer also provides an interface to the popular Centronics printer. The same parallel port is used, but unique software "handshaking" is done by the Monitor I/O driver. An example of the handshaking which occurs between the Sorcerer and printer might be the following "electronic conversation" over port FE, the parallel interface status port:

Printer: "Wait, I'm still busy, send no data."

"OK, now you can send."

Exidy: "Here it is, let me know when I can send more."

The 8-bit (and at times status) rides on port FF.

To successfully hook up a Centronics or Centronics-like printer to the parallel port, again follow the printer's and Exidy's instructions. Here are some additional guidelines:

1. Connect parallel pins (DB25 connectors again) 5-7 and 16-19 (data bits 0-6) to the printer's data lines 0-6 (see printer's pinouts).
2. Connect pin 4 (data output bit 7) to the printer's input strobe line, a negative (true is low, false is high) pulse indicating data is ready to be transmitted.
3. Connect pin 1 to the printer ground.
4. Connect pin 25 (input data bit 7) to the printer busy line, indicating the printer is not ready to accept any data (probably still printing previous data).
5. Pins 2 and 3 (output accepted and available) and others may also be required depending on the printer model.

Once this is done, Reset the Exidy, enter the Monitor, type in the command SET O=L, and from that point on all output will be routed to the screen and the printer, until Reset occurs or until another SET O=x command is entered.

CASSETTE TAPE FILE FORMAT

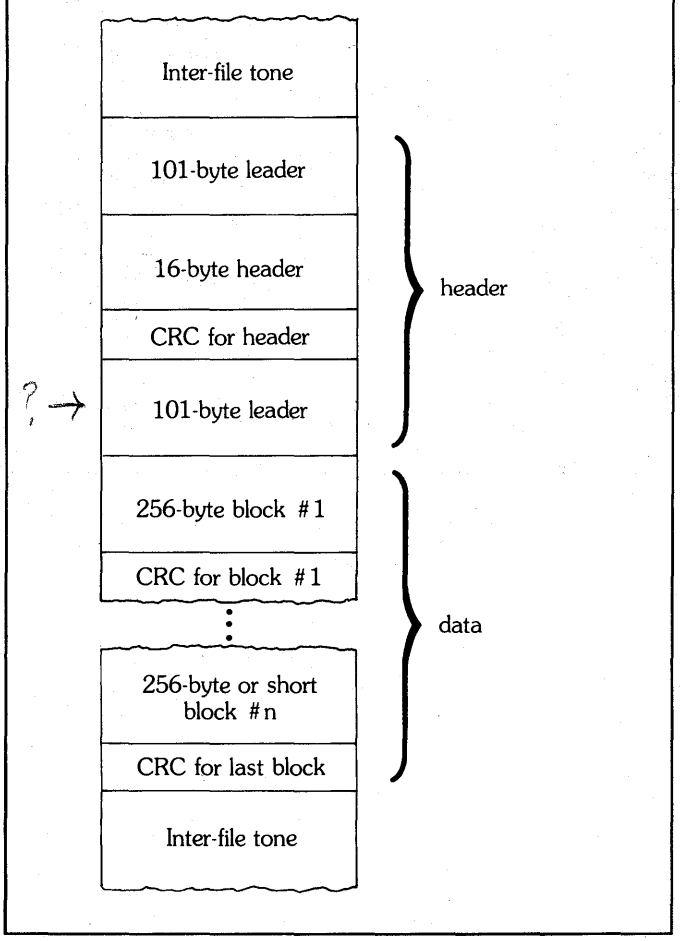
When a SAVE, LOAD, or FILES command is done from the Monitor, or when a CSAVE or CLOAD is done from BASIC, files are processed from the cassette tape device on the serial interface. This applies to both cassette #1 and #2. Cassette tape motor-on routine can be found at E024 (−8156), motor-off at E027 (−8153), casette save at E02A (−8151), and cassette load at E02D (−8148).

Cassette files on the Exidy have the following appearance, whether at 300 or 1200 baud:

1. Inter-file tone
   a. a high frequency tone always output by the cassette interface when data is not present.
2. 101-byte leader
   a. 100 bytes of 00 (nulls)
   b. 1 byte of 01 (control-A or SOH, Start-Of-Header).
3. 16-byte file header (see description in MWA above).
4. CRC for header
   a. 1 byte CRC for error checking. Details later.
5. Up to 256 bytes of data.
6. CRC for above data block (1 byte again).
7. Repeat 5 and 6 until data exhausted. The last data block may be short (less than 256 bytes). CRC still follows.
8. Inter-file tone (same as before the file).

This format is used by both BASIC and machine language files. It is depicted pictorially as follows:

Table 3. Cassette Tape File Format



To LOAD or CLOAD a file, or to perform a FILES command, the Monitor scans the tape (whichever is on) for the leader. Then the header is read into the MWA and the "FOUND . . . " message is sent to the current SEND device. The data portion is then either skipped (wrong file, or FILES command) or loaded. All CRCs are always validity checked for any of these commands. Thus, to check all the bits on an entire tape for errors, it is sufficient to perform a FILES command.

Note that the default tape transfer rate is 1200 baud. A much more reliable method of saving data is to use 300 baud. However it will take four times longer to SAVE and LOAD, and use a lot more tape. This is accomplished with the SET T=1 command.

Still, even at 1200 baud, the Sorcerer tape system is the best I've come across. It is the most reliable, and with its file headers, it is the easiest to use. The user does not even need a recorder with a tape digital counter to find files with these headers. The cleverness of the tape system makes the Exidy basic offering (just cassette, no expansion to S-100 capability, diskette, etc.) a very attractive low-priced system.

Tips on Loading and Saving Files on Tape

The following hints can be used to minimize problems with cassette recording of files:

To Load:

1. Use a relatively inexpensive cassette recorder ($30-$60) with ALC (Automatic Level Control). This means you have no control over the volume or tone of the recordings. All are made exactly the same way. Strangely enough, experience shows that expensive recorders work worse.
2. Connect the MIC wire to the microphone input. Do ***not*** use the auxiliary input on most recorders. The signal will be too weak.
3. Connect the EAR wire to the earphone or monitor jack.

To Play:

1. You must find the correct volume and tone for your recorder. As a first guess, set volume and tone to 7-8 out of 10, or 3/4 high.
2. Listen to the tape play through the speaker. The intra-file tone should be louder than normal listening volume, maybe even as loud as possible without distortion and noise. The data should sound high-pitched and clear, like static.
3. Try loading a file. Tinker with volume and tone until at least a file header is read without a CRC error ("FOUND . . . " message appears). Now you are close enough to the correct settings.
4. Once found, the correct settings should be able to be used for all tapes recorded on that recorder.

Cassette Tape Error Checking

The CRC (Cyclic Redundancy Check) method is used to detect bit transmission errors in cassette data recordings. The CRC is stored at MWA+46. CRC checking is done with this algorithm: When the file is first written to tape (i.e., when the 101-byte leader is written), the CRC is 0'd. For every data byte, in program or header, the current CRC is subtracted from the data (data-CRC), and the ones complement of this is used as the next CRC for the next byte (i.e., FF−(data−CRC), or all the bits are flipped — 0's become 1's, and 1's 0's). When the file or block is completely written, the current CRC is writen as the final byte. Note: this is why BASIC programs grow by one byte every time they are loaded and re-saved. When the file is loaded again, the CRC is calculated again as above, and is compared to the last byte of the block (the CRC written). A match means no errors (almost always), while a mismatch means an error. This is identical in BASIC files as in machine language files, since the same Monitor routines are used to write/read tapes.

Programmable Graphics Character Set

Each byte in memory can contain exactly one character which can be input from the keyboard, displayed on the video, printed, etc. Thus, there are 256 possible combinations of these characters (00-FF, 0-255). These codes can be mapped as follows on the Exidy. Again, codes are given in both hex and decimal.

Table 4. Character Codes

Code		Description
00-7F	0-127	128 standard ASCII characters:
00-1F	0-31	32 ASCII control characters (e.g., CR, LF, etc.).
20	32	ASCII blank
21-2F	33-47	ASCII punctuation
30-39	48-57	ASCII numbers 0-9
3A-40	58-64	ASCII punctuation
41-5A	65-90	ASCII upper case A-Z
5B-60	91-96	ASCII punctuation
61-7A	97-122	ASCII lower case a-z
7B-7F	123-127	ASCII punctuation and "delete" character (7F)
80-BF	128-191	64 standard Exidy keyboard graphics. These are obtained by depressing the GRAPHICS key
C0-FF	192-255	64 programmable graphics characters. These are obtained by depressing SHIFT and GRAPHICS keys:
C0	192	GRAPHIC SHIFT 1
C1	193	2
C2	194	3
C3	195	4
C4	196	5
C5	197	6
C6	198	7
C7	199	8
C8	200	9
C9	201	0
CA	202	:
CB	203	- (hyphen)
CC	204	<
CD	205	(tab)
CE	206	Q
CF	207	W
D0	208	E
D1	209	R
D2	210	T
D3	211	Y
D4	212	U
D5	213	I
D6	214	O

Code		Description
D7	215	P
D8	216	[
D9	217	]
DA	218	A
DB	219	S
DC	220	D
DD	221	F
DE	222	G
DF	223	H
E0	224	J
E1	225	K
E2	226	L
E3	227	;
E4	228	@
E5	229	↑
E6	230	← (underscore)
E7	231	Z
E8	232	X
E9	233	C
EA	234	V
EB	235	B
EC	236	N
ED	237	M
EE	238	, (comma)
EF	239	. (period)
F0	240	/ (slash)
F1	241	- (on numeric pad)
F2	242	7 (on numeric pad)
F3	243	8 (on numeric pad)
F4	244	9 (on numeric pad)
F5	245	+ (on numeric pad)
F6	246	4 (on numeric pad)
F7	247	6 (on numeric pad)
F8	248	x (on numeric pad)
F9	249	1 (on numeric pad)
FA	250	2 (on numeric pad)
FB	251	3 (on numeric pad)
FC	252	+ (on numeric pad)
FD	253	0 (on numeric pad)
FE	254	• (on numeric pad)
FF	255	= (on numeric pad)

Each of the preceeding 64 characters can be defined to be any design or shape desired. Each consists of 8 bytes in memory, or 64 bits. These sets of 8 bytes (64 of them) start at address FE00 (−512). On the screen each character consists of 8 lines of 8 dots, or 64 dots. Thus, each of the 8 bytes defining the character in memory corresponds to one of the 8 lines of the character in the display, and each of the 8 bits in that byte is a dot in that line. If the bit is on (1), then the dot is white. If the bit is off (0), then the dot is black. For example, a circle with a dot in the middle could be defined as a character. It would require defining each of the 64 (8x8) dots as 64 (8x8) bits in memory. So

••••••••	00000000 binary	00 hex	0 decimal
••xxx•••	00111000	38	56
•x•••x••	01000100	44	68
x•••••x•	10000010	82	130
x••x••x•	10010010	92	146
x•••••x•	10000010	82	130
•x•••x••	01000100	44	68
••xxx•••	00111000	38	56

The first 128 characters (00-7F, ASCII) are not under user control. The information required to display these characters is located in PROM at F800-FBFF (1K). The next 64 characters (80-BF, Exidy Graphics) can be programmed if desired, but they are already programmed to be standard keyboard graphics. The 64x8 (512) bytes for these are located at FC00-FDFF. This RAM can be changed at any time by the programmer to redefine these characters. However, the Monitor refreshes this area from its ROM every time a RESET occurs, or whenever the video screen is cleared (e.g., when CLEAR is pressed, or when a Form Feed ASCII control is displayed). This will clobber any such modifications.

The last 64 characters (C0-FF) are completely under programmer control. They are always displayed as nonsense until they are "defined" by turning on and off the bits of the 8 bytes associated with the character. These bytes are in RAM from FE00 to FFFF (−512 to −1). For example, the character C0 (192) is a FE00-FE07 (−512 to −505), C1 (193) at FE08-FE0F (−504 to −497), C2 at FE10-FE17, and so on, until FF (255) is at FFF8-FFFF (−8 to −1). The formula to calculate where the 8 bytes in RAM begin for any of these 128 characters which can be programmed (80-FF) is (assume "c" is the character code of the character to be programmed):

FC00+(8 * (c − 80)) hex, or
(8 * (c − 128)) − 1024 BASIC decimal

where "c" ranges from 80-FF (128-255).

For example, to print a "blot" (all dots on, a white square) on the screen followed by the above circle with the dot in the middle, the following BASIC program can be written. The blot will be made from the first programmable graphic 192, and the circle/dot will be 193:

```
10 FOR I=0 TO 7: REM 8 BYTES AT FE00 (-512) FOR BLOT
20 POKE -512+I,255: NEXT: REM TURN ON ALL BITS/DOTS
30 FOR I=0 TO 7: REM 8 BYTES AT FE08 (-504) FOR CHR #193
40 READ J: REM GET A BYTE VALUE FROM THE TABLE AS ABOVE
50 POKE -504+I,J: NEXT: REM TURN ON CORRECT DOTS
60 PRINT CHR$(192);CHR$(193): REM PRINT THE 2 NEW CHRS
70 DATA 0,56,68,130,146,130,68,56: REM DATA CHR #193
80 END
```

EXIDY KEYBOARD ARCHITECTURE

The keyboard on the Exidy has a clever physical (hardware) and logical (software) architecture.

It actually resides on small parts of input and output ports FE (254). It is composed of a potential 80 keys, organized as sixteen rows of five columns each. For each one of the sixteen rows of possible keys (0-F, 0-15, output port FE bits 0, 1, 2, and 3) any one of the five columns of possible keys can be depressed (0-4, input FE bits 0, 1, 2, 3, and 4).

For example, row 0 column 0 is ESC, row 9 column 3 is a P, and row 15 column 4 is the = key on the numeric pad. Not all 80 possibilities are in use (about three are meaningless). Each of the valid possibilities can assume any one of five states:

1. When SHIFT is depressed — upper case, punctuation; no numerics or graphics; cursor arrow keys operative.
2. When LOCK is depressed — this is a CAPS LOCK, so upper case letters, numerics, and punctuation are valid, but no graphics or cursor movement keys.
3. When CONTROL is pressed — this produces ASCII control characters, some numerics, and cursor movement; no graphics.
4. When GRAPHICS is pressed — this is standard Exidy keyboard graphics (codes 80-BF). If SHIFT is also pressed simultaneously, the programmable graphics codes C0-FF are used.
5. If none of the above are pressed — standard lower case and numerics and punctuation are used; no graphics or cursor movement.

The Monitor ROM area EC1E-EDFD contains the tables necessary to allow the keyboard input routine to translate the row/column of the key pressed into a 1-byte character codes, depending on which of the five states the keyboard is in. These tables are actually broken down into six tables total: the first is a what-to-do table to calculate the state etc., and the last five are the character codes for the five states.

Performing Keyboard Input

To get keyboard input from the user from BASIC or Z80 Assembly Language without INPUT statements, a very useful subroutine can be used. In fact, this can be done such that the program sees each character as it is typed without having to wait (or ever get) a carriage return (RETURN). For example, a program can react and respond immediately to input commands as they are typed.

From BASIC, characters can be input with the following example assembly routines. Place this simple and relocatable Monitor keyboard routine driver interface at, say, location F0 (240). It can go anywhere, but F0 is a good start.

```
F0: CD15E0  SCAN: CALL  QCKCHK  ;Control-C pressed?
F3: C2FADF        JPNZ  BASIC   ;Yes, back to BASIC (warm)
F6: CD09E0        CALL  RECEIVE ;No, get input character
F9: 28F5          JRZ   SCAN    ;Nothing yet, continue
FB: 32FF00        LD    (CHR),A ;Got it, save at loc FF
FE: C9            RET           ;Return after USR call
FF: 00      CHR:  NOP           ;Where byte stored for BASIC
```

The routine first checks to see if CTL-C, ESC, or RUN/STOP have been entered, meaning the user wants to quit. If so (**N**ot **Z**ero) back to READY level. If not, the current RECEIVE device (usually keyboard) is scanned for a character. If none (**Z**ero), scanning continues. If found, the character is put at location FF (255). Control is then return to BASIC after the USR call. The following example BASIC program can use this routine:

```
10 PRINT "ENTER CHARACTER"
20 POKE 260,240: POKE 261.0: REM LOC 00F0 IS 240,0
30 Z=USR(Z): REM CALL SCAN
40 REM IF WE GET HERE LOC FF HAS A CHARACTER
50 A$=CHR$(PEEK(255))
60 IF A$="S" THEN STOP: REM STOP IF S ENTERED
70 PRINT A$: REM ECHO THE CHARACTER
80 GOTO 20: REM LOOP TILL S ENTERED
```

These are both simple routines that can be modified to be as fancy as possible.

From Z80 machine language there is no need to necessarily store the character in RAM. It is returned in the accumulator by the RECEIVE routine.

The above programs accept their input from the current RECEIVE device. To set this device the SET I=x command is used.

Cursor Positioning

Cursor positioning is the process of moving the cursor (that underscore character) on the screen to locations other than where it usually is when standard BASIC or Monitor video output is done (e.g., PRINT, DUMP, etc.). This is very useful especially when data is to be placed on the screen but not in a line by line fashion. For example, if a graphic diagram is displayed and certain segments are to be labelled, the cursor can be moved directly to each one and the output generated in a random fashion on the screen. Also many times the usual output statements will destructively erase what is already on the screen. For example, if something is to be printed in the middle of a line but there is information already in the beginning of that line, an output statement will erase it. Cursor positioning to the middle will not.

To perform cursor positioning from Assembly Language or BASIC is quite simple:

1. Decide what line the cursor is to be on. There are 30 numbered 0-29. Call this "1".
2. Decide what column of that line the cursor is to be on. There are 64 numbered 0-63 on each line. Call this "c".
3. Calculate 64x1. This is the offset from the beginning of the screen to the first column (0) of line 1. This is easy in BASIC (Q=64*L). In machine language, just shift 1 left six times, or, assuming 1 were in register E:

```
    LD   D,0    ;DE=01
    LD   B,6    ;TIMES TO SHIFT
X:  SLA  E      ;SHIFT E
    RL   D      ;SHIFT D
    DJNZ X      ;6 TIMES, DE=64x1
```

   Or if 1 were in register pair HL, just execute the ADD HL,HL instruction six times in a row to double 1 six times, or multiply by 64.

4. Find the MWA. This is described in detail p.20 ~~earlier~~. For the examples below, assume register IY points to the MWA for Assembly, and AD for BASIC.

5. At offset 68 hex (IY+68 or AD+104) is 2 bytes where 64x1 is to be stored:

```
LD  (IY+68),E
LD  (IY+69),D
```

   or in BASIC, POKE the low part (low byte) of the number 64x1 (64x1 MOD 256) into AD+104, and POKE the high part (byte) of 64x1 (INT(64x1/256)) at AD+105. Now, 64x1 MOD 256 is just the remainder when 64x1 is divided by 256, and this can be calculated as follows in BASIC:

```
905 L2=64*L
910 MD=L2 — INT(L2/256)*256
```

   To do the POKEs, assuming AD is already pointing to the MWA:

```
915 POKE AD+104,MD
916 POKE AD+105,INT(L2/256)
```

6. At offset 6A in the MWA (IY+6A, AD+106) is 2 bytes where "c" is to be stored. If it were in register A:

```
LD  (IY+6A),A
LD  (IY+6B),O
```

   or in BASIC

```
930 POKE AD+106,C
940 POKE AD+107,O
```

   BASIC also requires you to put c at location 1BE (398) in the BCA:

```
950 POKE 398,C
```

7. Call the Monitor cursor move routine. This will replace the current cursor with the character which was at that spot ("underneath" it), move the cursor to the requested spot and save the character there. From Z80:

```
CALL E9CC
```

   From BASIC the USR technique must be used:

```
960 POKE 260,204: REM HEX CC
965 POKE 261,233: REM HEX E9
970 X=USR(X): REM CALL E9CC
```

8. Now a standard output statement like PRINT can be done and the output will begin at this new cursor location.

With this new technique, horizontal and vertical tabbing can also be done.

Horizontal tabbing may also be done in Basic directly with the use of the TAB(n) function.

Vertical tabbing may be done with Control-Z (down arrow) characters. For example, to tab to line 15 (0-29), home the cursor with a Control-Q — hex 11 — 17 decimal — and Control-Z fifteen times (Control-Z is hex 1A, decimal 16):

```
2220 PRINT CHR$(17); : REM HOME
2240 FOR I=1 TO 15
2260 PRINT CHR$(26); : REM DOWN ONE LINE
2280 NEXT
```

PRINT TAB(n) can then be used to tab horizontally on that line.

EXIDY STANDARD BASIC

BASIC Floating Point Format

Numbers in BASIC are not integers. Fractions are allowed. Thus, the decimal point can move. For example, the decimal point "floats" when 13.25 is divided by 10 — 1.325. It is from this idea that the term "floating point" was derived.

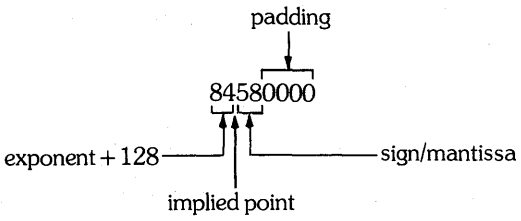
These numbers are stored by BASIC in four bytes of memory. Each number has three parts:

1. the sign (+ or −);
2. the "mantissa" (the actual number, but with the point shifted to the left of the leftmost 1 bit of the number). So the number 127 decimal (7F, 01111111) is a mantissa if it is thought of as .1111111;
3. the "exponent," which is how much the point had to be shifted in the number to produce the mantissa with the point at the left.

This all sounds very complex, but it actually is not. Let's take an example, say 13.5 decimal. In hex this would be equal to D.8 (13+8*1/16). Remembering that hex is just groups of four bits, the binary equivalent of 13.5 would be 1101.1000. To create a mantissa from this, we must shift the point (in this case, the "binary point," not the decimal point) to the left four places, producing .11011000. The exponent can now be calculated. It is always ***positive*** if the mantissa shift was to the ***left, negative*** if to the ***right,*** and ***zero*** if ***no shift*** was necessary. Thus, the exponent in this example would be +4 (four to the left). However, we are not quite done. Rather than worrying about how to express a negative number exponent, 128 decimal (hex 80) is always added to the exponent to produce the final result. Thus, the final exponent is 84 (132). Now we come to the sign. Since the digit to the far left of the mantissa is always 1 (because we shifted until that was the case), then the sign can be stored in this bit without losing any information. If the number is positive or zero, then the sign bit will be 0. If negative, then the sign bit will be a 1. So the mantissa for 13.8 .11011000 changes to .01011000. To assemble this number, first we put the exponent 84 then the mantissa filled out to the right to fill out the four bytes:

10000100 .01011000 00000000 00000000

Now if we ignore the point, since it is always in the same place, and convert to hex, we have:



If the original number were −13.5 instead, then nothing would change except the sign. That is the mantissa would change from .01011000 to .11011000, so the new number would be

84D80000

In the reverse direction, to convert floating point back to decimal, let's use 88FF4000 as an example:

1. Examine the exponent (88) and subtract hex 80 (128). In this example 88−80=08. But this may produce a negative number.
2. Examine the mantissa with the implied point (.FF4000).
3. If the left bit (high order, the one next to the point) is on (it is), then the number is negative. Otherwise it is positive.
4. In either case, turn that bit on.
5. Shift the point according to the exponent from step 1 (08 here). If plus, shift right, if minus, left, if zero, no shift. Since we have +8, shift the point right 8 ***bits***.

.11111111010000000000000

6. The number is now FF.4000, and with the sign, −FF.4000, or −255.25 decimal.

The only special case is the number 0. Here the exponent is 00. Other examples are:

1815	=	hex 717	=	8B62E000
1		1	=	81000000
−1		−1	=	81800000
−.5		−.8	=	80800000
0		0	=	0061000

The last idea that must be mentioned is that the number is actually stored in memory in ***reverse***, so the number eemmnnpp is stored ppnnmmee. For example, decimal 1815 in the above example:

00E628B

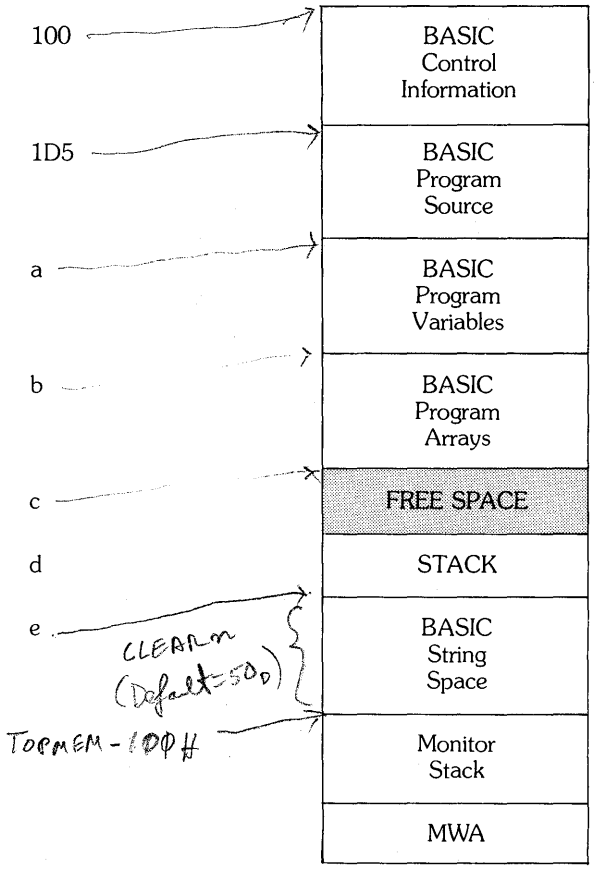
note: uses TOP in opposite sense to MONITOR description

BASIC CONTROL AREA

This is a discussion of the workarea in RAM used by BASIC, called the BASIC Control Area, or BCA. The BCA begins at address 100 (256), and has an overall appearance like

TOP

Table 5. BASIC Control Area



In detail, RAM locations 100-14E (256-334) are copied from the BASIC ROM (address C258) when a BASIC Cold Start occurs (i.e., after Reset or a PP X command is entered). The BCA described below includes only those areas which are of direct use to the programmer. It is intentionally sketchy, especially due to the great number of fields.

Address	Description
100/256	Three-byte JUMP instruction to C06B (Warm Start). Done when PP command is entered without operands.
103/259	Three-byte JUMP to C7E5 default (displays "FC ERROR" message). This is the USR function hook. See BASIC Assembly interface section later for details.
145/325	Two-byte address of top of string space (letter "e" above) or the beginning of the BASIC stack. This is set by the BASIC CLEAR n command.
147/327	BASIC line input buffer and Direct Mode execution line.
18E/398	Current line column number.
1B1/433	Two-byte address of instruction in the BASIC program about to be executed when Control-C break is entered. This could be in the middle of a line of multiple statements separated by colons.
1B3/435	Two-byte BASIC line number of current line.
1B5/437	Two-byte address of the next ***full*** line to execute from the link pointer of the current line (see below).
1B7/439	Two-byte address of the end of the program and the beginning of the BASIC Program Variable Area (letter "a" above).
1B9/441	Two-byte address of the end of the Variable Area and the start of the BASIC Program Array Area (letter "b" above). Whenever changes are made to the BASIC program (adding, deleting, updating lines) the above two addresses are used to define a new Variable and Array area below the new BASIC program. Thus, a program cannot be continued with old variable/array values once a change has been made.
1BB/443	Two-byte address of the end of the Array Area and the pointer to free space (room for expansion — letter "C").
1BD/445	Two-byte address of the last used data operand of a DATA statement so that the next READ will find the appropriate item. This is reset by a RESTORE command.
1BF/447	Four-byte input parameter (usually floating point format) to the USR function, and output parameter from the USR function. If USR (3.5) is called, 3.5 is passed to the subroutine in floating point. See a later section for BASIC/Assembly interfacing details.
1D5/469	Beginning of all BASIC programs.

Format of BASIC String Variables and Arrays

A BASIC string variable is similar to a floating point variable. It is also six bytes long. It looks like:

Offset	Description
+0	Two-byte variable name. The high order bit is always 1.
+2	One-byte current length of the variable length string value.
+3	00
+4	Two-byte address of the string itself. It resides either in the string space or in the program statement itself (e.g., 1005 A$="HI").

A string array is identical to a numeric array except for two very important features:

1. The high order bit of the array name is always 1.
2. The four byte value is not floating point format but the length/00/ stringaddress fields described above. All dimensioning remains the same.

Format of BASIC Program Statements

The first line of every BASIC program begins at location 1D5. All BASIC lines have the following variable length format:

Offset	Description
+0	Two-byte link pointer address of the next sequential full line in the program. This is independent of multiple statements on one line (separated by colons). The last line of the program points to location 0000 to indicate the end.
+2	Two-byte BASIC line number of the line in integer binary (a number between 0000 and FFF9, 0-65529).
+4	The BASIC statement(s), variable in length. Let us say they are "n" bytes long. Each BASIC "reserved word" such as GOTO, IF, END, DIM, PRINT, etc. is encoded here to a one-byte character not belonging to the ASCII character set (i.e., hex codes greater than 7F). This speeds up processing and saves program memory space. When the program is LISTed, these special bytes are decoded back into their corresponding reserved words.
+4+n	Byte of 00 indication the end of this line and beginning of the next.

Format of BASIC Floating Point Variables and Arrays

A BASIC floating point variable resides in the BASIC Program Variable Area. Each one takes a constant six bytes:

Offset	Description
+0	Two-byte ASCII variable name. The high order bit is always 0. The letters are also reversed as usual.
+2	Four-byte floating point value currently held by this variable. See the format description earlier.

BASIC arrays all reside together after the variables in the BASIC Program Array Area. A floating point array is variable in length. It takes a minimum of seven bytes and looks like this: (Note: an array in Exidy BASIC can have any number of dimensions; call that number "n". Each can have any number of elements).

Offset	Description
+0	Two-byte array name. The high order bit is always 0. The letters are reversed.
+2	Two-byte total array length minus four (i.e., the length of the array starting after these two bytes). This is used to find the next array in the area quickly.
+4	One-byte number of dimensions (we called it n).
+5	Two-byte size (number of elements) in the first dimension.
+7	Two-bytes sie of the second dimension (if any).
•	•
•	•
•	•
+5+2(n-1)	Two-byte size of the nth dimension.
+5+2n	Beginning of a list of contiguous four-byte floating point array elements. These are in Row order.

BASIC to Z80 Assembly Language Interface

To call Z80 Assembly Language subroutines from Exidy BASIC, certain general conventions and procedures must be followed:

1. The machine language program must reside either in the first 256 bytes of memory (00-FF, 0-255 — usually a bad idea) or in the BASIC free space area described earlier. Either BASIC control, program, variables, arrays or strings, or Monitor/video control resides in the rest of memory. This is the only way a BASIC and machine language hybrid can coexist without complicated machinations such as putting the machine language routine right after the BASIC program and fooling BASIC into thinking that it is part of the program. The BASIC free space is the best and easiest choice. However there are some potential problems:

   a. Free space is dynamic. As the program changes, as variables/arrays are added or change size, the start of the free space moves. A machine language program placed too close to the end of the Array Area can get walked on. The end of the free space changes too, since the BASIC stack (or string space) will grow and shrink, especially with the CLEAR command. Since this change is usually not as radical as that of the start of the free space, I recommend putting the program close to the ***end*** of the free space. But there are now other considerations.

   b. The free space ends near HIMEM of the machine (where the BASIC stack is). This changes with each different Exidy size. So a generalized subroutine designed to run on any machine (probably with several BASIC programs) would either have to be relocatable (able to be moved without affecting anything), or there would have to be different versions of the program to run on different size machines. This of course would allow the BASIC program to use the maximum amount of free space. A subroutine designed for a ***particular*** BASIC program could be placed at the top of the free space as long as the BASIC program does not grow too much.

   c. If the program is placed at the end of the free space an excessive CLEAR n BASIC statement could kill it.

   d. Thus, no matter where the program is placed, certain restrictions have to be made to coexist with BASIC.

2. Assume a good location is found, and the Z80 program is written and relocated to that address in RAM. Assume this address to be 312A hex (12586). To call this subroutine from BASIC, it must already be in memory, and the USR function must be used. When BASIC executes it, it converts the argument to floating point and places this number in the four-byte USR parameter area at 1BF-1C2 (447-450). It then calls the subroutine at location 103 (259). For example, when the statement

   2030 X=USR(25.7)

   is executed, 25.7 is placed at 1BF and a CALL is made to 103.

3. Now, by default 103 contains the following Z80 instruction

   JP C7E5

   or in machine language — hex C3E5C7. This unconditional JUMP to the instruction at address C7E5 in BASIC ROM. This default subroutine prints the error message "FC ERROR" (function call invalid) and stops the program. To call ***your*** subroutine, you must change the JUMP instruction address to the address of the beginning of your program. Again the instruction after a BASIC Cold Start looks like

Address	Contents	Description
103/259	C3	JUMP Z80 operation code
104/260	E5	Low part of address
105/261	C7	High part of address

   Leave the C3 JUMP, but change the address. If your program was at 312A as we said, you must make the jump to 312A, or

   JP 312A

   or in machine language — hex C32A31. It is a good idea to change the two address bytes every time the subroutine is to be called. Use the BASIC POKE statement for this (which requires ***decimal*** operands). Put 2A (42) at location 104 (260), and put 31 (49) at location 105 (261):

```
10000 POKE 260,42
10010 POKE 261,49
10020 XX = USR(Y)
```

   When the USR function is executed in line 10020, your routine at 312A will be called. It could use the value in variable Y placed at 1BF as input. It could also put another value back as output. This value will be returned to the BASIC statement as the "result" of the USR function. In the above example, the value returned will be placed in variable XX. Note that the short BASIC routine shown above can easily be made into a GOSUB subroutine by adding the statement

   10030 RETURN

   Thus, to call your routine you need only say

   GOSUB 10000

4. To terminate your subroutine, one of four things can be done:

   a. Return directly to the Monitor and exit BASIC altogether, e.g., for catastrophic errors. For Monitor Warm Start jump to address E003. For Cold Start use E000. The user will be shown the Monitor prompt (">").

   b. For lesser errors detected, give an FC ERROR message, stop the program, and return to BASIC READY level. This is simply done by jumping to C7E5.

   c. If errors are detected and your routines have displayed the error message(s), you can stop the program and exit directly to BASIC READY level. For a BASIC Warm Start jump to DFFA, for a Cold Start DFFD.

   d. Of course you can return normally to BASIC so it will continue the program where it left off after the USR statement. This is simply done by the RET instruction. Fill in the parameter at 1BF first, if necessary.

Note that all the Monitor subroutines are available to the Z80 subroutine, including turning the tape on, reading a file, and turning it off; or getting input from the keyboard. See the section on Monitor Subroutines later.

Debugging of the Z80 routine is a little more difficult than debugging BASIC programs. BASIC loses control of the situation and of what you are doing while your routine is running, and can't "keep an eye out" for potential errors as it can within a BASIC program. Great care, desk checking, and modular programming are a must.

An assembly language routine can also use as input and output actual BASIC variables and arrays. Using the pointers in the BCA described earlier, the program can find the variable/array lists and scan for the one(s) with the correct name(s). The using the floating point or string formats, the values can be examined or changed.

* See also S.U.N II:65, A/S 80

EXIDY POWER-ON MONITOR

Monitor Workarea

This is a detailed description of the area of memory shown above at locations 1F91, 3F91, or 7F91, depending on the size of the machine.

The Monitor Workarea, hereafter called MWA, is the area in RAM used by the Exidy Monitor program to save important information needed for its successful operation. This area is always located right next to the Monitor Stack, and is always placed at the very top of available RAM space. For an 8K machine, the top of RAM is at 1FFF (8191), for 16K 3FFF (16383), and for 32K 7FFF (32767). This number, Himem, is placed by the Monitor in the two bytes at address F000-F001 (−4096 to −4095) in the video driver RAM space. Remember as with most micros, the two bytes are ***reversed*** in storage. For example, for a 16K Exidy, F000-F001 contains FF3F, not 3FFF. The address of the MWA can be obtained from this HIMEM address so that you don't have to worry about what size machine your programming is running on. To do this, you must get the HIMEM value at F000-F001 and subtract 6E (110) or add FF92 (−110). For example, in Z80 Assembly Language:

```
LD      HL,(F000)   ;GET HIMEM
LD      BC,FF92     ;GET −110
ADD     HL,BC       ;HL POINTS TO THE MWA
```

Or in BASIC:

```
100 AD=256*PEEK(−4095)+PEEK(−4096)
110 IF AD>32767 THEN AD=AD−65536
120 AD=AD−110
```

There is also a Monitor subroutine designed to do this calculation for you. It is at address E1A2 (−7774). When CALLed, it puts the MWA address in Z80 register IY. Example:

```
CALL    E1A2        ;IY POINTS TO THE MWA
```

A detailed map of the contents of the MWA will now be given. This will be in the same fashion as the overall memory map listed above, except that the addresses will be shown in a different form. First the offset in hex from the beginning of the MWA will be given. This can be used in Z80 Assembly Language as a displacement away from an index register such as IY, which points to the MWA. For example, if the displacement is listed as +41 to a particular field, then that field can be addressed in Z80 by (IY+41) or by 41(IY). The second part of the address is given as an absolute address of the field in RAM. Since the whole MWA moves dependent on the size of the machine, the first two hex digits of these addresses can change. The last two digits are always the same. So only these last two digits are listed. The first two will either be 1F (8K), 3F (16K), or 7F (32K). Note: if the user coldstarts the Sorcerer (Resets) with a size other than the above sizes (such as 21239 bytes, not even a whole multiple of a K) then the above addressing scheme is not applicable and only the displacement from the index register scheme may be used.

Exidy Monitor Memory Map

To get an overall picture of how the Exidy utilizes the 64K of (possible) memory, a "memory map" is given.

Memory is cut up into pieces and each piece is used for a different purpose. In the map below the address of the first byte of each piece is listed along with the use of that area. The address is given in both hex and a form of decimal that is usable directly in BASIC with the PEEK and POKE commands. Note that some of these decimal numbers are negative. If the address exceeds 32767 (hex 7FFF), then BASIC requires that the "twos-complement" form of the number be used, or the negative form. For numbers greater than 7FFF, 65536 is subtracted from the number.

Be aware also that this is an ***overall*** wide angle view of memory. Detailed maps of certain areas (such as the Monitor Workarea and the BASIC Control Area) are included.

Table 6. Monitor Memory Map

Address		Description
0000	0	256-byte Z80 Restart space (RAM)
0100	256	User RAM start, begin BASIC Control Area (RAM)
1F00	7936	8K Monitor Stack end (8K machines) (RAM)
3F00	16128	16K
7F00	32512	32K
1F90	8080	8K Monitor Stack start (8K machines) (RAM)
3F90	16272	16K
7F90	32656	32K
1F91	8081	8K Monitor Workarea start (8K machines) (RAM)
3F91	16273	(16K)
7F91	32657	(32K)
1FFF	8191	8K End User RAM (8K machines) (RAM)
3FFF	16383	16K
7FFF	32767	32K
C000	−16384	Begin 8K ROM PAC (e.g., begin BASIC) (ROM)
E000	−8192	Begin 4K Monitor Program (ROM)
F000	−4096	128-byte video driver space (RAM)
F080	−3968	1920-byte video screen (64x30) (RAM)
F800	−2048	1K standard Exidy ASCII alphanumerics (00-7F) (PROM)
FC00	−1024	512-byte Exidy keyboard standard graphics character set, accessed by depressing GRAPHICS key, character codes hex 80-BF (128-191) (RAM)
FE00	−512	512-byte User Programmable graphics character set, accessed by depressing SHIFT and GRAPHICS keys, codes hex C0-FF (192-255) (RAM)
FFFF	−1	End Exidy address space (64K)

SET T=			Hex
0	1200	Cassette	40
1	300	"	00
2	1200	RS232	C0
3	300	"	80

Table 7. Monitor Workarea

Address		Description
+00	91	60-byte Monitor command input buffer. Any command entered from the current RECEIVE device (SET I=x) such as the keyboard, serial or parallel ports is placed in this area. It is left-justified, and terminated by an ASCII carriage return character (hex code OD, 13 decimal, hereafter called a CR). The Monitor subroutine at E13A (−7878) builds this buffer from the input.
+3C	CD	Port FE interface status.
+3D	CE	Serial interface and dual cassette interface baud rate save area. 1200 baud is indicated by hex 40, 300 baud by the value 00. Serial port or cassette baud rates are set to the default of 1200 baud (hex 40) by the Monitor COLD Reset routine (at E000, −8192) and by the Monitor USER Reset entry point (at E003, −8189). Such a coldstart is done, for example, when the RESET keys are depressed. This byte is also set by the SET T=0 and SET T=1 commands (at Monitor routines at E5A2, −6750).
+3E	CF	SEND delay time. This value is used to delay before a SEND (to video, serial, or parallel) is done. The actual delay is about 1500 times this value machine cycles. This delay can therefore range form 0 to approximately 400000 cycles. The value is set by the SET S=n command.
+3F	D0	Current SEND routine address. The default address set by COLD starts is the video routine at E9F0 (−5648). It can be changed by the SET O=x command.
+41	D2	Current RECEIVE routine address. The default is set by COLD starts to be the keyboard routine at EB1C, −5348. It can be changed by the SET I=x command.
+43	D4	Batch mode status. 00=normal input, nonzero=batch mode. This byte is used by the Monitor command input routine (E142) to determine whether commands are to be gotten from the RECEIVE device or from the batch tape serial port. The OVER command turns this off and the BATCH command turns this on.
+44	D5	Monitor output prompt character. The default is the character ">" or ASCII code 3E (62) set by COLD starts. It can be changed by the PROMPT x command. It is output to the SEND device every time a Monitor input command is being requested (at EOED, −7955).
+45	D6	Tape status, baud rate, motor control save area. This is zeroed when the tape(s) is turned off, and otherwise remembers the status of the tape baud rates (00=300, 40=1200) and motor controls (10=motor #1 on, 20=motor #2 on).
+46	D7	Tape input and output CRC (**C**yclic **R**edundancy **C**heck). The CRC is used to check whether the data has been transmitted successfully to/from the tape. This technique is described in detail in a subsequent section.

Address		Description
+47	D8	Beginning of the 16-byte tape output file header area. The first 5 bytes here contain the 5-character ASCII file name as entered on the SAVE or CSAVE command. It is left justified and padded to the right with ASCII blanks (code 20, 32 decimal).
+4C	DD	File header id, usually hex 55.
+4D	DE	File type. Usually C2 (194) for a BASIC save file. If the high order bit (80, 128 decimal) is on, the file cannot be automatically executed with the LOADG command. This is set by the SET F=xx command.
+4E	DF	2-byte length of the file in bytes.
+50	E1	2-byte program loading address. For BASIC files, this is always 01D5 (469) because BASIC programs always start at that address. See the BASIC Control Area description following. For other programs such as those in machine language, this address is the "ssss" of the command "SAVE name ssss eeee."
+52	E3	2-byte program "go-address" for auto execution files. The Monitor will automatically begin execution of the program at this address with the LOADG command. This address is set by the SET X=nnnn command.
+54	E5	3 bytes of reserved space, ending the output tape header.
+57	E8	16-byte tape input header area. The format is identical to that of the area at +47. This area is filled in from reading the tape for commands such as CLOAD, LOAD, FILES, and so on.
+67	F8	Character under the cursor. Since the cursor is an underscore character (ASCII code 5F, 95 decimal), it actually ***replaces*** the character at the cursor location. This hidden character is saved to be put back when the cursor is moved. The save is done by E9CC (−5684), and it is replaced by E9E8 (−5656).
+68	F9	2-byte line number where the cursor is times 64. This ranges from 0x64 (0) to 29x64 (1856), and is the offset from the beginning of the screen to the cursor line start.
+6A	FB	2-byte cursor column number (0-63). When added to +68 the actual cursor offset into the screen is found.
+6C	FD	Last character entered from the keyboard. This is used for the processing of the REPT (repeat) key logic. This character is entered to the keyboard input routine about every 30000 machine cycles as long as the REPT key is depressed. It is always the last key entered, and is saved and used by the keyboard processing routine at EB1C (−5348).
+6D	FE	Two bytes of reserved space. This brings us to the end of the MWA, and in fact the end of user RAM.

Monitor Subroutines

The Exidy ROM Monitor is just packed with very well-written and useful subroutines which can be called from BASIC and assembly language. All are resident in the 4K ROM between locations E000 and EFFF. This is a brief description of all the useful routines, and how to interface them. Here the address will be given in hex of course, but will also be given as a two-part decimal number in the order necessary to POKE into the USR JUMP vector at locations 260-261.

Table 8. Monitor Subroutines

Address		Description
E000	0,224	Monitor Cold Start (on RESET).
E003	3,224	Monitor Warm Start (on BYE command).
E006	6,224	Monitor User Cold Start — similar to E000 except HL is input containing what the user wants to use as HIMEM.
E009	9,224	RECEIVE: returns NZ and a character from the current RECEIVE device in the accumulator (A), or Z if no character yet. DEFAULT=E018
E00C	12,224	SEND: sends character in A to the current SEND device. DEFAULT= E01B
E00F	15,224	SERIAL IN: reads a character into A from the serial input device or from cassette tape.
E012	18,224	SERIAL OUT: writes character from A to serial/tape.
E015	21,224	QCKCHK: returns NZ if Control-C or ESC (RUN/STOP) is depressed, otherwise it returns Z.
E018	24,224	KEYBOARD: the RECEIVE routine if SET I=K (default) See E009.
E01B	27,224	VIDEO: the SEND routine if SET O=V (default). See E00C.
E01E	30,224	PARALLEL IN: the RECEIVE routine if SET I=P.
E021	33,224	PARALLEL OUT: the SEND routine if SET O=P.
E993	147,233	CENTRONICS OUT: the SEND routine for SET O=L.
E024	36,224	CASSETTE MOTOR CONTROL ON: will turn motor on and set the baud rate of the requested cassette. MWA+3D must contain the baud rate (00=300, 40=1200) and reg B must contain the cassette number (1 or 2).
E027	39,224	CASSETTE OFF: turns off both tapes.
E02A	42,224	TAPE SAVE: Save memory onto tape. MWA+50, MWA+51 must contain the memory address where SAVEing is to start. It must also be pushed on the stack. DE must contain the ending address. HL must point to a byte containing a CR (hex 0D). MWA+47 through MWA+4B must contain the ASCII file name; MWA+4D must contain the file type; MWA+52,MWA+53 the GO address, if any.
E02D	45,224	TAPE LOAD: load a file into memory from tape. MWA+47 through MWA+4B must contain the file name to load. If a LOADG is to be done, a Z flag must be on the stack, otherwise an NZ flag. Then if the program name is specified, put NZ in the flags, otherwise Z (i.e., load the next file on the tape).
E13A	58,225	MONITOR INPUT: will put the command in the command input buffer at MWA+0. IY must point to the MWA. MWA+43 must contain 0 (not Batch).
E1A2	162,225	Will find MWA and put the address in IY without causing screen flicker (only does so during vertical retrace on the TV to avoid DMA conflicts).
E1BA	186,225	SENDLINE: sends an entire line to the SEND device. HL points to the line, which must end in a 00. LFs are always sent when CRs are found.
E1C9	201,225	ERROR: sends "ERROR" followed by the diagnostic message (which is pointed to by HL).
E1D4	212,225	OVER command processor (CP). Handles all work necessary for the OVER command.
E1E8	232,225	Sends 4-byte ASCII equivalent of the 2-byte integer in DE. If DE=3F29, then "3F29" is sent.
E1ED	237,225	Send 2-byte ASCII of byte in A.
E205	5,226	Send a CR followed by a LF, CRLF.
E23D	61,226	Convert a 1-4 byte ASCII hex number (pointed to by HL) into DE. If HL points to A93 followed by a "Monitor Delimiter" (e.g., blank, CR, etc.), then DE will contain 0A93. This is the reverse process of the routine at E1E8.
E2D2	210,226	Send as many blanks as the number in B.
E4D3	211,228	DUMP CP
E538	56,229	ENTER CP
E562	98,229	MOVE CP
E597	151,229	GO CP
E5A2	162,229	SET CP
E638	56,230	SAVE CP
E6B9	185,230	FILES CP
E78A	138,231	LOAD CP
E845	69,232	~~PROMPT CP~~
E858	88,232	BATCH CP
E85C	92,232	CREATE CP
E884	132,232	LIST CP
E8A1	161,232	TEST CP
E98A	138,233	PP CP
E9B1	177,233	Clear the video screen and refresh/rewrite the graphics character set at FC00.
E9CC	204,233	Move the cursor to line/column specified in the MWA. See cursor positioning described previously.
E9D6	214,233	Find the cursor. HL is set to the screen address (which starts at F080) and DE is set to the column number.
EB10	16,235	Refresh character set at FC00.
EC1E	30,236	Keyboard input tables (to EDFD). See keyboard section.
EDFE	254,237	Character set for the 64 standard graphics 80-BF to be copied to FC00.

→ Print address, colon, SP = PADDR @ E20FH
Print space, byte = PS2HEX @ E21CH

MONITOR LISTINGS

```
0000                    0002 ;
0000                    0003 ;
0000                    0004 ;
0000                    0005 ;      **********************************
0000                    0006 ;      *                                *
0000                    0007 ;      *     EXIDY STANDARD MONITOR     *
0000                    0008 ;      *                                *
0000                    0009 ;      **********************************
0000                    0010 ;
0000                    0011 ;
0000                    0012 ;
0000                    0013 ;
0000                    0014 ;
0000                    0015 ;
0000                    0016 ;          DEVELOPED FOR EXIDY INC.
0000                    0017 ;
0000                    0018 ;          BY    JOHN K. BORDERS JR.
0000                    0019 ;
0000                    0020 ;
0000                    0021 ;
0000                    0022 ;  Z80 BASED MONITOR SOFTWARE
0000                    0023 ;  WITH FULL CASSETTE AND VIDEO
0000                    0024 ;  DRIVER ROUTINES. SELF-SEEKING
0000                    0025 ;  RAM STORAGE AND STACK ROUTINES.
0000                    0026 ;
0000                    0027 ;
0000                    0028 ;
0000                    0029 ;
0000                    0030 ;
0000                    0031 ;  VERSION 1.0      DATED:  7/26/78
0000                    0032 ;
0000                    0033 ;
0000                    0034 ;
0000                    0035 ;
0000                    0036 ;
```

```
0000                    0038 ;
0000                    0039 ;
0000                    0040 ;      EQUATE TABLE
0000                    0041 ;
0000                    0042 ;
0000                    0043 ;**********************************
0000                    0044 ;
0000                    0045 ; ASCII EQUATES
0000                    0046 ;
      000D              0047 CR:      EQU   ØDH         ;CARRIAGE RETURN
      000A              0048 LF:      EQU   ØAH         ;LINE FEED
      001B              0049 ESC:     EQU   1BH         ;ESCAPE
      0001              0050 CNTRLA:  EQU   'A'-40H
      0003              0051 CNTRLC:  EQU   'C'-40H
      0008              0052 CNTRLH:  EQU   'H'-40H
      0011              0053 CNTRLQ:  EQU   'Q'-40H
      0013              0054 CNTRLS:  EQU   'S'-40H
      0017              0055 CNTRLW:  EQU   'W'-40H
      001A              0056 CNTRLZ:  EQU   'Z'-40H
      007F              0057 RUBOUT:  EQU   7FH         ;RUB OUT
      0020              0058 SPACE:   EQU   20H         ;SPACE
0000                    0059 ;
0000                    0060 ; RAM POINTERS
0000                    0061 ;
      F000              0062 RAMTOP:  EQU   0F000H      ;POINTER STORE
      0000              0063 RAM:     EQU   0000H       ;START OF RAM
      0000              0064 BUFFER:  EQU   0           ;INPUT BUFFER
      003C              0065 LINELN:  EQU   BUFFER+60   ;LINE LENGTH
      003D              0066 TAPES:   EQU   LINELN+1    ;TAPE RATE
      003E              0067 SPEEDS:  EQU   TAPES+1     ;DISPLAY SPEED
      003F              0068 OUTADD:  EQU   SPEEDS+1    ;OUTPUT ADDRESS
      0041              0069 INADD:   EQU   OUTADD+2    ;INPUT ADDRESS
      0043              0070 BATCHF:  EQU   INADD+2     ;BATCH FLAG
      0044              0071 PROMPT:  EQU   BATCHF+1    ;PROMPT CHARACTER
      0045              0072 CMTRFG:  EQU   PROMPT+1    ;CASSETTE MOTOR FLAG
      0046              0073 CRCBYT:  EQU   CMTRFG+1    ;CRC BYTE
      0047              0074 CHEAD:   EQU   CRCBYT+1    ;COMMAND HEADER
      0057              0075 THEAD:   EQU   CHEAD+16    ;TAPE HEADER
0000                    0076 ;    VIDEO SCREEN EQUATES
      00F8              0077 TOPHRG:  EQU   0F8H
      F000              0078 SCREEN:  EQU   0F000H
      F080              0079 VID:     EQU   SCREEN+128
      F800              0080 TOP:     EQU   SCREEN+2048
      0067              0081 VDHLD:   EQU   THEAD+16    ;CHAR HOLD
      0068              0082 LINE:    EQU   VDHLD+1     ;LINE #
      006A              0083 CHR:     EQU   LINE+2      ;CHAR #
      006C              0084 LSTKEY:  EQU   CHR+2       ;LAST KEY PRESSED
      0010              0085 HEADLN:  EQU   16          ;HEADER LENGTH
      006E              0086 STORE:   EQU   LSTKEY+2    ;END OF EQU TABLE
0000                    0087 ;
0000                    0088 ;  CASSETTE HEADER EQUATES
0000                    0089 ;
      0000              0090 HNAME:   EQU   0
      0006              0091 HTYPE:   EQU   6
      0007              0092 HSIZE:   EQU   7
      0009              0093 HADDR:   EQU   9
      000B              0094 HXEQ:    EQU   11
```

```
0000                    0096 ;
0000                    0097 ;
0000                    0098 ;
0000                    0099 ;
0000                    0100 ;
0000                    0101          ORG    0E000H
E000                    0102 ;
E000                    0103 ;
E000                    0104 ;
E000                    0105 ;      JUMP TABLE INTO MONITOR
E000                    0106 ;
E000                    0107 ;
E000                    0108 ;
E000  C3 62 E0          0109 COLD:    JP     INITC      ;COLD START
E003  C3 E8 E0          0110 WARM:    JP     INITW      ;WARM START
E006  C3 77 E0          0111 USER:    JP     INITU      ;USER START
E009  C3 30 E0          0112 RECEVE:  JP     CHRIN      ;INPUT CHARACTER
E00C  C3 45 E0          0113 SEND:    JP     CHROUT     ;OUTPUT CHARACTER
E00F  C3 DA E2          0114 INTAPE:  JP     TAPEIN     ;TAPE INPUT
E012  C3 EE E2          0115 OUTAPE:  JP     TAPOUT     ;TAPE OUTPUT
E015  C3 D1 EA          0116 QUIKCK:  JP     QUIK       ;CNTRLC CHECK
E018  C3 1C EB          0117 KEYBRD:  JP     CHRIN1     ;KEYBOARD INPUT
E01B  C3 F0 E9          0118 VIDEO:   JP     CHROT1     ;VIDEO OUTPUT
E01E  C3 76 E7          0119 PARLIN:  JP     PARIN      ;PARALLEL INPUT
E021  C3 7F E7          0120 PARLOT:  JP     PAROUT     ;PARALLEL OUTPUT
E024  C3 8A E2          0121 CMOTON:  JP     MOTRON     ;TURN CASSETTE MOTOR ON
E027  C3 AF E2          0122 CMOTOF:  JP     MTROFF     ;TURN CASSETTE MOTOR OFF
E02A  C3 5A E6          0123 BASSAV:  JP     SAVBAS     ;ENTRY FOR BASIC CSAVE
E02D  C3 99 E7          0124 BASLOD:  JP     LODBAS     ;ENTRY FOR BASIC CLOAD
E030                    0125 ;
E030  FD E5             0126 CHRIN:   PUSH   IY         ;WE DESTROY THESE
E032  E5                0127          PUSH   HL
E033  CD A2 E1          0128          CALL   GETIY
E036  21 41 E0          0129          LD     HL,CHRINR  ;FOR RETURN
E039  E5                0130          PUSH   HL
E03A  FD 6E 41          0131          LD     L,(IY+INADD);GET ADDRESS
E03D  FD 66 42          0132          LD     H,(IY+INADD+1)
E040  E9                0133          JP     (HL)       ;GO DO IT
E041  E1                0134 CHRINR:  POP    HL         ;RESTORE
E042  FD E1             0135          POP    IY
E044  C9                0136          RET
E045                    0137 ;
E045  FD E5             0138 CHROUT:  PUSH   IY         ;WE DESTROY THESE
E047  E5                0139          PUSH   HL
E048  F5                0140          PUSH   AF
E049  CD A2 E1          0141          CALL   GETIY
E04C  FD 66 3E          0142          LD     H,(IY+SPEEDS);GET DISPLAY SPEED
E04F  2E 01             0143          LD     L,1        ;FINISH OFF
E051  2B                0144 OUTDLY:  DEC    HL         ;DELAY
E052  7C                0145          LD     A,H        ;ARE WE THROUGH?
E053  B5                0146          OR     L
E054  20 FB             0147          JR     NZ,OUTDLY  ;NOPE-
E056  F1                0148          POP    AF         ;GET 'EM BACK
E057  21 41 E0          0149          LD     HL,CHRINR  ;FOR RETURN
E05A  E5                0150          PUSH   HL         ;SAVE
E05B  FD 6E 3F          0151          LD     L,(IY+OUTADD)
E05E  FD 66 40          0152          LD     H,(IY+OUTADD+1)
E061  E9                0153          JP     (HL)
```

```
E062                    0154 ;
E062                    0155 ;
E062                    0156 ;
E062                    0157 ;      INITIALIZE ROUTINES
E062                    0158 ;
E062                    0159 ;
E062                    0160 ;
E062                    0161 ;
E062                    0162 ;
E062                    0163 ;
E062                    0164 ;     INITC = COLD START - FINDS
E062                    0165 ;             TOP OF RAM AND SETS
E062                    0166 ;             STACK AND STORAGE THERE
E062                    0167 ;     INITW = WARM START - USES
E062                    0168 ;             STACK FROM INITC
E062                    0169 ;     INITU = USER START - USES
E062                    0170 ;             HL FROM USER AS TOP OF
E062                    0171 ;             RAM LIKE INITC
E062                    0172 ;
E062                    0173 ;
E062                    0174 ;
    E062                0175 INITC:  EQU   $
E062 3E FF              0176         LD    A,0FFH      ;INITIALIZE CASSETTE
E064 D3 FD              0177         OUT   0FDH,A
E066 16 00              0178         LD    D,0
E068 21 00 00           0179         LD    HL,RAM      ;POINT BEG RAM
E06B 7E                 0180 INITC2: LD    A,(HL)      ;GET IT
E06C 46                 0181         LD    B,(HL)      ;TWICE
E06D 2F                 0182         CPL               ;TURN AROUND
E06E 77                 0183         LD    (HL),A      ;PUT BACK
E06F BE                 0184         CP    (HL)        ;& CHK IT
E070 70                 0185         LD    (HL),B      ;PUT REAL BACK
E071 23                 0186         INC   HL          ;POINT NEXT
E072 28 F7              0187         JR    Z,INITC2    ;LOOP IF GOOD
E074 2B                 0188         DEC   HL          ;ADJUST
E075 2B                 0189         DEC   HL          ;  H & L
E076 01                 0190         DB    1           ;LXI B — ?
E077                    0191 ;
E077                    0192 ;      USER START ENTRY POINT
E077                    0193 ;
    E077                0194 INITU:  EQU   $
E077 16 01              0195         LD    D,1
    E079                0196 INITU1: EQU   $
E079 22 00 F0           0197         LD    (RAMTOP),HL;USER IS HERE
E07C FD 2A 00 F0        0198         LD    IY,(RAMTOP)
E080 01 92 FF           0199         LD    BC,0-STORE
E083 FD 09              0200         ADD   IY,BC       ;DO IT
E085 FD F9              0201         LD    SP,IY       ;GET A STACK
E087 CD D1 EA           0202         CALL  QUIK        ;SEE IF WARM RESET
E08A C2 FA DF           0203         JP    NZ,PWARM    ;YES-GO DO IT
E08D 7D                 0204         LD    A,L         ;CLEAR RAM!
E08E FD E5              0205         PUSH  IY
E090 E1                 0206         POP   HL          ;GET BEGINNING
E091 36 00              0207 INITU2: LD    (HL),0      ;MAKE ZERO
E093 23                 0208         INC   HL          ;NEXT
E094 BD                 0209         CP    L           ;THRU?
E095 20 FA              0210         JR    NZ,INITU2   ;NO-KEEP GOIN'
E097 FD 36 44 3E        0211         LD    (IY+PROMPT),'>';INIT PROMPT
```

```
E09B  FD 36 3D 40      0212          LD    (IY+TAPES),40H;SET FOR 1200 BAUD
E09F  D5               0213          PUSH  DE          ;WE DESTROY
E0A0  CD B1 E9         0214          CALL  VIDINT      ;INIT VIDEO BOARD
E0A3  D1               0215          POP   DE          ;GET BACK
E0A4  21 1C EB         0216          LD    HL,CHRIN1   ;POINT KEYBOARD
E0A7  FD 75 41         0217          LD    (IY+INADD),L
E0AA  FD 74 42         0218          LD    (IY+INADD+1),H;PUT AWAY
E0AD  21 F0 E9         0219          LD    HL,CHROT1   ;POINT VIDEO
E0B0  FD 75 3F         0220          LD    (IY+OUTADD),L
E0B3  FD 74 40         0221          LD    (IY+OUTADD+1),H
E0B6  3A FD DF         0222          LD    A,(PCOLD)   ;SEE IF PROM PACK IS IN
E0B9  FE C3            0223          CP    0C3H        ;IS THE "JUMP" THERE?
E0BB  20 0B            0224          JR    NZ,INITU3   ;NO-
E0BD  3A FA DF         0225          LD    A,(PWARM)   ;HOW ABOUT THIS ONE?
E0C0  FE C3            0226          CP    0C3H
E0C2  20 04            0227          JR    NZ,INITU3
E0C4  15               0228          DEC   D
E0C5  C3 8D E9         0229          JP    PROMP1
E0C8  21 62 E3         0230 INITU3:  LD    HL,HEDING   ;POINT MSG
E0CB  CD BA E1         0231          CALL  MSGOUT
E0CE  ED 5B 00 F0      0232          LD    DE,(RAMTOP)
E0D2  CD E8 E1         0233          CALL  ADDOUT      ;PRINT RAM TOP
E0D5  21 BC E3         0234          LD    HL,HEAD2
E0D8  CD BA E1         0235          CALL  MSGOUT      ;FINISH
E0DB  FD E5            0236          PUSH  IY          ;PUT STACK
E0DD  D1               0237          POP   DE          ;  IN DE
E0DE  1B               0238          DEC   DE          ;ADJUST
E0DF  CD E8 E1         0239          CALL  ADDOUT      ;PRINT IT
E0E2  21 D5 E3         0240          LD    HL,HEAD3    ;LAST ONE
E0E5  CD BA E1         0241          CALL  MSGOUT
E0E8                   0242 ;
E0E8                   0243 ;      WARM START ENTRY POINT
E0E8                   0244 ;
      E0E8             0245 INITW:   EQU   $
E0E8  CD A2 E1         0246          CALL  GETIY       ;GO GET A VALID IY FROM RAMTOP
```

← Note E0E8 : Read only works with PROM PAC

← my clear stack

```
E0EB                    0248 ;
E0EB                    0249 ;
E0EB                    0250 ;
E0EB                    0251 ;    BEGINNING OF MAIN PROGRAM
E0EB                    0252 ;
E0EB                    0253 ;
E0EB                    0254 ;
E0EB                    0255 ;
E0EB                    0256 ;
      E0EB              0257 START: EQU   $           ;START MAINLINE
E0EB  FD F9             0258        LD    SP,IY       ;REDO STACK
E0ED  CD 05 E2          0259        CALL  CRLF        ;FRESH LINE
E0F0  FD 7E 44          0260        LD    A,(IY+PROMPT);LOAD PROMPT
E0F3  CD 45 E0          0261        CALL  CHROUT      ;& OUT
E0F6  CD 3A E1          0262        CALL  LINEIN      ;GET A LINE
E0F9  FD E5             0263        PUSH  IY          ;MOVE IY
E0FB  E1                0264        POP   HL          ;    TO HL
E0FC  CD 25 E2          0265        CALL  SCAN        ;SKIP DELIMS
E0FF  CA 34 E1          0266        JP    Z,ERRCMD    ;UH-OH NONE!
E102  DD 21 12 E3       0267        LD    IX,TABLE    ;POINT CMD TBL
E106  E5                0268 MAIN1: PUSH  HL          ;SAVE'EM
E107  DD E5             0269        PUSH  IX
E109  06 02             0270        LD    B,2         ;CHECK 2 CHRS
E10B  DD 7E 00          0271 MAIN2: LD    A,(IX)      ;LOAD FRM TABLE
E10E  BE                0272        CP    (HL)        ;COMPARE?
E10F  20 12             0273        JR    NZ,MAIN4    ;NO-TRY NEXT
E111  23                0274        INC   HL          ;CHECK NEXT CHR
E112  DD 23             0275        INC   IX
E114  10 F5             0276        DJNZ  MAIN2       ;LOOP FOR 2
E116  D1                0277        POP   DE          ;CLEAR STACK
E117  D1                0278        POP   DE          ;I/O PNTR
E118  01 EB E0          0279        LD    BC,START    ;PUSH RETURN
E11B  C5                0280        PUSH  BC
E11C  DD 6E 00          0281 MAIN3: LD    L,(IX)      ;LOAD
E11F  DD 66 01          0282        LD    H,(IX+1)    ;  JUMP
E122  E9                0283        JP    (HL)        ;    ADDRESS
E123  DD E1             0284 MAIN4: POP   IX          ;RESET
E125  E1                0285        POP   HL          ; POINTERS
E126  DD 23             0286        INC   IX          ;NEXT ENTRY
E128  DD 23             0287        INC   IX          ;    IN
E12A  DD 23             0288        INC   IX          ; TABLE
E12C  DD 23             0289        INC   IX
E12E  DD 7E 00          0290        LD    A,(IX)      ;IS IT
E131  B7                0291        OR    A           ; THE END?
E132  20 D2             0292        JR    NZ,MAIN1    ;NO-CONTINUE
E134  21 E6 E3          0293 ERRCMD: LD   HL,IVCMSG
E137  C3 C9 E1          0294        JP    WHAT
```

```
E13A                    0296 ;
E13A                    0297 ;
E13A                    0298 ;
E13A                    0299 ;    LINE INPUT ROUTINE
E13A                    0300 ;
E13A                    0301 ;
E13A                    0302 ;
E13A                    0303 ;
E13A                    0304 ;  THE FOLLOWING ARE COMMAND CHRS:
E13A                    0305 ;            <CR> = END LINE
E13A                    0306 ;            RUB  = BACKSPACE
E13A                    0307 ;             @   = START OVER
E13A                    0308 ;  ALL OTHER CHARS SIMPLY INPUT
E13A                    0309 ;
E13A                    0310 ;
E13A                    0311 ;
     E13A               0312 LINEIN: EQU   $
E13A FD E5              0313         PUSH  IY          ;MOVE IY
E13C E1                 0314         POP   HL          ;    TO HL
E13D 3E 3C              0315         LD    A,LINELN    ;SET LINE
E13F 85                 0316         ADD   L           ;  LENGTH AND
E140 4F                 0317         LD    C,A         ;     START IN
E141 45                 0318         LD    B,L         ;     IN BC
E142 FD 7E 43           0319         LD    A,(IY+BATCHF);GET BATCH FLAG
E145 B7                 0320         OR    A           ;TEST IT
E146 20 39              0321         JR    NZ,LINE3    ;GO BATCH IT
E148 CD 30 E0           0322 LINE1:  CALL  CHRIN       ;GET
E14B 28 FB              0323         JR    Z,LINE1
E14D CB 7F              0324         BIT   7,A
E14F 20 1D              0325         JR    NZ,LINE2A
E151 FE 0D              0326         CP    CR
E153 28 12              0327         JR    Z,LINE2
E155 FE 20              0328         CP    SPACE       ;CONTROL CHR?
E157 38 15              0329         JR    C,LINE2A    ;YES!
E159 FE 7F              0330         CP    RUBOUT      ;RUB?
E15B 28 18              0331         JR    Z,BKSPC     ;YES!
E15D FE 40              0332         CP    '@'         ;NEW LINE?
E15F 20 06              0333         JR    NZ,LINE2    ;NO-GO ON
E161 CD 05 E2           0334         CALL  CRLF        ;NEXT LINE
E164 C3 3A E1           0335         JP    LINEIN      ;OVER
E167 77                 0336 LINE2:  LD    (HL),A      ;PUT AWAY
E168 23                 0337         INC   HL          ;POINT NEXT
E169 FE 0D              0338         CP    CR          ;CAR RET?
E16B CA 05 E2           0339         JP    Z,CRLF      ;YES-DO IT & RET
E16E CD 45 E0           0340 LINE2A: CALL  CHROUT      ;PRINT IT
E171 79                 0341         LD    A,C         ;TOO MANY
E172 BD                 0342         CP    L           ;  CHARS?
E173 20 D3              0343         JR    NZ,LINE1    ;NO-CONTINUE
E175                    0344 ;
E175                    0345 ;      BACKSPACE ROUTINE
E175                    0346 ;
E175 78                 0347 BKSPC:  LD    A,B         ;ARE YOU
E176 BD                 0348         CP    L           ;   AT BEG?
E177 28 CF              0349         JR    Z,LINE1     ;YES-IGNORE
E179 3E 08              0350         LD    A,CNTRLH
E17B CD 45 E0           0351         CALL  CHROUT
E17E 2B                 0352         DEC   HL          ;DELETE CHR
E17F 18 C7              0353         JR    LINE1       ;CONTINUE
```

```
E181                    0354 ;
E181                    0355 ;
E181                    0356 ;
E181  06 01             0357 LINE3:  LD    B,1
E183  E5                0358         PUSH  HL          ;SAVE BEGINNING
E184  CD 8A E2          0359         CALL  MOTRON
E187  CD 59 E7          0360         CALL  TAPWT       ;WAIT FOR NULLS
E18A  CD DA E2          0361 LINE4:  CALL  TAPEIN      ;GET
E18D  CA D4 E1          0362         JP    Z,FINISH
E190  77                0363         LD    (HL),A      ;PUT
E191  23                0364         INC   HL          ;NEXT
E192  FE 0D             0365         CP    CR          ;IS IT?
E194  20 F4             0366         JR    NZ,LINE4
E196  CD 4E E7          0367         CALL  CKCRC
E199  CD AF E2          0368         CALL  MTROFF      ;TURN OFF
E19C  36 00             0369         LD    (HL),0
E19E  E1                0370         POP   HL
E19F  C3 BA E1          0371         JP    MSGOUT
E1A2                    0372 ;
E1A2                    0373 ;
E1A2                    0374 ;
E1A2                    0375 ;       CREATES A IY FROM RAMTOP IN F000
E1A2                    0376 ;        + SYNC TO SCREEN RETRACE
E1A2                    0377 ;
      E1A2              0378 GETIY:  EQU   $
E1A2  C5                0379         PUSH  BC          ;I NEED
E1A3  F5                0380         PUSH  AF
E1A4  DB FE             0381 SEEIFR: IN    A,0FEH      ;SEE IF SCREEN IS READY
E1A6  CB 6F             0382         BIT   5,A
E1A8  28 FA             0383         JR    Z,SEEIFR
E1AA  F1                0384         POP   AF
E1AB  06 08             0385         LD    B,WINPK5    ;LOAD WAIT CONSTANT
E1AD  10 FE             0386 WFBTZ:  DJNZ  WFBTZ       ;WAIT FOR B TO ZERO
E1AF  FD 2A 00 F0       0387         LD    IY,(RAMTOP)
E1B3  01 92 FF          0388         LD    BC,0-STORE  ;OFFSET
E1B6  FD 09             0389         ADD   IY,BC       ;SET UP IY
E1B8  C1                0390         POP   BC
E1B9  C9                0391         RET
E1BA                    0392 ;
      0008              0393 WINPK5: EQU   8           ;DELAY FOR 15KC SIGNAL
```

```
E1BA                    0395 ;
E1BA                    0396 ;
E1BA                    0397 ;
E1BA                    0398 ;      UTILITY ROUTINES
E1BA                    0399 ;
E1BA                    0400 ;
E1BA                    0401 ;
E1BA                    0402 ;-------------------------------------
E1BA                    0403 ;
E1BA                    0404 ;
E1BA                    0405 ;
E1BA                    0406 ;  MESSAGE OUTPUT ROUTINE
E1BA                    0407 ;
E1BA                    0408 ;  SCANS ASCII TEXT FOR:
E1BA                    0409 ;         0 = RETURN
E1BA                    0410 ;        CR = CRLF
E1BA                    0411 ;    ALL OTHERS OUTPUT
E1BA                    0412 ;
E1BA                    0413 ;
     E1BA               0414 MSGOUT: EQU   $
E1BA 7E                 0415         LD    A,(HL)      ;GET CHR
E1BB B7                 0416         OR    A           ;IS IT END?
E1BC C8                 0417         RET   Z           ;YES- RETURN
E1BD 23                 0418         INC   HL          ;NEXT
E1BE CD 45 E0           0419 MSGOT2: CALL  CHROUT      ;PRINT IT
E1C1 FE 0D              0420         CP    CR          ;NEED CRLF?
E1C3 20 F5              0421         JR    NZ,MSGOUT   ;NO
E1C5 3E 0A              0422         LD    A,LF        ;DO LF PART
E1C7 18 F5              0423         JR    MSGOT2
E1C9                    0424 ;
E1C9                    0425 ;-------------------------------------
E1C9                    0426 ;
E1C9                    0427 ;
E1C9                    0428 ;  "WHAT" ERROR ROUTINE
E1C9                    0429 ;
E1C9                    0430 ;
     E1C9               0431 WHAT:   EQU   $
E1C9 E5                 0432         PUSH  HL          ;SAVE MSG ADDRESS
E1CA 21 DD E3           0433         LD    HL,ERRMSG   ;POINT "ERROR - "
E1CD CD BA E1           0434 WHAT1:  CALL  MSGOUT
E1D0 E1                 0435         POP   HL          ;GET BACK ERROR ADDRESS
E1D1 CD BA E1           0436         CALL  MSGOUT      ;PRINT IT
E1D4 FD 36 43 00        0437 FINISH: LD    (IY+BATCHF),0;CLEAR BATCH MODE
E1D8 CD B4 E2           0438         CALL  MTROF1      ;TURN OFF TAPE
E1DB C3 EB E0           0439         JP    START       ;REDO STACK
E1DE                    0440 ;
E1DE                    0441 ;  ERROR ROUTINES
E1DE                    0442 ;
E1DE 21 F6 E3           0443 ERRPAR: LD    HL,IVPMSG ;POINT "INVALID PARAMETER"
E1E1 18 E6              0444         JR    WHAT
E1E3 21 08 E4           0445 ERRCRC: LD    HL,CRCMSG ;POINT"TAPE CRC ERROR"
E1E6 18 E1              0446         JR    WHAT
```

```
E1E8                    0448 ;
E1E8                    0449 ;
E1E8                    0450 ;
E1E8                    0451 ;
E1E8                    0452 ;
E1E8                    0453 ;    HEXADECIMAL OUTPUT ROUTINES
E1E8                    0454 ;
E1E8                    0455 ;
E1E8                    0456 ;
E1E8                    0457 ;    ENTRYS:
E1E8                    0458 ;
E1E8                    0459 ;      ADDOUT = OUTPUT ADDRESS IN DE
E1E8                    0460 ;      HCHOUT = OUTPUT BYTE IN A
E1E8                    0461 ;
E1E8                    0462 ;
E1E8                    0463 ;
      E1E8              0464 ADDOUT: EQU   $                          P4 HEX
E1E8  7A                0465         LD    A,D
E1E9  CD ED E1          0466         CALL  HCHOUT     ;PRINT MSB
E1EC  7B                0467         LD    A,E        ;PRINT LSB
      E1ED              0468 HCHOUT: EQU   $                          P2 HEX
E1ED  F5                0469         PUSH  AF         ;SAVE
E1EE  E6 F0             0470         AND   0F0H       ;ONLY LEFT HALF
E1F0  0F                0471         RRCA             ;MOVE RIGHT
E1F1  0F                0472         RRCA
E1F2  0F                0473         RRCA
E1F3  0F                0474         RRCA
E1F4  CD FA E1          0475         CALL  HCHOT2     ;FORM ASCII
E1F7  F1                0476         POP   AF         ;GET BACK CHAR
E1F8  E6 0F             0477         AND   0FH        ;ONLY RIGHT HALF
E1FA  FE 0A             0478 HCHOT2: CP    0AH       ;NEED LETTER?      P1 HEX
E1FC  38 02             0479         JR    C,HCHOT3   ;NO
E1FE  C6 07             0480         ADD   'A'-3AH    ;ADJUST FOR A-F
E200  C6 30             0481 HCHOT3: ADD   30H        ;MAKE ASCII
E202  C3 45 E0          0482         JP    CHROUT     ;RETURN THERE
```

```
E205                    0484 ;
E205                    0485 ;
E205                    0486 ;
E205                    0487 ;  CARRIAGE RETURN / LINE FEED
E205                    0488 ;
E205                    0489 ; ISSUES A <CR>,<LF> TO TERMINAL
E205                    0490 ;
E205                    0491 ;
E205                    0492 ;
     E205               0493 CRLF:   EQU   $
E205 3E 0D              0494         LD    A,CR
E207 CD 45 E0           0495         CALL  CHROUT    ; 'SEND' ROUTINE
E20A 3E 0A              0496         LD    A,LF
E20C C3 45 E0           0497         JP    CHROUT    ;RETURN THERE
E20F                    0498 ;
E20F                    0499 ;-----------------------------------------------
E20F                    0500 ;
E20F                    0501 ;
E20F                    0502 ;
E20F                    0503 ;    ADDRESS AND COLON OUTPUT
E20F                    0504 ;
E20F                    0505 ;    PRINTS ADDRESS IN DE FROM
E20F                    0506 ;    ADDOUT THEN PRINTS COLON
E20F                    0507 ;    AND A SPACE.
E20F                    0508 ;
E20F                    0509 ;
E20F                    0510 ;
     E20F               0511 ADDCOL: EQU   $
E20F CD E8 E1           0512         CALL  ADDOUT    ;PRINT ADDRESS
E212 3E 3A              0513         LD    A,':'     ;FORM COLON
E214 CD 45 E0           0514         CALL  CHROUT    ;AND SEND IT
E217 3E 20              0515         LD    A,' '     ;FORM SPACE
E219 C3 45 E0           0516         JP    CHROUT    ;SEND AND RETURN
E21C                    0517 ;
E21C                    0518 ;-----------------------------------------------
E21C                    0519 ;
E21C                    0520 ;
E21C                    0521 ;
E21C                    0522 ;    PRINT SPACE AND HEX BYTE          P52 HEX
E21C                    0523 ;
E21C                    0524 ;    PRINTS A SPACE AND THEN
E21C                    0525 ;    THE CHARACTER IN THE A
E21C                    0526 ;    REGISTER IN HEX.
E21C                    0527 ;
E21C                    0528 ;
E21C                    0529 ;
     E21C               0530 HEXSPC: EQU   $
E21C F5                 0531         PUSH  AF        ;SAVE CHR
E21D 3E 20              0532         LD    A,' '     ;FORM SPACE
E21F CD 45 E0           0533         CALL  CHROUT    ;AND SEND IT
E222 F1                 0534         POP   AF        ;GET CHAR BACK
E223 18 C8              0535         JR    HCHOUT    ;PRINT & RETURN
```

```
E225                    0537 ;
E225                    0538 ;
E225                    0539 ;
E225                    0540 ;    SCANNER ROUTINE
E225                    0541 ;
E225                    0542 ;
E225                    0543 ;
E225                    0544 ;   THIS ROUTINE SCANS THE
E225                    0545 ;   INPUT BUFFER LOCATED IN
E225                    0546 ;   THE STORAGE AREA AND SKIPS
E225                    0547 ;   OVER EITHER:
E225                    0548 ;           SCAN = DELIMITERS
E225                    0549 ;                OR
E225                    0550 ;          SCANLT = TEXT THEN SCAN
E225                    0551 ;
E225                    0552 ;   THIS ROUTINE USED FOR FINDING
E225                    0553 ;   PARAMETERS IN I/O BUFFER
E225                    0554 ;
E225                    0555 ;
E225                    0556 ;
     E225               0557 SCAN:    EQU    $
E225 7E                 0558          LD     A,(HL)      ;GET ASCII
E226 FE 0D              0559          CP     CR          ;CAR RET?
E228 C8                 0560          RET    Z           ;YES THRU
E229 FE 2E              0561          CP     '.'         ;DELIM?
E22B D0                 0562          RET    NC          ;YES - GO BACK
E22C 23                 0563          INC    HL          ;NEXT
E22D 18 F6              0564          JR     SCAN
E22F                    0565 ;
E22F                    0566 ;
     E22F               0567 SCANHL:  EQU    $
E22F FD E5              0568          PUSH   IY
E231 E1                 0569          POP    HL          ;GET BUFF BEG
     E232               0570 SCANLT:  EQU    $
E232 7E                 0571          LD     A,(HL)      ;GET
E233 FE 0D              0572          CP     CR
E235 C8                 0573          RET    Z           ;THRU IF CR
E236 FE 30              0574          CP     '0'         ;< 0?
E238 38 EB              0575          JR     C,SCAN      ;YES-GO UP
E23A 23                 0576          INC    HL          ;NEXT
E23B 18 F5              0577          JR     SCANLT
```

```
E23D                    0579 ;
E23D                    0580 ;
E23D                    0581 ;
E23D                    0582 ;    CONVERSION ROUTINE        ASCHEX
E23D                    0583 ;
E23D                    0584 ;
E23D                    0585 ;   THIS ROUTINE SCANS THE ASCII
E23D                    0586 ;   I/O BUFFER AND CONVERTS THE
E23D                    0587 ;   ASCII HEX TEXT TO BINARY IN
E23D                    0588 ;   THE DE REGISTER PAIR. VALUE
E23D                    0589 ;   IS ROTATD IN THROUGH E, SO
E23D                    0590 ;   IF ONLY ONE BYTE THEN USE E.
E23D                    0591 ;
E23D                    0592 ;   ERROR FOR INVALID ASCII ROUTES
E23D                    0593 ;   TO WHAT ERROR ROUTINE.
E23D                    0594 ;
E23D                    0595 ;
E23D                    0596 ;
     E23D               0597 CONV:    EQU    $
E23D 11 00 00           0598          LD     DE,0          ;SET FOR NUMBER
E240 7E                 0599 CONV1:   LD     A,(HL)        ;GET CHAR
E241 FE 30              0600          CP     '0'           ;DELIM?
E243 D8                 0601          RET    C             ;YES-THRU
E244 23                 0602          INC    HL            ;NEXT
E245 FE 47              0603          CP     'F'+1         ;IS IT TOO BIG?
E247 D2 DE E1           0604          JP     NC,ERRPAR     ;YES
E24A FE 3A              0605          CP     '9'+1         ;IS IT A #?
E24C 38 07              0606          JR     C,NUMBER      ;YES
E24E FE 41              0607          CP     'A'           ;IS IT A LETTER
E250 DA DE E1           0608          JP     C,ERRPAR      ;NO!
E253 C6 09              0609          ADD    9             ;MAKE 10-15
E255 07                 0610 NUMBER:  RLCA                 ;SHIFT
E256 07                 0611          RLCA                 ;  TO
E257 07                 0612          RLCA                 ;    LEFT
E258 07                 0613          RLCA
E259 06 04              0614          LD     B,4           ;COUNT
E25B 07                 0615 CONV2:   RLCA                 ;INTO CARRY
E25C CB 13              0616          RL     E             ;INTO E
E25E CB 12              0617          RL     D             ; AND D
E260 10 F9              0618          DJNZ   CONV2         ;TILL B=0
E262 18 DC              0619          JR     CONV1         ;TRY AGAIN
```

```
E264                    0621 ;
E264                    0622 ;
E264                    0623 ;
E264                    0624 ;    NAME FIND ROUTINE
E264                    0625 ;
E264                    0626 ;
E264                    0627 ;   THIS ROUTINE FINDS THE ASCII
E264                    0628 ;   NAME IN I/O BUFFER AND MOVES
E264                    0629 ;   IT TO CHEAD FILLING WITH SPACES
E264                    0630 ;   FOR 5 CHARACTERS.
E264                    0631 ;
E264                    0632 ;   EXIT:      Z SET = NO NAME
E264                    0633 ;              C SET = BAD NAME
E264                    0634 ;
E264                    0635 ;
     E264               0636 NAMFND: EQU    $
E264 CD 2F E2           0637         CALL   SCANHL      ;SKIP COMMAND
E267 C8                 0638         RET    Z           ;FLAG SET IF CR
E268 FE 41              0639         CP     'A'         ;IS IT
E26A D8                 0640         RET    C
E26B FE 5B              0641         CP     'Z'+1       ;A LETTER?
E26D 3F                 0642         CCF                ;SET CARRY
E26E D8                 0643         RET    C           ; IF NOT
E26F E5                 0644         PUSH   HL          ;SAVE PNTR
E270 FD E5              0645         PUSH   IY          ;MOVE INDEX
E272 D1                 0646         POP    DE          ;  TO DE
E273 21 47 00           0647         LD     HL,CHEAD    ;HL-OFFSET
E276 19                 0648         ADD    HL,DE       ;HL-ADDRESS
E277 D1                 0649         POP    DE          ;RESTORE PNTR
E278 06 05              0650         LD     B,5         ;5 CHRS
E27A FE 30              0651 NAMEN1: CP     '0'         ;< 0?
E27C 13                 0652         INC    DE          ;NEXT
E27D 30 03              0653         JR     NC,NAMEN2   ;NO-GO ON
E27F 1B                 0654         DEC    DE          ;MOVE PNTR BACK
E280 3E 20              0655         LD     A,SPACE     ;SPACE FILL
E282 77                 0656 NAMEN2: LD     (HL),A      ;PUT AWAY
E283 23                 0657         INC    HL          ;POINT NEXT
E284 1A                 0658         LD     A,(DE)      ;GET NEXT
E285 10 F3              0659         DJNZ   NAMEN1      ;GO FOR 5
E287 B7                 0660         OR     A           ;REDO FLAGS
E288 EB                 0661         EX     DE,HL       ;RESTORE HL
E289 C9                 0662         RET
```

```
E28A                    0664 ;
E28A                    0665 ;
E28A                    0666 ;
E28A                    0667 ;    CASSETTE MOTOR CONTROL ROUTINES
E28A                    0668 ;
E28A                    0669 ;
E28A                    0670 ;
     E28A               0671 MOTRON: EQU   $
E28A FD E5              0672         PUSH  IY
E28C CD A2 E1           0673         CALL  GETIY
E28F FD 7E 3D           0674         LD    A,(IY+TAPES);GET SPEED
E292 05                 0675         DEC   B
E293 28 02              0676         JR    Z,MOTRO1   ;NO
E295 C6 10              0677         ADD   10H
E297 C6 10              0678 MOTRO1: ADD   10H
E299 D3 FE              0679         OUT   0FEH,A
E29B FD 77 45           0680         LD    (IY+CMTRFG),A;PUT AWAY
E29E FD E1              0681         POP   IY
E2A0 06 04              0682 DELAY:  LD    B,4        ;LOOP COUNT
E2A2 E5                 0683 DELAY1: PUSH  HL         ;WE DESTROY
E2A3 21 00 00           0684 DELAY2: LD    HL,0       ;CLEAR IT
E2A6 2B                 0685 DELAY3: DEC   HL
E2A7 7C                 0686         LD    A,H
E2A8 B5                 0687         OR    L
E2A9 20 FB              0688         JR    NZ,DELAY3  ;LOOP
E2AB 10 F6              0689         DJNZ  DELAY2     ;SOME MORE
E2AD E1                 0690         POP   HL         ;RESTORE
E2AE C9                 0691         RET              ;WE'RE THRU
E2AF                    0692 ;
     E2AF               0693 MTROFF: EQU   $
E2AF 06 01              0694         LD    B,1
E2B1 CD A2 E2           0695         CALL  DELAY1
E2B4 FD E5              0696 MTROF1: PUSH  IY
E2B6 CD A2 E1           0697         CALL  GETIY
E2B9 AF                 0698         XOR   A
E2BA D3 FE              0699         OUT   0FEH,A
E2BC FD 77 45           0700         LD    (IY+CMTRFG),A;PUT AWAY
E2BF FD E1              0701         POP   IY
E2C1 C9                 0702         RET              ;GO BACK
E2C2                    0703 ;
E2C2                    0704 ;  UART EQUATES
E2C2                    0705 ;
     00FD               0706 UARTS:  EQU   0FDH
     00FC               0707 UARTD:  EQU   0FCH
E2C2                    0708 ;
E2C2                    0709 ;
E2C2                    0710 ;     NULL ROUTINE
E2C2                    0711 ;
E2C2                    0712 ;
     E2C2               0713 NULL:   EQU   $
E2C2 06 64              0714         LD    B,100      ;SET B/#
E2C4 AF                 0715 NULL1:  XOR   A          ;FORM NULL
E2C5 CD EE E2           0716         CALL  TAPOUT     ;SEND IT
E2C8 10 FA              0717         DJNZ  NULL1      ;IS B 0?
E2CA 3C                 0718         INC   A
E2CB CD EE E2           0719         CALL  TAPOUT
E2CE FD 70 46           0720         LD    (IY+CRCBYT),B;CLEAR CRC
E2D1 C9                 0721         RET
```

```
E2D2                    0722 ;
E2D2                    0723 ;
E2D2                    0724 ;     SPACES ROUTINE
E2D2                    0725 ;
E2D2                    0726 ;
     E2D2               0727 SPACES: EQU   $
E2D2  3E 20             0728         LD    A,SPACE
E2D4  CD 45 E0          0729         CALL  CHROUT
E2D7  10 F9             0730         DJNZ  SPACES     ;LOOP TINL B=0
E2D9  C9                0731         RET
E2DA                    0732 ;
E2DA                    0733 ;    CASSETTE TAPE INPUT / OUTPUT
E2DA                    0734 ;
E2DA                    0735 ;
E2DA                    0736 ;   TAPE BYTE INPUT
E2DA                    0737 ;
     E2DA               0738 TAPEIN: EQU   $
E2DA  FD E5             0739         PUSH  IY
E2DC  CD A2 E1          0740         CALL  GETIY      ;GO GET IY
E2DF  CD D1 EA          0741 TAPIN1: CALL  ESCCHK     ;USER?
E2E2  20 2B             0742         JR    NZ,TAPLVE ;HE WANTS US!
E2E4  DB FD             0743         IN    A,UARTS
E2E6  CB 4F             0744         BIT   1,A
E2E8  28 F5             0745         JR    Z,TAPIN1
E2EA  DB FC             0746         IN    A,UARTD
E2EC  18 0F             0747         JR    CRCOMP
E2EE                    0748 ;
E2EE                    0749 ;   TAPE BYTE OUTPUT
E2EE                    0750 ;
     E2EE               0751 TAPOUT: EQU   $
E2EE  FD E5             0752         PUSH  IY
E2F0  CD A2 E1          0753         CALL  GETIY      ;GO GET IY
E2F3  F5                0754         PUSH  AF          Save character
E2F4  DB FD             0755 TAPOT1: IN    A,UARTS
E2F6  CB 47             0756         BIT   0,A         - check buffer status
E2F8  28 FA             0757         JR    Z,TAPOT1    Delay till empty
E2FA  F1                0758         POP   AF          Load character
E2FB  D3 FC             0759         OUT   UARTD,A     - Serial Data Port
E2FD                    0760 ;
E2FD                    0761 ;      CRC COMPUTATION ROUTINE
E2FD                    0762 ;
E2FD  C5                0763 CRCOMP: PUSH  BC         ;WE DESTROY
E2FE  F5                0764         PUSH  AF         ;ALSO
E2FF  FD 46 46          0765         LD    B,(IY+CRCBYT);GET CRC
E302  90                0766         SUB   B
E303  47                0767         LD    B,A
E304  A8                0768         XOR   B
E305  2F                0769         CPL
E306  90                0770         SUB   B
E307  FD 77 46          0771         LD    (IY+CRCBYT),A
E30A  F1                0772         POP   AF
E30B  C1                0773         POP   BC         ;RESTORE
E30C  FD E1             0774 TAPLV2: POP   IY         ;RESTORE
E30E  C9                0775         RET
E30F                    0776 ;
E30F                    0777 ;
E30F  AF                0778 TAPLVE: XOR   A
E310  18 FA             0779         JR    TAPLV2
```

```
E312                    0780 ;
E312                    0781 ;
E312                    0782 ;
E312                    0783 ;
E312                    0784 ;      COMMAND TABLE
E312                    0785 ;
E312                    0786 ;    FORMATED AS FOLLOWS:
E312                    0787 ;       2 BYTE ASCII COMMAND
E312                    0788 ;       2 BYTE JUMP ADDRESS
E312                    0789 ;     END BYTE IS 0
E312                    0790 ;
E312                    0791 ;
     E312               0792 TABLE: EQU   $
E312 44 55              0793        DB    'DU'
E314 D3 E4              0794        DW    DUMP        ;DUMP FROM MEMORY
E316 45 4E              0795        DB    'EN'
E318 38 E5              0796        DW    ENTER       ;ENTER TO MEMORY
E31A 53 41              0797        DB    'SA'
E31C 38 E6              0798        DW    SAVE        ;SAVE FILE ON CASSETTE
E31E 4C 4F              0799        DB    'LO'
E320 8A E7              0800        DW    LOAD        ;LOAD FILE FROM CASS.
E322 46 49              0801        DB    'FI'
E324 B9 E6              0802        DW    FILES       ;LIST CASSETTE FILES
E326 47 4F              0803        DB    'GO'
E328 97 E5              0804        DW    GO          ;GO TO PROGRAM
E32A 43 52              0805        DB    'CR'
E32C 5C E8              0806        DW    CREAT       ;CREAT BATCH FILE
E32E 53 45              0807        DB    'SE'
E330 A2 E5              0808        DW    SET         ;SET PARAMETERS
E332 4D 4F              0809        DB    'MO'
E334 62 E5              0810        DW    MOVE        ;MOVE BLOCK MEMORY
E336 54 45              0811        DB    'TE'
E338 A1 E8              0812        DW    TEST        ;TEST
E33A 42 41              0813        DB    'BA'
E33C 58 E8              0814        DW    BATCH       ;EXECUTE BATCH FILE
E33E 4C 49              0815        DB    'LI'
E340 84 E8              0816        DW    LIST        ;LIST BATCH FILE
E342 50 52              0817        DB    'PR'
E344 45 E8              0818        DW    PRMPTC      ;CHANGE PROMPT CHAR
E346 4F 56              0819        DB    'OV'
E348 D4 E1              0820        DW    FINISH      ;END BATCH MODE
E34A 50 50              0821        DB    'PP'
E34C 8A E9              0822        DW    PROMPK      ;BRANCH TO PROM PACK
     E34E               0823 ENDTBL: EQU   $
E34E 00                 0824        DB    0
```

```
E34F                    0826 ;
E34F                    0827 ;
E34F                    0828 ;
E34F                    0829 ;
E34F                    0830 ;
E34F                    0831 ;      SET COMMAND TABLE
E34F                    0832 ;
E34F                    0833 ;
E34F                    0834 ;
E34F                    0835 ;
E34F                    0836 ;
      E34F              0837 SETTBL: EQU    $
E34F                    0838 ;
E34F  54                0839         DB     'T'
E350  DE E5             0840         DW     TAPE        ;SET TAPE RATE
E352  53                0841         DB     'S'
E353  EA E5             0842         DW     SPEED       ;SET DISPLAY SPEED
E355  58                0843         DB     'X'
E356  F2 E5             0844         DW     XEQSET      ;SET XEQ ADDRESS
E358  46                0845         DB     'F'
E359  EE E5             0846         DW     SETFIL      ;SET FILE TYPE
E35B  4F                0847         DB     'O'
E35C  F9 E5             0848         DW     SETOUT      ;SET OUTPUT
E35E  49                0849         DB     'I'
E35F  1C E6             0850         DW     SETIN       ;SET INPUT
E361  00                0851         DB     0
```

```
E362                    0853 ;
E362                    0854 ;
E362                    0855 ;
E362                    0856 ;
E362                    0857 ;      MESSAGE TABLE
E362                    0858 ;
E362                    0859 ;
E362                    0860 ;
E362                    0861 ;
E362  0D                0862 HEDING:  DB     CR
E363  45 58 49 44       0863          DB     'EXIDY STANDARD MONITOR'
      59 20 53 54
      41 4E 44 41
      52 44 20 4D
      4F 4E 49 54
      4F 52
E379  0D 0D             0864          DB     CR,CR
E37B  56 45 52 53       0865          DB     'VERSION 1.0'
      49 4F 4E 20
      31 2E 30
E386  0D                0866          DB     CR
E387  43 4F 50 59       0867          DB     'COPYRIGHT (C) 1978 BY '
      52 49 47 48
      54 20 28 43
      29 20 31 39
      37 38 20 42
      59 20
E39D  45 58 49 44       0868          DB     'EXIDY INC.'
      59 20 49 4E
      43 2E
E3A7  0D 0D             0869          DB     CR,CR
E3A9  54 48 45 20       0870          DB     'THE TOP OF RAM IS '
      54 4F 50 20
      4F 46 20 52
      41 4D 20 49
      53 20
E3BB  00                0871          DB     0
E3BC  20 48 45 58       0872 HEAD2:   DB     ' HEX.'
      2E
E3C1  0D                0873          DB     CR
E3C2  53 54 41 43       0874          DB     'STACK BEGINS FROM ',0
      4B 20 42 45
      47 49 4E 53
      20 46 52 4F
      4D 20 00
E3D5  20 48 45 58       0875 HEAD3:   DB     ' HEX.'
      2E
E3DA  0D 0D 00          0876          DB     CR,CR,0
E3DD                    0877 ;
E3DD  45 52 52 4F       0878 ERRMSG:  DB     'ERROR - ',0
      52 20 2D 20
      00
E3E6  49 4E 56 41       0879 IVCMSG:  DB     'INVALID COMMAND',0
      4C 49 44 20
      43 4F 4D 4D
      41 4E 44 00
E3F6  49 4E 56 41       0880 IVPMSG:  DB     'INVALID PARAMETER',0
      4C 49 44 20
```

```
       50 41 52 41
       4D 45 54 45
       52 00
E408   54 41 50 45       0881 CRCMSG: DB     'TAPE CRC ERROR',0
       20 43 52 43
       20 45 52 52
       4F 52 00
E417                    0882 ;
E417   0D               0883 DHEAD:  DB     CR
E418   41 44 44 52       0884         DB     'ADDR   0  1  2  3'
       20 20 20 30
       20 20 31 20
       20 32 20 20
       33
E429   20 20 20 34       0885         DB     '   4  5  6  7'
       20 20 35 20
       20 36 20 20
       37
E436   20 20 20 38       0886         DB     '   8  9  A  B'
       20 20 39 20
       20 41 20 20
       42
E443   20 20 20 43       0887         DB     '   C  D  E  F'
       20 20 44 20
       20 45 20 20
       46
E450   0D 0D 00          0888         DB     CR,CR,0
E453                    0889 ;
E453   0D 0D             0890 FILHD:  DB     CR,CR
E455   4E 41 4D 45       0891         DB     'NAME   '
       20 20 20
E45C   46 49 4C 45       0892         DB     'FILE '
       20
E461   42 4C 43 4B       0893         DB     'BLCK ADDR '
       20 41 44 44
       52 20
E46B   47 4F 41 44       0894         DB     'GOADDRS'
       44 52 53
E472   0D 0D 00          0895         DB     CR,CR,0
E475                    0896 ;
E475                    0897 ;
E475   0D 41 44 44       0898 TESTHD: DB     CR,'ADDR   BIT'
       52 20 20 20
       42 49 54
E480   20 30 20 20       0899         DB     ' 0   1   '
       20 31 20 20
       20
E489   32 20 20 20       0900         DB     '2   3   '
       33 20 20 20
E491   34 20 20 20       0901         DB     '4   5   '
       35 20 20 20
E499   36 20 20 20       0902         DB     '6   7',CR,CR,0
       37 0D 0D 00
E4A1   42 41 44 20       0903 BADMSG: DB     'BAD ',0
       00
E4A6   4F 4B 20 20       0904 OKMSG:  DB     'OK  ',0
       00
E4AB   20 20 50 41       0905 PSCMSG: DB     '  PASS COMPLETED.',CR,CR,0
```

```
      53 53 20 43
      4F 4D 50 4C
      45 54 45 44
      2E 0D 0D 00
E4BF                        0906 ;
E4BF  0D 4C 4F 41           0907 LDGMSG: DB     CR,'LOADING -',0
      44 49 4E 47
      20 2D 00
E4CA  46 4F 55 4E           0908 FNDMSG: DB     'FOUND - ',0
      44 20 2D 20
      00
```

```
E4D3                    0910 ;
E4D3                    0911 ;
E4D3                    0912 ;      DUMP COMMAND
E4D3                    0913 ;
E4D3                    0914 ;
    E4D3                0915 DUMP:    EQU   $
E4D3  CD 05 E2          0916          CALL  CRLF        ;NEXT LINE
E4D6  CD 2F E2          0917          CALL  SCANHL      ;SKIP OVER "DUMP"
E4D9  CA DE E1          0918          JP    Z,ERRPAR    ;EOL?
E4DC  CD 3D E2          0919          CALL  CONV        ;MAKE #
E4DF  CD 25 E2          0920          CALL  SCAN        ;NEXT PARAM?
E4E2  28 46             0921          JR    Z,SDUMP     ;NO-SINGLE DUMP
E4E4  7B                0922          LD    A,E         ;MAKE SO THAT
E4E5  E6 F0             0923          AND   0F0H        ;  NO ODD #'S
E4E7  5F                0924          LD    E,A
E4E8  D5                0925          PUSH  DE          ;SAVE "FROM"
E4E9  CD 3D E2          0926          CALL  CONV        ;GET "TO"
E4EC  13                0927          INC   DE          ;ADJUSTMENT
E4ED  D5                0928          PUSH  DE          ;SAVE TO
E4EE  21 17 E4          0929 DUMP1:   LD    HL,DHEAD    ;POINT HEADING
E4F1  CD BA E1          0930          CALL  MSGOUT      ;& SEND IT
E4F4  06 10             0931          LD    B,16        ;# OF LINES
E4F6  E1                0932          POP   HL          ;GET "TO"
E4F7  D1                0933          POP   DE          ;GET "FROM"
E4F8  CD D1 EA          0934 DUMP2:   CALL  ESCCHK      ;OPERATOR?
E4FB  C2 D4 E1          0935          JP    NZ,FINISH   ;YES!
E4FE  CD 0F E2          0936          CALL  ADDCOL      ;PRINT ADDRESS
E501  1A                0937 DUMP3:   LD    A,(DE)      ;GET
E502  CD 1C E2          0938          CALL  HEXSPC      ;& PRINT
E505  13                0939          INC   DE          ;NEXT
E506  E5                0940          PUSH  HL          ;SAVE "TO"
E507  B7                0941          OR    A           ;CLEAR CARRY
E508  ED 52             0942          SBC   HL,DE       ;END?
E50A  E1                0943          POP   HL          ;RESTORE
E50B  CA 05 E2          0944          JP    Z,CRLF      ;YES-GO BACK AFTER CRLF
E50E  7B                0945          LD    A,E         ;CHECK IF NEED
E50F  E6 0F             0946          AND   0FH         ;  SLASH
E511  FE 04             0947          CP    4
E513  28 1C             0948          JR    Z,SLASH
E515  FE 08             0949          CP    8
E517  28 18             0950          JR    Z,SLASH
E519  FE 0C             0951          CP    0CH
E51B  28 14             0952          JR    Z,SLASH
E51D  FE 00             0953          CP    0           ;EOL?
E51F  20 E0             0954          JR    NZ,DUMP3    ;NO-GO ON
E521  CD 05 E2          0955          CALL  CRLF
E524  10 D2             0956          DJNZ  DUMP2       ;16 LINES?
E526  D5                0957          PUSH  DE          ;SAVE "FROM"
E527  E5                0958          PUSH  HL          ;SAVE "TO"
E528  18 C4             0959          JR    DUMP1       ;YES-REDO HEADING
E52A  CD 0F E2          0960 SDUMP:   CALL  ADDCOL      ;PRINT ADDRESS
E52D  1A                0961          LD    A,(DE)      ;GET BYTE
E52E  C3 1C E2          0962          JP    HEXSPC      ;& PRINT IT
E531  3E 20             0963 SLASH:   LD    A,SPACE
E533  CD 45 E0          0964          CALL  CHROUT
E536  18 C9             0965          JR    DUMP3       ;RETURN
```

Need to put in 10F0-FFE

```
E538                    0967 ;
E538                    0968 ;
E538                    0969 ;
E538                    0970 ;      ENTER COMMAND
E538                    0971 ;
E538                    0972 ;
E538                    0973 ;
     E538               0974 ENTER: EQU   $
E538 CD 05 E2           0975        CALL  CRLF       ;NEXT LINE
E53B CD 2F E2           0976        CALL  SCANHL     ;SKIP "EN"
E53E CA DE E1           0977        JP    Z,ERRPAR   ;EOL?
E541 CD 3D E2           0978        CALL  CONV       ;GET ADDRESS
E544 CD 0F E2           0979 ENTER1: CALL ADDCOL     ;PRINT ADDRESS
E547 D5                 0980        PUSH  DE         ;SAVE IT
E548 CD 3A E1           0981        CALL  LINEIN     ;GET A LINE
E54B FD E5              0982        PUSH  IY         ;GET BUFFER
E54D E1                 0983        POP   HL         ;  INTO HL
E54E D1                 0984        POP   DE         ; AND ADDRESS
E54F CD 25 E2           0985 ENTER2: CALL SCAN       ;FIND PARAM
E552 CA 44 E5           0986        JP    Z,ENTER1   ;CR-LOOP
E555 FE 2F              0987        CP    '/'        ;END?
E557 C8                 0988        RET   Z          ;YES
E558 D5                 0989        PUSH  DE         ;SAVE-CONV DESTROYS
E559 CD 3D E2           0990        CALL  CONV       ;MAKE A #
E55C 7B                 0991        LD    A,E        ;  IN A
E55D D1                 0992        POP   DE         ;RESTORE
E55E 12                 0993        LD    (DE),A     ;  AND MEM
E55F 13                 0994        INC   DE         ;NEXT
E560 18 ED              0995        JR    ENTER2     ;AGAIN
```

```
E562                    0997 ;
E562                    0998 ;
E562                    0999 ;
E562                    1000 ;      MOVE BLOCK ROUTINE
E562                    1001 ;
E562                    1002 ;
E562                    1003 ;
     E562               1004 MOVE:    EQU   $
E562 CD 2F E2           1005          CALL  SCANHL      ;SKIP "MO"
E565 CA DE E1           1006          JP    Z,ERRPAR
E568 CD 3D E2           1007          CALL  CONV
E56B D5                 1008          PUSH  DE          ;SAVE "FROM"
E56C CD 25 E2           1009          CALL  SCAN
E56F CA DE E1           1010          JP    Z,ERRPAR
E572 CD 3D E2           1011          CALL  CONV
E575 D5                 1012          PUSH  DE          ;SAVE "FROM END"
E576 CD 25 E2           1013          CALL  SCAN
E579 FE 53              1014          CP    'S'         ;SWATH?
E57B 28 11              1015          JR    Z,MOVE2     ;YES-ALL SET!
E57D CD 3D E2           1016          CALL  CONV        ;GET SWATH
E580 37                 1017          SCF
E581 3F                 1018          CCF               ;CLEAR CARRY
E582 E1                 1019          POP   HL          ;GET "FROM END"
E583 C1                 1020          POP   BC          ;GET "FROM BEG"
E584 C5                 1021          PUSH  BC          ;SAVE AGAIN
E585 ED 42              1022          SBC   HL,BC       ;MAKE SWATH
E587 E5                 1023          PUSH  HL          ;MOVE HL
E588 C1                 1024          POP   BC          ;  TO BC
E589 E1                 1025 MOVE1:   POP   HL          ;GET "FROM"
E58A 03                 1026          INC   BC          ;ADJUST
E58B ED B0              1027          LDIR              ;MOVE'EM
E58D C9                 1028          RET
E58E 23                 1029 MOVE2:   INC   HL          ;SKIP "S"
E58F CD 3D E2           1030          CALL  CONV        ;GET SWATH
E592 D5                 1031          PUSH  DE          ;MOVE DE
E593 C1                 1032          POP   BC          ;  TO BC
E594 D1                 1033          POP   DE          ;GET "TO"
E595 18 F2              1034          JR    MOVE1       ;CONTINUE UPSTAIRS
```

```
E597                    1036 ;
E597                    1037 ;
E597                    1038 ;
E597                    1039 ;      GO COMMAND
E597                    1040 ;
E597                    1041 ;
E597                    1042 ;
      E597              1043 GO:      EQU   $
E597  CD 2F E2          1044          CALL  SCANHL      ;SKIP "GO"
E59A  CA DE E1          1045          JP    Z,ERRPAR
E59D  CD 3D E2          1046          CALL  CONV        ;GET ADDRESS
E5A0  EB                1047          EX    DE,HL       ;PUT IN HL
E5A1  E9                1048          JP    (HL)        ;GO TO IT!
```

```
E5A2                    1050 ;
E5A2                    1051 ;
E5A2                    1052 ;
E5A2                    1053 ;      SET COMMAND
E5A2                    1054 ;
E5A2                    1055 ;
E5A2                    1056 ;
      E5A2              1057 SET:     EQU   $
E5A2  CD 2F E2          1058          CALL  SCANHL      ;SKIP "SE"
E5A5  CA DE E1          1059          JP    Z,ERRPAR
E5A8  DD 21 4F E3       1060          LD    IX,SETTBL   ;POINT SET TABLE
E5AC  DD BE 00          1061 SET1:    CP    (IX)        ;IS IT?
E5AF  28 11             1062          JR    Z,SET2      ;YES-GO SET UP
E5B1  DD 23             1063          INC   IX          ;NO-
E5B3  DD 23             1064          INC   IX          ;  POINT
E5B5  DD 23             1065          INC   IX          ;    NEXT
E5B7  F5                1066          PUSH  AF          ;SAVE CHAR
E5B8  DD 7E 00          1067          LD    A,(IX)      ;IS IT
E5BB  B7                1068          OR    A           ;  END?
E5BC  CA DE E1          1069          JP    Z,ERRPAR    ;YES-INVALID
E5BF  F1                1070          POP   AF          ;RESTORE
E5C0  18 EA             1071          JR    SET1        ;CONTINUE
E5C2  23                1072 SET2:    INC   HL          ;SKIP CHAR
E5C3  CD 25 E2          1073          CALL  SCAN        ;TO NEXT
E5C6  FE 3D             1074          CP    '='         ;?
E5C8  C2 DE E1          1075          JP    NZ,ERRPAR   ;NO-INVALID
E5CB  23                1076          INC   HL          ;SKIP "="
E5CC  CD 25 E2          1077          CALL  SCAN        ;AND DELIMS
E5CF  CA DE E1          1078          JP    Z,ERRPAR    ;BAD END
E5D2  FE 47             1079          CP    'G'
E5D4  30 03             1080          JR    NC,SET3
E5D6  CD 3D E2          1081          CALL  CONV        ;MAKE FOR SET
      E5D9              1082 SET3:    EQU   $
E5D9  DD 23             1083          INC   IX          ;FOR MAIN3
E5DB  C3 1C E1          1084          JP    MAIN3       ;JUMP FROM TBL
```

```
E5DE                    1086 ;
E5DE                    1087 ;
E5DE                    1088 ;      SET VALUE ROUTINES
E5DE                    1089 ;
E5DE                    1090 ;
E5DE                    1091 ;
E5DE                    1092 ;  SET TAPE RATE
E5DE                    1093 ;
     E5DE               1094 TAPE:   EQU    $
E5DE 7B                 1095         LD     A,E
E5DF B7                 1096         OR     A           ;TEST IF ZERO
E5E0 3E 00              1097         LD     A,0         ;SET IN CASE 300 BAUD
E5E2 20 02              1098         JR     NZ,TAPE1    ;GO DO 300 BAUD
E5E4 3E 40              1099         LD     A,40H       ;MAKE 1200 BAUD
E5E6 FD 77 3D           1100 TAPE1:  LD     (IY+TAPES),A;PUT AWAY
E5E9 C9                 1101         RET
E5EA                    1102 ;
E5EA                    1103 ;  SET DISPLAY SPEED
E5EA                    1104 ;
     E5EA               1105 SPEED:  EQU    $
E5EA FD 73 3E           1106         LD     (IY+SPEEDS),E
E5ED C9                 1107         RET
E5EE                    1108 ;
E5EE                    1109 ;  SET CASSETTE FILE TYPE
E5EE                    1110 ;
     E5EE               1111 SETFIL: EQU    $
E5EE FD 73 4D           1112         LD     (IY+CHEAD+HTYPE),E
E5F1 C9                 1113         RET
E5F2                    1114 ;
E5F2                    1115 ;  SET XEQ ADDRESS
E5F2                    1116 ;
     E5F2               1117 XEQSET: EQU    $
E5F2 FD 73 52           1118         LD     (IY+CHEAD+HXEQ),E
E5F5 FD 72 53           1119         LD     (IY+CHEAD+HXEQ+1),D
E5F8 C9                 1120         RET
E5F9                    1121 ;
E5F9                    1122 ;      SET OUTPUT ADDRESS
E5F9                    1123 ;
E5F9 FE 56              1124 SETOUT: CP     'V'
E5FB 20 03              1125         JR     NZ,SETOT1
E5FD 11 1B E0           1126         LD     DE,VIDEO
E600 FE 50              1127 SETOT1: CP     'P'
E602 20 03              1128         JR     NZ,SETOT2
E604 11 21 E0           1129         LD     DE,PARLOT
E607 FE 53              1130 SETOT2: CP     'S'
E609 20 03              1131         JR     NZ,SETOT3
E60B 11 12 E0           1132         LD     DE,OUTAPE
E60E FE 4C              1133 SETOT3: CP     'L'         ;IS IT CENTRONICS
E610 20 03              1134         JR     NZ,SETOT4   ;NO
E612 11 93 E9           1135         LD     DE,CENDRV
E615 FD 73 3F           1136 SETOT4: LD     (IY+OUTADD),E
E618 FD 72 40           1137         LD     (IY+OUTADD+1),D
E61B C9                 1138         RET
E61C                    1139 ;
E61C                    1140 ;      SET INPUT ADDRESS
E61C                    1141 ;
     E61C               1142 SETIN:  EQU    $
E61C FE 4B              1143         CP     'K'
```

```
E61E  20 03        1144          JR    NZ,SETIN1
E620  11 18 E0     1145          LD    DE,KEYBRD
E623  FE 50        1146 SETIN1:  CP    'P'
E625  20 03        1147          JR    NZ,SETIN2
E627  11 1E E0     1148          LD    DE,PARLIN
E62A  FE 53        1149 SETIN2:  CP    'S'
E62C  20 03        1150          JR    NZ,SETIN3
E62E  11 0F E0     1151          LD    DE,INTAPE
E631  FD 73 41     1152 SETIN3:  LD    (IY+INADD),E
E634  FD 72 42     1153          LD    (IY+INADD+1),D
E637  C9           1154          RET
```

```
E638                    1156 ;
E638                    1157 ;
E638                    1158 ;
E638                    1159 ;      SAVE COMMAND
E638                    1160 ;
E638                    1161 ;
E638                    1162 ;
     E638               1163 SAVE:    EQU   $
E638 CD 64 E2           1164          CALL  NAMFND     ;GET NAME
E63B CA DE E1           1165          JP    Z,ERRPAR   ;NO NAME
E63E DA DE E1           1166          JP    C,ERRPAR   ;BAD NAME
E641 CD 32 E2           1167          CALL  SCANLT     ;SKIP NAME
E644 CA DE E1           1168          JP    Z,ERRPAR   ;EOL
E647 CD 3D E2           1169          CALL  CONV       ;GET BEG ADD
E64A D5                 1170          PUSH  DE         ;SAVE
E64B FD 73 50           1171          LD    (IY+CHEAD+HADDR),E
E64E FD 72 51           1172          LD    (IY+CHEAD+HADDR+1),D
E651 CD 25 E2           1173          CALL  SCAN       ;NEXT
E654 CA DE E1           1174          JP    Z,ERRPAR   ;NO END ADD
E657 CD 3D E2           1175          CALL  CONV
E65A EB                 1176 SAVBAS:  EX    DE,HL      ;SAVE HL
E65B C1                 1177          POP   BC         ;GET BEG
E65C C5                 1178          PUSH  BC         ;RESAVE
E65D 37                 1179          SCF              ;CLEAR ARRY
E65E 3F                 1180          CCF
E65F ED 42              1181          SBC   HL,BC
E661 23                 1182          INC   HL         ;ADJUST
E662 E5                 1183          PUSH  HL         ;SAVE BLK
E663 FD 75 4E           1184          LD    (IY+CHEAD+HSIZE),L
E666 FD 74 4F           1185          LD    (IY+CHEAD+HSIZE+1),H
E669 FD 36 4C 55        1186          LD    (IY+CHEAD+5),55H;MAKE AN EXIDY FILE
E66D EB                 1187          EX    DE,HL
E66E 06 01              1188          LD    B,1        ;DEFAULT
E670 CD 25 E2           1189          CALL  SCAN       ;SKIP TO EOL
E673 28 04              1190          JR    Z,SAVE1
E675 CD 3D E2           1191          CALL  CONV       ;GET UNIT
E678 43                 1192          LD    B,E        ; IN B
E679 CD 8A E2           1193 SAVE1:   CALL  MOTRON     ;TURN ON CAS.
E67C CD C2 E2           1194          CALL  NULL       ;& NULL IT
E67F FD E5              1195          PUSH  IY         ;MOVE IY
E681 DD E1              1196          POP   IX         ;  TO IX
E683 06 10              1197          LD    B,HEADLN   ;HEADER LENGTH
E685 DD 7E 47           1198 SAVE2:   LD    A,(IX+CHEAD);GET
E688 CD EE E2           1199          CALL  TAPOUT     ;SEND
E68B DD 23              1200          INC   IX         ;NEXT
E68D 10 F6              1201          DJNZ  SAVE2      ;LOOP FOR HEADER
E68F CD 9B E8           1202          CALL  WRCRC      ;WRITE CRC
E692 CD C2 E2           1203          CALL  NULL       ;WRITE NULLS AFTER HEADER
E695 D1                 1204          POP   DE         ;GET BLOCK SIZE
E696 E1                 1205          POP   HL         ;GET BEGGINNING ADDRESS
E697 CD A9 E6           1206 SAVE3:   CALL  BLKADJ     ;DO BLOCK ADJUST
E69A CA AF E2           1207          JP    Z,MTROFF   ;GO TURN OFF IF THRU
E69D 7E                 1208 SAVE4:   LD    A,(HL)     ;GET BYTE
E69E CD EE E2           1209          CALL  TAPOUT     ;SEND IT
E6A1 23                 1210          INC   HL         ;NEXT
E6A2 10 F9              1211          DJNZ  SAVE4      ;LOOP FOR BLOCK
E6A4 CD 9B E8           1212          CALL  WRCRC      ;WRITE CRC
E6A7 18 EE              1213          JR    SAVE3      ;KEEP GOIN'
```

```
E6A9                    1214 ;
E6A9                    1215 ;  BLOCK ADJUST ROUTIN
E6A9                    1216 ;
      E6A9              1217 BLKADJ: EQU   $
E6A9  AF                1218         XOR   A          ;CLEAR A
E6AA  FD 77 46          1219         LD    (IY+CRCBYT),A;CLEAR CRC
E6AD  47                1220         LD    B,A        ;ALSO B
E6AE  B2                1221         OR    D          ;IS D ZERO?
E6AF  20 05             1222         JR    NZ,BLKAJ2  ;NO-NORMAL RETURN
E6B1  B3                1223         OR    E          ;IS E ZERO?
E6B2  C8                1224         RET   Z          ;YES-WE'RE THRU!
E6B3  43                1225         LD    B,E        ;DO ADJUSTMENT ON DE
E6B4  5A                1226         LD    E,D
E6B5  C9                1227         RET
E6B6  15                1228 BLKAJ2: DEC   D          ;ONE LESS BLOCK
E6B7  B7                1229         OR    A          ;RESET ZERO FLAG
E6B8  C9                1230         RET              ;BYE BYE
```

```
E6B9                    1232 ;
E6B9                    1233 ;
E6B9                    1234 ;    FILES COMMAND
E6B9                    1235 ;
E6B9                    1236 ;  LISTS FILES FROM CASSETTE TO
E6B9                    1237 ;  TERMINAL.
E6B9                    1238 ;
     E6B9               1239 FILES:  EQU   $
E6B9  CD 2F E2          1240         CALL  SCANHL     ;SKIP "FI"
E6BC  06 01             1241         LD    B,1        ;UNIT DEFAULT
E6BE  28 04             1242         JR    Z,FILES1
E6C0  CD 3D E2          1243         CALL  CONV       ;GET UNIT
E6C3  43                1244         LD    B,E        ; IN B
E6C4  21 53 E4          1245 FILES1: LD    HL,FILHD
E6C7  CD BA E1          1246         CALL  MSGOUT     ;SEND HEADING
E6CA  CD 8A E2          1247         CALL  MOTRON     ;TURN ON!
E6CD  CD 1B E7          1248 FILES2: CALL  GETHED
E6D0  CD DE E6          1249         CALL  HEDPRT     ;PRINT HEADER
E6D3  FD 7E 5C          1250         LD    A,(IY+THEAD+5);GET EXIDY FILE CHECK
E6D6  B7                1251         OR    A          ;SET FLAGS
E6D7  28 F4             1252         JR    Z,FILES2   ;DO PROC TECH SKIP
E6D9  CD 34 E7          1253         CALL  SKIPFL     ;NEXT FILE
E6DC  18 EF             1254         JR    FILES2
E6DE                    1255 ;
E6DE                    1256 ;-----------------------------------
E6DE                    1257 ;
E6DE                    1258 ;      PRINTS HEADER ON TERMINAL
E6DE                    1259 ;
E6DE                    1260 ;
E6DE  FD E5             1261 HEDPRT: PUSH  IY
E6E0  DD E1             1262         POP   IX         ;MOVE IY>IX
E6E2  06 05             1263         LD    B,5        ;NAME
E6E4  DD 7E 57          1264 FILES3: LD    A,(IX+THEAD);GET
E6E7  CD 45 E0          1265         CALL  CHROUT     ;SEND
E6EA  DD 23             1266         INC   IX         ;NEXT
E6EC  10 F6             1267         DJNZ  FILES3     ;LOOP FOR 5
E6EE  06 03             1268         LD    B,3
E6F0  CD D2 E2          1269         CALL  SPACES     ;3 SPACES
E6F3  DD 23             1270         INC   IX         ;SKIP OVER ZERO IN HEADER
E6F5  DD 7E 57          1271         LD    A,(IX+THEAD)
E6F8  CD 45 E0          1272         CALL  CHROUT     ;SEND FILE TYPE
E6FB  06 03             1273         LD    B,3
E6FD  CD D2 E2          1274         CALL  SPACES     ;3 SPACES
E700  DD 23             1275         INC   IX         ;NEXT
E702  06 03             1276         LD    B,3        ;THREE ADDRESS'
E704  DD 5E 57          1277 FILES4: LD    E,(IX+THEAD)
E707  DD 56 58          1278         LD    D,(IX+THEAD+1);GET ADD
E70A  DD 23             1279         INC   IX
E70C  DD 23             1280         INC   IX         ;SKIP THIS 1
E70E  CD E8 E1          1281         CALL  ADDOUT     ;PRINT IT
E711  3E 20             1282         LD    A,SPACE
E713  CD 45 E0          1283         CALL  CHROUT     ;1 SPACE
E716  10 EC             1284         DJNZ  FILES4     ;LOOP FOR 3
E718  C3 05 E2          1285         JP    CRLF       ;NEW LINE
```

```
E71B                    1287 ;
E71B                    1288 ;
E71B                    1289 ;
E71B                    1290 ;      CASSETTE UTILITY ROUTINES
E71B                    1291 ;
E71B                    1292 ;
E71B                    1293 ;-----------------------------------------------
E71B                    1294 ;
E71B                    1295 ;      GET HEADER
E71B                    1296 ;
E71B                    1297 ;  LOADS HEADER FROM TAPE TO BUFFER
E71B                    1298 ;
     E71B               1299 GETHED: EQU    $
E71B CD 59 E7           1300         CALL   TAPWT       ;SKIP NULLS
E71E FD E5              1301         PUSH   IY          ;MOVE IY
E720 DD E1              1302         POP    IX          ;   TO IX
E722 06 10              1303         LD     B,HEADLN    ;GET LENGTH
E724 CD DA E2           1304 GETHD1: CALL   TAPEIN      ;GET BYTE
E727 CA D4 E1           1305         JP     Z,FINISH    ;USER WANTS US
E72A DD 77 57           1306         LD     (IX+THEAD),A;MOVE IT
E72D DD 23              1307         INC    IX          ;NEXT
E72F 10 F3              1308         DJNZ   GETHD1      ;LOOP
E731 C3 4E E7           1309         JP     CKCRC       ;CHECK CRC & RETURN
E734                    1310 ;
E734                    1311 ;
E734                    1312 ;-----------------------------------------------
E734                    1313 ;
E734                    1314 ;      SKIP A CASSETTE FILE
E734                    1315 ;
E734                    1316 ;  THIS ROUTINE SKIPS A FILE ON TAPE
E734                    1317 ;  WITHOUT LOADING IT INTO MEMORY.
E734                    1318 ;
E734                    1319 ;
     E734               1320 SKIPFL: EQU    $
E734 CD 59 E7           1321         CALL   TAPWT       ;WAIT FOR THE NULLS
E737 FD 5E 5E           1322         LD     E,(IY+THEAD+HSIZE);GET BLK SIZE
E73A FD 56 5F           1323         LD     D,(IY+THEAD+HSIZE+1)
E73D CD A9 E6           1324 SKIPF1: CALL   BLKADJ      ;GO ADJUST BLOCK
E740 C8                 1325         RET    Z           ;THAT ' S ALL!
E741 CD DA E2           1326 SKIPF2: CALL   TAPEIN      ;GET FROM TAPE
E744 CA D4 E1           1327         JP     Z,FINISH
E747 10 F8              1328         DJNZ   SKIPF2      ;FOR ENTIRE BLOCK
E749 CD 4E E7           1329         CALL   CKCRC       ;CHECK CRC
E74C 18 EF              1330         JR     SKIPF1      ;MORE-
E74E                    1331 ;
E74E                    1332 ;      CHECK CRC ON TAPE
E74E                    1333 ;
     E74E               1334 CKCRC:  EQU    $
E74E FD 46 46           1335         LD     B,(IY+CRCBYT)
E751 CD DA E2           1336         CALL   TAPEIN
E754 B8                 1337         CP     B
E755 C2 E3 E1           1338         JP     NZ,ERRCRC
E758 C9                 1339         RET
```

```
E759                    1341 ;
E759                    1342 ;
E759                    1343 ;
E759                    1344 ;      TAPE WAIT ROUTINE
E759                    1345 ;
E759                    1346 ;  THIS ROUTINE WAITS FOR TEN NULLS
E759                    1347 ;  FOLLOWED BY OTHER NULLS TILL A 1
E759                    1348 ;
     E759               1349 TAPWT:  EQU   $
E759 C5                 1350         PUSH  BC          ;WE DESTROY
E75A 06 0A              1351 TAPWT1: LD    B,10
E75C CD DA E2           1352 TAPWT2: CALL  TAPEIN
E75F CA D4 E1           1353         JP    Z,FINISH
E762 B7                 1354         OR    A           ;IS IT A NULL?
E763 20 F5              1355         JR    NZ,TAPWT1   ;NO-START OVER
E765 10 F5              1356         DJNZ  TAPWT2      ;LOOP FOR 10
E767 CD DA E2           1357 TAPWT3: CALL  TAPEIN
E76A CA D4 E1           1358         JP    Z,FINISH
E76D FE 01              1359         CP    1           ;A ONE?
E76F 20 F6              1360         JR    NZ,TAPWT3
E771 FD 70 46           1361         LD    (IY+CRCBYT),B;CLEAR CRC
E774 C1                 1362         POP   BC
E775 C9                 1363         RET
E776                    1364 ;
E776                    1365 ;-----------------------------------------
E776                    1366 ;
E776                    1367 ;
E776                    1368 ;     PARALLEL I/O ROUTINES
E776                    1369 ;
E776                    1370 ;
     E776               1371 PARIN:  EQU   $
E776 DB FE              1372         IN    A,(0FEH)
E778 CB 7F              1373         BIT   7,A
E77A 28 FA              1374         JR    Z,PARIN
E77C DB FF              1375         IN    A,(0FFH)
E77E C9                 1376         RET
E77F                    1377 ;
     E77F               1378 PAROUT: EQU   $
E77F F5                 1379         PUSH  AF
E780 DB FE              1380 PAROT1: IN    A,(0FEH)
E782 CB 77              1381         BIT   6,A
E784 28 FA              1382         JR    Z,PAROT1
E786 F1                 1383         POP   AF
E787 D3 FF              1384         OUT   (0FFH),A
E789 C9                 1385         RET
```

```
E78A                    1387 ;
E78A                    1388 ;
E78A                    1389 ;
E78A                    1390 ;      LOAD COMMAND
E78A                    1391 ;
E78A                    1392 ;
E78A                    1393 ;
     E78A               1394 LOAD:    EQU   $
E78A CD 2F E2           1395          CALL  SCANHL      ;SKIP "LO"
E78D 2B                 1396 LOAD1:   DEC   HL          ;CHK FOR "G"
E78E 7E                 1397          LD    A,(HL)
E78F FE 30              1398          CP    '0'
E791 38 FA              1399          JR    C,LOAD1     ;SKIP DELIMS
E793 FE 47              1400          CP    'G'         ;IS IT A "G"
E795 F5                 1401          PUSH  AF          ;SAVE TEST FLGS
E796 CD 64 E2           1402          CALL  NAMFND      ;GET NAME
E799 F5                 1403 LODBAS:  PUSH  AF          ;SAVE ALSO
E79A 06 01              1404          LD    B,1         ;DEFAULT UNIT
E79C F5                 1405          PUSH  AF          ;FOR LATER
E79D 28 19              1406          JR    Z,LOAD3     ;GO LOAD
E79F F1                 1407          POP   AF          ;DON'T NEED
E7A0 38 07              1408          JR    C,LOAD2
E7A2 CD 32 E2           1409          CALL  SCANLT      ;SKIP NAME
E7A5 F5                 1410          PUSH  AF
E7A6 28 10              1411          JR    Z,LOAD3     ;GO LOAD
E7A8 F1                 1412          POP   AF
E7A9 CD 3D E2           1413 LOAD2:   CALL  CONV        ;MAKE UNIT
E7AC 43                 1414          LD    B,E         ;  IN B
E7AD CD 25 E2           1415          CALL  SCAN        ;SKIP OVER
E7B0 F5                 1416          PUSH  AF          ;SAVE FLAGS
E7B1 28 05              1417          JR    Z,LOAD3     ;GO LOAD IF EOL
E7B3 C5                 1418          PUSH  BC
E7B4 CD 3D E2           1419          CALL  CONV
E7B7 C1                 1420          POP   BC          ;RESTORE
E7B8 CD 05 E2           1421 LOAD3:   CALL  CRLF        ;START WITH FRESH LINE
E7BB CD 8A E2           1422          CALL  MOTRON      ;WHAT A TURN ON!
E7BE D5                 1423 LOAD3A:  PUSH  DE          ;LOAD ADDRESS
E7BF CD 1B E7           1424          CALL  GETHED      ;GET HEADER
E7C2 FD 7E 5C           1425          LD    A,(IY+THEAD+5);GET EXIDY FILE CHECK
E7C5 B7                 1426          OR    A           ;SET FLAGS
E7C6 28 0B              1427          JR    Z,LOAD3B    ;NO PRINTING FOR PT
E7C8 E5                 1428          PUSH  HL          ;WE NEED RIGHT NOW!
E7C9 21 CA E4           1429          LD    HL,FNDMSG   ;POINT TO "FOUND -"
E7CC CD BA E1           1430          CALL  MSGOUT      ;PRINT IT
E7CF CD DE E6           1431          CALL  HEDPRT      ;PRINT TAPE HEADER
E7D2 E1                 1432          POP   HL          ;GET BACK
E7D3 D1                 1433 LOAD3B:  POP   DE          ;RESTORE ADD
E7D4 F1                 1434          POP   AF          ;FLAGS
E7D5 F5                 1435          PUSH  AF
E7D6 20 06              1436          JR    NZ,LOAD5    ;ADD IN HEADER
E7D8 FD 5E 60           1437          LD    E,(IY+THEAD+HADDR);GET ADD
E7DB FD 56 61           1438          LD    D,(IY+THEAD+HADDR+1)
E7DE E1                 1439 LOAD5:   POP   HL
E7DF F1                 1440          POP   AF          ;NAME?
E7E0 F5                 1441          PUSH  AF          ;PUT BACK
E7E1 E5                 1442          PUSH  HL          ;DITTO
E7E2 28 14              1443          JR    Z,LOAD7     ;NOPE-GO LOAD
E7E4 38 12              1444          JR    C,LOAD7
```

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E7E6  FD E5        1445          PUSH  IY          ;PUT IY
E7E8  DD E1        1446          POP   IX          ;  IN IX
E7EA  06 05        1447          LD    B,5         ;NAME LNGTH
E7EC  DD 7E 47     1448 LOAD6:   LD    A,(IX+CHEAD);GET
E7EF  DD BE 57     1449          CP    (IX+THEAD);SAME?
E7F2  DD 23        1450          INC   IX          ;NEXT
E7F4  20 49        1451          JR    NZ,LOADSK   ;GO SKIP
E7F6  10 F4        1452          DJNZ  LOAD6       ;KEEP GOIN
E7F8  FD 7E 5C     1453 LOAD7:   LD    A,(IY+THEAD+5);GET EXIDY FILE CHECK
E7FB  B7           1454          OR    A           ;SET FLAGS
E7FC  28 09        1455          JR    Z,LOAD7A    ;NO PRINTING FOR PT
E7FE  21 BF E4     1456          LD    HL,LDGMSG   ;POINT TO "LOADING -"
E801  CD BA E1     1457          CALL  MSGOUT      ;PRINT IT
E804  CD 59 E7     1458          CALL  TAPWT       ;WAIT FOR NULLS
E807  EB           1459 LOAD7A:  EX    DE,HL       ;FLIP 'EM
E808  FD 5E 5E     1460          LD    E,(IY+THEAD+HSIZE);GET BLK
E80B  FD 56 5F     1461          LD    D,(IY+THEAD+HSIZE+1)
E80E  CD A9 E6     1462 LOAD8:   CALL  BLKADJ      ;ADJUST BLOCK
E811  28 0F        1463          JR    Z,LOAD10    ;THRU
E813  CD DA E2     1464 LOAD9:   CALL  TAPEIN      ;GET BYTE
E816  CA D4 E1     1465          JP    Z,FINISH    ;USER WANTS US
E819  77           1466          LD    (HL),A      ;PUT AWAY
E81A  23           1467          INC   HL          ;NEXT
E81B  10 F6        1468          DJNZ  LOAD9       ;DO ALL BLOCKS
E81D  CD 4E E7     1469          CALL  CKCRC       ;CHECK CRC
E820  18 EC        1470          JR    LOAD8       ;LOOP FOR ALL BLOCKS
E822  CD AF E2     1471 LOAD10:  CALL  MTROFF      ;SHUT UP
E825  21 53 E4     1472          LD    HL,FILHD    ;POINT TO HEADING
E828  CD BA E1     1473          CALL  MSGOUT      ;PRINT IT
E82B  CD DE E6     1474          CALL  HEDPRT      ;GO PRINT HEADER
E82E  F1           1475          POP   AF
E82F  F1           1476          POP   AF
E830  F1           1477          POP   AF
E831  C0           1478          RET   NZ          ;WE'RE THRU
E832  FD 7E 5D     1479          LD    A,(IY+THEAD+HTYPE);GET FILE TYPE
E835  E6 80        1480          AND   80H         ;DATA FILE?
E837  C0           1481          RET   NZ          ;YES! GO BACK
E838  FD 6E 62     1482          LD    L,(IY+THEAD+HXEQ);GET XEQ ADDR
E83B  FD 66 63     1483          LD    H,(IY+THEAD+HXEQ+1)
E83E  E9           1484          JP    (HL)        ;GO DO IT!!
E83F  CD 34 E7     1485 LOADSK:  CALL  SKIPFL      ;GO OVER IT!
E842  C3 BE E7     1486          JP    LOAD3A
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E845                    1488 ;
E845                    1489 ;
E845                    1490 ;
E845                    1491 ;      CHANGE PROMPT CHARACTER COMMAND
E845                    1492 ;
E845                    1493 ;
E845                    1494 ;
     E845               1495 PRMPTC: EQU   $
E845 FD E5              1496         PUSH  IY
E847 E1                 1497         POP   HL
E848 7E                 1498 PRMP1:  LD    A,(HL)
E849 FE 0D              1499         CP    CR
E84B CA DE E1           1500         JP    Z,ERRPAR
E84E FE 3D              1501         CP    '='
E850 23                 1502         INC   HL
E851 20 F5              1503         JR    NZ,PRMP1
E853 7E                 1504         LD    A,(HL)
E854 FD 77 44           1505         LD    (IY+PROMPT),A
E857 C9                 1506         RET
E858                    1507 ;
E858                    1508 ;-----------------------------------------------
E858                    1509 ;
E858                    1510 ;
E858                    1511 ;
E858                    1512 ;      BATCH COMMAND
E858                    1513 ;
E858                    1514 ;
     E858               1515 BATCH:  EQU   $
E858 FD 70 43           1516         LD    (IY+BATCHF),B;SET FLAG
E85B C9                 1517         RET
```

```
E85C                    1519 ;
E85C                    1520 ;
E85C                    1521 ;
E85C                    1522 ;      CREAT BATCH FILE COMMAND
E85C                    1523 ;
E85C                    1524 ;
E85C                    1525 ;
     E85C               1526 CREAT:  EQU   $
E85C 3E 2A              1527         LD    A,'*'
E85E CD 45 E0           1528         CALL  CHROUT
E861 CD 3A E1           1529         CALL  LINEIN     ;GET A LINE
E864 FD E5              1530         PUSH  IY         ;MOVE IY
E866 E1                 1531         POP   HL         ;  TO HL
E867 7E                 1532         LD    A,(HL)
E868 FE 0D              1533         CP    CR         ;SEE IF END
E86A C8                 1534         RET   Z          ;YES!
E86B 06 01              1535         LD    B,1
E86D CD 8A E2           1536         CALL  MOTRON     ;TURN ON
E870 CD C2 E2           1537         CALL  NULL       ;SEND NULLS
E873 7E                 1538 CREAT1: LD    A,(HL)     ;GET
E874 23                 1539         INC   HL         ;NEXT
E875 CD EE E2           1540         CALL  TAPOUT     ;SEND
E878 FE 0D              1541         CP    CR         ;END?
E87A 20 F7              1542         JR    NZ,CREAT1  ;NO
E87C CD 9B E8           1543         CALL  WRCRC      ;WRITE CRC
E87F CD AF E2           1544         CALL  MTROFF     ;OFF
E882 18 D8              1545         JR    CREAT      ;CONTINUE
E884                    1546 ;
E884                    1547 ;-----------------------------------------
E884                    1548 ;
E884                    1549 ;
E884                    1550 ;      LIST BATCH FILE COMMAND
E884                    1551 ;
E884                    1552 ;
E884                    1553 ;
     E884               1554 LIST:   EQU   $
E884 06 01              1555         LD    B,1
E886 CD 8A E2           1556         CALL  MOTRON     ;TURN ON
E889 CD 05 E2           1557 LIST1:  CALL  CRLF       ;NEW LINE
E88C CD 59 E7           1558         CALL  TAPWT      ;WAIT FOR NULLS
E88F CD DA E2           1559 LIST3:  CALL  TAPEIN     ;GET
E892 FE 0D              1560         CP    CR         ;IS IT?
E894 28 F3              1561         JR    Z,LIST1    ;YES!
E896 CD 45 E0           1562         CALL  CHROUT     ;PRINT IT
E899 18 F4              1563         JR    LIST3      ;CONTINUE
E89B                    1564 ;
E89B                    1565 ;      WRITE CRC TO TAPE
E89B                    1566 ;
     E89B               1567 WRCRC:  EQU   $
E89B FD 7E 46           1568         LD    A,(IY+CRCBYT)
E89E C3 EE E2           1569         JP    TAPOUT     ;GO WRITE & RETURN
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E8A1                    1571 ;
E8A1                    1572 ;
E8A1                    1573 ;
E8A1                    1574 ;      MEMORY TEST COMMAND
E8A1                    1575 ;
E8A1                    1576 ;
E8A1                    1577 ;
     E8A1               1578 TEST:    EQU   $
E8A1 CD 2F E2           1579          CALL  SCANHL     ;SKIP "TE"
E8A4 CA DE E1           1580          JP    Z,ERRPAR
E8A7 CD 3D E2           1581          CALL  CONV       ;GET FROM
E8AA D5                 1582          PUSH  DE         ;AND SAVE IT
E8AB CD 25 E2           1583          CALL  SCAN       ;SKIP DELIMS
E8AE CA DE E1           1584          JP    Z,ERRPAR
E8B1 CD 3D E2           1585          CALL  CONV       ;GET TO
E8B4 D5                 1586          PUSH  DE         ;SAVE TO
E8B5 CD 25 E2           1587          CALL  SCAN       ;SEE IF CONTINUOUS
E8B8 D1                 1588          POP   DE
E8B9 E1                 1589          POP   HL         ;GET FROM STACK
E8BA 01 01 00           1590          LD    BC,1       ;SET PASS COUNTER
E8BD FE 43              1591 TEST1:   CP    'C'        ;SET CONTINUOUS FLAGS
E8BF F5                 1592          PUSH  AF         ;      IN STACK
E8C0 D5                 1593          PUSH  DE         ;PUT BACK TO & FROM
E8C1 E5                 1594          PUSH  HL
E8C2 C5                 1595          PUSH  BC
E8C3 06 00              1596          LD    B,0        ;CREAT MASK
E8C5 08                 1597          EX    AF,AF'
E8C6 AF                 1598          XOR   A
E8C7 08                 1599          EX    AF,AF'
E8C8 CD 2F E9           1600 TEST2:   CALL  REGRST
E8CB 70                 1601 STUFF1:  LD    (HL),B     ;PUT MASK IN MEM
E8CC 23                 1602          INC   HL         ;NEXT MEMORY
E8CD CD 3C E9           1603          CALL  ENDCK      ;SEE IF THRU
E8D0 20 F9              1604          JR    NZ,STUFF1  ;GO ON IF NOT!
E8D2 CD D1 EA           1605          CALL  QUIK       ;SEE IF USER WANTS US
E8D5 CD 81 E9           1606          CALL  STARPT     ;PRINT "*"
E8D8 C2 D4 E1           1607          JP    NZ,FINISH  ;GO TO HIM IF SO
E8DB CD 2F E9           1608          CALL  REGRST     ;GET TO & FROM
E8DE 78                 1609 CHECK1:  LD    A,B
E8DF BE                 1610          CP    (HL)       ;IS IT OK?
E8E0 C4 42 E9           1611          CALL  NZ,BADBYT  ;NO-GO SAY SO!
E8E3 23                 1612          INC   HL         ;NEXT ONE
E8E4 CD 3C E9           1613          CALL  ENDCK      ;END?
E8E7 20 F5              1614          JR    NZ,CHECK1  ;NO!
E8E9 CD 85 E9           1615          CALL  STARP2     ;ERASE "*"
E8EC 04                 1616          INC   B          ;NEW MASK
E8ED 20 D9              1617          JR    NZ,TEST2   ;CONTINUE FOR 255
E8EF 0E 00              1618          LD    C,0        ;CREATE MASK
E8F1 41                 1619 TEST3:   LD    B,C        ;PUT IN PROPER PLACE
E8F2 CD 2F E9           1620          CALL  REGRST
E8F5 70                 1621 STUFF3:  LD    (HL),B
E8F6 23                 1622          INC   HL         ;NEXT
E8F7 04                 1623          INC   B          ;SHIFT MASK
E8F8 CD 3C E9           1624          CALL  ENDCK      ;END?
E8FB 20 F8              1625          JR    NZ,STUFF3  ;NO
E8FD 41                 1626          LD    B,C        ;RESET
E8FE CD D1 EA           1627          CALL  QUIK       ;IS HE THERE?
E901 CD 81 E9           1628          CALL  STARPT     ;PRINT "*"
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E904  C2 D4 E1          1629          JP    NZ,FINISH ;YES-GO TO HIM!
E907  CD 2F E9          1630          CALL  REGRST
E90A  78                1631 CHECK3:  LD    A,B
E90B  BE                1632          CP    (HL)      ;IS IT OK?
E90C  C4 42 E9          1633          CALL  NZ,BADBYT ;NO!
E90F  23                1634          INC   HL        ;NEXT
E910  04                1635          INC   B         ;MASK TOO
E911  CD 3C E9          1636          CALL  ENDCK     ;THRU?
E914  20 F4             1637          JR    NZ,CHECK3 ;NO
E916  CD 85 E9          1638          CALL  STARP2    ;ERASE "*"
E919  0C                1639          INC   C
E91A  20 D5             1640          JR    NZ,TEST3
E91C                    1641 ;
E91C  D1                1642          POP   DE        ;GET PASS COUNT
E91D  D5                1643          PUSH  DE        ;NOW-MOVE IT TO BC
E91E  C1                1644          POP   BC
E91F  CD 0F E2          1645          CALL  ADDCOL    ;PRINT PASS #
E922  21 AB E4          1646          LD    HL,PSCMSG ;PRINT PASS MESSAGE
E925  CD BA E1          1647          CALL  MSGOUT
E928  E1                1648          POP   HL        ;GET EVERYTHING OFF STACK
E929  D1                1649          POP   DE
E92A  F1                1650          POP   AF
E92B  C0                1651          RET   NZ        ;NOT CONTINUOUS
E92C  03                1652          INC   BC        ;NEW PASS
E92D  18 8E             1653          JR    TEST1     ;GO START OVER
E92F                    1654 ;
E92F                    1655 ;  TEST PROGRAM UTILITIES
E92F                    1656 ;
E92F                    1657 ;
      E92F              1658 REGRST:  EQU   $
E92F  D9                1659          EXX             ;SAVE REGISTERS
E930  E1                1660          POP   HL        ;GET RET ADDRESS
E931  D1                1661          POP   DE        ;TWICE
E932  D9                1662          EXX             ;POINT OUR REGS
E933  E1                1663          POP   HL
E934  D1                1664          POP   DE
E935  D5                1665          PUSH  DE        ;PUT BACK
E936  E5                1666          PUSH  HL
E937  D9                1667          EXX
E938  D5                1668          PUSH  DE        ;PUT BACK RETURNS
E939  E5                1669          PUSH  HL
E93A  D9                1670          EXX
E93B  C9                1671          RET
E93C                    1672 ;
      E93C              1673 ENDCK:   EQU   $
E93C  7A                1674          LD    A,D
E93D  BC                1675          CP    H
E93E  C0                1676          RET   NZ
E93F  7B                1677          LD    A,E
E940  BD                1678          CP    L
E941  C9                1679          RET
E942                    1680 ;
      E942              1681 BADBYT:  EQU   $
E942  08                1682          EX    AF,AF'    ;GET FHEADING FLAGS
E943  20 0B             1683          JR    NZ,BADB2  ;GO AROUND HEADING
E945  E5                1684          PUSH  HL        ;WE NEED
E946  21 75 E4          1685          LD    HL,TESTHD ;POINT HEADING
E949  CD BA E1          1686          CALL  MSGOUT    ;PRINT IT
```

```
E94C  E1              1687          POP   HL
E94D  3E 55           1688          LD    A,55H       ;SET HEADING FLAGS
E94F  B7              1689          OR    A           ;SET THOSE FLAGS!
E950  08              1690 BADB2:   EX    AF,AF'      ;PUT IT BACK!
E951  C5              1691          PUSH  BC
E952  D5              1692          PUSH  DE          ;I NEED DE
E953  EB              1693          EX    DE,HL       ;  FOR HL
E954  CD D1 EA        1694          CALL  QUIK        ;SEE IF HE'S THERE
E957  C2 D4 E1        1695          JP    NZ,FINISH   ;YEP-GO TO HIM
E95A  CD 0F E2        1696          CALL  ADDCOL      ;PRINT ADDRESS
E95D  06 05           1697          LD    B,5         ;PRINT 5 SPACES
E95F  CD D2 E2        1698          CALL  SPACES
E962  EB              1699          EX    DE,HL
E963  D1              1700          POP   DE          ;RESTORE EVERYTHING
E964  0E 01           1701          LD    C,1         ;CREATE MASK
E966  7E              1702 BADBY2:  LD    A,(HL)
E967  A8              1703          XOR   B           ;SET ERROR BITS
E968  A1              1704          AND   C           ;PEEL OFF CURRENT BITS
E969  E5              1705          PUSH  HL          ;I NEED
E96A  20 10           1706          JR    NZ,BADBIT
E96C  21 A6 E4        1707          LD    HL,OKMSG
E96F  CD BA E1        1708 BADBY3:  CALL  MSGOUT      ;PRINT MESSAGE
E972  E1              1709          POP   HL          ;RESTORE
E973  CB 21           1710          SLA   C           ;ROTATE MASK
E975  30 EF           1711          JR    NC,BADBY2   ;LOOP TILL ROTATE THRU
E977  C1              1712          POP   BC          ;RESTORE "C"
E978  CD 05 E2        1713          CALL  CRLF        ;NEW LINE!
E97B  C9              1714          RET
E97C  21 A1 E4        1715 BADBIT:  LD    HL,BADMSG   ;POINT BAD MSG
E97F  18 EE           1716          JR    BADBY3      ;PRINT IT UP THERE!
      E981            1717 STARPT:  EQU   $
E981  3E 2A           1718          LD    A,'*'
E983  18 02           1719          JR    STARP3      ;GO PRINT IT
E985  3E 08           1720 STARP2:  LD    A,CNTRLH    ;FORM BACKSPACE
E987  C3 0C E0        1721 STARP3:  JP    SEND        ;GO PRINT IT & RET
```

* Monitor 1.1 Bug [SA 4(1):16]; Insert POP BC ; recover B
PUSH BC ; Put C on stack

E963 CD LO HI CALL ROUTINE @ HILO$_H$

HI LO	D1	POP DE : Replacement
	C1	POP BC } Insertions
	C5	PUSH BC }
	ØE Ø1	LD C,1 : Replacement
	C9	RET

EXCEPT CAN'T PATCH 1700 PROMS!!

```
E98A                    1723 ;
E98A                    1724 ;
E98A                    1725 ;
E98A                    1726 ;       PROM PACK COMMAND
E98A                    1727 ;
E98A                    1728 ;
E98A                    1729 ;
     E98A               1730 PROMPK: EQU   $
E98A CD 2F E2           1731         CALL  SCANHL     ;SKIP "PP"
E98D C2 FD DF           1732 PROMP1: JP    NZ,PCOLD  ;COLD START
E990 C3 FA DF           1733         JP    PWARM     ;WARM START
E993                    1734 ;
E993                    1735 ;   PROM PACK EQUATES
E993                    1736 ;
     DFFD               1737 PCOLD:  EQU   0DFFDH
     DFFA               1738 PWARM:  EQU   0DFFAH
E993                    1739 ;
E993                    1740 ;
E993                    1741 ;
E993                    1742 ;
E993                    1743 ;
E993                    1744 ;       CENTRONICS PRINTER DRIVER
E993                    1745 ;
E993                    1746 ;
     E993               1747 CENDRV: EQU   $
E993                    1748 ;
E993 F5                 1749         PUSH  AF
E994 CD 1B E0           1750         CALL  VIDEO
E997 FE 0A              1751         CP    LF
E999 28 14              1752         JR    Z,CENGBK
E99B F5                 1753         PUSH  AF
E99C DB FF              1754 CENBSY: IN    A,(0FFH)
E99E CB 7F              1755         BIT   7,A
E9A0 20 FA              1756         JR    NZ,CENBSY
E9A2 F1                 1757         POP   AF
E9A3 F6 80              1758         OR    80H
E9A5 D3 FF              1759         OUT   (0FFH),A
E9A7 E6 7F              1760         AND   7FH
E9A9 D3 FF              1761         OUT   (0FFH),A
E9AB F6 80              1762         OR    80H
E9AD D3 FF              1763         OUT   (0FFH),A
E9AF F1                 1764 CENGBK: POP   AF
E9B0 C9                 1765         RET
```

OMITS LF's.

CENTRX1 [Send LF]

Centrx2 [Skip LF]

"No"

STROBE ROUTINE

Sets Bit 7 to 1

Send out

sets Bit 7 to 0

Sends out

Bit 7 to 1

Sends out

To modify for Epson 8 bit see SA.4(2): p41 (?) No strobe

Note: JMP CENTRX1 or CENTRX2 need PUSH AF 1st

[Can't use CALL - stack confused by PUSH before call]

```
E9B1                    1767 ;
E9B1                    1768 ;
E9B1                    1769 ;
E9B1                    1770 ;      VIDEO DRIVER ROUTINES
E9B1                    1771 ;
E9B1                    1772 ;
E9B1                    1773 ;
E9B1                    1774 ;  INITIALIZE VIDEO BOARD
E9B1                    1775 ;
     E9B1               1776 VIDINT: EQU    $
E9B1 21 80 F0           1777         LD     HL,VID
E9B4 3E F8              1778         LD     A,TOPHRG
E9B6 36 20              1779 CLR1:   LD     (HL),SPACE
E9B8 23                 1780         INC    HL
E9B9 BC                 1781         CP     H
E9BA 20 FA              1782         JR     NZ,CLR1
E9BC 65                 1783         LD     H,L
E9BD FD 75 68           1784         LD     (IY+LINE),L
E9C0 FD 74 69           1785         LD     (IY+LINE+1),H
E9C3 FD 75 6A           1786         LD     (IY+CHR),L
E9C6 FD 74 6B           1787         LD     (IY+CHR+1),H
E9C9 CD 10 EB           1788         CALL   WCSET      ;MOVE USER CHR SET
E9CC                    1789 ;
E9CC                    1790 ;  WRITE CURSOR ROUTINE
E9CC                    1791 ;
     E9CC               1792 WCUR:   EQU    $
E9CC CD D6 E9           1793         CALL   PTRSET
E9CF 7E                 1794         LD     A,(HL)
E9D0 FD 77 67           1795         LD     (IY+VDHLD),A
E9D3 36 5F              1796         LD     (HL),05FH
E9D5 C9                 1797         RET
E9D6                    1798 ;
E9D6                    1799 ;    SET CURSOR POINTER ROUTINE
E9D6                    1800 ;
     E9D6               1801 PTRSET: EQU    $
E9D6 21 80 F0           1802         LD     HL,VID
E9D9 FD 5E 68           1803         LD     E,(IY+LINE)
E9DC FD 56 69           1804         LD     D,(IY+LINE+1)
E9DF 19                 1805         ADD    HL,DE
E9E0 FD 5E 6A           1806         LD     E,(IY+CHR)
E9E3 FD 56 6B           1807         LD     D,(IY+CHR+1)
E9E6 19                 1808         ADD    HL,DE
E9E7 C9                 1809         RET
E9E8                    1810 ;
E9E8                    1811 ;     REPLACE CHARACTER UNDER CURSOR
E9E8                    1812 ;
     E9E8               1813 REC:    EQU    $
E9E8 CD D6 E9           1814         CALL   PTRSET
E9EB FD 7E 67           1815         LD     A,(IY+VDHLD)
E9EE 77                 1816         LD     (HL),A
E9EF C9                 1817         RET
```

```
E9F0                    1819 ;
E9F0                    1820 ;
E9F0                    1821 ;
E9F0                    1822 ;      VIDEO DRIVER ENTRY POINT
E9F0                    1823 ;
E9F0                    1824 ;
E9F0                    1825 ;
     E9F0               1826 CHROT1: EQU   $
E9F0 FD E5              1827         PUSH  IY
E9F2 CD A2 E1           1828         CALL  GETIY
E9F5 F5                 1829         PUSH  AF
E9F6 C5                 1830         PUSH  BC
E9F7 D5                 1831         PUSH  DE
E9F8 E5                 1832         PUSH  HL
E9F9 4F                 1833         LD    C,A
E9FA CD E8 E9           1834         CALL  REC        ;REPLACE CURSOR
E9FD 79                 1835         LD    A,C
E9FE FE 0C              1836         CP    0CH        ;FORM FEED
EA00 28 43              1837         JR    Z,FRMFED
EA02 FE 0D              1838         CP    CR         ;CAR RET
EA04 28 44              1839         JR    Z,CARRET
EA06 FE 0A              1840         CP    LF         ;LINE FEED
EA08 28 45              1841         JR    Z,LINFED
EA0A FE 17              1842         CP    CNTRLW
EA0C CA A3 EA           1843         JP    Z,CURUP
EA0F FE 1A              1844         CP    CNTRLZ
EA11 28 3C              1845         JR    Z,LINFED
EA13 FE 01              1846         CP    CNTRLA
EA15 CA BA EA           1847         JP    Z,CURLFT
EA18 FE 13              1848         CP    CNTRLS
EA1A 28 18              1849         JR    Z,CURRGT
EA1C FE 08              1850         CP    CNTRLH     ;BACKSPACE?
EA1E 28 72              1851         JR    Z,BAKSPC
EA20 FE 11              1852         CP    CNTRLQ     ;HOME?
EA22 CA C3 EA           1853         JP    Z,HOMECU
EA25 FE 20              1854         CP    SPACE
EA27 30 0A              1855         JR    NC,OKDATA
EA29 CD CC E9           1856         CALL  WCUR
EA2C                    1857 ;
     EA2C               1858 RETURN: EQU   $
EA2C E1                 1859         POP   HL
EA2D D1                 1860         POP   DE
EA2E C1                 1861         POP   BC
EA2F F1                 1862         POP   AF
EA30 FD E1              1863         POP   IY
EA32 C9                 1864         RET
EA33                    1865 ;
EA33                    1866 ;  DATA OK FOR DISPLAY
EA33                    1867 ;
     EA33               1868 OKDATA: EQU   $
EA33 71                 1869         LD    (HL),C
     EA34               1870 CURRGT: EQU   $
EA34 13                 1871         INC   DE
EA35 7B                 1872         LD    A,E
EA36 E6 3F              1873         AND   3FH
EA38 28 06              1874         JR    Z,NXLOC
EA3A FD 73 6A           1875 OKDAT1: LD    (IY+CHR),E
EA3D FD 72 6B           1876         LD    (IY+CHR+1),D
```

```
EA40  CD CC E9          1877 NXLOC:  CALL   WCUR
EA43  18 E7             1878         JR     RETURN
EA45                    1879 ;
EA45                    1880 ;  FORM FEED
EA45                    1881 ;
      EA45              1882 FRMFED: EQU    $
EA45  CD B1 E9          1883         CALL   VIDINT
EA48  18 E2             1884         JR     RETURN
EA4A                    1885 ;
EA4A                    1886 ;  CARRIAGE RETURN
EA4A                    1887 ;
      EA4A              1888 CARRET: EQU    $
EA4A  11 00 00          1889         LD     DE,0
EA4D  18 EB             1890         JR     OKDAT1
EA4F                    1891 ;
EA4F                    1892 ;    LINE FEED ROUTINE
EA4F                    1893 ;
      EA4F              1894 LINFED: EQU    $
EA4F  FD 5E 68          1895         LD     E,(IY+LINE)
EA52  FD 56 69          1896         LD     D,(IY+LINE+1)
EA55  7B                1897         LD     A,E
EA56  E6 C0             1898         AND    0C0H
EA58  CB 07             1899         RLC    A
EA5A  CB 07             1900         RLC    A
EA5C  CB 22             1901         SLA    D
EA5E  CB 22             1902         SLA    D
EA60  B2                1903         OR     D
EA61  FE 1D             1904         CP     1DH
EA63  28 15             1905         JR     Z,LLN
EA65  FD 6E 68          1906         LD     L,(IY+LINE)
EA68  FD 66 69          1907         LD     H,(IY+LINE+1)
EA6B  11 40 00          1908         LD     DE,64
EA6E  19                1909         ADD    HL,DE
EA6F  FD 75 68          1910         LD     (IY+LINE),L
EA72  FD 74 69          1911         LD     (IY+LINE+1),H
EA75  CD CC E9          1912         CALL   WCUR
EA78  18 B2             1913         JR     RETURN
EA7A  11 80 F0          1914 LLN:    LD     DE,VID
EA7D  21 C0 F0          1915         LD     HL,VID+64
EA80  01 40 07          1916         LD     BC,2048-192
EA83  ED B0             1917         LDIR
EA85  3E BF             1918 LLN1:   LD     A,0BFH
EA87  36 20             1919         LD     (HL),SPACE
EA89  2B                1920         DEC    HL
EA8A  BD                1921         CP     L
EA8B  20 F8             1922         JR     NZ,LLN1
EA8D  CD CC E9          1923         CALL   WCUR
EA90  18 9A             1924         JR     RETURN
EA92                    1925 ;
EA92                    1926 ;    BACKSPACE ROUTINE
EA92                    1927 ;
      EA92              1928 BAKSPC: EQU    $
EA92  3E 01             1929         LD     A,CNTRLA
EA94  CD 45 E0          1930         CALL   CHROUT
EA97  3E 20             1931         LD     A,SPACE
EA99  CD 45 E0          1932         CALL   CHROUT
EA9C  3E 01             1933         LD     A,CNTRLA
EA9E  CD 45 E0          1934         CALL   CHROUT
```

```
EAA1  18 89              1935          JR     RETURN
EAA3                     1936 ;
EAA3                     1937 ;  CURSOR UP ROUTINE
EAA3                     1938 ;
      EAA3               1939 CURUP:   EQU    $
EAA3  FD 5E 68           1940          LD     E,(IY+LINE)
EAA6  FD 56 69           1941          LD     D,(IY+LINE+1)
EAA9  7B                 1942          LD     A,E
EAAA  B2                 1943          OR     D
EAAB  28 E3              1944          JR     Z,BAKSPC-2
EAAD  EB                 1945          EX     DE,HL
EAAE  11 C0 FF           1946          LD     DE,-64
EAB1  19                 1947          ADD    HL,DE
EAB2  FD 75 68           1948          LD     (IY+LINE),L
EAB5  FD 74 69           1949          LD     (IY+LINE+1),H
EAB8  18 86              1950          JR     NXLOC
EABA                     1951 ;
EABA                     1952 ;  CURSOR LEFT ROUTINE
EABA                     1953 ;
      EABA               1954 CURLFT:  EQU    $
EABA  7A                 1955          LD     A,D
EABB  B3                 1956          OR     E
EABC  CA 2C EA           1957          JP     Z,RETURN
EABF  1B                 1958          DEC    DE
EAC0  C3 3A EA           1959          JP     OKDAT1
EAC3                     1960 ;
EAC3                     1961 ;      HOME UP CURSOR ROUTINE
EAC3                     1962 ;
      EAC3               1963 HOMECU:  EQU    $
EAC3  FD 36 68 00        1964          LD     (IY+LINE),0
EAC7  FD 36 69 00        1965          LD     (IY+LINE+1),0;HOME UP LINE COUNTER
EACB  11 00 00           1966          LD     DE,0
EACE  C3 3A EA           1967          JP     OKDAT1     ;GO HOME UP CHR AND RET
```

```
EAD1                    1969 ;
EAD1                    1970 ;
EAD1                    1971 ;
EAD1                    1972 ;      KEYBOARD QUICK CHECK
EAD1                    1973 ;
EAD1                    1974 ;  SCANS FOR :   CONTROL C
EAD1                    1975 ;                ESCAPE
EAD1                    1976 ;                RUN / STOP
EAD1                    1977 ;
EAD1                    1978 ;
     EAD1               1979 QUIK:    EQU   $
     EAD1               1980 ESCCHK:  EQU   $           ;FOR PREVIOUS ROUTINES
EAD1 FD E5              1981          PUSH  IY
EAD3 CD A2 E1           1982          CALL  GETIY
EAD6 FD 7E 45           1983          LD    A,(IY+CMTRFG);GET MOTOR FLAG
EAD9 F6 01              1984          OR    1             ;SET MASK
EADB D3 FE              1985          OUT   KYPORT,A
EADD DB FE              1986          IN    A,KYPORT
EADF CB 67              1987          BIT   4,A
EAE1 28 13              1988          JR    Z,QUIK1
EAE3 FD 7E 45           1989          LD    A,(IY+CMTRFG);GET FLAGS
EAE6 E6 F0              1990          AND   0F0H          ;MASK FOR ZERO
EAE8 D3 FE              1991          OUT   KYPORT,A
EAEA DB FE              1992          IN    A,KYPORT
EAEC CB 47              1993          BIT   0,A
EAEE 28 06              1994          JR    Z,QUIK1
EAF0 CB 57              1995          BIT   2,A
EAF2 28 06              1996          JR    Z,QUIK3
EAF4 18 11              1997          JR    QUKRT1
EAF6 3E 1B              1998 QUIK1:   LD    A,ESC         ;FORM ESCAPE
EAF8 18 12              1999          JR    QUKRET
EAFA FD 7E 45           2000 QUIK3:   LD    A,(IY+CMTRFG);GET MOTOR FLAGS
EAFD F6 03              2001          OR    3             ;SET MASK BITS
EAFF D3 FE              2002          OUT   KYPORT,A
EB01 DB FE              2003          IN    A,KYPORT
EB03 CB 47              2004          BIT   0,A
EB05 28 03              2005          JR    Z,QUIK4
EB07 AF                 2006 QUKRT1:  XOR   A
EB08 18 02              2007          JR    QUKRET
EB0A 3E 03              2008 QUIK4:   LD    A,CNTRLC
EB0C B7                 2009 QUKRET:  OR    A
EB0D FD E1              2010          POP   IY
EB0F C9                 2011          RET
```

BIT 3 = 0000 0011

IBM = 0001 1011

Row 1

Reset Bit 7 I/O Port

Row 1, Col 4 = (SEL)

Row 0

Row 0, Col 0 = STOP

Row 0 Col 2 = CTRL

add 0

Row 3

Row 3, Col 0 = 'C'

→ No change

If (IY + 45H) has bit 7 = 1 then OR 1, AND 0F0H, and OR 3 will not reset it to 0. So for RS232 can load byte with Bit 7 = 1 in (IY + 45H)

```
EB10                    2013 ;
EB10                    2014 ;
EB10                    2015 ;
EB10                    2016 ;      WRITE USER CHARACTER SET
EB10                    2017 ;
EB10                    2018 ;
EB10                    2019 ;
      EB10              2020 WCSET:   EQU    $
EB10  21 FE ED          2021          LD     HL,CHRSET
EB13  11 00 FC          2022          LD     DE,0FC00H
EB16  01 00 02          2023          LD     BC,512
EB19  ED B0             2024          LDIR
EB1B  C9                2025          RET
```

```
                                2027 ;
                                2028 ;
                                2029 ;
EB1C                            2030 ;      KEYBOARD INPUT ROUTINE
EB1C                            2031 ;
EB1C                            2032 ;
EB1C                            2033 ;
     EB1C                       2034 CHRIN1: EQU   $
EB1C                            2035 ;*************************************
EB1C                            2036 ;KEYBOARD INPUT ROUTINE
EB1C                            2037 ;VERSION 1.0    4/17/78
     00FE                       2038 KYPORT: EQU   0FEH       ;ON EXIDY COMPUTER
     0100                       2039 DTIME:  EQU   100H       ;TO BE DETERMINED
EB1C                            2040 ;*************************************
EB1C                            2041 ;
EB1C                            2042 ;
EB1C                            2043 ;INITIALIZATION
EB1C                            2044 ;
EB1C FD E5                      2045 KEYBD:  PUSH  IY
EB1E CD A2 E1                   2046         CALL  GETIY
EB21 C5                         2047         PUSH  BC         ;PUSH REGS ON STACK
EB22 D5                         2048         PUSH  DE
EB23 E5                         2049         PUSH  HL
EB24 DD E5                      2050         PUSH  IX
EB26 3E 01                      2051         LD    A,1  **    ;LOOK FOR REPEAT KEY
EB28 D3 FE                      2052         OUT   KYPORT,A   ;SEND MASK
EB2A DB FE                      2053         IN    A,KYPORT
EB2C CB 4F                      2054         BIT   1,A        ;REPEAT?
EB2E 20 0E                      2055         JR    NZ,NORPT   ;NO-GO ON
EB30 01 88 13                   2056         LD    BC,5000    ;DELAY FOR REPEAT
EB33 0B                         2057 REPET:  DEC   BC
EB34 78                         2058         LD    A,B
EB35 B1                         2059         OR    C          ;DONE?
EB36 20 FB                      2060         JR    NZ,REPET   ;NO-
EB38 FD 7E 6C                   2061         LD    A,(IY+LSTKEY);GET LAST KEY
EB3B C3 10 EC                   2062         JP    FINEND     ;GO BACK
EB3E AF                         2063 NORPT:  XOR   A          ;CLEAR A
EB3F 0E FE                      2064         LD    C,KYPORT   ;LOAD KEYBOARD PORT NO.
EB41 5F                         2065         LD    E,A        ;CLEAR E
EB42 CB FB                      2066         SET   7,E        ;SET SCAN ONCE FLAG
EB44 16 00                      2067 MLOOP:  LD    D,0        ;CLEAR SPECIAL KEY FLAGS
EB46 42                         2068         LD    B,D        ;CLEAR NEW FLAGS REG
EB47 26 00                      2069         LD    H,0        ;CLEAR SECTION COUNTER
EB49 DD 21 1E EC                2070         LD    IX,INSTBL  ;LOAD INSTRUCTION TABLE POINTER
EB4D ED 61                      2071 SLOOP:  OUT   (C),H      ;OUTPUT SECTION NO.
EB4F 2E 01                      2072         LD    L,1        ;LOAD BIT POSITION REG
EB51 ED 78                      2073 BLOOP:  IN    A,(C)      ;INPUT SECTION BYTE
EB53 A5                         2074         AND   L          ;TEST BIT
EB54 C2 E2 EB                   2075         JP    NZ,ABIT1   ;JUMP IF BIT=1
EB57 E5                         2076         PUSH  HL         ;LOAD DEBOUNCE TIMER
EB58 21 00 01                   2077         LD    HL,DTIME   ;LOAD TIME
EB5B 2D                         2078 DEBOUN: DEC   L          ;COUNT DOWN
EB5C 20 FD                      2079         JR    NZ,DEBOUN
EB5E 25                         2080         DEC   H
EB5F 20 FA                      2081         JR    NZ,DEBOUN
EB61 E1                         2082         POP   HL         ;RESTORE HL
EB62 ED 78                      2083         IN    A,(C)      ;INPUT SECTION BYTE
EB64 A5                         2084         AND   L          ;TEST BIT
```

* Differences from KEYBD or SMRTS

MONITOR VERS 1.1

[SOME INTERNAL JP ADDRESSES ARE CHANGED]

Need to time keyboard interrupt to vertical trace to avoid screen flicker

FD 7E 4S / F6 01 / OR 01

LD A,(IY+0)

LD E,80H

1E 80

FD 7E YS / E6 F0 / 67

LD A,(IY+0) / AND F0H / LD H,A

Row 1

Row 1, Col 1 = Repeat

EB2B

EB44

EB46

EB49

EB4F

Outputs 0 (FE) = Row 0

Col No.

OUTPUT MASK → ROW NO.

INPUT → COL NO.

```
EB65  C2 E2 EB        2085           JP    NZ,ABIT1   ;JUMP IF BIT=1
EB68  DD 56 00        2086           LD    D,(IX+0)   ;LOAD SPECIAL KEY FLAGS
EB6B  CB 7A           2087           BIT   7,D        ;TEST FOR CODED KEY
EB6D  28 1A           2088           JR    Z,CODED    ;JUMP IF CODED KEY
EB6F  CB 62           2089           BIT   4,D        ;TEST FOR GRAPHIC KEY
EB71  28 02           2090           JR    Z,NONGRA   ;JUMP IF NOT GRAPHIC KEY
EB73  CB F0           2091           SET   6,B        ;SET GRAPHIC FLAG
EB75  CB 5A           2092 NONGRA:   BIT   3,D        ;TEST FOR CONTROL KEY
EB77  28 02           2093           JR    Z,NONCON   ;JUMP IF NOT CONTROL KEY
EB79  CB E8           2094           SET   5,B        ;SET CONTROL FLAG
EB7B  CB 52           2095 NONCON:   BIT   2,D        ;TEST FOR SHIFT KEY
EB7D  28 02           2096           JR    Z,NONSHI   ;JUMP IF NOT SHIFT KEY
EB7F  CB E0           2097           SET   4,B        ;SET SHIFT FLAG
EB81  CB 4A           2098 NONSHI:   BIT   1,D        ;TEST FOR SHIFT/LOCK KEY
EB83  28 5D           2099           JR    Z,ABIT1    ;JUMP IF NOT SHIFT/LOCK KEY
EB85  CB D8           2100           SET   3,B        ;SET SHIFT/LOCK FLAG
EB87  18 59           2101           JR    ABIT1
EB89  E5              2102 CODED:    PUSH  HL         ;CALCULATE TABLE POSITION
EB8A  D5              2103           PUSH  DE
EB8B  DD E5           2104           PUSH  IX
EB8D  E1              2105           POP   HL
EB8E  11 1E EC        2106           LD    DE,INSTBL
EB91  B7              2107           OR    A          ;CLEAR CARRY
EB92  ED 52           2108           SBC   HL,DE
EB94                  2109 ;DECIDE WHICH TABLE TO USE
EB94  D1              2110           POP   DE
EB95  CB 70           2111           BIT   6,B        ;TEST FOR GRAPHIC KEY
EB97  28 15           2112           JR    Z,NOGRAP   ;JUMP IF NO GRAPHIC KEY
EB99  CB 72           2113           BIT   6,D        ;TEST FOR NONGRAPHIC CHAR.
EB9B  28 11           2114           JR    Z,NOGRAP   ;JUMP IF NOT GRAPHIC CHAR.
EB9D  D5              2115           PUSH  DE         ;CALCULATE TABLE POINTER
EB9E  11 6E EC        2116           LD    DE,GRATBL  ;LOAD GRAPHIC TABLE START
EBA1  19              2117           ADD   HL,DE
EBA2  7E              2118           LD    A,(HL)     ;LOAD A WITH CODE
EBA3  CB FF           2119           SET   7,A        ;SET GRAPHIC BIT
EBA5  D1              2120           POP   DE         ;TEST FOR SHIFT
EBA6  CB 60           2121           BIT   4,B
EBA8  28 26           2122           JR    Z,FINOP    ;JUMP IF NO SHIFT
EBAA  CB F7           2123           SET   6,A        ;SET SHIFT BIT
EBAC  18 22           2124           JR    FINOP      ;JUMP TO FINISH OP.
EBAE  D5              2125 NOGRAP:   PUSH  DE
EBAF  CB 68           2126           BIT   5,B        ;TEST FOR CONTROL KEY
EBB1  28 05           2127           JR    Z,SKIP1    ;SKIP IF NOT CONTROL KEY
EBB3  11 BE EC        2128           LD    DE,CONTBL  ;LOAD CONTROL TABLE START
EBB6  18 15           2129           JR    SKIP4
EBB8  CB 60           2130 SKIP1:    BIT   4,B        ;TEST FOR SHIFT KEY
EBBA  28 05           2131           JR    Z,SKIP2    ;SKIP IF NOT SHIFT KEY
EBBC  11 0E ED        2132           LD    DE,SHITBL  ;LOAD SHIFT TABLE START
EBBF  18 0C           2133           JR    SKIP4
EBC1  CB 58           2134 SKIP2:    BIT   3,B        ;TEST FOR SHIFT/LOCK KEY
EBC3  28 05           2135           JR    Z,SKIP3    ;SKIP IF NOT SHIFT/LOCK KEY
EBC5  11 5E ED        2136           LD    DE,SLOTBL  ;LOAD SHIFT/LOCK TABLE START
EBC8  18 03           2137           JR    SKIP4
EBCA  11 AE ED        2138 SKIP3:    LD    DE,UNSTBL  ;LOAD UNSHIFT TABLE START
EBCD  19              2139 SKIP4:    ADD   HL,DE      ;SETUP POINTER
EBCE  D1              2140           POP   DE
EBCF  7E              2141           LD    A,(HL)     ;LOAD A WITH CODE
EBD0  CB E3           2142 FINOP:    SET   4,E        ;SET END OF SCAN FLAG
```

EBD6 — 1E 1C

LD E,1CH ; Probably adjust Bits 2,3,4, allotance

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EBD2  CB DB          2143          SET   3,E        ;SET SECTION FLAG
EBD4  CB D3          2144          SET   2,E        ;SET BIT POSITION FLAG
EBD6  CB BB          2145          RES   7,E        ;RESET SCAN ONCE FLAG
EBD8  E1             2146          POP   HL         ;WAIT FOR KEY TO BE RELEASED
EBD9  F5             2147          PUSH  AF
EBDA  ED 78          2148 WAITK:   IN    A,(C)      ;INPUT SECTION BYTE
EBDC  A5             2149          AND   L
EBDD  28 FB          2150          JR    Z,WAITK
EBDF  F1             2151          POP   AF
EBE0  18 0B          2152          JR    BITEND
EBE2  CB 05          2153 ABIT1:   RLC   L          ;SHIFT L
EBE4  3E 20          2154          LD    A,20H      ;TEST FOR LAST BIT POSITION
EBE6  BD             2155          CP    L
EBE7  20 02          2156          JR    NZ,SKIP5   ;SKIP IF NOT END
EBE9  CB D3          2157          SET   2,E        ;SET BIT POSITION FLAG
EBEB  DD 23          2158 SKIP5:   INC   IX         ;INCREMENT TABLE POINTER
EBED  CB 53          2159 BITEND:  BIT   2,E        ;TEST FOR BIT END
EBEF  CA 51 EB       2160          JP    Z,BLOOP
EBF2  CB 93          2161          RES   2,E        ;RESET BIT FLAG
EBF4  CB 5B          2162          BIT   3,E        ;TEST FOR SECTION FLAG
EBF6  20 07          2163          JR    NZ,SECEND  ;JUMP TO SECTION END
EBF8  24             2164          INC   H          ;INCREMENT SECTION
EBF9  3E 10          2165 LD A,H   LD    A,16       ;TEST FOR END
EBFB  BC             2166 AND 0FH  CP    H
EBFC  C2 4D EB       2167          JP    NZ,SLOOP   ;STAY IN LOOP
EBFF  CB 9B          2168 SECEND:  RES   3,E        ;RESET SECTION FLAG
EC01  37             2169          SCF              ;SET CARRY
EC02  CB 7B          2170          BIT   7,E        ;TEST SCAN ONCE FLAG
EC04  28 03          2171          JR    Z,SKIP6
EC06  AF             2172          XOR   A          ;CLEAR A AND CARRY
EC07  CB E3          2173          SET   4,E        ;SET END OF SCAN
EC09  CB 63          2174 SKIP6:   BIT   4,E        ;TEST FOR END OF SCAN
EC0B  20 03          2175          JR    NZ,FINEND  ;JUMP TO FINISH TEST
EC0D  C3 44 EB       2176          JP    MLOOP
EC10  DD E1          2177 FINEND:  POP   IX         ;RESTORE REGISTERS
EC12  E1             2178          POP   HL
EC13  D1             2179          POP   DE
EC14  C1             2180          POP   BC
EC15  B7             2181          OR    A
EC16  28 03          2182          JR    Z,KEYRET   ;NO CHAR TODAY
EC18  FD 77 6C       2183          LD    (IY+LSTKEY),A;SAVE IN CASE REPEAT
EC1B  FD E1          2184 KEYRET:  POP   IY
EC1D  C9             2185          RET              ;RETURN FROM SUBROUTINE
EC1E                 2186 ;
EC1E  00 90 88 82    2187 INSTBL:  DB    0,90H,88H,82H,84H ;INSTRUCTION TABLE(0)
      84
EC23                 2188 ;
EC23  40 80 00 40    2189          DB    40H,80H,0,40H,0 ;(1)
      00
EC28  40 40 40 40    2190          DB    40H,40H,40H,40H,40H ;(2)
      40
EC2D  40 40 40 40    2191          DB    40H,40H,40H,40H,40H ;(3)
      40
EC32  40 40 40 40    2192          DB    40H,40H,40H,40H,40H ;(4)
      40
EC37  40 40 40 40    2193          DB    40H,40H,40H,40H,40H ;(5)
      40
EC3C  40 40 40 40    2194          DB    40H,40H,40H,40H,40H ;(6)
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                40
EC41  40 40 40 40       2195            DB      40H,40H,40H,40H,40H ;(7)
                40
EC46  40 40 40 40       2196            DB      40H,40H,40H,40H,40H ;(8)
                40
EC4B  40 40 40 40       2197            DB      40H,40H,40H,40H,40H ;(9)
                40
EC50  40 40 40 40       2198            DB      40H,40H,40H,40H,40H ;(A)
                40
EC55  40 00 00 40       2199            DB      40H,0,0,40H,40H ;(B)
                40
EC5A  40 40 40 40       2200            DB      40H,40H,40H,40H,0 ;(C)
                00
EC5F  40 40 40 40       2201            DB      40H,40H,40H,40H,40H ;(D)
                40
EC64  40 40 00 40       2202            DB      40H,40H,0,40H,40H ;(E)
                40
EC69  00 00 00 40       2203            DB      0,0,0,40H,40H ;(F)
                40
EC6E  00 00 00 00       2204 GRATBL:    DB      0,0,0,0,0 ;GRAPHIC TABLE(0)
                00
EC73  0C 00 00 0D       2205            DB      0CH,0,0,0DH,0 ;(1)
                00
EC78  28 27 1A 0E       2206            DB      28H,27H,1AH,0EH,0 ;(2)
                00
EC7D  29 1C 1B 0F       2207            DB      29H,1CH,1BH,0FH,1 ;(3)
                01
EC82  1D 11 10 03       2208            DB      1DH,11H,10H,3,2 ;(4)
                02
EC87  2B 2A 1E 12       2209            DB      2BH,2AH,1EH,12H,4 ;(5)
                04
EC8C  2D 2C 1F 13       2210            DB      2DH,2CH,1FH,13H,5 ;(6)
                05
EC91  21 15 20 14       2211            DB      21H,15H,20H,14H,6 ;(7)
                06
EC96  2E 22 16 08       2212            DB      2EH,22H,16H,8,7 ;(8)
                07
EC9B  30 2F 23 17       2213            DB      30H,2FH,23H,17H,9 ;(9)
                09
ECA0  25 24 19 18       2214            DB      25H,24H,19H,18H,0AH ;(A)
                0A
ECA5  26 00 00 0C       2215            DB      26H,0,0,0CH,0BH ;(B)
                0B
ECAA  3C 38 35 31       2216            DB      3CH,38H,35H,31H,0 ;(C)
                00
ECAF  3D 39 36 33       2217            DB      3DH,39H,36H,33H,32H ;(D)
                32
ECB4  3E 3A 00 37       2218            DB      3EH,3AH,0,37H,34H ;(E)
                34
ECB9  00 00 00 3F       2219            DB      0,0,0,3FH,3BH ;(F)
                3B
ECBE  03 00 00 00       2220 CONTBL:    DB      3,0,0,0,0 ;CONTROL TABLE(0)
                00
ECC3  0C 00 20 0B       2221            DB      0CH,0,20H,0BH,1BH ;(1)
                1B
ECC8  18 1A 01 11       2222            DB      18H,1AH,1,11H,31H ;(2)
                31
ECCD  03 04 13 17       2223            DB      3,4,13H,17H,32H ;(3)
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                32
ECD2  06 12 05 34       2224            DB      6,12H,5,34H,33H ;(4)
                33
ECD7  02 16 07 14       2225            DB      2,16H,7,14H,35H ;(5)
                35
ECDC  0D 0E 08 19       2226            DB      0DH,0EH,8,19H,36H ;(6)
                36
ECE1  0B 09 0A 15       2227            DB      0BH,9,0AH,15H,37H ;(7)
                37
ECE6  2C 0C 0F 39       2228            DB      2CH,0CH,0FH,39H,38H ;(8)
                38
ECEB  2F 2E 3B 10       2229            DB      2FH,2EH,3BH,10H,30H ;(9)
                30
ECF0  1C 00 1D 1B       2230            DB      1CH,0,1DH,1BH,3AH ;(A)
                3A
ECF5  1F 0D 0A 1E       2231            DB      1FH,0DH,0AH,1EH,2DH ;(B)
                2D
ECFA  2B 2A 2F 2D       2232            DB      2BH,2AH,2FH,2DH,20H ;(C)
                20
ECFF  30 31 01 17       2233            DB      30H,31H,01H,17H,37H ;(D)
                37
ED04  2E 1A 11 13       2234            DB      2EH,1AH,11H,13H,39H ;(E)
                39
ED09  00 00 00 3D       2235            DB      0,0,0,3DH,33H ;(F)
                33
ED0E  03 00 00 00       2236 SHITBL:    DB      3,0,0,0,0 ;SHIFT TABLE(0)
                00
ED13  0C 00 20 09       2237            DB      0CH,0,20H,9,1BH ;(1)
                1B
ED18  58 5A 41 51       2238            DB      58H,5AH,41H,51H,21H ;(2)
                21
ED1D  43 44 53 57       2239            DB      43H,44H,53H,57H,22H ;(3)
                22
ED22  46 52 45 24       2240            DB      46H,52H,45H,24H,23H ;(4)
                23
ED27  42 56 47 54       2241            DB      42H,56H,47H,54H,25H ;(5)
                25
ED2C  4D 4E 48 59       2242            DB      4DH,4EH,48H,59H,26H ;(6)
                26
ED31  4B 49 4A 55       2243            DB      4BH,49H,4AH,55H,27H ;(7)
                27
ED36  3C 4C 4F 29       2244            DB      3CH,4CH,4FH,29H,28H ;(8)
                28
ED3B  3F 3E 2B 50       2245            DB      3FH,3EH,2BH,50H,30H ;(9)
                30
ED40  7C 60 7D 7B       2246            DB      7CH,60H,7DH,7BH,2AH ;(A)
                2A
ED45  7F 0D 0A 7E       2247            DB      7FH,0DH,0AH,7EH,3DH ;(B)
                3D
ED4A  2B 2A 2F 2D       2248            DB      2BH,2AH,2FH,2DH,20H ;(C)
                20
ED4F  30 31 01 17       2249            DB      30H,31H,01H,17H,37H ;(D)
                37
ED54  2E 1A 11 13       2250            DB      2EH,1AH,11H,13H,39H ;(E)
                39
ED59  00 00 00 3D       2251            DB      0,0,0,3DH,33H ;(F)
                33
ED5E  1B 00 00 00       2252 SLOTBL:    DB      1BH,0,0,0,0 ;SHIFT/LOCK TABLE(0)
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                00
ED63  0C 00 20 0B       2253            DB    0CH,0,20H,0BH,1BH ;(1)
                1B
ED68  58 5A 41 51       2254            DB    58H,5AH,41H,51H,31H ;(2)
                31
ED6D  43 44 53 57       2255            DB    43H,44H,53H,57H,32H ;(3)
                32
ED72  46 52 45 34       2256            DB    46H,52H,45H,34H,33H ;(4)
                33
ED77  42 56 47 54       2257            DB    42H,56H,47H,54H,35H ;(5)
                35
ED7C  4D 4E 48 59       2258            DB    4DH,4EH,48H,59H,36H ;(6)
                36
ED81  4B 49 4A 55       2259            DB    4BH,49H,4AH,55H,37H ;(7)
                37
ED86  2C 4C 4F 39       2260            DB    2CH,4CH,4FH,39H,38H ;(8)
                38
ED8B  2F 2E 3B 50       2261            DB    2FH,2EH,3BH,50H,30H ;(9)
                30
ED90  5C 40 5D 5B       2262            DB    5CH,40H,5DH,5BH,3AH ;(A)
                3A
ED95  5F 0D 0A 5E       2263            DB    5FH,0DH,0AH,5EH,2DH ;(B)
                2D
ED9A  2B 2A 2F 2D       2264            DB    2BH,2AH,2FH,2DH,20H ;(C)
                20
ED9F  30 31 34 38       2265            DB    30H,31H,34H,38H,37H ;(D)
                37
EDA4  2E 32 35 36       2266            DB    2EH,32H,35H,36H,39H ;(E)
                39
EDA9  00 00 00 3D       2267            DB    0,0,0,3DH,33H ;(F)
                33
EDAE  1B 00 00 00       2268 UNSTBL:    DB    1BH,0,0,0,0 ;UNSHIFTED TABLE(0)
                00
EDB3  0C 00 20 0B       2269            DB    0CH,0,20H,0BH,1BH ;(1)
                1B
EDB8  78 7A 61 71       2270            DB    78H,7AH,61H,71H,31H ;(2)
                31
EDBD  63 64 73 77       2271            DB    63H,64H,73H,77H,32H ;(3)
                32
EDC2  66 72 65 34       2272            DB    66H,72H,65H,34H,33H ;(4)
                33
EDC7  62 76 67 74       2273            DB    62H,76H,67H,74H,35H ;(5)
                35
EDCC  6D 6E 68 79       2274            DB    6DH,6EH,68H,79H,36H ;H6)
                36
EDD1  6B 69 6A 75       2275            DB    6BH,69H,6AH,75H,37H ;(7)
                37
EDD6  2C 6C 6F 39       2276            DB    2CH,6CH,6FH,39H,38H ;(8)
                38
EDDB  2F 2E 3B 70       2277            DB    2FH,2EH,3BH,70H,30H ;(9)
                30
EDE0  5C 40 5D 5B       2278            DB    5CH,40H,5DH,5BH,3AH ;(A)
                3A
EDE5  5F 0D 0A 5E       2279            DB    5FH,0DH,0AH,5EH,2DH ;(B)
                2D
EDEA  2B 2A 2F 2D       2280            DB    2BH,2AH,2FH,2DH,20H ;(C)
                20
EDEF  30 31 34 38       2281            DB    30H,31H,34H,38H,37H ;(D)
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        37
EDF4    2E 32 35 36     2282        DB      2EH,32H,35H,36H,39H ;(E)
        39
EDF9    00 00 00 3D     2283        DB      0,0,0,3DH,33H ;(F)
        33
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```
EDFE                    2285 ;
EDFE                    2286 ;
EDFE                    2287 ;
EDFE                    2288 ;      USER DEFINABLE CHARACTER SET
EDFE                    2289 ;
EDFE                    2290 ;
EDFE                    2291 ;
     EDFE               2292 CHRSET: EQU    $
EDFE 80 80 80 80        2293         DB     80H,80H,80H,80H,80H,80H,80H,80H
     80 80 80 80
EE06 40 40 40 40        2294         DB     40H,40H,40H,40H,40H,40H,40H,40H
     40 40 40 40
EE0E 20 20 20 20        2295         DB     20H,20H,20H,20H,20H,20H,20H,20H
     20 20 20 20
EE16 10 10 10 10        2296         DB     10H,10H,10H,10H,10H,10H,10H,10H
     10 10 10 10
EE1E 00 3C 7E FF        2297         DB     00H,3CH,7EH,0FFH,0FFH,7EH,3CH,00H
     FF 7E 3C 00
EE26 04 04 04 04        2298         DB     4,4,4,4,4,4,4,4
     04 04 04 04
EE2E 02 02 02 02        2299         DB     2,2,2,2,2,2,2,2
     02 02 02 02
EE36 01 01 01 01        2300         DB     1,1,1,1,1,1,1,1
     01 01 01 01
EE3E 00 3C 42 81        2301         DB     0,3CH,42H,81H,81H,42H,3CH,0
     81 42 3C 00
EE46 FF 00 00 00        2302         DB     0FFH,0,0,0,0,0,0,0
     00 00 00 00
EE4E 00 FF 00 00        2303         DB     0,0FFH,0,0,0,0,0,0
     00 00 00 00
EE56 00 00 FF 00        2304         DB     0,0,0FFH,0,0,0,0,0
     00 00 00 00
EE5E 00 00 00 FF        2305         DB     0,0,0,0FFH,0,0,0,0
     00 00 00 00
EE66 00 00 00 71        2306         DB     0,0,0,71H,0BEH,24H,24H,24H
     BE 24 24 24
EE6E 81 42 24 18        2307         DB     81H,42H,24H,18H,18H,24H,42H,81H
     18 24 42 81
EE76 00 00 00 00        2308         DB     0,0,0,0,1,6,8,8
     01 06 08 08
EE7E 00 00 00 00        2309         DB     0,0,0,0,0C0H,30H,8,8
     C0 30 08 08
EE86 FF 80 80 80        2310         DB     0FFH,80H,80H,80H,80H,80H,80H,80H
     80 80 80 80
EE8E FF 01 01 01        2311         DB     0FFH,1,1,1,1,1,1,1
     01 01 01 01
EE96 FF FE FC F8        2312         DB     0FFH,0FEH,0FCH,0F8H,0F0H,0E0H,0C0H,80H
     F0 E0 C0 80
EE9E FF 7F 3F 1F        2313         DB     0FFH,7FH,3FH,1FH,0FH,7,3,1
     0F 07 03 01
EEA6 00 00 00 00        2314         DB     0,0,0,0,0FH,0FH,0FH,0FH
     0F 0F 0F 0F
EEAE 00 00 00 00        2315         DB     0,0,0,0,0F0H,0F0H,0F0H,0F0H
     F0 F0 F0 F0
EEB6 00 00 00 00        2316         DB     0,0,0,0,0FFH,0,0,0
     FF 00 00 00
EEBE 10 38 7C FE        2317         DB     10H,38H,7CH,0FEH,0FEH,7CH,10H,38H
     FE 7C 10 38
```

```
EEC6  00 66 FF FF      2318        DB    0,66H,0FFH,0FFH,7EH,3CH,18H,0
      7E 3C 18 00
EECE  08 08 08 06      2319        DB    8,8,8,6,1,0,0,0
      01 00 00 00
EED6  08 08 08 30      2320        DB    8,8,8,30H,0C0H,0,0,0
      C0 00 00 00
EEDE  80 80 80 80      2321        DB    80H,80H,80H,80H,80H,80H,80H,0FFH
      80 80 80 FF
EEE6  01 01 01 01      2322        DB    1,1,1,1,1,1,1,0FFH
      01 01 01 FF
EEEE  80 C0 E0 F0      2323        DB    80H,0C0H,0E0H,0F0H,0F8H,0FCH,0FEH,0FFH
      F8 FC FE FF
EEF6  01 03 07 0F      2324        DB    1,3,7,0FH,1FH,3FH,7FH,0FFH
      1F 3F 7F FF
EEFE  0F 0F 0F 0F      2325        DB    0FH,0FH,0FH,0FH,0,0,0,0
      00 00 00 00
EF06  F0 F0 F0 F0      2326        DB    0F0H,0F0H,0F0H,0F0H,0,0,0,0
      00 00 00 00
EF0E  08 08 08 08      2327        DB    8,8,8,8,8,8,8,8
      08 08 08 08
EF16  18 3C 7E FF      2328        DB    18H,3CH,7EH,0FFH,7EH,3CH,18H,0
      7E 3C 18 00
EF1E  1C 1C 6B 7F      2329        DB    1CH,1CH,6BH,7FH,6BH,8,8,1CH
      6B 08 08 1C
EF26  F0 F0 F0 F0      2330        DB    0F0H,0F0H,0F0H,0F0H,0FH,0FH,0FH,0FH
      0F 0F 0F 0F
EF2E  0F 0F 0F 0F      2331        DB    0FH,0FH,0FH,0FH,0F0H,0F0H,0F0H,0F0H
      F0 F0 F0 F0
EF36  F0 F0 F0 F0      2332        DB    0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H
      F0 F0 F0 F0
EF3E  0F 0F 0F 0F      2333        DB    0FH,0FH,0FH,0FH,0FH,0FH,0FH,0FH
      0F 0F 0F 0F
EF46  FF FF FF FF      2334        DB    0FFH,0FFH,0FFH,0FFH,0,0,0,0
      00 00 00 00
EF4E  00 00 00 00      2335        DB    0,0,0,0,0FFH,0FFH,0FFH,0FFH
      FF FF FF FF
EF56  01 02 04 08      2336        DB    1,2,4,8,10H,20H,40H,80H
      10 20 40 80
EF5E  80 40 20 10      2337        DB    80H,40H,20H,10H,8,4,2,1
      08 04 02 01
EF66  08 08 08 08      2338        DB    8,8,8,8,0FFH,8,8,8
      FF 08 08 08
EF6E  00 00 00 00      2339        DB    0,0,0,0,0,0FFH,0,0
      00 FF 00 00
EF76  00 00 00 00      2340        DB    0,0,0,0,0,0,0FFH,0
      00 00 FF 00
EF7E  00 00 00 00      2341        DB    0,0,0,0,0,0,0,0FFH
      00 00 00 FF
EF86  55 AA 55 AA      2342        DB    55H,0AAH,55H,0AAH,55H,0AAH,55H,0AAH
      55 AA 55 AA
EF8E  08 08 08 08      2343        DB    8,8,8,8,0FFH,0,0,0
      FF 00 00 00
EF96  FF FF 00 00      2344        DB    0FFH,0FFH,0,0,0,0,0,0
      00 00 00 00
EF9E  08 08 08 08      2345        DB    8,8,8,8,0FH,8,8,8
      0F 08 08 08
EFA6  50 A0 50 A0      2346        DB    50H,0A0H,50H,0A0H,50H,0A0H,50H,0A0H
      50 A0 50 A0
```

```
EFAE  C0 C0 C0 C0      2347        DB    0C0H,0C0H,0C0H,0C0H,0C0H,0C0H,0C0H,0C0H
      C0 C0 C0 C0
EFB6  03 03 03 03      2348        DB    3,3,3,3,3,3,3,3
      03 03 03 03
EFBE  00 00 00 00      2349        DB    0,0,0,0,55H,0AAH,55H,0AAH
      55 AA 55 AA
EFC6  08 08 08 08      2350        DB    8,8,8,8,0F8H,8,8,8
      F8 08 08 08
EFCE  00 00 00 00      2351        DB    0,0,0,0,0,0,0FFH,0FFH
      00 00 FF FF
EFD6  00 00 00 00      2352        DB    0,0,0,0,0FFH,8,8,8
      FF 08 08 08
EFDE  00 00 00 00      2353        DB    0,0,0,0,0FH,8,8,8
      0F 08 08 08
EFE6  00 00 00 00      2354        DB    0,0,0,0,0F8H,8,8,8
      F8 08 08 08
EFEE  08 08 08 08      2355        DB    8,8,8,8,0FH,0,0,0
      0F 00 00 00
EFF6  08 08 08 08      2356        DB    8,8,8,8,0F8H,0,0,0
      F8 00 00 00
```

```
EFFE                    2358 ;
EFFE                    2359 ;
EFFE                    2360 ;      END OF PROGRAM!!!!!
EFFE                    2361 ;
EFFE                    2362 ;
                        2363          END
```

CROSS REFERENCE

```
ABIT1    EBE2    2075 2085 2099 2101
ADDCOL   E20F    0936 0960 0979 1645 1696
ADDOUT   E1E8    0233 0239 0512 1281
BADB2    E950    1683
BADBIT   E97C    1706
BADBY2   E966    1711
BADBY3   E96F    1716
BADBYT   E942    1611 1633
BADMSG   E4A1    1715
BAKSPC   EA92    1851 1944
BASLOD   E02D
BASSAV   E02A
BATCH    E858    0814
BATCHF   0043    0071 0319 0437 1516
BITEND   EBED    2152
BKSPC    E175    0331
BLKADJ   E6A9    1206 1324 1462
BLKAJ2   E6B6    1222
BLOOP    EB51    2160
BUFFER   0000    0065
CARRET   EA4A    1839
CENBSY   E99C    1756
CENDRV   E993    1135
CENGBK   E9AF    1752
CHEAD    0047    0075 0647 1112 1118 1119 1171 1172 1184 1185 1186 1198
                 1448
CHECK1   E8DE    1614
CHECK3   E90A    1637
CHR      006A    0084 1786 1787 1806 1807 1875 1876
CHRIN    E030    0112 0322
CHRIN1   EB1C    0117 0216
CHRINR   E041    0129 0149
CHROT1   E9F0    0118 0219
CHROUT   E045    0113 0261 0340 0351 0419 0482 0495 0497 0514 0516 0533
                 0729 0964 1265 1272 1283 1528 1562 1930 1932 1934
CHRSET   EDFE    2021
CKCRC    E74E    0367 1309 1329 1469
CLR1     E9B6    1782
CMOTOF   E027
CMOTON   E024
CMTRFG   0045    0073 0680 0700 1983 1989 2000
CNTRLA   0001    1846 1929 1933
CNTRLC   0003    2008
CNTRLH   0008    0350 1720 1850
CNTRLQ   0011    1852
CNTRLS   0013    1848
CNTRLW   0017    1842
CNTRLZ   001A    1844
CODED    EB89    2088
COLD     E000
CONTBL   ECBE    2128
CONV     E23D    0919 0926 0978 0990 1007 1011 1016 1030 1046 1081 1169
                 1175 1191 1243 1413 1419 1581 1585
CONV1    E240    0619
CONV2    E25B    0618
CR       000D    0326 0338 0365 0420 0494 0559 0572 0862 0864 0864 0866
                 0869 0869 0873 0876 0876 0883 0888 0888 0890 0890 0895
                 0895 0898 0902 0902 0905 0905 0907 1499 1533 1541 1560
```

CROSS REFERENCE

```
                  1838
CRCBYT   0046     0074 0720 0765 0771 1219 1335 1361 1568
CRCMSG   E408     0445
CRCOMP   E2FD     0747
CREAT    E85C     0806 1545
CREAT1   E873     1542
CRLF     E205     0259 0334 0339 0916 0944 0955 0975 1285 1421 1557 1713
CURLFT   EABA     1847
CURRGT   EA34     1849
CURUP    EAA3     1843
DEBOUN   EB5B     2079 2081
DELAY    E2A0
DELAY1   E2A2     0695
DELAY2   E2A3     0689
DELAY3   E2A6     0688
DHEAD    E417     0929
DTIME    0100     2077
DUMP     E4D3     0794
DUMP1    E4EE     0959
DUMP2    E4F8     0956
DUMP3    E501     0954 0965
ENDCK    E93C     1603 1613 1624 1636
ENDTBL   E34E
ENTER    E538     0796
ENTER1   E544     0986
ENTER2   E54F     0995
ERRCMD   E134     0266
ERRCRC   E1E3     1338
ERRMSG   E3DD     0433
ERRPAR   E1DE     0604 0608 0918 0977 1006 1010 1045 1059 1069 1075 1078
                  1165 1166 1168 1174 1500 1580 1584
ESC      001B     1998
ESCCHK   EAD1     0741 0934
FILES    E6B9     0802
FILES1   E6C4     1242
FILES2   E6CD     1252 1254
FILES3   E6E4     1267
FILES4   E704     1284
FILHD    E453     1245 1472
FINEND   EC10     2062 2175
FINISH   E1D4     0362 0820 0935 1305 1327 1353 1358 1465 1607 1629 1695
FINOP    EBD0     2122 2124
FNDMSG   E4CA     1429
FRMFED   EA45     1837
GETHD1   E724     1308
GETHED   E71B     1248 1424
GETIY    E1A2     0128 0141 0246 0673 0697 0740 0753 1828 1982 2046
GO       E597     0804
GRATBL   EC6E     2116
HADDR    0009     1171 1172 1437 1438
HCHOT2   E1FA     0475
HCHOT3   E200     0479
HCHOUT   E1ED     0466 0535
HEAD2    E3BC     0234
HEAD3    E3D5     0240
HEADLN   0010     1197 1303
HEDING   E362     0230
HEDPRT   E6DE     1249 1431 1474
```

CROSS REFERENCE

```
HEXSPC   E21C    0938 0962
HNAME    0000
HOMECU   EAC3    1853
HSIZE    0007    1184 1185 1322 1323 1460 1461
HTYPE    0006    1112 1479
HXEQ     000B    1118 1119 1482 1483
INADD    0041    0070 0131 0132 0217 0218 1152 1153
INITC    E062    0109
INITC2   E06B    0187
INITU    E077    0111
INITU1   E079
INITU2   E091    0210
INITU3   E0C8    0224 0227
INITW    E0E8    0110
INSTBL   EC1E    2070 2106
INTAPE   E00F    1151
IVCMSG   E3E6    0293
IVPMSG   E3F6    0443
KEYBD    EB1C
KEYBRD   E018    1145
KEYRET   EC1B    2182
KYPORT   00FE    1985 1986 1991 1992 2002 2003 2052 2053 2064
LDGMSG   E4BF    1456
LF       000A    0422 0496 1751 1840
LINE     0068    0083 1784 1785 1803 1804 1895 1896 1906 1907 1910 1911
                 1940 1941 1948 1949 1964 1965
LINE1    E148    0323 0343 0349 0353
LINE2    E167    0327 0333
LINE2A   E16E    0325 0329
LINE3    E181    0321
LINE4    E18A    0366
LINEIN   E13A    0262 0335 0981 1529
LINELN   003C    0066 0315
LINFED   EA4F    1841 1845
LIST     E884    0816
LIST1    E889    1561
LIST3    E88F    1563
LLN      EA7A    1905
LLN1     EA85    1922
LOAD     E78A    0800
LOAD1    E78D    1399
LOAD10   E822    1463
LOAD2    E7A9    1408
LOAD3    E7B8    1406 1411 1417
LOAD3A   E7BE    1486
LOAD3B   E7D3    1427
LOAD5    E7DE    1436
LOAD6    E7EC    1452
LOAD7    E7F8    1443 1444
LOAD7A   E807    1455
LOAD8    E80E    1470
LOAD9    E813    1468
LOADSK   E83F    1451
LODBAS   E799    0124
LSTKEY   006C    0086 2061 2183
MAIN1    E106    0292
MAIN2    E10B    0276
MAIN3    E11C    1084
```

CROSS REFERENCE

```
MAIN4    E123    0273
MLOOP    EB44    2176
MOTRO1   E297    0676
MOTRON   E28A    0121 0359 1193 1247 1422 1536 1556
MOVE     E562    0810
MOVE1    E589    1034
MOVE2    E58E    1015
MSGOT2   E1BE    0423
MSGOUT   E1BA    0231 0235 0241 0371 0421 0434 0436 0930 1246 1430 1457
                 1473 1647 1686 1708
MTROF1   E2B4    0438
MTROFF   E2AF    0122 0368 1207 1471 1544
NAMEN1   E27A    0659
NAMEN2   E282    0653
NAMFND   E264    1164 1402
NOGRAP   EBAE    2112 2114
NONCON   EB7B    2093
NONGRA   EB75    2090
NONSHI   EB81    2096
NORPT    EB3E    2055
NULL     E2C2    1194 1203 1537
NULL1    E2C4    0717
NUMBER   E255    0606
NXLOC    EA40    1874 1950
OKDAT1   EA3A    1890 1959 1967
OKDATA   EA33    1855
OKMSG    E4A6    1707
OUTADD   003F    0069 0151 0152 0220 0221 1136 1137
OUTAPE   E012    1132
OUTDLY   E051    0147
PARIN    E776    0119 1374
PARLIN   E01E    1148
PARLOT   E021    1129
PAROT1   E780    1382
PAROUT   E77F    0120
PCOLD    DFFD    0222 1732
PRMP1    E848    1503
PRMPTC   E845    0818
PROMP1   E98D    0229
PROMPK   E98A    0822
PROMPT   0044    0072 0211 0260 1505
PSCMSG   E4AB    1646
PTRSET   E9D6    1793 1814
PWARM    DFFA    0203 0225 1733
QUIK     EAD1    0116 0202 1605 1627 1694
QUIK1    EAF6    1988 1994
QUIK3    EAFA    1996
QUIK4    EB0A    2005
QUIKCK   E015
QUKRET   EB0C    1999 2007
QUKRT1   EB07    1997
RAM      0000    0179
RAMTOP   F000    0197 0198 0232 0387
REC      E9E8    1834
RECEVE   E009
REGRST   E92F    1600 1608 1620 1630
REPET    EB33    2060
RETURN   EA2C    1878 1884 1913 1924 1935 1957
```

CROSS REFERENCE

```
RUBOUT   007F    0330
SAVBAS   E65A    0123
SAVE     E638    0798
SAVE1    E679    1190
SAVE2    E685    1201
SAVE3    E697    1213
SAVE4    E69D    1211
SCAN     E225    0265 0564 0575 0920 0985 1009 1013 1073 1077 1173 1189
                 1415 1583 1587
SCANHL   E22F    0637 0917 0976 1005 1044 1058 1240 1395 1579 1731
SCANLT   E232    0577 1167 1409
SCREEN   F000    0079 0080
SDUMP    E52A    0921
SECEND   EBFF    2163
SEEIFR   E1A4    0383
SEND     E00C    1721
SET      E5A2    0808
SET1     E5AC    1071
SET2     E5C2    1062
SET3     E5D9    1080
SETFIL   E5EE    0846
SETIN    E61C    0850
SETIN1   E623    1144
SETIN2   E62A    1147
SETIN3   E631    1150
SETOT1   E600    1125
SETOT2   E607    1128
SETOT3   E60E    1131
SETOT4   E615    1134
SETOUT   E5F9    0848
SETTBL   E34F    1060
SHITBL   ED0E    2132
SKIP1    EBB8    2127
SKIP2    EBC1    2131
SKIP3    EBCA    2135
SKIP4    EBCD    2129 2133 2137
SKIP5    EBEB    2156
SKIP6    EC09    2171
SKIPF1   E73D    1330
SKIPF2   E741    1328
SKIPFL   E734    1253 1485
SLASH    E531    0948 0950 0952
SLOOP    EB4D    2167
SLOTBL   ED5E    2136
SPACE    0020    0328 0655 0728 0963 1282 1779 1854 1919 1931
SPACES   E2D2    0730 1269 1274 1698
SPEED    E5EA    0842
SPEEDS   003E    0068 0142 1106
STARP2   E985    1615 1638
STARP3   E987    1719
STARPT   E981    1606 1628
START    E0EB    0279 0439
STORE    006E    0199 0388
STUFF1   E8CB    1604
STUFF3   E8F5    1625
TABLE    E312    0267
TAPE     E5DE    0840
TAPE1    E5E6    1098
```

CROSS REFERENCE

```
TAPEIN   E2DA    0114 0361 1304 1326 1336 1352 1357 1464 1559
TAPES    003D    0067 0212 0674 1100
TAPIN1   E2DF    0745
TAPLV2   E30C    0779
TAPLVE   E30F    0742
TAPOT1   E2F4    0757
TAPOUT   E2EE    0115 0716 0719 1199 1209 1540 1569
TAPWT    E759    0360 1300 1321 1458 1558
TAPWT1   E75A    1355
TAPWT2   E75C    1356
TAPWT3   E767    1360
TEST     E8A1    0812
TEST1    E8BD    1653
TEST2    E8C8    1617
TEST3    E8F1    1640
TESTHD   E475    1685
THEAD    0057    0081 1250 1264 1271 1277 1278 1306 1322 1323 1425 1437
                 1438 1449 1453 1460 1461 1479 1482 1483
TOP      F800
TOPHRG   00F8    1778
UARTD    00FC    0746 0759
UARTS    00FD    0743 0755
UNSTBL   EDAE    2138
USER     E006
VDHLD    0067    0082 1795 1815
VID      F080    1777 1802 1914 1915
VIDEO    E01B    1126 1750
VIDINT   E9B1    0214 1883
WAITK    EBDA    2150
WARM     E003
WCSET    EB10    1788
WCUR     E9CC    1856 1877 1912 1923
WFBTZ    E1AD    0386
WHAT     E1C9    0294 0444 0446
WHAT1    E1CD
WINPK5   0008    0385
WRCRC    E89B    1202 1212 1543
XEQSET   E5F2    0844
```

SUMMARY

I hope the information found in this manual will help you use the wonderful features of the Sorcerer Computer to their fullest extent. We went through a lot of design work on both the hardware and software of this machine, and it would be a shame not to take advantage of that effort.
Enjoy!